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F&U inden for avanceret kommunikationsteknologi i Europa (RACE)

Endelig rapport om fase 1 (1988-1992)
af det tiårige RACE-program

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(forelagt af Kommissionen i henhold til artikel 6, stk. 3, og artikel 9 i Rådets beslutning 88/28/EØF vedrørende RACE-programmet)

## Indholdsfortegnelse

# Sammenfatning

Telekommunikation er blevet et uundværligt element i produktions- og servicesektoren i Europa, og velfungerende teletjenester er en forudsætning for erhvervslivets konkurrencevne. Det grænsefrie Europæiske Økonomiske Samarbejdsområde vil ikke blot åbne nye muligheder, men også skabe nye konkurrencemæssige udfordringer. Efterhånden som telekommunikation bliver stadig vigtigere i international handel, er måden erhvervslivet opererer på under forandring. Europas succes i 1990'erne er kritisk afhængig af velfungerende kommunikation.

Den årlige omsætning i tele-, computer- og radio/tv-sektoren udgør allerede mere end 500 mia. ECU på verdensplan. I år 2000 vil telekommunikation være den tredjevigtigste sektor i Europa, kun overgået af levnedsmiddelsektoren og den kemiske industri. Infrastrukturen inden for telekommunikation vil være økonomisk vigtigere end de fysiske transportinfrastrukturer. Væksten inden for økonomi og beskæftigelse kommer således i høj grad til at afhænge af, om der er styr på teknologien. I dag baserer mere end halvdelen af beskæftigelsen sig på informations- og telematiksystemer, og størstedelen af væksten i beskæftigelsen foregår i informationssektoren.

Efterspøgslen efter tjenesteydelser ændrer sig hastigt. Virksomhederne har brug for mere fleksible tjenester, højere data- og billedtransmissionskapacitet og mere konkurrencedygtige priser. Den årlige tilvækst for tillægstjenester via digitale net med høj transmissionshastighed ligger nu på ca. 40%, med 40 mio. kombinationer af tjenester og brugere i 1987, 180 mio. i 1989 og mere end 300 mio. i 1991. Det ventes, at helt op til 30% af omsætningen inden for telekommunikation i år 2000 vil stamme fra tillægstjenester. Inden for de næste år vil de fleste større europæiske virksomheder have behov for at sammenkæde design, produktion, ledelse og distribution via hurtige kommunikationsforbindelser. Denne tendens tegner sig allerede kraftigt i USA, hvor alle større forskningsinstitutter har adgang til meget hurtig datakommunikation, og 60% af de 500 største virksomheder overfører data via digitale net med høj transmissionshastighed.

I erkendelse af denne udvikling blev der i 1985 iværksat en "definitionsfase" som led i RACE-programmet på initiativ af Ministerrådet (industri). Her blev det slået fast, at det ville være muligt og nyttigt at etablere en europæisk ramme for samarbejde på F&U-området. Ministerrådet vedtog i december 1987 en beslutning om første fase af det 10-årige program RACE (Research and development in Advanced Communications technologies in Europe). Heri fastlagde man en politik og et budget for den første periode på fem år, indtil 1992, som led i EF's 2. rammeprogram for forskning og teknologisk udvikling. Det var tanken at "gøre Fællesskabets telekommunikationsindustri, teleoperatører og teletjenesteleverandører mere konkurrencedygtige med henblik på hurtigst muligt og med de lavest mulige omkostninger at give slutbrugerne adgang til tjenester, der kan opretholde den europæiske økonomis konkurenceevne i de næste årtier og bidrage til at bevare og skabe beskæftigelse i Fællesskabet".

I beslutningens artikel 9 bestemmes følgende: "Ved afslutningen af programmets første femårsperiode tilsender Kommissionen, efter høring af Komitéen, medlemsstaterne og Europa-Parlamentet en rapport over udviklingen og resultaterne af programmet". Nærværende dokument udgør den omtalte rapport. Den ligger i forlængelse af 30-måneders-rapporten fra 1990.

## De vigtigste resultater

Det arbejde, der er blevet gjort i løbet af RACE-programmets første fem år, har givet Europa en klar føring i forbindelse med den overordnede udvikling af avancerede telenet og -tjenester. For første gang er teleoperatører, telematikindustrien og førende brugere i de fleste anvendelsessektorer gået sammen om at udvikle avanceret teknologi, som er en forudsætning for billige og nyskabende tjenester. RACE-programmet har skabt et enestående miljø, hvor parterne trækker på samme hammel.

RACE-programmet har styrket harmoniseringen af den europæiske infrastruktur på teleområdet; med udarbejdelsen af EF-dækkende funktionsspecifikationer er der etableret en "skabelon" for integreret bredbåndskommunikation. Programmet har skabt et nært samarbejde mellem kerneområder og randområder, hvilket har styrket den økonomiske og sociale samhørighed i EF. På teknologiudviklingsområdet har udviklingen af ATM inden for højhastighedskobling af digital kommunikation givet den europæiske industri et forspring i den internationale konkurrence; europæiske systemer til styring af net er internationalt anerkendte på grund af den forskning, der udføres på dette område; arbejdet med digital video og tv er mundet ud i internationale kodningstandarder, systemer til fremføring af multigigabittransmissioner samt specifikationer for digital video. På standardiseringsområdet er der som led i programmet forelagt 596 udkast til specifikationer for europæiske og internationale organisationer - ETSI, CCITT og CCIR (se bilag II). RACE og EUREKA er kommet til at supplere hinanden på en meget positiv måde, og der er offentliggjort over 1700 videnskabelige og tekniske dokumenter (se bilag III).

RACE-programmets resultater giver de europæiske teleorganisationer og -tjenesteleverandører en strategisk konkurrencefordel. RACE har gjort erhvervslivet mere opmærksom på, hvordan den næste generation af teletjenester i Europa vil forøge markedsmulighederne. Programmet viser tydeligt, at det er en fordel at samarbejde på europæisk plan om konkurrenceforberedende F&U, og den europæiske standardisering er således blevet styrket betydeligt inden for teleområdet.

## Forvaltning og evaluering af RACE-programmet

RACE-programmet er noget enestående inden for EF's 2. rammeprogram: det er det eneste program, som forvaltes som et samlet sæt opgaver; hvert enkelt projekt har sigtet mod en eller flere af et sammenhængende sæt F&U-opgaver, som hver især har bidraget til den fælles målsætning:

*"Indførelse af integreret bredbåndskommunikation under hensyntagen til det tjenesteintegrerede digitalnet (ISDN), der er under udvikling, og de nationale introduktionsstrategier med gradvis udbygning til EF-dækkende tjenester frem til 1995."*

I programmets arbejdsplan, som blev vedtaget i 1987, fastlagdes det, hvordan arbejdet i og mellem de forskellige projekter skulle foregå. Den vekselvirkning, man her søgte at opnå, er yderligere blevet styrket ved regelmæssig "samordning" af projekterne, i form af tekniske møder med intervaller på 6 – 8 uger, hvor samtlige projekter skulle være repræsenteret. De tekniske resultater af projekterne er endvidere cementeret ved et nøgleprojekt, hvor man skulle udforme strategier for indførelse af integreret bredbåndskommunikation (IBC), funktionsreferencemodeller, kundeservicefunktioner og referencekonfigurationer. Det stærke samspil med de europæiske standardiseringsorganisationisationer er fortløbende blevet sikret via en andet nøgleprojekt, som skulle sikre opbakning bag standarder og udarbejdelse af EF-dækkende funktionsspecifikationer.

Den høje grad af integration i programmet har også afspejlet sig i evalueringen og revisionen af arbejdet.

Der blev foretaget en strategisk revision af det samlede program i 1989, hvor man evaluerede arbejdet på baggrund af strategiske og politiske målsætninger for EF. I henhold til den tidligere omtalte beslutning blev der i "30-måneders-rapporten" aflagt rapport til Ministerrådet og Europa-Parlamentet om, hvordan arbejdet skred frem. I 1990 foretog et uvildigt panel af højtstående personer inden for industrien og medlemsstaternes administrationer en nyvurdering af behovene i forbindelse med F&U (Telecom 2000). I 1991 og i starten af 1992 blev arbejdet evalueret, sammenholdt med det 2. rammeprograms andre store programmer vedrørende informationsteknologi og telematik (ESPRIT og DRIVE), af et uafhængigt panel[1]. Endelig fremlagde Kommissionen i 1992 en rapport om programmet som led i evalueringen af det 2. rammeprogram[2], ligesom forvaltningskomitéen for RACE på opfordring af CREST selv foretog en evaluering[3].

Sideløbende med den FTU, der er udført i programmet, er der foretaget regelmæssige vurderinger af de økonomiske og sociale følgevirkninger af udviklingen af avancerede kommunikationsmidler[4]. Den seneste af disse vurderinger foregik i 1991, og resultaterne blev offentliggjort i 1992. Størstedelen af resultaterne er fuldt integreret i den anden fase af RACE i henhold til bestemmelserne i Rådets beslutning om særprogrammet for kommunikationsteknologi.

De programforvaltningsmetoder, som Kommissionen har fastlagt for RACE, blev underkastet en uvildig "programforvaltningsrevision" i 1989, som til fulde støttede Kommissionens holdning.

Hvad angår de enkelte projekter, udsættes de hvert år for en "teknisk revision", som foretages af uvildige tekniske eksperter inden for de pågældende forskningsområder. Den første af disse kontrolforanstaltninger fandt sted i oktober 1988, og den sidste i oktober 1992. Resultaterne heraf har tjent som beslutningsgrundlag for at tilpasse eller om nødvendigt afslutte forskellige projekter.

Samtlige vurderinger og revisioner har vist, at RACE-programmet har fungeret godt på baggrund af de oprindelige målsætninger.

Det arbejde, der blev sat i gang i første fase af RACE, er nu blevet fulgt op og udvidet med F&U-projekter i det nye særprogram for FTU inden for kommunikationsteknologi, som udgør anden fase af RACE. Den indgår i EF's 3. rammeprogram, hvorunder der blandt andet ydes delstøtte til F&U frem til december 1994. Disse projekter begyndte i januar 1992, og kontinuiteten er blevet sikret gennem de overlappende fase 1-projekter i 1992. Programmet vil fortsat spille en væsentlig rolle for den økonomiske udvikling og den sociale og økonomiske samhørighed i Europa. Det bakkes op af nationale tiltag[5] og internationale foranstaltninger, såsom EURESCOM's[6], som forstærker og forstærkes af EF-foranstaltningerne. RACE-programmet er en enestående ramme, inden for hvilken netoperatører, industrien og brugerne samarbejder.

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1) Rapporten fra revisionspanelet for informations- og kommunikationsteknologier med W. Dekker som formand, juni 1992.
2) Meddelelse fra Kommissionen: Evaluering af det andet rammeprogram for forskning og teknologisk udvikling (SEK(92)675 endelig udg.), juli 1992.
3) Se punkt 3.2.1 i nærværende rapport.
4) Rapporterne herom er blevet udsendt til vide kredse under titlen "Perspectives for Advanced Communications in Europe: PACE"
5) Forsøg med bredbåndskommunikation er under etablering i B, D, DK, F, IRL, P og UK.
6) Det europæiske institut for telekommunikationsforskning og strategiske studier GmBH.

# F&U inden for avanceret kommunikationsteknologi i Europa (RACE)

Endelig rapport om fase 1 (1988-1992)

af det tiårige RACE-program

## 1. Indledning

Telekommunikation er den mest dynamiske og ekspanderende af samtlige industrisektorer i Europa. Teletjenester skaber en omsætning på mere end 300 mia. ECU pr. år i Europa, og den årlige investering i telenet og -tjenester beløber sig til nær ved 30 mia. ECU. Hovedparten af omsætningen stammer stadig fra taletelefoni, men investeringerne retter sig nu først og fremmest mod de nye generationer af digitalt udstyr, hvormed man kan integrere tale-, data- og billedkommunikation. I år 2000 ventes helt op til 30% af indtægterne på telekommunikation at stamme fra tillægstjenester, som anvender avanceret datakommunikation.

Over hele verden påvirker det stigende sammenfald mellem informationsteknologi, radiospredning og telekommunikation alle aspekter af samfundet. Kombinationen af databehandlingsteknikker og nyskabelser inden for telekommunikation har allerede ført til ISDN (det tjenesteintegrerede digitalnet), men det er kun første skridt i en hastig udvikling henimod et langt bredere udvalg af multimedietjenester, som vil forudsætte ny teknologi og nye net- og tjenesteforvaltningssystemer og ny lovgivning. Kombinationen af tjenesteintegration og lyslederkabler, som muliggør omkostningseffektiv transmission med høj hastighed (en million gange hurtigere end via kobberkabler), giver teknisk og økonomisk grundlag for en fundamental omlægning af alle disse sektorer via integreret bredbåndskommunikation (IBC). Udviklingen heraf er målet for RACE-programmet.

I nærværende rapport gives en oversigt over samt dokumentation for resultaterne af første fase af det ti-årige RACE-program, dvs. perioden fra 1988 til 1992.

I anden del redegøres for, hvordan programmet er udformet og hvilke resultater det har givet, samt hvilken sammenhæng det indgår i, mens det i tredje del beskrives, hvordan programevaluering og -revision er udformet, samt hvilke resultater disse aktiviteter har givet. Forbindelserne til andre EF-foranstaltninger og europæiske foranstaltninger beskrives i fjerde del. Resultaterne af F&U i første fase af RACE er allerede i vidt omfang blevet udnyttet, både i forbindelse med udarbejdelse af standarder og idriftsætning af nye net og tjenester samt som grundlag for yderligere arbejde i programmets fase II. I femte del beskrives det, hvordan man har udnyttet resultaterne af fase I af RACE, og overgangen til fase II beskrives i sjette del. I syvende del redegøres der for, hvilket arbejde man bør og kan udføre på europæisk plan.

I bilag I findes en detaljeret oversigt over, hvilke resultater der er opnået ved F&U-projekterne. Bilag II indeholder en fortegnelse over bidrag til standardiseringsfremmende arbejde, og bilag III er en liste over samtlige videnskabelige og tekniske publikationer, som arbejdet har givet anledning til. Bilag IV indeholder en liste over patentansøgninger; bilag V er en ordliste over tekniske termer, mens der i bilag VI henvises til formelle ministerrådsbeslutninger og -afgørelser samt meddelelser fra Kommissionen. Bilag VII er en liste over F&U-projekter, som har modtaget støtte i fase I af RACE; I bilag VIII angives det, hvilke organisationer, der har deltaget, og sluttelig indeholder bilag IX statistiske oplysninger om finansiering af og deltagelse i projekterne.

## 2. RACE-programmets kontekst og udformning

### *2.1 F&U som led i EF's politik for teleområdet*

RACE-programmet udgør en integrerende del af EF's politik for teleområdet. Det hænger nært sammen med den politik, der føres i forbindelse med standardiseringsområdet og informationsmarkedet, ligesom det bygger videre på nyskabelser inden for informationsteknologi i forbindelse med ESPRIT. Programmet er ligeledes nyskabende derved, at man inddrager de europæiske telenetoperatører som væsentlige deltagere i et nært samarbejde om udviklingen af teknologi og tjenester. Eftersom omkostningsniveauet i Europas fremtidige kommunikationsinfrastruktur spiller en væsentlig rolle i RACE, har programmet medvirket til at virkeliggøre det indre marked samt til at øge den europæiske industris konkurrencedygtighed og den sociale og økonomiske samhørighed i Fællesskabet.

De vigtigste målsætninger i EF's politik for teleområdet er, som omhandlet i Rådets resolution af 30. juni 1988[1]:

- at sikre netintegriteten i hele Fællesskabet, jævnfør princippet om fuld interkonnektivitet mellem alle berørte offentlige net
- gradvis at skabe et åbent fælles marked for teletjenester
- at fremme skabelsen af Europa-dækkende tjenester i overensstemmelse med markedsbehov og samfundsmæssige behov
- at videreudvikle et åbent EF-dækkende marked for terminaludstyr
- at udvikle et fælles marked, hvor teleadministrationer og andre televirksomheder kan konkurrere på lige fod
- at videreføre Fællesskabets foranstaltninger for fælles standarder
- at stimulere til europæisk samarbejde på alle niveauer, specielt inden for forskning og udvikling på teleområdet
- at skabe et socialt miljø for den fremtidige udvikling af teleområdet, og
- fuldt ud at integrere Fællesskabets mindre gunstigt stillede områder i det fremvoksende fælles marked.

Med disse målsætninger er der udstukket en klar ramme for, hvordan teknologi, tjenester og anvendelsesområder kan udvikle sig fremover.

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1) Rådets resolution 88/C 257/01 af 30. juni 1988 om etablering af et fælles marked for teletjenester og -udstyr inden 1992 (EFT nr. C 257 af 4.10.1988, s 1).

*2.2 Målsætningerne for RACE*

Det er først og fremmest meningen, at RACE skal medvirke til

*"Indførelse af integreret bredbåndskommunikation (IBC)[2] under hensyntagen til det tjenesteintegrerede digitalnet (ISDN), der er under udvikling, og de nationale introduktionsstrategier med gradvis udbygning til EF-dækkende tjenester frem til 1995.[3]"*

Fase I havde følgende specifikke målsætninger:

- at fremme EF's teleindustri
- at give de europæiske netoperatører mulighed for at konkurrere på bedst mulige vilkår
- at gøre en tilpas stor del af medlemsstaterne i stand til at indføre økonomisk levedygtige IBC-tjenester inden udgangen af 1995
- at give tjenesteleverandørerne mulighed for at øge omkostningseffektiviteten og tilbyde nye tjenester til mindst lige så lave priser og lige så hurtigt som andre steder
- at støtte dannelsen af et indre europæisk marked for teleudstyr og -tjenester, samt
- at medvirke til regionaludviklingen ved at lade de mindre gunstigt stillede regioner drage den fulde nytte af udviklingen på teleområdet.

Derudover opstilles der i bilag I til beslutningen en række tekniske målsætninger. I tabel 1 beskrives det, hvordan F&U-projekter under RACE har medvirket til at virkeliggøre disse målsætninger.

Under udarbejdelsen og gennemførelsen af programmet har der været en ændring i, hvordan man forstår udtrykket "integreret bredbåndskommunikation" som følge af nye markedsmæssige og lovmæssige forhold. Nedenstående definition afspejler de konklusioner, man nåede frem til i forvaltningskomitéen for RACE i 1990.

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2) "I" for "integreret" betyder ikke kun "integrerede tjenester" (på brugerniveau og i de relevante netlag), men også, at der er sammenhæng i hele nettet, dvs. at der kan etableres samtrafik mellem alle dets dele, både eksisterende og kommende: telefoni, pakkekobling, ISDN, satellit- og mobiltjenester osv.

"B" for "bredbånd" henviser ikke blot til den "øvre ende" (m.h.t. bithastighed) af tjenesterne, men også til det samlede udvalg af tjenester, der kommer i betragtning, begyndende med den "øvre ende" af ISDN (i hvert fald fra og med tilslutninger på 2 Mbits/s og inden for bestemte anvendelsesområder muligvis endda 64 Kbits/s) og op til det, som det realistisk set vil kræve at indføre interaktive og distributive videotjenester (f.eks. 140 Mbit/s).

"C" for (eng.) "communication" henviser ikke kun til "gammeldags" opkoblings- og transmissionsfunktioner og abonnentnetplacerede net, men også til de mest avancerede funktioner, der skal gøre tjenesteudbuddet brugervenligt, ydedygtigt og økonomisk bæredygtigt.

3) Rådets beslutning af 14. december 1987 om et fællesskabsprogram inden for telekommunikationsteknologi - forskning og udvikling inden for avanceret kommunikationsteknologi i Europa (RACE-programmet) (EFT nr. L 16 af 21.1.88, s. 35)

# Tabel 1

| Tekniske målsætninger | Måder hvorpå målene søges nået i RACE | Virkninger af RACE-arbejdet |
|---|---|---|
| *Målsætninger i del I: Strategier for udvikling og implementering af IBC* | | |
| Fælles opfattelse af IBC-udviklingen og dens betydning | Etablering af samarbejde mellem operatører, industri og brugere<br><br>Fælles strategisk teknisk-økonomisk analyse, som bl.a. omfatter efterspørgsel og teknologiske muligheder | Udarbejdelse af en fælles metode for "systemkonstruktion" i forbindelse med planlægning af netudvikling<br><br>Fastlæggelse af, hvordan IBC bedst kan indføres<br><br>Fælles fastlæggelse af de vigtigste tekniske emner<br><br>Konsekvent EF-holdning til internationale aktiviteter uden for RACE |
| Fælles definition af IBC-systemer og -delsystemer | Udarbejdelse af en referencekonfiguration til brug ved fastlæggelsen af systemstrukturen i det integrerede bredbåndskommunikationsnet (IBCN) og af anvendelige implementeringsmåder og teknologiske muligheder | Styrkelse af europæisk standardisering<br><br>Enighed om en fælles europæisk strategi for ATM-specifikationer |
| Retningslinjer for funktionsspecifikationer for IBC-systemer og integrerede tjenester | Udarbejdelse af en funktionsreferencemodel, herunder en logisk struktur for funktioner og grænseflader | Enighed om fælles funktionsspecifikationer<br><br>Enighed om koncepter og protokoller for "netintegration"<br><br>Enighed om muligheder for opbygningen af abonnentnettet for bredbåndskommunikation på mellemlang og lang sigt |
| Bestemmelse af teknologi- og F&U-behov | Fælles udarbejdelse af en brugsreferencemodel med henblik på at sammenholde brugernes behov med de tekniske muligheder<br><br>Fælles vurdering af teknologiske nyskabelser | Europæisk F&U-fokusering på nøgleteknologier og nye brugerbehov |
| Bedømmelse af omkostningseffektivitet ved alternative implementeringsmåder | Udarbejdelse af fælles metoder til vurdering af teknisk-økonomiske og driftsmæssige faktorer | Der er udviklet fælles metoder til teknisk-økonomisk analyse samt avanceret netplanlægning og -forvaltning |
| Behovsanalyse i forbindelse med standardisering | Regelmæssige møder med standardiseringsorganisationer; samordning mellem konsensusforvaltningsprojektet og (ETSI), og fælles analyse af standardiseringsbehov, som følger af udviklingen i brugernes behov på verdensplan | 596 bidrag til standardiseringsorganisationer (bilag II) |

# Tabel 1

| Tekniske målsætninger | Måder hvorpå målene søges nået i RACE | Virkninger af RACE-arbejdet |
|---|---|---|
| *Målsætninger i del II: IBC-teknologi* | | |
| Anvendelse af avanceret teknologi til omkostningseffektiv iværksættelse af IBC | F&U i komponenter, delsystemer og systemer, hvor omkostningskritiske optiske komponenter, både til bredbåndstransmission frem til abonnenterne og til centraler<br><br>Analyse af mulighederne for omkostningsreduktioner på kort sigt<br><br>Analyse af mulighederne for væsentlige omkostningsreduktioner og forbedring af tjenester på mellemlang/lang sigt | Specificering og prototypeudvikling af konnektorer, lasere og koblingselementer til lokalnet, abonnentplacerede net og lign. Demonstration heraf og forslag til billige produktionsprocesser<br><br>Udvikling af "direkte" og "kohærente" detekteringsteknikker. Udvikling af ATM-teknologi med henblik på omkostningseffektiv brug af båndbredderessourerne<br><br>Udvikling af kompatible algoritmer til bitkompression i forbindelse med digital HDTV og højkvalitetsvideotjenester samt udvikling af billige KODEK |
| Telekommunikationsprogrammel til komplekse integrerede systemer | Udvikling af en ny arkitektur for tilrådighedsstillelse af tjenester: Open Service Architecture<br><br>Analyse af muligheder for at anvende avancerede informationsbehandlingsteknikker til at implementere IBC-funktioner<br><br>Analyse af nye programmelteknologi til specifikation, design, implementering, verifikation og vedligeholdelse af telesystemer | Udvikling af "objektorienteret" programmering til telesystemer. Validering af integrerede programmelkonstruktionsmetoder på prototypeplan<br><br>Udvikling af TMN-arkitekturer og prototyper til trafikforvaltning, vedligeholdelse, kvalitetskontrol for tjenester, abonnent- og netforvaltning samt sikkerhed i kommunikationen<br><br>Specifikationsmetoder, udviklingsmiljø og on-line assistance for telesystemer<br><br>Fastlæggelse af integritetskoncepter for IBC-tjenester, samt en fortegnelse over grundprincipper for integritet |
| Fremskridt med hensyn til IBC-udstyrets ergonomi og kognitive muligheder | Analyse af, hvilke faktorer der påvirker brugsegnetheden af dialog-, distibutions- og genfindingtjenester samt integrerede tjenester og abonnentplacerede net<br><br>Analyse af brugsegnethedsspørgsmål for mennesker med særligt behov (f.eks. ældre og handicappede)<br><br>Udarbejdelse af designmål i forbindelse med brugsegnethed<br><br>Inddragelse og evaluering af brugsegnethedsforsøg i praktiske forsøg | En taksonomi for teknisk udvikling i forbindelse med brugsegnethed<br><br>Anvendelse af brugeregnede tjenester i forsøg med avanceret kommunikation, herunder også for mennesker med særligt behov<br><br>Større samspil mellem brugsegnethedsforskere, brugere og udstyrskonstruktører<br><br>Fælles plan for indkredsning og analyse af almindelige brugsegnethedsproblemer i pilotprojekter for anvendelsesområder |

# Tabel 1

| Tekniske målsætninger | Måder hvorpå målene søges nået i RACE | Virkninger af RACE-arbejdet |
|---|---|---|
| Realisering af fremtidssikrede delsystemer og net | Definition og demonstration af generiske arkitekturer for IBC-systemer og -delsystemer, herunder reduktion af bithastigheder ved video | Specifikation af funktions- og designkrav til lokalnet, abonnentplacerede net og terminaler (multi-service, multimedia, herunder også digital video og tynde skærme) |
| | Etablering af principper for abonnentplacerede net med henblik på at opfylde behov i boligen og erhvervslivet | Demonstration af tynde EL-farveskærme og drivere |
| | Prototyper af forskellige terminaler | Designs for komponenter og delsystemer til abonnentplacerede net i ATM-miljø i boligen og erhvervslivet |
| | Tilpasningsdygtige systemer, som muliggør glidende udvikling fra de nuværende systemer til IBC | Specifikationer for integrerede systemer og validering af disse ved demonstration |
| | Integrerede systemer, der omfatter lokalnet, abonnentplacerede net og terminaler, indbyrdes forbundet gennem vedtagne grænseflader | |
| *Målsætninger i del III: Forsøgsordning for anvendelse af IBC* | | |
| Udvikling af afprøvningsmetoder, afprøvning af konstruktionsprincipper, funktionsgrupper eller protokoller | Udvikling af værktøjer og procedurer til prøvning af netelementer og delsystemer til IBC | Indkredsning af metoder og IBC-funktioner i terminaler og abonnentplacerede net samt i koblingselementet på lokal- og hovedcentraler |
| | Afprøvning af protokoller ved kritiske IBC-referencepunkter | Identifikation af tilslutningspunkter og -protokoller for prøvning. Anbefalede metoder til afprøvning af, hvorvidt protokollerne overholdes |
| Forbedring af funktionsspecifikationer og/eller afprøvning af standardforslag | Integration af pilotsystemer med henblik på afprøvning af samtrafikprotokoller | Specifikation af systemer og delsystemer i multiservicemiljø |
| | Standardforberedende afprøvning af kritiske punkter for standardisering og specificering | Validering af ordninger til påvisning af driftskompatibilitet og overholdelse af standarder og specifikationer |
| Udvikling af forsøgssituationer, hvor tjenesteleverandører, netoperatører og brugere kan afprøve IBC-forsøgsprodukter med henblik på at afgøre, hvorvidt der er basis for kommerciel udnyttelse | Definition af fremtidige tjenestebehov i samarbejde med førende brugere i alle større erhvervsbrancher | Praktiske forsøg i alle større sektorer: bankvæsen og finansiering, forsikring, medie- og udgivelsesvirksomhed, fremstillingsvirksomhed, sundhedsvæsen, mennesker med særligt behov, transport og distribution, forsøg med højopløsnings-tv |
| | Etablering af IBC-pilotprojekter på forskellige steder i Europa | |
| | Udforskning af forhold vedrørende sammenkobling og samfunktionalitet | Aftaler om sammenkobling af pilotprojekter og fastlæggelse af, hvad dette forudsætter |

*2.3 Gennemførelsen af programmet*

Som følge af den europæiske telesektors hastige udvikling besluttede man at gennemføre RACE-programmet i flere faser. Programmet indledtes med en definitionsfase[4] i 1986. Derefter fulgte fase I, som denne rapport omhandler. Den begyndte formelt i juni 1987 og sluttede i december 1992.

I fase I foregik arbejdet i tre dele:

**Del I - udviklings- og gennemførelsesstrategier for IBC**

Projekterne i Del I beskæftigede sig med udvikling af funktionsspecifikationer, systemer og driftsanalyse med henblik på at opstille forslag til IBC-standarder, koncepter og konventioner som led i tilrådighedsstillelse af åbne systemer, samt med analyse af interoperabilitet mellem IBC-udstyr og -tjenester. Resultaterne af projekterne i Del I er offentligt tilgængelige og udgør et vigtigt bidrag til arbejdet i de internationale standardiseringsorganisationer.

**Del II - IBC-teknologi**

Projekterne i Del II beskæftigede sig med de tekniske problemer ved at indføre IBC. Dette arbejde har spillet en stor rolle i forbindelse med udviklingen af den teknologi, der er nødvendig for at indføre IBC-udstyr og tjenester til en realistisk pris.

**Del III - standardforberedende funktionel integration**

Projekterne i Del III beskæftigede sig med standardforberedende målsætninger i forbindelse med indførelsen af et "åbent verifikationsmiljø", beregnet til at vurdere funktioner og driftsprincipper. I tyve af projekterne i denne del af programmet anvendtes pilotapplikationer af avanceret kommunikation til forskellige anvendelser i erhvervs- og servicesektoren. I disse projekter afprøvede man, hvorvidt nyt udstyr og nye anvendelser levede op til de funktionsspecifikationer og standardiseringsforslag, der var opstillet i projekterne i Del I.

RACE-programmet blev gennemført i to trin. Det første sæt projekter, som begyndte i januar 1988, drejede sig om systemudvikling (Del I) og teknologiarbejde (Del II)[5]. Det andet, som drejede sig om analysering af fremtidige tjenester samt systemintegration og -verifikation (Del III) dannede grundlag for en indkaldelse af forslag i juli 1988. Disse projekter blev sat i gang i januar 1989.

Vægtningen af de forskellige dele af programmet udviklede sig under udvælgelsen af projekter og under gennemførelsen af programmet. De midler, der var afsat til Del I, blev forøget fra de forventede 11,9% til 18%, mens Del II blev reduceret fra 66% til 55% og Del III steg fra 22,4% til 27%. Denne udvikling afspejlede, at vægten flyttede sig fra teknologiudvikling til tjenesteudvikling og efterspørgselsanalyse, ligesom kvaliteten af forslagene i Del I og II af programmet medvirkede til udviklingen.

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4) Rådets afgørelse 85/372/EØF af 25. juli 1985 om en definitionsfase for en fællesskabsaktion inden for telekommunikationsteknologi - F&U-program inden for avanceret kommunikationsteknologi for Europa (RACE) (EFT nr. L 210 af 7.8.1985, s. 24)

5) Meddelelse fra Kommissionen til Rådet og Parlamentet: På vej mod Telekom 2000: iværksættelse af RACE-programmet (KOM(88)240 endelig udg. af 31.5.88)

Denne fordeling af de finansielle midler fremgår også af Tabel 2.

TABEL 2

OVERSIGT OVER ANVENDELSEN AF DE FINANSIELLE MIDLER I RACE-PROGRAMMETS FASE I

| PROGRAM | AFSAT (mio. ECU) | AFSAT (%) | REELT BRUGT (%) |
|---|---|---|---|
| Del I | 60 | 11,9 | 18,0 |
| I.1 Strategier for IBC | 14 | 2,8 | |
| I.2 Indførelse af IBC | 28 | 5,5 | |
| I.3 Anvendelse af IBC | 10 | 2,0 | |
| I.4 Fælles driftsmiljø | 8 | 1,6 | |
| Del II | 332 | 65,7 | 55,0 |
| II.1 Systemfunktioner for IBC | 94 | 18,6 | 9,0 |
| Programmeringsinfrastruktur for IBC | 49 | 9,7 | 25,0 |
| Brugsegnethedsprogrammering | 12 | 2,4 | 11,0 |
| Netudvikling | 177 | 35,0 | 10,0 |
| Del III | 113 | 22,4 | 27,0 |
| III.1 Verifikationsmetoder | 63 | 12,5 | 6,0 |
| III.2 Pilotprojekter for anvendelse af IBC | 50 | 9,9 | |

De 92 F&U-projekter har haft deltagelse af 306 virksomheder, heriblandt samtlige større europæiske televirksomheder. Derudover også 27 organisationer fra EFTA-landene (Finland, Norge, Schweiz, Sverige og Østrig).

*2.4 De vigtigste resultater*

RACE har styrket harmoniseringen af den europæiske infrastruktur på teleområdet: dette er en forudsætning for virkeliggørelsen af det indre marked. De fælles funktionsspecifikationer kan ses som en model for europæisk bredbåndskommunikation. Det har kun været muligt at nå så vidt, fordi samtlige europæiske netoperatører, teleindustrien, radio/tv-organisationer og førende brugere har samarbejdet. Samarbejde har været en hjørnesten i RACE.

RACE har ligeledes skabt øget opmærksomhed om de ændringer, der sker inden for teleområdet, og dette har i høj grad været medvirkende til at give den europæiske teleindustri og tjenesteleverandørerne et strategisk forspring i konkurrencen på det stadig mere verdensomspændende marked for teleudstyr og –tjenester.

Ønsker man mere detaljerede beskrivelser af, hvilke resultater der er opnået i de enkelte projekter, henvises til nærværende rapports bilag I samt årsrapporterne for 1988, 1989, 1990, 1991 og 1992. I det følgende opsummeres de vigtigste resultater inden for programmets forskellige områder.

*De vigtigste resultater i Del I: Strategier for udvikling og indførelse af IBC*

Dette arbejde er mundet ud i en fælles opfattelse af, hvordan IBC bør udvikles, og hvad det vil forudsætte: et effektivt samarbejde mellem operatører, industri og brugere om udvikling af fælles funktionsspecifikationer for IBC og om fælles strategiske teknisk-økonomiske undersøgelser.

Der er etableret nære forbindelser til europæiske og internationale standardiseringsorganisationer. I 1989 blev der oprettet en gruppe, som skulle sikre samordning mellem konsensusforvaltningsprojektet og Det Europæiske Institut for Telestandarder (ETSI). Arbejdet med asynkron transmission (ATM) har direkte medvirket til at skabe enighed om en fælles europæisk strategi for dette område, ligesom det har sat skub i udarbejdelsen af internationale standarder.

Der er udarbejdet fælles definitioner af IBC-systemer og -delsystemer samt referencekonfigurationer, hvori man definerer systemstrukturen i IBCN-nettet. Der er vedtaget funktionsspecifikationer for IBC-systemer og integrerede tjenester. Der er opstillet en funktionsreferencemodel, som udstikker en logisk struktur for IBC-funktioner og -grænseflader. Den giver at fast holdepunkt, når det ved implementeringen skal fastlægges, hvilke krav og behov funktionerne skal opfylde. Der blev i 1990 udsendt fælles funktionsspecifikationer (CFS - *Common Functional Specifications*).

Der er opstillet definitioner for grænseflader ved de vigtigste referencepunkter i bredbåndsnet, ligesom komponent- og systemkrav er blevet defineret.

Der er udviklet en "brugsreferencemodel", som skal fungere som en model for, hvordan brugernes behov skal kobles til de funktionelle krav.

Der er foretaget systematiske vurderinger af de teknologiske og driftsmæssige muligheder, herunder optisk kommunikation, mobilkommunikation, satellitter, abonnentplacerede net, nye koblingsteknikker og HDTV.

Der er udviklet metoder til at bedømme omkostningseffektiviteten i alternative implementationsmåder: én af disse har at gøre med økonomisk analyse, en anden med netplanlægning og -standarder. Ved hjælp af disse metoder kan man sammenligne muligheder og strategier i de forskellige lande og sammenholde dem med tekniske og økonomiske forhold samt standardiseringsspørgsmål.

*De vigtigste resultater i Del II: IBC-teknologi*

F&U har hovedsagelig beskæftiget sig med omkostningskritiske optiske komponenter, delsystemer og systemer til bredbåndstransmission både til abonnenter og til centraler. Målet har været at finde omkostningseffektive løsninger til brug inden for alle vigtigere områder.

Tanken med ATM-teknologi er at indføre bredbåndskommunikation på en fleksibel og "fremtidssikret" måde. Man har udviklet og sammenlignet forskellige ATM-teknikker, og der er opstillet kravspecifikationer for ATM-koblingssystemer.

Der er udviklet kompatible videokodningsteknikker for (højopløsnings-)tv og videotelefoni, hvormed man kan sikre, at båndbredderessourcerne udnyttes på en omkostningseffektiv måde. Der er foretaget simuleringer for anvendelse af algoritmer til kompression i forbindelse med videotjenester af høj kvalitet (tv & videotelefon), og udviklingen af KODEK har allerede spillet en stor rolle i forbindelse med standardisering og kommerciel indførelse af billigere videokonferencer.

Der er sket store fremskridt inden for optiske kommunikationssystemer til fremføring af multigigabittransmissioner samt inden for fotonisk switching. Der er udarbejdet specifikationer for systemer, delsystemer og komponenter (konnektorer, lasere, koblingselementer og lignende) med særlig hensyntagen til prisniveauer på forskellige anvendelsesområder (lokalnet, abonnentplacerede net osv.). Forskellige komponenter og delsystemer er blevet fremstillet og demonstreret som prototyper.

Hvad angår software til integrerede komplekse telesystemer, er der udarbejdet objektorienterede modeller og defineret arkitekturer og prototyper for trafikforvaltning, vedligeholdelse og abonnent- og netforvaltning, ligesom der er etableret specifikationsmetoder og "udviklingsmiljø" for on-line assistance til telesystemer. Der er defineret en arkitektur for kommunikationssikkerhed.

Inden for ergonomisk og kognitiv forskning, er der opstillet en taksonomi for systemkonstruktion med henblik på brugsegnethed, der er fastlagt retningslinjer for konstruktion med henblik på brugsegnethed i forbindelse med avanceret kommunikation, herunder også for mennesker med særligt behov.

Der er udviklet generiske arkitekturer og hensigtsmæssige teknikker og teknologi for IBC-systemer og delsystemer, herunder videokompression. De fungerer som en model for, hvordan man kan opfylde privat- og erhvervssektorens og andre sektorers behov for en lang række forskellige anvendelser.

Der er foretaget afprøvning af forskellige typer terminaler med tynde skærme, som herefter er blevet tilpasset til anvendelse i IBC-tjenester. Funktionspecifikationer og teknologiske udviklinger er blevet valideret ved forsøg med integrerede systemer (som omfatter lokalnet, abonnentplacerede net og terminaler, sammenkoblet via fælles grænseflader ved S- og T-referencepunkter).

Forskningen i mobilkommunikation har fungeret som skabelon for 3. generation af cellebaserede radiokommunikationssystemer. Dette har ført til udarbejdelsen af UMTS (Universal Mobile Telecommunications), som forventes at opfylde efterspørgslen på det europæiske marked i midten af 90'erne.

*De vigtigste resultater i Del III: Udarbejdelse af gennemførelsesordninger for IBC*

Arbejdet på dette område har først og fremmest drejet sig om verifikationsmetoder og verifikation af designkoncepter, funktionsgrupper eller protokoller. Systemkonstruktører og testdesignere har i fællesskab udviklet metoder, hvormed der er foretaget afprøvning af terminaler, abonnentplacerede net, abonnenttilkoblingssystemer, lokal- og hovedcentraler og transmissionssystemer. Der er etableret netprøvningscentre og -protokoller.

I de pilotprojekter, der er igangsat vedrørende IBC, har tjenesteleverandører, netoperatører og brugere afprøvet IBC-forsøgsprodukter, så man hurtigere kunne fastlægge, hvad der er vigtigt i forbindelse med kommerciel udnyttelse af IBC. Der er gennemført forsøgsapplikationer inden for alle vigtigere sektorer: bankvæsen og finansiering, forsikring, medier og udgivelsesvirksomhed, fremstillingsvirksomhed, sundhedsvæsen, mennesker med særligt behov, transport og distribution samt forsøg med HDTV. Mere end 100 førende brugere har deltaget heri.

I forbindelse med gennemførelsen af Del III og visse supplerende opgaver under Del I og II stod det klart, at der var behov for en Europa-dækkende infrastruktur for afprøvning. I 1989 fremlagde de største europæiske teleadministrationer et forslag om at stille et foreløbigt bredbåndsnet til rådighed på forsøgsbasis på grundlag af en aftale om tværeuropæisk sammenkobling af bredsbåndsnet - European Broadband Interconnection Trial (EBIT) - med en kapacitet på 2 Mbits/s, som gradvis skulle udvides til 140 Mbits/s. De største deltagende netoperatører underskrev et aftalememorandum, og der blev sammensat en multinationalt panel, som i forbindelse med pilotprojekterne skulle rådgive om, hvad der ville kræves af net og software for at sikre interoperabiliteten i slutbrugernes systemer. Dette projekt til udnyttelse og understøtning af RACE-resultater gav assistance til de forskellige pilotprojekter. Men da man har haft svært ved af etablere omkostningseffektive forbindelser udenfor de enkelte landes grænser til forskningsaktiviteter, har de fleste projekters eksperimenter indtil nu kun været af nationalt omfang. Det er således først nu i 1993 og 1994, hvor man har mulighed for at lave forsøg med ATM-systemer, at der er økonomisk fornuft i tværeuropæiske bredbåndsforsøg hvor båndbredden fastlægges efter behov.

Ikke desto mindre må man sige, at pilotprojekterne for nye anvendelser har opfyldt deres mission, eftersom de har givet resultater - i reelle anvendelsesmiljøer - som nu kan inkorporeres i udarbejdelsen af teknologi og specifikationer.

## *2.5 Deltagelse af små og mellemstore virksomheder*

Selvom F&U i avanceret telekommunikation er temmelig dyrt, deltog en del små og mellemstore virksomheder i første fase af RACE. De udgjorde 28% af deltagelsen i RACE-projekter, hvilket er betydelig mere end det tilsvarende tal i det 2. rammeprogram under ét, nemlig 16,5%[6]. Små organisationer, såvel virksomheder som forskningsorganisationer, deltog i mere end 60% af projekterne.

6) Evalueringen af det andet rammeprogram for forskning og teknologisk udvikling: Rapport fra Udvalget for Videnskabelig og Teknisk Forskning til Rådet, september 1992, CREST/1212/1/92

*2.6 Fremme af den økonomiske og sociale samhørighed*

Da man i programmet udforsker og udvikler strategier for at indføre IBC i alle områder af EF, herunder de mindre gunstigt stillede områder, fungerer programmet som en forløber for tværeuropæiske bredbåndsnet, som omhandlet i afsnit XII af traktaten om den europæiske union. Der er blevet lagt særlig vægt på, at øer, indlandsområder og randområder skal forbindes med EF's centrale områder.

Der er iværksat en lang række ledsageforanstaltninger, workshops og kurser for at sikre, at forskere og ingeniører fra hele EF kunne få adgang til resultaterne af den F&U, der blev foretaget. Der er især blevet lagt vægt på at organisere workshops og seminarer i de mindre gunstigt stillede områder. Bilag I indeholder en komplet fortegnelse over disse aktiviteter.

53 projekter (60%) havde deltagelse fra mindre gunstigt stillede områder i Fællesskabet, og de medvirkede således til at øge den teknologiske viden og ekspertise i disse områder.

## 3. Evaluering og revision af RACE-programmet

### *3.1 Evaluering som en løbende proces*

På baggrund af den hastige udvikling i kommunikationsteknologi og -tjenester er der foretaget en løbende evaluering under programmets udarbejdelse, iværksættelse og gennemførelse. Det har også været en proces, der har omfattet alle niveauer: de strategiske retningslinjer for programmet, programmets praktiske forvaltning og den tekniske styring af hvert projekt.

Evalueringsprocessen begyndte med telekommunikationsaktøreres omfattende deltagelse i planlægningen af programmet og i udarbejdelsen af arbejdsplanen. Gennem et løbende samarbejde med industrien og telenetoperatørerne har både arbejdsplanen for selve RACE-programmet og arbejdsplanerne for hvert projekt kunnet ajourføres årligt. Desuden har regelmæssige møder mellem de konsortier, der har udarbejdet programmet (*concertation meetings* - samrådsmøder) sikret, at der løbende foregik en uformel kontrol og justering af fremdriften af alle projekter. Sammenhængen i arbejdet er blevet sikret gennem konsensusforvaltningsprojektet, der har knyttet nære forbindelser med europæiske standardiseringsorganer.

Der blev aflagt rapport om fremskridtene til Ministerrådet og Europa-Parlamentet i 1990 i 30-måneders-rapporten i henhold til Rådets beslutning[7)].

Den endelige rapport er udarbejdet i henhold til beslutningens artikel 9, hvorefter Kommissionen efter afslutningen af programmets første femårsperiode *"efter høring af Komitéen (tilsender) medlemsstaterne og Europa-Parlamentet en rapport over udviklingen og resultaterne af programmet"*. Den ajourfører og erstatter den 30-måneders-rapport, der blev forelagt i 1990.

I henhold til artikel 6, stk. 4, tredje led, har Kommissionen forelagt denne rapport for forvaltningskomitéen og anmodet om positiv udtalelse.

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7) Denne rapport blev aflagt i henhold til artikel 9 i Rådets beslutning, der er affattet således: "Programmet revideres efter 30 måneder på baggrund af en vurdering af resultaterne sammenholdt med de præcise målsætninger i bilag II til denne beslutning. Kommissionen underretter Rådet og Europa-Parlamentet om resultatet af denne revision."

*3.2 Programrevision og -evaluering*

Arbejdet med integreret bredbåndskommunikation (IBC) i RACE er periodisk blevet tilpasset, således at det stemte overens med de teknisk-økonomiske forhold og tjenestemuligheder, der undergår en hastig og konstant udvikling. Inden for programmet er der derfor foretaget en årlig kritisk behandling (revision) af to aspekter, nemlig

- **Det strategiske aspekt**, som omfatter en evaluering af RACE-programmets gennemførelse som helhed for så vidt angår Fællesskabets strategiske og politiske mål i international sammenhæng

- **De tekniske aspekter**, dvs. en evaluering af RACE-projekternes gennemførelse for så vidt angår RACE-målene.

Desuden blev der foretaget en revision af **programforvaltningen**. Dette har givet en uafhængig evaluering af, om Kommissionens tjenestegrene har forvaltet programmet, som de skulle.

*3.2.1 Strategisk revision og programevaluering*

Der blev foretaget en uafhængig strategisk revision i 1989 for at evaluere arbejdet med hensyn til Fællesskabets strategiske og politiske mål i international sammenhæng. De vigtigste konklusioner var,

- at det grundlæggende mål for RACE fortsat var gyldigt, idet udvikling af IBC er relevant og nødvendig for Europa, og 1995 var en måldato, der var forenelig med kravene og med udviklingen på verdensplan.

- at den vægt, der er lagt på de forskellige områder i RACE, var passende.

Revisionspanelet anbefalede også, at der i næste fase lægges større vægt på abonnentplacerede faciliteter, mobile applikationer, digital-HDTV samt afprøvning og testning, idet ATM ansås for at være den centrale netteknologi.

I overensstemmelse med subsidiaritetsprincippet blev det også fremhævet i den strategiske revision, hvilke aktioner der skulle gennemføres uden for RACE-programmet af nationale offentlige organisationer og af telekommunikationsaktørerne for at sikre, at de resultater, der opnås med F&U, følges op med implementering af IBC. Disse henstillinger findes i tabel 4.

Nogle af henstillingerne blev efterkommet: Henstillingen om, at teleadministrationerne skulle udarbejde et aftalememorandum om nært samarbejde i deres fjernforbindelser og drift i Europa blev fulgt i METRAN-aftalememorandummet og i udformningen af aftalerne mellem store nationale virksomheder samt i etableringen af EURESCOM. Udvidelsen af F&U's rækkevidde blev gennemført, indsatsen for standardisering af ATM blev øget, og en forsøgsimplementering af ATM er nu under udvikling. Andre henstillinger er derimod ikke blevet fulgt inden for den foreslåede tidsplan: De regler, der gælder i Europa har ikke muliggjort den forventede indbyrdes tilnærmelse mellem tele-, radiospredningss- og kabel-tv-administrationernes interesser, og udviklingen af HDTV er gået langsommere end forventet.

Efter den strategiske revision fulgte i 1990 en fremadrettet undersøgelse af de fremtidige behov og muligheder, hvori ledende strategiske, politiske og tekniske eksperter deltog. Henstillingerne fra dette behovspanel er omhandlet i "Telecom 2000"-rapporten og dannede grundlag for udarbejdelsen af arbejdsplanen for anden fase af RACE.

I 1991 og begyndelsen af 1992 blev RACE-programmet igen evalueret i forbindelse med de andre større programmer vedrørende informationsteknologi og anvendelse af telekommunikation under det 2. rammeprogram (ESPRIT og DRIVE) af et uafhængigt panel med W. Dekker som formand[8]. Kommissionen har svaret særskilt på dette panels henstillinger[9].

## Henstillinger fra Det Strategiske Revisionspanel i 1989

**A) Medlemsstaternes regeringer bør samarbejde om senest i 1992 at fastlægge de betingelser og bestemmelser, der skal gælde for indførelsen af fælleseuropæiske avancerede kommunikationstjenester,**

**B) Tele-, radiosprednings- og kabel-tv-administrationerne bør senest i midten af 1989 foreslå en samordnet fremgangsmåde og en tidsplan for udvikling og brug af IBC-infrastrukturer for både tele- og underholdningstjenester, herunder HDTV, idet den private sektors investeringsinitiativer udnyttes fuldt ud, når dette er hensigtsmæssigt,**

**C) Teleadministrationerne bør inden udgangen af 1990 udarbejde et foreløbigt aftalememorandum om et nærmere samarbejde i deres fjernforbindelser og drift i Europa,**

**D) Tjenesteleverandører bør inden udgangen af 1990 fastsætte et første sæt tjenestekrav, kommercielle betingelser og bestemmelser, der kan fremme hurtig og udbredt brug af IBC-tjenester,**

**E) Tele-, radiosprednings- og kabel-tv-administrationer, tjenesteleverandører og dataindustrien bør vedtage et aftalememorandum senest i midten af 1989, således at F&U-samarbejdet i RACE suppleres med pilotimplementering af nogle IBC-tjenester på europæisk plan med henblik på en kommercielt drevet indførelse af IBC i 1992,**

**F) F&U-samarbejde bør udvides til også at omfatte integreret tjenesteteknik, faste og mobile applikationer og teknikker for afprøvning og testning af kommunikationsudstyr og tjenestefunktioner inden udgangen af 1989,**

**G) Europæiske standardiseringsorganisationer bør øge og samordne deres indsats for international standardisering af IBC og avancerede tjenester. Der bør senest i midten af 1989 opstilles en tidsplan for standardiseringen, navnlig for ATM,**

**H) Medlemsstaterne bør behandle problemet vedrørende frekvenstildeling i Europa for så vidt angår alle frekvenser og anvendelsesområder. De bør senest i 1992 muliggøre en rationalisering af frekvenstildelingen, der afspejler de nye behov og prioriteter.**

8) Rapporten fra revisionspanelet for informations- og kommunikationsteknologier med W. Dekker som formand, juni 1992

9) Kommissionens svar på Dekker-rapporten, januar 199.

Sluttelig aflagde Kommissionen i 1992 rapport om programmet i forbindelse med sin evaluering af det 2. rammeprogram[10]. Rådet opfordrede Udvalget for Videnskabelig og Teknisk Forskning (CREST) til at kommentere Kommissionens rapport. CREST lod opfordringen gå videre til forvaltningskomitéen for RACE, der aflagde følgende rapport i juli 1992:

**Resultaternes kvalitet og indvirkning på konkurrenceevnen**

*Generelt har RACE-resultaterne som minimum været state-of-the-art, og der er i mange tilfælde sket gennembrud [f.eks. ATM: Asynchronous Transfer Mode, mobilkommunikation (UMTS: Universal Mobile Telecommunications System), optiske teknologier og udstyr].*

*Europa står bedre nu, end det ville have gjort uden RACE. Andre lande er måske stadig længere fremme end Europa, men det teknologiske efterslæb i europæisk telekommunikation er blevet reduceret betydeligt i forhold til både USA og Japan.*

*I de fem år, der er gået af det 2. rammeprogram, har RACE stort set nået sine tekniske mål som fastsat i Rådets beslutning. Ændringerne er imidlertid sket så hurtigt i telekommunikationssektoren (f.eks. nye tjenestebehov, ny teknologi, øget konkurrence mellem operatører), at målene og prioriteterne for selve programmet har måttet justeres i løbet af de fem år. Andre mål med nye prioriteter er opstået (såsom kommunikationsforsøg og test- og afprøvningsinfrastrukturer), der er taget op i senere programmer som RACE II (anden fase af det tidrige RACE-program).*

*RACE-programmet har stimuleret samarbejdet mellem offentlige netoperatører (om strategisk planlægning såsom EURESCOM), mellem industrier (om oprettelsen af et industrikonsortium - RIC) og mellem offentlige netoperatører og industrier (f.eks. i standardiseringsorganisationer såsom ETSI). Både omfanget af og arbejdsområdet for denne type samarbejde skal dog udvikles yderligere.*

*Foruden talrige videnskabelige og tekniske resultater har RACE I givet 596 bidrag (status pr. 6/92) til standardiseringsorganisationer (hovedsagelig ETSI) på grundlag af udviklingen af de fælles funktionsspecifikationer.*

*For telekommunikationsindustrien har samarbejdet med RACE øget konkurrenceevnen på globale markeder. For den europæiske industri som helhed skulle RACE's positive indflydelse blive tydeligere på længere sigt med en udbredt indførelse af avanceret kommunikation. Yderligere F&U inden for applikationer kan vise de potentielle brugere, hvilken konkurrencefordel de kan opnå gennem state-of-the-art kommunikation.*

10) Meddelelse fra Kommissionen: Evaluering af andet rammeprogram for forskning og teknologisk udvikling (SEK(92) 675 endelig udg.), juli 1992

**Forvaltning og omkostningseffektivitet**

*Inden for rammeprogrammet er RACE et sammenhængende program med specifikke mål, der er fælles for alle projekter, og med en samlet løbetid på ti år. Under RACE I blev der gjort størst fremskridt inden for ATM, optiske komponenter og teknologier, mobilkommunikation (UMTS) og bredbåndsforsøg. Som følge heraf er der lagt meget større vægt på de to sidstnævnte kategorier i RACE II. Områder, hvor der er gjort mindre fremskridt, er sikkerhed og brugsegnethed, hvor de oprindelige mål måtte reduceres.*

*I det samarbejde, der er opnået inden for RACE, er samrådsmekanismen central. Generelt er et europæisk samarbejde som det, der er gennemført under RACE, omkostningseffektivt, da det virker som en multiplikationsfaktor for de resultater, som parterne opnår af den investering, som de hver især har foretaget.*

*Procedurerne for evaluering af forslag og teknisk revision har fungeret godt: f.eks. har proceduren med "det røde flag" givet mulighed for at omlægge og give nye impulser til projekter, der ellers ikke ville have nået deres mål, eller for at standse projekter på et tidligt tidspunkt og dermed undgå ressourcespild.*

*Programmet var som helhed godt struktureret og forvaltet, men der kan stadig ske forbedringer på følgende områder:*

- *Samarbejdet med andre europæiske, multinationale forskningsprogrammer har ikke været effektivt nok.*
- *Kommissionen, de offentlige netoperatører og industrierne bør give hinanden tilsagn om støtte til programmet og dets mål, inden arbejdsplanen vedtages.*
- *Der bør gøres en større indsats for at opretholde kvaliteten af det samlede program til forskel fra de enkelte projekter. F.eks. er der for mange nøgledeltagere, der ikke medvirker i hele programmets løbetid.*
- *Samrådsmøderne skal gøres mere omkostningseffektive.*
- *Konsensusforvaltningsprojektet skulle helst være det første projekt, der påbegyndes, således at effektive forbindelser med de andre projekter kan sikres.*
- *Der bør træffes foranstaltninger til at øge små og mellemstore virksomheders aktive rolle og deltagelse i fremtidige programmer.*
- *Samordnede aktioner og støtteforanstaltninger bør i højere grad anvendes.*

**Overensstemmelse med EF-politikker og -principper**

*De tekniske udvælgelseskriterier, der anvendes for både evalueringen af forslag og revisionen af projekterne, har vist sig at være tilfredsstillende.*

*Der blev ikke specielt taget hensyn til sociale og økonomiske kriterier ved udvælgelsen af projekter under RACE I. Generelt er et telekommunikationsprogram som RACE dog foreneligt med den gældende politik for miljø og energibevarelse.*

*Med hensyn til subsidiaritet er det klart, at der vil være fordele ved et samarbejde på europæisk plan inden for standardforberedende forskning i telekommunikation. Et større samspil med nationale programmer og forsøg bør dog også fremmes.*

**Konklusioner**

*Forskningsprogrammer vedrørende telekommunikation i Europa må ikke slutte i 1995. Der må gennemføres endnu et program efter RACE.*

*Forskning og udvikling er nødvendige, men ikke tilstrækkelige til at opnå en god position på de fremtidige telekommunikationsmarkeder. Forvaltningskomitéen anfører ikke i dette dokument, hvilke yderligere foranstaltninger der er nødvendige for at nå dette resultat. Det forhold, at vægten i F&U inden for telekommunikation flyttes over på tjenester og applikationer bør have indflydelse på fremtidige programmers struktur og tilrettelæggelse.*

*Resultaterne af RACE bør i større udstrækning tages op og udnyttes i Europa. De nødvendige initiativer til denne overførsel skal tages af sektoraktørerne.*

Denne rapport udgjorde en del af grundlaget for CREST's rapport til Rådet om det 2. rammeprogram i oktober 1992.

*3.2.2 Vurdering af virkningerne og prognoser*

Forskningen og den teknologiske udvikling under programmet er i løbet af de fem år blevet ledsaget af regelmæssige vurderinger af de økonomiske og sociale virkninger af udviklingen i avanceret kommunikation. Rapporterne om disse vurderinger er offentliggjort og udsendt i vide kredse under titlen "Perspectives for Advanced Communications in Europe: PACE". Den seneste vurdering blev foretaget i 1991 og udsendt i 1992. De oplysninger, der fremkommer ved disse vurderinger, danner grundlag for den årlige ajourføring af programarbejdet og mindre tilpasninger i årets løb. Størstedelen af dette arbejde er nu blevet helt integreret i anden fase af RACE i henhold til bestemmelserne i Rådets beslutning om særprogrammet inden for kommunikationsteknologi.

*3.2.3 Revision af programforvaltningen*

De programforvaltningsprocedurer, som Kommissionens tjenestegrene har vedtaget for RACE-programmet, blev underkastet en uafhængig programforvaltningsrevision i 1989.

Hovedvurderingen var, at den industrielle forvaltningsmåde, som Kommissionens tjenestegrene har anvendt, i det store og hele passede til programmets mål og partnere, og at årlige tekniske revisioner og de periodiske samrådsmøder havde vist sig at være en effektiv måde at gennemføre programforvaltningen på.

*3.2.4 Teknisk revision af RACE-projekterne*

For at kunne tilpasse programmet til den teknologiske udvikling og til ændringer i opfattelsen af efterspørgslen skulle arbejdsplanen revideres årligt i henhold til RACE-beslutningen.

Dette indebar, at fremdriften i alle de igangværende projekter skulle revideres årligt i forhold til målene og til nye behov. Derfor har uafhængige eksperter på de pågældende forskningsområder hvert år foretaget en teknisk revision af hvert projekt. Den første tekniske revision fandt sted i oktober 1988, og den sidste i oktober 1992. Resultaterne af disse årlige revisioner er blevet brugt til at omlægge eller standse projekterne i nødvendigt omfang.

Den tekniske revision har især omfattet følgende:

a) Hvert år har partnerne i hvert projekt gennemført en "selv-evaluering" ved at gennemgå alle væsentlige aspekter af projektet, hvorefter de har beskrevet resultaterne i en årlig revisionsrapport.

b) Disse er blevet gennemgået af uafhængige eksterne eksperter (revisorer), der er udpeget med hjælp fra forvaltningskomitéen. Efter gennemgangen af rapporterne er der foretaget en "høring" af projekterne under forsæde af Kommissionen. Projektdeltagerne har lejlighed til at fremhæve resultater og skitsere det fremtidige arbejde. Revisorerne, der er grupperet i paneler efter ekspertområder, kan stille spørgsmål om projekterne som supplement til de oplysninger, der er givet i årsrapporten og præsentationen.

c) Panelerne har konsolideret deres konklusioner og henstillinger og har gjort rede herfor i deres revisionsrapporter til forvaltningskomitéen og Kommissionen.

d) Revisionsrapporterne er suppleret med en vurdering af projektleverancerne i henhold til kontrakterne; denne vurdering foretages af de projektansvarlige i Kommissionen (generelt betragtes projektleverancerne som fortrolige og meddeles ikke revisorerne).

Denne procedure har vist sig at være både retfærdig og effektiv. Revisionsrapporterne har været et udmærket grundlag for de årlige forhandlinger af kontrakter om de detaljerede arbejdsplaner for hvert projekt.

## 4. Forbindelserne med andre EF-aktioner og europæiske aktioner

### *4.1. Forbindelserne med CEPT*

Forbindelserne med CEPT og dets underorganer har ændret sig betydeligt under udarbejdelsen og gennemførelsen af RACE.

I definitionsfasen kom den særlige gruppe vedrørende bredbåndskommunikation (GLSB), som CEPT har oprettet, med vigtige bidrag til arbejdsplanen for fase I af RACE. I løbet af 1987 og 1988 blev samordningen med arbejdet i CEPT varetaget af GMR (en blandet gruppe for RACE), der blev oprettet med dette formål i september 1987.

I 1988 førte samarbejdet med CEPT også til, at 13 europæiske teleadministrationer undertegnede et aftalememorandum om indførelse af en generel forsøgsstruktur for IBC-arbejde (EBIT).

I forbindelse med omlægningen af reglerne for teleområdet - i overensstemmelse med den nye europæiske telekommunikationspolitik - oprettede CEPT en række særskilte organer, hvoraf to har etableret nære forbindelser med RACE-arbejdet: ETNO (European Telecommunications Network Operators Group) er nu forum for drøftelser mellem netoperatører om interoperabilitet, og EURESCOM er forum for fælles strategisk forskning. Ikke alle store europæiske offentlige netoperatører deltager i EURESCOM, men det fungerer alligevel som et værdifuldt kontaktpunkt mellem Kommissionen, RACE-projekterne og de fleste netoperatører.

### *4.2 Forbindelserne med europæiske og internationale standardiseringsorganisationer*

Som led i gennemførelsen af den europæiske telekommunikationspolitik blev ETSI, Det Europæiske Institut for Telestandarder, oprettet i 1988. Det er nu etableret som det vigtigste europæiske forum for udvikling af tekniske specifikationer. Det standardforberedende arbejde i RACE har frembragt 596 separate bidrag til standardiseringsarbejdet i ETSI, CCITT og CCIR.

Desuden er der holdt regelmæssige møder med repræsentanter for CEN/CENELEC, EBU og SPAG.

### *4.3 Forbindelserne med andre EF-programmer og europæiske aktiviteter*

RACE-projekterne nyder godt af resultaterne af projekter, der udvikler generiske teknologier, dvs. ESPRIT (mikroelektroniske komponenter, programmelværktøjer, AIP til netstyring osv.); tilsvarende trækker de applikationsorienterede programmer DRIVE, DELTA og AIM i vid udstrækning på de teknikker, der udvikles i igangværende RACE-projekter, til deres kommunikationsbehov.

Der er gennemført samarbejde med COST ved tætte kontakter mellem beslægtede projekter og regelmæssige møder på programforvaltningsniveau.

Med EUREKA-initiativet har samspillet været stærkest inden for audiovisuel teknologi. En del af arbejdet vedrørende fremme af HDTV (EUREKA-projekt 95) blev suppleret med arbejde under en RACE-kontrakt, og EUREKA-projekt 256 om videokodning var knyttet til RACE-integrationsarbejdet.

*4.4 Forbindelser med organisationer i EFTA-lande*

Organisationer fra Finland, Norge, Schweiz, Sverige og Østrig deltager i RACE. 27 organisationer fra disse lande har deltaget i 72 projekter (dvs. over 80% af arbejdet).

## 5. Udnyttelsen af RACE-resultaterne

Mulighederne i den nye kommunikationsteknologi vil få meget store virkninger for fremtidens økonomiske vækst i EF og for den internationale arbejdsfordeling på verdensplan. Der er tre forskellige, men indbyrdes forbundne vækstprocesser, som gør deres indflydelse gældende, nemlig følgende:

- Bedre adgang til bedre informationer øger produktiviteten i hele økonomien,
- Forbedringer i kommunikationsmulighederne øger nytten og dermed markedsføringsmulighederne for både gamle og nye tjenester, så de ekspanderer,
- Overgangen til den nye og informationsbaserede økonomi, hvor tjenesterne er drivkraften, kræver meget store offentlige og private investeringer i ny infrastruktur til udvikling af tillægstjenester, både fysiske - kabler, centraler, terminaler - og menneskelige.

Kommunikationens kvalitet - både teknisk og organisatorisk - bliver af central betydning for fremtidens økonomiske vækst, fordi den bestemmer økonomiens kapacitet til både at frembringe og effektivt udnytte den helt afgørende faktor i moderne "produktion", nemlig viden. Infrastrukturernes geografiske organisation vil få en meget stærk indflydelse på de sociale, økonomiske og kulturelle forhold, ligesom jernbanerne fik det i det 19. århundrede.

Derfor må resultaterne af F&U inden for kommunikation straks udnyttes effektivt. Der er af samme grund lagt særlig vægt på udnyttelsen af resultaterne under hele RACE-programmets forløb.

*5.1 Udnyttelsesplanen for RACE*

For at fremme og vurdere deltagernes udnyttelse af RACE-resultaterne er udnyttelsesplanen for RACE regelmæssigt blevet ajourført i perioden fra 1988 til 1992. Den giver et samlet overblik over deltagernes udnyttelse af resultaterne.

Bilag II indeholder en liste over bidragene til standardisering, og titlerne på videnskabelige og tekniske publikationer findes i bilag III. RACE-programmet har givet anledning til over 1700 videnskabelige og tekniske publikationer og har dermed ydet et betydeligt bidrag til den offentligt tilgængelige videnskabelige litteratur.

Resultaterne af den teknologiske udvikling er også blevet beskyttet med patentansøgninger, når dette har været relevant. 73 patentansøgninger i forbindelse med RACE-arbejdet er allerede registreret. De er angivet i bilag IV.

*5.2 Planlægning af IBC-implementering*

En effektiv udnyttelse af F&U er kun mulig, hvis alle parter har et ensartet syn på, hvordan den kommercielle udvikling skal styres, og hvor hurtigt den skal gå. F&U i RACE-programmet er derfor altid blevet planlagt og specificeret i forhold til en vejledende implementeringsplan for integreret bredbåndskommunikation, der er blevet ajourført med jævne mellemrum. Den omfatter en trinvis indførelse af avancerede tjenester begyndende med dem, som der er efterspørgsel efter i erhvervslivet allerede i 1992/1993. Den nuværende vejledende implementeringsplan som beskrevet i RACE-årsrapporten for 1992 (RACE'92) omfattede følgende milepæle:

1992/1993:

- Tidlig indførelse af erhvervsmæssige applikationer
- Avancerede kommunikationsforsøg til afprøvning af nye tjenester og netstyresystemer: ATM, MAN og IBC i abonnentplacerede net
- Beslutninger om anskaffelse af og investering i fremtidige fælleseuropæiske IBCN-net og fuldt udviklede IBC-tjenester
- Færdiggørelse af de vigtigste standardiseringsarbejder.

1994:

- Færdiggørelse af forbindelsen mellem alle EF-hovedstæderne og med nabolandene. Forbindelsen skal baseres på de bestående optiske hovedforbindelser, men skal kunne understøtte tale-, data- og billedoverførsel, enten hver for sig eller som integrerede tjenester.

1995:

- Første implementering af IBCN-net og fuldførelse af abonnenttilslutningen for erhvervsvirksomheder i centre for økonomisk aktivitet og produktion: mindst 50 000 erhvervsbrugere af avancerede tjenester.
- Praktiske feltforsøg til afprøvning af alle IBC-tjenester (herunder private abonnenter med tovejsvideo og digital-HDTV), der anvender kommercielt IBC-udstyr,

1996:

- Levering af kommercielle basisbredbåndstjenester baseret på forbindelser med 2, 34 og 155 MBit/s, herunder hurtig inter-LAN datatransmission, desk-top videokonferencer, videobehandling, CAD/CAM og terminalapplikationer.
- Samtrafik mellem faste bredbåndsnet og mobile net, satellitnet og andre net.

1997:

- Tilrådighedsstillelse af IBC-tjenester for erhvervsbrugere i byer med over 500 000 indbyggere og påbegyndelse af en omfattende implementering af lyslederforbindelser til husstandene ("fibre-to-the-home").

2005-2010:

- IBC-tjenester skal dække 50% af markedet.

Denne vejledende tidsplan vil blive revideret igen i 1993 i forbindelse med udarbejdelsen af retningslinjerne for udviklingen af transeuropæiske bredbåndsnet som fastsat i afsnit XII, artikel 129 B og C, i traktaten om den europæiske union.

## 6. Gennemførelse af fase II af RACE

Det har hele tiden været meningen, at RACE-programmet skulle løbe i ti år og gennemføres i to faser. For at sikre kontinuitet blev anden fase vedtaget i juni 1992 som et særprogram under Fællesskabets 3. rammeprogram for forskning og teknologisk udvikling.

Da man nåede til 1991, havde opfattelsen imidlertid ændret sig væsentligt. Det, der havde forekommet at være en ambitiøs, næsten futuristisk vision ved programmets begyndelse, havde udviklet sig til en realistisk mulighed. Kommerciel indførelse af integreret bredbåndskommunikation forventedes nu med sikkerhed inden for fire år. Desuden var det blevet endnu tydeligere, at telekommunikation og avancerede informationstjenester ville spille en central rolle i verdens sociale og økonomiske udvikling frem mod det 21. århundrede.

Disse forandringer fik Europa-Parlamentet og Ministerrådet til at prioritere vedtagelsen af det nye særprogram. Det var det første af programmerne under det 3. rammeprogram, der blev vedtaget[11], og forvaltningskomitéen afgav straks positiv udtalelse om arbejdsplanen. En indkaldelse af forslag blev offentliggjort i juni 1991, og forslagene blev evalueret i september og oktober 1991. Over 200 forslag blev evalueret, og 95 projekter blev indledt i begyndelsen af 1992. De skal med de nuværende budgetbevillinger være afsluttet ved udgangen af 1994.

Medens projekterne i fase I af RACE var koncentreret om evaluering af valgmuligheder, skal projekterne i fase II forberede indførelsen af IBC. RACE II-projekterne vil styrke det samarbejde, der allerede foregår mellem industrielle brugere, dataindustrien og teleoperatørerne, og de forpligtelser, som de har indgået i RACE I. I den nye F&U er der sat fokus på applikationer, tjenester, drift og forvaltning, men teknologisk udvikling opretholdes på højt niveau for at konsolidere og udvide de nøgleområder, der er nødvendige for en omkostningseffektiv levering af IBC-tjenester.

Arbejdet omfatter de otte prioriterede områder, der er fastsat i bilaget til Rådets beslutning, nemlig

| | |
|---|---|
| OMRÅDE 1 | F&U inden for IBC (Integrated Broadband Communications) |
| OMRÅDE 2 | Intelligens i netværk/fleksibel styring af kommunikationsressourcer |
| OMRÅDE 3 | Mobilkommunikation og personlig kommunikation |
| OMRÅDE 4 | Billed- og datakommunikation |
| OMRÅDE 5 | Teknologi til integrerede tjenester |
| OMRÅDE 6 | Teknologi til informationssikkerhed |
| OMRÅDE 7 | Avancerede kommunikationseksperimenter |
| OMRÅDE 8 | Testinfrastrukturer og sammenkobling (tværgående F&U til støtte for de øvrige prioriterede områder). |

En fuldstændig beskrivelse af de nye F&U-projekter i fase II og deres forbindelse med fase I-projekterne findes i årsrapporterne for 1992 (RACE'92) og 1993 (RACE'93).

11) Rådets beslutning af 7. juni 1991 om et særprogam for forskning og teknologisk udvikling inden for kommunikationsteknologi (1990-1994) (91/352/EØF) (EFT nr. L 192 af 16.7.1991, s. 8)

## 7. Fremtidige behov og valgmuligheder i F&U inden for kommunikationsteknologi på europæisk plan

I juni 1992 oprettede forvaltningskomitéen for RACE en ad hoc-gruppe, der skulle fastlægge prioriteterne for den fremtidige europæiske F&U inden for telekommunikation. Gruppens rapport er gengivet nedenfor.

Mange af disse idéer til og emner for EF's fremtidige F&U er allerede afspejlet i Kommissionens arbejdsdokument om fjerde rammeprogram, navnlig i de foreslåede emner "billedteknologi", "databehandling og netværksforbindelser med høj ydeevne", "funktionsintegration i produktionen" og "avanceret kommunikation". Kommissionen vil fremsætte sine forslag til særprogrammer under fjerde rammeprogram i 1993 efter gennemgang af alle bidragene.

**Begrundelsen for F&U på fællesskabsplan**

*Det er fortsat forvaltningskomitéens opfattelse, at der kan opnås klare fordele ved at gennemføre F&U inden for telekommunikation på fællesskabsplan. Generelt betragtet er forskning (navnlig telekommunikationsforskning) en løbende proces. For at opretholde den forbedrede stilling, som sektoraktørerne allerede har opnået gennem deltagelse i EF-aktioner som RACE, må de fortsat samarbejde og bygge videre på de resultater, de hidtil har opnået.*

*En yderligere konsolidering af de opsplittede telekommunikationssystemer i Fællesskabet er nødvendig, både for at sikre, at det indre marked fungerer effektivt, og for at øge europæiske organisationers konkurrencefordel på de globale markeder. Standardiseringsorganisationer som ETSI er kommet til at sætte pris på de tekniske bidrag, de har modtaget som et direkte resultat af RACE-arbejdet. Strømmen af resultater fra Fællesskabets F&U til standardiserings-organisationerne skal fortsat styres - og øges - som en del af kommende programmer.*

*Avanceret telekommunikation får stadig større betydning for de nationale økonomier i takt med, at grundelementerne (information og muligheden for at kommunikere informationen) betragtes som strategiske ressourcer. Dette kan måles i*

*- den stigende del af de nationale økonomier, der går til investeringer i telekommunikation, og*

*- avancerede teletjenesters øgede indvirkning på andre økonomiske sektorer.*

*Der er taget hensyn til disse tendenser i både Fællesakten og i de igangværende bestræbelser på at gennemføre EF's indre marked. Maastricht-Traktaten omhandler etableringen af transeuropæiske net (der omfatter telenet). Oprettelsen af telekommunikationsinfrastrukturer og -tjenester på europæisk plan vil kræve langsigtede forpligtelser fra alle berørte aktører i sektoren.*

*Samordningen af udviklingen (igen på europæisk plan) hen imod oprettelse af en infrastruktur for bredbåndskommunikation giver en klar økonomisk fordel med hensyn til afkast af investeringer. Samordningen ville også lette indførelsen af nye applikationer i alle europæiske regioner og gøre det muligt hurtigt at opnå den kritiske masse, der er nødvendig for en selvbærende vækst i brugen af avancerede tjenester. Der er ingen tvivl om, at telenettene og et stigende antal EF-tjenester får en voksende international rækkevidde. Et større samarbejde uden for de europæiske regioner kunne også opmuntres.*

*Af alle disse grunde mener forvaltningskomitéen, at en særlig EF-aktion for F&U inden for telekommunikation bør medtages som en del af ethvert fremtidigt rammeprogram. Dette bør desuden bygge på det betydelige grundlag, der er etableret under tidligere programmer. Der bliver dog efter 1995 brug for en telekommunikations-F&U, hvor vægten ligger væsentligt anderledes end hidtil i RACE-programmet.*

**Mål for fremtidig F&U inden for telekommunikation**

*Gennemførelsen af den avancerede kommunikationsvision om, at alle kan kommunikere med alle hvor som helst og når som helst ved brug af tekst, lyd og billeder, kræver, at Europa tager nye F&U-initiativer.*

*De igangværende programmer som RACE og ESPRIT har allerede ydet et væsentlig bidrag til etablering af det tekniske grundlag for denne vision. Drivkraften i et nyt program for Fællesskabets F&U inden for telekommunikation må nu komme fra behovene for nye anvendelser. I princippet bør disse også være bestemmende for, hvilke aktioner og prioriteter der er nødvendige for yderligere forskning i de grundlæggende støtteteknologier.*

*Nye programmer bør derfor centreres om følgende to mål:*

*- at fremme driftsforsøg med avancerede tjenester for at forbedre deres brugsegnethed og sikre, at slutresultatet er attraktivt nok til udbredt brug i europæernes dagligdag.*

*- at fremme den forskning i fremtidsteknologier, der er nødvendig for at støtte avanceret kommunikation og for at reducere omkostningerne til nøglekomponenter og dermed gøre det mere økonomisk tilgængeligt at stille avancerede tjenester til rådighed.*

*Disse to spørgsmål er særligt afgørende for den fælleseuropæiske kommercielle indførelse af avancerede kommunikationsnet og -tjenester, selv om denne indførelse også er afhængig af en række andre faktorer. For at komme nærmere en virkeliggørelse af den avancerede kommunikationsvision er det nødvendigt at bygge på sektoraktørernes voksende gensidige samarbejde og dermed opnå enighed om*

*- hvordan man bedst kan styrke tjenesternes og de tilknyttede støtteteknologiers funktion.*

*- hvilke muligheder der kan sigtes efter på grundlag af konvergensen i tele-, radiospredningsog informationsteknologien, som kan danne grundlag for en hurtig udvikling hen imod avanceret kommunikation.*

*Fortsat F&U inden for avanceret kommunikation i Fællesskabet vil altså i sig selv fremme europæisk samarbejde og harmonisering og føre til en styrkelse af Europas konkurrenceevne på internationale markeder og dermed til en styrkelse af de europæiske økonomi som helhed.*

**Samarbejdsgrundlaget (Modus Operandi)**

*For at gøre avanceret kommunikation attraktiv i vide kredse og gøre teknologierne mere økonomisk tilgængelige er det nødvendigt at inddrage alle berørte parter, dvs. brugere, netoperatører, tjenesteleverandører, industri, forskningscentre og universiteter. Det skal sikres fra starten, at alle disse aktører kommer med ved at inddrage dem i fastlæggelsen af en aftalt arbejdsplan. Navnlig bør offentlige netoperatørers deltagelse til støtte for kommunikationsforsøg fremmes, idet nuværende eller planlagte infrastrukturer udnyttes i muligt omfang.*

*I det næste F&U-program bør små og mellemstore virksomheder spille en større rolle, da mange af dem har en værdifuld ekspertise inden for udvikling af applikationer og tjenester. Denne ekspertise er central i Fællesskabets behov for at tage fat på dette nye forskningsområde. Behovet for at styrke små og mellemstore virksomheders rolle i den fremtidige kommunikations-F&U peger på, at der bør træffes særlige foranstaltninger for at lette deres aktive deltagelse yderligere. F.eks. skal Kommissionen måske benytte kontraktsprocedurer, der i højere grad understøtter SMV'erne (f.eks. CRAFT-mekanismen, der er brugt i BRITE/EURAM, eller andre nye fremgangsmåder).*

*Selv om RACE alt i alt har været en succes, bør der overvejes nogle nye procedurer eller forbedringer af de nuværende procedurer for forvaltningen af det næste F&U-program inden for kommunikation. De enkelte projekter bør fastlægges inden for en velstruktureret ramme, der er defineret i arbejdsplanen og specielt beregnet på at nå programmålene. Samrådsmekanismen, der med godt resultat er brugt i RACE, skal også styrkes yderligere.*

*En øget samordning af EF-programmer, bedre samarbejde med andre europæiske eller multinationale forskningsprogrammer og et nærmere samarbejde med nationale programmer og forsøg skal alle fremmes, når det er muligt. Samordnede aktioner med EUREKA, COST og andre projekter på nationalt plan kan også overvejes.*

*Foranstaltninger til støtte for programmet skal omfatte en passende reklame for projekterne under gennemførelsen og udbredelse af resultaterne (og disse resultaters potentielle fordele/anvendelsesmuligheder) til alle sektoraktørerne, navnlig de potentielle brugere af avanceret kommunikation.*

**Driftsforsøg og udvikling af tjenester**

*Erfaringer med indførelse af nye netteknologier og -tjenester har vist, at udvikling og gennemførelse af nye applikationer kræver velorganiseret, praktisk førdriftsvalidering (driftsforsøg), der omfatter alle aktører i sektoren. Den egentlige udfordring for de næste generationer af europæiske driftsforsøg er derfor at vise, hvordan potentielle tjenester kan grupperes (under frie markedsforhold), således at de opfylder centrale markedssektorers behov.*

*F&U inden for driftsforsøg og udvikling af tjenester bør koncentreres om ikke-brugsspecifikke forhold, idet det derved vil blive lettere at udvikle avancerede tjenester. Selv om forsøgene bygger på bestående teknologi, bør de sigte mod passende applikationer, efterhånden som nettene bliver mere intelligente og tjenesterne mere fleksible. De vigtigste mål for driftsforsøg bør omfatte udformning og indgivelse af forslag til standardiseringsprocessen og forslag til sektorprofiler, der tager hensyn til alle aspekter af sektorens applikation, dvs.*

- *virksomheden (herunder organisation, interaktion, information til brugeren, forvaltnings- og sikkerhedspolitik, cost-benefit-analyse samt juridisk, etisk og social fremgangsmåde),*
- *selve informationen (herunder definition af informationselementer, kvalitet, strøm og præsentation for brugerne),*
- *telematikfunktionerne (herunder kommunikations- og behandlingsfunktioner og datarepræsentationstyper),*
- *teknologierne (herunder hardware og software).*

*På denne måde skal der i driftsforsøg tages hensyn til ændringer i lovgivnings-, forvaltnings- og sikkerhedspolitikkerne, brugeradgang og grænseflader mellem menneske og maskine, og de skal indeholde cost-benefit-analyser og definitioner af informationskvaliteten.*

*Udvikling af generiske tjenester kræver værktøjer til tjenesteetablering, indarbejdelse af multimedie-teletjenester og -terminaler og levering af avancerede tjenester, styring og tjenesteteknik. Som følge heraf skal fremtidige applikationer opfylde følgende forudsætninger: De skal*

- *have sektorspecifikke definitioner, der er fastlagt af tjenesteleverandører og brugere*
- *være baseret på generiske tjenester og opfylde ONP-vilkårene*
- *være defineret ved klare cost-benefit-mål*
- *have verdensmarkedspotentiel*
- *på kort sigt kunne opfylde nye behov, f.eks. at den enkelte skal kunne kontaktes overalt, bredbåndsmultimedietjenester og brugervenlige eller intelligente net.*

*Et empirisk grundlag for fastlæggelsen af applikationerne kan uddrages af igangværende nationale programmer og EF-programmer (f.eks. RACE, telematiksystemer og ESPRIT). Fremtidige F&U-programmer skal først og fremmest tage sigte på førdriftsforsøg og på at godtgøre, at applikationerne kan anvendes på europæisk plan. Den efterfølgende specifikke "tjenesteudvikling" bør efter forvaltningskomitéens mening medtages i et fremtidigt F&U-program for bedre at opfylde brugernes behov for*

- *Forbedrede videokonferencer og interaktive multimedietjenester*
- *Distancearbejde og "virtual presence"*
- *Mulighed for at kontakte den enkelte hvor som helst og informationssikkerhed*
- *Distributionstjenester for større eller mindre modtagerkredse*
- *Tjenestestyring og intelligente nettjenester.*

## Forskning i støtteteknologier

*Ethvert nyt forskningsprogram inden for telekommunikation bør bygge videre på det betydelige teknologigrundlag, der er etableret gennem tidligere programmer. Strategisk forskning er nu nødvendig for, at der kan opnås omkostningsfordele ved brug af næste generations teknologier. De overordnede mål herfor er følgende:*

- *Levering af de teknologier, der er nødvendige for udvikling af net og tjenester i Europa, der er konkurrencedygtige på priserne, forud for de konkurrerende økonomiske blokke for at yde et vigtigt bidrag til styrkelsen af den europæiske økonomi.*

- *Etablering af et grundlag for en teknisk mulig og økonomisk rimelig udvikling i telenettene - med hensyn til standardisering - med henblik på at styrke den europæiske økonomi.*

*Den viden, der er opnået på disse forskningsområder, kan kræve en ændring af målene og prioriteterne på andre områder af programmet. F.eks. kan udviklingen i tjenesteteknologien yde nogle bidrag til forskningen inden for både komponent- og netteknologi. Hovedvægten bør dog fortsat lægges på de nye tjenester, der kan tilbydes brugerne gennem telenettene. Da disse tjenester vil være karakteriseret ved en høj grad af tilpasning til personlige behov, er der brug for en tæt interaktion mellem netudvikling og tjenesteudvikling. Følgende specifikke forskningsområder bør efter forvaltningskomitéens opfattelse medtages i et fremtidigt program:*

### Udvikling af nettet for at etablere et grundlag for teknisk mulige og økonomisk rimelige avancerede kommunikationsformer

- *Integrering af bestående og nye transmissionsmedier og -systemer (kobberkabler, optiske fibre, jord- og satellitbaseret radiospredning), også i distributions- og tilslutningsnet (fibre i lokal sløjfe og lign.); integrering af mobile og faste net;*
- *Udvikling af styrede transmissionhierarkier og forbedrede netstyresystemer;*
- *Optiske transmissionssystemer med ultrahøj kapacitet og fotoniske netarkitekturer;*
- *Styrede knudepunkter til B-ISDN (ATM) og forbedret signalering*
- *Avancerede intelligente net, informationsnetarkitekturer (kombination af IN og TMN) og avancerede software-arkitekturer.*

### Teknologiudvikling på grundlag af resultaterne fra RACE og andre EF-programmer, navnlig udvikling af terminaler hen imod et bedre pris-ydeevneforhold og større brugervenlighed

- *Multimediearbejdsstationer og billedtelefoni*
- *Avanceret billed- og audiobehandling*
- *Digital-tv (SDTV, EDTV, HDTV)*
- *Talestyring i naturligt sprog*
- *Ultra-LSI-chips til opkoblings- og transmissionskredsløb*
- *Avancerede mikrobølge-komponenter baseret på Si, III-V-materialer*
- *Opto-elektroniske materialer og anordninger til telekommunikationsapplikationer*

# Annex I

## Project contributions to the RACE objectives

Annex 1

# PROJECT CONTRIBUTIONS TO RACE OBJECTIVES

## 1. PART I : IBC Development and Implementation Strategies

### 1.1 Consensus Management and Synthesis

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1045 Consensus Management** | Consensus management across all RACE projects, leading to the publication of Common Functional Specifications (CFS) for IBC. Workplan for, and organisation of the Technical Groups which undertook the drafting of the CFSs (staffed by other projects' participants). | Secured the "overall" results of the RACE programme, through co-operation between Industry and Operators within the project. Formal conduit for coherent transfer of RACE results to ETSI. Exploitation of results through standardisation, and by widespread distribution of CFS to organisations participating in RACE. |
| **R1044 IBC Development & Implementation Strategies** | Provided a consistent view of IBC systems options, based on own work and that of all other RACE projects. Functionally separated service definitions into service components and service control elements. Developed reference configurations for specific network implementations, and used these to identify and evaluate evolution steps towards IBC. Developed a series of detailed specifications defining the UNI at the "T" reference point (the termination interface for public networks). | Core project to the systems study of RACE. The largest source of RACE contributions to standardisation bodies. Many publications. Active in the detailed transfer of results to and from RACE usage projects, (via R1077) and all other systems projects. Provided the backbone of support offered to R1045 for development of the CFS. |
| **R1077 URM** | Compilation of operational requirements based on results of usage projects. Results captured in a usage database. Methodology for, and examples of the derivation of generic service definitions from usage requirements. Wide ranging contributions to CFSs and consensus formation. | Concepts relevant to service designers working in a market driven environment. Core project of the usage area of RACE. Impact mainly felt within the programme, transferring results to and from the systems projects. |

### 1.2 Functional Specification

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1023 BEST** | Functional Specification Methodology. Handbook and consultation support given to other RACE Projects. | Harmonised approach to functional specification work. |
| **R1024 NETMAN** | Models and Methods for TMN functional specifications (eg. Cube Model, QoS Methodology). The actual specification of TMN Functions. Animated Simulation (Hypermedia tool) of the behavioural aspects of TM Functions. | Significant impact on Standards (CCITT SG IV and ETSI NA4). Results exploited by EURESCOM and RACE II Projects. |
| **R1025 SECURITY** | Definition of basic security services (authentication, integrity, confidentiality, non repudiation and denial of service detection). Concepts for a functional architecture for IBC security and security policy guidelines. | Integration of security aspects within IBC specifications. |
| **R1040 RIPE** | Recommended Portfolio of Integrity Primitives. Specified modes of use for these. | Implementation of secured network systems. Improved understanding of integrity primitives (statistical tests and simulation tools). |
| **R1047 TIMI** | Development of integrity concepts within IBC services, to support legally binding procedures for data exchange. | Introduction of low cost, reliable and easy to operate security measures in IBC. |

### 1.3 Reference Configurations

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1002 Satellite communication for IBC** | Specification of satellite system capabilities with respect to their utilisation in evolutionary scenarios towards IBC | Identification of the role of satellite communications in IBC. Contribution to elaboration of IBC standards, identification of role of satellite technology within IBC |
| **R1026 International Radio and TV** | Identification of requirements and scenarios for the integration of the Eurovision network into IBC. | Eurovision and Euroradio network digitalisation, ensuring Europe remains in the forefront of technical excellence and programme quality. Essential step towards full digitalisation of TV media. |
| **R1028 REVOLVE** | Evolution Scenarios most likely to be implemented within Less Favoured Regions (LFRs) were identified and assessed. Platforms for co-operation of Sector Actors established in Portugal and Greece | Tools for strategic planners responsible for LFRs, in their preparation of business plans and justification for further investment in infrastructure |
| **R1041 FUNCODE** | Techno-economic studies to determine optimal locations for video codecs. Contributions to image and voice coding standards. | Standardisation and strategic network planning of audio-visual services. |
| **R1049 ATM Concept** | Contributions to the specification of the ATM layer, ATM signalling protocol and Connectionless Services in B-ISDN. | Contributions to ETSI NA5 and CCITT SG I, XI, XIII, XVIII Recommendations on B-ISDN. |
| **R1052 SPOT** | Simulation and optimisation of sub-carrier multiplexing systems for the CAC network | Exploitation, development and assessment of signal processing techniques in a CAC environment |
| **R1053 TERRACE** | TMN Reference Configurations at three levels of detail. Methods and criteria to design, describe and evaluate Reference Configurations. Concept of GAMS - Gradual Automation of Management Systems, used internally by the project to define the evolution of the TMN. Surveys and case studies (SDH, MAN and ATM) | Means of implementing TMN now understood in detail. Results exploited by EURESCOM, and are influencing ONP studies. Also exploited by RACE II projects addressing Reference Configurations for IBC Services. Significant contributions to Standards (CCITT & ETSI). |
| **R1085 TET Adapt** | Provision of tools for techno-economic analysis | Tools widely used for evaluation of IBC scenarios by RACE systems projects |

### 1.4 Usage Reference Model

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1037 User criteria for the realisation of opportunities afforded by IBC** | Development of a methodology to identify and quantify user requirements | Contribution to further work under R1071 (IBC Applications Analysis) |
| **R1071 (1050) IBC Applications Analysis** | Based on 126 case-studies in 102 organisations, the project has identified eleven generic IBC services and implemented a formalised methodology for description of IBC market developments | Market entry strategies for IBC. Improved understanding of factors affecting service take-up and delivered substantive usage data for the definition of IBC services. |
| **R1076 REMUS** | Requirements for Usability Design Targets Database | Method for making end-user requirements available to designers |

## PART II : IBC Technologies

### 2.1 Networks and Switching

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1012 BLNT** | 2 major demonstrators: an ATM switch model and a Customer Access Connection (CAC), based on SDH and an optical link, using OEICs. Definition of performance parameters for the ATM switch, based on traffic studies. VLSI produced to implement the switch. 4 patents filed relating to CAC and ATM. | Low cost local loop and ATM switch , able to support a wide range of broadband services in a flexible and cost effective manner. Demonstrated incorporation of new OEIC techniques and technologies. Contributions to standardisation of ATM/SDH mapping and broadband interfaces for the access network. |
| **R1013 HDTV switching** | Switch matrix chip operating in synchronous time division multiplex mode at speeds up to 1.25 Gbit/s. | Key technology for support of digital (HD)TV services using ATM switching networks. |
| **R1014 Atmospheric** | Network configurations and solutions to accommodate uncertainties in the growth and mix of services during network transitions towards a full ATM-based IBC. Flexible and economic network & system architectures to maintain compatibility with existing public / private networks and terminals, as advanced networks evolve. Solutions evaluated in a demonstrator. | Evolutionary network architectures and contributions to the standardisation of new transmission and switching techniques, and of interworking. Extended Stratified Reference Model (ERM) now adopted by ETSI allowing a more flexible use of the lower three layers of the OSI model. |
| **R1022 ATD** | Defined generic ATM components. Implemented RATT (R1022 ATD Technology Testbed), a laboratory network integrating several models of ATM subsystems. Introduction scenarios and techno-economic evaluation for ATM - consolidated in a Network Planning Guide. Other results include architectures and interfaces, ATM traffic engineering methods, performance evaluation of ATM traffic control, traffic source models, and signalling. | Major impact on the development of ATM Standards by ETSI & CCITT. Results further by exploited consortium members in RACE II (the laboratory testbed), and in national field trials. Commercially available products based on project prototypes (components and subsystems). |
| **R1043 Mobile Telecommunications Project** | Provided the foundation for the work now undertaken by RACE II projects in UMTS and MBS. Preparation of CFSs for UMTS | Definition of the spectrum requirements for UMTS. Prime-mover for the establishment of ETSI SMG5. |

### 2.2 Optical Communications

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1008 Silicon-based Low-cost Passive Optical Components** | Low cost passive optical components including very low loss waveguides, 3dB directional coupler, fibre pigtailed power splitter, 1:4 WMUX/DMUX devices | Components for the realisation of an economic and & flexible architecture of the Customer Access |
| **R1010 Subscriber Coherent Multi-channel System** | Demonstrator of a CMC network with a transmission rate of 140 Mbit/s on each of ten channels. Coherent optical devices evaluated on 3 testbeds: 622 Mbit/s CPFSK, 565Mbit/s DPSK, and 565 Mbit/s FSK | "Path-finder" technology, having strong economic potential to meet requirements of domestic customers for non-switched services in the longer term . |
| **R1019 Polymeric Optical Switch** | Optically non-linear polymers and devices, such as electro-optical modulators and 2x2 electro-optical switches | Progress towards low cost optical switching matrices |
| **R1020 HYBRID** | Integrated ultra-fast all-optical switching devices; technologies for low cost polymers | Low cost devices for all optical communication systems |
| **R1027 Integrated Opto-electronics towards the Coherent Multi-Channel IBCN** | Components for HDWDM: 3-channel DM-DPSK heterodyne transmission experiment using DFB lasers, state-of-the-art receiver preamplifier, InP integrated polarisation modulator, uniform grating DFB lasers with narrow spectral line width, multi-electrode DFB laser as FSK transmitter, continuous tuneable narrow line width DBR lasers, GSMBE amplifiers for coherent multi-channel systems, OEIC receivers (4 and 8 channels) | High bandwidth services through HDWDM using optical frequency multiplexing with coherent detection. Project results exploited commercially include : a grating, coherent transmitters and receivers and state-of-the-art fabrication techniques. |
| **R1029 Improved InP Substrate Material for Opto-electronic Device Production** | Semi-conducting Sn-doped and semi-insulating Fe-doped InP-substrates fabrication; method of routinely testing Fe-doped "Epi-ready" substrates | European InP- substrates, Sn- and Fe- doped, commercially available and competitive in world markets. |

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1030 ACCESS** | Flexible Customer Access Connection (CAC) for 622 MBit/s services in the future IBC (interactive services, plus analogue CaTV). CAC systems and architectures using TDMA/SCM 2 Mbit/s. Design and evaluation of key components and modules (Flexible multiplexers, broadband switches, EDFA-modules optimised for AM-TV distribution). Cost analysis has shown that fibre solutions are often cheaper than copper. | Cost optimisation of the Customer Access. Inherent flexibility in service provision to residential and small business users through use of optical network topologies. Realisation of corresponding Opto-electronic components. |
| **R1031 Low Cost Opto-electronic Components** | Integrated transceiver modules, high speed detector. Coaxial packages of lasers, micro-optics and detectors. 1.5 μm all MOVPE grown SIPBH lasers. Wafer testable 1.5 μm DFB-lasers Alignment and fixing of fibre and lenses, package material costs, hybrid integration of the opto-electronic and electronic functions. | Low cost active opto-electronic devices made commercially available for early implementation of IBC: |
| **R1032 Optical Components for Subscribers Networks** | Key components, technologies and test equipment required for introduction of optical fibres in customer premises | Low cost, rugged devices for use in Customers Premises. Complementary perspective to related projects addressing public networks |
| **R1051 Multi-Gigabit Transmission in the IBC Subscriber Loop** | 10 Gbit/s optical transmission system distributing 64 TV-channels (each at 155 Mbit/s) to over 8 million different terminals | Technology for distributing digital (HD)TV now capable of supporting more subscribers than are likely to be connected to a single network node under any network architectures currently envisaged. |
| **R1057 AQUA** | High speed (up to 10 Gbit/s) and high power Quantum Well lasers | Europe now manufacturing high speed components for direct detection multi-gigabit transmission systems |
| **R1064 MIOCA** | Monolithically integrated, laser diode-monitor chip, and optical switch & amplifier chip with ridge waveguide structures. | Monolithic optical integration on InP substrates is a key technology for cost effective manufacturing of essential IBC components |
| **R1069 EPLOT** | Optical lasers for coherent systems, high speed devices for multi-gigabit systems, integration of amplifiers with DFB lasers | High density coherent systems and very high speed components made feasible, as a result of narrower spectral line-width and better control of wavelength. |
| **R1089 LOOP** | Realisation of superior quality passive optical components-better than any other commercially available devices. A low cost optical connector, de-mountable, achieving reflection-free 30% coupling to DFB lasers. A prototype connector-mounting machine for factory use. A fan-out connector (multi-way to single-way) equipped with optional monitoring functions. | The "Euro-Connector" now launched commercially, and adopted by most manufacturers and operators in Europe. Vigorous standardisation efforts ongoing, within international IEC and European CEN / CENELEC. Such components facilitate the earliest implementation of optical communications throughout Europe. Being truly transparent devices, evolution from multimode, to single mode and in future, to coherent transmission can be supported. |

## 2.3 Advanced Information Processing

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1003 GUIDELINE** | Synthesis of TMN Architecture based on experimental results and prototypes of other RACE I projects. Guidelines on the Application of AIP techniques to network management | Results exploited by RACE II and EURESCOM Projects. Potential harmonisation and reduction of risks in the commercial development of TMN systems. Significant contribution to Standards (CCITT and ETSI). |
| **R1005 NEMESYS** | 3 major testbeds for the evaluation of AIP techniques for Traffic and QoS Management. Corresponding simulators for Network, ATM traffic, Services & Users. Practical verification using case studies on Call acceptance & Virtual path. | Reduction of risks in the commercial development of Traffic Management and QoS related TMN systems. Specific results (Simulators, Platform, testbeds) used by RACE II and ESPRIT Projects. |
| **R1006 AIM** | Prototypes of maintenance applications for BERKOM, System X and Interconnected MANs. Specification of corresponding IBC maintenance functions. Development of AIP based Generic Maintenance System (GMS) in 11 modules Evaluation of applicability. | Significant increase in the reuse of system components when developing new applications. Larger scale prototype GMS applied to real networks in RACE II (R2002 GEMA) and ESPRIT projects. Development of commercial products based on GMS. |
| **R1009 ADVANCE** | Prototypes for Network and Customer Administration Systems (NCAS). Evaluation of the applicability of AIP techniques . | Reduction of risks in the commercial development of NCAS. Results used by RACE II and ESPRIT Projects. |
| **R1017 IOLE** | On-line environment (operating system) to support the execution of applications within IBC. Prototype tools for on line software extension, fault tolerance, testing, monitoring and HMI. | An Open Services Architecture for IBC Applications. Exploited by project consortium (embedded in products) and RACE II projects. |
| **R1021 ARISE** | Prototype integrated software engineering environment, specifically tailored for Telecommunications. Methods for software reuse. More than 20 tools for use within the environment. Applied to ISDN and IN software development. | Improvements in the cost and time required to develop software. Results exploited by RACE II and ESPRIT Projects and consortium members. Products now being based on tools produced by the project. |
| **R1046 SPECS** | Method providing maximum automation in the production, execution and maintenance of telecommunications software, based on the use of FDTs - Formal Description Techniques. Ability to handle and incorporate less formal specifications. Open tool architecture to support the method. Prototype tool set used in pilot case studies. | Facilitated the application of Formal Description Techniques in industrial environments. Significant contribution to Standards (CCITT SG X and ISO). Results exploited by RACE II and ESPRIT Projects and consortium members. |
| **R1068 ROSA I (see also R1093)** | Feasibility study for an Open Services Architecture. Identification of requirements and development of the essential concepts to be incorporated. | Leading-edge technology and concepts for service provision. Justified increased RTD in this field. |

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1093 ROSA II (See also R1068)** | Architectural framework for the provision of IBC services - this a fundamental step towards the definition of an Open Services Architecture. Developed an object model (ROOM), compatible with the ODP standard, and incorporating the characteristics required in a Telecommunications Open Architecture and for IBC service specifications. Methodology for Service analysis, specification and implementation.. | Major benefits in terms of cost and time for the development of advanced IBC services. Significant contribution to world-wide research initiatives (TINA-C). Results are exploited by EURESCOM and various RACE Projects. |

## 2.4 IBC Customer Systems

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1001 DVT** | Video codec and scanner assembly for 100 Mbit/s HDTV digital recorder on very high density ME tapes. | High density digital video recorder for the consumer electronics market. |
| **R1004 Electro-luminescent Flat panel Display** | 1st European electro-luminescent (EL) flat panel display and corresponding driver developed and launched commercially. | World leadership in multicolour EL displays. Technology essential for multi-service terminal and high quality displays. |
| **R1011 B-CPN** | B-CPN demonstrator, validating a framework architecture covering business requirements across many applications and network sizes. | Economically viable evolution steps from current installations in customer premises, towards the future IBC. |
| **R1015 D-CPN** | D-CPN demonstrator, validating a concept which supports services and applications offered by pre-existing systems (e.g. EUREKA IHS) as well as new advanced services like switched high quality sound and video, using low cost technology. | Definition of services and technical/technological developments to facilitate the introduction of IBC in the domestic environment. |
| **R1018 HIVITS** | HDTV codec for use by the EBU during WARC 92 for HDTV broadcasting around 20GHz. (Digital video codecs for video telephony, TV and HDTV.) Successful demonstration that current low-bitrate coding standards can be significantly improved by means of advanced image analysis techniques. Significant advances in VLSI technology for video encoding.. Complete study of video transportation over ATM networks. Adaptation of current coding schemes for ATM. | World leadership in devising hierarchical multi-resolution coding techniques which will play a key role in the ongoing definition of digital TV standards. Central contribution to the development by ETSI of the 34Mbit/s standard for contribution codecs. Hierarchical coding is an essential element for the compatibility of different terminal types where video interworking will be required under future MPEG (& multimedia) standards. Products based on HIVITS technology are already being marketed. Basis for further analysis/coding projects in Race II. |
| **R1035 CPN Part I** | Specification of the terminal-CPN interface (at the S reference point), including medium adapters. Definition of CPN architectures suitable for business and domestic environments. Evaluation of options these provide, for evolution from present diverse implementations towards IBC. | Provided customers perspective on public-network termination requirements. Strong contributions to standards bodies (ETSI and CCITT). Results exploited within RACE Part II Projects. |
| **R1036 WTDM Broadband Customer Premises Network** | Broadband Customer Premises Network suitable for digital (HD)TV contribution services and for a wide range of applications up to 40 Gbit/s. Uses 16 WDM channels (at 2.5 Gbit/s each). Mux/Demux: 16 STM-1 to STM-16 and vice-versa. All-fibre 16x16 star coupler. Node controller for internal CPN routing. Wavelength demultiplexer with wavelength tracking. 2.5 Gbit/s silicon ASICs (interleaver/disinterleaver, 12x12 expandable cross-point switch matrix). Project has proven interworking of a WTDM CPN and a public B-ISDN through a protocol converter. | A practical solution for routing of studio quality digital video and HDTV signals within private domains. Can also support interworking across public networks : The viability of early IBC implementations depend on an ability to support a rapidly expanding demand for video services. Expectation that this technology will be increasingly exploited as HDTV is introduced. Contributions to ETSI TM3 on the use of SDH for studio quality video and audio services. |

## 2.5 Usability Engineering

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1034 Usability Engineering Requirements for IBC** | An overview of usability issues for IBC. | Contribution to IBC requirements in the area of Usability Engineering. |
| **R1065 ISSUE** | Usability requirements and design recommendations for videophone and multi-media retrieval services | Guidelines for embedding user requirements in the design process for IBC equipment and services |
| **R1066 IPSNI** | Functional specification of requirements for input/output media at the man-machine interface of a generic IBC terminal | Full incorporation of people with special needs within the population using IBC services and equipment |
| **R1067 GUIDANCE** | Design method and recommendations for distributed multi-author multi-media co-operative system | Guidelines for embedding user requirements in the design process for IBC equipment and services |
| **R1088 TUDOR** | Usability requirements, market data and design recommendations regarding elderly and/or handicapped people | Full incorporation of people with special needs within the population using IBC services and equipment |

# PART III Pre-normative Functional Integration

## 3.1 Demonstrators and Verification

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1007 ITIS** | Multi-service, multi-media IBC terminal demonstrator on a PC platform with ISDN and TV interfaces | Initial implementation of functional design, modular architecture and user interface for multi-service terminals. |
| **R1016 Test Tools and Equipment** | Specific hardware, software and ancillary requirements for an IBC testbed. | Availability of tools for verification of Subscriber Network functionality |
| **R1033 OSCAR** | 3 photonic switching demonstrators: Access Cross-Connect for fully transparent optical switching, space packet-switching at 622 Mbit/s and VHSOL with a ring structure New packaging techniques for low cost mass-manufacture of OEICs | Photonic switching components (optical switches, optical amplifiers, detectors and electronics) complete the realisation of systems employing all-optical transmission / switching . |
| **R1038 MCPR** | IBC terminal demonstrator on workstation platform, having multimedia, hypermedia, and ATM handling functions | Architecture for multi-media information access on IBC facilities |
| **R1048 RSVP** | Initial studies towards a common methodology for Verification | Identification of an approach for the development of common verification techniques |
| **R1056 BIPED** | A business IBC demonstrator integrating multi-service-terminals, CPN, customer access network and ATM switch with a gateway to ISDN | Assessment of the relationship between QoS and Network Performance within selected network configurations |
| **R1072 ITACA** | Protocol Conformance test specification and automation | Protocol specification and testing methodologies. |
| **R1080 HDTV Experimental Usage** | Complete chain of HDTV production, transmission, and consumer equipment according to HD-MAC. | Operational experience in HDTV production and distribution. Raised public awareness of HDTV, within Europe. |
| **R1081 BUNI** | IBC Demonstrator constructed as two separate sub-systems, each comprising multi-service terminals, customer premises network, customer access and broadband switch. One demonstrator addresses the broadcasters studio environment, the other, domestic needs. These were later integrated together as a final, 3rd demonstrator. | Major contribution to the agreed T-interface specification in Europe. Verification of IBC system design concepts. Feedback on the application of test tools to the demonstrator, to improve both future network performance and the tools themselves. |
| **R1082 QOSMIC** | Methods and Models for the verification of Quality of Service (QoS). 2 prototype tools for verification of QoS. Physically connected to the hardware test environment via the UNI. 4 Case studies evaluated. Animated presentation of project results. | Prototypes of future commercial test equipment. Significant contributions to standards formation in ETSI. |
| **R1083 PARASOL** | ATM traffic generator and analyser tools for network verification | Support of network integration projects with tools for testing and verification |
| **R1084 MIME** | Emulator/Simulator hybrid systems for ATM networks | Provision of tools to support design, verification and testing of methods, protocols and functions of IBC (including TMN prototypes) |
| **R1087 PROVE** | Development of a series of verification and testing modules as an integrated tool set : cell generator/analyser, testing of signalling protocols using test scripts, analysis of signalling and call handling | Verification, test and maintenance strategies for IBC. Contributions to ETSI (e.g. Computer Aided Test Generation). User interface design for test tools. Assessment of ATM signalling. |
| **R1092 DIRAC** | Definition of a structured data collection procedure targeted on an innovative analysis method for reliability data. Calculation of reliability of telecommunication systems. | Production of a specification on reliability prediction and measurement. Potentially a European standard. |

## 3.2 Applications Pilots

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1039 DIMUN** | Development and testing of new 'intelligent' applications & services to support distributed design and manufacture | A multimedia communications facility proven in an international manufacturing environment. Yielded increased efficiency, reduced costs and reduced time for the order-design-manufacture cycle |
| **R1042 MULTIMED** | Definition and development of a prototype multimedia environment for the health-care sector | Improvement in the accessibility and usability of multimedia health-care information. |
| **R1054 APPSN** | Six videophone service trials for (social care of) elderly and/or handicapped people | Service models for applications of videophone in social care; user requirements for elderly and handicapped people |
| **R1055 MERCHANT** | Definition of a general architecture for a pan-European ERP (Electronic Retail Payment) system. Implementation of a laboratory demonstrator. Validation of technical options for wider-scale implementation. | A new generation of ERP systems that respects the role, independence and responsibility of each existing ERP actor. |
| **R1058 RESAM** | Field trials have shown that real demand exists for broadband applications in the airline industry, supporting unscheduled aircraft maintenance. These applications involve video, still picture and broadband data transmissions, supporting aircraft maintenance . Users, their needs and business functions, application domains and system requirements were each identified or defined. | Meets the need for multimedia, distributed problem-solving applications within airlines, aircraft manufacturers and shipping companies. Potential applications in many other sectors identified, e.g. design, health care, crisis management, marketing and sales. |
| **R1059 DIVIDEND** | Production of functional requirement specifications for the use of advanced communications within the banking sector, and a multimedia terminal based on these. | Raised awareness of users re the potential offered by advanced services in banking sector. User interest triggered. |
| **R1060 DIDAMES** | Demonstration of collaborative work in manufacturing, using local and wide area broadband communications, supporting PC-integrated video conferencing. | Resulted in commercial tools, applications and telecommunications products. with emphasis on standards, (eg. for workstation interface cards and video codecs). |

| Project | Main Deliverable(s) | Impact |
|---|---|---|
| **R1061 DIMPE** | Pilot of Distributed Multimedia Publishing Environment between major publishing sites. | An understanding of publishers requirements, to realise commercial viability of the application. Development of an open, flexible application architecture and agreement on standards. |
| **R1062 MARIN ABC** | Demonstration of IBC application in the maritime industry: non-routine maintenance and repair of a ship at sea, with assistance of shore-based expertise. | Demonstrated feasibility and cost effectiveness of ship-to-shore video communications via satellite, to prevent/solve maintenance problems as they arise. |
| **R1063 MAPS** | Specification of four application pilot schemes for mobile communications | Focus and approach better defined for subsequent projects in RACE II |
| **R1070 Testing pay-per view** | Pilots for pay-per view television in three separate, existing CaTV networks. Specialised software for traffic modelling and evaluation tools. | Requirements for the man-machine interface. Strategy for the transition to IBC. |
| **R1073 GEOTEL** | Multinational pilot implementation of a library service for petrochemical and related industries | An effective commercial image library accessible from all over Europe (initially by ISDN) |
| **R1074 ECHO** | Installation of an IBC-based, electronic case handling system within insurance companies. | Increase in effectiveness and productivity of clerical and professional personnel in the insurance sector by the use of a distributed system of workstations and servers. |
| **R1075 Telepublishing** | 2 Application Pilots :<br>An individualised electronic newspaper<br>The designing, printing and publishing of catalogues. | Scenario of a broadband working environment, providing easy, time shared interaction between separate locations in the printing and publishing industry. |
| **R1078 European Museums Network** | A full digital multimedia system with as applications, an authoring tool for museum staff and a "discovery machine" for navigation of the museum by visitors | Identification of requirements for workstations and man-machine interface. |
| **R1079 CAR** | A conference demonstrator to support design engineers at different sites in their decision-making. A remote surveillance system relevant to the manufacturing sector. A multimedia messaging system between the various actors in manufacturing design. New methodologies for requirements capture and evaluation | Provided an understanding of the implications of introducing IBC services in the automotive industry. Established knowledge base for future service design. |
| **R1086 TELEMED** | Demonstration of the potential for medical image and data transmission in an IBC environment | Stimulation of the development of medical applications such as remote expert consultation and diagnosis, co-operative research and teaching |
| **R1091 ESP** | Assessment of a common strategy for implementation of the communication links required to support RACE Application Pilots. Assisted in the Pilots' own assessment of requirements for end-systems, software protocols and network provision. | Focused the on-going discussions amongst Sector Actors, and acted as a catalyst for further network provision initiatives. Results & synergies achieved now exploited in RACE II. |

## Concerted Actions and Accompanying Measures

| Date | Event / Workshop | Impact |
|---|---|---|
| **1988 (7 Dates)** | **RACE Concertation Meetings** | Established working relationships amongst RACE projects, with appropriate links to other CEC programmes (Esprit, COST and Eureka). Technical approaches and systems concepts pooled, to mutual advantage. |
| **1989 (7 Dates)** | **RACE Concertation Meetings** | Integration of application pilots, usage and verification projects within the on-going programme. Extensive work supporting the development of Common Functional Specifications (CFS) |
| **6 & 14 June 1990** | **User Meeting on Advanced Communications in Europe** | Raised awareness of the potential for application of advanced communications in different business sectors. Generated the interest of user organisations to respond to possible future call for application pilots. |
| **20 June 1990 (in Dublin)** | **IBC Islands Workshop** | Highlighted the extent to which broadband communications already existed, and showed how interconnection of such "islands" could feasibly be achieved in the shorter term |
| **26 June 1990** | **Fibre to the Home** | Examined the economics of deploying optical fibre in the Customer Access network, and highlighted the most promising technical approaches, for further development. |
| **2 July 1990** | **Mobile Communications in IBC** | Determined the relationship between systems supporting broadband and mobile communications. Intelligence in Networks and "Mobility in the fixed network" amongst the common factors. |
| **10-12 July 1990 (in Aveiro)** | **Optical Communications Summer School** | Strengthening of links with peripheral countries. Dissemination of optical RACE results to engineers expecting to begin research in this field. |
| **15 October 1990 (in London)** | **International IBC Conference** | Single conference giving the broadest coverage of RACE I results, and progress made in the functional specifications of IBC. Wide dissemination achieved. |
| **23 October 1990** | **Impact Assessment and Forecasting** | A review of socio/political issues pertinent to the development of IBC. An indication of the priorities for future RTD in the area. |
| **24 October 1990** | **Intelligent Network, Service Engineering and Usability** | Raised awareness of the potential for separation of service provision from network operation. Technological basis for a faster, more effective approach to service design, based on combinations of discrete service components. |
| **26 October 1990** | **IBC Implementation Framework** | Communication with the sector actors concerned. Examined the feasibility of implementing evolutionary scenarios developed within RACE. |
| **30 October 1990** | **Image Communications** | Identification of priority areas for RTD to meet emerging IBC requirements, based on a review of the state-of-the-art in image communications. |
| **13 December 1990** | **Intelligent Cities** | Development of co-operation between City authorities , in applying informational resources and communications links to find solutions to urban problems. Identified requirements for RTD, which led to the establishment of the ENS Action. |
| **1990 (6 Dates)** | **RACE Concertation Meetings** | Mid-Term results collated and fed into planning process for RACE II. First draft of CFSs fed back to projects. |
| **10 September 1991** | **Fibre to the User (International Audit)** | Comparison of roll-out strategies in Japan, USA, Canada and Europe, for introduction of optical fibre in the customer access. Factors determining the technical and economic suitability of the different approaches examined in detail |
| **1991 (6 Dates)** | **RACE Concertation Meetings** | Highlighted issues of common interest, for further examination. Second consolidation of CFS. |
| **1992 (6 Dates)** | **RACE Concertation Meetings** | Transfer of RACE I results to newly launched RACE II projects. Assured continuity of momentum and links between RACE Projects & other Programmes. |

# Annex II

## Contributions to Standards

# RACE
# CONTRIBUTIONS TO STANDARDS

## R1003 AIP and Standards for TMN

| | | | | |
|---|---|---|---|---|
| Taxonomy of Reference Points (Re view of M.30) | CCITT | | 1991/03 | UK |
| Mediation function definition | ETSI | NA 4 | 1990/03 | UK |
| Taxonomy of Reference Points (Review of M.30) | ETSI | NA 4 | 1991/03 | UK |
| The workstation function | ETSI | NA 4 | 1990/03 | UK |
| TMN reference point definition | ETSI | NA 4 | 1990/09 | UK |
| Taxonomy of Reference Points (Re view of M.30) | ETSI | NA4 | 1991/03 | UK |

## R1014 Atmospheric

| | | | | |
|---|---|---|---|---|
| Distributed Bit Scrambling Method for ATM Cells | ANSI | T1S1.1. | 1989/09 | Canada |
| The Distributed Bit Scrambling Method for ATM Cells | ANSI | T1S1.5 | 1990/02 | USA |
| New questions on string mode for the next CCITT period | CCITT | | 1992/06 | |
| Distributed Sample Scrambler : State Transition Machine | CCITT | SG | 1991/06 | Switzerland |
| Mapping of ATM cells into lower-order VCs | CCITT | SG | 1992/03 | |
| On the Equivalence Between two Proposed Network Architectures | CCITT | SG | 1991/06 | Switzerland |
| On the harmonisation of two proposed network architectures | CCITT | SG | 1991/12 | Australia |
| The Distributed Bit Scrambling Method for ATM Cells | CCITT | SG | 1990/01 | Switzerland |
| The Stratified Concept - an extension to ISDN PRM I.320 | CCITT | SG | 1990/01 | Italy |
| Distributed Sampler Scrambler : Technical Description | CCITT | SG | 1990/12 | Japan |
| Cell Delineation with the Distributed Sample Scrambler | CCITT | SG | 1990/10 | Japan |
| Distributed Sample Scrambler : Synchronisation Confidence Limits | CCITT | SG | 1990/12 | Japan |
| Introduction of the Stratified Reference Model | ETSI | NA4 | 1989/11 | |
| Signalling and Management in the SRM | ETSI | NA4 | 1992/09 | |
| Stratified Reference Model | ETSI | NA4 | 1992/03 | |
| 31st Order Distributed Sample Scrambler | ETSI | NA5 | 1990/10 | France |
| 600 Mbit/s structure at T | ETSI | NA5 | 1989/03 | Germany |
| Allocation of PTI Values | ETSI | NA5 | 1991/04 | Netherlands |
| ATM Cell Format | ETSI | NA5 | 1989/03 | Germany |
| ATM header error control cell delineation combined with scrambling | ETSI | NA5 | 1989/05 | France |
| ATM Information Field Size | ETSI | NA5 | 1989/03 | Germany |
| ATM Routing Field | ETSI | NA5 | 1989/03 | Germany |
| ATM Routing Field | ETSI | NA5 | 1989/05 | France |
| Distributed Bit Scrambler with 8-bit HEC | ETSI | NA5 | 1990/03 | Italy |
| Distributed Bit Scrambling Method for ATM Cells | ETSI | NA5 | 1989/09 | France |
| Distributed Scrambler with 31st order Polynomial | ETSI | NA5 | 1990/09 | Spain |
| Frame Synchronisation | ETSI | NA5 | 1989/04 | Netherlands |
| Layer Stamping | ETSI | NA5 | 1990/10 | France |
| Mapping the ATM UNI into the SDH UNI | ETSI | NA5 | 1989/03 | Germany |
| Media Adaptors at T | ETSI | NA5 | 1989/03 | Germany |
| Multi-link protocols for ATM | ETSI | NA5 | 1991/09 | Turkey |
| NT1 Functionality | ETSI | NA5 | 1989/04 | Netherlands |
| Proposed Structure of CCITT B-ISDN Rec. | ETSI | NA5 | 1989/05 | France |
| Service Requirements for ATM Priority and Layering | ETSI | NA5 | 1989/03 | Germany |
| Service Requirements for ATM Priority and Layering | ETSI | NA5 | 1989/03 | Germany |
| String Mode | ETSI | NA5 | 1991/09 | Turkey |
| String Mode Protocol for ATM Network | ETSI | NA5 | 1991/04 | Netherlands |
| Synchronisation | ETSI | NA5 | 1988/10 | Netherlands |
| The Distributed Bit Scrambling Method for ATM Cells | ETSI | NA5 | 1989/10 | Sweden |
| The Distributed Bit Scrambling Method for ATM Cells | ETSI | NA5 | 1989/11 | UK |
| The Distributed Byte Scrambling Method for ATM Cells | ETSI | NA5 | 1990/04 | Portugal |
| The resilience of the distributed bit scrambling method to Random or Malicious Interference | ETSI | NA5 | | |
| Transmission aspects - Virtual Bandwidth | ETSI | NA5 | 1992/09 | |
| Transmission Format | ETSI | NA5 | 1988/10 | Netherlands |
| Transmission Format for ATM | ETSI | NA5 | 1988/10 | Netherlands |
| Transmission System on the Line Side of NT1 | ETSI | NA5 | 1989/03 | Germany |
| Virtual Network Concept | ETSI | NA5 | 1988/10 | Netherlands |
| Virtual Path Identifier | ETSI | NA5 | 1988/10 | Ireland |

| | | | | |
|---|---|---|---|---|
| VPI Field Size at the UNI | ETSI | NA5 | 1989/11 | UK |
| Proposal for definition of the Service Profile Concept for B-ISDN and its use for customer/access/terminal | ETSI | SPS3 | 1991/05 | Germany |
| Mapping ATM into lower order VCs | ETSI | TM1 | 1990/10 | Germany |
| The Distributed Bit Scrambling Method for ATM Cells | ETSI | TM3 | 1989/10 | Portugal |
| Signalling at the UNI and NNI. Introductory Remarks | RACE | ARG | 1990/06 | Norway |
| Naming and Addressing within the Stratified Reference Model | RACE | STG 1.1 | 1992/05 | |
| The Extended Stratified Reference Model | RACE | STG 1.1 | 1991/09 | |
| Contribution to D410 CFS : Signalling Protocols | RACE | STG 3.1 | 1990/05 | Belgium |
| Contribution to the Functional Model for IBC Basic Service | RACE | STG 3.1. | 1991/02 | Belgium |

## R1015 Domestic Customer Premises Network

| | | | | |
|---|---|---|---|---|
| Comments on Draft Recommendation I.363 | ETSI | NA 5 | 1990/04 | Portugal |

## R1018 High Quality Videotelephone and (High Definition) Television

| | | | | |
|---|---|---|---|---|
| Impact of digital transmission on HDTV sampling parameters | CCIR | IWP-11/ | 1990 | |
| Hardware realisation of a 140/155 Mbit/s HDTV-codec progress report | CCIR | TG11-2 | 1991/02 | France |
| ATM cell loss experiments with TM1 | CCITT | IEC | 1992/07 | Netherlands |
| ATM cell loss experiments with TM1 | CCITT | ISO | 1992/07 | Netherlands |
| H 261 compatible 2-layer video codec with high cell loss resiliance. | CCITT | SG XV | 1991/05 | France |
| Simulation of random cell loss | CCITT | SG XV | 1992/01 | UK |
| Two Remarks to the text of the Flexible Hardware specification | CCITT | SG XV | 1989/11 | Germany |
| Two Remarks to the text of the Flexible Hardware specification | CCITT | SG XV | 1989/11 | France |
| Two Remarks to the text of the Flexible Hardware specification | CCITT | SG XV | 1989/11 | Italy |
| Two Remarks to the text of the Flexible Hardware specification | CCITT | SG XV | 1989/11 | Netherlands |
| Two Remarks to the text of the Flexible Hardware specification | CCITT | SG XV | 1989/11 | Sweden |
| Two Remarks to the text of the Flexible Hardware specification | CCITT | SG XV | 1989/11 | UK |
| ATM cell loss experiments with TM1 | CCITT | SG XV/1 | 1992/07 | Netherlands |
| Error sensivity of the TM1 syntax | CCITT | SG | 1992/07 | Netherlands |
| Normes pour les systèmes de distribution secondaire | CMTT | | 1989 | France |
| Rewording of annex A of report AD/CMTT | CMTT | | 1990/03 | |
| Comparison of the two VLC and videomultiplier proposals according to report AD/CMTT | CMTT/2 | | 1989/12 | |
| Contribution codec VLC parameters | CMTT/2 | | 1989/10 | |
| Contribution to the adhoc group on 34 Mbit/s DCT coding | CMTT/2 | | 1988/03 | |
| Contribution to the specification writing | CMTT/2 | | 1988/08 | |
| Corrections and rewording to the draft recommendation AT/CMTT | CMTT/2 | | 1990/03 | |
| Criticality and Quantisation | CMTT/2 | | 1989/09 | |
| Hardware realisation of the 34/45 Mbit/s 4:2:2 codec and of the 140 Mbit/s HDTV codec | CMTT/2 | | 1990/03 | |
| Performances of the VLC based on ACVLC | CMTT/2 | | 1989/10 | |
| Proposal for an amendment to CMTT DCT ad hoc group document No 1 | CMTT/2 | | 1988/04 | |
| Scanning standard to be used on the secondary distribution channels | CMTT/2 | | 1990/02 | |
| Specification of a variable length coding | CMTT/2 | | 1989/09 | |
| The issue of VLC and videoframing | CMTT/2 | | 1989/10 | |
| Variable length coding | CMTT/2 | | 1989/08 | |
| Videoframing | CMTT/2 | | 1989/09 | |
| VLC and videomultiplex proposal | CMTT/2 | | 1988/06 | |
| Hardware realisation of a 140/155 Mbit/s HDTV-codec Progress Report | CMTT/2 | WB11 | 1991/02 | France |
| 34/45 Mbit/s videocodec - The issue of VLC and videoframing | ETSI | NA | 1990 | |
| Introduction to the project HIVITS | ETSI | NA | 1990 | |
| Status of the 34/45 Mbit/s contribution codec standard | ETSI | NA | 1990 | |
| H 261 compatible 2-layer video codec with high cell loss resiliance. | ETSI | NA 5 | 1991/04 | Netherlands |
| Specification for CCITT H.261 comatible video coding for ATM networks | ETSI | NA 5 | 1992/02 | UK |
| A draft proposal for ALL Type 2 | ETSI | NA5 | 1992/05 | UK |

## R1022 Technology for ATD

| | | | | |
|---|---|---|---|---|
| AAL-PDU Structure for CBR audio and video services | CCITT | SG | 1990/01 | Portugal |
| Sequence number protection for AALL Class 1 services | CCITT | SG | 1990/05 | Portugal |
| VCI Management For A Signalling Link | CCITT | SG | | USA |
| "VPI/VCI pastition at UNI and ""active bits"" restriction" | CCITT | SG | 1990/01 | Germany |
| Compatibility Between S and T Interfaces In The Subscriber Premises Network | CEPT | NA5 | 1988/10 | Portugal |
| Echo in the Finnish PSTN | CEPT | NA5 | 1988/10 | Portugal |
| Bit Error Bursts At 139 264 kbit/s | CMTT | IWP | | |
| Monitoring Of The Quality Of Digital Circuits Using ATM | CMTT | IWP | | |
| On The Necessity Of Protection Against Cell Losses For High-Quality Audio And Video Services | CMTT | IWP | | |

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|---|---|---|---|---|
| Synchronization Aspects In A Pure ATM-Based Broadband Network | CMTT | IWP | | |
| Treatment Of Cell Losses In An ATM-Based Broadband Network | CMTT | IWP | | |
| AAL Sequence number synchronization algorithm | ETSI | NA 5 | 1990/09 | Portugal |
| Application Of Maintenance Principles To B-ISDN Basic Customer Access | ETSI | NA 5 | 1989/03 | |
| Impact of ATM Cell Size on Mobile Communications | ETSI | NA 5 | 1989/05 | |
| Priorities In An ATM Network | ETSI | NA 5 | | Germany |
| ROS subattributes in I. 2XX | ETSI | NA 5 | 1989/11 | |
| Sequence number protection for AAL Class 1 Services | ETSI | NA 5 | 1990/04 | Portugal |
| Sequence number protection for AAL type 1 | ETSI | NA 5 | 1990/10 | Portugal |
| Service Bit Rates Amendments to Draft Rec. I. 2XX | ETSI | NA 5 | 1989/11 | |
| Considerations on the ATM Layer Functions | ETSI | SPS 3 | 1990/04 | |
| Considerations on the Cell Header Translation Function | ETSI | SPS 3 | 1990/04 | |
| Considerations on the Physical Layer Functions | ETSI | SPS 3 | 1990/04 | |
| Considerations on Virtual Channel | ETSI | SPS 3 | 1990/04 | |
| Functions of ATM Network Nodes | ETSI | SPS 3 | 1990/04 | |
| General Characteristics of ATM Network Nodes | ETSI | SPS 3 | 1990/04 | |
| INTERFACES | ETSI | SPS 3 | 1989/10 | |
| "Introduction, Scope and Field of Application (for Rec. on Broad-Bandswitching)" | ETSI | SPS 3 | 1990/04 | |
| New Structure for Recommendation on Broadband Switching | ETSI | SPS 3 | 1990/04 | |
| Some Considerations on Overload Handling | ETSI | SPS 3 | 1989/10 | |
| ATM-Related Functions | ETSI | STG 3.2 | 1990/06 | Netherlands |
| Connection Acceptance Control | ETSI | STG 3.2 | 1990/08 | Netherlands |
| Connections through an Exchange | ETSI | STG 3.2 | 1990/06 | Netherlands |
| Maintenance aspects of an ATM Exchange | ETSI | STG 3.2 | 1990/06 | Netherlands |
| Performance of established connections | ETSI | STG 3.2 | 1990/07 | Netherlands |
| Service specific functions in an ATM Exchange | ETSI | STG 3.2 | 1990/06 | Netherlands |
| Traffic Characterization | ETSI | STG 3.2 | 1990/08 | Netherlands |

## R1024 Functional Specifications for IBC System Requirements

| | | | | |
|---|---|---|---|---|
| QOS Methodology | ETSI | NA | 1990/03 | UK |
| Analysis of Network Management Requirements | ETSI | NA 4 | 1990/09 | |

## R1030 Advanced Customer Connections, an Evolutionary System

| | | | | |
|---|---|---|---|---|
| Consideration concerning loopback in CAC | ETSI | NA 5 | 1991/06 | Sweden |

## R1031 Low Cost Optoelectronic Components

| | | | | |
|---|---|---|---|---|
| Measurement Techniques for Essential Ratings and Characteristics of Components | CCITT | IEC | | |
| "Blank detail specification: ""Coaxial laser""" | CENELEC | CECC | 1989/04 | Germany |

## R1035 Customer Premises Network

| | | | | |
|---|---|---|---|---|
| Physical Layer OAM for cell based option. | ETSI | NA 5 | 1991/09 | |
| Cost and performance of different coaxial cable and receiver types. | ETSI | TM 3 | 1991/04 | |
| Definition of terminal failure voltage for the coaxial interface at 155.52 Mbps. | ETSI | TM 3 | 1991/04 | |
| "Input to the ""Living List"" for Rec. I.432." | ETSI | TM 3 | 1991/04 | |
| Line code for Interfaces at TB- and SB reference points. | ETSI | TM 3 | 1991/04 | |

## R1041 Functional Specifications of Codes

| | | | | |
|---|---|---|---|---|
| Principle of Functional Modelling | ETSI | NA 4 | 1990/09 | France |

## R1044 IBCN Development of the Functional Reference Model

| | | | | |
|---|---|---|---|---|
| UK Contribution on Protocol Reference Models | CCITT | SG | 1988 | |
| UK contribution on Signalling Channel Structures | CCITT | SG | 1988 | |
| Optical CATV User-Network-Interface Based on a High-speed WDM | ETSI | NA 3 | 1990/02 | Germany |
| Optical CATV-User-Network-Interface b.opt. | ETSI | NA 3 | 1990/02 | Germany |
| Impact of intelligent Networks on TMN | ETSI | NA 4 | 1989/10 | Denmark |
| A formal stage I description of Multi-Media services | ETSI | NA 5 | 1989/10 | Denmark |
| AAL messages | ETSI | NA 5 | 1990/09 | Belgium |
| AAL primitives for non-assured operation without flow control | ETSI | NA 5 | 1990/09 | Belgium |
| AAL primitives for operation with flow control | ETSI | NA 5 | 1990/09 | Belgium |
| AAL protocol model and peer-to-peer procedures | ETSI | NA 5 | 1990/09 | Belgium |
| AAL type 3 functional model (allocation AAL) | ETSI | NA 5 | 1991/09 | Belgium |
| An adaptation convergence sub-layer (CS) and protocol for connectionless services | ETSI | NA 5 | 1990/03 | |

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|---|---|---|---|---|
| An adaptation layer protocol model for signalling packet-mode connection oriented service and | ETSI | NA 5 | 1989/10 | |
| An ATM Adaption Layer Protocol Model for IEEE LAN Interconnects | ETSI | NA 5 | 1989/11 | Belgium |
| An ATM Adaption Layer Protocol Model for packet mode services | ETSI | NA 5 | 1989/11 | Belgium |
| Analysis of Multi Media Aspects of Broadband Services | ETSI | NA 5 | 1989/10 | Denmark |
| Answer to CCITT XI/4 open questions on meta-signalling | ETSI | NA 5 | 1990/09 | Belgium |
| ATM adaptation layer for VBR service | ETSI | NA 5 | 1989/10 | |
| ATM adaptation model layer service classification for non-time-related services | ETSI | NA 5 | 1990/03 | |
| ATM signalling channel allocation and meta-signaling issues | ETSI | NA 5 | 1989/10 | |
| Attributes classification | ETSI | NA 5 | 1990/09 | Belgium |
| B-ISDN Arch.Prin.for Interactive and Non-Switch.Distribn.Services | ETSI | NA 5 | 1990/07 | UK |
| B-ISDN Arch.Prin.for Interactive and Non-Switch.Distribn.Services | ETSI | NA 5 | 1990/07 | Germany |
| B-ISDN bearer service definition | ETSI | NA 5 | 1990/09 | Belgium |
| B-ISDN Connection Types and their attributes | ETSI | NA 5 | 1992/01 | Belgium |
| Basic Requirements and Principles for MANs | ETSI | NA 5 | 1990/01 | Belgium |
| Benefits of activation/deactivation at the TB reference point | ETSI | NA 5 | 1990/09 | Belgium |
| Categorization of B-ISDN Connection Types | ETSI | NA 5 | 1992/01 | Belgium |
| Clarification of channel associated signalling (CAS) at the access | ETSI | NA 5 | 1991/01 | Belgium |
| Clarification of the ATM adaptation service classification model | ETSI | NA 5 | 1990/03 | |
| Comments on ATM header functions | ETSI | NA 5 | 1990/10 | |
| Comments on NA5 Draft Rec.1413 (UNI) | ETSI | NA 5 | 1989/11 | |
| Comments on SG XI meta-signalling document | ETSI | NA 5 | 1991/01 | Belgium |
| Common channel signalling (CCS) for B-ISDN | ETSI | NA 5 | 1991/01 | Belgium |
| Contribution on Short term IBCN | ETSI | NA 5 | 1989/03 | |
| Cost comparison of the coaxial with the fibre optical interface at UNI | ETSI | NA 5 | 1989/11 | |
| Cost figures of a coaxial interface at UNI | ETSI | NA 5 | 1989/11 | |
| Cost figures of a fibre optical interface at UNI | ETSI | NA 5 | 1989/11 | |
| Error detection for PO services | ETSI | NA 5 | 1989/11 | |
| Estimate of activation times for an activation/deactivation procedure at the TB reference point | ETSI | NA 5 | 1990/09 | Belgium |
| Evolution of Optical Multi-Customer Access Links in the IBCN | ETSI | NA 5 | 1990/03 | Germany |
| Guidelines for dynamic description of Multi-Media services using SDL diagrams | ETSI | NA 5 | 1989/10 | |
| Implications of the introduction of the P bit for AAL type 3 and 4 (allocation AAL) | ETSI | NA 5 | 1991/09 | Belgium |
| Information type related attributes for service components | ETSI | NA 5 | 1989/03 | Germany |
| Introduction IBCN Reference Configuration | ETSI | NA 5 | 1990/03 | |
| Introduction of the BRAN and LIT functional groups into the functional architectural model (allocation | ETSI | NA 5 | 1991/09 | Belgium |
| Introduction to the static description of multimedia services | ETSI | NA 5 | 1989/03 | Germany |
| Introductory description of multimedia services | ETSI | NA 5 | 1989/03 | |
| List of parameters for the physical medium dependent layer of an electrical interface at the Tb reference | ETSI | NA 5 | 1989/09 | |
| Location of meta-signalling in the B-ISDN FRM | ETSI | NA 5 | 1991/01 | Belgium |
| Meta-signalling | ETSI | NA 5 | 1990/03 | Italy |
| Meta-signalling message transport | ETSI | NA 5 | 1989/11 | |
| Meta-signalling states description | ETSI | NA 5 | 1989/11 | |
| Multi-media structure | ETSI | NA 5 | 1990/09 | Belgium |
| Notes on Access Network MAN Architecture 5 | ETSI | NA 5 | 1990/03 | Italy |
| Open questions on meta-signalling raised at Brussels meeting of CCITT SG XI/4 | ETSI | NA 5 | 1991/01 | Belgium |
| Optical CATV User-Network-Interface Based on a High-speed WDM | ETSI | NA 5 | 1990/02 | Germany |
| Optical CATV-User-Network-Interface b.opt. | ETSI | NA 5 | 1990/02 | Germany |
| Optical Multicustomer Access Networks and its Evolution | ETSI | NA 5 | 1990/03 | Germany |
| Optical Multicustomer Access Networks and its Evolution | ETSI | NA 5 | 1990/03 | Germany |
| Optical Network Architecture for a Combined B-ISDN & CATV Multicustomer Access Link in IBCN | ETSI | NA 5 | 1990/04 | Switzerland |
| Optical Network Architecture for a Combined B-ISDN & CATV Multicustomer Access Link in IBCN | ETSI | NA 5 | 1990/04 | Germany |
| Optical Reference Configuration of Multigigabit CATV Customer Access Network (R.1051) | ETSI | NA 5 | 1990/02 | Germany |
| Physical layer of the cell-based UNI | ETSI | NA 5 | 1990/09 | Belgium |
| Power feeding accross the interface at the Tb reference point | ETSI | NA 5 | 1989/09 | |
| Preliminary Network Architecture for the IBCN | ETSI | NA 5 | 1989/10 | |
| Principles on Interworking | ETSI | NA 5 | 1989/10 | UK |
| Proposal for a cyclic counting in the AAL sequence number field | ETSI | NA 5 | 1990/03 | |
| Proposal for a data-link protocol as part of AAL Convergence Sub-layer (CS) protocol for non-time-related | ETSI | NA 5 | 1990/03 | Italy |
| Proposal for basic primitives between the ATM adaptation layer (AAL) and the ATM layer | ETSI | NA 5 | 1990/03 | |
| Proposal for primitives between the ATM adaptation layer and the ATM layer | ETSI | NA 5 | 1990/03 | |
| Proposal for single BASIC ATM Adaptation (SAR) sub-layer for all Packet Oriented (PO) services | ETSI | NA 5 | 1989/11 | |
| Proposed Document Structure for MAN Standards | ETSI | NA 5 | 1990/01 | Belgium |
| Proposed Structure for ETSI draft ETSI on MANs | ETSI | NA 5 | 1990/03 | |
| Prose description and definition of multimedia services | ETSI | NA 5 | 1989/03 | Germany |
| Protocol Architecture for AAL type 3 and type 4 (allocation AAL) | ETSI | NA 5 | 1991/09 | Belgium |
| Reference Configuration for TMN | ETSI | NA 5 | 1989/03 | |

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|---|---|---|---|---|
| Reference Configurations Construction Rules | ETSI | NA 5 | 1990/09 | Belgium |
| Service Component Concept | ETSI | NA 5 | 1988/03 | Germany |
| Service primitives exchanged between the ATM Layer Entity and the AAL Layer Entity (allocation PRS) | ETSI | NA 5 | 1991/09 | Belgium |
| Service Requirements for MANs | ETSI | NA 5 | 1990/01 | Belgium |
| Signalling requirements for multiparty calls | ETSI | NA 5 | 1990/09 | Belgium |
| Specification of the Physical Characteristics for an electrical interface of 155.52 MBit/s | ETSI | NA 5 | 1989/11 | Belgium |
| Stage 2 studies on Multi-Media Services | ETSI | NA 5 | 1989/10 | Denmark |
| Support of Broadband distributive services | ETSI | NA 5 | 1989/10 | |
| SVCI management protocol SDL | ETSI | NA 5 | 1990/09 | Belgium |
| Target IBCN Reference Configuration | ETSI | NA 5 | 1990/03 | |
| Target IBCN Reference Configurations | ETSI | NA 5 | 1989/03 | |
| The BRANching functional group in the CAN | ETSI | NA 5 | 1992/01 | Belgium |
| The Optical Line Outlet concept | ETSI | NA 5 | 1989/10 | |
| The use of selective broadcasting | ETSI | NA 5 | 1990/09 | Belgium |
| Transmission range for coaxial interface | ETSI | NA 5 | 1989/09 | |
| Transmission ranges for an optical fibre interface | ETSI | NA 5 | 1989/11 | |
| Use of generic layering architecture to structure the broadband user-network signalling interface | ETSI | NA 5 | 1989/10 | |
| Use of unused octets in meta-signalling messages and indication | ETSI | NA 5 | 1991/01 | Belgium |
| User network interface based on SDH | ETSI | NA 5 | 1989/10 | |
| Utilisation of the 780 nm optical window for transmission at the UNI | ETSI | NA 5 | 1990/09 | Belgium |
| A framework for the TSI TC/TR on "Signalling protocol requirements for B-ISDN services" | ETSI | NA5 | 1991/11 | Finland |
| A proposal for S-AAL protocol architecture | ETSI | NA5 | 1992/05 | Sweden |
| AAL functional models for class D services | ETSI | NA5 | 1991/10 | Greece |
| AAL SSCP protocol model for B-ISDN signalling and CO Data Service | ETSI | NA5 | 1992/05 | Sweden |
| AAL SSCP protocol model for B-ISDN signalling & (high speed) conection oriented data services | ETSI | NA5 | 1992/01 | France |
| AAL type 3 functional model | ETSI | NA5 | 1991/09 | Turkey |
| AAL type 4 functional model | ETSI | NA5 | 1991/09 | Turkey |
| Application of the Service Component - Concept to stage 2 and 3 of I.130 | ETSI | NA5 | 1991/04 | Turkey |
| B-ISDN Connection Types and their attributes | ETSI | NA5 | 1992/01 | France |
| Categorization of B-ISDN Connection Types | ETSI | NA5 | 1992/01 | France |
| Cell delineation for burst & continuous ATM, cell based option | ETSI | NA5 | 1991/09 | Turkey |
| Clarification of the PRM information flows | ETSI | NA5 | 1992/01 | France |
| Comments on pr ETS DE/NA-52511 par. 13 "Operational Functions" | ETSI | NA5 | 1992/09 | Sweden |
| Comparison of the BRAN FG Concept for the Optical Access Network as an addition to the liaison statement | ETSI | NA5 | 1992/04 | Italy |
| Editorial amendment for paragraph 4.4 in I.432 | ETSI | NA5 | 1991/10 | Greece |
| Functional ATM Layer Model for service primitives definitions | ETSI | NA5 | 1991/09 | Turkey |
| General NNIs and Interworking | ETSI | NA5 | 1992/09 | Sweden |
| Identifiers for B-ISDN signalling | ETSI | NA5 | 1991/11 | Finland |
| Impact of service component concept on stage 2 & stage 3 of CCITT Rec. I.130 | ETSI | NA5 | 1991/10 | Greece |
| Implication of the introduction of the P bit for AAL type 3 & 4 | ETSI | NA5 | 1991/09 | Turkey |
| Improved wavelength allocation | ETSI | NA5 | 1991/10 | Greece |
| Introduction of BRAN into the Generic RC of CE; Introduction of BRANs into the FAM of a PL | ETSI | NA5 | 1992/09 | Sweden |
| Introduction of the BRAN and LIT functional groups into the functional architecture model | ETSI | NA5 | 1991/09 | Turkey |
| Loss priority parameter in AAL Primitives | ETSI | NA5 | 1991/10 | Greece |
| Maintenance for cell based UNI | ETSI | NA5 | 1991/09 | Turkey |
| Mapping of service components into bearer components for multimedia services | ETSI | NA5 | 1991/10 | Greece |
| Naming conventions for primitives related to the association between VCI/VPI & CEI | ETSI | NA5 | 1992/01 | France |
| No need for a Fast Reservation Protocol | ETSI | NA5 | 1991/09 | Turkey |
| Physical layer functional model for service primitives definition | ETSI | NA5 | 1991/10 | Greece |
| Physical Layer OAM for cell based option | ETSI | NA5 | 1991/09 | Turkey |
| Physical layer OAM for cell based option | ETSI | NA5 | 1991/10 | Greece |
| Primitives definition related to local monitoring functions : M-ATM CONGESTION-INDICATION | ETSI | NA5 | 1992/09 | Sweden |
| Primitives definition related to local monitoring functions : M-ATM MONITOR-INVOKE | ETSI | NA5 | 1992/09 | Sweden |
| Primitives definition related to local monitoring functions : M-ATM MONITOR-REMOVE | ETSI | NA5 | 1992/09 | Sweden |
| Primitives definition related to local monitoring functions : M-ATM MONITOR-INDICATION | ETSI | NA5 | 1992/09 | Sweden |
| Primitives exchanged between the PMD sublayer entity & the TC sublayer entity | ETSI | NA5 | 1991/10 | Greece |
| Proposal for a Concept of multiparty | ETSI | NA5 | 1991/09 | Turkey |
| Proposal for burst ATM transmission | ETSI | NA5 | 1991/09 | Turkey |
| Proposed Structure for MANs | ETSI | NA5 | 1990/03 | Italy |
| Protocol architecture for AAL type 3 & type 4 | ETSI | NA5 | 1991/09 | Turkey |
| Revision of ATM layer functional model | ETSI | NA5 | 1992/01 | France |
| Revision of service primitives exchanged between the ATM Layer Entity & the AAL Layer Entity | ETSI | NA5 | 1992/03 | Portugal |
| Service primitives exchanged between the ATM Layer Entity and the ATM Layer Management Entity | ETSI | NA5 | 1991/09 | Turkey |
| Service primitives exchanged between the ATM Layer Entity and the ATM Layer Management Entity | ETSI | NA5 | 1991/09 | Turkey |
| Service primitives exchanged between the ATM Layer Entity and the AAL Layer Entity | ETSI | NA5 | 1991/09 | Turkey |

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|---|---|---|---|---|
| Service primitives exchanged between the ATM Layer Entity and the SAR Sublayer Entity | ETSI | NA5 | 1991/09 | Turkey |
| Service primitives exchanged between the ATM layer Management Entity related to data transfer | ETSI | NA5 | 1991/09 | Turkey |
| Service primitives exchanged between the PH layer entity & the ATM layer entitiy | ETSI | NA5 | 1991/10 | Greece |
| State matrix at TB interface for cell based option | ETSI | NA5 | 1991/10 | Greece |
| The BRANching functional group in the Customer Access Network | ETSI | NA5 | 1992/01 | France |
| The way ahead on broadband numbering within NA2 | ETSI | NA5 | 1991/09 | Turkey |
| Use of the PRM for user plane and control plane connection establishments | ETSI | NA5 | 1991/09 | Turkey |
| Comments on SG XI meta-signalling document | ETSI | SPS 3 | 1991/01 | Belgium |
| Comments on the CCITT SG XI metasignalling protocol working document WD4-33 | ETSI | SPS 3 | 1990/04 | Belgium |
| Global messages for remove and check procedures | ETSI | SPS 3 | 1990/10 | Belgium |
| Global primitives for remove and check procedures | ETSI | SPS 3 | 1990/10 | Belgium |
| Initialisation of Meta-signalling and SVCI assignment procedure | ETSI | SPS 3 | 1990/10 | Belgium |
| Location of meta-signalling in the B-ISDN FRM | ETSI | SPS 3 | 1991/01 | Belgium |
| Metasignalling protocol functions and limitations | ETSI | SPS 3 | 1990/04 | Belgium |
| Open questions on meta-signalling raised at Brussels meeting of CCITT SG XI/4 | ETSI | SPS 3 | 1991/01 | Belgium |
| Point-to-point signalling channel management procedures and SDLs | ETSI | SPS 3 | 1990/10 | Belgium |
| Signalling Virtual Channel Bandwidth | ETSI | SPS 3 | 1990/10 | Belgium |
| Use of unused octets in meta-signalling messages and indication | ETSI | SPS 3 | 1991/01 | Belgium |

# R1045 Consensus Management

| | | | | |
|---|---|---|---|---|
| UK contribution on the Service Component Concept for the definition of Multi Media Services | CCITT | | 1988 | UK |
| UK contribution to CCITT SG XVIII on Protocol Reference Models | CCITT | | 1988 | UK |
| UK contribution to CCITT SG XVIII on Signalling Channel Structures | CCITT | | 1988 | UK |
| Overview of the current status of the CM0 activities I | CEPT | GMR | 1990/11 | Portugal |
| Presentation of RACE projects to GMR | CEPT | GMR | 1990/01 | |
| R1022 Initial Network Planning Guideline | CEPT | GMR | 1989/12 | Portugal |
| RACE Application Analysis R1071 | CEPT | GMR | 1990/09 | |
| RACE Atmospheric R1014 | CEPT | GMR | 1990/09 | |
| RACE Concertation Meeting Technical Workshops | CEPT | GMR | 1990/01 | |
| RACE Mobile Project R1043 | CEPT | GMR | 1990/01 | |
| RACE Satellite Communication for IBCN R1002 | CEPT | GMR | 1989/07 | Portugal |
| RACE: Spectrum Requirements for the 1-3 GHz | CEPT | GMR | 1989/10 | Italy |
| Request for support the RACE Workpackage EPF | CEPT | GMR | 1989/03 | Germany |
| Testbed Infrastructure for RACE Operation 92 | CEPT | GMR | 1989/03 | Germany |
| Long Distance Network : Preliminary Results | CEPT | PSR | 1989/12 | Germany |
| Optical Interfaces for the Customer Access Network | ETSI | | 1991/01 | Denmark |
| "Optical Transmission in the OLN, Architecture and Evolution" | ETSI | | 1991/01 | Denmark |
| The Optical Line Outlet concept | ETSI | | 1989/10 | France |
| Acronyms and abbreviations related to specificaiton and testing of communication systems | ETSI | ATM | 1990/09 | Netherlands |
| Draft report: State of research and standardisation in the area of analytical/formal test specification methods | ETSI | ATM | 1991/06 | Belgium |
| Draft Specification RACE B410: Protocol Conformance Testing | ETSI | ATM | 1990/09 | Belgium |
| Proposal for a new work item : Study of the Scope for interoperability testing | ETSI | ATM | 1990/04 | France |
| Requirements on methodology for conformance testing of lower layers in advanced digital networks | ETSI | ATM | 1991/06 | Sweden |
| Standardisation opportunities in the area of formal test methods | ETSI | ATM | 1991/06 | Sweden |
| Technical Specifications of the IBC PCT Service | ETSI | ATM | 1990/09 | Netherlands |
| Vocabulary | ETSI | ATM | 1990/04 | France |
| Vocabulary of interims terms | ETSI | ATM | 1990/09 | Netherlands |
| Vocabulary of stable terms | ETSI | ATM | 1990/09 | Netherlands |
| Proposal for extending the terms of references of ETSI/TC-HF | ETSI | HF | 1989/10 | Germany |
| ISDN Videotelephony Requirements for the Deaf | ETSI | HF 3 | 1990/07 | UK |
| A comparison of the Layered Network models used in draft CCITT Recs. M.gnm and Gsna.1 | ETSI | NA 4 | 1991/03 | Belgium |
| A Stratified Reference Model - an Extension to ISDN PRM | ETSI | NA 4 | 1989/11 | France |
| Contribution to the Definition of Reference Configurations (RCs) for the Telecommunications Management | ETSI | NA 4 | 1990/03 | UK |
| Definition of QoS and NP | ETSI | NA 4 | 1990/09 | France |
| Deletion of F Reference Point | ETSI | NA 4 | 1990/03 | UK |
| Draft text for ETR on TMN vocabulary | ETSI | NA 4 | 1991/03 | Belgium |
| Functional Scope of TMN | ETSI | NA 4 | 1990/09 | France |
| Impact of Intelligent Network on TMN | ETSI | NA 4 | 1989/10 | Germany |
| Mediation Function Definition | ETSI | NA 4 | 1990/03 | UK |
| "QoS and NP, relationships between related terms" | ETSI | NA 4 | 1991/07 | Belgium |
| Quality of Service Methodology | ETSI | NA 4 | 1990/03 | UK |
| Reference Configuration Construction Rules | ETSI | NA 4 | 1990/09 | France |
| Requirements Capture Methodology | ETSI | NA 4 | 1990/09 | France |
| Revised Vocabulary of Terms for TMN | ETSI | NA 4 | 1990/09 | France |

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|---|---|---|---|---|
| Some comments on draft CCITT Recommendation I.35B | ETSI | NA 4 | 1990/09 | France |
| Taxonomy and Naming of Reference Points | ETSI | NA 4 | 1991/03 | Belgium |
| Telecommunications Management Specification Method | ETSI | NA 4 | 1991/03 | Belgium |
| The Layering of OSFs | ETSI | NA 4 | 1990/03 | UK |
| The timeline model | ETSI | NA 4 | 1991/07 | Belgium |
| TMN Reference Point Definition | ETSI | NA 4 | 1990/09 | France |
| A Formal Stage 1 Description of Multimedia Services | ETSI | NA 5 | 1989/10 | Denmark |
| AAL protocol model and high level description of the AAL peer-to-peer procedures for B-ISDN signalling | ETSI | NA 5 | 1990/09 | Spain |
| Addressing Requirements in MAN | ETSI | NA 5 | 1990/04 | France |
| All functional Models for Class O Services | ETSI | NA 5 | 1991/10 | Belgium |
| An Adaptation Convergence Sublayer (CS) Protocol for Connectionless Services | ETSI | NA 5 | 1990/03 | Italy |
| "An Adaption Layer Protocol Model for Signalling, Packet Mode-Connection oriented and Connectionless | ETSI | NA 5 | 1989/10 | Belgium |
| An Application Layer Protocol Model for Signalling - Packet Mode-Connection oriented and | ETSI | NA 5 | 1989/10 | Denmark |
| Analysis of Multimedia Aspects of Broadband Services | ETSI | NA 5 | 1989/10 | Denmark |
| Answer to liaison statement from NA5 concerning Activation/Deactivation Procedures in B-ISDN | ETSI | NA 5 | 1990/03 | Italy |
| Application of the Service Component concept to stage 2 and 3 of I.130 | ETSI | NA 5 | 1991/09 | Belgium |
| Assumptions on the Dynamic Behaviour of Multimedia Services | ETSI | NA 5 | 1990/03 | Italy |
| ATM Adaptation Layer for VBR Services | ETSI | NA 5 | 1989/10 | Denmark |
| ATM Adaptation Layer Service Classification for non-time related services | ETSI | NA 5 | 1990/03 | Italy |
| ATM based Broadband ISDN | ETSI | NA 5 | 1989/03 | Germany |
| ATM cell format | ETSI | NA 5 | 1988/12 | Ireland |
| ATM Cell Header Error Protection | ETSI | NA 5 | 1989/04 | Netherlands |
| ATM Header Functionalities and Size | ETSI | NA 5 | 1989/03 | Germany |
| ATM Signalling Channel Allocation and Meta-signalling issues | ETSI | NA 5 | 1989/10 | Denmark |
| ATM signalling channel structure and allocation | ETSI | NA 5 | 1989/04 | Netherlands |
| Attributes and possible values for B-ISDN | ETSI | NA 5 | 1992/01 | France |
| B-ISDN Architectural Principes for interactive and non-switched distribution services | ETSI | NA 5 | 1990/09 | Spain |
| B-ISDN Connection Types and Attributes Values | ETSI | NA 5 | 1990/10 | France |
| B-ISDN Reference Configuration with MAN and MSS | ETSI | NA 5 | 1990/04 | France |
| Basic Concept of B-ISDN Connection Types | ETSI | NA 5 | 1990/10 | France |
| Basic Requirements and Principles for MANs | ETSI | NA 5 | 1990/01 | Germany |
| Benefits of activation/deactivation at the TB reference point | ETSI | NA 5 | 1990/09 | Spain |
| Bit Timing for the Likely Solution | ETSI | NA 5 | 1989/04 | Netherlands |
| Business customers where MAN facilities do not exist | ETSI | NA 5 | 1991/02 | Belgium |
| Categories of B-ISDN Connection Types | ETSI | NA 5 | 1992/01 | France |
| Clarification of Channel Associated Signalling (CAS) at the access | ETSI | NA 5 | 1991/01 | France |
| Clarification of the ATM Adaptation Service Classification Model | ETSI | NA 5 | 1990/03 | Italy |
| Comments on ATM Header Functions | ETSI | NA 5 | 1989/10 | Denmark |
| "Comments on DETS ""Connectionless Broadband Data Service""" | ETSI | NA 5 | 1991/02 | Belgium |
| Comments on NA5 Draft Rec. I413 | ETSI | NA 5 | 1989/11 | UK |
| Comments on SG XI metasignalling baseline document | ETSI | NA 5 | 1991/01 | France |
| Comments on the NA4 liaison related to SAP location | ETSI | NA 5 | 1991/04 | Belgium |
| Comments on the suitability of an activation/deactivation procedure of B-ISDN | ETSI | NA 5 | 1991/02 | Belgium |
| Comments to draft Rec. I.311 | ETSI | NA 5 | 1990/04 | Portugal |
| Comments to draft Rec. I.363 | ETSI | NA 5 | 1990/04 | Portugal |
| Common Channel Signalling (CCS) for B-ISDN | ETSI | NA 5 | 1991/01 | France |
| Commonality between SNI and T interfaces | ETSI | NA 5 | 1990/06 | Finland |
| Congestion Control for CL Services | ETSI | NA 5 | 1990/04 | France |
| Congestion control for MAN Networks | ETSI | NA 5 | 1990/09 | Spain |
| Congestion Control of Connectionless Services | ETSI | NA 5 | 1990/06 | Finland |
| Considerations on the use of physical layer maintenance signals for fault location indication | ETSI | NA 5 | 1990/09 | Spain |
| Considerations on VPI/VCI Allocation for Physical Layer OAM Flows | ETSI | NA 5 | 1990/04 | Portugal |
| Coordination of RACE Contributions | ETSI | NA 5 | 1990/04 | France |
| Core network and interworking aspects | ETSI | NA 5 | 1991/02 | Belgium |
| Cost comparison of the coaxial with the fibre optical interface at UNI | ETSI | NA 5 | 1989/11 | UK |
| Cost figures of a coaxial interface at UNI | ETSI | NA 5 | 1989/11 | UK |
| Cost Figures of a Fibre Optical Interface at UNI | ETSI | NA 5 | 1989/11 | UK |
| Customer Network Evolutionary Aspects | ETSI | NA 5 | 1991/02 | Belgium |
| "Description of the Convergence Sub-layer (CS) Protocol for UNI Access Signalling,Broadcast | ETSI | NA 5 | 1990/04 | Portugal |
| DQDB Performance Enhancements | ETSI | NA 5 | 1990/04 | France |
| Editorial amendment for par. 44 in I432 | ETSI | NA 5 | 1991/10 | Belgium |
| Error detection for PO services | ETSI | NA 5 | 1989/11 | UK |
| Estimate of motivation time for activation/deactivation procedure for broadband ISDN | ETSI | NA 5 | 1990/09 | Spain |
| Evolution of MANs | ETSI | NA 5 | 1991/02 | Belgium |
| Evolution of mobile | ETSI | NA 5 | 1991/02 | Belgium |

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|---|---|---|---|---|
| Evolution of satellites | ETSI | NA 5 | 1991/02 | Belgium |
| Evolution of the residential area | ETSI | NA 5 | 1991/02 | Belgium |
| Evolutionary graph | ETSI | NA 5 | 1991/02 | Belgium |
| First revision of I.140 attributes | ETSI | NA 5 | 1990/09 | Spain |
| Functional ATM Layer Model for service primitive definitions | ETSI | NA 5 | 1991/09 | Belgium |
| Handling of Distributed Databases | ETSI | NA 5 | 1991/09 | Belgium |
| Impact of Deactivation on Metasignalling and Signalling | ETSI | NA 5 | 1991/03 | Belgium |
| Impact of Service Components into Bearer Components for multi media services | ETSI | NA 5 | 1991/10 | Belgium |
| Impact of the OLI/OLO concept on the evolution of services and of the optical access network | ETSI | NA 5 | 1991/02 | Belgium |
| Inclusion of the OLI/OLO concept in CCITT Rec. I.327 | ETSI | NA 5 | 1990/10 | France |
| Indentifiers for B-ISDN Signalling | ETSI | NA 5 | 1991/10 | Greece |
| Information Field Size | ETSI | NA 5 | 1989/03 | Germany |
| Initialisation of metasignalling and SVCI assignment procedure | ETSI | NA 5 | 1990/09 | Spain |
| Introduction of the BRAN and LIT functional groups into the functional architectural model | ETSI | NA 5 | 1991/09 | Belgium |
| Introductory IBCN Reference Configurations | ETSI | NA 5 | 1990/03 | Italy |
| List of Contributions | ETSI | NA 5 | 1990/09 | Spain |
| List of contributions from RIC | ETSI | NA 5 | 1989/09 | France |
| List of contributions from RIC | ETSI | NA 5 | 1989/10 | Denmark |
| List of Contributions from RIC | ETSI | NA 5 | 1990/01 | Germany |
| List of contributions from RIC | ETSI | NA 5 | 1990/03 | Italy |
| List of contributions from RIC | ETSI | NA 5 | 1990/04 | Portugal |
| List of parameters for the PMD layer of an electrical interface at the T-reference point | ETSI | NA 5 | 1989/11 | France |
| Location of metasignalling in the B-ISDN PRM | ETSI | NA 5 | 1991/01 | France |
| Loss Priority Parameters in AAL primitives | ETSI | NA 5 | 1991/10 | Greece |
| MAN ACCESS Facility | ETSI | NA 5 | 1990/06 | Finland |
| Management Issues related to MAN Architecture | ETSI | NA 5 | 1990/06 | Finland |
| Mapping of Service Components into Bearer Components for multi-media Services | ETSI | NA 5 | 1991/10 | Greece |
| Meta-signalling assignment procedure | ETSI | NA 5 | 1990/03 | Italy |
| Meta-signalling message transport | ETSI | NA 5 | 1989/11 | UK |
| Meta-signalling states description | ETSI | NA 5 | 1989/11 | UK |
| Metasignalling Protocol Functions and Limitations | ETSI | NA 5 | 1990/04 | Portugal |
| Metasignalling Protocol Issues | ETSI | NA 5 | 1990/04 | Portugal |
| Model | ETSI | NA 5 | 1990/11 | Germany |
| MSS Functional Model | ETSI | NA 5 | 1990/06 | Finland |
| Multimedia service structure | ETSI | NA 5 | 1990/09 | Spain |
| No need for a Fast Reservation Protocol | ETSI | NA 5 | 1991/09 | Belgium |
| Notes on Access Network MAN Architectures | ETSI | NA 5 | 1990/04 | France |
| On traffic and service evolution in TR in evolution onwards B-ISDN | ETSI | NA 5 | 1991/10 | Belgium |
| Open questions on metasignalling raised at the Brussels meeting of CCITT SG XI/4 | ETSI | NA 5 | 1990/09 | Spain |
| Open questions on metasignalling raised at the Brussels meeting of CCITT XI/4 | ETSI | NA 5 | 1991/01 | France |
| Performance measurement aspects of the cell based interface | ETSI | NA 5 | 1991/02 | Belgium |
| Physical Layer OAM for cell based option | ETSI | NA 5 | 1991/09 | Belgium |
| Physical Medium Dependent Sublayer for the Broadband S Interface | ETSI | NA 5 | 1989/09 | France |
| PL-OAM cells and rate-adaptation of the cell-based UNI | ETSI | NA 5 | 1990/09 | Spain |
| Point-to-point signalling channel management procedures and SDLs | ETSI | NA 5 | 1990/09 | Spain |
| Possible conflicts in CUG membership | ETSI | NA 5 | 1991/02 | Belgium |
| Possible options for multiparty cells | ETSI | NA 5 | 1990/09 | Spain |
| Power Feeding across the interface at the T-reference point | ETSI | NA 5 | 1989/09 | France |
| Preliminary considerations of the early stages network evolution towards the B-ISDN | ETSI | NA 5 | 1990/09 | Spain |
| Preliminary Network Architecture for the IBCN | ETSI | NA 5 | 1989/10 | Denmark |
| Primitives between ATM and ATM LME for Meta-signalling | ETSI | NA 5 | 1991/03 | Belgium |
| Primitives between ATM LE and ATM LME connection establishment/release | ETSI | NA 5 | 1991/09 | Belgium |
| Principles of Interworking | ETSI | NA 5 | 1989/11 | UK |
| Proposal for a cyclic counting in the Sequence number field | ETSI | NA 5 | 1990/03 | Italy |
| Proposal for a new recommendation on Adaptation Protocol for Signalling | ETSI | NA 5 | 1990/04 | Portugal |
| Proposal for a single BASIC ATM Adapt. (SAR) sublayer for all Packet Oriented (PO)Services | ETSI | NA 5 | 1989/11 | UK |
| Proposal for Basic Primitives Between the ATM adaptation Layer and the ATM layer | ETSI | NA 5 | 1990/03 | Italy |
| Proposal for cell delineation at S reference point | ETSI | NA 5 | 1989/10 | Denmark |
| Proposal for Characterization of Broadband Traffic | ETSI | NA 5 | 1990/09 | Spain |
| Proposal for data-link protocol as part of AAL Convergence Sublayer (CS) protocol for non-time related | ETSI | NA 5 | 1990/03 | Italy |
| Proposal for Physical Layer Transmission Parameter | ETSI | NA 5 | 1990/04 | Portugal |
| Proposal for Primitives Between the ATM adaptation Layer and the ATM layer | ETSI | NA 5 | 1990/03 | Italy |
| Proposal for text on AAL Type 3 primitives for AAL operations to be inserted in I.363 | ETSI | NA 5 | 1990/09 | Spain |
| Proposal for text on AAL Type 3 primitives for non-assured operation without flow control to be inserted in | ETSI | NA 5 | 1990/09 | Spain |
| Proposal for text on ATM Layer Primitives to be inserted in I.321 | ETSI | NA 5 | 1990/04 | Portugal |

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| Proposal for the use of Terms in I.311 | ETSI | NA 5 | 1990/03 | Italy |
| Proposal of a new recommendation on a Metasignalling Protocol | ETSI | NA 5 | 1990/04 | Portugal |
| Proposed Document Structure for MAN Standards | ETSI | NA 5 | 1990/01 | Germany |
| Proposed structure of draft ETSs for MANs | ETSI | NA 5 | 1990/03 | Italy |
| Qos Principles for CL Services | ETSI | NA 5 | 1990/04 | France |
| Reference Configuration Construction Rules | ETSI | NA 5 | | Spain |
| Reference Configurations for the SB interface | ETSI | NA 5 | 1989/09 | France |
| Reference Configurations (RC) and their Implementation Options | ETSI | NA 5 | 1989/11 | UK |
| Section and Path Overhead Functions Required for Performance Monitoring at the UNI | ETSI | NA 5 | 1989/09 | France |
| Selective broadcastsignalling channel (SBSVC) management | ETSI | NA 5 | 1990/09 | Spain |
| Service Component Concept | ETSI | NA 5 | 1989/03 | Germany |
| Service primitives between the ATM LE and the ATM LME for error reporting | ETSI | NA 5 | 1991/09 | Belgium |
| Service primitives between the ATM LE and the SAR SLE | ETSI | NA 5 | 1991/09 | Belgium |
| Service primitives exchanged between the ATM LE and the ATM LME for data transfer | ETSI | NA 5 | 1991/09 | Belgium |
| Service Primitives exchanged between the PM Layer Entity and the ATM Layer Entity | ETSI | NA 5 | 1991/10 | Belgium |
| Service Primitives for the Connectionless Data Service | ETSI | NA 5 | 1991/04 | Belgium |
| Service Requirements for MANs | ETSI | NA 5 | 1990/01 | Germany |
| Signalling Virtual Channel bandwidth | ETSI | NA 5 | 1990/09 | Spain |
| Specification of different functionality | ETSI | NA 5 | 1989/11 | UK |
| Specification of the self-synchronizing scrambler in Recommendation I.432 | ETSI | NA 5 | 1990/09 | Spain |
| Specifications of B-ISDN addressing functions - first draft | ETSI | NA 5 | 1991/02 | Belgium |
| Stage 1 Description of CL Service (1) | ETSI | NA 5 | 1990/06 | Finland |
| Stage -1 Description of CL Service (2) | ETSI | NA 5 | 1990/06 | Finland |
| Stage 2 studies on Multimedia Services | ETSI | NA 5 | 1989/10 | Denmark |
| Support of Broadband Distributive Services | ETSI | NA 5 | 1989/11 | UK |
| Surface Transfer Impedance in the specification of the TB interface | ETSI | NA 5 | 1990/09 | Spain |
| Target IBCN Reference Configurations | ETSI | NA 5 | 1990/03 | Italy |
| Termination of the section and path overhead (POH) at the UNI | ETSI | NA 5 | 1989/10 | Denmark |
| Termination of the SOH and POH at the UNI | ETSI | NA 5 | 1989/09 | France |
| Terminology Lifecycle | ETSI | NA 5 | 1990/09 | Netherlands |
| Terminology (related to Connectionless Data Service) | ETSI | NA 5 | 1990/09 | Spain |
| Terminology Related to connectionless Services | ETSI | NA 5 | 1990/06 | Finland |
| Terminology Update | ETSI | NA 5 | 1990/10 | Sweden |
| The Branching Functional Group with Functions and Reference Points in the Customer Access Network | ETSI | NA 5 | 1992/01 | France |
| The Coding of the Sequence Number (SN) in SAR class 2 | ETSI | NA 5 | 1990/04 | Portugal |
| The messages used by the AAL protocol for B-ISDN signalling and connection oriented data services | ETSI | NA 5 | 1990/09 | Spain |
| The OLI/OLO concept | ETSI | NA 5 | 1991/02 | Belgium |
| The Optical Line Outlet Concept | ETSI | NA 5 | 1989/10 | Denmark |
| The Optical Line Outlet Function | ETSI | NA 5 | 1990/10 | France |
| The way ahead on Broadband numbering within NA2 | ETSI | NA 5 | 1991/09 | Belgium |
| Third-Party-Charging | ETSI | NA 5 | 1991/09 | Belgium |
| Traffic aspects | ETSI | NA 5 | 1991/02 | Belgium |
| Transmission aspects in the core network | ETSI | NA 5 | 1991/02 | Belgium |
| Transmission Range for a Coaxial Interface | ETSI | NA 5 | 1989/08 | France |
| Transmission ranges for an optical fibre interface | ETSI | NA 5 | 1989/11 | UK |
| Units for Traffic Capacity in ATM Networks | ETSI | NA 5 | 1990/04 | Portugal |
| Use of Generic Layering Architecture to structure the Broadband User - Network Signalling Interface | ETSI | NA 5 | 1989/10 | Denmark |
| Use of the PRM for User Plane and Control Plane connection establishment | ETSI | NA 5 | 1991/09 | Belgium |
| "Use of unused octets in metasignalling message, and identification" | ETSI | NA 5 | 1991/01 | France |
| User Network Interface based on SDH | ETSI | NA 5 | 1989/10 | Denmark |
| Vocabulary - Abbreviations | ETSI | NA 5 | 1989/09 | France |
| Working procedures for ETSI/NA5 | ETSI | NA 5 | 1990/09 | Spain |
| Workprogramme for ETSI/NA5 | ETSI | NA 5 | 1990/09 | Spain |
| Execution of Service on a Functional IN Model | ETSI | NA 6 | 1989/11 | Germany |
| Intelligent Network Terminology Definitions | ETSI | NA 6 | 1989/11 | Germany |
| Liaison Report from RACE | ETSI | NA 6 | 1989/11 | Germany |
| Liaison Report from RACE | ETSI | NA 6 | 1990/02 | UK |
| Proposal for a functional Plane Architecture | ETSI | NA 6 | 1990/02 | UK |
| Proposal for further Definition | ETSI | NA 6 | 1990/02 | UK |
| Broadening of the User Concept in UPT | ETSI | NA 7 | 1990/09 | Netherlands |
| Requirements for User Profiles in UPT | ETSI | NA 7 | 1990/09 | Netherlands |
| UPT Numbering Plan Requirement related to the ACCESS of the UPT Service Centre | ETSI | NA 7 | 1990/09 | Netherlands |
| UPT Numbering Plan Requirements related to Distinguishing between UPT - and ohter numbers | ETSI | NA 7 | 1990/09 | Netherlands |
| UPT Numbering Plan Requirements related to Location Information included in the Number | ETSI | NA 7 | 1990/09 | Netherlands |
| UPT Terminology | ETSI | NA 7 | 1990/09 | Netherlands |

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| UPT User Requirements related to Charging | ETSI | NA 7 | 1990/09 | Netherlands |
| UPT User Requirements related to Information Feedback at Call Set-up Time | ETSI | NA 7 | 1990/09 | Netherlands |
| Numbering and Addressing Requirements Architectural Requirements | ETSI | NA2 | 1990/10 | Denmark |
| Numbering and Addressing Requirements : Concepts of addressing | ETSI | NA2 | 1990/10 | Denmark |
| Numberings and Addressing Requirements : Requirements from customers and B-ISDN | ETSI | NA2 | 1990/10 | Denmark |
| Numberings and Addressings Requirements : Requirements from services with special addressing needs. | ETSI | NA2 | 1990/10 | Denmark |
| Medium Term Evaluation on Codec location in B-ISDN | ETSI | NA3 | 1989/10 | UK |
| TV Picture frequencies used in picture coding for transmission | ETSI | NA3 | 1990/05 | Sweden |
| Comments on SG XI metasignalling baseline document | ETSI | SPS | 1991/01 | France |
| Connection Acceptance Control | ETSI | SPS 3 | 1990/10 | Italy |
| Definition of Call and Connection in the B-ISDN | ETSI | SPS 3 | 1990/10 | Italy |
| Performance of Established Connections | ETSI | SPS 3 | 1990/10 | Italy |
| Requirements for the separation of Call and Connection Control | ETSI | SPS 3 | 1990/10 | Italy |
| Traffic Characterization | ETSI | SPS 3 | 1990/10 | Italy |
| Spectrum Allocation in the Optical Local Network | ETSI | TM 1 | 1989/10 | France |
| CMI coding on the 155.520 Mbit/s optical interface | ETSI | TM 3 | 1991/04 | Belgium |
| Cost benefits of utilising the 800 nm optical window for transmission at the UNI | ETSI | TM 3 | 1991/04 | Belgium |
| EMC aspects of CATV cable at the B-UNI: spectral considerations | ETSI | TM 3 | 1991/04 | Belgium |
| Functional Architecture Model & Realisation of an Optical Access Network (OAN) with OLI/OLO | ETSI | TM 3 | 1991/04 | Belgium |
| Improved Wavelength Allocation in OAN's | ETSI | TM 3 | 1991/10 | Belgium |
| Optical Interfaces for the Customer ACCESS Network | ETSI | TM 3 | 1990/04 | Germany |
| Optical Interfaces for the Customer Access Network | ETSI | TM 3 | 1991/03 | Belgium |
| Optical Transmission of the OAN - Architecture and Evolution | ETSI | TM 3 | 1991/03 | Belgium |
| Proposal for Physical Layer Transmission Parameters | ETSI | TM 3 | 1990/04 | Austria |
| Quality of Services and Netw. Performance Requirements in ATM Networks | ETSI | TM 3 | 1989/10 | Portugal |
| Specification of Surface Transfer Impedance to Tb interface cabling and connectors | ETSI | TM 3 | 1991/04 | Belgium |
| Utilisation of the 800 nm optical window for transmission at the UNI | ETSI | TM 3 | 1990/10 | |
| Evolution towards UMTS | ETSI | UMTS | 1990/11 | Belgium |
| Status of the RACE Mobile Project | ETSI | UMTS | 1990/11 | Belgium |
| Study items for the network aspects of UMTS | ETSI | UMTS | 1991/03 | Belgium |
| UMTS at the Turn of the Century | ETSI | UMTS | 1990/08 | Belgium |
| UMTS Requirements to B-ISDN | ETSI | UMTS | 1990/11 | Belgium |
| UMTS Services - Environmental Considerations/Potential Usage Characteristics | ETSI | UMTS | 1990/11 | Belgium |

## R1046 Specification and Programming Environment

| | | | | |
|---|---|---|---|---|
| "Extension of SDL to support Object-Orientation, Generic Parameter and Libraries" | CCITT | SG X | 1990/06 | Finland |

## R1053 TMN Evolution of Reference Configuration for RACE

| | | | | |
|---|---|---|---|---|
| A TMN Functional Hierarchy | ETSI | NA 4 | 1990/03 | UK |
| Contribution to the Definition of Reference Configurations (RCs) for the Telecommunication Management | ETSI | NA 4 | 1990/03 | UK |

## R1054 Application Pilot for People with Special Needs

| | | | | |
|---|---|---|---|---|
| Specifications of terminals for disabled users with respect to standards for user-system interface | ETSI | NA3.2 | 1991 | |

## R1060 Distributed Industrial Design and Manufacturing

| | | | | |
|---|---|---|---|---|
| "Structural Walkthrough of the IPC Standard and Electrical Conceptual Model, STEP" | CCITT | ISO | 1990/09 | Germany |

## R1077 Usage Reference Model for IBC

| | | | | |
|---|---|---|---|---|
| Engineering IBC Services. Joint URM/CSF/RCD Position Paper | ETSI | HF-1008 | 1991 | |

## R1079 CAR-CAR/CAM for Automotive Industry in RACE

| | | | | |
|---|---|---|---|---|
| Appraisal of M-IT-04 | CEN | TG 11-2 | 1992/06 | UK |

## R1080 HDTV Experimental Usage

| | | | | |
|---|---|---|---|---|
| Progress on development of studio equipment for progressively scanned HDTV | CCIR | | 1991/02 | |
| Progress on HDTV standards conversion | CCIR | | 1991/02 | |
| Progress report on the 1250/50/2 system | CCIR | | 1991/01 | |

## R1082 Quality of Service (QoS) Verification Methodology and Tools

| | | | | |
|---|---|---|---|---|
| "Relationship between Qos terms such as Planned, Achieved, Inferred, Qos etc." | ETSI | | | |
| "Qos and NP, Relationship between related terms." | ETSI | NA 4 | 1991/07 | France |

| The Timeline Model | ETSI | NA 4 | 1991/07 | France |
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# R1089 Low Cost Optimized Optical Passive Components

| | | | | |
|---|---|---|---|---|
| "Sectional Specification, Connectors sets type CF08" | CCITT | IEC | 1990/07 | France |
| "Sectional specification, connectors sets type CF08" | CENELEC | CECC | 1990/10 | France |

# Annex III

# List of Publications

# RACE
# List Of Publications

## R1001 Digital Video tape Recording Terminal for HDTV

*A new single-table assignment technique for transform coded images*
1990/04 Paper for 8th Conference on Video, Audio & Data Recording

*A Simple Recursive Motion Estimation Technique for Compression of HDTV Signals*
1992/04 IEEE proceedings 4th Int. Conf. Image Proc. & its Applications (IPA 92), Conf. Publ. No 354 -

*Characterisation and measurements of non-linear bit shifts in digital magnetic tape recording*
1990/04 8th conference on Video, Audio & Data Recording

*CoCr double-layered media with NiFe and CoZrNb soft-magnetic layers*
1988 Journal of Applied Physics, vol 63(8)

*Data Compression System for Home-Use Digital Video Recording*
IEEE Journ. Sel. Areas Commun, Spec. Issue on Digital Rec.

*Digital Consumer HDTV Recording based on Motion Compensated DCT Coding of Video Signals*
1992/06 Signal Processing and Image Communications, Vol 4, No 3

*Electronics for reading and writing*
1991/06 Digest of the Magnetic Recording Conference 1991 (TMRC 91)

*Error detecting run-length limited sequences*
1990/04 8th Conference on Video, Audio & Data Recording

*Full-Search versus Tree-Search Vector Quantization of Discrete Cosine Transform Coefficients*
1990/09 Proceedings of the European Signal Processing Conference

*Head-to-tape spacing and recording process evaluated from modulation noise spectra*
1988/11 Intermag 88, IEEE Trans. Magn.

*High-performance metal-in-gap heads with very small track widths*
1990 J. Magnetism and Magnetic Material (jmmm) 83

*High-performance small-track-width metal-in-gap heads made by reactive-ion etching*
1990 J. Magnetism & Magnetic Materials (JMMM)

*Implementation of TV and HDTV in B-ISDN*
1990/09 Invited paper for 16th ECOC conference

*Magnetic recording trends: media developments and future (video) recording systems*
1990/01 MRM'89, published in IEEE Trans Magn, vol 26

*Modelling of electromagnetic systems*
1991/11 IEEE Transaction on Magnetics, Vol. Mag-27, No. 6

*Motion adaptive intraframe transform coding of video signals*
1989 Philips Journal of Research, vol 44 Nos 2/3

*On the Construction of High-Performance Self-Synchronizing Codes*
1990/10 Proceedings 11th Benelux Symposium Information Theory, Noordwijkerhout 1990

*On the interpretation of tape friction*
1990 IEEE Trans Magn., vol 26

*Perpendicular recording with a one-sided MIG-head on SL Co-Cr*
Intermag'90

*Source Coding of HDTV with Compatibility to TV*
1990/10 SPIE Vol. 1360, Proc. 5th Visual Communications & Image Processing '90

*Sputtered sandwich heads for high-density digital video recording*
1990/04 INTERMAG Conference

*Structural Inhomogenities in Co-Cr layers and the influence on the magnetic properties*
1989 PMRC'89, Journal Magn. Soc

*Transform Coding of Digital TV Signals using Vector Quantization*
1990 Image Communication

*Transform Coding of Images using Adaptive Tree-Searched Vector Quantization*
1988/09 Abstract in Proceedings Picture Coding Symposium

*Transform Coding of Images using Directionally Adaptive Vector Quantization*
1988/04 Proceedings International Conference on Accoustics, Speech and Signal Processing

## R1002 Satellite Communication for IBC

*Satellite links and integrated broadband communication networks*
1990/10 Int. Conf. on Integrated Broadband Services & Networks

## R1003 AIP and Standards for TMN

*A Model of the TMN Workstation Function*
1991/11 Proceeding of the Fifth RACE TMN Conference.

*A Proposal for an Integration Methodology for a TMN*
1991/11 Proceedings of the Fifth RACE TMN Conference

*An architecture for the management of a Broadband Multi-service network*
1990/05 XIII International Switching Symposium Proceedings

*Broadband Communications Management the RACE TMN Approach*
1990/10 IEEE Broadband Conference on Broadband TELECOM

*Network Management for RACE*
1991/11 British Telecommunications Engineering Journal, to be pub. later this year.

*Synergies Between ESPRIT and RACE*
1990/08 European conference on Artificial Intelligence (ECAI - 90)

*Telecommunications Management Network Concepts*
1990/01 IEE Electronics division colloquium organised by professional group E7 (Telecom Networks &

*The application of information modelling in the telecommunication management network (TMN)*
1991/03 Telecommunications Information Networking Architecture Workshop (TINA '91)

## R1004 Electro-Luminescent Flat Panel Display for Terminal Applications

*A 9 inch diagonal Compact, Multicolor TFEL Display*
1991 SID 1991

*Active matrix CdSe TFT addressed electroluminescent displays*
1988/10 Proceedings of the International Display Research Conference

*Aspects on Thin-film Electroluminescence*
1990 Acta Polytechnica Scandinavica, Vol. Ph. 170

*Bildschirme Flache Flundern*
1989/03 Techno-Tip Nr. 3

*Brightness and light conversion Efficiency in High Field AC Electroluminsescence*
1990 Acta Polytechnica Scandinavica, vol Ph 170

*Design of a prototype active matrix CdSe TFT addressed EL display*
1990/09 Eurodisplay '90

*Development of Advanced Thin-Film Electroluminescent Displays*
1990 Proceedings of Eurodisplay 1990

*Evaluation of a 64x64 CdSE TFT Addressed ACFTEL display demonstrator*
1991/10 91 International Display Research Conference

*Green Emitting Thin-Film Electroluminescent Device grown by Atomic Layer Epitaxy*
1990 SID 1990 DIGEST

*High-voltage polycrystalline CdSe TFT's*
1990 IEEE Transactions on Electron Devices, ED-37.

*Large Area VGA-Compatible EL-Display with 16 Gray Shades*
1989/06 ED 89 Electronic Displays Conference Proceedings

*Low-Power Thin-Film Electromuniscent Display*
1991 SID International Symposium, Digest of Technical Papers, Vol. XXII

*Modeling & Simulation of an ACTFEL Display*
1990 SID 1990 DIGEST

*Modeling the Luminescence of the ACTFEL Display*
1990/06 5th International Workshop on Electroluminescence

*Multi-colour Thin-Film Electroluminescent Displays*
1992 6th Int. Workshop on Electroluminescence - El Paso

*Multicolour Electroluminescent Displays*
1990 Proceedings of 14th Nordic Semiconductor Meeting

*The realization and evaluation of poly-CdSe TFT driving circuits*
1988/10 Proceedings of the International Display Research Conference

*Thin-Film Electroluminescent Displays*
1989/05 Society for Information Displays,Seminar Lecture Notes,volume I

## R1005 NEMESYS - Traffic and QOS Management for IBC

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*Adaptive bit rate transmission for personal telecommunications*
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*Bildkommunikation via Satellit auf offener See*
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*Outlook Shipping & Banking*
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*The second generation of maritime computarization and communication*
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## R1064 Monolithic Integrated Optics for Customer Access Applications

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# R1069 Enhanced Performance Lasers for Optical Transmitters

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1992/03 HCI and User Interface Design - Institute for Electrical Engineers

*Multi media interactive working in design to manufacture*
1990/05 Proceedings of 22nd International Symposium on Automotive Technology and Automation

*Multi-Media Collaborative Working in the Automotive Industry - The role for Broadband Communications*
1992/04 Ergonomics and Design Colloquium - East Midlands Ergonomics Group of the Ergonomics Society

*Multimedia Collaborative Working in the Automotive Industry - The Role for Broadband Communication*
1990/05 Proceedings of the CIM Europe Conference

*Multimedia Conferencing as a Tool for Collaborative Writing : A case study*
1991/11 Proceedings of the CSCW SIG Seminar on Collaborative Writing

*Multimedia Conferencing : From Prototype to National Pilot*
1992/06 Proceedings of INET '92 Conference - Kobe

*Multimedia interactive working in design to manufacture*
1991/09 4th IFIP Conference on computer applications in production and engineering

*New Applications in High Speed Networks for the European Automotive Industry (in German)*
1991/10 Annual GI Conference 91 - Darmstadt, Germany

*Problems of Designing Task-Based User Interfaces for large-scale CIM systems*
1992/05 Computer-Integrated Manufacturing Systems, Butterworth-Heinemann Ltd, Vol 5 No 2, 91-96

*RACE CAR - New applications in High Speed Networks for the European Automotive Industry*
1991/10 Proceedings of the GI Conference 91 - Darmstadt, Germany

*Some Multimedia Traffic Characterisation and Measurement Results*
1992/04 Networks '92 - Trvandrum, India

*The Open Multimedia System Architecture : An overview*
1992/05 The Computer Journal

*User requirements specifications for workstations incorporating high speed broadband communications links*
1990/08 Human Factors Aspects of Advanced Manufacturing & Hybrid Automation

# R1080 HDTV Experimental Usage

*HD tape to film transfer*
1992/02 SPIE/IS & T - San Jose, US

*HDP/HDQ processing in an Experimental Digital HDTV studio*
1992/06 Les assises des jeunes chercheurs - Tokyo

*HDTV production and postproduction : an original compatible digital approach*
1992/06 FKTG Berlin

*Progress on development of studio equipment for progressively scanned 1250/50 HDTV*
1991/02 Document TG 11/1, Document TG 11/2

*Progress on HDTV standard conversion*
1991/02 Document TG11/1. Document WP11/A

*Progress report on the 1250/50/2 system*
1991/01 Document : TG 11/1

*Transferring to film*
1991/09 HDTV Dublin

*Vision 1250, A European economic interest grouping*
1991/02 Document TG 11/1

# R1081 BUNI - Broadband User/Network Interface Demonstrator

*An European Demonstrator and Test-bed for the Broadband User/network Interface*
1993/01 BT Technical Journal

*Broadband User-Network Interface Projects in RACE*
1990/10 International Conference on Integrated Broadband Services and Networks, IEE

# R1082 Qual. of Serv. Verif. Method. & Tools for Integr. Broadband

*ATM technology*
1990/10 7th Congress de Nouvelles Architectures pour les Communications

*QoS in Broadband Networks*
1990/06 NETWORKS '90 conference

*Some aspects of quality of service*
1991 13th ITC Conference

# R1083 PARASOL - ATM Specific Measurement Equipment

*A Model for Real-Time Generation of ATM Traffic from a Large Number of Sources*
1990/08 9th Nordic Teletraffic Seminar

*ATM Measurement Tool*
1990/08 9th Nordic Teletraffic Seminar

*ATM Traffic Processes: A Model for Real-Time Generation*
1990/09 Technical Seminar on B-ISDN

*Bitfehlerstrukturanalyse in der Breitband-ISDN-Me·technik*
1991 Nachrichtentechnische Zeitschrift 44

*Correlation in ATM traffic streams*
1991/06 Queuing Performance & Control in ATM

*Guaranteeing B-ISDN transmission quality internationally*
1991 Telcom Report International 14, No 2

*Me·prezision auf breitem Band*
1991 Telcom Report 14, Heft 2

*Measurement precision over broadband*
1991 Telcom Report 14, No 3

*Messtechnik fÁr zukÁnftige Breitbandsysteme*
1990/12 Nachrichtentechnische Zeitschrift ntz.

*Network performance measurements in ATM systems*
1991/08 Telecommunications

*Testing in the ATM environment*
1991/10 Communications International

*Traffic generation for ATM systems testing environment modelling and feasibility studies*
1991 ITC-13

*Uebertragungsqualitaet im B-ISDN international sicherstellen*
1991 Telcom report 14

## R1084 MIME - Development of Emulators and Simulators

*A high speed parallel simulator for ATM networks*
1990/11 Proceedings of 4th RACE TMN conference

*A high speed simulation engine for B-ISDN*
1991/05 3rd Bangor Communications Symposium

*A modular simulator for ATM based B-ISDN communication*
1991/04 IEE conference

*An ATM parallel simulator*
1991/06 4th Greek National Confeence of Informatics

*ATM Network Simulation Emulation Hybrid Systems*
1990/11 2nd TMN Implementors Workshop

*Broadband Network Simulation Using Parallel Transputer Technology*
1990/10 RACE/IEE Conference - Publication No 329

*Conservative parallel simulation of ATM networks*
1991/11 5th TMN Conference

*Contribution à la realisation d'un simulateur de reseaux ATM*
1992/09 Thèse de Doctorat Un. de NICE-SOPHIA ANT

*MEM for arbitrary exponential open network with blocking and multiple job classes*
1991 Performance Engineering Workshop '91

*Modelling of ATM networks*
1991/11 5th TMN conference

*Queueing Models of Packet-Sqitched Networks with Locally Adaptive Routing*
1991 Performance Engin. Workshop '91

*Simulation support for the Management Network*
1992/09 6th TMN Conference

*Switch Models for TMN applications*
1992/09 6th TMN Conference

*Unified representation of different Flow Control Methods*
1991/11 5th TMN conference

## R1086 TELEMED

*Anwendung neuer Kommunikationskonzepte zur kooperativen Bearbeitung unterschiedlich strukturierter*
1990/06 Berliner Herzkonferenz

*Bridging the Gap: Using a Summary Primary Health Care Patient Record in Secondary Health Care*
1990/12 Second European Conference on Health Services Research & Primary Health Care

*Communication aspects in the RACE TELEMED Project*
1990/11 12th International Conference

*Communications between Hospitals and Remote Users*
1990/04 IMIA working conference

*Creation d'une banque de donnees europeenne inter-universitaire d'Imagerie Medicale*

*Design of a Cost-Effectivesness Analysis Study in Teleradiology*
1991/07 CAR '91, 5th International Symposium & Exhibition

*Design of a Portable software on X-Window for Interactive Image Analysis PACS Workstations*
1990/06 EuroPACS 90

*Experiences in picture communications in the medical field*
1990/11 IDATE 12th International Conference: Key Technologies, Experiments, New Concepts

*High Speed Medical Applications*
1989/05 Proceedings of EARN 89. An International Conference of Technical Aspects of networking and

*Integration und Kommunikation von Patientenbefunddaten am Deutschen Herzzentrum Berlin*
Einsatz der EDV im Gesundheitswesen S.164

*Laboratory results - Reporting to General Practitioners*
1990 Current Perspectives in Health Computing

*Perspectives in Teleradiology*
1991/06 IV Congr. Naz. Ass. Ital. Fisica Biomedica

*Presentation of the TELEMED project*
1990/10 RACE seminar (organised by Swedish Telecom)

*Proposal of a Relational Model for a Radiological Scientific Data Base*
1990/05 EuroPACS 90

*Proyecto de una PACS en un Hospital pediŧrico con integraciŧn en el proyecto TELEMED*
1990/11 XX Congresso Nacional de Radiologia

*RECPHONE: A new environment for medical remote expert consultation*
1991/07 EuroPACS '91, 9th International Meeting

*Scientific and Technological Experiences and Tendency of Medicine in Italy*
1991/02 Teleradiology

*Specifications for the Development of a Programming Environment for Remote Expert Consultation in Medicine*
1991/05 3rd Panhellenic Conference on Computer Technology

*TELEMED: First results from Europe's largest Broadband Communications Project in Telemedicine*
1990/05 EuroPACS 90

*Telemed: il ruolo della tecnologia fiorentina in un programma europeo di ricerca applicata*
1991/03 Rotary Club Firenze Sud

*Telemed: project within telemedicine*
1990/02 2nd Information Technology Conference

*Telemed: un progretto Applicativo*
1991/01 Assolombarda

*Teleradiology in Europe, EEC project TELEMED*
1991/05 PACS and Teleradiology Conference

*The RACE TELEMED Project R1086*
1989/10 AIM Concertation Meeting

*The robusness of communication of emotion via facial expression*
1991 European Journal of Social Psychology

*The TELEMED approach to terminology standardisation*
1991/03 Workshop ECR-SCDI

*The TELEMED project*
1990/12 AIM Euroforum

*The Teleradiology in Europe*
1991/03 Milano Europa

*Value Added and Data Services in Health*
1990 Medical Informatics in Europe

*Videoconference*
1991/06 Informatica in Radiologia

# R1087 PROVE - Provision of Verification

*Architecture Modulaire de Test pour Reseaux ATM Large-Bande*
1991/09 L'Onde Electrique - Vol 71 No 5 pp 34-39

*Assynchroner Transfer-Modus : Grundbaustein fuer das Breitband-ISDN*
1992 Nachrichtentechnik, Elektronik - Berlin - Vol 2-3-4

*Modulare Testarchitektur fuer Breitbandige ATM-Netze*
1992/02 NTZ : Nachrichtentechnische Zeitschrift - Helft 2, 45 Jahrgang, pp 88-97

*Provision of Verification in RACE*
1993/01 BT Technology Journal, Vol 11, No 1

*RACE Partners all over Europe*
1992/09 Clemessy "News Magazine" - No 2

*Test architecture for Broadband Network*
TE&M magazine (Geneva exhibition issue)

*Test derivation for SDL based on ACTs*
1992 FORTE 92 - 5th International Conference on Formal Description Techniques

*The RACE to Test Broadband Nets*
1991/09 TE&M : Telephone Engineer & Management - Vol 95 No 17 pp 68-72

# R1088 TUDOR - Usability Issues for People with Special Needs

*Attitudes and acceptance*
1991 Chapter in Issues in Telecommunications for People with Disabilities, COST 219

*Concerns of elderly consumers and their attitudes towards new technologies*
1990/09 13th HFT Conference

*Domestic Terminals*
1991 Future Telecommunications and Teleinformatics for Disabled People. Final report of COST 219

*Elderly people in a new world: Attitudes to advanced communications*
1991/08 Gerontechnology: First International Conference on Technology and Ageing

*Picture Communication*
1991/10 6th World Telecommunications Exhibition and Forum

*Pilot Applications for Advanced Communication Technology in Care for the Elderly in Europe*
1991/08 1st Internationa Conference on Technology and Ageing

*RACE projects: APPSN and TUDOR*
1990/06 Telematics '90 - Proceedings of the Conference held at Bremen

*Remote Working in the United Kingdom*
1991 Future Telecommunications and Teleinfomatics for Disabled People. Final report of COST 219

*Telecommunications needs as expressed by elderly people and people with disabilities*
1991 Chapter in Issues in Telecommunications for People with Disabilities, COST 219

*The interface between the elderly and new technology*
1990/04 BPS Annual Conference

*The Role of Human Factors in Designing for Special Needs*
1990/05 Belgium Ergonomics Society Journal

*Uability Issues for People with Special Needs with Regards to IBC*
1990/04 Institute of Electrical Engineers

## R1089 LOOP - Low-cost Optimised Optical Passive Components

*Achievements of Both Low Cost, Low Loss and Very Low Reflection for a New European Connector*
1991/03 French-German Workshop on Optical Measurements Techniques and Fibre Optics Conference

*Connecteur monomode à hautes performances et à faible cout = Application au Reseau Large Bande*
1991/03 OPTO '91

*High performance and low cost passive optical components for the subscriber loop*
1991 IWCS 1991

*Low cost wavelength independent 1 x N and N x N Branching Components*
1991 ECOC 91 Proceedings

*Low Reflection Receptacles for Active Devices*
1992/05 42nd Electronic Components and Technology Conference - San Diego, CA - USA

*Passive components for multichannel networks*
1991/02 Technical Digest of OFC 91

*Silicon-based fibre-pigtailed 1x16 and 2x16 power splitters*
1992/09 ECOC 92 - Berlin

## R1091 ESP - Exploitation and Service Project

*Contributions to the integration of advanced applications with high-speed protocols - RACE 1091 ESP*
1991/05 RARE 2nd European Networking Conference

*ESP - Exploitation of RACE I Application Pilots*
1991/06 Networks 91

*Perspektiven zu einem europNischen IBC*
1990 TUBKOM-Kolloquium Breitbandtechnik

*Prototyping Multimedia Tele-Services*
1991/06 R1022 Technical Committee Workshop

*Transportprotokoll Profile und erweiterte Transport Service fÄr integrierte Breitbandnetze*
1990 Vorschlag des RACE Projectes 1091 ESP, TUBKOM-Kolloquium Breitbandtechnik

*What Infrastructure do the RACE Advanced Communication Experiments Need*
1990/06 RACE Broadband Islands Workshop

## R1092 DIRAC - Database for Reliability Calculations

*DIRAC - A Component Reliability Database*
1991 Proceedings of ESREF 91

*European Database for Component Reliability in Telecommunications*
1990/06 Proceedings of 7th International Conference on reliability and maintainability

## R1093 ROSA - RACE Open Services Architecture

*Introduction to Algebraic Specifications based on ACT ONE*
1989/12 GMD Technical report

*Object-Oriented Service Descriptions in ROSA*
1991/04 Proceedings of the TINA Workshop

*Platform Modelling Requirements from the ROSA Project*
1992/01 Proceedings of the TINA Workshop

*ROSA: An Object Oriented Architecture for Open Services*
1990/10 British Telecom Technology Journal

*ROSA: An Object-Oriented Architecture for Integrated Broadband Communication Services*
1990/06 Proceedings of the TINA workshop

*ROSA: From the service to the Architecture*
1991/06 Proceedings of the TINA Workshop

*ROSA - RACE Open Services Architecture*
1989/07 Proceedings of SETSS '89

*Suggestions for Object Oriented Modelling form ROSA*
1992/01 Proceedings of the TINA Workshop

*The ROSA Object Model*
1991/10 Proceedings International Workshop on Open Distributed Processing

*Towards a Convergence between Telecommunication Services Architectures and ODP*
1991/10 Proceedings International Workshop on Open Distributed Processing

# Annex IV

## RACE Patents Registered

# RACE PATENTS REGISTERED

**PROJECT :** R1010
**PAT-TITLE :** Modulierbare Laserdiode für hohe Frequenzen
**PAT-AUTHOR :** Siemens
**DATE :** 1992/07/08
**COUNTRY :** Germany
**OBSERVATIONS :** German Patent Application P 42 22 466.7 - GR 92 P 1393 DE

**PROJECT :** R1010
**PAT-TITLE :** Abstimmbarer Halbleiterlaser
**PAT-AUTHOR :** Siemens
**DATE :** 1989/02/15
**OBSERVATIONS :** European Patent Application 89 10 25 96.7 - GR 89 P 1075.E.
Corresponding applications in Japan and USA.

**PROJECT :** R1010
**PAT-TITLE :** Doppel-PIN-Photodiode mit sperrendem p-n-Übergang zwischen Substrat und Absorptionsschicht
**PAT-AUTHOR :** Siemens
**DATE :** 1989/03/17
**COUNTRY :** Germany
**OBSERVATIONS :** German Patent Application P 39 08 886.3 - GR 89 9 1181 DE

**PROJECT :** R1010
**PAT-TITLE :** Monolitisch integrierte Photodiode-FET-Kombination
**PAT-AUTHOR :** Siemens
**DATE :** 1990/15/16
**COUNTRY :** Germany
**OBSERVATIONS :** European Patent Application 0 400 399 - GR 89 P 1457 E.
Corresponding applications in Japan and USA.

**PROJECT :** R1010
**PAT-TITLE :** pin-FET-Kombination mit vergrabener p-Schicht
**PAT-AUTHOR :** Siemens
**DATE :** 1990/06/11
**COUNTRY :** Germany
**OBSERVATIONS :** European Patent Application 0 405 214 - GR 89 P 1525 E.
Corresponding applications in Japan and USA.

**PROJECT :** R1010
**PAT-TITLE :** Verfahren zur Herstellung eines dotierten Bereiches in einer Halbleiterschicht
**PAT-AUTHOR :** Siemens
**DATE :** 1989/09/15
**COUNTRY :** Germany
**OBSERVATIONS :** European Patent Application 0 417 348 - GR 89 P 1770 E.
Corresponding applications in Japan and USA.

**PROJECT :** R1010
**PAT-TITLE :** Verfahren zur Herstellung von FETs
**PAT-AUTHOR :** Siemens
**DATE :** 1989/10/19
**COUNTRY :** Germany
**OBSERVATIONS :** German Patent Application P 39 864.4 - GR 89 P 1918 DE

**PROJECT :** R1011
**PAT-TITLE :** Verfahren zur Übertragungstechnischen Integration von ISDN-Kanälen mit einem breitbandigen asynchronen Zeitmultiplex-Kanal für digital betriebene Kommunikations-Vermittlungsanlagen

**PROJECT :** R1012
**PAT-TITLE :** Koppelnetz, bei dem Kurzwege schaltbar sind
**PAT-AUTHOR :** Siemens
**DATE :** 1992/08/06
**COUNTRY :** Germany
**OBSERVATIONS :** Patent No 92 11 34 50.8 - GR 92 P 1477 E

**PROJECT :** R1012
**PAT-TITLE :** Monolithisch integrierte Laserdiode-Wellenleiter-Kombination
**PAT-AUTHOR :** Siemens
**DATE :** 1989/05/24
**COUNTRY :** Germany
**OBSERVATIONS :** German Patent Application P 39 16 962.6 - GR 89 P 1404 DE

**PROJECT :** R1012
**PAT-TITLE :** Verfahren und Schaltungsanordnung für die Aufnahme und Weiterleitung nach einem asynchronen Transfermodus übertragen
**PAT-AUTHOR :** Siemens
**DATE :** 1990/08/10
**OBSERVATIONS :** Corresponding applications in Canada, Japan and USA. European Patent Application 90 11 54 17.9 - GR 90 P 1488 E.

**PROJECT :** R1012
**PAT-TITLE :** Verfahren zur Überwachung und Glättung von Datenströmen, die nach einem asynchronen Übertragungsverfahren übertragen worden
**PAT-AUTHOR :** Siemens
**DATE :** 1991/02/01
**OBSERVATIONS :** European Patent Application 91 30 08 07.4 - GR 91 P 8002 E (Coapplicant Plessey Research Roke Manor Ltd. Corresponding)

**PROJECT :** R1013
**PAT-TITLE :** Circuitry for regeneration and synchronization of a digital signal (P4025 004)
**ABSTRACT :** The invention describes a way to perform bitsynchronization of a data stream with respect to a local or masterlock in a mesochronous or plesiochronous environment (jitter, wander, static phase arbitrary).
The principle can be used from DC up to slightly above 1 Gbit/s, using available semiconductor technologies. It can be monolictically integrated, no chip-external components are needed.
This is done by oversampling (for medium frequencies) or tapped delay lines (for 1/TB>300 Mbits).
The correlation of subsequent samples (spaced < = TB/4) of the input signal used to evaluate the eye opening.
The eye opening is catched and tracked in a way that data are sampled in its middle.
In a first stage jitter and wander are overcome up to 1.5 bitlenghts; a second stage, working with bit clock, overcomes bigger jitter and wander, only limited by chip size, not by principle. The second stage is realized with FIFO, RAM or shift register structures.
A control clock, which processes the algorithm for catching and tracking, organizes a coordinated step of the two stages, if the first stage is going to reach its range limits. This is done without slips or biterrors --> Bit slip compensation.
**PAT-AUTHOR :** K.-D. Menk and H. Preisach - SEL ALCATEL ZFZ/NV
**DATE :** 14990/08/dd
**COUNTRY :** Gennany

PROJECT : R1015
PAT-TITLE : Procédé et dispositif pour contrôler le débit de données d'un terminal couplé à un réseau de transmission de l'information
DATE : 1990/12/27
OBSERVATIONS : Registration No (France) : 90 16330

PROJECT : R1015
PAT-TITLE : Procédé et dispositif de protection contre les erreurs bits et les pertes de cellules dans un reseau temporel asynchrone
ABSTRACT : The ATM Adaption Layer of the Protocol Reference Model of the B-ISDN aims at ensuring the Time Transparency and the Information Transparency for the services,
This patent describes a mechanism which deals with the Information Transparency. Based on an interleaving mechanism gathered with a Reed-Solomon error correcting code this patent provides a Convergence Sublayer format, the originality of zhich is the splitting of one cell payload on two rows of the interleaving array used together with the capacity of correcting errors and erasures.
PAT-CATEGORY : IBC Customer Systems
PAT-AUTHOR : Mr B. Guilbaud
DATE : 1991/06/25
COUNTRY : France
OBSERVATIONS : Registration No 91 07 797

PROJECT : R1015
PAT-TITLE : Procédé et dispositif pour le multiplexage asynchrone de donnéées sur des réseaux à support partagé
ABSTRACT : Thanks to a flow control mechanism installed inside data sources connected on a small multiplexer, a file dimensioning is possible for both data source and multiplexer without assumptions on the other party, This mechanism is based on a counter inside the sourcem increased when data are sentm decreased at a regular rate. Further data can be sent only if the counter value is below a given threshold. This is an original application of the "leaky bucket" mechanism.
PAT-CATEGORY : IBC Customer Systems
PAT-AUTHOR : F. Adam
DATE : 1991/02/01
COUNTRY : France
OBSERVATIONS : Registration No (France) : 91 01171

PROJECT : R1020
PAT-TITLE : Bistable optic device utilising the thermo-optic effect in a polymer
PAT-AUTHOR : D.J. Westland, V. Skarda, W. Blau, L. Costa

PROJECT : R1020
PAT-TITLE : Non-linear optical switch utilising organic conjugated materials and four wave mixing techniques
PAT-AUTHOR : D.J. Westland, V. Skarda, W. Blau, L. Costa
OBSERVATIONS : Ultra-fast all-optical switch

PROJECT : R1027
PAT-TITLE : A method for adjusting the operation on integrated optic devices
ABSTRACT : A method for the adjustment of operation characteristics of integrated optical devices, which allows the recovery of a considerable fraction of devices, being initially out of tolerance, by depositing on the surface of the waveguide material, after the final processing step of the device, a suitable layer of transparent material.
PAT-CATEGORY : Optical Communiation
PAT-AUTHOR : C. Caldera, S. Morasca, C. de Bernardi
DATE : 1991/03/07
COUNTRY : Italy, USA, Canada, Japan, GB, F, D, NL and Sweden
OBSERVATIONS : Applicant : CSELA - It will be extended by March 1991 to USA, Canada, Japan, GB, F, D, NL and Sweden.

PROJECT : R1027
PAT-TITLE : Fabrication procedure for an integrated semiconductor structure
ABSTRACT : The fabrication of a butt-coupled integrated photodectector-waveguide with high efficiency of the detector, is usually prevented by the poor quality of the regrown interface. To overcome this limitation, a special structure is proposed, with the photosensitive material grown on a double stepped waveguide/substrate surface; this structure is also made suitable the high optical power thanks to the insertion of a beam spreading region between the waveguide and the detector.
PAT-CATEGORY : Optical Communication
PAT-AUTHOR : L. Menigaux, A. Carenco, A. Scavennec
DATE : 1990/05/21
COUNTRY : France
OBSERVATIONS : Applicant : CNET

PROJECT : R1031
PAT-TITLE : High Speed Submount
PAT-AUTHOR : H.P. Mayer, G. Luz
OBSERVATIONS : German Patent No P4110378

PROJECT : R1031
PAT-TITLE : Laserwafer und Verfahren zu seiner Herstellung (Laser wafer and method for fabrication)
PAT-AUTHOR : K. Dutting, K. Wünstel
COUNTRY : Germany
OBSERVATIONS : German Patent OE 3934748 and European Patent EP 423513

PROJECT : R1031
PAT-TITLE Dispositif semiconducteur intégré incluant un élément optoélectronique de commutation en forme de Y
PAT-AUTHOR : Ph. Authier, M. Erman. LEP
DATE : 1988/06/27
COUNTRY : UK, F, D, I, SW, NL
OBSERVATIONS : Filed with the US, Japan and South Korea Patent Office and under the European Patent Convention

PROJECT : R1031
PAT-TITLE : Method for testing edge emitting semiconductor devices
PAT-AUTHOR : K.H. Bihler, H. Hauer, B. Schwaderer
COUNTRY : Germany
OBSERVATIONS : Applied for German Patent under No P3916924

PROJECT : R1033
PAT-TITLE : Dispositif semiconducteur intégré incluant un commutateur optoélectronique
PAT-AUTHOR : J.A. Cavailles, LEP
DATE : 1989/06/09
COUNTRY : UK, F, D, I, NL, SW
OBSERVATIONS : Filed with the US, Japan and South Korea Patent Office and under the European Patent Convention

PROJECT : R1033
PAT-TITLE : Dispositif semiconducteur intégré incluant un élément optoélectronique de commutation
PAT-AUTHOR : M. Erman, LEP
DATE : 1988/11/28
COUNTRY : UK, F, D, I, SW, NL
OBSERVATIONS : Filed with the US, Japan and South Korea Patent Office and under the European Patent Convention

PROJECT : R1033
PAT-TITLE : Optical Devices (HBT Waveguides)
PAT-AUTHOR : GEC
DATE : 1988/06/16
COUNTRY : F, D, I, NL, SW
OBSERVATIONS : Filed with the US Patent Office and under the European Patent Convention

PROJECT : R1033
PAT-TITLE : Verfahren und Vorrichtung zum dezentralen Aussenden von Information auf eine Uebertragungsstrecke
PAT-AUTHOR : S. Rao, M. Potts, R. Beeler, ASCOM TECH AG
OBSERVATIONS : Filed with the Swiss Patent Office (No 04 093/88-4)

PROJECT : R1033
PAT-TITLE : Dispositif semiconducteur comprenant un guide de lumière intégré qui présente au moins une partie rectiligne
PAT-AUTHOR : Ph. Autier, M. Erman, J.M. Auger, LEP
DATE : 1988/06/27
COUNTRY : UK, F, D, NL
OBSERVATIONS : Filed with the US, Japan and South Corea Patent Office and under the European Patent Convention

PROJECT : R1033
PAT-TITLE : Dispositif semiconducteur incluant un coupleur directionnel pour les composantes TE, TM
PAT-AUTHOR : J. Angenent, J.A. Cavailles, LEP
DATE : 1989/07/28
COUNTRY : UK, F, D, I, SW, NL

PROJECT : R1033
PAT-TITLE : Uebertragungseinrichtung mit einer optischen Uebertragungsstrecke
PAT-AUTHOR : P. Vogel, Th. Martinson, Ascom Tech AG
DATE : 1989/12/12
OBSERVATIONS : Filed with the Swiss Patent Office

PROJECT : R1033
PAT-TITLE : Bit- und Rahmensynchronisiereinheit für einen Zugriffseinheit einer optischen Uebertragungseinrichtung
PAT-AUTHOR : P. Vogel, Th. Martinson, ASCOM TECH AG
DATE : 1990/04/09
OBSERVATIONS : Filed with the Swiss Patent Office (No 01 192/90-3)

PROJECT : R1033
PAT-TITLE : Code-Erkennungseinheit und Verwendung derselben
PAT-AUTHOR : P. Vogel, Th. Martinson, ASCOM TECH AG
DATE : 1990/05/23
OBSERVATIONS : Filed with the Swiss Patent Office (No 01 769/90-0)

PROJECT : R1033
PAT-TITLE : Optoelectronic assemblies (SiTHRU packaging)
PAT-AUTHOR : I.R. Crostonm S.G. Tyler, GEC-Marconi
DATE : 1991/06/26
OBSERVATIONS : Filed with the UK Patent Office

PROJECT : R1035
PAT-TITLE : Connectionless ATM Data Services
OBSERVATIONS : Official publication of the application did not occur yet

PROJECT : R1038
PAT-TITLE : Vermittlungsunabhängiges Konferenzsystem (Audio/Video)
OBSERVATIONS : Application submitted by Alcatel SEL

PROJECT : R1038
PAT-TITLE : Videophone bei Multimedia mittels Umlenkspiegelanordnung
OBSERVATIONS : Application submitted by Alcatel SEL

PROJECT : R1038
PAT-TITLE : Videophone bei Multimedia - "Periskoplösung"
OBSERVATIONS : Application submitted by Alcatel SEL

PROJECT : R1041
PAT-TITLE : Hybrid-Codierer für Videosignale
PAT-AUTHOR : J. Speidel, P. Vogel
OBSERVATIONS : Patent No EP 0 244 01

PROJECT : R1041
PAT-TITLE : Verfahren u. Schaltungsanordnung zur Bitratenreduktion
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3631252 - EP 0 260 748

PROJECT : R1041
PAT-TITLE : Quellcodierer für Videobilder
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3710119 - EP 0 284 161

PROJECT : R1041
PAT-TITLE : System zur Übertragung von Videobildern
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3726520 - EP 0 290 085

PROJECT : R1041
PAT-TITLE : Verfahren zur Bestimmung von Bewegungsvektoren
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3727530

PROJECT : R1041
PAT-TITLE : System zur Übertragung von Videobildern
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3744280

PROJECT : R1041
PAT-TITLE : Schaltungsanordnung zur Auswertung eines Videosignals
PAT-AUTHOR : M. Riegel
OBSERVATIONS : Patent No DE 3809076 - EP 0 333 274

PROJECT : R1041
PAT-TITLE : Steuersignalgenerator für die Verarbeitung eines Videosignals
PAT-AUTHOR : M. Riegel
OBSERVATIONS : Patent No DE 3809075 - EP 0 333 275

PROJECT : R1041
PAT-TITLE : Prädiktiver Standbildcodierer
PAT-AUTHOR : K. Hienerwadel & G. Weth
OBSERVATIONS : Patent No DE 3811536 - EP 0 336 510

PROJECT : R1041
PAT-TITLE : Hybrid-Codierer für Videosignale
PAT-AUTHOR : K. Hienerwadel & G. Weth
OBSERVATIONS : Patent No DE 3811535 - EP 0 336 535

PROJECT : R1041
PAT-TITLE : Verfahren zur Speicherung und Wiedergabe von Videosignalen
PAT-AUTHOR : G. Weth
OBSERVATIONS : Patent No DE 38731277

PROJECT : R1041
PAT-TITLE : Speicher für Videosignale
PAT-AUTHOR : M. Riegel
OBSERVATIONS : Patent No DE 3838171 - EP 0 365 069

PROJECT : R1041
PAT-TITLE : Verfahren zur Bestimmung der Bewegungsvektoren einer Sequenz von Videobildern
PAT-AUTHOR : K. Hinerwadel
OBSERVATIONS : Patent No DE 3839502

PROJECT : R1041
PAT-TITLE : Schaltungsanordnung zur Filterung eines Videosignals
PAT-AUTHOR : K. Hinerwadel
OBSERVATIONS : Patent No DE 3917085

PROJECT : R1041
PAT-TITLE : Codierer für blocksweise Codierung von Videobildern
PAT-AUTHOR : P. Vogel
OBSERVATIONS : Patent No DE 3929280

PROJECT : R1041
PAT-TITLE : Schaltungsanordnung zur Bestimmung der Lage von extremalen Werten einer Ähnlichkesf
PAT-AUTHOR : K. Hinerwadel
OBSERVATIONS : Patent No DE 4009610 - EP 0 449 363

PROJECT : R1041
PAT-TITLE : Vorrichtung zur Steuerung einer Videokamera
PAT-AUTHOR : W. Demmer & G. Weth
OBSERVATIONS : Patent No DE 4012846

PROJECT : R1041
PAT-TITLE : Adaptives Filter zur Reduktion von Codierartefakten
PAT-AUTHOR : W. Demmer
OBSERVATIONS : Patent No 4017375

**PROJECT :** R1041
**PAT-TITLE :** Schaltungsanordnung zum Erkennen eines menschlichen Gesichts
**PAT-AUTHOR :** E. Badiqué
**OBSERVATIONS :** Patent No DE 4028191 - EP 0 474 304

**PROJECT :** R1041
**PAT-TITLE :** Anordnung zur Speicherung digitaler Farbbildsignale
**PAT-AUTHOR :** B. Friedrich
**OBSERVATIONS :** Patent No DE 4041821

**PROJECT :** R1044
**PAT-TITLE :** Multi-user Optical line Outlet
**PAT-AUTHOR :** Fussgänger (SEL)
**DATE :** 1990
**COUNTRY :** Germany
**OBSERVATIONS :** Exploitation of this patent will be "free of charge" to all participants in RACE Programme

**PROJECT :** R1044
**PAT-TITLE :** Optical Communication System for the Multi-Customer Access Area
**ABSTRACT :** Multi-Customer Optical Line Inlet/Multi-Customer Optical Line Outlet (MC-OLI/MC-OLO); Threefold WDM :
- High Density WDM (eg. 2-5 nm) for multi-customer signal transmissions
- Medium-Density WDM (eg. 65-85 nm) for bidirectional signal transmissions, and
- Low-Density WDM (eg. 185-235 nm) for optical integration of interactive (B)ISDN and distributive CATV service signals

**PAT-CATEGORY :** IBC Customer Systems
**PAT-AUTHOR :** Dr. Kurt Fussgaenger, SEL
**DATE :** 1989/90
**COUNTRY :** Germany, EC

**PROJECT :** R1064
**PAT-TITLE :** Integrierte optische Anordnung mit wenigstens einem auf einem Substrat aus Halbleitermaterial integriertem optischem Wellenleiter
**DATE :** 1989/09/01
**COUNTRY :** Germany
**OBSERVATIONS :** German Application P 39 29 131.6 - GR 89 P 1730 DE

**PROJECT :** R1064
**PAT-TITLE :** Monolithisch integrierter Schaltkreis mit einer DDB-Laserdiode, optischem Schalter und Wellenleiterverbindungen
**DATE :** 1990/05/03
**COUNTRY :** Germany
**OBSERVATIONS :** German Application P 40 14 234.5 - GR 90 P 1231 DE

**PROJECT :** R1064
**PAT-TITLE :** Steuerbarer integrierter optischer Richtkoppler
**DATE :** 1990/09/28
**COUNTRY :** Germany
**OBSERVATIONS :** German Application P 40 30 754.9 - GR 90 P 1725 DE

**PROJECT :** R1064
**PAT-TITLE :** Steuerbarer integrierter optischer Mach-Zehnder-Interferometer
**DATE :** 1990/09/28
**COUNTRY :** Germany
**OBSERVATIONS :** German Application P 40 30 755.7 - GR 90 P 1726 DE

PROJECT : R1064
PAT-TITLE : Passiver integrierter optischer Richtkoppler
DATE : 1990/09/28
COUNTRY : Germany
OBSERVATIONS : German Application P 40 30 756.5 - GR 90 P 1727 DE

PROJECT : R1083
PAT-TITLE : Method and Circuit Arrangement for Data Block Synchronisation in TDM Communiation System, particularly in an ATM
PAT-AUTHOR : S. Wahl, B. Cesar
DATE : 1991/07/12
OBSERVATIONS : (EP 91 111 615.0 12.07.91)

PROJECT : R1089
PAT-TITLE : Verfahren zum Absetzen von Kabeln, insbesondere Lichtwellenleiterkabeln
ABSTRACT : Cutting of aramid yarns for cable end preparation
PAT-AUTHOR : H. Deharde, J. Rogalla, J. Schulte
DATE : 1989/0
COUNTRY : Germany
OBSERVATIONS : Application Submitted

PROJECT : R1089
PAT-TITLE : Verfahren zum zugfesten Verbinden eines Steckers mit einem Lichtwellenleiterkabel
ABSTRACT : Procedure for the mounting of the crimp sleeve of an optical connector
PAT-AUTHOR: H. Deharde
DATE : 1990/01
COUNTRY : Germany
OBSERVATIONS : Application submitted

PROJECT : R1089
PAT-TITLE : Connecteurs pour fibres optiques à verrouillage et déverrouillage rapide
ABSTRACT : Design of the housing for a push-pull operating fibre optic connector
PAT-AUTHOR : E. Grassin d'Alphonse, S. Dubois, N. Valade
DATE : 1990/06/21
COUNTRY : France
OBSERVATIONS : Application submitted, extension to foreign countries planned

PROJECT : R1089
PAT-TITLE : Connecteur pour fibres optiques
ABSTRACT : Silicone-based membrane fixed inside the adaptor connecting 2 optical fibres
PAT-AUTHOR : L. Boillot, S. Boudard
DATE : 1990/01/29
COUNTRY : France
OBSERVATIONS : Application submitted, extension planned for European cointries and the US

PROJECT : R1089
PAT-TITLE : Oblique Fibre Cleaving
OBSERVATIONS : Application submitted

PROJECT : R1089
PAT-TITLE : Singleway re-enterable splice
OBSERVATIONS : Application submitted

**PROJECT :** R1089
**PAT-TITLE :** Design of compact fan-out with splitters
**OBSERVATIONS :** Application submitted in April 1992

# Annex V

## Glossary of technical terms

ATM - Asynchronous Transfer Mode.
CEPT - Conference of European Post and Telecommunications Organisations
CCIR - Comite Consultatif International des Radiocommunications of ITU
CCITT - Comite Consultatif International des Telegraphique et Telephonique - International Telephone and Tele
CFS - Common Functional Specifications
CODEC - Coder/Decoder
COST _ Co-operation in Science and Technology: A European multi-national framework for R&D co-operation.
CPN - Customer Premises Network
CREST - EC Committee on Research, Science and Technology.
DRIVE - EC R&D on Telematic systems in the area of Transport
EBIT - European Broadband Interconnection Trial
ECU - European Currency Unit
EDTV - Enhanced Definition Television
EFTA - European Free Trade Association
EL - Electro-luminescent
ESPRIT - European Strategic Programme of Research in Information Technologies
ETSI - European Telecommunications Standards Institute
EURESCOM - European Institute for Research and Strategic Studies in Telecommunications GmbH
GEN - General European Network: A 34 MBit/s fibre transmission Backbone
IBC - Integrated Broadband Communicatons
IC - Integrated Circuit
IN - Intelligent Networking
ISDN - Integrated Services Digital Network
ITU - International Telecommunications Union
HDTV - High Definition Television
LSI devices - Large-Scale Integrated devices
METRAN - Managed European Transport Network
MOU - Memorandum of Understanding
PNO - Public Network Operator
RACE - Research on Advanced Communications technologies for Europe
RMC - RACE Management Committee
SME - Small and medium-sized Enterprise
TMN - Telecommunications Management Network
UMTS - Universal Mobile Telecommunications System

# Annex VI

## Key references

**Council Decision** of 25th July 1985 on a definition phase for a Community action in the field of telecommunications technologies - R&D programme in advanced communications technologies for Europe (RACE): 85/372/EEC; O.J. No L 210/24; 7.8.1985

**Council Decision** of 14 December 1987 on a Community programme in the field of telecommunications technologies - R&D in advanced Communications technologies in Europe (RACE programme); 88/28/EEC: O.J. No L 16/35, 21.1.88.

**Council resolution** of 30th June 1988 on the development of the common market for telecommunications services and equipment up to 1992; 88/C 257/01: O.J. No C 257/1, 4.10.88.

**Communication from the Commission** to the Council and Parliament "Working towards Telecom 2000 - Launching the Programme RACE - COM(88) 240 final II of 31.5.88

Report of the IBC strategic Audit: "Establishing advanced communications in Europe". February 1989.

**Communication of the Commission** to the Council concerning R&D in Advanced Communications technologies for Europe (RACE) - Progress report '89 and 30-month review, SEC(89) Final, July 1989.

Annual technical reports on the RACE programme - RACE '88; RACE '89; RACE '90; RACE '91, and RACE '92 - Available on request from the RACE central office, DG XIII, Direction B.

**Perspectives for Advanced Communications in Europe**: PACE '89; PACE '90; and PACE '92, January 1992 - Available on request from the RACE central office, DG XIII, Direction B.

**Council Decision** 91/352/CEE of 7th June 1991 adopting a Specific Programme of research and technology development in the field of Communications technologies: O.J. No L 192/8, 16.7.91

The report of the information and communications technologies review Board, Chaired by Mr. W. Dekker, June 1992.

**Communication from the Commission** on "Evaluation of the second Framework Programme for research and technological development (SEC(92)675 Final), July 1992.

Evaluation of the second Framework Programme of RTD: **Report from CREST to the Council**, September 1992. CREST/1212/1/92.

# Annex VII

## Listing of Projects

1001 DVT:Digital video-tape recording terminal for HDTV
1002 Satellite communications for IBCN
1003 GUIDELINE:AIP and standards for TMN
1004 Electro-luminescent flat-panel display for terminal applications
1005 NEMESYS:Traffic and QOS management for IBCN
1006 AIM: AIP application to IBCN maintenance
1007 ITIS: IBC terminal for interactive services
1008 Silicon-based low-cost passive optical components
1009 ADVANCE: Network and customer administration systems for IBCN
1010 Subscriber coherent Multi-channel system
1011 Business CPN
1012 BLNT: Braodband local network technology
1013 HDTV-Switching
1014 ATMOSPHERIC
1015 Domestic CPN
1016 Test tools and equipment
1017 IOLE: IBC on-line environment
1018 HIVITS: High-quality video-telephone and hihg-definition television system
1019 Polymeric optical switching
1020 All-optical switching and bi-stable devices based on semi-conducting polymers
1021 ARISE: A resuable infrastructure for software engineering
1022 Technology for ATD
1023 BEST: A methodological approach to IBC system requirements specifications
1024 NETMAN: Functional specifications for IBC TNM
1025 Functional specification of security and privacy in IBC
1026 International transmission of digital radio and television
1027 Integrated opto-electronics towards coherent multi-channel IBCN
1028 REVOLVE: Regional evolution planning for IBC
1029 Development of improved InP substrate material for opto-electronic devices
1030 ACCESS: Advanced customer connections, an evolutionary systems strategy
1031 Low-cost opto-electronic components
1032 Development and testing of optical components for subscriber networks
1033 OSCAR: Optical switching systems, components and architecture research
1034 Usability engineering requirement for IBC
1035 Customer premises network (CPN)
1036 WDTM broadband customer premises network
1037 User criteria for the realisation of opportunities afforded by IBC
1038 MCPR: Multi-media communication, processing and representation
1039 DIMUN: Distributed international manufacturing
1040 RIPE: RACE integrity primitives evaluation
1041 FUNCODE: Functional specification of codes
1042 MULTI-MED: Functional service integration in support of professional users
1043 Mobile telecommunications project
1044 IBCN development and implementation strategies

1045 Consensus management project
1046 SPECS: Specification and programming environment for comms software
1047 Techniques and integrity mechanisms in IBCN
1048 RSVP: RACE strategy for verification
1049 ATM concept
1050 IBC applications analysis
1051 Multi-gigabit transmission in IBCN subscriber loops
1052 SPOT: Signal processing for optical and cordless transmission
1053 TERRACE: TMN evolution of reference configurations for RACE
1054 APPSN: Application pilot for people with special needs
1055 MERCHANT: Methods in electronic retail cash handling
1056 BIPED: Basic business IBC demonstrator
1057 AQUA: Advanced quantum-well lasers for multi-gigabit transmission
1058 RESAM: Remote expert support for aircraft maintenance
1059 DIVIDEND: Dealer interactive video
1060 DIDAMES: Distributed industrial design and manufacturing of electronic subassemblies
1061 DIMPE: Distributed integrated multi-media publishing environment
1062 MARIN: Marine industry applications of broadband communications
1063 MAPS: RACE mobile applications pilot scheme
1064 MIOCA: Monolithic integrated optics for customer access applications
1065 ISSUE: IBCN systems and services useability engineering
1066 IPSNI: Integration of people with special needs by IBC
1067 Usability design information support
1068 ROSA: RACE open services architecture
1069 EPLOT: Enhanced performance lasers for optical transmission
1070 Testing Pay-per-view in Europe
1071 Applications analysis
1072 ITACA: IBCN testing architecture for conformance assessment
1073 GEOTEL: Application pilot in the petroleum and chemicals industry
1074 ECHO: Electronic case-handling in offices
1075 Telepublishing
1076 REMUS: Reference models for useability specifications
1077 Usage reference model for IBC
1078 European museums network
1079 CAR: CAD/CAM for the automotive industry in Europe
1080 HDTV experimental usage
1081 BUNI demonstrator
1082 QOSMIC: QOS verification methodology and tools for integrated communications
1083 PARASOL: ATM specific measurement equipment
1084 MIME: Development of emulators and simulators
1085 TET-ADAPT: Adaptation of techno-economic evaluation tools for RACE
1086 TELEMED
1087 PROVE: Provision of verification
1088 TUDOR: Usability issue for people with special needs
1089 LOOP: Low-cost optical components
1091 ESP: EBIT service project
1092 DIRAC: Database for reliability calculations

# Annex VIII

## Organisations involved in RACE Projects

# ANNEX B - Alphabetical List of Participating Organisations

| | Organisation | Country | Project(s) |
|---|---|---|---|
| 01-PLIRO | 01-PLIROFORIKI | GR | R1075 |
| AAS/TAU | Austrian Academy of Sciences Technology Assessment Unit | A | R1037 |
| ACEC | ACEC SA | B | R1018, 22, 41 |
| AEG | AEG Aktiengesellschaft | D | R1018, 39 |
| AEG | AEG Forschungsinstitut | D | R1041 |
| AEG | AEG Kabel AG | D | R1030, 44, 56 |
| AEG | AEG Olympia AG | D | R1063 |
| AET | Applicazioni Elettrotelefoniche A.E.T. Spa | I | R1044 |
| AIB | Allied Irish Bank Plc | IRL | R1059 |
| AKZO | AKZO International Research BV | NL | R1019* |
| ALCASP | Alcatel Espace SA | F | R1002*, 86 |
| ALGO | Algotech Sistemi | I | R1076* |
| ALPHA | ALPHA SAI | GR | R1016, 84 |
| AMPER | Amper SA | E | R1044, 45, 81 |
| ANALYSIS | Analysis Ltd | UK | R1028 |
| ANDUS | ANDUS GmbH | D | R1060 |
| ANITRA | Anitra Medienprojekte | D | R1070* |
| ANT | ANT Nachrichtentechnik GmbH | D | R1002, 30, 31, 44, 47*, 51 |
| APD | Grupo de Empresas A.P.D. | E | R1042 |
| APM | Architecture Projects Management | UK | R1068 |
| APSIS | APSIS | F | R1042 |
| APT | AT&T en Philips Telecommunicatie Bedrijven BV | NL | R1022, 31, 33, 44, 51, 81, 83 |
| ASCOM | Ascom Tech AG | CH | R1053, 83, 87 |
| AT&T NSI | AT&T Network Systems International BV | NL | R1045, 77 |
| ATEA | ATEA | B | R1044 |
| ATR | ALCATEL Radiotelephone | F | R1043 |
| AXI | AXION A/S | DK | R1009 |
| B&S | Barr & Stroud Ltd (Pilkington) | UK | R1019 |
| B3i | Bureau International d'Ingénierie Informatique | F | R1083 |
| BALT | Baltimore Technologies (Subcontractor) | IRL | R1021 |
| BARCO | Barco Industries N.V. | B | R1044 |
| BED | BED | D | R1015 |
| BBC | British Broadcasting Corporation | UK | R1018, 36*,43, 63, 77, 81 |
| BC | Bertin & Cie. | F | R1092 |
| BCOM | Broadcom Eireann Research Ltd | IRL | R1003, 09*, 21*, 23, 24*, 28, 53, 91 |
| BELSER | Belser Verlag | D | R1078 |
| BIBA | Bremer Institut für Betriebstechnik und angewandte Arbeitswissenschaft an der Universität Bremen | D | R1039*, 62, 85 |
| BICC | BICC Cables Plc | UK | R1032*, 39, 60 |
| BNP | Banque Nationale de Paris | F | R1059 |
| BOSCH | Robert Bosch GmbH | D | R1043, 44, 54 |

| | | | |
|---|---|---|---|
| BT | British Telecommunications Plc | UK | R1003*, 06, 09, 18, 22, 23, 24, 25, 28, 30, 32, 33, 34, 37*, 41, 43, 44, 45, 48, 55, 59, 67, 68*, 77, 79, 81*, 87, 91, 92* |
| BT/NoI | British Telecommunications Plc (Northern Ireland) | UK | R1028 |
| BT/NoS | British Telecommunications Plc (North of Scotland District) | UK | R1028 |
| BTM | Alcatel/BTM | B | R1002, 22*, 44, 45, 46, 83 |
| BTS | Broadcast Television Systems GmbH | D | R1080 |
| BURDA | Burda GmbH | D | R1061 |
| CAP | CAP SESA Régions | F | R1087 |
| CAP | CAP Sesa Telecom | F | R1021 |
| CAP | CAP SOGETI Innovation | F | R1016, 17 |
| CASE | Case Communications Ltd | UK | R1003, 05*, 53, 79, 82 |
| CCETT | Centre Commun d'Etudes de Télédiffusion et Télécommunications | F | R1018 |
| CEA | Commissariat à l'Energie Atomique | F | R1008 |
| CEL | Crosfield Electronics | UK | R1061 |
| CERDA | Institut Cerda | E | R1037, 71 |
| CET | (Centro de Estudos de Telecommunicações) Correios & Telecomunicações de Portugal | P | R1009, 21, 23, 24, 28*, 54, |
| CIRU | Computer Industry Research Unit | UK | R1055, 59 |
| CIT | Alcatel CIT SA | F | R1022, 44, 45 |
| CLEM | Clemessy SA | F | R1016, 82, 87 |
| CNET | Etat Français - Ministère des PTT Centre National d'Etudes des Télécommunications | F | R1015, 18, 22, 27, 30, 32, 5, 41, 44, 46, 48, 57, 68, 3, 87, 92 |
| CNR | Consiglio Nazionale Delle Ricerche | I | R1066* |
| CNRG | Communication Networks Research Group | GR | R1083 |
| CNUSC | C.N.U.S.C. | F | R1086 |
| CONTEL | Contel IPC (UK) Ltd | UK | R1059 |
| CORNEL | Cornelsen Verlag | D | R1075 |
| COSI | Consorzio per l'OSI in Italia | I | R1044, 72* |
| CPR | Consorzio Pisa Ricerche | I | R1091 |
| CPS | Condatec Projekt Software GmbH | D | R1075 |
| CSATA | CSATA - Tecnopolis (Centro Studi e Applicazioni in Tecnologie Avanzate) | I | R1028, 38, 92 |
| CSELT | C.S.E.L.T. - Centro Studi e Laboratori Telecomunicazioni Spa | I | R1018, 27, 44, 46, 48, 53*, 54, 57, 68 |
| CT | Compagnie Technicon | F | R1042 |
| CTE | Centro de Textos Electronico SA | E | R1061 |
| CTT | Correios e Telecomunicações de Portugal | P | R1022, 91 |
| CU | Commercial Union Assurance Company | UK | R1074 |
| CWI | Stichting Mathematisch Centrum - CWI | NL | R1040* |
| DANAOS | Danaos Shipping Co. | GR | R1062 |

| | | | |
|---|---|---|---|
| DANET | DANET GmbH | D | R1006 |
| DBP | Bundesministerium für das Post und Fermeldewesen | D | R1045 |
| DBP | Deutsche Bundespost | D | R1051, 92 |
| DEA | Danish Engineering Academy | DK | R1092 |
| DETECON | DETECON GmbH | D | R1075*, 86*, 91* |
| DEUTSCH | Compagnie Deutsch | F | R1031 |
| DHL | DHL Worldwide Express | B | R1063* |
| DHZ | Deutches Herzentrum | D | R1086 |
| DIT/UPM | Departamento de Ingenieria Telemática Universidad Politecnica de Madrid | E | R1072 |
| DLV | Delta Lloyd Verz. | NL | R1074 |
| DORNIER | Dornier System GmbH | D | R1002 |
| DTB | Deutsche Thomson-Brandt GmbH | D | R1001, 18 |
| EBT | EB Teknologi Ltd | N | R1039, 43, 46 |
| EBU | Technical Centre of the EBU | B | R1026* |
| ELBASA | ELBASA | E | R1060 |
| ELCENT | ElektronikCentralen | DK | R1016, 84, 87 |
| ELCOMA | Philips International BV. Elcoma Division | NL | R1022 |
| ELEC | Electricity Council | UK | R1063 |
| ELIN | Alcatel Austria Elin Forschungcentrum GmbH | A | R1046 |
| ELSYP | ELSYP | GR | R1075 |
| EMI | EMI Electromagnetics Institute | DK | R1014 |
| EMP | Empirica GmbH | D | R1054 |
| ENI | Enichem Synthesis Spa | I | R1020 |
| EOLAS | The Irish Science and Technology Agency | IRL | R1087 |
| EPFL | EFPL | CH | R1057 |
| ERA | ERA Technology Ltd | UK | R1020 |
| ERC | Alcatel Austria - ELIN Research Center | A | R1017 |
| ERICSSON | Ericsson Radio Systems AB | S | R1043 |
| ERICSSON | Ericsson Telecom | S | R1056*, 68, 81 |
| ESTTO | ESTTO SA | GR | R1061 |
| FACE | Industrie FACE Standard Spa | I | R1002, 06, 08, 13, 17, 22, 38, 44, 45, 66 |
| FATME | Fabbrica Apparecchiature Telefoniche e Materiale Elettrico - Brevetti Ericsson | I | R1011*, 15, 35*, 44, 45, 56, 72, 81 |
| FCR | France Cable & Radio | F | R1059, 87 |
| FCRE | F.C.R. Entreprises | F | R1091 |
| FI/DBP | Forschungsinstitut der DBP TELEKOM beim Fernmeldetechnischen Zentralamt | D | R1018, 22, 25*, 32, 41 |
| FIAR | Fabricca Italiana Apparecchiature, Radioelettriche SpA | I | R1009 |
| FINTEL | Post and Telecommunications of Finland | SF | R1039, 44 |
| FIT | Swiss Federal Institute of Technology, Zurich | CH | R1033 |

| | | | |
|---|---|---|---|
| FHG | Fraunhofer Abbeitsgruppe für Graphische Datenverarbeitung | D | R1079 |
| FLZ | Fischer-Madsen & Lorenz Petersen Data Communications Consultants A/S (Fischer and Lorenz) | DK | R1005 |
| FMH | Universidade Tecnica de Lisboa, Faculdade de Motricidade Humana, Departamento de Educaçao Especial e Reabilitaçao, (FMH-DEER) | P | R1054, 88 |
| FOKKER | Fokker Aircraft BV | NL | R1058 |
| FORD | User 2 - Ford (Europe) | | R1079 |
| FORTH | Foundation for Research and Technology - Hellas | GR | R1005, 66 |
| FTZ | Deutsche Bundespost TELEKOM - Fernmeldetechnisches Zentralamt | D | R1044, 48, 53, 87 |
| FUB | Fondazione Ugo Bordoni | I | R1043, 65, 68, 72 |
| GEC | GEC-Marconi Research Ltd. | UK | R1043, 92 |
| GEC | GEC Research Ltd (Subcontractor) | UK | R1011 |
| GEC | The General Electric Company Plc (GEC Research Ltd, Marconi Research Centre) | UK | R1002 |
| GEC | The General Electric Company Plc | UK | R1014, 18, 24, 30, 33, 35, 36 |
| GEOSTOCK | Société Francaise de Stockage Géologique | F | R1073* |
| GMD | Gesellschaft für Mathematik & Datenv. | D | R1068, 72, 75 |
| GPT | GEC-Plessey Telecommunications Ltd. | UK | R1005, 44, 45, 46, 51 56, 81 |
| GRUNDIG | Grundig AG | D | R1001 |
| HAI | Hellenic Aerospace Industry | GR | R1044 |
| HAMBURG | Museum Hamburg | D | R1078 |
| HASLER | Research & New Technologies Division of Ascom Holding Ltd (Hasler AG) | CH | R1016, 33 |
| HELL | Dr. Ing. Rudolf Hell GmbH | D | R1061 |
| HHI | Heinrich Hertz Institut | D | R1010 |
| HIDB | Highlands & Islands Development Board | UK | R1028 |
| HP | Hewlett-Packard Ltd | UK | R1016, 83 |
| HUSAT | Husat | UK | R1063, 65*, 76, 79 |
| HUT | Helsinki University of Technology | SF | R1039, 62 |
| IAD | International Automotive Design | UK | R1079* |
| IBM | IBM France SA | F | R1005, 46, 53, 68, 79, 82*, 84 |
| ICOM | International Council of Museums | F | R1078 |
| ICOM | Intracom SA | GR | R1009, 21, 24 |
| IDATE | IDATE | F | R1050, 71, 77, 86 |
| IFC | IFC Research Ltd | UK | R1050*, 71*, 77 |
| IMEC | Inter-universitair Mikro-electronika Centrum vzw | B | R1010, 19, 22, 33, 69 |
| IMS | Irish Medical Systems | IRL | R1086 |
| INESC | Instituto de Engenharia de Sistemas e Computadores | P | R1011, 22, 46 |
| INET | I-NET Limited | UK | R1053 |

| | | | |
|---|---|---|---|
| INMARSAT | Inmarsat | UK | R1062 |
| INST | Instruments SA | F | R1032, 36 |
| INSTM | Institut Montpellier | F | R1086 |
| INTECS | INTECS Sistemi Spa | I | R1017, 21 |
| INTELSA | Industrias de Telecomunicacion SA | E | R1023, 44, 48 |
| INTERCAI | INTERCAI | NL | R1070 |
| INTRACOM | Intracom SA | GR | R1053, 60, 61 |
| IPSYS | IPSYS Plc | UK | R1021 |
| IROE | Instituto di Recerca sulle Onde - Electromagnetiche del Consiglio Nazionale dell Recerche | I | R1020 |
| IRR | Institute for Rehabilitation Research | NL | R1066 |
| ISI | ISI-Fraunhofer GmbH | D | R1050, 71, 75, 78* |
| ISL | Institut für Seeverkehrswirtschaft und Logistik | D | R1062 |
| ISOFT | Intrasoft (Subcontractor) | GR | R1009, 21 |
| ISR | Alcatel/ISR | F | R1053, 55, 60, 63 |
| IST | Instituto Superior Tecnico | P | R1051 |
| ITALTEL | Societa Italiana di Telecomunicazioni SpA | I | R1012, 44, 45, 49, 81 |
| ITEC | Reading ITEC (Information Technology Centre) | UK | R1066 |
| JTAS | Jutland Telephone Aktieselskab | DK | R1022, 44, 72, 81 |
| KME | Kabelmetal Electro GmbH | D | R1032, 44, 89 |
| KONE | Kone Belgium SA | B | R1039 |
| KTAS | Kjobenhavns Telefon Aktieselskab | DK | R1005, 09, 22, 44, 53, 58, 82, 83, 84, 91 |
| KUL | Katholieke Universiteit Leuven | B | R1066 |
| L-CUBE | L-CUBE Information Systems SA | GR | R1061 |
| LABEIN | Labein | E | R1072 |
| LC | Lohja Corporation Electronic Industries | SF | R1004* |
| LDM | Laboratoires de Marcoussis | F | R1006, 19, 27, 46, 57 |
| LEP | Philips - LEP (Laboratoires d'Electronique Philips) | F | R1010, 18, 33* |
| LER | Thomson-CSF | F | R1080* |
| LME | L.M.Ericsson Ireland | IRL | R1009 |
| LME | Telefonaktiebolaget L M Ericsson | S | R1014, 21, 30, 33 |
| LOEWE | Loewe Opta GmbH | D | R1007* |
| LOHJA | Lohja Corporation | SF | R1081 |
| LUT | Loughborough University of Technology Dept of Electronic & Electrical Engineering | UK | R1042 |
| LWB | Lloyd Werft Bremerhaven GmbH | D | R1062* |
| MARCONI | Marconi Italiana Spa | I | R1044 |
| MARI | MARI Advanced Microelectronics Ltd | UK | R1007, 09, 21, 23*, 81 |
| MATRA | MATRA Communication | F | R1004, 07, 18, 41, 81 |
| MATRA | SA Matra-Space | F | R1014 |
| MBLE | MBLE N.V./ S.A. | B | R1022 |
| MCC | Maxwell Communication Corporation Plc | UK | R1061* |

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|---|---|---|---|
| MCS | (Marconi Communication Systems) The Marconi Company Limited | UK | R1002 |
| MCP | MCP Wafer technology | UK | R1029* |
| MECF | Medical Computers France | F | R1042 |
| MET | Matra-Ericsson Télécommunications | F | R1014*, 44, 56, 83 |
| METATYPE | Metatype SA | GR | R1061 |
| MM | Midland Montagu | UK | R1059 |
| MONOTYPE | Monotype Corporation Plc | UK | R1061 |
| MSS | Marconi Space Systems The Marconi Company Limited | UK | R1002 |
| NAH | Nassauisches Heim | D | R1054 |
| NAVICON | Navicon SA | E | R1062 |
| NCC | National Computing Centre Ltd. | UK | R1048 |
| NCI | Norcontel (Ireland) Ltd | IRL | R1059 |
| NEDPTT | Centraaldirectie Nederlandse PTT | NL | R1088 |
| NEWPOL | Newcastle Polytechnic | UK | R1088 |
| NIHE | The National Institute for Higher Education | IRL | R1046 |
| NKT | Aktieselskabet Nordiske Kabel & Traadfabriker Denmark | DK | R1014, 30*, 45, 51, 56 |
| NMRC | National Microelectronics Research Centre | IRL | R1020, 43 |
| NOKIA | NOKIA Corporation | SF | R1011, 22, 35, 43, 44 |
| NSDD | Telecom Eireann NSDD | IRL | R1059 |
| NTA | Norwegian Telecommunications Administration | N | R1022, 44, 53, 68, 83, 86, 91 |
| NTA | Research Department (Teledirektorat) of Norwegian Telecommunications Administration | N | R1023 |
| NTE | NTE GmbH | D | R1075 |
| NTUA | National Technical University of Athens | GR | R1014, 22, 24, 62 |
| NTUA | National Technical University of Athens (Subcontractor) | GR | R1009 |
| ORT | Offset Repro Technik | D | R1075 |
| OTE | Hellenic Telecommunications | GR | R1028, 43 |
| OTTO | Otto Versand | D | R1075 |
| OXC | Oxford Consultants (Europe) | UK | R1042 |
| OXP | Oxford Polytechnic Dept of Computing And Mathematical Science | UK | R1042 |
| PEUSA | Peugeot SA | F | R1079 |
| PHILIPS | Nederlandse Philips Bedrijven BV | NL | R1001, 10*, 31, 64, 69, 80 |
| PHILIPS | Philips SA | B | R1022 |
| PHILIPS | Philips Telecommunicatie en Data Systemen, Nederland BV | NL | R1022, 45 |
| PHILIPS | Philips USFA | NL | R1040, 47 |
| PHILIPS | Philips International BV | NL | R1074* |
| PKB | PK Berlin | D | R1078 |
| PKI | Philips Kommunikations Industrie AG | D | R1015, 18, 22, 35, 41, 43, 44, 58, 74, 78, 83 |
| PLANET | Planet SA | GR | R1061, 73 |
| PLES | Plessey Research, Roke Manor Ltd | UK | R1009, 11, 12*, 15, 35, 49* |

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|---|---|---|---|
| PLES | Plessey Research (Caswell) Ltd | UK | R1010, 18, 64, 69* |
| PLESSEY | Plessey UK Ltd | UK | R1043, 67, 68 |
| PRC | Philips Radio Communication Systems Ltd | UK | R1043*, 63 |
| PRENSA | PRENSA | E | R1075 |
| PROMAR | Proyectos Marinos | E | R1062 |
| PRL | Philips Research Labs | UK | R1043 |
| PTT | Swiss PTT | CH | R1045, 86 |
| PUM | Philips Universitaet Marburg | D | R1057 |
| QMC | QMC Instruments Ltd | UK | R106 |
| QMC | Queen Mary College, London | UK | R1022 |
| QMW | Queen Mary & Westfield College (University of London) | UK | R1083 |
| RADI | Radiall SA | F | R1032, 89* |
| RAL | Rutherford Appleton Laboratory of the Science and Engineering Research Council | UK | R1042 |
| REFER | Refer BVBA | B | R1076, 87 |
| RIC | RIC Association Internationale | B | R1044*, 45* |
| RKL | Regio Kabel Limbourg | NL | R1070 |
| RNL | Research Neher Laboratories of the Netherlands PTT | NL | R1015, 18, 19, 22, 25, 33 35, 36, 40, 41, 43, 44, 46, 48, 54, 65, 68, 81, 91 |
| RTC | RTC-Compelec | F | R1031 |
| RTT | Régie T.T. | B | R1022, 44, 45 |
| SACM | SACM | F | R1062 |
| SAGEM | Sagem Sa | F | R1047 |
| SAIT | SAIT S.A. (Subcontractor) | B | R1041 |
| SARDE | Sarde S.A. | F | R1073 |
| SARIN | Sarin | I | R1065 |
| SAS | SAS Denmark | DK | R1058* |
| SAT | Société Anonyme de Télécommunications | F | R1030, 44, 45, 56 |
| SEB | S-E-Banken, SEB Data | S | R1059 |
| SEC | SOURIAU & Cie. | F | R1089 |
| SEL | Alcatel/SEL AG | D | R1003, 06*, 13*, 15, 16*, 17*, 22, 31*, 32, 33, 34*, 35, 38*, 44, 45, 51*, 53, 54*, 57*, 60, 67*, 77*, 81, 83, 86, 87, 88* |
| SEPT | Service d'Etudes communes des Postes et Télécommunications | F | R1025 |
| SES | Scitex Europe Sa | B | R1061 |
| SESA | Alcatel/SESA | E | R1002, 06, 11, 17, 18, 22, 35, 36, 38, 43, 44, 46, 48, 56 |
| SFI | Senter for Industrieforskning | N | R1039 |
| SGS | SGS Microelletronica SpA | I | R1004, 14, 44 |
| SGS | SGS-Thomson Microelectronics SA | F | R1030, 36 |
| SIBS | Sociedade Interbancaria de Servicos | P | R1055 |
| SID | Synergie Informatique et Developpement | F | R1068 |
| SIE | Sistemas Expertos | E | R1042, |

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|---|---|---|---|
| SIEMENS | Siemens AG | D | R1010, 12, 31, 40, 44, 45, 47, 49, 53, 64*, 69, 81, 83, 92 |
| SIETEC | SIETEC | D | R1075 |
| SIETTE | SIETTE | I | R1086 |
| SIGOS | SIGOS | D | R1074 |
| SINTRA | Thomson - SINTRA | F | R1033 |
| SIP | Società Italiana per le Telecomunicazioni | I | R1053 |
| SIRTI | SIRTI SpA | I | R1032, 89 |
| SIXCOM | Sixcom (Olivetti Group) | I | R1055 |
| SLIGOS | Sligos | F | R1055* |
| SNS | Sloman Neptun Schiffahrts AG | D | R1062 |
| SOFREC | SOFRECOM | F | R1070 |
| SOGITEC | SOGITEC | F | R1075 |
| SOPHA | Sopha Medical | F | R1042 |
| SOURIAU | Souriau et Cie. | F | R1030 |
| SPAG | SPAG Services S.A. | B | R1048*, 87* |
| SPECTRUM | Spectrum Energy & Information Technology Ltd | UK | R1073 |
| STAL | Televerket (Swedish Telecommunications Administration) | S | R1009, 11, 14, 18, 21, 23, 24, 25, 30, 33, 35, 41*, 43, 44, 45, 53, 56, 59, 67, 83, 86, 87 |
| STAT | STAT SA | GR | R1075 |
| STC | Alcatel STC Plc | UK | R1014, 22, 24, 27*, 31, 36, 44, 45, 53, 56, 57, 59*, 68, 83, 86, 89 |
| STK | Alcatel/STK | N | R1022, 38, 86 |
| STL | STC Technology Ltd | UK | R1036 |
| STL | STC Plc, STC Technology Ltd | UK | R1008* |
| STOLL | Stollmann GmbH | D | R1060 |
| SUS | SUS Research Ltd | IRL | R1028 |
| SWIFT | S.W.I.F.T. | B | R1055 |
| SWIN | (Swedish Institute for the Handicapped | S | R1088 |
| SYD | Synergie Informatique et Developpement | F | R1009 |
| T&T | Thrane & Thrane | DK | R1062 |
| TCD | University of Dublin, Trinity College | IRL | R1009, 20* |
| TCE | Thomson Consumer Electronics | F | R1080 |
| TCSF | Thomson-CSF | F | R1015*, 18*, 29, 33, 35, 36, 47, 57, 81 |
| TECHNI | Technisystems | GR | R1062 |
| TECHNO | TechnoPlan | D | R1060 |
| TECSI | GSI-Tecsi SA | F | R1005, 46*, 59, 82, 84 |
| TEE | Telecom Eireann (Subcontractor) | IRL | R1020 |
| TEKNON | Teknon Gesellschaft für Wissenbasierte Systeme GmbH | D | R1017 |
| TELE-S | Telematic Services GmbH | D | R1060* |

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|---|---|---|---|
| TELEFON | Telefónica de España SA | E | R1014, 18, 22, 24, 27, 28, 30, 41, 44, 48, 51, 53, 55, 72, |
| TELENORMA | Telefonbau & Normalzeit GmbH | D | R1011, 35, 38, 44, 45, 56 |
| TELES | Télésystèmes SA | F | R1061, 65, 73, 74, 77, 86 |
| TELETTRA | Telefónica Elettronica e Radio Spa | I | R1027, 44 |
| TELINDUS | Telindus N.V. | B | R1044 |
| TELSI | Telefónica Sistemas | E | R1009, 42*, 78, 86, 91 |
| TELSPACE | Telspace S.A. | F | R1002 |
| TESA | Telettra Espanola S.A. | E | R1043, 44, 45, 81 |
| TFL | Teleteknisk Forskningslaboratorium | DK | R1046, 68 |
| THEM | Thomson Hybrides et Microondes SA | F | R1029, 30, 43 |
| THOMSON | Thomson SA | F | R1044, 45 |
| THORN | Thorn EMI Central Research Labs | UK | R1015, 43 |
| TITN | T.I.T.N. | F | R1044, 61 |
| TL | TeleLOGIC AB | S | R1021, 24 |
| TLP | Telefones de Lisboa e Porto | P | R1053, 78 |
| TNC | The Networking Centre Ltd | UK | R1083 |
| TRCF | Technical Research Centre of Finland | SF | R1008, ,42, 54, 65, 66 |
| TRICOM | Konsortium TRICOM | CH | R1022, 44 |
| TRT | Telecommunications Radioélectriques et Téléphoniques | F | R1018, 22, 43, 63 |
| TST | Telefunken System Technik and Logistics | D | R1062 |
| TUB | Technische Universität Berlin | D | R1075 |
| TUD | Technical University of Denmark | DK | R1013, 27 |
| TVE | Thomson Video Equipment | F | R1080 |
| UCL | University College London | UK | R1005, 54, 67, 79 |
| UCW | University College of Wales (Subcontractor) | UK | R1021 |
| UDOR | Universitat Dortmund | D | R1033 |
| UNIBIT | UNIBIT (Holdings) | UK | R1006 |
| UOA | University of Athens | GR | R1027, 51 |
| UOA | University of Aveiro | P | R1052* |
| UOB | University of Bremen | D | R1062 |
| UOC | University of Cambridge | UK | R1042 |
| UOD | University of Dundee | UK | R1066 |
| UOF | University of Florence | I | R1086 |
| UOG | University of Ghent | B | R1004 |
| UOH | University of Heidelberg | D | R1086 |
| UOL | University of London | UK | R1086 |
| UOM | University of Manchester | UK | R1088 |
| UOMU | University of Mulhouse | F | R1087 |
| UOS | University of Strathclyde | UK | R1043 |
| UOS | University of Stuttgart | D | R1022, 57 |
| UPM | Fundaciòn General de la Universidad Politècnica de Madrid | E | R1023 |
| UPMC | DNAC - Université Pierre et Marie Curie | F | R1009 |
| UST | Stirling University | UK | R106[illegible] |

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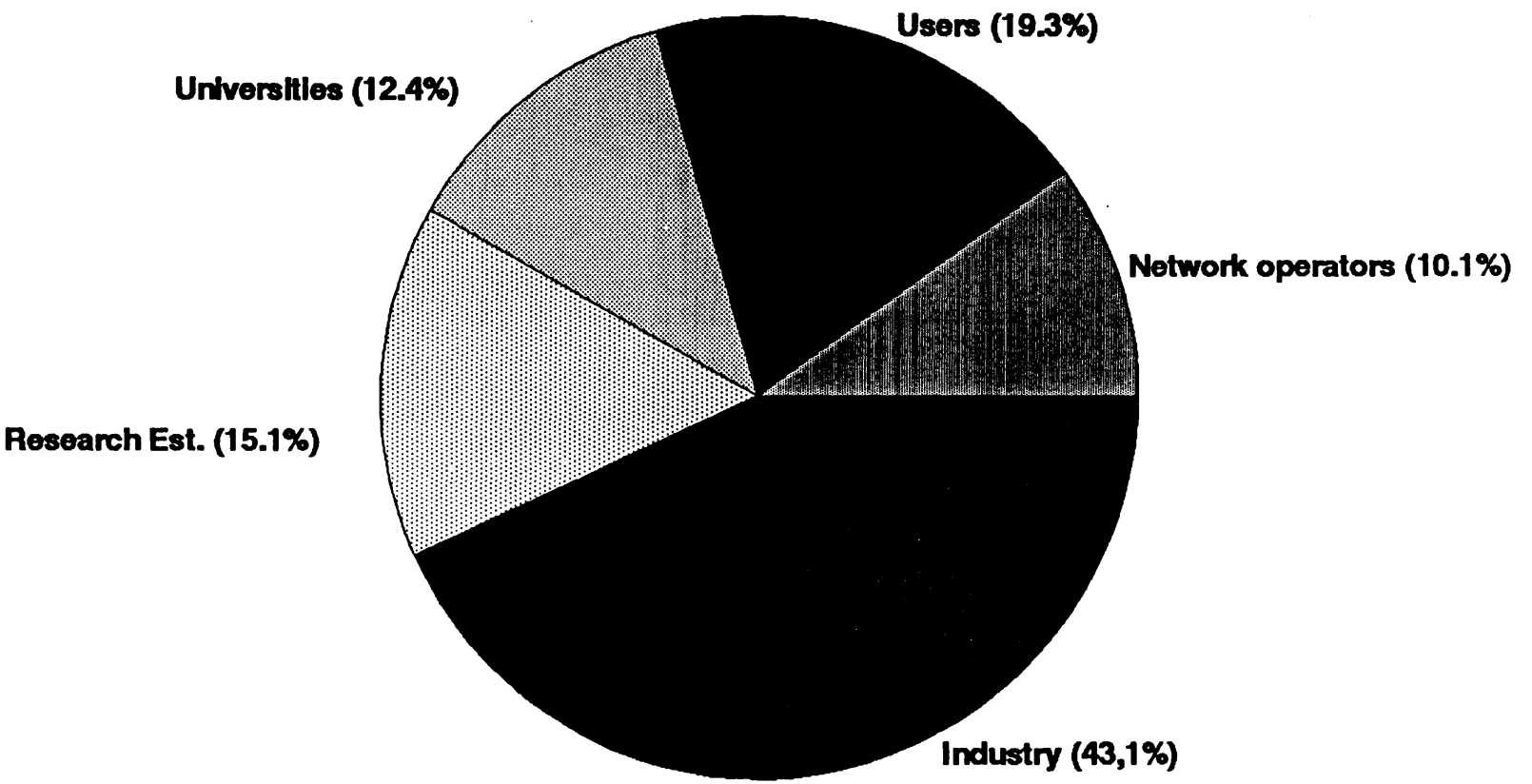
|---|---|---|---|
| USTL | Université de Sciences et Techniques du Languedoc | F | R1029 |
| UVA | University of Aarhus | DK | R1040 |
| UVD | University of Durham | UK | R1084 |
| UVL | University of Leuven | B | R1040 |
| UVS | University of Surrey | UK | R1023 |
| VERITAS | Det Norske Veritas | N | R1062 |
| VITEC | VITEC | F | R1079 |
| W&G | Wandel & Goltermann GmbH & Co | D | R1083* |
| WRC | Work Research Center Ltd | IRL | R1034, 77 |
| WSD | Wärtsilä Diesel | SF | R1062 |
| ZMF | ZMF | D | R1078 |

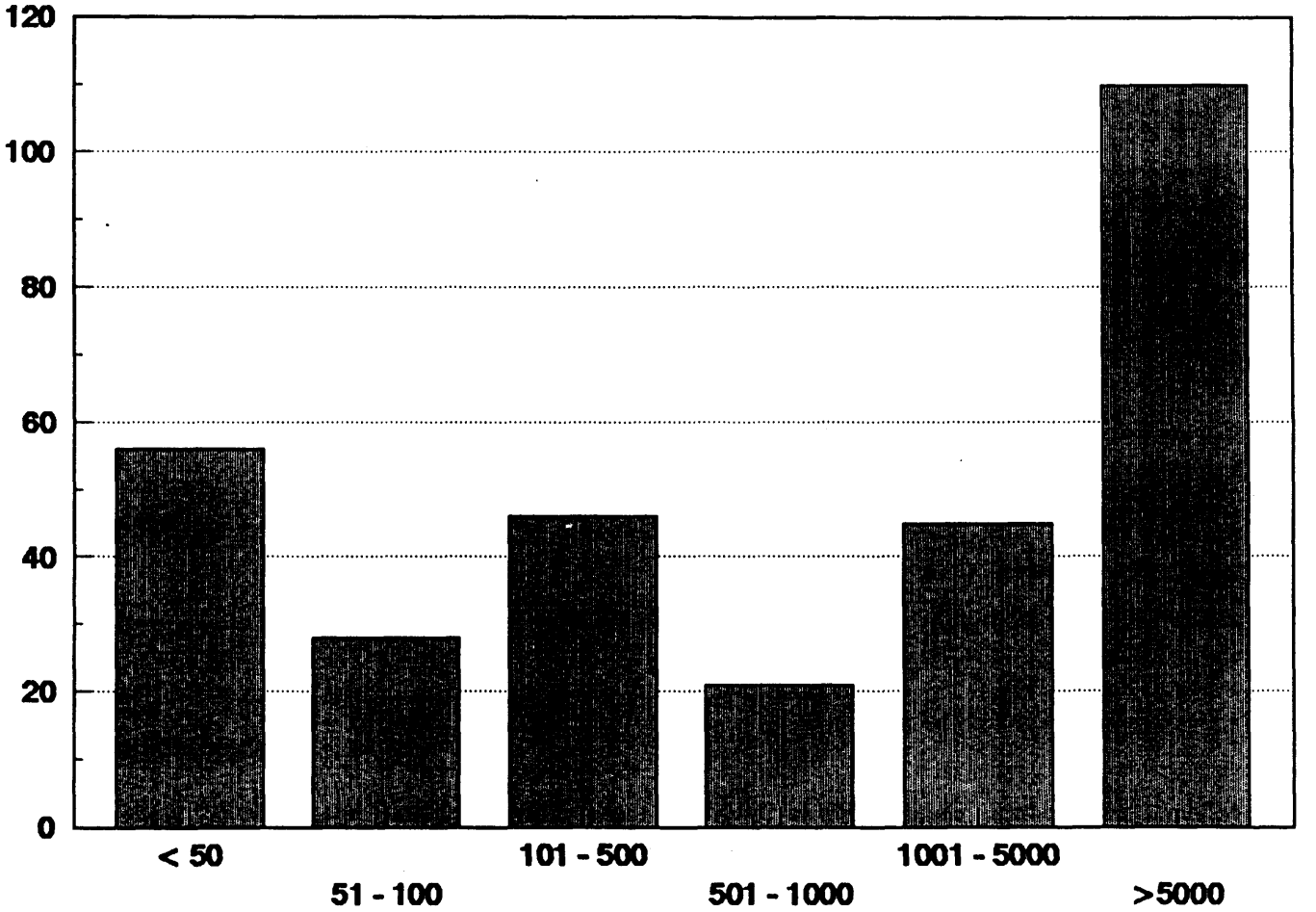
* Prime Contractor for Project

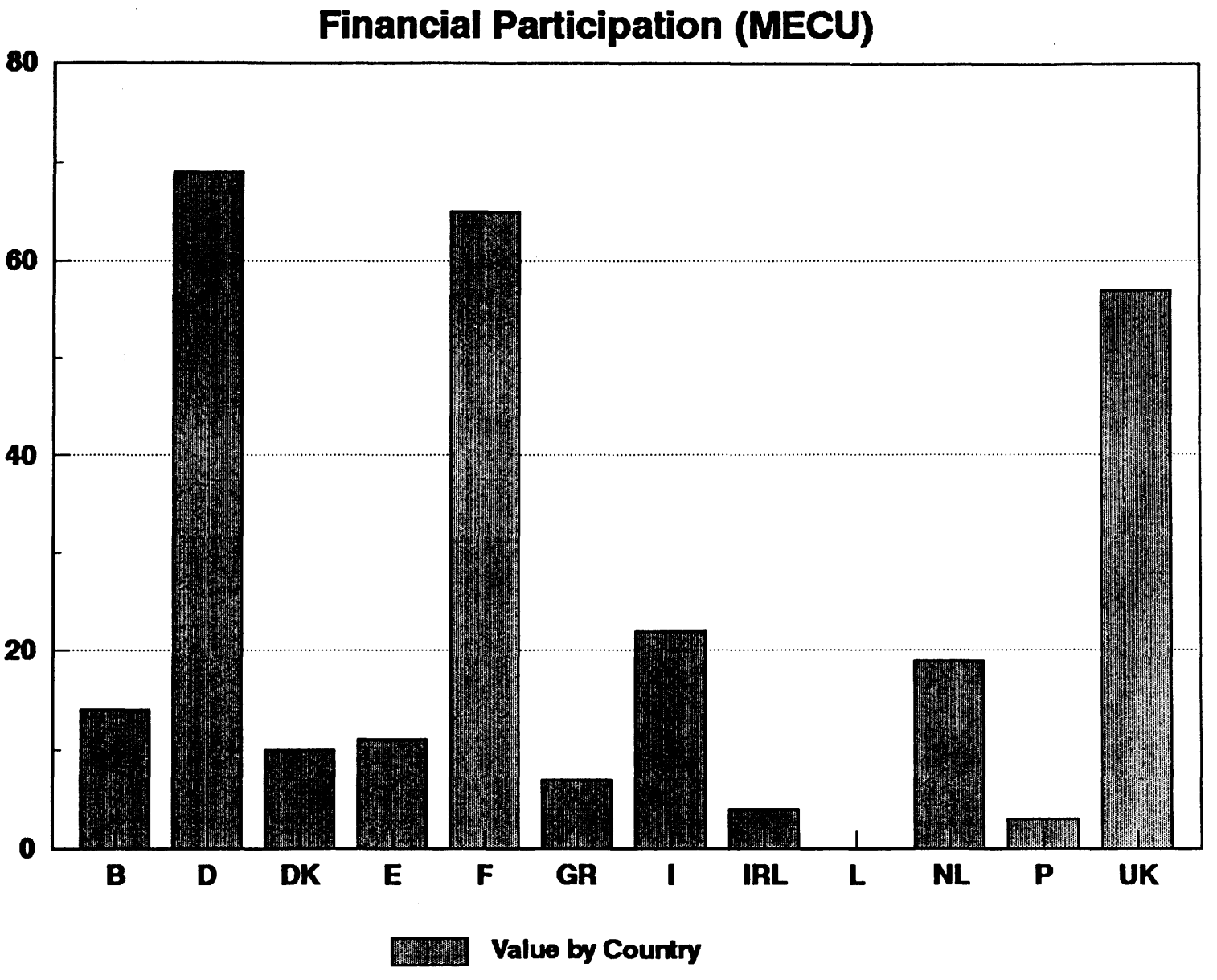
# Annex IX

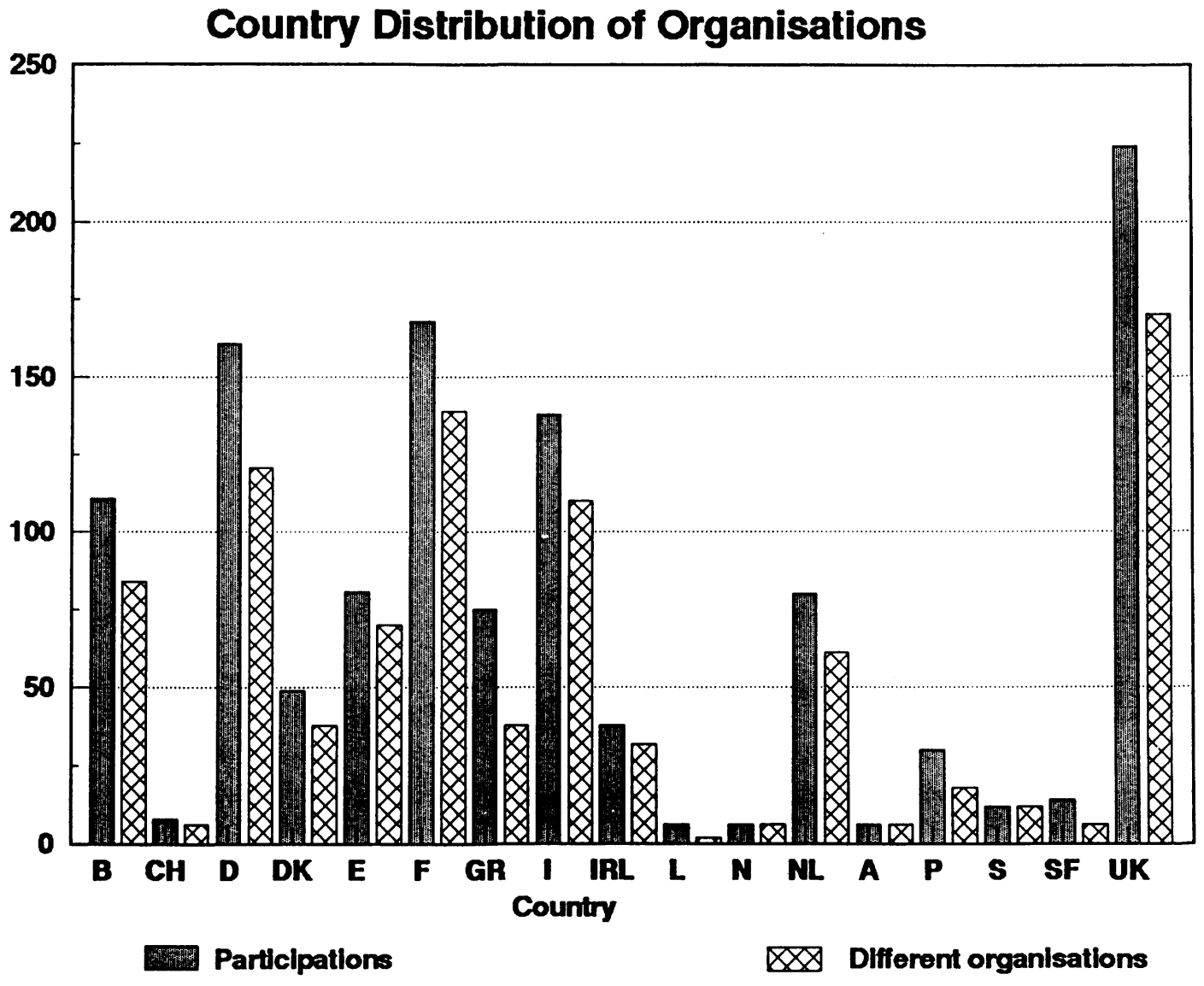
## Financial and participation statistics

# Types of Organisations




Sizes of Organisations
120
100
80
60
40
20
0
< 50
51 - 100
101 - 500
501 - 1000
1001 - 5000
>5000


Financial Participation (MECU)
80
60
40
20
0
B
D
DK
E
F
GR
I
IRL
L
NL
P
UK
Value by Country


Country Distribution of Organisations
250
200
150
100
50
0
B
CH
D
DK
E
F
GR
I
IRL
L
N
NL
A
P
S
SF
UK
Country
Participations
Different organisations

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