

Ten years of EBU participation in European collaborative projects

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1. Introduction

The impact of contributions made by Members of the EBU to European research and development of new radio and television systems has been decisive in the rapid development of digital techniques. It has made possible the definition of new systems and services, appropriate ETSI and ITU international standards, and the creation of substantial consensus with other industries.

Considerable work remains to be done in creating future broadcasting and related services which use digital audio, video and data signals. Broadcasters thus have an important role to play in tomorrow's Information Society.

For many years, initiatives have been taken to enhance coordination and collaboration between various European partners in Research and Development. RACE and its Accompanying Measures programme, ACTS, DVB and EUREKA are among the most important projects in terms of broadcasters' involvement. EBU Members have also taken part in COST, ESPRIT, DRIVE and TIDE projects.

A short description of some of these R & D programmes is given here, along with summary details of many of the projects in which Members of the EBU have played a leading or active role.

2. RACE and ACTS

In 1985, the RACE Programme was set up with considerable foresight by the European Commission to prepare for the introduction of integrated broadband communications (IBC), i.e. the bringing together of telecommunications, broadcast and personal computer services.

The key rationales that were considered when building this cooperative European framework

RACE I (1987-1991)

R 1018: HIVITS

Prime: Thomson CSF *Partners:* BBC, CCETT and others

Studies and development of TV/HDTV and high-quality videotelephony codecs, based on the hybrid DCT/DPCM algorithms. An HDTV codec was used by the EBU for transmissions in the 20-GHz band during WARC-92 in Torremolinos. Work within this project was seminal to the development of digital video compression systems.

R 1026: International Transmission of Digital Television and Radio

Prime: EBU Technical Centre (sole contractor)

Studies for digitalization of the Eurovision and Euroradio Networks and interconnection with IBCN. This project was involved in the elaboration of the ETSI specification known as ETS 300 174 (34 Mbit/s codecs).

R 1036: Wavelength and Time Division Multiplexed (WTDM) Broadband Customer Premises Network (BPCN)

Prime: BBC *Partners:* NRK (sponsoring partner) and others

Realisation of a BPCN demonstrator for broadband service providers (TDM up to 2.5 Gbit/s with a control system based on ISDN protocols), and validation of the broadband user-network interface via R 1081 (BUNI – Broadband User-Network Interface Demonstrator). The work was continued in R 2001 for a pilot installation of a studio-quality broadband optical routing system.

R 1077: Usage Reference Model for IBC

Prime: Alcatel SEL *Partners:* BBC and others

Design of an IBC support infrastructure, and design of services to support specific applications, starting from data provided by Usage Studies of the RACE Preparation Phase.1

RACE II (1991-1995)

R 2001: WTDM Pilot installation

Prime: BBC *Partners:* DR, NRK (sponsoring partner) and others

Specification and installation of a pilot Customer Premises Network (CPN) based on the R 1036 developments and in collaboration with *ESPRIT* (see *Section 6*). This has led to the realisation of a full optical routing installation in a BBC television studio complex, in Cardiff. This demonstrator is a full-scale application of the system in a professional user environment which has allowed the validation of various optical-network techniques. SDH prototype interfaces for audio, video and data have been developed. Another pilot installation in planned for one of NRK's studios in 1995. A reduced-scale demonstration was offered by the BBC in the EBU Village at Montreux'93.

R 2045: DISTIMA Digital Stereoscopic Imaging and Applications

Prime: Siemens *Partners:* CCETT, IRT and others

Development of a stereoscopic imaging system (3D) based on MPEG-2 and 2D-compatible, e.g. for television broadcasting, television signal processing, medical imaging or quality control. This project led to the definition of specifications for cameras, codecs and displays. Motion estimation, based on the modelling of 2D and 3D objects, was also studied.

R 2064: FLASH-TV Flexible and Advanced Satellite System for High-quality TV with Interconnection to IBC

Prime: Eutelsat *Partners:* CCETT, RAI, Retevision, TDF-C2R, EBU (sponsoring partner) and others

A full system for operation of high-quality digital video transmissions (near-contribution HDTV applications) has been developed and specified, based on the R 1018 HIVITS codec with improvements in both performance and functionality. The satellite transmission system supports four user bitrates (34.5, 46.0, 55.2 and 69.0 Mbit/s), allowing flexible real-time re-configuration for point-to-multi-point liaisons. A Plesiochronous Digital Hierarchy (PDH) network adapter, based on two G.703/G.751 interfaces, has also been defined. Demonstrations were given during IBC'94 and in the EBU Village during Montreux'95 (see *page 51*).

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RACE II (1991-1995)

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R 2072: MAVT Mobile Audio-Visual Terminal

Prime: Robert Bosch *Partners:* CCETT and others

MAVT has initiated studies and development of audio and video coding techniques, suited for audio-visual services via networks for mobiles. Potential audio and video services have been identified, based on the use of very low bitrate streams occasionally derived from H.261, MPEG and JPEG. Studies on advanced coding techniques have also started within this framework.

R 2075: HD-SAT Studio Quality HDTV Satellite Broadcasting

Prime: Alcatel Espace *Partners:* CCETT, IRT, RAI, TDF-C2R, EBU (sponsoring partner) and others

Characterization of Virtual Studio-Quality HDTV and Video Services, based on MPEG-2, for satellite broadcasting in the 30/20 GHz bands, including graceful degradation features (switching from 45 Mbit/s to 5 Mbit/s in adverse transmission conditions). The interfaces and modulation schemes for terrestrial (including MMDS), cable and IBCN/ATM secondary distribution have also been defined. A full demonstrator covering all transmission aspects has been built; it had its first public showing during Montreux'95 in a joint HD-SAT / dTTb (M 1002) demonstration (see page 43).

R 2082: dTTb Digital Terrestrial Television Broadcasting

Prime: CCETT *Partners:* BBC, Retevision, UKIB-ITC, IRT, RAI, TDF-C2R, EBU (sponsoring partner) and others

Definition of a digital terrestrial television broadcasting system, based on 64-QAM Coded Orthogonal Frequency Division Multiplex (COFDM) for 8 MHz channels. The dTTb project is playing an active role in the DVB European project to prepare a specification for digital terrestrial broadcasting. A follow-up to the dTTb activities has been proposed within the framework of ACTS, under the project name VALIDATE (see Section 2.3.). A dTTb demonstrator for digital terrestrial television, and compatible secondary distribution over cable, was presented during Montreux'95 in a common dTTb / HD-SAT demonstration (see page 43).

R 2110: HAMLET High-definition Advanced Multilevel Encoding Techniques

Prime: CCETT *Partners:* BBC, UKIB-ITC and others

Originally the scope of HAMLET was focused on the development and improvement of MPEG-2 hardware for HDTV (H-1440, SNR and Spatial scalable), in order to support the activities within other projects, namely DVB, HD-SAT, dTTb, ADTT and HDTV-T. Its mandate was extended to the study of advanced coding techniques (beyond MPEG-2) to encode TV at bitrates around 1 Mbit/s and HDTV at bitrates below 20 Mbit/s, based on the experience gathered in HIVITS, MORPHECO and TRANSIT.

R 2111: MOSAIC Methods for Optimization and Subjective Assessment in Image Communications

Prime: UKIB-ITC *Partners:* CCETT, RAI, EBU and others

The main objective here was to develop and test new methods for the assessment of picture quality and degradation, taking particular account of the constraints imposed by new digital systems and services. Other operational system features which influence image quality have also been investigated, such as: audio quality, relative audio/video quality ruggedness and delay, and system re-synchronization time. Associated studies in statistics have also been undertaken, both for the purpose of picture content analysis and also for the processing and presentation of results. A first demonstration of the MOSAIC developments was given in the EBU Village at Montreux'95 (see page 51). A MOSAIC Workshop is planned for September 1995 to present the overall MOSAIC results.

R 2120: MARS Multimedia Audio-visual Retrieval Service

Prime: CCETT *Partners:* CCETT, BBC and others

Development and demonstration of prototype multimedia retrieval services with trans-border interconnection. Definition of multimedia protocols.

for R&D were: pre-competitive cooperation between major companies; common functional specifications; overall system integration and the dissemination of results.

Three different phases were distinguished:

Phase I: System engineering, specifications and key technologies;

Phase II: Integration and prototyping of new services and applications;

Phase III: User-driven experimentation and trials.

parts, whose aim was to build consensus between the different activities/industries:

Part I: Strategies for IBC development and evolution;

Part II: Technologies for IBC implementation;

Part III: Integration and verification.

Although only a fraction of the work in RACE I was specifically focused on television, the information transmission requirements of digital video have had a large impact on much of the technology development.

■ 2.1. RACE I

RACE I concentrated on the evaluation of options, starting from the conclusions of the preparation phase. Its work was organized in three

■ 2.2. RACE II

RACE II has prepared for the introduction of IBC in the prototyping of new services and applications. RACE II is organised into “project lines” (PL) as follows:

RACE II: Accompanying Measures

M 1002: dTTb DEM

Prime: BBC

Partners: CCETT, TDF-C2R, RAI, UKIB-ITC, IRT, EBU and others

Realisation of a demonstrator to complement the work achieved in R 2082: dTTb

M 1003: EURO IMAGE

The European Initiative on Digital Image Distribution

Prime: EBU

Partners: CCETT, IRT, RAI and others

This project is involved in the evaluation of satellite (11/12 GHz), cable broadcasting and Service Information (SI) systems published as ETSI standards following the initiative of the European DVB Project. Some of these ETSI standards have already been submitted to the ITU.

M 1004: DIGISMATV

Community Reception of Digital Image Transmission

Prime: Hispasat

Partners: RAI, Retevision and others

The SMATV distribution systems common to satellite (DTH reception) and terrestrial broadcasting (see *page 50*) have been studied in detail. A specification for SMATV systems in Europe, which has been endorsed by the DVB Project, has been published as an ETSI standard which, in turn, has been submitted to the ITU.

M 1006: AMMIS

Advanced Man-machine Interface for Programme Selection in a Digital Television Multiplex

Prime: France 3

Partners: BBC, CCETT and others

This project is working on the development of man-machine interfaces suited to programme selection and presentation of multimedia information, within the framework of the distribution of television programmes.

M 1007: DIMMP

Digital Microwave Multi-point / Multi-channel Propagation

Prime: Star Telematics

Partners: TDF-C2R and others

The main goal of this project is to study the adaptation of the MMDS distribution techniques for broadcasting of four digital television programmes in 8 MHz channels. The use of 64-QAM modulation, and its impact on the system feasibility and frequency planning optimization, have also been studied. A DIMMP International Workshop was organized by TDF-C2R in May 1995.

ACTS (1995-1998)
Selected proposals*

QUOVADIS

Quality of Video and Audio for Digital Television Systems (Supervising and Monitoring)

Prime: TDF-C2R *Partners:* CCETT, Retevision, RAI, IRT, Orbis, EBU and others

VALIDATE

Verification and Launch of Integrated Digital Advanced Television in Europe

Prime: BBC *Partners:* TDF-C2R, CCETT, IRT, RAI, Retevision, EBU and others

TAPESTRIES

The Application of Psychological Evaluations to Systems and Technologies in Remote Imaging and Entertainment Services

Prime: UKIB-ITC *Partners:* CCETT, RAI, EBU and others

MIRAGE

Manipulation of Images in Real-time for the Creation of Artificially Generated Environments

Prime: UKIB-ITC *Partners:* Others

INTERACT

Interactive Television and Multimedia Return Channel Service Trials

Prime: UKIB-ITC *Partners:* TDF-C2R, RAI, Retevision, CCETT, EBU and others

MONET

Multimedia Open Network Environment for Television Studios

Prime: *Partners:* YLE and others

DIGISAT

Advanced Digital Satellite Broadcasting and Interactive Services

Prime: Retevision, Hispasat *Partners:* RAI, TVE, Canal Plus and others

ASP

Advanced Spectrum Planning

Prime: EBU *Partners:* CCETT, UKIB-ITC, TDF-C2R, Retevision, BBC, RAI, IRT, ERT and others

MOTIVE

Multimedia and Television in Vehicles

Prime: EBU *Partners:* CCETT, IRT, RAI, TF1 and others

BIDS

Broadband Infrastructure for Digital TV and Multimedia Services

Prime: IDATE *Partners:* TDF and others

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* This is a preliminary list of ACTS proposals, subject to modification pending the results of the negotiation meetings, and of the "Repeat Call for Proposals" in September 1995.

ACTS (1995-1998) Selected proposals*

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TALISMAN

Tracing Author's Rights by Labelling Image Services and Monitoring Access Network

Prime: Partners: RTBF and others

OKAPI

Open Kernel for Access to protected Interoperable Interactive Services

Prime: Partners: RTBF and others

CINENET

Cinema Network

Prime: Partners: CCETT, IRT and others

* This is a preliminary list of ACTS proposals, subject to modification pending the results of the negotiation meetings, and of the "Repeat Call for Proposals" in September 1995.

PL1: IBC Developments;

PL2: Intelligence in Networks/Flexible Communications Resource Management;

PL3: Mobile and Personal Communications;

PL4: Image and Data Communications;

PL5: Service Engineering;

PL6: Information Security;

PL7: Advanced Communications Experiments;

PL8: Test Infrastructure and Interworking.

The Image and Data Communication project line (PL4) has been set up to optimize the transmission of television signals and other digital video services on future broadband networks. PL4 projects are clustered in three general research areas: digital representation and processing of images, digital transmission for broadcasting, and interoperability.

"Accompanying Measures" and "Preparatory Actions" in the area of advanced communication technology developments were set up to complement RACE II. These included digital image communications.

■ 2.3. ACTS

ACTS (Advanced Communications Technologies and Services) represents Phase III and the

projects funded in its framework should start in July 1995. The projects are distributed into seven main areas:

Area 1: interactive digital multimedia services;

Area 2: photonic technologies;

Area 3: high speed networking;

Area 4: mobility and personal communications networks;

Area 5: intelligence in networks and service engineering;

Area 6: horizontal actions;

Area 7: quality security and safety of communications services and systems.

The rationale behind ACTS includes the obligation to set up cooperative projects, including services and applications, to support the development and verification of new technologies, and to give a key role to system integration, usage trials and demonstrations of advanced services. The seven areas mentioned above were defined to address the challenges of the "information society".

The aim of Area 1 is to enable the integration of existing broadband services, including terrestrial, cable and satellite television distribution, development of interactive services, and mobile audio-visual services.

3. DVB

The DVB Project – currently a group of 170 organizations from 21 countries around the world – is committed to establishing the technical framework for market-led developments in digital broadcasting. The DVB Project Office is located at the EBU Headquarters in Geneva. The DVB members are broadcasters, manufacturers, network operators, and administrations.

Since 1993, the DVB Project has defined digital systems, based on the use of MPEG-2 transport streams as the input signals, for the distribution of television over cable and satellite. The specifications of the cable and satellite systems have been published separately as ETSI Standards. A digital terrestrial system has been drafted and is undergoing tests prior to finalisation. A service information system has been approved to help users to navigate in the DVB environment. A common scrambling system and conditional access interface are also available. (S)MATV for local secondary distribution of satellite and terrestrial signals, and teletext, have also been studied and standardized at ETSI.

Some of the technical groups acting in the framework of the DVB Technical Module were originally groups of the EBU Technical Committee

(e.g. Specialist Groups V4/MOD, V2/SI) whose membership was extended to DVB members.

The DVB activities have now been extended to include subtitling, MMDS and interactive television.

The EBU Members involved in the DVB project are as follows: ARD, BBC, BTRN, Channel-4, Canal Plus, CCETT, CLT, Czech TV, EBU, IRT, UKIB-ITC, NRK, RAI, Retevision, RTVE, SVT, TDF, TF1, YLE and ZDF.

4. ATT (DRIVE)

Action has also been undertaken by the European Commission in the area of traffic and transport. This led to the launching of the DRIVE programme. Between 1989 and 1991, 72 projects were carried out in the framework of DRIVE I. This was followed by DRIVE II “Advanced Road Transport Telematics” with 52 projects being launched within the 1992-1994 period. A new programme for “Advanced Transport Telematics” (ATT) is being set up for the period 1995-1998.

The following EBU Members have been involved in various DRIVE projects dealing with the dissemination of traffic and travel information: ARD (comprising BR, NDR, SDR, SWF and WDR), BBC, RAI, SR and TDF.

ATT (DRIVE)

V 2023: PHOEBUS RDS Broadcast Display system for Remote Information Display

Prime: *Partners:* CCETT, TDF, SR and others

Development and specification of an integral Vehicle Scheduling Control System (VSCS) covering all the functional requirements for urban, interurban and rural public transport applications.

To complement the GPS system, RDS was considered as a candidate sub-system to relay the VSCS information.

V 2038: GEMINI Generation of Event Messages in the New Integrated Road Transport Environment

Prime: *Partners:* RAI, BBC and others

A feasibility assessment and the specification of a driver information system which integrates the Radio Data System Travel Message (RDS-TMC) and the Variable Message Signs (VMS) networks has now been completed. This work has led to field trials in the United Kingdom and Italy.

V 2046: ACCEPT / ALERT Concerted Co-operation European Pilots for TMC

Prime: *Partners:* TDF and others

This project was set up to check the international interoperability of the RDS-TMC system and to make it a real pan-European service.

EUREKA

EU 95: HDTV Compatible High Definition Television System (Phase III – Implementation)

Prime: Philips Consumer Electronics *Partners:* CCETT, TDF, IRT, RAI, Retevision, RTVE, NOB, BBC, ITVA and others

Implementation of a 50-Hz-based HDTV system along an evolutionary development from the MAC-Packet concept and compatible with MAC transmitters and receivers. This work resulted in the specification of the European HD-MAC high-definition television system. The EBU carried out the picture quality evaluation of HD-MAC.

EU 147 / DAB Digital Audio Broadcasting System

Prime: DLR *Partners:* CCETT, TDF, IRT, BBC, SR, YLE, RAI and others

Phase I: Development of a European technical standard for digital audio broadcasting based on MPEG audio;
Phase II: Final system standardization (ETSI ETS 300 401) and design, system verification and investigation of implementation aspects.

The EBU has taken an active part in the definition of the system, as well as in the standardization process (via the EBU / ETSI JTC), and in the promotion of the system.

EU 256 / DIGTRANS Bitrate Reduction System for HDTV Digital Transmission

Prime: Alcatel Italia *Partners:* RAI, RTVE and others

To define and implement an algorithm and a codec structure for bitrate reduction of HDTV signals in contribution links.

EU 625 / VADIS Video-Audio Digital Interactive System, Digital TV below 10 Mbit/s

Prime: CSELT *Partners:* CCETT, IRT, RAI, Retevision, BBC and others

Development of a European enabling technology for digital television at bitrates below 10 Mbit/s, including the development of related micro-electronics. VADIS was considered as the MPEG-2 European Platform.

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5. EUREKA

EUREKA is a pan-European platform to promote cross-border cooperation in “market-driven” research and development of new products, processes and services. Launched in 1985 by 17 European countries, EUREKA has now become a consortium of 22 countries in both Western and Eastern Europe (Hungary, Russia and Slovenia). The European Commission is also involved in EUREKA activities.

EUREKA projects cover all areas of advanced technology, including the following:

- information and telecommunications;
- robotics;
- materials;
- manufacturing;

- biotechnology;
- marine technology;
- lasers;
- environmental protection and transport technologies.

EUREKA projects aim to achieve significant technological advances in areas concerned with civilian market-driven applications. Activities are self-initiated by the proponents, who may be industrialists or researchers. A proposal will qualify as a EUREKA project if it is a cooperative venture involving at least two EUREKA Members who are significantly committed, particularly at a financial level. Projects are approved during EUREKA Ministers’ Conferences.

The EBU has regularly been invited to take an active part in different EUREKA projects.

EUREKA

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EU 637 / PAL-PLUS

Research and Development Related to Compatible Enhancement of PAL Terrestrial Transmissions

Prime: BBC *Partners:* IRT, ZDF, ITVA, UKIB-ITC and others

Development of a means to remove artefacts associated with existing PAL systems. and to convey additional information which enables suitably-equipped receivers to reproduce a higher vertical resolution picture with a 16:9 aspect ratio. This work has led to the specification of the PALplus system, whose picture-quality evaluation was undertaken by the EBU. An informative IAB / EBU Workshop was organised in June 1995 at the IAB in Montreux.

EU 775 / TV MIX

Multi-application Variable Bitrate Digital TV/HDTV Transmission System

Prime: Digital Television *Partners:* UKIB-ITC (TV-MIX extension) and others

To develop a prototype for a multi-application variable bitrate digital TV and HDTV transmission system.

EU 1187 / ADTT

Advanced Digital Television Technologies

Prime: Philips Consumer Electronics *Partners:* BBC, CCETT, NOB, IRT, RTVE, Retevision, RAI and others

Fundamental research, industrial basic research and applied R & D, culminating in a prototype demonstrator of a high-definition broadcast system. This covers production, reception and replay equipment from key technologies. This project is also covering the study and development of non-broadcast and multimedia applications. ADTT gave a first demonstration of its system at Montreux '95.

EU 1197 / SWIFT

System for Wireless Infotainment Forwarding and Teledistribution

Prime: TDF-C2R *Partners:* CCETT and others

Introduction of a novel application-oriented service, based on high data-rate broadcasting on existing FM networks. Field trials have been set up in France and Sweden. Commercial development of terminals including highly integrated receivers according to the PCMCIA standard.

6. ESPRIT

ESPRIT is another R&D programme under the responsibility of the European Commission.

The overall aim of the ESPRIT Fourth Framework Programme (ESPRIT IV, "Information Technologies") is to contribute to the development of the emerging information infrastructure, with a smooth transition to the information society and industry of the future. ESPRIT IV projects are market/user-driven.

ESPRIT activities are distributed into the following domains and "focused clusters", considered as vital for a rapid and safe development of the required information infrastructure:

- Software Technologies;
- Technologies for Components and Sub-systems;

- Multimedia Systems;
- Long Term Research;
- Focused Cluster: Open Microprocessor Systems Initiative;
- Focused Cluster: High Performance Computing and Networking;
- Focused Cluster: Technologies for Business Processes;
- Focused Cluster: Integration in Manufacturing.

7. COST

COST (European Cooperation on Scientific and Technical Research) was established in 1971 – on the initiative of the Council of the European Communities – to strengthen the cooperation in pre-competitive research and development, by means of cross-border 3-to-5-year collaborative projects.

ESPRIT

OMHEGA

Open MHEG Architecture

Prime:

Partners: CCETT and others

Feasibility studies in an Multimedia Hypermedia Expert Group (MHEG) environment, a preparatory standardization work.

COST

COST 206

Coding and Transmission of High Definition Television Signals

Countries: Belgium, France, Germany, Italy and Sweden

Partners: CCETT and others

Study and development of bitrate reduction techniques for High-Definition Television (HDTV): prefiltering and subsampling, postfiltering and interpolation, and source coding for contribution and distribution. A preliminary comparison on the coding efficiency for progressive and interlaced systems was also undertaken in this project.

COST 211

Redundancy Reduction Techniques for the Coding of Broadband Video Signals

Countries: Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom

Partners: CCETT and others

Study and development of bitrate reduction techniques for digital transmission of videoconference and broadcast quality television. A Class-I 34 Mbit/s codec has been implemented for television. A Class-II 384 kbit/s codec has been developed for videoconference signals. Bitrate reduction techniques for videotelephony over B-ISDN ATM have also been studied.

COST 230

Stereoscopic Television – Technology and Signal Processing

Countries: France and Germany

Partners: CCETT and others

Development of methods and technologies for production, coding, transmission and display of stereoscopic television images. Compatible MPEG-2 encoding techniques have been developed.

TIDE

AUDETTEL

Audio Description of Television

Countries:

Partners: UKIB-ITC and others

Study of a system based on digital signal processing techniques to provide good quality speech at very low bitrates. This system has been developed to assist visually-impaired people by providing an additional audio description to complement television pictures. This work has led to a large and successful field trial in the United Kingdom. The AUDETTEL signal was broadcast by ITV and the BBC over regional networks and 100 homes were equipped to decode the additional information provided by the system. The use of AUDETTEL methods have also been considered for other commercial services.

Originally, 19 European Countries supported the COST actions. COST is covering a wide range of different domains of activity: informatics, telecommunications, transport, oceanography, materials science, environment, meteorology, agriculture, food technology and medical research.

In the field of telecommunications, the COST activities can be sub-divided as follows:

- Optical technologies, devices and systems;
- Asynchronous and synchronous multiservice digital networks;
- Radio systems;
- Man-machine communications;
- Encoding of video signals and high-definition television;
- Telecommunications for the disabled;
- Secure communications.

As in EUREKA, the bottom-up approach is the rule. Each COST project is built on the basis of a Consortium of interested parties agreeing, at their initiative, on a common Memorandum of Understanding (MoU) for cooperation in one particular area of activity. COST projects are open to all bodies and institutions of the member States. The Commission and some European bodies (e.g. ESA, EBU) may also sign the project MoU. A project becomes operational when four countries have signed the MoU.

COST activities have included the definition of encoding algorithms for broadband video (including

HDTV and stereoscopic TV) and the definition of videotelephony/videoconference signals.

8. TIDE

The TIDE programme (Technology Initiatives for Disabled and Elderly people) was set up by the European Commission. Various projects, selected from a Call for Proposals, have been carried out in this framework. One such project is AUDETEL.

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Jean-Pierre Evain graduated from ENSEA in 1983. He joined the EBU Technical Department, Geneva, in 1992 as a Senior Engineer and is currently concerned with the coordination of Research & Development projects in broadcasting.

Mr Evain is particularly involved in new television systems. After joining the EBU, he followed the activities of EBU Working Groups V1, V3, V/EPS and their associated ad-hoc groups. He has also taken part in various system evaluation groups including HD-MAC, PALplus and MPEG.

Jean-Pierre Evain represents the EBU in ETSI, ITU-R SG11, ITU-T SG9 and in RACE Projects, HD-SAT, MOSAIC and dTTb DEM.