EBU Village at Montreux ’95

Over 26 000 visitors attended the *19th Montreux International Television Symposium and Technical Exhibition* (Montreux ’95) in June. Among the 300-plus exhibition stands was the second EBU Village of its type, the first having made its appearance at Montreux ’93. Forming part of the Future Technology exhibition, the EBU Village offered visitors a fascinating insight into state-of-the-art research and development projects in broadcasting, presented by prominent Members of the EBU. This report offers a brief description of the various demonstrations which took place within the EBU Village at Montreux ’95.

Within the framework of the DIGISMATV RACE II project (Number M 1004), **Retevisión** – in conjunction with the project leader, Hispasat – demonstrated the performance of a complete digital television transmission chain from Madrid, via the Hispasat 1B satellite (30º west), to the EBU Village in Montreux. In Madrid, the picture source signals were passed through an MPEG-2 compression encoder and an MPEG-2 multiplexer before sending them along an optical fibre link at 34 Mbit/s to the Hispasat up-link station. Here, the multiplex signal was QPSK-modulated according to the DVB specification for satellite digital services and then uplinked to an FSS transponder of the Hispasat satellite system. The signal received in Montreux, after being QPSK-demodulated, was 64-QAM-modulated in order to feed an SMATV network model. Alternatively, the signal distributed through the SMATV network could be based on the first intermediate frequency. The demonstration consisted of a display of the digital television signal at two different points in the receive chain: immediately after the satellite receiver, but prior to the 64-QAM modulator, and at the furthest point along the SMATV network model.

The EBU reception desk

On the **Swedish Television** (SVT) stand, visitors were treated to a demonstration of LightStudio, a multimedia training aid for the lighting of film and television studios. This interactive system – stored on a single CD-ROM – teaches the student how to light a film or television studio, without the need for an expensive real studio. By means of digitized still images, taken from high-quality 35-mm photographs of real studios which contain motionless model humans, the simulation provides variable lighting configurations for four different studio situations:

– one person in front of a single camera;
– two people conducting an interview;
– the final scene in Henrik Ibsen’s “A Doll’s House” with five different sets (i.e acting areas) and three cameras;
– different types of mood lighting where the student can form the optimum atmosphere for day lighting and night lighting.

Using a programme of tutorials, prepared by the well-known Swedish lighting director, Sten Modigh, a student can follow the Master, lamp by lamp and fader by fader, at his/her own pace – currently either in Swedish or English. Other languages are planned, with a French version becoming available soon: it takes only one week to produce LightStudio on a CD-ROM in a different language, provided a correct manuscript in that language has been supplied to SVT. A full-motion video training aid called SoundStudio is set for release by SVT in Autumn 1995. It will provide interactive training tutorials in the fundamental techniques of sound recording in film and television studios.

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From the United Kingdom, **UKIB-ITC** and **NTL** jointly mounted a live over-air demonstration of multi-channel digital terrestrial television. Using MPEG-2 codecs and the new SPECTRE-II 2000-carrier OFDM modulator, four television services of various bit-rates between 2 and 6 MHz, including one in widescreen format, were transmitted within the exhibition hall, between the NTL and ITC stands.This was the first public demonstration to use 2000-carrier OFDM modulation, one of two options currently being considered for the DVB terrestrial broadcasting standard, expected to be announced later this year. The four television services are transmitted within a single 8 MHz UHF channel with a digital capacity of 20 Mbit/s.

UKIB-ITC also demonstated MOSAIC (RACE II project R 2111) within the EBU Village. This 2-year project, which began in January 1994, aims to develop and test new methods for the assessment of picture quality, particularly from the viewer's perspective. This is not merely an academic exercise, as the viewer's opinion on picture quality/impairments is becoming of greater importance at a commercial level; competition between digital delivery media will soon be more influenced by picture quality than ever before. Also, the advent of digital compression systems with increasingly lower bit-rates is forcing designers to "tune" their systems to suit the visual characteristics of the human observer. The MOSAIC project is gathering information on television viewing habits and environments within European homes, so that future delivery systems can be optimized for typical domestic viewing conditions. The lack of a common standard for analyzing and presenting the results of television subjective measurements often limits their value, because surveys carried out using different methods cannot be compared between laboratories or interpreted at a later date. To overcome this drawback and to make subjective testing more accessible, a software package is being developed for the Windows environment; it will provide advice, full results analysis and presentation, and will support the existing methods of subjective assessments as well as the new MOSAIC approaches.

The Flash-TV and Retevisión stands

The three-year RACE II project known as FLASH-TV (R 2064) ended in December 1994 and has already been described in **EBU Technical Review** No. 259 (Spring 1994). Its objective was to develop flexible all-digital satellite solutions for HDTV outside broadcasts, using variable net bit-rates of up to 70 Mbit/s. Visitors to the EBU Village were able to gain "hands-on" experience of the system that has evolved during the project, its most distinctive feature being the on-line and automatic bit-rate adaptation system which uses a return link. Under normal conditions, the bit-rate is 69.0 Mbit/s but, when necessary, the system is able to reduce the bit-rate in three successive steps – 55.2, 46.0 and 34.5 Mbit/s – and still maintain a quasi-error-free transmission performance. This graceful degradation makes the system ideal for the most demanding of live OB events in high definition. Visitors to the stand were able to select an HDTV sequence, to switch the bit-rate and to compare instantly the pictures on two 28-inch monitors; one displaying the original source, the other the processed signal. It was also possible to increase the simulated transmission noise and observe the automatic bit-rate adaptation performed by the FLASH-TV decision unit. The sytem has now been involved in over 100 hours of satellite transmission, involving major events such as the demonstration given to ITU Working Party 4 (SNG) last December and the demonstration given at the G-7 Summit on the Information Society, held in Brussels during February 1995.

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The **RAI** exhibited several projects within the EBU Village. One of these, known as Butterfly, was set up to develop – in conjunction with Italtel – a terrestrial digital television system which is based on the COFDM transmission format with 16-QAM modulation and powerful coding schemes, based on convolutional codes (rates 1/2 or 3/4) and Reed-Solomon codes. The Butterfly system – which is a subset of the dTTb system – can provide two SDTV programmes or one EDTV programme within a standard 8 MHz UHF television channel. It offers maximum ruggedness against noise and interference in a multipath environment, and serves both fixed and portable receivers with the full system capacity. The system also offers the possibility to operate over large single frequency networks, to achieve the maximum exploitation of the frequency resources. In this case, the number of COFDM carriers is increased to around 7000 and a guard interval of about 200 μs is adopted.

The RAI stand

A second exhibit on the **RAI** stand concerned video compression techniques. The RAI Research Centre in Turin has carried out various tests to define the ranges of bit-rate that are best suited for HDTV and EDTV coding. When a high bit-rate transmission channel is available, there is no problem; HDTV pictures can be coded with a low compression factor, without introducing any unwanted artefacts. However, when the transmission channel is restricted, high compression factors are required and the received HDTV pictures are corrupted by artefacts and coding noise; this generally begins to occur at bit-rates of around 10 to 15 Mbit/s and below, depending on picture content. At these bit-rates, EDTV picture sources can provide a better overall picture quality at the receiving end, even when upconverted for display on an HDTV screen. Now that eye perception is increasingly being exploited in the design of coding algorithms (and in the objective measurement of picture quality), it should become possible to optimize the design of digital compression systems. Such studies are in the course of development at the RAI Research Centre.

Another exibit on the **RAI** stand related to narrow-band digital sound broadcasting systems. The RAI has developed an experimental narrow-band digital sound system, using general-purpose DSP devices, and plans shortly to evaluate it at its DAB SFN test site in the Aosta Valley (north-west Italy) as well as in urban environments. The RAI narrow-band system employs many of the advanced digital techniques used in the Eureka 147 DAB system, such as “Musicam” sound coding, convolutional FEC coding and OFDM modulation. A single stereo programme is transmitted in a bandwidth of 300 kHz but it requires a clear channel, not occupied by an existing FM programme, as it cannot operate in the so-called “on-channel” mode. The Montreux demonstration of the system allowed visitors to compare its audible performance with that of a standard FM transmission, in the presence of simulated multipath distortion.

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A fourth display on the **RAI** stand featured the broadcasting of weather forecast pictures via the RAI’s datacast service. In Turin, the system captures digitized images of Europe and North Africa, complete with weather patterns, from ESA’s Meteosat satellite every 30 minutes. After processing these images to improve their presentation, the pictures are organized in a 640 x 480 pixel format and conveyed to Rome for insertion in the Datacast streams carried by the RAI-UNO and RAI-DUE satellite broadcasts from Hot Bird I. At the user’s premises, a PC with specially-developed software enables the incoming weather pictures to be continuously acquired. Future improvements to the PC software will allow the user, for example, to zoom in on an area of interest and will also enable the computer to display the daily evolution of weather patterns, by sequentially presenting the images acquired every 30 minutes.

HIText is an enhanced teletext system, known as Level 2.5, which is fully compatible with existing teletext decoders. The enhancements provided by Level 2.5 decoders are:

– a wider colour palette is displayed;
– broadcast information is used to optimize page storage;
– graphical objects and side-panels are enhanced.

The wider colour palette and the use of graphical objects gives a more readable and inviting teletext display for the viewer, whilst the variety of methods to store pages means that the viewer can find the page instantly – as page selection is no longer dependent on the transmitted cycle time. The consumer-industry launch of HIText will be at IFA-95 in Berlin (25 August to 3 September) where all the major European manufacturers will be displaying their Level 2.5 teletext receivers. A number of broadcasters are planning to launch HIText services within the next year. The specification of the system has been the work of a joint EBU/EACEM Working Party which includes representatives from the broadcasters, the equipment manufacturers, the European consumer electronics industry and the designers of integrated circuits. In the live demonstration of HIText on the **RAI** stand, two television sets displayed some pages from the Televideo teletext service of RAI-UNO, received via the Hot Bird 1 satellite; one receiver showed the Level 2.5 display while the other showed the fully-compatible display on a standard teletext receiver.

There were three separate demonstrations on the **IRT** stand. One of these related to the transmission of data signals including weather forecast tables, a telejournal for schools and a TV programme guide. Within the framework of the $^{H}DTV_{T}$ project, the IRT has developed experimental software and hardware which would allow the generation, transmission and reception of such data signals via a future digital television service. The information conveyed could be displayed either on a domestic television set, equipped with a data decoder, or on a standard PC. The transmission capacity of the data channel will be 384 kbit/s, which would allow acceptable transmission times for still pictures with a resolution of 640 x 480 pixels, provided they were compressed using either JPEG or run-length encoding. A single compressed page – containing a 50 % mixture of text and JPEG-encoded graphics, plus a header with logo – would require about 36 kbyte of storage capacity in the receiver while a 30-page telejournal would require about 1.3 Mbyte; to transmit the full journal via an HD1 data channel, at 384 kbit/s, would take about 27 seconds. In the Montreux demonstration, the data signals were carried in analogue form – albeit at a much lower transmission rate – within four lines of the vertical blanking interval.

Another **IRT** demonstration showed the internal nodes of an MPEG-2 video encoder. The IRT, with the cooperation of the BBC, had built a number of such decoders for use in the joint dTTb/HD-SAT demonstration of digital television at Montreux '95 (see page 43). In general, each internal node can be used to observe and analyze the effect of parameter changes in the encoder (e.g. different bit-rates, different prediction modes, the search area of the six different motion estimators). Thus, the behaviour and the quality of MPEG-2 processing can be analyzed in real time, with a great variety of different source material.

The ITC, SVT and IRT stands

The third **IRT** demonstration related to PALplus source and transmission management. Although PALplus has been designed primarily for 16:9 component inputs to achieve optimum results, it will have to cope with a variety of source formats – ranging from state-of-the-art 4:2:2 downconverted 16:9 component quality, to taped 4:3 PAL-encoded letterbox quality taken from existing archives. The operational modes defined within the PALplus format require information about the properties of the originating source to be carried transparently through the production chain. Preparations for the imminent launch of PALplus services have identified areas within the broadcast chain which will be required to adapt automatically to the different operational modes. This adaptation can be performed automatically by using a studio version of the ETSI-defined Widescreen Signalling Standard (WSS), carried within the component channel of the 4:2:2 studio signal, or directly by using the WSS control information contained in line 23 of the PAL- or PALplus-encoded signal. The Montreux demonstration showed:

– the extraction of a 16:9 excerpt from a taped 4:3 film source;
– the up-convertion of a taped 4:3 letterbox source to a 16:9 format;
– the insertion of a logo (within the active picture area of a 16:9 PALplus input, and within the black bands of a 4:3 PAL letterbox transmission)
– mode control of the PALplus encoder to provide outputs in either PALplus format, conventional 4:3 PAL format or by applying pre-processing before the compatible PAL encoder, using the motion adaptive colour plus (MACP) PALplus module.

The IRT pictures had been subjected to a number of processing stages, as follows:

– encoding and transformation of multiple digital 4:2:2 signals into a serial digital multiplex;
– moderate bit-rate reduction of the above multiplex for contribution through a component 140 Mbit/s channel;
– encoding into either PALplus, MACP or conventional PAL for distribution;
– bit-rate reduction of the above signal to 34 Mbit/s within an ETSI-defined codec, equipped with PAL / PALplus input/output ports;
– decoding into analogue components in 16:9 aspect ratio or 4:3 letterbox form.

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(Photos by John Barrett, BBC, and Photo Cornaro, Montreux)

DVB stand at Montreux ’95

In the space of two years, the European Digital Video Broadcasting (DVB) Project has developed from an agreement between a number of European organizations who were interested in the introduction of digital television services in Europe, to being a viable world-wide step beyond the existing PAL, SECAM, NTSC and MAC services.

In order to promote DVB’s philosophy of a common approach to digital television, the DVB Project Office mounted a stand in the Future Technology Hall at this year’s International Television Symposium and Exhibition in Montreux. The stand provided information on the DVB System’s suite of standards and agreements, and demonstrated the current status of this highly successful European initiative, now comprising more than 180 members.

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The centrepiece of the stand was a demonstration of DVB-S, the satellite transmission system proposed by DVB. Four monitors were fed from four separate DVB-S integrated receiver decoders (IRDs), provided by Irdeto, National Transcommunications Ltd. (NTL), PACE Microtechnology Ltd. and Tandberg. The aim was to show that DVB-compliant equipment was available and interoperable.

The digital picture sources were uplinked from the UK by News Datacom to the Astra-1D satellite. For this purpose, News Datacom used their VCS 4000 System which comprises video compression hardware and DVB Service Information (DVB-SI) from NTL, and a QPSK modulator from Comstream Inc.

The transmission parameters of the ASTRA 1D transponder-77 signal were as follows:

Downlink Frequency:	11.9535 GHz
Downlink Polarization:	Horizontal
Symbol Rate:	20 Msymbols/s
Information Rate:	26.67 Mbit/s
Forward Error Correction (FEC) Rate:	2/3

A 1.2 metre dish, with a BSS LNB, was situated on the balcony outside the Montreux exhibition centre. The incoming signals from the Astra-1D satellite were split two ways at the dish; one half was sent by cable to the NTL stand (A213) and the other half to the DVB Stand (A416). The cable run to the DVB stand was around 200 m.

At the DVB stand, the incoming signals were split four ways, using an active splitter, in order to feed the four DVB-S integrated receiver decoders.

A 9-minute segment from a Betacam-SP component VTR provided the same source material for each of the four channels in the DVB/MPEG-2 multiplex. The bit-rates of the channels were 6 Mbit/s, 4 Mbit/s, 3 Mbit/s and 2 Mbit/s respectively. The channel had video resolutions which varied from H.704 x V.576 pixels at the highest bit-rate to H.352 x V.288 at the lowest bit-rate, combined with MPEG Layer II audio (MUSICAM). All four IRDs successfully decoded the News Datacom signal, giving visitors an opportunity to compare the various video bit-rates and the IRD functionalities.

During the course of the exhibition, a Tandberg 1.5 m dish – also situated on the balcony – was directed towards the Eutelsat Hot Bird 1 satellite (13º East); all the decoders were able to lock to the MTV DVB-S test transmission. This provided yet more proof of the interoperability of the DVB equipment on display.

To complement the DVB-S demonstration, the DVB stand also had feeds from other DVB member organizations who were showing their DVB-compliant signals and equipment at Montreux. An RGB link from the Independant Television Commission (UKIB-ITC) booth, located in the EBU Village, provided the DVB stand with 16:9, 6-Mbit/s, 625-line pictures from the ITC’s terrestrial digital television demonstration of SPECTRE-II. Also available to the DVB stand was a PAL feed from the Retevision booth in the EBU Village where there was a DIGISMATV demonstration of DVB-CS, the DVB Project’s SMATV delivery standard.

Bearing in mind the range of DVB equipment seen in the commercial parts of the exhibition, to have a DVB stand in the Future Technology Hall was in practice an anachronism – many commercial DVB-compliant products are already proving themselves in the market place.

DVB-compliant satellite and cable services are planned in several countries towards the end of 1995.