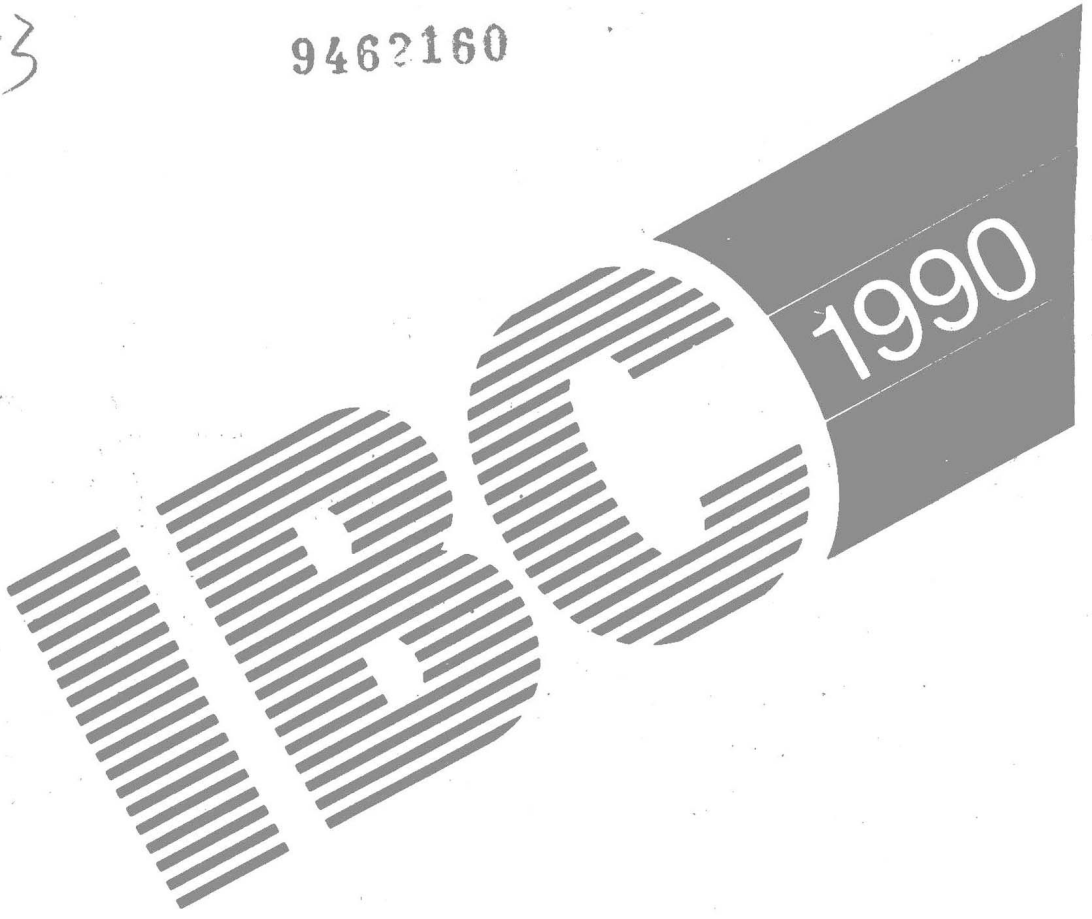
INTERNATIONAL BROADCASTING CONVENTION



INTERNATIONAL BROADCASTING CONVENTION

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Brighton, UK

21-25 September 1990

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Final Programme of Technical Sessions

The number appearing alongside the title of the contribution refers to the page in the Convention Publication on which the text commences.
*** denotes sessions to be held in the Regency Suite**
† denotes sessions to be held in the Clarence Room

Saturday 22 September

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Chairman, Technical Programme Committee, UK

** Keynote Addresses from the following industry personalities:*

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J Sabatier
Thomson Consumer Electronics, France

412 'Japan is rowing a boat . . . to a new broadcast world. HDTV broadcasting creating a new image culture for the 21st century'
T Fujio
Matshushita Electic Industrial Co., Japan

417 'Advanced Television broadcast services: an individual perspective on the scenario in the United States'
S N Baron
National Broadcasting Company, USA

421 'The turtle and the hare or the future of broadcasting'
A Todorović
Yugoslav Radiotelevision – J R T, Yugoslavia

△ 'Television or broadcasting – is there a difference?'
A Vere
SVC Television Ltd, UK

12.30 hrs CLOSE OF SESSION AND LUNCH INTERVAL

△ Paper not available at the time of publication

Final Programme of Technical Sessions

Saturday 22 September (continued)

14.00 hrs * SESSION 1 – HIGH DEFINITION TELEVISION 1
Chairman: G T Waters, Switzerland

1 'Canadian perspectives on the development and introduction of HDTV services'
K P Davies
Canadian Broadcasting Corporation, Canada

6 'Technical development and its application in High-Definition Television'
Y Ninomiya and K Okada
NHK (Japan Broadcasting Corporation), Japan

30 'Subjective assessments of the quality of HDTV pictures impaired by noise'
M B Amin
Independent Television Association, UK

15.30 hrs CLOSE OF SESSION AND TEA

16.00 hrs * SESSION 2 – HIGH DEFINITION TELEVISION 2
Chairman: J A Flaherty, USA

10 'Further developments in the use of DATV for bandwidth compression of HDTV'
R Storey and P J Brightwell
British Broadcasting Corporation, UK

15 'Performance of codecs for a bit-rate reduction applied on conventional TV and HDTV signals'
M Ardito and M Barbero
RAI-Radiotelevisione Italiana, Italy
D Ibañez
Ente Público de la Red Técnica Española de Televisión, (Retevision)
Spain

20 'Maintaining the mean luminance of decoded HD/MAC signals'
T I P Trew
Philips Research Laboratories, UK

25 'Digital, two-dimensional aperture correction – a way to improved HDTV-pictures'
F Jung
BTS Broadcast Television Systems GmbH, Federal Republic of Germany

18.00 hrs CLOSE OF SESSION

Final Programme of Technical Sessions

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A G Mason, G M Drury and N K Lodge
Independent Broadcasting Authority, UK

58 'PALplus – an approach to meet the challenges of the future for existing PAL services'
Ü Messerschmid
IRT Munich, Federal Republic of Germany

60 'Compatible enhancement of terrestrial PAL TV transmission'
J O Drewery, C P Sandbank, M Weston and R I Black
British Broadcasting Corporation, UK

65 'Future enhancements to terrestrial TV'
R Morcom
Independent Broadcasting Authority, UK
C Dalton
Independent Television Association, UK

70 'Spectrum-compatible high-definition television'
W C Luplow
Zenith Electronics Corporation, USA

74 'The business of advanced television: A Canadian perspective'
L M Rankin and J Cook
Telesat Canada, Canada

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G Gerrard
TVT Ltd, UK

44 'Multi-stage-depressed-collector Klystron for high-efficiency UHF transmitter in high and medium power range'
W Schmidt
Philips Components, Federal Republic of Germany

46 'Review of energy saving gained by the use of the MSDC klystron in a UHF TV transmitter'
D Drury
TVT Ltd, UK

10.30 hrs CLOSE OF SESSION AND COFFEE

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J F H Binns, M McGann and E G Owen
Marconi Communications Systems Ltd, UK

86 'Tardis – an integrated design for an 8-channel FM relay'
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British Broadcasting Corporation, UK

91 'Transmitter network management for the 1990's'
G M Holt
Independent Broadcasting Authority, UK
P Hajittofi
Logica Ltd, UK

97 'From transmitter to receiver – the weakest link in the broadcast chain'
R S Sandell
Radio Spectrum Services, UK

102 'Determination of the vertical radiation pattern of UHF broadcast arrays by near field measurements'
D T Hancock
Radio Frequency Systems, Australia

106 'Modern analysis methods for medium wave antenna design'
B F Dawson
Hatfield and Dawson Consulting Engineers, USA

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Chairman: R J G Ellis, UK

111 'UP conversion from interlace to progressive using motion detection and Quincunx filtering'
J Grimaldi, F Thoumy and H Duhamel
Thomson Video Equipment, France

116 'New trilateral television standard converter'
T Tsutsui, Y Yamamoto, Y Inoue
Japan Broadcasting Corporation (NHK), Japan

121 'Generation of high quality slow-motion replay using motion compensation'
G A Thomas and H Y K Lau
British Broadcasting Corporation, UK

126 'Video keying – new ideas to a known technique'
B Poth
BTS Broadcast Television Systems GmbH, Federal Republic of Germany

130 'Real-time weather color graphics in the USA: a decade of innovation'
T Glickman
WSI Corporation, USA

15.30 hrs CLOSE OF SESSION AND TEA

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G Duvic, J Palicot, J Veillard and M Veillard
CCETT, France

137 'Wide-screen-broadcast TV – a commercial reality'
E Griffiths
British Satellite Broadcasting Ltd, UK
M D Windram
Independent Broadcasting Authority, UK

145 'E7 Nonlinear pre-emphasis for MAC packet family signals'
B Beech
Independent Broadcasting Authority, UK

151 'Antennas for direct to home reception of DBS television'
N Haller
British Satellite Broadcasting Ltd, UK

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R Asada, S Nishikawa, H Toyoda, Y Miyakawa, Y Kitamura, M Watanabe, T Kiguchi and M Taniguchi
Matsushita Electric Industrial Co Ltd, Japan

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T Nakamura
Sony Corporation, Japan
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J D Ingham
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C Wittrock
Philips TV Test Equipment A/S, Denmark

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C P Bell and J H Stott
British Broadcasting Corporation, UK

213 'Programme loudness assessment'
J R Emmett
Thames Television plc, UK

217 'A single chip solution for interfacing digital audio in broadcast applications'
W H Fletcher and S C Wegerif
British Broadcasting Corporation, UK

18.00 hrs CLOSE OF SESSION

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W J Hobson and M P Gold
Independent Broadcasting Authority, UK

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S Moriyama, T Kuroda and O Yamada
NHK (Japan Broadcasting Corporation), Japan
Y Tomida
Sanyo Electric Co Ltd, Japan

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S J Parnall and J L Riley
British Broadcasting Corporation, UK

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T Kuroda, M Takada and O Yamada
NHK (Japan Broadcasting Corporation), Japan

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F Morrison
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W R Godden and R T Lees
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Eastman Kodak, USA

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J P Chambers
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E J Wilson
European Broadcasting Union, Switzerland

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D J Cutts
European Television Encrypton Ltd, UK

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P W Bagenal and S M Upton
British Satellite Broadcasting, UK

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J-P Clément, F Coutrot and P Février
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12.30 hrs CLOSE OF SESSION AND LUNCH INTERVAL

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282 'The replacement of recording facilities at Television Centre'
J A Frisby and A C Ferne
British Broadcasting Corporation, UK

287 '½" composite digital VTR (PAL version)'
R Scott
Panasonic Broadcast Europe, UK
K Suesada
Matsushita Electric Industries, Japan
Y Oba and K Murayama
NHK (Japan Broadcasting Corporation), Japan

292 'Diagnostic support within a digital tape recorder'
R Fach
BTS Broadcast Television Systems GmbH, Federal Republic of Germany

296 'A professional DAT system for broadcast and production'
D Bush, M Sakai, Y Maruyama, R Lagadec and D Walstra
Sony Corporation, UK and Japan

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J R Forrest and G J Tonge
Independent Broadcasting Authority, UK

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A G Toth and E Lubchenko
Philips Laboratories, USA
J Donahue, Thomson Consumer Electronics, USA

316 'Modem dram-technology in the TV set: improved picture quality and new features'
G Scheffler and U Libal
Siemens, Federal Republic of Germany

321 'Motion compensated display field rate UP conversion'
T J Borer
British Broadcasting Corporation, UK
M G Hulyer and D W Parker
Philips Research Laboratories, UK

326 'Picture quality enhancement and ghost cancellation technologies for EDTV receivers'
I Yuyama, H Miyazawa and T Kurita
NHK (Japan Broadcasting Corporation), Japan

15.30 hrs CLOSE OF SESSION AND TEA

14.00 hrs † SESSION 9B – SATELLITE, MICROWAVE AND CABLE SERVICES 1
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R J G Ellis
Granada Television Ltd, UK

336 'MVDS at 12GHz'
G O Towler
RadioCommunications Agency, UK

341 'MVDS and cable – modulation and coding for efficient spectrum utilisation'
J S Lothian and B H Beech
Independent Broadcasting Authority, UK

346 'A digital satellite news gathering system'
N Kitazato
Sony Corporation, Japan
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Sony Broadcast and Communications, UK

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ERA Technology Ltd, UK

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N Brydon
Independent Television Association, UK

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M C D Maddocks
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British Broadcasting Corporation, UK

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Sony Broadcast and Communications, UK
T Takamori
Communications Product Group, Japan

384 'Radio-cameras: The key to improved flexibility in live outside broadcasts'
C Gandy, J M C Scott and B F Devlin
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RAI – Radiotelevisione Italiana, Italy

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B Sueur
CCETT, France

398 'Digital transmission of HDTV – Vector quantization coding'
Y Shishikui, E Nakasu, Y Ohtsuka and T Nishizawa
NHK (Japan Broadcasting Corp), Japan

403 'Satellite data narrowcasting – system investigations'
W Dobbie, N Golfin and P Whitworth
British Telecom Research Laboratories, UK

18.00 hrs CLOSE OF SESSION

List of Authors

CANADIAN PERSPECTIVES ON THE DEVELOPMENT AND INTRODUCTION OF HDTV SERVICES

K P. Davies

Canadian Broadcasting Corporation, Canada

SYNOPSIS

At the present time in Canada there exist well developed telecommunications and broadcasting networks and thus Canada is well positioned to take the next steps towards the information age by the introduction of HDTV services for both broadcasting and private uses.

These services will doubtless have much in common with HDTV services developed for the USA, for Japan, and for Europe but the unique Canadian environment will also strongly influence the choices and strategies selected, thus exerting considerable leverage on decisions concerning N. American standards. The critical factors include technical, regulatory, policy, economic and cultural concerns. These have led to Canadian positions on production and programme exchange that are strongly "internationalist" in character, while in emission the position favours an evolutionary approach, that is both economic for viewers and deals equitably with the integrated programme delivery network formed from terrestrial broadcasting, cable, satellite, fiber and pre-recorded media.

INTRODUCTION

The television community in Canada has an enviable record of technical innovation, based very much on the necessity of running services that are competitive in programme content with those of the neighbor to the south, which has a population ten times that of Canada, while contending with the economic facts-of-life in a country where the 15 million receivers are spread over an enormous area and where the viewers demand high technical quality, multiple choices and strong regional and local content in programming. If necessity is the mother of invention, the Canadian TV industry is abundantly blessed with both mothers and mothers-in-law. In this climate it is then no surprise that Canadian broadcasters and the Government have been active in HDTV since 1980 with a view to its eventual introduction into programme production and into broadcast service, seeking to guide its development in directions that are beneficial to our applications, and opening further the door to international programme exchanges and to production across national boundaries. The 1982 Ottawa Colloquium on HDTV represented the first major step in this process and has continued since that time to bring the developers and potential users of HDTV together in a specialized forum. The work is now in a position where the results of ten years of study, development, experimentation, planning and consultation are beginning to bear fruit, and some directions, conclusions and opportunities are becoming visible.

The Current Situation For Television In Canada

Compared to other parts of the world, the structure of television broadcasting in Canada, and in the USA to a large extent, is unique, being a complex, interconnected web of over-the-air, cable and satellite delivery media, programmed by many competing sources, often independently of the delivery mechanism. A strong influence is exerted also by the video-cassette player, now present in over 50 percent of homes, opening the door to further channels off-tape. Viewers are thus well served, most having access to at least 12 channels and over 60 percent receiving more than 30 channels by cable. A small percentage of homes (1-2 percent) receive programmes by satellite, using de-facto DBS service in C-band and in Ku band from low or medium power communications, satellites. HDTV broadcasting in not expected to change the situation, very much and can only raise the pressure on spectrum for over-the-air delivery, a resource that is already very crowded in the major cities along the US border.

In Canada, television broadcasting is regulated on a service basis, essentially neutral to the delivery media, by the Department of Communications (DOC) and the Canadian Radio and Telecommunications Commission (CRTC). For HDTV, this is expected to continue, creating strong pressure for broadcast and delivery schemes that are similarly "media neutral" to the viewers' home and to

a receiver that deals equitably with all media.

In regard to HDTV production, it is to be noted that although Canada is a 60 Hz NTSC country, culturally, and in software production and interchange, it has strong links with both the 50 Hz and 60 Hz worlds of TV and with the 24Hz world of film. In addition, Canada is not a major producer of TV hardware, particularly at the consumer level, and thus is not greatly influenced by the economic/industrial aspects of the recent discussions. Accordingly, the "software industry" aspects of HDTV are a high priority, as they are in other similar countries such as Australia, Sweden and others, giving rise to a strong desire for HDTV development along convergent lines in various parts of the world. It is noted that software is the dominant factor in the acceptability of HDTV services and the need for universality and cost sharing, especially during their introductory phase, may prove to be critical, emphasizing further the need for convergence and commonality in programme-making.

Development work in Canada has also confirmed that there exists a high degree of separation between the standards for production and for emission, assuming an adequate level of production quality is achieved, offering further opportunities for convergence of the television systems of the world.

Advanced TV Services

A number of proposals have been put forward for systems that could deliver some level of improvement of TV performance. They are summarized in a recent paper (1) and fall generally into these categories:

(i) - Single channel - NTSC receiver compatible
(ii) - Single channel - NTSC receiver incompatible (simulcast)
(iii) - Dual channel - NTSC + Augmentation (3 MHz or 6 MHz)

Studies have indicated that approach (iii) is unacceptable from the viewpoints of costs, spectrum usage and questionable practicability and this conclusion has been reinforced recently by FCC action in the USA, effectively dropped this approach from further consideration. [Sikes - March 1990]

Approach (i), ie. Channel and Receiver-compatibility has considerable attraction but is limited by these compatibilities in the performance improvement possible. This may be less obvious for the near-term future, as the performance of economic receiver displays is similarly limited. Display costs are estimated to be about 70 percent of the receiver cost and hence this limitation is critical. IDTV receivers (using line-doubling and frame-store-based internal processing) are already in the marketplace in 4:3 aspect radio and show promising levels of acceptance. Extension of these technologies to 16:9 aspect rate receivers and the use of down-converters in complementary processing at the source may be seen as a logical evolution. Two major questions then remain:

(a) Aspect ratio. Proposals have been made for both "letter-box" and "side-panel" (with pan/scan) solutions. The "letter-box" approach leads to system simplicity and the resulting loss of vertical resolution can be compensated by transmission of a V-detail signal in an appropriate, low-visibility format on the blank lines created by this approach. The "side-panel" approach retains full-screen service to 4:3 receivers but then must transmit side-panel information on sub-carriers and must use some intelligence to sectionalize the image for the 16:9 receivers. The sectionalization and reconstruction of the 16:9 image under all conditions are formidable tasks as the sections must match precisely and the splice-points be invisible.

Studies and practical tests of the two approachs to aspect-ratio enhancement continue. Viewer acceptance is also a matter under investigation, as the reaction to a 16:9 image on the 4:3 screen is not clearly documented.

b) Audio transmission. Subjective testing and viewer surveys have revealed the value of high quality, stereo sound or surround-sound as an enhancement to the TV service. A preference is noted for "CD" quality ie. Digital transmission. Three compatible possibilities exists:

- Improvements to be FM analogue MTS system currently used. This seems unlikely to be satisfactory.

- Digital modulation of an additional carrier located at the edge of the channel, similar to the technique used in certain 625 line TV systems.

- Digital data muliplexed with the video data in the horizontal or vertical blanking areas.

Coding schemes under development in a number of laboratories promise "CD quality" sound at about 100 k bits/sec, making either of the latter proposals practicable. Extensive testing will be required to weigh the advantages of each, in different delivery media and conditions of transmission.

Any of the technologies used can be improved by the reduction of ghosts and echoes in the received signal and the inclusion of a "training signal" for this purpose is anticipated.

This emergence of a "wide-screen E-NTSC" form of ATV now appears highly probable in 2-3 years as the technology is available and the evolution to receivers and delivery systems for such a system is believed manageable. The impact on spectrum is minimal, beyond the fact that the NTSC broadcasting system would continue to be viable for a further period, a matter of regret only to non-broadcasters seeking spectrum space for other service. The adoption of this proposal could delay the emergence of a "full-HDTV-quality" emission system until economic, high-quality, large display systems and a fully digital emission system become feasible. Production and studio standards impacts of the E-NTSC proposal are discussed later in this paper.

For the future, delivery of HDTV in a channel compatible, receiver-incompatible form appears attractive as a means to make large improvements in quality and spectrum efficiency. This so-called "simulcast" approach would see NTSC service retained on a separate channel for some time. Both analogue and hybrid digital/analog proposals have been made but the key question will be the date of introduction, as consumer-electronics manufacturers must obtain a large, bright, high-resolution, high, performance display at acceptable levels of cost, to render the HDTV performance visible to the viewer.

As digital-coding (bit-rate reduction) of HDTV is advancing very rapidly and as there are significant advantages to a fully-digital transmission scheme, a delay in implementation will render a fully digital system increasingly likely. Such a system would need to operate in the 40-50 Mbit/sec region, requiring the use of advanced channel-coding technologies to transmit this bit-rate in an environment of 6 MHz channel spacing. Implementation at an early date would favour hybrid or analogue proposals. A fully-digital proposal would be readily adaptable to satellite emission, to the optical-fiber networks planned for the future and is readily recordable in cassette-form.

Work is at an early stage in the development of fully digital proposals but their feasibility is already well established.

Programme Production For HDTV Services

Programme production for ATV services is a major concern for the broadcaster, as he must be able to produce programmes for these new services that are competitive and attractive while the potential audience is still relatively small. Furthermore, it is unlikely that he will receive accompanying large increases in advertising revenue, considering the market situation, and will have to finance the capital costs of new facilities, at least initially, as "an augmentation of current facilities" and not as "new business venture." This results in the need for the total equipment cost (capital, operational, maintenance) to be reasonably related to that of equivalent current facilities and for new equipment to be capable of producing, in addition, output for normal programme streams. This latter requirement could be accomplished by switchable equipment or by format conversion.

His choices are further influenced by the fact that while E-NTSC forms of ATV are likely to occur in the near-term future (3-4 years), in the longer term, a higher level of ATV such as hybrid or all-digital, receiver-incompatible ATV service are likely to emerge, whose characteristics are not yet fully determined. In summary, it is clear that the new facilities must be adaptable, cost-effective and operate in a format that lends itself to simple conversion to NTSC, to E-NTSC, to digital or hybrid simulcast and likely to full HDTV, as these all loom large in the future of broadcasting. Equipment decisions and format decisions made today will be critical to the broadcaster's future.

While Canadian broadcasters have not yet developed a complete strategy in regard to production matters, and in particular, the production format, the following comments can be made on the key decisions to be taken:

Separability. The format for production, the formats for broadcasting and the formats for the display cannot be uniquely linked, as in current TV systems (NTSC, PAL, etc.), due to their number and diversity. Experimentation has shown that as long as the production format allows an adequate quality margin, great freedom exists in the choices for the image parameters, though motion rendition concerns render the choice of the image repetition rate, at the present time, to a narrow range. If, as appears likely, early ATV systems employ interlace, to achieve compatibility, then account must also be taken of future conversions to sequentially-scanned or up-converted displays (IDTV).

Common Elements. A number of elements can already be seen to be defined. They include aspect ration (16:9), colorimetry and component-coding. Consideration of the possible advantage of a constant-luminance form of signal coding is still active.

Image Structure. Much confusion exists regarding the choice of an appropriate image structure for production, though the choice is relatively straightforward, based on considerations of desired quality-level, convertibility and the range of target conversions to be accounted for. For N. America the essential consideration is the balance necessary between a close relationship with 525-line structures and with those of other systems. In Canada, there is a strong consensus for image commonality across all applications and a preference for an image structure of 1080 lines by 1920 samples as the basis of future TV systems.

Frame Rate. While the frame-rate at the source, in production and in the display may differ, and the frame rate in the transmission path may be a variable (in an all-digital system for example), there is still a need to define a basic value, for any particular application at least. For production exclusively for NTSC, E-NTSC or a future NTSC-related system a frame rate of 29.97 Hz has many advantages at present. For multiple system distribution other frame rates such as 24, 25, 30 Hz may be a better choice. Again the broadcaster has some choices to make.

Equipment. Equipment cost is seen by many broadcasters are a key issue, as it represents the most significant change in a move to ATV services, though on the average, the equipment-related costs amount to less than ten percent of a production budget. What is required is equipment at the necessary level of performance (eg. 10 MHz bandwidth for luminance, 150 Mbits/sec) but derived from the image structure and image repetition rate(s) selected for HDTV. Such equipment would interface to the future, but meet the economic constraints of early ATV production with adequate quality. Scaling up of current equipment, while initially attractive, imposes road-blocks later in the way to convergance.

Canadian broadcasters also note a number of production concerns in the selection of an emission format, in the method used for the aspect-ratio conversion. While side-panel transmission, possibly enhanced by pan-and-scan on non-real-time products might offer better results for current receivers, its use constrains ATV production for wide-screen displays thus reducing the impact of the new aspect-ratio.

Selection of a letter-box transmission format reduces the level of resolution on current receivers somewhat, but gives full production flexibility in the new format, with no constraints and with a clear "on-screen" incentive for viewers to convert. Studies on the balance of opinion on this subject are taking place shortly.

Conclusions

There is little doubt that the consumers will soon have available to them wide-screen receivers with CD-quality sound capability and that some of them will include sophisticated in-receiver processing such as line-doubling and multi-channel surround sound. A video-cassette machine will not be far behind. This will make an impressive "home-theatre" environment for the broadcasters' programmes, if they take advantage of the opportunity. There is every reason to believe that others, such as the video-cassette rental industry will certainly be there.

Some time into the future, a second wave may take place, when transmission and display technology permit, to an incompatible, very high quality system that may gradually replace NTSC as the predominant systems in N. America.