

REPORT 1220

WIDER ASPECT RATIO TELEVISION SYSTEMS*

(Question 42/11, Study Programme 42B/11)

1. Introduction

(1990)

Television pictures wider than the conventional 4:3 aspect ratio have been available for many years through the medium of cinematographic film. However, the development of high definition television with an aspect ratio of 16:9 has increased the availability of wide aspect ratio source material and has led to the development of wide aspect ratio television displays. There is therefore considerable current interest in ways of using wide aspect ratio formats for 4:3 enhanced and conventional television systems, in addition to those of high definition described in Report 801. It is noted that many of the enhancements described in the context of 4:3 aspect ratio systems in Report 1077 can also be applied to the wider aspect ratio systems described here.

The problems of protection ratio and radio-frequency receiver characteristics will be studied in IWP 11/5 (see Decision 42).

The new wide screen formats may be used in several ways. For example, the total screen may be used to combine one main 4:3 picture and several smaller sub-pictures. These sub-pictures might provide a variety of other services, such as teletext, transmitted pages of text, transmitted stills, etc.

Decision 91 and Report 1224 describe the work to be done and the main results already reached on the matter of harmonization with other international standardizing bodies for industrial/consumer usage applications.

2. Wide aspect ratio systems

Several wide aspect ratio systems have been described and demonstrated.

In Japan, the time compressed integration (TCI) multiplexing system has been developed [CCIR, 1982-86a] for use in HDTV broadcasting by satellite, but the concept is also applicable to wide aspect ratio systems [Rhodes, 1982].

In the Netherlands and the United Kingdom, the concept of time-multiplexed analogue components has been extended and applied to the vertical or horizontal dimension so that wider aspect ratios are more readily obtained [Long, 1983; Windram *et al.*, 1983; CCIR, 1982-86b].

* The Director, CCIR is requested to bring this Report to the attention of the IEC.

At the International Television Symposium at Montreux in 1983, Philips N.V. demonstrated the feasibility of a 5 : 3 aspect ratio in a system with line-multiplexed (vertical) luminance and colour-difference components.

In the United Kingdom, the IBA has developed a system based on the 625-line C-MAC/packet coding scheme for the single-channel transmission of wide aspect ratio television, and also for BSS in the 12 GHz band [Windram *et al.*, 1983]. This system is called enhanced C-MAC.

In [CCIR, 1982-86c] it is claimed that it is possible that the enhanced C-MAC system transmission system for a higher line-rate HDTV production standard based on a 50 Hz field rate. (For example, the enhanced C-MAC transmission format could interface readily with a 625-line non-interlaced source.) It is also claimed that an enhanced transmission system could then equally be seen as an HDTV-transmission system using vertical sub-sampling.

It has been suggested that, within the existing WARC-1977 planning constraints, the compressed video bandwidth for C, D and D2-MAC could be increased from about 9 MHz to about 12 MHz (CCIR Report 1074, section 3.6.1). This increase could be used to provide 33% more resolution for a conventional 4:3 aspect ratio MAC signal. Alternatively it could provide for an increase in aspect ratio from 4:3 to 16:9 whilst retaining the same resolution as for conventional MAC transmissions. The latter is a form of wide aspect ratio MAC which has been suggested as a step along an evolutionary path leading from conventional MAC through to high definition MAC (HD-MAC). The use of a non-linear pre-and de-emphasis characteristic with this system enables the signal-to-noise degradation caused by the additional bandwidth needed by this arrangement to be fully compensated in the region near FM threshold [Windram and Drury, 1988].

In Japan, the study of a second generation NTSC-compatible enhanced television system, known as EDTV-2, began in August 1989. The target features of the EDTV-2 system [Kawauchi, 1989] are wider aspect ratio, increased horizontal and vertical picture resolution and higher fidelity PCM sound.

In the Federal Republic of Germany an enhanced PAL-compatible system, featuring 16:9 aspect ratio on new wide-screen receivers is being investigated [Ziemer and Matzel, 1989a,b]. On conventional 4:3 displays compatibility is achieved by presenting the 16:9 material in a "letterbox" configuration. The system further employs means to provide an increased horizontal luminance resolution with reduced cross-effects (Q-PAL [Silverberg, 1989] or I-PAL M [Holoch *et al.*, 1985]), in order to cope with the requirements of increased detail reproduction in wide-screen pictures.

[Tichit and Tonge, 1989] describe joint experiments in France and the United Kingdom of a system using progressive scanning at source and display, with synthesized interlaced scanning for studio processes and transmission. A 16:9 aspect ratio system has been implemented using existing studio component equipment. It can be delivered to the home using MAC signals and provides a displayed image of substantially enhanced resolution.

Sources delivering progressive scanned signals with bandwidths in excess of 15 MHz have been used, sub-sampled with a field quincunx pattern in order to reach a data rate of 216 Mbit/s, recordable on unmodified D1 video tape recorders. It is noted that signals resulting from tapes recorded using this technique cannot be directly intermixed with conventional 4:3 recordings.

Up-conversion from the received signal to progressive display is provided by motion adaptive signal interpolation. Alternatively, MAC transmission enables compatible reception of wide aspect ratio signals on 4:3 MAC receivers.

3. Multiple picture display applications

New wide aspect ratio television sets for domestic use were demonstrated during the IFA 89 exhibition [CCIR, 1986-90]. The equipment uses a 16:9 aspect ratio high definition screen to display a range of either high definition signals directly or conventionally scanned 16:9 signals by up-conversion. The display operates with a horizontal scanning frequency of 31.25 kHz. Format control is possible so that, for example, a 4:3 aspect ratio signal can be displayed so as to fill the picture height. The remaining part of the display can then be used for other purposes, such as the display of one animated compressed picture and two still pictures. In this way, the wide screen format can be used to give multiple picture-in-picture displays in a domestic receiver (see Report 1225).

The requirements of additional reception circuitry for the simultaneous display of multiple programme channels as sub-pictures in a wide aspect ratio display are to be studied by IWP 11/5. The general principles concerning such applications, which include teletext and teletext-like presentations are already embodied in the terms of reference of JIWP 10-11/5. JIWP 10-11/6 will be examining the quality assessment of wide aspect ratio systems including the issue of sub-pictures or picture windows which are inset or adjacent to the main picture (see Rec. 500, Rec. 710 and Report 1216).

In Japan, [Ogino et al., 1989 and Achiha et al., 1983] a multi-scan high definition 16:9 projection display has been developed to display HDTV, conventional television and other signals, such as the output of personal computers. A range of vertical scanning frequencies from 40 Hz to 120 Hz is provided. Horizontal scanning frequencies from 15 kHz to 70 kHz are possible. NTSC signals are displayed using a high resolution scan converter, which doubles the number of NTSC scanning lines through motion-adaptive frame combing. A personal computer output can be superimposed onto the double-scanned NTSC signal, thus widening the applications of the display.

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[1982-86]: a. 11/32 (Japan); b. 10-11S/33 (Netherlands); c. 11/285 (United Kingdom).

[1986-90]: 11/547 (Belgium, Finland, France, Germany (Federal Republic of), Netherlands, Portugal, United Kingdom).

