

POSSIBILITIES FOR INCORPORATING THE SOUND INFORMATION IN THE VIDEO SIGNAL IN TERRESTRIAL TELEVISION

(Question 1/11, Study Programme 1H/11)

(1982-1986)

1. Introduction

At some time in the future it may be possible to implement a new system in terrestrial television in which the sound information is incorporated in the video signal. The implementation of such a system while at the same time maintaining compatibility with existing television broadcasting systems, poses many problems which must still be resolved. The present Report is a first response to § 1 of Study Programme 1H/11.

2. Compatibility requirements

The EBU [CCIR, 1978-82a] has taken into consideration the various items mentioned in Study Programme 1H/11 and has come to the conclusion that in terrestrial television the following requirements must be fulfilled to ensure compatibility with existing systems:

- the inserted digital sound signal should not cause any unacceptable interference with the performance of existing receivers;
- the new system should at least allow for the use of either two independent high quality channels, or stereophony, or four to six independent speech channels, and switching to those various modes should be made automatic;
- the reception quality of a transmitter should be limited by the degradation of the picture and *not* by that of the sound signals.

The last requirement seems to be fulfilled if the new system will allow for a sound quality definitely better than the corresponding vision quality, in all reception conditions where the vision quality is at least grade 1.5 (in a 5-grade scale) [CCIR, 1982-86].

It is felt desirable that the new technology be developed with a view to achieving a single overall system suitable for satellite as well as for terrestrial broadcasting applications and that this be done in such a way that the configuration for terrestrial television forms a compatible sub-system of the overall system [CCIR, 1978-82b].

3. Compatibility tests with existing receivers

In order to study the feasibility of integrating sound information into the video signal, preliminary tests with system M have been carried out in Japan [CCIR, 1978-82c], to investigate the compatibility with existing television receivers in the case of pulse signals inserted into the line blanking interval and of line synchronizing signals modified as shown in Fig. 1.

* This Report is also of interest to Study Group 10 and the CMTT.

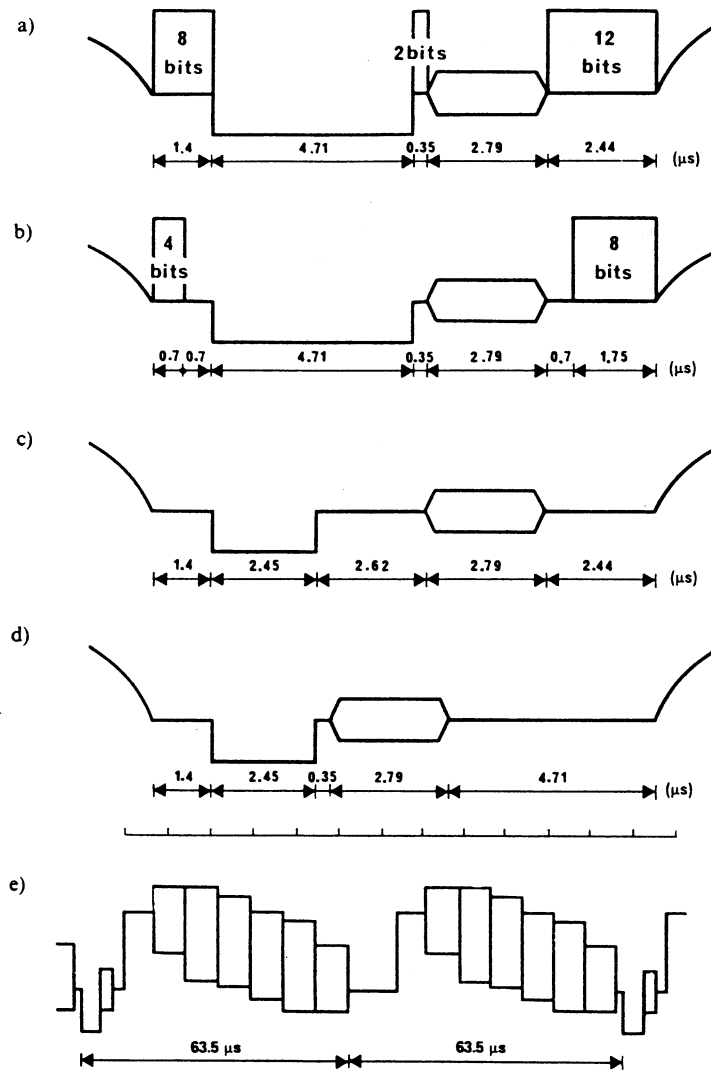


FIGURE 1 — Waveform of signals for tests with system M

The results showed that the signals tested were incompatible with receivers currently on the market. However, it seems possible that compatible receivers might be developed by improving their signal processing circuits since several receivers tested were not impaired by the test signals.

Preliminary compatibility tests with existing modern receivers for systems PAL/B have been carried out in Sweden [CCIR, 1978-82d], in which the whole horizontal blanking interval on every other line was used for a 8.86 Mbit/s digital signal; alternatively, two successive such lines were followed by two original lines (Fig. 2). The results showed that the signals caused more or less serious picture or synchronization impairments and that no real compatibility was obtained.

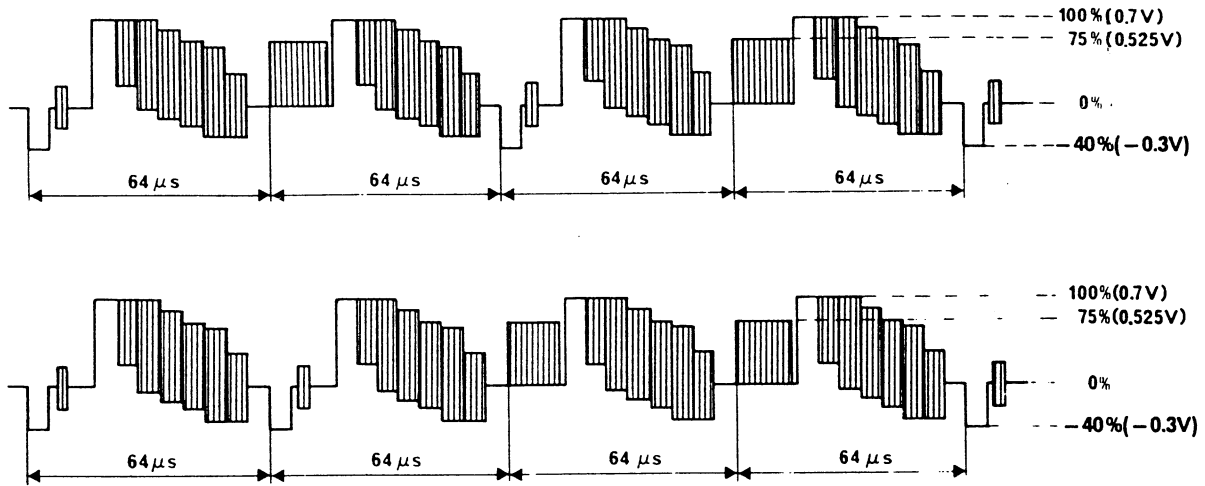


FIGURE 2 - Waveform of test signals for system PAL

4. Introduction of a digital system

The EBU has considered various practical aspects of implementing a new transmission standard whereby digital signals are included in the line-blanking interval and has come to the following conclusions for a 625-line PAL signal. Further work is required to determine whether these conclusions apply also to other systems, in particular the SECAM system.

- Experiments with conventional receivers have shown that any new system with digital signals in the line blanking interval is not likely to be compatible with existing receivers. This is true even if only alternate line blanking intervals (or similar schemes for partial use) are used.
- In order to achieve the greatest sound capacity viz. four high-quality sound channels (see Report 632), it is necessary to introduce digital signals within the entire blanking interval of every line.
- Because of the problem of incompatibility and the desirability of introducing any new system within the shortest possible transition period (about 15 years corresponding to one generation of receivers), it would be necessary to adopt a new generation of receivers within that period. This situation cannot be avoided by adopting the partial use of blanking periods either on a temporary or permanent basis.
- Such receivers should have circuits which can function with the standard waveform during the transition period and with the digital signals once the new transmission system is introduced. This circuitry could be contained entirely within the receiver or else could be included in a device external to the receiver, to be connected via standardized external plugs*. The latter solution would probably offer the greatest receiver flexibility.
- Special services such as cable or pay television could probably implement digital sound in the video waveform during the transition period.
- A possible disadvantage of the digital system in terrestrial broadcasting is the somewhat increased sensitivity of the picture to impairments arising from multipath propagation. This occurs when the delayed digital signal appears in the active picture period and arises from its greater visibility as compared with a normal waveform in the line blanking period.
- Further work is required on the quality of sound achieved under certain unfavourable propagation conditions.

REFERENCES

CCIR Documents

- [1978-82]: a. 11/60 (EBU); b. 10-11S/7 (EBU); c. 11/75 (Japan); d. 11/298 (EBU).
 [1982-86]: 11/35 (EBU).

* The Director, CCIR, is invited to draw the attention of the IEC to the necessity for the standardization of such interface plugs and sockets. CENELEC Technical Committee TC 103 have drafted such a standard (see CENELEC Doc. pr. GN 50 049).