

SECTION 11B: ANCILLARY TELEVISION SERVICES

REPORT 802-3 *

ADDITIONAL SERVICES USING BROADCASTING CHANNELS

(Question 29/11, Study Programmes 29A/11, 29C/11 and 29H/11)

(1978-1982-1986-1990)

1. Introduction

Many countries are now broadcasting information and other services in a television channel, in addition to normal television services. Most of these use digital data broadcasting, and probably the most widely-known at the present time are the teletext systems described in Annex I to Recommendation 653. Systems which use analogue techniques, or a combination of digital and analogue techniques, are also within the scope of this report.

A classification of additional services is given in Table I, which, for completeness, also includes services using sound-broadcasting channels.

The sections of this report are as follows:

- section 2 deals with multiplexing and organizational methods for data broadcasting;
- section 3 deals with the services which use data broadcasting systems;
- section 4 deals with systems to provide conditional access to services;
- section 5 is concerned with still-picture television broadcasting (SPTV).

2. Digital data broadcasting systems2.1 Multiplexing methods within the television channel

Recent work on defining methods for broadcasting television, sound and data signals in one satellite channel, has led to the description of new multiplexing systems and the adaption of one of these to terrestrial broadcasting has been reported [CCIR, 1986-90a]. For ease of reference, and association with other CCIR reports, the various methods are referred to under the application for which they were first developed.

* This Report should be brought to the attention of the CCITT.

2.1.1 Methods for terrestrial broadcasting

a) Time division multiplexing (TDM)

At present, most systems use this method, inserting the data signals into television lines in the field blanking time, (data lines), or into the line blanking time of the video signal. The teletext systems described in Annex I to Recommendation 653 use data lines which, in the absence of television picture signals, may extend throughout the active field time as well as the field blanking time; though the television line and field synchronizing signals are preserved.

Some possibilities for incorporating the sound information in the video signal in terrestrial broadcasting are given in Report 958. An estimated capacity corresponding to four high-quality sound channels could be obtained in 625-line systems. Such a technique may provide an opportunity for broadcasting data.

The influence of the data signal on television protection ratios is under study and some results are available in Recommendation 653 for 625-line B or G/PAL television. Some recent results concerning the protection of a data broadcasting service for television system L are quoted in [CCIR 1982-86a].

b) Frequency division multiplexing (FDM)

Several European administrations have selected the NICAM 728 system [CCIR, 1986-90b, and c; BBC/IBA, 1987] which is recommended for television systems B, G, H and I in Recommendation 707 for use when multi-channel sound transmission for terrestrial television services is introduced. This system uses an extra digitally modulated carrier to provide two high-quality digital sound channels and a small amount of additional data capacity. The two sound channels may be used to transmit a single stereophonic signal or two independent monophonic signals. Alternatively, one or both sound channels may be used for transparent transmission of data (see Report 795).

2.1.2 *Methods of multiplexing for satellite broadcasting*

Information on this topic is available from other CCIR Reports as follows:

- Report 632: "Broadcasting-satellite service (sound and television) – *Technically suitable methods of modulation*"

Although the main topic of this Report is *modulation* methods, some information is given on multiplexing.

- Report 954: "Multiplexing methods for the emission of several digital audio signals and also data signals in broadcasting"

This describes two multiplexing methods known as "system A" or "continuous" which is an FDM system and "system B" or "interrupted" which is a TDM system.

- Report 1073: "Television standards for the broadcasting-satellite service"

This describes several well-developed systems providing for data broadcasting and known as C-MAC/packet, D2-MAC/packet, B-MAC and digital sub-carrier/NTSC.

These systems provide for sharing of the entire WARC-BS-77 channel capacity among the different services. Means for assisting users to access the different services possible within one WARC channel, and the different WARC channels, are provided. Further information on this aspect is given in § 3.2.2 below.

TABLE I – *A classification of identified additional services which may be provided by data broadcasting systems*

Additional services ⁽¹⁾	Television broadcasting channel multiplex		⁽²⁾ Sound broadcasting channel multiplex
	Time division multiplex (TDM)	Frequency division multiplex (FDM)	AM or FM channel
1. Teletext	Reports 802 (§ 3.1), 956; Recommendations 653, 655		
2. Sub-titling	Reports 802 (§ 3.2.1), 1080; Recommendation 653		
3. Service and programme identification	Reports 802 (§ 3.2.2), 1073; Recommendation 653		Report 463 ⁽³⁾ ⁽⁴⁾
4. Programme delivery control	Reports 802 (§ 3.2.3), 1073 Recommendation 653 Report 1 226		Report 463 ⁽⁴⁾
5. Speech-quality sound	Report 802 (§ 3.2.4.1) Report 958 Report 954, Report 632 Report 1073	Report 795 ⁽²⁾ ⁽³⁾ Report 954 Report 632 ⁽³⁾	Report 632 ⁽³⁾
6. Synthesized sound	Report 802 (§ 3.2.4.2); Recommendation 653		
7. Broadcast audiography	Report 802 (§ 3.2.5)		Report 463 ⁽³⁾ ⁽⁴⁾
8. Data for processing (includes "telesoftware")	Report 802 (§ 3.2.6)		Report 1061
9. Broadcasting of time and date in coded form	Reports 802 (§ 3.2.6.1), 1073 and 1078; Recommendation 653		
10. Independent data services	Reports 802 (§ 3.2.7) and 1073; Recommendation 653	Report 1073	Report 463 ⁽⁴⁾
11. Broadcast facsimile	Report 802 (§ 3.2.8)	Report 795 ⁽²⁾ ⁽³⁾	Report 463 ⁽⁴⁾
12. Still picture television	Report 802 (§ 4) ⁽³⁾		Report 463 ⁽³⁾ ⁽⁴⁾

Note. – The modulation is assumed to be digital, unless otherwise stated.

⁽¹⁾ Conditional-access techniques may be used with television and sound and any of the additional services 1-12 (see § 3.3 of this Report, Reports 1073, 1079 and Recommendation 653).

⁽²⁾ The systems for these services are being studied by Study Group 10.

⁽³⁾ Service may partly be provided using analogue modulation.

⁽⁴⁾ Report 463 while not referring to "teletext" does deal with the transmission of supplementary information including text using FM sound broadcasting.

a) *Time division multiplexing (TDM)*

Report 1073 describes several TDM systems:

C-MAC/packet : A radio-frequency multiplexing system: available bit rate approximately 3 Mbit/s.

D-MAC/packet: A baseband multiplex using duobinary coding: available bit rate approximately 3 Mbit/s.

D2-MAC/packet: A baseband multiplex using duobinary coding: available bit rate approximately 1.5 Mbit/s.

B-MAC : A baseband multiplex system using quaternary coding with an available bit rate of approximately 1.6 Mbit/s.

Baseband representation of member of the MAC/packet family (D, D2, HD) may be distributed over digital links. Where these links make use of data compression techniques it is important that channel coding schemes are transparent to all TDM structures including field interval and full field data. One proposal [CCIR, 1986-90c] has been made for channel coding in the 140 Mbit/s hierarchical level.

While it is expected that satellite data broadcasting services will progressively make use of a digital sound/data multiplex, during a transitional period, present data standards may be adapted to the transmission in the field blanking interval of any television signal. This may be desirable for the provision of certain multilingual subtitling services at the outset but rapid adoption of teletext transmitted in the sound/data multiplex as proposed [CCIR, 1986-90a] will facilitate the compatible introduction of HD-MAC.

In Germany (Federal Republic of) data broadcasting transmission tests were carried out with a 20.48 Mbit/s system originally intended for sound-only broadcasting via satellite channels in the 12 GHz band. With this system (see Report 215-6, Annex II) 16 stereophonic or 32 monophonic high-quality sound channels may be conveyed. One or more of these channels can be used for data broadcasting purposes. Each monophonic channel offers one 352 kbit/s highly protected capacity (for C/N = 12 dB the BER is $8.1 \cdot 10^{-3}$) together with 96 kbit/s of unprotected data capacity. Under typical receiving conditions the BER is negligible [Assmus, U., 1989].

b) *Frequency division multiplexing (FDM)*

Report 1073 describes a system known as digital sub-carrier/NTSC which uses a digitally-modulated sub-carrier giving an available bit rate of approximately 2.0 Mbit/s.

2.2 *Organization of the multiplex*

The organization of the data multiplex is defined by a certain number of characteristics and parameters concerning the available resource and sharing mode:

- available resource;
- method of multiplexing data from different sources;
- identification of a data channel;
- number of available data channels;
- specification of a data channel.

General descriptions of the data broadcasting systems that have been used primarily for the teletext service are given in Annex I to Recommendation 653. The use of a packet transmission technique for broadcasting data is described on the basis of the lowest four layers of the ISO reference model for open system interconnection.

Similarly, the sound/data multiplex of the MAC/packet direct satellite broadcasting systems described in Report 1073 uses a packet multiplexing structure to allocate the available digital resource to the various sound and data sources.