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SERIES J: CABLE NETWORKS AND TRANSMISSION
OF TELEVISION, SOUND PROGRAMME AND OTHER
MULTIMEDIA SIGNALS

Digital transmission of television signals

**Distribution of digital multi-programme signals
for television, sound and data services through
SMATV networks**

ITU-T Recommendation J.84

(Formerly CCITT Recommendation)

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ITU-T Recommendation J.84

Distribution of digital multi-programme signals for television, sound and data services through SMATV networks

Summary

This Recommendation "Distribution of digital multi-programme signals for television, sound and data services through SMATV networks" covers the definition of the framing structure, channel coding and modulation for digital multi-programme signals for television, sound and data services received from a satellite system and distributed in a transparent way through Satellite Master Antenna Television (SMATV) networks.

This Recommendation defines the required network architecture for SMATV systems and is closely related to ITU-R BO.1211 (applicable to the satellite path) and to ITU-T J.83 (applicable to the cable path).

This Recommendation has four Annexes (A, B, C and D) that provide the specifications for the digital television SMATV systems submitted to the ITU-T. This reflects the fact that standardization of digital SMATV television systems is being addressed for the first time by the ITU-T and that a number of systems had been developed and provisionally implemented when this standardization effort was undertaken by the ITU.

This Recommendation recommends that those implementing new digital multi-programme services on existing and future SMATV networks should use one of the systems whose framing structure, channel coding and modulation are specified in Annexes A, B, C and D.

Source

ITU-T Recommendation J.84 was revised by ITU-T Study Group 9 (2001-2004) and approved under the WTSA Resolution 1 procedure on 9 March 2001.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Introduction

The development of new digital technologies is now reaching the point at which it is evident that they enable digital systems to offer significant advantages, in comparison with conventional analogue techniques, in terms of vision and sound quality, spectrum and power efficiency, service flexibility, multimedia convergence and potentially lower equipment costs. Moreover, the use of SMATV distribution for the delivery of video and audio signals to individual viewers and listeners is continually growing, and has already become a significant form of distribution in some parts of the world. It is also evident that these potential benefits can best be achieved through the economies of scale resulting from the widespread adoption of digital systems designed to be easily implementable on existing infrastructure and to take advantage of the many possible synergies with related audiovisual systems.

Common features of SMATV networks are the use of consumer-type equipment and the lack of regular maintenance, and therefore the system ruggedness is a primary consideration. In particular, the SMATV head-end should be transparent to the digital TV multiplex, without any baseband interfacing, thus permitting the use of simple and cost-effective consumer-type head-end equipment.

This Recommendation has four Annexes (A, B, C and D) that provide the specifications for the digital SMATV systems submitted to the ITU-T. This reflects the fact that standardization of digital SMATV systems is being addressed for the first time by ITU-T and that a number of systems had been developed and provisionally implemented when this standardization effort was undertaken by the ITU.

Administrations and private operators planning the introduction of SMATV systems are encouraged to consider the use of one of the systems described in Annexes A, B, C and D and to seek opportunities for further convergence, rather than developing a different system based on the same technologies.

This second version of this Recommendation incorporates Amendment 1 and Amendment 2. These amendments brought the following changes with respect to the first edition of this Recommendation:

- a) Annex C has now full text. In the first edition it was stated that Annex C was under study.
- b) Annex D takes into account additional VSB modes which are specified in the second edition of ITU-T J.83.
- c) A new Table 1/J.84 is added to show the comparison of the digital multi-programme SMATV systems.

ITU-T Recommendation J.84

Distribution of digital multi-programme signals for television, sound and data services through SMATV networks

1 Scope

The scope of this Recommendation is the definition of the framing structure, channel coding and modulation for digital multi-programme signals distributed by SMATV networks, possibly in frequency-division multiplex with existing analogue television signals.

NOTE – It should be noted that requirements for some ancillary data capacity in the forward channel, related to the needs of interactive services, can be accommodated in the MPEG-2 transport layer, which is specified for all the systems described in the annexes to this Recommendation (a description of the provision and characteristics of the return channel is outside the scope of this Recommendation).

It should also be noted that the specified MPEG-2 transport layer allows the delivery of a number of digital sound channels, at various possible levels of quality; the content of those channels can be either related or unrelated to the video signal content.

This Recommendation is intended to ensure that the designers and installers of SMATV networks carrying digital multi-programme signals will have the information they need to be able to establish and maintain fully satisfactory networks. It also provides the information needed by the designers and manufacturers of equipment (including receivers) for digital multi-programme signals distributed by SMATV networks.

It is to be noted that this Recommendation is complementary to other Recommendations which define the transmission characteristics for digital multi-programme signals distributed by satellite and cable networks (see References).

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T J.83 (1997), *Digital multi-programme systems for television, sound and data services for cable distribution*.
- [2] ITU-R BO.1211 (1995), *Digital multi-programme emission systems for television, sound and data services for satellites operating in the 11/12 GHz frequency range*.
- [3] ITU-T H.222.0 (2000) | ISO/IEC 13818-1:2000, *Information technology – Generic coding of moving pictures and associated audio information: Systems*.
- [4] FORNEY (G.D.): Burst-correcting codes for the classic bursty channel, *IEEE Trans. Comm. Tech.*, COM-19, pp. 772-781, October 1971.
- [5] ITU-R BO.1294 (1997), *Common functional requirements for the reception of digital multi-programme television emissions by satellites operating in the 11/12 GHz frequency range*.
- [6] ITU-R BO.1408 (1999), *Transmission system for advanced multimedia services provided by integrated services digital broadcasting in a broadcasting-satellite channel*.

3 Definitions

This Recommendation defines the following term.

3.1 satellite master antenna television (SMATV) network: A broadband network intended for the distribution of television, sound and data signals received directly from one or more satellites, possibly in frequency-division multiplex with similar terrestrial UHF or VHF signals, to households located in one or more adjacent buildings. Where intended also for the distribution of new digital multi-programme television, sound and data services, such networks are known as "Digital SMATV networks", and the digital configuration made for this purpose is known as a "Digital multi-programme SMATV system".

4 Symbols and abbreviations

4.1 Symbols

This Recommendation uses the following symbols:

α	Roll-off factor
f_0	Channel centre frequency
R_s	Symbol rate corresponding to the bilateral Nyquist bandwidth of the modulated signal
R_u	Useful bit rate after MPEG-2 transport multiplexer
$R_{u'}$	Bit rate after RS outer coder
T	Number of bytes which can be corrected in RS error protected packet
T_s	Symbol period

4.2 Abbreviations

This Recommendation uses the following abbreviations:

BB	BaseBand
BER	Bit Error Ratio
BPSK	Binary Phase Shift Keying
BW	BandWidth
DTVC	Digital Television by Cable
EBU	European Broadcasting Union
ETS	European Telecommunication Standard
FEC	Forward Error Correction
FIR	Finite Impulse Response
IF	Intermediate Frequency
IRD	Integrated Receiver Decoder
LNB	Low Noise Block
LSB	Least Significant Bit
MPEG	Motion Picture Experts Group
MSB	Most Significant Bit

MUX	Multiplex
PDH	Plesiochronous Digital Hierarchy
PRBS	PseudoRandom Binary Sequence
PSK	Phase Shift Keying
QAM	Quadrature Amplitude Modulation
QEF	Quasi Error Free
QPSK	Quaternary Phase Shift Keying
RF	Radio Frequency
RS	Reed-Solomon
SMATV	Satellite Master Antenna Television
SMATV-DTM	SMATV system based on Digital TransModulation
SMATV-IF	SMATV system based on distribution at IF
SMATV-S	SMATV system based on distribution at extended Super Band
TDL	Tapped Delay Line
TDM	Time Division Multiplex
TDT	Transparent Digital Transmodulator
TV	Television
UHF	Ultra High Frequency
VHF	Very High Frequency
VSF	Vestigial SideBand

5 Digital multi-programme SMATV systems

It is recommended that those wishing to distribute new digital multi-programme services on existing and future SMATV networks should use one of the systems whose framing structure, channel coding and modulation are specified in Annexes A, B, C and D. The specifications are compared in Table 1, indicating common features.