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

Digital transmission of sound-programme signals

**Sampling frequencies to be used for the digital
transmission of studio-quality and high-quality
sound-programme signals**

ITU-T Recommendation J.53

(Formerly CCITT Recommendation)

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TRANSMISSION OF TELEVISION, SOUND PROGRAMME AND OTHER MULTIMEDIA SIGNALS

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ITU-T Recommendation J.53

Sampling frequencies to be used for the digital transmission of studio-quality and high-quality sound-programme signals

Summary

The present Recommendation specifies the sampling frequency and tolerance to be used for the digital transmission of studio-quality and high-quality sound-programme signals.

Source

ITU-T Recommendation J.53 was revised by ITU-T Study Group 9 (1997-2000) and approved under the WTSC Resolution 1 procedure on 18 May 2000.

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 Conference (WTSC), 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 WTSC 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

Digital systems for the transmission of high-quality sound-programme signals are in wide and current use, and it is important to specify for them a single sampling frequency, in order to simplify equipment and facilitate programme exchange.

For ease of implementation, the sampling frequency should in any case be an integer multiple of the 8 kHz network clock

According to subjective tests, limiting the audio frequency band to 15 kHz does not cause any appreciable degradation in subjective quality, even in critical listening conditions.

Consequently, it is appropriate to specify a sampling frequency of 32 kHz for the transmission of high-quality sound-programme signals. Such a sampling frequency is close to the theoretical limit compatible with a nominal passband of 15 kHz, it is also already in use in current equipment, and it is compatible with the bit rates corresponding to the various hierarchical levels defined by the ITU-T.

Digital systems in the broadcast studio environment are covered in ITU-R BS 646, which specifies a sampling frequency of 48 kHz for the digital coding of sound-programme signals in the studio. Consequently it is appropriate to specify a sampling frequency of 48 kHz for connections that carry studio-quality sound-programme signals.

ITU-T Recommendation J.53

Sampling frequencies to be used for the digital transmission of studio-quality and high-quality sound-programme signals

1 Scope

The present Recommendation specifies the sampling frequencies and the tolerance to be used for the digital transmission of studio-quality and of high-quality sound-programme signals.

2 Normative 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; 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.

- ITU-T G.703 (1998), *Physical/electrical characteristics of hierarchical digital interfaces*.
- ITU-R BS 646-1 (1992), *Source encoding for digital sound signals in broadcasting studios*.

3 Terms and Definitions

Only conventional, widely employed terms and definitions are used in this Recommendation.

4 Sampling frequencies

A sampling frequency of 48 kHz should be used in coding for the digital transmission systems interconnecting digital broadcast studios according to ITU-R BS 646-1.

A sampling frequency of 32 kHz should be used in coding for the digital transmission of high quality sound programme signals with a nominal passband of 15 kHz. The associated tolerance should be $\pm 5 \times 10^{-5}$ as specified in ITU-T G.703.

It should be noted that a tolerance of 50 ppm corresponds to the current network tolerance. On the other hand, a sampling frequency tolerance of 10 ppm is specified by ITU-R BS 646-1 for digital studio operation for the sampling frequency 48 kHz. It is recommended that a tolerance of 10 ppm should be used for 48 kHz as the target tolerance for future digital audio encoders for use in audio transmission networks, while decoders for use in transmission networks should continue to be able to accept digital audio signals with a sampling frequency tolerance of 50 ppm.

For sound-programme transmission at quality levels other than "studio quality" or "high quality" (15 kHz), other sampling frequencies may be preferred. They should always be multiples of 8 kHz.

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