RECOMMENDATION ITU-R BO.651*

Digital PCM coding for the emission of high-quality sound signals in satellite broadcasting (15 kHz nominal bandwidth)

(1986)

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The ITU Radiocommunication Assembly,

considering

a) that the compromise between quality objectives and bit rate may be different for sound services which may have various quality requirements and planning constraints; they may also vary according to the requirements of individual administrations;

b) that there are clear advantages for broadcasters, receiver manufacturers and the public in using a single standard for each application,

recommends

1 that where PCM coding is employed (see Note 1), the sampling frequency should be 32 kHz for the emission of audio digital signals in satellite broadcasting having a 15 kHz nominal bandwidth;

2 that when a reduction in bit rate is necessary (see Note 2), a non-linear coding law should be used with near-instantaneous companding to reduce the number of bits/sample from 14 to 10. The companding law should have five scale ranges. The selected range is associated with a block of 32 consecutive samples. The pre-emphasis should conform either to ITU-T Recommendation J.17 with an insertion loss of 6.5 dB at 0.8 kHz or to a 50/15 μs pre-emphasis, both shown in Fig. 1 (see Note 3);

3 that when the above bit-rate reduction is not necessary (see Note 2), linear coding should be used with 14 bits/sample, with pre-emphasis as in § 2 above, or, if judged to be needed, a 16-14 bits/sample floating-point system (see Note 4);

4 that in both cases (§ 2 and 3 above), 2s complement coding should be used (see Note 5).

NOTE 1 – Report ITU-R BO.953 describes an alternative system of digital coding suitable for high quality sound signals for satellite sound broadcasting employing adaptive delta modulation.

NOTE 2 – The area of application for this case is related to national requirements.

NOTE 3 – In Region 1, the use of the pre-emphasis given in ITU-T Recommendation J.17 is preferred.

NOTE 4 – For the case of sound-only broadcasting, studies are still in progress on the subject of emphasis for linear coding.

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* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44.

NOTE 5 – In both of the above cases (§ 2 and 3 above), the number of bits/sample does not include ancillary bits: for example, error-protection bits, or scale factor bits.

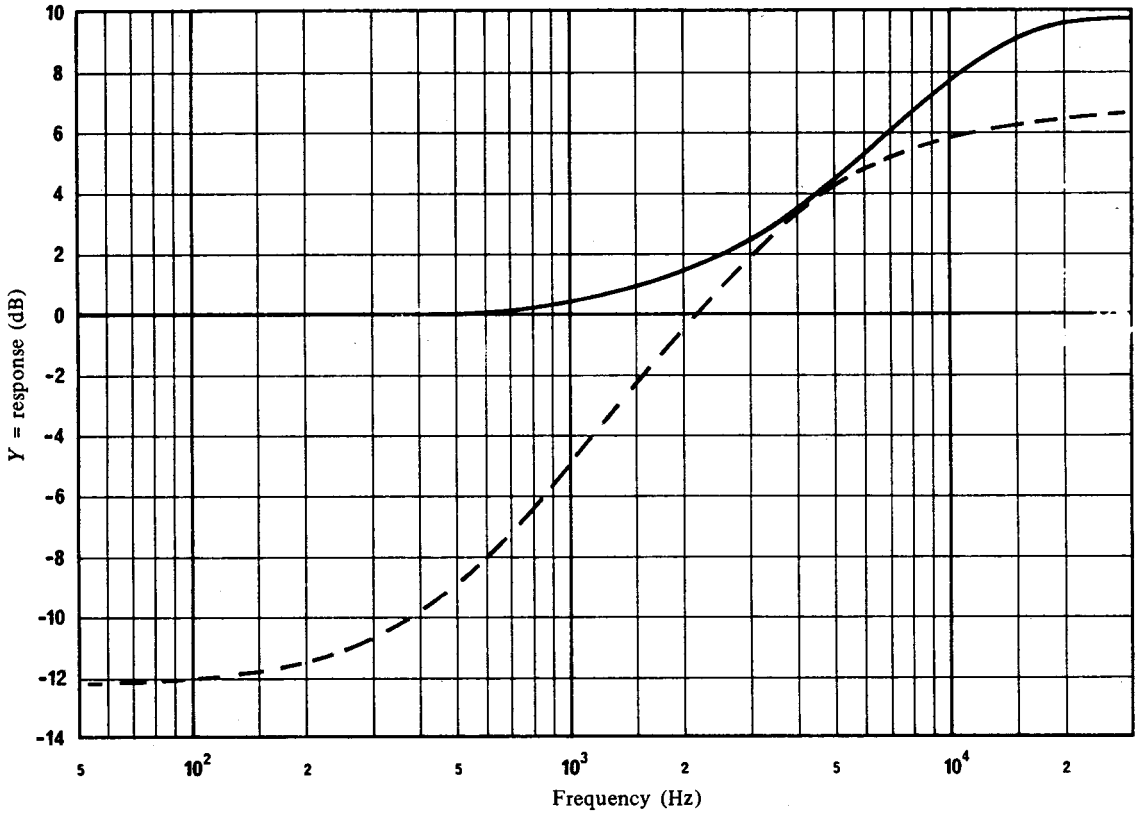

FIGURE 1 – *Pre-emphasis characteristics*

Note – Curves correspond to the following formulae:

——— For 50/15 μs ; $Y = 10 \log \frac{1 + (0.05\ \omega)^2}{1 + (0.015\ \omega)^2}$ dB

— — - For ITU-T Recommendation J.17; $Y = 10 \log \frac{1 + \left(\frac{\omega}{3}\right)^2}{75 + \left(\frac{\omega}{3}\right)^2}$ dB*

where : $\frac{\omega}{2\pi}$: frequency (kHz)

* Attenuation of the pre-emphasis at 800 Hz is set to 6.5 dB.

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