EBU – TECH 3270

Euroradio Measurements audio test material

Users' handbook for the Euroradio Measurements CD

Geneva
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Users' handbook for the Euroradio Measurements CD

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Introduction

The programme and test material included on the Euroradio Measurements CD is particularly suitable for testing stereophonic sound programme circuits.

To encourage the use of automatic measurement procedures, the CD includes three sequences conforming to the relevant CCITT Recommendation. These automatic procedures could substantially reduce pre-transmission test times.

As a further operational aid, a Start/source/programme identification signal is sent at 110 baud at the start of each track. Details of these codes are set out in the Appendix.

Details of each track are given below.

Level adjustment and automatic measurements

Track 1: Two-level test signal

The sequence recorded on this track is shown in Fig. 1. It is repeated six times. Its principal use is to eliminate confusion regarding the level that is being transmitted; it includes two convenient and internationally recognised amplitudes: Alignment Level (0 dBu0s) and Measurement Level (-12 dBu0s).

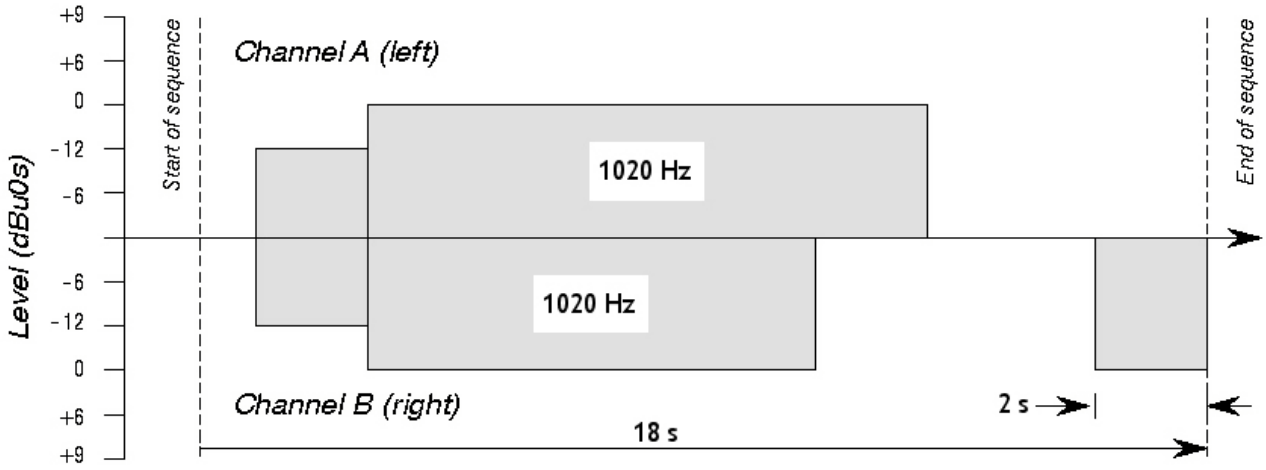

Fig. 1: Two-level test sequence

Track 2: Automatic measurement sequence

This track reproduces the automatic test sequence for the measurement of stereophonic sound-programme circuits as laid down in CCITT Recommendation O.33. It is shown in Fig. 2. The sequence is played twice.

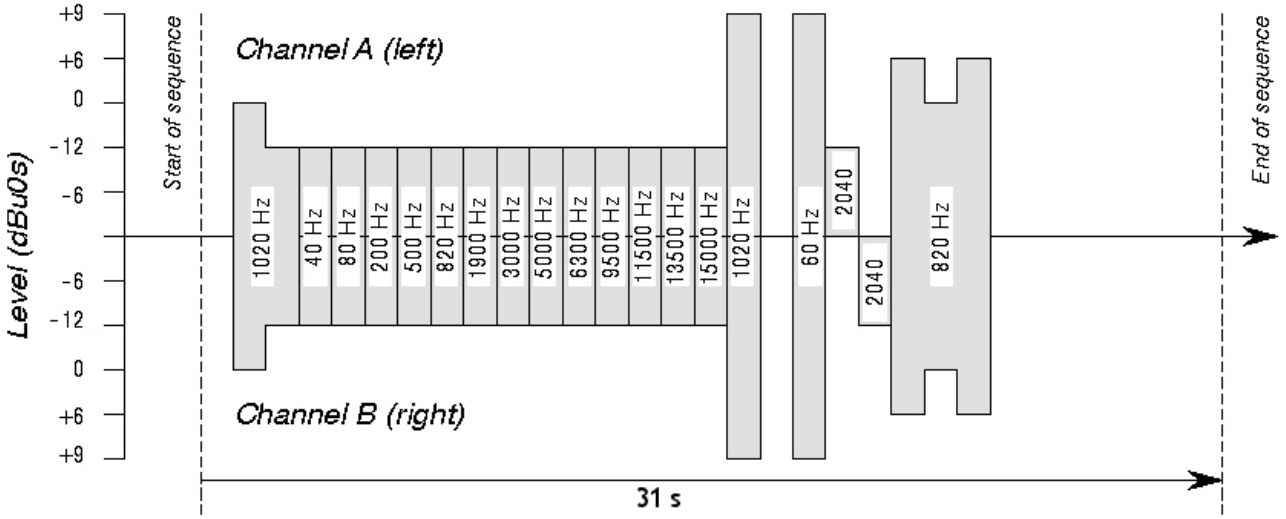

Fig. 2: CCITT measurement sequence

Track 3: Three-level test signal

The sequence is shown in Fig. 3. It is repeated six times. This sequence is identical to that of track 1, except that it includes signals at the maximum permitted level (+9 dBm0s).

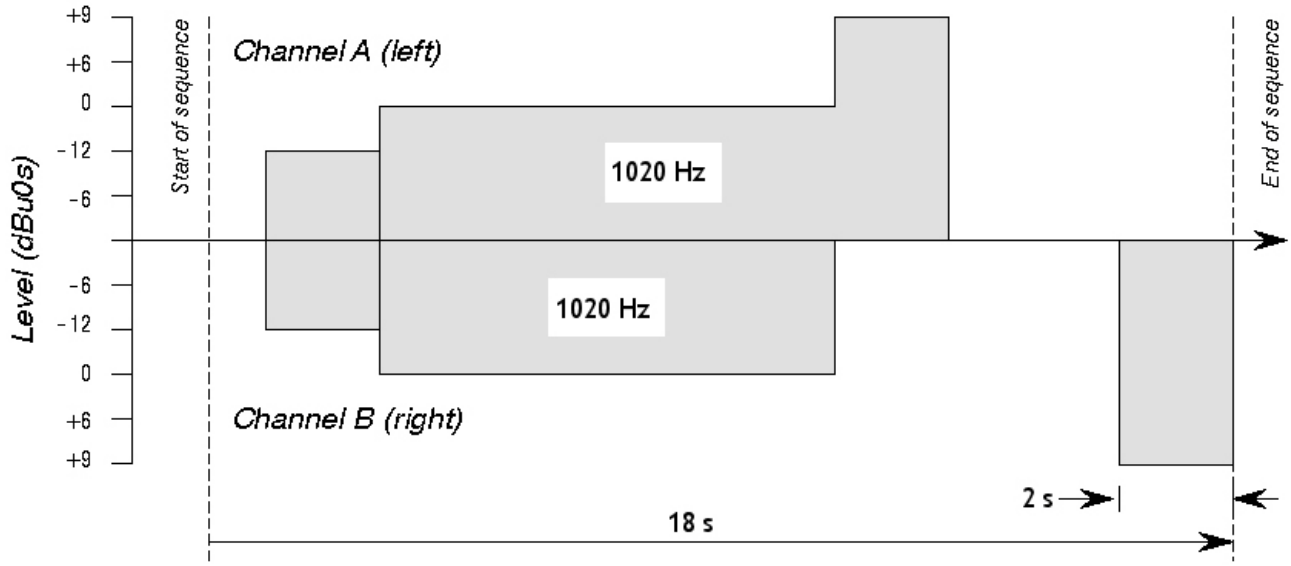

Fig. 3:Three-level test sequence

Note: The CMTT (a Joint CCIR/CCITT Study Group on Transmission of Sound Broadcasting and Television Systems Over Long Distances) recommends that the two-level test signal (track 1) be used in preference to the three-level test signal (track 3) when the transmission system cannot carry sinusoidal signals at +9 dBu0s without producing excessive channel loading or crosstalk into other channels.

Manual measurement sequence

The signals on tracks 4, 5, 6, 7 and 8 constitute the normal manual measurement sequence, which is used before each transmission.

Track 4: Channel identification

The sequence consists of thirty seconds of 1020 Hz at alignment level (0 dBu0s) on each channel consecutively. Its purpose is to identify the right and left stereophonic channels.

Track 5: Amplitude frequency response

This sequence of selected frequencies at Measurement Level (-12 dBu0s) allows manual measurement of the amplitude/frequency response of a wideband circuit. Each frequency is sent for 15 s, except for the reference frequency (1020 Hz) which lasts 30 s.

The following frequencies are present: 1020, 40, 60, 90, 150, 250, 500, 1020, 1900, 4000, 6000, 8000, 9000, 12000, 13000 and 15000 Hz. Announcements in English and French are made before each frequency is transmitted.

Track 6: Balance and signal-to-noise measurements

The balance between the left and right channels is verified by measuring the level received from the matched 1020 Hz signals at Measurement Level (-12 dBu0s), recorded for 60 s on this track.

There is also a period of silence for two minutes during which time signal-to-noise measurements may be carried out. An announcement in French and English indicates the start of this period.

Track 7: Non-linearity distortion

The measurement of non-linearity distortion is generally carried out at 60 Hz and at 1020 Hz. The amplitude of the signals used for this test is Maximum Permitted Level (+9 dBu0s). To prevent carrier circuit overload, the signals are sent in pulses.

Track 8: Musical sequence 1 - Subjective assessment 1

The musical excerpt is the *Infernal Dance* from *The Firebird Suite* by Stravinsky; the NDR Symphony Orchestra, conductor Günther Wand, recorded it on 21st March 1983.

Track 9: Compandor test 1

This recording of a sinusoid at 820 Hz, sent consecutively at +6 dBu0s, -6 dBu0s, and +6 dBu0s, is a particularly convenient test signal for analogue companding problems. The duration of each different amplitude step is 3 s followed by a pause of 3 s, making a complete sequence of 12 s. The sequence is repeated six times.

Track 10: Compandor test 2

Problems in digital companded circuits are analysed with a sinusoidal signal at 1020 Hz in the lower amplitude regions of –30 dBu0s, -20 dBu0s, and –10 dBu0s. This track contains these three levels, each sent consecutively for 3 s followed by a period of silence. The sequence is repeated six times.

Track 11: Short control sequence

The restricted selection of signals shown in Fig. 4 allows rapid verification of a sound-programme circuit. It is particularly suitable for checking radio commentary circuits.

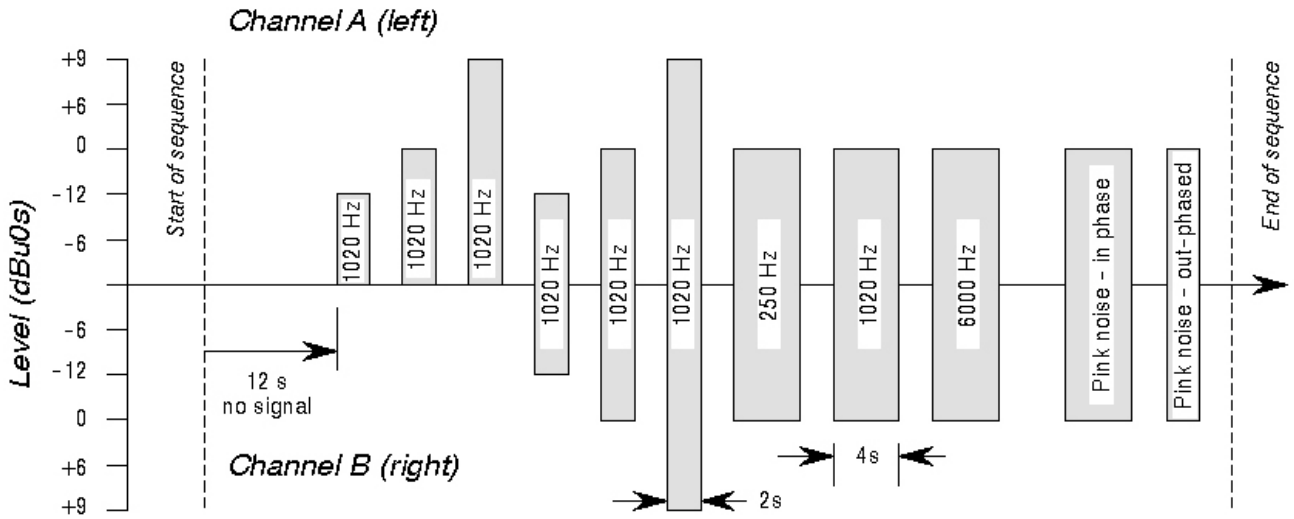

Fig. 4:Short control sequence

Track 12: Crosstalk

A 1020 Hz signal at Measurement Level (0 dBu0s) is sent first on the left-hand and then on the right-hand channel.

Track 13: Intermodulation test

Intermodulation is measured with input signals of 800 Hz (fa) and 1420 Hz (fb), each at a level of +3 dBu0s. The level of the third-order difference tone at 180 Hz (2fa-fb) is measured.

Track 14: Reconstituted frequency error

CCITT Recommendation O.111 specifies the use of two sinusoidal test frequencies, 2040 Hz and 1020 Hz, having a harmonic relationship.

In-Band intermodulation

Tracks 15, 16 and 17 contain signals for measuring intermodulation products due to the combination of the sound signal and the sampling frequency.

Track 15: In-band intermodulation 1

For sound-programme circuits of 7 kHz nominal bandwidth with a sampling frequency of 16 kHz. The frequencies are 5000 Hz, 7000 Hz, 3000 Hz, and 5000 Hz. Measurements are generally made at 6000 Hz, 2000 Hz, 7000 Hz, and 1000 Hz.

Track 16: In-band intermodulation 2

For sound-programme circuits of 15 kHz nominal bandwidth with a sampling frequency of 32 kHz. The frequencies are 9000 Hz, 13000 Hz, 7000 Hz, and 11000 Hz. Measurements are generally made at: 14000 Hz, 6000 Hz, 11000 Hz, and 1000 Hz.

Track 17: In-band intermodulation 3

For sound-programme circuits of 23 kHz nominal bandwidth with a sampling frequency of 48 kHz. The frequencies are 13000 Hz, 20000 Hz, 13000 Hz, and 15000 Hz. Measurements are generally made at: 22000 Hz, 8000 Hz, 9000 Hz, and 3000 Hz.

Non-linearity distortion measurements

Tracks 18 to 21 contain signals for two-tone distortion measurements; several widely used pre-emphasis networks have been considered.

Each track begins with an alignment signal at 4000 Hz, sent for 15 s.

Track 18: Non-linearity distortion 1 (no pre-emphasis)

8000 Hz signal at +3.0 dBu0s and 11950 Hz at +3.0 dBu0s.

Track 19: Non-Linearity distortion 2 (pre-emphasis as per CCITT Recommendation J.17)

8000 Hz signal at -2.6 dBu0s and 11950 Hz at -3.1 dBu0s.

Track 20: Non-linearity distortion 3: (pre-emphasis 50/15 ms)

8000 Hz signal at -3.7 dBu0s and 11950 Hz at -5.2 dBu0s.

Track 21: Non-linearity distortion 4: (pre-emphasis 50 ms)

8000 Hz signal at -5.6 dBu0s and 11950 Hz at -8.8 dBu0s.

Track 22: Quantising noise and overload margin

Tests of quantising noise and overload margin can be carried out using a compandor-style test. This track provides the necessary sinusoidal test signals at levels of –20 dBu0s, -10 dBu0s, 0 dBu0s, +6 dBu0s, and +12 dBu0s. The step sequences last 40 s as shown in Fig. 5. This track is divided into two sections: the first section is at a frequency of 2000 Hz, the second section is at 60 Hz.

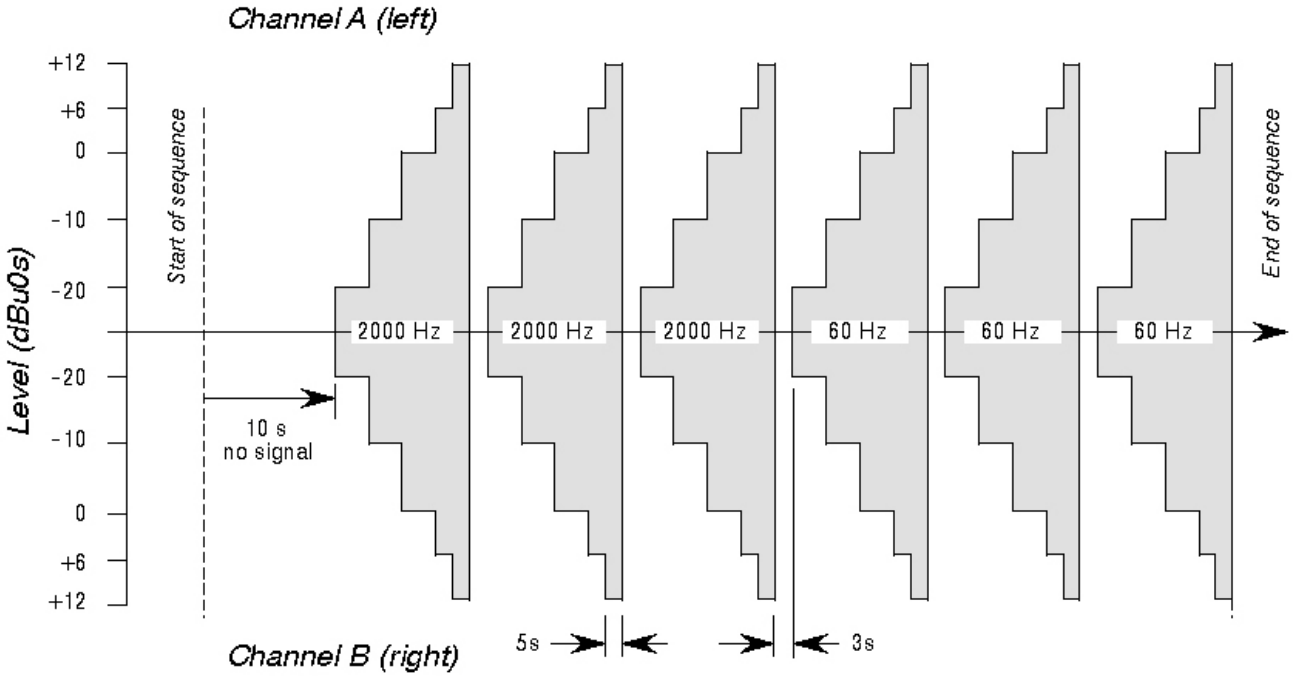

Fig. 5: Test signal for quantising noise and headroom

Simple subjective tests

Track 23: Electronic tune

This artificial signal is reminiscent of the popular French folksong *Frère Jacques*. It permits the detection of non-linear effects in a digital sound-programme channel by subjective listening tests.

Track 24: Musical sequence 2 - Subjective assesment 2

The musical excerpt is taken from *The Rite of Spring* by Stravinsky, performed by the Swedish Radio Symphony Orchestra conducted by Sixten Ehrling.

Modem tests

Tracks 25, 26, 27, and 28 provide four test signals for modems using frequency-shift keying modulation, conforming to CCITT Recommendation V.21.

Track 25: Modem Test 1

1650 Hz at the Measurement Level of –12 dBu0.

Track 26: Modem Test 2

1850 Hz at the Measurement Level of –12 dBu0.

Track 27: Modem Test 3

980 Hz at the Measurement Level of –12 dBu0.

Track 28: Modem Test 4

1180 Hz at the Measurement Level of –12 dBu0.

Track 29: Euroradio signature tune

Electronic musical excerpt, Monteverdi Vespers.

Appendix: Start/source/programme identification signal

The start/source/programme identification signal using the ISO-7 code with one even parity bit and two stop bits, is sent by frequency-shift keying with a mark frequency of 1650 Hz and a space frequency of 1850 Hz, at a transmission rate of 110 baud (CCITT Rec. V.21). Details of messages and the structure of a message are given in Table 1.

Table 1 - Start/source/programme identification message structure

SOH	Start of Header	(SOH = ASCII code 01H)
	Source Identification	(4 alphanumeric characters)
	Special Signalling	(1 character)
STX	Start of Text	(STX = ASCII code 02H)
	Measurement Programme Identification	(2 integers)
ETX	End of Text	(ETX = ASCII code 03H)

1: (SOH) C D 0 1 (STX) 9 9 (ETX) (SOH) E B U * (STX) 0 5 (ETX)
2: (SOH) C D 0 2 (STX) 9 9 (ETX) (SOH) E B U * (STX) 0 1 (ETX)
3: (SOH) C D 0 3 (STX) 9 9 (ETX) (SOH) E B U * (STX) 0 5 (ETX)
4: (SOH) C D 0 4 (STX) 9 9 (ETX)
5: (SOH) C D 0 5 (STX) 9 9 (ETX)
6: (SOH) C D 0 6 (STX) 9 9 (ETX)
7: (SOH) C D 0 7 (STX) 9 9 (ETX)
8: (SOH) C D 0 8 (STX) 9 9 (ETX)
9: (SOH) C D 0 9 (STX) 9 9 (ETX)
10: (SOH) C D 1 0 (STX) 9 9 (ETX)
11: (SOH) C D 1 1 (STX) 9 9 (ETX)
12: (SOH) C D 1 2 (STX) 9 9 (ETX)
13: (SOH) C D 1 3 (STX) 9 9 (ETX)
14: (SOH) C D 1 4 (STX) 9 9 (ETX)
15: (SOH) C D 1 5 (STX) 9 9 (ETX)
16: (SOH) C D 1 6 (STX) 9 9 (ETX)
17: (SOH) C D 1 7 (STX) 9 9 (ETX)
18: (SOH) C D 1 8 (STX) 9 9 (ETX)
19: (SOH) C D 1 9 (STX) 9 9 (ETX)
20: (SOH) C D 2 0 (STX) 9 9 (ETX)
21: (SOH) C D 2 1 (STX) 9 9 (ETX)
22: (SOH) C D 2 2 (STX) 9 9 (ETX)
23: (SOH) C D 2 3 (STX) 9 9 (ETX)
24: (SOH) C D 2 4 (STX) 9 9 (ETX)
25: (SOH) C D 2 5 (STX) 9 9 (ETX)
26: (SOH) C D 2 6 (STX) 9 9 (ETX)
27: (SOH) C D 2 7 (STX) 9 9 (ETX)
28: (SOH) C D 2 8 (STX) 9 9 (ETX)
29: (SOH) C D 2 9 (STX) 9 9 (ETX)