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SERIES N: MAINTENANCE OF INTERNATIONAL SOUND-PROGRAMME AND TELEVISION TRANSMISSION CIRCUITS

International sound-programme transmissions – Setting-up, lining-up and monitoring the international sound-programme links and connections

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Limits for the lining-up of international sound-programme links and connections

Reedition of CCITT Recommendation N.10
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NOTES

1 CCITT Recommendation N.10 was published in Fascicle IV.3 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

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

Recommendation N.10

LIMITS FOR THE LINING-UP OF INTERNATIONAL SOUND-PROGRAMME LINKS AND CONNECTIONS

1 General

This Recommendation gives limits in Tables 1/N.10 to 5/N.10 for the lining-up of international sound-programme links as defined in Recommendation N.1. These limits correspond to those for three audio sections of the hypothetical reference circuit as defined in CCIR Recommendation 502 [1] for 5 kHz, 6.4 kHz, 7 kHz and 10 kHz type sound-programme circuits, but correspond to four audio sections for 15-kHz type sound-programme circuits except for noise limits, which correspond to three audio sections [2][1)].

It is not possible at the present time to recommend limits for the sound-programme connection. However, Administrations shall endeavour to provide national sound-programme circuits to as high a standard as possible so that the performance of the sound-programme connection is not markedly different to that of the sound-programme link.

Some Administrations arrange their apparatus in an ISPC so that at the point of interconnection the output impedance of every receive channel or circuit over the frequency band of interest is substantially lower than the input impedance of any send channel or circuit. This is the so-called constant-voltage technique. Other Administrations arrange for an impedance match at the point of interconnection and choose the value of this impedance to be equal to the design resistance of measuring instruments. This is known as the impedance-matching technique (previously referred to as the constant electromotive force technique It should be noted that in both cases the through-level measurement results relative to the through-level at 800 Hz will be the same. Furthermore the terminated-level measurement results relative to the terminated-level at 800 Hz will also be the same value[2)].

Hence the limits recommended in the following tables are applicable regardless of the arrangement adopted by Administrations at their ISPCs.

The test procedures are described in Recommendation N.21. The limits for 15 kHz and 7 kHz circuits are applicable both for analogue and digital transmissions.

2 Limits for the loss/frequency distortion of an international sound-programme link

The majority of international sound-programme links are in practice established with three or less circuits in series.

Many links could be established without additional equalizers but links comprising four or more circuits will probably require equalization. In this case the opportunity could again be taken to obtain as good a loss/frequency characteristic as possible.

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1) Wider tolerance limits are recommended for 15-kHz type sound-programme circuits because of performance limitation of commercial equipment.

2) This depends on the almost constant ratio of the impedances on the send and receive sides at the various frequencies. (See § 4 of Recommendation N.11.)

TABLE 1/N.10

Limit for the lining-up of 15 kHz sound-programme links

Item	Parameter		Unit	Limits
1	Insertion gain	Adjustment error	dB	± 0.6
		Variation during 24 h	dB	± 0.6
2	Gain/frequency response referred to 0.8 or 1 kHz	0.04 to 0.125 kHz	dB	+ 0.6
			dB	– 2.4
		0.125 to 10 kHz	dB	± 0.6
		10 to 14 kHz	dB	+ 0.6
			dB	– 2.4
		14 to 15 kHz	dB	+ 0.6
			dB	– 3.6
3	Group delay/frequency response referred to minimum	0.04 kHz	ms	73
		0.075 kHz	ms	32
		14 kHz	ms	11
		15 kHz	ms	16
4	Weighted noise	Idle channel	dBq0ps	– 42
		Programme-modulated	dBq0ps	– 30
5	Single tone interference level + ψ		dBm0s	– 71
6	Disturbing modulation by power supply		dB	– 43
7	Total harmonic distortion	0.04 to 0.125 kHz	%	1.2
		0.125 to 7.5 kHz	%	0.6
8	3rd order difference tone at 0.18 kHz		%	0.6
9	Error in reconstituted frequency		Hz	± 1.2
10	Intelligible crosstalk ratio	0.04 kHz	dB	48
		0.5 to 5 kHz	dB	72
		15 kHz	dB	58
11	Error in amplitude/amplitude response		dB	± 0.6

TABLE 1/N.10 *(cont.)*

	Item	Parameter		Unit	Limits
Additional parameters for stereo transmission	12	Difference in gain between A and B channels	0.04 to 0.125 kHz	dB	1.8
			0.125 to 10 kHz	dB	1
			10 to 14 kHz	dB	1.8
			14 to 15 kHz	dB	3.6
	13	Phase difference between A and B channels	0.04 to 0.2 kHz	degree	36
			0.2 to 4 kHz	degree	18
			14 kHz	degree	36
			15 kHz	degree	48
	14	Intelligible crosstalk ratio A/B		dB	48
	15	Crosstalk ratio (intermodulation) A/B		dB	58

TABLE 2/N.10

Limits for the lining-up of 10 kHz sound programme links

Item	Parameter		Unit	Limits
1	Insertion gain	Adjustment error	dB	± 0.5
		Variation with time	dB	± 0.5
2	Gain/frequency response referred to 0.8 or 1 kHz	0.05 to 0.1 kHz	dB	+ 1.7
			dB	– 4.3
		0.1 to 0.2 kHz	dB	± 1.7
			dB	– 2.6
		0.2 to 6 kHz	dB	± 1.7
		6 to 8 kHz	dB	+ 1.7
			dB	– 2.6
		8 to 10 kHz	dB	+ 1.7
			dB	– 4.3
3	Group delay/frequency response referred to minimum	0.05 kHz	ms	80
		0.1 kHz	ms	20
		10 kHz	ms	8
4	Weighted noise (idle channel) [a]		dBq0ps	– 39
5	Single tone interference level + ψ [b]		dBm0s	– 71
6	Disturbing modulation by power supply		dB	– 45
7	Total harmonic distorsion	0.05 to 0.1 kHz	%	3
		0.1 to 10 kHz	%	2
8	3rd order difference tone at 0.18 kHz		%	2
9	Error in reconstituted frequency		Hz	± 1
10	Intelligible crosstalk ratio [c]		dB	74
11	Error in amplitude/amplitude response		dB	± 0.5

[a] For circuits on carrier systems, it is not always possible in absence of special precautions, to meet these limits (see Annex II to CCIR Recommendation 504 [3]).

[b] Or 20 dB below measured weighted noise level, whichever is higher.

[c] It is in some cases difficult or impossible to meet these limits (see § 3.8, Note 2, in the Annex I to CCIR Recommendation 504 [3]).

TABLE 3/N.10

Limits for the lining-up of 7 kHz sound-programme links

Item	Parameter		Unit	Limits
1	Insertion gain	Adjustment error	dB	± 0.5
		Variation during 24 h	dB	± 0.5
2	Gain/frequency response referred to 0.8 or 1 kHz	0.05 to 0.1 kHz	dB	+ 1
			dB	– 3
		0.1 to 6.4 kHz	dB	± 1
		6.4 to 7 kHz	dB	+ 1
			dB	– 3
3	Group delay/frequency response referred to minimum	0.05 kHz	ms	80
		0.1 kHz	ms	20
		6.4 kHz	ms	5
		7 kHz	ms	10
4	Weighted noise	Idle channel	dBq0ps	– 44
		Programme-modulated	dBq0ps	– 32
5	Single tone interference level + ψ		dBm0s	– 73
6	Disturbing modulation by power supply		dB	– 45
7	Total harmonic distortion	< 0.1 kHz	%	2
		0.1 to 3.5 kHz	%	1.4
8	3rd order difference tone at 0.18 kHz		%	1.4
9	Error in reconstituted frequency		Hz	± 1
10	Intelligible crosstalk ratio	0.05 kHz	dB	53
		0.5 to 3.2 kHz	dB	74
		7 kHz	dB	67
11	Error in amplitude/amplitude response		dB	± 0.5

TABLE 4/N.10

Limits for the lining-up of 6.4 kHz sound-programme links

Item	Parameter		Unit	Limits
1	Insertion gain	Adjustment error	dB	±0.5
		Variation during 24 h	dB	±0.5
2	Gain/frequency response referred to 0.8 or 1 kHz	0.05 to 0.1 kHz	dB	+1
			dB	−3
		0.1 to 5 kHz	dB	±1
		5 to 6.4 kHz	dB	+1
			dB	−3
3	Group delay/frequency response referred to minimum	0.05 kHz	ms	80
		0.1 kHz	ms	20
		5 kHz	ms	5
		6.4 kHz	ms	10
4	Maximum weighted noise level		dBq0ps	−39
5	Single tone interference level at + ψ		dBm0s	−73
6	Disturbing modulation by power supply		dB	−45
7	Total harmonic distortion	< 0.1 kHz	%	2
		> 0.1 kHz	%	1.4
8	3rd order difference tone at 0.18 kHz		%	1.4
9	Error in reconstituted frequency		Hz	±1
10	Intelligible crosstalk ratio	0.05 kHz	dB	74
		0.5 to 3.2 kHz	dB	74
		6.4 kHz	dB	68
11	Error in amplitude/amplitude response		dB	±0.5

TABLE 5/N.10

Limits for the lining-up of 5 kHz sound-programme links

Item	Parameter		Unit	Limits
1	Insertion gain	Adjustment error	dB	±0.5
		Variation during 24 h	dB	±0.5
2	Gain/frequency response referred to 0.8 or 1 kHz	0.7 to 0.2 kHz	dB	+1
			dB	−3
		0.2 to 4 kHz	dB	±1
		4 to 5 kHz	dB	+1
			dB	−3
3	Group delay/frequency response referred to minimum	0.07 kHz	ms	60
		5 kHz	ms	15
4	Maximum weighted noise level		dBq0ps	−32
5	Single tone interference level + ψ		dBm0s	−73
6	Disturbing modulation by power supply		dB	−45
7	Total harmonic distortion	< 0.1 kHz	%	2
		> 0.1 kHz	%	1.4
8	3rd order difference tone at 0.18 kHz		%	1.4
9	Error in reconstituted frequency		Hz	±1
10	Intelligible crosstalk radio	0.07 kHz	dB	57
		0.5 to 3.2 kHz	dB	74
		5 kHz	dB	70
11	Error in amplitude/amplitude response		dB	±0.5

References

[1] CCIR Recommendation *Hypothetical reference circuits for sound-programme transmissions*, Vol. XII, Rec. 502, ITU, Geneva, 1986.

[2] CCIR Recommendation *Estimation of transmission performance of sound-programme circuits shorter or longer than the hypothetical reference circuit*, Vol. XII, Rec. 605, ITU, Geneva, 1986.

[3] CCIR Recommendation *Performance characteristics of 10 kHz type sound-programme circuits*, Vol. XII, Rec. 504, ITU, Geneva, 1982.

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