

RECOMMENDATION 739

**ADDITIONAL METHODS FOR DETERMINING IF DETAILED COORDINATION
IS NECESSARY BETWEEN GEOSTATIONARY-SATELLITE NETWORKS
IN THE FIXED-SATELLITE SERVICE SHARING THE
SAME FREQUENCY BANDS**

(Question 49/4)

(1992)

The CCIR,

considering

- a) that FSS networks may share the same frequency bands;
- b) that these networks may cause and experience mutual interference;
- c) that this mutual interference can be minimized through coordination;
- d) that the method described in Recommendation 738 is very conservative;
- e) that additional methods may be useful to determine if detailed coordination is necessary,

recommends

1. that, to the extent data is available, the following methods be used, by mutual agreement between the administrations concerned, to determine if detailed coordination is necessary:
 - the normalized $\Delta T/T$ method described in Annex 1;
 - the power density-averaging bandwidth method described in Annex 2;
2. that the following Notes should form part of this Recommendation.

Note 1 – The normalized $\Delta T/T$ method for determining the interference level using the normalized values of the apparent increase in equivalent noise temperature, is based on the technique shown in Appendix 29 to the Radio Regulations, appropriately modified to give more accurate results. This approach consists in using a set of predetermined values for $\Delta T/T$ which depends upon the types of wanted and interfering carriers involved, instead of the single 6% value given in Appendix 29.

Note 2 – The power density-averaging bandwidth method is an extension of the Appendix 29 $\Delta T/T$ method that allows the calculation of the interference power for any interfered-with carrier bandwidth. This method may be applied for determining the need for detailed coordination and may also be used in more detailed coordination.

ANNEX 1

**Method of the normalized equivalent noise
temperature of the satellite link**

1. Introduction

This method is based on the technique shown in Appendix 29 to the Radio Regulations and described in Recommendation 738 appropriately modified to give accurate results. To do so, the threshold of 6% used in Appendix 29 is replaced by thresholds which depend on the carriers involved and which meet the CCIR criteria.

2. Normalized values for the relative increase in the admissible equivalent link noise temperature

2.1 Definition

The method involves determining the overall increase in equivalent link noise temperature due to the various types of transmission in the two networks.

The normalized values for the relative increase in equivalent link noise temperature are given by:

$$\left(\frac{\Delta T}{T}\right)_N = \frac{I}{N_0 B_2}$$

where:

N_0 : thermal noise density corresponding to the equivalent noise temperature of the satellite link

I/N_0 : ratio of interfering power to the thermal noise density of the wanted carrier

B_2 : bandwidth defined by the ratio of the interfering carrier power P' to its maximum spectral power density p'_m :

$$p'_m = P'/B_2$$

2.2 Values for various carrier types

The method for computing I/N_0 and $(\Delta T/T)_N$ is given in § 3 to 9.

The calculation method for $(\Delta T/T)_N$ depends on the type of wanted and interfering carriers. Five types are considered:

- FDM-FM,
- SCPC-FM,
- digital SCPC (SCPC-DIG),
- wideband digital (DIG-BB),
- FM-television (FM-TV).

For a given type of wanted carrier and a given type of interfering carrier, the $(\Delta T/T)_N$ value obtained (using the method which corresponds to this pair of carrier types) depends on carrier parameters such as bandwidth and coding.

In order to limit the necessary computations, each general carrier type is broken down into various sub-headings so that, for each pair of carrier types, the carrier parameters no longer affect $(\Delta T/T)_N$ (as long as these parameters lie in the range specified for each type) (see Table 1). Thus $(\Delta T/T)_N$ can be determined simply from the knowledge of the type of the two carriers.

Carriers are classified according to their type.

An initial analysis of the carriers leads to the identification of about 50 different types:

- about 20 FDM-FM, characterized by the number of channels and allocated band,
- several SCPC-FM, characterized by the allocated band,
- about 15 DIG-BB, characterized by the bit rate, type of coding, and number of states,
- several SCPC-DIG, characterized by the bit rate, type of coding, and number of states,
- several FM-TV, characterized by the allocated band and energy dispersal characteristics.

In order to simplify the presentation of the table of thresholds, the 50 types of carriers have been gathered in 12 categories as given in Table 2.

The corresponding values of $\Delta T/T$ for each pair of wanted and interfering categories of types of carriers is given in Table 3.

TABLE 1

Standard carrier types

FDM-FM No.	Type		N/V	B_{oc} (MHz)	f_{min} (kHz)	f_{max} (kHz)	Δf_{st} (kHz)	Δf_m (kHz)
1	12	1.3	12	1.13	12.0	60.0	108.5	159.0
2	12	2.5	12	2.2	12.0	60.0	238.9	350.0
3	24	2.5	24	1.96	12.0	108.0	163.4	275.0
4	60	2.5	60	2.25	12.0	252.0	136.5	276.0
5	72	2.5	72	2.25	12.0	300.0	124.5	261.0
6	60	5.0	60	3.96	12.0	252.0	270.1	546.0
7	132	5.0	132	4.45	12.0	552.0	223.5	529.0
8	192	5.0	192	4.51	12.0	804.0	180.0	459.0
9	96	7.5	96	5.87	12.0	408.0	359.8	799.0
10	192	7.5	192	6.40	12.0	804.0	297.2	758.0
11	252	7.5	252	6.74	12.0	1 052.0	259.7	733.0
12	132	10.0	132	7.50	12.0	552.0	430.0	1 020.0
13	252	10.0	252	8.49	12.0	1 052.0	357.4	1 009.0
14	312	10.0	312	8.96	12.0	1 300.0	320.0	1 005.0
15	252	15.0	252	12.39	12.0	1 052.0	576.4	1 627.0
16	432	15.0	432	12.95	12.0	1 796.0	400.2	1 479.0
17	432	20.0	432	17.99	12.0	1 796.0	615.8	2 276.0
18	612	20.0	612	17.70	12.0	2 540.0	453.7	1 996.0
19	432	25.0	432	20.59	12.0	1 796.0	727.3	2 688.0
20	792	25.0	792	22.34	12.0	3 284.0	498.4	2 494.0
21	972	25.0	972	25.00	12.0	4 028.0	410.0	2 274.0
22	972	36.0	972	35.99	12.0	4 028.0	796.7	4 417.0
SCPCA No.	Type			B_{oc} (kHz)	f_{min} (kHz)	f_{max} (kHz)	Δf (kHz)	
23	0.020		-	20.0	0.3	3.4	5.8	
24	0.025		-	25.0	0.3	3.4	12.0	
25	0.030		-	30.0	0.3	3.4	8.5	
26	0.090		-	90.0	0.3	3.4	3.4	
27	0.180		-	180.0	0.3	3.4	3.3	
SCPCN No.	Type		N/E	B_{oc} (kHz)	Bite rate (kbit/s)			
28	0.064		4	38.0	64.0			
29	0.085		4	50.0	85.0			
30	0.128		4	150.0	128.0			
31	0.256		4	300.0	256.0			
32	0.512		4	600.0	512.0			
NUM-LB No.	Type		N/E	B_{oc} (MHz)	Bite rate (Mbit/s)			
33	2Q		4	1.44	2.048			
34	3Q		4	1.84	3.072			
35	4Q		4	2.25	4.096			
36	8Q		4	5.0	8.448			
37	10Q		4	5.0	10.0			
38	17Q		4	10.2	17.0			
39	25Q		4	18.0	24.6			
40	34Q		4	20.6	34.368			
41	40Q		4	20.0	40.0			
42	50Q		4	25.6	50.0			
43	120Q		4	75.0	120.0			
44	139Q		4	82.0	139.264			
45	147Q		4	110.0	147.0			
FM-TV No.	Type	Δf (MHz)	B_{oc} (MHz)	Δf_{pm} (MHz)	Δf_{pnm} (MHz)	f_{bal} (Hz)		
46	TV.17	4.75	17.5	1.0	2.0	60/30		
47	TV.20	4.8	20.0	1.0	2.0	50		
48	TV.30	6.2	30.0	2.0	4.0	50		
49	TV.35	5.0	30.0	2.0	4.0	50/25		
50	TV.36	11.0	32.0	1.0	2.0	50		

SCPCA : SCPC (analogue)
 SCPCN : SCPC (digital)
 NUM-LB : wideband (digital)
 N/V : number of channels
 N/E : number of states
 B_{oc} : occupied bandwidth

Δf : frequency deviation
 Δf_{pm} : frequency deviation (modulated carrier)
 Δf_{pnm} : frequency deviation (unmodulated carrier)
 f_{bal} : sweep frequency
 Δf_{st} : frequency deviation (signal test)
 Δf_m : frequency deviation (multiplex signal)