RECOMMENDATION ITU-R SA.1262

SHARING AND COORDINATION CRITERIA FOR METEOROLOGICAL AIDS IN THE 400.15-406 MHz AND 1 668.4-1 700 MHz BANDS

(Question ITU-R 144/7)

(1997)

The ITU Radiocommunication Assembly,

considering

a) that data collected by meteorological aids (MetAids) operations is vital to the prediction of life- and property-threatening weather worldwide;

b) that degradation of data collection in excess of established performance criteria will adversely affect meteorological operations worldwide;

c) that other existing systems, terrestrial and space-to-Earth, currently operate in the 400.15-406 MHz and 1 668.4-1 700 MHz bands;

d) that additional services, terrestrial and space-to-Earth, may be considered for allocations in these bands;

e) that Recommendation ITU-R SA.1263 specifies the interference criteria required to calculate sharing and coordination criteria;

f) that sharing and coordination criteria may be calculated using the methodology presented in Recommendation ITU-R SA.1023,

recommends

1 that the single-entry interference levels presented in Table 1 be used as sharing criteria for the determination of permissible levels of interference to the MetAids service operated in the bands 400.15-406 MHz and 1 668.4-1 700 MHz.

TABLE 1

Sharing criteria for MetAids

System and frequency band (MHz)	Interfering power at receiver input to be exceeded for no more than 20% of the time		Interfering power at receiver input to be exceeded for no more than p_1% of the time		Interfering power at receiver input to be exceeded for no more than p_2% of the time	
	Space-to-Earth	Terrestrial	Space-to-Earth	Terrestrial	Space-to-Earth	Terrestrial
Radiosonde radio direction finding (RDF) system 1 668.4-1 700	−158.2 dB(W/1.3 MHz)	−156.4 dB(W/1.3 MHz)	−153.8 dB(W/1.3 MHz), p_1% = 0.167	−150.8 dB(W/1.3 MHz), p_1% = 0.25	−135.4 dB(W/1.3 MHz), p_2% = 0.003	−135.5 dB(W/1.3 MHz), p_2% = 0.004
Radiosonde NAVAID system with directional antenna 400.15-406	−163.7 dB(W/300 kHz)	−161.9 dB(W/300 kHz)	−150.8 dB(W/300 kHz), p_1% = 0.167	−150.7 dB(W/300 kHz), p_1% = 0.25	−140.7 dB(W/300 kHz), p_2% = 0.003	−140.8 dB(W/300 kHz), p_2% = 0.004
Radiosonde NAVAID system with omnidirectional antenna 400.15-406	−164.9 dB(W/300 kHz)	−163.1 dB(W/300 kHz)	−158.3 dB(W/300 kHz), p_1% = 0.167	−157.8 dB(W/300 kHz), p_1% = 0.25	−142.0 dB(W/300 kHz), p_2% = 0.003	−142.1 dB(W/300 kHz), p_2% = 0.004
Dropsonde system 400.15-406	−175.9 dB(W/20 kHz)	−174.1 dB(W/20 kHz)	−162.7 dB(W/20 kHz), p_1% = 0.004	−162.6 dB(W/20 kHz), p_1% = 0.006	−153.4 dB(W/20 kHz), p_2% = 0.003	−153.5 dB(W/20 kHz), p_2% = 0.004
Rocketsonde system 400.15-406	−143.5 dB(W/3.0 MHz)	−141.7 dB(W/3.0 MHz)	−125.9 dB(W/3.0 MHz), p_1% = 0.004	−125.9 dB(W/3.0 MHz), p_1% = 0.006	−125.6 dB(W/3.0 MHz), p_2% = 0.003	−125.3 dB(W/3.0 MHz), p_2% = 0.004

NOTE 1 – Since details of services which could potentially share are unknown, these levels are calculated for a single service provider. Further subdivision to the single emitter level may be performed during the formal coordination process.

NOTE 2 – Sharing and coordination criteria for MetAids are calculated for significant levels: loss of receiver/antenna lock (p_2%), data loss (p_1%), and long-term levels allowing reliable data reception (20%).

ANNEX 1

1 Introduction

The bands 400.15 to 406 MHz (referred to as the 403 MHz bands throughout) and 1 668.4 to 1 700 MHz (referred to as the 1 680 MHz band throughout) are allocated to MetAids on a primary basis. The bands 400.15-403 MHz and 1 670-1 700 MHz are also allocated to the meteorological satellite (METSAT) service on a co-primary basis. The band 400.15-401 MHz is allocated, worldwide, to the mobile-satellite service (MSS) on a co-primary basis and the bands 1 675-1 700 MHz are allocated to the MSS on a co-primary, non-interference basis in ITU Region 2.

The term MetAids is used to describe a variety of types of meteorological equipment: radiosondes, dropsondes and rocketsondes. MetAids are flown worldwide for the collection of upper atmosphere meteorological data for weather forecasts and severe storm prediction, collection of ozone level data, and measurement of parameters for various military applications. The data collected from these flights, or soundings, is of extreme importance for the protection of life and property through the prediction of severe storms and providing vital data for commercial airlines operations.

2 Methodology for calculation of MetAids sharing and coordination criteria

The interference criteria for MetAids are given in Recommendation ITU-R SA.1263 and are presented in Tables 2 and 3. With these values, the sharing and coordination criteria for MetAids can be determined in accordance with Recommendation ITU-R SA.1023.

TABLE 2

Interference criteria for radiosonde systems in the MetAids

Parameter	RDF radiosonde system 1 668.4-1 700 MHz	NAVAID radiosonde system with directional antenna 400.15-406 MHz	NAVAID radiosonde system with omnidirectional antenna 400.15-406 MHz
System reference bandwidth	1.3 MHz	300 kHz	300 kHz
Interference signal power (dBW) in the reference bandwidth to be exceeded no more than 0.02% of the time = $I_{(0.02)}$	–135.3	–140.6	–141.9
Interference signal power (dBW) in the reference bandwidth to be exceeded no more than 1.25% of the time = $I_{(1.25)}$	–148.5	–149.6	–154.4
Interference signal power (dBW) in the reference bandwidth to be exceeded no more than 20% of the time = $I_{(20)}$	–149.4	–154.9	–156.1

TABLE 3

Interference criteria for rocketsonde and dropsonde systems in the MetAids service

Parameter	Dropsonde systems 400.15-406 MHz	Rocketsonde systems 400.15-406 MHz
System reference bandwidth	20 kHz	3 MHz
Interference signal power (dBW) in the reference bandwidth to be exceeded no more than 0.02% of the time = $I_{(0.02)}$	–153.3	–124.9
Interference signal power (dBW) in the reference bandwidth to be exceeded no more than 0.03% of the time = $I_{(0.03)}$	–161.5	–125.5
Interference signal power (dBW) in the reference bandwidth to be exceeded no more than 20% of the time = $I_{(20)}$	–167.1	–134.7

2.1 Initial division of interference criteria.

In accordance with Recommendation ITU-R SA.1023, the long-term allowable interference levels for each type of MetAids systems listed in Tables 2 and 3 must be subdivided between terrestrial services ($I_{t(20)}$) and space-to-Earth paths ($I_{s(20)}$). Since long-term interference is present for large percentages of time (the levels from terrestrial services and from space-to-Earth will both be present simultaneously for large percentages of time), the interference is divided on a power basis. Subdivision is accomplished using equations (1a) and (1b) of Recommendation ITU-R SA.1023. For the 403 MHz and 1 680 MHz band, the power will be subdivided such that 40% is attributed to space-to-Earth paths, and 60% will be apportioned to terrestrial paths. The long-term interference criteria for the terrestrial services and the space-to-Earth paths are presented in Table 4.

TABLE 4

Terrestrial and space-to-Earth long-term interference criteria

System type	A_s (%)	$I_{s(20)}$	A_t (%)	$I_{t(20)}$
1 680 MHz RDF	40	–153.4 dB(W/1.3 MHz)	60	–151.6 dB(W/1.3 MHz)
403 MHz NAVAID with directional antenna	40	–158.9 dB(W/300 kHz)	60	–157.1 dB(W/300 kHz)
403 MHz NAVAID with omni-directional antenna	40	–160.1 dB(W/300 kHz)	60	–158.3 dB(W/300 kHz)
403 MHz dropsonde	40	–171.1 dB(W/20 kHz)	60	–169.3 dB(W/20 kHz)
403 MHz rocketsonde	40	–138.7 dB(W/3.0 MHz)	60	–136.9 dB(W/3.0 MHz)

The short-term interference criteria associated with loss of lock and loss of data must then be calculated using equations (2a) and (2b) of Recommendation ITU-R SA.1023. Since short-term interference from the two services is mutually uncorrelated (short-term interference occurs for only very small percentages of time, and the probability of short-term interference from the two services occurring simultaneously is negligible), the short-term criteria are divided on a time basis. Since the probability of long-term levels being present during periods of short-term interference is high, the long-term level must be subtracted from the short-term level in this calculation. For the 403 MHz and 1 680 MHz bands, the time will be subdivided such that 40% is apportioned to space-to-Earth paths, and 60% will be apportioned to terrestrial paths. The results of the short-term subdivision are presented in Table 5.

TABLE 5

Short term terrestrial and space-to-Earth interference criteria

System type		P_s (%)	$I_{s(ps)}$	P_t (%)	$I_{t(pt)}$
1 680 MHz RDF	Lock loss	0.008	–135.4 dB(W/1.3 MHz)	0.012	–135.4 dB(W/1.3 MHz)
	Data loss	0.5	–151.4 dB(W/1.3 MHz)	0.75	–150.2 dB(W/1.3 MHz)
403 MHz NAVAID with directional antenna	Lock loss	0.008	–140.7 dB(W/300 kHz)	0.012	–140.7 dB(W/300 kHz)
	Data loss	0.5	–150.4 dB(W/300 kHz)	0.75	–150.1 dB(W/300 kHz)
403 MHz NAVAID with omnidirectional antenna	Lock loss	0.008	–142.0 dB(W/300 kHz)	0.012	–142.0 dB(W/300 kHz)
	Data loss	0.5	–156.7 dB(W/300 kHz)	0.75	–155.8 dB(W/300 kHz)
403 MHz dropsonde	Lock loss	0.008	–153.4 dB(W/20 kHz)	0.012	–153.4 dB(W/20 kHz)
	Data loss	0.012	–162.3 dB(W/20 kHz)	0.018	–162.0 dB(W/20 kHz)
403 MHz rocketsonde	Lock loss	0.008	–125.2 dB(W/3.0 MHz)	0.012	–125.1 dB(W/3.0 MHz)
	Data loss	0.012	–125.8 dB(W/3.0 MHz)	0.018	–125.7 dB(W/3.0 MHz)

2.2 Calculation of single entry criteria

In accordance with Recommendation ITU-R SA.1023, single entry criteria are normally calculated for individual emitters. Since the exact characteristics of the systems which could potentially be sharing in these bands is not known, the single entry levels will be calculated for a single system rather than emitter. Subdivision of the levels for individual emitters can be accomplished in the formal coordination process. In order to divide the interference into individual systems, the number of terrestrial systems, n_t, and the number of space-to-Earth, n_{s-E}, systems must be estimated. For both bands it will be assumed that three terrestrial systems may be present ($n_t = 3$) and three space-to-Earth systems may be present ($n_{s-E} = 3$). The long-term interference is subdivided on a power basis since long-term levels are mutually correlated; and is calculated using equation (3) of Recommendation ITU-R SA.1023. Since the short-term levels can be assumed to be mutually uncorrelated, the short-term levels are subdivided on a time basis. The long-term level will also be present for large percentages of time and must be subtracted from the short-term level. This division is performed using equations (4a) and (4b) of Recommendation ITU-R SA.1023. The short-term and long-term single entry (single service) criteria are calculated in accordance with Recommendation ITU-R SA.1023 and presented in Tables 6 and 7.

TABLE 6

Long term single system entry criteria*

System type	$I'_{s(20)}$	$I'_{t(20)}$
1 680 MHz RDF	–158.2 dB(W/1.3 MHz)	–156.4 dB(W/1.3 MHz)
403 MHz NAVAID with directional antenna	–163.7 dB(W/300 kHz)	–161.9 dB(W/300 kHz)
403 MHz NAVAID with omnidirectional antenna	–164.9 dB(W/300 kHz)	–163.1 dB(W/300 kHz)
403 MHz dropsonde	–175.9 dB(W/20 kHz)	–174.1 dB(W/20 kHz)
403 MHz rocketsonde	–143.5 dB(W/3.0 MHz)	–141.7 dB(W/3.0 MHz)

* Since details of systems which could potentially share are unknown, these levels are calculated for a single system. Further subdivision to the single emitter level may be performed during the formal coordination process.

TABLE 7

Short term single system entry criteria*

System type		P'_s (%)	$I'_{s(p's)}$	P'_t (%)	$I'_{t(p't)}$
1 680 MHz RDF	Lock loss	0.003	–135.4 dB(W/1.3 MHz)	0.004	–135.5 dB(W/1.3 MHz)
	Data loss	0.167	–153.8 dB(W/1.3 MHz)	0.25	–150.8 dB(W/1.3 MHz)
403 MHz NAVAID with directional antenna	Lock loss	0.003	–140.7 dB(W/300 kHz)	0.004	–140.8 dB(W/300 kHz)
	Data loss	0.167	–150.8 dB(W/300 kHz)	0.25	–150.7 dB(W/300 kHz)
403 MHz NAVAID with omnidirectional antenna	Lock loss	0.003	–142.0 dB(W/300 kHz)	0.004	–142.1 dB(W/300 kHz)
	Data loss	0.167	–158.3 dB(W/300 kHz)	0.25	–157.8 dB(W/300 kHz)
403 MHz dropsonde	Lock loss	0.003	–153.4 dB(W/20 kHz)	0.004	–153.5 dB(W/20 kHz)
	Data loss	0.004	–162.7 dB(W/20 kHz)	0.006	–162.6 dB(W/20 kHz)
403 MHz rocketsonde	Lock loss	0.003	–125.6 dB(W/3.0 MHz)	0.004	–125.3 dB(W/3.0 MHz)
	Data loss	0.004	–125.9 dB(W/3.0 MHz)	0.006	–125.9 dB(W/3.0 MHz)

* See Table 6.