RECOMMENDATION ITU-R M.1318-1

Evaluation model for continuous[1] interference from radio sources other than in the radionavigation-satellite service to the radionavigation-satellite service systems and networks operating in the 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz bands

(Question ITU-R 217/8)

(2005-2007)

Scope

This Recommendation provides a model for use in the initial evaluation of the potential for radio sources other than in the radionavigation-satellite service to cause continuous[1] interference to a radionavigation-satellite system or network operating in the 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz bands.

The ITU Radiocommunication Assembly,

considering

a) that the radionavigation-satellite service (RNSS) provides, in some of the above bands, radionavigation that can be used for safety and regularity of flight;

b) that radio transmitters generally emit a level of out-of-band emissions dependent on the conditions of their use;

c) that while Appendix 3 of the Radio Regulations (RR) specifies the maximum permitted spurious emission power levels, it also notes that in some cases, these levels may not provide adequate protection for receiving stations in space services and more stringent levels might be considered in each individual case in the light of the geographical position of the stations concerned, and that these levels may not be applicable to systems using digital modulation techniques;

d) that the bands 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz are also allocated on a primary or secondary basis to other services besides RNSS services;

e) that emissions from other RNSS systems and networks, and from other services and sources in the bands allocated for RNSS, as well as unwanted emissions, may cause interference to an RNSS system's or RNSS network's receivers and should be included in an interference evaluation,

noting

a) that several Recommendations, currently under revision by ITU-R, provide technical data and protection criteria for RNSS system and network operations;

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[1] Continuous interference is used here to mean interference from sources of fairly constant power that is generally present at all times. This is distinguished from pulsed type interference which requires a separate analysis based on pulse duration, peak power and duty cycle. A future recommendation addressing pulsed interference is the subject of further study in the ITU-R.

recognizing

a) that RR No. 4.10 states that "the safety aspects of radionavigation require special measures to ensure their freedom from harmful interference";

b) that RR No. 4.5 states "the frequency assigned to a station of a given service shall be separated from the limits of the band allocated to this service in such a way that, taking account of the frequency band assigned to a station, no harmful interference is caused to services to which frequency bands immediately adjoining are allocated",

recommends

1 that the analytic model in Annex 1 to this Recommendation should be used for the preliminary evaluation of the potential for continuous interference from radio sources other than in the RNSS to an RNSS system or network operating in the bands 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz, or 5 010-5 030 MHz;

2 that if this model indicates that there is a potential for continuous interference that would impair the ability of RNSS systems or networks to function, then a more detailed analysis may be required.

Annex 1

Model for the evaluation of continuous[1] interference levels to radionavigation-satellite service receivers operating in the frequency bands 1 164-1 215, 1 215-1 300, 1 559-1 610 and 5 010-5 030 MHz

Step 1: Evaluation of the aggregate non-RNSS interference level tolerable at receiving antenna's output (depends on RNSS system design)

Parameter	Comments
a) Maximum aggregate non-RNSS interference power density specified for the receiver (dB(W/Hz))	RNSS receiver rated maximum value of non-RNSS interference power density referenced to its passive antenna terminals at which performance requirements for necessary operations are met. Not to include RNSS self interference or interference from other RNSS networks. Safety service RFI to be handled on a case-by-case basis. For example, RR No. 5.328 states that RNSS in the band 1 164-1 215 MHz cannot claim protection from interference from ARNS (DME beacons) sharing the band. As such, the RNSS receiver RFI threshold for that band should account for that RFI source.
b) Protection margin (dB)	To ensure protection as provided by RR No. 4.10
c) Aggregate non-RNSS interference power density level tolerable at receiver (dB(W/Hz))	Maximum tolerable non-RNSS interference power density level, $c = a - b$

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Step 2: Interference level from non-RNSS interference sources, excluding the interferer under consideration

Parameter	Comments
d) Interference power density level at receiving passive antenna output from all non-RNSS sources (dB(W/Hz))	Inside the RNSS receiver passband. Not to include RNSS self interference or interference from other RNSS networks

Step 3: Calculation of the maximum tolerable emission power density level for the interferer under consideration at a specified distance from the RNSS receiver

Parameter	Comments
e) RNSS receiver passive antenna gain towards the interference signal including polarization loss (dBi)	None
f) Nominal path loss between antenna and interference source (dB)	Propagation loss between the RNSS receiver antenna and the interference source: 20 log (frequency (MHz)) + 20 log (distance (m)) – 27.55
g) Maximum tolerable power density level for the interferer at the distance from the RNSS receiver specified (dB(W/Hz))	$g = 10 \log(10^{c/10} - 10^{d/10}) - e + f$ If this power is exceeded at the specified distance from the RNSS receiver, further analysis is required. A more detailed analysis could address dynamics, modulation and access types as a minimum. If the interferer in Step 3 consists of a collection of similar sources distributed about a nominal location, then the procedure must be modified to account for an aggregation factor in addition to the receiver antenna gain and path loss to find the maximum individual source emission.