

RECOMMENDATION ITU-R F.1613^{*,**}

Operational and deployment requirements for fixed wireless access systems in the fixed service in Region 3 to ensure the protection of systems in the Earth exploration-satellite service (active) and the space research service (active) in the band 5 250-5 350 MHz

(Questions ITU-R 113/9 and 218/7)

(2003)

The ITU Radiocommunication Assembly,

considering

- a) that the frequency band 5 250-5 350 MHz is allocated to the Earth exploration-satellite service (EESS) (active) and space research service (SRS) (active) for spaceborne active sensors and to the radiolocation service on a primary basis;
- b) that the allocations in the frequency band 5 250-5 350 MHz will be reviewed by WRC-03 under agenda item 1.5 with a view to allocating this band to the fixed service in Region 3 on a primary basis;
- c) that some administrations in Region 3 have proposed using the band 5 250-5 350 MHz for licence-based fixed wireless access (FWA) systems in the fixed service;
- d) that these FWA systems operating outdoors may cause unacceptable interference to the EEES/SRS (active) in the above band;
- e) that there is a need to specify operational and deployment requirements for FWA systems in Region 3 in order to protect spaceborne active sensor systems,

* This Recommendation was developed jointly by Radiocommunication Study Groups 7 and 9, and any future revision will also be undertaken jointly.

** This Recommendation should be brought to the attention of Radiocommunication Study Groups 7 and 8.

noting

- a) that the interference from EESS/SRS (active) systems into FWA systems with the characteristics described in Annex 1 is considered to be acceptable,

recognizing

- a) that it is difficult for FWA and other types of wireless access systems (including radio local area networks (RLANs)) to operate simultaneously on a co-coverage, co-frequency basis,

recommends

- 1 that the aggregate interference from FWA systems (sum of the directional e.i.r.p. towards the satellite) should be smaller than -7.6 dB(W/20 MHz) at the Earth's surface within the footprint of the active sensor of the EESS/SRS satellite (see Notes 1, 2 and 3);

- 2 that the methodology described in Annex 1 should be used to assess the aggregate interference level from FWA systems;

- 3 that, based on the FWA system characteristics presented in Table 4 for Region 3, a maximum density of 23 FWA base stations per 220 km^2 should be allowed within a satellite active sensor footprint. Variation of the maximum e.i.r.p., antenna pattern and frequency planning would imply a variation in the maximum allowed density of FWA base stations;

- 4 that the maximum e.i.r.p. of each FWA station should be no more than 3 dB(W/20 MHz) (see Notes 4 and 5);

- 5 that administrations should control these systems to ensure that the deployment requirements for FWA systems specified in the above *recommends* are satisfied.

NOTE 1 – This aggregate interference level is derived from the interference threshold of -132.35 dB(W/20 MHz) at the satellite receiver specified for the SAR4 in Table 5.

NOTE 2 – The footprint of the active sensor of the EESS/SRS the satellite referred to here has an area of about 220 km^2 .

NOTE 3 – The aggregate interference from FWA systems toward the spaceborne active sensor satellite depends on such parameters as transmit power of the FWA systems, the antenna directivity and the number of the FWA base stations using the same RF channel within the satellite active sensor footprint.

NOTE 4 – If the main beam direction is above 10° in elevation, a 6 dB lower e.i.r.p. limit should apply, i.e. a maximum e.i.r.p. of -3 dB(W/20 MHz).

NOTE 5 – The direction of FWA station antennas should be controlled in order to avoid accidental direct illumination to the satellite due to misalignment of antenna direction, for example, a remote station not pointing towards the base station.

NOTE 6 – Additional guidance should be developed in order to facilitate the application of this Recommendation. This matter requires further study.

Annex 1

Frequency sharing between FWA systems and spaceborne active sensor systems in the EESS (active) and the SRS (active) in the band 5 250-5 350 MHz

1 Introduction

The frequency band 5 250-5 350 MHz is considered to be suitable for FWA systems in the fixed service to provide high-speed Internet or other multimedia service applications. Since the frequency band is allocated in the ITU Radio Regulations to the EESS (active) and the SRS (active) on a worldwide basis, sharing feasibilities between FWA systems and systems in the EESS/SRS (active) needs to be determined.

In this frequency band various types of spaceborne synthetic aperture radar (SAR), spaceborne radar altimeter and spaceborne scatterometer systems in the EESS/SRS (active) are operating.

This Annex deals with sharing consideration between FWA systems and these spaceborne active sensors, using typical system parameters that are currently available or being considered in the developmental stage.

2 Technical characteristics of spaceborne active sensors

Technical characteristics of spaceborne active sensors in the 5 250-5 350 MHz are given in Tables 1 to 3.

TABLE 1

5.3 GHz typical spaceborne SAR characteristics

Parameter	Value		
	SAR2	SAR3	SAR4
Orbital altitude (km)	600 (circular)	400 (circular)	
Orbital inclination (degrees)	57		
RF centre frequency (MHz)	5 405	5 305	5 300
Peak radiated power (W)	4 800	1 700	
Polarization	Horizontal and vertical (HH, HV, VH, VV)		
Pulse modulation	Linear FM chirp		
Pulse bandwidth (MHz)	310		40
Pulse duration (μs)	31	33	

TABLE 1 (*end*)

Parameter	Value		
	SAR2	SAR3	SAR4
Pulse repetition rate (pps)	4 492	1 395	
Duty cycle (%)	13.9	5.9	
Range compression ratio	9 610	10 230	1 320
Antenna type (m)	Planar phased array 1.8 × 3.8	Planar phased array 0.7 × 12.0	
Antenna peak gain (dBi)	42.9	42.7/38 (full focus/beamspoiling)	
Antenna median side-lobe gain (dBi)	−5		
Antenna orientation (degrees)	20-38 from nadir	20-55 from nadir	
Antenna beamwidth	1.7 (El), 0.78 (Az)	4.9/18 (El), 0.25 (Az)	
Antenna polarization	Linear horizontal/vertical		
Receiver noise figure (dB)	4.62		
Receiver front end 1 dB compression point referred to receiver input	−62 dBW input		
Receiver input maximum power handling (dBW)	+7		
Operating time	30% of the orbit		
Minimum time for imaging (s)	15		
Service area	Land masses and coastal areas		
Image swath width (km)	20	16/320	
Footprint (km²)	159.03	76.5	76.5-220
Receiver bandwidth (MHz)	356.5		46.00
Interference threshold (dB)	I/N = −6		

TABLE 2

5.3 GHz typical spaceborne altimeter characteristics

Jason mission characteristics	
Lifetime	5 years
Altitude (km)	1 347 ± 15
Inclination (degrees)	66
Poseidon 2 altimeter characteristics	
Signal type	Pulsed chirp linear frequency modulation
C band PRF (Hz)	300
Pulse duration (µs)	105.6
Carrier frequency (GHz)	5.3
Bandwidth (MHz)	320
Emission RF peak power (W)	17
Emission RF mean power (W)	0.54
Antenna gain (dBi)	32.2
3 dB aperture (degrees)	3.4
Side-lobe level/Maximum (dB)	−20
Back-side-lobe level/Maximum (dB)	−40
Beam footprint at −3 dB (km)	77
Interference threshold (dBW)	−118

TABLE 3

5.3 GHz typical spaceborne scatterometer characteristics

Parameter	Value	
System name	Scatterometer 1	Scatterometer 2
Orbital altitude (km)	780	800
Inclination (degrees)	81.5	
Centre frequency (GHz)	5.3	5.255
Pulse width	70 µs (mid) 130 µs (fore/aft)	8 ms (mid) 10.1 ms (fore/aft)
Modulation	Interrupted CW	Linear FM (chirp)
Transmitter bandwidth (kHz)	15	500
PRF (Hz)	115 (mid) 98 (fore/aft)	29.4
Antenna type	Slotted waveguide	