

**Results of theoretical compatibility studies**

▪ Aggregate interference

Calculation 1: **maximum tolerable density/or number of active UWB transmitters**

	FCC limits (-41.3 dBm/MHz)	
Maximum active UWB transmitters	34 Millions in a area covered by a zonal beam	For FSS, GSO-satellite based methodologies
Maximum active UWB transmitters	400 Millions in a area covered by a global beam	For FSS, NTIA methodologies
Maximum density of active UWB transmitters	885 /km <sup>2</sup>	For MSS feeder links, GSO-satellite based methodologies
Maximum density of active UWB transmitters	1686/km <sup>2</sup>	For MSS feeder links, NTIA methodologies

**7.11.2.2 Conclusions**

Preliminary results indicate that the aggregate interference into the satellite receiver is unlikely to be problematic and no changes to UWB e.i.r.p limits are proposed.

**7.12 Amateur/Amateur Satellite Services**

**7.12.1 Summary table**

Victim Service	Radiocommunication
	Amateur ( Satellite) service

- Application  
System description      Receiver stations in the Amateur (Satellite) Service
- Frequency band  
A. 5650-5850 MHz (taken as main example)  
B. 3400-3500 MHz  
C. 2300-2450 MHz  
D. 1260-1300 Mhz  
X. 10000-10500 MHz
- Receiver station  
Station description      Low noise narrow band receiver
- Receiver characteristics  
Bandwidth                      3 kHz or 500 Hz  
Noise figure / Noise temperature                      1 dB  
Signal model                      Signals to be received are SSB-Telephony and/or morse telegraphy
- Receiver antenna  
Type                                  Parabolic dish  
Gain                                  A. 30 dBi boresight/ 0 dBi off boresight  
    B. 27 dBi boresight/ 0 dBi off boresight  
    C. 25 dBi boresight/ 0 dBi off boresight  
    D. 22 dBi boresight/ 0 dBi off boresight  
    X. 33 dBi boresight/ 0 dBi off boresight
- Model                                  -

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>Protection requirement</li> <li>Criterion</li> </ul> | <p>The receiver systems noise shall not increase by more than 1 dB due to the interfering UWB signal</p> <p>The “reference/protection distance” between the UWB device is 10 meter</p> |
|---|--|

**Interference scenario & methodology**

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|--|---|
| <ul style="list-style-type: none"> <li>UWB characteristics</li> <li>PSD limit</li> </ul> | <p>As currently considered in the compatibility study</p> <p>A and B. -41.3 dBm/MHz (FCC limit and sloped mask)</p> <p>C. -61.3 dBm/MHz outdoor</p> <p>D. -85.5 dBm/MHz outdoor</p> <p>X. -41.3 dBm/MHz</p> |
|--|---|
  
- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>Activity factor</li> <li>Category B - Single entry</li> </ul> | <p>Single interferer; 100 % activity</p> |
|--|--|
  
- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>Single interferer</li> <li>Methodology</li> <li>Propagation model</li> <li>Mitigation techniques</li> <li>Receiver antenna not directed towards UWB device</li> </ul> | <p>Minimum Coupling Loss (MCL)</p> <p>Free space</p> <p>-</p> |
|--|---|

**Result:**

**Required UWB emission limit** to ensure given protection distance(s)

Protection distance:	10 m	
	A. 5,65-5.85 GHz	Eirp max -51 dBm/MHz
	B. 3,4 – 3,5 GHz	Eirp max - 55 dBm/MHz
	C. 2,3 – 2,45 GHz	Above spectrum mask
	D. 1,26 – 1,3 GHz	Above spectrum mask
	X. 10 – 10.5 GHz	Eirp max -46 dBm/MHz

**7.12.2 Conclusion**

The interference criterion for Amateur Service Receivers is < 1 dB increase of the receiver noise level at a “protection distance” of 10 meter.

The impact of a single UWB device deployed in closest vicinity of the Amateur Station in the 5,7 GHz range is analysed. The separation distance is computed for an increase in the receiver noise level of 1 dB. Assuming the “FCC mask” or the proposed European “sloped mask”, separation distances are required of at least 33 meter. In order to arrive at the required protection level at a distance of 10 meters the max eirp of the UWB device shall be not more than -51 dBm/MHz. For the 10 GHz band the values are respectively 19 meter and -46 dBm/MHz. For the 3,4 GHz band the values are respectively 55 meter and -55 dBm/MHz. Due to the fall of of the UWB spectrum mask below 3 GHz no interference in the 2,4 and 1,3 GHz amateur band will be encountered in the model situation.

**7.13 Maritime mobile service and maritime radionavigation service including Global Maritime Distress and Safety System**

**7.13.1 Summary table**

The radiocommunication systems and radionavigation systems used on ships and by shore stations have been considered as shown in the table. Cospas-Sarsat and Inmarsat systems which are widely used on ships have not however been included as these are covered elsewhere. Similarly the RNSS which is widely used on ships has not been included as this is also covered elsewhere. Two protection distances have been used – 10m in consideration of the case of UWB devices carried onboard a ship and 300m in consideration of UWB devices on the shore.

**TABLE 1**