|  |  |
| --- | --- |
|  | ECC PT1(21)006 |
| ECC PT1 #67 |
| Web meeting, 19-21 and 26-28 January 2021 |
|  |
| Date issued:  | 11 December 2020 |
| Source:  | France |
| Subject:  | Protection of radio altimeters from 5G/MFCN in the band 3.4-3.8 GHz |
| Group membership required to read? (Y/N)N |
|  |
| Summary:  |
| The recent RTCA Report1 has showed the risk of interference from MFCN (5G in the 3.5 GHz) into radioaltimeters operated in the frequency band 4 200- 4 400 MHz, As agreed, there is a need to have more thorough assessment of the risk of interference and to clarify the assumptions to be used, beyond the elements given in the RTCA Report1 and taking into account potential recommendations from EASA.The issue is clearly European since same radioaltimeters are used in Europe and worldwide and 5G in the 3.5 GHz is subject to European (CEPT and EC) harmonisation measures. As follow up action to initial discussion that took place at the last ECC, ECC/PT1, which has already started to address the risk of interference from 5G unwanted emissions into radio altimeters should complete urgently its analysis and include also radio altimeter blocking as an interference mechanism.  |
| Proposal: |
| France invites ECC/PT1 to study, as a matter of urgency and taking into account the safety aspect, the risk of interference from 5G in the 3.5 GHz band into radio altimeters, taking into accountThat, as demonstrated in the RTCA report1, the blocking of radio altimeter has a highest interference potential compared to the effect of 5G OOBThat it is necessary for the aeronautical community to provide measurement of interference threshold(s) of various radio altimeters in the widest spectrum range, including 3.4-3.8 GHz, for all aeronautical use case scenarios, including also helicopters and small aircrafts.That EASA may provide some elements/recommendations for the protection of radio altimetersThat the mobile industry (vendors, operators) needs to provide technical characteristics on the 5G base stations: elements on tilt scanning range, antenna pattern including grating lobes if any in band and in unwanted domain as well as unwanted emissions mask to be used in the studiesThat any measures taken by countries outside Europe for the protection of radio altimeter should be analysedBased on these studies, some measures for the protection of radio altimeters may be recommended for a transitional period, until the aeronautical community ensure any relevant retrofit of radio altimeters which present a high susceptibility to interference.  |
| Background: |
| **Initial ECC PT1 investigations** * ECC PT1(20)172 ANNEX VIII-16\_LS to ETSI on radio altimeters
* ECC(20)100\_Report from ECC PT1 –section 5

The risk of interference from 5G in the 3.5 GHz band into radio altimeter has initially not been studied by ECC/PT1 taking into account the large frequency separation (>400 MHz). Concerns about potential high level of unwanted emissions in the 4.2-4.4 GHz was raised during the ECC meeting in July 2020 and ECC/PT1, in September, concluded that the spurious limit of -30 dBm/MHz should apply in the band 4.2-4.4 GHz. **Radio altimeters issue in France**Authorizations in the band 3.4-3.8 GHz for 5G/MFCN in France mainland have been issued by Arcep on 12th November 2020. Taking into account the additional concerns expressed by the civil aviation on the basis of the RTCA Report[[1]](#footnote-2), published on 8th October and showing that some radio altimeters exhibit a low blocking level, some immediate measures (see annex 1) have been defined in France until the issue can be more thoroughly studied.  |

**ANNEX 1**

**Immediate measures for the protection of radioaltimeters (RA)**

1. **List of measures**

Three measures have been decided for the protection of radio altimeters (RA):

1. Operators must implement only downward tilting
2. Operators have to take measures to avoid grating lobes as far as practicable
3. Special protection zone have been defined around airports

Measures 1 and 3 are verified by ANFR on the basis of the information provided by operators and in close cooperation with the Civil aviation and with the operators.

1. **Definition of the protection zones**

Two kind of protection zones have been defined:

* “zones de sécurité” (safety zone) around the airport for the protection of the RA in the phase where the aircraft is below 200 ft (61 m), based on the following assumptions :
	+ 3° slope with a tolerance of 0.375° (ie 2.625°). Therefore the aircraft may be below 200 ft on a line corresponding to the runway extended by 1130 m each side (1330 m from the touchdown point).
	+ Base station maximum eirp.
	+ 6 dB safety margin
	+ 0 dBi maximum RA antenna gain below 3.8 GHz (RTCA Report)
	+ -19 dBm interference threshold (RTCA Report Cat.1 @200 ft)
	+ The rectangular safety zone has a width on each side of the runway (protection distance) calculated with these assumptions and a length extended by 1330 m + the protection distance
* “zones de precaution” (precautionary zone) on each side of the “zones de sécurité” to protect the landing approach below 1000 ft (305 m), based on the following assumptions :
	+ 3° slope with a tolerance of 0.375° (ie 2.625°) and a vertical margin of 80 m, ie, the aircraft will be at 1000 ft from the ground at 8393 m from the touchdown point (8193 from runway edge)
	+ Lateral tolerance assumed to be 91 m
	+ Base station maximum TRP
	+ BS antenna gain :
		- Envelope provided by the operator
		- In the absence of the envelope from the operator, the maximum grating lobes is taken as 18 dBi, as per ITU-R draft characteristics for AAS in the band 3-6 GHz, 54° vertical beamwidth and 0.9 wavelength for V for rural and suburban macro stations (Att.4 of ITU-R WP5D Chairman Report), as well as within 3GPP
	+ No safety margin
	+ 0 dBi maximum RA antenna gain below 3.8 GHz (RTCA Report)
	+ -26 dBm interference threshold (RTCA Report Cat.1 @1000 ft), with logarithmic interpolation between 200 ft and 1000 ft
	+ The rectangular precautionary zone has a width on each side of the runway calculated by adding the horizontal projection of the these assumptions and a length extended by 1330 m from touchdown (1130 from runway edge) + the protection distance

The precautionary zone does not apply in the case where calculations based on the antenna gain envelope provided by the operator and worst case location of BS outside the safety zone shows that the RA remains protected under the above assumptions.

These two zones are described in figure 1 for the following assumptions of 78 dBm eirp and 53 dBm TRP, and in the absence of any antenna gain envelope from the operator.



Figure 1 : safety zone and precautionary zone

1. **Impact of these immediate measures**

For the time being, under these immediate measures, about 96% of 3.5 GHz 5G stations declared by the operators have been accepted. Some work is ongoing with each operator to take into account at best the envelope they declared in order to accept more stations in the precautionary zones.

1. <https://www.rtca.org/wp-content/uploads/2020/10/SC-239-5G-Interference-Assessment-Report_274-20-PMC-2073_accepted_changes.pdf> [↑](#footnote-ref-2)