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| Working Group FM |  |

Doc. SE(19)102

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| To |  | |
| Mr Jérôme André  Chairman WG SE  Mail: [jerome.andre@anfr.fr](mailto:jerome.andre@anfr.fr)    **Cc:**  Mr Petteri Jokela  Chairman of WG SE 7  Mail: [petteri.jokela@traficom.fi](mailto:petteri.jokela@traficom.fi)  Cc:  Mr Steve Green  Chairman of ECC PT1  Mail: [steve.green@ofcom.org.uk](mailto:steve.green@ofcom.org.uk) | | |
| Date | Enclosures | |
| 07 June 2019 | --- | |
| Our reference | Your reference | |
| WGFM#94 | WI SE7\_31 | |
| Subject |  | |
| Studies needed on Unmanned Aircraft Systems (UAS) in the 1880-1900 MHz, 1900-1920 MHz and 5000-5010 MHz bands | |  |

Dear Jérôme,

WG FM at its 94th meeting in June 2019 decided to amend the liaisons statement already sent to you in February 2019.

WG FM would like to request WG SE to perform technical studies related to UAS in the 1880-1900 MHz, 1900-1920 MHz and 5000-5010 MHz bands:

The governmental use of Command and Control (C2 link) as well as payload systems by UAS in the 1880-1900 MHz and 1900-1920 MHz bands;

The commercial use of C2 link by UAS in the 1900-1920 MHz and 5000-5010 MHz bands.

**Technical studies to be performed:**

1. Governmental C2 link and payload in 1880 - 1900 MHz and 1900 - 1920 MHz

a. Technical parameters to be considered in compatibility studies for Governmental UAS in both candidate bands

It is assumed that the C2 link and payload are working permanently during the operational mission, including flight information and quality of service about link budget (QoS). For the technical studies, LTE technology in TDD mode should be taken into account, without precluding other technologies. The C2 link and payload (data) are on the same link.

Also receiver or antenna diversity is commonly used.

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| **Technical parameters to be considered in compatibility studies (LTE based)** | | | | |
|  | Ground Station | | Aerial Vehicle | |
| Transmitter |  | | | |
| Emission power max | 1 W (30 dBm), transmit power control | | | |
| Frequency band (MHz) | 1880 to 1920 | | | |
| Antenna |  | | | |
| Antenna gain (dBi): long range (10 km) / short range (1.5 km) | 5 / 2 | | 5 / 2 | |
| EIRP (dBm): long range / short range | | 35 / 32 | | 35 / 32 |
| C2 link & Payload | | | | |
| Bandwidth (MHz) | 5/10 | | | |

Operating range: A radius of 1.5 km (short range) or 10 km (long range) with a maximum flight altitude of 150m above ground level

One set of possible scenarios for technical studies are:

- 15 MHz for 3 drones operating at the same time (5 MHz bandwidth C2 link & Payload for each drone)

- 20 MHz for 3 drones operating at the same time as follows: 2 drones (5 MHz bandwidth C2 link & Payload for each drone) and one drone (10 MHz bandwidth C2 link & Payload)

b. Frequency band 1880-1900 MHz

Coexistence with DECT

Coexistence with IMT below 1880 MHz

Coexistence with FRMCS above 1900 MHz, UK: PPDR solution in 1900-1910 MHz

c. Frequency band 1900-1920 MHz

At this stage, it is understood that FRMCS and UAS are under investigation.

1905-1915 MHz; note that ECC Report 220 indicates that airborne use in 1915-1920 MHz is difficult (MFCN BS Rx above 1920 MHz).

- Coexistence with MFCN

Coexistence of UAS on MFCN BS receiving above 1920 MHz

Realistic performance values should be used with regard to out-of-band filtering capability below 1920 MHz of MFCN BS

Coexistence of MFCN UE above 1920 MHz and UAS CC

- Coexistence with other adjacent applications

Coexistence with DECT below 1900 MHz  
Review of the compatibility study performed in CEPT Report 39 - Annex 3 with DECT below  
1900 MHz

Coexistence with governmental UAS below 1900 MHz (C2 and payload)

Based on the Mandate, RSCOM18-05, adjacent channel compatibility between FRMCS and UAS in 1900-1920 MHz.

1. Commercial C2 link in 1900 - 1920 MHz

Take the same considerations regarding the use in this band and in the adjacent bands as in for the Governmental Drones in this frequency band into account.

1. Commercial C2 link in 5000 - 5010 MHz

This band is foreseen for UAS of the specific category only.

Certified category have to use AM(R)S or AMS(R)S bands.

Depending on Specific Operations Risk Assessment (SORA) result, Specific category UAS may have to use an AM(R)S or AMS(R)S frequency band such as 5030 - 5091MHz. Therefore, a band next to an use AM(R)S or AMS(R)S band could be beneficial.

Studies with the following services are considered necessary.

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| 4990 MHz - 5000 MHz  ECA :  [5.149](javascript:displayFootnote('In%20making%20assignments%20to%20stations%20of%20other%20services%20to%20which%20the%20bands:13360-13410%20kHz,25550-25670%20kHz,37.5-38.25%20MHz,73-74.6%20MHz%20in%20Regions%201%20and%203,150.05-153%20MHz%20in%20Region%201,322-328.6%20MHz,406.1-410%20MHz,608-614%20MHz%20in%20Regions%201%20and%203,1330-1400%20MHz,1610.6-1613.8%20MHz,1660-1670%20MHz,1718.8-1722.2%20MHz,2655-2690%20MHz,3260-3267%20MHz,3332-3339%20MHz,3345.8-3352.5%20MHz,4825-4835%20MHz,4950-4990%20MHz,4990-5000%20MHz,6650-6675.2%20MHz,10.6-10.68%20GHz,14.47-14.5%20GHz,22.01-22.21%20GHz,22.21-22.5%20GHz,22.81-22.86%20GHz,23.07-23.12%20GHz,31.2-31.3%20GHz,31.5-31.8%20GHz%20in%20Regions%201%20and%203,36.43-36.5%20GHz,42.5-43.5%20GHz,48.94-49.04%20GHz,76-86%20GHz,92-94%20GHz,94.1-100%20GHz,102-109.5%20GHz,111.8-114.25%20GHz,128.33-128.59%20GHz,129.23-129.49%20GHz,130-134%20GHz,136-148.5%20GHz,151.5-158.5%20GHz,168.59-168.93%20GHz,171.11-171.45%20GHz,172.31-172.65%20GHz,173.52-173.85%20GHz,195.75-196.15%20GHz,209-226%20GHz,241-250%20GHz,252-275%20GHz%20are%20allocated,%20administrations%20are%20urged%20to%20take%20all%20practicable%20steps%20to%20protect%20the%20radio%20astronomy%20service%20from%20harmful%20interference.%20Emissions%20from%20spaceborne%20or%20airborne%20stations%20can%20be%20particularly%20serious%20sources%20of%20interference%20to%20the%20radio%20astronomy%20service%20(see%20Nos.%204.5%20and%204.6%20and%20Article%2029).%20%20(WRC-07)',%20'5.149');), [ECA20](javascript:displayFootnote('This%20fixed%20service%20band%20is%20designated%20for%20common%20use%20by%20civil%20and%20non%20civil%20users.%20Any%20user%20priorities%20in%20respect%20of%20preferred%20channels%20or%20sub-bands%20are%20to%20be%20determined%20after%20discussions%20between%20interested%20parties.',%20'ECA20');), [ECA36](javascript:displayFootnote('A%20frequency%20band,%20which%20has%20been%20harmonised%20by%20NATO%20and%20NATO%20member%20nations%20for%20military%20use%20as%20defined%20in%20the%20NATO%20Joint%20Civil/Military%20Frequency%20Agreement%20(NJFA)%202014.%20Note:%20NATO%20Joint%20Civil/Military%20Frequency%20Agreement%20(NJFA)%20-%20Extract%20for%20Public%20Disclosure%20–%2014%20February%202017',%20'ECA36');) | [FIXED](https://www.efis.dk/views2/map.jsp?maptype=5&low=4990000000&high=5000000000&termId=18)  [MOBILE EXCEPT AERONAUTICAL MOBILE](https://www.efis.dk/views2/map.jsp?maptype=5&low=4990000000&high=5000000000&termId=33)  [RADIO ASTRONOMY](https://www.efis.dk/views2/map.jsp?maptype=5&low=4990000000&high=5000000000&termId=51) |
| 5000 MHz - 5010 MHz | [AERONAUTICAL MOBILE-SATELLITE (R)](https://www.efis.dk/views2/map.jsp?maptype=5&low=5000000000&high=5010000000&termId=38) ([5.443AA](javascript:displayFootnote('In%20the%20frequency%20bands%205000-5030%20MHz%20and%205091-5150%20MHz,%20the%20aeronautical%20mobile-satellite%20(R)%20service%20is%20subject%20to%20agreement%20obtained%20under%20No.%209.21.%20The%20use%20of%20these%20bands%20by%20the%20aeronautical%20mobile-satellite%20(R)%20service%20is%20limited%20to%20internationally%20standardized%20aeronautical%20systems.%20%20(WRC-12)',%20'5.443AA');))  [AERONAUTICAL RADIONAVIGATION](https://www.efis.dk/views2/map.jsp?maptype=5&low=5000000000&high=5010000000&termId=55)  [RADIONAVIGATION-SATELLITE (EARTH-TO-SPACE)](https://www.efis.dk/views2/map.jsp?maptype=5&low=5000000000&high=5010000000&termId=110)  [Radio Astronomy](https://www.efis.dk/views2/map.jsp?maptype=5&low=5000000000&high=5010000000&termId=51)  [Space Research (passive)](https://www.efis.dk/views2/map.jsp?maptype=5&low=5000000000&high=5010000000&termId=84) |
| 5010 MHz - 5030 MHz | [AERONAUTICAL MOBILE-SATELLITE (R)](https://www.efis.dk/views2/map.jsp?maptype=5&low=5010000000&high=5030000000&termId=38) ([5.443AA](javascript:displayFootnote('In%20the%20frequency%20bands%205000-5030%20MHz%20and%205091-5150%20MHz,%20the%20aeronautical%20mobile-satellite%20(R)%20service%20is%20subject%20to%20agreement%20obtained%20under%20No.%209.21.%20The%20use%20of%20these%20bands%20by%20the%20aeronautical%20mobile-satellite%20(R)%20service%20is%20limited%20to%20internationally%20standardized%20aeronautical%20systems.%20%20(WRC-12)',%20'5.443AA');))  [AERONAUTICAL RADIONAVIGATION](https://www.efis.dk/views2/map.jsp?maptype=5&low=5010000000&high=5030000000&termId=55)  [RADIONAVIGATION-SATELLITE (SPACE-TO-EARTH) (SPACE-TO-SPACE)](https://www.efis.dk/views2/map.jsp?maptype=5&low=5010000000&high=5030000000&termId=111) ([5.328B](javascript:displayFootnote('The%20use%20of%20the%20bands%201164-1300%20MHz,%201559-1610%20MHz%20and%205010-5030%20MHz%20by%20systems%20and%20networks%20in%20the%20radionavigation-satellite%20service%20for%20which%20complete%20coordination%20or%20notification%20information,%20as%20appropriate,%20is%20received%20by%20the%20Radiocommunication%20Bureau%20after%201%20January%202005%20is%20subject%20to%20the%20application%20of%20the%20provisions%20of%20Nos.%209.12,%209.12A%20and%209.13.%20Resolution%20610%20(WRC-03)%20shall%20also%20apply;%20however,%20in%20the%20case%20of%20radionavigation-satellite%20service%20(space-to-space)%20networks%20and%20systems,%20Resolution%20610%20(WRC-03)%20shall%20only%20apply%20to%20transmitting%20space%20stations.%20In%20accordance%20with%20No.%205.329A,%20for%20systems%20and%20networks%20in%20the%20radionavigation-satellite%20service%20(space-to-space)%20in%20the%20bands%201215-1300%20MHz%20and%201559-1610%20MHz,%20the%20provisions%20of%20Nos.%209.7,%209.12,%209.12A%20and%209.13%20shall%20only%20apply%20with%20respect%20to%20other%20systems%20and%20networks%20in%20the%20radionavigation-satellite%20service%20(space-to-space).%20(WRC-07)',%20'5.328B');)) ([5.443B](javascript:displayFootnote('In%20order%20not%20to%20cause%20harmful%20interference%20to%20the%20microwave%20landing%20system%20operating%20above%205030%20MHz,%20the%20aggregate%20power%20flux-density%20produced%20at%20the%20Earth’s%20surface%20in%20the%20frequency%20band%205030-5150%20MHz%20by%20all%20the%20space%20stations%20within%20any%20radionavigation-satellite%20service%20system%20(space-to-Earth)%20operating%20in%20the%20frequency%20band%205%20010-5%20030%20MHz%20shall%20not%20exceed%20−124.5%20dB(W/m²)%20in%20a%20150%20kHz%20band.%20In%20order%20not%20to%20cause%20harmful%20interference%20to%20the%20radio%20astronomy%20service%20in%20the%20frequency%20band%204990-5000%20MHz,%20radionavigation-satellite%20service%20systems%20operating%20in%20the%20frequency%20band%205%20010-5%20030%20MHz%20shall%20comply%20with%20the%20limits%20in%20the%20frequency%20band%204990-5000%20MHz%20defined%20in%20Resolution%20741%20(Rev.WRC-15).%20(WRC-15)',%20'5.443B');))  [Radio Astronomy](https://www.efis.dk/views2/map.jsp?maptype=5&low=5010000000&high=5030000000&termId=51)  [Space Research (passive)](https://www.efis.dk/views2/map.jsp?maptype=5&low=5010000000&high=5030000000&termId=84) |

Study period: WGSE requested to deliver draft study results by September 2020 to WGFM.

WG SE would be very kind to inform WG FM on progress of its work and when (an) ECC Report(s) can be made available. Results would be needed by September 2020 so that WG FM can make further development on the basis of WG SE results.

Best regards,

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