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Consultation on Technical Arrangements of the 3.5 GHz Band
Radio Spectrum Management Policy and Planning
Ministry of Business, Innovation and Employment
PO Box 2847
WELLINGTON 6140
(via email)

NZART Response to RSM Consultation: Technical Arrangements of the 3.5 GHz Band

Introduction

On behalf of NZART, I would like to thank you for the opportunity to comment on your document *Discussion document: Technical Arrangements of the 3.5 GHz Band June 2019.*

We note the following ITU allocations:

- Region 2 the Amateur Service is allocated 3,400 MHz – 3,475 MHz on a secondary basis
- Region 3 the Amateur Service is allocated 3,300 MHz – 3,500 MHz on a secondary basis
- In Regions 2 and 3 the Amateur-Satellite Service is allocated 3,400 MHz – 3,410 MHz, on a non-interference basis to other users (ITU footnote 5.282).

While there is no Amateur Service allocation in Region 1 the European Common Allocation Table footnote EU17 allocates 3,400 MHz – 3,410 MHz to European amateurs on a secondary basis.

In the discussion document, it is suggested that there has been limited historic use of this band by amateurs but the need for the consultation document is itself evidence that technological progress makes past frequency band usage an inadequate predictor of future potential. As RSM notes, the spectrum range 3,410 – 3,800 MHz (3.5 GHz band) is considered a pioneer band for the deployment of 5G systems internationally and is now becoming extremely important commercially.

Similarly, the spectrum range 3,300 – 3,40 MHz (3.4 GHz band) through past pioneering efforts by individual amateurs is now becoming extremely important to amateur radio in general.

We note that there has been relatively little interest in the band 3,300 MHz – 3,400 MHz for commercial 5G at the ITU country level, other than in Africa and of course by cellular industry proponents. The band was identified for IMT in Region 1 at WRC-15 by a number of African countries but not the CEPT (footnote 5.R1a, 5.R1b, Resolution 223) . As of April 2019, only one country (Ghana) has licensed the 3.4 GHz MHz band, despite this being widely available through the relevant footnotes.

In the following we have included comments on some other existing uses of the 3.4 GHz band from a position of experience as incumbents and from a history of active New Zealand amateur usage since the early seventies.

Questions 1 to 8

NZART has no comment on these questions other than to note the well thought out TDD co-existence strategy.

Question 9: Do you have any other comments regarding the out-of-band emission mask?

While 5G will have an important impact on life in New Zealand we hardly need to remind the ministry that commercial cellular is not the only worthwhile use of the radio spectrum.

In considering the unwanted emissions below the lower boundary of a sample management right the radio spectrum below 3,410 MHz is not a guard band for 5G. In all ITU regions the Radiolocation service is primary (high power shipboard, airborne, and satellite, radars for searching, tracking and surveillance both civil and military) alongside the secondary Amateur Service allocations.

We note the International Civil Aviation has identified (ACP-WGF30/WP27 - 2014-03-17) the potential for new services operating in the 3.5 GHz band to interfere with radar operation in the band 2,900 – 3,300 MHz. Mention is made of spectrum below 3,300 MHz because the RSM discussion document considers unwanted emissions below the lower boundary of the sample management right to 3,200 MHz which must be of some concern.

NZART also note that Footnote 149 to the Table of Frequency Allocations states that "administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference" in consideration of the ranges 3,332 – 3,339 MHz and 3,345.8 – 3,352.5 MHz which, while not allocated to the Radio Astronomy Service, are important spectral line observation bands for the carbon-hydrogen CH ion. The study of interstellar CH is considered to be extremely important in understanding the chemistry of interstellar material as the presence of CH suggests the existence of the molecule CH4 (methane) which is considered one of the basic molecules for the initial stages of life formation. Amateur stations voluntarily avoid using these frequencies when in geographic proximity to a radio telescope such as the Warkworth Radio Astronomical Observatory operated by the Institute for Radio Astronomy and Space Research, Auckland University of Technology.

While MBIE has decided not to continue participation in the Square Kilometre Array (SKA) project, excessive emissions from 5G equipment in the CH molecule line spectrum located within the amateur band below 3,410 MHz would make any potential future decision to participate extremely difficult as the necessary radio quiet zones need to protect SKA receivers would be almost impossible.

It is difficult to assess the protection offer by the mask because the interference power experienced by the various services using spectrum below 3,410 MHz is not limited to a single base station but to the cumulative effect of thousands of base stations. The additive effect of low-level interference raises the noise floor across much of the spectrum today.

Question 10: Do you agree with the technical compatibility analysis between the amateur operation in 3300-3410 MHz and 5G (or compatible technology) in the 3.5 GHz band?

Long distance high power narrow band communications take place in the in the range 3,400 – 3,401 MHz including both terrestrial and 'moon bounce' also known as EME (earth-moon-earth) communications. This frequency range is used on a world-wide basis for such communications and retaining international interoperability is important to New Zealand amateurs as the station being communicated with may well be in a different country. It is also important that the present General User Radio Licence for Amateur Radio Operators (Amateur GURL) maximum power of 30 dBW is maintained for these operations given the tremendous path losses involved for the weak signal modes. However, these operations occur using highly directional antennas and very sensitive receivers. It is unlikely that services above 3,410 MHz will be affected by high EIPR as these will typically be directed at high elevations.

The upper end the amateur allocation, particularly 3,400 – 3410 MHz is free of interference from the ubiquitous wideband services (Wi-Fi network devices) operating under GURL that interfere with amateur operations in the shared 2,396 – 2,425 and 5,650 – 5,850 MHz bands. This makes preservation of access to this frequency range of vital importance to amateurs. Since March 2009, the International Amateur Radio Union (IARU) has maintained a policy to seek upgrading of the Amateur service allocation status of 3,400 – 3410 MHz to primary[1] with some success.

The amateur radio service is also embracing digital voce modes on many bands, particularly at VHF and UHF. New Zealand amateurs, through the Amateur Radio Emergency Communications group, are building a national network of UHF linked DMR repeaters designed to provide high quality and resilient communications when commercial services have failed. This network presently utilises both commercial Internet as well as 5.8 GHz links operating under the Fixed Radio Link Devices GURL. Both of the current linking services have significant drawbacks and AREC intends to expand the use of low-cost linking technology into the 3,300 MHz – 3,400 MHz band, replacing the reliance on commercial Internet connectivity. These facilities will usually be located at prominent sites but the EIRP

[1] Wireless Institute of Australia 30 July 2014 submission to Australian Communications and Media Authority IFC 24/2014 *Making the most of the 3.5 GHz band in future*

of these links will be similar to the Fixed Link GURL limit, typically no more than 23 dBW EIRP. An introduction to this application is included in the reference below[2].

We would also like to bring to your attention the recent launch of a geostationary amateur satellite transponder, a joint project between the Qatar Satellite Company (Es'hailSat), the Qatar Amateur Radio Society (QARS), and the German amateur radio satellite group AMSAT Deutschland (AMSAT-DL). The transponder is onboard Es'hail-2, a commercial broadcast satellite owned by the Es'hailSat Qatar Satellite Company in orbit at 25.9° E. The amateur radio transponder is approximately 8 MHz wide in the Amateur Satellite Service spectrum with the uplink at 2,400 MHz and downlink at 10,490 MHz. In future we expect similar arrangements to occur in other parts of the world making use of other Amateur Satellite Service spectrum such as 3,400 MHz – 3,410 MHz but it is too early to assess the interference effect that will be experienced from services in the 3.5 GHz band. The band is most likely to be considered for uplink (earth to space) purposes with only modest amateur transmit power levels.

In summary NZART does not anticipate amateur service operations in the 3.4 GHz band to cause any interference to services in the 3.5 GHz band. However, we do expect to be subject to interference from 5G services operating in the adjacent band and for that interference to grow over time as 5G services expand and would recommend that any plan for the 3.5 GHz band include a guard band at the bottom to safeguard weak signal Amateur and Radio Astronomy operation.

Question 11: Do you agree with the technical compatibility analysis between SRD operation in 2900-3400 MHz and 5G (or compatible technology) in the 3.5 GHz band?

While the low power SRD use case is noted in the discussion document, we also note several existing radio location licenses in this band and, as noted earlier, other potential radiolocation system users including satellite and military.

Question 12:

NZART has no comment on this question

Once again, thank you for the opportunity to comment on your consultation document.

Regards

Don Wallace
NZART Administration Liaison Officer.

[2] Bern, D. and Elkin, K., 2014 ARRL TAPR Digital Communications Conference, *High-Speed Wireless Networking in the UHF and Microwave Bands*