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VIA ECFS

Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street SW
Washington DC 20554

**Re: Ex Parte Letter - Kongsberg Seatex AS
Request for Waiver of Section 15.407(a)(3) of the Commission's Rules
for Maritime Broadband Communications
ET Docket No. 19-240**

Dear Ms. Dortch:

On July 2, 2019, Kongsberg Seatex AS¹ ("Kongsberg") filed a request for waiver of Section 15.407(a)(3) of the FCC's rules for a Maritime Broadband Radio ("MBR") communications system that employs high-gain antennas having directional properties similar to those used for fixed point-to-point land communications. Phased-array antennas are used that continuously steer the beam to keep the aim steady, while the antenna moves with the vessel. Kongsberg requested a waiver to use directional gains in excess of 6 dBi without reducing transmitter power for two-way communications between vessels, and between shore points at fixed locations and vessels. The waiver request has been pending for more than a year.

It appears that there may be some concern that devices operating under the proposed waiver may have the potential to cause interference to coastal military radar installations, and specifically, Patrick Air Force Base near Cape Canaveral. In December 2019, the National Telecommunications and Information Administration ("NTIA") published a report detailing among other things, interference from U-NII operations to Range Instrumentation Radars ("RIRs") at that location.² In order to provide additional assurances to the FCC that the waiver

¹ On March 23, 2020, Hydroid, Inc. filed a letter informing the Commission that Hydroid, Inc., was being sold, and requested that Kongsberg Seatex AS be added or substituted as the party to the waiver request.

² See U.S. Dep't of Commerce, Technical Report TR-10-544, National Telecommunications and Information Administration: *Lessons Learned from the Development and Deployment of 5 GHz Unlicensed National Information Infrastructure (U-NII) Dynamic Frequency Selection* (2019).

request will not cause harmful interference to RIRs, Kongsberg supplements its waiver request with the following additional information and proposed conditions:

First, Kongsberg proposes to include additional information in the user manual informing operators that the system may cause harmful interference to RIRs at Cape Canaveral, and may not be used within a certain distance of that location. Specifically, the user manual will contain information regarding the MBR system’s geofencing feature. Users will be informed that MBR transmissions will be automatically shut off when the system is within the proximity of Cape Canaveral as described below, i.e., 5 km for Channel IV, and 53 km for Channels I, II, and III. There will be no need for the end user to manually terminate transmissions when the system is within the restricted transmissions zones near Cape Canaveral, and the end user will not be able to disable the geofencing system.

Second, Kongsberg proposes to include an automatic geofencing feature in the MBR system that will prevent transmissions within certain distances of Patrick Air Force Base, which will vary depending on the frequencies being used. The MBR system includes GPS capabilities, which will be used to continuously monitor the system’s location to ensure that 5 GHz transmissions are not made in locations that are too close in proximity to the RIRs at Cape Canaveral.

The *NTIA Report* included a schematic of the 5 GHz spectrum that is shared between RIRs and U-NIIs. Figure 8 from the *NTIA Report* is shown below:

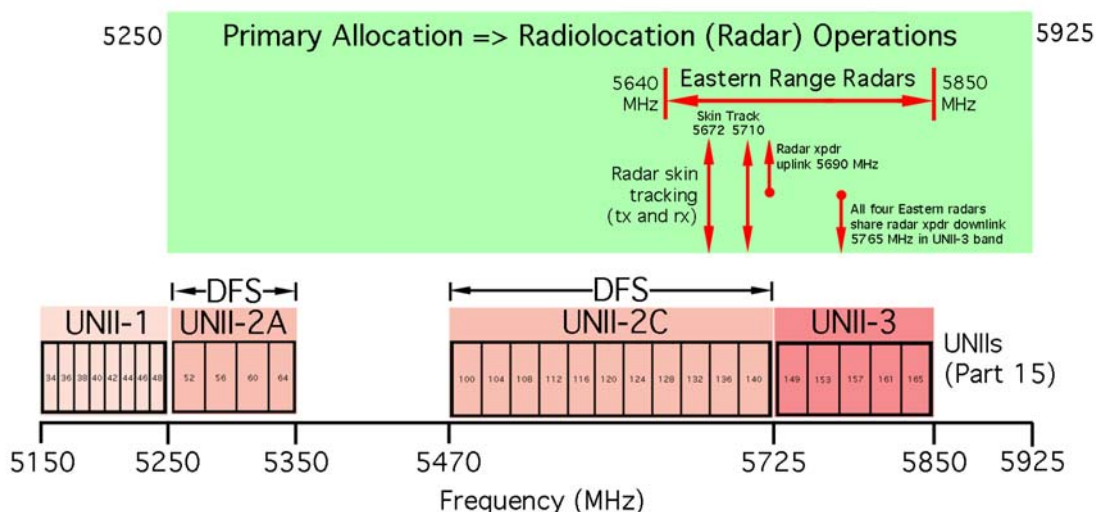


Figure 8. The 5 GHz spectrum that is shared between RIRs and U-NIIs, with Eastern Range frequencies used as an example case. U-NII Band 3 shares spectrum with radars, including some RIR frequencies, but has never had any DFS requirement.³

(“*NTIA Report*”) A copy of the report can be found at <https://www.its.bldrdoc.gov/publications/download/TR-20-544.pdf> (last viewed August 19, 2020).

³ *NTIA Report* at 60.

The Eastern Range Radars, which includes operations at Patrick Air Force Base, operate in the 5640-5850 MHz range, with specific operational frequencies centered at 5672, 5710, 5690, and 5765 MHz. In its waiver request, Kongsberg stated that typical operating EIRPs were in the range of 36-54 dBm.⁴ The MBR system employs a spectrum mask that is more strict (according to ETSI EN 303 276) than the one set forth in Section 15.407 of the Commissions' rules. A diagram depicting that mask is set forth below:

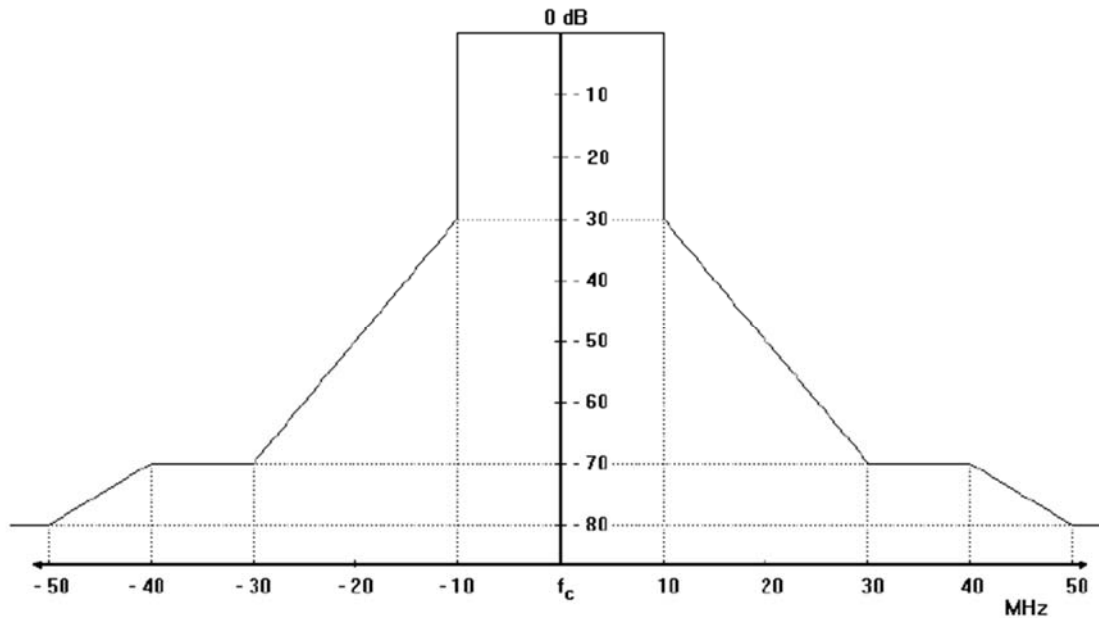


Figure 1: Transmitter power spectrum mask

The MBR system operates on frequencies between 5725-5850 MHz, which Kongsberg has divided into the following 20 MHz channels:

- Channel I: 5725-5745 MHz
- Channel II: 5760-5780 MHz
- Channel III: 5795-5815 MHz
- Channel IV: 5830-5850 MHz

Kongsberg proposes that transmissions on Channel IV be limited to distances greater than 5 km, and Channels I-III be limited to distances greater than 53 km, from Patrick Air Force Base. Channel IV (5830-5850 MHz) provides 65 MHz of channel separation to the Eastern Range Radar xpr downlink center frequency (5765 MHz). As shown in the spectrum mask diagram, the attenuation of the MBR transmission at 5765 MHz would be greater than 80 dBc, and the EIRP would decrease to a level below -26 dBm EIRP from the maximum of 54 dBm EIRP. However, this attenuation would be at the transmitting antenna. At the receiving antenna, the signal level at a distance of 5 km would be a maximum of -147 dBm.⁵

⁴ Kongsberg Waiver Request at 5.

⁵ Using the FSPL formula discussed below, the attenuation at the receiving antenna location at a distance of 5 km at 5765 MHz is approximately -121 dB. The resulting signal level would be: -121 dB + -26 dBm = -147 dBm.

For Channels I, II, and III, 53 km would be below the horizon, i.e., beyond line-of-sight (“BLOS”). Vessel antenna heights are typically in the range of 5-20 meters above sea level. At a distance of 53 km and a radar height of 20 meters, the line-of-sight would be limited to 32 km.⁶ Accordingly, the vessel antenna would be more than 20 km behind the horizon, which would provide additional attenuation to the -142 dB free space path loss (“FSPL”) at 53 km. It is important to note that the MBR system incorporates automatic power control, and maximum EIRP is only used at the edges of operation.

In order to determine the direct line-of-sight FSPL discussed above, Kongsberg utilized the standard free space path loss equation, which is shown below:

$$FSPL = 20 \log_{10}(d) + 20 \log_{10}(f) + 20 \log_{10}\left(\frac{4\pi}{c}\right)$$

Where: FSPL = free space path loss in dB
 d = the distance between antennas in meters
 f = the frequency in Hz
 c = the speed of light in meters per second

Below the horizon, there is no good model for signal attenuation for BLOS over-sea-transmissions, though the attenuation of microwaves for BLOS over-land-transmissions is, for all intents and purposes, infinite, i.e., total signal loss. The attenuation for BLOS over-sea-transmissions could be -20 or -30 dB, and therefore, would likely offset any receiving antenna gains. As noted above, the -142 dB FSPL attenuation at 53 km for Channels I, II, and III is a theoretical direct line-of-sight calculation that does not take into account any attenuation due to BLOS transmissions, and additional attenuation would be expected.

The geofencing proposal outlined above would define the 5 km and 53 km restriction zones for Patrick Air Force Base as follows:

53 km Restriction Zone Definition for Channels I / II / III

SE corner: 27 47'14"N 80 03'32"W
 NE corner: 28 48'23"N 80 03'32"W
 NW corner: 28 48'23"N 80 54'15"W
 SW corner: 27 47'14"N 80 39'00"W

⁶ The line-of-sight (“LOS”), i.e., distance to the horizon, is calculated by using the formula $d = 3.57 \times \sqrt{h}$, where d is the distance in kilometers, and h is the antenna height in meters. At a transmitting antenna height of 20 m, the LOS distance is approximately 16 km. However, because the receiving antenna is also assumed to be at 20 m, the LOS distance is doubled to 32 km.

5 km Restriction Zone Definition for Channel IV

SE corner: 28 09'37"N 80 32'25"W
NE corner: 28 19'08"N 80 32'25"W
NW corner: 28 19'08"N 80 44'04"W
SW corner: 28 09'37"N 80 44'04"W

A map depicting the proposed restriction zones are attached hereto as Exhibit A.

Third, because Channel IV provides the greatest channel separation between the MBR system and the Eastern Range Radar xpdr downlink center frequency, Kongsberg proposes to set the factory default channel for the system at Channel IV. This will ensure that basic users that have no need to change system settings will operate with the greatest channel separation between the MBR system and the RIRs. The automatic geofencing feature will prohibit transmissions within 5 km of Cape Canaveral. Although the initial default operating channel can be changed by the end user to Channels I, II, or III, the automatic geofencing feature will ensure that those channels will not cause harmful interference to RIRs by shutting off transmissions within 53 km of Cape Canaveral.

Kongsberg submits that the additional protections as set forth in this supplement will provide adequate protection to Air Force radar tracking operations at Cape Canaveral, and requests that the FCC grant Kongsberg's requested waiver. Should there be any questions with respect to this matter please feel free to contact the undersigned.

Respectfully submitted,

/s/ Tony S. Lee
Tony S. Lee

Counsel for Kongsberg Seatex AS

Exhibit A

Map Depicting Proposed Restriction Zones

