

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of)
Kongsberg Seatex AS) ET Docket No. 19-240
Request for waiver of Section 15.407(a)(3) of the)
rules for Unlicensed National Information)
Infrastructure devices that emit steerable)
directional beams.)

ORDER

Adopted: June 21, 2022

Released: June 21, 2022

By the Acting Chief, Office of Engineering and Technology:

I. INTRODUCTION

1. By this Order we grant a request for waiver of Section 15.407(a)(3) of the Commission’s rules filed by Kongsberg Seatex AS (Kongsberg) so that it can apply for FCC certification to market Unlicensed National Information Infrastructure (U-NII) devices in the 5.725-5.850 GHz band that emit steerable directional beams at power levels that exceed the limits in that section. For the reasons discussed below, we find that there is good cause to grant Kongsberg’s narrowly tailored waiver request.

II. BACKGROUND

2. The Kongsberg system operates in the 5.725-5.850 GHz band and is used for broadband communications between maritime vessels, and between maritime vessels and shore. Each communication is between two points, with no simultaneous point-to-multipoint operations. The Kongsberg system employs high-gain antennas having directional properties similar to antennas used for fixed point-to-point land communications, but the design is different in that the radios use phased-array antennas (both transmit and receive) that are kept closely aligned with each other as the vessel(s) on which they operate move. Both the shipboard and shore units are the same product type and use the same transmission technology.¹

3. On July 2, 2019, Kongsberg filed a request for a waiver of Section 15.407(a)(3) of the Commission’s rules, 47 C.F.R. § 15.407(a)(3), to allow the certification, marketing and operation of its communication system.² Section 15.407(a)(3) permits U-NII devices to operate in the 5.725-5.850 GHz band with a maximum conducted power output of one watt. If an antenna with a maximum directional gain of greater than 6 dBi is used, the conducted power output must be reduced below one watt by the amount in dB that the antenna gain exceeds 6 dBi, which corresponds to an EIRP limit of four watts. However, because antennas deployed in fixed point-to-point applications that have a gain of greater than

¹ Letter from Tony S. Lee, Counsel to Kongsberg Seatex AS, Fletcher, Heald and Hildreth, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 19-240, at 1 (filed May 7, 2021) (Kongsberg May 7, 2021 ex parte).

² Kongsberg Seatex AS Request for Waiver (filed July 2, 2019) (Kongsberg Waiver Request). The request was originally filed by Hydroid, Inc., which was subsequently sold. Its counsel then requested that the name Kongsberg Seatex AS be substituted or, in the alternative, added to the waiver request. Letter from Michelle A. McClure and Tony S. Lee, Counsel to Hydroid, Inc., Fletcher, Heald and Hildreth, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 19-240, at 1 (filed Mar. 23, 2020). We grant this request and use the name Kongsberg Seatex AS throughout this document.

6 dBi may be used without any corresponding reduction in conducted power output, there is no specific EIRP limit for those applications. The Kongsberg system is not a fixed point-to-point system because it is used to communicate with maritime vessels that move. Kongsberg is seeking a waiver to permit the operation of its non-fixed system with one-watt maximum conducted power and an antenna gain that exceeds 6 dBi, i.e., it seeks to operate under the provisions that are applicable to fixed point-to-point systems.³ It also proposes specific conditions on the sale, installation, and use of the equipment that would be associated with the waiver.⁴

4. In response to the Office of Engineering and Technology's (OET) request for comment on the Kongsberg waiver request, one party (University of New Hampshire) submitted comments in support of the request, and Kongsberg submitted brief reply comments.⁵ Kongsberg subsequently filed information on measures its system will incorporate to protect Federal Government radar operations at four locations (Patrick Air Force Base, Florida; Vandenberg Air Force Base, California; Wallops Island, Virginia; Coquina, North Carolina) as well as information requested by OET clarifying certain aspects of the waiver request.⁶ No other parties filed comments.

III. DISCUSSION

5. We are authorized to grant a waiver under Section 1.3 of the Commission's rules if the petitioner demonstrates good cause for such action.⁷ Good cause, in turn, may be found and a waiver granted "where particular facts would make strict compliance inconsistent with the public interest."⁸ To make this public interest determination, the waiver cannot undermine the purposes of the rule, and there must be a stronger public interest benefit in granting the waiver than in applying the rule.⁹

6. We find that the Kongsberg system promises to deliver strong public interest benefits. The higher antenna gain limits it requests will increase the maximum achievable communication distance over water from approximately 1.2 kilometers (under the current rules) to at least 9 kilometers.¹⁰ This increased range will be useful for a variety of maritime applications, including operation of autonomous

³ Kongsberg states that the antenna arrays range from 4 to 76 elements and the gains of the antennas used with its system vary between 6 and 24 dBi. Kongsberg Waiver Request at 5.

⁴ Kongsberg Waiver Request at 10.

⁵ *Office of Engineering and Technology Seeks Comment on Hydroid Inc.'s Request for Waiver of Section 15.407(a)(3) of the Rules for Unlicensed National Information Infrastructure Devices that Emit Steerable Directional Beams*, ET Docket No. 19-240, Public Notice, DA 19-826 (OET Aug. 27, 2019).

⁶ Letter from Tony S. Lee, Counsel to Kongsberg Seatex AS, Fletcher, Heald and Hildreth, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 19-240, at 2-5 (filed Sept. 29, 2020) (Kongsberg Sept. 29, 2020 *ex parte*); Letter from Tony S. Lee, Counsel to Kongsberg Seatex AS, Fletcher, Heald and Hildreth, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 19-240, (filed Jan. 15, 2021) (Kongsberg Jan. 15, 2021 *ex parte*); Letter from Tony S. Lee, Counsel to Kongsberg Seatex AS, Fletcher, Heald and Hildreth, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 19-240, (filed Jun. 6, 2022) (Kongsberg Jun. 6, 2022 *ex parte*).

⁷ 47 CFR § 1.3. *See also* *ICO Global Communications (Holdings) Limited v. FCC*, 428 F.3d 264 (D.C. Cir. 2005); *Northeast Cellular Telephone Co. v. FCC*, 897 F.2d 1164 (D.C. Cir. 1990); *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

⁸ *Northeast Cellular*, 897 F.2d at 1166; *see also* *ICO Global Communications*, 428 F.3d at 269 (quoting *Northeast Cellular*); *WAIT Radio*, 418 F.2d at 1157-59.

⁹ *See, e.g.,* *WAIT Radio*, 418 F.2d at 1157 (stating that even though the overall objectives of a general rule have been adjudged to be in the public interest, it is possible that application of the rule to a specific case may not serve the public interest if an applicant's proposal does not undermine the public interest policy served by the rule); *Northeast Cellular*, 897 F.2d at 1166 (stating that in granting a waiver, an agency must explain why deviation from the general rule better serves the public interest than would strict adherence to the rule).

¹⁰ Kongsberg Waiver Request at 6. The University of New Hampshire states that its real-world experience with the Kongsberg system has resulted in ranges of more than 12 kilometers. University of New Hampshire Comments at 1.

surface vessels; hydrographic surveying prior to and during dredging of ports and waterways; remote inspection of underwater pipelines and other underwater installations; monitoring marine life; oil and gas exploration; scientific research; communications during search and rescue operations; fishery research; tracking of unmanned underwater vehicles; dock and harbor inspections; and monitoring sediment in river outlets for safe navigational passages.¹¹ These applications can augment efforts to promote safety (e.g., search and rescue, man-overboard alerts, and oil spill management) and have obvious economic benefits (e.g. using autonomous vessels for undersea inspection of pipelines and harbor facilities). Kongsberg indicates that the U.S. military has shown interest in its system, and that grant of the waiver would enable military users to deploy these systems quickly.¹²

7. As noted by the University of New Hampshire and Kongsberg, alternatives to the Kongsberg system for broadband maritime communications are limited and less suitable for the intended applications.¹³ Commercial cellular data service is typically available only close to land, and available cellular and satellite options can have data speed and usage limitations. For example, Kongsberg states that some scientific applications must transport several gigabytes per day, which it has found to exceed all but the costliest data caps.¹⁴ In addition, the latency inherent in many cellular deployments and satellite data communications could be a problem for precision applications, such as steering autonomous vessels through congested waterways.

8. We also conclude that, with appropriate operational and technical restrictions to prevent harmful interference to authorized services, granting Kongsberg's request for waiver does not undermine the purpose of the rules, i.e., to prevent harmful interference to authorized communication services. In this case, the authorized services operate under a primary federal radiolocation allocation and secondary amateur allocations.¹⁵ As discussed below, the Kongsberg system will incorporate a geo-fencing mechanism to prevent operation near certain Federal Government radar systems.

9. We find that, with the inclusion of this geo-fencing mechanism, there will be little or no additional risk of harmful interference to authorized services as a result of this waiver. The Kongsberg devices use narrow, steerable beams to transmit to other devices, minimizing the areas exposed to interference. The only difference between these devices and the fixed point-to-point links permitted under the rules is that the transmitters on-board vessels will be in motion instead of restricted to fixed locations.¹⁶ As the devices will be limited to one watt conducted power by the U-NII rules, they will necessarily use narrow-beam antennas to achieve the higher EIRP. The transmit paths will be almost entirely over water, either between vessels or between a vessel and a location on shore with line-of-sight to the water. Consequently, there is a low likelihood that a receiver that could receive interference will be present in the path between devices. In addition, devices will employ an always-on transmit power control to limit power to the minimum necessary for communications, which will further reduce the

¹¹ Kongsberg Waiver Request at 3-4.

¹² Kongsberg Waiver Request at 7 (citing Federal Government provisions that facilitate agencies' purchase of non-licensed devices for which the FCC has granted a waiver).

¹³ University of New Hampshire Comments at 1 (no other telemetry system capable of the data throughput at the ranges required); Kongsberg Waiver Request at 7.

¹⁴ Kongsberg Waiver Request at 7.

¹⁵ 47 CFR § 2.106. The federal radiolocation allocation covers the entire 5725-5850 MHz band where Kongsberg plans to operate. The 5725-5830 MHz portion of this band contains a secondary amateur allocation, and the 5830-5850 MHz portion contains both a secondary amateur allocation and a secondary amateur (space-to-Earth) allocation. In addition, the 5725-5850 MHz band falls within the 5725-5875 MHz band, which is designated for use by industrial, scientific, and medical (ISM) equipment. 47 CFR §§ 18.107(c) and 18.301. ISM equipment uses radiofrequency energy for non-communication purposes.

¹⁶ The Office of Engineering and Technology previously granted a waiver of this same rule to permit high-gain antennas to be used by U-NII devices on trains. Letter from Julius Knapp, Chief, Office of Engineering and Technology, to Robert D. Primosch, Counsel for Amtrak, ET Docket No. 16-415, DA 17-441 (filed June 1, 2017).

likelihood of interference to authorized services.¹⁷ Also, only one radio in a network transmits at a time, creating a low transmit duty cycle; this characteristic further reduces the probability of interference.¹⁸

10. Kongsberg acknowledges that the National Telecommunications and Information Administration (NTIA) has raised concerns outside of this proceeding regarding interference to Federal Government radar systems at Patrick Air Force Base, Florida and has committed to incorporating measures into its system to provide assurance that it will not cause harmful interference to these federal radar systems.¹⁹ Specifically, its devices will incorporate a geo-fencing system and use exclusion zones to protect this base (i.e., the device will stop transmitting if it enters a defined exclusion zone around the base).²⁰ To implement these exclusion zones, Kongsberg devices will divide the 5725-5850 MHz band into four 20-megahertz channels with a 15-megahertz guard band between each channel. Devices operating on the lower three channels will have to be separated by at least 53 kilometers from the base, and devices on the highest channel will have to be separated by at least 5 kilometers from the base.²¹ The difference in these separation distances is due to the fact that the highest channel has a greater frequency separation from radar systems. To further protect Federal Government radar systems, the devices will have a tighter out-of-band emission mask than the U-NII rules require.²²

11. Kongsberg subsequently requested additions and modifications to its originally recommended exclusion zones to address NTIA concerns about potential impacts on other Federal Government radar systems.²³ The National Aeronautics and Space Administration (NASA) operates numerous precision tracking radars in this band to support launch activities, including systems at Wallops Island, Virginia, and Coquina, North Carolina. To protect these radar operations, Kongsberg states that its devices will not operate on channels I, II and IV within a 200 km radius, and on channel III within a 65 km radius, of Wallops Island, Virginia (37° 51' 17" N, 75° 27' 48" W) and Coquina, North Carolina (35° 50' 12" N, 75° 34' 14" W).²⁴ In addition, Kongsberg requests an increase in size of its originally suggested all-channel exclusion zone at Patrick Air Force Base to protect radar operations at Cape Canaveral, Florida and requests an additional all-channel exclusion zone to protect radar operations at Vandenberg Air Force Base, California.²⁵

12. *Waiver conditions.* We find that the conditions on the grant of waiver that Kongsberg has suggested will help limit the potential for harmful interference from Kongsberg's system while still allowing for deployment in maritime applications, and we therefore incorporate them into this Order. Specifically, we will permit communications only between vessels or between vessels and shore.²⁶ We will permit the system to be used in connection with operational aspects of cruise ships, but will prohibit

¹⁷ Kongsberg Waiver Request at 5.

¹⁸ Kongsberg Waiver Request at 8.

¹⁹ Kongsberg Sept. 29, 2020 *ex parte* at 1-2 (citing 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), <https://www.its.bldrdoc.gov/publications/download/TR-20-544.pdf> (last viewed Dec. 3, 2020).

²⁰ Kongsberg Sept. 29, 2020 *ex parte* at 2.

²¹ Kongsberg's 5-kilometer exclusion zone is a square, while its 53-kilometer exclusion zone is a polygon. Because of these shapes, much of the area in those zones is actually farther away from the base than 5 or 53 kilometers.

²² 47 CFR § 15.407(b)(4) and Kongsberg Sept. 29, 2020 *ex parte* at 3.

²³ Kongsberg Jun. 6, 2022 *ex parte* at 1-2.

²⁴ Kongsberg indicates that NASA may provide some flexibility regarding the boundaries of the Wallops Island and Coquina exclusion zones for channel IV after pre-coordination with and approval of NASA Wallops Flight Facility spectrum managers. Kongsberg Jun. 6, 2022 *ex parte* at 2.

²⁵ Kongsberg Jun. 6, 2022 *ex parte* at 2.

²⁶ Kongsberg Waiver Request at 10.

cruise ship passenger communications.²⁷ We will require devices to comply with the emission mask shown by Kongsberg and to incorporate always-on adaptive transmit power control and integral, non-replaceable antennas.²⁸ To protect Federal Government radar operations, we will prohibit device operation on specific channels within defined exclusion zones at four locations (Patrick Air Force Base, Florida; Vandenberg Air Force Base, California; Wallops Island, Virginia; Coquina, North Carolina) as described in Kongsberg's June 6, 2022 filing.²⁹ Because portions of all of these exclusion zones fall over land, we will require devices located on land to be subject to the same channel and zone restrictions as shipboard devices.

13. Furthermore, and consistent with Kongsberg's suggested conditions, we will prohibit marketing directly to consumers and, to provide stakeholders in the band with more certainty in how many Kongsberg devices could be used under the authority of the FCC during the initial deployment, we will limit annual U.S. sales to 200 units for the first five years after the date of this Order.³⁰ This 200-unit annual limit applies to the combined number of shipborne and coastal units sold, but does not apply to any units sold to Federal Government entities for use under NTIA's authority.³¹ Additionally, to be consistent with Section 15.407(a)(3) we are requiring that no simultaneous point-to-multipoint operations be permitted.³² We will also require that Kongsberg obtain certification of its equipment from a designated Telecommunication Certification Body prior to marketing and operation and that it provide information in the user manual on the potential for interference to Federal Government radar operations at Patrick Air Force Base, Vandenberg Air Force Base, and NASA's Wallops Island and Coquina facilities, and the measures incorporated in the equipment to prevent such interference.

14. Accordingly, pursuant to the delegated authority in Sections 0.31 and 0.241 of the Commission's rules, 47 C.F.R. §§ 0.31 and 0.241, we waive the requirements of Section 15.407(a)(3) to permit the certification and marketing of the Kongsberg non-fixed communication system with a one-watt maximum conducted power and an antenna gain that exceeds 6 dBi with a maximum antenna gain of 24 dBi. This waiver is subject to the following conditions:

- 1) The Kongsberg system shall be certified by an authorized Telecommunications Certification Body.
- 2) The Kongsberg system shall be used for maritime operation only: between vessels, and between vessels and land. No land-to-land applications are permitted under this waiver.
- 3) The Kongsberg system shall not be used for simultaneous point-to-multipoint operations.
- 4) The Kongsberg system shall incorporate a geo-fencing mechanism as described in its September 29, 2020 and January 15, 2021 filings in ET Docket No. 19-240 and avoid operating within the exclusion zones around the Federal Government radar installations listed below.

²⁷ Kongsberg Waiver Request at 10 and Kongsberg Jan. 15, 2021 *ex parte* at 3.

²⁸ Kongsberg Waiver Request at 10. *See also* Kongsberg Sept. 29, 2020 *ex parte* at 3-5 and Kongsberg Jan. 15, 2021 *ex parte* at 1-3 (including clarification that the specified emission mask applies on all channels).

²⁹ Kongsberg Jun. 6, 2022 *ex parte* at 2. There are two different size exclusion zones at Patrick Air Force Base, with operation prohibited on channels I, II and III within the larger zone, and on all channels within the smaller zone. Operation is prohibited on all channels within the exclusion zone at Vandenberg Air Force Base. With respect to the Wallops Island and Coquina sites, operation is prohibited on channels I, II and IV within a 200 km radius, and on channel III within a 65 km radius.

³⁰ Kongsberg Waiver Request at 10.

³¹ *See* Kongsberg May 7, 2021 *ex parte*. NTIA, and not the FCC, authorizes the use of spectrum by Federal Government entities.

³² Kongsberg has indicated that its devices will communicate between two points with no simultaneous point-to-multipoint applications. Kongsberg Waiver Request at 5.

- a. The device shall use the following channelization:
- Channel I: 5725-5745 MHz
 - Channel II: 5760-5780 MHz
 - Channel III: 5795-5815 MHz
 - Channel IV: 5830-5850 MHz
- b. A shipboard device shall monitor its location while in operation and may not operate on the following channels within the following zones. Devices located on land are subject to the same channel and zone restrictions as shipboard devices.

Operation prohibited on Channels I, II and III (Patrick Air Force Base, Florida)

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

Operation prohibited on all channels (Patrick Air Force Base, Florida)

SE corner: 28 09'37"N 80 32'25"W
NE corner: 28 39'50"N 80 28'12"W
NW corner: 28 39'50"N 80 50'20"W
SW corner: 28 09'37"N 80 44'04"W

Operation prohibited on Channels I, II and IV within a 200 km radius of the following locations:

Wallops Island, Virginia: 37 51'17"N, 75 27'48"W, and
Coquina, North Carolina: 35 50'12"N, 75 34'14"W

Operation prohibited on Channel III within a 65 km radius of the following locations:

Wallops Island, Virginia: 37 51'17"N, 75 27'48"W, and
Coquina, North Carolina: 35 50'12"N, 75 34'14"W

Operation prohibited on all channels (Vandenberg Air Force Base, California)

SE corner: 34 13'12"N 120 36'00"W
NE corner: 35 00'00"N 120 36'00"W
NW corner: 35 00'00"N 121 00'00"W
SW corner: 34 13'12"N 121 00'00"W

- c. A request by Kongsberg to modify the boundaries of the Wallops Island and Coquina restriction zones in channel IV may be approved by the FCC in coordination with NTIA.
- 5) The user manual provided with the device must caution operators that the system may not be used within certain distances from locations where Federal Government radar operations take place to avoid the possibility of causing harmful interference to those Federal operations. The user manual must contain information describing the system's geo-fencing feature and must indicate that transmissions are prohibited on specific channels within the specified zones listed in paragraph (4) above. It must also indicate that devices located on land are subject to the same restrictions as shipboard devices. The user manual must further provide a pictorial representation of the exclusion zones to scale, including the geographic coordinates of the corners and the lengths of the edges, or the geographic coordinates of the center points and radii of the circles.

- 6) The Kongsberg system's geo-fencing mechanism used to prevent transmissions within the exclusion zones set forth in this waiver shall not have any override function or capability.³³
- 7) The Kongsberg system shall on all channels comply with the out-of-band emission mask shown in its September 29, 2020 filing in ET Docket No. 19-240.
- 8) The Kongsberg system shall not be used for cruise ship passenger communications but may be used in connection with operational aspects of cruise ships.
- 9) The Kongsberg system shall incorporate always-on adaptive power control as described in its January 15, 2021 filing in ET Docket No. 19-240.
- 10) The Kongsberg system shall incorporate integral, non-replaceable antennas and may not use any antennas other than those tested with the transmitter for certification.
- 11) No sales to consumers are permitted.
- 12) U.S. sales shall not exceed 200 units per year. This 200-unit annual limitation applies to the combined number of shipborne and coastal units sold and shall only apply through the end of the fifth year following the date of this Order, but shall not include any units sold to Federal Government entities for use under the authority of the National Telecommunications and Information Administration.

IV. ORDERING CLAUSES

15. Accordingly, pursuant to authority delegated in Sections 0.31 and 0.241 of the Commission's rules, 47 CFR §§ 0.31, 0.241, and Section 1.3 of the Commission's rules, 47 CFR § 1.3, IT IS ORDERED that the Request for Waiver filed by Kongsberg Seatex AS on July 2, 2019 IS GRANTED consistent with the terms of this Order. This action is taken pursuant to Sections 4(i), 302, 303(e), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 302, 303(e), and 303(r). This action is effective upon release of this Order.

16. IT IS FURTHER ORDERED that, if no applications for review are timely filed, this proceeding SHALL BE TERMINATED, and the docket CLOSED.

FEDERAL COMMUNICATIONS COMMISSION

Ronald T. Repasi
Acting Chief, Office of Engineering and Technology

³³ See also 47 CFR § 15.15(b).