APPLICATION FOR BLANKET EARTH STATION AUTHORIZATION

I. Overview

By the instant application, Hiber Inc. ("Hiber")[1] requests from the Federal Communications Commission ("FCC" or "Commission") a blanket license to operate up to 10,000 mobile earth station user terminals in the United States in conjunction with the Hiberband satellite network.[2] This blanket license application seeks authority to deploy and operate Hiber's user terminals throughout the continental United States, Alaska, Hawaii, Puerto Rico, Guam, American Samoa, the U.S. Virgin Islands, the North Mariana Islands, all other U.S. territories and possessions, and all U.S. territorial waters. As explained in detail in the pending request by Hiber for U.S. market access,[3] the Hiberband network will be comprised of 24 low-earth orbit non-voice, non-geostationary ("NVNG") satellites with service links in the 399.9-400.05 MHz band (uplink) and 400.15-401 MHz band (downlink).[4] Once authorized by the FCC, Hiber will offer low-cost, low-power satellite-based Internet-of-Things ("IoT") services and other applications throughout the United States, including in rural and remote areas. Among

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1 Hiber is a wholly owned subsidiary of Hiber B.V., a Dutch company based in the Netherlands.

2 *See* 47 C.F.R. §§ 25.115(d), 25.135, 25.287(c).

3 *See* Hiber, Petition for Declaratory Ruling, File No. SAT-PDR-20180910-00069 (filed Sep. 10, 2018) ("Petition for Declaratory Ruling"). Hiber's market access request was placed on public notice on March 21, 2019, and the Commission initiated a satellite processing round for certain of the UHF frequencies used by the Hiberband network terminals. *See Cut-off Established for Additional NVNG MSS Applications or Petitions for Operations in the 399.9-400.05 MHz and 400.15-401 MHz Bands*, Public Notice, 34 FCC Rcd 7185 (2019).

4 As explained in the Petition for Declaratory Ruling, the Hiberband network operates on other frequency bands for gateway earth stations located outside of the United States. *See, e.g.*, Petition for Declaratory Ruling at 4.

other things, customers will be able to use the Hiberband network to manage natural resources, grow crops more efficiently, protect wild animals, and track weather and soil data.

A. User Terminal

The Hiber user terminals consist of a battery-powered modem operating in conjunction with a passive, square flat-plate antenna. The modem is capable of providing low-throughput data connectivity via the Hiberband network. These modem devices are designed as compact, solderable surface-mount technology modules, which can be easily connected to or integrated into IoT and other devices, allowing for global delivery of data. Operationally, the user modems are designed to be dormant 99 percent of the time, operating only when a satellite is overhead. In part because of the device's low-duty cycle and low-power consumption, the terminals can operate on a single battery for up to ten years, and users can deploy terminals in the field at a fraction of the cost of traditional satellite systems and without concerns about the need to revisit remote deployment sites.

B. IoT Service

Hiber currently operates two satellites and intends to launch additional satellites in 2020. Since launching its satellites one year ago, Hiber has engaged in pilot testing in numerous locations around the world.[5] The testing has revealed a tremendous customer desire for low-cost, low-power connectivity across many industries. Innovative applications for which the Hiber technology has been, or will soon be, utilized include beekeeping (temperature and humidity),

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5 Testing in the U.S. has been undertaken pursuant to an experimental license. *See* Application of Hiber, ELS File No. 0704-EX-CN-2018; *see also* Application of Hiber, ELS File No. 0195-EX-CM-2019.

cattle tracking (location), biomass storage (temperature and humidity), agriculture (soil moisture and temperature), and post-harvest silo monitoring (temperature and humidity).

Hiber believes that the potential applications of its technology are limitless. Many U.S. customers have expressed a desire to integrate Hiber technology into other new solutions once Hiber has been granted U.S. market access. Such uses include monitoring dams for erosion and other potential failure points, tracking and load monitoring for trucks and rail cars, data feeds from ocean buoys to monitor temperature, winds, and currents, and precision farming to increase yields. Hiber's technology allows users to deploy efficient and cost-effective IoT solutions in environments, such as geographically remote areas or other areas without terrestrial or other infrastructure, which otherwise would not be possible because of prohibitively high costs and/or maintenance requirements. For all of the above reasons, the public interest would be served by expeditious grant of this application.

II. Technical Information

A. Frequencies

The user terminals will communicate in the 399.9-400.05 MHz band for uplink and the 400.15-401 MHz band for downlink.[6] For the service uplink, Hiber will operate in one 120-kHz channel using Quadrature Phase Shift Keying ("QPSK") modulation. Hiber's broadcast service downlinks will operate in one 100-kHz channel using Gaussian Minimum Shift Keying ("GFSK") modulation. As shown below, Hiber may also operate with different bandwidth

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[6] Hiber notes the recent decision by the ITU at WRC-19 to permit higher-power telemetry, tracking, and command ("TT&C") transmissions in the upper 30 kHz of the Earth-to-Space band. This decision will take full effect in November 2022. While Hiber is applying to use the full 399.9-400.05 MHz Earth-to-space band, it is Hiber's intention to limit its data collection service activities to the 120 kHz of spectrum from 399.9 to 400.02 MHz in compliance with this new limitation.

configurations as operational requirements dictate, including, for example, as a result of coordination requirements.

B. Emission Characteristics

Hiber has the flexibility and spectral efficiency to operate with similar systems in this band by varying the bandwidth of the emissions of its satellites and user terminal. This will potentially accommodate other users of the bands according to international coordination agreements, FCC technical limits and/or sharing requirements. Information regarding the characteristics of additional emissions designators and their corresponding power, EIRP, and EIRP density levels is provided in Table 1 below.

Table 1

Emission designator	Bandwidth (kHz)	Power level (W)	Max EIRP (dBW)[7]	Max EIRP Density (dBW/4 kHz)	Max EIRP Density towards horizon (dBW/4 kHz)
120kG7D	120	1.5	7.16	-6.82	-14.23
60KG7D	60	1.5	7.16	-3.8	-11.2
30KG7D	30	1.5	7.16	-0.8	-8.2
15KG7D	15	1.5	7.16	2.21	-5.2

C. Out-of-Band Emissions

Figure 1 below shows the specific spectrum mask for the Hiber service uplink in the 399.9-400.05 MHz band. The spectrum mask demonstrates that Hiber's user terminals will

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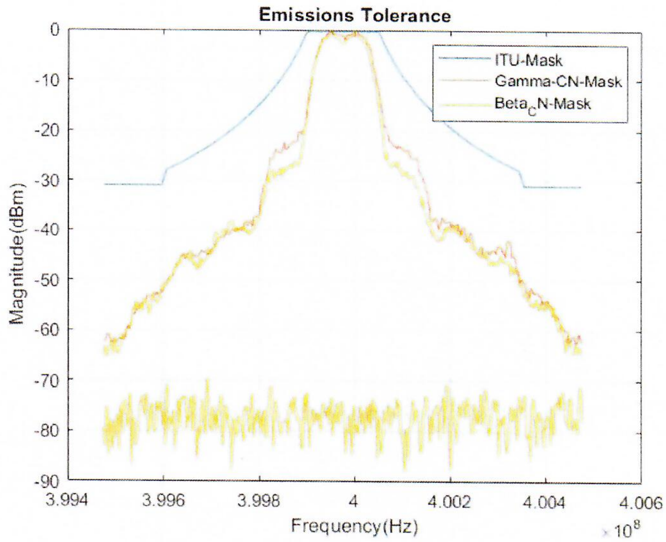
7 It was agreed at WRC-19 that by November 2022 the EIRP values in the band 399.9-400.02 MHz will be limited to no more than 5 dBW. *See supra* note 6. To be protected against current TT&C operations, the maximum power presented under this application will not exceed 7.16 dBW. Hiber will comply with the 5 dBW EIRP limit before the limit comes into force in 2022.

comply with the out-of-band emission limitations specified in § 25.202(f) of the Commission's rules.

Figure 1



In addition, the carrier frequency of each user terminal will be maintained within 0.001% of the reference frequency as required by § 25.202(d) of the Commission's rules.

D. Additional Technical Parameters and Operating Conditions (47 C.F.R. §§ 25.135, 25.142)

Pursuant to 47 C.F.R. § 25.135 of the Commission's rules, Hiber describes its proposed NVNG MSS operations and the relevant technical and operational aspects of the system to demonstrate that its user terminals comply with the requirements set forth in 47 C.F.R. § 25.142.

For the service uplink, the user terminals can transmit uplink messages up to 1,400 bits in size, and the duration of each transmission will be from less than half a second to a maximum of 4 seconds, depending on the bandwidth used and other factors. The longest possible transmission time of 4 seconds, within the 15-minute window of a single satellite pass, corresponds to a duty cycle of only 0.44 %.

For the broadcast service downlinks, the duration of each broadcast transmission will be from 400 milliseconds (for typical operations) to a maximum of 1 second every 10 seconds. These burst transmissions, within the 15-minute window of a satellite pass, correspond respectively to duty cycles ranging from 4% to a maximum of 10%. The length and intervals of such broadcasts are configurable by Hiber. The typical transmission size will range from a few bytes to a few hundred kilobytes, and transmission intervals will be approximately 10 seconds.

The user terminals mainly use CDMA for random access because this scheme better supports asynchronous low-power transmissions. The main feature of asynchronous CDMA is that each message sent by each terminal is spread over the available frequency bandwidth and multiplied by a long pseudo-random scrambling code. The messages of different terminals reach the satellite asynchronously, which allows the demodulator to distinguish them and recover each message by de-spreading it based on its time of arrival. Hence, the messages have a relatively high probability of being successfully decoded even when they experience interference.

This tolerance to interference enables true random access at a single frequency without the need for synchronization among different terminals or for channel sensing before transmission. As a result, using asynchronous random access with CDMA eliminates the synchronization overhead on the uplink channel and reduces the risk for system congestion caused by multiple access attempts.

To further decrease the risk of interference, the satellite will use the downlink to collectively specify the repetition period for user terminal transmissions, which will maximize the probability that user terminal messages will be successfully decoded. This active technique helps maintain the traffic at the point of optimal efficiency, avoiding system congestion due to destructive interference to messages.

This traffic control technique is also crucial for reducing interference to other systems by minimizing Hiber's access attempts. Further, the low duty cycle described above together with the geographical distribution of the Hiber user terminals in rural and remote areas further reduces the probability of signal interference.

E. Service Limitation (47 C.F.R. § 25.142(b)(1))

Pursuant to 47 C.F.R. § 25.142(b)(1), Hiber will not provide voice services.

III. Conclusion

As demonstrated herein, grant of this application serves the public interest and is consistent with the Commission's rules. Accordingly, Hiber requests expeditious grant of the application to allow the company to commence providing service to U.S. customers.

Respectfully submitted,

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TECHNICAL CERTIFICATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this application and that it is complete and accurate to the best of my knowledge and belief.

Maarten Engelen
Chief Technology Officer
Hiber B.V.

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