**Before the**

**Federal Communications Commission**

**Washington, D.C. 20554**

In the Matter of )

)

Request by Piper Networks, Inc. ) ET Docket No. 19-246

For Waiver of Sections 15.250(c)-(d) and )

15.519(a) of the Commission’s Rules )

To: Chief, Office of Engineering and Technology

**REPLY COMMENTS OF PIPER NETWORKS, INC.**

Piper Networks, Inc. (“Piper”), by its attorney and pursuant to the September 3, 2019 Public Notice in the above-referenced matter,[[1]](#footnote-1) hereby replies to the September 23, 2019 Comments (“Comments”) submitted by Aviation Spectrum Resources Inc. (“ASRI”).[[2]](#footnote-2) On June 6, 2019, Piper submitted its waiver request of Sections 15.250(c)-(d) and 15.519(a)(2) of the Commission’s rules (“Waiver”).[[3]](#footnote-3) The Waiver would permit Piper’s installation of an ultra-wideband (“UWB”) train positioning system as fixed wireless infrastructure under the handheld UWB device rules in the 3200-3700 MHz and 4243-4743 MHz bands or under the wideband device rules with additional power in the 6240-6740 MHz band.[[4]](#footnote-4) More specifically, the Waiver allows the installation of Piper’s UWB equipment on subway and commuter train lines in urban and outdoor areas and the creation of an enhanced transit location system (“ETLS”).

In its Comments, ASRI expressed concern about the potential for the ETLS causing interference to radio altimeters and Wireless Avionics Intra-Communications (“WAIC”) because both operate throughout the 4200-4400 MHz band.[[5]](#footnote-5) According to ASRI, radio altimeters are sensors that operate during all stages of flight, but are most important to aviation safety during take-off and landing because they give accurate vertical position and obstacle avoidance data when flying in poor weather conditions or at night. WAIC systems support safe and reliable wireless internal aircraft communications. Specifically, ASRI is concerned with the outdoor use of Piper’s ETLS on fixed infrastructure along railways because trains may operate in the vicinity of an airport. ASRI is concerned that this proximity could increase the risk of interference from Piper’s UWB devices to radio altimeters on both fixed-wing aircraft and helicopters.[[6]](#footnote-6)

Piper appreciates ASRI’s concerns and notes that ASRI made a number of requests for information in its Comments.[[7]](#footnote-7) Below are Piper’s answers to ASRI’s requests. Piper shares ASRI’s commitment to maintaining the absolute highest standards for air traffic safety in the U.S. Piper also firmly believes that it can deploy the ETLS without any risk to air traffic safety standards nationwide and hopes the answers to the questions below address all of ASRI’s concerns.

**1. What are the transmitted signal power levels and characteristics of ETLS?**

In the 4243-4743 MHz band, Piper’s UWB radios will transmit under the limits the Commission has placed on UWB devices, which specifies a maximum EIRP of -41.3 dBm with a bandwidth of 1MHz averaged over a 1ms window. Piper’s UWB radios use an unmodulated, pulsed signal with a bandwidth of just over 500MHz, and highly directional antennas which focus the radiation along the path of the train.

Antennas have a 3 dBm drop at +33 degrees from horizontal, and a 13 dBm drop at 90 degrees.

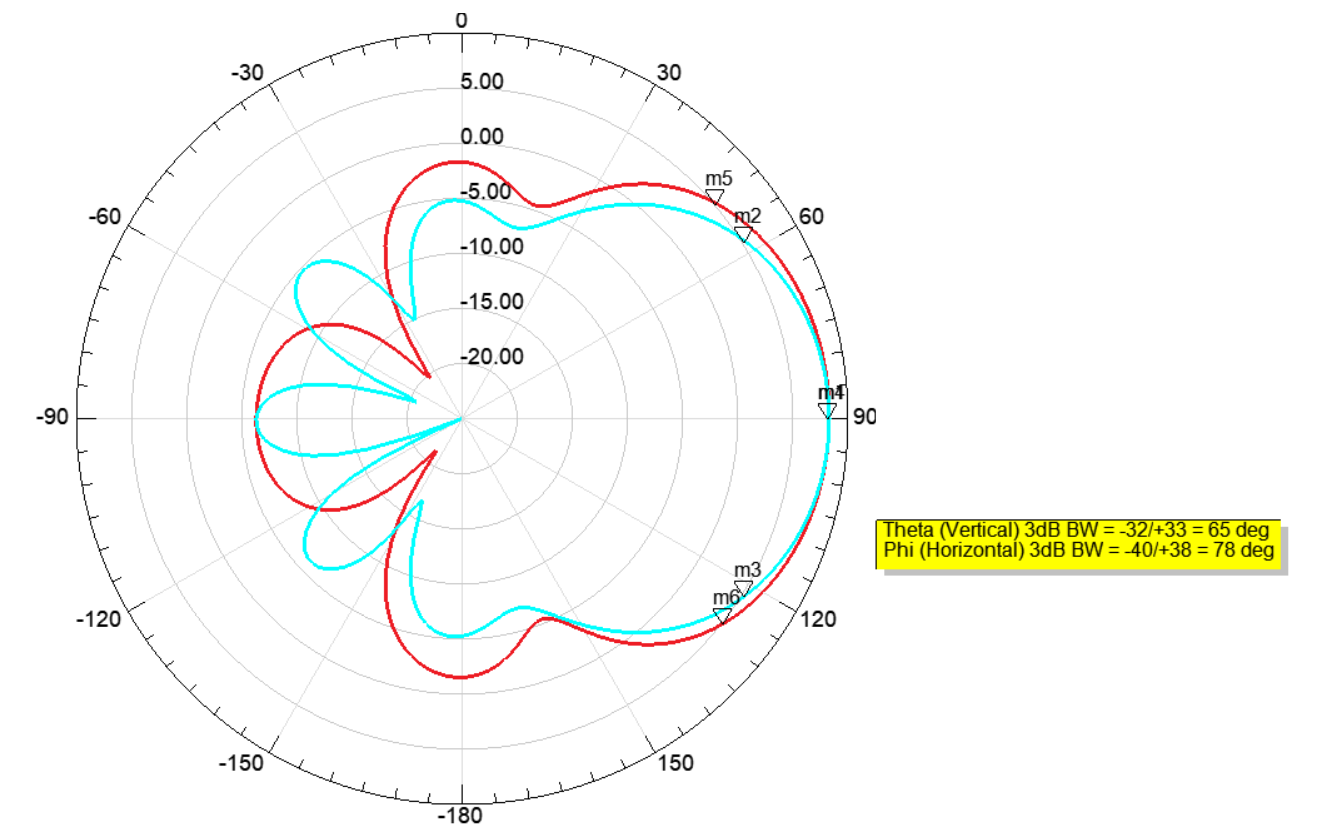


Fig. 1 - Radiation Pattern of Piper Antennas

Piper’s calculations show that even at peak gain, the noise levels induced by the transmissions from Piper’s ETLS become unsubstantial (-174 dBm/Hz) less than 100 feet from the devices.

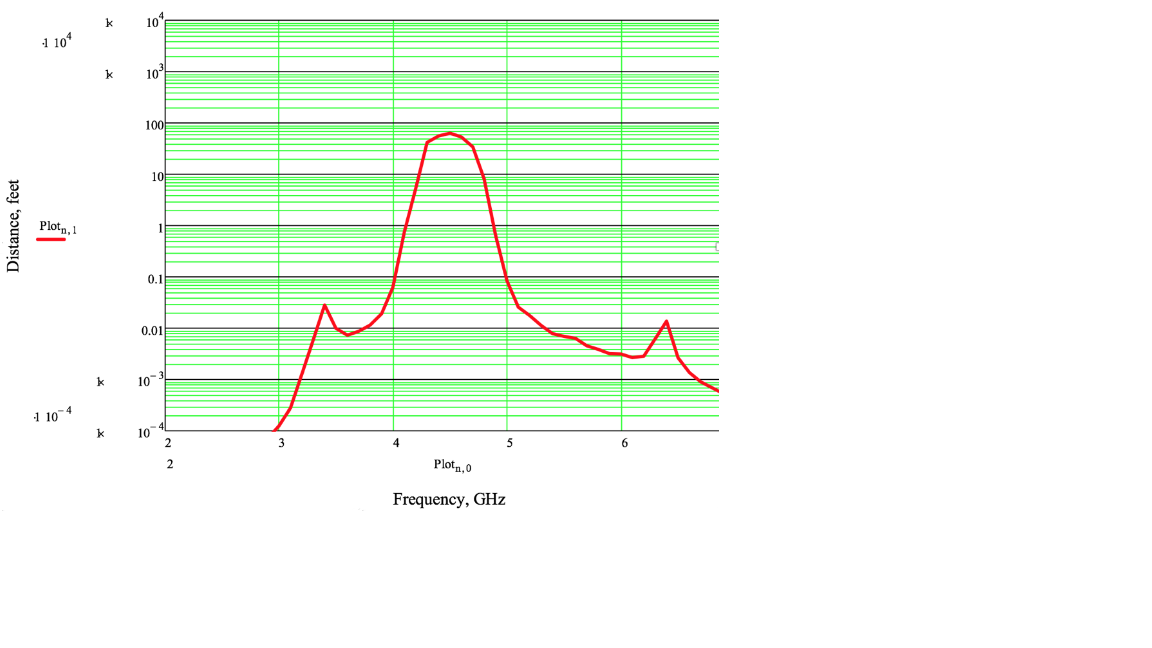


Fig. 2 - Noise Distance at maximum gain.

**2. What is the duty cycle(s) of ETLS operations and its periodic system status signals?**

Piper’s UWB radios have a nominal transmit time of approximately 125 µs per data packet. Each wayside radio, or “anchor,” will transmit a single packet once per minute. The eight UWB radios on the train, or “tags,” have a duty cycle of 0.6%. Wayside anchors in range of the train will respond to each on-board tag with a combined total of 0.6% duty cycle. Piper is also capable of operating with frequency diversity that further reduces duty cycle at 4200-4400 MHz. Therefore, a system composed of one train and the wayside anchors in range will have a combined duty cycle of 9.6%, but with transmission sources spread over several hundred meters.

**3. What kind of installation is required for fixed ETLS transmitting stations (devices)?**

The devices that transmit UWB signals are equivalent in size to a tablet device and are affixed to both trains and the wayside of train tracks using a simple installation method.[[8]](#footnote-8) It is also important to consider that personal mobile devices will be adopting the use of UWB radios in the near future.[[9]](#footnote-9) The proliferation of this technology potentially presents a greater risk because these devices will be operating in an omnidirectional fashion. Piper’s regulated and limited devices do not present this risk because they are highly directional.

**4. What is the density along rail lines of both fixed and mobile transmitting devices?**

The “anchors,” or UWB radios installed on the wayside of tracks, are positioned at intervals of 30-80 meters depending on the curvature of the train track at any given time. The straighter the direction of the track, the greater the interval at which the anchors can be positioned. The “tags,” or UWB radios installed on the trains themselves (mobile), number eight per train car, so their density depends on how many cars are included in each train.

**5. What is the proximity of potential ETLS deployments to airports?**

There is currently no planned deployment of ETLS operating on the 4200-4400 MHz band in proximity to any airports. Indeed, considering the noise distance at maximum gain, Piper can ensure that there will be no potential interference with airport radios operating in this frequency.

**6. How long will ETLS be deployed?**

The ETLS is not meant to be a temporary system. While its deployment does not have to be permanent and it can easily be removed if necessary, the ETLS acts as a long-term, cost-effective, and safe system for accurately tracking the position of commuter rail and subway trains.

**7. Have other chipsets/waveforms been considered for use in the ELTS?**

Piper has considered other chipsets for integration into our devices. However, many of these operate in a wider frequency band and at a higher duty cycle. UWB is by far the best solution for Piper’s ETLS.

**CONCLUSION**

Piper has designed the UWB devices used in its ETLS to be operable on three different channels, only one of which is implicated by the concerns expressed in ASRI’s Comments. This malleable design feature presents Piper with options beyond operating in the 4200-4400 MHz band, and operating on any one channel is sufficient to Piper’s requirements for deploying and operating the ETLS. Piper is confident that its ETLS and UWB devices can be deployed on all three of its channels without interference to any other systems, including those required for aviation safety. But, Piper hopes that the information it has provided herein satisfies any concerns raised by ASRI in its Comments.

Respectfully Submitted,

**Piper Networks, Inc.**

/s/ Robert Hanczor

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1. Public Notice, *Office of Engineering and Technology Seeks Comment on Piper Networks Inc. Request for Waiver of Part 15 Rules for Enhanced Transit Location System,* ET Docket No. 19-246, DA 19-865 (released Sept. 3, 2019). [↑](#footnote-ref-1)
2. Comments of Aviation Spectrum Resources, Inc., *Office of Engineering and Technology Seeks Comment on Piper Networks Inc. Request for Waiver of Part 15 Rules for Enhanced Transit Location System*, ET Docket No. 19-246 (submitted Sept. 23, 2019). [↑](#footnote-ref-2)
3. 47 C.F.R. §§ 15.250(c)-(d), 15.519(a)(2). [↑](#footnote-ref-3)
4. 47 C.F.R. §§ 15.519(a)(2) and 15.250(c)-(d), respectively. [↑](#footnote-ref-4)
5. Comments at 1-2. [↑](#footnote-ref-5)
6. Comments at 4-5. [↑](#footnote-ref-6)
7. Comments at 5-6. [↑](#footnote-ref-7)
8. Petition for Waiver, *Office of Engineering and Technology Seeks Comment on Piper Networks Inc. Request for Waiver of Part 15 Rules for Enhanced Transit Location System,* pgs. 3-4, ET Docket No. 19-246 (submitted June 6, 2019). [↑](#footnote-ref-8)
9. *See The Biggest iPhone News Is a Tiny New Chip Inside It*, Wired.com (Sept. 12, 2019), <https://www.wired.com/story/apple-u1-chip/>; *See also* *What is Ultra-Wideband–and What Does It Do in the iPhone 11*, Gizmodo.com (Sept. 16, 2019), <https://gizmodo.com/what-is-ultra-wideband-and-what-does-it-do-in-the-iphon-1838097808>. [↑](#footnote-ref-9)