RM-11002

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Doc. 34031/2
Ref. Doc. 34031/1

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UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

January 31, 2005

RECEIVED
APR 11 2005
Federal Communications Commission
Office of the Secretary

Mr. Edmond J. Thomas
Chief, Office of Engineering and Technology
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Dear Mr. Thomas:

The National Telecommunications and Information Administration (NTIA) appreciates the opportunity to provide comments in response to the Federal Communications Commission (Commission) *Public Notice in the Matter of Global Positioning System (GPS) Networking Inc. (GNI) Petition for Rulemaking and Request for Waiver to Market GPS Re-Radiating Systems*.[1] NTIA's comments address the potential impact to federal and commercial GPS operations based on the proposals in the GNI petition.

The GNI GPS re-radiating kit brings GPS signals, which by their nature tend to be very weak, into areas where GPS signal coverage is unavailable, such as airport hangars, underground facilities, laboratories, anechoic chambers, and other closed facilities. As mentioned in the GNI petition, several federal agencies have shown interest is using GPS re-radiating devices for testing and experiments at such facilities.[2] These facilities are typically under the control of an organization operating the re-radiator, be it a federal or commercial entity, and have limited access by the general public. However, GNI has identified a wide variety of terrestrial applications that are not limited to controlled environments, which may increase the potential of interference to GPS operations. Therefore, the interference potential resulting from implementing GPS re-radiating systems as proposed by GNI needs careful examination.

Having reviewed the GNI petition, we believe that conflicting and incomplete technical characteristics make it impossible to assess whether the proposed GPS re-radiating system is compatible with other GPS receiver applications. For example, the GNI petition states that the power is 0.0001 picowatts, equating to a signal level of -160 dBW, the minimum guaranteed GPS signal power at the surface of the earth.[3] The power transmitted by the re-radiator exceeds the minimum level for most GPS receivers to process the signal. As part of the petition, GNI

1. Federal Communications Commission, Consumer & Governmental Affairs Bureau, Public Notice,*In the Matter of GPS Networking Petition for Rulemaking to Market a GPS Re-Radiating* Kit, Report No. 2662, Rulemaking Number 2662 (June 25, 2004) ("GNI Petition").

2. *Id.* at 9.

3. There have been several Special Temporary Authorizations that have been requested by GNI listing transmitter power levels that range from -140 dBW to -160 dBW.

provides measurements from a compliance laboratory that reports a voltage of 75 dBμV, measured at a distance of 1 meter, which equates to a power out of the GPS re-radiator of -28.1 dBW.[4] The petition also includes a copy of a U.S. Department of the Army Spectrum Planning Subcommittee submission indicating the transmitter power is -101 dBW (59 dB higher than the minimum GPS guaranteed signal level).[5] Before we can perform an assessment to determine the potential impact of the proposed GPS re-radiator signal on federal and commercial GPS operations, the appropriate technical parameters must be determined. We believe that as a minimum the technical questions provided in the enclosure to this letter need to be addressed.

As stated in the petition, re-radiators are intended to be used in public areas where GPS signal levels are weak or non-existent (e.g., indoors). However, receivers employing assisted GPS (A-GPS) technology are also capable of operating in areas where GPS received signal availability is degraded.[6] A-GPS receivers are capable of processing received signal levels as low as -181 dBW (21 dB lower than the minimum guaranteed signal level), which will make them very susceptible to re-radiated GPS signals.[7] Handsets employing A-GPS technology will be used to meet the Commission's enhanced-911 (E-911) mandate requiring the position of a cell phone to be available to emergency call dispatchers. Given the critical nature of E-911 phone calls, the compatibility between A-GPS receivers must be assessed prior to permitting the operation of re-radiation systems.

Unlike many of the other types of potentially interfering signals (e.g., noise, continuous wave, pulse) the signals generated by the GPS re-radiator devices can cause an active GPS receiver to lock onto a signal that appears legitimate but is actually a false signal. This phenomenon is referred to as spoofing. Spoofing can create signal position, velocity and timing errors. There are little publicly available information or test results concerning the response of commercial GPS receivers to spoofing or concerning the magnitude of the range error that can be induced. Since spoofing can result in misleading information rather than a loss or degradation of GPS service, the effect can be more onerous for safety-related applications. This could result in a more stringent requirement for interference protection of safety-related services.

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4. GNI Petition at Exhibit B. Convert the voltage to power of -64.5 dBW and add the path loss at 1 meter of 36.4 dB.

5. *Id.* at Exhibit C.

6. A-GPS describes a system where outside sources, such as an assistance server and reference network, helps a GPS receiver perform the tasks required to make range measurements and position solutions. The supplemental information provides Doppler and code shift data to allow acquisition and tracking of low level GPS signals. The A-GPS receiver also integrates the satellite signal over a longer time period, allowing the receiver to obtain a 20 to 30 dB higher processing gain compared to a conventional GPS receiver.

7. The October 2003 GPS World reported that Motorola has launched an A-GPS module for applications in cell phones that achieves a signal detection of -182 dBW.

The GNI petition included laboratory measurements of attenuation levels for different types of building materials.[8] As shown in these measurements, most of the materials examined exhibited less than 6 dB of attenuation.[9] The test results provided in the petition are of limited use in assessing potential interference to GPS receivers operating outside of a building where a GPS re-radiating system is deployed. The measurements did not include different GPS receivers, such as those employing A-GPS technology, that are capable of processing weak desired signals.[10] Furthermore, the metric of position fix used in the measurements is subject to many uncertainties.

The petition proposes to allow GPS re-radiators to operate under Section 15.211 of the Commission's Rules, which allows for the use of radio frequency devices in tunnels, mines, and in other areas where natural barriers prevent harmful interference from devices used there.[11] We believe that there are no similarities between the areas where Section 15.211 is intended to permit unlicensed device operation and those proposed by GNI in their petition.[12] Moreover, we cannot support the use of GPS re-radiators as Part 15 devices. A GPS re-radiator is a device that re-transmits GPS signals as intentional transmissions within the restricted frequency bands used by GPS.[13] We strongly support the long-standing national policy prohibiting intentional unlicensed device transmissions in the restricted frequency bands.

We understand that representatives of the U.S. GPS Industry Council and GNI are engaged in discussions concerning these issues. Industry discussions such as these can result in the productive exchange of information that is necessary to resolve the technical issues raised in this letter. We recommend that the Commission defer any regulatory decision in this matter until the industry discussions are completed and all applicable technical issues resolved.

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8. GNI Petition at Exhibit B.

9. *Id.* at 11.

10. The receivers used in the measurements are described as handheld receivers, which typically employ the conventional course/acquisition architecture that processes signals above the minimum guaranteed signal level

11. GNI Petition at 16.

12. Under Section 15.211 GPS re-radiators would be permitted to operate at the Section 15.209 general emission limits. Under Section 15.209, in the GPS frequency bands a maximum allowable equivalent isotropically radiated power level of -71 dBW/MHz is permitted.

13. *See* 47 C.F.R. Section 15.205. The restricted frequency bands are listed in Section 15.205 and include bands used to support safety-of-life functions such as aeronautical radionavigation and bands employed by radio services that must function, as a nature of their operation, using extremely low received signal levels. The systems that operate in these frequency bands may be passive, such as radio astronomy, or active, such as satellite downlinks. In these restricted frequency bands, only spurious and unintentional emissions are permitted.

We recommend that the Commission take into consideration the enclosed information and look forward to working with your staff to find the best way to accommodate GPS re-radiators, without posing an operational burden upon or disruption of GPS services. If you have any questions about our comments, please feel free to contact me at 202-482-1850.

Sincerely,

Fredrick R. Wentland
Associate Administrator
Office of Spectrum Management

Enclosure

ENCLOSURE

TECHNICAL QUESTIONS REGARDING GLOBAL POSITIONING SYSTEM RE-RADIATORS

The following list of technical questions is based on the Global Positioning System (GPS) Networking Inc. petition for rulemaking and request for waiver to market GPS re-radiating systems.

1) Can a typical installation and the greatest variance to the typical installation of the GPS re-radiators be identified? Can this information be used to develop an operational scenario (e.g., minimum separation distance, antenna coupling) to assess potential interference from GPS re-radiators to other GPS receiver applications?

2) What are the minimum and maximum transmit power levels of the GPS re-radiated signal? How much control or flexibility is there in setting the transmit power level? Is the transmit power level set at the factory or can it be changed after the GPS re-radiator is installed?

3) What is the bandwidth of the re-radiated GPS signal?

4) What are the vertical and horizontal radiation patterns of the GPS re-radiator antennas?

5) Once installed is the GPS re-radiating system fixed or can it be moved to other locations?

6) Maximum allowable interference susceptibility limits exist for the following categories of interfering signals: broadband noise, continuous wave, and pulsed. The GPS re-radiated signal, which is similar in structure to the desired signal, does not fit into any of these categories of interfering signals. What interference susceptibility level should be used in assessing potential interference from GPS re-radiator signals to other GPS receivers?

7) How would you estimate the GPS re-radiator signal level outside of a building?

8) Will the GPS re-radiators be installed by professional installers? If so, what qualifications must an individual possess in order to be classified as a professional installer?

9) Can the locations of the installed GPS re-radiator systems be entered into an on-line database?