

From: Andrew Meier

To: Doug Young

Date: March 12, 2018

Subject: Request for Info - File # 0874-EX-CN-2017

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Message:

1. Additional description of proposed use of the re-radiator as an experimental RNSS (Radionavigation-satellite service) Test Equipment for the purpose of testing GPS receivers:

Air-Weigh requires the use of a GPS Re-Radiation ("Re-Rad") system inside our final assembly and test building in Eugene, Oregon. This equipment will be used as "Experimental RNSS Test Equipment," for the purpose of developing, testing and verifying GPS receiver functionality. The GPS receivers are contained within heavy duty truck and trailer asset tracking systems.

Currently, there is no way to test GPS receiver functionality because satellite transmitted GPS signals do not adequately penetrate the walls and roof of the building containing the final assembly and test area of company operations. Without a Re-Rad system, in order to obtain adequate GPS signal for testing and verifying truck and trailer asset tracking systems, it would be necessary to place the GPS receivers under test outdoors, directly exposing electronics products and computing equipment to adverse weather conditions and theft, and inhibiting access to other needed test equipment. The Experimental RNSS Test Equipment will only be powered on at times required for test and verification of GPS receiver functionality, and company employees will be trained and directed via a formal Work Instruction document to power down the Re-Rad system at all other times. The Tri-M Systems Super-Radiator will be permanently installed well inside the building so that its 10 meter specified reception limit will be fully contained within the building.

2. Additional information showing compliance with Section 8.3.28 of the NTIA Manual, items a, b, and e-i:

- a. Individual authorization is for indoor use only, and is required for each device at a specific site.

Air-Weigh Response: "YES, This request is for one indoor system. The system will be permanently mounted indoors such that its specified range plus margin is fully contained within the building located as described in the FCC Form 422."

- b. Applications for frequency assignment should be applied for as an XT station class with a note indicating the device is to be used as an "Experimental RNSS Test Equipment for the purpose of testing GPS receivers" and describing how the device will be used.

Air-Weigh response: "YES, Air-Weigh concurs with the XT station class. The system will be used to develop, test and verify GPS receivers installed on electronics equipment products for use in asset tracking of heavy duty trucks and trailers. The Tri-M Systems Super-Radiator will be permanently installed well inside the building so that its 10 meter specified reception limit will be fully contained within the building. The Experimental RNSS Test Equipment will only be powered on at times required for test and verification of GPS receiver functionality, and company employees will be trained and directed via a formal Work Instruction document to power down the Re-Rad system at all other times.

- e. The area of potential interference to GPS reception (e.g., military or contractor facility) has to be under the control of the user. Areas beyond the range for potential interference are protected by the maximum power calculation described in f. below, and thus no further record notes are required for frequency assignments.

Air-Weigh response: "YES, the indoor building location as described in FCC Form 442 is under Air-Weigh control. YES, areas beyond the range for potential interference are protected by the maximum power calculation described in (f) below."

f. The equivalent isotropically radiated power (EIRP) must be such that the emissions are no greater than -140 dBm/24 MHz as received by an isotropic antenna at a distance of 100 feet (30 meters) from the building where the test is being conducted. The calculation for maximum EIRP shall be based on free space propagation with no allowance for additional attenuation (e.g., building attenuation) as shown below.

$$??_{\max} = ?? + 20 \log_{10} ? + 20 \log_{10}(30 + ?) - 27.55$$

Where:  $??_{\max}$  is the maximum permissible EIRP in dBm

$??$  is the power received at 30 meters from the building (i.e. -140 dBm/24 MHz)

$?$  is frequency in MHz (i.e. 1575.42 for L1, 1227.60 for L2, 1176.45 for L5)

$?$  is the distance between the radiator and the closest exterior wall of the building in meters.

$??_{\max}$  can then be converted to picowatts by using the formula:  $??_{\max}(W) = 10^{(PT_{\max}/10+9)}$

Air-Weigh response: For L1 signal, the Tri-M Super-Radiator rooftop external receiving antenna provides 28 dB of amplifier gain to the re-radiating antenna. The re-radiating antenna provides 30 dB of gain. There is a 40 meter length of "low loss RG-58A/U" cable between the external receiving antenna and the indoor re-radiating antenna.

$$??_{\max} = -140 + 20 \log_{10}(1575.42) + 20 \log_{10}(30+15.5) - 27.55$$

$$??_{\max} = -70.4 \text{ dBm}$$

$??_{\max} = 90.3 \text{ pW}$ . YES, it is anticipated that the re-radiating antenna will output no more than -72 dBm, or 50pW, which is well under the  $PT_{\max}$  allowed.

Applications requesting power greater than the  $??_{\max}$  calculated at  $? = 0$  meters (i.e. 39.3 pW for L1, 23.8 pW for L2, and 21.9 pW for L5) must provide the distance from the transmit antenna to the nearest exterior wall so that reviewing agencies can determine if the requested power meets the maximum EIRP described above.

Air-Weigh response: Not applicable, as we are not requesting to transmit power greater than  $PT_{\max}$  calculated at  $d = 0$  meters.

g. GPS users in the area of potential interference to GPS reception must be notified that GPS information may be impacted for periods of time.

Air-Weigh response: Yes. GPS users within the interference risk area will be fully informed of the operation of a local GPS re-rad system.

h. The use is limited to activity for the purpose of testing RNSS equipment/systems.

Air-Weigh response: Yes. The use of the GPS re-radiating system will be limited to activity for the purpose of testing RNSS equipment/systems.

i. A "Stop Buzzer" point of contact for the authorized device must be identified and available at all times during GPS re-radiator operations.

Air-Weigh response: Yes. The POCs:

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