

NTIA Items 1 – 9 Explained

8.3.28 Use of Fixed Devices That Re-Radiate Signals Received From the Global Positioning System.

Except as otherwise authorized under Section 7.14, federal agencies and departments may, under the following conditions, operate fixed devices that re-radiate signals received from the GPS.

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

ANSWER: Yes, the device will be limited to indoor use only. As per the Attachment-1 of file# 0483-EX-CN-2017, the device will be used indoors in a lab located at the address: 101 Innovation Drive, San Jose, California; with following coordinates: 37°24' 3.932"N; 121°56' 7.708"W

- 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.

ANSWER: Yes, per the application, intended use is fixed station class (FX) for purpose of Experimental Testing (XT) and indoor verification of GPS sensors mounted on cars. Intel plans to operate a vehicle lab for autonomous driving at its San Jose campus. GNSS sensors will be mounted on the test vehicles for this experimental testing to be conducted inside the lab at the address and coordinates given above to (a.).

- c. Approved applications for frequency assignment will be entered in the GMF.

ANSWER: Yes, upon approval, application will be entered in the GMF

- d. The maximum length of the assignment will be two years, with possible renewal.

ANSWER: Yes, the duration requested is 24 months (2years).

- 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.

ANSWER: Yes, we (Intel) are in control of the building, which is part of the Intel campus SJI, and yes we (Intel) are responsible for the testing.

- 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.

$$PTTTT = PR + 20 \log_{10} f + 20 \log_{10}(30 + d) - 27.55$$

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Where: $PTTTT$ is the maximum permissible EIRP in dBm

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

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

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

$PTTTT$ can then be converted to picowatts by using the formula: $PT(pp) = 10^{\frac{PTTTT}{10} + 9}$

$PTTTT$

$10 + 9$

Applications requesting power greater than the $PTTTT$ calculated at $d = 0$ 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.

ANSWER:

Taking the following-

$f = 1575.42$ MHz; $d=5$ m (distance of indoor repeater to closest wall);

$PTTT \text{ [dBm]} = -140 + 20*\log_{10}(1575.42) + 20*\log_{10}(30+5) - 27.55 = -72.72 \text{ dBm}$

$PTTT \text{ [pW]} = 53.45 \text{ pW}$

We have two indoor repeater with adjustable output power. We plan to operate them each with EIRP of $-75.8\text{dBm} = 26.30\text{pW}$ (ERP of $-73.6\text{dBm} = 43.65\text{pW}$) with a distance of 10m from each other. I.e. the combined EIRP of both repeaters at 30m distance from the building will be lower than the -140dBm .

- 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.

ANSWER: Area of coverage will be limited to laboratory site as previously stated in (a.) above. So, notification will only apply to related Intel personnel.

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

ANSWER: Yes purpose of this activity for is strictly limited to Experimental Testing (XT) and indoor verification of GPS sensors equipment mounted on cars.

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

ANSWER:

The "stop buzzer" point of contact is Domingo Gonzalez (Tel: 408.839.7646; email: domingo.c.gonzalez@intel.com)