

8.3.27 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.
 - i. ***Denton County is using a single fixed GPS repeater inside our vehicle workshop.***
- 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.
 - i. ***1. Illumination in part of the vehicle workshop illustrated with a GPS radiation path to allow for indoor testing and experimentation for continued exploration of GPS technologies to provide innovative applications. *See Workshop GPS Radiation Path.jpg file attachment.***
2. Further design, development, and enhancement of existing GPS applications to provide greater efficiency and more effective means of utilizing GPS derived information.
3. Troubleshoot, test, and repair GPS systems indoors.
- c. Approved applications for frequency assignment will be entered in the GMF.
- d. The maximum length of the assignment will be two years, with possible renewal.
- 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.
 - i. ***The proposed location of the GPS re-radiating equipment is owned and solely managed by the County of Denton and its technology staff.***
- 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.
$$PT_{max} = PR + 20 \log_{10} f + 20 \log_{10}(30 + d) - 27.55$$
Where: PT_{max} 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.
$$PT_{max}$$
 can then be converted to picowatts by using the formula: $PT_{ma}(pW) = 10(PT_{max} 10 + 9)$ Applications requesting power greater than the PT_{max} 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.

- i. Denton County is not requesting power greater than -140 dBm. We have calculated the repeated signal power at -136.64 at 30 feet or 9.35 meters.*
- ii. See the Link Budget Calculation PDF attachment for details.*

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.

- i. Denton County will post signage in the area to alert anyone within the operating range of the repeating system alerting them to the use and possible interference to their GPS receiving devices.*

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

- i. The GPS repeating system will only be powered on during testing and equipment validation. Personnel will have access to the system to activate it on demand and deactivate when not in use. The power for the GPS unit will be attached to a physical timer which will not allow operation for more than one hour at a time as a failsafe.*

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

- i. Please see the PDF attachment titled, "GPS Repeater Stop Buzzer Contact" for a list of stop buzzer contacts.*