City of Tucson, Arizona
Experimental License Application
File Number: 0185-EX-PL-2016

Overview and Explanation

Overview: The City of Tucson Fire Department is filing this application for use of a GPS re-radiation system at its facilities at 300 S. Fire Central Pl., Tucson, Arizona. This facility will use GPS for positioning information aboard fire and emergency equipment to aid their GPS system receivers. The GPS re-radiation system is required for the testing GPS guaranteeing GPS initialization lock on all fire and emergency equipment before those resources leave the fire station.

Type of Entity: The City of Tucson is a public municipality.

General compliance with NTIA section 8.3.28: set forth below are the City of Tucson's responses to the requirements of 8.3.28 as those answers apply for this location.

For any questions about this application, please contact Anne Cortez, Washington Federal Strategies, 520-360-0925, alc@conspecinternational.com.

Reason for filing: The Tucson Fire Department is experiencing delays in GPS lock when their equipment leaving the fire house. This lock can cause navigation delays of several minutes, which slows the response of emergency responders to the places where they are urgently needed. The fire trucks, ambulances, and other emergency response vehicles have GPS antennas installed on all vehicles. Those GPS antennas are integrated with navigational/directional and dispatch software which help guide the response vehicles to the emergency, using the most direct route possible. However, when these vehicles are in the station, out of sight of the sky, the GPS signal is not initialized until the unit leaves the fire station and the navigation can take several minutes to provide routing. This slows the response. And, since the systems are also integrated with traffic signal management, the absence of a route increases the danger of accidents by not having traffic signal controls that prioritize the emergency response vehicles.

Without this initialization the unit is traveling blind to the nearest intersection, waiting for initialization, and, if not received, it may not be taking the shortest route to the emergency scene. It is estimated that the use of the GPS re-radiation in place when the unit is dispatched, GPS will always be initialized and leaving the Station with the location and shortest route to the emergency.

This system is in compliance with the requirements of the provisions in the NTIA Manual that govern use of a GPS re-radiation system by a federal agency.

Compliance with the Requirements of NTIA Manual Section 8.3.28

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

   This GPS re-radiation system will be installed indoors in the fire station. Access to all components is limited to authorized personnel only.

2. **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.**

   The City of Tucson requests the assistance of the FCC and NTIA to properly classify the frequency authorizations.

3. **Approved application for frequency assignment will be entered in the GMF.**

   The City of Tucson requests the assistance of NTIA and the FCC in entering this data into the GMF.

4. **The maximum length of the assignment will be two years, with possible renewal.**

   The City of Tucson is seeking an authorization for two years, and it will seek renewals when required.

5. **The area of potential interference to GPS reception (e.g., military or contractor facility) has to be under the control of the user.**

   The proposed installation will be inside the fire station at 300 S. Fire Central Pl. Tucson, Arizona. Access to the facility is limited to Fire Department personnel and limited authorized visitors.

6. **The maximum equivalent isotropically radiated power (EIRP) must be such that the calculated 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 calculations showing compliance with this requirement must be provided with the application for frequency assignment and should be based on free space propagation with no allowance for additional attenuation (e.g., building attenuation.)**

Link Budget: The link budget for the L1 re-radiation is attached to this exhibit, and it shows the calculations applicable to this proposed installation of a GPS re-radiation system.

Location in building: The re-radiation device will be installed inside Fire Station @ 300 S. Fire Central Pl., Tucson, Az. The re-radiating antenna is installed near the ceiling of the vehicle bay. The attached link budget shows that the signal strength *at 100 feet from the re-radiating antenna* is below -140 dBm/24 MHz. Thus, the signal strength at 100 feet from the building is going to be significantly lower, and the system will be in compliance with the provisions of the NTIA Manual.

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

   City of Tucson will post signs in the Fire House where the re-radiation system is installed alerting those in the area that there are GPS re-radiation systems in use in that area.

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

   City of Tucson is requesting authorization to use a re-radiation system specifically for testing the full-time initialization of GPS systems on its fire and emergency equipment.

9. **A "Stop Buzzer" point of contact for the authorized device must be identified and available at all times during GPS re-radiation operation of the device under any condition.**

   The Stop Buzzer point of contact for this device is:

   Greg McNeal
   IT Manager City of Tucson
   520-837-6053
   greg.mcneal@tucsonaz.gov

   Mr. McNeal can initiate shut off the GPS re-radiation system at any time.

Location Number: 1, Latitude 32-13-00 N Longitude 110-58-39 W
Use: Re-radiation system used 100% for keeping GPS live in fire trucks
installed: indoors
Manufacturer: all components are part of GPS Source.

GPS Signal Analysis - L1 Link Budget

Frequency	1575.42	MHz	Signal Level		
Wavelength	0.19042541	meters	dBm	Watts	picoWatts
GPS Input Signal Level	-130	dBm	-130	1E-16	0.0001
GPS Receive Antenna gain	35	dB	-95	3.2E-13	0.32
GPS RF Amplifier gain	30	dB	-65	3.2E-10	316.23
GPS RF Attenuator	0	dB	-65	3.2E-10	316.23
Coax loss per foot average	-0.067	dB			
Coax Length	200	feet			
Total Coax Loss	-13.4	dB	-78.4	1.4E-11	14.454
GPS Transmitting Antenna Gain	3	dB	-75.4	2.9E-11	28.840
Distance from transmit antenna	30.48	meters			
Distance from transmit antenna	100.0000002	feet			
Pathloss to 100 ft	-66.06999119	dB	-141.5	7.1E-18	7.129E-06
Signal level at 100 ft ERP			-143.6	4.4E-18	4.355E-06