

FCC 442

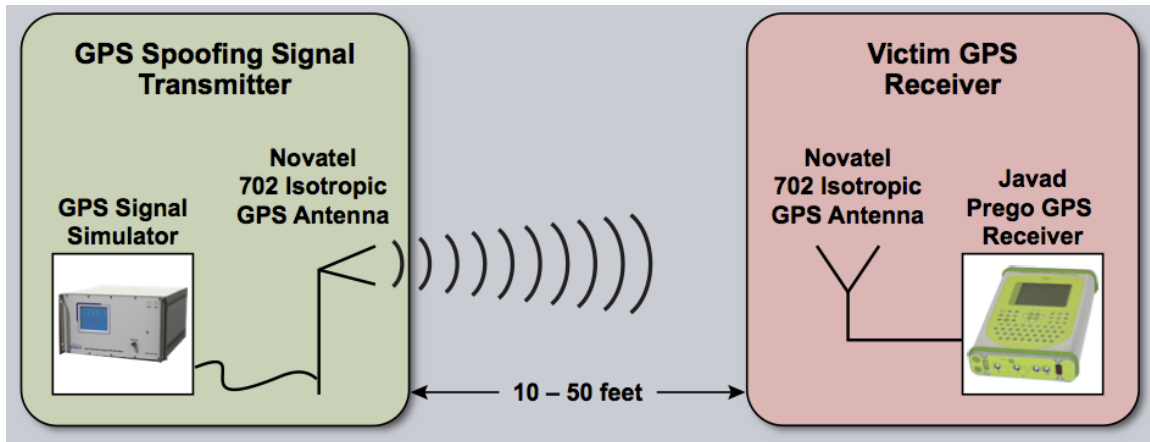
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Introduction

Group 109 at MIT Lincoln Laboratory tests GPS receivers and interference sources as part of its mission in support of the warfighter. Part of this testing involves measuring performance of GPS spoofing attacks on receivers. The lab would greatly benefit from the ability to perform these tests over the air. This would allow fratricide risk to be measured, as well as the effect on the guidance and control of unmanned systems. MIT Lincoln Laboratory would like to temporarily radiate GPS spoofing signals inside one of the laboratories in I-222. The complete test setup is described in this document.

System Description

The diagram below shows the desired system configuration for the GPS spoofing tests. These tests could be performed in one of two locations, each 30'x50' in size with a 10' or 15' ceiling. The spoofing equipment consists of a Spirent GSS7700 GPS/SBAS simulator and a Novatel GPS-702 antenna. The transmit power can be adjusted to meet FCC requirements for radiated power.



Radiated Power Calculations

In order to meet FCC requirements the maximum power measured by an isotropic antenna located 100 feet away from the transmitter must be kept below -140 dBm (-170 dBW). This calculation needs to account for only free space path loss and not the attenuation due to building walls.

The transmitter shall not exceed -133 dBW. The antenna has a gain of 5 dB with an LNA gain of 27 dB. There are 3 dB of cable losses between transmitter and antenna. The free space path loss 100 feet away is 66.07 dB. Net gain is:
 $-133 - 3 + 5 + 27 - 66.07 = -170.07 \text{ dBW} (-140.07 \text{ dBm})$. This is below the maximum receiver power in accordance with FCC regulations.

Bill of Materials

The components listed below are to be used in this transmitter test setup. Where appropriate datasheets are included.

- Spirent GSS7700 GPS/SBAS simulator
- Novatel 702 GPS antenna
- LMR400 coaxial cable (~10 feet)