

From: donald miklovic

To: Behnam Ghaffari

Date: May 24, 2021

Subject: FCC File No. 0656-EX-ST-2021

Message:

Experiment Description

Background. Sensable Solutions (SS) has been providing engineering services to General Atomics Aeronautical Systems, Inc. (GA-ASI) in the San Diego area over the past 6 years to support development of advanced RF sensing technologies. In particular, SS is now developing applications for GA-ASI's unique and proprietary magnetic antenna technology well suited for conformal mounting to aircraft, ground vehicles and surface ships.

Goal To evaluate various configurations of multi-element magnetic antennas for signal detection, classification, and localization (direction finding), and SIGINT. Configurations considered are to include phased arrays of elements measuring one, two and three components of the magnetic field (vector sensor measurements).

Objectives

1. To measure amplitude and phase response of several (possibly coupled) magnetic elements in close proximity as a function of signal incident angle and frequency for various configurations consistent with the experiment goal.
2. Compare these measurements with predictions from the High Frequency Structure Simulator (HFSS), and modify the predictive model as necessary
3. Predict performance of capabilities described in the Goal
4. Demonstration of a capability using sources of opportunity

Approach

Transmission related approach. We will coherently measure the amplitude and phase response of multiple magnetic elements to single frequency control signals. The elements will be configured to measure mutually perpendicular components of the magnetic field vector. Elements will be mounted without nearby interfering structures, and on vehicles where the effect of the mounting could be significant. The measurements will be made with a 4-channel Ettus USRP x310 with two TwinRX daughterboards. The control signals will be transmitted from a vertical ground-mounted monopole on private property that is 100-1000 feet from the magnetic sensors. The minimum power needed to achieve the measurements will be used, but typically no more than 100 mW. Only commercially available, FCC approved transmitter equipment will be used. Frequencies will be limited to the amateur radio bands to minimize interference to other users, and only on a not-to-interfere basis. Test frequencies may range from the 160 meter to the 70 cm amateur bands, one frequency at a time.

Non-Transmission related approach. These measurements will be compared with predictions from HFSS and a modified model developed if needed. These models will be used to predict performance for various military applications being perused by GA-ASI. Demonstrations of certain capabilities will be done using sources of opportunity such as AM, FM and VHF/UHF TV broadcast.

Safety

The transmit antenna will be no closer than 100 feet from the nearest residence. A commercial EMR meter will be used to ensure that levels of .01 mW/cm² are never exceeded at the property line, or at the location of any personnel near the antenna.

Operation Control

Transmitter equipment will be operated solely by Dr. D.W. Miklovic who has extensive experience in the

RF field testing, and holds an engineering degree, a PhD from Caltech, and an Amateur Radio Extra Class FCC license (AE6II) valid through 7-16-2023.