Form Confirmation Number: EL931289 Daniel N. Aloi, Ph.D.
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Attachment
FCC Form 442
Experimental Operator's License

A. Research Description

The Applied Electromagnetics and Wireless Lab at Oakland University, under the direction of Dr. Daniel N. Aloi, was awarded $400K from the National Science Foundation's 2005 Major Research Instrumentation solicitation to purchase an automotive antenna range as described below. This equipment will be located on the campus of Oakland University.

The primary purpose of this equipment is to perform antenna measurements located on automotive platforms. The duration of this license request is 5 years since it will be an ongoing operation.

Also, Oakland University was listed as "Other" because it is a public University.

B. Description of Research Instrumentation and Needs

The Automotive Antenna Measurement Instrumentation (AAMI) is a spherical far-field (FF) / near-field (NF) antenna measurement system (Figure 1). The antenna measurement system is capable of measuring on-vehicle antenna performance in the frequency range 800 MHz to 6 GHz for a variety of vehicle platforms. The spherical FF/NF antenna measurement system are comprised of the following major sub-components:

1. Positioning and control equipment,
2. Signal source and receiver,
3. Data collection and processing.

The above three sub-components of the AAMI are addressed for the spherical FF/NF antenna measurement system.

B.1 Positioning and Control Equipment:

A ground-level drive-on vehicle turntable is used to rotate the vehicle 360 degrees in the azimuth direction [MI-7121M]. The vehicle turntable has a 6-meter diameter, can support a load capacity of 14,400 lbs, and rotates at an angular velocity up to 2 rpm. The vehicle turntable also has a slip-ring and rotary joint installed to prevent the radio frequency cables from winding up as the turntable rotates.

A motorized elevation gantry (0 – 90 degrees) with pivot height adjustment (1 – 6 meters) and polarization adjustment (0 – 90 degrees) is used to orient the source antenna of the spherical FF/NF measurement system with respect the antenna under test [MI-7141M]. The pivot point of this gantry can be adjusted from 1 meter to 3 meters in order to align the spherical axis of rotation of the gantry at the same height of the antenna under test on various platforms. The gantry has a 10-meter radius with respect to the antenna under test.

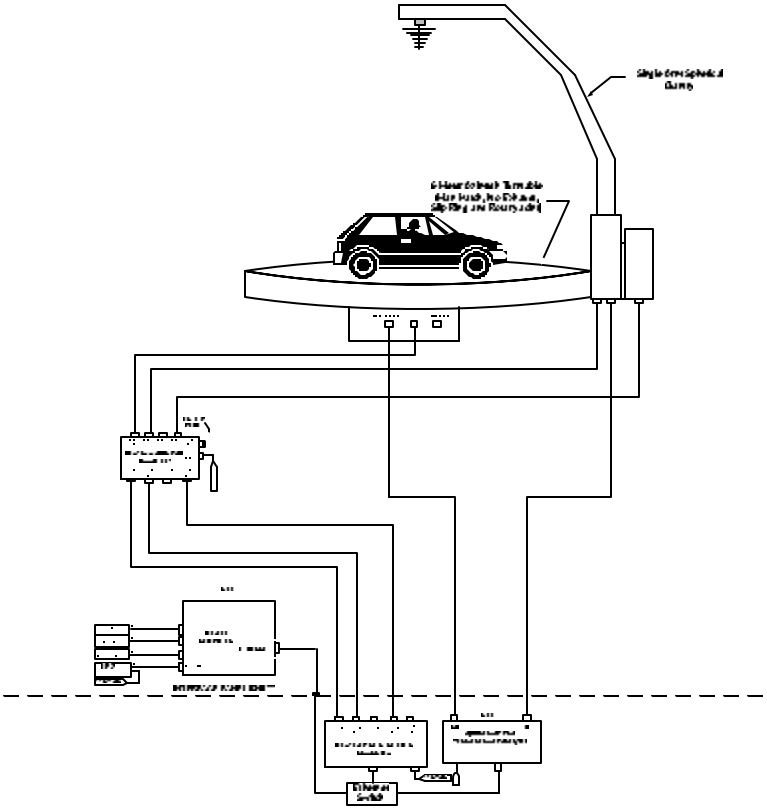
The MI-7121M (turntable azimuth angle) and the MI-7141M (gantry elevation angle, gantry height, source antenna polarization angle) are controlled by the MI-4193M, which is a position control sub-system that can simultaneously control four axes of motion.

B.2 Signal Source and Receiver:

An Agilent 8358A vector network analyzer is used as both the transmitter and the receiver during the antenna measurement process. The vector network analyzer is used as a two-port system to measure the coupling between the desired source antenna (ETS-3164-03) and the antenna under test. This subsystem also includes the required radio frequency cables that go from the transmission port of the vector network analyzer to the source antenna of the spherical near-field antenna measurement system, and from the antenna under test to the reception port of the vector network analyzer. The remaining components of this system are a radio frequency switch, near-field source antenna, and the reference antennae.

B.3 Data Collection and Processing

A data acquisition and analysis workstation is used to control the position controllers, the vector network analyzer, and process the received data [MI-3001]. The acquisition and analysis software operating system [MI-3041] and the software drivers for the MI-4193 position controller and the Agilent 8358A vector network analyzer are loaded on the MI-3041. A separate software module is used to process the recorded measurements from the spherical near-field antenna measurement system [MI-3046]. This equipment will reside in a temperature-controlled shelter.



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Please note that the source antenna described in Figure 1 shows the elevation gantry oriented above the vehicle. In this orientation, the main beam of the source antenna is pointed towards the ground (i.e. -90 degrees). The elevation gantry can also be lowered to ground level. In this orientation the main beam of the source antenna is parallel to the ground. Lastly, the elevation gantry extends 10 meters above the ground at its maximum. This height is significantly below the surrounding buildings in the nearby vicinity.