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PSDS Application Note No. 01-A

Antenna Calibration
Using the Precision Spherical Dipole System (PSDS)

Introduction

Antennas that are used for radiated field measurements should be calibrated periodically. This is usually done by sending the antenna to a special laboratory. The antenna must be packaged and shipped to a remote location. It is often gone for weeks, and when returned, there is no assurance that the return shipping did not cause invisible damage which might change the calibration factors. The calibration is typically performed once a year, and traditionally, there is no convenient way to check to see that the antenna factors have not changed during the year. The Precision Spherical Dipole system (PSDS) can be easily used to help make these measurements.

Discussion

The accuracy of the antenna factors used during measurements is very important. Often, the passing or failing of a product undergoing a test might be dependant on a few dB only. If the antenna factors are incorrect, then a test could produce an incorrect result.

Calibration of antennas is not difficult. One must simply create a known electric field and measure the response of the antenna with a spectrum analyzer or other receiver. The antenna factor is simply the difference between the measured value and the known field level. Traditionally, creating an accurate, known field strength is quite difficult.

The PSDS is a very accurate and repeatable electric field source. It can easily create an accurate field for antenna calibration.

Antenna Calibration

The antenna to be calibrated should be placed in the normal test environment where it will be used. Accurate calibration factors are dependant on the test environment. The distance from normal test objects and the receive antenna should also be maintained.

The PSDS radiating element should be positioned on a wood table or bench at a height over any metal floor, etc. typically used for normal testing. IT should be orientated to match the orientation of the receive antenna. The PSDS radiating element is a spherical dipole and has a the same radiation pattern as a dipole.

The RF generator is connected to the input of the PSDS control unit. The signal level of the generator is increased for a convenient reading on the PSDS control unit's front panel display and a convenient reading on the spectrum analyzer display. The reading on the PSDS control unit display and the spectrum analyzer should be recorded. This is repeated for all frequencies of interest.

Once the test is completed, and the spectrum analyzer readings adjusted for any cable loss, amplifier gain, etc., the antenna factor for each frequency is found by subtracting the adjusted spectrum analyzer level from the PSDS field level.

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Summary
The PSDS is useful for antenna calibration. A more accurate measurement is possible, because the gap voltage (signal applied to the antenna's radiating elements) can be monitored and the radiated field calculated. Regardless of the RF signal generator's own calibration accuracy, the PSDS provides a repeatable and accurate electric field.