Application NOTE

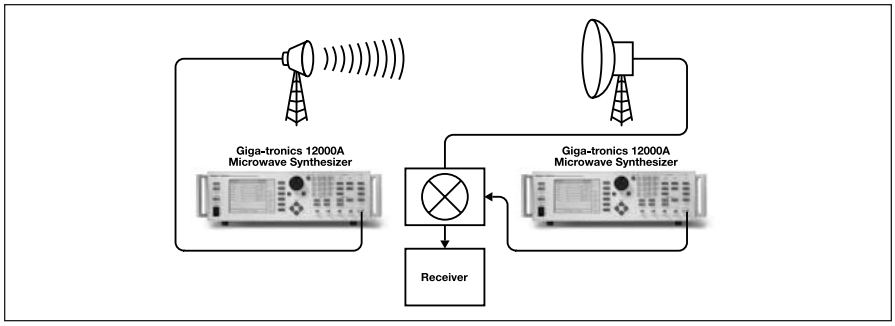
USING THE 12000A FOR ANTENNA MEASUREMENTS

An important use for microwave frequency synthesizers is in the area of antenna and field measurements. These measurements may be divided into three basic categories: Far Field, Near Field, and Radar Cross Section (RCS).

FAR FIELD MEASUREMENTS

Far field measurements are usually performed on large outdoor sites with the monitor antenna often located many feet from the antenna under test. In this application, the synthesizer is used as the source for the signal fed to the antenna being tested. A microwave receiver is used to measure the received signal. Some systems will use a second microwave synthesizer for the LO of a mixer at the receiver. Others use a harmonic mixer with a fixed frequency source.

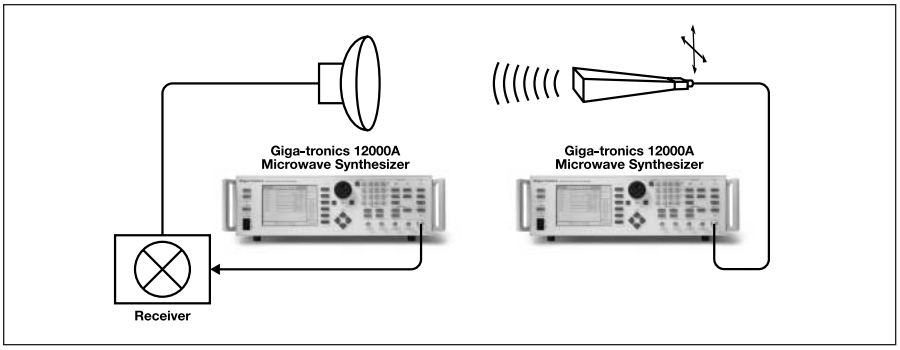
This application requires a microwave synthesizer with stable, accurate frequency and good spectral purity, including good single-side band phase noise. The 12000A synthesizer provides the spectral purity required for accurate characterization of antennas in a far field test. Additionally, high output power is needed to allow couplers, splitters and long cables to be used without the need for amplifiers. The 15 dBm minimum guaranteed output power of the 12000A up to 20 GHz provides the highest standard power level available in a microwave synthesizer. In addition, the 20 dBm option offers even more power for power-hungry antenna setups.



NEAR FIELD MEASUREMENTS

Near field measurements are usually made in indoor anechoic chambers with the monitor antenna located within a few feet of the antenna under test. By measuring the amplitude and phase at each of many physical locations, mathematical transforms can be used to determine the equivalent far field performance. This measurement method generally requires two microwave sources, one for the signal and a second for a local oscillator.

The key to accurate characterization of antennas using the near field method is the requirement for a large number of test points during scanning. Because of the large number of measurements, measurement speed is a critical factor. A common method for optimizing measurement speed is to sweep frequency at each position before stepping to the next location. This technique offers the



fastest possible measurements if the synthesizer is able to switch frequencies faster than what was previously available in indirect synthesized sweepers. The 500 µs switching speed of the 12000A offers a twentyfold-plus advantage over previous indirect synthesizers. Therefore, the cost-effective 12000A indirect synthesizer can now be used in this application where previously the more costly direct synthesis method signal generators were used.

RADAR CROSS SECTION

Although Radar Cross Section measurements are not actually a test of an antenna, the measurement system is similar to that used in the far field antenna test. Here the objective is to determine the reflection characteristics of the target being evaluated.

This test requires a synthesizer with similar performance characteristics as for the far field test. In addition, the pulse modulation characteristics of the generator must be fast enough to accurately characterize the target. The better than 10 ns pulse modulation rise time offered as standard in the 12000A provides the performance needed to accurately measure the reflection properties of the unit under test.