

Add MW 1973 8

"Short on space?"

Gloser

Try The Compact Range.

Far field measurements of microwave antennas are now possible using a compact range technique. It consists of a simple feed and large paraboloidal reflector.

[and biological studies]

Richard Davis
Managing Editor

An antenna range sleeper—the compact range—is coming alive. By means of a properly focused paraboloidal reflector and a special feed system placed close to an antenna under test, incident plane-waves can be produced in a space no bigger than a large room.

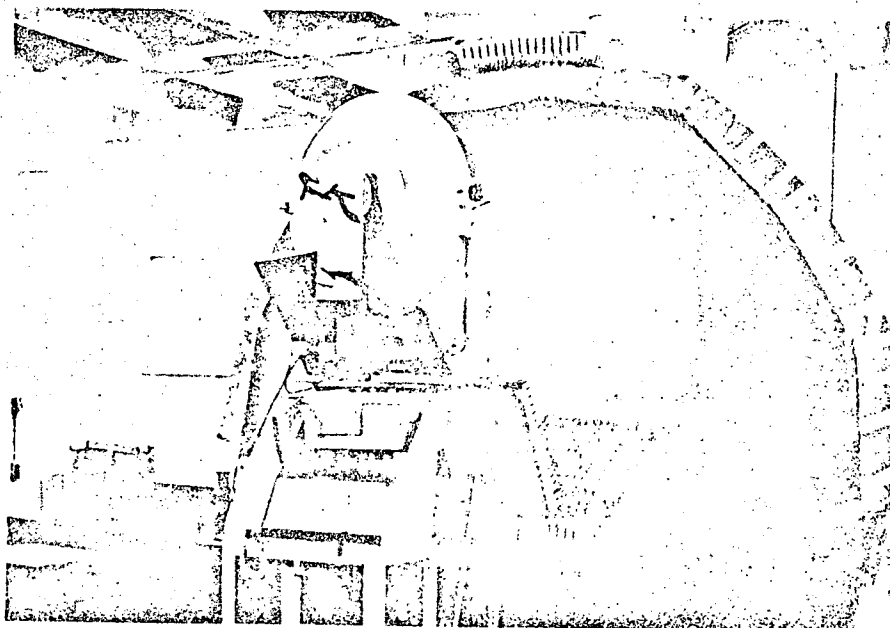
Conventional antenna ranges usually require expansive area in environments relatively free of RFI sources.

In a far field range the transmitting antenna must be located at a sufficient distance from the test antenna or target such that its spherical wavefront closely approximates a uniform planewave when incident upon the test antenna. Often this means the range is several hundred feet or even several thousand feet long. With real estate prices soaring lately, many companies and institutions have found such antenna ranges quite costly.

The compact range technique was actually developed five years ago at Georgia Tech's Engineering Experiment Station, in Atlanta, Ga. Scientific Atlanta is also active in this field and plans to install one of the first fully automated compact ranges at the Alameda Naval Station near Oakland, California.

According to Dr. Richard Johnson of the Engineering Experiment Station, a compact range is able to create a planewave in the immediate vicinity of the test antenna by using a properly focused paraboloidal reflector, Fig. 1, to collimate the rays and thus produce a planewave across its aperture. "The wave is not entirely uniform due to the illumination taper of the feed horn and due to space-attenuation effects," says Johnson, "However, a properly designed feed will generate a wave which is approximately uniform over an acceptable area".

Johnson cautions that in using a compact range one must be careful to eliminate direct radiation from the feed to the test antenna



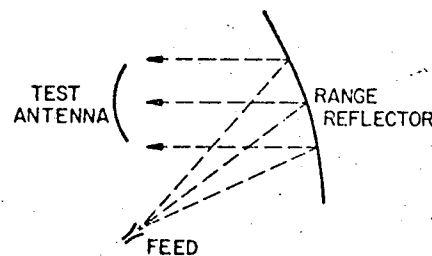
The reflector of this compact range is about two or three times larger than the antenna under test. Absorbing material reduces back radiation from the feed, as well as from the discontinuity at the edge of the reflector.

tion from the feed, as well as from the discontinuity at the edge of the reflector.

as well as diffraction from the edges of the range reflectors. This is so it doesn't cause stray radiation to occur in the test region.

A three-foot dish that operates at X-band could be tested in a 15 ft. x 20 ft. space rather than over a distance of approximately 180 feet—necessary in a conventional far field range. "In addition," claims Johnson, "no special provisions need be incorporated into the room to reduce reflections or interference." All our compact ranges have been built and used without using an anechoic chamber.

The compact range at Georgia Tech, above, only uses the top portion of the reflector. The feed is between the absorbing panels and illuminates the top part of the dish. Absorbing material is also placed at the edges of the reflector to reduce edge diffraction, but new reflector versions roll the edges to reduce this edge diffraction effect to an acceptable level. The reflector must be constructed very accurately, since surface tolerances must be within about 1/



In a compact range only the top portion of a reflector is illuminated. The test antenna is placed near the aperture of the range reflector.

100 of a wave length. This gets tougher to do as the reflector gets larger.

Johnson doesn't feel the compact range method will put other ranges out of business any more than the anechoic chamber has done so. "It does represent another good auxiliary range capability". Johnson predicts the big uses for the compact range will be for assembly line test or as a rework test facility. Thus, as soon as an antenna comes off the product line, it can be tested or a microwave engineer can make design changes based on his initial test results.

1973-8