A DUAL REFLECTOR FEED SYSTEM FOR A SUB-MM HOLOGRAM CATR

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Compact antenna test range (CATR) based on a hologram is a potential measurement method for large telescopes at submillimeter wave frequencies. In the hologram CATR, a computer-generated binarized amplitude hologram is used to form a planar wave from the incident spherical wave into the quiet-zone (QZ) of the CATR. The hologram pattern is manufactured by etching slots onto a copper-plated Mylar film.

The aperture field of the hologram has to be tapered to reduce undesired edge diffraction. The tapering is done by narrowing the hologram slots at the hologram edges. However, the etching of narrow slots (below 100 μm) is difficult. The slots can be widened and the possibilities to manufacture a hologram accurately can be improved by introducing an amplitude taper into the hologram illumination. One suitable illumination is a rotationally symmetric Butterworth-type illumination function. The main benefit of the modified illumination is that it increases the achievable QZ size considerably.

The hologram illumination can be modified with a dual reflector feed system (DRFS) consisting of two shaped hyperbolic surfaces. The surfaces will be milled onto metal plates. The basic structure is presented in Figure 1. The design of the DRFS is done with geometrical optics based dual reflector synthesis and MATLAB synthesis software has been developed for this purpose. The simulated radiation of the DRFS on a 600 mm hologram at 310 GHz is shown in Figure 2.

The design of a DRFS for the hologram CATR will be described together with a design example. The structure of DRFS and simulation results will be presented.

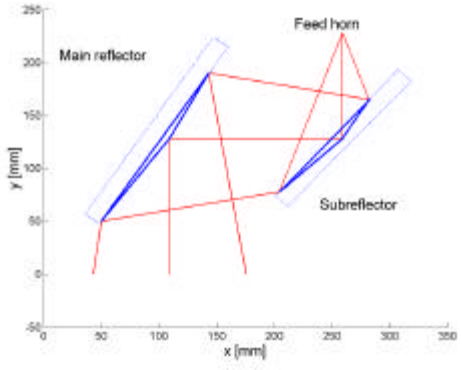

Figure 1. DRFS structure.

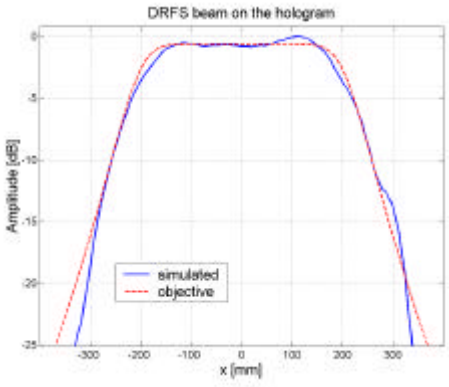

Figure 2. Simulated DRFS beam.