

Microstrip Reflectarray and Its Applications

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The microstrip reflectarray antenna, being in the form of a flat reflector, has recently been investigated by several antenna researchers. This antenna, when compared to the conventional parabolic reflector, not only has the potential advantages of achieving smaller mass, smaller volume, simpler deployment mechanism, but also has the capability of scanning its main beam to larger angles from the broadside direction. Without any power divider and its associated large insertion loss, a phased reflectarray may not need the high cost T/R modules and can still remain an efficient array antenna.

To demonstrate that such an antenna can be developed with relatively large electrical aperture, a half-meter-diameter microstrip reflectarray has been designed and constructed at 32 GHz with circular polarization. It is believed that this is electrically the largest microstrip reflectarray ever built. Close to seven thousand square patches are etched on 10-mil thick Duroid substrate. All square patches have identical dimensions. Far-field phase coherence is achieved by attaching to the patches different-length microstrip phase delay lines. A corrugated feed horn was specially designed to optimally illuminate the reflectarray aperture. Measurement results of this microstrip reflectarray will be presented in the symposium. Potential applications of the microstrip reflectarray are many fold. For examples, it can be used as a large aperture deployable SAR radar antenna, a large low-mass inflatable antenna, a wall or roof mounted DBS antenna, an integrated solar/antenna array, etc. These applications will also be discussed in the symposium.

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