CORREO

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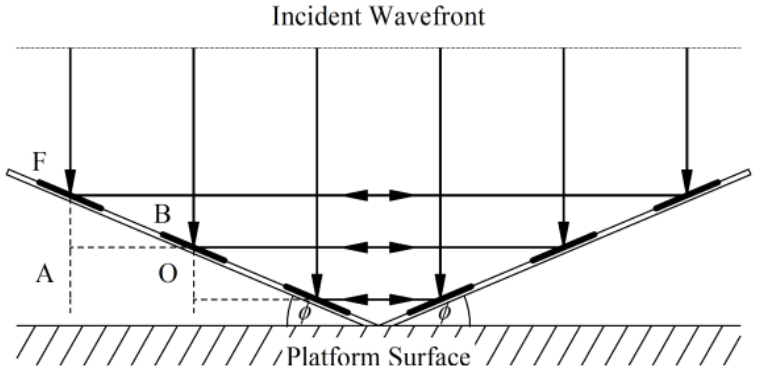
MOTIVATION?

Ground-segment calibration and validation activities in support of a satellite mission are a vital and continuous component of the mission.

Increasing sophistication in SAR functionality and the emergence of new application areas; higher resolution; increased radiometric and geometric performance; digital beam forming techniques featuring based on multi-channel architectures.

These new systems will require further sophistication of calibration techniques and procedures.

Retrodirector: Principle of Operation

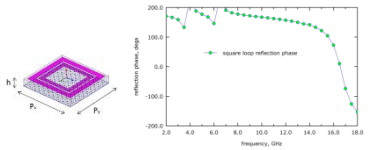


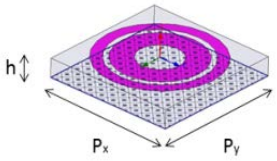
Side view of microstrip FSS reflect array with broadside beam illumination (Note panel flare angle 135^o and NOT 90^o as in a conventional dihedral).

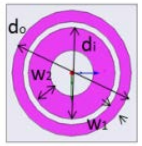
Adjusting the wave vector of a scattered wave, or guided wave mode, on a linear path by using inhomogeneous progressively varying local impedance. The objective is to realize a scattering surface with controlled patterns, polarisation and beamwidth for microwave devices and retroreflectors.

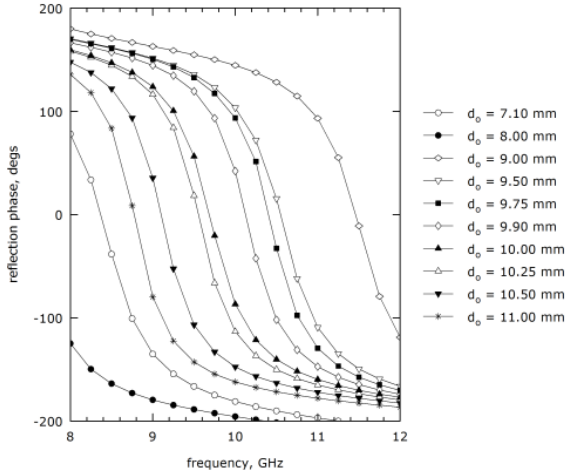
- Small geometry in terms of the wavelength (metamaterial approach). Planar arrays of microstrip sub-resonant ($\leq \lambda/2$) frequency selective surfaces.
- Densely packed (i.e. highly coupled) planar periodic lattices.
- Losses due to spillover, amplitude taper, dielectric, metallisation, phase errors.

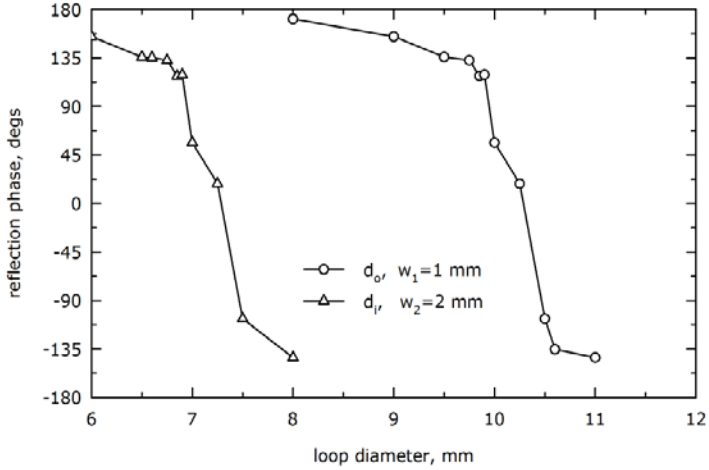
Dual closely coupled circular loops

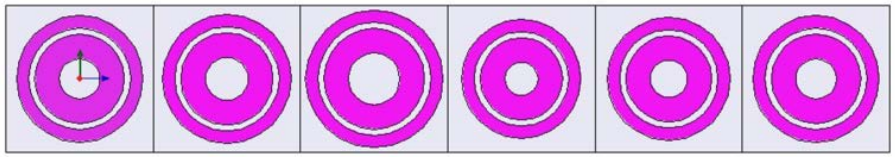






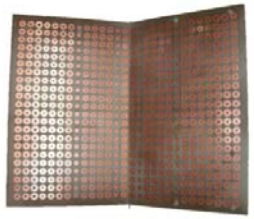






0° 75° 150° 225° 300° 375/15°

Prototypes

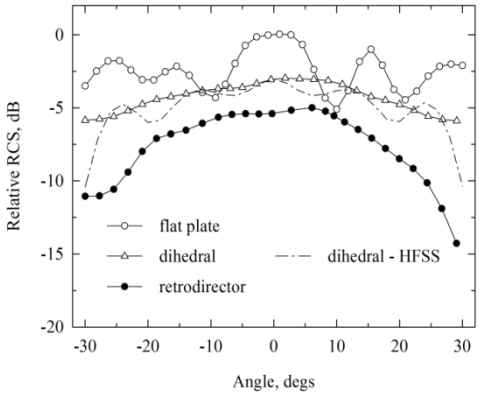


Large specimen meta-reflector

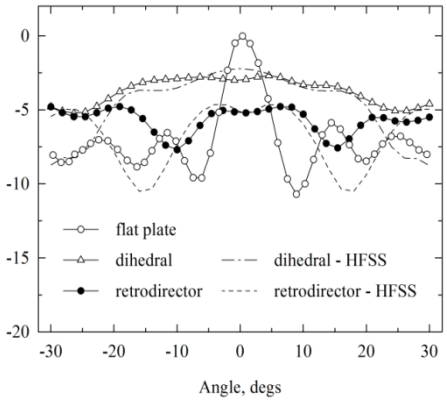
Large specimen dihedral

Flat plate

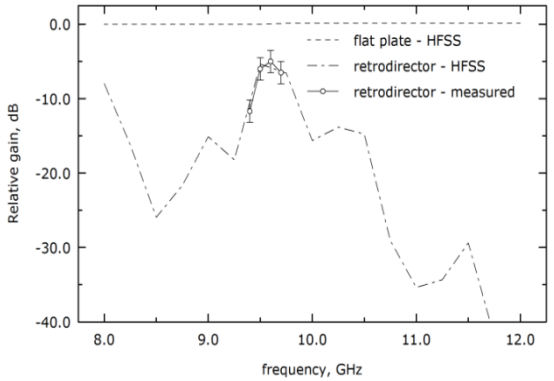
RCS - VV Polarised



HH Polarised



Gain-Bandwidth Response



- Retrodirector backscatter 2.3-2.5 dB down on comparable metallic dihedral.
- Quite flat response over boresight $\pm 15°$ incident angles whichever polarisation used.
- Depth of dihedral reflector is improved.

Summary Conclusions

- Reduced height profile by two-thirds compared with metal dihedral.
- Omni-directional backscatter over $\pm 15^o$ with polarisation change on reflection.

Aperture efficiency lower than anticipated, reasons include;

- Possible deviation from infinite periodic structure assumption.
- Resonant element requires stringent manufacturing tolerances to avoid phase errors.