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# Circular Eleven Feed with Significantly Improved $BOR_1$ and Aperture Efficiency Over 1.3-14 GHz

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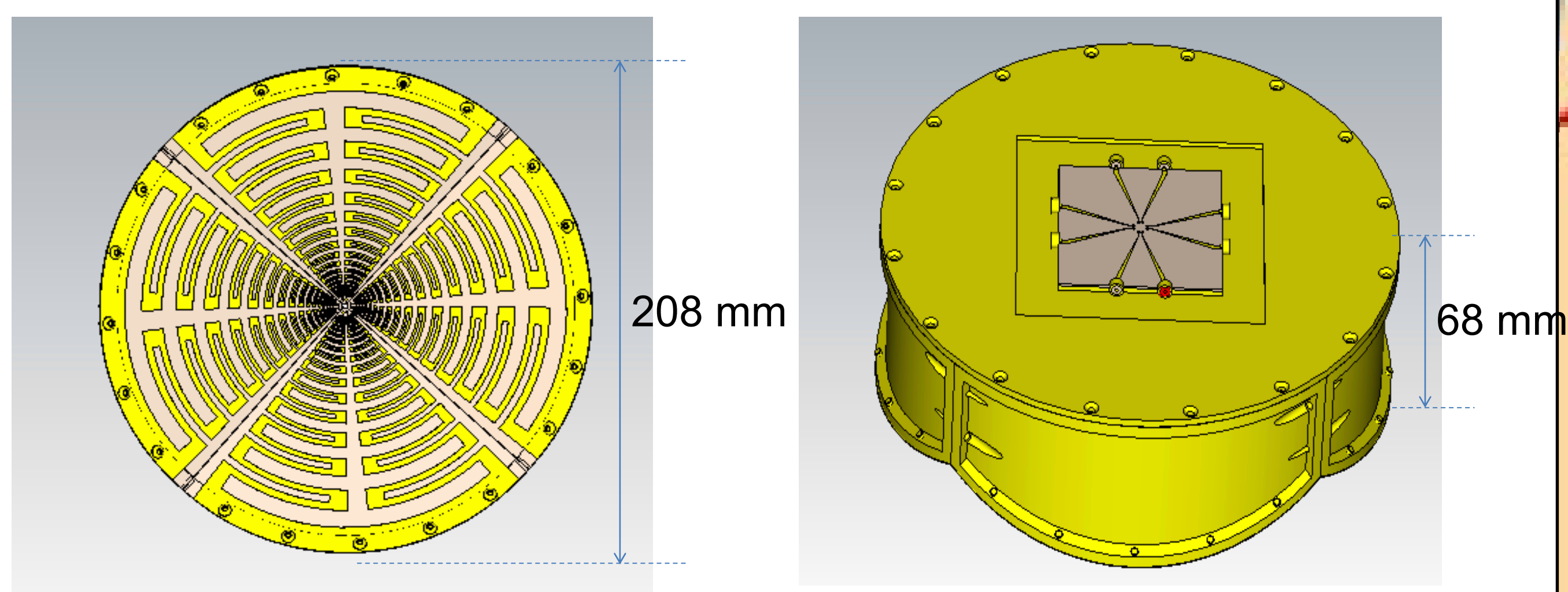


## Abstract

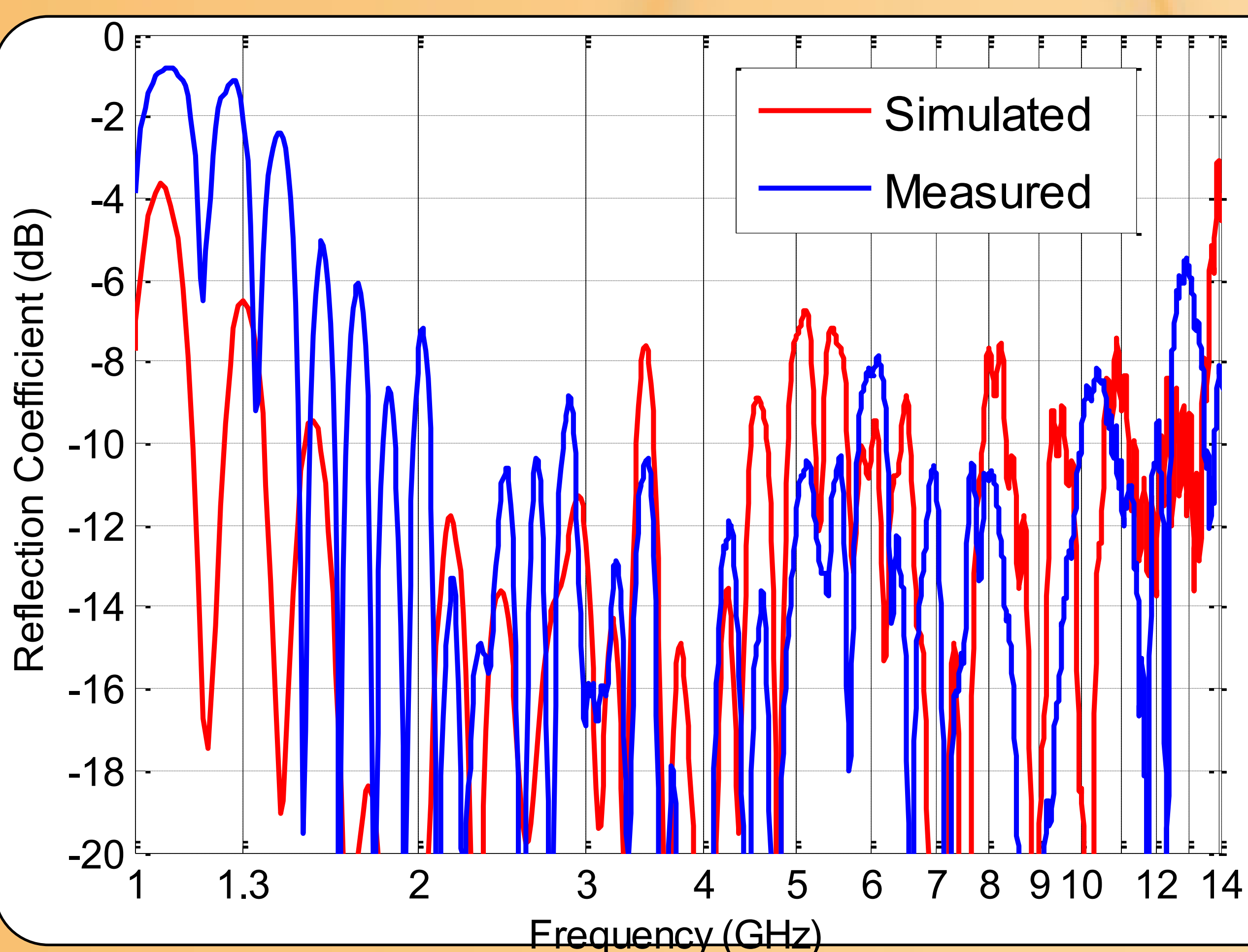
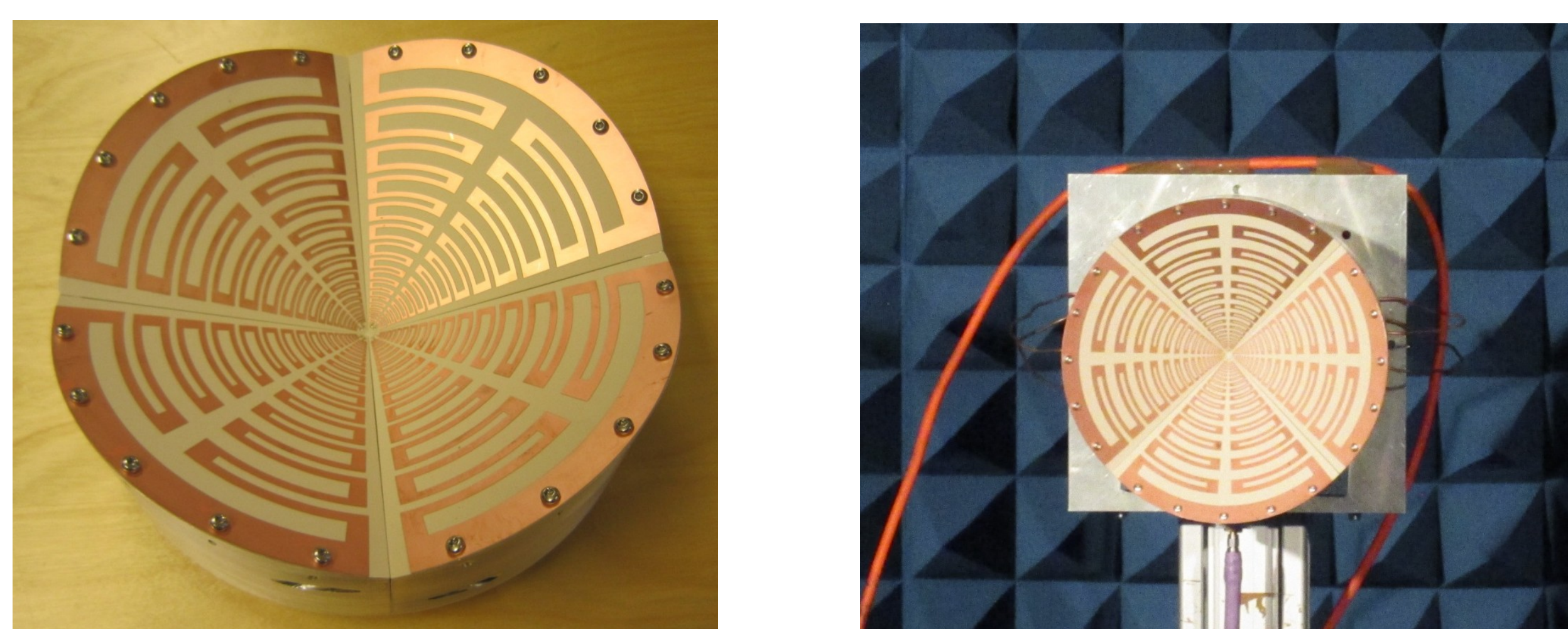
The Eleven feed has during the past few years been shown well suited for prime-fed reflectors in radio telescopes. One important measure of the performance of the wideband feeds is the so-called  $BOR_1$  efficiency since only the  $BOR_1$  component of the far-field function contributes to the directivity (aperture efficiency) of reflector antennas while other higher order  $\varphi$ -mode components contribute to side lobes. Recently, a new decade bandwidth circular Eleven feed for future radio telescope projects has been developed, with a significantly improved  $BOR_1$  efficiency (therefore aperture efficiency). This Eleven feed is constructed of “circularly” curved folded dipoles on a flat printed circuit board (PCB), with the aim to make this antenna structure more rotationally symmetrical at a very low manufacture cost.

## Decade-Bandwidth Feed For Reflectors

- 17-pair quasicircular folded dipoles (logarithmic-periodically scaled) per polarization; flat printed circuit boards (etched dipole strips on top) tilted from ground plane; 4 differential two-wire transmission lines through ground plane, with 8 ports ( $50 \Omega$  SMA connectors), mounted on the back side of ground plane.



- Photos of prototype



## Features and Applications

- Reflection coefficient mainly below -8 dB
- Aperture efficiency is very good over 1-11 GHz, -2.5 dB from 1 to 10 GHz and about -3 dB up to 11 GHz.
- The spillover efficiency is very high, -0.5 dB in general, so the noise temperature will be low.
- Very compact, low profile

- ✓ Cryogenic feed in reflector antennas for radio telescopes
- ✓ Feed in reflector antennas for broadband communications
- ✓ Separate antenna for test measurements
- ✓ RFI monitoring

