Tianlai beam pattern: scale model update

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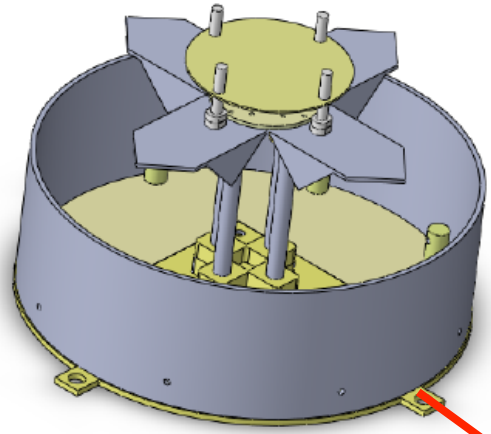
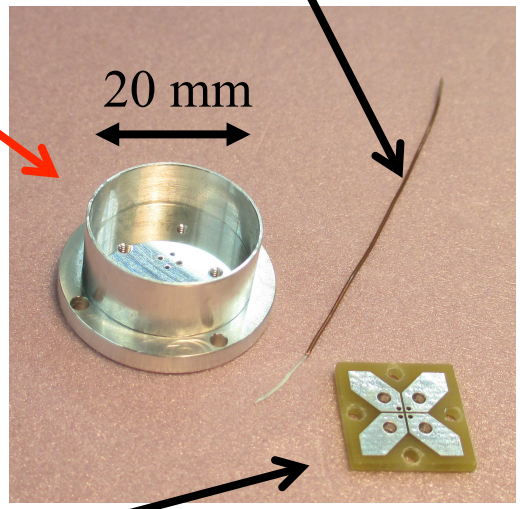
Scale Model feed: 10.5 X smaller

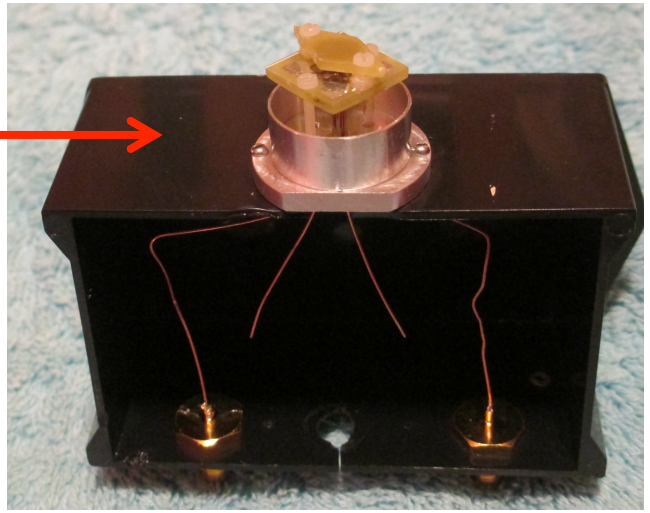


'coffee can'
four-square feed

world's smallest
coax (0.5 mm dia)

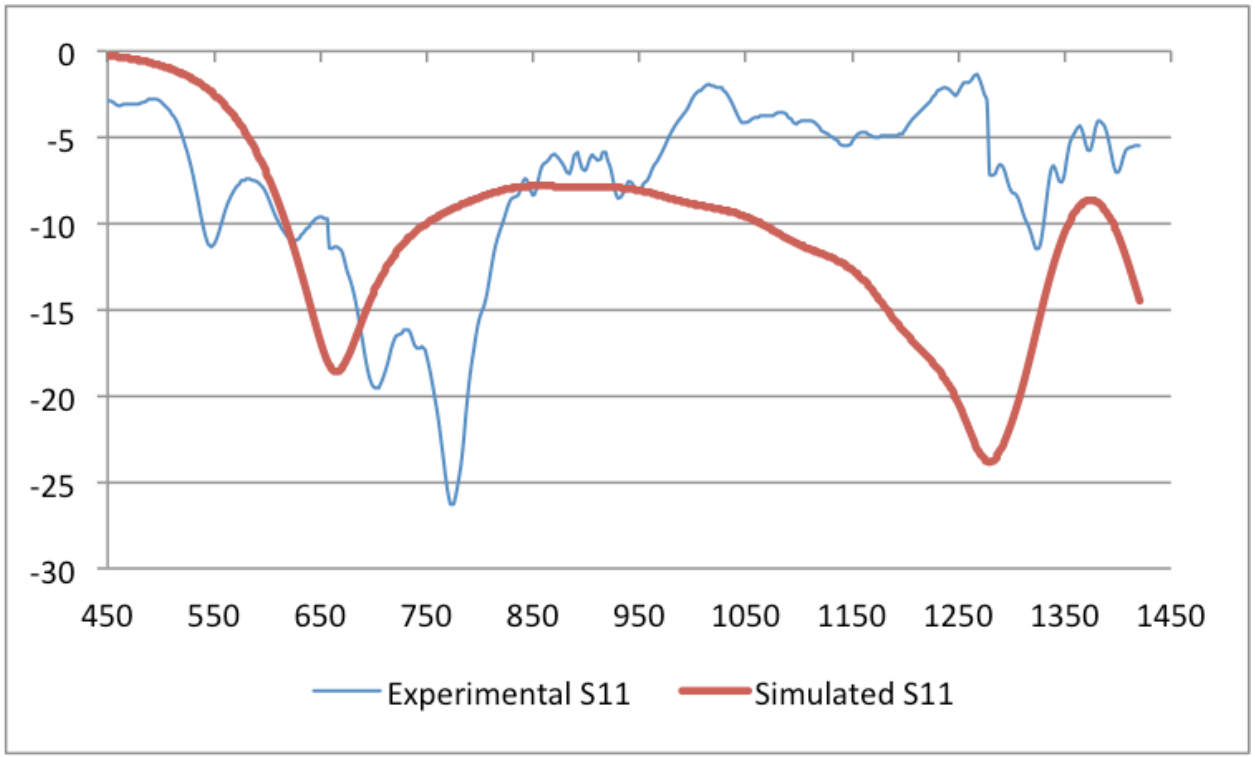


dipoles on
PCB



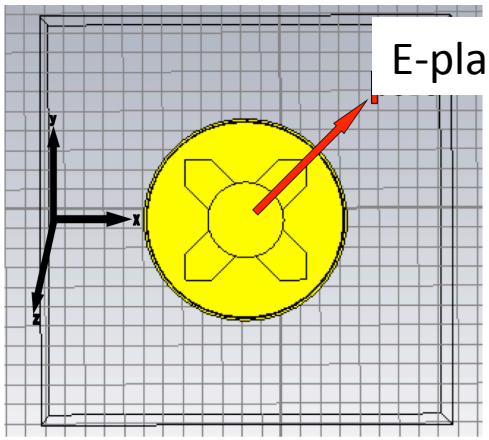
Simulated and measured reflection coefficient (S_{11}) for scaled 4-square feed antenna

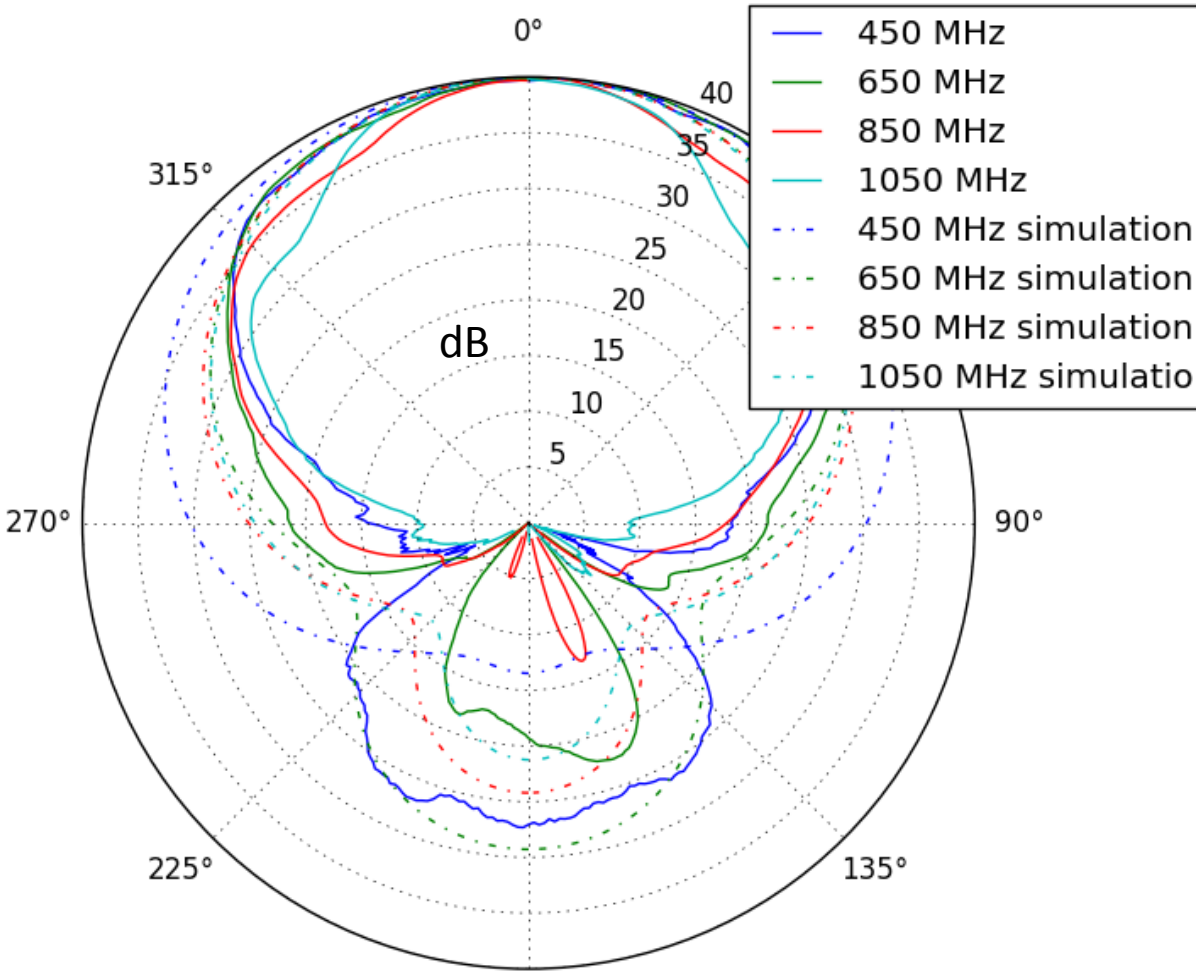
dB



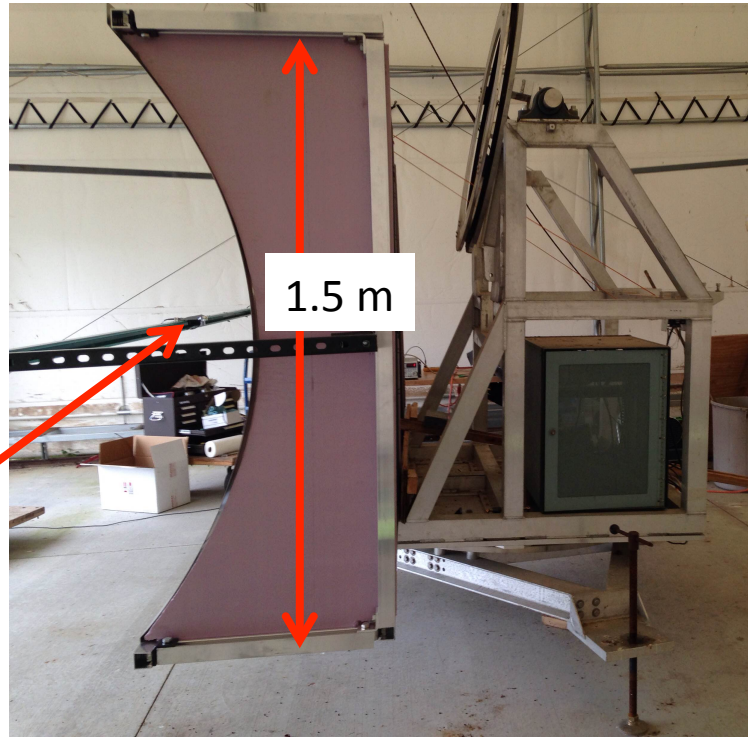
MHz

Simulated and measured beam patterns for scaled 4-square feed antenna





Beam pattern measurement of scaled feed & cylinder



scaled 4-square
feed antenna

http://arxiv.org/abs/1505.05885

BEAM CALIBRATION OF RADIO TELESCOPES WITH DRONES

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ABSTRACT

We present a multi-frequency far-field beam map for the 5m dish telescope at the Bleien Observatory measured using a commercially available drone. We describe the hexacopter drone used in this experiment, the design of the flight pattern, and the data analysis scheme. This is the first application of this calibration method to a single dish radio telescope in the far-field. The high signal-to-noise data allows us to characterise the beam pattern with high accuracy out to at least the 4th side-lobe. The resulting 2D beam pattern is compared with that derived from a more traditional calibration approach using an astronomical calibration source. We discuss the advantages of this method compared to other beam calibration methods. Our results show that this drone-based technique is very promising for ongoing and future radio experiments, where the knowledge of the beam pattern is key to obtaining high-accuracy cosmological and astronomical measurements.

TABLE 1
Basic characteristics of the drone.

Quantity	Specification
Diameter of full vehicle	110 cm
Weight	10.88 kg[a] (total)
Maximum motor power	2.01 kW
Propeller dimensions	16" (diameter) × 6" (pitch)
Flight control system	DJI WooKong-M[b]
Maximum flight duration	13.5 minutes

http://arxiv.org/abs/1505.05885