

Reflectarray antenna research in TL@NUS & DSO – Part II

Chia Tse Tong

DSO National Laboratories & Temasek Laboratories@NUS

A review of selected reflectarray antennas developed by high school students and undergraduates will be given. They include spatial power combining reflectarray, Ka-band reflectarray, bi-focal reflectarray, nearfield focused reflectarray and all-metal reflectarrays.

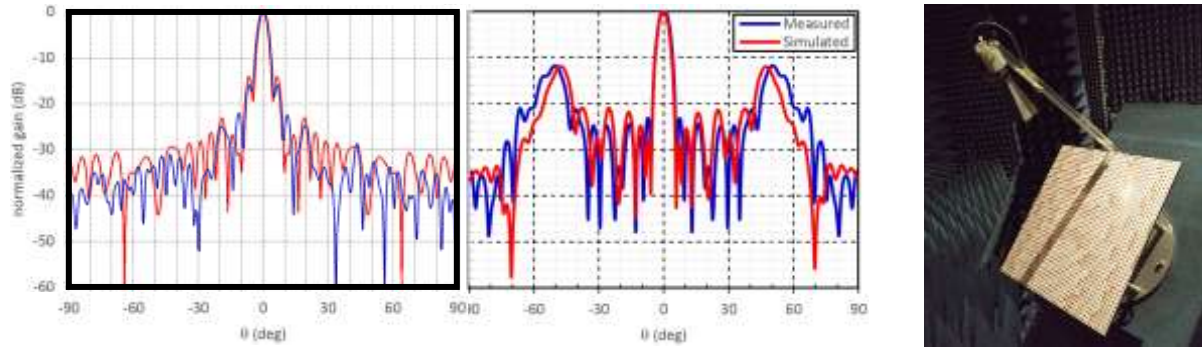


Figure 1: A novel design approach for dual-feed spatial-power combining reflectarray antenna. Comparison of measured and simulation gain patterns in (L) H-plane, and (M) E-plane. (R) Prototype in anechoic chamber. [1]

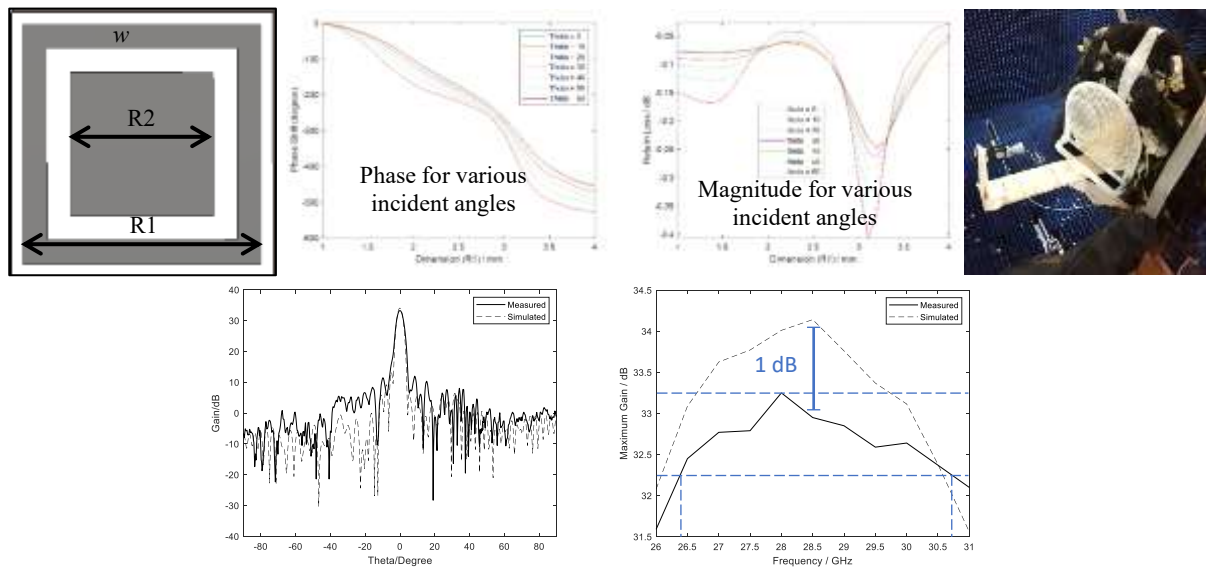


Figure 2: Ka-band reflectarray antenna for space application. Top row (L-R) unit element, phase and magnitude vs. $R1$ for various incident angles, prototype. Bottom row (L-R) Comparison of measured and simulation gain, and gain-bandwidth. [2]



Figure 3: Bi-focal reflectarray. (L-R) Schematic, prototype in anechoic chamber, comparison of measured and simulated amplitude. [3]

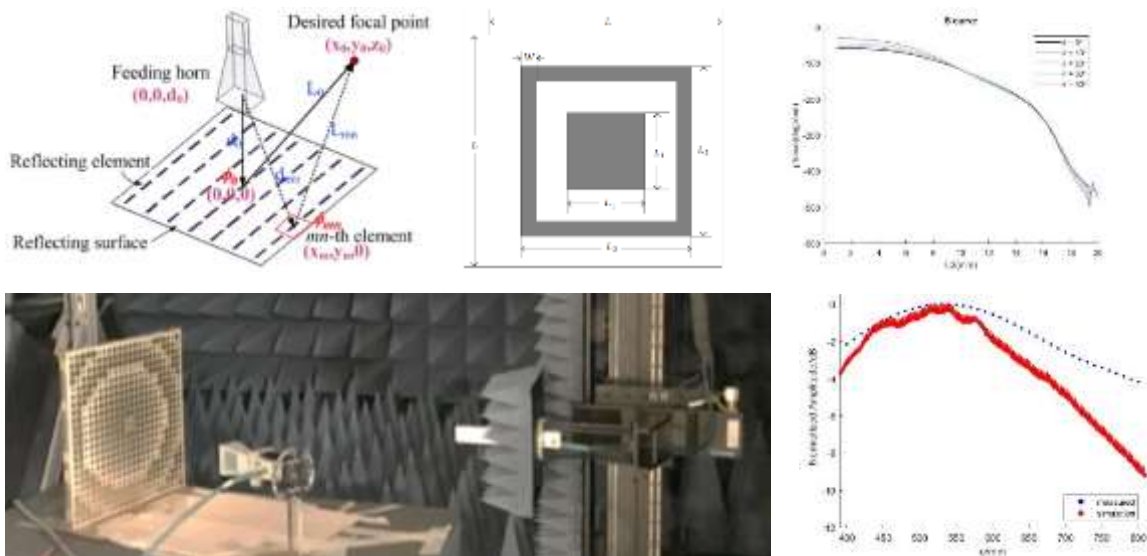


Figure 4: Nearfield focused reflectarray. Top row (L-R) Schematic, unit cell, phase response of unit cell, prototype under measurement. Bottom row (L-R) Comparison of measured and simulated amplitude. [2]

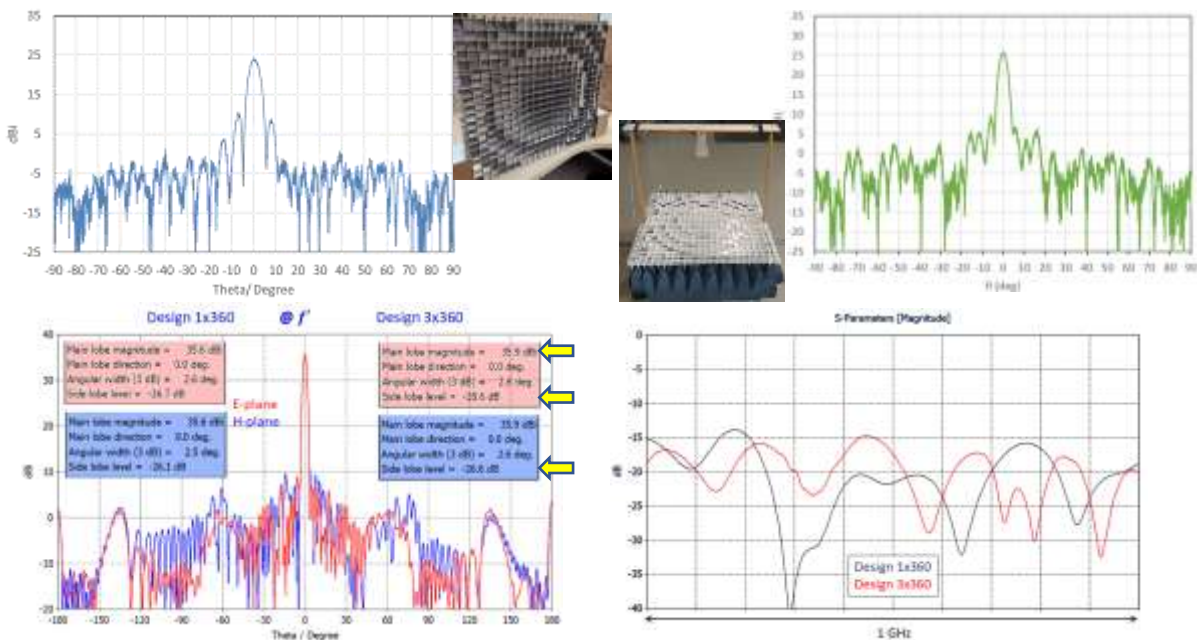


Figure 5: All-metal reflectarray. Top row (L-R) Measured patterns of two prototypes by students. Bottom row (L-R) Comparison of simulated patterns for $1 \times 360^\circ$ and $3 \times 360^\circ$ reflectarrays. [5]

References

- [1] T-T Chia, F. Y-F Tai, K. X. Siah, "An alternative design approach for multi-feed spatial power combining reflectarray antenna," 2017 47th European Microwave Conference (EuMC).
- [2] T. T. Chia, T. K. Chua, Z. N. Chen, "Design of C-band reflectarray antenna for near-Field applications," 2019 International Conference on Electromagnetics in Advanced Applications (ICEAA).
- [3] Joel Lim, Tan Wei Ye, Chia Tse Tong, "Comparison of scan performance of prime-focus, bifocal and quadrifocal reflectarray antennas," Research@Young Defence Scientist Programme, 2017.
- [4] Chia Tse Tong and Tan Xue Wen, "Design of Ka-Band Reflectarray antenna for Space application," SIMULIA Regional User Meeting, 2019.
- [5] Chia Tse Tong, "Design & performance of all-metal reflectarray antennas," SIMULIA Virtual Regional User Meeting, 2021 (invited).