

X-band Phased Array for Ground Station Terminals

Panagiotis (Yani) Ioannis Theoharis
Quasar Satellite Technologies
Corner Vimiera &, Pembroke Rd, Marsfield NSW 2122, Australia
email: yani@quasarsat.com

The increasing number of satellites generates large amount of data that must be downloaded back to the Earth through ground station terminals. Traditional parabolic dish ground station antennas can only communicate with one satellite at a time and their steering capabilities is limited by mechanical means. On that account, phased array antennas are a viable solution. This is because they have multibeam capabilities leading to a higher beam capacity. Moreover, the beams can be steered electronically, thus eliminating the need of mechanical parts, and increasing the reliability of the system. At Quasar Sat, a multibeam phased array ground station is currently developed. This will allow one aperture to communicate with hundreds of satellites, multiple orbits and can support different missions simultaneously. The phased array antenna is based on the differential “rocket” antenna element developed in [1] for the ASKAP radio telescope phased array feed. The phased array unit cell and the finite array simulation model can be seen in Fig.1. The active reflection coefficient magnitude for different scan angles was used as the optimization goal. As shown in Fig.2, a 32-element dual polarized prototype was developed to measure the antenna performance. The prototype was designed to be a passive array with a single broadside beam. To achieve that, a 1-to-32 Wilkinson power combiner network was used where the negative and the positive feeds of the antennas were combined using a balun to a single output. The prototype was measured in a far field anechoic chamber and excellent similarity was observed between measurements and simulated results.

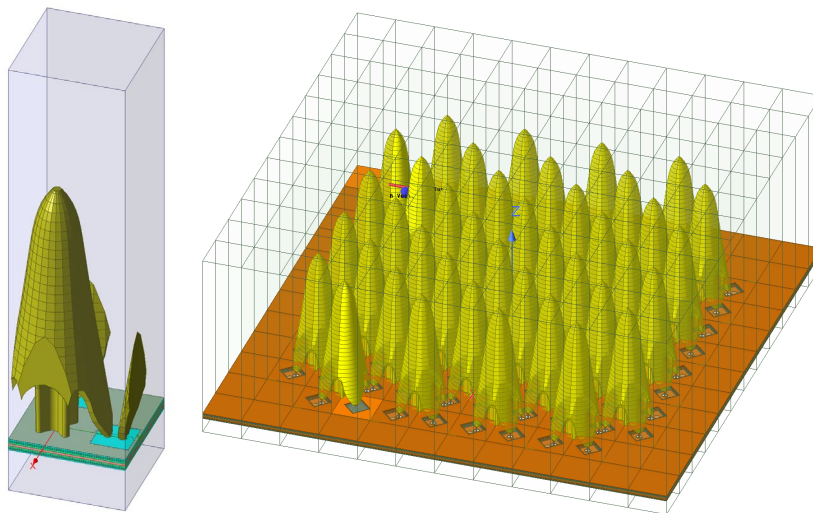


Fig. 1: Phased array Unit cell (left), Finite array model(right)

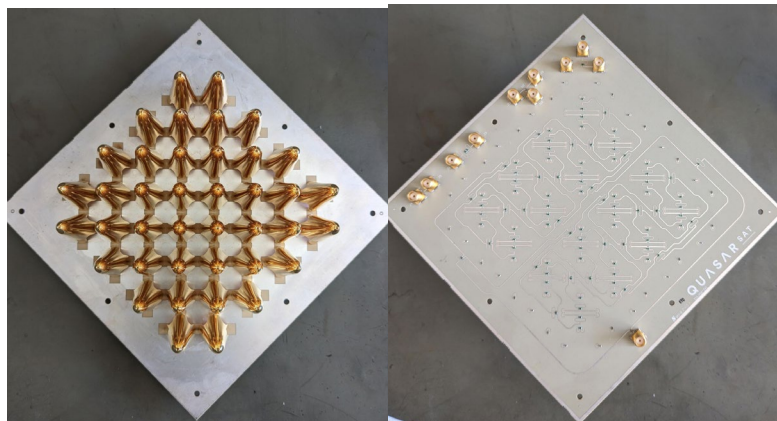


Fig. 2: Antenna prototype, Top view (left), Bottom view (right)

- [1] A. Dunning *et al.*, "The development of a wideband ‘rocket’ phased array feed," 2016 46th European Microwave Conference (EuMC), London, UK, 2016, pp. 1568-1571, doi: 10.1109/EuMC.2016.7824657.