

# Accepted Manuscript

An investigation of millimeter wave reflectarrays for small satellite platforms

Ghulam Ahmad, Tim W.C. Brown, Craig I. Underwood, Tian H. Loh

PII: S0094-5765(18)30862-2

DOI: [10.1016/j.actaastro.2018.06.044](https://doi.org/10.1016/j.actaastro.2018.06.044)

Reference: AA 6962

To appear in: *Acta Astronautica*

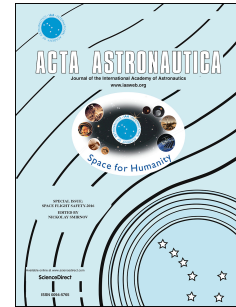
Received Date: 20 May 2018

Revised Date: 7 June 2018

Accepted Date: 19 June 2018

Please cite this article as: G. Ahmad, T.W.C. Brown, C.I. Underwood, T.H. Loh, An investigation of millimeter wave reflectarrays for small satellite platforms, *Acta Astronautica* (2018), doi: 10.1016/j.actaastro.2018.06.044.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



# An Investigation of Millimeter Wave Reflectarrays for Small Satellite Platforms

Ghulam Ahmad<sup>\*1</sup>, Tim W.C. Brown<sup>1</sup>, Craig I. Underwood<sup>1</sup>, Tian H. Loh<sup>2</sup>

<sup>1</sup>*Faculty of Electronics and Physical Sciences, University of Surrey, Guildford, GU2 7XH  
United Kingdom*

<sup>2</sup>*National Physical Laboratory, Teddington, TW11 0LW, United Kingdom*

---

## Abstract

This article reports two contributions related to reflectarray antenna design at millimeter waves (mm-waves). First, a closed form analytical formulation is provided for the prediction of reflection properties of square/rectangular mm-waves reflectarray unit cells based on various quality factors and the theory of waveguide coupled resonators. To ensure a high accuracy at mm-waves, the effects of fringing fields, surface waves, metal conductivity, and metal surface roughness are included in the analysis. This analysis program greatly facilitates the parametric studies of a unit cell's constituting parameters to converge on an optimum design solution. Secondly, the concept of phase quantization is proposed for a cost effective realization of mm-waves reflectarrays. The developed formulation in the first contribution was used to design two 3 bit phase quantized, single layer, 19 wavelength, passive reflectarrays at 60 GHz. The test results are compared with simulations and a very good agreement was observed. These findings are potentially useful for the realization of high gain antennas for mm-wave inter-satellite links in small satellite platforms.

*Keywords:* Antenna, Reflectarray, Reflection Loss, Satellite, Unit Cell

---

---

<sup>\*</sup>Corresponding author  
*Email address:* g.ahmad@surrey.ac.uk (Ghulam Ahmad)

Download English Version:

<https://daneshyari.com/en/article/8055422>

Download Persian Version:

<https://daneshyari.com/article/8055422>

[Daneshyari.com](https://daneshyari.com)