Sub-millimetre wave imaging array configurations using EBG technology.

I. Ederra*, R. Gonzalo, B. Martínez & C. Del Río,
Universidad Pública de Navarra, Spain,

L. Azcona, B. Alderman & P. G. Huggard,
Rutherford Appleton Laboratory, UK;

B. P. de Hon & M. C. van Beurden,
Eindhoven University of Technology, The Netherlands;

L. Marchand & P. de Maagt,
ESTEC, The Netherlands.

* Corresponding author: Email inigo.ederra@unavarra.es; Tel. +34 948 168933; Fax + 34 948 169720;
Postal address: Universidad Pública de Navarra, Campus Arrosadia, Pamplona, Navarra, E-31006, Spain.

The use of EBG crystals as substrates for planar antennas has been shown to offer great improvements in their radiation features. For imaging array applications the main advantages of configurations combining EBGs and planar antennas are that the directivity of each individual pixel increases and the mutual coupling between them is greatly reduced.

This paper presents some results concerning the design of an imaging array at 500 GHz using dipole antennas on an EBG substrate as radiating elements. The used EBG was a silicon woodpile structure. An extensive study was made on the different radiation patterns and return losses of the 8 symmetry positions of a dipole on top of the EBG structure. The selected position was the perpendicular solid-solid symmetry position as this forms the best compromise between radiation pattern quality and impedance match. In this position the antenna feed lines run along a bar in the top layer and the dipole arms overlay a perpendicular bar in the layer immediately below.

The design constraints of an imaging array consisting of 8 radiating elements such as that previously described were studied. Different array configurations, such as linear, circular and hexagonal arrays, were considered. Their advantages and drawbacks and the final hexagonal array configuration will be presented.