

## **The Development of Rectangular Aperture Dichroic Plate Filters for Sharp Image Rejection in Heterodyne Receivers**

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We report on the development of a new fabrication technique for the formation of an electrically thick array of rectangular apertures in a metal plate. Theoretical and experimental results are compared to good agreement. As image rejection filters, these structures demonstrate improved performance compared with previously used circular aperture arrays. Furthermore, the ability to form rectangular apertures increased the number of degrees of freedom in the design, allowing the filter to accommodate wide-angle reflection whilst retaining sharp sideband rejection. This technique has been used to realise filters working in the range from 500 GHz to 1.8 THz.

Drilling an array of circular holes in a thick metallic substrate is usually used to form these filters. This technique is readily available for devices operating at wavelengths of order 1 mm, but becomes more difficult at terahertz frequencies as the dimension of the hole reduces and the number of holes typically increases. To make our filters, slots are cut in a resin layer, which has been deposited on a metal substrate. Electroplating is used to fill the slots and the filter is then detached and the resin removed.

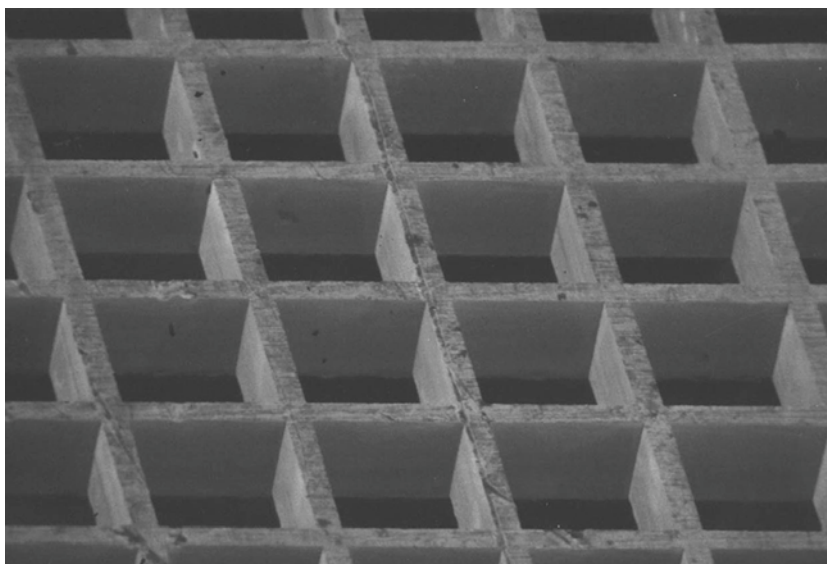


Fig.1: Square aperture dichroic filter for 500 GHz. The holes measure  $430 \times 430 \mu\text{m}^2$