

**Quasi-Optical Faraday Rotator Design, Construction and Evaluation**

**R.I. Hunter**, D.A. Robertson, G.M. Smith,  
Millimetre Wave and High Field ESR Group, University of St Andrews,  
North Haugh, St Andrews, Fife KY 16 9SS, Scotland, United Kingdom  
tel: +44 1334 463156, 2669, fax: 463104, rih1, dar, gms@st-and.ac.uk  
P. Goy, S. Caroopen, M. Gross,  
AB MILLIMETRE, 52 rue Lhomond 75005 Paris, France  
tel: +33 1 47 07 71 00, fax: +33 1 47 07 70 71, abmillimetre@wanadoo.fr

**Abstract**

Quasi-Optical Faraday Rotators (QOFRs) are a vital enabling technology for a wide range of millimeter and submillimeter wave applications. QOFRs are used in the construction of quasi-optical isolators and circulators for use in a wide variety of radar, imaging and precision measurement systems, where they provide a low loss and low VSWR alternative to conventional waveguide devices.

Using data from the characterization of magnetized ferrite samples, together with data for adhesives and dielectric matching materials, a model has been developed that accurately predicts the performance of finished QOFRs. This model can be used to optimise the design of QOFRs for any desired centre frequency and bandwidth. This model has been experimentally verified by the construction of several W-band (75-110 GHz) devices using these designs. The results show excellent agreement with those predicted by the model for devices constructed using both sintered and plastroferrites and a variety of matching materials. The model has also been extended to predict the likely performance which might be realized for devices designed for operation at up to 500 GHz.