High Performance component development at RAL for the ISMAR instrument

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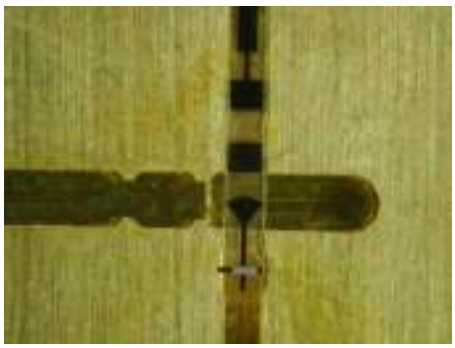
Abstract

The source/mixer components required for the 325 GHz receiver channel has been developed at RAL for the International Sub-millimetre Air-Borne radiometer (ISMAR), new instrument for FAAM aircraft. We report here the design and development of the high performance components required for this receiver channel.
The source operating at 162.5 GHz is based on RAL GaAs schottky varactor diodes in anti-series configuration mounted inside the waveguide as shown in the photograph Fig. 1a. The doubler gives a conversion efficiency ~30% and 3dB BW >15% (Fig. 1b).



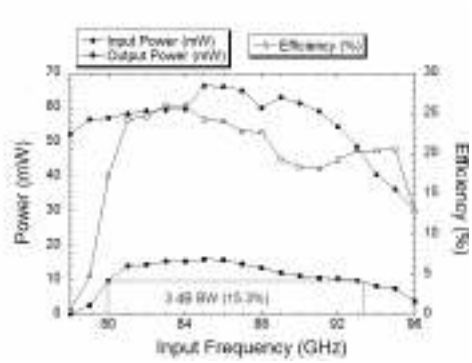


Figure 1 (a) Photograph of the 162 GHz doubler inside the split block waveguide (b) doubler efficiency plot

The double side band sub-harmonic mixer at 325 GHz is designed using RAL anti-parallel GaAs schottky mixer diodes. The mixer shows an excellent conversion loss <= 6.5 dB over a wider IF band (0.7 GHz to 11 GHz) for an optimum pump power of 3 mW. The performance is achieved using suspended substrate technology for the diode/matching circuits in order to reduce high frequency losses.

IF Band (GHz)	Tm (K)	L (dB)	Optimum LO power (mW)
0.7-2.3	1181	5.9	3.0
2.3-4.7	1142	6.1	3.0
8-11	1254	6.5	3.0

Figure 2 Mixer performance for the 325 GHz ISMAR receiver channel over the required IF band (0.5-11 GHz).