

Unexpected Frequency Shift on Membrane Based Double-Slot and Double-Dipole HEB Receivers

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Double-slot and double-dipole antennas are one of the main choices in quasi-optical sub-millimetre heterodyne receivers design. Being easily adapted to planar technology, they are widely used for their frequency and polarisation selectivity, symmetrical gaussian beam shape.

This type of antenna will resonate, in theory, at the frequency determined by antenna's length. But frequency shift may take place and depend on the electrical characteristics of the antenna's substrate or the device connected to the antenna.

In this paper, we'll report on the analysis results of the frequency shifts observed on the membrane based double-slot HEB receivers working around 2 THz. Intensive simulations have been performed with CST Microwave Studio and have shown that several technical parameters (such as HEB's impedance, dielectric constant of the substrate, ...) can strongly influence the resonance frequency given by the antenna's length.

These analysis and the comparative study between simulation and FTS measurement will lead to the understanding of the observed frequency shift as well as to control or guide some technical parameters' choice during the receiver's design and fabrication.