Low noise 1.4 THz SIS mixer for SOFIA

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We report on the development of a 1.4 THz SIS mixer. The mixer uses SIS junctions made off Nb/Al-AlN/NbTiN. The junction area is 0.24 μm^2 and the R_NA= 6 Ohm μm^2. The junctions are diamond-like shaped in order to optimize the suppression of the Josephson DC currents. We are using a double slot planar antenna to couple the mixer chip with the telescope beam. The matching microcircuit is made of Nb and gold. The on-chip coupling prediction is plotted below in the Fig. 1. The mixer is expected to provide a low noise operation in a 1.3 – 1.5 THz receiver. The mixer IF circuit is designed to cover 4 - 8 GHz band.

The 1.3-1.5 THz SIS mixer is aimed for the 1.4 Terahertz channel of the Caltech Airborne Submillimeter Interstellar Medium Investigations Receiver (CASIMIR). It is a far-infrared and submillimeter heterodyne spectrometer, designed for the Stratospheric Observatory For Infrared Astronomy, (SOFIA). The goal of this work is to provide a low noise spectrometer particularly for the studies of the H_2D^+ 1_{01} - 0_{00} line around 1370 GHz.

The mixer test with a limited LO power allows us to make an estimation of very good receiver performance with a higher LO levels (fig.2). The mixer test with a more powerful LO source is under way and will be presented.

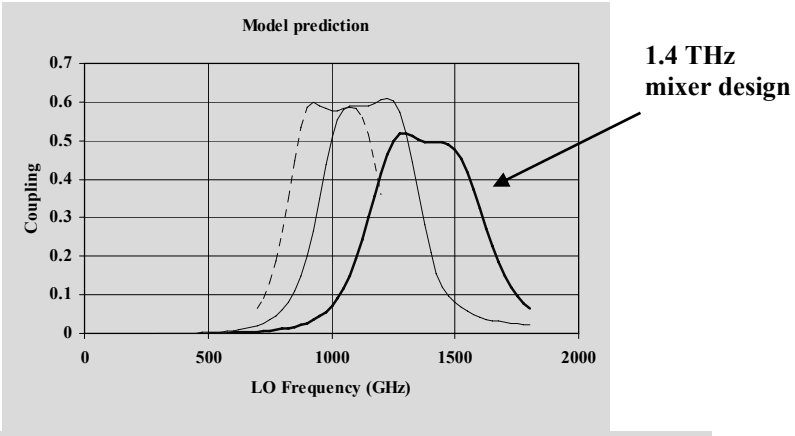

Fig. 1

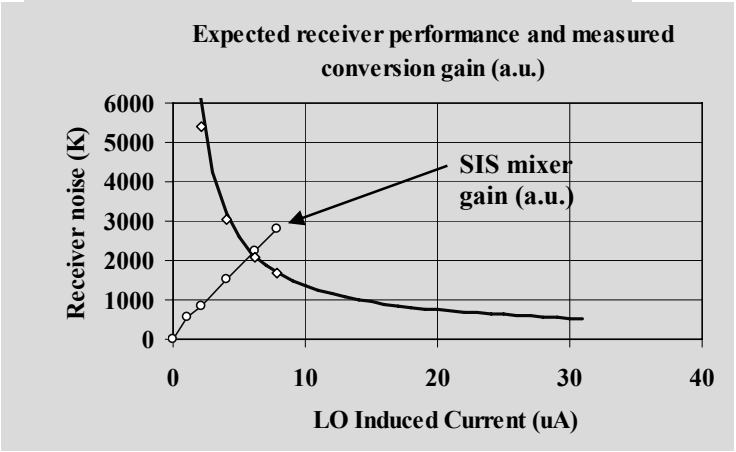

Fig. 2.