## Investigations into the effect of reflections at the RF and LO ports of an SIS mixer

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## Abstract:

The effect of reflections at the signal and local oscillator (LO) ports of an SIS mixer has been calculated using the Tucker mixer theory. As expected, it is found that the reflections affect both the mixer conversion gain and mixer effective input noise temperature with the magnitude of these effects depending on the details of the mixer matching circuit. For a well optimised single sideband SIS mixer working below the gap frequency it is found that a -40dB source reflection coefficient can give 2% peak-to-peak IF ripple. For a double sideband mixer, the input reflection also modulates the sideband ratio and a peak-to-peak variation of 4% is found for a -40 dB source reflection coefficient.

The results are discussed in the context of mm & sub-mm wavelength radio astronomy systems where potentially important sources of reflections include the telescope and the LO source. By considering the sensitivity of the mixer to input reflections, upper limits to the allowed input reflection coefficient and the dimensional stability of the round trip path-length are derived.