

Contribution of IF Chain Reflections in the Image Rejection Ratio of 2SB SIS receivers

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Abstract—Here we present new results in our study of the Image Rejection Ratio (IRR) of a sideband separating (2SB) receiver based on SIS mixers. In this work we focus specifically on IF part of the receiver. It was found that the reflections from the IF amplifier, or isolator (if present) and from the SIS mixers can give a periodic imbalance in the IF chain, which influences the receiver IRR much more than the imbalance of the IF hybrid. This is clearly seen both in modeling and experiment. The measurements have been done for an ALMA Band 9 2SB receiver (600-720GHz) with different IF configurations: coupling the IF amplifiers to the IF hybrid directly or through an isolator. It was shown that having RF imbalances below a -20dB level we obtain IRR better than 10 dB in the entire receiver band, even when using IF amplifiers with return loss of only -7dB in the worst point (without isolators). Development of a receiver architecture without the isolators is an important step towards implementation of heterodyne arrays.

We explain the mechanism of IF imbalances and show how it influences the final IRR pattern depending on the level of RF imbalance.