

“A six-port receiver analog front-end for direct conversion reception in the K-band”, pp.156-161

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Abstract - In modern radio communication systems high data rates are of great interest for home and business applications. Beside the use of novel techniques like MIMO the demand for bandwidth increases in order to deal with these requirements. Frequency allocation issues and technical aspects shift the carrier frequencies more and more toward microwave frequencies. With shrinking wavelengths and the high performance of today's digital signal processing devices an alternative receiver architecture starts to compete with heterodyne and homodyne receiver concepts. In this paper the analog front-end of a so-called six-port receiver for the K-band is introduced. In difference to the heterodyne and homodyne concepts the conversion of the RF signal to baseband is done by additive superpositions of the local oscillator's (LO) signal and the RF with different phase relations. The results are four output signals with different amplitudes generated by constructive and destructive superposition of the two input signals. By evaluating their powers the complex valued information of the sent RF signal can be recovered. The receiver's hardware complexity is drastically reduced compared to other direct conversion concepts. Theoretical background, design process, practical tips for assembling and measurement results of the passive analog structure of a six-port receiver operating at 24 GHz will be presented in this paper.