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Compact, Low-Power, High Image Rejection Sideband Separation Receiver

-Background

Spectral observation is used to detect the molecular content and isotopic abundance in a compound, and a set of unique spectral lines identify one element from another. One field application is space observation, where observing the spectral lines can give away information about the mass distribution of elements and its relationship to star formation. Existing solutions are not suitable for space missions due to size and weight constraints, costs, and power consumption.

Invention Description

Researchers at Arizona State University have developed a novel sideband separation method for RF receivers using a two-stage Weaver architecture. This method employs a novel separation and image rejection design by configuring the two paths coming out of the first mixing stage with the right designed phase. The manipulation of the phase and amplitude of each spectral line in the two paths allows separation of the signals where each path will only observe one signal and no image.

The size and cost reduction that this method provides is an order of magnitude lower than that of current sideband separation receivers. This method can be implemented for any frequency band and fabricated with any microelectronics technology.

Potential Applications

- Space observatories
- Space missions
- Food components spectrometry
- RF receivers with dual channel operation

Benefits & Advantages

- Compact configuration
- Less expensive
- Lower power consumption without impacting the sensitivity of the receiver
- Can be implemented for any frequency band
- Can be fabricated with any microelectronics technology
- High image rejection ratio (IRR)

