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Analysis and design of 4-path filter using gyrator based complex impedance

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ARTICLE INFO

ABSTRACT

Article history:

A novel N-path filter using a complex impedance is designed to replace the frontend SAW filters in receivers with on-chip bandpass filters. It is demonstrated that the center frequency of the filter can be tuned solely by changing the value of some capacitances without the need to change the clock frequency. In addition, thanks to the use of smaller capacitors, the silicon area is reduced compared to similar designs.

Keywords:

N-path filter
Bandpass filter
complex impedance
gyrator
quality factor
MOS switch

The high-Q bandpass filter is realized utilizing two gyrators and an arrangement of four baseband capacitors with NMOS switches, driven by 4-phase 25% duty cycle clock signals. This paper also analyzes the performance of the proposed filter against imperfections such as thermal noise of the switches. It will be shown that the noise performance of the proposed circuit is in an acceptable range.

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