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Poorya Karami, Baktash Behmanesh, Seyed Mojtaba Atarodi

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

Poorya Karami[a], Baktash Behmanesh[b] and Seyed Mojtaba Atarodi[c]*

[a] Electrical Engineering Department, karami_poorya@ee.sharif.edu, Sharif University of Technology, Tehran, Iran
[b] Electrical Engineering Department, baktash@ee.sharif.edu, Sharif University of Technology, Tehran, Iran
[c] Electrical Engineering Department, atarodi@sharif.ir, Sharif University of Technology, Tehran, Iran

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ABSTRACT

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.

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.

* Corresponding author. Tel.: +982166043610; fax: +982166016470; e-mail: atarodi@sharif.edu