

A Novel High-Qu Octave-Tunable Resonator And Filter With Lumped Tuning Elements

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ABSTRACT

This invention utilizes standard printed circuit board (PCB) fabrication technology to create a novel high-quality factor (Qu) continuously-tunable resonator and filter. The inherent benefits of the proposed design are: 1) flexibility in choosing various types of tuning components (e.g. solid-state, ferroelectric, and radio frequency microelectromechanical systems (RF MEMS) varactors), 2) compared to traditional cavity tunable resonators, the initial starting frequency is primarily determined by the tuning element as opposed to precise assembly techniques, and 3) industry-standard PCB substrates with commercially-available tuning components are used, thereby facilitating high-volume manufacturing, ease of integration with other RF front-end components and lower fabrication costs.

A tunable resonator and two-pole bandpass filter with solid-state varactors are designed and fabricated to experimentally validate the approach. The resonator surpasses the state-of-the-art with a frequency tuning range of 0.5–1.2 GHz (tuning ratio of 2.4 : 1) and a Qu of 82–197. The bandpass filter exhibits frequency tuning of 0.57-1.17 GHz, insertion loss of 4.9-1.9 dB and a 3-dB bandwidth of 2-8 %. Lastly, an RF MEMS varactor enabled tunable resonator based on the same design further shows Qu of 240 at 6.6 GHz.

APPLICATIONS

- ▶ Tunable resonators
- ▶ Tunable oscillators
- ▶ Tunable filters
- ▶ Tunable matching networks
- ▶ Reconfigurable radio frequency front-end

FEATURES/BENEFITS

- ▶ Flexibility in choosing tuner component
- ▶ Fast switching time
- ▶ High quality factor
- ▶ Wide frequency tuning range
- ▶ High volume manufacturing

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,325,052	04/26/2016	2013-703

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OTHER INFORMATION

KEYWORDS

Cavity resonator filters,
Tunable resonator, Tunable
filters, Tunable matching
networks, Reconfigurable
radio frequency front-end

CATEGORIZED AS

- ▶ **Semiconductors**
 - ▶ Assembly and Packaging
 - ▶ Design and Fabrication
 - ▶ Materials
- ▶ **Engineering**
 - ▶ Other

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