Many future radio technologies will be enabled by new developments in circuit design for radio frequency (RF) signal filtering. The higher-order signal filtering required for advanced radio technologies has traditionally only been achieved using bulky and inefficient LC filters. N-path filters are complex circuits that are energy efficient and have highly linear behavior and flexible tunability, but higher order N-path filters require moving parts that make them energy inefficient and are limited to the fourth order at the highest. This technology is a RF filter design that combines multiple second order N-path filters with no moving parts to achieve arbitrarily high-order signal filtering. It can be used as a replacement for current LC filters to scale-down and increase the efficiency of advanced radio technologies like cognitive radio and software-defined radio.

**Higher order N-path filter design combined power efficiency with sharp signal cutoffs, linear passbands, and flexible tunability**

The circuit design employed for this technology preserves the advantages of N-path filters, while allowing for the generation of RF filters with orders greater than four. This technology can be used to develop smaller and more efficient cognitive radios (or “smart radios”) that can dynamically tune their transmission and reception parameters based on the quality of wireless channels in their vicinity and in software-defined radios (SDRs) that use a simplified general hardware system and advanced software to interpret signals.

This technology has been used to successfully generate a sixth-order N-path filter on a chip.

**Lead Inventor:**

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Applications:
- Software-defined radio systems
- Cognitive radio systems
- Mobile communications devices
- Compact RF wireless systems-on-chip (SoC)

Advantages:
- No fundamental limitation on the order of N-path filters generated
- More power-efficient than LC filters and other N-path filter designs
- Sharp cutoffs
- Flexible tunability
- Highly linear passbands
- Allows for smaller-scale RF filters

Patent Information:
Patent Pending
Tech Ventures Reference: IR CU15161

Related Publications:

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