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Ultra-Wideband Tunable Filters based on Multi-Resolution Band-Selection

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Intellectual Property Status:

Patent Pending

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Background

Tunable RF filters have significant utility in software-defined radio applications. Often, these applications require wideband frequency coverage that may differ greatly from frequency coverage used in civilian telecommunication systems. Most commonly, tuning response is a product of changes made to capacitors and inductors in the resonators of a bandpass filter; however, the higher order resonances and spurious pass-bands induced by the periodic nature of the distributed elements present in the filter structure limit the utility of this method of tuning.

Invention Description

Researchers at Arizona State University have developed a multi-resolution filter comprising a number of cascaded bimodal filter stages that takes advantage of the periodic response of the individual stages to achieve a selectable high-resolution bandpass response. Designing each stage as a bimodal switchable filter allows the device to act as a channel-select filter operating over a range from near DC up to a maximum frequency of several GHz.

Potential Applications

Ultra-Wideband Tunable Filters may provide substantial utility to applications requiring RF band select functions. The following examples illustrate some potential applications of this technology:

- **Software-Defined Radio Transceivers (e.g. Joint Tactical Radio System)**
- **Multi-Functional Radio Transceivers**
- **Wideband RF Sensors**
- **Ad-Hoc Wireless Sensor Networks**

Benefits and Advantages

- **Ultra-Wideband Coverage** – A tunable frequency response between DC and RF is a very desirable capability that is not afforded by any other technology
- **Equal Channel Widths –** All bands have equal absolute bandwidths
- **Reduced Size – Significantly smaller and less complicated than filters banks.** It can be miniaturized through using synthetic transmission lines
- **Versatility –** possible to implant topology using PIN diode, FET, or MEMS switches