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Licensing Opportunity

TTO – Technology Transfer Office

Suspended Acoustic Wave Resonator

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Description

Next-generation wireless standards, particularly 5G mid-band (n77–n79), impose stringent requirements on RF filters, including wide fractional bandwidth, low insertion loss, and high power handling. Existing solutions face key limitations:
- BAW and FBAR technologies offer limited electromechanical coupling and struggle to support the very large fractional bandwidths required for 5G mid-band operation.
- Conventional SAW devices suffer from performance degradation at higher frequencies, often requiring ultra-thin films that compromise mechanical robustness.
- Suspended Lamb-wave and XBAR resonators achieve high coupling but rely on film thickness to define resonance frequency, limiting lithographic frequency tunability.
These constraints hinder the development of compact, high-performance, and scalable RF filters for current and future wireless systems.
This invention introduces a suspended acoustic wave resonator based on a thin piezoelectric film—such as lithium niobate ($LiNbO_3$)—incorporating buried interdigital transducer (B-IDT) electrodes embedded within the film. The buried configuration enables efficient excitation of propagating SH0 and S0 acoustic modes while maintaining a mechanically robust suspended structure. The architecture allows resonance frequencies to be defined lithographically, rather than by film thickness alone, enabling multiple high-performance resonators and filters to be integrated on a single substrate.

Advantages

- High electromechanical coupling ($keff^2$) maintained at small acoustic wavelengths, overcoming the scaling limits of surface-electrode designs
- Wide fractional bandwidths, enabling full-band coverage of 5G n77 and n79 bands
- Low insertion loss and high quality factors, suitable for demanding RF front-end applications
- Optimized electric field distribution through buried electrodes, reducing spurious mode excitation
- Fabrication-friendly architecture avoiding through-film electrodes and associated mechanical risks
- Compatibility with advanced filter topologies, including ladder filters and multi-resonator integration
- Scalable toward frequencies beyond 6 GHz, supporting future wireless standards such as 6G.

Applications

- RF filters for 5G NR mid-band mobile communications
- RF front-end modules (RFFE) for smartphones and wireless devices
- Wideband filters for IoT, automotive, and industrial wireless systems
- Scalable platform for next-generation (6G) RF filtering solutions