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New RF filters suitable for \geq 5G frequency operation based on LiNbO₃ or LiTaO₃ epitaxial films directly grown on Si substrates

Keywords : RF filters / FBAR filters / SMR filters telecommunication / epitaxy / large passband filters



CONTEXT

Communication systems and continuously increasing transmission of information through different channels, today in 4G and after tomorrow in 5G and beyond in close future, require more and more technology breakthrough.

This implies more and more radio frequency (RF) bands and more complex RF circuits without increasing the total size of the systems. Conventional RF filters based on Surface Acoustic Wave (SAW) are limited to 3,5 GHz operational frequency. Thin Film Bulk Acoustic Resonator (TFBAR) based on nitrate of aluminium films, are limited to their electromechanical coupling (7,5%) limiting their operational frequency to 4 GHz.

Thus, new suitable low loss materials are needed with larger electromechanical coupling to achieve larger bandwidth and frequencies.

DESCRIPTION

This invention concerns Film Bulk Acoustic Resonator (FBAR) filters or Spectral Multiband Resonator (SMR) filters.

The innovation proposes the direct layer deposition of LiNbO₃, LiTaO₃ and their derivatives with 33°Y and X- orientations on Si substrates.

33°Y- and X- orientation of LiNbO₃ presents particular interest for the applications based on volume acoustic waves (BAW).

Their high electromechanical coupling will allow to achieve large passband (> 10 %) of BAW filters operating at frequencies \geq 5 GHz or to fabricate filters with tunable frequencies at standard operational frequencies (around 2 – 3 GHz).

COMPETITIVE ADVANTAGES

- Able to operate at standard frequencies (2-3 GHz) and frequency \geq 5GHz (up to 10GHz by adjusting the thickness film) and/or with relative bandwidth in excess of 10%.
- Epitaxial process allowing very good control of the film thicknesses
- Direct layer deposition optimizing step in process run
- Compatibility with TFBAR and SMR standard processing



Markets & applications

Markets

- ❖ Information & Communication
- ❖ Automotive navigation
- ❖ Toll system
- ❖ Medical instrument
- ❖ All industry
- ❖ Military
- ❖ Household appliance



Development stage

Technology demonstrated in a simulated environment (TRL 5)



Research team

Laboratory FEMTO-ST



Intellectual property

Patent under deposition



Target partnership

Patent licensing/cession

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