

MEMSLand

MEMSLand

Cost Effective MEMS to Develop a Sustainable High Tech Business

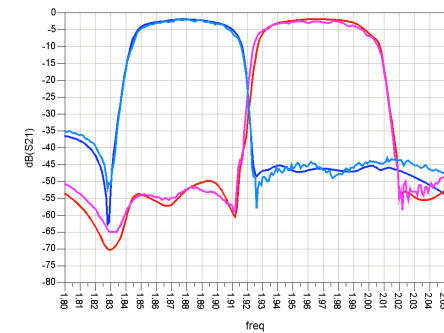
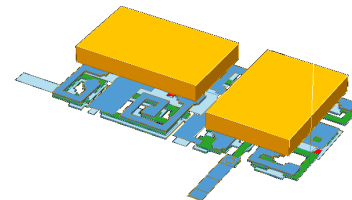
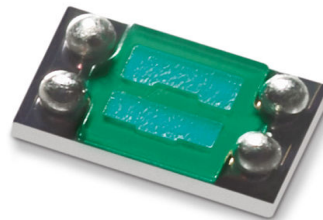
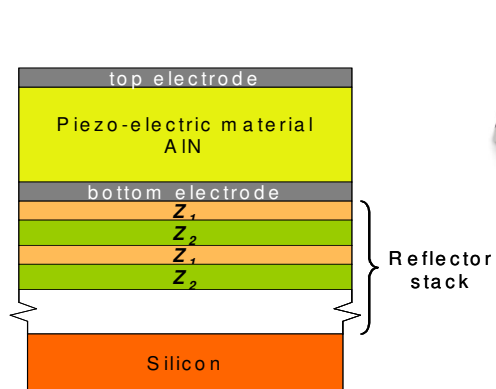
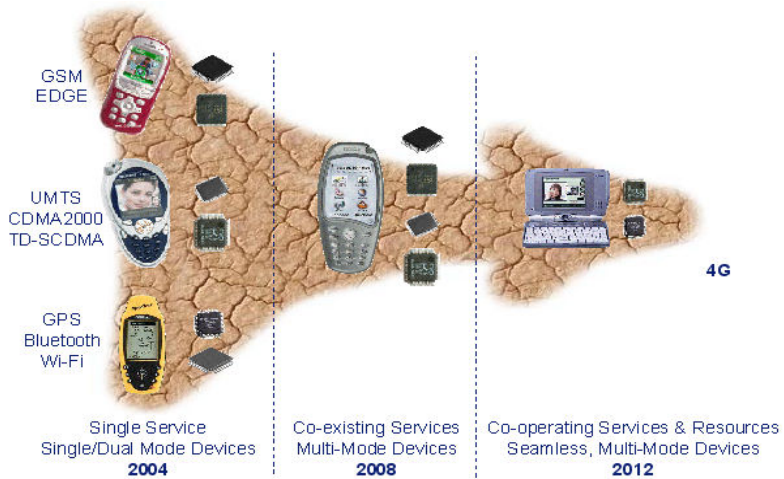


Point-One

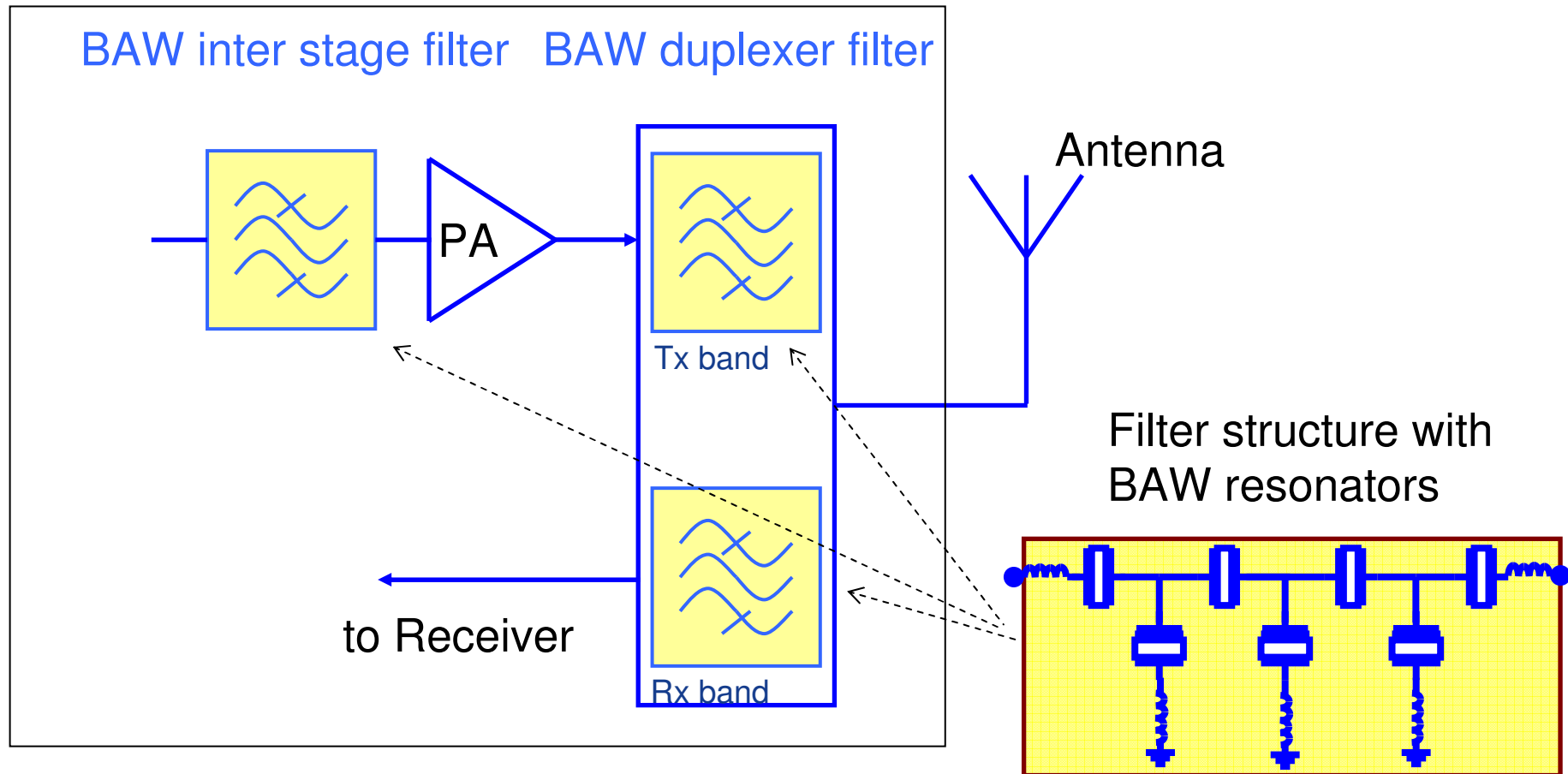
Pole of innovative technology on nanoelectronics and embedded systems

BAW Filters Introduction

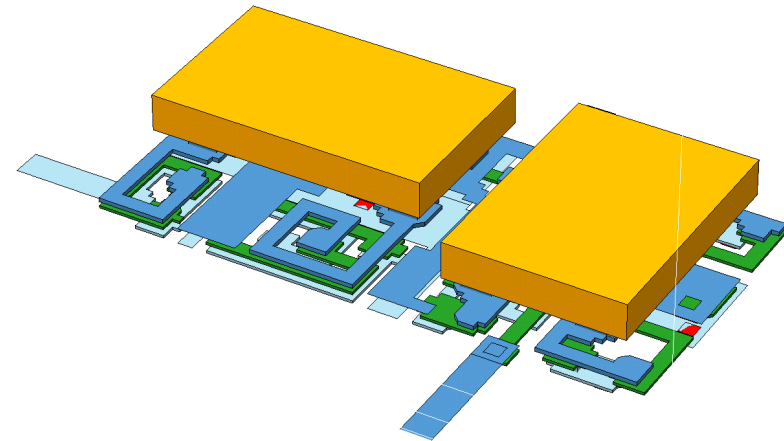
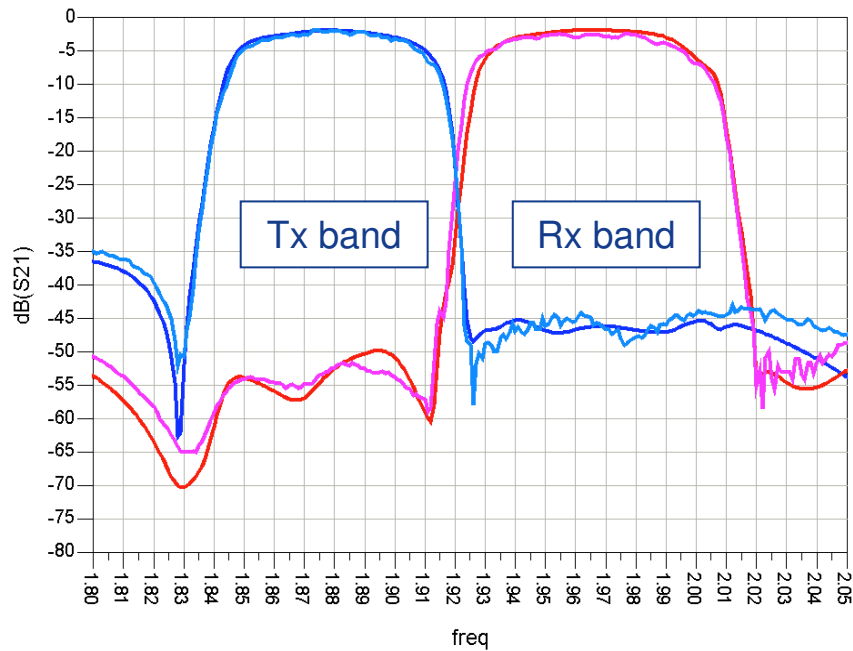
- future multimode applications require improvements in RF filter size and performance
- BAW uses piezoelectric thin film MEMS resonators to design small, high quality RF filters



BAW Filter Application



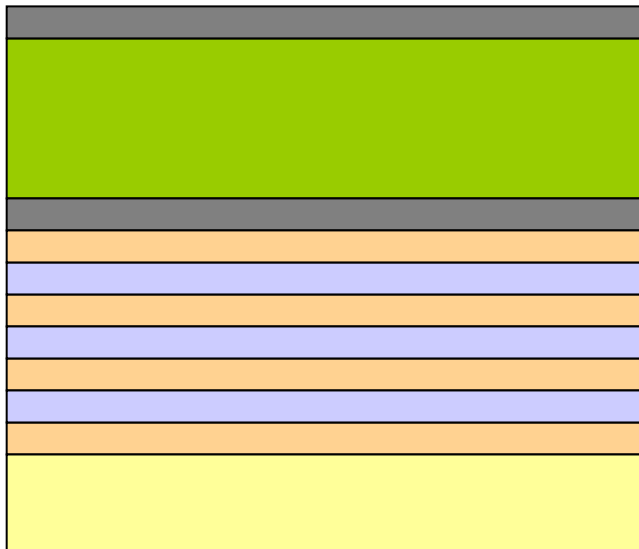
USPCS Duplexer Application



*Good agreement between
simulation and measurement*

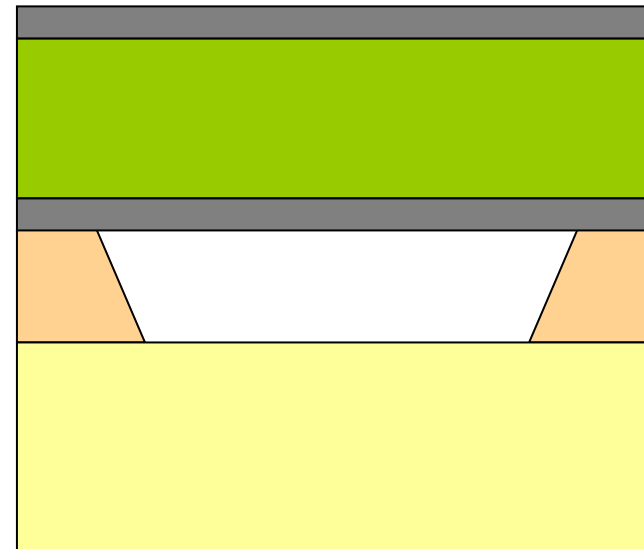
BAW Resonator Concepts

Solidly Mounted Resonator
(SMR)



- Lower bandwidth
- Cheap packaging
- Good suppression higher harmonics
- More layers/ lower throughput
- Power Handling better

Film Bulk Acoustic Resonator
(FBAR)

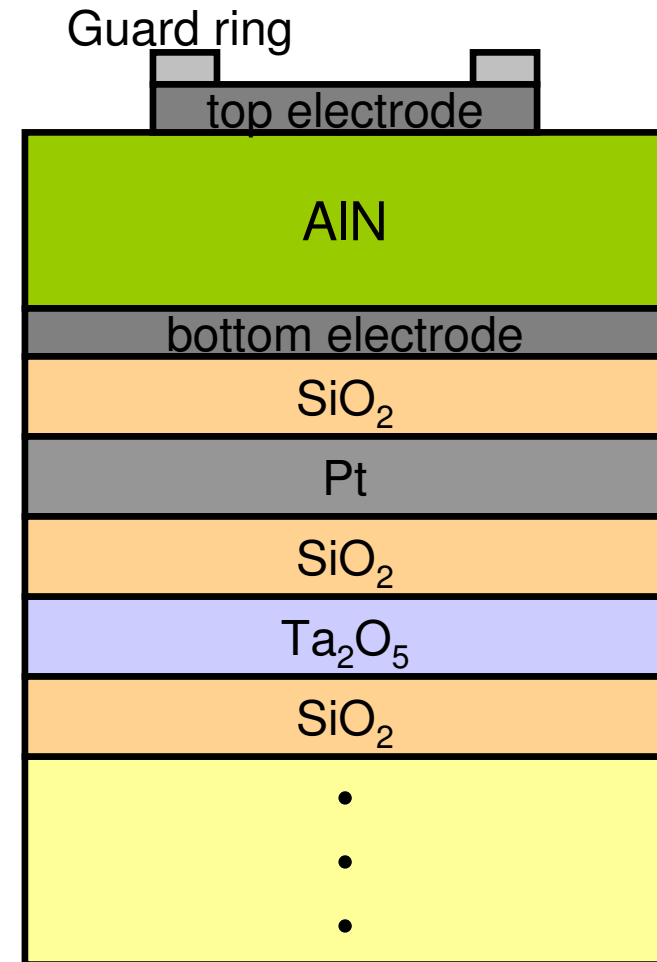
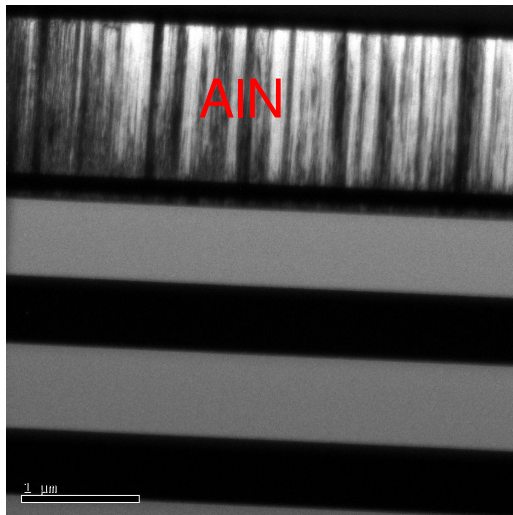


- Larger bandwidth
- Expensive packaging
- No suppression higher harmonics
- Manufacturability/Reliability
- Power Handling Good

Solidly-Mounted-Resonator at NXP

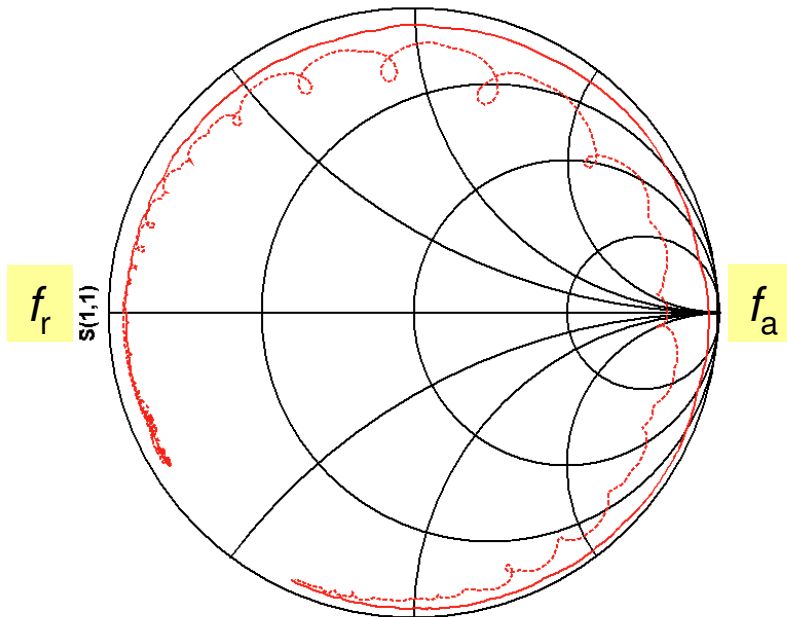
- Pt/Ta₂O₅/SiO₂ based reflector stack
- Stress and roughness control extremely important
- Standard semiconductor equipment
- FWHM measured < 1.0° on complete stack

X-section

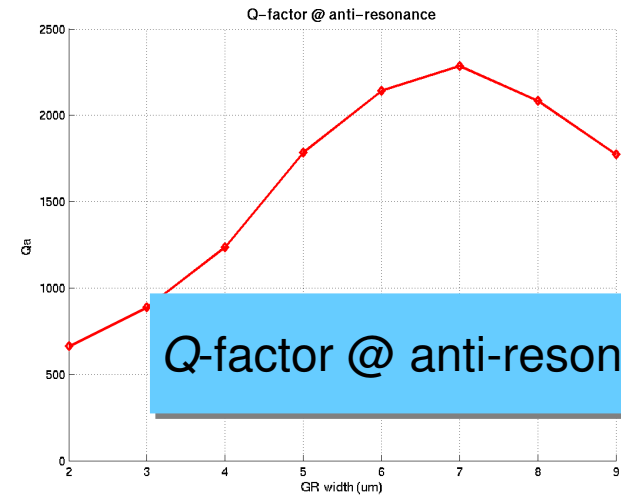


High-Q Resonator with low Spuriousity

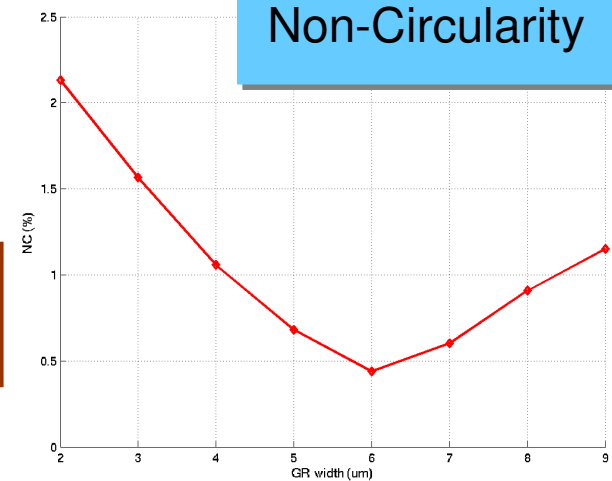
--- Before guard ring
— After guard ring



High Q-factor and smooth resonator response obtained for optimal guard ring width

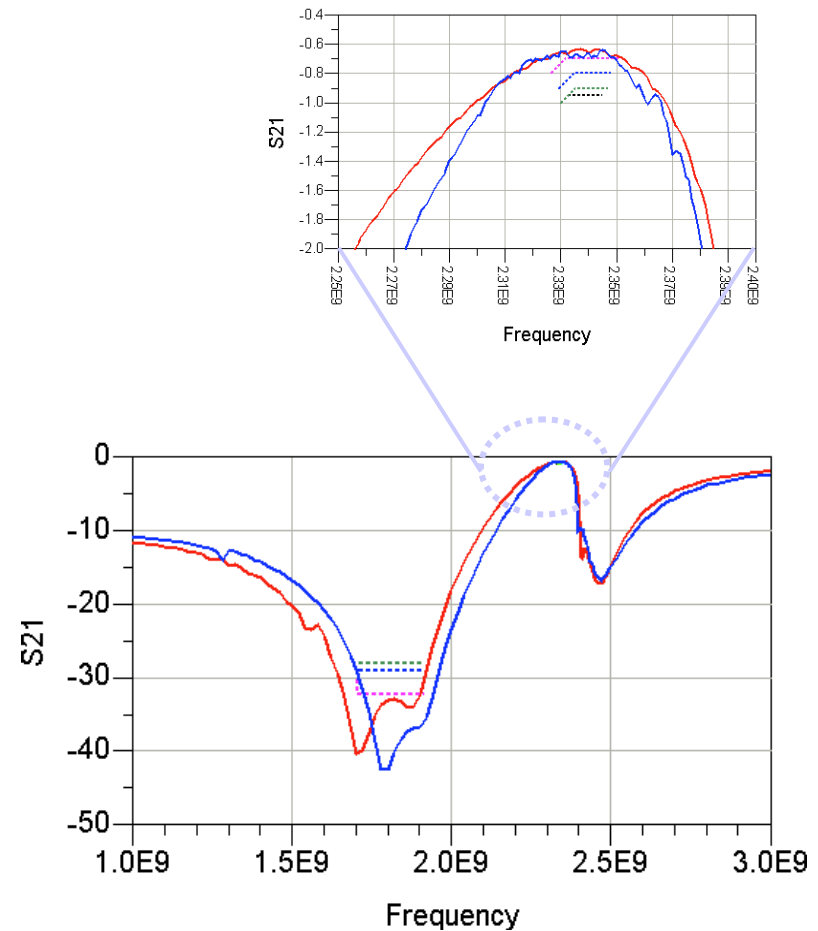
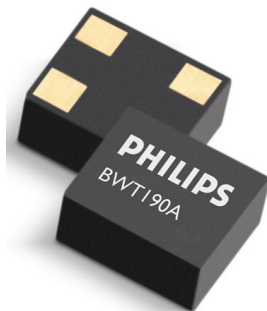


Q-factor @ anti-resonance



BAW Filter Satellite Radio Filter

- 2.3GHz antenna filter for satellite radio application in mobile phone
 - lower loss than SAW
 - smaller than ceramic
- BAW filter in small molded package (2.0x1.6x1.1 mm³)



BAW Filter Roles in MEMSLAND

- NXP: design, modeling, process integration, testing, industrialization
- AppTech: package development
- TNO: polymer packages (next generation)
- Univ. Twente: non-linear compact modelling (to start when student is available)