

# Multi-Band Operating BAW Resonator

---

## BAW resonators that are multi-band operating at non-harmonically related frequencies

Georgia Tech researchers have developed BAW resonators that are multi-band operating at non-harmonically related frequencies providing multiple modes excited in a single, solidly-mounted BAW resonator. The resonators have a very high resonator Q, are robust, and are simple to fabricate. The advantages of a multi-mode device could be significant in bio sample analyses, especially because the TSM is desirable for liquid-phase sensing while the TEM is applicable in vapor-phase sensing.

### Summary Bullets

- Extremely high resonator Q
- Simple fabrication process
- Robust design — not fragile

### Solution Advantages

- Extremely high resonator Q
- Simple fabrication process
- Robust design — not fragile

### Potential Commercial Applications

- High-Q resonators
- Electronic filters
- Sensors
- Oscillator components

### Background and More Information

Advances in piezoelectric thin film deposition technology have led to the creation of advanced Bulk-Acoustic-Wave (BAW) devices that enable GHz range acoustic resonators much higher than Quartz-Crystal-Microbalance and Surface-Acoustic-Wave resonator frequencies. Thinner piezoelectric films are required for higher mass sensitivity application; unfortunately, this configuration becomes very fragile for GHz range operation. For robustness, BAW resonators may employ a Solidly Mounted Resonator (SMR) configuration. While devices operating in different acoustic modes have been created with devices employing an inclined/tilted c-axis growth

of ZnO (as opposed to substantially c-axis oriented), these devices require sophisticated deposition and etching processes and have membrane structures that are inherently fragile when dealing in the GHz range due to the necessity of an extremely thin film.

## **Inventors**

- Dr. William Hunt  
Professor — Georgia Tech School of Electrical and Computer Engineering
- Adam Wathen  
Graduate Research Assistant — Georgia Tech School of Electrical and Computer
- Farasat Munir  
Graduate Research Assistant — Georgia Tech School of Electrical and Computer Engineering
- Anthony Dickherber  
Graduate Student — Georgia Tech School of Electrical and Computer Engineering
- Christopher Corso  
Student — Georgia Tech School of Electrical and Computer Engineering

## **IP Status**

: US20120062068A1

## **Publications**

, -

## **Images**

Visit the Technology here:

[Multi-Band Operating BAW Resonator](#)

---

<https://s3.sandbox.research.gatech.edu//print/pdf/node/3591>