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## Film Bulk Acoustic Resonator Based Radiation Sensors

Ionizing radiation sensing has many applications in a variety of industries. Low dose sensing is important for nuclear materials detection and security. Some space applications require measurement of the flux and direction of high energy radiation. Furthermore, it is essential to determine the exact location and amount of radiation directed toward human tissues in radiation therapies used for cancer treatment. Presently, there are several different types of sensors that are utilized for these different types of radiation detection; however some are very expensive and large, while others demand extensive post-processing of the information acquired.

Researchers at Arizona State University have designed a film bulk acoustic-wave resonator (FBAR) that detects high energy radiation focused at the device by trapping charge produced by the radiation. The trapped charge changes the operating attributes of the device by altering the static capacitance, which modifies the resonant frequency of the FBAR. The system employs zinc oxide (ZnO) as the piezoelectric material in charge of creating the standing acoustic wave. This device is much smaller than current sensors and is constructed completely by MicroElectroMechanical System (MEMS) techniques. It also exhibits the ability to perform passive telemetry.

### Potential Applications

- Biomedical Applications
- Space Exploration
- National Security MonitoringM

### Benefits and Advantages

- Much smaller than current gamma detectors
- Good passive telemetry ability
- Ease of fabrication using known MEMS techniques

