Theme: Bulk Acoustic Wave

- Sub Theme: Loss Mechanisms and Causes of Failure under High Power Loads in BAW Resonators

When a bulk acoustic wave (BAW) resonator is operated with high frequencies or under high radio frequency power, self-heating occurs in it due to various energy loss mechanisms such as electromagnetic or mechanical dissipations. This self-heating increases its temperature which makes some energy loss mechanisms worse augmenting the self-heating itself. This vicious cycle typically leads to deterioration of performances of the resonator such as impedance drifts, increased insertion loss, or even failure under higher power levels. If these mechanisms are quantified and failure modes are thoroughly studied, then optimizing structures with appropriate materials can be conducted so that the resonator is robust to high temperature and failure modes. In addition, since this research is related to characterization of sub-micron thick films under high temperature and frequency, we believe it is widely applicable to other micro-/nanoscale fields of studies.

We expect that the following research topics would be helpful for identifying individual loss mechanisms and failure modes in BAW resonators.

- Acoustic attenuation or viscoelasticity in thin film metals and ceramics at frequencies in the GHz ranges
- Measurement of thin film interfacial adhesion under high temperatures and vibration in the GHz frequency range
- Dynamic mechanical behaviors in thin film composites under the GHz-range oscillation

※ The topics are not limited to the above examples and the participants are encouraged to propose original idea.
※ Funding: Up to USD $150,000 per year