

Master thesis project

Manipulating Microparticles with Surface Acoustic Wave Devices

Background In the Wieczorek lab we magnetically levitate superconducting microparticles to test quantum mechanics at large mass scales, using on-chip magnetic coils in a dilution refrigerator. Loading the trap is a bottleneck: adhesion makes particles stick to the surface, and any release mechanism must work inside the cryostat. Our on-chip solution is a surface acoustic wave (SAW) device: interdigitated transducers on a piezoelectric substrate that, driven at resonance, launch a travelling wave along the surface. We have shown that such waves dislodge and transport particles. The next step is control — positioning single particles precisely and manipulating several at once.

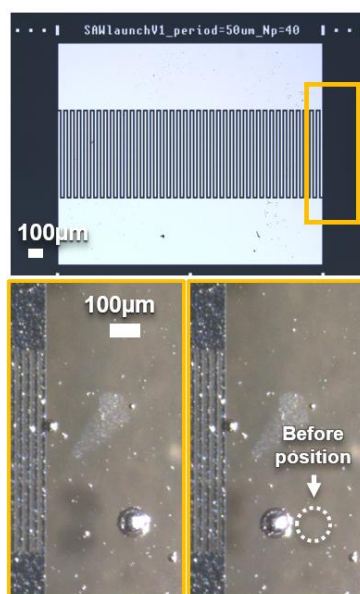


Figure 1: Moving 80µm particles with SAW device



Video: Moving 10µm particles with SAW device

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The project consists of

- Experiment with SAW devices at room temperature and in a cryostat, controlled via RF signals
- Develop methods for precise transport of single and multiple particles
- Automate experiments in Python
- Design new types of SAW devices to improve positioning capabilities

What will you learn

- Physics of surface acoustic waves in piezoelectric substrates
- Operate RF instrumentation and a cryostat
- Design experiments and automate them in Python
- Design devices for microfabrication

Questions? Feel free to contact us:

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