

Quantum Sensing: From Materials to Universe

Topic for 2021

- We made high-quality semiconductor TMDC (transition metal dichalcogenides) thin flakes inside a glove box with a controllable atmosphere, and developed gate-tunable devices with Bi-based low resistance contacts working at cryogenic temperatures
- We created quantum point contact devices on a GaAs substrate and performed experiments to investigate how the quantum point contacts respond to radiation
- We observed the superconducting (SC) transition of high-T_c cuprate materials by coupling to 2D coplanar waveguides.
- We explored schemes to improve SC microwave resonators/cavities (used as sensitive detector of microwave photons, which axion dark matter particles can convert to in strong magnetic field) by depositing/interfaces with improved higher T_c superconductors with higher operating magnetic fields
- Continued collaboration with Purdue developed methods to use spin defect centers such as NV centers in nanodiamond as quantum sensors to study magnetic quantum materials