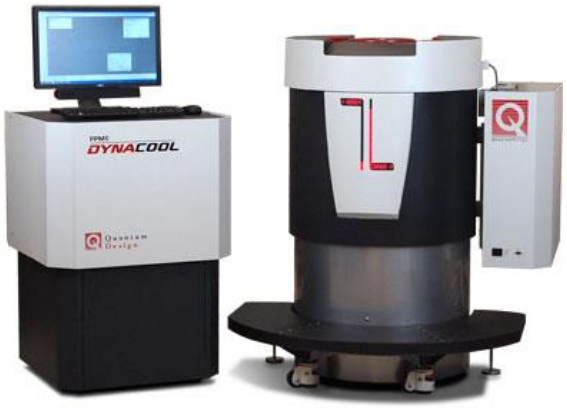
DynaCool Physical Properties Measurement System (PPMS) at Purdue

Please visit BNC Wiki page for the PPMS : https://wiki.itap.purdue.edu/x/zYZzB



- General field/temperature platform:
  - Temperature: 1.8 – 400 K
  - Magnetic field: +/- 9 tesla (90 kOe)
  - 25mm diameter sample space
- Hosts wide variety of automated measurements...
- Electrical transport: magnetoresistance, Hall effect, I-V curves; external gating possible
  - Micro-ohm up to 5 giga-ohm
  - Automated sample rotation
- Heat Capacity micro-calorimeter
- Thermal Transport:
  - Thermal conductivity
  - Seebeck & Nernst effects
- Magnetometry: DC magnetic moment using VSM
  - 10^{-6} emu up to 100 emu
- Ferromagnetic Resonance (FMR) to 18 GHz

Samples mount on "pucks" which insert in system

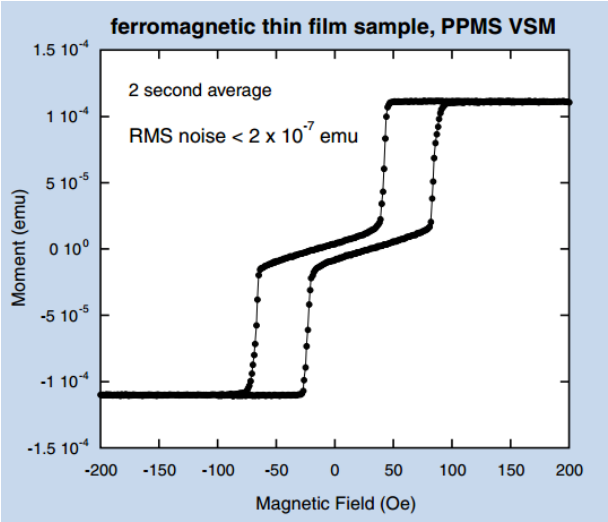
Which research uses the PPMS?

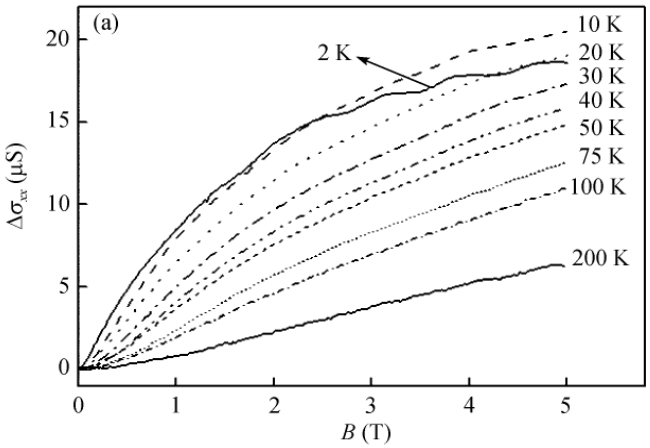
- Magnetic materials
- Semiconductor transport / 2DEGs
- Phase transitions
- Photovoltaics
- Magnetocalorics
- Thermoelectrics
- Superconductivity

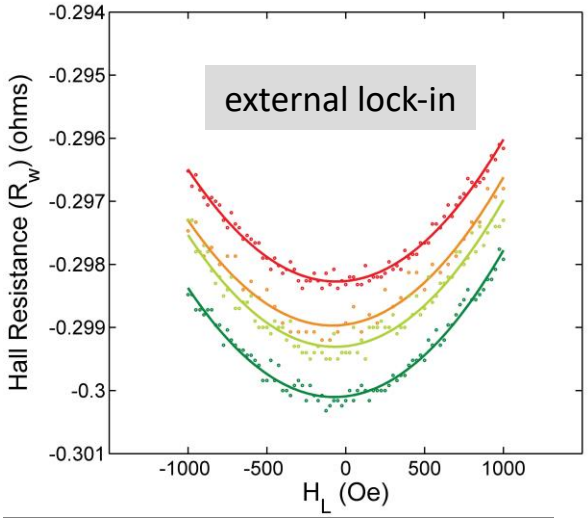
Other measurements can be added:

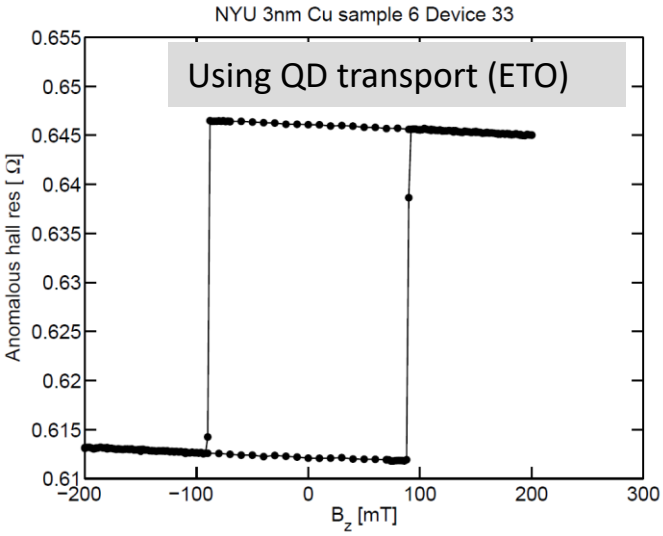
- Torque magnetometry
- Dilatometry
- Fiber optic for photoconductivity
- Dielectric constant
- 50 mK Dilution Refrigerator

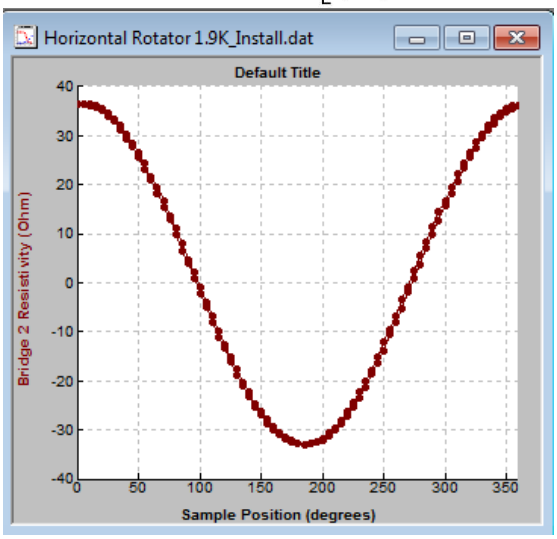
Gallery of PPMS data

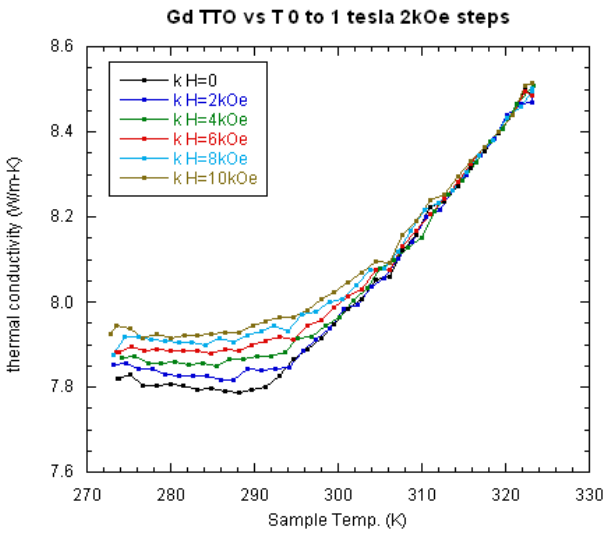












Captions to figures from previous page

(top-left): VSM M(H) loop of spin valve film sample courtesy of Y. U. Idzerda, Montana State Univ. **(top-right):** magnetoconductance of graphene (Tan et al., 2009).
(middle): Hall effect spintronics device measurements using external lock-in (left) and ETO built-in option of PPMS (right).
(bottom-left): Hall sensor signal vs. rotation angle on horizontal rotator probe. T=1.9 K and H=1 kOe. **(bottom-right):** thermal conductivity of Gd metal through its Curie point at 293 K at various fields; TTO option.

Inside the PPMS DynaCool

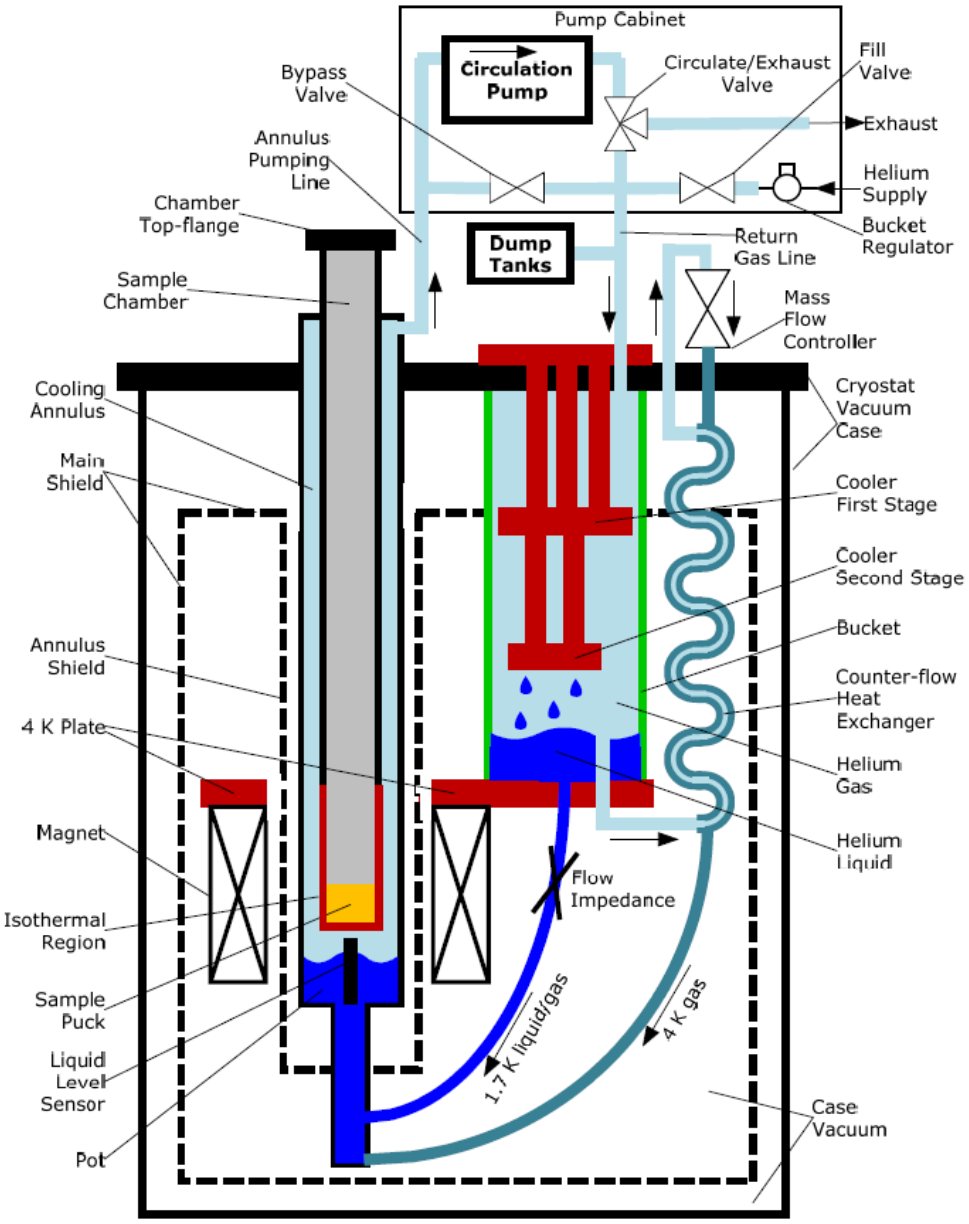


Figure 1: The DynaCool Cryostat showing the components of the Cryostat Control System, Chamber Temperature Control System, ad Magnetic Field Control System.