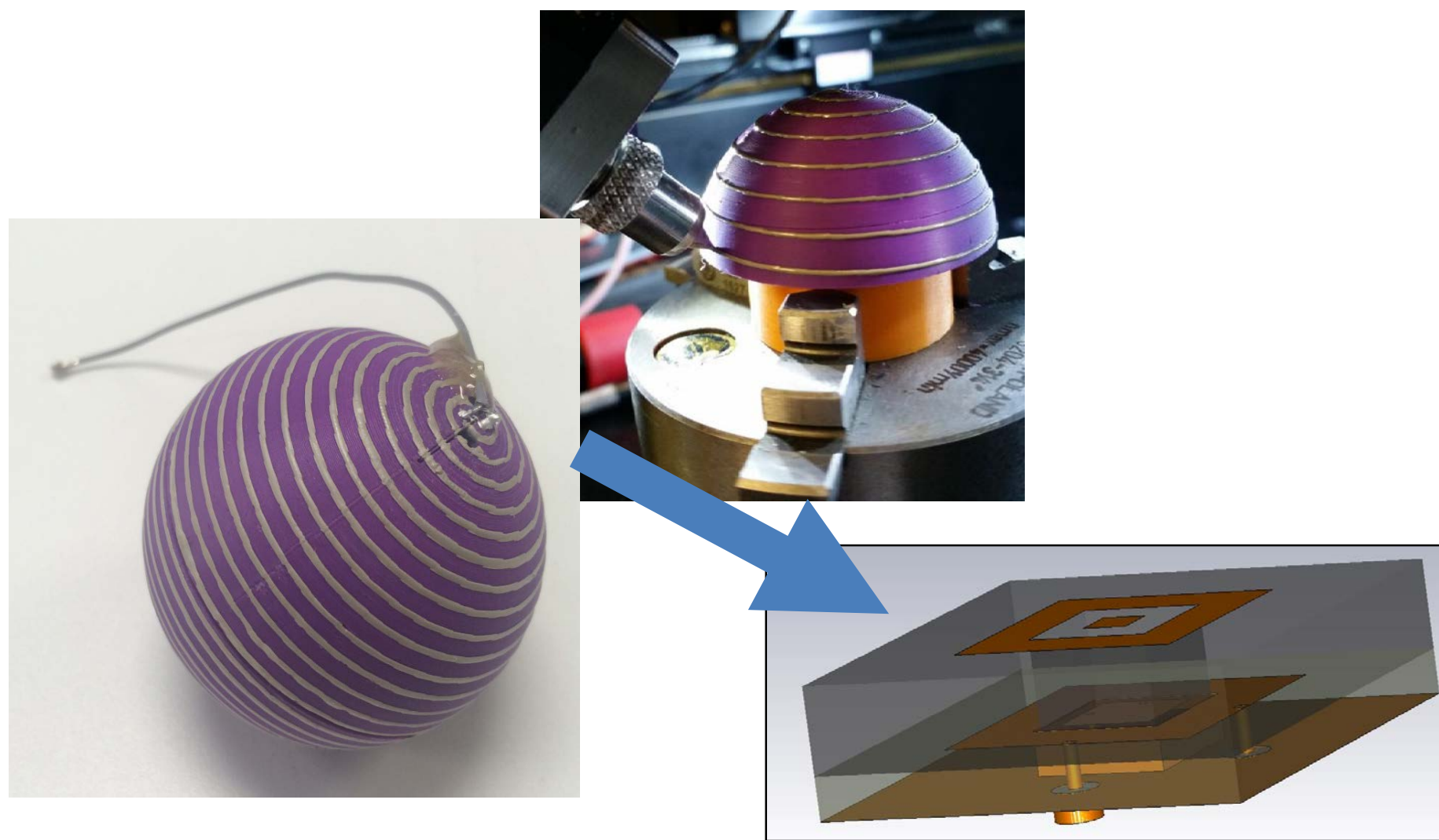


S&T Campaign: Materials Research
Electronics
RF Active & Passive

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Research Objective

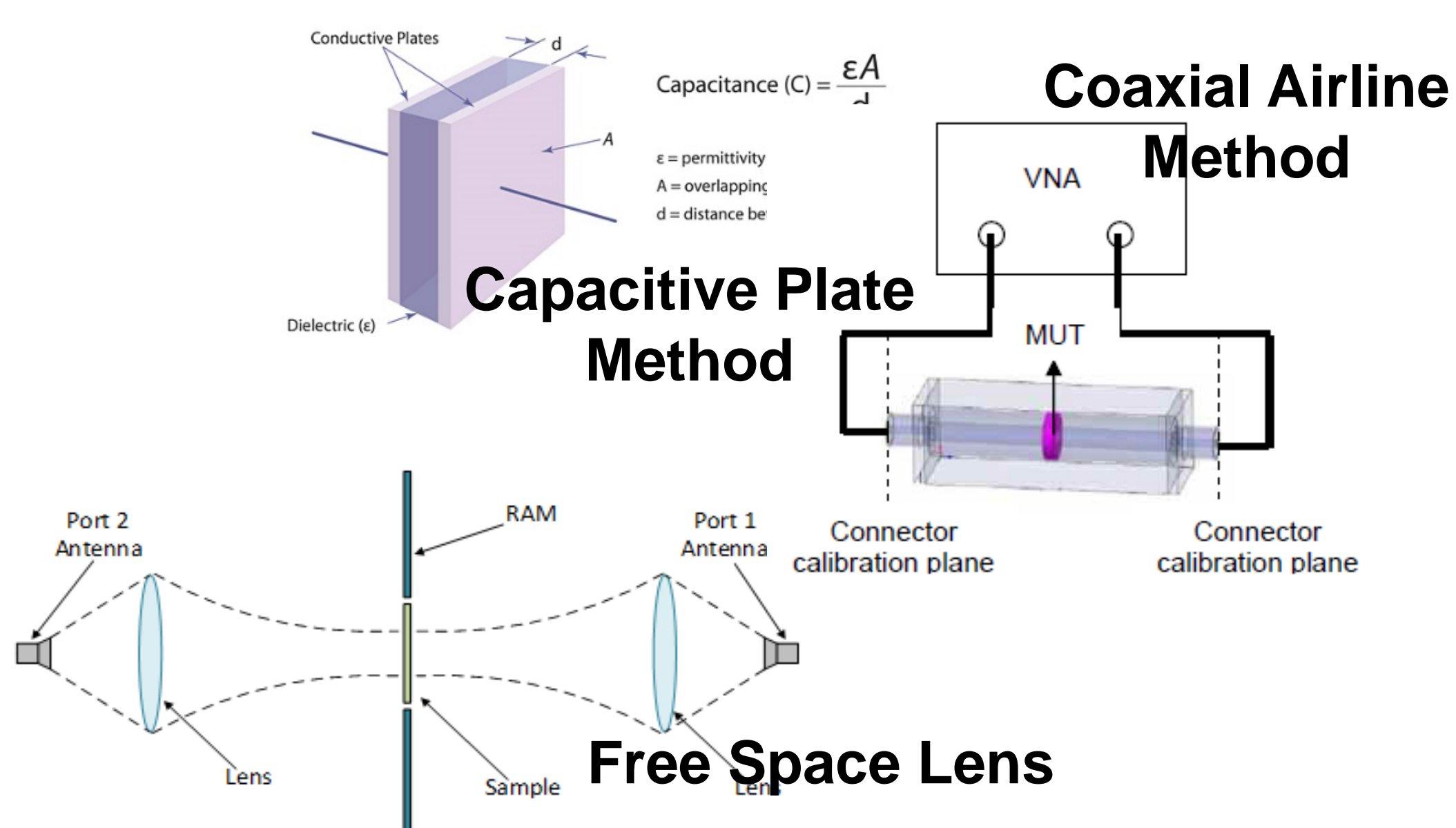
- Develop additive manufacturing for fabrication, characterization, and printing of polymer/ceramic composite electromagnetic (EM) and conductive materials for antennas and other radio frequency (RF) devices
- Additive manufacturing is a transformative technology facilitating both rapid prototyping and complex designs not achievable by current manufacturing methods



Spherical dipole manufactured with ARL nScript tool. We wish to transition to hybrid material vertically integrated antenna models.

Challenges

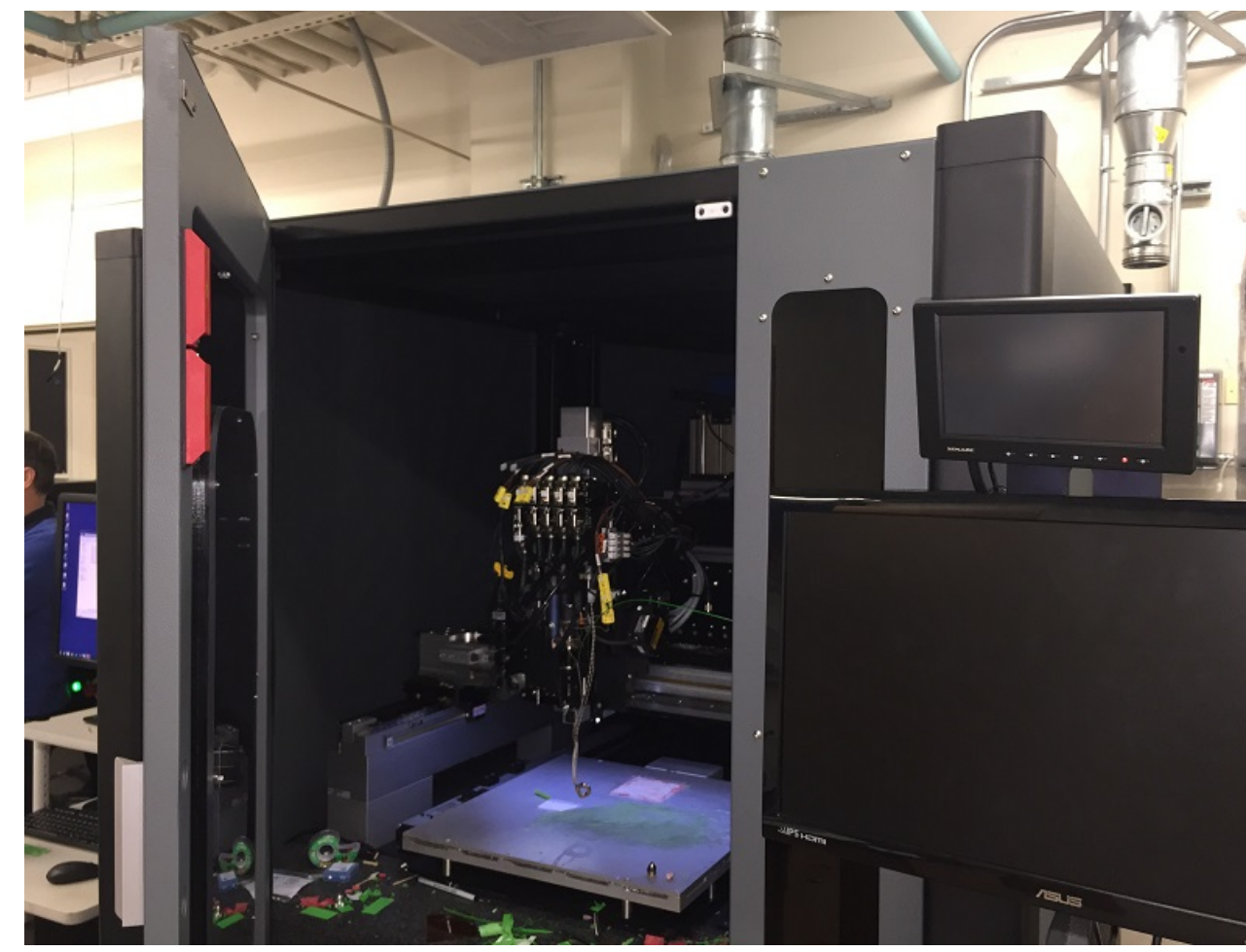
- 3D printed materials are hard to characterize below 1-2 GHz



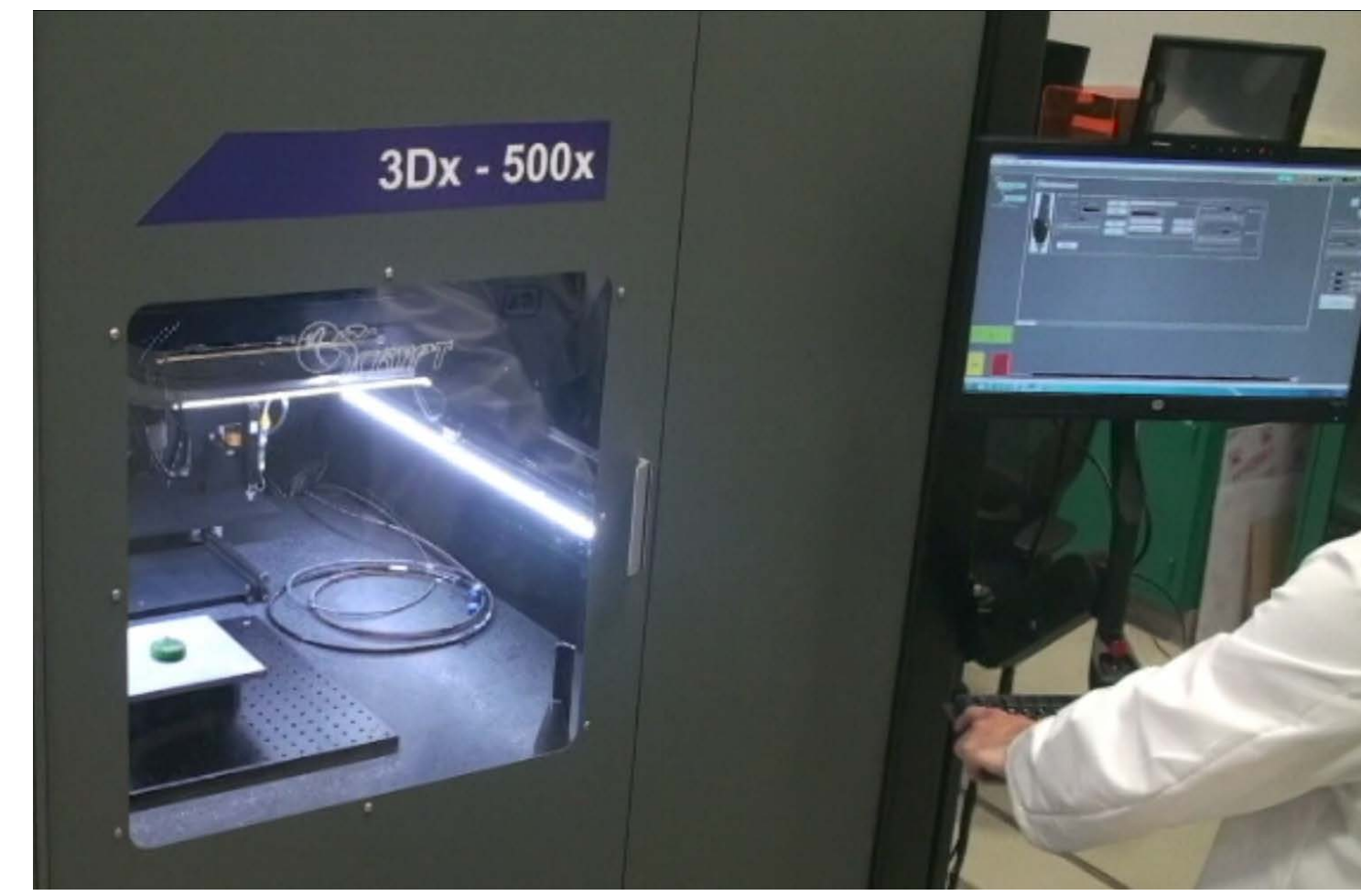
Characterization methods typically used for 3D printed materials

- Commercial off-the-shelf thermoplastic filaments for nScript printers with high dielectric constant and low loss tangent don't exist
- Current conductive inks are an order of magnitude less conductive than bulk copper leading to ohmic losses and radiation inefficiency

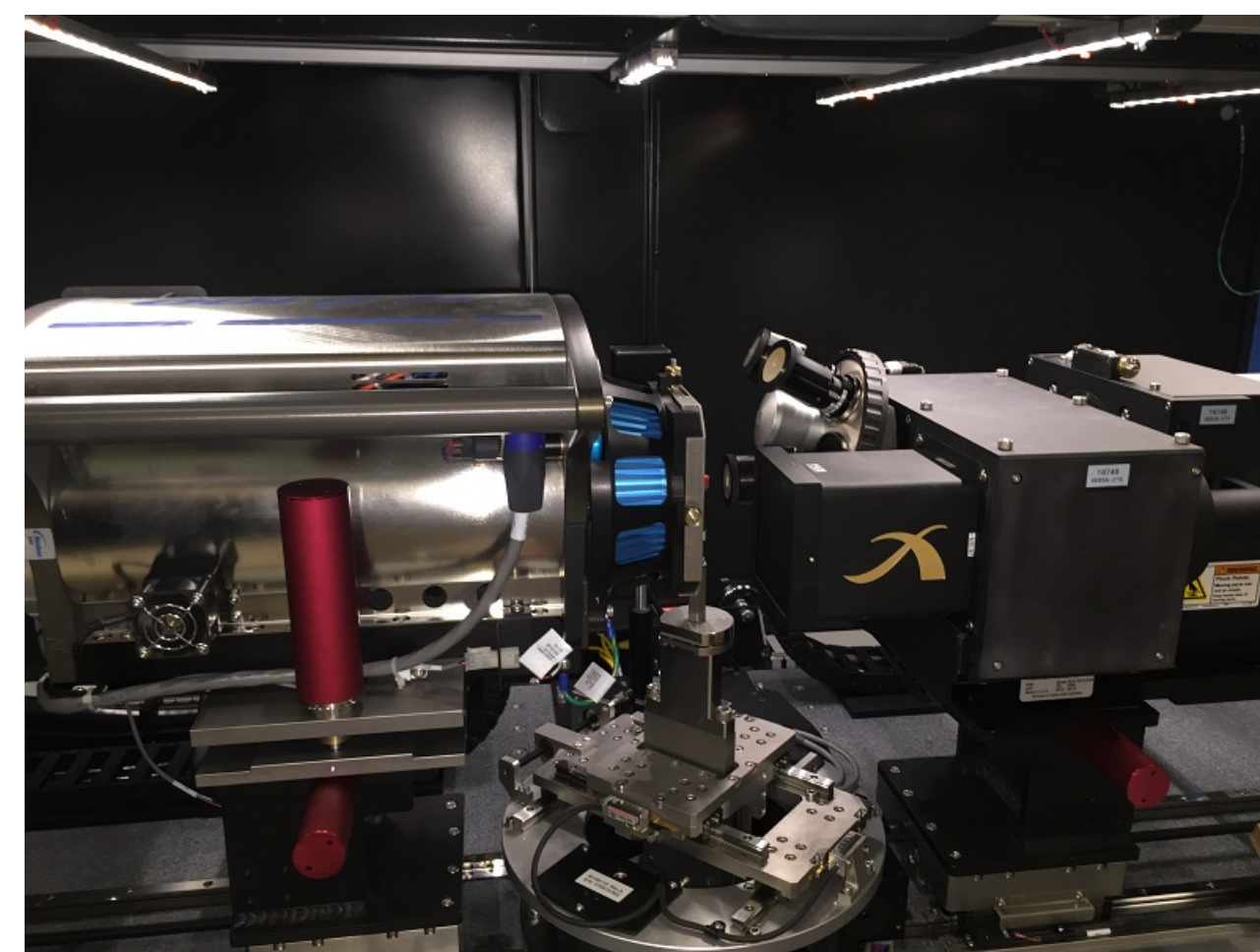
ARL Facilities and Capabilities Available to Support Collaborative Research



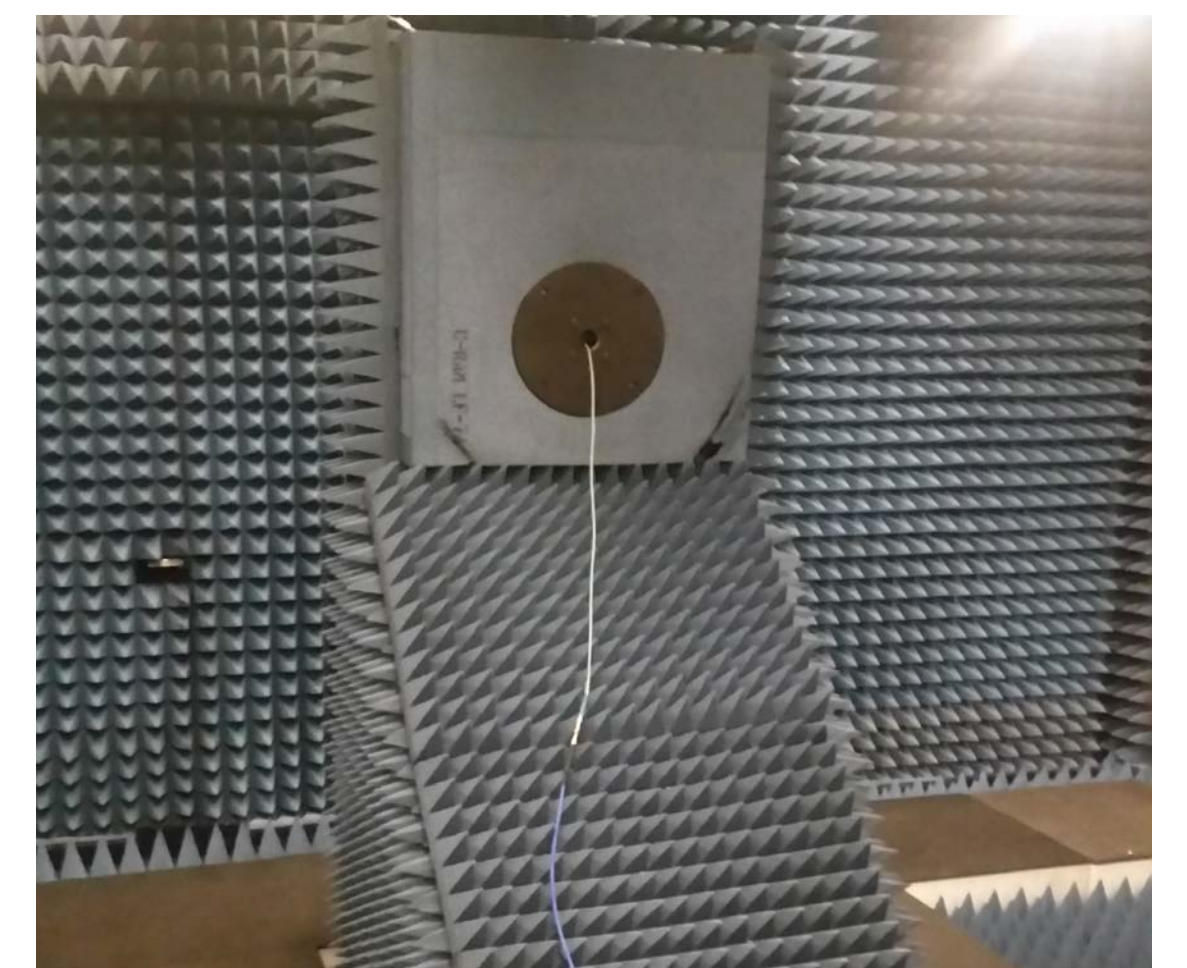
nScript printer with flash annealing for high conductivity



SuperScript printer with 5-axis head for printing on complex and curved surfaces



CT microscope for 3D analysis of printed internal structures



Far-field anechoic chamber for antenna characterization

Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Ability to extrude thermoplastic filaments with dielectric constants up to 15 that are compatible with nScript printers
- Facilities for the accurate characterization of 3D-printed dielectric materials from 500 MHz to 20 GHz
- Research in the area of increased conductivity of conductive inks at low temperatures and additively manufactured RF connectors