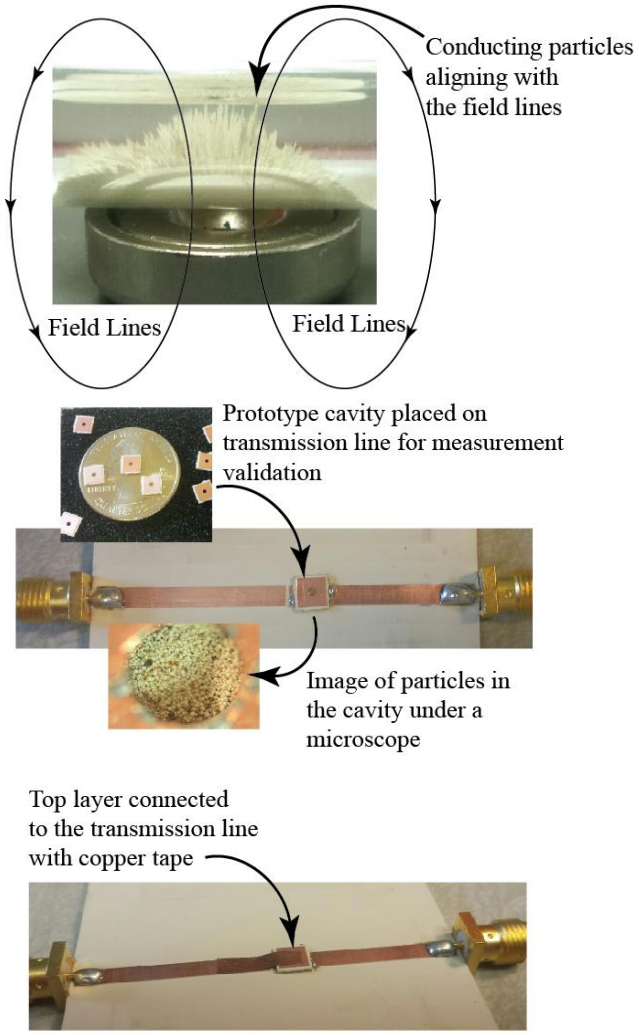
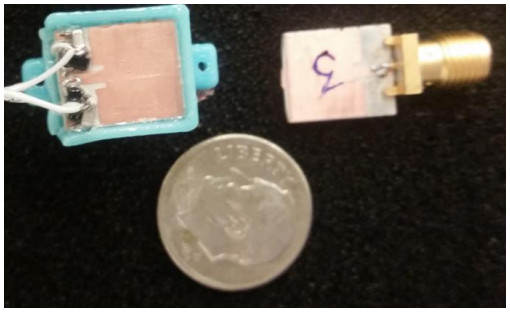
Engineering Electromagnetic-Responsive Structures for Improved Wireless Communications.

The goal of this research is to explore the use of sub-wavelength particles, namely Static Field Nanoparticle Components (SFN-PCs), for the enablement of electromagnetic (EM) responsive structures. The sub-wavelength particles are embedded in a host material and externally manipulated by applying well-controlled magnetostatic fields. The applied field causes the particles to columnize/orientate in the direction of the field lines, and hence changes the EM response of the host material. Preliminary studies have shown that SFN-PCs (e.g. silver coated magnetite particles) can be aligned and addressed in individual voxels for both real-time tunability and ON/OFF control of spatial material properties, i.e. permittivity (ε) and permeability (μ) tensors. This research will include the derivations of design parameters for improving future wireless systems.





Implantable Antennas for Energy Delivery in the Human Body

Personalized medicine is becoming more and more accessible each day. On method of achieving a new level of this type of treatment is the use of implanted devices that can be used to monitor and eventually treat patients. These features require the use of electronics and hence energy in the body. This research focuses on delivering this energy wirelessly into the human body for medical benefits.

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