SOUTH DAKOTA SCHOOL OF MINES & TECHNOLOGY

OFFICE OF ECONOMIC DEVELOPMENT

Phase-Change Materials for Reconfigurable Radio-Frequency Front-Ends, Antennas, Microwave Components, Vanishing Ground Planes, Reconfigurable or Tunable Radomes and Cloaking.

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LICENSING OPPORTUNITIES

South Dakota School of Mines Office of Economic Development is actively seeking exclusive and/or nonexclusive licensing opportunities. Joint development opportunities are also available.

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Description

This technological breakthrough consists of the integration of phase-change materials with antennas and other components to enable the wideband tuning and limitless frequency reconfigurability of antennas, microwave components, ground planes, radomes, and other electromagnetic structures. This innovation enables the tuning, reconfiguration or turning on/off of integrated electronic and electromagnetic devices off through the localized actuation (through temperature control and other methods) of thin films of phase-change materials.

Impact and Benefits

This technology makes antennas and other electromagnetic and electronic devices multi-functional, low-loss, and more robust.

Advantages

- **No bandwidth limitation:** The designs overcome the ~20% tuning bandwidth limitation of traditional designs such as reconfigurable microstrip antennas) because it electrically decouples the biasing circuitry from the actual component. This allows any bandwidth or frequency ratio to be achievable.
- **Thin, planar, and extremely robust:** The integrated thin-film for the phase-change material makes the structure less bulky and far more robust than other that uses traditional, soldered, off-the-shelf component (p-i-n diodes, MEMS, varactors, transistors).
- **Extreme linearity:** The material has linear frequency response (no dispersion up to 60 GHz), surpassing the limitations of pin diodes (6 GHz) and digitally tuned capacitors (3 GHz) by a factor of 10x.

Example Applications

- Antennas (reconfigurable and shape-changing, planar, horns, etc)
- Radio-frequency Front-Ends
- Microwave components (RF switches, filters)
- Transmission lines with variable impedance
- Vanishing ground planes
- Beam-steering arrays
- Reconfigurable and Tunable Radomes and Cloaking