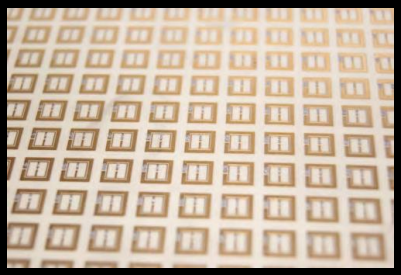
Metamaterial Smart Reflector



Surface with 2-D array of unit cells each comprising unique coupled resonator concept

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Development Stage:

Prototype
Validation

Protection Status:

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CA application 3,196,718
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Seeking:

Development Partners
Licensees

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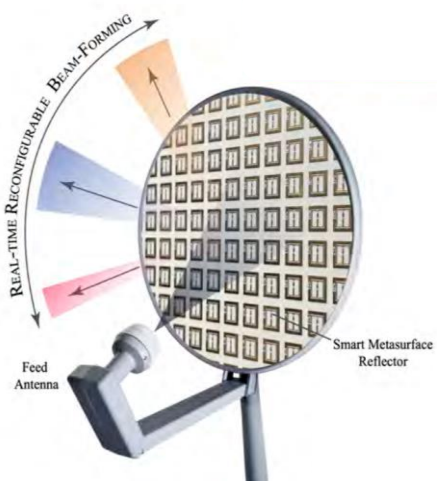
Background

To support the increased demand in data capacity for 5G and beyond wireless networks, current efforts are focused on migrating towards higher frequency bands, including millimeter-waves (typically 24 GHz onwards). Near-directive 5G communications can exploit the paradigm shifting concept of engineering the radio environment to consciously manipulate and distribute the EM power to desired destinations. To this end, Carleton's **Metamaterial Smart Reflector** can be installed in strategic areas of a given radio environment (e.g., ceilings, floors and other objects) and, in co-operation with fixed antenna sources and receivers, guide the EM power along preferred directions.

Description of the Invention

Carleton researchers have developed and tested a novel metasurface that provides unprecedented control of the reflection characteristics of the surface. The architecture consists of a 2D array of unit cells each comprising electro-magnetically coupled resonators. This novel unit cell configuration enables independent control of reflection phase and magnitude at the specified frequency, resulting in a smart software programmable reflector system scalable to various frequency bands.



Key Benefits

- Real-time configurable and independent control of magnitude and phase at desired frequency
- Dynamic real-time control row-by-row or a pixel-by-pixel
- Scalable Architecture ideal for sub-6 GHz Microwave Bands, X-Band, mm-Wave Bands
- Integrated metasurface controller to wireless communicate with a central control unit located elsewhere; capability to add AI/ML based software controls to respond to changes in the radio environment
- Superior coverage and ultra high speed can be gained in communications applications

Applications

- Communications: Radio environment engineering for 5G short-range communication in indoor or dense urban areas; phased-array solutions for point-to-point links, satellite communication, tracking, wireless backhaul
- Defense: Electromagnetic camouflaging and radar spoofing