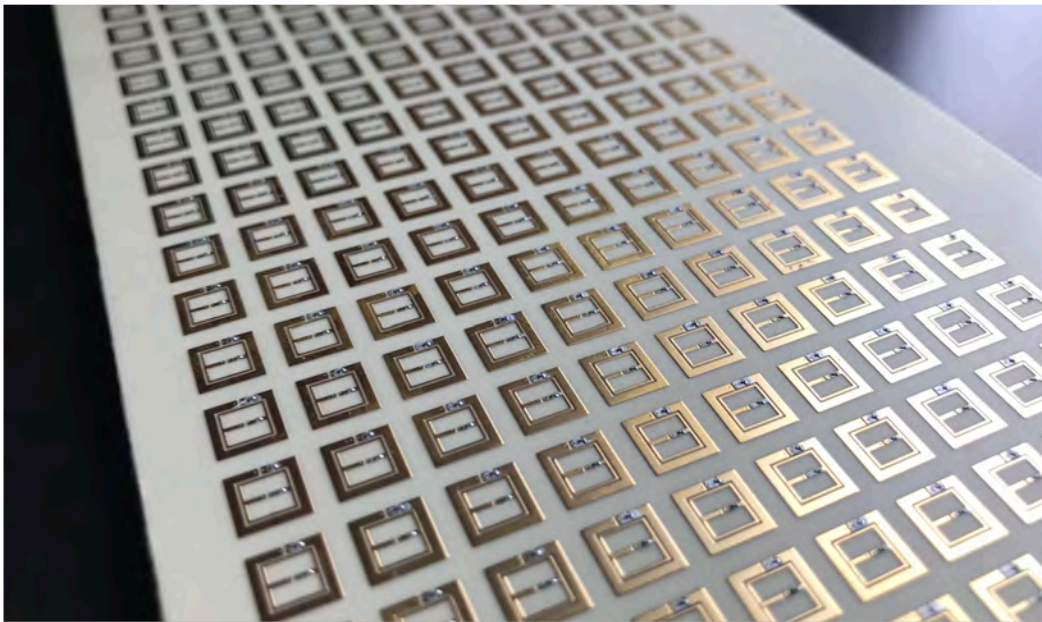


# Smart Reflectors

for 5G Communication & Defense Systems



**Novel Structure**  
unique coupled resonator concept

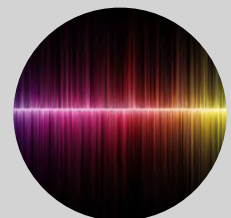


**Electronic Controller**  
Custom on-board microprocessor and analog/digital control

## Electromagnetically Engineered Metasurfaces

based on fundamental electromagnetic principles of Metamaterials

Our novel configuration of a metasurface unit cell can independently control its reflection phase and magnitude at the specified frequency. This technology can operate on the new 5G frequency spectrum.



**Scalable Architecture**  
ideal for sub-6 GHz microwave bands, X-band, mm-Wave wave (e.g. 28 GHz)

1

### REFLECTANCE

independent control of both magnitude & phase, polarization

2

### DYNAMIC

programmable real-time control, pixel-by-pixel or row-by-row

3

### SOFTWARE CONTROL

embedded on-board metasurface controllers with electronic controls

The smart reflectors will provide key enabling features in 5G communication systems. Acting as smart reconfigurable reflectors in homes, offices and dense areas like airports, they can provide superior coverage and ultra high-speed communication performance.

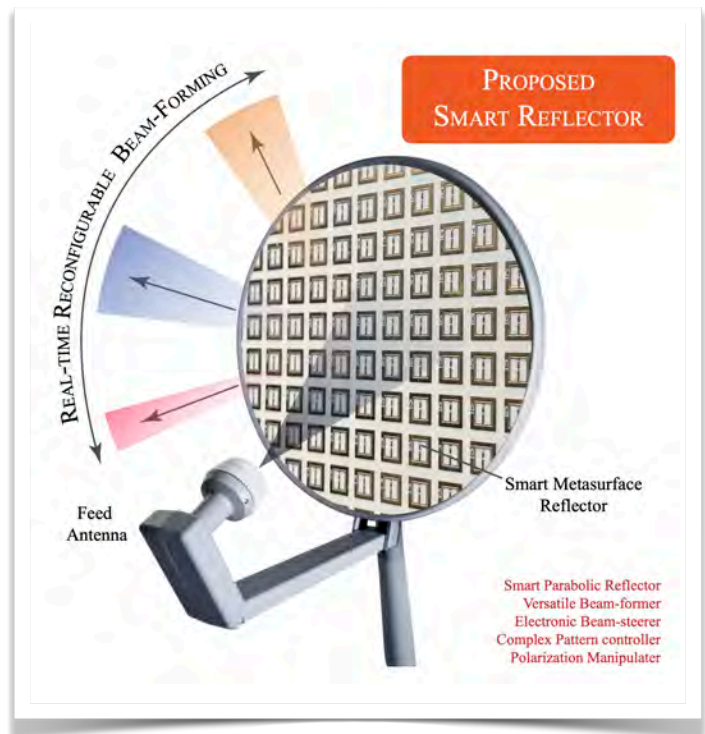
## Potential Applications

Dynamic reflectance characteristics either as standalone reflectors or as alternatives conventional parabolic reflectors open up attractive phased array type solutions and possibilities in point-to-point links, satellites communication, tracking and Wireless backhaul, for example. Defense applications include but not limited to electromagnetic camouflaging & radar spoofing.

## “Patent Pending”

### “Independent Control of the Magnitude and Phase of a Reflected Electromagnetic Wave”

US Provisional Patent Application no: 63/083,432 --filed September 25, 2020



**Inventors:** Shulabh Gupta & Ahmed Z. Ashoor

The proof-of-concept demonstration of the technology is currently been developed in the X-band (8-12 GHz) for linear polarized operation. The demonstration is focussed on experimental characterization in terms of bandwidth, loss performance, amplitude and phase coverage. More details at <https://arxiv.org/abs/2009.13369>

## FOR MORE INFORMATION ABOUT LICENSING OPPORTUNITIES AND RESEARCH COLLABORATIONS, CONTACT

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Video Synopsis: [bit.ly/CarletonMARS-Research](http://bit.ly/CarletonMARS-Research)

Metamaterials & Antenna

<http://bit.ly/CarletonMARS>

