

**Docket #:** S24-166

# **A high resolution, near THz imaging system for all weather environmental mapping**

Researchers at Stanford University have developed a novel millimeter wave imaging radar system designed to enhance driver-assistance technologies.

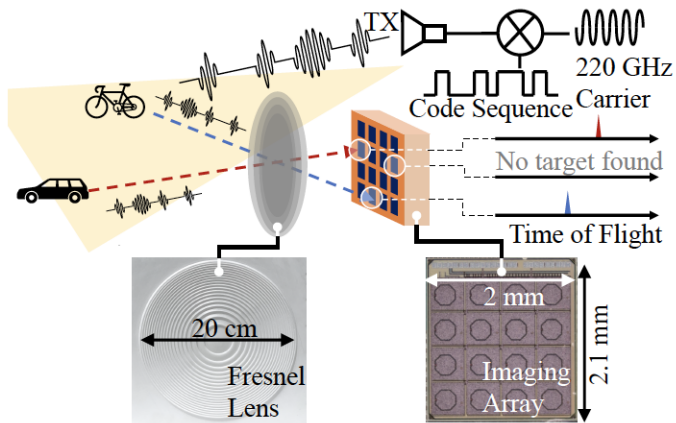
Current automotive sensors, such as phased arrays and multiple-input multiple-output (MIMO) systems, struggle with high cost, limited field-of-view (FoV), and slow refresh rates, which can degrade performance in dynamic driving environments.

This technology addresses these limitations by utilizing a plastic Fresnel lens combined with a 65 nm CMOS imaging array to achieve high angular resolution. The system operates at 220 GHz, offering  $0.78^\circ$  angular resolution and 3 m range resolution. This approach simplifies the receiver architecture and eliminates additional latency, providing a cost-effective and efficient solution. Potential applications include advanced driver-assistance systems (ADAS) and autonomous vehicles, where high-resolution imaging is critical for object detection in various weather conditions. This technology could greatly enhance safety and reliability in automotive systems.

## **Stage of Development**

- Proof of Concept

**Figure:**



**Figure description:** Block diagram of the proposed focal planar imaging array. The prototype imaging array consists of a beamforming Fresnel lens and a 4x4 receiver array in 65 nm CMOS.

*Image credit: Publication*

## Applications

- Automotive sensor
- Outdoor motion detection
- Security scanning

## Advantages

- Scalable - requires no specialized manufacturing processes
- Cost Effective - costs 100 times less than existing LIDAR and radar mapping solutions
- Weather proof - Reduces weather-related signal degradation compared to LiDAR by 15 dB
- Immune to near-by interference

## Publications

- Xu, Y., Hassibi, A., & Lee, T. H. (2023, June). [A 220 GHz Code-Domain Focal Plane Imaging Radar with 0.78° Angular Resolution for Automotive Applications.](#) In *2023 IEEE/MTT-S International Microwave Symposium-IMS 2023* (pp. 446-

449). IEEE.

## **Innovators**

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