TxACE Symposium

Panel Discussion : When Will My Car Drive me to Work ?

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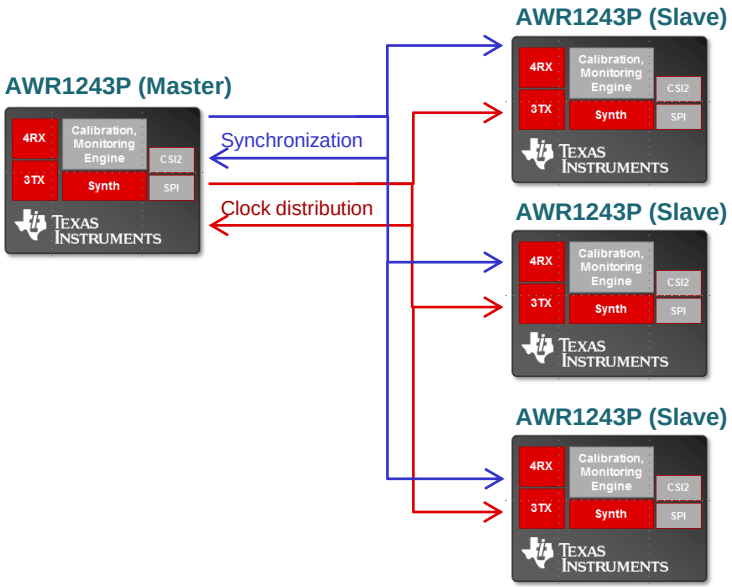
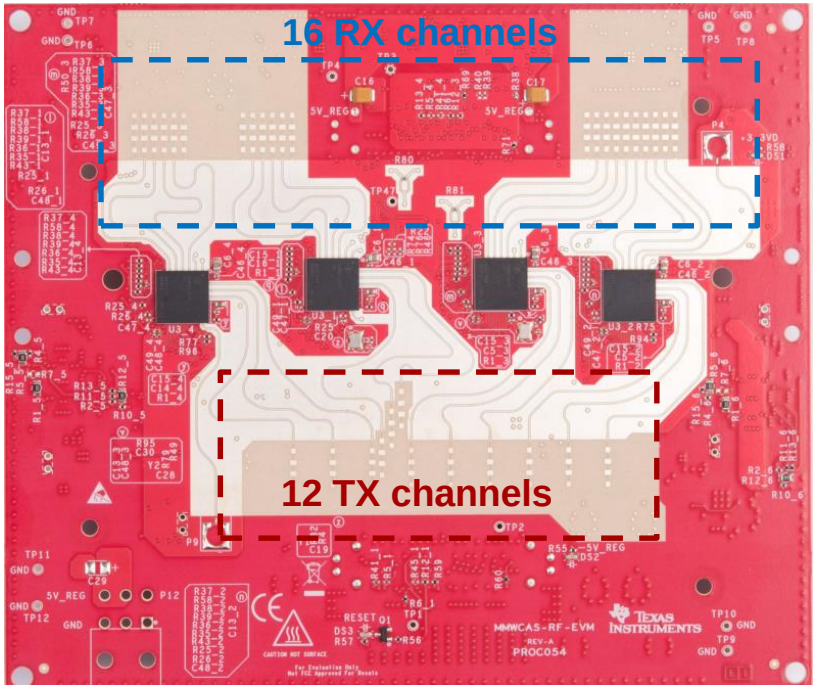
Imaging Radar – TI RF CMOS 4-Chip Cascade solution

- For Autonomous Driving (L4/L5), a radar sensor with imaging capabilities (i.e. large number of channels) is required

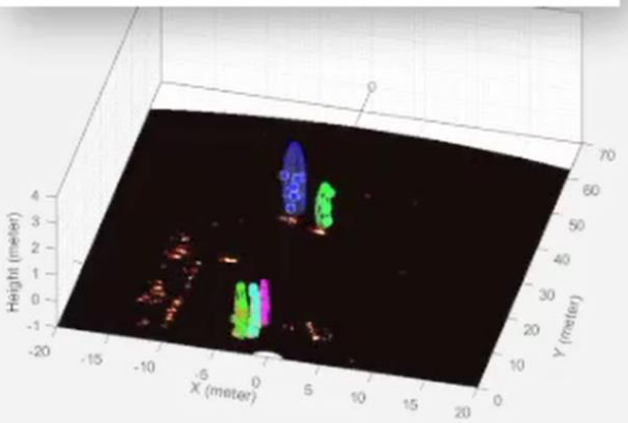


The four devices are synchronized and work as a single unit, coherently processing data from all the antennas

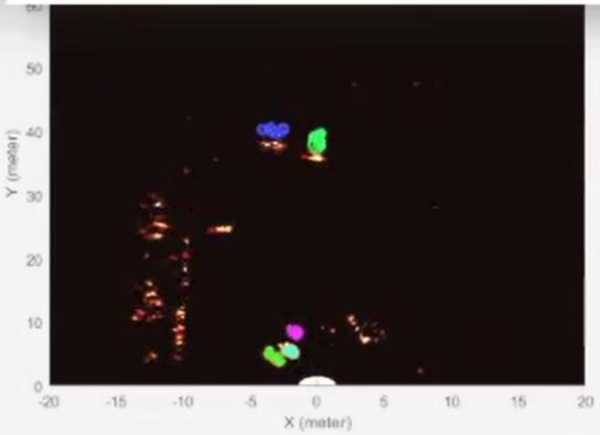


192 Virtual channels

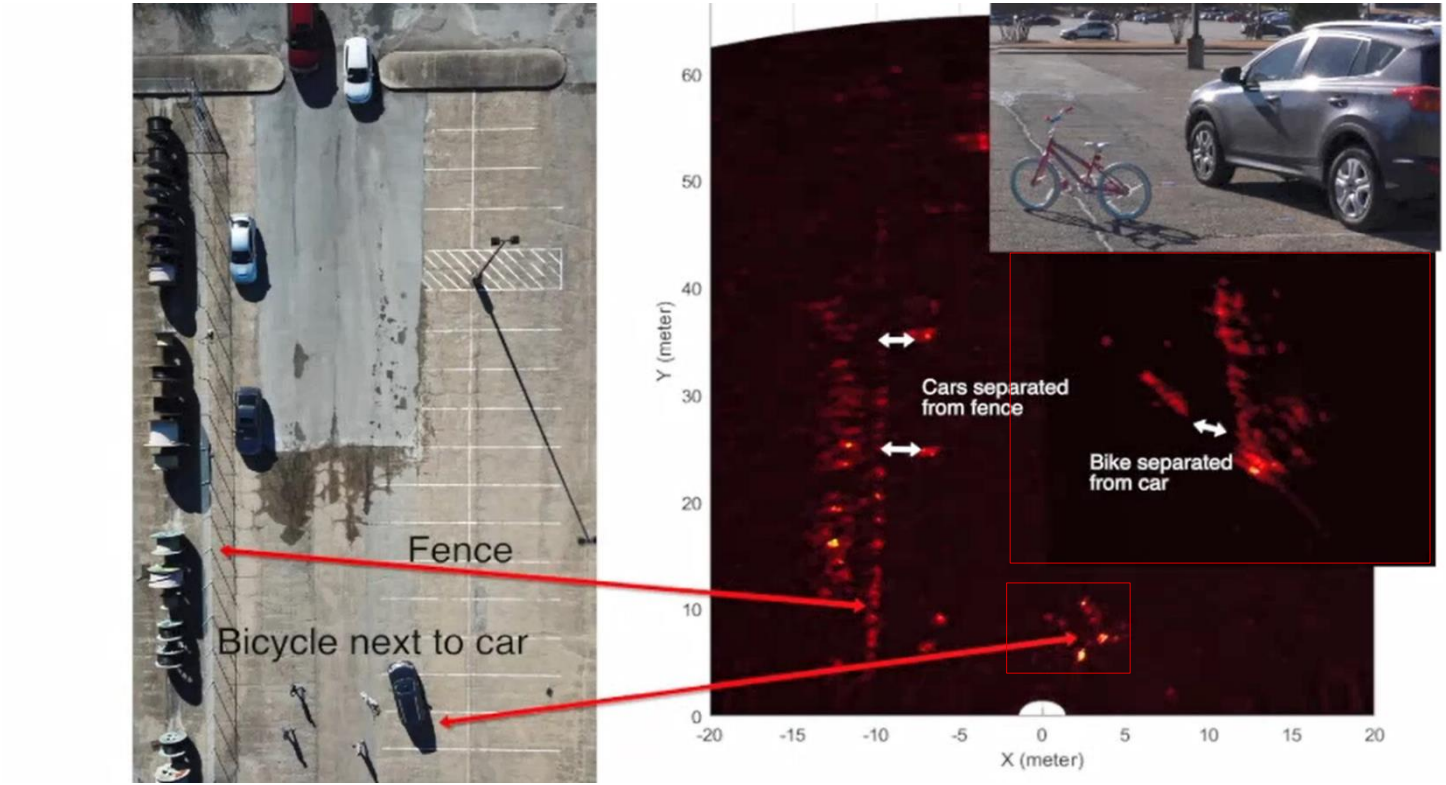
3D radar object detection



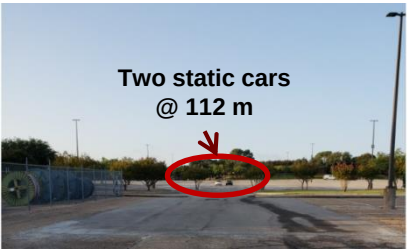
Top view of identified objects

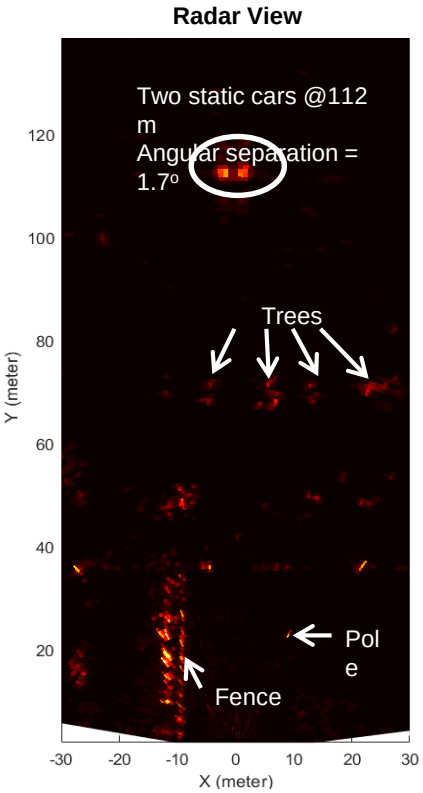


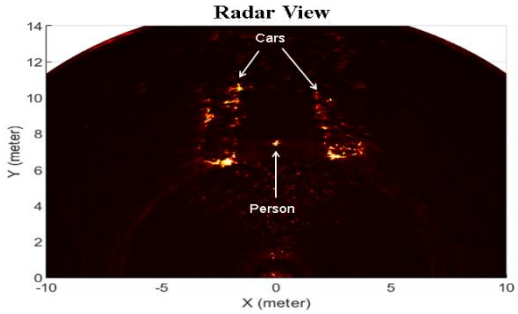
Radar Delivers Imaging –Static Scene

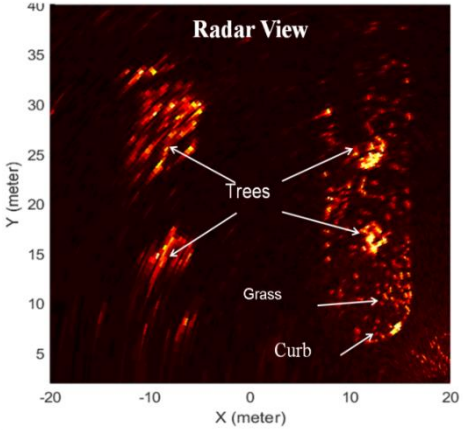


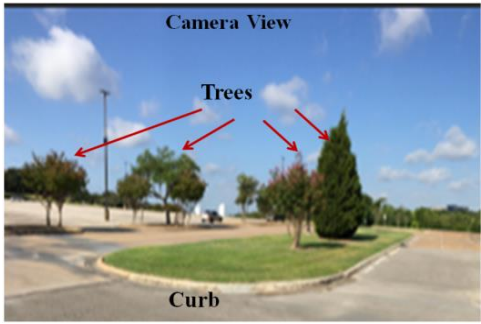
Radar Delivers Imaging











Radar for Autonomous Driving

- Radar sensors have robust performance in varying environmental conditions (such as rain, fog, dust, low light etc.) and can innately measure the depth and velocity of the objects.
- Radar sensors have proved to be indispensable for several Driver Assistance Functions (e.g. Adaptive cruise control, Blind spot warning etc.).

However, several challenges remain for taking the Radar to the next level i.e. Autonomous Driving

High Angular Resolution

Angular resolution of radar is significantly less than other sensor modalities such as cameras, lidar. A high angle resolution < 0.5 deg in both azimuth and elevation is desired

Interference mitigation and Suppression

Interference is going to be a major issue as the density of radar sensors in automotive environment increases. Interference can cause false detections and difficulty in detecting weak targets

Measuring Large Dynamic Range

Ability to detect weak reflectivity targets (e.g. Bicyclist, pedestrian etc.) in the presence of strong reflectivity targets (e.g. Trucks, sign posts)

Removing False detections due to Multi-path Reflections

Multipath reflections can result in creation of ghost objects. Need improved ways (tracker, ML, sensor fusion etc.) to identify these ghost targets

When Will My Car Drive me to Work ?

- **Affordable Full Self-Driving (L5) that would take a person from A to B anywhere in an urban environment is probably at least a decade away (if not more).**
- Self-Driving under constrained conditions (Highways, Geo-fenced Areas) i.e. L4 is arguably feasible. However, too expensive for mass-market adoption

- **Why will Full Autonomy take a long time ?**

  - **Massive Investment in infrastructure required**
    - Lane markings, Vehicle-Vehicle/Vehicle-Infrastructure communication etc.
  - **Robust Perception systems are likely to be very expensive**
    - Safe, Reliable, Robust systems coupled with the compute power are likely to be expensive and not affordable for mass-market consumer
    - Is ML the solution? How to train for random, one-off events that can be encountered in real-life scenarios
  - **Regulatory Challenges**
    - Liability in case of accidents
    - No established standards or Testing protocols
    - Safety and Security Concerns
  - **Others……**