Welcome!
Texas Instruments New Product Update

- **This webinar will be recorded and available at www.ti.com/npu**
- **Phone lines will be muted**
- **Please post questions in the chat or contact your sales person or field applications engineer**

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TI 60GHz AWR6843AOP
Incabin Sensing Solutions

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mmWave Sensors – Technology Overview, TI Advantages and Applications

What is mmWave Technology

- mmWave sensors provide **range**, **velocity** and **angle** for detected objects with high accuracy
- mmWave technology **works in challenging environmental conditions** such as darkness, extreme bright light, dust, rain, snow and extreme temperatures

Texas Instruments' mmWave Advantages

- **Single-chip, Low-power** sensing solution achieved through RFCMOS technology
- **Integrated processing** solutions remove the need for an external processor in the system
- **Scalable Portfolio –** SW re-use across Automotive & Industrial platforms, regardless of band
- **Antenna on Package** – Optimized solution simplifies design & manufacturing challenges
- **Imaging Radar –** Lidar-like performance at the right price point

mmWave Applications

Automotive

Industrial

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mmWave sensors for occupancy detection

Market Trends

- Unattended child detection
- Seat belt reminder
- Air bag deployment control
- Occupant Monitoring

Why TI radar ?

- Scalable platform to address all interior sensing needs (60 GHz and 77 GHz)
- Single chip and small form factor enables easy vehicle integration
- PPAP ready mature solution
- Faster TTM with reference design/partners

- **Active mmWave sensing** for high accuracy sensing compared to false detections prone passive sensors
- **EURO NCAP** driving sensing solution to detect newborn babies left behind – Need low cost edge sensors
- One mmWave sensor can replace multiple weight based sensors – **Cost benefit**

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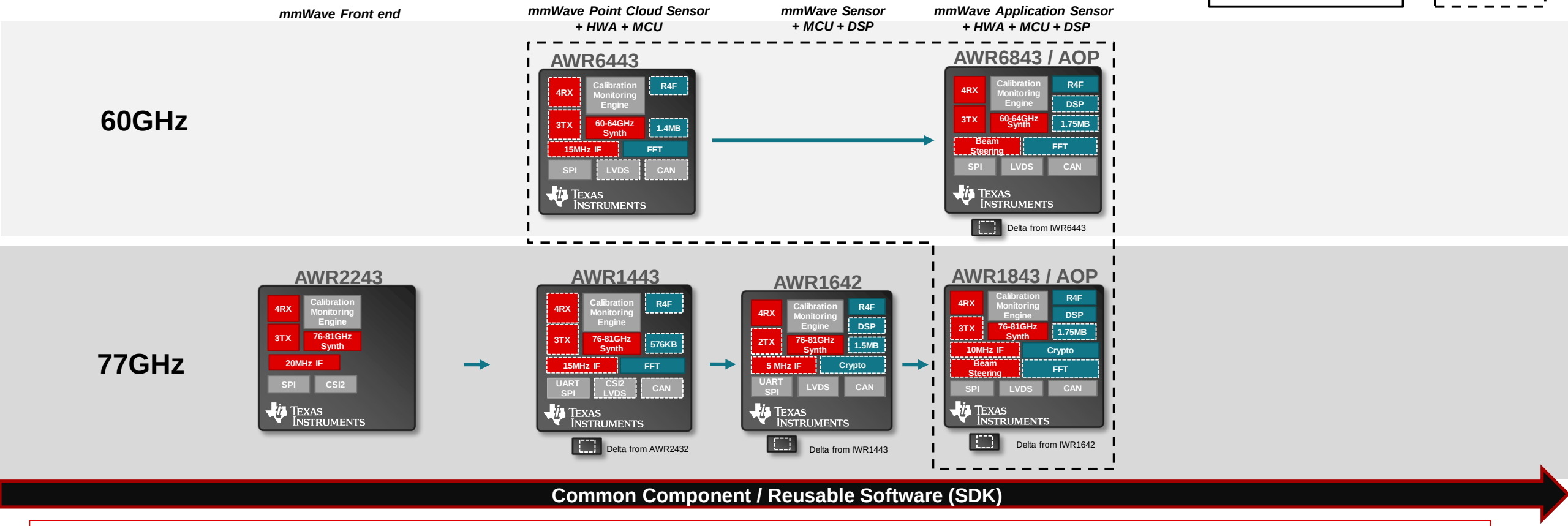
TI 60Ghz Radar – Portfolio Overview

AWR – Automotive
IWR- Industrial

Pin-to-Pin Compatible



- **Frequency regulation agnostic design :** Pin 2 Pin compatibility with 60GHz and 77GHz sensors.
- **One Software Investment:** Common software API and framework across 60GHz and 77Ghz devices make software re-usable and portable across devices.
- **Safety story:** ASIL B safety target for automotive applications

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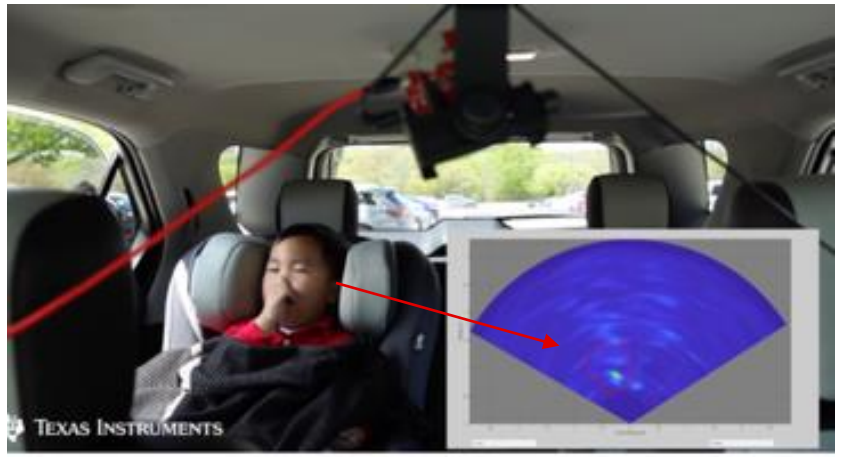
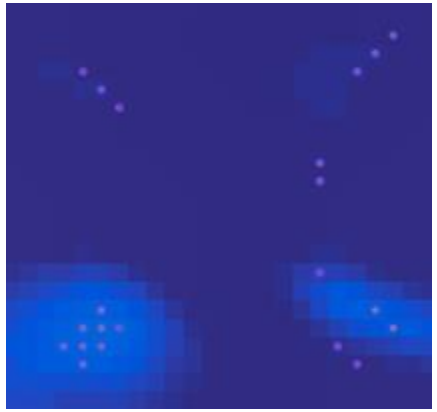
Vehicle Occupant detection



Child left behind in car detection



Multi Zone Occupant Detection

mmWave sensing

- Detects sleeping new born babies in rear facing child seats
- Detects even when covered by thick clothing
- No false alarms due to rain, shaking of car, water bottles
- Robust to heat, cold, different lighting conditions
- Detect intruders

Performance Advantages:

- Small form factor < 50mm * 50mm sensor size
- One sensor for detection of 5 occupants in 2 rows including child (Child Presence, Seat Belt reminder, Intruder alert)
- Classification of occupants
- Flexible sensor placement (roof/front)

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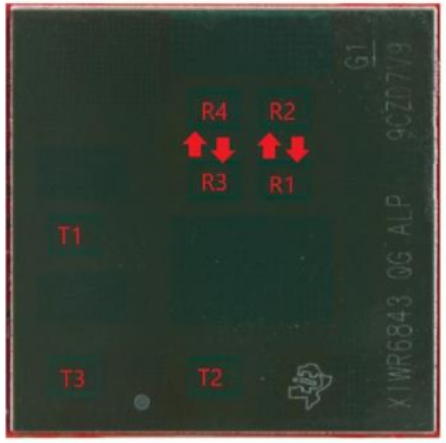
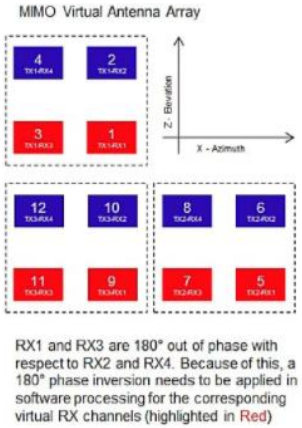
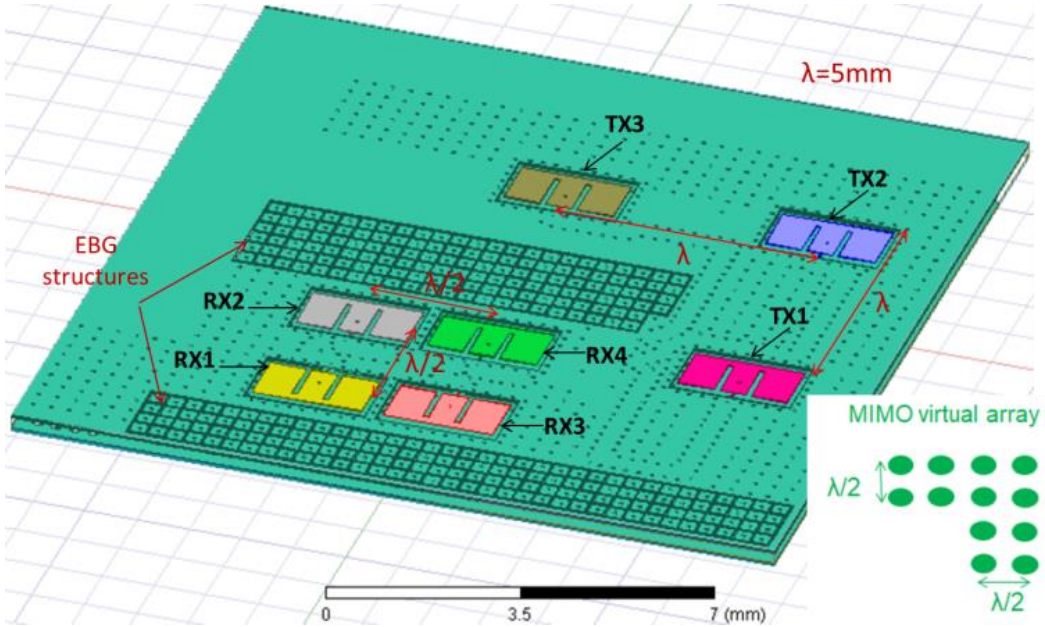
Antenna on package technology







- 15mmx15mm embedded die fcCSP package
- AWR6843 silicon die with 4 receive and 3 transmit channels

Array configuration

- RX and TX elements are arranged to enable beam forming and detection with equal angular resolution in in both Az & El directions

Angular resolution

- Azimuth: 29dZeg
- Elevation: 29deg

Angle estimation Accuracy

- Boresight: 1deg
- +/-80deg : 6deg

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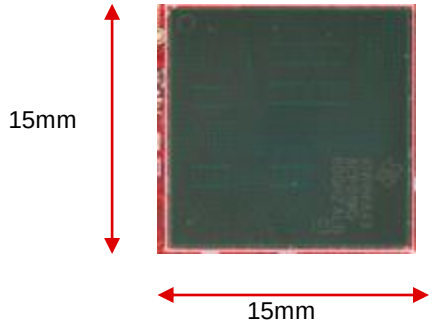
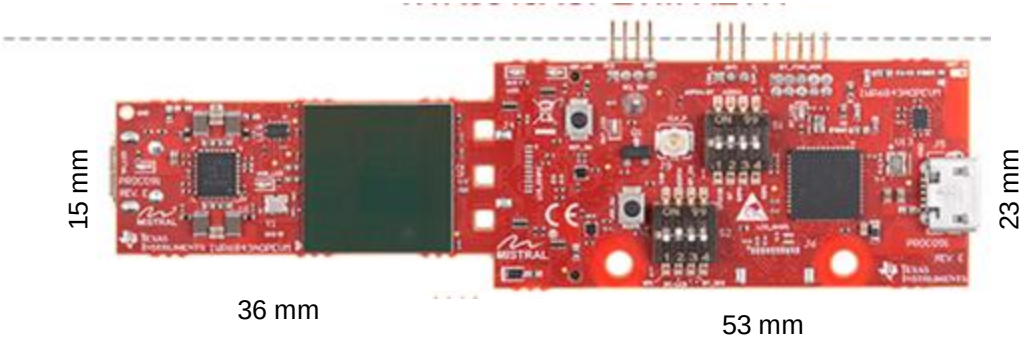
Antenna On Package Benefits

AOP Benefits

- **Small** form factor
- **Reduced complexity** for system design
  - Developers do not need RF EM expertise
  - Savings on antenna design cost and time
- **Reduced system cost**
  - Cheaper board solution (e.g. FR4)
  - Simpler board routing
  - Reduced PCB size and housing
- **Higher efficiency** (lower loss) compared to modules with similar antennas
- Sampling AWR6843AOP version now



Sensor



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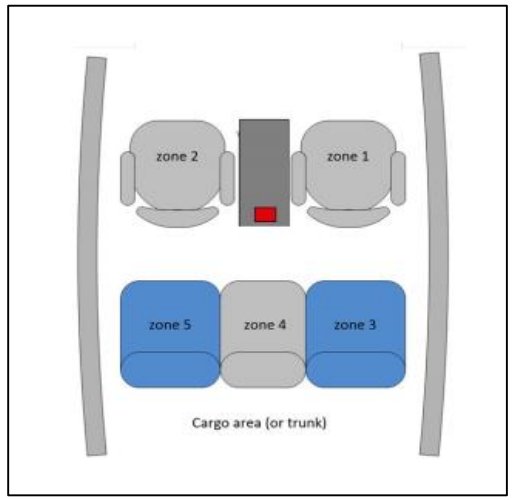
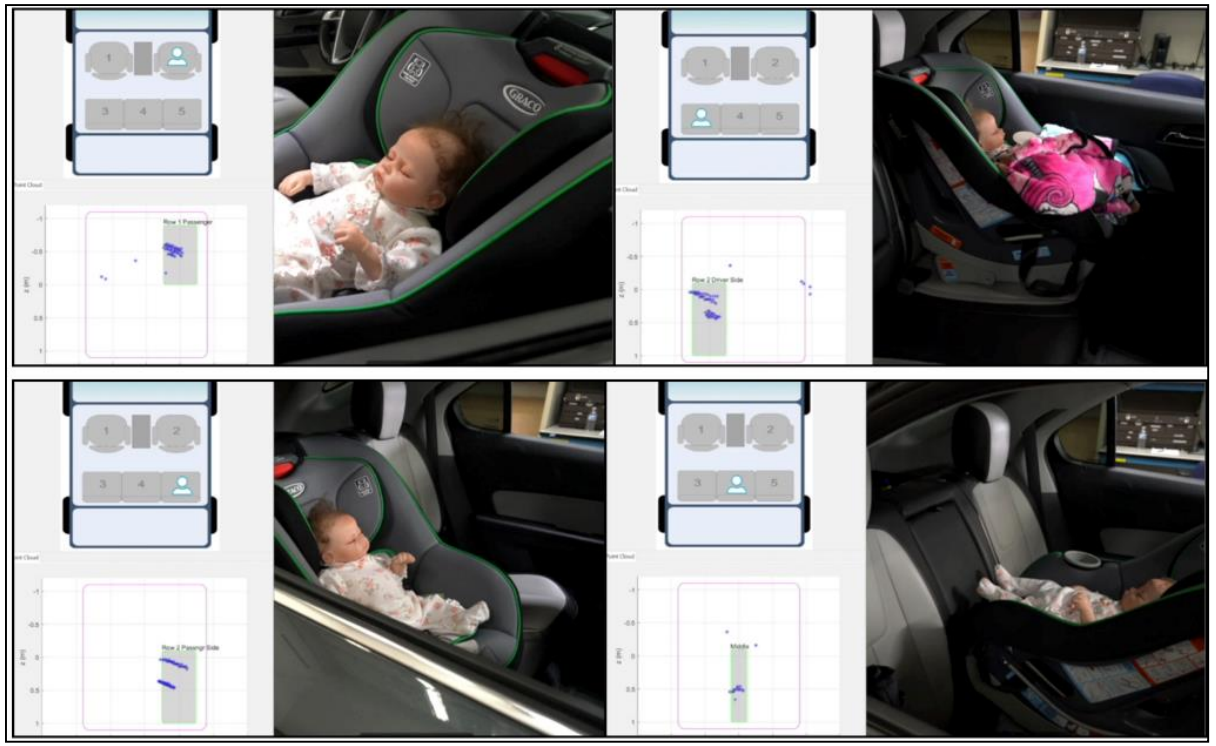
AWR6843AOP for Child presence detection tests



AWR6843AOP sensor in the over head position



Child presence detected with child in different positions – in child seat, forward/rear facing, covered by blanket

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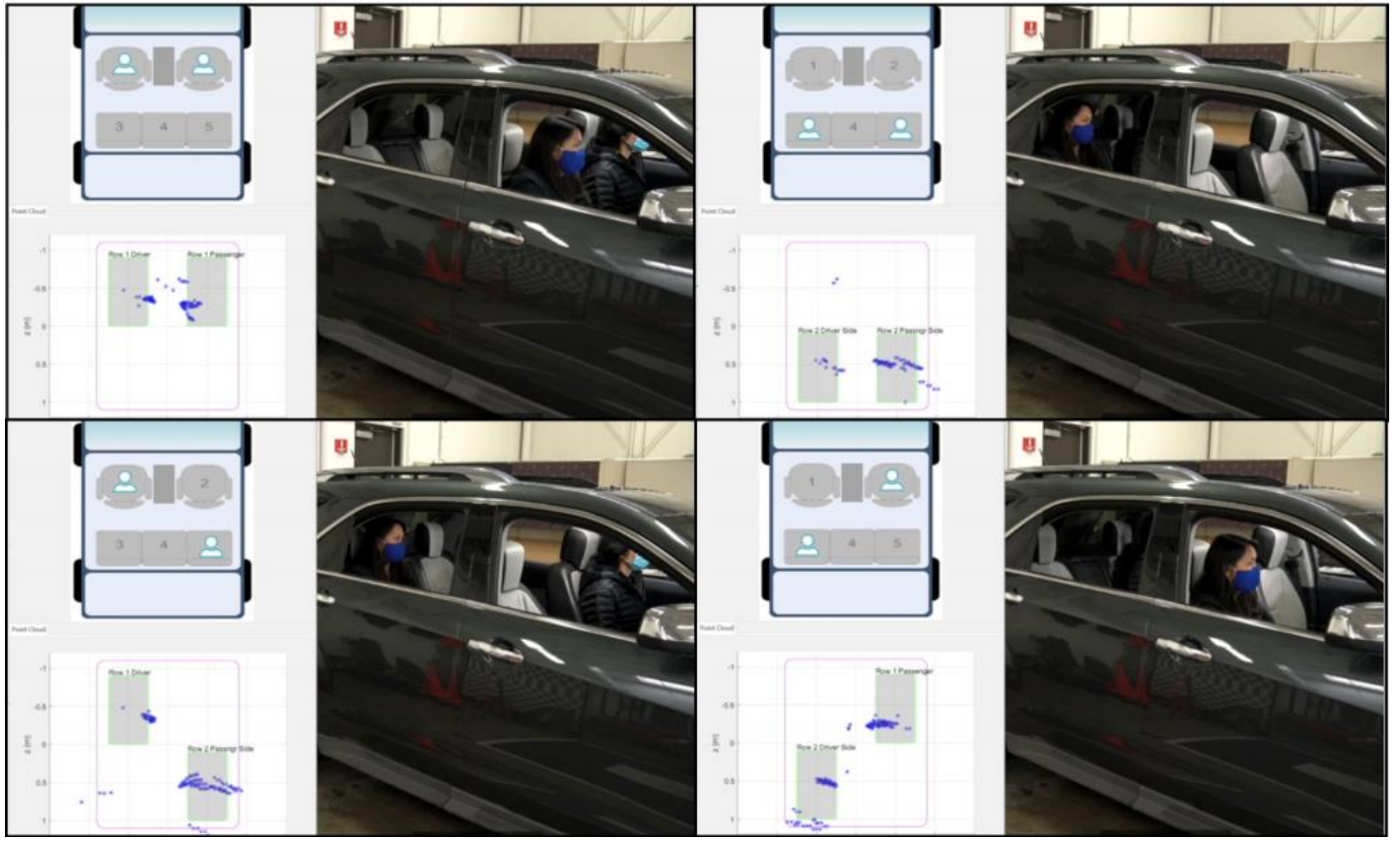
AWR6843AOP for occupant presence detection tests

AWR6843AOP sensor in the over head position



Detection of multiple occupants inside the car

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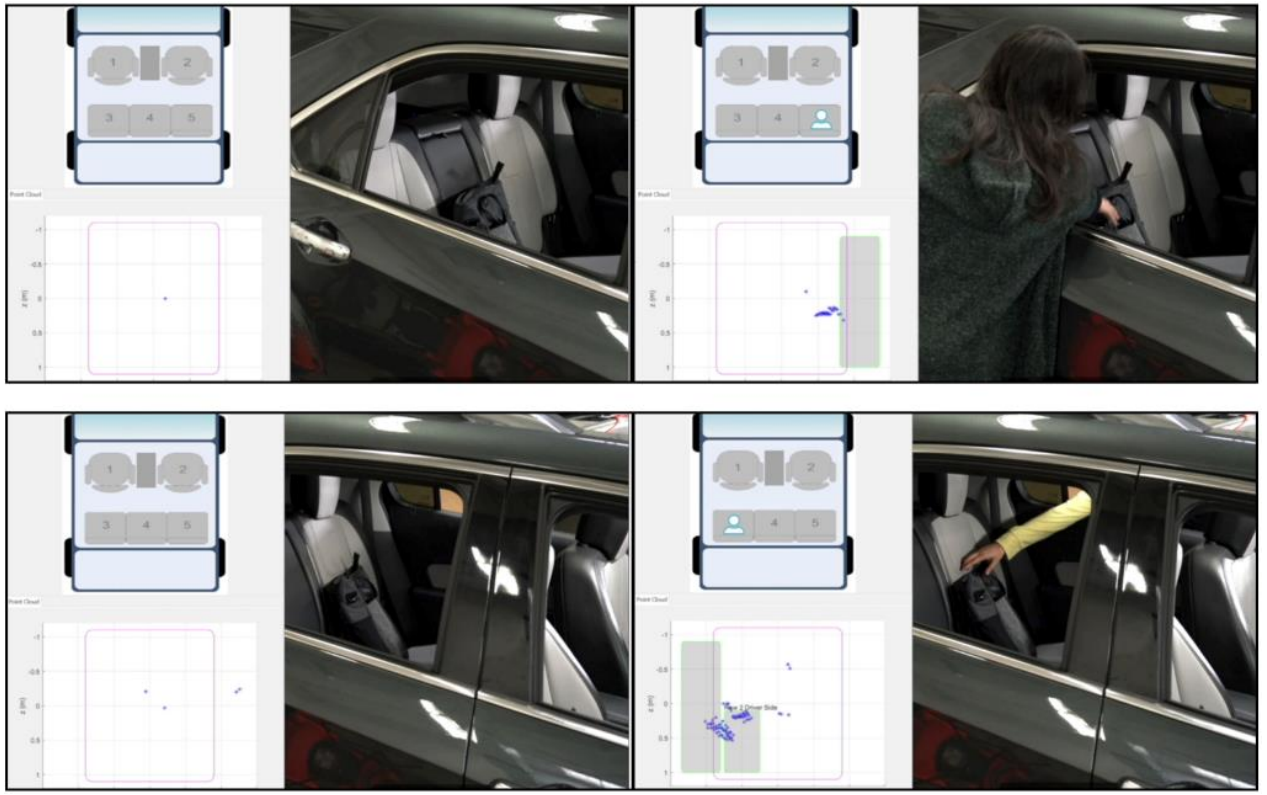
AWR6843AOP for intruder detection tests

AWR6843AOP sensor in the over head position



Detection of intruder trying to steal objects inside the car

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AWR6843AOP multimodal sensor

Intruder Detection

- Detects intruders around car
- Operates in low power mode (mW)
- Multi mode sensing

Multi-row Occupant Detection

- Detects/Localize 5 occupants in 2 rows
- Classify occupants

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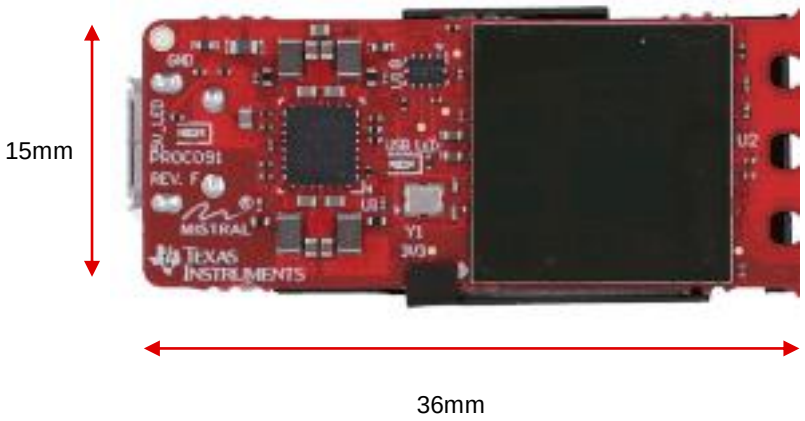
Incabin sensing 60GHz evaluation

	AWR643AOPEVM
Azimuth x Elevation FOV	120 deg x 120 deg
Azimuth/ Elevation resolution	29 deg
Sensor Position (Current SW Tested)	**Roof Mount:** Detect 4+ people in 2 rows CPD across 2 rows including footwell
Reference Software (Target C code)	LINK
Design Document (Algorithms/processing chain)	TIDEP-01023
Video	https://training.ti.com/automotive-cabin-sensing-60ghz-antenna-package-radar



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