Technical Article

Meet Euro NCAP Child Presence Detection Requirements with Low-power 60-GHz mmWave Radar Sensors

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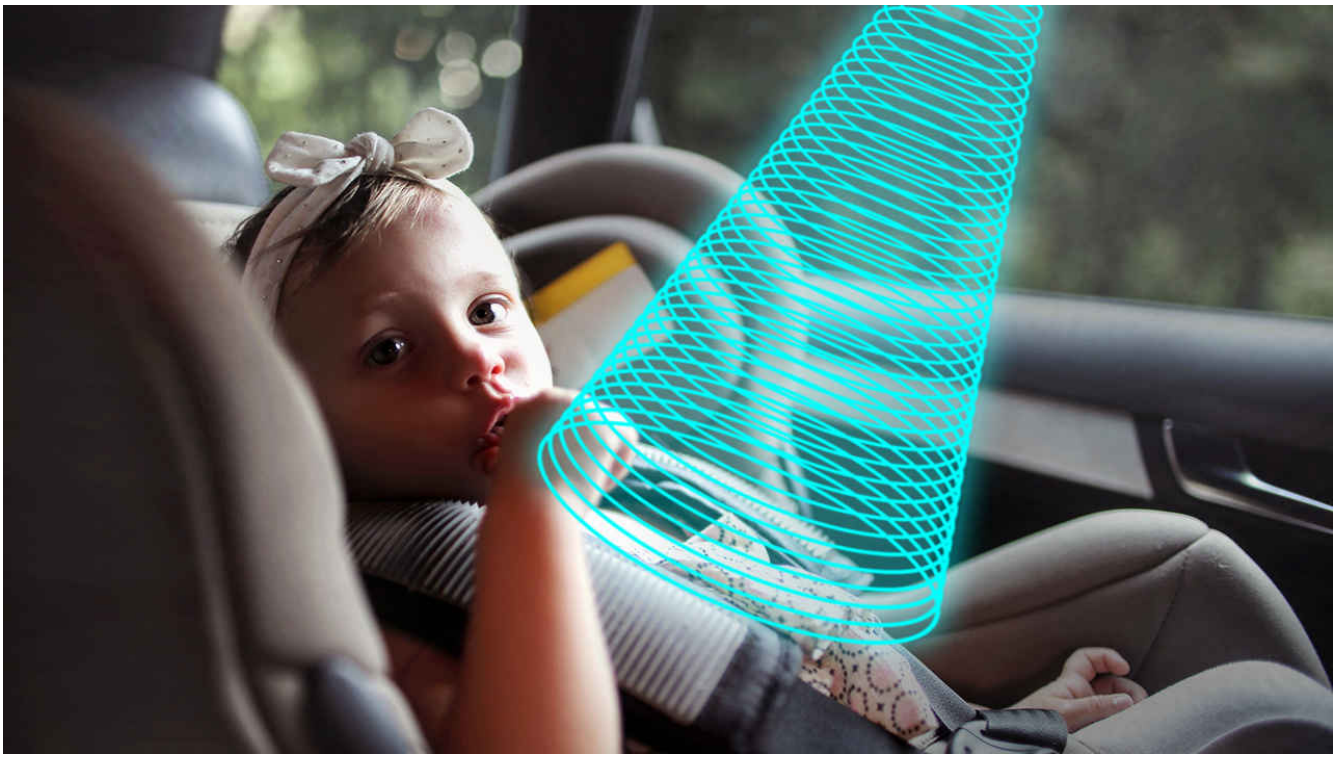


When shopping for new cars, safety-minded consumers can review New Car Assessment Program (NCAP) ratings to see how cars compare NCAP ratings vary by region, but Euro NCAP has been driving the initiative for child presence detection inside cars as part of its roadmap.

Going into 2025 and beyond, only direct sensing solutions will garner NCAP points, steering automakers away from indirect sensing alternatives – such as door-opening logic, pressure capacitive sensing and unreliable weight sensing solutions – toward approaches that use a single 60-GHz radar sensor.

60-GHz radar sensors deliver improved accuracy and are more cost-effective than solutions such as weight sensors and camera-based alternatives, which can struggle in challenging real-world lighting conditions. Sensors such as the 60-GHz AWRL6432 radar sensor can help you meet Euro NCAP design requirements by enabling in-cabin sensing that can detect a child's presence in a car, including in the footwells, and enable very low system bill-of-materials costs.

See our automotive 60-GHz radar demo video

Watch the demo video "Using 60-GHz radar sensors for automotive child presence detection and intruder alerts" to learn how low-power 60-GHz mmWave radar sensors can deliver full-cabin automotive child presence detection and intruder monitoring.

Streamlining automotive child presence detection

Many companies have tested the potential to save children who are left in cars unattended. For example, TI has performed several tests related to child presence detection inside a two-row SUV with the AWRL6432. The tests included the detection of a breathing doll, simulating a child, in a rear- or forward-facing car seat or even laying in the footwell. Just one sensor was able to detect the doll's presence across two rows of seats, including the footwell of both the first and second rows. Figure 1b shows how the radar sensor was mounted overhead.

Test results, shown in Figure 1, demonstrate the sensor's accuracy and ability to detect a breathing doll left in an SUV. You can see that the doll placed in the front footwell and in a rear-facing car seat installed in both the front passenger seat and the second row driver's side seat are all highlighted as "detected," even when the car's engine is off.

Figure 1. (a) Detection of a child (Baby Doll) in the front driver footwell, (b) front passenger seat rear-facing, and (c) 2nd row driver-side rear-facing inside SUV using the AWRL6432.

Harnessing the low-power capabilities of mmWave radar sensors

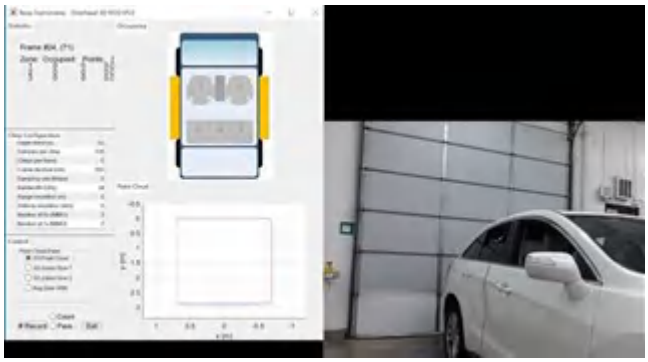
Euro NCAP requires child presence detection systems to run for a minimum of 15 minutes after the engine is turned off, ensuring that the sensor can scan, detect and alert drivers if a child was left in the vehicle or gained unattended access to the cabin.

Most radar sensors typically consume an average of hundreds of milliwatts, some as high as 4 W. Newer 60-GHz millimeter wave (mmWave) sensors with low-power architectures such as the AWRL6432 only consume an average of <10 mW over a 500-ms frame period. Minimizing chirp time and processing time can lead to average power-optimized consumption as low as 2 mW, which helps automakers in two ways:

1. Enabling highly accurate child presence detection without performance trade-offs to save power on multiple trips.
2. Also facilitating intrusion detection with the same sensor, protecting vehicles until the consumer's next trip.

For intrusion detection capabilities, radar sensor must be able to continuously run, monitor and accurately detect an intruder inside the vehicle for extended periods of time.

Figure 2 shows that the AWRL6432 sensor is capable of proximity sensing, detecting a person close to the car 1 m out. This is important for false flags if, for example, someone was standing close to a car in a grocery store parking lot loading their own groceries into their car. If a person were to actually break into the car, breaking the proximity zone by sticking their hand through a window, for example, the sensor would then alert owners that there is an intruder.



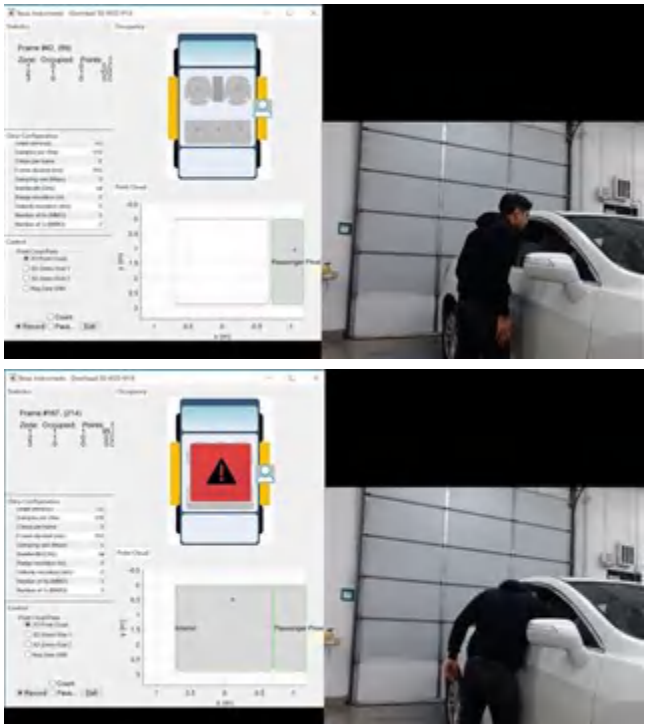


Figure 2. Intrusion detection simulation using the AWRL6432 (a) No living presence near car, (b) Person standing near the car, (c) Person reaching into car, Sensor detecting an arm reaching through a car window.

Conclusion

Low-power 60-GHz radar devices such as the AWRL6432 enable automakers to support child presence detection and intrusion detection while also helping meet developing NCAP requirements. The AWRL6432 sensor's low-power capability makes it a good fit for electric vehicles, which have strict power budgets. Implementing these capabilities with a single chip saves space and cost, helping automakers incorporate these important safety features even on low-end models.

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