Radar-based driver assistance systems

Mid-range radar sensor

BOSCH
Invented for life

PRODUCT BENEFITS

- Digital beam forming (DBF) for flexible antenna use and high accuracy throughout the angular range
- Independent mode for height measurement using an elevation antenna, enabling the system to reliably classify objects and brake safely, even when the object is stationary
- Cost-effective and robust sensor design for all vehicle segments; can be concealed behind the bumper
- Self-calibration function reduces fitting costs
- Small size for easy integration into the vehicle
- Sensor data fusion in MRR possible without additional hardware (optional)

1 Mid-range radar sensor for front applications (MRR front)
2 Mid-range radar sensor for rear applications (MRR rear)

best cost/performance ratio

with single sensor solution – to fulfill EU-NCAP automatic emergency braking (AEB) functions such as AEB-pedestrian, AEB-City and AEB-Interurban.

scalable and robust sensor

design enables a wide range of safety and driver assistance functions.

TASK

The radar sensor's main task is to detect objects and measure their speed and position relative to the movement of the vehicle in which it is fitted. The mid-range radar sensor (MRR) allows vehicle manufacturers to implement a range of comfort and safety functions in their vehicles. The sensor forms the basis to fulfill the ever-increasing safety standards set by legislators and consumer protection organizations, e. g. requirements for NCAP (New Car Assessment Program) with automatic emergency braking systems are high on the list of priorities.

FUNCTION

The MRR uses the frequency band of 76–77 GHz, which is universally accepted for radar applications in the automotive sector. Thanks to its triple carrier frequency, a 77 GHz sensor requires only a third of the antenna surface of an existing 24 GHz model in order to cover the same field of view at the same resolution. The triple frequency also supports the system when measuring speed, producing results that are three times more accurate than measurements from a 24-GHz version.

The MRR is a bi-static multimodal radar with four independent receive channels and digital beam forming (DBF). These technologies allow the MRR to be configured with independent antennae for different directions. This improves the angular measurement accuracy and means that the radar's field of view can be adjusted depending on the situation.

By focusing the main antenna on a narrow main lobe the system is capable of reacting to vehicles in front at long range (up to 160 meters) and performing exceptionally well at higher speeds while also minimizing interference from vehicles in adjacent lanes. Thanks to the elevation antenna, the system achieves a wide opening angle at close range – so a pedestrian stepping out into the road from behind a parked car, is detected at an early stage.

An independent mode for height measurement using an elevation antenna, enables the system to reliably classify objects and brake safely, even when the object is stationary.

Bosch is developing front and rear versions of the MRR. The MRR rear monitors the area around the rear of the vehicle, reliably detecting vehicles in the driver's blind spot as well as traffic approaching from behind.

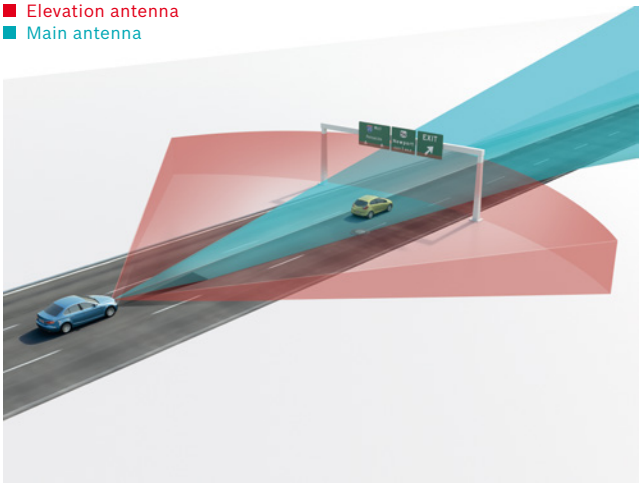
EXEMPLARY SAFETY AND ASSISTANCE FUNCTIONS

- Predictive emergency braking system
- Adaptive cruise control
- Lane change assist
- Rear cross traffic alert
- Integrated cruise assist
- Left turn assist
- Evasive steering support
- Highway assist
- Blind spot detection

TECHNICAL CHARACTERISTICS

	MRR front	MRR rear
Frequency range	76 ... 77 GHz	76 ... 77 GHz
Detection range	0.36 ... 160 m	0.36 ... 80 m
Field of view (horizontal) Main antenna Elevation antenna	 ±6° (160 m) ±9° (100 m) ±10° (60 m) ±25° (36 m) ±42° (12 m)	 ±5° (70 m, main beam direction) ±75° (close range)
Measuring accuracy Distance Speed Angle	 0.12 m 0.11 m/s ±0.3°	 0.12 m 0.14 m/s ±0.8°
Object separation capability Distance Speed Angle	 0.72 m 0.66 m/s 7°	 0.72 m 1.4 m/s 7°
Cycle time	~ 60 ms	~ 60 ms
Modulation	Frequency modulation (FMCW)	
Dimensions (W × H × D) in mm	70 × 60 × 30 (without connectors) 70 × 82 × 30 (with connectors)	
Weight	~ 190 g	~ 190 g
Interfaces	High-speed CAN + FlexRay	High-speed CAN + FlexRay
Radome heating	Available	Not available

Elevation antenna
Main antenna



Robert Bosch GmbH | PO 106050 | 70049 Stuttgart | Germany | **www.bosch-mobility-solutions.com**