

Sensor Blocking Method

Assisted Driving

Technical Bulletin AD 001

Implementation 1st January 2026

PREFACE

DISCLAIMER: Euro NCAP has taken all reasonable care to ensure that the information published in this protocol is accurate and reflects the technical decisions taken by the organisation. In the unlikely event that this protocol contains a typographical error or any other inaccuracy, Euro NCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

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INTRODUCTION

In real world driving it is anticipated that the sensors involved with the Driver Assistance System (Radar, LiDAR, or camera) may either deteriorate by age or damage or become blocked in adverse weather conditions. Having a blocked or deteriorated sensor may reduce the competency of the system. It is important that the system does not operate with reduced competency and that the driver is aware of the reason that the system becomes unavailable. It is believed that all current systems will see some reduction in competency when a sensor fails, but there may be redundancy built into the system or multi-function sensors used to mitigate the effects to the performance of the system if a single sensor fails.

Due to the complexity of modern radar technology a suitable material specification is required for consistent and repeatable testing across multiple Euro NCAP testing laboratories. This Technical Bulletin outlines the specification of the material that shall be used to block the forward facing radar and forward facing camera, in addition to outlining parameters in which the blocking material shall be applied to the sensors which will simulate a blocked sensor whilst the vehicle is in motion. The material and application methods were verified as acceptable through a Euro NCAP workshop hosting multiple Vehicle Manufactures and Tier 1 Suppliers.

1 RADAR COVERAGE

1.1 Material Specifications

The material to be used for blocking the forward facing radar has the correct attributes required to ensure the effect of a physically fully blocked radar therefore, reducing the system competency which shall initiate a warning to the driver of a blocked sensor. A common blocking material is needed to ensure consistent and repeatable testing across multiple Euro NCAP laboratories.

This radar blocking material is to be used only for the forward facing radar.

1.1.1 Material Properties

The blocking material to be used shall be a broadband Radar Absorbing Material (RAM), two way damping within 77-81Ghz automotive frequency range at approximately 50dB. The required material to be used is the RAM found within the rear and side skirts of the Global Vehicle Target as specified in TB025. Item number 10 in Figure 1



Figure 1 Global Vehicle Target areas

1.1.2 Material dimensions

The required blocking material used shall be the following dimensions:

- The width shall be 200mm \pm 10mm
- The length shall be 200mm \pm 10mm
- The height shall be 10mm \pm 1mm*

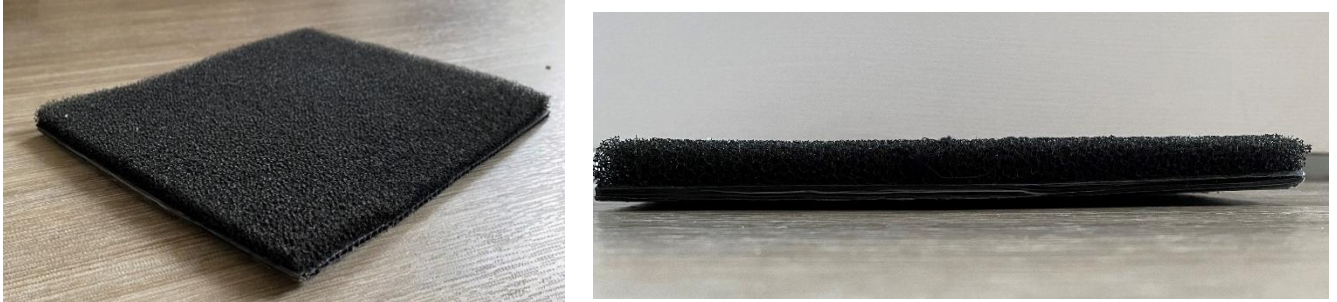


Figure 2 Example images of GVT foam material

**If a stationary GVT is detected by the VUT with a blocked radar then it is permissible to use a double layered material, 20mm \pm 1mm.*

1.2 Application Method

The application method of the blocking material shall result in full physical blockage of the front radar. The method shall ensure that the sensor is fully blocked in a consistent way throughout the time in which is require as per the Assisted Driving - Highway Assist Systems v1.1 protocol such that the systems blockage detection algorithm does not reset.

The blocking material shall be applied with the following criteria:

- It shall be close conforming to external vehicle surface in front of sensor, acknowledging challenge of corner sensors and non-planar coverage. (e.g., if the sensor is placed behind the front bumper the material shall be placed close conforming to the section of the bumper directly in front of the radar placement.)
- There shall be minimal vibration of the blocking material whilst it is applied to the vehicle surface.
- For tests within the Assisted Driving protocol which requiring the sensor to go from an unlocked to a blocked state, sections 4.1.2.2 and 4.1.2.3. The material shall be applied to block the sensor so that it goes from a fully unblocked to a fully blocked physical condition within two seconds.

2 CAMERA COVERAGE

2.1 Material Specifications

For blocking a camera sensor mounted behind the front windscreen, a solid single piece of opaque dark material is to be applied to the outside of windscreen.

2.2 Application method

2.2.1 Full Camera Blockage

The application method of the blocking material shall result in full physically blockage of the front camera. The camera shall be blocked using a solid material piece e.g., plastic, which fully covers the camera view.

The method shall ensure that the sensor is fully blocked in a consistent way throughout the time in which is require as per the Assisted Driving - Highway Assist Systems v1.1 protocol such that the systems blockage detection algorithm does not reset.

2.2.2 Partial Camera Blockage

Systems which use a single camera shall have 50% (-0/+5%) of its effective view covered. For Systems which use a stereo camera, one of the lenses will be fully blocked.

For sensor location/design for which the field of view cannot easily be determined, the Vehicle Manufacturer may advise the test laboratory on the positioning of the blocking material.

For both full and partial blocking the material shall block the camera view when fixed to the windscreen in front of the camera and shall be applied with the following criteria:

- It shall be close conforming to external vehicle surface in front of sensor.
- There shall be minimal vibration of the blocking material whilst it is applied to the vehicle surface.
- For tests within the Assisted Driving protocol which requiring the sensor to go from an unlocked to a blocked or partially blocked state, sections 4.1.2.2 and 4.1.2.3. The material shall be applied to block the sensor so that it goes from a fully unblocked to a fully or partially blocked physical condition within two seconds.

Whilst it is common for the lateral support of the Assisted Driving system to be control by a camera mounted within the windscreen, if an alternative method is use by the OEM this shall informed to Euro NCAP.

ANNEX 1: RCS MEASUREMENT OF BLOCKED RADAR

The RCS value was measured using a Continental ARS5408 radar. Two measurements were taken: one with a clear view, and a second with the RAM material in front of the sensor.

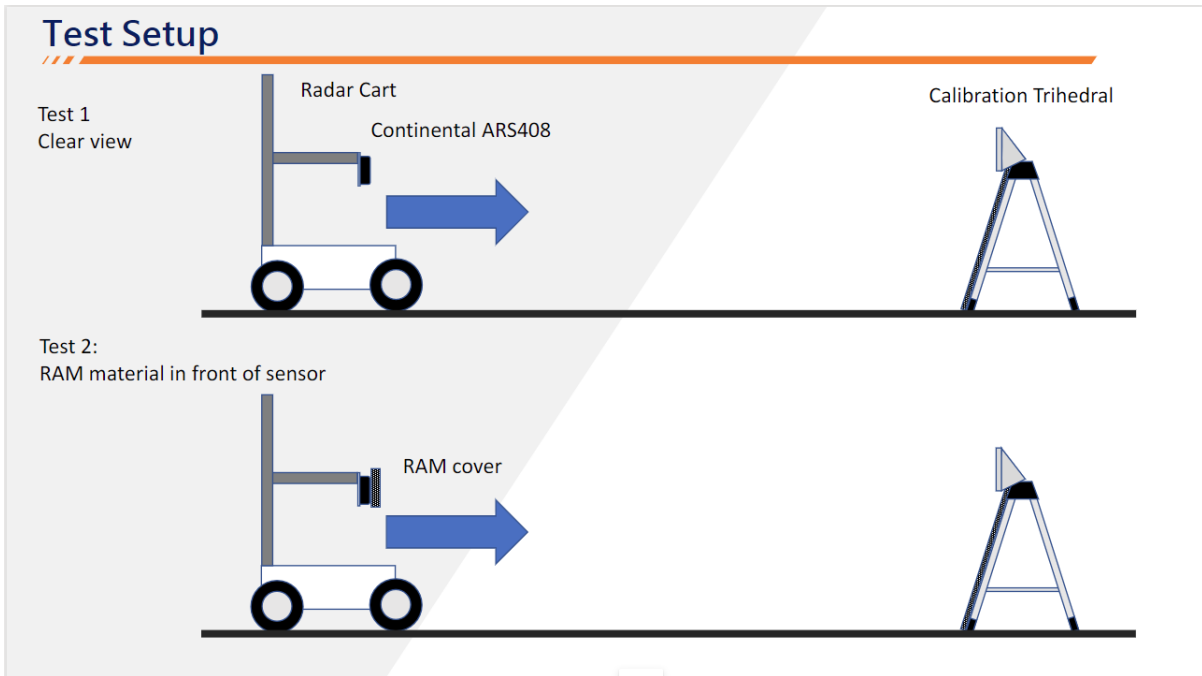


Figure 3 RCS Measurement Test Setup

Figure 4 shows the RCS measurements of both test setups, showing a 50dBm^2 decrease with the sensor blocked by the RAM material.

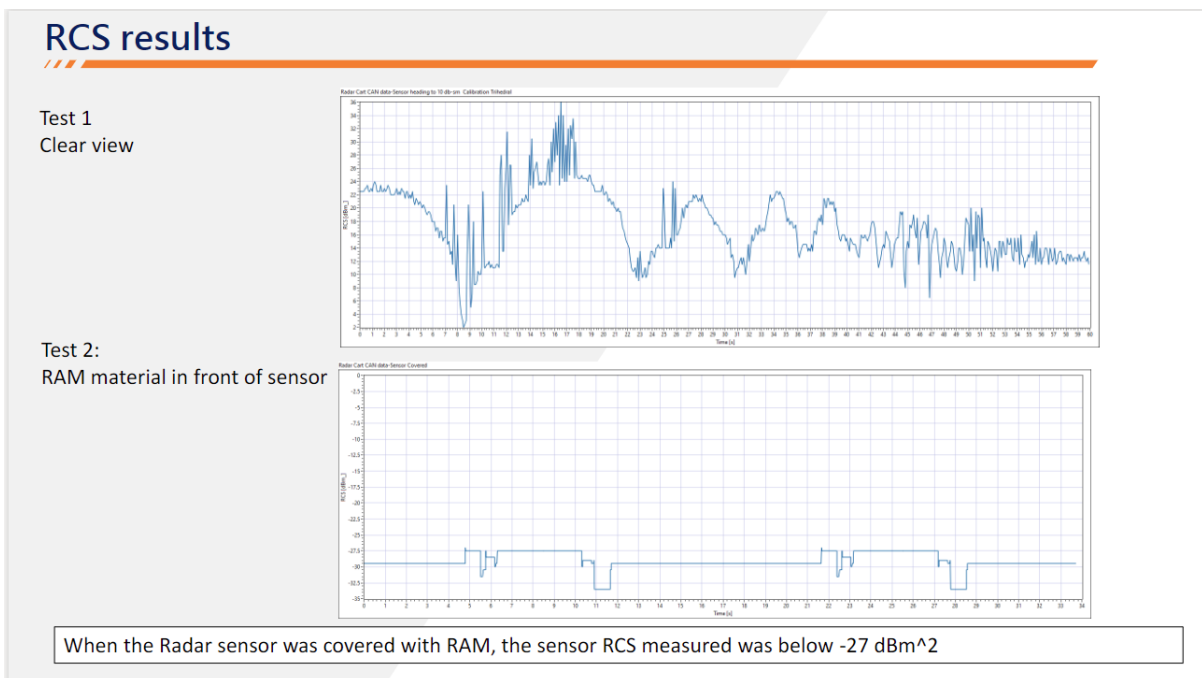


Figure 4 RCS Results of Clear View and Blocked

ANNEX 2: EXAMPLES OF EURO NCAP TEST LAB BLOCKING DEVICES



Figure 5 Thatcham Research Manual Blocking Method



Figure 6 UTAC Electronic Servo Blocking Method



Figure 7 IDIADA Electronic Servo Blocking Method