



Application Note

Application Note #4

Raditeq Setup Calibration following the ISO11451-2



Calibration following the ISO11451-2

Raditeq Calibration Setup

The ISO11451-2 is the internationally recognized ‘basic’ standard developed to address the testing of electronic components or systems’ immunity against radiated electromagnetic disturbances. Specifically, the immunity of passenger cars and commercial vehicles to electrical disturbances caused by off-vehicle radiation sources.

This standard encompasses vehicles with diverse propulsion systems, such as spark ignition engines, diesel engines, and electric motors, and focuses on assessing electromagnetic disturbances within the narrowband electromagnetic field range.

As defined in this standard, the calibration setup for radiated susceptibility (immunity) can be performed using one single reference probe or using four reference probes, where tests are performed in an anechoic chamber (Absorber-Lined Shielded Enclosure – ALSE). The aim of using this ALSE is to create an indoor EMC test facility that simulates an open field test environment.

This application note shows how to configure and perform the calibration using a single reference probe and four probes in one setup, using Raditeq test & measurement equipment and automation software.

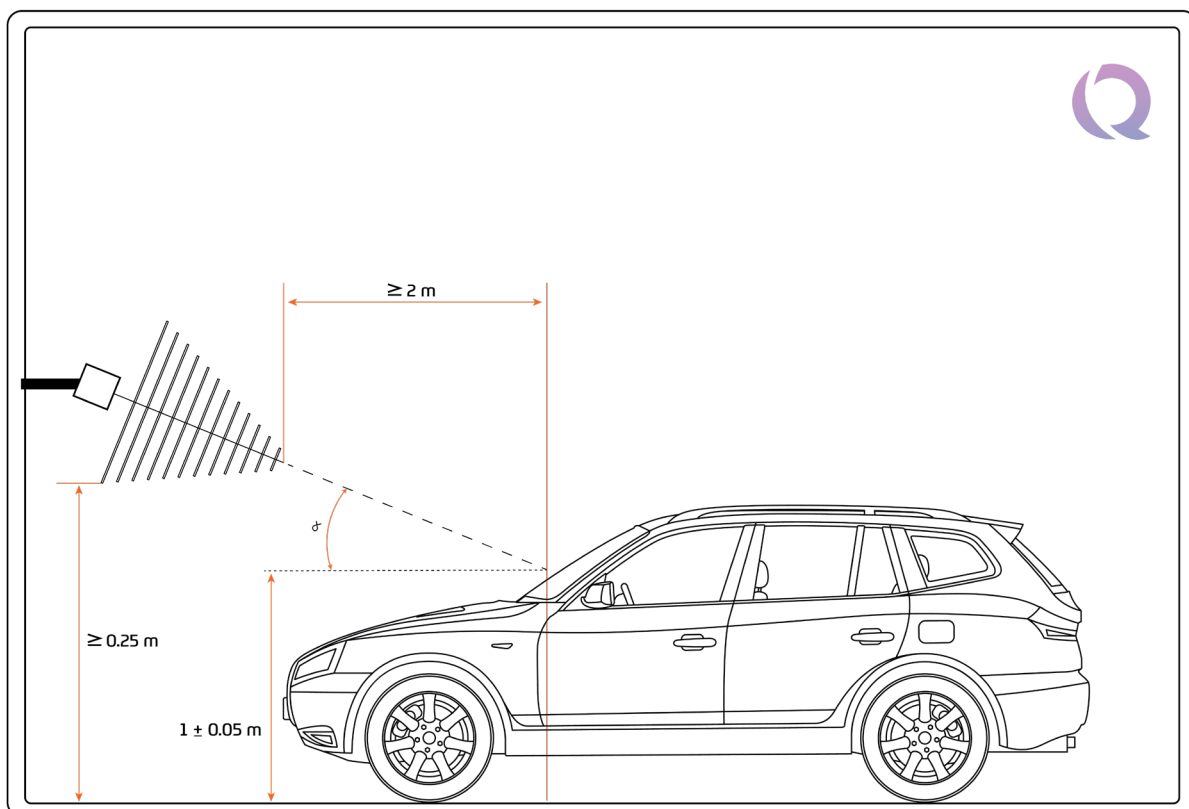


Figure 1. Typical setup for ALSE with vehicle under test | Side view



Test requirements

As defined in the ISO11451-2 standard, testing should be performed using radiated electromagnetic field generating devices covering the specified frequency range from 10 kHz to 18 GHz. The generated electromagnetic field should be measured using isotropic E-field probes, that shall be electrically small in relation to the wavelength of the signal and should communicate using a fibre optic link. Annex A - paragraph A.2 of the ISO11451-2 basic standard provides classification of field strength test levels varying from 20 V/m up to 100 V/m depending on the frequency range. Typically, the Automotive OEM standards, specify test levels of up to 200 V/m and 300-600 V/m for specific frequency ranges (Radar Pulse).

Field Calibration

The ISO11451-2 standard defines, that the field calibration shall be performed without a vehicle in the test location (ALSE). During calibration, a specific test level (field) shall be generated periodically by recording the forward power required to produce a specific field strength (measured by the field probe) for each test frequency. The calibration shall be performed using a signal generator which provides an unmodulated (CW) signal. The total field strength must be calibrated for both horizontal and vertical polarized fields.

Reference point and reference line

The standard defines three basic frequency ranges:

- Low frequency 10 kHz to 20 or 30 MHz (*)
- Mid frequency 20 or 30 MHz (*) to 2 GHz
- High frequency 2 GHz to 18 GHz

(*) The 20 / 30 MHz breakpoint depends on the field generating device in the ALSE. Typically, this can be Transmission Line System (TLS) or an antenna. For the low- and high frequency range, the standard defines that a single field probe (reference point) shall be used. The reference point is the exact position (location point) at which the field strength shall be measured. The reference point height position of the field probe is specified at 1 meter \pm 5 cm above the ALSE floor for vehicles with roof height \leq 3 meter. For vehicles with a roof height of \geq 3 meter the reference point height is 1,8 meter \pm 5

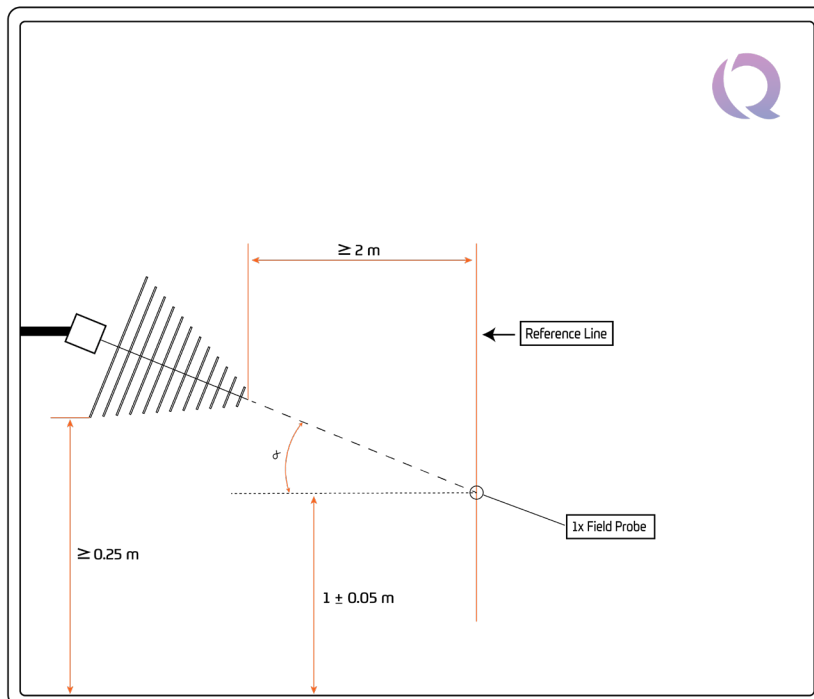


Figure 2: Single probe position calibration setup



For the mid frequency range, the standard defines a four (4) field probe calibration method, where the mean value (average) of the four field probe values shall be used as the calibration value. The four field probes should be positioned in a vertical reference line over which the field strength shall be established.

The reference point height positions of the four (4) field probes are specified at 0,5-meter, 0,8-meter, 1-meter, and 1,2-meter above the ALSE floor for vehicles with roof height ≤ 3 meter. For vehicles with a roof height of ≥ 3 meter the reference point heights are specified at 1,2-meter, 1,5-meter, 1,8-meter, and 2,1-meter.

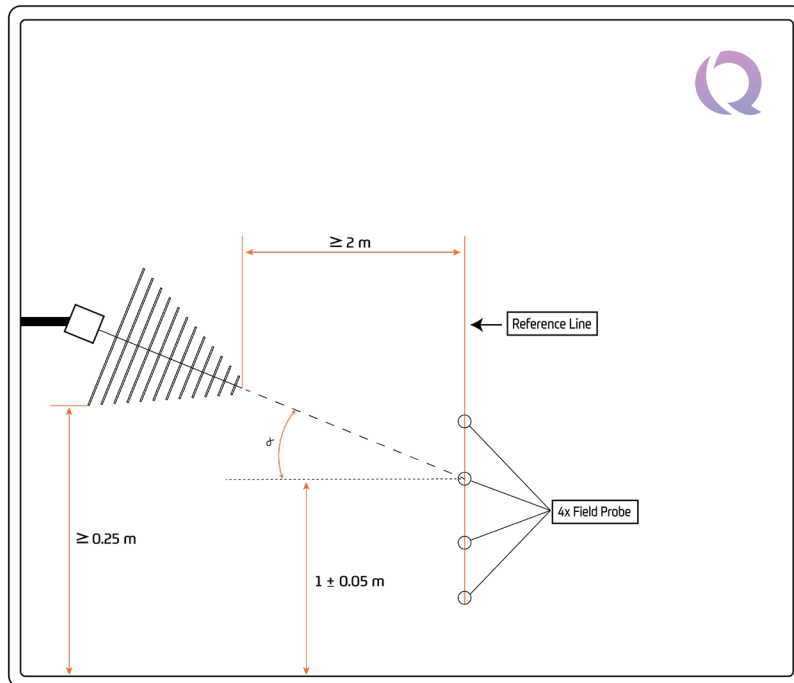


Figure 3: Four probe positions calibration setup



Raditeq solution

The 'Automotive Calibration Bundle' provides the ideal solution for field calibration in accordance to the ISO11451-2 standard and consists of the following Raditeq products:

- CTR1009B RadiCentre 7-slot modular test system, USB/LAN
- 4xRSS2010I RadiSense laser powered E-field probe with 2.5m fixed fibre, FC-ST
- 4xLPS2001B Laser power plug-in card for RadiCentre
- 4xCBL2001-10M Fibre optic extension cable, FC-ST connectors - 10 meter
- 4x CPL2001A Fibre optic coupling connectors, FC - ST
- 1x PST1004A Non-reflective probe stand, 2.3m height with 4x probe mount holders

Optionally, the Automotive Calibration Bundle can be extended with a RadiMation Pro RMP3002A license that allows automated calibration and radiated immunity testing and report generation.

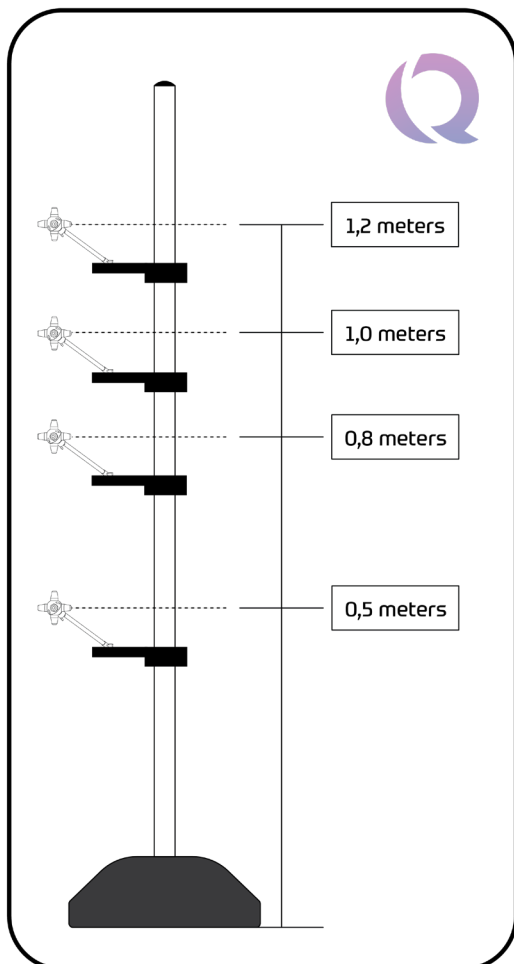


Figure 4: Four RadiSense® probes calibration setup



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