



raditeq

RadiSense



Agenda

- Latest developments
- Measurement errors
- Multi-probe testing





Latest developments

Reseller meeting (EMV 2024)

By: Koen Pepping

Product specialist RadiSense



RadiSense developments

- Factory adjustment facility
- RadiSense18 Ultra
- RadiSense10M

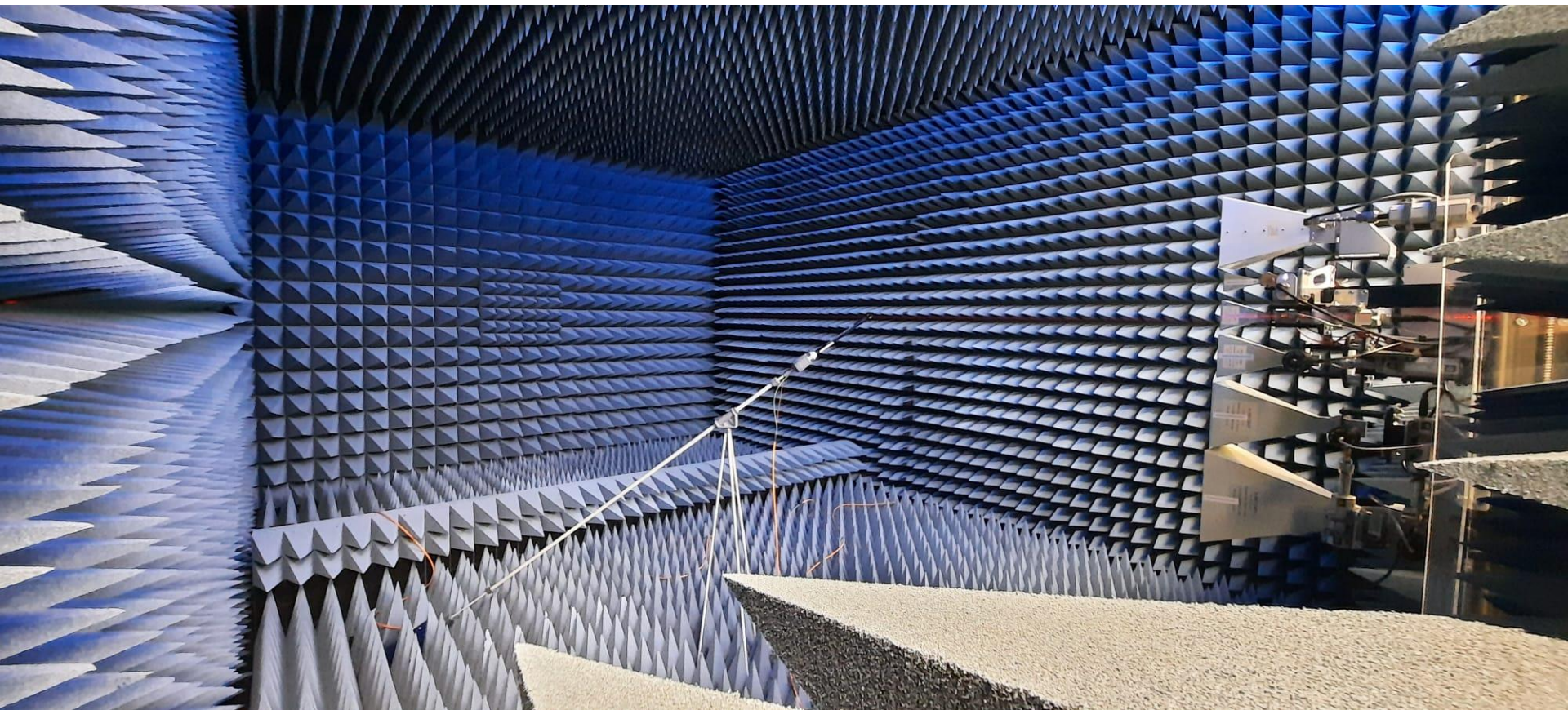




Factory adjustment facility

- Production quality improvement
 - Full range adjustment in-house
 - Full range verification in-house
 - Independent verification
- RadiSense R&D
 - Research capability's
 - Faster development







RadiSense18U

- Ultra high-speed
 - 6 Msps
 - 2 Msps X, Y, Z
- Stand-alone operation
 - (no post-processing by PC required)





RSS2010M

- Application
 - MIL-STD-461G (Military)
- Hardware filtering





MIL-STD-461G

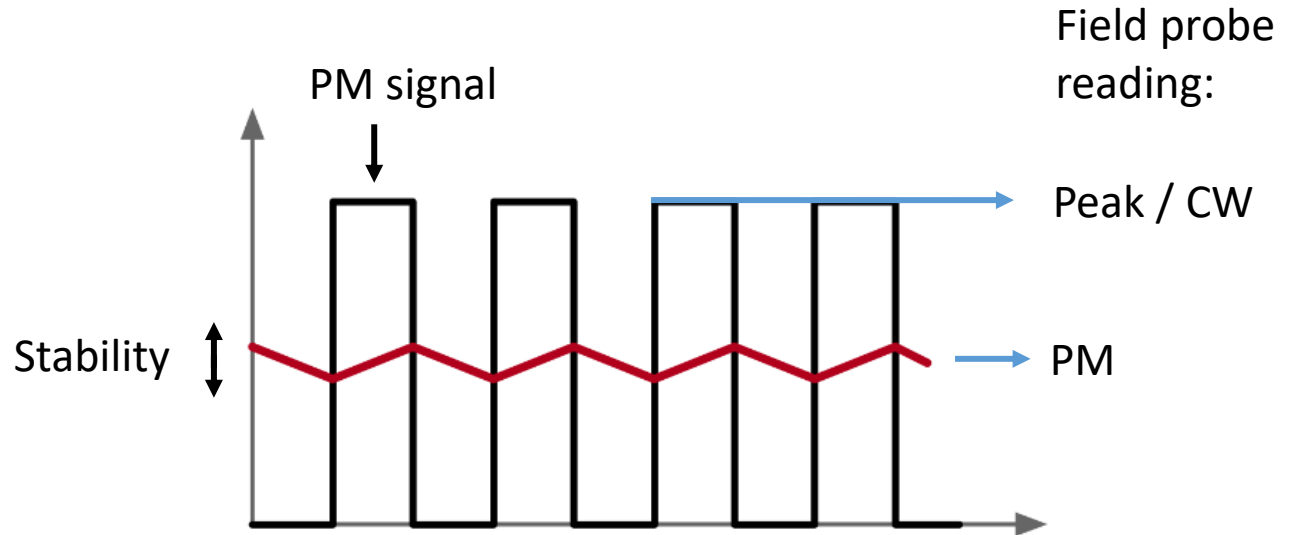
- Pulse modulated signals
 - 1 kHz, 50% duty cycle
 - Level/limits:
 - Frequency dependent
 - EUT dependent
 - Aircrafts, ships or safety critical: typical 200V/m



MIL-STD-461G

- Calibration steps:
 - Generate unmodulated field (CW) & note the field probe reading
 - Modulate the field as required
 - E.g. 1 kHz pulse, 50% duty cycle
 - Note the field probe reading
 - Determine correction factor
 - Repeat the above at several frequencies to verify consistency

Hardware filtering





Measurements Errors (Field probe)

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Product specialist RadiSense



Measurement errors

- Positioning
- User settings
- Measurement uncertainty
- User corrections



Positioning

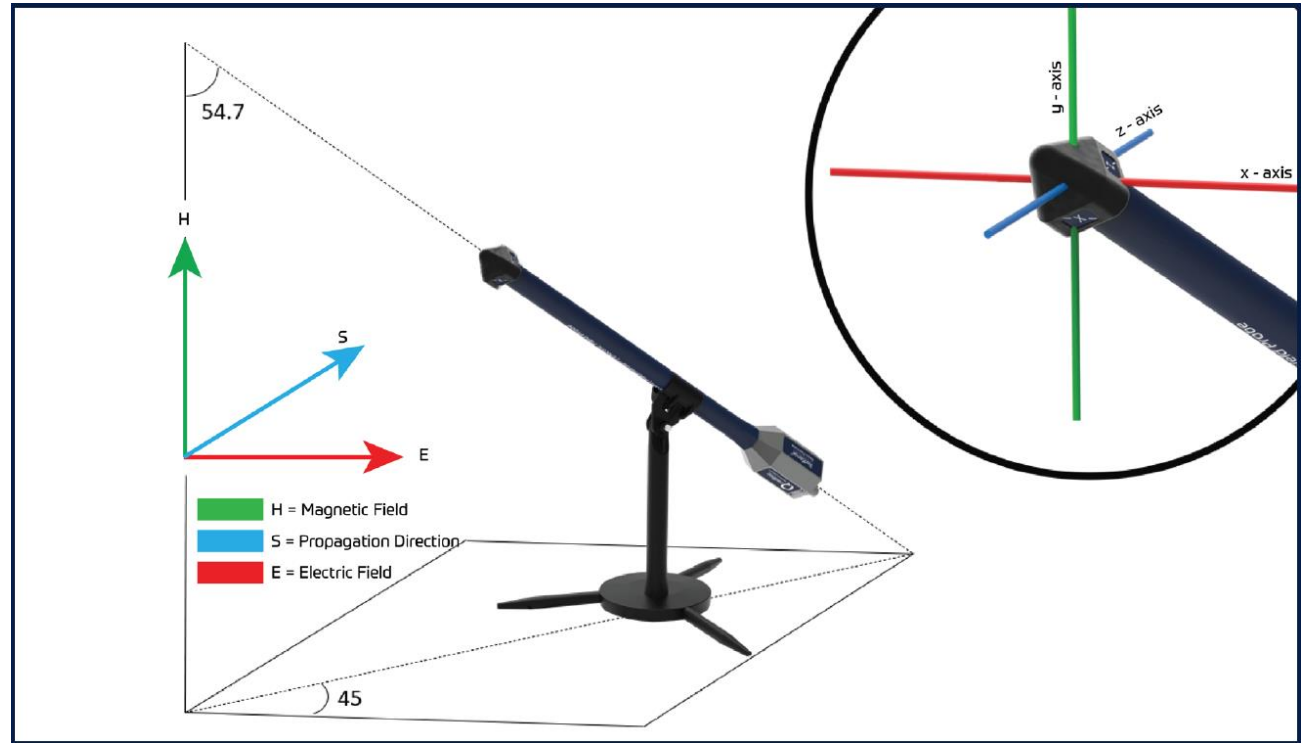
- The part of the probe containing the element(s) and intercepting the applied field shall be closest to the field source. (IEEE 1309)
- Calibration: Close to normal operation
 - Positioning
 - Mounting



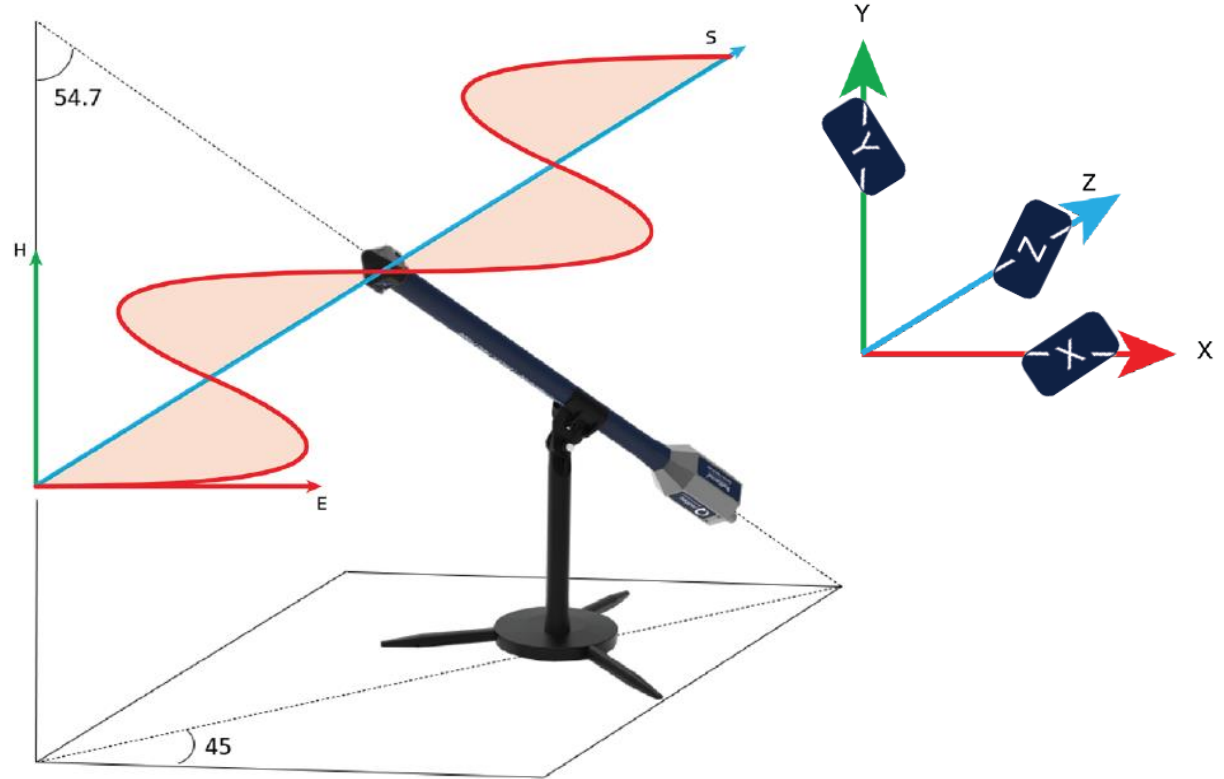
Positioning

- For stickprobes (RadiSense26/40 and RadiSense18U) the “Body” can directly reflect incident wave to the sensing elements, causing larger measurement uncertainties.
- **Conclusion:** the body should be as far away as possible from the propagation line between the transmitting antenna and the sensing elements.

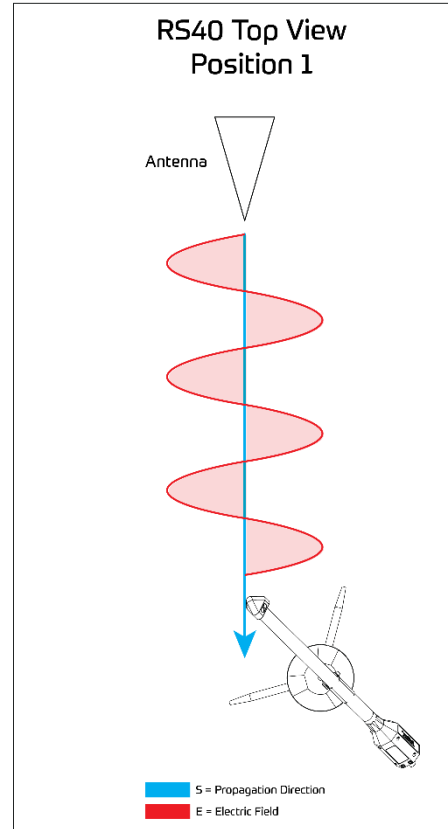
Positioning



Positioning



Positioning





User settings

- Zeroing
- Frequency settings
- Filter settings



Zeroing

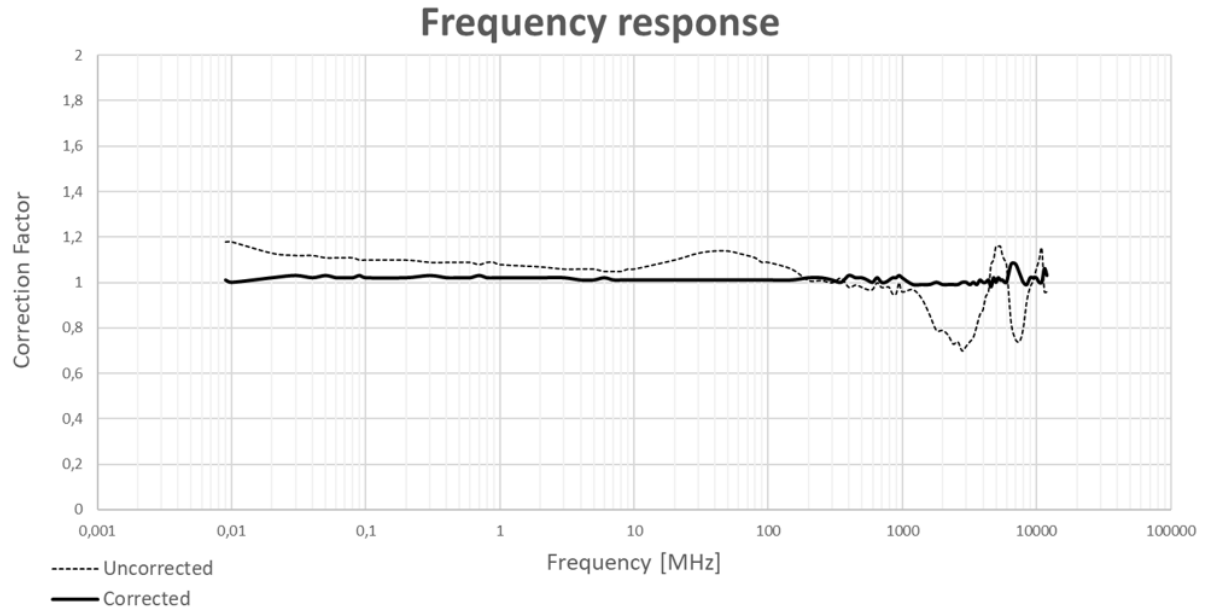
- Amplifier noise or applied field during zeroing



Frequency setting

- Frequency response correction
- Anisotropic response correction
 - Frequency dependent

Frequency setting





Filter settings

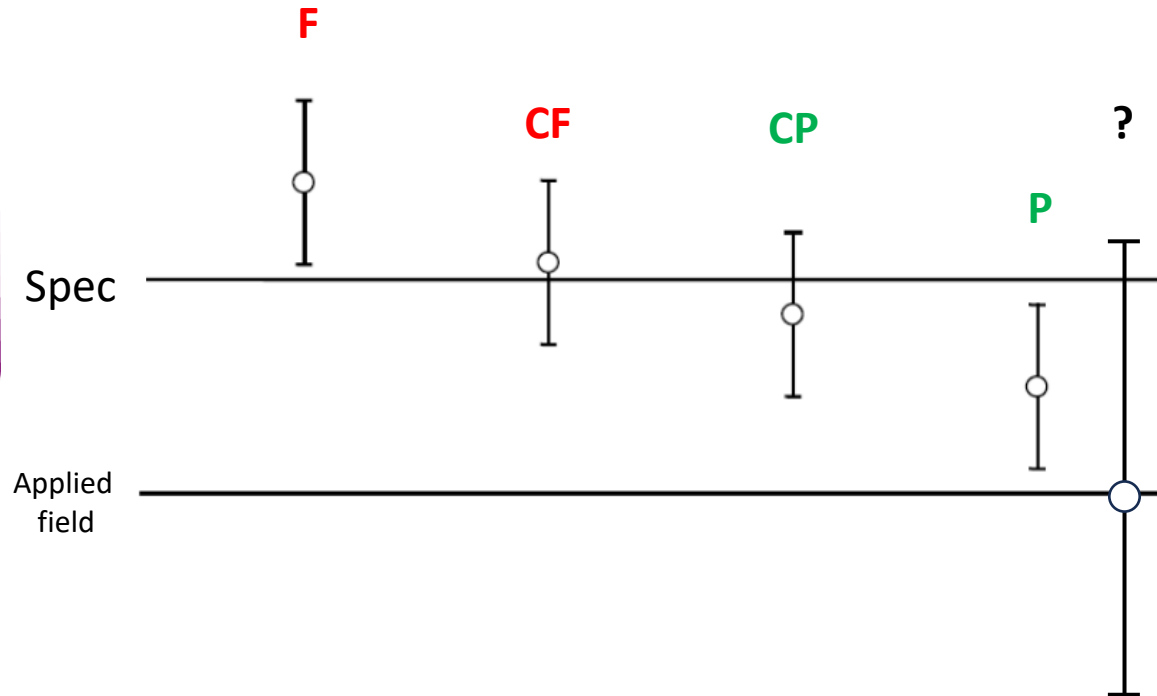
- Lower filter setting → Faster measurement
- Higher filter setting → More accurate



Filter settings

- Lower field Levels
 - Diode detector → Non-linear noise
- Wide band probes
 - Shorter antenna's → needs more gain → more noise
 - Higher bandwidth → more noise

Stated Uncertainty





User correction

- For the user (customer)
- To be aware of:
 - Uncertainty of the lab
 - Wrong corrections
 - Applied twice



Multiprobe testing

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Multi-probe testing

- ISO11451-2 (ALSE)
- ISO11451-5 (Reverberation Chamber)

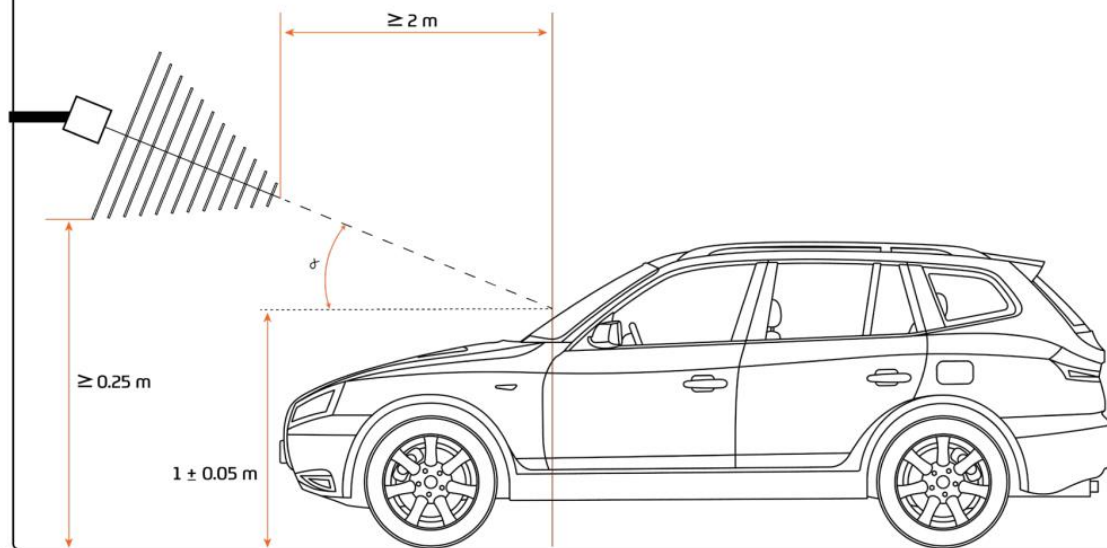


Absorber-Lined Shield Enclosure

- ISO11451-2 (ALSE)
 - Radiated Immunity
 - Frequency range: 10 kHz – 18 GHz
 - Field level: 20 – 100 V/m*

* 300-600 V/m for specific frequency ranges applicable for Radar Pulse testing

Typical test setup





Field calibration

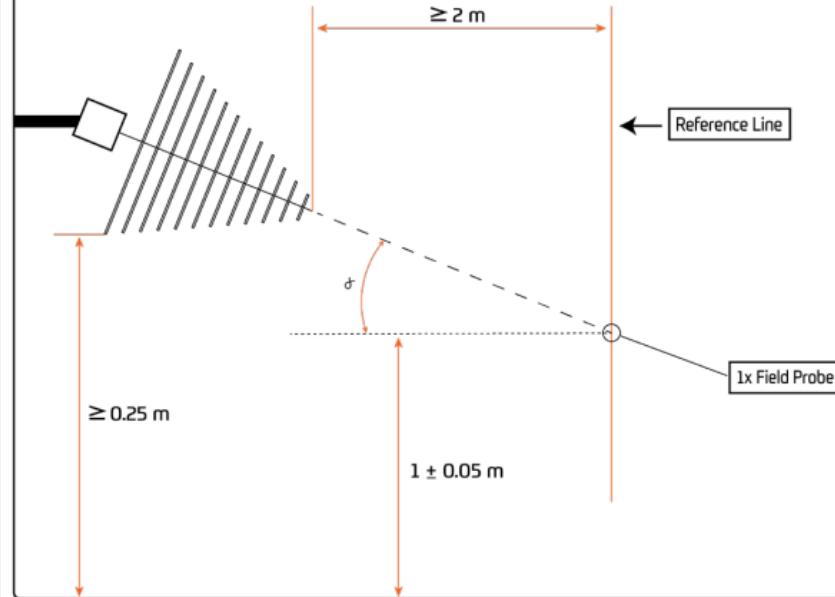
- “Prove that the field was there”
- Field:
 - Unmodulated (CW)
 - Polarized horizontally and Vertically



Field calibration

- Single reference point:
 - 10 kHz to 30 MHz* (Low frequency range)
 - 2 GHz to 18 GHz* (High frequency range)
- *Frequency ranges may vary per manufacturer
-
- Vehicle roof $\leq 3\text{m}$: 1 meter $\pm 5\text{ cm}$
 - Vehicle roof $> 3\text{m}$: 1.8 meter $\pm 5\text{ cm}$

Single reference point

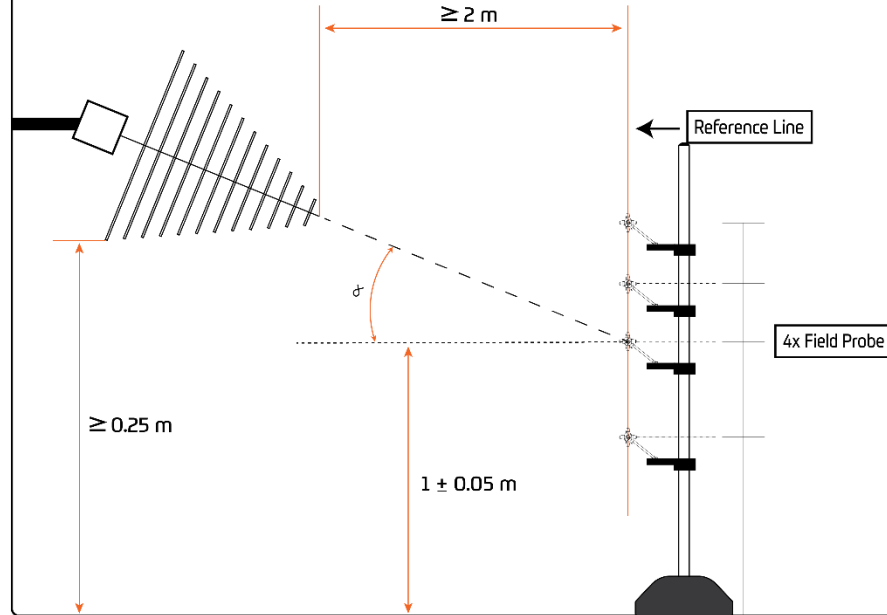




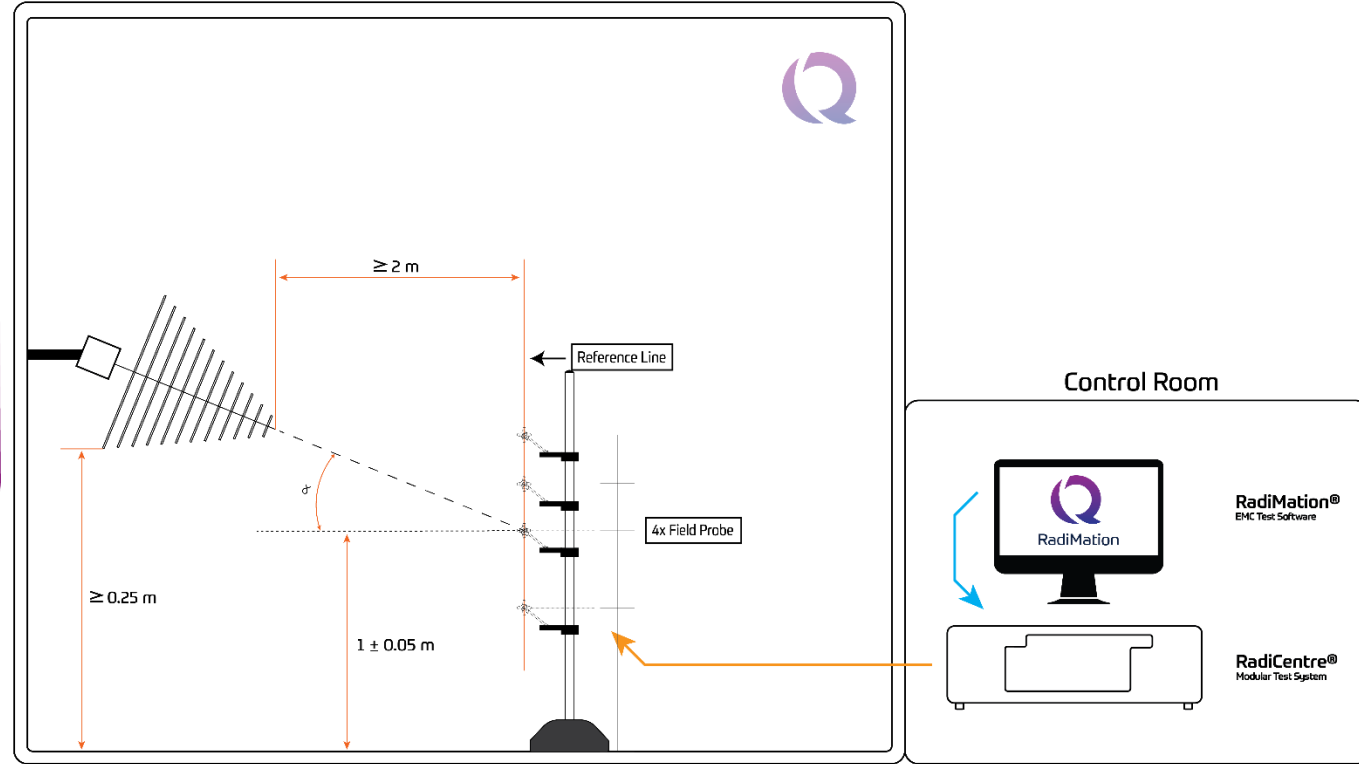
Field calibration

- Multiple reference points:
 - 20/30 MHz to 2 GHz (Mid frequency range)
- Vehicle roof $\leq 3\text{m}$:
 - 0.5m
 - 0.8m
 - 1.0m
 - 1.2m
- Vehicle roof $\geq 3\text{m}$:
 - 1.2m
 - 1.5m
 - 1.8m
 - 2.1m

Multiple reference points



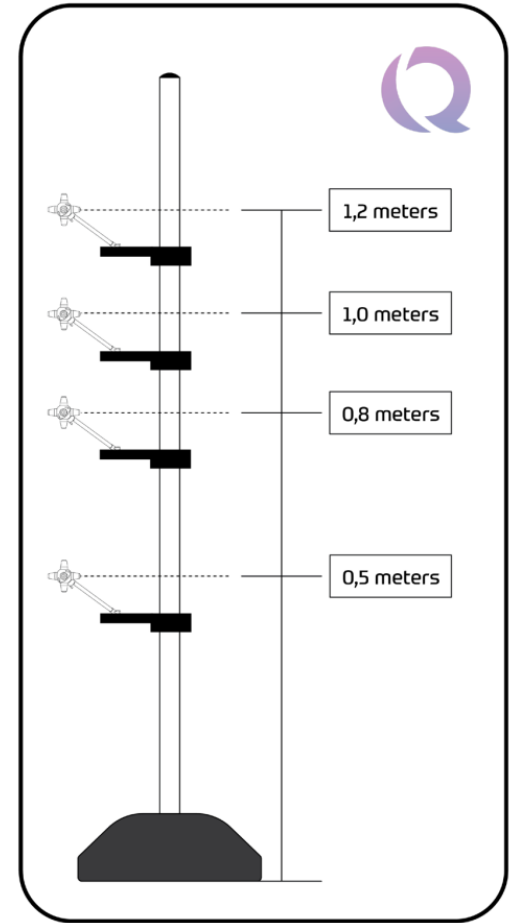
Multiple reference points





Raditeq solution

- 10 kHz – 10 GHz:
 - RadiSense10I
 - RadiSense10B
- 20 MHz – 18 GHz
 - RadiSense26/40H
 - RadiSense26/40S
 - RadiSense18U
- Probe stand





Reverberation Chamber

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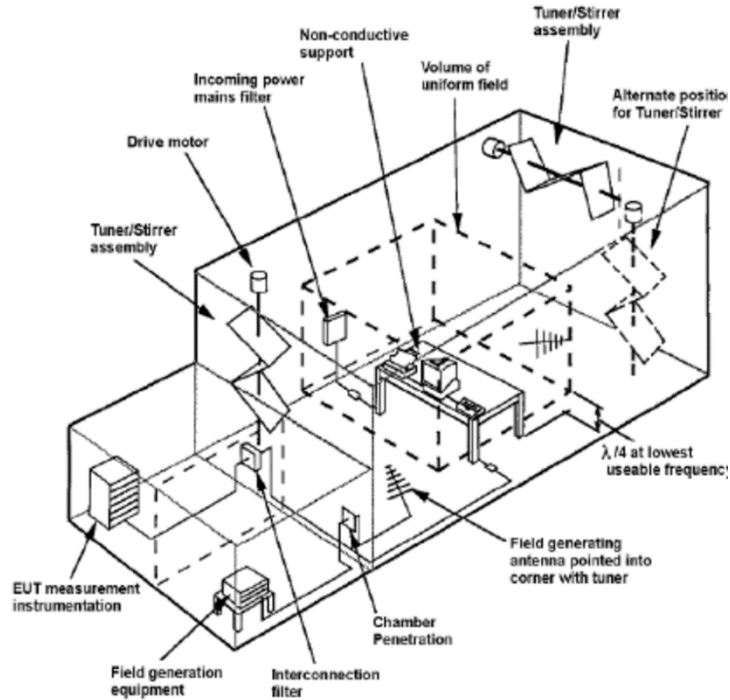
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Reverberation Chamber

- ISO11451-5
 - Context
 - Vehicle testing (Radiated Immunity)
 - Calibration
 - Single reference point calibration
 - Multi reference point calibration (testing)

Reverberation Chamber





Reverberation Chamber

- Achieve higher field strength at lower power levels
- More accurate representation of real word
- No need to rotate EUT (vehicle)



Calibration

- Single point reference (substitution)
 - Tuned mode
 - Stirred mode
- Multi point reference
 - Fast stirred mode



Single point reference

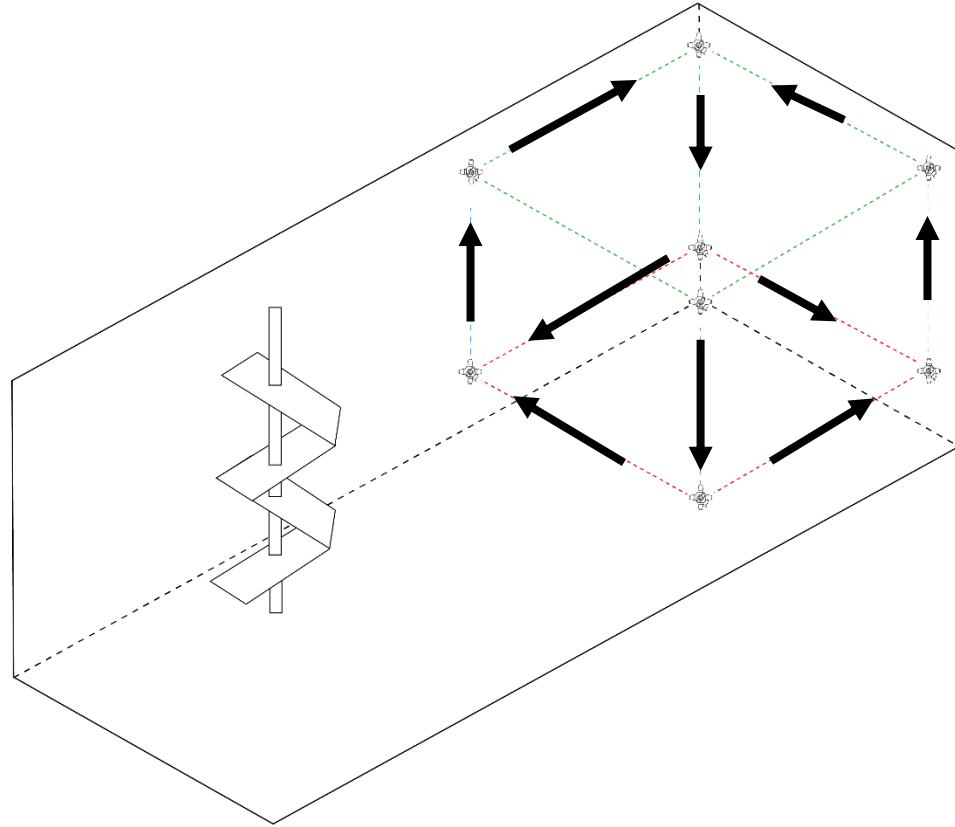
- Tuned mode:
 - Tuner is fixed → Field is stable
 - Measurement corresponds to angle of tuner



Single point reference

- Stirred mode:
 - Field is unstable
 - Measurement does not correspond to angle of stirrer

Single point reference



Single point reference

- Calibration:
 - Empty chamber (8 points) → CAL interval
 - Loaded chamber (8 points) ↘ For each
 - EUT loading factor (8 point) ↗ EUT
- Test:
 - Substitution

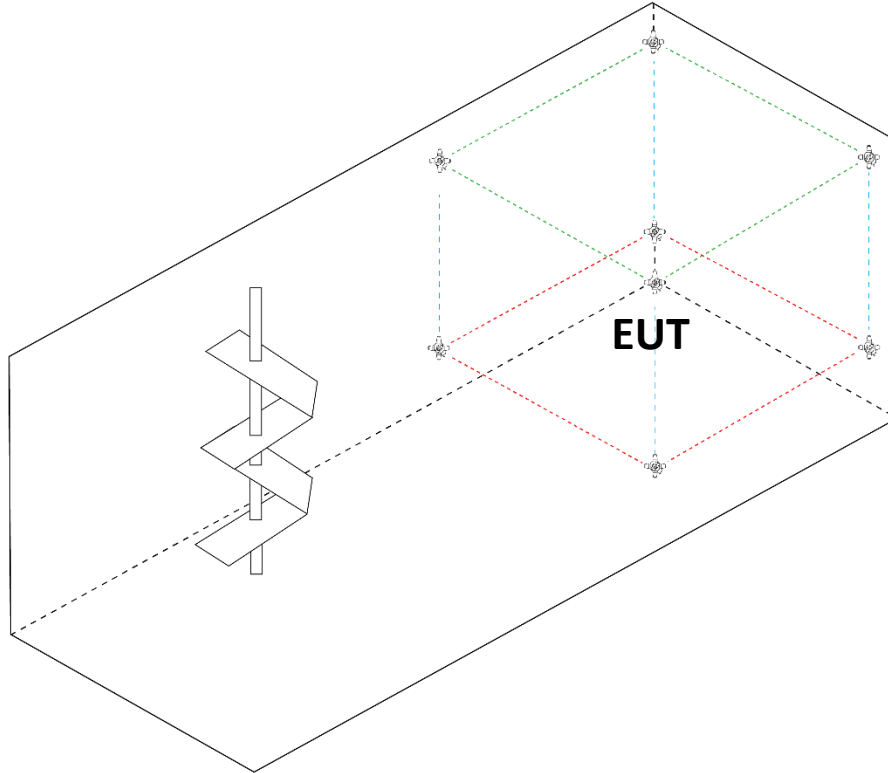


Multi point reference

- Fast mode-stirred:
 - 8 Probe system
 - Calibration and test are performed simultaneously



Multi point reference





Thank you!

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