

Client **Intel France**

Certificate No: **Horn_WR15-0590_May17**

CALIBRATION CERTIFICATE

Object **Horn WR15-0590, type: PE9881-24, SN: 37/216**

Calibration procedure(s) **QA CAL-44.v1
Calibration procedure for free space horns**

Calibration date: **May 8, 2017**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power sensor NRP33T	100967	17-Oct-16 (No. 0186)	Oct-18
Power sensor NRP33T	100968	17-Oct-16 (No. 0185)	Oct-18
Attenuator 10 dB	10A (84231)	18-Apr-17 (No. 217-02536)	Apr-19
Mismatch combination	10B (84224), SS001	18-Apr-17 (No. 217-02537)	Apr-19
Probe EUmmWV2	SN: 9350	24-Mar-17 (No. EUmmWV2-9350_Mar17)	Mar-18
DAE4	SN: 908	10-Mar-17 (No. DAE4-781_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor NRP-Z58	SN: 101016	24-Oct-15 (in house check Nov-16)	In house check: Nov-17
RF generator E8251A	US41140111	04-Aug-03 (in house check Mar-17)	In house check: Mar-19
Frequency Extender 50 – 75 GHz	SN: 13071-01	14-Apr-17 (in house check Apr-17)	In house check: Apr-19
Network Analyzer Agilent E8361A	US43140798	28-Oct-13 (in house check Jan-16)	In house check: Jan-18

	Name	Function	Signature
Calibrated by:	Fin Bomholt	Deputy Manager	

Approved by:	Katja Pokovic	Technical Manager
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Issued: May 9, 2017

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

References

[1] IEC106 WG10 draft report, February 2017

Methods Applied and Interpretation of Parameters:

- *Coordinate System:* z-axis in the waveguide horn boresight, x-axis is in the direction of the E-field, y-axis normal to the others in the field scanning plane parallel to the horn flare and horn flange.
- *Measurement Conditions:* The forward power to the horn antenna is measured prior and after the measurement with a power sensor. During the measurements, the horn is directly mounted to the waveguide source. Absorbers are used around the horn, in the boresight axis and at the back connector.
- *Horn Positioning:* The waveguide horn is mounted vertically on the flange of the waveguide source to allow vertical positioning of the EUmmW probe during the scan. The plane is parallel to the phantom surface. Probe distance is verified using mechanical gauges positioned on the flare of the horn.
- *E- field distribution:* E field is measured in the x-y-plane with a vectorial E-field probe with the source power of typ. 20 dBm at < 50 GHz and 10 dBm at > 50 GHz. The probe sensor center is 10 mm (in z) above the flare frame of the waveguide horn in the near field. The E-field value stated as calibration value represents the E-field-maxima 10mm in front of the horn.
- *E-field polarization:* Above the open horn, linear polarization of the field is expected. This is verified graphically in the field representation.

1. Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY	V52.10.0.1428
DASY PP Version	SEMCAD X	V14.6.10
Phantom	Free Space	N/A
Distance WG horn front - Probe Center	10 mm	
Scan resolution	dx, dy = 1 mm	30 x 16 mm (longitudinal in E-field polarization)
Reference frequency	60 GHz ± 10 MHz	
Measured input power	7.13 dBm	after adapter
Input power at WG horn flange	7.53 dBm	at flange

2. Maximum Field values at 60 GHz, normalized to 10 mW forward power

E-field 10 mm above horn front	condition	Maximum
Maximum measured above high end	7.53 dBm source power	67.91 V/m
Maximum measured above low end	7.53 dBm source power	67.86 V/m
Averaged maximum, scaled to 10 dBm	10 dBm source power	90.3 V/m

3. Appendix

3.1 DASY E-Field Results

Date: 08.05.2017

Test Laboratory: SPEAG mmW

DUT: WG-15 Horn; Type: PE9881-24; Serial: 37/216

Communication System: UID 0, CW (0); Frequency: 60000 MHz

Medium parameters used: $\sigma = 0$ S/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

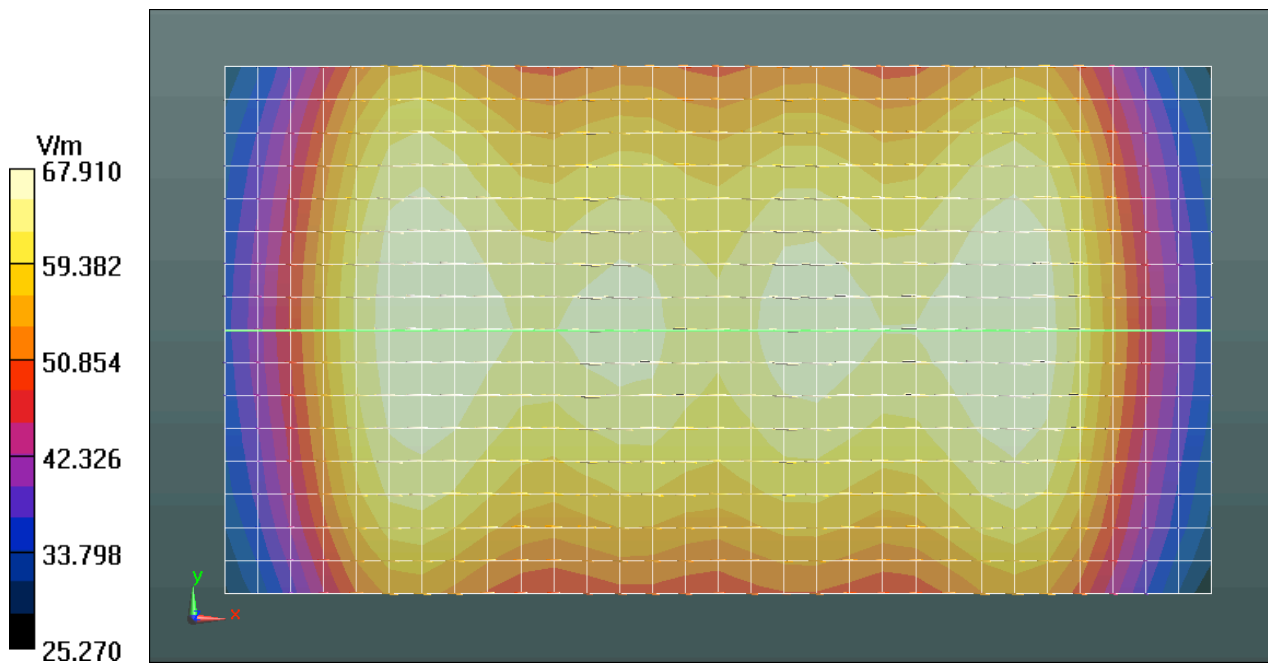
DASY Configuration:

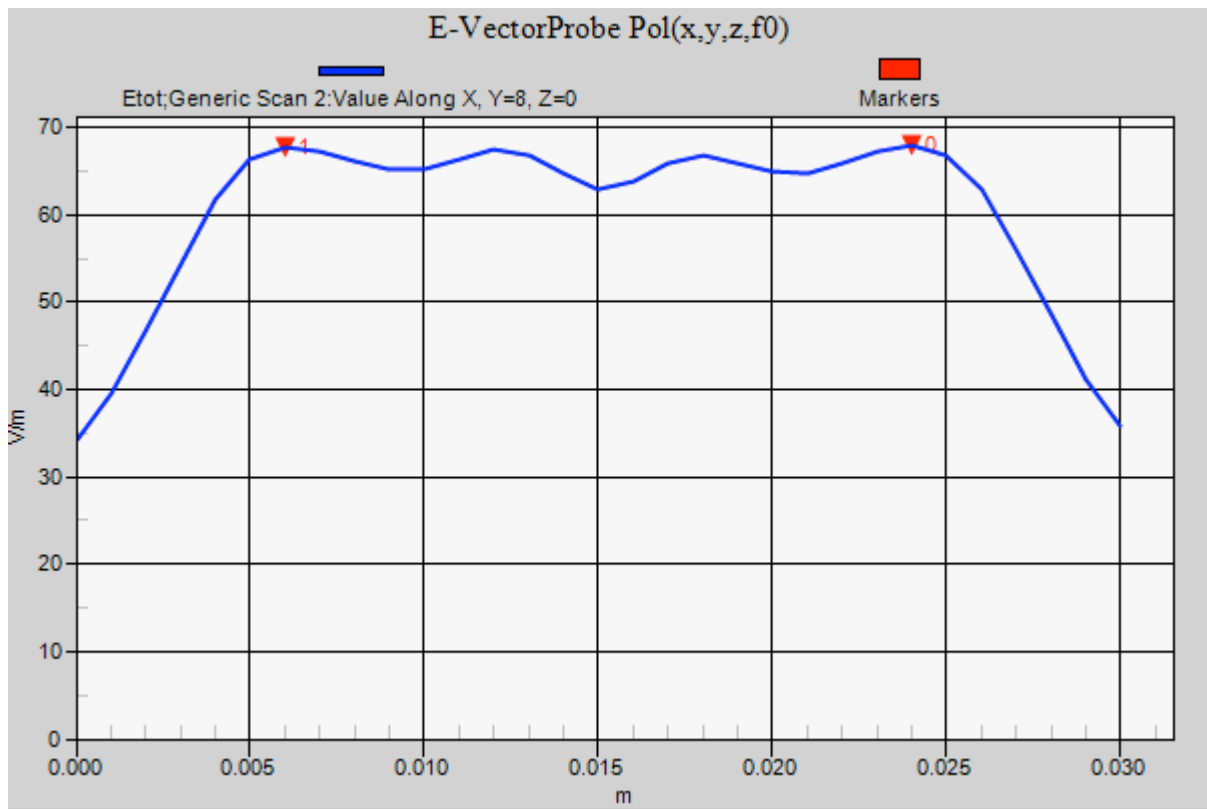
- Probe: EUmWV2 - SN9350 (as EummW) 60 GHz 170508; ConvF(1, 1, 1); Calibrated: 24.03.2017;
- Sensor-Surface: 0mm (Fix Surface), $z = 1.0$
- Electronics: DAE4 Sn908; Calibrated: 10.03.2017
- Phantom: Horn Cal Setup Conn_front; Type: Slot4
- DASY52 52.10.0(1428); SEMCAD X 14.6.10(7373)

170508_908_9350_IntelHorn24dB_SAGEsource_7.13dBm/Fine Scans 10mm/Generic Scan 2 (31x17x1):

Measurement grid: $dx=1$ mm, $dy=1$ mm, $dz=20$ mm

Maximum value of E_{tot} (measured) = 67.91 V/m





References

- [1] Certificate No. Horn_WR15-0590_May17

Overview

The rectangular waveguide Horn WR15-0590 was calibrated at 60 GHz at a distance of 10 mm for the maximum E_{tot} -field according to [1]. The scan area was 30 mm x 16 mm with a resolution of 1.0 mm at a sensor distance of 10.0 mm from the front of the horn. The maxima at this distance are observed along the line of the E-field polarization (short dimension of the horn flare). Additional plots were required to see the Field variation within the plot; they are scaled to the overall maximum.

Field variation along the E-field polarization

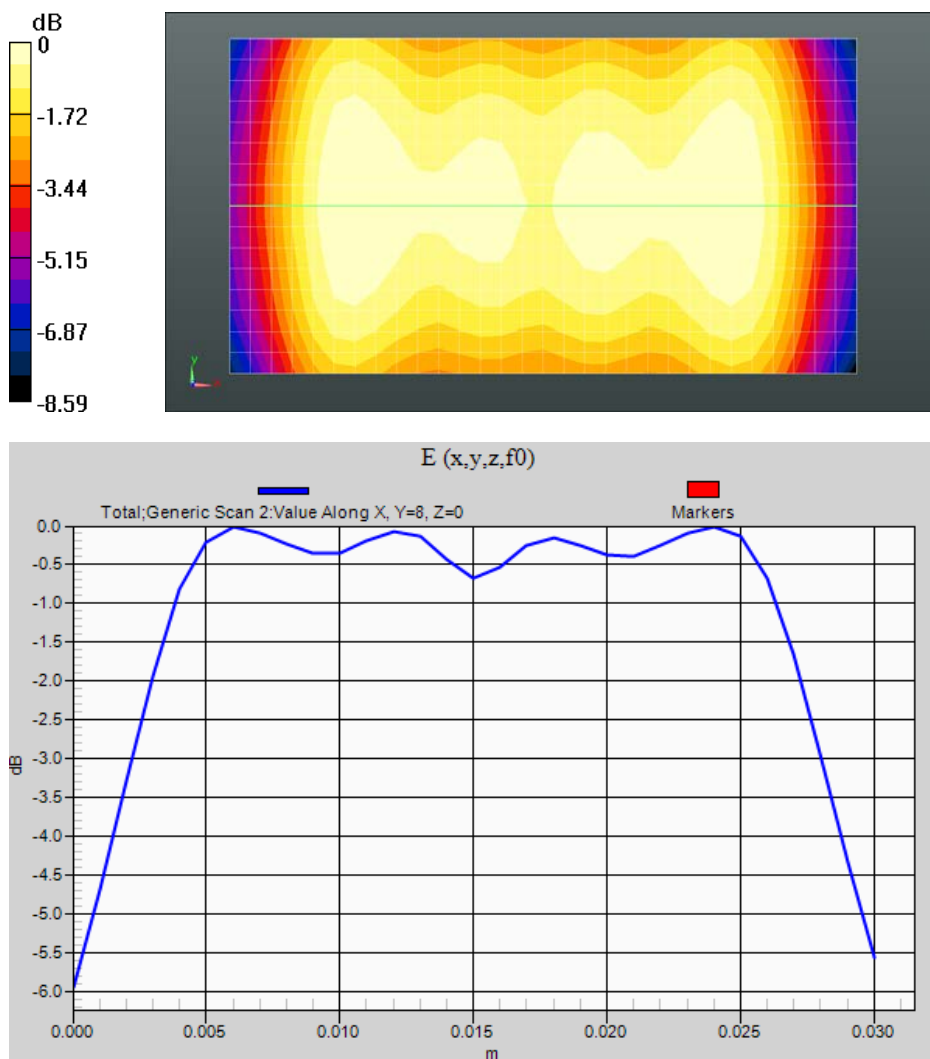


Fig. 1: Field variation through the maximum along the E-field polarization

Field variation across the E-field polarization

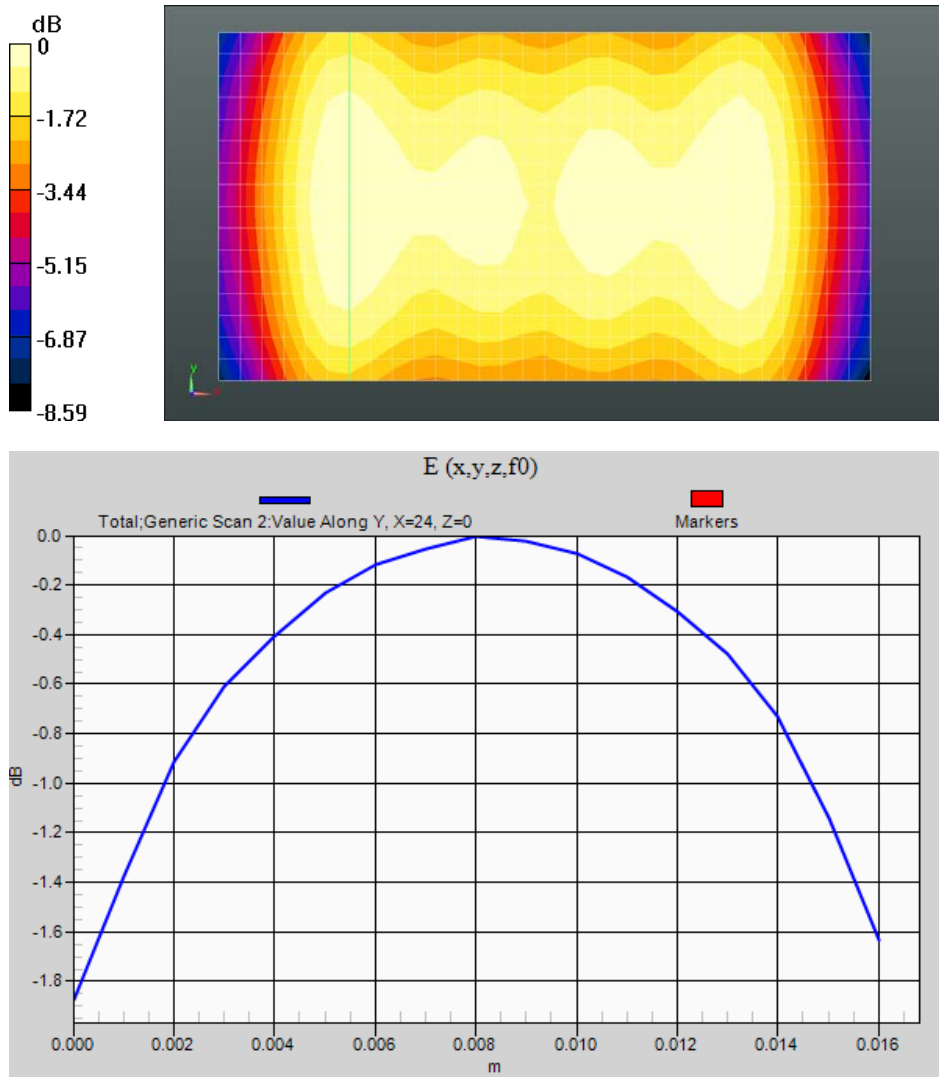


Fig. 2: Field variation through the maximum across (normal to) the E-field polarization