

CERTIFICATE OF CALIBRATION

Applicant: Bureau Veritas Consumer Products Service (H.K.) Ltd.
Taoyuan Branch

Order by: EMC Instruments corporation
1F, No.8, Lane38 WenSan 3rd street
Kwei-Shan Hsiang Taoyuan Hsien

Instrument: H- Field Probe + Broadband field meter
manufacturer Narda / Wandel & Goltermann
type HF 3061 + NBM- 550
serial number A-0122 + B-0872
identification E2-020086
asset number. 140000119

Calibration method: The instrument was allowed to acclimatize for at least 2 hours before any measurements were made.

During calibration, all axis of the field probe are switched on as in the normal isotropic mode of operation of the probe.

The calibration is performed in a TEM cell. The calculated field method is used for the calibration.

$$\text{Correction Factor} = \frac{\text{Applied field strength}}{\text{Measured field strength}}$$

The polarization of the E-field is vertical. For each frequency and field strength setting, the field probe is rotated so that each position is aligned with the E-field. The axis under test is always perpendicular to the direction of propagation and parallel to the E-field.

The H-Field is calculated by dividing the E-Field with 377 ohm.

The probe position has been determined as follows:
The point of view is from the antenna to the probe.

Position 1: probe horizontal, perpendicular to the field, display horizontal (up). Probe head aligned with center of the antenna, probe box to the right.

Position 2: probe horizontal, perpendicular to the field, display aligned vertical, to the front facing the antenna. Probe head aligned with center of the antenna, probe box to the right.

Position 3: probe horizontal, perpendicular to the field, display horizontal (down). Probe head aligned with center of the antenna, probe box to the right.

Certificate number 201600474.01

This certificate is issued provided that DARE!! Calibrations does not assume any liability.

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Reproduction of the complete certificate is allowed. Parts of the certificate may only be reproduced with written approval of the calibration laboratory.

See page 7 and 8 for a detailed drawing of the probe positioning.

Ambient conditions: The calibration was carried out in a screened room, at an ambient temperature of $(23 \pm 2)^\circ\text{C}$ and a relative humidity of $(50 \pm 10)\%$.

Period of calibration: 2016 February, 9.

Due date: 2017 February, 9

Results: The results are listed on page 3 to 5.
No adjustments have been made to the instrument.
The measured values were calculated from a single sample.

This certificate replaces certificate number 201600474.00.
Frequency range corrected at page 4.

Uncertainty: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

The uncertainties refer to the measured values only with no account being taken of the ability of the instruments under test to maintain their calibration.

Traceability: The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA.

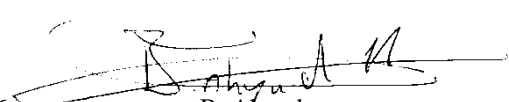
<u>Description</u>	<u>Identification</u>	<u>Certificate number</u>	<u>Last calibration date</u>
Signal Generator	ID 1265	RvA K063/201501248.00	October 2015
Power meter	ID 1247	RvA K063/201404632.01	November 2014
Power head	ID 1248	RvA K063/201404632.01	November 2014
RF Amplifier	ID 7387	D.A.R.E!! Calibrations/201501265.00	October 2015
Coupler	ID 7432	RvA K063/201500583.00	April 2015
TEM cell	ID 1073	-/No cal required	-
Attenuator 30dB	ID 1313	RvA K063/201600022.00	January 2016
Termination 50 ohms, N-type	ID 1545	/No cal required	-
Radacentre, Siemens	ID 7407	/-/No cal required	-

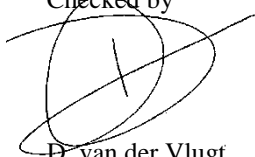
Date

Calibrated by

Checked by

2017 January, 6


B. Ahyud
Calibration Engineer


D. van der Vlugt
Director

H-field Probe linearity (Position 1)

Frequency: 1 MHz, Septum height: 0,45 m
Range: range less

APPLIED FIELD [A/m]	MEASURED FIELD [A/m]	LINEARITY ± UNCERTAINTY [dB]	CORRECTION FACTOR
0,0213	0,0211	(-0,281 ± 0,026) dB	1,01
0,0425	0,0408	0 dB (Reference)	1,04
0,0852	0,0827	(-0,103 ± 0,027) dB	1,03
0,1702	0,1655	(-0,11 ± 0,05) dB	1,03
0,2650	0,2592	(-0,17 ± 0,06) dB	1,02

H-field Probe linearity (Position 2)

Frequency: 1 MHz, Septum height: 0,45 m
Range: range less

APPLIED FIELD [A/m]	MEASURED FIELD [A/m]	LINEARITY ± UNCERTAINTY [dB]	CORRECTION FACTOR
0,0213	0,0199	(0,300 ± 0,026) dB	1,07
0,0425	0,0412	0 dB (Reference)	1,03
0,0852	0,0830	(-0,037 ± 0,027) dB	1,03
0,1703	0,1662	(-0,06 ± 0,05) dB	1,02
0,2652	0,2599	(-0,10 ± 0,06) dB	1,02

H-field Probe linearity (Position 3)

Frequency: 1 MHz, Septum height: 0,45 m
Range: range less

APPLIED FIELD [A/m]	MEASURED FIELD [A/m]	LINEARITY ± UNCERTAINTY [dB]	CORRECTION FACTOR
0,0213	0,0216	(-0,348 ± 0,026) dB	0,99
0,0425	0,0413	0 dB (Reference)	1,03
0,0852	0,0832	(-0,031 ± 0,027) dB	1,02
0,1703	0,1662	(-0,03 ± 0,05) dB	1,02
0,2651	0,2597	(-0,07 ± 0,06) dB	1,02

H-field Probe frequency response

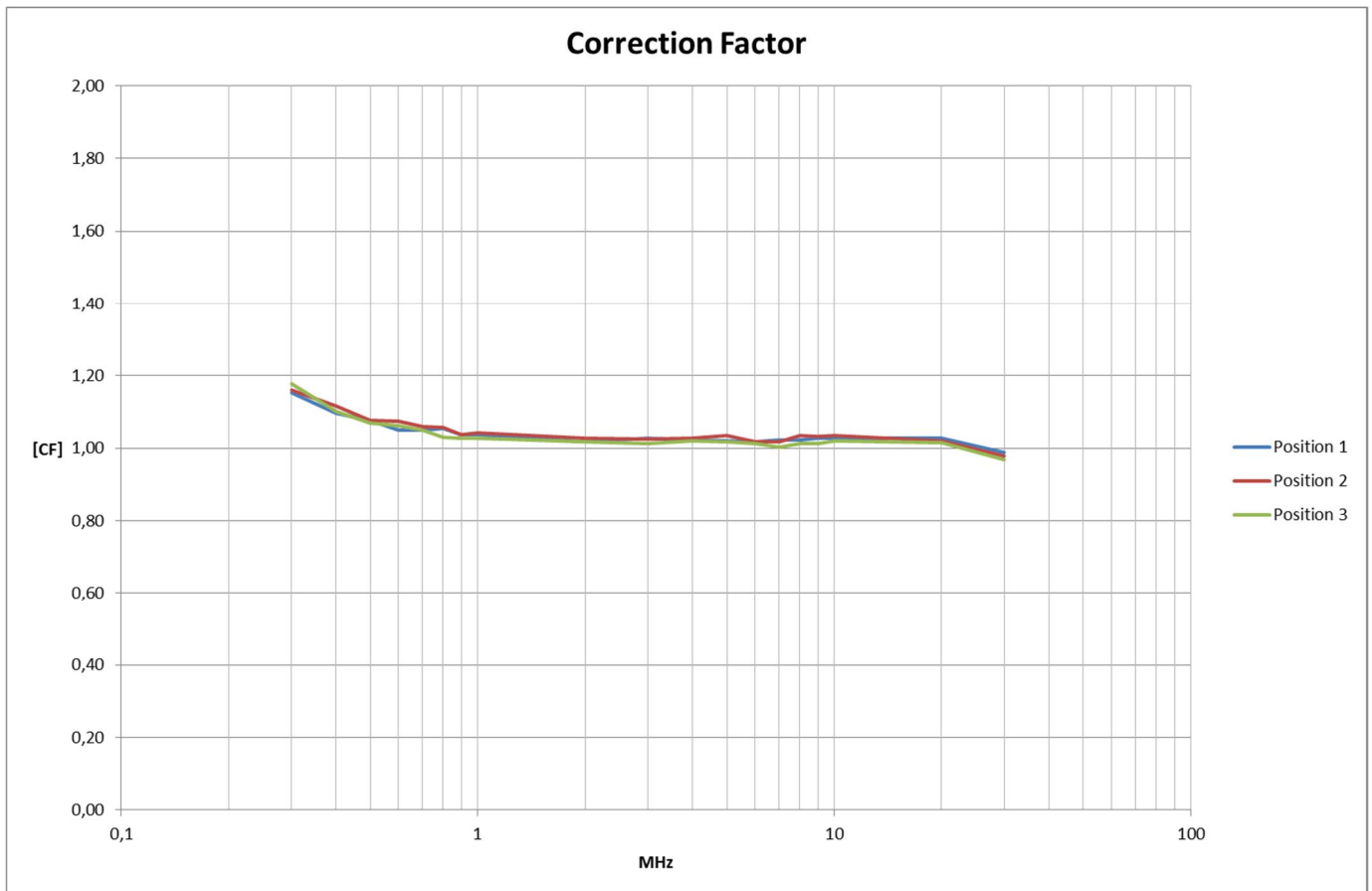
Frequency range: 300 kHz – 30 MHz

Septum height: 0,45 m

Range: range less

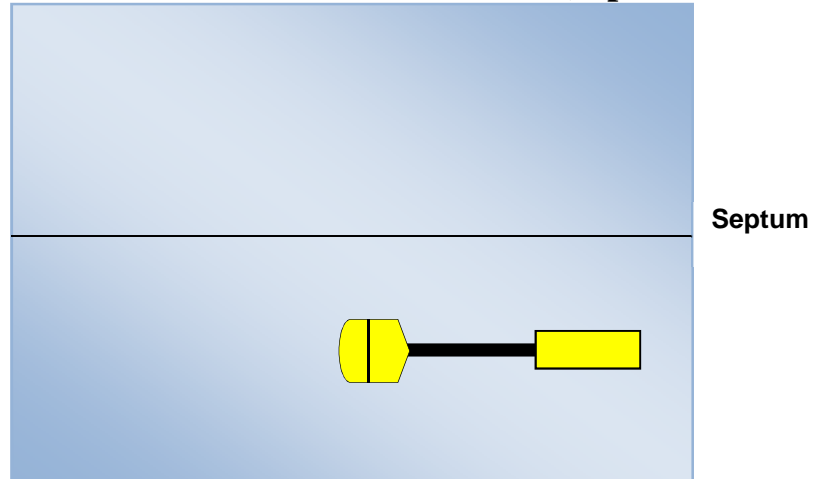
FREQUENCY [MHz]	APPLIED FIELD [A/m]			MEASURED FIELD [A/m]			CF ± UNCERTAINTY		
	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3
0,3	0,053	0,053	0,053	0,046	0,046	0,045	1,15 ± 0,31	1,16 ± 0,31	1,18 ± 0,32
0,4	0,054	0,054	0,054	0,049	0,048	0,049	1,10 ± 0,30	1,12 ± 0,30	1,10 ± 0,30
0,5	0,053	0,053	0,053	0,049	0,049	0,050	1,08 ± 0,29	1,08 ± 0,29	1,07 ± 0,29
0,6	0,053	0,053	0,053	0,051	0,049	0,050	1,05 ± 0,28	1,07 ± 0,29	1,06 ± 0,29
0,7	0,054	0,054	0,054	0,051	0,051	0,051	1,05 ± 0,28	1,06 ± 0,29	1,05 ± 0,28
0,8	0,053	0,053	0,053	0,051	0,051	0,052	1,05 ± 0,28	1,06 ± 0,28	1,03 ± 0,28
0,9	0,053	0,053	0,053	0,051	0,051	0,052	1,04 ± 0,28	1,04 ± 0,28	1,03 ± 0,28
1	0,053	0,053	0,053	0,051	0,051	0,052	1,04 ± 0,28	1,04 ± 0,28	1,03 ± 0,28
2	0,053	0,053	0,053	0,052	0,052	0,052	1,02 ± 0,27	1,03 ± 0,28	1,02 ± 0,27
3	0,053	0,053	0,053	0,052	0,052	0,052	1,03 ± 0,28	1,02 ± 0,28	1,01 ± 0,27
4	0,053	0,053	0,053	0,052	0,052	0,052	1,02 ± 0,28	1,03 ± 0,28	1,02 ± 0,27
5	0,053	0,053	0,054	0,052	0,051	0,053	1,02 ± 0,28	1,03 ± 0,28	1,02 ± 0,27
6	0,053	0,053	0,053	0,052	0,052	0,052	1,02 ± 0,27	1,02 ± 0,27	1,01 ± 0,27
7	0,053	0,053	0,053	0,052	0,052	0,053	1,02 ± 0,28	1,02 ± 0,27	1,00 ± 0,27
8	0,053	0,053	0,053	0,052	0,051	0,052	1,02 ± 0,28	1,03 ± 0,28	1,01 ± 0,27
9	0,053	0,053	0,053	0,051	0,051	0,052	1,03 ± 0,28	1,03 ± 0,28	1,01 ± 0,27
10	0,053	0,053	0,053	0,052	0,051	0,052	1,03 ± 0,28	1,03 ± 0,28	1,02 ± 0,27
20	0,053	0,053	0,053	0,052	0,052	0,052	1,03 ± 0,28	1,02 ± 0,28	1,01 ± 0,27
30	0,053	0,053	0,053	0,054	0,054	0,055	0,99 ± 0,27	0,98 ± 0,26	0,97 ± 0,26

H-field Probe isotropy Applied field: 0,0531 A/m				
FREQUENCY [MHz]	MEASURED FIELD Position 1 [A/m]	MEASURED FIELD Position 2 [A/m]	MEASURED FIELD Position 3 [A/m]	ANISOTROPY ± UNCERTAINTY [dB]
0,5	0,0491 A/m	0,0491 A/m	0,0496 A/m	(0,0 ± 1,2) dB
1	0,0510 A/m	0,0510 A/m	0,0515 A/m	(0,0 ± 1,2) dB
10	0,0515 A/m	0,0515 A/m	0,0520 A/m	(0,0 ± 1,2) dB

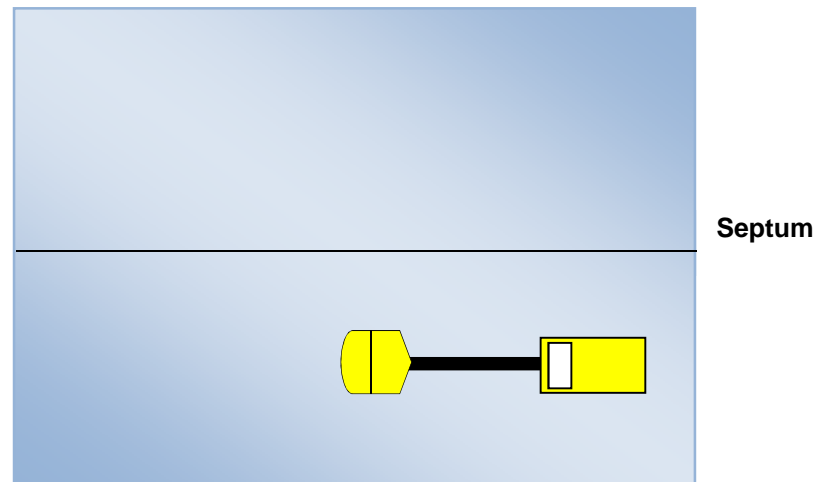


Probe orientation in Tem Cell 10 kHz – 150 MHz (Input side view)

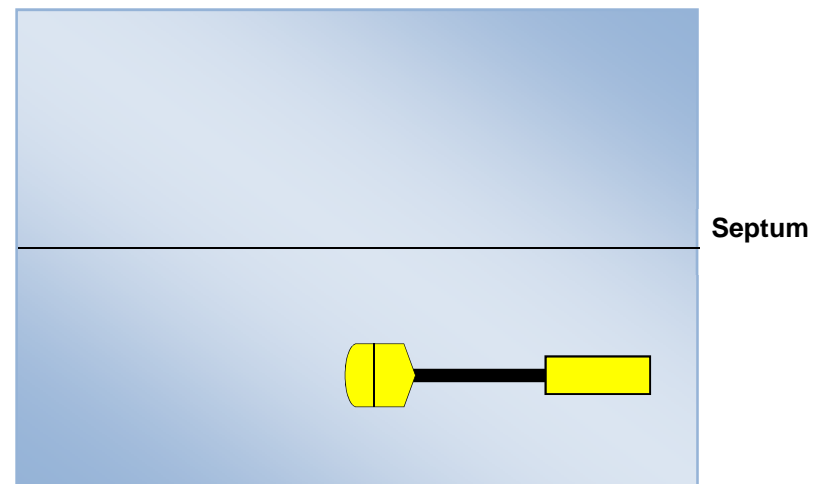
Position 1



Position 2



Position 3



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Probe orientation in anechoic room 200 MHz – 40 GHz (Top view)

