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Deutschen Kalibrierdienst



Deutsche
Akkreditierungsstelle
D-K-15033-01-00

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

5729
D-K- 15033-01-00
2017-11

Gegenstand
Object **Isotropic field measurement system
CI250 V1.2**

Hersteller
Manufacturer **LUMILOOP GmbH**

Typ
Type **LSProbe 1.2**

Fabrikat/Serien-Nr.
Serial number **78**

Auftraggeber
Customer **LUMILOOP GmbH
Gostritzer Str. 63
01217 Dresden**

Auftragsnummer
Order No. **20171017**

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate **24**

Datum der Kalibrierung
Date of calibration **02.11.2017**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.

Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

The user is obliged to have the object recalibrated at appropriate intervals.

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Datum
Date

Leiter des Kalibrierlaboratoriums
Head of the calibration laboratory

Bearbeiter
Person in charge

06.11.2017

U. Karsten

C. Pissulla

1. Details about the object under calibration

1.1 Object under calibration:

"Isotropic field measurement system with field probe type LSProbe 1.2"
frequency range: 10 kHz to 100 MHz, 100 MHz to 6 GHz
dynamic range: <1 V/m to > 10 kV/m, <0,1 V/m to >700 V/m

1.2 Components of object under calibration

component / type / manufacturer	serial-no.	description / remarks
electrical field probe type: LSProbe 1.2 manufacturer: LUMILOOP GmbH	78	contains 3 orthogonal positioned E-field antennas (X; Y; Z - direction). Inside the field probe the detected field strength is processed for each single direction and converted to a digital signal which can be transmitted over a fibre optic cable to an external laser module/interface. The power supply of the field probe is based on this external laser module.
- fibre optic cable, 10m duplex cable	-	-
- laser module/interface type: CI250 V1.2 CI Firmware: 1964 Server Firmware: 1964 manufacturer: LUMILOOP GmbH	126	The further processing of the measurements carried out about a laser data interface with change this optical signal into serial signals and passing on the measurement information to an external computer. The laser module is supplied with 230V AC mains voltage via a plug-in power supply.

1.3 Previous calibration

27.09.2017 - manufacturer calibration

2. Details about calibration method

2.1 frequency range 10 kHz to 1 GHz

The electric field at a defined location in the GTEM cell was calibrated by using a transfer standard probe (10 MHz to 1 GHz) which is directly traceable to the national primary standard of PTB (Physikalisch-Technische Bundesanstalt) and a calibrated field probe (10 kHz up to 10 MHz). That results a correction factor k for the GTEM cell depending on frequency and location of the probe. When the object under calibration is placed at the same location the electric field is produced to use the display of calibration field strength E_{disp} of the object under calibration. Then the actual field strength E_c is calculated. The measured values of field strength are effective values.

2.1.1 Determination of actual field strength in GTEM cell

The electric field strength at the calibration position is calculated from the forward power measured at a directional coupler at the GTEM feeding point and a frequency- and location depended correction factor of the GTEM cell with the following formula:

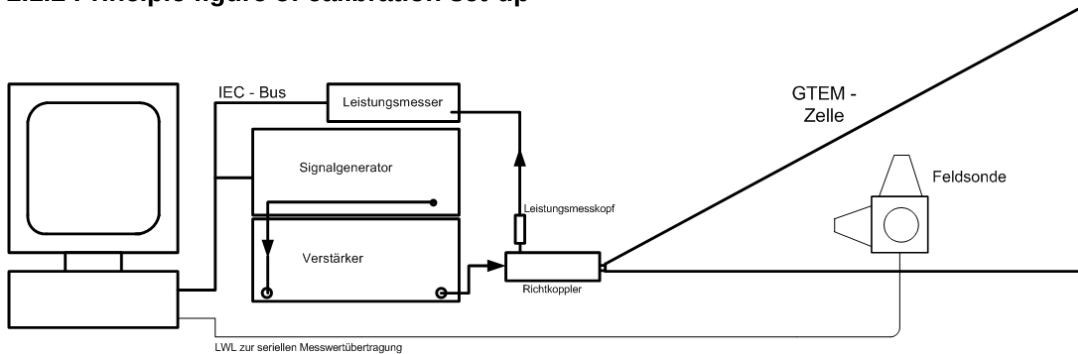
$$E = k \cdot \sqrt{P} \quad [1]$$

E = electric field strength in V/m

P = forward power measured at coupling gate of the directional coupler

k = correction factor of GTEM-cell (depends on frequency and location)

2.1.2 Principle figure of calibration set-up



The measured input power values are recorded and later used as target value to reproduce the electrical field for the calibration. The measured values of field strength are effective values.

2.2 frequency range 1,05 GHz to 6 GHz

The electric field was adjusted at a defined position inside of the calibration facility by using horn antennas. The distance between the aperture size of the horn antennas and the calibration object equal 1 m. The measurement of "Electric field strength" is calculated by the supplied power and antenna gain at the calibration point. The calculation according to:

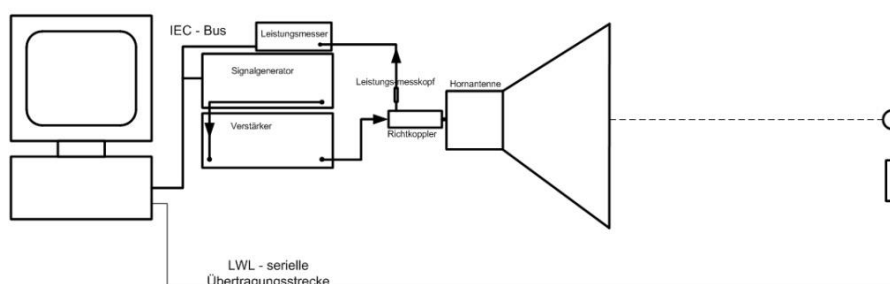
$$k(f) = \frac{E_c}{E_{disp}} \quad [2]$$

$$E_c = \sqrt{\frac{P_s \cdot G_i \cdot Z_0}{4 \cdot \pi \cdot r^2}} \quad [3]$$

E_c	= calculated field strength in V/m
P_s	= measured forward power at antenna in W
G_i	= linear antenna gain
Z_0	= wave impedance of free space in Ω
r	= distance between field probe and horn antenna in m
E_{disp}	= displayed field strength of the calibration object in V/m
$k(f)$	= correction factor (depend on frequency)

From formula [2] and [3] can now represent the context for the further consideration

$$k(f) = \frac{\sqrt{\frac{P_s \cdot G_i \cdot Z_0}{4 \cdot \pi \cdot r^2}}}{E_{disp}} \quad [4]$$



The determined power values are recorded and used as reference values to generate the calibration field.

Further notes to the calibration set-up:

The calibration carried out is only valid in connection with the positionings of the calibration object (LSProbe 1.2), shown in Figures 1-3. Since slight changes in the position of the E-field probe results an influence of the measuring results. The individual measuring set-up were photographed in order to achieve comparable conditions during a recalibration.

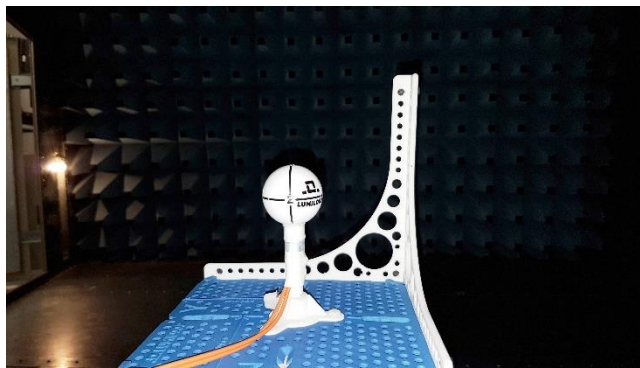
2.3 Used References and Instruments

Device	Type	Serial number
Electric field transfer normal Reference normal	TFS11 HI-4421G	EB22016DC / LRS11 77632A000
Power meter with Power head sensor (used with GTEM-cell)	NRVD NRV-Z52 NRV-Z52	101384 826496/018 826496/012
Power meter with Power head sensor (used with horn antennas)	NRVS NRV-Z51	101685 101881
Gtem-cell	1750	10107
Anechoic chamber	-	-
RF generator	NSG4070 ITS 6006 SMR20	030594 029377 100094
RF amplifier	CBA 100M-110 CBA 1G-250 AS0840-30-30 TWAL0408-20	T43791 T43793 1011451 913424
Directional coupler	DCP 0100A C5982-10	25417 80904
Horn antenna	HA17 with BDC 0842-30/200 SGH-1 with BDC 0842-30/200 SGH-2 with BDC 2080-30/500 ARRA187-880-460 with BDC 2080-30/500 ARRA137-880-620-460 with 137-620-A-1-1- 20NF	03/10089 066251 03/10090 128773 03/10091 128773 1001198 107797 1001199 1001200

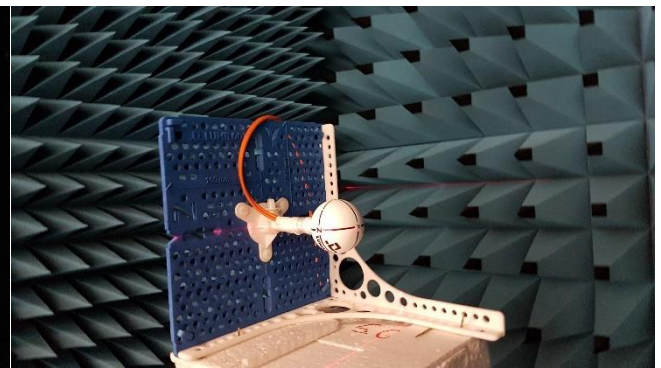
3. Details about carrying out the calibration process

3.1	Optical check:	OK.
3.2	Power supply check:	power supply during the calibration process: voltage operation state before and after calibration OK (no fault message)
3.3	Warming up check:	The warm-up period of the field probe system before start the calibration was more than 20 min.
3.4	Calibration task:	- Determination of the electrical field strength, that causes a calibration value of 10 V/m in the frequency range of 10 kHz to 6000 MHz - Signal not modulated. - frequencies to measure: 0,01 MHz, 0,03 MHz, 0,05 MHz, 0,07 MHz, 0,1 MHz, 0,3 MHz, 0,5 MHz, 0,7 MHz, 1 MHz, 3 MHz, 5 MHz, 7 MHz, 10 MHz to 90 MHz with 10 MHz steps, 100 MHz to 1000 MHz with 20 MHz steps, 1050 MHz to 4000 MHz with 50 MHz steps, 4025 MHz to 6000 MHz with 25 MHz steps The field strength measurement system shall indicate the field strength, which is present at the location of the sensor in the undisturbed field.
3.5	Positioning of object of calibration and settings of the field probe	The object of calibration was positioned on a fixture consists of material with low electromagnetic interference inside the calibration facility. The measured value was displayed on an external computer which was connected via USB-interfaces to the laser module. The reference point for the calibration was in each case the geometrical middle point of the field probe. For the frequency range 10 kHz to 1 GHz was used a gtem-cell and for the frequency range 1,05 GHz to 6 GHz was used an anechoic chamber. The calibration was performed in mode 3 for the frequency range 10 kHz to 400 MHz (10 Hz filter on) and in mode 0 in the frequency range 30 MHz to 6 GHz (100 Hz filter on).
3.6	Measurement cycles 1-3:	Each of the three sensors (X, Y, Z) was positioned parallel to the E-field vector of the calibration facility. The frequency response was recorded at a calibration field strength of 10 V/m (unipolar value). All measured field strength results stated in this document represent averaged values from 5 single power measurements. Used calibration software: WIN6000 V1.35

Pictures to the probe positions in the calibration facility:

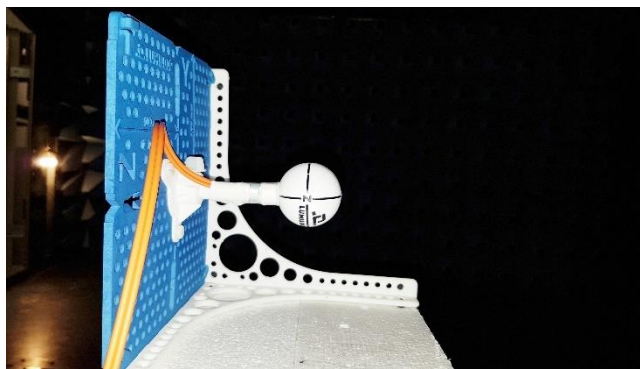


(x-position in GTEM-cell)



(x-position in anechoic chamber)

figure 1

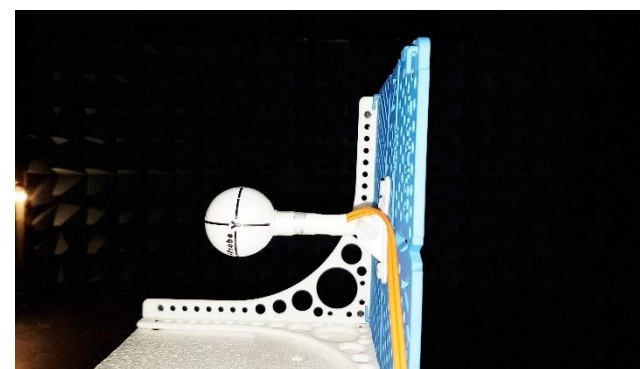


(y-position in GTEM-cell)

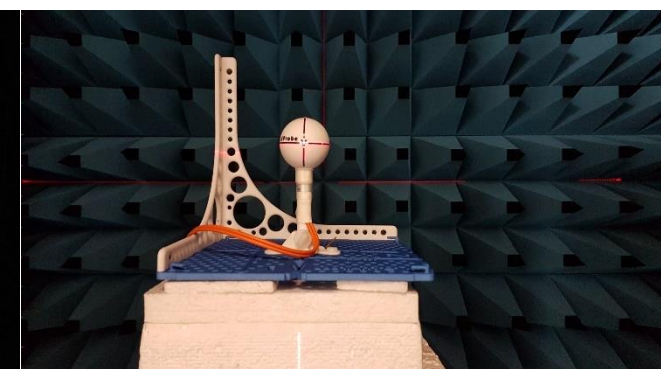


(y-position in anechoic chamber)

figure 2



(z-position in GTEM-cell)



(z-position in anechoic chamber)

figure 3

4. Environmental conditions

Temperature: $(23 \pm 2) ^\circ\text{C}$
Humidity: $(50 \pm 15) \%$

5. Measurement results

5.1 Measurement cycles

1 ... 3 see following pages

5.2 Uncertainty in measurements

The reproduction of the calibration field in the calibration facilities has a relatively uncertainty of:

- $\pm 1,3 \text{ dB}$ in frequency range 10 kHz to <10 MHz,
- $\pm 1,5 \text{ dB}$ in frequency range 10 MHz to 1000 MHz,
- $\pm 1,0 \text{ dB}$ in frequency range >1000 MHz to 6000 MHz

Indicated are the expanded relative uncertainties resulting from the standard deviation multiplied by the expansion factor $k=2$, as given by DAkkS-DKD-3. It does not contain any contribution concerning the long-term instability of the calibration object. The measured values are within the given interval with a probability of 95%.

frequency response LSProbe 1.2 (x-antenna parallel to the electric field vector positioned, Mode 3)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- x-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility: GTEM-
cell

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
0.01	10.04	10.05	1.00	0.00
0.03	10.00	9.73	1.03	0.24
0.05	10.03	9.79	1.02	0.21
0.07	10.02	9.78	1.02	0.21
0.1	10.01	9.68	1.03	0.29
0.3	10.02	9.87	1.02	0.13
0.5	10.02	9.51	1.05	0.46
0.7	10.01	9.80	1.02	0.18
1	10.00	9.74	1.03	0.23
3	10.00	9.78	1.02	0.20
5	10.00	9.79	1.02	0.19
7	10.00	9.79	1.02	0.19
10	10.01	9.75	1.03	0.23
20	9.93	9.79	1.01	0.12
30	10.02	9.73	1.03	0.25
40	9.99	9.61	1.04	0.34
50	10.01	9.71	1.03	0.26
60	10.02	9.69	1.03	0.28
70	10.06	9.83	1.02	0.20
80	10.01	9.75	1.03	0.23
90	9.99	9.63	1.04	0.32
100	10.08	9.78	1.03	0.26
120	9.92	9.65	1.03	0.24
140	9.98	9.67	1.03	0.27
160	10.08	9.70	1.04	0.33
180	9.90	9.86	1.00	0.04
200	9.87	9.68	1.02	0.17
220	9.91	9.79	1.01	0.10
240	9.99	10.03	1.00	-0.03
260	9.96	10.17	0.98	-0.18
280	9.90	9.91	1.00	-0.01
300	10.08	9.91	1.02	0.14
320	9.98	9.96	1.00	0.02
340	9.98	10.02	1.00	-0.03
360	10.01	9.96	1.00	0.04
380	9.99	10.27	0.97	-0.24
400	9.99	10.35	0.97	-0.31

frequency response LSProbe 1.2 (y-antenna parallel to the electric field vector positioned, Mode 3)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- y-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility: GTEM-
cell

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
0.01	10.08	9.39	1.07	0.61
0.03	10.04	9.10	1.10	0.85
0.05	10.03	9.08	1.10	0.87
0.07	10.01	9.11	1.10	0.82
0.1	10.02	9.26	1.08	0.69
0.3	10.02	9.22	1.09	0.72
0.5	10.04	9.10	1.10	0.85
0.7	10.01	9.16	1.09	0.77
1	10.03	9.06	1.11	0.88
3	10.00	9.17	1.09	0.76
5	10.02	9.19	1.09	0.74
7	10.00	9.21	1.09	0.72
10	10.01	9.14	1.09	0.79
20	9.92	9.12	1.09	0.74
30	10.01	9.07	1.10	0.85
40	10.02	8.96	1.12	0.97
50	10.04	9.06	1.11	0.89
60	10.02	9.03	1.11	0.90
70	10.06	9.10	1.11	0.87
80	10.02	9.05	1.11	0.88
90	10.01	8.96	1.12	0.95
100	10.09	8.89	1.14	1.10
120	9.98	9.02	1.11	0.88
140	9.94	8.86	1.12	1.00
160	10.09	8.96	1.13	1.03
180	9.91	9.10	1.09	0.74
200	9.87	8.92	1.11	0.88
220	9.98	9.05	1.10	0.85
240	10.05	9.39	1.07	0.60
260	9.92	9.46	1.05	0.41
280	9.88	9.20	1.07	0.62
300	10.06	9.13	1.10	0.84
320	9.95	9.11	1.09	0.77
340	9.95	9.15	1.09	0.73
360	9.95	9.04	1.10	0.83
380	9.95	9.27	1.07	0.62
400	9.99	9.54	1.05	0.40

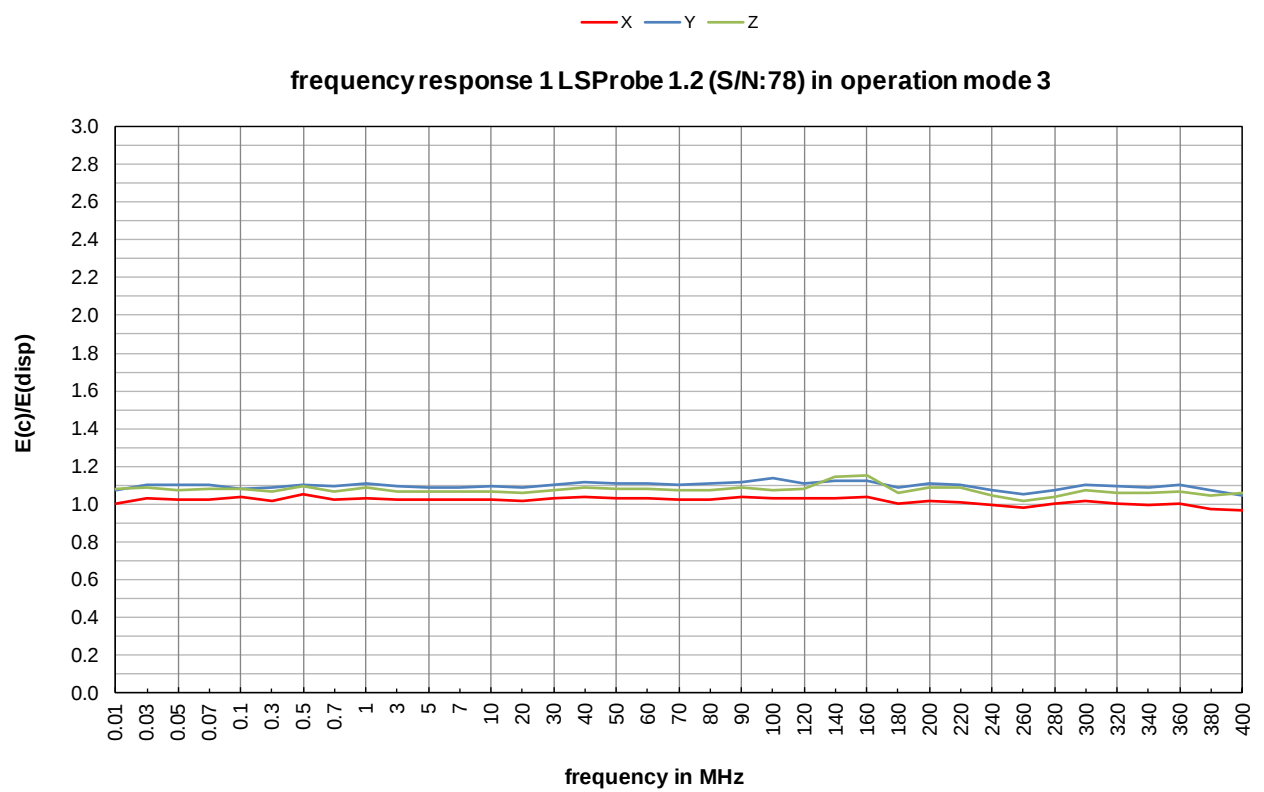
frequency response LSProbe 1.2 (z-antenna parallel to the electric field vector positioned, Mode 3)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- z-antenna parallel to the
electric field vector
- y-antenna in front to the
feeding point

calibration facility: GTEM-
cell

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
0.01	9.99	9.25	1.08	0.67
0.03	10.00	9.21	1.09	0.71
0.05	10.00	9.29	1.08	0.64
0.07	10.01	9.29	1.08	0.65
0.1	10.00	9.24	1.08	0.69
0.3	10.01	9.41	1.06	0.54
0.5	10.01	9.14	1.10	0.79
0.7	10.00	9.35	1.07	0.58
1	10.00	9.22	1.08	0.70
3	9.99	9.39	1.06	0.53
5	9.98	9.38	1.06	0.54
7	9.99	9.38	1.06	0.54
10	9.99	9.36	1.07	0.57
20	9.95	9.38	1.06	0.51
30	9.99	9.29	1.08	0.63
40	9.97	9.17	1.09	0.73
50	10.01	9.29	1.08	0.64
60	10.01	9.26	1.08	0.67
70	10.06	9.35	1.08	0.63
80	9.99	9.32	1.07	0.61
90	9.99	9.21	1.08	0.71
100	10.06	9.39	1.07	0.59
120	9.97	9.26	1.08	0.64
140	9.92	8.69	1.14	1.15
160	9.97	8.66	1.15	1.22
180	9.97	9.44	1.06	0.47
200	9.87	9.06	1.09	0.74
220	9.98	9.15	1.09	0.75
240	9.97	9.54	1.05	0.39
260	9.92	9.73	1.02	0.17
280	9.84	9.47	1.04	0.34
300	10.10	9.44	1.07	0.59
320	9.97	9.43	1.06	0.48
340	9.94	9.38	1.06	0.50
360	9.96	9.33	1.07	0.57
380	9.97	9.52	1.05	0.40
400	10.01	9.48	1.06	0.47



frequency response LSProbe 1.2 (x-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- x-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility: GTEM-
cell

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
30	9.99	9.67	1.03	0.28
40	9.99	9.51	1.05	0.43
50	9.99	9.67	1.03	0.28
60	10.01	9.65	1.04	0.31
70	10.06	9.78	1.03	0.24
80	10.03	9.74	1.03	0.26
90	10.02	9.56	1.05	0.40
100	10.02	9.67	1.04	0.32
120	9.97	9.69	1.03	0.24
140	9.97	9.65	1.03	0.28
160	10.09	9.69	1.04	0.35
180	9.92	9.90	1.00	0.02
200	9.87	9.70	1.02	0.15
220	9.95	9.85	1.01	0.09
240	9.97	10.01	1.00	-0.04
260	9.91	10.18	0.97	-0.24
280	9.85	9.84	1.00	0.01
300	10.06	9.78	1.03	0.25
320	9.96	9.75	1.02	0.18
340	9.96	9.75	1.02	0.18
360	9.98	9.60	1.04	0.34
380	9.96	9.79	1.02	0.15
400	9.96	9.68	1.03	0.25
420	9.98	9.69	1.03	0.25
440	10.08	9.65	1.04	0.37
460	10.06	9.67	1.04	0.34
480	10.08	9.50	1.06	0.51
500	10.08	9.66	1.04	0.37
520	9.95	9.65	1.03	0.26
540	10.09	9.64	1.05	0.39
560	9.98	9.63	1.04	0.31
580	9.96	9.67	1.03	0.25
600	9.95	9.65	1.03	0.26
620	10.02	9.73	1.03	0.25
640	10.02	9.75	1.03	0.24
660	10.01	9.72	1.03	0.25
680	10.02	9.79	1.02	0.20
700	9.97	9.67	1.03	0.26
720	10.05	9.70	1.04	0.31
740	10.05	9.77	1.03	0.25
760	9.99	9.71	1.03	0.25
780	10.01	9.70	1.03	0.27
800	10.01	9.87	1.01	0.12
820	10.01	9.56	1.05	0.39
840	9.99	9.68	1.03	0.28
860	9.99	9.68	1.03	0.28
880	9.99	9.77	1.02	0.20
900	10.01	9.59	1.04	0.37
920	10.03	9.60	1.04	0.38
940	9.99	9.74	1.03	0.23
960	9.99	9.86	1.01	0.12
980	9.97	9.77	1.02	0.18
1000	10.10	9.80	1.03	0.26

frequency response LSProbe 1.2 (y-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- y-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility: GTEM-
cell

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
30	10.03	9.23	1.09	0.72
40	10.02	9.13	1.10	0.80
50	10.02	9.20	1.09	0.74
60	10.02	9.18	1.09	0.76
70	10.07	9.29	1.08	0.70
80	10.01	9.23	1.08	0.70
90	10.01	9.14	1.09	0.78
100	10.06	9.21	1.09	0.77
120	10.01	9.24	1.08	0.69
140	10.01	9.19	1.09	0.74
160	10.09	9.16	1.10	0.83
180	9.93	9.36	1.06	0.52
200	9.87	9.12	1.08	0.68
220	9.99	9.31	1.07	0.61
240	9.97	9.44	1.06	0.47
260	9.87	9.52	1.04	0.31
280	9.89	9.31	1.06	0.52
300	10.08	9.22	1.09	0.77
320	9.98	9.13	1.09	0.78
340	9.99	9.06	1.10	0.86
360	9.95	8.92	1.12	0.95
380	9.96	9.19	1.08	0.70
400	10.01	9.12	1.10	0.80
420	9.98	9.13	1.09	0.78
440	10.10	9.10	1.11	0.91
460	10.06	9.15	1.10	0.82
480	10.09	9.09	1.11	0.90
500	10.09	9.13	1.11	0.87
520	9.96	9.09	1.10	0.79
540	10.11	9.12	1.11	0.90
560	9.99	9.06	1.10	0.86
580	9.96	9.08	1.10	0.80
600	9.96	9.02	1.10	0.86
620	9.96	9.04	1.10	0.84
640	9.96	9.00	1.11	0.88
660	9.99	8.97	1.11	0.94
680	9.99	9.00	1.11	0.91
700	9.96	8.93	1.12	0.95
720	10.02	8.98	1.12	0.95
740	10.03	9.07	1.11	0.87
760	10.01	9.02	1.11	0.90
780	10.02	9.02	1.11	0.91
800	10.01	9.18	1.09	0.75
820	9.99	8.87	1.13	1.03
840	10.01	9.01	1.11	0.91
860	10.01	8.95	1.12	0.96
880	10.01	9.05	1.11	0.87
900	10.01	8.87	1.13	1.04
920	10.02	8.88	1.13	1.05
940	10.01	8.98	1.11	0.94
960	10.01	9.05	1.11	0.87
980	10.03	9.00	1.11	0.94
1000	10.11	8.96	1.13	1.05

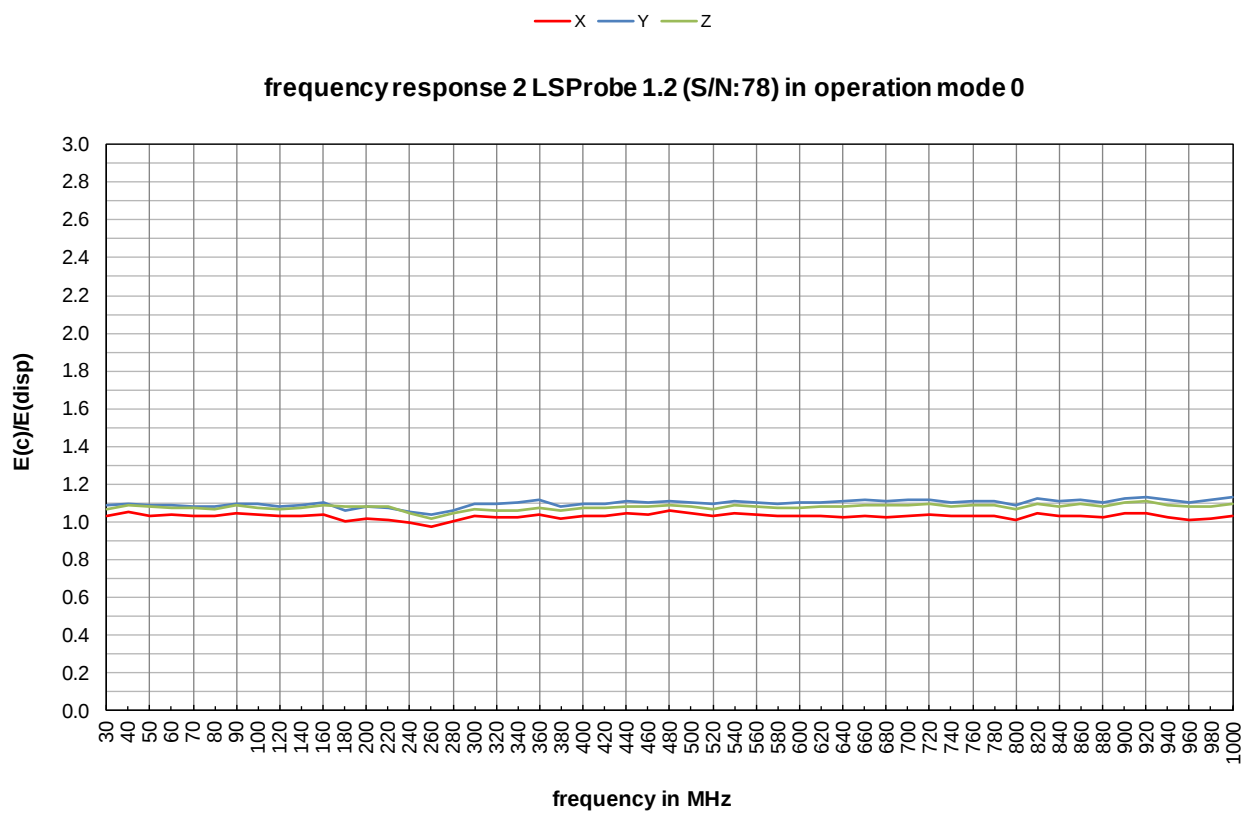
frequency response LSProbe 1.2 (z-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- z-antenna parallel to the
electric field vector
- y-antenna in front to the
feeding point

calibration facility: GTEM-
cell

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
30	10.03	9.38	1.07	0.58
40	10.03	9.23	1.09	0.72
50	10.02	9.29	1.08	0.65
60	10.02	9.30	1.08	0.64
70	10.06	9.38	1.07	0.61
80	10.02	9.36	1.07	0.59
90	10.01	9.21	1.09	0.72
100	10.05	9.32	1.08	0.65
120	10.04	9.40	1.07	0.57
140	9.92	9.25	1.07	0.62
160	10.12	9.30	1.09	0.74
180	9.88	9.14	1.08	0.67
200	9.89	9.14	1.08	0.69
220	9.96	9.19	1.08	0.71
240	9.96	9.53	1.04	0.38
260	9.91	9.74	1.02	0.14
280	9.90	9.48	1.04	0.37
300	10.05	9.42	1.07	0.56
320	10.01	9.45	1.06	0.49
340	9.96	9.38	1.06	0.52
360	9.98	9.26	1.08	0.65
380	9.95	9.38	1.06	0.51
400	9.97	9.28	1.07	0.62
420	9.97	9.29	1.07	0.61
440	10.06	9.28	1.08	0.70
460	10.06	9.32	1.08	0.67
480	10.11	9.28	1.09	0.75
500	10.05	9.30	1.08	0.67
520	9.99	9.34	1.07	0.58
540	10.06	9.23	1.09	0.75
560	9.96	9.23	1.08	0.66
580	9.95	9.26	1.07	0.62
600	10.01	9.33	1.07	0.61
620	9.96	9.22	1.08	0.67
640	9.95	9.20	1.08	0.68
660	9.97	9.18	1.09	0.72
680	9.99	9.17	1.09	0.75
700	9.96	9.13	1.09	0.76
720	10.02	9.13	1.10	0.80
740	10.02	9.24	1.08	0.70
760	10.02	9.20	1.09	0.74
780	10.01	9.18	1.09	0.75
800	9.99	9.35	1.07	0.58
820	9.98	9.09	1.10	0.81
840	9.98	9.22	1.08	0.69
860	10.01	9.13	1.10	0.80
880	9.99	9.24	1.08	0.68
900	9.99	9.05	1.10	0.86
920	10.02	9.05	1.11	0.88
940	10.01	9.18	1.09	0.75
960	9.99	9.22	1.08	0.70
980	9.99	9.22	1.08	0.70
1000	10.09	9.19	1.10	0.81



frequency response LSProbe 1.2 (x-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- x-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
1050	9.99	9.70	1.03	0.25
1100	10.00	9.91	1.01	0.07
1150	9.99	9.92	1.01	0.06
1200	9.99	9.92	1.01	0.06
1250	9.98	9.94	1.00	0.04
1300	9.99	9.99	1.00	0.00
1350	10.00	9.79	1.02	0.19
1400	10.00	10.03	1.00	-0.03
1450	9.98	9.52	1.05	0.41
1500	10.00	9.71	1.03	0.26
1550	9.99	9.82	1.02	0.15
1600	9.98	9.78	1.02	0.18
1650	10.00	9.77	1.02	0.20
1700	10.00	9.75	1.03	0.22
1750	10.00	9.54	1.05	0.40
1800	10.00	9.64	1.04	0.32
1850	10.00	9.75	1.03	0.22
1900	9.96	9.66	1.03	0.27
1950	10.00	9.48	1.05	0.46
2000	10.03	9.49	1.06	0.48
2050	9.94	9.67	1.03	0.23
2100	9.96	9.60	1.04	0.32
2150	9.97	9.64	1.03	0.29
2200	9.97	9.91	1.01	0.06
2250	9.98	9.64	1.04	0.31
2300	9.97	10.05	0.99	-0.06
2350	9.97	9.85	1.01	0.10
2400	9.96	9.96	1.00	-0.01
2450	10.00	9.91	1.01	0.08
2500	9.98	10.19	0.98	-0.18
2550	10.38	10.26	1.01	0.10
2600	10.31	10.19	1.01	0.11
2650	10.27	10.11	1.02	0.13
2700	10.26	10.34	0.99	-0.07
2750	10.26	9.99	1.03	0.23
2800	10.21	10.18	1.00	0.03
2850	10.14	9.98	1.02	0.14
2900	10.24	10.05	1.02	0.16
2950	10.16	9.75	1.04	0.36
3000	10.32	9.95	1.04	0.32
3050	10.33	9.57	1.08	0.67
3100	9.94	9.60	1.03	0.30
3150	10.12	9.37	1.08	0.66
3200	10.09	9.91	1.02	0.16
3250	10.16	9.44	1.08	0.64
3300	10.21	9.83	1.04	0.34
3350	9.94	9.63	1.03	0.27
3400	10.23	9.81	1.04	0.37
3450	10.02	9.82	1.02	0.18
3500	10.02	9.73	1.03	0.26
3550	10.16	9.88	1.03	0.24
3600	10.12	9.85	1.03	0.24
3650	9.99	9.79	1.02	0.17
3700	10.00	10.00	1.00	0.00
3750	10.00	9.74	1.03	0.23
3800	10.21	10.26	1.00	-0.04
3850	10.09	9.74	1.04	0.31
3900	9.98	10.18	0.98	-0.18
3950	10.09	9.67	1.04	0.36
4000	9.89	10.06	0.98	-0.15
4025	9.96	9.72	1.03	0.22
4050	9.97	9.56	1.04	0.37
4075	9.99	9.60	1.04	0.35
4100	9.98	9.65	1.03	0.30

frequency response LSProbe 1.2 (x-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- x-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
4125	9.99	9.55	1.05	0.39
4150	10.00	9.46	1.06	0.49
4175	9.99	9.48	1.05	0.46
4200	9.99	9.42	1.06	0.51
4225	9.98	9.33	1.07	0.59
4250	9.99	9.34	1.07	0.59
4275	9.99	9.36	1.07	0.57
4300	9.99	9.37	1.07	0.56
4325	10.00	9.28	1.08	0.65
4350	9.99	9.38	1.06	0.55
4375	10.00	9.55	1.05	0.40
4400	9.94	9.58	1.04	0.33
4425	10.00	9.61	1.04	0.35
4450	10.00	9.59	1.04	0.36
4475	10.00	9.59	1.04	0.36
4500	10.00	9.56	1.05	0.39
4525	10.00	9.47	1.06	0.48
4550	10.00	9.51	1.05	0.44
4575	10.00	9.33	1.07	0.60
4600	9.98	9.41	1.06	0.52
4625	10.01	9.37	1.07	0.58
4650	10.00	9.41	1.06	0.54
4675	10.00	9.57	1.04	0.38
4700	10.01	9.66	1.04	0.31
4725	10.00	9.71	1.03	0.26
4750	10.00	9.69	1.03	0.28
4775	10.00	9.85	1.02	0.14
4800	10.00	9.92	1.01	0.07
4825	9.99	9.87	1.01	0.10
4850	9.96	9.94	1.00	0.01
4875	9.99	10.04	1.00	-0.04
4900	9.99	10.16	0.98	-0.14
4925	10.00	10.15	0.98	-0.13
4950	9.99	10.19	0.98	-0.18
4975	10.01	10.37	0.97	-0.30
5000	10.00	10.35	0.97	-0.30
5025	9.99	10.37	0.96	-0.32
5050	9.99	10.46	0.96	-0.40
5075	10.00	10.57	0.95	-0.48
5100	10.00	10.38	0.96	-0.33
5125	9.99	10.44	0.96	-0.38
5150	9.98	10.63	0.94	-0.55
5175	9.98	10.56	0.95	-0.49
5200	10.01	10.46	0.96	-0.38
5225	10.01	10.51	0.95	-0.42
5250	10.00	10.51	0.95	-0.43
5275	9.99	10.46	0.95	-0.40
5300	10.01	10.53	0.95	-0.45
5325	10.00	10.54	0.95	-0.46
5350	10.00	10.51	0.95	-0.44
5375	10.00	10.53	0.95	-0.45
5400	10.01	10.71	0.93	-0.59
5425	10.02	10.66	0.94	-0.54
5450	9.98	10.75	0.93	-0.65
5475	9.99	10.62	0.94	-0.54
5500	10.00	10.88	0.92	-0.73
5525	9.99	10.73	0.93	-0.62
5550	10.05	10.99	0.91	-0.78
5575	10.00	10.93	0.91	-0.77
5600	10.01	10.93	0.92	-0.77
5625	10.00	10.94	0.91	-0.78
5650	10.02	10.96	0.91	-0.77
5675	10.04	10.96	0.92	-0.76
5700	10.02	10.99	0.91	-0.81

frequency response LSProbe 1.2 (x-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- x-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
5725	10.02	10.71	0.94	-0.57
5750	10.01	10.78	0.93	-0.65
5775	10.01	10.75	0.93	-0.61
5800	10.03	10.82	0.93	-0.66
5825	9.98	10.69	0.93	-0.60
5850	10.01	10.71	0.94	-0.58
5875	9.98	10.79	0.92	-0.68
5900	10.03	10.81	0.93	-0.65
5925	10.01	10.75	0.93	-0.62
5950	9.99	10.51	0.95	-0.44
5975	10.01	10.25	0.98	-0.20
6000	10.00	10.25	0.98	-0.22

frequency response LSProbe 1.2 (y-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- y-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
1050	9.98	8.87	1.13	1.03
1100	9.99	9.06	1.10	0.84
1150	9.99	9.00	1.11	0.90
1200	9.99	8.92	1.12	0.98
1250	9.99	8.95	1.12	0.95
1300	9.99	8.94	1.12	0.97
1350	10.00	8.77	1.14	1.15
1400	9.99	8.97	1.11	0.93
1450	9.98	8.53	1.17	1.36
1500	10.00	8.69	1.15	1.22
1550	9.98	8.80	1.13	1.09
1600	9.98	8.80	1.13	1.10
1650	10.00	8.76	1.14	1.15
1700	10.01	8.82	1.14	1.10
1750	9.99	8.61	1.16	1.30
1800	10.01	8.64	1.16	1.27
1850	9.99	8.81	1.13	1.09
1900	9.99	8.78	1.14	1.12
1950	10.00	8.61	1.16	1.30
2000	10.03	8.67	1.16	1.27
2050	9.94	8.82	1.13	1.03
2100	9.96	8.80	1.13	1.08
2150	9.97	8.90	1.12	0.99
2200	9.97	9.14	1.09	0.76
2250	10.00	8.95	1.12	0.96
2300	9.97	9.35	1.07	0.56
2350	9.96	9.24	1.08	0.65
2400	9.97	9.42	1.06	0.49
2450	9.95	9.33	1.07	0.56
2500	10.03	9.81	1.02	0.19
2550	10.37	9.86	1.05	0.44
2600	10.31	9.90	1.04	0.35
2650	10.26	9.90	1.04	0.32
2700	10.25	10.18	1.01	0.06
2750	10.25	9.89	1.04	0.31
2800	10.20	10.10	1.01	0.08
2850	10.15	9.97	1.02	0.16
2900	10.22	10.02	1.02	0.17
2950	10.15	9.80	1.04	0.30
3000	10.32	10.01	1.03	0.27
3050	10.32	9.63	1.07	0.61
3100	9.93	9.71	1.02	0.20
3150	10.13	9.47	1.07	0.58
3200	10.08	10.05	1.00	0.03
3250	10.17	9.59	1.06	0.51
3300	10.22	9.97	1.02	0.21
3350	9.93	9.74	1.02	0.17
3400	10.22	9.99	1.02	0.19
3450	10.00	9.98	1.00	0.02
3500	10.03	10.03	1.00	0.00
3550	10.16	10.17	1.00	-0.01
3600	10.12	10.24	0.99	-0.10
3650	9.99	10.16	0.98	-0.15
3700	10.00	10.39	0.96	-0.34
3750	9.99	10.10	0.99	-0.09
3800	10.21	10.63	0.96	-0.35
3850	10.09	10.08	1.00	0.01
3900	10.02	10.48	0.96	-0.39
3950	10.11	9.81	1.03	0.26
4000	9.88	10.01	0.99	-0.11
4025	10.01	10.09	0.99	-0.07
4050	9.99	9.87	1.01	0.11
4075	10.00	9.82	1.02	0.16
4100	9.95	9.78	1.02	0.15

frequency response LSProbe 1.2 (y-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- y-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
4125	9.98	9.67	1.03	0.27
4150	10.00	9.53	1.05	0.42
4175	10.00	9.46	1.06	0.48
4200	10.00	9.50	1.05	0.44
4225	9.98	9.40	1.06	0.52
4250	10.00	9.35	1.07	0.58
4275	10.00	9.42	1.06	0.52
4300	10.00	9.47	1.06	0.47
4325	9.99	9.46	1.06	0.48
4350	10.00	9.60	1.04	0.35
4375	9.99	9.74	1.03	0.22
4400	9.99	9.83	1.02	0.14
4425	10.00	9.93	1.01	0.06
4450	10.00	9.94	1.01	0.05
4475	9.99	10.08	0.99	-0.08
4500	10.00	10.10	0.99	-0.09
4525	10.00	10.26	0.97	-0.23
4550	10.00	10.55	0.95	-0.46
4575	10.00	10.56	0.95	-0.48
4600	9.99	10.77	0.93	-0.65
4625	10.01	10.84	0.92	-0.69
4650	9.98	11.04	0.90	-0.88
4675	10.00	11.22	0.89	-1.00
4700	10.01	11.34	0.88	-1.08
4725	10.01	11.37	0.88	-1.11
4750	10.01	11.50	0.87	-1.20
4775	10.01	11.54	0.87	-1.24
4800	10.05	11.83	0.85	-1.41
4825	9.99	11.76	0.85	-1.41
4850	9.96	11.94	0.83	-1.58
4875	9.98	12.07	0.83	-1.65
4900	10.00	12.27	0.81	-1.78
4925	9.99	12.32	0.81	-1.82
4950	9.99	12.27	0.81	-1.78
4975	10.01	12.54	0.80	-1.96
5000	10.01	12.48	0.80	-1.92
5025	10.00	12.53	0.80	-1.96
5050	10.01	12.59	0.79	-1.99
5075	9.99	12.73	0.78	-2.11
5100	10.00	12.45	0.80	-1.90
5125	9.99	12.46	0.80	-1.92
5150	9.99	12.62	0.79	-2.03
5175	9.98	12.58	0.79	-2.01
5200	9.99	12.30	0.81	-1.80
5225	10.01	12.42	0.81	-1.87
5250	9.98	12.36	0.81	-1.86
5275	10.01	12.30	0.81	-1.79
5300	10.02	12.33	0.81	-1.81
5325	9.98	12.39	0.81	-1.88
5350	10.01	12.28	0.82	-1.77
5375	9.99	12.27	0.81	-1.79
5400	10.00	12.39	0.81	-1.86
5425	10.01	12.35	0.81	-1.83
5450	9.98	12.52	0.80	-1.97
5475	10.02	12.47	0.80	-1.90
5500	10.00	12.61	0.79	-2.01
5525	10.03	12.51	0.80	-1.92
5550	10.00	12.85	0.78	-2.17
5575	10.02	12.96	0.77	-2.23
5600	10.01	12.86	0.78	-2.17
5625	10.01	12.91	0.78	-2.21
5650	9.98	12.89	0.77	-2.22
5675	10.00	12.96	0.77	-2.25
5700	10.02	12.94	0.77	-2.22

frequency response LSProbe 1.2 (y-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- y-antenna parallel to the
electric field vector
- z-antenna in front to the
absorber

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
5725	10.00	12.75	0.78	-2.11
5750	10.03	12.78	0.78	-2.11
5775	10.00	12.76	0.78	-2.12
5800	10.02	12.98	0.77	-2.25
5825	10.00	12.72	0.79	-2.09
5850	10.01	12.70	0.79	-2.07
5875	9.96	12.82	0.78	-2.19
5900	9.98	12.59	0.79	-2.02
5925	10.00	12.63	0.79	-2.02
5950	9.99	12.31	0.81	-1.81
5975	10.01	12.10	0.83	-1.65
6000	10.01	12.05	0.83	-1.61

frequency response LSProbe 1.2 (z-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- z-antenna parallel to the
electric field vector
- y-antenna in front to the
horn antenna

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
1050	9.99	9.02	1.11	0.88
1100	10.00	9.28	1.08	0.65
1150	9.99	9.22	1.08	0.70
1200	9.98	9.18	1.09	0.73
1250	9.98	9.27	1.08	0.65
1300	9.98	9.26	1.08	0.65
1350	10.00	9.06	1.10	0.85
1400	9.99	9.26	1.08	0.67
1450	9.98	8.74	1.14	1.15
1500	9.99	8.89	1.12	1.01
1550	9.99	8.95	1.12	0.95
1600	9.98	8.89	1.12	1.00
1650	10.00	8.90	1.12	1.01
1700	10.01	8.91	1.12	1.01
1750	10.00	8.74	1.14	1.17
1800	10.00	8.80	1.14	1.11
1850	10.00	8.99	1.11	0.93
1900	10.00	8.97	1.11	0.94
1950	10.00	8.79	1.14	1.12
2000	10.03	8.86	1.13	1.07
2050	9.95	9.07	1.10	0.80
2100	9.98	9.11	1.10	0.79
2150	9.97	9.22	1.08	0.68
2200	9.98	9.55	1.05	0.38
2250	9.99	9.38	1.06	0.55
2300	9.95	9.80	1.02	0.14
2350	9.96	9.72	1.02	0.21
2400	9.97	9.92	1.01	0.05
2450	9.96	9.86	1.01	0.09
2500	10.00	10.31	0.97	-0.26
2550	10.38	10.44	0.99	-0.05
2600	10.30	10.47	0.98	-0.14
2650	10.27	10.47	0.98	-0.16
2700	10.27	10.80	0.95	-0.44
2750	10.25	10.46	0.98	-0.18
2800	10.20	10.73	0.95	-0.44
2850	10.15	10.59	0.96	-0.37
2900	10.22	10.72	0.95	-0.42
2950	10.16	10.51	0.97	-0.29
3000	10.32	10.81	0.95	-0.40
3050	10.32	10.46	0.99	-0.12
3100	9.94	10.63	0.93	-0.59
3150	10.11	10.43	0.97	-0.26
3200	10.08	11.14	0.90	-0.87
3250	10.16	10.67	0.95	-0.43
3300	10.21	11.13	0.92	-0.75
3350	9.94	10.93	0.91	-0.83
3400	10.23	11.18	0.92	-0.77
3450	10.03	11.17	0.90	-0.94
3500	10.04	11.12	0.90	-0.89
3550	10.16	11.30	0.90	-0.92
3600	10.11	11.30	0.89	-0.96
3650	9.99	11.22	0.89	-1.01
3700	10.00	11.39	0.88	-1.13
3750	9.99	11.13	0.90	-0.93
3800	10.21	11.66	0.88	-1.15
3850	10.09	11.16	0.90	-0.87
3900	10.02	11.58	0.87	-1.25
3950	10.09	11.06	0.91	-0.79
4000	9.89	11.31	0.87	-1.17
4025	10.01	11.13	0.90	-0.91
4050	9.99	11.00	0.91	-0.84
4075	10.01	11.01	0.91	-0.83
4100	10.01	11.14	0.90	-0.93

frequency response LSProbe 1.2 (z-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- z-antenna parallel to the
electric field vector
- y-antenna in front to the
horn antenna

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
4125	10.03	11.15	0.90	-0.92
4150	10.00	10.96	0.91	-0.79
4175	10.00	11.13	0.90	-0.93
4200	9.99	11.07	0.90	-0.89
4225	9.99	11.10	0.90	-0.92
4250	9.99	11.13	0.90	-0.94
4275	10.00	11.24	0.89	-1.01
4300	9.99	11.27	0.89	-1.05
4325	9.99	11.19	0.89	-0.98
4350	9.99	11.37	0.88	-1.12
4375	10.00	11.52	0.87	-1.23
4400	9.99	11.61	0.86	-1.30
4425	10.00	11.58	0.86	-1.28
4450	10.01	11.59	0.86	-1.27
4475	9.97	11.62	0.86	-1.33
4500	9.98	11.56	0.86	-1.27
4525	10.01	11.63	0.86	-1.30
4550	10.00	11.78	0.85	-1.42
4575	9.99	11.68	0.86	-1.36
4600	9.99	11.93	0.84	-1.54
4625	10.01	11.89	0.84	-1.49
4650	9.98	12.02	0.83	-1.61
4675	10.01	12.14	0.82	-1.68
4700	10.00	12.23	0.82	-1.74
4725	10.01	12.26	0.82	-1.76
4750	10.01	12.28	0.82	-1.77
4775	10.00	12.45	0.80	-1.90
4800	10.02	12.67	0.79	-2.04
4825	10.00	12.61	0.79	-2.01
4850	9.99	12.97	0.77	-2.27
4875	9.99	13.22	0.76	-2.44
4900	10.00	13.42	0.75	-2.56
4925	9.99	13.51	0.74	-2.62
4950	9.99	13.53	0.74	-2.64
4975	10.00	13.91	0.72	-2.87
5000	10.00	13.92	0.72	-2.87
5025	10.00	13.93	0.72	-2.88
5050	10.00	14.11	0.71	-2.99
5075	10.00	14.33	0.70	-3.13
5100	9.99	14.04	0.71	-2.95
5125	9.98	14.11	0.71	-3.01
5150	9.99	14.35	0.70	-3.15
5175	10.00	14.28	0.70	-3.09
5200	9.95	14.09	0.71	-3.02
5225	10.02	14.15	0.71	-3.00
5250	10.00	14.08	0.71	-2.97
5275	9.99	14.04	0.71	-2.96
5300	10.01	13.99	0.72	-2.91
5325	10.01	14.12	0.71	-2.99
5350	10.03	13.96	0.72	-2.87
5375	9.98	13.85	0.72	-2.84
5400	9.98	13.91	0.72	-2.88
5425	10.02	13.89	0.72	-2.83
5450	9.97	13.89	0.72	-2.88
5475	9.99	13.75	0.73	-2.78
5500	9.99	13.85	0.72	-2.83
5525	10.01	13.67	0.73	-2.71
5550	10.02	13.90	0.72	-2.85
5575	9.99	14.00	0.71	-2.94
5600	10.03	13.90	0.72	-2.84
5625	9.98	13.75	0.73	-2.79
5650	10.02	13.82	0.72	-2.80
5675	10.02	13.76	0.73	-2.76
5700	10.01	13.80	0.73	-2.78

frequency response LSProbe 1.2 (z-antenna parallel to the electric field vector positioned, Mode 0)

probe : LSProbe 1.2
S/N : 78
interface : CI250 V1.2
S/N : 126

probe position:
- z-antenna parallel to the
electric field vector
- y-antenna in front to the
horn antenna

calibration facility:
anechoic chamber

frequency in MHz	E(c) in V/m	E(dis) in V/m	E(c)/E(dis)	E(c)/E(dis) in dB
5725	9.99	13.46	0.74	-2.59
5750	9.99	13.52	0.74	-2.63
5775	10.03	13.48	0.74	-2.57
5800	9.99	13.68	0.73	-2.73
5825	10.02	13.47	0.74	-2.57
5850	9.98	13.37	0.75	-2.54
5875	10.02	13.58	0.74	-2.64
5900	9.99	13.51	0.74	-2.62
5925	10.02	13.54	0.74	-2.61
5950	10.00	13.37	0.75	-2.53
5975	10.00	13.17	0.76	-2.39
6000	10.01	12.94	0.77	-2.23

— X — Y — Z

frequency response 2 LSProbe 1.2 (S/N:78) in operation mode 0

