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TCB ID: DE0001



Accredited by the
German Accreditation Council
DAR–Registration Number
TTI–P–G 166/98-30



Independent ETSI
compliance test house



Test report No.: 5-4117-01-18/02

Applicant : BALOGH S.A.

Type : LMB_6013

FCC-ID : QNOLMB-6013

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item .

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Tester :

Date	Name	Signature
12.12.02	Detlev Gillmann	

Technical responsibility for area of testing:

Date	Name	Signature
12.12.02	Dirk Hausknecht	

1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimerstraße 6–10

D-66117 Saarbrücken

Germany

P.O. Box 10 04 45

D-66004 Saarbrücken

Germany

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Fax : + 49 (0) 681 598–9075

e-mail: info@ict.cetecom.de

Internet: <http://www.cetecom.ict.de>

Accredited testing laboratory

Accredited by : Regulierungsbehörde für Telekommunikation und Post (RegTP)

Listed by : Federal Communications Commission (FCC)

Authority	Identification/Registration No.
RegTP	TTI-P-G 166/98-30
FCC	90462

Testing location, if different from CETECOM ICT Services GmbH: (Not applicable)

Name : Not applicable

1.3 Details of applicant

Name : Balogh S.A.

Street : 105, rue general Eisenhower

Town : 31023 Toulouse Cedex 1

Country : France

Tel. : +33 561 194 380

Fax : +33 561 194 881

Contact person

Name : Philippe Gobrecht

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Fax : +33 561 194 881

e-mail : philippe.gobrecht@balogh-group.com

1.4 Application details

Date of application : 25.09.2002

Date of receipt of EUT : 25.11.2002

Date of test : 25.11. – 28.11.2002

Person (s) who have been : Mathieu GUERIN
present during the test

Description of EUT : Compact readers for tag with internal antenna
Identification system

System designation :
Type designation : **LMB_6013**
Manufacturer : see applicant

1.6 Technical data

Frequency range(Radio Regul.) : 2.435 000 GHz ... 2.465 000 GHz
Frequency range (EUT) : 2.435 250 GHz ... 2.464 750 GHz
Operational frequency : 2.435 250 GHz
Operational frequency : 2.450 000 GHz
Operational frequency : 2.464 750 GHz
Type of modulation : 250KNON
Antenna name;type : 13182 (1x1patches)
Normal DC power supply : U nom = 12.0V or 24.0V
Extreme DC power supply : U min = 11.0 V
: U max = 28.0 V

1.6.1 Operation conditions

Operation: :
Purpose of operation : Identification System

1.6.2 Equipment under test

Type LMB_6013		
Constitution of Equipment	Reference	Reference mark
Circuit Board with Equipment and Shielding alveolar structure	13053	P 04X04
Internal antenna board (1x1 patches)	13182	P 04
Hyper TAG - BDG_1020	1020X01	-
Hyper TAG - BDG_1051	1051X01	-
Hyper TAG - BDG_1090	1090X01	-

**Remark: all 3 TAGs are identical due to their function and their electrical behaviour.
The measurements were performed with TAG – BDG_1090**

1.7 **Test standard : Code of Federal Regulations (CFR 47)**
Federal Communications Commission (FCC)

FCC Part 15 **Radio Frequency Devices (07/2002)**
Section 15.245
Operation within the band 2.435 to 2.465 MHz.

Section 15.209
Radiation emission limits, general requirements

Section 15.205
Restricted bands of operation.

2. **Technical test**

2.1 **Summary of test results**

☒ No deviations from the technical specification (s) were ascertained in the course of the performed tests.

☐

This test report :

☒ describes the first test

☐ describes an additional test

☐ is a verification of documents

☐ is only valid with the test report no.

2.2 **Test environment**

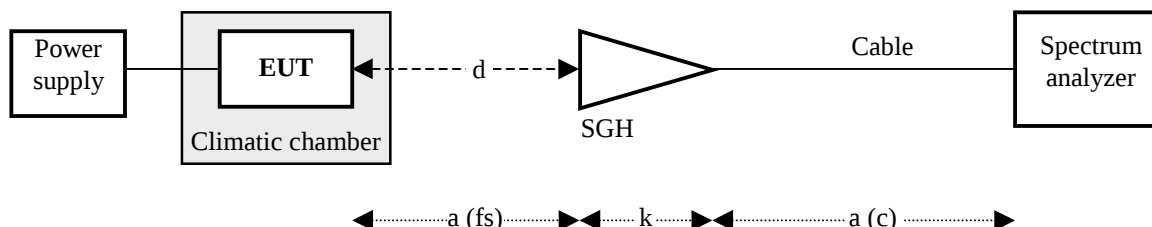
The environmental conditions are documented especially for each test.

2.3 **Measurement and test set-up**

The measurement and test set-up is defined in the technical specification .

2.4 Test equipment utilized and test set-up

2.4.1 Field strength and spurious radiation in the frequency range 2.0 GHz to 40 GHz



Frequency f [GHz]	Distance d [m]	SGH	Antenna factor k [dB 1/m]	Distance correction dc (3 m/Xm) [dB]	Cable loss a [dB]
2.45	3.0	fmi0893-NF10	27.49	-	1.0
4.90	1.0	narda 643	27.21	- 9.54	1.0
7.35	1.0	narda 642	29.94	- 9.54	1.5
7.35	0.5	narda 642	33.64	-15.56	1.5
8.0–10.0	0.5	narda 640	33.64	-15.56	2.0
10.0–12.5	0.5	narda 640	33.64	-15.58	2.3
12.0–18.0	0.25	narda 639	36.83	-21.58	2.5
18.0–26.5	0.25	narda 638	40.35	-21.58	3.0
26.0–40.0	0.25	narda 639	44.17	-21.58	6.0

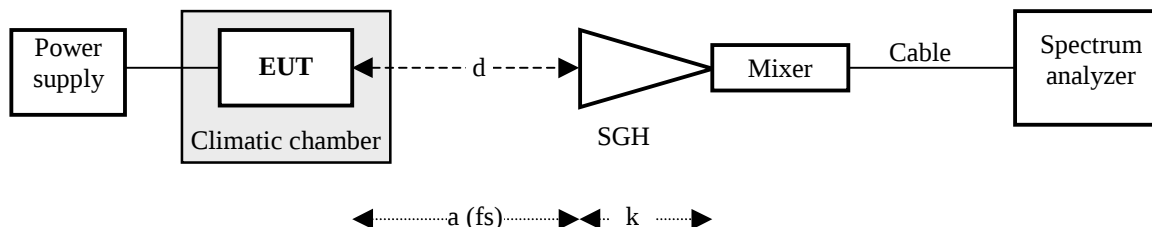
Calculation : Field strength = Analyser reading + Cable loss + Antenna factor

Test equipment	Manufacturer	Type	Cetecom reference
Spectrum Analyser	HP	HP 8565E	300001665
Fmi 1.7 2.6 GHz	fmi	0824-10	300000230
SGH 3.955.85GHz	narda	613 A	300000230
SGH 5.48.2 GHz	narda	642	300002445
SGH 8.2 ... 12.4 GHz	narda	640	300002213
SGH 12.0.. 18.0 GHz	narda	639	300002214
SGH 18.0.. 27.0 GHz	narda	638	300002442
RF-cable	HP	5061-5359	300002035

Measurement uncertainty

Test parameter	Measurement uncertainty
Power supply	±0.1 VDC
Temperature	±0.2 °C
Frequency	±0.01 ppm

2.4.2 Field strength and spurious radiation in the frequency range 33 GHz to 110 GHz



Frequency f [GHz]	Distance d [m]	Distance correction dc (3 m/Xm) [dB]	Antenna factor k [dB 1/m]
42.0	1.0	-9.54	38.98
52.5	1.0	-9.54	39.66
63.0	0.5	-15.56	45.5
73.5	0.5	-15.56	41.5
84.0	0.5	-15.56	40.0

Calculation : Field strength = Analyser reading + Cable loss + Antenna factor + Distance correction

$$e = u + a + k + dc$$

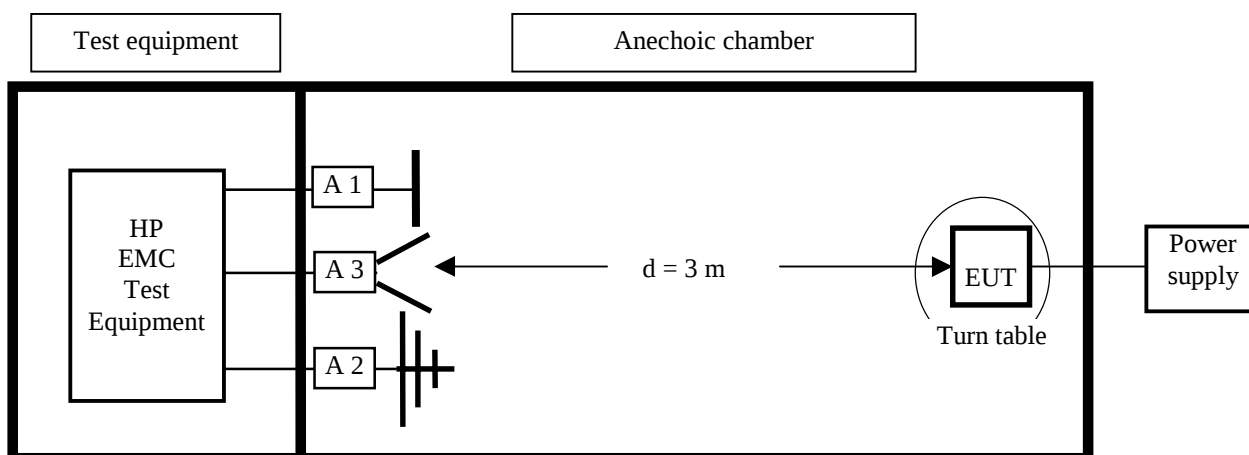
Test equipment	Manufacturer	Type	CETECOM reference
Spectrum Analyser	HP	HP 8565E	300001665
Power supply	HP	6032A	300002115
SGH 33 ... 50 GHz	Thomson	COR 33_50	300000812
Mixer 33 ... 50 GHz	HP	11970Q	300000781i
SGH 50 ... 75 GHz	Thomson	COR 50_75	300000789k
Mixer 50 ... 75 GHz	HP	11970V	300000871o
SGH 75 ... 110 GHz	Thomson	COR 75_110	300000789m
Mixer 50 ... 110 GHz	HP	11970W	300000871v

Measurement uncertainty

Test parameter	Measurement uncertainty
Power supply	±0.1 VDC
Temperature	±0.2 °C
Frequency	±0.01 ppm
eirp	±1.0 dB

2.4.3 Field strength and spurious radiation in the frequency range 9 kHz to 4 GHz

Set-up for radiated measurements



Test equipment	Manufacturer	Type	Serial No.
Spectrum analyser	HP	HP 85660B	2478A05306
Analyser display	HP	HP 85662A	2816A16541
Quasi peak adapter	HP	HP 85650A	2811A01131
RF-preselector	HP	HP 85685A	2833A00768
Biconical antenna A 1	Emco	3104	3758
Log.-per.-antenna A 2	Emco	3146	2304
Double ridge horn ant. A 3	Emco	3115	3007
Relay switch	R&S	RSU	375 339/002
High pass filter	FSY Microwave	HM 985955	001
Amplifier	Tron-Tech	P42-GA29	B2302
Power supply	HP	HP 6038A	2848A07027
RF-cable	HP	5061-5359	P36303

Measurement uncertainties

Performance	Measurement uncertainty
Input power (DC)	±0.1 V
Temperature	±0.2 °C
Frequency	±0.01 ppm
RF-power	±1.5 dB

2.5 **Test results**

2.5.1 **Test results overview**

This test was performed :

☐ in addition to the test report no.

Verification of EUT :

- ☒ EUT is in accordance with the technical description
- ☐ EUT is not in accordance with the technical description
- ☒ The equipment is compliant to FCC requirement
- ☐ Equipment Class
- ☐ Power Class
- ☐ Duty cycle Class

2.5.2 **Summary of test results**

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 60 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform with specifications ANSI C63.2-1987 clause 15 and ANSI C63.4-1992 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.

The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-1992 clause 4.2.

2.5.3 Test results in details

Equipment under test (EUT) : LMB_6013

Ambient temperature : 23 °C

Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

FUNDAMENTAL FREQUENCY

Microwave module : LMB_6013 TX: 2.450 GHz operating in CW

Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER			
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]	See plot on page
T (nom) = Fehler! Unbekannter Name für Dokument-Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	2.450 003	56.66	680.77	17
	U (min) = 11.0 V	2.450 003	56.66	680.77	17
	U (max) = 28.0 V	2.450 003	56.66	680.77	17

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBmV/m]	Field strength E [mV/m]
2.435 – 2.465	3.0	67.9	500
Harmonics	3.0	27.9	1.6

Verdict : Field strength limit is kept

2.5.3 Test results in details

Equipment under test (EUT) : **LMB_6013**

Ambient temperature : 23 °C

Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

FUNDAMENTAL FREQUENCY

Microwave module : **LMB_6013** TX: 2.435 250 GHz operating in CW

Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER		
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = Fehler! Unbekannter Name für Dokument-Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	2.435 255	55.12	510.16
	U (min) = 11.0 V	2.435 255	55.12	510.16
	U (max) = 28.0 V	2.435 255	55.12	510.16

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBmV/m]	Field strength E [mV/m]
2.435 – 2.465	3.0	67.9	500
Harmonics	3.0	27.9	1.6

Verdict : Field strength limit is kept

2.5.3 Test results in details

Equipment under test (EUT) : LMB_6013

Ambient temperature : 23 °C

Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

FUNDAMENTAL FREQUENCY

Microwave module : LMB_6013 TX: 2.464 750 GHz operating in CW

Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER		
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = Fehler! Unbekannter Name für Dokument-Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	2.464 756	54.83	551.442
	U (min) = 11.0 V	2.464 756	54.83	551.442
	U (max) = 28.0 V	2.464 756	54.83	551.442

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBmV/m]	Field strength E [mV/m]
2.435 – 2.465	3.0	67.9	500
Harmonics	3.0	27.9	1.6

Verdict : Field strength limit is kept

2.5.3 Test results in details

EUT : **LMB_6013**

Ambient temperature : 23 °C

Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

HARMONIC FREQUENCIES

Microwave module : **LMB_6013** TX: 2.450 GHz operating in CW

Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER			
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]	See plot on page
T (nom) = Fehler! Unbekannter Name für Dokument-Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	4.900 006	- 17.83	0.13	18
	U (min) = 11.0 V	4.900 006	- 17.83	0.13	18
	U (max) = 28.0 V	4.900 006	- 17.83	0.13	18

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3.0	27.9	1.6

Verdict : Field strength limit is kept

EUT : **LMB_6013**
 Ambient temperature : 23 °C
 Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

HARMONIC FREQUENCIES

Microwave module : **LMB_6013** TX: 2.450 GHz operating in CW
 Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER			
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]	See plot on page
T (nom) = Fehler! Unbekannter Name für Dokument-Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	7.350 002	- 18.95	0.11	19
	U (min) = 11.0 V	7.350 002	- 18.95	0.11	19
	U (max) = 28.0 V	7.350 002	- 18.95	0.11	19

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500

Verdict : Field strength limit is kept

SECTION 15.245

Microwave module : LMB_6013 TX: 2.450 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER			
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]	See plot on page
T (nom) = Fehler! Unbekannter Name für Dokument- Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	9.800 013	- 30.14	0.031	20
	U (min) = 11.0 V	9.800 013	- 30.14	0.031	20
	U (max) = 28.0 V	9.800 013	- 30.14	0.031	20

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength E [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3	87.9 = 27.9 dBmV/m	25.000

Verdict : Field strength limit is kept

2.5.3 Test results in details

EUT : **LMB_6013**
 Ambient temperature : 23 °C
 Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

HARMONIC FREQUENCIES

Microwave module : **LMB_6013** TX: 2.435 250 GHz operating in CW
 Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER		
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = Fehler! Unbekannter Name für Dokument- Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	4.870 509	- 18.45	0.12
	U (min) = 11.0 V	4.870 509	- 18.45	0.12
	U (max) = 28.0 V	4.870 509	- 18.45	0.12

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3.0	27.9	1.6

Verdict : Field strength limit is kept

EUT : **LMB_6013**
 Ambient temperature : 23 °C
 Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

HARMONIC FREQUENCIES

Microwave module : **LMB_6013** TX: 2.435 250 GHz operating in CW
 Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER		
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = Fehler! Unbekannter Name für Dokument-Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	7.305 767	- 19.60	0.10
	U (min) = 11.0 V	7.305 767	- 19.60	0.10
	U (max) = 28.0 V	7.305 767	- 19.60	0.10

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500

Verdict : Field strength limit is kept

2.5.3 Test results in details

EUT : **LMB_6013**
 Ambient temperature : 23 °C
 Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

HARMONIC FREQUENCIES

Microwave module : **LMB_6013** TX: 2.464 750 GHz operating in CW
 Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER		
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = Fehler! Unbekannter Name für Dokument- Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	4.929 513	- 18.06	0.125
	U (min) = 11.0 V	4.929 513	- 18.06	0.125
	U (max) = 28.0 V	4.929 513	- 18.06	0.125

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3.0	27.9	1.6

Verdict : Field strength limit is kept

EUT : **LMB_6013**
 Ambient temperature : 23 °C
 Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

HARMONIC FREQUENCIES

Microwave module : **LMB_6013** TX: 2.464 750 GHz operating in CW
 Antenna assembly: Integral antenna (1x1patches)

TEST CONDITIONS		TRANSMITTER POWER		
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = Fehler! Unbekannter Name für Dokument-Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	7.394 270	- 19.31	0.108
	U (min) = 11.0 V	7.394 270	- 19.31	0.108
	U (max) = 28.0 V	7.394 270	- 19.31	0.108

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8

LIMITS:

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500

Verdict : Field strength limit is kept

SECTION 15.245

Microwave module : LMB_6013 TX: 2.464 750 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER		
Power supply (DC)		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = Fehler! Unbekannter Name für Dokument- Eigenschaft. °C	U (nom) = 12.0 V or = 24.0 V	9.859 026	- 30.84	0.029
	U (min) = 11.0 V	9.859 026	- 30.84	0.029
	U (max) = 28.0 V	9.859 026	- 30.84	0.029

LIMITS: **SECTION 15.245 / 15.205 / 15.209**

Frequency range (MHz)	Measurement distance [m]	Field strength E [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3	87.9 = 27.9 dBmV/m	25.000

Verdict : Field strength limit is kept

EUT : **LBM_6013**

Ambient temperature : 23 °C

Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

SPURIOUS FREQUENCIES

Microwave module : LBM_6013 2.450 GHz operating in CW

Antenna assembly: Integral patch antenna

TEST CONDITIONS	TRANSMITTER SPURIOUS FIELD STRENGTH			
Frequency range [MHz]	Spurious frequencies [MHz]	S A e [dBμV/m]	E [μV/m]	See plot on page
0.009 – 30.000	0.100	33.35	46.5	21
0.030 – 4 000 (h + v)	Noise (without Tx=2 450)	<< limit	<< limit	29
4 000 – 6 000 (h + v)	5 187 (Noise) (2. harmonic see plot 2)	44.85	174.783	22
6 000 – 8 000 (h + v)	7 113 (Noise) (3. harmonic see pot 3)	42.22	129.122	23
8 000 – 10 000 (h + v)	8 233 (Noise)	47.25	230.409	24
10 000 – 12 500 (h + v)	11 075 (Noise)	47.71	242.940	25
12 000 – 18 000 (h + v)	14 600 (Noise)	47.63	240.713	26
18 000 – 26.500 (h + v)	25 747 (Noise)	53.31	462.91	27
26 500 – 40 000 (h + v)	37 130 (Noise)	49.83	310.01	28

LIMITS:

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3	87.9 = 27.9 dBmV/m	25.000

REFERENCE OF TEST EQUIPMENT USED : see test set-up on pages 8, 9 and 10

Verdict : Spurious limits are kept

EUT : LBM_6013

Ambient temperature : 23 °C

Relative humidity : 55 %

TRANSMITTER PARAMETERS

SECTION 15.245

SPURIOUS FREQUENCIES

Microwave module : LBM_6013 2.435 250 GHz operating in CW

Antenna assembly: Integral patch antenna

TEST CONDITIONS	TRANSMITTER SPURIOUS FIELD STRENGTH		
Frequency range [MHz]	Spurious frequencies [MHz]	S A e [dBμV/m]	E [μV/m]
0.009 – 30.000	0.100	33.10	45.2
0.030 – 4 000 (h + v)	Noise (without Tx=2 435 250)	<< limit	<< limit
4 000 – 6 000 (h + v)	5 163 (Noise) (2. harmonic see plot 2)	42.55	134.12
6 000 – 8 000 (h + v)	7 059 (Noise) (3. harmonic see pot 3)	41.64	120.781
8 000 – 10 000 (h + v)	8 270 (Noise)	46.13	202.535
10 000 – 12 500 (h + v)	11 007 (Noise)	46.30	206.538
12 000 – 18 000 (h + v)	14 514 (Noise)	47.19	228.823
18 000 – 26.500 (h + v)	25 594 (Noise)	52.12	403.645
26 500 – 40 000 (h + v)	36 894 (Noise)	48.25	258.523

LIMITS:

SECTION 15.245 / 15.205 / 15.209

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBμV/m] @ 3 m	Field strength E [μV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3	87.9 = 27.9 dBmV/m	25.000

REFERENCE OF TEST EQUIPMENT USED : see test set-up on pages 8, 9 and 10

Verdict : Spurious limits are kept

SECTION 15.245

Microwave module : LBM_6013 2.464 750 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS	TRANSMITTER SPURIOUS FIELD STRENGTH		
Frequency range [MHz]	Spurious frequencies [MHz]	S A e [dBμV/m]	E [μV/m]
0.009 – 30.000	0.100	31.72	38.54
0.030 – 4 000 (h + v)	Noise (without Tx=2 464 750)	<< limit	<< limit
4 000 – 6 000 (h + v)	5 200 (Noise) (2. harmonic see plot 2)	43.58	151.008
6 000 – 8 000 (h + v)	7 250 (Noise) (3. harmonic see pot 3)	41.21	114.947
8 000 – 10 000 (h + v)	8 233 (Noise)	46.53	212.080
10 000 – 12 500 (h + v)	11 140 (Noise)	46.23	204.880
12 000 – 18 000 (h + v)	14 687 (Noise)	47.48	236.591
18 000 – 26.500 (h + v)	25 902 (Noise)	52.66	429.536
26 500 – 40 000 (h + v)	37 353 (Noise)	49.71	305.844

SECTION 15.245 / 15.205 / 15.209

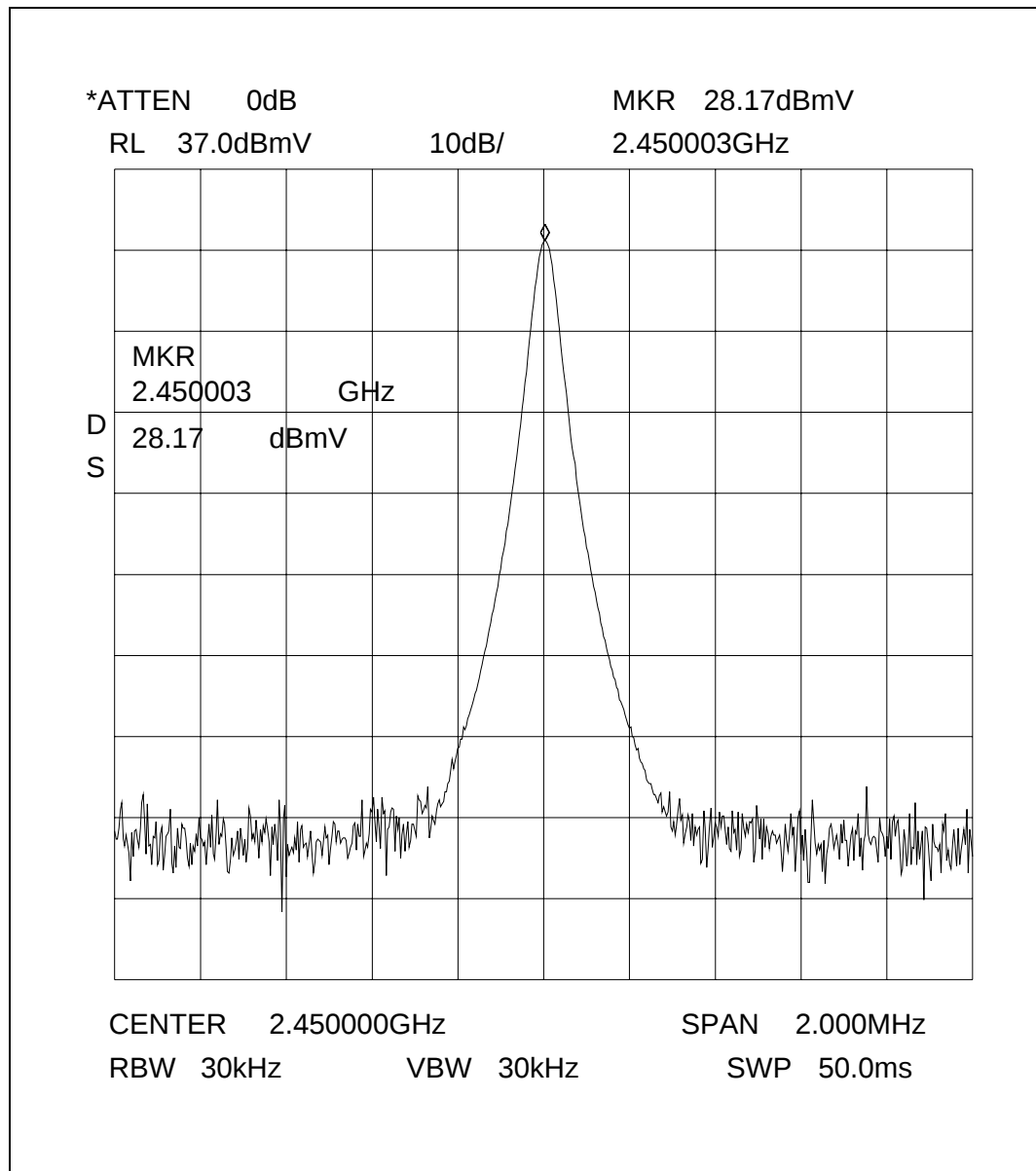
Frequency range (MHz)	Measurement distance [m]	Field strength E [dBµV/m] @ 3 m	Field strength E [µV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0	500
Harmonics	3	87.9 = 27.9 dBmV/m	25.000

REFERENCE OF TEST EQUIPMENT USED : see test set-up on pages 8, 9 and 10

Verdict :	Spurious limits are kept
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3. Plots of EUT

Plot No.: 01



Measurement distance d = 3.0 m

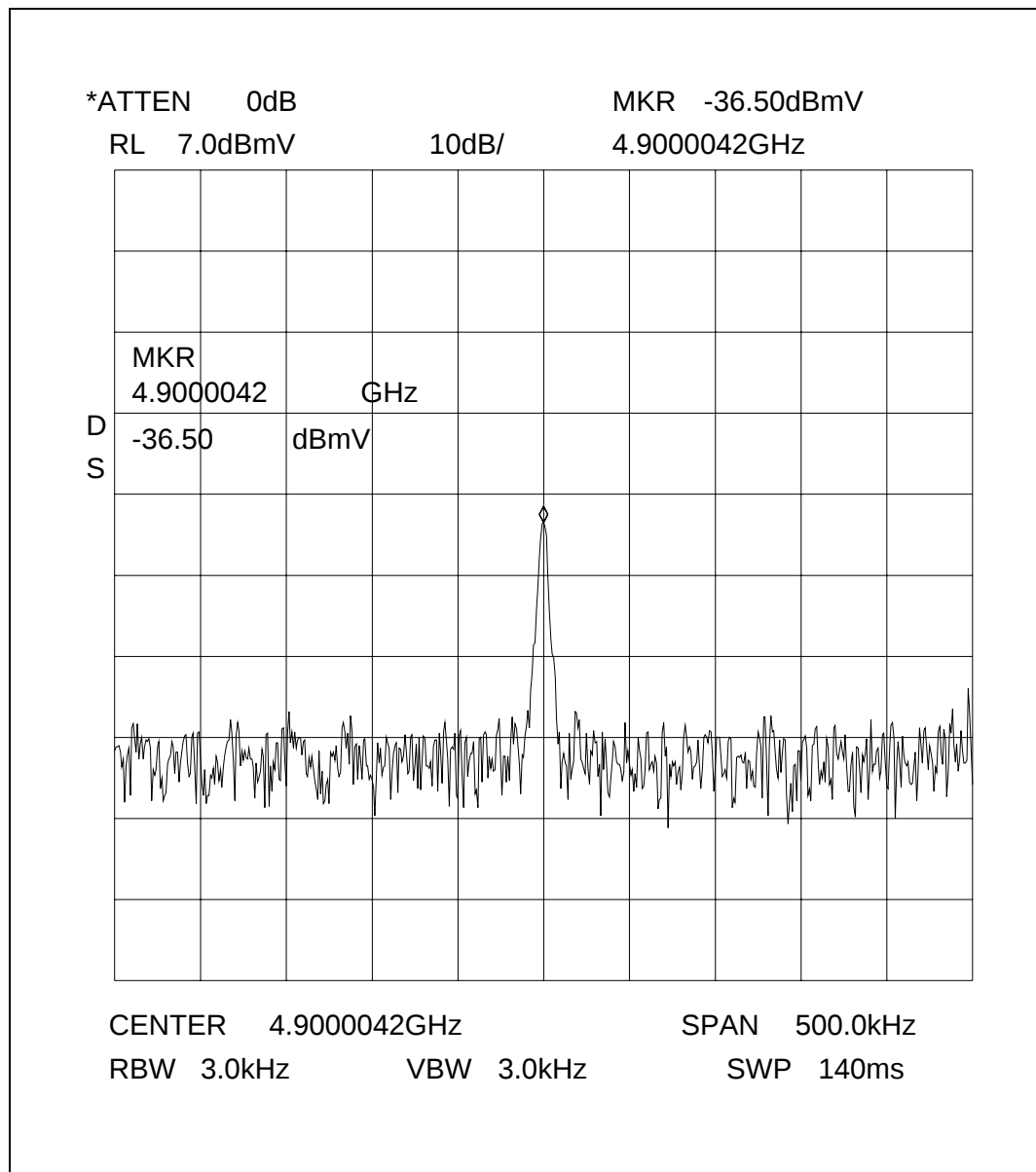
Calculation : Field strength = Analyser reading + Cable loss + Antenna factor

e = 28.17 dB(mV) + 1.0 dB + 27.49 dB(1/m)

e = 56.66 dB(mV/m)

E = 680.77 mV/m

Plot No.: 02

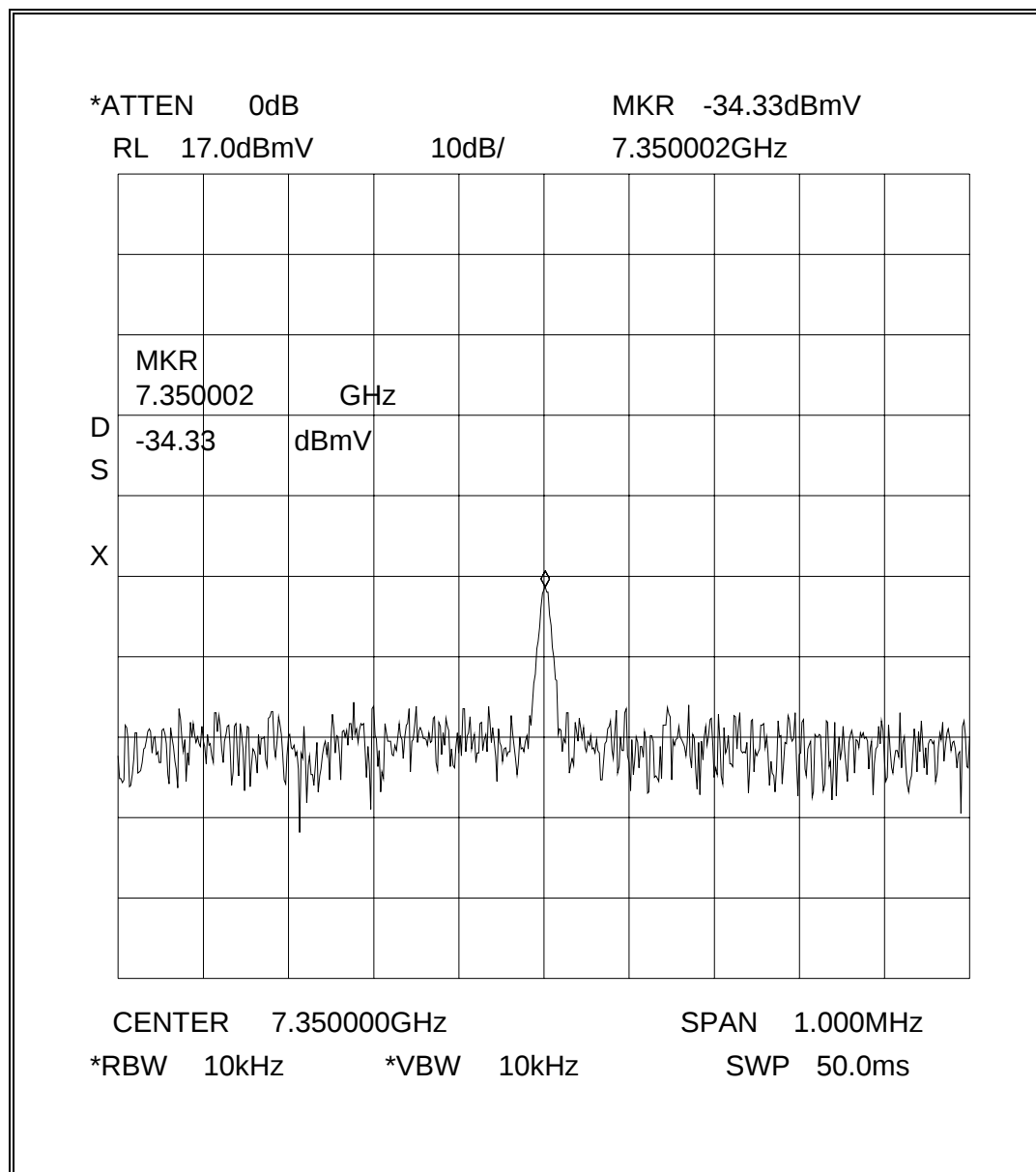


distance d = 1.0 m

Calculation :

$$\begin{aligned}
 \text{Field strength } e &= \text{Analyser reading} + \text{Dist. corr.} + \text{Cable loss} + \text{Antenna factor} \\
 e &= -36.5 \text{ dB(mV)} + (-9.54) \text{ dB} + 1.0 \text{ dB} + 27.21 \text{ dB (1/m)} \\
 e &= -1783 \text{ dB(mV/m)} \\
 E &= 0.13 \text{ mV/m}
 \end{aligned}$$

Plot No.: 03

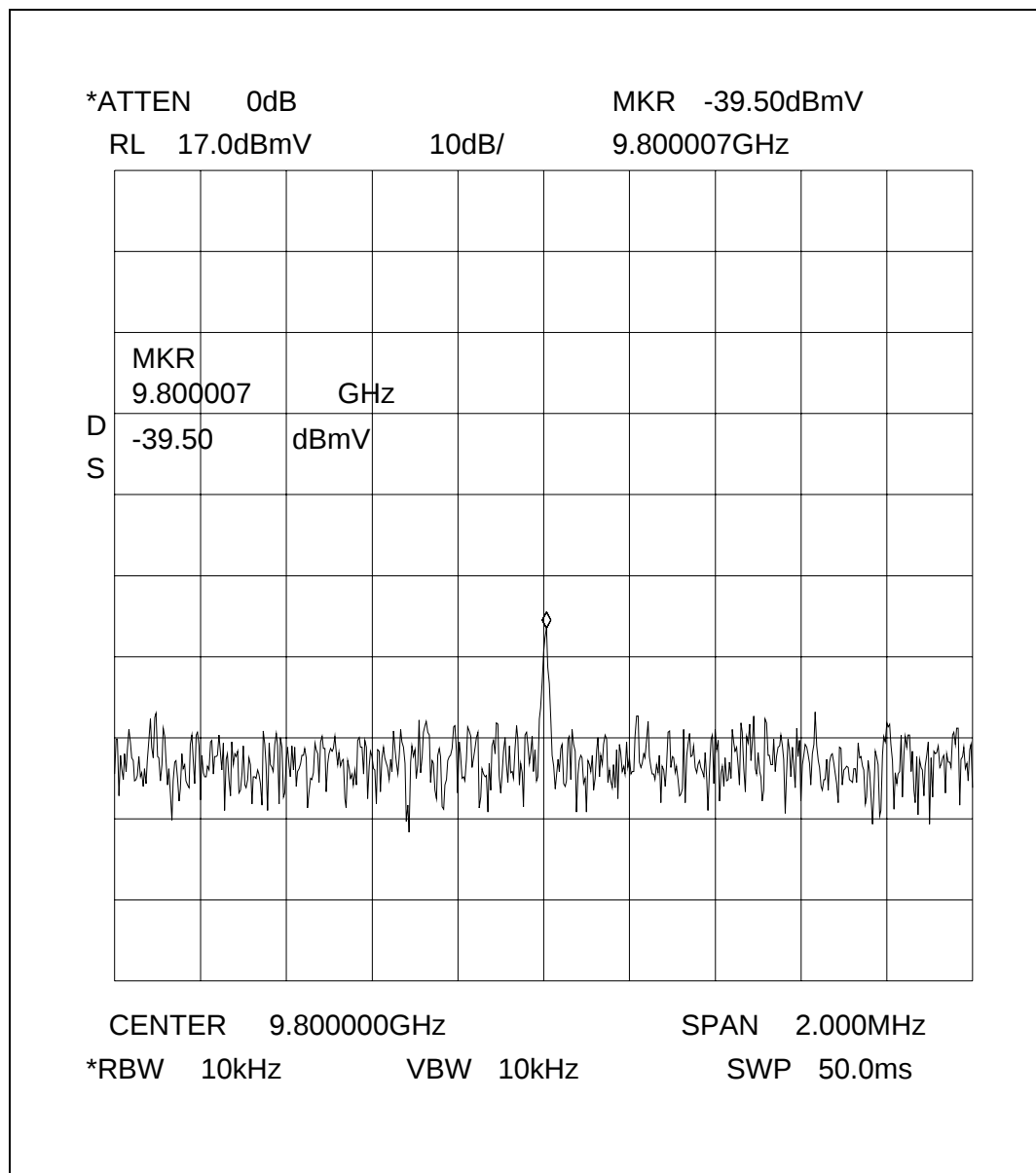


Measurement distance $d = 0.5 \text{ m}$

Calculation :

$$\begin{aligned}
 \text{Field strength} &= \text{Analyser reading} + \text{Dist. corr.} + \text{Cable loss} + \text{Antenna factor} \\
 e &= -34.33 \text{ dB(mV)} + (-15.56) \text{ dB} + 1.0 \text{ dB} + 29.94 \text{ dB (1/m)} \\
 e &= -18.95 \text{ dB(mV/m)} \\
 E &= 0.11 \text{ mV/m}
 \end{aligned}$$

Plot No.: 04



Measurement distance $d = 0.25 \text{ m}$

Calculation :

Field strength = Analyser reading + Dist. corr. + Cable loss + Antenna factor

$e = -39.50 \text{ dB(mV)} + (-21.58) \text{ dB} + 1.0 \text{ dB} + 29.94 \text{ dB (1/m)}$

$e = -30.14 \text{ dB(mV/m)}$

$E = 0.031 \text{ mV/m}$

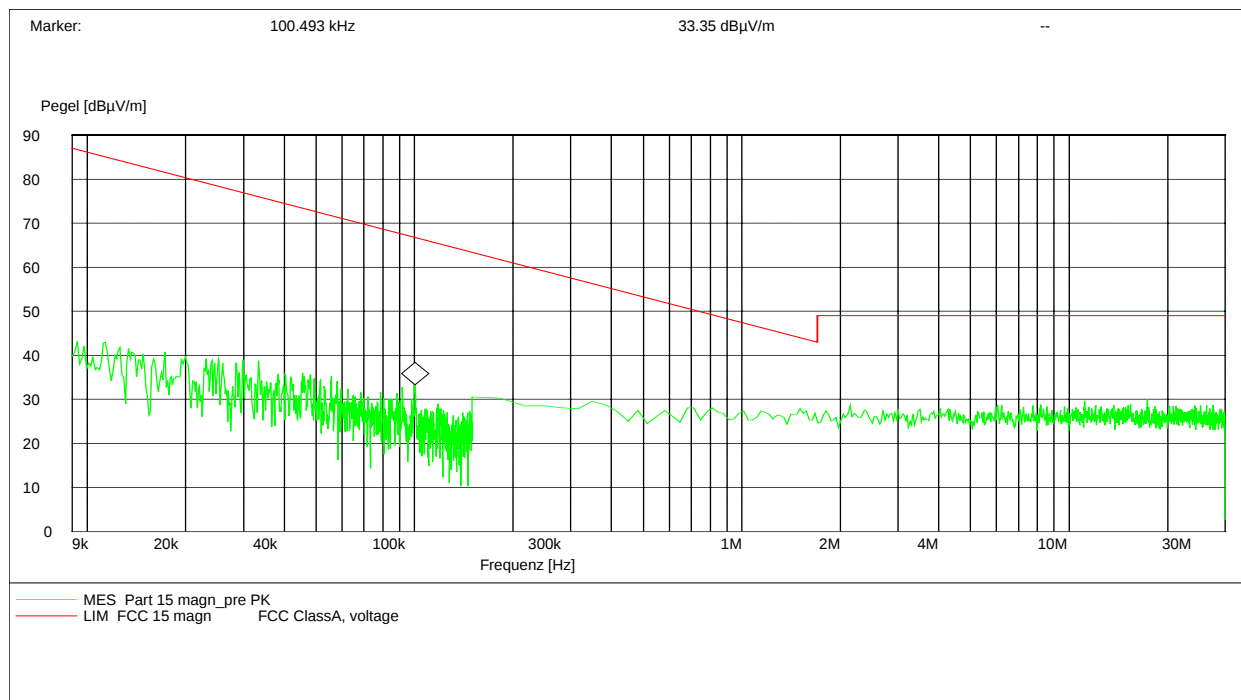
Plot 5

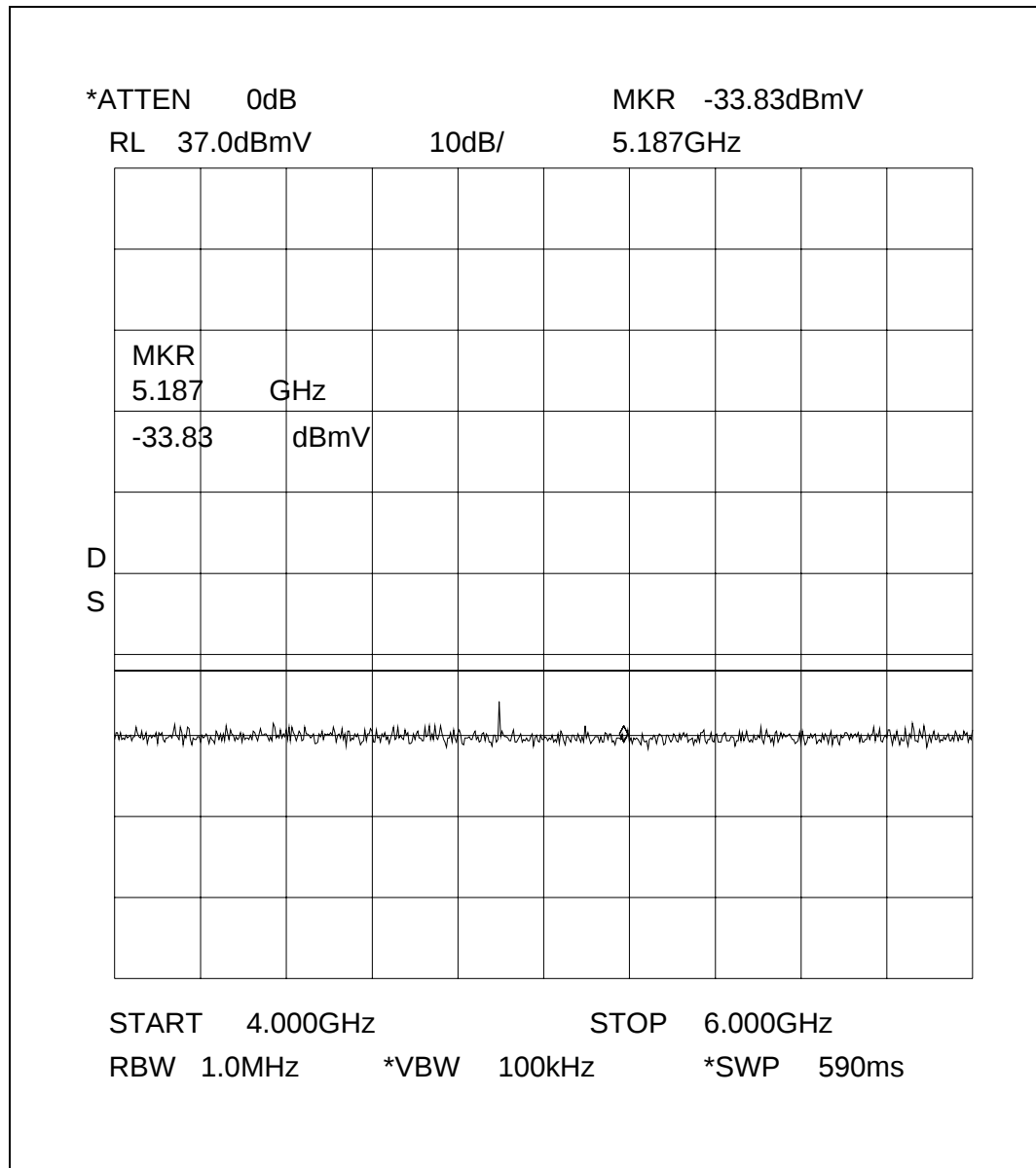
FCC Section 15.209

EUT: LMB_6013
Applicant: BALOGH
Operating condition: TX = 2 450 GHz Mod.: N0N ; RX = 2.450 GHz
Test Site: CETECOM ICT Services GmbH Saarbrücken, Room 006

Power Supply: 24 V DC
Start of Test: 27.11.02 / 11:09:38

Detector: Quasi peak mode



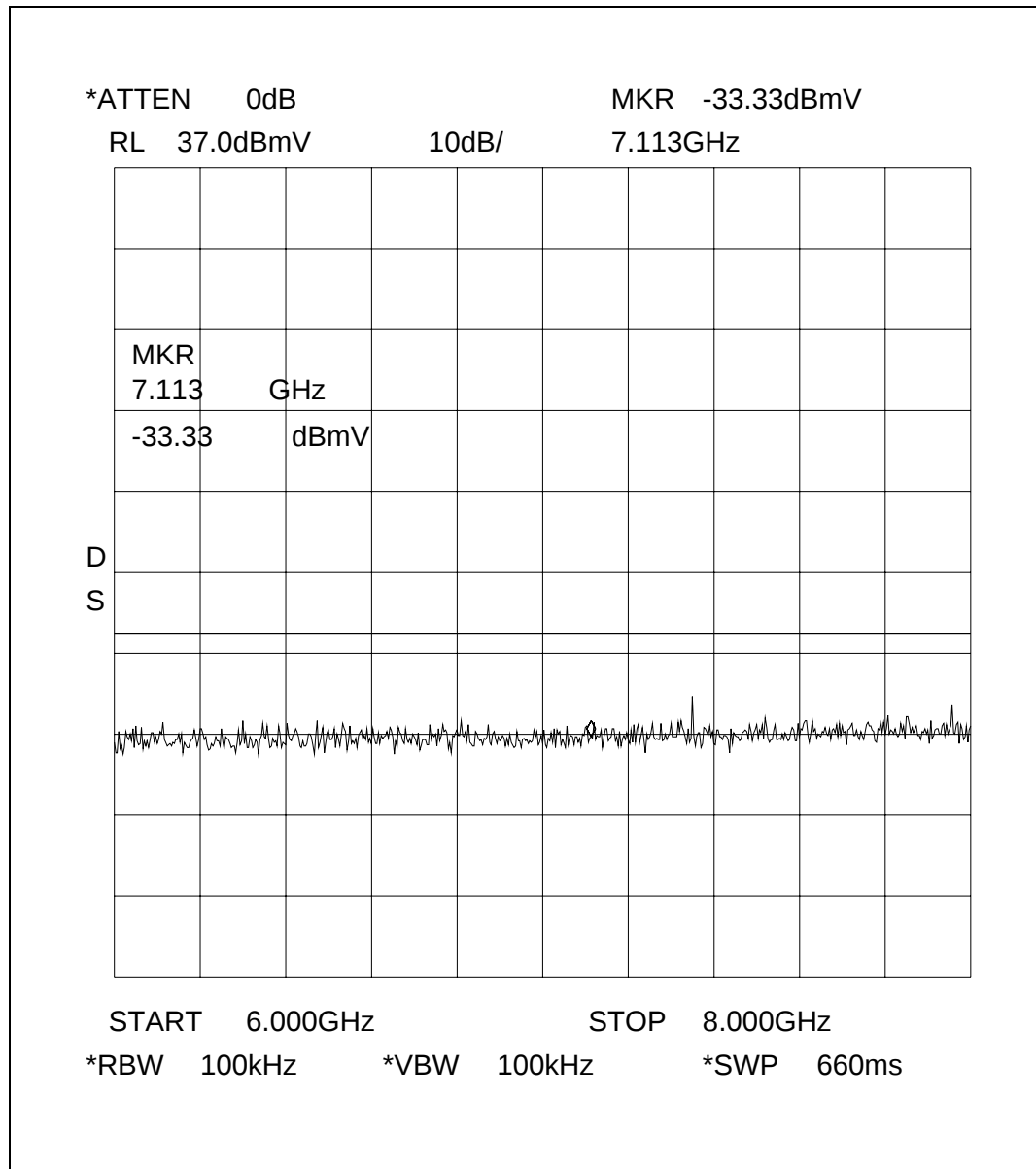


Measurement distance d = 1.0 m

$$\begin{aligned} \text{Calculation : Field strength} &= \text{Analyser reading} + \text{Cable loss} + \text{Antenna factor} + \text{Dist. corr.} \\ \text{e} &= -33.83 \text{ dB(mV)} + 1.0 \text{ dB} + 27.22 \text{ dB(1/m)} + (-9.54 \text{ dB}) \end{aligned}$$

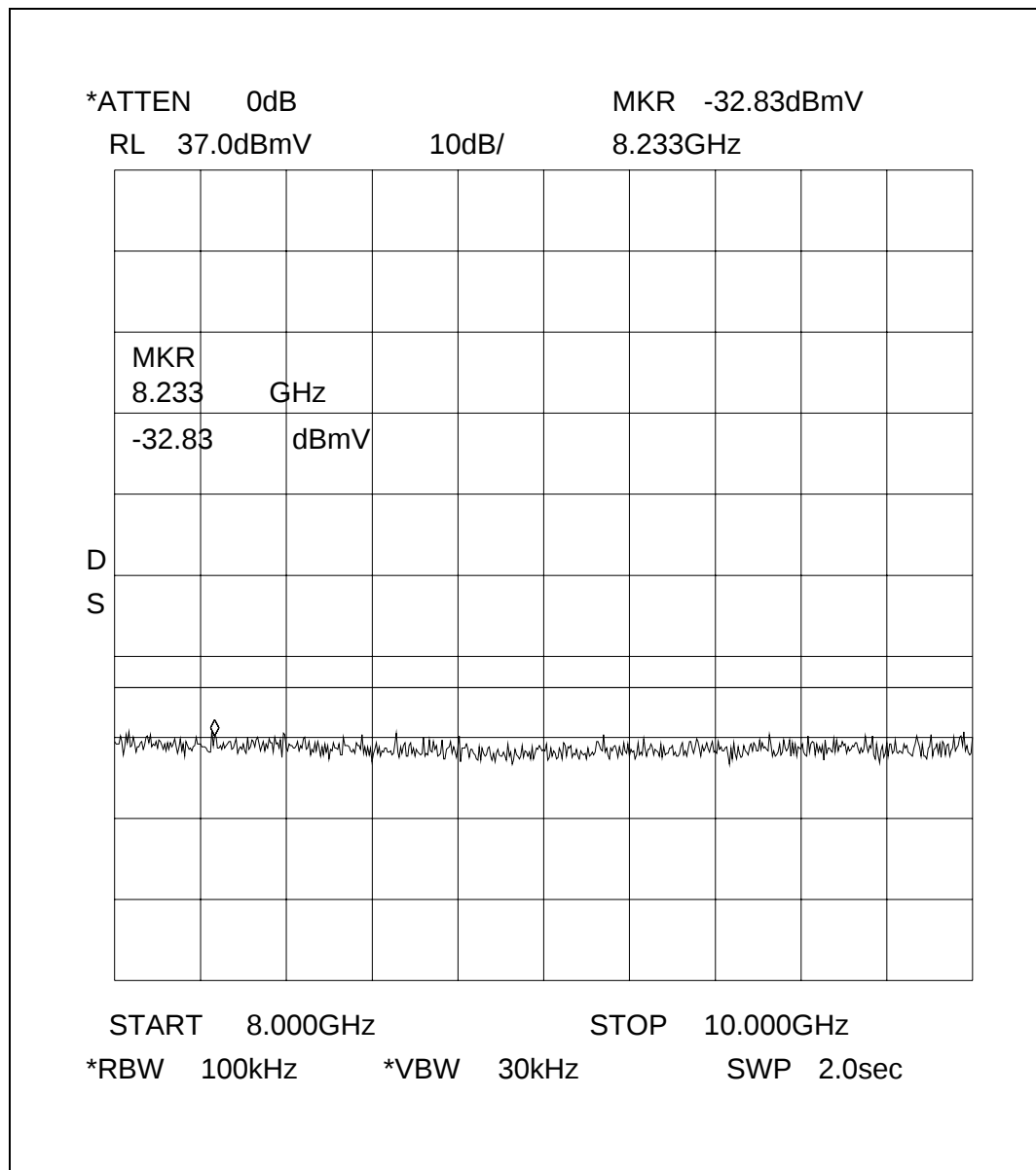
Noise e = -15.15 dB(mV/m) = 44.85 dB(μV/m)

Display line = 54 dB(μ V/m)



Calculation : Field strength	=	Analyser reading + Cable loss + Antenna factor + Dist. corr.
e	=	-33.33 dB(mV) + 1.5 dB + 29.94 dB(1/m) + (-15.56 dB)
Noise e	=	-17.45 dB(mV/m) = 42.55 dB(μV/m)
Display line	=	54 dB(μV/m)

Plot No.: 07

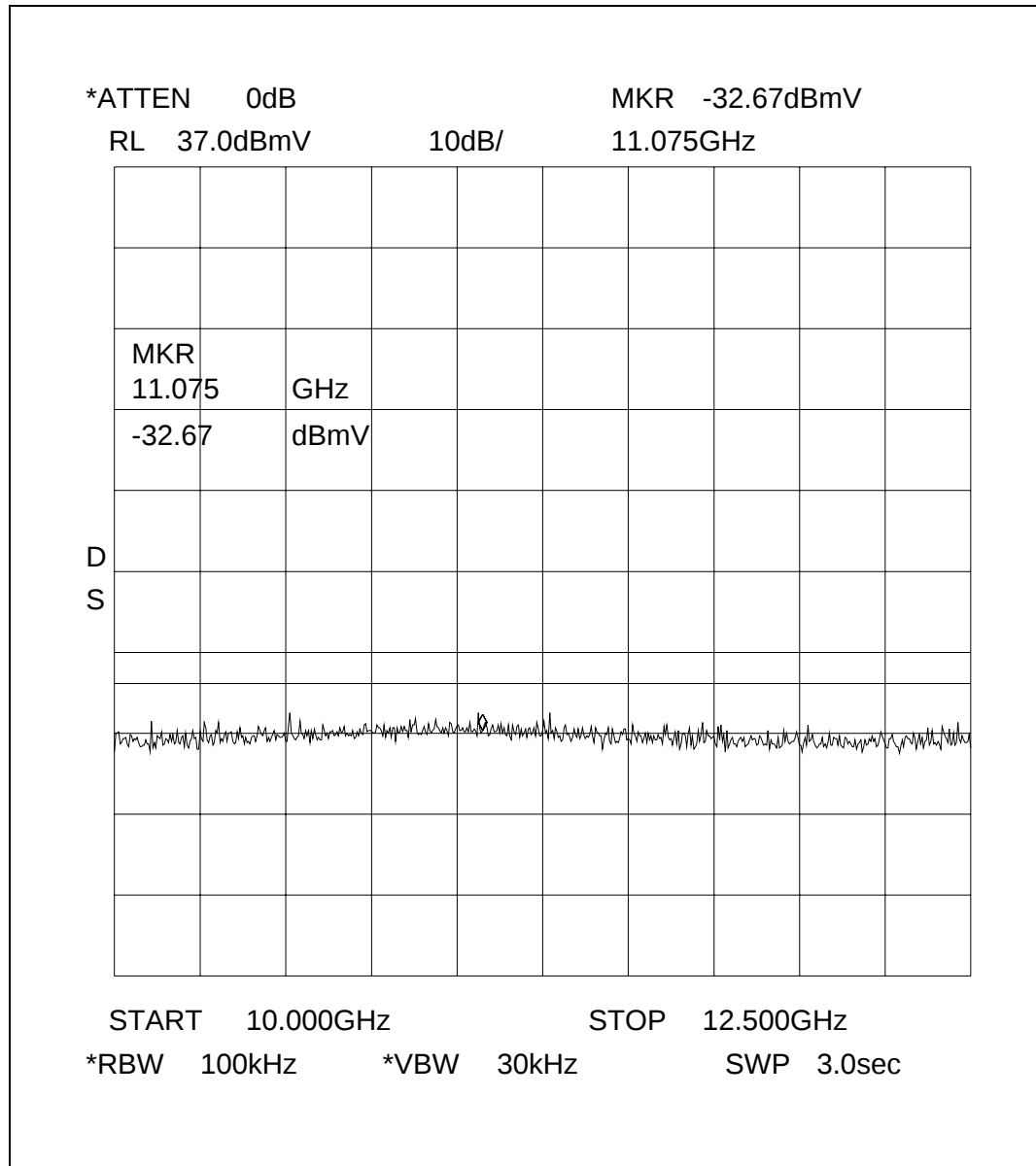


Measurement distance d = 0.5 m

Calculation : Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.
e = -32.83 dB(mV) + 2.0 dB + 33.64 dB(1/m) + (-15.56 dB)

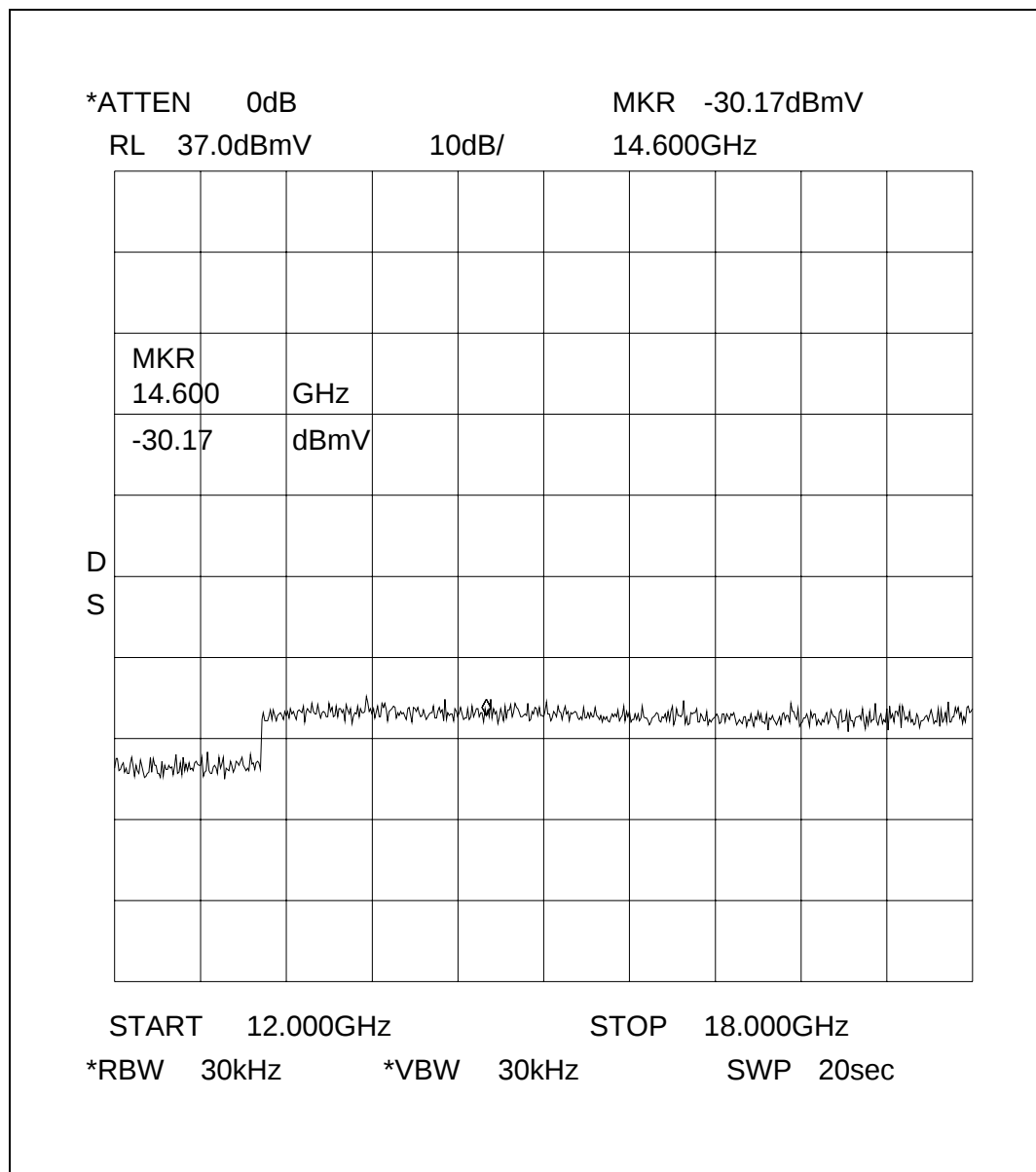
Noise e = -12.75 dB(mV/m) = 47.25 dB(µV/m)

Display line = 54 dB(µV/m)



Calculation : Field strength	=	Analyser reading + Cable loss + Antenna factor + Dist. corr.
e	=	-32.67 dB(mV) + 2.3 dB + 33.64 dB(1/m) + (-15.56 dB)
Noise e	=	-12.29 dB(mV/m) = 47.71 dB(μV/m)
Display line	=	54 dB(μV/m)

Plot No.: 09

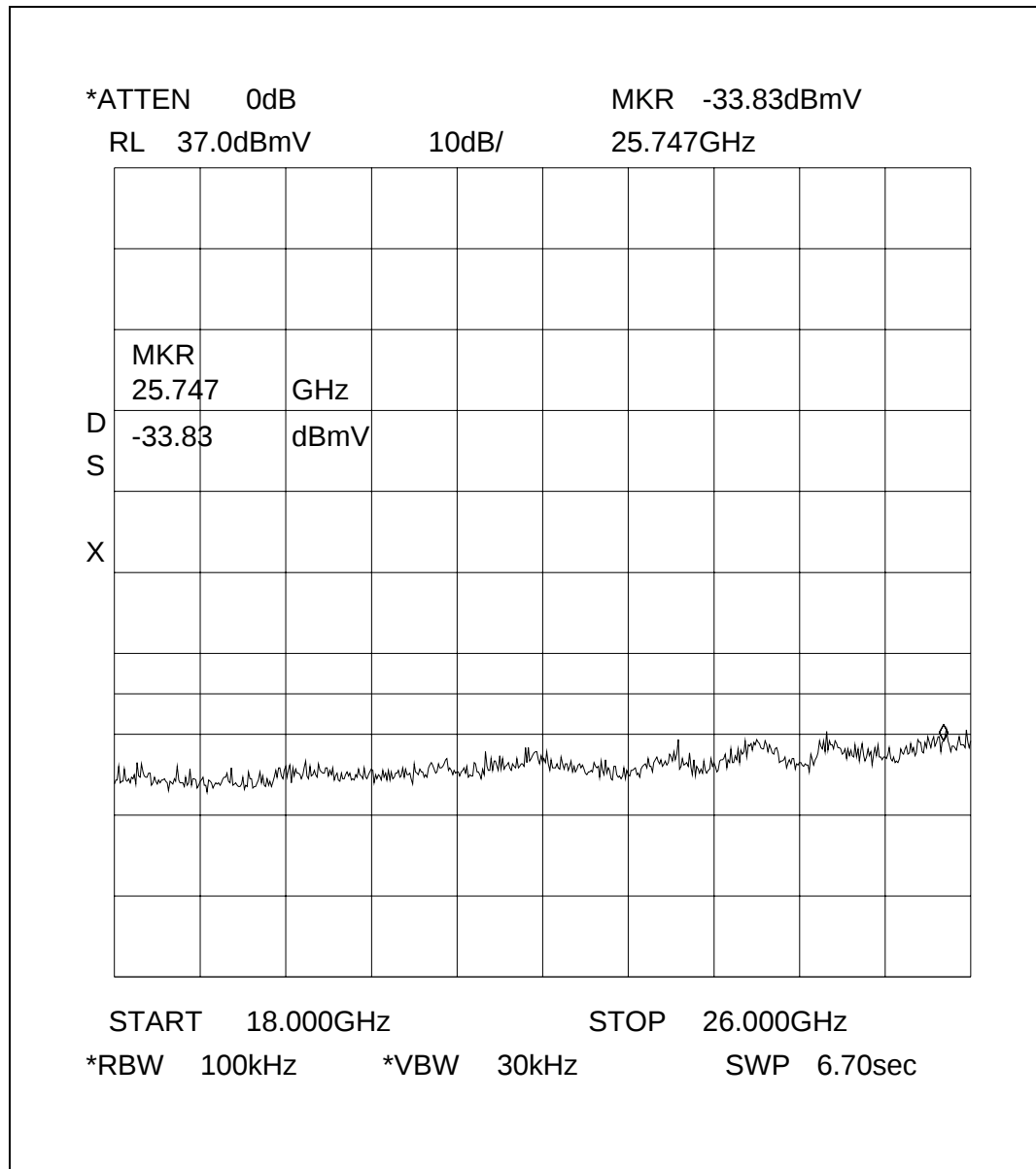


Measurement distance d = 0.25 m

Calculation : Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.
e = -30.17 dB(mV) + 2.5 dB + 36.88 dB(1/m) + (-21.58 dB)

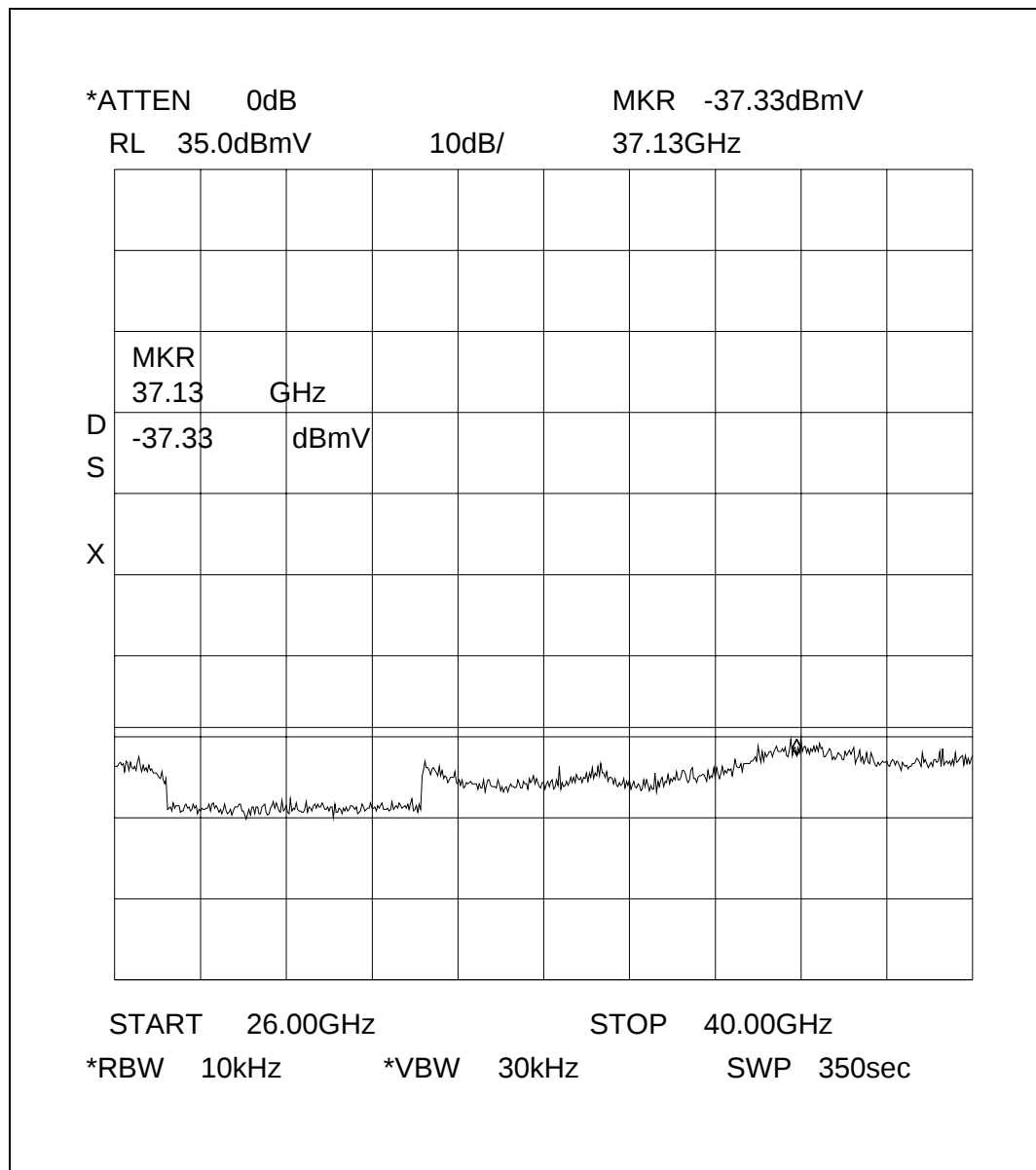
Noise e = -12.37 dB(mV/m) = 47.63 dB(μV/m)

Display line = 54 dB(μV/m)



Calculation : Field strength	=	Analyser reading + Cable loss + Antenna factor + Dist. corr.
e	=	-33.83 dB(mV) + 4.8 dB + 43.94 dB(1/m) + (-21.58 dB)
Noise	=	-6.67 dB(mV/m) = 53.31 dB(µV/m)
Display line	=	54 dB(µV/m)

Plot No.: 11



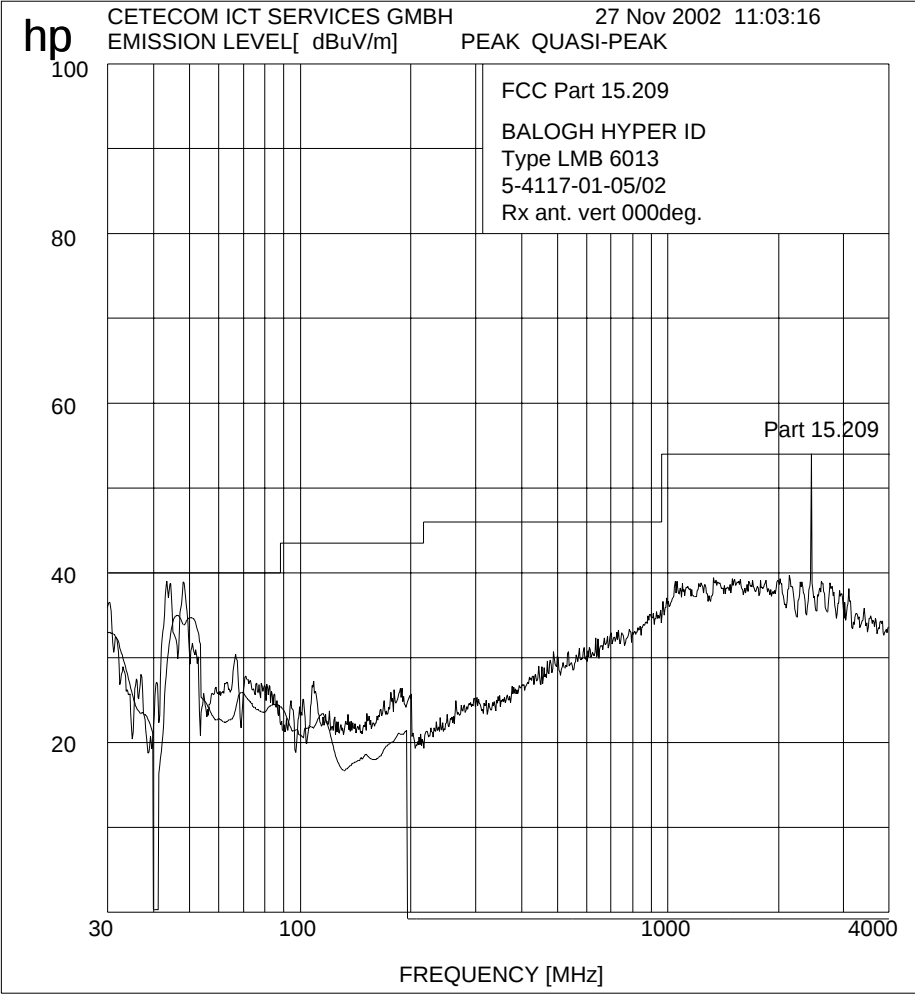
Measurement distance d = 0.25 m

Calculation : Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.
 e = -37.33 dB(mV) + 4.8 dB + 43.94 dB(1/m) + (-21.58 dB)

Noise e = -10.17 dB(mV/m) = 49.83 dB(μV/m)

Display line = 54 dB(μV/m)

Plot No.: 12



Photographs of EUT

Photo No.: 01



Photo No.: 02



Photo No.: 03



Photo No.: 04



Photo No.: 05



Photo No.: 06

TAG – BDG_1020



Photo No.: 07

TAG – BDG_1051



Photo No.: 08

TAG – BDG_1090

