CETECOM ICT Services GmbH

Radio Satellite Communication
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Recognized by the
Federal Communications Commission
FCC–Identification Number
TCB ID: DE0001

Federal Communications Commission

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

Deutscher Akkreditierungs Rat
DAR

Independent ETSI
compliance test house

ETSI

Test report No.: 5-4117-01-05/02
Applicant : BALOGH S.A.
Type : LMB_6033
FCC-ID : QNOLMB-6033

Table of contents

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 generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item .

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Date	Name	Signature
04.12.02	Detlev Gillmann	

Technical responsibility for area of testing:

Date	Name	Signature
04.12.02	Dirk Hausknecht	

1.2 Testing laboratory

CETECOM ICT Services GmbH
Untertürkheimerstraße 6–10 P.O. Box 10 04 45
D-66117 Saarbrücken D-66004 Saarbrücken
Germany Germany

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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
Tel. : +33 561 194 380
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 present during the test : Mathieu GUERIN

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

System designation : LMB_6033
Type designation : **see 1.6.1** (equipment under test)
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	:	13180 (4x4 patches)
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_6033		
Constitution of Equipment	**Reference**	**Reference mark**
Circuit Board with Equipment and Shielding alveolar structure	13053	P 02X04
Internal antenna board (4x4 patches)	13180	P 02
Waterproof case	13175	P 02
Hyper TAG - BDG_1020	1020X01	-
Hyper TAG - BDG_1051	1051X01	-
Hyper TAG - BDG_1090	1090X01	-

Remark: 1) All 3 TAGs are identical due to their function and their electrical behaviour. The measurements were performed with TAG – BDG_1090

2) EUT was measured at frequencies 2.450 000; 2.435 250 and 2.464 750 GHz The middle channel 2.450 GHz showed the highest results in eirp and spurious. For this reason the frequency 2.450 GHz was recorded in the test report

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

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

[ ]

This test report :

[X] 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

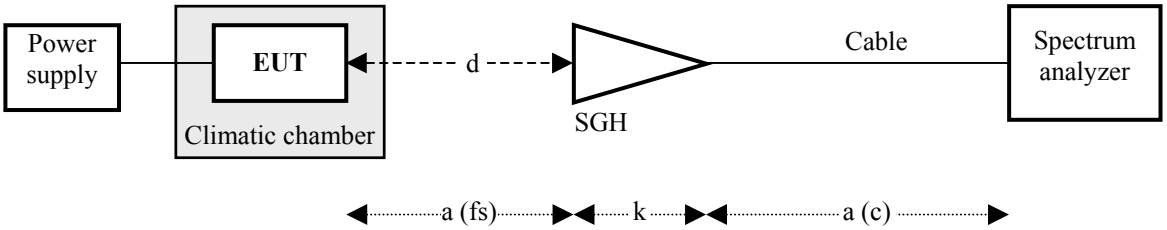
The environmental conditions are documented especially for each test.

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 18 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

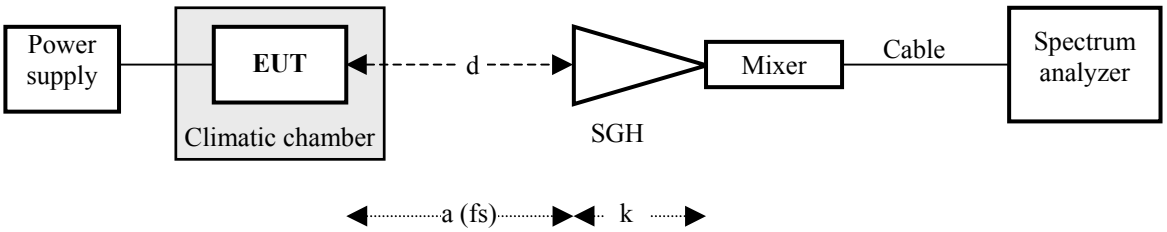
Calculation : Field strength = Analyser reading + Cable loss + Antenna factor

Test equipment	Manufacturer	Type	Cetecom reference
Spectrum Analyser	HP	HP 8565E	300001665
Fmi 1.7 ..... 2.6 GHz	fmi	0824-10	300000230
SGH 3.95 ....5.85GHz	narda	613 A	300000230
SGH 5.4 .....8.2 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

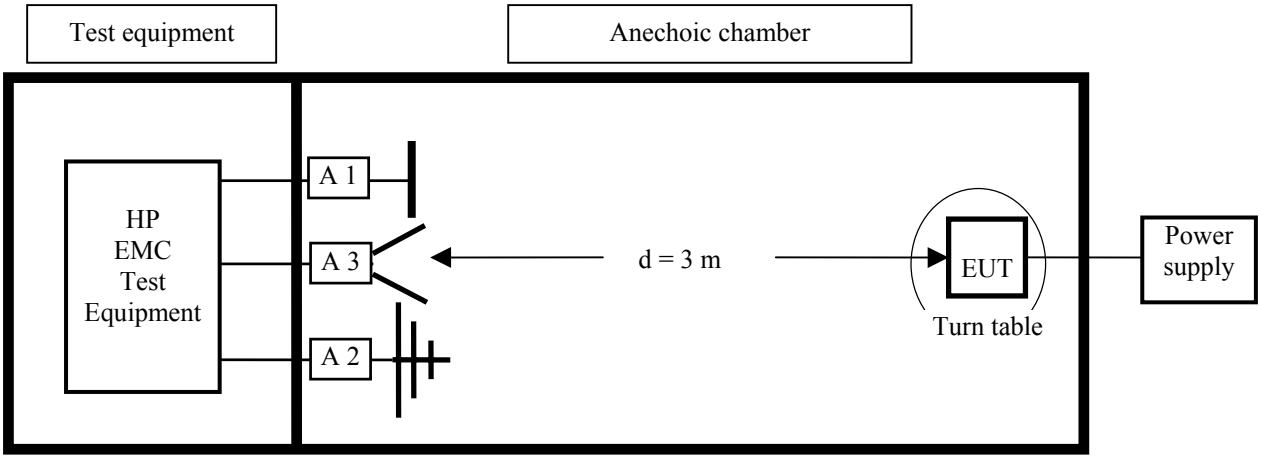
Test equipment	Manufacturer	Type	CETECOM reference
Spectrum Analyser	HP	HP 8565E	300001665
Power supply	HP	6032A	300002115
SGH 33 ... 50 GHz	Thomson	COR 33_50	300000812
Mixer 33 ... 50 GHz	HP	11970Q	300000781i
SGH 50 ... 75 GHz	Thomson	COR 50_75	300000789k
Mixer 50 ... 75 GHz	HP	11970V	300000871o
SGH 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_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

FUNDAMENTAL FREQUENCY

Microwave module : **LMB_6033** Tx: 2.450 000 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER			
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]	See plot on page
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	2.450	53.82	490.91	17
	U (min) = 11.0 V	2.450	53.82	490.91	17
	U (max) = 28.0 V	2.450	53.82	490.91	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_6033
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

FUNDAMENTAL FREQUENCY

Microwave module : **LMB_6033** Tx: 2.435 250 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER		
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	2.435 258	52.62	427.56
	U (min) = 11.0 V	2.435 250	52.62	427.56
	U (max) = 28.0 V	2.435 250	52.62	427.56

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_6033
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

FUNDAMENTAL FREQUENCY

Microwave module : **LMB_6033** Tx: 2.464 750 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER		
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	2.464 744	51.80	389.05
	U (min) = 11.0 V	2.464 744	51.80	389.05
	U (max) = 28.0 V	2.464 744	51.80	389.05

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_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : **LMB_6033** Tx: 2.450 000 GHz operating in CW
Antenna assembly:

TEST CONDITIONS		TRANSMITTER POWER			
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]	See plot on page
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	4.900	- 17.16	0.14	18
	U (min) = 11.0 V	4.900	- 17.16	0.14	18
	U (max) = 28.0 V	4.900	- 17.16	0.14	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_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : LMB_6033 operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER			
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]	See plot on page
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	7.350	- 11.90	0.251	19
	U (min) = 11.0 V	7.350	- 11.90	0.251	19
	U (max) = 28.0 V	7.350	- 11.90	0.251	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

EUT : **LMB_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : LMB_6033 operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER			
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]	See plot on page
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	9.80	n.f.	n.f.	-
	U (min) = 11.0 V	9.80	n.f.	n.f.	-
	U (max) = 28.0 V	9.80	n.f.	n.f.	-

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	87.9 = 27.9 dBmV/m	25.000

Verdict :	Field strength limit is kept

2.5.3 Test results in details

EUT : **LMB_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : **LMB_6033** Tx: 2.435 250 GHz operating in CW
Antenna assembly:

TEST CONDITIONS		TRANSMITTER POWER		
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	4.870 512	- 19.6	0.105
	U (min) = 11.0 V	4.870 512	- 19.6	0.105
	U (max) = 28.0 V	4.870 512	- 19.6	0.105

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_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : **LMB_6033** Tx: 2.435 250 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER		
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	7.305 766	- 13.20	0.219
	U (min) = 11.0 V	7.305 766	- 13.20	0.219
	U (max) = 28.0 V	7.305 766	- 13.20	0.219

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

EUT : **LMB_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : **LMB_6033** Tx: 2.435 250 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER		
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	9.741 000	n.f.	n.f.
	U (min) = 11.0 V	9.741 000	n.f.	n.f.
	U (max) = 28.0 V	9.741 000	n.f.	n.f.

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	87.9 = 27.9 dBmV/m	25.000

Verdict :	Field strength limit is kept

EUT : **LMB_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : **LMB_6033** Tx: 2.464 750 GHz operating in CW
Antenna assembly:

TEST CONDITIONS		TRANSMITTER POWER		
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	4.929 490	- 18.98	0.11
	U (min) = 11.0 V	4.929 490	- 18.98	0.11
	U (max) = 28.0 V	4.929 490	- 18.98	0.11

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_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : **LMB_6033** Tx: 2.464 750 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER		
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	7.394 235	- 13.5	0.211
	U (min) = 11.0 V	7.394 235	- 13.5	0.211
	U (max) = 28.0 V	7.394 235	- 13.5	0.211

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

EUT : **LMB_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

HARMONIC FREQUENCIES

Microwave module : **LMB_6033** Tx: 2.464 750 GHz operating in CW
Antenna assembly: Integral patch antenna

TEST CONDITIONS		TRANSMITTER POWER		
Power supply		Frequency [GHz]	Spectrum Analyzer e [dBmV/m]	Field strength E [mV/m]
T (nom) = 23 °C	U (nom) = 12.0 V or = 24.0 V	9.858 980	n.f.	n.f.
	U (min) = 11.0 V	9.858 980	n.f.	n.f.
	U (max) = 28.0 V	9.858 980	n.f.	n.f.

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	87.9 = 27.9 dBmV/m	25.000

Verdict :	Field strength limit is kept

EUT : **LBM_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

SPURIOUS FREQUENCIES

Microwave module : LBM_6033 Tx: 2.450 000 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	30
30 – 4 000 horizontal plane	Noise	<< limit	<< limit	38
4 000 – 6 000 (h + v)	5 187 (Noise) (with the 2.harmonic)	44.85	174.783	31
6 000 – 8 000 (h + v)	7 113 (Noise) (with the 3. harmonic)	42.22	129.122	32
8 000 – 10 000 (h + v)	8 233 (Noise)	47.25	230.409	33
10 000 – 12 500 (h + v)	11 075 (Noise)	47.71	242.940	34
12 000 – 18 000 (h + v)	14 600 (Noise)	47.63	240.713	35
18 000 – 26.500 (h + v)	25.74 (Noise)	53.31	453.42	367
26 500 – 40 000 (h + v)	37.13 (Noise)	49.83	310.10	37

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_6033**
Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

SPURIOUS FREQUENCIES

Microwave module : LBM_6033 Tx: 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	32.58	42.56
30 – 4 000 vertical plane	Noise (without Tx=2 435 250)	<< limit	<< limit
4 000 – 6 000 (h + v)	5 300 (Noise) (without the 2. Harmonic)	43.60	151.36
6 000 – 8 000 (h + v)	7 650 (Noise) (without the 3. harmonic)	41.42	117.76
8 000 – 10 000 (h + v)	9 000 (Noise)	46.30	206.54
10 000 – 12 500 (h + v)	11 000 (Noise)	47.10	226.46
12 000 – 18 000 (h + v)	14 800 (Noise)	47.00	223.87
18 000 – 26.500 (h + v)	23.00 (Noise)	52.60	426.58
26 500 – 40 000 (h + v)	36.40 (Noise)	47.93	249.17

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_6033

Ambient temperature : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS **SECTION 15.245**

SPURIOUS FREQUENCIES

Microwave module : LBM_6033 Tx: 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	33.05	44.93
30 – 4 000 vertical plane	Noise (without Tx=2 450)	<< limit	<< limit
4 000 – 6 000 (h + v)	5 350 (Noise) (without the 2. harmonic)	42.25	129.57
6 000 – 8 000 (h + v)	6 800 (Noise) (without the 3. harmonic)	41.86	123.88
8 000 – 10 000 (h + v)	9 500 (Noise)	46.55	212.579
10 000 – 12 500 (h + v)	12 200 (Noise)	47.20	229.08
12 000 – 18 000 (h + v)	16 600 (Noise)	46.82	219.28
18 000 – 26.500 (h + v)	25 200 (Noise)	52.60	426.58
26 500 – 40 000 (h + v)	38 600 (Noise)	46.86	220.29

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

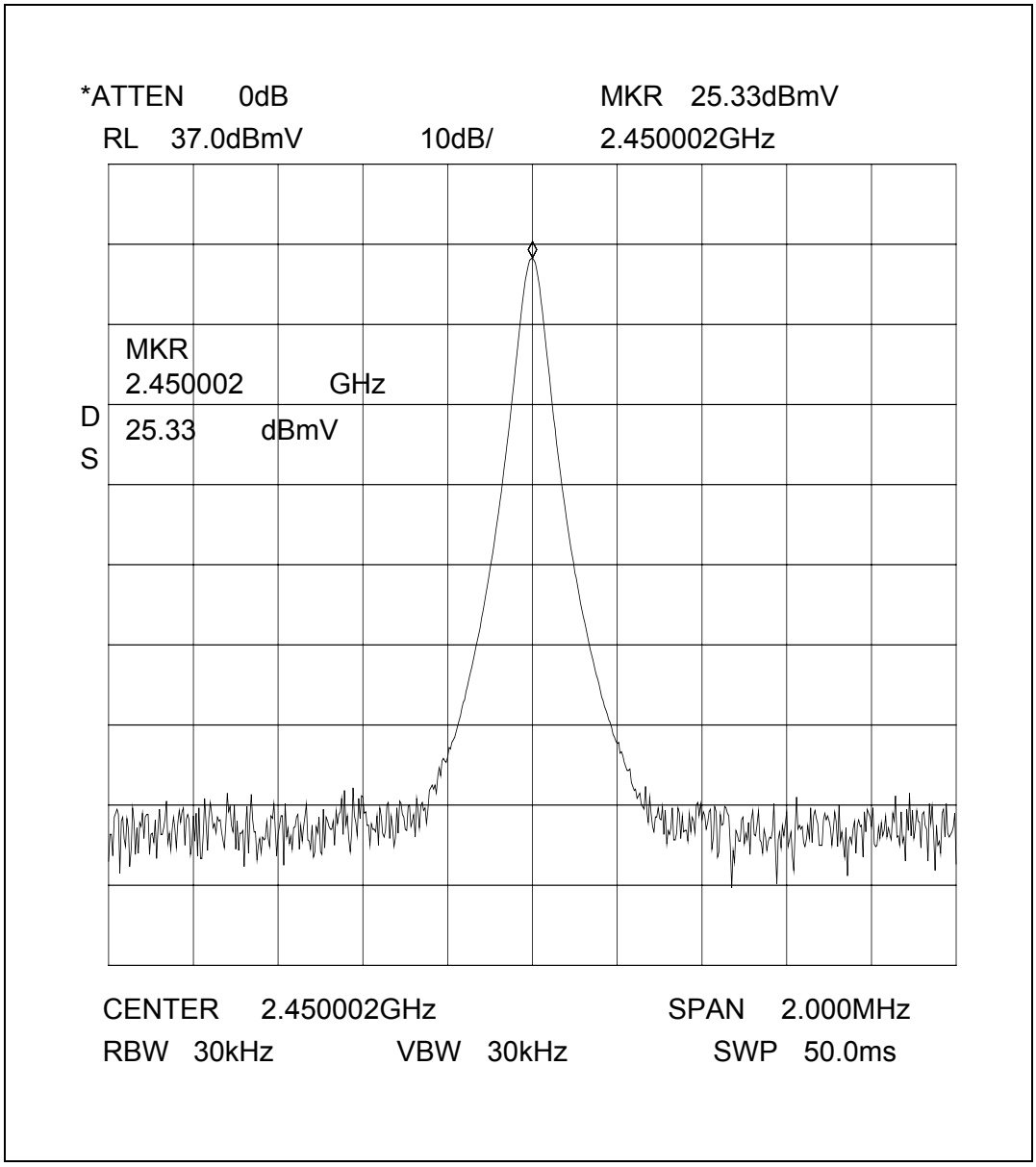
Frequency range (MHz)	Measurement distance [m]	Field strength e [dBµV/m] @ 3 m	Field strength E [µV/m]
0.009 – 0.490	300	88.5 ... 53.8	2400/F(kHz)
0.490 – 1.705	30	53.8 ... 43.0	24000/F(kHz)
1.705 – 30.0	30	49.5	30
30.0 – 88.0	3	40.0	100
88.0 – 216.0	3	43.5	150
216.0 – 960.0	3	46.0	200
> 960.0	3	54.0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

3. Plots of EUT

Plot No.: 01



Measurement distance d = 3.0 m

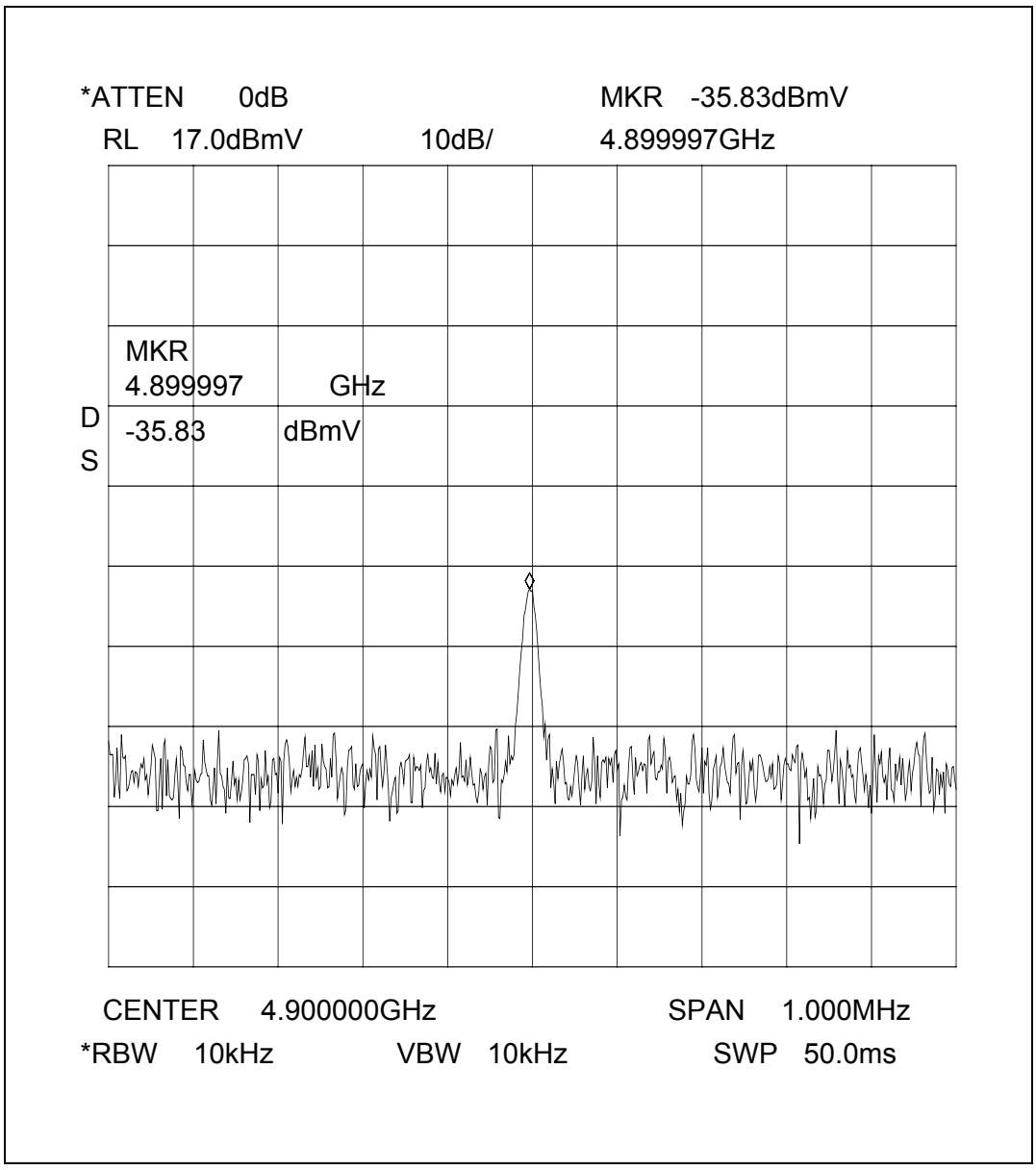
Calculation **:** Field strength = Analyser reading + Cable loss + Antenna factor

e = 25.33 dB(mV) + 1.0 dB + 27.49 dB(1/m)

e = 53.82 dB(mV/m)

E = 490.91 mV/m

Plot No.: 02



distance d = 1.0 m

Calculation :

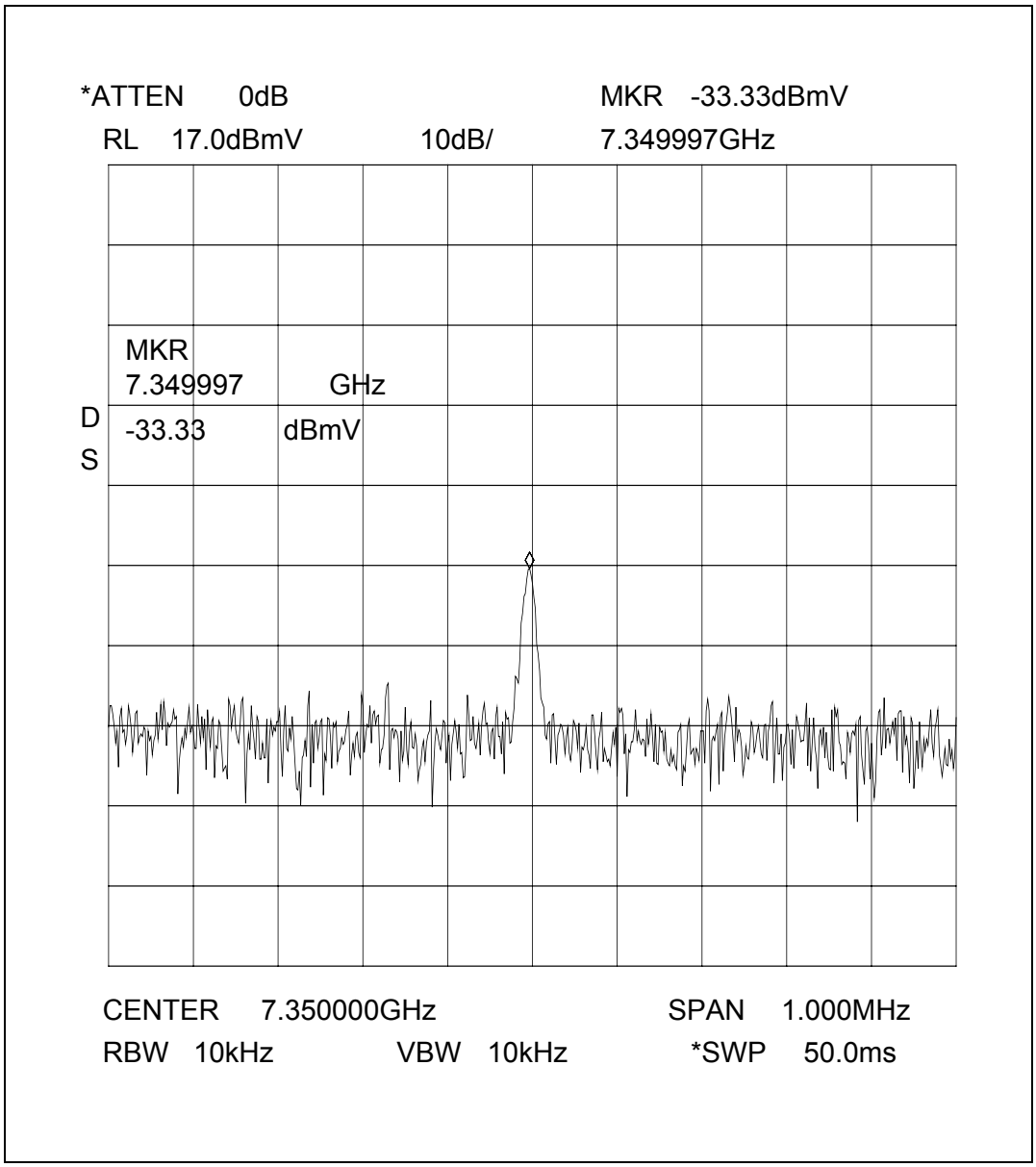
Field strength = Analyser reading + Dist. corr. + Cable loss + Antenna factor

e = - 35.83 dB(mV) + (-9.54) dB + 1.0 dB + 27.21 dB (1/m)

e = - 17.16 dB(mV/m)

E = 0.14 mV/m

Plot No.: 03



Measurement distance d = 1.0 m

Calculation :

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

e = - 33.30 dB(mV) + (-9.54) dB + 1.0 dB + 29.94 dB (1/m)

e = - 11.90 dB(mV/m)

E = 0.251 mV/m

Plot No.: 04

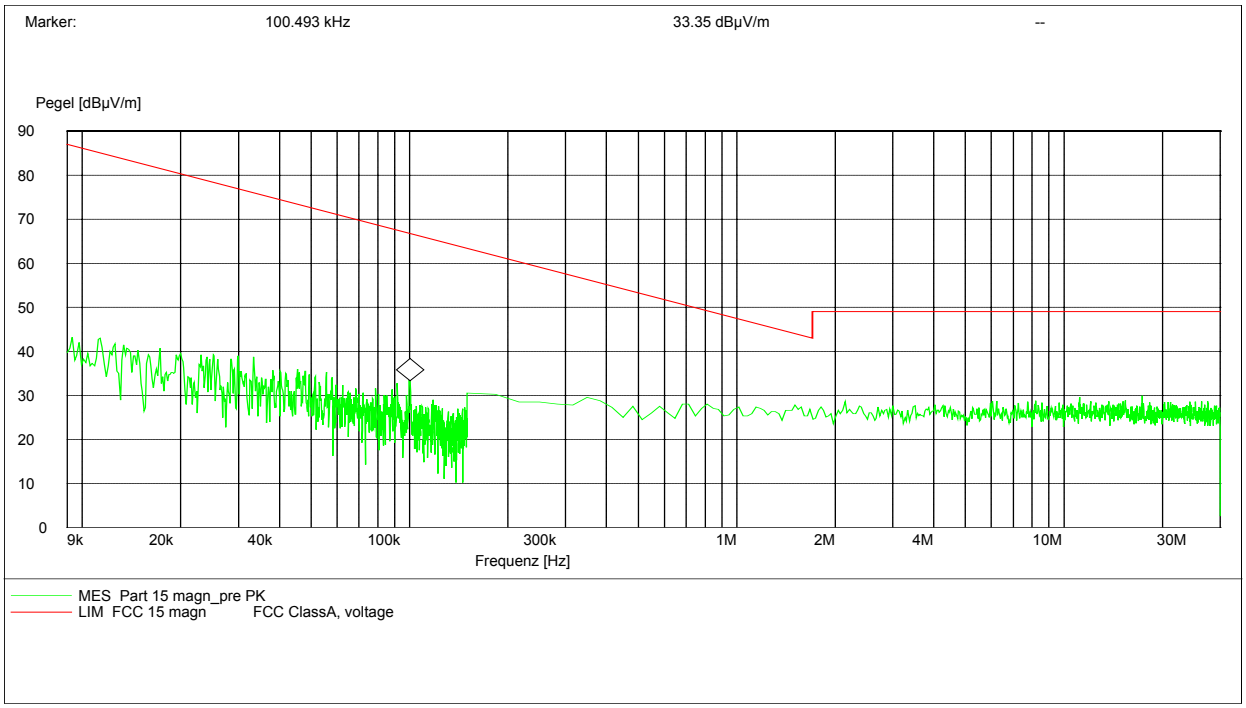
Plot 4

FCC Section 15.209

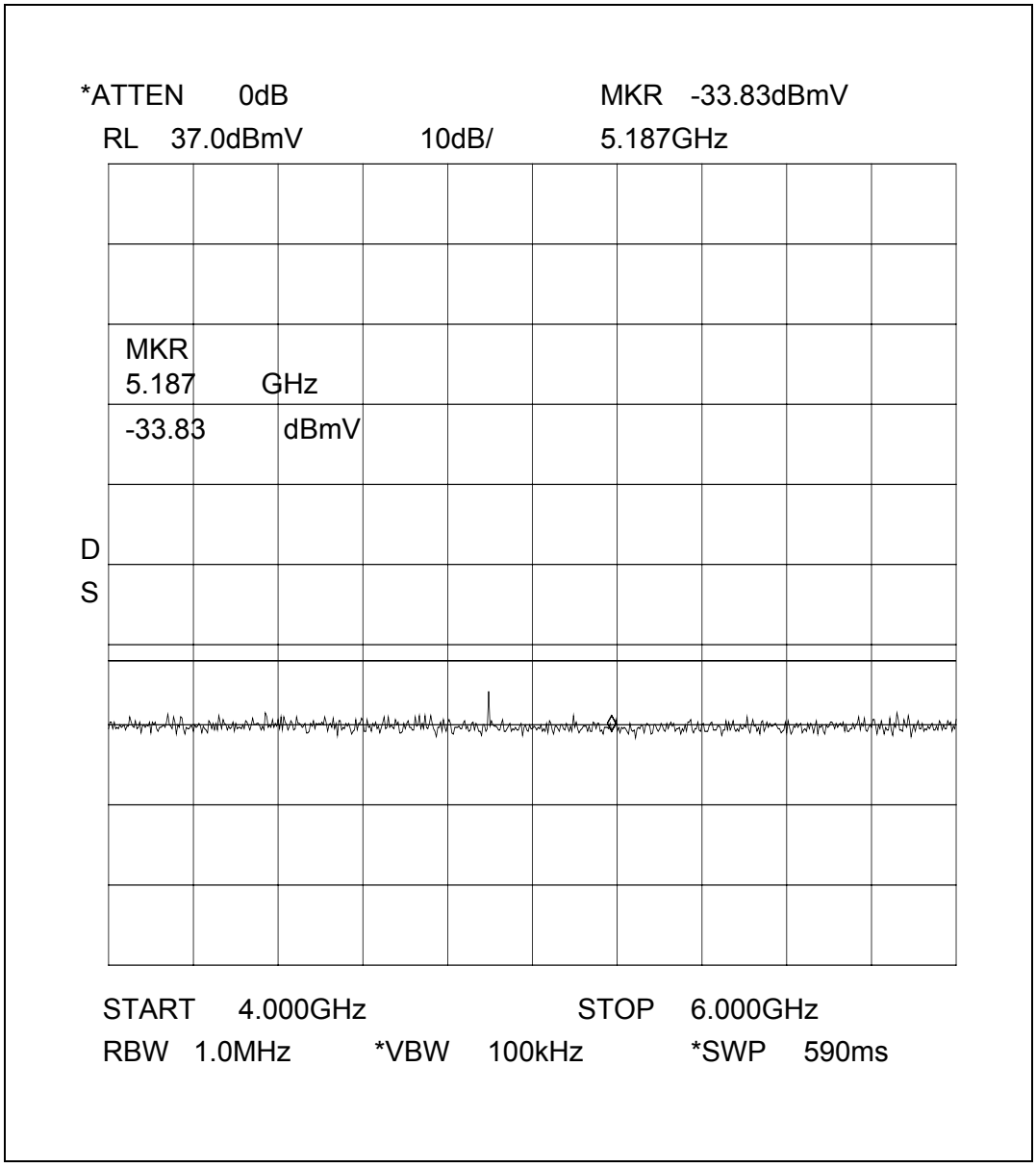
EUT:	in CW mode
Applicant:	Balogh
Operating condition:	TX = 2.450 GHz Mod.: N0N ; RX = 2.450 GHz
Test Site:	CETECOM ICT Services GmbH Saarbrücken, Room 006

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

Detector: Quasi peak mode



Plot No.: 05



Measurement distance d = 1.0 m

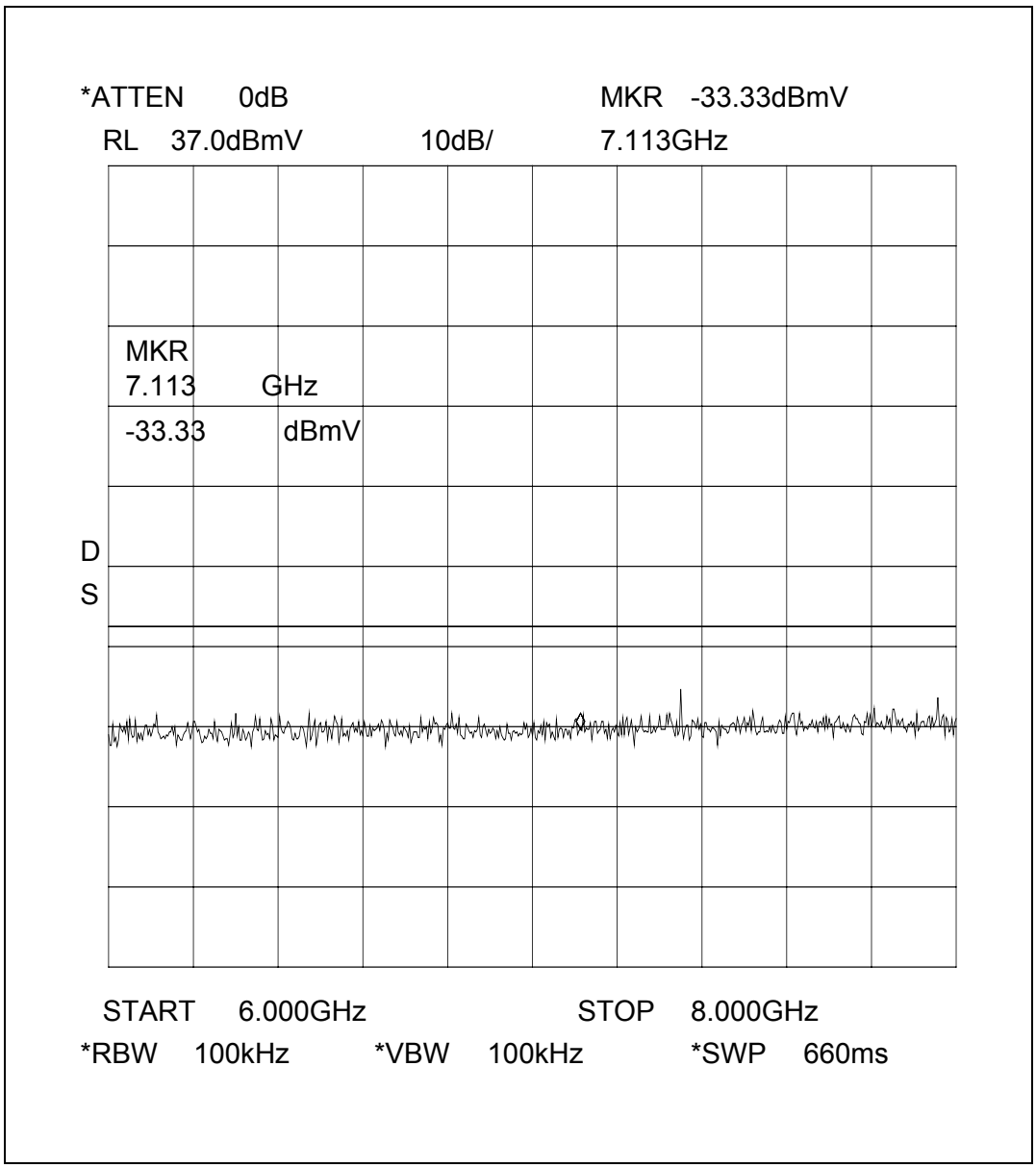
Calculation **:** Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.

e = -33.83 dB(mV) + 1.0 dB + 27.22 dB(1/m) + (-9.54 dB)

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

Display line = 54 dB(µV/m)

Plot No.: 06



Measurement distance d = 0.5 m

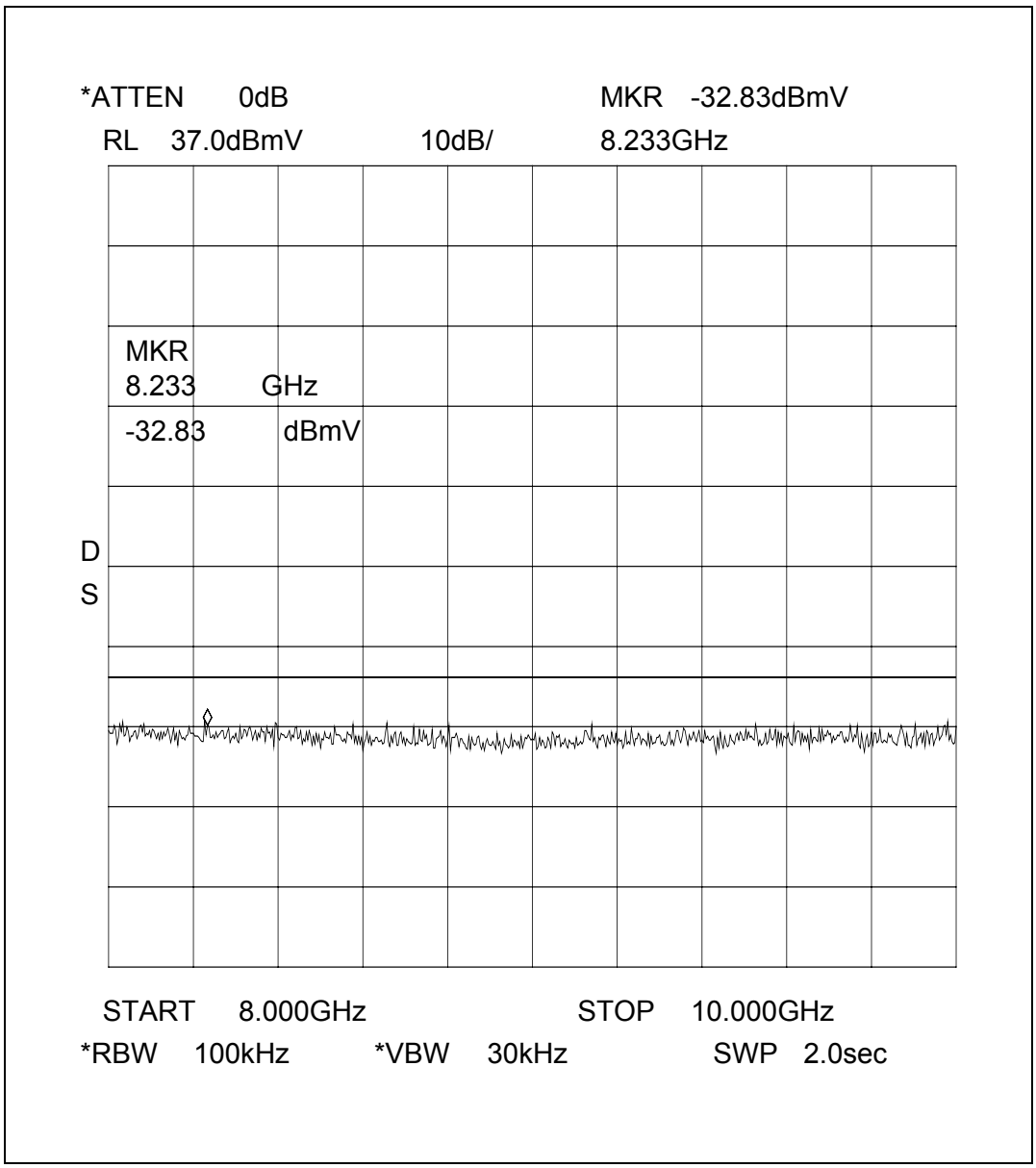
Calculation **:** Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.

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

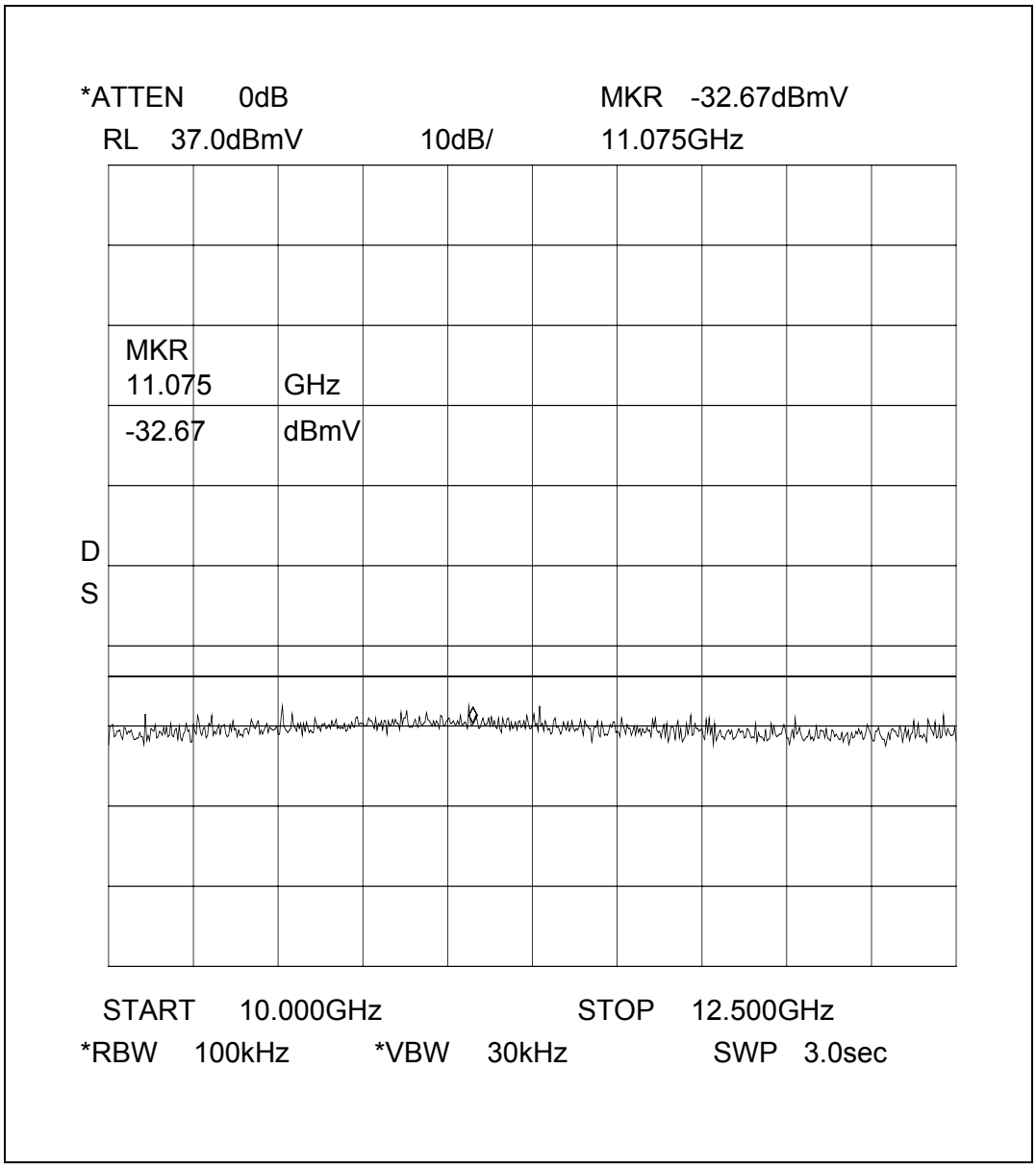
Calculation **:** Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.

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)

Plot No.: 08



Measurement distance d = 0.5 m

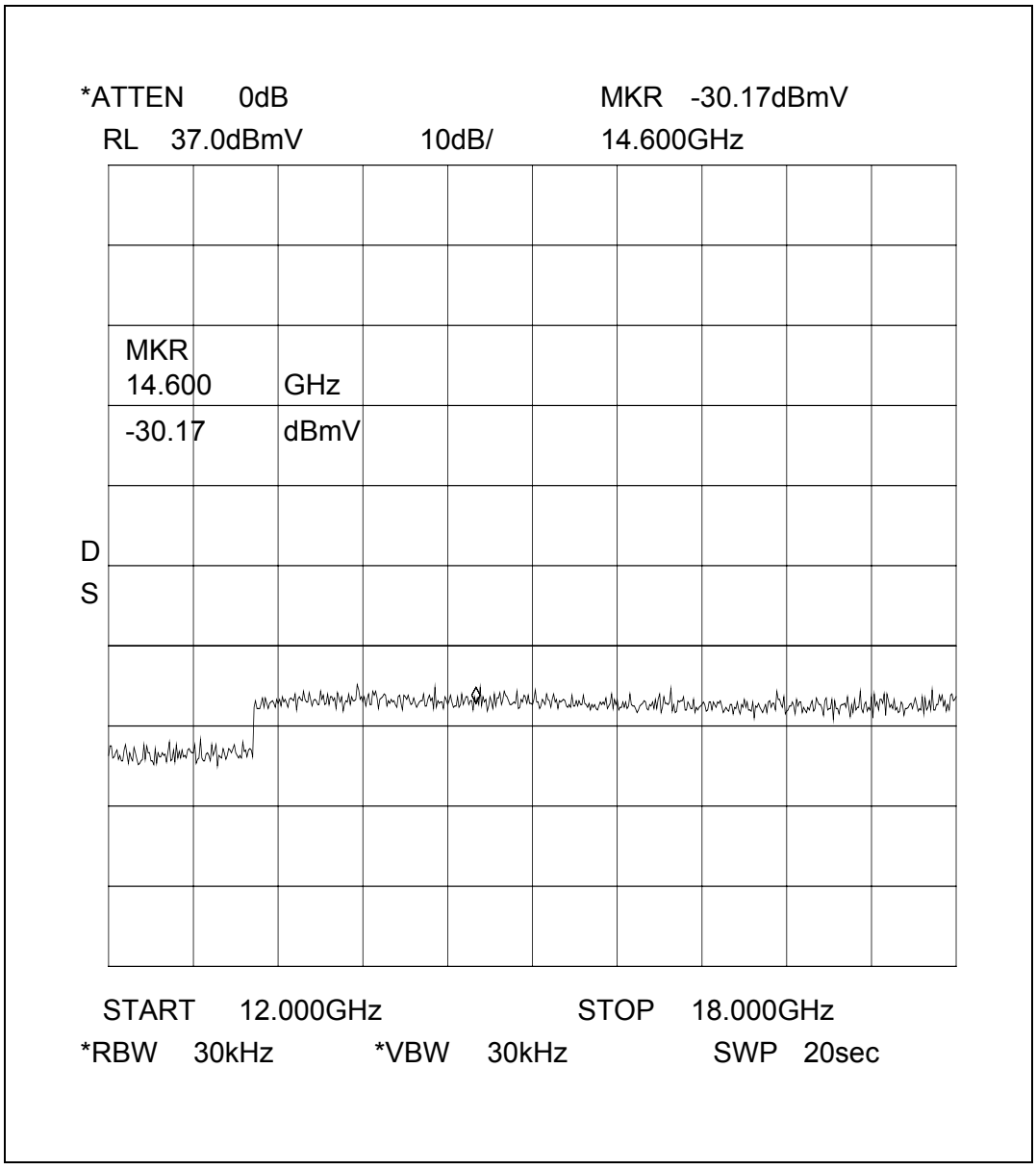
Calculation **:** Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.

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

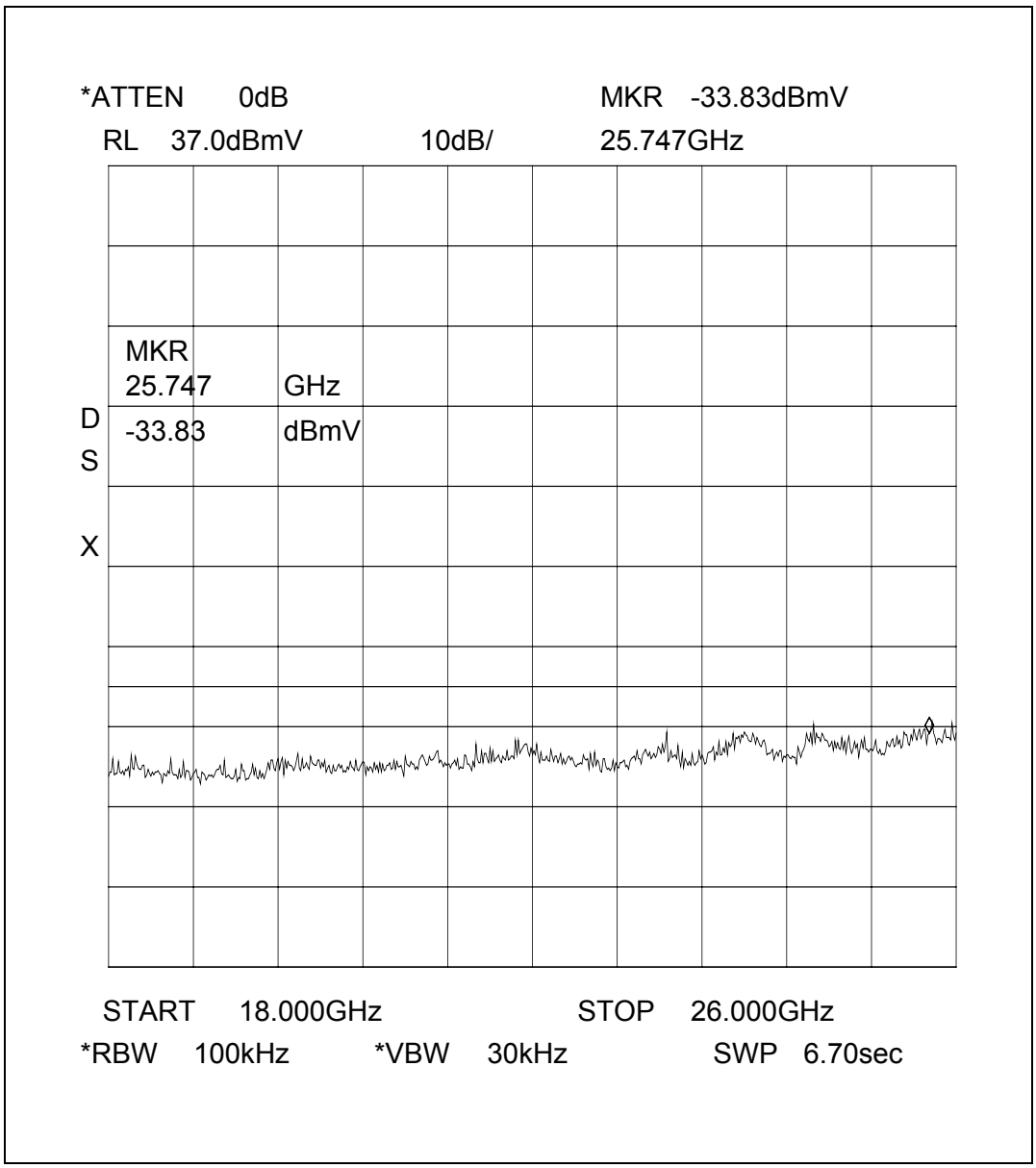
Calculation **:** Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.

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)

Plot No.: 10



Measurement distance d = 0.25 m

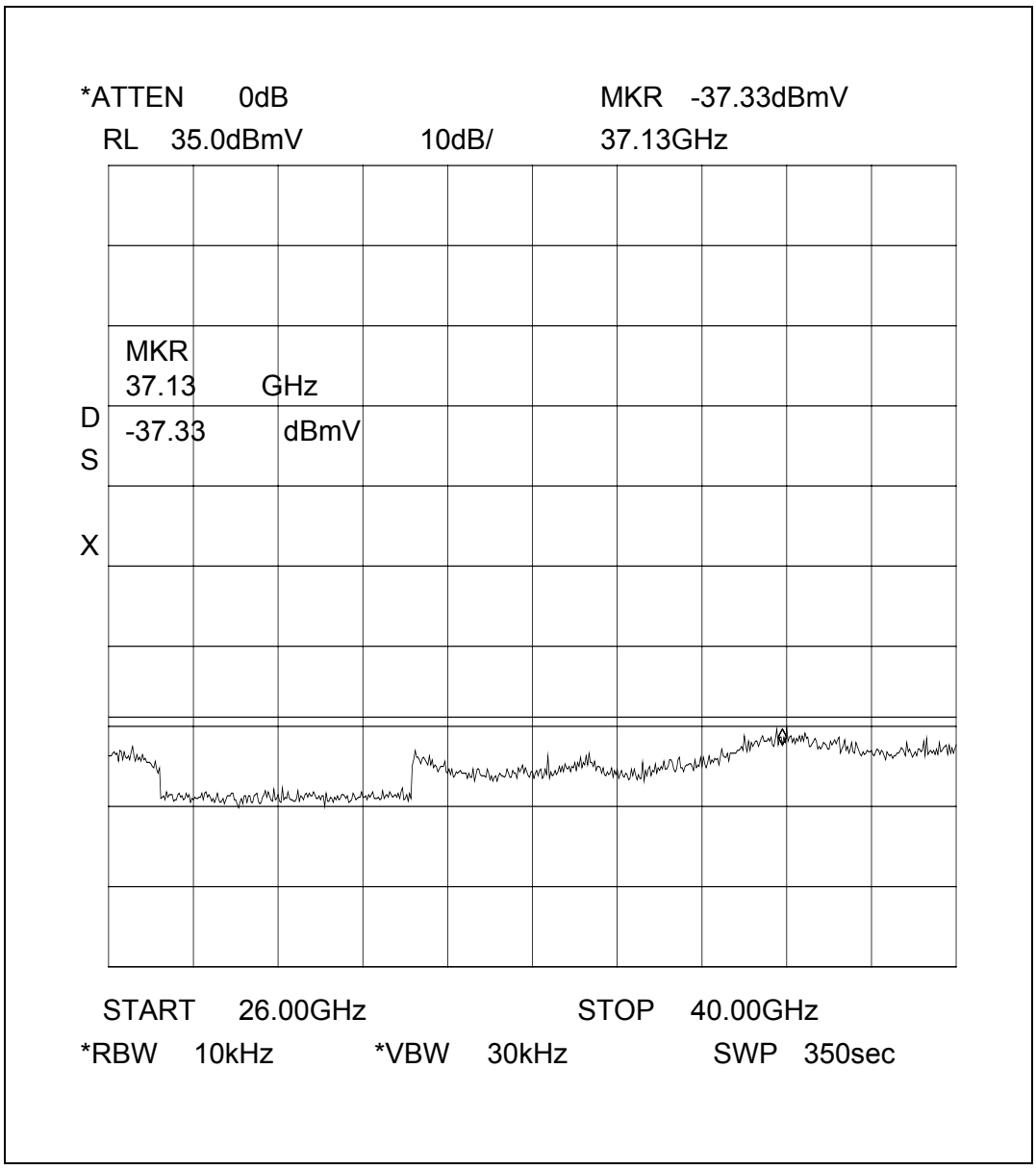
Calculation **:** Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.

e = -33.83 dB(mV) + 4.8 dB + 43.94 dB(1/m) + (-21.58 dB)

Noise e = -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

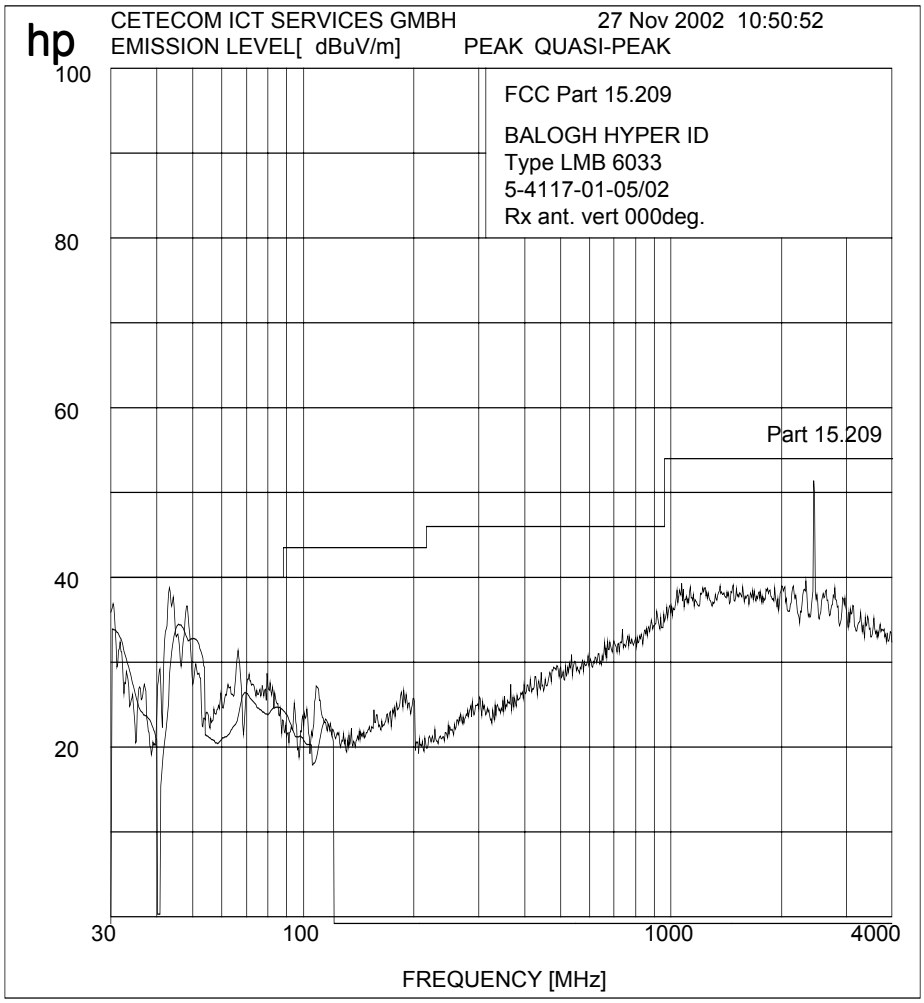
Calculation **:** Field strength = Analyser reading + Cable loss + Antenna factor + Dist. corr.

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


hp
CETECOM ICT SERVICES GMBH
27 Nov 2002 10:50:52
EMISSION LEVEL[dBuV/m]
PEAK QUASI-PEAK
FCC Part 15.209
BALOGH HYPER ID
Type LMB 6033
5-4117-01-05/02
Rx ant. vert 000deg.
Part 15.209
100
80
60
40
20
30
100
1000
4000
FREQUENCY [MHz]

Photographs of EUT

Photo No.: 01

Photo No.: 02

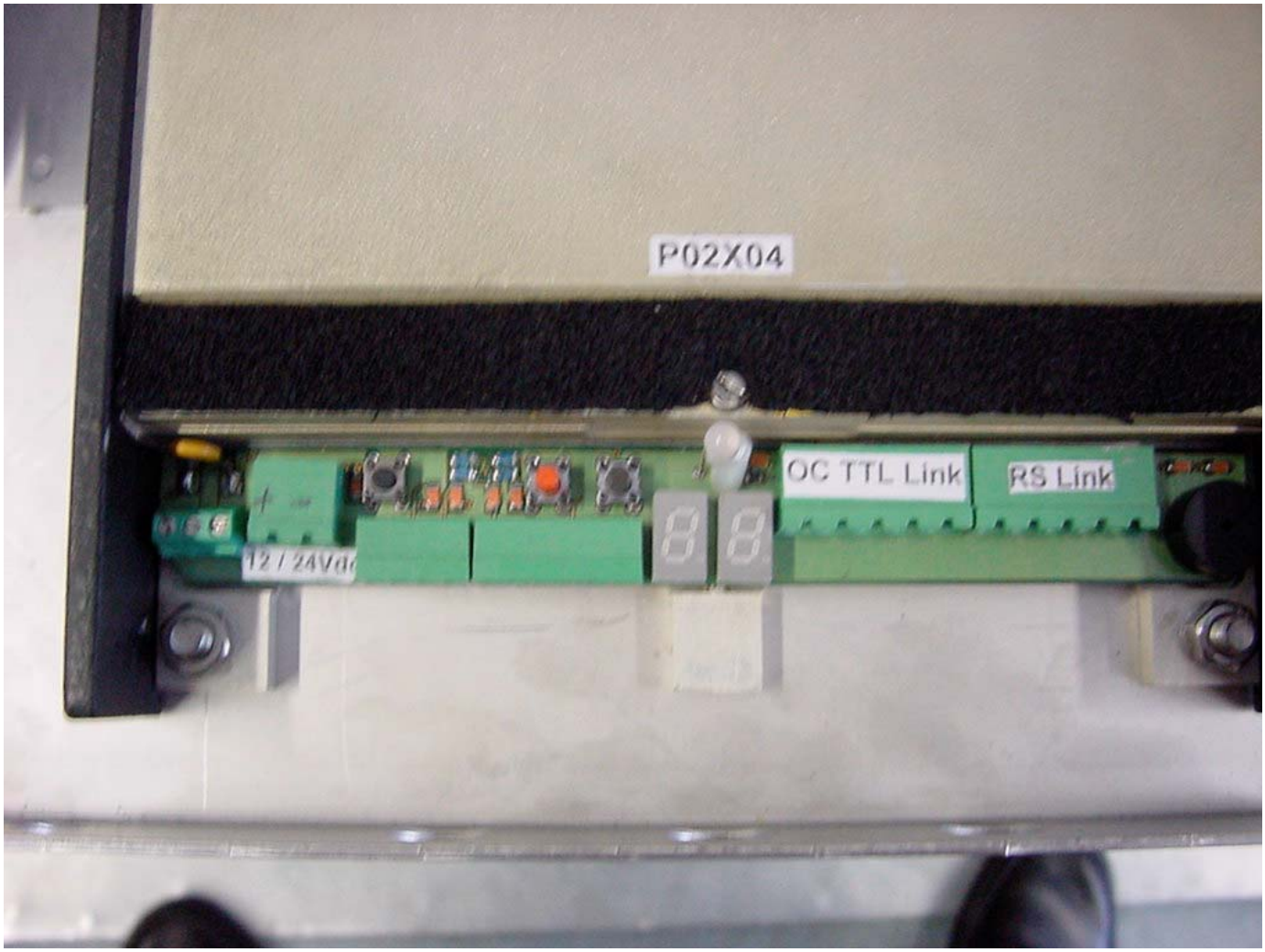


Photo No.: 03

Photo No.: 04

Photo No.: 05

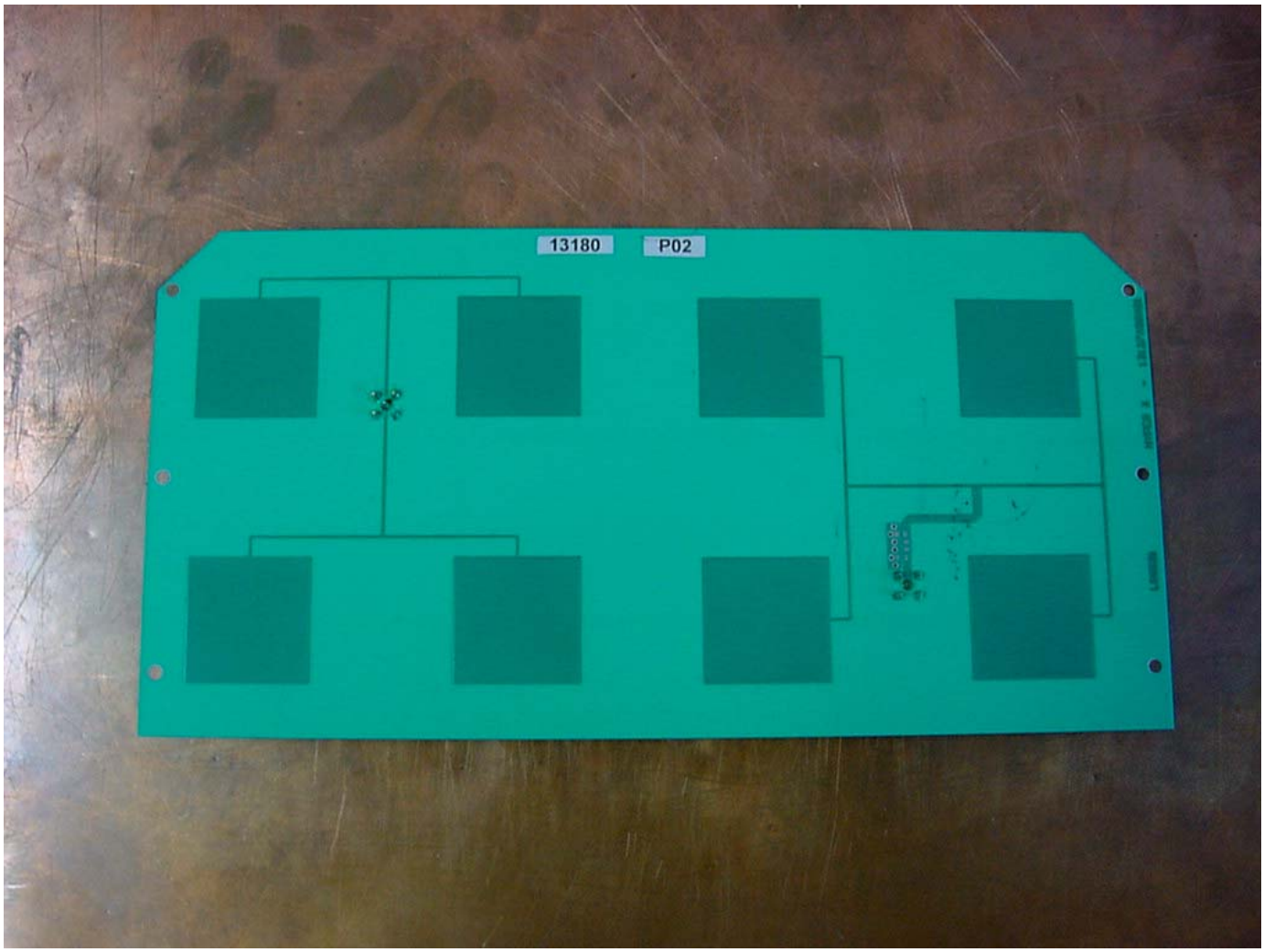


Photo No.: 06

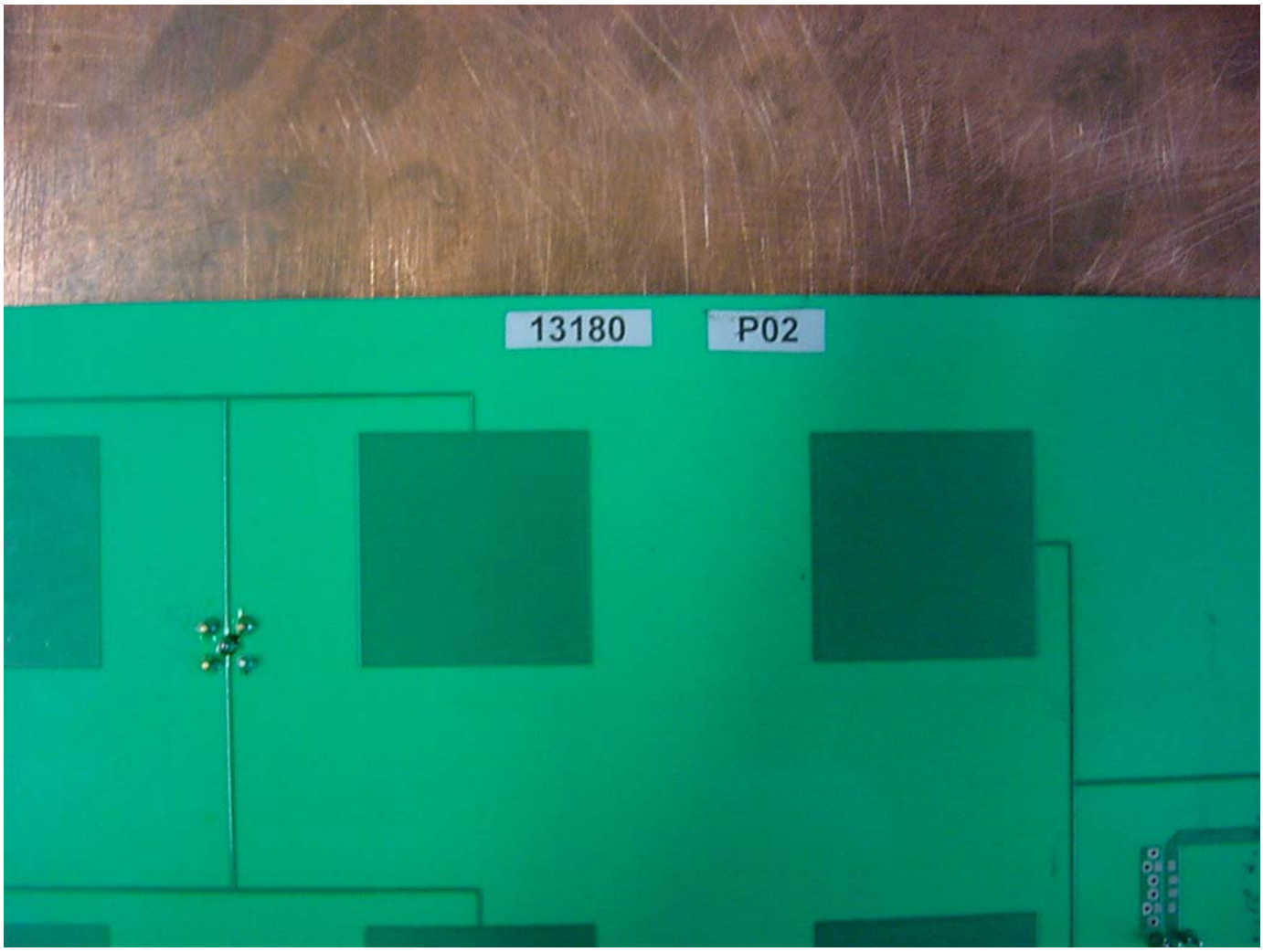


Photo No.: 07

TAG – BDG_1020

Photo No.: 08

TAG – BDG_1051

Photo No.: 09

TAG – BDG_1090