PHOENIX TEST-LAB

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Test Report

No.: R00339 Edition 1

OIS-P 3100 Transponder system for TAG identification

FCC ID: PNTOIS-P3100

EMC Test Laboratory
accredited by
DATech e.V.
in compliance with DIN EN 45001
under the
Reg. No. TTI-P-G071/94-00
and
listed by **FCC31040/SIT1300F2**

Testing body:	PHOENIX TEST-LAB Königswinkel 10 D-32825 Blomberg Germany
Applicant:	Baumer Ident GmbH Hertzstrasse 10 69469 Weinheim Germany
Equipment under test:	OIS-P3100
FCC ID:	PNTOIS-P3100
Manufacturer:	applicant
Order number:	00339
Type of test:	Unintentional radiator (whole system) Class B limits 15.109 Intentional radiator (only EUT), 15.245 field disturbance sensor

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Method of measurement according to: - ANSI C63.4 dd. 1992

Limits and requirements according to: - FCC Part 15.245
- FCC Part 15.109

Contents: **Page**

1 GENERAL INFORMATION

1.1 APPLICANT

Name:	Baumer Ident GmbH
Address:	Hertzstrasse 10
	69469 Weinheim
Country:	Germany
Name for contact purposes:	Günther Meuthen
Tel:	+49 62 01 99 57 0
Fax:	+49 62 01 99 57 99

1.2 MANUFACTURER

Name:	Baumer Ident GmbH
Address:	Hertzstrasse 10
	69469 Weinheim
Country:	Germany
Name for contact purposes:	Günther Meuthen
Tel:	+49 62 01 99 57 0
Fax:	+49 62 01 99 57 99

1.3 DATES

Date of Receipt of Test Sample:	16th February 2001
Start of test:	19th February 2001
Finish of test:	15th May 2001

1.4 TEST LABORATORY

The tests were carried out at: **PHOENIX TEST-LAB GmbH**
Königswinkel 10
D-32825 Blomberg **Tel: +49 (0) 52 35 / 95 00-0**
Germany **Fax: +49 (0) 52 35 / 95 00-10**

accredited by DATech e.V. in compliance with DIN EN 45001 under Reg. No. TTI-P-G071/94-01, and listed by **FCC 31040/SIT1300F2**

Applicant:	G. MEUTHEN		
	name	signature	date
Test engineer:	W. MEIER		
	name	signature	date
Test report checked:	B. STEINER		
	name	signature	date
		stamp	

1.5 RESERVATION

This test report is only valid in the original form.

Any reproduction of it's contents without written permission of the accredited test laboratory PHOENIX TEST-LAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TEST-LAB GmbH is not responsible for any generalisations or conclusions draw from these test results and concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page contains the PHOENIX TEST-LAB Logo and the TEST REPORT REFERENCE.

2 EUT DESCRIPTION

2.1 GENERAL EUT DESCRIPTION

The OIS-P3100 is a high frequency field sensor (transpondersystem) for TAG identification. The EUT consist of three parts: first part is the transceiver module with internal antenna, the second part is the computing module and the third part is the TAG. The transceiver module transmits in CW mode until the semi passive TAG reflects a modulated signal. The system contains alternative two types of transceiver modules the long range device and the short range device. The only difference between the two types is the adjustment of the output power. The output power of the Long Range Transmitter is 3dB higher than the output power of the short range device. The computing module prepares and detects data for periphery system (host computer). The transceiver module is supplied by the computing module which is powered by 24 VDC (external power supply). The TAG is powered by 3.6 V battery (internal). The operating frequency of the transceiver is 2.45 GHz.

2.2 EUT

Transceiver Module Long Range (LR)

Type:	PC3114/01A
Part No.:	124395 Rev. A
S/N:	K484 035
Connector:	-7 pin connector

Transceiver Module Short Range (SR)

Type:	PC3114/00C
Part No.:	124394
S/N:	K99450505
Connector:	-7 pin connector

Computing Module

Type:	PC3141/03B
Part No.:	2321-021 Rev. A
S/N:	K484 035
Connectors:	-Transceiver (Antenna), 9 pin D-Sub, female -Terminal, only for service, 9 pin D-Sub, male -Power, 24 VDC, 9 pin D-Sub, male -HOST, communication to periphery system, 15 pin D-Sub, male -I/O, connect optional device, 15 pin D-Sub, female

TAG

Type:	PC3104/32A
Part No.:	8623 104-321 Rev. A
S/N:	9720 3266
Connector:	-

2.3 PERIPHERY DEVICE

The following equipment was used as host computer for monitoring purposes.

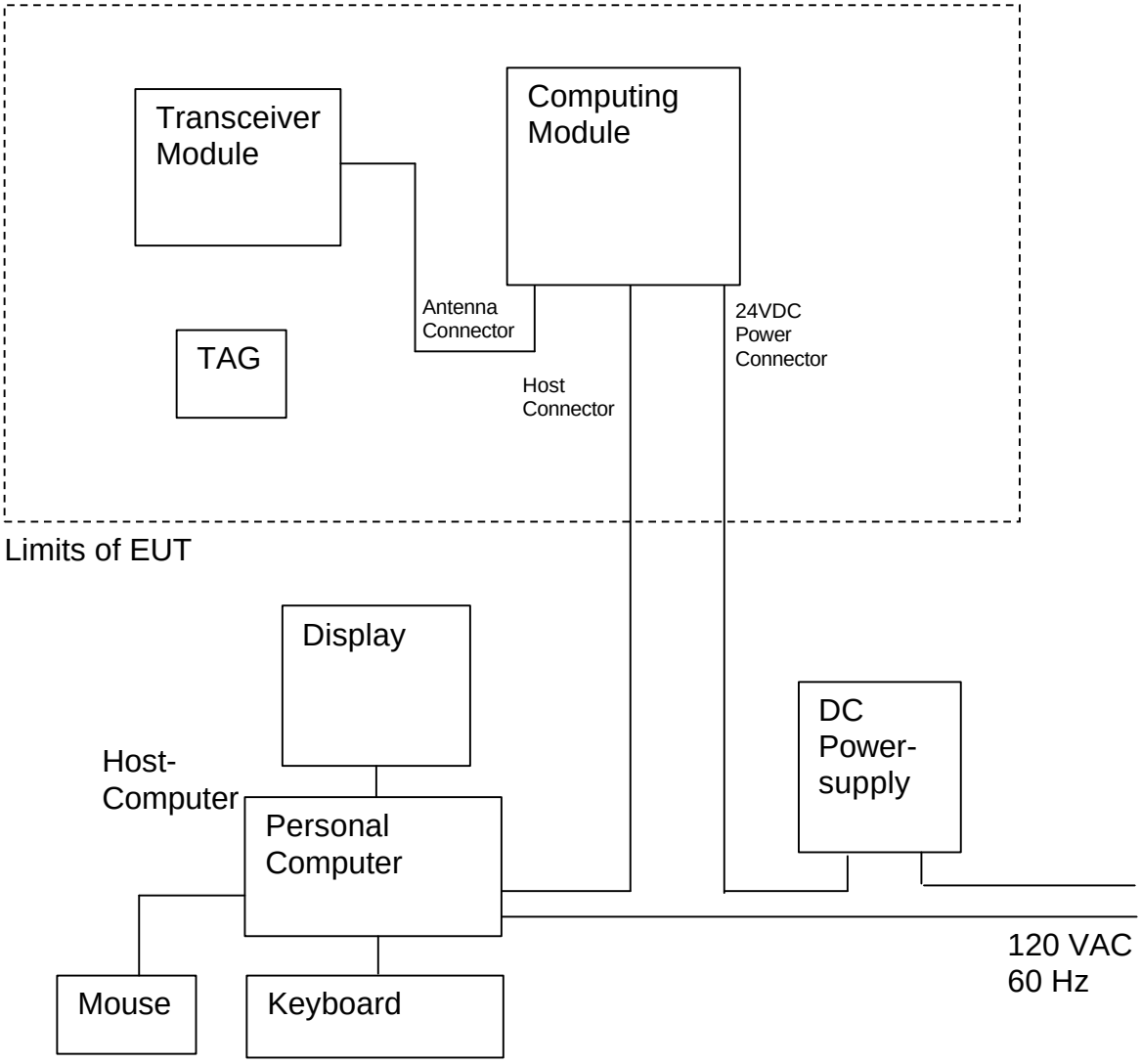
PC:	Hewlett Packard type Vectra VL5 Series 5 DT 5/166 serial no.: FR70969699 Declaration of conformity to Part 15 by HP
keyboard:	Hewlett Packard Part #: C3758-60203 Product #: C3758A ABD FCC ID: CIGEØ3633
mouse:	Hewlett Packard serial no.: LZB64208399 FCC ID: DZL211Ø29
monitor:	Elsa type GDM-17E03T5 serial no.: 6302392 FCC ID: AK8GDM17SE2T
Power Supply:	Hewlett Packard 6673A serial no.: 3501 A 00874

As operating system of the PC Windows 95 was used. The driver for the video card had the version FCS 76.
The mains voltage was 120VAC and the mains frequency was 60Hz.
The tests carried out with a video resolution for standard 625-line systems.

2.4 TEST CONFIGURATION

The system was tested in a typical configuration, as it is normally used by a customer

The system was set up as follows:



The following external I/O cables were used:

cable:	length	shielding	connectors
Transceiver Module to Computing Module	10 m	yes	D-SUB
Computing Module to Personal Computer (HOST)	1.5 m	yes	D-SUB
Computing Module to DC-Power Supply	2.0 m	no	D-SUB / n.s.
Personal Computer to Display	1.8 m	yes	D-SUB / fixed
Personal Computer to Mouse	1.5 m	yes	PS2
Personal Computer to Keyboard	1.5 m	yes	D-SUB
Personal Computer to AC-mains	2.0 m	no	IEC 320/ IEC Europe

3 TEST PROCEDURE

The test procedure was splitted in unintentional radiator test and intentional radiator test. The unintentional radiator test included the whole system with the personal computer and the intentional radiator is only the transmitter module, the computing module and the TAG.

Preliminary measurements were made in a fully anechoic chamber (FAC) with 3 m measuring distance for unintentional radiator and 1m for intentional radiator. In the first step the equipment under test is measured from two sides in its normal fitted position with horizontal and vertical polarization of the antenna. This scan uses the scantable for preliminary measurements. This procedure makes it possible to ascertain without the effect of external interference sources and without adjusting the antenna in a height where the test object is emitting interference at certain frequencies.
In the second step the frequency range, with the results from the first step, is divided into six ranges. In each range the six frequencies with the highest level, which are closer than 10dB to the limit line, are measured with the receiver set up shown in the scan table for the search scan and with both polarizations for the antenna. In this case the turntable is moved by 2 degree steps over 360 degrees. In the last stage the positions with the highest levels are measured with the quasi-peak detector or, above 1GHz with the average detector.

The final measurement are described under subclause 3.1 and 3.2 of this document.

3.1 UNINTENTIONAL RADIATOR

The radiated testing were performed in accordance with C63.4 procedure, as revised in 1992. The specification used was Class B limits of Rules Part 15 Subpart B for radiated (§15.109) interference measurements.
The preliminary measurement was performed at antenna to EUT (with LR-Transceiver) distance of 3 meters in a fully anechoic chamber to select the emissions in the frequency range of 30 MHz to 2 GHz.
The final measurement was performed at antenna to EUT (with LR-Transceiver) distance of 10 meters on open area test site to measure the selected emissions in the frequency range of 30 MHz to 2 GHz.

3.2 INTENTIONAL RADIATOR

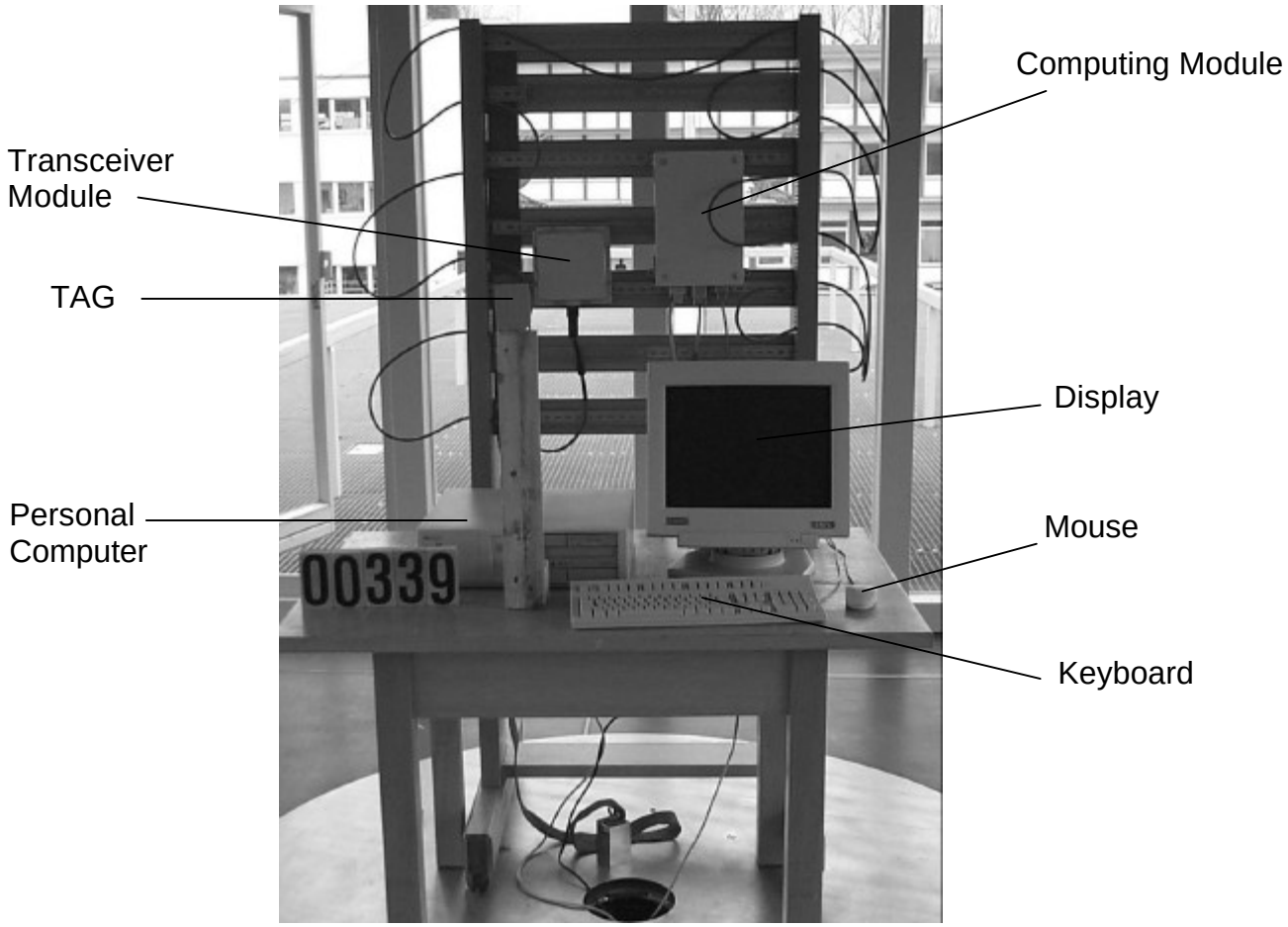
The radiated testing were performed in accordance with C63.4 procedure, as revised in 1992. The specification used was the limit of CFR 47 Part 15 Subpart C §15.245, §15.205 and §15.209.

The preliminary measurement was performed at antenna to EUT (with LR-Transceiver and SR-Transceiver) distance of 3 meters in a fully anechoic chamber to select the fundamental frequency, harmonic frequencies and indefinable emissions in the frequency range of 2 GHz to 26 GHz.

The final measurement was performed at antenna to EUT (with LR-Transceiver and SR-transceiver) distance of 3 meters on a open area test site to measurement the selected emissions in the frequency range of 2 GHz to 26 GHz.

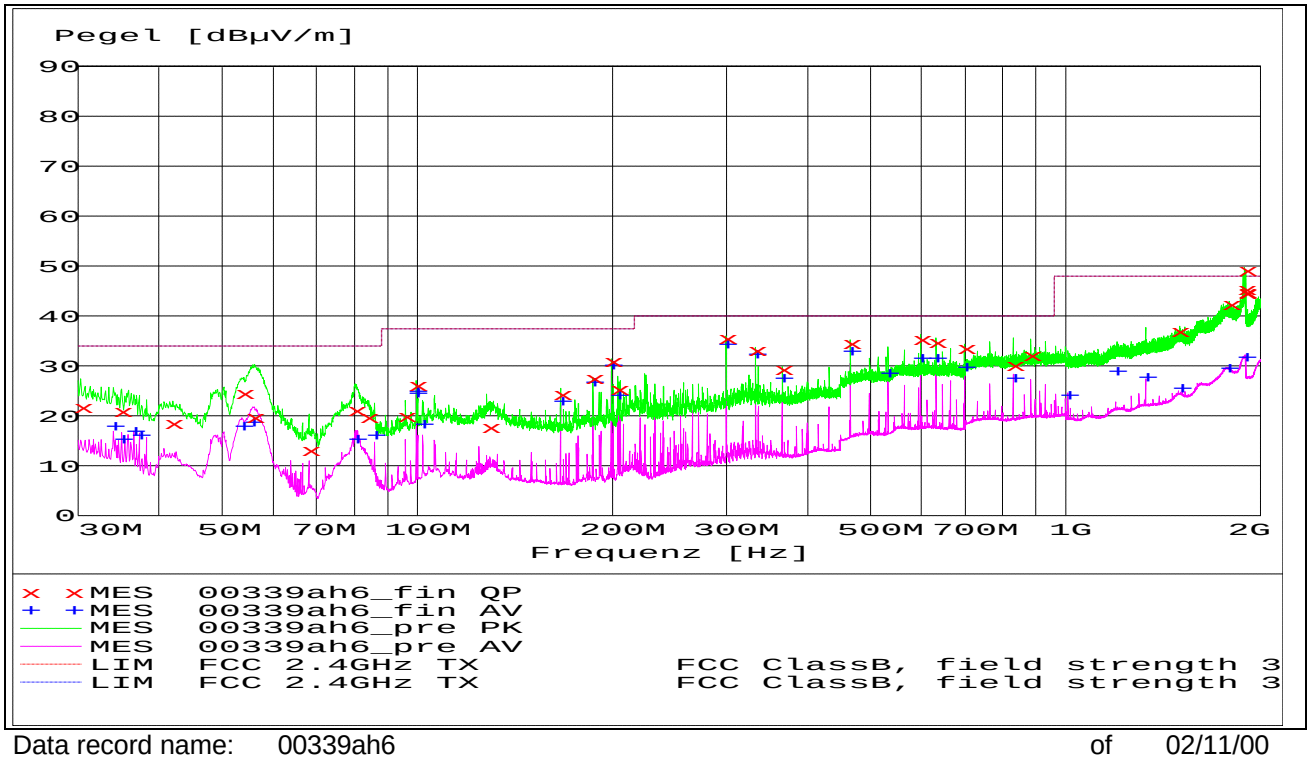
4 RADIATED EMISSION FOR UNINTENTIONAL RADIATOR

4.1 TEST SET UP



4.2 PRELIMINARY MEASUREMENT

1st header line	preliminary emission measurement
2nd header line	according to FCC Part 15
EUT	OIS-P 3100
Manufacturer	Baumer Ident
Operating Condition	transmit
Test Site	fully anechoic chamber M8 PHOENIX TEST LAB
Operator	W. Meier
Test Specification	whole system (TAG with LR-Transceiver and computer)
Comment line	



Data record name: 00339ah6 of 02/11/00

The limit line and measurement curve shown in the diagram below refer to the preliminary measurements. Here, it must be noted that because of the floor absorbers, the measured values do not comply with the values of the above mentioned standard; they only serve as orientation in determining which frequencies must be measured on the open area test site. The limit line is achieved with the applied standard by converting to the correction for the free space in which in the "worst case" the reflected floor wave is missing entirely (-6dB). Therefore -6dB is added to the limit line of the standard concerned.

The curves in the diagram only represent the maximum measured value for each frequency point of all preliminary measurements, which were carried out with the EUT in various positions.
For frequencies ≤1GHz:
The top measured curve represents the peak measurement. The measured points marked with x are frequency points of the highest emissions relativ to the limit, for which in the next step measurements with a quasi-peak detector on the open area test side were carried out. These values are indicated in the following table. The bottom measured curve represents average values, which are only required for control purposes.
For frequencies >1GHz:
The top measured curve represents the peak measurement. The measured points marked with x are the final measured max-peak results. These values are indicated in the following table. The bottom measured curve represents average values. The measured points marked with + are the final measured average results

Result measured:

£1GHz with quasi-peak detector

(These values are marked in the above diagram by x)

Frequency MHz	Level dBµV/m	Transducer 1/m	Limit dBµV/m	Margin dB	Azimuth	Polarisation
30.320000	21.70	19.5	34.0	12.3	136.00	VERTICAL
34.880000	20.90	16.4	34.0	13.1	211.00	VERTICAL
41.904000	18.40	12.3	34.0	15.6	314.00	VERTICAL
53.920000	24.50	8.2	34.0	9.5	180.00	VERTICAL
55.896000	19.80	7.7	34.0	14.2	359.00	HORIZONTAL
68.056000	13.30	6.7	34.0	20.7	80.00	HORIZONTAL
80.272000	21.20	8.7	34.0	12.8	135.00	HORIZONTAL
83.784000	19.60	9.4	34.0	14.4	69.00	VERTICAL
95.976000	20.00	11.3	37.5	17.5	295.00	HORIZONTAL
99.704000	26.00	12.0	37.5	11.5	100.00	HORIZONTAL
129.120000	17.70	13.0	37.5	19.8	127.00	HORIZONTAL
166.168000	24.40	11.2	37.5	13.1	357.00	HORIZONTAL
186.704000	27.60	10.3	37.5	9.9	46.00	HORIZONTAL
199.408000	31.10	10.8	37.5	6.4	80.00	HORIZONTAL
203.664000	25.40	10.9	37.5	12.1	315.00	VERTICAL
299.144000	35.50	14.6	40.0	4.5	11.00	VERTICAL
332.352000	33.20	15.3	40.0	6.8	216.00	HORIZONTAL
365.616000	29.40	16.5	40.0	10.6	222.00	HORIZONTAL
465.320000	34.50	18.5	40.0	5.5	261.00	HORIZONTAL
598.312000	35.20	20.4	40.0	4.8	75.00	VERTICAL
631.504000	34.70	20.8	40.0	5.3	18.00	VERTICAL
697.976000	33.50	20.5	40.0	6.5	31.00	VERTICAL
831.016000	30.10	21.8	40.0	9.9	180.00	VERTICAL
882.672000	32.20	22.1	40.0	7.8	2.00	VERTICAL

Data record name: 00339ah6_fin QP of 06/10/00

Result measured:
>1GHz with average detector:
(These values are marked in the above diagram by +)

Frequency MHz	Level dBµV/m	Transducer 1/m	Limit dBµV/m	Margin dB	Azimuth	Polarisation
1008.000000	24.10	23.1	48.0	23.9	27.00	VERTICAL
1196.672000	28.90	24.5	48.0	19.1	207.00	VERTICAL
1329.624000	27.80	25.7	48.0	20.2	1.00	VERTICAL
1503.368000	25.60	26.9	48.0	22.4	149.00	HORIZONTAL
1777.032000	29.50	29.8	48.0	18.5	187.00	HORIZONTAL
1890.400000	31.70	31.6	48.0	16.3	240.00	VERTICAL

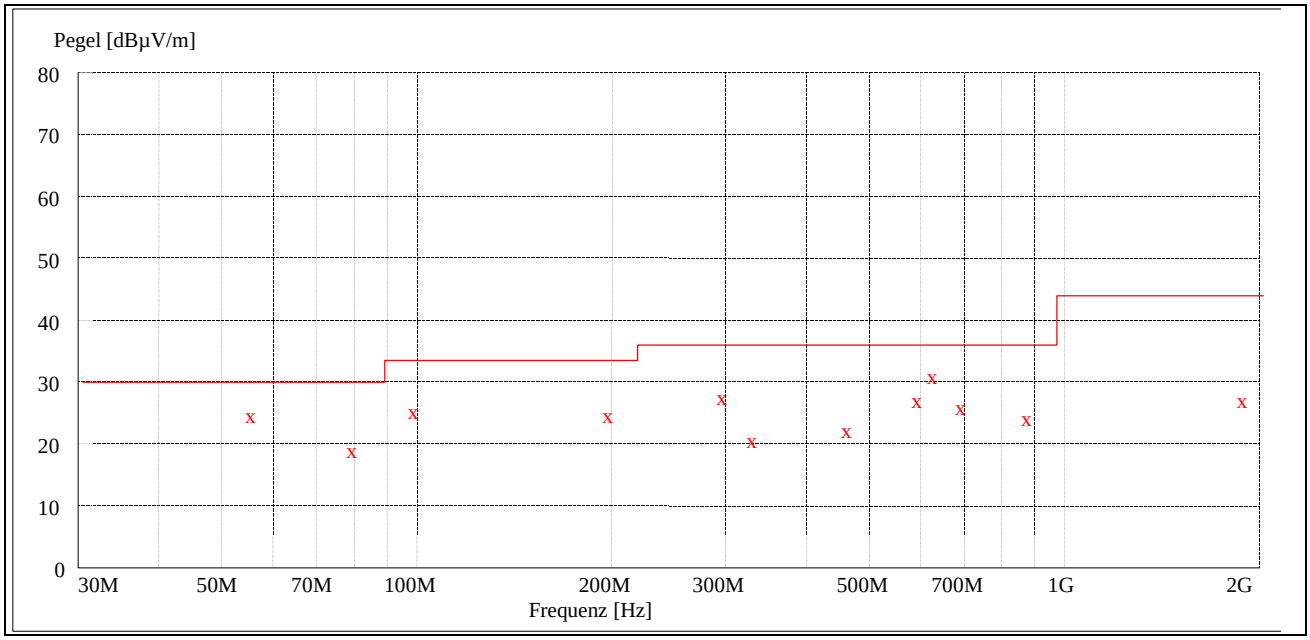
Data record name: 00339ah6_fin AV

For frequencies above 1 GHz the values in the table above, measured in the fully anechoic chamber with the average detector, are the final results.
The results from the final measurements below 1 GHz on the open area test site, at the above listed frequency points of the highest radiated emissions relativ to the limit for quasi-peak, are presented in the following.

Test Equipment used:
02, 06, 11, 112

4.3 FINAL MEASUREMENT UNINTENTIONAL RADIATOR

1st header line	finalary emission measurement
2nd header line	according to FCC Part 15
EUT	OIS-P 3100
Manufacturer	Baumer Ident
Operating Condition	transmit
Test Site	Open area test site M6 (10 m)
Operator	W. Meier
Test Specification	whole system (TAG with LR-Transceiver and computer)
Comment line	



Filename: 00339ffnm

The limit line and measurement curve shown in the diagram below refer to the preliminary measurements. Here, it must be noted that because of the expansion measuring distance (10 m instead of 3m), the measured values do not comply with the values of the above mentioned standard; they only serve as orientation in determining which frequencies must be measured on the open area test site.
The limit line is achieved with the applied standard by converting to a 10 m measurement distance (-10 dB).
The curves in the diagram only represent the maximum measured value for each frequency point of all preliminary measurements, which were carried out with the EUT in various positions.

For frequencies ≤1GHz:
The measured points marked with x are frequency points of the highest emissions relative to the limit, for which in the next step measurements with a quasi-peak detector on the open area test side were carried out. These values are indicated in the following table.
For frequencies >1GHz:
The measured points marked with x are the final measured average results. These values are indicated in the following table.

Measurement Results:
(These values are marked in the above diagram by x)

Frequency MHz	Level dBµA/m	Transducer dB	Limit dBµA/m	Margin dB	Height of measuring antenna cm	Azimuth of EUT deg	Polar-isation
55.896000	24.81	7.1	30.0	5.2	259.0	38.00	Ver.
80.272000	19.16	8.0	30.0	10.8	40.0	40.00	Ver.
99.704000	25.47	11.3	30.0	4.5	140.0	40.00	Hor.
199.408000	24.95	9.8	33.5	8.6	100.0	0.00	Ver.
299.144000	27.82	13.3	36.0	8.2	100.0	0.00	Ver.
332.352000	20.88	13.9	36.0	15.1	130.0	0.00	Ver.
465.320000	22.39	16.9	36.0	13.6	110.0	8.00	Hor.
598.312000	27.26	18.5	36.0	8.7	140.0	217.00	Hor.
631.504000	31.09	19.0	36.0	4.9	164.0	140.00	Hor.
697.976000	26.18	18.6	36.0	3.8	168.0	23.00	Ver.
882.672000	24.44	19.9	36.0	5.6	118.0	0.00	Ver.
1897.100000	27.14	28.5	44.0	28.0	259.0	38.00	Ver.

Filename: 00339ffnm_fin QP

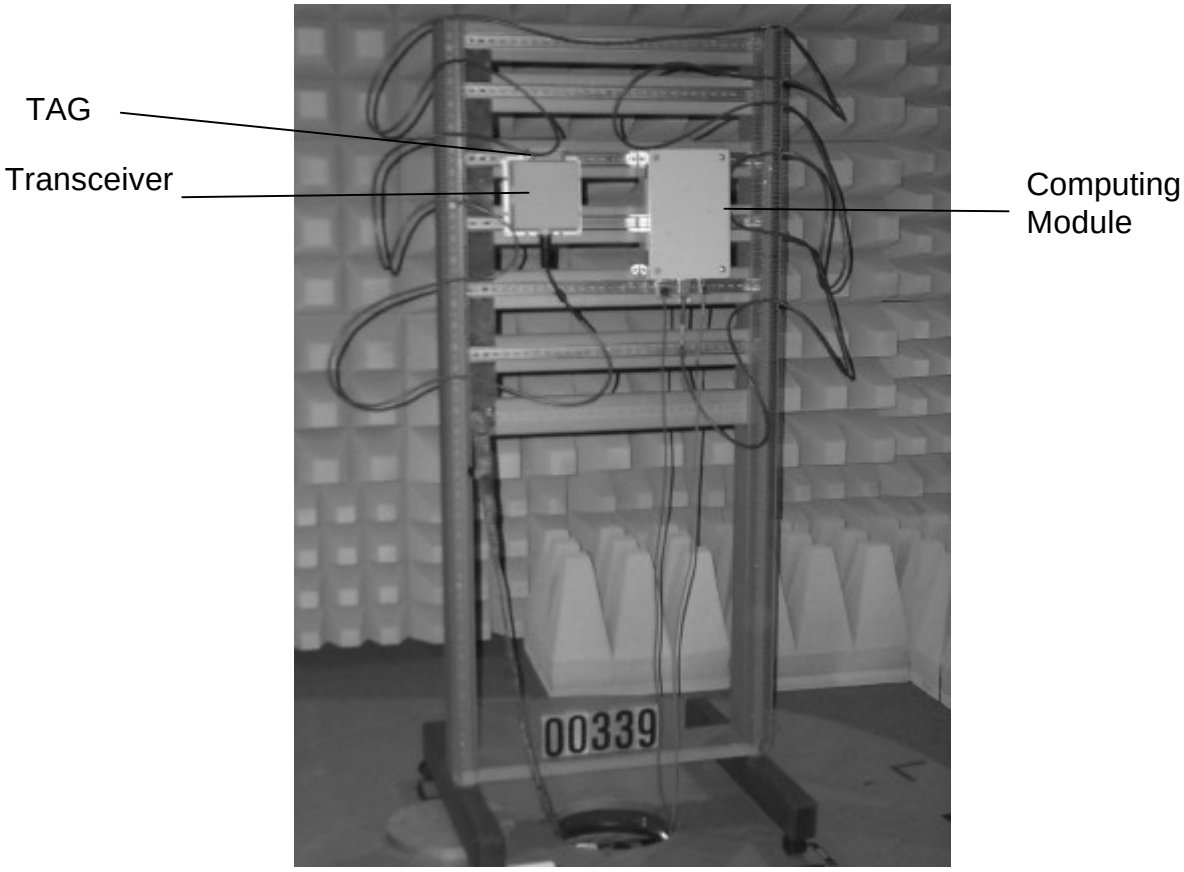
Test Equipment used:
03, 06, 11

5 RADIATED EMISSION FOR INTENTIONAL RADIATOR

5.1 PRELIMINARY MEASUREMENT

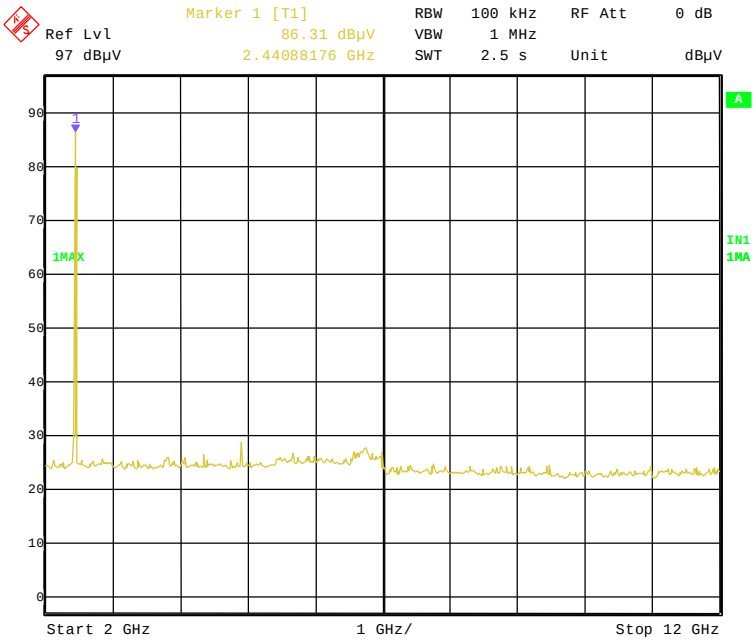
The preliminary measurement was performed at antenna to EUT (with LR-Transceiver and SR-Transceiver) distance of 3 meter in a fully anechoic chamber to select the fundamental frequency, harmonic frequencies and indefinable emissions in the frequency range of 2 GHz to 26 GHz. The measurement was carry out in the presence of the TAG in the vertical and horizontal polarisation (the maximum value was shown).

5.1.1 TEST SET UP

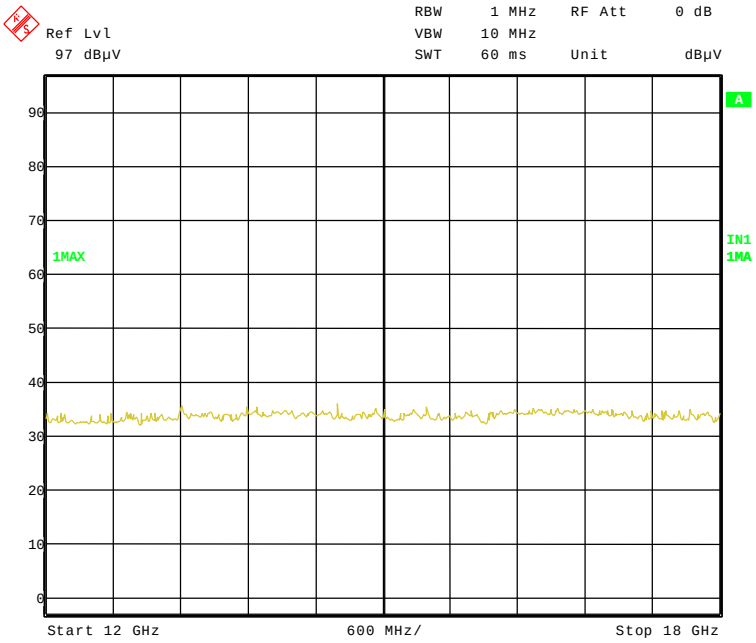


Test Equipment used:
02, 07, 17, 19, 20, 21, 22, 23, 24, 43, 63

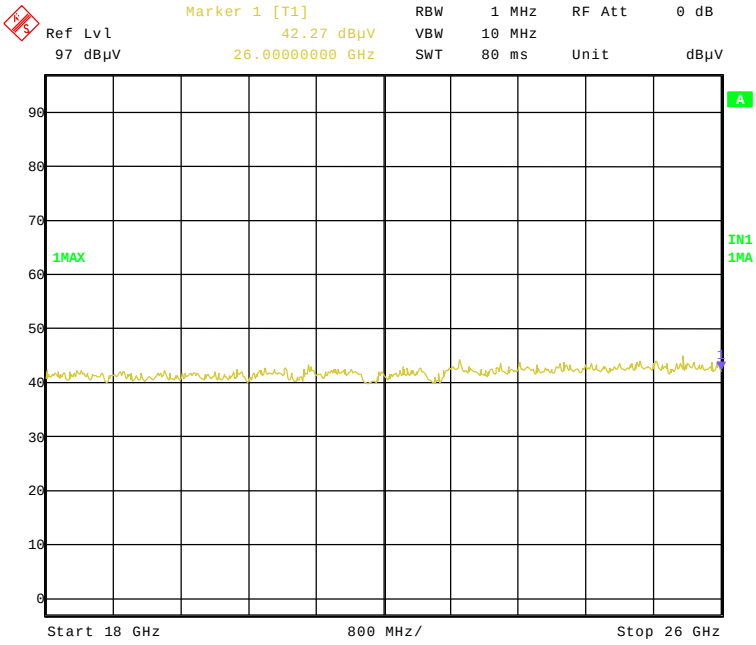
5.1.2 OVERVIEW FREQUENCY RANGE 2 GHZ TO 12 GHZ LR-TRANSCEIVER



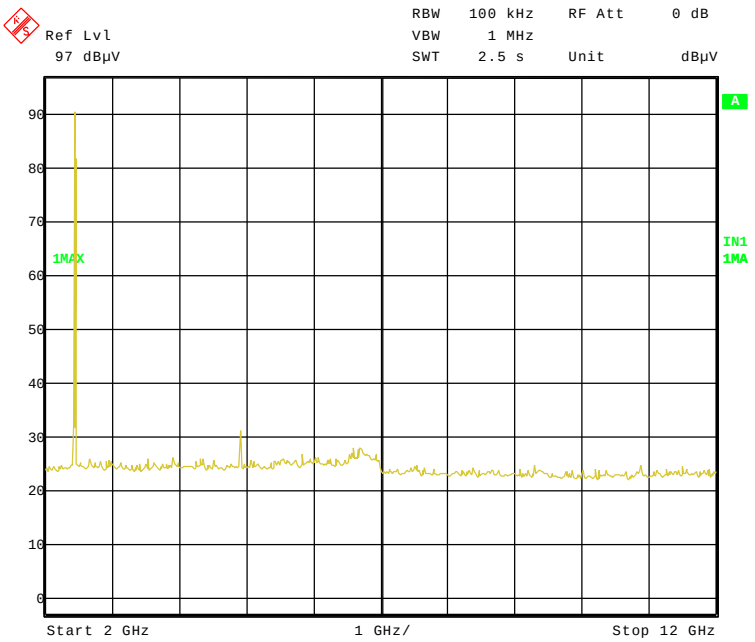
5.1.3 OVERVIEW FREQUENCY RANGE 12 GHZ TO 18 GHZ LR-TRANSCEIVER



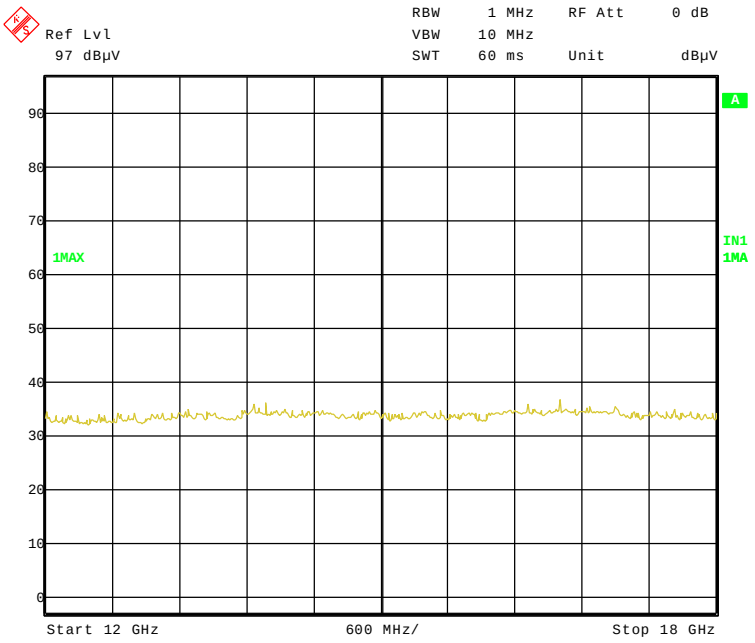
5.1.4 OVERVIEW FREQUENCY RANGE 18 GHZ TO 26 GHZ LR-TRANSCEIVER



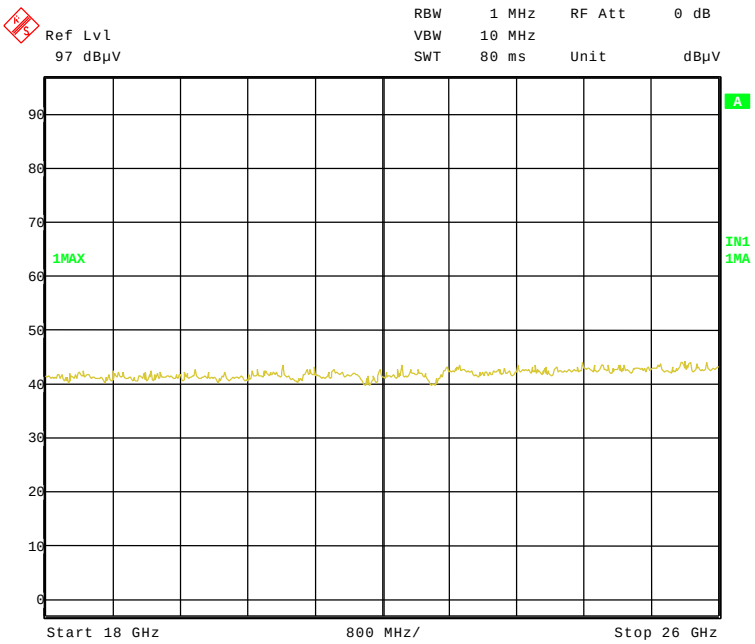
5.1.5 OVERVIEW FREQUENCY RANGE 2 GHZ TO 12 GHZ SR-TRANSCEIVER



5.1.6 OVERVIEW FREQUENCY RANGE 12 GHZ TO 18 GHZ SR-TRANSCEIVER



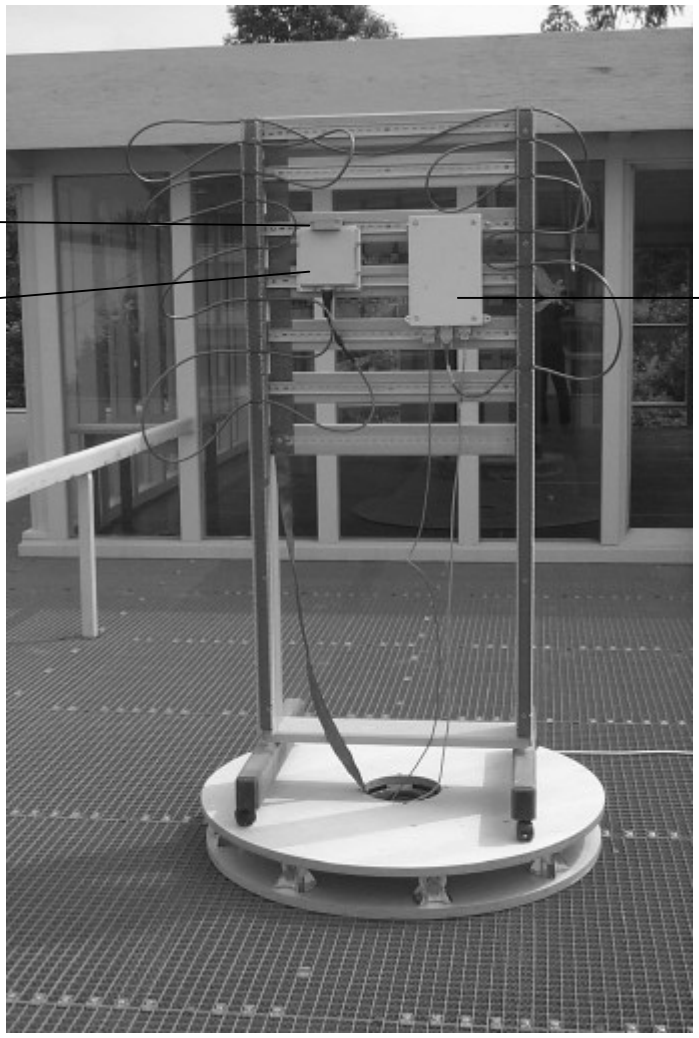
5.1.7 OVERVIEW FREQUENCY RANGE 18 GHZ TO 26 GHZ SR-TRANSCEIVER



5.2 FINAL MEASUREMENT

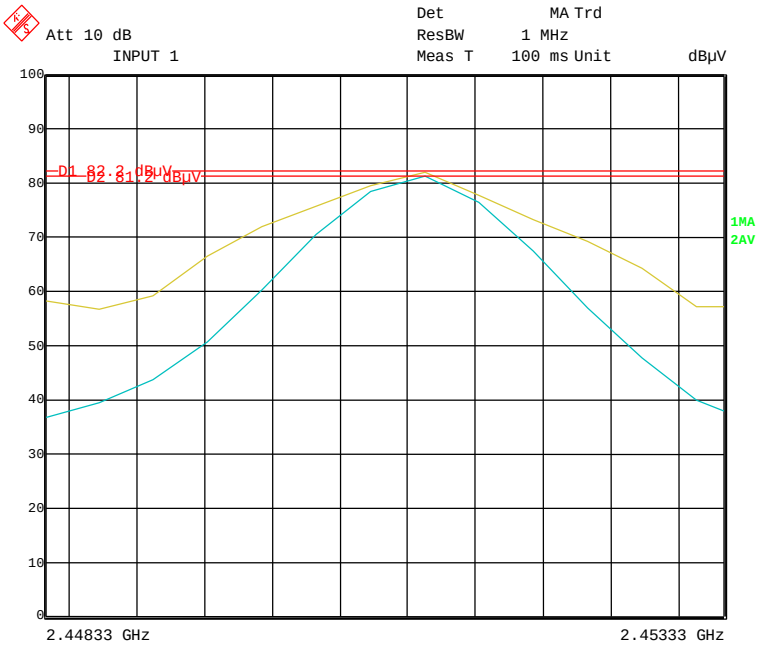
The final measurement was performed at antenna to EUT (with LR-Transceiver and SR-Transceiver) distance of 3 meters on open area test site to measurement the select emissions in the frequency range of 2 GHz to 26 GHz. The measurement was carry out in the presence of the TAG with a scan high of 1m to 4m in the vertical and horizontal polarisation (the maximum value was shown, average blue trace, peak yellow trace).

5.2.1 TEST SET UP

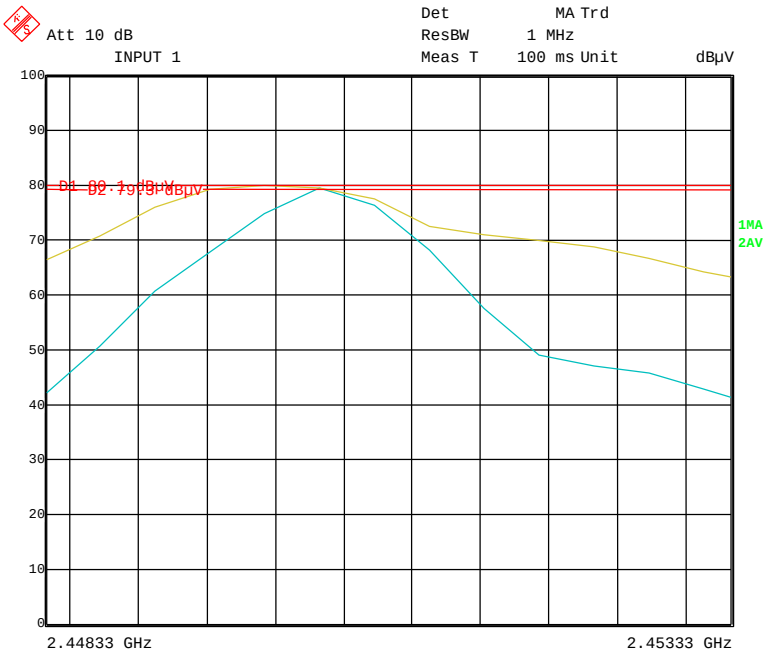


5.2.2 FUNDAMENTAL EMISSION

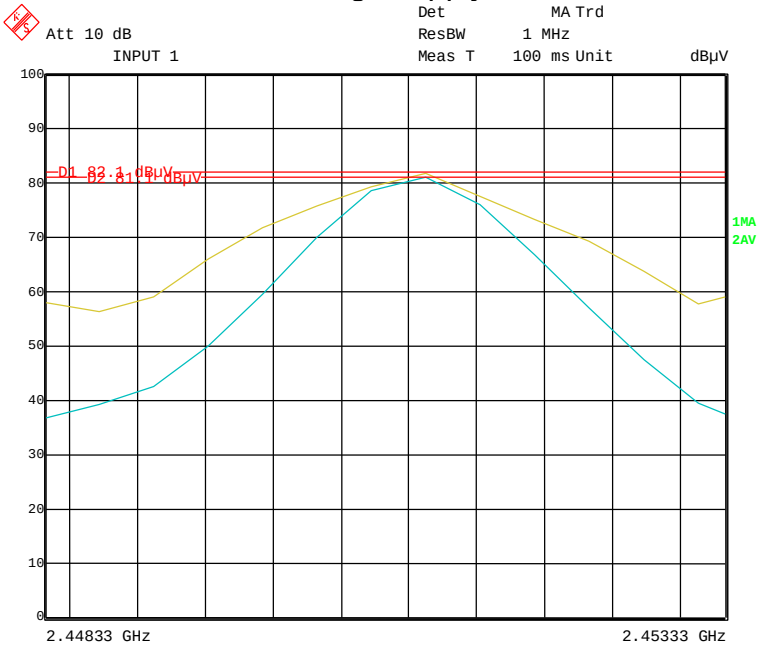
2.45 GHz, normal rated supply voltage 24 VDC, measurement distance 3 m, LR-Transceiver



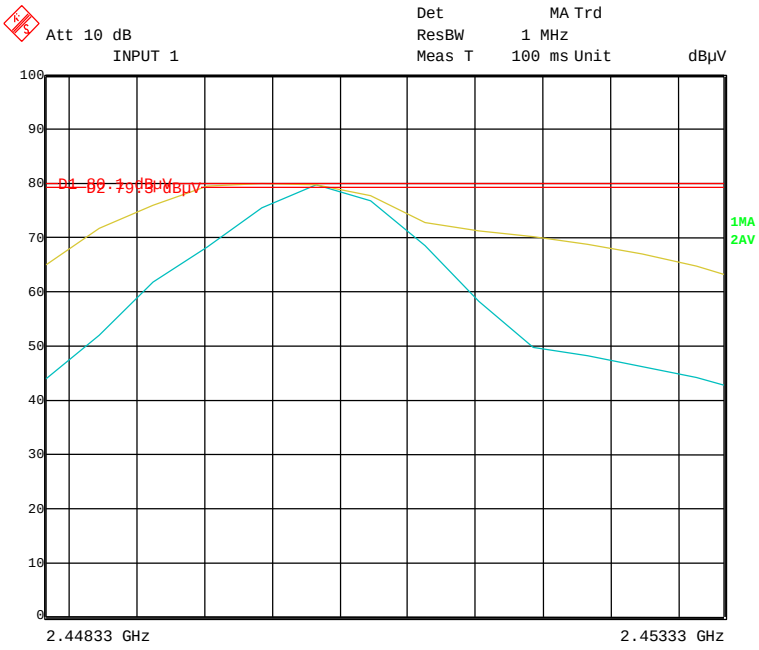
2.45 GHz, normal rated supply voltage 24 VDC, measurement distance 3 m, SR-Transceiver



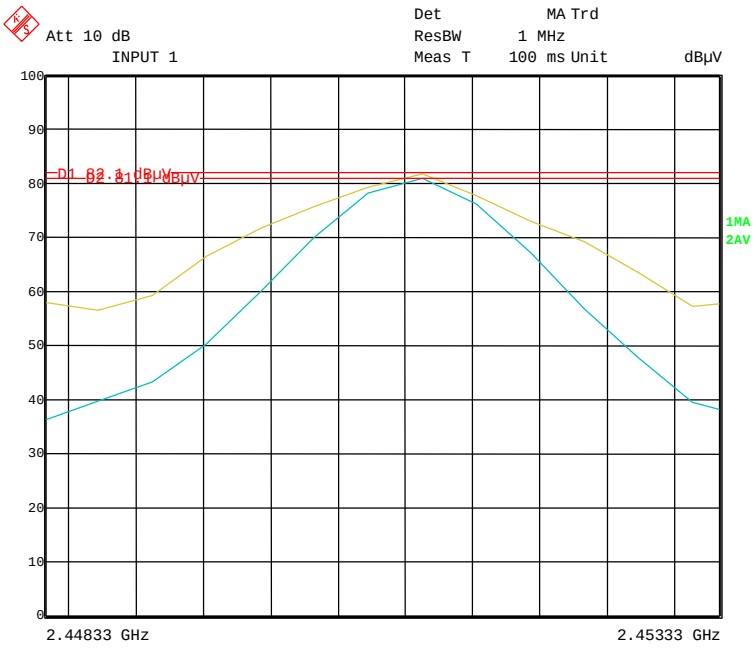
2.45 GHz, extreme voltage supply 20.4 VDC, measurement distance 3 m, LR-Transceiver



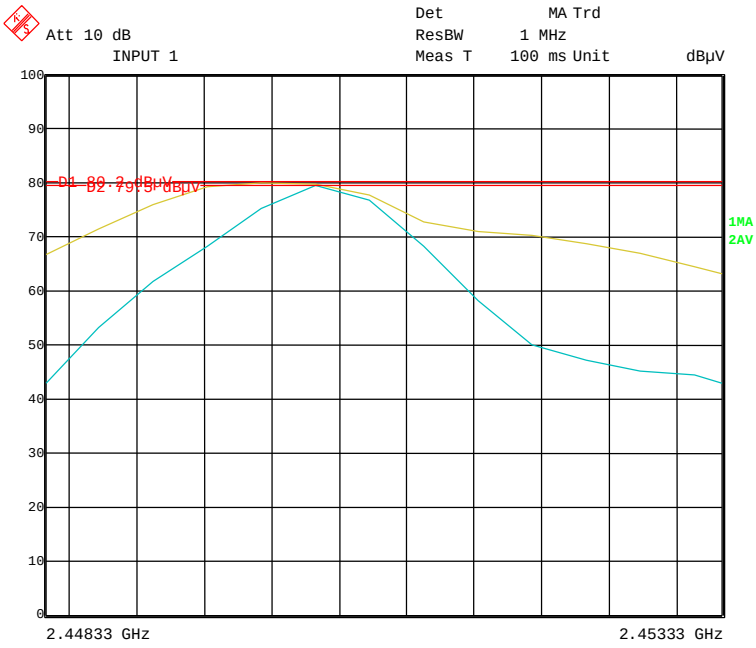
2.45 GHz, extreme voltage supply 20.4 VDC, measurement distance 3 m, SR-Transceiver



2.45 GHz, extreme voltage supply 27.6 VDC, measurement distance 3 m, LR-Transceiver

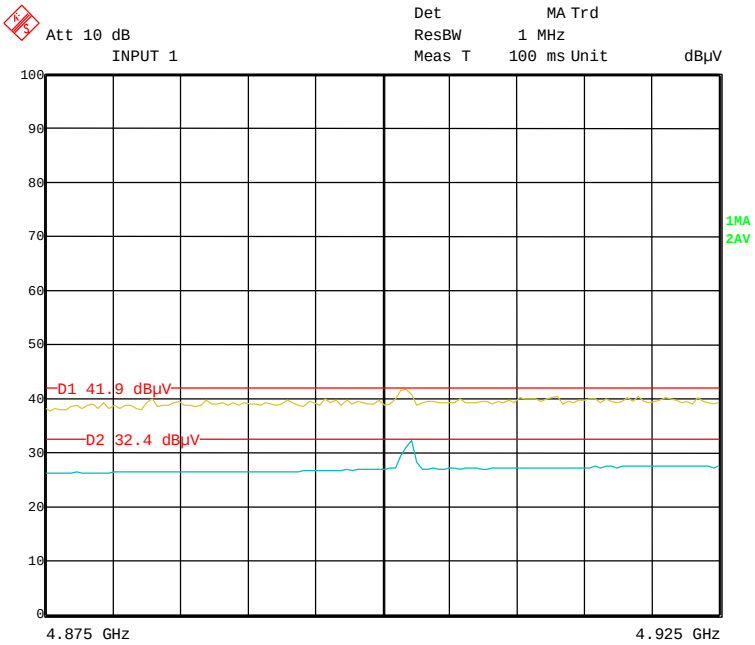


2.45 GHz, extreme voltage supply 27.6 VDC, measurement distance 3 m, SR-Transceiver

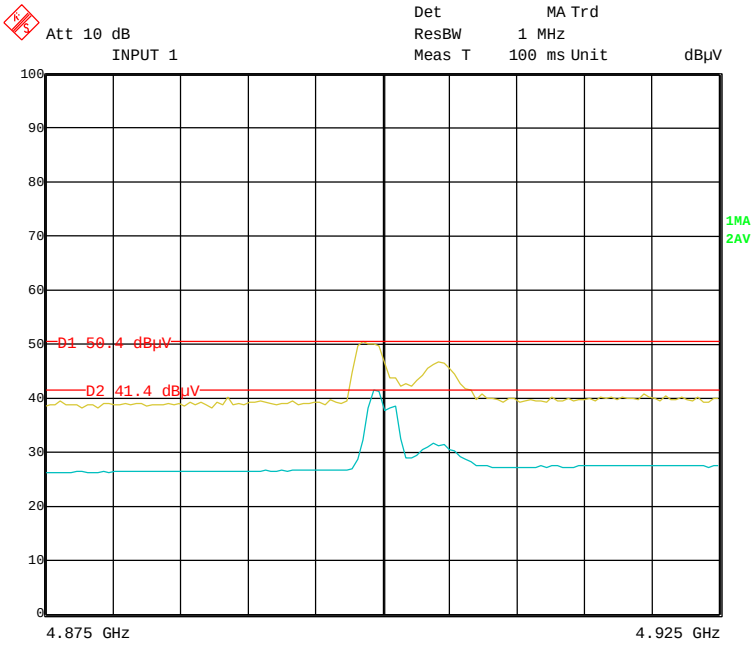


5.2.3 HARMONIC EMISSIONS

1st harmonic emission, normal rated supply voltage 24 VDC, measurement distance 3 m, LR-Transceiver



1st harmonic emission, normal rated supply voltage 24 VDC, measurement distance 3 m, SR-Transceiver



Test Equipment used:
03, 07, 17 ,43, 63,

5.3 LIST OF RESULTS

fadiated emission intentional radiator with LR-Transceiver

Frequency GHz	Voltage Supply V	Measured Result Avg dBµV	Measured Result Peak dBµV	Cable Loss dB	Pre-amplifier dB	Antenna Factor dB/m	Polar-isation	Limit d=3m dBµV/m	Measured Result Avg dBµV/m	Test Result
2.45*	24	81.2	82.2	3.8	-	28.5	hor.	114	113.5	passed
2.45*	20.4	81.1	82.1	3.8	-	28.5	hor.	114	113.4	passed
2.45*	27.6	81.1	82.1	3.8	-	28.5	hor.	114	113.4	passed
4.90**	24	32.4	41.9	4.2	26.0	33.4	hor.	54	43.6	passed
7.35***	24	-	< 28 noise level	1.1	26.0	37.8	hor.	54	< 40.9 noise level	passed
9.80***	24	-	< 28 noise level	1.1	26.0	38.5	hor.	64	< 41.6 noise level	passed
12.25***	24	-	< 36 noise level	1.5	25.8	33.6	hor.	64	< 45.3 noise level	passed
14.70***	24	-	< 36 noise level	1.5.	26.6	33.7	hor.	64	< 44.6 noise level	passed
17.15***	24	-	< 36 noise level	2.0	27.4	33.8	hor.	64	< 44.4 noise level	passed
19.60***	24	-	< 45 noise level	2.2	38.2	37.1	hor.	64	< 46.1 noise level	passed
22.05***	24	-	< 45 noise level	2.4	38.2	37.1	hor.	54	< 46.3 noise level	passed
24.50***	24	-	< 45 noise level	2.5	38.9	37.2	hor.	64	< 45.8 noise level	passed

* OATS with high scan 1m – 4m , RBW 1 MHz, 3m distance
** OATS with high scan 1m – 4m , RBW 1 MHz (100kHz), 3m distance, Notchfilter 2.4 GHz
***preliminary measurement fully anechoic chamber, RBW 1 MHz, 3m distance, Notchfilter 2.4 GHz, no emission found

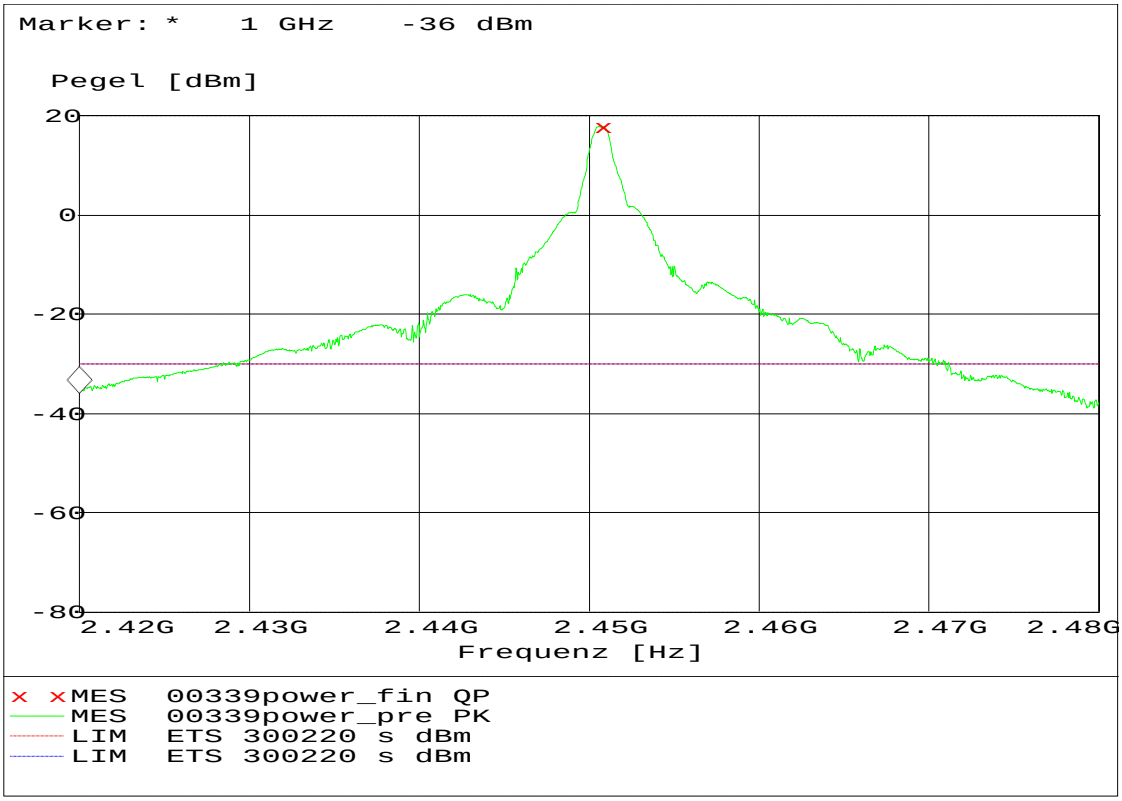
Radiated emission intentional radiator with SR-Transceiver										
Frequency GHz	Voltage Supply V	Measured Result Avg dBµV	Measured Result Peak dBµV	Cable Loss dB	Pre-amplifier dB	Antenna Factor dB/m	Polar-isation	Limit d=3m dBµV/m	Measured Result Avg dBµV/m	Test Result
2.45*	24	79.3	80.1	3.8	-	28.5	hor.	114	111.6	passed
2.45*	20.4	79.3	80.1	3.8	-	28.5	hor.	114	111.6	passed
2.45*	27.6	79.3	80.1	3.8	-	28.5	hor.	114	111.6	passed
4.90**	24	41.4	50.4	4.2	26.0	33.4	hor.	54	53	passed
7.35***	24	-	< 28 noise level	1.1	26.0	37.8	hor.	54	< 40.9 noise level	passed
9.80***	24	-	< 28 noise level	1.1	26.0	38.5	hor.	64	< 41.6 noise level	passed
12.25***	24	-	< 36 noise level	1.5	25.8	33.6	hor.	64	< 45.3 noise level	passed
14.70***	24	-	< 36 noise level	1.5.	26.6	33.7	hor.	64	< 44.6 noise level	passed
17.15***	24	-	< 36 noise level	2.0	27.4	33.8	hor.	64	< 44.4 noise level	passed
19.60***	24	-	< 45 noise level	2.2	38.2	37.1	hor.	64	< 46.1 noise level	passed
22.05***	24	-	< 45 noise level	2.4	38.2	37.1	hor.	54	< 46.3 noise level	passed
24.50***	24	-	< 45 noise level	2.5	38.9	37.2	hor.	64	< 45.8 noise level	passed
* OATS with high scan 1m – 4m , RBW 1 MHz, 3m distance ** OATS with high scan 1m – 4m , RBW 1 MHz (100kHz), 3m distance, Notchfilter 2.4 GHz ***preliminary measurement fully anechoic chamber, RBW 1 MHz, 3m distance, Notchfilter 2.4 GHz, no emission found										

PHOENIX TEST-LAB

EFFECTIVE RADIATED POWER

The effective radiated power measurement was performed at antenna to EUT distance of 1 meter in a fully anechoic chamber to measurement the fundamental frequency.

The effective radiated power measurement carried out only with LR-Transceiver module and computing module without TAG and periphery device.



Effective Radiated Power							
Frequency GHz	Voltage Supply V	Measured Result dBm	Transducer dB	Minimum Distance to Human Body cm	Calculate Result mW/cm²	Limit mW/cm²	Test Result
2.45	24	17.7	-73.7	20	0.0117	1	passed

5.4 HUMAN EXPOSURE TO RF-ELECTROMAGNETIC FIELDS

In accordance with the OET Bulletin 65 Edition 97.01,

S: power density (mW/cm²)
EIRP: equivalent isotropically radiated power (mW)
R: distance to the center of radiation of the antenna (cm)

$$S = \frac{EIRP}{4 * p * R^2}$$

The transceiver is classified as mobile device therefore the distance between the transmitter module and human body is minimum 20 cm (see user manual), and the EIRP is 17.7 dBm (58.9 mW), so the power density is:

S = 0.0117 mW/cm²

The limit for “General Population/Uncontrolled Exposure” of the power density is 1 mW/cm² (2.45 GHz), in accordance with the 47 CFR 2.1310.

6 MEASUREMENT EQUIPMENT

6.1 TEST EQUIPMENT

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
01	Fully anechoic chamber M8	-	Siemens Matsushita	B83117-E7019-T231	480190
02	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303
03	Open area test site	-	Phoenix Test-Lab	-	480085
04	Outdoor test site	-	Phoenix Test-Lab	-	480293
05	Measuring receiver	ESAI	Rohde & Schwarz	831953/001 833181/018	480025 480026
06	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
07	Measuring receiver	ESI 40	Rohde & Schwarz	837808/007	480334
08	Measuring receiver	ESCS 30	Rohde & Schwarz	828985/014	480270
09	Spectrum analyser	R2361C	Advantest	51720469	480144
10	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059
11	BILOG Antenna	CBL6112 A	Chase	2034	480185
12	BILOG Antenna	CBL6112 B	Chase	2688	480328
13	Bikon Antenna	HK 116	Rohde & Schwarz	833599/008	480071
14	Bikon Antenna	HK 116	Rohde & Schwarz	836891/012	480122
15	Lop-Per Antenna	HL 223	Rohde & Schwarz	835556/014	480123
16	Lop-Per Antenna	HL 223	Rohde & Schwarz	833335/005	480072
17	Horn Antenna	3115 A	EMCO	9609-4918	480183
18	Horn Antenna	3115 B	EMCO	9609-4922	480184
19	Standard Gain Horn	18240-20	FLANN	483	480337
20	Standard Gain Horn	20240-20	FLANN	56	480296
21	pre amplifier 12 GHz	23-5A	Miteq	681851	480337
22	pre amplifier 18 GHz	16-5A	Miteq	571667	480334
23	pre amplifier 26.7 GHz	20-5A	Miteq	658697	480342

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
24	microwave cable	KPS--800	Insulated wire	-	480302
25	microwave cable	KPS--400	Insulated wire	-	480300
26	Signal generator	SME 06	Rohde & Schwarz	844530/008	480174
27	Signal generator	SMG	Rohde & Schwarz	8334497/030	480013
28	Signal generator	83650L	Agilent	3844A00554	480333
29	Radio communication analyser	CMTA 54	Rohde & Schwarz	841904/011	480169
30	Oscilloscope 4channel	54540A	Hewlett Packard	3339A00192	480001
31	Oscilloscope 2 channel	54520A	Hewlett Packard	3344A00390	480007
32	Signal generator	TOE 7704	TOELLNER	39385	480008
33	Combiner	ZFSC-2-11	Mini Circuits	-	410089
34	Combiner	ZFSC-2-11	Mini Circuits	-	410090
35	Power splitter	11850C	Hewlett Packard	01052	410069
36	Power splitter	-	Suhner	-	410070
37	Symmetrical transformer	-	Phoenix Test Lab	-	410086
38	Feeding bridge A	-	Phoenix Test Lab	-	410087
39	Feeding bridge A	-	Phoenix Test Lab	-	410088
40	Regulating transformer	BR802	Block	-	480094
41	Regulating transformer	BR802	Block	-	480095
42	Regulating transformer	B9701089	Block	105713	480341
43	Power supply	TOE 8752	Toellner	31566	480010
44	Power supply	TOE 8852	Toellner	51712	480233
46	Power supply	TOE 8752	Toellner	31569	480009
47	Power supply	TOE 8852	Toellner	51786	490001
48	Climatic chamber	KS600/75L	RS-Simulatoren	19002901	490065
49	Climatic chamber	KS600/75	RS-Simulatoren	19004201	490070
50	Climatic chamber	ST2K220/75	RS-Simulatoren	9803901	490020
51	Climatic chamber	ST2K220/75	RS-Simulatoren	2002701	490072
52	Climatic chamber	GTS500.40	GTS	1660	490073
53	Double circulator	-	Motorola	-	-
54	Directional coupler	ZFDC-2O-5	Mini Circuits	-	410092

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
55	Directional coupler	4001B-20	Narda Microwave	02010	410150
56	Directional coupler	774D	Hewlett Packard	06375	410149
57	Impedance matching unit	-	Phoenix-Test-Lab	-	410091
58	High Pass Filter	HP-350	Dirk Fischer Elektronik	-	410151
59	High Pass Filter	HP-450	Dirk Fischer Elektronik	-	410152
60	High Pass Filter	HP-1000	Dirk Fischer Elektronik	-	410147
61	IF-Filter 20kHz/25kHz	MQF 10.7-1400/11	Telefilter	0043	480323
62	IF-Filter 12.5kHz	MQF 10.7-0850/11	Telefilter	0043	480324
63	Notch Filter 2.44 GHz			-	480346
64	Notch Filter	TTR 190-3EE	TELONIC Berkeley	97284-6	480331
65	Notch Filter	TTR 95-3EE	TELONIC Berkeley	00104-2	480332
66	Mixer	ZP-1	Mini Circuits	15542	410148
67	Variable Attenuator 0 -11 dB	8494B	Hewlett Packard	3308A38264	480264
68	Variable Attenuator 0 - 110 dB	8496B	Hewlett Packard	3308A71365	480265
69	Attenuator / 3 dB / 5 W	WA2-3	Weinschel	8250	410115
70	Attenuator / 3 dB / 5 W	WA2-3	Weinschel	8251	410116
71	Attenuator / 3 dB / 5 W	WA2-3	Weinschel	8252	410117
72	Attenuator / 3 dB / 50 W	33-3-34	Weinschel	BH 5062	410131
73	Attenuator / 6 dB / 5 W	WA2-6	Weinschel	8253	410118
74	Attenuator / 6 dB / 5 W	WA2-6	Weinschel	8254	410119
75	Attenuator / 6 dB / 5 W	WA2-6	Weinschel	8255	410120
76	Attenuator / 6 dB / 25 W	33-6-34	Weinschel	BH 5536	410128
77	Attenuator / 10 dB / 1 W	6810.17A	Huber + Suhner	-	410067
78	Attenuator / 10 dB / 5 W	WA2-10	Weinschel	8259	410121
79	Attenuator / 10 dB / 5 W	WA2-10	Weinschel	8260	410122
80	Attenuator / 10 dB / 5 W	WA2-10	Weinschel	8261	410123
81	Attenuator / 10 dB / 10 W	WA8-10	Weinschel	7538	410112
82	Attenuator / 10 dB / 25 W	33-10-34	Weinschel	BH 4878	410129
83	Attenuator / 10 dB / 25 W	33-10-34	Weinschel	BH 4856	410130

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
84	Attenuator / 10 dB / 100 W	BN 745353	Spinner	20262	480274
85	Attenuator / 20 dB / 1 W	6820.17A	Huber + Suhner	-	410068
86	Attenuator / 20 dB / 5 W	WA2-20	Weinschel	8256	410124
87	Attenuator / 20 dB / 5 W	WA2-20	Weinschel	8257	410125
88	Attenuator / 20 dB / 5 W	WA2-20	Weinschel	8258	410126
89	Attenuator / 20 dB / 10 W	WA8-20	Weinschel	7539	410113
90	Attenuator / 30 dB / 200 W	BN 745395	Spinner	29971	480232
91	Termination / 50 Ω / 15 W	6515.17.A	Huber + Suhner	-	410078
92	Termination / 50 Ω / 0.5 W	6500.17.A	Huber + Suhner	-	410074
93	Termination / 50 Ω / 0.5 W	6500.17.A	Huber + Suhner	-	410075
94	RF-cable No. 1	RTK 081	Rosenberger	-	410093
95	RF-cable No. 2	RTK 081	Rosenberger	-	410094
96	RF-cable No. 3	RTK 081	Rosenberger	-	410095
97	RF-cable No. 4	RTK 081	Rosenberger	-	410096
98	RF-cable No. 5	RTK 081	Rosenberger	-	410097
99	RF-cable No. 6	RTK 081	Rosenberger	-	410098
100	RF-cable No. 7	Sucoflex 104	Huber + Suhner	-	410099
101	RF-cable No. 8	RG223	Phoenix-Test-Lab	-	410100
102	RF-cable No. 9	RG223	Phoenix-Test-Lab	-	410101
103	RF-cable No. 10	RG223	Phoenix-Test-Lab	-	410102
104	RF-cable No. 11	RG223	Phoenix-Test-Lab	-	410103
105	RF-cable No. 12	RG223	Phoenix-Test-Lab	-	410104
106	RF-cable No. 13	RG223	Phoenix-Test-Lab	-	410105
107	RF-cable No. 14	RG223	Phoenix-Test-Lab	-	410106
108	RF-cable No. 15	RG223	Phoenix-Test-Lab	-	410107
109	RF-cable No. 16	RG223	Phoenix-Test-Lab	-	410108
110	RF-cable No. 17	RG223	Phoenix-Test-Lab	-	410109
111	RF-cable No. 18	RG58	Phoenix-Test-Lab	-	410110
112	RF-cable No. 30	RTK 081	Rosenberger	-	410141
113	RF-cable No. 31	RTK 081	Rosenberger	-	410142

- Fully anechoic chamber meets the 4 dB requirements of ANSI C63. 4 above 100MHz up to 5GHz
- Open area test site meets the requirements of ANSI C 63.4

All measuring equipment underlie a quality system and are calibrated.

6.2 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the antenna factor and cable loss from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL

FS = Field Strength
RA = Receiver Amplitude
CL = Cable Loss
AF = Antenna Factor