

Test Report

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RF test report

140275-AU01+W05



Industry
Canada

Industrie
Canada

GYMWATCH GmbH

GYMWATCH Sensor

GW-1000

bluetooth-low-energy-mode



The test result refers exclusively
to the tested model.
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Deutsche
Akkreditierungsstelle
D-PL-12155-01-01

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Accreditation:



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Page 2 of 93

Table of contents

1	Test regulations	7
2	Equipment under Test (EUT)	10
3	AC power line conducted emissions	13
4	6 dB bandwidth	17
5	20 dB bandwidth	21
6	Occupied bandwidth	25
7	Maximum conducted output power	29
8	Power spectral density	34
9	Band-edge Compliance	39
10	Spurious RF Conducted Emission	44
11	Radiated emission measurement (<1 GHz)	63
12	Radiated emission measurement (>1 GHz)	72
13	Exposure of humans to RF fields	88
14	Equipment calibration status	89
15	Measurement uncertainty	91
16	Summary	92



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Page 3 of 93

List of pictures

Picture 1: Outline of conducted emission test setup	14
Picture 2: Conducted emission on mains, phase (120V 60Hz)	15
Picture 3: Conducted emission on mains, neutral (120V 60Hz)	16
Picture 4: Test setup for 6 dB bandwidth measurement.....	18
Picture 5: 6dB bandwidth channel 1	19
Picture 6: 6dB bandwidth channel 19	19
Picture 7: 6dB bandwidth channel 38	20
Picture 8: Test setup for 20 dB bandwidth measurement.....	22
Picture 9: 20dB bandwidth channel 1	23
Picture 10: 20dB bandwidth channel 19	23
Picture 11: 20dB bandwidth channel 38	24
Picture 12: Test setup for occupied bandwidth measurement.....	26
Picture 13: Occupied bandwidth channel 1.....	27
Picture 14: Occupied bandwidth channel 19.....	27
Picture 15: Occupied bandwidth channel 38.....	28
Picture 16: Test setup for conducted output power measurement	30
Picture 17: Conducted output power channel 1	32
Picture 18: Conducted output power channel 19	32
Picture 19: Conducted output power channel 38	33
Picture 20: Test setup for conducted output power measurement	35
Picture 21: Power spectral density channel 11	37
Picture 22: Power spectral density channel 19	37
Picture 23: Power spectral density channel 38	38
Picture 24: Test setup for band-edge compliance measurement	40
Picture 25: lower edge - PK.....	42
Picture 26: lower edge - AV	42
Picture 27: upper edge - PK	43
Picture 28: upper edge - AV	43
Picture 29: Test setup for conducted spurious emission measurement	45
Picture 30: spurious emission channel 1	46
Picture 31: spurious emission channel 19.....	46
Picture 32: spurious emission channel 38.....	47
Picture 33: spurious emission channel 1 (30MHz – 1GHz)	48



Picture 34: spurious emission channel 19 (30MHz – 1GHz)	48
Picture 35: spurious emission channel 38 (30MHz – 1GHz)	49
Picture 36: spurious emission channel 1 - PK (1GHz - 26GHz)	51
Picture 37: spurious emission channel 1 - AV (1GHz - 26GHz)	51
Picture 38: spurious emission channel 1 - PK (1GHz - 26GHz)	52
Picture 39: spurious emission channel 1 - PK (1GHz - 26GHz)	53
Picture 40: spurious emission channel 1 - PK (1GHz - 26GHz)	53
Picture 41: spurious emission channel 19 - PK (1GHz - 26GHz)	55
Picture 42: spurious emission channel 19 - AV(1GHz - 26GHz)	55
Picture 43: spurious emission channel 19 - PK (1GHz - 26GHz)	56
Picture 44: spurious emission channel 19 - AV (1GHz - 26GHz)	56
Picture 45: spurious emission channel 19 - PK (1GHz - 26GHz)	57
Picture 46: spurious emission channel 19 - PK (1GHz - 26GHz)	57
Picture 47: spurious emission channel 19 - PK (1GHz - 26GHz)	58
Picture 48: spurious emission channel 19 - AV (1GHz - 26GHz)	58
Picture 49: spurious emission channel 38 - PK (1GHz - 26GHz)	60
Picture 50: spurious emission channel 38 - AV (1GHz - 26GHz)	60
Picture 51: spurious emission channel 38 - PK (1GHz - 26GHz)	61
Picture 52: spurious emission channel 38 - PK (1GHz - 26GHz)	61
Picture 53: spurious emission channel 38 - PK (1GHz - 26GHz)	62
Picture 54: Test setup for radiated emission measurement (< 30 MHz)	65
Picture 55: Test setup for radiated emission measurement (< 1 GHz)	65
Picture 56: Radiated emission 9 kHz – 30MHz (Channel 1)	67
Picture 57: Radiated emission 9 kHz – 30MHz (Channel 19).....	67
Picture 58: Radiated emission 9 kHz – 30MHz (Channel 38).....	68
Picture 59: Radiated emission 30 MHz – 1000MHz (Channel 1)	69
Picture 60: Radiated emission 30 MHz – 1000MHz (Channel 19)	70
Picture 61: Radiated emission 30 MHz – 1000MHz (Channel 38)	71
Picture 62: Test setup for radiated emission measurement (> 1 GHz)	74
Picture 63: Radiated emission 1GHz – 16GHz ¹⁾	75
Picture 64: spurious emission channel 1 - PK (1GHz - 26GHz)	76
Picture 65: spurious emission channel 1 - PK (1GHz - 26GHz)	76
Picture 66: spurious emission channel 1 - PK (1GHz - 26GHz)	77
Picture 67: spurious emission channel 1 - AV (1GHz - 26GHz)	77
Picture 68: spurious emission channel 1 - PK (1GHz - 26GHz)	78

Picture 69: Radiated emission 1GHz – 16GHz ¹⁾	79
Picture 70: spurious emission channel 19 - PK (1GHz - 26GHz)	80
Picture 71: spurious emission channel 19 - PK (1GHz - 26GHz)	80
Picture 72: spurious emission channel 19 - AV (1GHz - 26GHz)	81
Picture 73: spurious emission channel 19 - PK (1GHz - 26GHz)	81
Picture 74: spurious emission channel 19 - AV (1GHz - 26GHz)	82
Picture 75: spurious emission channel 19 - PK (1GHz - 26GHz)	82
Picture 76: Radiated emission 1GHz – 16GHz ¹⁾	83
Picture 77: spurious emission channel 38 - PK (1GHz - 26GHz)	84
Picture 78: spurious emission channel 38 - PK (1GHz - 26GHz)	85
Picture 79: spurious emission channel 38 - AV (1GHz - 26GHz)	85
Picture 80: spurious emission channel 38 - PK (1GHz - 26GHz)	86
Picture 81: spurious emission channel 38 - AV (1GHz - 26GHz)	86
Picture 82: spurious emission channel 38 - PK (1GHz - 26GHz)	87

List of tables

Table 1: Equipment calibration status	90
Table 2: Measurement uncertainty	91



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Revision: 1.0

GYMWATCH GmbH
GYMWATCH Sensor
GW-1000

140275-AU01+W05

Page 6 of 93

1 Test regulations

CFR 47 Part 2: 10-2013	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)
CFR 47 Part 15: 10-2013	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)
KDB Publication no. 558074 June 5, 2014	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
OET Bulletin 65: August 1997	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
ANSI C63.4: December 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
RSS-Gen Issue 4, November 2014	General Requirements for Compliance of Radio Apparatus, published by Industry Canada
RSS-102 Issue 4, March 2010, updated December 2010	Radio Frequency Exposure Compliance of Radiocommunications Apparatus
RSS-210 Issue 8, December 2010	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada



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GW-1000

140275-AU01+W05

Page 7 of 93

1.1 Cross reference of FCC and Industry Canada standards

CFR 47 Part and Section	Test	Equivalent to IC
15.207	AC power line conducted emissions 150 kHz to 30 MHz	RSS-Gen Issue 4 section 8.8
15.247(a)(2) KDB 558074, section 8	6 dB bandwidth	RSS-210 Issue 8, section A 8.2
15.247(a)(1)	20 dB bandwidth ¹	RSS-210 Issue 8, section A 8.1(a)
2.202(a)	Occupied bandwidth	RSS-Gen Issue 4, section 6.6
15.247(b) KDB 558074, section 9	Maximum conducted output power	RSS-Gen Issue 4, section 6.12 RSS-210 Issue 8, A 8.4
15.247(d)	Band-edge Compliance	RSS-210 Issue 8, section A 8.5
15.247(e) KDB 558074, section 10	Power spectral density	RSS-210 Issue 8, section A 8.2
15.247(d)	Spurious RF Conducted Emission	RSS-210 Issue 8, section A 8.5
15.247(d)	Radiated emission 9 kHz to 10 th harmonic	RSS-Gen Issue 4, section 6.13 RSS-210 Issue 8, section A 8.5
2.1091	Radiofrequency radiation exposure evaluation for mobile devices	RSS-Gen Issue 4, section 3.2 Exempted from SAR and RF evaluation

¹ For DTS equipment recorded for information only.



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GYMWATCH Sensor
GW-1000

140275-AU01+W05

Page 8 of 93

1.2 Summary of test results

Standard	Test result
FCC CFR 47 Part 15, section 15.247	Passed
RSS-210 Issue 8 Annex 8 and RSS-Gen Issue 4	Passed



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GW-1000

140275-AU01+W05

Page 9 of 93

2 Equipment under Test (EUT)

Product type:	GYMWATCH Sensor
Model Name:	GW-1000
Manufacturer:	GYMWATCH GmbH
Serial number:	- sample 1 -> radiated measurements - sample 2 -> conducted measurements
FCC ID:	2AC6J-GW1000
IC:	12332A-GW1000
Application freq. band:	2400 MHz – 2483.5 MHz
Frequency range:	2404MHz – 2478 MHz
Operating frequency:	2404MHz – 2478 MHz
Channel spacing:	2 MHz
Number of RF-channels:	37 (channel 1 to 38, channel 12 not used)
Type of modulation:	DSSS (GFSK)
Antenna type:	internal smd onboard antenna
Antenna gain:	1.7 dBi
Power supply:	Host powered nominal: 3.7 V
Temperature range:	-20°C to +60°C



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GYMWATCH Sensor
GW-1000

140275-AU01+W05

Page 10 of 93

2.1 Photo documentation

For photos taken during testing, see annex A.

For photos of the EUT, see annex B.

For internal photos of the EUT, see annex C.

2.2 Short description of the EUT

The EUT is a workout sensor which uses bluetooth or bluetooth low energy to transfer its collected data to a host (e.g. an i-phone)

During the pre-measurements it was investigated which EUT position is the respective worst-case. The EUT positions are documented in annex A.

2.3 Operation mode

To configure the EUT for continuous transmission on a single channel the terminal program "Hterm" was used.

The following adjustments were set for testing:

BLUETOOTH-LOW-ENERGY

- Tx-mode:
- GFSK
 - power level 15
 - test pattern: "0101 0101 0101 0101"
 - Channel 1, 19, 38



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GW-1000

140275-AU01+W05

Page 11 of 93

2.4 Configuration

The following peripheral devices and interface cables were connected during the tests:

Device	Model:	S/N
GYMWATCH Sensor	GW-1000	sample1/2
FUJITSU Notebook	Lifebook A531	YLDS013094
AC power source	CHROMA 61602	616020002099
Power supply	Input 120V/60Hz /Output 0-30V DC Statron 3252.1	1201211
Multimeter	Gossen METRAhit 29S	E00099

Used cables

Numbers:	Description: (type / lengths / remarks)	Serial No
2	DC cable / 1.5m / unshielded	N/A
1	Antenna cable / 0.3m / shielded	N/A



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GW-1000

140275-AU01+W05

Page 12 of 93

3 AC power line conducted emissions

according to CFR 47 Part 15, section 15.207

3.1 Test location

Description	Manufacturer	Inventory No.
Shielded chamber	Siemens - Matsushita	E00107

3.2 Test instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30	Rohde & Schwarz	E00003
<input type="checkbox"/>	ESCI	Rohde & Schwarz	E00001
<input type="checkbox"/>	ESH3 Z2	Rohde & Schwarz	E00028
<input type="checkbox"/>	ESH 2-Z5	Rohde & Schwarz	E00004
<input type="checkbox"/>	ESH 2-Z5	Rohde & Schwarz	E00005

3.3 Limits

Frequency [MHz]	Quasi-peak [dB μ V]	Avarage [dB μ V]
0.15 – 0.5	66 - 56	56 – 46
0.5 – 5.0	56	46
5 – 30	60	50



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GW-1000

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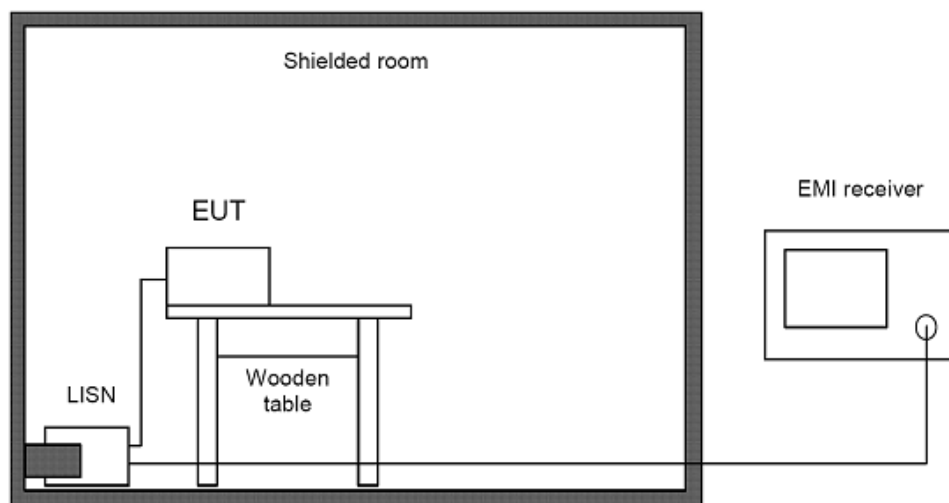
Page 13 of 93

3.4 Test procedure

1. The tests of conducted emission were carried out in a shielded room using a line impedance stabilization network (LISN) 50 μ H/50 Ohms and an EMI test receiver.
2. The EMI test receiver was connected to the LISN and set to a measurement bandwidth of 9 kHz in the frequency range from 0.15 MHz to 30 MHz.
3. The EUT was placed on a wooden table and connected to the LISN.
4. To accelerate the measurement the detector of the EMI test receiver was set to peak and the whole frequency range from 0.15 MHz to 30 MHz were scanned.
5. After that all peaks values with fewer margins than 10 dB to quasi-peak limit or exceeding the limit were marked and re-measured with quasi-peak detector.
6. If after that all values are under the average limit no addition measurement is necessary. In case there are still values between quasi-peak and average limit than these values were re-measured again with an average detector.
7. These measurements were done on all current carrying conductors.

According to ANSI C63.4, section 13.1.3.1 testing of intentional radiators with detachable antennas shall be done with a dummy load otherwise the tests should be done with connected antenna and if adjustable fully extended.

3.5 Test setup

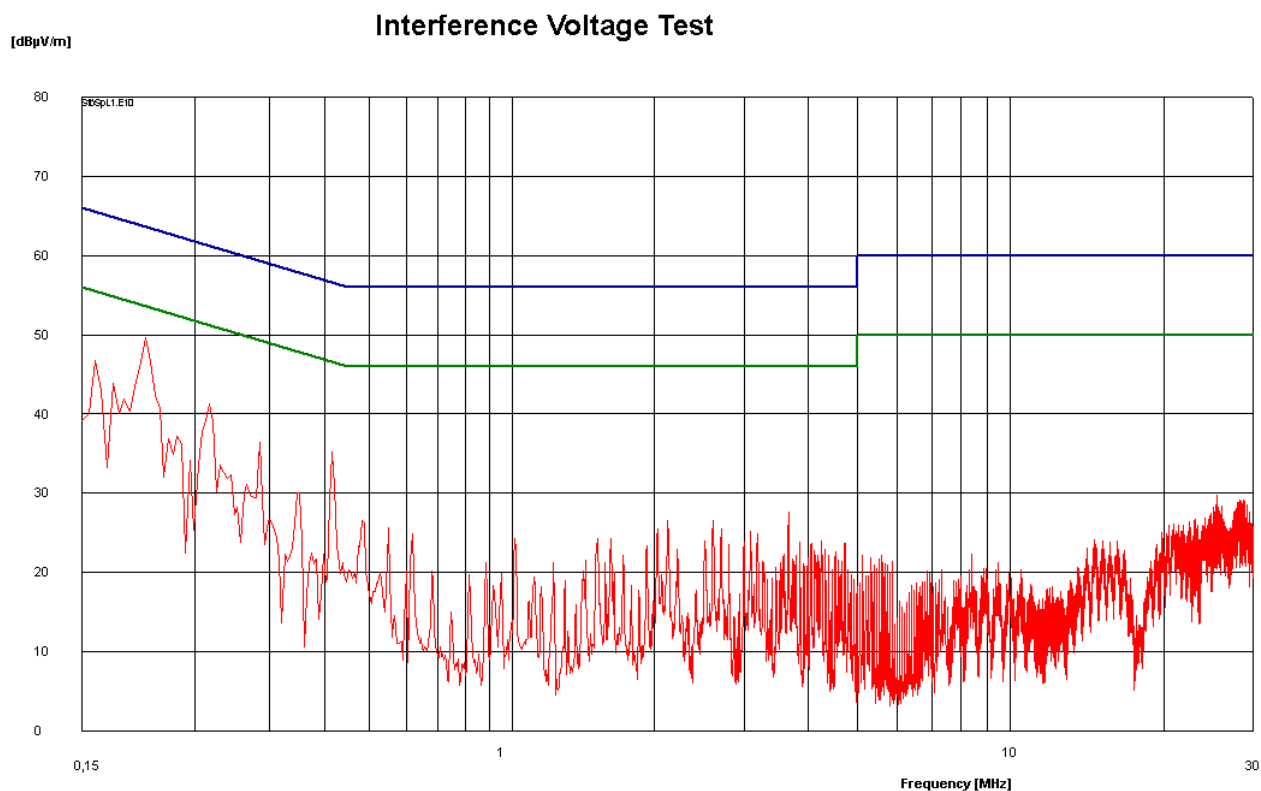


Picture 1: Outline of conducted emission test setup

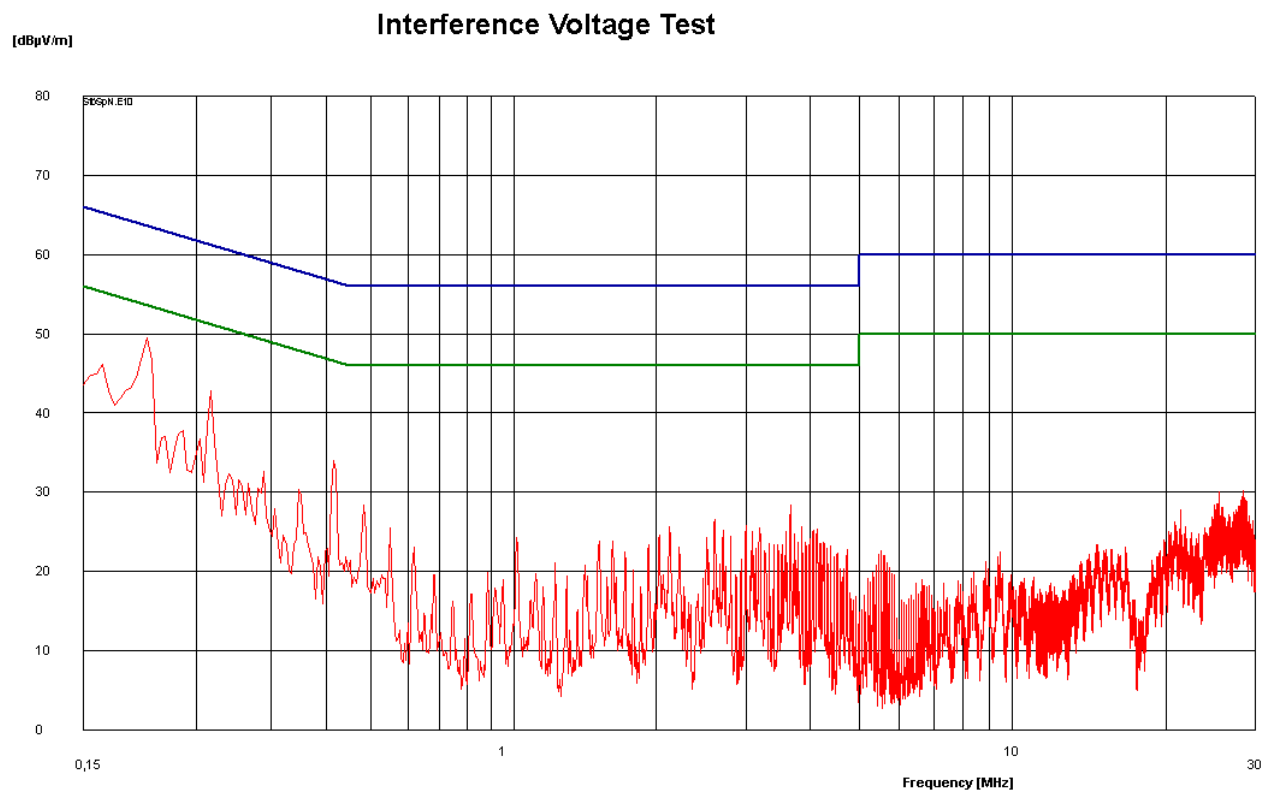
Comments: The EUT needs to be charged via USB. This is the only possibility to get it connected to mains. So this setting was used for this test.

3.6 Test results

Temperature:	21°C	Humidity:	41%
Tested by:	M. Müller	Test date:	2014-09-22



Picture 2: Conducted emission on mains, phase (120V 60Hz)



Picture 3: Conducted emission on mains, neutral (120V 60Hz)

4 6 dB bandwidth

according to CFR 47 Part 15, section 15.247(a), and
KDB Publication no. 558074, section 8

4.1 Test location

- ☒ Conducted measurement
- ☐ Scan with peak detector in 3 m CDC
- ☐ CISPR measurement with quasi peak detector on 10m open area test site.
- ☐ Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

4.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

4.3 Limits

The minimum 6 dB bandwidth shall be at least 500kHz

4.4 Test procedure

1. The test is performed in accordance with FCC KDB publication no. 558074
2. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
3. The unit was operated in continuous transmit mode with modulation.
4. The resolution bandwidth was set to 100 kHz with video bandwidth at least equal to three times the resolution bandwidth.
5. The maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission were recorded.



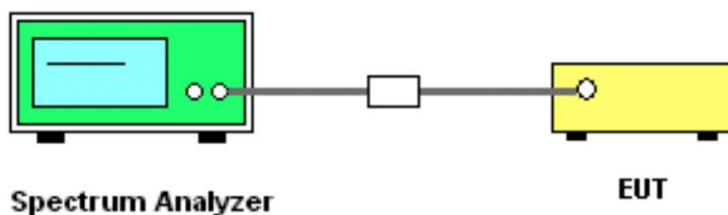
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Page 17 of 93

4.5 Test setup



Picture 4: Test setup for 6 dB bandwidth measurement

4.6 Test deviation

There is no deviation with the original standard.

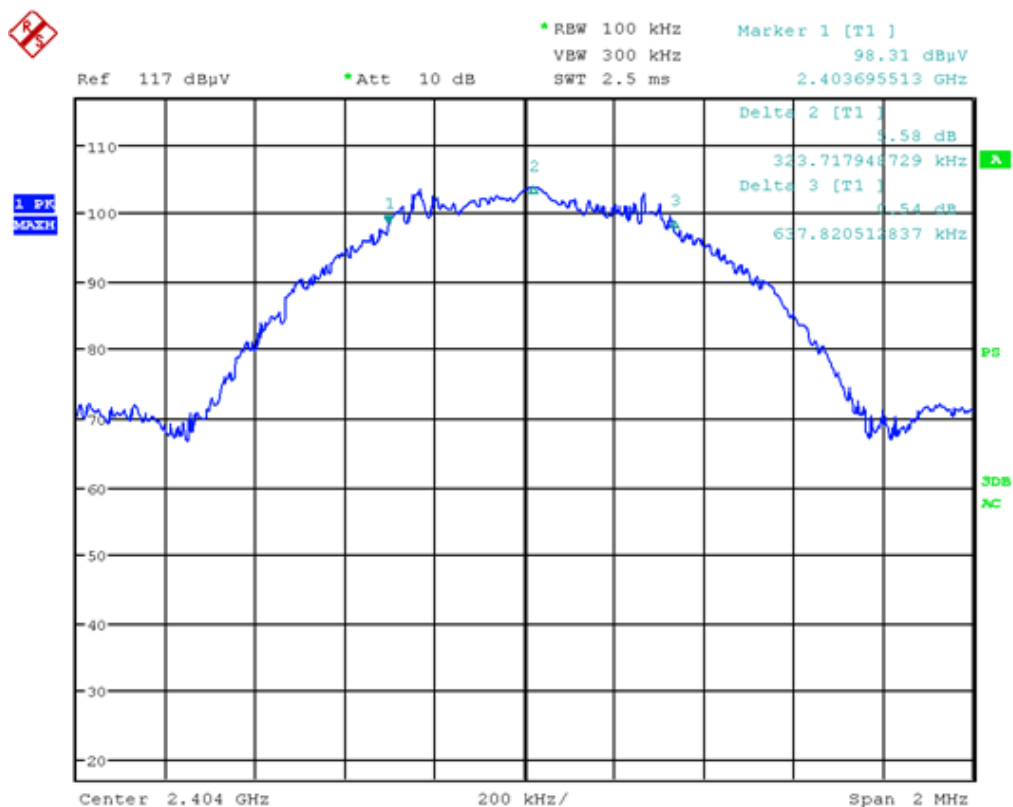
4.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

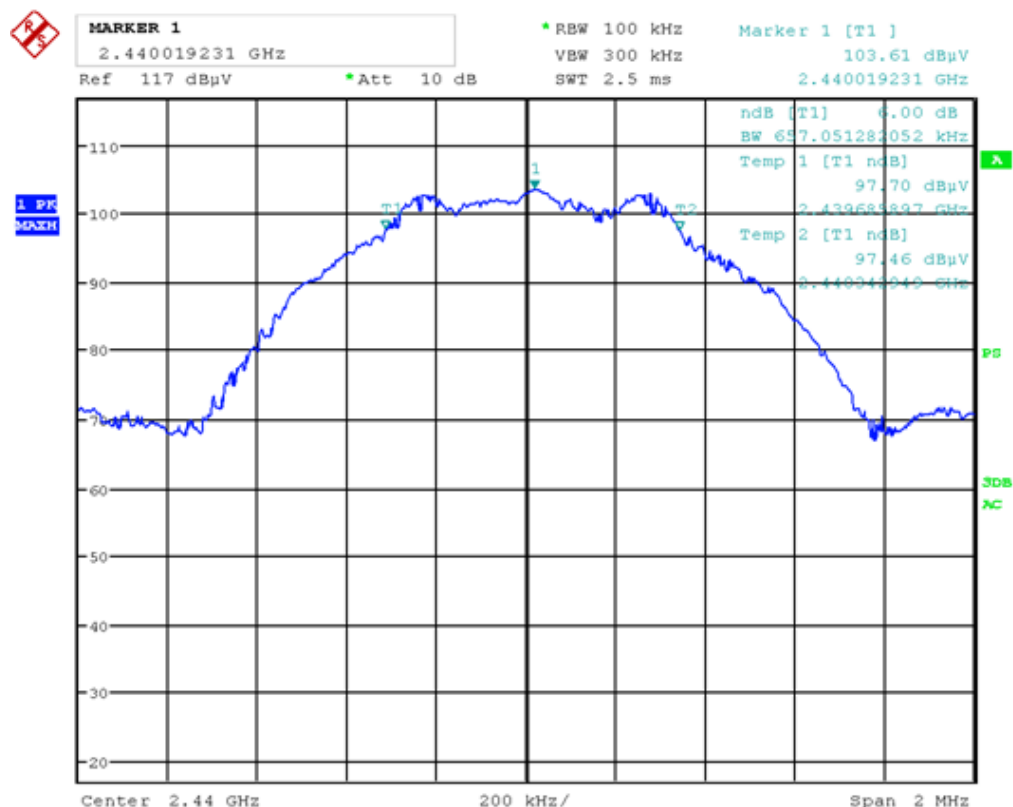
4.8 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-11-22

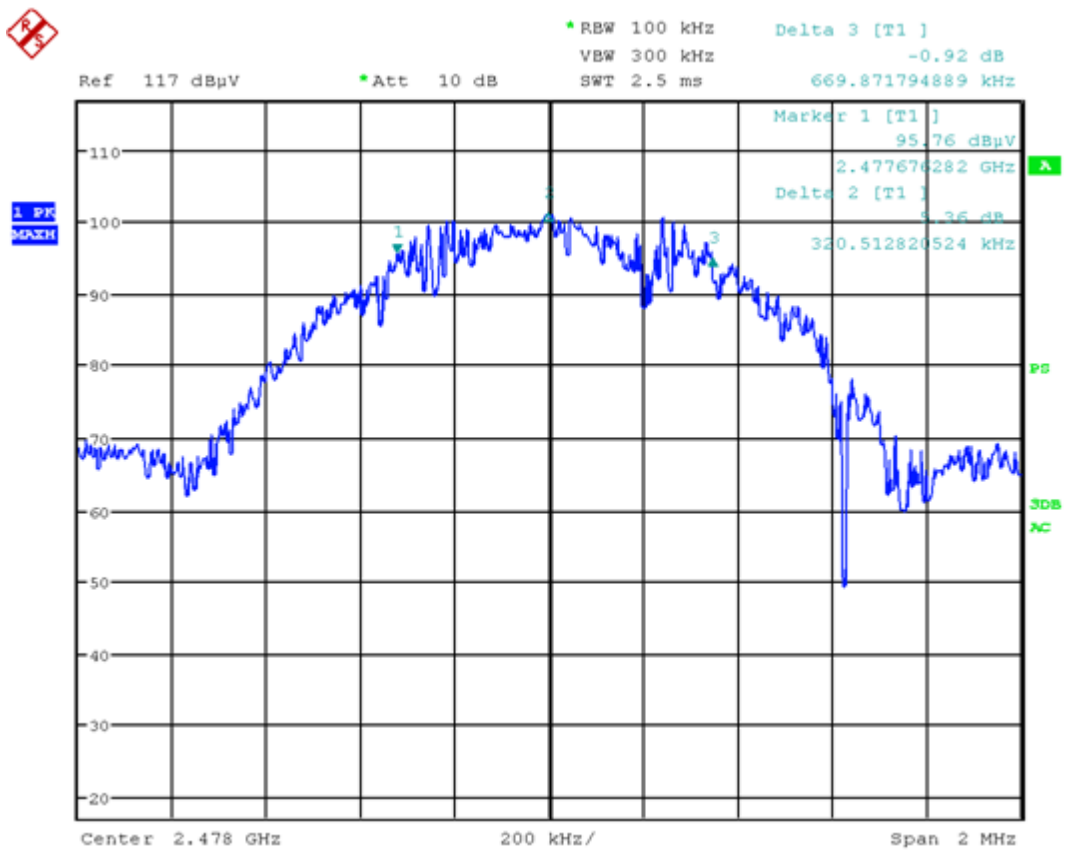
Channel	Frequency (GHz)	6 dB bandwidth (kHz)
1	2.404	637.82
19	2.440	657.05
38	2.478	669.87



Picture 5: 6dB bandwidth channel 1



Picture 6: 6dB bandwidth channel 19



Picture 7: 6dB bandwidth channel 38

5 20 dB bandwidth

according to CFR 47 Part 15, section 15.247(a)

5.1 Test location

- ☒ Conducted measurement
- ☐ Scan with peak detector in 3 m CDC
- ☐ CISPR measurement with quasi peak detector on 10m open area test site.
- ☐ Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

5.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

5.3 Limits

N/A

5.4 Test procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The unit was operated in continuous transmit mode with modulation.
3. The resolution bandwidth was set to 100 kHz with video bandwidth at least equal to three times the resolution bandwidth.
4. The maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission were recorded.



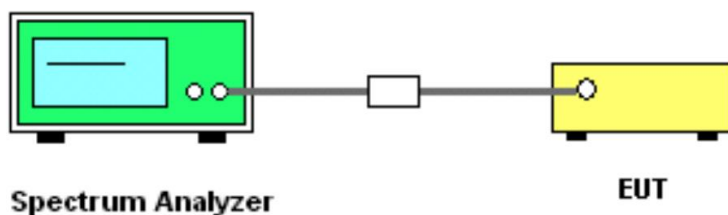
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Page 21 of 93

5.5 Test setup



Picture 8: Test setup for 20 dB bandwidth measurement

5.6 Test deviation

There is no deviation with the original standard.

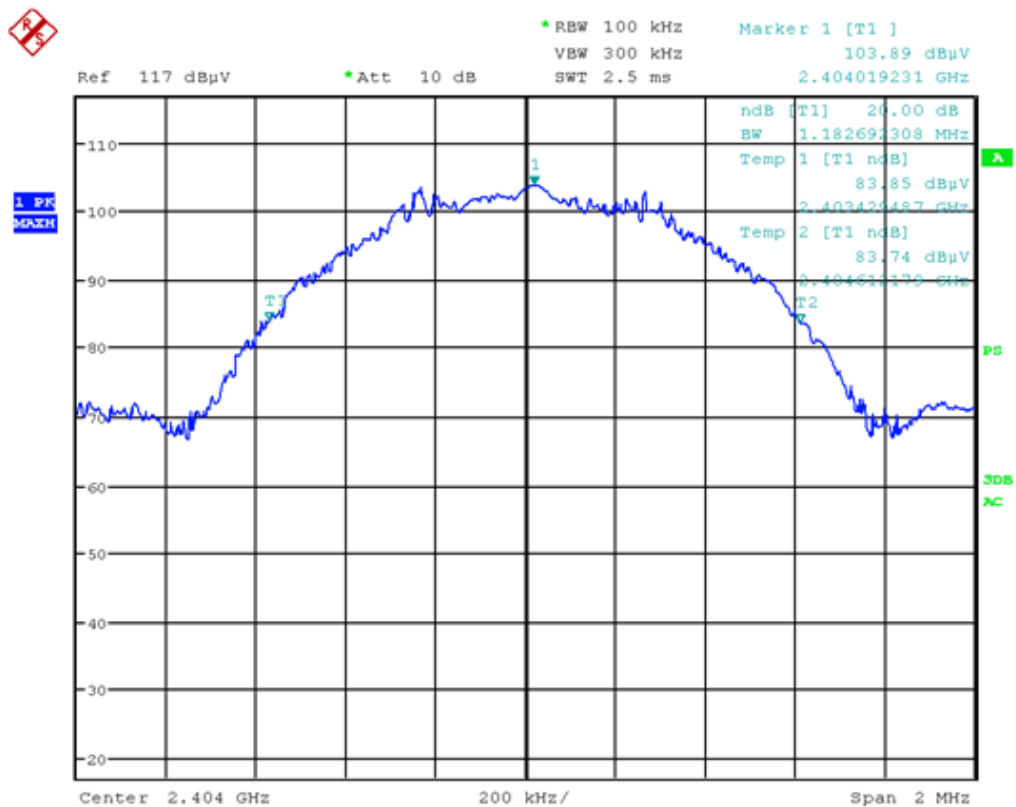
5.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

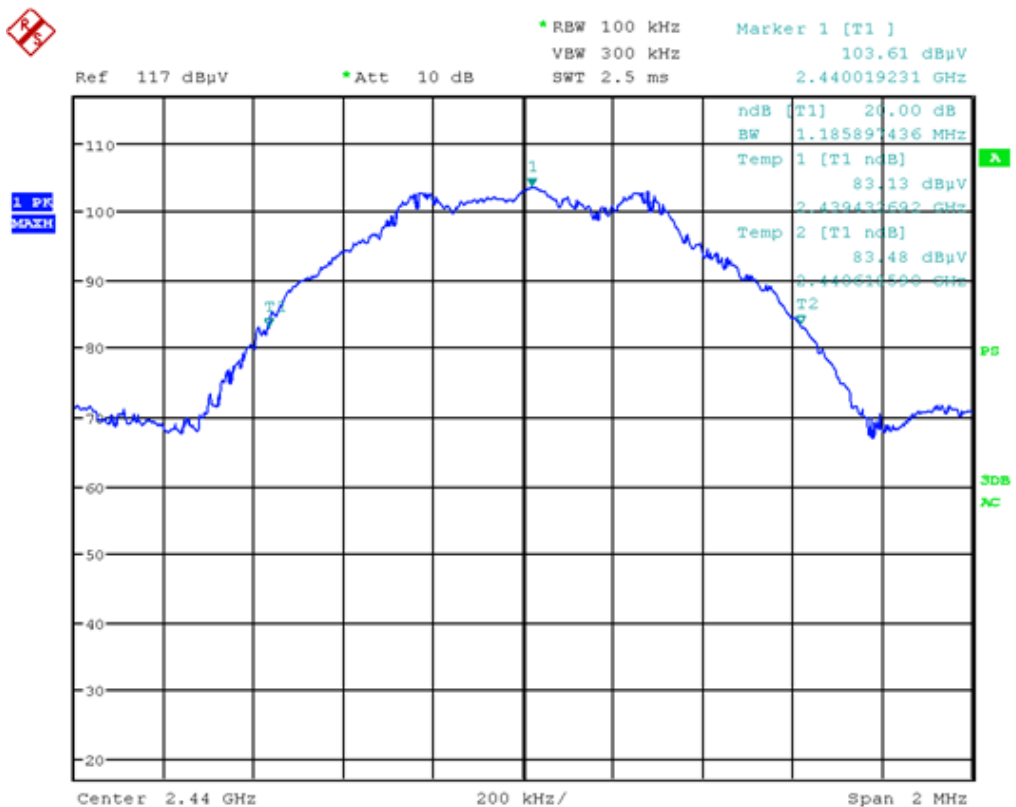
5.8 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-11-20

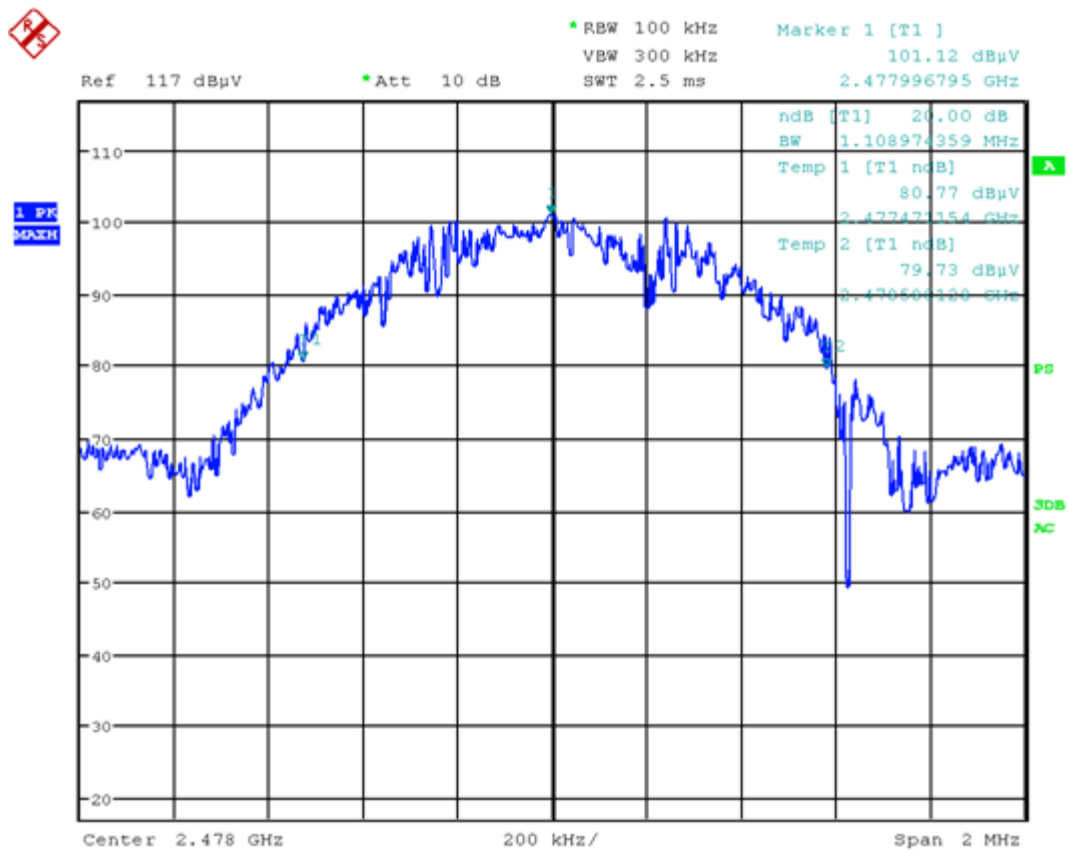
Channel	Frequency (GHz)	20 dB bandwidth (MHz)
1	2.404	1.1827
19	2.440	1.1859
38	2.478	1.1090



Picture 9: 20dB bandwidth channel 1



Picture 10: 20dB bandwidth channel 19



Picture 11: 20dB bandwidth channel 38

6 Occupied bandwidth

according to CFR 47 Part 2, section 2.202(a)

6.1 Test location

- ☒ Conducted measurement
- ☐ Scan with peak detector in 3 m CDC
- ☐ CISPR measurement with quasi peak detector on 10m open area test site.
- ☐ Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

6.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

6.3 Limits

N/A

6.4 Test procedure

1. The test is performed in accordance with CFR 47 Part 2, section 2.202(a)
2. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
3. The unit was operated in continuous transmit mode with modulation.
4. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately three times the RBW.
5. The 99 % frequency bandwidth was measured so that, below its lower and above its upper frequency limits, the mean powers radiated were each equal to 0.5 percent of the total mean power radiated by a given emission.



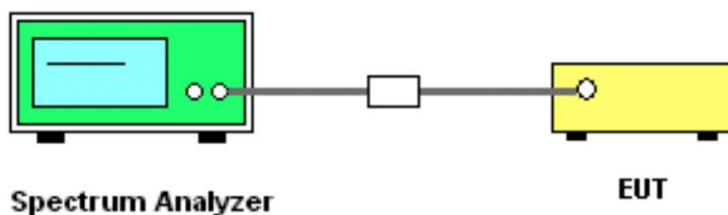
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Page 25 of 93

6.5 Test setup



Picture 12: Test setup for occupied bandwidth measurement

6.6 Test deviation

There is no deviation with the original standard.

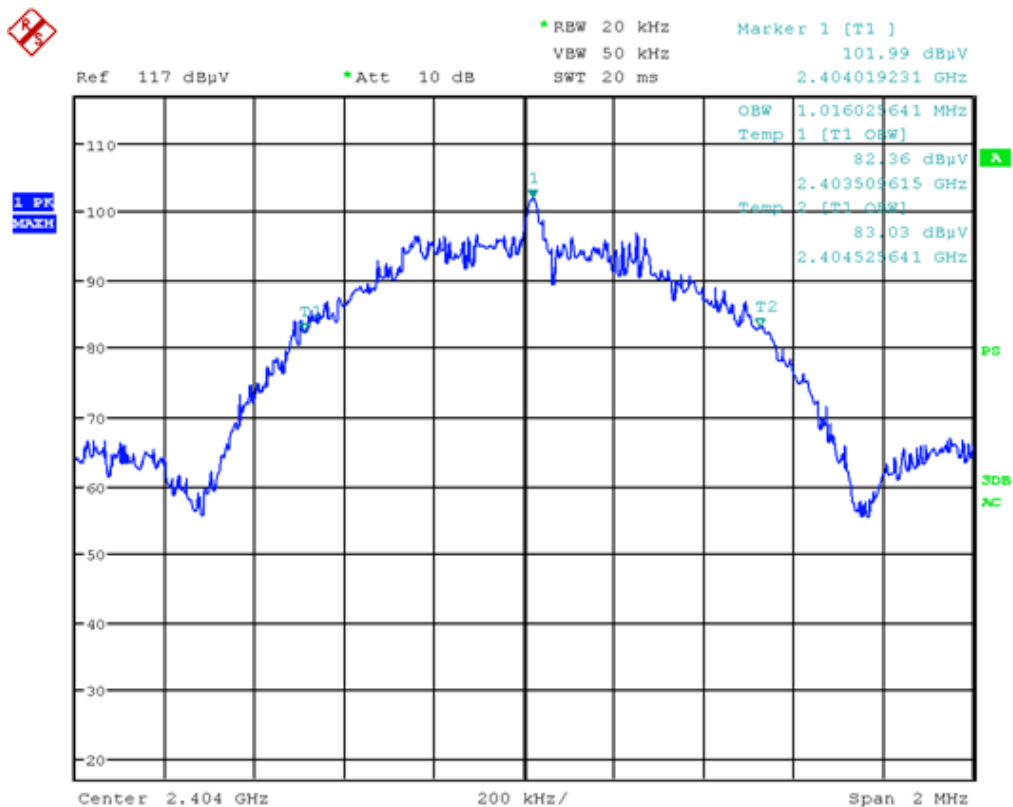
6.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

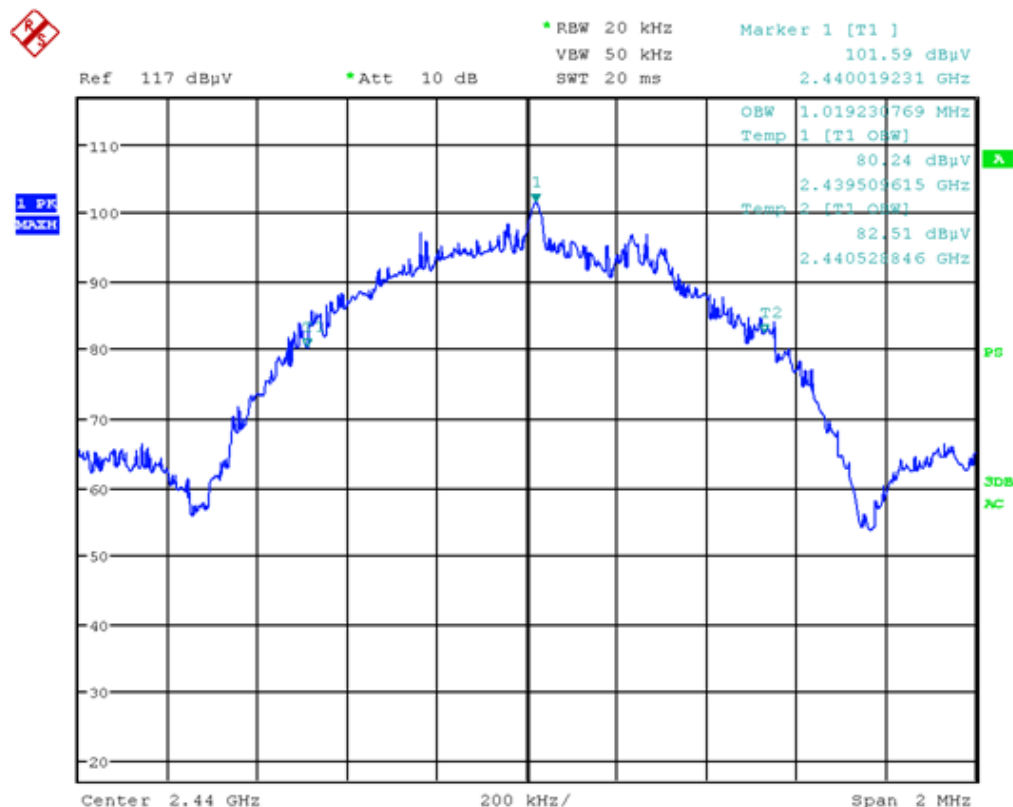
6.8 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-09-23

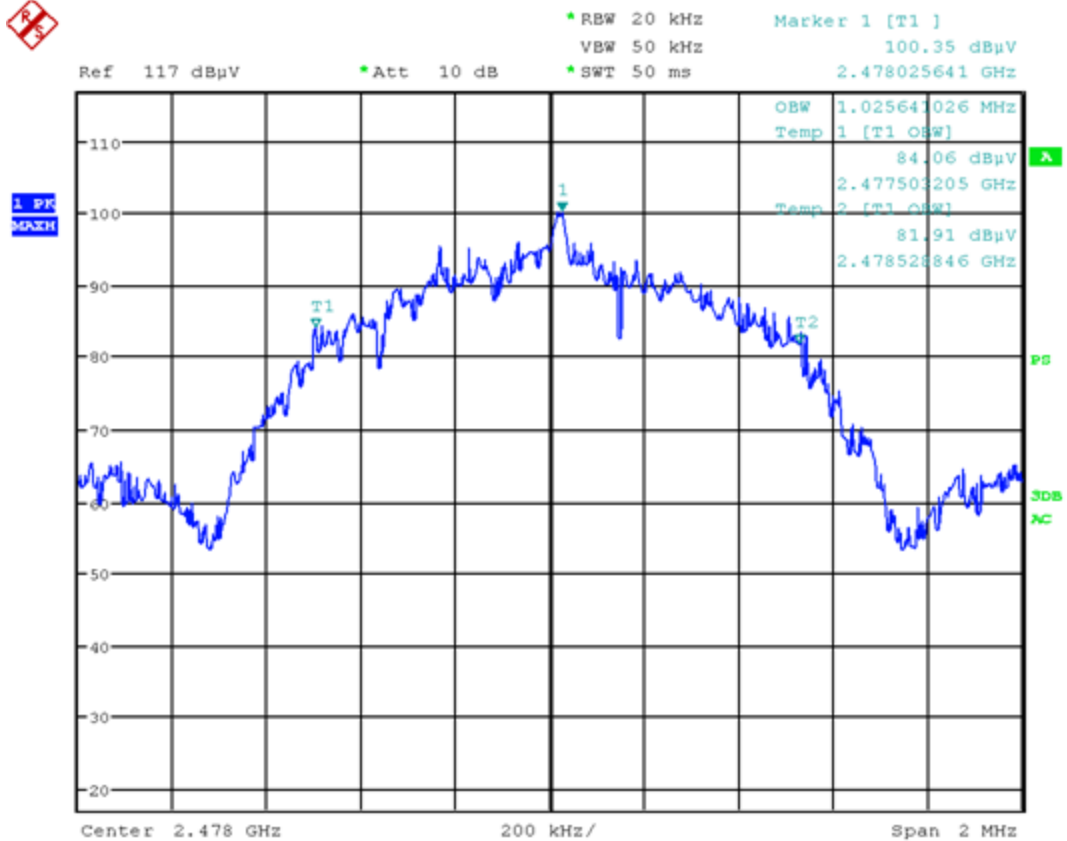
Channel	Frequency (GHz)	Occupied bandwidth (MHz)
1	2.404	1.0160
19	2.440	1.0192
38	2.478	1.0256



Picture 13: Occupied bandwidth channel 1



Picture 14: Occupied bandwidth channel 19



Picture 15: Occupied bandwidth channel 38



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Page 28 of 93

7 Maximum conducted output power

according to CFR 47 Part 15, section 15.247(b), and KDB 558074, section 9

7.1 Test location

- ☒ Conducted measurement
- ☐ Scan with peak detector in 3 m CDC
- ☐ CISPR measurement with quasi peak detector on 10m open area test site.
- ☐ Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

7.2 Test instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

7.3 Limits

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt (30 dBm).

For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts (21 dBm).

For systems using digital modulation: 1 Watt (30 dBm).

As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level.

The conducted output power limit is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the



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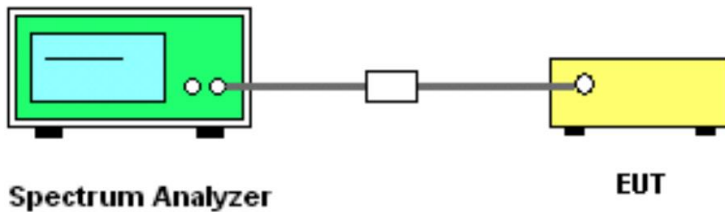
Page 29 of 93

conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.4 Test procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Test was performed in accordance with measurement of Digital Transmission Systems operating under Section 15.247 and FCC KDB publication no. 558074, section 9 with detector set to peak (max hold) and the following settings:
 - a) $RBW \geq DTS \text{ bandwidth}$ (6 dB bandwidth)
 - b) $VBW \geq 3 \times RBW$.
 - c) $\text{span} \geq 3 \times RBW$
 - d) Sweep time = auto couple.

7.5 Test setup



Picture 16: Test setup for conducted output power measurement

7.6 Test deviation

There is no deviation with the original standard.

7.7 EUT operation during Test

The EUT was programmed to be in continuously transmitting mode.

7.8 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-09-23

Channel	Frequency (GHz)	Detector	Conducted power (dBm)	Limit FHSS (dBm)	Limit DTS (dBm)	Result
1	2.404	PK	-3.86	21	30	PASS
19	2.440	PK	-5.04	21	30	PASS
38	2.478	PK	-7.08	21	30	PASS

Comments: - none -

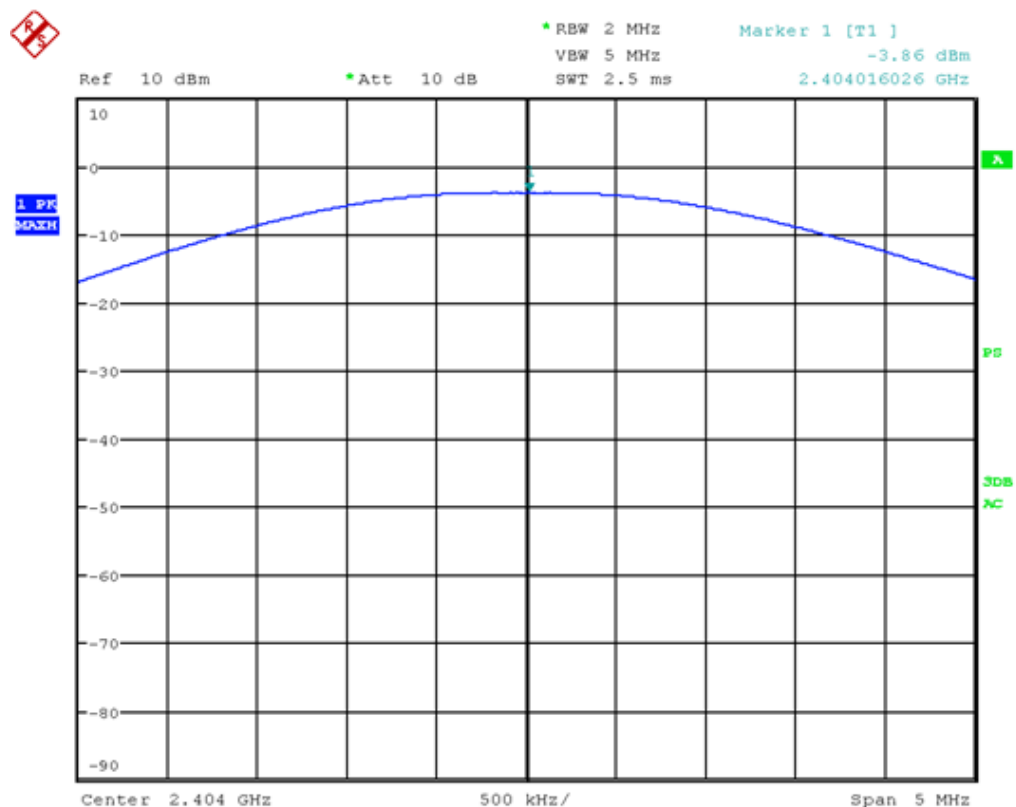


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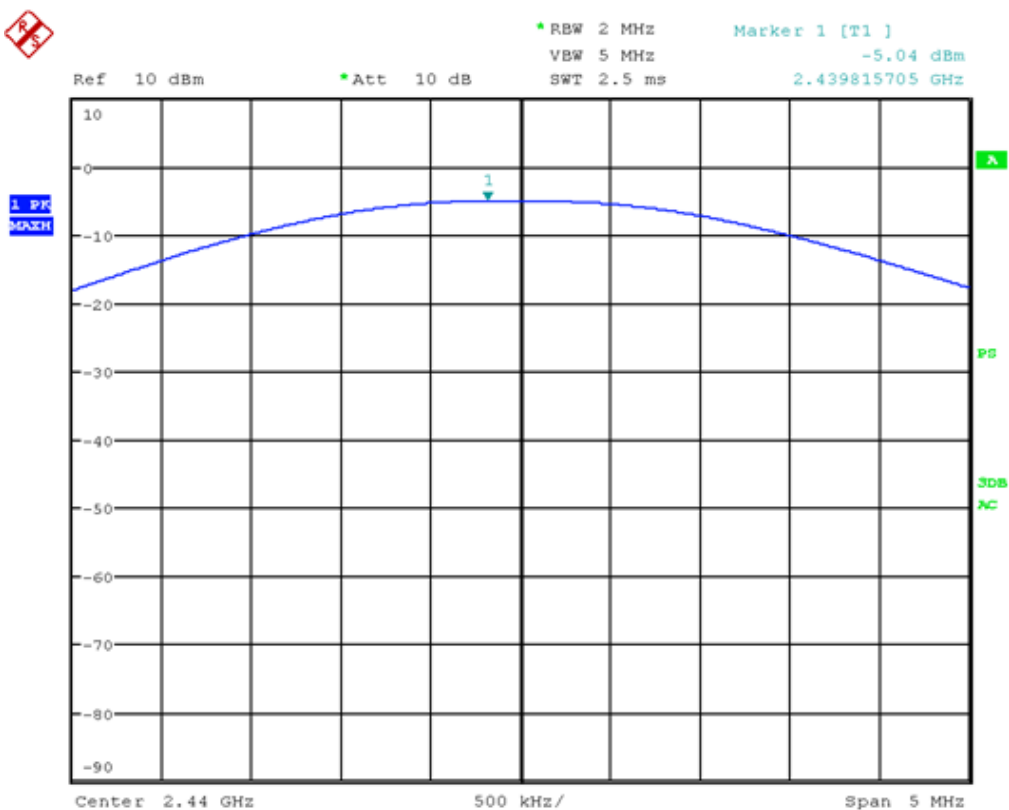
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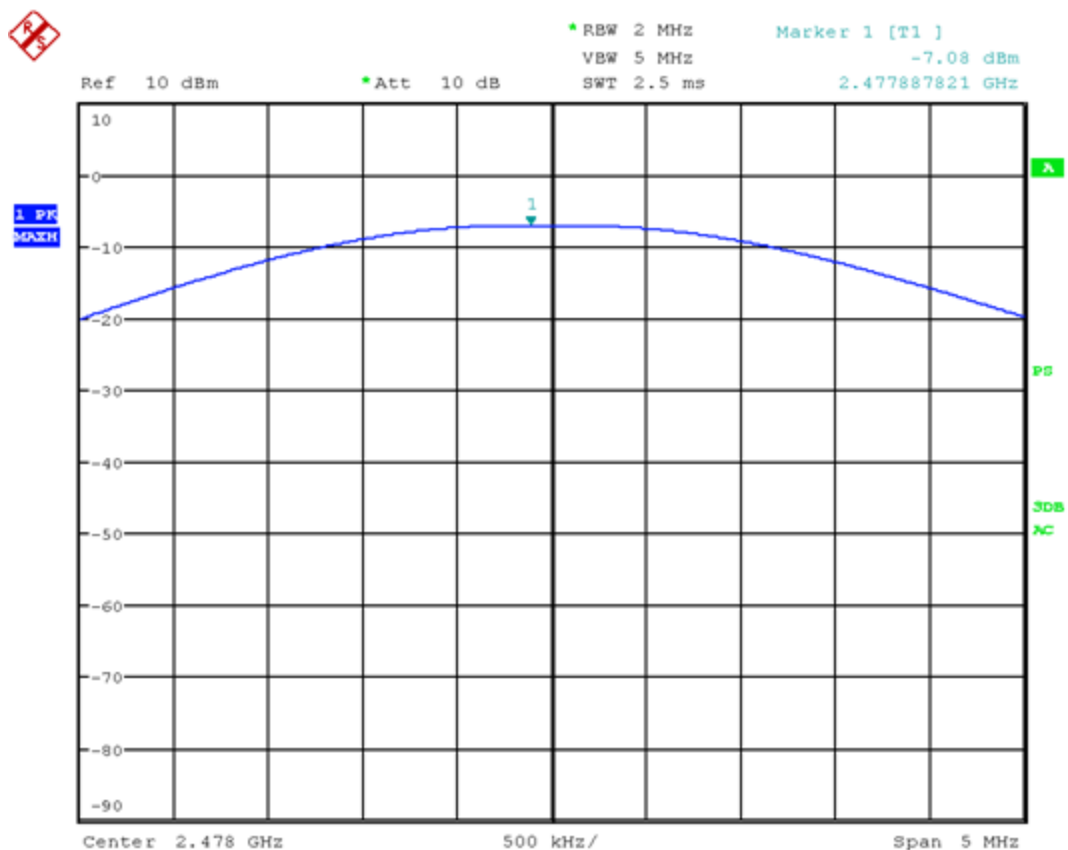
Page 31 of 93



Picture 17: Conducted output power channel 1



Picture 18: Conducted output power channel 19



Picture 19: Conducted output power channel 38

8 Power spectral density

according to CFR 47 Part 15, section 15.247(e), and KDB 558074, section 10

8.1 Test location

- ☒ Conducted measurement
- ☐ Scan with peak detector in 3 m CDC
- ☐ CISPR measurement with quasi peak detector on 10m open area test site.
- ☐ Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

8.2 Test instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

8.3 Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of section 15.247.

The same method of determining the conducted output power shall be used to determine the power spectral density.

8.4 Test procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Test was performed in accordance with measurement of Digital Transmission Systems operating under Section 15.247 and FCC KDB publication no. 558074, section 10 with detector set to peak (max hold) and the following settings:
 - a) span = 1.5 x DTS bandwidth (6 dB bandwidth)
 - b) $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$



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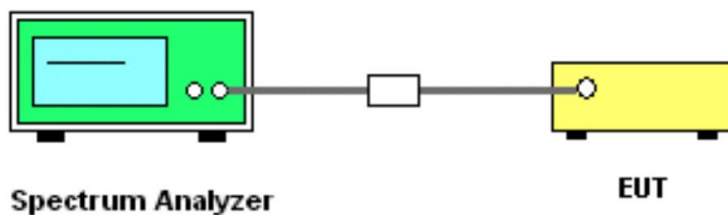
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Page 34 of 93

c) $VBW \geq 3 \times RBW$.

d) Sweep time = auto couple for prescans, $\geq \text{span} / RBW$ for final scan

8.5 Test setup



Picture 20: Test setup for conducted output power measurement

8.6 Test deviation

There is no deviation with the original standard.

8.7 EUT operation during Test

The EUT was programmed to be in continuously transmitting mode.

8.8 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-11-20

Channel	Detector	Frequency (GHz)	PSD @ 3kHz RBW (dBm)	Limit (dBm)	Result
1	PK	2.4040	-15.54	8	PASS
19	PK	2.4400	-15.09	8	PASS
38	PK	2.4780	-17.24	8	PASS

Comments: - none -

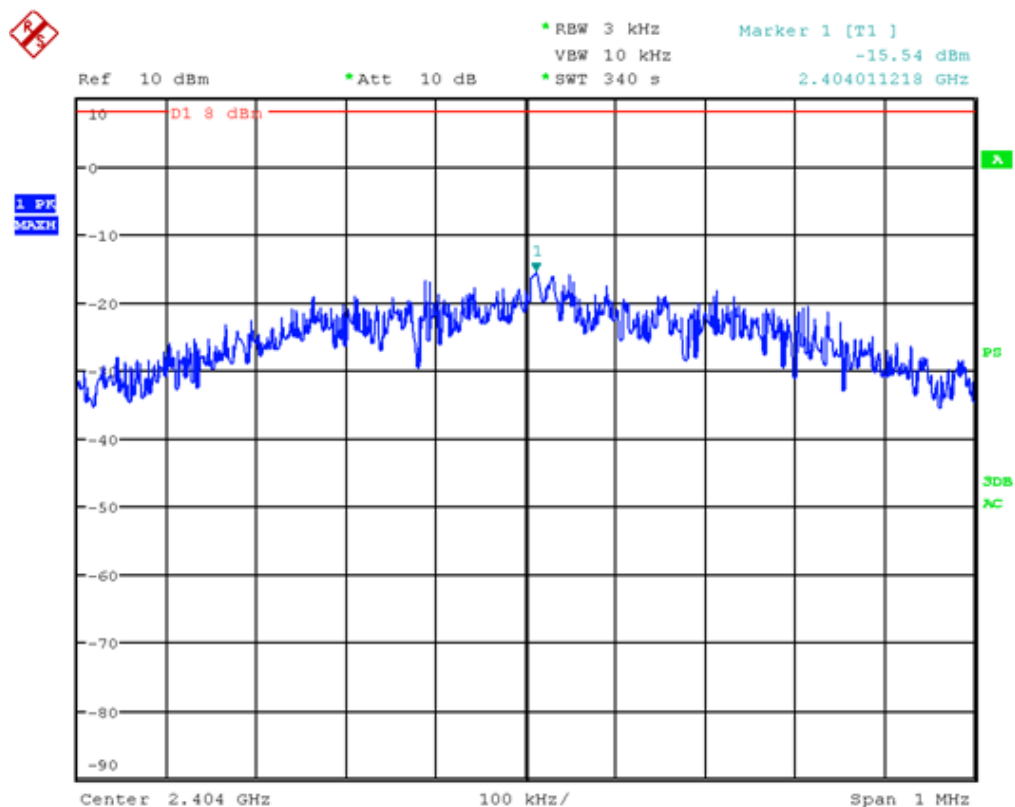


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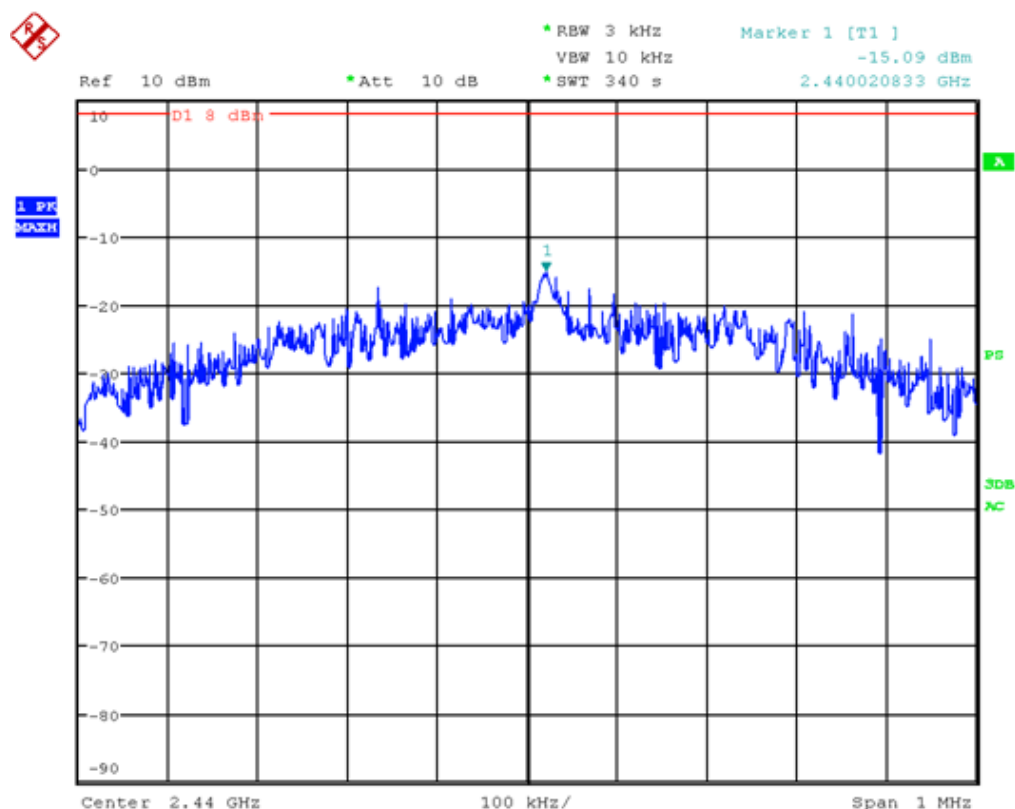
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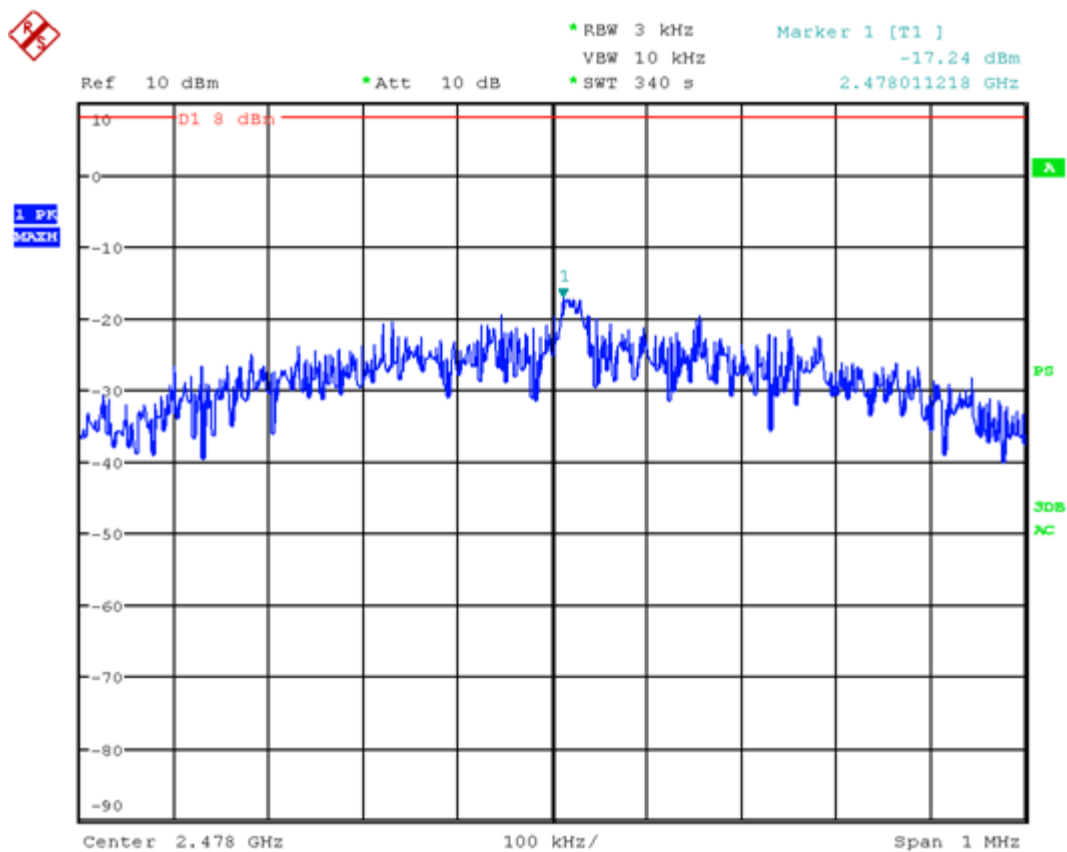
Page 36 of 93



Picture 21: Power spectral density channel 11



Picture 22: Power spectral density channel 19



Picture 23: Power spectral density channel 38

9 Band-edge Compliance

according to CFR 47 Part 15, section 15.247(d)

9.1 Test location

☒ Conducted measurement

9.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESU26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	AMF-5D-00501800-28-13P	Miteq	W00089
<input type="checkbox"/>	AMF-6F-16002650-25-10P	Miteq	W00090
<input checked="" type="checkbox"/>	BBHA 9170	Schwarzbeck	W00054
<input type="checkbox"/>	BBHA 9170	Schwarzbeck	W00055
<input checked="" type="checkbox"/>	COSB 4-1-26	Conformitas	W00091

9.3 Limits

< -20dBc outside restricted bands
< 54dB μ V (video average) inside restricted bands
< 74dB μ V (peak detector) inside restricted bands

9.4 Test procedure

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The receiving antenna was placed 3 meters from the turntable. The test setup was placed inside a fully anechoic chamber.
2. Power on the EUT and all peripherals.
3. Set frequency to lowest channel
4. Maximize radiated emission at band edges by moving turntable and antenna height with horizontal and vertical antenna polarization.
5. Record this trace(s) and set appropriate markers
6. Set frequency to highest channel
7. Repeat steps 4 and 5

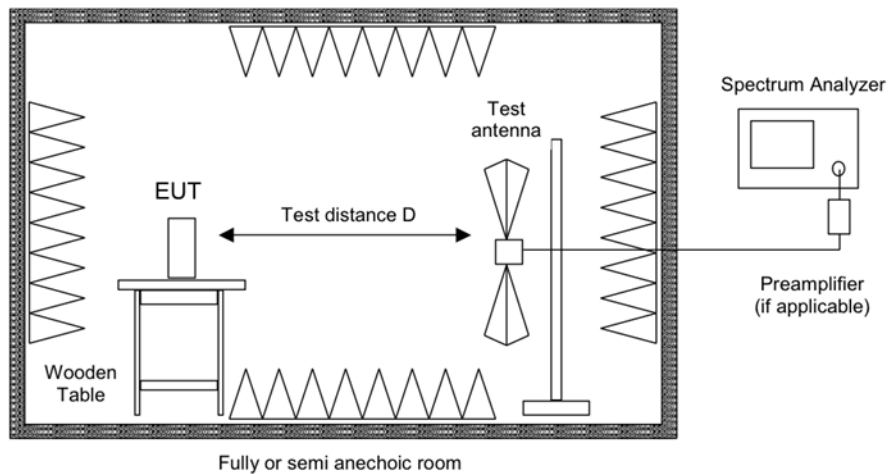


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Page 39 of 93



Picture 24: Test setup for band-edge compliance measurement

9.5 Test deviation

There is no deviation with the original standard.

9.6 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

9.7 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-11-25

Frequency (GHz)	Detector	Reading value (dBµV/m)	Restricted Band	Limit (dBµV/m)	Result
2.3100	PK	38.87	Yes	74	Pass
2.3100	AV	27.63	Yes	54	Pass
2.3566	PK	40.92	Yes	74	Pass
2.3566	AV	27.59	Yes	54	Pass
2.3900	PK	38.93	Yes	74	Pass
2.3910	AV	28.82	No	-20dBc	Pass
2.4041	PK	91.89	No	- - -	Carrier
2.4041	AV	91.69	No	- - -	Carrier

Frequency (GHz)	Detector	Reading value (dBµV/m)	Restricted Band	Limit (dBµV/m)	Result
2.4780	PK	89.53	No	- - -	Carrier
2.4780	AV	89.21	No	- - -	Carrier
2.4835	PK	40.29	Yes	74	Pass
2.4835	AV	29.13	Yes	54	Pass
2.4859	PK	41.28	Yes	74	Pass
2.4909	AV	28.75	Yes	54	Pass
2.5000	PK	39.61	Yes	74	Pass
2.5000	AV	27.76	Yes	54	Pass

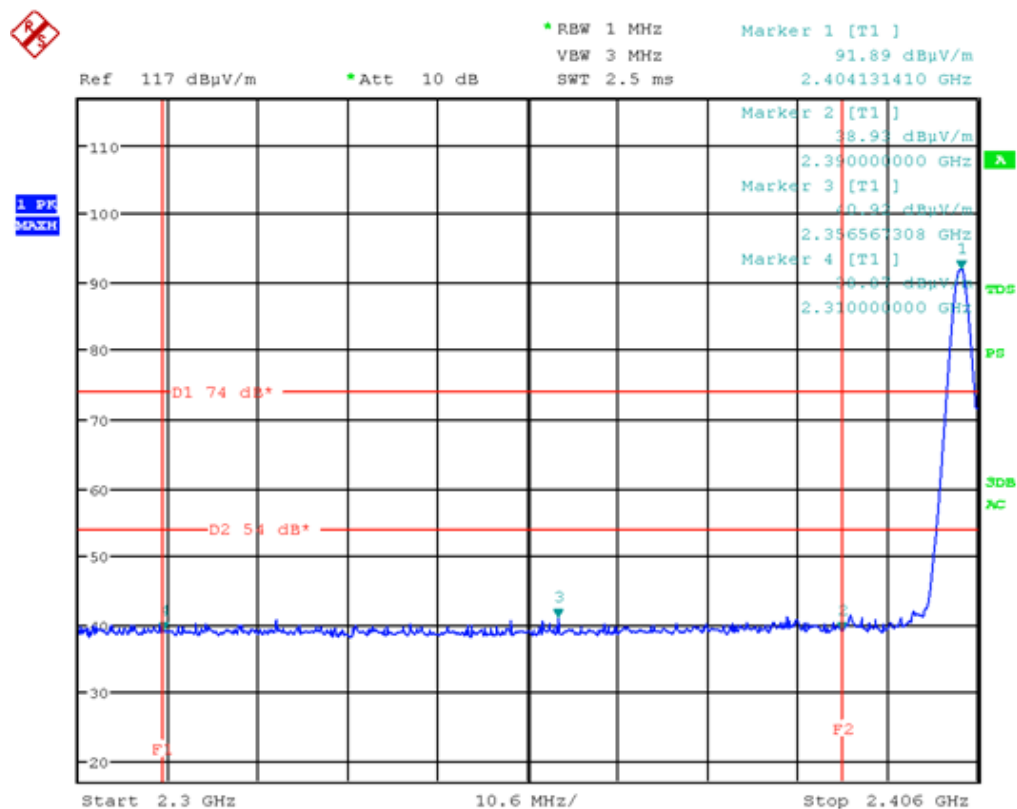


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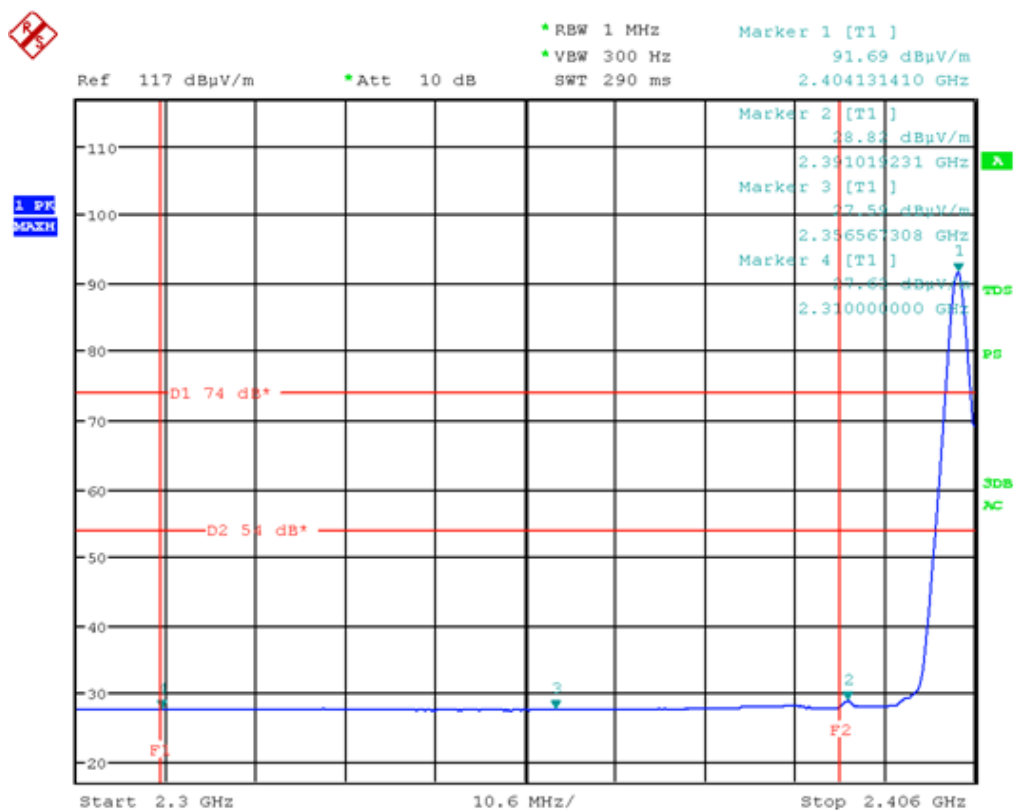
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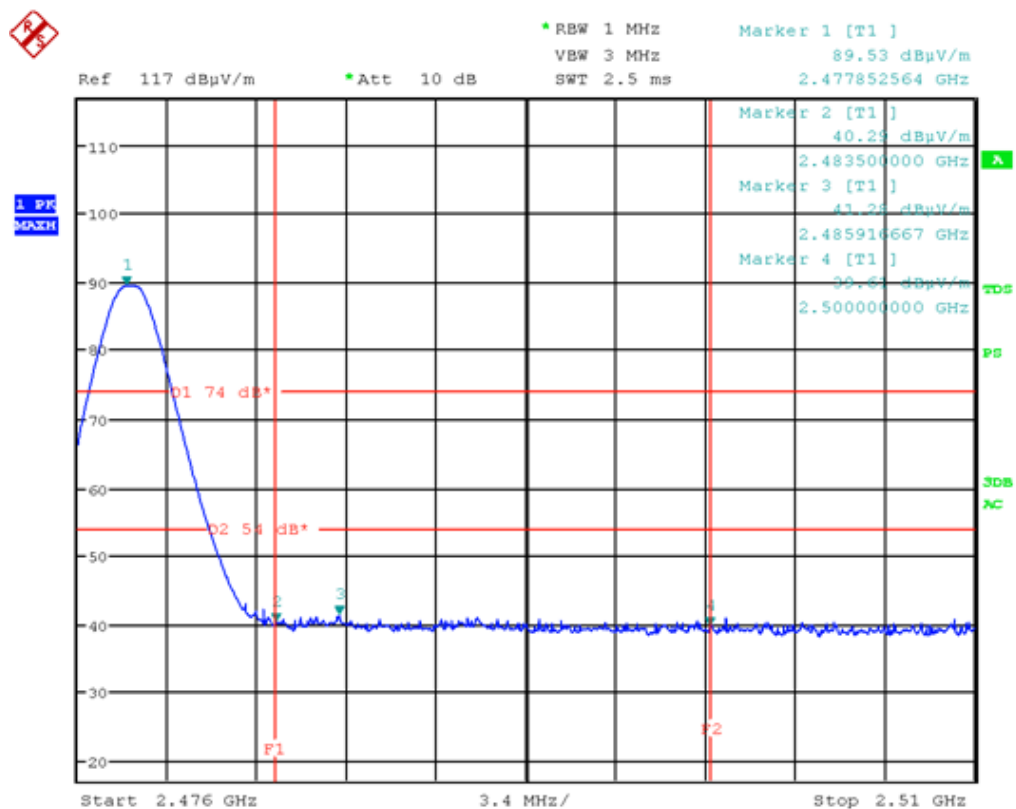
Page 41 of 93



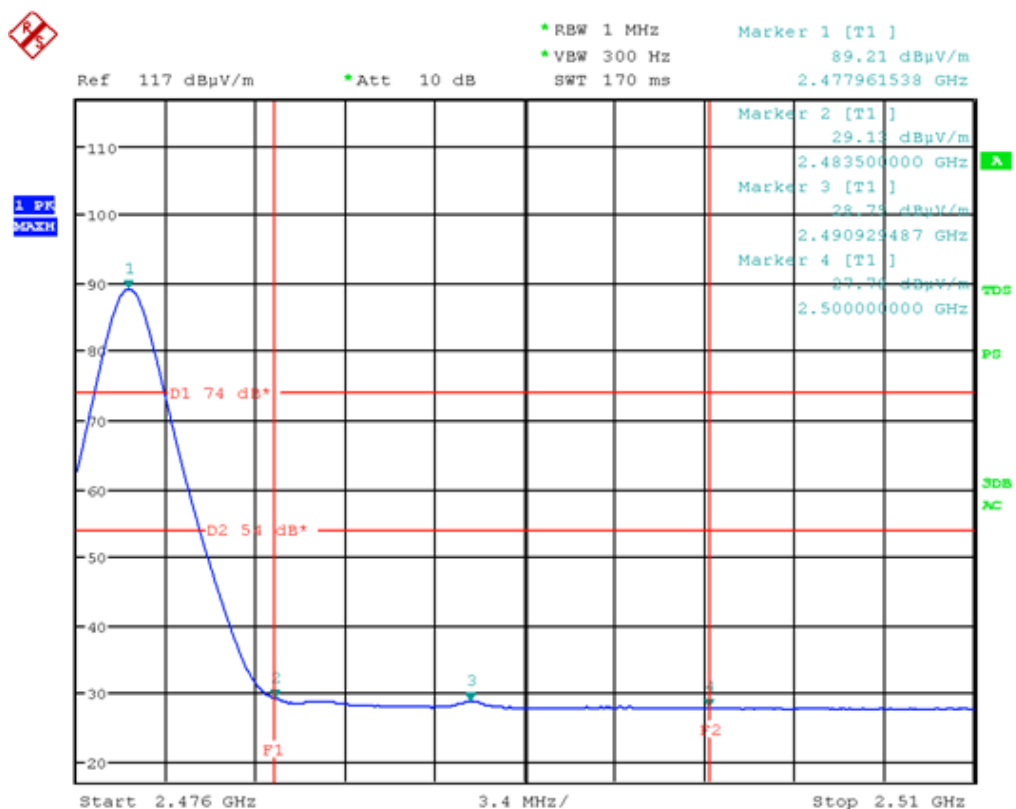
Picture 25: lower edge - PK



Picture 26: lower edge - AV



Picture 27: upper edge - PK



Picture 28: upper edge - AV

10 Spurious RF Conducted Emission

according to CFR 47 Part 15, section 15.247(d)

10.1 Test location

- ☒ Conducted measurement
- ☐ Scan with peak detector in 3 m CDC
- ☐ CISPR measurement with quasi peak detector on 10m open area test site.
- ☐ Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

10.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

10.3 Limits

- < - 20dBc outside restricted bands
- < 54dB μ V (video average) inside restricted bands
- < 74dB μ V (peak detector) inside restricted bands

10.4 Test procedure

1. The test is performed in accordance with FCC Public Notice KBD 558074
2. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
3. The unit was operated in continuous transmit mode with modulation.
4. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
5. Measure the spectrum from the lowest frequency generated in the EUT up through the 10th harmonic.



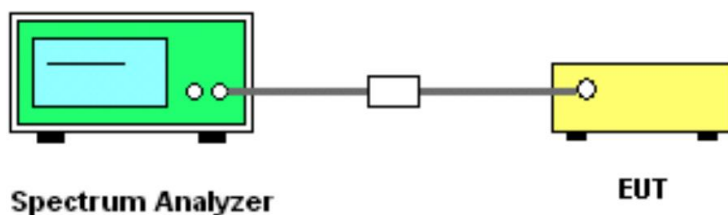
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Page 44 of 93

10.5 Test setup



Picture 29: Test setup for conducted spurious emission measurement

10.6 Test deviation

There is no deviation with the original standard.

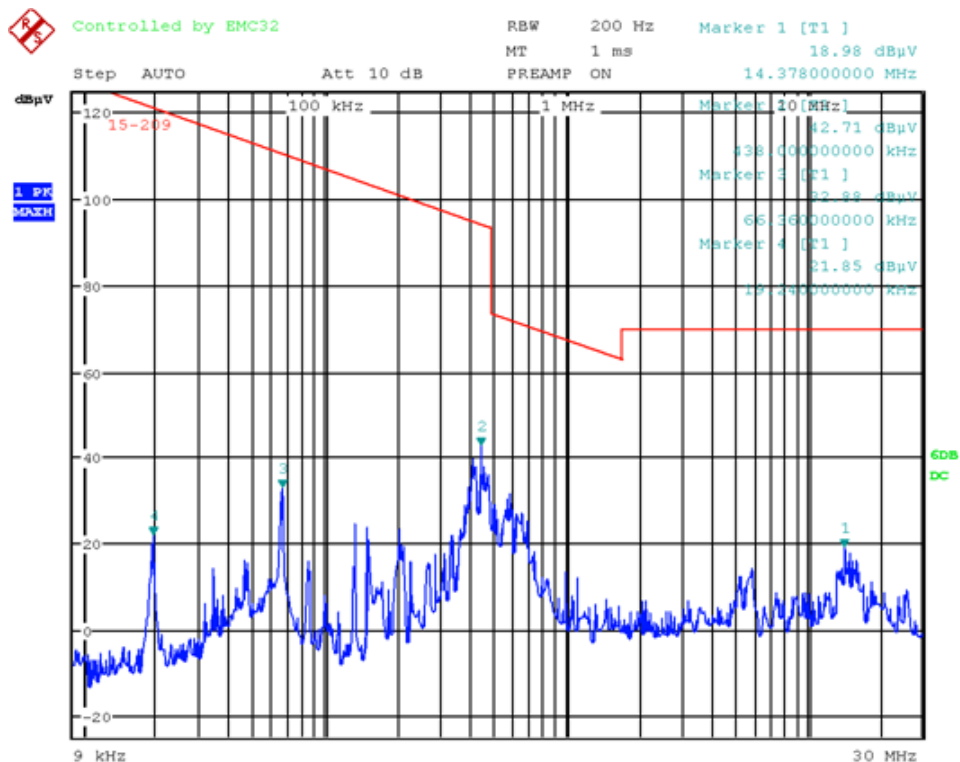
10.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

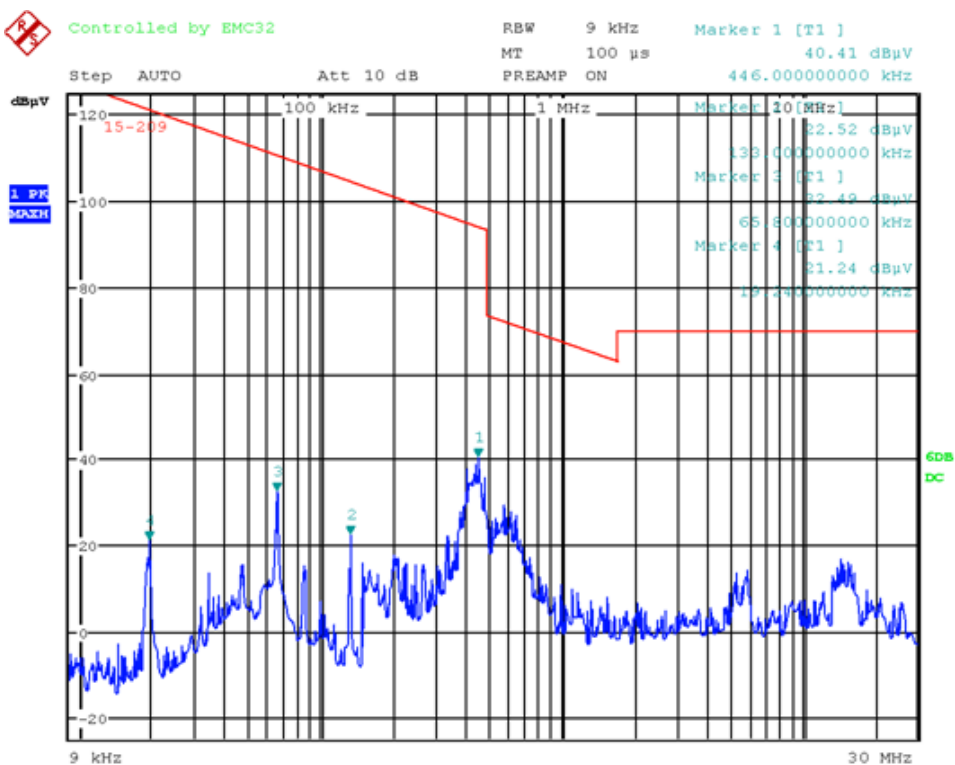
10.8 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-09-23

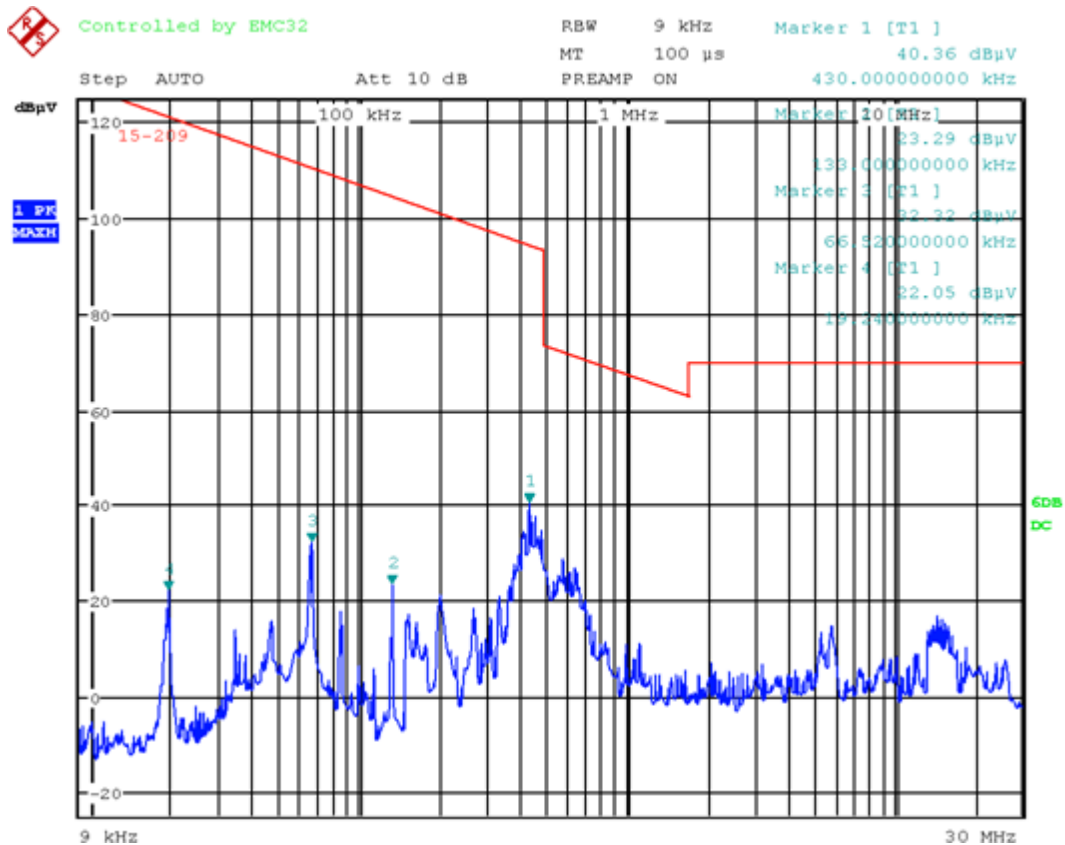
10.9 Test results 9kHz - 30MHz



Picture 30: spurious emission channel 1

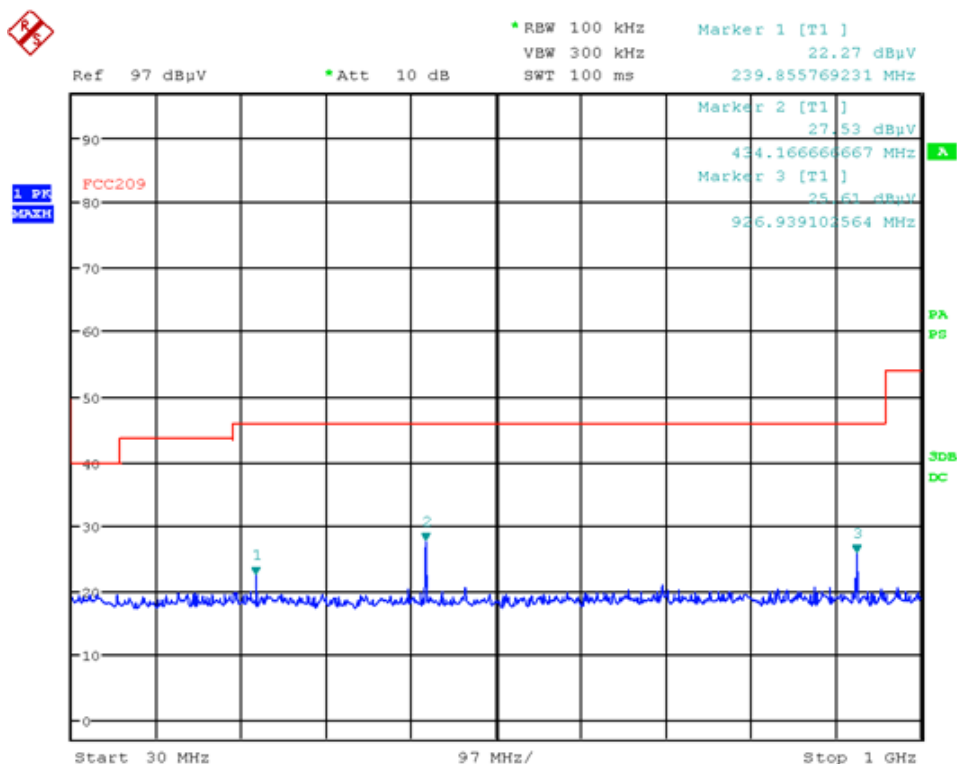


Picture 31: spurious emission channel 19

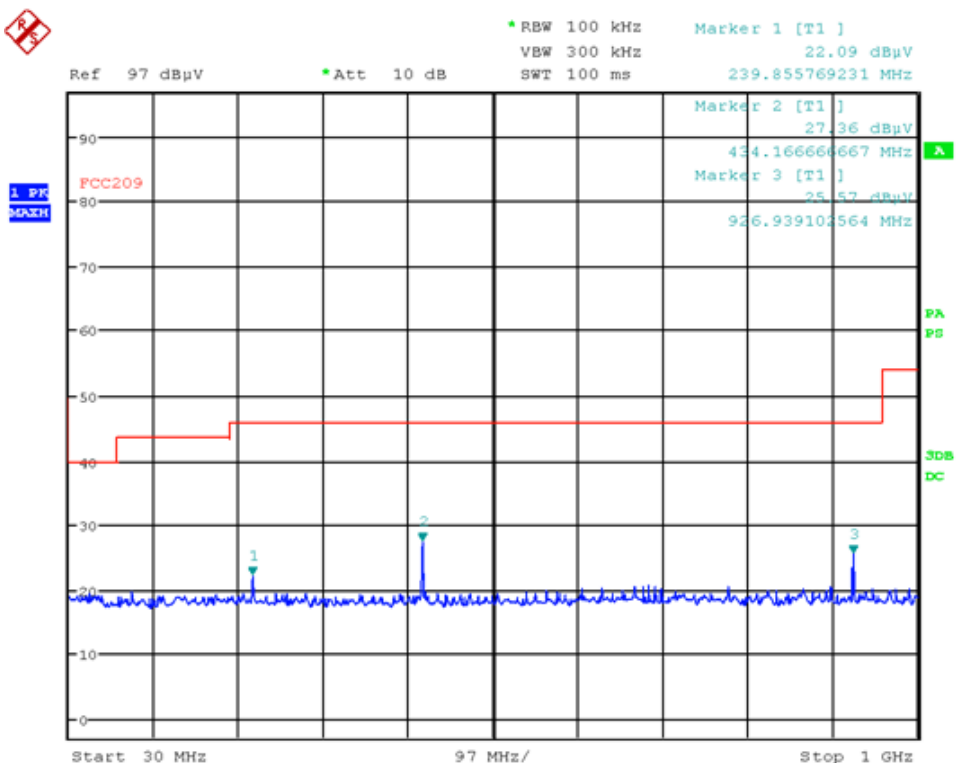


Picture 32: spurious emission channel 38

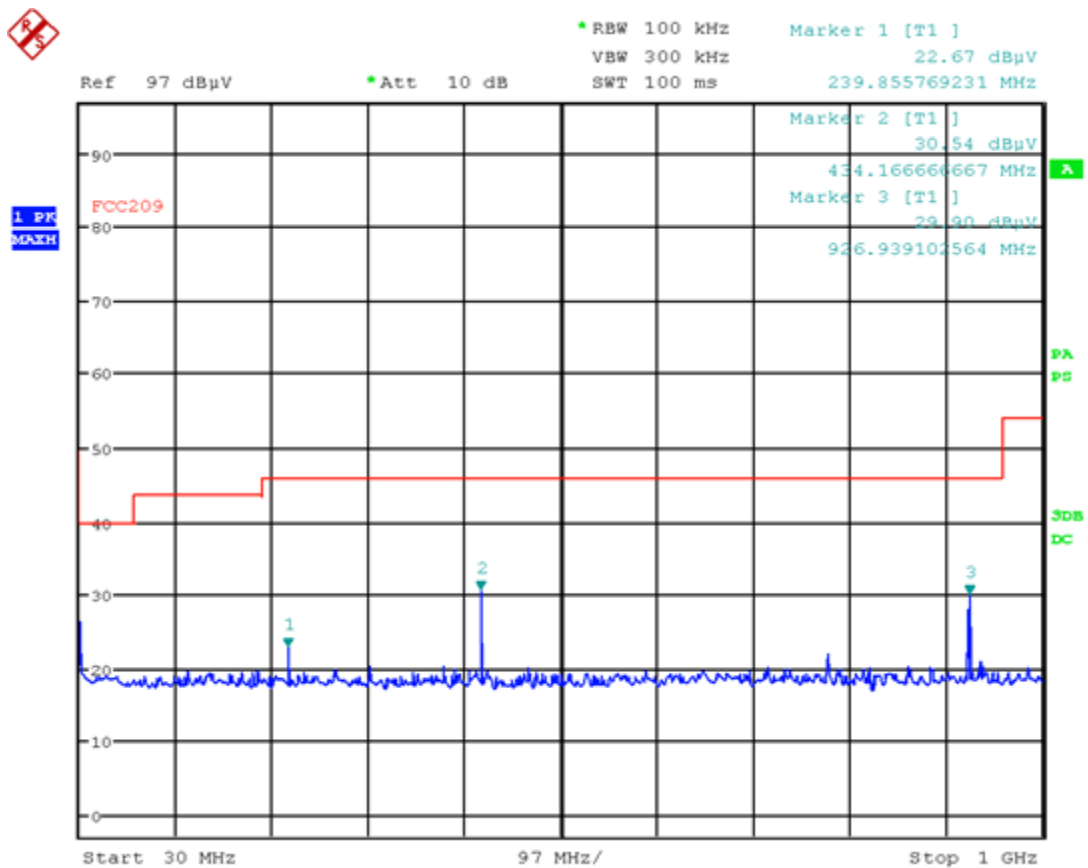
10.10 Test results 30MHz - 26GHz



Picture 33: spurious emission channel 1 (30MHz – 1GHz)



Picture 34: spurious emission channel 19 (30MHz – 1GHz)



Picture 35: spurious emission channel 38 (30MHz – 1GHz)

Channel 1					
f [GHz]	Reading [dBμV]	Detector	Limit [dBμV]	Restricted Band	Result
2.4042	103.19	PK	- - -	NO	Carrier
2.4040	102.87	AV	- - -		Carrier
4.8082	49.72	PK	74 (PK)	YES	Pass
4.8082			54 (AV)		Pass
7.2124	51.48	PK	-20dBc (PK)	NO	Pass
7.2124			-20dBc (AV)		Pass
9.6167	51.04	PK	-20dBc (PK)	NO	Pass
9.6167			-20dBc (AV)		Pass

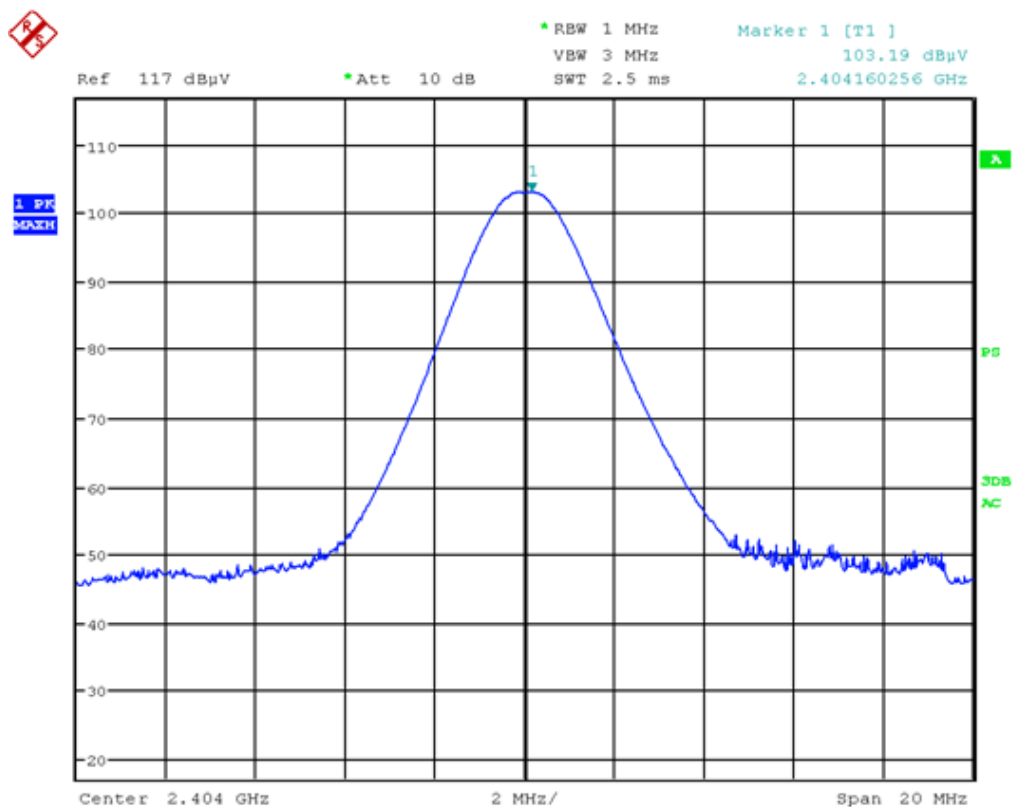


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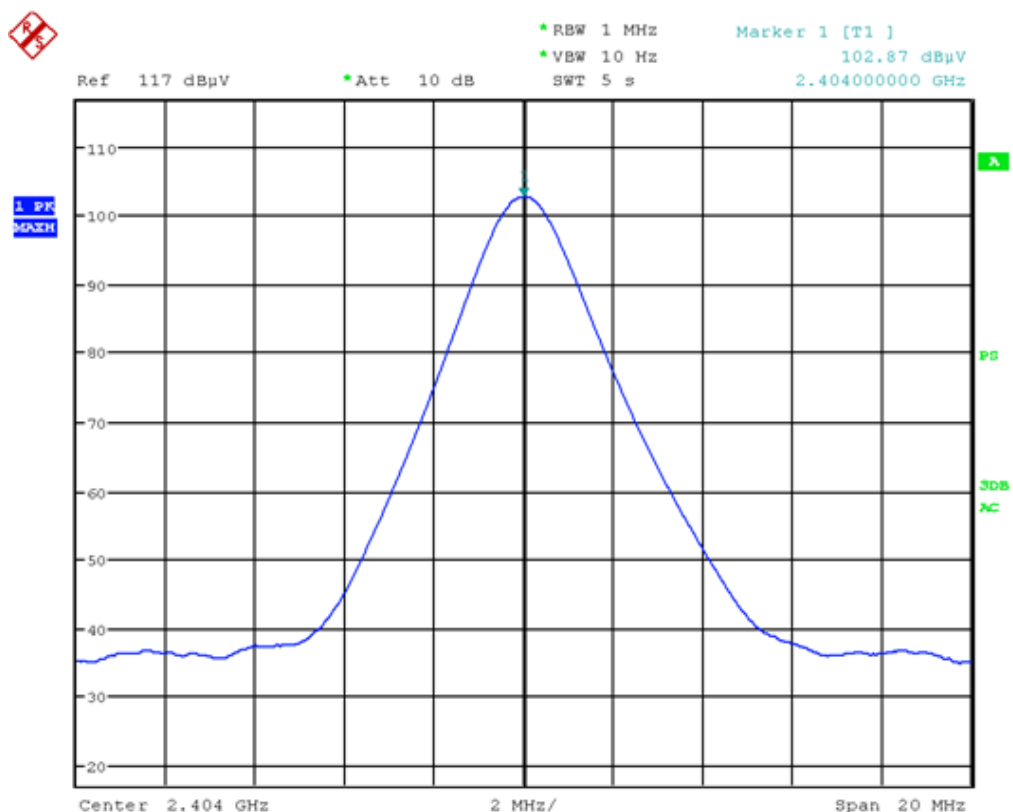
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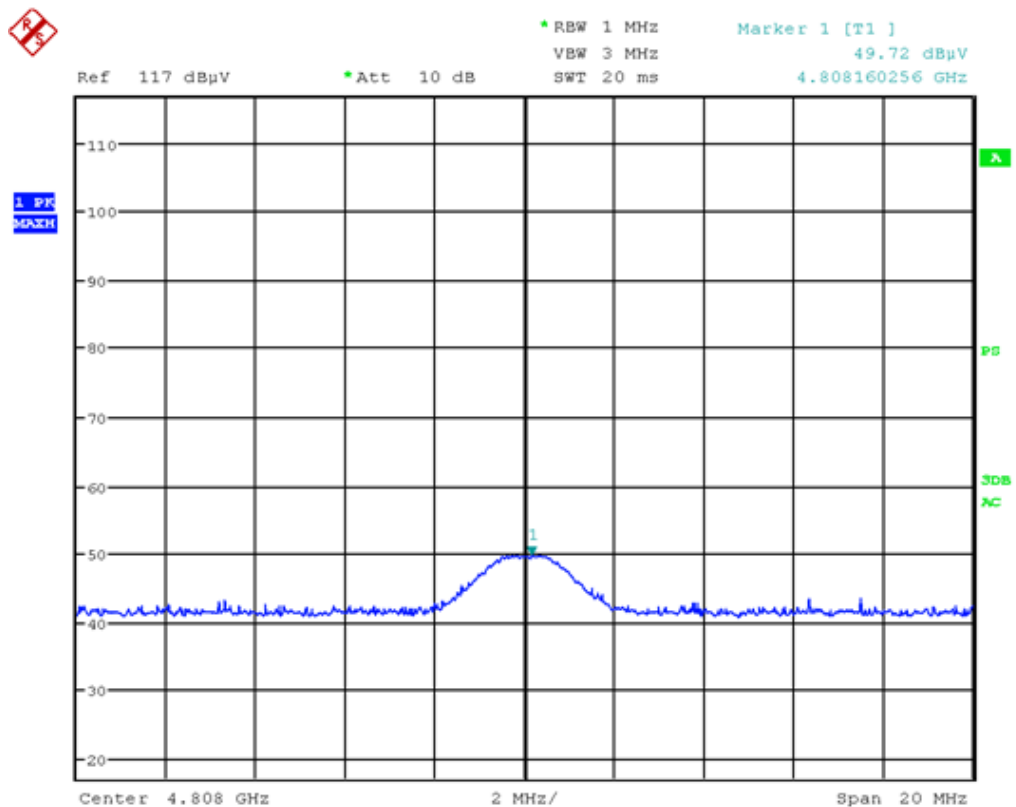
Page 50 of 93



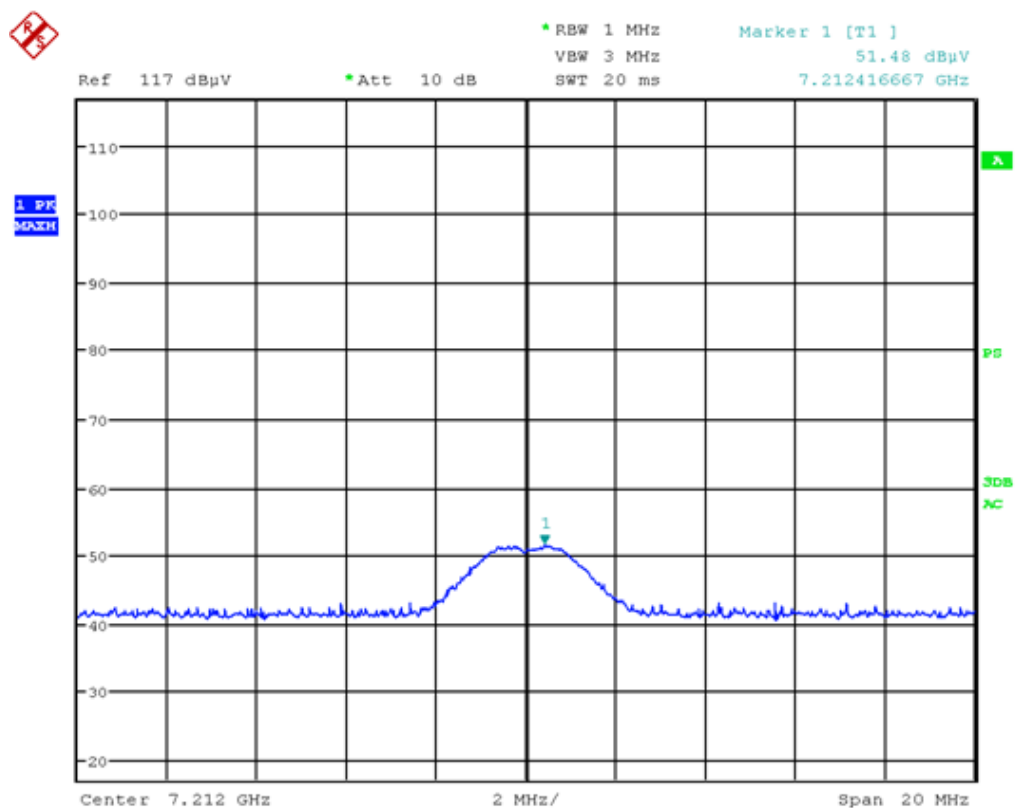
Picture 36: spurious emission channel 1 - PK (1GHz - 26GHz)



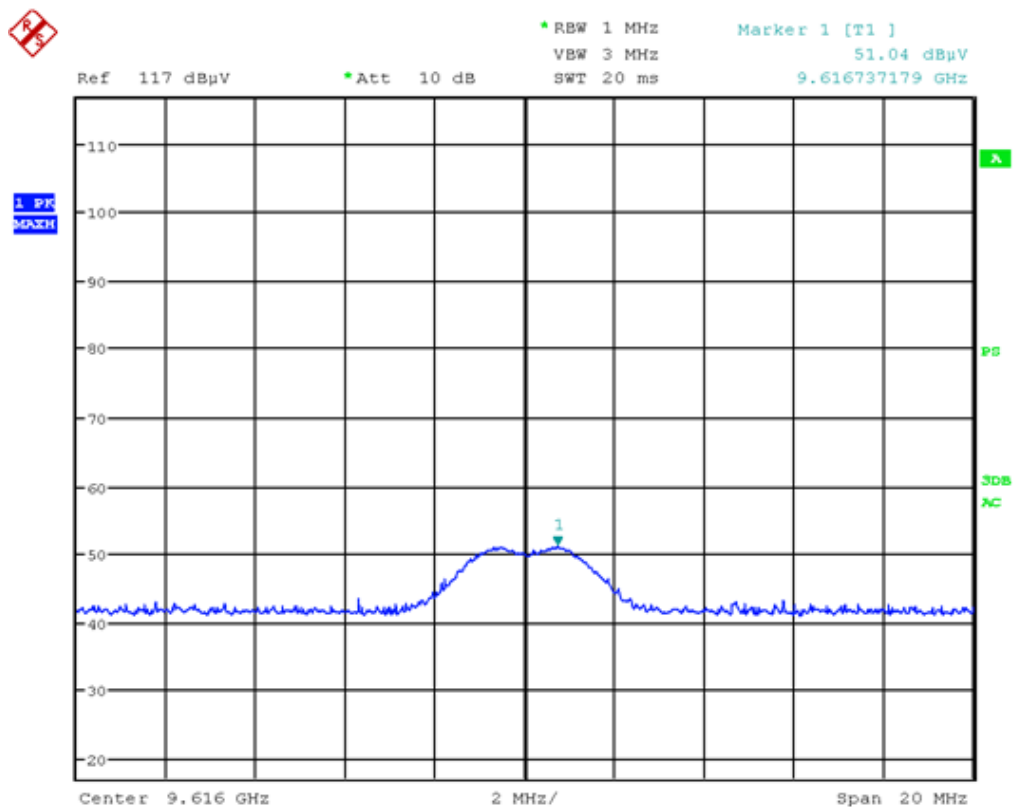
Picture 37: spurious emission channel 1 - AV (1GHz - 26GHz)



Picture 38: spurious emission channel 1 - PK (1GHz - 26GHz)



Picture 39: spurious emission channel 1 - PK (1GHz - 26GHz)



Picture 40: spurious emission channel 1 - PK (1GHz - 26GHz)

Channel 19					
f [GHz]	Reading [dBµV]	Detector	Limit [dBµV]	Restricted Band	Result
1.8977	64.11	PK	-20dBc (PK)	NO	Pass
1.8975	31.62	AV	-20dBc(AV)		Pass
2.4402	102.04	PK	- - -	NO	Carrier
2.4400	101.69	AV	- - -		Carrier
4.8795	48.67	PK	74 (PK)	YES	Pass
4.8795			54 (AV)		Pass
7.3205	51.16	PK	74 (PK)	YES	Pass
7.3205			54 (AV)		Pass
9.7607	53.98	PK	-20dBc (PK)	NO	Pass
9.7600	48.30	AV	-20dBc(AV)		Pass

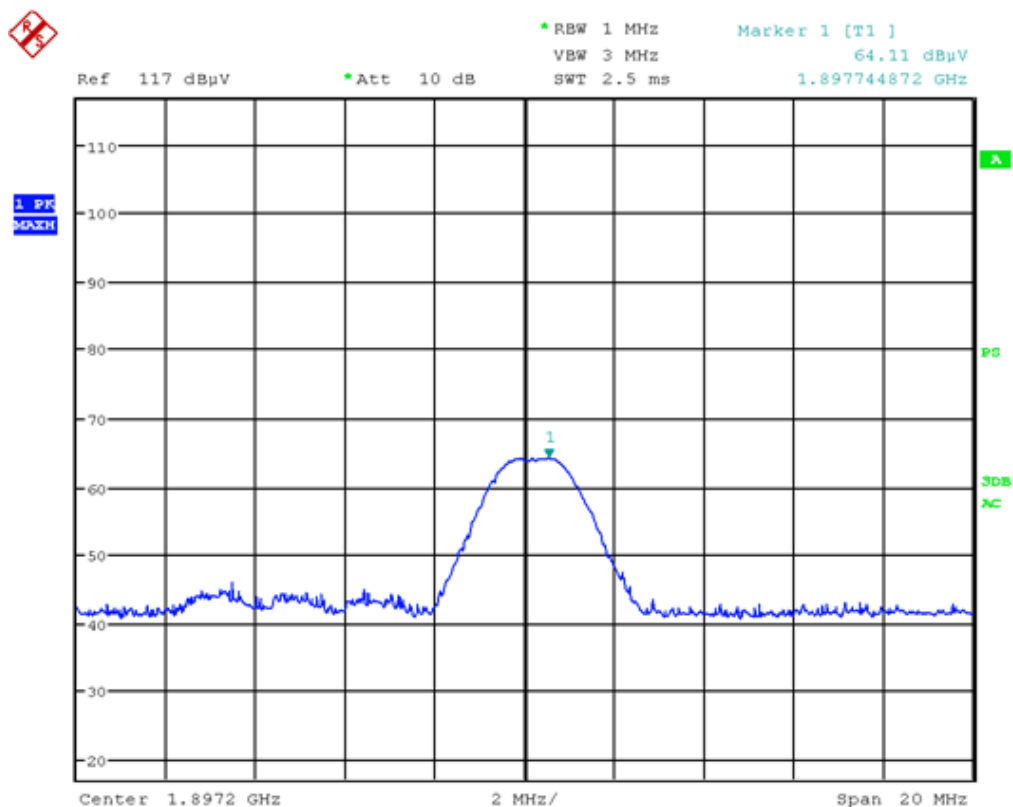


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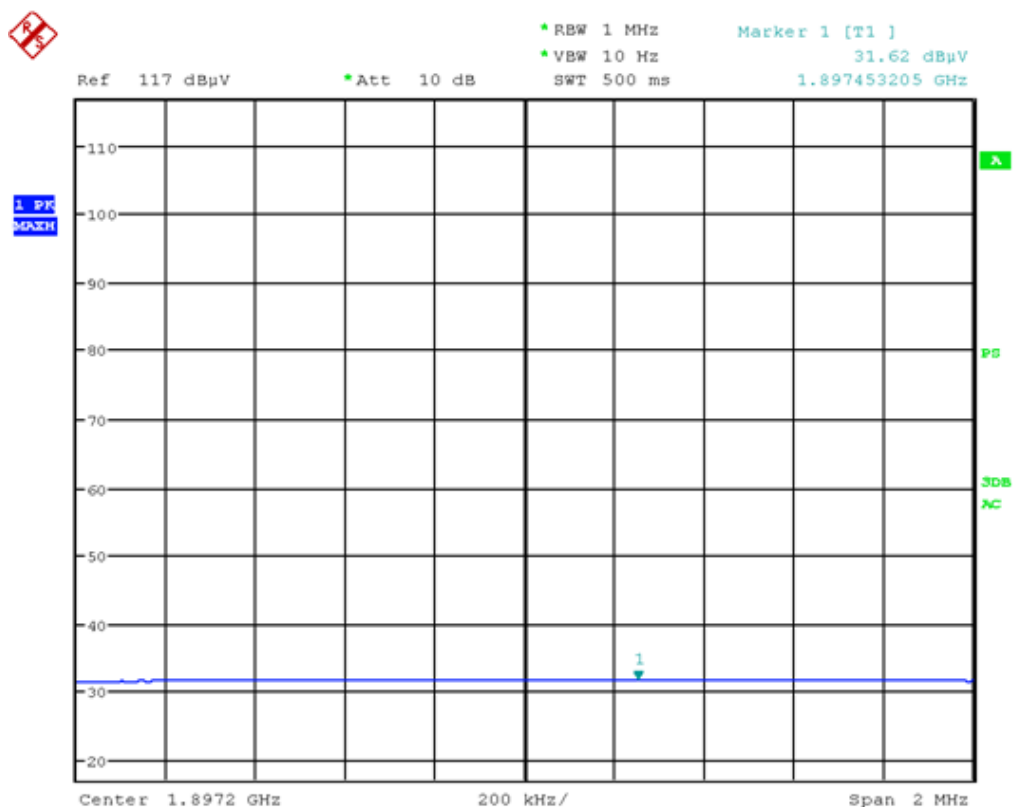
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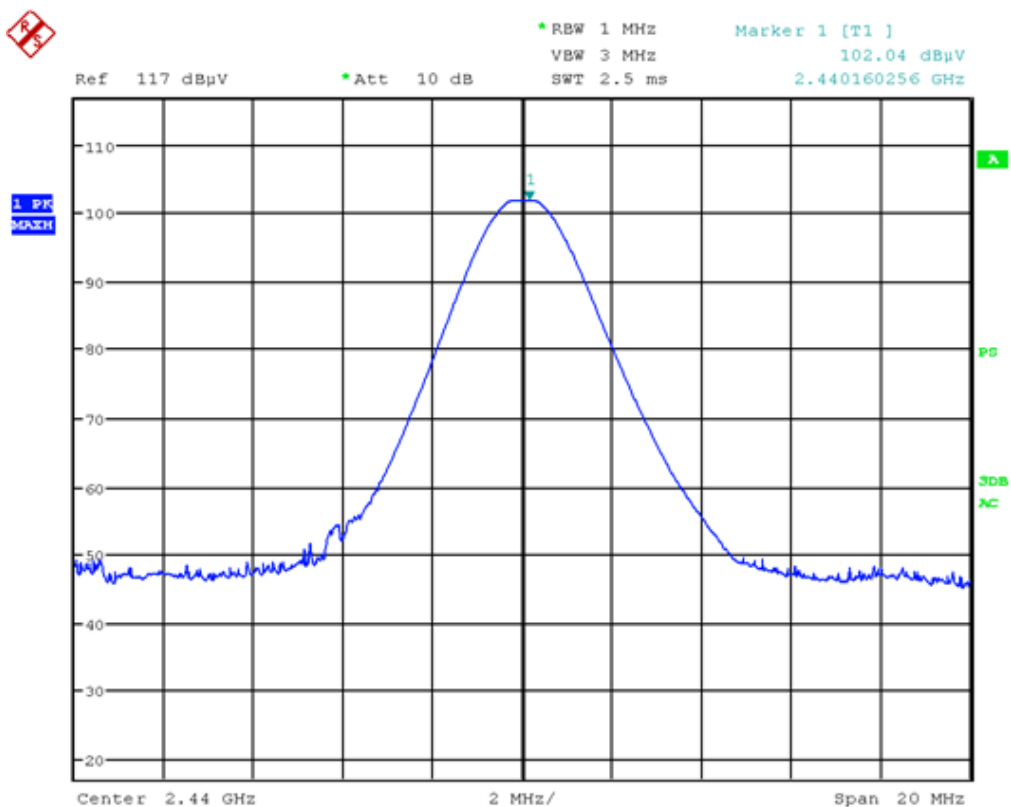
Page 54 of 93



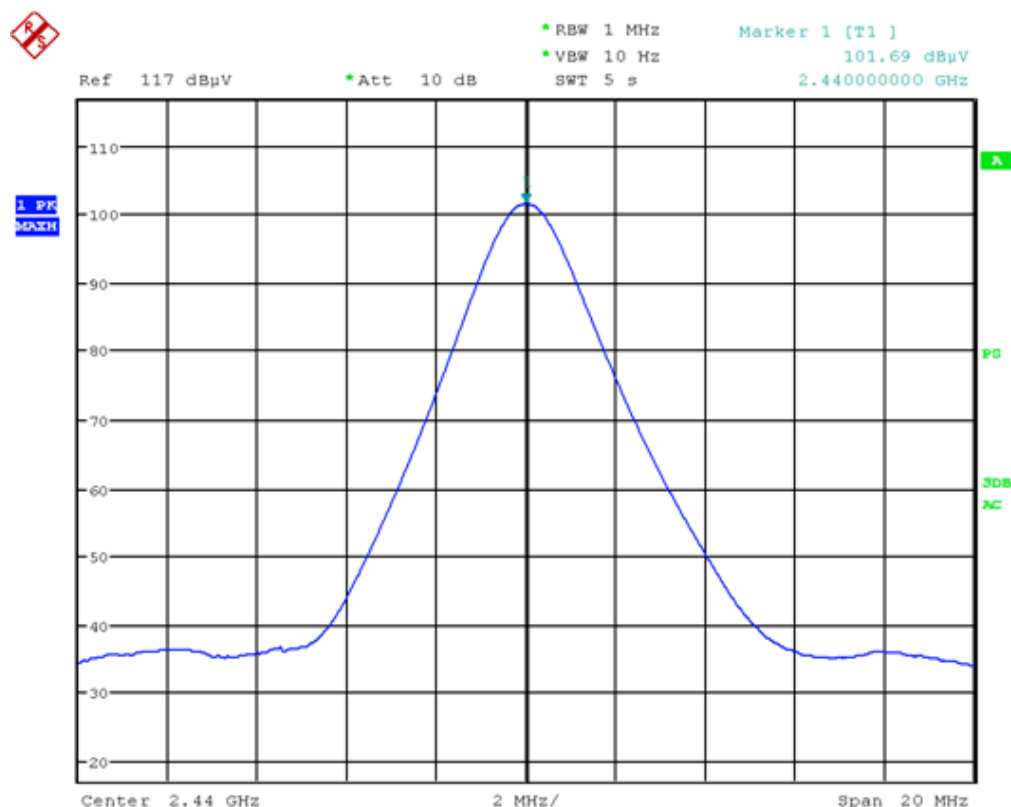
Picture 41: spurious emission channel 19 - PK (1GHz - 26GHz)



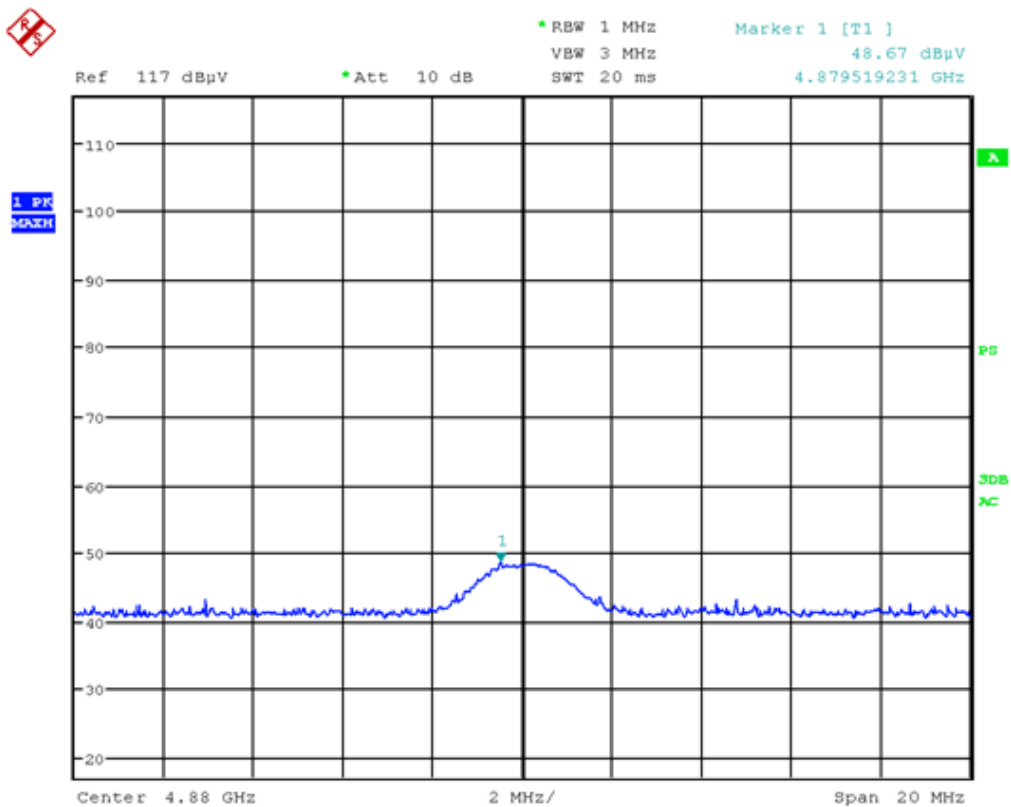
Picture 42: spurious emission channel 19 - AV(1GHz - 26GHz)



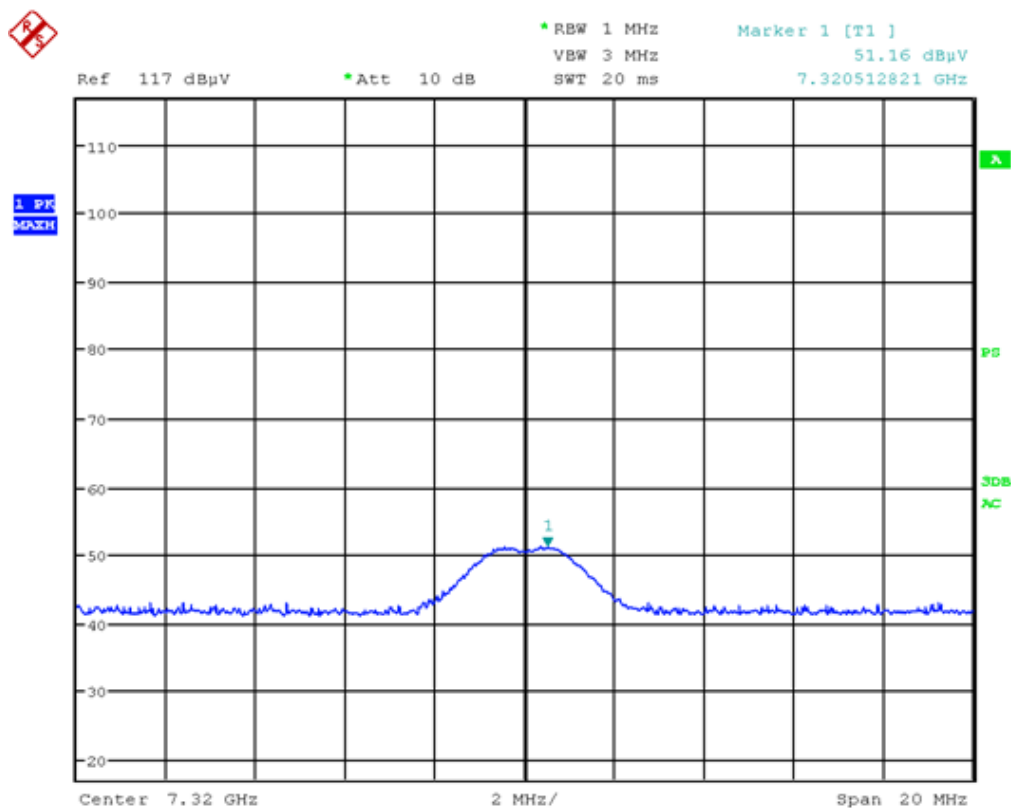
Picture 43: spurious emission channel 19 - PK (1GHz - 26GHz)



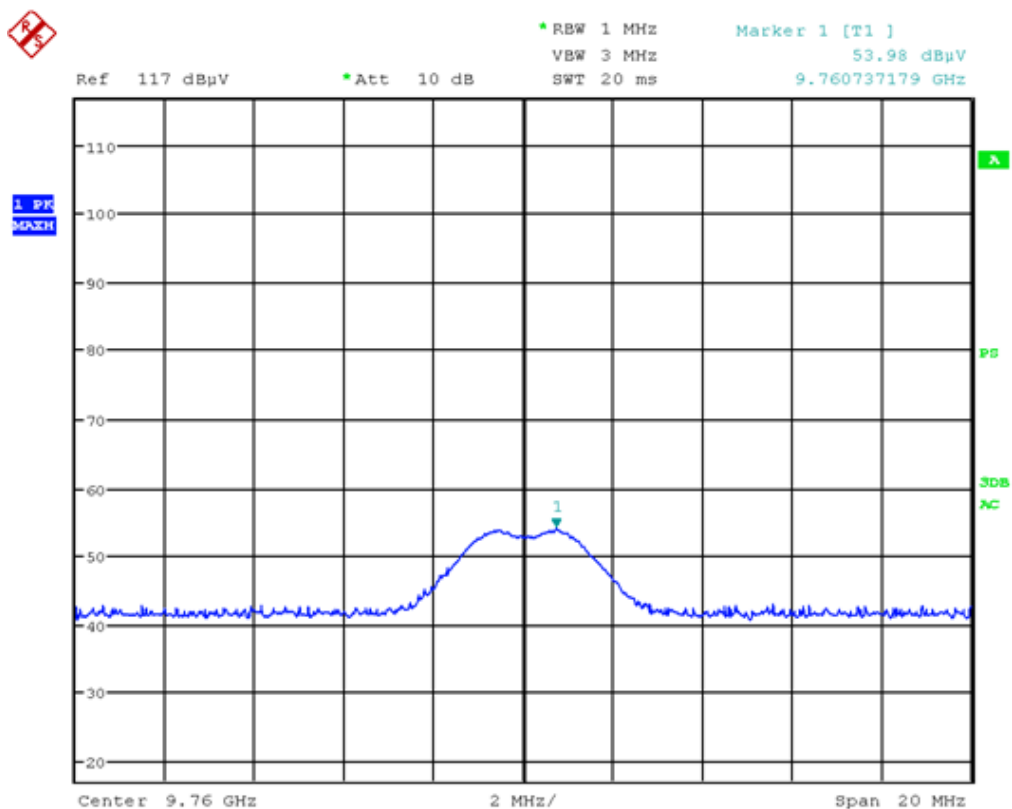
Picture 44: spurious emission channel 19 - AV (1GHz - 26GHz)



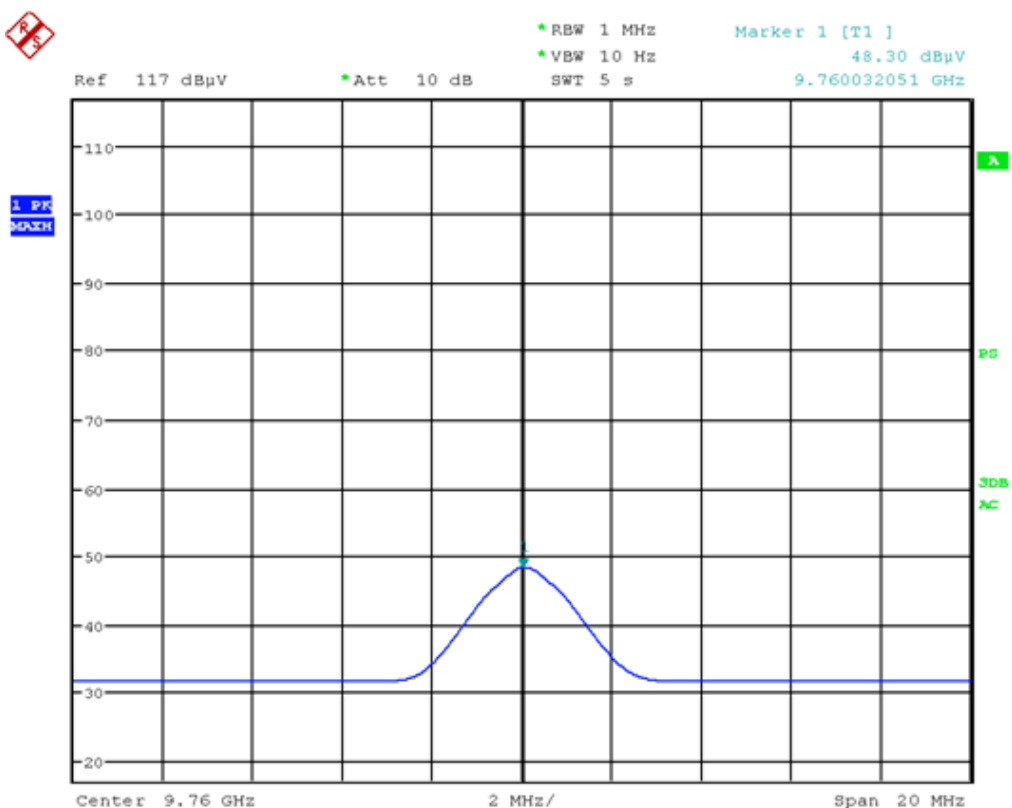
Picture 45: spurious emission channel 19 - PK (1GHz - 26GHz)



Picture 46: spurious emission channel 19 - PK (1GHz - 26GHz)



Picture 47: spurious emission channel 19 - PK (1GHz - 26GHz)



Picture 48: spurious emission channel 19 - AV (1GHz - 26GHz)

Channel 38					
f [GHz]	Reading [dBμV]	Detector	Limit [dBμV]	Restricted Band	Result
2.4782	100.01	PK	- - -	NO	Carrier
2.4780	99.63	AV	- - -		Carrier
4.9564	48.44	PK	74 (PK)	YES	Pass
4.9564			54 (AV)		Pass
7.4335	50.91	PK	74 (PK)	YES	Pass
7.4335			54 (AV)		Pass
9.9127	55.76	PK	-20dBc (PK)	NO	Pass
9.9127			-20dBc(AV)		Pass

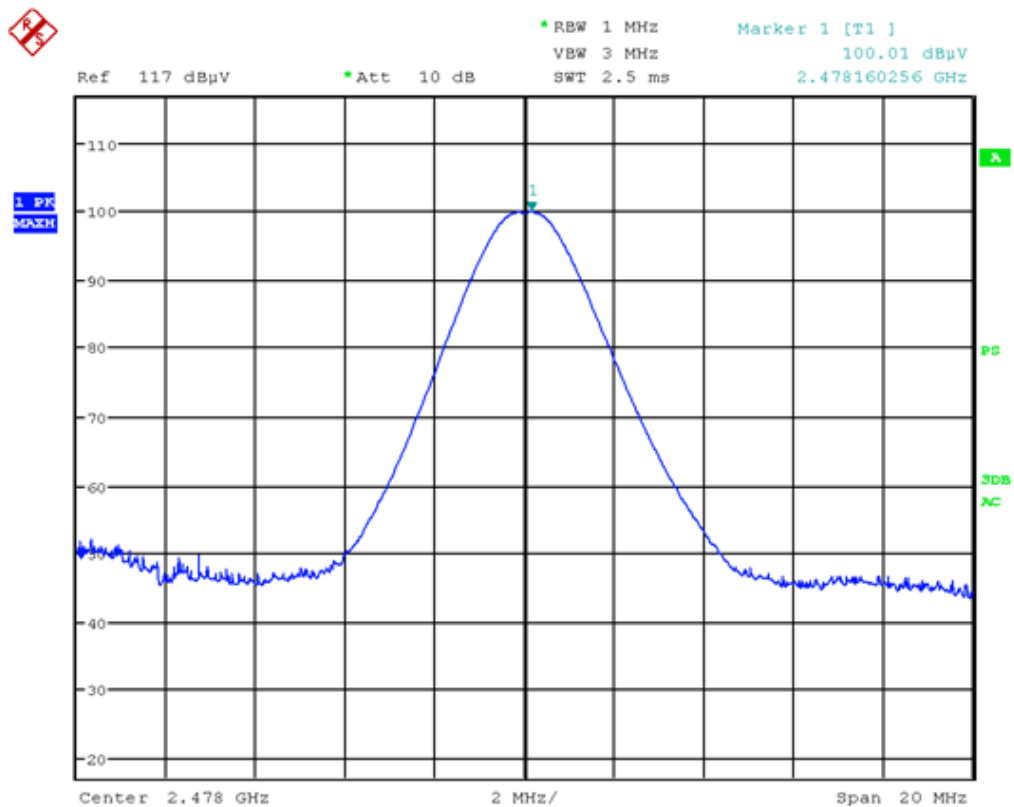


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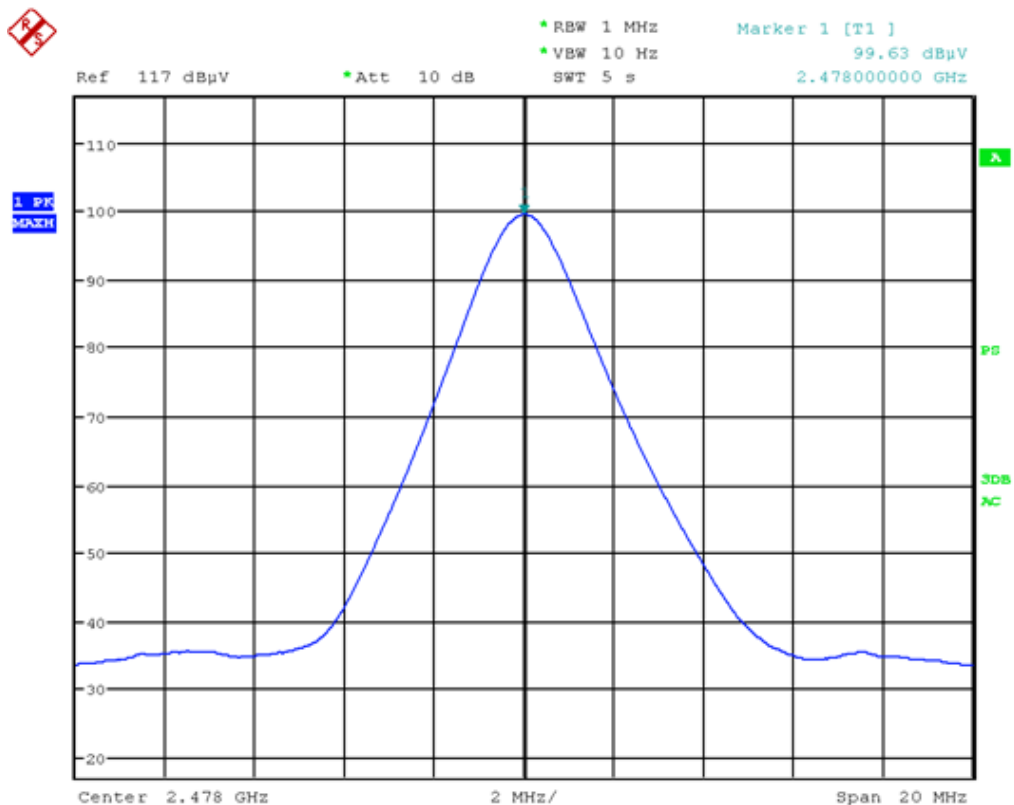
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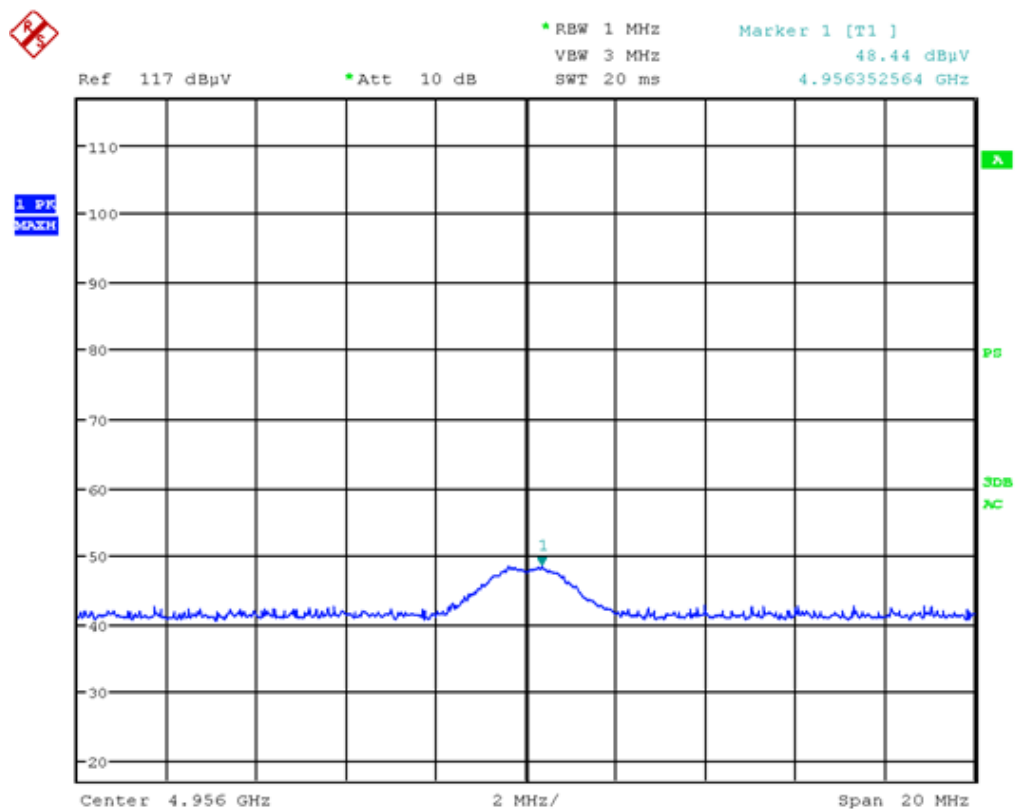
Page 59 of 93



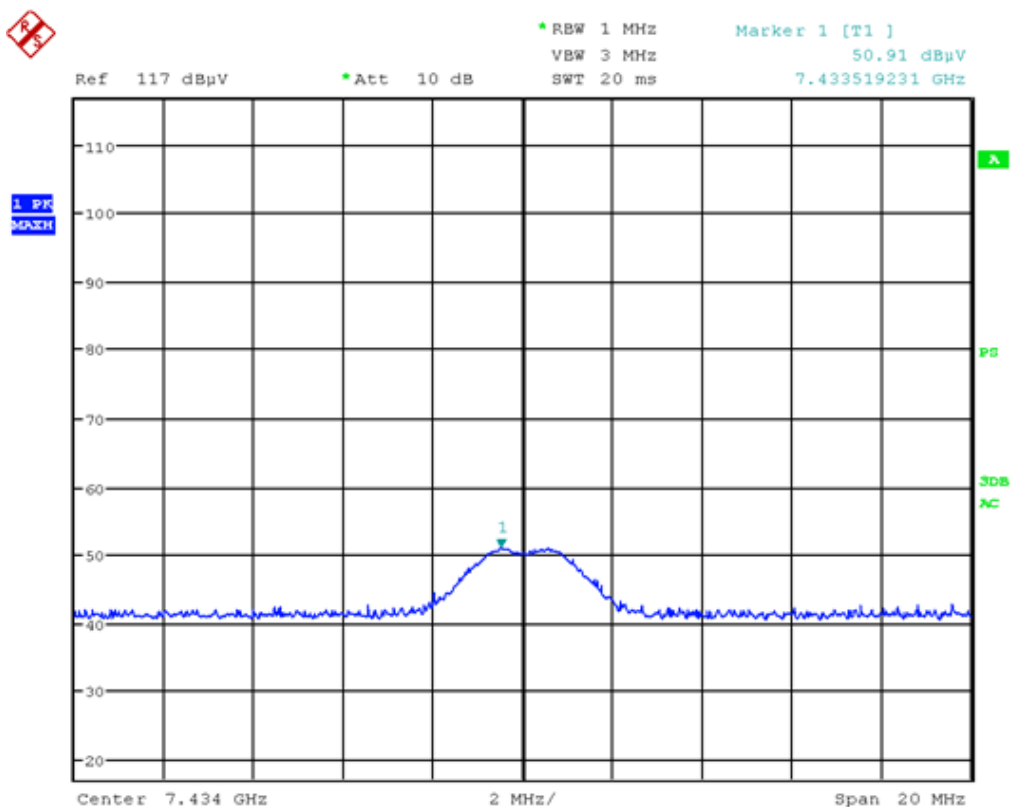
Picture 49: spurious emission channel 38 - PK (1GHz - 26GHz)



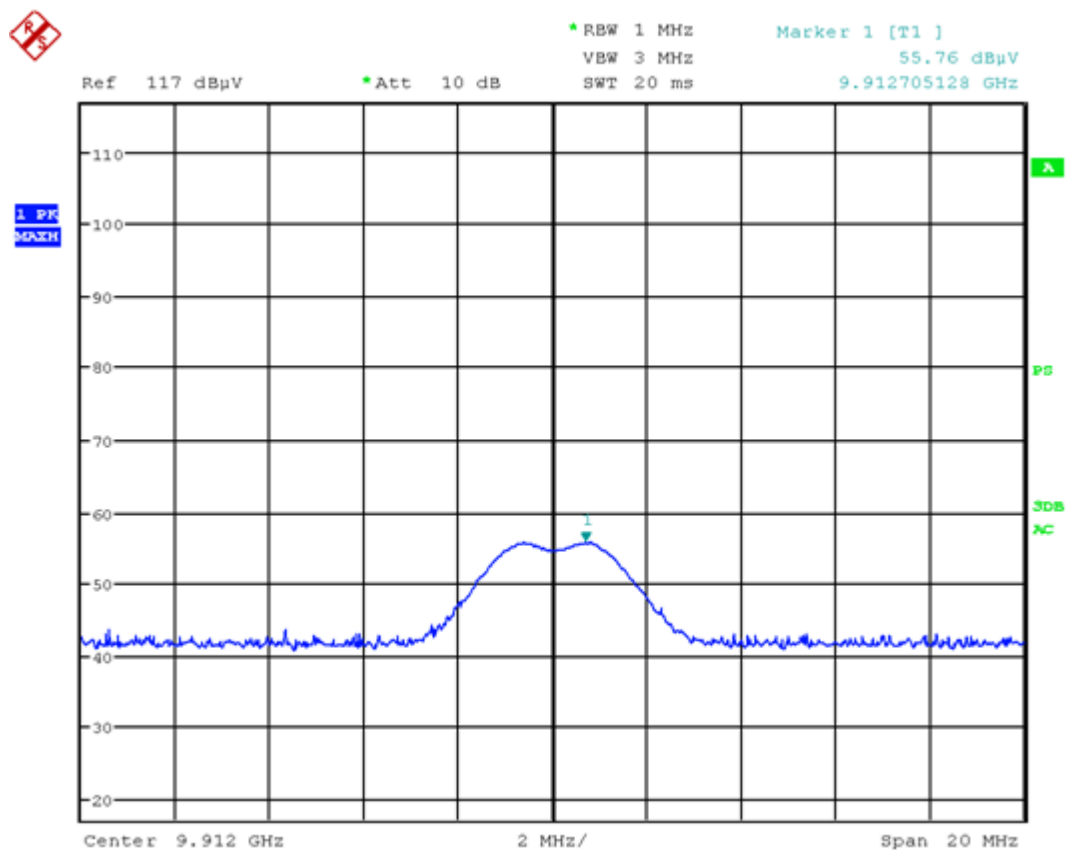
Picture 50: spurious emission channel 38 - AV (1GHz - 26GHz)



Picture 51: spurious emission channel 38 - PK (1GHz - 26GHz)



Picture 52: spurious emission channel 38 - PK (1GHz - 26GHz)



Picture 53: spurious emission channel 38 - PK (1GHz - 26GHz)

11 Radiated emission measurement (<1 GHz)

according to CFR 47 Part 15, sections 15.205(a), 15.209(a),
15.247(d)

11.1 Test Location

- ☒ Scan with peak detector in 3 m CDC.
- ☒ Final CISPR measurement with quasi peak detector on 3 m open area test site.

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open site area	EMV TESTHAUS GmbH	E00354

11.2 Test instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input checked="" type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input checked="" type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011
<input checked="" type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input checked="" type="checkbox"/>	Feedline OATS	Huber & Suhner	200024



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Page 63 of 93

11.3 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency [MHz]	Field strength Fs [$\mu\text{V/m}$]	Field strength [$\text{dB}\mu\text{V/m}$]	Measurement distance d [m]
0.009 – 0.490	266.6 – 4.9	48.5 – 13.8	300
0.490 – 1.705	48.98 – 14.08	33.8 – 22.97	30
1.705 – 30.0	30	29.54	30
30 – 88	100	40	3
88 – 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

11.4 Test procedure

1. Configure the EUT according to ANSI C63.4. The EUT is placed on the top of the turntable 0.8 meter above ground. The receiving antenna is placed 3 meters from the turntable. For prescan measurements the test setup is placed inside a compact diagnostic chamber.
2. Power on the EUT and all peripherals.
3. The broadband antenna is set to vertical polarization.
4. The EMI receiver performs a scan from 9 kHz to 30 MHz or 30MHz to 1000MHz with the detector set to peak. Appropriate CISPR measurement bandwidths are used, i. e. 200 Hz for the frequency range 9 kHz to 150 kHz, 10 kHz for 150 kHz to 30 MHz and 120 kHz for 30MHz to 1000MHz.
5. The turn table is rotated to 6 different positions ($360^\circ / 6$) and the antenna polarization is changed to horizontal.
6. Repeat the test procedure at step 4 and 5.
7. Then the test setup is placed in an OATS at 3 m distance and all peak values over or with less than 6dB margin to the limit are re-measured with quasi-peak detector (except for the frequency bands 9–90 kHz and 110–490 kHz where average detector is used). If the margin of all emissions recorded prescan in the compact diagnostic chamber is more than 6 dB no final test in OATS is performed.
8. The turntable is rotated by 360 degrees to determine the position of the highest radiation.
9. The height of the broadband receiving antenna is varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization. The highest value is recorded.
10. For emissions below 30MHz, measurements are performed with a loop antenna. The antenna height is not changed during this test.



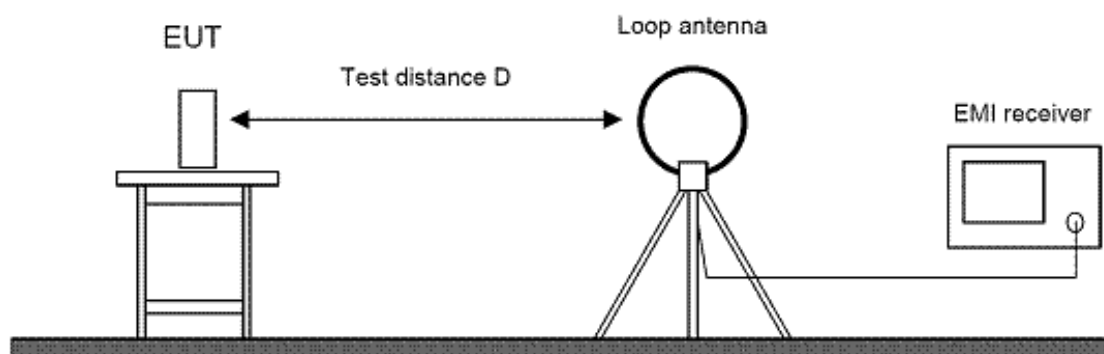
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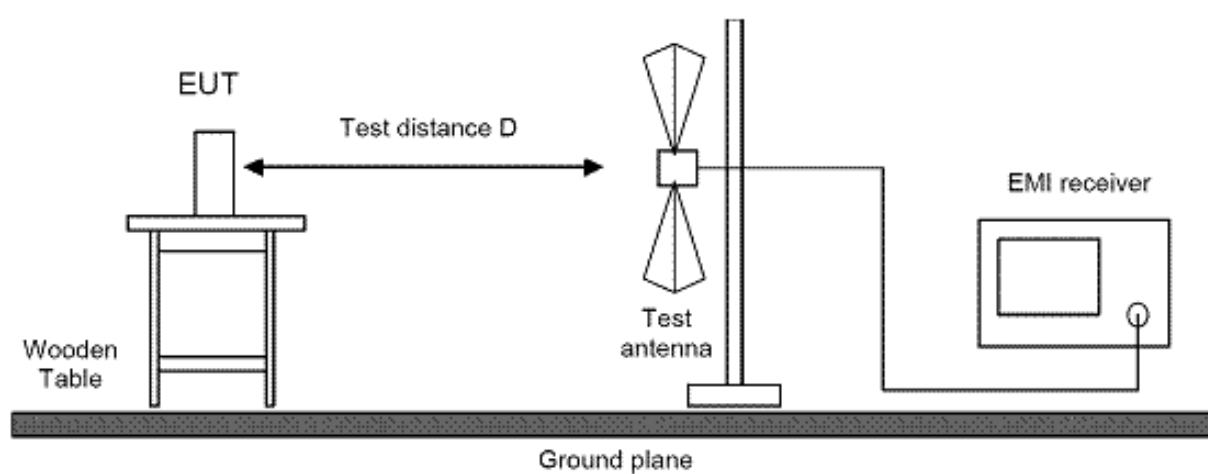
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Page 64 of 93

11.5 Test setup



Picture 54: Test setup for radiated emission measurement (< 30 MHz)



Picture 55: Test setup for radiated emission measurement (< 1 GHz)

11.6 Test deviation

There is no deviation with the original standard.

11.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

It was also investigated that the EUT-position1 is the respective worst-case for the measurements below 1GHz.

For the measurements below 30MHz the loop-antenna was polarised to "I".

11.8 Test results

Transmit mode

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-09-24

Radiated Emission Measurement 9 kHz – 30 MHz

Note:

Measured value = dB μ V/m @ 3 m

Recalculation factor = 40 dB / decade

Recalculated value1 = dB μ V/m @ 3 m - 40 dB = **dB μ V/m @ 30 m**

Recalculated value2 = dB μ V/m @ 30 m - 40 dB = **dB μ V/m @ 300 m**

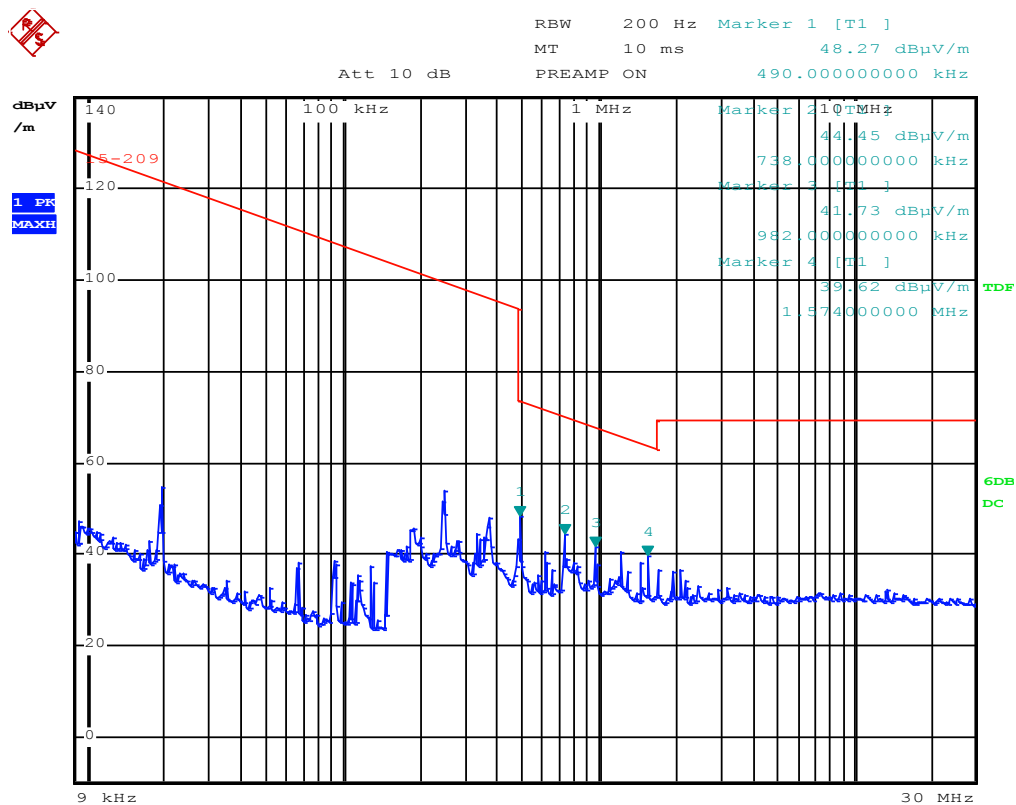


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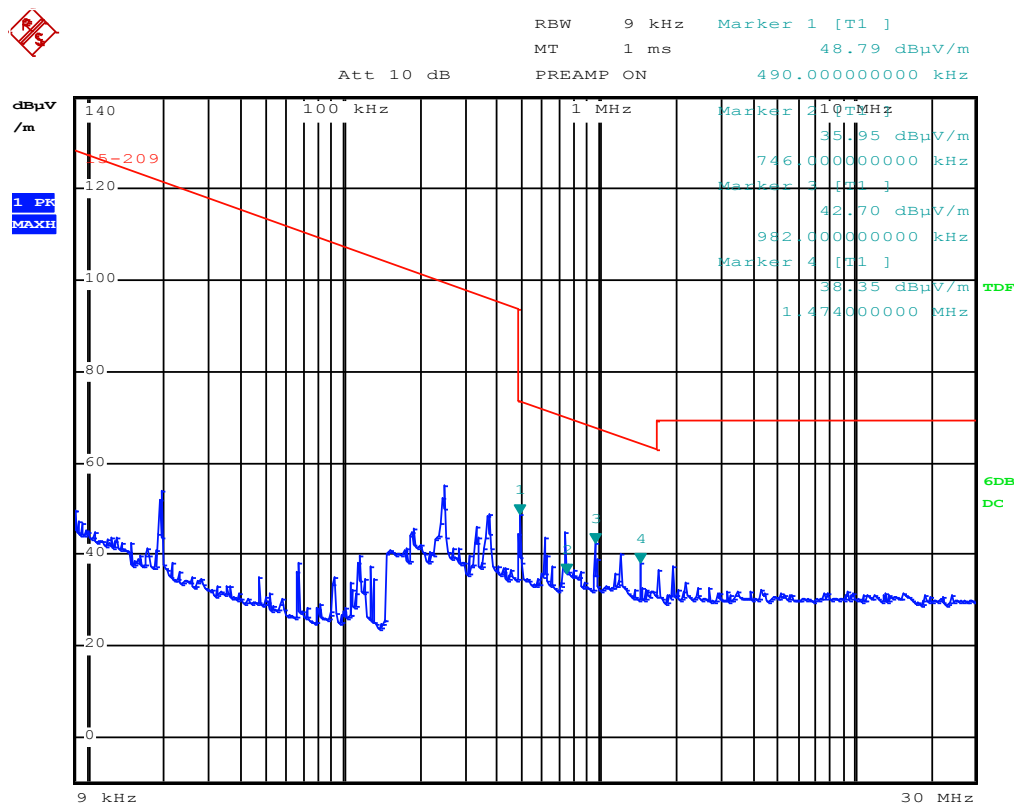
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Page 66 of 93



Picture 56: Radiated emission 9 kHz – 30MHz (Channel 1)



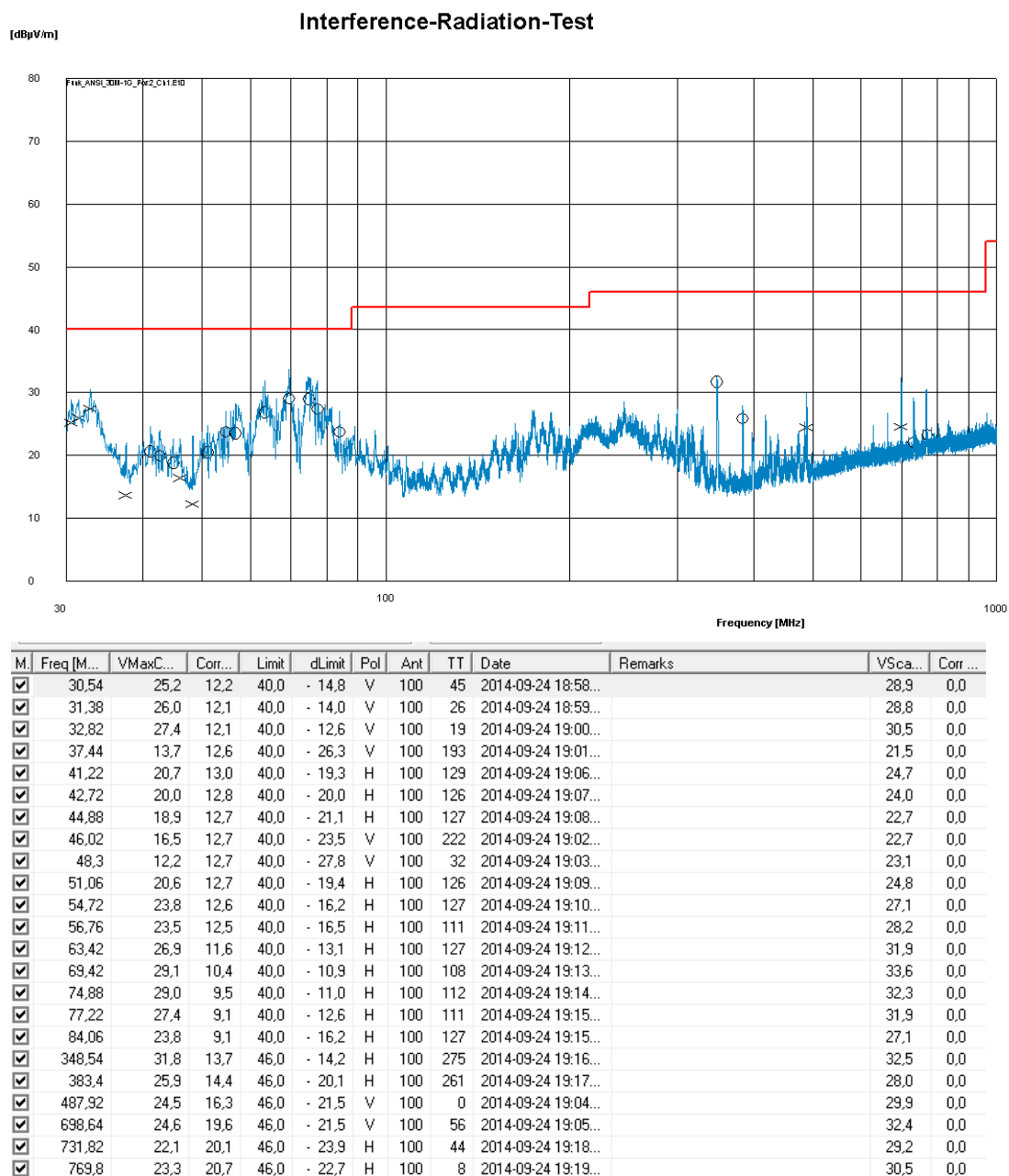
Picture 57: Radiated emission 9 kHz – 30MHz (Channel 19)

Transmit mode

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-09-24

Radiated Emission Measurement 30 MHz - 1 GHz

It was investigated that EUT position 2 is the respective worst-case.



Picture 59: Radiated emission 30 MHz – 1000MHz (Channel 1)



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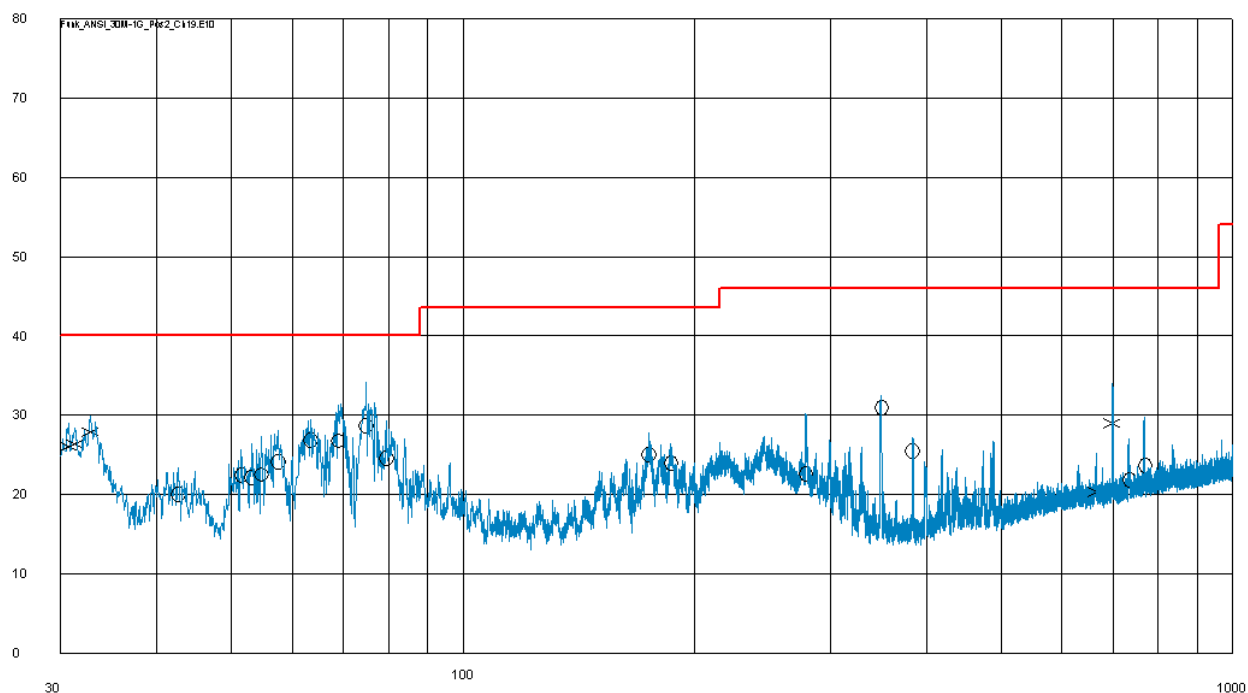
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140275-AU01+W05

Page 69 of 93

[dBµV/m]

Interference-Radiation-Test



M	Freq [M...	VMaxC...	Corr...	Limit	dLimit	Pol	Ant	TT	Date	Remarks	VScal...	Corr ...
✓	30,72	26,0	12,2	40,0	- 14,0	V	100	36	2014-09-24 19:36...		29,1	0,0
✓	31,32	26,4	12,1	40,0	- 13,6	V	100	41	2014-09-24 19:37...		28,4	0,0
✓	32,76	27,8	12,1	40,0	- 12,2	V	100	0	2014-09-24 19:38...		29,9	0,0
✓	42,66	20,1	12,8	40,0	- 19,9	H	100	124	2014-09-24 19:41...		23,4	0,0
✓	51,54	22,5	12,6	40,0	- 17,5	H	100	127	2014-09-24 19:42...		25,7	0,0
✓	53,22	22,2	12,6	40,0	- 17,8	H	100	111	2014-09-24 19:43...		26,5	0,0
✓	54,78	22,6	12,6	40,0	- 17,4	H	100	127	2014-09-24 19:44...		27,4	0,0
✓	57,54	24,2	12,5	40,0	- 15,8	H	100	111	2014-09-24 19:45...		28,1	0,0
✓	63,42	26,9	11,6	40,0	- 13,1	H	100	127	2014-09-24 19:46...		29,4	0,0
✓	68,82	26,8	10,5	40,0	- 13,2	H	100	108	2014-09-24 19:47...		31,3	0,0
✓	74,82	28,8	9,5	40,0	- 11,2	H	100	112	2014-09-24 19:48...		34,1	0,0
✓	79,5	24,7	8,7	40,0	- 15,3	H	100	114	2014-09-24 19:49...		29,3	0,0
✓	174,3	25,1	12,7	43,5	- 18,4	H	100	100	2014-09-24 19:49...		27,8	0,0
✓	186,36	24,0	11,1	43,5	- 19,5	H	100	99	2014-09-24 19:50...		26,4	0,0
✓	278,94	22,6	12,3	46,0	- 23,4	H	100	57	2014-09-24 19:51...		30,3	0,0
✓	349,86	31,0	13,7	46,0	- 15,0	H	100	275	2014-09-24 19:52...		32,5	0,0
✓	383,4	25,6	14,4	46,0	- 20,4	H	100	261	2014-09-24 19:53...		27,2	0,0
✓	664,74	20,4	19,3	46,0	- 25,6	V	100	59	2014-09-24 19:39...		25,3	0,0
✓	697,02	29,0	19,6	46,0	- 17,0	V	100	57	2014-09-24 19:40...		34,0	0,0
✓	734,76	21,9	20,2	46,0	- 24,1	H	100	44	2014-09-24 19:54...		27,0	0,0
✓	769,74	23,8	20,7	46,0	- 22,3	H	100	45	2014-09-24 19:55...		29,7	0,0

Picture 60: Radiated emission 30 MHz – 1000MHz (Channel 19)



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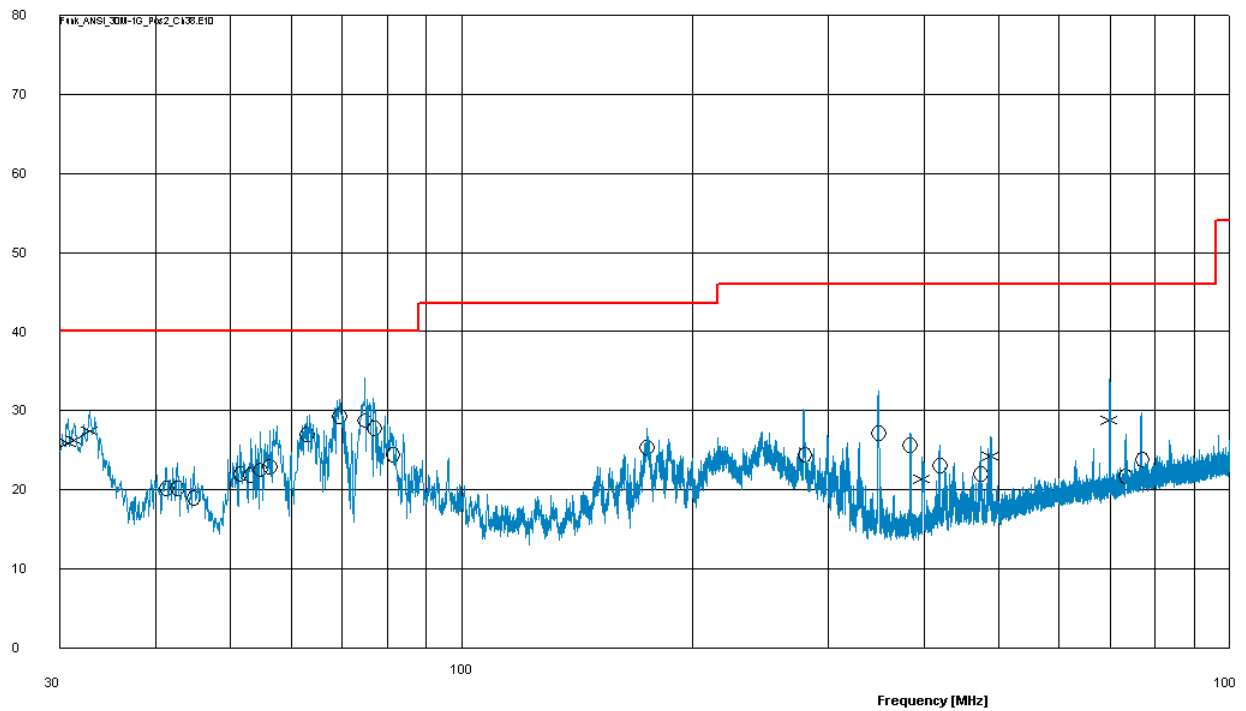
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140275-AU01+W05

Page 70 of 93

Interference-Radiation-Test

BpV/m]



M	Freq [M...	VMaxC...	Corr...	Limit	dLimit	Pol	Ant	TT	Date	Remarks	VScal...	Corr ...
✓	30.72	25.9	12.2	40,0	- 14,1	V	100	37	2014-09-24 19:58...		29,1	0,0
✓	31.32	26,3	12,1	40,0	- 13,7	V	100	45	2014-09-24 19:59...		28,4	0,0
✓	32.76	27,4	12,1	40,0	- 12,6	V	100	17	2014-09-24 20:00...		29,9	0,0
✓	41.28	20,2	13,0	40,0	- 19,8	H	100	124	2014-09-24 20:04...		22,8	0,0
✓	42.66	20,2	12,8	40,0	- 19,8	H	100	127	2014-09-24 20:05...		23,4	0,0
✓	44.82	19,0	12,7	40,0	- 21,0	H	100	127	2014-09-24 20:06...		23,0	0,0
✓	51.54	22,0	12,6	40,0	- 18,0	H	100	127	2014-09-24 20:07...		25,7	0,0
✓	53.22	21,9	12,6	40,0	- 18,1	H	100	111	2014-09-24 20:08...		26,5	0,0
✓	54.78	22,6	12,6	40,0	- 17,4	H	100	127	2014-09-24 20:09...		27,4	0,0
✓	56.34	23,0	12,5	40,0	- 17,0	H	100	111	2014-09-24 20:10...		27,5	0,0
✓	63	27,1	11,7	40,0	- 12,9	H	100	112	2014-09-24 20:11...		29,3	0,0
✓	69.42	29,3	10,4	40,0	- 10,7	H	100	108	2014-09-24 20:12...		31,5	0,0
✓	74.82	28,8	9,5	40,0	- 11,2	H	100	124	2014-09-24 20:13...		34,1	0,0
✓	77.1	27,8	9,1	40,0	- 12,2	H	100	114	2014-09-24 20:14...		30,6	0,0
✓	81.42	24,5	8,8	40,0	- 15,5	H	100	127	2014-09-24 20:15...		27,0	0,0
✓	174.3	25,4	12,7	43,5	- 18,2	H	100	99	2014-09-24 20:15...		27,8	0,0
✓	279.9	24,4	12,3	46,0	- 21,6	H	100	57	2014-09-24 20:16...		30,0	0,0
✓	349.14	27,1	13,7	46,0	- 18,9	H	100	276	2014-09-24 20:17...		32,4	0,0
✓	383.4	25,7	14,4	46,0	- 20,3	H	100	261	2014-09-24 20:18...		27,2	0,0
✓	398.34	21,3	14,6	46,0	- 24,7	V	100	178	2014-09-24 20:01...		24,1	0,0
✓	419.82	23,1	15,1	46,0	- 22,9	H	100	32	2014-09-24 20:19...		25,7	0,0
✓	474.78	22,0	16,2	46,0	- 24,0	H	100	139	2014-09-24 20:20...		25,5	0,0
✓	487.92	24,2	16,3	46,0	- 21,8	V	100	352	2014-09-24 20:02...		26,8	0,0
✓	697.02	28,8	19,6	46,0	- 17,2	V	100	57	2014-09-24 20:03...		34,0	0,0
✓	731.88	21,8	20,1	46,0	- 24,2	H	100	44	2014-09-24 20:21...		26,3	0,0
✓	769.74	23,8	20,7	46,0	- 22,2	H	100	8	2014-09-24 20:22...		29,7	0,0

Picture 61: Radiated emission 30 MHz – 1000MHz (Channel 38)



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GW-1000

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Page 71 of 93

12 Radiated emission measurement (>1 GHz)

according to CFR 47 Part 15, sections 15.205(a), 15.209(a), 15.247(d)

12.1 Test location

- ☒ Scan with peak detector in 3 m anechoic chamber
- ☒ Final measurement with average and max peak detector.

Description	Manufacturer	Inventory No.
Anechoic chamber	EMV TESTHAUS GmbH	E00100

12.2 Test instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESU26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	AMF-5D-00501800-28-13P	Miteq	W00089
<input checked="" type="checkbox"/>	AMF-6F-16002650-25-10P	Miteq	W00090
<input checked="" type="checkbox"/>	BBHA 9120D	Schwarzbeck	W00053
<input checked="" type="checkbox"/>	BBHA 9170	Schwarzbeck	W00055
<input checked="" type="checkbox"/>	COSB 4-1-26	Conformitas	W00091

12.3 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.



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Page 72 of 93

Frequency [MHz]	Field strength Fs [μV/m]	Field strength [dBμV/m]	Measurement distance d [m]
30 – 88	100	40	3
88 – 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

12.4 Test procedure

6. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The receiving antenna was placed 3 meters from the turntable. The test setup was placed inside a fully anechoic chamber.
7. Power on the EUT and all peripherals.
8. The broadband antenna was set to vertical polarization.
9. The EMI receiver performed a scan from 1000 MHz to 10th harmonic of the fundamental frequency with the detector set to peak and the measurement bandwidth set to 1 MHz (VBW ≥ 3 MHz). The trace data was recorded with the receiver Max Hold function.
10. The turn table was rotated in intervals of 15°.
11. After a full 360°-turn the antenna polarization was changed to horizontal and the test was repeated at step 4 and 5.
12. After the scan suspicious frequencies were selected and the RBW was set to 1 MHz and the VBW was set to 10Hz and the detector was changed to average reading.
13. The receiving antenna was set to vertical polarization.
14. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
15. The receiving antenna was then set to horizontal polarization and the measurement was repeated at step 9.
16. The highest recorded level was noted.



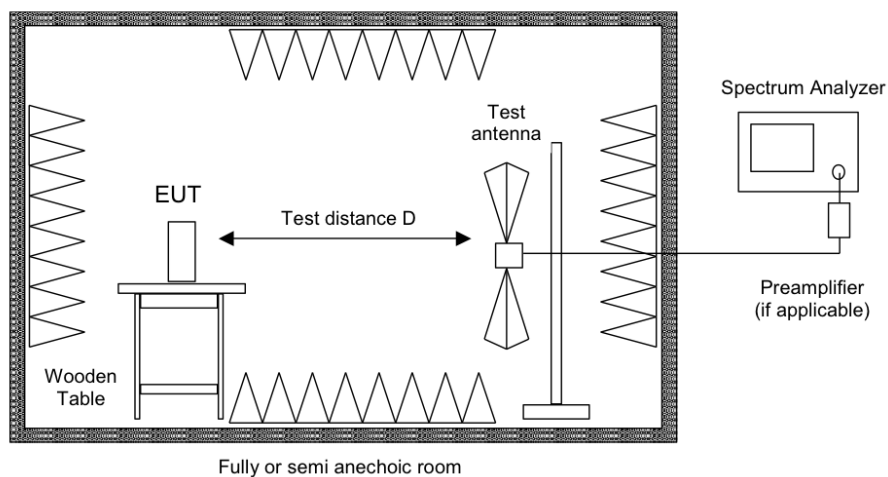
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Page 73 of 93

12.5 Test setup



Picture 62: Test setup for radiated emission measurement (> 1 GHz)

12.6 Test deviation

There is no deviation with the original standard.

12.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode. For these measurements it was investigated that EUT-position2 in conjunction with antenna polarised to horizontal is the respective worst-case.

12.8 Test results channel 1

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-09-23

Channel 1					
f [GHz]	Reading [dB μ V/m]	Detector	Limit [dB μ V/m]	Restricted Band	Result
1.4375	43.78	PK	74 (PK)	YES	Pass
1.4375			54 (AV)		Pass
1.6874	49.04	PK	74 (PK)	YES	Pass
1.6874			54 (AV)		Pass
2.4042	91.44	PK	- - -	NO	Carrier
2.4040	91.09	AV	- - -		Carrier
4.8084	47.69	PK	74 (PK)	YES	Pass
4.8084			54 (AV)		Pass

Picture 63: Radiated emission 1GHz – 16GHz¹⁾

¹⁾: above 16GHz no significant emissions were detected

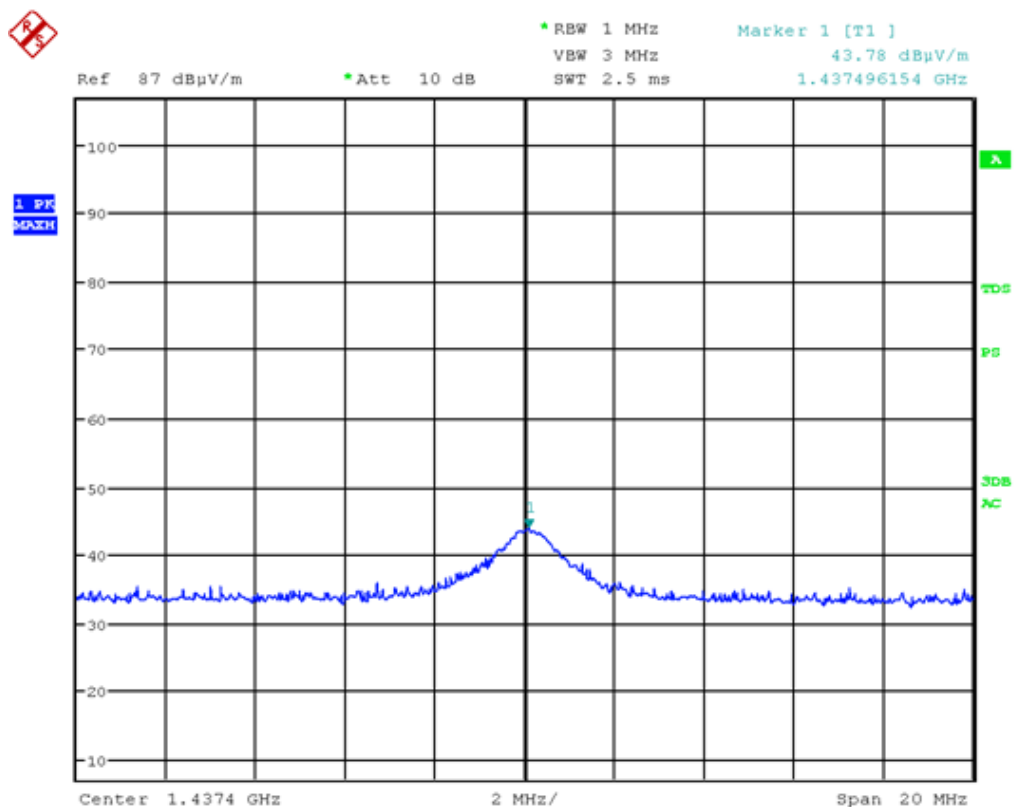


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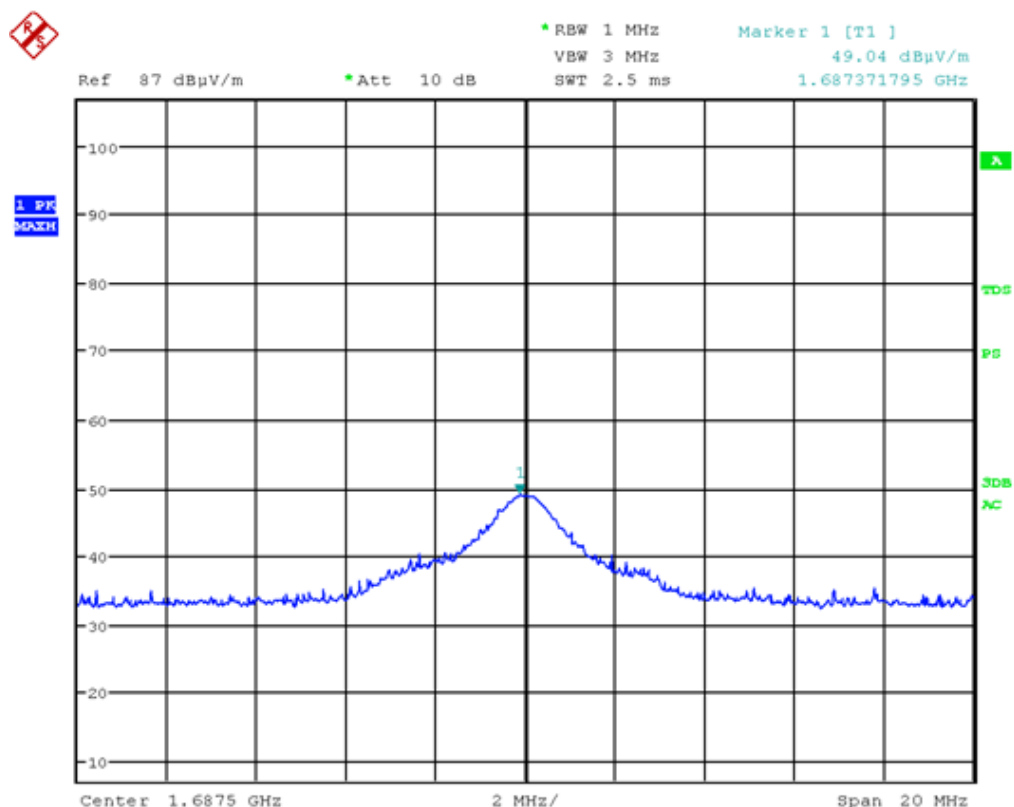
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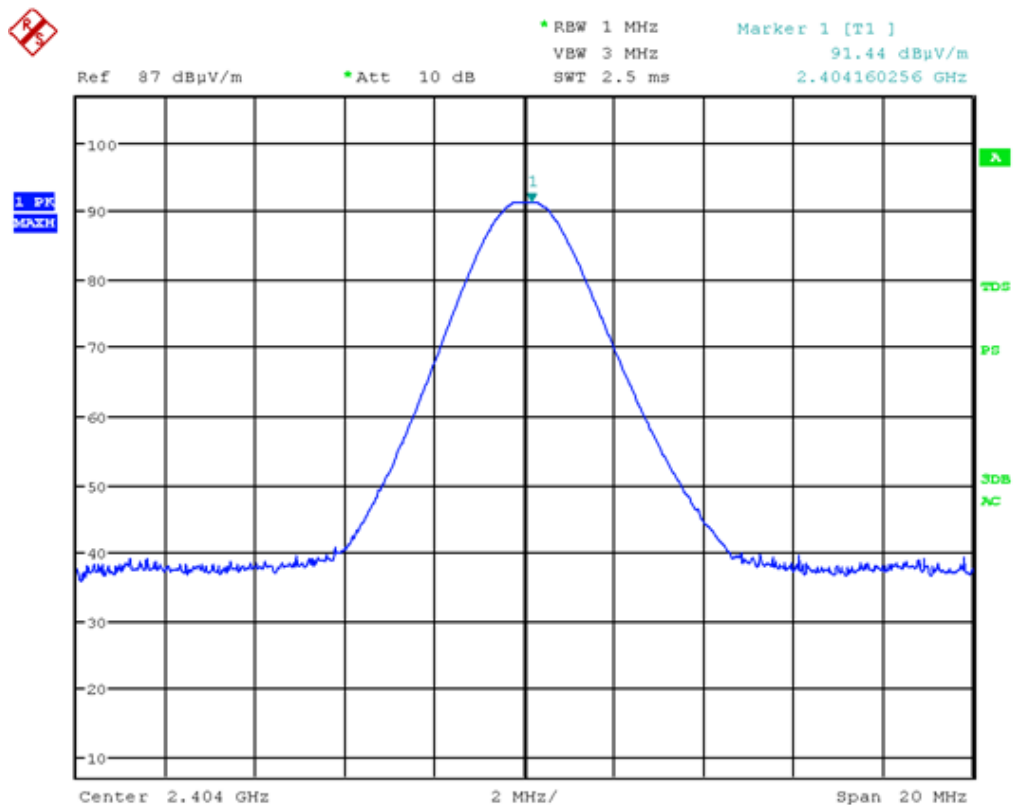
Page 75 of 93



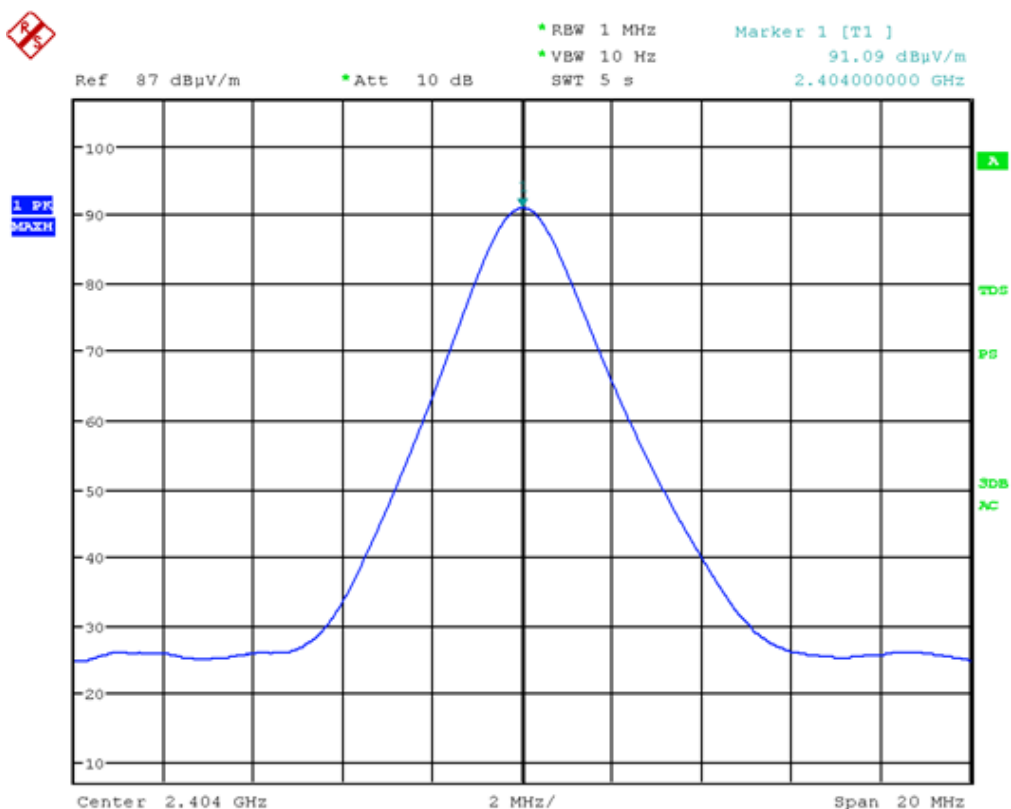
Picture 64: spurious emission channel 1 - PK (1GHz - 26GHz)



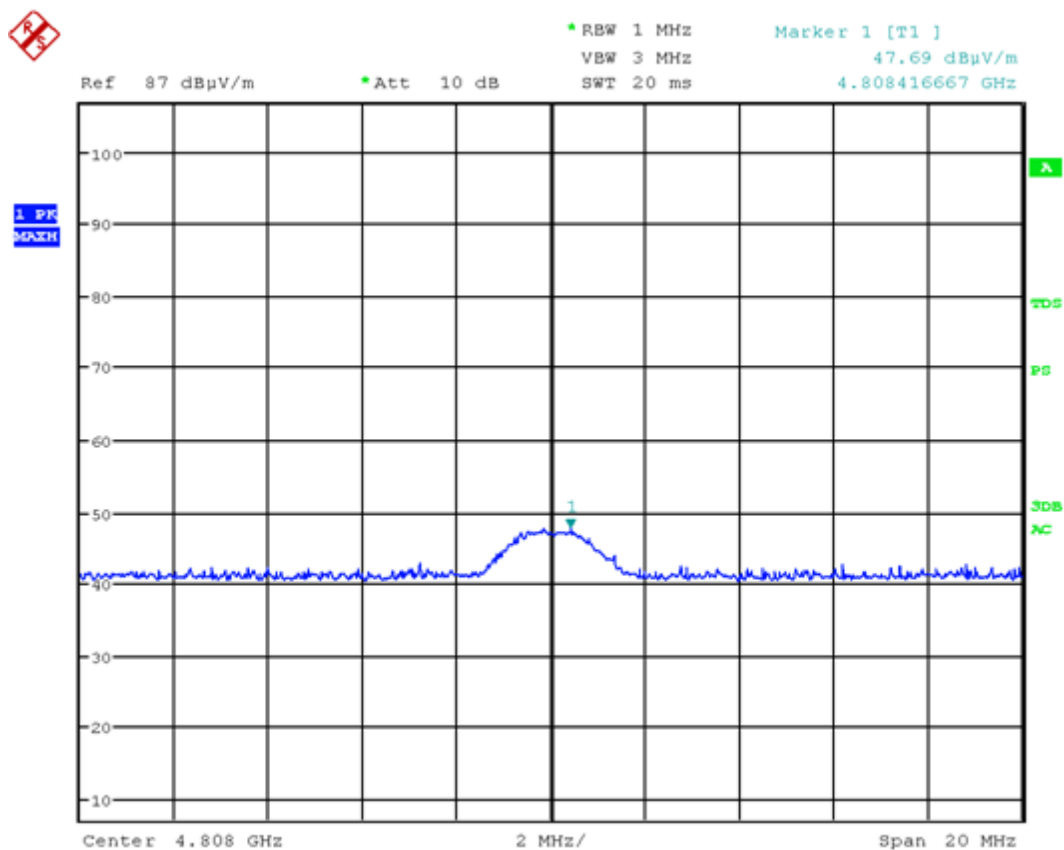
Picture 65: spurious emission channel 1 - PK (1GHz - 26GHz)



Picture 66: spurious emission channel 1 - PK (1GHz - 26GHz)



Picture 67: spurious emission channel 1 - AV (1GHz - 26GHz)



Picture 68: spurious emission channel 1 - PK (1GHz - 26GHz)

12.9 Test results channel 19

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-09-23

Channel 19					
f [GHz]	Reading [dB μ V/m]	Detector	Limit [dB μ V/m]	Restricted Band	Result
1.4374	50.12	PK	74 (PK)	YES	Pass
1.4374			54 (AV)		Pass
1.6876	53.32	PK	74 (PK)	YES	Pass
1.6875	47.51	AV	54 (AV)		Pass
2.4402	90.58	PK	- - -	NO	Carrier
2.4400	90.15	AV	- - -		Carrier
4.8801	47.36	PK	74 (PK)	YES	Pass
4.8801			54 (AV)		Pass

Picture 69: Radiated emission 1GHz – 16GHz¹⁾

¹⁾: above 16GHz no significant emissions were detected

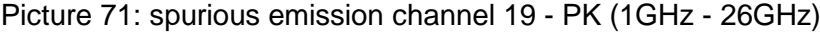
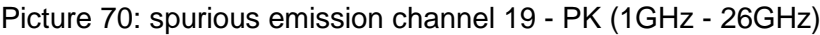


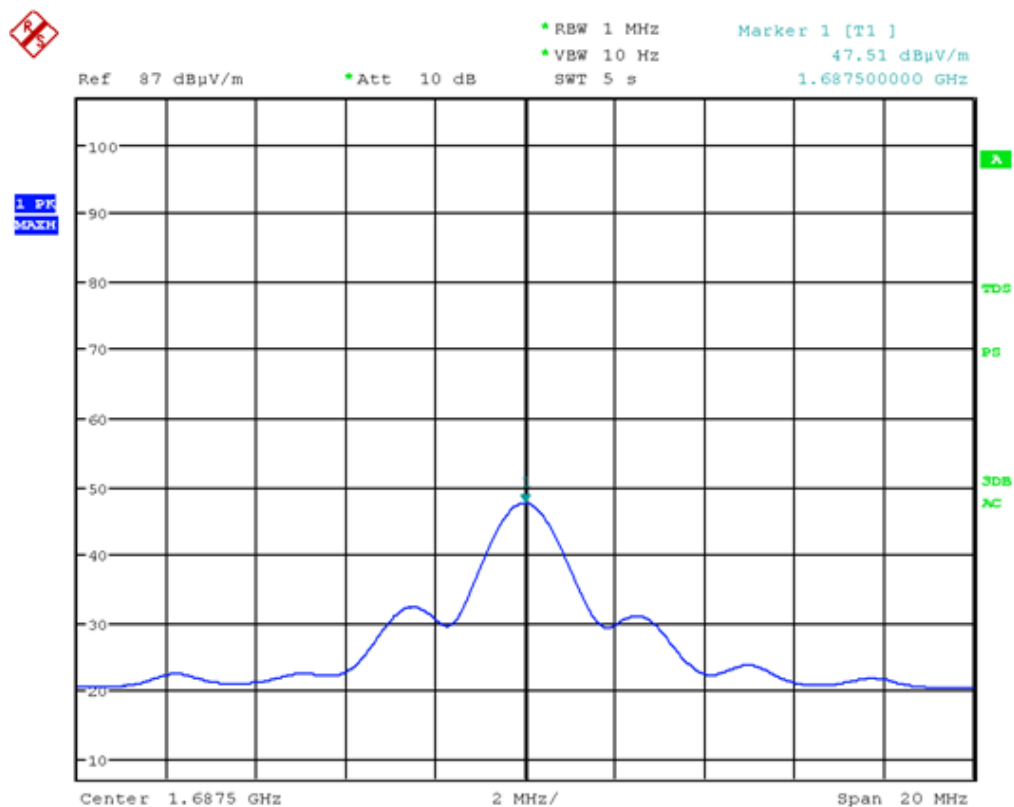
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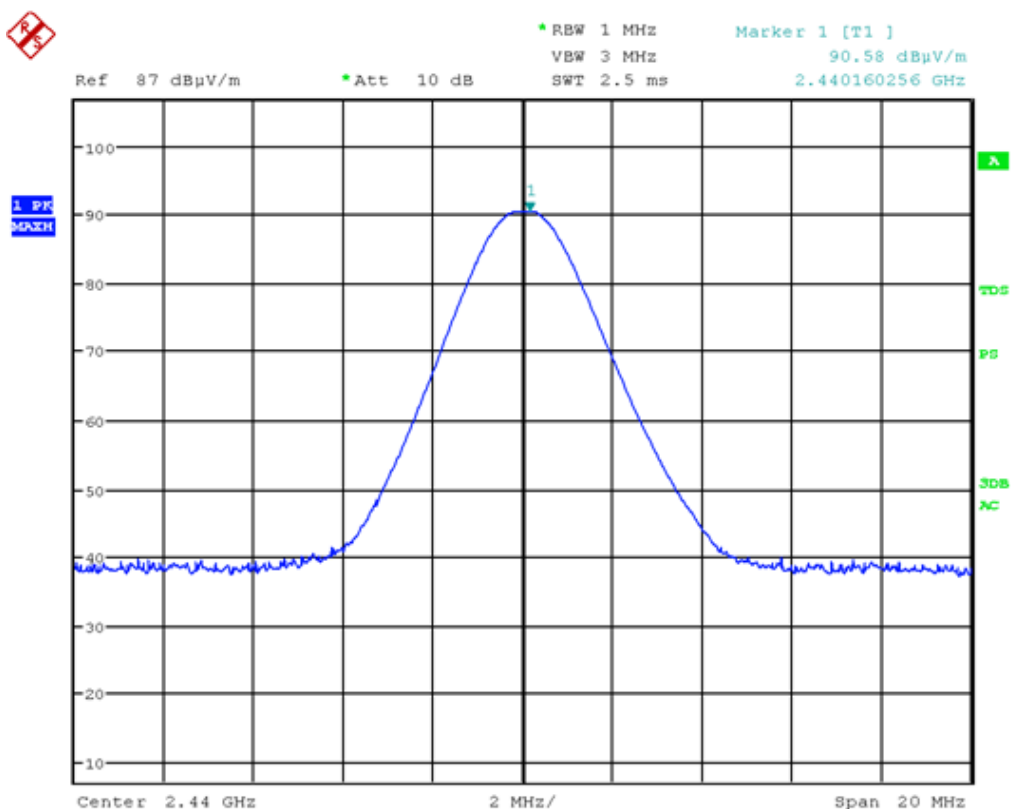
140275-AU01+W05

Page 79 of 93

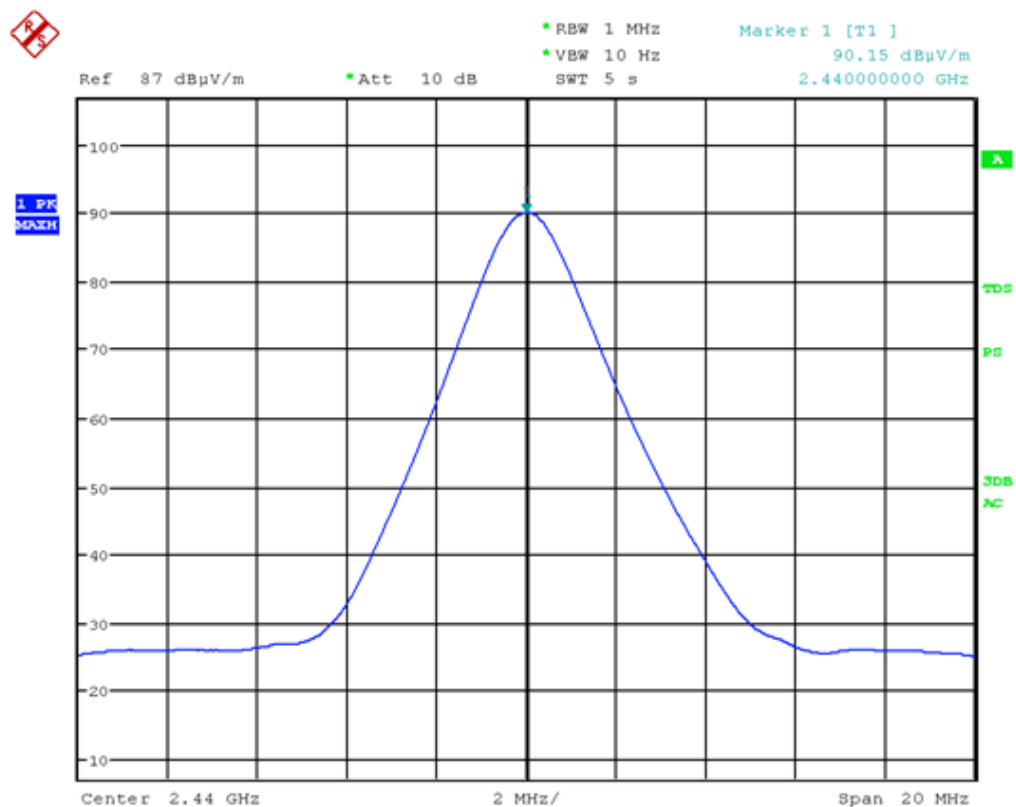




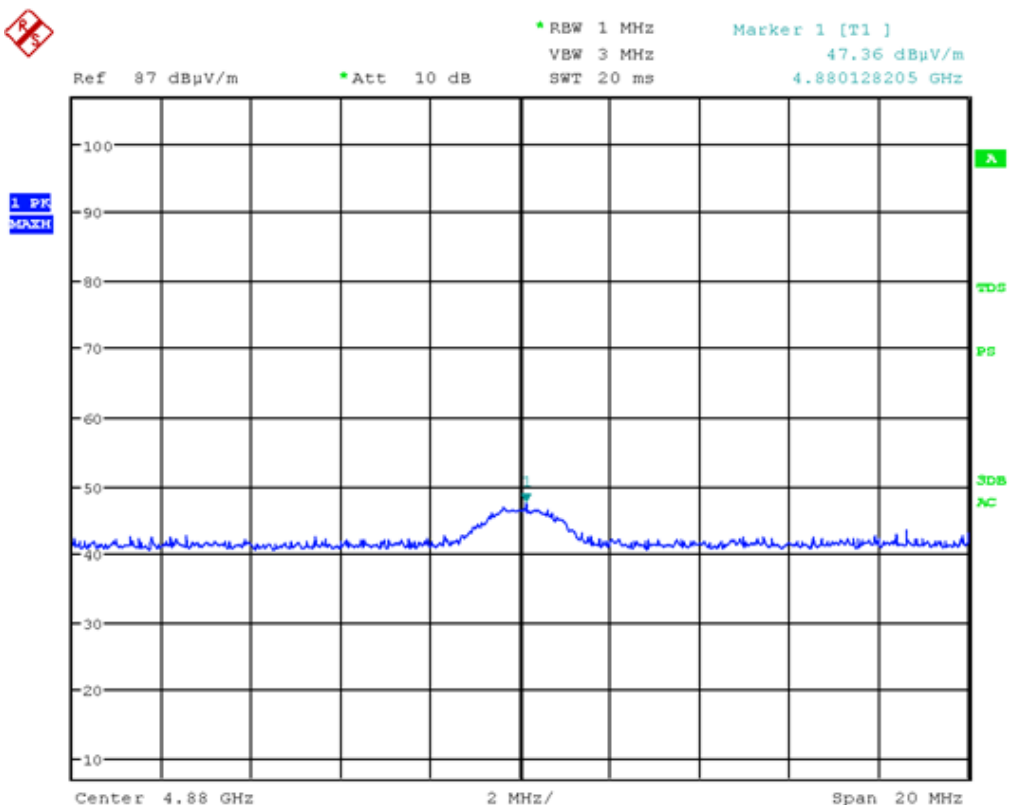
Picture 72: spurious emission channel 19 - AV (1GHz - 26GHz)



Picture 73: spurious emission channel 19 - PK (1GHz - 26GHz)



Picture 74: spurious emission channel 19 - AV (1GHz - 26GHz)



Picture 75: spurious emission channel 19 - PK (1GHz - 26GHz)

12.10 Test results channel 38

Temperature:	22°C	Humidity:	44%
Tested by:	M. Müller	Test date:	2014-09-23

Channel 38					
f [GHz]	Reading [dB μ V/m]	Detector	Limit [dB μ V/m]	Restricted Band	Result
1.4374	49.99	PK	74 (PK)	YES	Pass
1.4374			54 (AV)		Pass
1.6874	53.29	PK	74 (PK)	YES	Pass
1.6875	47.47	AV	54 (AV)		Pass
2.4782	91.64	PK	- - -	NO	Carrier
2.4780	91.05	AV	- - -		Carrier
4.9557	48.08	PK	74 (PK)	YES	Pass
4.9557			54 (AV)		Pass

Picture 76: Radiated emission 1GHz – 16GHz¹⁾

¹⁾: above 16GHz no significant emissions were detected

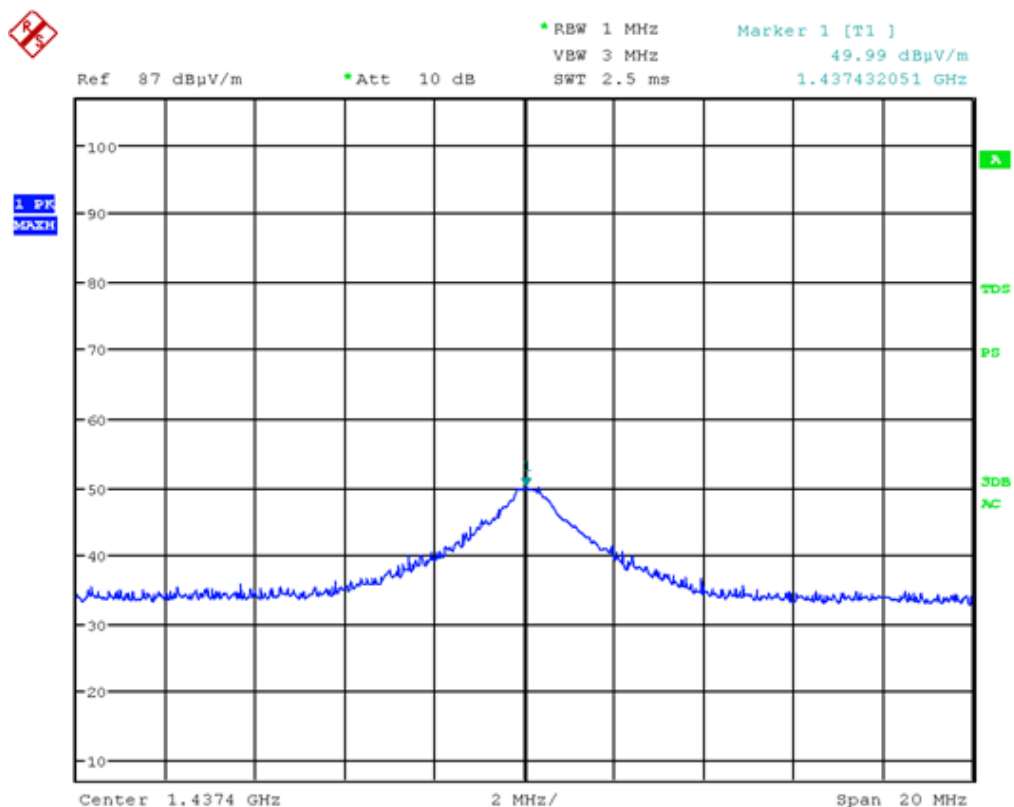


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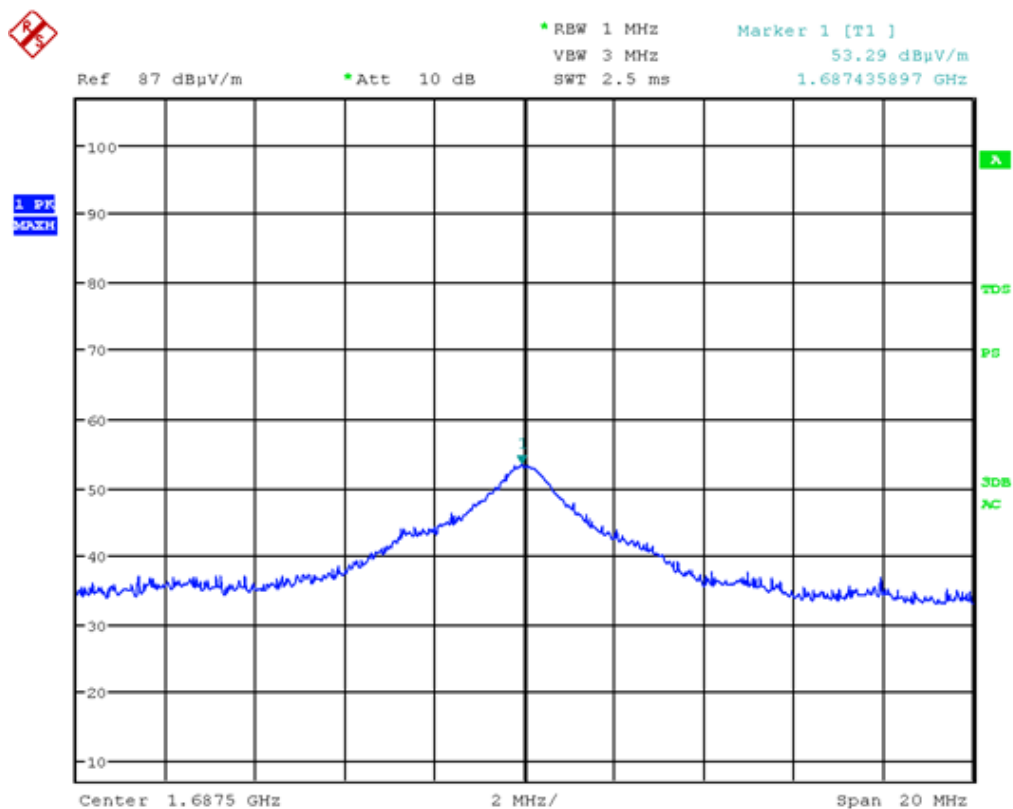
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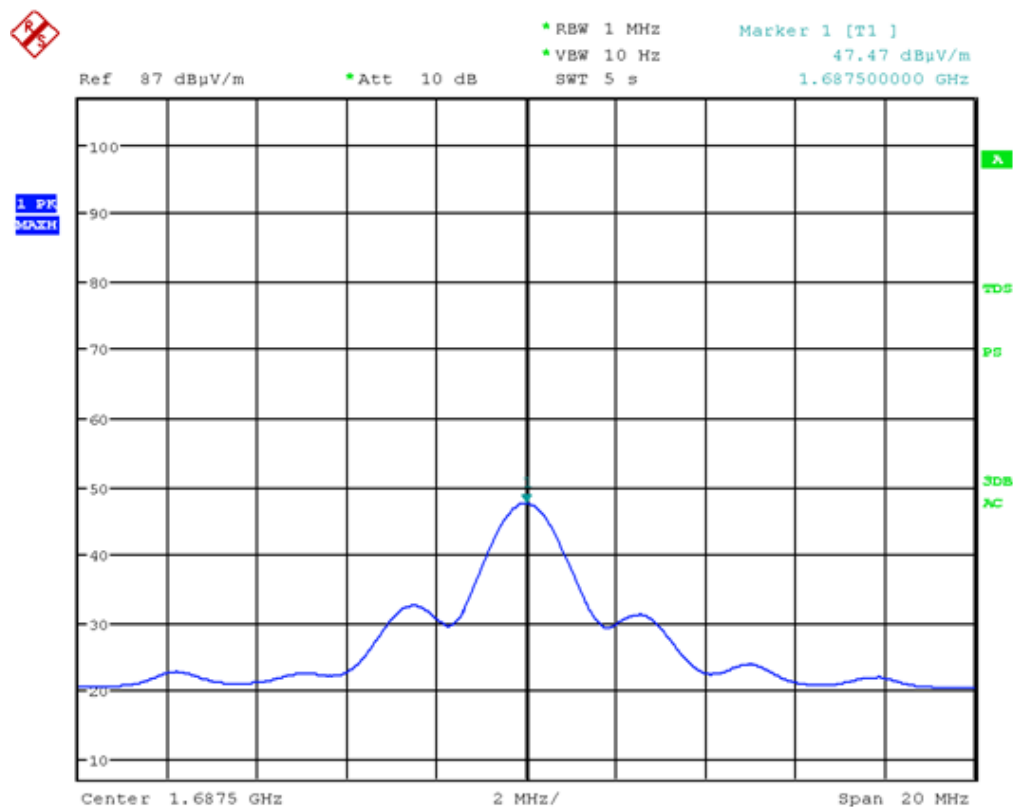
Page 83 of 93



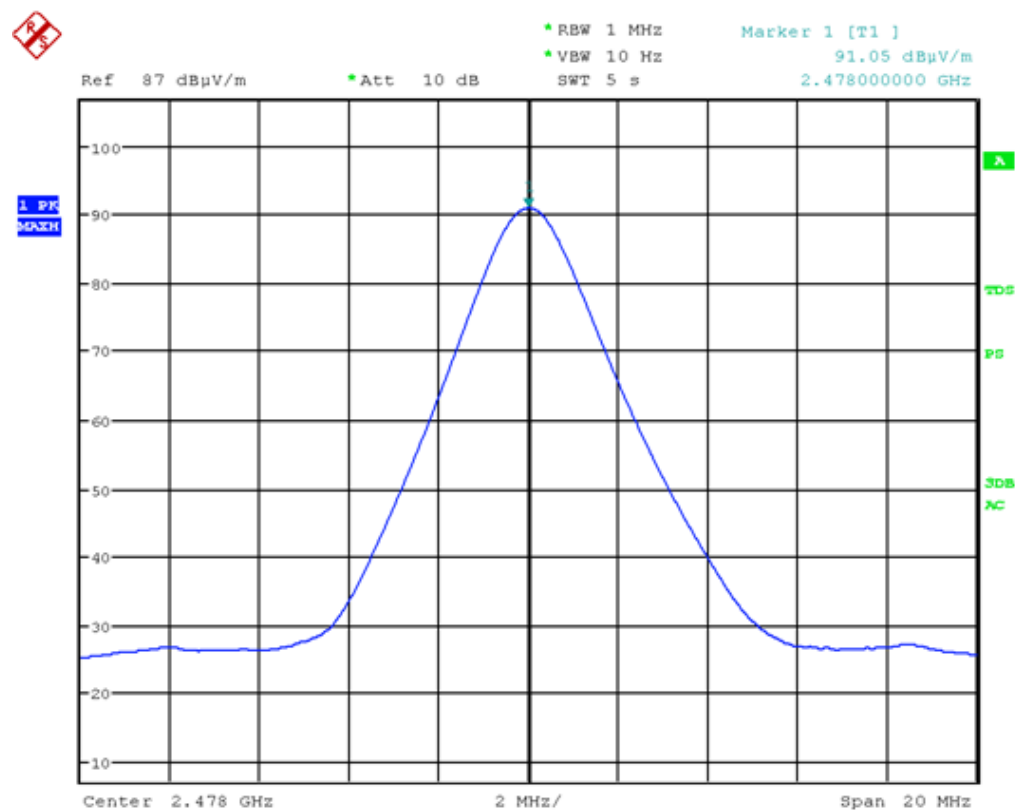
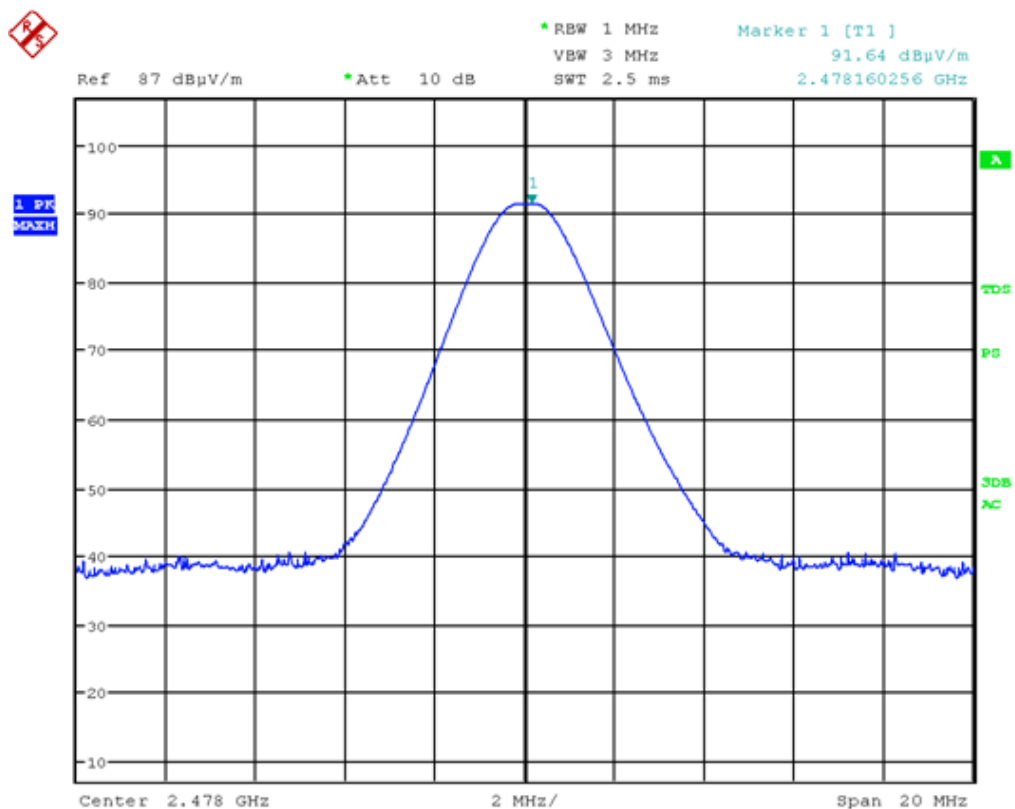
Picture 77: spurious emission channel 38 - PK (1GHz - 26GHz)

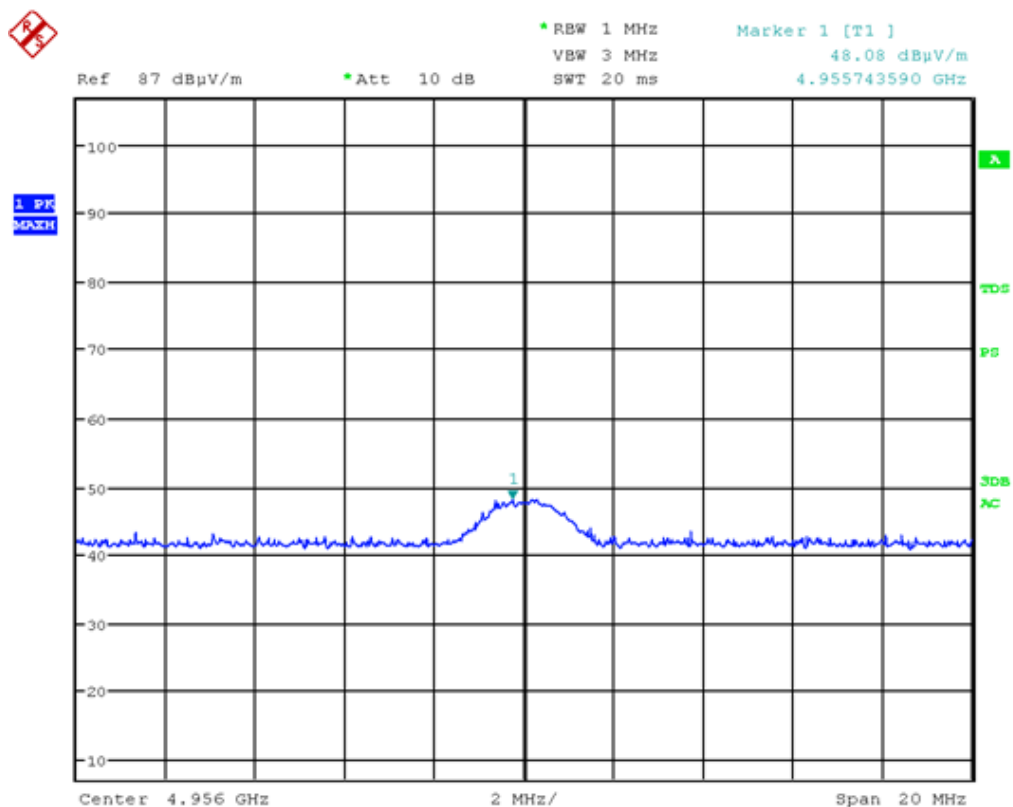


Picture 78: spurious emission channel 38 - PK (1GHz - 26GHz)



Picture 79: spurious emission channel 38 - AV (1GHz - 26GHz)





Picture 82: spurious emission channel 38 - PK (1GHz - 26GHz)

13 Exposure of humans to RF fields

according to CFR 47 Part 2, section 2.1091, OET Bulletin 65,
RSS-Gen Issue 4, section 3.2, and RSS-102 Issue 4, section 2.5.2

Radiofrequency radiation exposure evaluation for mobile devices

External detachable antenna (see antenna specification)

Gi: 1.7dBi = numeric gain 1.479

Output power conducted: -3.86dBm = 0.411mW

$\pi = 3,1416$

R=20cm

$$S = \frac{G \cdot CP}{4 * \pi * R^2}$$

G: numerical antenna gain
CP: conducted output power
[W]

$$S = \frac{1.479 \cdot 0.411 \text{ mW}}{4 * \pi * 400 \text{ cm}^2} = 0,000121 \text{ mW} / \text{cm}^2$$

Limit:
1mW/cm²



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Page 88 of 93

14 Equipment calibration status

Description	Modell number	Serial number	Inventory number(s)	Last calibration	Next calibration
Test receiver	ESU 26	100026	W00002	2014-02	2016-02
Test receiver	ESCI 3	100013	E00001	2013-12	2015-12
Test receiver	ESCI 3	100328	E00552	2014-07	2016-07
Test receiver	ESCS 30	825442/0002	E00003	2014-02	2015-02
Test receiver	ESCS 30	845552/0008	E00551	2014-01	2015-01
LISN	ESH2-Z5	881362/037	E00004	2013-03	2015-03
LISN	ESH2-Z5	893406/009	E00005	2014-01	2016-01
Loop antenna	HFH2-Z2	871398/0050	E00004	2014-07	2016-07
Broadband antenna	VULB 9163	9163-114	E00013	2013-09	2015-09
Broadband horn antenna	BBHA 9120D	9120D-593	W00053	2014-03	2016-03
Broadband horn antenna	BBHA 9170	9170-331	W00055	2014-03	2016-03
Shielded room	P92007	B83117C1109T211	E00107	N/A	
Compact Diagnostic Chamber (CDC)	VK041.0174	D62128-A502-A69-2-0006	E00026	N/A	
Open area test site (OATS)	---	---	E00354	2014-10	2015-10
Climatic chamber 340 I	VC ³ 4034	58566123250010	C00015	2014-09	2016-09
Cable set shielded room	Cable no. 30	---	E00424	2014-07	2015-07
Cable set CDC	Cables no. 37 and 38	---	E00459 E00460	2014-05	2015-05
Cable set OATS 3 m	Cables no. 19, 34 and 36	---	E00453 E00456 E00458	2014-10	2015-10
Cable set OATS 10 m	Cables no. 19, 33 and 36	---	E00453 E00455 E00458	2014-10	2015-10
Cable set anechoic chamber 01	Cables no. 01, 09, 11 and 13	---	W00095 E00307 E00319 E00436	2014-04	2015-04



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Page 89 of 93

Description	Modell number	Serial number	Inventory number(s)	Last calibration	Next calibration
Cable set anechoic chamber 02	Cables no. 01, 09, 12 and 14	---	W00095 E00307 E00320 E00437	2014-04	2015-04

Table 1: Equipment calibration status

Note: Expiration date of measurement facility registration (OATS) by

- FCC (registration number 221458): 2017-04
- Industry Canada (test site number 3472A-1): 2015-10



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Page 90 of 93

15 Measurement uncertainty

Description	Max. deviation	k=
Conducted emission AMN (9kHz to 30 MHz)	$\pm 4,0$ dB	2
Radiated emission open field (30 MHz to 1 GHz)	$\pm 4,5$ dB	2
Radiated emission absorber chamber (> 1000 MHz)	$\pm 5,4$ dB	2

Table 2: Measurement uncertainty

Comment: The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k. If k=2 the value of the measurements lies within the assigned range of values with a probability of 95 %.



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Page 91 of 93

16 Summary

The EMC Regulations according to the marked specifications are


☒ **KEPT**

The EUT does fulfill the general approval requirements mentioned.

☐ **NOT KEPT**

The EUT does not fulfill the general approval requirements mentioned.


Place, Date: Straubing, December 3rd, 2014



Martin Müller

Test engineer

EMV **TESTHAUS** GmbH



Rainer Heller

Head of EMC / radio department

EMV **TESTHAUS** GmbH



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Page 92 of 93

17 Revision History

Date	Description	Person	Revision
2014-12-03	First edition	M. Müller	----



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Page 93 of 93