Test Report

Customer:

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RF test report

130594-AU01+W01

Moticon GmbH

EMV TESTHAUS

The test result refers exclusively
to the model tested.

This report must not be copied without
the written authorization by the lab.
Revision: 1.1

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-12155-01-01

EMV **TESTHAUS** GmbH

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Accreditation:

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-12155-01-01

FCC facility registration number: 221458
Test Firm Type “2.948 listed”: Valid until 27.06.2014
Test Firm Type “accredited”: Valid until 11.06.2015
MRA US-EU, FCC designation number: DE0010
BnetzA-CAB-02/21-02/04 Valid until 27.11.2018

Test Laboratory:

EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany

The technical accuracy is guaranteed through the quality management of the
EMV **TESTHAUS** GmbH

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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)
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 3, December 2010	General Requirements and Information for the Certification of Radiocommunication Equimpment, published by Industry Canada
RSS-102 Issue 4, March 2010, updated December 2010	Radio Frequency Exposure Compliance of Radiocommunications Apperatus
RSS-210 Issue 8, December 2010	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada

1.1 Cross reference of FCC and Industry Canada standards

CFR 47 Part and Section	**Test**	**Equivalent to IC**
2.249(a)	Radiated emission 30 MHz to 10th Harmonics	RSS Gen Issue 3 Section 4.9

1.2 Summary of test results

Standard	Test result
FCC CFR 47 Part 15	Passed
RSS Gen Issue 3 Section 4.9	Passed

2 Equipment under Test (EUT)

Product type:	Insole
Model Name:	OpenGo sensor insole
Manufacturer:	Moticon GmbH
Serial number:	Left: 265, Right 268
FCC ID:	2AB3O-INSOLE1
IC	---
Application freq. band:	2400 MHz – 2483.5 MHz
Frequency range:	2400MHz – 2483.5 MHz
Operating frequency:	2403MHz – 2480 MHz
Channel spacing:	N/A
Number of RF-channels:	77
Type of modulation:	GFSK
Antenna type:	PCB antenna
Power supply:	Battery PD2032 3,7V DC
Temperature range:	20°C to +40°C

2.1 List of antennas

For detailed specification see annex C.

Manufacturer	Model	Gain	Antenna type
Moticon	---	---	PCB antenna

2.2 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.

2.3 Short description of the EUT

The OpenGo sensor insole can sample different sensors (13 pressure sensors, acceleration sensor, temperature) and send the data continuously to a PC or mobile device, or record it on a flash memory and transmit it later via “Burst messages”
There are two types of EUT (left foot and right foot). The only difference is the pcb wire of the antenna. See internal pictures annex C.

During the pre-measurements it was observed that there is no difference in the results between left and right insole. Therefore only type one was measured and documented.

2.4 Operation mode

The EUT was tested in the following operation modes:

- Burst mode
- 100Hz, 50Hz, 20Hz, 10Hz message rate
- Find mode (6,5Hz) 3 channels active

  Remark: During the pre-measurements it was observed that burst mode is worst case. Therefore all tests were performed in this mode.

2.5 Configuration

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

Device	Model:	S/N
Insole	OpenGo sensor insole	265 /268
RF stick	Dynastream USB2 Wireless stick, FCC ID: 06RUSB2	---
Notebook	HP	---

Used cables

Numbers:	Description: (type / lengths / remarks)	Serial No
1	Power cord of notebook / 1.5m / unshielded	---

3 Radiated emission measurement

according to CFR 47 Part 15, section 15.249(a) and 15.209

3.1 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

3.2 Test instruments

	Description	Manufacturer	Inventory No.
☑	ESCS 30 (FF)	Rohde & Schwarz	E00003
☑	ESCI (CDC)	Rohde & Schwarz	E00001
☑	VULB 9163 (FF)	Schwarzbeck	E00013
☑	VULB 9160 (CDC)	Schwarzbeck	E00011
☐	HFH2-Z2	Rohde & Schwarz	E00060
☑	Feedline OATS	Huber & Suhner	200024

3.3 Limits

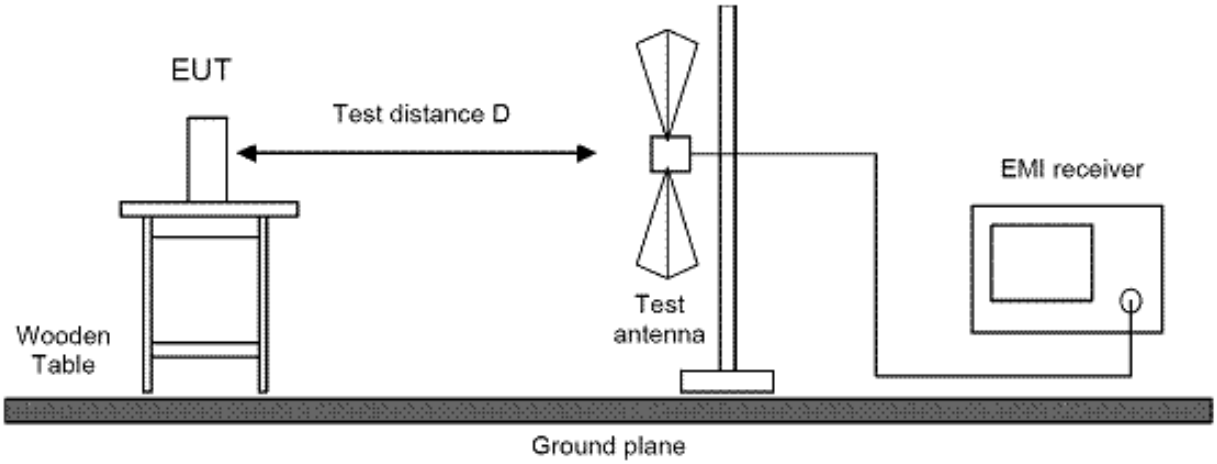
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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 fundamental [µV/m]	Field strength [dBµV/m]	Measurement distance d [m]	Detektro
30 - 88	100	40,0	3	QP
88 - 216	150	43,5	3	QP
216 – 960	200	46,0	3	QP
960 – 1000	500	54,0	3	QP
Abov 1000	500	54,0	3	AV

3.4 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 compact diagnostic chamber.
2. Power on the EUT and all peripherals.
3. The broadband antenna was set to vertical polarization.
4. The EMI receiver performed a scan from 30MHz to 1000MHz with the detector set to peak and the measurement bandwidth to 120 kHz.
5. The turn table was rotated to 6 different positions (360° / 6) and the antenna polarization was changed to horizontal.
6. Repeat the test procedure at step 4 and 5.
7. The test setup was then placed in an OATS at 3 m distance and all peak values over or with less distance to limit then 6dB were marked and re-measured with a quasi-peak detector.
8. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
9. The height of the broadband receiving antenna was 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 was recorded.
10. For emissions below 30MHz, measurements were done with a loop antenna. The recorded data were measured in QP mode oft he receiver. The antenna height was not changed during this test.

3.5 Test setup



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

3.6 Test deviation

There is no deviation with the original standard.

3.7 EUT operation during test

The EUT was programmed to be in continuously transmitting in burst mode.

3.8 Test results

Transmit mode

Temperature:	22°C	Humidity:	44%
Tested by:	Ch. Kiermeier	Test date:	2014-03-25

Radiated Emission Measurement 9 kHz – 30 MHz

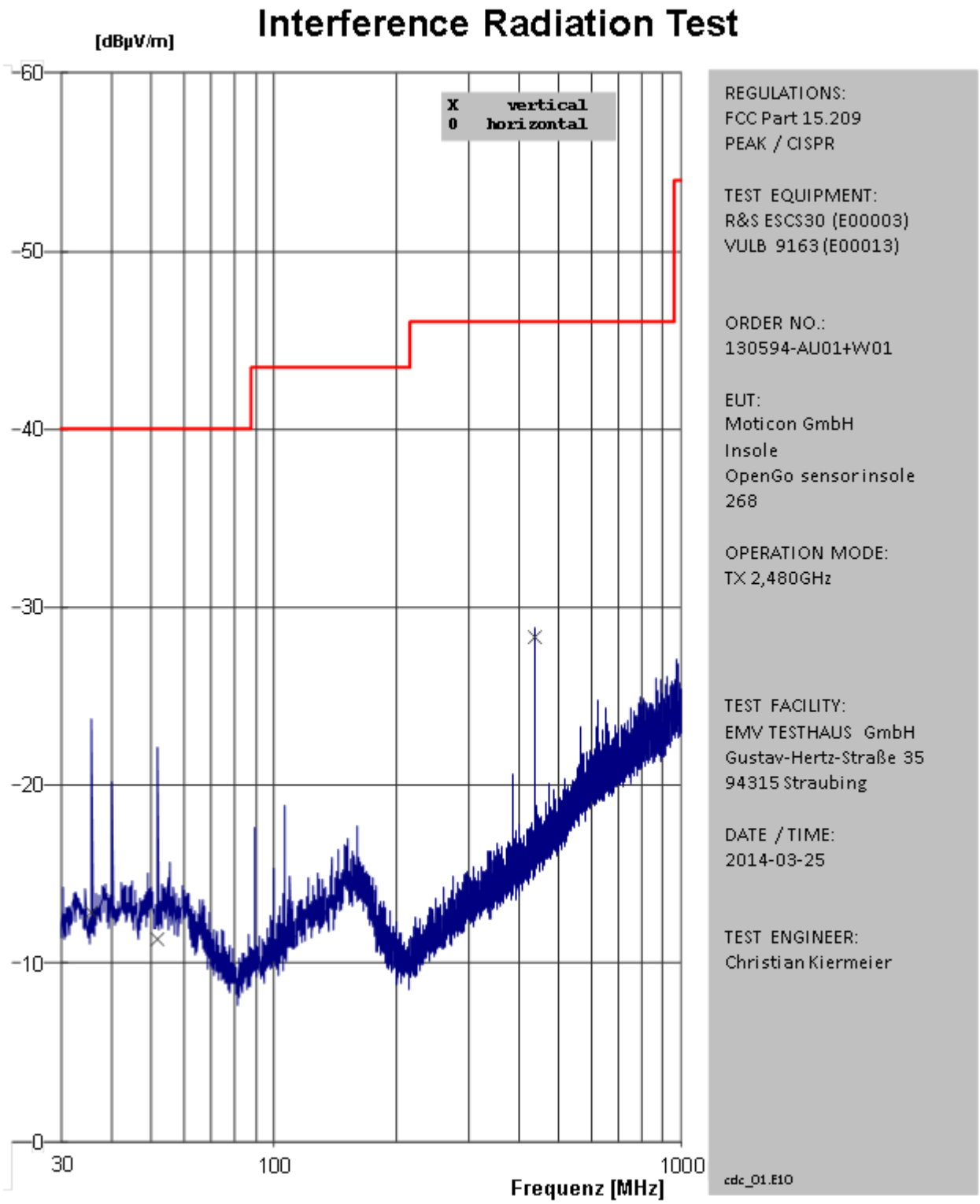
Amplitudes of spurious emissions that are attenuated more than 20 dB below the permissible limit are not reported.

Frequency (MHz)	Reading (dBµV/m)	Detector	Recalculation factor (dB/decade)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
			40				N/A

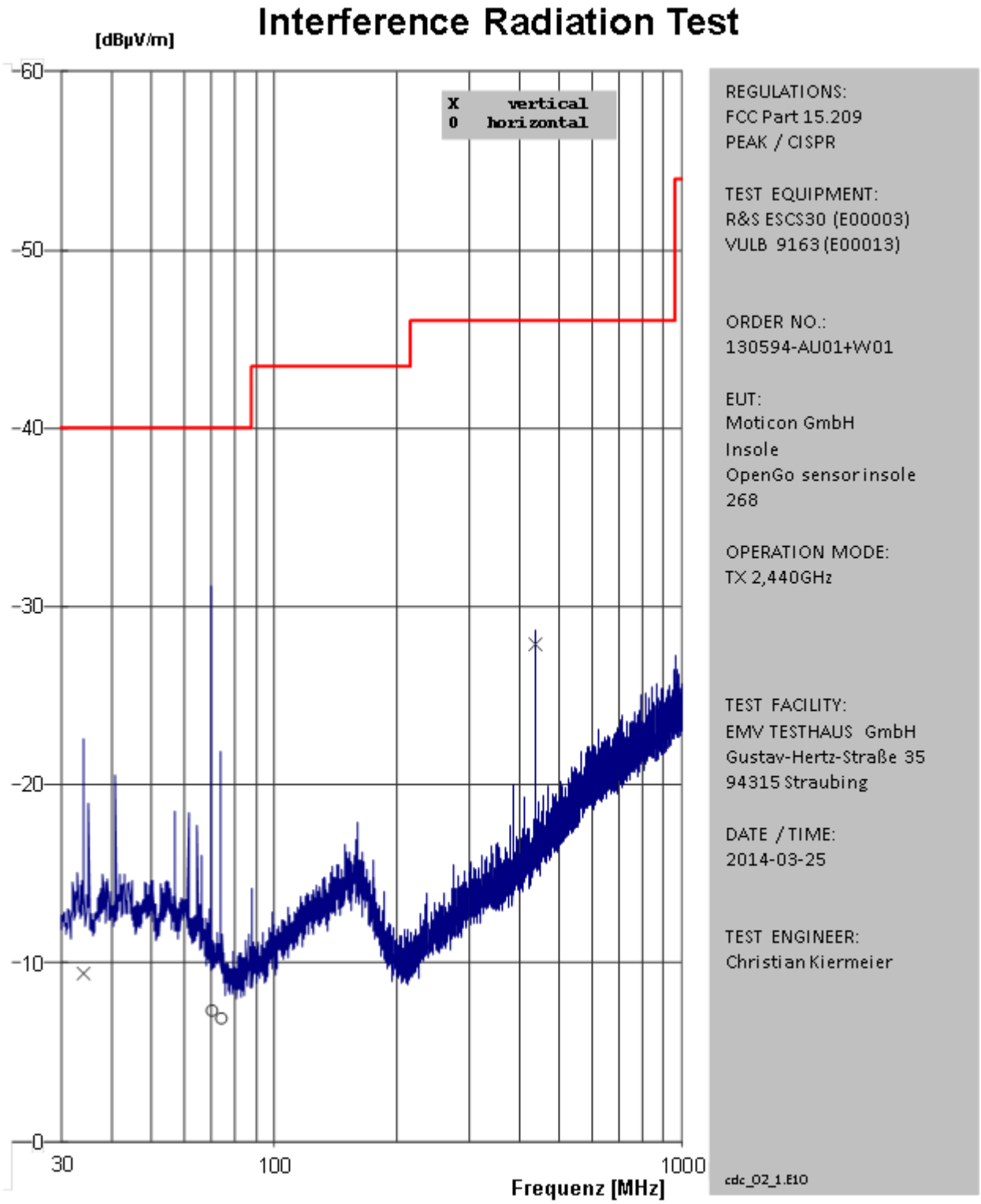
Radiated Emission Measurement 30 MHz – 1000 MHz

Amplitudes of spurious emissions that are attenuated more than 20 dB below the permissible limit are not reported.

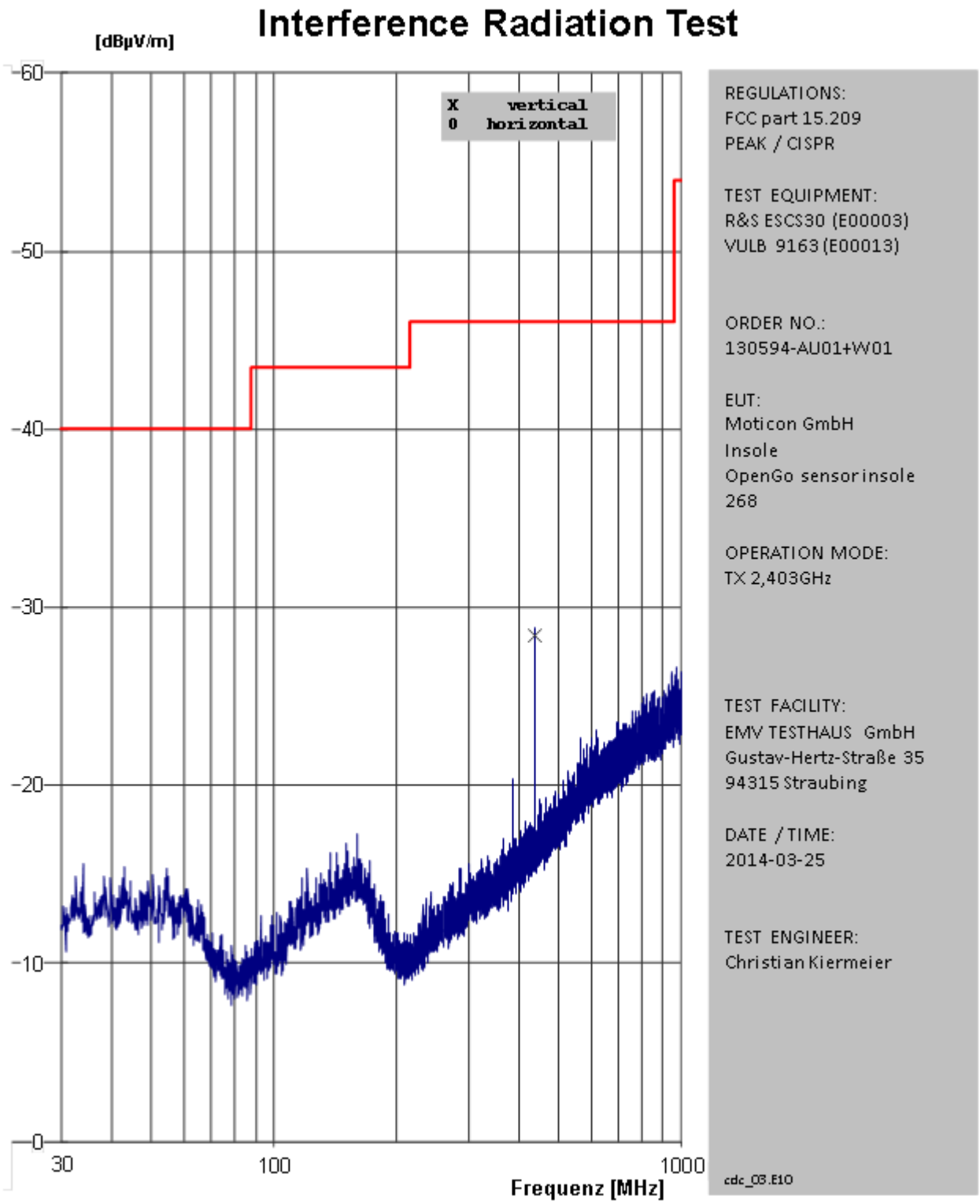
Frequency (MHz)	Reading (dBµV/m)	Detector	Recalculation factor (dB/decade)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
437,5	28,3	QP	--	**--**	46,0	17,6	PASS



Picture 2: Radiated emission 30 MHz – 1000MHz (2,480GHz) - Burst Mode



Picture 3: Radiated emission 30 MHz – 1000MHz (2,440GHz) - Burst Mode



Picture 4: Radiated emission 30 MHz – 1000MHz (2,403GHz) - Burst Mode

4 Radiated emission measurement (>1 GHz)

according to CFR 47 Part 15, section , 15.209(a), 15.249(a)

4.1 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

4.2 Test instruments

	Description	Manufacturer	Inventory No.
☑	ESU26	Rohde & Schwarz	W00002
☑	AMF-5D-00501800-28-13P	Parzich	W00089
☑	AMF-6F-16002650-25-10P	Parzich	W00090
☑	BBHA 9120 D	Schwarzbeck	W00052
☑	BBHA 9170	Schwarzbeck	W00054
☑	COSB 4-1-26	Conformitas	W00091

4.3 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.

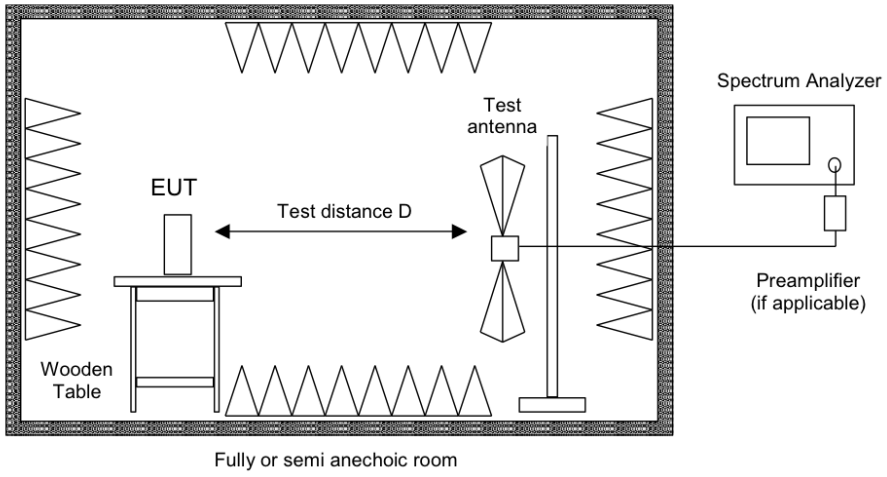
Frequency [MHz]	**Field strength Fs fundamental [mV/m]**	**Field strength [dBµV/m]**	**Measurement distance d [m]**	**Detector**
2400 – 2483.5	50	114	3	PK
2400 – 2483.5	50	94	3	AV
Frequency [MHz]	**Field strength Fs harmonics [µV/m]**	**Field strength [dBµV/m]**	**Measurement distance d [m]**	**Detector**
2400 – 2483.5	500	74	3	PK
2400 – 2483.5	500	54	3	AV

Frequency [MHz]	**Field strength Fs fundamental [µV/m]**	**Field strength [dBµV/m]**	**Measurement distance d [m]**	**Detector**
Above 1000	500	74,0	3	PK
Above 1000	500	54,0	3	AV

4.4 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. The broadband antenna was set to vertical polarization.
4. 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.
5. The turn table was rotated in intervals of 15°.
6. After a full 360°-turn the antenna polarization was changed to horizontal and the test was repeated at step 4 and 5.
7. 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.
8. The receiving antenna was set to vertical polarization.
9. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
10. The receiving antenna was then set to horizontal polarization and the measurement was repeated at step 9.
11. The highest recorded level was noted.

4.5 Test setup



Picture 5: Test setup for radiated emission measurement (> 1 GHz)

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 in burst mode.

4.8 Test results

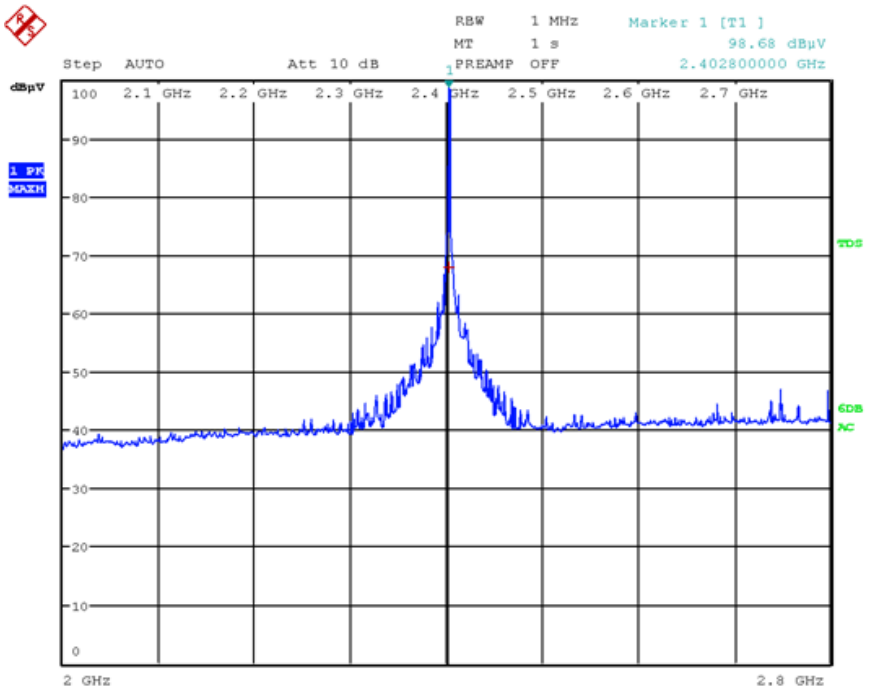
Temperature:	22°C	Humidity:	44%
Tested by:	Ch.Kiermeier	Test date:	2014-03-25

In receive mode there were no significant emissions detected!

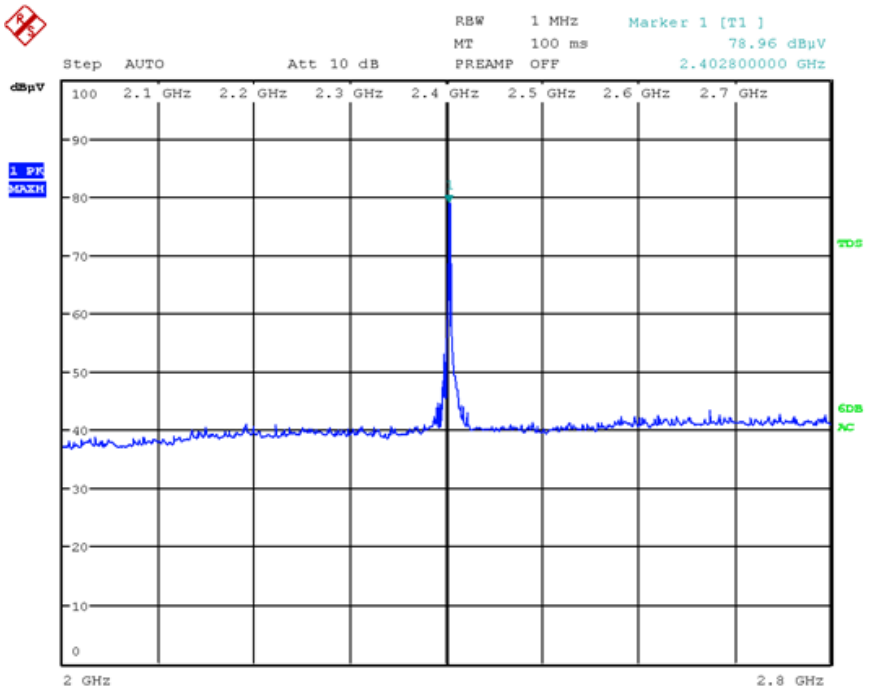
Radiated Emission Measurement 2400 MHz – 2483.5 MHz

Amplitudes of spurious emissions that are attenuated more than 20 dB below the permissible limit are not reported.

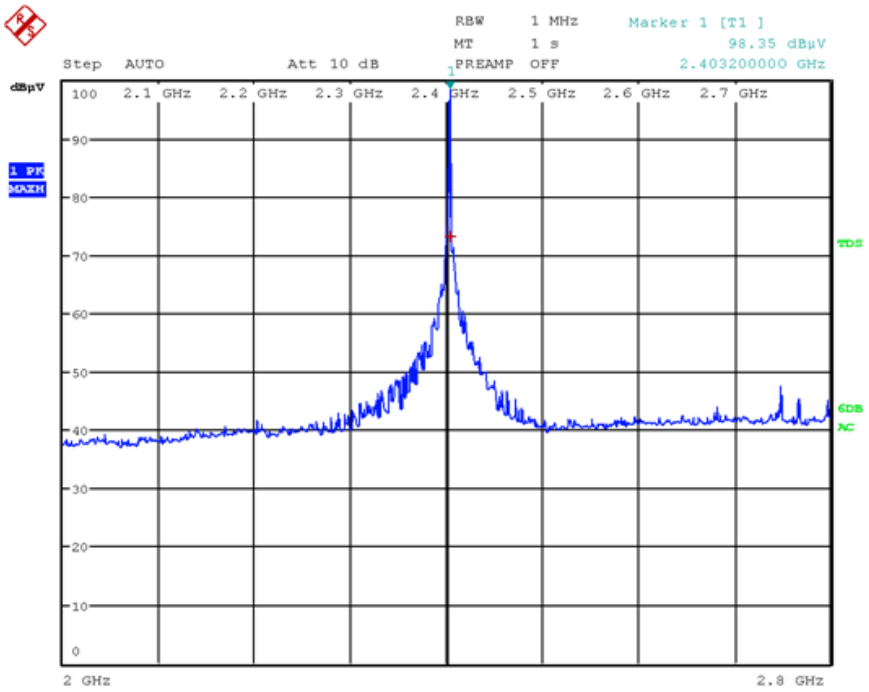
Frequency (MHz)	Reading (dBµV/m)	Detector	Polarization	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
2403	98,68	PK	H	--	114		PASS
2403	73,29	AV	H	--	94		PASS
2440	96,48	PK	H	--	114		PASS
2440	74,12	AV	H	--	94		PASS
2480	95,95	PK	H	--	114		PASS
2480	59,36	AV	H	--	94		PASS



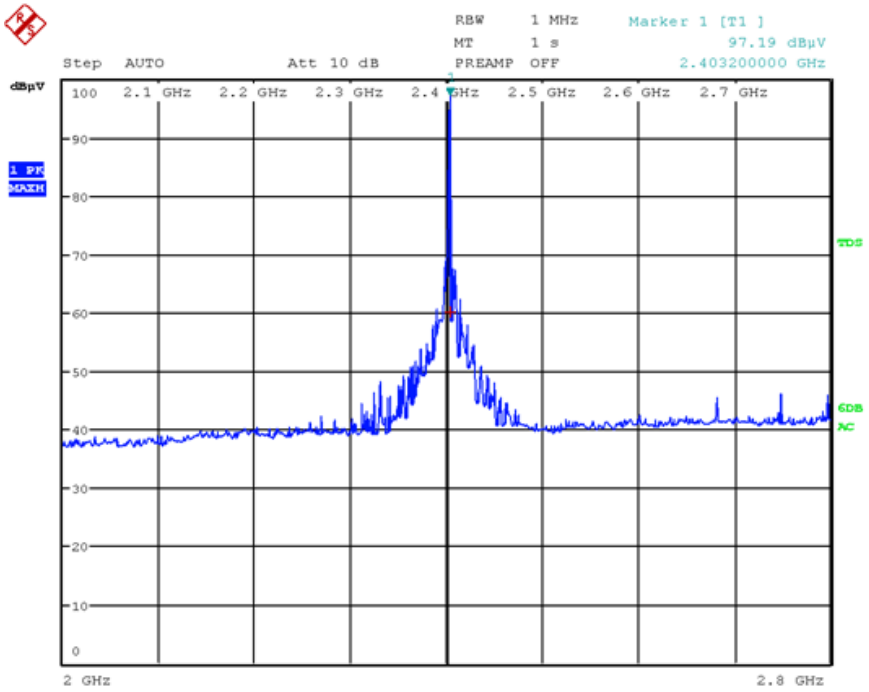
Picture 6: Radiated emission 2,403GHz (PK) – Horizontal - Burst Mode



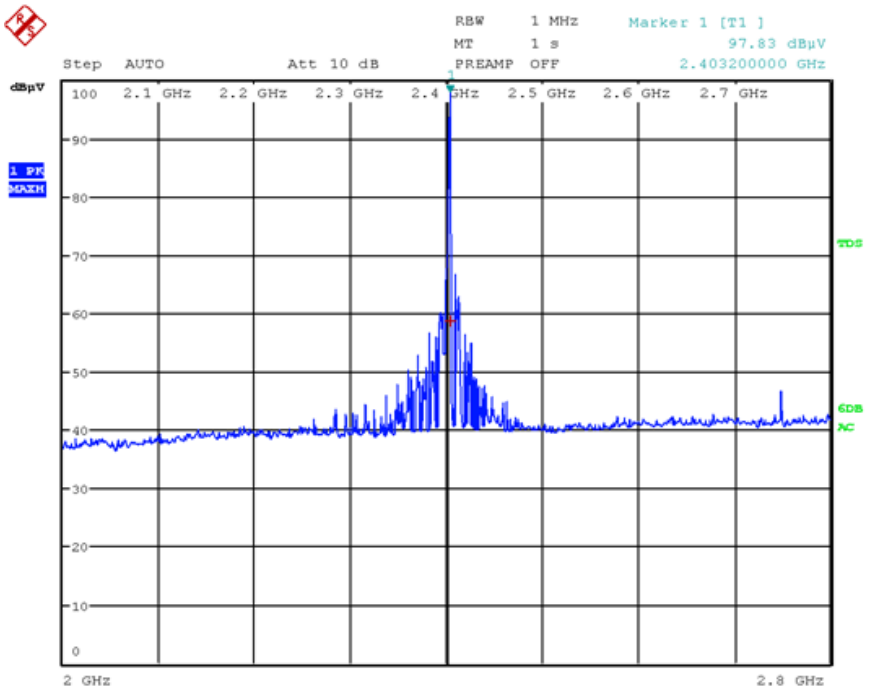
Picture 7: Radiated emission 2,403GHz (PK) – Vertical - Burst Mode



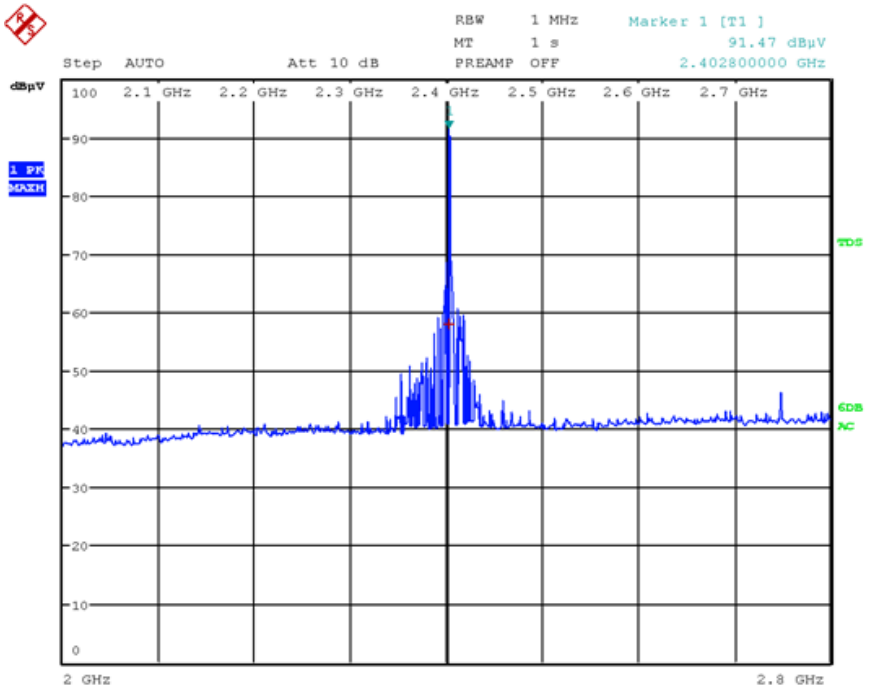
Picture 8: Radiated emission 2,403GHz (PK) – Horizontal – 100Hz



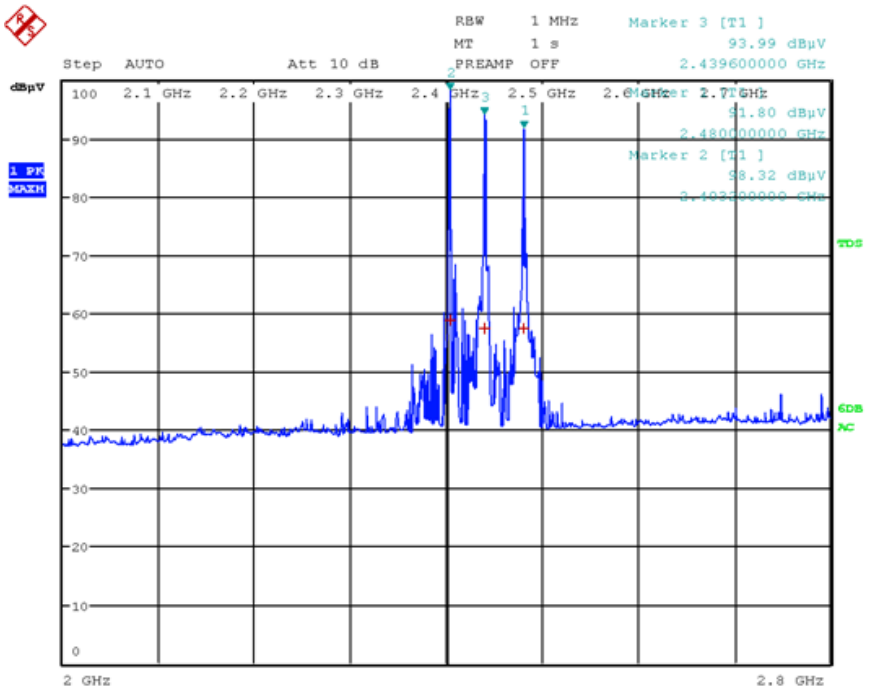
Picture 9: Radiated emission 2,403GHz (PK) – Horizontal – 50Hz



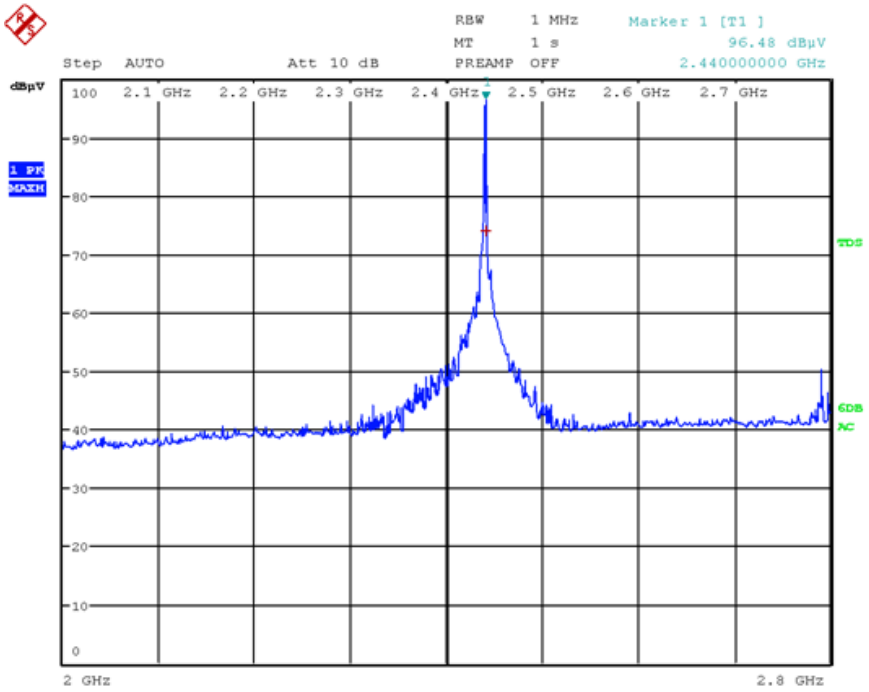
Picture 10: Radiated emission 2,403GHz (PK) – Horizontal – 20Hz



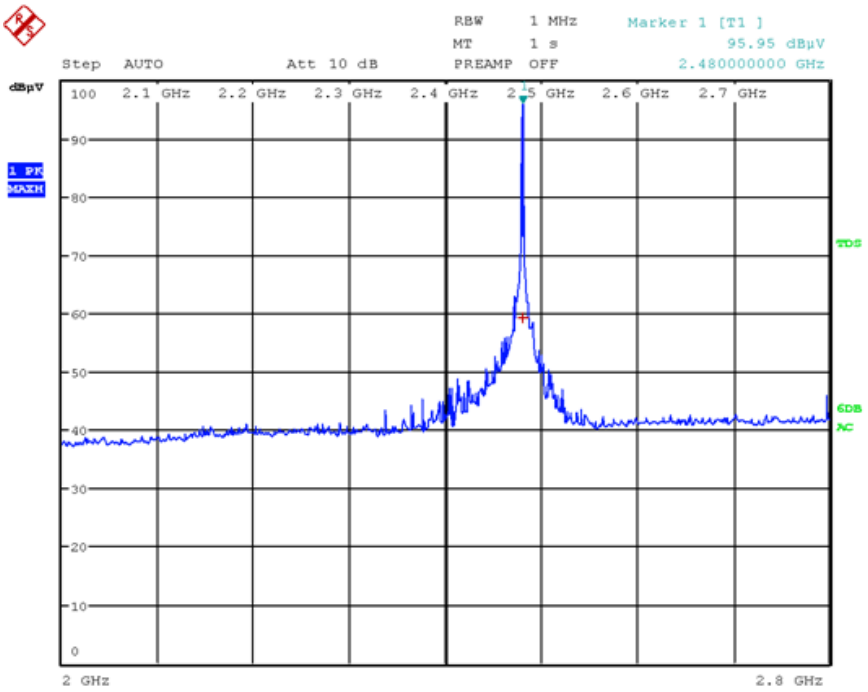
Picture 11: Radiated emission 2,403GHz (PK) – Horizontal – 10Hz



Picture 12: Radiated emission (PK) – Horizontal – Find Mode



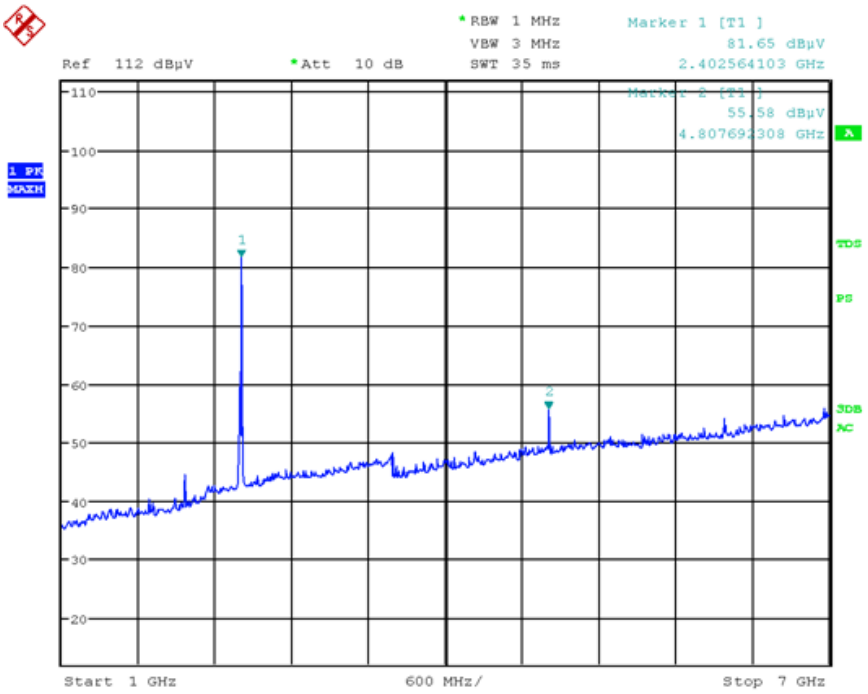
Picture 13: Radiated emission 2,440GHz (PK) – Horizontal - Burst Mode



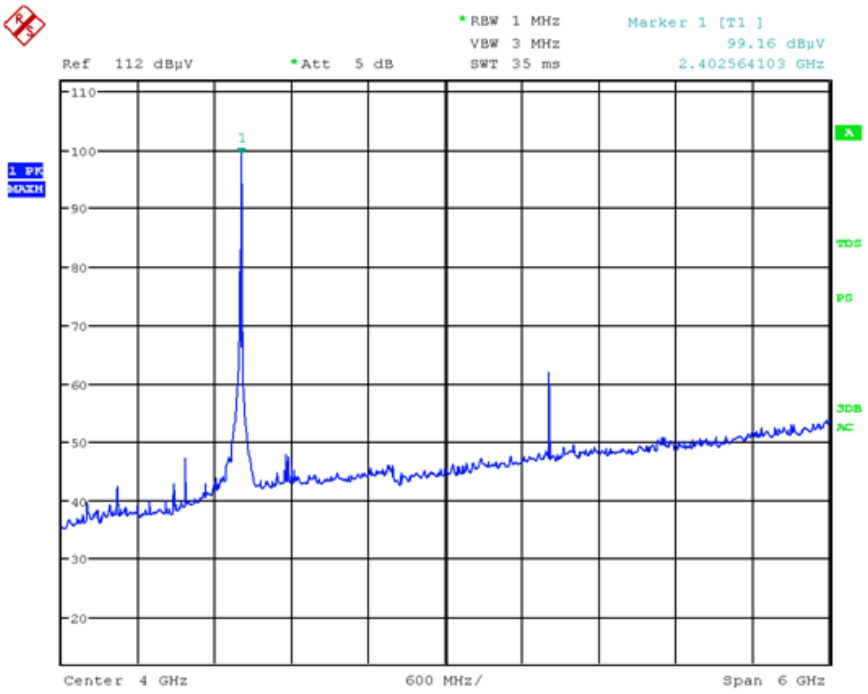
Picture 14: Radiated emission 2,480GHz (PK) – Horizontal - Burst Mode

Radiated Emission Measurement 1 GHz – 25 GHz

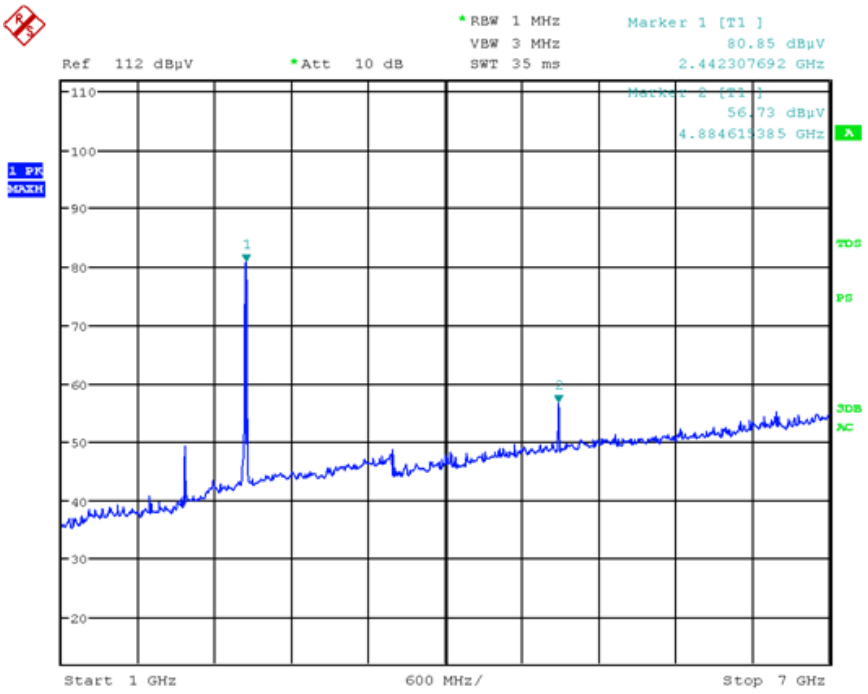
Frequency (MHz)	Reading (dBµV/m)	Detector	Polarization	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
4807	61,79	PK	H	--	74		PASS
4807	41,81	AV	H	--	54		PASS
4807	55,58	PK	V	--	74		PASS
4807	39,52	AV	V	--	54		PASS



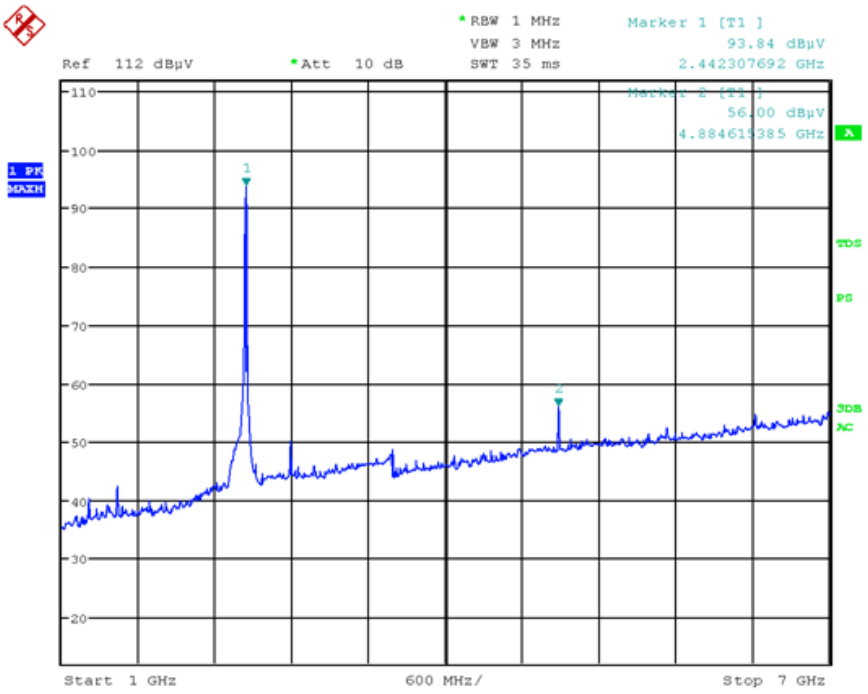
Picture 15: Radiated emission 1 – 7GHz – Vertical (2403MHz) - Burst Mode



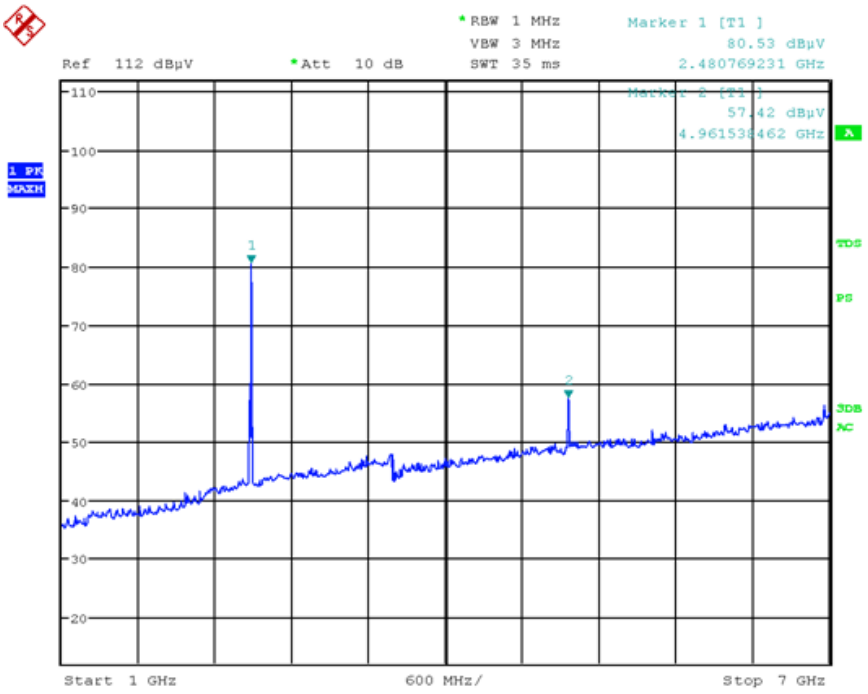
Picture 16: Radiated emission 1 – 7GHz – Horizontal (2403MHz) - Burst Mode



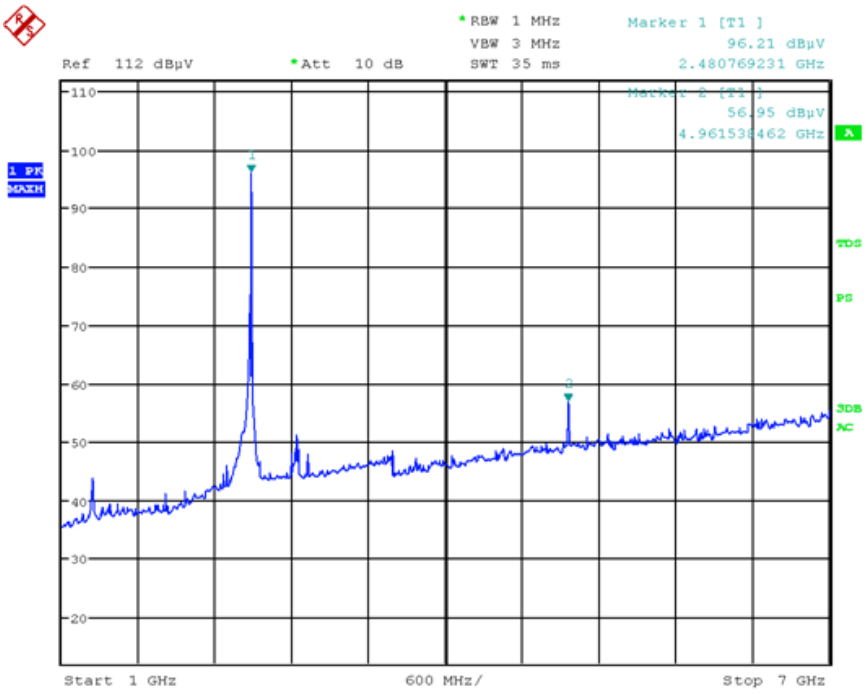
Picture 17: Radiated emission 1 – 7GHz – Vertical (2440MHz) - Burst Mode



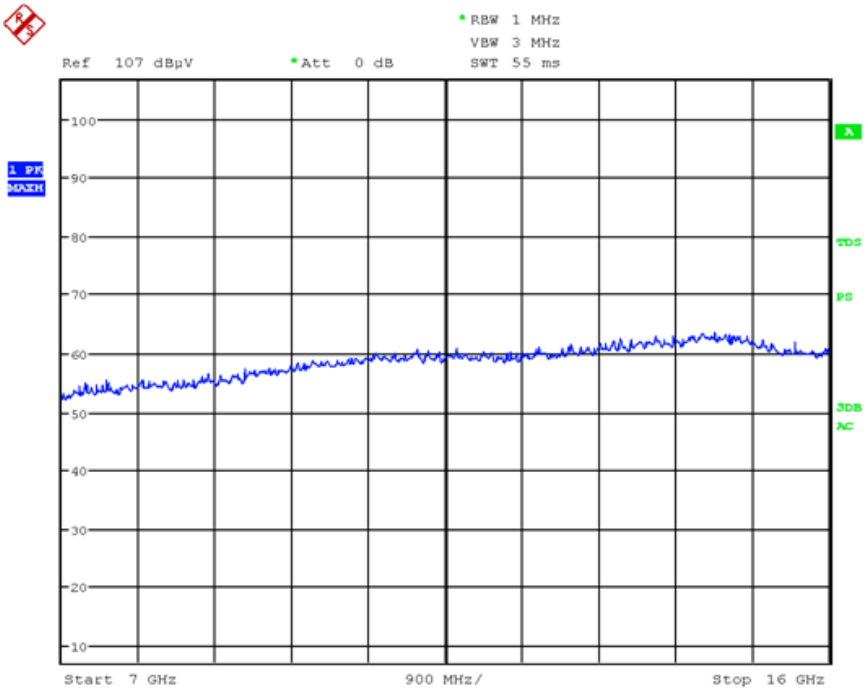
Picture 18: Radiated emission 1 – 7GHz – Horizontal (2440MHz) - Burst Mode



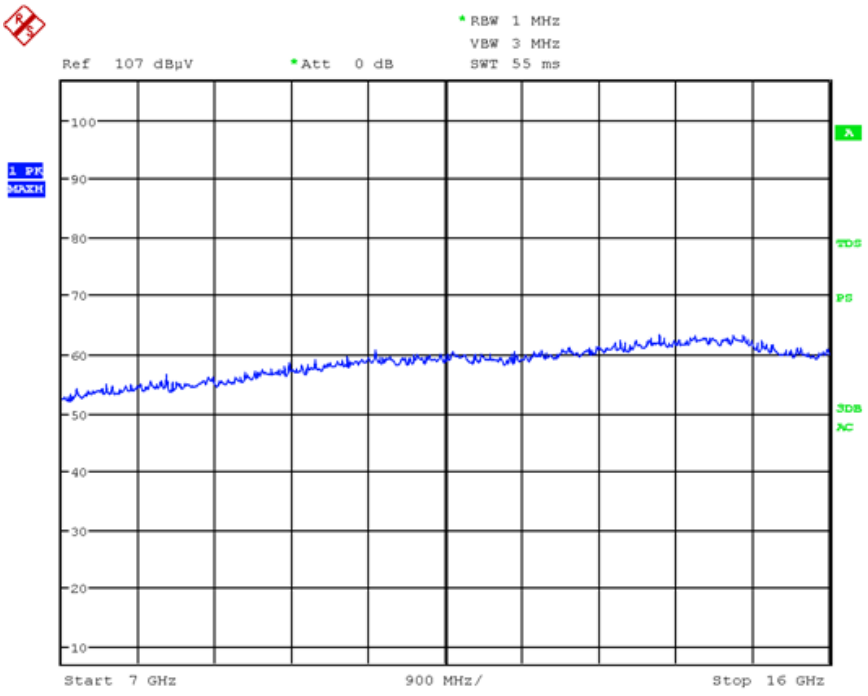
Picture 19: Radiated emission 1 – 7GHz – Vertical (2480MHz) - Burst Mode



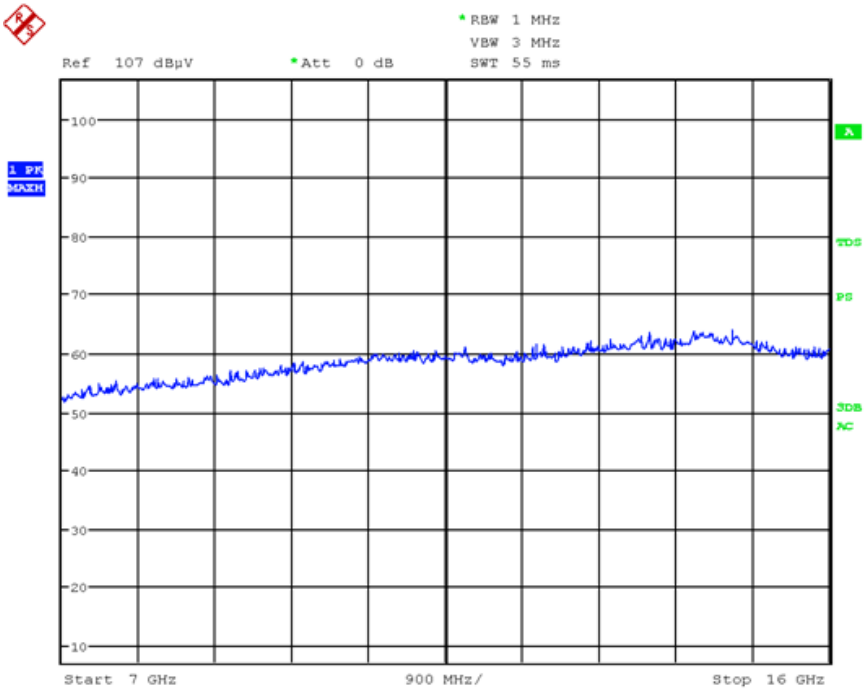
Picture 20: Radiated emission 1 – 7GHz – Horizontal (2480MHz) - Burst Mode



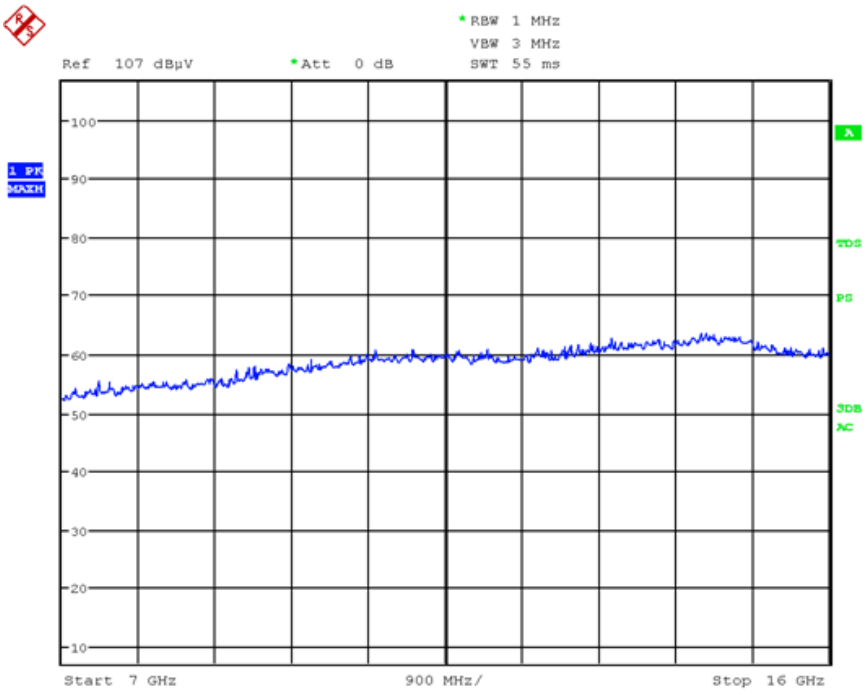
Picture 21: Radiated emission 7 – 16GHz – Vertical (2403MHz) - Burst Mode



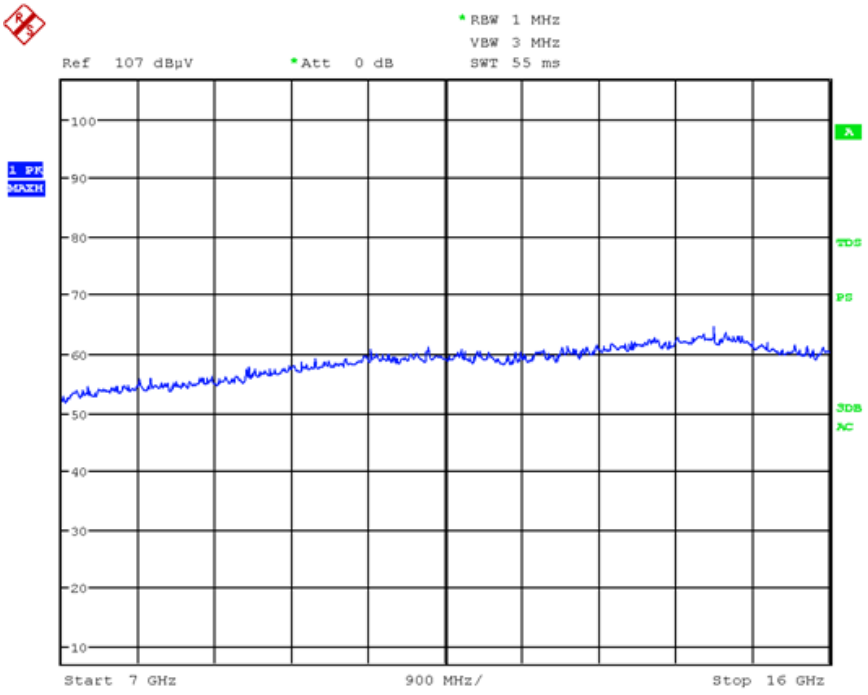
Picture 22: Radiated emission 7 – 16GHz – Horizontal (2403MHz) - Burst Mode



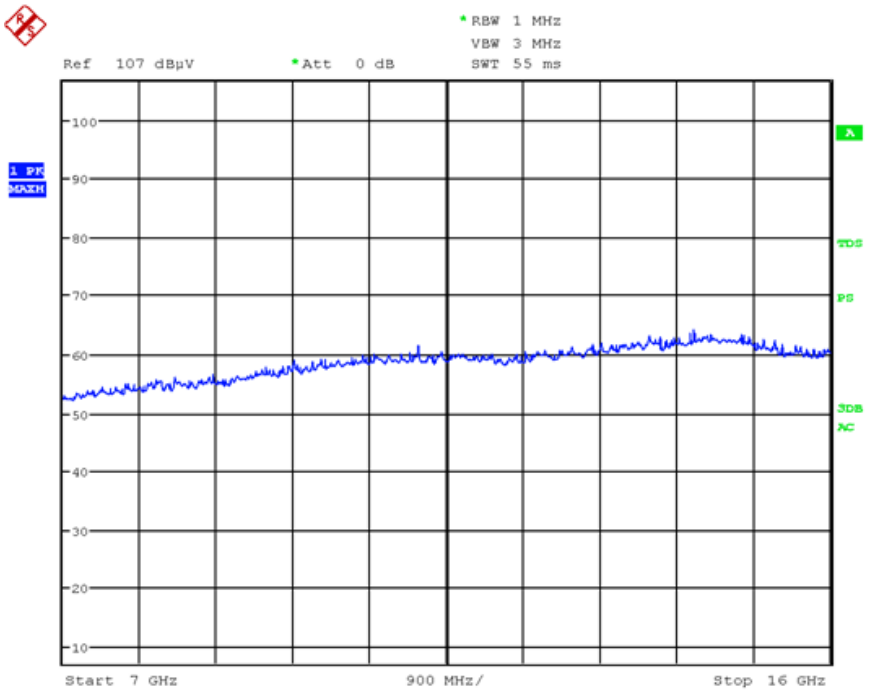
Picture 23: Radiated emission 7 – 16GHz – Vertical (2440MHz) - Burst Mode



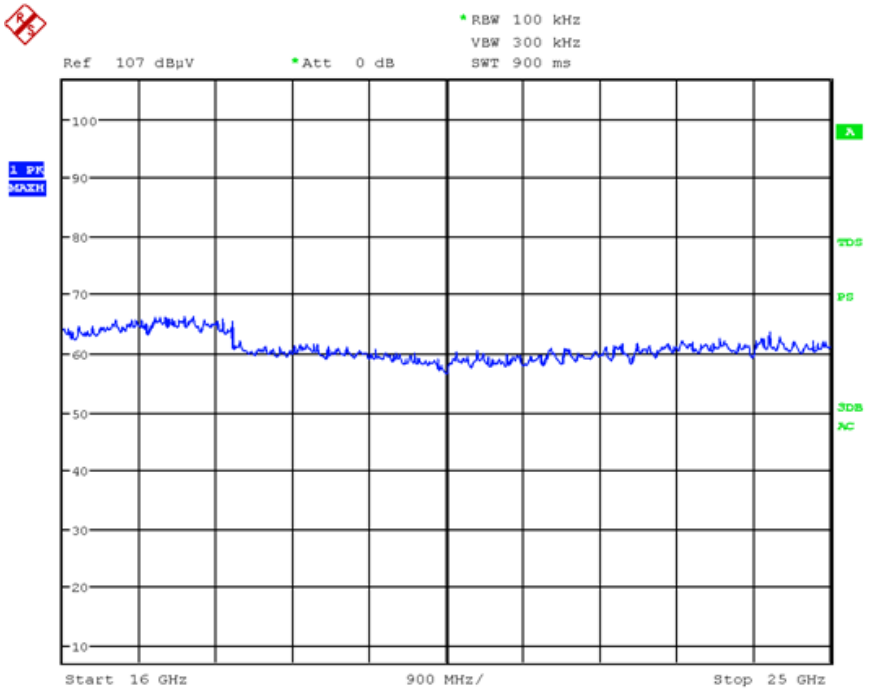
Picture 24: Radiated emission 7 – 16GHz – Horizontal (2440MHz) - Burst Mode



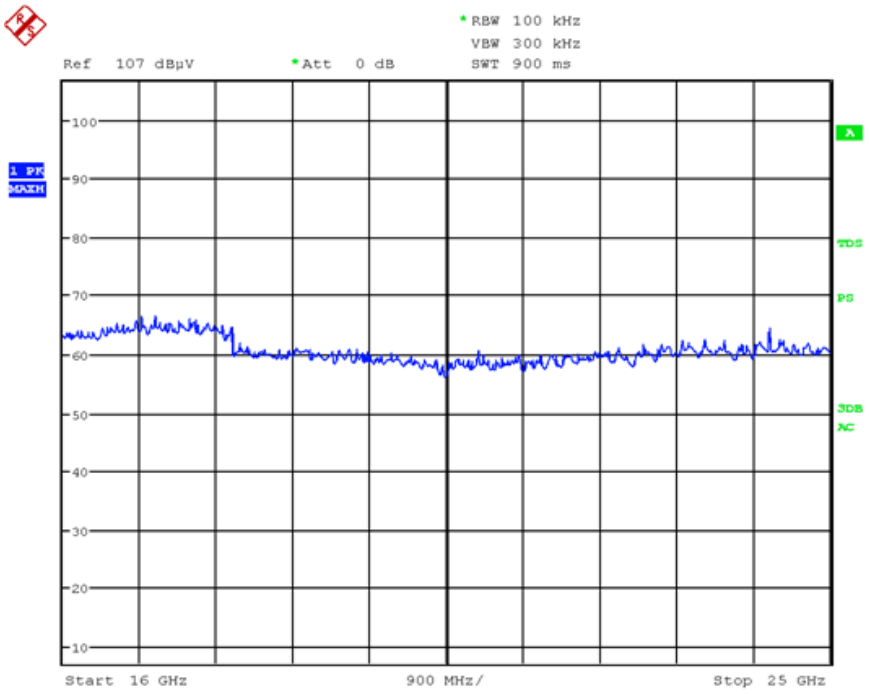
Picture 25: Radiated emission 7 – 16GHz – Vertical (2480MHz) - Burst Mode



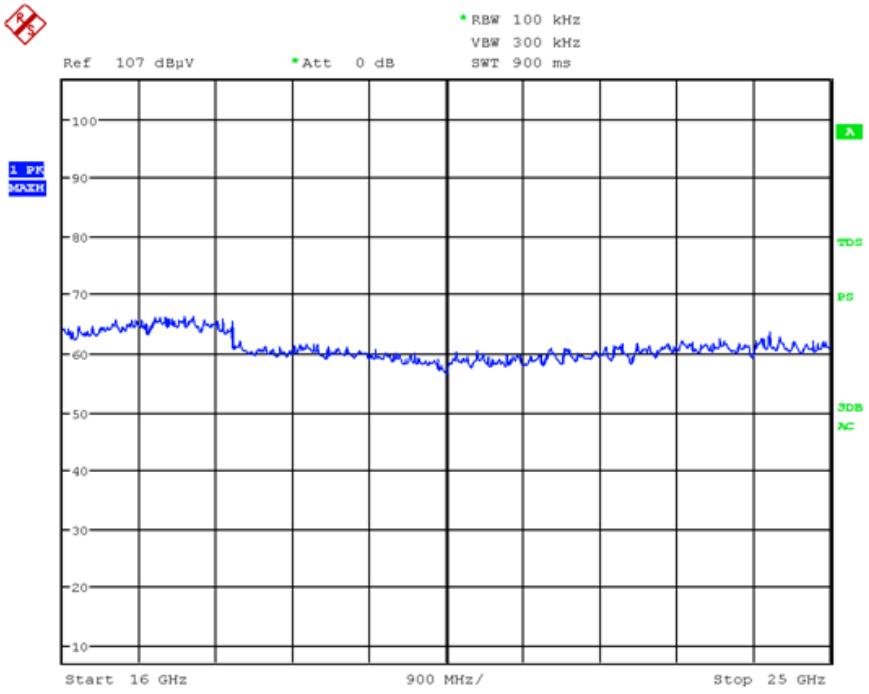
Picture 26: Radiated emission 7 – 16GHz – Horizontal (2480MHz) - Burst Mode



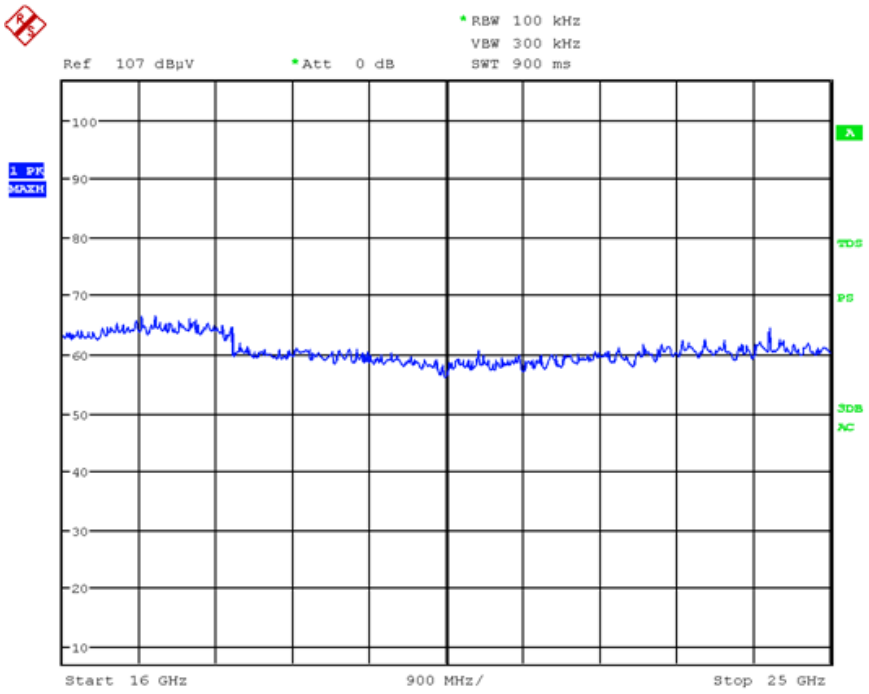
Picture 27: Radiated emission 16 – 25GHz – Vertical (2403MHz) - Burst Mode



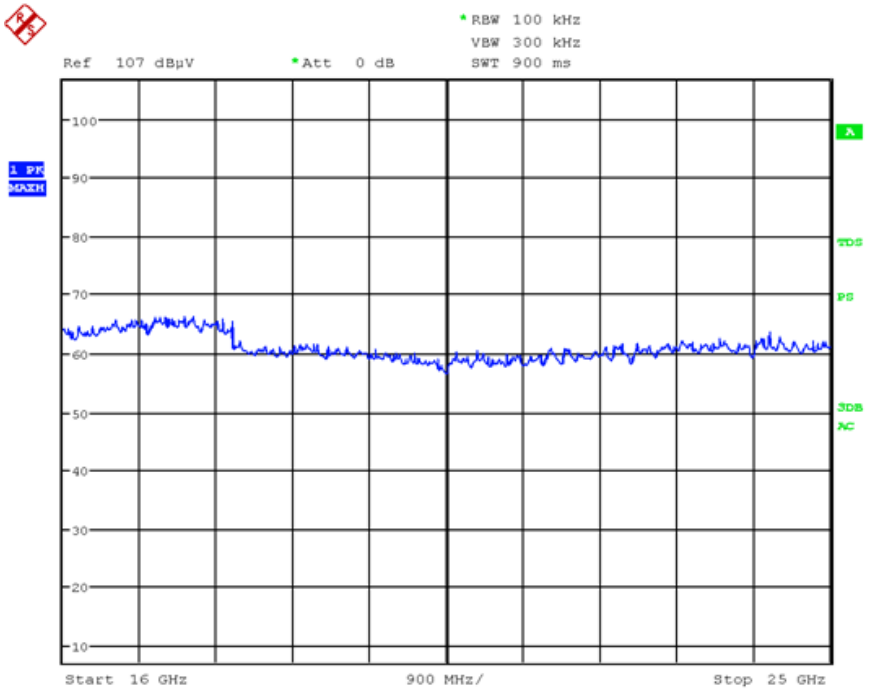
Picture 28: Radiated emission 16 – 25GHz – Horizontal (2403MHz) - Burst Mode



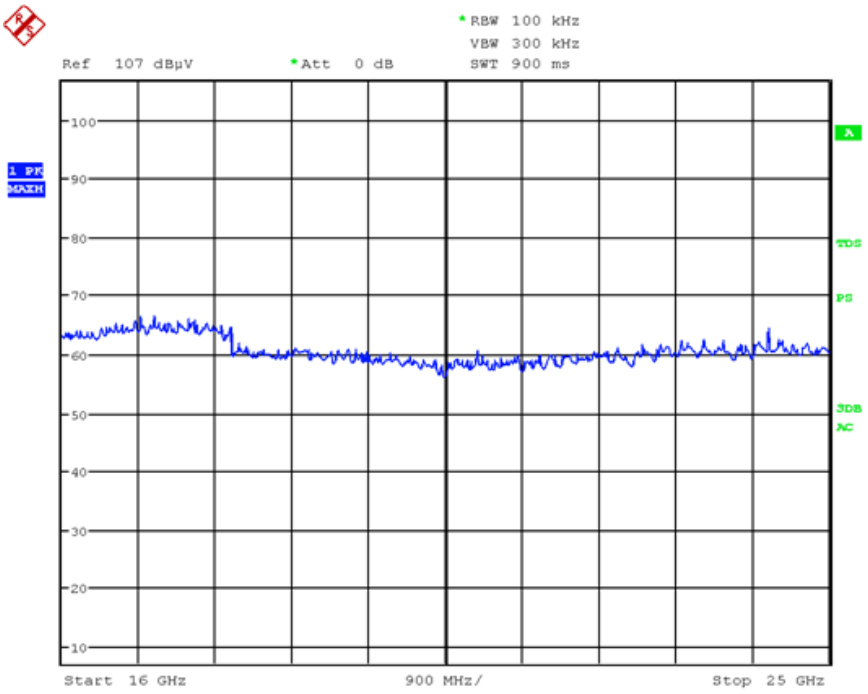
Picture 29: Radiated emission 16 – 25GHz – Vertical (2440MHz) - Burst Mode



Picture 30: Radiated emission 16 – 25GHz – Horizontal (2440MHz) - Burst Mode



Picture 31: Radiated emission 16 – 25GHz – Vertical (2480MHz) - Burst Mode



Picture 32: Radiated emission 16 – 25GHz – Horizontal (2480MHz) - Burst Mode

5 Equipment calibration status

Inventory Number	Model Number	Manufacturer	Last calibration	Next calibration	Cycle of calibration
W00002	ESU26	Rohde & Schwarz	Jan 14	Jan 16	2 Years
E00001	ESCI	Rohde & Schwarz	Dec 13	Dec 15	2 Years
E00003	ESCS 30	Rohde & Schwarz	Feb 14	Feb 15	1 Year
E00004	ESH 2-Z5	Rohde & Schwarz	Mar 13	Mar 15	2 Years
E00005	ESH 2-Z5	Rohde & Schwarz	Jan 14	Jan 16	2 Years
E00060	HFH2-Z2	Rohde & Schwarz	Jan 12	Jan 15	3 Years
E00013	VULB 9163	Schwarzbeck	Sep 13	Mar 15	2 Years
C00014	VC^{3}4100	Vötsch	Jan 12	Jan 15	3 Years
W00052	BBHA 9120D	Schwarzbeck	Mar 14	Mar 17	3 Years
W00055	BBHA 9170	Schwarzbeck	Mar 14	Jan 17	3 Years

Table 1: Equipment Calibration status

6 Measurement uncertainty

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

7 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, April 07, 2014

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