T E S T R E P O R T
No.: 2-20757120b/08-C1

According to: FCC/IC-Regulations
Part 15.247 &
RSS-210e

for

Harmonix Music Systems, Inc.

XBOX 360 Drum Set XBDMS2-A

Laboratory Accreditation and Listings			
Deutscher Akkreditierungs Rat DAR DAT-P176/94-02	FEDERAL COMMUNICATIONS COMMISSION FC USA Reg. No.: 99538 MRA US-EU 0003	Industry Canada Reg. No.: IC 3465	VCI Reg. No.: R-2665, R-2666 C-2914, T-339
accredited according to DIN EN ISO/IEC 17025			

CETECOM GmbH
Laboratory Radio Communications & Electromagnetic Compatibility
Im Teelbruch 116 • 45219 Essen • Germany
Registered in Essen, Germany, Reg. No.: HRB Essen 8984
Tel.: + 49 (0) 20 54 / 95 19-954 • Fax: + 49 (0) 20 54 / 95 19-964
E-mail: info@cetecom.de • Internet: www.cetecom.com

Table of contents

Table of annex

Total pages

1. Summary of test results

The test results apply exclusively to the test samples as presented in chapter 3.1. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests.

The customer was informed about possible critical issues found within the measurements.

Following tests have been performed to show compliance with applicable CFR47, FCC Part 15 and Industry Canada RSS-120e and RSS-Gen, Issue 2 regulations.

The XBOX360 Drum Set (EUT B) incorporates a Harmonix RF 2.4 GHz Wireless Module (EUT A). Tests have been performed conducted on the Wireless Module itself, radiated tests on the Drum Set.

1.1. Tests overview & standards

TEST CASES	PORT	REFERENCES & LIMITS			EUT set-up	EUT opera-ting mode	Result
		FCC Standard	RSS Section	TEST LIMIT			
TX-Mode							
20dB Bandwidth	Antenna terminal (conducted)	§15.247(a)(1)	RSS210, Issue 7: A8.1 (b)	At least 25kHz or 2/3 of 20dB bandwidth	1	1	Passed
Channel carrier frequency separation					3	3	
99% occupied bandwidth	Antenna terminal (conducted)	--	RSS210, Issue 7	99% Power bandwidth	1	1	Passed
Channel use, average channel use, input bandwidth and synchronization between signals	--	§15.247(a)(1)	RSS210, Issue 7: A8.1	See specification	--	--	Not performed *
Hopping channel numbers & Channel average occupancy time	Antenna terminal (conducted)	§15.247(a)(1)(iii)	RSS210, Issue 7 A8.1(d)	0.4 seconds	3	3	Passed
Transmitter output power (conducted)	Antenna terminal (conducted)	§15.247(b)(1)	RSS210, Issue 7: A8.4 (2)	0.125 Watt Peak	1	1	Passed
Transmitter Output power radiated	Cabinet (radiated)	§15.247(b)(4)	RSS210, Issue 7: A8.4 (2)	< 4 Watt (EIRP) for antenna with directional gain less 6dBi	2	1	Passed
Out-Of-Band RF-emissions Band-Edge emissions (conducted)	Antenna terminal (conducted)	§15.247 (d)	RSS210, Issue 7: A8.5	20 dBc	1+3	1+3	Passed
Power spectral density	Antenna terminal (conducted)	§15.247(e)	RSS210, Issue 7: A8.3 (b)	8dBm in any 3kHz band	1	1	Passed
General field strength emissions + restricted bands (radiated)	Cabinet + Interconnecting cables (radiated)	§15.247 (d) §15.205 §15.209	RSS210, Issue 7 §2.6 + §2.7, Table 1,2	Emissions in restricted bands must meet the general field-strength radiated limits	2	1	Passed

RX Mode							
RECEIVER Spurious emissions	Cabinet + Interconnecting cables (radiated)	§15.109 §15.33 §15.35	RSS-132: 4.6 RSS-Gen, Issue 2: 6(a) RSS 133: 6.7(a)	FCC 15.109, class B Limits IC-Limits: Table 1, Chapter 6	2	2	Passed

Remark: *.) Pls. find applicants separate declaration (B_2_20757120b_08-A3.pdf for the detailed information about the implementation of this requirement.

The current version of the test report 2-20757120b_08-C1 replaces the test report 2-20757120b_08 dated 2008-11-25. The replaced test report is herewith invalid.

ATTESTATION:

I declare that all measurements were performed by me or under my supervision and that all measurements have been performed and are correct to my best knowledge and belief to Industry Canada standards. All requirements as shown in below table are met in accordance with enumerated standards.

W. Richter

.....

Dipl.-Ing. W. Richter
Responsible for testing laboratory

CETECOM GmbH
Im Teelbruch 116
45219 Essen
Tel.: + 49 (0) 20 54 / 95 19 - 0
Fax: + 49 (0) 20 54 / 95 19 - 997

.....

Dipl.-Ing. C. Lorenz
Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

Company name: Address:	CETECOM GmbH Im Teelbruch 116 45219 Essen - Kettwig Germany
Laboratory accreditations/Listings:	DAR-Registration No. DAT-P176/94-02 FCC-Registration No. 99538, MRA US-EU 0003 IC-Registration No. 3465 VCCI Registration No. R-2665,R-2666,C-2914,T-339
Responsible for testing laboratory:	Dipl.-Ing. W. Richter
Deputies:	Dipl.-Ing. H. Strehlow, D. Franke

2.2. Test location

2.2.1. Test laboratory "CTC"

Company name:	see chapter 2.1. Identification of the testing laboratory

2.3. Organizational items

Order No.:	20757120
Responsible for test report and project leader:	Dipl.-Ing. C. Lorenz
Receipt of EUT:	2008-10-20
Date(s) of test:	2008-10-21, 2008-11-19, 2008-11-20
Date of report:	2008-12-22
Version of template: 08.08	

2.4. Applicant's details

Applicant's name:	Harmonix Music Systems, Inc.
Address:	625 Massachusetts Avenue, 2nd Floor 02139, Cambridge Massachusetts USA
Contact person:	Mr. Daniel Sussman

2.5. Manufacturer's details

Manufacturer's name:	please see Applicant's details
Address:	please see Applicant's details

3. Equipment under test (EUT)

3.1. Additional declaration and description of main EUT

Main function	Wireless Drum for XBOX360		
Type	XBDMS2-A		
Frequency range	2.4 – 2.4835 GHz		
Type of modulation	2GFSK		
Number of channels	Channel no.0 : 2402 MHz Channel no.20: 2442 MHz Channel no.40: 2482 MHz		
EMISSION DESIGNATOR(S)	1M35F1D		
Antenna Type	☒ Integrated ☐ External, no RF- connector ☐ External, separate RF-connector		
Antenna Gain	☒ radiated: Max. 0.92 dBi gain at 2482 MHz. Results are taken from other tests/test report.		
Ouput PowerConducted	Radiated: 3.13 dBm at highest channel (40) Conducted: 5.15 dBm at lowest channel (0)		
FCC-ID	VFRHMXDRM05		
FCC-Registration no.	0016637639		
IC ID	7543A-HMXDRM06		
Installed option	--		
Power Supply	Set-up 1+3: 3.3V nominal voltage over external power source Set-up 2: Internal regulated power source powered by 3pcs. AA 1.5V batteries. Internal regulated voltage: 3V nominal		
Special EMI components	--		
EUT sample type	☐ Production	☒ Pre-Production	☐ Engineering

3.2. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	--	--	--	--	--
Cable 2	--	--	--	--	--

None used

3.3. EUT: Type, S/N etc. and short descriptions used in this test report

Short description*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	HARMONIX RF-Module	Adams 2.4GHz	H	Pre-Production	Complete
EUT B	XBOX 360 Drum Set	XBDMS2-A	2816	Production	complete

*) EUT short description is used to simplify the identification of the EUT in this test report.

3.4. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

AE short description *)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	Headset	Microsoft licensed	#1	Production	--
AE 2	Foot pedal	Reed switch actuated	#1	Production	--
AE 3	Atmel Developers Kit	AT89C51	#1	--	--
AE 4	Notebook	DELL D610	#PC4	--	Windows XP + Docklight Program + *ADAMS ROM2_COM1.ptp script*
AE 5	XBOX360 Wireless Receiver for Windows	1086	X809782-003	523-3506106-00703	--

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report.

3.5.EUT set-ups

EUT set-up no.*)	Combination of EUT and AE	Remarks
Set. 1	EUT A + AE3 + AE 4	Used for conducted tests
Set. 2	EUT B + AE 1 + AE 2 + (AE 3 + AE 4)	Used for radiated tests
Set. 3	EUT A + AE3 + AE4 + AE 5	For conducted tests, hopping mode over 41 channels

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

3.6. EUT operating modes

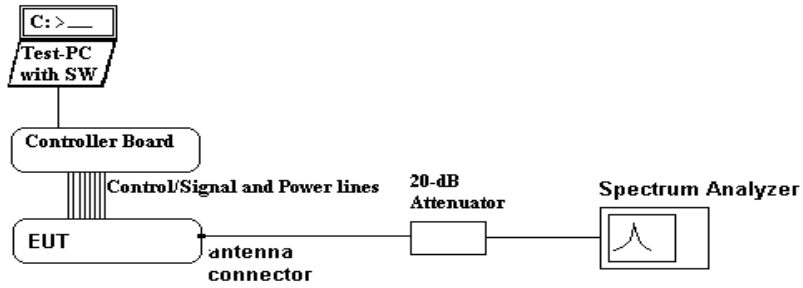
EUT operating mode no.*)	Description of operating modes	Additional information
op. 1	**Transmit Mode**	The transmitter is set to certain transmission frequency within the operational range and broadcast an modulated carrier. The EUT was set to lowest (2402MHz), middle (2442 MHz) and highest (2482MHz) possible working frequency within the assigned operational band. Hopping mode was switched off.
op. 2	**Receive Mode**	The transmitter is set to receive mode only (“initiate binding” command)
op. 3	**Transmit mode**	The transmitter was set-up to hopping mode within the assigned operational band

*) EUT operating mode no. is used to simplify the test report.

4. DESCRIPTION OF TEST SET-UP's

4.1. Test Set-up for conducted measurements

EUT's RF-signal is first attenuated by 20dB before it is feed to the spectrum analyzer. Customers RF-adapters are used in case of no suitable RF-Adapters are mounted on the EUT. The specific attenuation losses for the RF-signal path is determined within a path-loss calibration and the readings corrected therefore.



Schematic: Test set-up 3: conducted for RF-tests

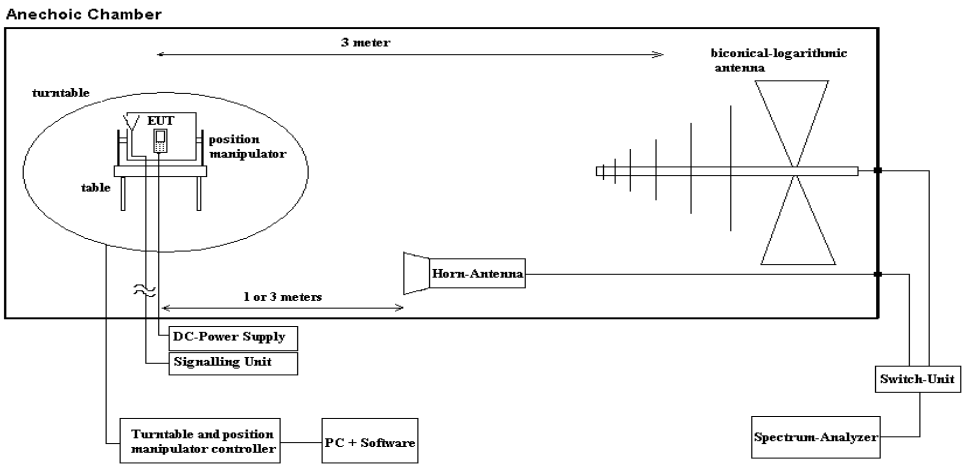
4.2. Test set-up for radiated measurements

The radiated emissions from the test device are measured first as exploratory measurement in a FCC recognized semi anechoic chamber or fully anechoic chamber with the dimensions of 8.05m x 6.85m x 5.48m. Very critical frequencies within a defined range, can be re-checked on CETECOM's Open Area Test side, recognized by the FCC to be compliant with ANSI 63.4: 2001 according registration no. 99538.

The EUT and accessories are placed on a non-conducting tipping table of 0.8 meter height (semi-anechoic chamber) or 1.55m height (fully-anechoic chamber) which is situated in the middle of the turntable. The turntable can rotate the device under test 360 degree, the position manipulator can rotate the device from laid to standing position. This way the device under test can be rotated in all three orthogonal planes in order to maximize the detected emissions. The turn- and position manipulator are controlled by a controller unit. All positions manipulations are software controlled from a operator PC.
The measurements are performed for both receiving antenna polarisations: vertical and horizontal.

Up to 18GHz a measurement distance of 3 meters is used, above 18GHz the distance is 1meter. A biconical-logarithmic antenna up to 1 GHz and a horn antenna for frequencies above 1 GHz was used. (see equipment list)

The EUT is powered either by internal batteries, an external DC-supply with nominal voltage or a AC/DC power supply as accessory. Details can be found in the set-up description.



Schematic: radiated measurements test set-up

5. Measurements

5.1. Radiated emissions, below 30 MHz, §15.205 and §15.209, RSS210, RSS132, RSS133, RSS-gen

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☒ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☐ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☒ 001 ESS	☐	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
antenna	☐ 048 EMCO3143	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☒ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 298 CMU	☐ 460 CMU	☐ 295 RACAL	☒ 392 MT8820A		
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☐ 482 Filter Matrix		

STANDARDS AND LIMITS: CFR 47, PART 15, SUBPART B, §15.209, ANSI C63.4

Frequency [MHz]	Field strength [µV/m]	Field strength [dBµV/m]	Measurement distance [meters]	Remarks
0,009 – 0,490	2400/f (kHz)	67,6 – 20Log(f) (kHz)	300	Correction factor used due to measurement distance of 3 m
0,490 – 1,705	24000/f (kHz)	87,6 – 20 Log(f) (kHz)	30	Correction factor used due to measurement distance of 3 m
1,705 – 30	30	29,54	30	Correction factor used due to measurement distance of 3 m
Remark: * decreases with the logarithm of the frequency				

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	☐ air link	☐ cable connection	☐	
EUT-grounding	☒ none	☐ with power supply	☐ additional connection	
Equipment set up	☒ table top		☐ floor standing	
Climatic conditions	Temperature: (22.7°C)		Rel. humidity: (42)%	Air pressure: (1016)hPa
EMI-Receiver (Analyzer) Settings	Span/Range: 9 kHz to 150 kHz; 150 kHz to 30 MHz RBW/VBW: 200 Hz/auto; 10 kHz/ auto (CISPR#16) Detector/ Mode: PEAK, TRACE max-hold mode, repetitive scan for exploratory measurements Quasi-Peak, for final measurement on critical frequencies (f<1GHz)			

GENERAL MEASUREMENT PROCEDURES:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.4: 2003

The **Equipment under Test** (EUT) was placed on a non-conductive positioning table of 0.8 meter height. The EUT was set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

The measurement loop antenna was situated in 3m distance to the EUT. Radiated magnetic emission measurements were made with the antenna situated in 1 meter height. The loop antenna was moved at least to 2-perpendicular axes (antenna vector in direction of EUT and parallel to EUT) in order to maximize the emissions, the EUT itself over 3-orthogonal axes (no defined usage position) or 2-orthogonal axis (defined usage position) by the position manipulator.

According the standard the compliance should be checked in 30m and 300m measurement distance. Therefore a additional extrapolation factor was used in order to normalize the measurement data. The frequency dependent extrapolation factor used for this reduced measurement distance, can be found in the chapter annexes.

MEASUREMENT RESULTS

Channel Low (channel 0)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.25	8.40	11.15	10ms	10	100	--	--	--	18.39	29.54
	18.34	19.98	10ms	10	100	--	--	--	9.56	29.54

Remark: *.) see also diagrams enclosed

Channel middle (channel 20)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.26	19.00	19.76	10ms	10	100	--	--	--	9.78	29.54

Remark: *.) see also diagrams enclosed

Channel High (channel 40)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.27	8.27	10.12	10ms	10	100	--	-	--	21.27	29.54
	19.045	15.6	1000 ms	10	100	--	45	2.7	13.94	29.54

Remark: *.) see also diagrams enclosed

Margin to Limit:

$$M = L_T - R_R + C_F + D_F$$
$$= L_T - R_R + (AF_{ANTENNA} + Cable_{LOSS}) + D_F$$

Remark: positive margin means passed result

Abbreviations used:

- R_R : Receiver readings in dBµV/m
- C_F: Transducer in dB = AF (antenna factor) + CL (cable loss)
- D_F : distance correction factor (if different measurement distance used than specified in the standard
- L_T : Limit in dBµV/m

VERDICT

Summary of measurement results for radiated emissions below 30 MHz: Passed

5.2. Radiated emissions, 30 MHz - 1 GHz, §15.205 and §15.209, RSS210, RSS132, RSS133, RSS-gen

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☒ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☐ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☒ 001 ESS	☐	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
antenna	☒ 048 EMCO3143	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☐ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 298 CMU	☐ 460 CMU	☐ 295 RACAL	☒ 392 MT8820A		
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☒ 482 Filter Matrix		

STANDARDS AND LIMITS: CFR 47, PART 15, SUBPART B, §15.109 (CLASS B), §15.209, ANSI C63.4

Frequency [MHz]	Radiated emission limits [dBµV]	
	QUASI-Peak [microvolts/meter]	QUASI-Peak [dBµV/m]
30-88	100	40
88-216	150	43,5
216-960	200	46,0
above 960	500	54,0

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	☐ air link	☐ cable connection	☐	
EUT-grounding	☒ none	☐ with power supply	☐ additional connection	
Equipment set up	☒ table top 0.8m height		☐ floor standing	
Climatic conditions	Temperature: (22.7°C)		Rel. humidity: (42)%	Air pressure: (1016±20)hPa
EMI-Receiver (Analyzer) Settings	Span/Range: 30 MHz to 1 GHz RBW/VBW: 120 kHz / (auto) Detector/ Mode: PEAK, TRACE max-hold mode, repetitive scan Quasi-Peak, for final measurement for critical measurements			

RESTRICTED BANDS OF OPERATION, §15.205

MHz	MHZ	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	--
13.36-13.41	--	--	--

Remark: only spurious emissions are allowed within these frequency bands not exceeding the limits per §15.209

MEASUREMENT PROCEDURES:
The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.4: 2003

The ***Equipment under Test*** (EUT) set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

MEASUREMENT METHOD (30 MHZ<F <1 GHZ):

A EMI analyzer together with a broadband antenna was used in order to identify the emissions from the EUT by positioning the antenna close to the EUT surfaces. The interconnecting cables and equipment position were varied in order to maximize the emissions. Then most critical frequencies are recorded for further investigations. Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's operating mode, cable position, etc. The EUT was placed on a non-conductive support of 0.8 m height. By rotating the turntable angle in the range 0 to 360 degree, the EUT itself in 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position) and the measurement antenna height from 1 meter to 4 meters, the maximized emissions are recorded. The measurements are performed for both polarizations of the measuring antenna: horizontal and vertical.

MEASUREMENT RESULTS

Channel Low (channel 0)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.19	539.96	41.32	1000.0	120.00	100.0	H	329.0	21.4	4.68	46.00
	563.99	43.01	1000.0	120.00	100.0	H	329.0	21.4	3.00	46.00
	707.99	43.5	1000.0	120.00	121.0	H	320.0	23.7	2.5	46.00

Remark: *.) see also diagrams enclosed

Channel Middle (Channel 20)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.20	563.99	44.07	1000.0	120.00	100.0	H	350.0	21.4	1.93	46.00
	707.98	42.89	1000.0	120.00	298.0	V	343.0	23.7	3.11	46.00

Remark: *.) see also diagrams enclosed

Channel High (Channel 40)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.21	74.97	34.86	1000.0	120.00	112.0	V	230.0	7.7	11.14	40.00
	240.03	40.04	1000.0	120.00	273.0	V	330.0	13.2	5.96	46.00
	564.00	43.71	1000.0	120.00	100.0	H	346.0	21.4	2.29	46.00
	708.00	43.54	1000.0	120.00	298.0	V	343.0	23.7	2.46	46.00

Remark: *.) see also diagrams enclosed

RX-mode

Set-up No.		2								
Operating Mode		2								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.22	240.00	39.8	1000.0	120.00	278.0	V	302.0	13.2	6.2	46.00
	564.00	43.49	1000.0	120.00	100.0	H	346.0	21.4	2.51	46.00
	708.00	42.93	1000.0	120.00	295.0	V	342.0	23.7	3.07	46.00
	878.88	41.54	1000.0	120.00	360.0	V	299.0	26.9	4.43	46.00

Remark: *.) see also diagrams enclosed

Margin to Limit:

$$M = L_T - R_R + C_F + D_F$$
$$= L_T - R_R + (AF_{ANTENNA} + Cable_{LOSS}) + D_F$$

Remark: positive margin means passed result

Abbreviations used:

- R_R : Receiver readings in dBµV/m
- C_F: Transducer in dB = AF (antenna factor) + CL (cable loss)
- D_F : distance correction factor (if different measurement distance used than specified in the standard
- L_T : Limit in dBµV/m

VERDICT

Summary of measurement results for radiated emissions above 30 MHz and below 1 GHz: Passed

5.3. Radiated emissions, above 1GHz, §15.205 and §15.209, RSS210, RSS132, RSS133, RSS-gen

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test site	☐ 441 EMI SAR	☐ 348 EMI cond.	☒ 443 EMI FAR	☐ 347 Radio.lab.	☐ 337 OATS	☐
equipment	☐ 331 HC 4055	☐	☐	☐	☐	☐
Spectr. analys.	☐ 138 139 FSBS	☐ 120 FSEM	☐ 264 FSEK	☒ 489 ESU	☐	☐
antenna meas	☐ 048 3143	☐ 289 CBL 6141	☐ 439 HL 562	☒ 133 EMCO3115	☒ 302 BBHA9170	☐ 477 GPS
antenna meas	☐ 123 HUF-Z2	☐ 132 HUF-Z3	☐ 030 HFH-Z2	☐	☐	☐
antenna subst	☐ 071 HUF-Z2	☐ 020 EMCO3115	☐ 063 LP 3146	☐ 303 BBHA9170	☐	☐
power meter	☐ 009 NRV	☐ 010 URV5-Z2	☐ 011 URV5-Z2	☐	☐	☐
Signalgener.	☐ 008 SMG	☐ 140 SMHU	☐ 263 SMP04	☐	☐	☐
power meter	☐ 262 NRV-S	☐ 266 NRV-Z31	☐ 265 NRV-Z33	☐ 261 NRV-Z55	☐ 356 NRV-Z1	☐
DCpower	☐ 086 LNG50-10	☐ 087 EA3013	☐ 354 NGPE 40	☐ 349 car battery	☐ 350 Car battery	☐
multimeter	☐ 341 Fluke 112	☐	☐	☐	☐	☐
signaling	☐ 298 CMU	☐ 460 CMU	☐ 295 RACAL	☐ 392 MT8820A		

STANDARDS AND LIMITS: CFR 47, PART 15, SUBPART B, §15.109 (CLASS B), §15.209, ANSI C63.4

Frequency [MHz]	Radiated emission limits [dBµV], 3 meters measurement distance			
	AV [microvolts/meter]	AV [dBµV/m]	Peak [microvolts/meter]	Peak [dBµV/m]
above 1GHz	500	54,0	5000	74

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	☐ air link	☐ cable connection	☐	
EUT-grounding	☒ none	☐ with power supply	☐ additional connection	
Equipment set up	☒ table top 1.5m height		☐ floor standing	
Climatic conditions	Temperature: (23°C)		Rel. humidity: (34)%	Air pressure: (1008)hPa
Spectrum-Analyzer settings	Span/Frequency range :	1..18 GHz +single frequencies determined in step 1		
	RBW/VBW:	1 MHz / 3 MHz		
	Detector/ Mode:	Peak, MAX-hold, repetitive scan for exploratory measurement PEAK/ AVERAGE, for final measurement for critical frequencies		
	Antenna Polarisation	Horizontal / Vertical		

GENERAL MEASUREMENT PROCEDURES:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.4: 2003

The ***Equipment under Test*** (EUT) was placed on a non-conductive positioning table of 0.8 or 1.5 meter height depending from the frequency range. The measuring distance was set to 3 meter for frequencies up to 18GHz and 1 meter above 18GHz.

The EUT was set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

1. **Step exploratory measurement**: see above description as in the frequency range lower 1GHz.
2. **Step Final Measurement(1 GHz < f <18 GHz)**: On the Worst-Case EUT configuration, frequency components with a margin lower than 6 dB to the limits, will be re-measured by maintaining the EUT's operating mode, cable position, etc.. For find the worst-case emission, the turntable was changed in the range 0 to 360 degree and the EUT itself in 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurements are performed for both polarizations of the measuring antenna: horizontal and vertical.

MEASUREMENT RESULTS:

Channel Low (channel 0)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.16[1.)]	1296.00	39.2	100.00	1000.00	155.0	H	-10.0	-1.0	34.8	74.0 (PK)
	1296.00	31.4	100.00	1000.00	155.0	H	-6.0	-1.0	22.6	54.0 (AV)
2.15[1.)]	4804.30	63.2	100.00	1000.00	155.0	H	75.0	-0.6	10.8	74.0 (PK)
	7206.00	53.2	100.00	1000.00	155.0	H	136.0	6.6	20.8	74.0 (PK)
	4801.50	34.4	100.00	1000.00	155.0	H	117.0	-0.6	19.6	54.0 (AV)
	7206.70	35.7	100.00	1000.00	155.0	V	326.0	6.6	18.3	54.0 (AV)
2.51[2.)]	--	--	--	1000.00	--	--	--	--	--	54.0 (AV)

Remark: 1.) diagrams shows PK/AV detector measurements
*.) see also diagrams enclosed
2.) measurements from 18 to 25 GHz performed as exploratory measurements only, due to noise level. No peaks detected

Channel Middle (channel 20)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.13[1.)]	1296.00	39.3	100.00	1000.00	155.0	H	-4.0	-1.0	34.7	74.0 (PK)
	1296.00	31.4	100.00	1000.00	155.0	H	-7.0	-1.0	22.6	54.0 (AV)
2.14[1.)]	4884.100000	59.8	100.00	1000.00	155.0	V	218.0	-0.6	14.2	74.0 (PK)
	7325.000000	55.0	100.00	1000.00	155.0	H	135.0	6.8	19.0	74.0 (PK)
	4884.100000	33.9	100.00	1000.00	155.0	H	232.0	-0.6	20.1	54.0 (AV)
	7326.400000	35.8	100.00	1000.00	155.0	H	135.0	6.8	18.2	54.0 (AV)
2.52[2.)]	--	--	--	1000.00	--	--	--	--	--	54.0 (AV)

Remark: 1.) diagrams shows PK/AV detector measurements
*.) see also diagrams enclosed
2.) measurements from 18 to 25 GHz performed as exploratory measurements only, due to noise level. No peaks detected

Channel High (channel 40)

Set-up No.		2								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.12[1.)]	1296	31.25	100.00	1000.00	155.0	H	306.0	--8	-22.75	54.0 (AV)
2.11[1.)]	4963.90	59.7	100.00	1000.00	155.0	V	218.0	-0.4	14.3	74.0 (PK)
	7446.10	53.1	100.00	1000.00	155.0	H	135.0	6.9	20.9	74.0 (PK)
	4963.90	33.4	100.00	1000.000	155.0	V	221.0	-0.4	20.6	54.0 (AV)
2.53[2.)]	--	--	--	1000.00	--	--	--	--	--	54.0 (AV)

Remark: 1.) diagrams shows PK/AV detector measurements
*.) see also diagrams enclosed
2.) measurements from 18 to 25 GHz performed as exploratory measurements only, due to noise level. No peaks detected.

RX-Mode:

Set-up No.		2								
Operating Mode		2								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C_F)	Margin (dB) (M)	Limit (dBµV/m) (L_T)
2.30[1.)]	1296.00	39.1	100.00	1000.00	155.0	H	317.0	-1.0	34.9	74.0 (PK)
	1200.10	29.6	100.00	1000.00	155.0	H	-6.0	-1.1	24.4	54.0 (AV)
	1296.00	31.4	100.00	1000.00	155.0	H	316.0	-1.0	22.6	54.0 (AV)
2.31[1.)]	14050.60	57.8	100.00	1000.00	155.0	V	45.0	17.7	16.2	74.0 (PK)
	17998.10	51.6	100.00	1000.00	155.0	H	39.0	23.8	2.4	54.0 (AV)

Remark: 1.) diagrams shows PK/AV detector measurements
*.) see also diagrams enclosed

Margin to Limit:

$$M = L_T - R_R + C_F + D_F$$
$$= L_T - R_R + \left(AF_{ANTENNA} + Cable_{LOSS}\right) + D_F$$

Remark: positive margin means passed result

Abbreviations used:

- R_R : Receiver readings in dBµV/m
- C_F: Transducer in dB = AF (antenna factor) + CL (cable loss)
- D_F : distance correction factor (if different measurement distance used than specified in the standard
- L_T : Limit in dBµV/m

VERDICT

Summary of measurement results for radiated emissions above 1 GHz : Passed

5.4. 20-dB Bandwidth, FCC 15.247 (a)(1), RSS210: A8.1(b)

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
otherwise	☒20dB Attenuator			☒ cable K5		

REFERENCES: §15.247(a)(1), RSS210: A8.1(b)

(1) *Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.*

(2) *DSSS Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.*

MEASUREMENT METHOD:

The measurement to confirm the above requirement is performed in two separate steps: first the 20-dB bandwidth is measured and recorded, in a second step the frequency carrier separation measured with hopping mode turned on. After these two steps a pass/fail verdict can be made.

STEP 1: 20-DB BANDWIDTH

The measurement was performed with the RBW set to 10kHz. The span was set to cover the complete carrier. Three carrier frequencies (low/middle/high) were used for showing the compliance with this requirement. A DELTA Marker method was set to measure the bandwidth compared to the highest In-Band power. The operating modes have been varied (e.g. data rate, modulation scheme, etc.). If applicable the hopping-mode is switched off.

Also the **99% emission bandwidth** was measured. Two markers are placed on frequency points such that left to lower f-marker and right to higher f-marker only 1% of the TX-power is contained. Between the markers, 99% of the power is laying. The RBW value is re-adjusted and the measurement repeated until the RBW/EBW ratio is around 1%.

SETTINGS ON SPECTRUM-ANALYZER:

Span	Set as to fully display the emissions and approximative 20dB below the PEAK level
Resolution Bandwidth (RBW)	Set to approx 1% of the emission width
Video Bandwidth (VBW)	3 times the resolution bandwidth
Sweep time	Coupled and low enough to have no gaps within power envelope
Detector	Sample (if bin width: Span/no. of frequency points SA < 0.5*RBW SA otherwise Peak detector)
Sweep mode	Repetitive Mode, MAX-HOLD

RESULTS TO STEP 1:

Set-Up No. 1 Op. Mode 1	20 dB BANDWIDTH [MHz]		
T_{NOM} =21°C, V_{NOM} = 3V	Low channel = 0 (2402 MHz)	Middle channel = 20 (2442 MHz)	High channel = 40 (2482 MHz)
Results	1.360576923	1.365384615	1.360576923

Remark: Remarks: see also diagrams enclosed

Set-up No. 1 Op. Mode 1	99% EMISSION BANDWIDTH [MHz]		
T_{NOM} =21°C, V_{NOM} = 3V	Low channel = 0 (2402 MHz)	Middle channel = 20 (2442 MHz)	High channel = 40 (2482 MHz)
Results	1.345352564	1.345352564	1.345352564

Remark: Remarks: see also diagrams enclosed

5.5. Channel carrier frequency separation, FCC 15.247 (a)(1), RSS210: A8.1(b)

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
otherwise	☒20dB Attenuator			☒ cable K5		

REFERENCES: §15.247(a)(1), RSS210:A8.1(b)

(1) FHHS Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

(2) DSSS Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

MEASUREMENT METHOD

The measurement to prove this requirement was performed with a low RBW of 100kHz, peak detector and trace Hold-Max function in order to resolve each frequency carrier separately.

The span of the frequency analyzer was set to cover the carrier investigated as well as its neighbour channels. A frequency DELTA Marker method was set to measure the frequency separation between the channels.

RESULTS TO STEP 2:

Set-up No. 1 Op. Mode 3	CHANNEL SEPARATION
T_{NOM} =21°C, V_{NOM} =3V	Measured around middle channel (2442 MHz)
Measured Result	2.0032 MHz
Applicants declared value	2.0 MHz

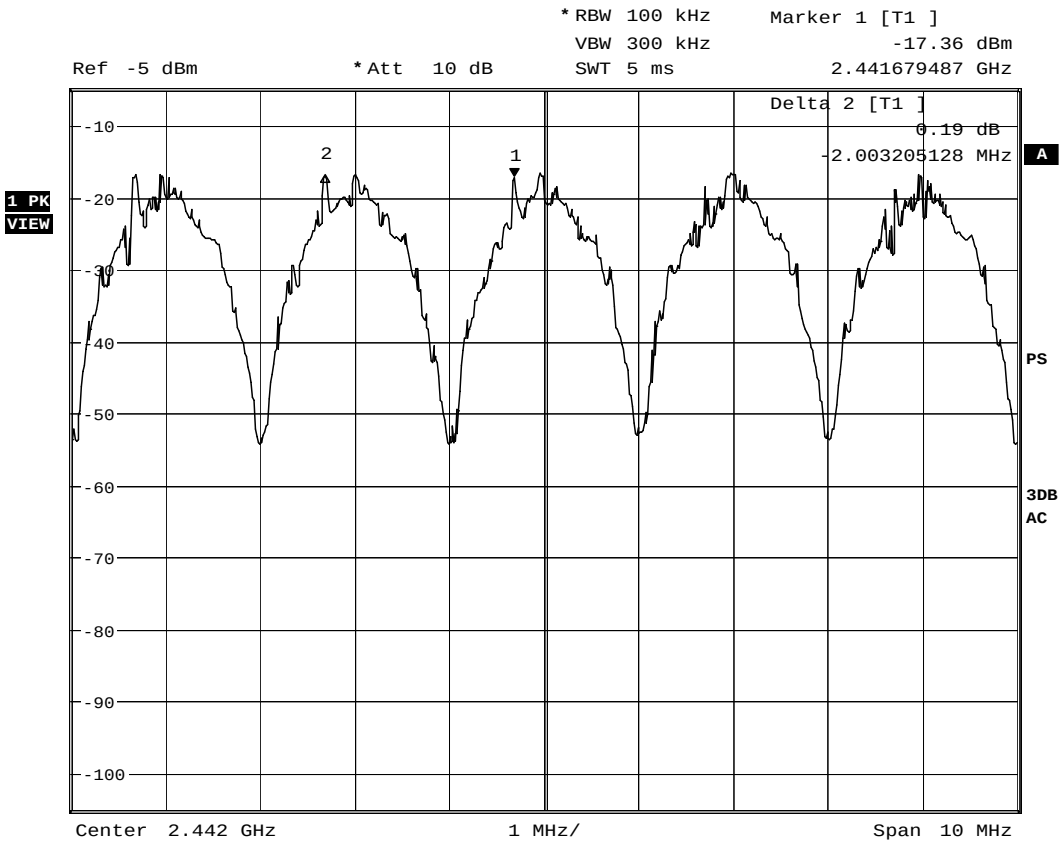
LIMIT

Either:

1. 25 kHz or 20dB BW: 1.365 MHz BW

Or

2. 25kHz or 2/3of 20dB BW if Power<125mW: 0.91 MHz



Date: 22.OCT.2008 11:43:06

Diagram – carrier frequency separation

VERDICT: pass

5.6. Requirements on channel use, average channel use, input bandwidth and synchronization between signals, FCC §15.247(a)(1), RSS210: A8.1(b)

REQUIREMENT:
The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

RESULT:
Tests are not performed by CETECOM. The above requirement is implemented in the firmware of the device. Please find applicants separate declaration for detailed information of the implementation of this requirement, named annex B_2_20757120b/08-A3.pdf

REQUIREMENT:
Each frequency must be used equally on the average by each transmitter.

RESULT:
Tests are not performed by CETECOM. The above requirement is implemented in the firmware of the device. Please find applicants separate declaration for detailed information of the implementation of this requirement named annex B_2_20757120b/08-A3.pdf

REQUIREMENT:
The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and ..

RESULT:
Tests are not performed by CETECOM. Please find applicants separate declaration for detailed information of the implementation of this requirement, named annex B_2_20757120b/08-A3.pdf

REQUIREMENT:
The system receivers shall shift frequencies in synchronization with the transmitted signals.

RESULT:
Tests are not performed by CETECOM. The above requirement is implemented in the firmware of the device. Please find applicants separate declaration for detailed information of the implementation of this requirement, named annex B_2_20757120b/08-A3.pdf

5.7. Hopping channel numbers and time of occupancy, FCC 15.247 (a)(1)(iii), RSS210: A8.1(d)

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒20dB Attenuator			☒ cable K5		

REFERENCE: §15.247(A)(1)(III) AND RSS210, ISSUE 7 A8.1(d)

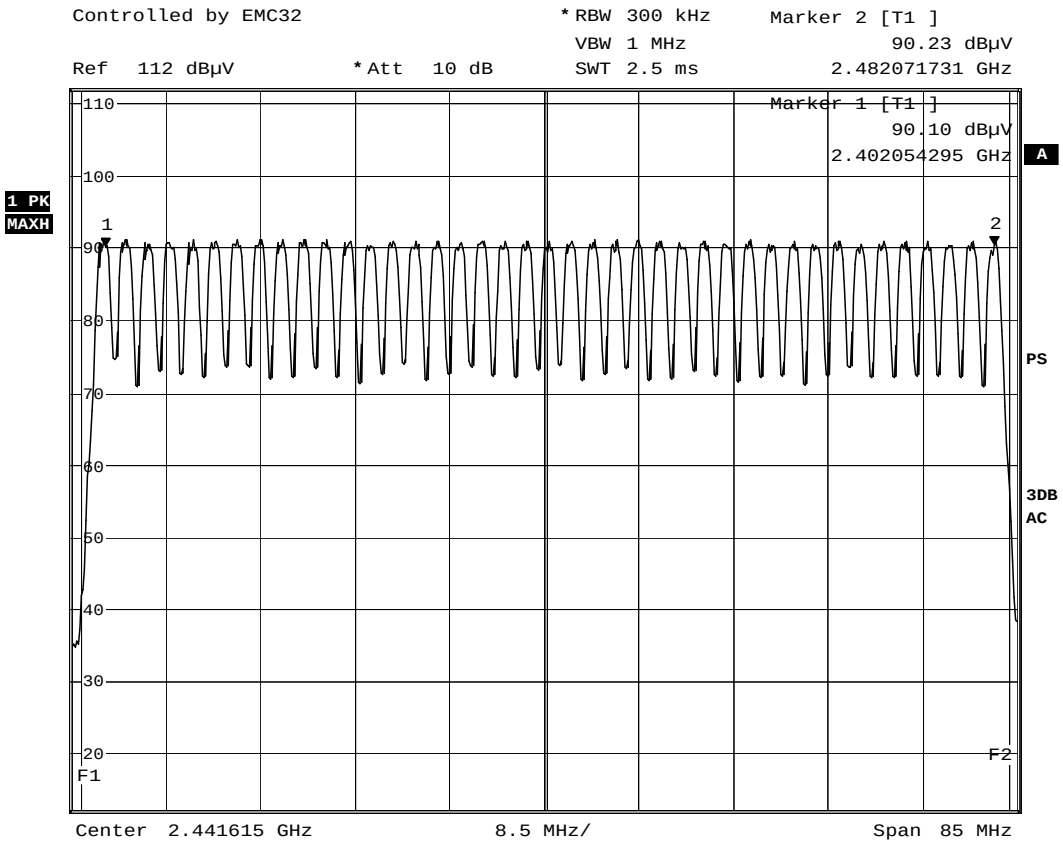
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

METHOD FOR MEASUREMENT OF THE CHANNEL NUMBERS:

The measurement was performed with spectrum analyzer's RBW set to 300kHz. The device was set to work within the defined specification with frequency hopping mode set on. The spectrum-analyzer was set to MAX-Hold positive peak detector mode. After a certain time the stabilized trace is recorded and the number of channels counted.

RESULTS

SET-UP NO. 3 OP. MODE 3	NUMBER OF CHANNELS
T_{NOM} =21°C, V_{NOM} =3 V	41



Date: 22.OCT.2008 11:04:10

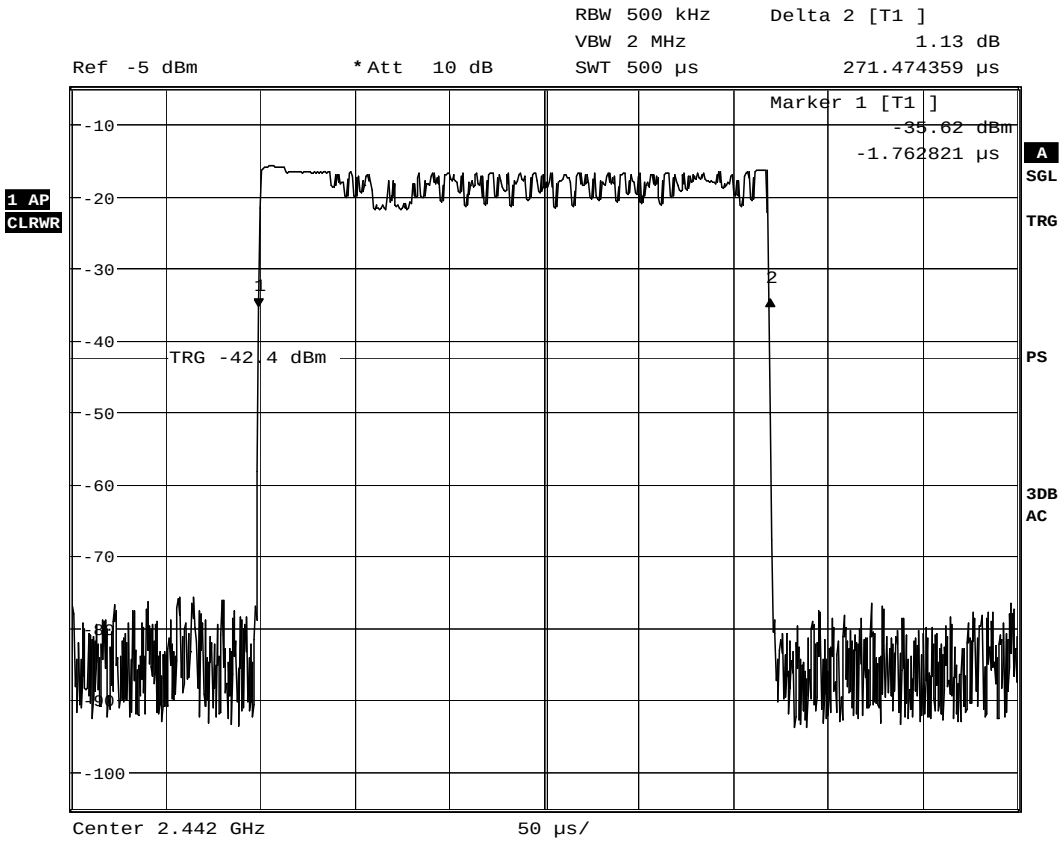
Diagram – channel numbers

METHOD FOR MEASURING THE OCCUPANCY TIME:
The measurement was performed with a spectrum analyzer set to ZERO span. The device was set to work within the defined specification with frequency hopping mode turned on. The spectrum-analyzer was set the MAX-Hold positive peak detector mode. The sweep time set as long as necessary to capture the full signal burst per hopping channel. The burst on-period is captured by setting appropriate markers in the rising and falling edges.

RESULTS

SET-UP NO. 3 OP-MODE: 3	**OCCUPANCY TIME**		
	Low Channel	Middle Channel	High Channel
T_{NOM} =21°C, V_{NOM} = 3V	271.474359 µs	271.474359 µs	271.474359 µs

Remark:--



Date: 22.OCT.2008 11:35:03

Diagram – Time Slot (TX-on)

Calculations:

The total occupancy time of one channel per allowed time period is calculated as follows:

Time period for calculating the Dwell time: 0.4s * 41 Channels employed = 16.4 seconds as time period

Time Slot length: 271.474359µs (measured on channel 20)
Hopping rate: 125 1/s (=1/8ms) as declared by the customer

Formula for calculating the dwell time:

Dwell Time: $Timeslot\ \ length\ \cdot \frac{Hop\ \ rate}{number\ \ of\ \ hopping\ \ channels} \cdot time\ \ period$

Therefore:

Dwell time: $271\ .474359\ \ \mu s \cdot \frac{125\ \frac{1}{s}}{41\ channels} \cdot 16\ .4\ s\ =\ 0\ .0135737\ \ \ s \leq 0\ .4\ s$

VERDICT: Pass

5.8. Power specification FCC 15.247 (b)(1), RSS-210: A8.4(2)

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☒ 443 System CTC-FAR-EMI-		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒20dB Attenuator			☒ cable K5		

REFERENCE: §15.247(B)(1) AND RSS-210: A8.4 (2)

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(1) For frequency hopping systems (FHHS) 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. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
(3) For systems using digital modulation (DSSS) in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. 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. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ANTENNA CHARACTERISTICS:

☒ Directional Gain < 6 dBi (measured: difference between measured conducted and radiated eirp. power)
☐ Directional Gain > 6 dBi (measured / applicant's declaration) -> conducted power reduction necessary

MEASUREMENT METHOD:
The measurement was performed in non-hopping transmission mode with the carrier set to lowest/middle and highest channel. The power was also checked for different data rates, modulation scheme or packet types if applicable.

SETTINGS ON SPECTRUM-ANALYZER:

Center Frequency	Nominal channel frequency
Span	8 MHz
Resolution Bandwidth (RBW)	3 MHz > 20dB-Bandwidth of the signal
Video Bandwidth (VBW)	3 times the resolution bandwidth = 10MHz
Sweep time	coupled
Detector	Peak, Max hold mode
Sweep Mode	Repetitive mode

CONDUCTED MEASUREMENT: MAX. PEAK POWER

- Maximum declared antenna gain [isotropical]:

RESULTS

MAX PEAK POWER (conducted)			
SET-UP: 1 OP-MODE: 1	Low channel (2402 MHz)	Middle channel (2442 MHz)	High channel (2482 MHz)
Measured Peak power [dBm]	-15.81	-16.01	-16.22
Correction factor- Path loss: [dB] 20dB Attenuator Cable attenuation	 19.86 1.10	 19.77 1.10	 19.86 1.10
Resulting Peak Power	 5.15 dBm 3.27 mW	 4.86 dBm 3.06 mW	 4.74 dBm 2.97 mW
Limit	125 mWatt (21dBm)		

VERDICT: passed

5.8.1. RADIATED MEASUREMENT: MAX. E.I.R.P POWER

Test location and equipment (for reference numbers please see chapter 'List of test equipment')

test site	☐ 441 EMI SAR	☐ 348 EMI cond.	☒ 443 EMI FARr	☐ 347 Radio.lab.	☐ 337 OATS	☐
equipment	☐ 331 HC 4055	☐	☐	☐	☐	☐
Spectr. analys.	☐ 138 139 FSBS	☐ 120 FSEM	☒ 264 FSEK	☐ 489 ESU	☐	☐
antenna meas	☐ 048 3143	☐ 289 CBL 6141	☐ 439 HL 562	☒ 133 EMCO3115	☐ 302 BBHA9170	☐ 477 GPS
antenna meas	☐ 123 HUF-Z2	☐ 132 HUF-Z3	☐ 030 HFH-Z2	☐	☐	☐
antenna subst	☐ 071 HUF-Z2	☐ 020 EMCO3115	☐ 063 LP 3146	☐ 303 BBHA9170	☐	☐
power meter	☐ 009 NRV	☐ 010 URV5-Z2	☐ 011 URV5-Z2	☐	☐	☐
Signalgener.	☐ 008 SMG	☐ 140 SMHU	☐ 263 SMP04	☐	☐	☐
power meter	☐ 262 NRV-S	☐ 266 NRV-Z31	☐ 265 NRV-Z33	☐ 261 NRV-Z55	☐ 356 NRV-Z1	☐
DCpower	☐ 086 LNG50-10	☐ 087 EA3013	☐ 354 NGPE 40	☐ 349 car battery	☐ 350 Car battery	☐

MEASURING METHOD:

The method is according ANSI/TIA/EIA-603-C-2004 and consist of two steps.

First step: The maximum power was recorded by turning the EUT continuously 360 degree steps, the EUT in horizontal (laying) and vertical (standing) position. Measurements have been performed with the measurement antenna set to horizontal and vertical polarisation. The spectrum analyzer was set to MAX-PEAK Detector, MAX-Hold Mode. The RBW used was bigger than the 20-dB bandwidth of the EUT and set to 3 MHz. VBW set to 10MHz with coupled sweep time. The maximum trace peak value was recorded.

Second step: a horn antenna was set instead of the EUT and connected to the signal generator. The level was adjusted such as the same level as in step 1 could be reached. The conducted power delivered to the antenna was measured and the value corrected with the known antenna eirp-gain.

RADIATED MEASUREMENT: MAX. EIRP POWER

MAXIMUM RADIATED EIRP			
Set-up 2 Op. Mode 1	Low channel (2402 MHz)	Middle channel (2442 MHz)	High channel (2482 MHz)
Determined eirp Power [dBm]	2.47 (V) 2.07 (H)	1.84 (V) 2.91 (H)	3.13 (V) 2.78 (H)

Remark:--

VERDICT: pass, Maximum value: 3.13 dBm (antenna gain < 6 dBi)

5.9. 20dBc Emission specification FCC 15.247 (d), RSS210: A8.5

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒20dB Attenuator			☒ cable K5		

REFERENCES: §15.247, §15.205, RSS-210: A8.5

(d) 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

MEASUREMENT METHOD:

The frequency spectrum was investigated for spurious emissions values lower than 20dB related to the RF-carrier power value. Three carrier frequencies (low/middle/high channel) were used for showing the compliance with this requirement. The detector were chosen according §15.209(d). The video bandwidth (VBW) was chosen 10 times the resolution bandwidth (RBW). The frequency scan was up to 10 times the highest channel frequency within the operational mode. The spectrum-analyzer was set to MAX-PEAK Detector, MAX-Hold Mode

Set-up 1 Op. Mode 1	**RF-CONDUCTED TEST: 20 dBc SPURIOUS EMISSIONS**					
Frequency Range	Low channel (2402 MHz) Level Reference (In-Band) = 90.65 dBµV		Middle channel (2442 MHz) Level Reference (In-Band) = 90.35 dBµV		High channel (2482 MHz) Level Reference (In-Band) = 90.14 dBµV	
	Frequency [MHz]	Value [dBc]	Frequency [MHz]	Value [dBc]	Frequency [MHz]	Value [dBc]
30 .. 1000 MHz	657.102	51.08	634.6701923	52.37	413.54951	52.9
1 GHz .. 18 GHz	2355.128205	50.47	2395.511281	50. 8	1872.75641	52.36
18GHz .. 25 GHz	4795.128205 7212.496795	44.02 45.53	3568.403846 4867.288462 7320.737179 14175.96153	45.2 45.25 44.1 44.91	4963.740385 7443.910256	48.76 51.79

Remark: Remarks: see also diagrams enclosed
The limit on the diagrams is 20dB under the reference level measured In-Band for each channel

VERDICT: pass

5.10. Power Spectral Density (PSD) FCC 15.247(e), RSS210: A8.3

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☐ Please see Chapter. 2.2.2		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒20dB Attenuator			☒ cable K5		

REFERENCES: §15.247(E), RSS-210:A8.3

(e) 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 this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

METHOD

A frequency sweep around nominal carrier frequency is performed over the complete power envelope of the signal with PEAK detector, MAX hold mode. The maximum peak is located and the frequency recorded. With the nominal frequency set to the determined frequency in the step before, a new frequency sweep is performed with a reduced resolution bandwidth of 3kHz. The resulting value is compared with the standard requirement.

RESULTS

SET-UP 1 **OP. MODE 1**	**POWER SPECTRAL DENSITY**		
	Low channel (2402 MHZ)	Middle channel (2442 MHZ)	High channel (2482 MHZ)
Measured Level [dBm/3kHz]	-23.55	-23.46	-24.05
Correction factor- Path loss: [dB] 20-dB Attenuator Cable attenuation	 19.86 1.10	 19.77 1.10	 19.86 1.10
Resulting Power spectral density [dBm/3kHz]	-2.59	-2.59	-3.09
Limit	< 8dBm/3kHz		

Remark: Remarks: see also diagrams enclosed

VERDICT: pass

5.11. Band-Edge compliance measurements, FCC 15.247(d), RSS210: A8.5

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	☒ CETECOM Essen (Chapter. 2.2.1)		☒ 443 System CTC-FAR-EMI-		☐ Please see Chapter. 2.2.3	
test site	☐ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS	☒ 347 Radio.lab.	☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☒20dB Attenuator			☒ cable K5		

MEASUREMENT METHOD:
A Delta marker method was used for showing compliance to restricted bands according §15.205. The method is according Public Notice "Marker-Delta method", Extract from DA00-705. The method consists of three independent steps:

1. Step: Prior to the measurement the fundamental radiated In-Band field strength was performed. The determined value is used as reference value.
2. Step: Second step consist of finding the relative attenuation between the fundamental emission and the maximum local out-of-band emission (within 2 MHz range around the band edge either on the band-edge directly or some modulation product if the level is greater than that on the band-edge) when measured with lower resolution bandwidth.
3. Step: The delta value recorded in step 2 will be subtracted from value recorded in step 1, thus giving the required field strength at the band-edge. This value must fulfil the requirements for radiated spurious emissions in restricted bands in §15.205 with the general limits of §15.209.

For frequency-hopping systems the measurement is done in hopping mode on and off.

RESULTS

Hopping mode off

Set-up: 1 Op. Mode: 1				
T_{NOM} = 21°C, V_{NOM} = 5V	Fundamental field strength-radiated [dBµV/m]	Delta Marker Value [dB]	Value at Band-Edge [dBµV/m]	Verdict
Channel Low	91.20	56.45	34.75 (Peak)	Passed
Channel High	90.40	44.92	45.48 (Peak)	Passed

Remarks: see also diagrams enclosed

Hopping mode on

Set-up: 3 Op. Mode: 3				
T_{NOM} = 21°C, V_{NOM} = 5V	Fundamental field strength-radiated [dBµV/m]	Delta Marker Value [dB]	Value at Band-Edge [dBµV/m]	Verdict
Channel Low	91.20	56.97	34.23 (Peak)	Passed
Channel High	90.40	43.29	47.11 (Peak)	Passed

Remarks: see also diagrams enclosed

VERDICT: pass

5.12. Measurement uncertainties

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved.

For uncertainty determination, each component used in the concrete measurement set-up was taken in account and it's contribution to the overall uncertainty according it's statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

Measurement	Frequency range	Calculated uncertainty based on a confidence level of 95%	Remarks:
RF-Power Output conducted	9 kHz .. 20 GHz	1 dB	--
RF-Power Output radiated	30 MHz .. 4 GHz	3.17 dB	Substitution method
Conducted RF-emissions on antenna ports	9 kHz .. 20 GHz	1 dB	--
Radiated RF-emissions enclosure	150 kHz .. 30 MHz	5 dB	Magnetic field
	30 MHz .. 1 GHz	4.2 dB	E-Field
	1 GHz .. 18GHz	4.8 dB	E-Field
	1 GHz .. 20 GHz	3.17 dB	Substitution method
Occupied bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker method)	Frequency error
		1 dB	Power
Emission bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker method)	Frequency error
		1 dB	Power
Frequency stability	9 kHz .. 20 GHz	0.0636 ppm	--
Conducted emissions on AC-mains port (U_{CISPR})	9 kHz .. 150 kHz 150 kHz .. 30 MHz	4 dB	--

Table : measurement uncertainties, valid for conducted/radiated measurements

6. Instruments and Ancillary

6.1. Used equipment "CTC"

The "Ref.-No" in the left column of the following tables allows the clear identification of the laboratory equipment.

6.1.1. Test software and firmware of equipment

Ref.-No.	Equipment	Type	Serial-No.	Version of Firmware or Software during the test
001	emi test receiver	ESS	825132/017	Firm.= 1.21 , OTP=2.0, GRA=2.0
003	spectrum monitor (EMI Ltg)	EZM	883580/001	?
012	signal generator (EMS-cond.)	SMY 01	839069/027	Firm.= V 2.02
013	power meter (EMS cond.)	NRVD	839111/003	Firm.= V 1.51
017	Communication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT Firmware D2.87
053	audio analyzer	UPA3	860612/022	Firm. V 4.3
119	RT harmonics analyser/dig. flickermeter	B10	G60547	Firm.= V 3.1DHG
120	spectrum analyzer	FSEM 30	845538/011	Bios=2.1, Analyzer-Firmware= 3.30.3
140	signal generator	SMHU	831314/006	Firm.= 3.21
261	thermal power sensor	NRV-Z55	825083/0008	EPROM-Datum 02.12.04, SE EE 1 B
262	power meter	NRV-S	825770/0010	Firm.= 2.6
263	signal generator	SMP 04	826190/0007	Firm.=3.21
264	spectrum analyzer	FSEK 30	826939/005	Bios=2.1, Analyzer= 3.20
277	Vector-Networkanalyzer	ZVC	831363/0005	Bios= 3.3, Analyzer=3.52
295	Racal Digital Radio Test Set	6103	1572	UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04,
298	Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f.
323	Communication Tester	CMD 55	825878/034	Firm.= 3.52 .22.01.99
331	climatic test chamber -40/+80 Grad	HC 4055	43146	TSI 1.53
335	System-CTC-EMS-Conducted	System EMS Conducted	-	EMS-K1 Immunity Test-Software 1.20SR10
340	Communication Tester	CMD 55	849709/037	Firm.= 3.52 .22.01.99
355	power meter	URV 5	891310/027	Firm.= 1.31
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Eprom Data = 31.03.08
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	Firm. UCS 500=001925/3.06a02, rc=ISMIEC 4.10
371	Bluetooth Tester	CBT32	100153	CBT V4.6.1 + SW-Option K55
377	emi test receiver	ESCS 30	100160	Firm.= 2.29, OTP= 02.01, GRA= 02.36
378	broadband RF field monitor	RadiSense III	03D00013SNO-08	Firm.= V.03D13
383	signal generator	SME 03	842 828 /034	Firm.= 4.61
389	digital multimeter	Keithley 2000	0583926	Firm. = A13 (Mainboard) A02 (Display)
392	Radio Communication Tester	MT8820A	6K00000788	Firm.= 4.50 #005, IPL=4.01#001,OS=4.02#001,
420	System CTC CTIA-OTA	System CTC CTIA-OTA	-	EMQuest EMQ-100 Ver. 1.05
436	Radio Communication Tester	CMU 200	103083	R&S Test Firmware Base=4.53, Mess-Software=4.52
441	System CTC-SAR-EMI	System EMI field (SAR)	-	EMC 32 Version 6.10. 3, ESXS-K1 Version 2.20
442	System CTC-SAR-EMS	System EMS field (SAR)	-	EMS-K1 Immunity-Software 1.20SR10
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	Spuri 6.4a und Spuri 7.0
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	EMS-K1 Immunity-Software 1.20SR10
460	Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=4.52/Messsoftware=4.51
489	emi test receiver	ESU40	1000-30	Firmware=3.93, Bios=V5.1-16-3, Specification=01.00
491	ESD Simulator dito	ESD dito	dito307022	V 2.30
524	Voltage Drop Simulator	VDS 200	0196-16	Software Nr: 000037 Version V4.20a01
526	Burst Generator	EFT 200 A	0496-06	Software Nr. 000034 Version V2.32
527	Micro Pulse Generator	MPG 200 B	0496-05	Software-Nr. 000030 Version V2.43
528	Load Dump Simulator	LD 200B	0496-06	Software-Nr. 000031 Version V2.35a01

6.1.2. Single instruments and test systems

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
001	emi test receiver	ESS	825132/017	Rohde & Schwarz	12 M	-	31.03.2009
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	31.03.2009
007	DC - LISN (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	31.03.2009
009	power meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	12 M	-	31.03.2009
012	signal generator (EMS-cond.)	SMY 01	839069/027	Rohde & Schwarz	36/12 M	-	31.03.2011
013	power meter (EMS cond.)	NRVD	839111/003	Rohde & Schwarz	12 M	-	31.03.2009
014	insertion unit (EMS cond.)	URV5-Z2	838519/029	Rohde & Schwarz	12 M	-	31.03.2009
015	insertion unit (EMS cond.)	URV5-Z4	838570/024	Rohde & Schwarz	12 M	-	31.03.2009
016	line impedance simulating network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	31.10.2010
017	Communication Tester	CMD 60 M	844365/014	Rohde & Schwarz	12 M	-	31.03.2009
020	horn antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36/12 M	-	31.03.2010
021	loop antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	31.03.2010
022	audio measurement amplifier	2636C	1537643	Brüel & Kjaer	12 M	-	31.03.2009
030	loop antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2009
031	absorbing clamp	MDS-21	863325/015	Rohde & Schwarz	24/12 M	-	31.03.2009
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	12 M	-	31.03.2009
048	bicon. - log. antenna (SAR)	3143	1108	EMCO	36/12 M	-	30.04.2011
049	current clamp (injection)	F-120-2	48	FCC	12 M	-	31.03.2009
050	3-ph coupling-decoupling-netw. (Burst)	CDN 300	176	Schaffner	12 M	-	31.03.2009
051	VHF-current probe 20-300 MHz	ESV-Z1	872421	Rohde & Schwarz	12 M	-	31.03.2009
052	notch filter DECT	WRCB 1887,82/1889,55SS	12	Wainwright Industries	12 M	-	31.03.2009
053	audio analyzer	UPA3	860612/022	Rohde & Schwarz	36 M	-	31.03.2011
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	-	1a	30.04.2009
058	capacitive clamp (Burst)	IP 4	99	Hafely	-	4	
059	ferrite tube	FGZ 40 X 15 E	4225	Lüthi	36 M	-	31.03.2010
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
061	ferrite tube	FGZ 40 X 15 E	4250	Lüthi	36 M	-	31.03.2010
063	log.-per. antenna (Subst 1)	3146	860941/007	EMCO	36/12 M	-	31.10.2010
065	attenuator, (6 dB) 50 Ohm, 250W	AT 50-6-250	521057	BNOS Electronics	12 M	1b	30.04.2009
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-	5	Wainwright GmbH	12 M	-	31.03.2009
067	coupling decoupling-network	CDN801-M2/M3	272	Lüthi	12 M	-	31.03.2009
068	coupling decoupling-network	CDN 801-M5	95226	Lüthi	12 M	-	31.03.2009
069	EM - clamp	EM101	9535159	Lüthi	36 M	-	31.03.3009
070	ferrite tube	FTC101	4199	Lüthi	24/12 M	-	31.03.2010
071	biconical antenna (Subst 1)	HUF-Z2	863.029/010	Rohde & Schwarz	36/12 M	-	31.10.2010
072	coupling decoupling-network	CDN801-M2/M3	276	Lüthi	12 M	-	31.03.2009
079	4 wire T-network	EZ-10	862 939 / 011	Rohde & Schwarz	24/12 M	-	31.03.2009
083	AC - power supply, 0-10 A	EAC/MT 27010	910502096	EURO TEST	pre-m	2	
084	AC - power supply, 0-5 A	ELABO-8-34214	-	ELABO	pre-m	2	
085	AC - power supply, 0-10 A	R250	-	Schunterm.&Benningh.	pre-m	2	
086	DC - power supply, 0 -10 A	LNG 50-10	-	Heinzinger Electronic	pre-m	2	
087	DC - power supply, 0 -5 A	EA-3013 S	-	Elektro Automatik	pre-m	2	
090	Helmholtz coil: 2x10 coils in series	-	-	RWTÜV	pre-m	4	
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
094	artificial head (No.1)	4905	1566990	Brüel & Kjaer	pre-m	2	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	12 M	-	31.03.2009
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	12 M	-	31.03.2009
110	USB-LWL-Converter	OLS-1	-	Extreme USB	-	4	
119	RT harmonics analyser/dig. flickermeter	B10	G60547	BOCONSULT	36 M	-	31.03.2010
120	spectrum analyzer	FSEM 30	845538/011	Rohde & Schwarz	12 M	-	31.03.2009
121	notch filter GSM 1900	WRCB 1879,5/1880,5EE	15	Wainwright GmbH	12 M	-	31.03.2009
122	notch filter GSM 1800	WRCB 1747/1748	12	Wainwright GmbH	12 M	-	31.03.2009
123	biconical antenna (Subst 2)	HUF-Z2,	860941/007	Rohde & Schwarz	36/12 M	-	31.03.2010
131	RF-Current Probe	F-52	19	FCC	12 M	-	31.03.2009
132	log.-per. antenna (Subst 2)	HUF-Z3	860862/014	Rohde & Schwarz	36/12 M	-	31.03.2010
133	horn antenna 18 GHz (Meas 1)	3115	9012-3629	EMCO	36/12 M	-	31.03.2010
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	12 M	-	31.03.2009
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	12 M	-	31.03.2009
137	1000 Hz calibrator 94 dB SPL	4230 94 dB	1 594 698	Brüel & Kjaer	12 M	-	31.03.2009
140	signal generator	SMHU	831314/006	Rohde & Schwarz	24/12 M	-	31.03.2010
142	attenuator (6 dB) 2 W, 8 GHz	DGL N	-	Radiall	12 M	1b	30.04.2009
248	attenuator	SMA 6dB 2W	-	Radiall	pre-m	2	
249	attenuator	SMA 10dB 10W	-	Radiall	pre-m	2	
252	attenuator	N 6dB 12W	-	Radiall	pre-m	2	
254	high pass GSM1800/1900/DECT	5HC 2600/12750-1.5KK	23042	Trilithic	12 M	-	31.03.2009
256	attenuator	SMA 3dB 2W	-	Radiall	pre-m	2	
257	hybrid	4031C	04491	Narda	pre-m	2	
260	hybrid coupler	4032C	11342	Narda	pre-m	2	
261	thermal power sensor	NRV-Z55	825083/0008	Rohde & Schwarz	24/12 M	-	31.03.2010
262	power meter	NRV-S	825770/0010	Rohde & Schwarz	24/12 M	-	31.03.2010
263	signal generator	SMP 04	826190/0007	Rohde & Schwarz	36/12 M	-	31.03.2010
264	spectrum analyzer	FSEK 30	826939/005	Rohde & Schwarz	12 M	-	31.03.2009
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24/12 M	-	31.03.2010
266	peak power sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24/12 M	-	31.03.2010
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH	12 M	-	31.03.2009
268	AC/DC power supply	EA 3050-A	9823636	-	pre-m	2	
270	termination	1418 N	BB6935	Weinschel	pre-m	2	
271	termination	1418 N	BE6384	Weinschel	pre-m	2	
272	attenuator (20 dB) 50 W	Model 47	BF6239	Weinschel	pre-m	2	

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
273	attenuator, (10 dB) 100 W	Model 48	BF9229	Weinschel	pre-m	2	
274	attenuator (10 dB) 50 W	Model 47 (10 dB) 50 W	BG0321	Weinschel	pre-m	2	
275	DC-Block	Model 7003 (N)	C5129	Weinschel	pre-m	2	
276	DC-Block	Model 7006 (SMA)	C7061	Weinschel	pre-m	2	
277	Vector-Networkanalyzer	ZVC	831363/0005	Rohde & Schwarz	12 M	-	31.03.2009
279	power divider	1515 (SMA)	LH855	Weinschel	pre-m	2	
284	coupling decoupling network	CDN 801-M1	1661	Lüthi	12 M	-	31.03.2009
285	coupling decoupling network	CDN 801-S1	1642	Lüthi	12 M	-	31.03.2009
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	-	31.03.2009
289	bicon. - log. antenna (OATS)	CBL 6141	4107	Schaffner Chase	36/12 M	-	31.10.2010
290	notch filter GSM 900	WRCA 901,9/903,1SS	3RR	Wainwright GmbH	12 M	-	31.03.2009
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH	12 M	-	31.03.2009
295	Racal Digital Radio Test Set	6103	1572	Racal	24/12 M	3	31.03.2009
298	Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	12 M	-	31.03.2009
299	audio microphone	134	-	Brüel & Kjaer	pre-m	2	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	12 M	-	31.03.2009
301	attenuator (20 dB) 50W, 18GHz	47-20-33	AW0272	Lucas Weinschel	pre-m	2	
302	horn antenna 40 GHz (Meas 1)	BBHA9170	155	Schwarzbeck	24/12 M	-	31.03.2010
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	24/12 M	-	31.03.2010
304	fix dipole antenna 1,6 GHz	EMCO 3125-307	9907-1001	ETS	24/12 M	-	31.03.2009
305	fix dipole antenna 1,8-2,0 GHz	EMCO 3125-306	9907-1001	ETS	24/12 M	-	31.03.2009
306	fix dipole antenna 2,45 GHz	EMCO 3125-308	9907-1001	ETS	24/12 M	-	31.03.2009
307	fix dipole antenna 3 GHz	EMCO 3125-309	9907-1001	ETS	24/12 M	-	31.03.2009
312	Switch unit	TS-RSP	1000147	R&S	12 M	1f	31.03.2009
317	1000 Hz calibrator 94 dB SPL	4230 94dB	1542286	Brüel & Kjaer	12 M	-	31.03.2009
323	Communication Tester	CMD 55	825878/034	Rohde & Schwarz	12 M	-	31.03.2009
331	climatic test chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	31.10.2009
335	System-CTC-EMS-Conducted	System EMS Conducted	-	Rohde & Schwarz	12 M	5	30.04.2009
340	Communication Tester	CMD 55	849709/037	Rohde & Schwarz	12 M	-	31.03.2009
341	digital multimeter	Fluke 112	81650455	Fluke	24 M	-	31.03.2010
342	digital multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	12 M	-	31.03.2009
344	adaptor 150/50 Ohm	150/50	-	Krohne	12 M	-	31.03.2009
345	adaptor 150/50 Ohm	150/50	-	Krohne	12 M	-	31.03.2009
347	laboratory site	radio lab.	-	-	-	3	
348	laboratory site	EMI conducted	-	-	-	3	
349	car battery 12 V	car battery 12 V	without	-	-	3	
350	car battery 12 V	car battery 12 V	without	-	-	3	
354	DC - power supply 40A	NGPE 40/40	448	Rohde & Schwarz	24 M	-	31.03.2010
355	power meter	URV 5	891310/027	Rohde & Schwarz	12 M	-	31.03.2009
356	power sensor	NRV-Z1	882322/014	Rohde & Schwarz	24/12 M	-	31.03.2009
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24/12 M	-	31.03.2009
358	Power Amplifier 10 kHz-220MHz	AR75A220M1	15860	Amplifier Research	12 M	1b	30.04.2009
362	TOSM Calibration Kit 50 Ohm	ZV-Z21/ZV-Z11	without	Rohde&Schwarz	12 M	-	31.03.2009
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Rohde & Schwarz	24/12 M	-	31.03.2010
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	EM-Test	12 M	-	31.03.2009
367	audio measurement amplifier	2636	316832/001	Brüel & Kjaer	12 M	-	31.03.2009
369	insertion unit (SAR-EMS, Ch. A)	URV5-Z2	100301	Rohde & Schwarz	24/12 M	-	31.03.2010
370	insertion unit (SAR-EMS, Ch. B)	URV5-Z2	100302	Rohde & Schwarz	24/12 M	-	31.03.2009
371	Bluetooth Tester	CBT32	100153	R&S	12 M	-	31.03.2009
373	V-Network 5µH/50 Ohm	ESH3-Z6	100535	Rohde & Schwarz	other	-	31.03.2010
374	power amplifier 0,8-3 GHz	60S1G3	306528	Amplifier Research	-	1a	30.04.2009
375	directional coupler	DC7144M1	306498	Amplifier Research	-	1a	30.04.2009
376	horn antenna 6 GHz	BBHA9120 E	BBHA 9120 E 179	Schwarzbeck	12 M	-	31.03.2009
377	emi test receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	31.03.2009
378	broadband RF field monitor	RadiSense III	03D00013SNO-08	DARE B.V.	12 M	-	31.03.2009
383	signal generator	SME 03	842 828 /034	Rohde & Schwarz	36/12 M	-	31.03.2010
386	coupling decoupling network	CDN USB/p	19397	Schaffner	12 M	-	31.03.2009
387	coupling decoupling network	CDN L-801 M2	2051	Lüthi	12 M	-	31.03.2009
388	coupling decoupling network	CDN L-801 T2	1929	Lüthi	12 M	-	31.03.2009
389	digital multimeter	Keithley 2000	0583926	Keithley	24/12 M	-	31.03.2009
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	31.03.2009
394	power amplifier 80-1000 MHz	BLWA 0810-250/200	045610	Bonn-Elektronik	-	1a	30.04.2009
400	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5559	Lüthi	12 M	-	31.03.2009
401	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5560	Lüthi	12 M	-	31.03.2009
411	Test Cable Kit N 50 Ohm (male)	ZV-Z11	100200	R&S / Rosenberger	pre-m	2	
413	Quad-Ridge Horn Antenna	3164-04	00090667	ETS-Lindgren	12 M	1f	31.03.2009
414	Circulary polarized com. Antenna	3102	00033734	EMCO	-	3	
415	Antenna Position Controller	2090	00035634	ETS-Lindgren	-	4	
416	MAPS Positioner (light duty)	2010	-	ETS-Lindgren	-	4	
420	System CTC CTIA-OTA	System CTC CTIA-OTA	-	ETS-Lindgren/Cetecom	12 M	5	31.03.2009
429	MAPS-Positionier (medium duty)	2015	-	ETS-Lindgren	-	4	
430	Thermo-Hygrometer	H270	54476	Dostmann electronic	24 M	-	30.11.2008
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
432	pre-amplifier 100MHz-26GHz	JS4-00102600-38-5P	1030896	Miteq USA	12 M	-	31.03.2009
436	Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	31.03.2009
439	UltraLog-Antenna	HL 562	100248	Rohde + Schwarz	12 M	-	31.03.2009
441	System CTC-SAR-EMI	System EMI field (SAR)	-	ETS	12 M	5	30.06.2009
442	System CTC-SAR-EMS	System EMS field (SAR)	-	ETS-Lindgren/Cetecom	12 M	5	30.04.2009
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	ETS-Lindgren/Cetecom	12 M	5	30.04.2009
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	ETS Lindgren/Cetecom	12 M	5	30.04.2009
448	notch filter WCDMA FDD II	WRCT 1850.0/2170.0-	5	Wainwright Instruments	12 M	1c	31.03.2009
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-	1	Wainwright Instruments	12 M	1c	31.03.2009
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
455	Oscilloscope	HP 54602B	US 350 336 45	Hawlett Packard	-	4	
456	DC-Power supply 0-5A	EA 3013 S	207810	Elektro Automatik	pre-m	2	

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
457	DC-Power supply, 0-5A	EA-3013 S	9624680	Elektro Automatik	pre-m	2	
459	DC -power supply 0-5 A , 0-32 V	EA-PS 2032-50	910722	Elektro Automatik	pre-m	2	
460	Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	31.03.2009
462	AF-Generator	MX-2020	-	Conrad	-	4	
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
464	Thermo-Hygro-Monitor	WS-9400	without	Europe Supplies Ltd.	24 M	-	30.11.2009
465	Thermo-Hygro-Monitor	WS-9400	without	Europe Supplies Ltd.	24 M	-	30.11.2009
466	digital multimeter	Fluke 112	89210157	Fluke USA	24 M	-	31.03.2010
467	digital multimeter	Fluke 112	89680306	Fluke USA	24 M	-	31.03.2010
468	digital multimeter	Fluke 112	90090455	Fluke USA	24 M	-	31.03.2010
470	Thermo-Hygro-Monitor	WS-9400	-	distr. by Conrad	24 M	-	30.11.2009
476	Spectrum Analyzer	FSM	840500/004	Rohde & Schwarz	24/12 M	-	31.03.2009
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
482	filtermatrix	FilterMatrix SAR 1	-	CETECOM (Brl)	-	1d	
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-	1244554	Miteq	12 M	-	31.03.2009
487	NSA-Verification of CTC-SAR-EMI	System EMI field (SAR)	-	ETS	12 M	-	31.10.2009
489	emi test receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	31.03.2009
490	high pass 2,65 GHz>18GHz	6HC 2650/18000-3-KK	200709138	Trilithic	12 M	-	31.03.2009
491	ESD Simulator dito	ESD dito	dito307022	EM-Test	24 M	-	31.03.2009
494	power supply (GPIB)	Agilent 66332A	US 37474017	Agilent	24/12 M	-	31.03.2009
498	Power Supply	NGPE 40/40	402	Rohde & Schwarz	-	2	
500	industry Acoustic System	MO 2000 Set	100048	Sennheiser	-	4	
502	band reject filter	WRCG 1709/1786-	SN 9	Wainwright	-	-	
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright	-	-	
517	relais switc matrix	HF Relais Box Keithley	SE 04	-	-		
522	electronical load	EL 9000	-	ELV	-	-	
523	Digitalmultimeter	L4411A	MY46000154	Agilent	24 M	-	31.03.2009
524	Voltage Drop Simulator	VDS 200	0196-16	EM Test	18 M	-	31.03.2009
525	Koppelnetzwerk	CNA 200	1196-01	EM Test	18 M	-	31.03.2009
526	Burst Generator	EFT 200 A	0496-06	EM Test	18 M	-	31.03.2009
527	Micro Pulse Generator	MPG 200 B	0496-05	EM Test	18 M	-	31.03.2009
528	Load Dump Simulator	LD 200B	0496-06	EM Test	18 M	-	31.03.2009
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	-	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	2		
531	H-field system	Lackman System	without	Lackmann	-	2	
533	Impedance Stabilization Network	ISN T200A	25706	Teseq	12 M	-	29.04.2009
534	Impedance Stabilization Network	ISN T400A	24881	Teseq	12 M	-	29.04.2009
535	Impedance Stabilization Network	ISN T800	26321	Teseq	12 M	-	28.04.2009
536	Impedance Stabilization Network	ISN ST08	25867	Teseq	12 M	-	28.04.2009

6.1.3. Legend

Note / remarks		Calibrated during system calibration:
	1a	System CTC-SAR-EMS (Ref.-No. 442)
	1b	System-CTC-EMS-Conducted (Ref.-No. 335)
	1c	System CTC-FAR-EMI-spurious emission (Ref.-No . 443)
	1d	System CTC-SAR-EMI (Ref.-No . 441)
	1e	System CTC-OATS (EMI radiated) (Ref.-No. 337)
	1 f	System CTC-CTIA-OTA (Ref.-No . 420)
	1 g	System CTC-FAR-EMS (Ref.-No . 444)
	2	Calibration or equipment check immediately before measurement
	3	Regulatory maintained equipment for functional check or support purpose,
	4	Ancillary equipment without calibration e.g. mechanical equipment or monitoring equipment
	5	Test System

Interval of calibration	12 M	12 month
	24 M	24 month
	36 M	36 month
	24/12 M	Calibration every 24 months, between this every 12 months internal validation
	36/12 M	Calibration every 36 months, between this every 12 months internal validation
	Pre-m	Check before starting the measurement
	-	Without calibration

7. Measurement diagrams

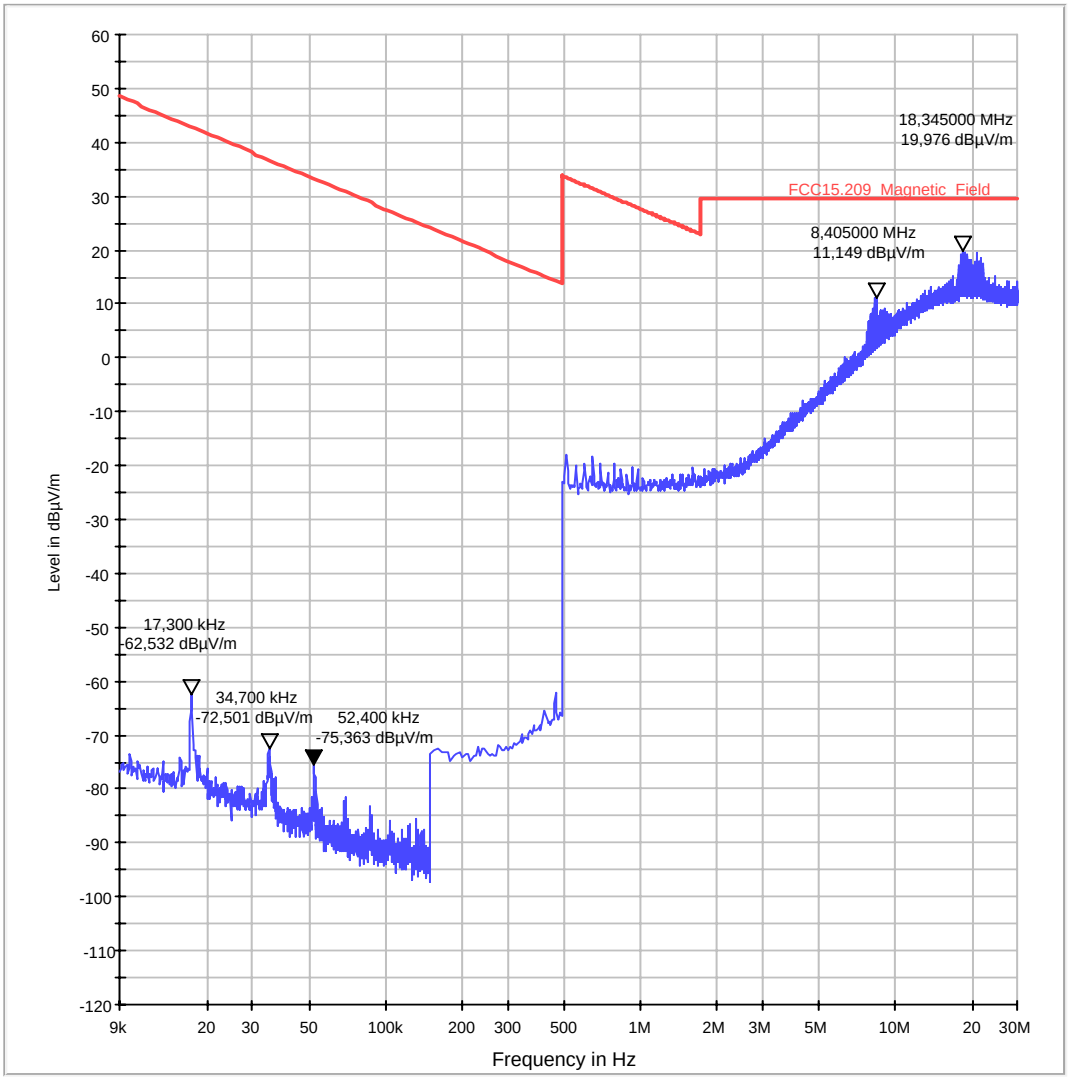
7.0.1. Measurement diagrams – Magnetic field strength (§15.205&15.209)

Diagram No. 2.25

Common Information

Test description:	Magnetic Fieldstrength Measurement
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Measured sides of EUT:	front, right, rear, left sides
Rec. antenna (pre-scan):	height 1.00 m
Rec. antenna (final):	height 1.00 m
Turntable step:	90° during pre-scan, continuously turning during final measurement
Used filter:	--
Test specification.:	FCC 15.209 & 15.247
EUT Name:	Rockband 2 Drum + Headset + Footpedal
Operator:	Lor
Operating conditions:	TX-on, Channel Low

01_FCC_MG_FELD_PK_FAST_H&V_EUT



Scan Setup: 01_FCC_MG_FELD_PK_FAST_H&V_EUT [EMI radiated]

Hardware Setup: HW25_FCC15109_ESCS_MgFeld_ohne_SAR_MATRIX
Level Unit: dBµV/m

Subrange	**Detectors**	**IF Bandwidth**	**Meas. Time**	**Receiver**
9 kHz - 150 kHz	MaxPeak	200 Hz	0,01 s	ESCS 30
150 kHz - 30 MHz	MaxPeak	10 kHz	0,01 s	ESCS 30

Diagram No. 2.26

Common Information

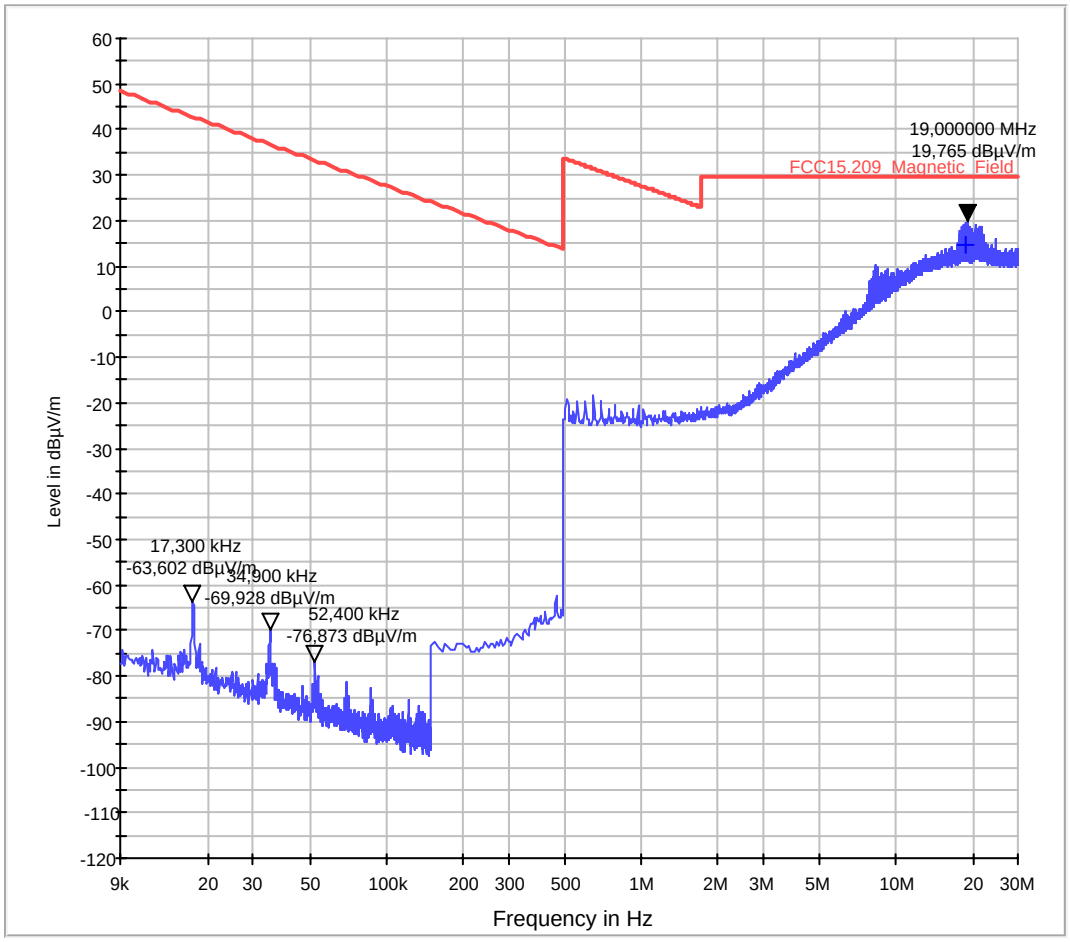
Test description:	Magnetic Fieldstrength Measurement
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Measured sides of EUT:	front, right, rear, left sides
Rec. antenna (pre-scan):	height 1.00 m
Rec. antenna (final):	height 1.00 m
Turntable step:	90° during pre-scan, continuously turning during final measurement
Used filter:	--
Test specification.:	FCC 15.209 & 15.247
Operator:	Lor
Operating conditions:	Tx-on, middle channel

EUT Information

Description:

EUT Name:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix
Serial Number:	--
Hardware Rev:	
Software Rev:	
Comment:	

01_FCC_MG_FELD_PK_FAST_H&V_EUT



Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Average (dBµV/m)	RMS (dBµV/m)	MinPeak (dBµV/m)	CAverage (dBµV/m)	CRMS (dBµV/m)	ACVideo (dBµV/m)
18.670000	---	14.9	---	---	---	---	---	---

(continuation of the "Result Table_Single" table from column 9 ...)

Frequency (MHz)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Comment
18.670000	1000.00	10.000	100.0	H	90.0	2.7	

Scan Setup: 01_FCC_MG_FELD_PK_FAST_H&V_EUT [EMI radiated]

Hardware Setup: HW25_FCC15109_ESCS_MgFeld_ohne_SAR_MATRIX
Level Unit: dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
9 kHz - 150 kHz	MaxPeak	200 Hz	0,01 s	ESCS 30
150 kHz - 30 MHz	MaxPeak	10 kHz	0,01 s	ESCS 30

Hardware Setup: EMI radiated\HW25_FCC15109_ESCS_MgFeld_ohne_SAR_MATRIX - [EMI radiated]

Subrange 1

Frequency Range: 9 kHz - 30 MHz

Receiver: ESCS 30 [ESS]
@ GPIB0 (ADR 19), SN 0, FW 1.21 02.00 02.00

Signal Path: Mg-Feld direkt ohne SAR-Switch-Matrix

Antenna: R&S HFH2-Z2
Correction Table (vertical): FCC_R&S HFH2-Z2 (Mg-Feld)
Correction Table (horizontal): FCC_R&S HFH2-Z2 (Mg-Feld)

Turntable: Kipptisch EUT [Generic Turntable]
@ GPIB0 (ADR 21)

Diagram No. 2.27

Common Information

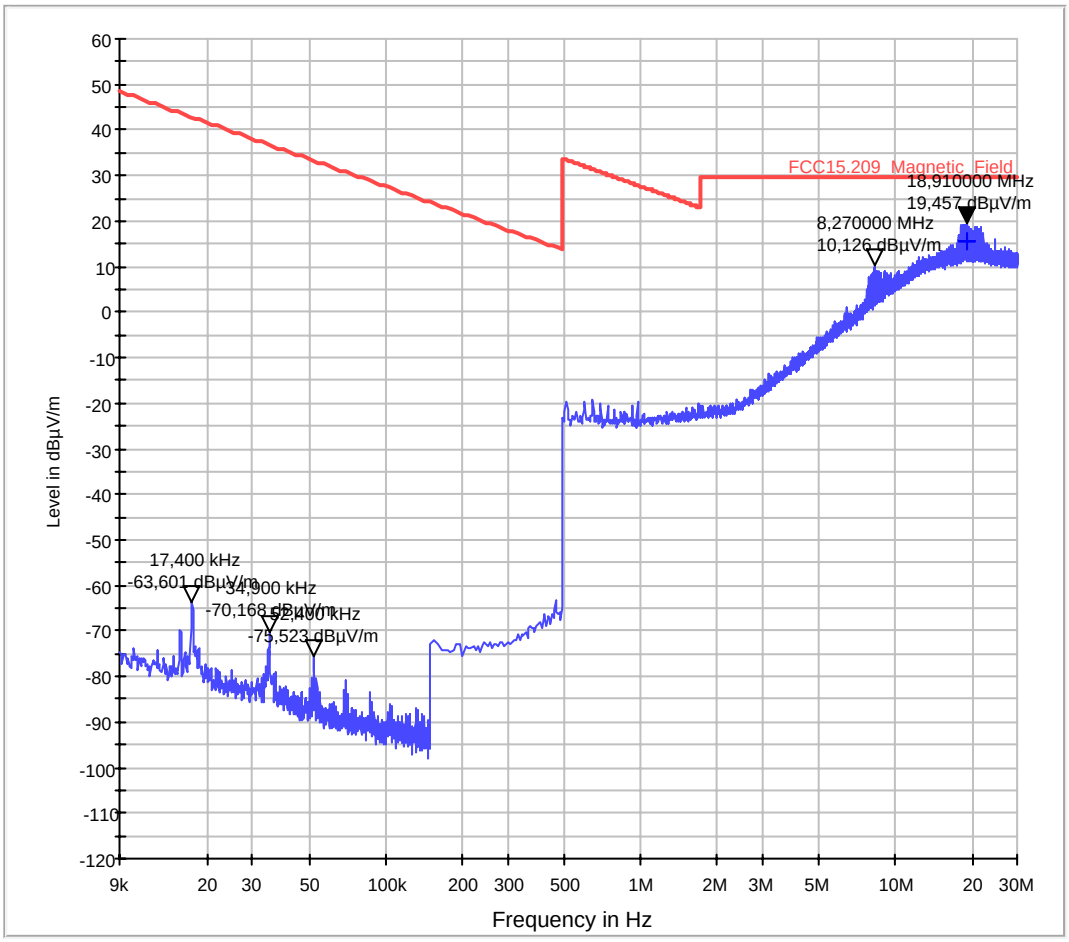
Test description:	Electric Fieldstrength Measurement
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Measured sides of EUT:	front, right, rear, left sides
Rec. antenna (pre-scan):	height 1.00 m and 1.82 m, horizontal and vertical polarisation
Rec. antenna (final):	height between 1 m to 4 m, polarisation according to pre-scan results
Turntable step:	90° during pre-scan, continuously turning during final measurement
Used filter:	--
Test specification.:	FCC 15.209&15.247
Operator:	Lor
Operating conditions:	TX-on, channel High

EUT Information

Description:

EUT Name:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix
Serial Number:	--
Hardware Rev:	
Software Rev:	
Comment:	

01_FCC_MG_FELD_PK_FAST_H&V_EUT



Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Average (dBµV/m)	RMS (dBµV/m)	MinPeak (dBµV/m)	CAverage (dBµV/m)	CRMS (dBµV/m)	ACVideo (dBµV/m)
19.045000	---	15.5	---	---	---	---	---	---
19.045000	---	15.6	---	---	---	---	---	---

(continuation of the "Result Table_Single" table from column 9 ...)

Frequency (MHz)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Comment
19.045000	1000.00	10.000	100.0	H	45.0	2.7	
19.045000	1000.00	10.000	100.0	H	45.0	2.7	

Scan Setup: 01_FCC_MG_FELD_PK_FAST_H&V_EUT [EMI radiated]

Hardware Setup: HW25_FCC15109_ESCS_MgFeld_ohne_SAR_MATRIX
Level Unit: dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
9 kHz - 150 kHz	MaxPeak	200 Hz	0,01 s	ESCS 30
150 kHz - 30 MHz	MaxPeak	10 kHz	0,01 s	ESCS 30

7.0.2. Measurement diagram – Radiated field strength, f < 1GHz (§15.205 & 15.209)

Diagram No. 2.19

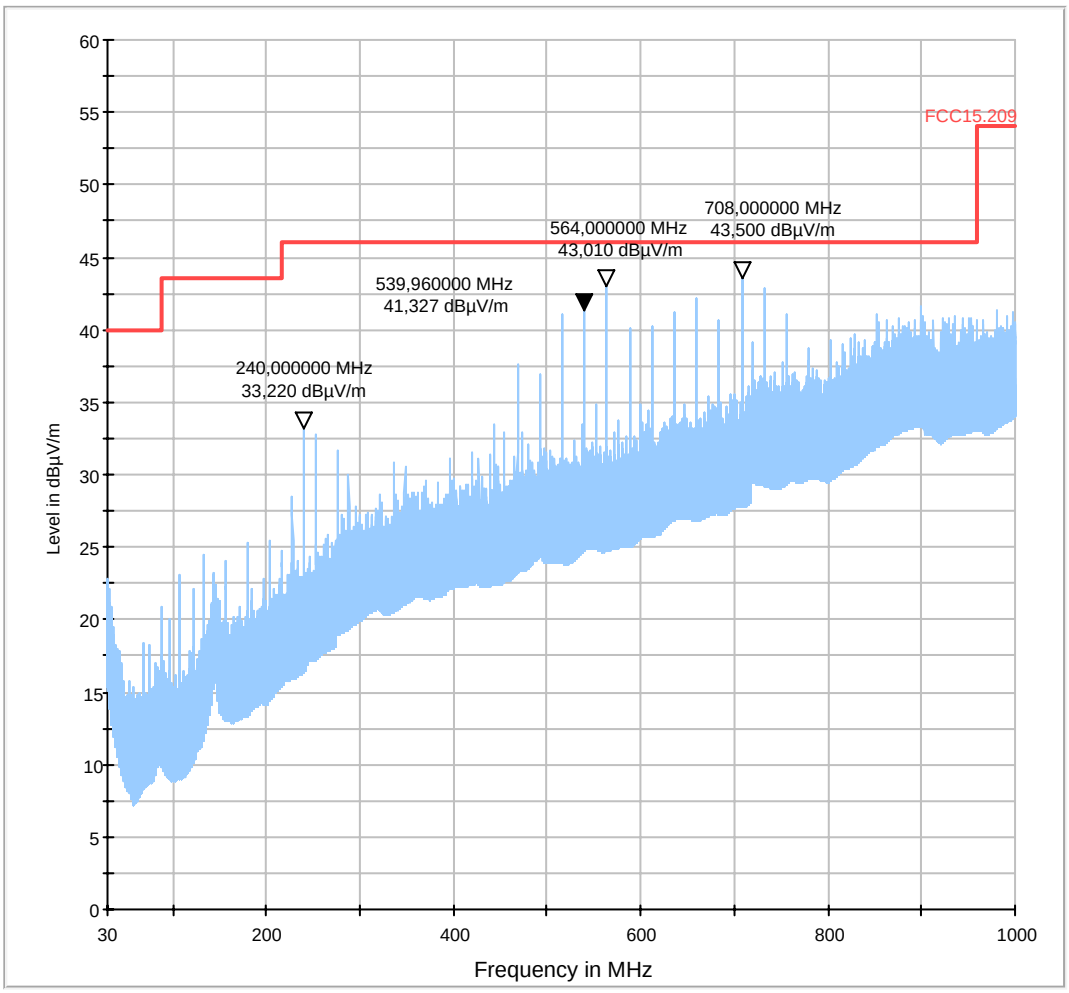
Common Information

Test description:	Electric Fieldstrength Measurement related to 3 m distance
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Measured sides of EUT:	front, right, rear, left
Rec. antenna (pre-scan):	height 1.00 m and 1.82 m, horizontal and vertical polarisation
Rec. antenna (final):	height between 1 m to 4 m, polarisation according to pre-scan results
Turntable step:	90° during pre-scan, continuously turning during final measurement
Used filter:	lowpass 1200 MHz
Test specification.:	FCC 15.205 & 15.209
Operator:	Lor
Operating conditions:	TX-on
Comment 1:	Channel Low

EUT Information

Description:	
EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix
Serial Number:	

FCC15.209_hor+vert



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
539.960000	41.32	1000.00	120.000	100.0	H	329.0	21.4	4.68	46.00
563.990000	43.01	1000.00	120.000	100.0	H	329.0	21.4	3.00	46.00
707.990000	43.5	1000.00	120.000	121.0	H	320.0	23.7	2.5	46.00

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
539.960000	
563.990000	
707.990000	

EMI Auto Test Template: FCC15.209_hor+vert

Hardware Setup: HW11_FCC_ESCS30_TP1200
Measurement Type: Open-Area-Test-Site
Frequency Range: 30 MHz - 1 GHz
Graphics Level Range: 0 dBµV/m - 60 dBµV/m

Preview Measurements:
- Antenna height: 100 - 182 cm , Step Size = 82 cm , Speed = 8
- Polarity: H + V
- Turntable position: 0 - 270 deg , Step Size = 90 deg , Speed = 8
- Scan Test Template: EMI Scan 01_fast_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,00005 s	ESCS 30

Data Reduction:
- Limit Line #1: FCC15.209
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 25
- Maxima per Subrange: 1
- Acceptance Offset: -6 dB
- Maximum Number of Results: 20

Frequency Zoom:
- Zoom Scan Template: EMI Scan 02_20ms_zoom_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,02 s	ESCS 30

Adjustment:
- Antenna height: Adjustment with full Range , Speed = 3
- Turntable position: Adjustment with full Range , Speed = 3
- Template for Single Meas.: EMI Scan 02_20ms_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,02 s	ESCS 30

Final Measurements:
- Template for Single Meas.: EMI Scan 03_1s_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	1 s	ESCS 30

Report Settings:
- Report Template: FCC15_209_vert_hor
- Create Electronic Report: RTF PDF
- Document Name: EMI Report

Diagram No. 2.20

Common Information

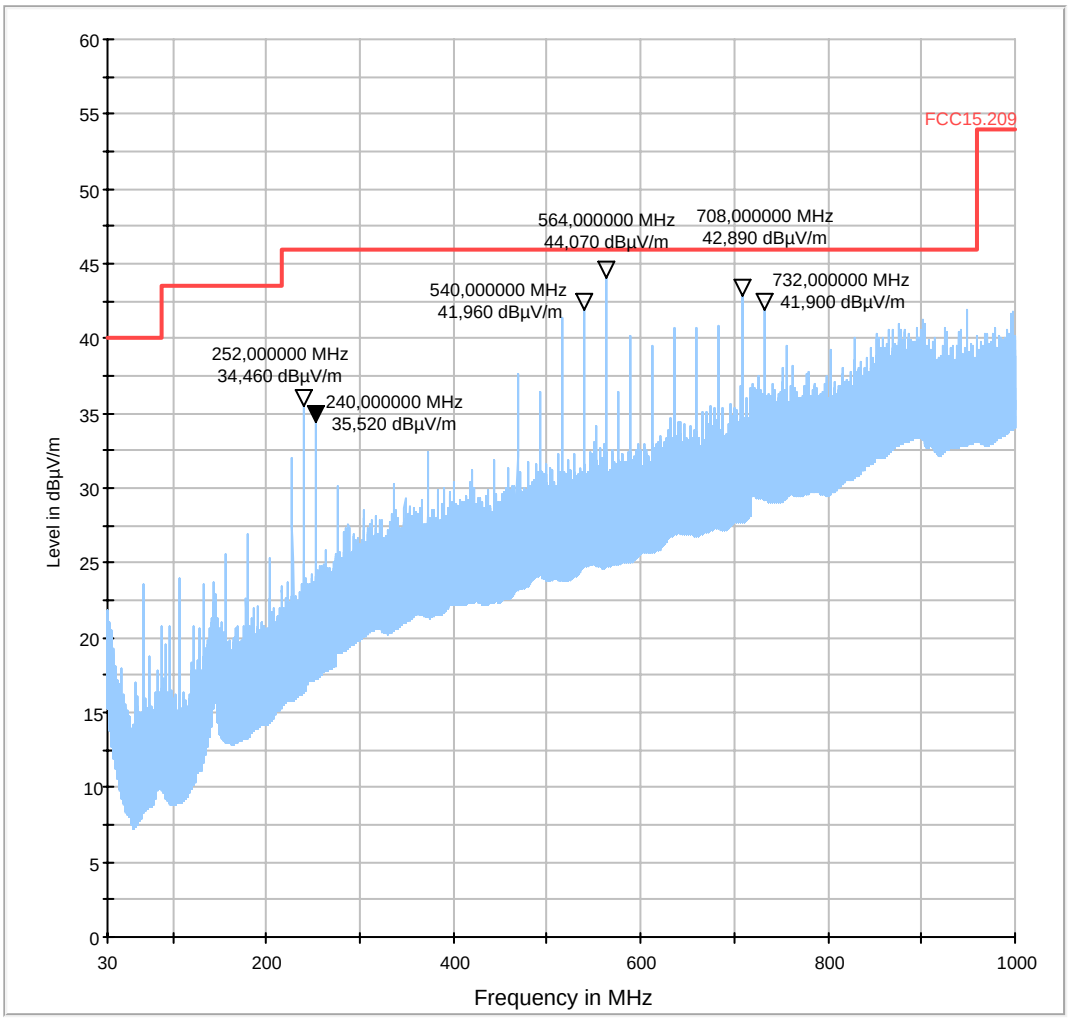
Test description:	Electric Fieldstrength Measurement related to 3 m distance
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Measured sides of EUT:	front, right, rear, left
Rec. antenna (pre-scan):	height 1.00 m and 1.82 m, horizontal and vertical polarisation
Rec. antenna (final):	height between 1 m to 4 m, polarisation according to pre-scan results
Turntable step:	90° during pre-scan, continuously turning during final measurement
Used filter:	lowpass 1200 MHz
Test specification.:	FCC 15.205 & 15.209
Operator:	Lor
Operating conditions:	Tx-on
Remark	Channel Middle

EUT Information

Description:

EUT Name:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix

FCC15.209_hor+vert



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
563.990000	44.07	1000.00	120.000	100.0	H	350.0	21.4	1.93	46.00
707.980000	42.89	1000.00	120.000	298.0	V	343.0	23.7	3.11	46.00

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
563.990000	
707.980000	

EMI Auto Test Template: FCC15.209_hor+vert

Hardware Setup: HW11_FCC_ESCS30_TP1200
Measurement Type: Open-Area-Test-Site
Frequency Range: 30 MHz - 1 GHz
Graphics Level Range: 0 dBµV/m - 60 dBµV/m

Preview Measurements:
- Antenna height: 100 - 182 cm , Step Size = 82 cm , Speed = 8
- Polarity: H + V
- Turntable position: 0 - 270 deg , Step Size = 90 deg , Speed = 8
- Scan Test Template: EMI Scan 01_fast_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,00005 s	ESCS 30

Data Reduction:
- Limit Line #1: FCC15.209
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 25
- Maxima per Subrange: 1
- Acceptance Offset: -6 dB
- Maximum Number of Results: 20

Frequency Zoom:
- Zoom Scan Template: EMI Scan 02_20ms_zoom_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,02 s	ESCS 30

Adjustment:
- Antenna height: Adjustment with full Range , Speed = 3
- Turntable position: Adjustment with full Range , Speed = 3
- Template for Single Meas.: EMI Scan 02_20ms_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,02 s	ESCS 30

Final Measurements:
- Template for Single Meas.: EMI Scan 03_1s_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	1 s	ESCS 30

Report Settings:
- Report Template: FCC15_209_vert_hor
- Create Electronic Report: RTF PDF
- Document Name: EMI Report

Diagram No. 2.21

Common Information

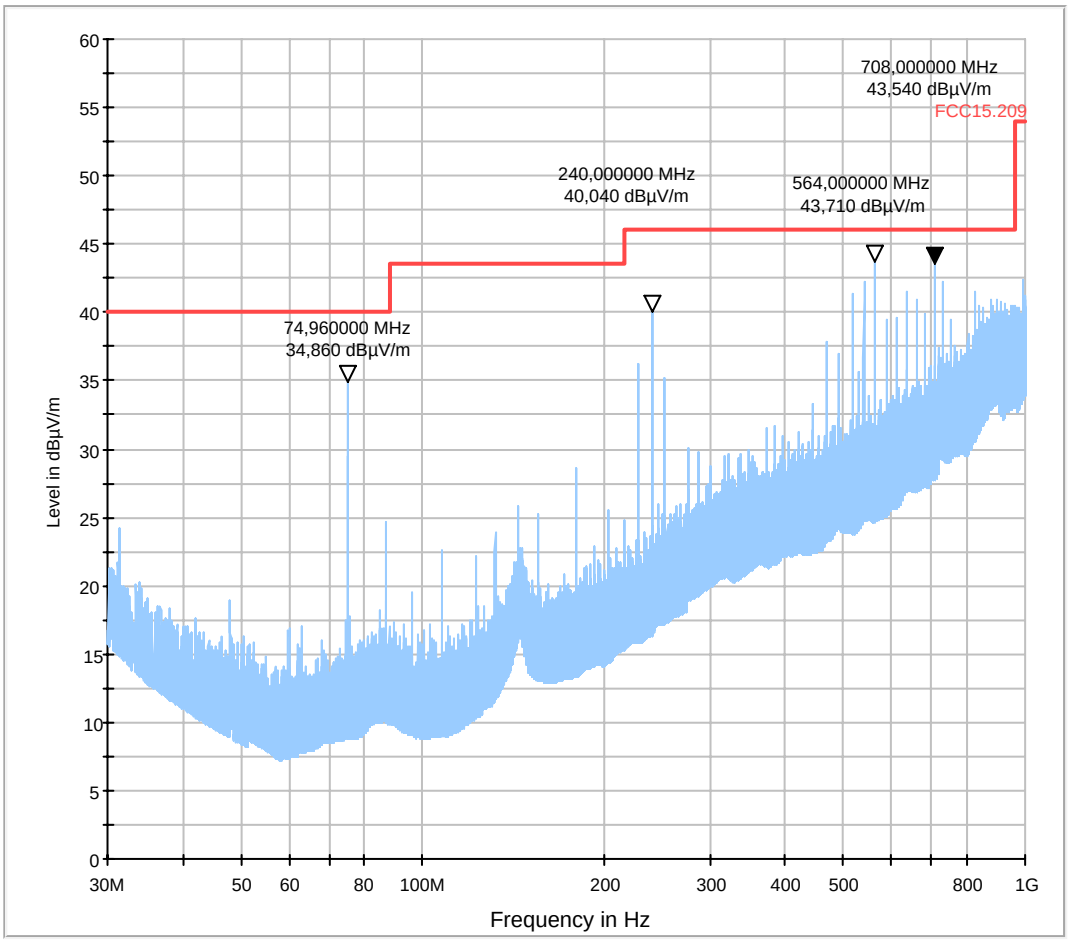
Test description:	Electric Fieldstrength Measurement related to 3 m distance
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Measured sides of EUT:	front, right, rear, left side
Rec. antenna (pre-scan):	height 1.00 m and 1.82 m, horizontal and vertical polarisation
Rec. antenna (final):	height between 1 m to 4 m, polarisation according to pre-scan results
Turntable step:	90° during pre-scan, continuously turning during final measurement
Used filter:	lowpass 1200 MHz
Test specification.:	FCC 15.209 & 15.247
Operator:	Brl/Lor
Operating conditions:	Tx-mode, Channel High

EUT Information

Description:

EUT Name:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix
Serial Number:	--
Hardware Rev:	
Software Rev:	
Comment:	

FCC15.209_hor+vert



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
74.970000	-44.2	1000.00	120.000	112.0	V	230.0	7.7	84.20	40.00
240.030000	-34.3	1000.00	120.000	273.0	V	330.0	13.2	80.30	46.00
564.000000	-27.3	1000.00	120.000	100.0	H	346.0	21.4	73.30	46.00
708.010000	-28.0	1000.00	120.000	298.0	V	343.0	23.7	74.00	46.00

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
74.970000	
240.030000	
564.000000	
708.010000	

EMI Auto Test Template: FCC15.209_hor+vert

Hardware Setup: HW11_FCC_ESCS30_TP1200
Measurement Type: Open-Area-Test-Site
Frequency Range: 30 MHz - 1 GHz
Graphics Level Range: 0 dBµV/m - 60 dBµV/m

Preview Measurements:
- Antenna height: 100 - 182 cm , Step Size = 82 cm , Speed = 8
- Polarity: H + V
- Turntable position: 0 - 270 deg , Step Size = 90 deg , Speed = 8
- Scan Test Template: EMI Scan 01_fast_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,00005 s	ESCS 30

Data Reduction:
- Limit Line #1: FCC15.209
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 25
- Maxima per Subrange: 1
- Acceptance Offset: -6 dB
- Maximum Number of Results: 20

Frequency Zoom:
- Zoom Scan Template: EMI Scan 02_20ms_zoom_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,02 s	ESCS 30

Adjustment:
- Antenna height: Adjustment with full Range , Speed = 3
- Turntable position: Adjustment with full Range , Speed = 3
- Template for Single Meas.: EMI Scan 02_20ms_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,02 s	ESCS 30

Final Measurements:
- Template for Single Meas.: EMI Scan 03_1s_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	1 s	ESCS 30

Report Settings:
- Report Template: FCC15_209_vert_hor
- Create Electronic Report: RTF PDF
- Document Name: EMI Report

Diagram No. 2.22

Common Information

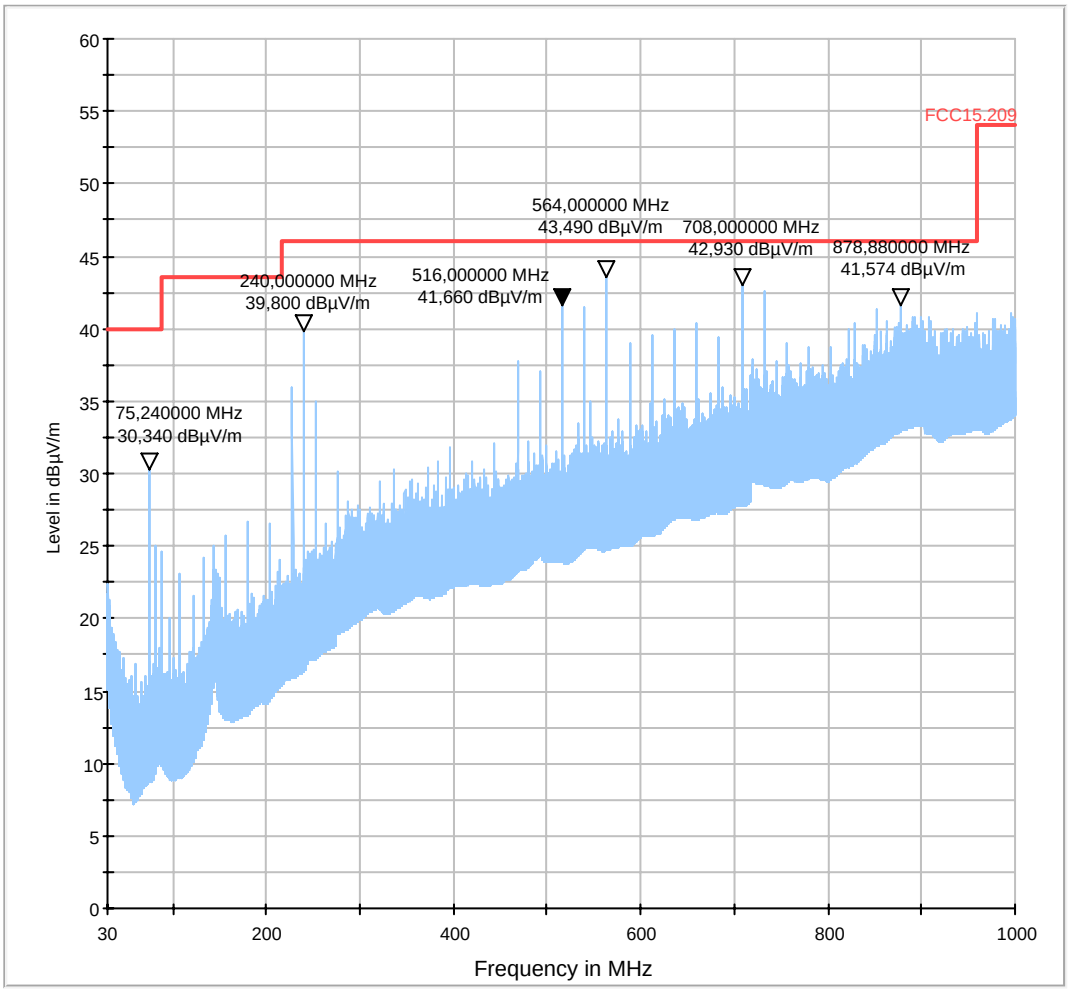
Test description:	Electric Fieldstrength Measurement related to 3 m distance
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Measured sides of EUT:	front, right, rear, left sides
Rec. antenna (pre-scan):	height 1.00 m and 1.82 m, horizontal and vertical polarisation
Rec. antenna (final):	height between 1 m to 4 m, polarisation according to pre-scan results
Turntable step:	90° during pre-scan, continuously turning during final measurement
Used filter:	lowpass 1200 MHz
Test specification.:	FCC 15.205 & 15.209
Operator:	Lor
Operating conditions:	RX-mode
Comment 1:	--

EUT Information

Description:

EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix
Serial Number:	

FCC15.209_hor+vert



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
240.000000	39.80	1000.00	120.000	278.0	V	302.0	13.2	6.2	46.00
564.010000	43.49	1000.00	120.000	100.0	H	346.0	21.4	2.51	46.00
708.000000	42.93	1000.00	120.000	295.0	V	342.0	23.7	3.07	46.00
878.880000	41.54	1000.00	120.000	360.0	V	299.0	26.9	4.43	46.00

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
240.000000	
564.010000	
708.000000	
879.660000	

EMI Auto Test Template: FCC15.209_hor+vert

Hardware Setup: HW11_FCC_ESCS30_TP1200
Measurement Type: Open-Area-Test-Site
Frequency Range: 30 MHz - 1 GHz
Graphics Level Range: 0 dBµV/m - 60 dBµV/m

Preview Measurements:
- Antenna height: 100 - 182 cm , Step Size = 82 cm , Speed = 8
- Polarity: H + V
- Turntable position: 0 - 270 deg , Step Size = 90 deg , Speed = 8
- Scan Test Template: EMI Scan 01_fast_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,00005 s	ESCS 30

Data Reduction:
- Limit Line #1: FCC15.209
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 25
- Maxima per Subrange: 1
- Acceptance Offset: -6 dB
- Maximum Number of Results: 20

Frequency Zoom:
- Zoom Scan Template: EMI Scan 02_20ms_zoom_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,02 s	ESCS 30

Adjustment:
- Antenna height: Adjustment with full Range , Speed = 3
- Turntable position: Adjustment with full Range , Speed = 3
- Template for Single Meas.: EMI Scan 02_20ms_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak	120 kHz	0,02 s	ESCS 30

Final Measurements:
- Template for Single Meas.: EMI Scan 03_1s_FCC 15_209 B

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	1 s	ESCS 30

Report Settings:
- Report Template: FCC15_209_vert_hor
- Create Electronic Report: RTF PDF
- Document Name: EMI Report

7.0.3. Measurement diagram – Radiated field strength, f > 1GHz (§15.205 & 15.209)

Diagram No.: 2.11

Common Information

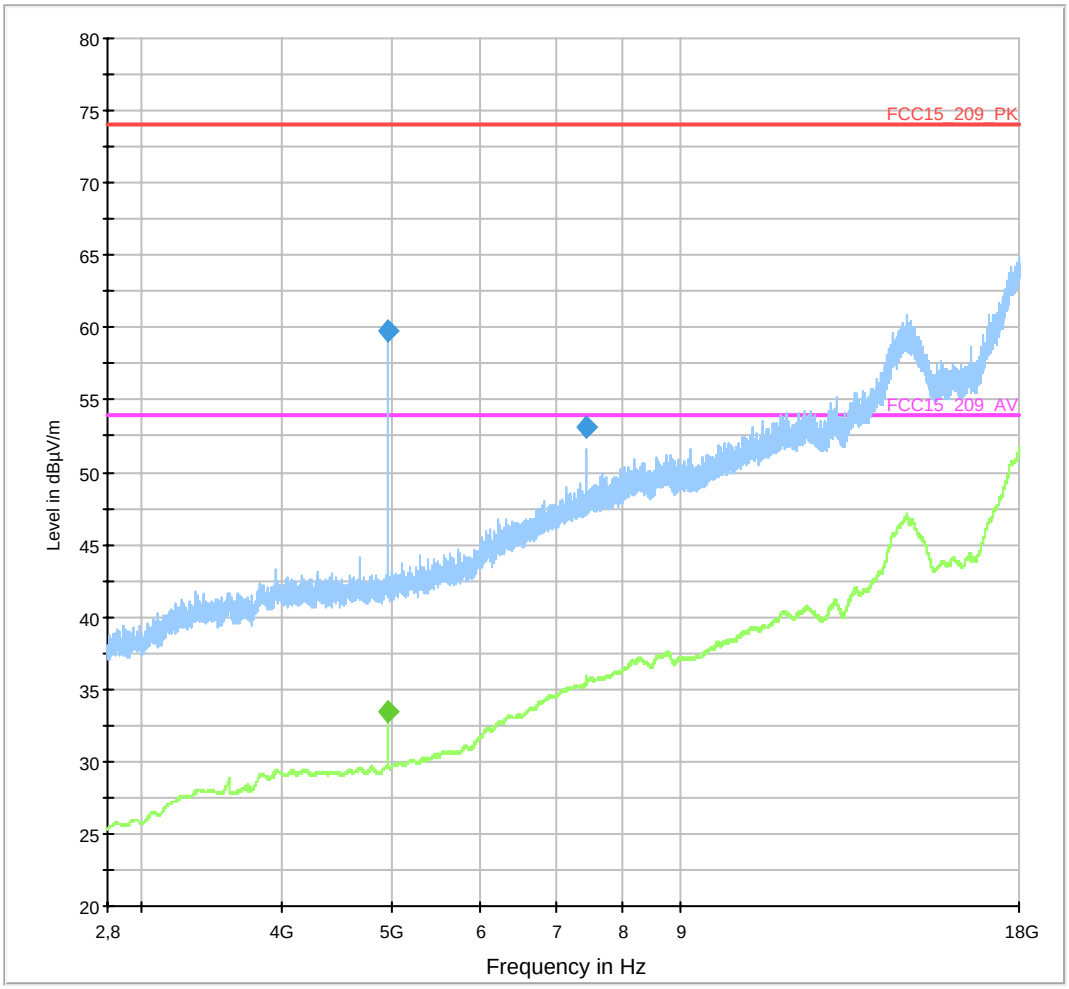
Test Description:	Radiated field strength emission accord. §15.247
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	TX-on Mode
Operator Name:	X_Ken
Comment:	Channel no. high

EUT Information

Description:

EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix Music Systems
Serial Number:	
Comment:	

02_2.8_18G_ohne switch H&V



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4963.90000	59.7	100.00	1000.000	155.0	V	218.0	-0.4	14.3	74.0
7446.10000	53.1	100.00	1000.000	155.0	H	135.0	6.9	20.9	74.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
4963.90000	
7446.10000	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4963.90000	33.4	100.00	1000.000	155.0	V	221.0	-0.4	20.6	54.0

(continuation of the "Final Result 2" table from column 10 ...)

Frequency (MHz)	Comment
4963.90000	

EMI Auto Test Template: 02_2.8_18G_ohne switch H&V

Hardware Setup: 13_ESU_Horn_18G_Preamp_ohne_SM
Measurement Type: Open-Area-Test-Site
Frequency Range: 2.8 GHz - 18 GHz
Graphics Level Range: 20 dBµV/m - 80 dBµV/m

Preview Measurements:
- Scan Test Template: 08_ESU_ExtPreamp_2.7_18G_pre

Data Reduction:
- Limit Line #1: FCC15_209_PK
- Limit Line #2: FCC15_209_AV
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 50
- Maxima per Subrange: 1
- Acceptance Offset: -20 dB
- Maximum Number of Results: 30

Frequency Zoom:
- Zoom Scan Template: 10_ESU_ExtPreamp_2.7_18G_zoom

Adjustment:
- Template for Single Meas.: 08_ESU_ExtPreamp_2.7_18G_pre

Final Measurements:
- Template for Single Meas.: 12_ESU_ExtPreamp_2.7_18G_fin
- Template for Single Meas.:(>1GHz) 12_ESU_ExtPreamp_2.7_18G_fin

Report Settings:
- Report Template: Report Setup FCC 15_209
- Create Electronic Report: PDF
- Document Name: dummy EMI Report

Diagram No.: 2.12

Common Information

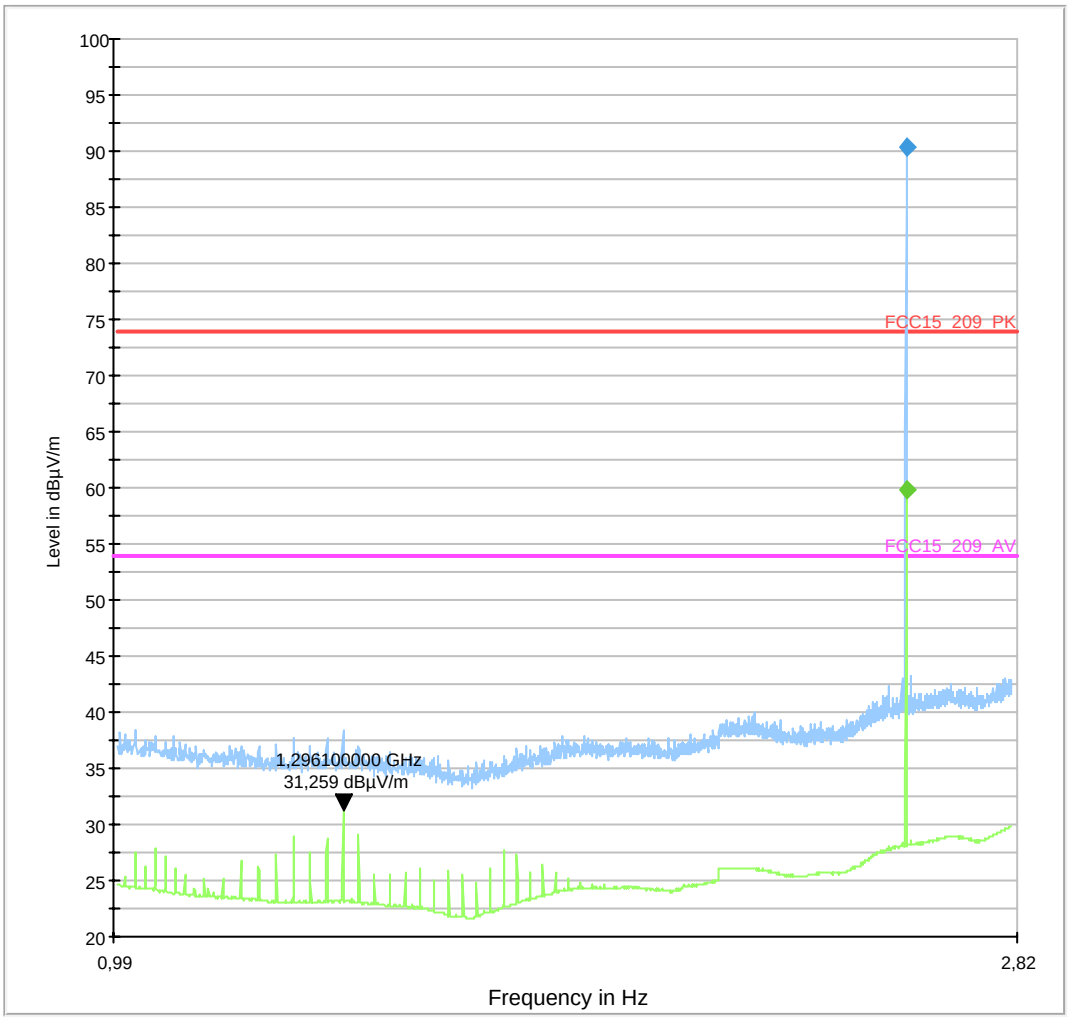
Test Description:	Part 15.247, Radiated field strength emission
Test Site:	CETECOM GmbH Essen
Test Standard:	§ 15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	TX-on Mode
Comment:	Channel no. high

EUT Information

Description:

EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix Music Systems
Serial Number:	

01_1_2.7G_ohne switch_mit_preAmp_dBuV_H&V_mit Kipp



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2481.80000	90.4	100.00	1000.000	155.0	H	307.0	1.8	-16.4	74.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
2481.80000	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2481.80000	59.8	100.00	1000.000	155.0	H	306.0	1.8	-5.8	54.0

(continuation of the "Final Result 2" table from column 10 ...)

Frequency (MHz)	Comment
2481.80000	

EMI Auto Test Template: 01_1_2.7G_ohne switch_mit_preAmp_dBuV_H&V_mit Kipp

Hardware Setup: 13_ESU_Horn_18G_Preamp_ohne_SM
Measurement Type: Open-Area-Test-Site
Frequency Range: 1 GHz - 2,8 GHz
Graphics Level Range: 20 dBµV/m - 80 dBµV/m

Preview Measurements:
- Scan Test Template: 07_ESU_1_2.7G_pre

Data Reduction:
- Limit Line #1: FCC15_209_PK
- Limit Line #2: FCC15_209_AV
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 50
- Maxima per Subrange: 1
- Acceptance Offset: -20 dB
- Maximum Number of Results: 30

Frequency Zoom:
- Zoom Scan Template: 09_ESU_1_2.7G_zoom

Adjustment:
- Template for Single Meas.: 07_ESU_1_2.7G_pre

Final Measurements:
- Template for Single Meas.: 11_ESU_1_2.7G_fin
- Template for Single Meas.:(>1GHz) 11_ESU_1_2.7G_fin

Report Settings:
- Report Template: Report Setup FCC 15_247

Actions:
- Test start
  - Notify: "Matrix richtig geschaltet ?!?"

Diagram No.: 2.13

Common Information

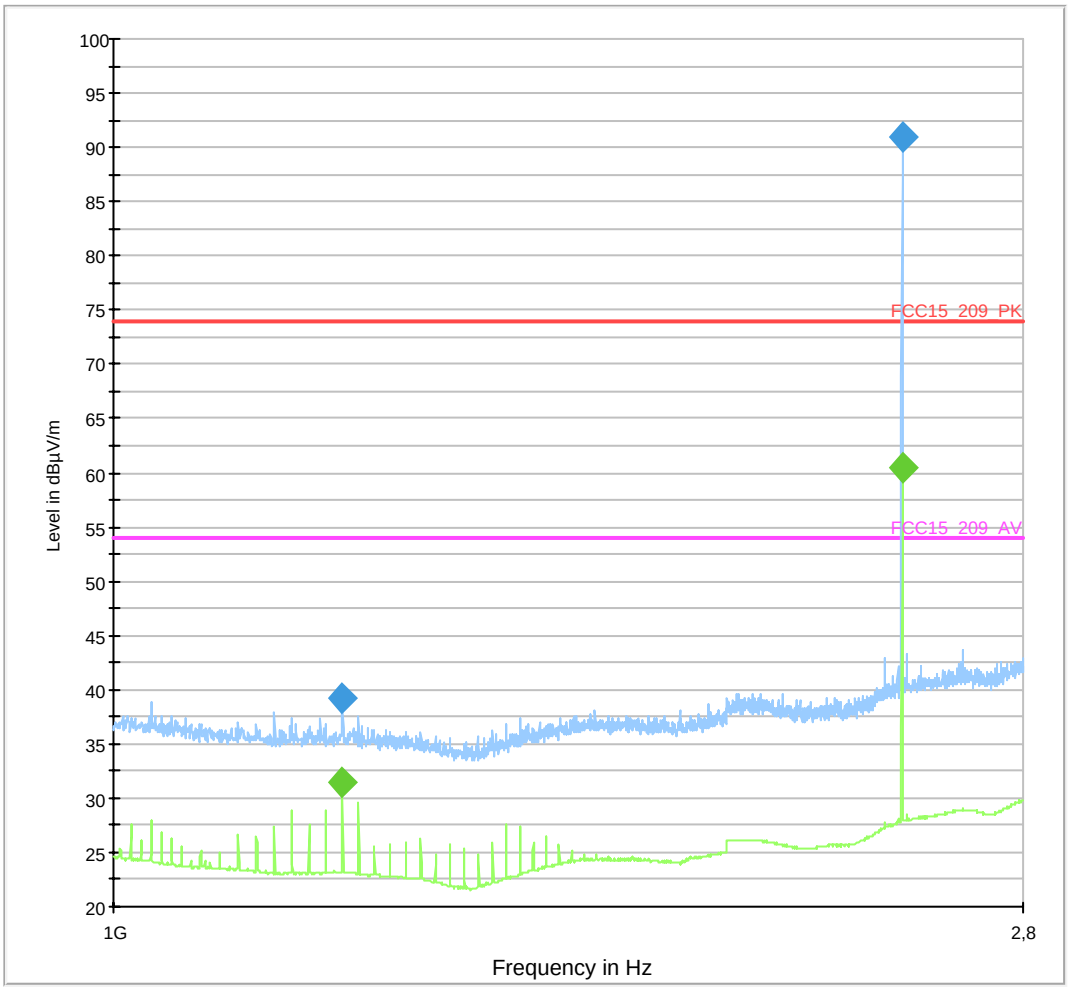
Test Description:	Part 15.247, Radiated field strength emission
Test Site:	CETECOM GmbH Essen
Test Standard:	§ 15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	TX-on Mode
Operator Name:	X_KEN
Comment:	Channel no. middle

EUT Information

Description:

EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix Music Systems
Serial Number:	

01_1_2.7G_ohne switch_mit_preAmp_dBuV_H&V_mit Kipp



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1296.00000	39.3	100.00	1000.000	155.0	H	-4.0	-1.0	34.7	74.0
2441.90000	90.9	100.00	1000.000	155.0	V	155.0	1.6	-16.9	74.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
1296.00000	
2441.90000	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1296.00000	31.4	100.00	1000.000	155.0	H	-7.0	-1.0	22.6	54.0
2441.90000	60.5	100.00	1000.000	155.0	V	154.0	1.6	-6.5	54.0

(continuation of the "Final Result 2" table from column 10 ...)

Frequency (MHz)	Comment
1296.00000	
2441.90000	

EMI Auto Test Template: 01_1_2.7G_ohne switch_mit_preAmp_dBuV_H&V_mit Kipp

Hardware Setup: 13_ESU_Horn_18G_Preamp_ohne_SM
Measurement Type: Open-Area-Test-Site
Frequency Range: 1 GHz - 2,8 GHz
Graphics Level Range: 20 dBµV/m - 80 dBµV/m

Preview Measurements:
- Scan Test Template: 07_ESU_1_2.7G_pre

Data Reduction:
- Limit Line #1: FCC15_209_PK
- Limit Line #2: FCC15_209_AV
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 50
- Maxima per Subrange: 1
- Acceptance Offset: -20 dB
- Maximum Number of Results: 30

Frequency Zoom:
- Zoom Scan Template: 09_ESU_1_2.7G_zoom

Adjustment:
- Template for Single Meas.: 07_ESU_1_2.7G_pre

Final Measurements:
- Template for Single Meas.: 11_ESU_1_2.7G_fin
- Template for Single Meas.:(>1GHz) 11_ESU_1_2.7G_fin

Report Settings:
- Report Template: Report Setup FCC 15_247

Actions:
- Test start
  - Notify: "Matrix richtig geschaltet ?!?"

Diagram No.: 2.14

Common Information

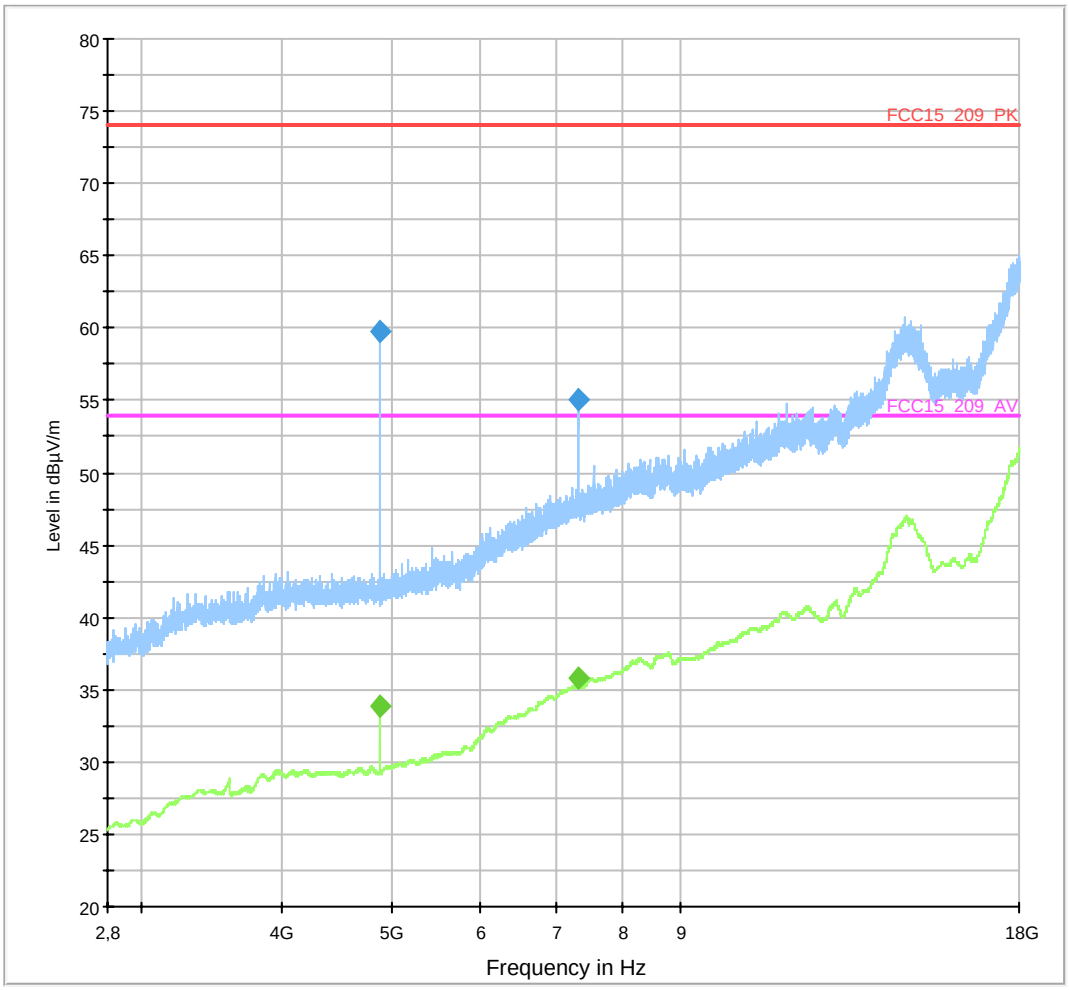
Test Description:	Radiated field strength emission accord. §15.247
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC §15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	TX-on Mode
Operator Name:	X_Ken
Comment:	Channel no. middle

EUT Information

Description:

EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix Music Systems
Serial Number:	
Comment:	

02_2.8_18G_ohne switch H&V



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4884.10000	59.8	100.00	1000.000	155.0	V	218.0	-0.6	14.2	74.0
7325.00000	55.0	100.00	1000.000	155.0	H	135.0	6.8	19.0	74.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
4884.10000	
7325.00000	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4884.10000	33.9	100.00	1000.000	155.0	H	232.0	-0.6	20.1	54.0
7326.40000	35.8	100.00	1000.000	155.0	H	135.0	6.8	18.2	54.0

(continuation of the "Final Result 2" table from column 10 ...)

Frequency (MHz)	Comment
4884.10000	
7326.40000	

EMI Auto Test Template: 02_2.8_18G_ohne switch H&V

Hardware Setup: 13_ESU_Horn_18G_Preamp_ohne_SM
Measurement Type: Open-Area-Test-Site
Frequency Range: 2.8 GHz - 18 GHz
Graphics Level Range: 20 dBµV/m - 80 dBµV/m

Preview Measurements:
- Scan Test Template: 08_ESU_ExtPreamp_2.7_18G_pre

Data Reduction:
- Limit Line #1: FCC15_209_PK
- Limit Line #2: FCC15_209_AV
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 50
- Maxima per Subrange: 1
- Acceptance Offset: -20 dB
- Maximum Number of Results: 30

Frequency Zoom:
- Zoom Scan Template: 10_ESU_ExtPreamp_2.7_18G_zoom

Adjustment:
- Template for Single Meas.: 08_ESU_ExtPreamp_2.7_18G_pre

Final Measurements:
- Template for Single Meas.: 12_ESU_ExtPreamp_2.7_18G_fin
- Template for Single Meas.:(>1GHz) 12_ESU_ExtPreamp_2.7_18G_fin

Report Settings:
- Report Template: Report Setup FCC 15_209
- Create Electronic Report: PDF
- Document Name: dummy EMI Report

Diagram No.: 2.15

Common Information

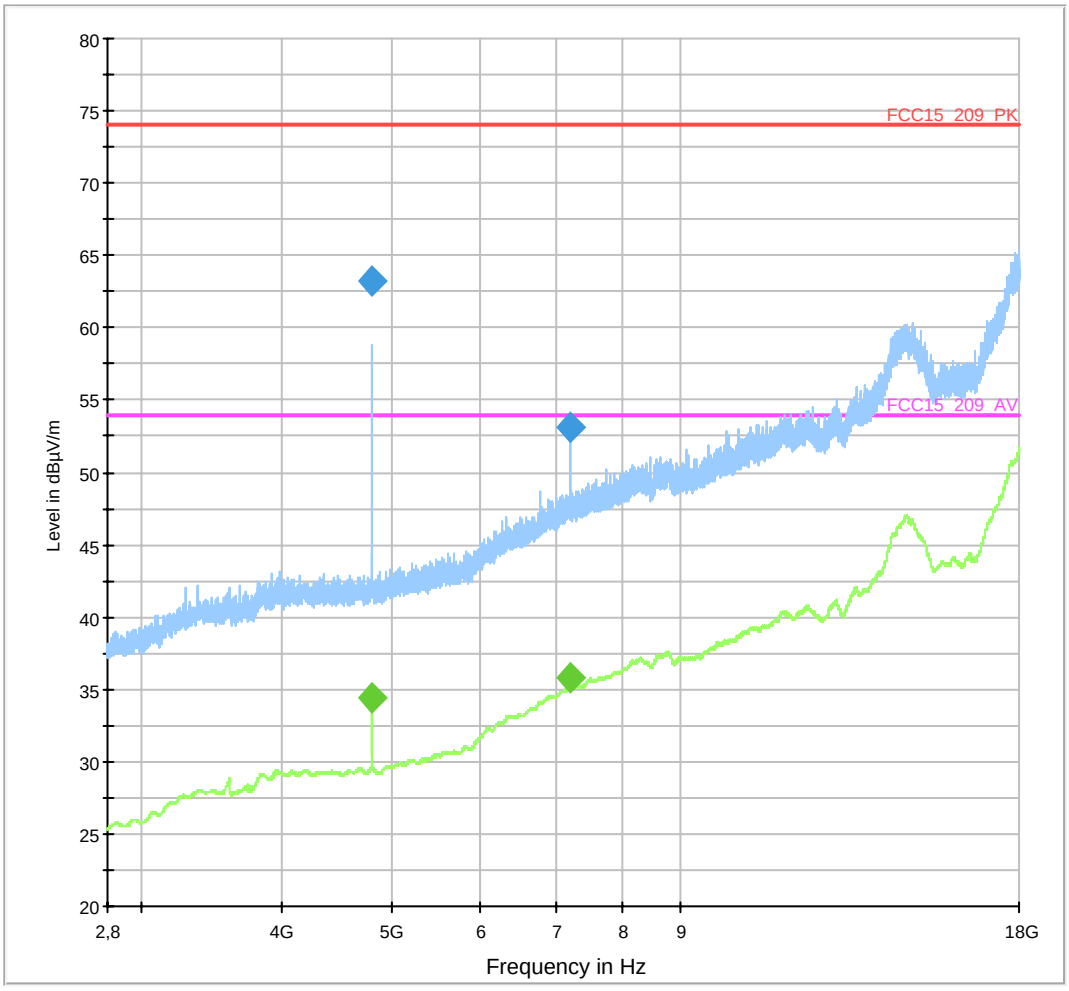
Test Description:	Radiated field strength emission accord. §15.247
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	TX-on Mode
Operator Name:	X_Ken
Comment:	Channel no. low

EUT Information

Description:

EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix Music Systems
Serial Number:	
Comment:	

02_2.8_18G_ohne switch H&V



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4804.30000	63.2	100.00	1000.000	155.0	H	75.0	-0.6	10.8	74.0
7206.00000	53.2	100.00	1000.000	155.0	H	136.0	6.6	20.8	74.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
4804.30000	
7206.00000	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4801.50000	34.4	100.00	1000.000	155.0	H	117.0	-0.6	19.6	54.0
7206.70000	35.7	100.00	1000.000	155.0	V	326.0	6.6	18.3	54.0

(continuation of the "Final Result 2" table from column 10 ...)

Frequency (MHz)	Comment
4801.50000	
7206.70000	

EMI Auto Test Template: 02_2.8_18G_ohne switch H&V

Hardware Setup: 13_ESU_Horn_18G_Preamp_ohne_SM
Measurement Type: Open-Area-Test-Site
Frequency Range: 2.8 GHz - 18 GHz
Graphics Level Range: 20 dBµV/m - 80 dBµV/m

Preview Measurements:
- Scan Test Template: 08_ESU_ExtPreamp_2.7_18G_pre

Data Reduction:
- Limit Line #1: FCC15_209_PK
- Limit Line #2: FCC15_209_AV
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 50
- Maxima per Subrange: 1
- Acceptance Offset: -20 dB
- Maximum Number of Results: 30

Frequency Zoom:
- Zoom Scan Template: 10_ESU_ExtPreamp_2.7_18G_zoom

Adjustment:
- Template for Single Meas.: 08_ESU_ExtPreamp_2.7_18G_pre

Final Measurements:
- Template for Single Meas.: 12_ESU_ExtPreamp_2.7_18G_fin
- Template for Single Meas.:(>1GHz) 12_ESU_ExtPreamp_2.7_18G_fin

Report Settings:
- Report Template: Report Setup FCC 15_209
- Create Electronic Report: PDF
- Document Name: dummy EMI Report

Diagram No.: 2.16

Common Information

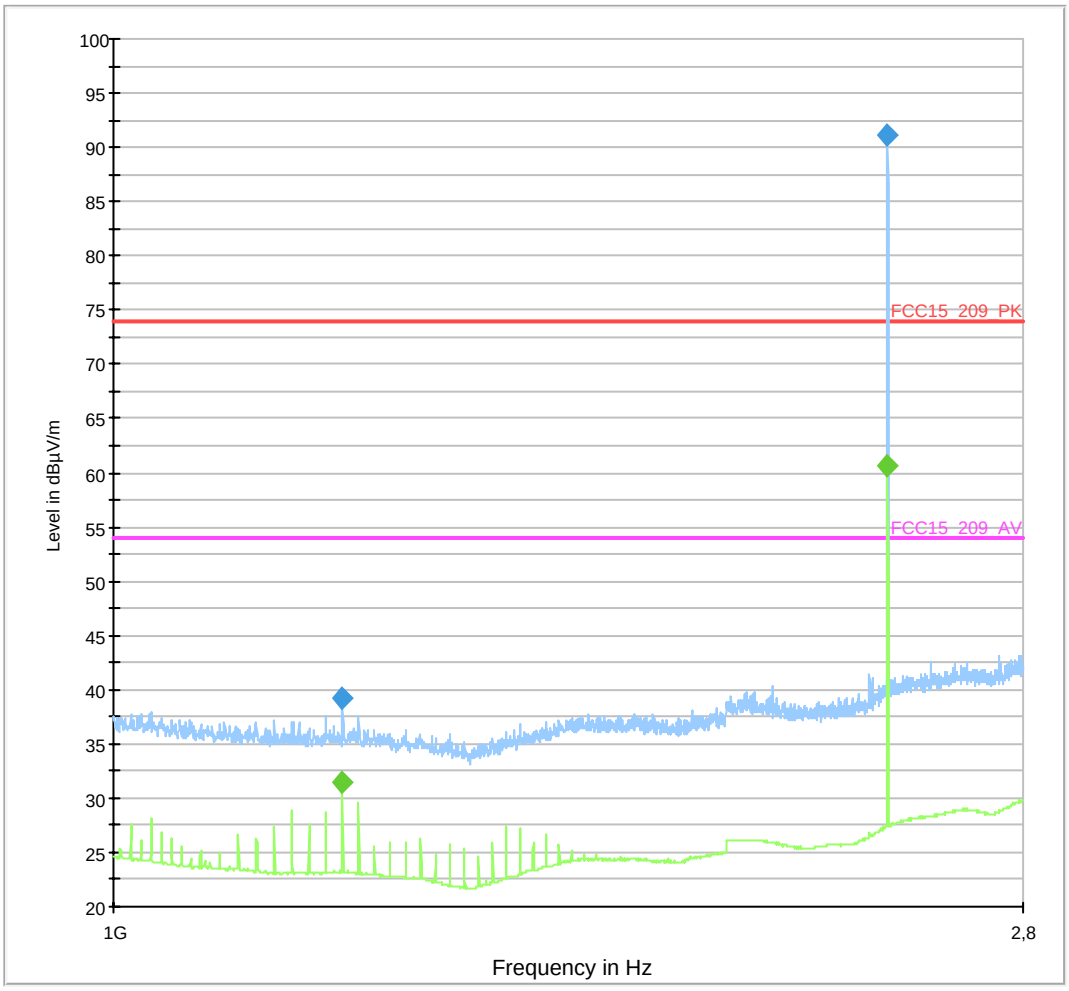
Test Description:	Part 15.247, Radiated field strength emission
Test Site:	CETECOM GmbH Essen
Test Standard:	§ 15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	TX-on Mode
Operator Name:	X_Ken
Comment:	Channel no. low

EUT Information

Description:

EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix Music Systems
Serial Number:	

01_1_2.7G_ohne switch_mit_preAmp_dBuV_H&V_mit Kipp



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1296.00000	39.2	100.00	1000.000	155.0	H	-10.0	-1.0	34.8	74.0
2402.00000	91.2	100.00	1000.000	155.0	H	225.0	1.3	-17.2	74.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
1296.00000	
2402.00000	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1296.00000	31.4	100.00	1000.000	155.0	H	-6.0	-1.0	22.6	54.0
2402.00000	60.7	100.00	1000.000	155.0	H	223.0	1.3	-6.7	54.0

(continuation of the "Final Result 2" table from column 10 ...)

Frequency (MHz)	Comment
1296.00000	
2402.00000	

EMI Auto Test Template: 01_1_2.7G_ohne switch_mit_preAmp_dBuV_H&V_mit Kipp

Hardware Setup: 13_ESU_Horn_18G_Preamp_ohne_SM
Measurement Type: Open-Area-Test-Site
Frequency Range: 1 GHz - 2,8 GHz
Graphics Level Range: 20 dBµV/m - 80 dBµV/m

Preview Measurements:
- Scan Test Template: 07_ESU_1_2.7G_pre

Data Reduction:
- Limit Line #1: FCC15_209_PK
- Limit Line #2: FCC15_209_AV
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 50
- Maxima per Subrange: 1
- Acceptance Offset: -20 dB
- Maximum Number of Results: 30

Frequency Zoom:
- Zoom Scan Template: 09_ESU_1_2.7G_zoom

Adjustment:
- Template for Single Meas.: 07_ESU_1_2.7G_pre

Final Measurements:
- Template for Single Meas.: 11_ESU_1_2.7G_fin
- Template for Single Meas.:(>1GHz) 11_ESU_1_2.7G_fin

Report Settings:
- Report Template: Report Setup FCC 15_247

Actions:
- Test start
  - Notify: "Matrix richtig geschaltet ?!?"

Diagram No.: 2.30

Common Information

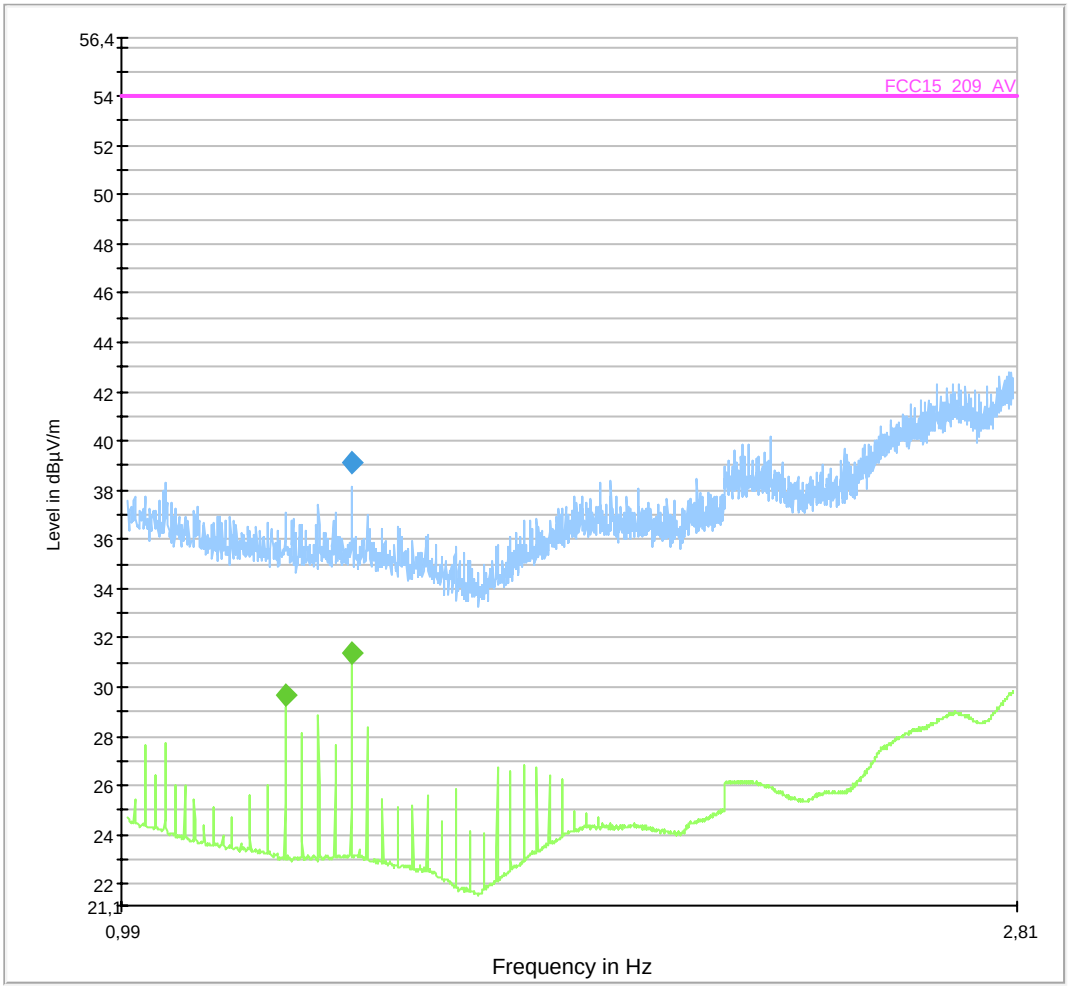
Test Description:	Part 15, Radiated field strength emission §15.247
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 § 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	IDLE Mode
Operator Name:	Lor
Comment:	Channel no. middle

EUT Information

Description:

EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix Music Systems
Serial Number:	
Comment:	

01_1_2.8G_ohne switch_mit_preAmp_dBuV_H&V



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1296.00000	39.1	100.00	1000.000	155.0	H	317.0	-1.0	34.9	74.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
1296.00000	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1200.10000	29.6	100.00	1000.000	155.0	H	-6.0	-1.1	24.4	54.0
1296.00000	31.4	100.00	1000.000	155.0	H	316.0	-1.0	22.6	54.0

(continuation of the "Final Result 2" table from column 10 ...)

Frequency (MHz)	Comment
1200.10000	
1296.00000	

EMI Auto Test Template: 01_1_2.8G_ohne switch_mit_preAmp_dBuV_H&V

Hardware Setup: 13_ESU_Horn_18G_Preamp_ohne_SM
Measurement Type: Open-Area-Test-Site
Frequency Range: 1 GHz - 2,8 GHz
Graphics Level Range: 20 dBµV/m - 80 dBµV/m

Preview Measurements:
- Scan Test Template: 07_ESU_1_2.7G_pre

Data Reduction:
- Limit Line #1: FCC15_209_PK
- Limit Line #2: FCC15_209_AV
- Interactive data reduction
- Peak Search: 6 dB
- Maximum Results: 10
- Subrange Maxima: 50
- Maxima per Subrange: 1
- Acceptance Offset: -20 dB
- Maximum Number of Results: 30

Frequency Zoom:
- Zoom Scan Template: 09_ESU_1_2.7G_zoom

Adjustment:
- Template for Single Meas.: 07_ESU_1_2.7G_pre

Final Measurements:
- Template for Single Meas.: 11_ESU_1_2.7G_fin
- Template for Single Meas.:(>1GHz) 11_ESU_1_2.7G_fin

Report Settings:
- Report Template: Report Setup FCC 15_247

Actions:
- Test start
  - Notify: "Matrix richtig geschaltet ?!?"

Diagram No.: 2.31

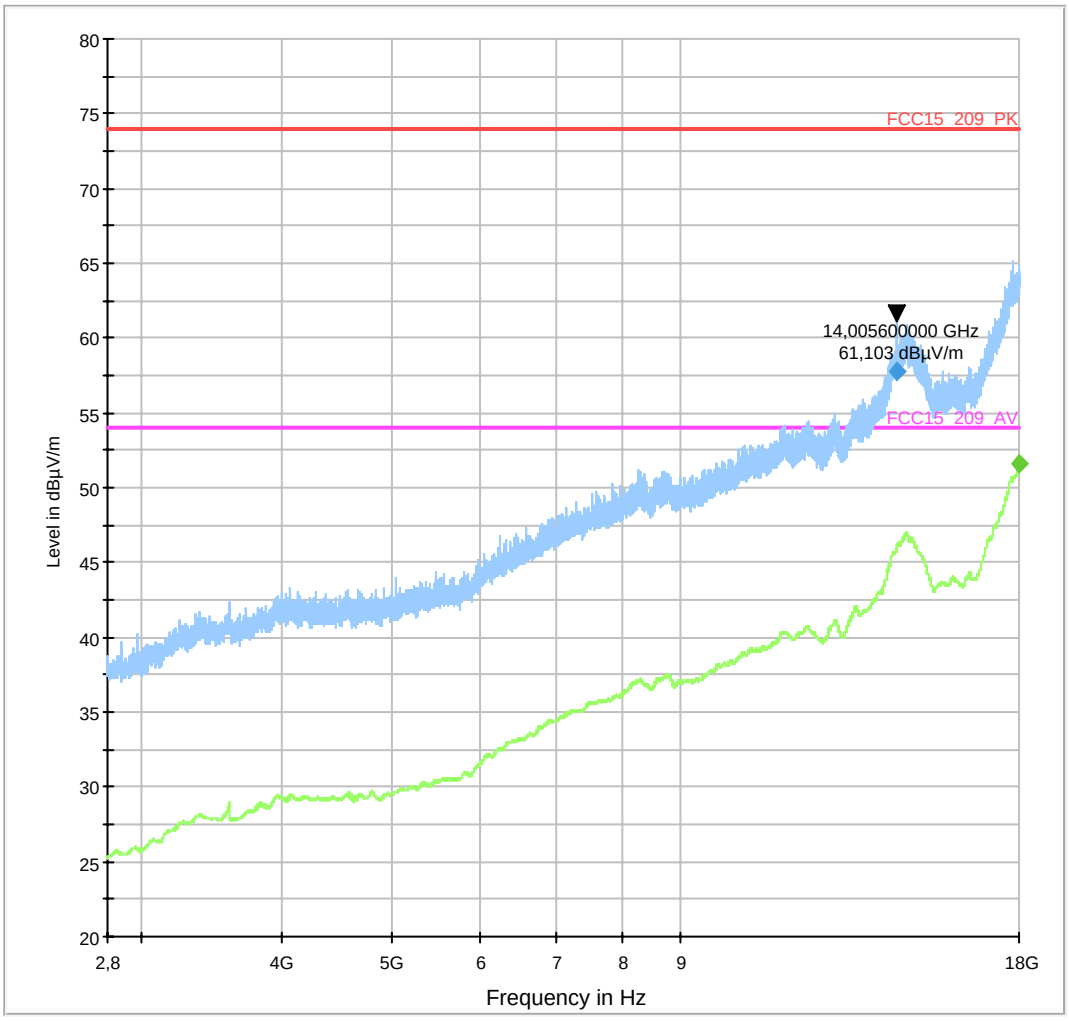
Common Information

Test Description:	§15.247 Radiated field strength emission
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	RX-mode
Operator Name:	Lor

EUT Information

Description:	
EUT:	Rockband 2 Drum + Headset + Footpedal
Manufacturer:	Harmonix Music Systems
Serial Number:	
Comment:	

02_2.8_18G_ohne switch H&V



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14050.60000	57.8	100.00	1000.000	155.0	V	45.0	17.7	16.2	74.0

(continuation of the "Final Result 1" table from column 10 ...)

Frequency (MHz)	Comment
14050.60000	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
17998.10000	51.6	100.00	1000.000	155.0	H	39.0	23.8	2.4	54.0

(continuation of the "Final Result 2" table from column 10 ...)

Frequency (MHz)	Comment
17998.10000	

EMI Auto Test Template: 02_2.8_18G_ohne switch H&V

Hardware Setup: 13_ESU_Horn_18G_Preamp_ohne_SM
Measurement Type: Open-Area-Test-Site
Frequency Range: 2.8 GHz - 18 GHz
Graphics Level Range: 20 dBµV/m - 80 dBµV/m

Preview Measurements:
Scan Test Template: 08_ESU_ExtPreamp_2.7_18G_pre

Data Reduction:
Limit Line #1: FCC15_209_PK
Limit Line #2: FCC15_209_AV
Interactive data reduction
Peak Search: 6 dB
Maximum Results: 10
Subrange Maxima: 50
Maxima per Subrange: 1
Acceptance Offset: -20 dB
Maximum Number of Results: 30

Frequency Zoom:
Zoom Scan Template: 10_ESU_ExtPreamp_2.7_18G_zoom

Adjustment:
Template for Single Meas.: 08_ESU_ExtPreamp_2.7_18G_pre

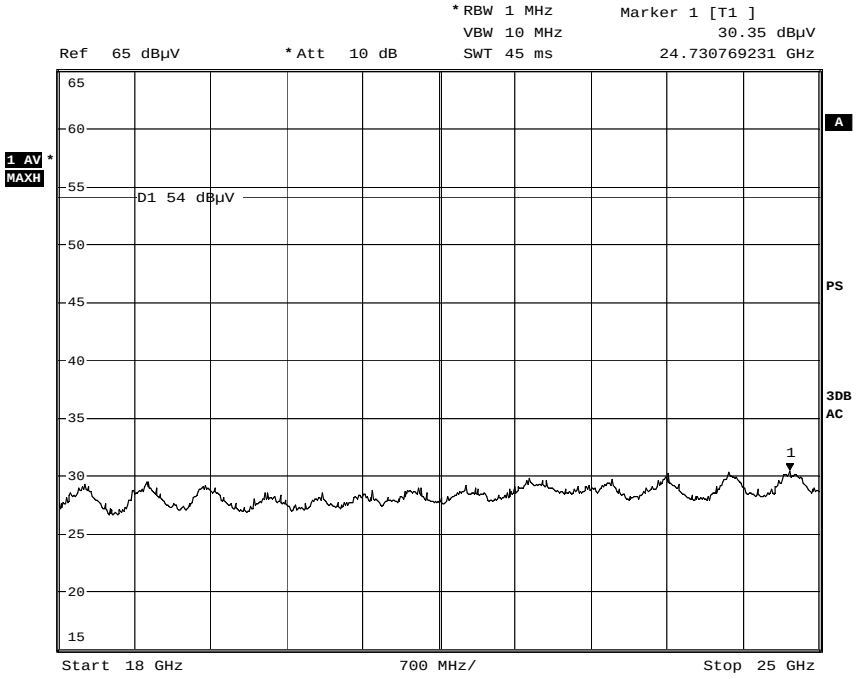
Final Measurements:
Template for Single Meas.: 12_ESU_ExtPreamp_2.7_18G_fin

Template for Single Meas.:(>1GHz) 12_ESU_ExtPreamp_2.7_18G_fin

Report Settings:
Report Template: Report Setup FCC 15_209
Create Electronic Report: PDF
Document Name: dummy EMI Report

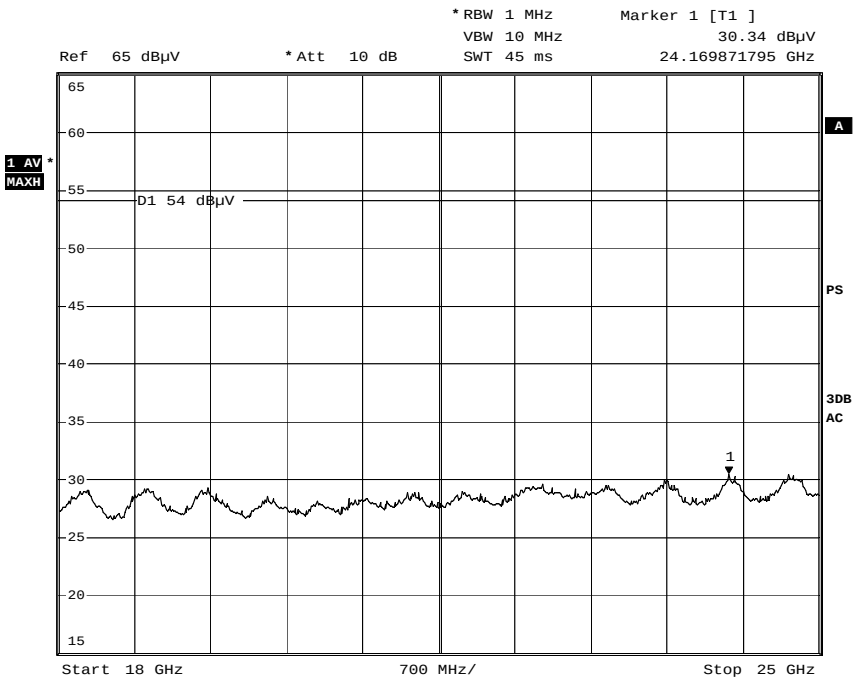
7.0.4. Measurement diagram – Radiated field strength, f >18 GHz (§15.205 & 15.209)

Measured performed for overview only due to noise level. No peaks could be found within noise floor.



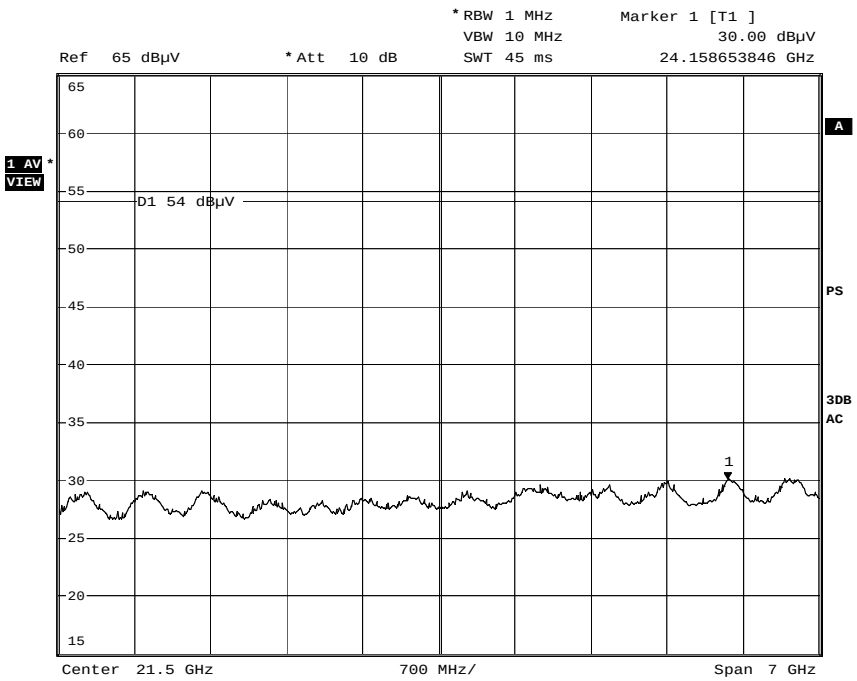
Date: 5.NOV.2008 12:36:44

Diagram No. 2.51 – Channel Low



Date: 5.NOV.2008 12:28:25

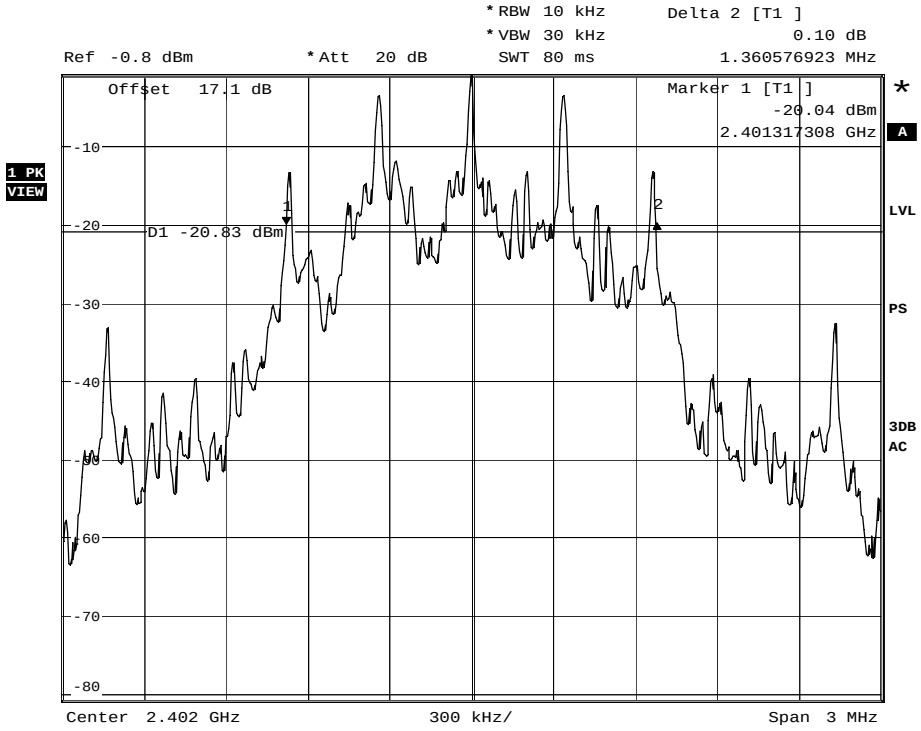
Diagram No. 2.52 – Channel Middle



Date: 5.NOV.2008 12:20:32

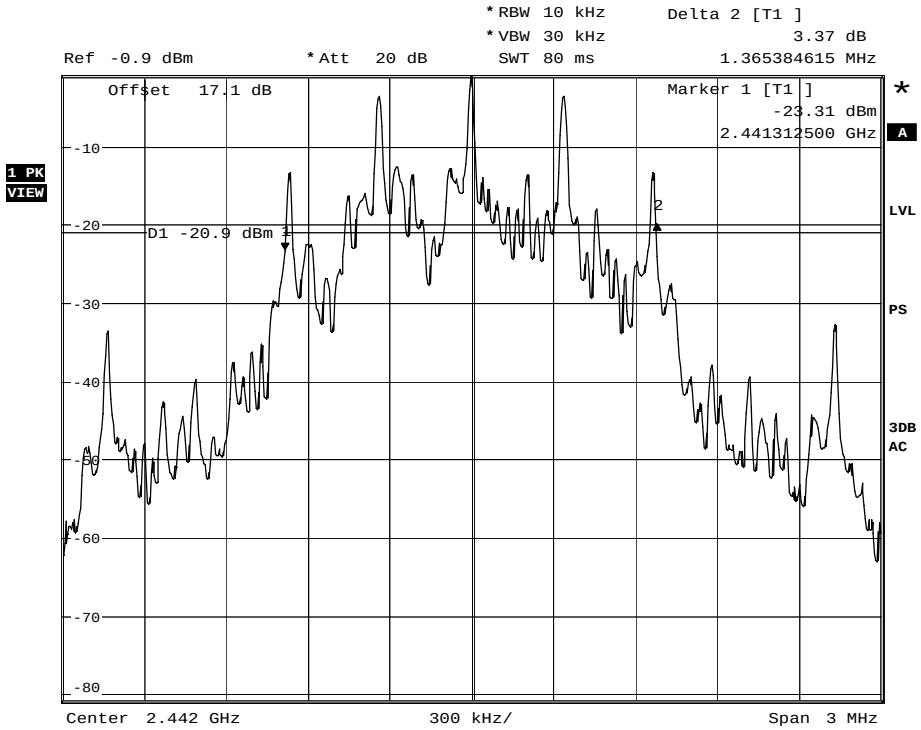
Diagram No. 2.53 – Channel high

7.0.5. Measurement diagrams – 20dB bandwidth



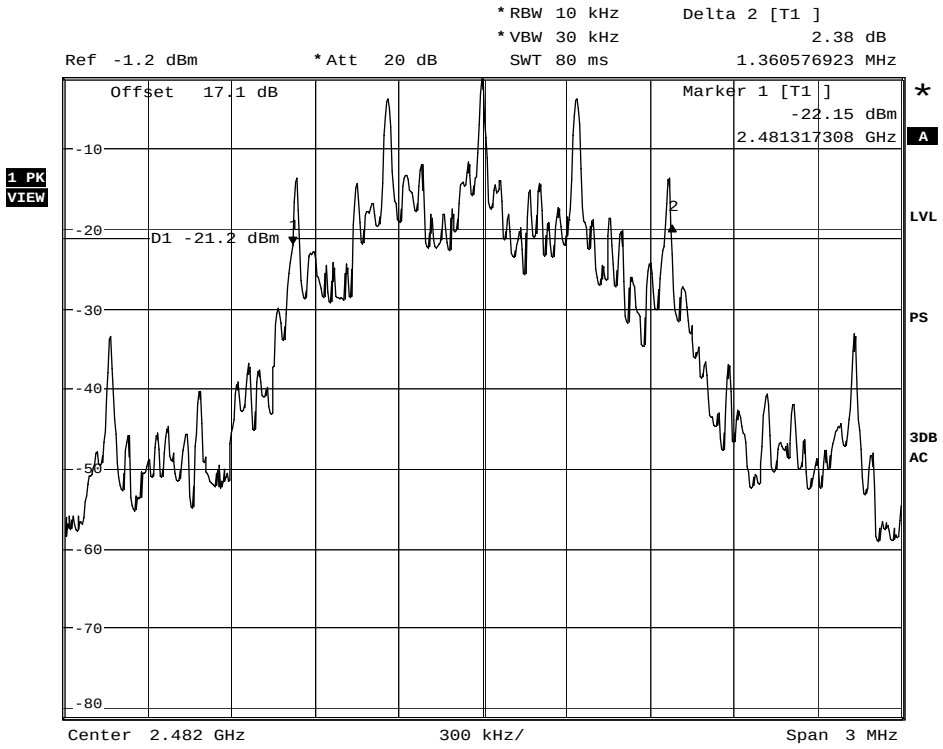
Date: 21.OCT.2008 16:13:44

Channel low



Date: 21.OCT.2008 16:07:01

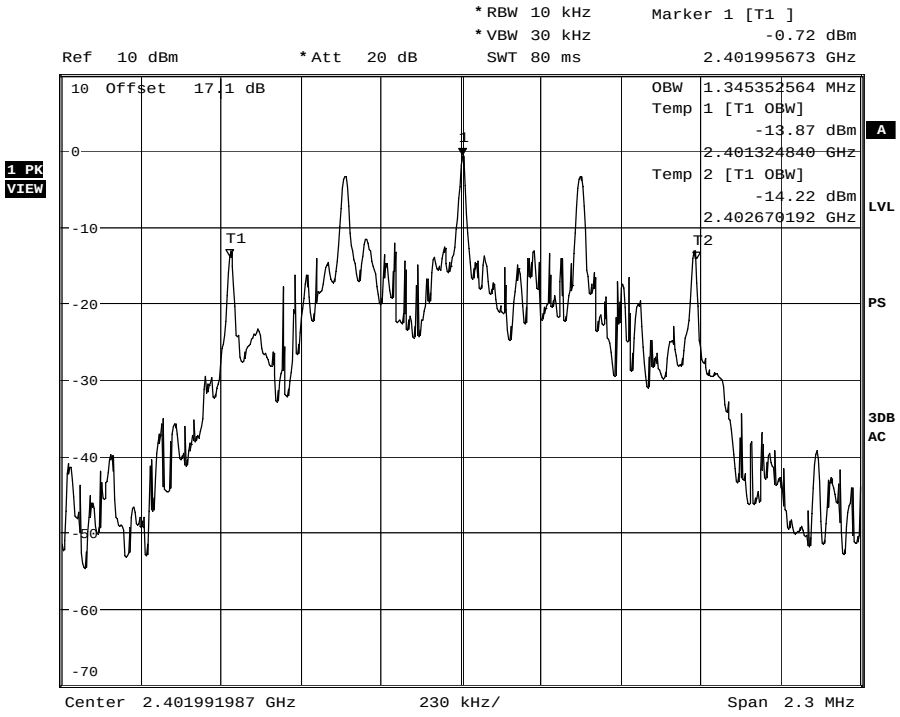
Channel middle



Date: 21.OCT.2008 15:58:49

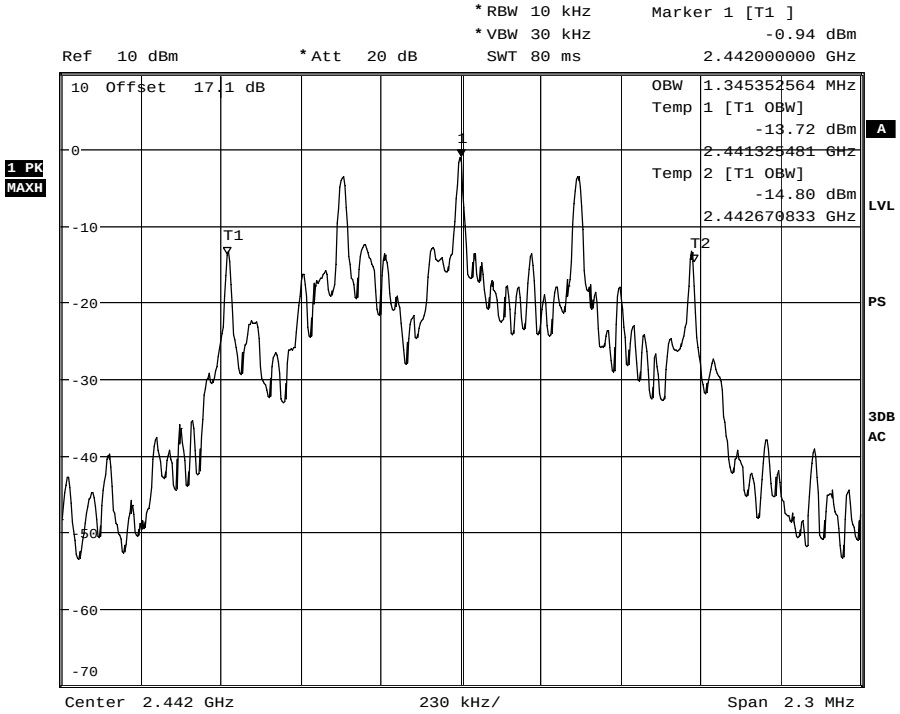
Channel high

7.0.6. Measurement diagrams – 99% Bandwidth



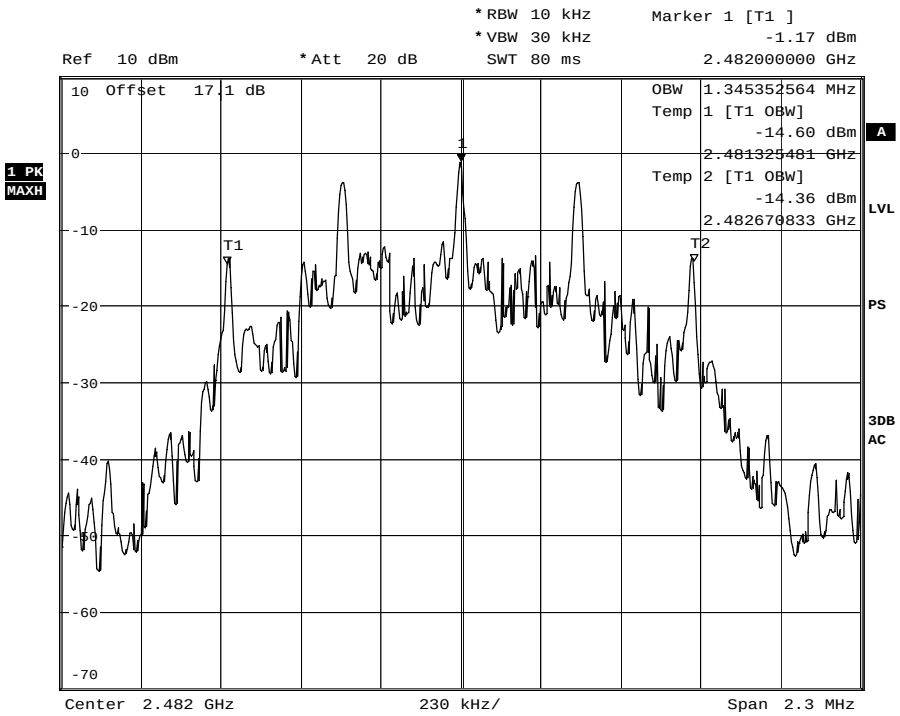
Date: 21.OCT.2008 16:30:01

Channel low



Date: 21.OCT.2008 16:33:04

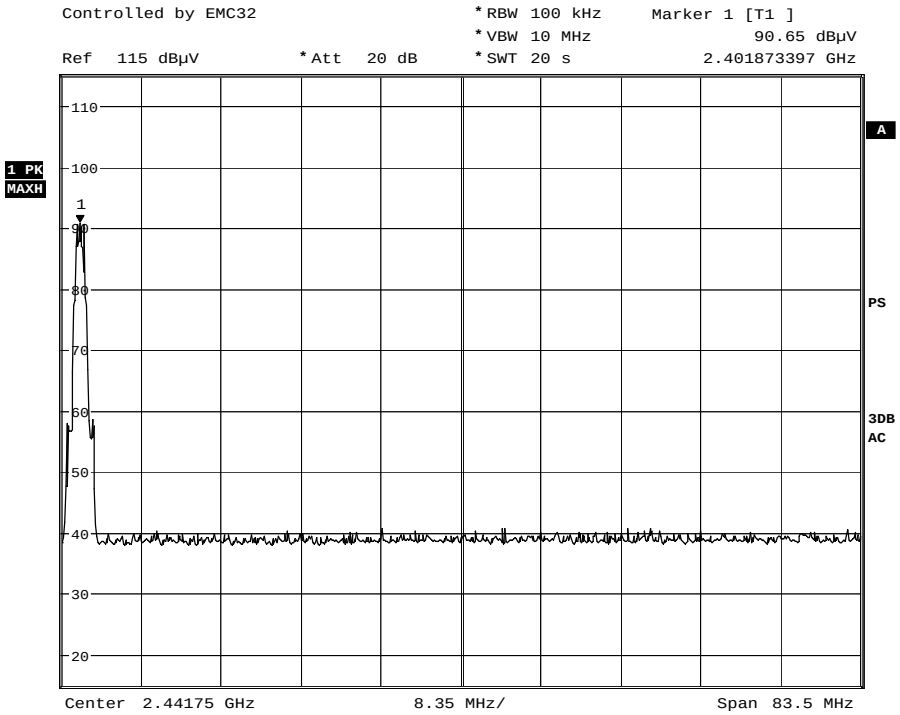
Channel middle



Date: 21.OCT.2008 16:36:13

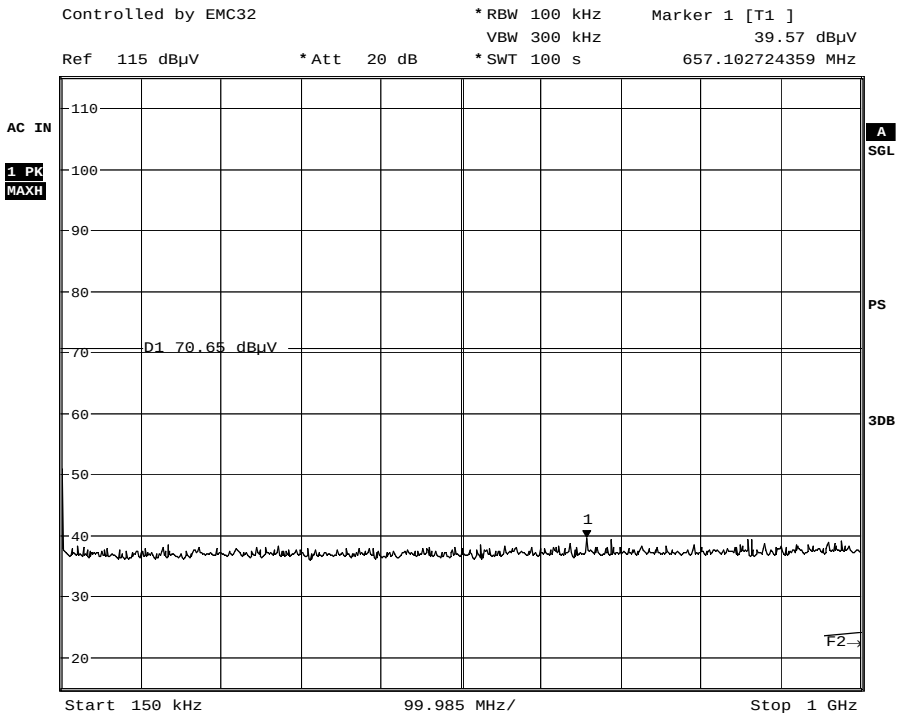
Channel high

7.0.7. Measurement diagrams – 20dBc emission specification



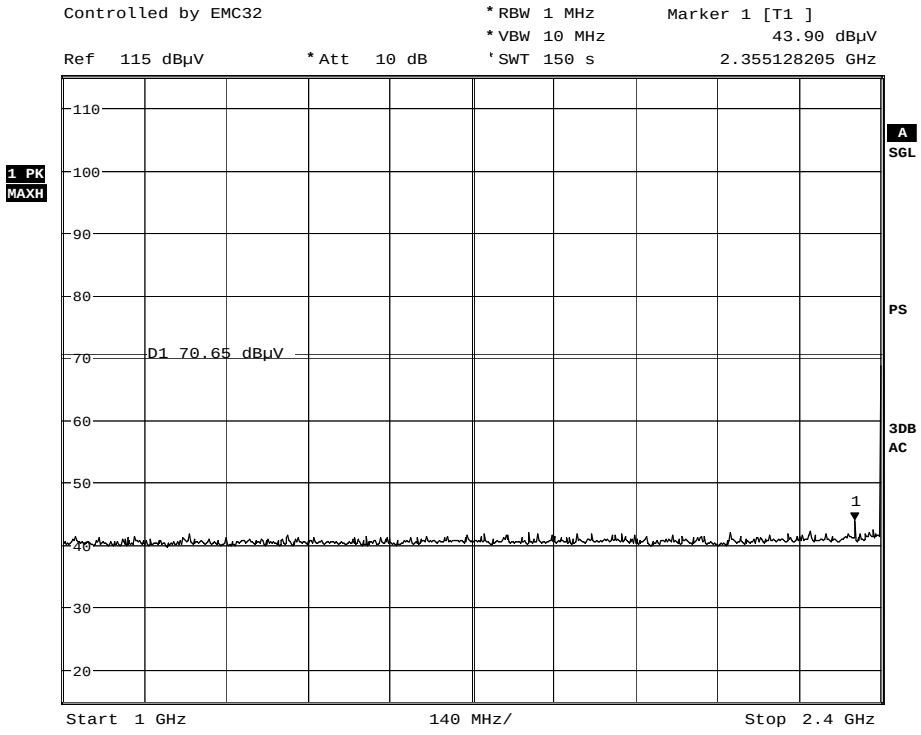
Date: 21.OCT.2008 18:35:58

Channel low: In-Band Power (reference)



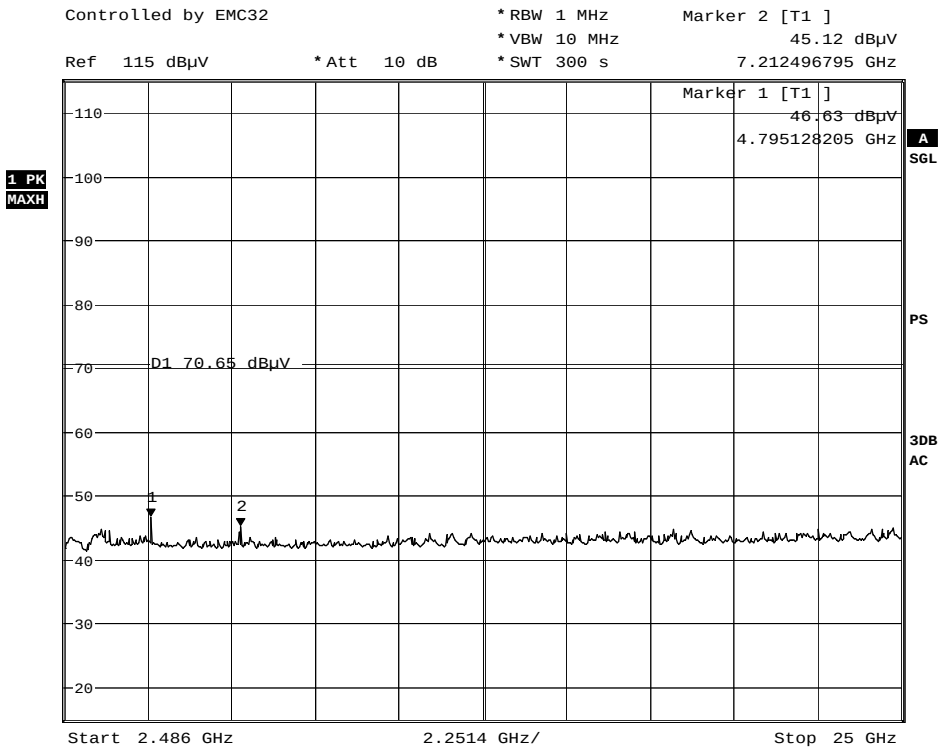
Date: 22.OCT.2008 11:56:24

Out-of band emission per 100kHz, Sweep 1



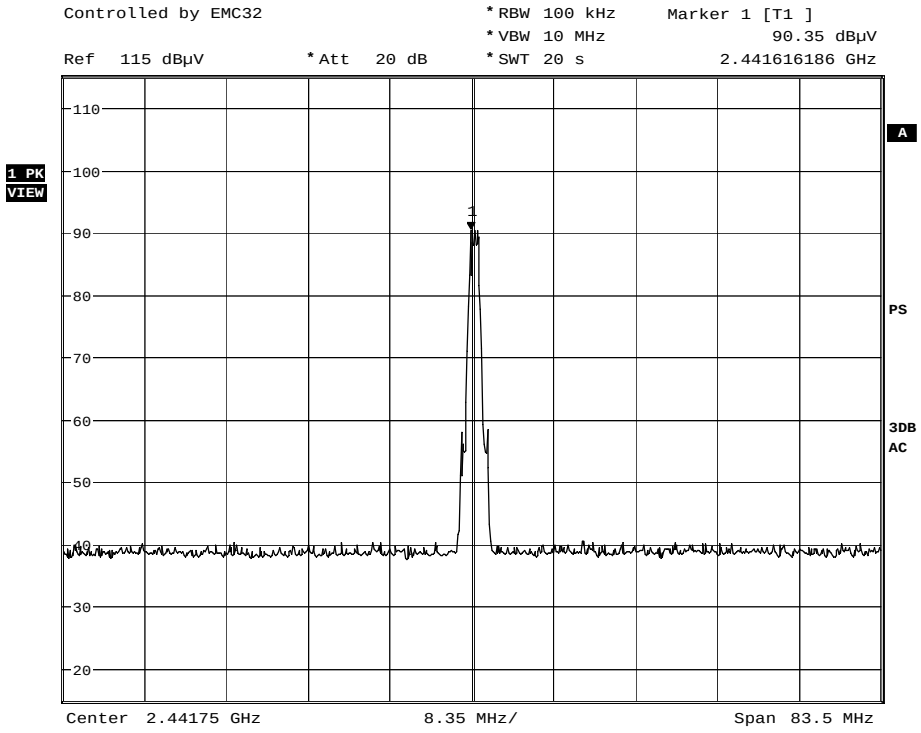
Date: 22.OCT.2008 12:11:03

Out-of band emission per 100kHz, Sweep 2



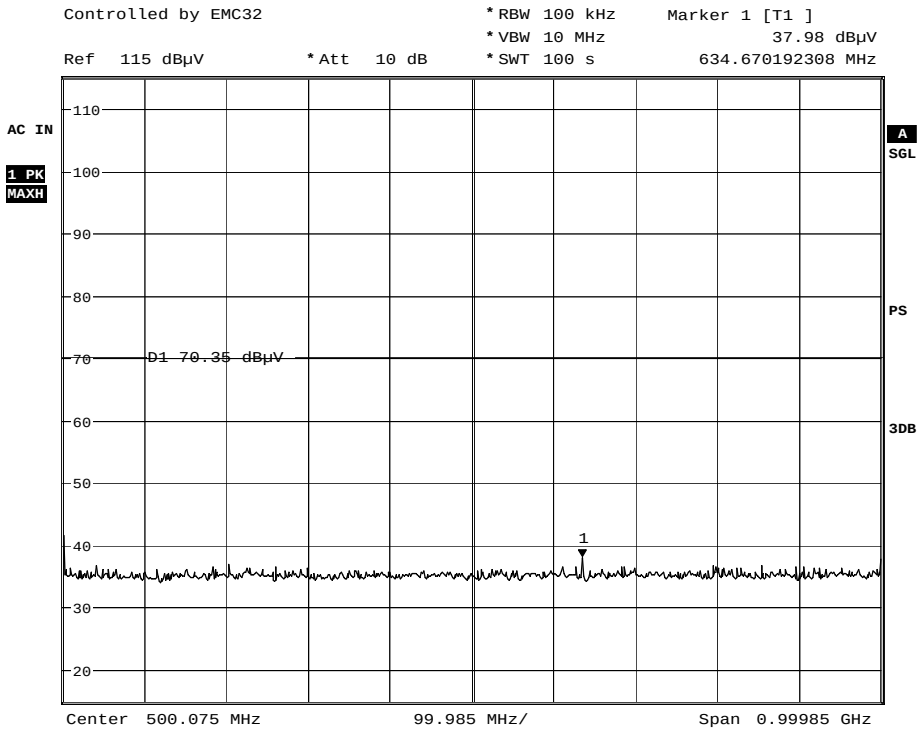
Date: 22.OCT.2008 12:25:55

Out-of band emission per 100kHz, Sweep 3



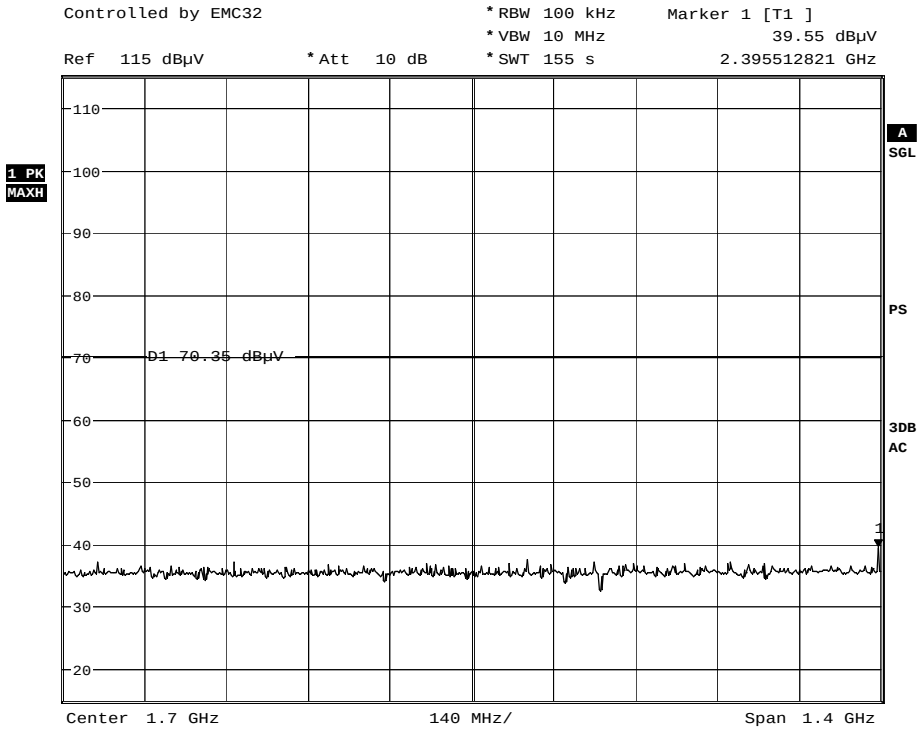
Date: 21.OCT.2008 18:16:01

Channel middle: In-Band Power (reference)



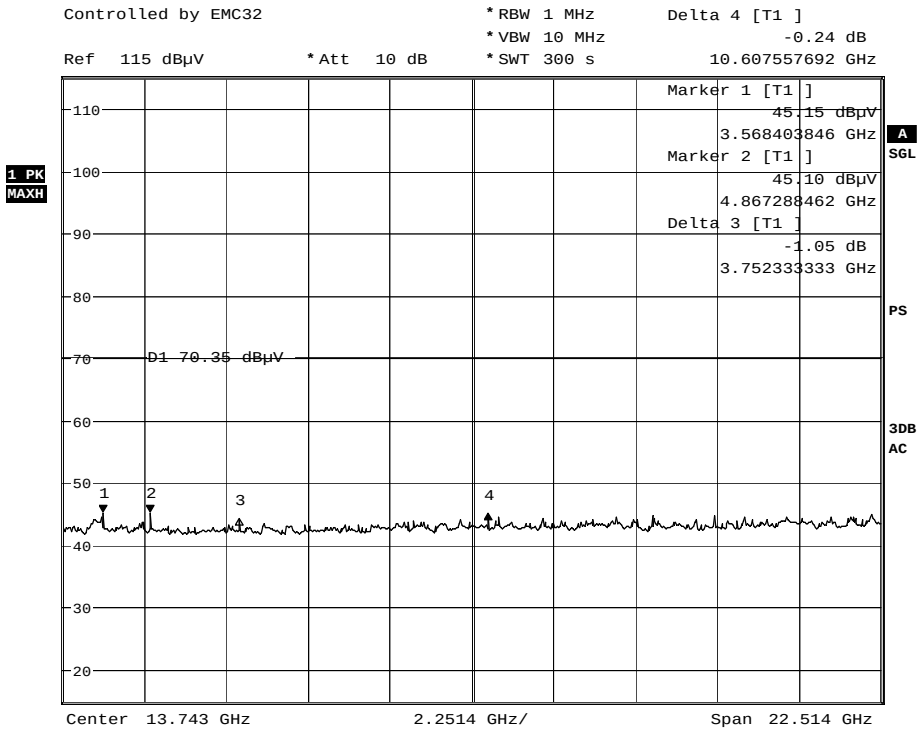
Date: 22.OCT.2008 12:57:53

Out-of band emission per 100kHz, Sweep 1



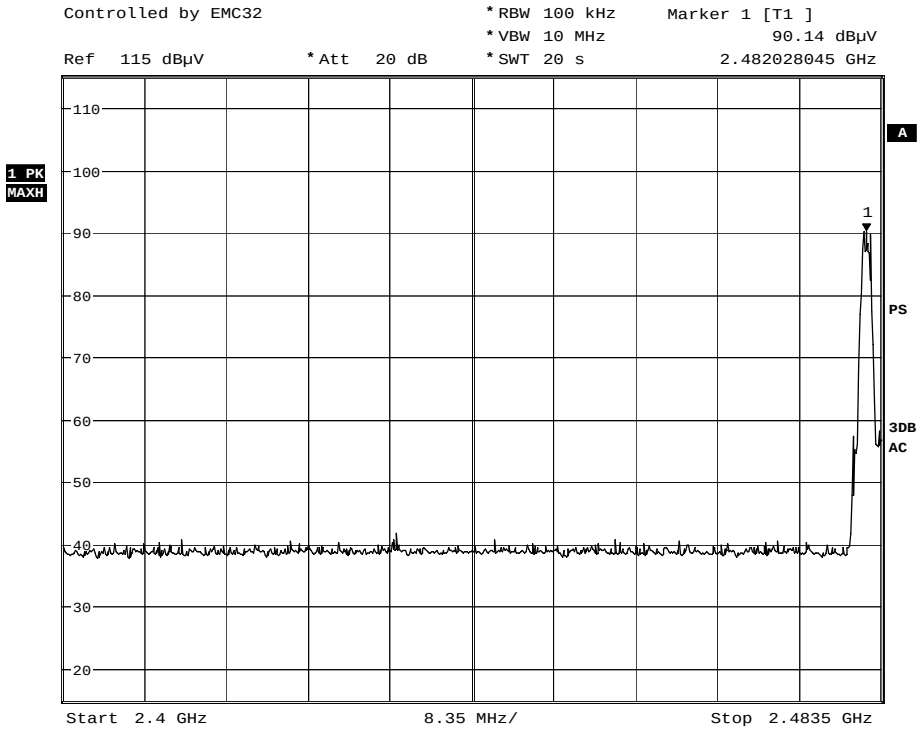
Date: 22.OCT.2008 12:52:23

Out-of band emission per 100kHz, Sweep 2



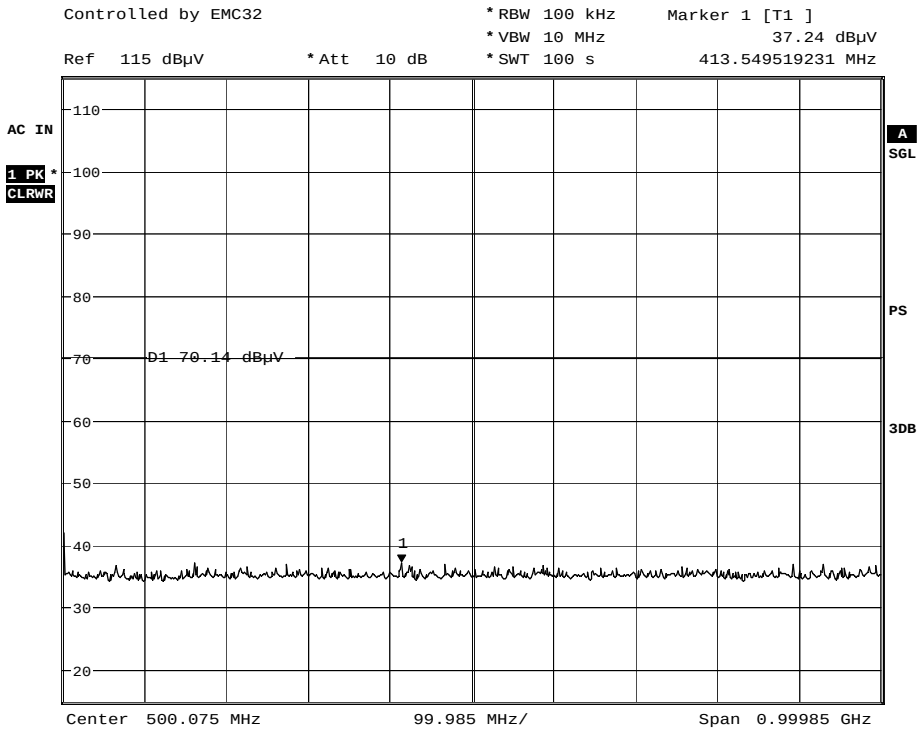
Date: 22.OCT.2008 12:47:13

Out-of band emission per 100kHz, Sweep 3



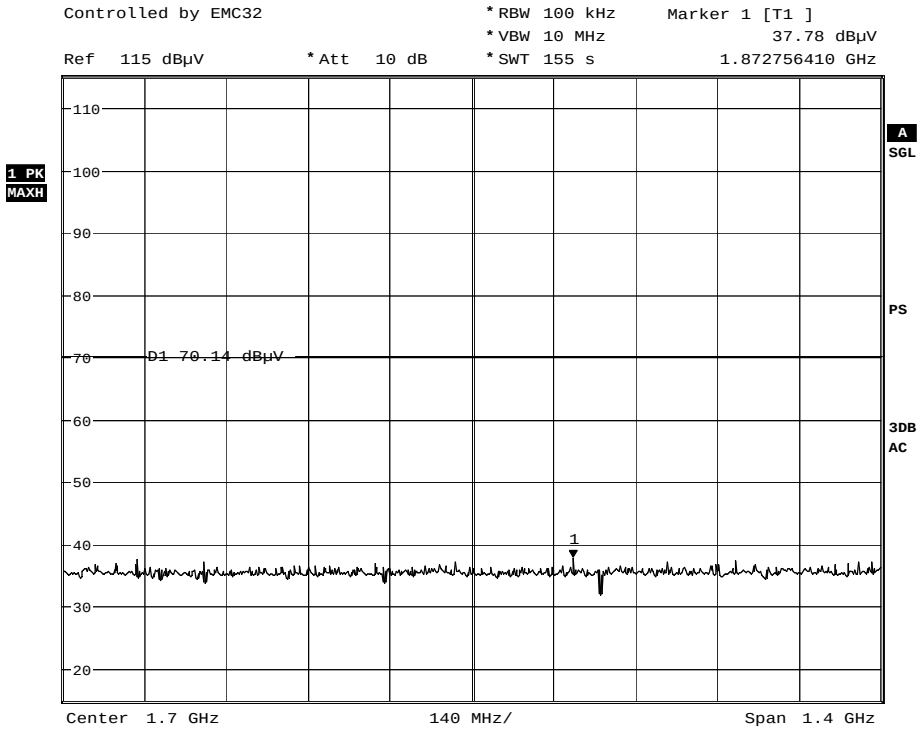
Date: 21.OCT.2008 18:37:28

Channel high: In-Band Power (reference)



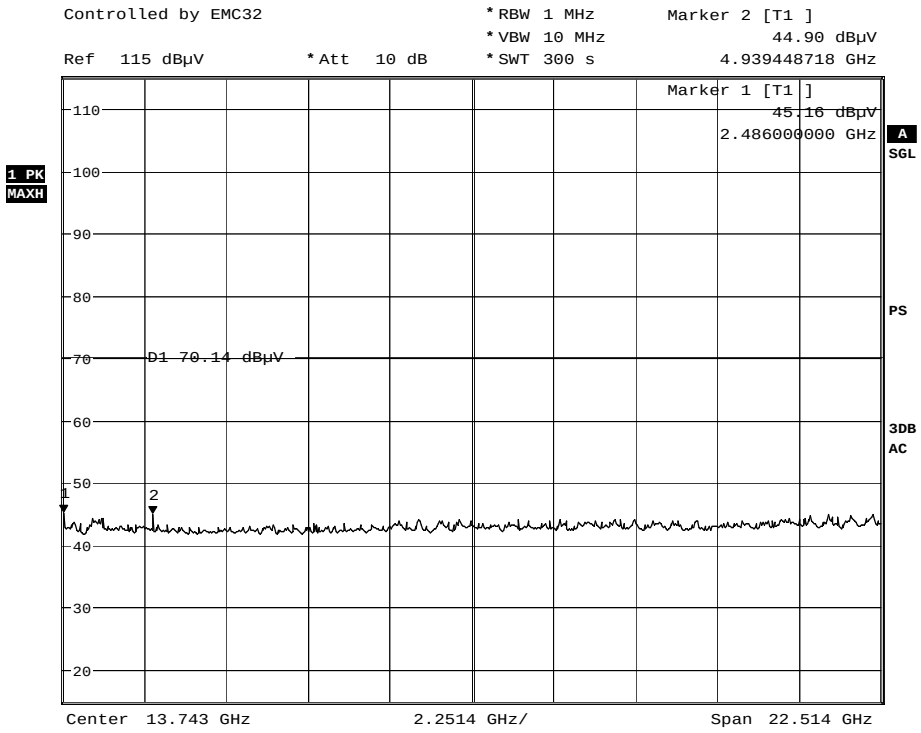
Date: 22.OCT.2008 13:04:32

Out-of band emission per 100kHz, Sweep 1



Date: 22.OCT.2008 13:09:33

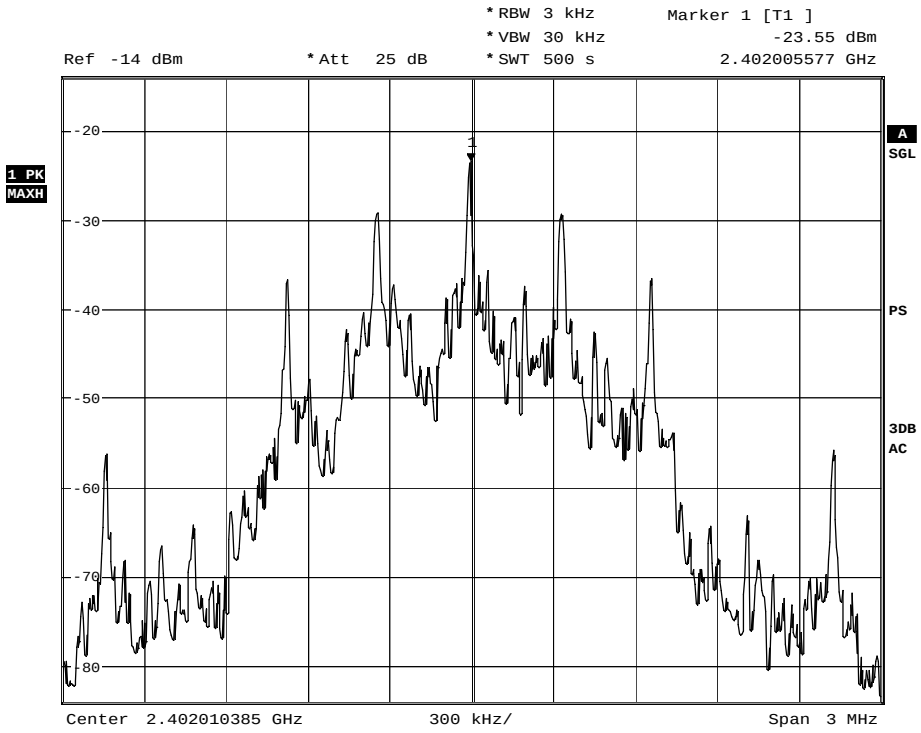
Out-of band emission per 100kHz, Sweep 2



Date: 22.OCT.2008 13:15:37

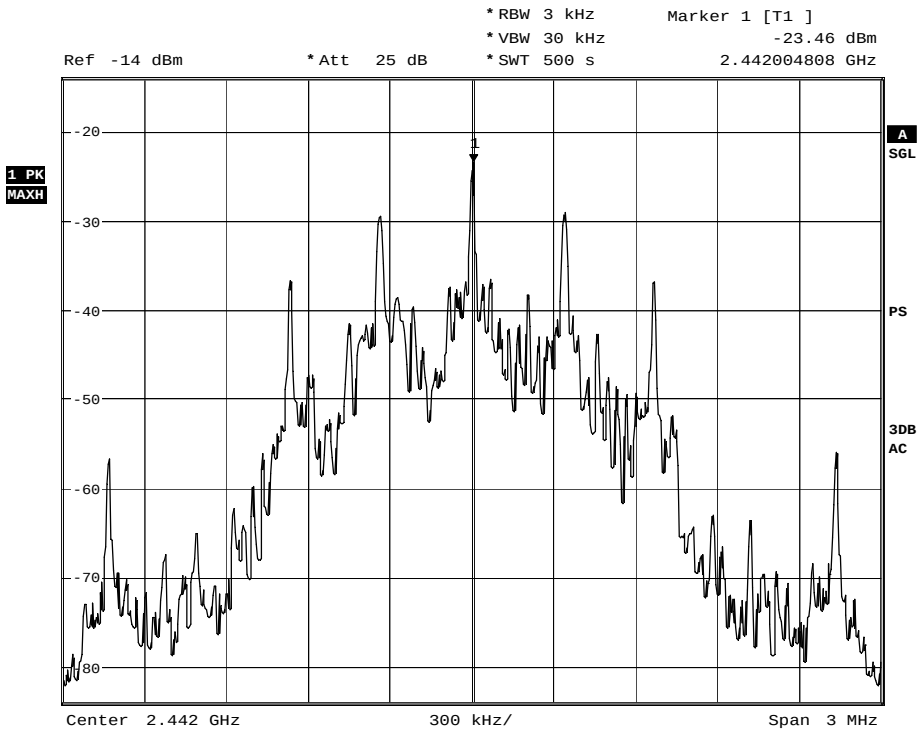
Out-of band emission per 100kHz, Sweep 3

7.0.8. Measurement diagrams – power density



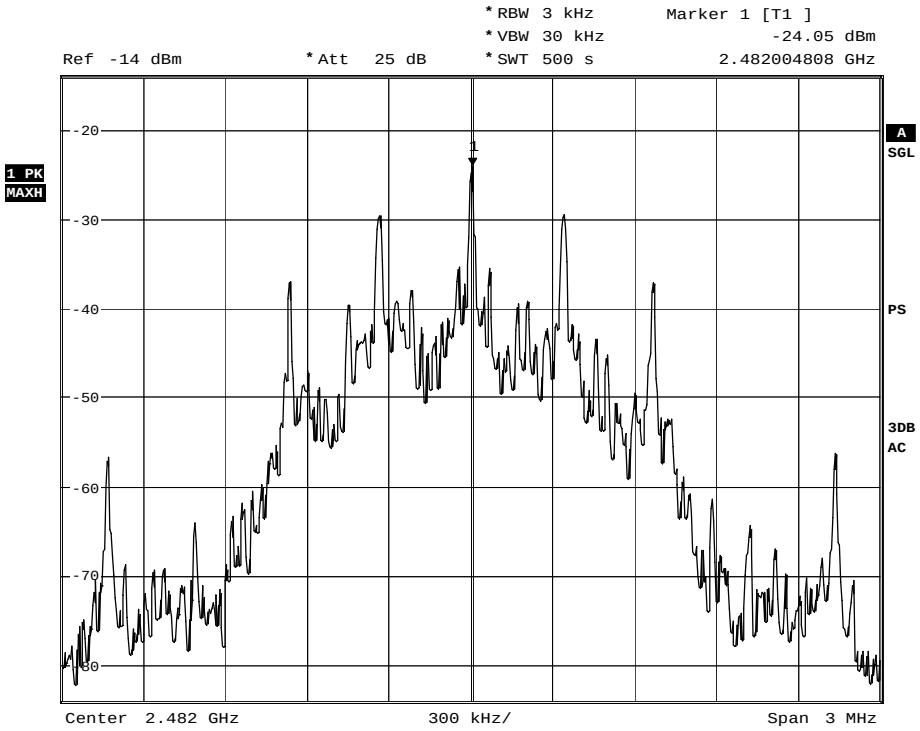
Date: 29.OCT.2008 08:17:29

Channel low



Date: 29.OCT.2008 08:48:37

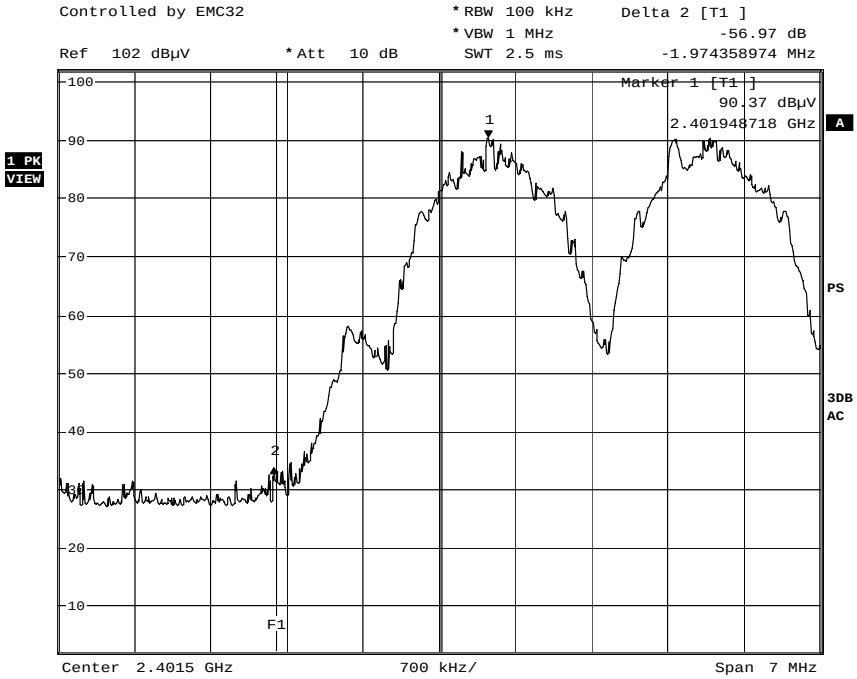
Channel middle



Date: 29.OCT.2008 08:58:31

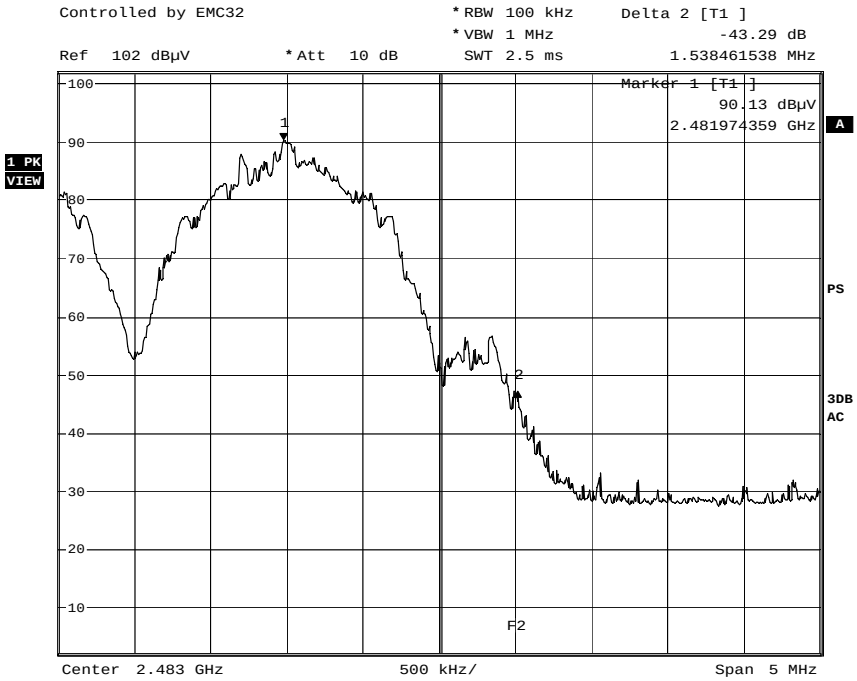
Channel high

7.0.9. Measurement diagrams – radiated emissions in restricted bands, band-edge compliance



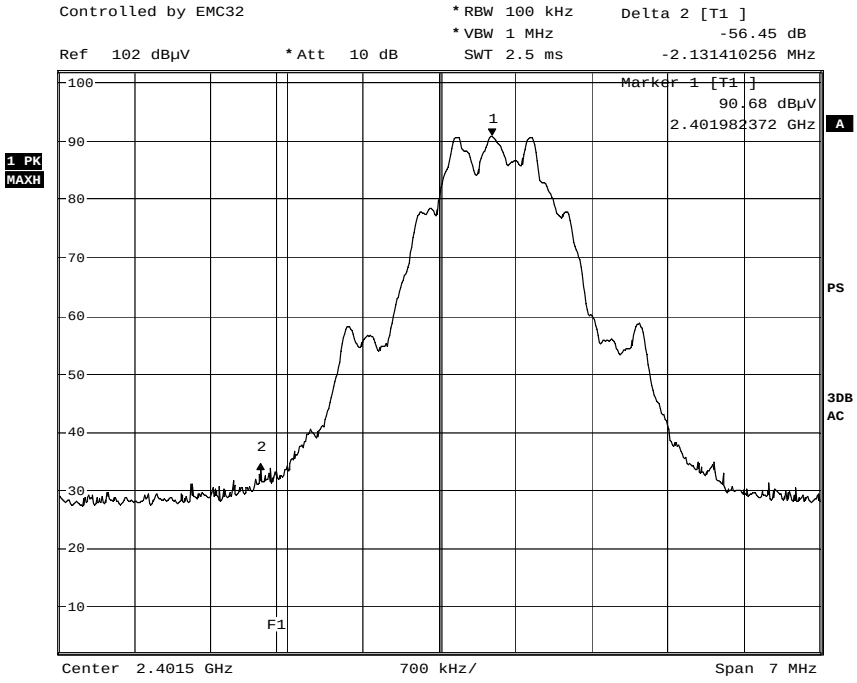
Date: 22.OCT.2008 11:17:58

Left Edge: Delta marker, Hopping mode on



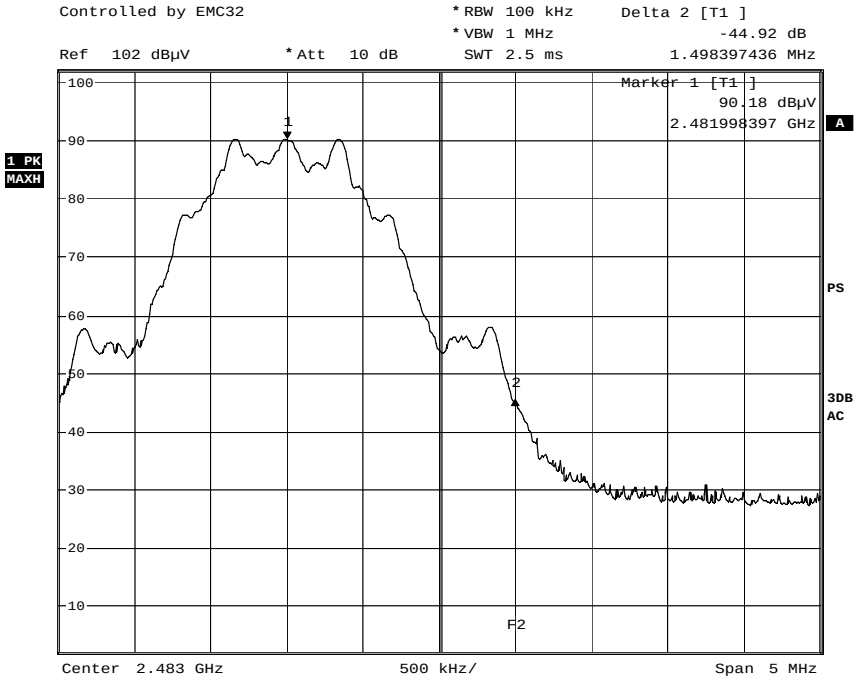
Date: 22.OCT.2008 11:23:56

Right Edge: Delta marker, Hopping mode on



Date: 21.OCT.2008 17:20:38

Left Edge: Delta marker, Hopping mode off



Date: 21.OCT.2008 17:23:09

Right Edge: Delta marker, Hopping mode off

8. Correction factors due to reduced meas. distance (f< 30 MHz)

The used correction factors when the measurement distance is reduced, are taken from IEEC Transaction EMC, Vol 47, No.3, Aug. 2005, Journal Paper *"EXTRAPOLATING NEAR-FIELD EMISSIONS OF LOW-FREQUENCY LOOP TRANSMITTERS"*.

Used Transducer factors (f < 30 MHz)					
1	2	3	4	5	6
					=2+3+4+5
Frequency	Antenna factor	Corection factor		Cable loss	Transducer factor
		300m to 3m	30m to 3m		
kHz	dB µV/m	dB	dB	dB	dB µV/m
9,0	20,0	-116,7		0,0	-96,7
10,6	20,0	-116,7		0,0	-96,7
12,6	20,0	-116,7		0,0	-96,7
14,8	20,0	-116,7		0,0	-96,7
17,5	20,0	-116,6		0,0	-96,6
20,7	20,0	-116,6		0,0	-96,6
24,4	20,0	-116,6		0,0	-96,6
28,9	20,0	-116,6		0,0	-96,6
34,1	20,0	-116,5		0,0	-96,5
40,3	20,0	-116,4		0,0	-96,4
47,6	20,0	-116,3		0,0	-96,3
56,2	20,0	-116,2		0,0	-96,2
66,4	20,0	-116,0		0,0	-96,0
78,4	20,0	-115,8		0,0	-95,8
92,7	20,0	-115,4		0,0	-95,4
109,4	20,0	-115,0		0,0	-95,0
129,3	20,0	-114,5		0,0	-94,5
152,7	20,0	-113,9		0,0	-93,9
180,4	20,0	-113,1		0,0	-93,1
213,1	20,0	-112,2		0,0	-92,2
251,7	20,0	-111,3		0,0	-91,3
297,3	20,0	-108,3		0,0	-88,3
351,2	20,0	-105,2		0,0	-85,2
414,8	20,0	-102,1		0,0	-82,1
490,0	20,0	-99,1		0,0	-79,1
490,0	20,0		-56,4	0,1	-36,3
582,0	20,0		-56,2	0,1	-36,1
690,0	20,0		-56,0	0,2	-35,8
820,0	20,0		-55,7	0,2	-35,5
973,0	20,0		-55,4	0,2	-35,2
1.155,0	20,0		-54,9	0,3	-34,6
1.371,0	20,0		-54,4	0,3	-34,1
1.627,0	20,0		-53,7	0,3	-33,4
1.931,0	20,0		-52,9	0,4	-32,5
2.292,0	20,0		-52,0	0,4	-31,6
2.721,0	20,0		-49,8	0,5	-29,3
3.230,0	20,0		-46,6	0,5	-26,1
3.834,0	20,0		-43,3	0,6	-22,7
4.551,0	20,0		-40,1	0,6	-19,5
5.402,0	20,0		-36,8	0,7	-16,1
6.412,0	20,0		-33,5	0,7	-12,8
7.612,0	20,0		-30,3	0,8	-9,5
9.035,0	20,0		-27,0	0,8	-6,2
10.725,0	20,0		-23,9	0,9	-3,0
12.730,0	20,0		-21,2	0,9	-0,3
15.111,0	20,0		-19,3	1,0	1,7
17.937,0	20,0		-18,4	1,0	2,6
21.292,0	20,0		-18,2	1,1	2,9
25.274,0	20,0		-18,3	1,1	2,8
30.000,0	20,0		-18,4	1,2	2,8