T E S T R E P O R T
No.: 6-0173-12-2-2c

According to:
FCC Regulations
Part 15.209
Part 15.247

IC-Regulations
RSS-Gen
RSS-210

for

Zero1.tv GmbH

IR Remote Control System for Smartphones VooMote Air
Bluetooth® - Low Energy Mode
FCC-ID: ORD-AIR
IC-ID: 10489A-AIR

Laboratory Accreditation and Listings			
DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-01	Reg. No.: 736496 MRA US-EU 0003	Industry Canada Reg. No.: 3462D-1 Reg. No.: 3462D-2 Reg. No.: 3462D-3	Voluntary Controls for Electromagnetic Emissions Reg. No.: R-2665, R-2666 C-2914, T-1967, G-301
Wi Fi ALLIANCE AUTHORIZED RF LABORATORY	CTIA Authorized Test Lab LAB CODE 20011130-00		
accredited according to DIN EN ISO/IEC 17025			

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1. Summary of test results

The test results apply exclusively to the test samples as presented in this Report. 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 Equipment Under Test (in this report, hereinafter referred as EUT) supports radiofrequency technology. The presented device integrates a Bluetooth-Low Energy transmitter operating in the 2.4 to 2.483 GHz frequency range.

Following test cases have been performed to show compliance with valid Part 15.209/15.247 of the FCC CFR 47 Rules, Edition 1st October 2011 and IC RSS-210 Issue 8/RSS-Gen Issue 3 standards.

1.1. Tests overview FCC and Canada IC Standards (RSS)

TEST CASES	PORT	REFERENCES & LIMITS			EUT set-up	EUT operating mode	Result
		FCC Standard	RSS Section	TEST LIMIT			
TX-Mode							
6 dB bandwidth	Antenna terminal (conducted)	§15.247(a)(2)	RSS-210 Issue 8: A8.2 (a) RSS-Gen Issue 3: Chapter 4.6.2	≥ 500 kHz for DTS systems	2	1	passed
99% occupied bandwidth	Antenna terminal (conducted)	--	RSS-Gen Issue 3: Chapter 4.6.1	99% Power bandwidth	2	1	for Information only
Transmitter Peak output power	Antenna terminal (conducted)	§15.247(b)(1)	RSS-210 Issue 8: A8.4 (4)	1 Watt Peak	2	1	passed
Transmitter Peak output power radiated	Cabinet (radiated)	§15.247(b)(4)	RSS-210 Issue 8:A8.4 (4)	< 4 Watt (EIRP) for antenna with directional gain less 6dBi	1	1	passed
Out-Of-Band RF- emissions Band-Edge emissions	Antenna terminal (conducted)	§15.247 (d)	RSS-210 Issue 8: A8.5	20 dBc	2	1	passed
Power spectral density	Antenna terminal (conducted)	§15.247(e)	RSS-210 Issue 8: A8.2 (b)	8 dBm in any 3 kHz band	2	1	passed
General field strength emissions + restricted bands	Cabinet + Inter-connecting cables (radiated)	§15.247 (d) §15.205 §15.209	RSS-210 Issue 8, Chapter 2.5 RSS-Gen: Issue 3: §7.2.5 Table 5+6	Emissions in restricted bands must meet the general field-strength radiated limits	1	1	passed
AC-Power Lines Conducted Emissions	AC-Power lines	§15.207	RSS-Gen, Issue 3: Chapter 7.2.4, Table 4	FCC §15.107 class B limits §15.207 limits IC: Table 4, Chapter 7.2.4	--	--	remark 1

RX Mode							
AC-Power Lines Conducted Emissions	AC-Power lines	§15.107 §15.207	RSS-Gen, Issue 3: Chapter 7.2.4	FCC §15.107 class B limits §15.207 limits IC: Table 4, Chapter 7.2.4	--	--	N/A remark 1
RECEIVER Radiated emissions	Cabinet + Inter-connecting cables (radiated)	§15.109 §15.33 §15.35	RSS-Gen, Issue 3: Chapter 6.1	FCC 15.109 class B limits IC-limits: Table 1, Chapter 6	--	--	N/A remark 2

Remark: 1) Not applicable, only DC powered.
2) According to the applicant not applicable.

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 above table are met in accordance with enumerated standards.

.....
Dipl.-Ing. Ch. Lorenz
Responsible for test section

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45219 Essen
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Fax: + 49 (0) 20 54 / 95 19 - 997

.....
Dipl.-Ing. B. Taslica
Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Responsible for testing laboratory:	Dipl.-Ing. W. Richter
Deputy:	Dipl.-Ing. J. Schmitt

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

Responsible for test report and project leader:	Dipl.-Ing. B. Taslica
Receipt of EUT:	2012-05-30
Date(s) of test:	2012-05-30 – 2012-06-22
Date of report:	2012-08-07
Version of template: 12.06	

2.4. Applicant's details

Applicant's name:	Zero1.tv GmbH
Address:	Heinrich-Roller-Strasse 16b 10405 Berlin GERMANY
Contact person:	Mr. Christoph Rhodius

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. TECHNICAL DATA OF MAIN EUT DECLARED BY APPLICANT

Main function	IR Remote Control System for Smartphones (Bluetooth® v4.0 - Low Energy (BLE) to Infrared Converter)		
Type	VooMote Air		
Frequency range (US/Canada -bands)	2402 MHz (Channel 37) to 2480 MHz (Channel 39)		
Type of technology\modulation[1)]	FHSS\GFSK		
Number of channels (USA/Canada -bands)	0 to 39		
Antenna Type	☒ Integrated ☐ External, no RF- connector ☐ External, separate RF-connector		
Antenna Gain	Max. 0 dBi gain according applicants information in 2.4 GHz band		
Maximum spurious field strength (radiated):	55.1 dBµV/m (PK)@3m distance at 9.60 GHz 50.2 dBµV/m (AV)@3m distance at 9.58 GHz		
FCC-ID	ORD-AIR		
IC	10489A-AIR		
Installed options	--		
Power supply	☒ Internal battery Li-Ion, range nominal 3.0, Low voltage= 2.2V to High voltage= 3.6V.		
Special EMI components	--		
EUT sample type	☐ Production	☒ Pre-Production	☐ Engineering
FCC label attached	☐ yes ☒no		

Remark: 1.) *Bluetooth* LE does not fulfill the FCC/IC regulatory requirements of FHSS systems, instead *Bluetooth* LE is a system using *digital modulation techniques (DTS)*.

3.2. 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	IR Remote Control System for Smartphones	VooMote Air	BT address : 3C:2D:B7:85:6E:42	1.0	1.2
EUT B	IR Remote Control System for Smartphones	VooMote Air	BT address : 3C:2D:B7:85:6E:BA	1.0	1.2

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

3.3. 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	CC debugger	Texas Instruments controlling device	10092	rev 1.0	--

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

3.4. EUT set-ups

EUT set-up no.*)	Combination of EUT and AE	Remarks
Set. 1	EUT A + AE 1	Used for radiated tests (TX-Mode)
Set. 2	EUT B + AE 1	Used for conducted tests (TX Mode)

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

3.5. EUT operating modes

EUT operating mode no.*)	Description of operating modes	Additional information
op. 1	TX mode	The transmitter (modulated) is set to broadcast mode in transmission frequency within the operational range and send a modulated carrier (100% duty cycle factor). The EUT could be set to lowest (CH 36= 2402 MHz), middle (CH 17= 2440 MHz) and highest (CH 38= 2480 MHz) possible working frequencies within the assigned operational band. AE1 was connected to the main EUT in order to control its function and operating mode.

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

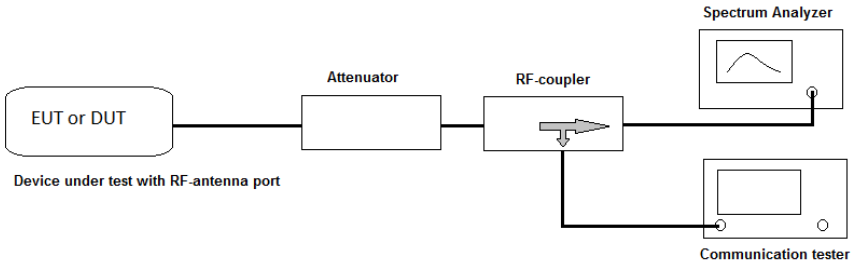
3.6. Description of test system set-up's

3.6.1. Test system set-up for conducted RF-measurements at antenna port

Specification: ANSI C63.10-2009

General Description: The EUT's RF-signal is first attenuated before it is connected to the input of the RF-coupler. The direct output branch is connected to the spectrum – analyzer, the coupled branch to the communication tester. The specific attenuation is determined prior to the measurement within a set-up calibration. The value is taken into account by correcting the measurement readings on the spectrum-analyzer either by a transducer factor (TDF) or an relative offset to reference level.

Schematic:



Testing method: According to ANSI C63.10-2009 for each individual test, see more details in each chapter.

3.6.2. Test system set-up for radiated measurements

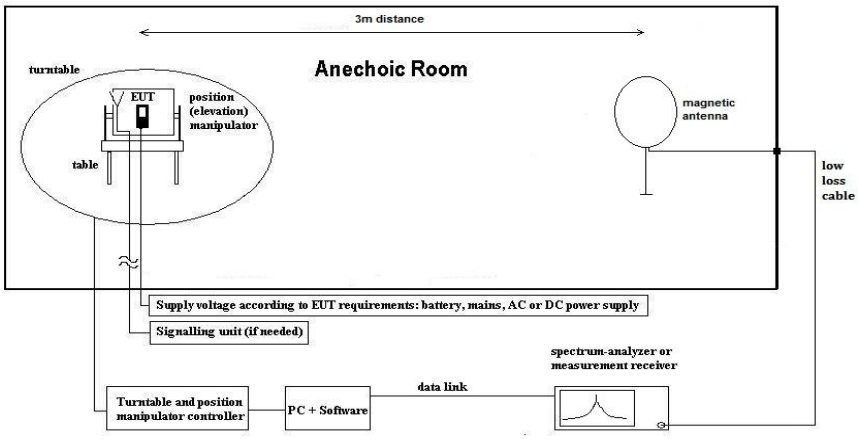
3.6.2.1. Test system set-up for radiated magnetic field measurements below 30 MHz

Specification: ANSI C63.4-2009 chapter 8.2.1, ANSI C63.10-2009 chapter 6.4

General Description: Evaluating the radiated field emissions to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies.

The loop antenna was placed at 1 m height above ground plane and 3 m measurement distance from set-up for investigations. Because of reduced measurement distance, correction data were applied, as stated in chapter "General Limit - Radiated field strength emissions below 30 MHz". The tests are performed in the semi anechoic room recognized by the regulatory commissions.

Schematic:



Testing method:

Exploratory, preliminary measure-ment
The EUT and it's associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (step 90°, range 0°to 360°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT), the emission spectrum and it's characteristics was recorded with an EMI-receiver, broadband loop antenna and software.
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 results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a data reduction table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies
Based on the exploratory measurements, the most critical frequencies are re-measured by main-taining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position).

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$E_C = E_R + AF + C_L + D_F - G_A$

$M = L_T - E_C$

AF =Antenna factor
C_L = Cable loss
D_F= Distance correction factor
E_C = Electrical field – corrected value
E_R = Receiver reading
G_A= Gain of pre-amplifier (if used)
L_T = Limit
M = Margin

All units are dB-units, positive margin means value is below limit.

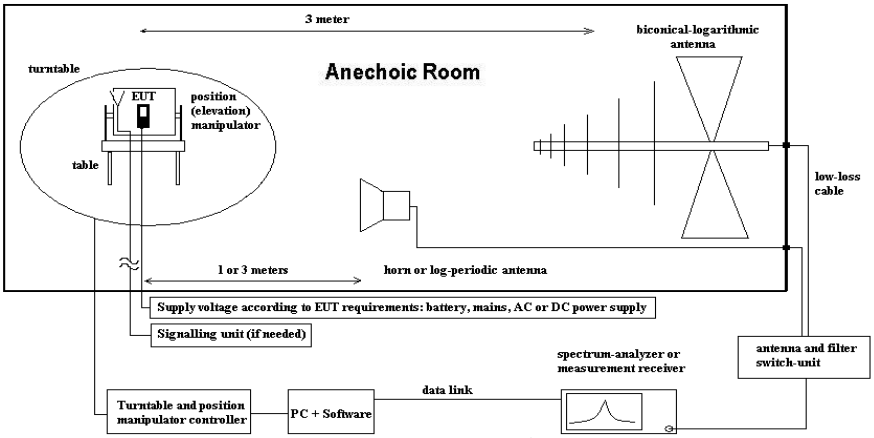
Distance correction: Reference for applied correction (extrapolating) factors:
IEEC Transaction EMC, Vol. 47, No. 3 , Aug. 2005, Journal Paper
"*Extrapolating Near-field emissions of low frequency loop transmitters".*

3.6.2.2. Test system set-up for electric field measurement in the range 30 MHz to 1 GHz

Specification: ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.5

General Description: Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a NSA-compliant semi anechoic room (SAR) recognized by the regulatory commissions.

Schematic:



Testing method:

Exploratory, preliminary measurements

The EUT and it's associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 90°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and it's characteristics was recorded with an EMI-receiver, broadband antenna and software.

Measurement antenna: horizontal and vertical, heights: 1,0 m and 1,82 m. The results are documented in a

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal

diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

axis (defined usage position). The measurement antenna height between 1 m and 4 m.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$E_C = E_R + AF + C_1 + D_F - G_A$ (1)

$M = L_T - E_C$ (2)

AF = Antenna factor
C_L = Cable loss
D_F = Distance correction factor
E_C = Electrical field – corrected value
E_R = Receiver reading
G_A = Gain of pre-amplifier (if used)
L_T = Limit
M = Margin

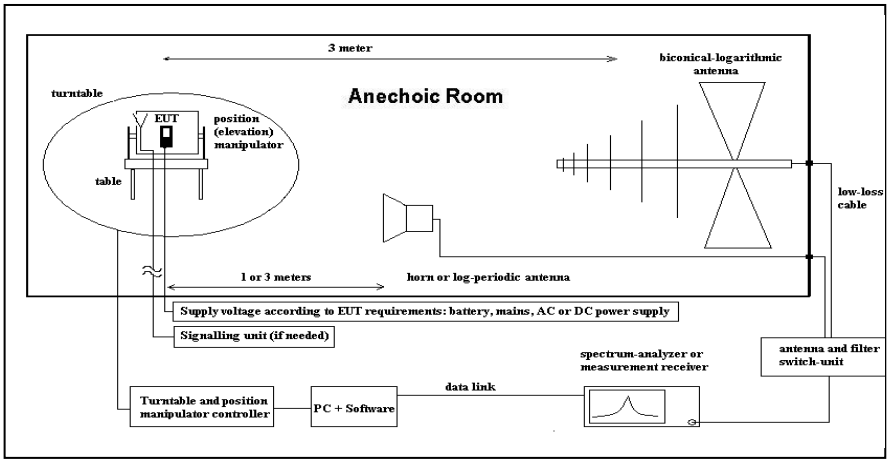
All units are dB-units, positive margin means value is below limit.

3.6.2.3. Test system set-up for electric field measurement above 1 GHz

Specification: ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.6

General Description: Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a CISPR 16-4 compliant fully anechoic room (FAR) recognized by the regulatory commissions. The measurement distance was set to 3 meter for frequencies up to 18 GHz and 1 meter above 18 GHz. Logarithmic periodic antenna is used for frequency range 1 GHz to 18 GHz, above 18 GHz a horn antenna is used. The antennas are set to fixed antenna height of 1.55 m and the EUT aligned within 3 dB cone of radiation pattern.

Schematic:



Testing method:	**Exploratory, preliminary measurements** The EUT and it's associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.55 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 45°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and it's characteristics was recorded with an EMI-receiver, broadband antenna and software. The measurements are performed in horizontal and vertical polarization of the measurement antennas. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.	**Final measurement on critical frequencies** Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc. First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined. Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurement antenna height is fixed to 1.55 m. On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.
Formula:	$E_C = E_R + AF + C_1 + D_F - G_A$ (1) $M = L_T - E_C$ (2)	E_C = Electrical field – corrected value E_R = Receiver reading M = Margin L_T = Limit AF = Antenna factor C_L = Cable loss D_F = Distance correction factor G_A = Gain of pre-amplifier (if used)

All units are dB-units, positive margin means value is below limit.

4. Measurements

4.1. General Limit - Radiated field strength emissions below 30 MHz

4.1.1. 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	☐ 347 Radio.lab.		☐	☐
receiver	☐ 377 ESCS30	☒ 001 ESS	☐	☐	☐	☐
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☐	☐	☐
antenna	☐ 574 BTA-L	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☒ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 392 MT8820A	☐ 436 CMU	☐ 547 CMU			
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☐ 482 Filter Matrix	☐ 378 RadiSense	
DC power	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
line voltage	☐ 230 V 50 Hz via public mains		☐060 110 V 60 Hz via PAS 5000			

4.1.2. Requirements

FCC	Part 15, Subpart B, §15.205, §15.209				
IC	RSS-Gen., Issue 3				
ANSI	C63.10:2009				
Limit	Frequency [MHz]	Field strength [µV/m]	[dBuV/m]	Dis-tance	Remarks
	0.009 –	2400/f (kHz)	67.6 – 20Log(f) (kHz)	300m	Correction factor used due to measurement distance of 3m
	0.490 –	24000/f (kHz)	87.6 – 20 Log(f) (kHz)	30m	Correction factor used due to measurement distance of 3m
	1.705 – 30	30	29.54	30m	Correction factor used due to measurement distance of 3m
Remark: * decreases with the logarithm of the frequency					

4.1.3. Test condition and 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±3°C)		Rel. humidity: (40±20)%
EMI-Receiver (Analyzer) Settings	Scan frequency range:	☒ 9 – 150 kHz ☒ 150 kHz – 30 MHz ☐ other:		
	Scan-Mode	☒ 6dB EMI-Receiver Mode ☐ 3dB Spectrum Analyser Mode		
	Detector	Peak (pre-meas) and Average (final if applicable)		
	RBW/VBW	200 Hz / 9 kHz		
	Mode:	Repetitive-Scan, max-hold		
	Scan step	80 Hz /4 kHz		
	Sweep-Time	Coupled – calibrated display if continuous signal otherwise adapted to EUT's individual transmission duty-cycle		
	Range:	100dB		
General measurement procedures		See chapter 3.6.2.1		

4.1.4. Measurement results

The results are presented below in summary form only. For more information please see diagrams enclosed in the chapter 8.1 to this report.

Table of measurement Results

Diagram No.	Carrier Channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Range	Nr.					PK	AV	QP	
2.01	Low	37	9kHz .. 30MHz	1	1	--	☒	☐	☐	passed
2.02	Middle	17				--	☒	☐	☐	passed
2.03	High	39				--	☒	☐	☐	passed

4.1.5. 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

4.2. General Limit - Radiated field strength emissions, 30 MHz - 1 GHz

4.2.1. 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				
receiver	☐ 377 ESCS30	☒ 001 ESS	☐ 489 ESU 40	☐ 620 ESU 26		
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK			
antenna	☒ 574 BTA-L	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☐ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 392 MT8820A	☐ 436 CMU	☐ 547 CMU			
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☒ 482 Filter Matrix		
DC power	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE
line voltage	☐ 230 V 50 Hz via public mains		☐ 060 110 V 60 Hz via PAS 5000			

4.2.2. Requirements

FCC		☐ Part 15 Subpart B, §15.109, class B ☒ Part 15 Subpart C, §15.209	
IC		RSS-Gen., Issue 3	
ANSI		☐ C63.4: 2009 ☒ C63.10: 2009	
Limit	Frequency [MHz]	Radiated emissions limits, 3 meters	
		QUASI Peak [µV/m]	QUASI-Peak [dBµV/m]
	30-88	100	40.0
	88-216	150	43.0
	216-960	200	46.0
	above 960	500	54.0
Remark: * decreases with the logarithm of the frequency			

4.2.2.1. 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	37.5-38.25	1645.5-1646.5	9.3-9.5
6.215-6.218	73-74.6	1660-1710	10.6-12.7
6.26775-6.26825	74.8-75.2	1718.8-1722.2	13.25-13.4
6.31175-6.31225	108-121.94	2200-2300	14.47-14.5
8.291-8.294	123-138	2310-2390	15.35-16.2
8.362-8.366	149.9-150.05	2483.5-2500	17.7-21.4
8.37625-8.38675	156.52475-156.52525	2690-2900	22.01-23.12
8.41425-8.41475	156.7-156.9	3260-3267	23.6-24.0
12.29-12.293	162.0125-167.17	3332-3339	31.2-31.8
12.51975-12.52025	167.72-173.2	3345.8-3358	36.43-36.5
12.57675-12.57725	240-285	3600-4400	--
13.36-13.41	322-335.4	--	--
Remark: only spurious emissions are allowed within these frequency bands not exceeding the limits per §15.209			

4.2.3. 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±3°C)		Rel. humidity: (40±20)%
EMI-Receiver (Analyzer) Settings	Scan frequency range:	☒ 30 – 1000 MHz ☐ other:		
	Scan-Mode	☒ 6dB EMI-Receiver Mode ☐ 3dB spectrum analyser mode		
	Detector	Peak		
	RBW/VBW	100 kHz/300 kHz		
	Mode:	Repetitive-Scan, max-hold		
	Scan step	80 kHz		
	Sweep-Time	Coupled – calibrated display if continuous tx-signal otherwise adapted to EUT's individual transmission duty-cycle		
	Range:	100dB		
General measurement procedures		See chapter 3.6.2.2		

4.2.4. Measurement results:

The results are presented below in summary form only. For more information please see diagrams enclosed in the chapter 8.2 to this report.

Table of measurement Results

Dia-gram no.	Carrier Channel Range	Carrier Channel Nr.	Frequency range	Set-up no.	OP-mode no.	Remark	Used detector PK	Used detector AV	Used detector QP	Result
3.01	Low	37	30MHz .. 1000MHz	1	1	--	☒	☐	☒	passed
3.02	Middle	17				--	☒	☐	☐	passed
3.03	High	39				--	☒	☐	☒	passed

Remark: --

4.3. General Limit - Radiated emissions, above 1 GHz

4.3.1. 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.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☒ 489 ESU	☐ 620 ESU 26	☐
antenna meas	☐ 574 BTA-L	☐ 289 CBL 6141	☐ 608 HL 562	☒ 549 HL025	☒ 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	☐
multimeter	☐ 341 Fluke 112	☐	☐	☐	☐	☐
signaling	☐ 392 MT8820A	☐ 436 CMU	☐ 547 CMU			
DCpower	☐ 086 LNG50-10	☐ 087 EA3013	☐ 354 NGPE 40	☐ 349 car battery	☐ 350 Car battery	☒ 611 E3632A
line voltage	☐ 230 V 50 Hz via public mains		☐060 110 V 60 Hz via PAS 5000			

4.3.2. Requirements

FCC		☐ Part 15 Subpart B, §15.109 class B ☒ Part 15 subpart C, §15.209			
IC		RSS-Gen., Issue 3			
ANSI		☐ C63.4: 2009 ☒ C63.10: 2009			
Limit	Frequency [MHz]	Limits:			
		☒ 3 meters measurement distance		☐ 10 meters measurement distance	
		AV [µV/m]	AV [dBµV/m]	Peak [µV/m]	Peak [dBµV/m]
	above 1 GHz	500	54.0	5000	74.0
Remark: * decreases with the logarithm of the frequency					

4.3.3. 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: (22±3°C)	Rel. humidity: (40±20)%
Spectrum-Analyzer settings	Scan frequency range:	☒ 1 - 18GHz ☒ 18 – 25 GHz ☐ 18 – 40 GHz ☐ other:	
	Scan-Mode	☒ 3dB EMI-Receiver Mode ☐ 6dB Spectrum analyser Mode	
	Detector	Peak and Average	
	RBW/VBW	1MHz/3MHz and 500kHz/5MHz	
	Mode:	Repetitive-Scan, max-hold	
	Scan step	400kHz	
	Sweep-Time	Coupled – calibrated display if CW signal otherwise adapted to EUT's individual transmission duty-cycle	
	Range:	100dB	
General measurement procedures		see chapter 3.6.2.3	

4.3.4. Measurement results:

The results are presented below in summary form only. For more information please see diagrams enclosed in the chapter 8.3 to this report.

Dia-gram no.	Carrier Channel Range	Carrier Channel Nr.	Frequency range	Set-up no.	OP-mode no.	Remark	Used detector PK	Used detector AV	Used detector QP	Result
4.01	Low	37	1 – 18 GHz	1	1	--	☒	☒	☐	passed
4.02	Low	37	18 –25 GHz			--	☒	☒	☐	passed
4.03	Middle	17	1 – 18 GHz			--	☒	☒	☐	passed
4.04	Middle	17	18-25 GHz			--	☒	☒	☐	passed
4.05	High	39	1 – 18 GHz			--	☒	☒	☐	passed
4.06	High	39	18 –25 GHz			--	☒	☒	☐	passed

4.4. General Limit - Carrier field strength and radiated band-edge compliance measurements

4.4.1. 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.	☒ 443 EMI FAR	☐
antenna meas	☒ 549 HL025	☐ 289 CBL 6141	☐ 439 HL 562	☐ 133 EMCO3115	☐ 302 BBHA9170	☐477 GPS
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU	☐	☐	☐
spectr. analys.	☐ 489 ESU	☐ 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	☐530 10dB Attenuator			☐ cable K15		

4.4.2. MEASUREMENT METHOD:

A Marker-Delta marker method was used for showing compliance to restricted bands according §15.205. The method is according ANSI C63.10:2009 “Marker-Delta method” described in §6.9.3. 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.

4.4.3. RESULTS

Set-up: 1 Op. Mode: 1						
T_{NOM} = 21°C, V_{NOM} = 3.0V	Fundamental field strength-radiated [dBµV/m]	Delta Marker Value[1)] [dBc]	Subtraction: Fundamental Field strength – Delta value	Value at Band-Edge [dBµV/m]	Limits	Verdict
Channel Low	98.9 (PK) 98.4 (AV)	50.2	48.7 (PK) 48.9(AV)	--	>20dBc	Passed
Channel High	98.4 (PK) 98.0 (AV)	50.6	--	47.8 (PK) 47.4 (AV)	74 dBµV/m (PK) 54 dBµV/m (AV)	Passed Passed

Remark:--

4.5. General Limit - 20dBc Emission specification

4.5.1 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.	☐ 489 ESU	☐ 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	☒530 10dB Attenuator			☒ cable K5		

4.5.2 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.*

4.5.3 EUT SETTINGS:

For FHHS-systems hopping mode was switched-off so fixed three different channels could be measured.The EUT was instructed to send with maximum power (if adjustable) according to applicants instructions.

4.5.4 MEASUREMENT METHOD:

The frequency spectrum was investigated for **conducted** 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.

4.5.5 Results

Set-up no.: 2 Op. Mode: 1	**Test: 20 dBc Spurious emissions conducted**					
Frequency Range	Low channel =37 (2402 MHz) Level Reference (In-Band) = 111.07 dBµV/m Limit = 91.07 dBµV/m		Middle channel = 17 (2440 MHz) Level Reference (In-Band) = 111.44 dBµV/m Limit = 91.44 dBm		High channel = 39 (2480 MHz) Level Reference (In-Band) = 111.19 dBµV/m Limit= 91.19 dBµV/m	
	Level [dBm]	Margin to limit [dB]	Level [dBm]	Margin to limit [dB]	Level [dBm]	Margin to limit [dB]
0.15 .. 1000 MHz	See diagrams	>20	See diagrams	>20	See diagrams	>20
1 GHz .. 2.8 GHz						
2.8GHz .. 18 GHz						
18..25GHz						

Remark: See diagrams in chapter 8.6.

The limit on the diagrams is 20dB under the reference level measured In-Band for each channel

4.6. RF-Parameter - 6 dB, 20 dB and 99% Occupied Bandwidth

4.6.1. 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	☐
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☒ 489 ESU	☐	☐
attenuator	☒ 530 10 dB	☐	☐	☐	☐	☐
signaling	☐ 392 MT8820A	☐ 436 CMU	☐ 547 CMU			
DCpower	☒ 463 Power source	☐ 087 EA3013	☐ 354 NGPE 40	☐ 086 LNG50-10	☐	☐
line voltage	☐ 230 V 50 Hz via public mains		☐060 110 V 60 Hz via PAS 5000			
Others	☒ 530 10dB Attenuator		☒ cable K5			

4.6.2.Test condition and measurement test set-up

link to test system (if used):	☒ air link	☐ cable connection	☐
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%

4.6.3. References of occupied and emission bandwidth: §15.247(a)(1), RSS-210: 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.*

4.6.4. EUT Settings:

The EUT was instructed to send with maximum power (if adjustable) according applicants instructions. Different modulation characteristics have been checked, e.g. data rates which EUT can operate.

4.6.5. Measurement method:

At first the 6 dB bandwidth requirement according § 15.247 should be confirmed.

The measurement was performed with the RBW set to 10 kHz. 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 readjusted and the measurement repeated until the RBW/EBW ratio is around 1%.

4.6.6. Spectrum-Analyzer Settings:

Span	Set as to fully display the emissions + 30%
Scale y display	approximate 30dB below the maximum PEAK level
Resolution Bandwidth (RBW)	Set to initial value approx 1% to 5% of the emission bandwidth, re-adjust and proof that RBW/EBW is between 1% and 5%
Video Bandwidth (VBW)	Minimum 3 times the resolution bandwidth
Sweep time	Auto -coupled
Detector	Peak detector
Sweep mode	Repetitive Mode, MAX-HOLD, trace stabilization

4.6.7. Results:

6dB BANDWIDTH:

Set-up no.: 1 Op. Mode: 1	**6 dB bandwidth[2)] [MHz]**		
T_{NOM} =21°C, V_{NOM} = 3V	Low channel = 37 (2402 MHz)	Middle channel = 17 (2442 MHz)	High channel = 39 (2480 MHz)
Maximum value for GFSK Modulation[1)]	> 500 kHz	> 500 kHz	> 500 kHz

Remark: 1) 6dB BW Requirement fulfilled
2.) Initially 20dB bandwidth was measured

20dB BANDWIDTH FOR INFORMATION ONLY:

Set-up no.: 1 Op. Mode: 1	**20 dB bandwidth [MHz]**		
T_{NOM} =21°C, V_{NOM} = 3V	Low channel = 37 (2402 MHz)	Middle channel = 17 (2442 MHz)	High channel = 39 (2480 MHz)
Maximum value for GFSK Modulation[1)]	1.217 MHz	1.209 MHz	1.226 MHz

Remark: --

Additional also the 99% occupied bandwidth were measured for worst-case 20dB bandwidth.

99% OCCUPIED BANDWIDTH:

Set-up no.: 1 Op. Mode: 1	**99% Bandwidth [MHz]**		
T_{NOM} =21°C, V_{NOM} = 3V	Low channel = 37 (2402 MHz)	Middle channel = 17 (2442 MHz)	High channel = 39 (2802 MHz)
Maximum value for GFSK Modulation	1.073	1.057	**1.089[1)]**

Remark: 1.) maximum 99% occupied bandwidth value

VERDICT: DTS system requirements according §15.247 (BW > 500kHz) fulfilled

4.7. RF Power Conducted

4.7.1. 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	☒ 347 Radio.lab.		☐	☐
receiver	☐ 377 ESCS30	☐ 001 ESS	☒ 489 ESU 40	☐	☐	☐
spectr. analys.	☐ 584 FSU	☐ 120 FSEM	☐ 264 FSEK	☐ 489 ESU 40	☐	☐
antenna	☐ 574 BTA-L	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 289 CBL 6141	☐ 030 HFH-Z2	☐ 477 GPS
signaling	☐ 392 MT8820A	☐ 436 CMU	☐ 547 CMU			
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☐ 110 USB LWL	☐ 482 Filter Matrix	☐ 378 RadiSense	
DC power	☐ 456 EA 3013A	☒ 463 HP3245A	☐ 459 EA 2032-50	☐ 268 EA- 3050	☐ 494 AG6632A	☐ 498 NGPE 40
otherwise	☐ 331 HC 4055	☐ 248 6 dB Attenuator	☐ 529 Power divider	☐ - cable OTA20		
	☒530 10dB Attenuator		☒ K 5 Cable			
line voltage	☐ 230 V 50 Hz via public mains		☐060 110 V 60 Hz via PAS 5000			

4.7.2. 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 (FHSS) 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 signalling 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.

4.7.3. 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

4.7.4. EUT SETTINGS:

For FHSS-systems hopping mode was switched-off so fixed three different channels could be measured.
The EUT was instructed to send with maximum power (if adjustable) according applicants instructions.
Different modulation characteristics have been checked, e.g. data rates which EUT can operate.

4.7.5. 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.

MEASUREMENT METHOD/ SPECTRUM-ANALYZER SETTINGS:

Measurement Method [1.)]	§15.247(b) (3) Maximum Peak	1.) ☒ PK1-Method (§5.2.1.1): RBW > 6dB-bandwidth of the signal, ANSI 63.10: 2009, chapter 6.10.2.1a 2.) ☐ PK2-Method (§5.2.1.2): Channel integration method (ANSI 63.10:2009)
	§15.247(b) (3) Maximum Average	3.) ☐ AVG1 - power averaging over EBW + integrated band power measurement 4.) ☐ AVG2 - trace averaging over EBW + integrated band power measurement 5.) ☐ RMS power meter method
Center Frequency		Operating frequency range
Span		30% higher then the EBW measured before
Resolution Bandwidth (RBW)		5MHz
Video Bandwidth (VBW)		5MHz
Sweep time		coupled
Detector		Peak, Max hold mode for method PK1/PK2 or RMS and trace average for method AVG1/AVG2
Sweep Mode		Repetitive mode, allow trace to stabilize
Analyzer-Mode		☐ Activate Channel integration method with limits set to the EBW of the signal

Remark 1: guidance 558074 D01 measurement DTS guidance V01

4.7.6. CONDUCTED MEASUREMENT: MAX. PEAK POWER

- Maximum declared antenna gain [isotropical]: 0.0 dBi
- External path loss: 10.8 dB -> set as correction factor offset in spectrum-analyzer

4.7.7. RESULTS

MAX PEAK POWER (conducted) [dBm]			
Set-up no: 2 Op-Mode: 1	Low channel = 37 (2402 MHz)	Middle channel = 17 (2440 MHz)	High channel = 39 (2480 MHz)
GFSK modulation, 1Mbps	**4.33**	4.32	4.27
Limit	1 Watt (30dBm) Peak		

Remark: --

VERDICT: Maximum value of 4.33 dBm (2.7 mW) Peak -> Passed

4.8. RF Power Radiated measurement: Max. E.I.R.P Power

4.8.1. 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.	☐ 489 ESU	☐ 120 FSEM	☐ 264 FSEK	☒ 489 ESU	☐	☐
antenna meas	☒ 549 HL025	☐ 289 CBL 6141	☐ 439 HL 562	☐ 133 EMCO3115	☐ 302 BBHA9170	☐ 477 GPS
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	☐

4.8.2. EUT SETTINGS:

For FHSS-systems hopping mode was switched-off so fixed three different channels could be measured.
The EUT was instructed to send with maximum power (if adjustable) according applicants instructions.
Different modulation characteristics have been checked, e.g. data rates which EUT can operate.

4.8.3. MEASURING METHOD:

A field strength measurement was performed in 3m distance to the EUT. General measurement procedures as shown in chapter 5.3 applies therefore. Using transformation formula between field strength and e.i.r.p. power as shown in ANSI63.10: 2009, chapter 7.8.2 is used for conversion. In addition a bandwidth correction factor applied: 10*log(6dB BW/RBW=1 MHz)

4.8.4. RESULTS

BT-LE: TX-MODE

Maximum Radiated field strength measured in 3m distance			
Set-up no.: 1 Op. Mode: 1	Low channel = 37 (2402 MHz)	Middle channel = 17 (2440 MHz)	High channel = 39 (2480 MHz)
Determined field strength [dBuV/m] in 3m distance with RBW=1 MHz	98.9 (PK) 98.4 (AV)	99.0 (PK) 98.8 (AV)	98.4 (PK) 98.0 (AV)
Value in dBm using conversion formula and assumed numeric Gain=1: $E=\sqrt{\left(\frac{30*P*G}{d^2}\right)}$	3.67 (PK)	3.77 (PK)	3.17 (PK)
Bandwidth correction factor[1.)]	0.85	0.82	0.88
e.i.r.p. power [dBm] assumed 0dBi gain	4.52	4.59	3.95
Actual declared gain of antenna by applicant [dBi]	0	0	0
Final Result e.i.r.p. [dBm]:	4.52	**4.59**	3.95

Remark: 1.) see measured BW results before

VERDICT: Passed, maximum value: 4.59 dBm PK (antenna gain < 6 dBi)

4.9. Power Spectral Density

4.9.1. 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.	☐ 489 ESU	☐ 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	☒530 10dB Attenuator			☒ cable K5		

4.9.2. 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.*

4.9.3. EUT SETTINGS:

The EUT was instructed to send with maximum power (if adjustable) according applicants instructions.
Different modulation characteristics have been checked, e.g. data rates which EUT can operate.

4.9.4. MEASUREMENT 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 requiered resolution bandwidth of 3 kHz.
The method is as shown in ANSI63.10:2009, chapter 6.11.2.3
The measured value is corrected due to external measuring set-up path-loss and the resulting value is compared with the standard requirement.

4.9.5. RESULTS

Set-up no.: 2 Op. Mode: 1	**POWER SPECTRAL DENSITY** [dBm/3 kHz]		
	Low channel = 37 (2402 MHz)	Middle channel = 17 (2440 MHz)	High channel = 39 (2480 MHz)
GFSK modulation, 1Mbps	-6.83	-7.02	-7.02
Correction factor-[dB] (Path loss attenuation included)	10.8 (set as correction factor in SA-> readings = final result)		
Limit	< 8dBm/3 kHz		

Remark: see diagrams for details on frequency in chapter 8.10

VERDICT: Passed

4.10. 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.

RF-Measurement	Frequency range	Calculated uncertainty based on a confidence level of 95%	Remarks:
Power Output conducted	9 kHz .. 20 GHz	1.0 dB	--
Power Output radiated	30 MHz .. 4 GHz	3.17 dB	Substitution method
Conducted emissions on antenna ports	9 kHz .. 20 GHz	1.0 dB	--
Radiated emissions enclosure	150 kHz .. 30 MHz	5.0 dB	Magnetic field
	30 MHz .. 1 GHz	4.2 dB	E-Field
	1 GHz .. 20 GHz	3.17 dB	Substitution method
Occupied bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker)	Frequency error
		1.0 dB	Power
Emission bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker)	Frequency error
		1.0 dB	Power
Frequency stability	9 kHz .. 20 GHz	0.0636 ppm	--
Conducted emissions on AC-mains port (U_{CISPR})	9 kHz .. 150 kHz	4.0 dB	--
	150 kHz .. 30 MHz	3.6 dB	

Table: measurement uncertainties, valid for conducted/radiated measurements

5. Abbreviations used in this report

The abbreviations are listed in Alphabetical order	
ANSI	American National Standards Institute
AV or AVG	RMS average detector
C_F	Transducer in dB = AF (antenna factor) + CL (cable loss)
C_l	Cable loss
D_F	distance correction factor (if different measurement distance used than specified in the standard)
EIRP	Equivalent isotropically radiated power, determined within a separate measurement (unit: mW)
EGPRS	Enhanced General Packet Radio Service
EUT	Equipment Under Test
FCC	Federal Communications Commission, USA
G	Gain of the antenna relative to an isotropic radiator
IC	Industry Canada
L_T	Limit in dBµV/m
n.a.	not applicable
Op-Mode	Operating state of the equipment
PK	Peak detector
RBW	resolution bandwidth
RF	Radio frequency
R_R	Receiver readings in dBµV/m
RSS	Radio Standards Specification, (Dokuments from Industry Canada)
Rx	receiving unit
TCH	The traffic channels of the GSM mobilfunkystems
Tx	transmission unit
QP	Quasi peak detector

6. Accreditation details of CETECOM's laboratories and test sites

Ref.-No.	Accreditation Certificate	Valid for laboratory area or test site	Accreditation Body
-	D-PL-12047-01-01	All laboratories and test sites of CETECOM GmbH, Essen	DAkkS, Deutsche Akkreditierungsstelle GmbH
337 487 558 348 348	736496	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measurem.	FCC, Federal Communications Commission Laboratory Division, USA (MRA US-EU 0003)
337 487 550 558	3462D-1 3462D-2 3462D-2 3462D-3	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR)	IC, Industry Canada Certification and Engineering Bureau
337 487 550 348 348	R-2665 R-2666 G-301 C-2914 T-1967	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measurem.	VCCI, Voluntary Control Council for Interference by Information Technology Equipment, Japan
OATS = Open Area Test Site, SAR = Semi Anechoic Room, FAR = Fully Anechoic Room			

7. Instruments and Ancillary

7.1. Used equipment "CTC"

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

7.1.1. 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
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	Digital Radiocommunication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT = D2.87 13.01.99
053	Audio Analyzer	UPA3	860612/022	Firm. V 4.3
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	Firm.= V 3.1DHG
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
295	Racal Digital Radio Test Set	6103	1572	UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04, SW-DSP=1.02, Hardboot=1.02, Softboot=2.02
298	Univ. Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f. all band used
323	Digital Radiocommunication Tester	CMD 55	825878/0034	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	-	EMC 32 V 8.40
340	Digital Radiocommunication 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 V5,30+ SW-Option K55
377	Emi Test Receiver	ESCS 30	100160	Firm.= 2.30, 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, GSM=4.41#013, W-CDMA= 4.54#004, scenario=
436	Univ. Radio Communication Tester	CMU 200	103083	R&S Test Firmware Base=5.14, Mess-Software= GSM:5.14 WCDMA:5.14 (current Testsoftw. F. all
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	EMC 32 Version 8.40
442	CTC-SAR-EMS	System EMS field (SAR)	-	EMC 32 Version 8.40
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	Spuri 7.2.5 or EMC 32 Ver. 8.40
444	CTC-FAR-EMS field	System-EMS-Field (FAR)	-	EMC 32 Version 8.40
460	Univ. Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used,
489	Emi Test Receiver	ESU40	1000-30	Firmware=4.43 SP3, Bios=V5.1-16-3, Spec. =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
546	Univ. Radio Communication Tester	CMU 200	106436	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used
547	Univ. Radio Communication Tester	CMU 200	835390/014	R&S Test Firmware Base=V5.1403 (current Testsoftw., f. all band used, GSM = 5.14 WCDMA: = 5.14
584	Spectrum Analyzer	FSU 8	100248	2.82_SP3
594	Univ. Radio Communication Tester	CMW500	101757	Firmware Base=2.0.20.9, LTE=2.0.20.8. CDMA= 2.0.10
597	Univ. Radio Communication Tester	CMU 200	100347	R&S Test Firmware Base=5.01, GSM=5.02 WCDMA= not installed, Mainboard= µP1=V.850
598	Spectrum Analyzer	FSEM 30 (Reserve)	831259/013	Firmware Bios 3.40 , Analyzer 3.40 Sp 2
620	EMI Test Receiver	ESU 26	100362	4.43_SP3

7.1.2. 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	-	31.03.2013
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	24/12 M	-	31.03.2014
007	DC - LISN (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	24/12 M	-	31.03.2014
009	Power Meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	24 M	-	31.03.2013
016	Line Impedance Simulating Network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	31.03.2013
020	Horn Antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36/12 M	-	31.03.2013
021	Loop Antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	31.03.2015
030	Loop Antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2015
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	31.03.2013
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	pre-m	1a	
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-10EEK	5	Wainwright GmbH	12 M	1c	30.06.2013
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	-	4	
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	31.03.2015
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	31.03.2015
110	USB-LWL-Converter	OLS-1	-	Ing. Büro Scheiba	-	4	
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	BOCONSULT	36 M	-	31.03.2013
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	12 M	-	31.03.2014
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	36 M	-	31.03.2015
140	Signal Generator	SMHU	831314/006	Rohde & Schwarz	24 M	-	31.03.2014
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	
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 M	-	31.03.2014
262	Power Meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	31.03.2014
263	Signal Generator	SMP 04	826190/0007	Rohde & Schwarz	36 M	-	31.03.2013
264	Spectrum Analyzer	FSEK 30	826939/005	Rohde & Schwarz	12 M	-	31.03.2013
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	31.03.2014
266	peak power sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	31.03.2014
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH	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	
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	
279	power divider	1515 (SMA)	LH855	Weinschel	pre-m	2	
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	1c	30.06.2013
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH	12 M	1c	30.06.2013
298	Univ. Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	pre-m	3	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	24/12 M	-	31.03.2014
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	36 M	-	31.03.2014
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	36 M	-	31.03.2014
331	Climatic Test Chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	30.11.2012
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	31.03.2014
342	Digital Multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	24 M	-	31.03.2013
347	laboratory site	radio lab.	-	-	-	5	
348	laboratory site	EMI conducted	-	-	-	5	
354	DC - Power Supply 40A	NGPE 40/40	448	Rohde & Schwarz	pre-m	2	
355	Power Meter	URV 5	891310/027	Rohde & Schwarz	24 M	-	31.03.2014
356	power sensor	NRV-Z1	882322/014	Rohde & Schwarz	24 M	-	31.03.2013
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24 M	-	31.03.2013
373	V-Network 5µH/50 Ohm	ESH3-Z6	100535	Rohde & Schwarz	24/12 M	-	31.03.2014
376	Horn Antenna 6 GHz	BBHA9120 E	BBHA 9120 E 179	Schwarzbeck	12 M	-	31.03.2013
377	Emi Test Receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	31.03.2013
389	Digital Multimeter	Keithley 2000	0583926	Keithley	24 M	-	31.03.2013
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	31.03.2013
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
436	Univ. Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	31.03.2013
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR) Cable	-	CETECOM	12 M	5	31.10.2013

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren/CETECOM	12 M	5	30.06.2013
448	notch filter WCDMA_FDD II	WRCT 1850.0/2170.0-5/40-	5	Wainwright Instruments GmbH	12 M	1c	30.06.2013
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-8SSK	1	Wainwright	12 M	1c	30.06.2013
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
456	DC-Power supply 0-5 A	EA 3013 S	207810	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	Univ. Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	31.03.2013
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	31.03.2014
467	Digital Multimeter	Fluke 112	89680306	Fluke USA	24 M	-	31.03.2014
468	Digital Multimeter	Fluke 112	90090455	Fluke USA	24 M	-	31.03.2014
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
480	power meter (Fula)	NRVS	838392/031	Rohde & Schwarz	24 M	-	31.03.2013
482	filter matrix	Filter matrix SAR 1	-	CETECOM (Brl)	-	1d	
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-10P	1244554	Miteq	12 M	-	30.07.2013
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR) NSA	-	ETS Lindgren/CETECOM	24 M	-	30.09.2013
489	Emi Test Receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	31.03.2013
502	band reject filter	WRCG 1709/1786-1699/1796-	SN 9	Wainwright	pre-m	2	
503	band reject filter	WRCG 824/849-814/859-60/10SS	SN 5	Wainwright	pre-m	2	
512	notch filter GSM 850	WRCA 800/960-02/40-6EEK	SN 24	Wainwrght	12 M	1c	30.06.2013
517	relais switch matrix	HF Relais Box Keithley System	SE 04	Keithley	pre-m	2	
523	Digital Multimeter	L4411A	MY46000154	Agilent	24 M	-	31.03.2013
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	pre-m	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	pre-m	2	
546	Univ. Radio Communication Tester	CMU 200	106436	R&S	12 M	-	31.03.2013
547	Univ. Radio Communication Tester	CMU 200	835390/014	Rohde & Schwarz	12 M	-	31.03.2013
548	Digital-Barometer	GBP 2300	without	Greisinger GmbH	36/12 M	-	31.03.2013
549	Log.Per-Antenna	HL025	1000060	Rohde & Schwarz	36/12 M	-	31.03.2015
552	high pass filter 2,8-18GHz	WHKX 2.8/18G-10SS	4	Wainwright	12 M	1c	30.07.2013
558	System CTC FAR S-VSWR	System CTC FAR S-VSWR	-	CTC	24 M	-	31.07.2013
574	Biconilog Hybrid Antenna	BTA-L	980026L	Frankonia	36/12 M	-	30.03.2013
584	Spectrum Analyzer	FSU 8	100248	Rohde & Schwarz	12 M	-	31.03.2013
594	Univ. Radio Communication Tester	CMW500	101757	Rohde & Schwarz	24 M	-	31.03.2014
597	Univ. Radio Communication Tester	CMU 200	100347	Rohde & Schwarz	12 M	-	31.03.2013
598	Spectrum Analyzer	FSEM 30 (Reserve)	831259/013	Rohde & Schwarz	24 M	-	13.01.2013
600	power meter	NRVD (Reserve)	834501/018	Rohde & Schwarz	24 M	-	31.03.2013
601	medium-sensitivity diode sensor	NRV-Z5 (Reserve)	8435323/003	Rohde & Schwarz	24 M	-	12.01.2013
602	peak power sensor	NRV-Z32 (Reserve)	835080	Rohde & Schwarz	24 M	-	12.01.2013
608	UltraLog-Antenna	HL 562	830547/009	Rohde & Schwarz	36/12 M	-	31.03.2014
611	DC power supply	E3632A	KR 75305854	Agilent	pre-m	2	
612	DC power supply	E3632A	MY 40001321	Agilent	pre-m	2	
613	Attenuator	R416120000 20dB 10W	Lot. 9828	Radiall	pre-m	2	
616	Digitalmultimeter	Fluke 177	88900339	Fluke	24 M	-	31.03.2014
617	Power Splitter/Combiner	ZFSC-2-2-S+	S F987001108	Mini Circuits	-	2	
618	Power Splitter/Combiner	50PD-634	600994	JFW Industries USA	-	2	
619	Power Splitter/Combiner	50PD-634	600995	JFW Industries, USA	-	3	
620	EMI Test Receiver	ESU 26	100362	Rohde-Schwarz	12 M	-	01.01.2013
621	Step Attenuator 0-139 dB	RSP	100017	Rohde & Schwarz	pre-m	2	

7.1.3. 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-RSE (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

8. Measurement diagrams

8.1. Radiated Magnetic Field Strength measurements below 30MHz

Diagram No. 2.01

Test description:	Magnetic Fieldstrength Measurement related to 3 m distance
Test site and distance:	Semi Anechoic Room with mobile absorbers on the floor (SAR) with 3 m measurement distance
Distance correction:	no used
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test specification:	FCC 15.205 § 15.209; RSS-Gen: Issue 3
Operator:	Tas
Operating conditions:	BT LE, TX-on (Ch_low=2402MHz)
Power during tests:	Full loaded batteries (2x1,5V AA)

FCC15.209_magn hor+vert

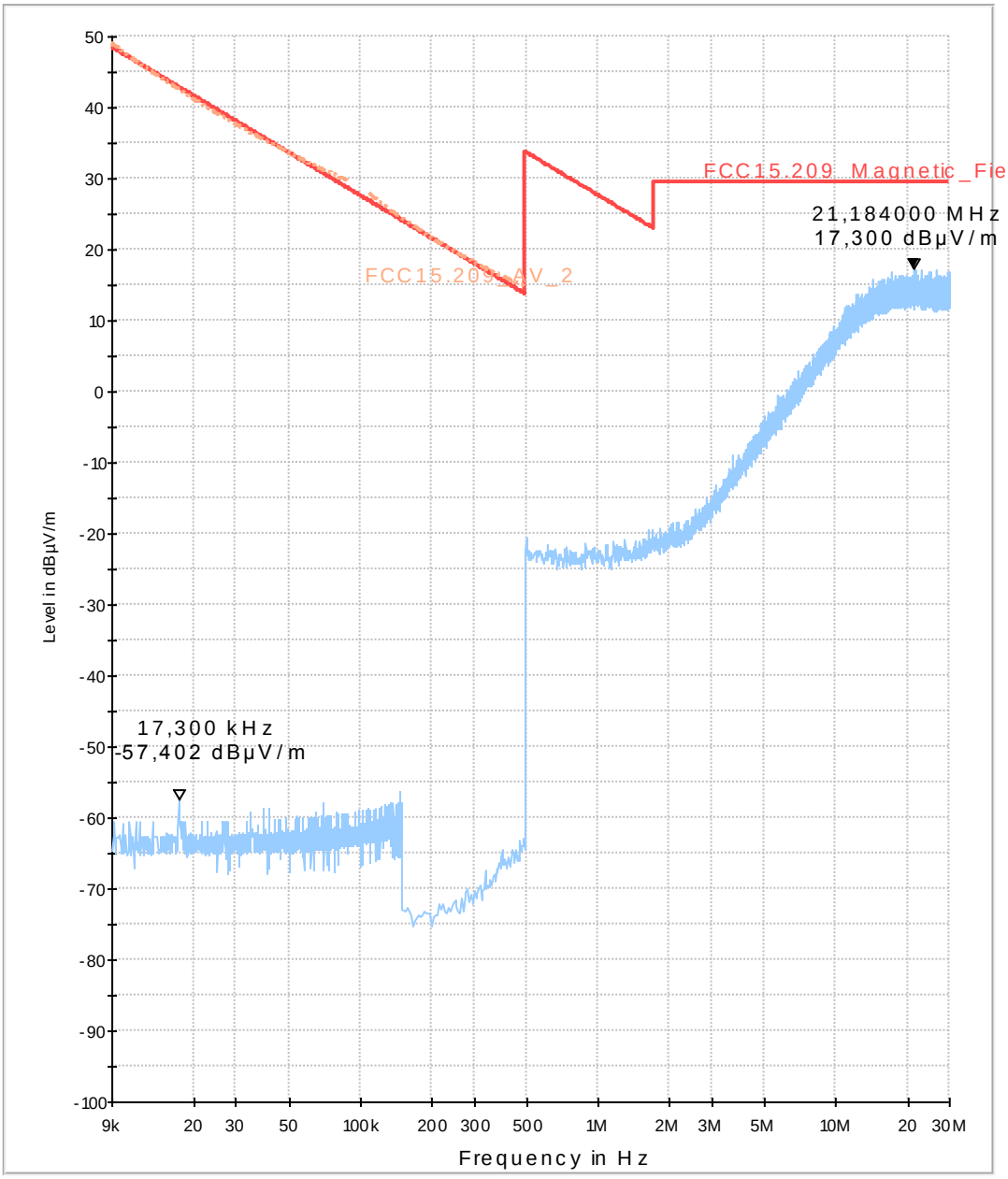


Diagram No. 2.02

Date: 30.05.2012 Page 1 of 2

Test description:	Magnetic Fieldstrength Measurement related to 3 m distance
Test site and distance:	Semi Anechoic Room with mobile absorbers on the floor (SAR) with 3 m measurement distance
Distance correction:	no used
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test specification:	FCC 15.205 § 15.209; RSS-Gen: Issue 3
Operator:	Tas
Operating conditions:	BT LE, TX-on (Ch_middle =2440 MHz)
Power during tests:	Full loaded batteries (2x1,5V AA)

FCC15.209_magn hor+vert

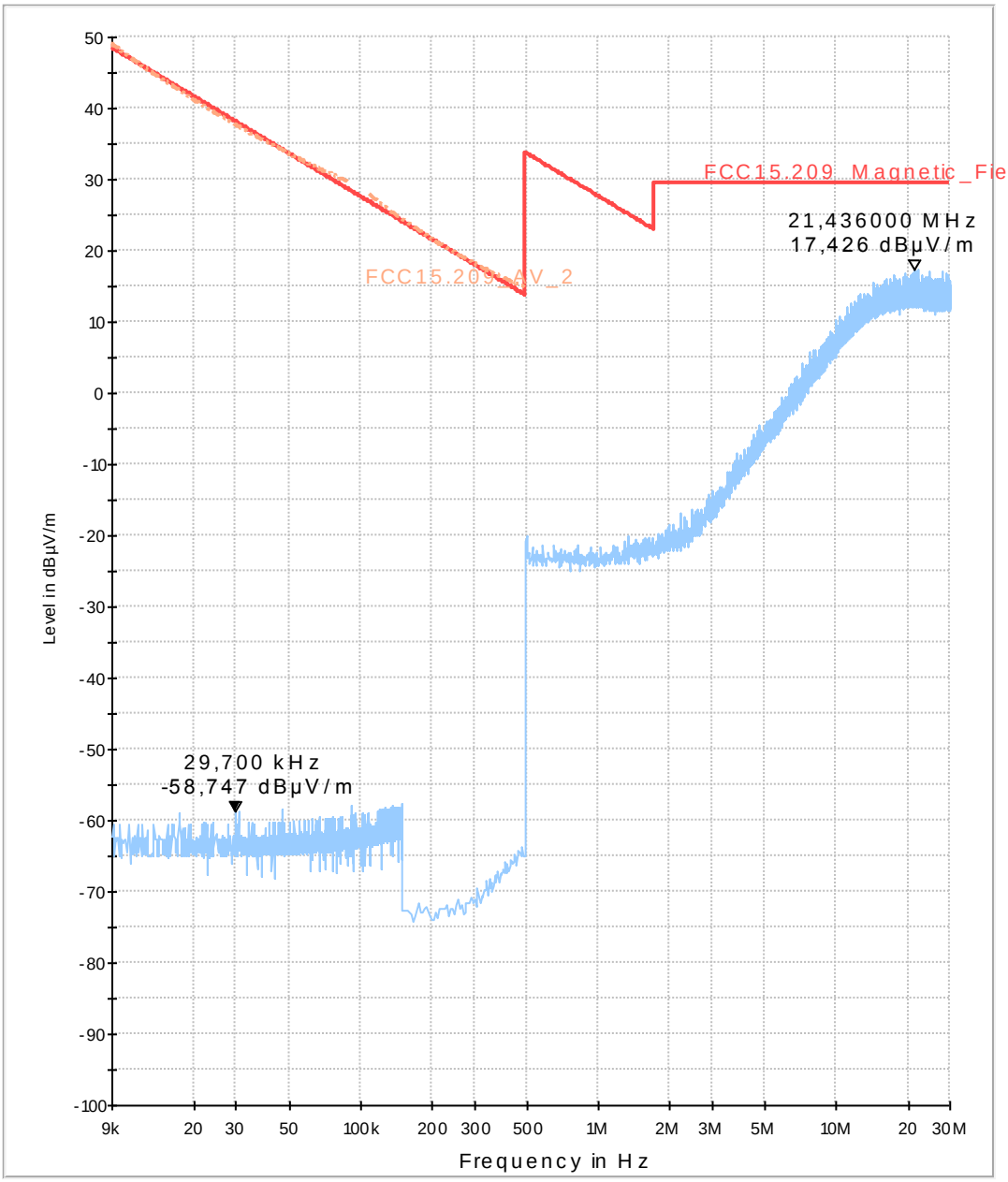
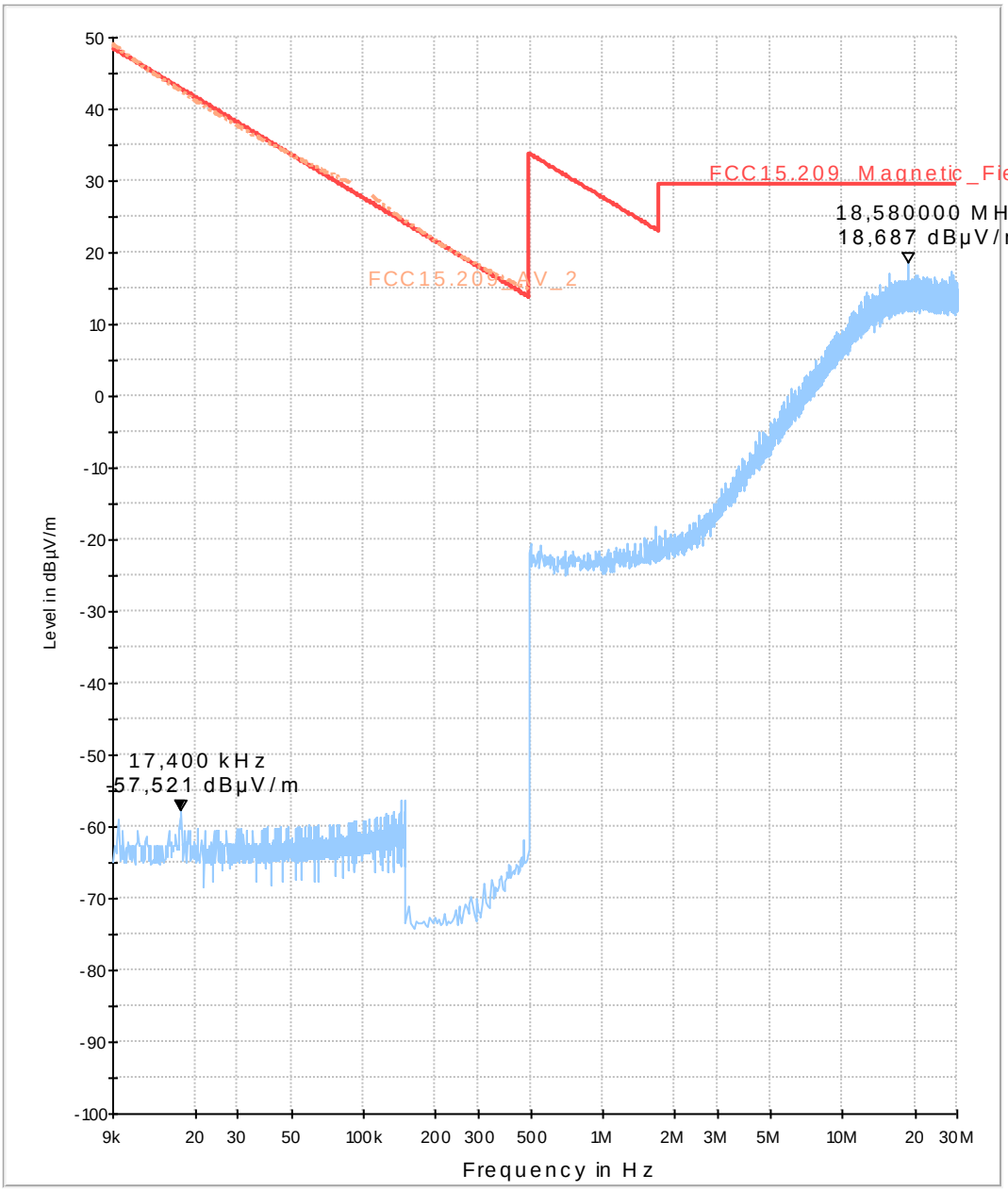


Diagram No. 2.03

Date: 30.05.2012 Page 1 of 2

Test description:	Magnetic Fieldstrength Measurement related to 3 m distance
Test site and distance:	Semi Anechoic Room with mobile absorbers on the floor (SAR) with 3 m measurement distance
Distance correction:	no used
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test specification:	FCC 15.205 § 15.209; RSS-Gen: Issue 3 6-0173-12-2a
Operator:	Tas
Operating conditions:	BT LE, TX-on (Ch_high =2480 MHz)
Power during tests:	Full loaded batteries (2x1,5V AA)

FCC15.209_magn hor+vert



8.2. Radiated emissions in the frequency range 0.030 – 1 GHz

Diagram No. 3.01

14.06.2012 Page 1 of 1

Test description:	Electric Fieldstrength Measurement
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Distance correction:	not used
Used filter:	not used
Technical Data:	please see page 2 for detailed data of measurement setup
Test specification.:	FCC 15.209 Class B; RSS-Gen: Issue 3
SAP No:	6-0173-12-2-2c
Operating conditions:	UE transmits on low ch. 37 (UL = 2402.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0
Operator:	HLa

EUT Information

EUT Name:	VOOMOTE AIR
Manufacturer:	Zero1.TV
Serial Number:	
Hardware Rev:	1.0
Software Rev:	1.2
Comment:	BT address : 3C:2D:B7:85:6E:42, and CC Debugger (rev. 1.0) connected

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
931.510000	29.7	1000.0	120.000	316.0	V	174.0	90.0	26.5	16.30	46.00

01_FCC15.209_hor+vert_kipp

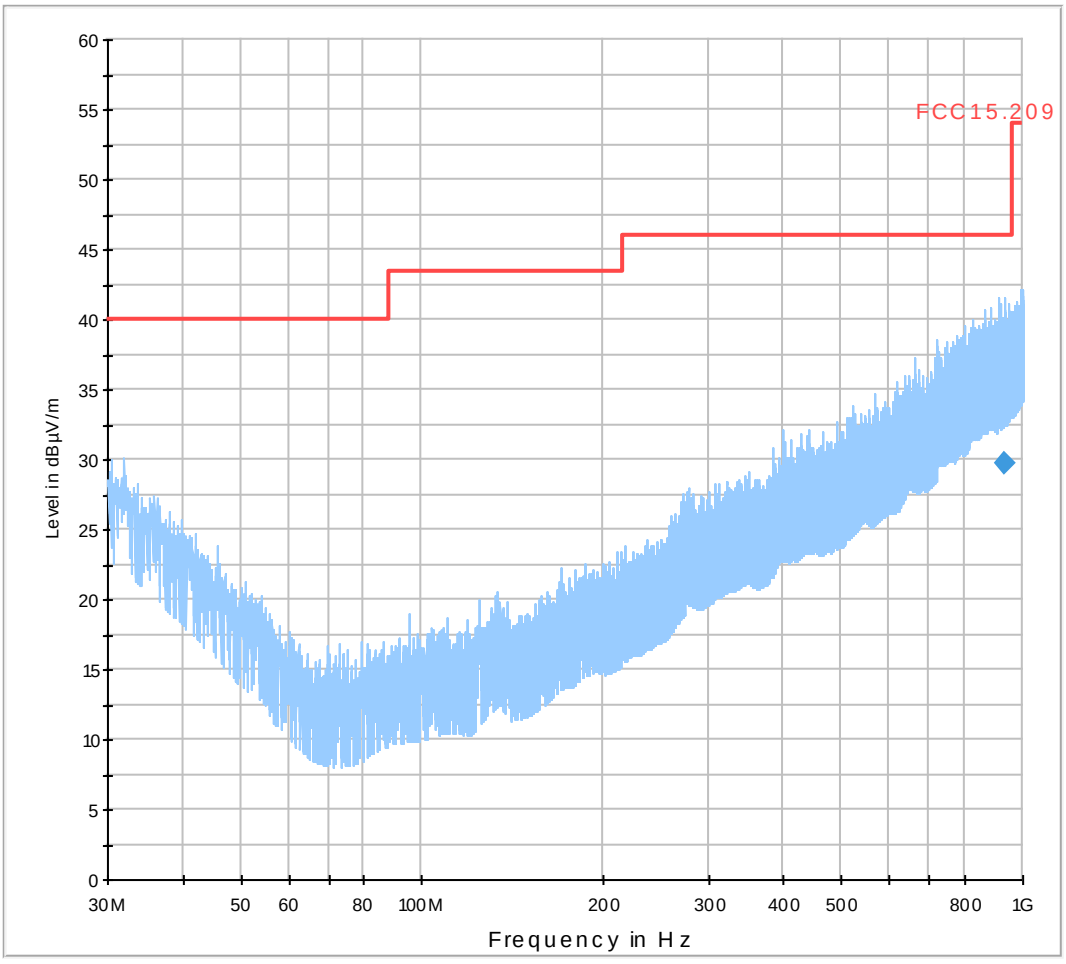


Diagram No. 3.02

14.06.2012 Page 1 of 1

Test description:	Electric Fieldstrength Measurement
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Distance correction:	not used
Used filter:	not used
Technical Data:	please see page 2 for detailed data of measurement setup
Test specification.:	FCC 15.209 Class B; RSS-Gen: Issue 3
SAP No:	6-0173-12-2-2c
Operating conditions:	UE transmits on mid ch. 17 (UL = 2440.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0
Operator:	HLa

EUT Information

EUT Name:	VOOMOTE AIR
Manufacturer:	Zero1.TV
Serial Number:	
Hardware Rev:	1.0
Software Rev:	1.2
Comment:	BT address : 3C:2D:B7:85:6E:42 and CC Debugger (rev. 1.0) connected

01_FCC15.209_hor+vert_kipp

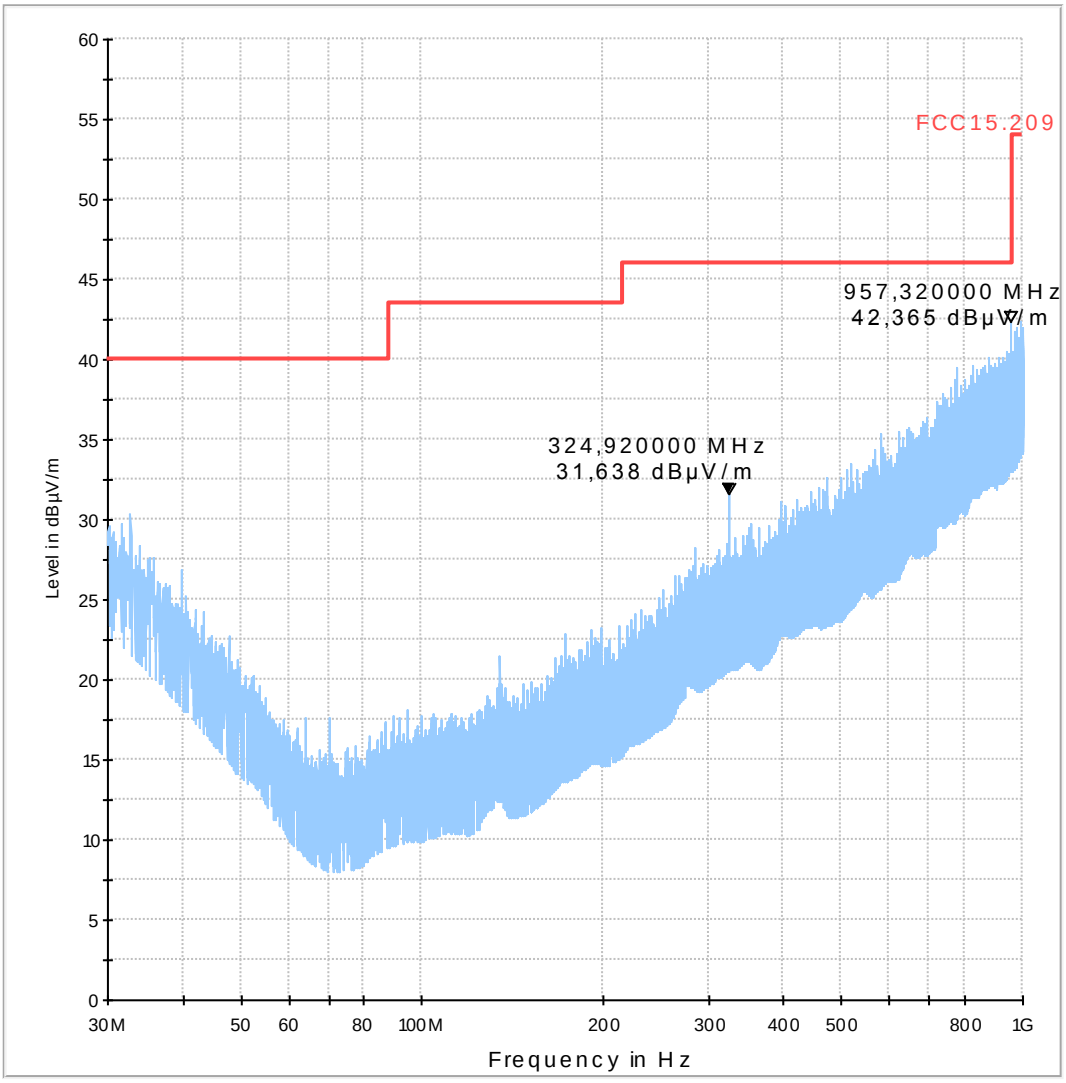


Diagram No. 3.03

18.06.2012 Page 1 of 2

Test description:	Electric Fieldstrength Measurement
Test site and distance:	Semi Anechoic Room (SAR) with 3 m measurement distance
Distance correction:	not used
Used filter:	not used
Technical Data:	please see page 2 for detailed data of measurement setup
Test specification.:	FCC 15.209 Class B; RSS-Gen: Issue 3 / RSS-210: Issue 8
SAP No:	6-0173-12-2-2c
Operator:	Tas
Operating conditions:	UE transmits on high ch. 39 (UL = 2480.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0

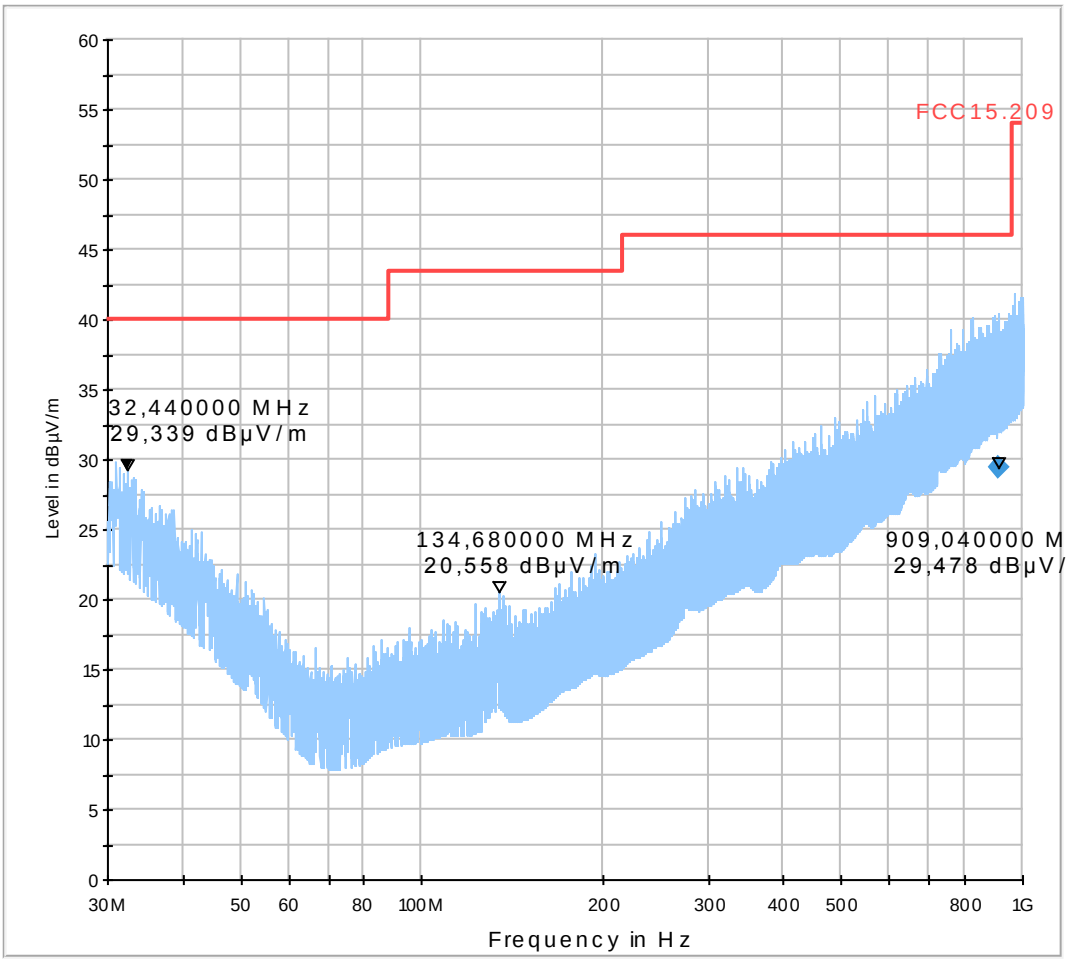
EUT Information

EUT Name:	VOOMOTE AIR
Manufacturer:	Zero1.TV
Serial Number:	
Hardware Rev:	1.0
Software Rev:	1.2
Comment:	BT address : 3C:2D:B7:85:6E:42, and CC Debugger (rev. 1.0) connected

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
909.040000	29.5	1000.0	120.000	361.0	H	23.0	0.0	26.6	16.50	46.00

01_FCC15.209_hor+vert_kipp



8.3. Radiated emissions in the frequency range above 1 GHz

4.01

Common Information

Test Description:	Radiated field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 &15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operating Mode:	UE transmits on low ch. 37 (UL = 2402.0MHz), cont. mode (unmodulated)
Comment:	BT-LE v4.0
Operator Name:	HLa
	6-0173-12-2-2c

EUT Information

EUT Name:	VOO MOTE AIR
Manufacturer:	Zero1.TV
Hardware Rev:	1.0
Software Rev:	1.2
Power during test:	4x 1,5 V AA batteries (full) inserted
Comment:	BT address : 3C:2D:B7:85:6E:42 and CC Debugger (rev. 1.0) connected

00431_SM1_KP1_WLAN_1_5ms

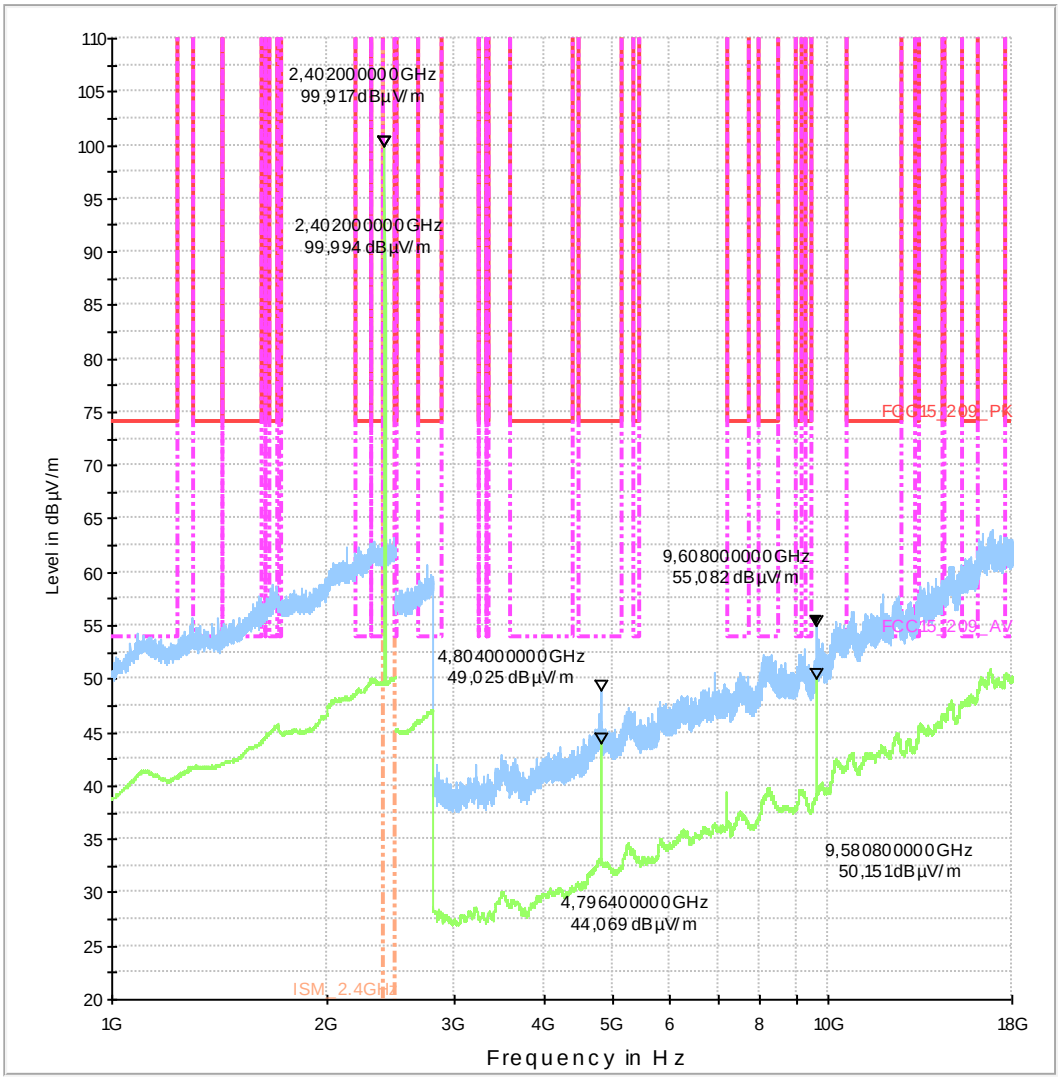
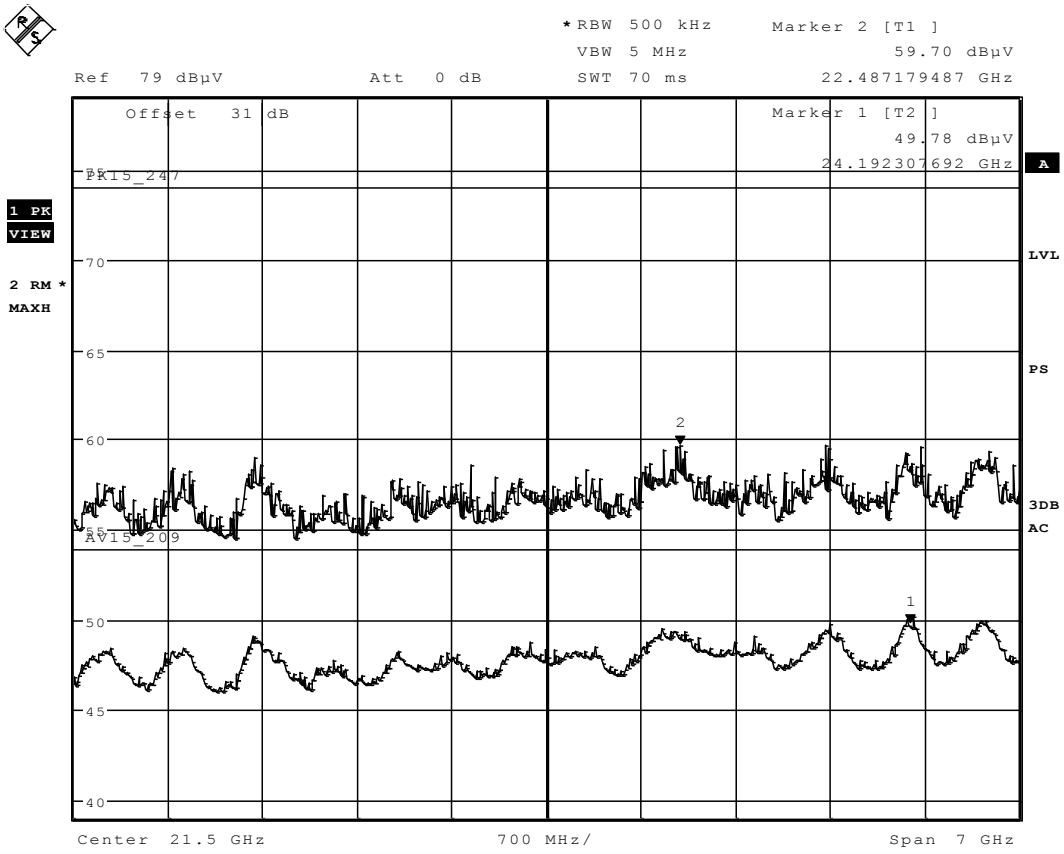


Diagram No.: 4.02

Radiated field strength measurement of low channel in the frequency range from 18GHz to 25GHz:



Date: 20.AUG.2012 14:25:47

Diagram No.: 4.03

Common Information

Test Description:	Radiated field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 &15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Op. Mode:	UE transmits on middle ch. 17 (UL = 2440.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0
Operator Name:	HLa
	6-0173-12-2-2c

EUT Information

EUT Name:	VOO MOTE AIR
Manufacturer:	Zero1.TV
Hardware Rev:	1.0
Software Rev:	1.2
Power during test:	4x 1,5 V AA batteries (full) inserted
Comment:	BT address : 3C:2D:B7:85:6E:42 and CC Debugger (rev. 1.0) connected

00431_SM1_KP1_WLAN_1_5ms

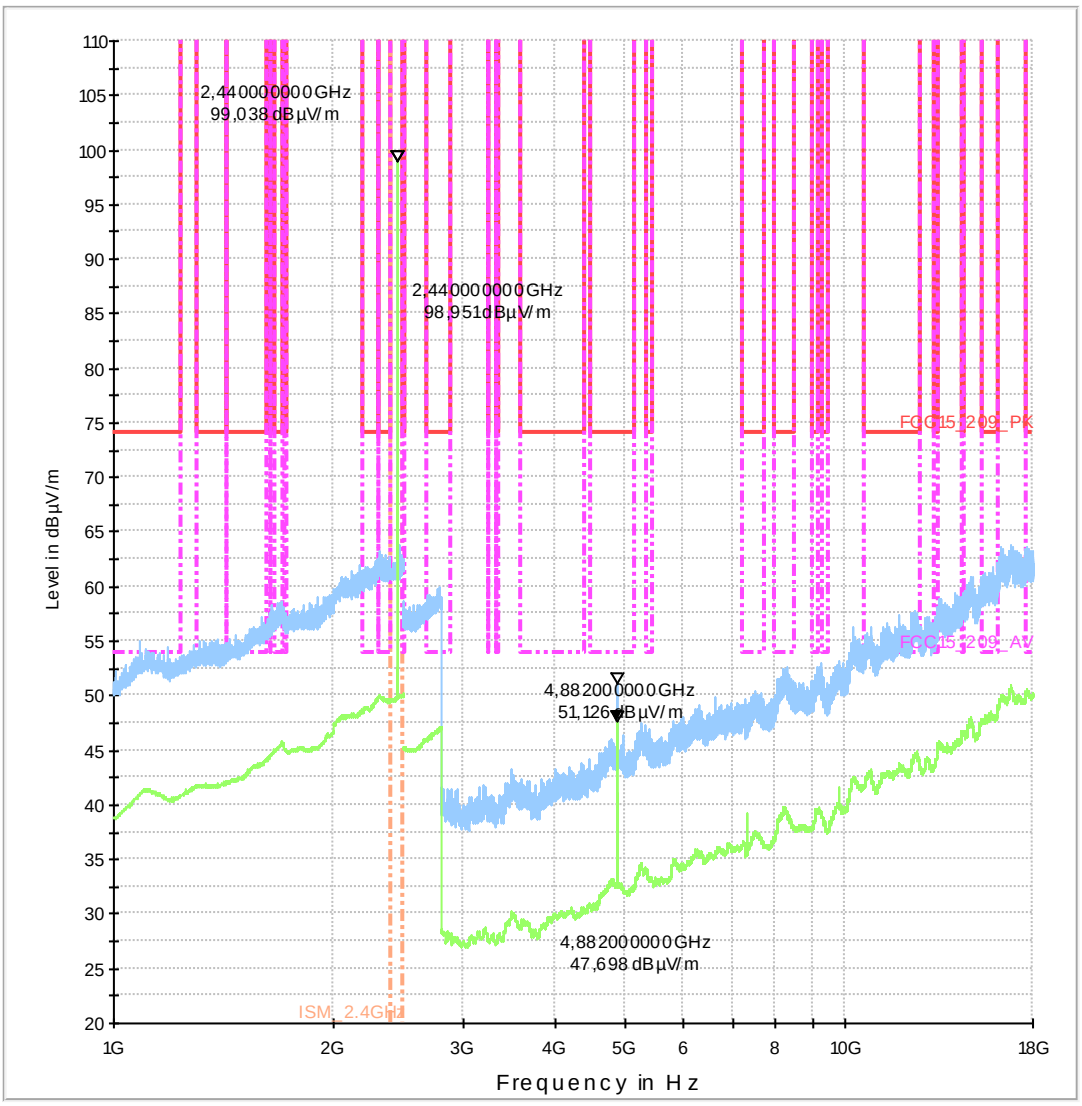
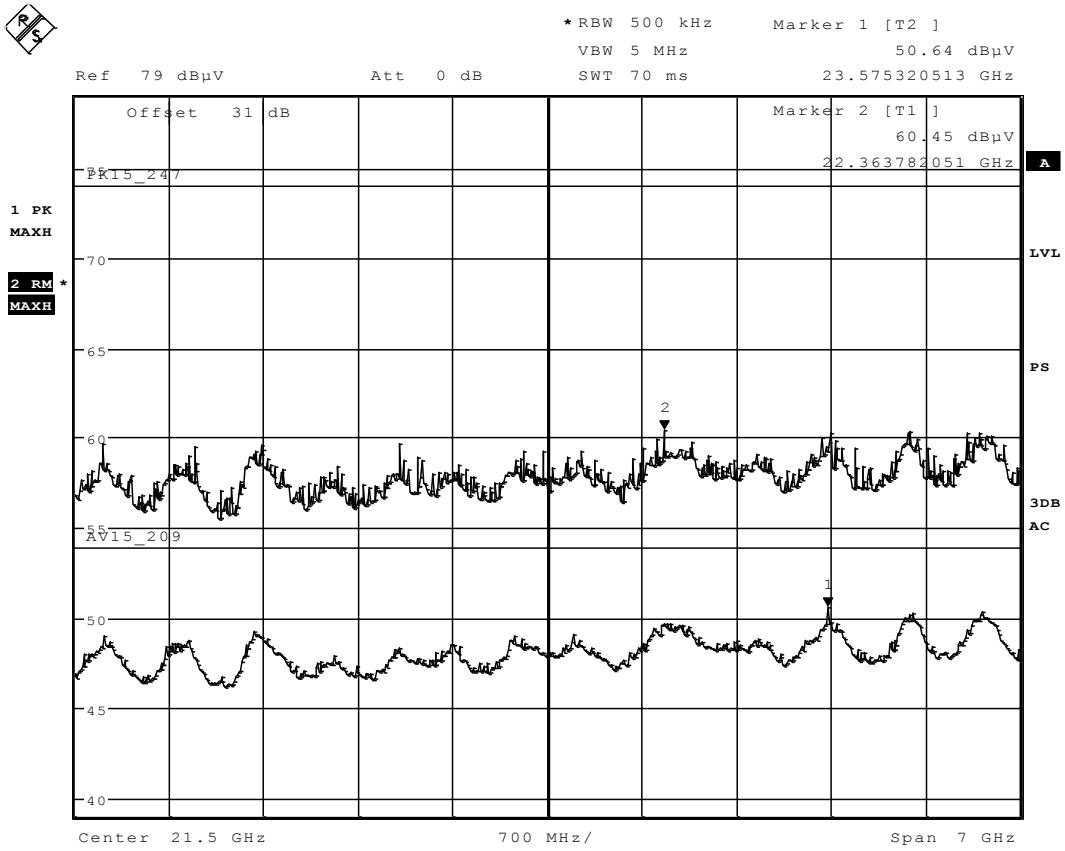


Diagram No.: 4.04

Radiated field strength measurement of middle channel in the frequency range from 18GHz to 25GHz:



Date: 22.JUN.2012 09:21:14

Diagram No.: 4.05

Common Information

Test Description:	Radiated field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 &15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operating mode:	UE transmits on high channel 39 (UL = 2480.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0
Operator:	Tas
	6-0173-12-2-2c

EUT Information

EUT Name:	VOO MOTE AIR
Manufacturer:	Zero1.TV
Hardware Rev:	1.0
Software Rev:	1.2
Power during test:	4x 1,5 V AA batteries (full) inserted
Comment:	BT address : 3C:2D:B7:85:6E:42 and CC Debugger (rev. 1.0) connected

Final Result 1

Freq. (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Band-width (kHz)	Height (cm)	Pol.	Azi-muth (deg)	Ele-vation (deg)	Corr. (dB)	Mar-gin (dB)	Limit (dBµV /m)
4958.1	51.1	100.0	1000.000	155.0	H	182.0	90.0	4.3	22.9	74.0

Final Result 2

Freq. (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azi-muth (deg)	Ele-vation (deg)	Corr. (dB)	Ma-gin (dB)	Limit (dBµV /m)
4958.1	47.5	100.0	1000.000	155.0	H	188.0	90.0	4.3	6.5	54.0

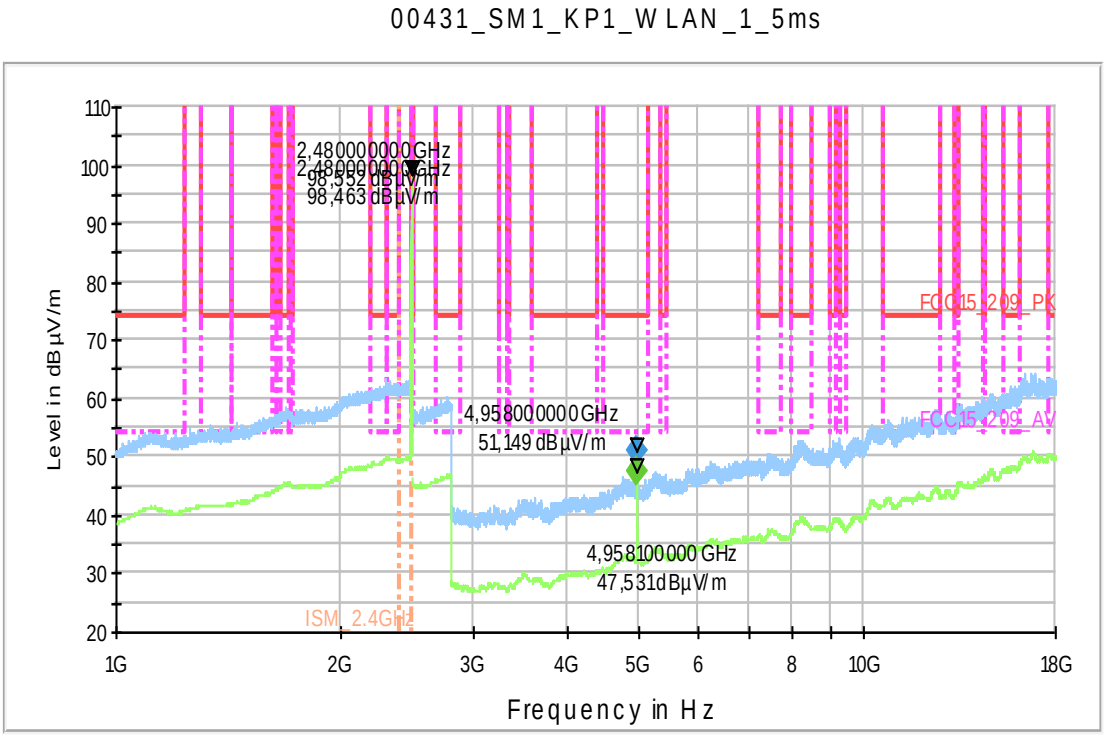
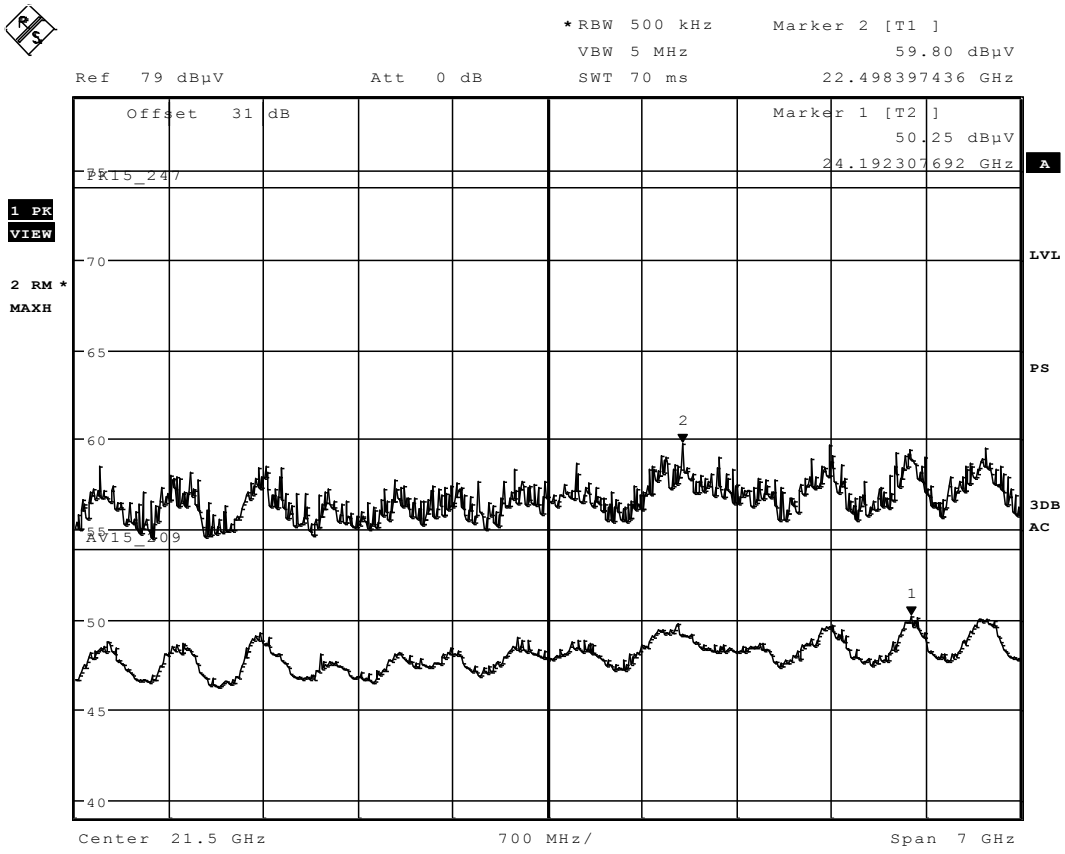


Diagram No.: 4.06

Radiated field strength measurement of high channel in the frequency range from 18GHz to 25GHz:



Date: 20.AUG.2012 14:22:34

8.4. Carrier field strength and radiated band-edge compliance

Diagram No.: 4.01_BE_Ch-Low

Common Information

Test Description:	Band-Edge radiated compliance field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 &15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operating mode:	UE transmits on low ch. 37 (UL = 2402.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0
Operator:	Tas
	6-0173-12-2-2c

EUT Information

EUT Name:	VOO MOTE AIR
Manufacturer:	Zero1.TV
Hardware Rev:	1.0
Software Rev:	1.2
Power during test:	4x 1,5 V AA batteries (full) inserted
Comment:	BT address : 3C:2D:B7:85:6E:42 and CC Debugger (rev. 1.0) connected

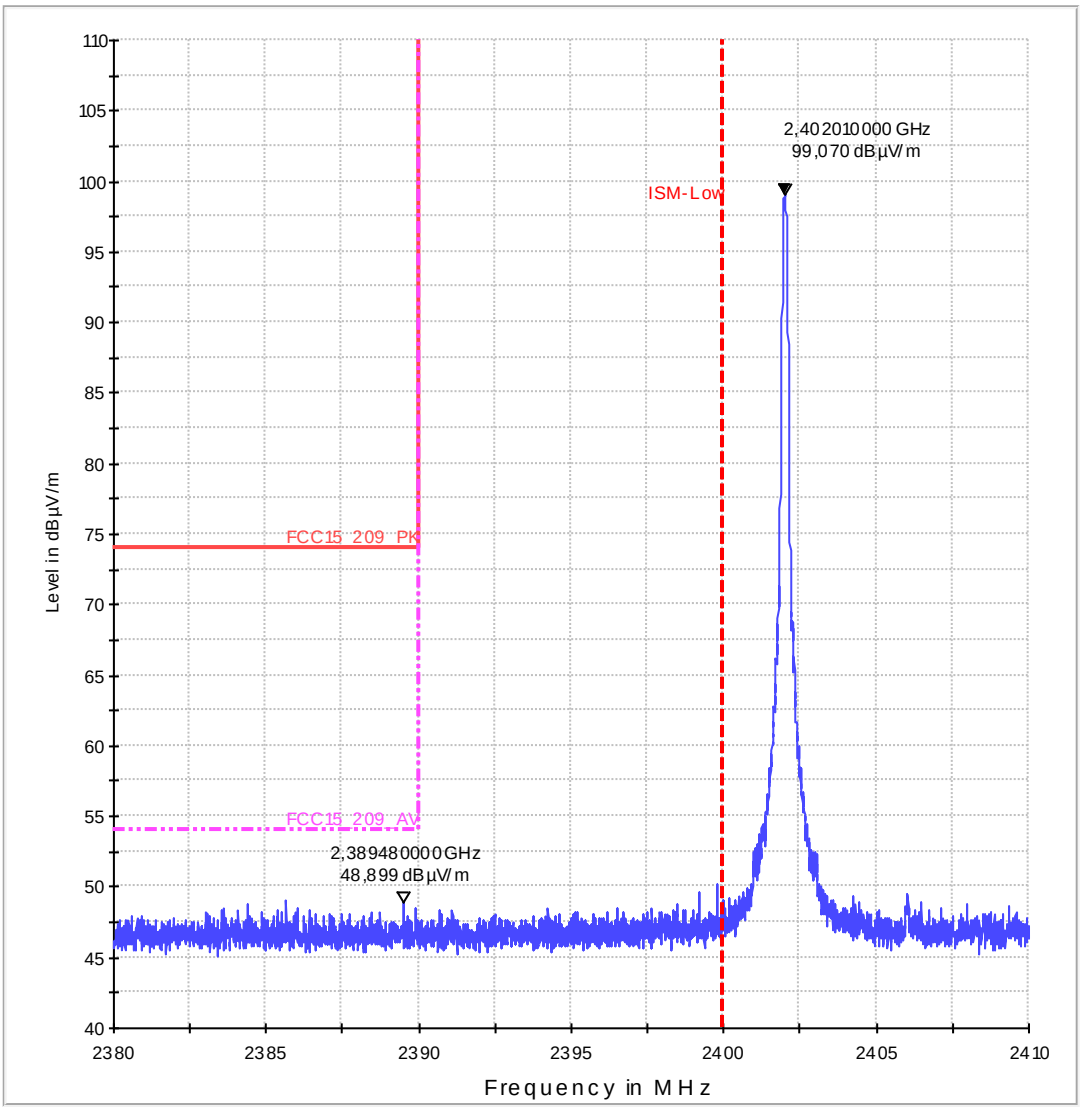


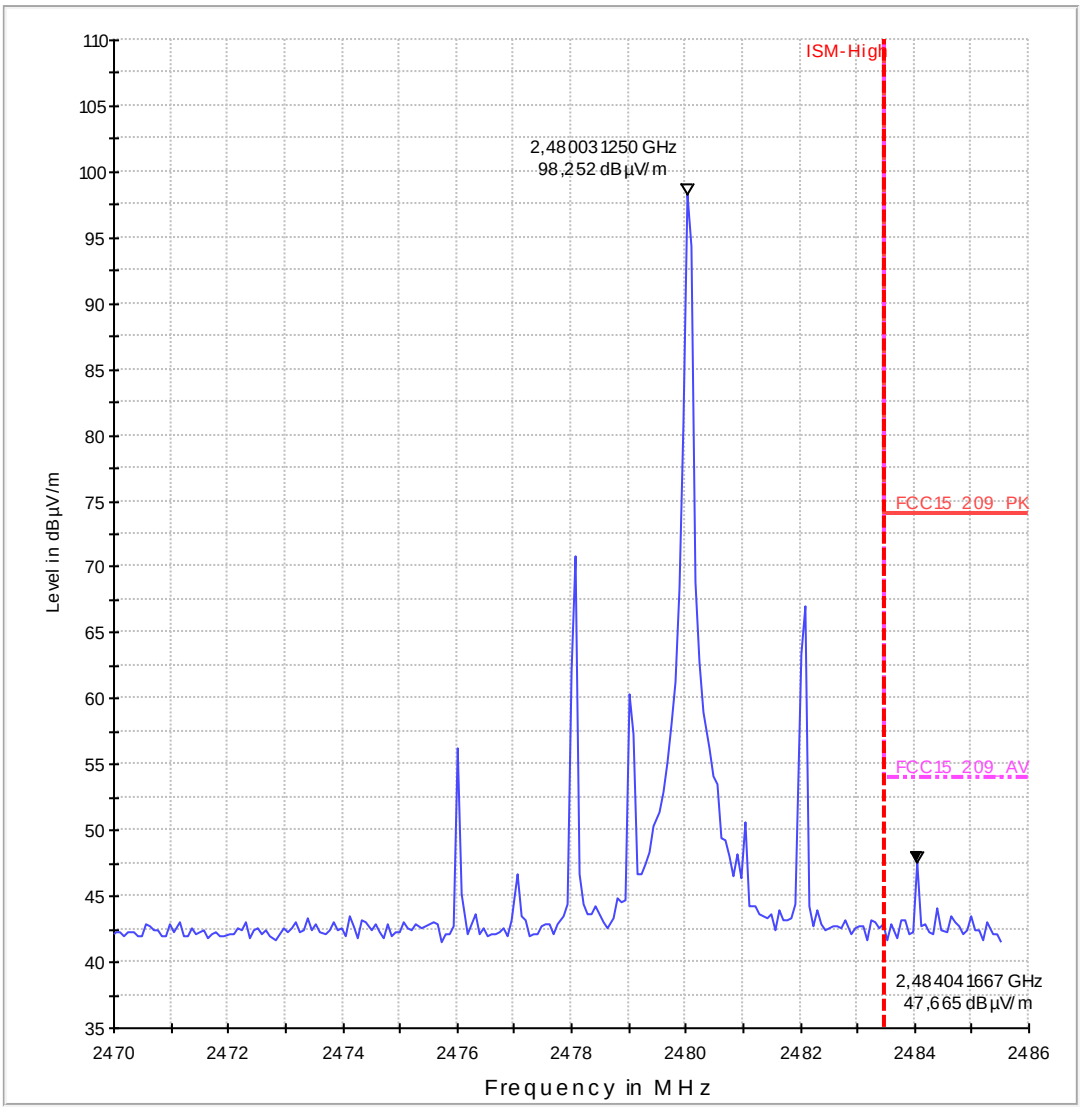
Diagram No.: 4.03_BE_Ch-High

Common Information

Test Description:	Band-Edge radiated compliance field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 &15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operator Name:	UE transmits on low ch. 37 (UL = 2402.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0
Op. Mode:	Tas
	6-0173-12-2-2c

EUT Information

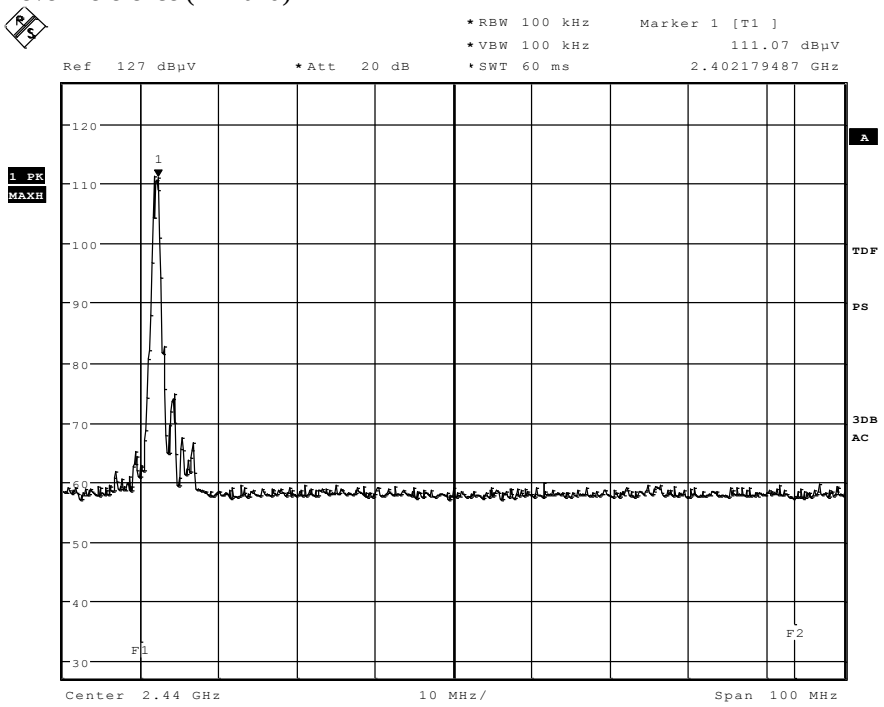
EUT Name:	VOO MOTE AIR
Manufacturer:	Zero1.TV
Hardware Rev:	1.0
Software Rev:	1.2
Power during test:	4x 1,5 V AA batteries (full) inserted
Comment:	BT address : 3C:2D:B7:85:6E:42 and CC Debugger (rev. 1.0) connected



8.5. Spurious emissions conducted

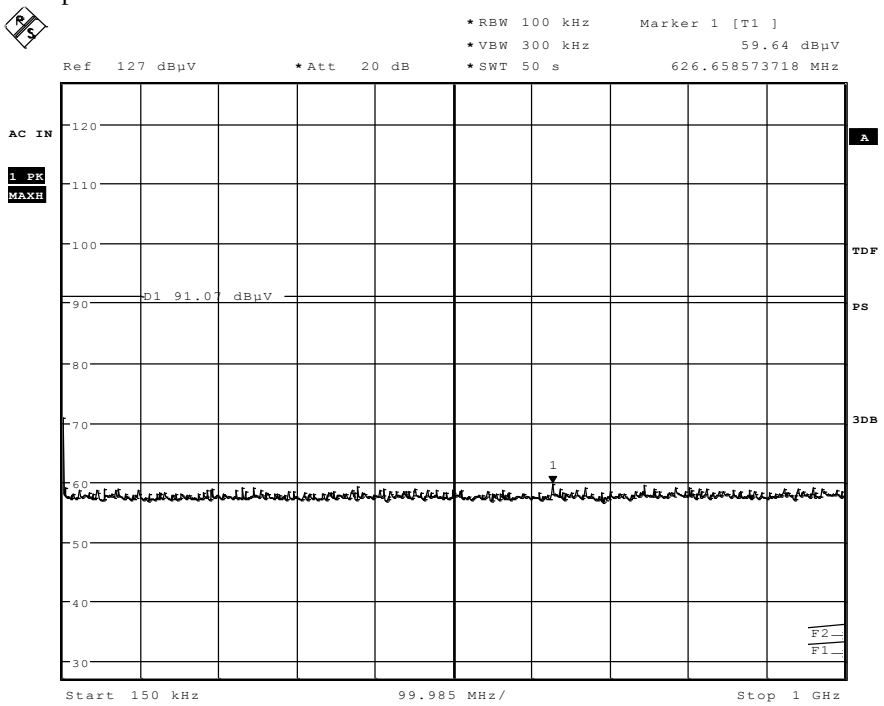
Diagrams – Channel low

Level Reference (In-Band)



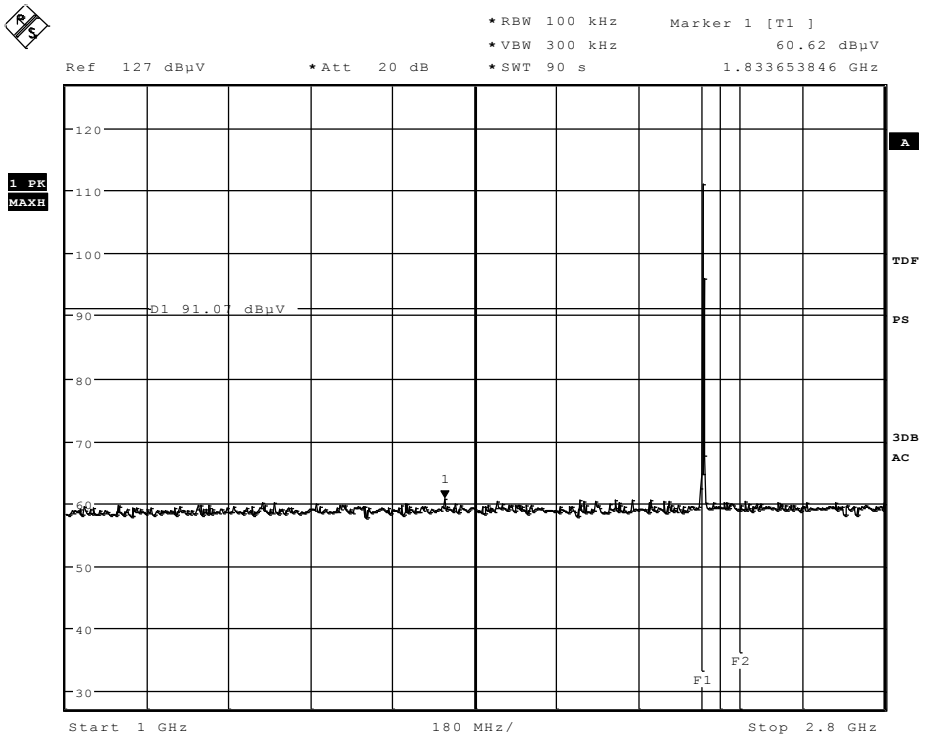
Date: 15.JUN.2012 18:28:47

Sweep 1: 150 MHz – 1GHz



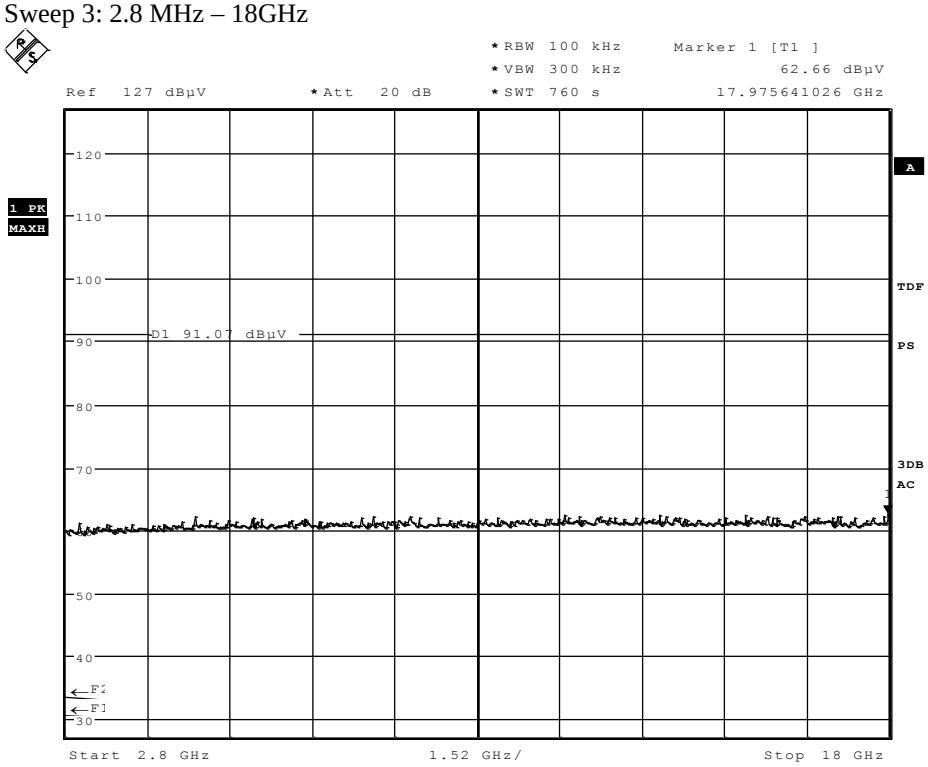
Date: 15.JUN.2012 18:34:25

Sweep 2: 1 GHz – 2.8GHz



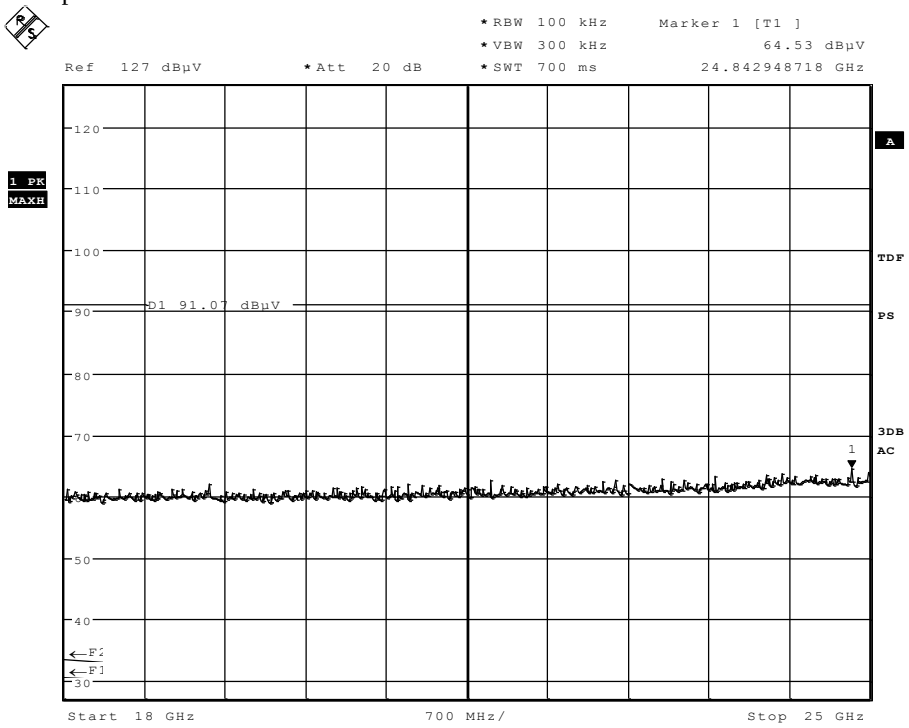
Date: 15.JUN.2012 18:46:32

Sweep 3: 2.8 MHz – 18GHz



Date: 15.JUN.2012 19:10:20

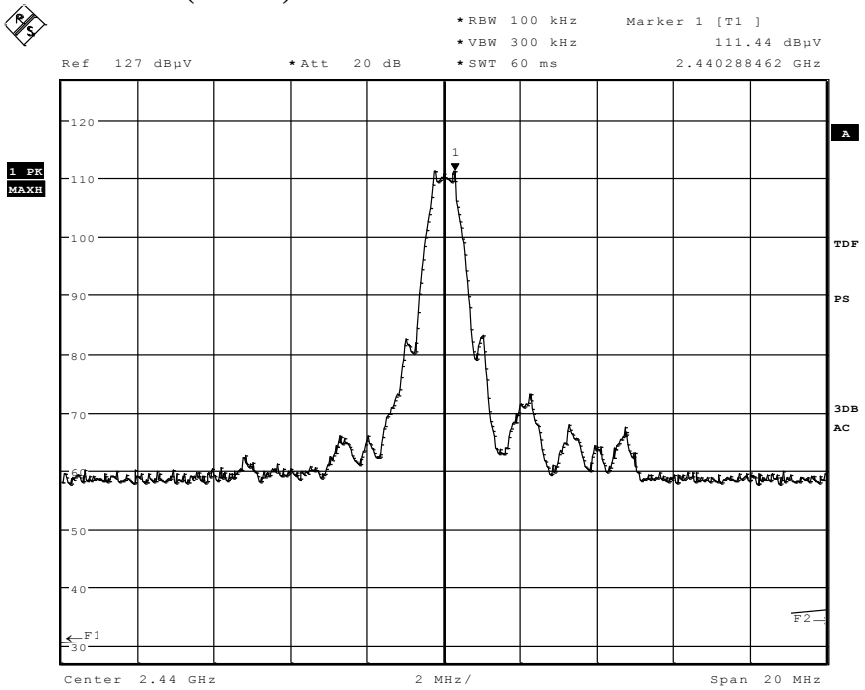
Sweep 4: 18 GHz – 25GHz



Date: 15.JUN.2012 19:11:32

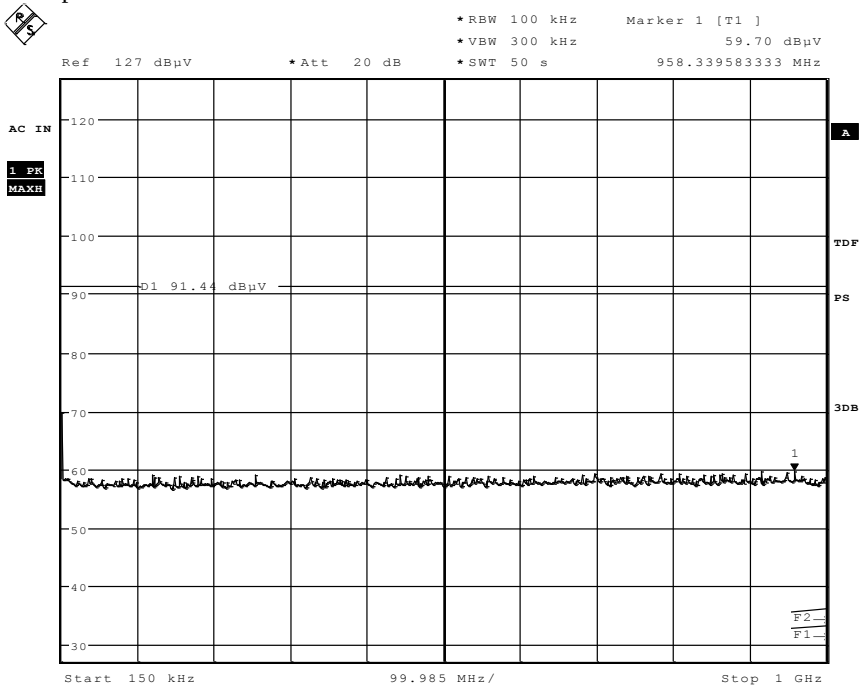
Diagrams – Channel middle

Level Reference (In-Band)



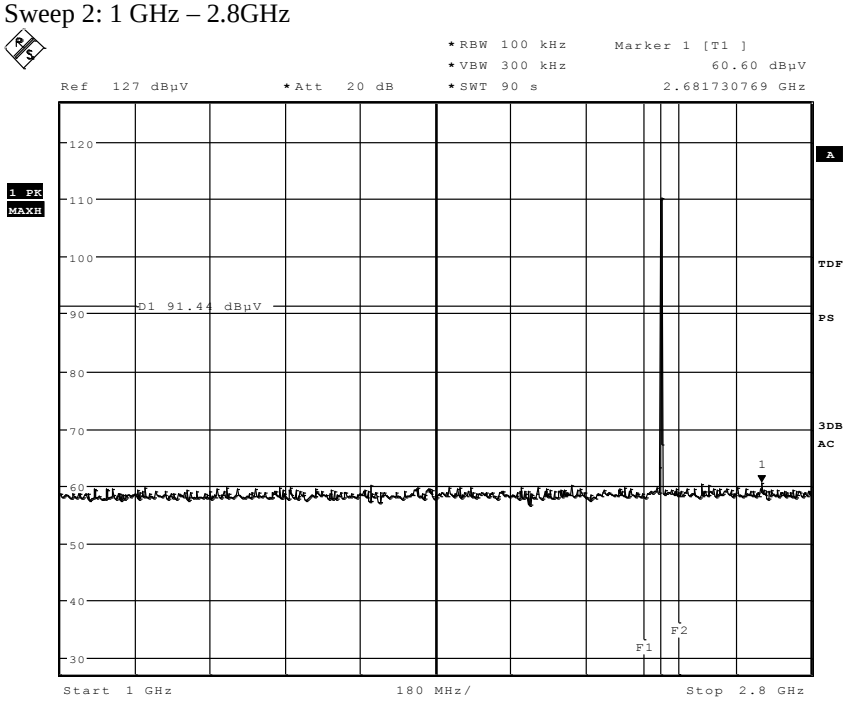
Date: 15.JUN.2012 19:22:05

Sweep 1: 150 MHz – 1GHz



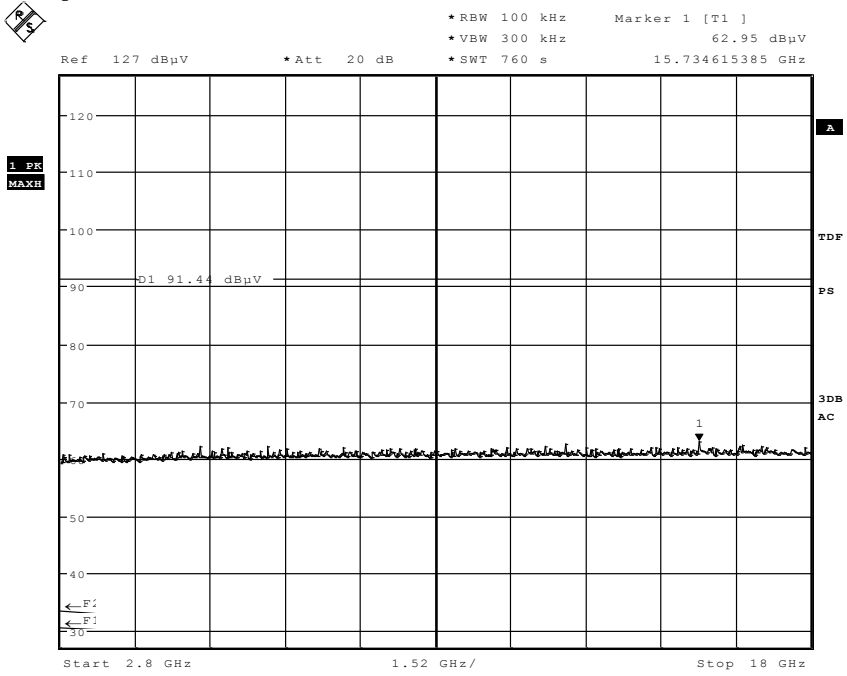
Date: 15.JUN.2012 19:26:31

Sweep 2: 1 GHz – 2.8GHz



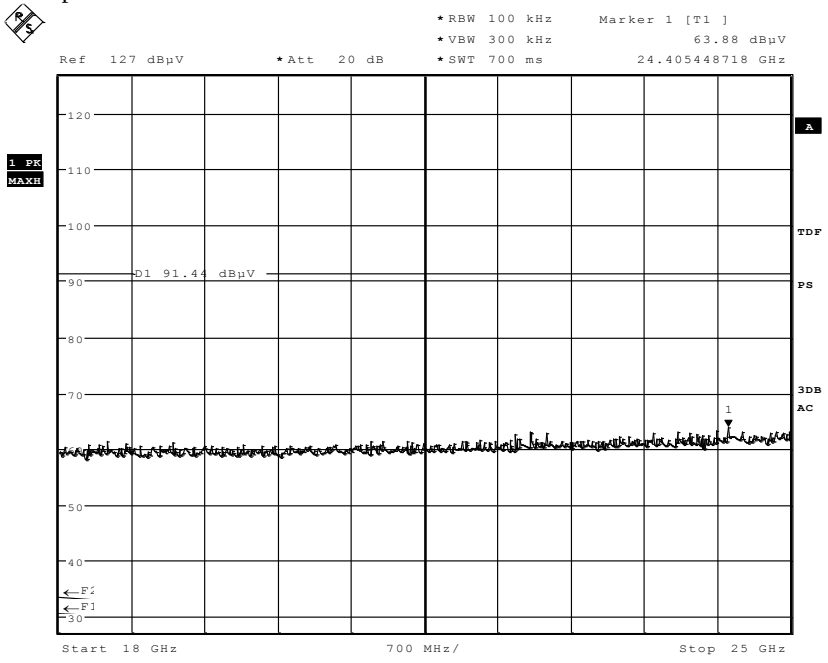
Date: 15.JUN.2012 19:28:57

Sweep 3: 2.8 MHz – 18GHz



Date: 15.JUN.2012 19:43:28

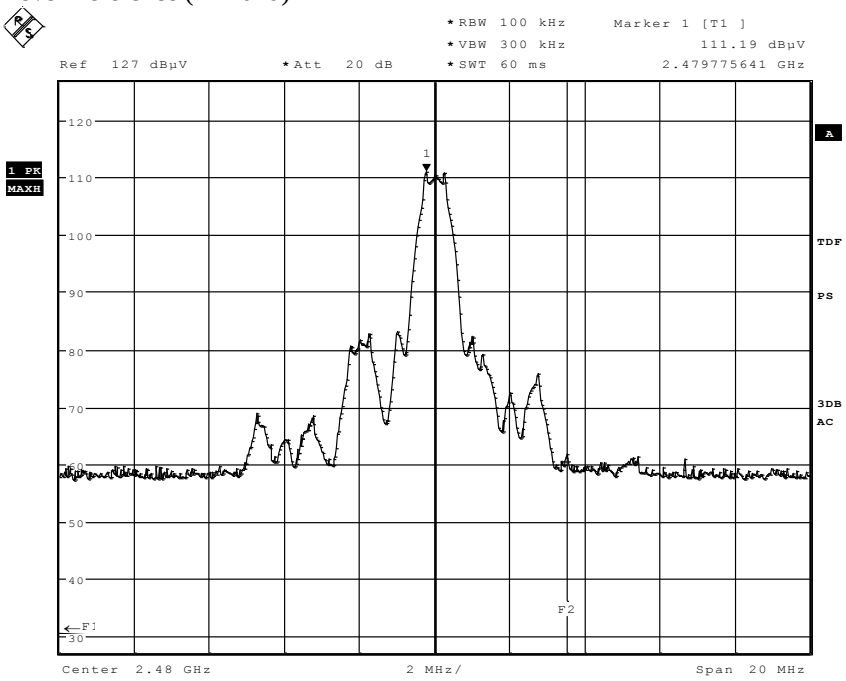
Sweep 4: 18 GHz – 25GHz



Date: 15.JUN.2012 19:44:15

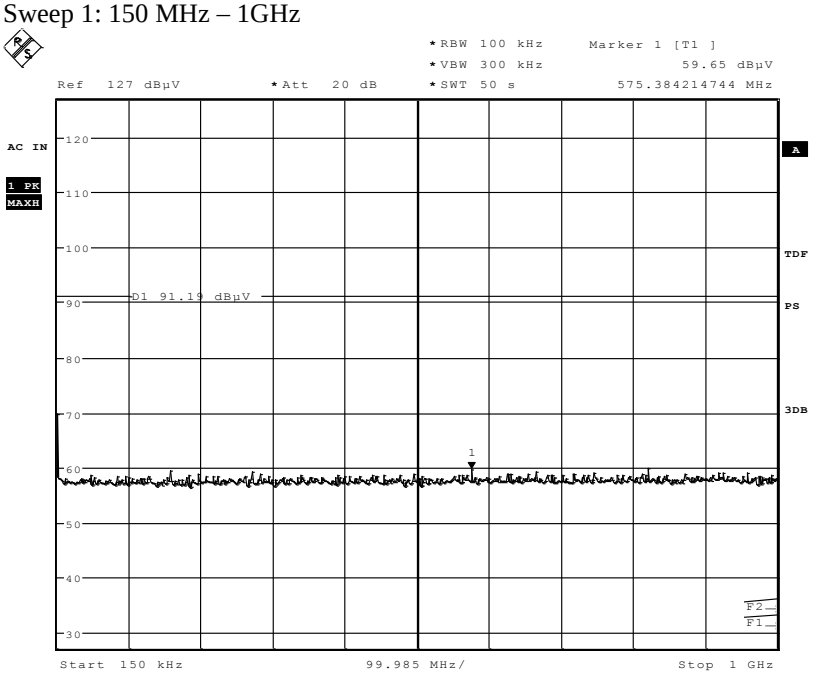
Diagrams – Channel high

Level Reference (In-Band)



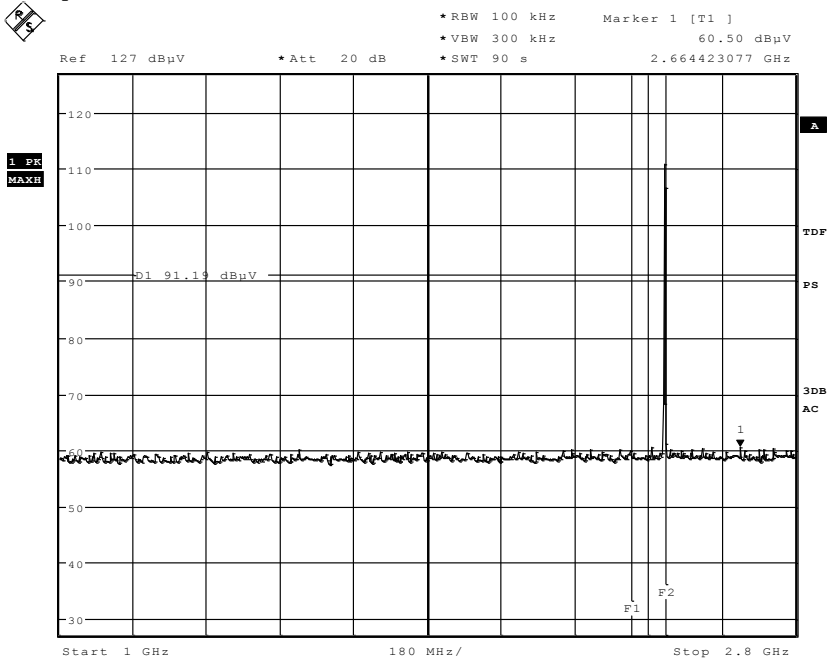
Date: 15.JUN.2012 19:46:28

Sweep 1: 150 MHz – 1GHz



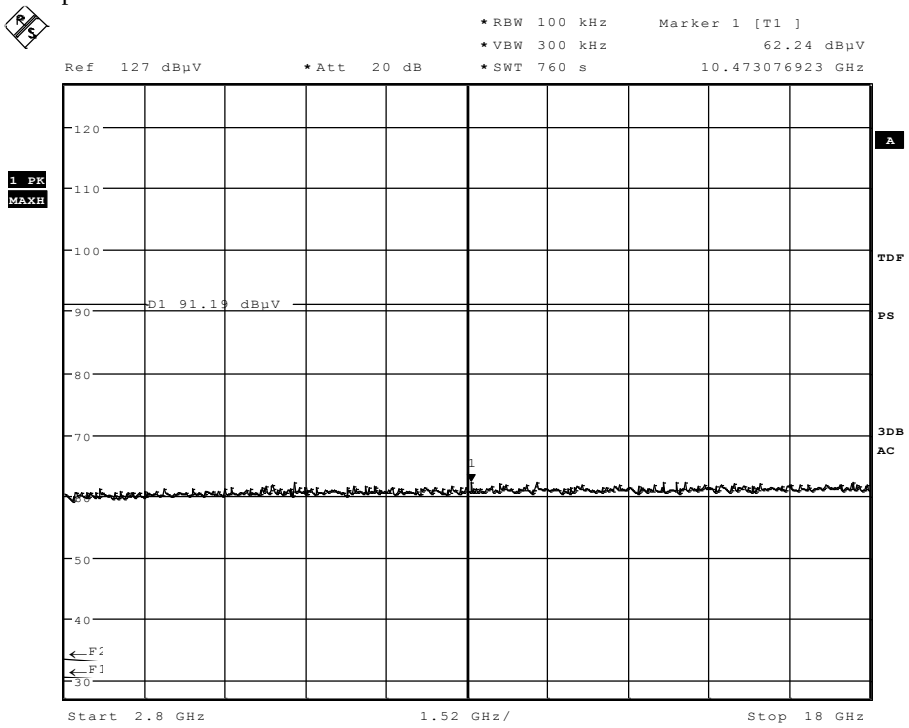
Date: 15.JUN.2012 19:49:35

Sweep 2: 1 GHz – 2.8GHz



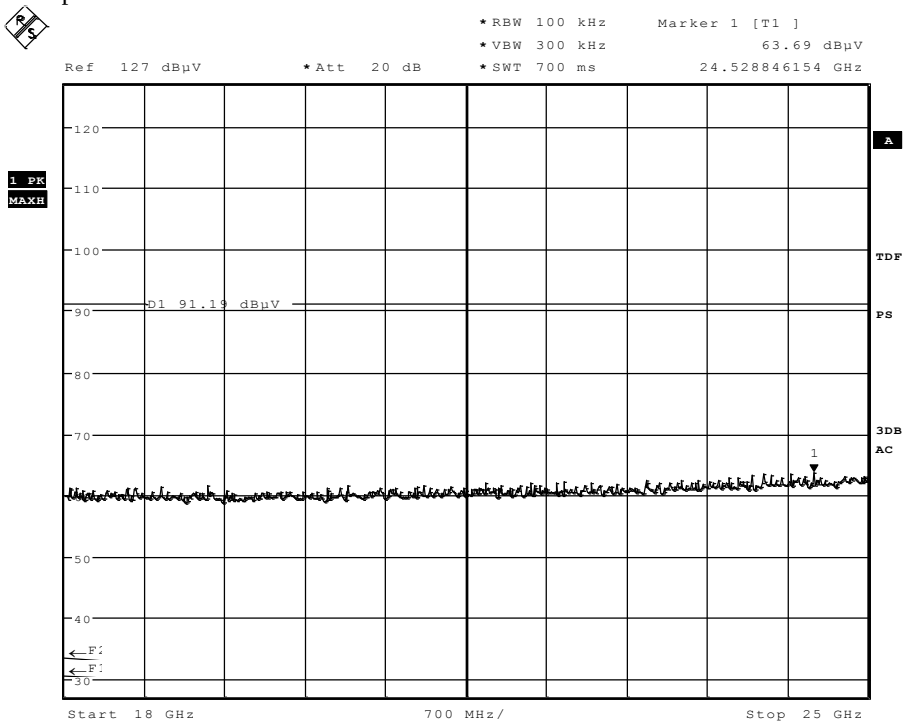
Date: 15.JUN.2012 19:53:47

Sweep 3: 2.8 MHz – 18GHz



Date: 15.JUN.2012 20:08:51

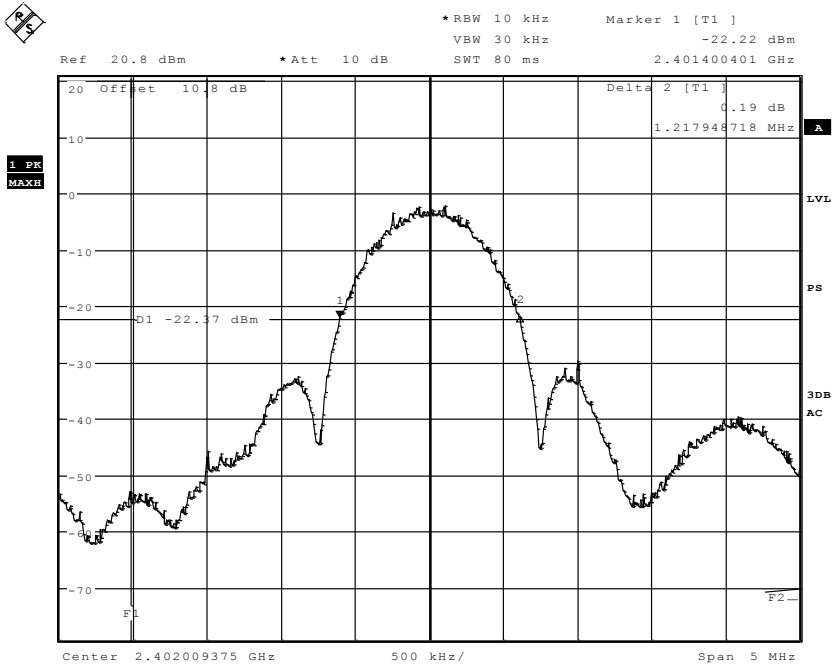
Sweep 4: 18 GHz – 25GHz



Date: 15.JUN.2012 20:11:02

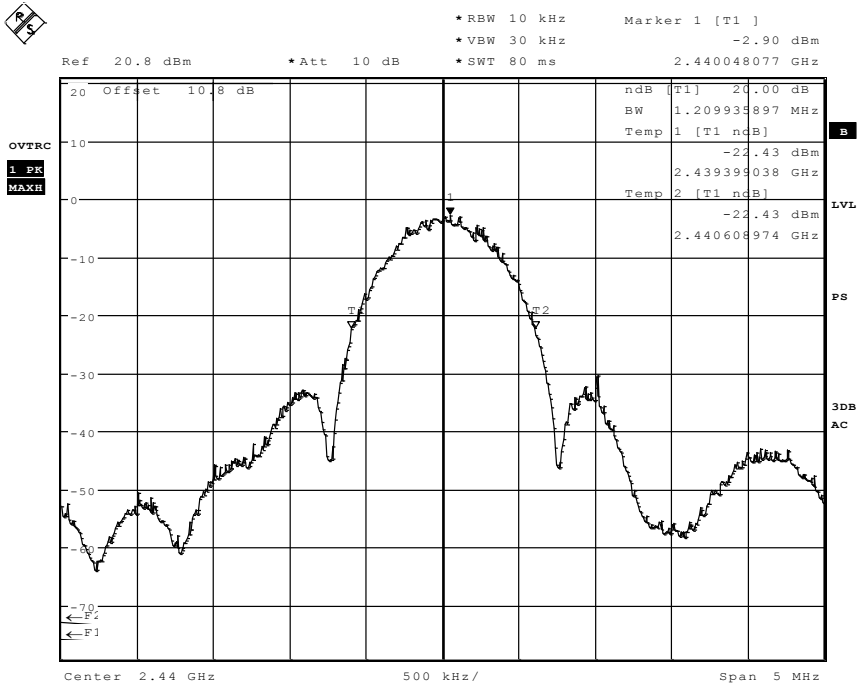
8.6. 20dB Emission bandwidth

Channel low



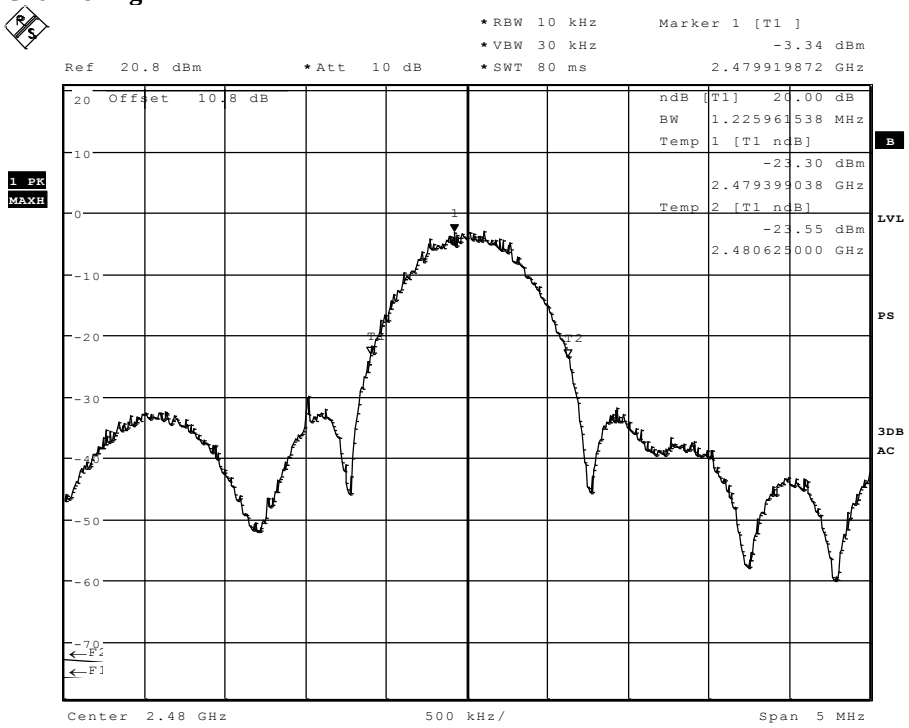
Date: 15.JUN.2012 16:42:37

Channel middle



Date: 15.JUN.2012 16:58:55

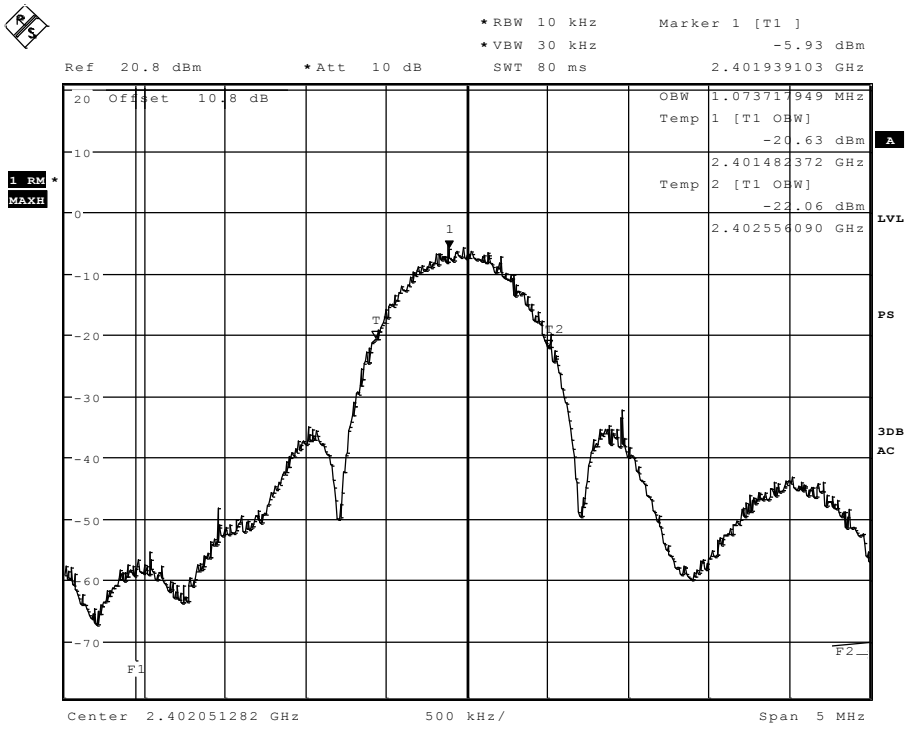
Channel high



Date: 15.JUN.2012 17:02:39

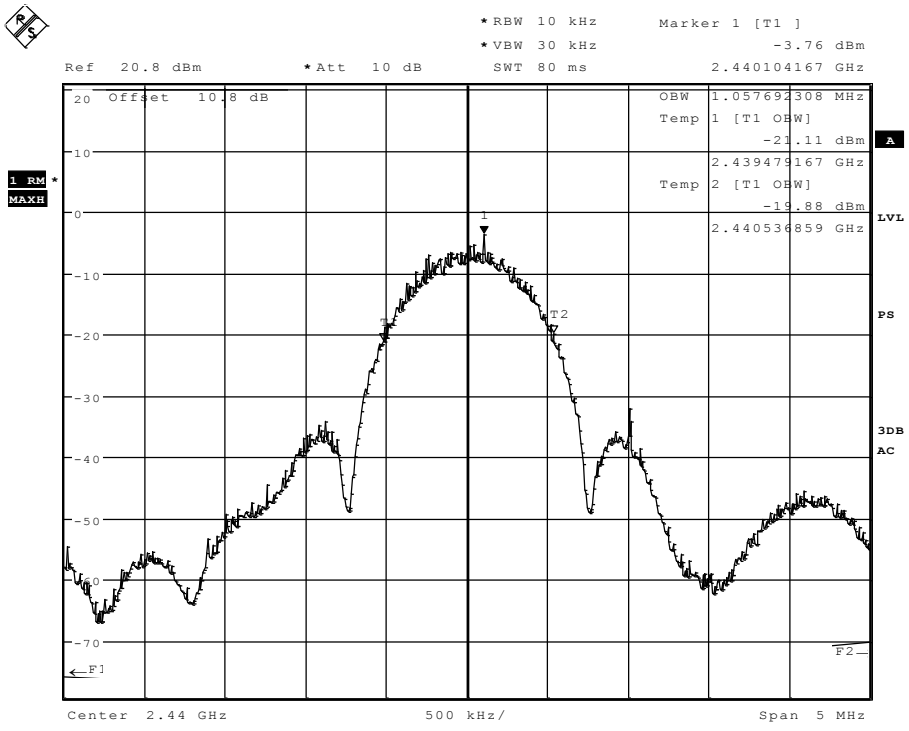
8.7. 99% Occupied bandwidth

Channel Low



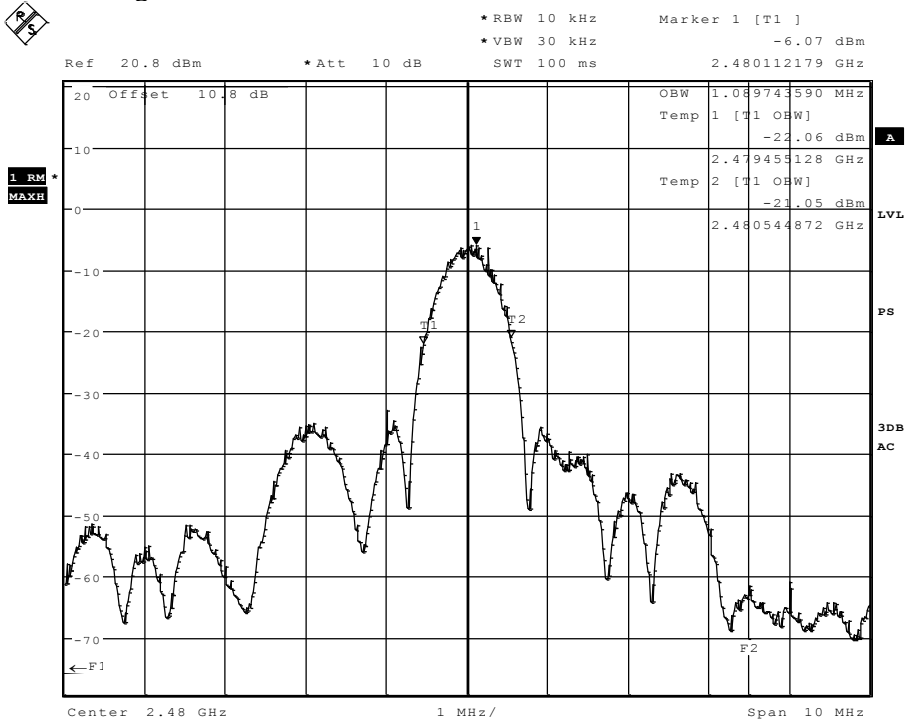
Date: 15.JUN.2012 16:49:52

Channel Middle



Date: 15.JUN.2012 16:52:25

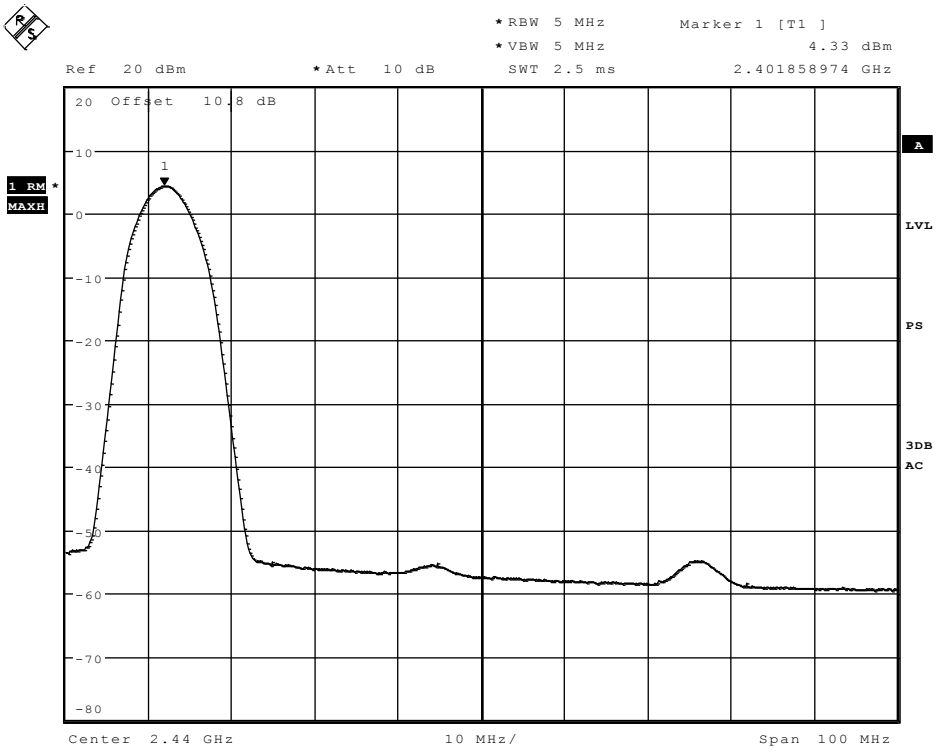
Channel High



Date: 15.JUN.2012 17:06:17

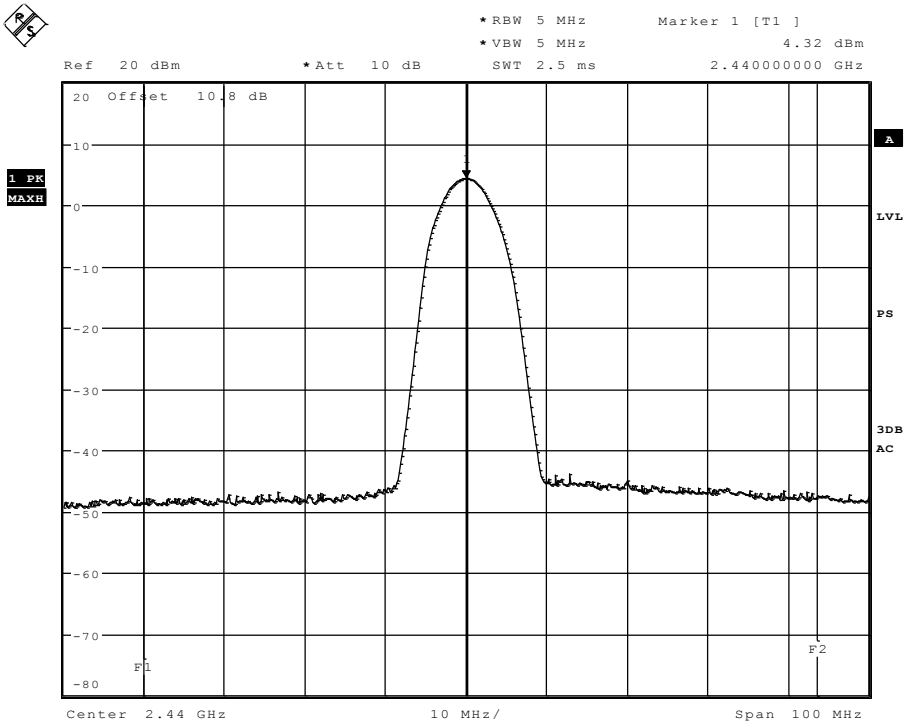
8.8. RF Power Conducted

Channel low



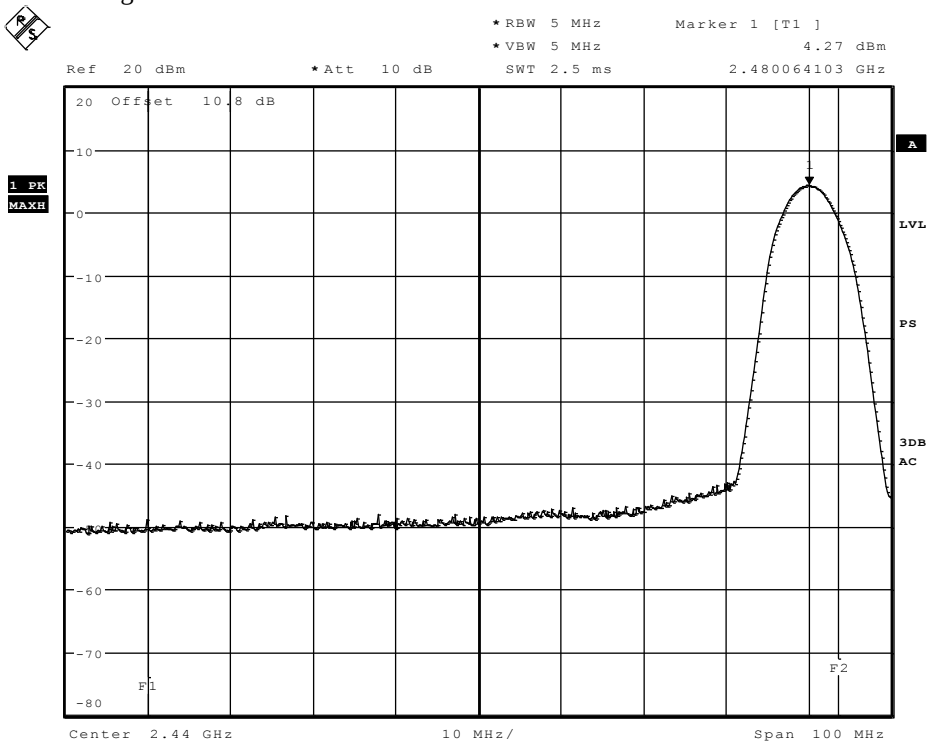
Date: 15.JUN.2012 16:00:59

Channel middle



Date: 15.JUN.2012 16:20:56

Channel high



Date: 15.JUN.2012 16:17:09

8.9. RF Power Radiated measurement: Max. E.I.R.P Power

Diagram No.: 4.01_EIRP_Ch-Low

Common Information

Test Description:	EIRP Power specification accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 &15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operator Name:	UE transmits on low ch. 37 (UL = 2402.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0
Op. Mode:	Tas
	6-0173-12-2-2c

EUT Information

EUT Name:	VOO MOTE AIR
Manufacturer:	Zero1.TV
Hardware Rev:	1.0
Software Rev:	1.2
Power during test:	4x 1,5 V AA batteries (full) inserted
Comment:	BT address : 3C:2D:B7:85:6E:42 and CC Debugger (rev. 1.0) connected

Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2402.000000	98.9	100.0	1000.000	155.0	H	315.0	0.0	35.5	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2402.000000	98.4	100.0	1000.000	155.0	H	315.0	0.0	35.5	

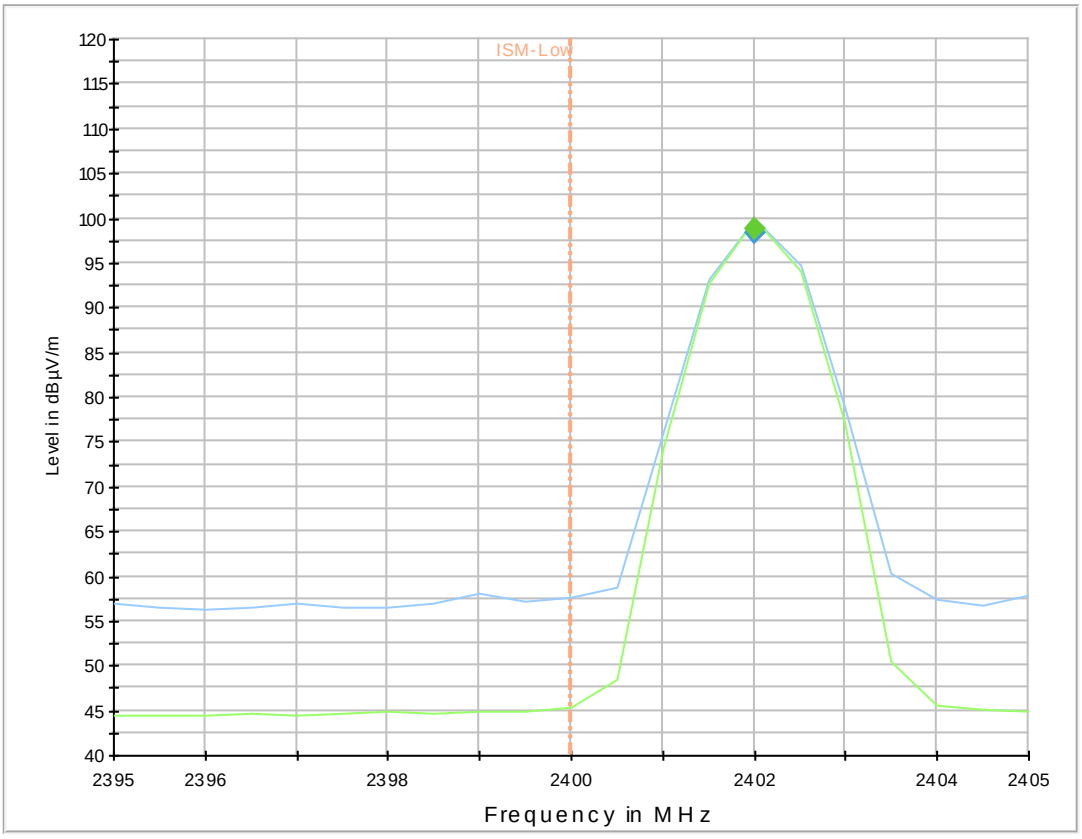


Diagram no.: 4.02_EIRP_Ch-Middle

Common Information

Test Description:	EIRP Power specification accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 &15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operating Mode:	UE transmits on middle ch. 17 (UL = 2440.0MHz), cont. mode (modulated)
Comment:	BT-LE v4.0
Operator Name:	HLa
	6-0173-12-2-2c

EUT Information

EUT Name:	VOO MOTE AIR
Manufacturer:	Zero1.TV
Hardware Rev:	1.0
Software Rev:	1.2
Power during test:	4x 1,5 V AA batteries (full) inserted
Comment:	BT address : 3C:2D:B7:85:6E:42, and CC Debugger (rev. 1.0) connected

Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Com.
2440.000000	99.0	100.0	1000.000	155.0	H	315.0	0.0	35.6	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2440.000000	98.8	100.0	1000.000	155.0	H	315.0	0.0	35.6	

Carrier_measurement_SM1_PA0_KP1_BT

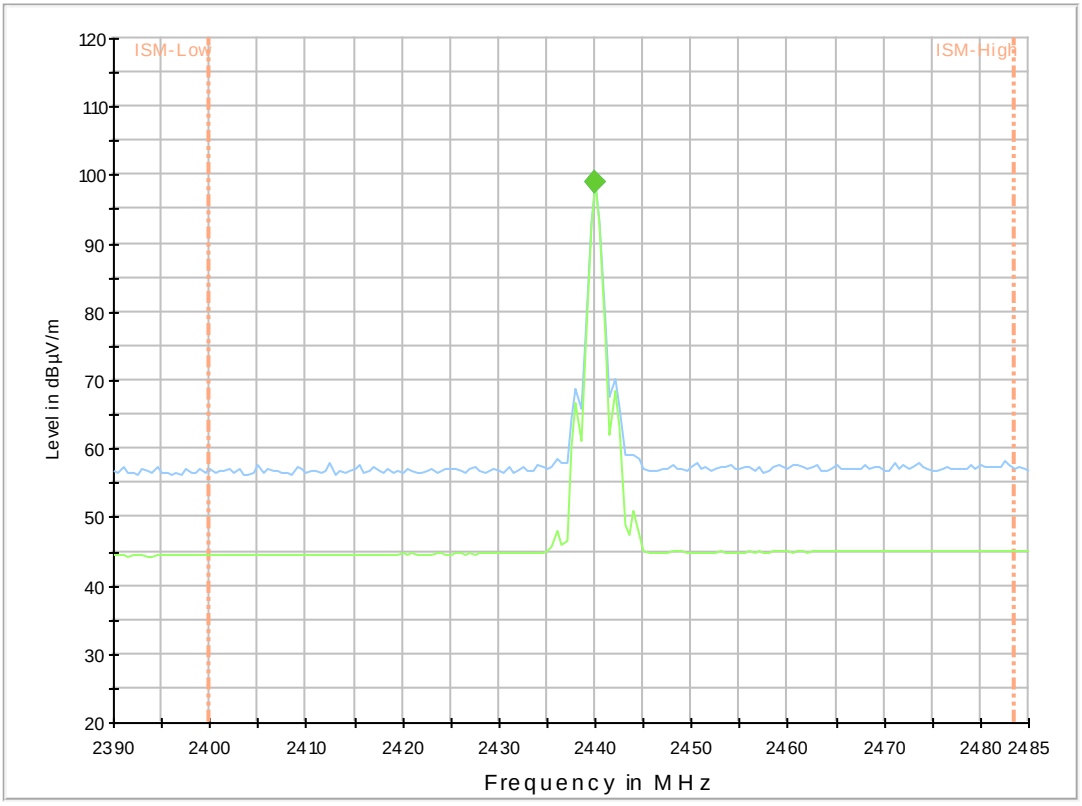


Diagram No.: 4.03_EIRP_Ch-High

Common Information

Test Description:	Radiated field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 &15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operating mode:	UE transmits on high channel 39 (UL = 2480.0MHz)
Comment:	BT-LE v4.0
Operator	Tas
	6-0173-12-2-2c

EUT Information

EUT Name:	VOO MOTE AIR
Manufacturer:	Zero1.TV
Serial Number:	
Hardware Rev:	1.0
Software Rev:	1.2
Power during test:	4x 1,5 V AA batteries (full) inserted
Comment:	BT address : 3C:2D:B7:85:6E:42 and CC Debugger (rev. 1.0) connected

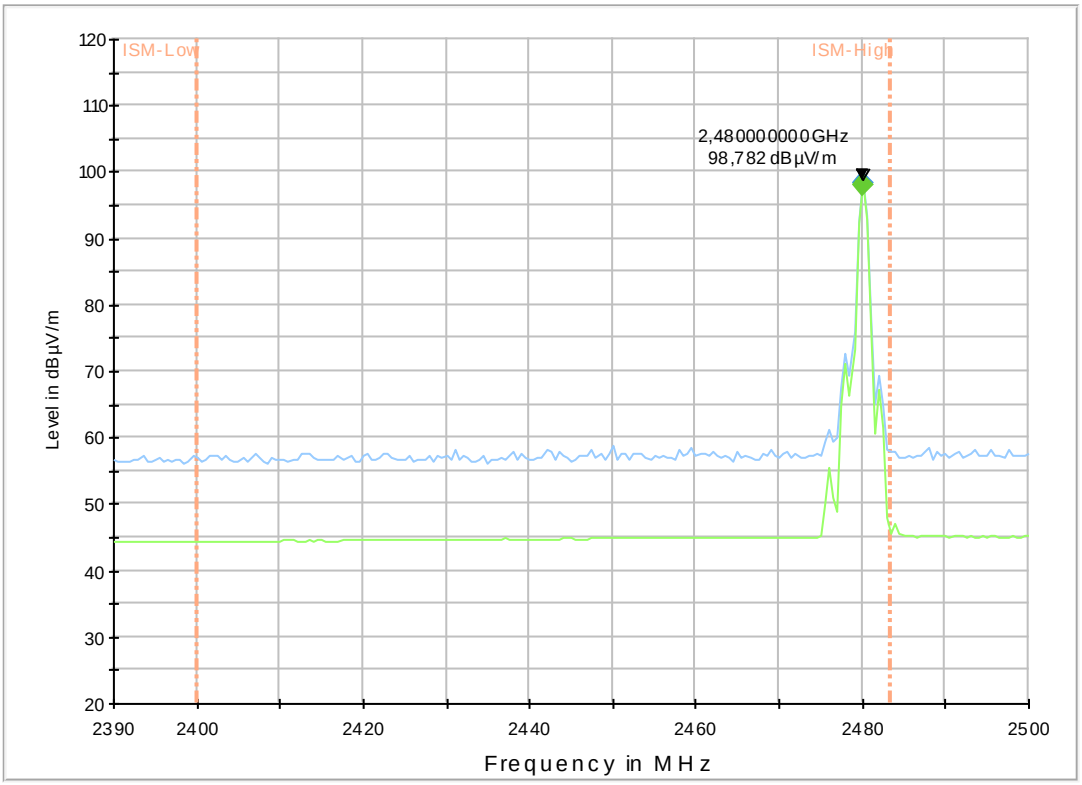
Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2480.000000	98.4	100.0	1000.000	155.0	V	176.0	90.0	35.7	

Final Result 2

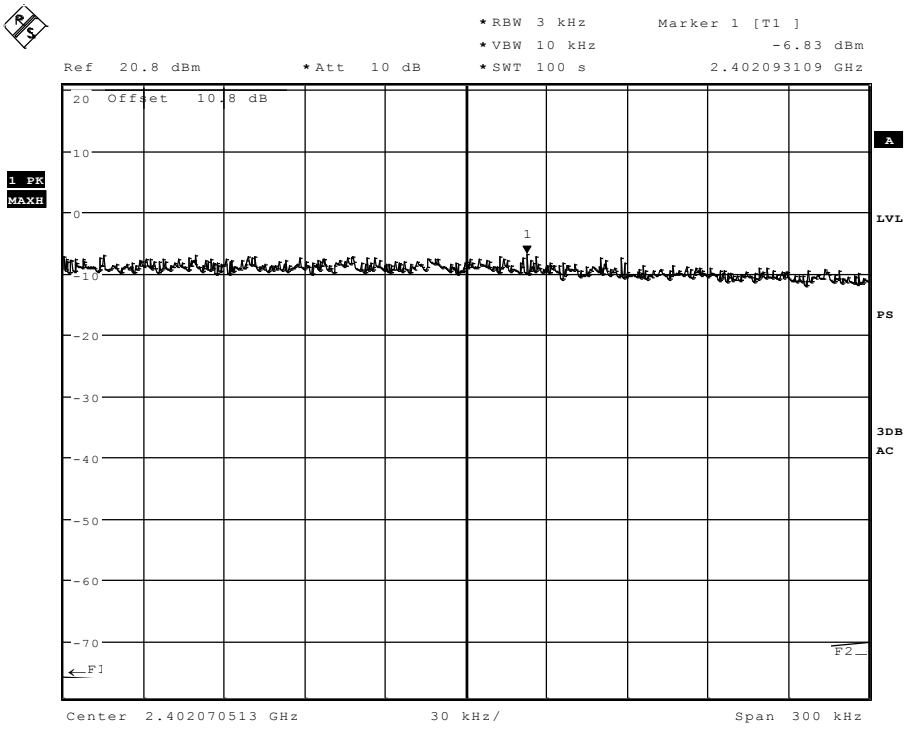
Frequency (MHz)	Average (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2480.000000	98.0	100.0	1000.000	155.0	V	175.0	90.0	35.7	

Carrier_measurement_SM1_PA0_KP1_BT



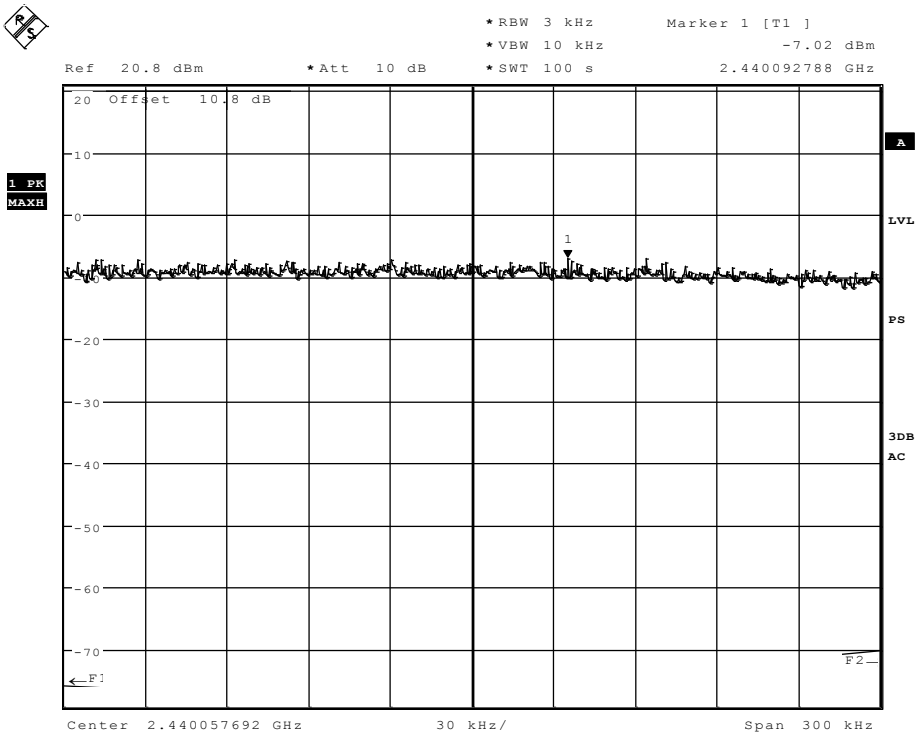
8.10. Power Spectral Density

Channle low



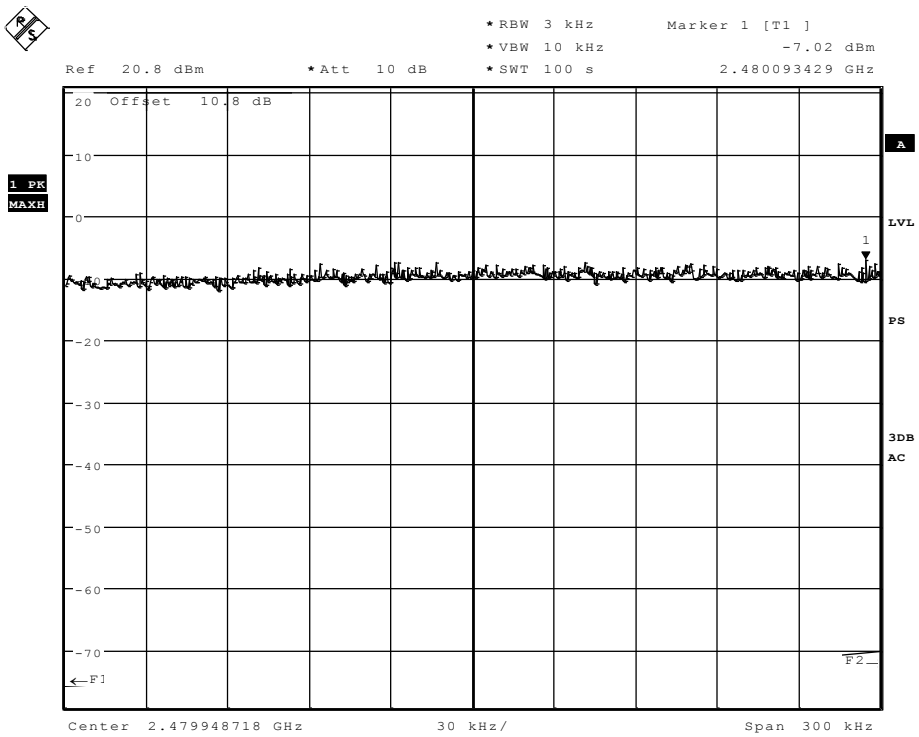
Date: 15.JUN.2012 17:42:29

Channel middle



Date: 15.JUN.2012 17:49:26

Channel high



Date: 15.JUN.2012 17:45:54