

TEST REPORT

Test report no.: 1-6965/13-09-09



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH

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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01

Area of Testing:

Radio Communications & EMC (RCE)

Applicant

Sony Mobile Communications AB

Nya Vattentornet

22188 Lund / SWEDEN

Phone: +46 46 19 30 00

Fax: -/-

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e-mail: Micke.nilsson@sonymobile.com

Phone: +46 7 03 22 75 03

Manufacturer

Sony Mobile Communications AB

Nya Vattentornet

22188 Lund / SWEDEN

Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:

Smart Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/V/VI/XIX; LTE FDD1/3/19/21; WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS

FCC ID:

PY7PM-0741

Frequency:

DTS band 5725 MHz to 5850 MHz
(lowest channel 149 – 5745 MHz; highest channel 165 – 5825 MHz)

Technology tested:

WLAN (OFDM/a – mode; n/ac HT20 / HT40 – mode and ac HT80 – mode)

Antenna:

Integrated antenna

Power supply:

3.7 V DC by Li - polymer battery

Temperature range:

-30°C to +60°C

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

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c=DE
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Andreas Luckenbill
Expert

Test performed:

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2014.02.21 11:56:23 +01'00'

Marco Bertolino
Testing Manager

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2013-12-19
Date of receipt of test item:	2014-02-03
Start of test:	2014-02-03
End of test:	2014-02-18
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15		Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

3.1 Measurement guidance

DTS : KDB 558074	2013-04	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
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4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+60 °C during high temperature tests
	T_{min}	-30 °C during low temperature tests
Relative humidity content:		40 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.7 V DC by Li - polymer battery
	V_{max}	4.2 V
	V_{min}	3.3 V

5 Test item

Kind of test item	:	Smart Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/V/VII/XIX; LTE FDD1/3/19/21; WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS
S/N serial number	:	Radiated unit: CB5A1X9G1M, CB5A1X9G4T Conducted unit: CB5A1X7XCZ
HW hardware status	:	AP2.0
SW software status	:	RF test software
Frequency band [MHz]	:	DTS band 5725 MHz to 5850 MHz (lowest channel 149 – 5745 MHz; highest channel 165 – 5825 MHz)
Type of radio transmission	:	OFDM
Use of frequency spectrum	:	
Type of modulation	:	BPSK, QPSK, 16 – QAM, 64 – QAM and 256 – QAM
Number of channels	:	5
Antenna	:	Integrated antenna
Power supply	:	3.7 V DC by Li - polymer battery
Temperature range	:	-30°C to +60°C

5.1 Additional information

Test setup- and EUT-photos are included in test report: 1-6965/13-09-01_AnnexA
1-6965/13-09-01_AnnexB
1-6965/13-09-01_AnnexD

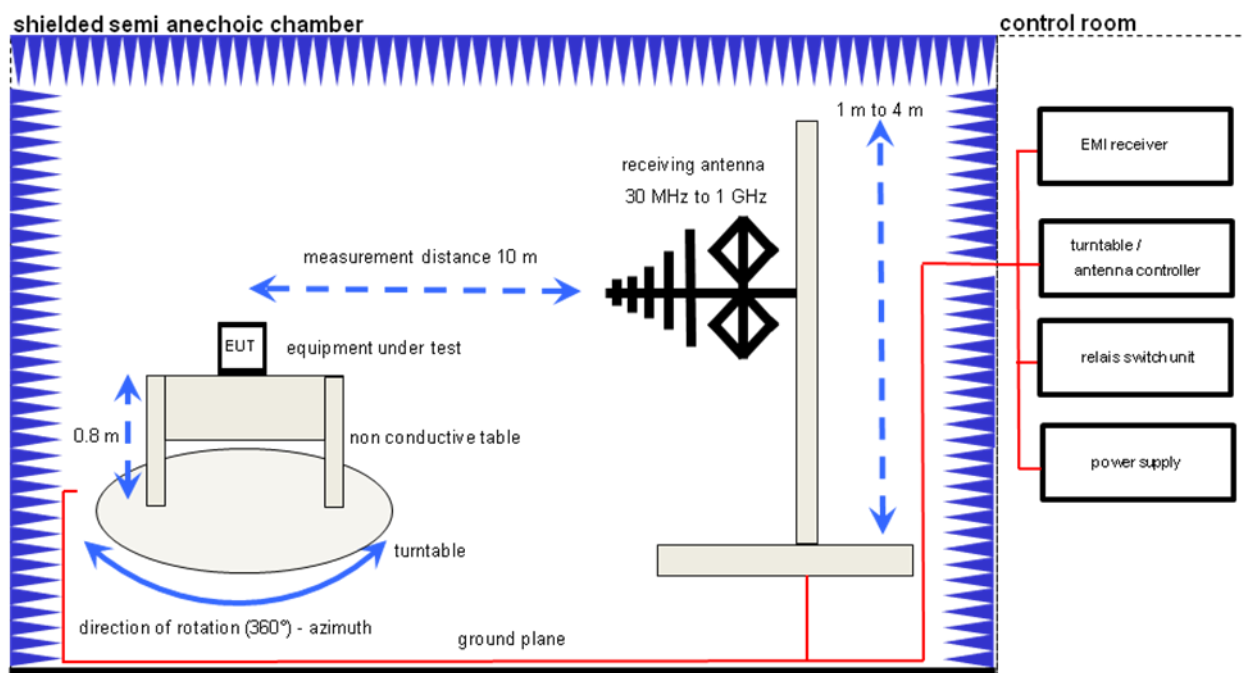
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements chamber F

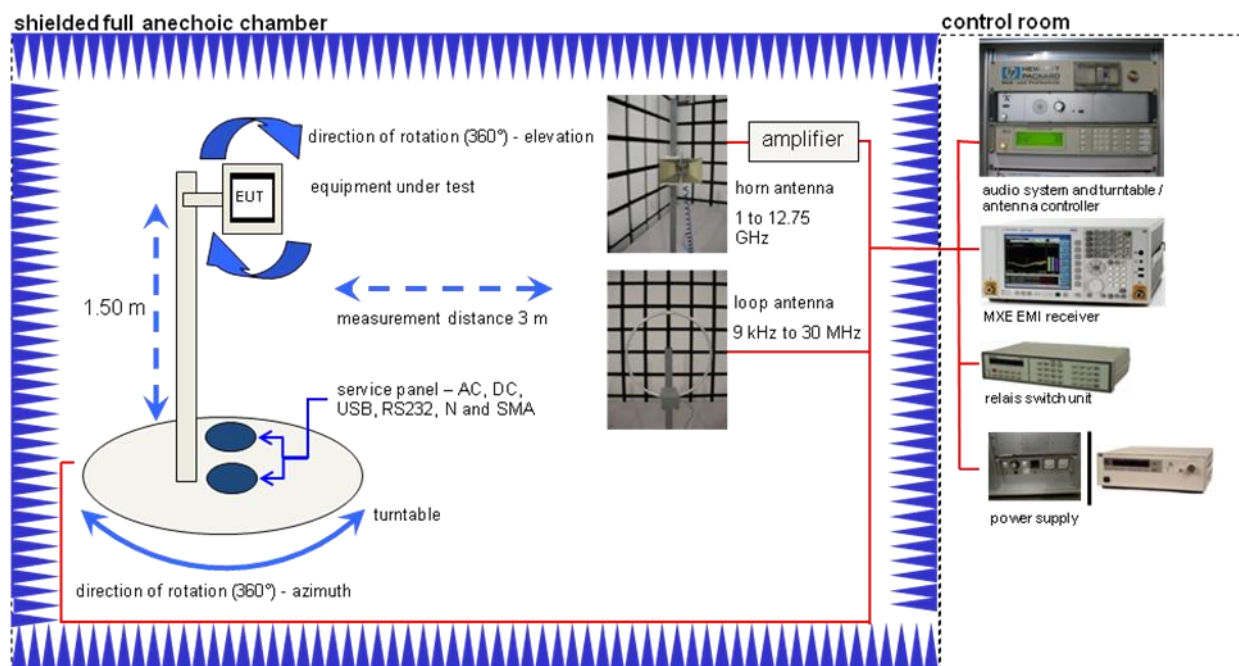
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Equipment table:

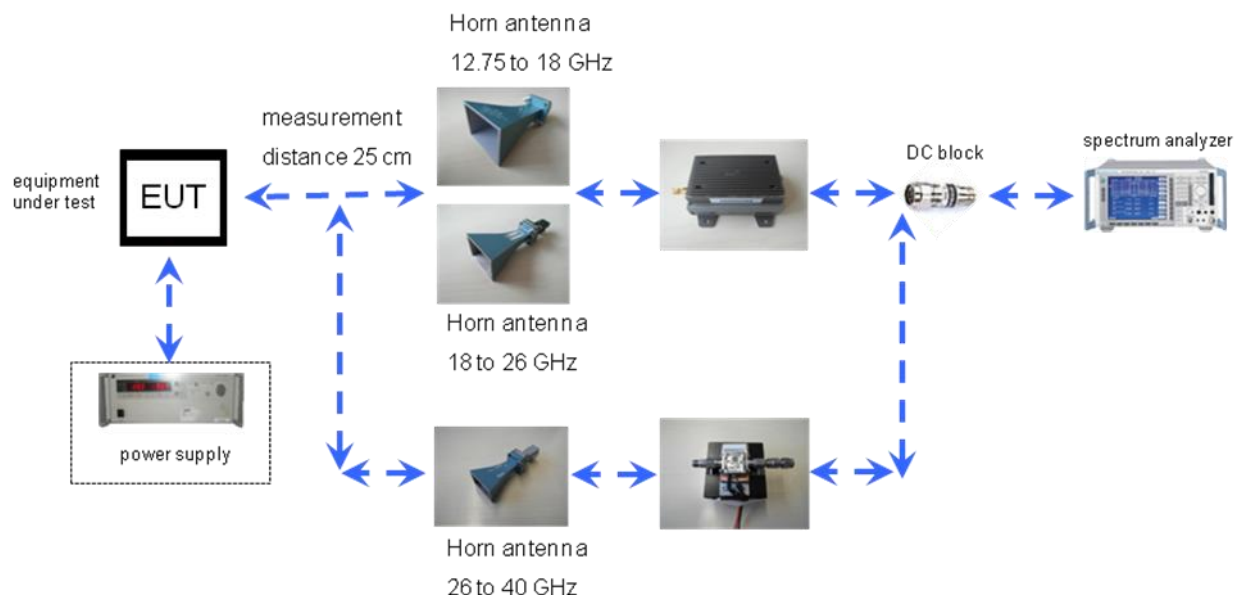
Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787

7.2 Radiated measurements chamber C



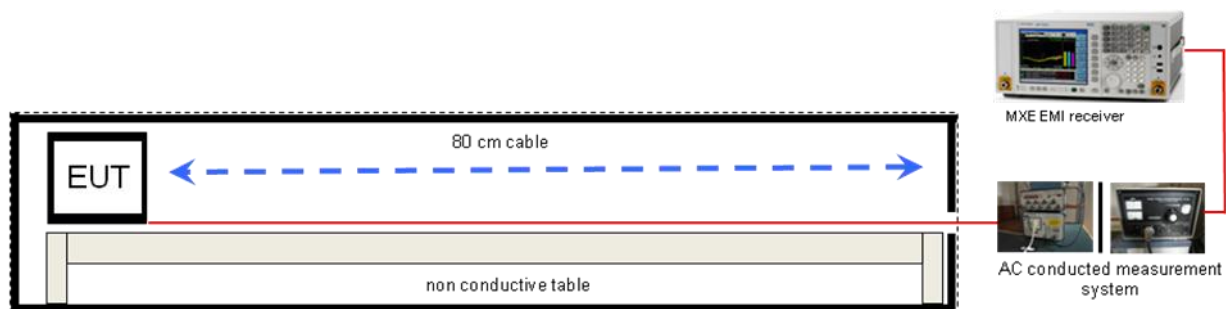
Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789
Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032
Active Loop Antenna	6502	EMCO	8905-2342	300000256
Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155
Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997
Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143

7.3 Radiated measurements 12.75 GHz to 40 GHz**Equipment table:**

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787
Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442
Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268
Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751
Broadband Low Noise Amplifier 18-50 GHz	CBL18503070-XX	CERNEX	19338	300004273
Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517

7.4 AC conducted



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erft	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168
Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210

8 Summary of measurement results



No deviations from the technical specifications were ascertained



There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15	Passed	2014-02-21	Delta tests according to manufacturer test plan!

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	Nominal	Nominal	OFDM	☐	☐	☐	☒	-/-
§15.247(e)	Power spectral density DTS clause 10.2	Nominal	Nominal	OFDM	☐	☐	☐	☒	-/-
§15.247(a)(2)	Spectrum bandwidth - 6dB bandwidth DTS clause 8.2	Nominal	Nominal	OFDM	☐	☐	☐	☒	-/-
§15.247(a)(2)	Spectrum bandwidth - 20dB bandwidth	Nominal	Nominal	OFDM	☐	☐	☐	☒	-/-
§15.247(b)(3)	Maximum output power DTS clause 9.1.2	Nominal	Nominal	OFDM	☐	☐	☐	☒	-/-
§15.247(d)	Band edge compliance conducted DTS clause 13.2.1	Nominal	Nominal	OFDM	☐	☐	☐	☒	-/-
§15.247(d)	TX spurious emissions conducted DTS clause 11.1 & 2	Nominal	Nominal	OFDM	☐	☐	☐	☒	-/-
§15.247(d)	TX spurious emissions radiated	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.109	RX spurious emissions radiated	Nominal	Nominal	-/-	☒	☐	☐	☐	complies
§15.209(a)	TX spurious emissions radiated < 30 MHz	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted emissions < 30 MHz	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies

Note: NA = Not Applicable; NP = Not Performed

9 Additional comments

Reference documents: Main test report:
1-6965/13-13-10-A / PY7TS-0020 (conducted values)

Special test descriptions: None

Configuration descriptions: None

Test mode:

- ☐ No test mode available.
Iperf was used to ping another device with the largest support packet size
- ☒ Special software is used.
EUT is transmitting pseudo random data by itself

10 Measurement results

10.1 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at the lowest, middle and highest channel. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 40 GHz
Trace-Mode:	Max Hold
Measured Modulation	☒ OFDM a – mode ☒ OFDM n/ac – mode HT20 ☒ OFDM n/ac – mode HT40 ☒ OFDM ac – mode HT80

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC		
TX Spurious Emissions Radiated		
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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results: OFDM / a – mode

TX Spurious Emissions Radiated [dBμV/m]								
OFDM / a – mode								
5745 MHz			5785 MHz			5825 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
Above 1 GHz: All detected peak emissions are below the average limit! See plots!			Above 1 GHz: All detected peak emissions are below the average limit! See plots!			Above 1 GHz: All detected peak emissions are below the average limit! See plots!		
Measurement uncertainty			± 3 dB					

Results: OFDM / n/ac – mode HT20

TX Spurious Emissions Radiated [dBμV/m]								
OFDM / n/ac – mode HT20								
5745 MHz			5785 MHz			5825 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
Above 1 GHz: All detected peak emissions are below the average limit! See plots!			Above 1 GHz: All detected peak emissions are below the average limit! See plots!			Above 1 GHz: All detected peak emissions are below the average limit! See plots!		
Measurement uncertainty			± 3 dB					

Results: OFDM / n/ac – mode HT40

TX Spurious Emissions Radiated [dB μ V/m]					
OFDM / n/ac – mode HT40					
5755 MHz			5795 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
Above 1 GHz: All detected peak emissions are below the average limit! See plots!			Above 1 GHz: All detected peak emissions are below the average limit! See plots!		
Measurement uncertainty			± 3 dB		

Results: OFDM / ac – mode HT80

TX Spurious Emissions Radiated [dB μ V/m]		
OFDM / ac – mode HT80		
5775 MHz		
F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
Above 1 GHz: All detected peak emissions are below the average limit! See plots!		
Measurement uncertainty		± 3 dB

Result: Passed

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

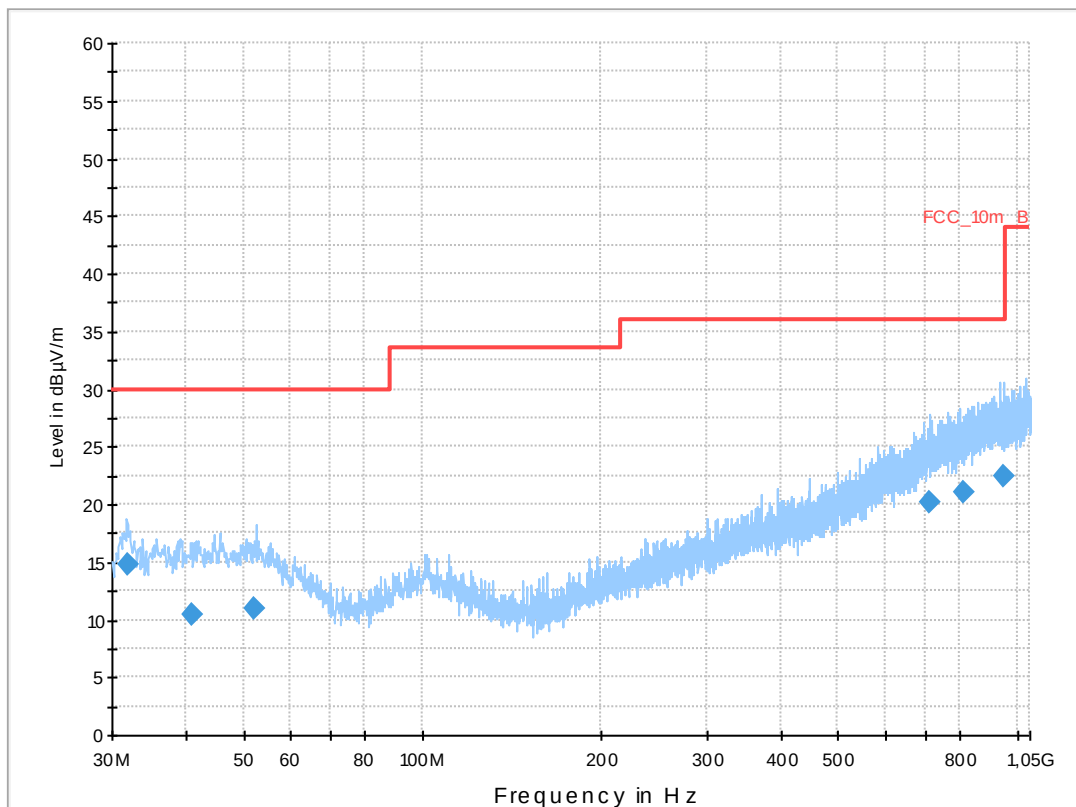
Plots: OFDM / a – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan a-mode tx ch 149
 Operator Name: Hennemann
 Comment: battery powered

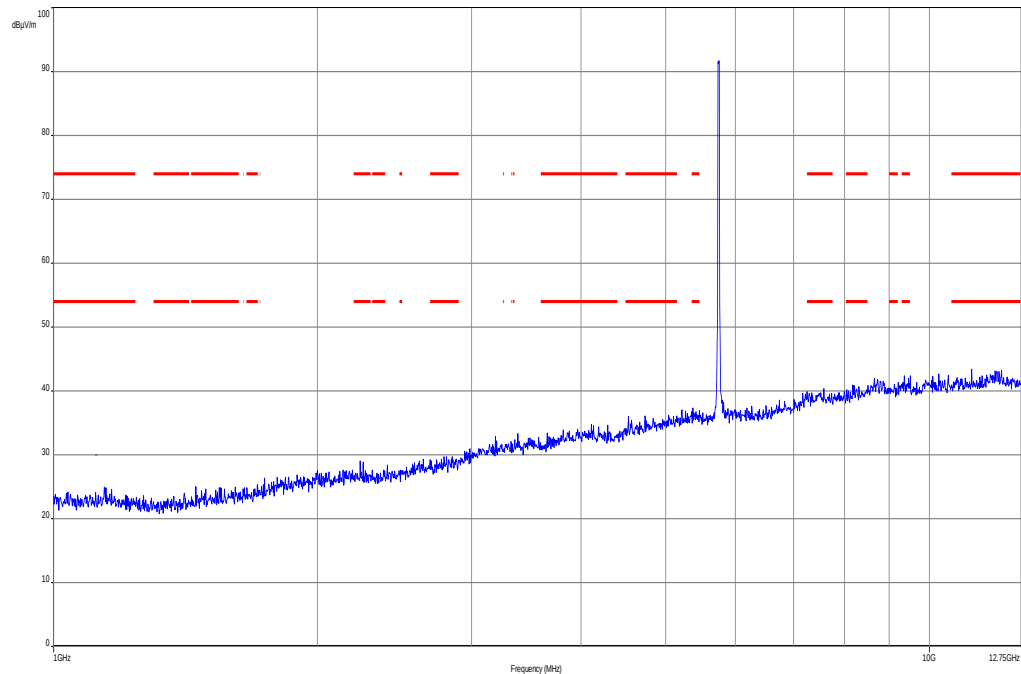
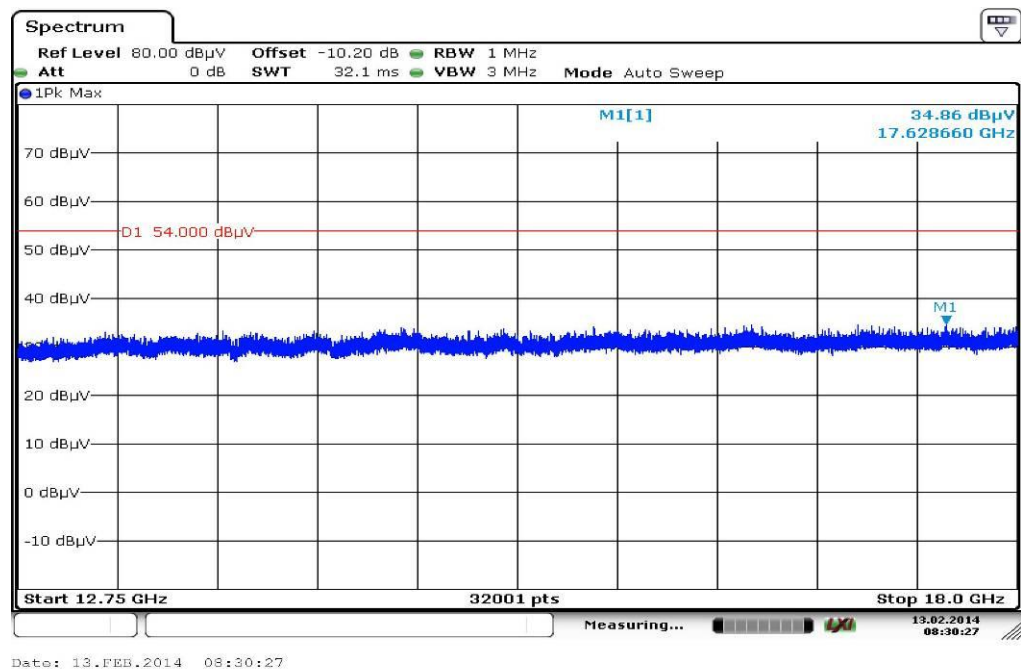
Scan Setup: STAN_Fin [EMI radiated]

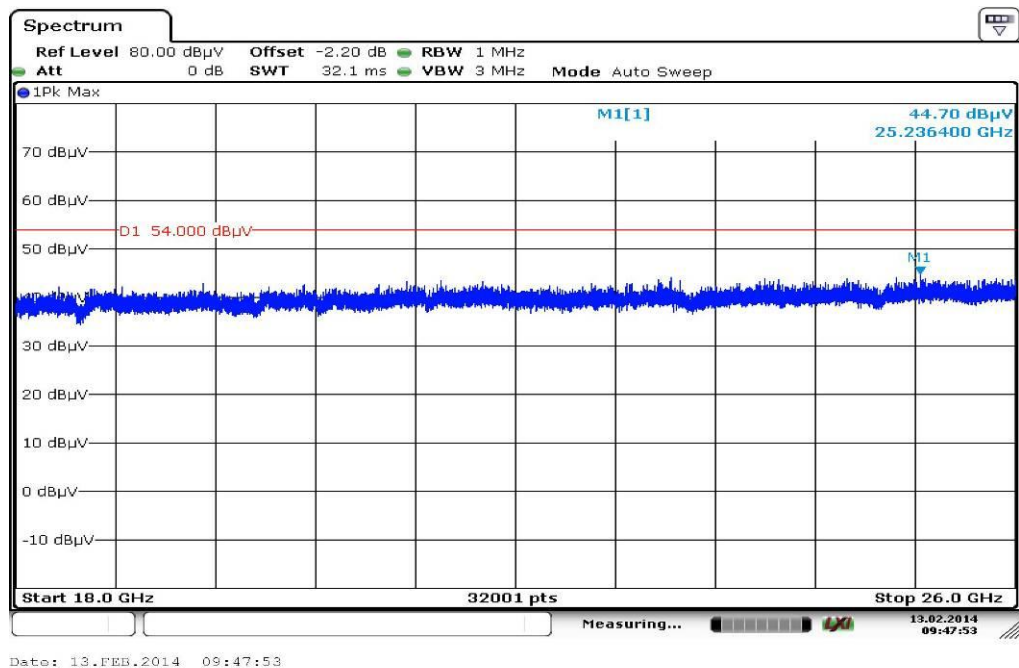
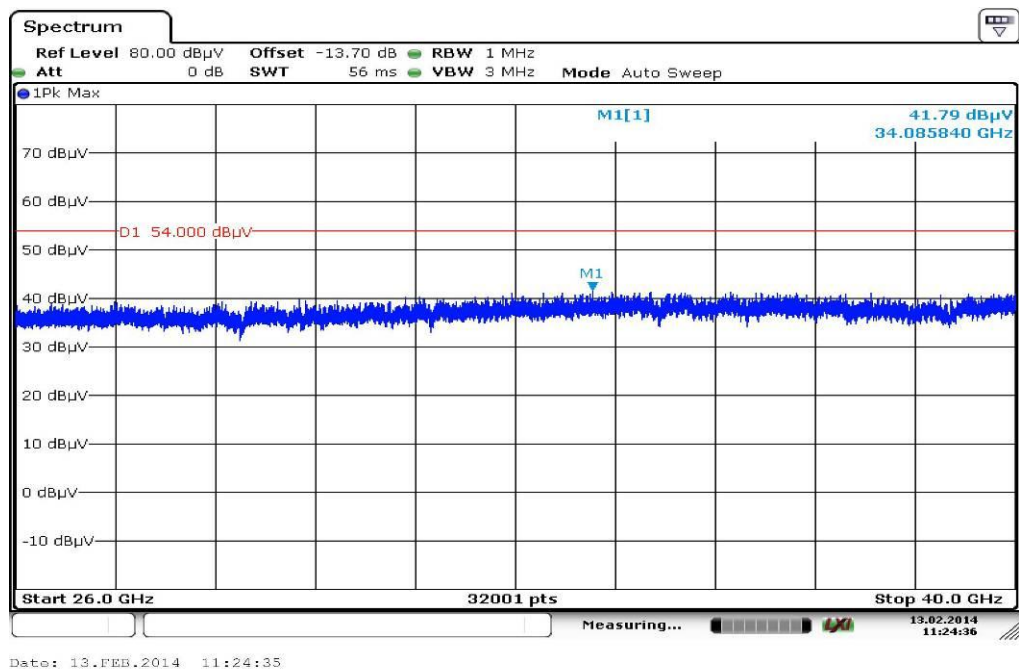
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
31.999350	14.9	1000.0	120.000	98.0	V	93.0	12.7	15.1	30.0	
41.053500	10.5	1000.0	120.000	106.0	H	93.0	13.4	19.5	30.0	
51.964800	10.9	1000.0	120.000	98.0	V	260.0	13.2	19.1	30.0	
710.657700	20.1	1000.0	120.000	104.0	V	190.0	22.8	15.9	36.0	
810.282600	21.1	1000.0	120.000	170.0	V	261.0	24.0	14.9	36.0	
949.740450	22.5	1000.0	120.000	170.0	V	280.0	25.4	13.5	36.0	

Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 3:** Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 5:** Lowest channel, 26 GHz to 40 GHz, vertical & horizontal polarization

Plot 6: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization

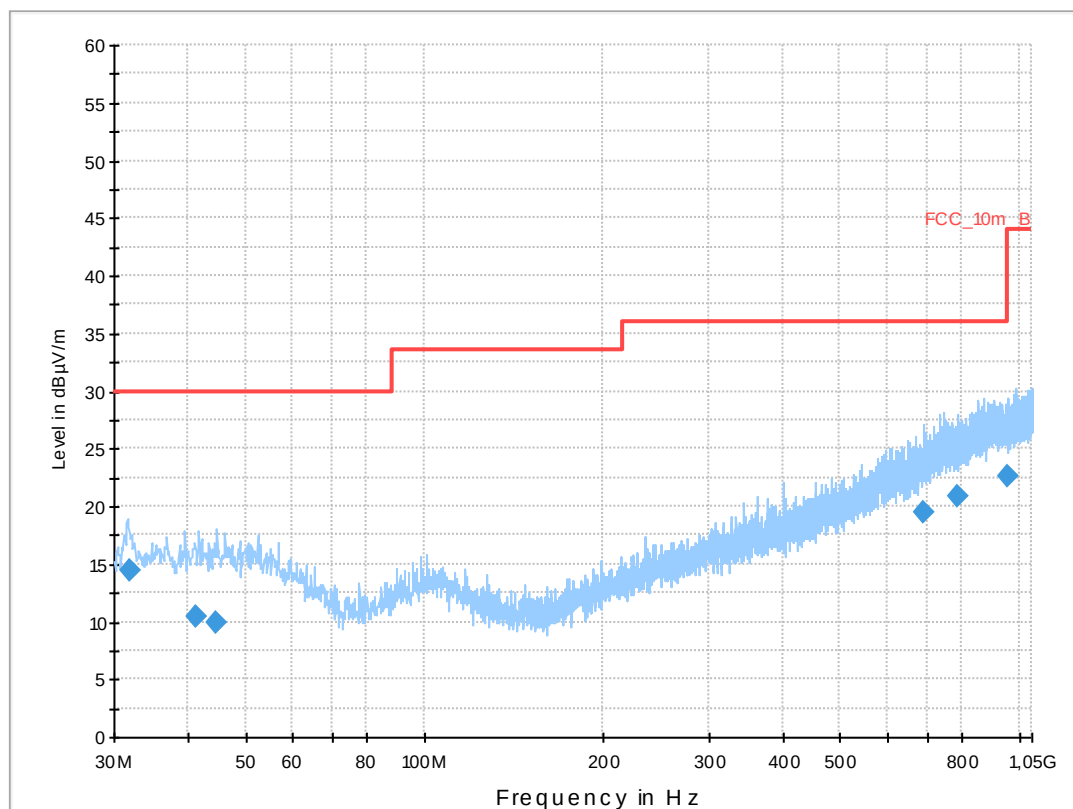
Common Information

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan a-mode tx ch 157
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

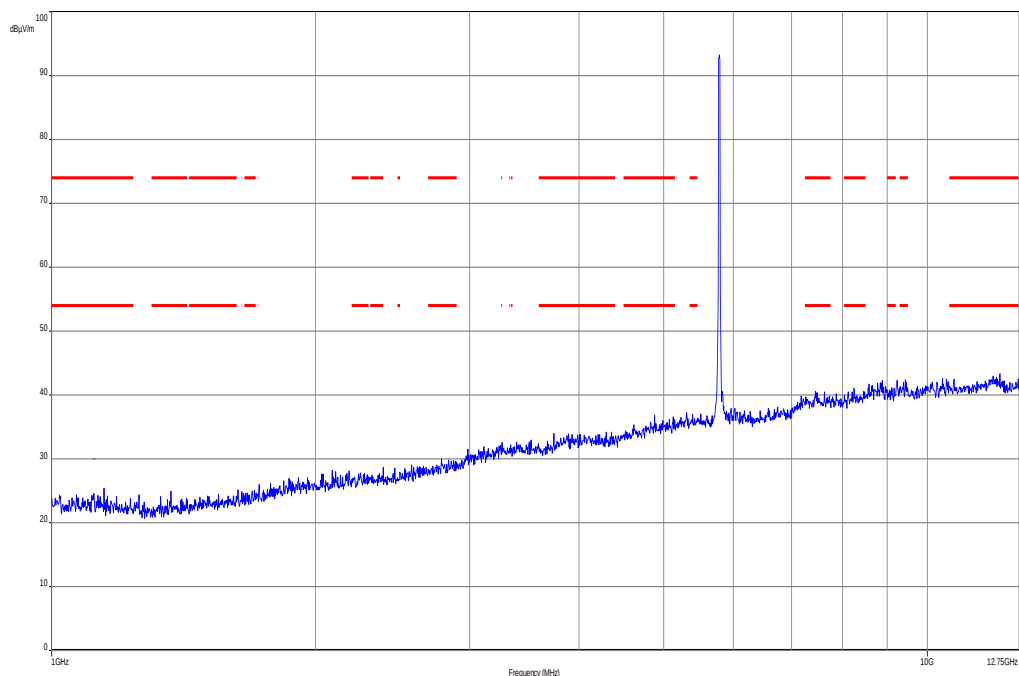
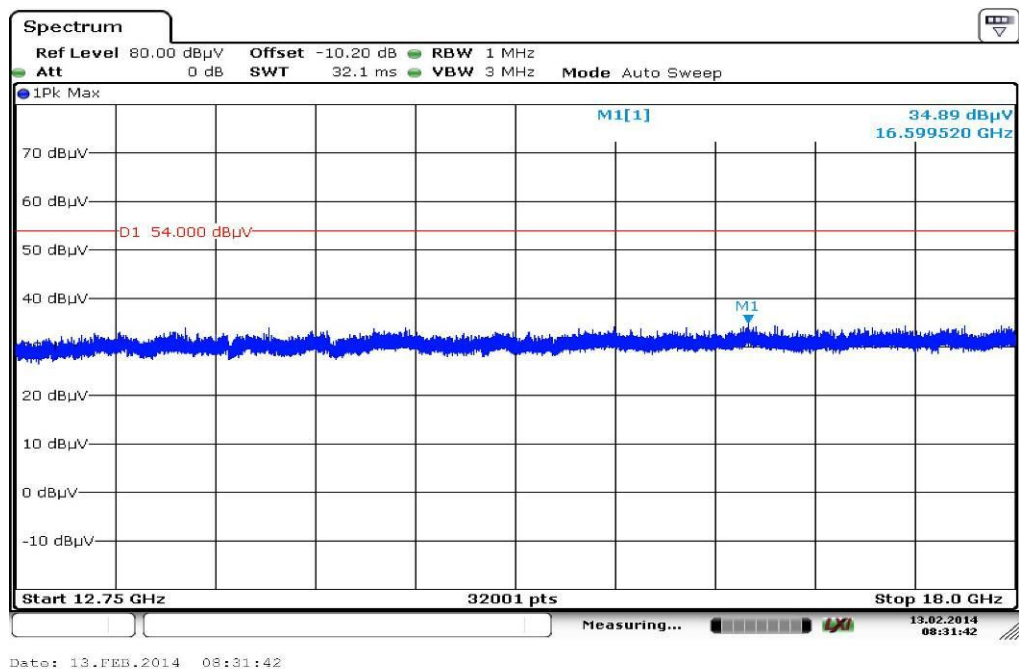
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m

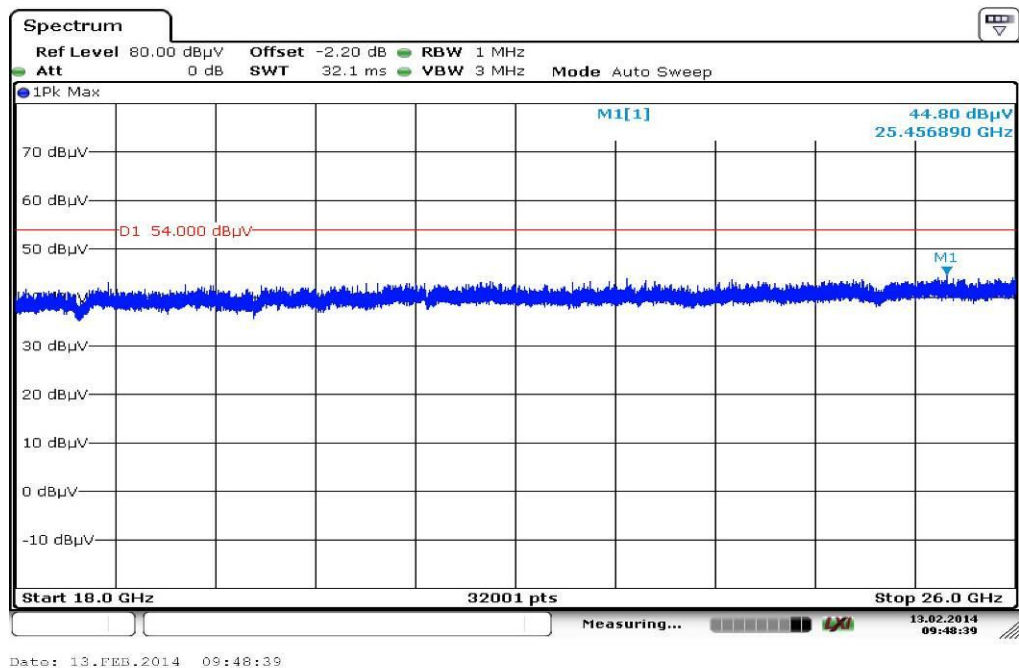
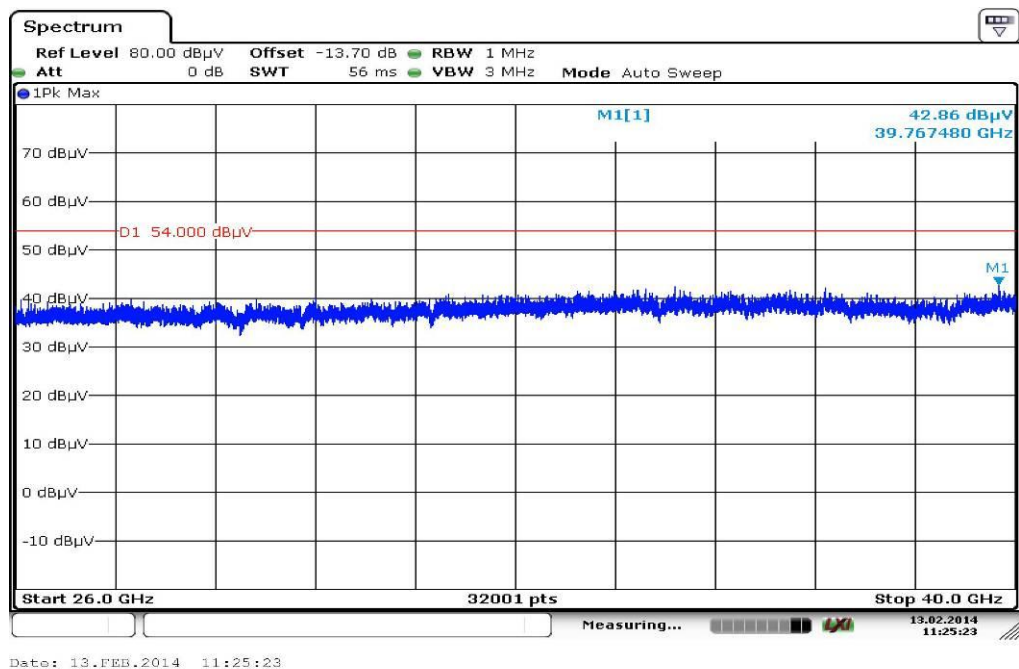
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
31.997550	14.4	1000.0	120.000	152.0	V	267.0	12.7	15.6	30.0	
41.273700	10.5	1000.0	120.000	161.0	V	182.0	13.4	19.5	30.0	
44.524050	10.0	1000.0	120.000	170.0	V	178.0	13.3	20.0	30.0	
691.354950	19.6	1000.0	120.000	161.0	V	190.0	22.3	16.4	36.0	
790.467600	20.9	1000.0	120.000	170.0	V	100.0	23.8	15.1	36.0	
956.198100	22.6	1000.0	120.000	111.0	V	10.0	25.4	13.4	36.0	

Plot 7: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 8:** Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 9: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 10:** Middle channel, 26 GHz to 40 GHz, vertical & horizontal polarization

Plot 11: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

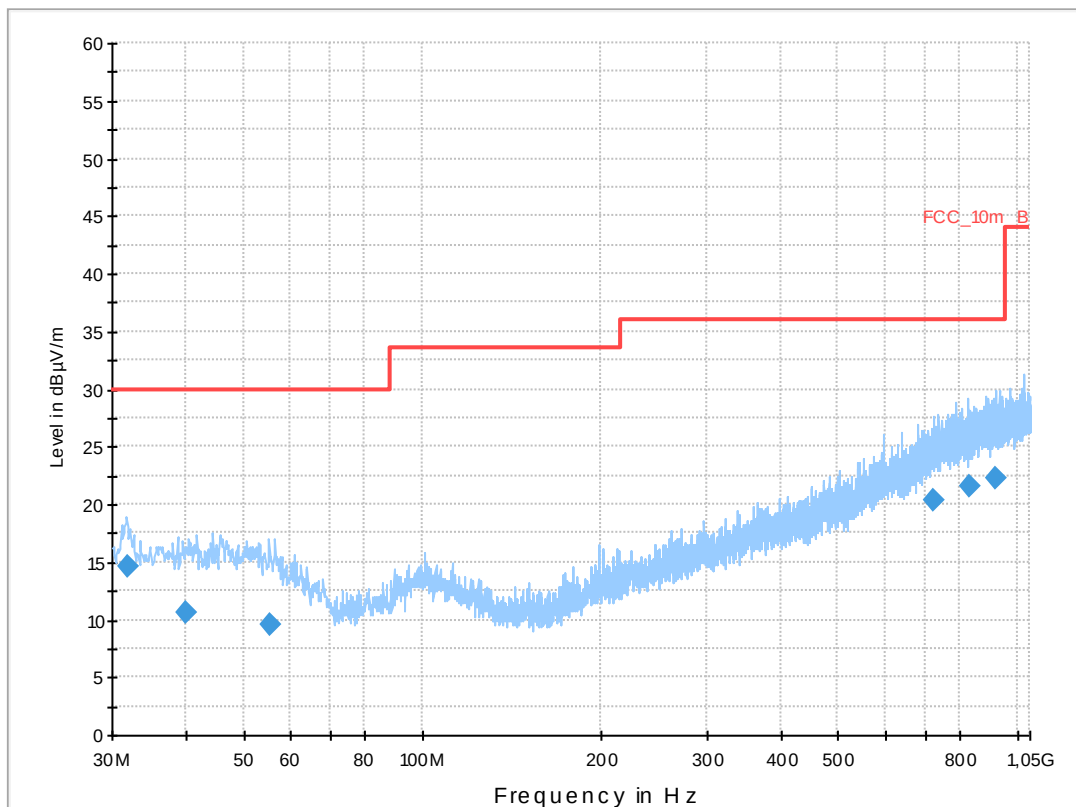
Common Information

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan a-mode tx ch 165
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

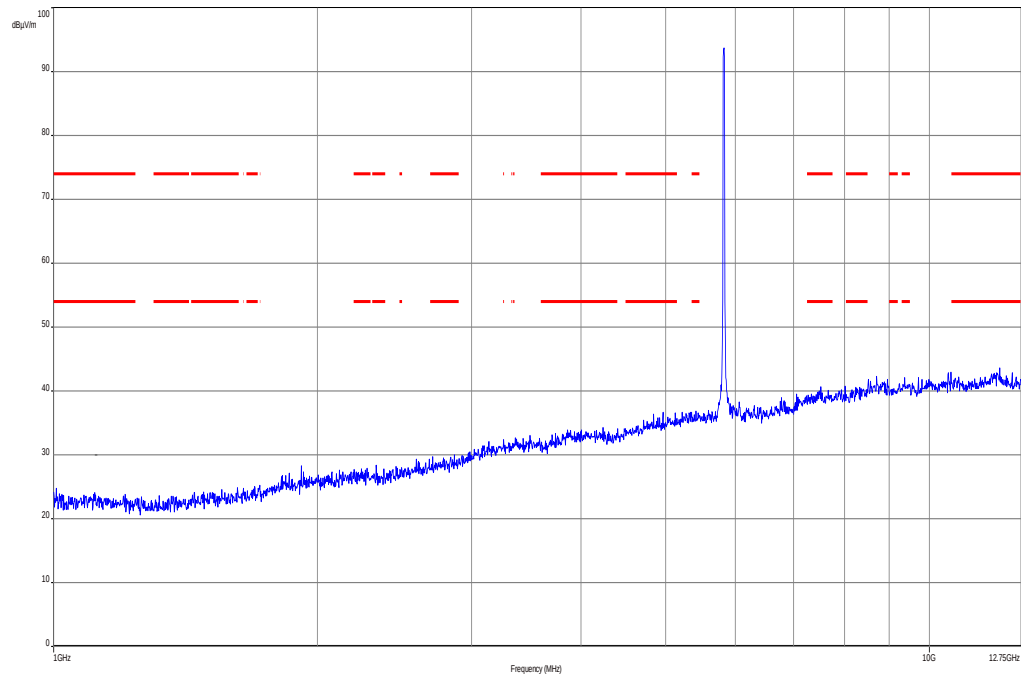
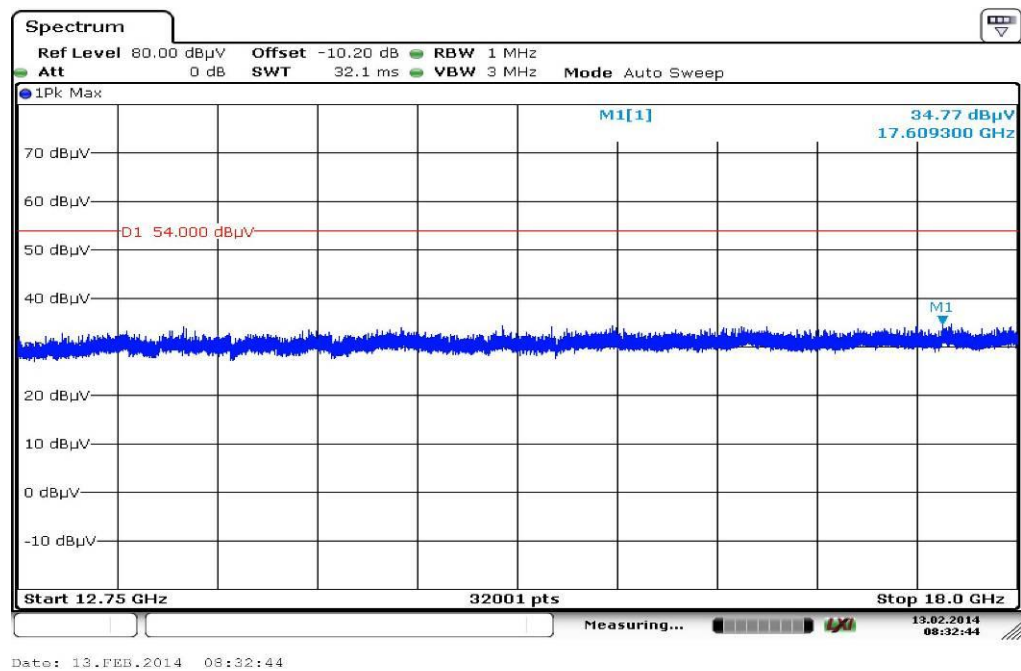
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m

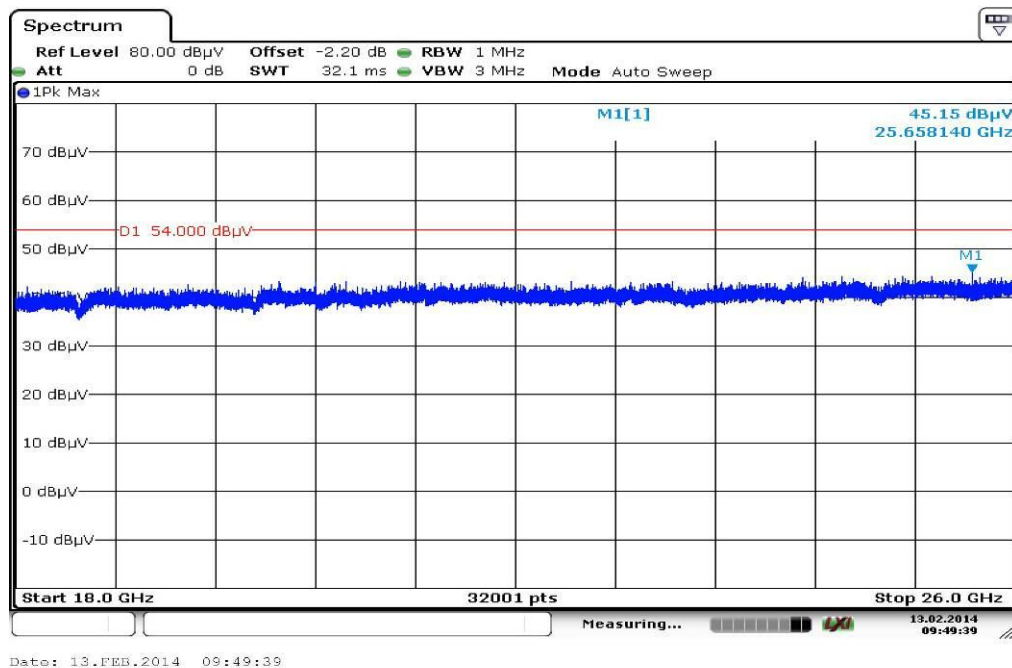
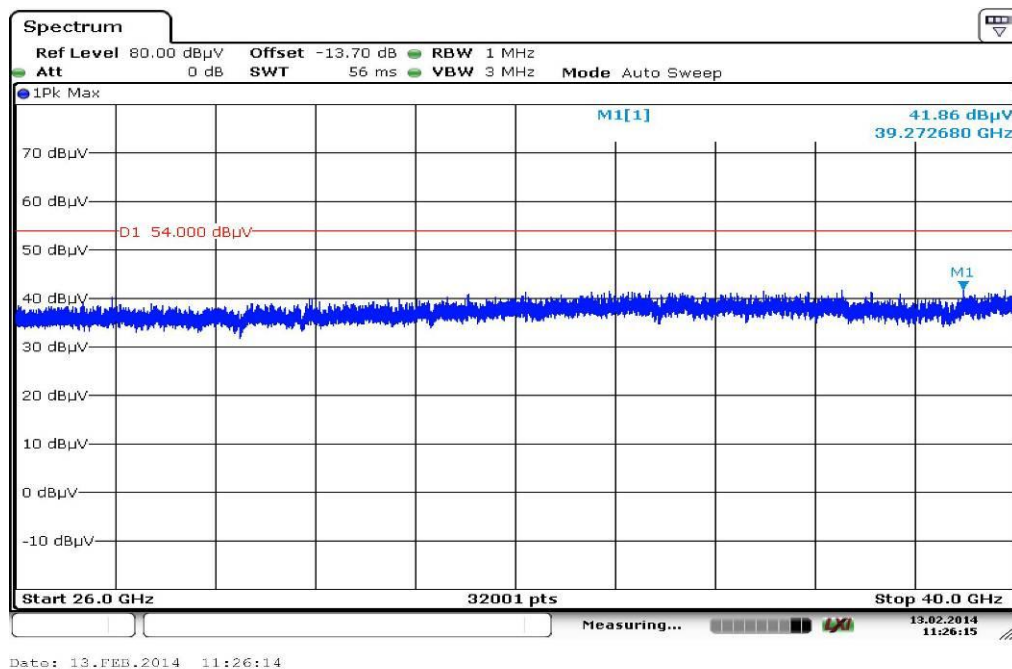
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
31.988100	14.5	1000.0	120.000	98.0	V	100.0	12.7	15.5	30.0	
40.028850	10.7	1000.0	120.000	170.0	V	80.0	13.4	19.3	30.0	
55.288050	9.5	1000.0	120.000	132.0	H	178.0	12.8	20.5	30.0	
723.633600	20.3	1000.0	120.000	170.0	V	-10.0	23.1	15.7	36.0	
830.805450	21.6	1000.0	120.000	170.0	V	100.0	24.3	14.4	36.0	
923.204700	22.3	1000.0	120.000	170.0	V	10.0	25.3	13.7	36.0	

Plot 12: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 13:** Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 14: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 15:** Highest channel, 26 GHz to 40 GHz, vertical & horizontal polarization

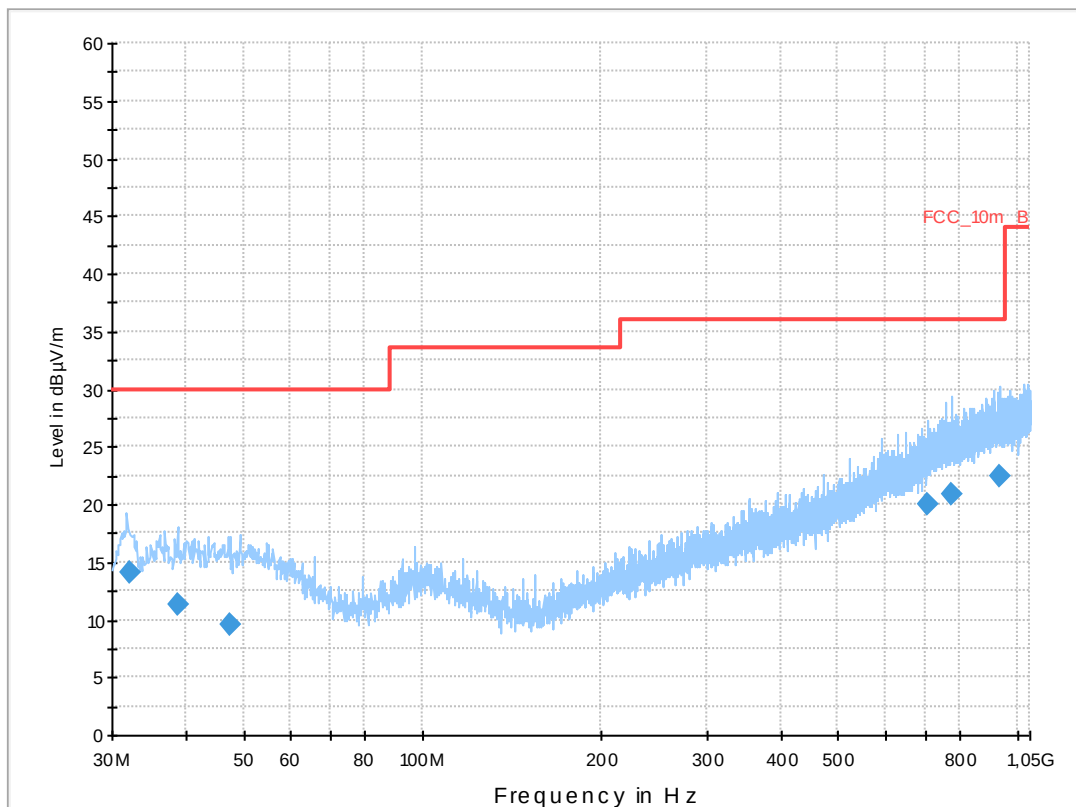
Plots: OFDM / n/ac HT20 – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan n-mode (HT20) tx ch 149
 Operator Name: Hennemann
 Comment: battery powered

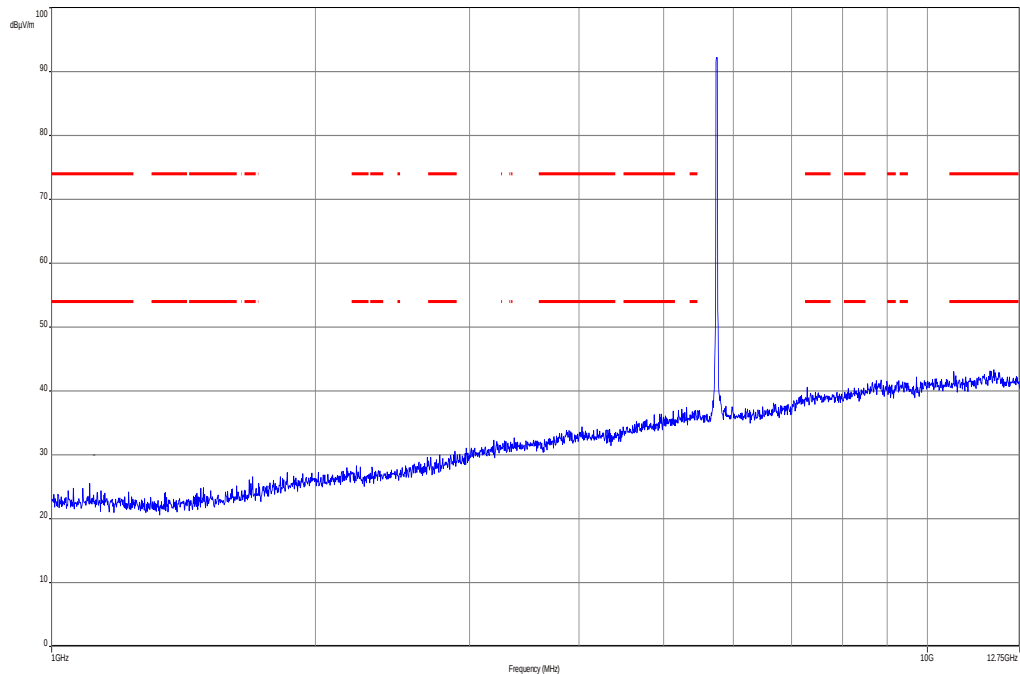
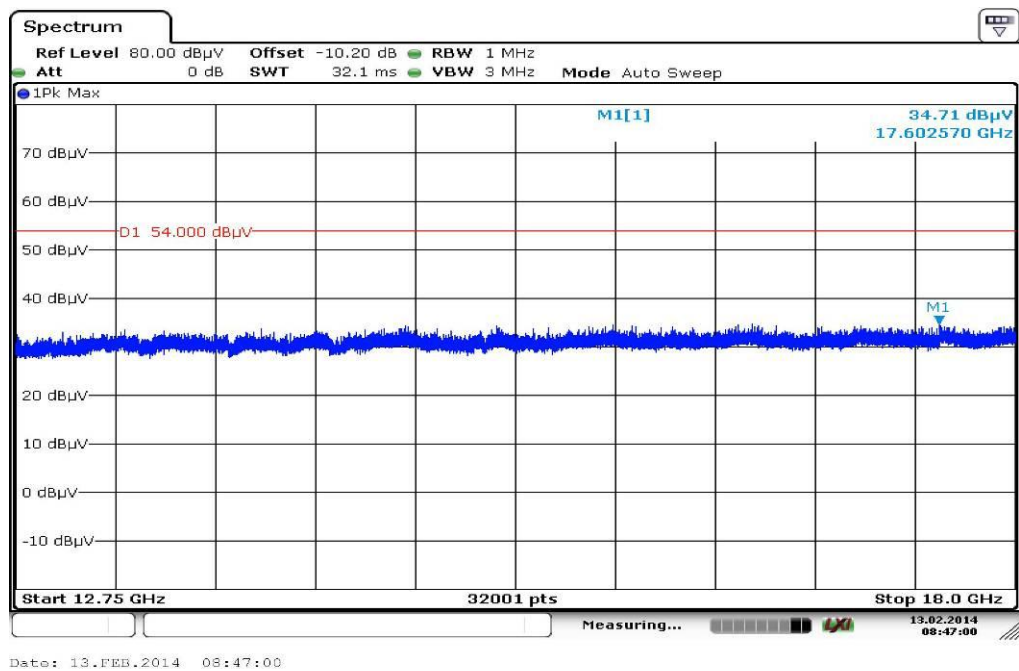
Scan Setup: STAN_Fin [EMI radiated]

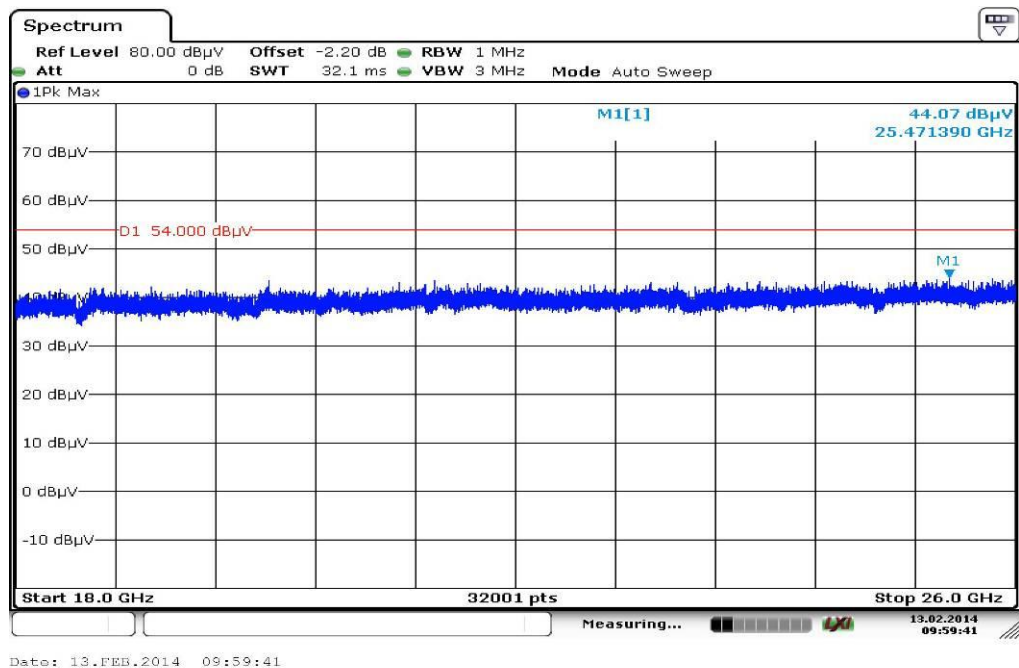
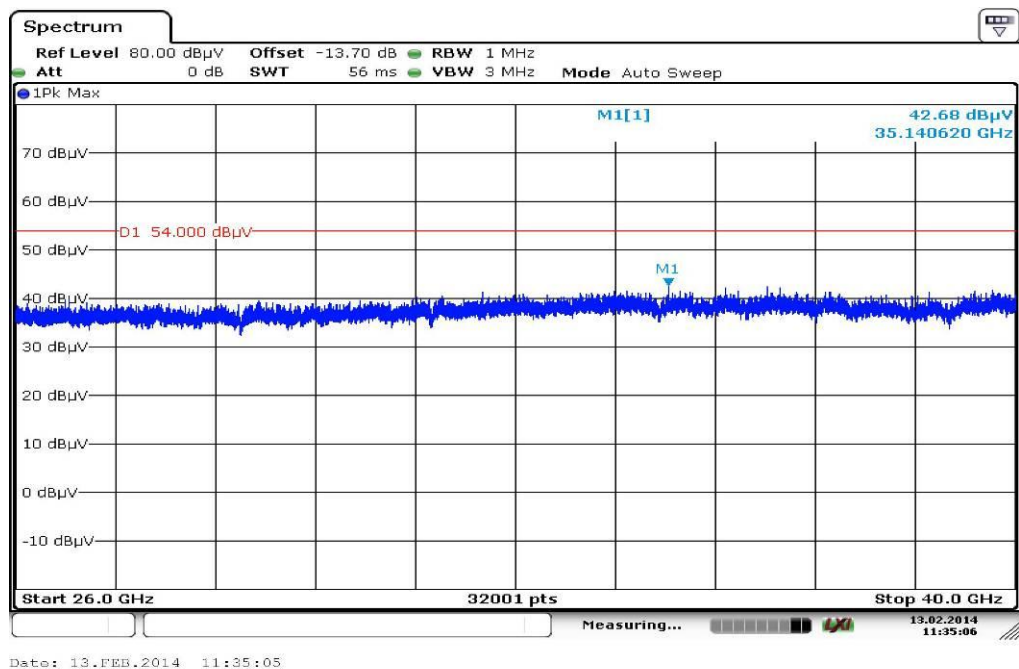
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
32.052750	14.0	1000.0	120.000	170.0	V	272.0	12.7	16.0	30.0	
38.662800	11.3	1000.0	120.000	170.0	V	-4.0	13.3	18.7	30.0	
47.492850	9.5	1000.0	120.000	170.0	V	171.0	13.3	20.5	30.0	
708.853500	20.1	1000.0	120.000	170.0	V	2.0	22.7	15.9	36.0	
774.327750	20.9	1000.0	120.000	170.0	H	190.0	23.7	15.1	36.0	
931.301100	22.5	1000.0	120.000	160.0	H	-5.0	25.3	13.5	36.0	

Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 3:** Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 5:** Lowest channel, 26 GHz to 40 GHz, vertical & horizontal polarization

Plot 6: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization

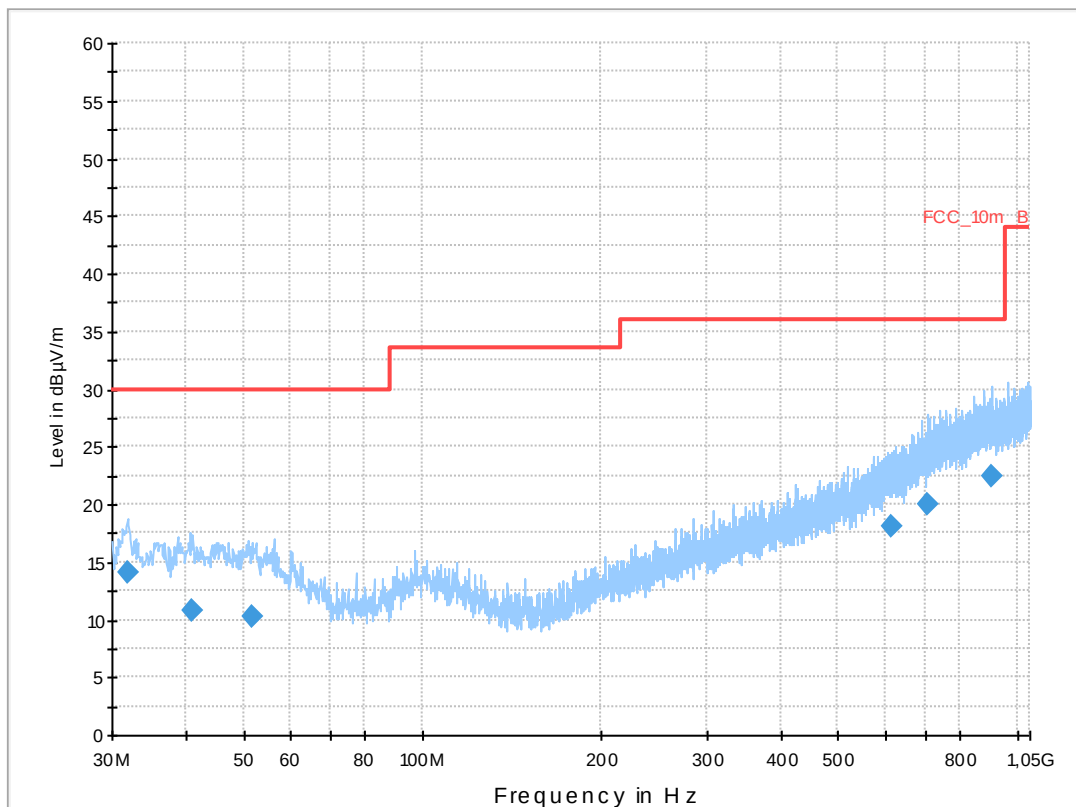
Common Information

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan n-mode (HT20) tx ch 157
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

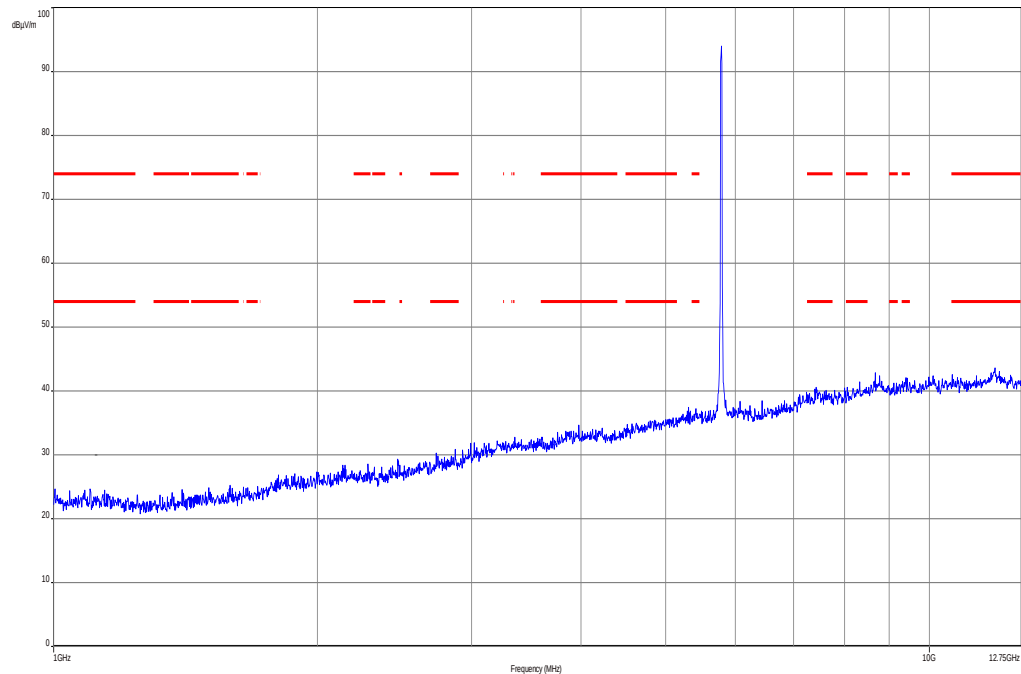
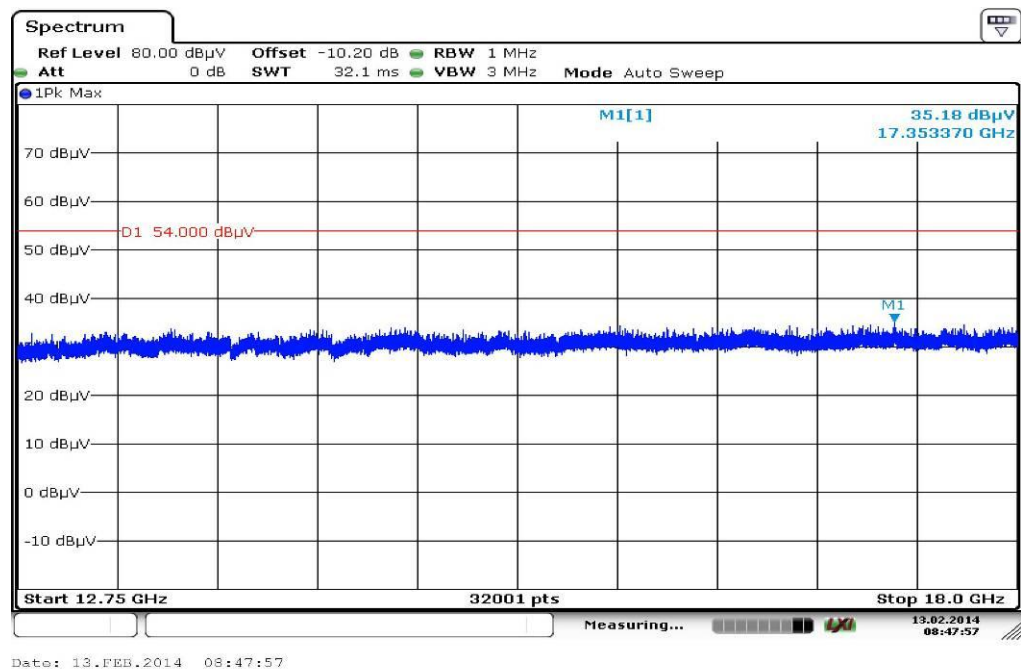
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

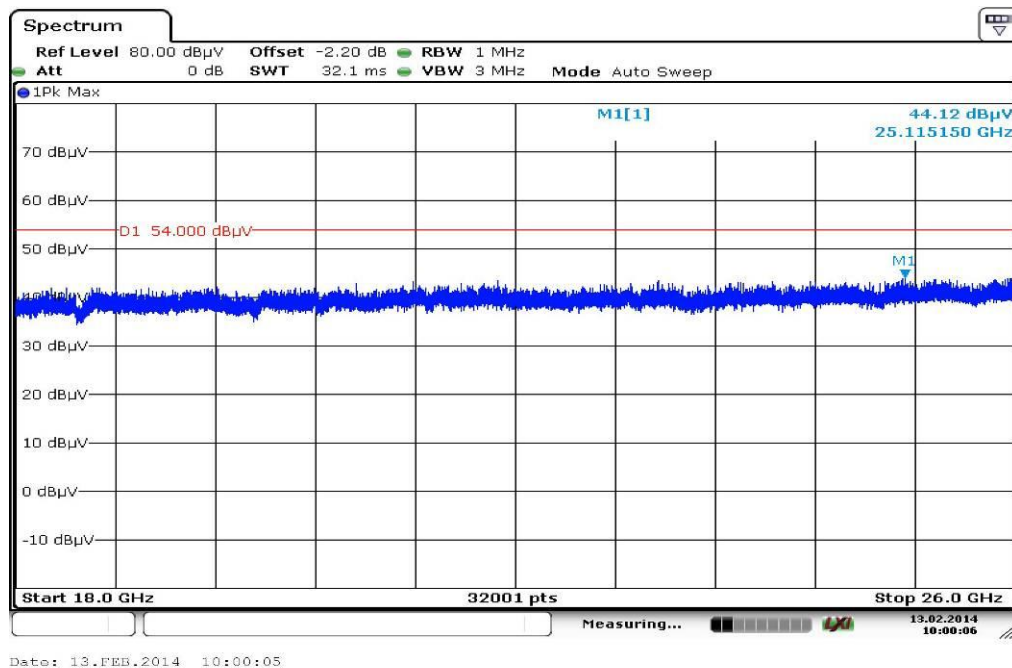
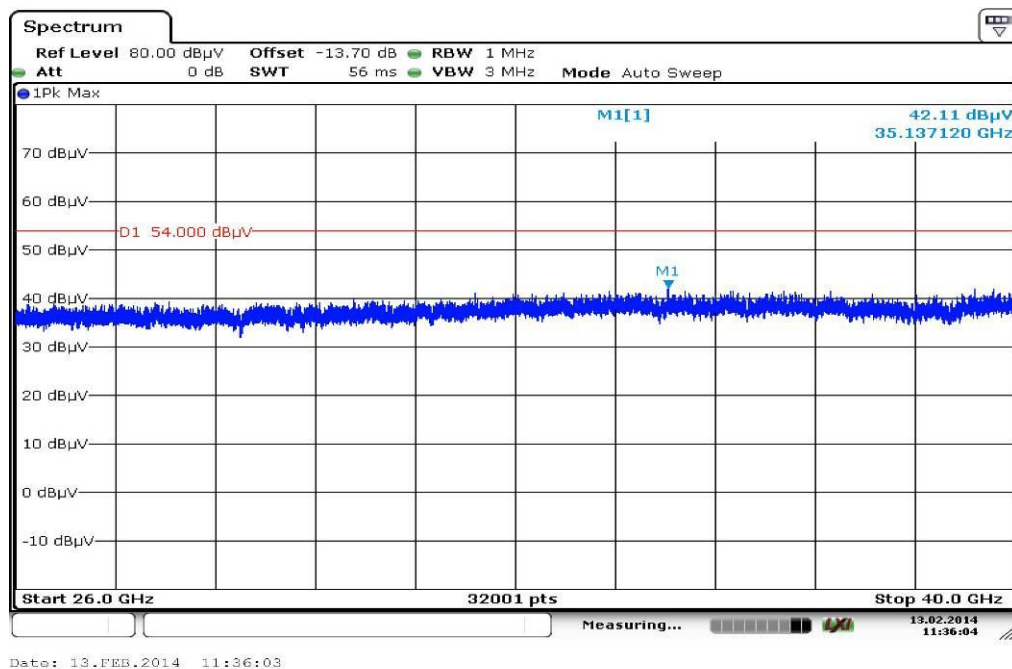
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
31.964550	14.2	1000.0	120.000	111.0	V	280.0	12.7	15.8	30.0	
40.888500	10.7	1000.0	120.000	104.0	V	272.0	13.4	19.3	30.0	
51.537450	10.2	1000.0	120.000	152.0	H	0.0	13.2	19.8	30.0	
615.876150	18.1	1000.0	120.000	170.0	V	100.0	20.9	17.9	36.0	
706.656900	20.0	1000.0	120.000	170.0	V	280.0	22.7	16.0	36.0	
902.993100	22.4	1000.0	120.000	160.0	H	100.0	25.2	13.6	36.0	

Plot 7: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 8:** Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 9: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 10:** Middle channel, 26 GHz to 40 GHz, vertical & horizontal polarization

Plot 11: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

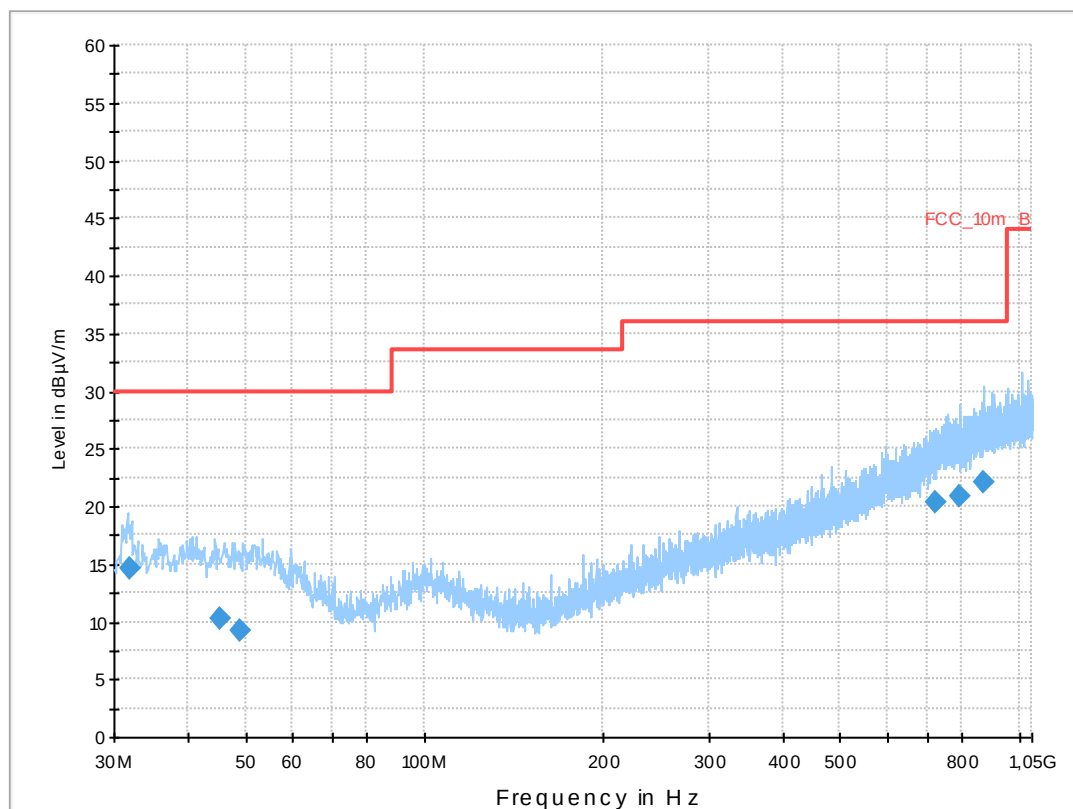
Common Information

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan n-mode (HT20) tx ch 165
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

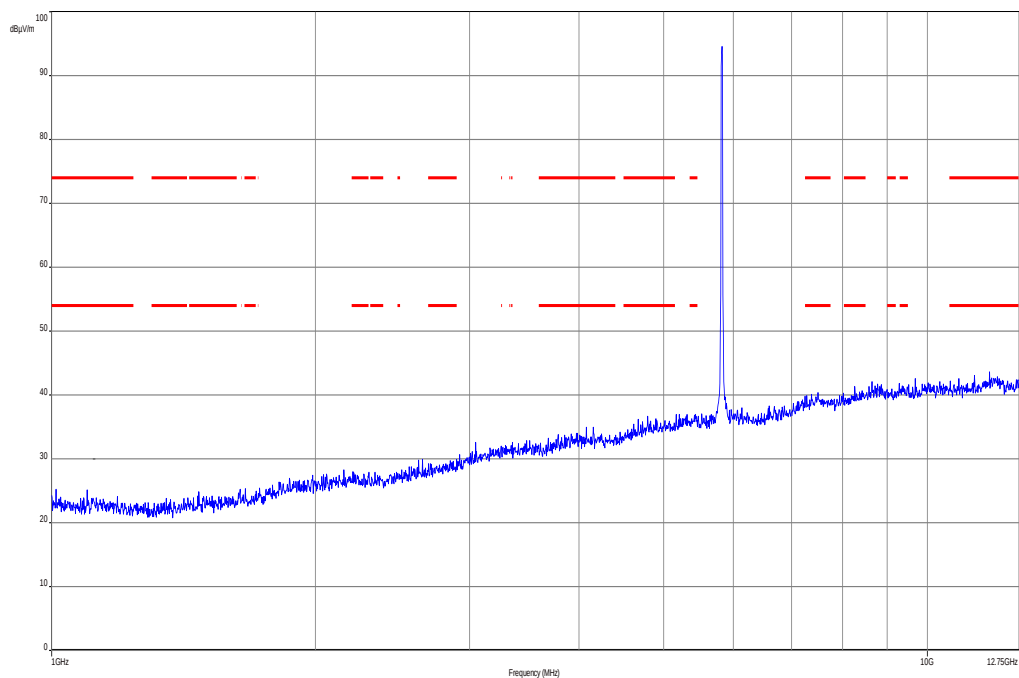
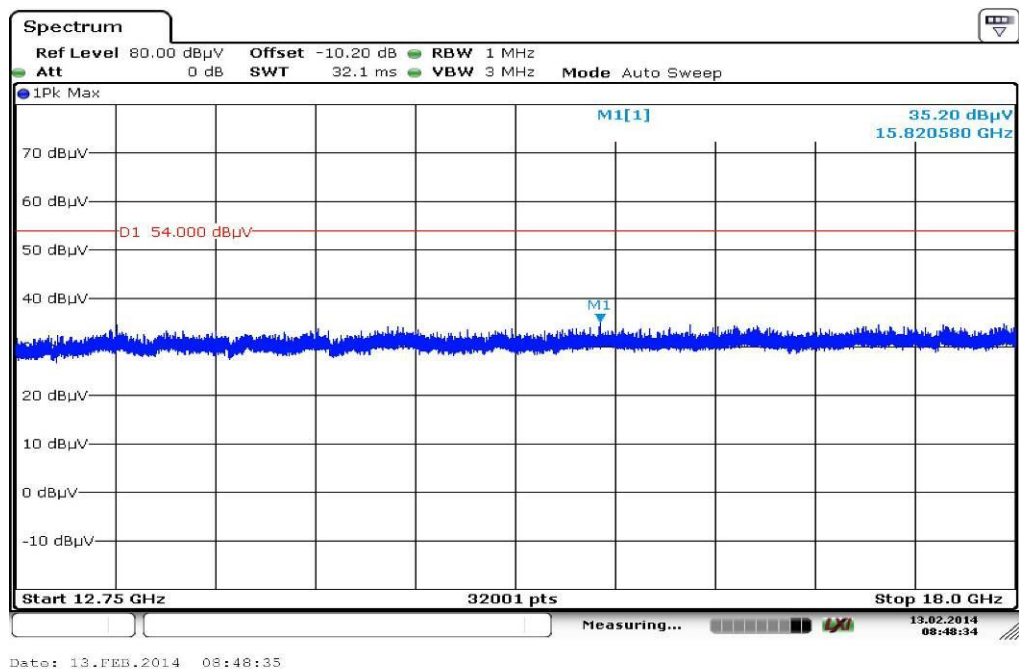
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

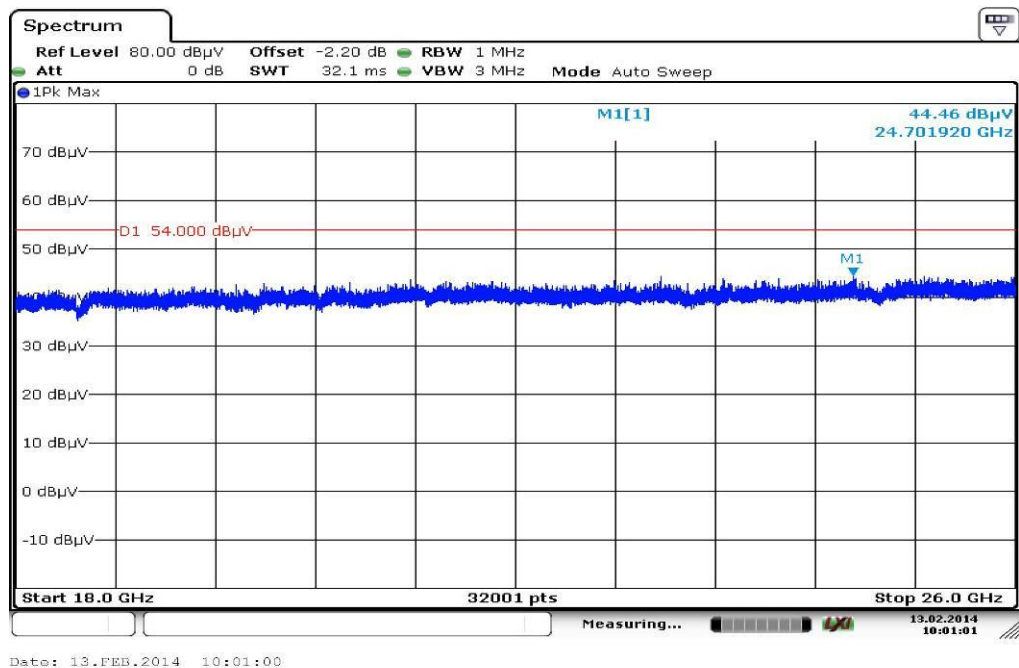
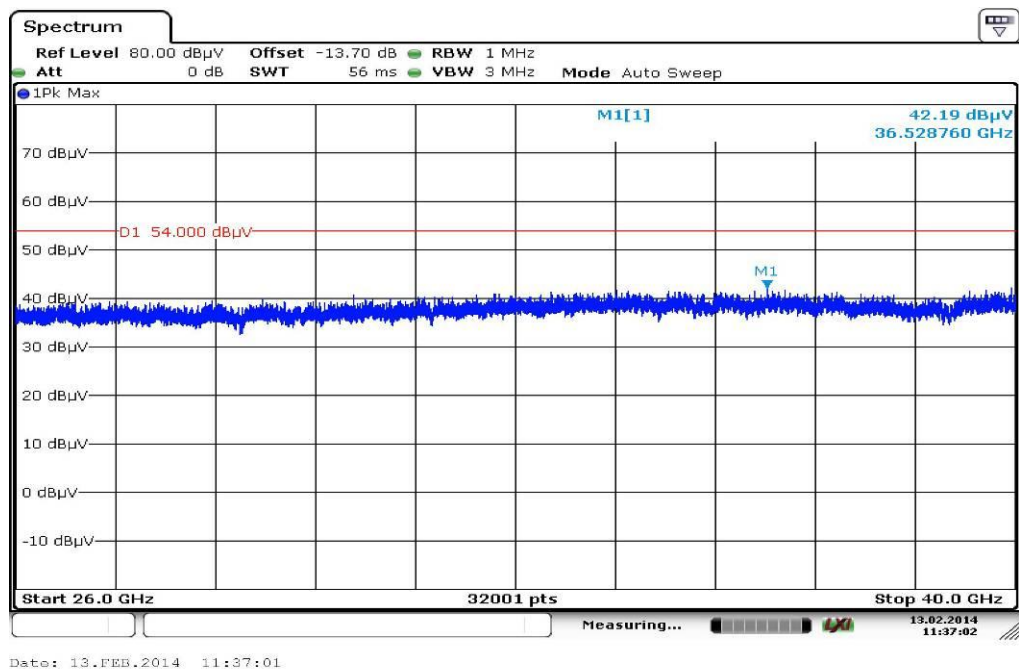
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
31.950600	14.6	1000.0	120.000	98.0	V	265.0	12.7	15.4	30.0	
45.350400	10.3	1000.0	120.000	144.0	H	270.0	13.3	19.7	30.0	
48.774000	9.3	1000.0	120.000	162.0	V	2.0	13.3	20.7	30.0	
723.399900	20.3	1000.0	120.000	119.0	H	272.0	23.0	15.7	36.0	
793.831800	20.9	1000.0	120.000	170.0	V	85.0	23.8	15.1	36.0	
869.707350	22.2	1000.0	120.000	120.0	V	180.0	24.8	13.8	36.0	

Plot 12: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 13:** Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 14: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 15:** Highest channel, 26 GHz to 40 GHz, vertical & horizontal polarization

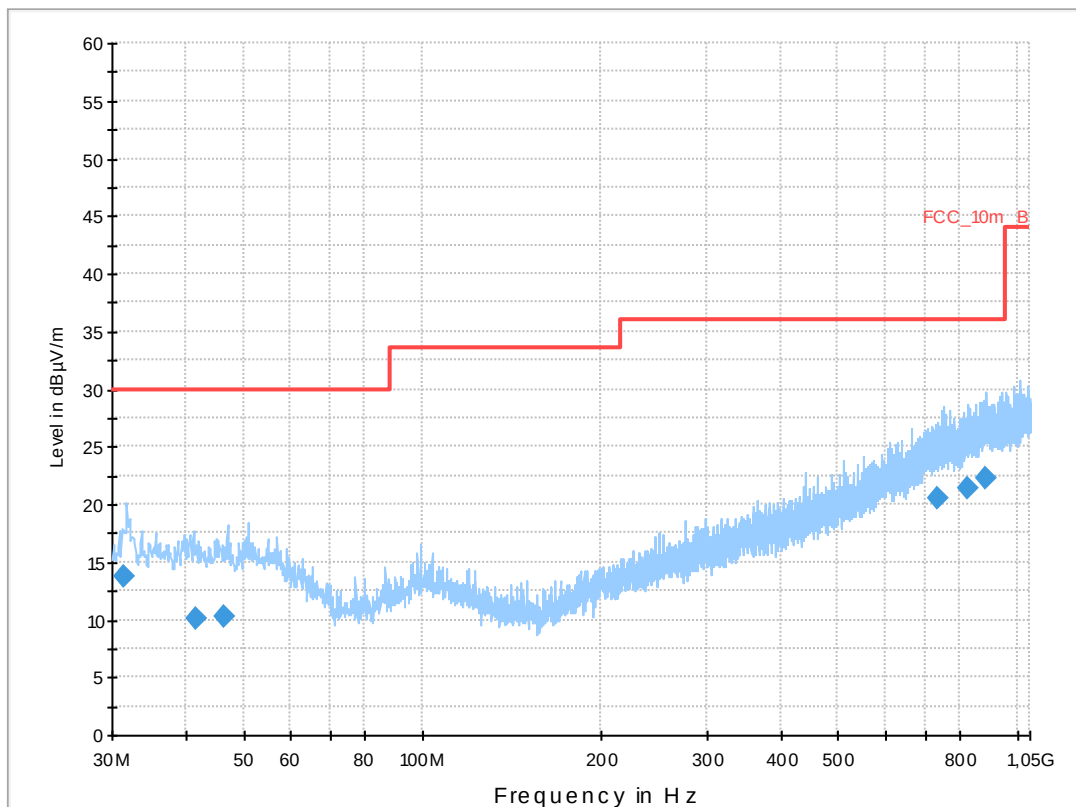
Plots: OFDM / n/ac HT40 – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan n-mode (HT40) tx ch 151
 Operator Name: Hennemann
 Comment: battery powered

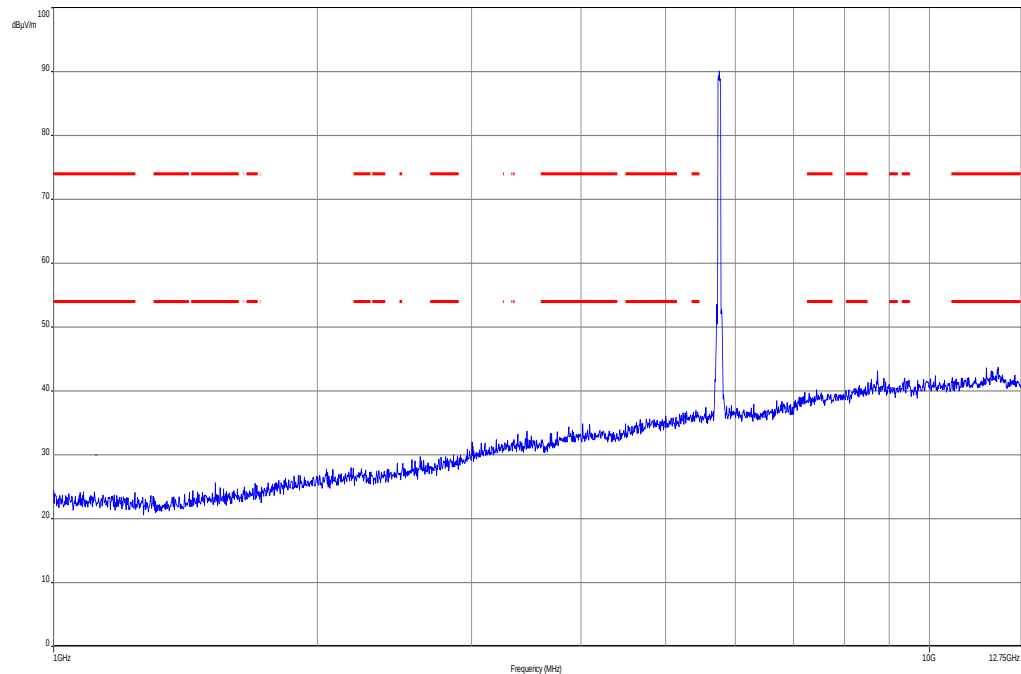
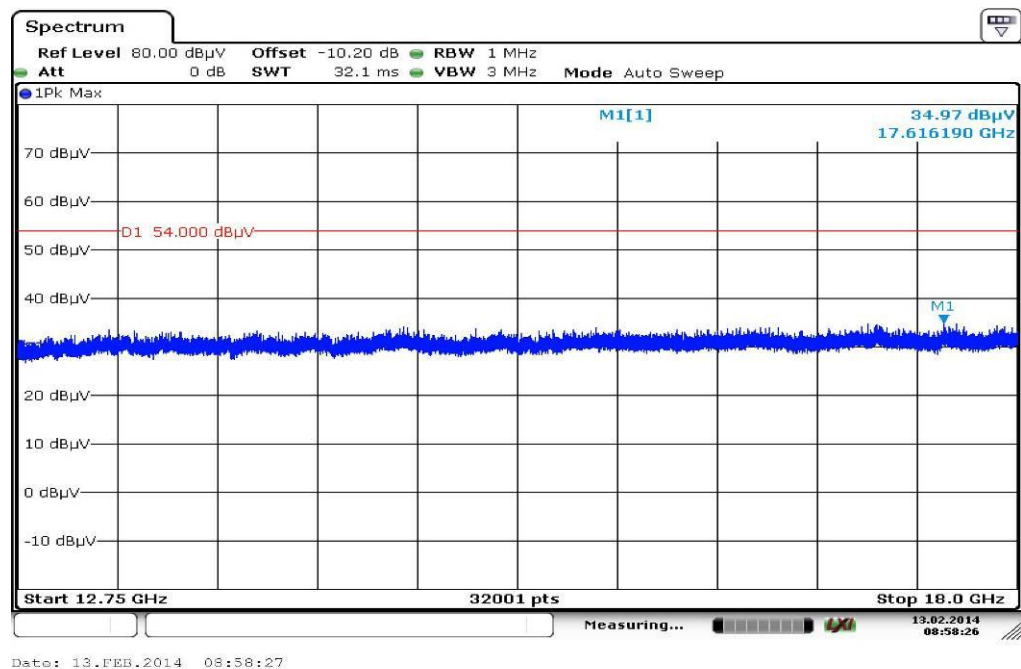
Scan Setup: STAN_Fin [EMI radiated]

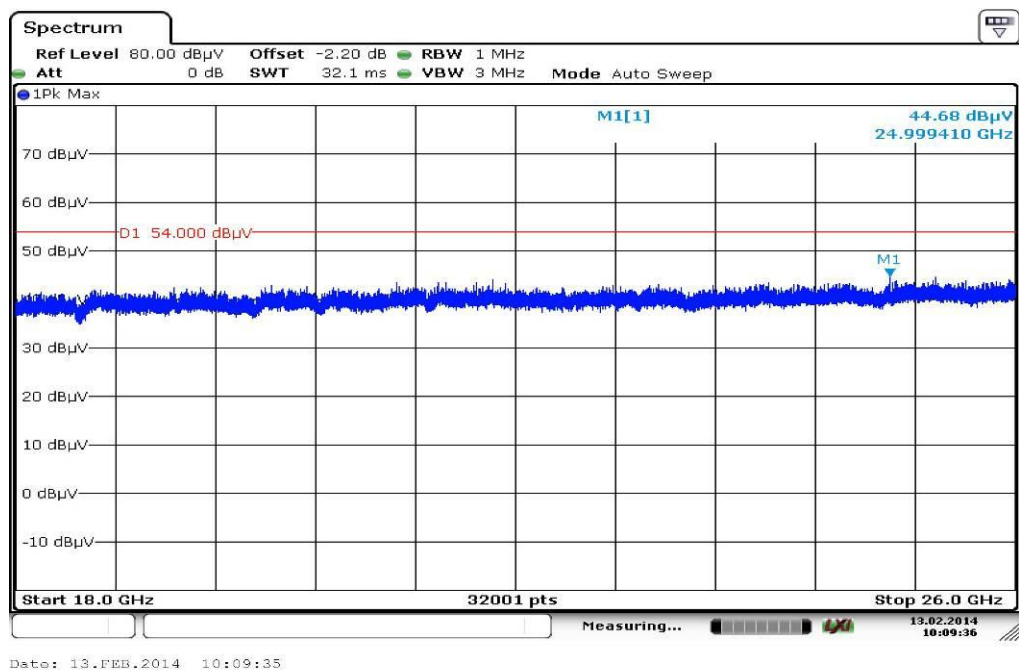
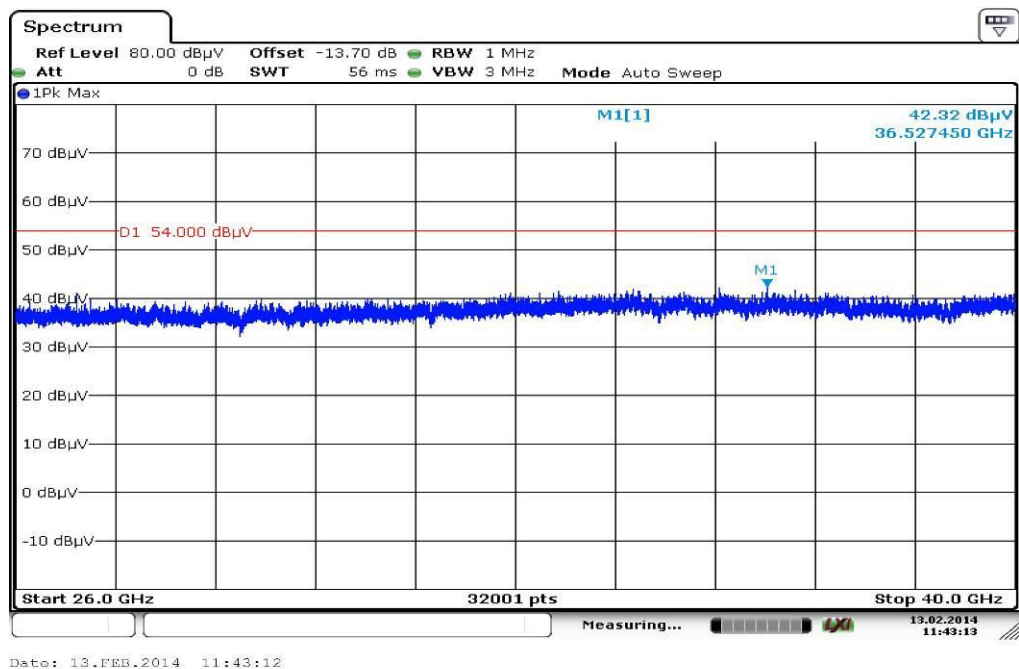
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
31.491750	13.7	1000.0	120.000	98.0	V	-2.0	12.7	16.3	30.0	
41.454150	10.2	1000.0	120.000	113.0	H	100.0	13.4	19.8	30.0	
46.478850	10.2	1000.0	120.000	170.0	V	-5.0	13.3	19.8	30.0	
732.360300	20.5	1000.0	120.000	98.0	V	175.0	23.3	15.5	36.0	
823.907250	21.3	1000.0	120.000	111.0	H	10.0	24.2	14.7	36.0	
885.184500	22.3	1000.0	120.000	98.0	V	10.0	25.0	13.7	36.0	

Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 3:** Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 5:** Lowest channel, 26 GHz to 40 GHz, vertical & horizontal polarization

Plot 6: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

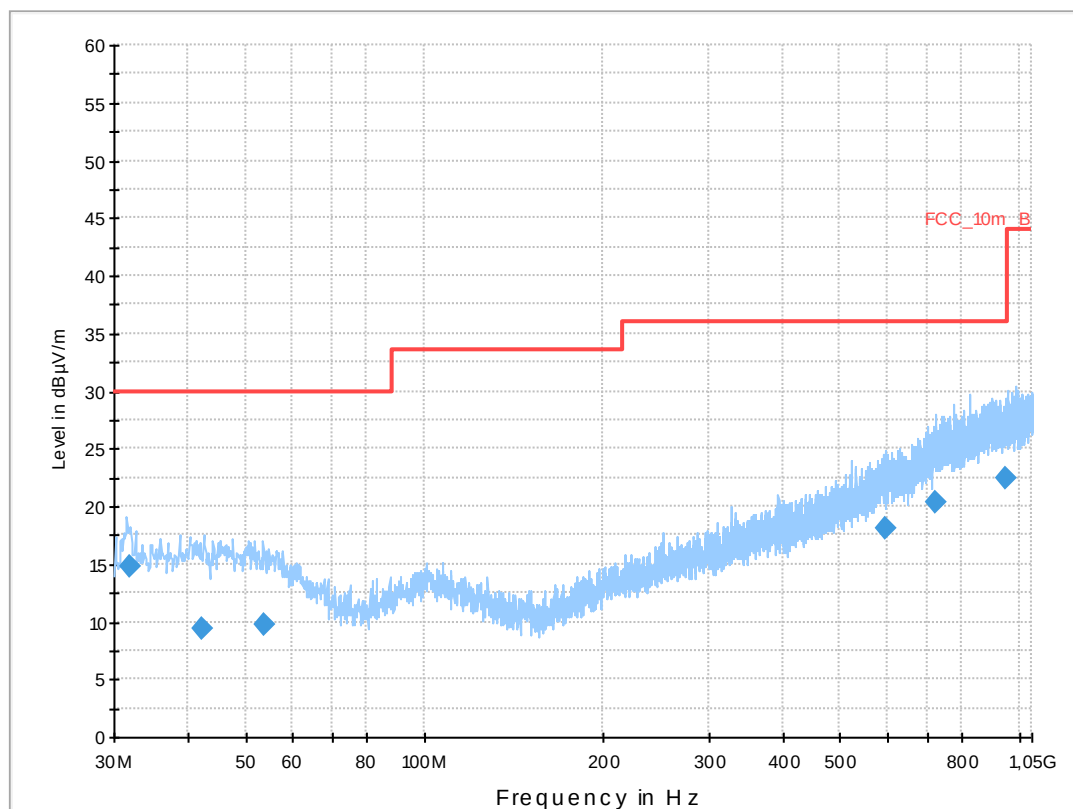
Common Information

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan n-mode (HT40) tx ch 159
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

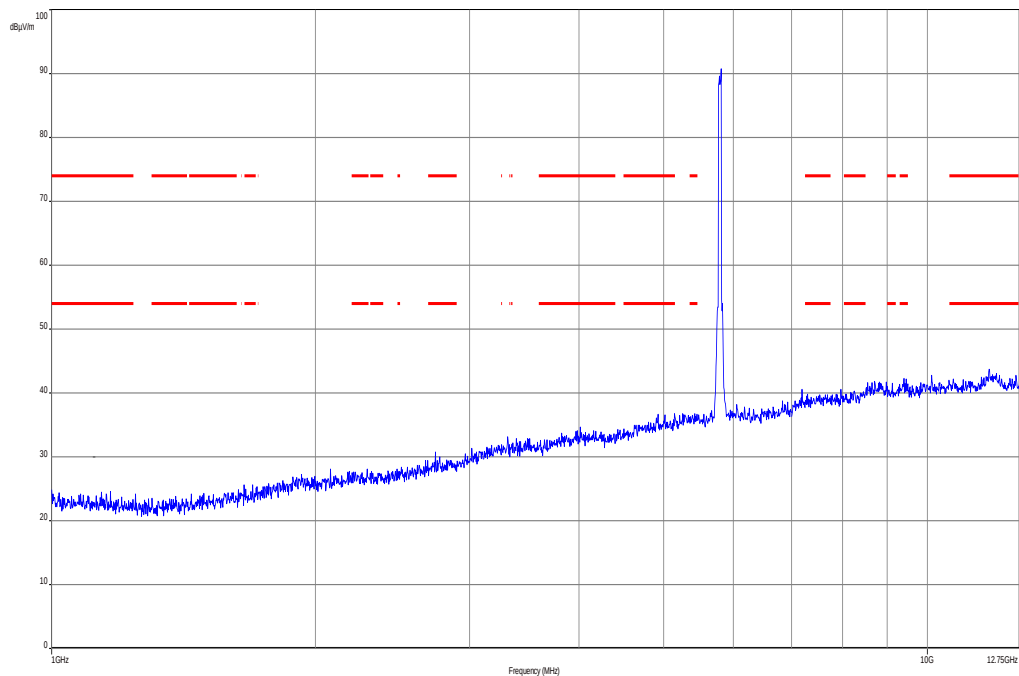
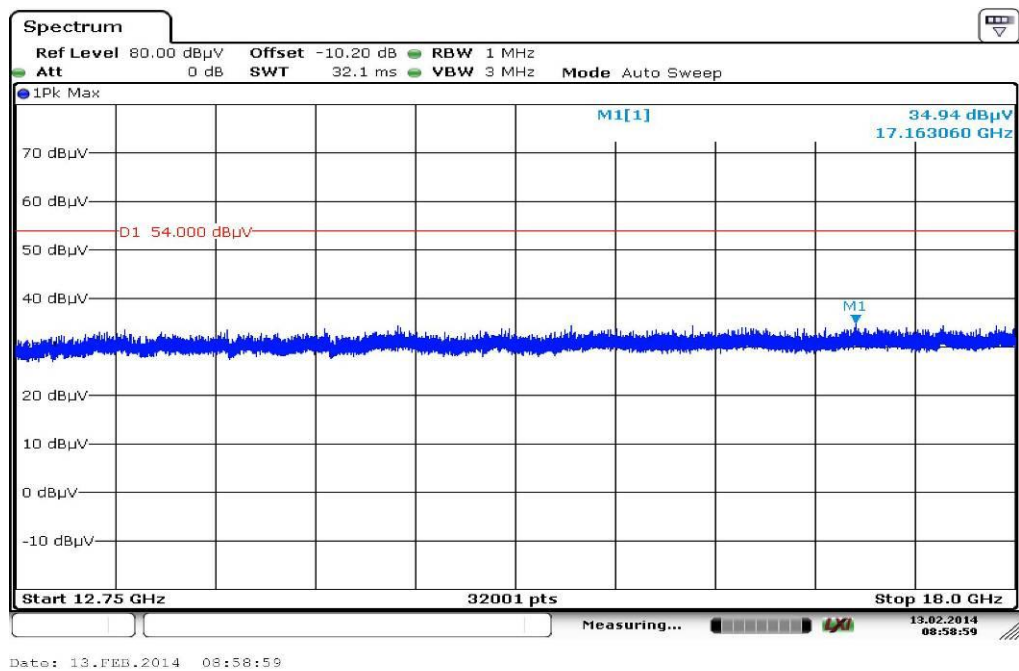
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

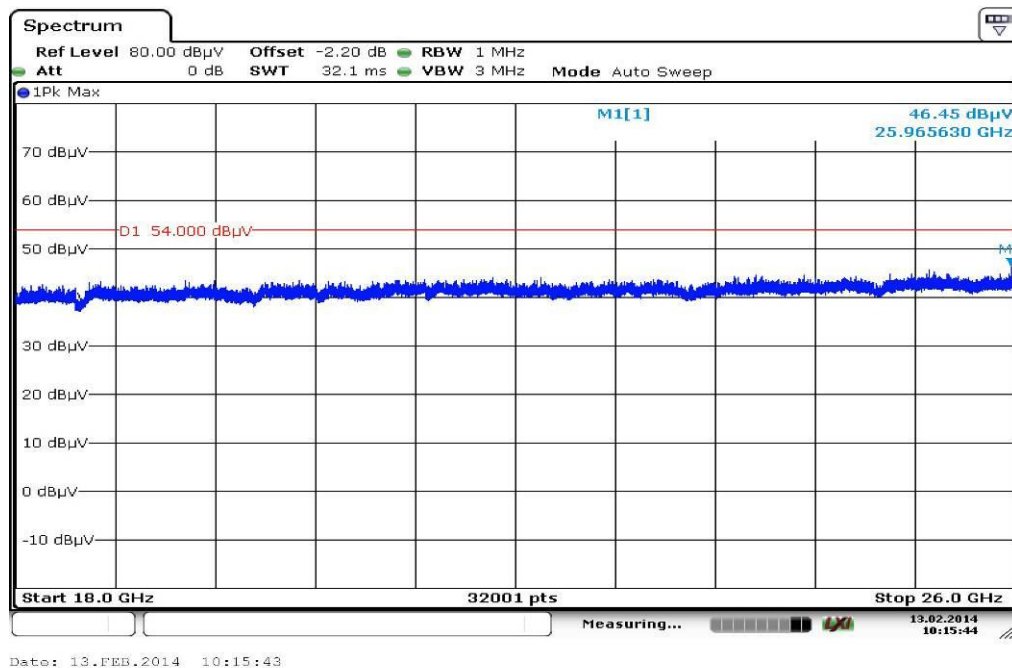
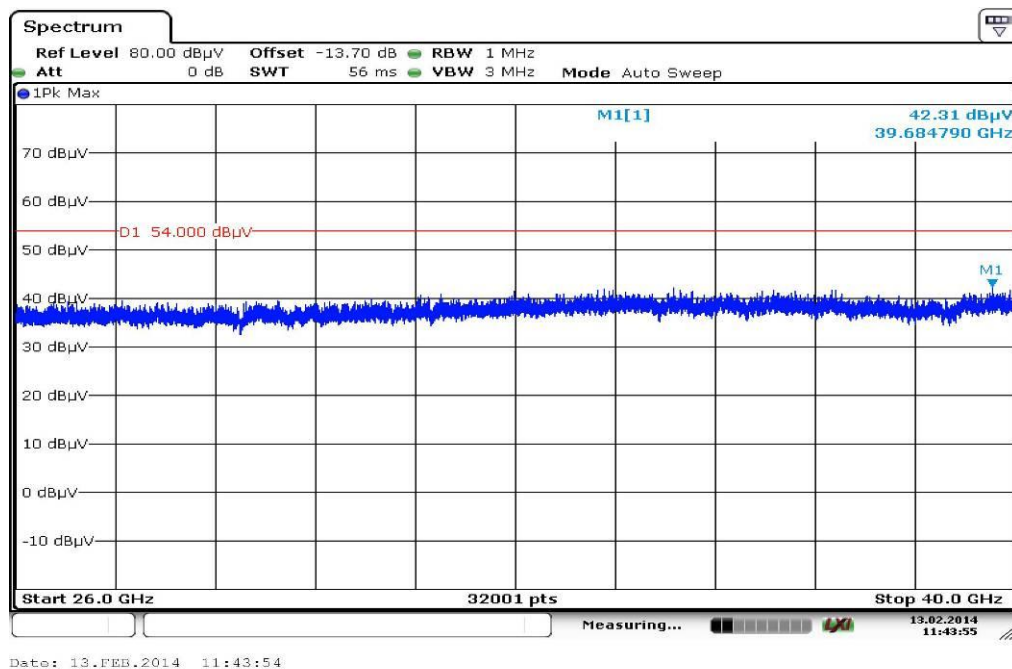
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
32.040150	14.7	1000.0	120.000	160.0	V	177.0	12.7	15.3	30.0	
42.294900	9.4	1000.0	120.000	170.0	H	80.0	13.4	20.6	30.0	
53.868450	9.8	1000.0	120.000	98.0	V	182.0	13.0	20.2	30.0	
596.084400	18.1	1000.0	120.000	98.0	V	90.0	20.7	17.9	36.0	
721.524900	20.3	1000.0	120.000	105.0	H	-9.0	23.0	15.7	36.0	
952.753200	22.5	1000.0	120.000	153.0	V	175.0	25.4	13.5	36.0	

Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 8:** Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 9: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 10:** Highest channel, 26 GHz to 40 GHz, vertical & horizontal polarization

Plots: OFDM / ac HT80 – mode

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization

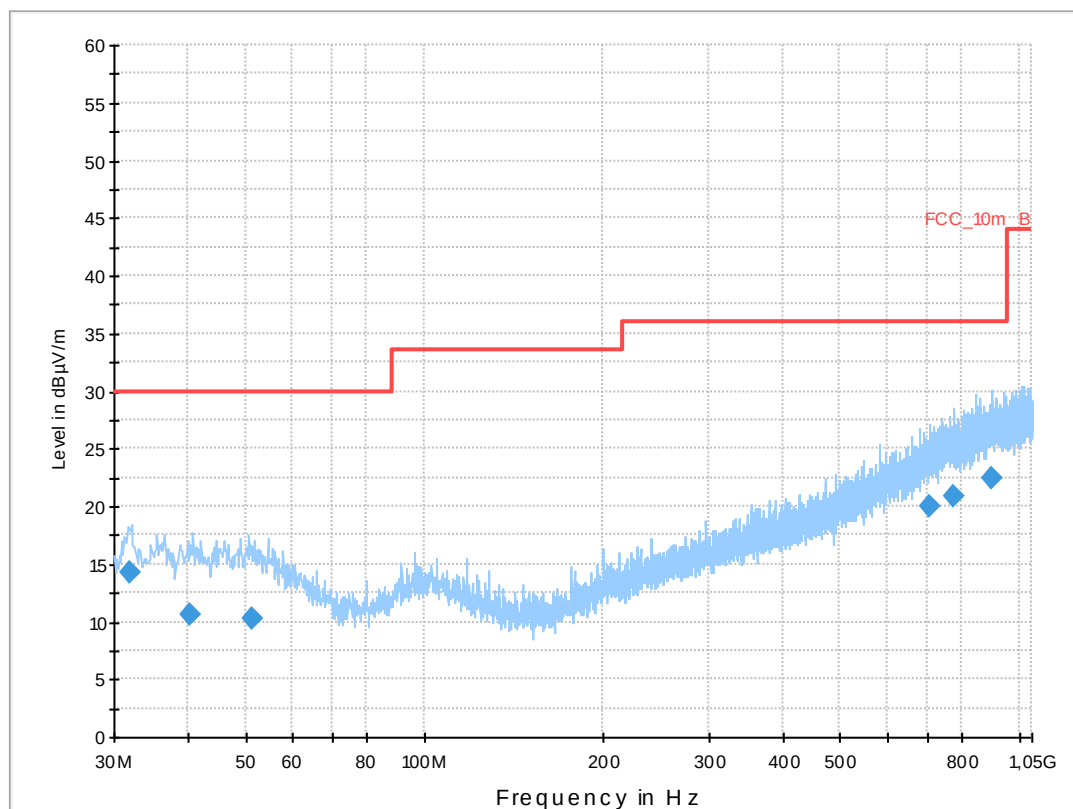
Common Information

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan ac-mode (HT80) tx ch 155
 Operator Name: Hennemann
 Comment: battery powered

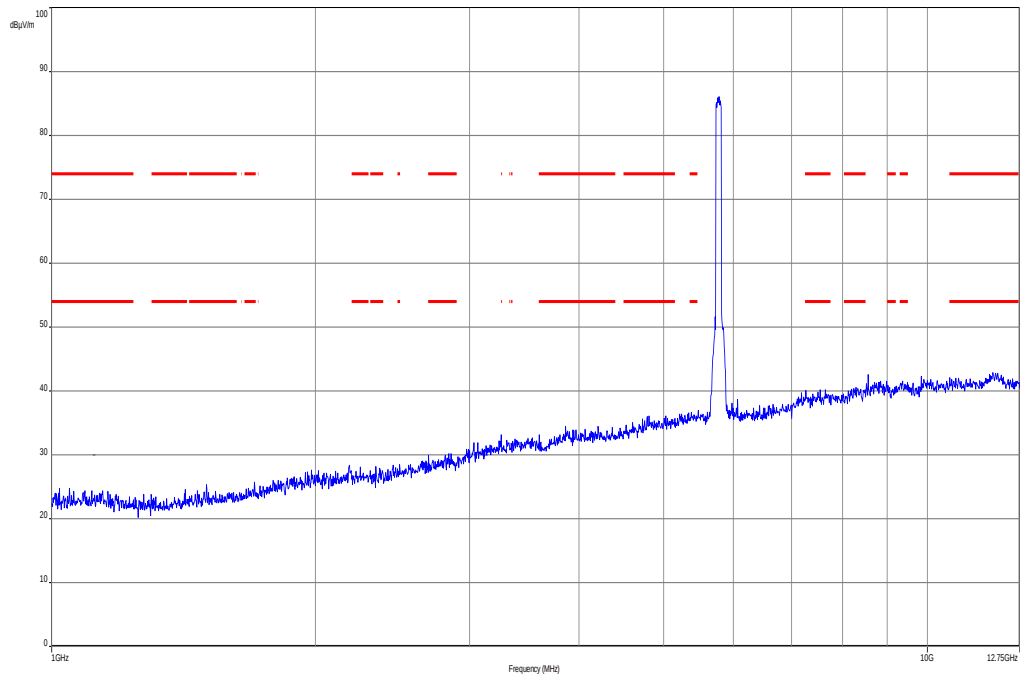
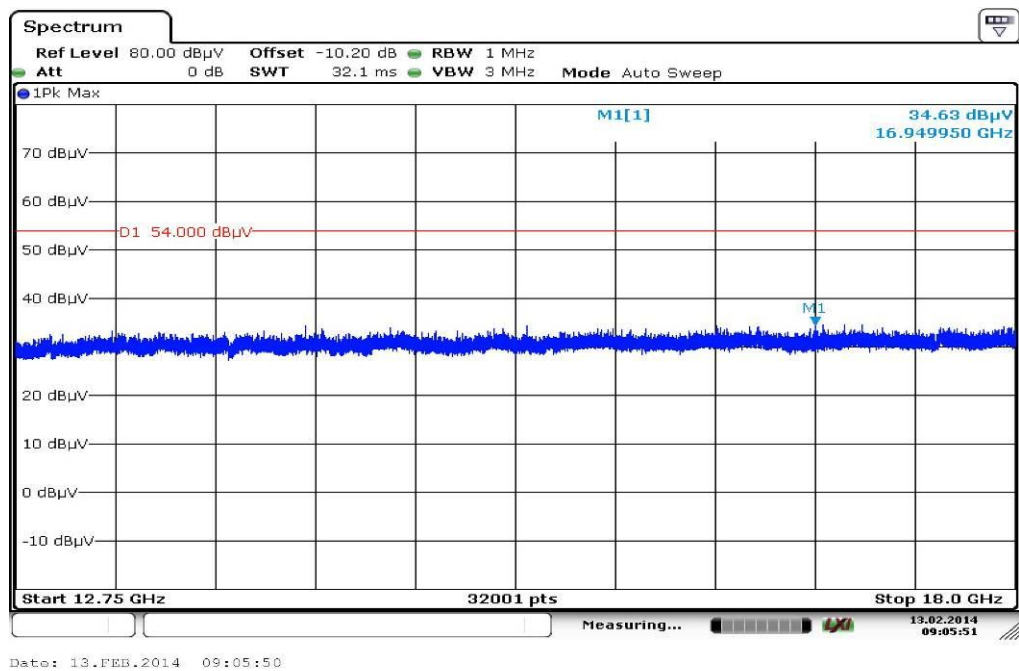
Scan Setup: STAN_Fin [EMI radiated]

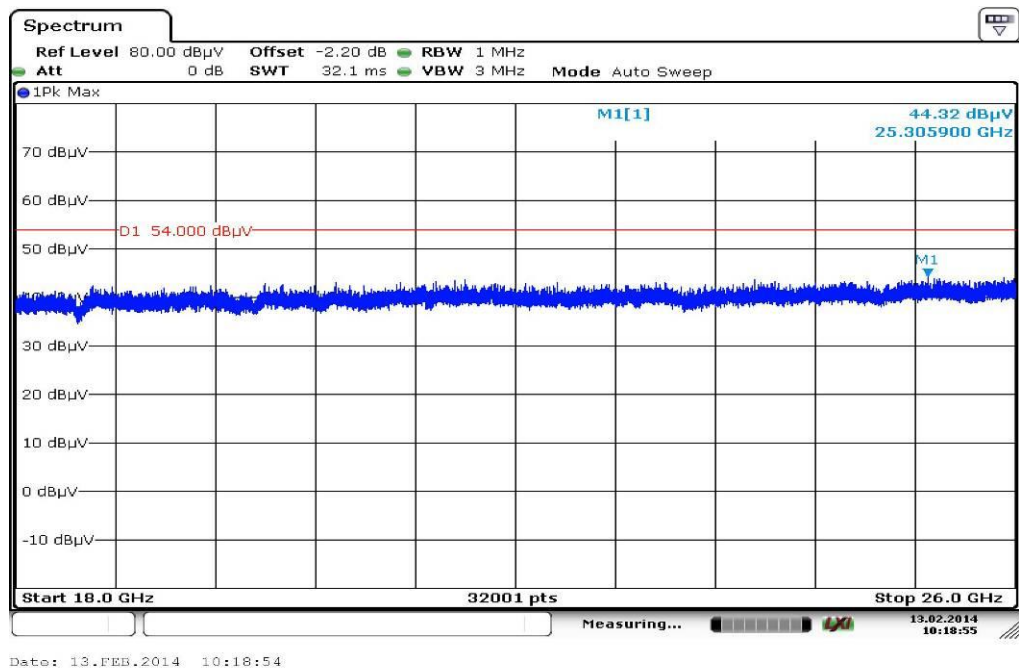
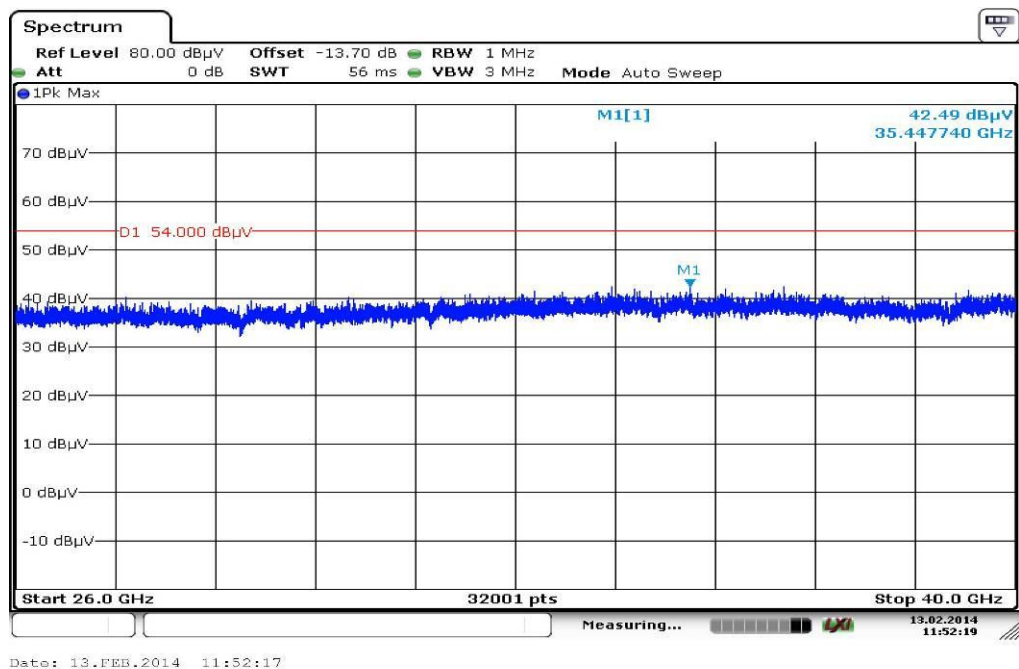
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
32.022600	14.2	1000.0	120.000	170.0	V	270.0	12.7	15.8	30.0	
40.184850	10.5	1000.0	120.000	143.0	H	175.0	13.4	19.5	30.0	
51.186000	10.3	1000.0	120.000	98.0	H	260.0	13.3	19.7	30.0	
709.311600	20.1	1000.0	120.000	170.0	V	176.0	22.7	15.9	36.0	
774.950700	20.9	1000.0	120.000	170.0	H	100.0	23.7	15.1	36.0	
897.714300	22.4	1000.0	120.000	170.0	V	0.0	25.2	13.6	36.0	

Plot 2: 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 3:** 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 4: 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 5:** 26 GHz to 40 GHz, vertical & horizontal polarization

10.2 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode. The results are valid for both modes.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 40 GHz
Trace-Mode:	Max Hold

Limits:

FCC		
RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

RX Spurious Emissions Radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
Above 1 GHz: All detected peak emissions are below the average limit! See plots!		
Measurement uncertainty	± 3 dB	

Result: Passed

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

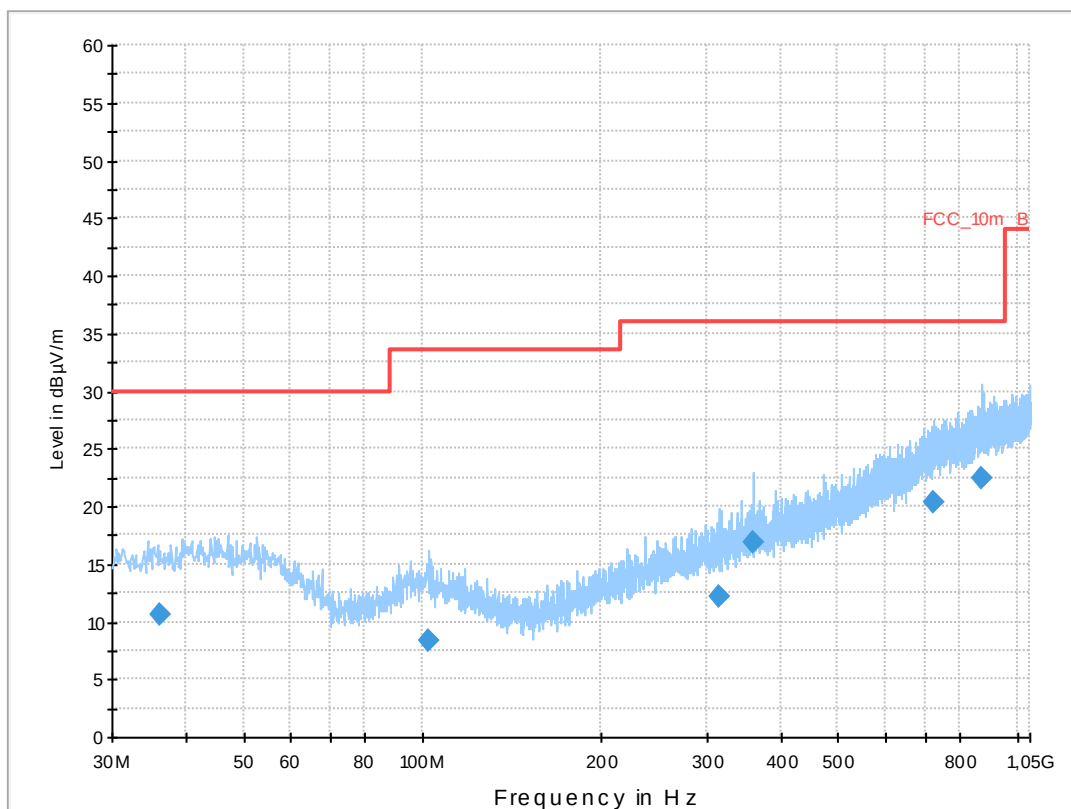
Plots: RX / Idle – mode**Plot 1:** 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

Serial Number: CB5A1X9G4T
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: w-lan idle
 Operator Name: Wolsdorfer
 Comment: battery powered

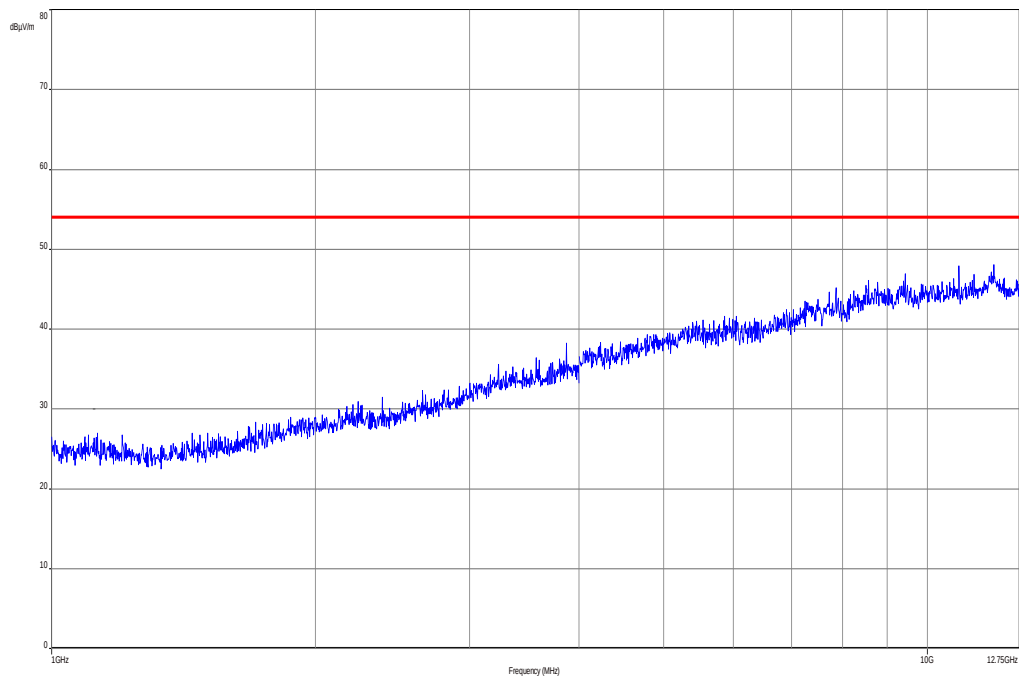
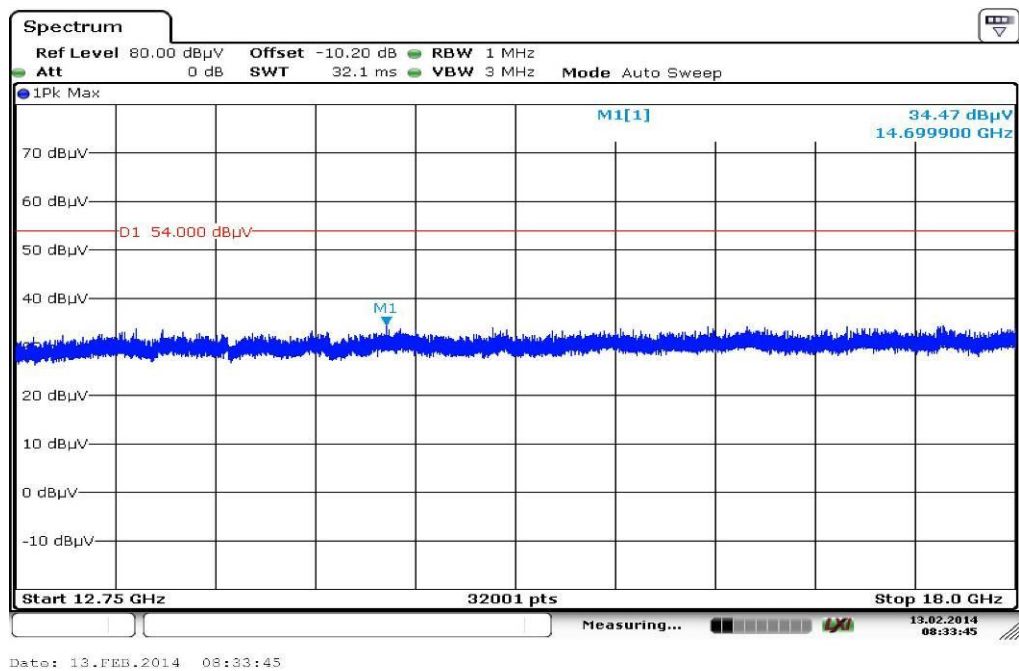
Scan Setup: STAN_Fin [EMI radiated]

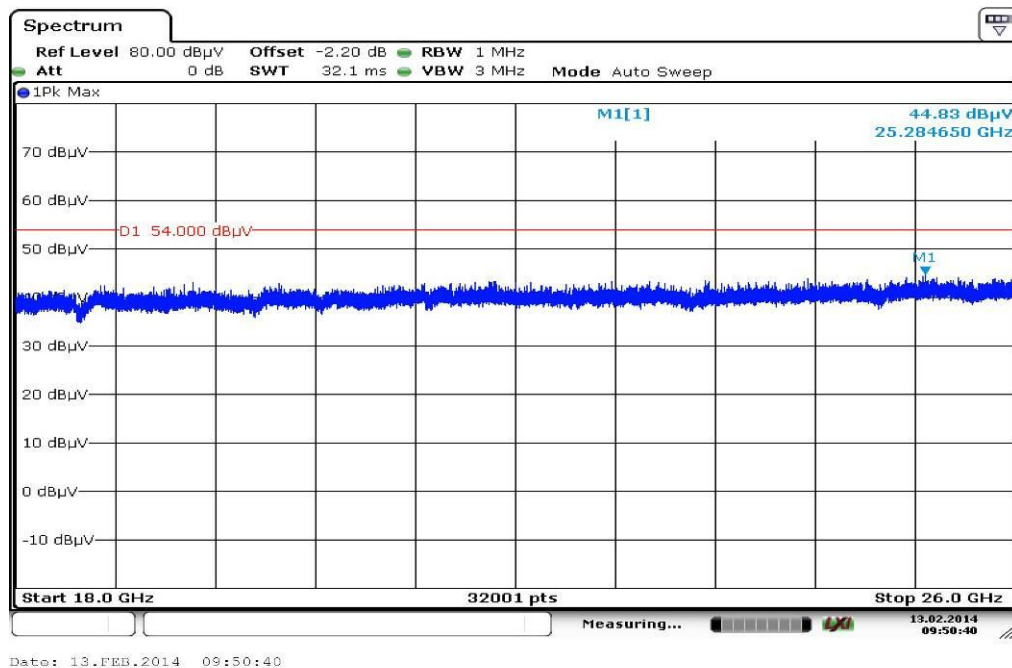
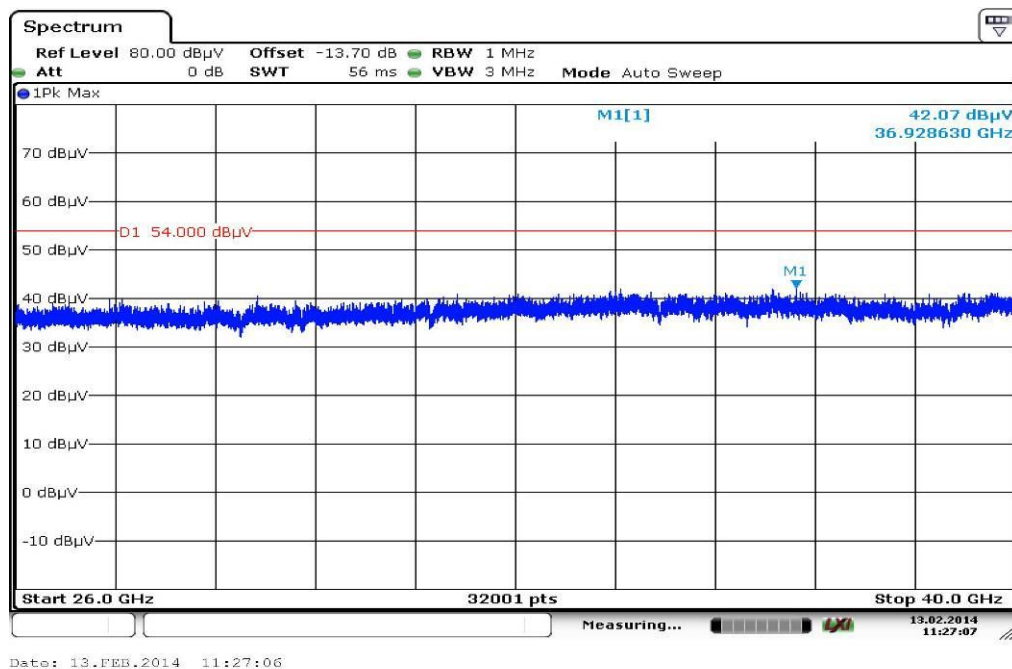
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
36.010950	10.6	1000.0	120.000	170.0	H	90.0	13.1	19.4	30.0	
102.360750	8.3	1000.0	120.000	170.0	H	183.0	11.7	25.2	33.5	
314.983800	12.1	1000.0	120.000	111.0	V	-10.0	15.0	23.9	36.0	
359.976300	16.9	1000.0	120.000	170.0	V	100.0	16.2	19.1	36.0	
723.804300	20.4	1000.0	120.000	98.0	H	190.0	23.1	15.6	36.0	
873.219600	22.4	1000.0	120.000	170.0	H	0.0	24.9	13.6	36.0	

Plot 2: 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 3:** 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 4: 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 5:** 26 GHz to 40 GHz, vertical & horizontal polarization

10.3 Spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to mid channel. This measurement is representative for all channels and modes. If peaks are found the lowest channel and the highest channel will be measured too. The measurement is performed with the data rate producing the highest output power. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		
TX Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

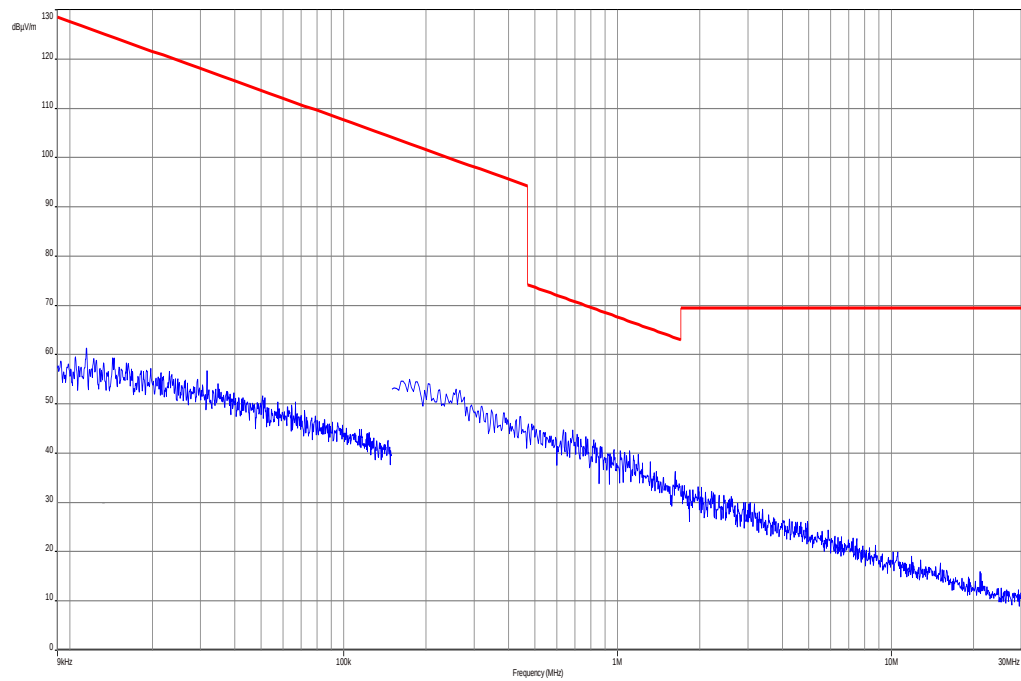
Results:

TX Spurious Emissions Radiated < 30 MHz [dBμV/m]		
F [MHz]	Detector	Level [dBμV/m]
No peaks detected.		
Measurement uncertainty	± 3 dB	

Result: Passed

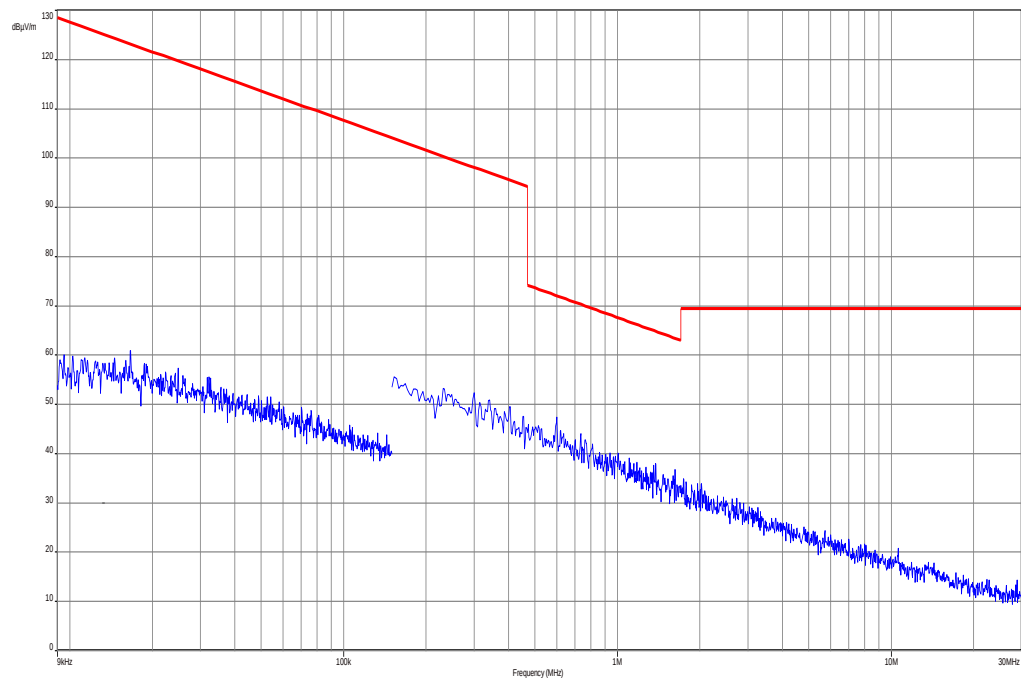
Plots: TX mode

Plot 1: 9 kHz to 30 MHz



Plots: RX / Idle – mode

Plot 1: 9 kHz to 30 MHz



10.4 Spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to mid channel. If peaks are found the lowest channel and the highest channel will be measured too. The measurement is performed with the data rate producing the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

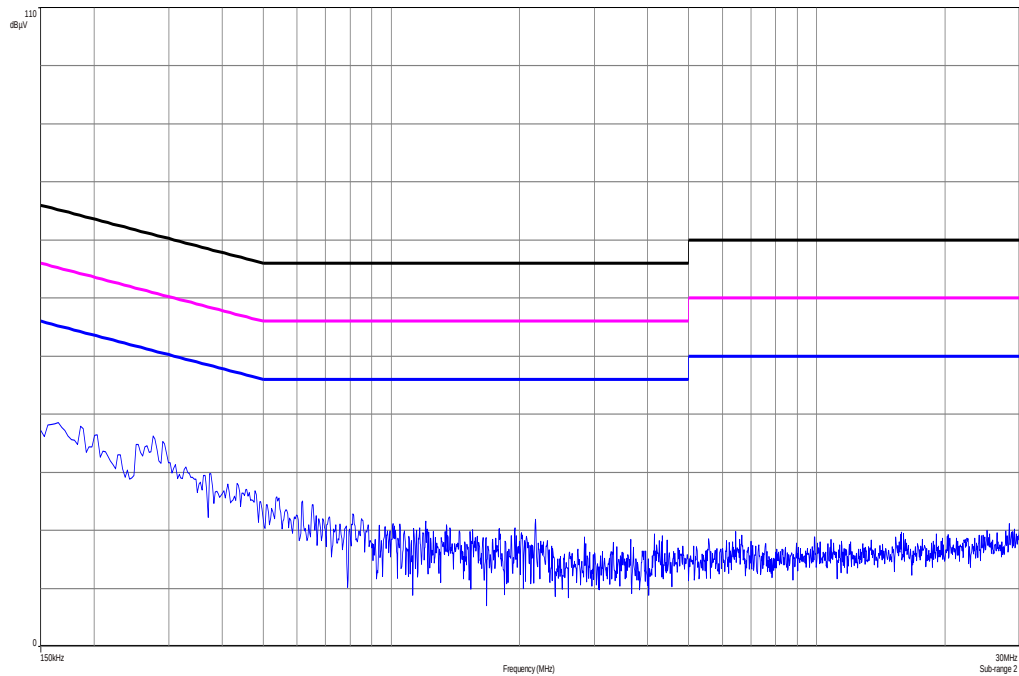
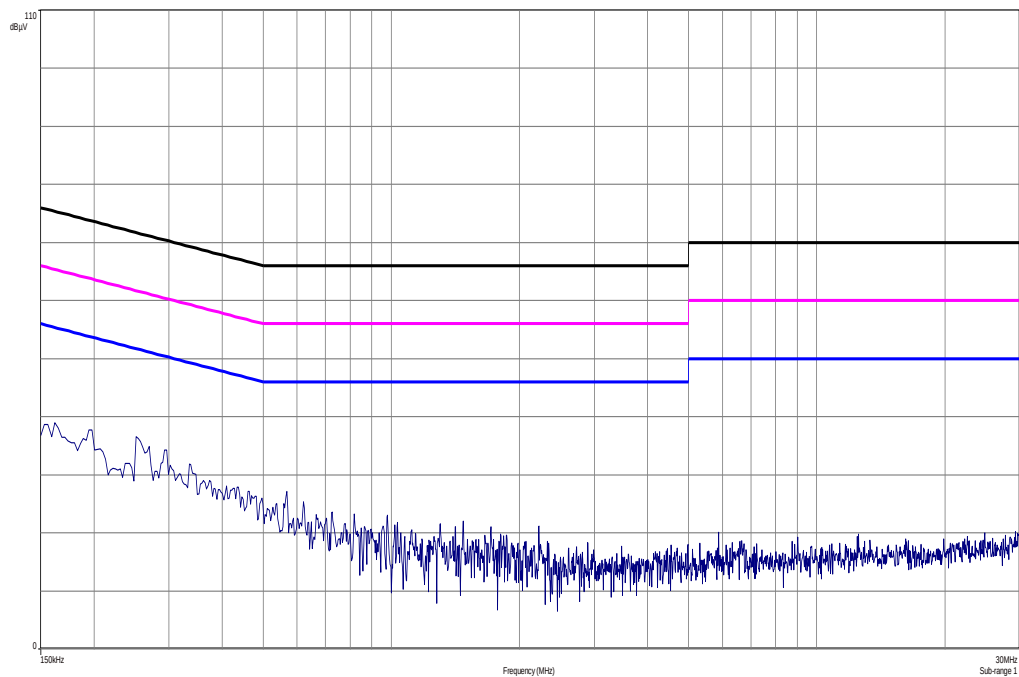
FCC		
TX Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dB μ V/m)	Average (dB μ V/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

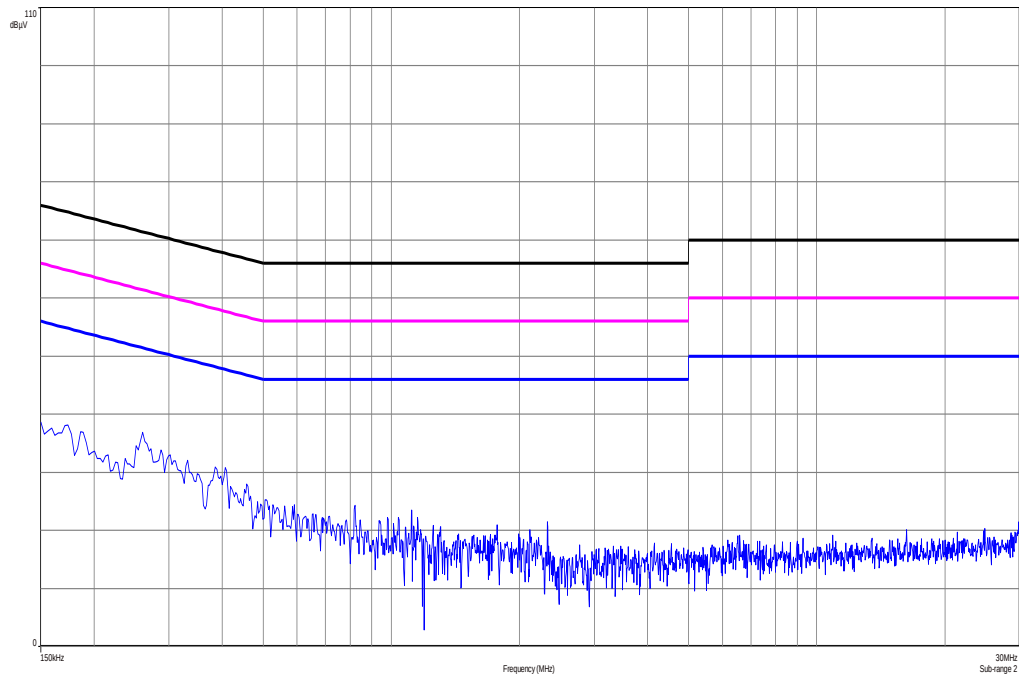
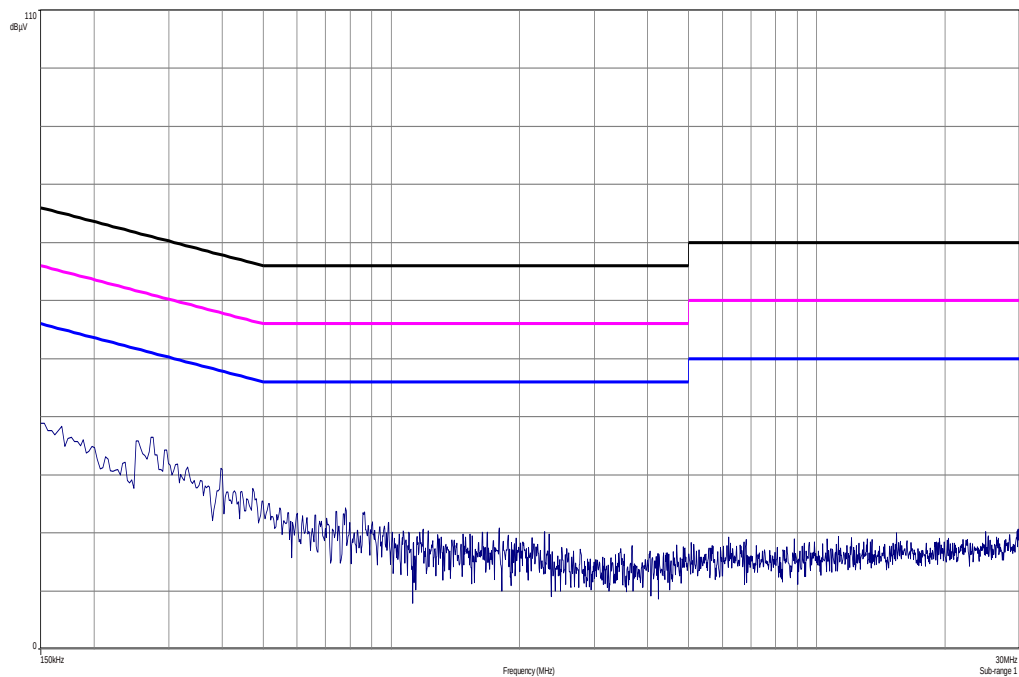
*Decreases with the logarithm of the frequency

Results:

TX Spurious Emissions Conducted < 30 MHz [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
No peaks detected.		
Measurement uncertainty	± 3 dB	

Result: Passed

Plots:**Plot 1: TX mode, 150 kHz to 30 MHz, phase line****Plot 2: TX mode, 150 kHz to 30 MHz, neutral line**

Plot 3: RX / Idle – mode, 150 kHz to 30 MHz, phase line**Plot 4: RX / Idle – mode, 150 kHz to 30 MHz, neutral line**

11 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
3	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
4	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
5	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
6	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
7	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	12.04.2012	12.04.2014
8	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKII	08.05.2013	08.05.2015
9	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
10	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
11	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
12	9	Isolating Transformer	MPL IEC625 Bus Regeltrennt ravo	Erfi	91350	300001155	ne		
13	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
14	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
15	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
16	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	21.02.2013	21.02.2014
17	11b	Microwave System Amplifier, 0,5-26,5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		
18	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
19	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
20	A031	Std. Gain Horn Antenna 26.5 to 40.0 GHz	637	Narda		300000510	k	19.07.2013	19.07.2015
21	n. a.	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2014	21.01.2015

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlk!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

12 Observations

No observations exceeding those reported with the single test cases have been made.

Annex A Document history

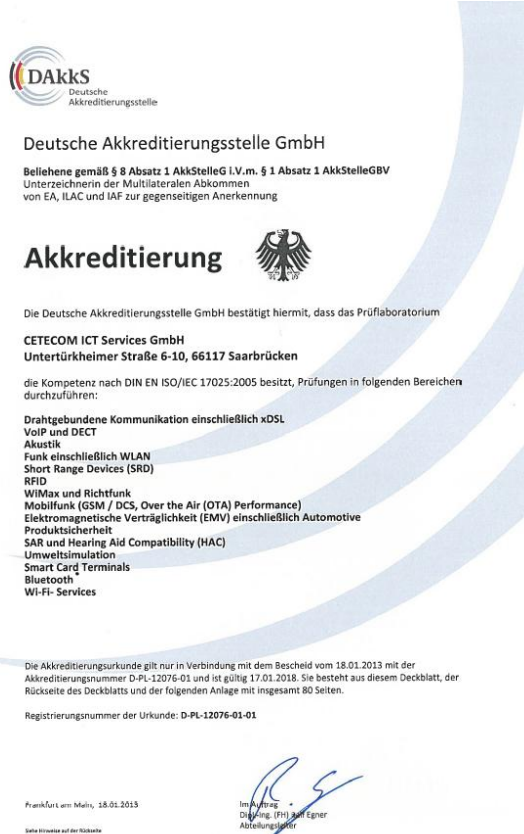
Version	Applied changes	Date of release
	Initial release	2014-02-21

Annex B Further information**Glossary**

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software

Annex C Accreditation Certificate

Front side of certificate



Back side of certificate



Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

<http://www.cetecom.com/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html>