

TEST REPORT

Test report no.: 1-6234/13-07-05-A



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH

Untertuerkheimer Strasse 6 – 10

66117 Saarbruecken / Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

Internet: <http://www.cetecom.com>

e-mail: ict@cetecom.com

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/Satellite Communications

Applicant

Research In Motion Limited

305 Phillip Street

Waterloo, ON N2L 3W8 / CANADA

Phone: +1 51 98 88 74 65

Fax: +1 51 98 88 69 06

Contact: Masud Attayi

e-mail: mattayi@rim.com

Manufacturer

Research In Motion Limited

305 Phillip Street

Waterloo, ON N2L 3W8 / CANADA

Test standard/s

47 CFR 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: Blackberry GSM Phones

Model name: RFW121LW

FCC ID: L6ARFW120LW

Frequency: DTS band 2400 MHz to 2483.5 MHz
(lowest channel 01 – 2412 MHz; highest channel 11 – 2462 MHz)

Technology tested: WLAN (DSSS / b – mode, OFDM / g & n HT20 – mode)

Antenna: Integrated antenna

Power supply: 3.8 V Li-Polymer battery

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:

p.o.

Stefan BöS
Senior Testing Manager

Test performed:

p.o.

Andreas Luckenbill
Expert

1 Table of contents

1	Table of contents	2
2	General information	3
2.1	Notes and disclaimer	3
2.2	Application details.....	3
3	Test standard/s	3
3.1	Measurement guidance.....	3
4	Test environment.....	4
5	Test item	4
5.1	Additional information	4
6	Test laboratories sub-contracted	4
7	Description of the test setup	5
7.1	Radiated measurements chamber F.....	5
7.2	Radiated measurements chamber C	6
7.3	Radiated measurements 12.75 GHz to 25 GHz	7
7.4	AC conducted	8
8	Summary of measurement results	9
9	Additional comments	10
10	Measurement results	11
10.1	Antenna gain	11
10.2	Maximum output power.....	11
10.3	Power spectral density	11
10.4	Spectrum bandwidth – 6 dB.....	11
10.5	Occupied bandwidth – 99% emission bandwidth.....	11
10.6	Band edge compliance conducted	11
10.7	Band edge compliance radiated	12
10.8	TX spurious emissions conducted	16
10.9	TX spurious emissions radiated.....	17
10.10	RX spurious emissions radiated	46
10.11	Spurious emissions radiated < 30 MHz	46
10.12	Spurious emissions conducted < 30 MHz	47
11	Test equipment and ancillaries used for tests	50
12	Observations	51
Annex A	Document history	52
Annex B	Further information.....	52
Annex C	Accreditation Certificate	53

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:	2013-07-09
Date of receipt of test item:	2013-07-15
Start of test:	2013-07-15
End of test:	2013-07-18
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR 15	01.10.2012	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}	no tests under extreme conditions
	T_{min}	no tests under extreme conditions
Relative humidity content:		50 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.8 V Li-Polymer battery
	V_{max}	no tests under extreme conditions
	V_{min}	no tests under extreme conditions

5 Test item

Kind of test item	:	Blackberry GSM Phones
Type identification	:	RFW121LW
S/N serial number	:	Rad. 004402242380164
HW hardware status	:	CER-54733-001 Rev2-x08-00
SW software status	:	OS Version: 10.2.0.519 Build: 546773
Frequency band [MHz]	:	DTS band 2400 MHz to 2483.5 MHz (lowest channel 01 – 2412 MHz; highest channel 11 – 2462 MHz)
Type of radio transmission	:	DSSS, OFDM
Use of frequency spectrum	:	
Type of modulation	:	BPSK, QPSK, 16 – QAM, 64 – QAM
Number of channels	:	11
Antenna	:	Integrated antenna
Power supply	:	3.8 V Li-Polymer battery

5.1 Additional information

Test setup- and EUT-photos are included in test reports: 1-6234/13-07-01_AnnexA
1-6234/13-07-01_AnnexD

All tests are made according RIM testplan:
RIM_EMI_Matrix for Cetecom_Astro_RFW121LW-Revised (June-27-2013).xlsx

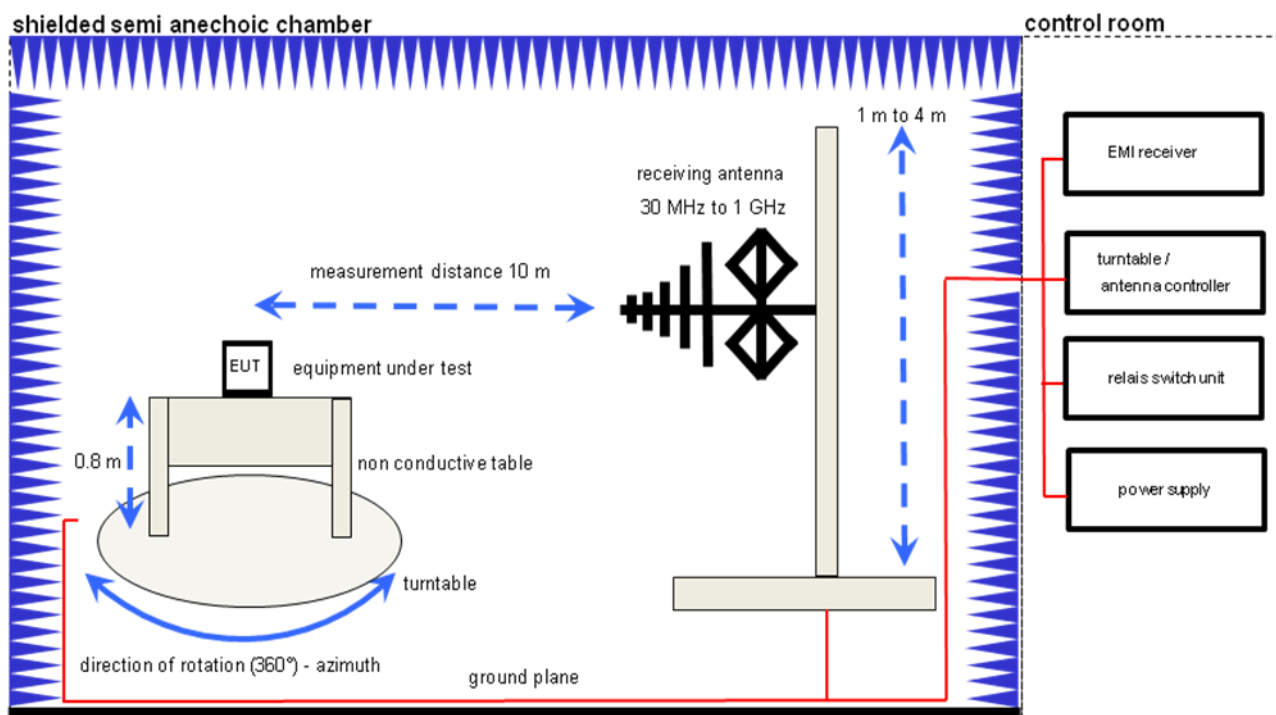
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements chamber F

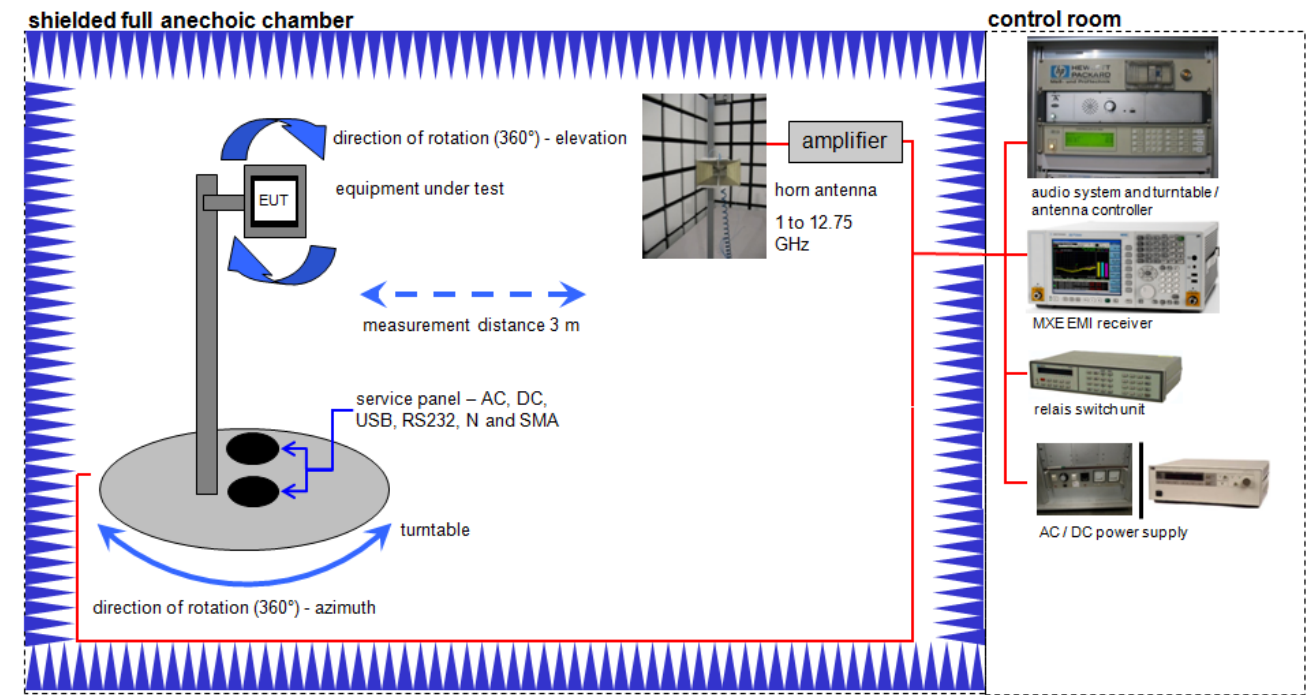
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas 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
Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351
Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032
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

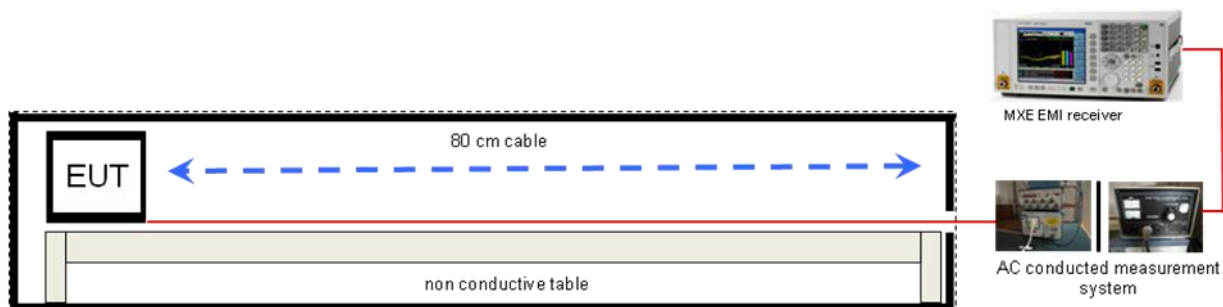
7.3 Radiated measurements 12.75 GHz to 25 GHz



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268
Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda		300000786
Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300000486
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	Erfi	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168

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	2013-08-16	Tests according to manufacturer test plan.

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	-/-	Nominal	Nominal	DSSS	☐	☐	☐	☒	-/-
§15.247(e)	Power spectral density	KDB 558074 DTS clause: 10.2	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	KDB 558074 DTS clause: 8.2	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.247(b)(3)	Maximum output power	KDB 558074 DTS clause: 9.1.2	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.247(d)	Band edge compliance conducted	KDB 558074 DTS clause: 13.2.1	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.205	Band edge compliance radiated	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d)	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.247(d)	TX spurious emissions radiated	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.109	RX spurious emissions radiated	-/-	Nominal	Nominal	-/-	☐	☐	☐	☒	-/-
§15.209(a)	TX spurious emissions radiated < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.107(a)	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies

Note: NA = Not Applicable; NP = Not Performed

9 Additional comments

Reference documents: None

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 Antenna gain

Not performed! Tests according to manufacturer tests plan!

10.2 Maximum output power

Not performed! Tests according to manufacturer tests plan!

10.3 Power spectral density

Not performed! Tests according to manufacturer tests plan!

10.4 Spectrum bandwidth – 6 dB

Not performed! Tests according to manufacturer tests plan!

10.5 Occupied bandwidth – 99% emission bandwidth

Not performed! Tests according to manufacturer tests plan!

10.6 Band edge compliance conducted

Not performed! Tests according to manufacturer tests plan!

10.7 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to channel 1 for the lower restricted band and to channel 11 for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3m.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz / 1 MHz
Video bandwidth:	1 MHz / 10 Hz
Span:	See plot!
Trace-Mode:	Max Hold

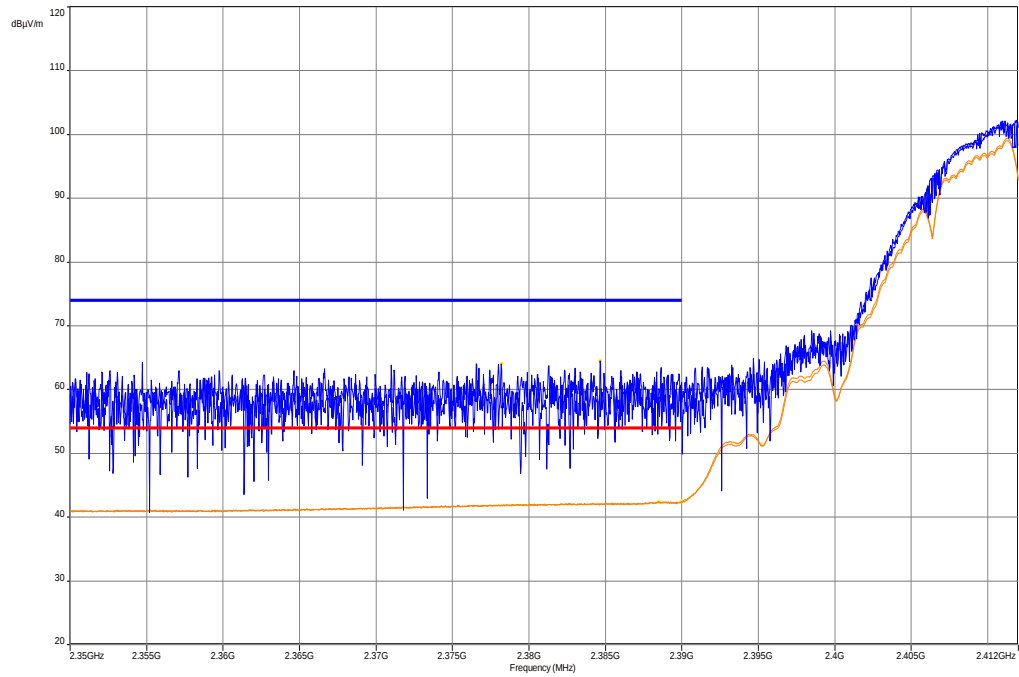
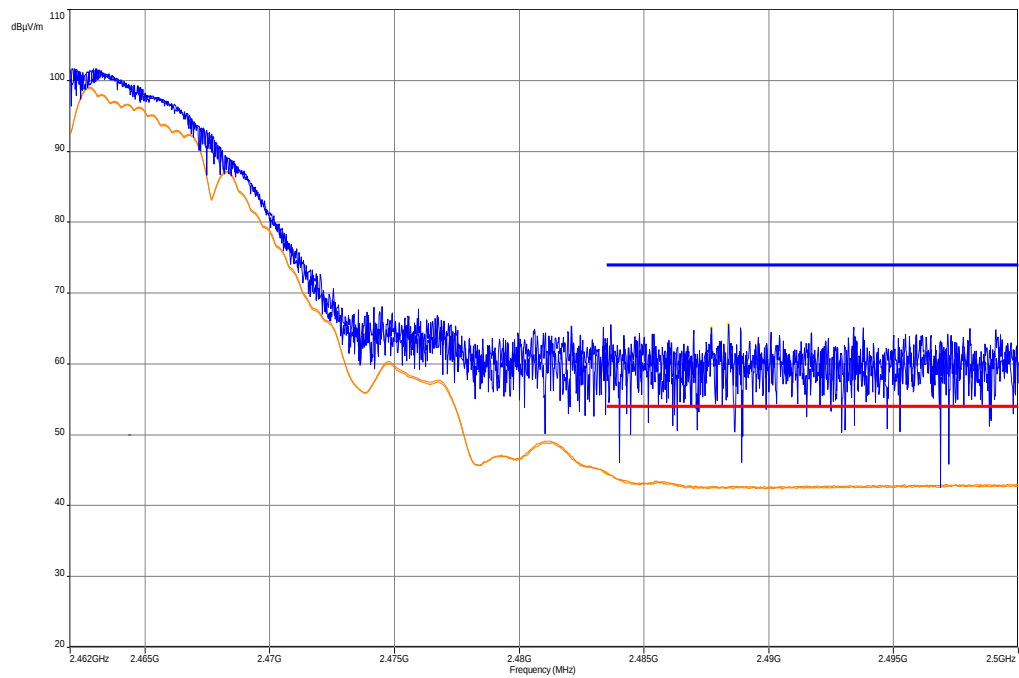
Limits:

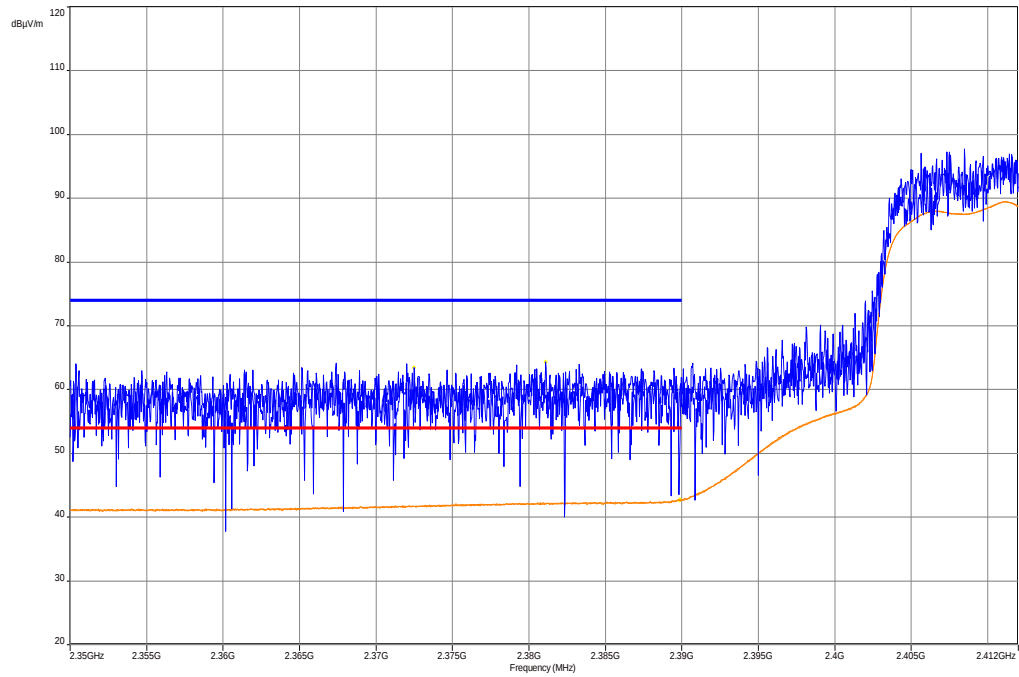
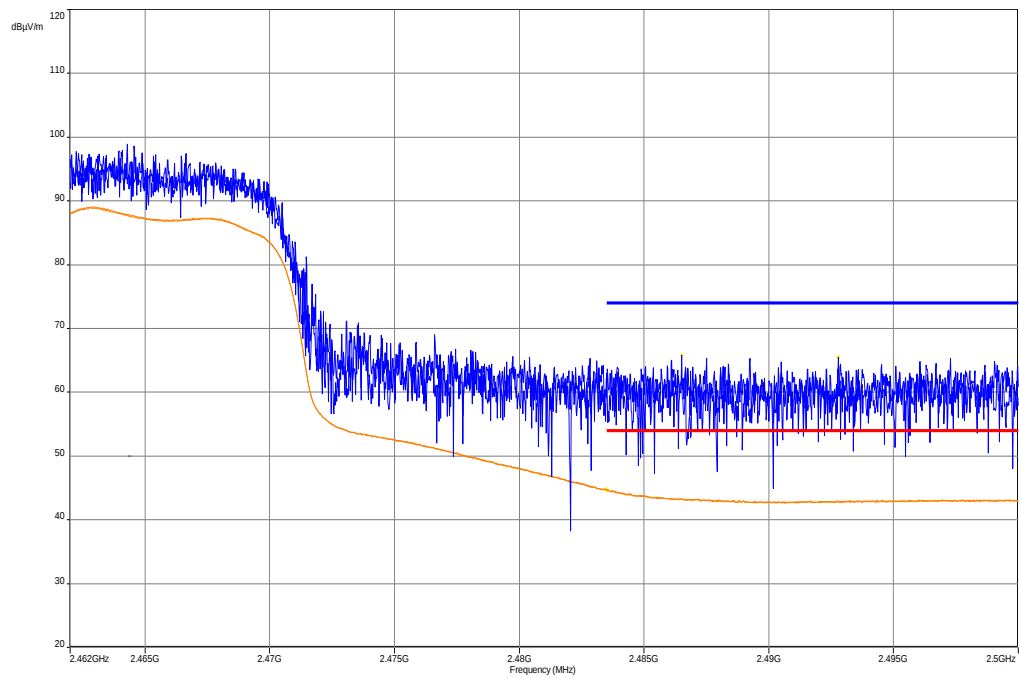
FCC
Band Edge Compliance Radiated
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth 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 Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).
54 dBμV/m AVG 74 dBμV/m Peak

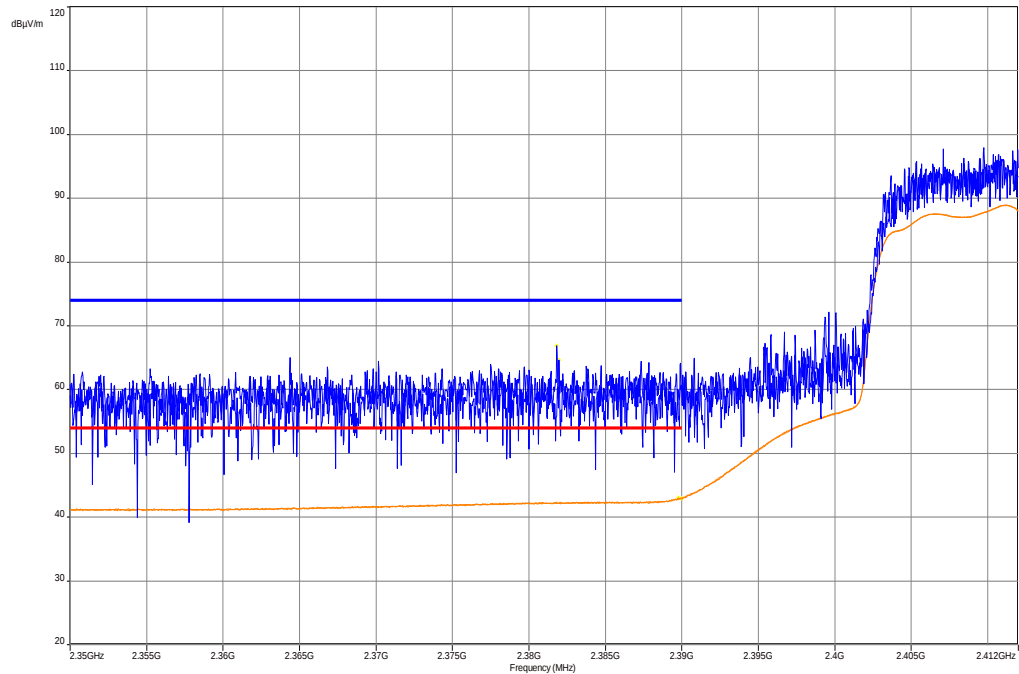
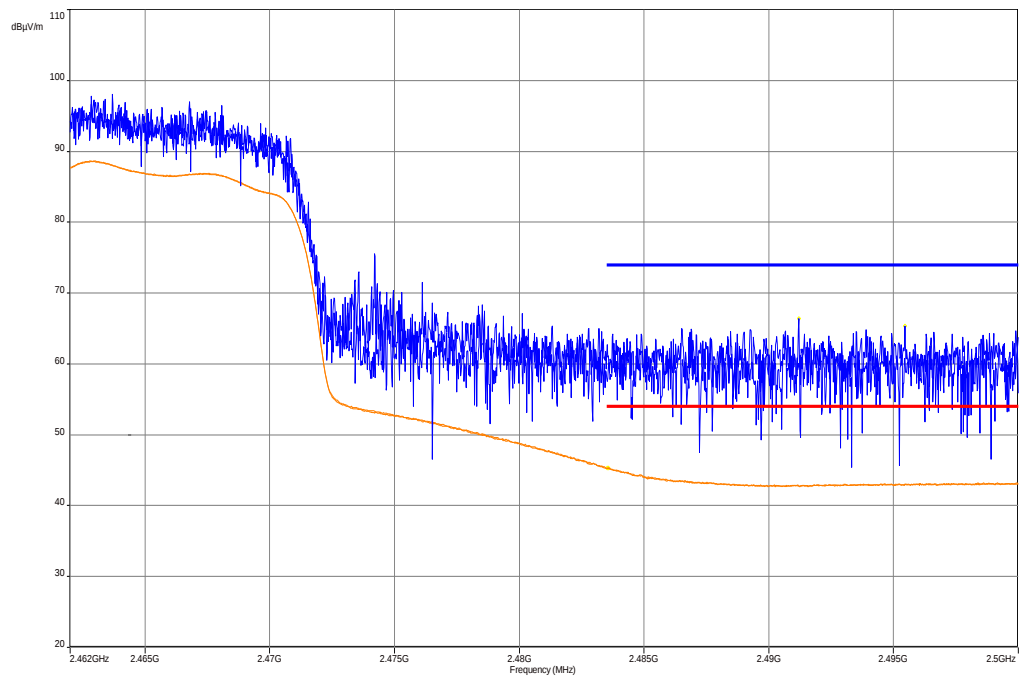
Results:

Scenario Modulation	Band Edge Compliance Radiated		
	DSSS / b – mode	OFDM / g – mode	OFDM / n – mode
Lower Band Edge – Channel 1	64.6 dBμV/m (Peak) 42.6 dBμV/m (AVG)	64.4 dBμV/m (Peak) 43.4 dBμV/m (AVG)	66.9 dBμV/m (Peak) 43.9 dBμV/m (AVG)
Upper Band Edge – Channel 11	65.6 dBμV/m (Peak) 44.4 dBμV/m (AVG)	65.8 dBμV/m (Peak) 46.0 dBμV/m (AVG)	66.4 dBμV/m (Peak) 45.2 dBμV/m (AVG)
Measurement uncertainty	± 3 dB		

Result: Passed

Plots: DSSS/ b – mode peak / average**Plot 1: TX mode, lower band edge, vertical & horizontal polarization****Plot 2: TX mode, upper band edge, vertical & horizontal polarization**

Plots: OFDM / g – mode peak / average**Plot 1: TX mode, lower band edge, vertical & horizontal polarization****Plot 2: TX mode, upper band edge, vertical & horizontal polarization**

Plots: OFDM / n – mode peak / average**Plot 1: TX mode, lower band edge, vertical & horizontal polarization****Plot 2: TX mode, upper band edge, vertical & horizontal polarization**

10.8 TX spurious emissions conducted

Not performed! Tests according to manufacturer tests plan!

10.9 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at channel 1, 6 and 11. 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:	Sweep: 100 kHz Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 25 GHz
Trace-Mode:	Max Hold
Measured Modulation	☒ DSSS b – mode ☒ OFDM g – mode ☒ OFDM n – mode

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: DSSS / b – mode

TX Spurious Emissions Radiated [dBμV/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 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.		
All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!		
Measurement uncertainty			± 3 dB					

Result: Passed**Results: OFDM / g – mode**

TX Spurious Emissions Radiated [dBμV/m]								
OFDM / g – mode								
2412 MHz			2437 MHz			2462 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.		
All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!		
Measurement uncertainty			± 3 dB					

Result: Passed**Results: OFDM / n – mode**

TX Spurious Emissions Radiated [dBμV/m]								
OFDM / n – mode								
2412 MHz			2437 MHz			2462 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.		
All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!		
Measurement uncertainty			± 3 dB					

Result: Passed

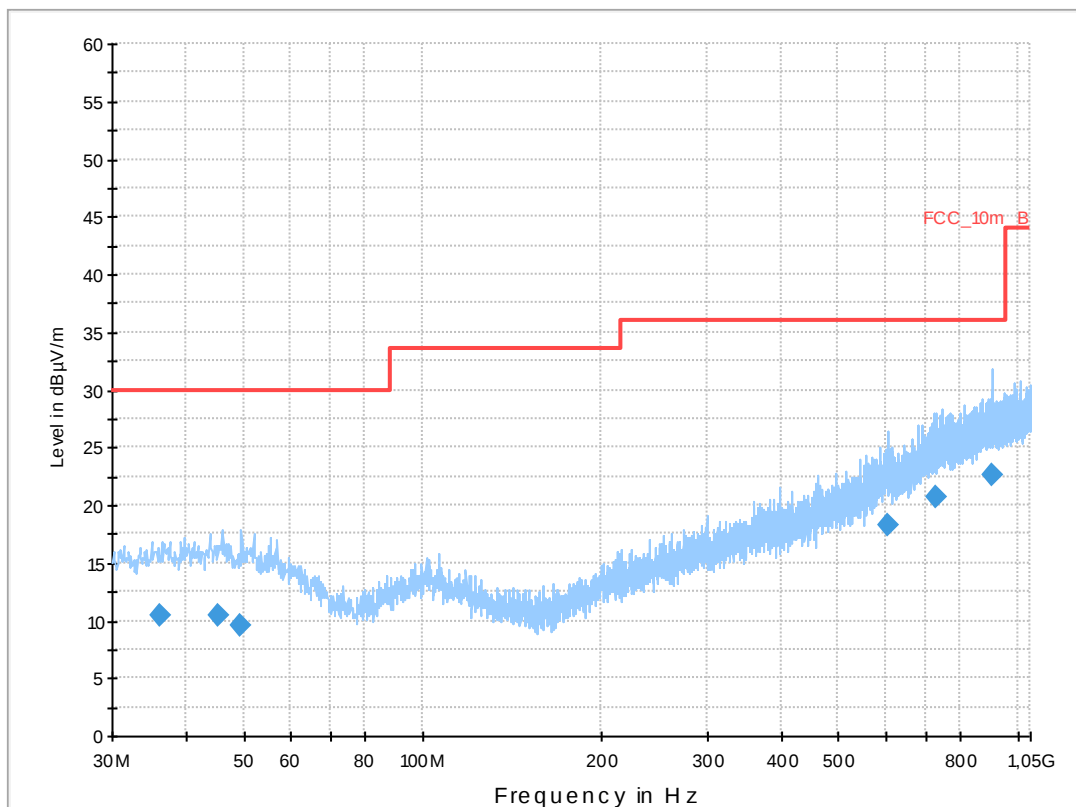
Plots: DSSS / b – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN b-mode, 1 Mbit/s, Ch. 1
 Operator Name: Hennemann
 Comment: battery powered

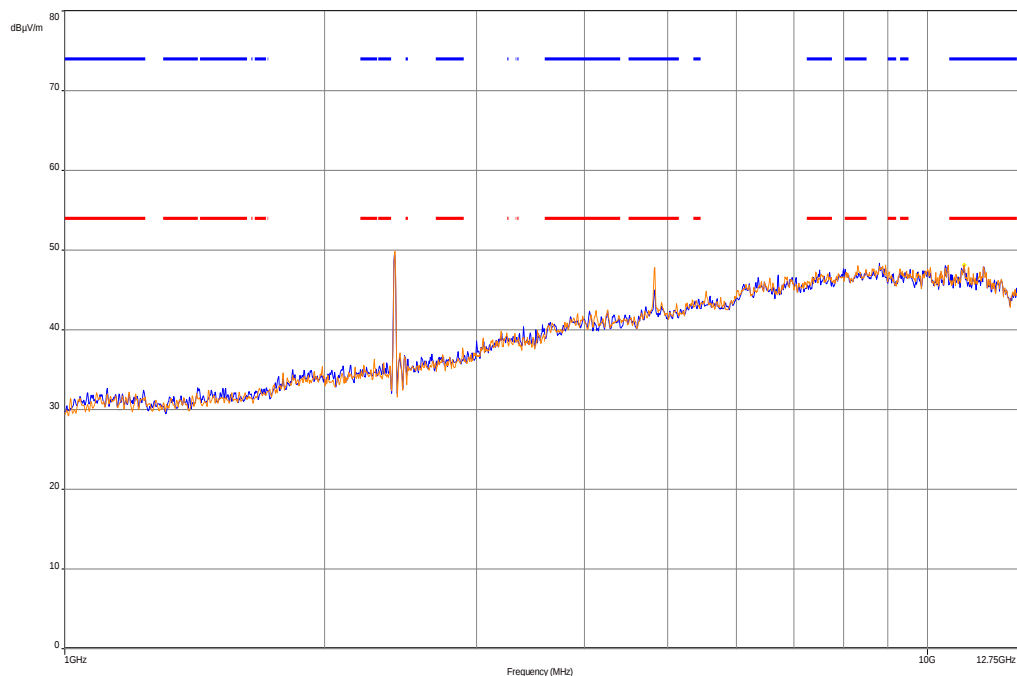
Scan Setup: STAN_Fin [EMI radiated]

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

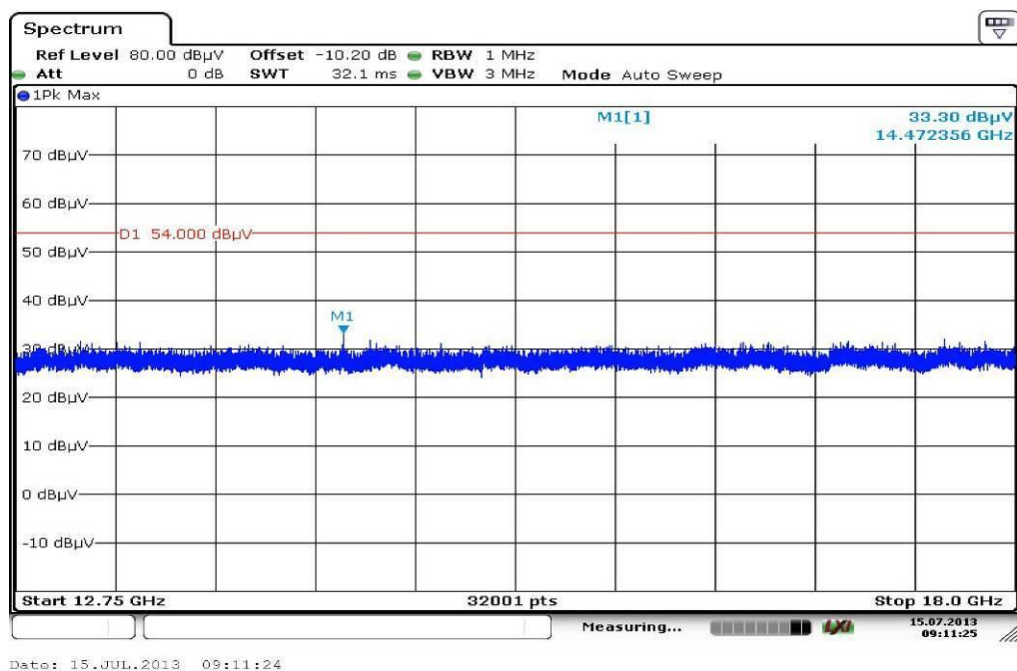
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

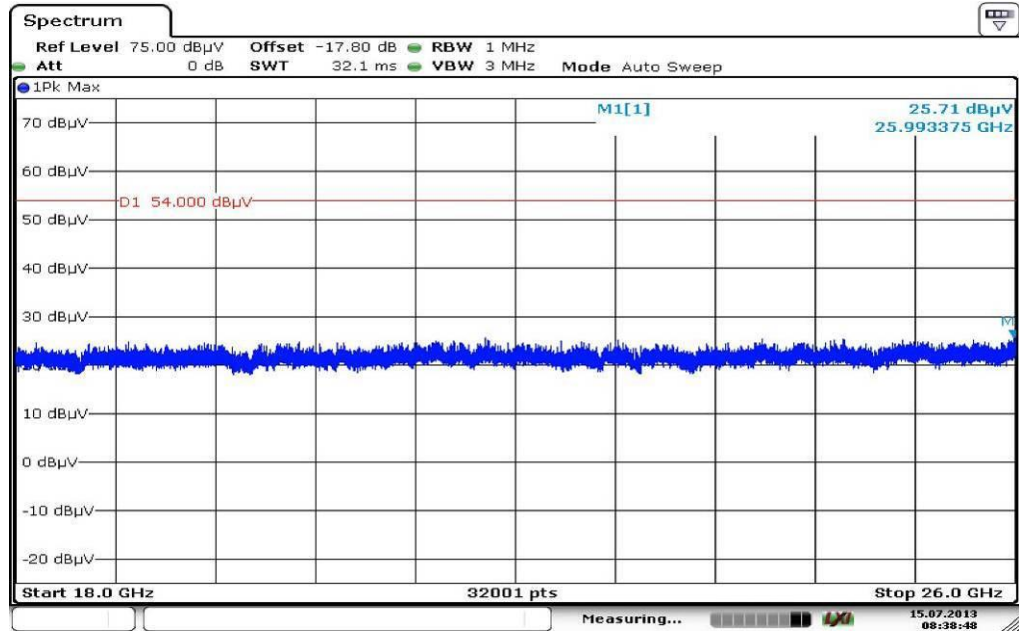
**Final Result 1**

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
36.144900	10.5	1000.0	120.000	160.0	H	280.0	13.1	19.5	30.0	
45.217800	10.4	1000.0	120.000	104.0	H	190.0	13.3	19.6	30.0	
49.149450	9.6	1000.0	120.000	170.0	V	260.0	13.4	20.4	30.0	
603.092250	18.2	1000.0	120.000	105.0	V	171.0	20.8	17.8	36.0	
728.016000	20.6	1000.0	120.000	170.0	V	177.0	23.2	15.4	36.0	
904.722600	22.5	1000.0	120.000	98.0	V	280.0	25.2	13.5	36.0	

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

The carrier signal is notched with a 2.4 GHz band rejection filter.

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

Date: 15.JUL.2013 08:38:48

Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization

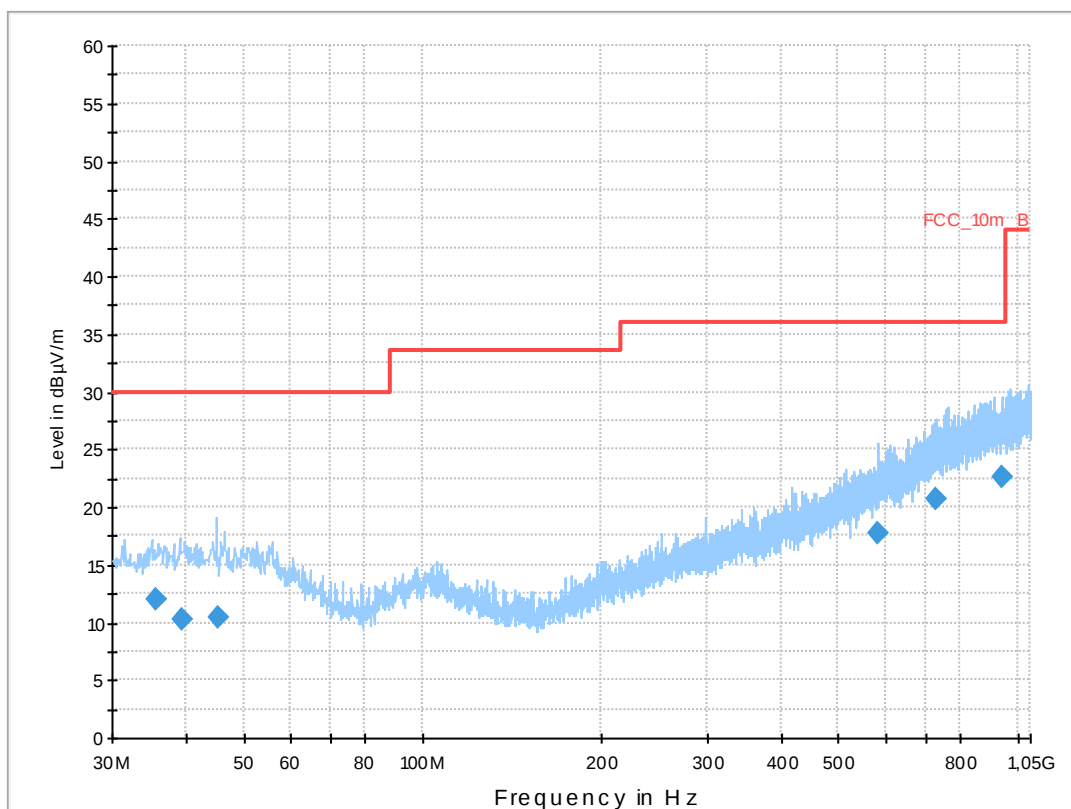
Common Information

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN b-mode, 1 Mbit/s, Ch. 6
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

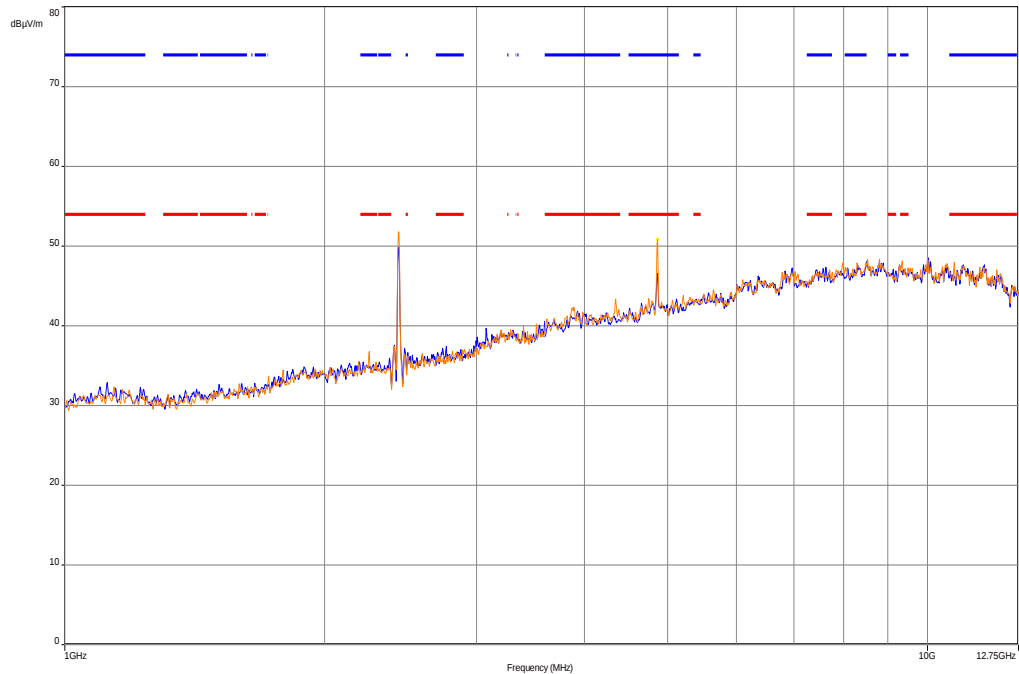
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

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

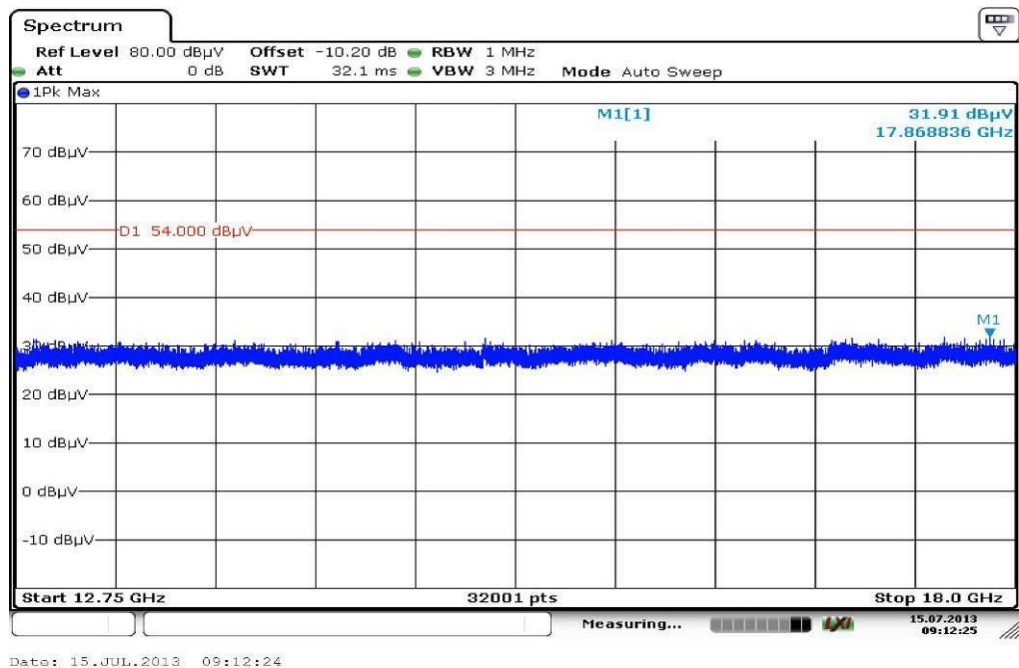


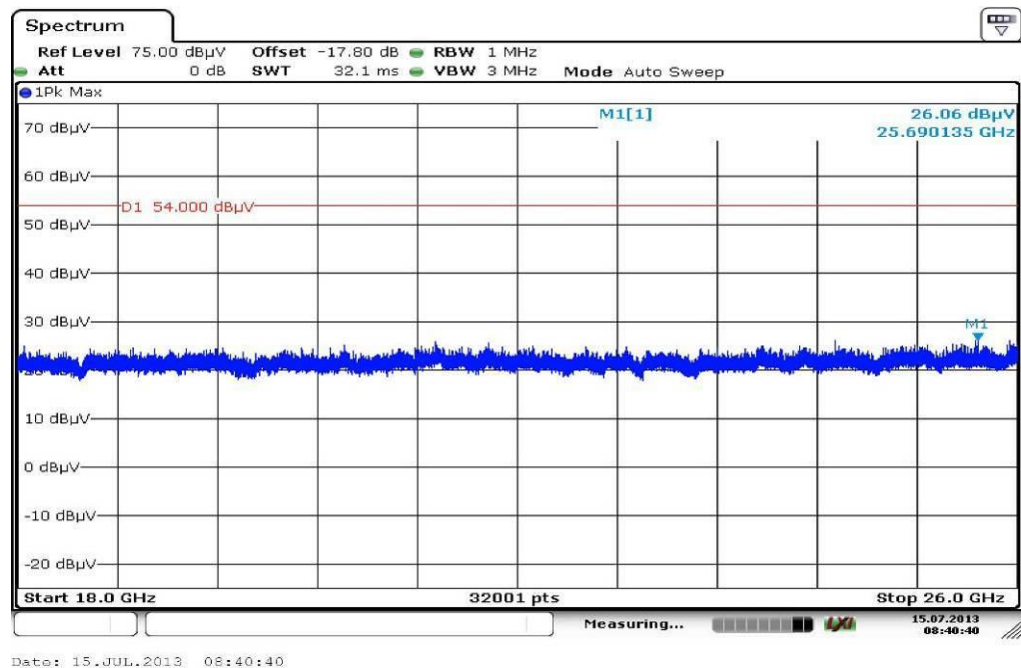
Final Result 1

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
35.480550	12.0	1000.0	120.000	170.0	V	90.0	13.1	18.0	30.0	
39.484650	10.2	1000.0	120.000	132.0	V	265.0	13.4	19.8	30.0	
45.361500	10.4	1000.0	120.000	170.0	H	265.0	13.3	19.6	30.0	
582.824850	17.7	1000.0	120.000	170.0	V	90.0	20.3	18.3	36.0	
731.503800	20.6	1000.0	120.000	170.0	V	280.0	23.2	15.4	36.0	
943.173900	22.6	1000.0	120.000	160.0	V	272.0	25.3	13.4	36.0	

Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

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

Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

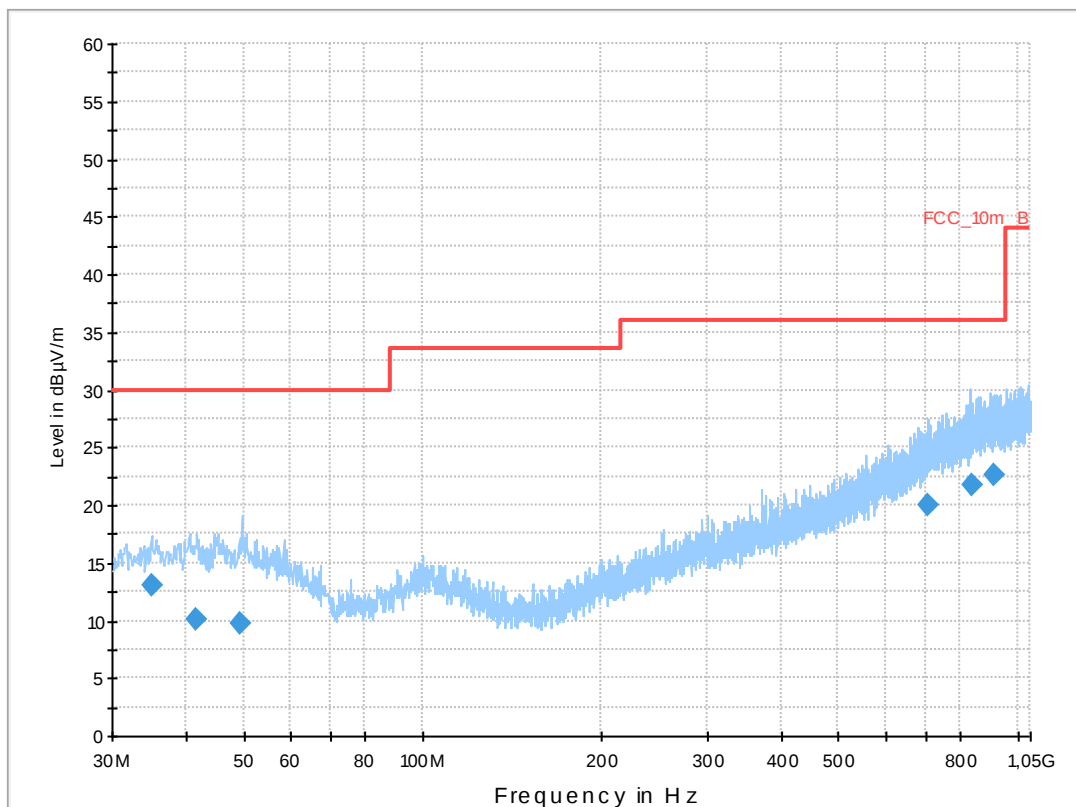
Common Information

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN b-mode, 1 Mbit/s, Ch. 11
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

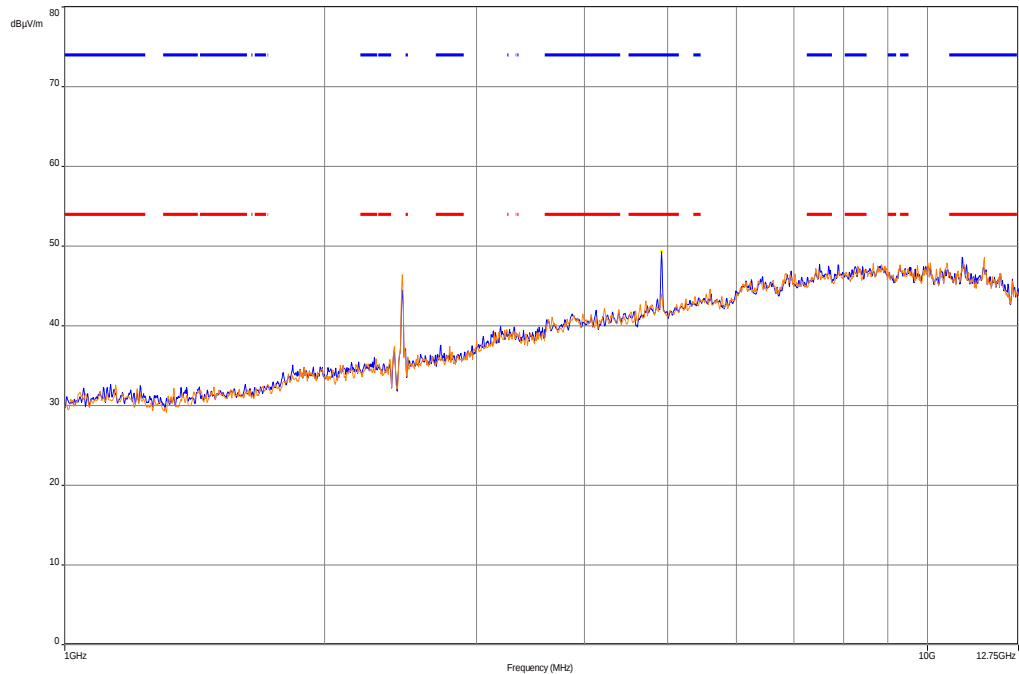
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

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

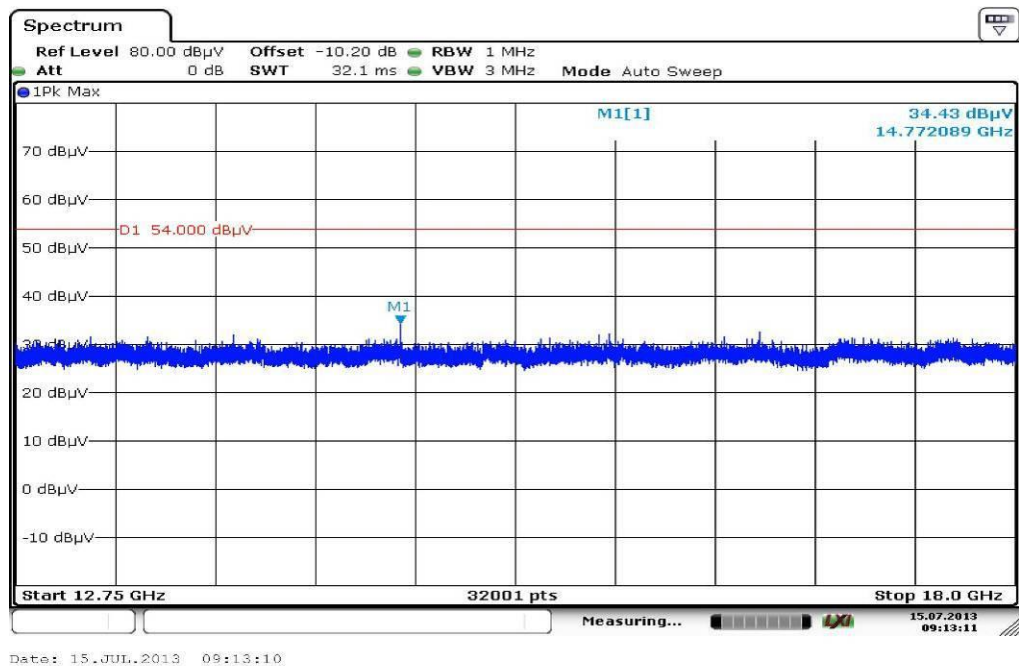


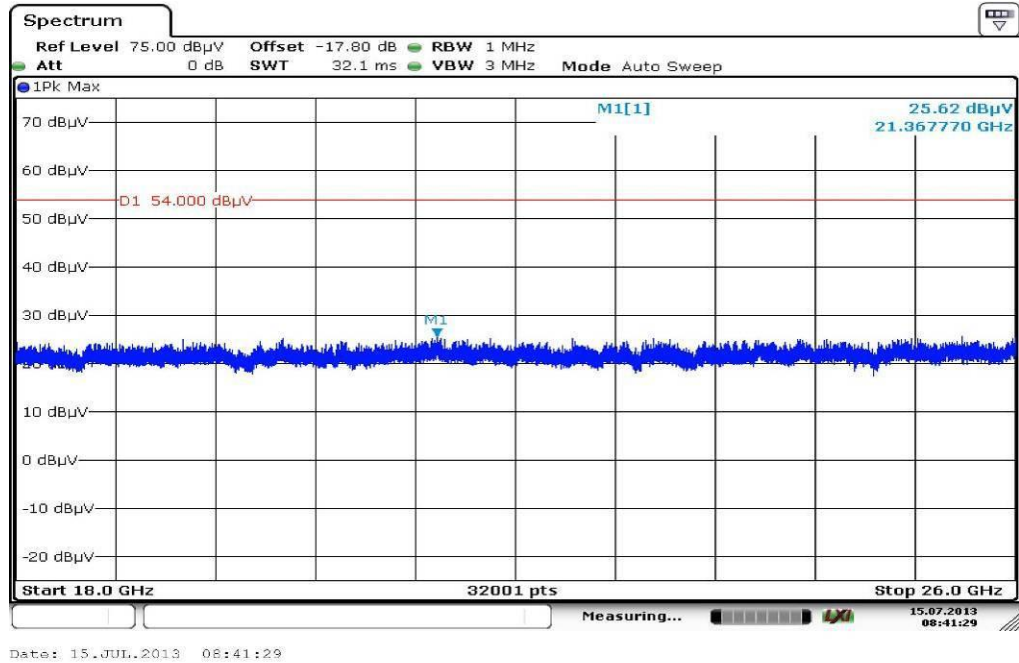
Final Result 1

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
35.019000	13.1	1000.0	120.000	143.0	V	-10.0	13.0	16.9	30.0	
41.625750	10.1	1000.0	120.000	120.0	H	-9.0	13.4	19.9	30.0	
49.338000	9.7	1000.0	120.000	170.0	H	10.0	13.4	20.3	30.0	
704.569200	20.1	1000.0	120.000	120.0	H	85.0	22.6	15.9	36.0	
835.219950	21.8	1000.0	120.000	170.0	V	280.0	24.3	14.2	36.0	
915.020250	22.5	1000.0	120.000	156.0	H	-9.0	25.2	13.5	36.0	

Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

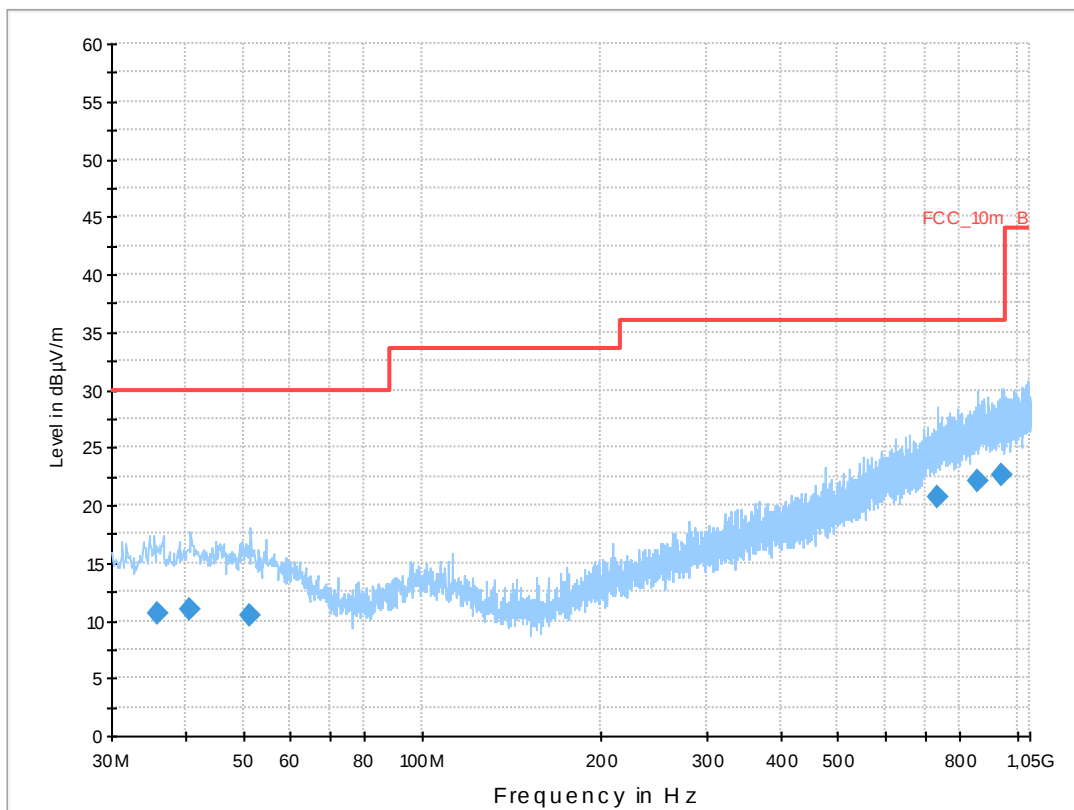
Plots: OFDM / g – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN g-mode, 6 Mbit/s, Ch. 1
 Operator Name: Hennemann
 Comment: battery powered

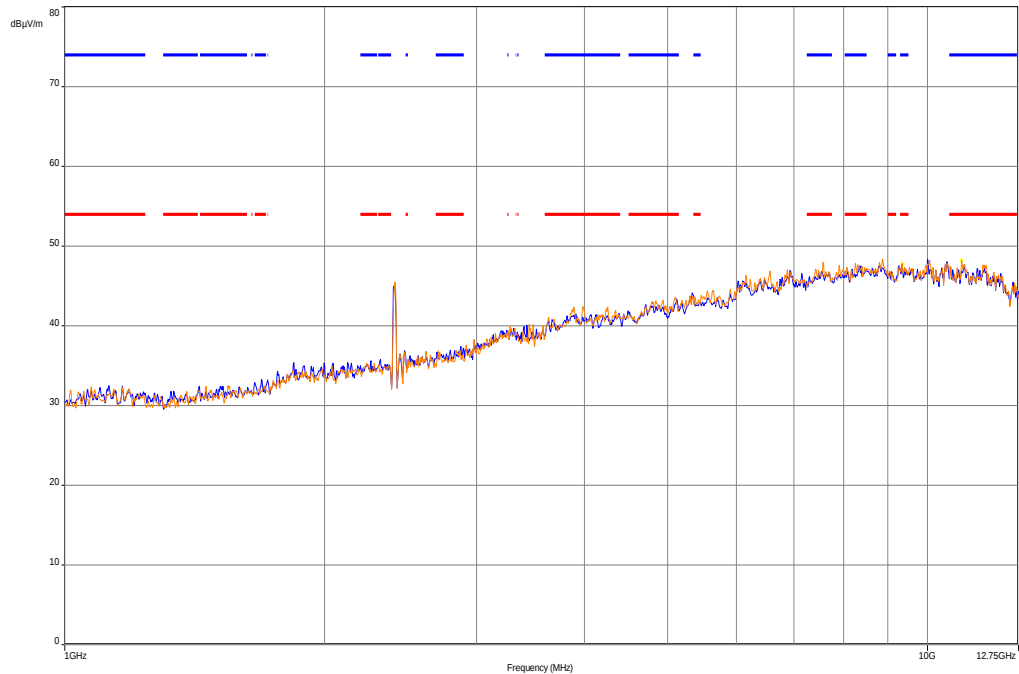
Scan Setup: STAN_Fin [EMI radiated]

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

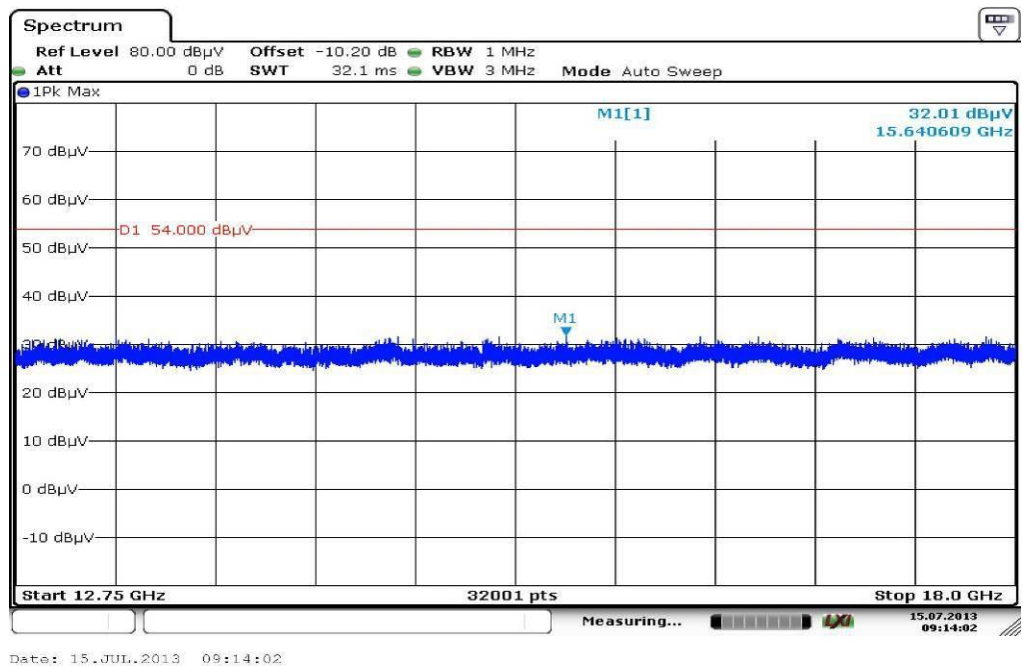
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

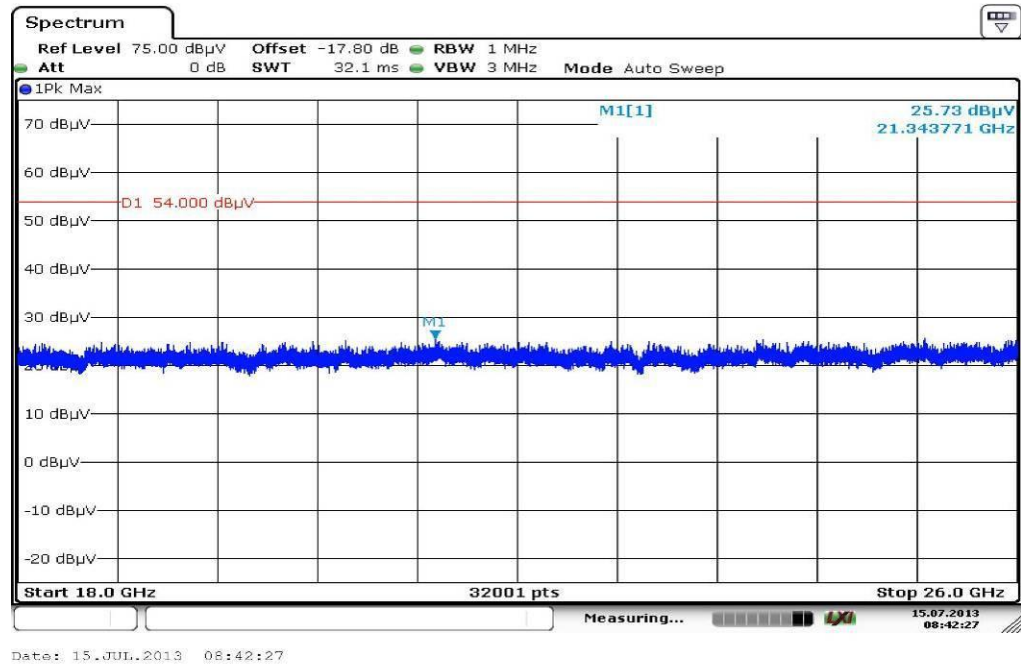
**Final Result 1**

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
35.903100	10.5	1000.0	120.000	170.0	H	100.0	13.1	19.5	30.0	
40.568550	10.9	1000.0	120.000	170.0	V	10.0	13.4	19.1	30.0	
51.141300	10.5	1000.0	120.000	98.0	H	-5.0	13.3	19.5	30.0	
732.542400	20.7	1000.0	120.000	170.0	H	190.0	23.3	15.3	36.0	
857.271150	22.1	1000.0	120.000	170.0	H	182.0	24.6	13.9	36.0	
942.051600	22.6	1000.0	120.000	170.0	H	280.0	25.3	13.4	36.0	

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

The carrier signal is notched with a 2.4 GHz band rejection filter.

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

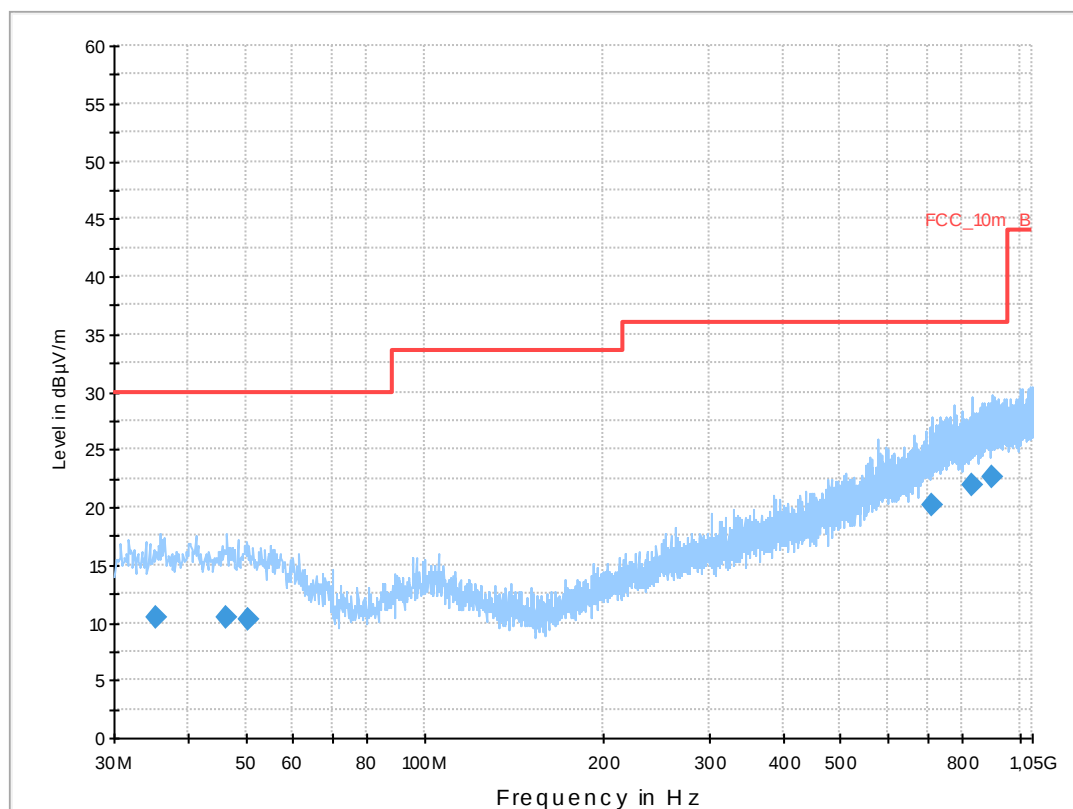
Common Information

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN g-mode, 6 Mbit/s, Ch. 6
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

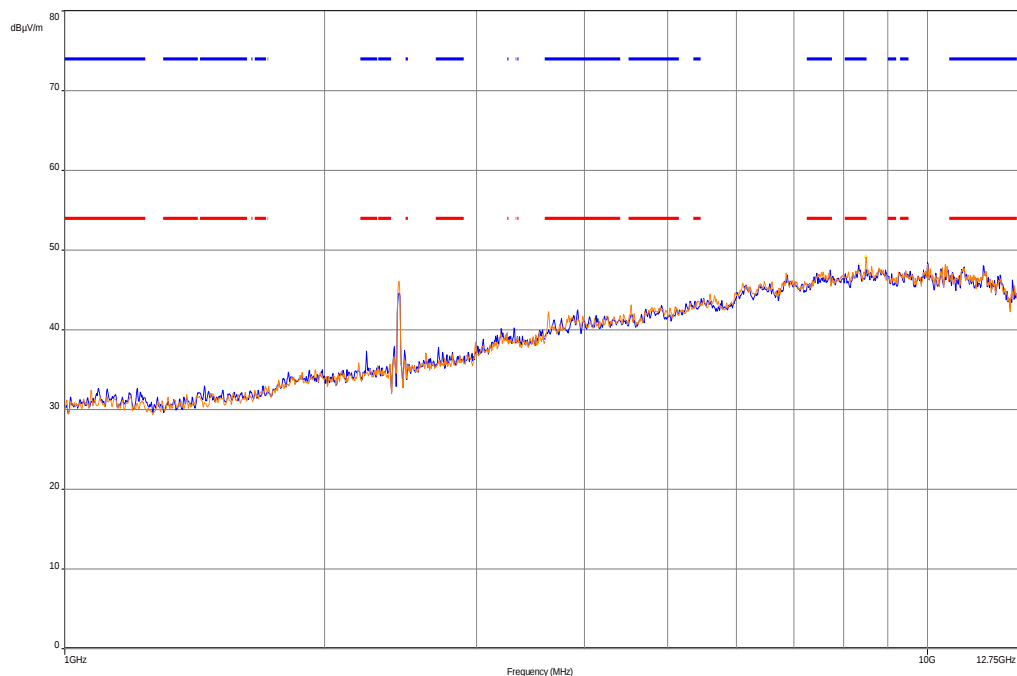
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

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

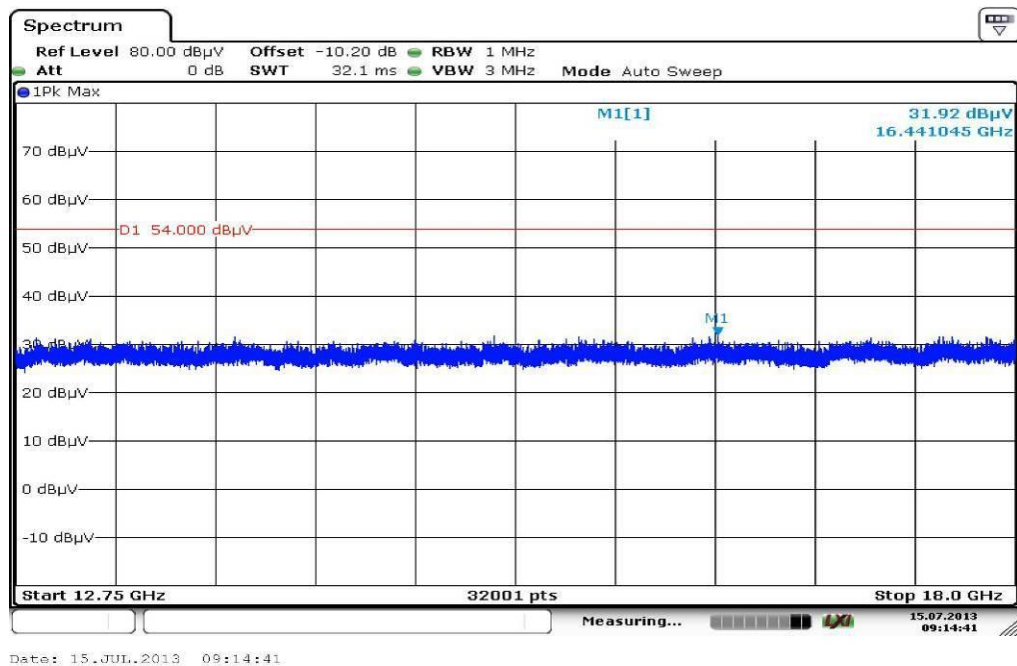


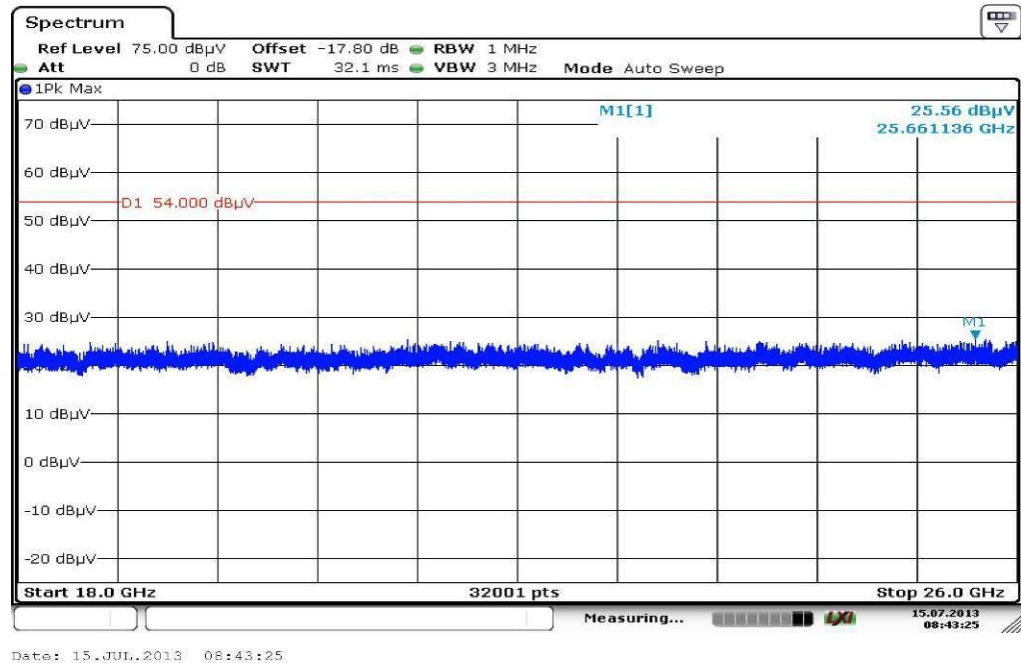
Final Result 1

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
35.355000	10.4	1000.0	120.000	132.0	H	175.0	13.1	19.6	30.0	
46.300950	10.4	1000.0	120.000	170.0	H	100.0	13.3	19.6	30.0	
50.335350	10.3	1000.0	120.000	170.0	V	0.0	13.3	19.7	30.0	
714.572700	20.2	1000.0	120.000	120.0	V	265.0	22.8	15.8	36.0	
832.028850	21.9	1000.0	120.000	170.0	V	90.0	24.3	14.1	36.0	
902.031450	22.6	1000.0	120.000	98.0	H	280.0	25.2	13.4	36.0	

Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

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

Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

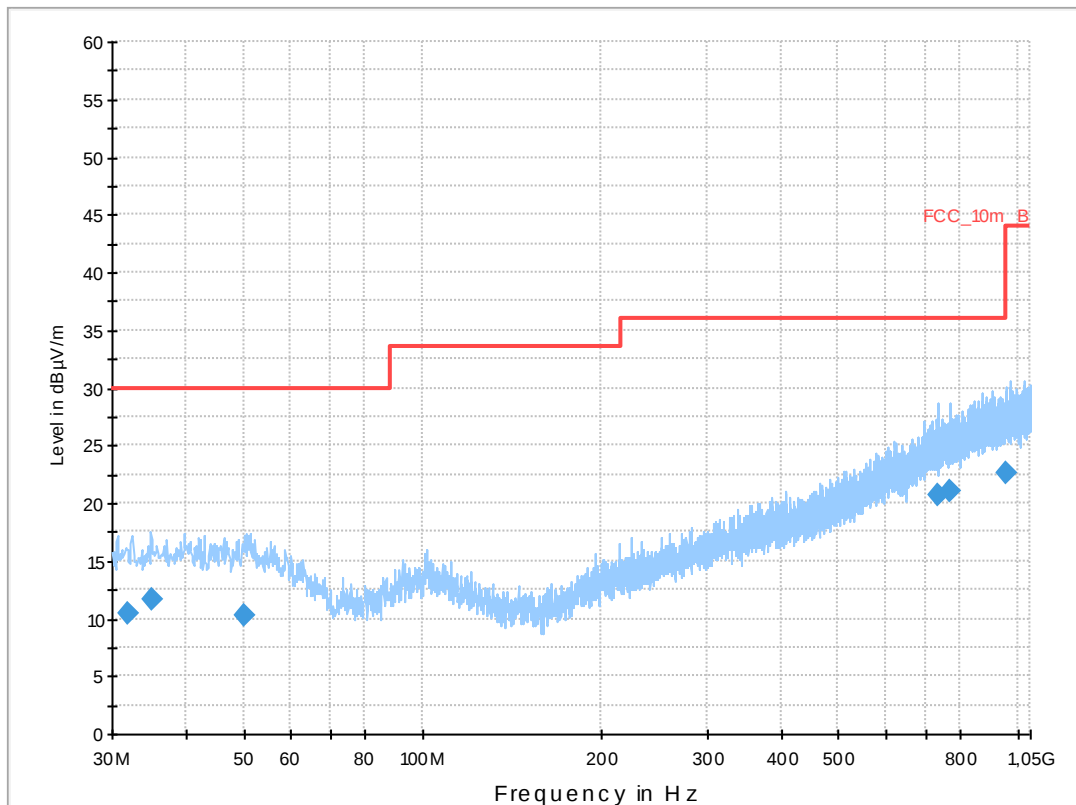
Common Information

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN g-mode, 6 Mbit/s, Ch. 11
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

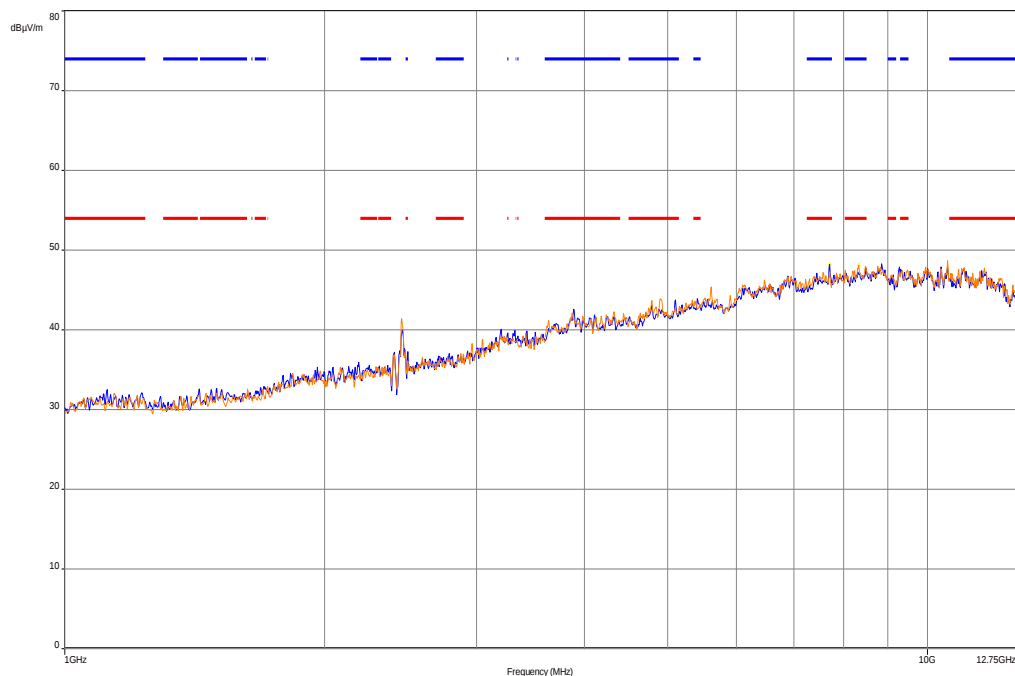
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

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

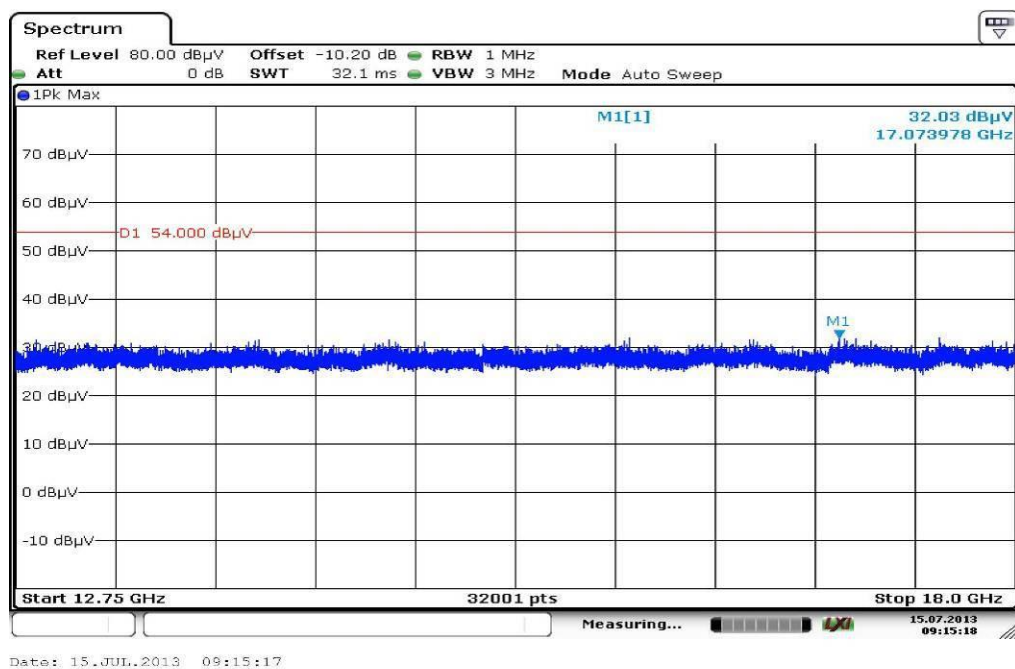


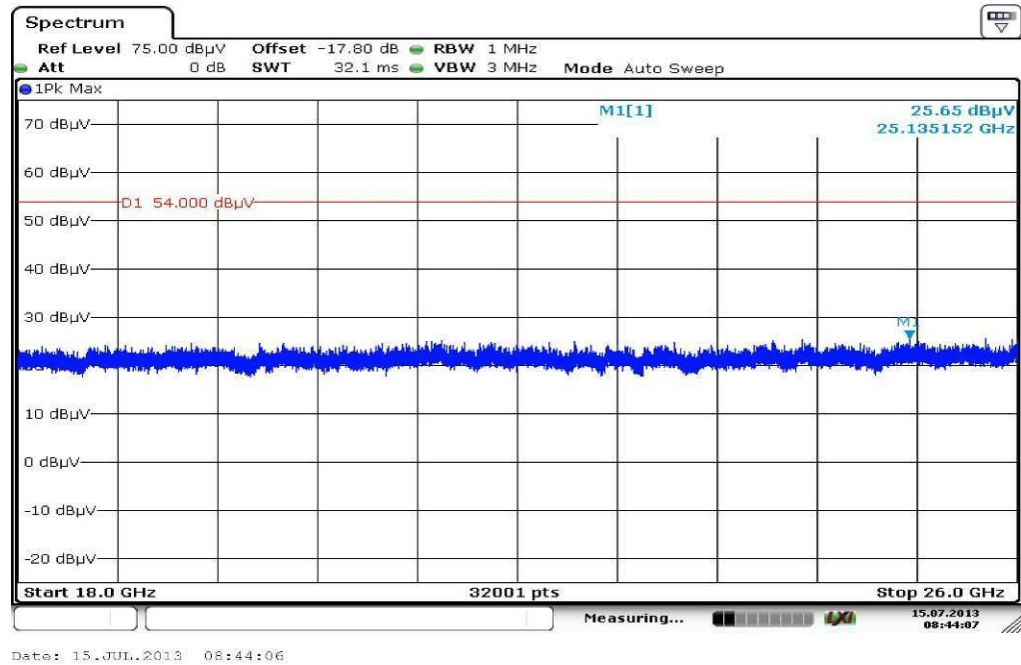
Final Result 1

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
31.992300	10.5	1000.0	120.000	170.0	V	261.0	12.7	19.5	30.0	
34.975350	11.7	1000.0	120.000	105.0	V	100.0	13.0	18.3	30.0	
50.225400	10.3	1000.0	120.000	170.0	V	10.0	13.4	19.7	30.0	
735.387450	20.7	1000.0	120.000	111.0	V	261.0	23.3	15.3	36.0	
769.150500	21.0	1000.0	120.000	170.0	H	100.0	23.7	15.0	36.0	
956.285400	22.7	1000.0	120.000	132.0	V	80.0	25.4	13.3	36.0	

Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

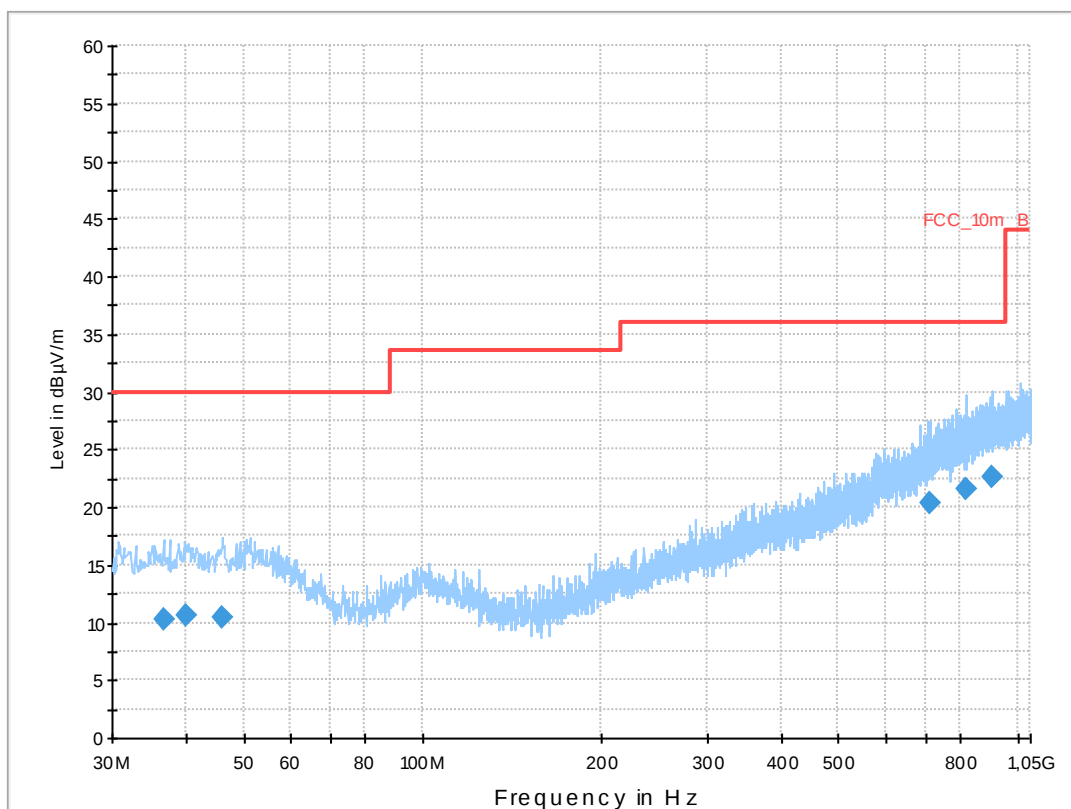
Plots: OFDM / n – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN n-mode, MCS0, Ch. 1
 Operator Name: Hennemann
 Comment: battery powered

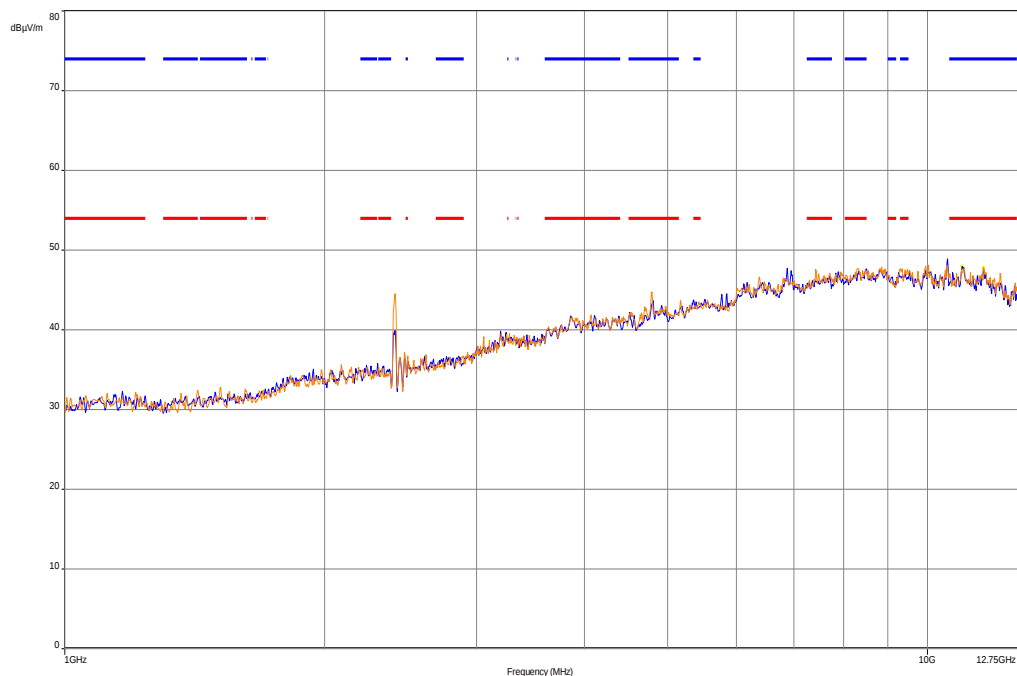
Scan Setup: STAN_Fin [EMI radiated]

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

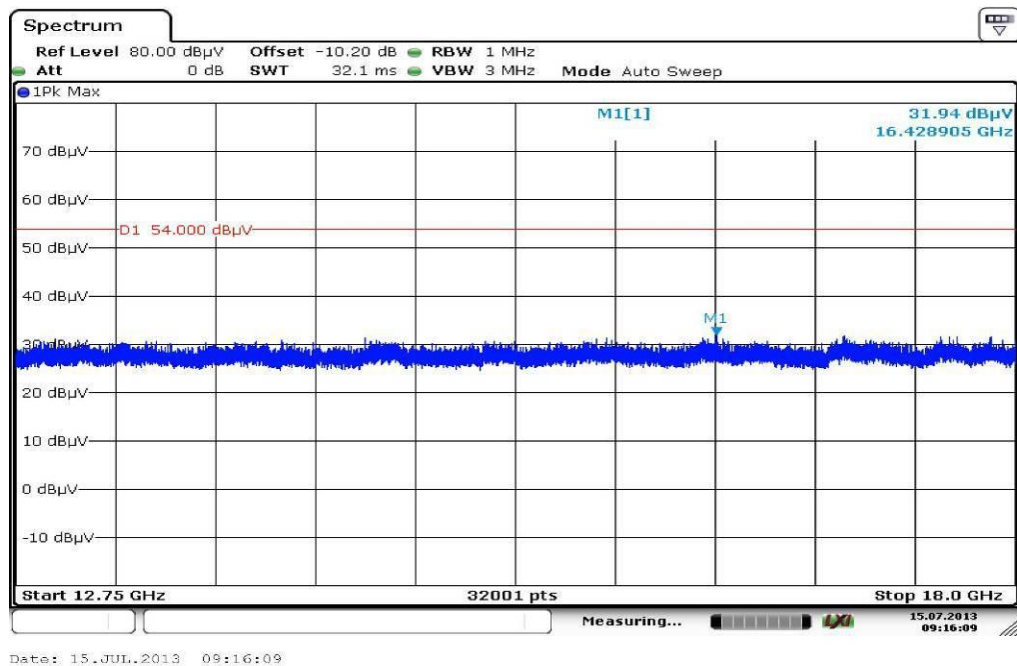
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

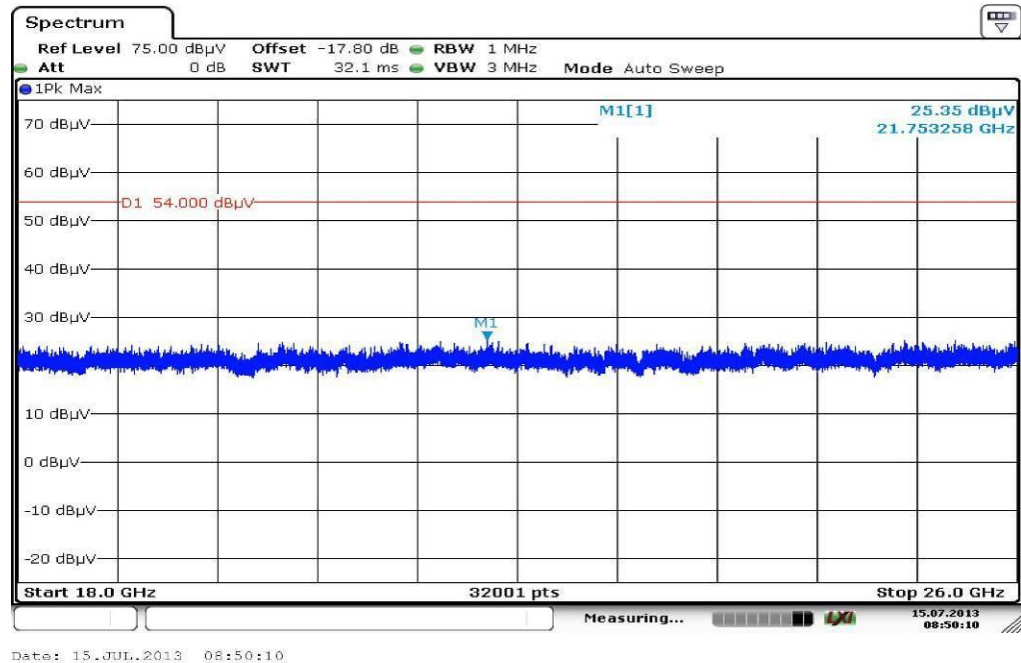
**Final Result 1**

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
36.599100	10.3	1000.0	120.000	160.0	V	170.0	13.2	19.7	30.0	
39.926400	10.6	1000.0	120.000	170.0	V	-10.0	13.4	19.4	30.0	
46.138950	10.5	1000.0	120.000	170.0	V	100.0	13.3	19.5	30.0	
711.573150	20.3	1000.0	120.000	98.0	H	280.0	22.8	15.7	36.0	
820.577550	21.5	1000.0	120.000	98.0	H	280.0	24.1	14.5	36.0	
907.444350	22.6	1000.0	120.000	170.0	V	0.0	25.2	13.4	36.0	

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

The carrier signal is notched with a 2.4 GHz band rejection filter.

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

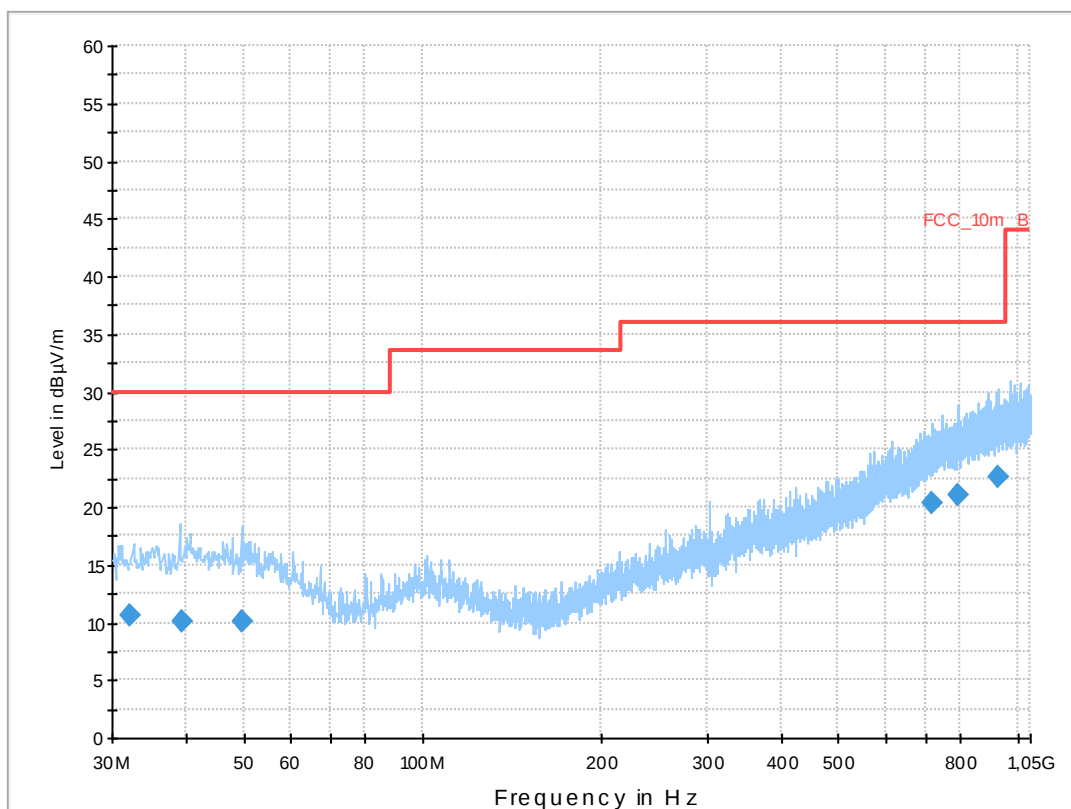
Common Information

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN n-mode, MCS0, Ch. 6
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

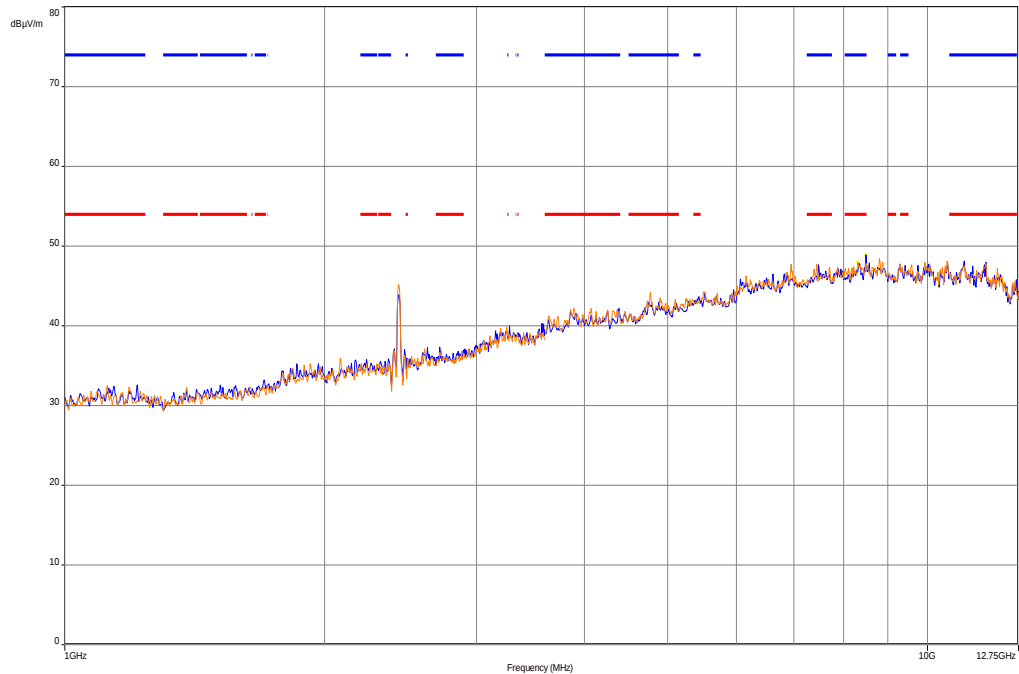
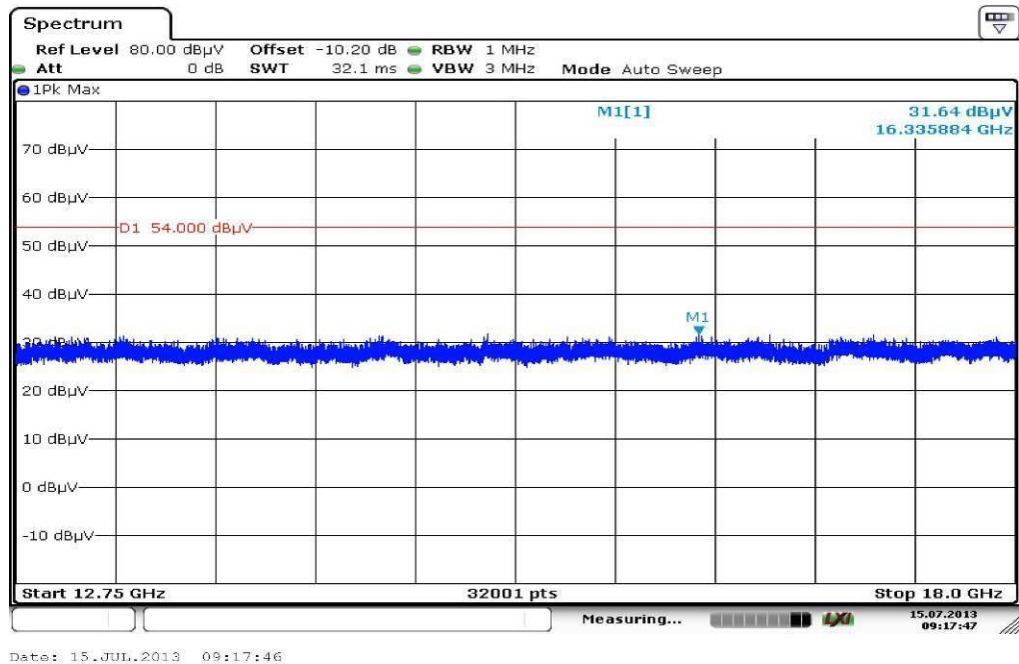
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

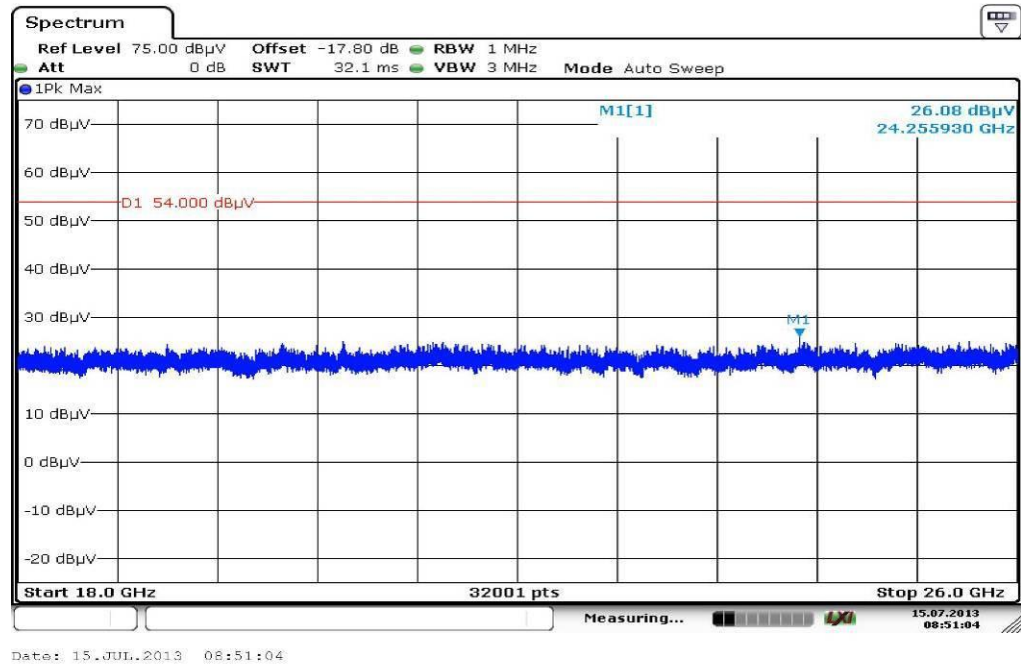
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



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
32.055900	10.6	1000.0	120.000	170.0	V	170.0	12.7	19.4	30.0	
39.353250	10.0	1000.0	120.000	170.0	H	-5.0	13.4	20.0	30.0	
49.792950	10.1	1000.0	120.000	98.0	H	10.0	13.4	19.9	30.0	
716.956350	20.3	1000.0	120.000	98.0	H	10.0	22.9	15.7	36.0	
796.040550	21.1	1000.0	120.000	150.0	V	90.0	23.8	14.9	36.0	
929.458500	22.5	1000.0	120.000	170.0	V	90.0	25.3	13.5	36.0	

Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 7:** Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

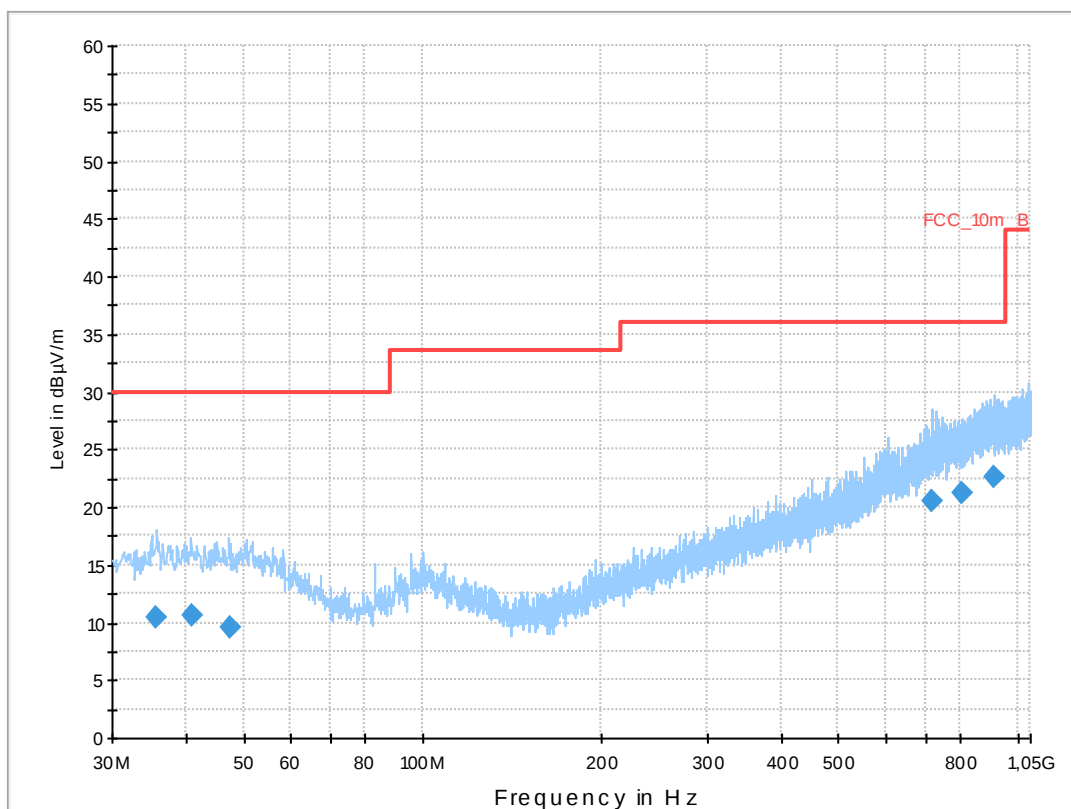
Common Information

EUT: RFW121LW
 Serial Number: IMEI: 004402242380297
 Test Description: FCC part 15 class B
 Operating Conditions: TX WLAN n-mode, MCS0, Ch. 11
 Operator Name: Hennemann
 Comment: battery powered

Scan Setup: STAN_Fin [EMI radiated]

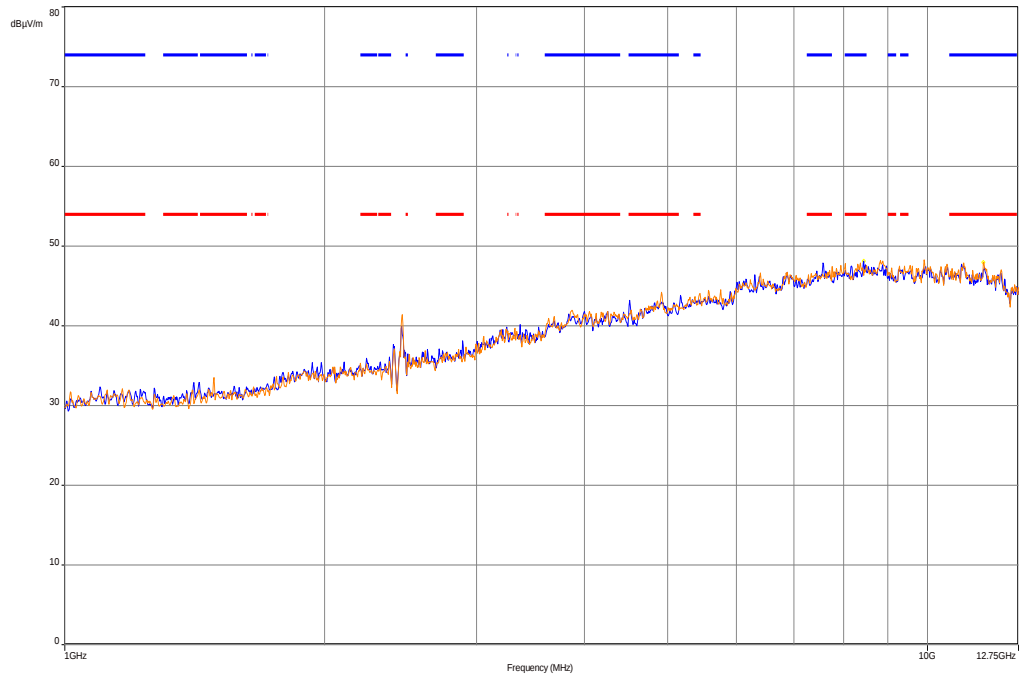
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

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

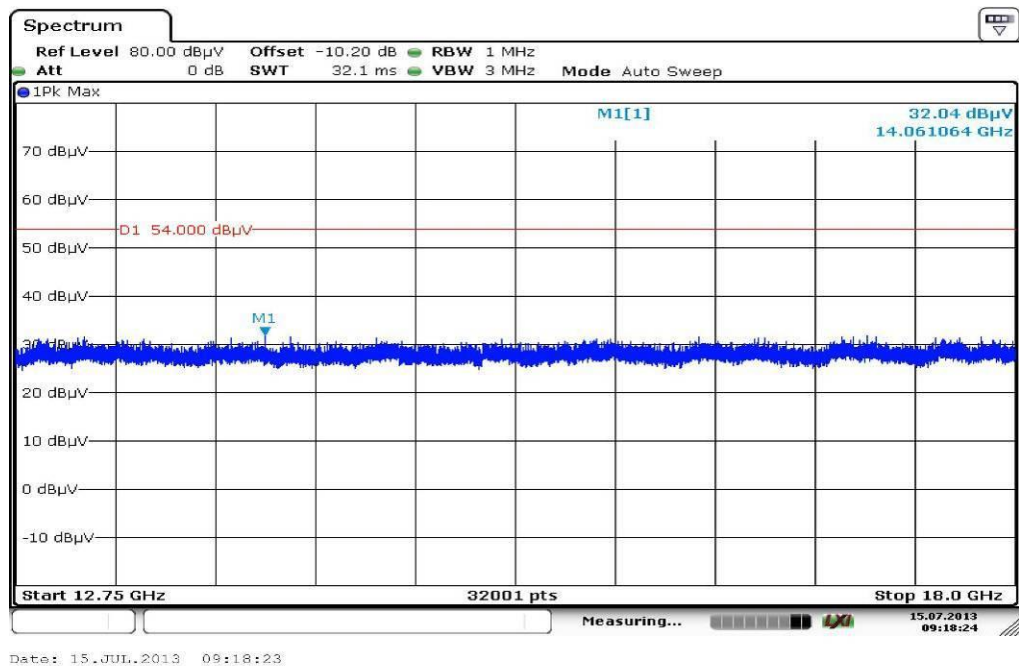


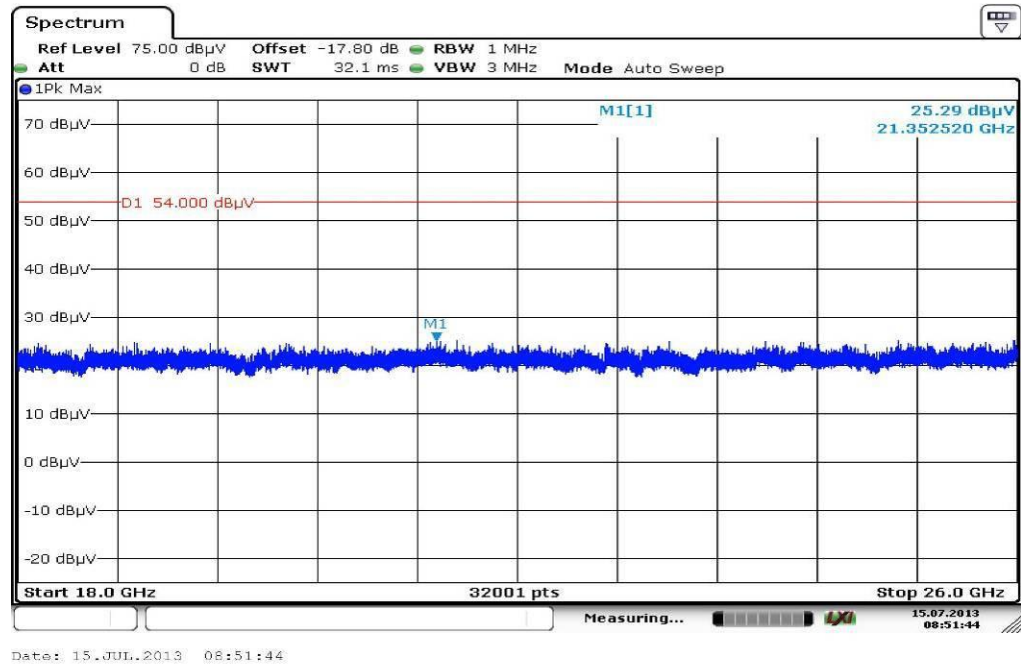
Final Result 1

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
35.569950	10.4	1000.0	120.000	163.0	H	261.0	13.1	19.6	30.0	
40.930800	10.6	1000.0	120.000	121.0	H	266.0	13.4	19.4	30.0	
47.432250	9.6	1000.0	120.000	121.0	V	10.0	13.3	20.4	30.0	
720.030150	20.5	1000.0	120.000	170.0	V	92.0	23.0	15.5	36.0	
806.609400	21.2	1000.0	120.000	170.0	V	180.0	23.9	14.8	36.0	
911.083500	22.5	1000.0	120.000	170.0	H	100.0	25.2	13.5	36.0	

Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

10.10 RX spurious emissions radiated

Not performed! Tests according to manufacturer tests plan!

10.11 Spurious emissions radiated < 30 MHz

Not performed! Tests according to manufacturer tests plan!

10.12 Spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is repeated for DSSS and OFDM modulation. If peaks are found channel 1 and channel 11 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 remeasured 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:

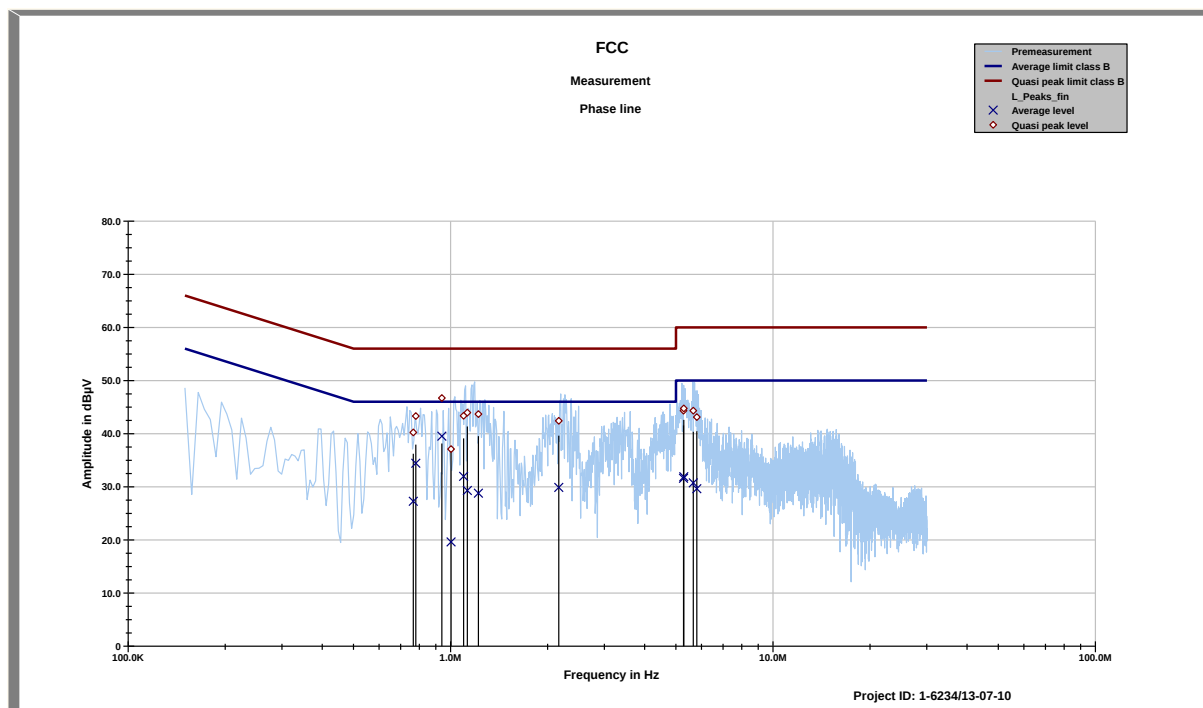
FCC		
TX Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dBμV/m)	Average (dBμV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

*Decreases with the logarithm of the frequency

Results:

TX Spurious Emissions Conducted < 30 MHz [dBμV/m]		
F [MHz]	Detector	Level [dBμV/m]
No peaks detected. All detected peak values are below the average limits.		
Measurement uncertainty	± 3 dB	

Result: Passed

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

FCC

Phase line tbl

Project ID: 1-6234/13-07-10

02:57:11 PM, Tuesday, July 16, 2013

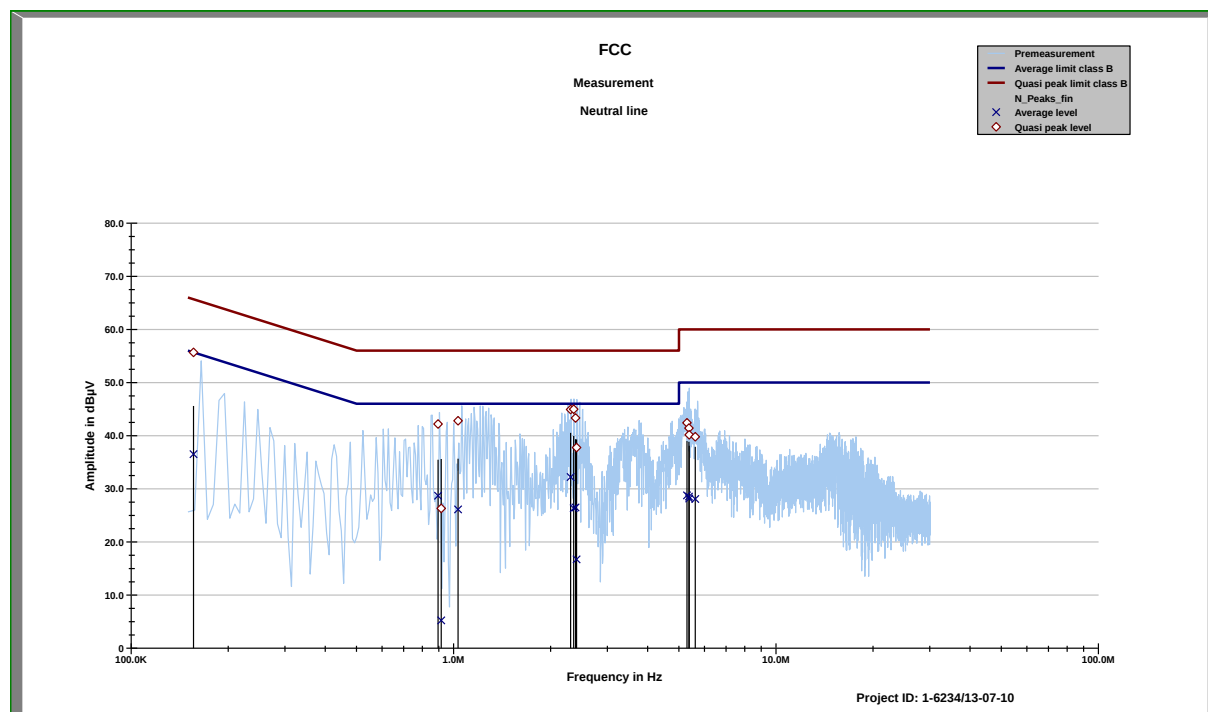
Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.76613	40.23	15.77	27.28	18.72
0.77988	43.31	12.69	34.43	11.57
0.93948	46.70	9.30	39.53	6.47
1.00301	37.09	18.91	19.62	26.38
1.09734	43.36	12.64	31.97	14.03
1.12723	43.95	12.05	29.31	16.69
1.21975	43.67	12.33	28.80	17.20
2.165	42.42	13.58	29.89	16.11
5.2752	44.33	15.67	31.59	18.41
5.2862	44.74	15.26	31.89	18.11
5.6571	44.32	15.68	30.74	19.26
5.8002	43.12	16.88	29.63	20.37

Project ID - 1-6234/13-07-10

EUT - RFW121LW + HS2 + CH2 + USB2 + HDMI

Serial Number - IMEI: 004402242380297

Operating mode - WLAN b-mode TX + charging + video out HDMI

Plot 2: TX mode, 150 kHz to 30 MHz, neutral line

FCC

Neutral line tbl

Project ID: 1-6234/13-07-10

02:57:11 PM, Tuesday, July 16, 2013

Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.15614	55.67	10.00	36.52	19.30
0.8947	42.18	13.82	28.68	17.32
0.91542	26.30	29.70	5.23	40.77
1.03197	42.79	13.21	26.12	19.88
2.3062	44.92	11.08	32.21	13.79
2.3563	44.97	11.03	26.34	19.66
2.3884	43.33	12.67	26.48	19.52
2.406	37.76	18.24	16.72	29.28
5.2928	42.42	17.58	28.75	21.25
5.3661	41.42	18.58	28.53	21.47
5.3796	40.15	19.85	28.16	21.84
5.6163	39.79	20.21	28.08	21.92

Project ID - 1-6234/13-07-10

EUT - RFW121LW + HS2 + CH2 + USB2 + HDMI

Serial Number - IMEI: 004402242380297

Operating mode - WLAN b-mode TX + charging + video out HDMI

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 (Labor/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.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B597 9	300000210	ne		
4	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	09.01.2013	09.01.2014
5	n. a.	Analyzer- Reference- System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2013	14.07.2015
6	n. a.	Amplifier	JS42- 00502650- 28-5A	MITEQ	1084532	300003379	ev		
7	n. a.	Antenna Tower	Model 2175	ETS- LINDGREN	64762	300003745	izw		
8	n. a.	Positioning Controller	Model 2090	ETS- LINDGREN	64672	300003746	izw		
9	n. a.	Turntable Interface-Box	Model 105637	ETS- LINDGREN	44583	300003747	izw		
10	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbe ck	295	300003787	k	12.04.2012	12.04.2014
11	n. a.	Spectrum- Analyzer	FSU26	R&S	200809	300003874	k	16.01.2013	16.01.2014
12	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKII	08.05.2013	08.05.2015
13	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
14	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
15	9	Isolating Transformer	MPL IEC625 Bus Regeltrennt ravo	Erfi	91350	300001155	ne		
16	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
17	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
18	n. a.	Amplifier	js42- 00502650- 28-5a	Parzich GMBH	928979	300003143	ne		
19	n. a.	Band Reject filter	WRCG240 0/2483- 2375/2505- 50/10SS	Wainwright	11	300003351	ev		
20	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologi es	MY51210197	300004405	k	21.02.2013	21.02.2014
21	11b	Microwave System Amplifier, 0.5- 26.5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		

22	A025	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda		300000786	ne		
23	A027	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300000486	ne		
24	n. a.	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.10.2012	22.10.2013

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
vkI!	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
1.0	Initial release	2013-08-12
-A	Editorial changes	2013-08-16

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
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



Deutsche Akkreditierungsstelle GmbH

Befähigung gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL
VoIP und DECT
Akustik
Funk einschließlich WLAN
Short Range Devices (SRD)
RFID
WiMax und Richtfunk
Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
Produktsicherheit
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth
Wi-Fi-Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 18.01.2013 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 80 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-01

Frankfurt am Main, 18.01.2013

Siehe Einträge auf der Rückseite

Im Auftrag
Ulrich Pöhl, Abteilungsleiter

Back side of certificate

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Standort Braunschweig
Rundellallee 100
38116 Braunschweig

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Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom 31. Juli 2009 (BGBl. I S. 2675) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung im Zusammenhang mit der Vermarktung von Produkten (Abl. L 218 vom 9. Juli 2008, S. 30). Die DAKKS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:

EA: www.european-accreditation.org

ILAC: www.ilac.org

IAF: www.iaf.nu

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>