

Test Report

of

JLT6012A

according to

Radiated emission in part of the restricted bands

FCC 47 CFR, Part 15 Subpart C
15.247 Operation within the band 2400 - 2483.5 MHz

EKTOS Testing & Reliability Services A/S

Performed by



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Examined by



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Report no.:	P20-0146-4	Report date:	2021-02-08
Test started:	2020-11-05	Test ended:	2020-12-15
Test laboratory:	EKTOS TRS A/S Peter Bangs Vej 17 7600 Struer Denmark	Client:	JLT Mobile Computers Isbjörnsvägen 3 352 45 Växjö Sweden
Contact person:	David Busk	Contact person:	Johan Elfström
Facility reg. no.	FCC Designation number: DK0003		
Test specimen:	Model: JLT6012A		
Test specification:	FCC 47 CFR Part 15 Subpart C 15.247 Operation within the band 2400 - 2483.5 MHz All tests were performed according to ANSI 63.10:2013 The tests relevant for the test specimens are listed in <i>section 1.1</i>.		
Documentation:	This test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The complete test documentation is archived for 10 years at the testing laboratory.		
Test results:	The test specimen complies with relevant parts of the test specifications. The test results relate only to the specimen tested.		
Test personnel:	David Busk		

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Appendices

None

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1 SUMMARY

The radio module has a modular approval, thus only radiated emission in restricted bands domain has been performed to show compliance after installation in host.

1.1 Test plan

Standard	Name of the test	Results
15.247 (d)	Emission in restricted bands	PASSED

PASSED The test was performed and the test specimen complies with the essential requirements in the standard.
FAILED The test was performed and the test specimen does not comply with the essential requirements in the standard.
REF The test is covered by a test in another report and/or on a similar test specimen.
NR The test is not relevant for the test specimen or has been waived by the manufacturer.

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1.2 Test specimen

Manufacturer	JLT Mobile
Name	JLT6012A
Model	JLT6012A
Serial number	6012A-000017
Part number	102213
Software	Image: 20200904.1599193220_sierra_userdebug
Firmware	MCU : 109
Supply voltage	12 - 60 VDC (24 VDC was used)
Radio modules	WIFI & BT: USI System on Module: MS01 Cellular and GPS: Sierra Wireless EM7455 NFC: PN7150



Photo 1. Test specimen. Front view.



Photo 2. Test specimen. Back view.

The JLT6012A contains 3 radio modules:

- WIFI & BT, 2.4 GHz and 5 GHz: USI System on Module MS01 using an internal antenna. The module has a Single Module Approval.
- Cellular and GPS: Sierra Wireless EM7455 using the external Main and Diversity Smartwing antenna from Smarteq designed for internal car usage. The module has a Single Module Approval.
- NFC: PN7150 internal module with an external Tag mounted to unit. The NFC reader was activated when performing 30 – 1000 MHz measurements. Tests for the NFC radio module are covered in other reports.

The WIFI & BT radio module and the cellular radio module has previously been tested according to relevant standards. Thus only the implementation of the radios and eventual interaction between the radios was tested.

Tests were made in worst-case configurations based on pre-measurements and existing test reports for the radio modules.

Application	Description	TX channel frequency [MHz]
Wi-Fi 802.11b	802.11b.Nss1 1 Mbps 2TX	2412
Wi-Fi 802.11AC	1747.8802.11ac VHT40 nss1 MCS0	5190
UMTS B2	UMTS Band 2 (1900)	1880
UMTS B5	UMTS Band 5 (850)	836.6
LTE B3	LTE Band 3 (1800)	1747.5
LTE B7	LTE Band 7 (2600)	2535

Table 1. TX channels.

1.3 Auxiliary equipment

1.3.1 External antennas

Manufacturer	Smarteq
Model	Smartwing
Serial no.	-
Part no.	710157
Details	Max 10W, 2.5m, Connector SMA
Supply voltage	3.3-5V
Operational mode	Passive Mode

1.3.2 Tag

Manufacturer	QUIO GmbH
Model	KEYFOB-TI2048-03ABS-BK
Serial no.	N/A
Part no.	101836
Details	ISO 15693 (Texas instrument)
Supply voltage	Passive tag
Operational mode	Passive tag

1.3.3 JLT computer

Manufacturer	JLT Mobile
Model	JLT6012
Serial no.	-
Details	Windows
Supply voltage	AC/DC 24V
Operational mode	Used programming test specimen

1.3.4 JLT computer

Manufacturer	JLT Mobile
Model	JLT6012
Serial no.	-
Details	Windows
Supply voltage	AC/DC 24V
Operational mode	Used programming test specimen

1.3.5 Loop-back dongle

Manufacturer	-
Model	-
Serial no.	-
Details	No specific details about the device
Supply voltage	-
Operational mode	Used as a loop-back device for the serial port.

1.3.6 USB drive

Manufacturer	Lacia
Model	-
Serial no.	-
Details	No specific details about the device
Supply voltage	-
Operational mode	Connected to USB-C port

1.3.7 USB dongle

Manufacturer	-
Model	-
Serial no.	-
Details	-
Supply voltage	-
Operational mode	Connected to USB 2.0 port

1.4 I/O ports / cables to test specimen

I/O Port Cable	Type	Shielding	Max Cable length
DC Power	2 wire	Unshielded	<3 m
USB 2.0 (Type A)	4 Wire	Shielded	<3 m
USB-C	Normal	Shielded	<3 m
Ethernet	S-Cat 6	Shielded	<3 m
Serial port	Normal	Shielded	<3 m
GNSS	Coaxial	Shielded	<3 m
WWAN	Coaxial	Shielded	<3 m

1.5 Test set-up

The WIFI & BT: USI System on Module: MS01 was set to transmit using radio module software installed on the JLT computer.

The UMTS part of the Cellular Sierra Wireless module was set to transmit by connecting it to a CMU200 radiocommunication tester.

The LTE part of the Cellular Sierra Wireless module was set to transmit using ATB commands from the JLT computer.

The NFC: PN7150 module was set to transmit by mounting the NFC tag.

2 TESTS

2.1 Emission in restricted bands

Test specimen	JLT6012A
Test specification	47 CFR Part 15.247 (d)
Test method	ANSI C63.10:2013 sec. 11.12
Frequency range	30 MHz – 26.5 GHz
Limits	15.209 in restricted bands.
Transmit mode	Continuous transmission with normal modulation
Comments	Tests were made in worst-case configurations based on pre-measurements and existing test reports for the radio modules.
Temperature / Humidity	24°C / 46%RH, 23°C / 49%RH, 24°C / 46%RH
Dates of measurements	2020-11-05, 2020-11-06, 2020-12-15
Test personnel	David Busk

2.1.1 Test setup

The measurement was performed in the Anechoic Chamber.

Below 1 GHz measurements were made with reflective floor and the test specimen was placed 80 cm above ground plan on a nonconductive table.

Above 1GHz measurements were made with absorbers on the floor and the test specimen was placed 1.5 m above ground plan on a nonconductive table.

The measuring distance was 3 m from 30 MHz – 18 GHz and 1 m above 18 GHz.

A pre-sweep for spurious components was performed by continuously sweeping over the frequency range while rotating the turn table 360 degrees. This was done in both horizontal and vertical polarization. Frequencies of any spurious components detected were recorded.

The following RBW were used:

30 MHz-1 GHz: RBW = 120 kHz

1-26.5 GHz: RBW = 1 MHz

The measurements were performed with the following combination of radios:

Wi-Fi 802.11b + UMTS B2

Wi-Fi 802.11b + UMTS B5

Wi-Fi 802.11b + LTE B3

Wi-Fi 802.11b + LTE B7

Wi-Fi 802.11AC + UMTS B1 (Investigative measurements were made according to ETSI standards. See appendix 1)

Setup when testing on Wi-Fi 802.11b + UMTS B2:

30 – 1000 MHz: No filters or additional attenuation.

1 – 3 GHz: 2.4 GHz notch filter + B2 notch filter.

3 – 18 GHz: 3 GHz high pass filter.

Above 18 GHz: No filters or additional attenuation.

Setup when testing on Wi-Fi 802.11b + UMTS B5:

1 – 3 GHz: 2.4 GHz notch filter + 1 GHz high pass filter.

3 – 18 GHz: 3 GHz high pass filter.

Above 18 GHz: No filters or additional attenuation.

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Setup when testing on Wi-Fi 802.11b + LTE B3:

- 1 – 3 GHz: 2.4 GHz notch filter + B3 notch filter.
- 3 – 18 GHz: 3 GHz high pass filter.
- Above 18 GHz: No filters or additional attenuation.

Setup when testing on Wi-Fi 802.11b + LTE B7:

- 1 – 3 GHz: 2.4 GHz notch filter + additional 9 dB attenuation.
- 3 – 18 GHz: 3 GHz high pass filter.
- Above 18 GHz: No filters or additional attenuation.

(Investigative measurements were made according to ETSI standards. See appendix 1):

Setup when testing on Wi-Fi 802.11AC + UMTS B1:

- 1 – 3.5 GHz: B1 notch filter + additional 12 dB attenuation.
- 3.5 – 6 GHz: 3 GHz high pass filter + additional 12 dB attenuation.
- 6 – 12.75 GHz: 5 GHz high pass filter.
- Above 12.75 GHz: No filters or additional attenuation.



Photo 3. Test set up 30 – 1000 MHz.



Photo 4. Test set up 1 – 18 GHz.



Photo 5. Test set up 18 – 26 GHz.

2.1.2 Test limits

Frequency range [MHz]	Field strength limit [$\mu\text{V/m}$]	Field strength limit [dB $\mu\text{V/m}$]
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Table 2. Radiated emission limits 3 m distance. FCC 47 CRF §15.209 (a), Class B.

The field strength limit in $\mu\text{V/m}$ is converted to limit in dB $\mu\text{V/m}$.

Average Limit 3 m [dB $\mu\text{V/m}$]	Peak limit 3 m [dB $\mu\text{V/m}$]	3 m / 1 m Factor [dB]	Average Limit 1 m [dB $\mu\text{V/m}$]	Peak limit 1 m [dB $\mu\text{V/m}$]
53.98	73.98	9.54	63.5	83.5

Table 3. Radiated emission limits at 1 m distance above 960 MHz. FCC 47 CRF §15.209 (a), Class B.

2.1.3 Test results

2.1.3.1 30 MHz to 1 GHz

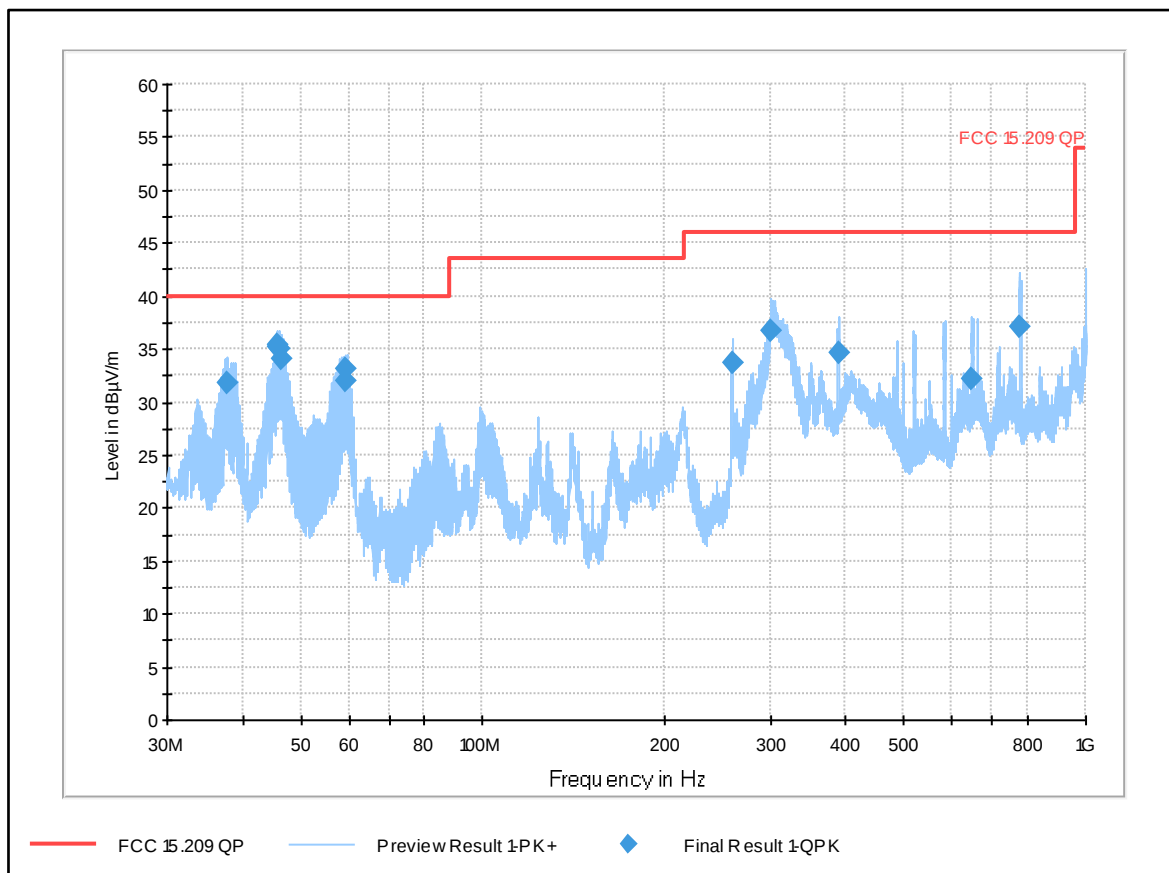


Figure 1. Emission in restricted bands test results 30 - 1000 MHz. EUT vertical. 802.11b + UMTS B2.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
37.670000	31.8	120.0	100.0	V	100.0	8.2	40.0	PASSED
45.640000	35.3	120.0	100.0	V	76.0	-	-	
45.880000	35.5	120.0	100.0	V	81.0	-	-	
46.120000	35.1	120.0	100.0	V	135.0	-	-	
46.350000	34.0	120.0	100.0	V	125.0	-	-	
59.160000	33.1	120.0	100.0	V	357.0	-	-	
59.390000	32.1	120.0	100.0	V	313.0	-	-	
259.870000	33.7	120.0	119.0	H	26.0	12.3	46.0	PASSED
301.390000	36.7	120.0	119.0	H	195.0	-	-	
389.860000	34.6	120.0	126.0	V	0.0	-	-	
646.890000	32.2	120.0	100.0	V	156.0	-	-	
776.570000	37.1	120.0	100.0	H	302.0	-	-	

Table 4. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna vertical. 802.11b + UMTS B2.

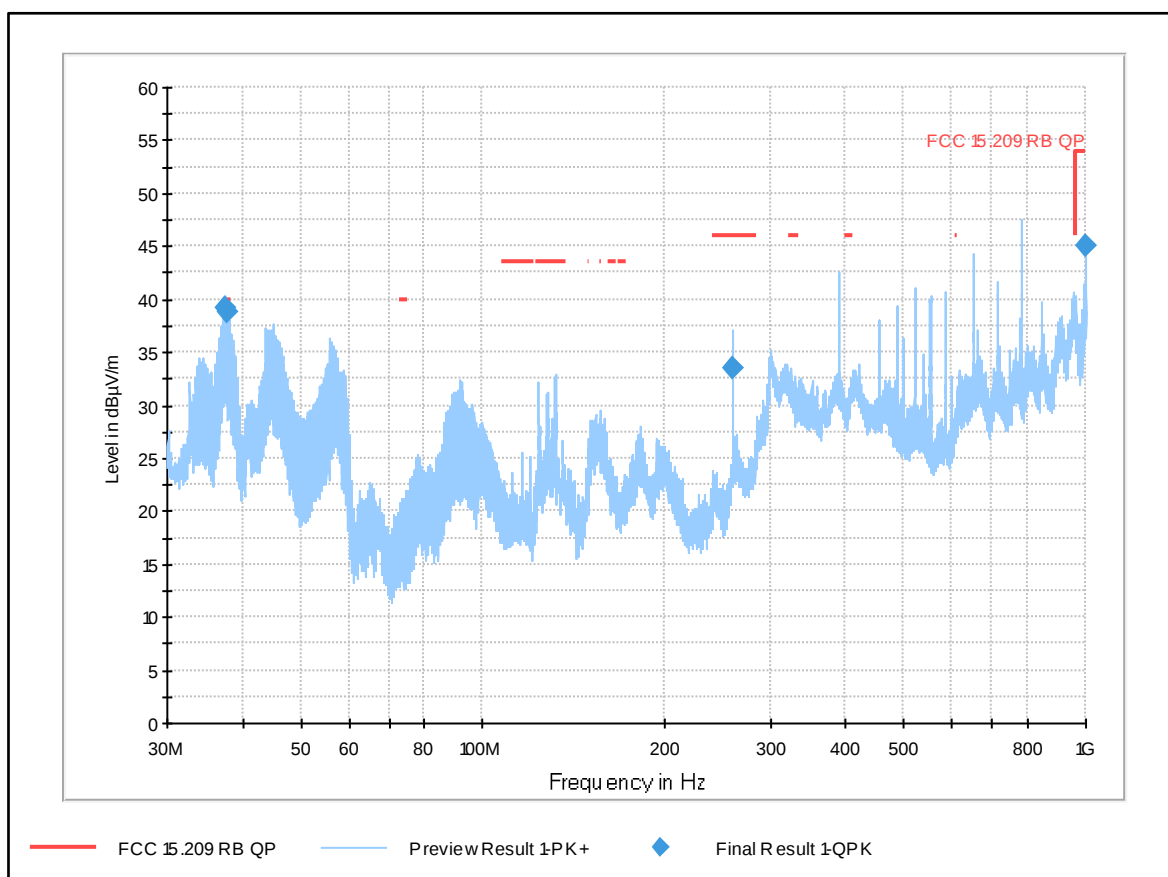


Figure 2. Emission in restricted bands test results 30 - 1000 MHz. EUT vertical. 802.11b + UMTS B2.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
37.580000	39.1	120.0	100.0	V	32.0	0.9	40.0	PASSED
37.820000	38.7	120.0	100.0	V	155.0	1.3	40.0	PASSED
260.000000	33.5	120.0	100.0	H	194.0	12.5	46.0	PASSED
997.460000	45.0	120.0	100.0	H	150.0	9.0	54.0	PASSED

Table 5. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna vertical. 802.11b + UMTS B2.

2.1.3.2 1 GHz to 3 GHz

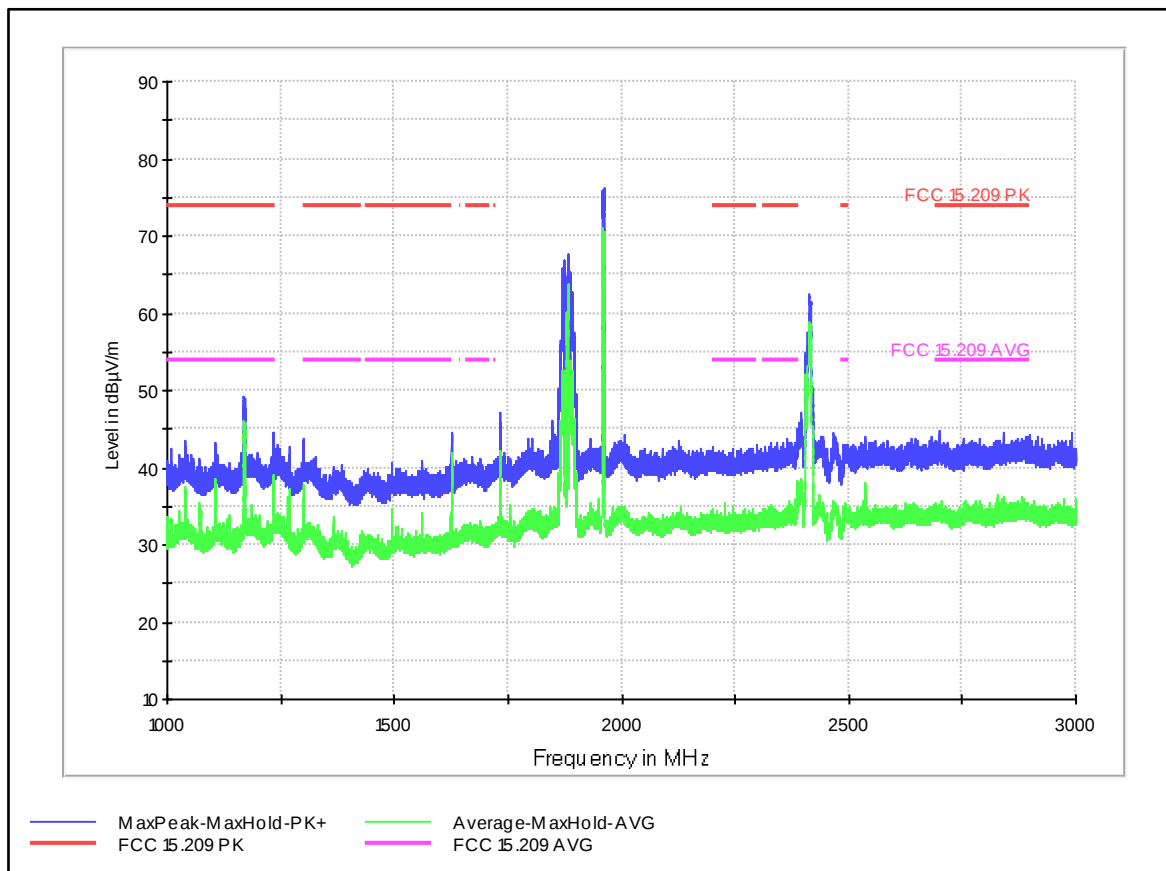


Figure 3. Emission in restricted bands test results 1 - 3 GHz. Antenna vertical. 802.11b + UMTS B2.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 6. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna vertical. 802.11b + UMTS B2.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 7. Radiated emission in restricted bands test results- 1 – 3 GHz. Average detector. Antenna vertical. 802.11b + UMTS B2.

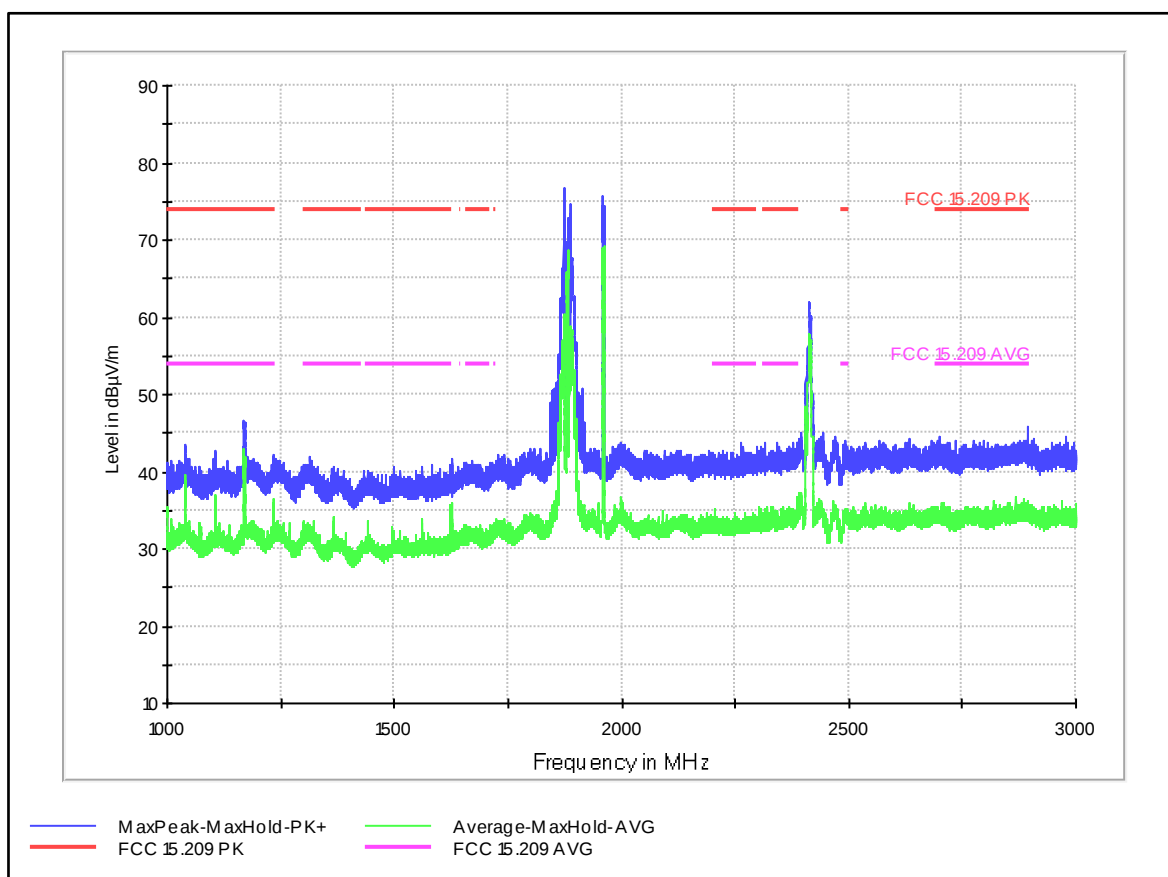


Figure 4. Emission test in restricted bands results 1 - 3 GHz. Antenna horizontal. 802.11b + UMTS B2.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 8. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna horizontal. 802.11b + UMTS B2.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 9. Radiated emission in restricted bands test results- 1 – 3 GHz. Average detector. Antenna horizontal. 802.11b + UMTS B2.

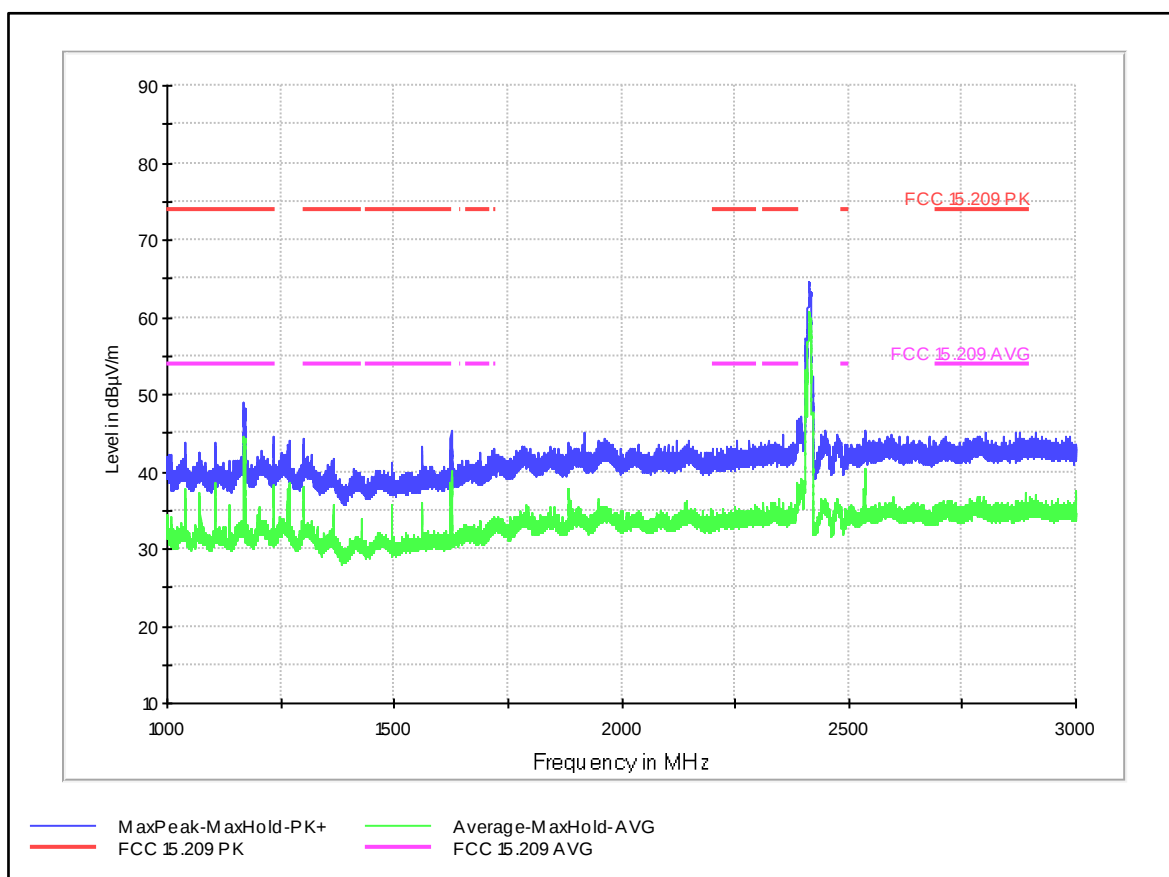


Figure 5. Emission in restricted bands test results 1 - 3 GHz. Antenna vertical. 802.11b + UMTS B5.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 10. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna vertical. 802.11b + UMTS B5.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 11. Radiated emission in restricted bands test results- 1 – 3 GHz. Average detector. Antenna vertical. 802.11b + UMTS B5.

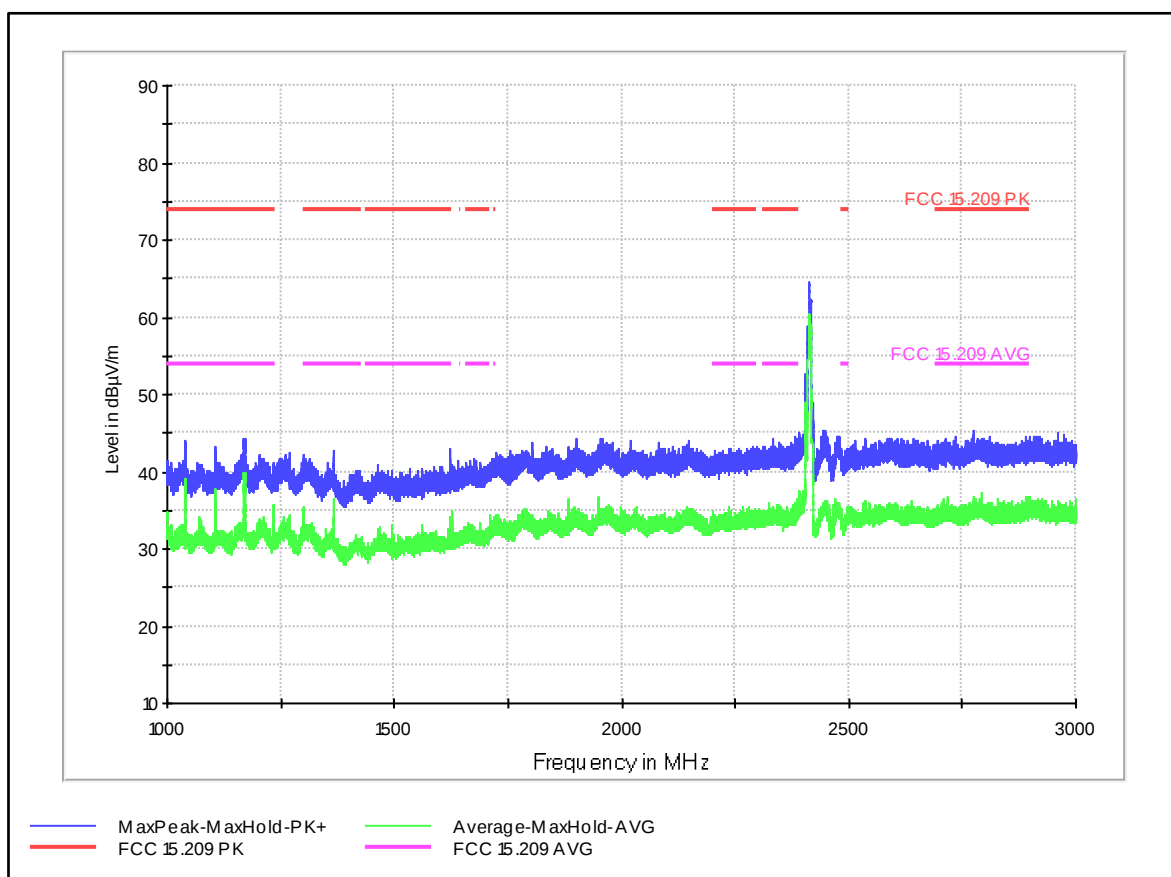


Figure 6. Emission in restricted bands test results 1 - 3 GHz. Antenna horizontal. 802.11b + UMTS B5.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 12. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna horizontal.802.11b + UMTS B5.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 13. Radiated emission in restricted bands test results- 1 – 3 GHz. Average detector. Antenna horizontal. 802.11b + UMTS B5.

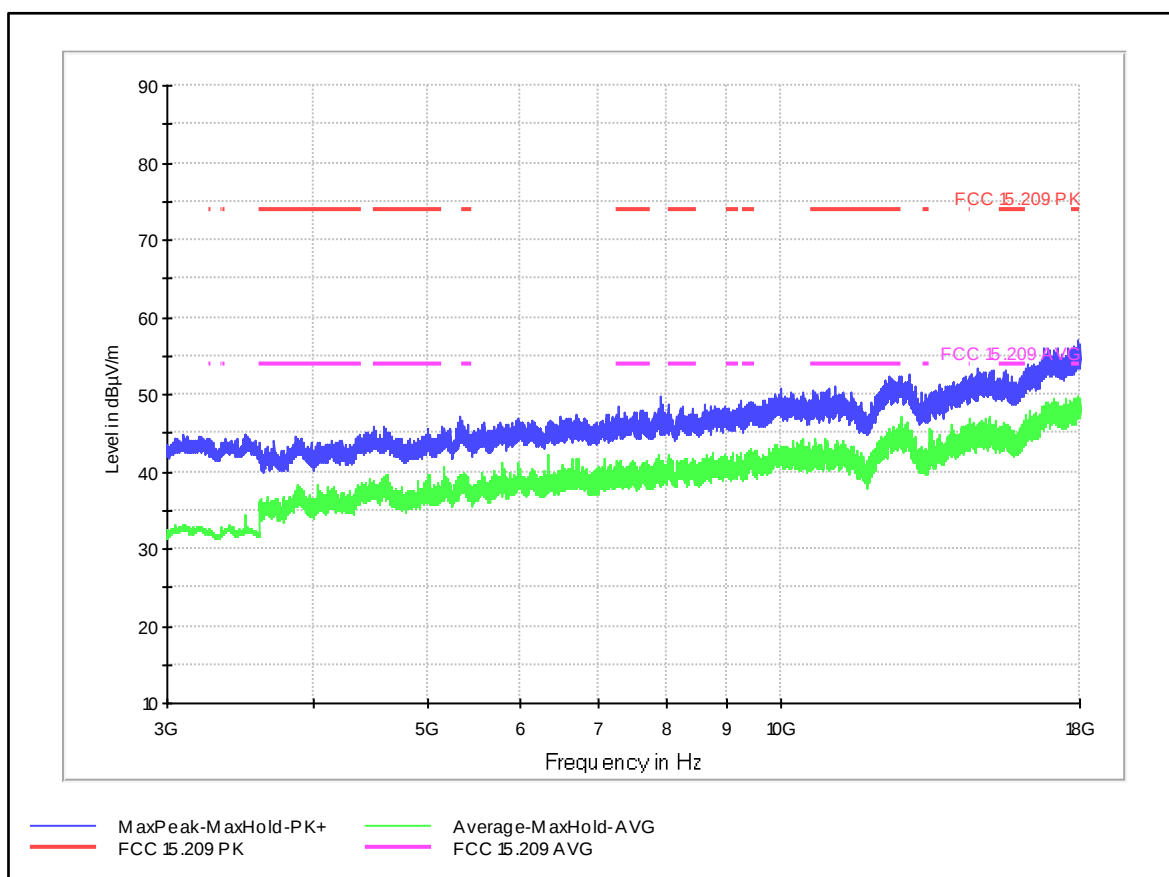


Figure 7. Emission in restricted bands test results 1 - 3 GHz. Antenna vertical. 802.11b + LTE B3.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 14. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna vertical. 802.11b + LTE B3.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 15. Radiated emission in restricted bands test results- 1 – 3 GHz. Average detector. Antenna vertical. 802.11b + LTE B3.

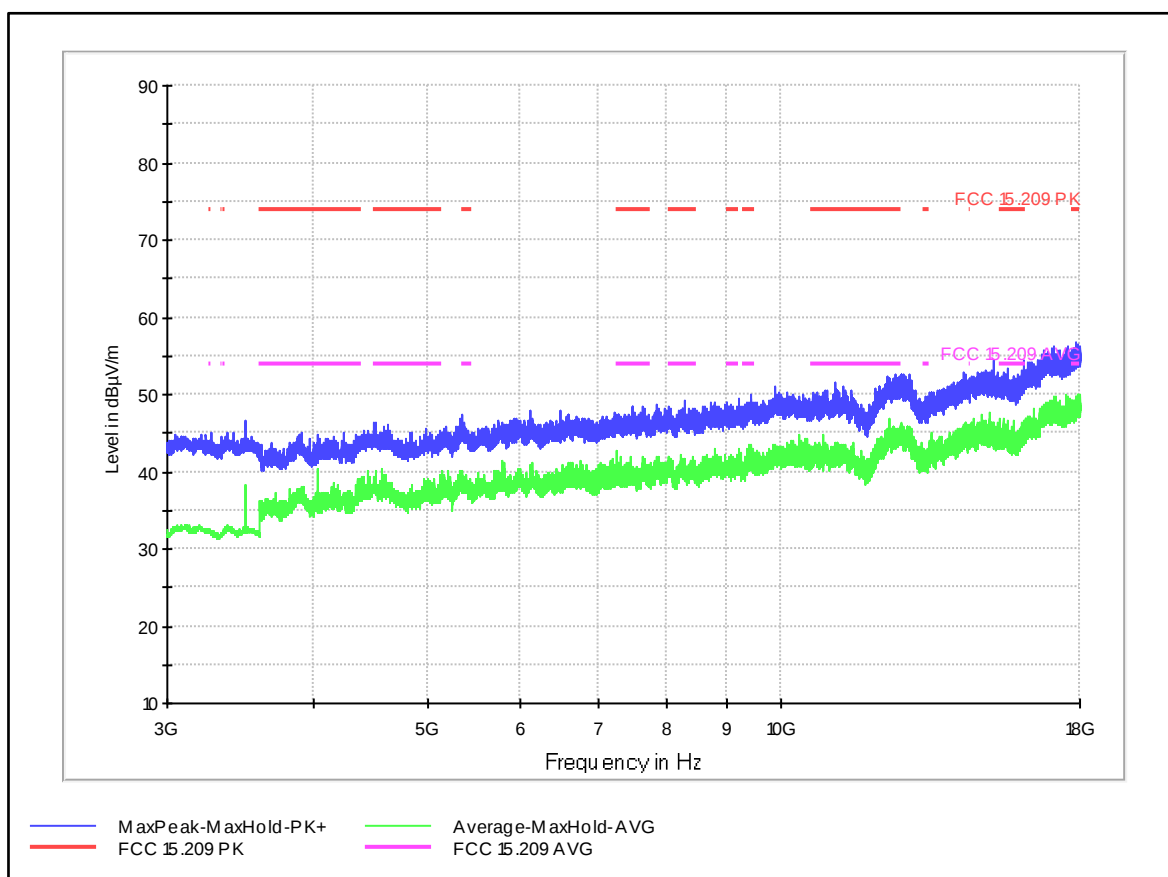


Figure 8. Emission in restricted bands test results 1 - 3 GHz. Antenna horizontal. 802.11b + LTE B3.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 16. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna horizontal. 802.11b + LTE B3.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 17. Radiated emission in restricted bands test results- 1 – 3 GHz. Average detector. Antenna horizontal. 802.11b + LTE B3.

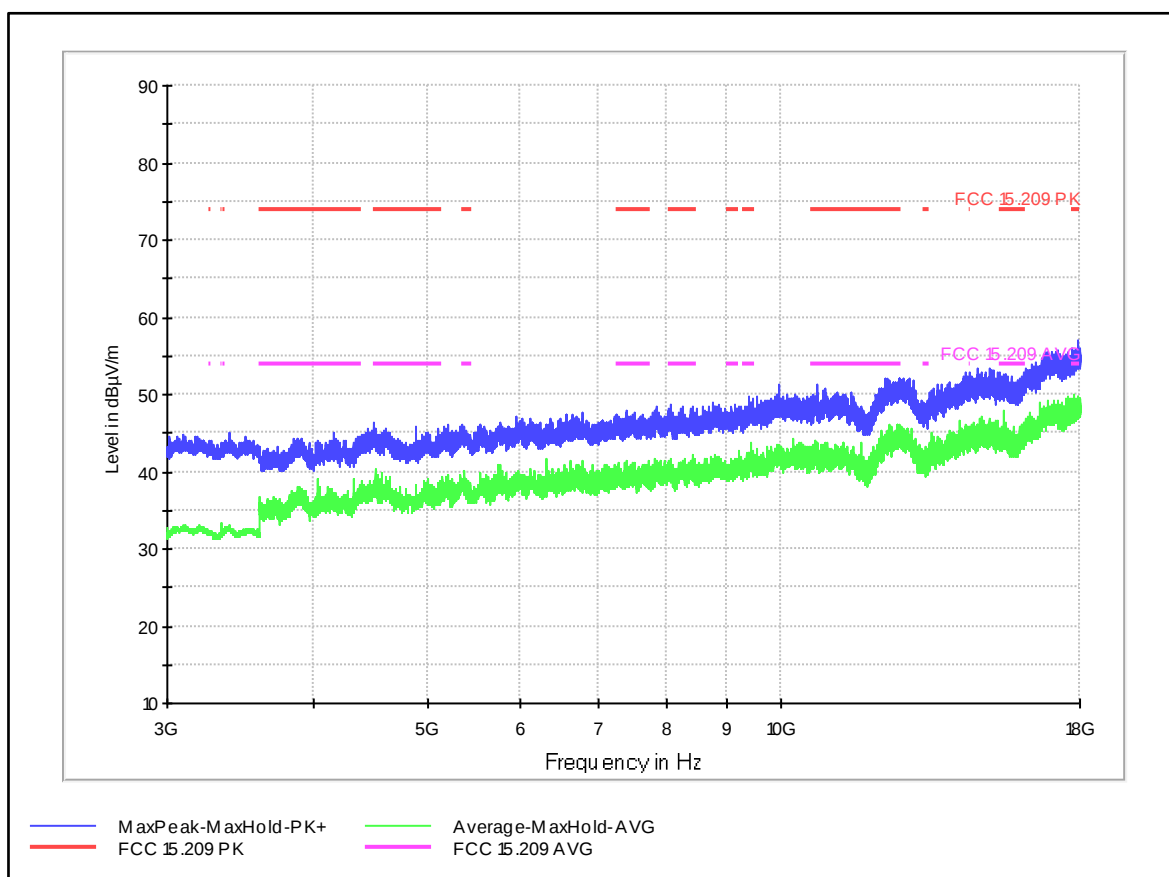


Figure 9. Emission test results 1 - 3 GHz. Antenna vertical. 802.11b + LTE B7.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 18. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna vertical. 802.11b + LTE B7.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 19. Radiated emission in restricted bands test results- 1 – 3 GHz. Average detector. Antenna vertical. 802.11b + LTE B7.

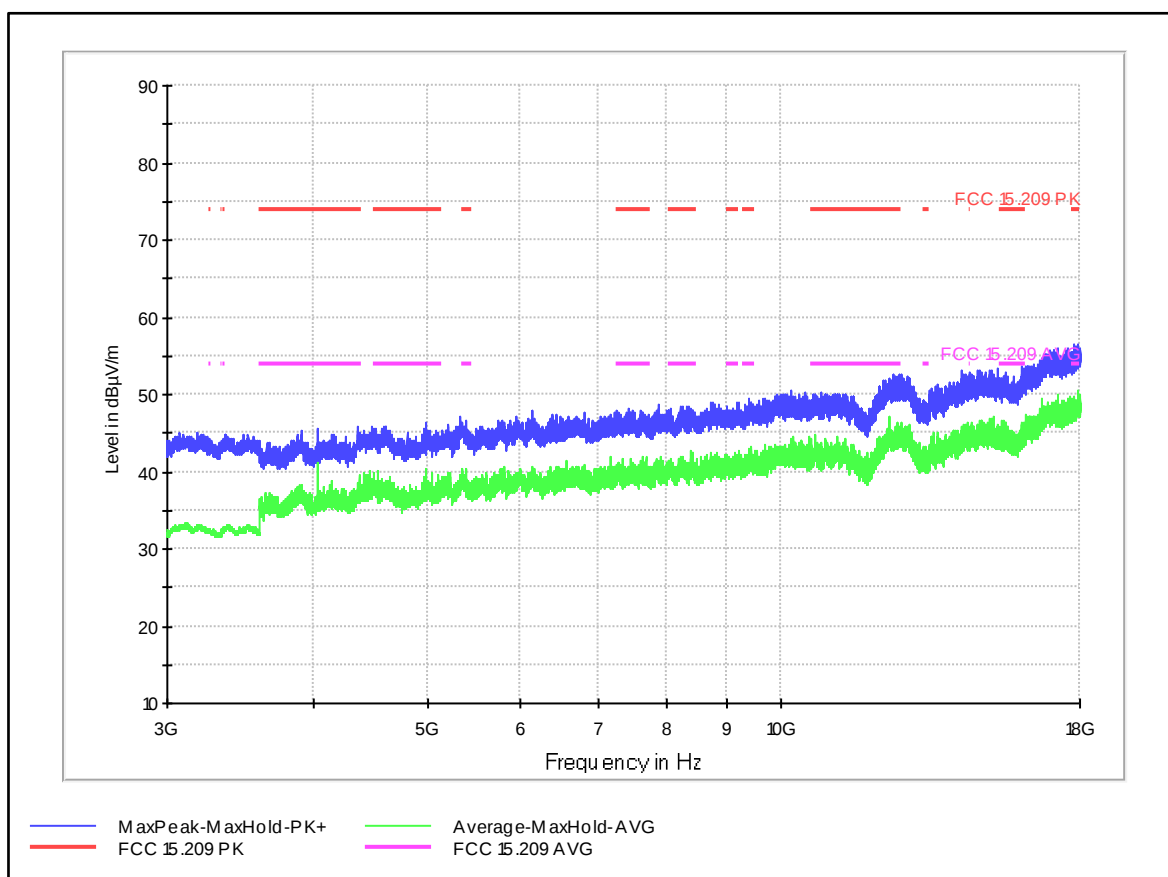


Figure 10. Emission in restricted bands test results 1 - 3 GHz. Antenna horizontal. 802.11b + LTE B7.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 20. Radiated emission in restricted bands test results 1 - 3 GHz. Peak detector. Antenna horizontal. 802.11b + LTE B7.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 21. Radiated emission in restricted bands test results- 1 – 3 GHz. Average detector. Antenna horizontal. 802.11b + LTE B7.

2.1.3.3 3 GHz to 18 GHz

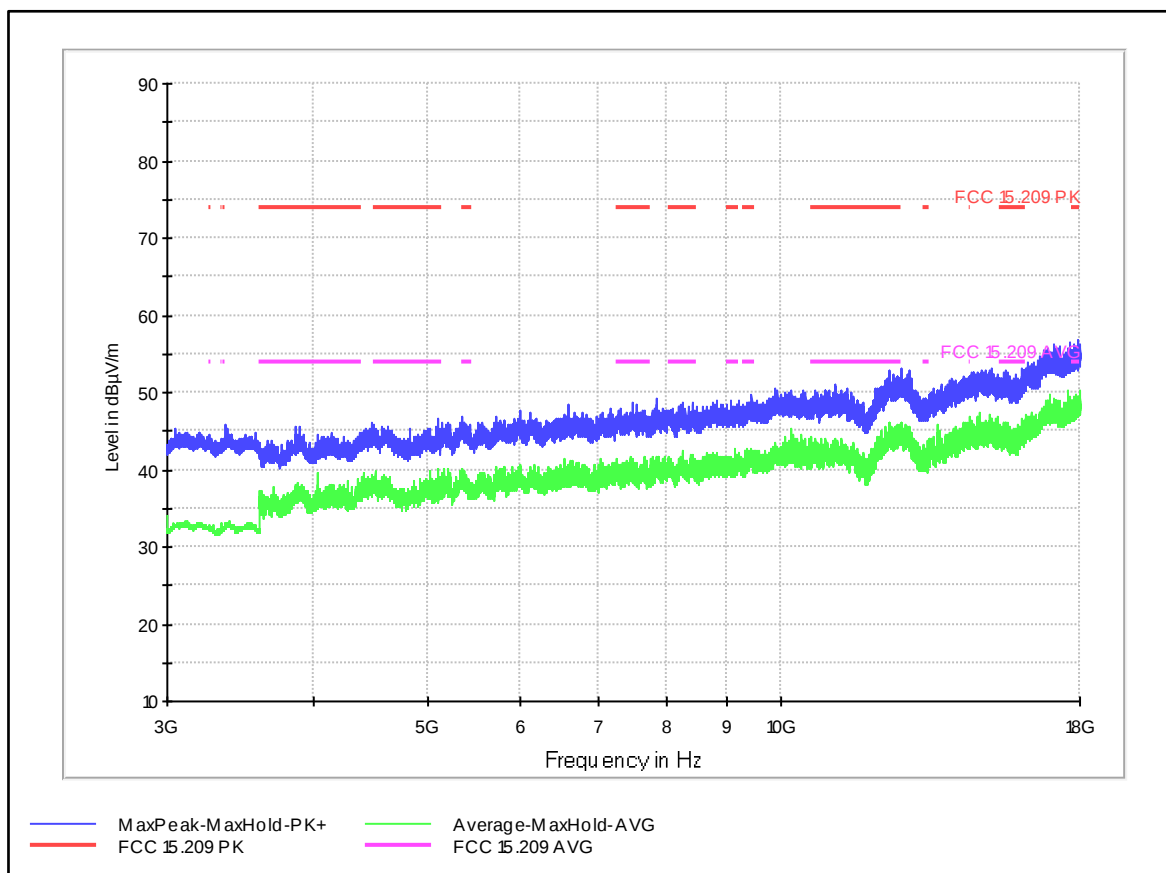


Figure 11. Emission in restricted bands test results 3 – 18 GHz. Antenna vertical. 802.11b + UMTS B2.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 22. Radiated emission in restricted bands test results 3 – 18 GHz. Peak detector. Antenna vertical. 802.11b + UMTS B2.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 23. Radiated emission in restricted bands test results- 3 – 18 GHz. Average detector. Antenna vertical. 802.11b + UMTS B2.

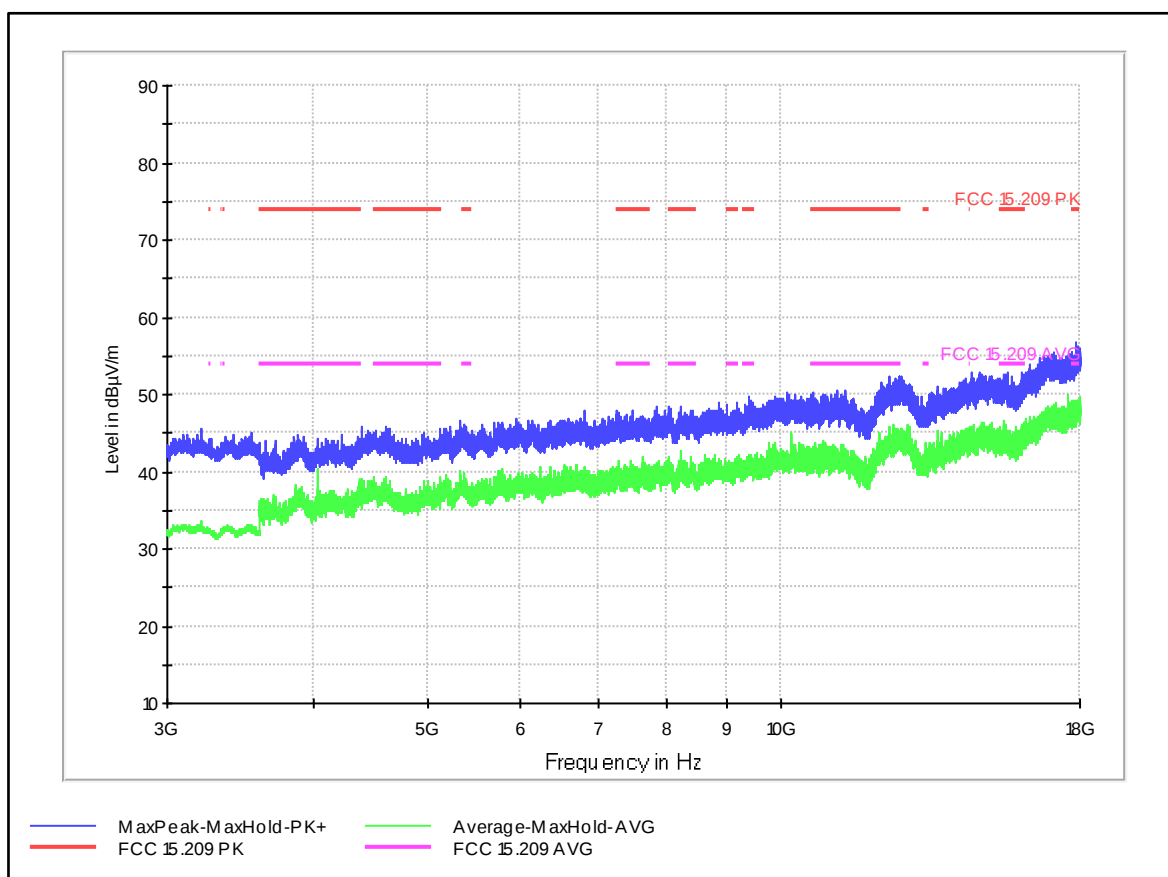


Figure 12. Emission in restricted bands test results 3 – 18 GHz. Antenna horizontal. 802.11b + UMTS B2.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 24. Radiated emission in restricted bands test results 3 – 18 GHz. Peak detector. Antenna horizontal.802.11b + UMTS B2.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 25. Radiated emission in restricted bands test results- 3 – 18 GHz. Average detector. Antenna horizontal. 802.11b + UMTS B2.

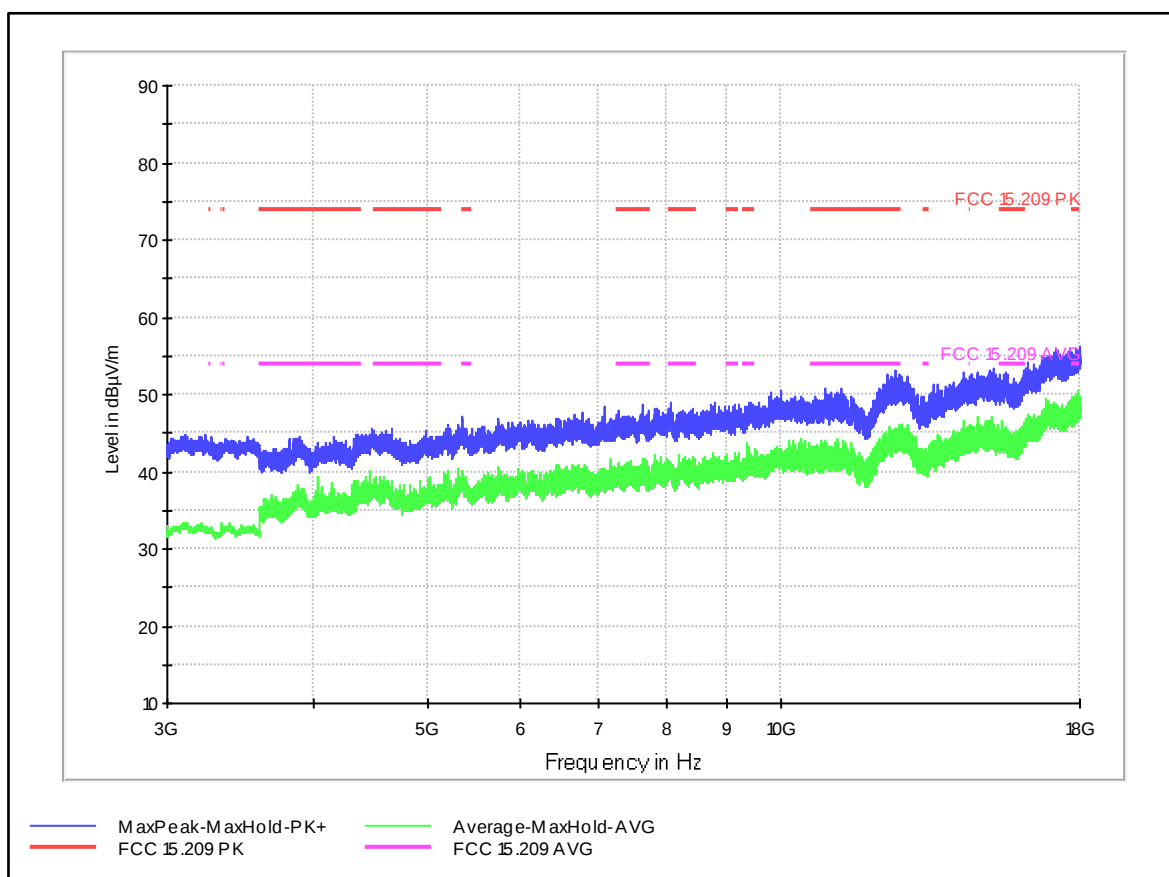


Figure 13. Emission in restricted bands test results 3 – 18 GHz. Antenna vertical. 802.11b + UMTS B5.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 26. Radiated emission in restricted bands test results 3 – 18 GHz. Peak detector. Antenna vertical. 802.11b + UMTS B5.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 27. Radiated emission in restricted bands test results- 3 – 18 GHz. Average detector. Antenna vertical. 802.11b + UMTS B5.

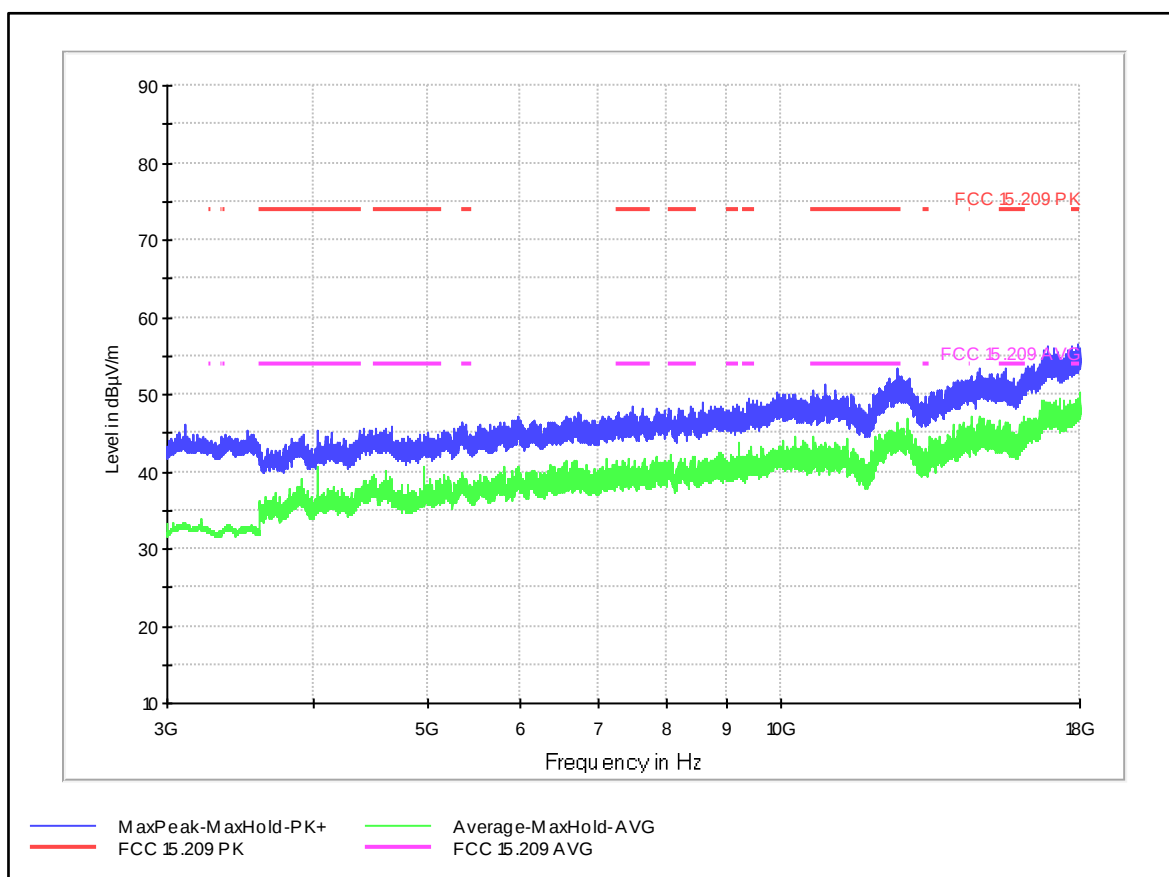


Figure 14. Emission in restricted bands test results 3 – 18 GHz. Antenna horizontal. 802.11b + UMTS B5.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 28. Radiated emission in restricted bands test results 3 – 18 GHz. Peak detector. Antenna horizontal.802.11b + UMTS B5.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 29. Radiated emission in restricted bands test results- 3 – 18 GHz. Average detector. Antenna horizontal. 802.11b + UMTS B5.

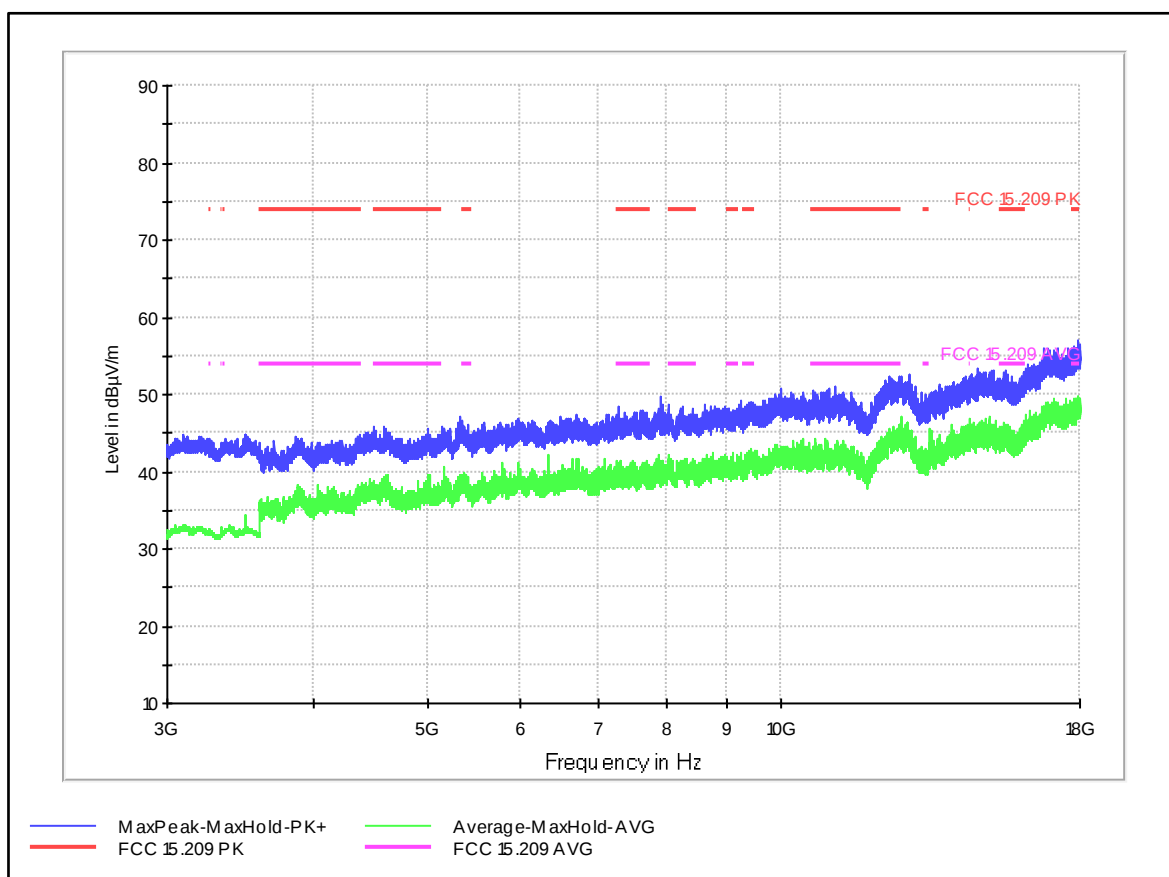


Figure 15. Emission in restricted bands test results 3 – 18 GHz. Antenna vertical. 802.11b + LTE B3.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 30. Radiated emission in restricted bands test results 3 – 18 GHz. Peak detector. Antenna vertical. 802.11b + LTE B3.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 31. Radiated emission in restricted bands test results- 3 – 18 GHz. Average detector. Antenna vertical. 802.11b + LTE B3.

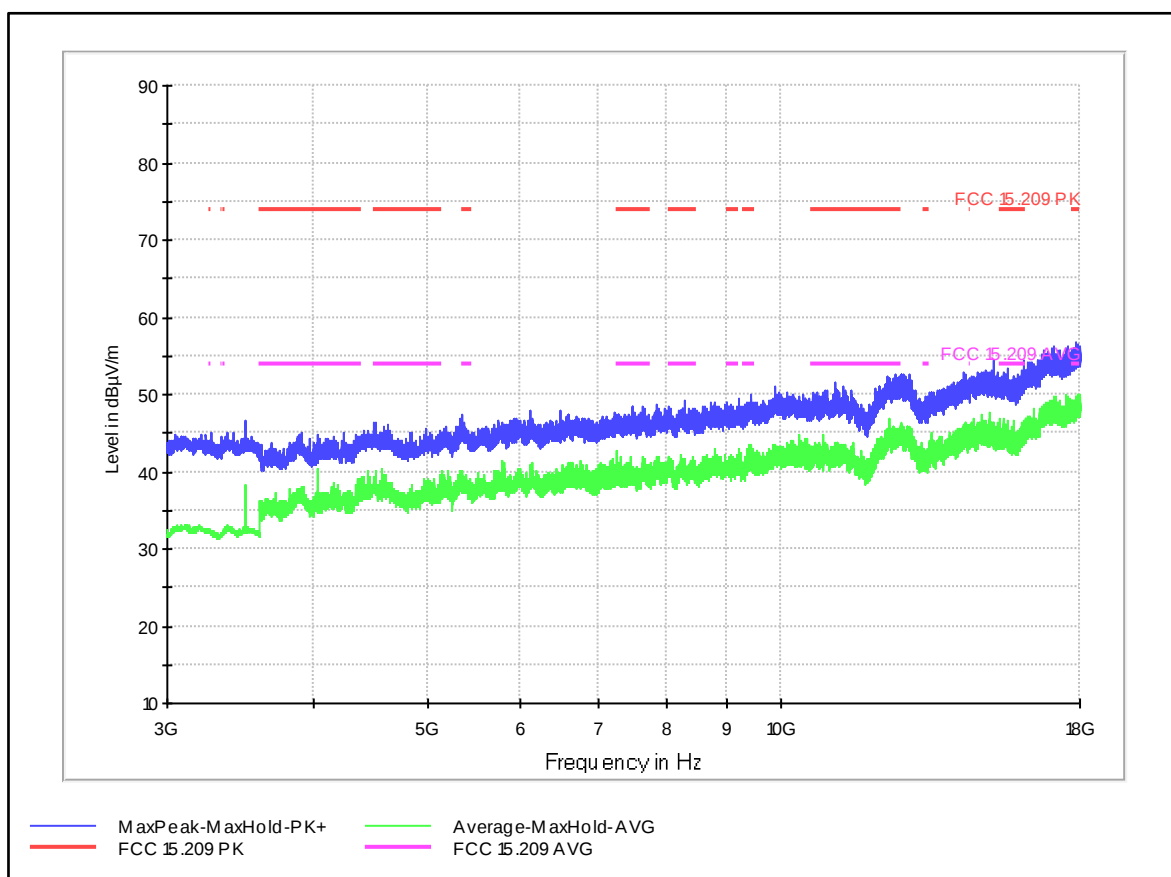


Figure 16. Emission in restricted bands test results 3 – 18 GHz. Antenna horizontal. 802.11b + LTE B3.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 32. Radiated emission in restricted bands test results 3 – 18 GHz. Peak detector. Antenna horizontal. 802.11b + LTE B3.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 33. Radiated emission in restricted bands test results- 3 – 18 GHz. Average detector. Antenna horizontal. 802.11b + LTE B3.

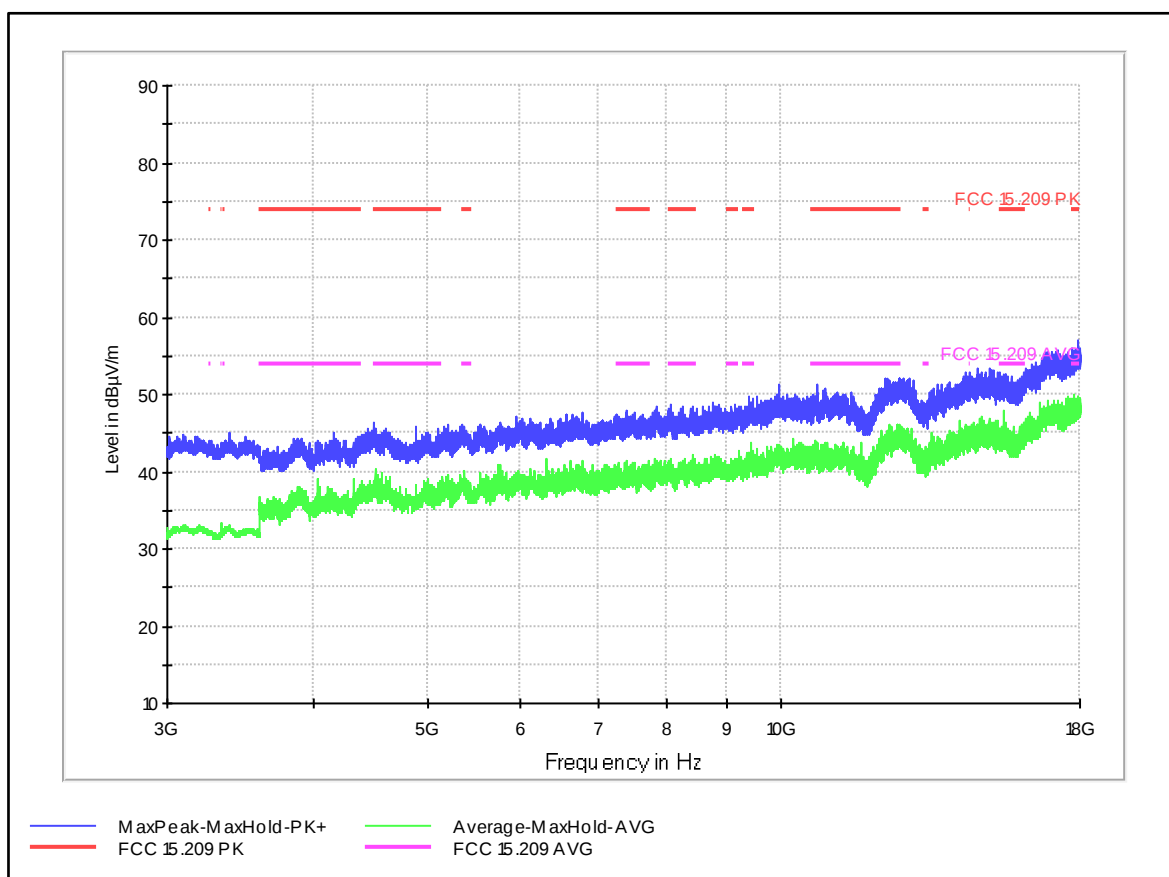


Figure 17. Emission in restricted bands test results 3 – 18 GHz. Antenna vertical. 802.11b + LTE B7.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 34. Radiated emission in restricted bands test results 3 – 18 GHz. Peak detector. Antenna vertical. 802.11b + LTE B7.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 35. Radiated emission in restricted bands test results- 3 – 18 GHz. Average detector. Antenna vertical. 802.11b + LTE B7.

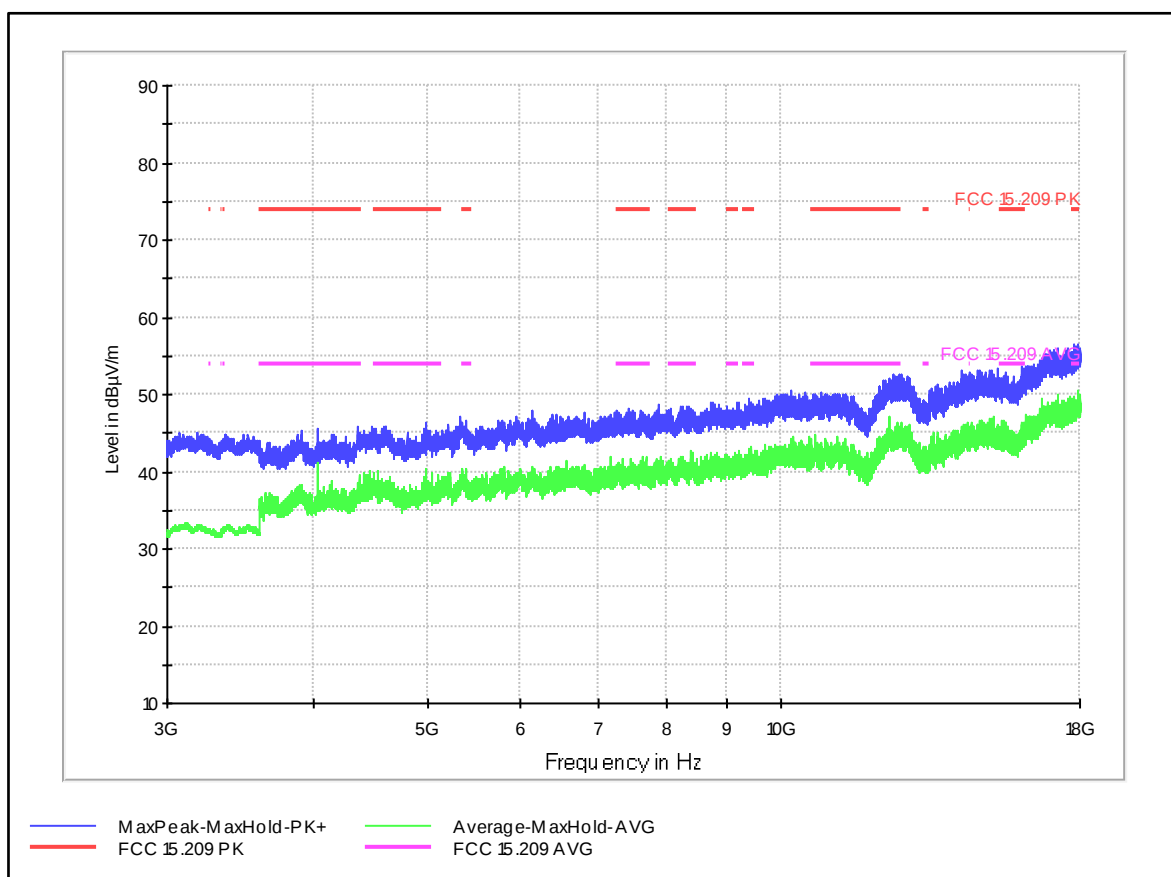


Figure 18. Emission test results 3 – 18 GHz. Antenna horizontal. 802.11b + LTE B7.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	74.0	PASSED

Table 36. Radiated emission in restricted bands test results 3 – 18 GHz. Peak detector. Antenna horizontal. 802.11b + LTE B7.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	54.0	PASSED

Table 37. Radiated emission in restricted bands test results- 3 – 18 GHz. Average detector. Antenna horizontal. 802.11b + LTE B7.

2.1.3.4 18 GHz to 26.5 GHz

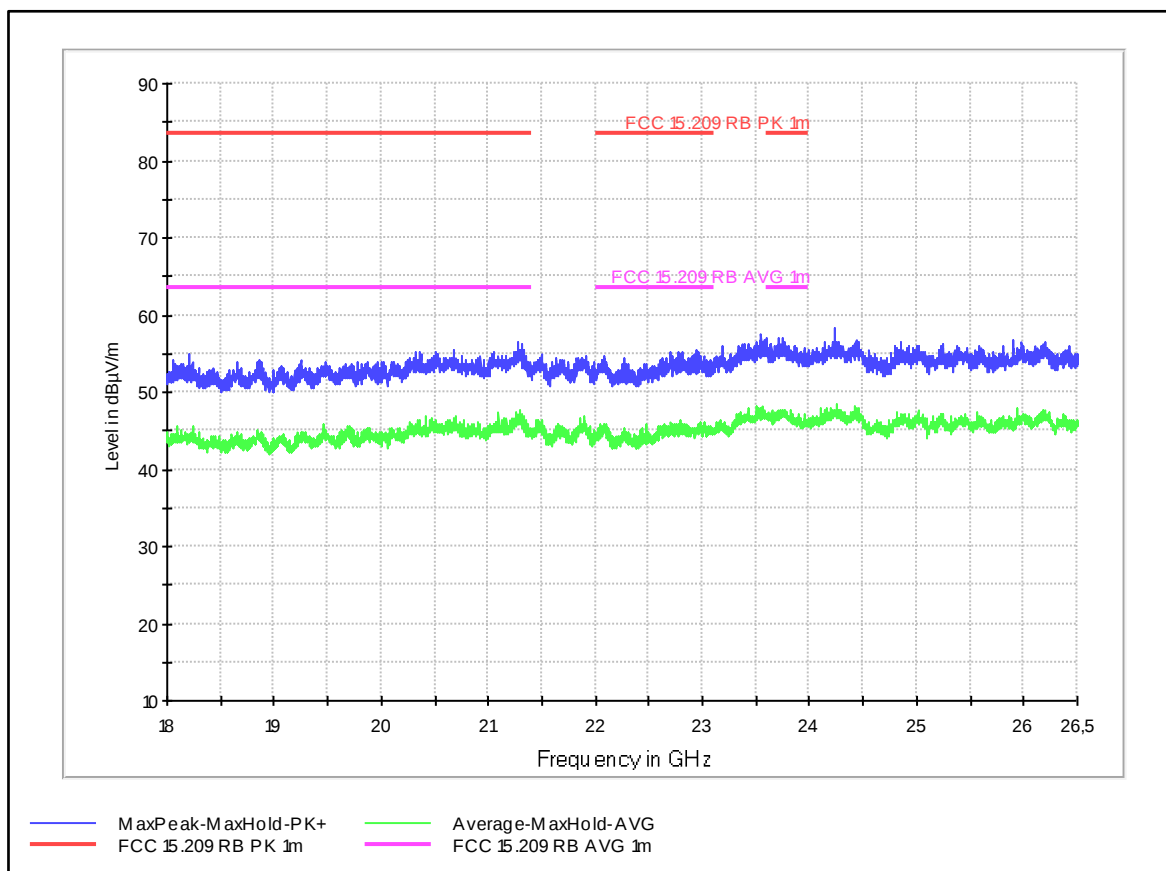


Figure 19. Emission in restricted bands test results 18 – 26.5 GHz. Antenna vertical. 802.11b + UMTS B2.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	83.5	PASSED

Table 38. Radiated emission in restricted bands test results 18 – 26.5 GHz. Peak detector. Antenna vertical. 802.11b + UMTS B2.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	63.5	PASSED

Table 39. Radiated emission in restricted bands test results- 18 – 26.5 GHz. Average detector. Antenna vertical. 802.11b + UMTS B2.

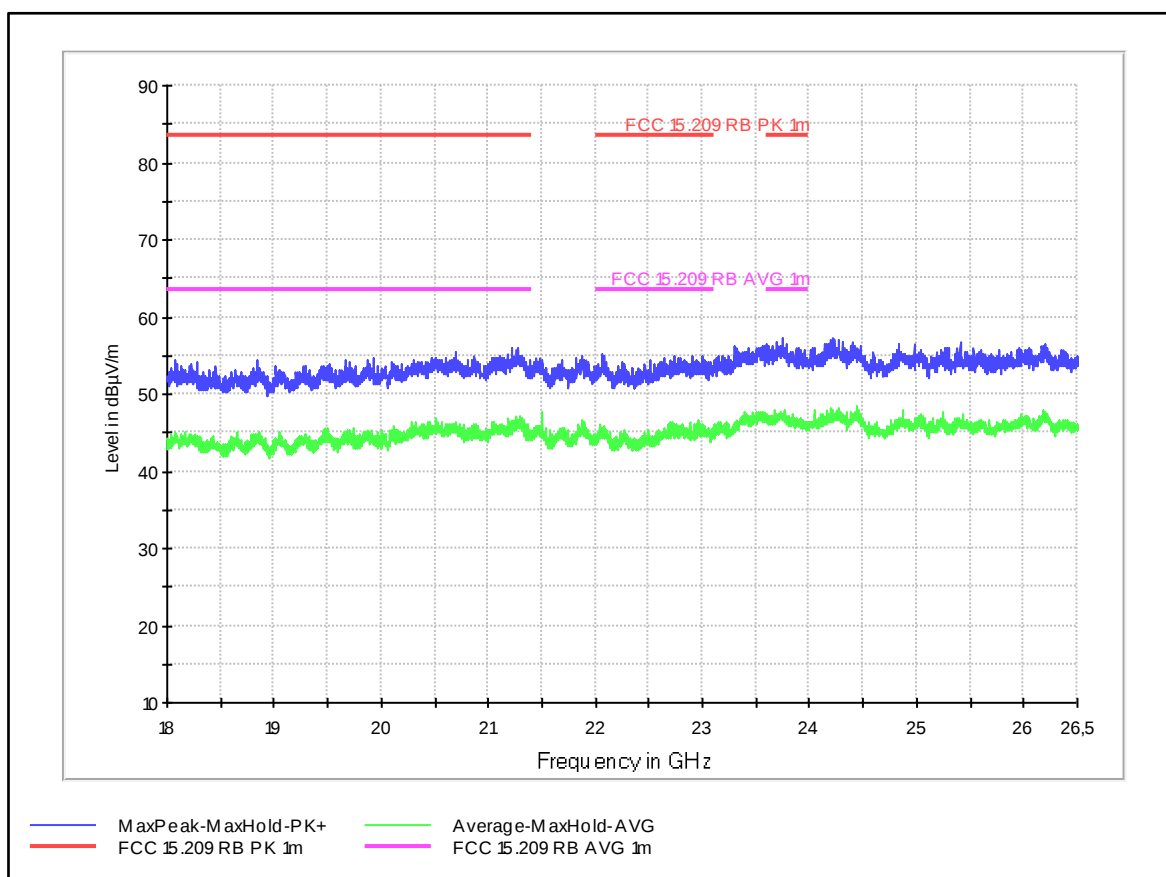


Figure 20. Emission in restricted bands test results 18 – 26.5 GHz. Antenna horizontal. 802.11b + UMTS B2.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	83.5	PASSED

Table 40. Radiated emission in restricted bands test results 18 – 26.5 GHz. Peak detector. Antenna horizontal. 802.11b + UMTS B2.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	63.5	PASSED

Table 41. Radiated emission in restricted bands test results- 18 – 26.5 GHz. Average detector. Antenna horizontal. 802.11b + UMTS B2.

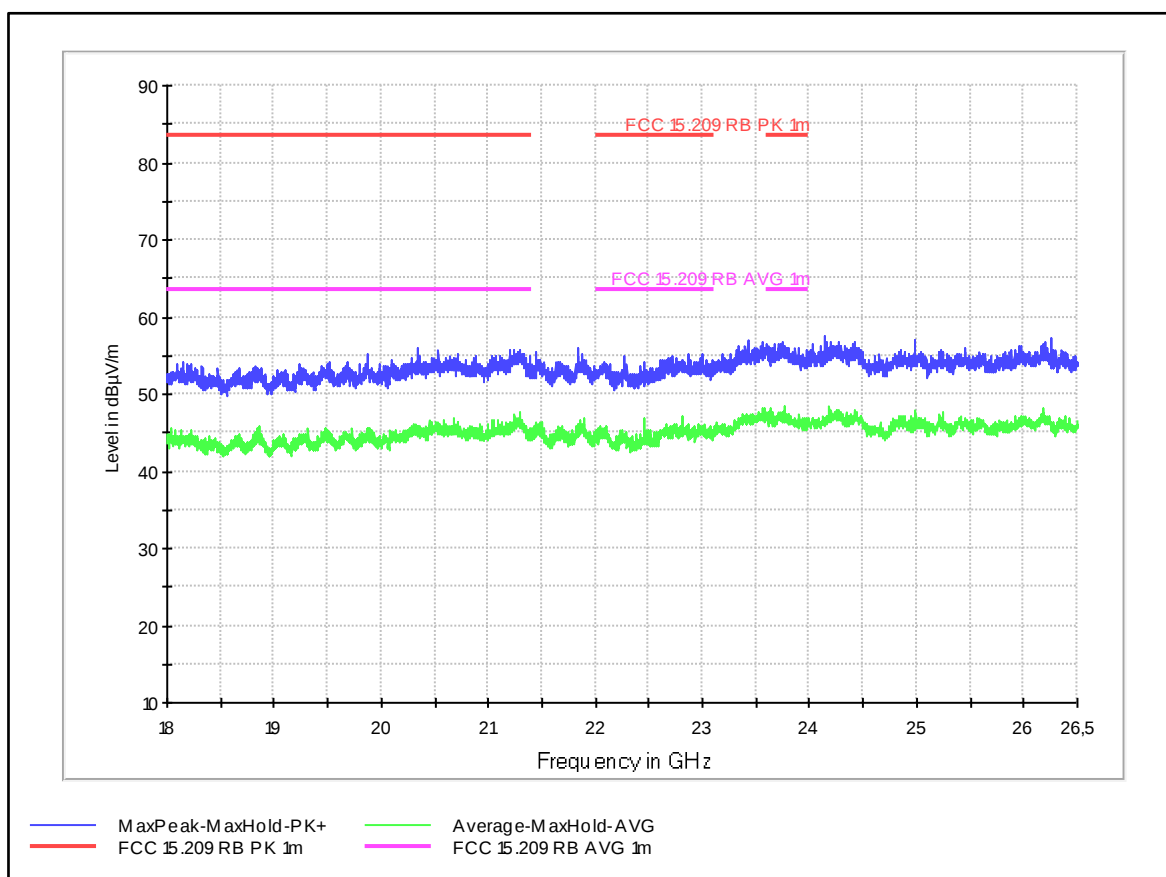


Figure 21. Emission in restricted bands test results 18 – 26.5 GHz. Antenna vertical. 802.11b + UMTS B5.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	83.5	PASSED

Table 42. Radiated emission in restricted bands test results 18 – 26.5 GHz. Peak detector. Antenna vertical. 802.11b + UMTS B5.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	63.5	PASSED

Table 43. Radiated emission in restricted bands test results- 18 – 26.5 GHz. Average detector. Antenna vertical. 802.11b + UMTS B5.

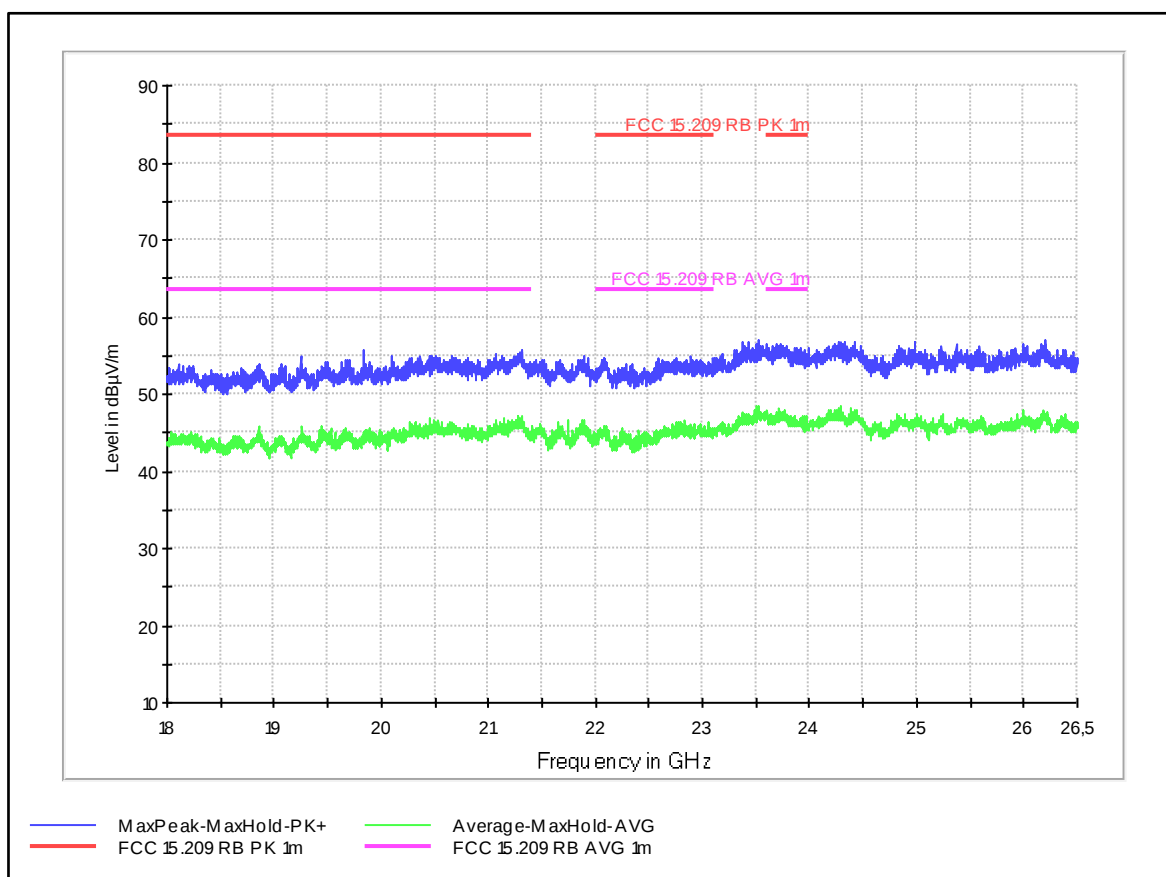


Figure 22. Emission in restricted bands test results 18 – 26.5 GHz. Antenna horizontal. 802.11b + UMTS B5.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	83.5	PASSED

Table 44. Radiated emission in restricted bands test results 18 – 26.5 GHz. Peak detector. Antenna horizontal. 802.11b + UMTS B5.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	63.5	PASSED

Table 45. Radiated emission in restricted bands test results- 18 – 26.5 GHz. Average detector. Antenna horizontal. 802.11b + UMTS B5.

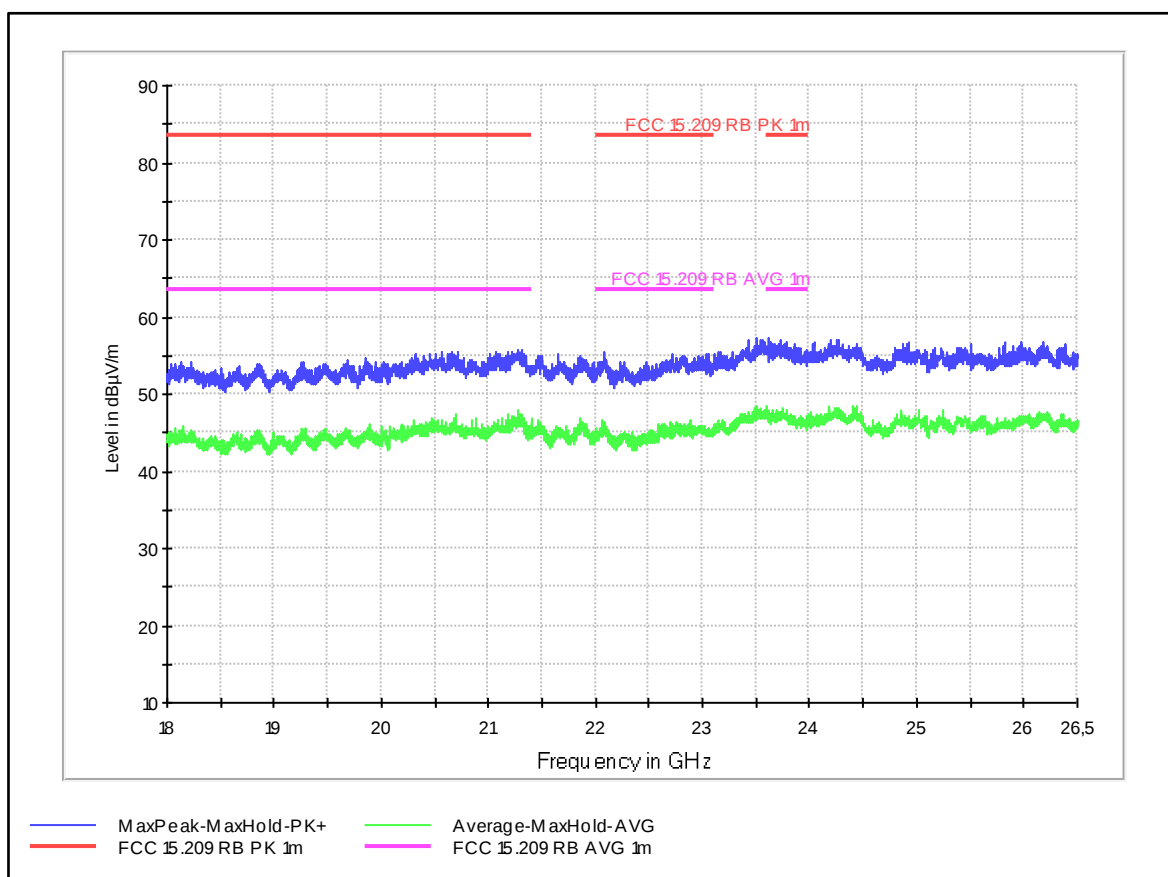


Figure 23. Emission in restricted bands test results 18 – 26.5 GHz. Antenna vertical. 802.11b + LTE B3.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	83.5	PASSED

Table 46. Radiated emission in restricted bands test results 18 – 26.5 GHz. Peak detector. Antenna vertical. 802.11b + LTE B3.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	63.5	PASSED

Table 47. Radiated emission in restricted bands test results- 18 – 26.5 GHz. Average detector. Antenna vertical. 802.11b + LTE B3.

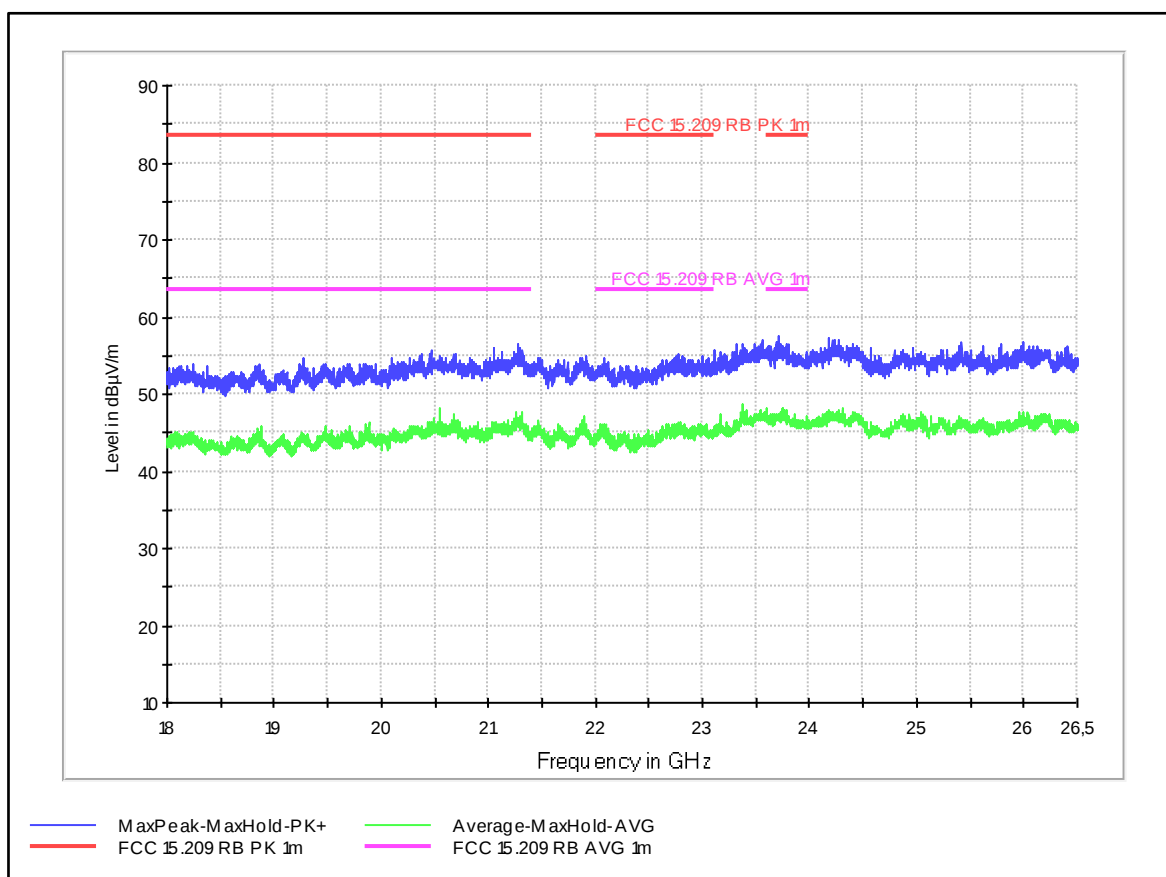


Figure 24. Emission in restricted bands test results 18 – 26.5 GHz. Antenna horizontal. 802.11b + LTE B3.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	83.5	PASSED

Table 48. Radiated emission in restricted bands test results 18 – 26.5 GHz. Peak detector. Antenna horizontal. 802.11b + LTE B3.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	63.5	PASSED

Table 49. Radiated emission in restricted bands test results- 18 – 26.5 GHz. Average detector. Antenna horizontal. 802.11b + LTE B3.

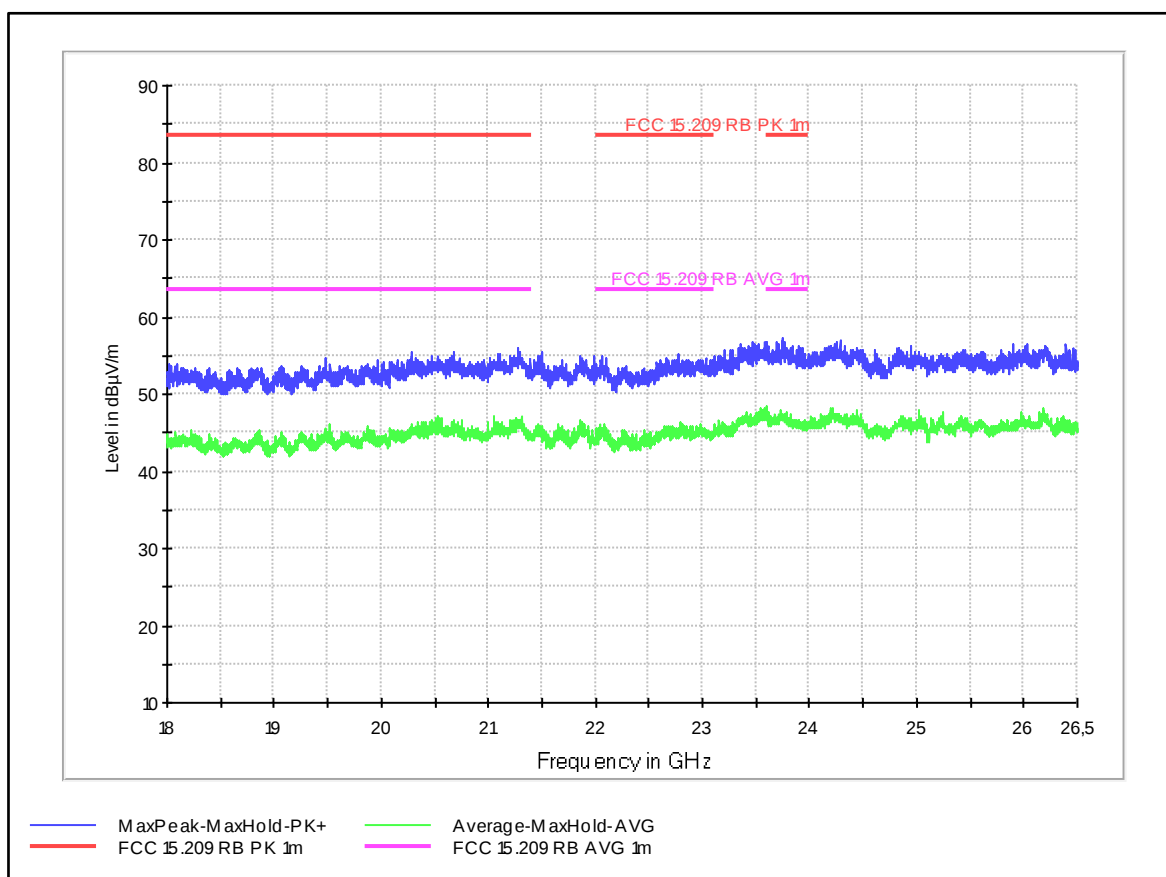


Figure 25. Emission in restricted bands test results 18 – 26.5 GHz. Antenna vertical. 802.11b + LTE B7.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	83.5	PASSED

Table 50. Radiated emission in restricted bands test results 18 – 26.5 GHz. Peak detector. Antenna vertical. 802.11b + LTE B7.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	63.5	PASSED

Table 51. Radiated emission in restricted bands test results- 18 – 26.5 GHz. Average detector. Antenna vertical. 802.11b + LTE B7.

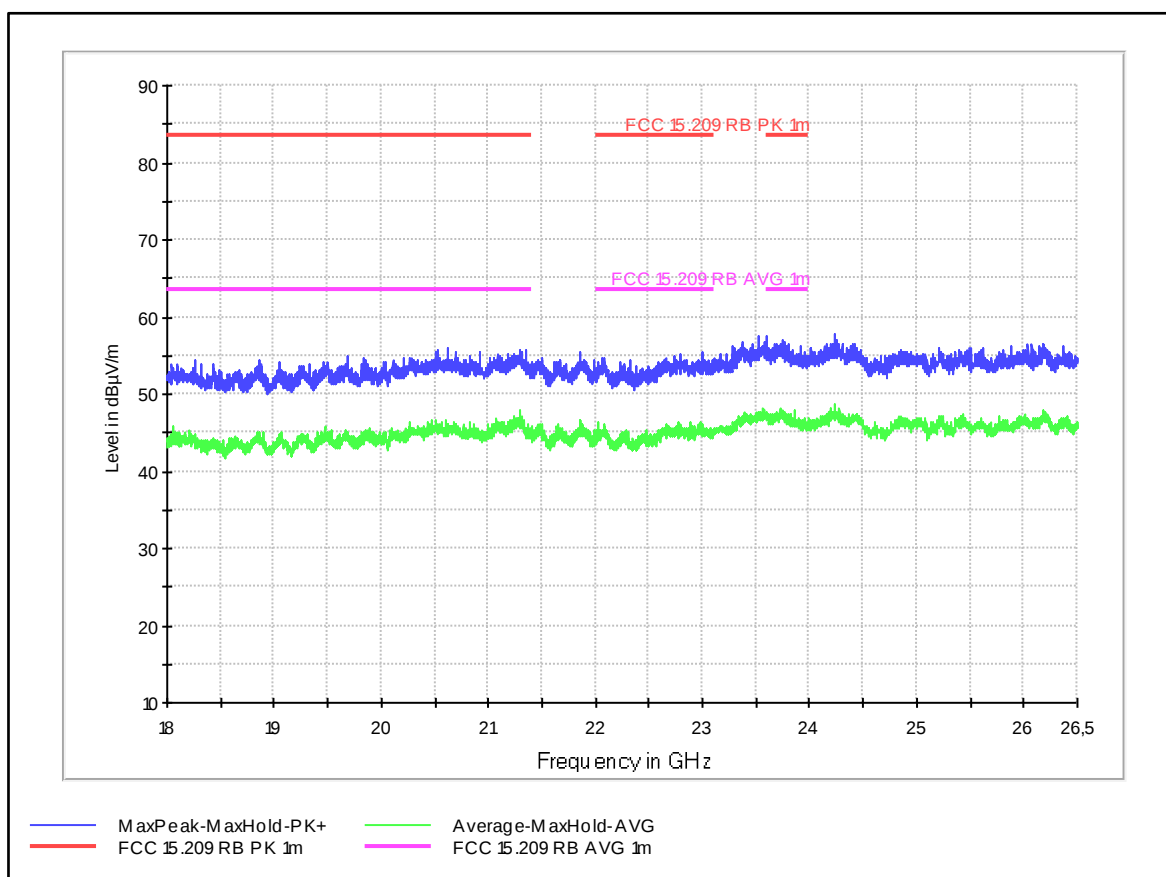


Figure 26. Emission in restricted bands test results 18 – 26.5 GHz. Antenna horizontal. 802.11b + LTE B7.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	83.5	PASSED

Table 52. Radiated emission in restricted bands test results 18 – 26.5 GHz. Peak detector. Antenna horizontal. 802.11b + LTE B7.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	-	-	-	-	-	63.5	PASSED

Table 53. Radiated emission in restricted bands test results- 18 – 26.5 GHz. Average detector. Antenna horizontal. 802.11b + LTE B7.

2.1.4 Test equipment

Description	Supplier	Model	Tag no.
Antenna Bilog 30MHz - 2GHz	Chase	CBL6112B	30114397
Antenna Horn	ETS Lindgren	3117	30090254
EMI Test Receiver 20 Hz-26.5 GHz	Rohde & Schwarz	ESU26	30090172
Amplifier 0.5GHz – 26.5GHz	Agilent	83017A	30090219
Filter WDCMA Band 1	Wainwright	WRCG1947/1953-1940/1960-40/6SS	30117855
Filter WDCMA Band 3	Wainwright	WRCG1744.4/1750.4-1740.4/1754.4-40/6SS	30120112
High pass filter 1 GHz	Wainwright	WHK1000-12SS	30114114
High pass filter 3 GHz	Wainwright	WHJS3000-10SS	30090086
High pass filter 5 GHz	Wainwright	WHKX8-5994-7400-18000-60SS	30090967
Filter BT/WLAN Band Reject	Wainwright	WRCG2400/2483-2390/2493-35/10SS	30119587

Table 54. Radiated emission test equipment.

Date
2021-02-08

Reference
P20-0146-4

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3 MEASURING UNCERTAINTIES

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

	Frequency [MHz]	Polarization	Expanded Uncertainty [dB] (k=2)
Radiated emission	30 - 200	Vertical	4.72
	200 - 1000	Vertical	4.07
	1000 - 18000	Vertical	3.99
	18000 - 26500	Vertical	4.11
	30 - 200	Horizontal	3.60
	200 - 1000	Horizontal	4.15
	1000 - 18000	Horizontal	4.00
	18000 - 26500	Horizontal	4.11

Date
2021-02-08

Reference
P20-0146-4

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Appendix 1

Appendix 1 Preliminary tests

Preliminary tests were made in the following mode 802.11AC + UMTS B1 according to:

ETSI EN 300 328 V2.1.1, sec. 4.3.2.9

ETSI EN 301 893 V2.1.1, sec. 4.2.4.1

ETSI EN 301 908-1 V13.1.1, sec. 4.2.2

Date
2021-02-08

Reference
P20-0146-4

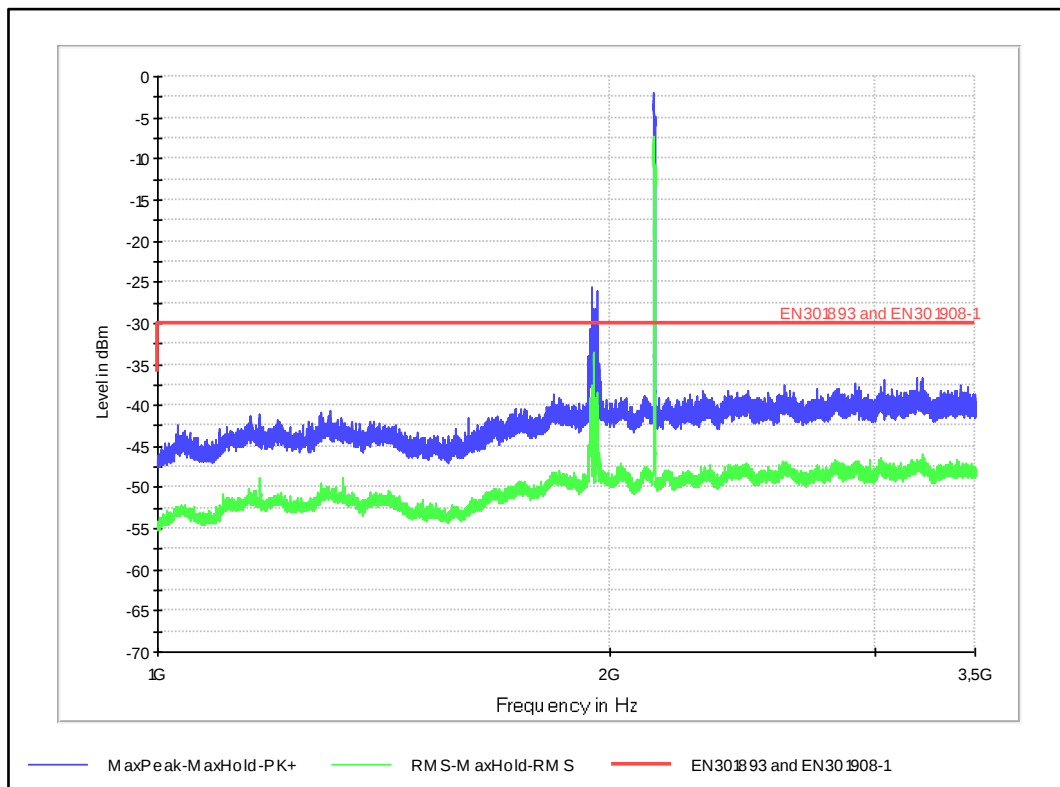
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Appendix 1


Figure 27. Emission test results 1 – 3.5 GHz. Antenna vertical. 802.11AC + UMTS B1.

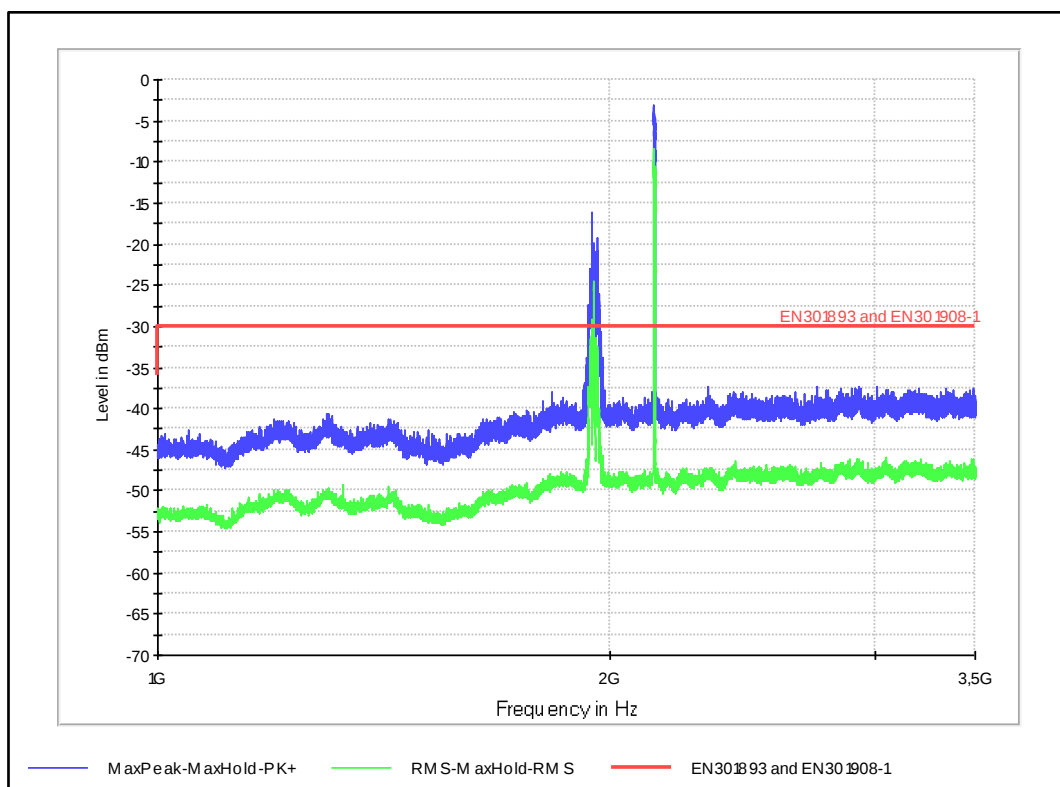


Figure 28. Emission test results 1 – 3.5 GHz. Antenna horizontal. 802.11AC + UMTS B1.

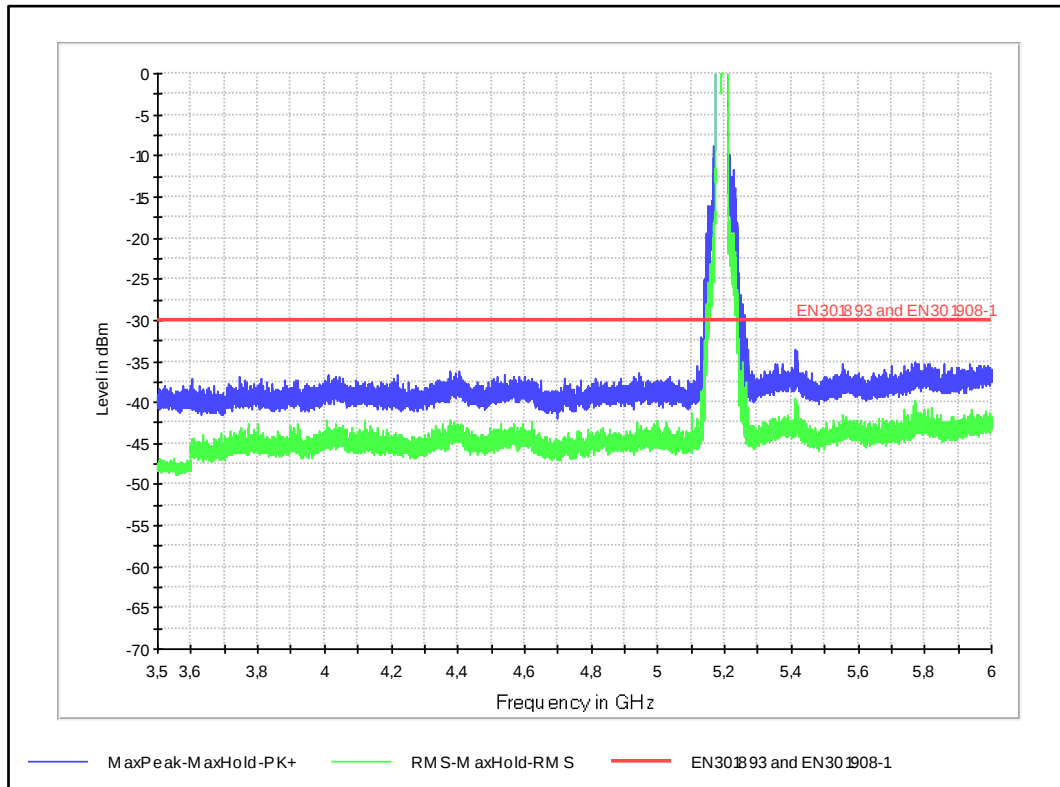


Figure 29. Emission test results 3.5 – 6 GHz. Antenna vertical. 802.11AC + UMTS B1.

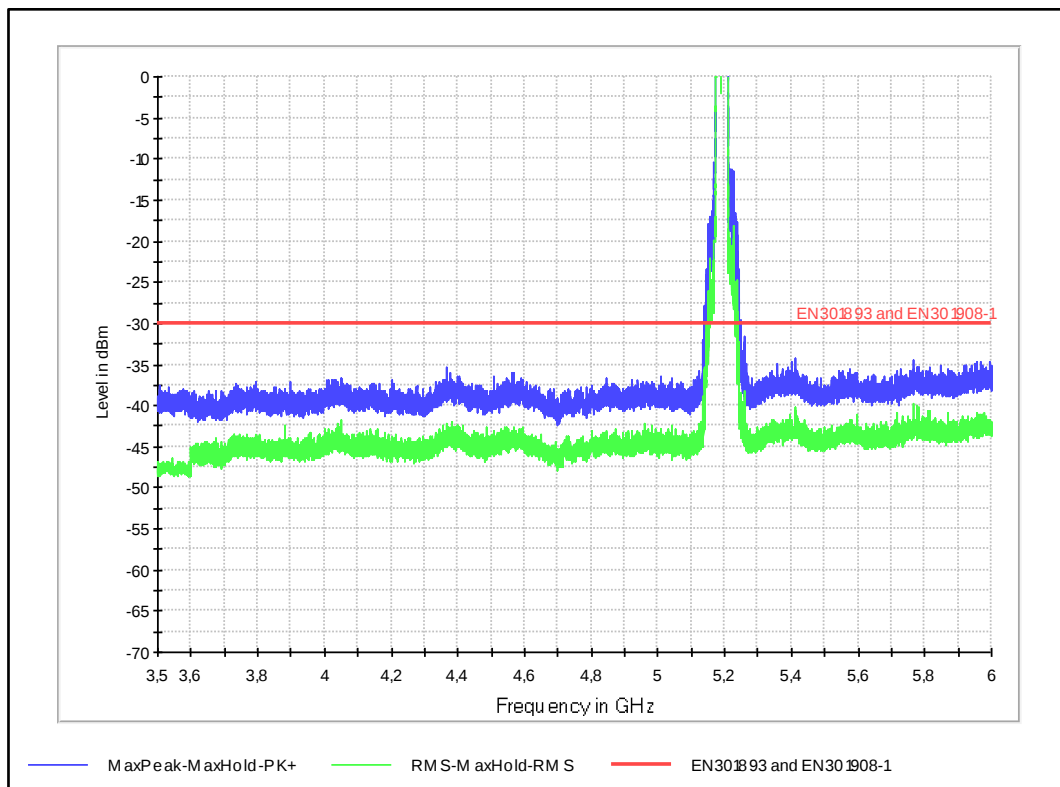


Figure 30. Emission test results 3.5 – 6 GHz. Antenna horizontal. 802.11AC + UMTS B1.

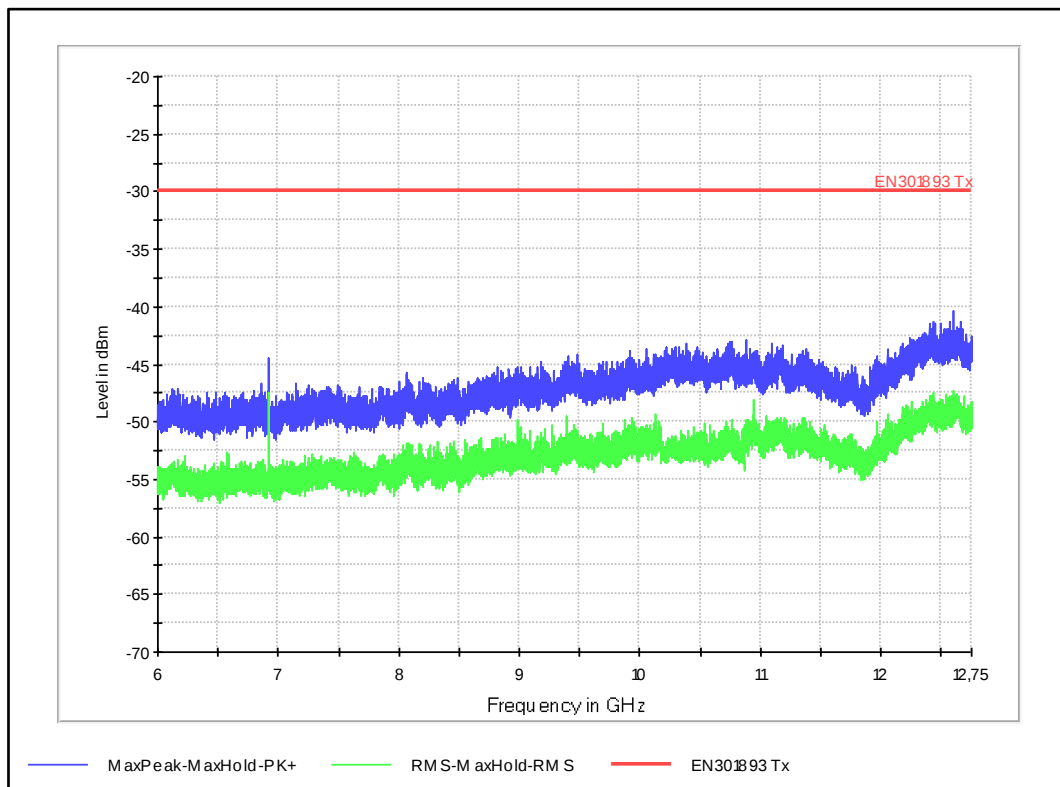


Figure 31. Emission test results 6 – 12.75 GHz. Antenna vertical. 802.11AC + UMTS B1.

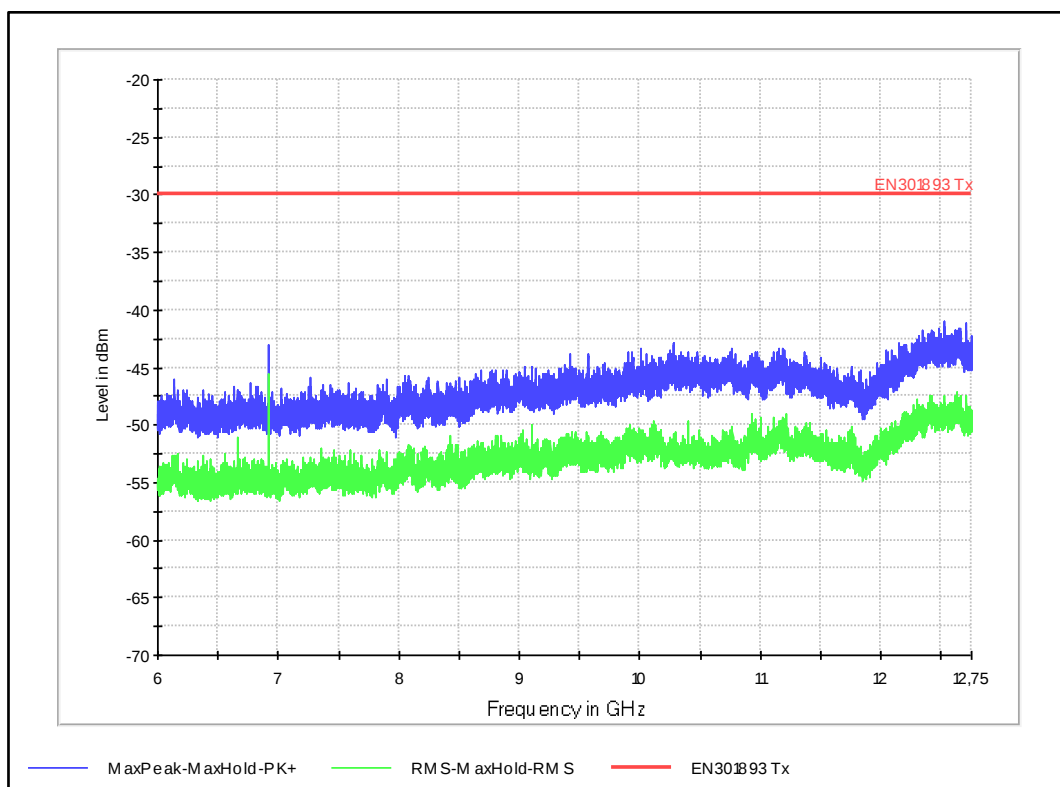


Figure 32. Emission test results 6 – 12.75 GHz. Antenna horizontal. 802.11AC + UMTS B1.

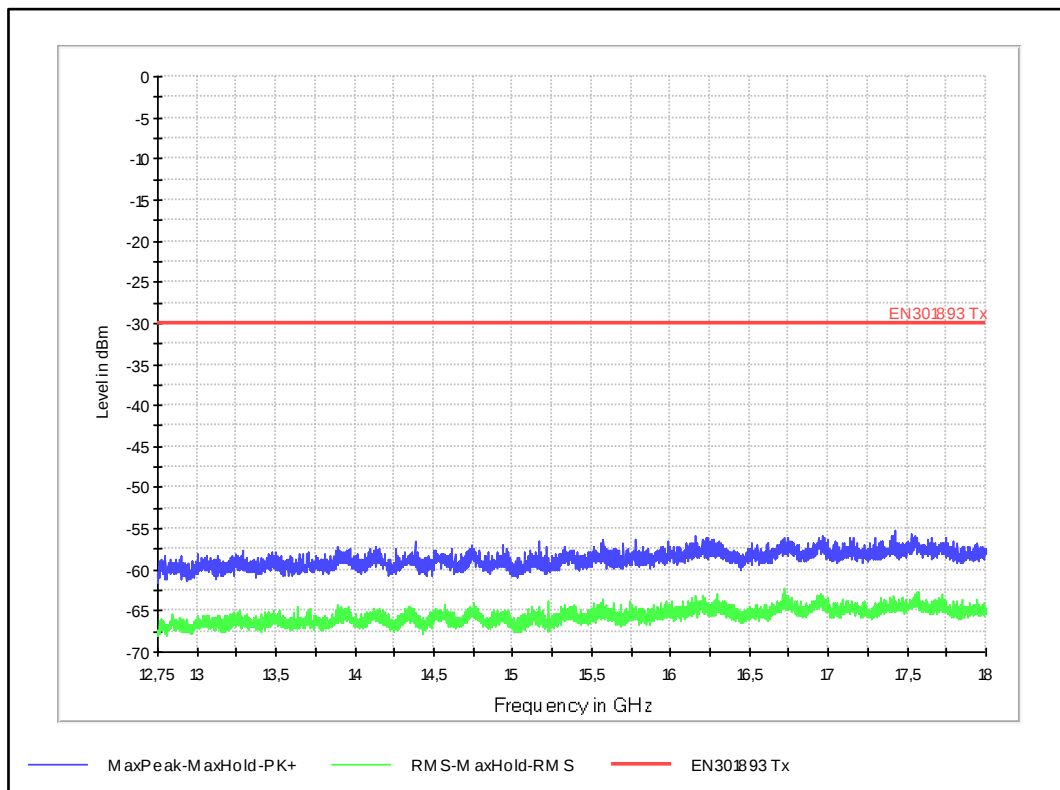


Figure 33. Emission test results 12.75 - 18 GHz. Antenna vertical. 802.11AC + UMTS B1.

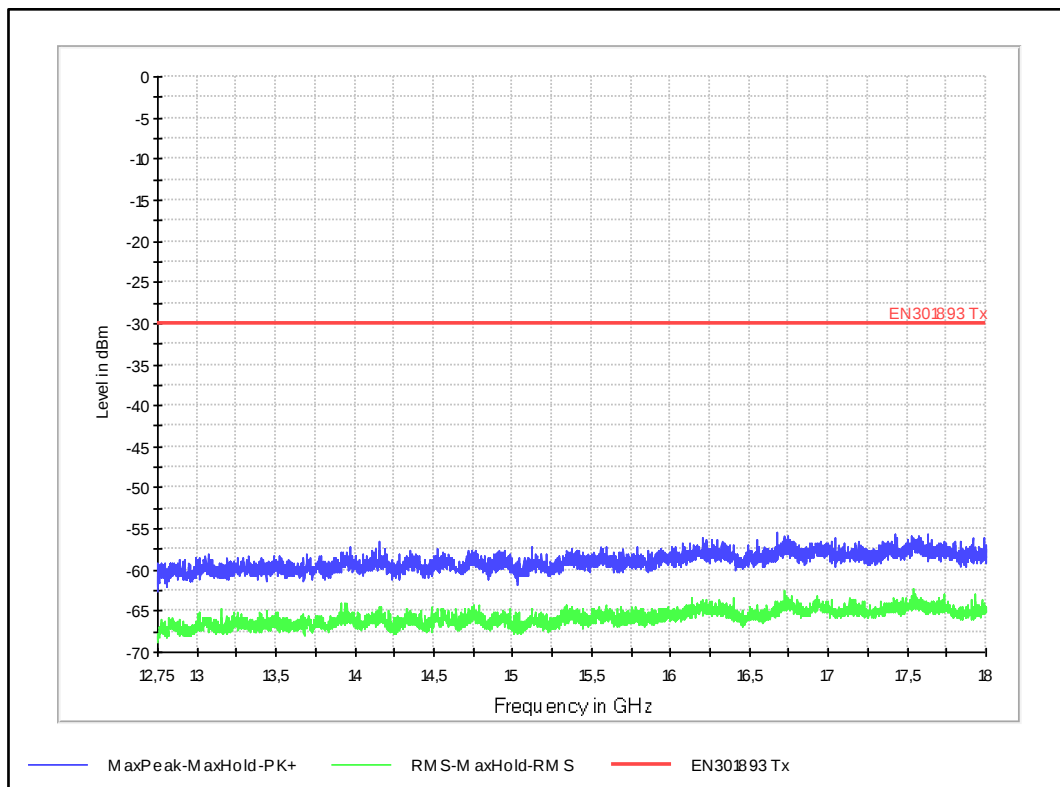


Figure 34. Emission test results 12.75 - 18 GHz. Antenna horizontal. 802.11AC + UMTS B1.

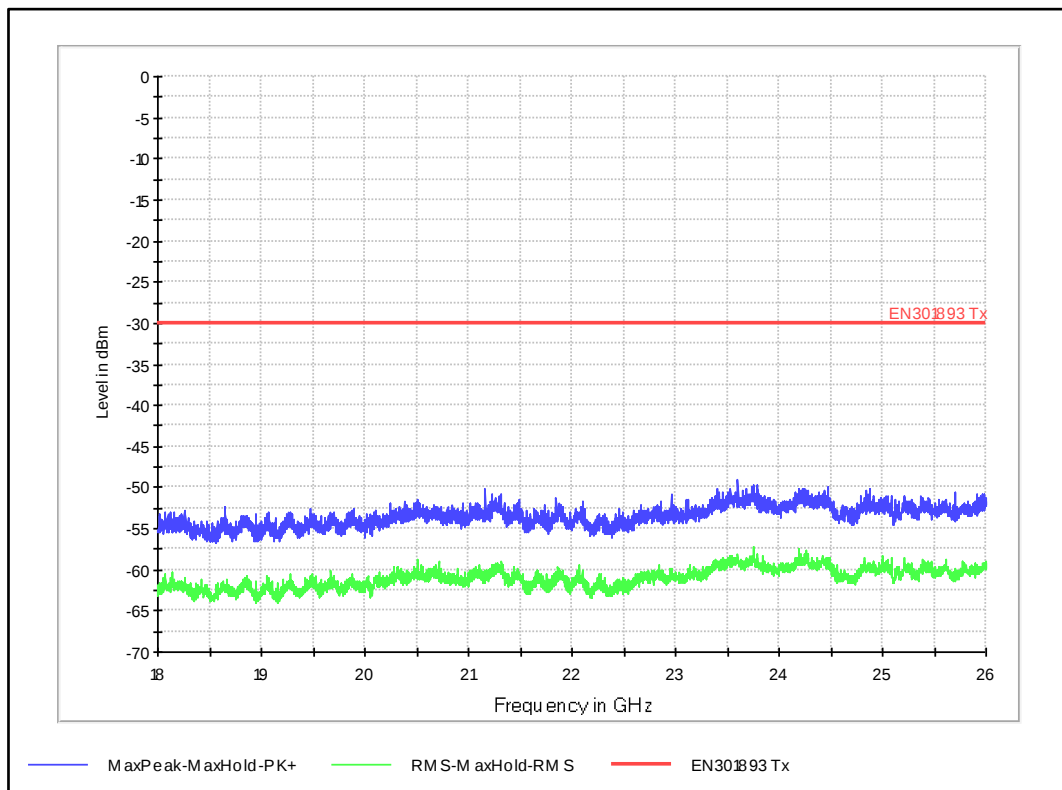


Figure 35. Emission test results 18 - 26 GHz. Antenna vertical. 802.11AC + UMTS B1.

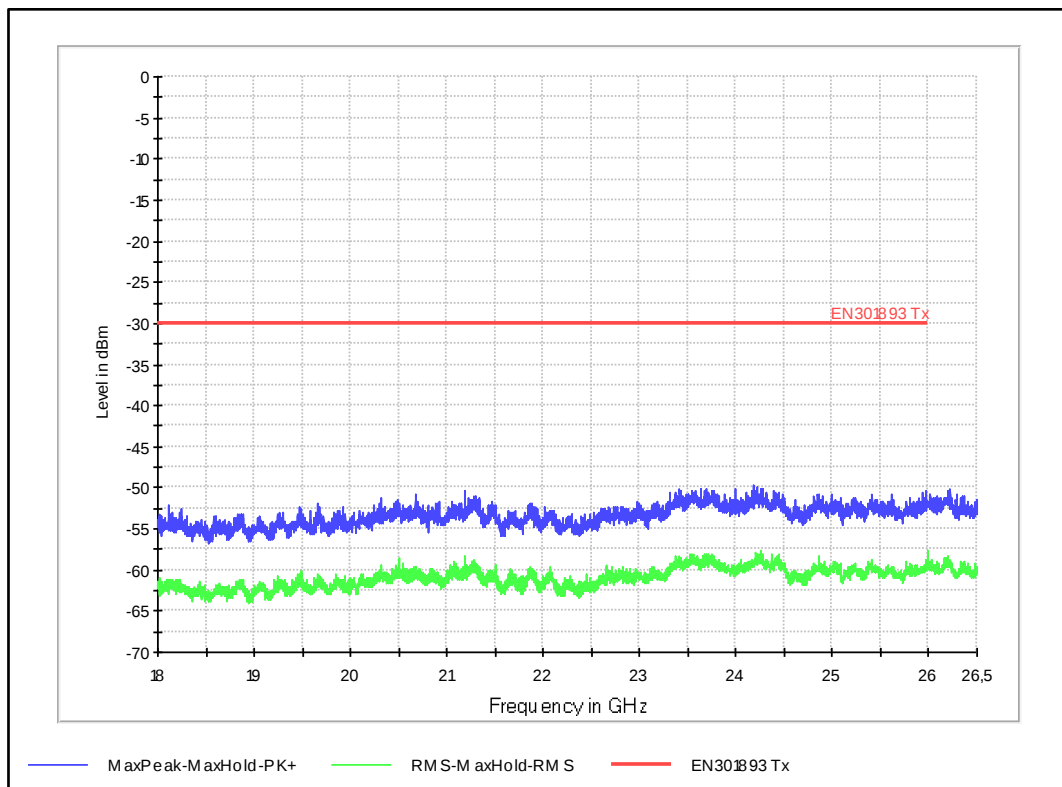


Figure 36. Emission test results 18 - 26 GHz. Antenna horizontal. 802.11AC + UMTS B1.