

Test Report

of

AT-DG2
FCC ID: 2ADEF AT-DG2
ISED ID 12460A-ATDG2

according to

FCC 47 CFR, Part 15 Subpart C
15.247 Operation within the band 2400 - 2483.5 MHz
and
RSS-247 Issue 2**EKTOS Testing & Reliability Services A/S**

Performed by



Søren Søtoft

Examined by



David Busk

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Report no.:	P18-0060-3 rev.1	Report date:	2018-12-14
Test started:	2018-09-10	Test ended:	2018-12-14
Number of pages:	97	Client contact:	Henrik Nordgren
Test laboratory:	EKTOS TRS A/S A. C. Meyers Vænge 15 2450 Copenhagen SV Denmark	Client:	Airtame ApS Kulegaardsvej 1 1434 Copenhagen Denmark
Facility reg. no.	FCC Designation number: DK0002 Industry Canada registration number: 10247A		
Test specimen:	Airtame 2 model no. AT-DG2		
Test specification:	FCC 47 CFR Part 15 Subpart C 15.247 Operation within the band 2400 - 2483.5 MHz RSS-247 Issue 2 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:	P18-0060-3 rev 1 supersedes P18-0060-3 issued 2018-11-22. Changes: Additional measurements were added. 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:	Søren Søltøft		

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Appendix issued in separate report

1 Photos of test setups and equipment.

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1 SUMMARY

See Appendix 1 for photos.

Emission measurements as specified below have been performed.

1.1 Test plan

Standard	Name of the test	Results
FCC 47 CFR Part 15C	15.247 Operation within the band 2400-2483.5 MHz	Passed
-	Duty cycle measurement	n.a.
15.247 (a) (2)	6 dB bandwidth	Passed
15.247 (b) (3)	Maximum peak conducted power	Passed
15.247 (d)	Emission outside frequency band.	Passed
15.247 (d)	Emission in restricted bands.	Passed
15.247 (d)	Band Edge	Passed
15.247 (e)	Power spectral density	Passed
15.207 (a)	AC conducted emission	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	Airtame ApS
Name	Airtame 2
Model No.	AT-DG2
Test Software	Production FW allowing set up of radio parameters.
Supply voltage	5 VDC from USB

The AT-DG2 enables streaming from computers and mobile devices to TVs and projectors wirelessly or through Ethernet by a Ethernet to USB adaptor with PoE.

The wireless connection is built on a Cypress (CYG89342) chip.

The 2.4 GHz radio uses frequencies in the range 2412 MHz to 2472 MHz.

The AT-DG2 had a production firm ware which enabled control of the Cypress chip.

As the frequency range is greater than 10 MHz, at least 3 frequencies are selected for test.

For the conducted test AT-DG2 no 12 was stripped of housing and equipped with a temporary antenna connector.

For radiated test AT-DG2 no 5 and AT-DG2 no 10 were used. They were not modified except for the firmware enabling control of radio parameters.

The following radio parameters were used during test.

Band: 2.4 GHz

Antenna chain: 0

Standard: 802.11n

Bandwidth: 20 MHz

Rate ID: 0

TX power: max. +17 dBm

Channel: 1 to 11

Control script and parameters was delivered by client.

"rf-control -t 192.168.1.104 -b 20 -s n -T 1 -p 17 -c 1 -m 0"

Channel	Power level setting
1	11
2	15
3 to 9	17
10	15
11	12

Table 1. Channel power setting.

See photo in appendix 1.

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1.1 Auxiliary Equipment

1.1.1 AC/DC adaptor

Manufacturer	Airtame ApS
Model	GS5V-2.3C-1U
Details	marked : 3
Supply voltage	100 VAC to 240 VAC 50 / 60 Hz
Output voltage	5 VDC 2.3 A

1.1.2 AT-PoE

Manufacturer	Airtame Aps
Model	AT-PoE
Serial no.	201809GR - 002
Details	-
Supply voltage	PoE input:44-57 VDC (48 VDC used during tests), PoE class 1
Output voltage	5 VDC / 3000 mA
Operational mode	Supplying AT-DG2

1.1.3 PoE Injector 1

Manufacturer	UBIQUITI
Model	GP-D480-050G
Details	-
Supply voltage	100 VAC to 240 VAC, 50 / 60 Hz
Output voltage	48VDC 0.5A

1.1.4 PoE Injector 2

Manufacturer	AXIS COMMUNICATIONS
Model	T8120 15W
Details	-
Supply voltage	100 VAC to 240 VAC 50 / 60 Hz
Output voltage	48 VDC 0.35 A

1.1.5 Laptop

Manufacturer	Lenovo
Model	X220
Product ID	42903WG
Serial no.	R9-KVYB6 11/12
Software	Microsoft Windows 10 Professional
Details	-
Supply voltage	20 VDC from AC/DC power supply

1.1.6 AC/DC power supply for laptop

Manufacturer	Lenovo
Model	42T4424
Serial no.	11S42T4424Z1ZF3E15B6DA REV 05
Details	-
Supply voltage	100 – 240 VAC (120 VAC 60 Hz was used during tests)
Output voltage	20 VDC

See photo in appendix 1.

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1.2 I/O ports / cables to test specimen

I/O Port Cable	Type	Shielding	Cable length
USB-C branching out to HDMI and USB-A	Customer	Shielded	107 cm

1.3 Test set-up

The nominal input voltage to AT-DG2 is 5 VDC

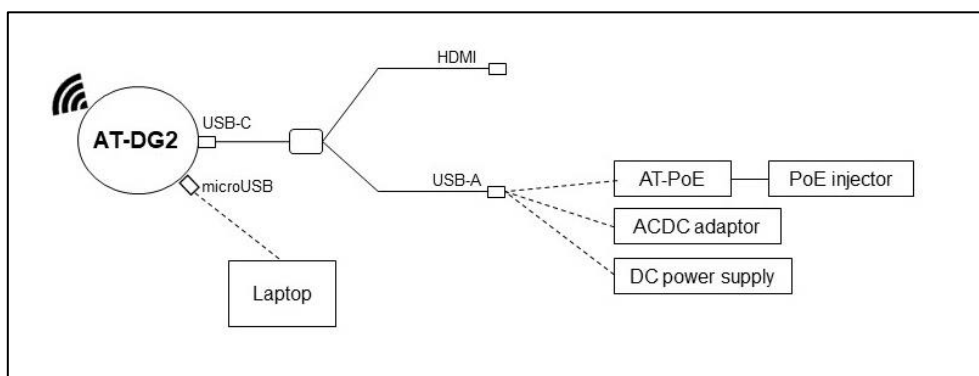


Figure 1. Test set up.

The dotted lines at USB-A indicates that just one is in use at a time.

The dotted line from laptop indicates that this connection was only present during set up of radio, not during test.

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2 TESTS

2.1 Duty Cycle

Test specimen	AT-DG2 no.12
Test specification	47 CFR Part 15 Subpart C
Test method	ANSI C63.10:2013
Comments	None
Temperature / Humidity	25°C / 36%RH
Dates of measurements	2018-10-02
Test personnel	Søren Søltøft

2.1.1 Test setup

The test specimen was connected directly to a spectrum analyzer using a temporary antenna connector.

See photo of test set up in appendix 1.

2.1.2 Test result

The duty cycle was measured at channel 7 at 2442 MHz.

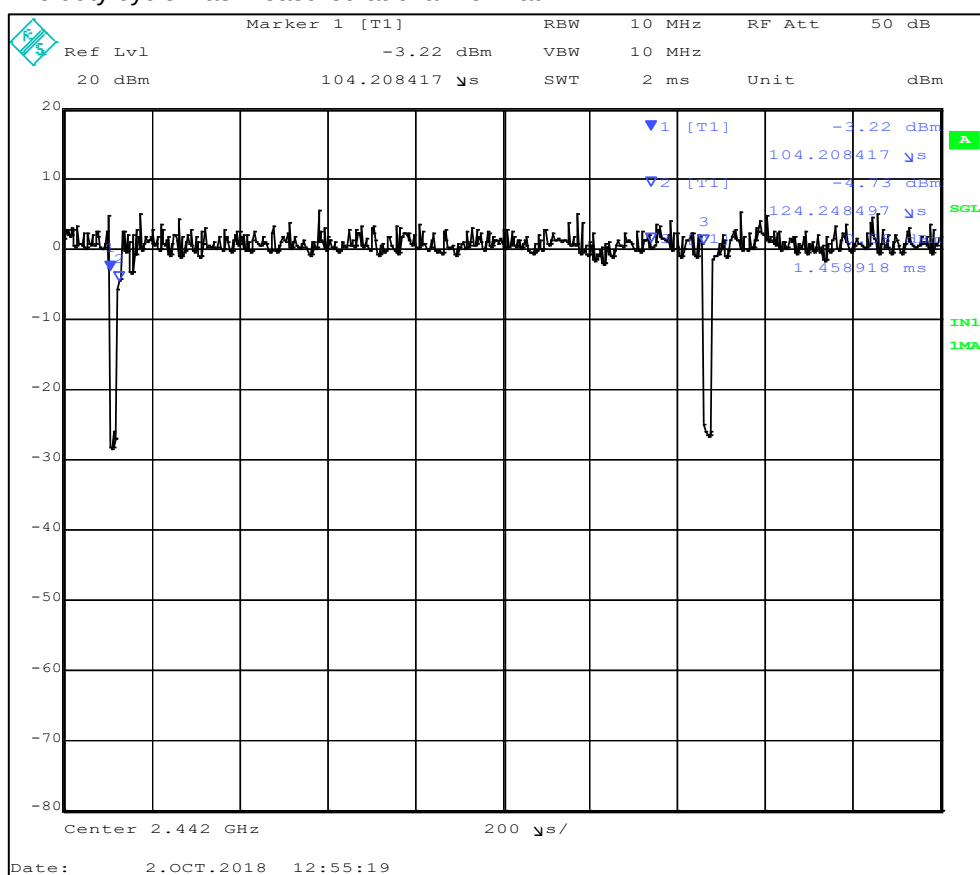


Figure 2. Duty Cycle.

T: 1354.21 μs.

t_{on}: 1334.67 μs

Duty cycle = t_{on} / T = 1334.67 μs / 1354.21 μs = 0,9856 = 98,56 %

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Duty cycle [%]	Duty cycle limit [%]	Result
98.56	98	Passed

Table 2. Duty cycle.

2.1.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2019-09-24

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2.2 6 dB Bandwidth

Test specimen	AT-DG2 no.12
Test specification	FCC 47 CFR Part 15.247 (a) (2) RSS-247 sec 5.2 a)
Test method	ANSI C63.10:2013 sec. 11.8
Comments	None
Temperature / Humidity	23°C / 26%RH
Dates of measurements	2018-12-13
Test personnel	Søren Søltøft

2.2.1 Test setup

The test specimen was connected to a spectrum analyzer using a temporary antenna connector.

See photo of test set up in appendix 1.

2.2.2 Test result

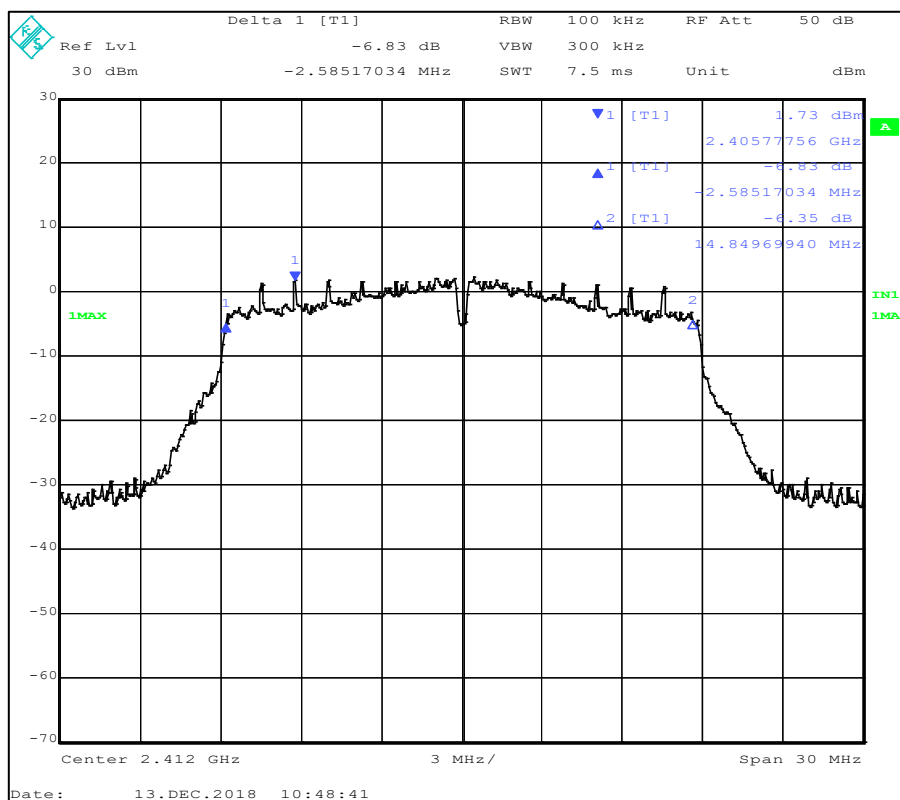


Figure 3. 6 dB Band Width at channel 1 .

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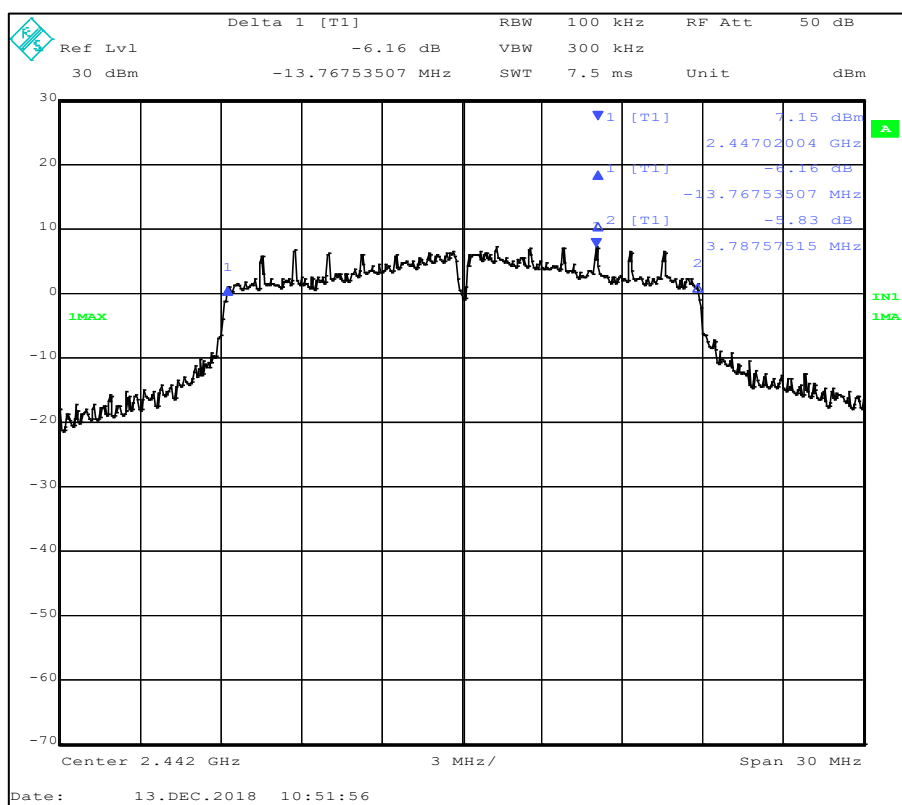


Figure 4. 6 dB Band Width channel 7.

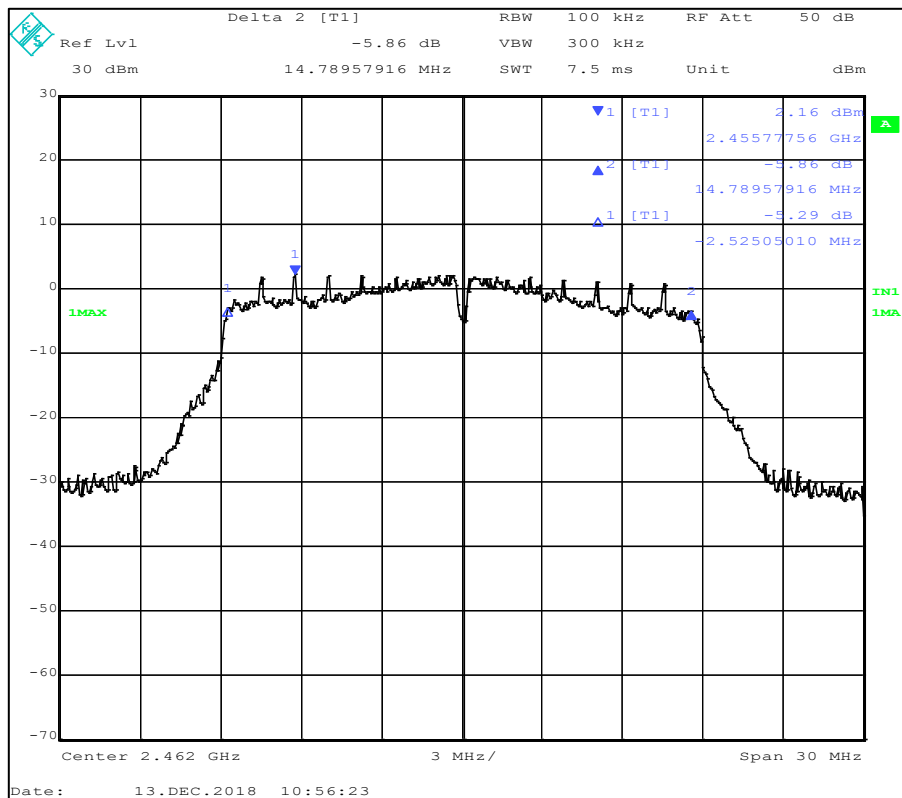


Figure 5. 6 dB Band Width channel 11.

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Channel	6 dB BW [kHz]	Limit [kHz]	Result
1	17434.9	500	Passed
7	17555.1	500	Passed
11	17314.6	500	Passed

Table 3. 6 dB Band Width.

2.2.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2019-09-24

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2.3 Maximum conducted output power

Test specimen	AT-DG2 no.12
Test specification	FCC 47 CFR Part 15.247 (b) (3) RSS-247 sec 5.4 d)
Test method	ANSI C63.10:2013 sec 11.9.2.2.2
Frequency range	2400-2483.5 MHz
Limits	FCC 47 CFR Part 15.247 (b) (3)
Comments	None
Temperature / Humidity	23°C / 26%RH
Dates of measurements	2018-12-13
Test personnel	Søren Søltøft

2.3.1 Test setup

The test specimen was connected to a spectrum analyzer using a temporary antenna connector.

See photo of test set up in appendix 1.

2.3.2 Test results

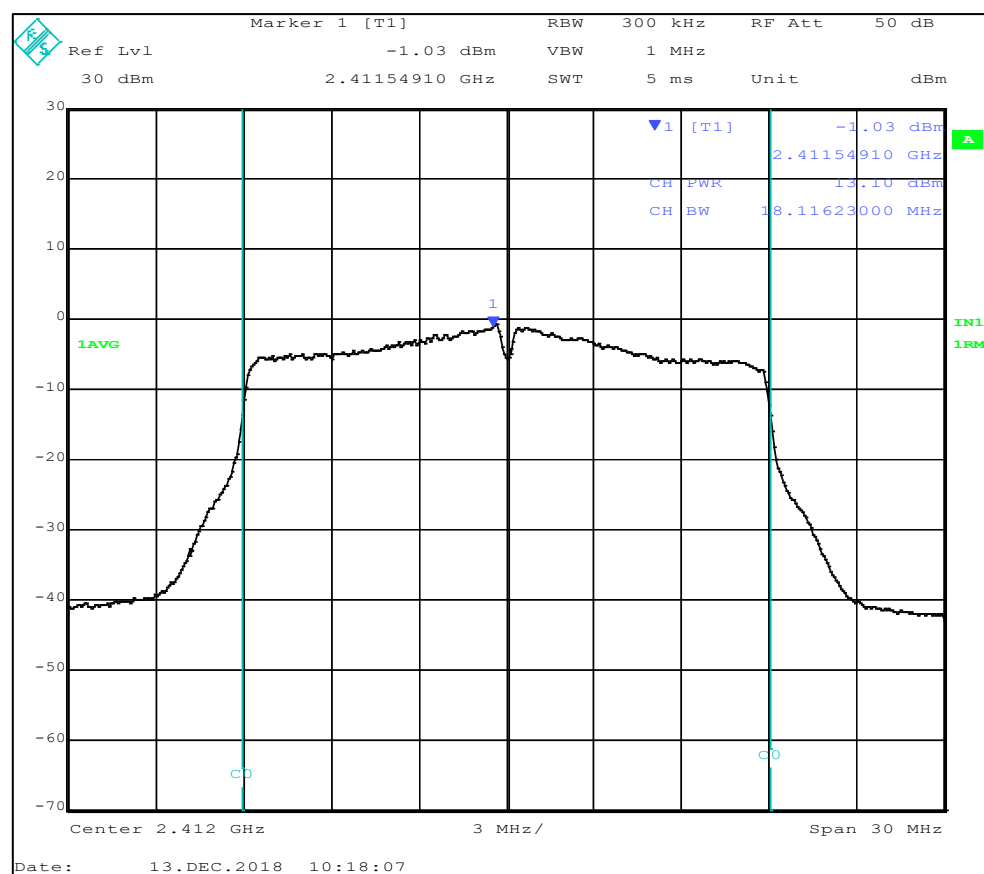


Figure 6. Output power channel 1.

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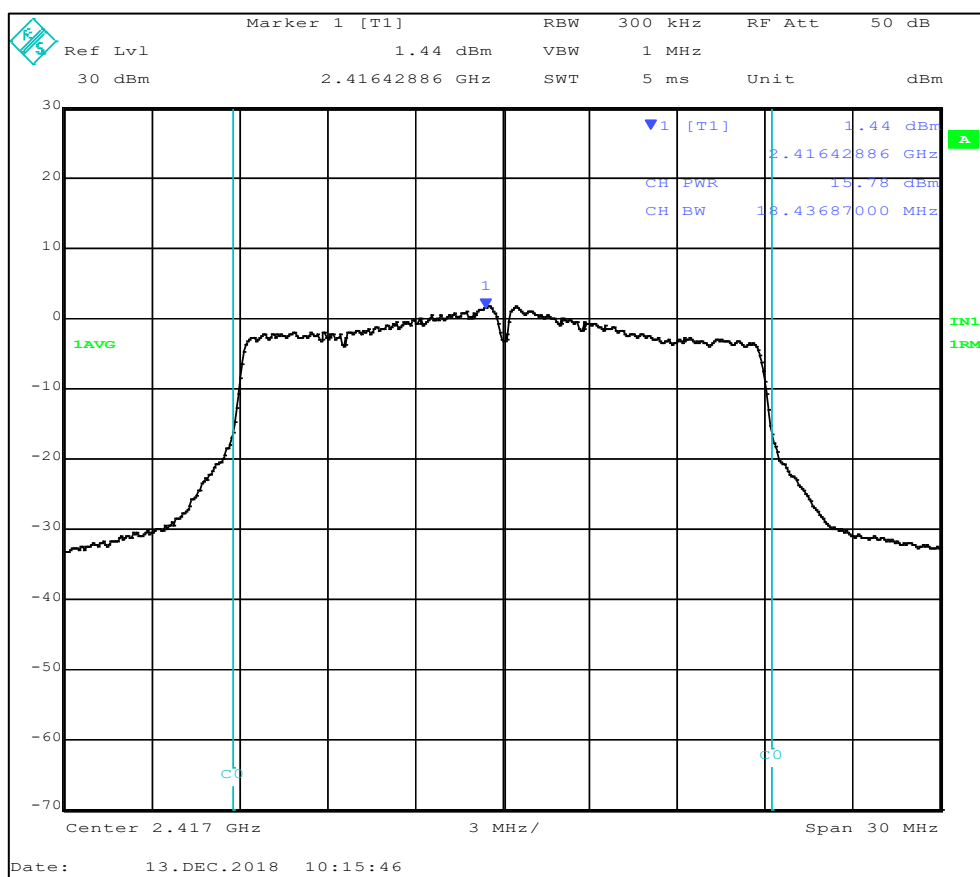


Figure 7. Output power channel 2.

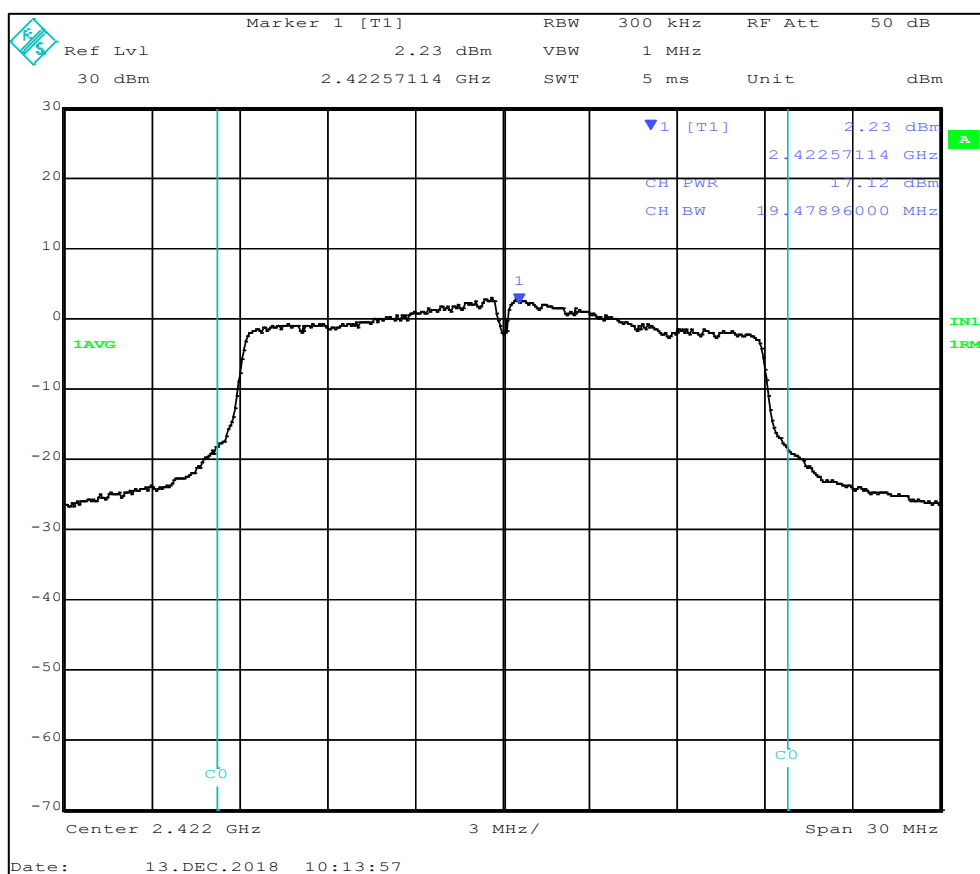


Figure 8. Output power channel 3.

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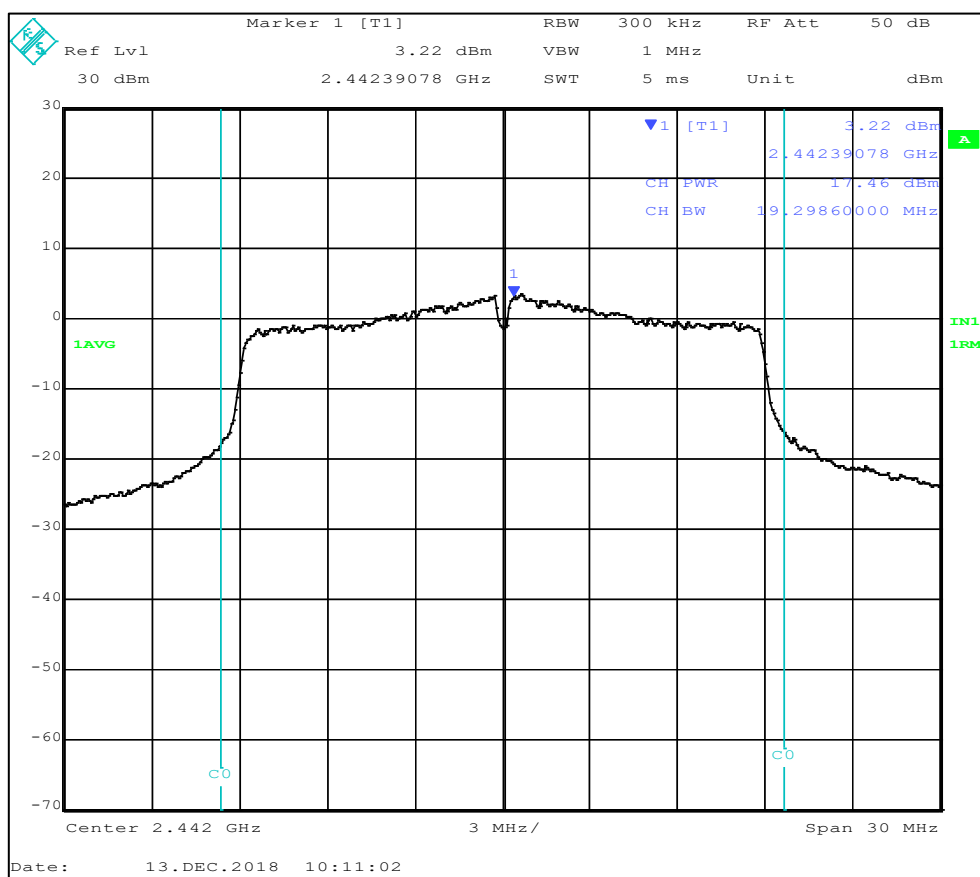


Figure 9. Output power channel 7.

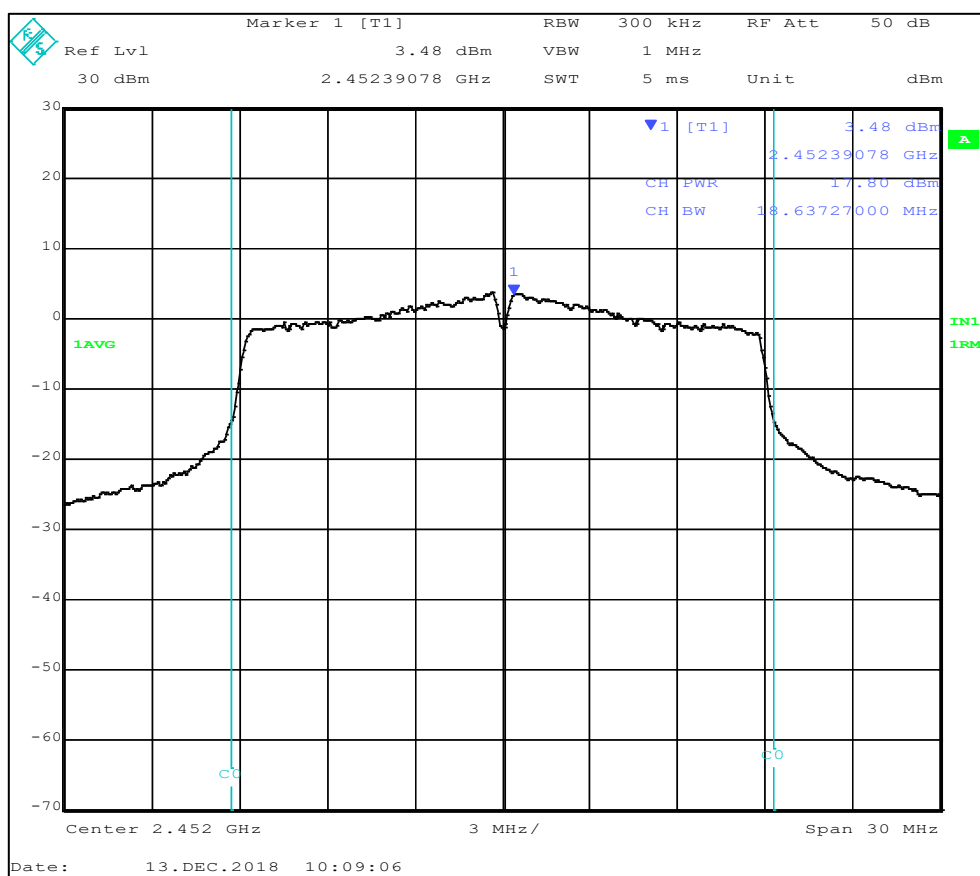


Figure 10. Output power channel 9.

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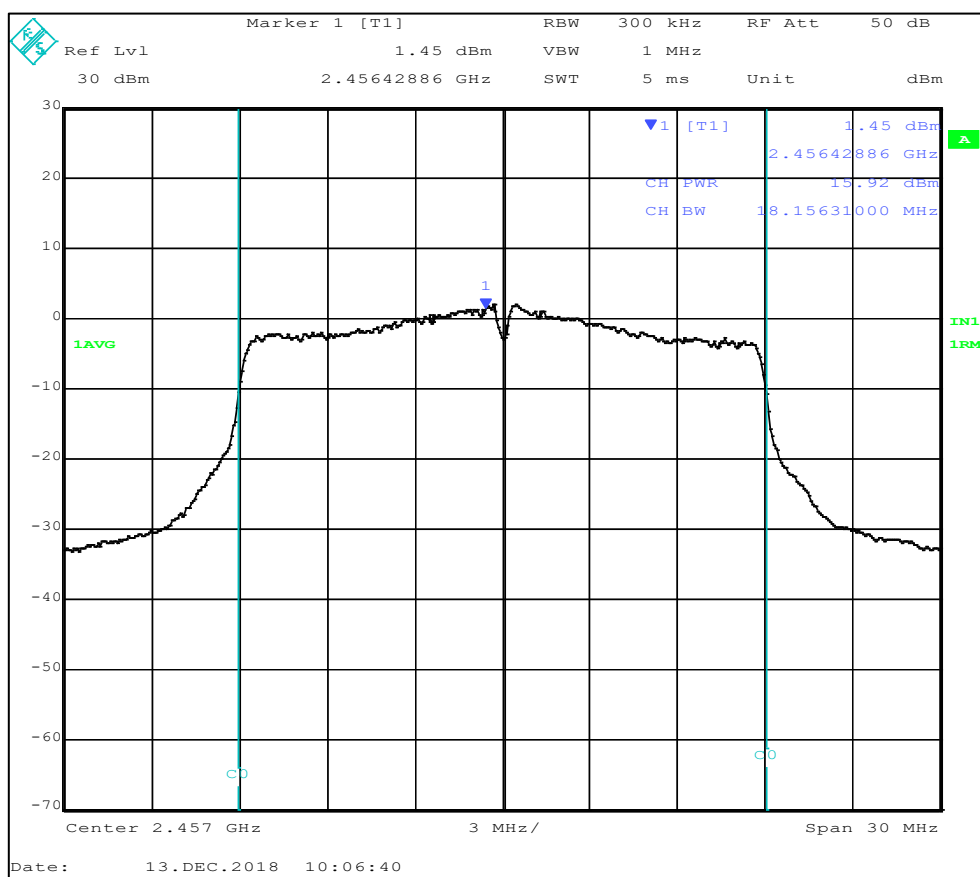


Figure 11. Output power channel 10.

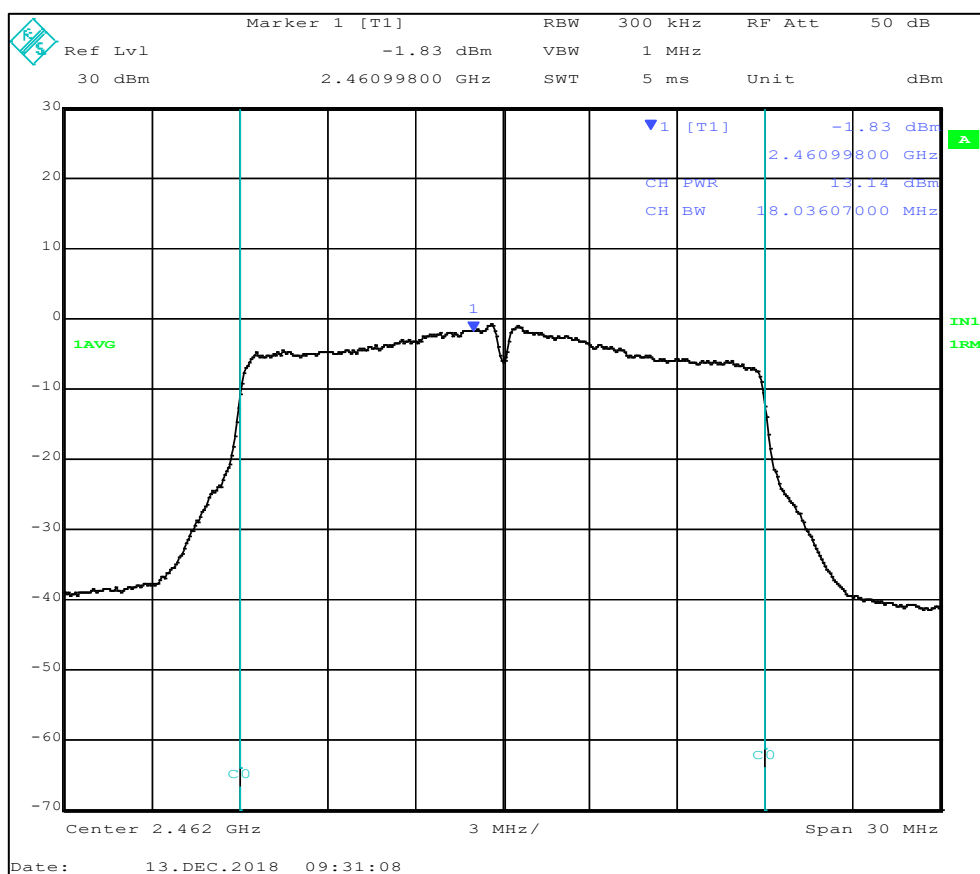


Figure 12. Output power channel 11.

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Channel	Frequency [MHz]	Output power [dBm]	Limit [dBm]	Result
1	2412	13.1	30	PASSED
2	2417	15.78	30	PASSED
3	2422	17.12	30	PASSED
7	2442	17.46	30	PASSED
9	2452	17.80	30	PASSED
10	2457	15.92	30	PASSED
11	2462	13.14	30	PASSED

The nominal voltage of 5 VDC were variated between 85% and 115% without any increase of the output power.

2.3.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2019-09-24

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2.4 Emission outside frequency band.

Test specimen	AT-DG2 no.12
Test specification	47 CFR Part 15.247 (d) RSS-247 sec. 5.5
Test method	ANSI C63.10:2013 sec. 11.11
Frequency range	30 MHz – 25 GHz
Limits	47 CFR Part 15.247 (d).
Comments	None
Temperature / Humidity	23°C / 26%RH
Dates of measurements	2018-12-13
Test personnel	Søren Søltøft

2.4.1 Test setup

The temporary antenna connector of the test specimen was connected directly to the spectrum analyzer.

See appendix 1 for photo of test set up

2.4.2 Test results

2.4.2.1 Reference level for test.

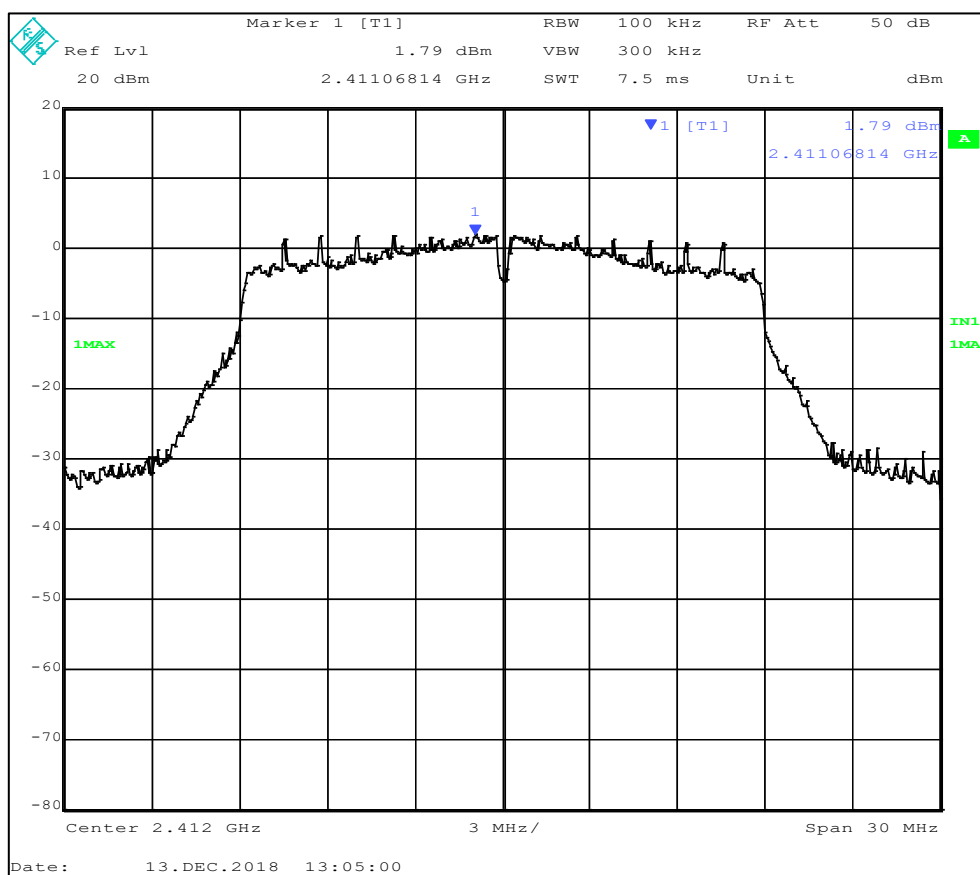


Figure 13. Reference level for channel 1.

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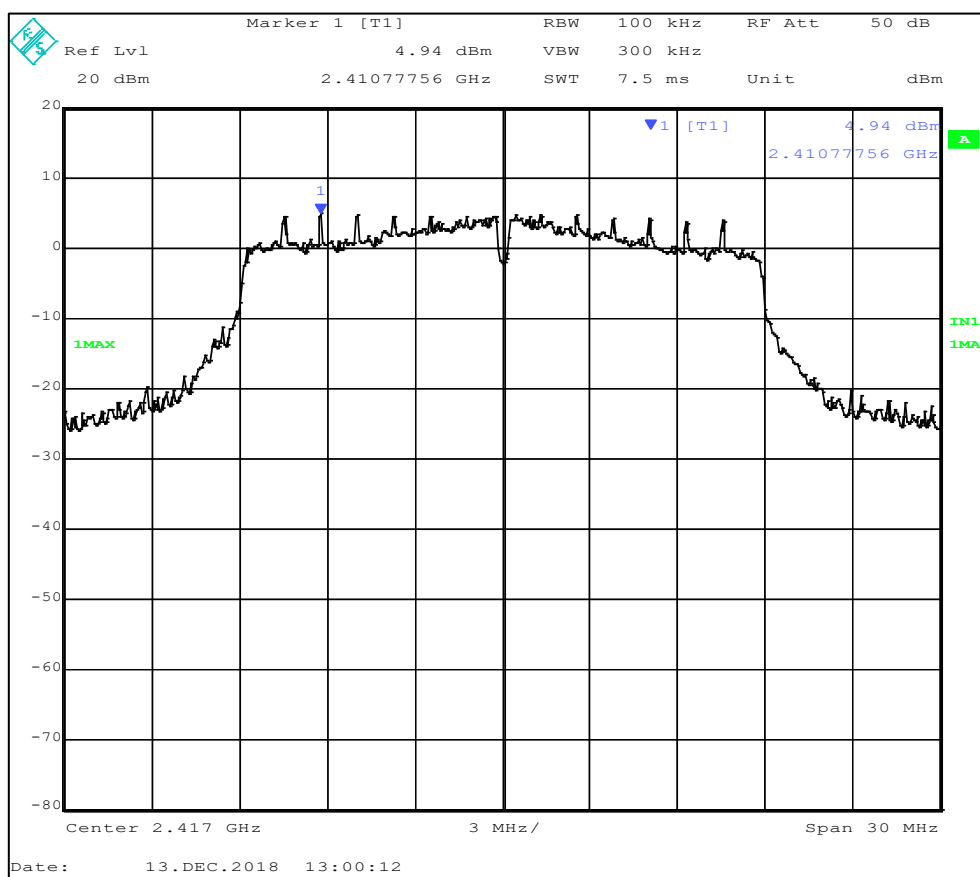


Figure 14. Reference level for channel 2.

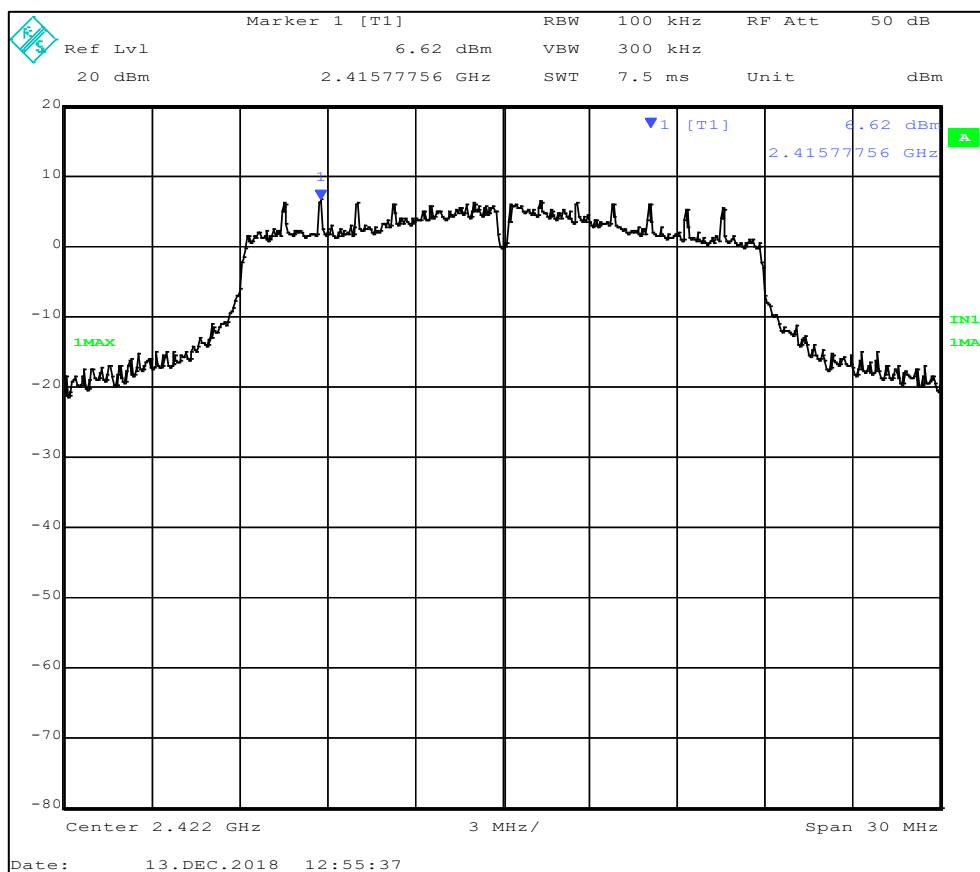


Figure 15. Reference level for channel 3.

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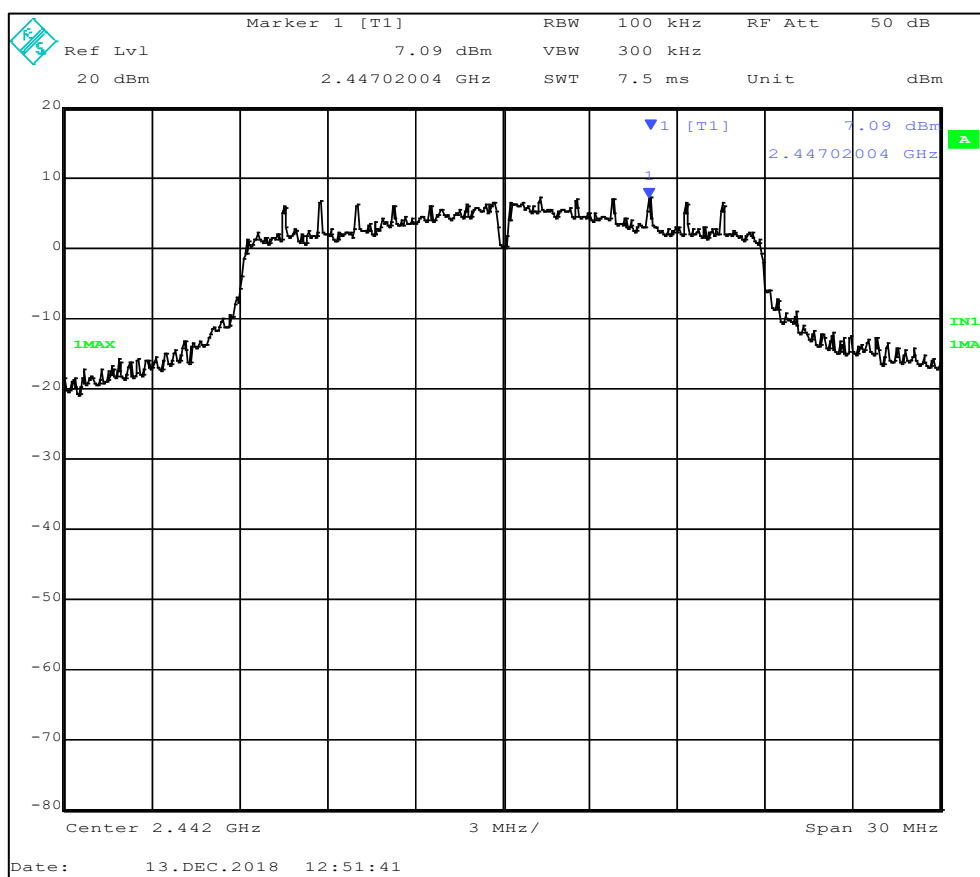


Figure 16. Reference level for channel 7 at 2442 MHz.

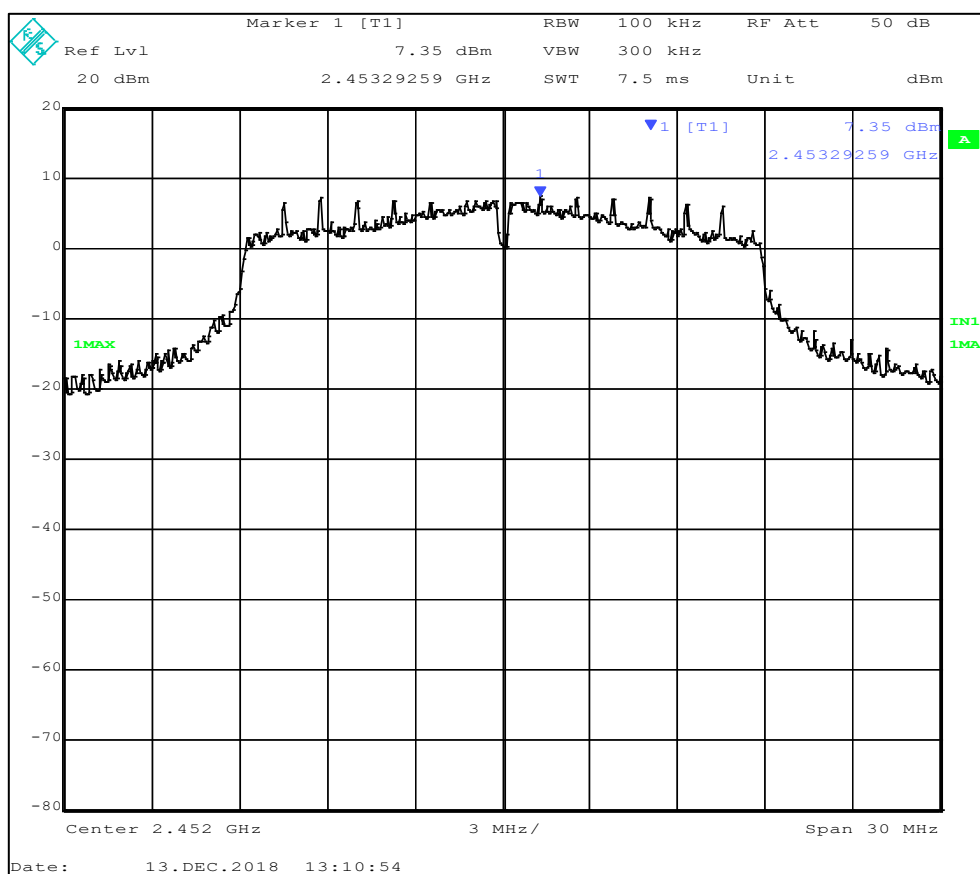


Figure 17. Reference level for channel 9.

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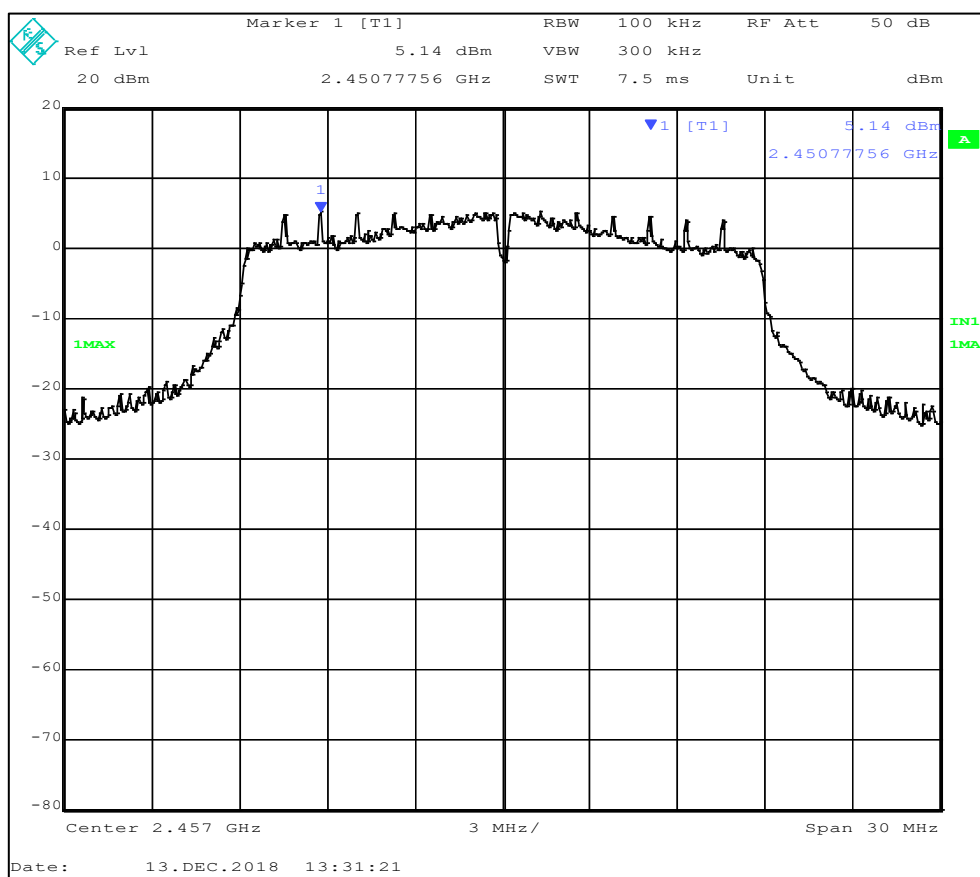


Figure 18. Reference level for channel 10.

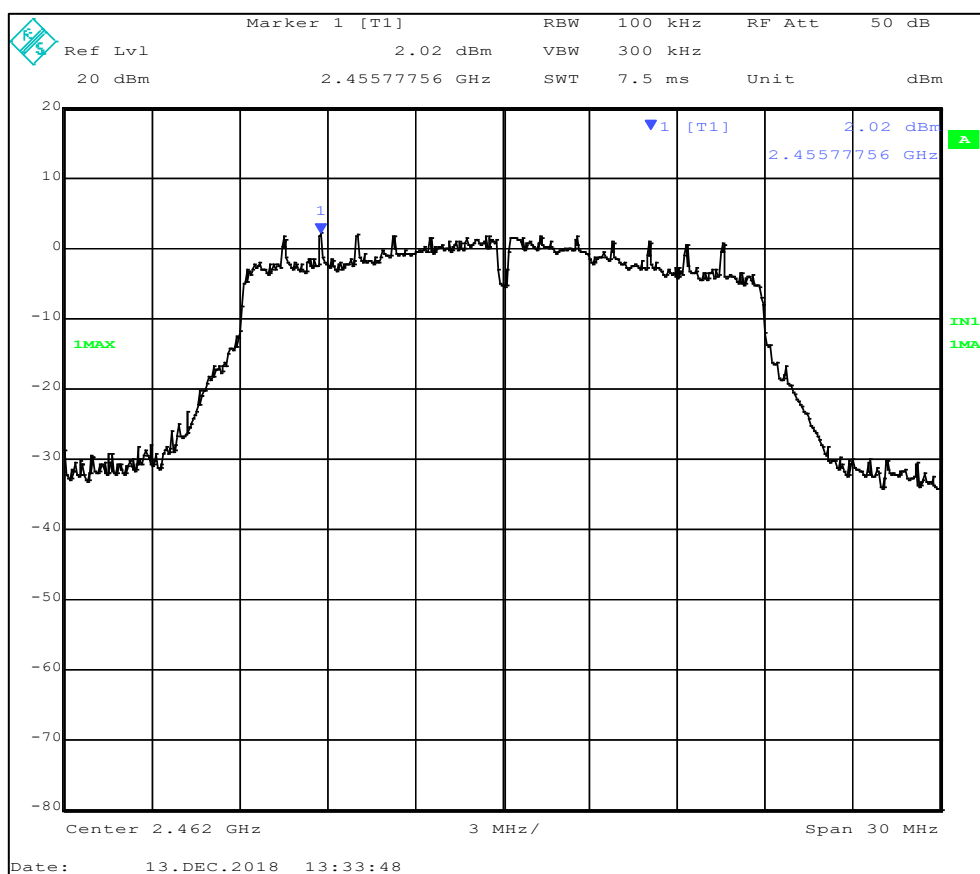


Figure 19. Reference level for channel 11.

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2.4.2.2 Test result for channel 1 at 2412 MHz

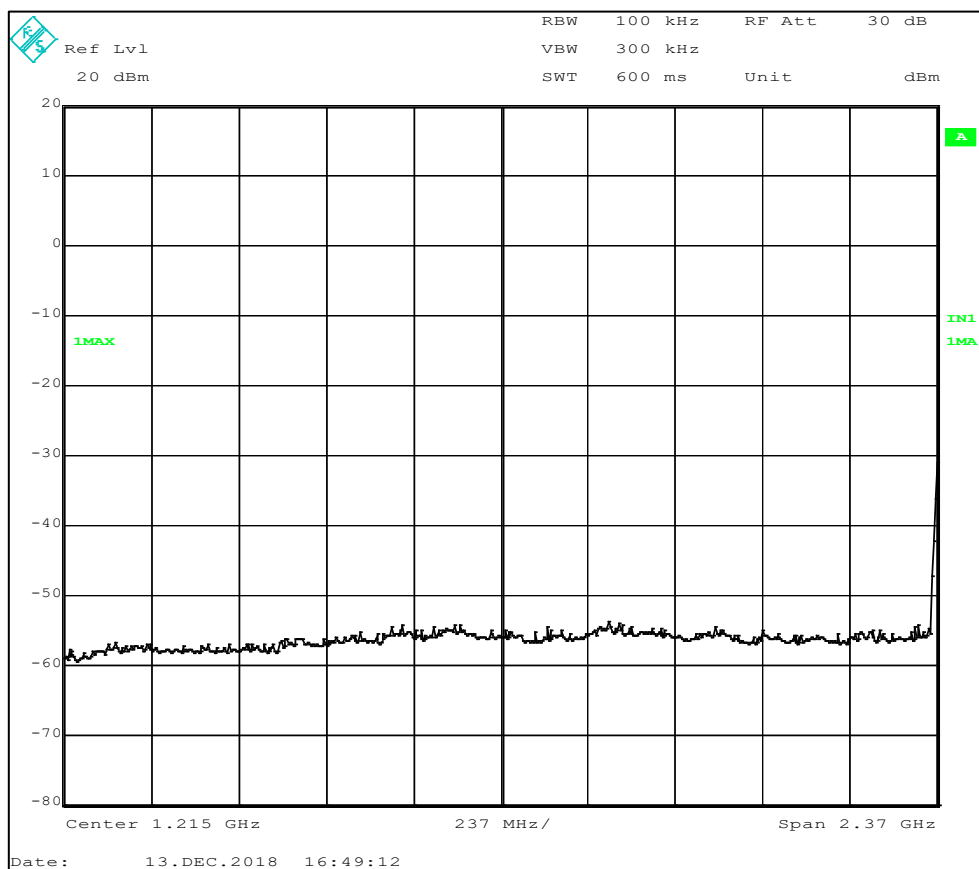


Figure 20. Emission test results. 30 MHz – 2.4 GHz.

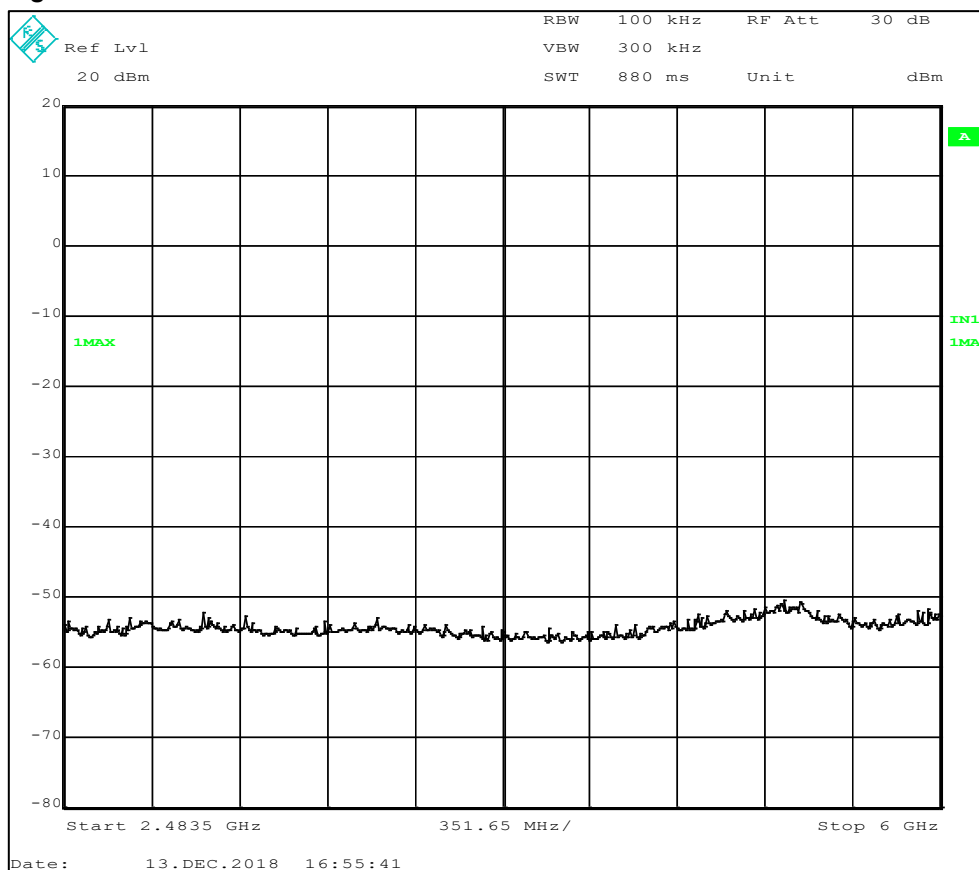


Figure 21. Emission test result 2.4835 GHz to 6 GHz.

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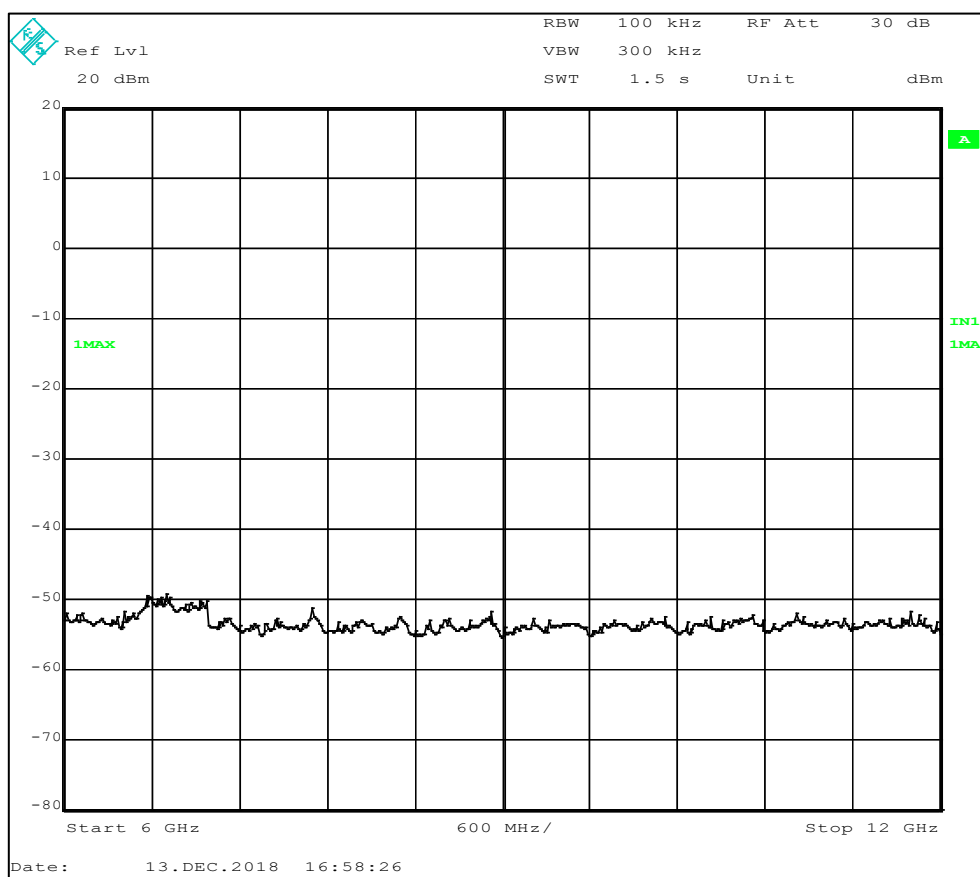


Figure 22. Emission test result 6 GHz to 12 GHz.

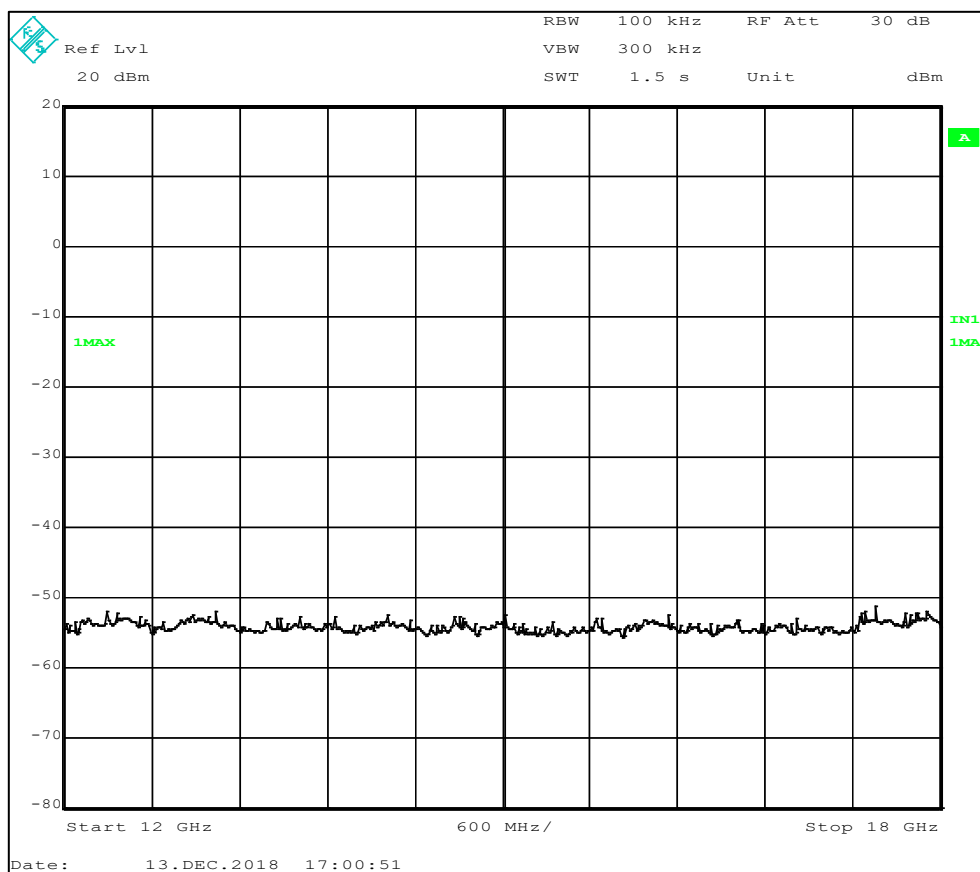


Figure 23. Emission test result 12 GHz to 18 GHz.

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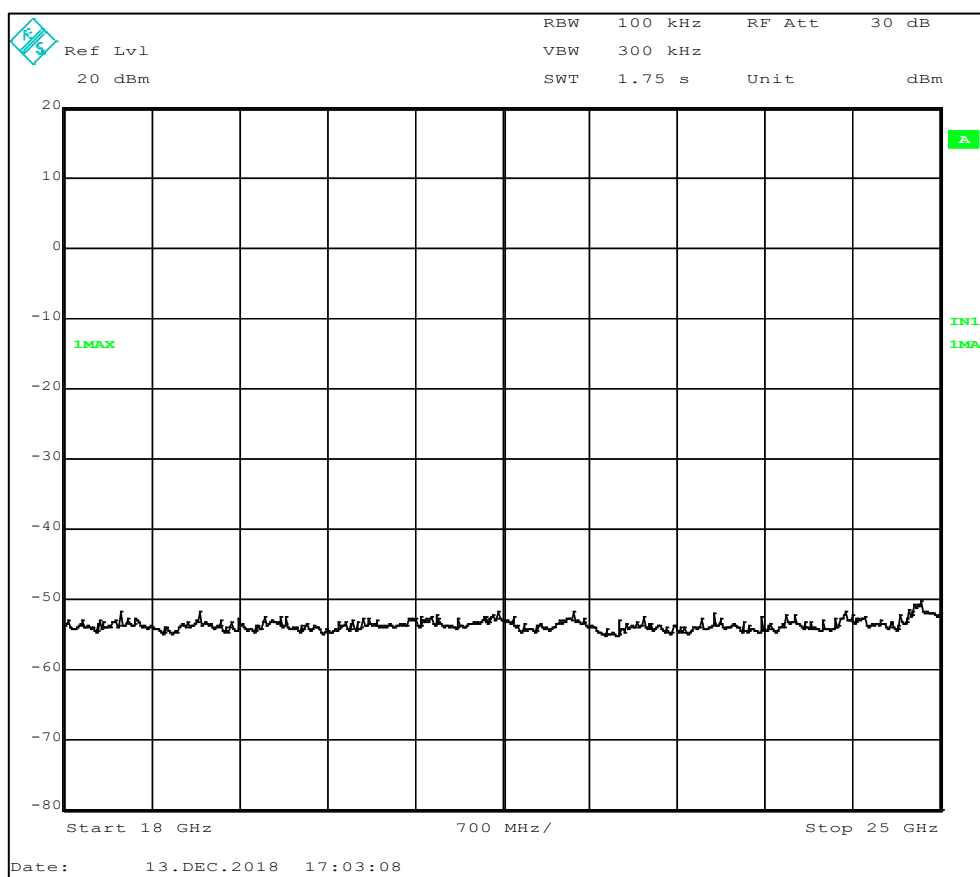


Figure 24. Emission test result 18 GHz to 25 GHz.

Frequency [MHz]	Peak [dBm]	BW [kHz]	Margin [dB]	Limit [dBm]	Result
2399.9399	-30,24	100	2,03	-28,21	PASSED

Table 4. Emission test results. Channel 1. 30 MHz to 25 GHz.

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2.4.2.3 Test result for channel 2 at 2417 MHz

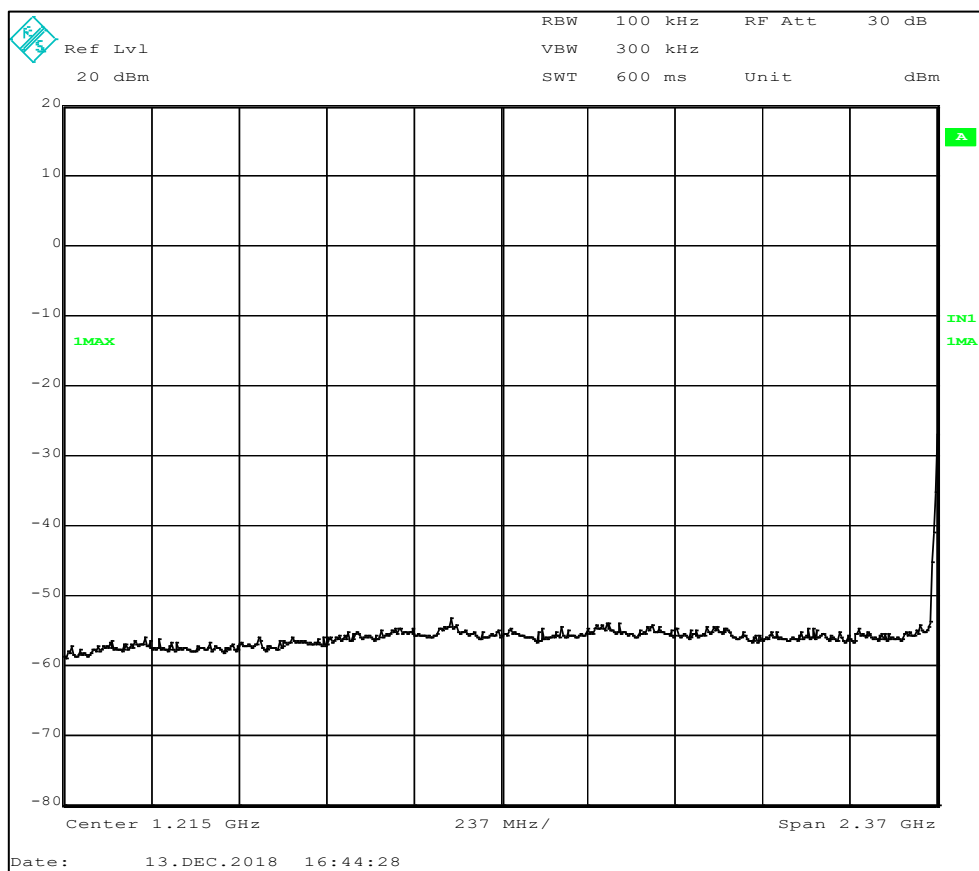


Figure 25. Emission test results. 30 MHz – 2.4 GHz.

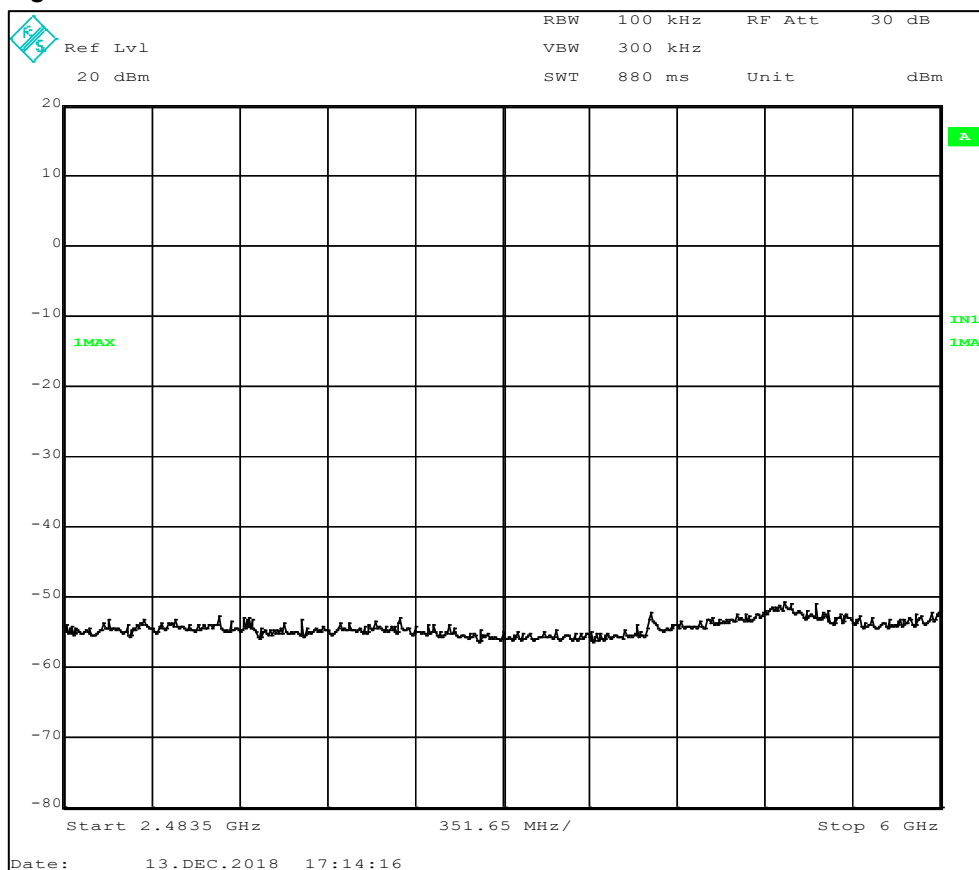


Figure 26. Emission test result 2.4835 GHz to 6 GHz.

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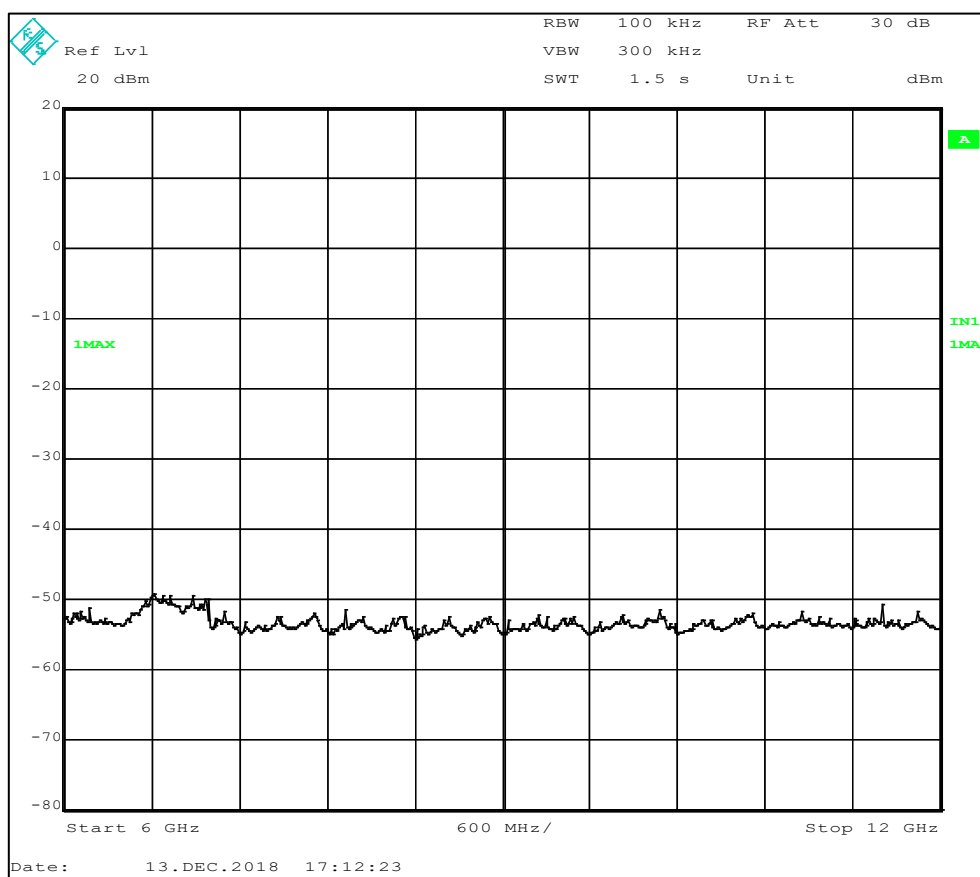


Figure 27. Emission test result 6 GHz to 12 GHz.

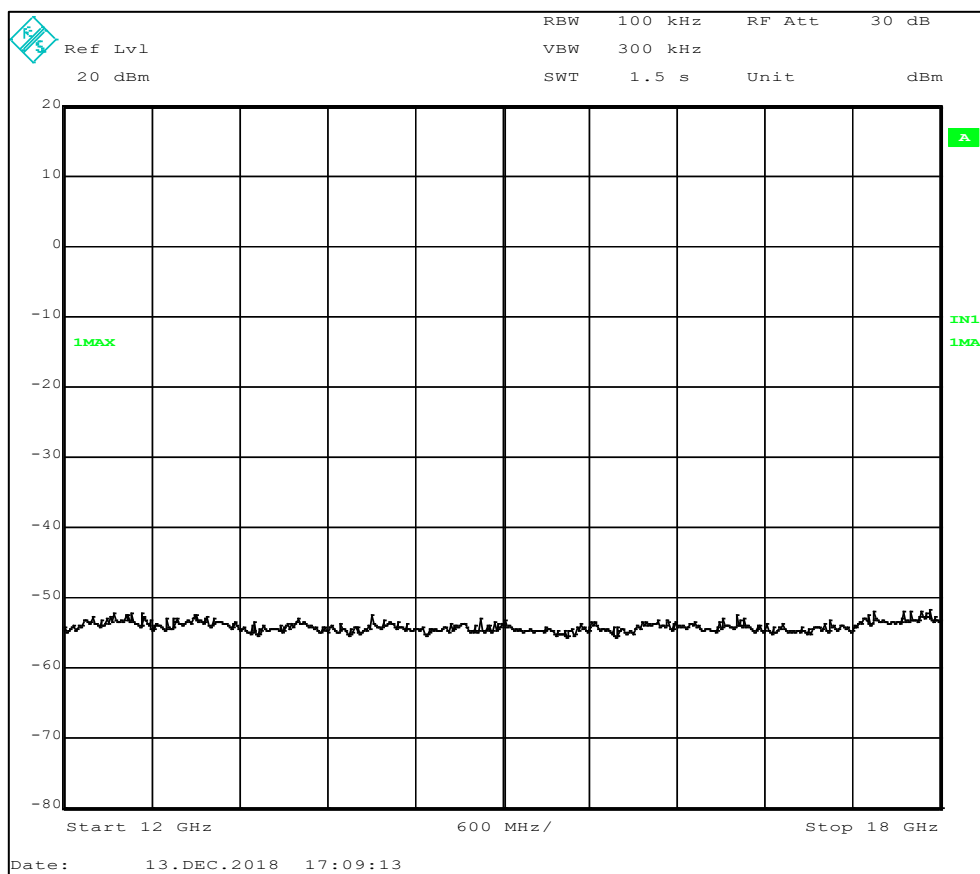


Figure 28. Emission test result 12 GHz to 18 GHz.

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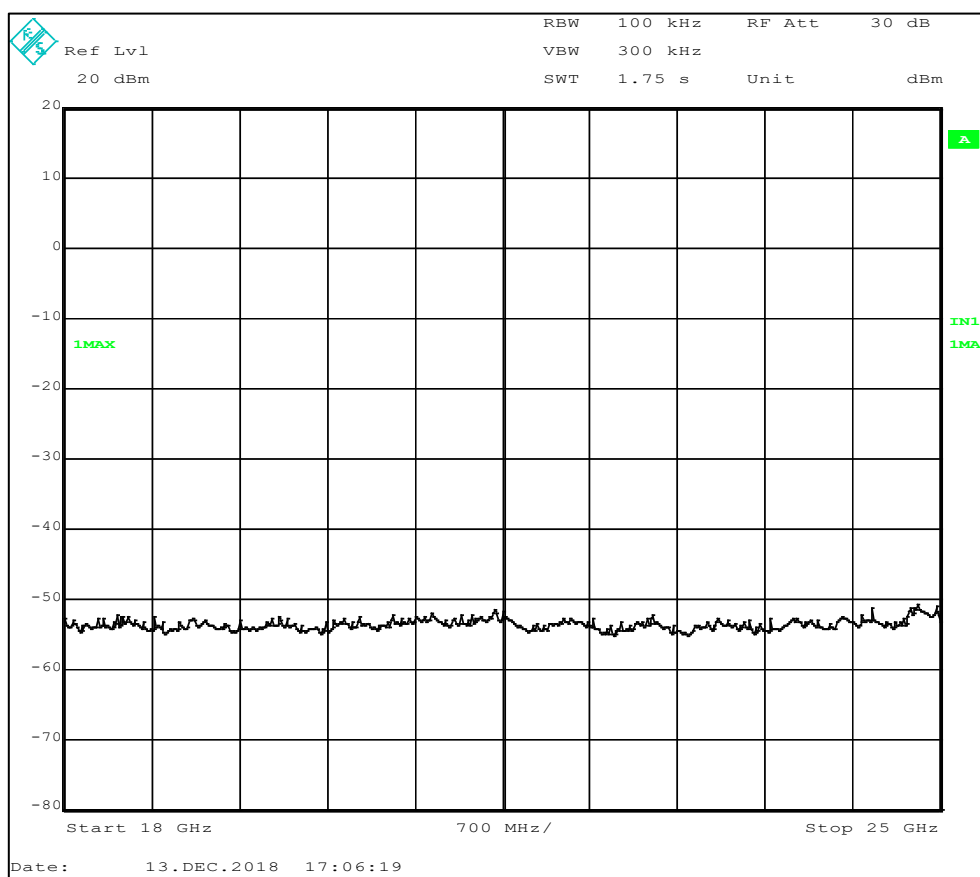


Figure 29. Emission test result 18 GHz to 25 GHz.

Frequency [MHz]	Peak [dBm]	BW [kHz]	Margin [dB]	Limit [dBm]	Result
2399.7194	-27,83	100	2.77	-25,06	PASSED

Table 5. Emission test results. Channel 2. 30 MHz to 25 GHz.

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2.4.2.4 Test result for channel 3 at 2422 MHz

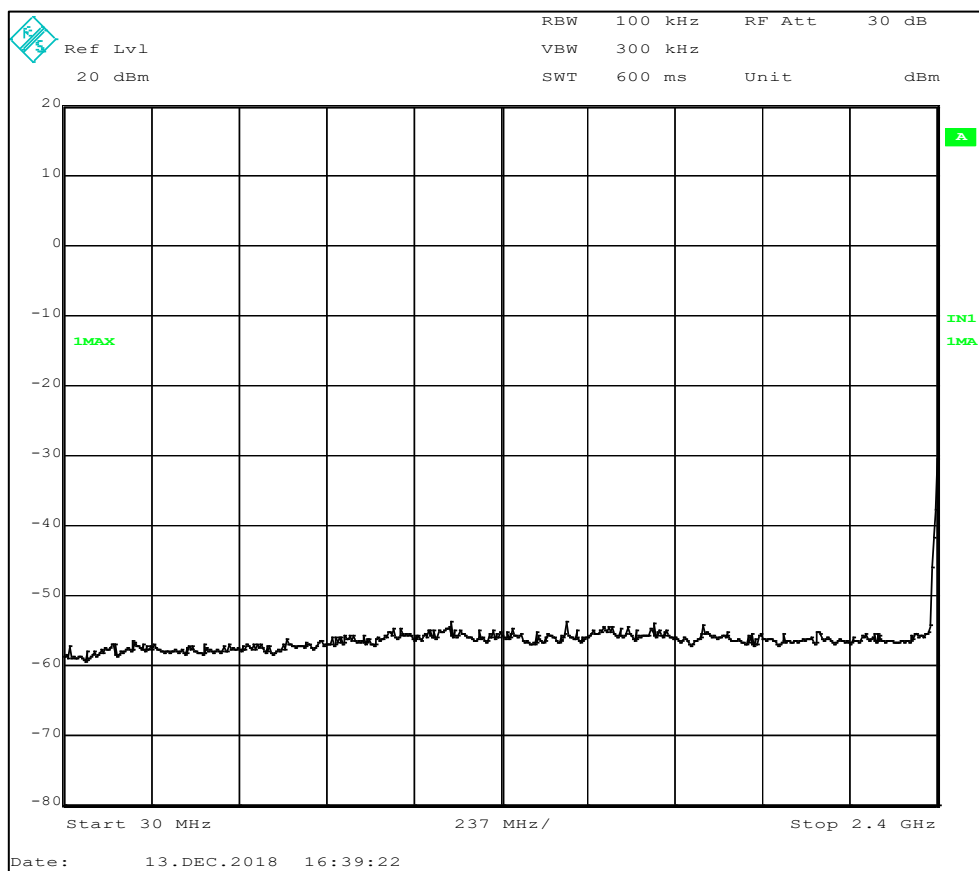


Figure 30. Emission test results. 30 MHz – 2.4 GHz.

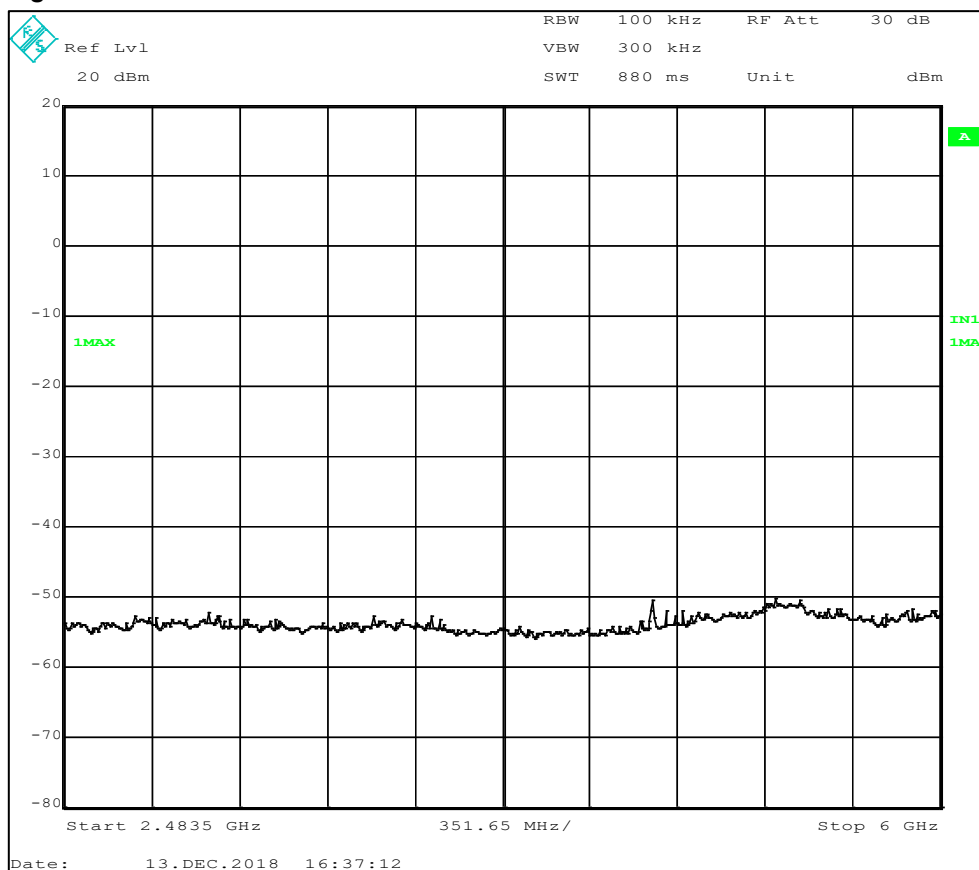


Figure 31. Emission test result 2.4835 GHz to 6 GHz.

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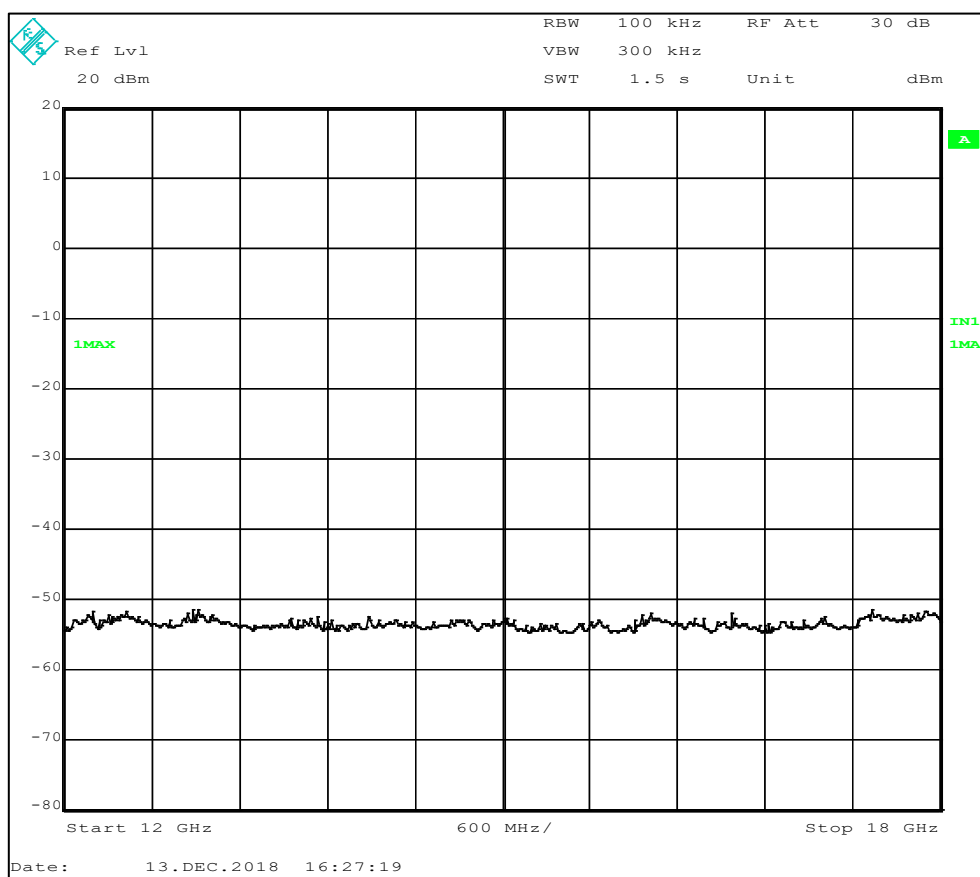


Figure 32. Emission test result 6 GHz to 12 GHz.

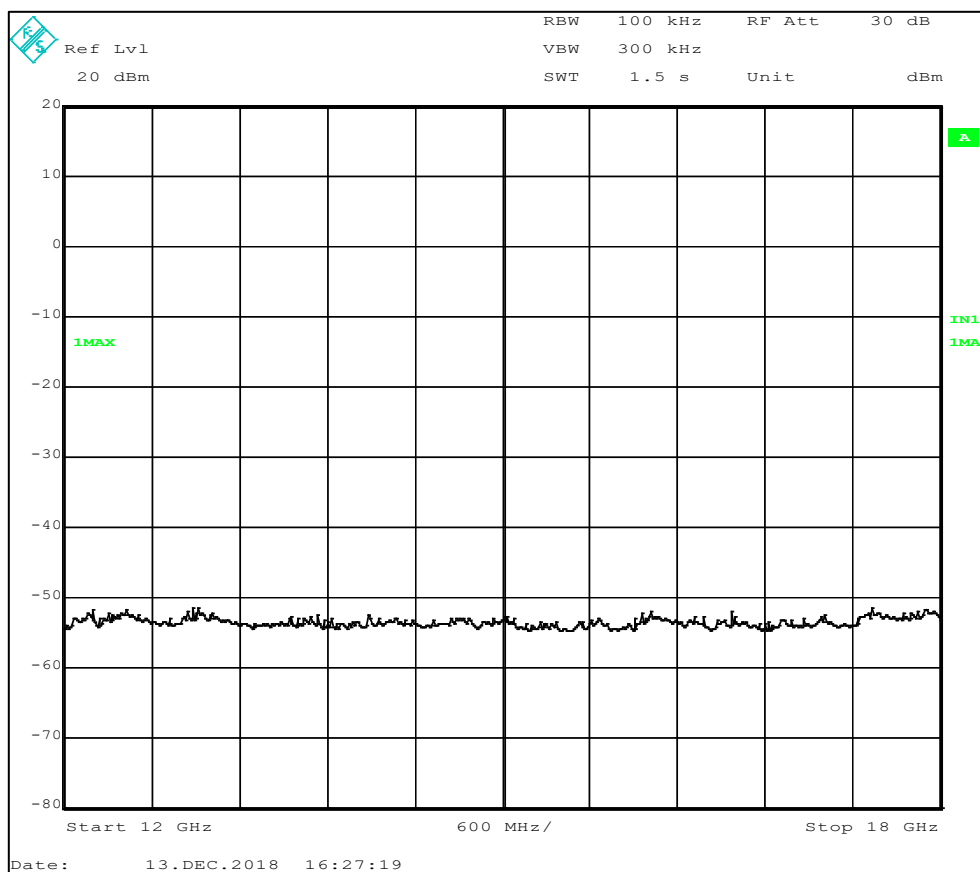


Figure 33. Emission test result 12 GHz to 18 GHz.

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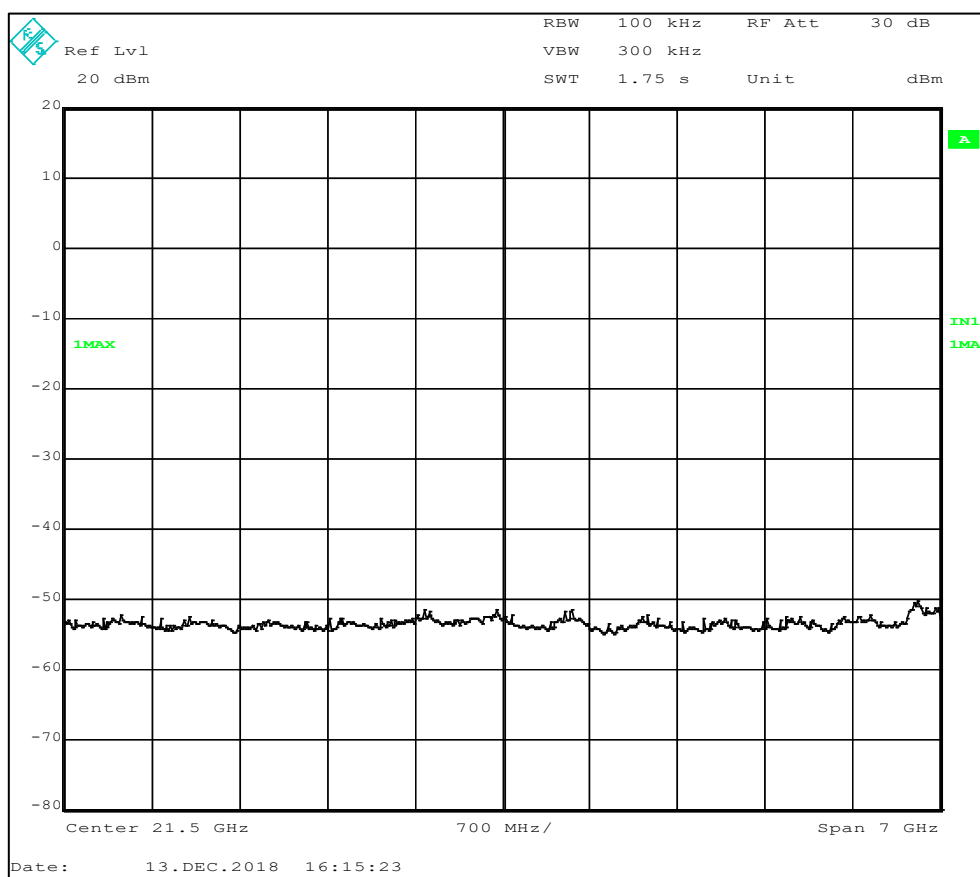


Figure 34. Emission test result 18 GHz to 25 GHz.

Frequency [MHz]	Peak [dBm]	BW [kHz]	Margin [dB]	Limit [dBm]	Result
2400	-31	100	7,62	-23.38	PASSED

Table 6. Emission test results. Channel 3. 30 MHz to 25 GHz.

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2.4.2.5 Test result for channel 7 at 2442 MHz

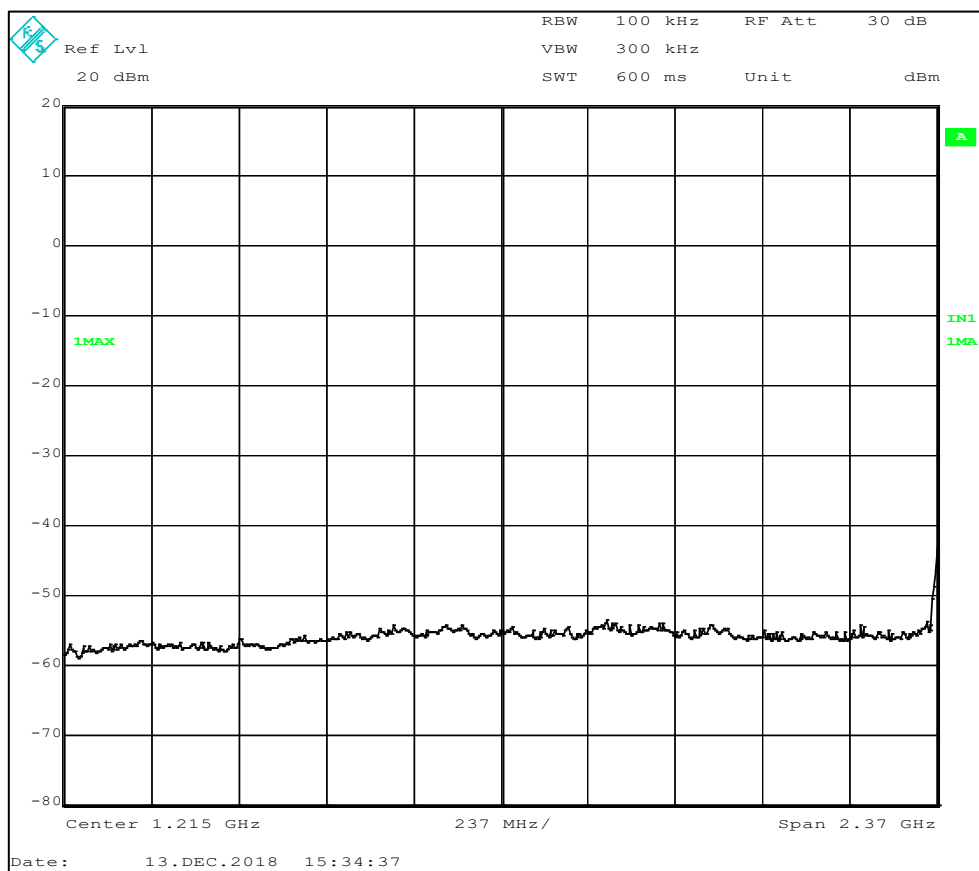


Figure 35. Emission test results. 30 MHz – 2.4 GHz.

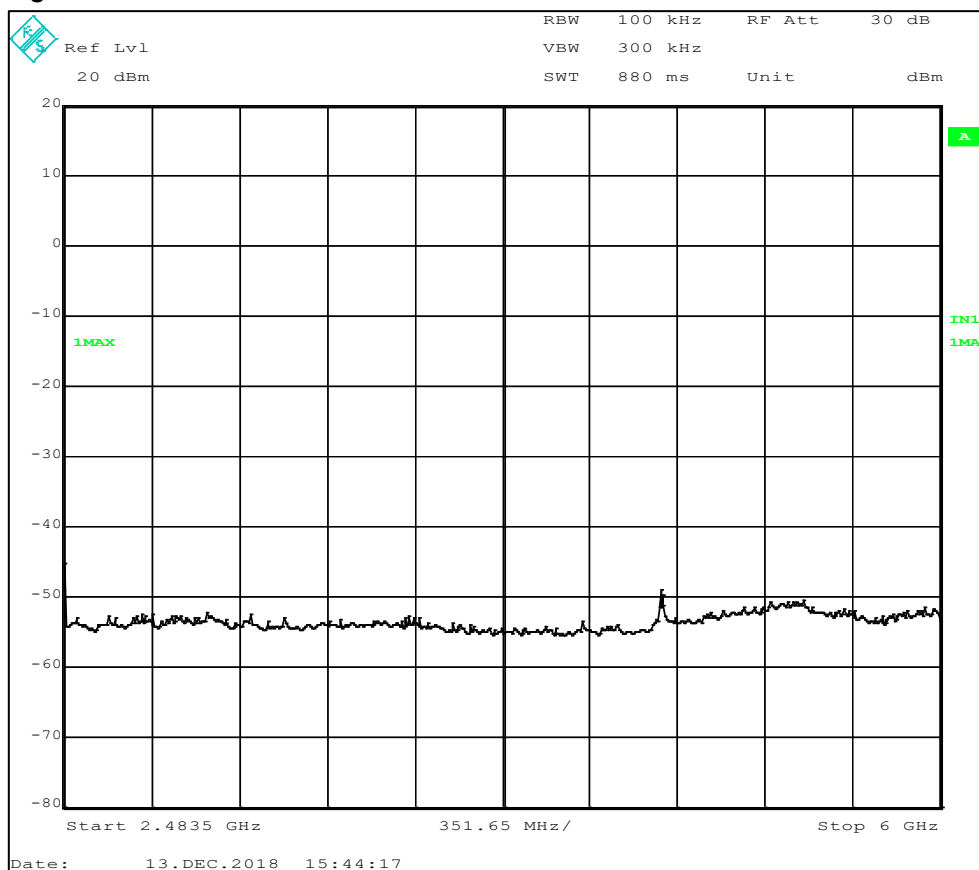


Figure 36. Emission test result 2.4835 GHz to 6 GHz.

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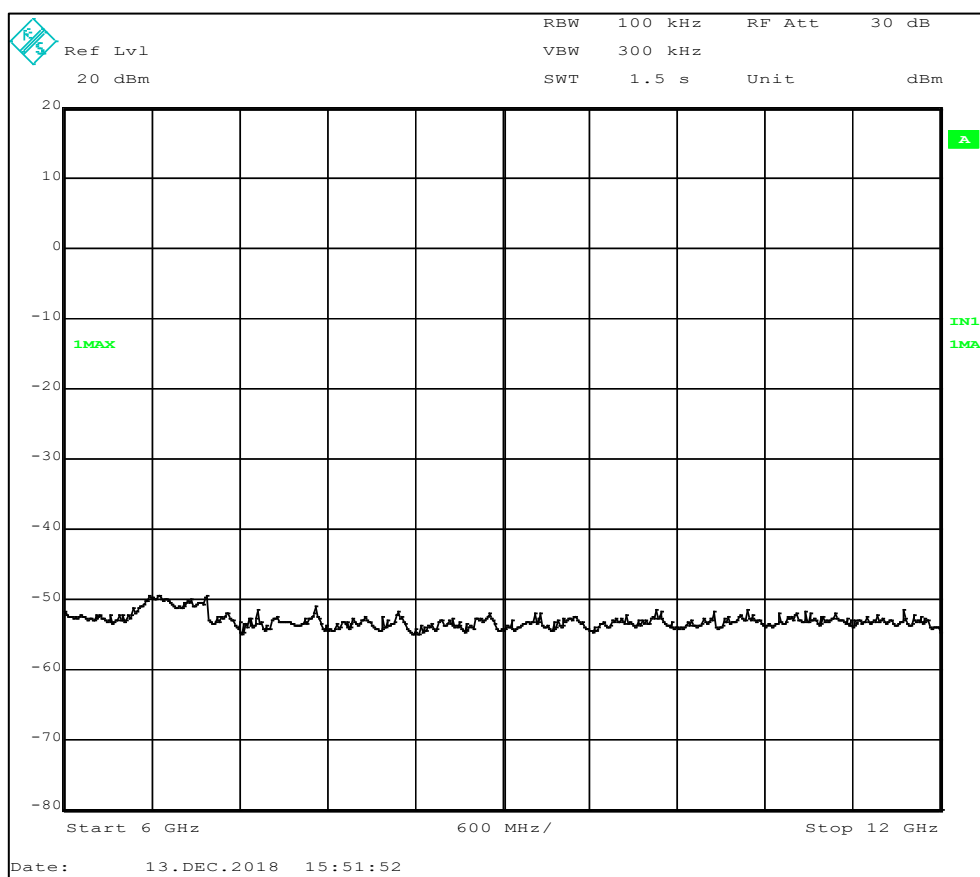


Figure 37. Emission test result 6 GHz to 12 GHz.

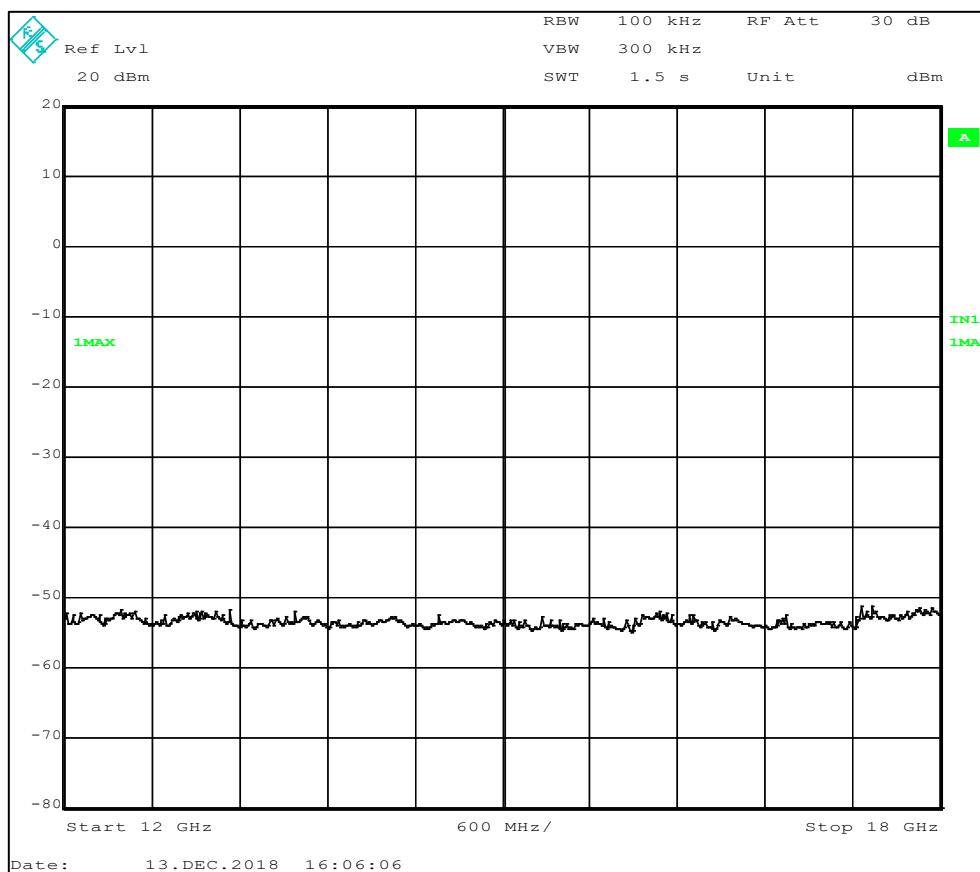


Figure 38. Emission test result 12 GHz to 18 GHz.

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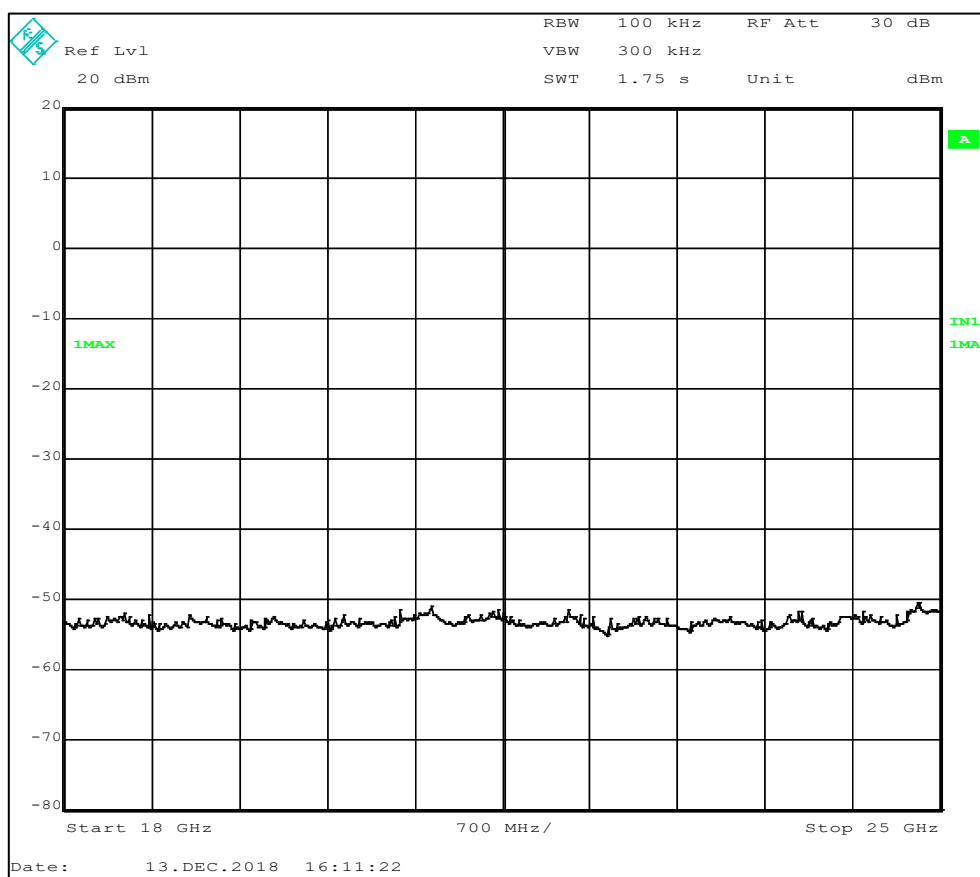


Figure 39. Emission test result 18 GHz to 25 GHz.

Frequency [MHz]	Peak [dBm]	BW [kHz]	Margin [dB]	Limit [dBm]	Result
2400	-43	100	20,09	-22,91	PASSED

Table 7. Emission test results. Channel 7. 30 MHz to 25 GHz.

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2.4.2.6 Test result for channel 9 at 2452 MHz

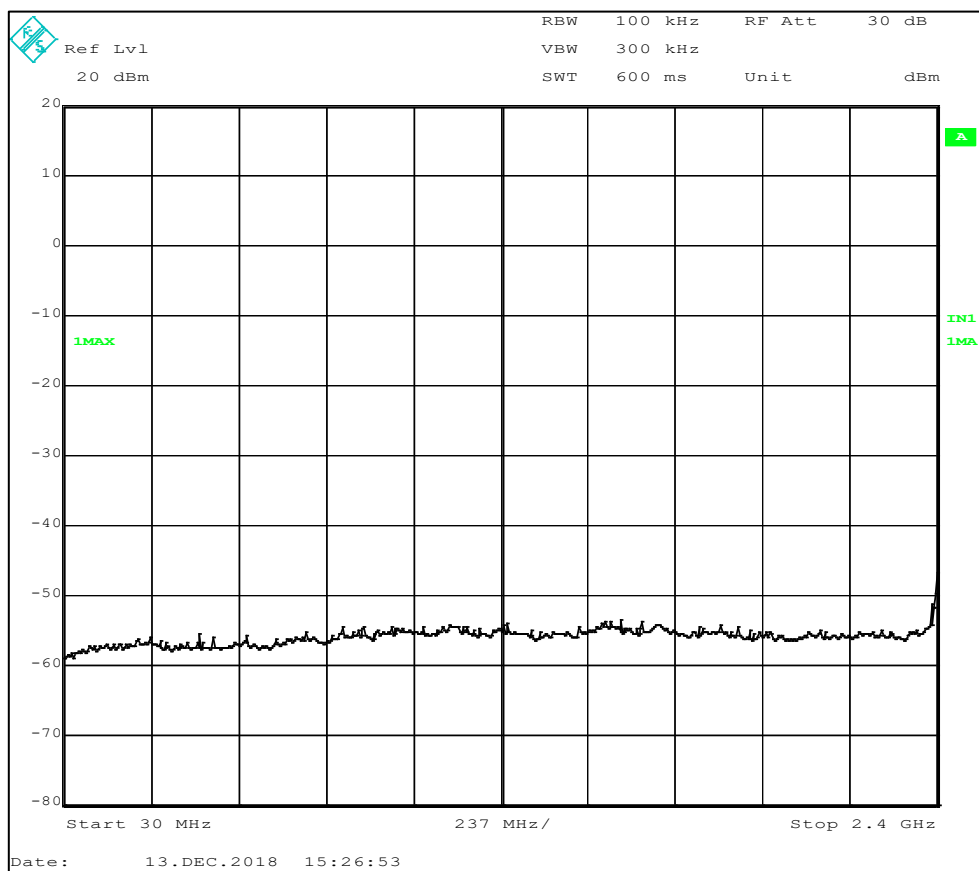


Figure 40. Emission test results. 30 MHz – 2.4 GHz.

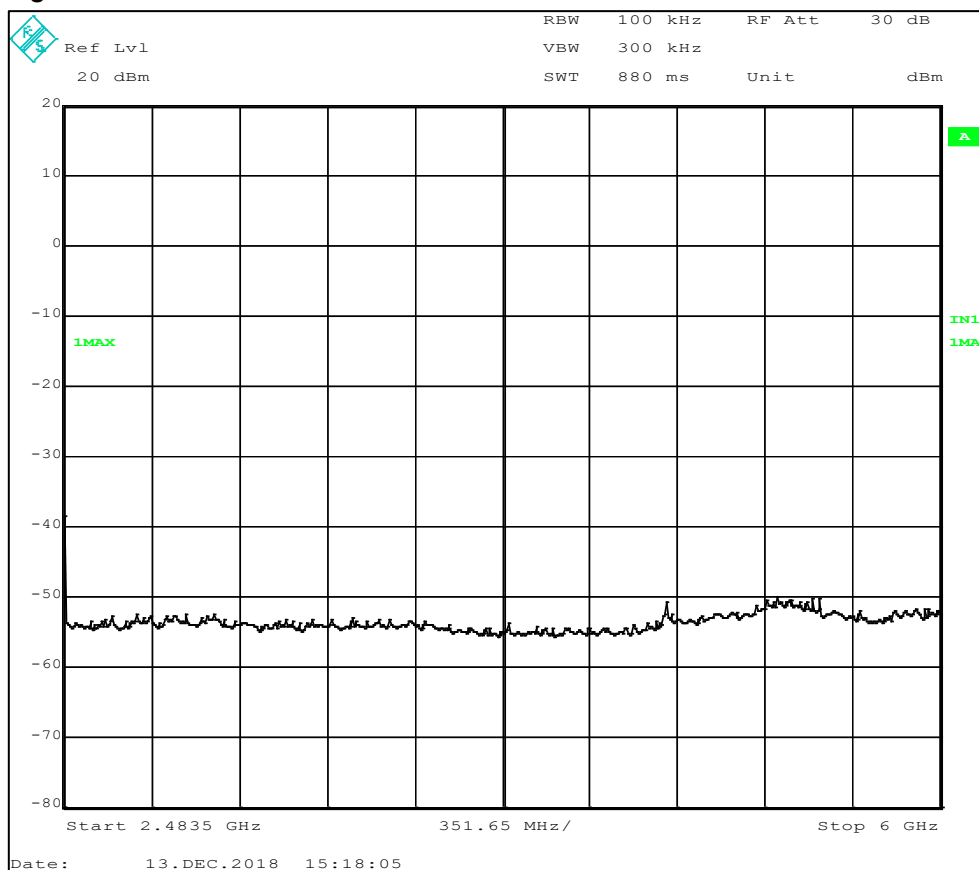


Figure 41. Emission test result 2.4835 GHz to 6 GHz.

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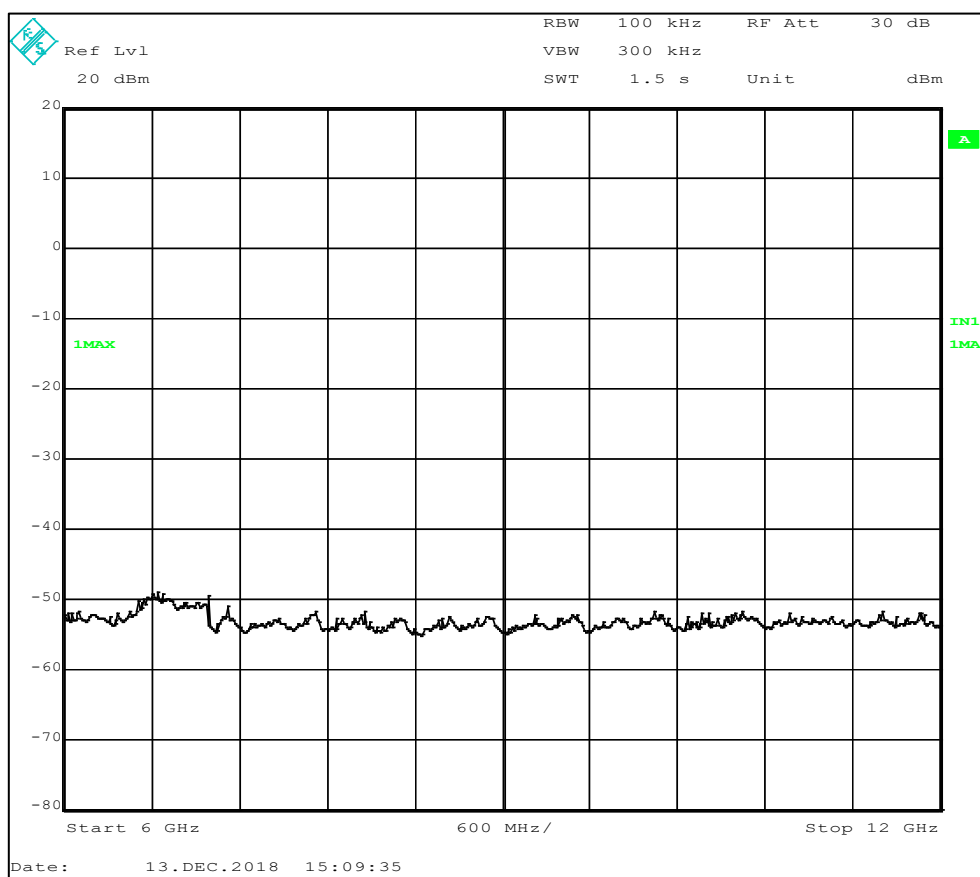


Figure 42. Emission test result 6 GHz to 12 GHz.

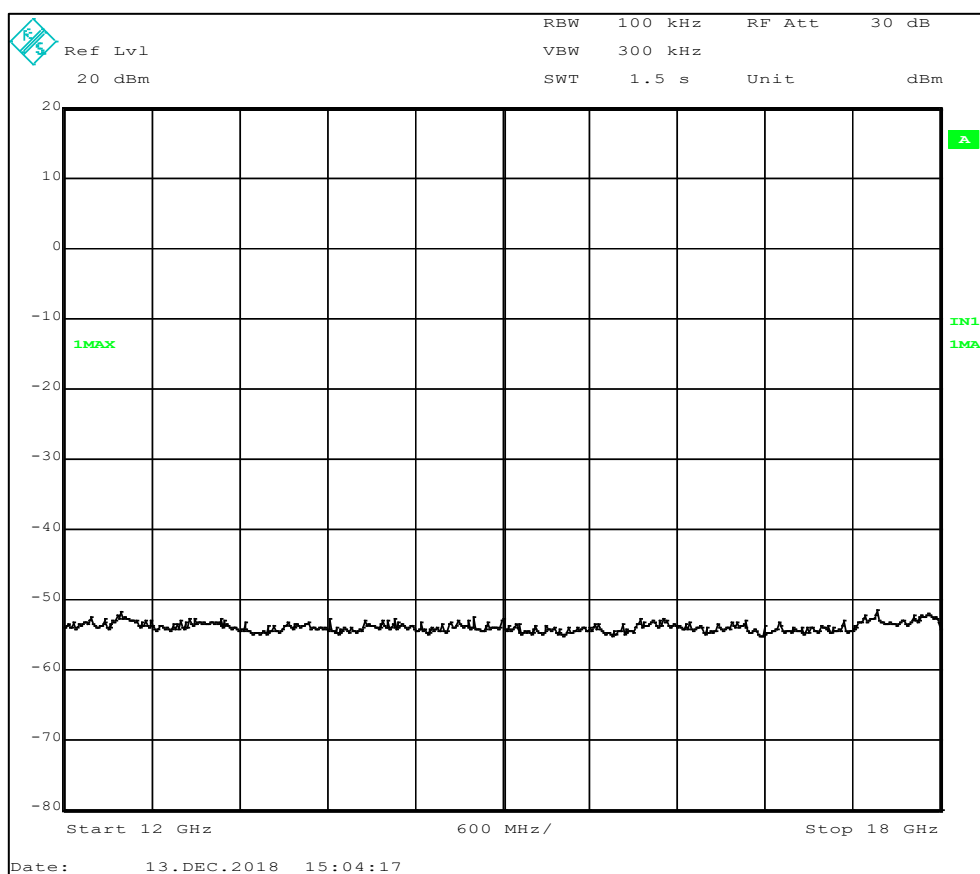


Figure 43. Emission test result 12 GHz to 18 GHz.

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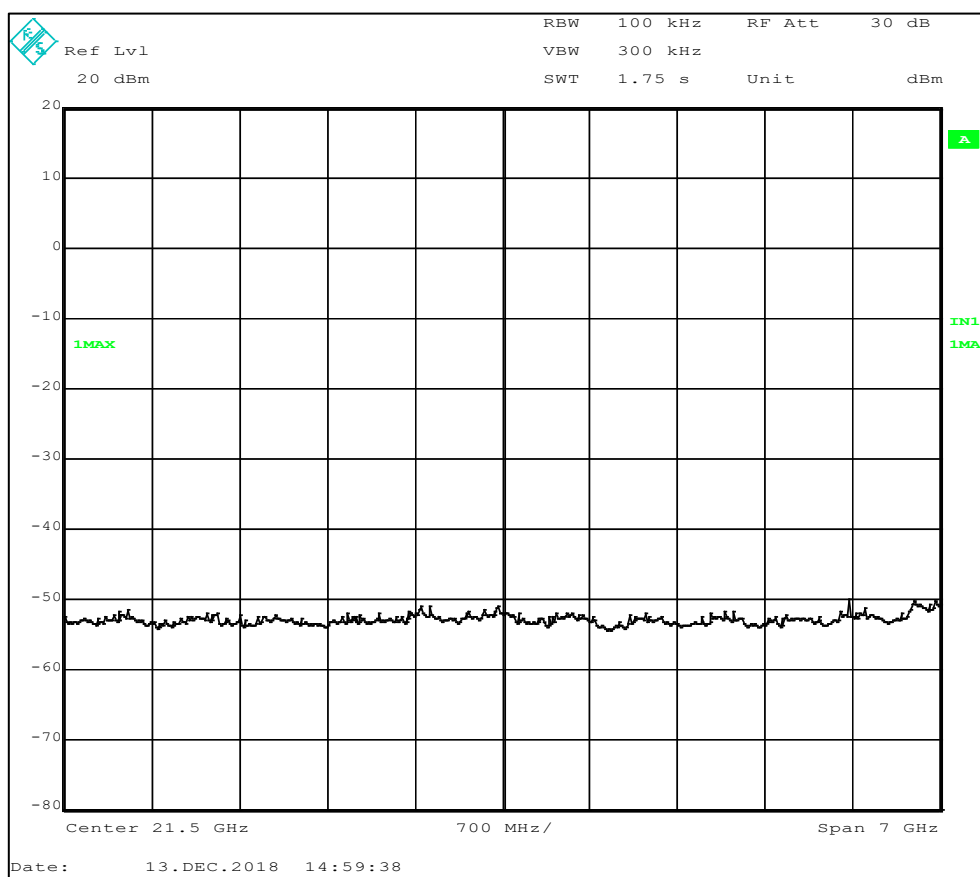


Figure 44. Emission test result 18 GHz to 25 GHz.

Frequency [MHz]	Peak [dBm]	BW [kHz]	Margin [dB]	Limit [dBm]	Result
2483.5	-38	100	15,35	-22,65	PASSED

Table 8. Emission test results. Channel 9. 30 MHz to 25 GHz.

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2.4.2.7 Test result for channel 10 at 2457 MHz

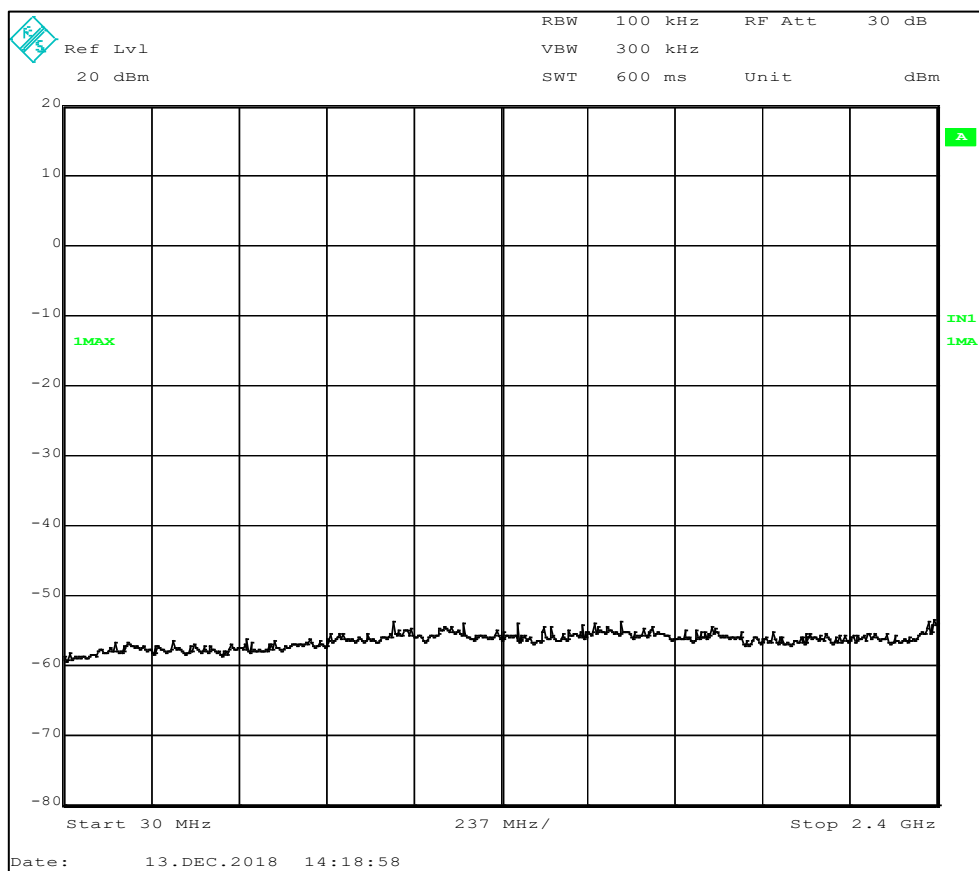


Figure 45. Emission test results. 30 MHz – 2.4 GHz.

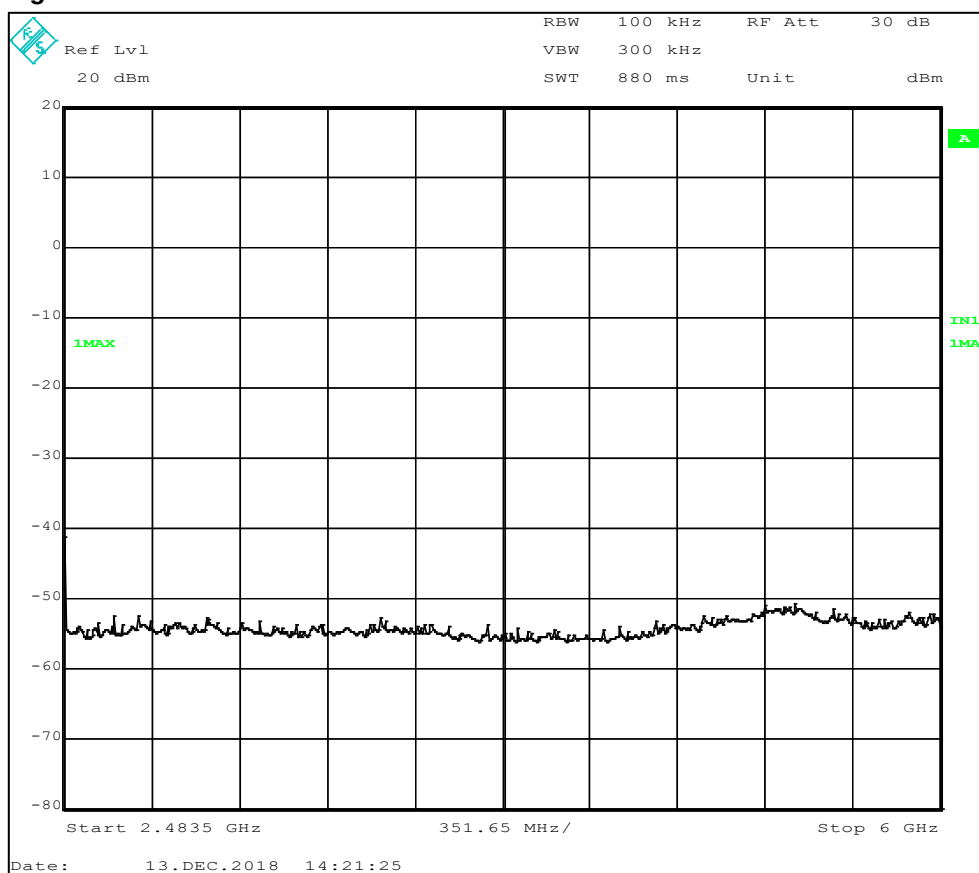


Figure 46. Emission test results. 2.4835 GHz to 6 GHz.

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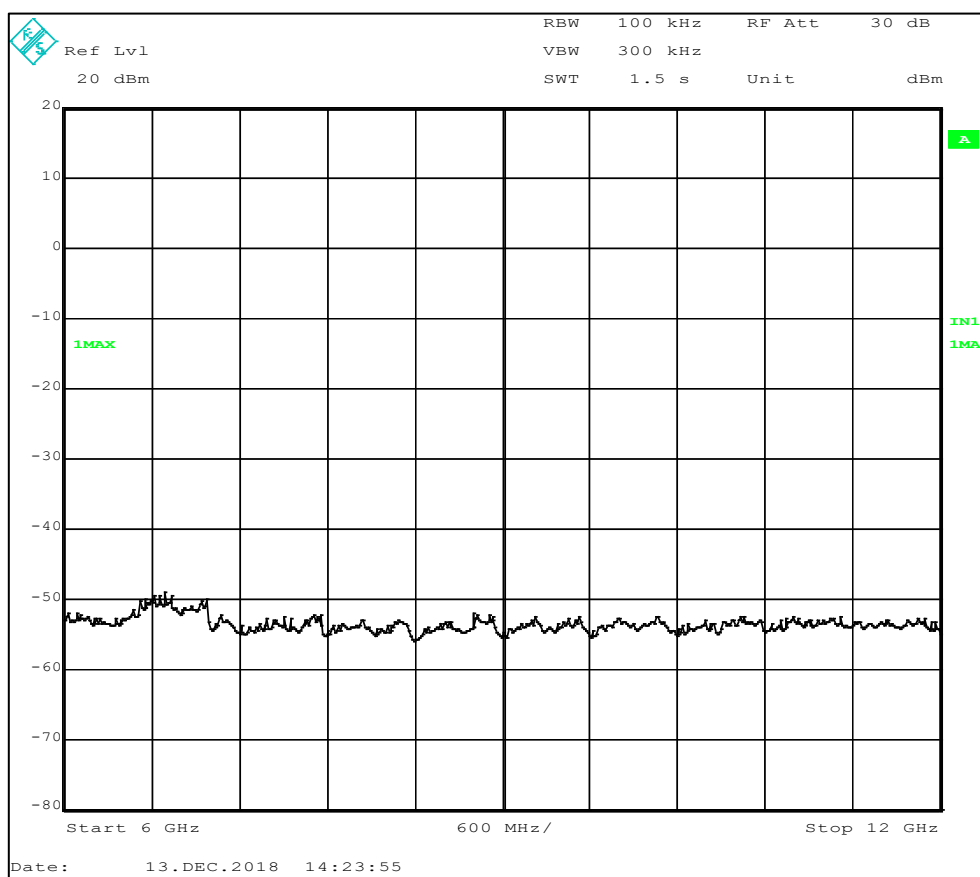


Figure 47. Emission test results. 6 GHz to 12 GHz.

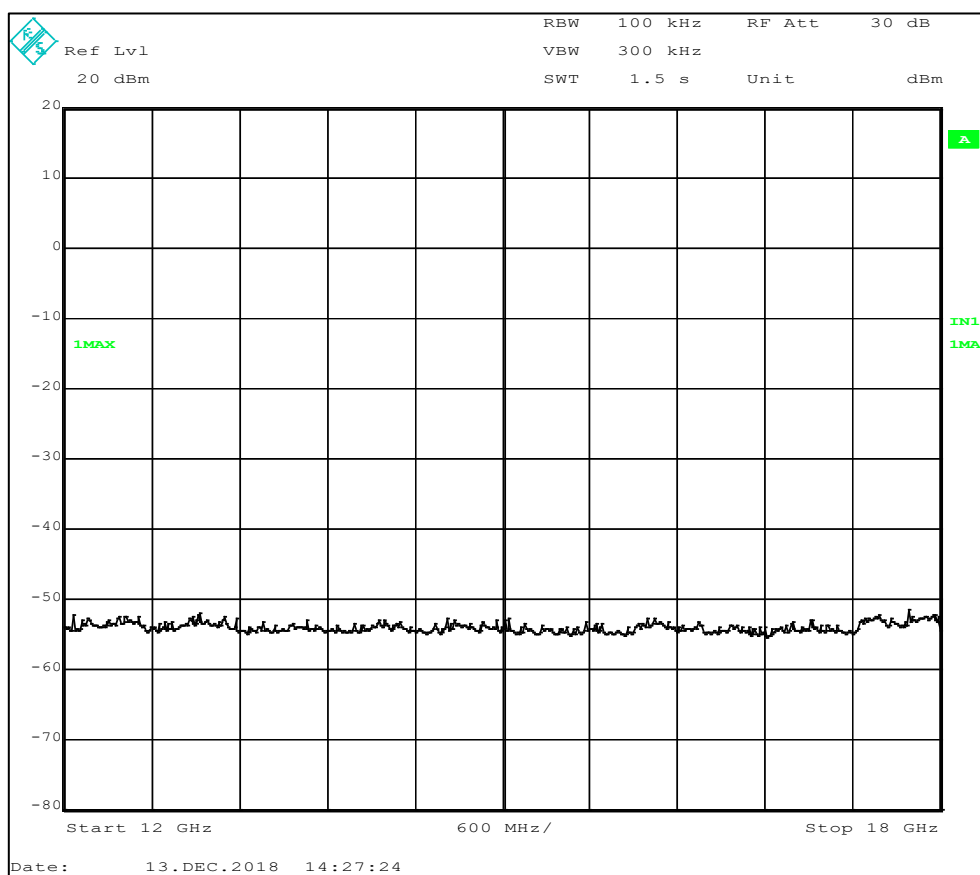


Figure 48. Emission test results. 12 GHz to 18 GHz.

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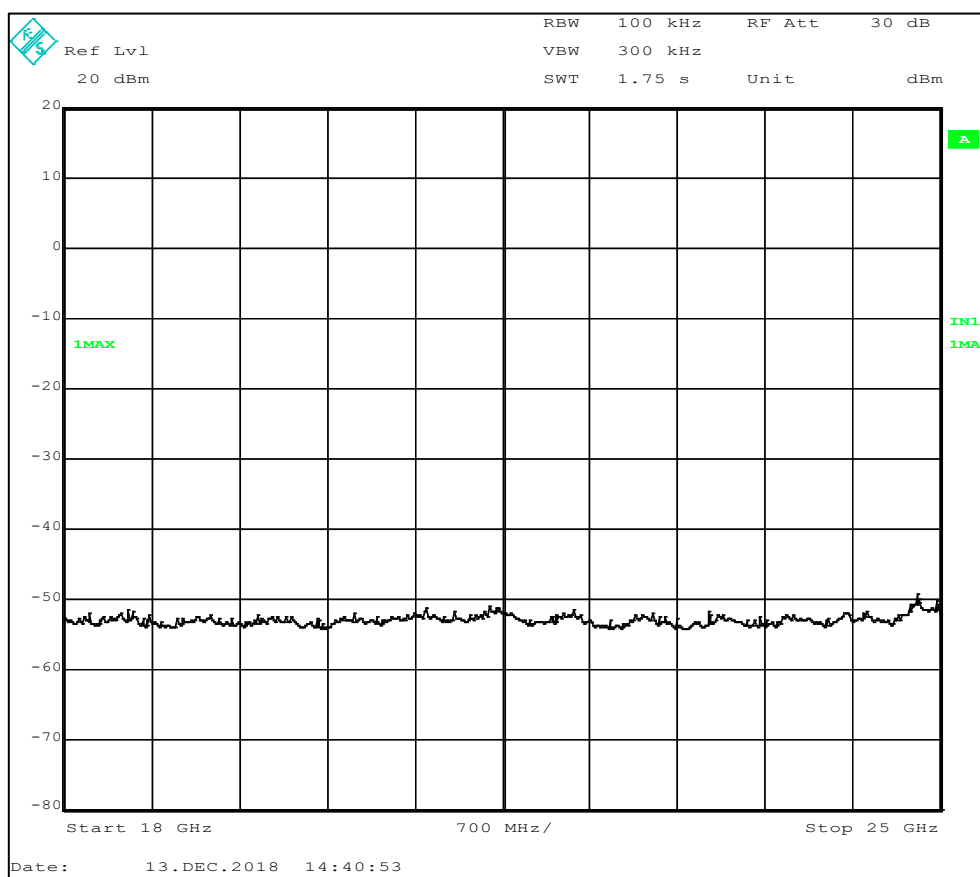


Figure 49. Emission test results. 18 GHz to 25 GHz.

Frequency [MHz]	Peak [dBm]	BW [kHz]	Margin [dB]	Limit [dBm]	Result
2483.5	-41	100	16,14	-24.86	PASSED

Table 9. Emission test results. Channel 10. 30 MHz to 25 GHz.

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2.4.2.8 Test result for channel 11 at 2462 MHz.

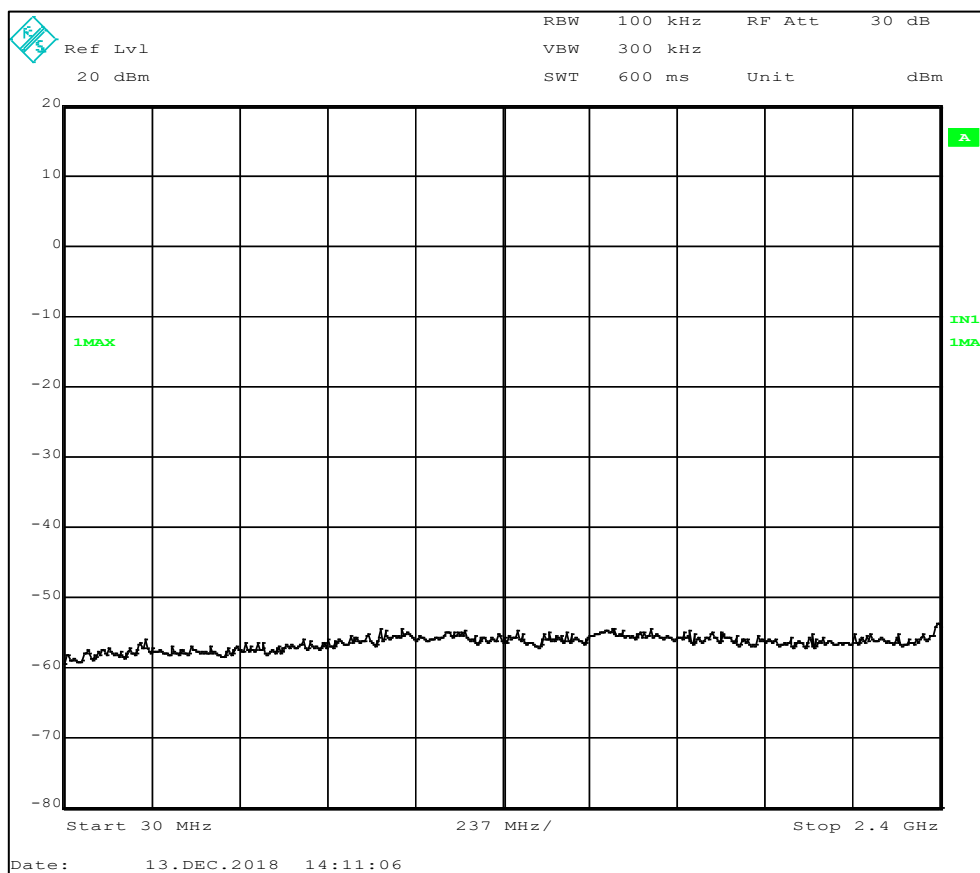


Figure 50. Emission test results. 30 MHz to 2.4 GHz.

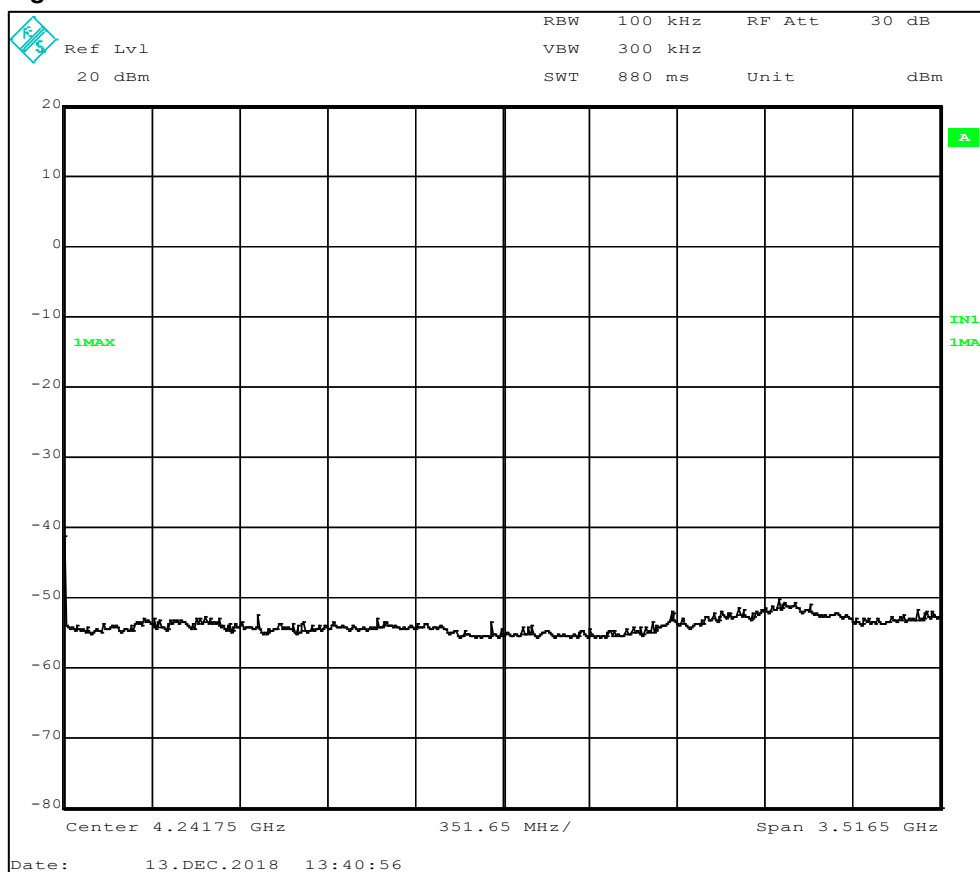


Figure 51. Emission test results. 2.4835 GHz to 6 GHz.

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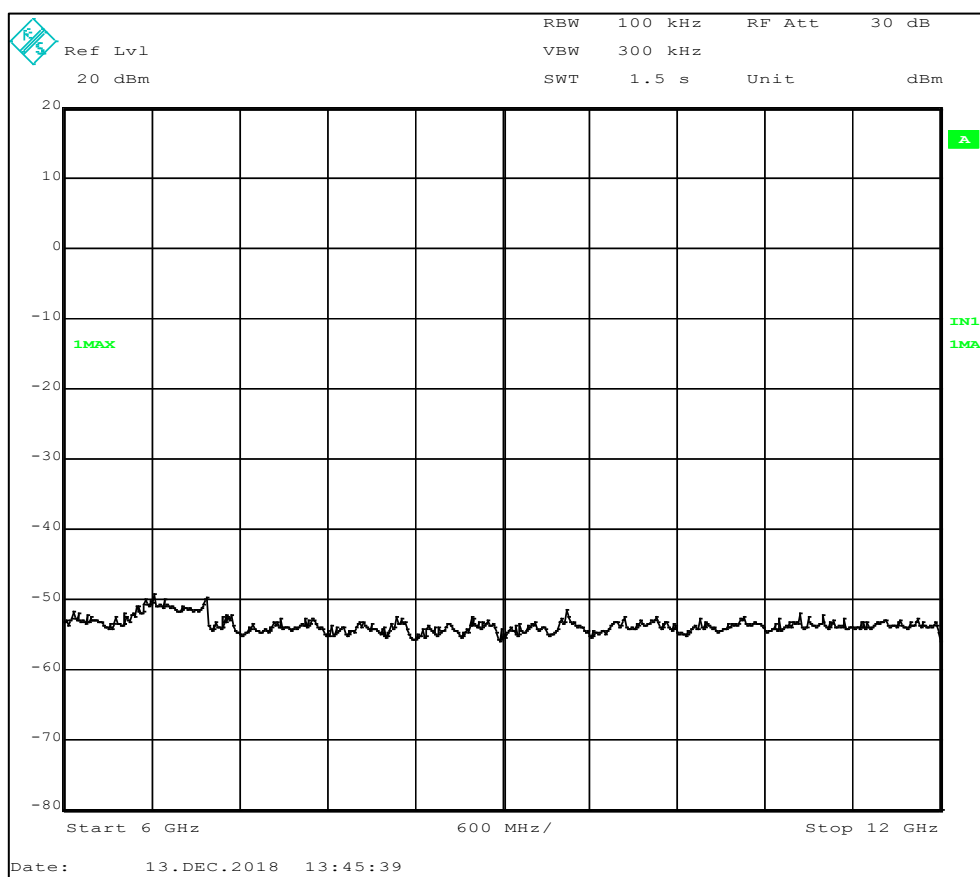


Figure 52. Emission test results. 6 GHz to 12 GHz.

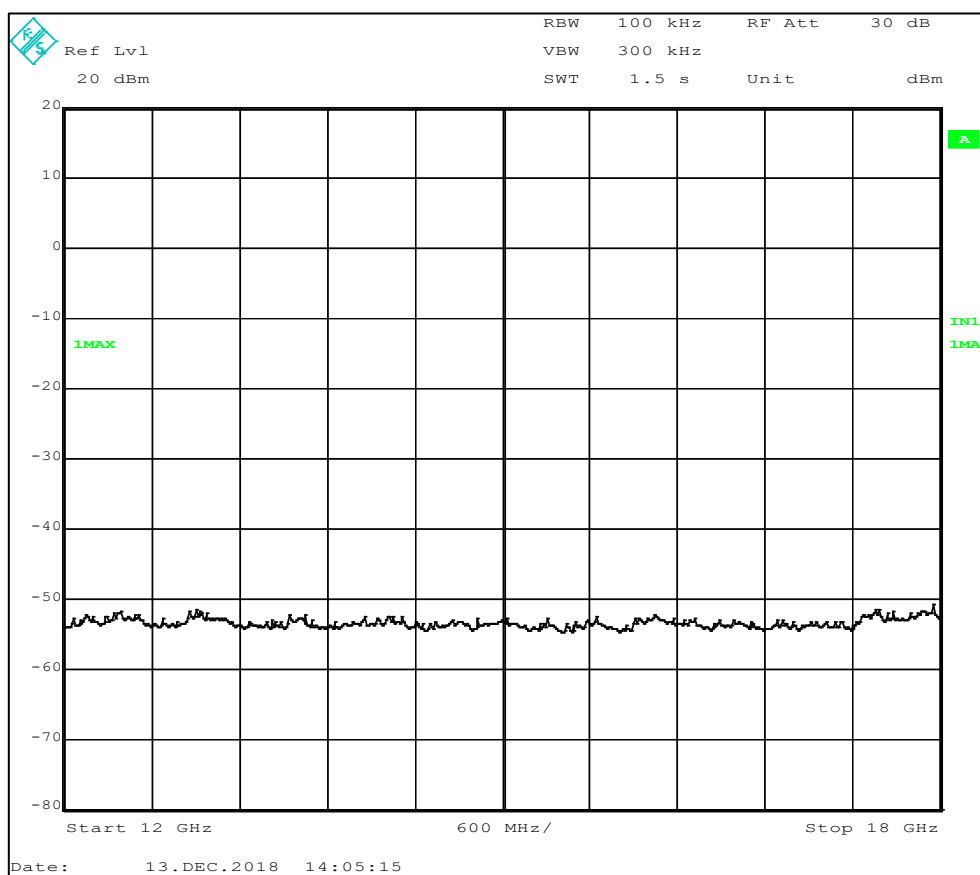


Figure 53. Emission test results. 12 GHz to 18 GHz.

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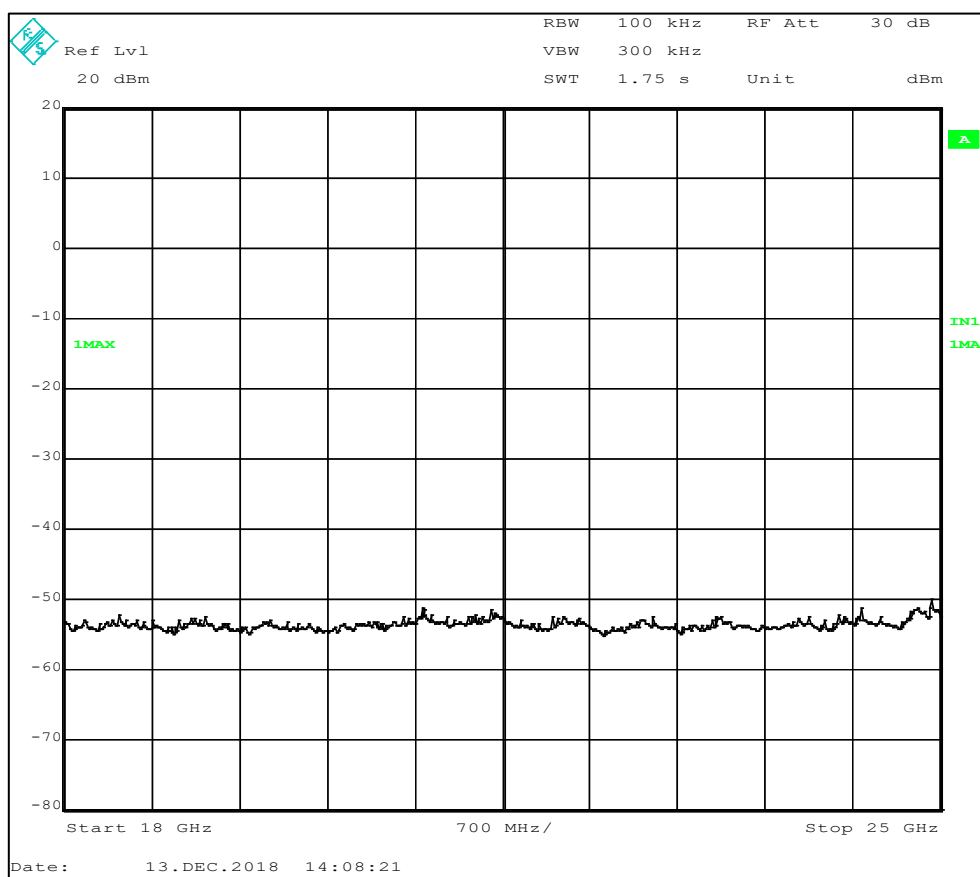


Figure 54. Emission test results. 18 GHz to 25 GHz.

Frequency [MHz]	Peak [dBm]	BW [kHz]	Margin [dB]	Limit [dBm]	Result
2483.5	-41	100	13.02	-27.98	PASSED

Table 10. Emission test results. Channel 11. 30 MHz to 25 GHz.

2.4.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2019-09-24

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2.5 Emission in restricted bands.

Test specimen	AT-DG2 no.5
Test specification	47 CFR Part 15.247 (d) RSS-247 sec. 6.2
Test method	ANSI C63.10:2013 sec. 11.12
Frequency range	30 MHz – 25 GHz
Limits	15.209 in restricted bands.
Comments	None
Temperature / Humidity	23°C / 50%RH, 22°C / 49%RH, 23°C / 43%RH, 23°C / 38%RH, 23°C / 53%RH, 21°C / 37%RH, and 21°C / 36%RH
Dates of measurements	2018-09-10, 2018-09-11, 2018-09-12, 2018-09-13, 2018-09-21, 2018-12-12 and 2018-12-14
Test personnel	Søren Søtoft, David Busk

2.5.1 Test setup

The measurement was performed in the full frequency range from 30 MHz to 25 GHz regardless whether it was a restricted band or not.

During test in the frequency range 200 MHz to 25 GHz the test specimen was supplied by PoE injector 1 and Airtame Ethernet to USB adaptor with PoE.

In the frequency range 30 MHz to 200 MHz the test specimen was supplied by a 5 VDC supply at Airtame USB cable.

The test specimen was tested in a combination of different orientations and channels:

Channel 1 (2412 MHz) were tested in Horizontal and Vertical -90 deg. orientations.

Channel 7 (2442 MHz) was tested in Vertical orientation.

Channel 11 (2462 MHz) was tested in Vertical -90 deg. orientation.

The channels were tested with the following power levels:

Channel 1 at power level 11

Channel 7 at power level 17

Channel 11 at power level 12

The outer channels (channel 1 and channel 11) were additionally tested at power level 17, such as to show that all channels between also complied with the highest possible channel power.

The test of radiated emission was performed in a semi anechoic chamber. The measurements were performed with both horizontal and vertical antenna polarization.

A measuring distance of 3 m was used in frequency range 30 MHz to 14 GHz.

In range 14 GHz to 25 GHz the distance was 0.5 m.

The EUT was placed on a non-conductive table.

For measurements below 1 GHz. the height was 0.8 m and above 1 GHz the height was 1.5 m.

1. A pre-measurement is performed with peak detector. The test object is measured in eight directions with the antenna in the frequency range 30-1000 MHz and in eighteen directions at frequencies above 1 GHz, with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m. In the frequency range of 14 GHz to 25 GHz the measurement distance was 0.5 m.
2. If the emission is close or above the limit during the pre-measurement, the test object is scanned 360 degrees and the antenna height scanned from 1 to 4 m for maximum response. Then the emission is measured with the quasi-peak detector on frequencies below 1 GHz and with the CISPR-average detector above 1 GHz.

The following RBW were used:

30 MHz-1 GHz: RBW = 120 kHz

1-25 GHz: RBW = 1 MHz

See appendix 1 for photo of test set up

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2.5.2 Test results

2.5.2.1 Test result for channel 1 at 2412 MHz in Vertical -90 deg. position at power level 11

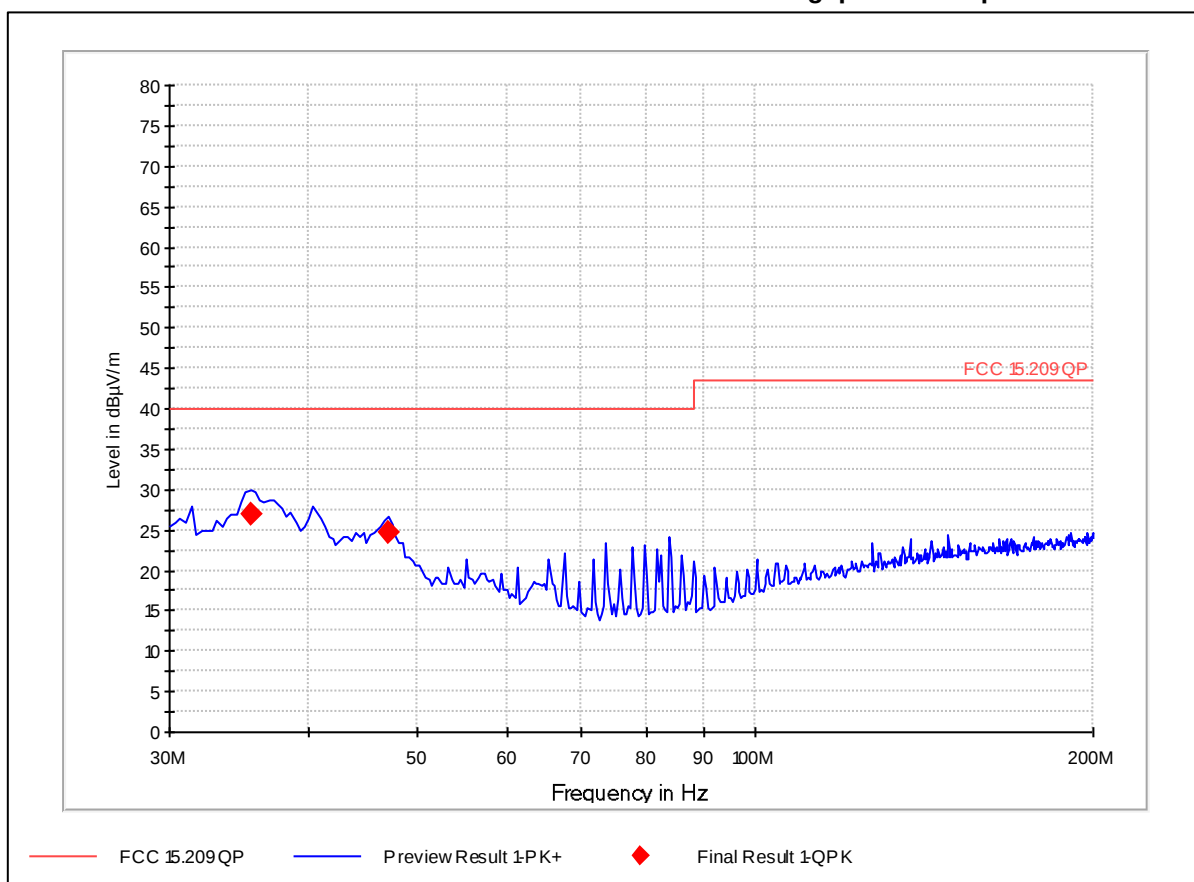


Figure 55. Radiated emission test results. 30 - 200 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
35.440902	27.0	120.0	269.9	H	246.0	13.0	40.0	PASSED
47.064068	24.6	120.0	338.0	V	126.0	15.4	40.0	PASSED

Table 11. Radiated emission test results. 30 - 200 MHz. Quasi peak detector

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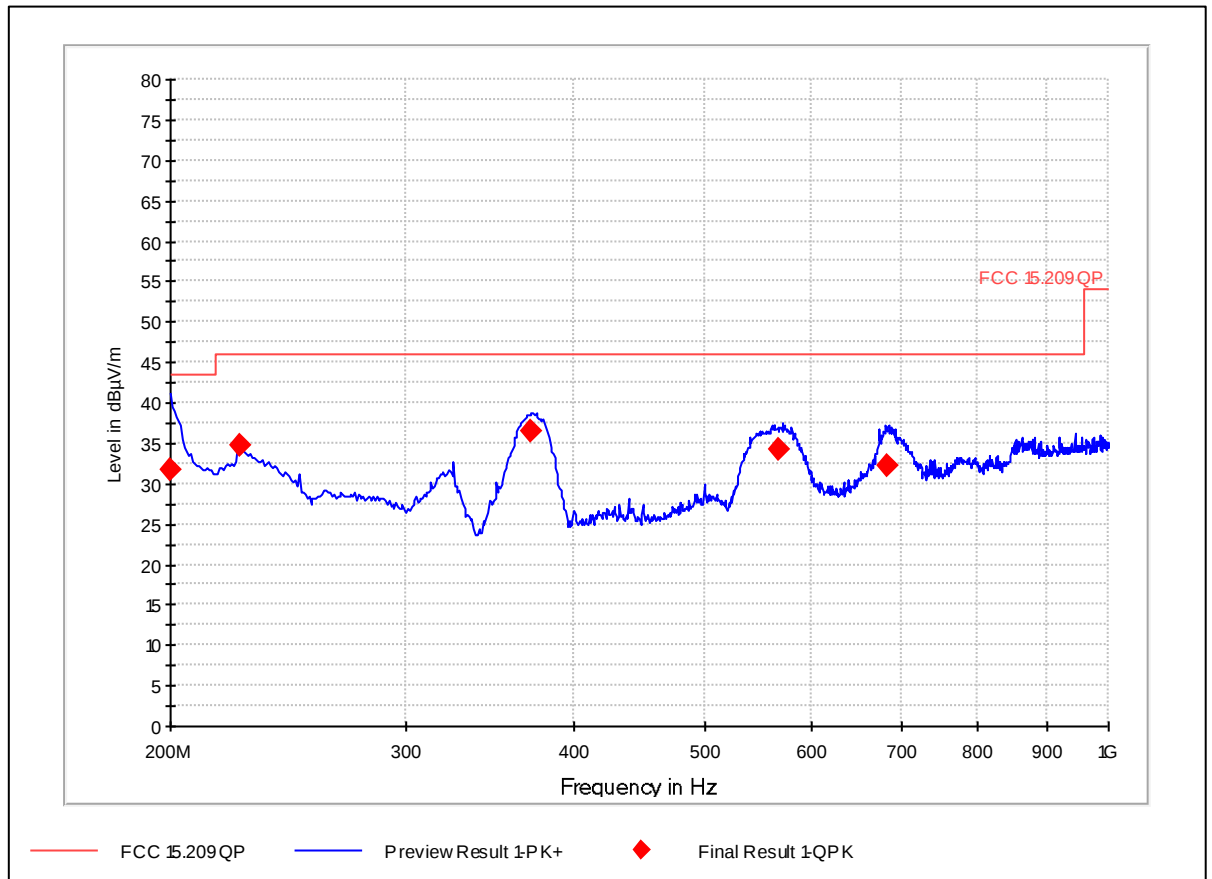


Figure 56. Radiated emission test results. 200 - 1000 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
200.090000	31.7	120.0	199.9	V	270.0	11.8	43.5	PASSED
225.029699	34.8	120.0	133.1	V	298.0	11.2	46.0	PASSED
371.351483	36.5	120.0	100.1	V	135.0	9.5	46.0	PASSED
568.437475	34.3	120.0	99.9	V	94.0	11.7	46.0	PASSED
685.291543	32.2	120.0	100.1	V	67.0	13.8	46.0	PASSED

Table 12. Radiated emission test results. 200 - 1000 MHz. Quasi peak detector.

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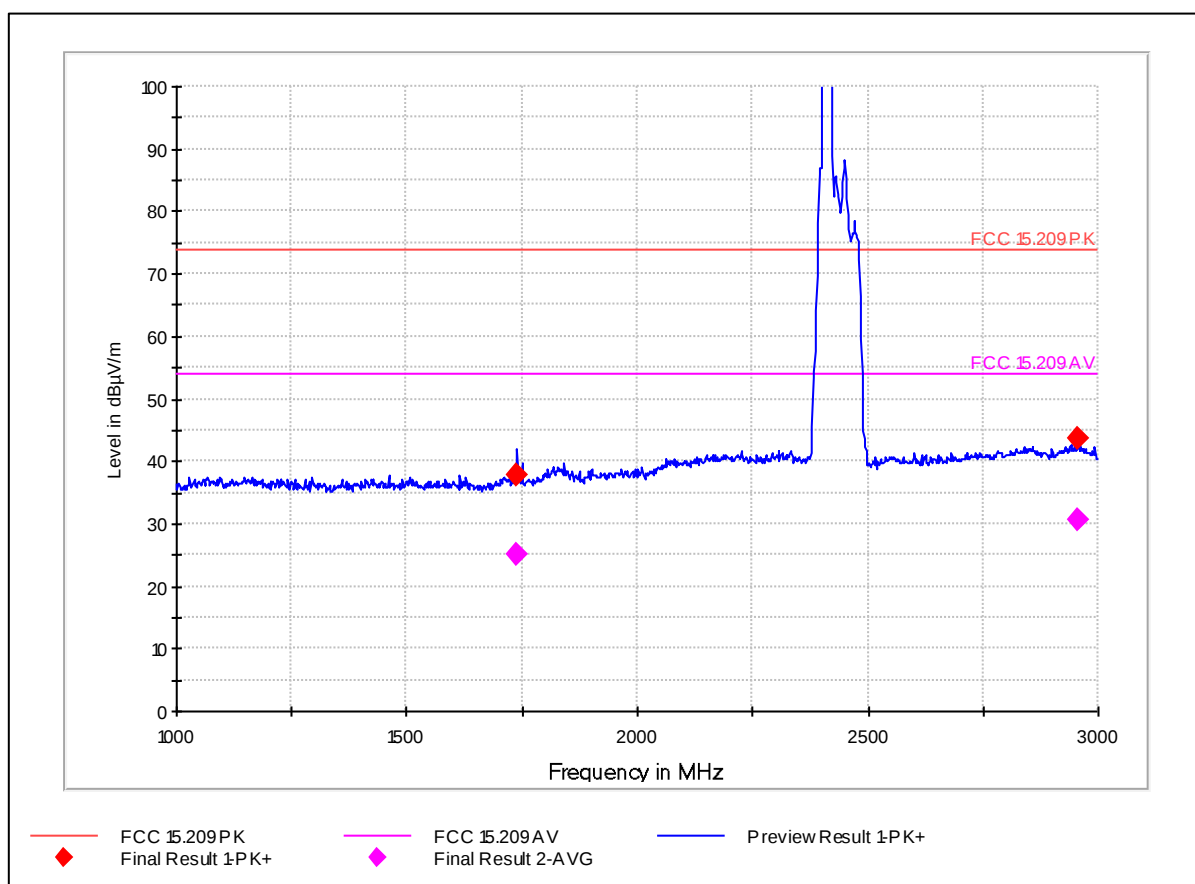


Figure 57. Radiated emission test results 1 - 3 GHz.

The peak in the frequency band is due to the attenuation of a 2.4 GHz band rejection filter, which was added to the measurement path. Thus it is ignored.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
1736.678958	37.9	1000.	349.9	H	100.0	36.1	74.0	PASSED
2953.999800	43.7	1000.	149.9	V	53.0	30.3	74.0	PASSED

Table 13. Radiated emission test results 1 - 3 GHz. Peak detector.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
1736.678958	25.2	1000.	349.9	H	100.0	28.8	54.0	PASSED
2953.999800	30.5	1000.	149.9	V	53.0	23.5	54.0	PASSED

Table 14. Radiated emission test results- 1 - 3 GHz. Average detector.

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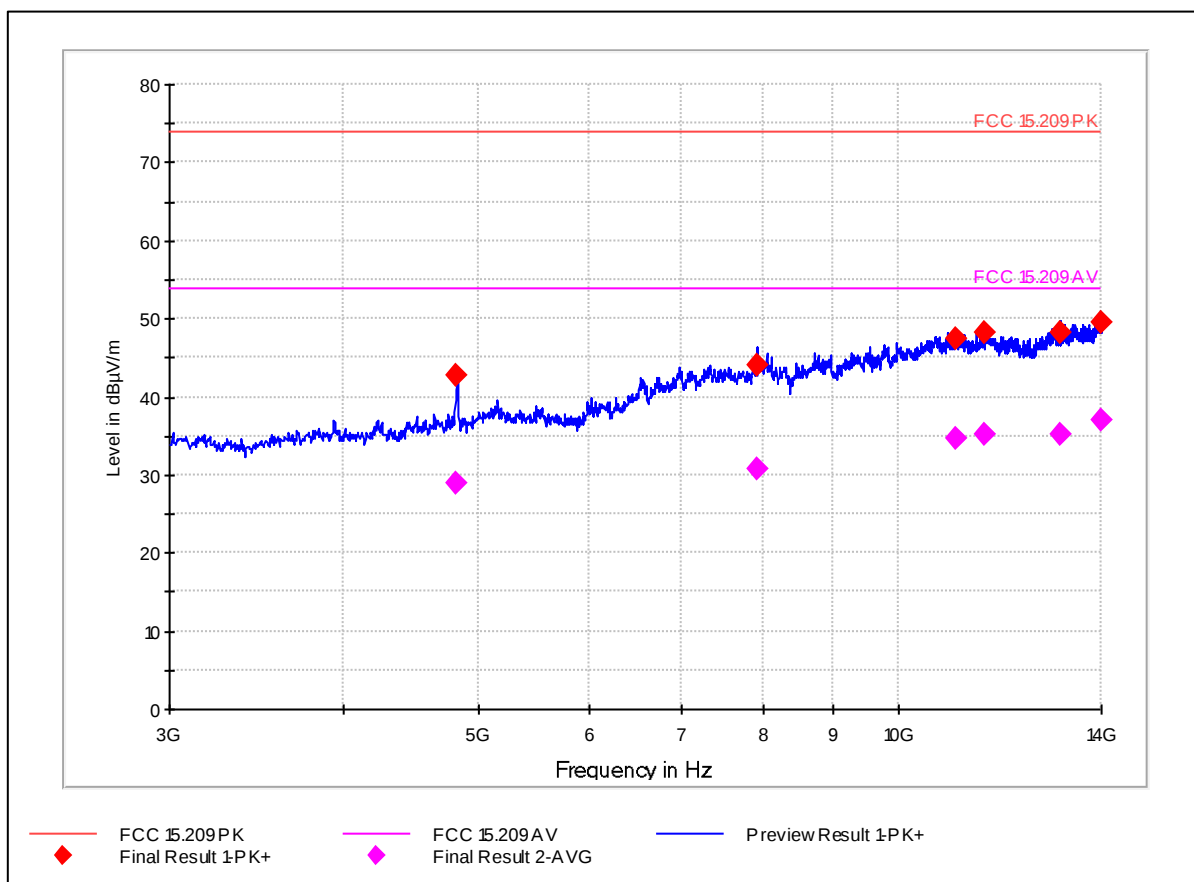


Figure 58. Radiated emission test results 3 - 14 GHz.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
4822.257315	42.8	1000.	149.9	H	184.0	31.2	74.0	PASSED
7916.049699	44.0	1000.	150.0	H	108.0	30.0	74.0	PASSED
11008.210020	47.3	1000.	236.2	H	237.0	26.7	74.0	PASSED
11551.183166	48.3	1000.	207.0	V	125.0	25.7	74.0	PASSED
13084.051303	48.3	1000.	380.9	V	58.0	25.7	74.0	PASSED
13985.559920	49.5	1000.	170.0	V	342.0	24.5	74.0	PASSED

Table 15. Radiated emission test results 3 - 14 GHz. Peak detector.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
4822.257315	29.0	1000.	149.9	H	184.0	25.0	54.0	PASSED
7916.049699	30.7	1000.	150.0	H	108.0	23.3	54.0	PASSED
11008.210020	34.6	1000.	236.2	H	237.0	19.4	54.0	PASSED
11551.183166	35.2	1000.	207.0	V	125.0	18.8	54.0	PASSED
13084.051303	35.3	1000.	380.9	V	58.0	18.7	54.0	PASSED
13985.559920	36.9	1000.	170.0	V	342.0	17.1	54.0	PASSED

Table 16. Radiated emission test results 3 - 14 GHz. Average detector.

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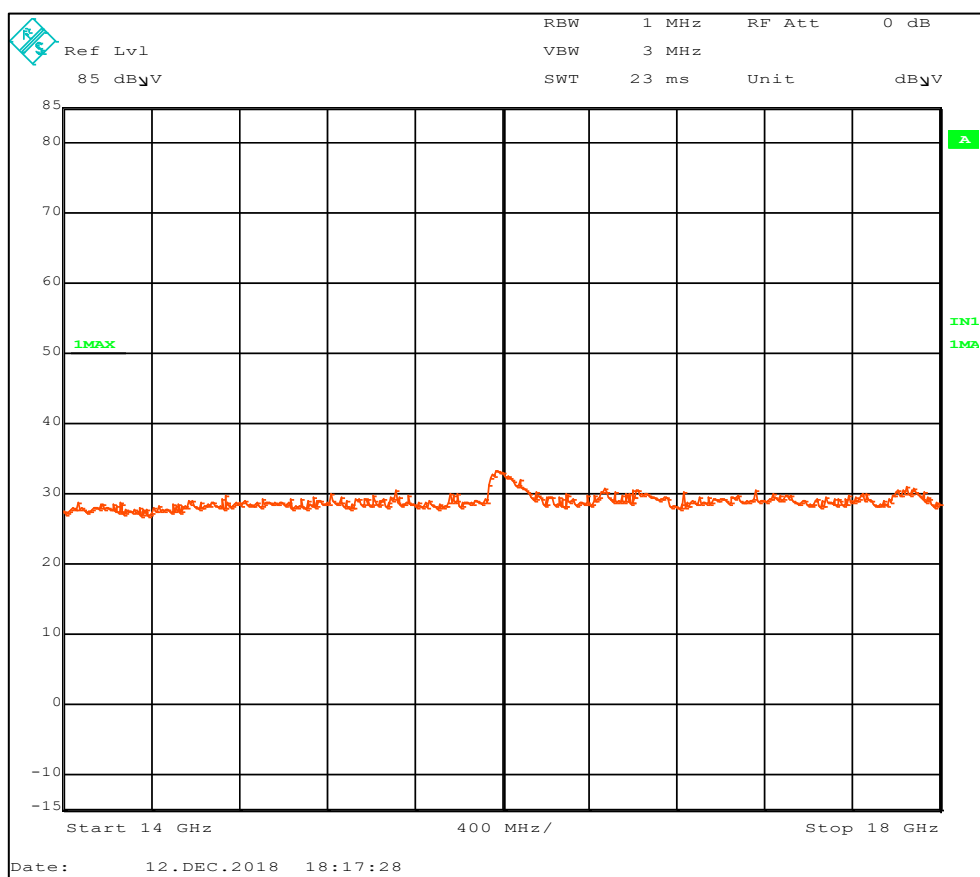


Figure 59 Radiated emission test results 14 - 18 GHz. Peak detector.

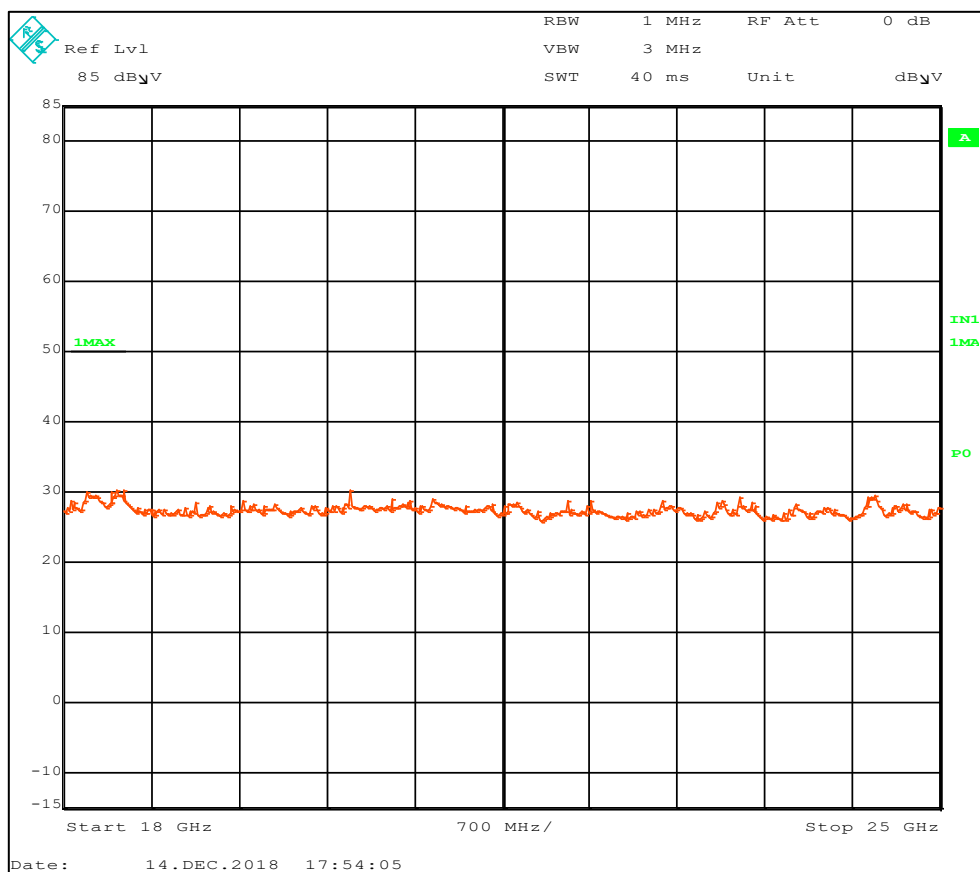


Figure 60. Radiated emission test results 18 - 25 GHz. Peak detector

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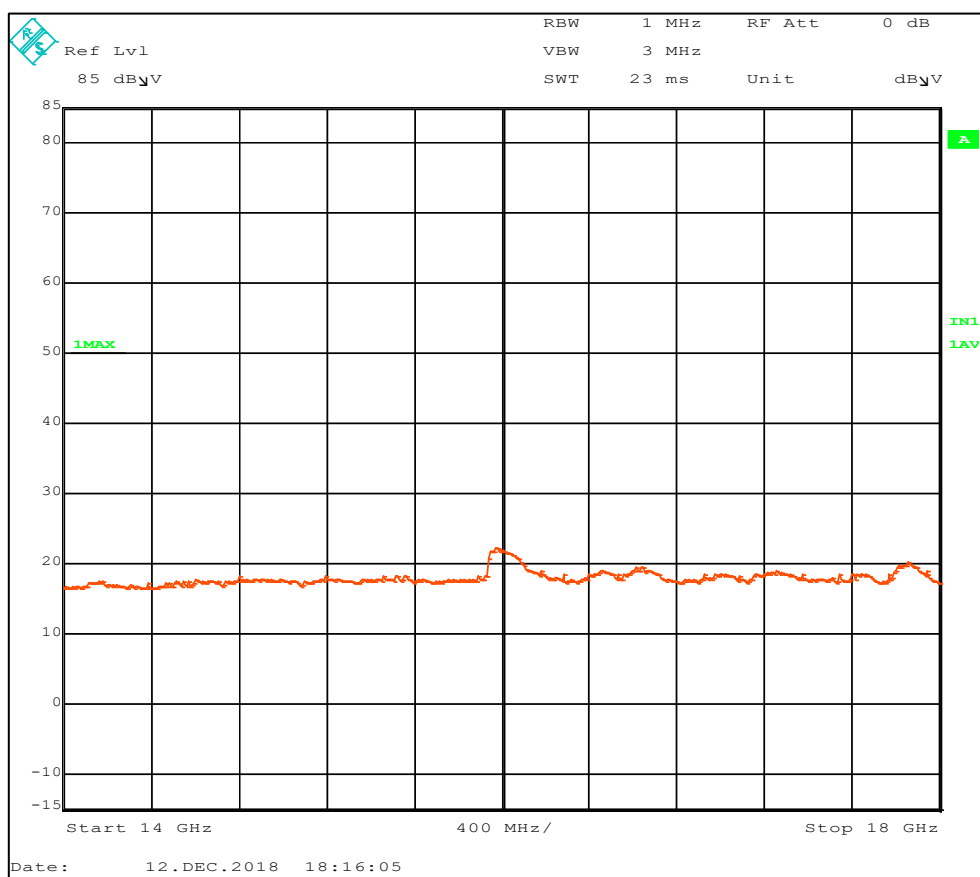


Figure 61. Radiated emission test results 14 - 18 GHz. Average detector.

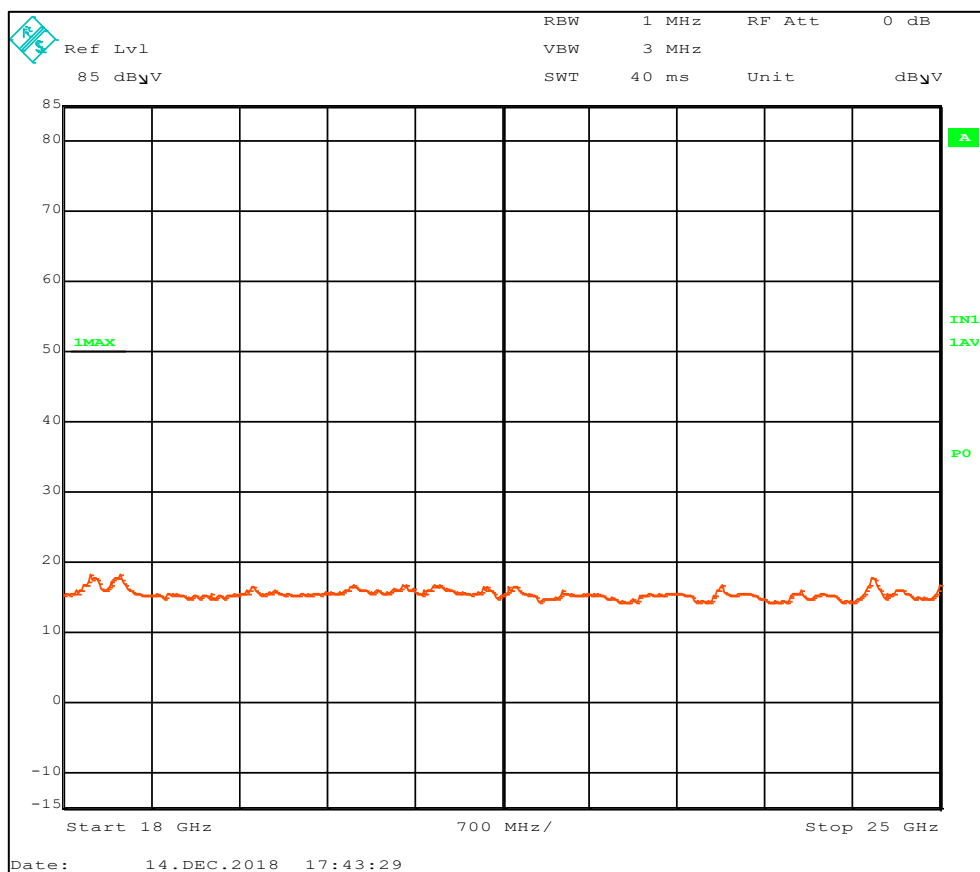


Figure 62. Radiated emission test results 18 - 25 GHz. Average detector.

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Average Limit 3 m.	Peak limit 3 m	3 m / 0.5 m factor	Average Limit 0.5 m.	Peak limit 0.5 m
dB μ V/m	dB μ V/m	dB	dB μ V/m	dB μ V/m
53.98	73.98	15.56 dB	69.54	89.54

Table 17. Calculation of limit at 0.5 m.

Frequency	AF	Cable loss	Correction factor
GHz	dB/m	dB	dB/m
14	37,1	< 2	39.1
18	37,4	< 2	39.4
18	40.3	< 2	42.3
25	40.6	< 2	42.6

Table 18. Correction factors 14 – 25 GHz.

Frequency [MHz]	Peak [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	89.54	PASSED

Table 19. Radiated emission test results 14 - 25 GHz. Peak detector.

Frequency [MHz]	Average [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	69.54	PASSED

Table 20. Radiated emission test results 14 – 25 GHz. Average detector.

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2.5.2.2 Test result for channel 1 at 2412 MHz in horizontal position at power level 17

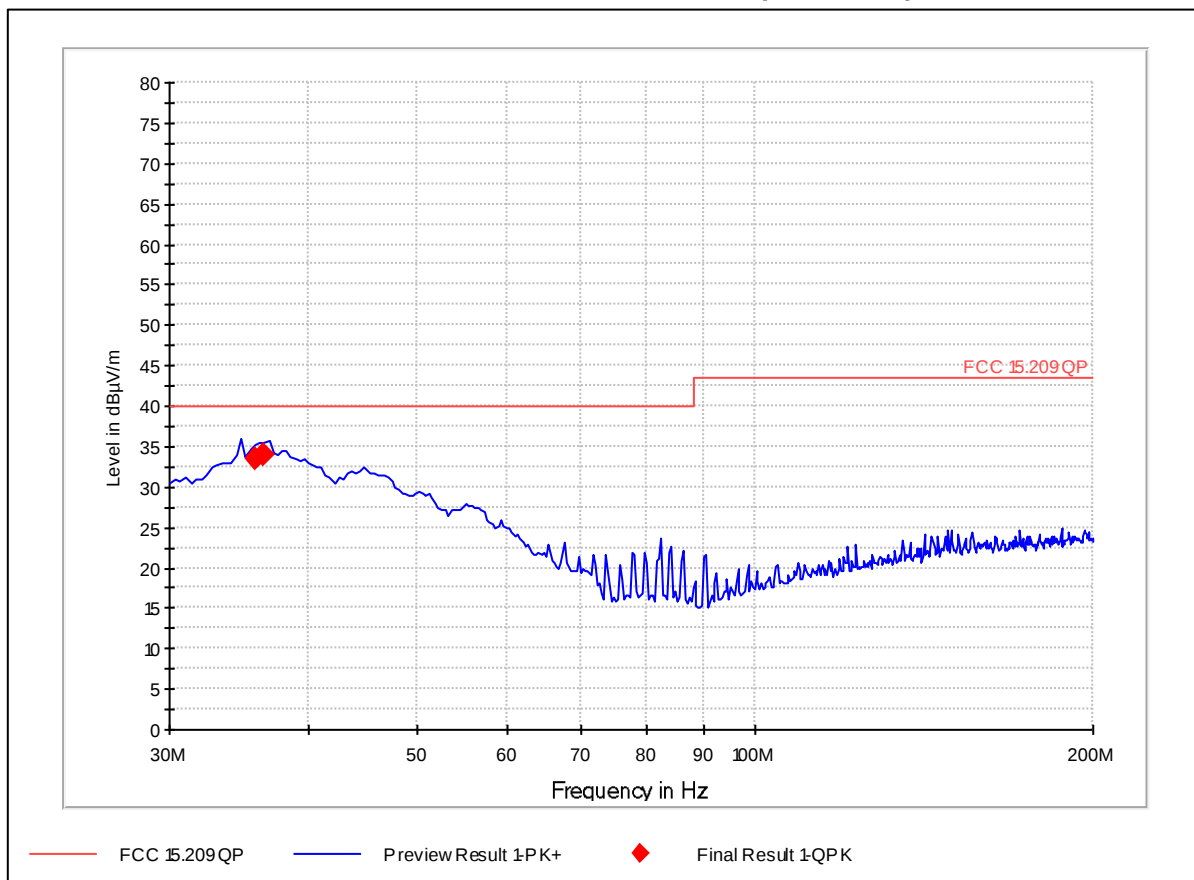


Figure 63. Radiated emission test results. 30 - 200 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
35.869539	33.5	120.0	274.0	H	40.0	6.5	40.0	PASSED
36.363627	33.9	120.0	278.0	H	111.0	6.1	40.0	PASSED

Table 21. Radiated emission test results. 30 - 200 MHz. Quasi peak detector

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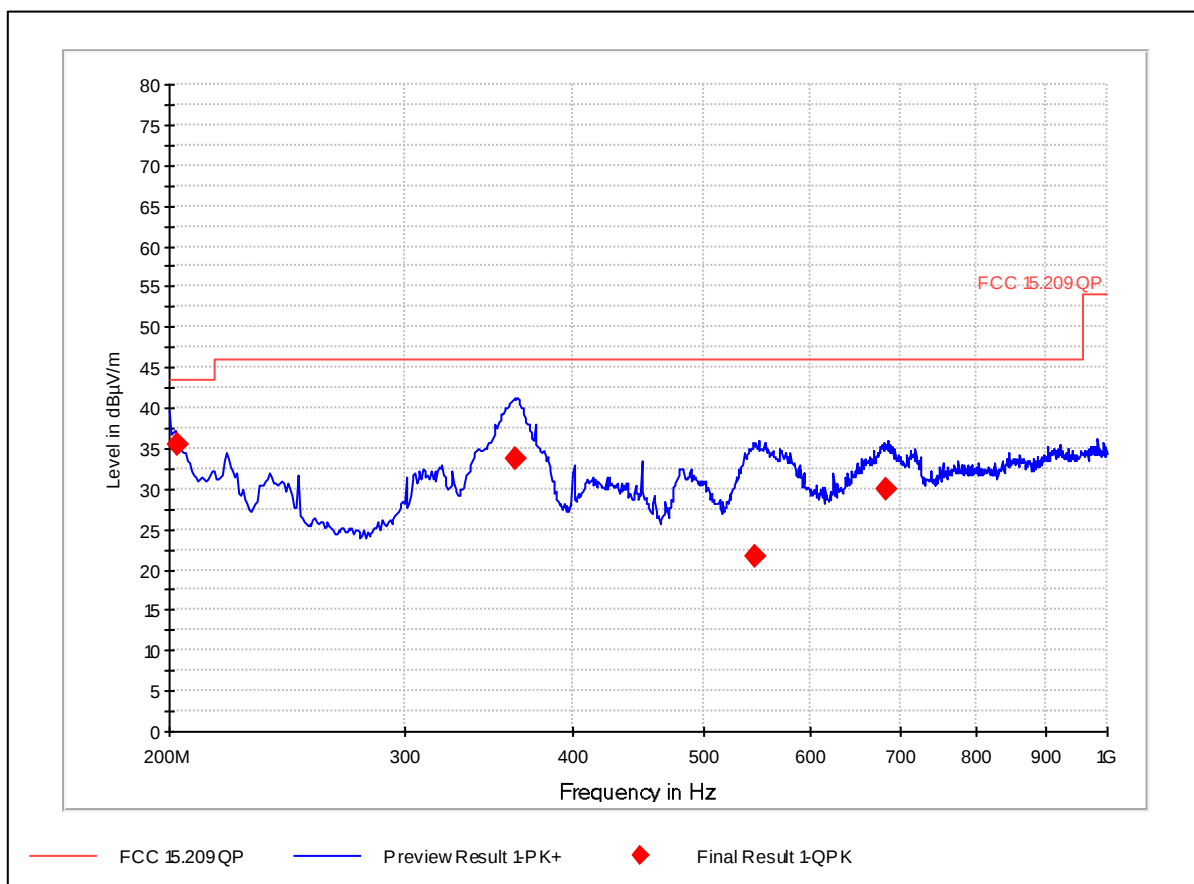


Figure 64. Radiated emission test results. 200 - 1000 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
202.864810	35.5	120.0	297.0	V	347.0	8.0	43.5	PASSED
362.245451	33.7	120.0	100.0	V	1.0	12.3	46.0	PASSED
547.312585	21.6	120.0	334.0	H	0.0	24.4	46.0	PASSED
683.878337	29.9	120.0	162.0	V	44.0	16.1	46.0	PASSED

Table 22. Radiated emission test results. 200 - 1000 MHz. Quasi peak detector.

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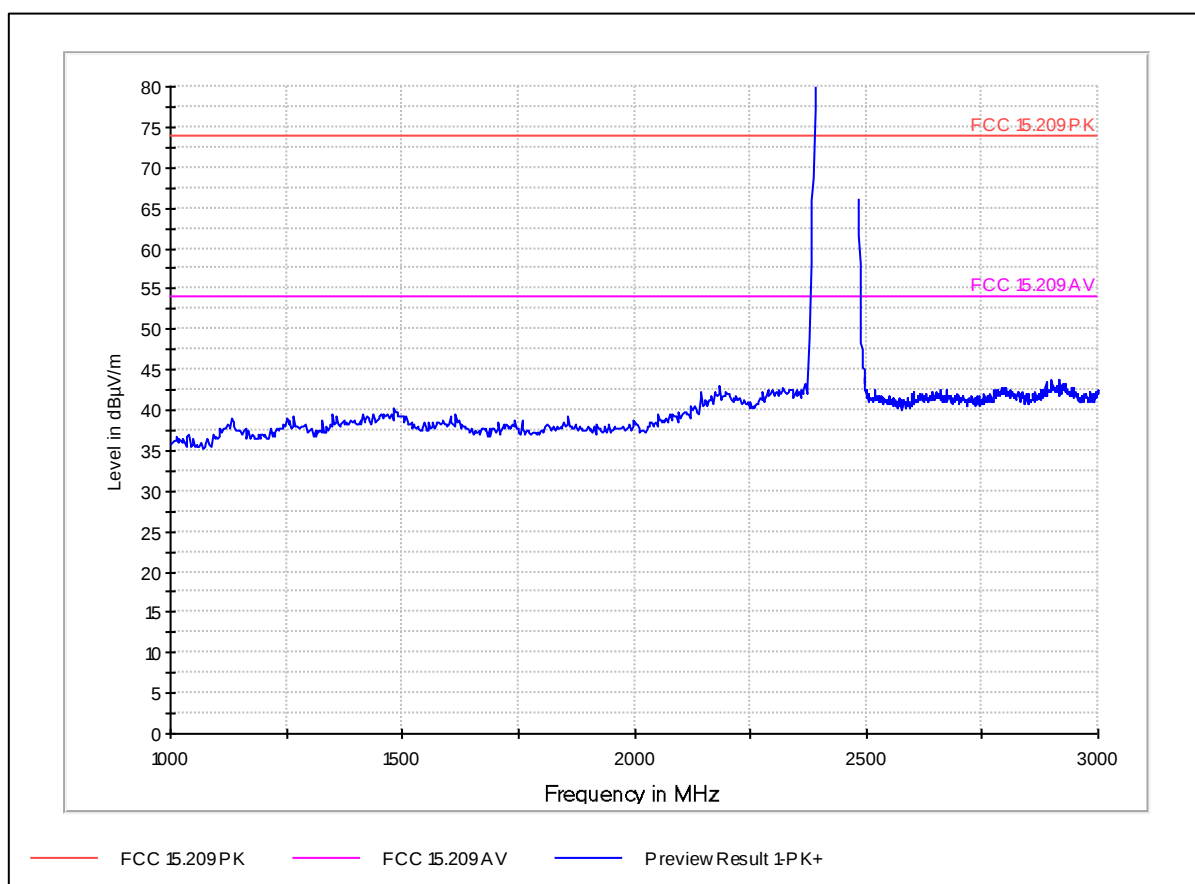


Figure 65. Radiated emission test results 1 - 3 GHz.

The peaks just below and above the frequency band are due to the attenuation of a 2.4 GHz band rejection filter were added to the measurement path. Thus ignored.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	1000	-	-	-	-	74.0	PASSED

Table 23. Radiated emission test results 1 - 3 GHz. Peak detector.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
-	-	1000	-	-	-	-	54.00	PASSED

Table 24. Radiated emission test results- 1 - 3 GHz. Average detector.

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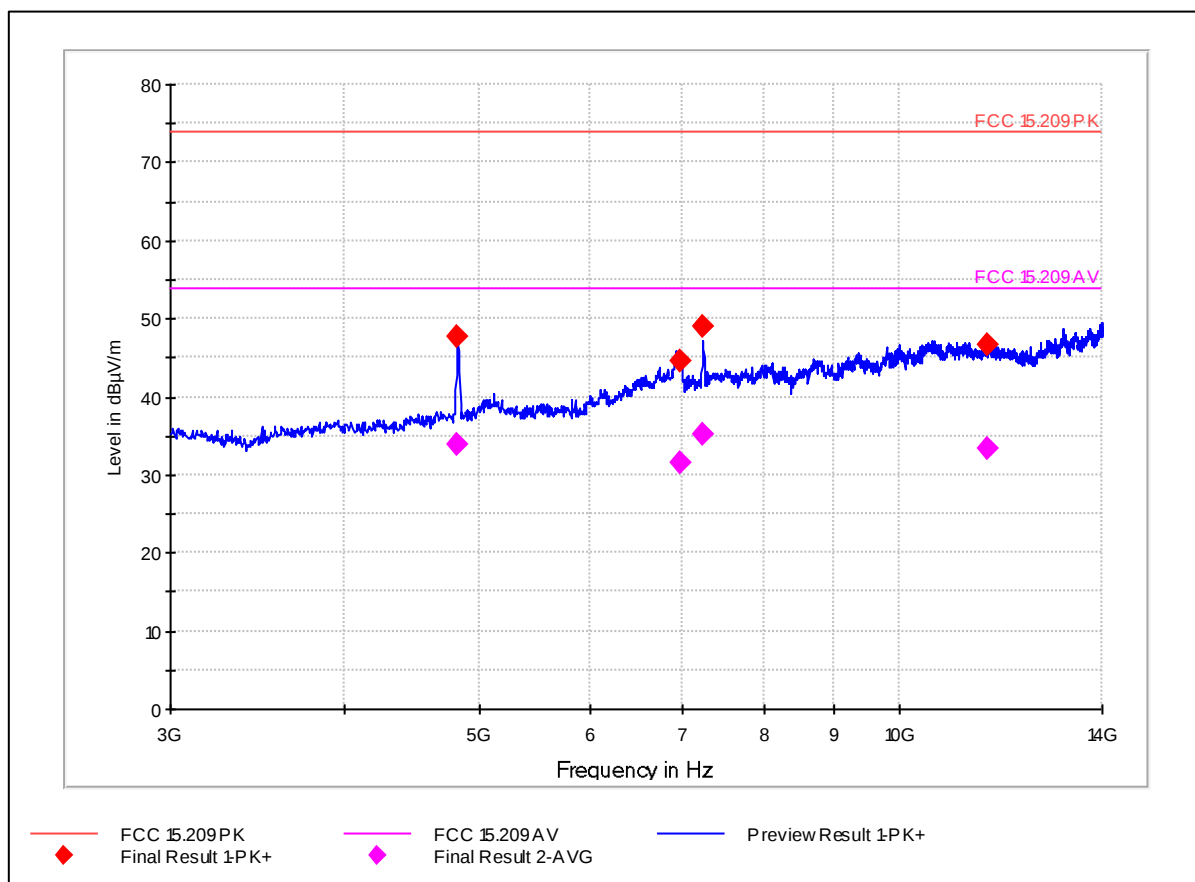


Figure 66. Radiated emission test results 3 - 14 GHz.

Frequency [MHz]	Peak [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
4826.144275	47.6	1000.	100.0	H	118.0	26.4	74.0	PASSED
6971.371272	44.5	1000.	180.0	V	43.0	29.5	74.0	PASSED
7235.884454	48.9	1000.	100.0	H	0.0	25.1	74.0	PASSED
11588.512883	46.6	1000.	157.0	H	116.0	27.4	74.0	PASSED

Table 25. Radiated emission test results 3 - 14 GHz. Peak detector.

Frequency [MHz]	Average [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
4826.144275	33.9	1000.	100.0	H	118.0	20.1	54.0	PASSED
6971.371272	31.6	1000.	180.0	V	43.0	22.4	54.0	PASSED
7235.884454	35.1	1000.	100.0	H	0.0	18.9	54.0	PASSED
11588.512883	33.3	1000.	157.0	H	116.0	20.7	54.0	PASSED

Table 26. Radiated emission test results 3 - 14 GHz. Average detector.

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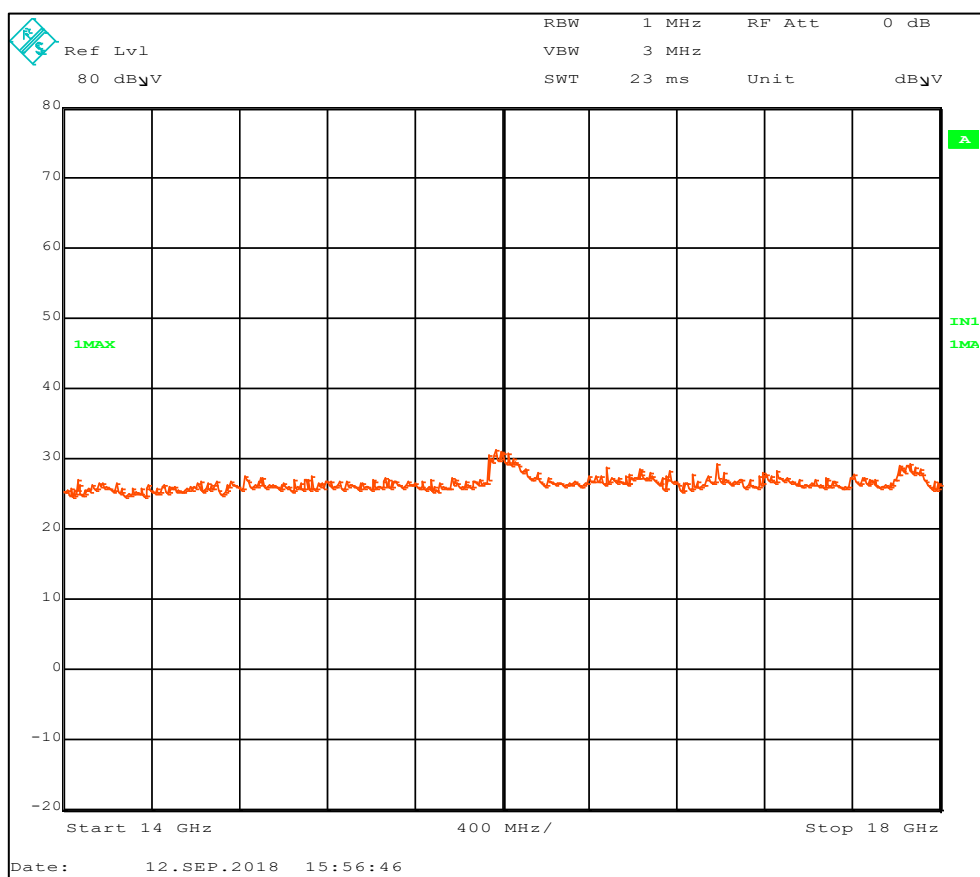


Figure 67 Radiated emission test results 14 - 18 GHz. Peak detector.

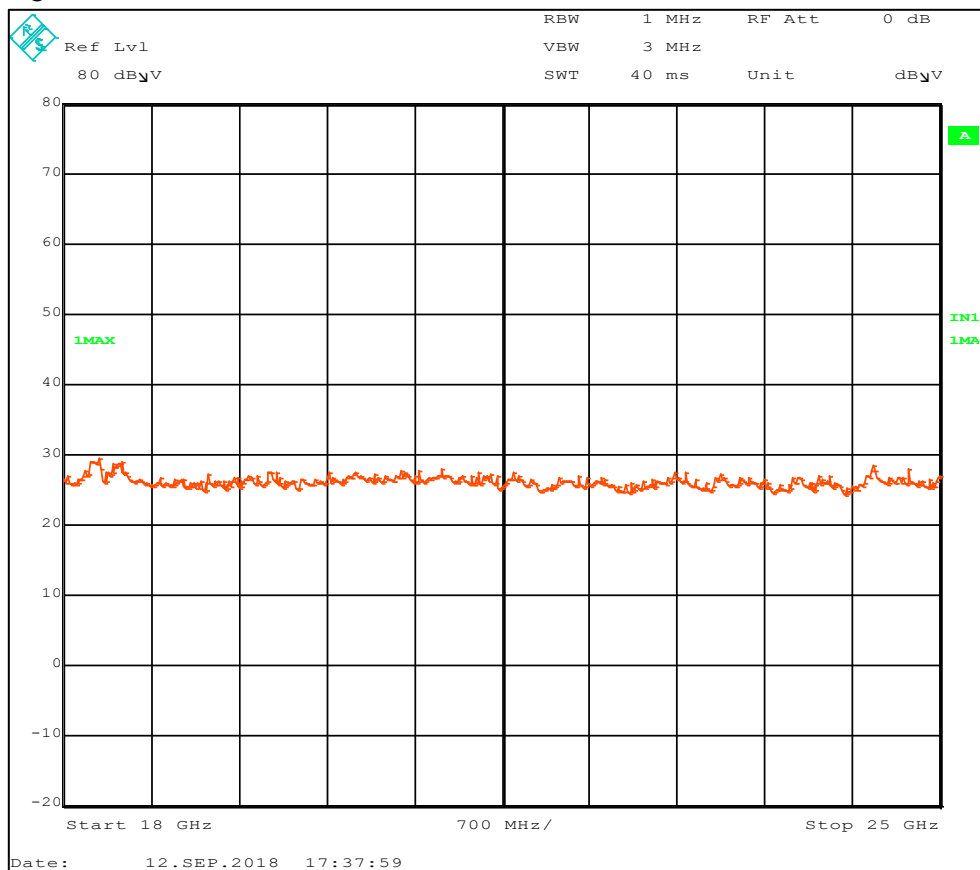


Figure 68. Radiated emission test results 18 - 25 GHz. Peak detector

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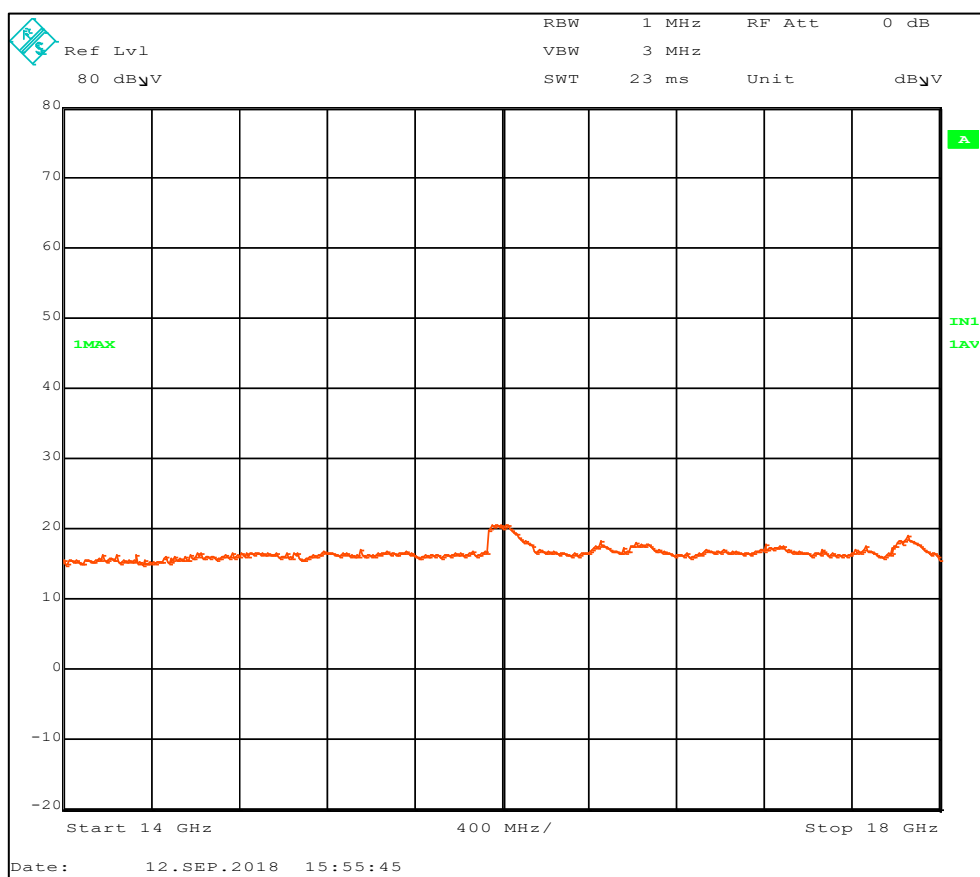


Figure 69. Radiated emission test results 14 - 18 GHz. Average detector.

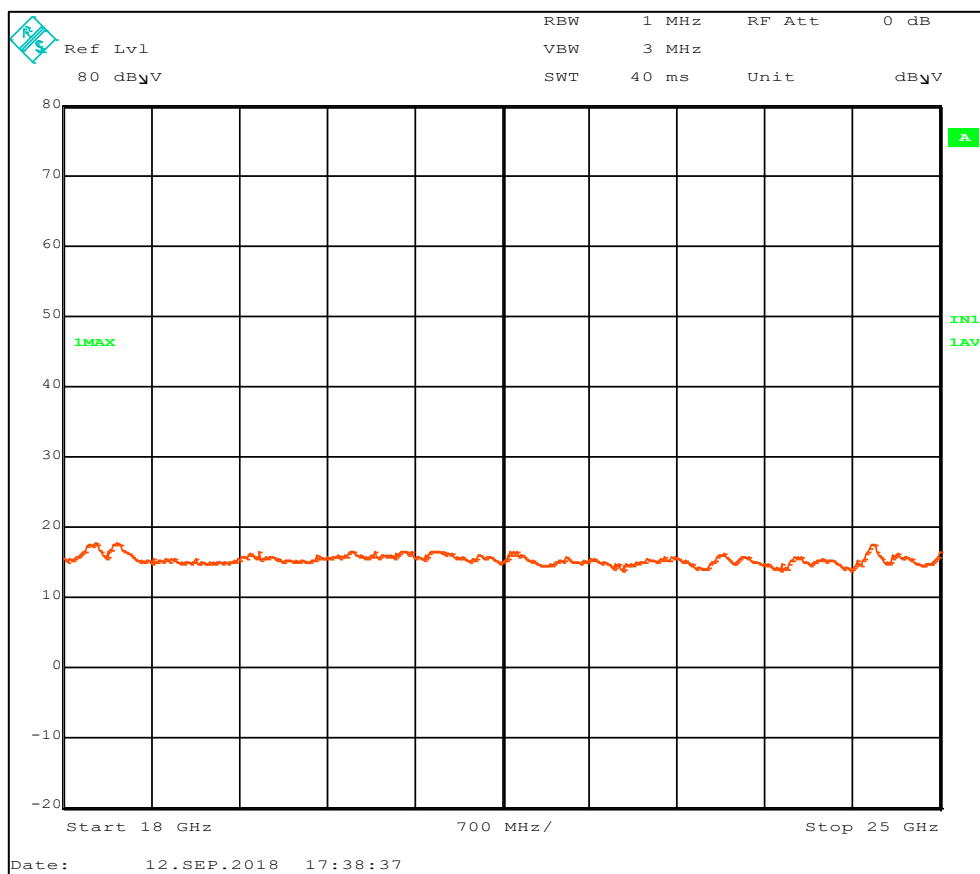


Figure 70. Radiated emission test results 18 - 25 GHz. Average detector.

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Average Limit 3 m.	Peak limit 3 m	3 m / 0.5 m factor	Average Limit 0.5 m.	Peak limit 0.5 m
dB μ V/m	dB μ V/m	dB	dB μ V/m	dB μ V/m
53.98	73.98	15.56 dB	69.54	89.54

Table 27. Calculation of limit at 0.5 m.

Frequency	AF	Cable loss	Correction factor
GHz	dB/m	dB	dB/m
14	37,1	< 2	39.1
18	37,4	< 2	39.4
18	40.3	< 2	42.3
25	40.6	< 2	42.6

Table 28. Correction factors 14 – 25 GHz.

Frequency [MHz]	Peak [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	89.54	PASSED

Table 29. Radiated emission test results 14 - 25 GHz. Peak detector.

Frequency [MHz]	Average [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	69.54	PASSED

Table 30. Radiated emission test results 14 – 25 GHz. Average detector.

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2.5.2.3 Test result for channel 7 at 2442 MHz in vertical position

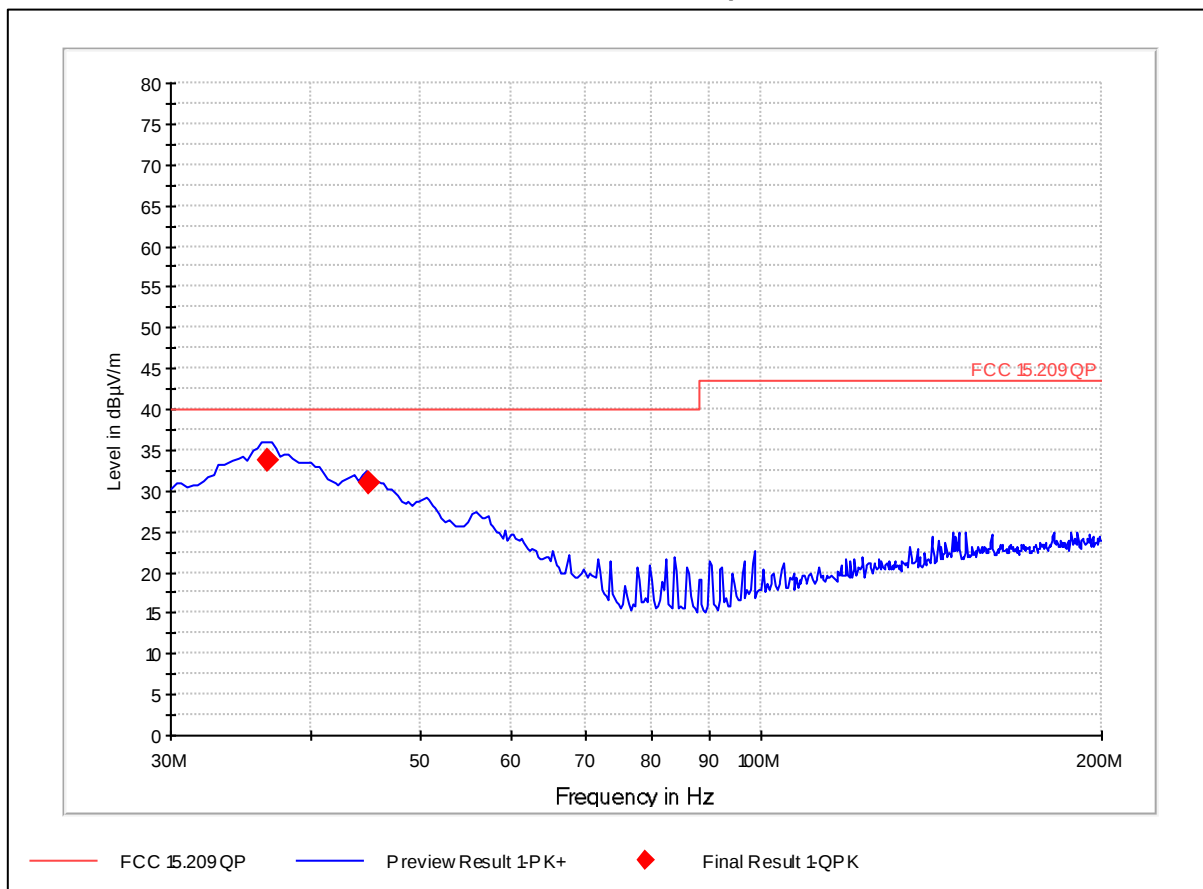


Figure 71. Radiated emission test results. 30 - 200 MHz.

Frequency [MHz]	QP [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
36.632946	33.7	120.0	277.0	H	126.0	6.3	40.0	PASSED
44.929299	30.9	120.0	318.0	V	87.0	9.1	40.0	PASSED

Table 31. Radiated emission test results 30 - 200 MHz.

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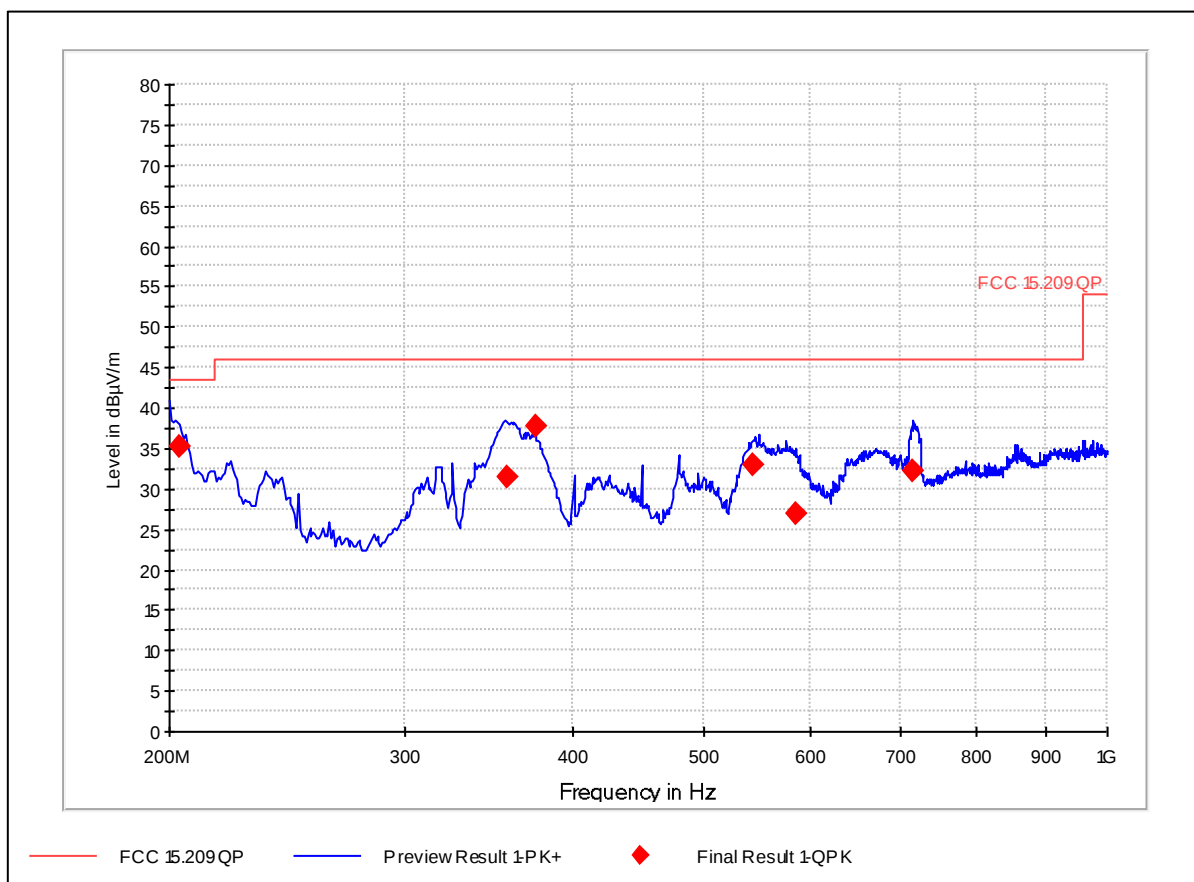


Figure 72. Radiated emission test results. 200 - 1000 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
203.404810	35.1	120.0	184.0	V	73.0	8.4	43.5	PASSED
357.152625	31.4	120.0	100.0	V	346.0	14.6	46.0	PASSED
375.019499	37.8	120.0	206.0	H	101.0	8.2	46.0	PASSED
544.670982	32.9	120.0	100.0	V	27.0	13.1	46.0	PASSED
586.002745	26.9	120.0	100.0	V	354.0	19.1	46.0	PASSED
716.184068	32.2	120.0	119.0	V	8.0	13.8	46.0	PASSED

Table 32. Radiated emission test results 200 - 1000 MHz.

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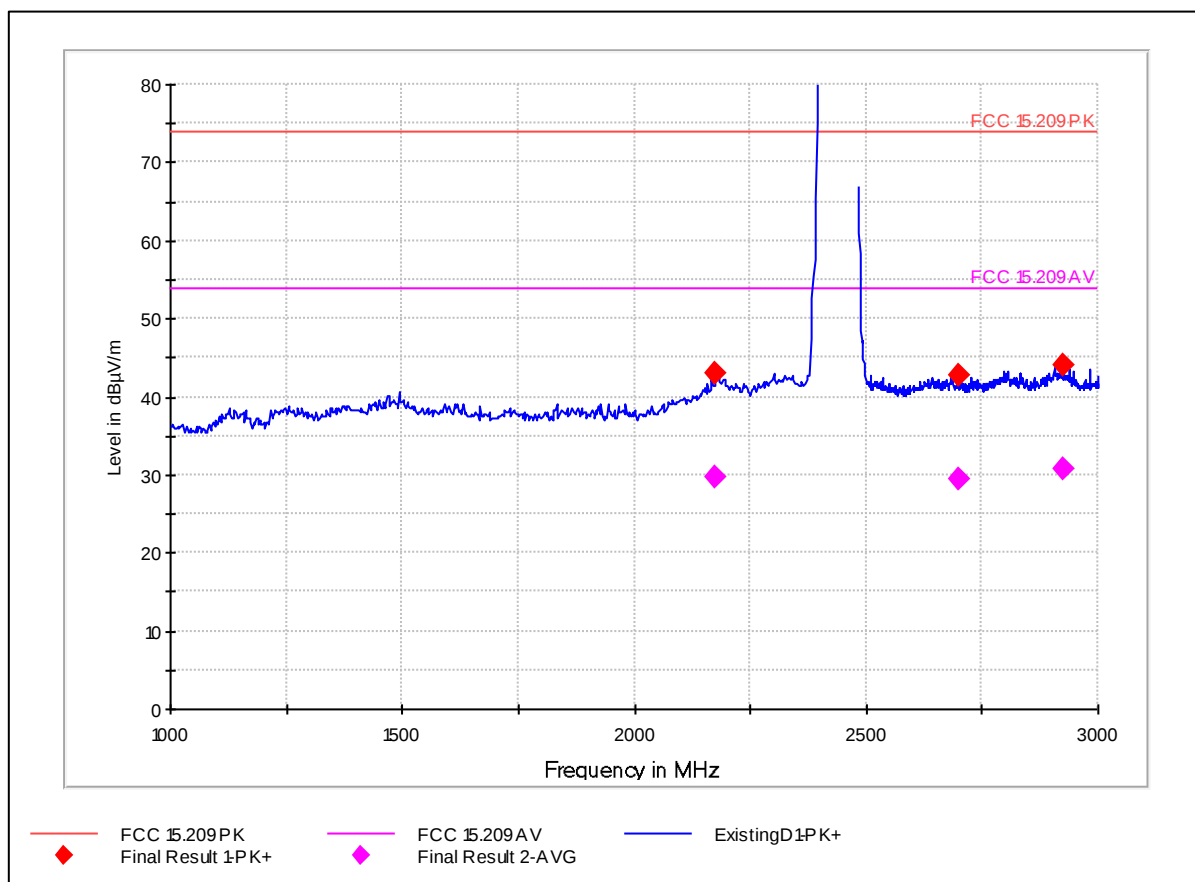


Figure 73. Radiated emission test results 1 - 3 GHz.

The peaks just below and above the frequency band are due to the attenuation of a 2.4 GHz band rejection filter were added to the measurement path. Thus ignored.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
2175.656325	43.1	1000.	349.0	H	339.0	30.9	74.0	PASSED
2699.041747	42.6	1000.	100.0	H	167.0	31.4	74.0	PASSED
2926.028169	44.1	1000.	200.0	H	164.0	29.9	74.0	PASSED

Table 33. Radiated emission test results 1 - 3 GHz. Peak detector.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
2175.656325	29.8	1000.	349.0	H	339.0	24.2	54.0	PASSED
2699.041747	29.4	1000.	100.0	H	167.0	24.6	54.0	PASSED
2926.028169	30.7	1000.	200.0	H	164.0	23.3	54.0	PASSED

Table 34. Radiated emission test results 1 - 3 GHz. Average detector.

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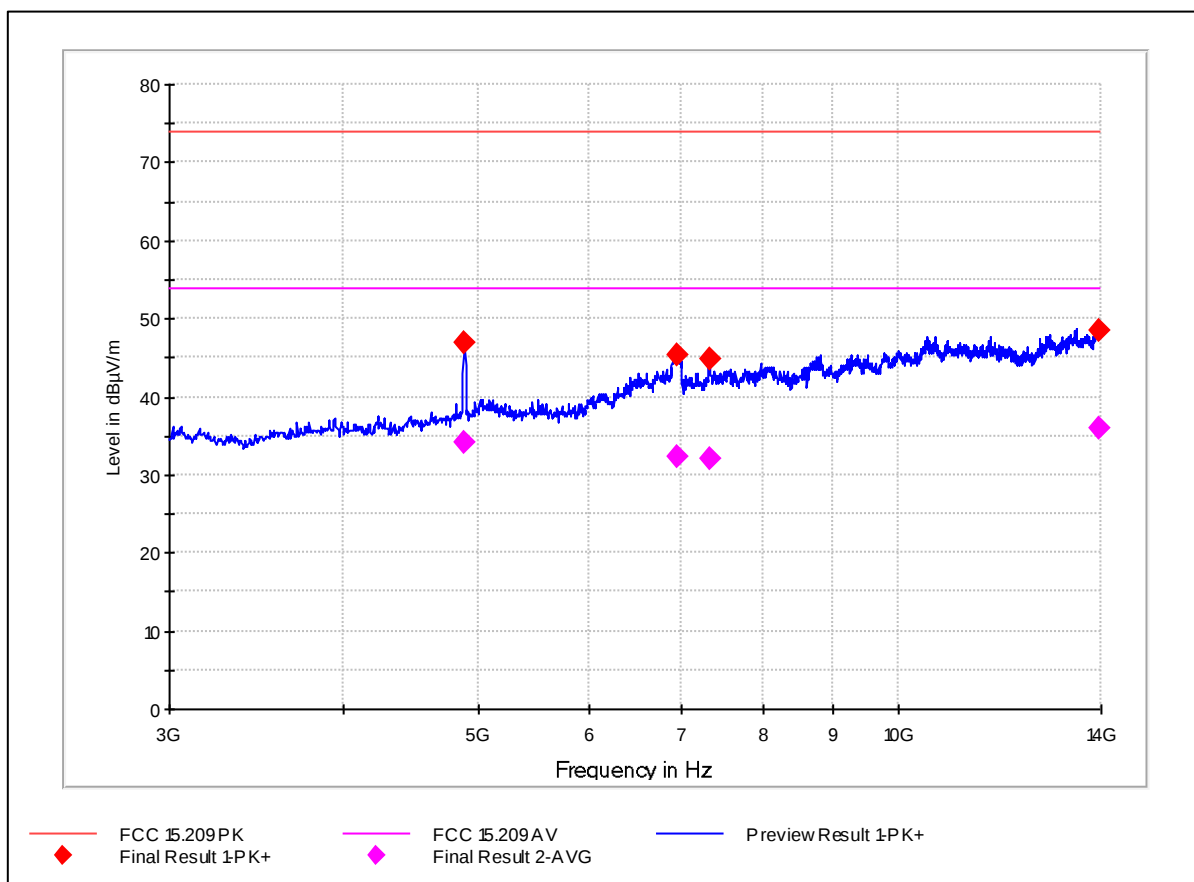


Figure 74. Radiated emission test results 3 - 14 GHz.

Frequency [MHz]	Peak [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
4883.348535	46.8	1000	200.0	V	354.0	27.2	74.0	PASSED
6938.386252	45.4	1000	217.7	V	174.0	28.6	74.0	PASSED
7328.813815	44.7	1000	205.0	H	240	29.3	74.0	PASSED
13951.219207	48.4	1000	201.0	H	6.0	25.6	74.0	PASSED

Table 35. Radiated emission test results 3 - 14 GHz. Peak detector.

Frequency [MHz]	Average [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
4883.348535	34.0	1000	200.0	V	354.0	20.0	54.0	PASSED
6938.386252	32.3	1000	217.7	V	174.0	21.7	54.0	PASSED
7328.813815	32.0	1000	205.0	H	240	22.0	54.0	PASSED
13951.219207	36.0	1000	201.0	H	6.0	18.0	54.0	PASSED

Table 36. Radiated emission test results 3 - 14 GHz. Average detector

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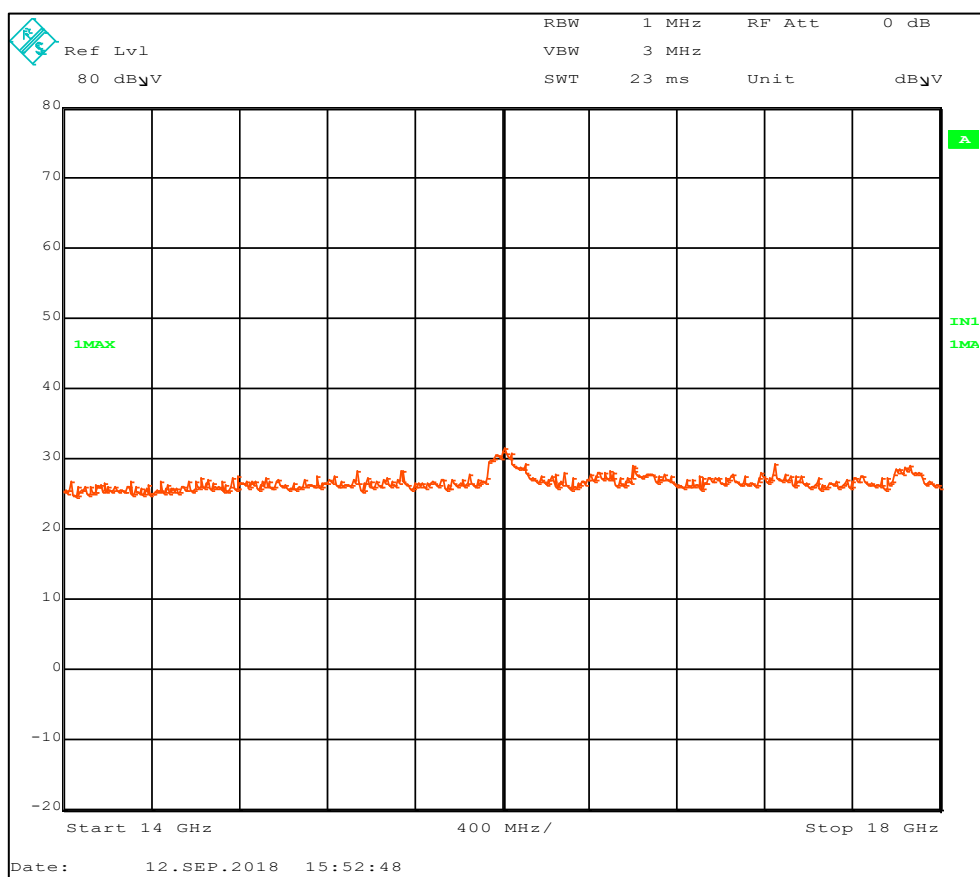


Figure 75. Radiated emission test results 14 - 18 GHz. Peak detector.

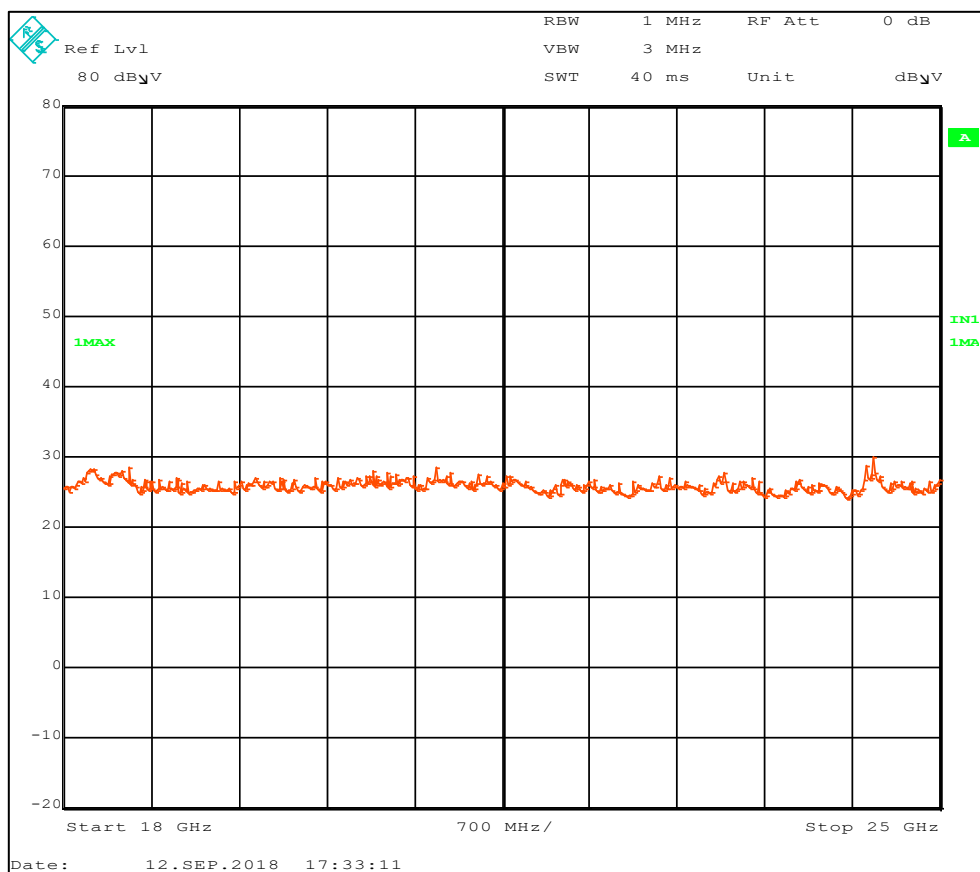


Figure 76. Radiated emission test results 18 - 25 GHz. Peak detector.

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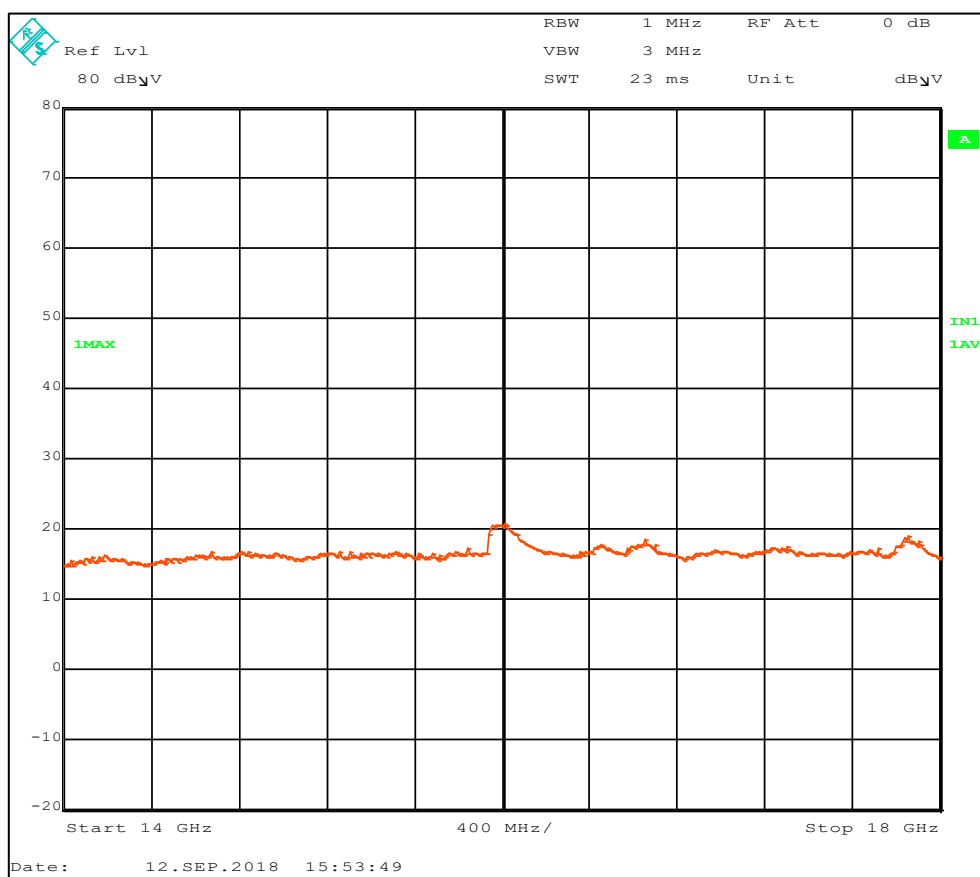


Figure 77. Radiated emission test results 14 - 18 GHz. Average detector.

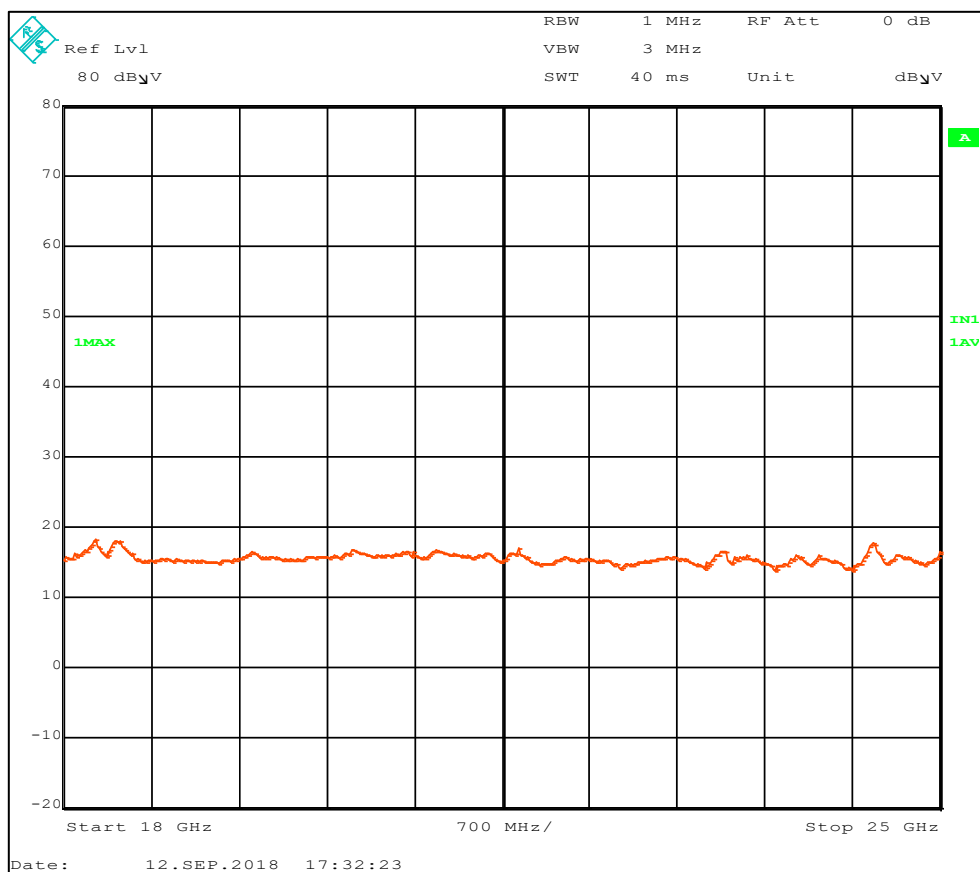


Figure 78. Radiated emission test results 18 - 25 GHz. Average detector.

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Average Limit 3 m.	Peak limit 3 m	3 m / 0.5 m factor	Average Limit 0.5 m.	Peak limit 0.5 m
dB μ V/m	dB μ V/m	dB	dB μ V/m	dB μ V/m
53.98	73.98	15.56 dB	69.54	89.54

Table 37. Calculation of limit at 0.5 m.

Frequency	AF	Cable loss	Correction factor
GHz	dB/m	dB	dB/m
14	37,1	< 2	39.1
18	37,4	< 2	39.4
18	40.3	< 2	42.3
25	40.6	< 2	42.6

Table 38. Correction factors 14 – 25 GHz.

Frequency [MHz]	Peak [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	89.54	PASSED

Table 39. Radiated emission test results 14 - 25 GHz. Peak detector.

Frequency [MHz]	Average [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	69.54	PASSED

Table 40. Radiated emission test results 14 - 25 GHz. Average detector.

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2.5.2.4 Test result for channel 11 at 2472 MHz in vertical – 90 deg. position at power level 12.

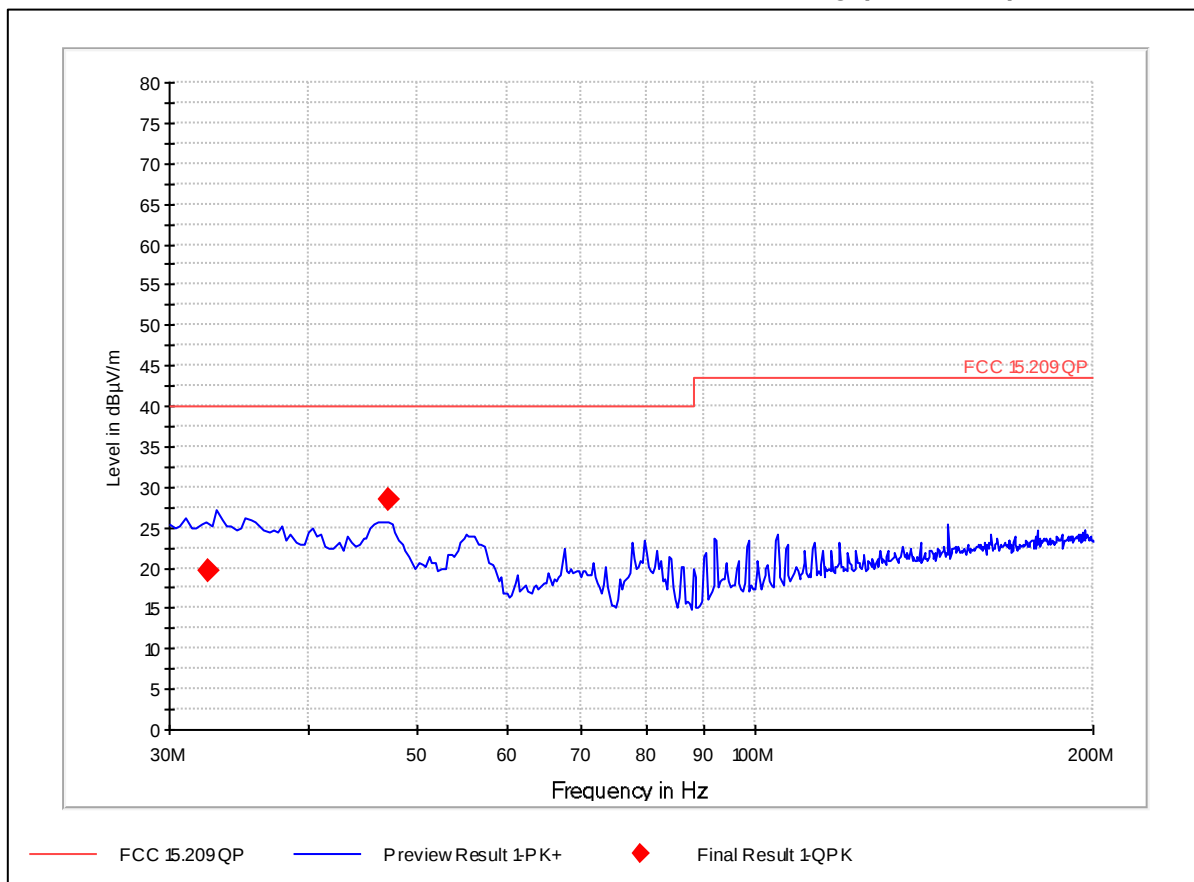


Figure 79. Radiated emission test results 30 - 200 MHz.

Frequency [MHz]	QP [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
32.506132	19.5	120.0	100.1	H	138.0	-4.0	20.5	PASSED
47.103387	28.5	120.0	334.8	V	39.0	-10.2	11.5	PASSED

Table 41. Radiated emission test results. 30 - 200 MHz.

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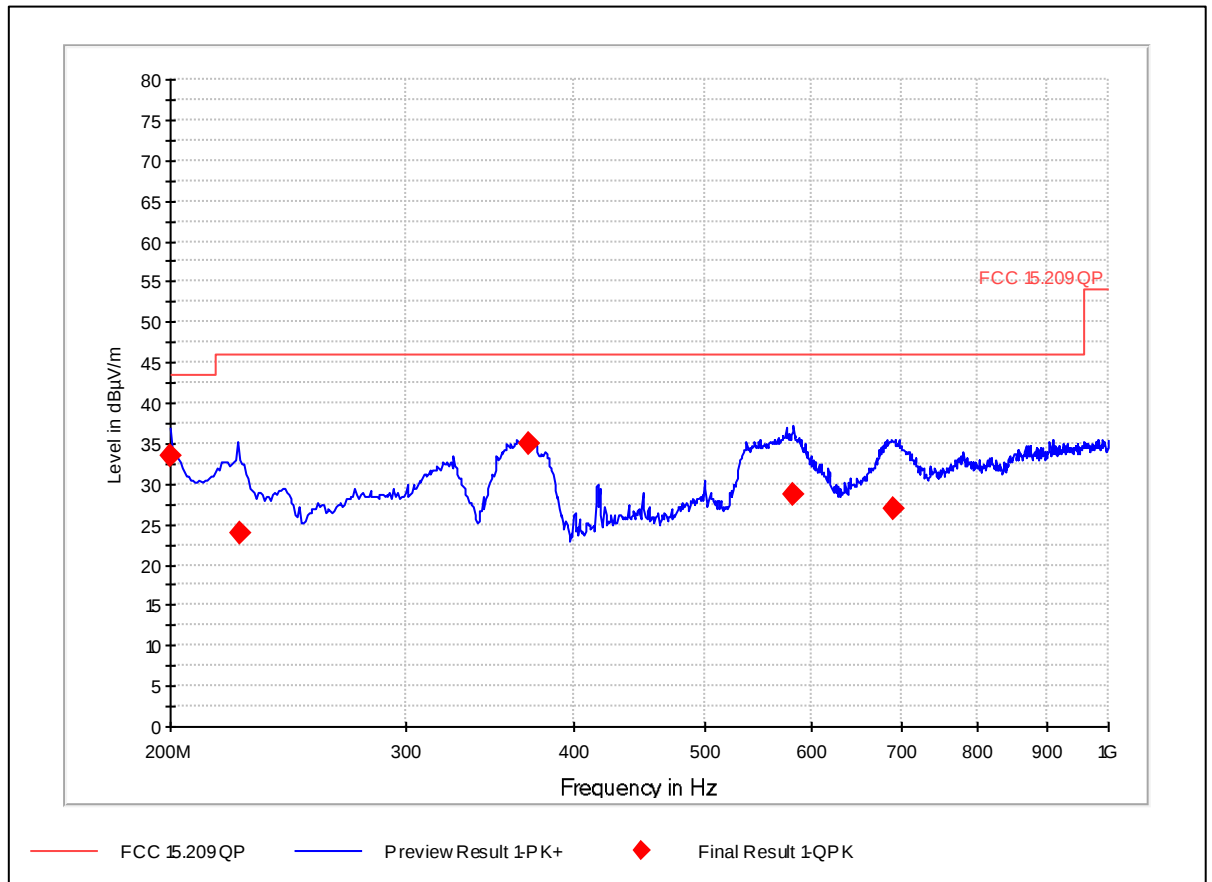


Figure 80. Radiated emission test results 200 - 1000 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
200.120000	33.4	120.0	363.9	V	64.0	10.1	43.5	PASSED
225.019699	23.9	120.0	119.0	V	180.0	22.1	46.0	PASSED
369.536673	34.9	120.0	133.0	H	335.0	11.1	46.0	PASSED
581.274729	28.6	120.0	99.9	V	85.0	17.4	46.0	PASSED
690.239559	26.9	120.0	230.0	H	40.0	19.1	46.0	PASSED

Table 42. Radiated emission test results 200 - 1000 MHz.

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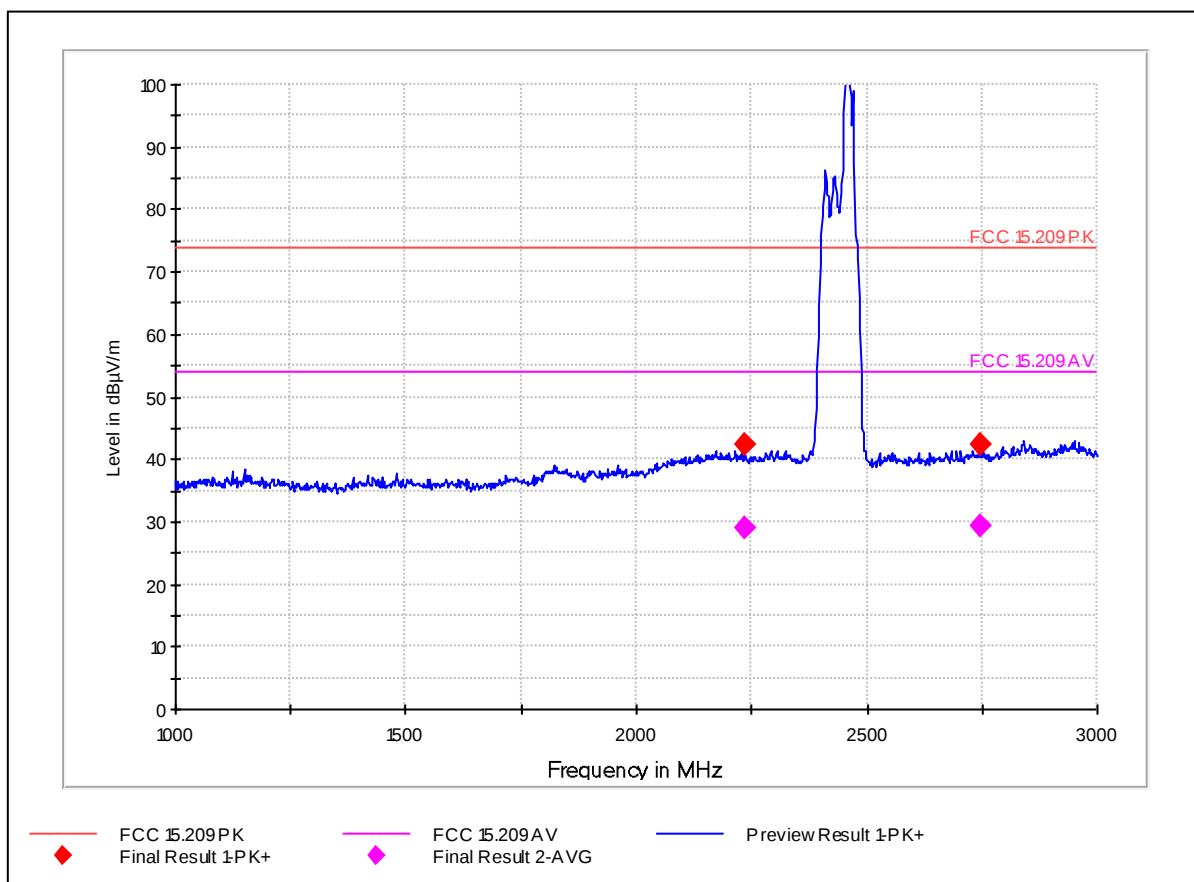


Figure 81. Radiated emission test results 1 - 3 GHz.

The peak in the frequency band is due to the attenuation of a 2.4 GHz band rejection filter, which was added to the measurement path. Thus it is ignored.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
2233.360922	42.2	1000.	379.9	H	0.0	31.8	74.0	PASSED
2746.086974	42.4	1000.	302.6	V	352.0	31.6	74.0	PASSED

Table 43. Radiated emission test results 1 - 3 GHz. Peak detector.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
2233.360922	28.8	1000.	379.9	H	0.0	25.2	54.0	PASSED
2746.086974	29.4	1000.	302.6	V	352.0	24.6	54.0	PASSED

Table 44. Radiated emission test results 1 - 3 GHz. Average detector.

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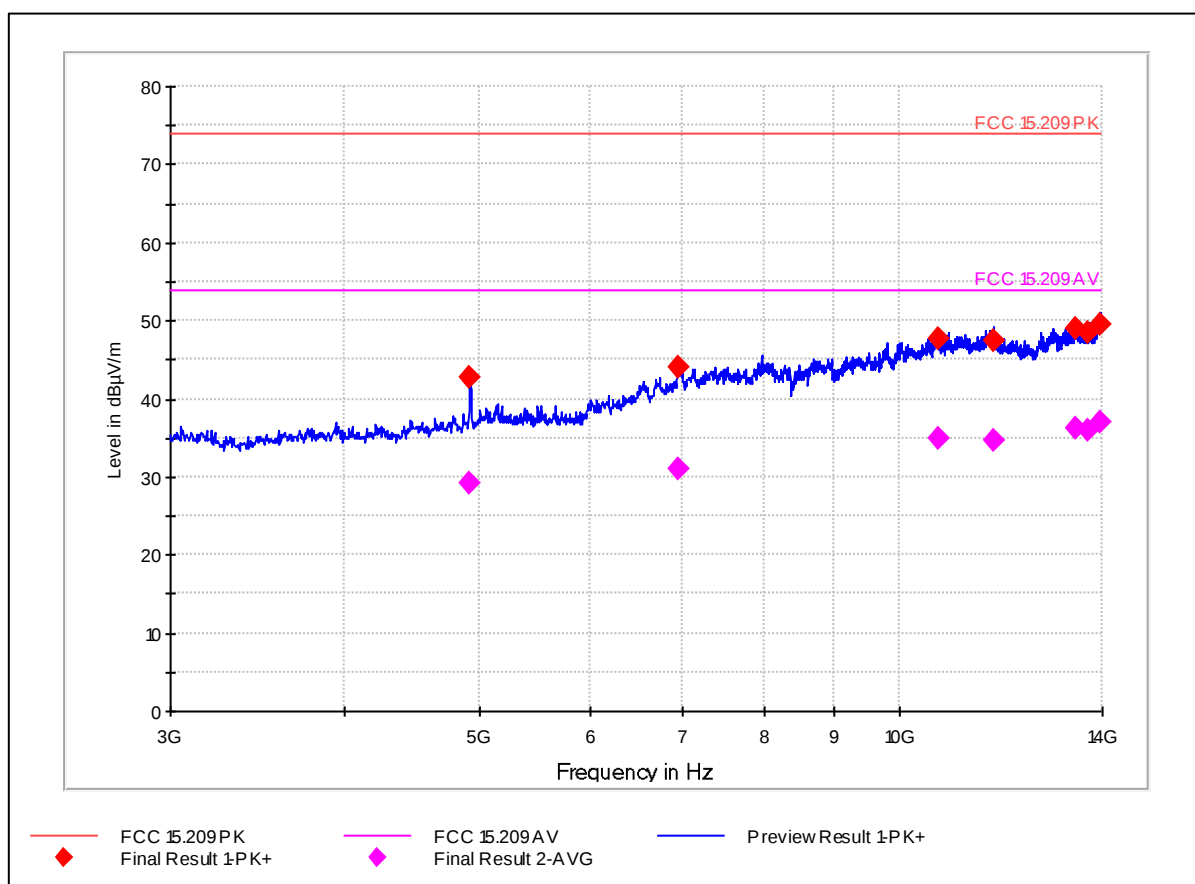


Figure 82. Radiated emission test results 3 - 14 GHz.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
4921.847695	42.6	1000.	150.1	V	145.0	31.4	74.0	PASSED
6955.305812	44.2	1000.	400.0	V	289.0	29.8	74.0	PASSED
10662.215631	47.6	1000.	303.1	V	1.0	26.4	74.0	PASSED
11684.562725	47.3	1000.	269.9	V	0.0	26.7	74.0	
13387.262525	49.0	1000.	282.1	V	78.0	25.0	74.0	
13691.903808	48.4	1000.	236.8	V	193.0	25.6	74.0	
13964.614830	49.6	1000.	396.0	H	290.0	24.4	74.0	PASSED

Table 45. Radiated emission test results 3 - 14 GHz. Peak detector.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
4921.847695	29.1	1000.	150.1	V	145.0	24.9	54.0	PASSED
6955.305812	30.9	1000.	400.0	V	289.0	23.1	54.0	PASSED
10662.215631	35.0	1000.	303.1	V	1.0	19.0	54.0	
11684.562725	34.5	1000.	269.9	V	0.0	19.5	54.0	
13387.262525	36.3	1000.	282.1	V	78.0	17.7	54.0	
13691.903808	35.8	1000.	236.8	V	193.0	18.2	54.0	PASSED
13964.614830	37.0	1000.	396.0	H	290.0	17.0	54.0	PASSED

Table 46. Radiated emission test results 3 - 14 GHz. Average detector.

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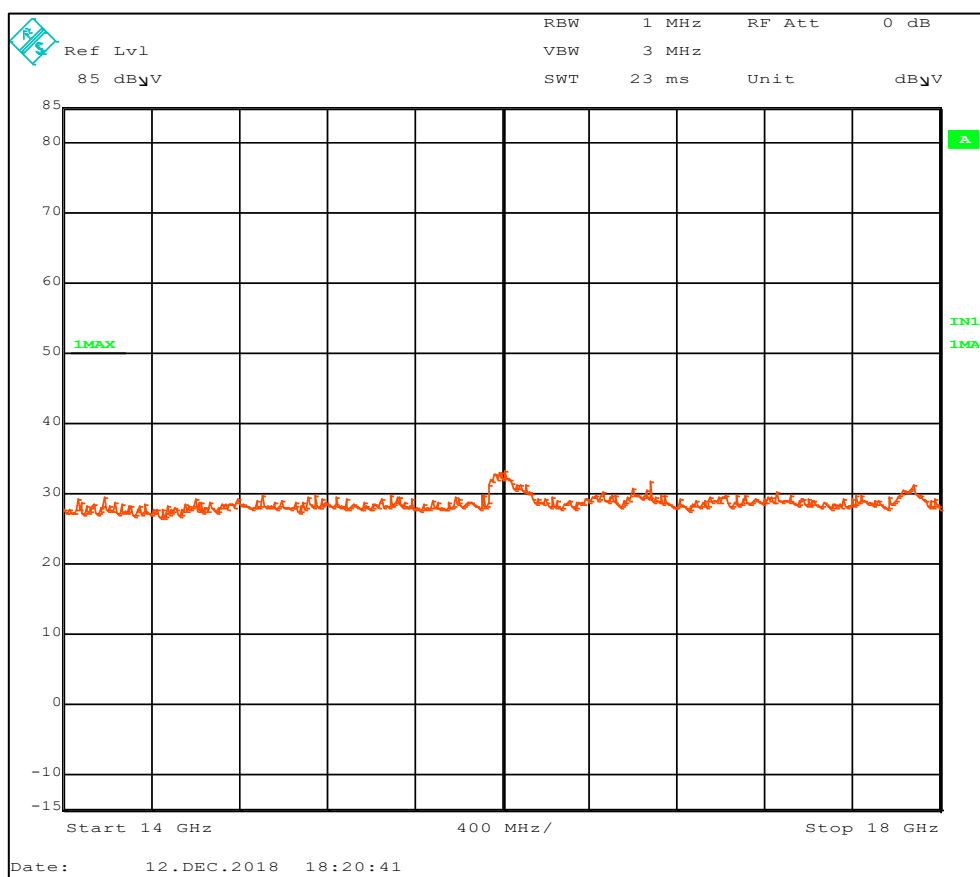


Figure 83. Radiated emission test results 14 - 18 GHz. Peak detector.

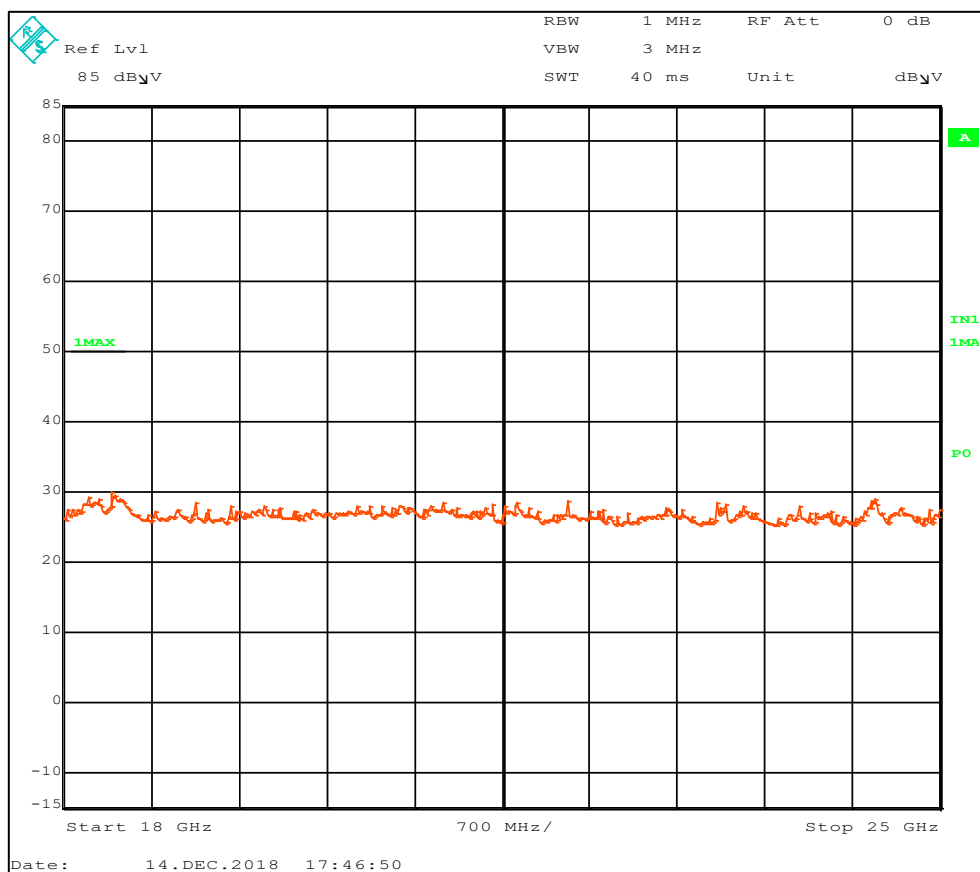


Figure 84. Radiated emission test results 18 - 25 GHz. Peak detector.

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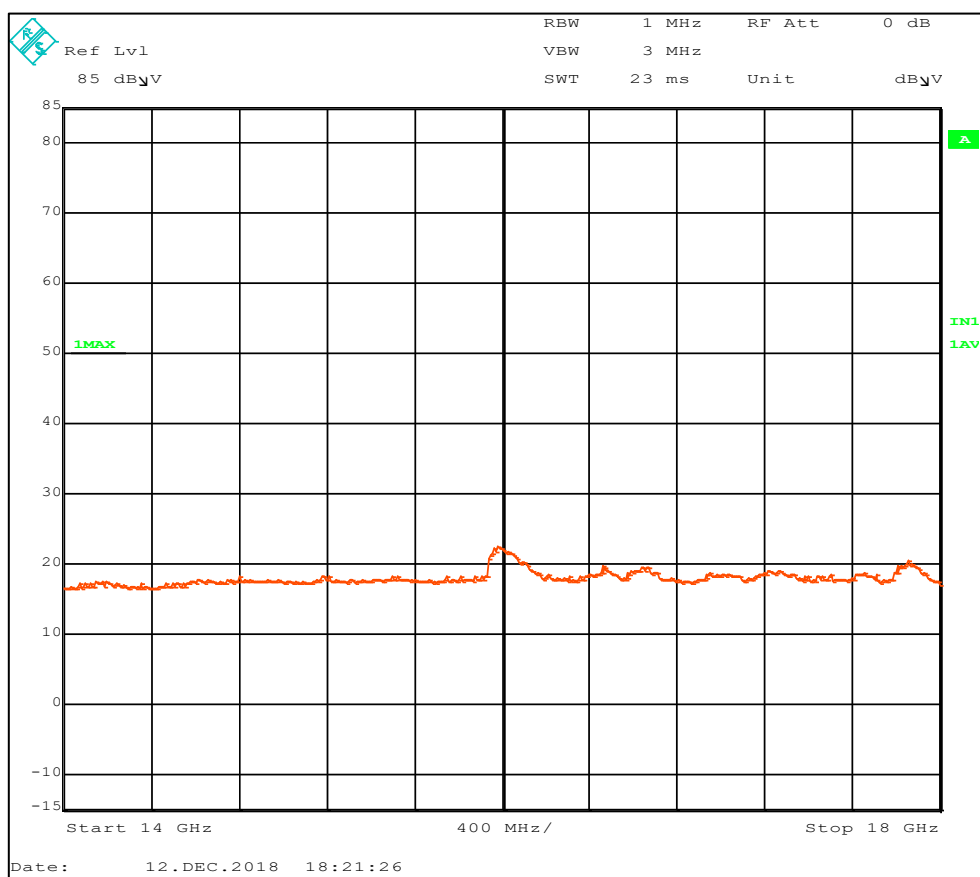


Figure 85. Radiated emission test results 14 - 18 GHz. Average detector.

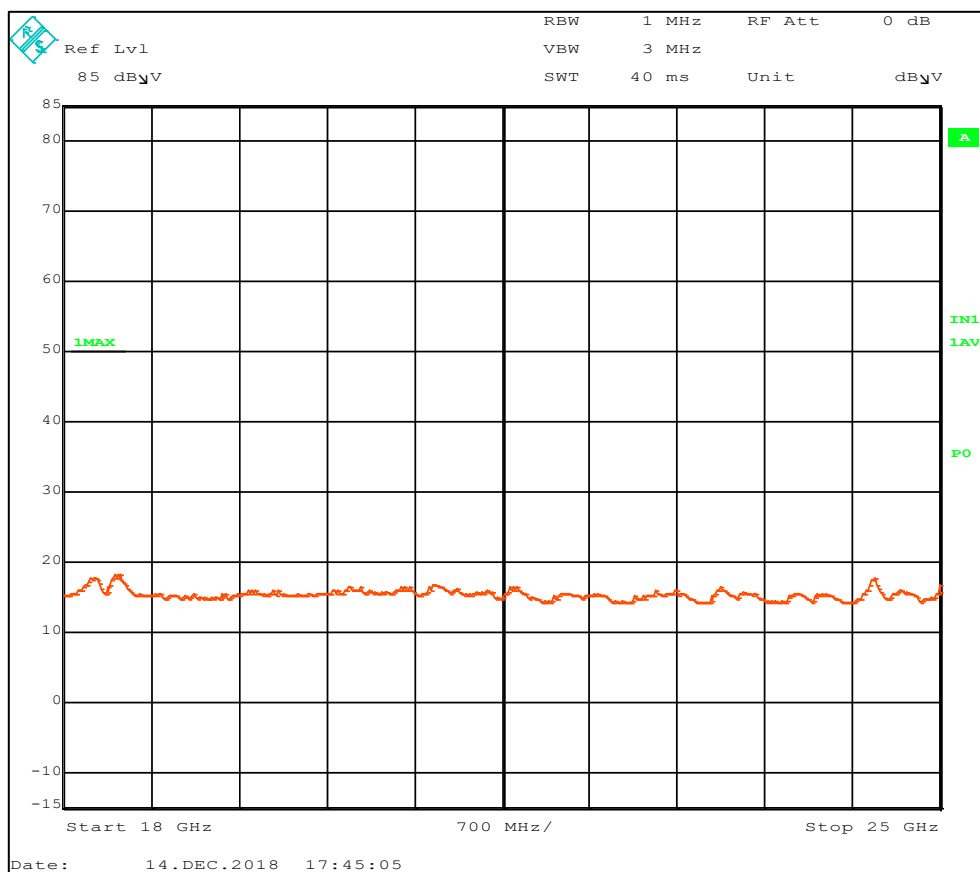


Figure 86. Radiated emission test results 18 - 25 GHz. Average detector.

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Average Limit 3 m.	Peak limit 3 m	3 m / 0.5 m factor	Average Limit 0.5 m.	Peak limit 0.5 m
dB μ V/m	dB μ V/m	dB	dB μ V/m	dB μ V/m
53.98	73.98	15.56 dB	69.54	89.54

Table 47. Calculation of limit at 0.5 m.

Frequency	AF	Cable loss	Correction factor
GHz	dB/m	dB	dB/m
14	37,1	< 2	39.1
18	37,4	< 2	39.4
18	40.3	< 2	42.3
25	40.6	< 2	42.6

Table 48. Correction factors 14 – 25 GHz.

Frequency [MHz]	Peak [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	89.54	PASSED

Table 49. Radiated emission test results. 14 - 25 GHz. Peak detector.

Frequency [MHz]	Average [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	69.54	PASSED

Table 50. Radiated emission test results 14.- 25 GHz. Average detector.

FCC ID: 2ADEF AT-DG2
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2.5.2.5 Test result for channel 11 at 2472 MHz in vertical – 90 deg. position at power level 17.

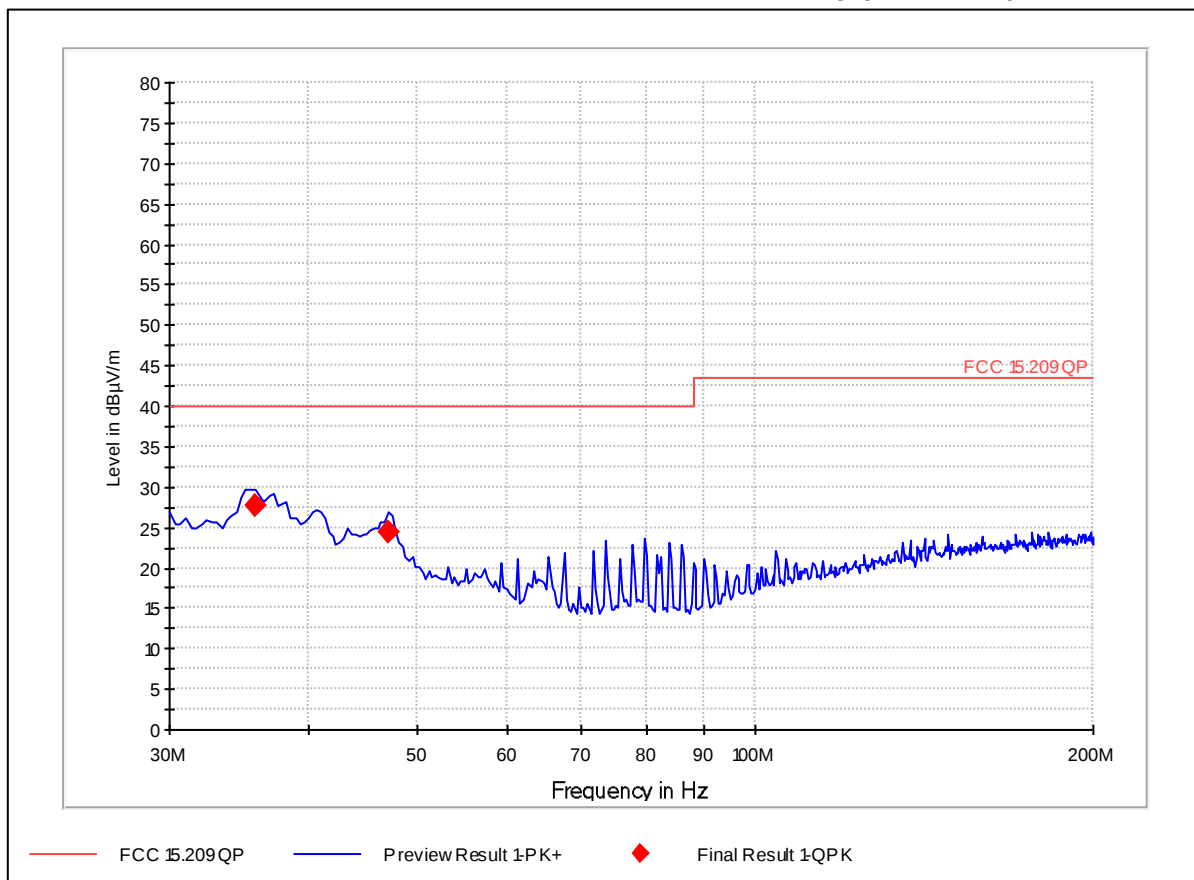


Figure 87. Radiated emission test results 30 - 200 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
35.730220	27.7	120.0	274.0	V	347.0	12.3	40.0	PASSED
47.104068	24.4	120.0	335.0	V	171.0	15.6	40.0	PASSED

Table 51. Radiated emission test results. 30 - 200 MHz.

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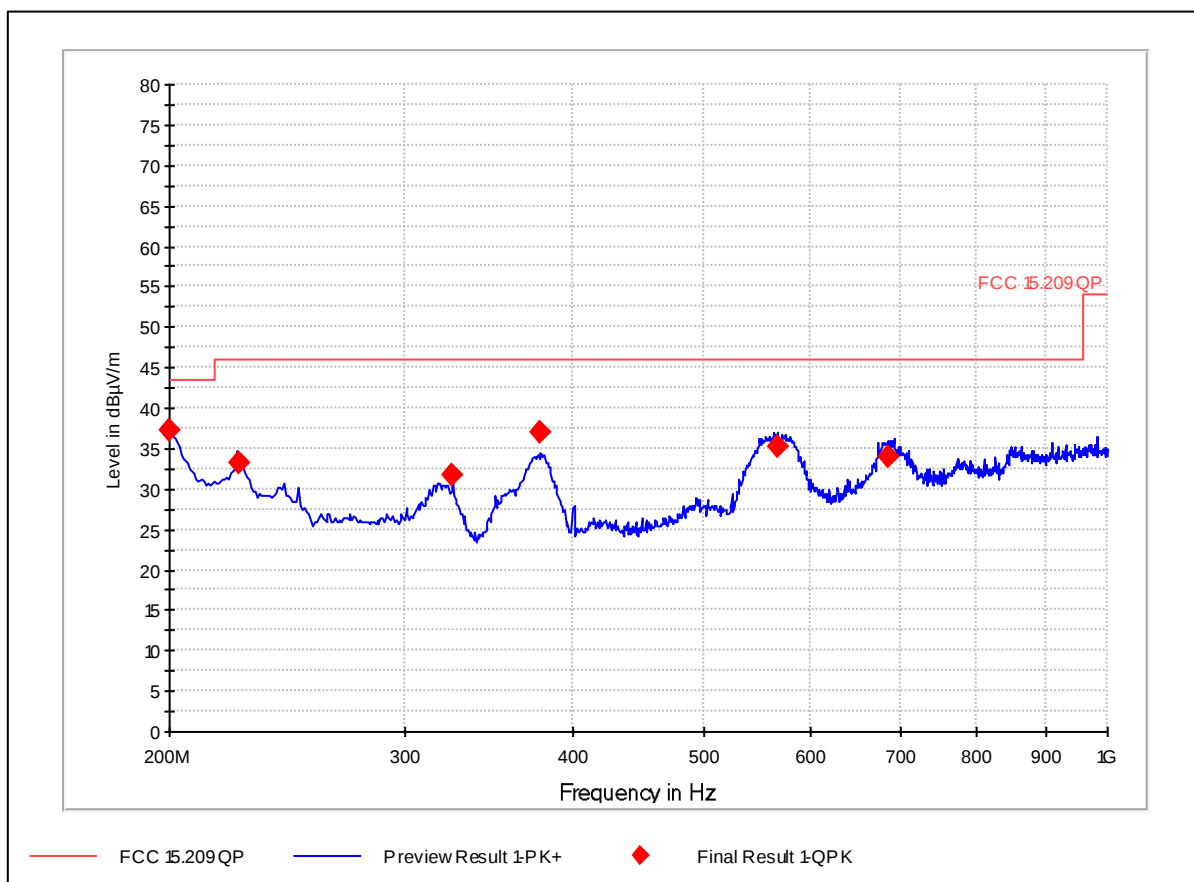


Figure 88. Radiated emission test results 200 - 1000 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
200.000000	38.2	199.8	V	270.0	5.3	43.5	200.00000	PASSED
224.849699	34.6	150.1	V	315.0	11.4	46.0	224.84969	PASSED
325.050100	32.4	199.8	H	225.0	13.6	46.0	325.05010	PASSED
378.757515	34.1	150.1	V	135.0	11.9	46.0	378.75751	
566.332665	36.8	150.1	V	90.0	9.2	46.0	566.33266	PASSED
685.771543	36.0	99.8	V	180.0	10.0	46.0	685.77154	PASSED

Table 52. Radiated emission test results 200 - 1000 MHz.

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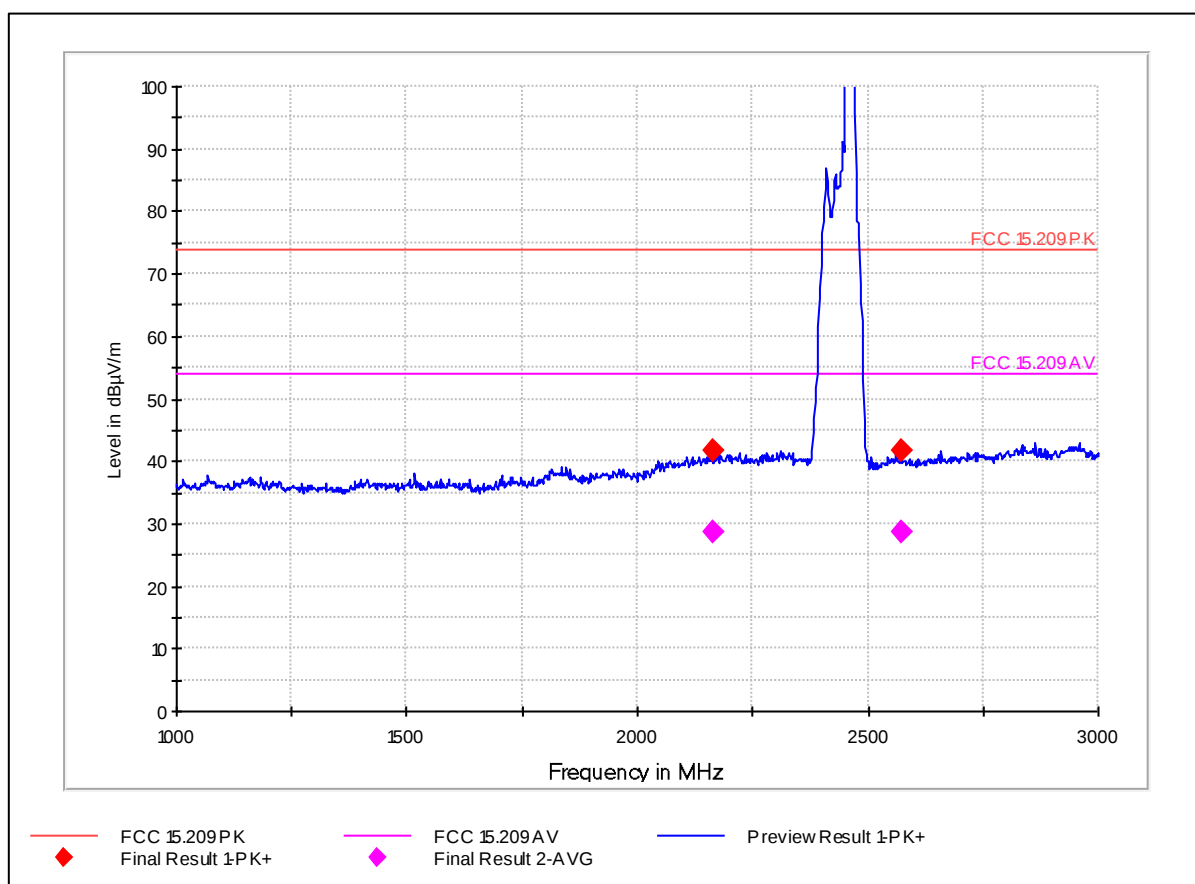


Figure 89. Radiated emission test results 1 - 3 GHz.

The peak in the frequency band is due to the attenuation of a 2.4 GHz band rejection filter, which was added to the measurement path. Thus it is ignored.

Frequency [MHz]	Peak [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
2163.820641	41.7	1000.	150.1	V	92.0	32.3	74.0	PASSED
2573.742285	41.5	1000.	342.0	V	296.0	32.5	74.0	PASSED

Table 53. Radiated emission test results 1 - 3 GHz. Peak detector.

Frequency [MHz]	Average [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
2163.820641	28.7	1000.	150.1	V	92.0	25.3	54.0	PASSED
2573.742285	28.6	1000.	342.0	V	296.0	25.4	54.0	PASSED

Table 54. Radiated emission test results 1 - 3 GHz. Average detector.

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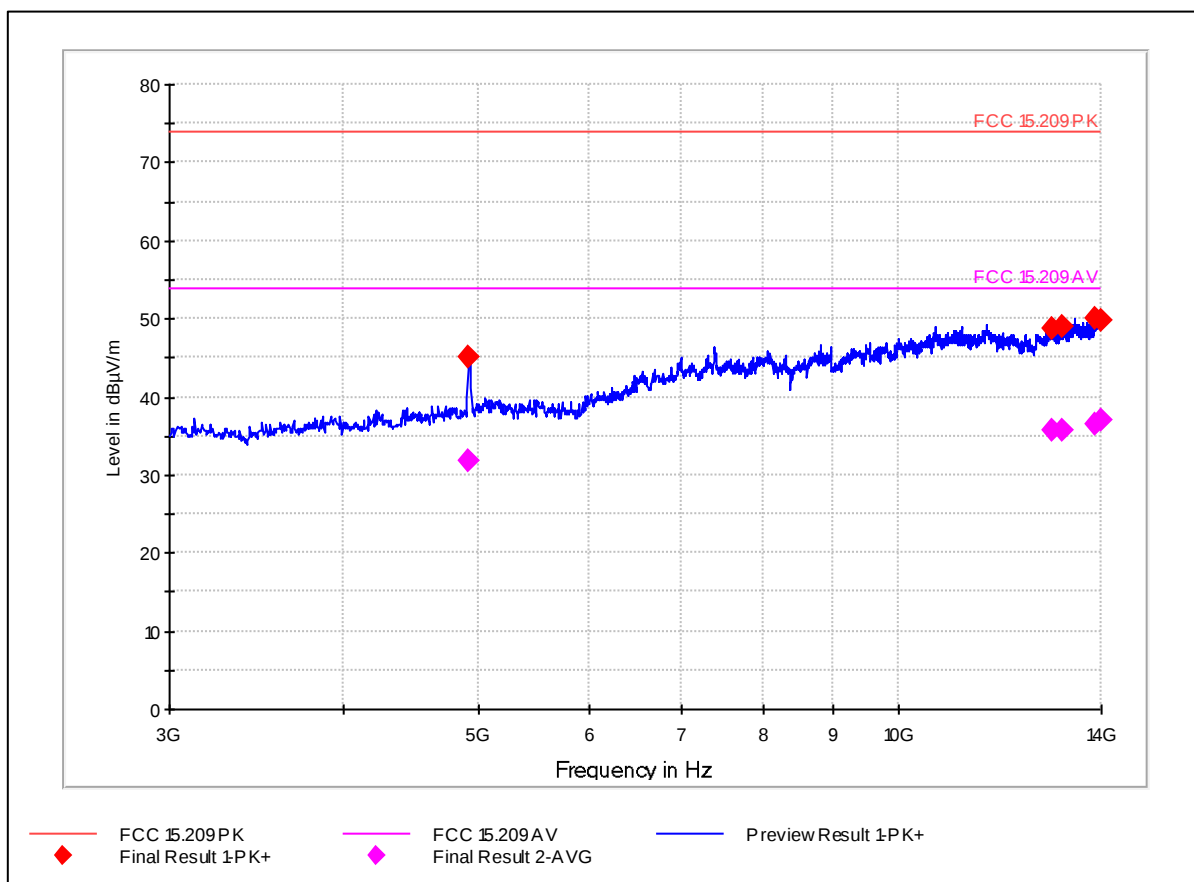


Figure 90. Radiated emission test results 3 - 14 GHz.

Frequency [MHz]	Peak [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
4924.057715	45.0	1000.	149.9	V	142.0	29.0	74.0	PASSED
12900.490581	48.8	1000.	397.1	V	218.0	25.2	74.0	PASSED
13141.896593	49.0	1000.	380.9	V	93.0	25.0	74.0	PASSED
13880.074549	49.9	1000.	177.2	V	27.0	24.1	74.0	PASSED
13980.254910	49.7	1000.	170.8	V	48.0	24.3	74.0	PASSED

Table 55. Radiated emission test results 3 - 14 GHz. Peak detector.

Frequency [MHz]	Average [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
4924.057715	31.7	1000.	149.9	V	142.0	22.3	54.0	PASSED
12900.490581	35.8	1000.	397.1	V	218.0	18.2	54.0	PASSED
13141.896593	35.8	1000.	380.9	V	93.0	18.2	54.0	PASSED
13880.074549	36.6	1000.	177.2	V	27.0	17.4	54.0	PASSED
13980.254910	37.0	1000.	170.8	V	48.0	17.0	54.0	PASSED

Table 56. Radiated emission test results 3 - 14 GHz. Average detector.

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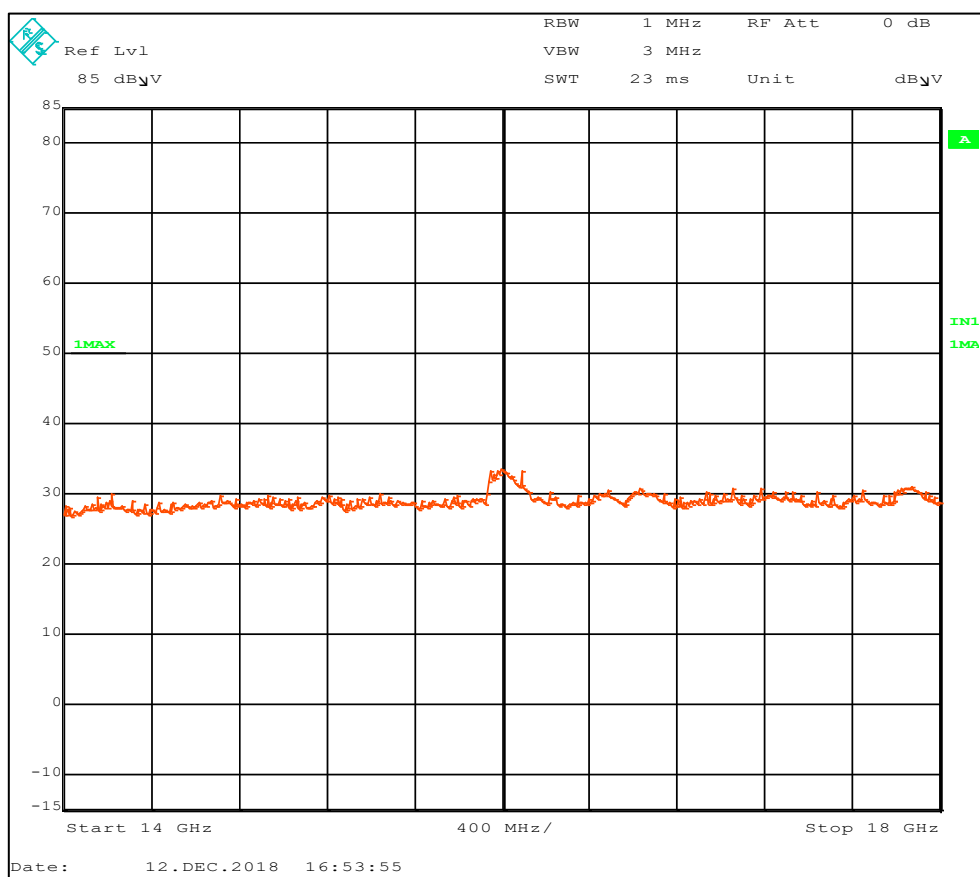


Figure 91. Radiated emission test results 14 - 18 GHz. Peak detector.

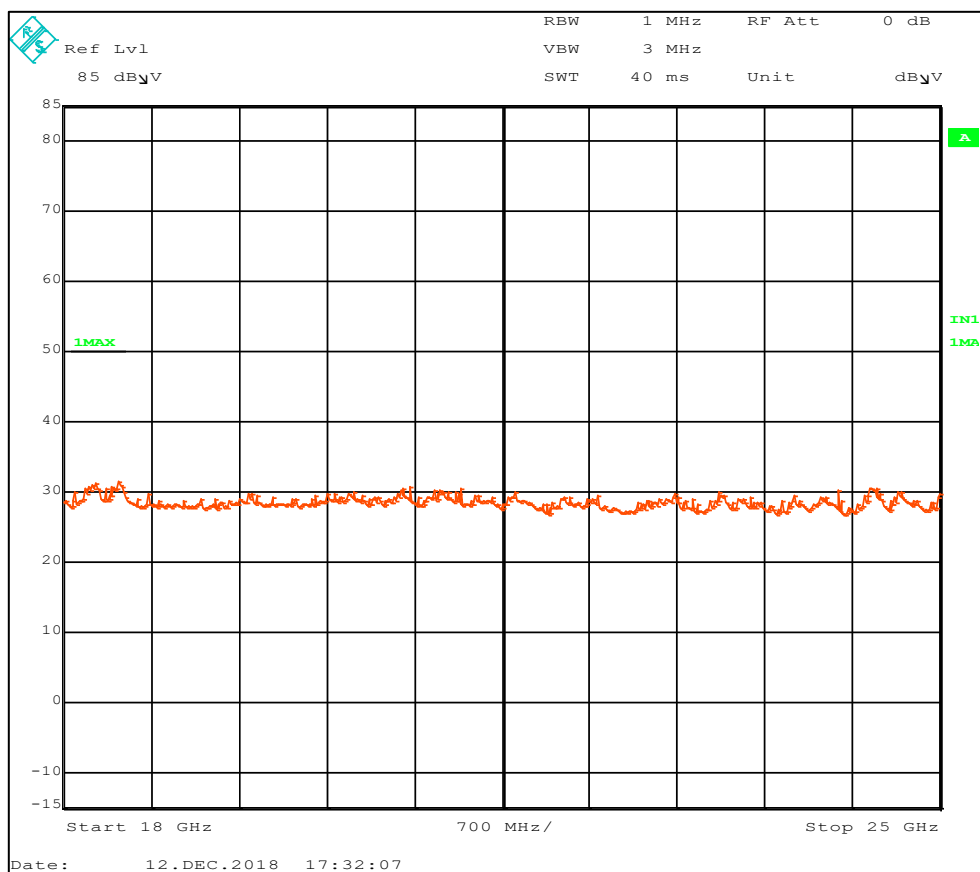


Figure 92. Radiated emission test results 18 - 25 GHz. Peak detector.

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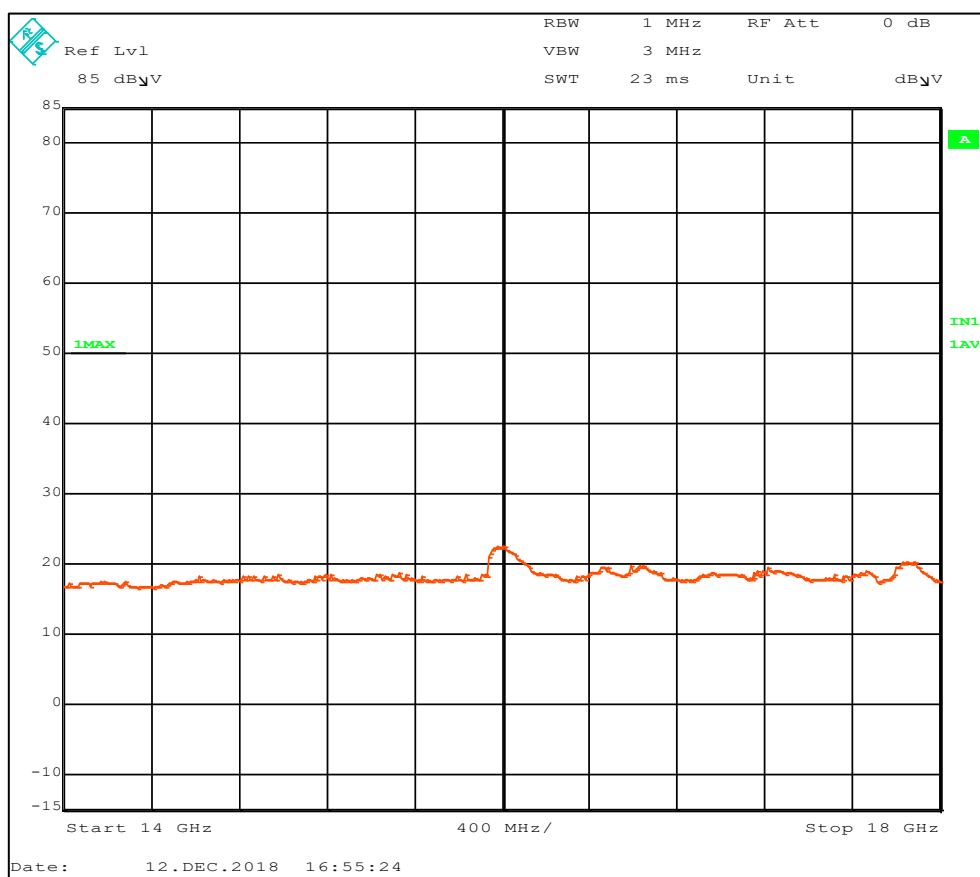


Figure 93. Radiated emission test results 14 - 18 GHz. Average detector.

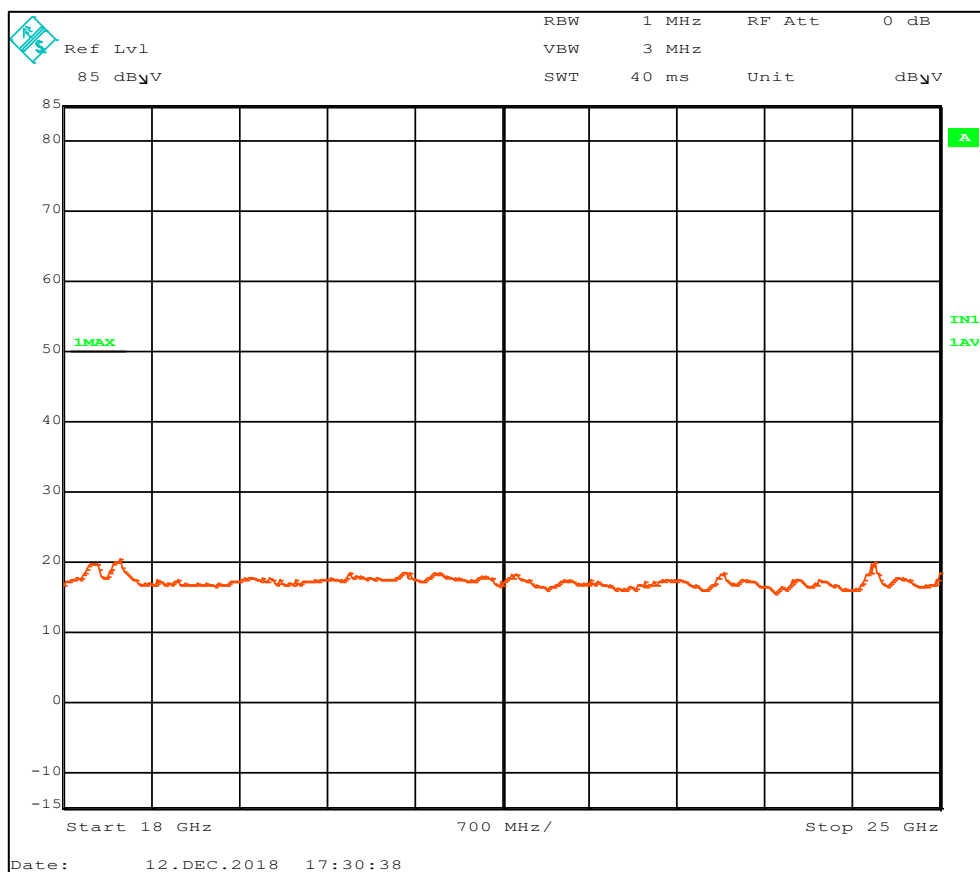


Figure 94. Radiated emission test results 18 - 25 GHz. Average detector.

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Average Limit 3 m.	Peak limit 3 m	3 m / 0.5 m factor	Average Limit 0.5 m.	Peak limit 0.5 m
dB μ V/m	dB μ V/m	dB	dB μ V/m	dB μ V/m
53.98	73.98	15.56 dB	69.54	89.54

Table 57. Calculation of limit at 0.5 m.

Frequency	AF	Cable loss	Correction factor
GHz	dB/m	dB	dB/m
14	37,1	< 2	39.1
18	37,4	< 2	39.4
18	40.3	< 2	42.3
25	40.6	< 2	42.6

Table 58. Correction factors 14 – 25 GHz.

Frequency [MHz]	Peak [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	89.54	PASSED

Table 59. Radiated emission test results. 14 - 25 GHz. Peak detector.

Frequency [MHz]	Average [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
-	-	1000	-	-	-	-	69.54	PASSED

Table 60. Radiated emission test results 14.- 25 GHz. Average detector.

2.5.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Antenna Biconical 30 - 300 MHz	ETS-LINDGREN	EMCO 3110B	13835	2019-02-20
Antenna Log Per 0.2 - 1 GHz	ETS-LINDGREN	3148	50083	2019-04-14
Antenna Horn	Schwarzbeck	BBHA 9120 D	20777	2019-02-18
Antenna Std gain Horn 12GHz-18GHz	Narda	639 + 609	17219	NA
Antenna Std gain Horn 18 - 26.5 GHz	Narda	638 + 4608B	17524	NA
Analyzer 20Hz-26.5GHz	Rohde & Schwarz	ESI 26	20763	2019-12-10
Receiver EMI 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2019-09-24

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2.6 Band edge

Test specimen	DG2 no.10
Test specification	558074 D01 15.247 Measurement Guidance v05
Test method	ANSI C63.10:2013 sec. 11.12
Comments	none
Temperature / Humidity	22°C / 37%RH
Dates of measurements	2018-11-09
Test personnel	Søren Søltøft

2.6.1 Test setup

The measurement was performed radiated in a semi anechoic chamber with absorbers on the floor.
The measuring distance was 3 m.

The EUT was placed on a non-conductive table, 1.5 m above the floor.

The test specimen was placed in the orientation giving the highest RF output at the fundamental frequency.

The measurements were performed at the edge of the nearest restricted band below and above the DTS band. Below at 2390 MHz and above at 2483.5 MHz.

An investigation of the Band Edge level versus MCS0 to MCS7 at channel 11 showed MCS0 to be worst case.

See appendix 1 for photo of test set up

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2.6.2 Test results

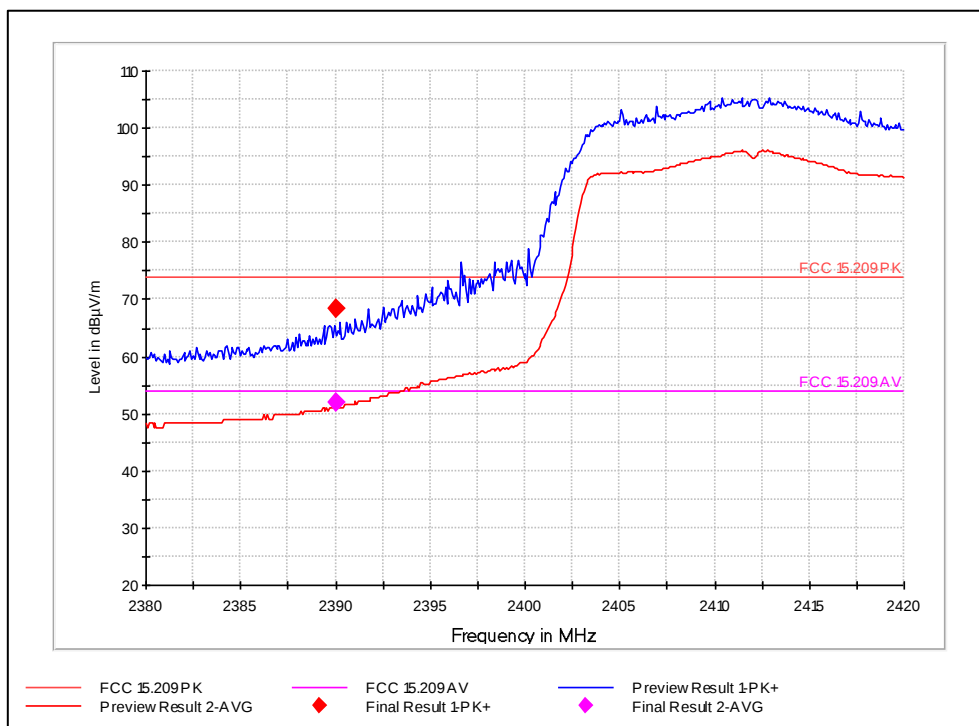


Figure 95. Band Edge for channel 1

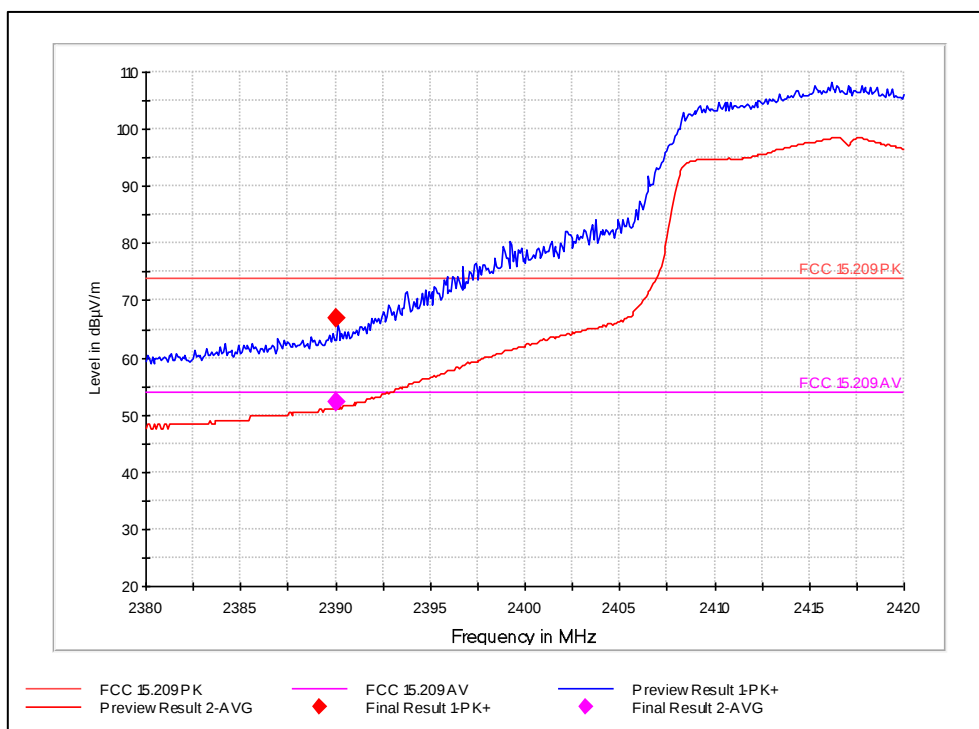


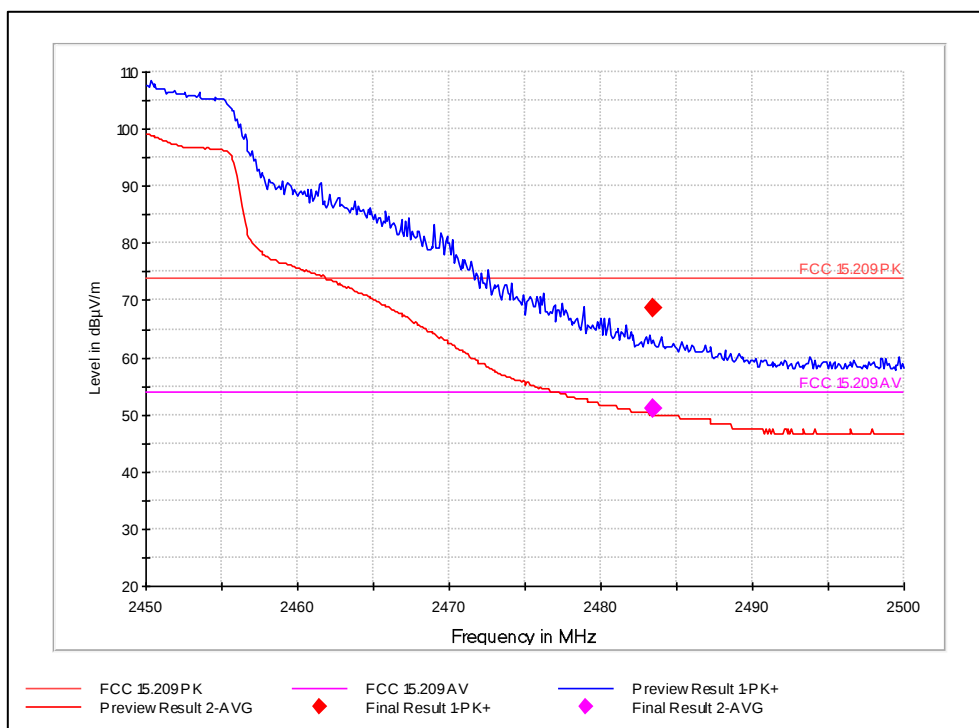
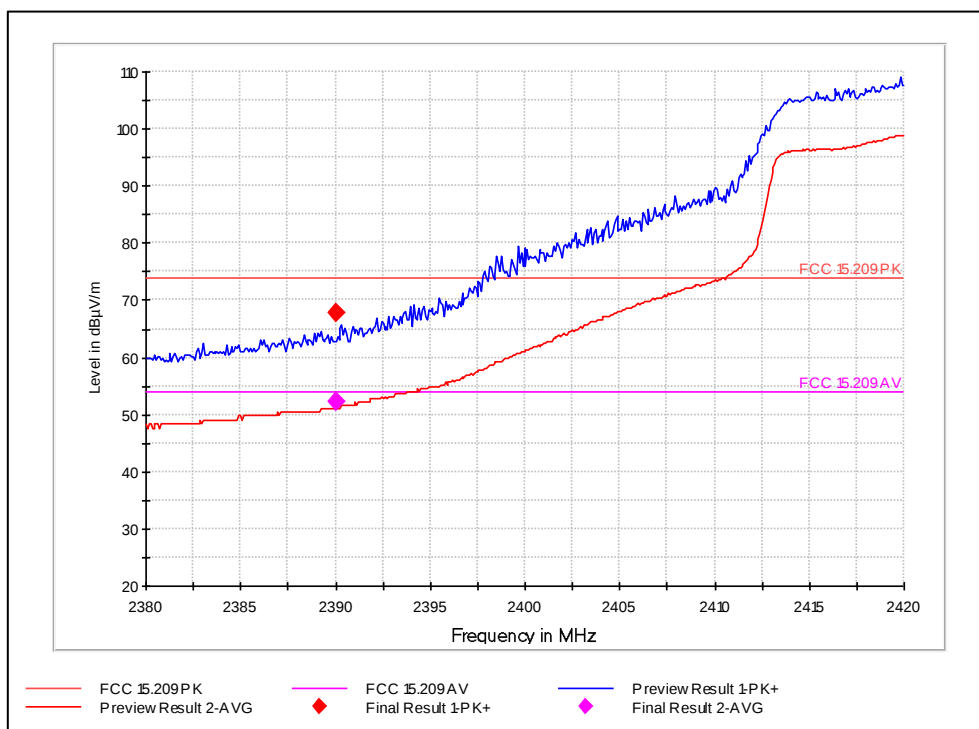
Figure 96. Band Edge for channel 2

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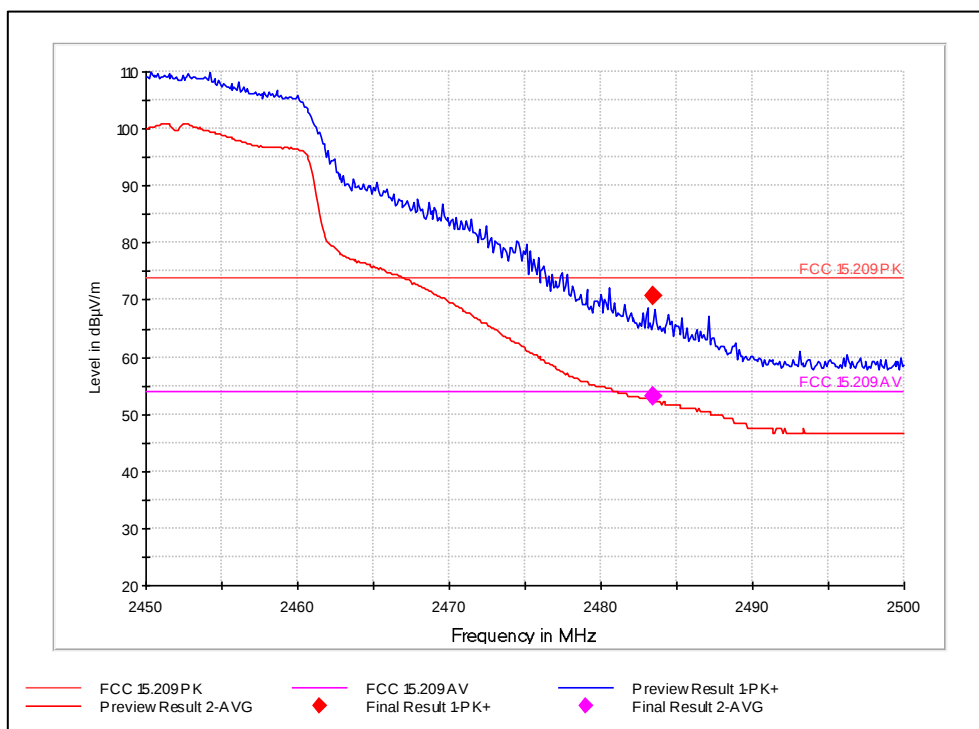


Figure 99. Band Edge for channel 9

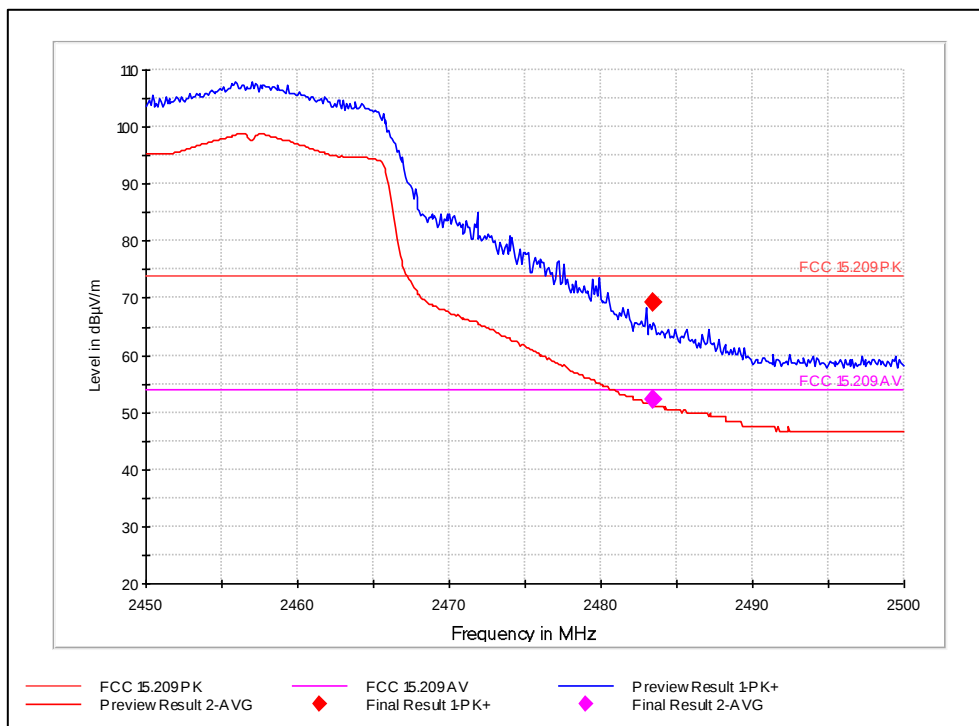


Figure 100. Band Edge for channel 10

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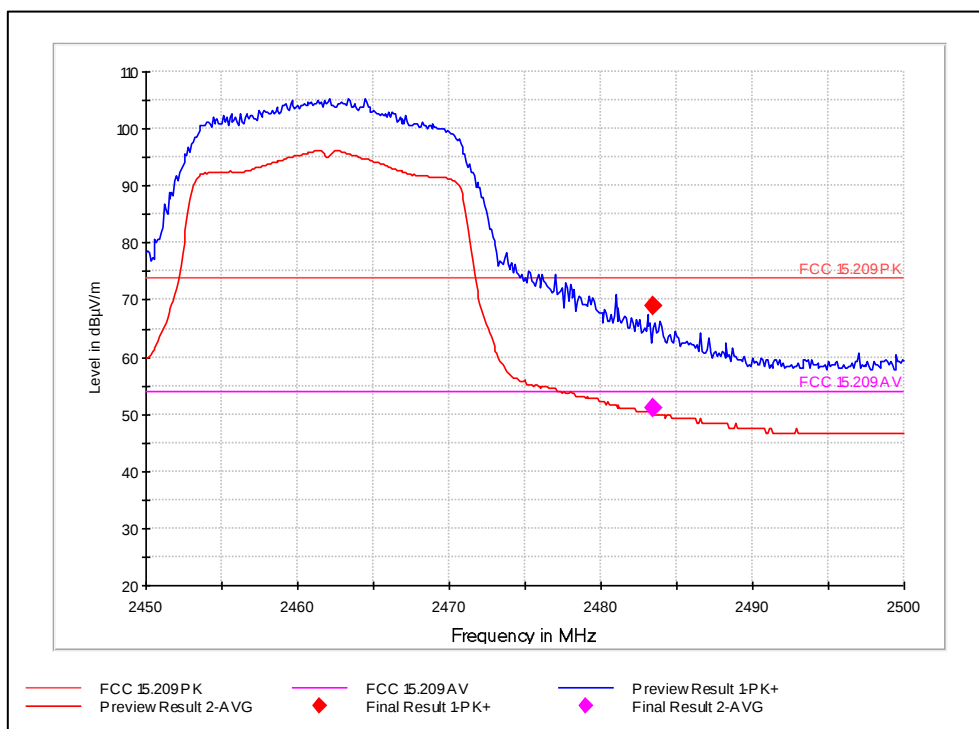


Figure 101. Band Edge for channel 11.

Channel	Peak	Average	Limit		Margin		Result
	[dBµV/m]	[dBµV/m]	Peak [dBµV/m]	Average [dBµV/m]	Peak [dB]	Average [dB]	
1	68.2	52	74	54	5.8	2	Passed
2	67	52.2	74	54	7	1.8	Passed
3	67.7	52.3	74	54	6.3	1.7	Passed
8	68.8	51.2	74	54	5.2	2.8	Passed
9	70.8	53.1	74	54	3.2	0.9	Passed
10	69.2	52.1	74	54	4.8	1.9	Passed
11	68.9	51.1	74	54	5.1	2.9	Passed

Table 61. Band Edge results.

2.6.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESI 26	20763	2018-12-05

Table 62. Band Edge test equipment.

FCC ID: 2ADEF AT-DG2
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2.7 Power spectral density

Test specimen	AT-DG2 no. 12
Test specification	FCC 47 CFR Part 15.247 (e) RSS-247 sec 5.2 b)
Test method	ANSI C63.10:2013 sec 11.10.2
Limits	FCC 47 CFR Part 15.247 (e)
Comments	None
Temperature / Humidity	23°C / 26%RH
Dates of measurements	2018-12-13
Test personnel	Søren Søltøft

2.7.1 Test setup

The test specimen was connected to a spectrum analyzer using a temporary antenna connector.

See photo of test set up in appendix 1.

2.7.2 Test results

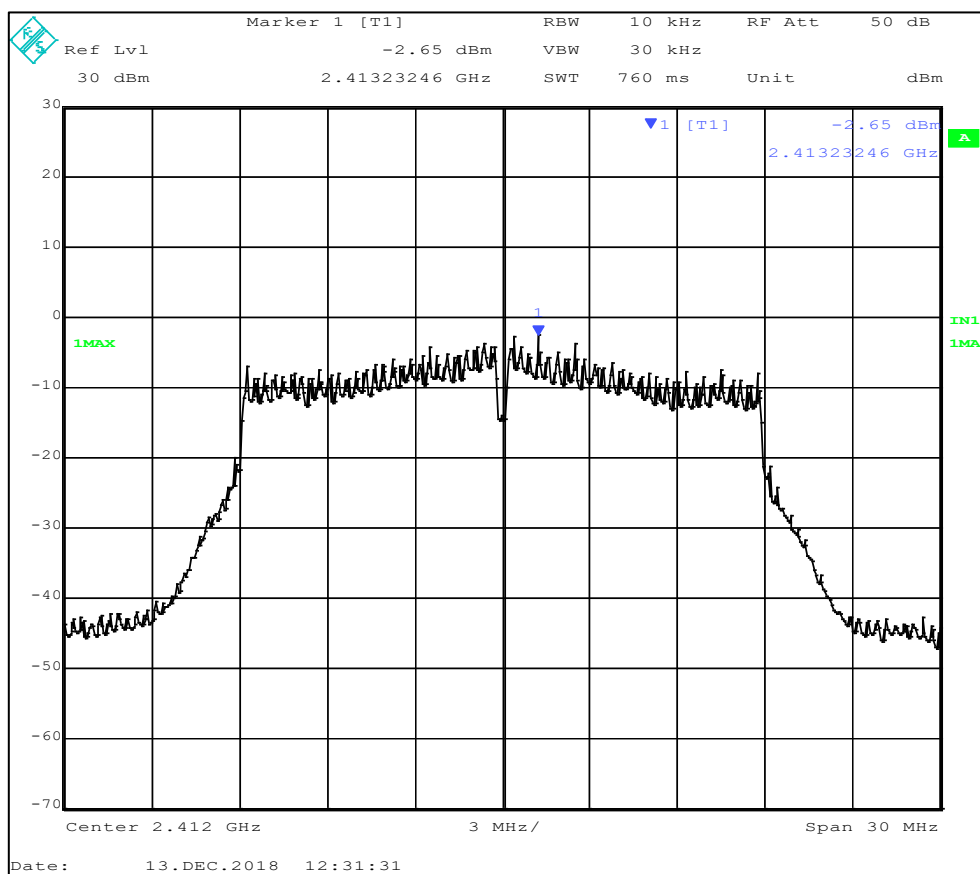


Figure 102. Power spectral density channel 1.

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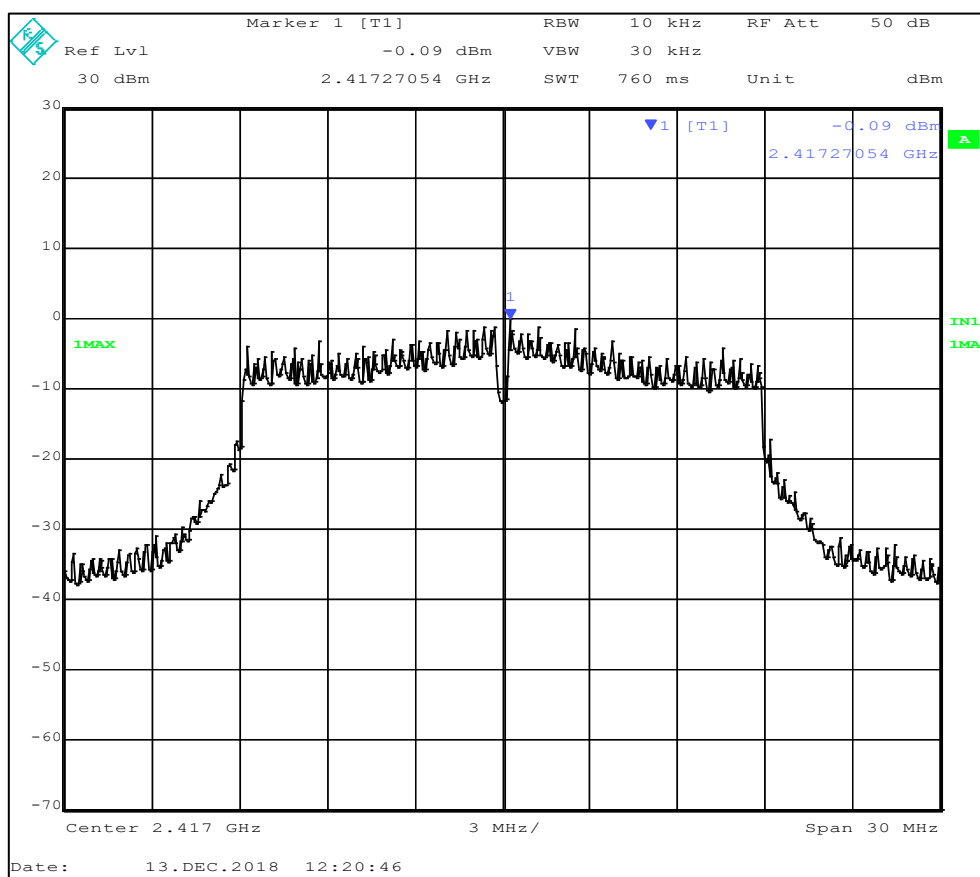


Figure 103. Power spectral density channel 2.

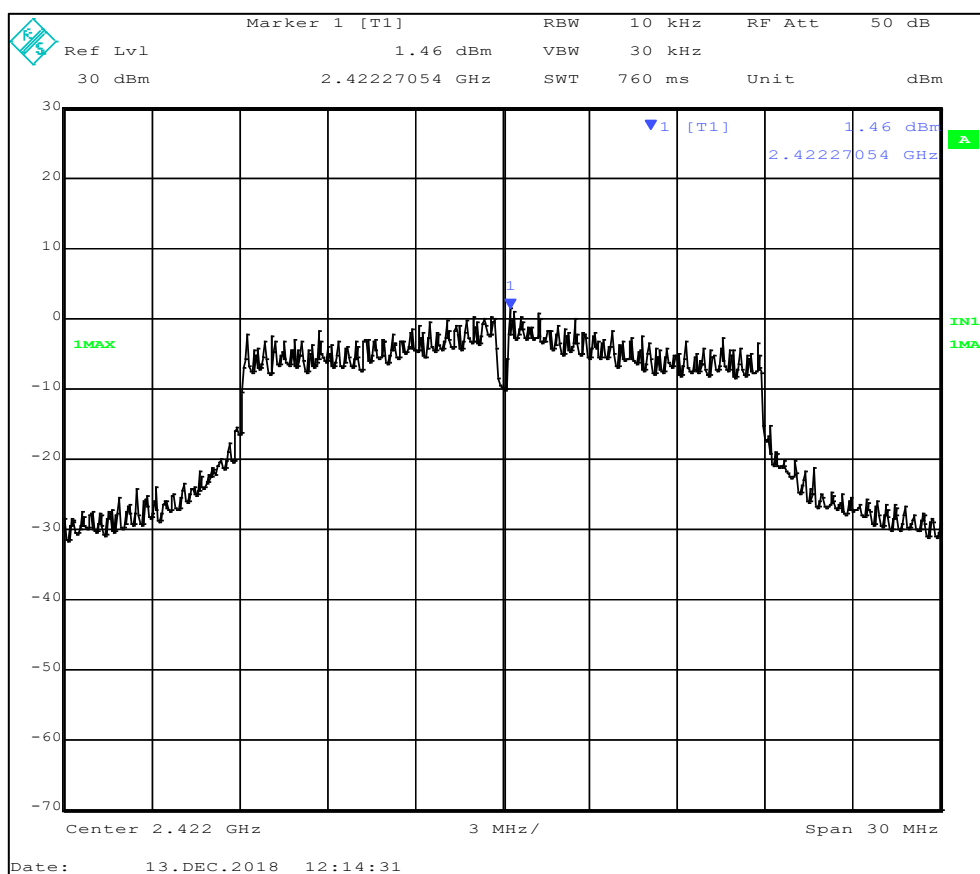


Figure 104. Power spectral density channel 3.

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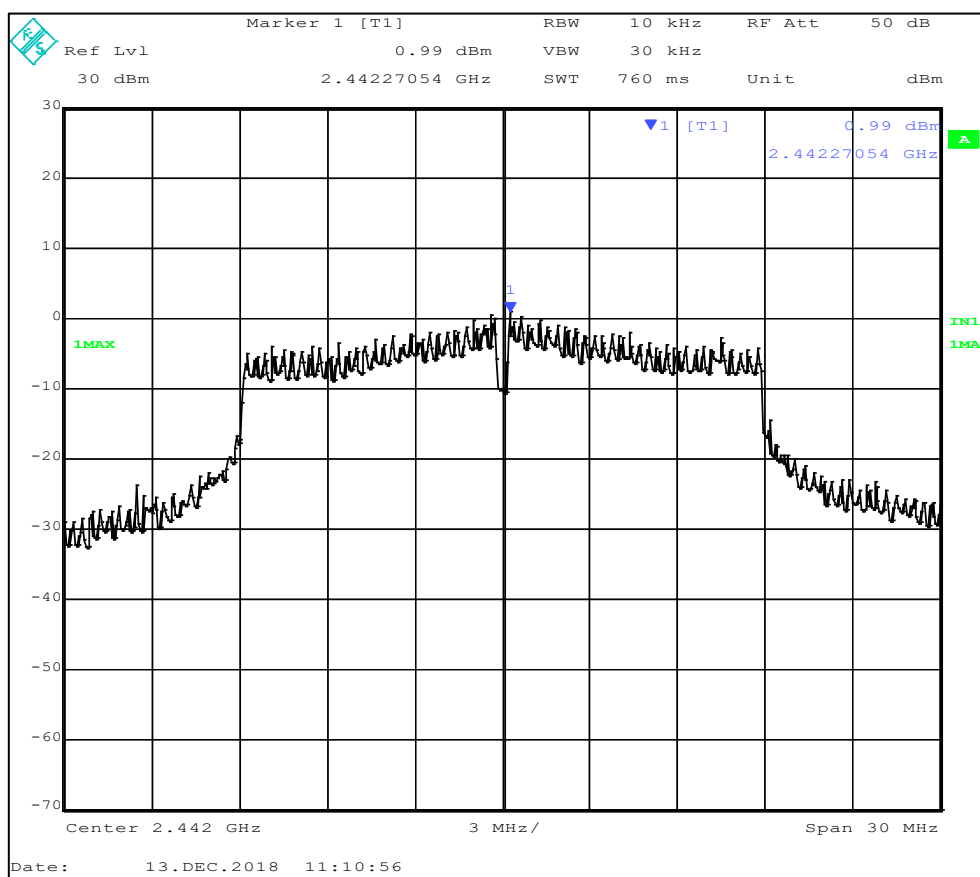


Figure 105 Power spectral density channel 7.

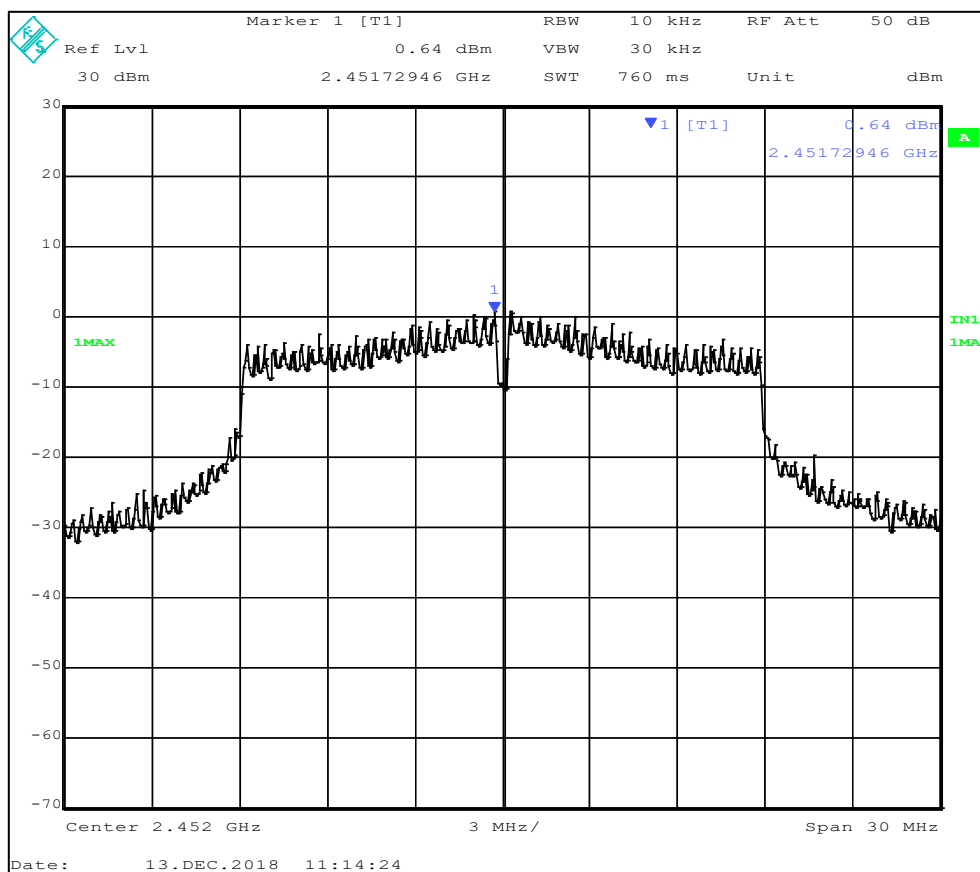


Figure 106. Power spectral density channel 9.

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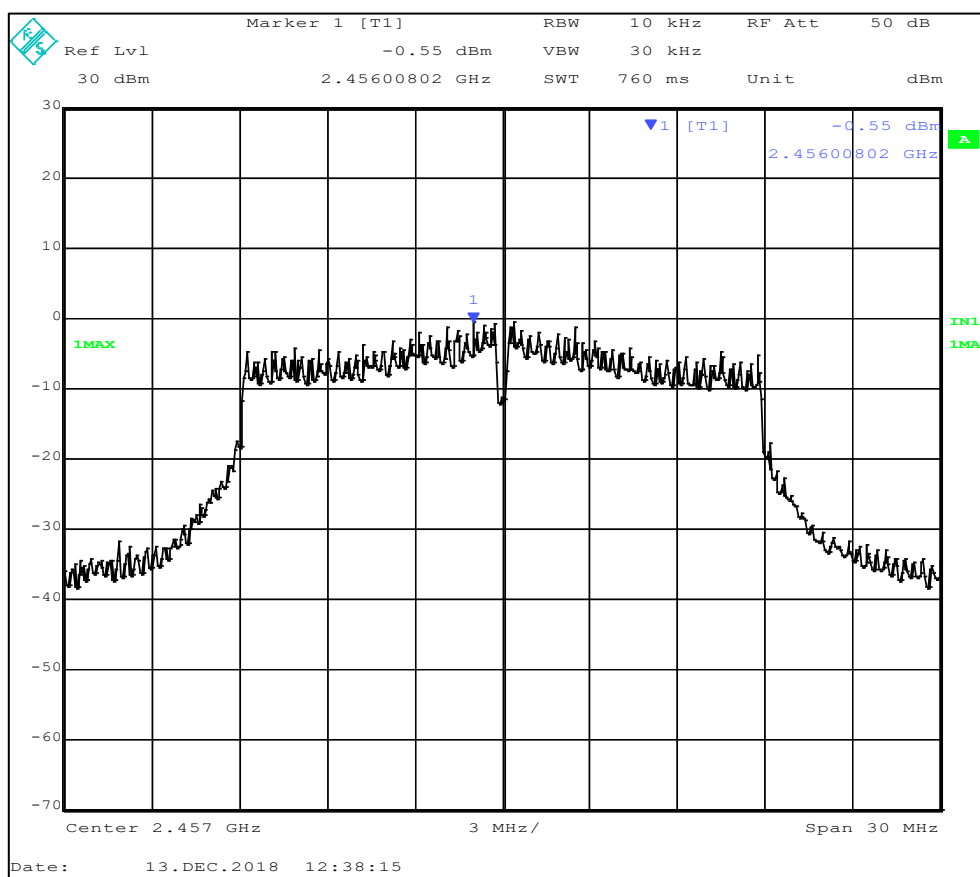


Figure 107. Power spectral density channel 10.

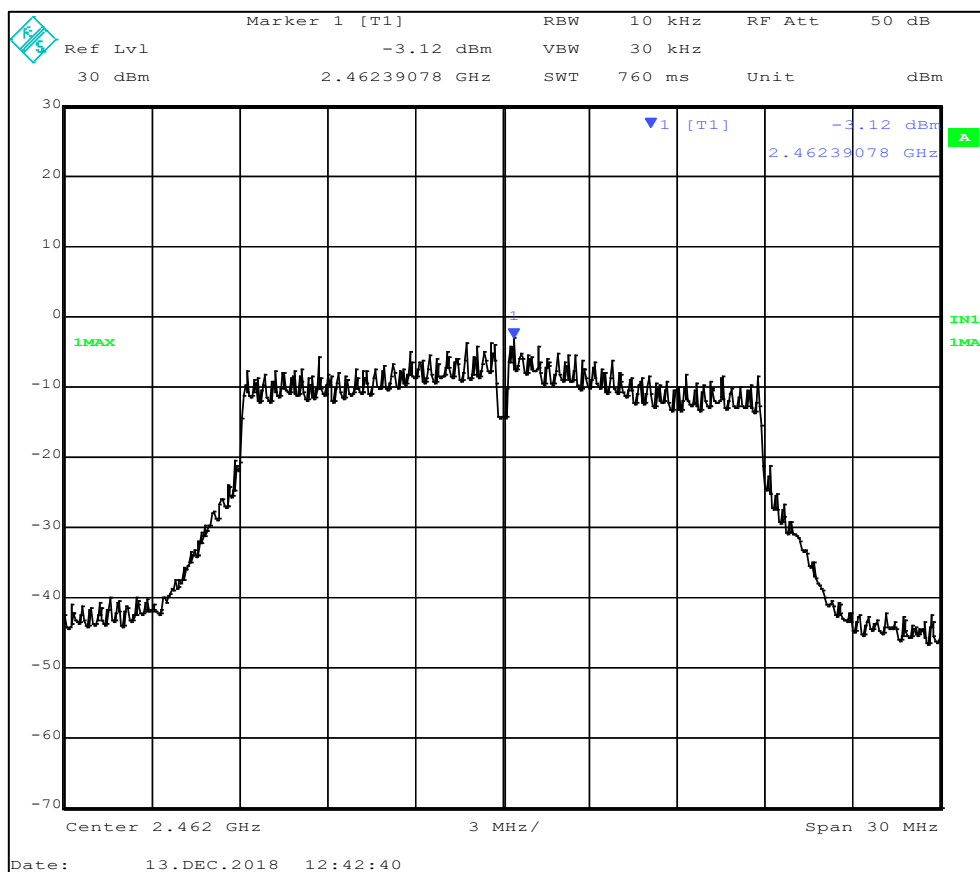


Figure 108. Power spectral density channel 11.

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Channel	Frequency [MHz]	Power Spectral density [dBm]	Limit [dBm]	Result
1	2412	-2.65	8	PASSED
2	2417	-0.09	8	PASSED
3	2422	1.46	8	PASSED
7	2442	0.99	8	PASSED
9	2452	0.64	8	PASSED
10	2457	-0.55	8	PASSED
11	2462	-3.12	8	PASSED

2.7.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2019-09-24

FCC ID: 2ADEF AT-DG2
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2.8 AC Conducted emission

Test specimen	AT-DG2 No 12
Test specification	47 CFR Part 15.207 RSS-Gen 8.8
Test method	ANSI C63.10:2013 sec. 6.2
Frequency range	0.15 - 30 MHz
Limits	47 CFR Part 15.207
Comments	none
Temperature / Humidity	23°C / 49%RH
Dates of measurements	2018-10-11
Test personnel	Søren Søltoft

2.8.1 Test setup

Measurements were performed with the test specimen powered from a AC/DC adaptor (EMC 3) and from Poe injector through Airtame Ethernet to USB adaptor with PoE (PoE 2). PoE Injector 2 was used as power supply.

The test specimen was set to max power with max duty cycle at channel 7.

The mains supply was 120 VAC.

The test specimen was equipped with a temporary antenna connector which was terminated in 50 ohm.

See appendix 1 for photo of test set up

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2.8.2 Test results

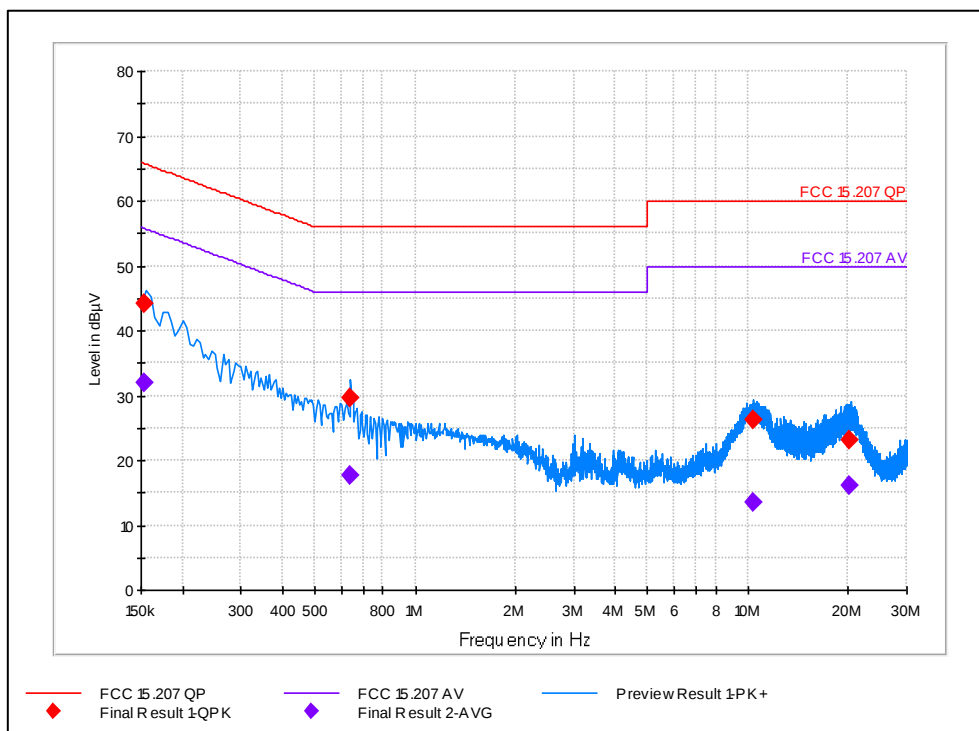


Figure 109. AC Conducted emission. Powered by ACDC adaptor

Frequency [MHz]	QuasiPeak [dBµV]	BW [kHz]	Line	Margin [dB]	Limit [dBµV]	Result
0.154000	44.0	9.000	N	21.70	65.80	PASSED
0.639000	29.5	9.000	N	26.50	56.00	PASSED
10.355700	26.2	9.000	N	33.80	60.00	PASSED
20.167900	23.1	9.000	L1	36.90	60.00	PASSED

Table 63. AC Conducted emission. Powered by ACDC adaptor. QuasiPeak detector.

Frequency [MHz]	Average [dBµV]	BW [kHz]	Line	Margin [dB]	Limit [dBµV]	Result
0.154000	32.1	9.000	N	23.70	55.80	PASSED
0.639000	17.6	9.000	N	28.40	46.00	PASSED
10.355700	13.4	9.000	N	36.60	50.00	PASSED
20.167900	16.0	9.000	L1	34.00	50.00	PASSED

Table 64. AC Conducted emission. Powered by ACDC adaptor. Average detector.

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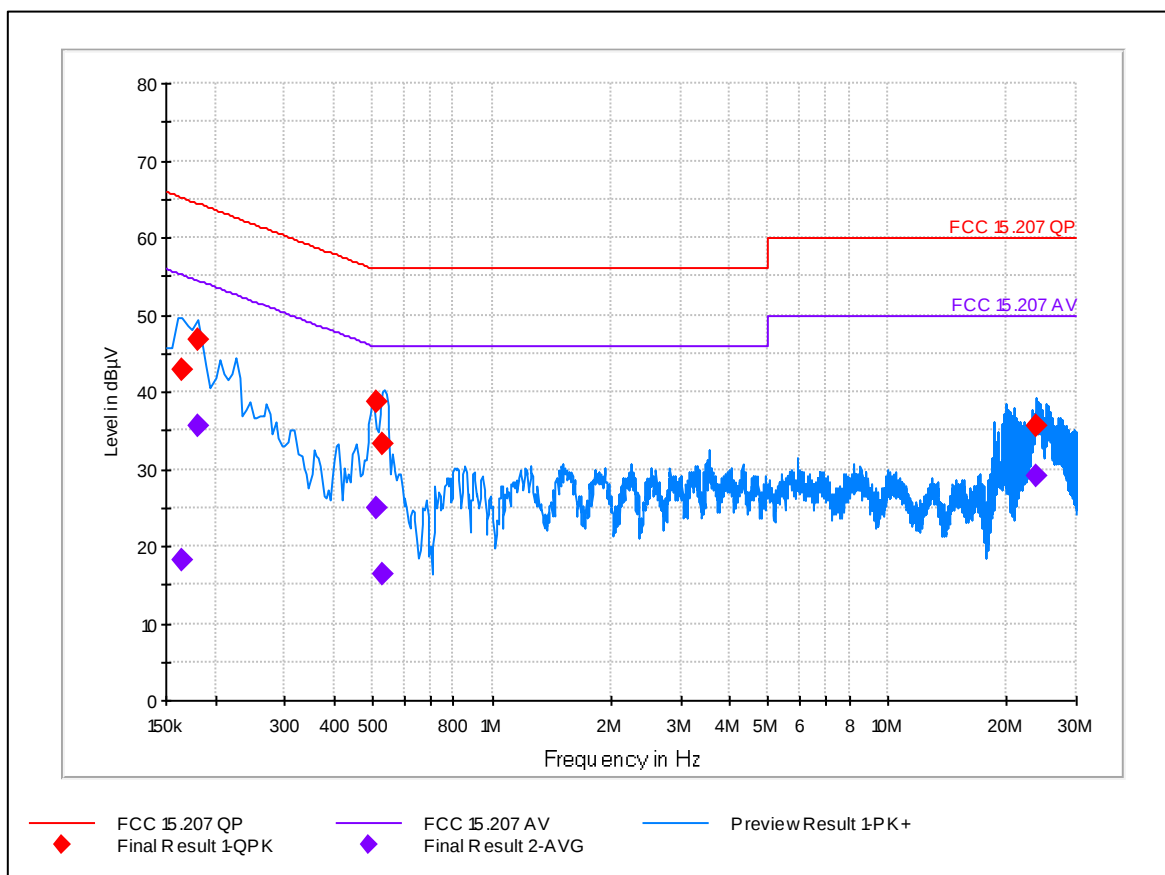


Figure 110. AC Conducted emission. Powered by PoE Injector 2.

Frequency [MHz]	QuasiPeak [dBµV]	BW [kHz]	Line	Margin [dB]	Limit [dBµV]	Result
0.165200	43.0	9.000	N	22.20	65.20	PASSED
0.180000	46.7	9.000	N	17.80	64.50	PASSED
0.510000	38.6	9.000	N	17.40	56.00	PASSED
0.526700	33.3	9.000	N	22.70	56.00	PASSED
23.661500	35.5	9.000	L1	24.50	60.00	PASSED

Table 65. AC Conducted emission. Powered by PoE Injector 2. QuasiPeak detector.

Frequency [MHz]	Average [dBµV]	BW [kHz]	Line	Margin [dB]	Limit [dBµV]	Result
0.165200	18.1	9.000	N	37.10	55.20	PASSED
0.180000	35.7	9.000	N	18.80	54.50	PASSED
0.510000	24.9	9.000	N	21.10	46.00	PASSED
0.526700	16.3	9.000	N	29.70	46.00	PASSED
23.661500	29.1	9.000	L1	20.90	50.00	PASSED

Table 66. AC Conducted emission. Powered by PoE Injector 2. Average detector.

2.8.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
V-network Two Line	R&S	ESH3-Z5	20682	2019-01-22
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2019-09-24

FCC ID: 2ADEF AT-DG2
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2.9 Occupied bandwidth

Test specimen	AT-DG2 no. 12
Test specification	47 CFR 2.1049 RSS-Gen 6.7
Test method	ANSI C63.10:2013 sec. 6.9.3
Comments	none
Temperature / Humidity	23°C / 26%RH
Dates of measurements	2018-12-13
Test personnel	Søren Søltøft

2.9.1 Test setup

The test specimen was connected to a spectrum analyzer using a temporary antenna connector.

See photo of test set up in appendix 1.

2.9.2 Test results

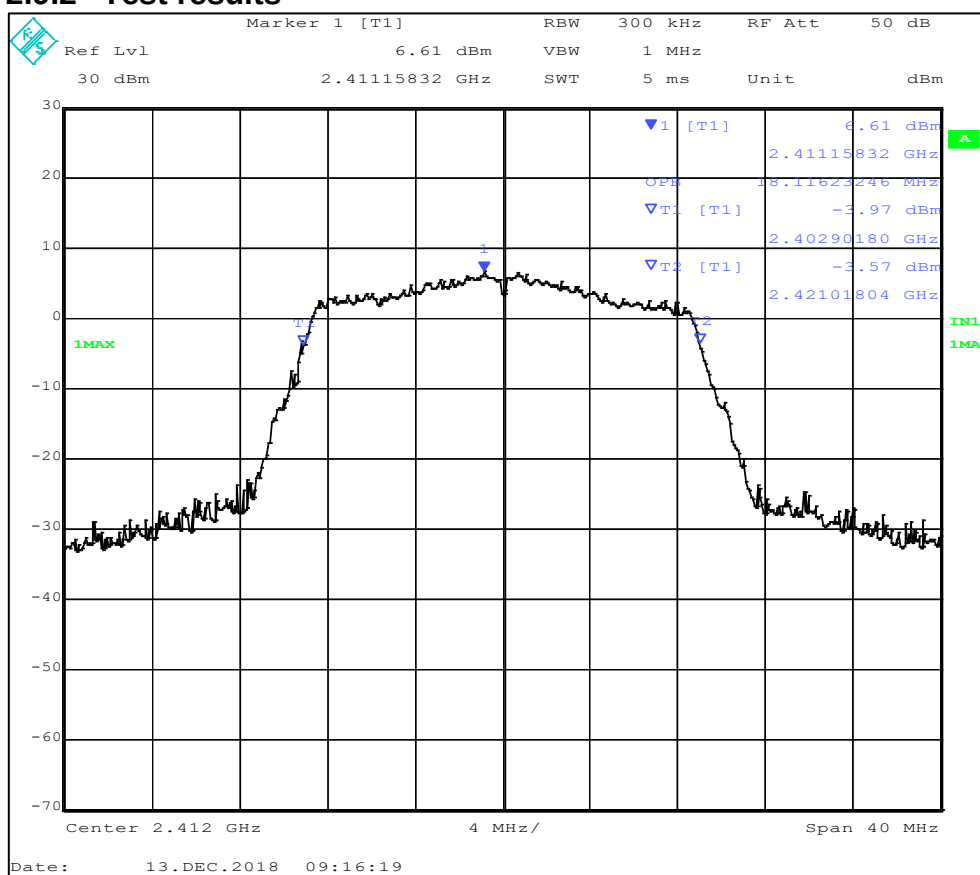


Figure 111. Occupied bandwidth 99% channel 1.

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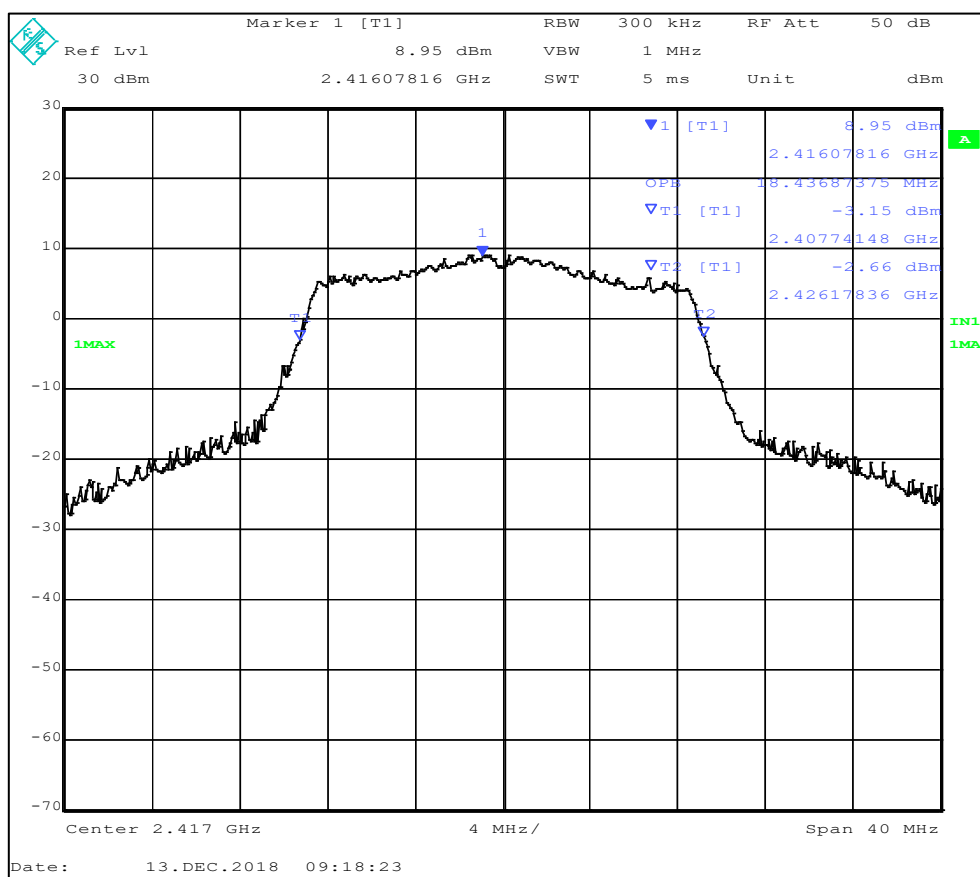


Figure 112. Occupied bandwidth 99% channel 2.

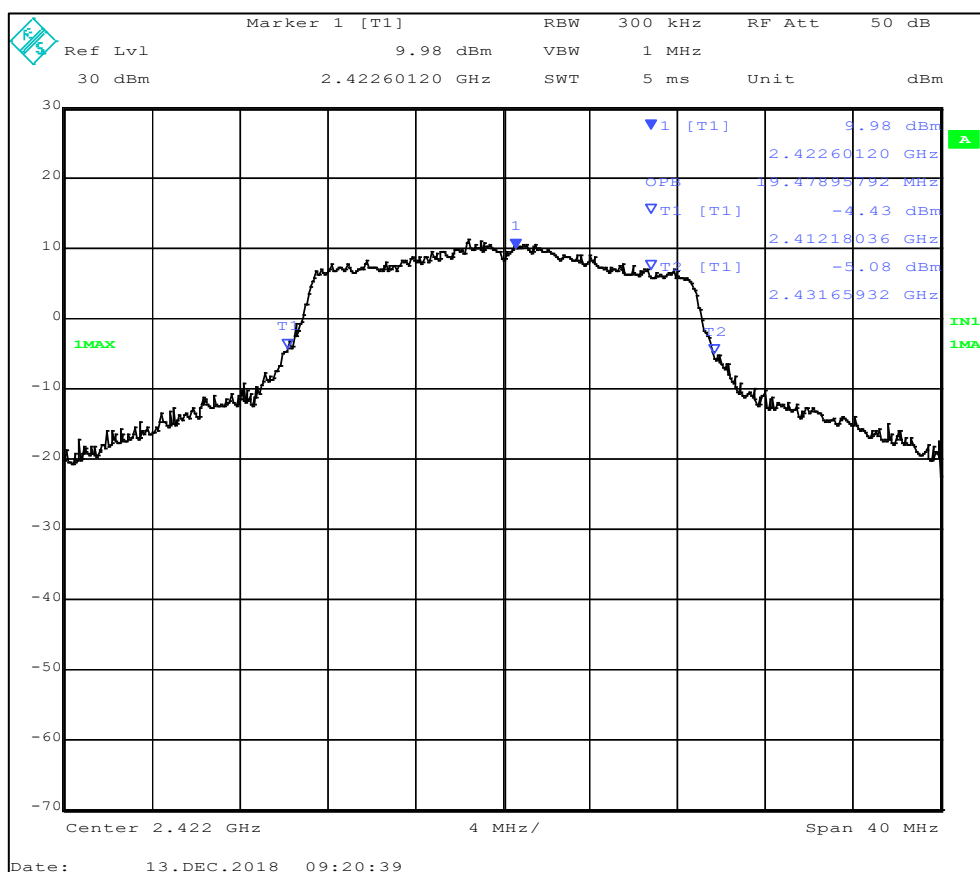


Figure 113. Occupied bandwidth 99% channel 3.

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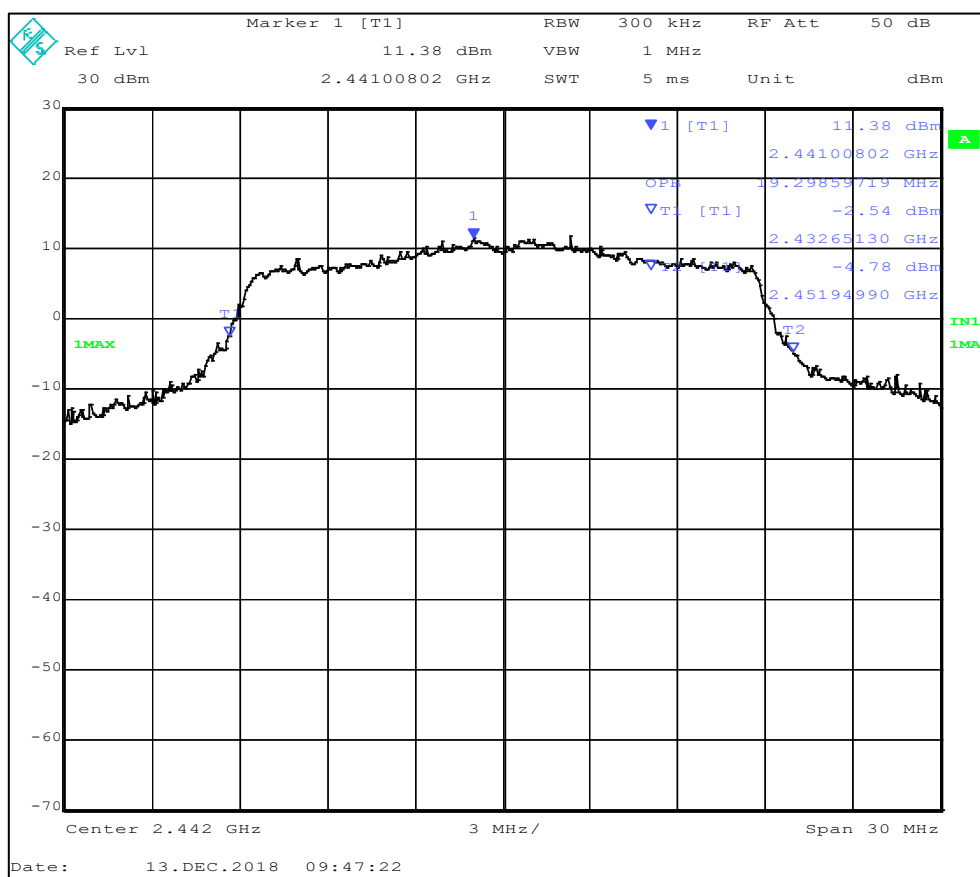


Figure 114. Occupied bandwidth 99% channel 7.

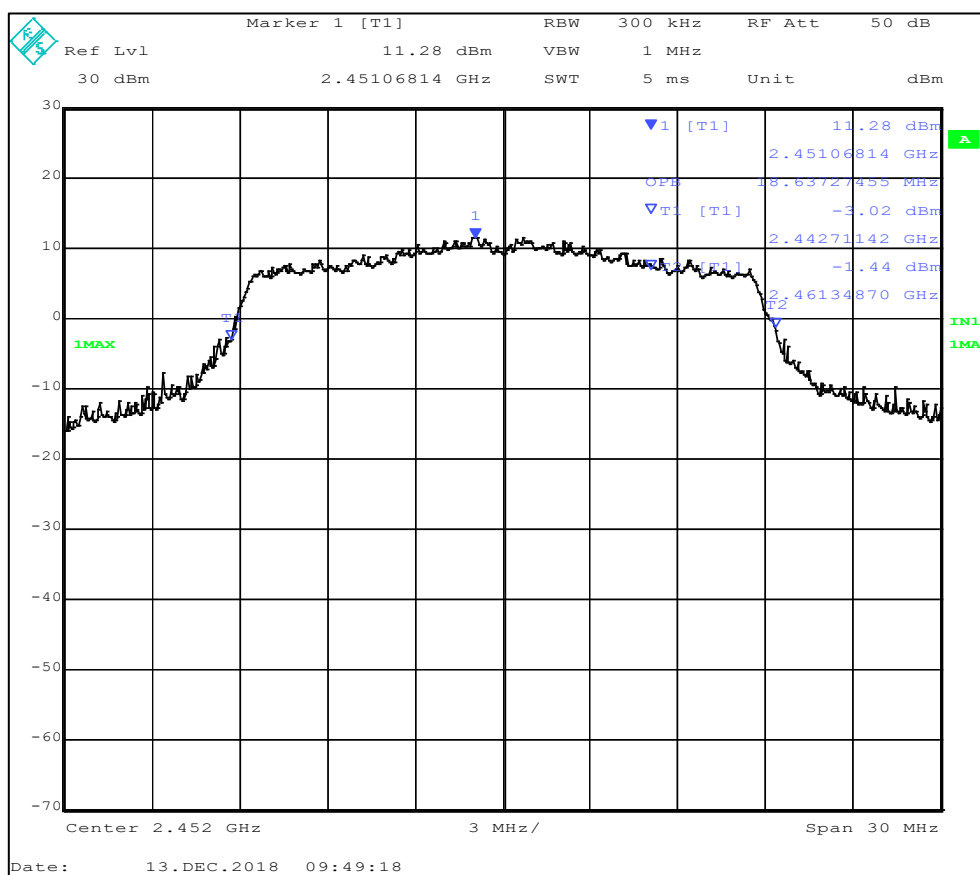


Figure 115. Occupied bandwidth 99% channel 9.

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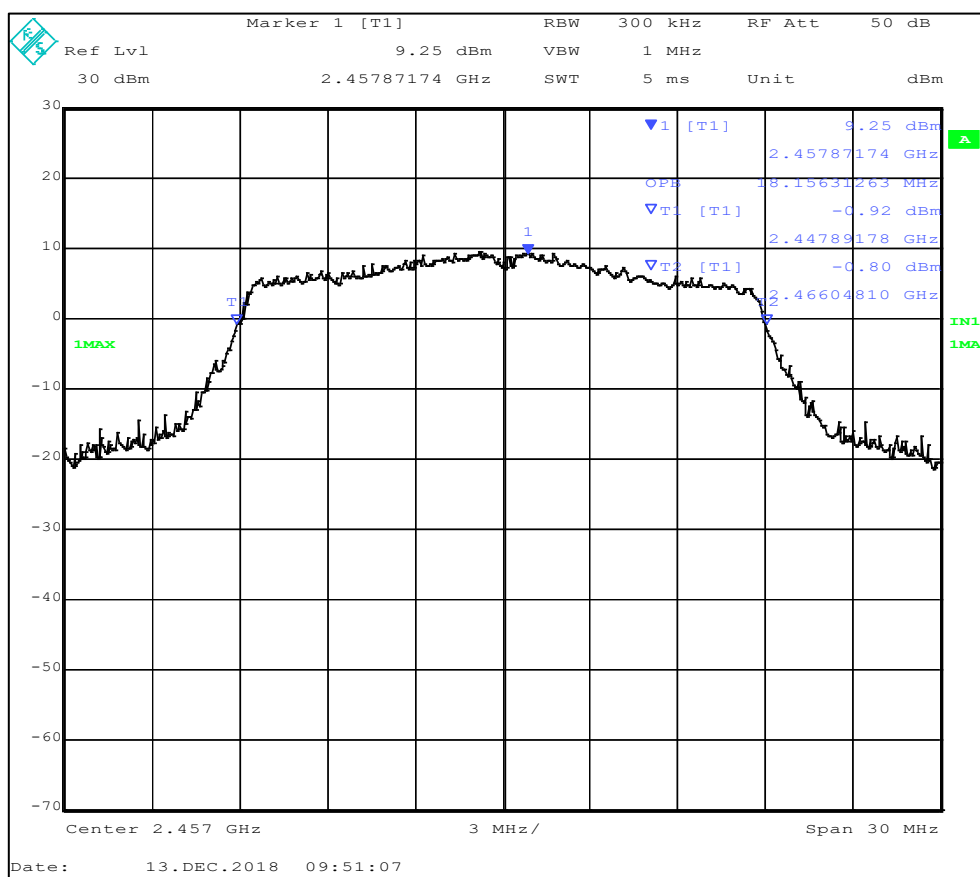


Figure 116. Occupied bandwidth 99% channel 10.

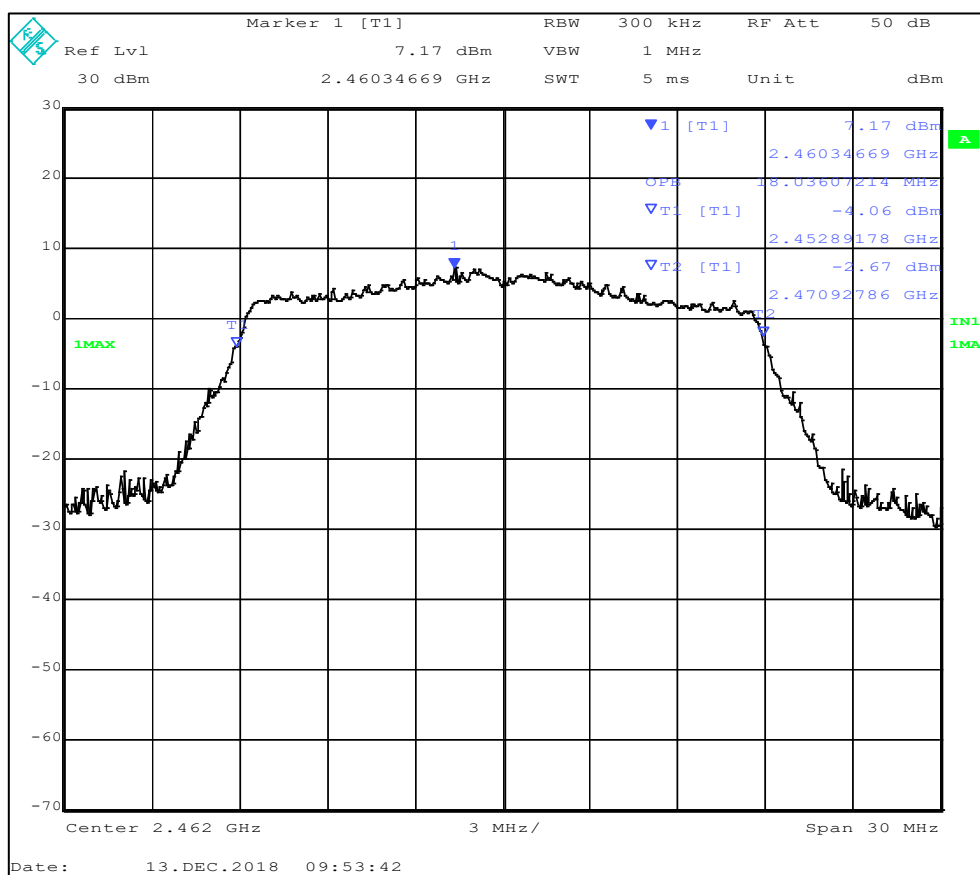


Figure 117. Occupied bandwidth 99% channel 11.

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Channel	Frequency [MHz]	Occupied bandwidth 99% [MHz]	Result
1	2412	18.1161	PASSED
2	2417	18.4369	PASSED
3	2422	19.4790	PASSED
7	2442	19.2986	PASSED
9	2452	18.6373	PASSED
10	2457	18.1563	PASSED
11	2462	18.0361	PASSED

Table 67. 99% Occupied bandwidth results.

2.9.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2019-09-24

Table 68. 99% Occupied bandwidth test equipment.

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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	4.59
	200 - 1000	Vertical	4.77
	1000 - 18000	Vertical	3.76
	18000 - 25000	Vertical	4.10
	30 - 200	Horizontal	4.57
	200 - 1000	Horizontal	4.86
	1000 - 18000	Horizontal	3.77
	18000 - 26500	Horizontal	4.11
Conducted emission (CISPR 16-4)	0.01 - 30	-	3.44
Conducted emission (ESIB 26)	<1000		2.58
	1000 - 7000		2.76
	7000 - 18000		3.38
	18000 - 26500		3.79