



Testing & Reliability Services

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REPORT

Accredited by DANAk under registration number 563 to testing.

TEST: Testing laboratory (DS/EN ISO/IEC 17025)

FCC Designation number: DK0002

ISED CAB identifier: DK0001

Date

2019-12-13

Reference

P19-0189-1

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Test Report

of

FCC ID: 2AQ2N-INT3520
ISED: 25683-INT3520

according to

FCC 47 CFR, Part 15 Subpart C
15.225 Operation within the band 13.110 – 14.010 MHz
and
ISED RSS-210 Annex B.6 Band 13.110 – 14.010 MHz

Performed by

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Senior EMC Engineer

Examined by

David Busk

Lab. Manager, M. Sc. EE.



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Report no.:	P19-0189-1	Report date:	2019-12-13
Test started:	2019-10-24	Test ended:	2019-11-25
Test laboratory:	EKTOS TRS A/S A. C. Meyers Vænge 15 2450 Copenhagen SV Denmark	Client:	Cryptera A/S Fabriksparken 20 2600 Glostrup Denmark
Contact person:	Søren Søltoft	Contact person:	Mark Bo Torstensen
Facility reg. no.	<p>FCC Designation number: DK0002 ISED CAB identifier: DK0001</p>		
Test specimen:	NFC Reader INT3520		
Test specification:	<p>FCC 47 CFR Part 15 Subpart C 15.225 Operation within the band 13.11 – 14.01 MHz. ISED RSS-210 Annex B.6 Band 13.110 – 14.010 MHz</p>		
	<p>The tests relevant for the test specimens are listed in <i>section 1.1</i>.</p>		
Documentation:	<p>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.</p>		
Test results:	<p>The test specimen complies with relevant parts of the test specifications. The test results relate only to the specimen tested.</p>		
Test personnel:	Søren Søltoft	David Busk	

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Appendix issued in separate report

1 Photos of test setups and equipment.

1 SUMMARY

See Appendix 1 for photos.

1.1 Test plan

Emission measurements as specified below have been performed.

Standard	Name of the test	Results
FCC 47 CFR Part 15C	15.225 Operation within the band 13.110 – 14.010 MHz	PASSED
RSS 210 Issue 9, Aug 2016 (Amendment)	B.6 Band 13.110 – 14.010 MHz	PASSED
15.225 (a) RSS 210 B.6 (a)	Field strength of fundamental emission	PASSED
15.225 (b), (c) RSS 210 B.6 (b), (c)	Field strength of in band emission	PASSED
15.225 (d) RSS 210 B.6 (d)	Emission outside frequency band	PASSED
15.225 (e) RSS 210 B.6	Frequency stability	PASSED
15.203 RSS-Gen 6.8	Antenna requirement	PASSED
15.207 (a) RSS-Gen 8.8	AC conducted emission	PASSED
15.215 (c) RSS-Gen 6.7	20 dB bandwidth	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.

1.2 Test Specimen

Manufacturer	Cryptera A/S
Product name	NFC reader
Model	INT3520
Serial no.	1542-93610303
Part no.	INT3520-2020
Firmware	HWT 413-0233 (master #14222 1f507f3, with EEPROM #7)
Hardware	-
Supply voltage	USB 2.0 Spec: 4.5V – 5.5V

Carrier frequency	13.56 MHz
Antenna	Integrated
Antenna size	59.9mm x 52.30mm
Transmission speed	106kBaud
Spectrum	wideband RFID (incl. NFC application)
Test duty cycle	100%
RF protocol: ISO14443-A	Reader side modulation:100 % ASK Bit encoding: modified Miller encoding Transfer speed: 106kbit/sec
RF protocol: ISO14443-B	Reader side modulation:10 % ASK Bit encoding: NRZ Transfer speed: 106kbit/sec

Table 1. Information about radio module.

During test a special firmware enabling the control of radio parameters was used.

Initial measurements with a measurement coil showed that the field strength of the fundamental was not influenced by changing the amplitude modulation from 10% to 100%. The Occupied bandwidth and the field strength in band was significantly higher.

Therefore, the measurements were performed at 100% AM.

See photo in appendix 1.

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1.1 Auxiliary Equipment

1.1.1 Laptop

Manufacturer	Dell
Model	Latitude E7250
Serial no.	34040064926
Software	“Tera Term” used for serial communication over USB
Details	-
Supply voltage	19.5 VDC from AC/DC power supply

1.1.2 AC/DC adaptor for Laptop

Manufacturer	Dell
Model	PA-1650-05D
Serial no.	05U092 - 71615 - 43F - 0F92 REV A02
Details	-
Supply voltage	AC 100 – 240 V 1.5A (120 VAC used during tests)
Output voltage	DC 19.5 V / 3.34 A

1.2 I/O port at test specimen

I/O Port	Type	Shielding	Cable length
Supply and communication	Mini USB	Shielded	< 3m

2 TESTS

2.1 Field strength of fundamental emission

Test specimen	INT3520
Test specification	47 CFR 15.225 (a) RSS 210 B.6 (a)
Test method	ANSI C63.10:2013 sec. 6.4
Modulation	100% AM
Comments	None
Temperature / Humidity	10°C / 58%RH
Dates of measurements	2019-10-30
Test personnel	David Busk, Søren Søltoft

2.1.1 Test setup

The test specimen was placed 0.8 m above ground at an open area test site without ground plan. The measurements were performed at a distance of 30 m. The test specimen was rotated for maximal level.

See photo of test set up in appendix 1.

2.1.2 Test result

Field strength in the band 13.553 to 13.567 MHz shall not exceed 15848 microvolt / meter at 30m. The level is converted to dB μ V/m.

Frequency [MHz]	QP [dB μ V/m]	BW [kHz]	Corr. Fac. [dB]	Ant Pol.	F.S. [dB μ V/m]	Margin [dB]	Limit [dB μ V/m]	Result
13.5609	17.5	9.000	18.64	V	36.14	47.86	84.00	PASSED
13.5609	28.4	9.000	18.64	V-90	47.04	36.96	84.00	PASSED

Table 2. Field strength of fundamental emissions test results.

2.1.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Antenna Magnetic Loop 9 kHz - 30 MHz	Rohde & Schwarz	HFH2-Z2	19966	2022-02-25
Receiver EMI Test 9KHz-2750MHz	Rohde & Schwarz	ESCS30	30114993	2020-07-09

Table 3. Radiated emission test equipment.

2.2 Field strength of in band emission

Test specimen	INT3520
Test specification	47 CFR 15.225 (a), (b), (c) RSS 210 B.6 (a), (b), (c)
Test method	ANSI C63.10:2013 sec. 6.4
Modulation	100% AM
Comments	None
Temperature / Humidity	22°C / 50%RH
Dates of measurements	2019-10-24
Test personnel	Søren Søltoft

2.2.1 Test setup

Due to high ambient noise level at open area test site the measurements were performed in a semi anechoic chamber.

Pretest measurements showed the 100% AM modulation mode to be the one with the highest radiation level.

The test specimen was placed in vertical position 0.8 m above ground, and rotated 0 to 360 deg. during measurement. The measurement distance was 3 meters and the antenna height was 1 meter. The measurement was performed with the antenna in parallel (V), perpendicular (V-90) and ground-parallel (H) orientations.

See photo of test set up in appendix 1.

The limits below 30 MHz was recalculated to a 3 m. distance, using the method described in ANSI C63.10-2013 clause 6.4.4.2 Extrapolation from the measurement of a single point.

The largest test specimen, for which this applies, is 0.625 times the wavelength. The smallest wavelength is 10 m. at 30 MHz, which gives a maximal test specimen size of 6.25 meters.

Frequency range	$d_{\text{nearfield}}$ [m]	d_{limit} [m]	d_{measure} [m]	Recalculation formula
9 kHz to 159 kHz	>300	300	3	$-40 \log(d_{\text{limit}} / d_{\text{measure}})$
159 kHz to 490 kHz	97.49 to 300	300	3	$-40 \log(d_{\text{near field}} / d_{\text{measure}}) - 20 \log(d_{\text{limit}} / d_{\text{near field}})$
490 kHz to 1.592 MHz	30 to 97.49	30	3	$-40 \log(d_{\text{limit}} / d_{\text{measure}})$
1.592 MHz to 15.923 MHz	3 to 30	30	3	$-40 \log(d_{\text{near field}} / d_{\text{measure}}) - 20 \log(d_{\text{limit}} / d_{\text{near field}})$
15.923 MHz to 30 MHz	< 3	30	3	$-20 \log(d_{\text{limit}} / d_{\text{measure}})$

2.2.2 Test result

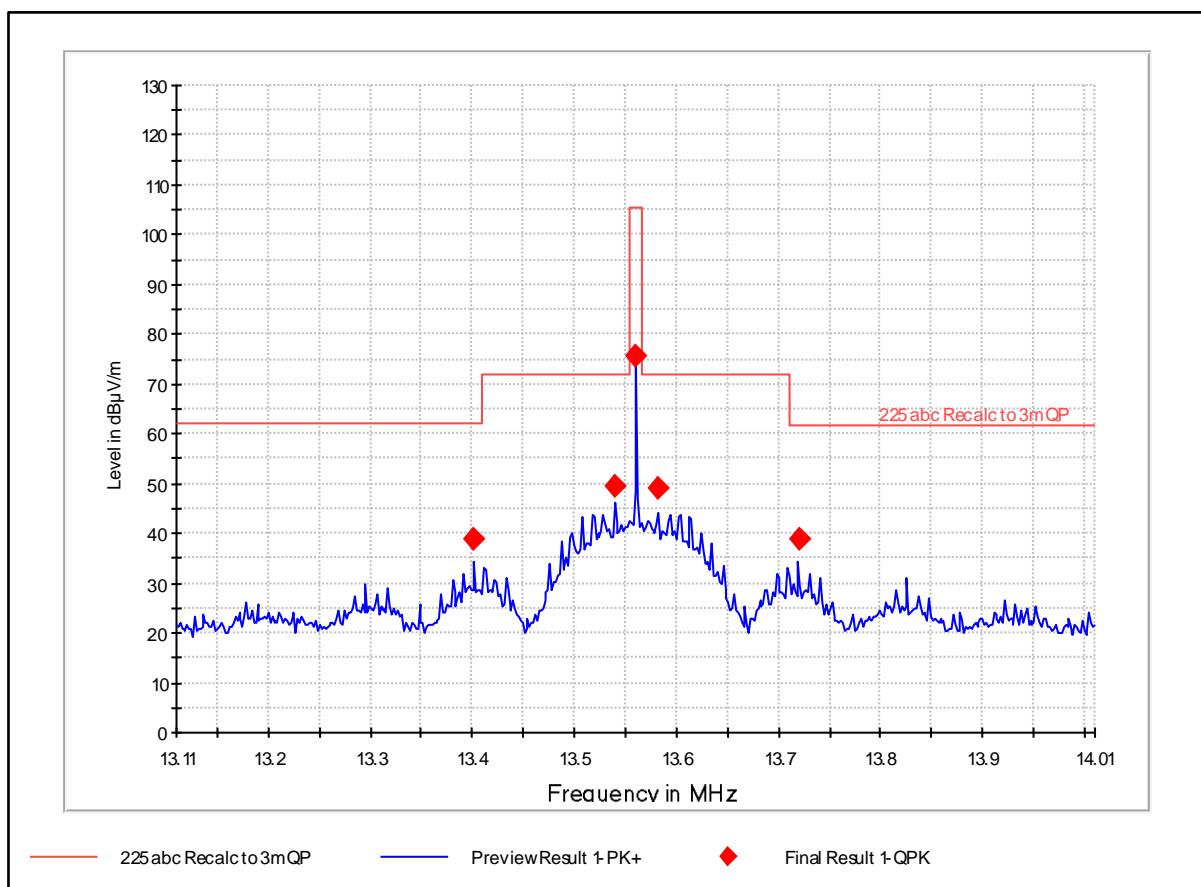


Figure 1. Field strength of fundamental emissions test results. EUT vertical. Ant. vertical.

The margin for the fundamental to the recalculated limit is less than the margin for measurement at 30 meters distance at an open areal test site.

Frequency [MHz]	QuasiPeak [dB μ V/m]	BW [kHz]	Ant. Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
13.401884	39.0	9.000	V	315.0	23.00	62.00	PASSED
13.539359	49.5	9.000	V	319.0	22.30	71.90	PASSED
13.560602	75.7	9.000	V	320.0	29.70	105.40	PASSED
13.581845	49.1	9.000	V	139.0	22.80	71.90	PASSED
13.719719	38.7	9.000	V	151.0	23.10	61.80	PASSED
13.401881	35.3	9.000	V-90	54.0	26.70	62.00	PASSED
13.507294	45.3	9.000	V-90	237.0	26.60	71.90	PASSED
13.560402	72.3	9.000	V-90	58.0	33.10	105.40	PASSED
13.612706	45.3	9.000	V-90	244.0	26.50	71.80	PASSED
13.718119	35.4	9.000	V-90	68.0	26.40	61.80	PASSED
13.401684	31.1	9.000	H	338.0	30.90	62.00	PASSED
13.508097	40.2	9.000	H	305.0	31.70	71.90	PASSED
13.560402	67.7	9.000	H	323.0	37.70	105.40	PASSED
13.612706	40.7	9.000	H	327.0	31.20	71.80	PASSED
13.718119	31.4	9.000	H	319.0	30.40	61.80	PASSED

Table 4. Field strength of fundamental emissions test results.

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2.2.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Antenna Magnetic Loop 9 kHz - 30 MHz	Rohde & Schwarz	HFH2-Z2	19966	2022-02-25
Analyzer 20 Hz-26.5 GHz	Rohde & Schwarz	ESI26	20763	2019-12-10

Table 5. Radiated emission test equipment.

2.3 Emission outside the 13.110-14.010 MHz band

Test specimen	INT3520
Test specification	47 CFR 15.225 (d) RSS 210 B.6 (d)
Test method	ANSI C63.10:2013 sec 6.4
Frequency range	9 kHz to 30 MHz
Limits	FCC 47 CFR Part 15.209 (a)
Modulation	100% AM
Comments	None
Temperature / Humidity	22°C / 50%RH
Dates of measurements	2019-10-24
Test personnel	Søren Søltoft

2.3.1 Test setup Emission below 30 MHz

Due to high ambient noise level at open area test site the measurements were performed in a semi anechoic chamber.

The test specimen was placed in vertical position 0.8 m above ground, and rotated 0 to 360 deg. during measurement. The measurement distance was 3 meters and the antenna height was 1 meter. The measurement was performed with the antenna in parallel (V), perpendicular (V-90) and ground-parallel (H) orientations.

See photo of test set up in appendix 1.

The limits below 30 MHz was recalculated to a 3 m. distance, using the method described in ANSI C63.10-2013 clause 6.4.4.2 Extrapolation from the measurement of a single point.

The largest test specimen, for which this applies, is 0.625 times the wavelength. The smallest wavelength is 10 m. at 30 MHz, which gives a maximal test specimen size of 6.25 meters.

Frequency range	$d_{nearfield}$ [m]	d_{limit} [m]	$d_{measure}$ [m]	Recalculation formula
9 kHz to 159 kHz	>300	300	3	$-40 \log(d_{limit} / d_{measure})$
159 kHz to 490 kHz	97.49 to 300	300	3	$-40 \log(d_{near field} / d_{measure}) - 20 \log(d_{limit} / d_{near field})$
490 kHz to 1.592 MHz	30 to 97.49	30	3	$-40 \log(d_{limit} / d_{measure})$
1.592 MHz to 15.923 MHz	3 to 30	30	3	$-40 \log(d_{near field} / d_{measure}) - 20 \log(d_{limit} / d_{near field})$
15.923 MHz to 30 MHz	< 3	30	3	$-20 \log(d_{limit} / d_{measure})$

2.3.2 Test results Emission below 30 MHz

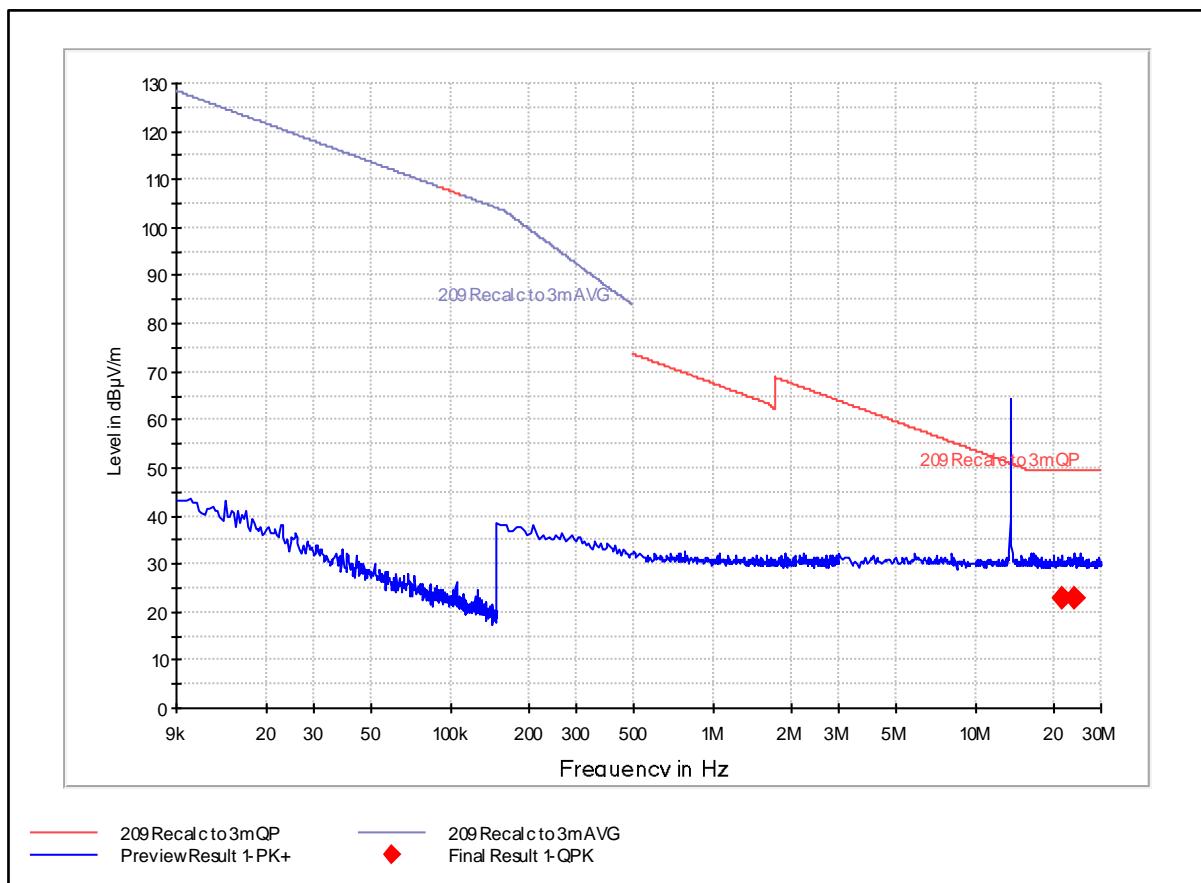


Figure 2. Emission outside the frequency band, below 30 MHz.

Frequency [MHz]	QP [dB μ V/m]	BW [kHz]	Height [cm]	Ant. Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
21.292077	23.1	9.000	100.0	V	282.0	26.50	49.50	PASSED
23.670839	22.8	9.000	100.0	V	152.0	26.70	49.50	PASSED

Table 6. Emission outside the frequency band test results, below 30 MHz.

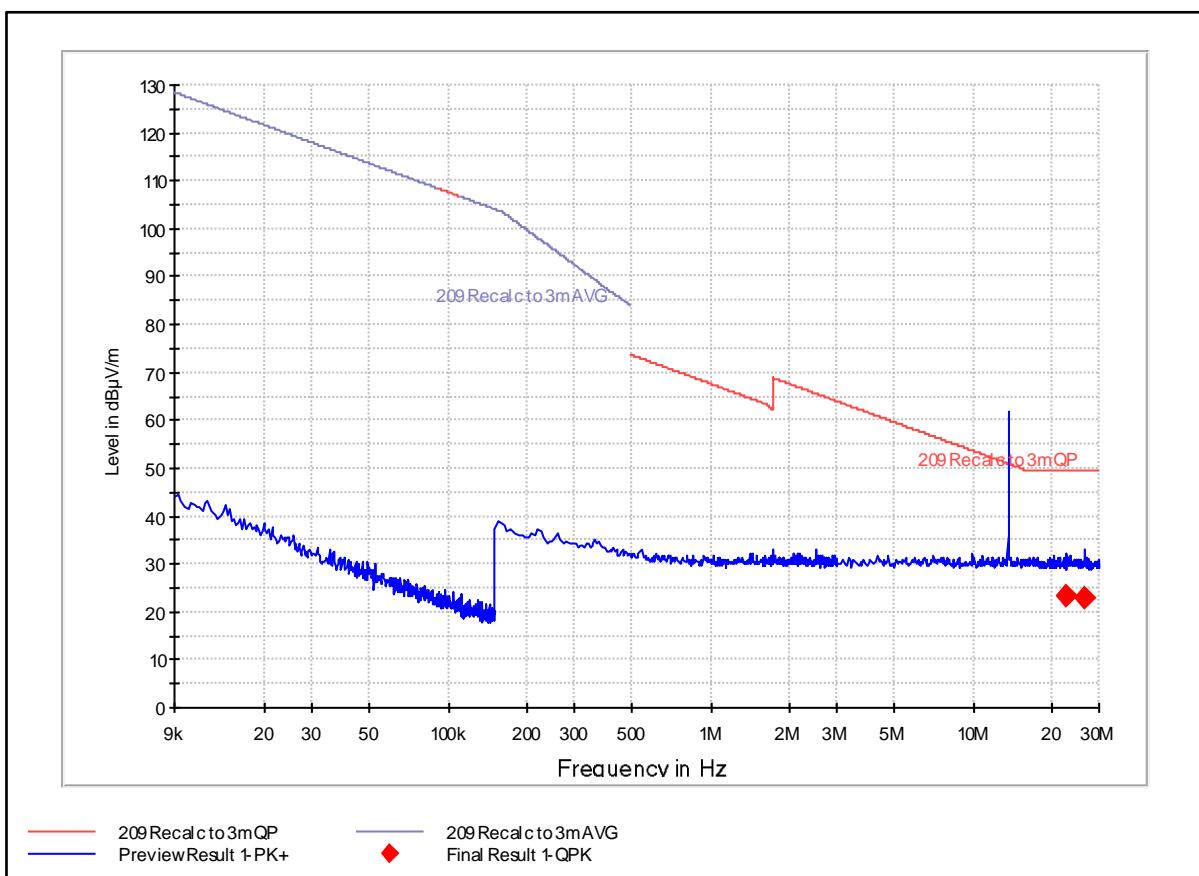


Figure 3. Emission outside the frequency band, below 30 MHz.

Frequency [MHz]	QP [dB μ V/m]	BW [kHz]	Height [cm]	Ant. Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
22.537566	23.08	9.000	100.0	V-90	121.0	26.50	49.50	PASSED
26.541574	23.03	9.000	100.0	V-90	51.0	26.50	49.50	PASSED

Table 7. Emission outside the frequency band test results, below 30 MHz.

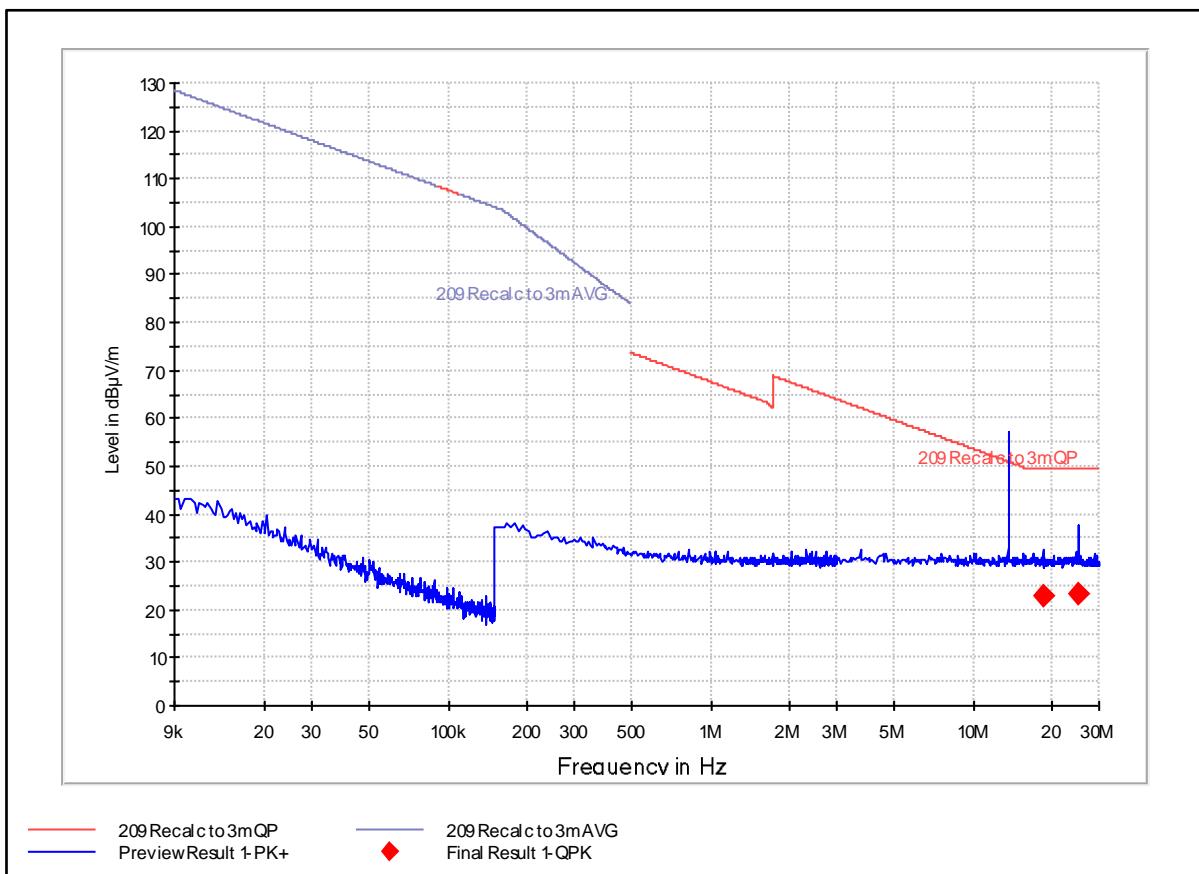


Figure 4. Emission outside the frequency band, below 30 MHz.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
18.312125	22.9	9.000	100.0	H	4.0	26.60	49.50	PASSED
25.074652	23.2	9.000	100.0	H	173.0	26.30	49.50	PASSED

Table 8. Emission outside the frequency band test results, below 30 MHz.

2.3.3 Test setup Emission 30 MHz to 1 GHz

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

The measuring distance was 3 m.

The test specimen was placed in vertical and horizontal position 0.8 m above ground, and rotated 0 to 360 deg. during measurement.

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, with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.

If the emission is close to 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 a quasi-peak detector.

See appendix 1 for photo of test set up

2.3.4 Test result Emission 30 MHz to 1 GHz

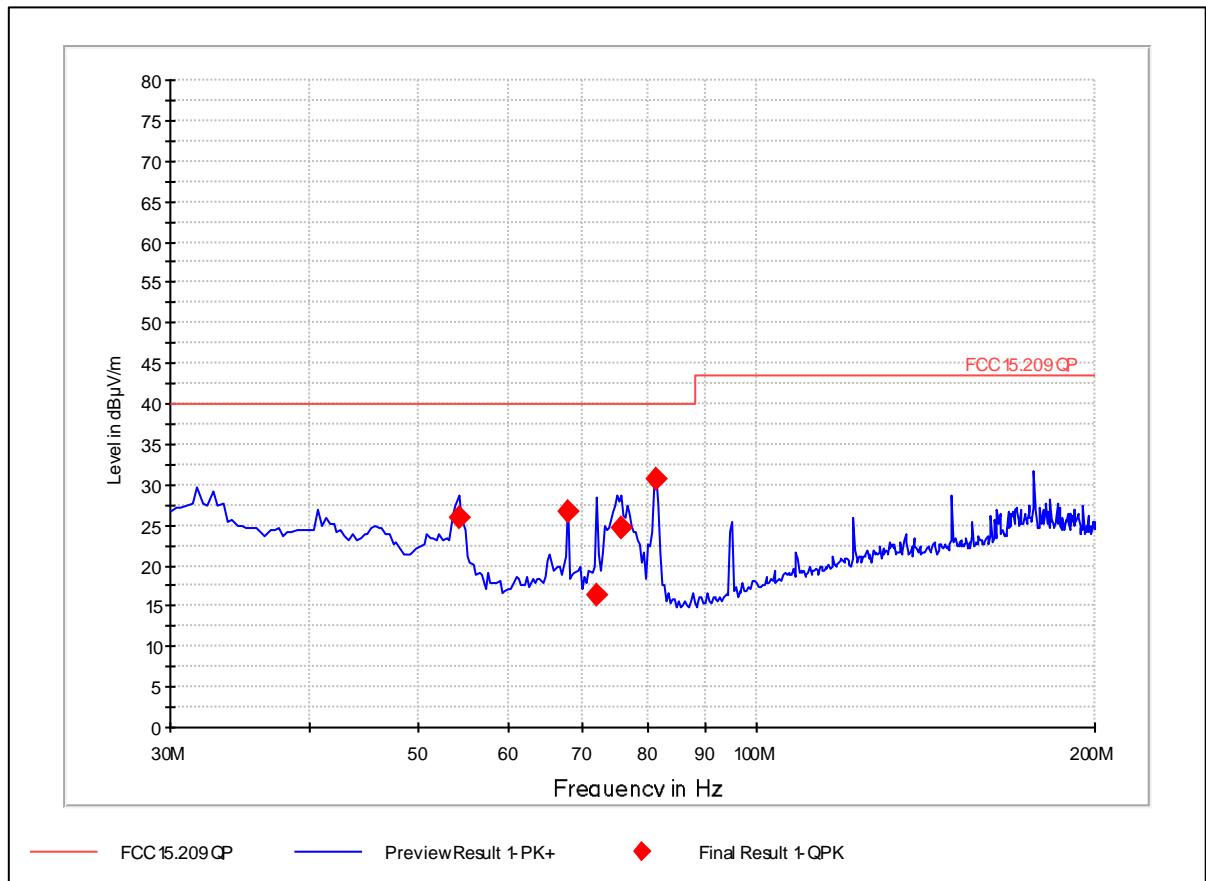


Figure 5. Emission outside the frequency band, 30 -200 MHz. EUT vertical.

Frequency [MHz]	QP [dBμV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBμV/m]	Result
54.208377	26.0	120	100	V	278.0	14.0	40.0	PASSED
67.805631	26.6	120	188	V	74.0	13.4	40.0	PASSED
71.963808	16.3	120	100	V	255.0	23.7	40.0	PASSED
75.619940	24.7	120	100	V	270.0	15.3	40.0	PASSED
81.352886	30.6	120	224	H	185.0	9.4	40.0	PASSED

Table 9. Emission outside frequency band test results. 30 - 200 MHz. EUT vertical.

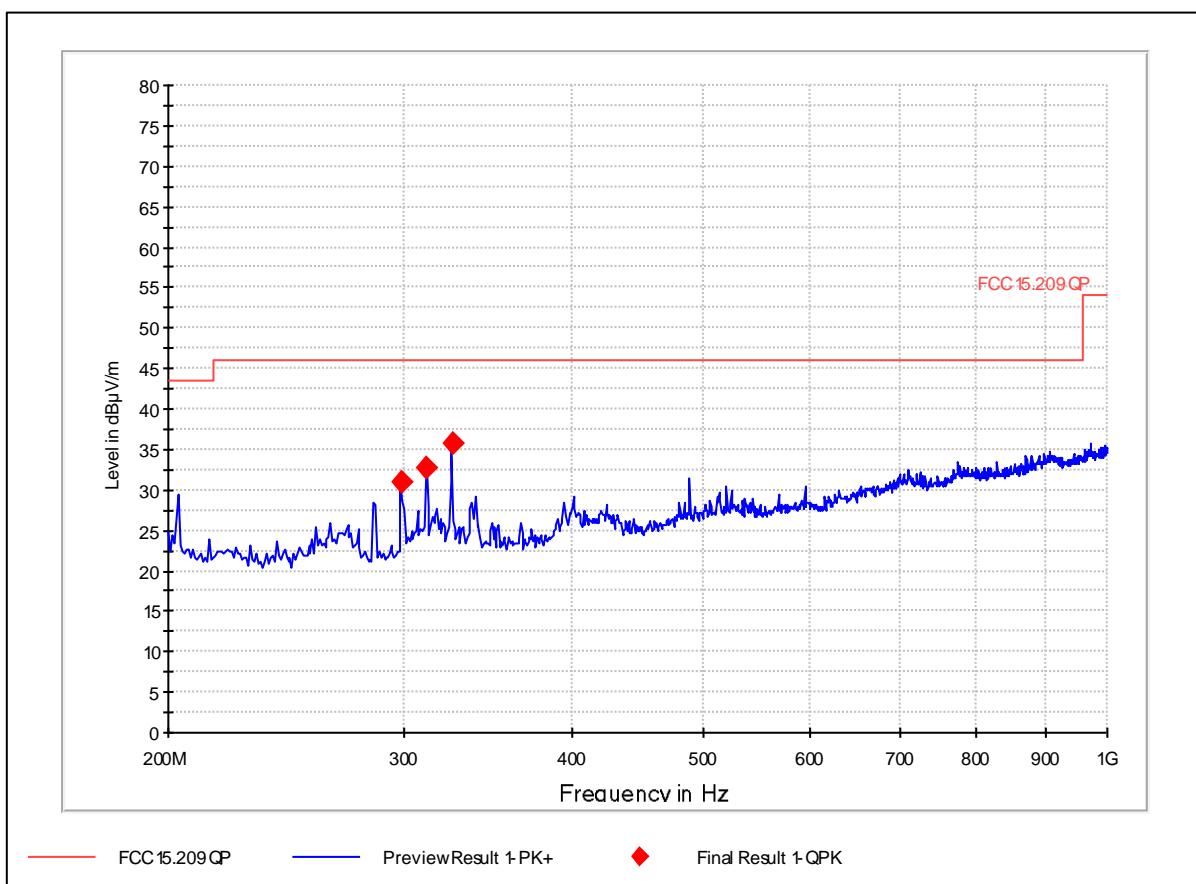


Figure 6. Emission outside frequency band 200 - 1000 MHz. EUT vertical.

Frequency [MHz]	QP [dBµV/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dBµV/m]	Result
298.345591	31.0	120	100	H	169.0	15.0	46.0	PASSED
311.912846	32.7	120	100	H	171.0	13.3	46.0	PASSED
325.430100	35.7	120	100	H	179.0	10.3	46.0	PASSED

Table 10. Emission outside frequency band test results. 200 - 1000 MHz. EUT vertical.

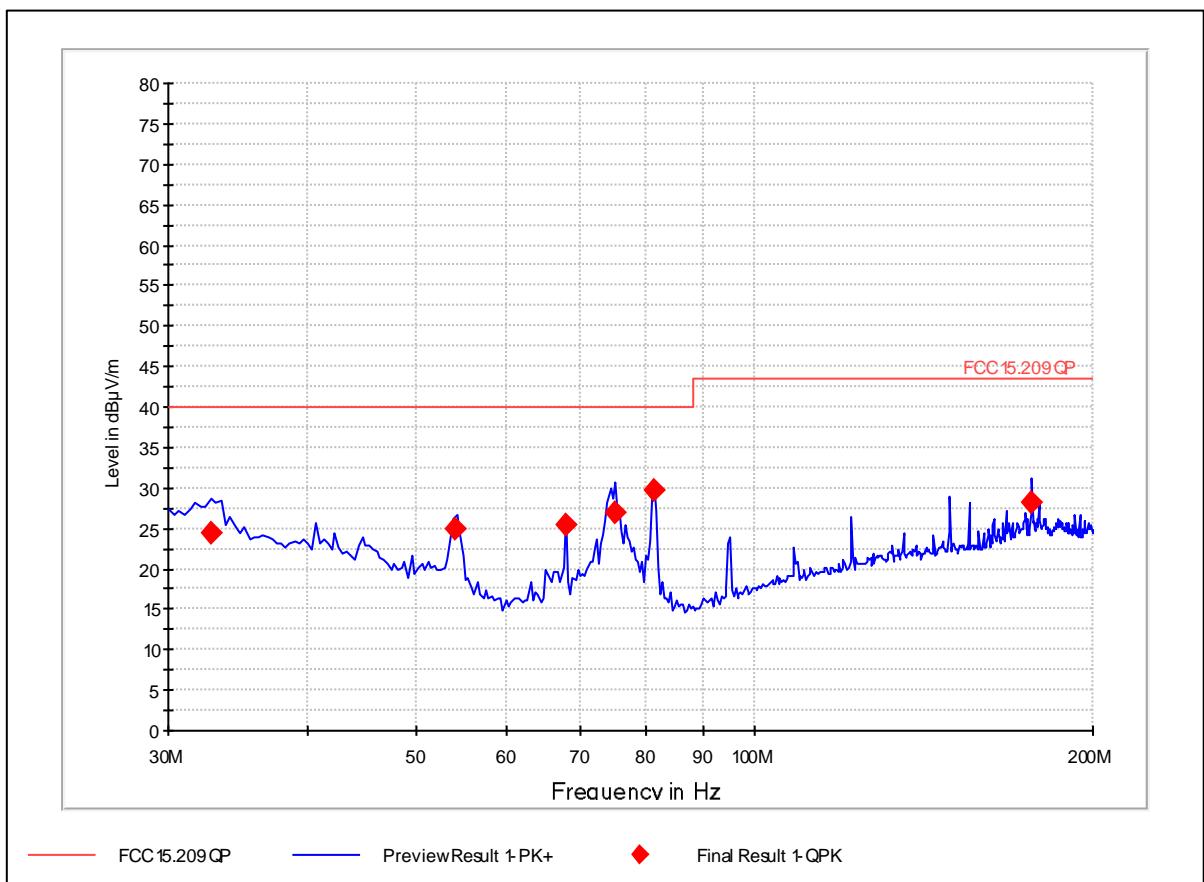
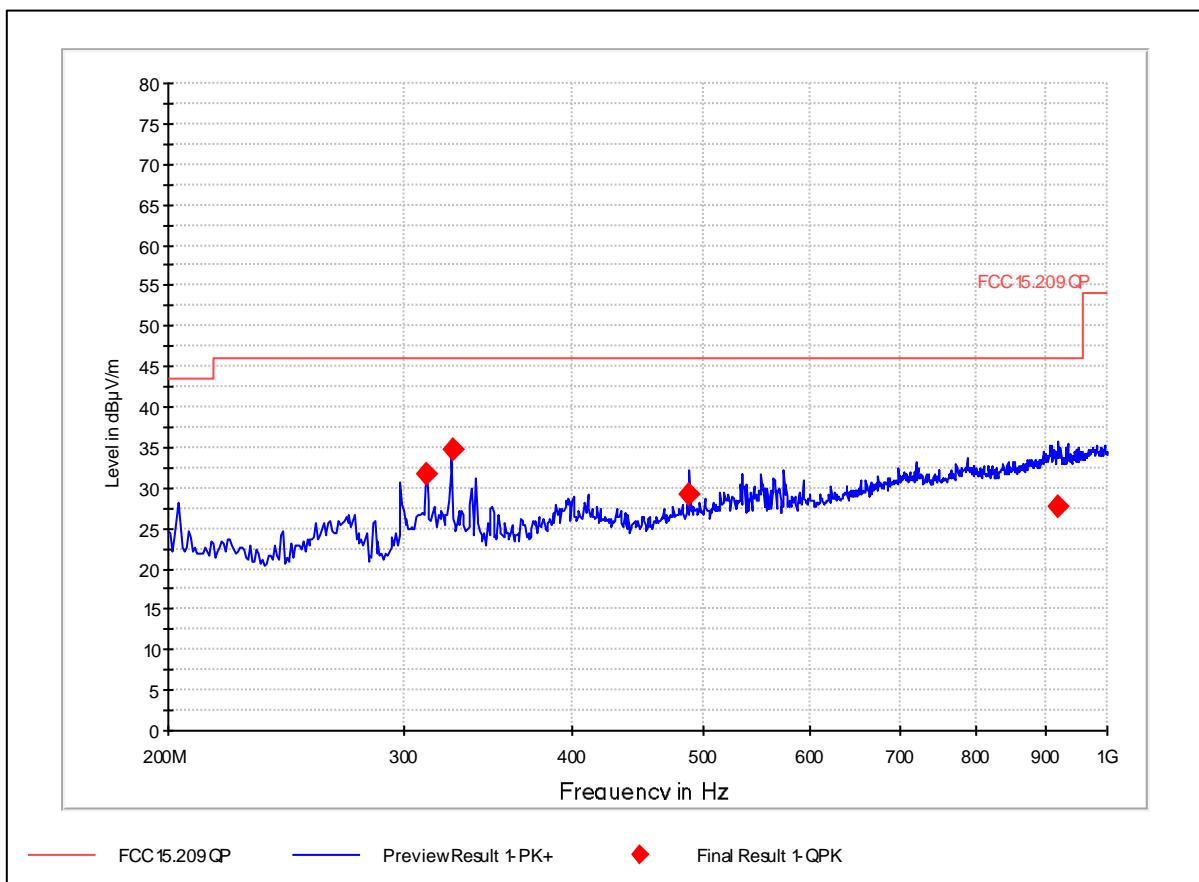


Figure 7. Emission outside frequency band 30 -200 MHz. EUT horizontal.

Frequency [MHz]	QP [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
32.785451	24.5	120.0	100.0	V	257.0	15.5	40.0	PASSED
54.138377	25.0	120.0	100.0	V	253.0	15.0	40.0	PASSED
67.795631	25.4	120.0	100.0	V	224.0	14.6	40.0	PASSED
74.999940	26.9	120.0	100.0	V	261.0	13.1	40.0	PASSED
81.362886	29.6	120.0	209.0	H	181.0	10.4	40.0	PASSED
176.252986	28.1	120.0	100.0	V	126.0	15.4	43.5	PASSED

Table 11. Emission outside frequency band test results. 30 - 200 MHz. EUT horizontal.


Figure 8. Emission outside frequency band 200-1000 MHz. EUT horizontal.

Frequency [MHz]	QP [dB μ V/m]	BW [kHz]	Height [cm]	Pol.	Azimuth [deg]	Margin [dB]	Limit [dB μ V/m]	Result
311.912846	31.8	120.0	100.0	H	61.0	14.2	46.0	PASSED
325.460100	34.8	120.0	100.0	H	155.0	11.2	46.0	PASSED
488.197154	29.3	120.0	119.0	V	8.0	16.7	46.0	PASSED
918.068076	27.6	120.0	337.0	V	122.0	18.4	46.0	PASSED

Table 12. Emission outside frequency band test results. 200 - 1000 MHz. EUT horizontal.

2.3.5 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Antenna Magnetic Loop 9 kHz - 30 MHz	Rohde & Schwarz	HFH2-Z2	19966	2022-02-25
Antenna Biconical 25-300MHz	Schwarzbeck	VHA9103 + BBA9106	13835	2022-02-28
Antenna Log Per 0.2 - 1 GHz	ETS-LINDGREN	3148	50023	2022-05-02
Amplifier 30 MHz – 3 GHz	Miteq	AFS3-00100400-18-ULN	50084	-
Analyzer 20 Hz-26.5 GHz	Rohde & Schwarz	ESI26	20763	2019-12-10

Table 13. Radiated emission test equipment.

2.4 Frequency stability

Test specimen	INT3520
Test specification	47 CFR 15.225 (e) RSS 210 B.6
Test method	ANSI C63.10:2013 sec. 6.8
Frequency range	13.110 - 14.010 MHz
Limits	47 CFR 15.225 (e) RSS 210 B.6
Comments	None
Temperature / Humidity	23°C / 35%RH, 23°C / 32%RH, 22°C / 37%RH
Dates of measurements	2019-11-13, 2019-11-14, 2019-11-18
Test personnel	Søren Søltoft

2.4.1 Test setup

The test specimen was placed in a shielded climatic chamber together with a loop antenna in a fixed position. The antenna was connected to a spectrum analyzer via a feedthrough in the chamber wall.

The frequency count function on the spectrum analyzer was used to improve accuracy.

The test specimen was configured to unmodulated carrier.

The test specimen was powered by a DC power supply and connected to a terminal program on a laptop during temperature and voltage variation.

The temperature variation was performed between 50°C and -20°C

The supply voltage variation between 85% and 115% of 5 VDC.

Client states that the test specimen is intended to be supplied by USB, with a variation of 4.5 VDC to 5.5 VDC. The behavior outside the specified range was also detected.

See appendix 1 for photo of test set up

2.4.2 Test result

Temperature [°C]	Dev. at power on [%]	Dev. after 2 min. [%]	Dev. after 5 min. [%]	Dev. after 10 min. [%]	Limit [%]	Result
50	0.0000664	0.0000516	0.0000074	-0.0000442	0.01	PASSED
45	0.0000516	0.0000295	0.0000000	-0.0000221	0.01	PASSED
35	0.0000147	0.0000295	0.0000442	0.0000442	0.01	PASSED
25	-0.0000664	-0.0000221	-0.0000074	0.0000000	0.01	PASSED
15	-0.0001401	-0.0001106	-0.0000885	-0.0000737	0.01	PASSED
5	-0.0001917	-0.0001844	-0.0001844	-0.0001696	0.01	PASSED
-5	-0.0001327	-0.0001696	-0.0001917	-0.0002065	0.01	PASSED
-15	0.0000369	-0.0000516	-0.0001106	-0.0001401	0.01	PASSED
-20	0.0002434	0.0000369	-0.0000295	-0.0000664	0.01	PASSED

Table 14. Frequency deviation as function of temperature.

Voltage [VDC]	Frequency [MHz]	Peak level [dBuV]	Deviation			Limit [%]	Result		
			Frequency		Peak level [dBuV]				
			[MHz]	[%]					
5.00	13.560692	118.99	-	-	-	0.01	PASSED		
4.50	13.560692	118.99	0.00	0.00	0.00	0.01	PASSED		
5.50	13.560692	118.99	0.00	0.00	0.00	0.01	PASSED		
5.75	13.560690	118.85	0.000002	0.00001475	-0.14	0.01	PASSED		

Table 15. Frequency and level deviation as function of supply voltage.

At 4.27 VDC the test specimen turned off without any change to frequency and peak level.

2.4.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Multi Meter	Agilent	34401A	14885	2020-06-17
Climatic chamber	Vötsch	VT4002EMC	19625	2020-08-16
Analyzer 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2020-10-15

Table 16. Radiated emission test equipment.

2.5 Antenna requirement

Test specimen	INT3520
Test specification	47 CFR 15.203 RSS-Gen 6.8
Test method	None
Comments	None
Dates of measurements	2019-11-25
Test personnel	Søren Søltoft

2.5.1 Test result

The test specimen has an internal antenna, which is part of the top layer printed circuit board.

See appendix 1 for photo of internal view test specimen.

Requirement	Result
47 CFR 15.203	PASSED

Table 17. Antenna requirements test results.

2.6 AC Conducted emission

Test specimen	INT3520
Test specification	47 CFR 15.207 (a) 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	22°C / 44%RH
Dates of measurements	2019-11-12
Test personnel	Søren Søltoft

2.6.1 Test setup

Measurements were performed with the test specimen powered from a USB port on a laptop.

The test specimen was sending continuous with 100% AM.

The mains supply was 120 VAC.

See appendix 1 for photo of test set up

2.6.2 Test results

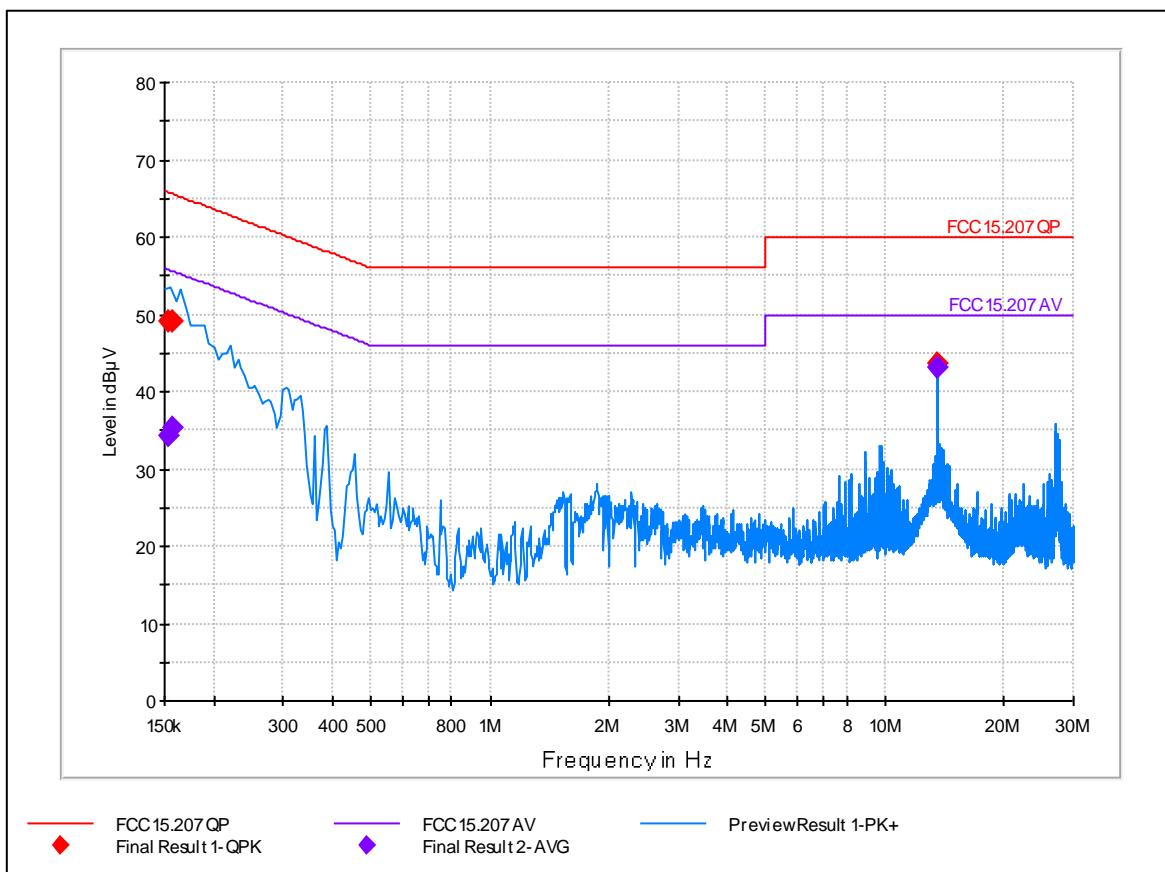


Figure 9. AC Conducted emission.

Frequency [MHz]	QuasiPeak [dBµV]	BW [kHz]	Line	Margin [dB]	Limit [dBµV]	Result
0.1530	49.0	9.0	L1	16.9	65.8	PASSED
0.1566	49.2	9.0	N	16.5	65.6	PASSED
13.5609	43.5	9.0	N	16.5	60.0	PASSED

Table 18. AC Conducted emission. QuasiPeak detector.

Frequency [MHz]	Average [dBµV]	BW [kHz]	Line	Margin [dB]	Limit [dBµV]	Result
0.1530	34.3	9.0	L1	21.5	55.8	PASSED
0.1566	35.4	9.0	N	20.2	55.6	PASSED
13.5609	43.0	9.0	N	7.0	50.0	PASSED

Table 19. AC Conducted emission. Average detector.

2.6.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
V-network Two Line	R&S	ESH3-Z5	20682	2020-02-25
Receiver EMI Test 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2020-10-15

Table 20. AC Conducted emission test equipment.

2.7 Occupied bandwidth

Test specimen	INT3520
Test specification	47 CFR 15.215 (c) RSS-Gen 6.7
Test method	ANSI C63.10:2013 sec. 6.9.2
Comments	None
Temperature / Humidity	22°C / 37%RH
Dates of measurements	2019-11-18
Test personnel	Søren Søltoft

2.7.1 Test setup

The test specimen was placed in a shielded climatic chamber together with a loop antenna in a fixed position. The antenna was connected to a spectrum analyzer via a feedthrough in the chamber wall.

See photo of test set up in appendix 1.

2.7.2 Test results

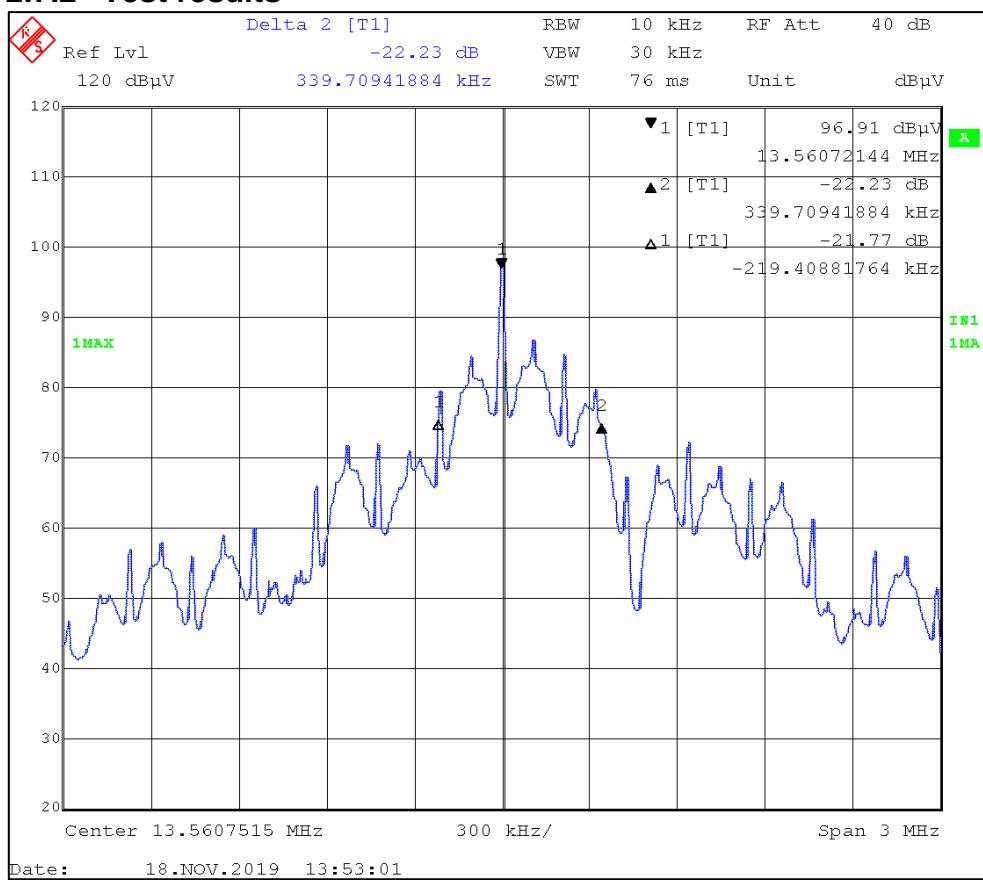


Figure 10. Occupied bandwidth 20 dB. 100% AM.

Highest frequency deviation detected during frequency stability test was +33 Hz and -28 Hz.

	-20 dB freq. [MHz]	Freq. Stab [MHz]	-20 dB w. Freq. Stab. [MHz]	Band limit [MHz]	Margin [MHz]	Result
High freq	13.900431	0.000033	13.900464	14.010	0.110	PASSED
Low freq	13.341313	-0.000028	13.341285	13.110	0.231	PASSED

Table 21. 20 dB Occupied bandwidth results.

2.7.3 Test equipment

Description	Supplier	Model	Tag no.	Cal. due date
Analyzer 20Hz-26.5GHz	Rohde & Schwarz	ESIB 26	18880	2020-10-15
Multi Meter	Agilent	34401A	14885	2020-06-17

Table 22. Occupied bandwidth test equipment.

3 MEASURING UNCERTAINTIES

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

	Frequency [MHz]	Polarization	Expanded Uncertainty (k=2)
Radiated emission (HFH2-Z2)	0.009 - 30		3.60 dB
Radiated emission (BiCon – LogPer)	30 - 200	Vertical	4.59 dB
	200 - 1000	Vertical	4.77 dB
	30 - 200	Horizontal	4.57 dB
	200 - 1000	Horizontal	4.86 dB
Conducted emission (CISPR 16-4)	0.009 - 30	-	3.44 dB
Conducted emission (ESIB 26)	<1000	-	2.58 dB
Frequency Error (ESIB)	13.56	-	0.39 ppm