

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C AND ISED CANADA REQUIREMENTS

Equipment Under Test:	Walk Through Metal Detector
Trade Mark:	Rapiscan, Metor
Model:	METOR 900M
Type:	MELS5317
Customer / Manufacturer:	Rapiscan Systems Oy Klovinpellontie 3 Torni 2 FI-02180 Espoo FINLAND
FCC Rule Part:	15.209: 2019 15.225: 2019
IC Rule Part:	RSS-210, Issue 9, 2016 RSS-GEN, Issue 5, Amendment 1, 2019

Date: 27 December 2019

Issued by:

A blue ink signature of Pekka Kälviäinen.

Pekka Kälviäinen
Testing Engineer

Date: 27 December 2019

Checked by:

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Rauno Repo
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Table of Contents

PRODUCT DESCRIPTION	3
Equipment Under Test (EUT)	3
Description of the EUT	3
Modifications incorporated in the EUT	3
Ratings and declarations	3
Power Supply	3
Mechanical Size of the EUT	3
Cables	3
Peripherals	4
GENERAL REMARKS.....	5
Disclaimer	5
TEST CONDITIONS.....	6
Summary of Testing	6
Block Diagram	6
EUT Test Conditions During Testing.....	6
TEST RESULTS.....	7
Antenna requirement.....	7
Conducted Emissions In The Frequency Range 150 kHz - 30 MHz.....	8
Radiated Emissions In The Frequency Range 9 kHz – 1 GHz	10
Operation within the band 13.110 – 14.010 MHz.....	15
Frequency Stability.....	18
20 dB Bandwidth	19
99% Power Bandwidth	20
TEST EQUIPMENT	21

Equipment Under Test (EUT)

Walk Through Metal Detector

Trade mark: Rapiscan, Metor
Model: METOR 900M
Type: MELS5317
Serial no: OME1924002

Classification of the device

Fixed device	<input checked="" type="checkbox"/>
Mobile Device (Human body distance > 20cm)	<input type="checkbox"/>
Portable Device (Human body distance < 20cm)	<input type="checkbox"/>

Description of the EUT

The EUT is a walk through metal detector (WTMD) designed to detect metal objects people are carrying with them. It consists of 13.56 MHz NFC unit.

Modifications incorporated in the EUT

One ferrite WE 742 711 11 added on USB cable of USB/ETH converter.

Ratings and declarations

Operating Frequency Range (OFR): 13.56 MHz
Channels: 1 transmit channel
Effective radiated or conducted power: -
Modulation: -
Antenna: Integral antenna

Power Supply

Rated voltage: 100 - 240 V 120 V 60 Hz was used during the test
Rated current: -
Rated frequency: 47 - 63 Hz
Rated power: 30 W

Mechanical Size of the EUT

Height: 225 cm Width: 85 cm Depth: 61 cm

Cables

Cable:	Length:	Type:
AC power input cable	2.0 m	unshielded, (L, N, PE)
ETH cable	3.0 m	shielded

Peripherals

Portable computer, type: HP ProBook 450 G3, s/n: 5CD6331CG2

Ethernet router, type ASUS RT-AC66U, s/n: G8IUGG00335

The peripherals units were located outside of the test area.

Disclaimer

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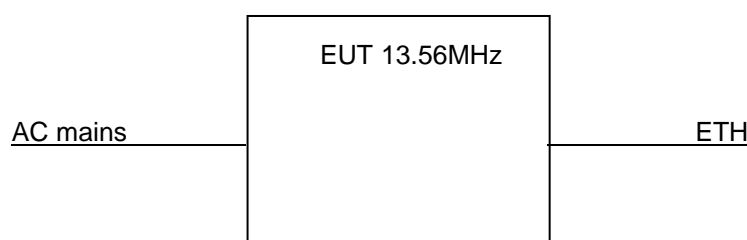
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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

Summary of Testing

Test Specification	Description of Test	Result
§15.203	Antenna requirement	PASS
§15.207(a), RSS-GEN	Conducted Emissions on Power Supply Lines	PASS
§15.209, RSS-210, RSS-GEN	Radiated Emissions 9 kHz to 1 GHz	PASS
§15.225, RSS-210	Operation within the band 13.110-14.010 MHz	PASS
§15.225, RSS-GEN	Frequency Stability	PASS
RSS-GEN	Occupied Bandwidth	PASS

Block Diagram



EUT Test Conditions During Testing

Configuration of the EUT was made to correspond to the actual assembling conditions as far as possible.

Table 1. Normal and extreme test conditions

Test conditions:		Temperature [°C]:	Voltage [V]:	Frequency [Hz]:
Normal		20 – 25	120 V	60
Extreme	Minimum	-20	102 V	
	Maximum	+50	138 V	

Test Facility

Testing Laboratory / address: FCC designation number: FI0002 ISSED CAB identifier: T004	SGS Fimko Ltd Takomotie 8 FI-00380, HELSINKI FINLAND
Test Site:	<input type="checkbox"/> K10LAB, ISSED Canada registration number: 8708A-1 <input checked="" type="checkbox"/> K5LAB, ISSED Canada registration number: 8708A-2 <input type="checkbox"/> T10LAB

TEST RESULTS

Antenna requirement

Standard: FCC Rule §15.203
Tested by: PKA
Date: 22 November 2019

FCC: 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Specification	Requirement (at least one of the following shall be applied)	Conclusion
§15.203	1. Permanently attached antenna 2. Unique coupling to the intentional radiator 3. Professionally installed radio. The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	PASS
Note	Option 1 is used	

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz.

Standard: ANSI C63.10 (2013)
Tested by: PKA
Date: 21 November 2019
Temperature: 23 °C
Humidity: 41 % RH
Barometric pressure: 1034 hPa
Measurement uncertainty: ± 2.9 dB Level of confidence 95 % (k = 2)

FCC: 15.207 (a), RSS 8.8

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with 4.5 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors.

During the test the EUT was powered from the separate power supply through the LISN.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Test results

120V 60Hz AC input. With tag

Full Spectrum

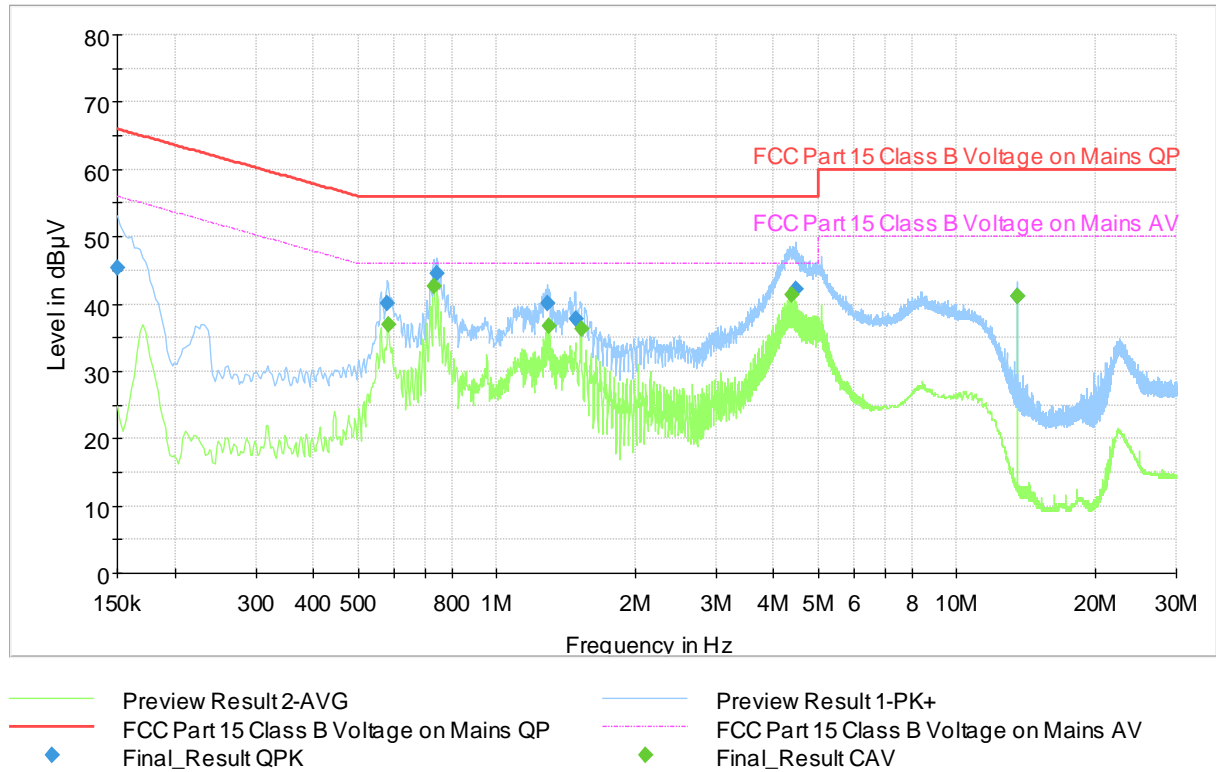


Figure 1: The measured curves with peak- and average detector

Final measurements from the worst frequencies

Table 2: Final QuasiPeak and Average measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	45.28	---	66.00	20.72	1000.0	9.000	N	ON	9.6
0.578750	40.20	---	56.00	15.80	1000.0	9.000	N	ON	9.7
0.581000	---	36.84	46.00	9.16	1000.0	9.000	N	ON	9.7
0.729500	---	42.65	46.00	3.35	1000.0	9.000	L1	ON	9.7
0.743000	44.60	---	56.00	11.40	1000.0	9.000	L1	ON	9.7
1.289250	40.02	---	56.00	15.98	1000.0	9.000	N	ON	9.8
1.302750	---	36.78	46.00	9.22	1000.0	9.000	N	ON	9.8
1.482750	37.77	---	56.00	18.23	1000.0	9.000	N	ON	9.8
1.525500	---	36.23	46.00	9.77	1000.0	9.000	N	ON	9.8
4.389750	---	41.28	46.00	4.72	1000.0	9.000	L1	ON	10.0
4.456500	42.22	---	56.00	13.78	1000.0	9.000	L1	ON	10.0
13.562500	---	41.14	50.00	8.86	1000.0	9.000	L1	ON	10.3
13.562500	41.18	---	60.00	18.82	1000.0	9.000	L1	ON	10.3

The correction factor in the final result table contains the sum of the transducers.

The result value is the measured value corrected with the correction factor.

Radiated Emissions In The Frequency Range 9 kHz – 1 GHz

Standard: ANSI C63.10
Tested by: PKA
Date: 20 and 21 November 2019
Temperature: 23 °C
Humidity: 41 - 43 % RH
Barometric pressure: 1034 hPa

Measurement uncertainty: ± 4.5 dB

Level of confidence 95 % (k = 2)

FCC: 15.209, ISED: RSS-210 B.6, RSS-GEN 8.9

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

According to ANSI C63.10 (clause 5.3.2) and RSS-Gen (Clause 4.11) the measurements below 30 MHz can be performed at a closer distance than the EUT limit distance, the results shall be extrapolated to limit distance by using the square of an inverse linear distance extrapolation factor (40 dB/ decade). This method was used when performing measurements at a distance of 3 m instead of limit distances 300 m or 30 m.

The correction factor in the final result table contains the sum of the transducers (antenna + cables + distance). The result value is the measured value corrected with the correction factor.

Test results

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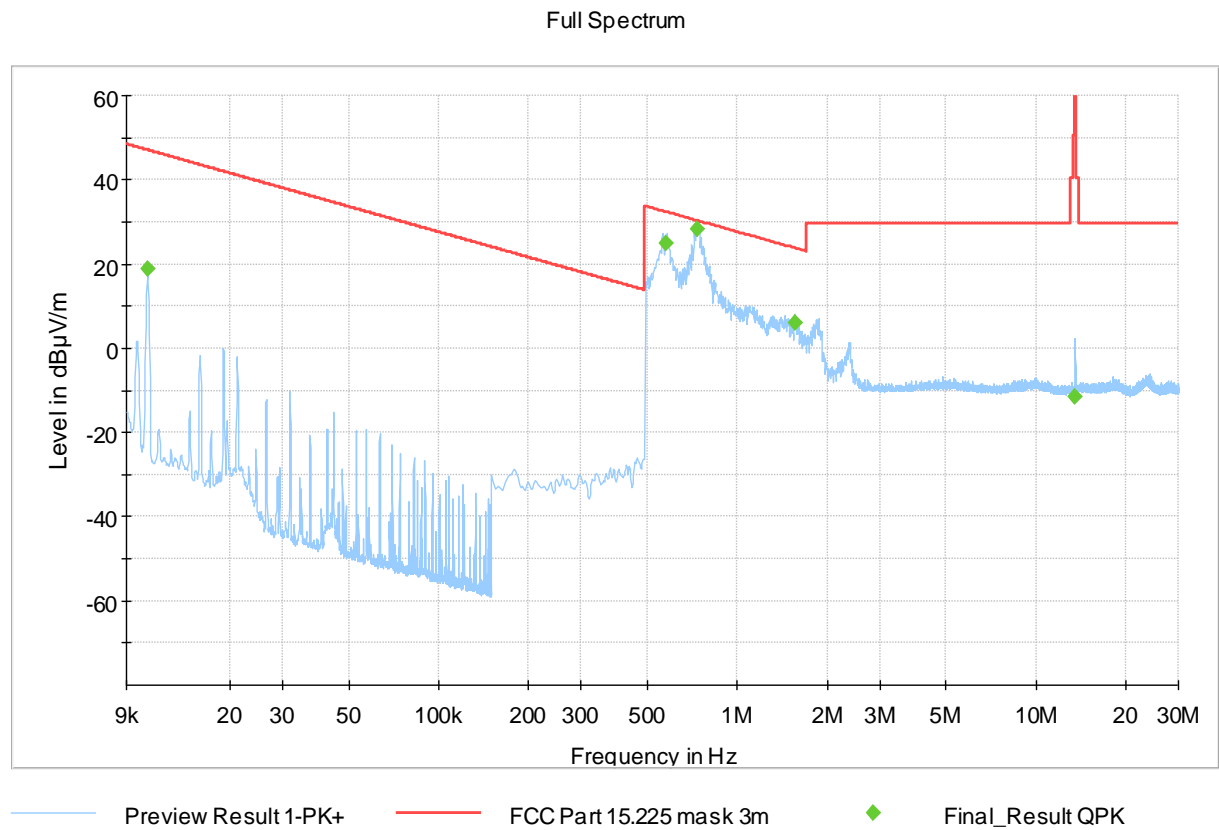


Figure 2. TX Radiated emission 9 kHz to 30MHz

Final measurements from the worst frequencies

Table 3. The final results with quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.010590	18.83	47.09	28.26	1000.0	0.200	190.0	V	162.0	-60.1
0.578750	24.97	32.36	7.39	1000.0	9.000	190.0	V	267.0	-20.5
0.731000	28.40	30.34	1.94	1000.0	9.000	190.0	V	266.0	-20.5
1.557000	5.94	23.79	17.85	1000.0	9.000	190.0	V	268.0	-20.5
13.557250	-11.60	84.00	95.60	1000.0	9.000	190.0	V	276.0	-20.5

The correction factor in the final result table contains the sum of the transducers.

The result value is the measured value corrected with the correction factor.

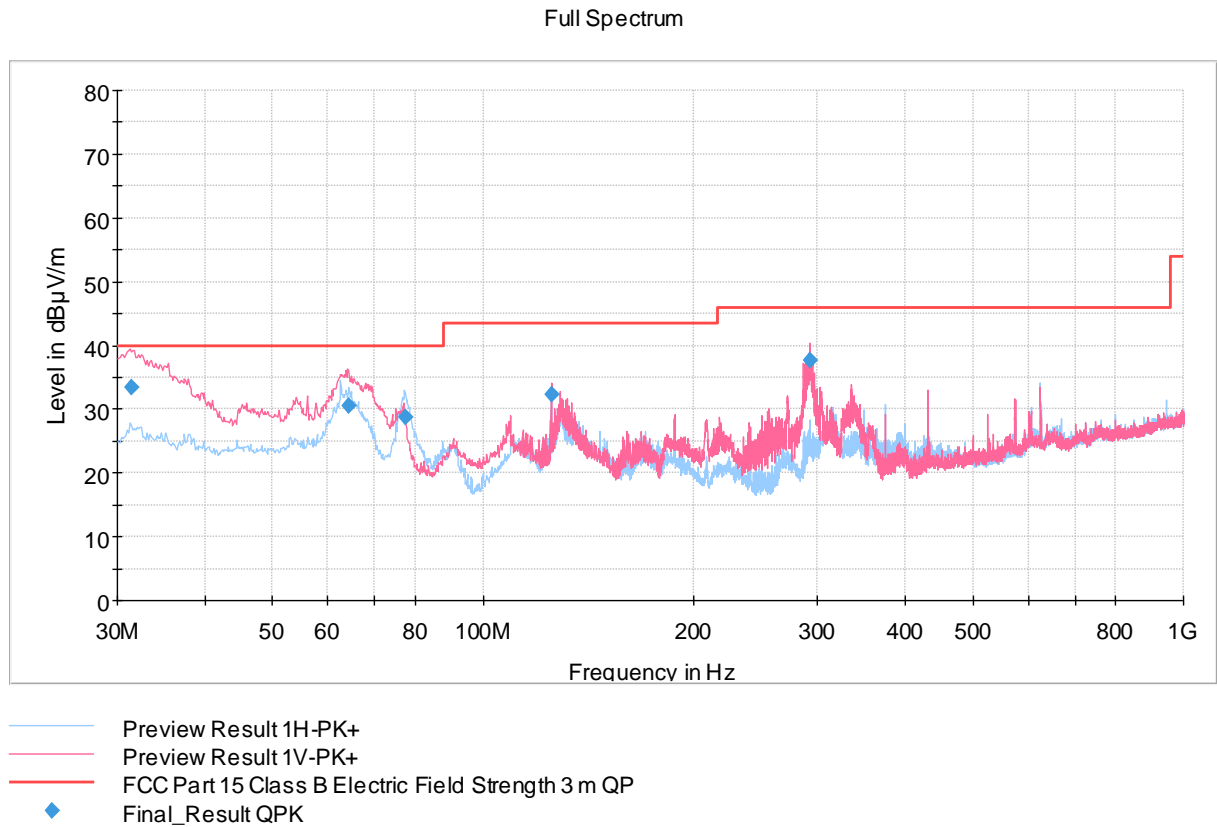


Figure 3. TX Radiated emission 30 MHz to 1000 MHz

Final measurements from the worst frequencies

Table 4. The final results with quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.475000	33.38	40.00	6.62	1000.0	120.000	108.0	V	109.0	16.4
64.195000	30.55	40.00	9.45	1000.0	120.000	133.0	V	62.0	16.4
77.395000	28.84	40.00	11.16	1000.0	120.000	296.0	H	15.0	13.6
125.005000	32.35	43.50	11.15	1000.0	120.000	111.0	V	48.0	15.6
292.895000	37.67	46.00	8.33	1000.0	120.000	105.0	V	190.0	17.1

The correction factor in the final result table contains the sum of the transducers.

The result value is the measured value corrected with the correction factor.

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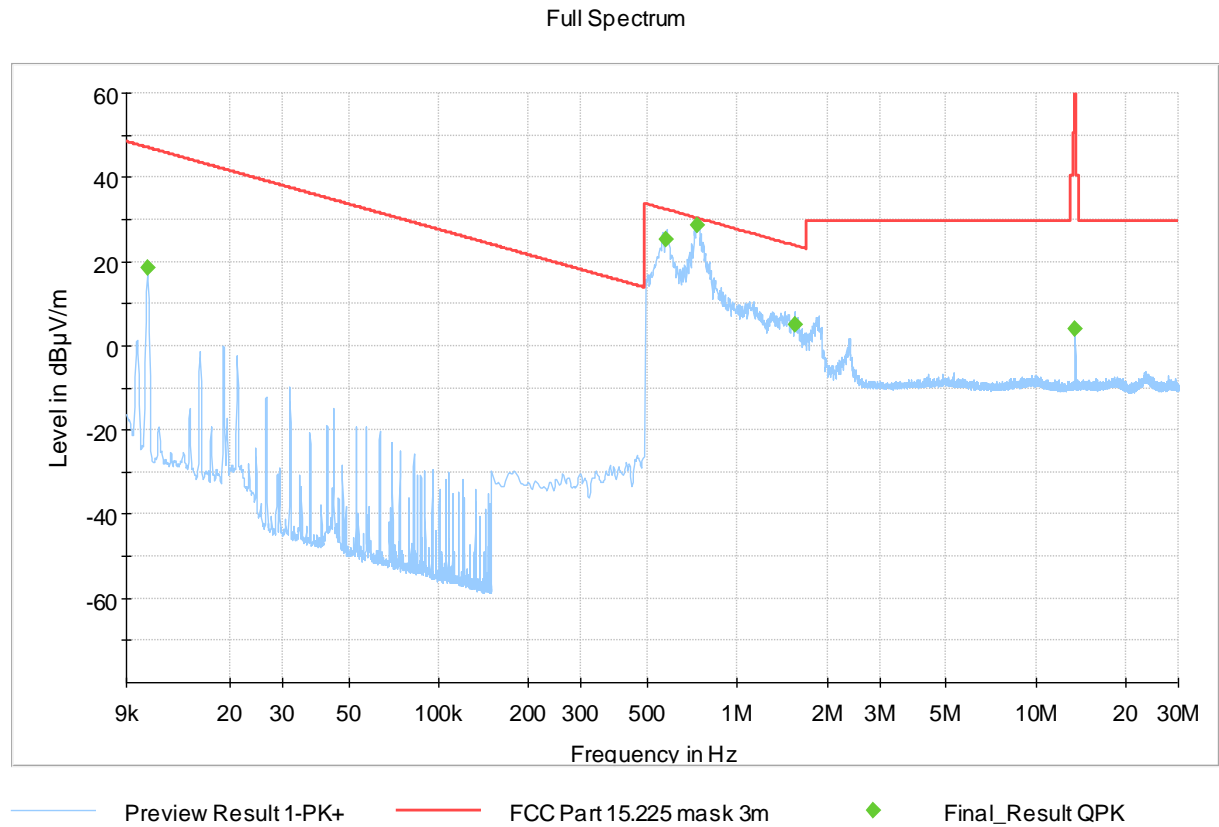


Figure 4. TX radiated emission 9 kHz to 30MHz

Final measurements from the worst frequencies

Table 5. The final results with quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.010560	18.37	47.11	28.74	1000.0	0.200	190.0	V	11.0	-60.1
0.578750	25.14	32.36	7.22	1000.0	9.000	190.0	V	271.0	-20.5
0.731000	28.46	30.34	1.88	1000.0	9.000	190.0	V	270.0	-20.5
1.559250	5.08	23.77	18.69	1000.0	9.000	190.0	V	267.0	-20.5
13.559000	4.06	84.00	79.94	1000.0	9.000	100.0	V	330.0	-20.5

The correction factor in the final result table contains the sum of the transducers.

The result value is the measured value corrected with the correction factor.

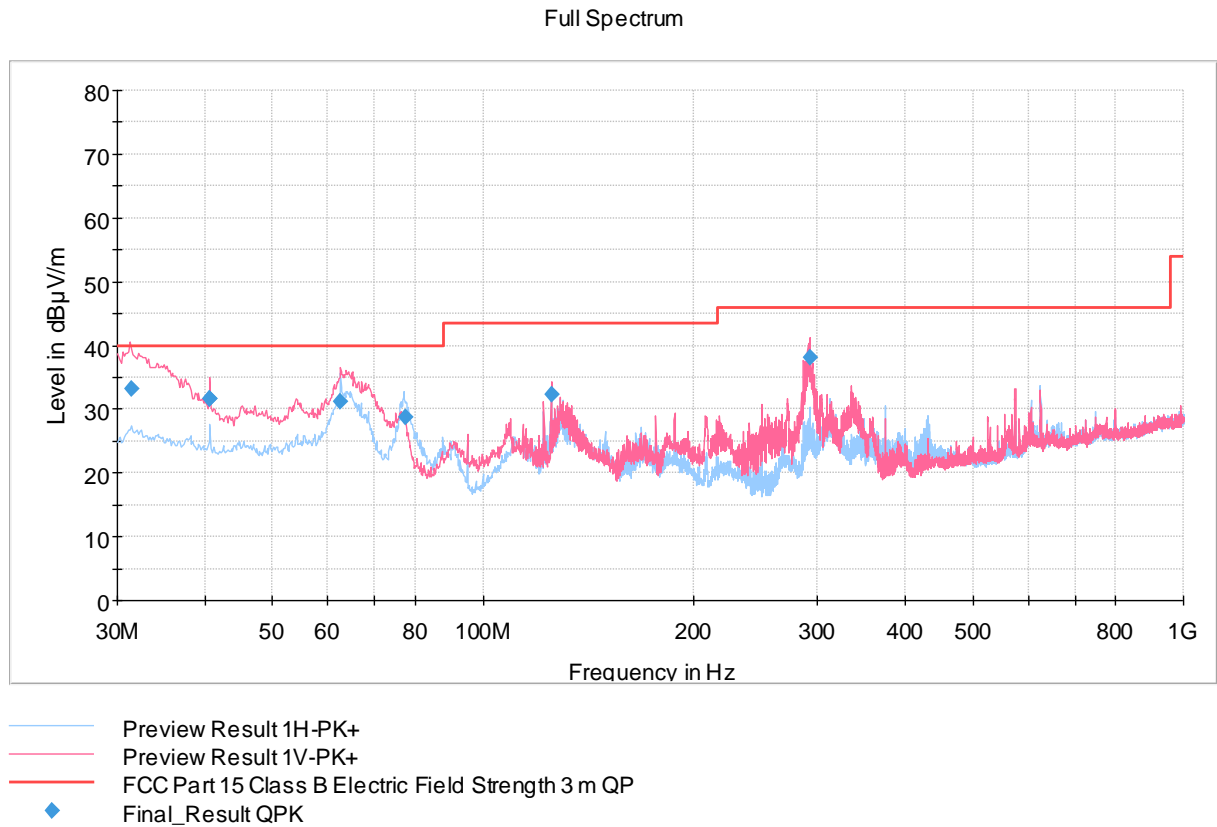


Figure 5. TX radiated emission 30 MHz to 1000 MHz

Final measurements from the worst frequencies

Table 6. The final results with quasi-peak detector

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.415000	39.78	40.00	0.22	1000.0	120.000	130.0	V	121.0	16.4
40.665000	34.94	40.00	5.06	1000.0	120.000	105.0	V	10.0	17.4
40.665000	34.96	40.00	5.04	1000.0	120.000	105.0	V	10.0	17.4
62.515000	38.34	40.00	1.66	1000.0	120.000	100.0	V	13.0	16.7
77.365000	34.73	40.00	5.27	1000.0	120.000	219.0	H	34.0	13.6
125.005000	34.18	43.50	9.32	1000.0	120.000	114.0	V	46.0	15.6
292.875000	42.45	46.00	3.55	1000.0	120.000	105.0	V	187.0	17.1

The correction factor in the final result table contains the sum of the transducers.

The result value is the measured value corrected with the correction factor.

Operation within the band 13.110 – 14.010 MHz

Standard: ANSI C63.10
Tested by: PKA
Date: 20 and 21 November 2019
Temperature: 23 °C
Humidity: 41 - 43 % RH
Barometric pressure: 1034 hPa

Measurement uncertainty ± 4.5 dB

Level of confidence 95 % (k = 2)

FCC: 15.225, ISSED: RSS-210 B.6

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (dBµV/m)	Measurement Distance (m)
13.110 – 13.410	40.5	30
13.410 – 13.553	50.5	30
13.553 – 13.567	84.0	30
13.567 – 13.710	50.5	30
13.710 – 14.010	40.5	30

Test results

without tag

Full Spectrum

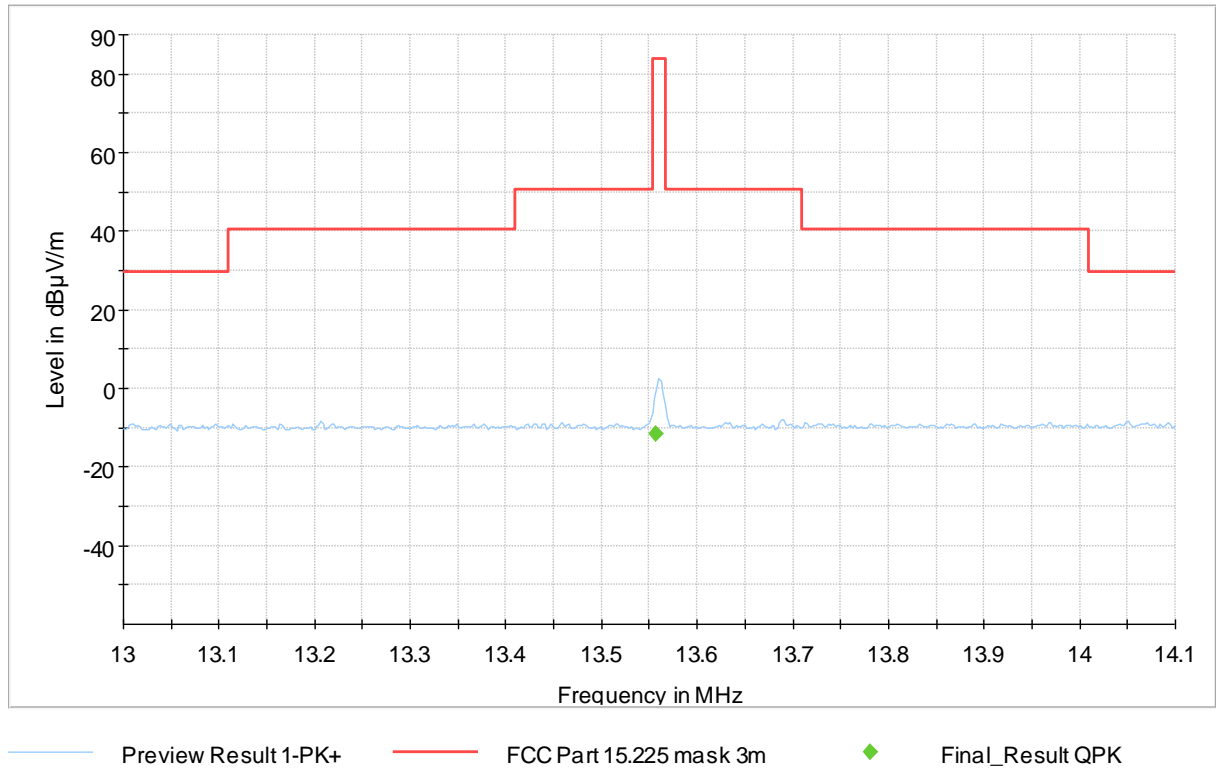


Figure 6. TX radiated emission within the band 13.110 to 14.010 MHz

Table 7. The final results with quasi-peak detector

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
13.557250	-11.60	84.00	95.60	1000.0	9.000	190.0	V	276.0	-20.5

The correction factor in the final result table contains the sum of the transducers.

The result value is the measured value corrected with the correction factor.

with tag

Full Spectrum

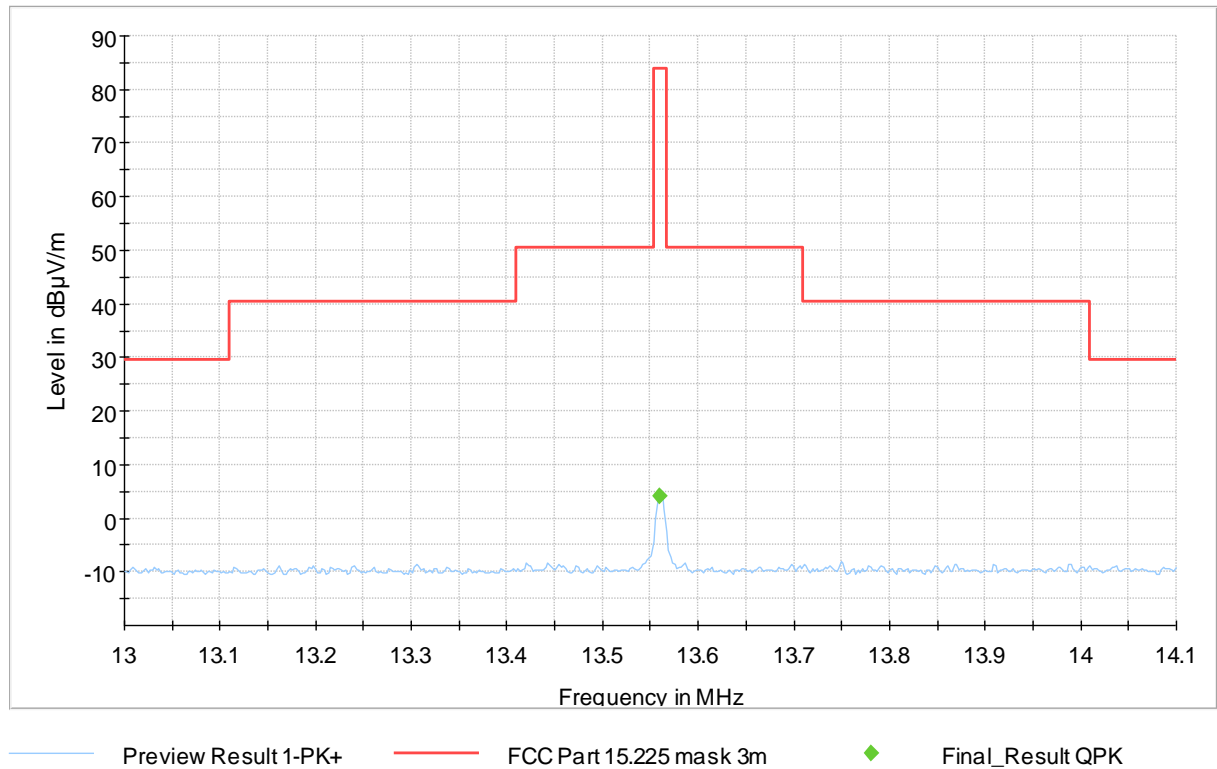


Figure 7. TX radiated emission within the band 13.110 to 14.010 MHz

Table 8. The final results with quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
13.559000	4.06	84.00	79.94	1000.0	9.000	100.0	V	330.0	-20.5

The correction factor in the final result table contains the sum of the transducers.

The result value is the measured value corrected with the correction factor.

Frequency Stability

Standard: ANSI C63.10
Tested by: PKA
Date: 22 November 2019
Temperature: 21 °C
Humidity: 23 % RH
Barometric pressure: 1031 hPa

FCC: 15.225(e), ISED: RSS-210 B.6, RS-GEN 6.11

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test results

Table 9. Frequency stability test, extreme conditions

Test conditions		Frequency (MHz)	deviation from nominal (%)	Result
Temperature [°C]	Voltage [V]			
-20	120	13.5606218	0.0016477	PASS
-10	120	13.5606484	0.0045855	PASS
0	120	13.5606522	0.0047817	PASS
10	120	13.5606367	0.0048097	PASS
20	102	13.5606059	0.0046954	PASS
20	120	13.5606082	0.0044683	PASS
20	138	13.5606056	0.0044853	PASS
30	120	13.5605761	0.0044661	PASS
40	120	13.5605439	0.0042485	PASS
50	120	13.5605205	0.0040111	PASS

20 dB Bandwidth

Standard: ANSI C63.10
Tested by: PKA
Date: 22 November 2019
Temperature: 21 °C
Humidity: 23 %RH
Barometric pressure: 1031 hPa

FCC: 15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sections 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule.

Test results

Table 10. 20 dB Bandwidth

20 dB Bandwidth	Resolution Bandwidth	Video Bandwidth
27.437 kHz	10 kHz	30 kHz

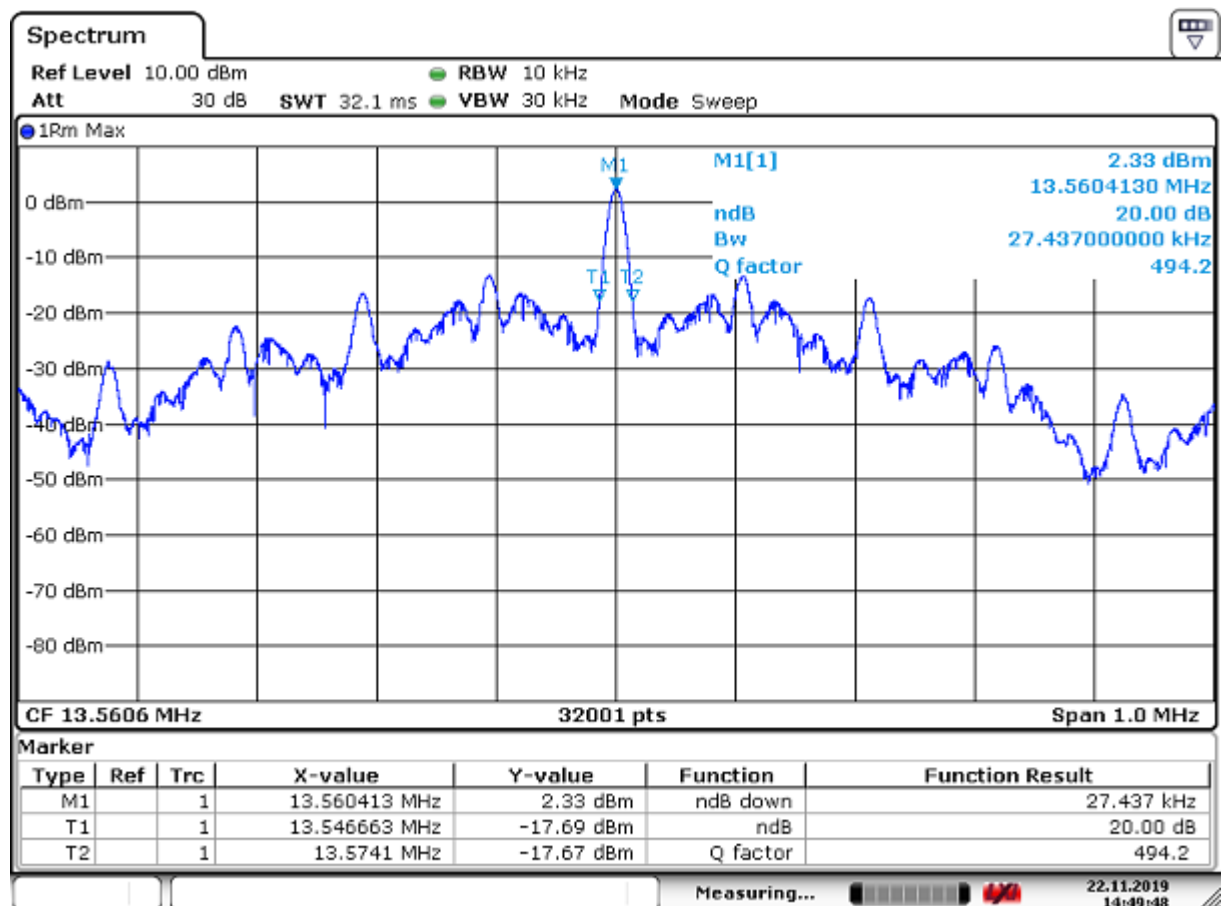


Figure 8: 20 dB bandwidth

99% Power Bandwidth

Standard: RSS-GEN
Tested by: PKA
Date: 22 November 2019
Temperature: 21 °C
Humidity: 23 %RH
Barometric pressure: 1031 hPa

ISED: RSS-GEN 6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value.

Test results

Table 11. EUT1 99% Power Bandwidth

99% Power Bandwidth	Resolution Bandwidth	Video Bandwidth
534.202 kHz	10 kHz	30 kHz

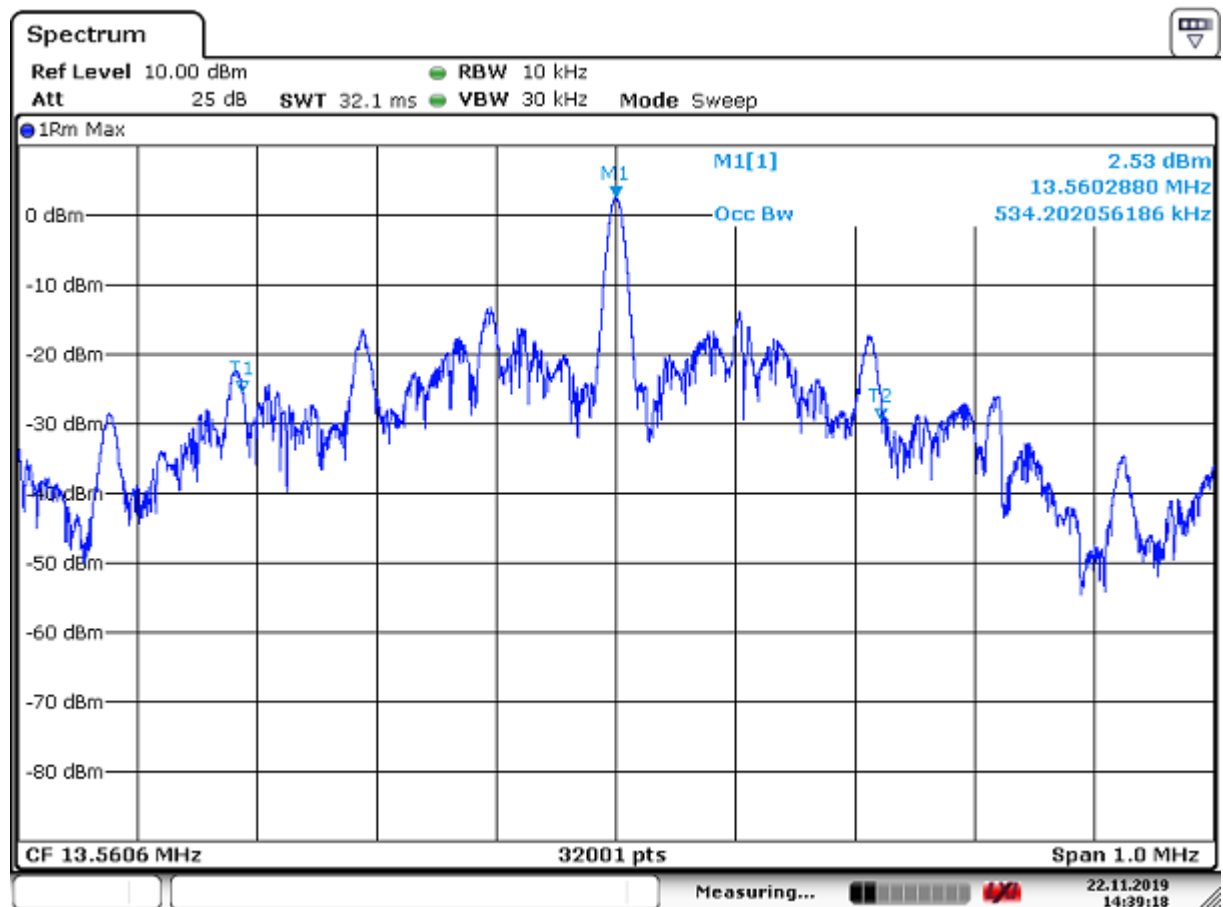


Figure 9. 99% Power Bandwidth

TEST EQUIPMENT

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2	inv:8013	2018-03-23	2020-03-23
ANTENNA	SCHWARZBECK	VULB 9168	inv:8911	2018-03-23	2020-03-23
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	-
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv:10183	NCR	-
ANTENNA MAST	MATURO	TAM 4.0E	inv:10181	NCR	-
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	-
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv:10679	2019-06-28	2020-06-27
ATTENUATOR	PASTERNAK	PE 7004-4	inv:10126	2019-04-01	2021-04-01
LISN	ROHDE & SCHWARZ	ENV216	inv:9611	2019-03-01	2020-03-01
SIGNAL ANALYZER	ROHDE & SCHWARZ	FSV40	inv:9093	2018-06-28	2020-06-28
TEMPERATURE/ HUMIDITY METER	VAISALA	HMT 333	inv:8638	2019-04-10	2020-04-10
TEMPERATURE CHAMBER	VÖTSCH	VC4033	inv:10412	-	-
NEAR-FIELD PROBE	ROHDE & SCHWARZ	HZ-14 1026.7744.02	inv:7883	-	-

NCR = No calibration required

END OF TEST REPORT