

Test Report

| | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product | Bluetooth Transceiver in IP Phone | | |
| Name and address of the applicant | Panasonic Corporation 1-62, 4-chome, Minoshima, Hakata-ku Fukuoka, 812-8531, Japan | | |
| Name and address of the manufacturer | Panasonic Corporation 1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8501, Japan | | |
| Model | KX-NT680 KX-NT680C | | |
| Rating | 120V 60Hz (Mains) 48V DC (PoE) | | |
| Trademark | PANASONIC | | |
| Serial number | / | | |
| Additional information | Bluetooth, Proprietary IP | | |
| Tested according to | FCC Part 15.247 Digital Transmission Systems Industry Canada RSS-247, Issue 2 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices | | |
| Order number | 354306 | | |
| Tested in period | 2018.06.18 to 2018.07.02 | | |
| Issue date | 2018.07.18 | | |
| Name and address of the testing laboratory |  Instituttveien 6 Kjeller, Norway | SITE NUMBER: FCC: NO0001 IC: 2040D-1 |   |
| An accredited technical test executed under the Norwegian accreditation scheme | | | |
|  Prepared by [Frode Sveinsen] | |  Approved by [G.Suhanthakumar] | |
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Template version: C

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1 INFORMATION

1.1 Test Item

| | |
|------------------------------------|----------------------------------------------------------------------------------------|
| Name | Panasonic |
| FCC ID | ACJ96NKX-NT680 |
| ISED ID | 216A-KXNT680 |
| Model/version | KX-NT680 KX-NT680C |
| Serial number | / |
| Hardware version | BT module: PNLB2118, Main board: PNLB2758S2 |
| Software version | BT module: V1198, Main board: V68.998 |
| Frequency Range | 2402 – 2480 MHz |
| Number of Channels | 79 |
| Operating Modes | FHSS |
| Type of Modulation | Digital (GFSK) |
| User Frequency Adjustment | None |
| Rated Output Power | 0.00662 Watts (Conducted) |
| Power Supply | AC Adaptor PNLV6508 (Input: 100-240V 0.5-0.3A 50/60Hz; Output: 12V _{DC} 1.5A) |
| Antenna Connector | None |
| Number of Antennas | 1 |
| Antenna Diversity Supported | No |
| Desktop Charger | N/A |

Description of Test Item

The EUT is an IP Phone with Bluetooth Transceiver.

The models KX-NT680 and KX-NT680C are identical.

1.2 Normal test condition

| | |
|----------------------|------------------------------------------------------|
| Temperature: | 20 – 24 °C |
| Relative humidity: | 20 – 50 % |
| Normal test voltage: | 120 V 60 Hz (Mains) 48 V DC (Power over Ethernet) |

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen

1.4 Description of modification for Modification Filing

Not applicable.

1.5 Family List Rational

Not Applicable.

1.6 Antenna Requirement

Is the antenna detachable? Yes No

If detachable, is the antenna connector non-standard? Yes No

The EUT has only internal antenna. A temporary antenna connector was used for conducted tests.

Ref. FCC §15.203

1.7 Worst-Case Configuration and Mode

The EUT supports only Basic Rate Bluetooth with standard bitrate.

1.8 Comments

The measurements were done with the EUT powered by the supplied AC adaptor and with the EUT supplied from Power over Ethernet.

It was checked that power variations between 85% and 115% did not have any influence on the measurements.

All ports were populated during spurious emission measurements.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and Industry Canada RSS-247 Issue 2 and RSS-GEN Issue 5.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Radiated tests were performed in a semi-anechoic chamber at measuring distances of 3m and 10m.

A description of the test facility is on file with the FCC and Industry Canada.

New Submission

Production Unit

Class II Permissive Change

Pre-production Unit

DSS Equipment Code

Family Listing



THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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2.2 Test Summary

| Name of test | FCC Part 15 reference | RSS-247 Issue 2, RSS-GEN Issue 5 reference | Result |
|----------------------------------------|-------------------------------------|--------------------------------------------|-----------------------|
| Supply Voltage Variations | 15.31(e) | 6.11 (RSS-GEN) | Complies |
| Number of Operating Frequencies | 15.31(m) | 5.1 (d) | Complies |
| Antenna Requirement | 15.203 | 6.8 (RSS-GEN) | Complies |
| Power Line Conducted Emission | 15.107(a) 15.207(a) | 8.8 (RSS-GEN) | Complies |
| Channel Separation | 15.247(a)(1) | 5.1 (b) | Complies |
| Pseudorandom Hopping Algorithm | 15.247(a)(1) | 5.1 (a) | Complies |
| Time of Occupancy | 15.247(a)(1)(iii) | 5.1 (d) | Complies |
| Occupied Bandwidth | 15.247(a)(1) | 5.1 (e) 6.7 (RSS-GEN) | Complies |
| Minimum 6 dB Bandwidth | 15.247(a)(2) | 5.2 (a) | N/A ¹ |
| Peak Power Output | 15.247(b) | 5.4 (b) | Complies |
| Power Spectral Density | 15.247(d) | 5.2 (b) | N/A ¹ |
| Spurious Emissions (Antenna Conducted) | 15.247(c) | 5.5 | Complies ² |
| Spurious Emissions (Radiated) | 15.247(c) 15.109(a) 15.209(a) | 6.13 (RSS-GEN) 8.9 (RSS-GEN) | Complies |

¹ Not applicable for FHSS equipment

² The tested equipment has integrated antennas only

3 TEST RESULTS

3.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

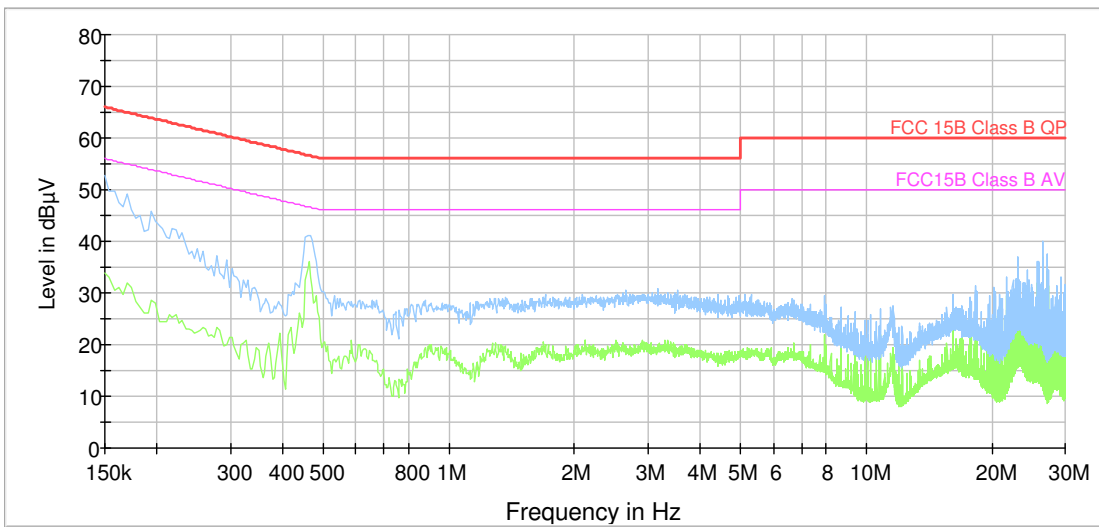
Measurement procedure: ANSI C63.4-2014 using 50 μ H/50 ohms LISN.

Test Results: Complies.

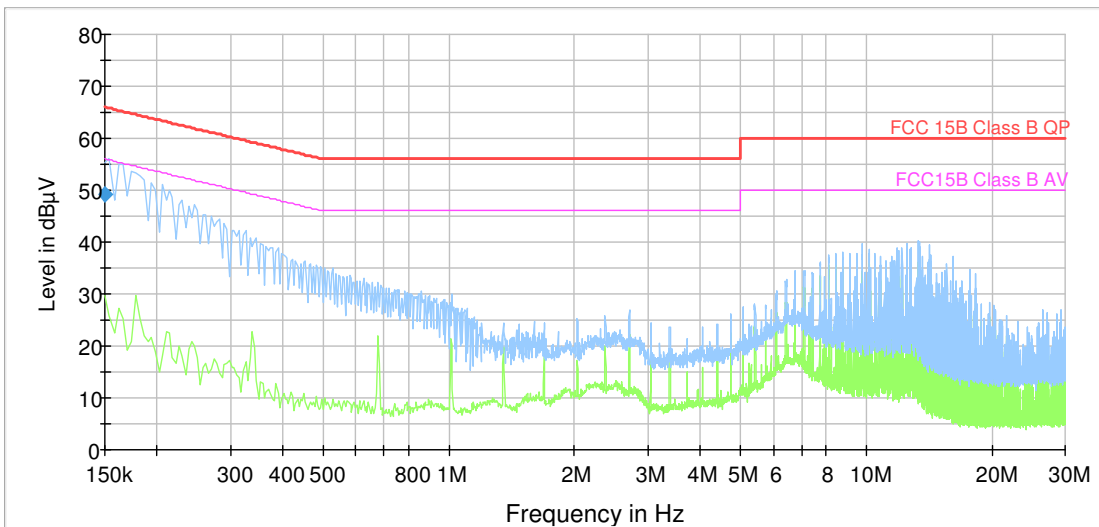
Highest measured value (L1 and N):

All emissions are below the Average Limit even when measured with Peak Detector.

AC Adaptor, 120V 60Hz:



Power over Ethernet, 120V 60Hz:



3.2 Channel Separation

Para. No.: 15.247 (a)(1)

Test Results: **Complies**

Measurement Data:

| | |
|---------------------------------------|---------|
| Channel Separation: | 1.0 MHz |
| Nominal value for Channel Separation | 1.0 MHz |
| 20 dB BW of hopping channel, 2402MHz: | 930 kHz |
| 20 dB BW of hopping channel, 2441MHz: | 928 kHz |
| 20 dB BW of hopping channel, 2480MHz: | 924 kHz |

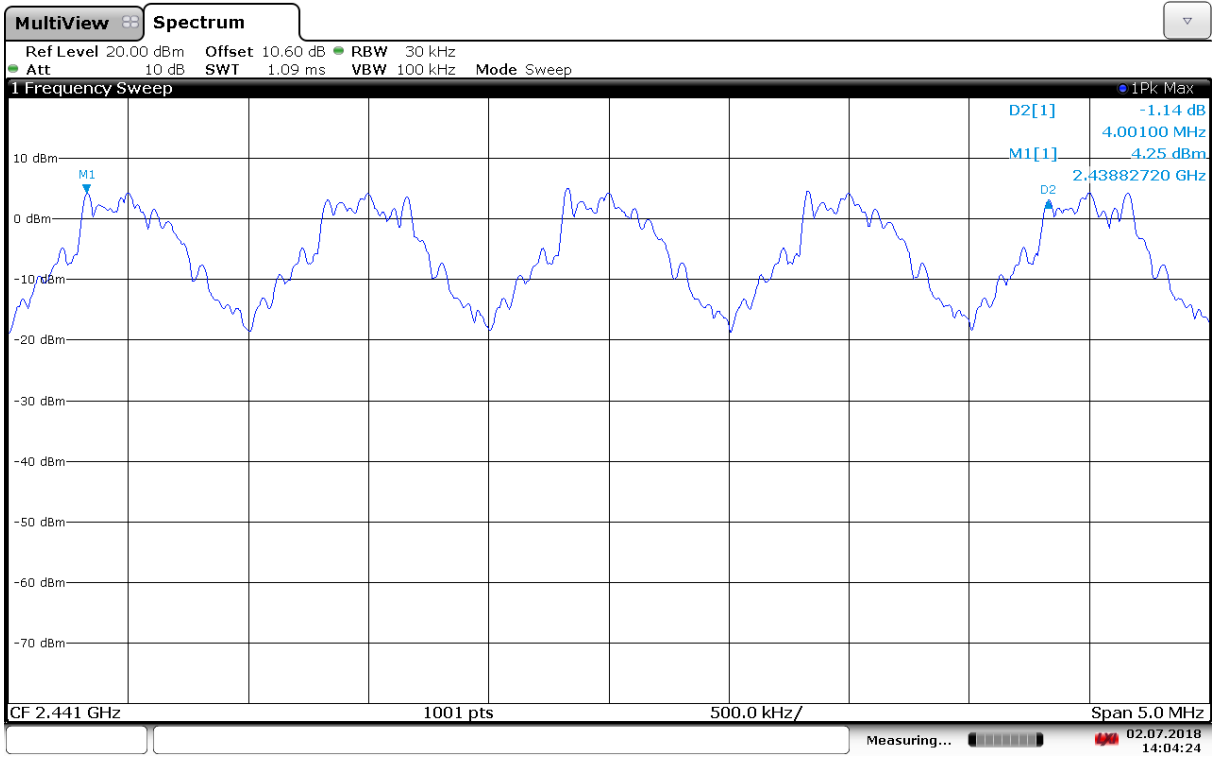
See attached plots

Requirement:

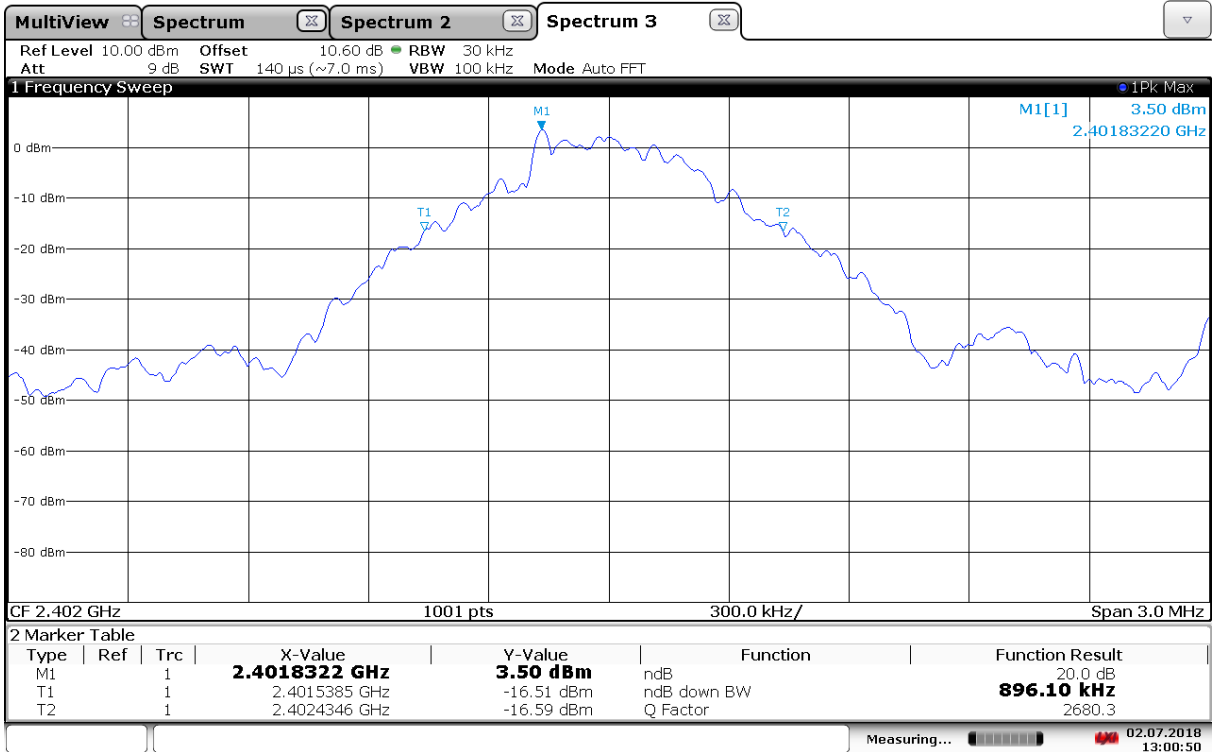
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

or:

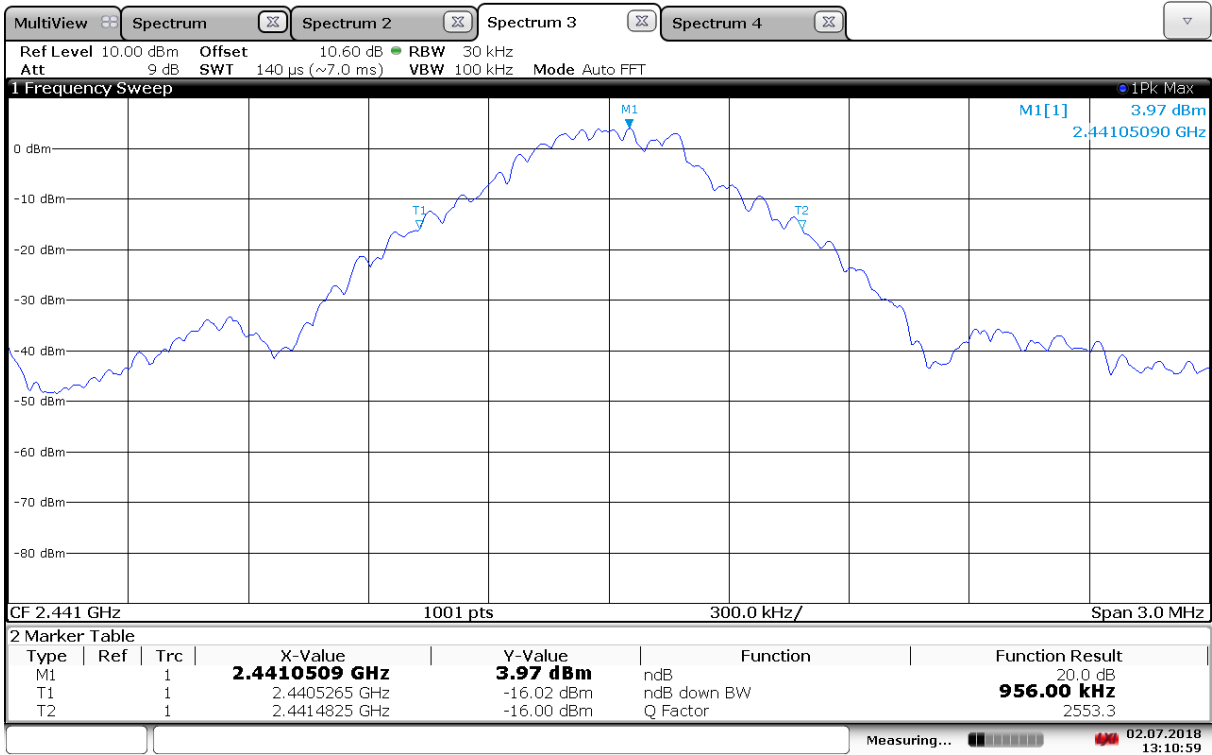
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the system operates with an output power no greater than 125 mW.



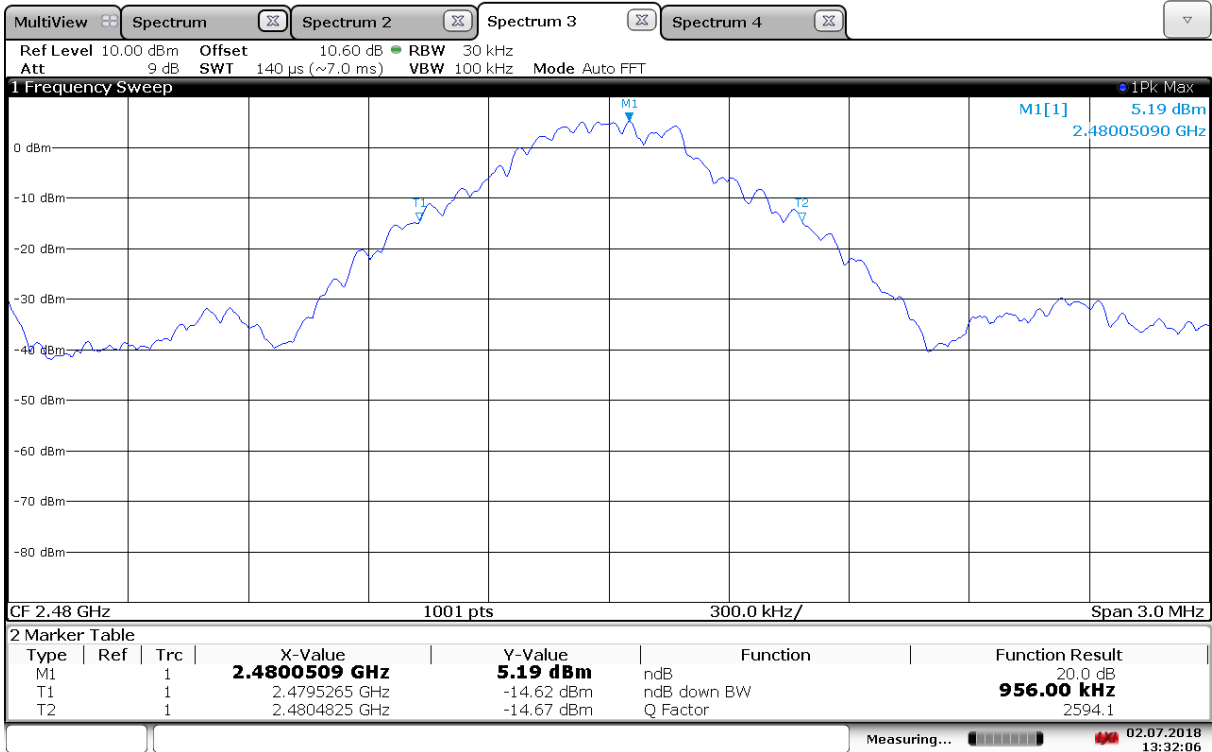
Channel Separation



20dB Bandwidth, 2402 MHz



20dB Bandwidth, 2441 MHz



20dB Bandwidth, 2480 MHz

3.3 Pseudorandom Hopping Algorithm

Para. No.: 15.247 (a)(1)

Test Results: Complies

Measurement Data: The EUT follows the Bluetooth standard.

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

No requirements for Digital Transmission Systems.

3.4 Occupancy Time

Para. No.: 15.247 (a)(1)(iii)

Test Results: Complies

Measurement Data:

| | |
|------------------------------------------|-------------------|
| Minimum Number of RF Channels: | 20 |
| Maximum Number of RF Channels: | 79 |
| Maximum Length of RF Burst pr. channel | 2.90 ms |
| Time between RF Burst on same RF Channel | 75.2 ms (20 ch) |
| | 297.04 ms (79 ch) |
| Time of Occupancy (20 and 79 ch mode) | 309.6 ms |

20 Ch Mode:

Time between RF burst on same channel: $3.76 \times 20 \text{ ms} = 75.2 \text{ ms}$

Time of occupancy: $(2.91 \times 400 \times 20) / 75.2 = 309.6 \text{ ms}$

79 Ch Mode:

Time between RF burst on same channel: $3.76 \times 79 \text{ ms} = 297.04 \text{ ms}$

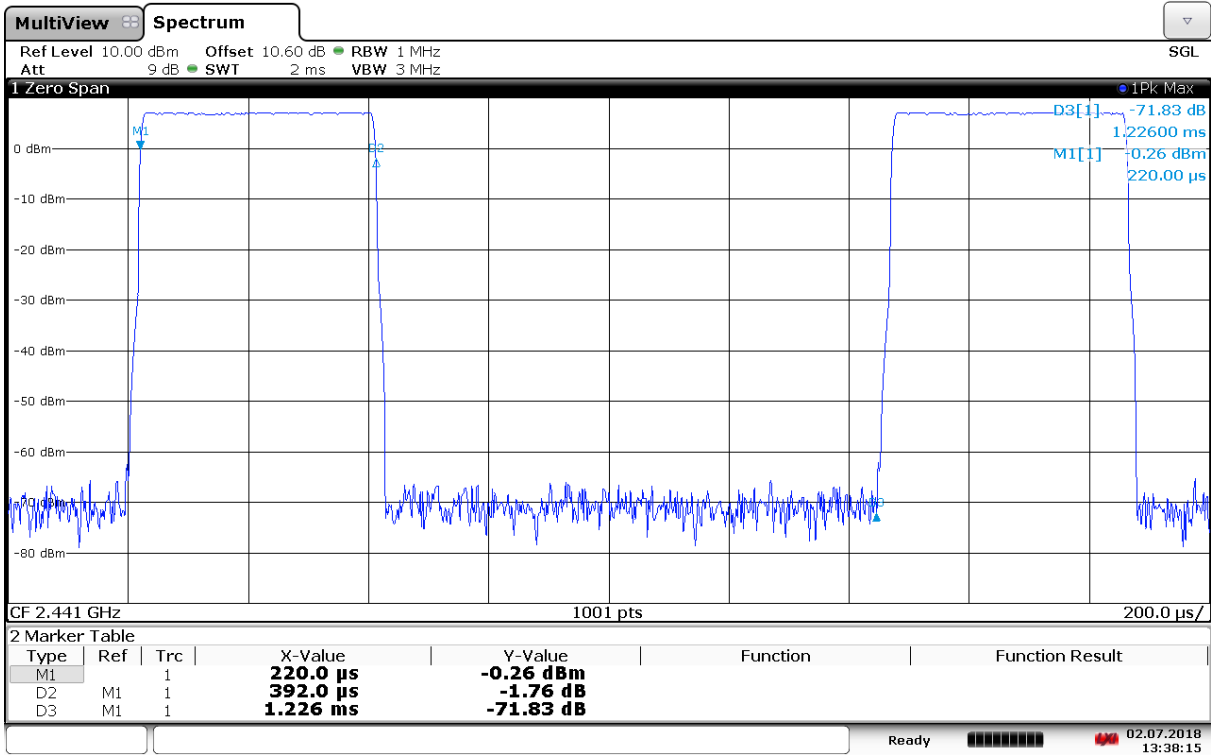
Time of occupancy: $(2.91 \times 400 \times 79) / 297.04 = 309.6 \text{ ms}$

See attached graph.

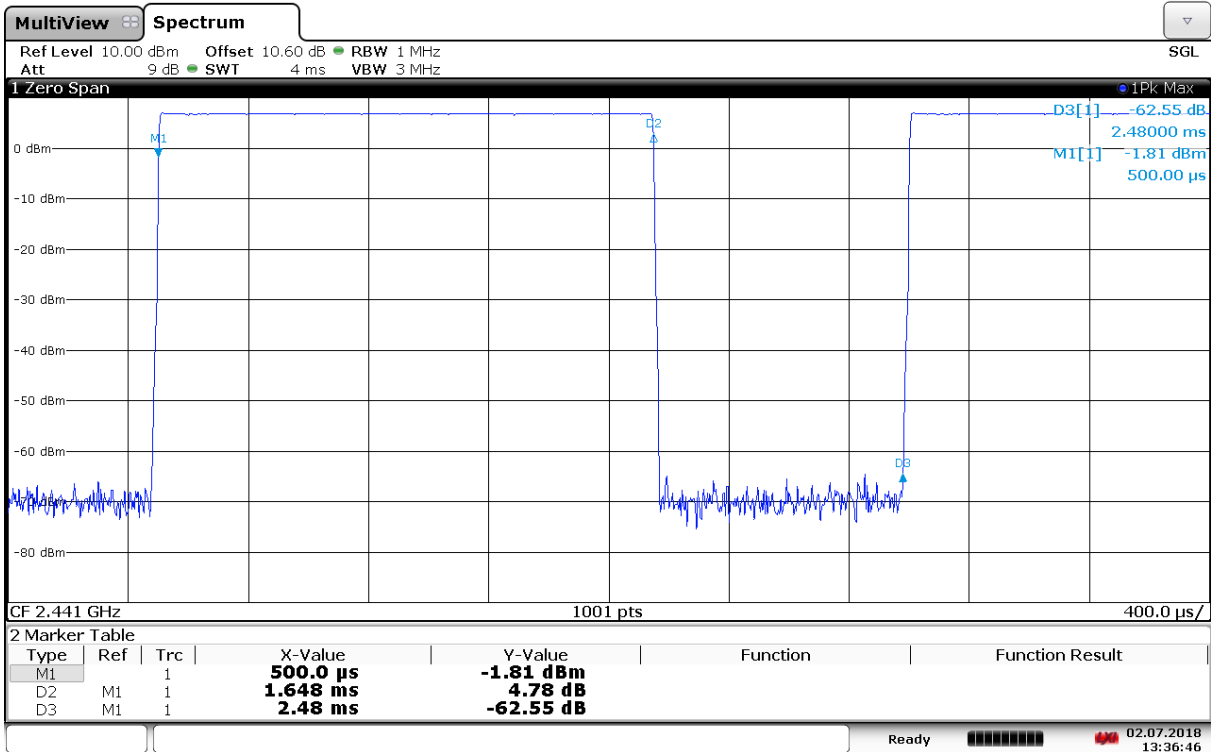
Requirements:

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

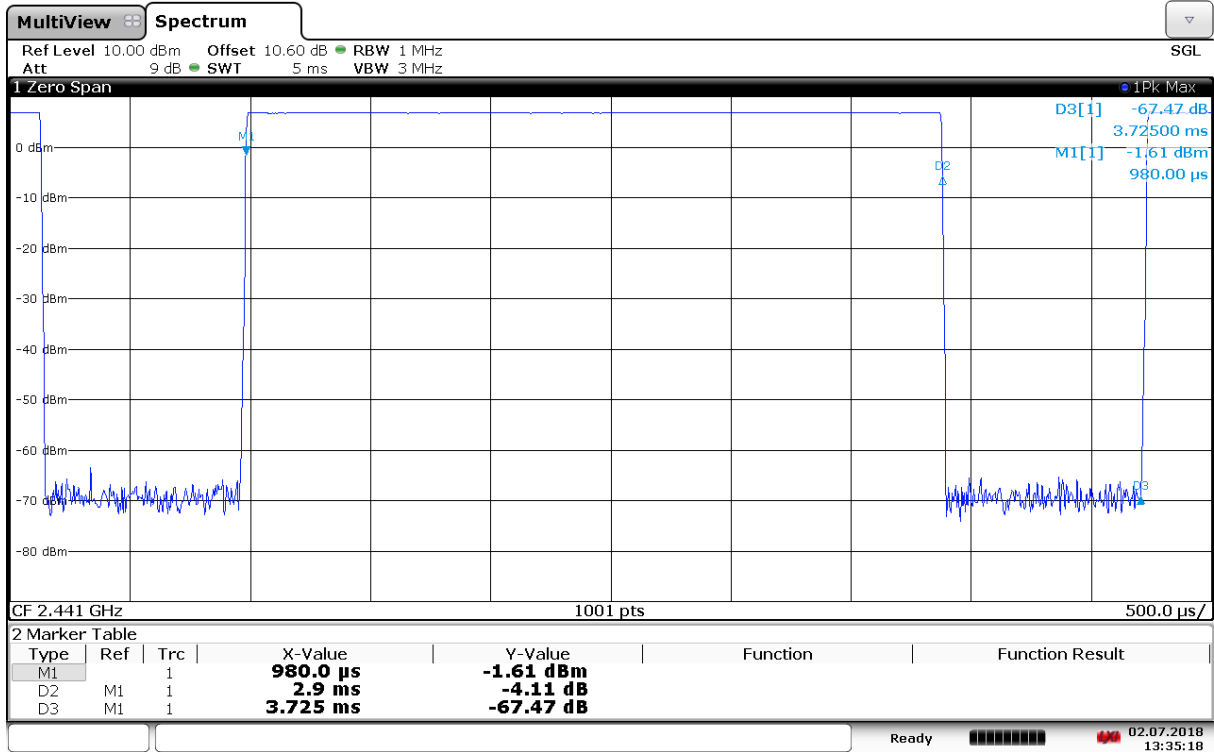
No requirements for Digital Transmission Systems.



Burst Length DH1



Burst Length DH3



Burst Length DH5

3.5 Occupied Bandwidth

Para. No.: 15.247 (a)(1)(iii)

Test Results: Complies

Measurement Data:

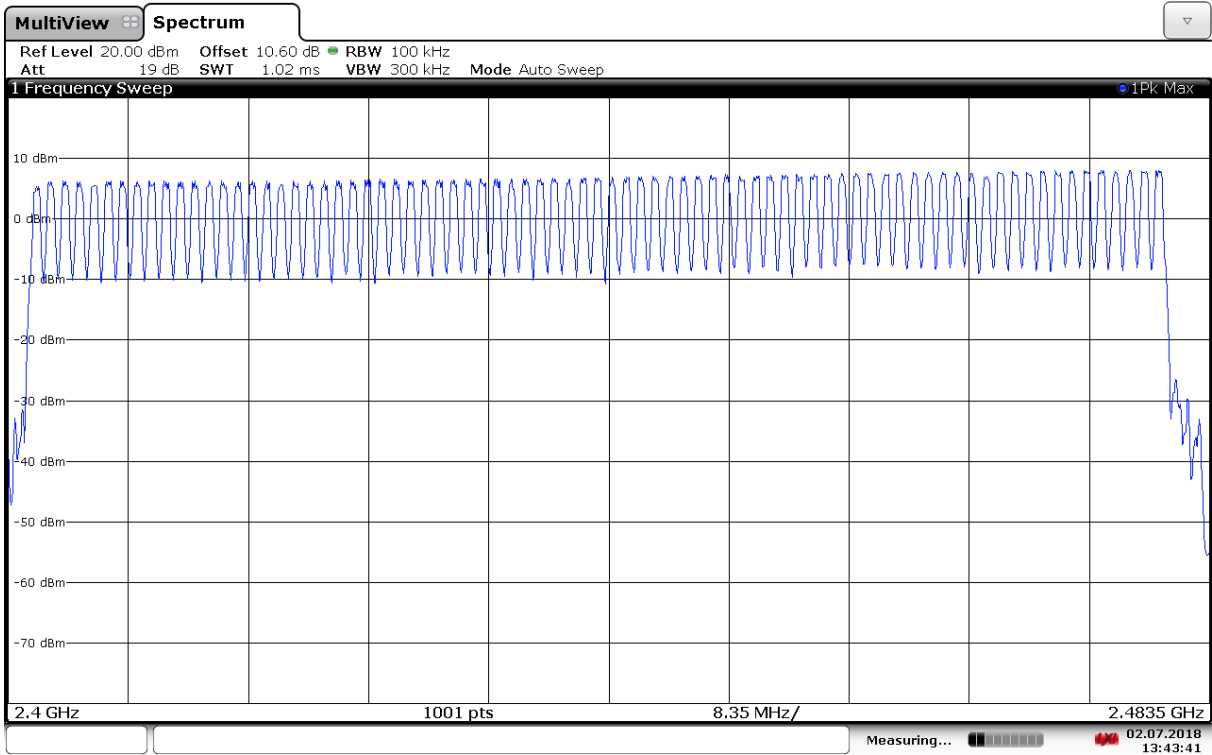
| | |
|-------------------------------|------------------------------------------------------------------|
| Number of RF Channels in use: | 20 or 79 RF channels in use |
| Channel Centre Frequencies: | The channels are centered at each full MHz from 2402 to 2480 MHz |
| 2402MHz: 99% Bandwidth | 847 kHz |
| 2441MHz: 99% Bandwidth | 872 kHz |
| 2480MHz: 99% Bandwidth | 880 kHz |

See attached plots.

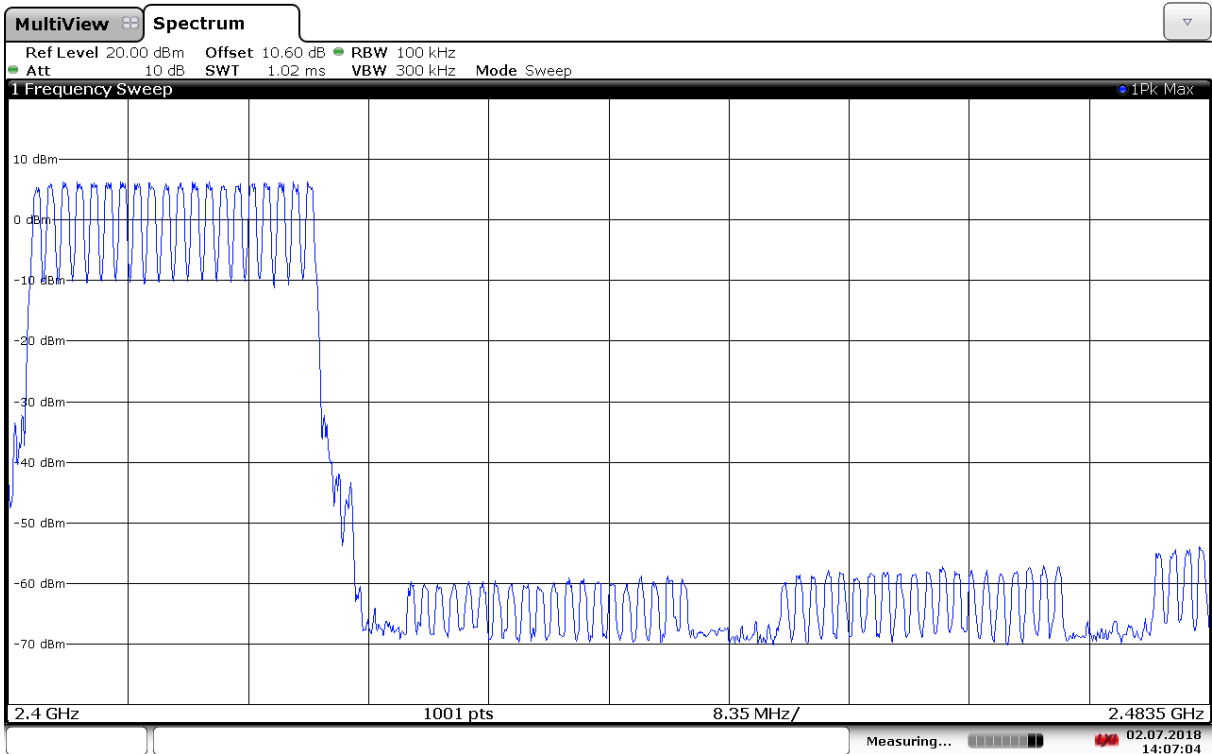
Requirements:

Frequency hopping systems in the 2400 - 2483.5 MHz band shall use at least 15 non-overlapping channels. No requirements for bandwidth for this frequency band.

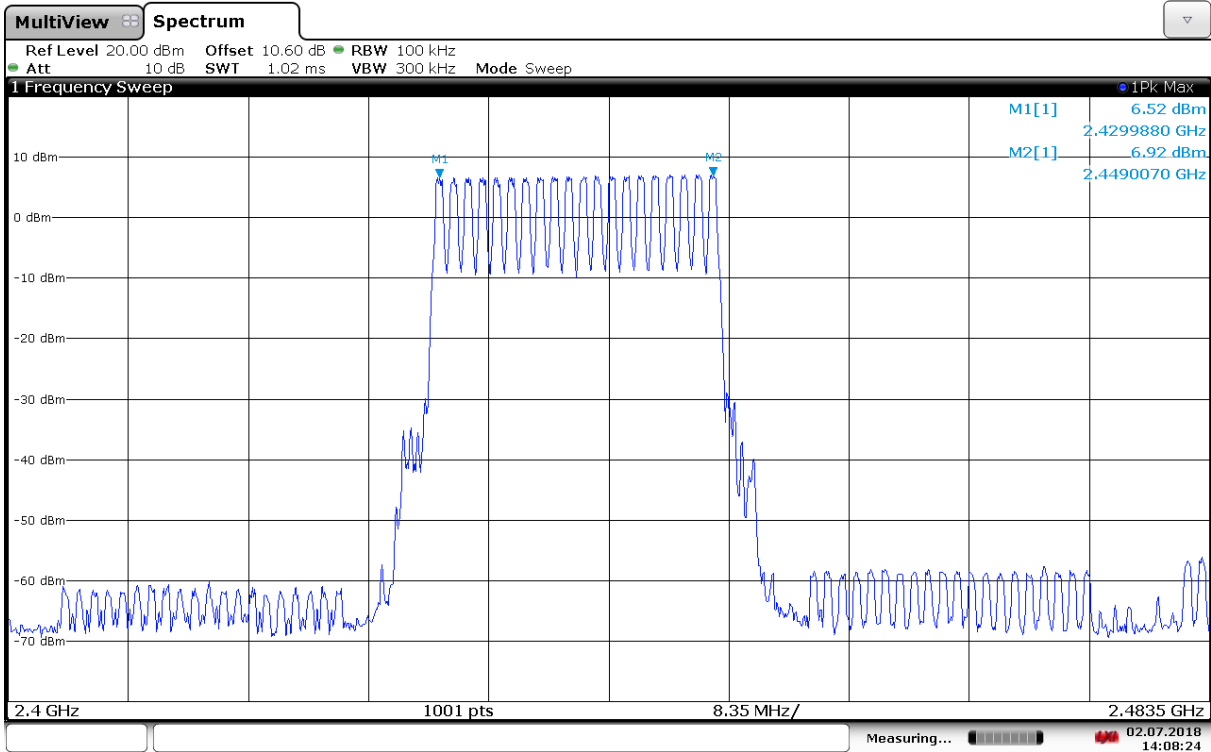
No requirement for 99% BW.



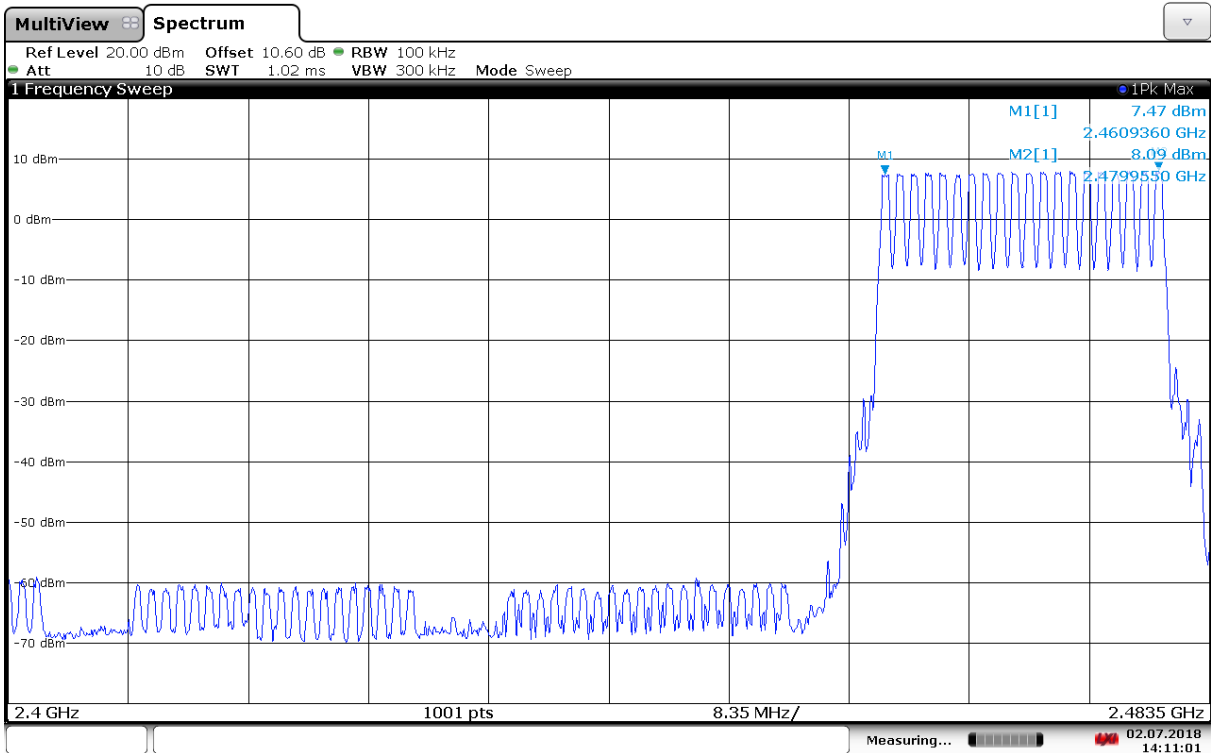
RF Channels in Use, 79 Ch



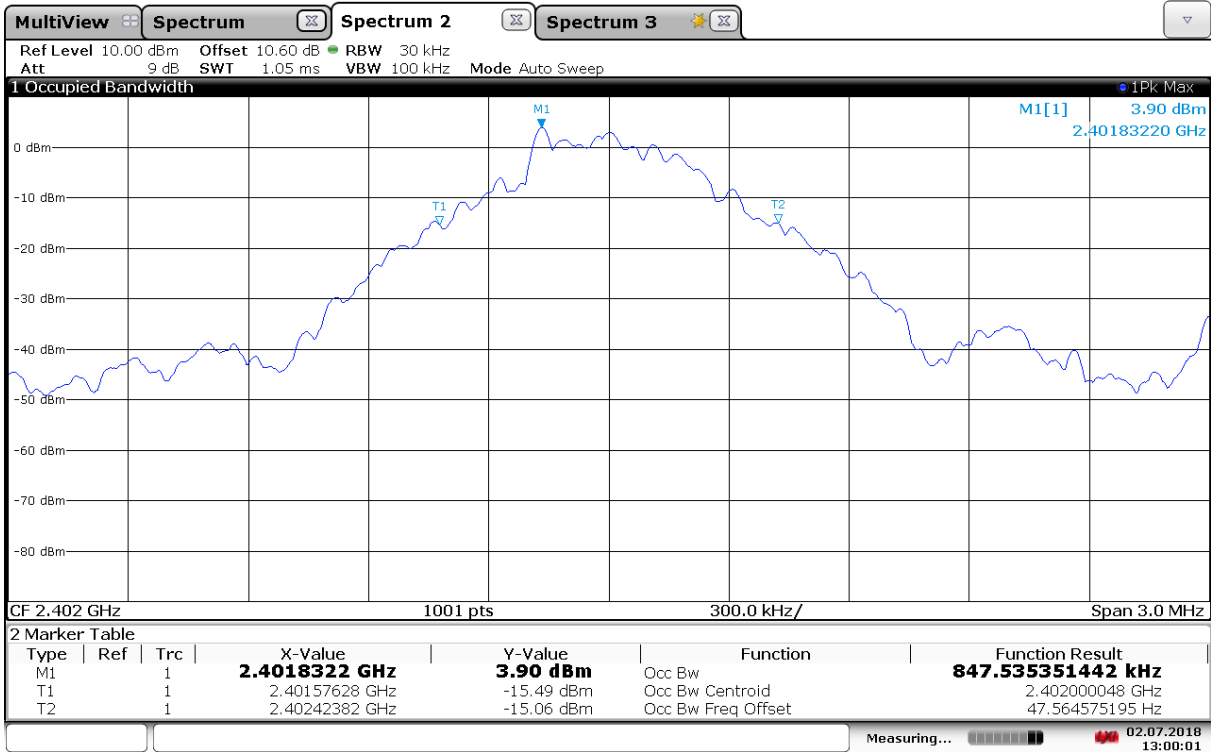
RF Channels in Use, 20 Ch, Low



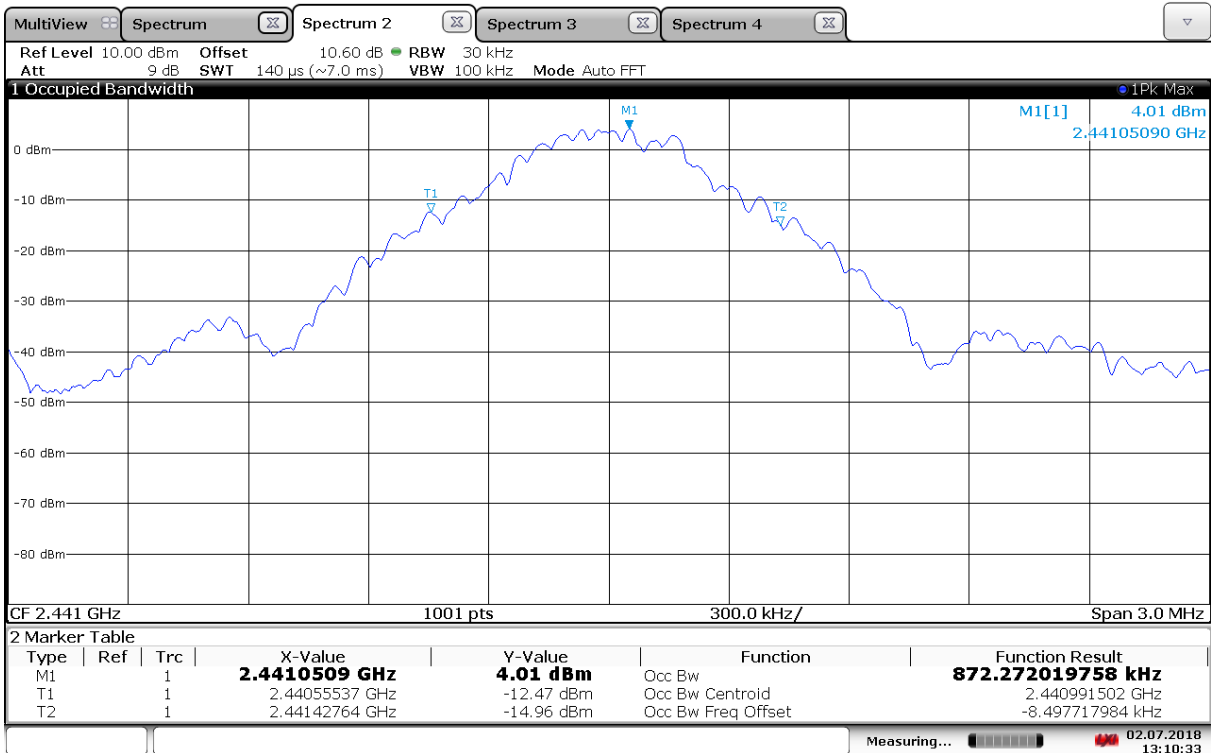
RF Channels in Use, 20 Ch, Mid



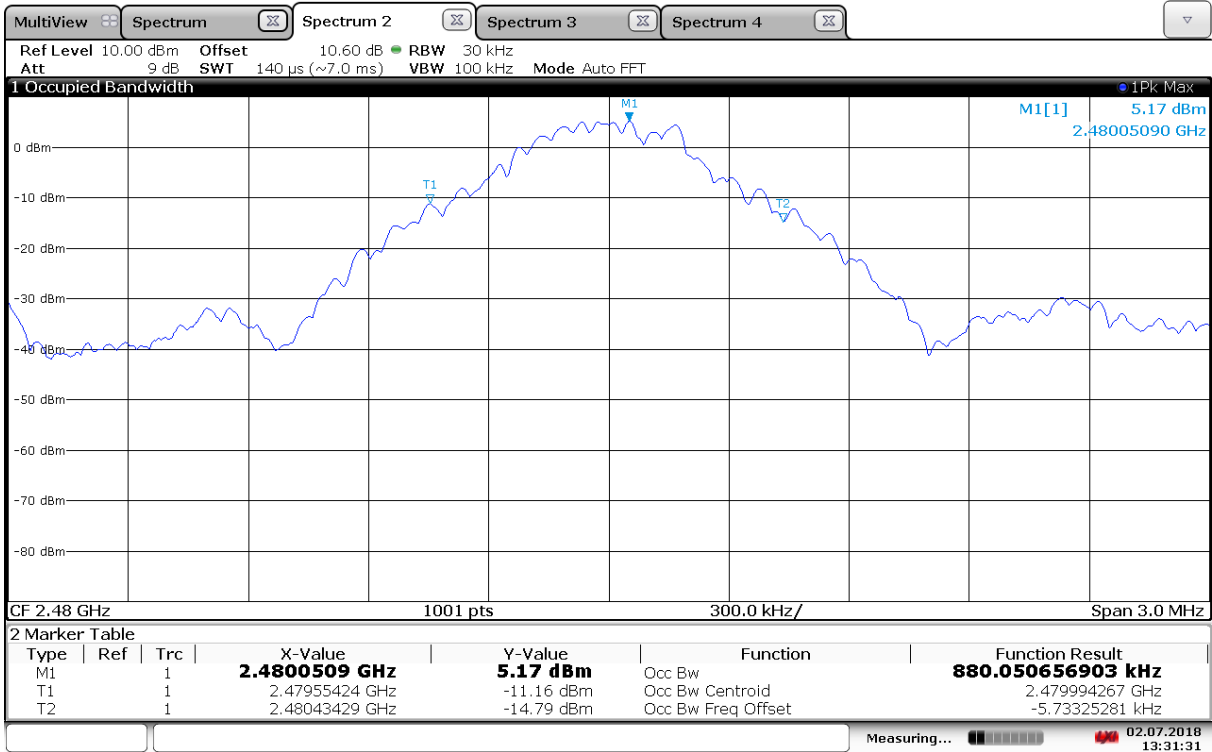
RF Channels in Use, 20 Ch, High



Occupied Bandwidth, 99% BW, 2402 MHz



Occupied Bandwidth, 99% BW, 2441 MHz



Occupied Bandwidth, 99% BW, 2480 MHz

3.6 Peak Power Output

Para. No.: 15.247 (b)

Test Results: Complies

Measurement Data:

| | 2402 MHz | 2441 MHz | 2480 MHz |
|---------------------------------------------|----------|----------|----------|
| Peak Conducted Power (dBm) | 5.77 | 7.10 | 8.21 |
| Peak Conducted Power (Watts) | 0.00378 | 0.00513 | 0.00662 |
| Measured Field Strength (dB μ V/m, @3m) | 101.7 | 104.2 | 105.1 |
| Calculated Output Power (dBm) | 6.49 | 8.94 | 9.90 |
| Calculated Antenna Gain (dBi) | 0.7 | 1.8 | 1.7 |

Radiated Power and Antenna Gain is calculated from measured Field Strength by the formulas in KDB 412172 D01 Determining ERP and EIRP v01r01.

See attached plots.

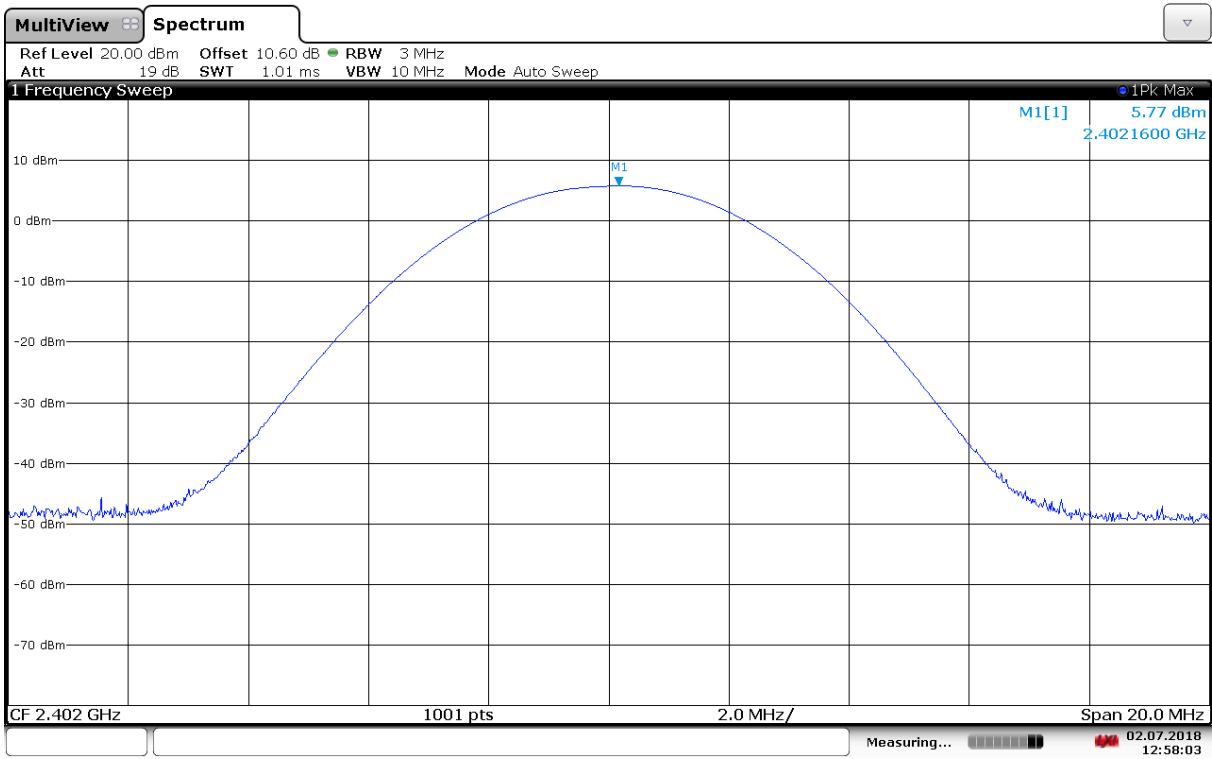
Requirements:

The maximum peak output power shall not exceed the following limits:

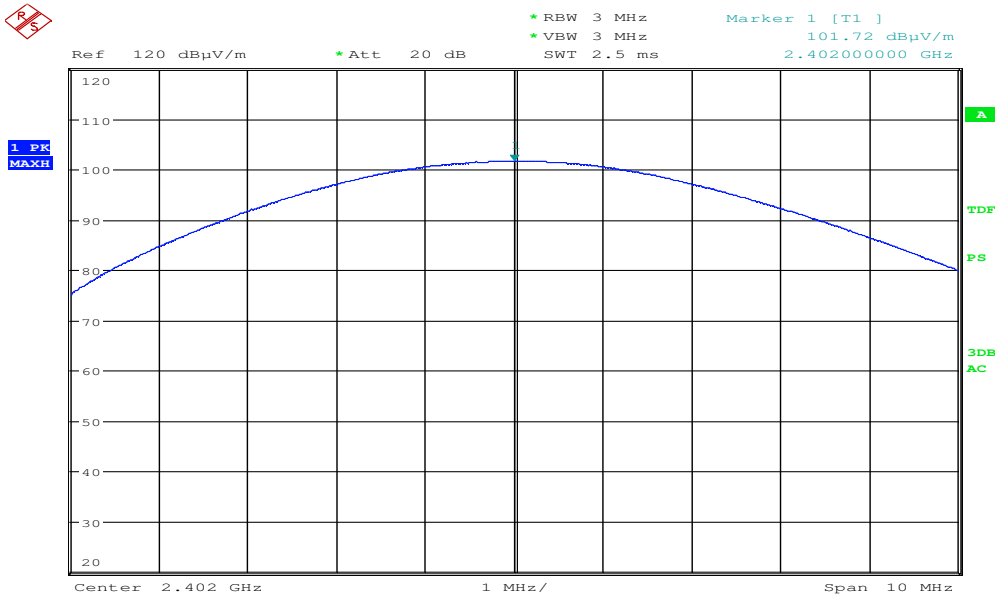
For frequency hopping systems employing at least 75 hopping channels: 1 Watt

For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

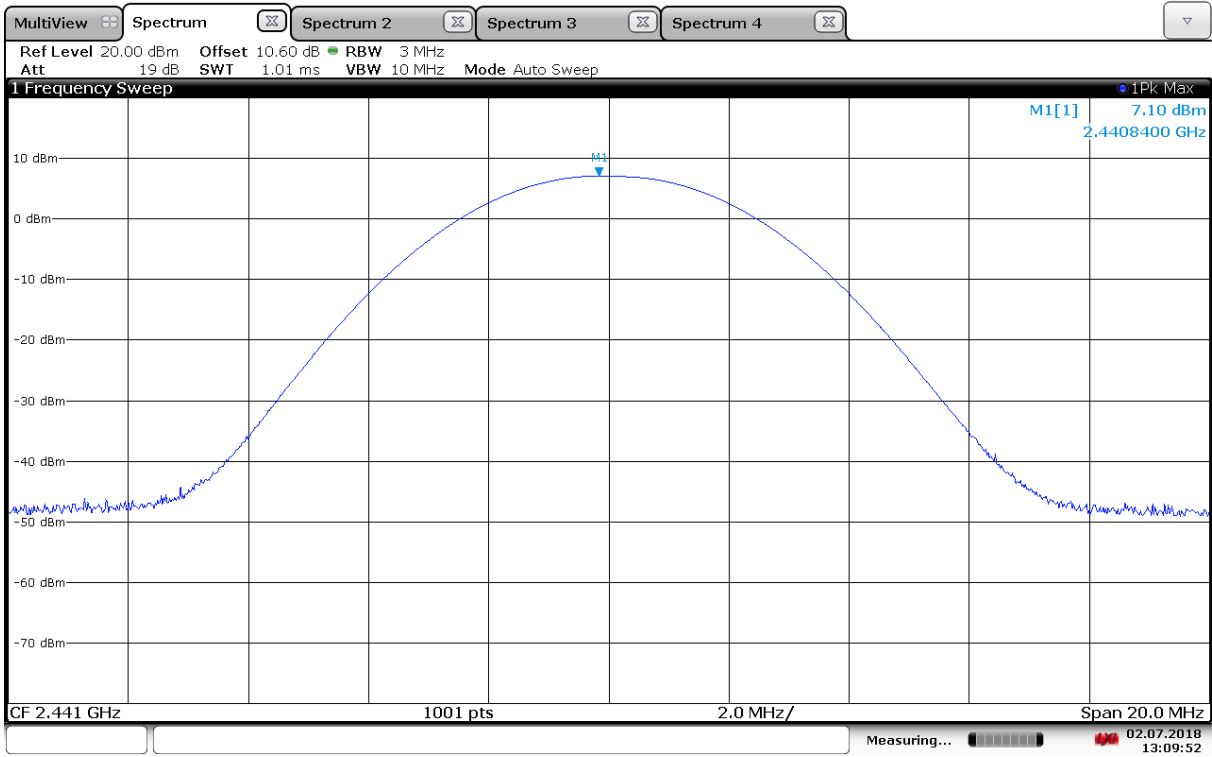


Conducted Power, 2402 MHz

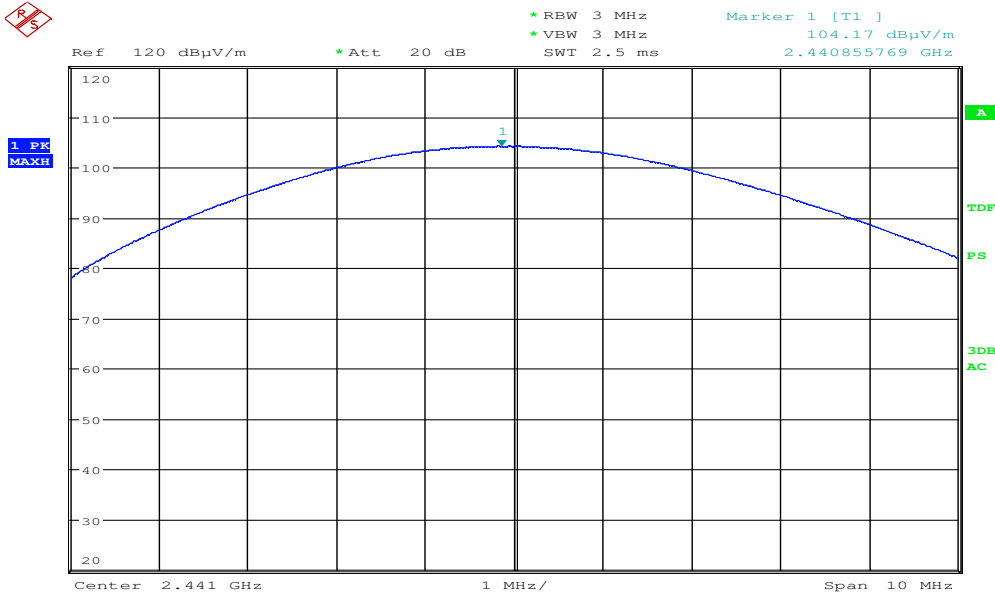


Date: 18.JUN.2018 14:42:38

Radiated Power, 2402 MHz

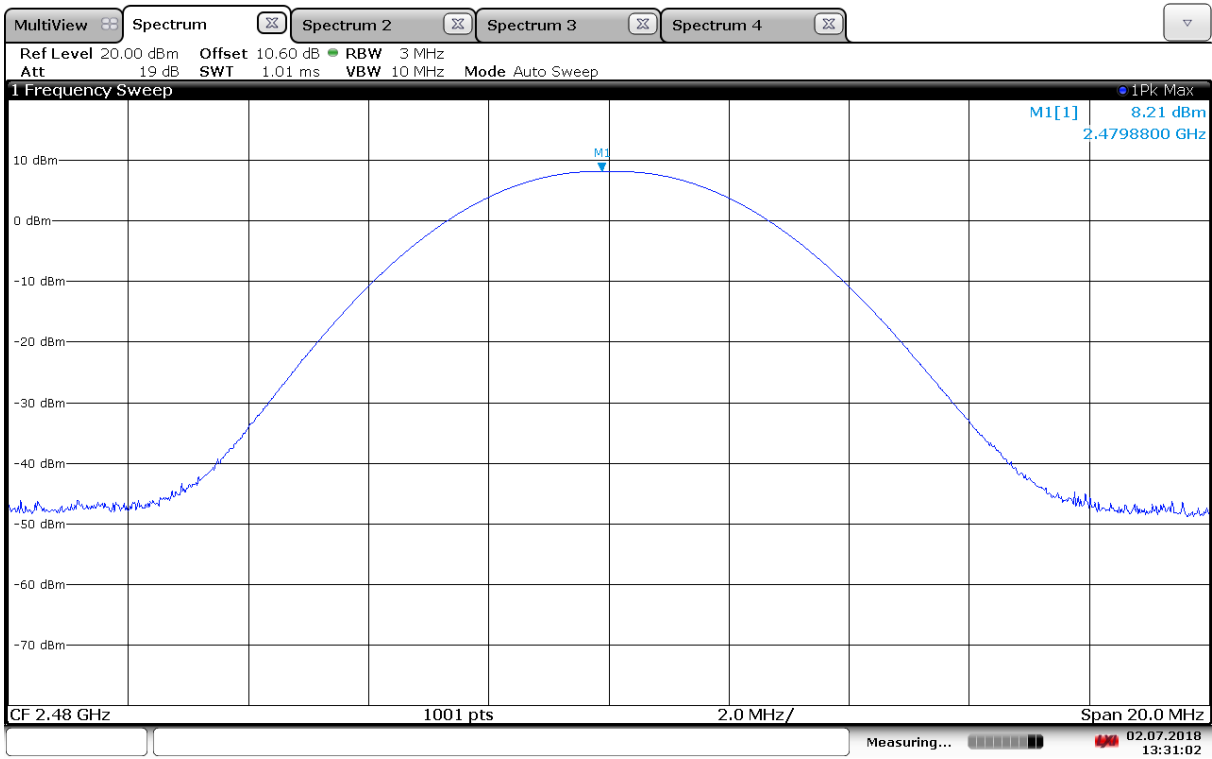


Conducted Power, 2441 MHz

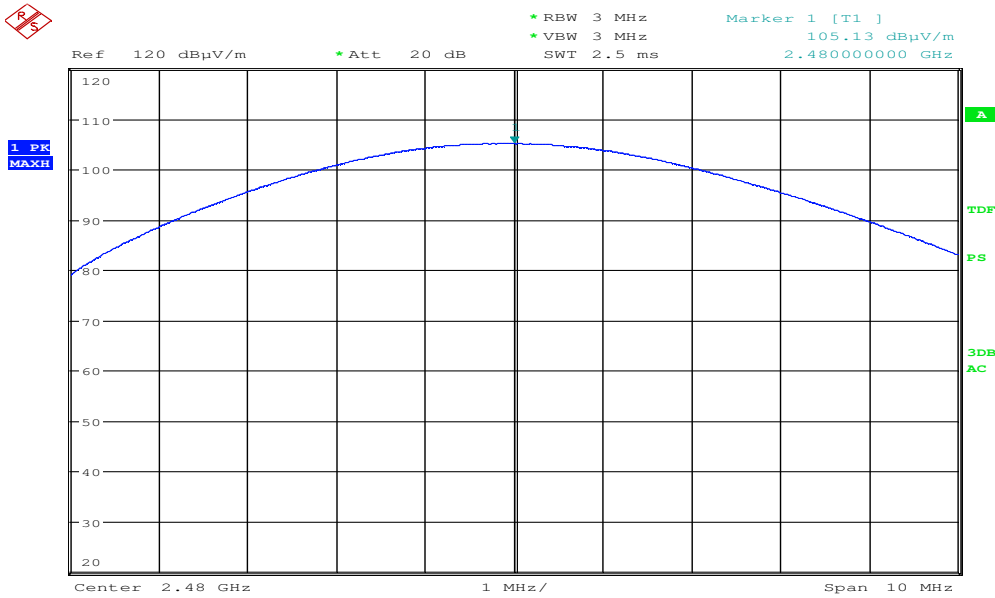


Date: 18.JUN.2018 14:41:55

Radiated Power, 2441 MHz



Conducted Power, 2480 MHz



Date: 18.JUN.2018 14:41:15

Radiated Power, 2480 MHz

3.7 Conducted Emissions at Antenna Connector

FCC Part 15.247 (d)

Test Results: Complies

Measurement Data:

| Carrier Frequency | Highest Value (dBc) | Margin (dB) | Verdict |
|-------------------|---------------------|-------------|---------|
| All | > 55 | > 35 | Pass |

Measured with Peak Detector

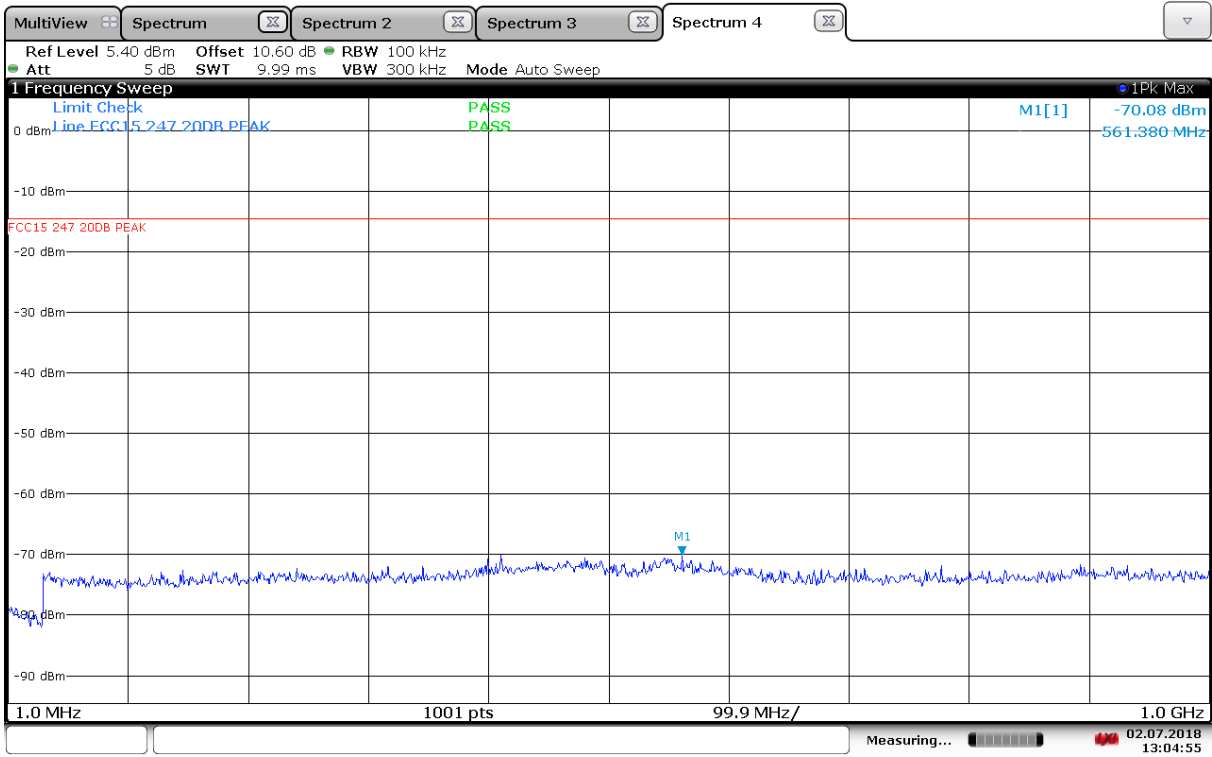
RF conducted power to 25 GHz: see attached plots.

Limit

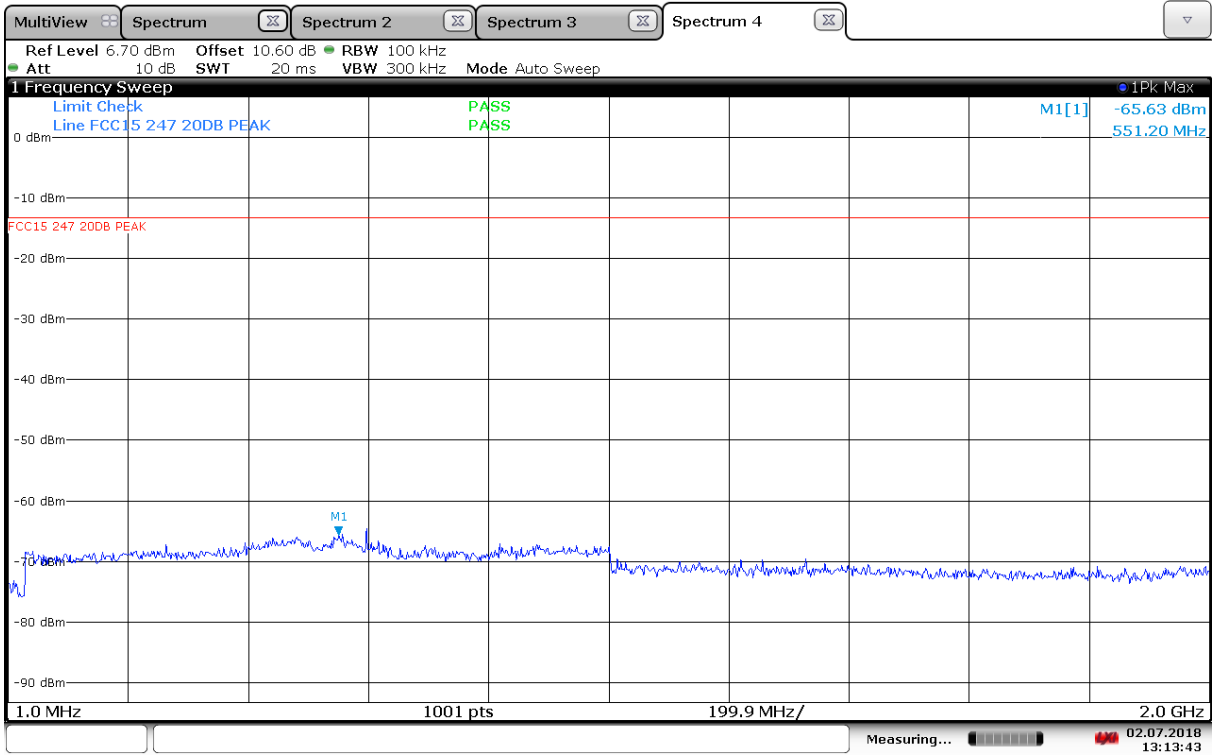
| Peak measurement | RMS averaging |
|-------------------------------------|-------------------------------------|
| 20 dBc or more in 100 kHz bandwidth | 30 dBc or more in 100 kHz bandwidth |

Detector type shall be the same as used for measuring Output Power.

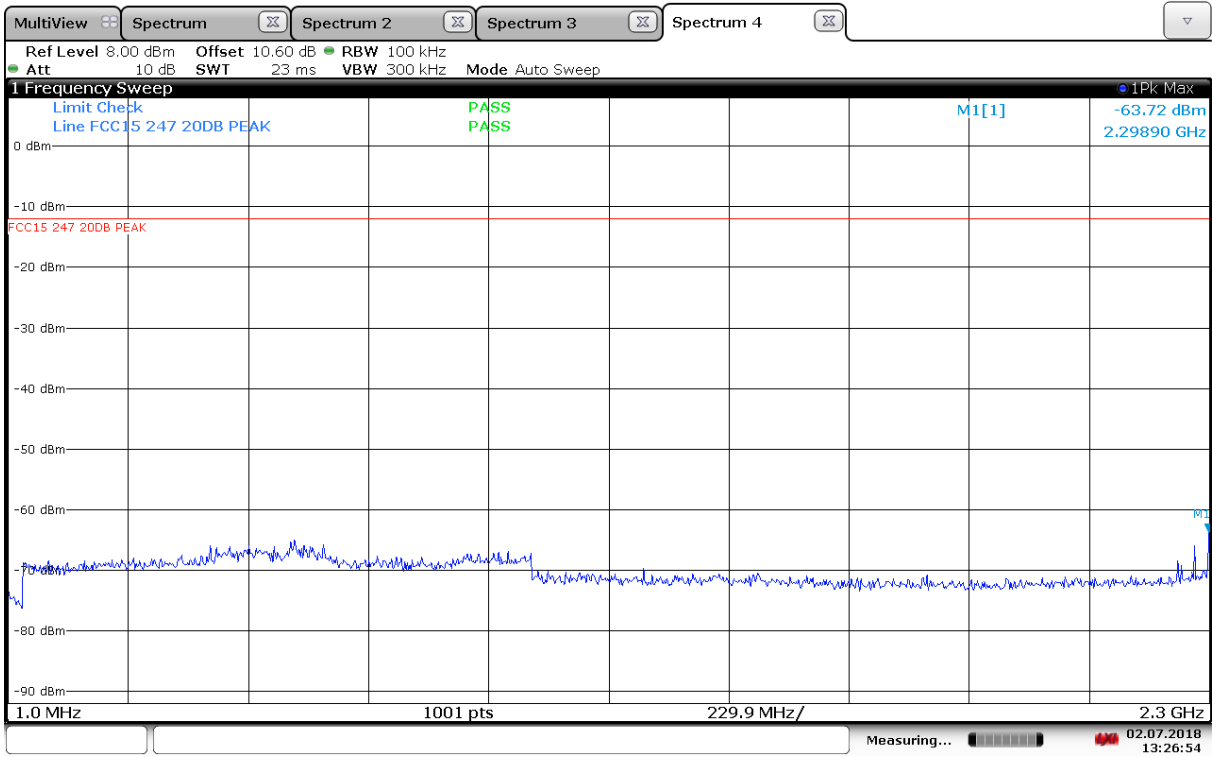
Attenuation below the general limits specified in part 15.209(a) is not required.



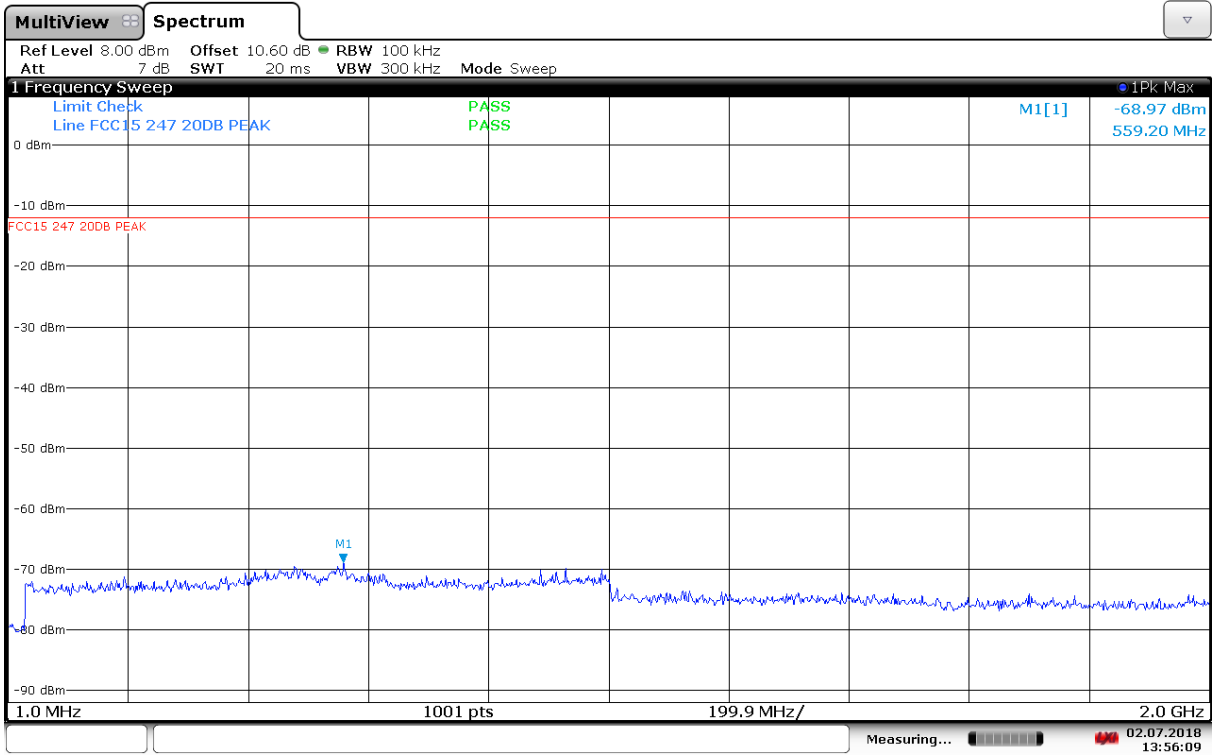
Conducted Emissions, 1 -2000MHz, ch00



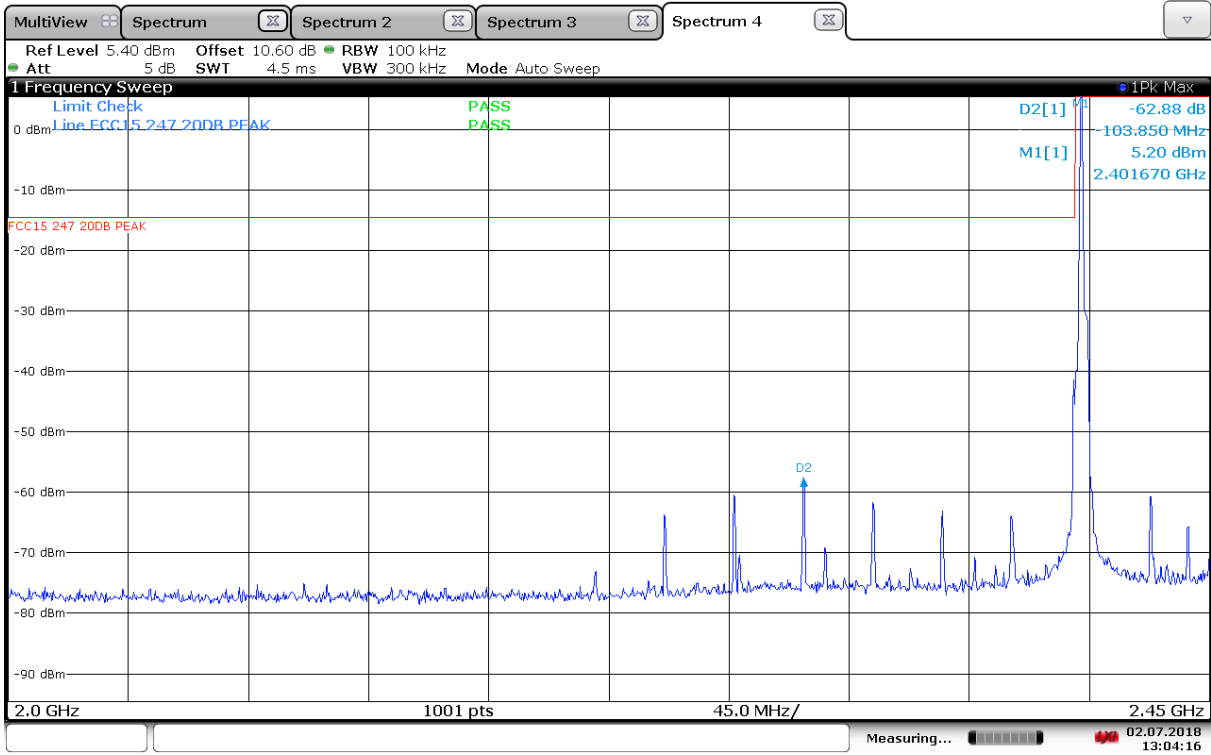
Conducted Emissions, 1 -2000MHz, ch39



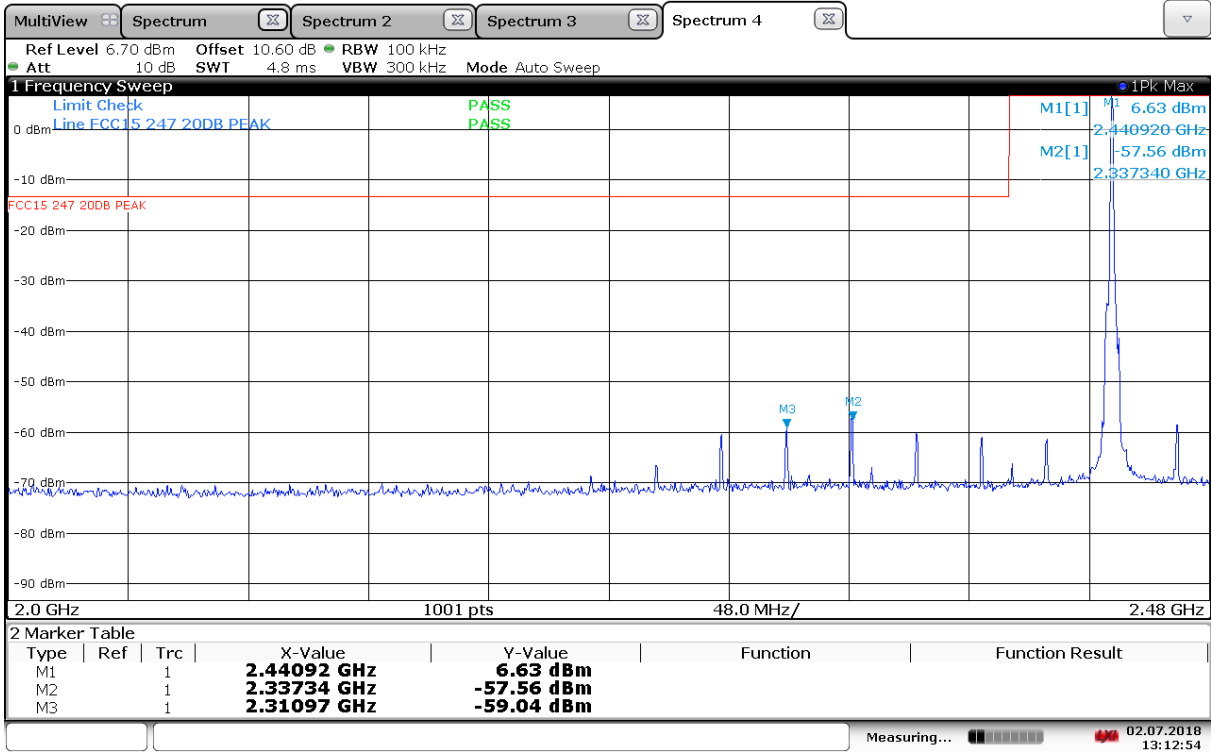
Conducted Emissions, 1 -2300MHz, ch78



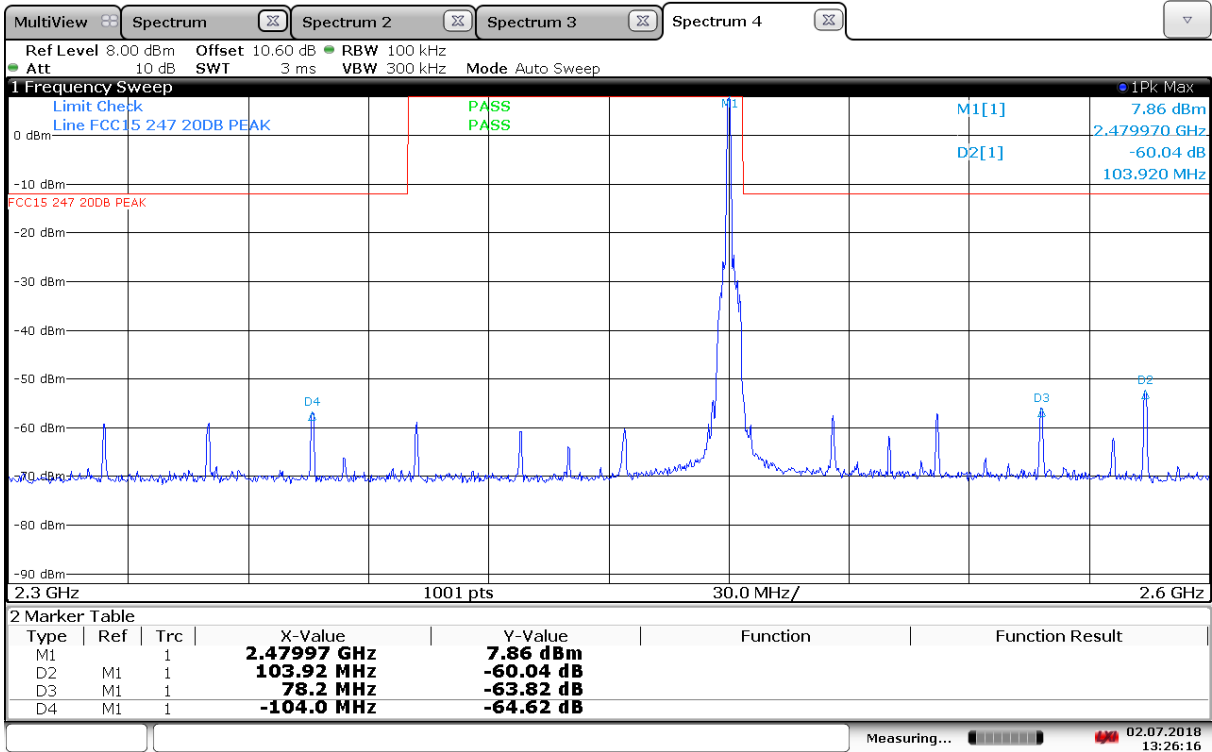
Conducted Emissions, 1 -2000MHz, Hopping



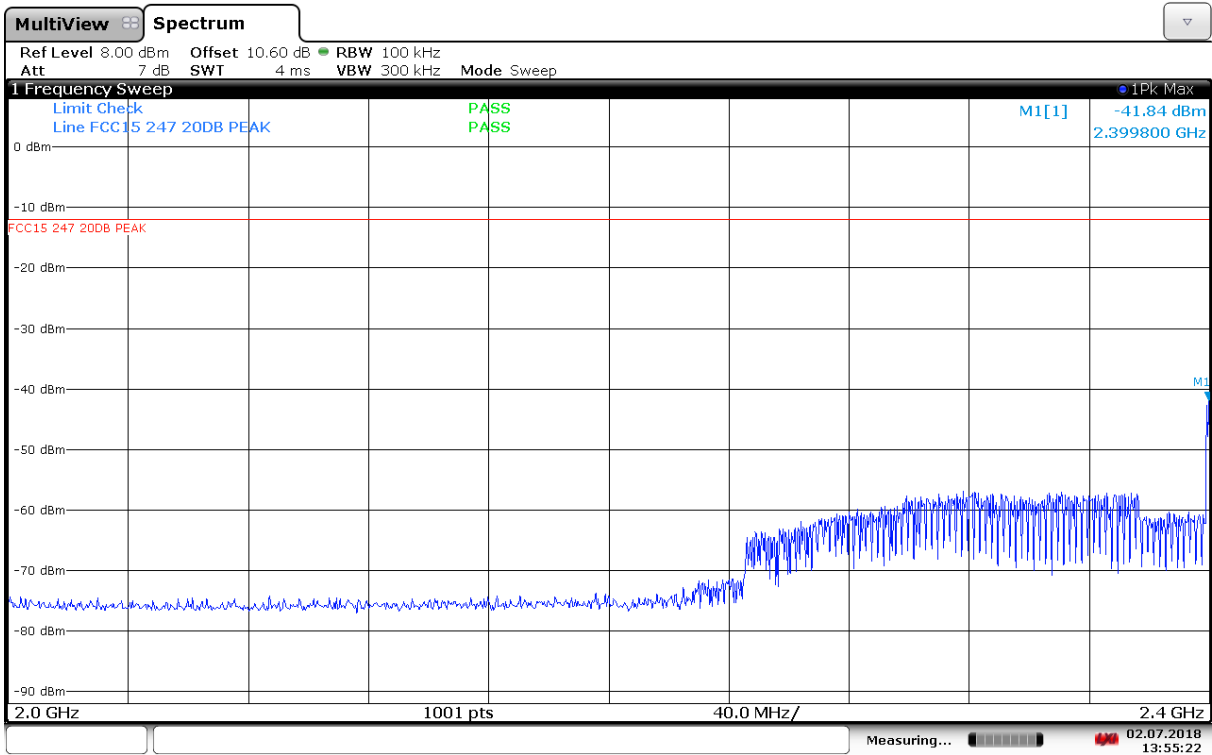
Conducted Emissions, 2000 -2450MHz, ch00



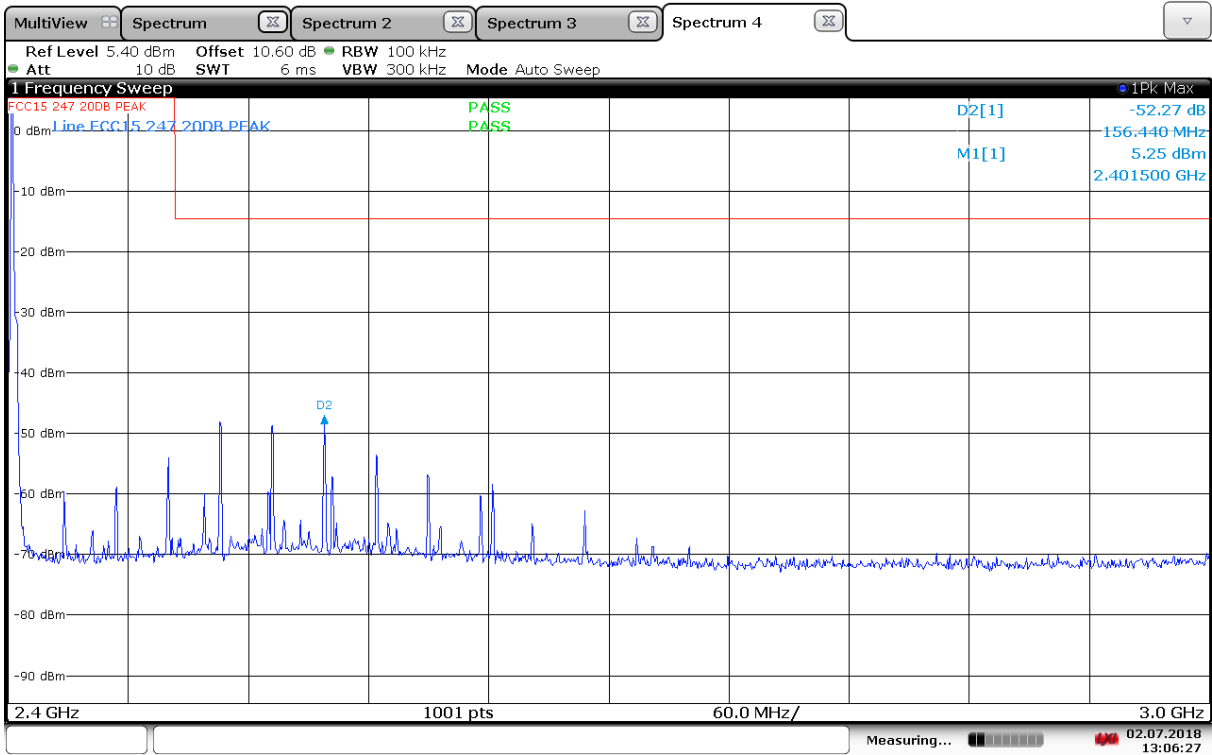
Conducted Emissions, 2000 -2480MHz, ch39



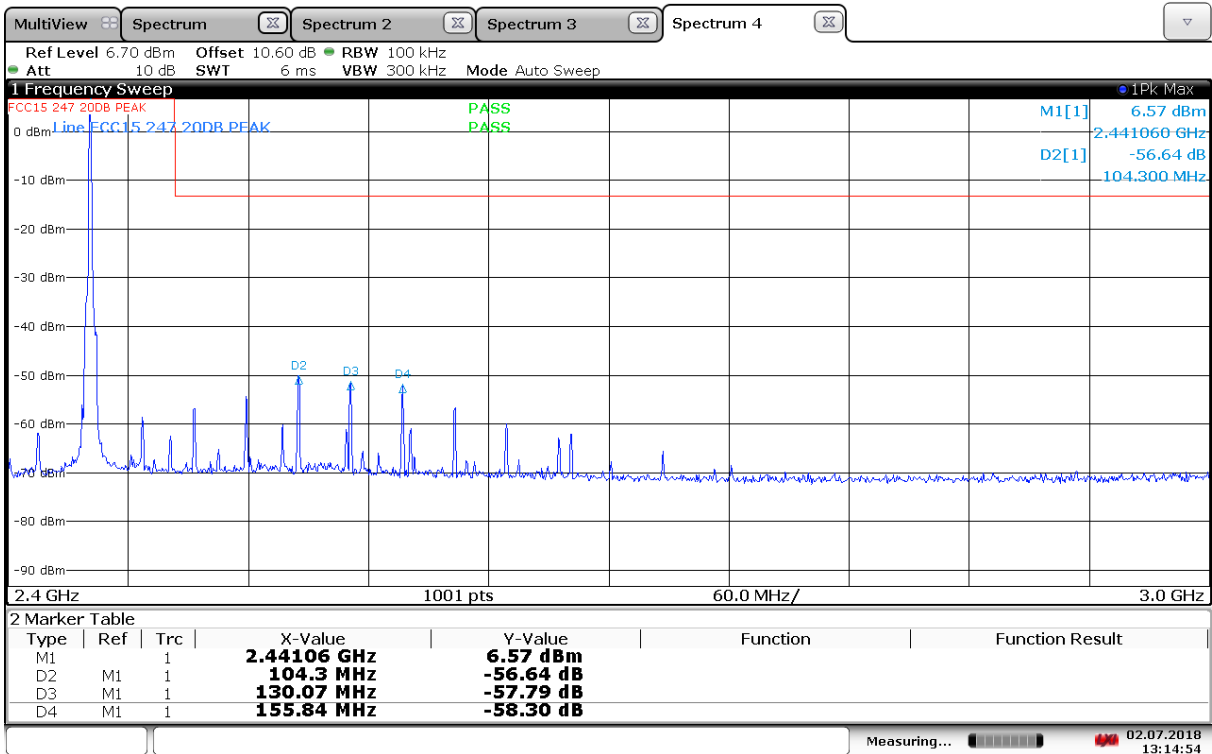
Conducted Emissions, 2300 -2600MHz, ch78



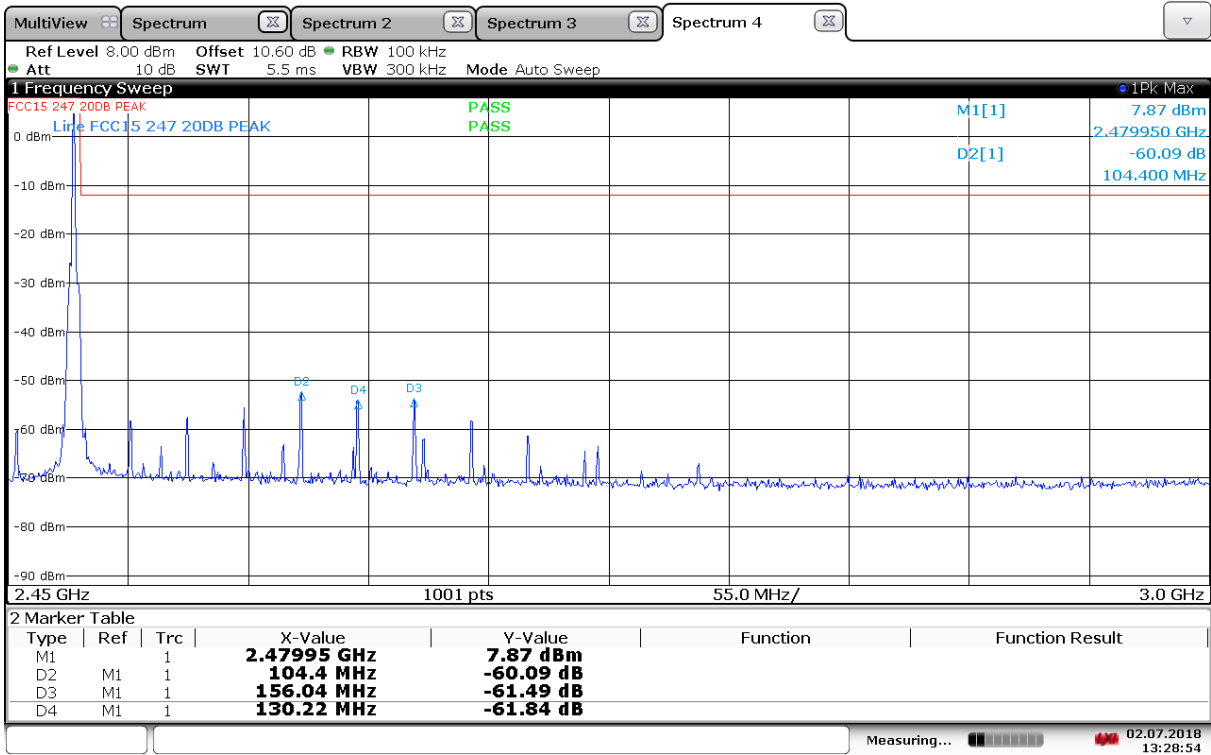
Conducted Emissions, 2000 -2400MHz, Hopping



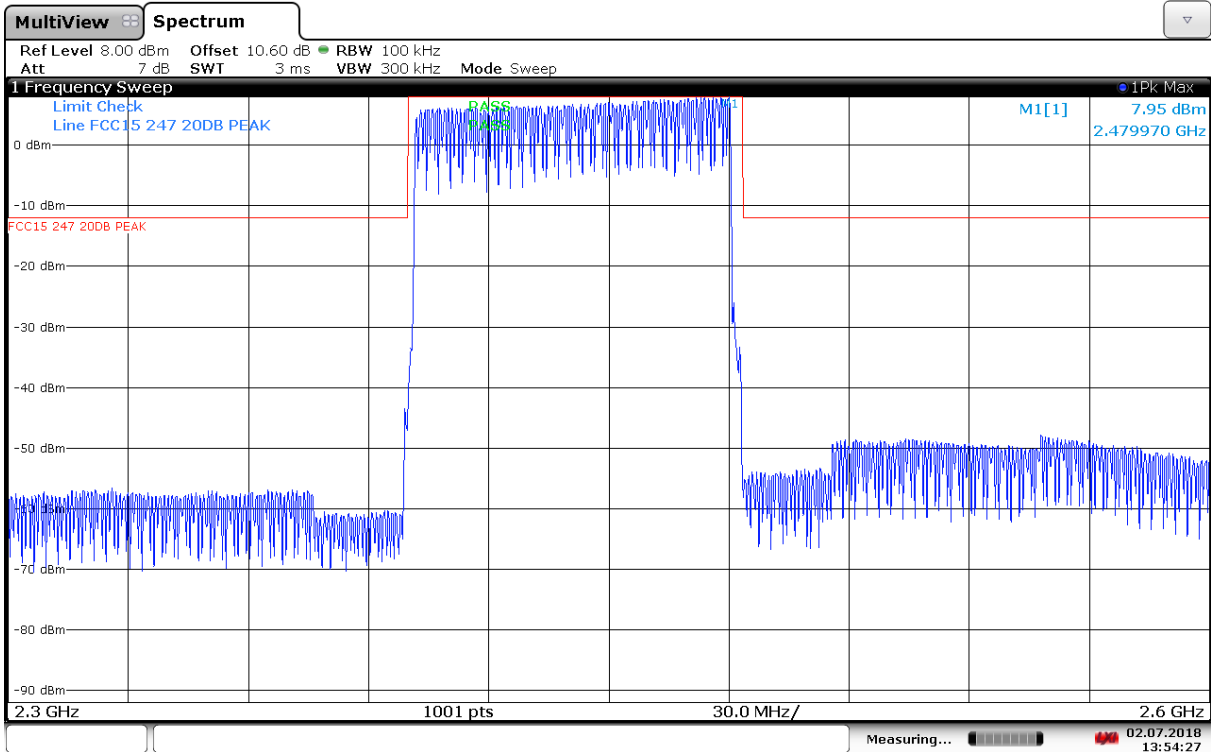
Conducted Emissions, 2400 -3000MHz, ch00



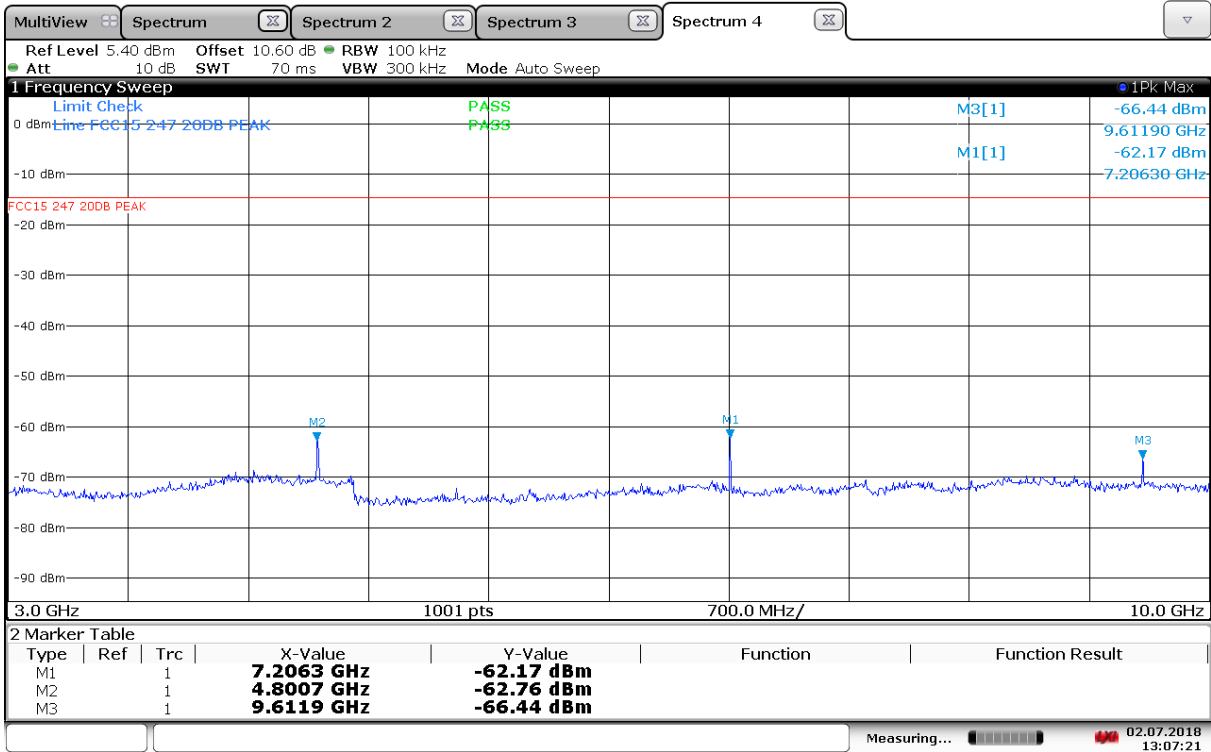
Conducted Emissions, 2400 -3000MHz, ch39



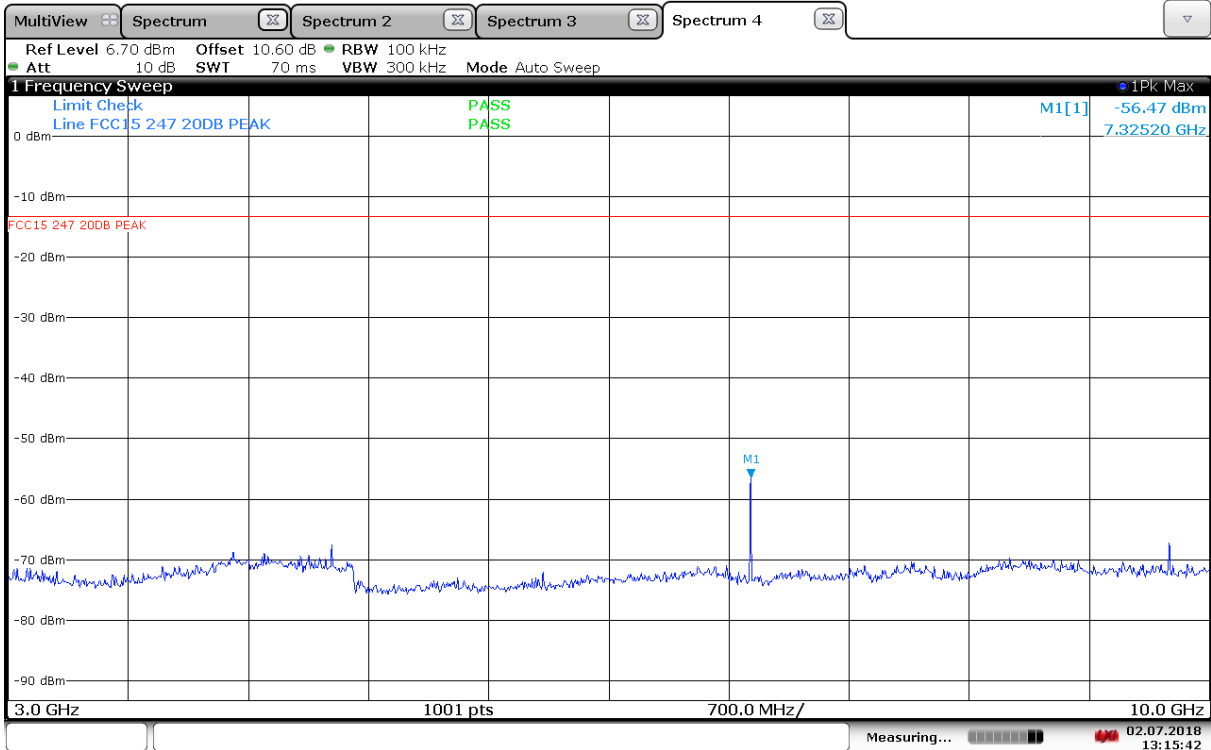
Conducted Emissions, 2450 -3000MHz, ch78



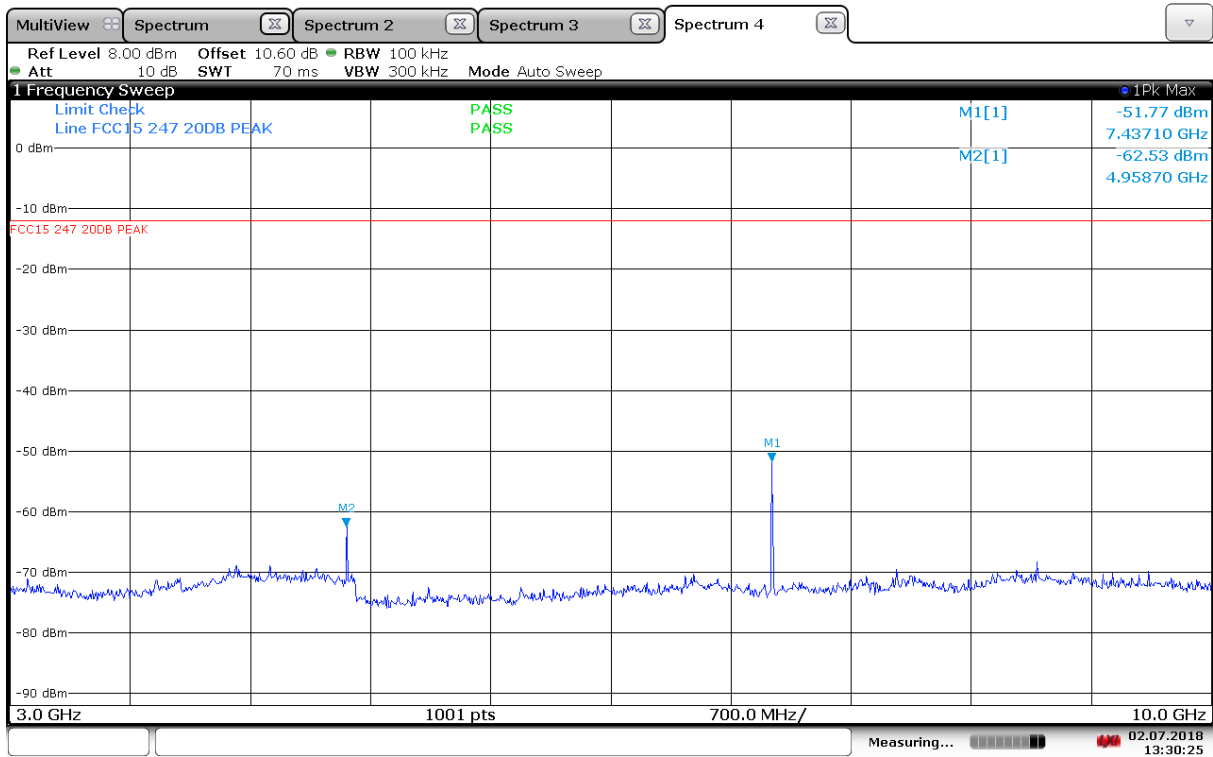
Conducted Emissions, 2300 -2600MHz, Hopping



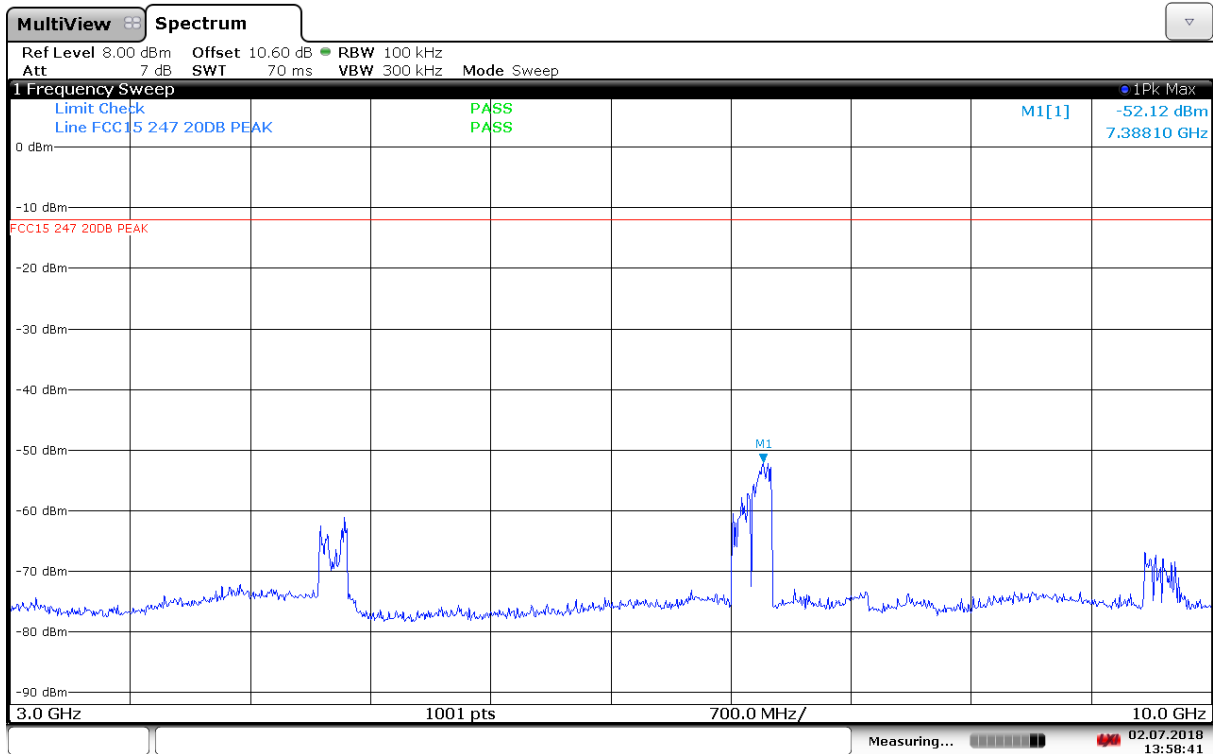
Conducted Emissions, 3000 -10000MHz, ch00



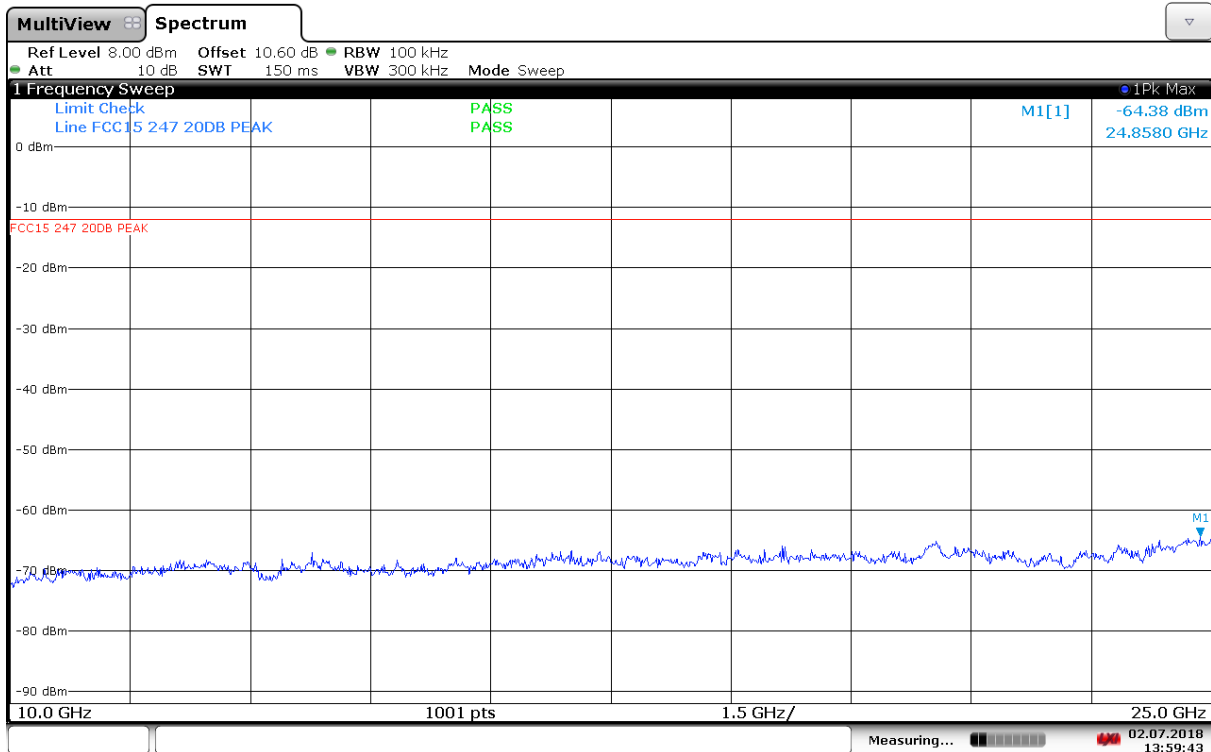
Conducted Emissions, 3000 -10000MHz, ch39



Conducted Emissions, 3000 -10000MHz, ch78



Conducted Emissions, 3000 -10000MHz, Hopping



Conducted Emissions, 10000 -25000MHz, Hopping

3.8 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED RSS-GEN, Issue 4 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 4, clause 8.9.

| FCC (MHz) | ISED (MHz) | FCC (GHz) | ISED (GHz) |
|-------------------------------------|--------------------|--------------------------------------|-------------------|
| 0.090-0.110 | | 0.96-1.24 1.3-1.427 | 0.96-1.427 |
| 0.495-0.505 | | 1.435-1.6265 | |
| 2.1735-2.1905 | | 1.6455-1.6465 | |
| | 3.020-3.026 | 1.660-1.710 | |
| 4.125-4.128 | | 1.7188-1.7222 | |
| 4.17725-4.17775 | | 2.2-2.3 | |
| 4.20725-4.20775 | | 2.31-2.39 | |
| | 5.677-5.683 | 2.4835-2.5 | |
| 6.215-6.218 | | 2.69-2.9 | 2.655-2.9 |
| 6.26775-6.26825 | | 3.26-3.267 | |
| 6.31175-6.31225 | | 3.332-3.339 | |
| 8.291-8.294 | | 3.3458-3.358 | |
| 8.362-8.366 | | 3.6-4.4 | 3.5-4.4 |
| 8.37625-8.38675 | | 4.5-5.15 | |
| 8.41425-8.41475 | | 5.35-5.46 | |
| 12.29-12.293 | | 7.25-7.75 | |
| 12.51975-12.52025 | | 8.025-8.5 | |
| 12.57675-12.57725 | | 9.0-9.2 | |
| 13.36-13.41 | | 9.3-9.5 | |
| 16.42-16.423 | | 10.6-12.7 | |
| 16.69475-16.69525 | | 13.25-13.4 | |
| 16.80425-16.80475 | | 14.47-14.5 | |
| 25.5-25.67 | | 15.35-16.2 | |
| 37.5-38.25 | | 17.7-21.4 | |
| 73-74.6 | | 22.01-23.12 | |
| 74.8-75.2 | | 23.6-24.0 | |
| 108-121.94 123-138 | 108-138 | 31.2-31.8 | |
| 149.9-150.05 | | 36.43-36.5 | |
| 156.52475-156.52525 | | Above 38.6 | |
| 156.7-156.9 | | | |
| 162.0125-167.17 | | | |
| 167.72-173.2 | | | |
| 240-285 | | | |
| 322-335.4 | | | |
| 399.9-410 | | | |
| 608-614 | | | |

Frequencies in **Bold** text are specific for FCC or ISED, all other frequencies are common.

3.9 Band Edge Emissions (Radiated)

FCC Part 15.209

Test Results: Complies

Measurement Data:

| | Calculated field strength (dB μ V/m) | | Limit dB | Margin dB | |
|------------------|------------------------------------------|------------|-------------|--------------|-----|
| | 2390 MHz | 2483.5 MHz | | dB | |
| Peak Detector | 45.9 | 64.1 | 74 | 28.1 | 9.9 |
| Average Detector | 25.9 | 44.1 | 54 | 28.1 | 9.9 |

Average Detector values are calculated from Peak Values.

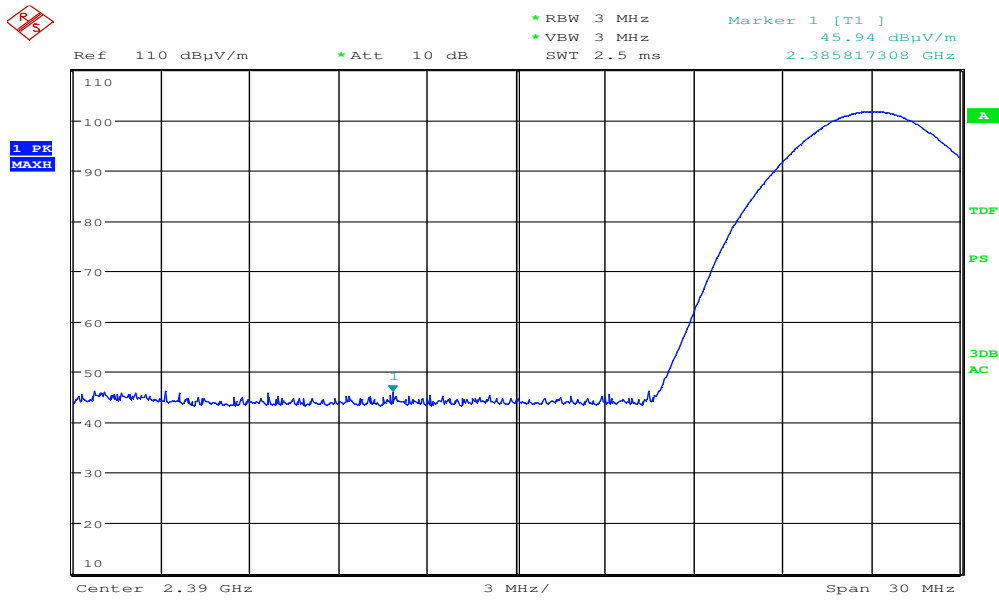
See attached plots.

Duty Cycle Correction Factor

Correction Factor = $-20 \times \log(\text{Burst Length} / (\text{Frame Length} * \text{Number of Hopping Channels}))$

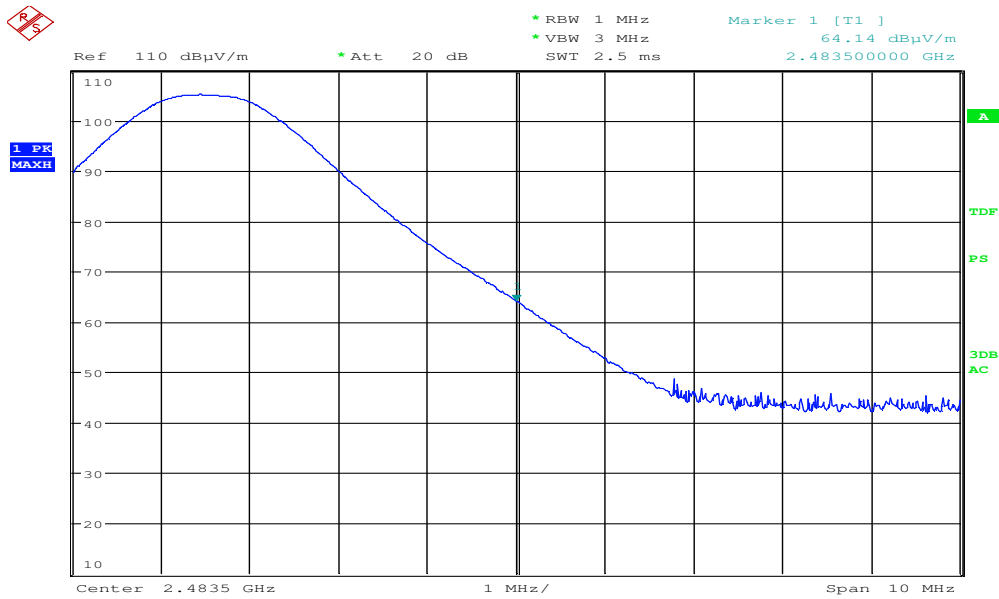
$$= -20 \times \log(2.91 / (3.76 * 20)) \text{ dB} = 28.25 \text{ dB}$$

Maximum Allowed Correction Factor = 20 dB



Date: 18.JUN.2018 14:44:02

Band Edge, Lower, Peak, 2402 MHz



Date: 18.JUN.2018 14:40:39

Band Edge, Upper, Peak, 2480 MHz

3.10 Radiated Emissions, below 1GHz

FCC 15.205, 15.209

ISED RSS-GEN, Issue 5, Clause 8.9

Test Results: Complies

Measuring distance 3m.

Measured with EUT in Hopping Mode.

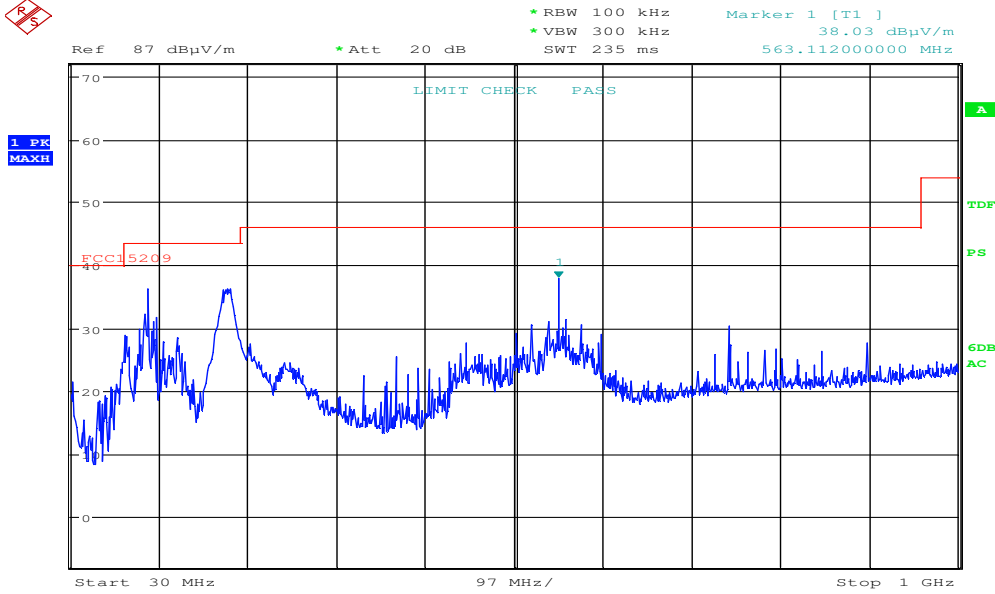
Measured values (QuasiPeak):

| Frequency (MHz) | Polarization | Height (cm) | Azimuth (deg) | Bandwidth (kHz) | Field Strength QP (dB μ V/m @3m) | Limit (dB μ V/m) | Margin (dB) |
|-----------------|--------------|-------------|---------------|-----------------|--------------------------------------|----------------------|-------------|
| 101.8 | VP | 114 | 270 | 120 | 28.1 | 43.5 | 15.4 |
| 115.7 | HP | 284 | 324 | 120 | 31.5 | 43.5 | 12.0 |
| 200.0 | HP | 177 | 109 | 120 | 34.8 | 43.5 | 8.7 |
| 562.5 | HP | 196 | 144 | 120 | 38.5 | 46.0 | 7.5 |

See attached plots.

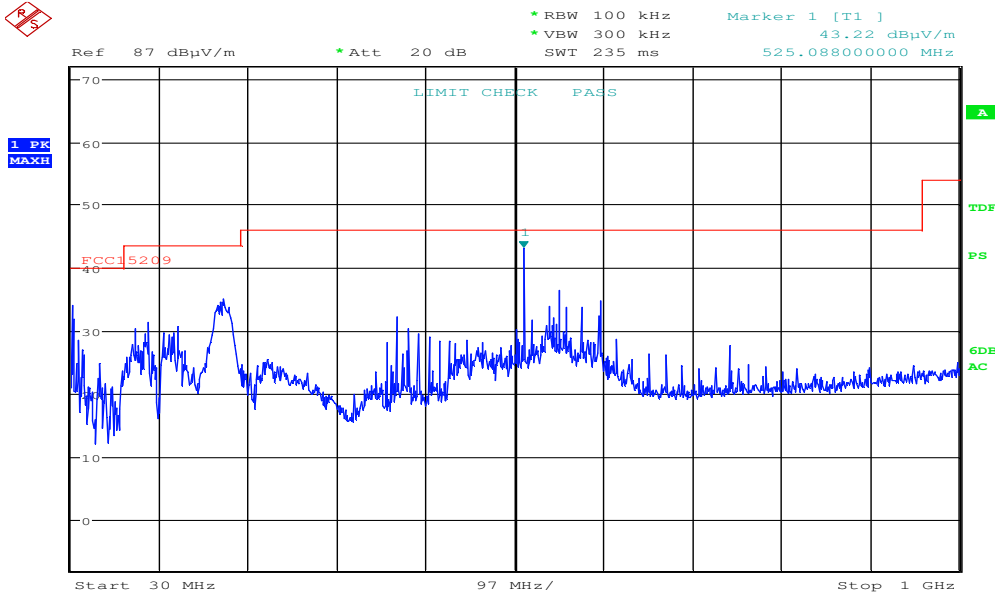
Requirements/Limit

| FCC | Part 15.209 @ frequencies defined in §15.205 | |
|-----------------------------------|------------------------------------------------------------------|---------------------------|
| ISED | RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10 | |
| Radiated emission limit @3 meters | | |
| Frequency (MHz) | Quasi Peak (μ V/m) | Quasi Peak (dB μ V/m) |
| 30 – 88 | 100 | 40.0 |
| 88 – 216 | 150 | 43.5 |
| 216 – 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |



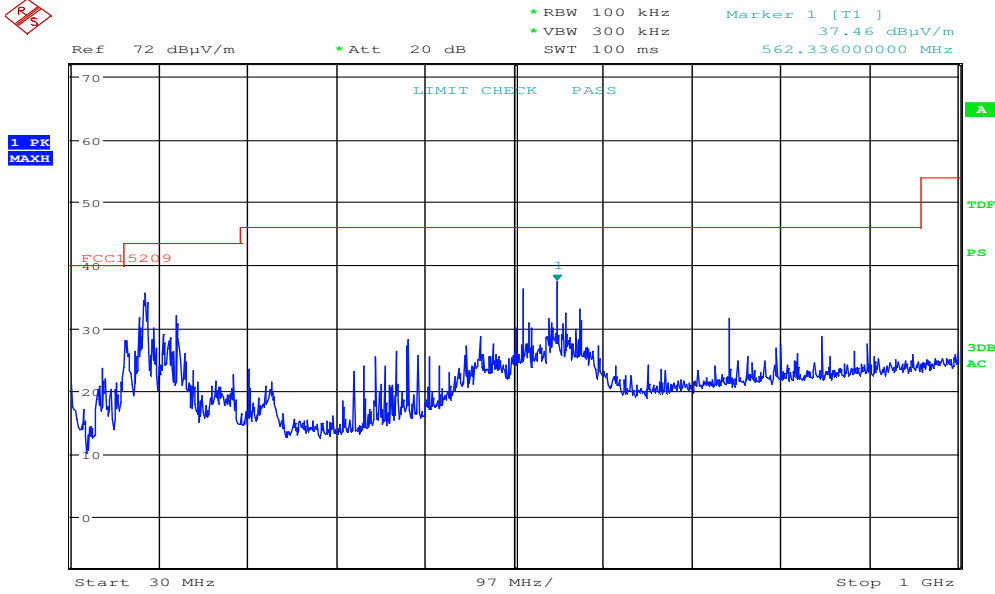
Date: 27.JUN.2018 09:57:52

Radiated Emissions, 30 -1000MHz, HP, Hopping ON, Power over Ethernet



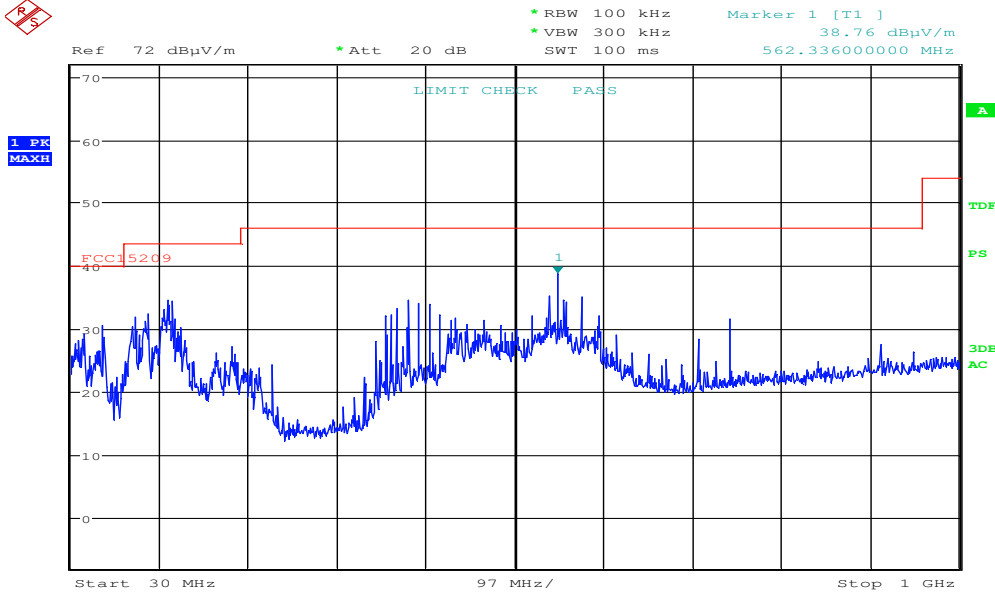
Date: 27.JUN.2018 09:55:46

Radiated Emissions, 30 -1000MHz, VP, Hopping ON, Power over Ethernet



Date: 27.JUN.2018 09:12:22

Radiated Emissions, 30 -1000MHz, HP, Hopping ON, AC Adaptor



Date: 27.JUN.2018 09:10:16

Radiated Emissions, 30 -1000MHz, VP, Hopping ON, AC Adaptor

3.11 Radiated Emissions, above 1GHz

FCC 15.205, 15.209

ISED RSS-GEN, Issue 5, Clause 8.9

Test Results: Complies

Measurement Data:

Radiated Emissions, 1-25 GHz

Measuring distance: 3m (1 – 18 GHz)
 1m (18 – 26 GHz)

A pre-scan was performed above 18 GHz and no spurious emissions were detected.

Measured values:

| Frequency (MHz) | Channel | Polarization | Max Peak (dB μ V/m) | Average (dB μ V/m) | Peak Margin (dB) | Av Margin (dB) |
|-----------------|---------|--------------|-------------------------|------------------------|------------------|----------------|
| 4804 | 00 | HP | 50.6 | 30.6 | 23.6 | 23.6 |
| 4882 | 39 | HP | 51.1 | 31.1 | 22.9 | 22.9 |
| 4960 | 78 | HP | 49.3 | 29.3 | 24.7 | 24.7 |

All emissions are below the Average Limit even when measured with Peak Detector.

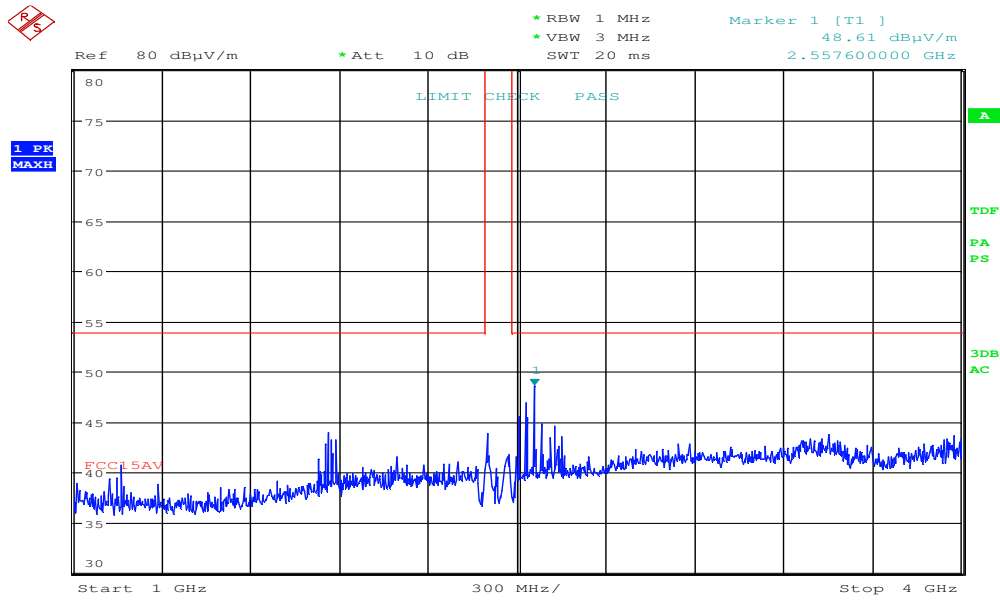
Average Values are calculated from Peak Values by Duty Cycle Correction Factor.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

See plots.

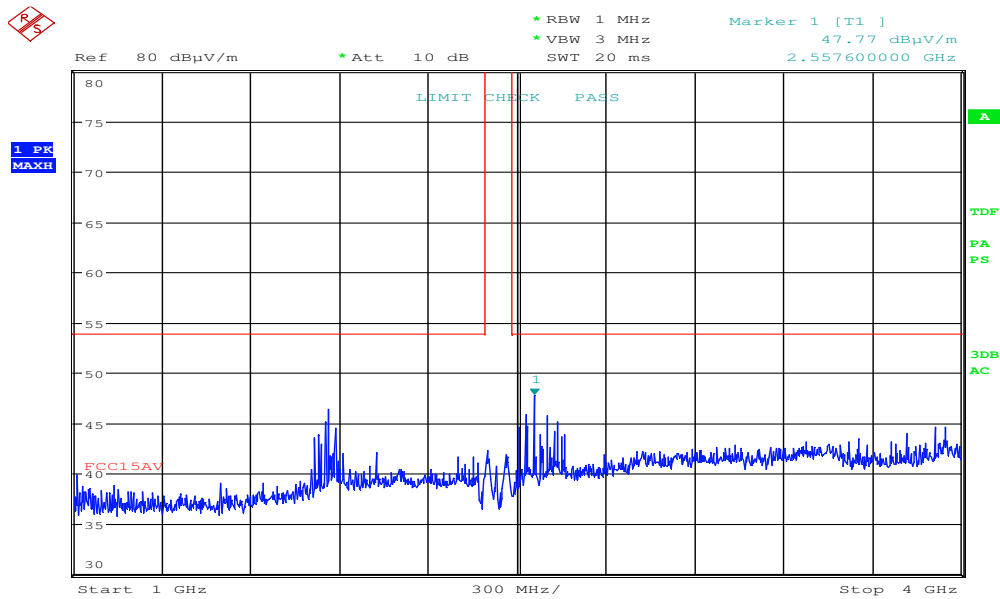
Requirements/Limit

| | | |
|-----------------|------------------------------------------------------------------|---------------------|
| FCC | Part 15.209 @ frequencies defined in §15.205 | |
| ISED | RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10 | |
| | Radiated emission limit @3 meters | |
| Frequency (MHz) | AV (dB μ V/m) | Peak (dB μ V/m) |
| Above 1 GHz | 54.0 | 74.0 |



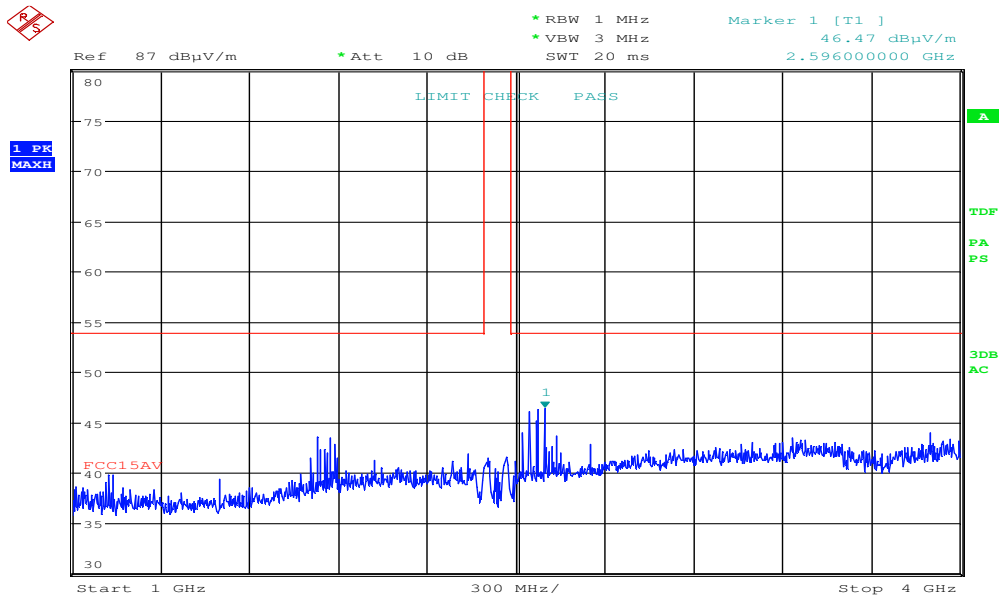
Date: 18.JUN.2018 14:30:39

Radiated Emissions, 1000 -4000 MHz, ch00, HP



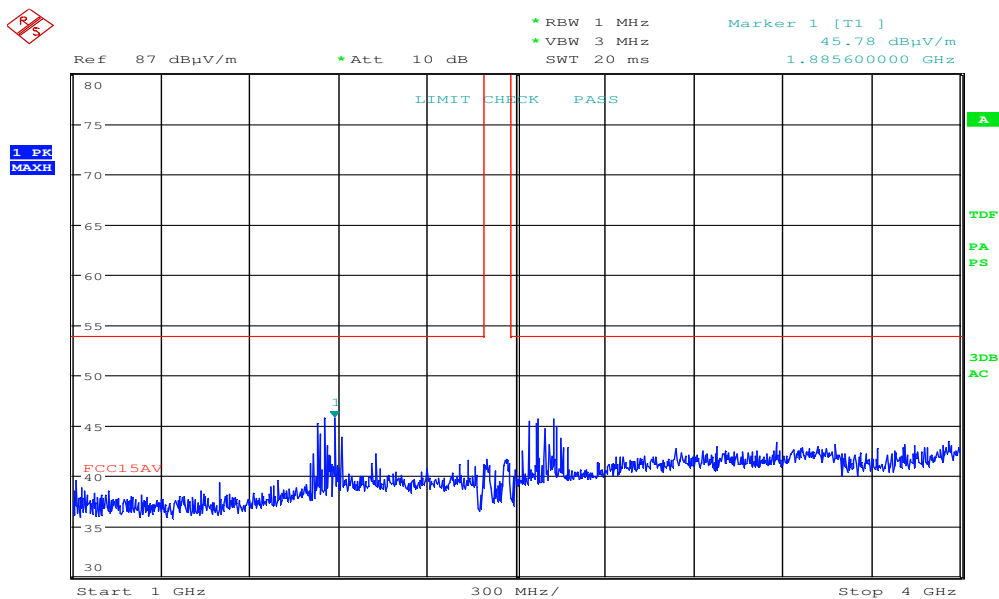
Date: 18.JUN.2018 14:28:44

Radiated Emissions, 1000 -4000 MHz, ch00, VP



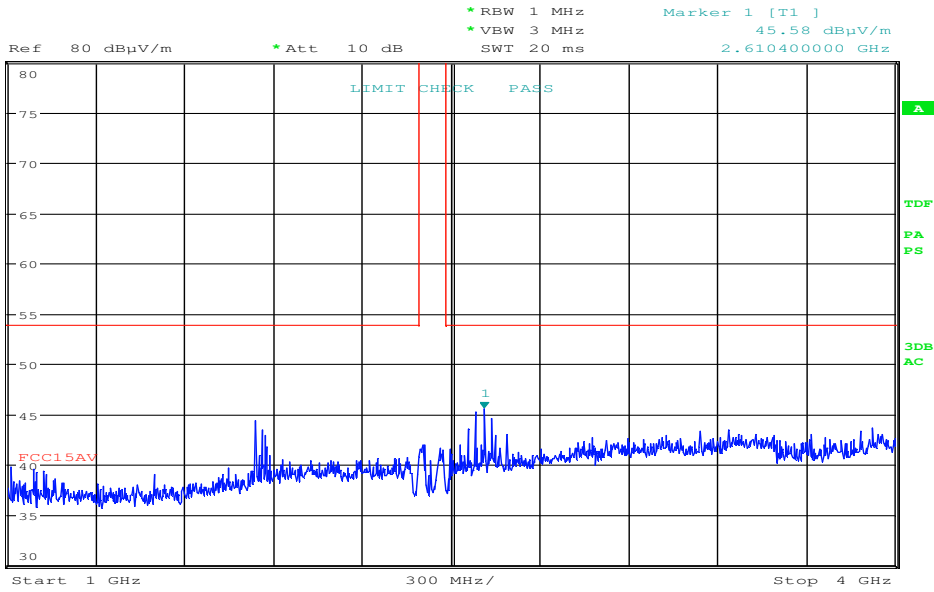
Date: 18.JUN.2018 14:26:16

Radiated Emissions, 1000 -4000 MHz, ch39, HP



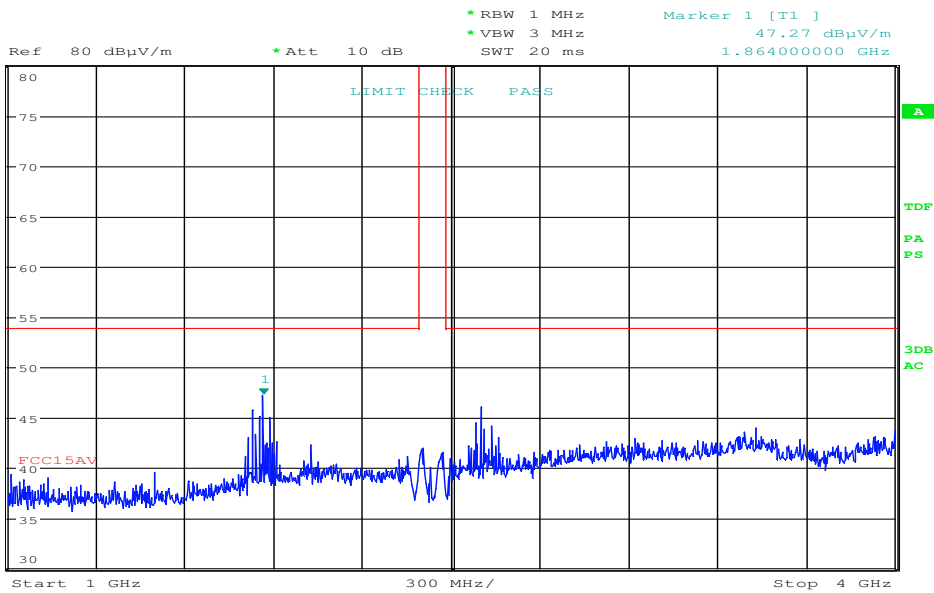
Date: 18.JUN.2018 14:24:21

Radiated Emissions, 1000 -4000 MHz, ch39, VP



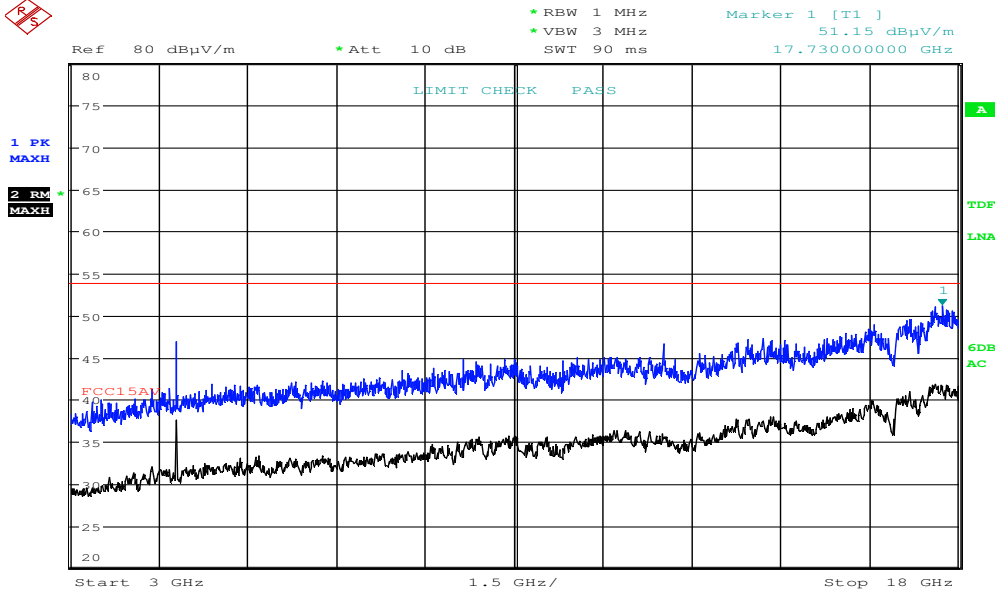
Date: 18.JUN.2018 14:35:51

Radiated Emissions, 1000 -4000 MHz, ch78, HP



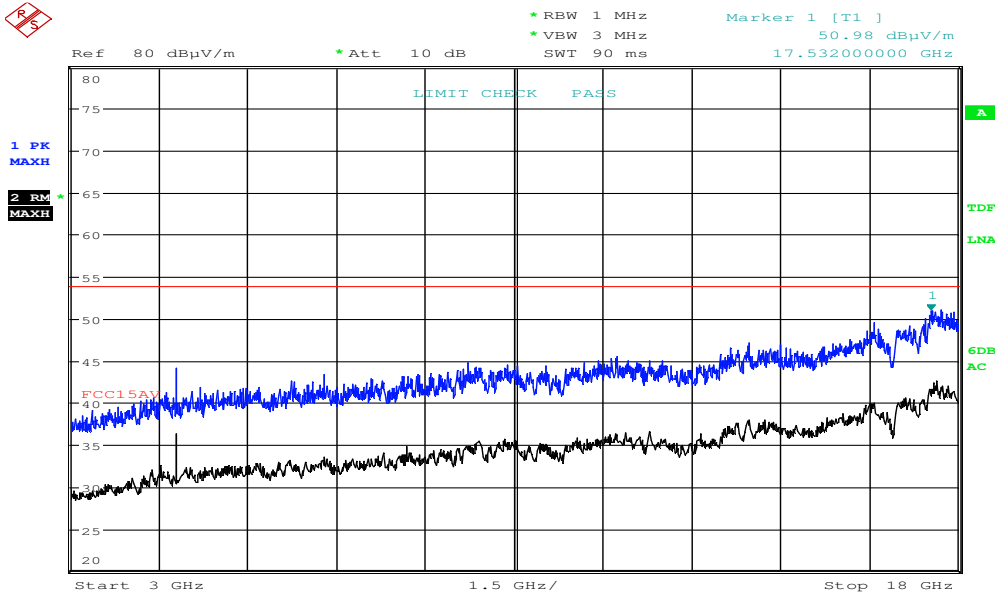
Date: 18.JUN.2018 14:33:55

Radiated Emissions, 1000 -4000 MHz, ch78, VP



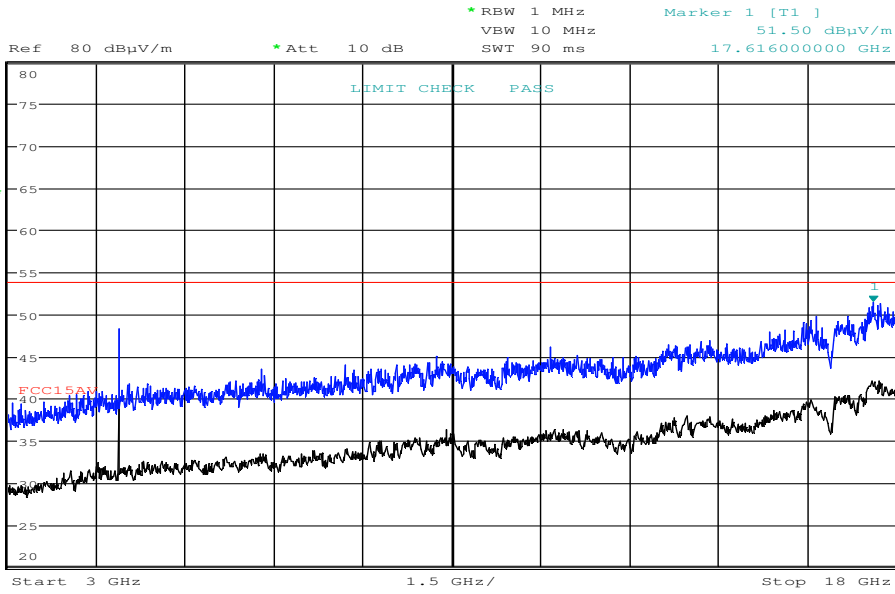
Date: 27.JUN.2018 13:14:58

Radiated Emissions, 3000 -18000 MHz, ch00, HP



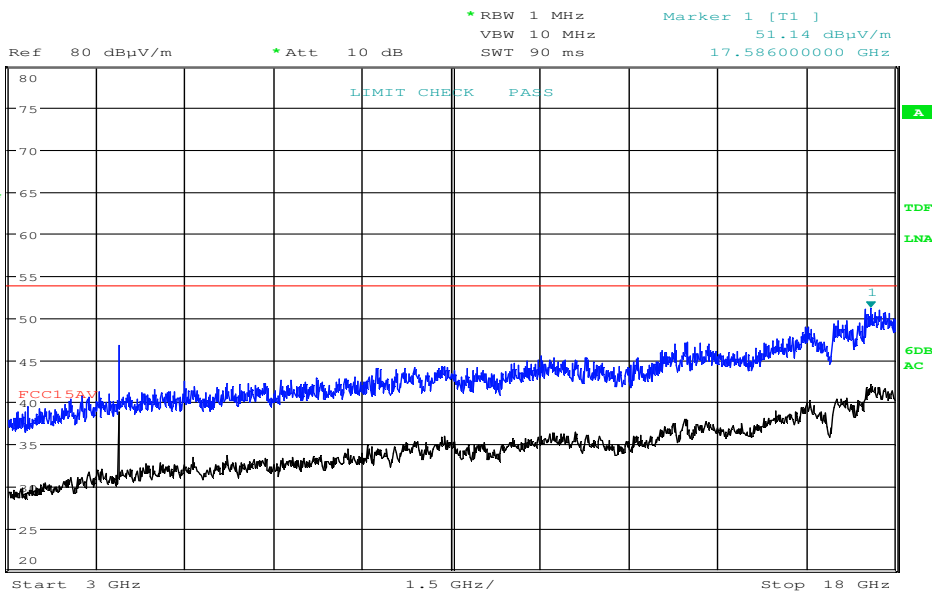
Date: 27.JUN.2018 13:13:03

Radiated Emissions, 3000 -18000 MHz, ch00, VP



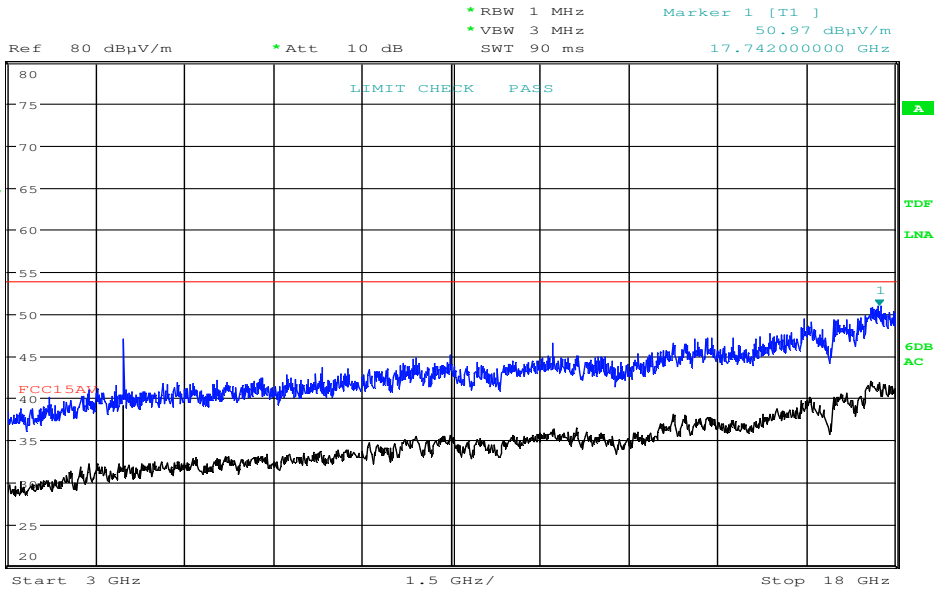
Date: 27.JUN.2018 13:08:09

Radiated Emissions, 3000 -18000 MHz, ch39, HP



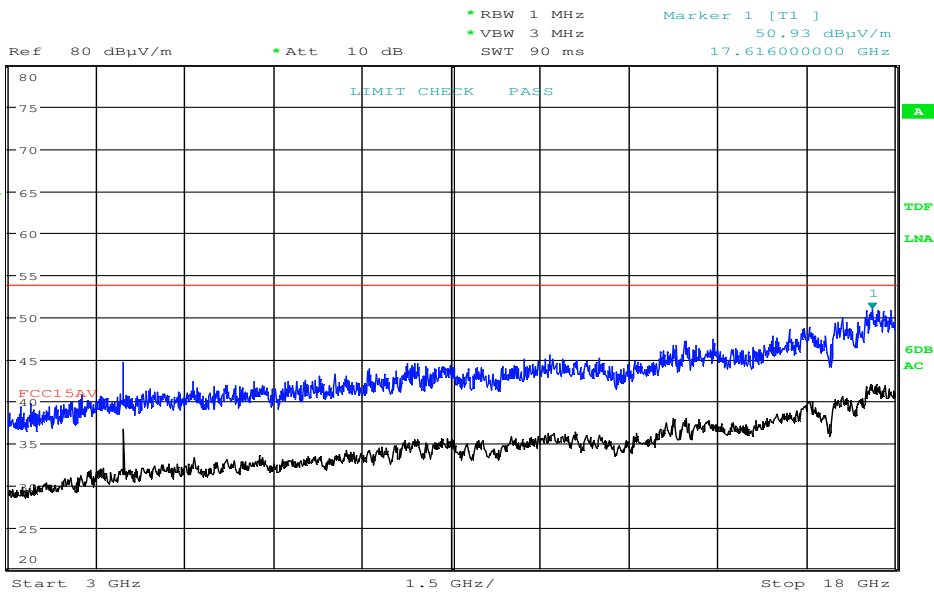
Date: 27.JUN.2018 13:05:48

Radiated Emissions, 3000 -18000 MHz, ch39, VP



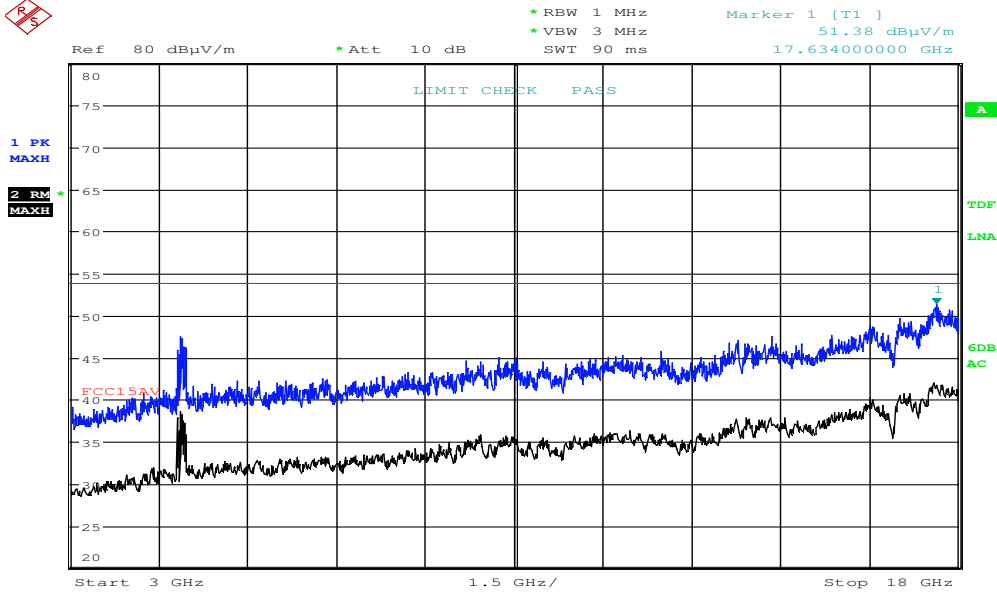
Date: 27.JUN.2018 13:19:58

Radiated Emissions, 3000 -18000 MHz, ch78, HP



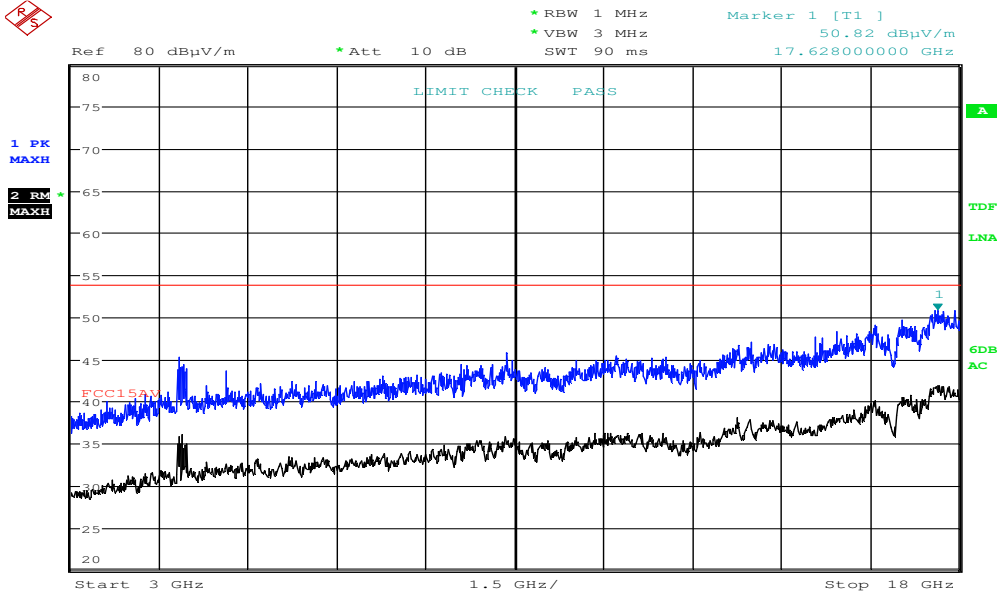
Date: 27.JUN.2018 13:18:05

Radiated Emissions, 3000 -18000 MHz, ch78, VP



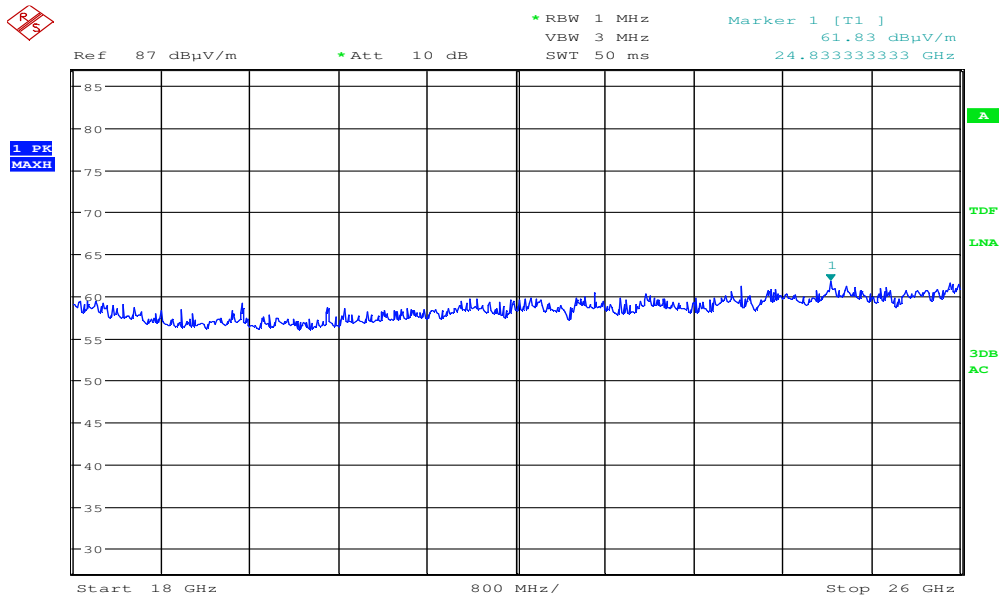
Date: 27.JUN.2018 12:51:14

Radiated Emissions, 3000 -18000 MHz, Hopping, HP



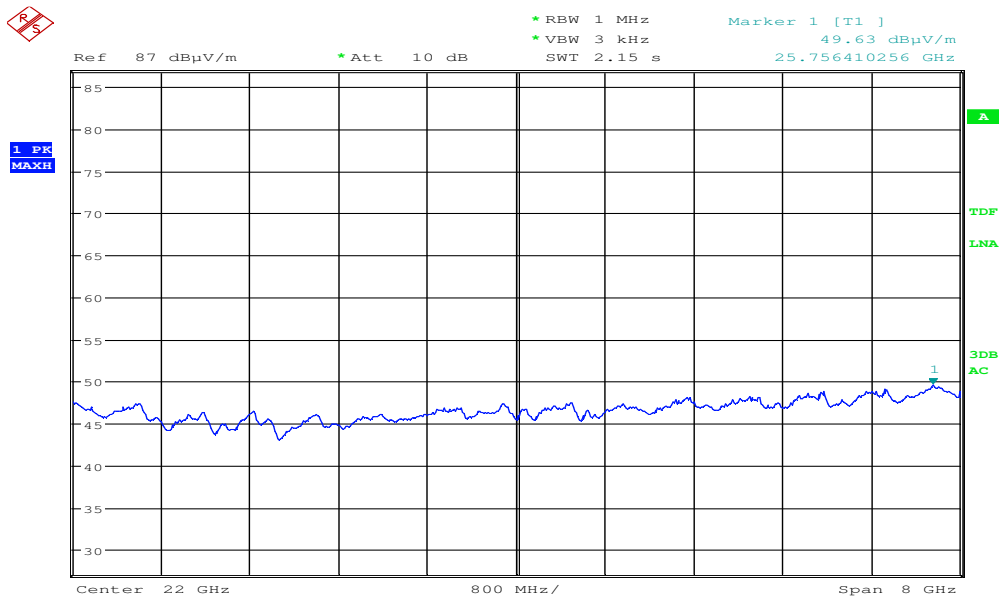
Date: 27.JUN.2018 12:46:39

Radiated Emissions, 3000 -18000 MHz, Hopping, VP



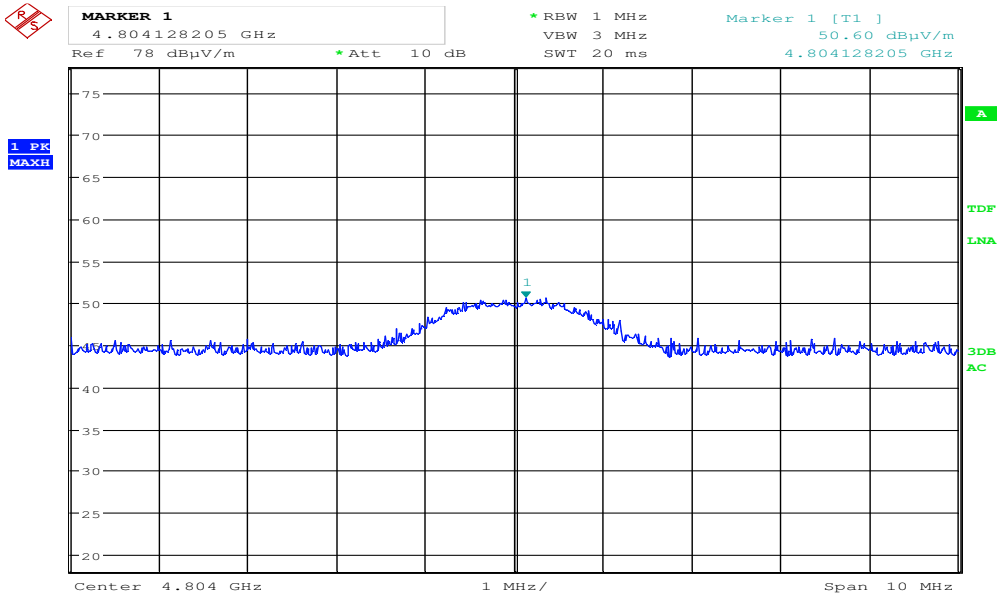
Date: 27.JUN.2018 14:07:52

Pre-scan, 18000 -26000 MHz, ch39, Peak



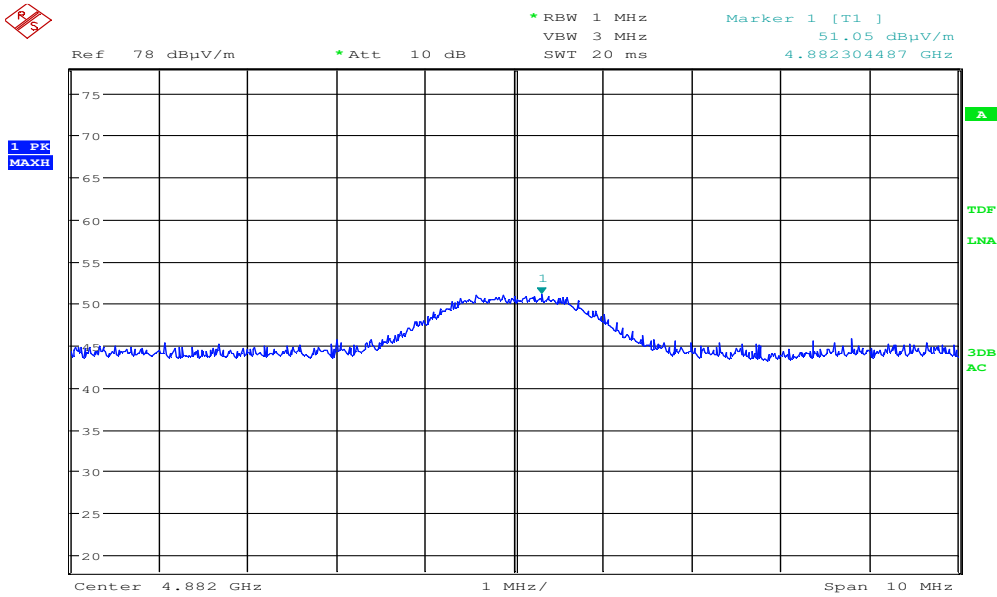
Date: 27.JUN.2018 14:09:40

Pre-scan, 18000 -26000 MHz, ch39, Av



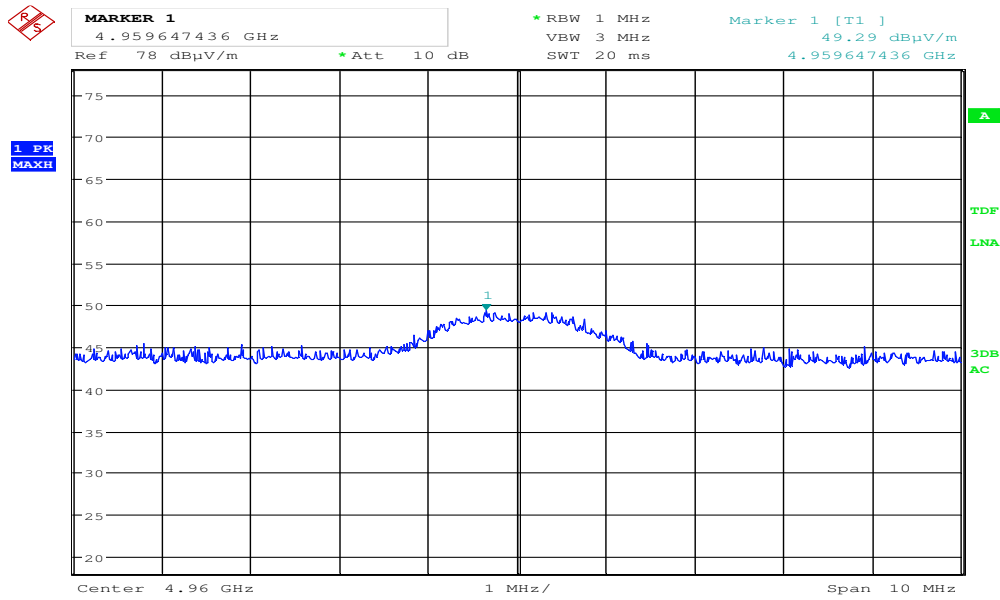
Date: 27.JUN.2018 14:53:46

Radiated Emissions, 4804 MHz, ch00, Pk, Max



Date: 27.JUN.2018 14:49:00

Radiated Emissions, 4882 MHz, ch39, Pk, Max



Date: 27.JUN.2018 14:54:35

Radiated Emissions, 4960 MHz, ch78, Pk, Max

4 Measurement Uncertainty

| Measurement Uncertainty Values | | |
|----------------------------------|-----------|----------------|
| Test Item | | Uncertainty |
| Output Power | | ±0.5 dB |
| Power Spectral Density | | ±0.5 dB |
| Out of Band Emissions, Conducted | < 3.6 GHz | ±0.6 dB |
| | > 3.6 GHz | ±0.9 dB |
| Spurious Emissions, Radiated | < 1 GHz | ±2.5 dB |
| | > 1 GHz | ±2.2 dB |
| Emission Bandwidth | | ±4 % |
| Power Line Conducted Emissions | | +2.9 / -4.1 dB |
| Spectrum Mask Measurements | Frequency | ±5 % |
| | Amplitude | ±1.0 dB |
| Frequency Error | | ±0.6 ppm |
| Temperature Uncertainty | | ±1 °C |

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

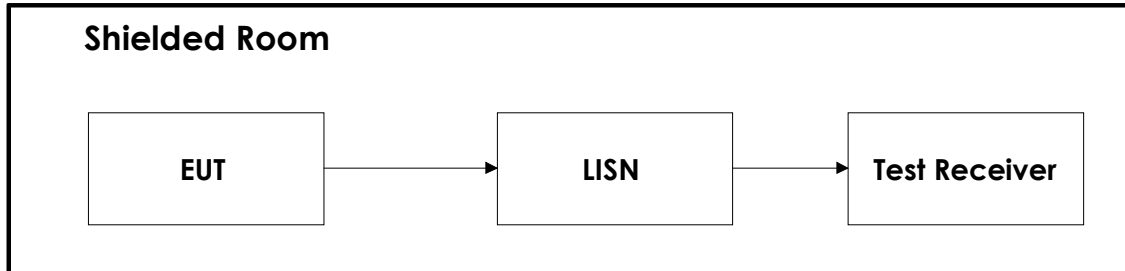
| No. | Model | Description | Manufacturer | Asset no. | Cal. date | Cal. Due |
|-----|----------------|--------------------------|-------------------|-------------------|-----------|----------|
| 1 | FSW40 | Spectrum Analyzer | Rohde & Schwarz | LR 1690 | 2018.01 | 2019.01 |
| 2 | ESU40 | Measuring Receiver | Rohde & Schwarz | LR 1639 | 2018.03 | 2019.03 |
| 3 | 6HC3000/18000 | Highpass Filter | Trilithic | LR 1614 | COU | |
| 4 | 310 | Preamplifier | Sonoma Instrument | LR 1686 | 2017.08 | 2018.08 |
| 5 | 317 | Preamplifier | Sonoma Instrument | LR 1687 | 2017.08 | 2018.08 |
| 6 | 8449A | Pre-amplifier | Hewlett Packard | LR 1322 | 2017.08 | 2018.08 |
| 7 | 6812B | AC Power Source | Agilent | LR 1515 | COU | |
| 8 | 3115 | Horn Antenna | EMCO | LR 1330 | 2016.10 | 2021.10 |
| 9 | 3117-PA | Horn Antenna with Preamp | EMCO | LR 1717 | 2017.12 | 2018.12 |
| 10 | JB3 | BiLog Antenna | Sunol | N-4525 | 2017.11 | 2020.11 |
| 11 | 638 | Antenna Horn | Narda | LR 1480 | 2010.06 | 2020.06 |
| 12 | Model 87 V | Multimeter | Fluke | N-4669 | 2016.10 | 2018.10 |
| 13 | ST8/SMAm/Nm/36 | RF Cable | Suhner | LR 1630 | COU | |
| 14 | Prosafe FS108P | 10/100 Switch with PoE | Netgear | SN: 2HK11B3W00AB8 | N/A | |

COU = Calibrate on use

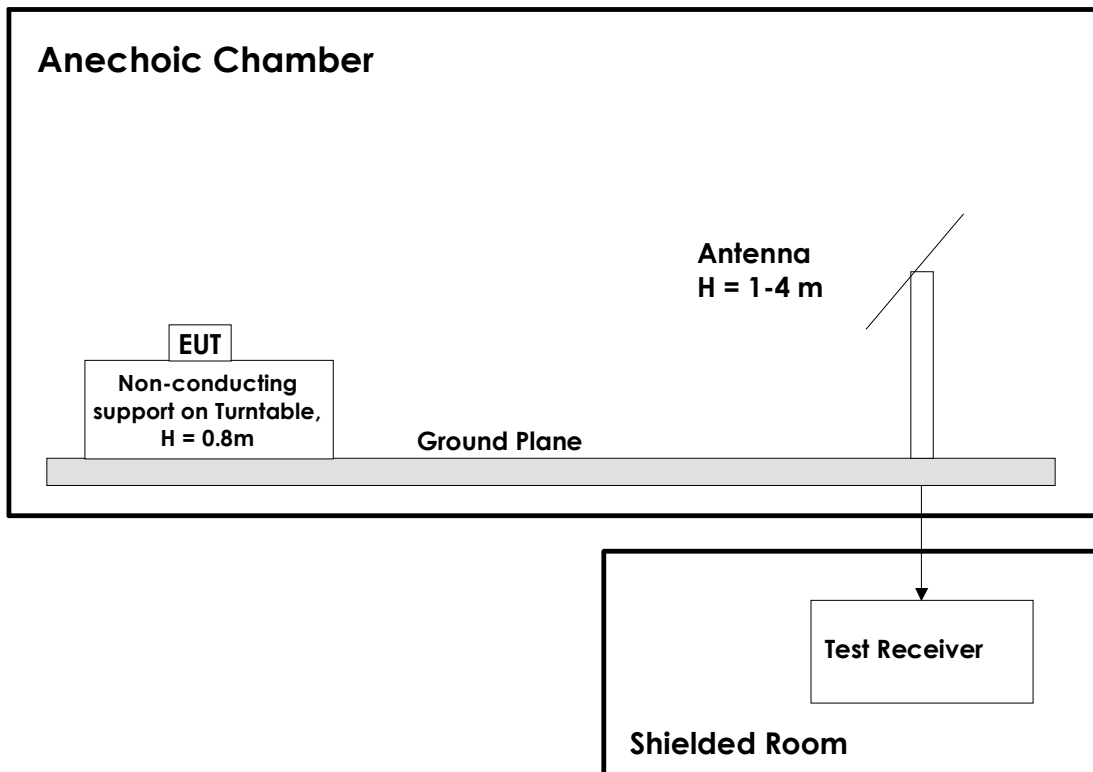
| Test Software List | | | |
|----------------------------------|-----------------|-------|----------|
| Description | Manufacturer | Model | Version |
| EMC Software for Conducted tests | Rohde & Schwarz | EMC32 | 10.20.01 |
| EMC Software for Radiated tests | Rohde & Schwarz | EMC32 | 10.20.01 |
| | | | |

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



All tests below 1 GHz were performed at 3m with ground plane. The EUT was placed on the stand at 0.8m height.

Tests above 1 GHz were performed with the space between the EUT and the antenna covered by absorbers. The EUT was placed on a 1.5m high stand. Tests from 1 GHz to 18 GHz were performed @3m distance. Tests above 18 GHz were performed @1m distance.

The antenna was raised from 1 to 4m and the turntable rotated from 0 to 360 degrees to maximize any emissions found.

Revision history

| Version | Date | Comment | Sign |
|---------|------------|------------------------|------|
| 1.0 | 2018.07.16 | First edition | FS |
| 1.1 | 2018.07.18 | Corrected version info | FS |
| | | | |