

TEST REPORT

of

ARIB STD-T66

Equipment Under Test : InforTab
 Model Name : R420
 Applicant : RAINUS Co., Ltd.
 Manufacturer : RAINUS Co., Ltd.
 Date of Receipt : 2017.08.02
 Date of Test(s) : 2018.08.12 ~ 2018.08.21
 Date of Issue : 2018.08.22

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date:

2018.08.22

James Bae

Technical
Manager:



Date:

2018.08.22

Hyunchae You

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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

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A4(210 mm x 297 mm)

1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Phone No. : +82 31 688 0901

Fax No. : +82 31 688 0921

1.2. Details of applicant

Applicant : RAINUS Co., Ltd.

Address : 173-36, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do, Korea, 3rd-Floor

Contact Person : Kim, Tae-Hoon

Phone No. : +82 31 548 0782

1.3. Description of EUT

Kind of Product	InforTab
Model Name	R420
Power Supply	DC 3.0 V
Frequency Range	2 405 MHz ~ 2 480 MHz
Modulation Technique	DSSS
Number of Channels	16 channels
Rated Output Power	1.0 mW/MHz
Antenna Type	PCB Antenna
Antenna Gain	-0.22 dBi
H/W version	V2.1
S/W version	34

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1.4. Test Equipment List

Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Authority	Cal. Method
Spectrum Analyzer	R&S	FSV30	103102	Jun. 11, 2018	SICT	c)
Signal Generator	Agilent	E8257D	MY51501169	Jul. 03, 2018	SICT	c)
Attenuator	MCLI	FAS-12-10	2	Jun. 12, 2018	SICT	c)
DC Power Supply	Agilent	U8002A	MY50020026	Dec. 07, 2017	SICT	c)

Note;

- a):** Calibration conducted by the National Institute of Information and Communications Technology or a designated calibration agency under Article 102-18 paragraph (1).
- b):** Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law. (Law No. 51 of 1992)
- c):** Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).
- d):** Calibration conducted by using other equipment that listed above from a) to c).

1.5. Test method

Measurement was conducted by the following test method:

The test method of Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment in Annex 1, the Ministry of Internal Affairs and Communication notification in Annex 43 of Article 88, Paragraph 1 or the test method more than equivalent.

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1.6. Summary of test results

The EUT has been tested according to the following specifications:

Applied standard : Radio equipment regulations and ARIB STD-T66		
Article Reference	Test item	Result
STD-T66 3.2	Frequency Tolerance	Complied
STD-T66 3.2	Occupied Bandwidth (99 %) and Spread Bandwidth (90 %)	Complied
STD-T66 3.2	Spurious Emission Intensity	Complied
STD-T66 3.2	Antenna Power	Complied
STD-T66 3.3	Secondary Radiated Emissions	Complied

1.7. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL012981	2018.08.22	Initial

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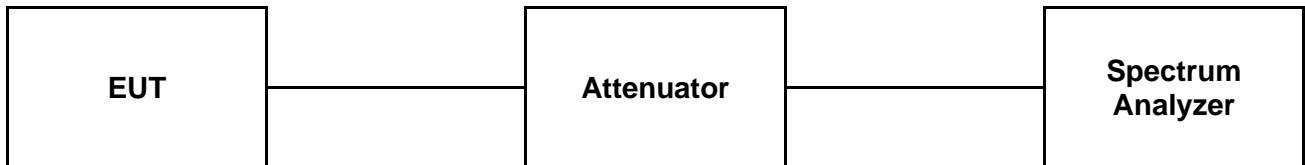
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2. Frequency Tolerance

2.1. Test Setup



2.2. Limit

Tolerance of frequency: $\pm 50 \times 10^{-6}$ or less.

2.3. Test procedure

1. Connect transmitter output to the spectrum analyzer input port.
2. The EUT should be transmitting at low, middle and high channel.
3. Set the spectrum analyzer as below;

Center frequency	: 2 405 MHz, 2 440 MHz, 2 480 MHz (Zigbee)
Span	: 1 MHz
RBW	: 10 kHz
VBW	: 10 kHz
Sweep time	: Auto
Sweep data points	: 1 001 or greater
Detector mode	: Positive peak
Indication mode	: Max hold

4. Find the peak carrier signal and measure its frequency.

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2.4. Test result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Test voltage(V _{d.c.})	Measured frequency (MHz)	Reading frequency (MHz)	Frequency tolerance [ppm]
V _{Min} = 2.7	Low Ch. (2 405)	2 405.001	0.42
	Middle Ch. (2 440)	2 440.001	0.41
	High Ch. (2 480)	2 480.001	0.40
V _{Nom} = 3.0	Low Ch. (2 405)	2 405.001	0.42
	Middle Ch. (2 440)	2 440.001	0.41
	High Ch. (2 480)	2 480.001	0.40
V _{Max} = 3.3	Low Ch. (2 405)	2 405.001	0.42
	Middle Ch. (2 440)	2 440.001	0.41
	High Ch. (2 480)	2 480.001	0.40

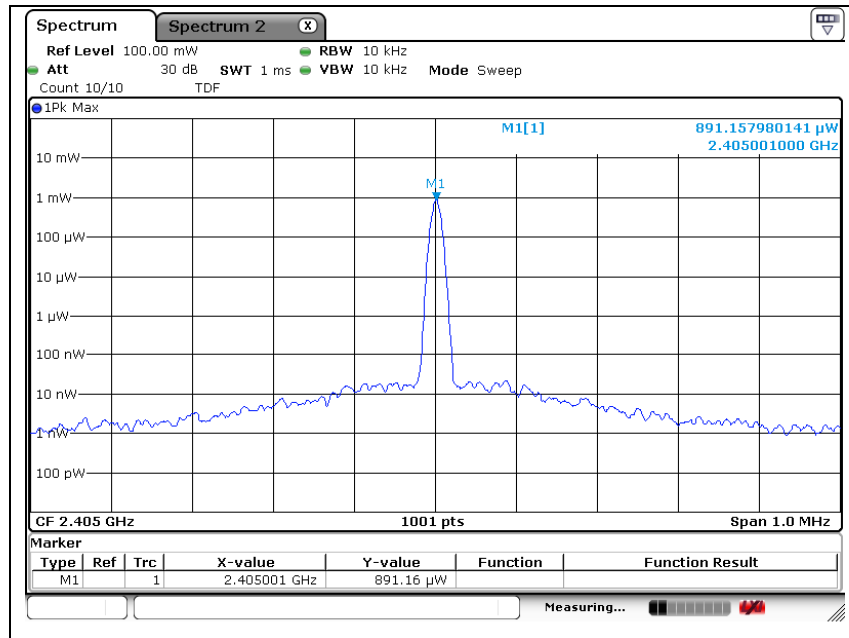
Note;

1. FT (ppm) = [(RF-MF)/MF] × 10⁶
- FT: Frequency Tolerance, RF: Reading Frequency and MF: Measurement Frequency

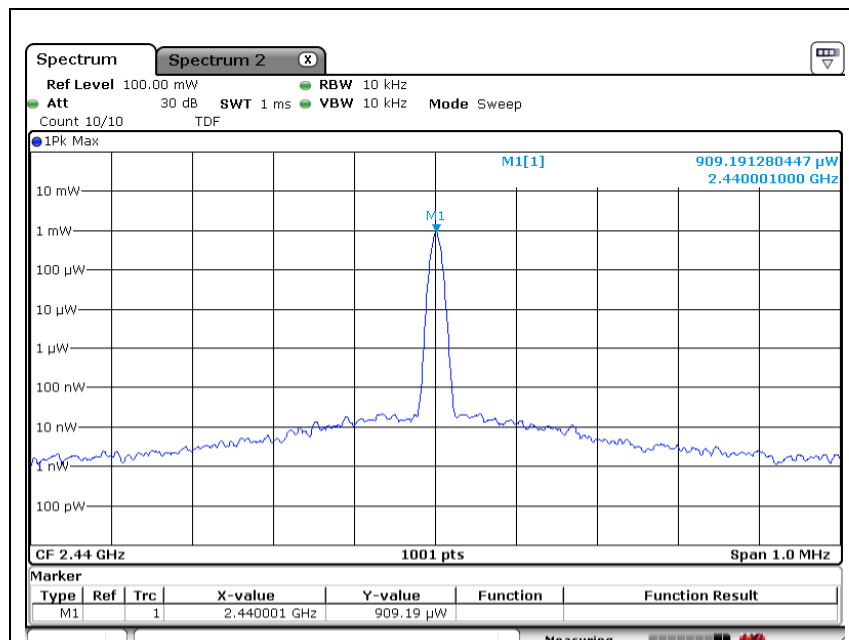
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Low voltage

Low channel

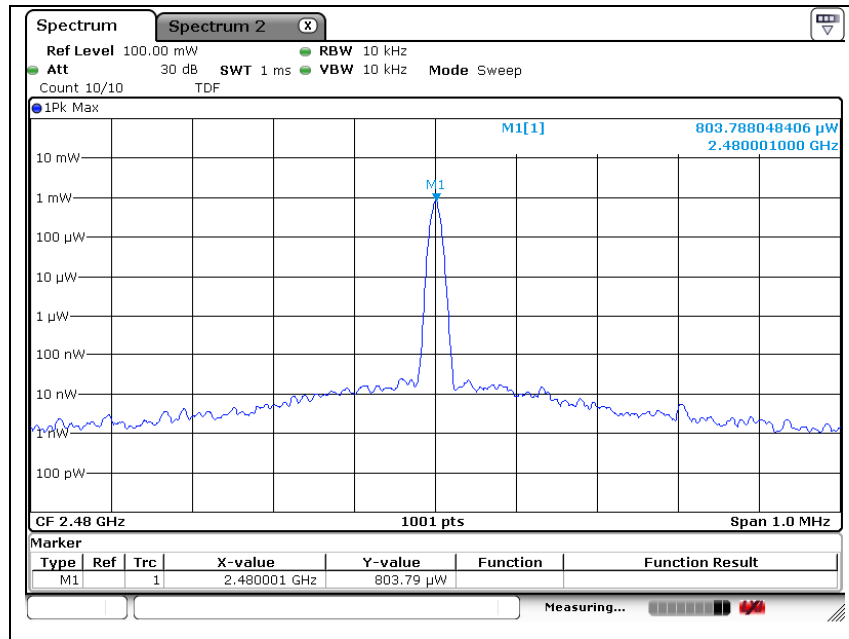


Middle channel



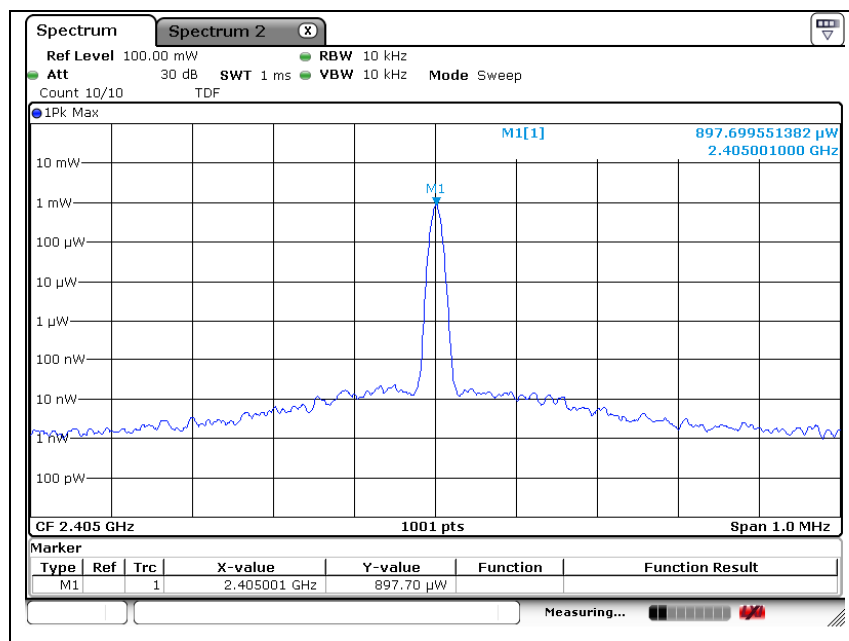
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High channel



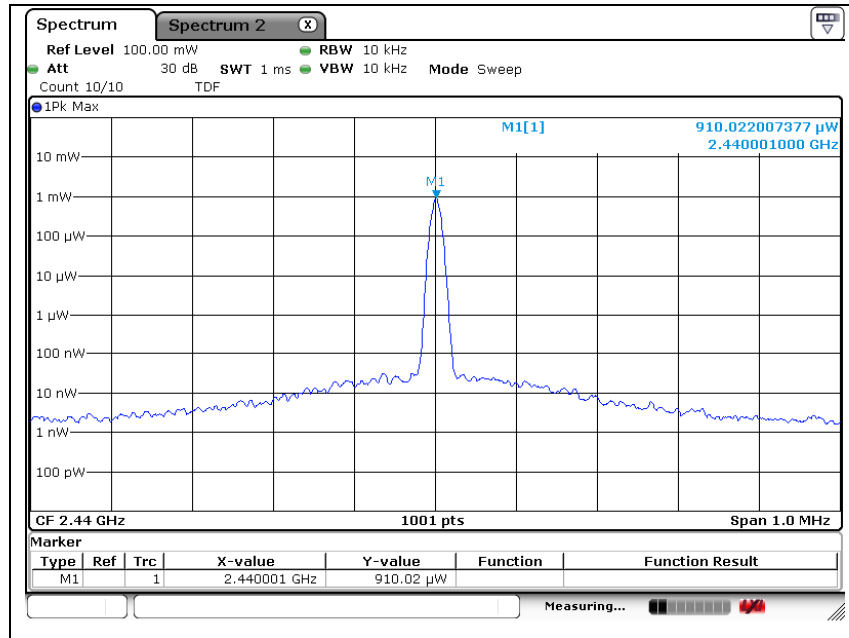
Normal voltage

Low channel

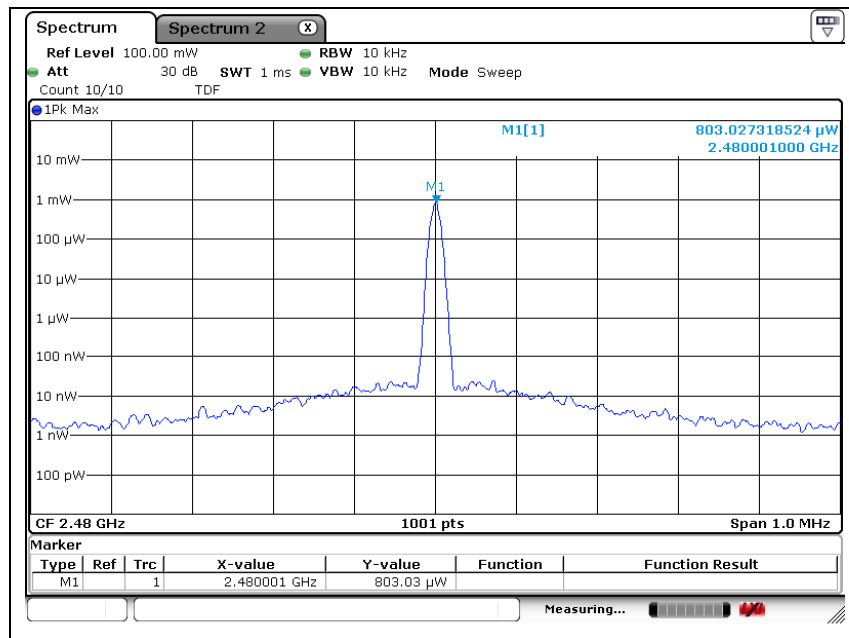


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Middle channel



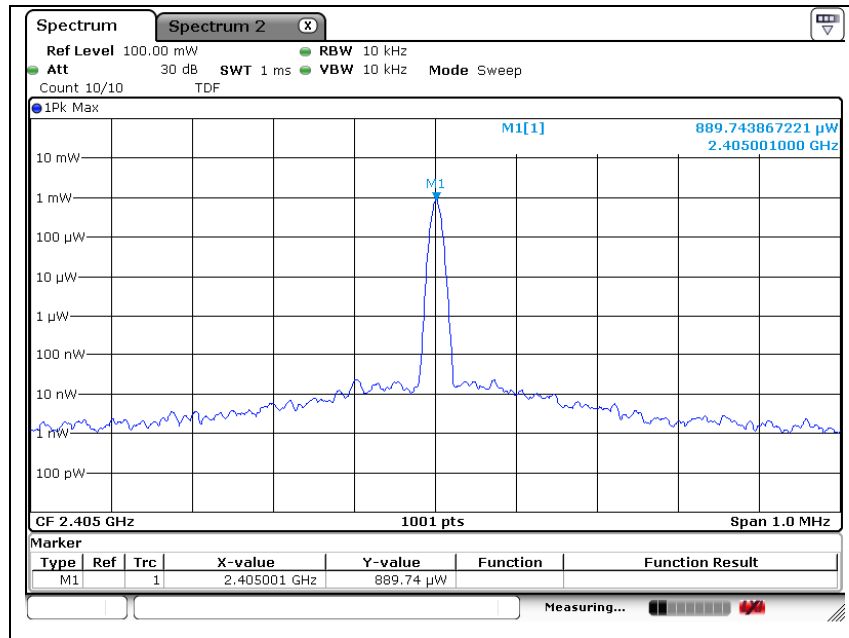
High channel



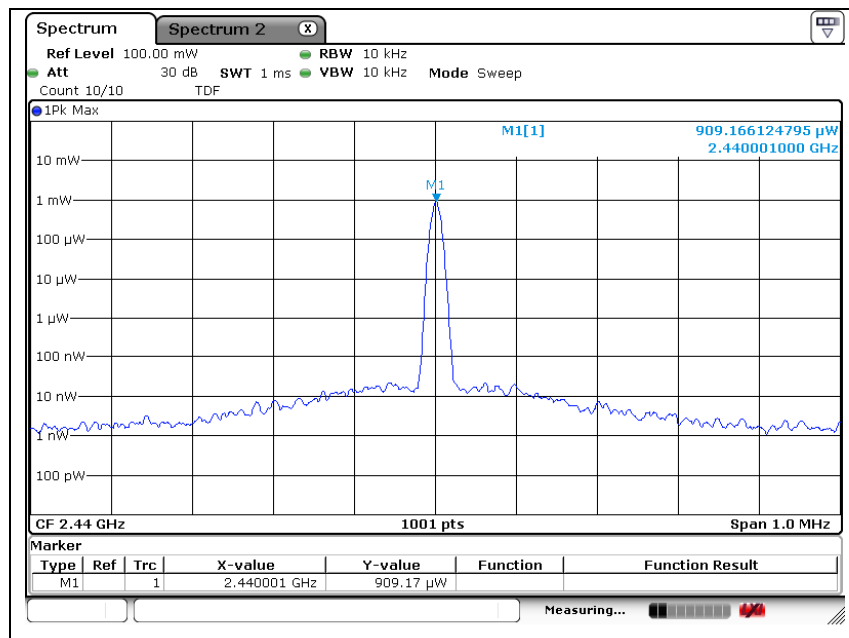
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High voltage

Low channel

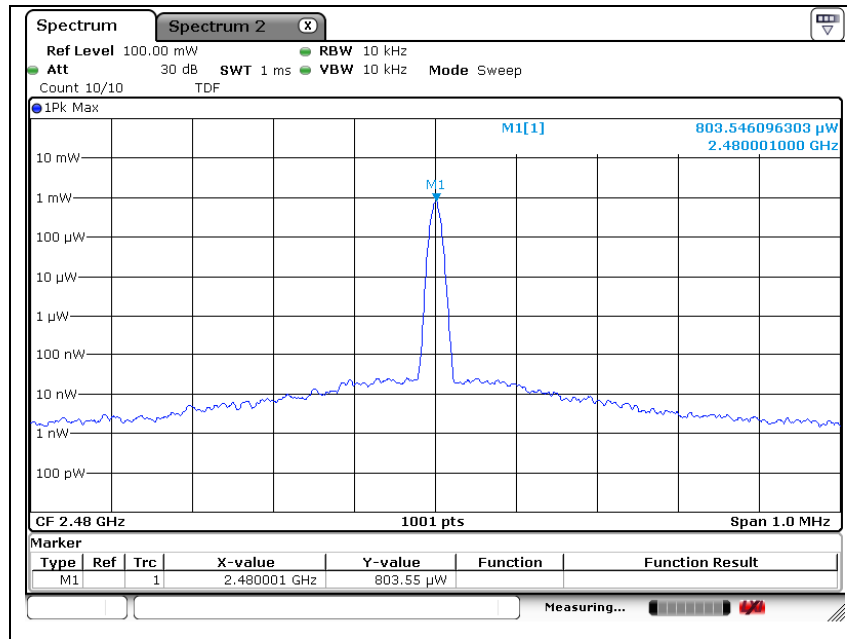


Middle channel



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High channel



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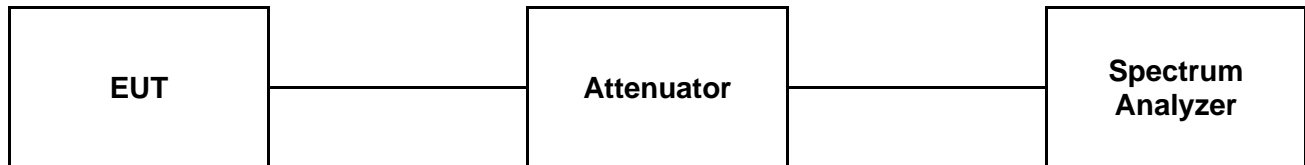
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A4(210 mm x 297 mm)

3. Occupied Bandwidth (99 %) and Spread Bandwidth (90 %)

3.1. Test Setup



3.2. Limit

[Occupied Bandwidth]
26 MHz or less

[Spread Bandwidth]
500 kHz or more

3.3. Test Procedure

1. Connect transmitter output to the spectrum analyzer input port.
2. Occupied Bandwidth and Spread Bandwidth is measured by following setting:

Use OBW capability of spectrum analyzer

[Occupied Bandwidth (99 %)]

Center frequency : 2 405 MHz, 2 440 MHz, 2 480 MHz
 Span : 10 MHz
 RBW : 100 kHz
 VBW : 100 kHz
 Sweep time : Auto
 Sweep data points : 1 001 or greater
 Detector mode : Positive peak
 Indication mode : Max hold
 BW setting : 99 %

[Spread Bandwidth (90 %)]

Center frequency : 2 405 MHz, 2 440 MHz, 2 480 MHz
 Span : 10 MHz
 RBW : 100 kHz
 VBW : 100 kHz
 Sweep time : Auto
 Sweep data points : 1 001 or greater
 Detector mode : Positive peak
 Indication mode : Max hold
 BW setting : 90 %

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3.4. Test result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

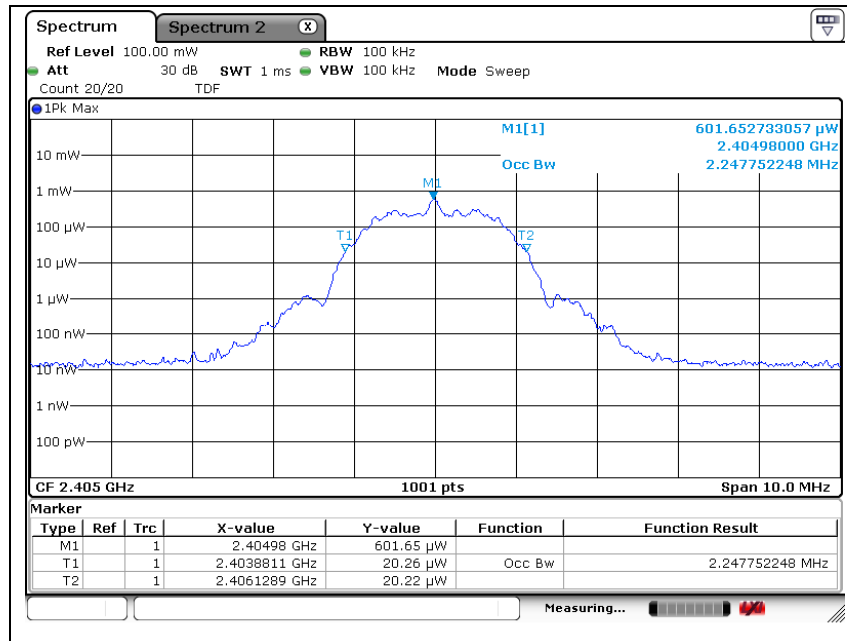
Test voltage(V _{d.c.})	Measured frequency (MHz)	Occupied bandwidth (MHz)	Spread bandwidth (MHz)
V _{Min} = 2.7	Low Ch. (2 405)	2.248	1.598
	Middle Ch. (2 440)	2.258	1.598
	High Ch. (2 480)	2.258	1.598
V _{Nom} = 3.0	Low Ch. (2 405)	2.258	1.608
	Middle Ch. (2 440)	2.258	1.608
	High Ch. (2 480)	2.278	1.588
V _{Max} = 3.3	Low Ch. (2 405)	2.248	1.618
	Middle Ch. (2 440)	2.258	1.598
	High Ch. (2 480)	2.258	1.598

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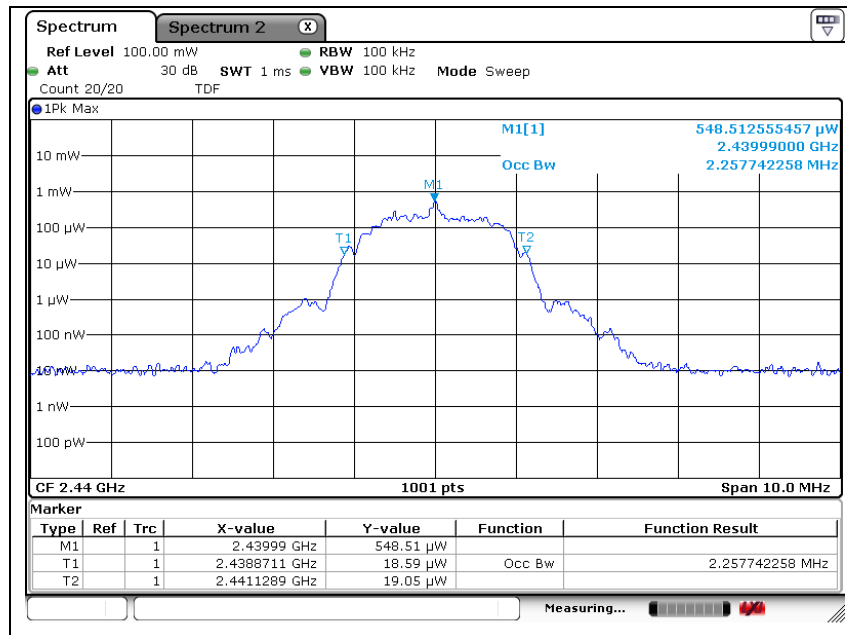
Occupied Bandwidth (99 %)

Low voltage

Low channel

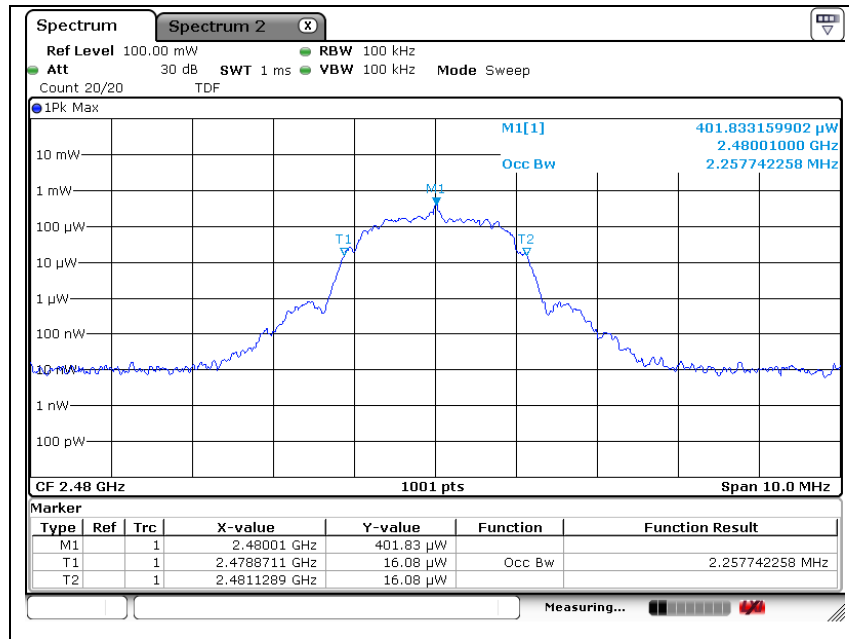


Middle channel



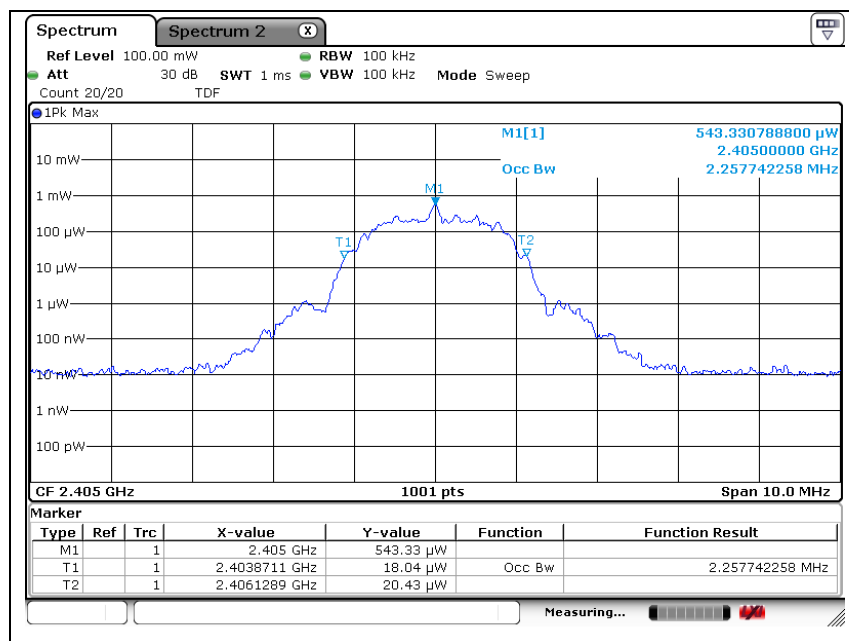
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High channel



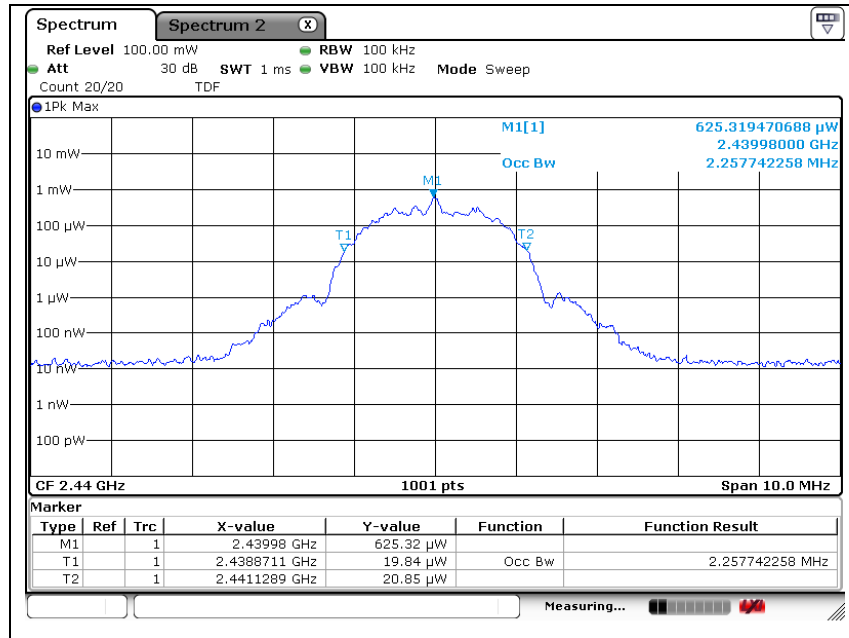
Normal voltage

Low channel

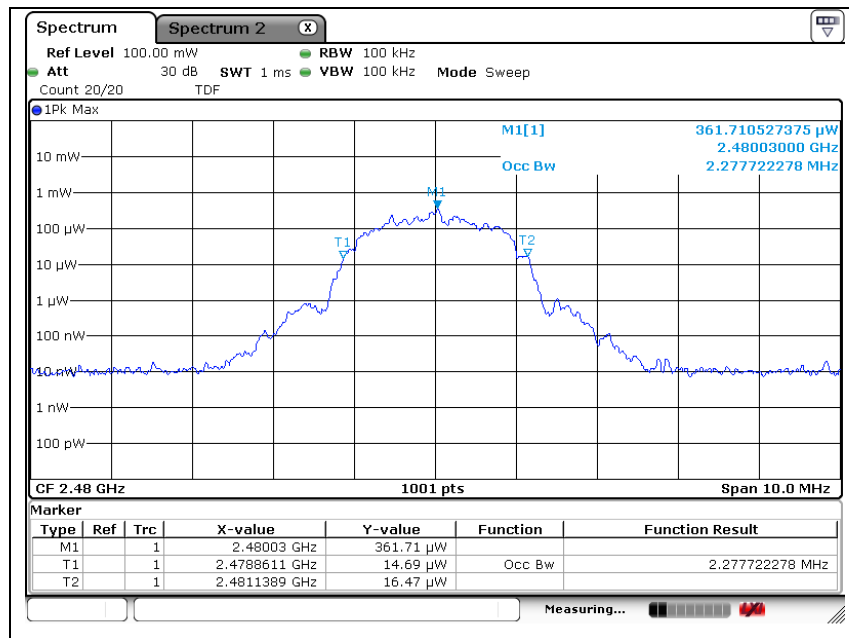


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Middle channel



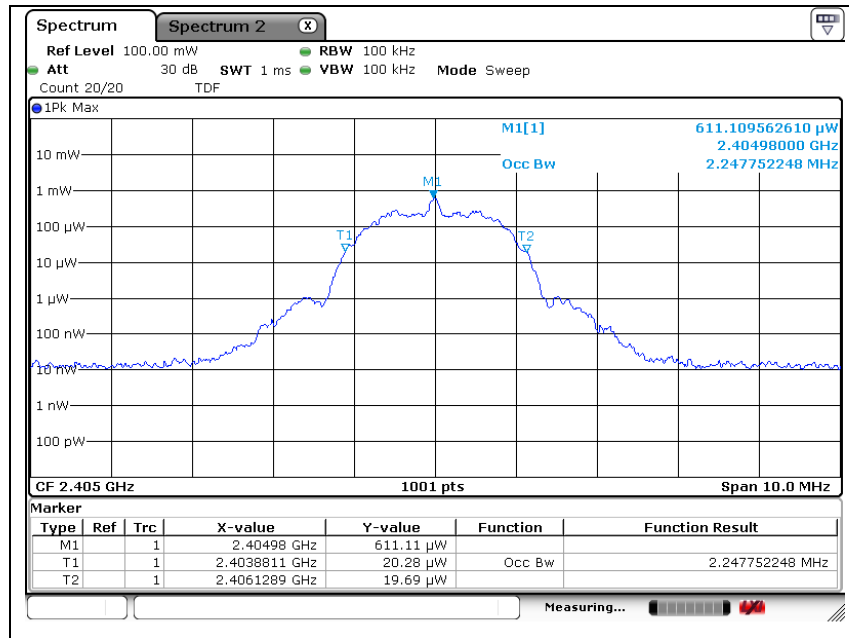
High channel



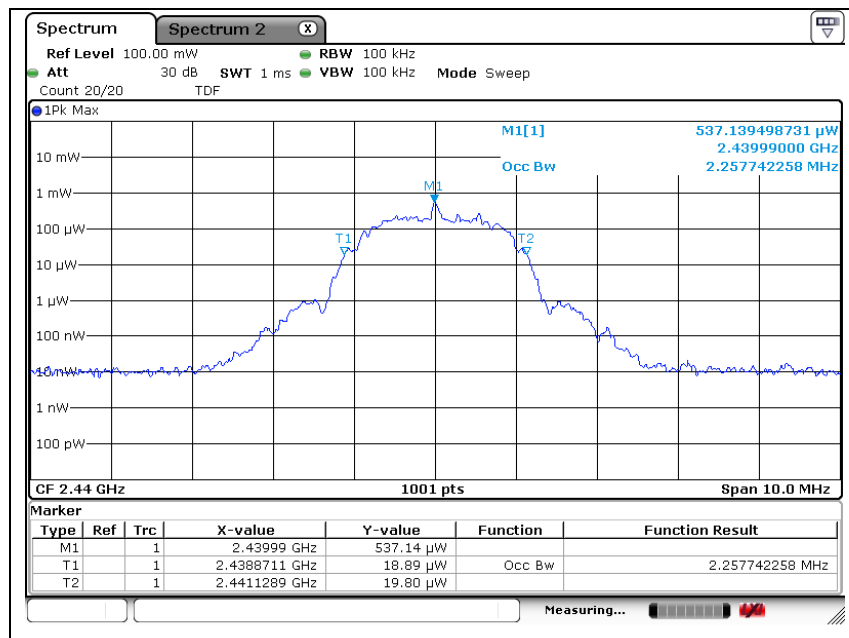
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High voltage

Low channel

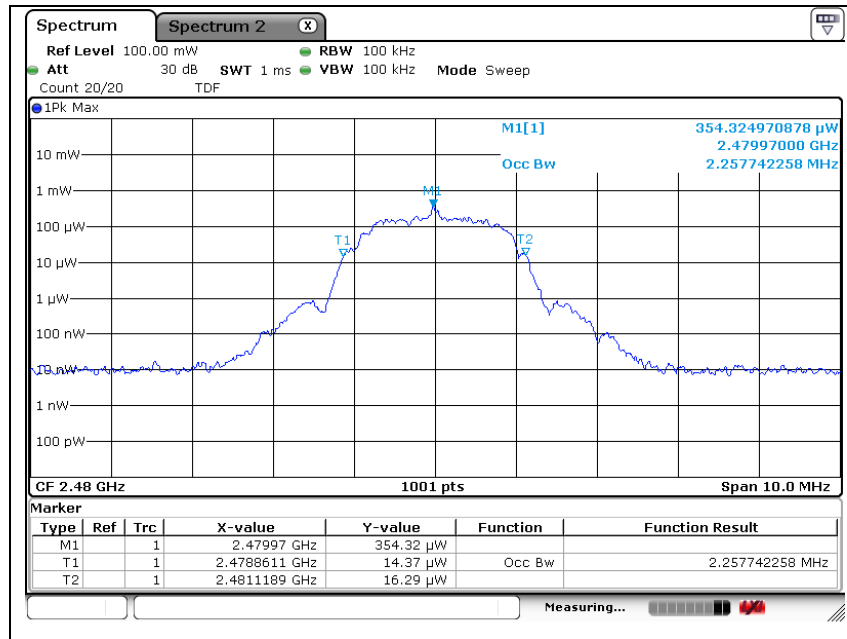


Middle channel



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High channel

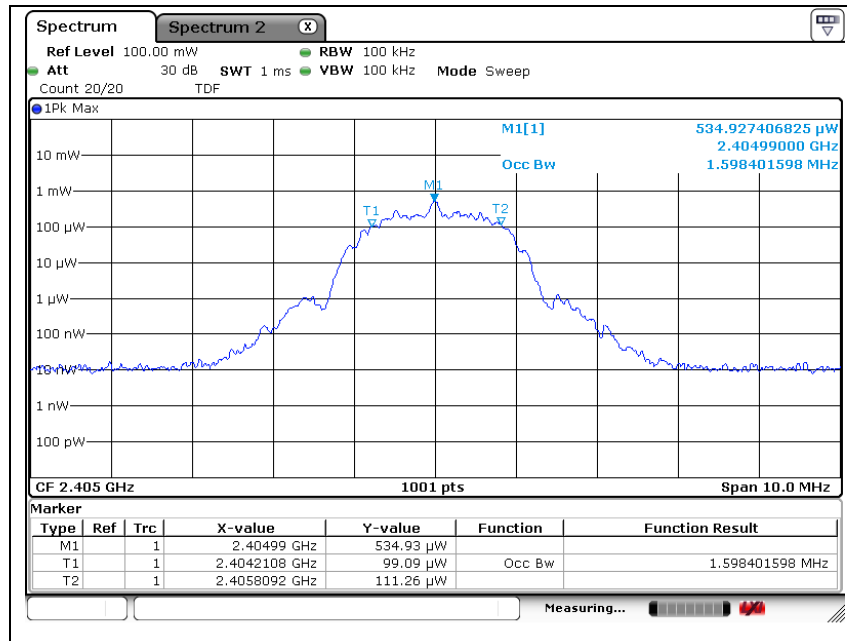


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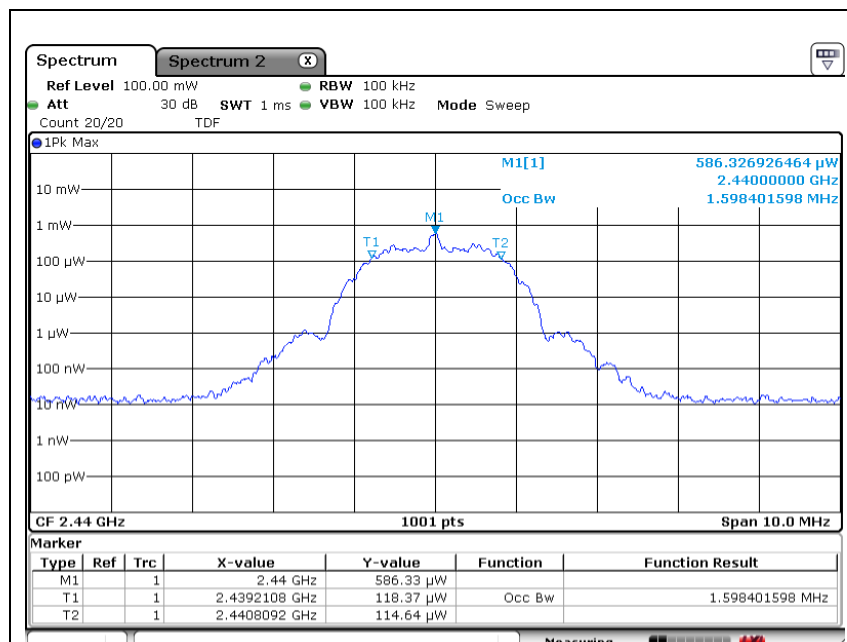
Spread Bandwidth (90 %)

Low voltage

Low channel

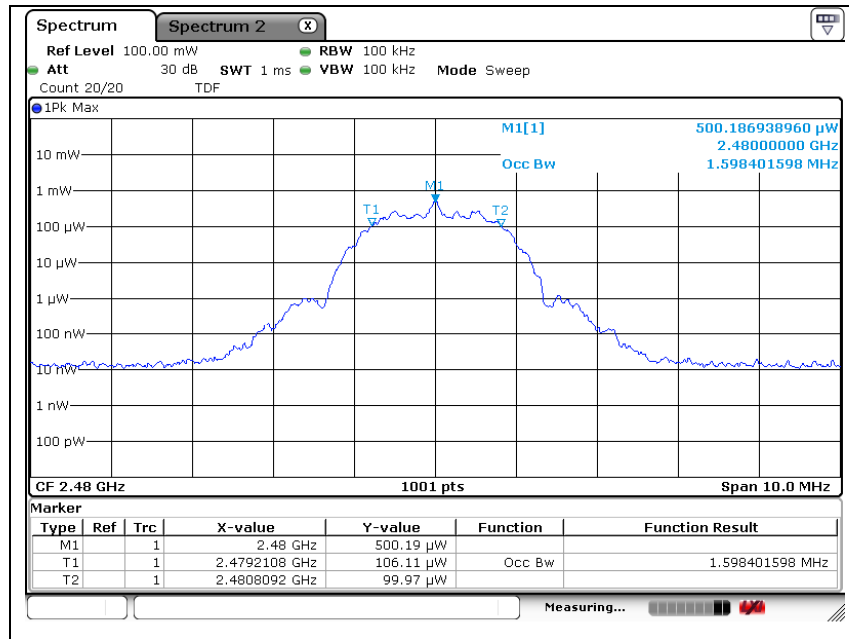


Middle channel



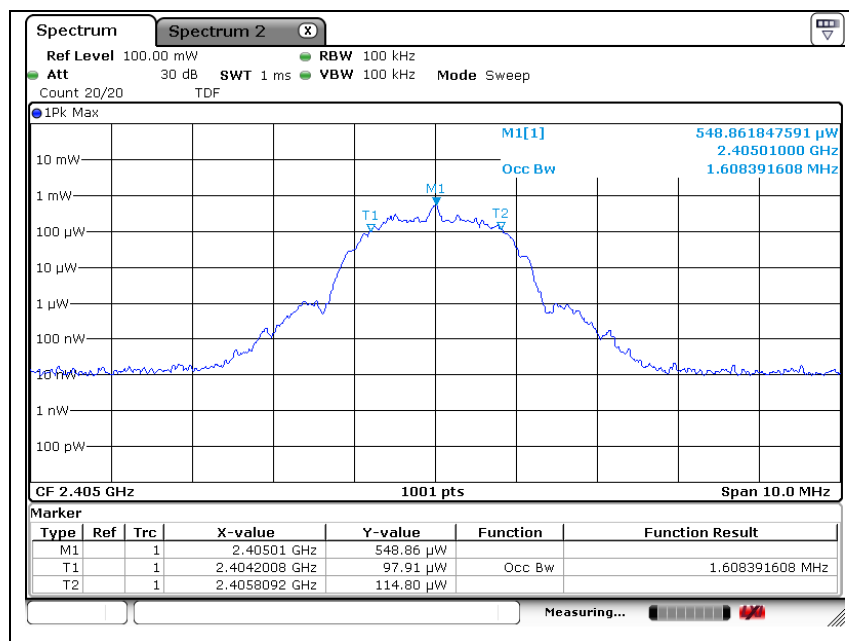
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High channel



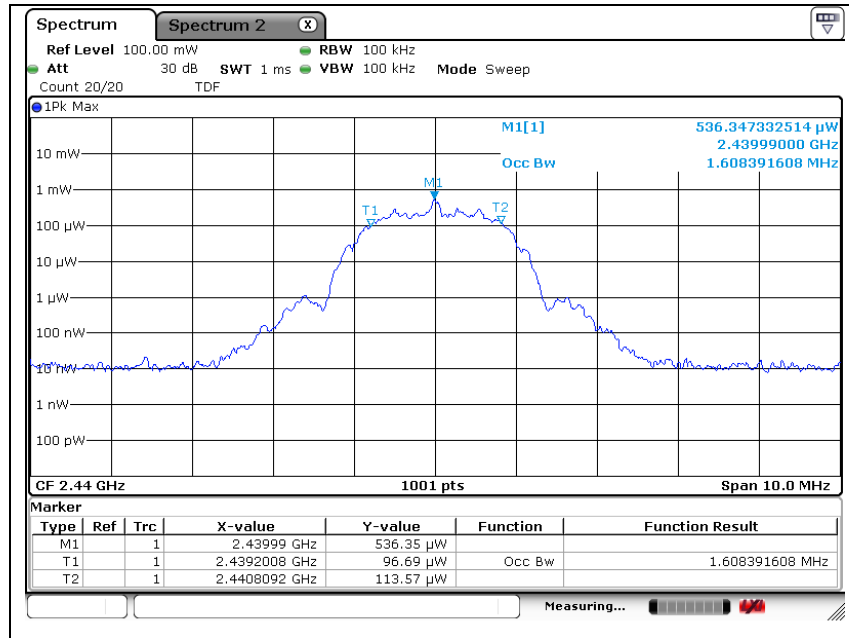
Normal voltage

Low channel

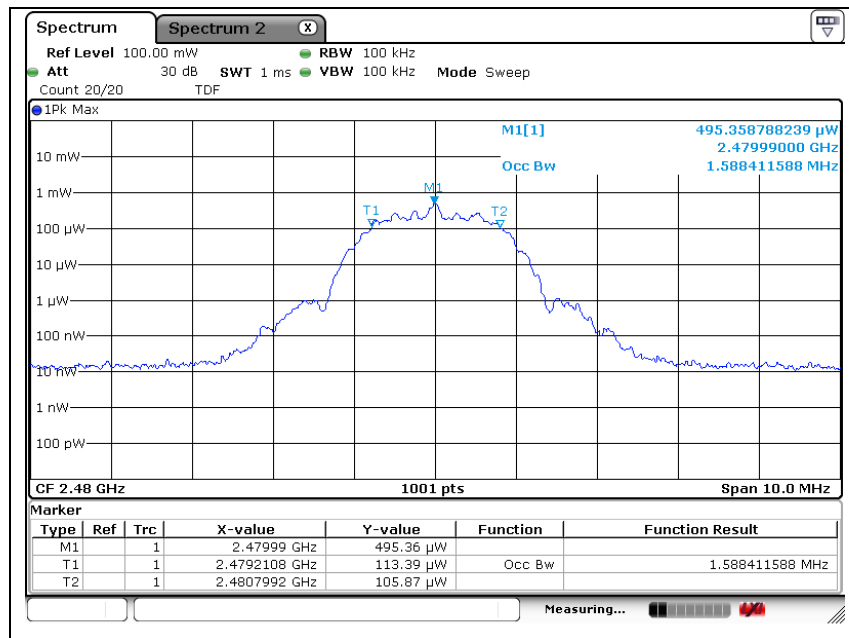


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Middle channel



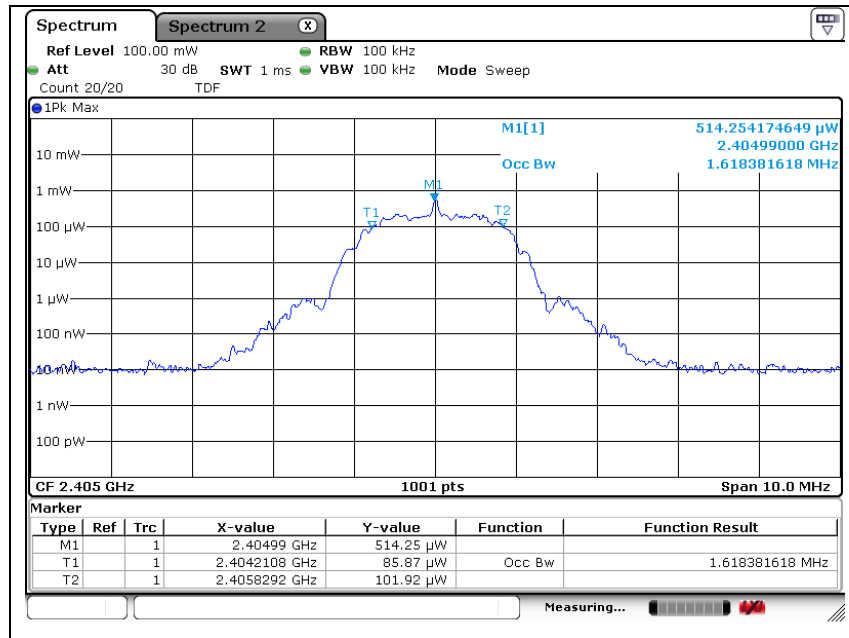
High channel



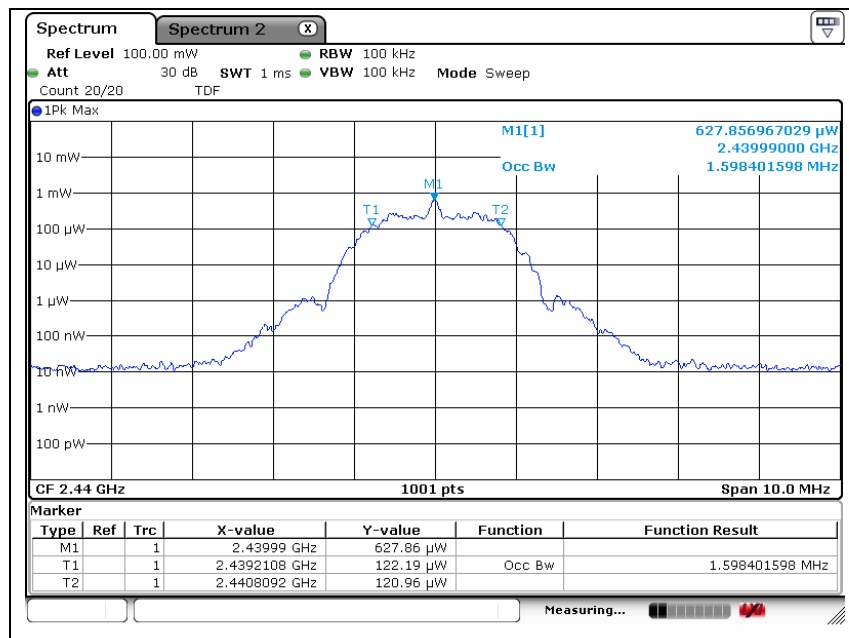
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High voltage

Low channel

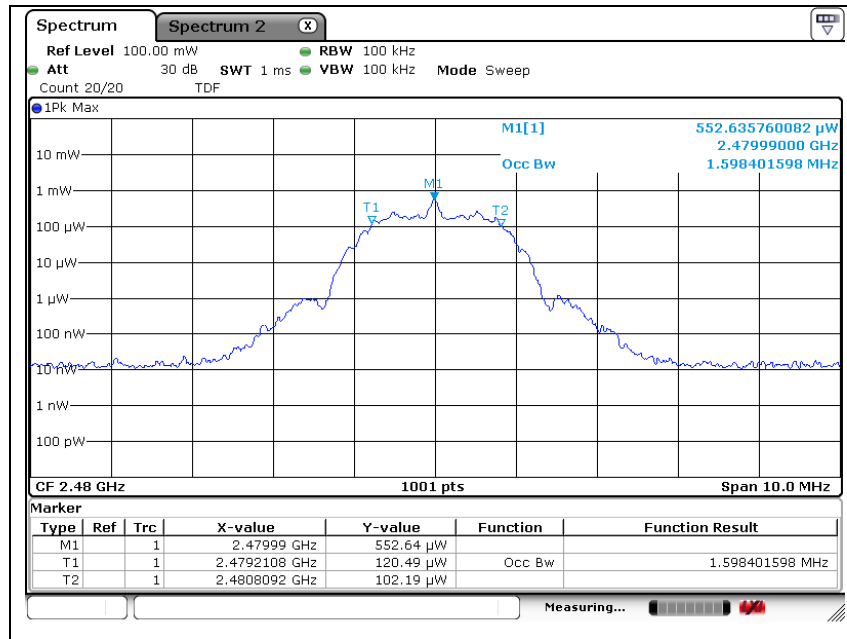


Middle channel



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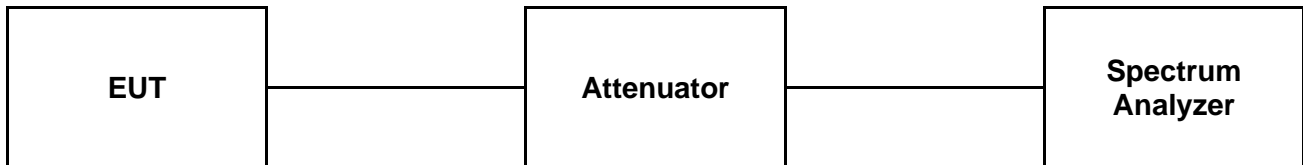
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A4(210 mm x 297 mm)

4. Spurious Emission Intensity

4.1. Test Setup



4.2. Limit

Below 2 387 MHz:	2.5 μ W (-26.02 dB m)/MHz or less
2 387 to 2 400 MHz:	25.0 μ W (-16.02 dB m)/MHz or less
2 483.5 to 2 496.5 MHz:	25.0 μ W (-16.02 dB m)/MHz or less
Over 2 496.5 MHz:	2.5 μ W (-26.02 dB m)/MHz or less

4.3. Test Procedure

1. Connect transmitter output to the spectrum analyzer input port.

2. Configure the EUT

- Test channels: low, middle, high

Frequency range	: 30 MHz to 12.5 GHz, except for 2 400 MHz to 2 483.5 MHz
RBW	: 1 MHz
VBW	: 1 MHz
Sweep time	: Minimum time required to make an accurate measurement
Sweep data points	: 1 001 or greater
Detector mode	: Positive peak
Indication mode	: Max hold
Note	: Sweep shall be repeated until the max hold waveform is stable.

3. Search for spurious emissions from 30 MHz to 12.5 GHz.

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4.4. Test result

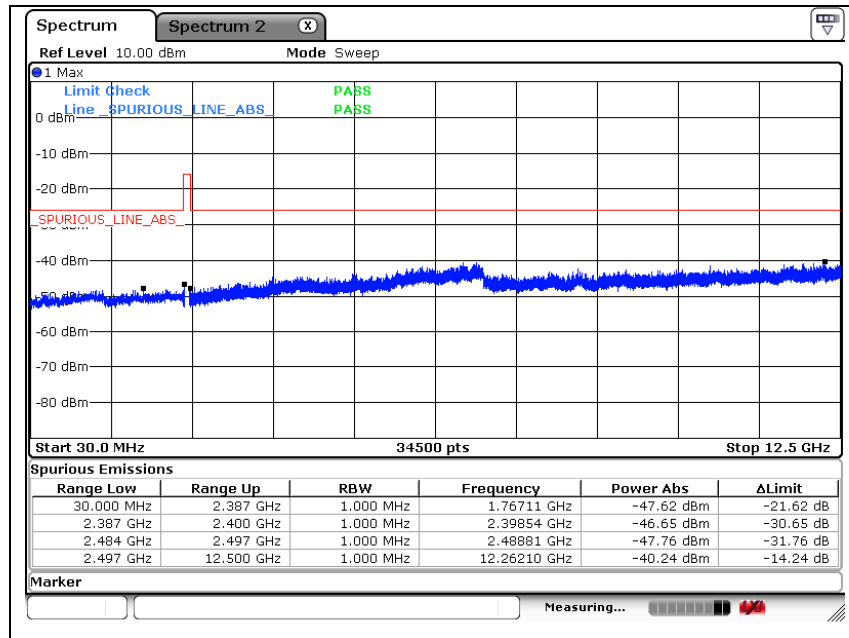
Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Test voltage (V _{d.c.})	Frequency Range (MHz)	Measured	Low Ch. (2 405 MHz)	Middle Ch. (2 440 MHz)	High Ch. (2 480 MHz)	Limit
V _{min} = 2.7	Below 2 387	Frequency (GHz)	1.767	2.096	1.041	-
		Level (dB m/MHz)	-47.62	-46.06	-47.54	-26.00
		Level (μW/MHz)	0.017 298	0.024 774	0.017 620	2.50
	2 387 to 2 400	Frequency (GHz)	2.399	2.393	2.391	-
		Level (dB m/MHz)	-46.65	-47.63	-47.28	-16.00
		Level (μW/MHz)	0.021 627	0.017 258	0.018 707	25.00
	2 483.5 to 2 496.5	Frequency (GHz)	2.489	2.486	2.484	-
		Level (dB m/MHz)	-47.76	-47.59	-44.45	-16.00
		Level (μW/MHz)	0.016 749	0.017 418	0.035 892	25.00
	Above 2 496.5	Frequency (GHz)	12.262	12.398	6.841	-
		Level (dB m/MHz)	-40.24	-40.36	-40.50	-26.00
		Level (μW/MHz)	0.094 624	0.092 045	0.089 125	2.50
V _{nom} = 3.0	Below 2 387	Frequency (GHz)	2.141	1.722	2.353	-
		Level (dB m/MHz)	-47.32	-46.86	-47.99	-26.00
		Level (μW/MHz)	0.018 535	0.020 606	0.015 885	2.50
	2 387 to 2 400	Frequency (GHz)	2.398	2.391	2.390	-
		Level (dB m/MHz)	-45.98	-46.82	-47.89	-16.00
		Level (μW/MHz)	0.025 235	0.020 797	0.016 255	25.00
	2 483.5 to 2 496.5	Frequency (GHz)	2.497	2.491	2.484	-
		Level (dB m/MHz)	-47.11	-47.21	-47.34	-16.00
		Level (μW/MHz)	0.019 454	0.019 011	0.018 450	25.00
	Above 2 496.5	Frequency (GHz)	6.598	12.243	11.659	-
		Level (dB m/MHz)	-39.28	-40.38	-40.88	-26.00
		Level (μW/MHz)	0.118 032	0.091 622	0.081 658	2.50
V _{max} = 3.3	Below 2 387	Frequency (GHz)	2.141	1.049	1.819	-
		Level (dB m/MHz)	-47.76	-47.68	-46.91	-26.00
		Level (μW/MHz)	0.016 749	0.017 061	0.020 370	2.50
	2 387 to 2 400	Frequency (GHz)	2.400	2.396	2.394	-
		Level (dB m/MHz)	-47.86	-47.90	-47.79	-16.00
		Level (μW/MHz)	0.016 368	0.016 218	0.016 634	25.00
	2 483.5 to 2 496.5	Frequency (GHz)	2.492	2.487	2.484	-
		Level (dB m/MHz)	-47.65	-47.66	-46.19	-16.00
		Level (μW/MHz)	0.017 179	0.017 140	0.024 044	25.00
	Above 2 496.5	Frequency (GHz)	11.716	6.939	6.872	-
		Level (dB m/MHz)	-40.37	-39.63	-40.63	-26.00
		Level (μW/MHz)	0.091 833	0.108 893	0.086 497	2.50

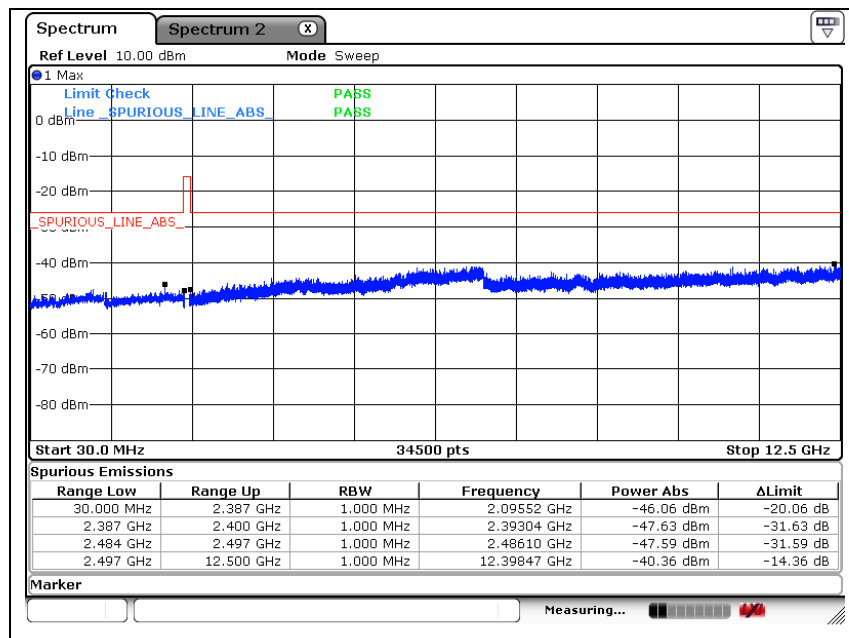
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Low voltage

Low channel

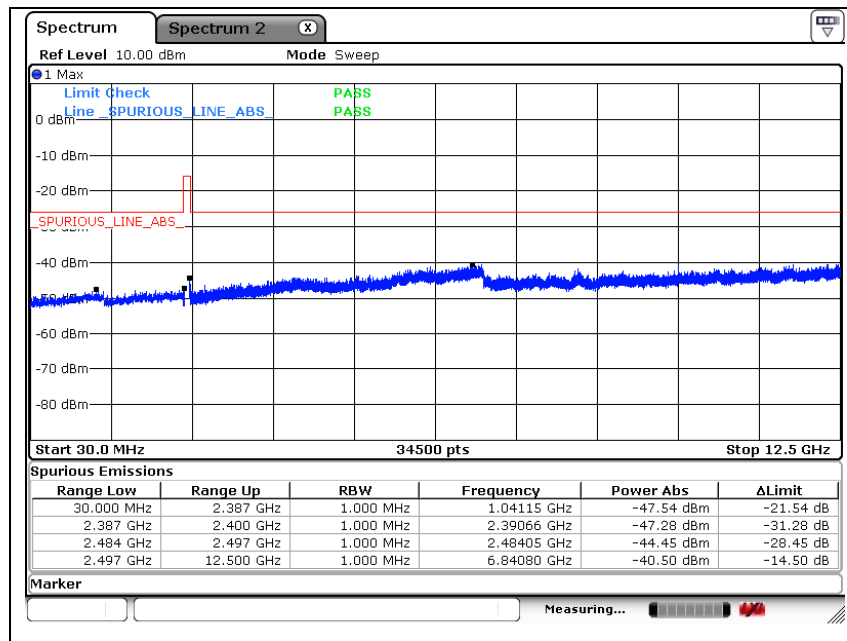


Middle channel



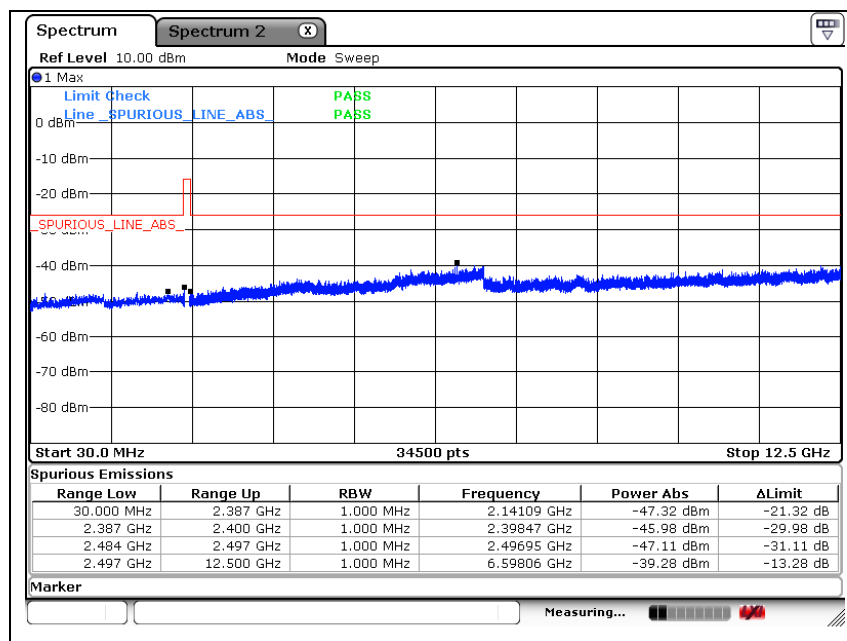
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High channel



Normal voltage

Low channel



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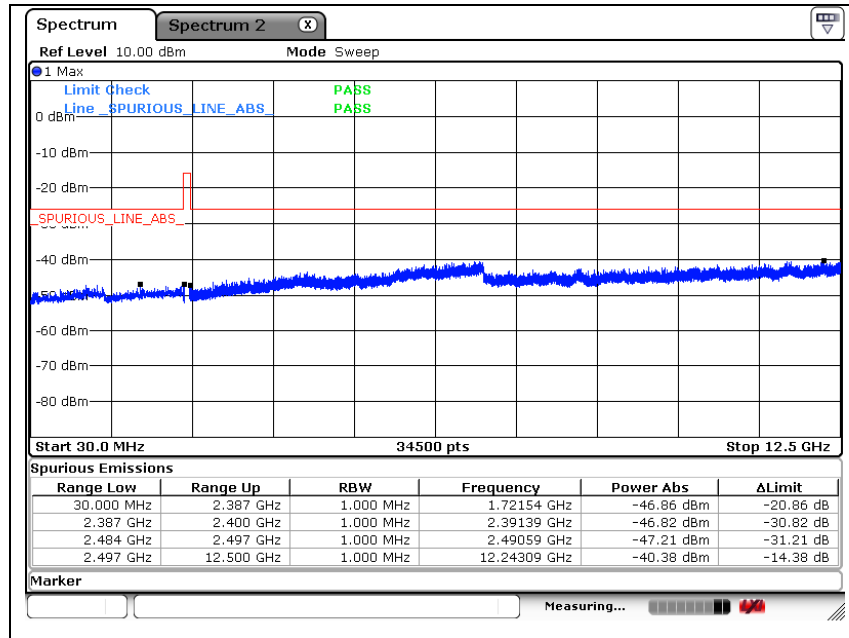
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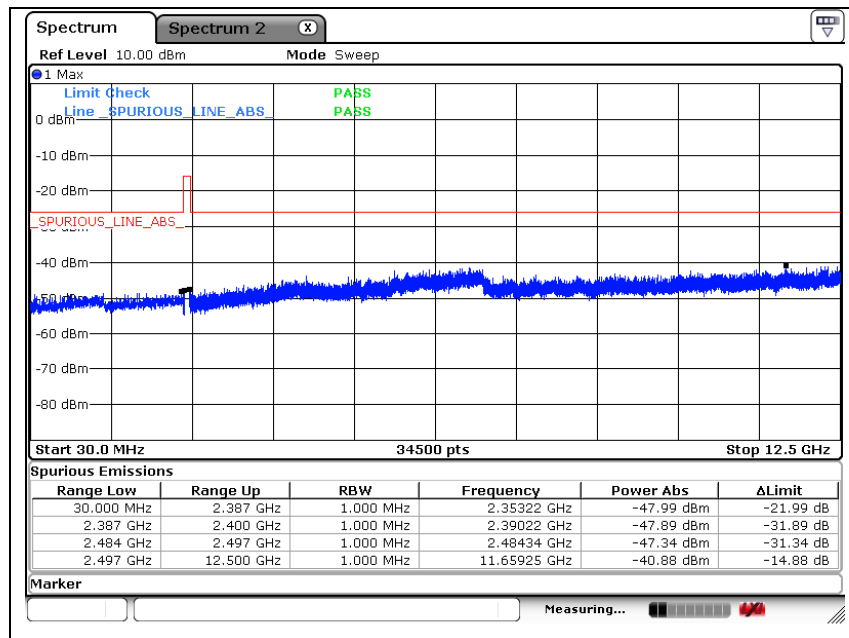
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A4(210 mm x 297 mm)

Middle channel



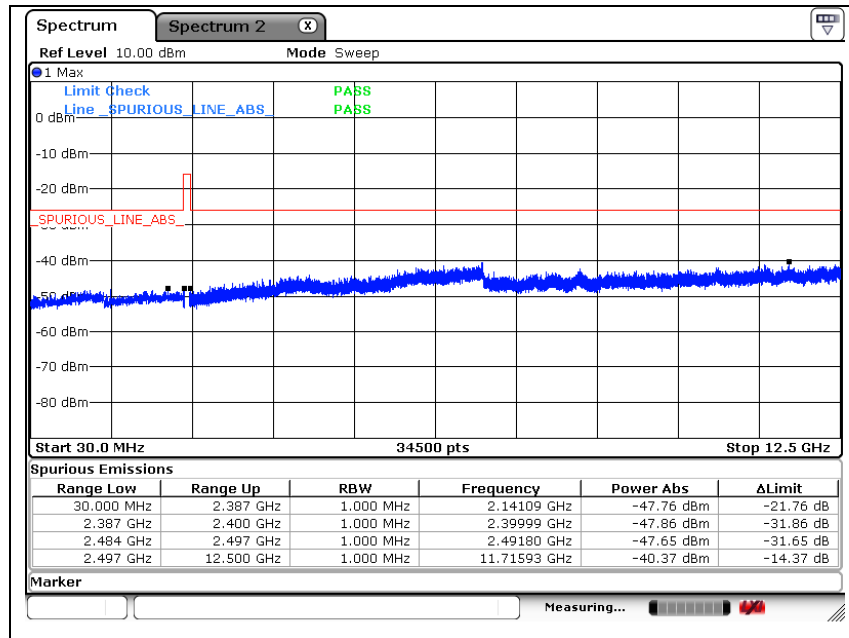
High channel



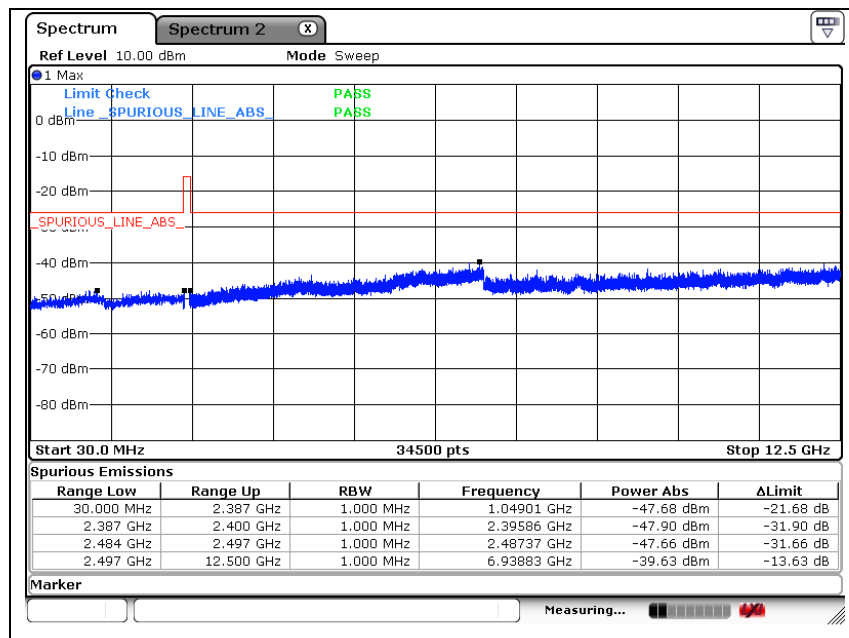
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

High voltage

Low channel

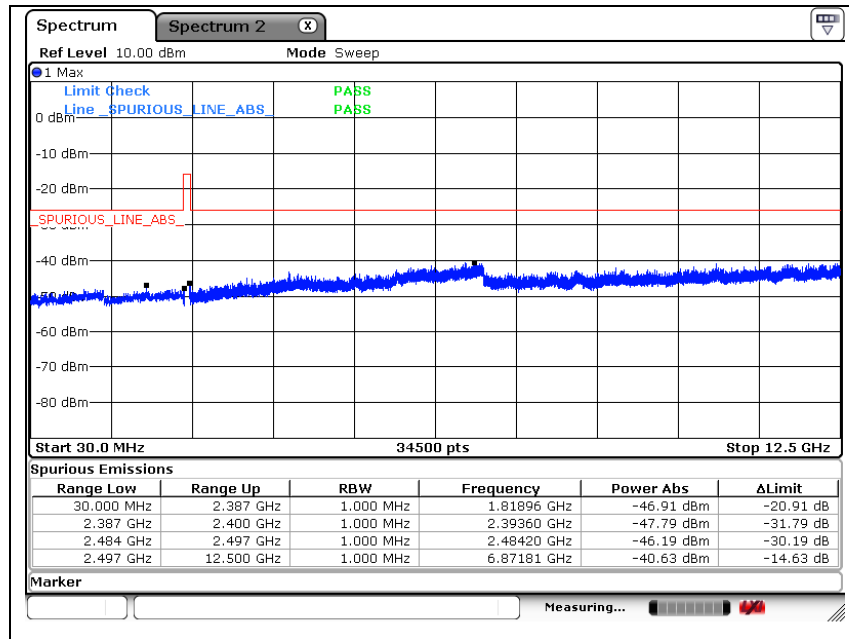


Middle channel



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High channel



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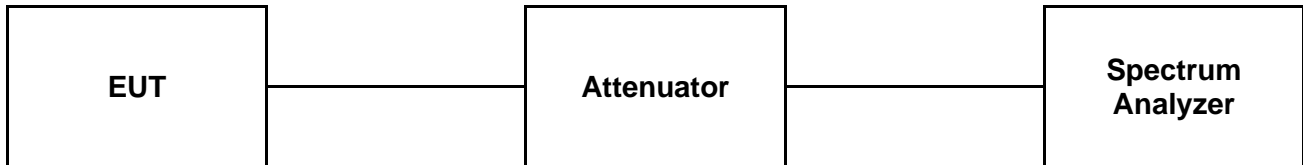
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A4(210 mm x 297 mm)

5. Antenna Power

5.1. Test setup



5.2. Limit

The difference between measured output power and the rated output power shall be within a tolerance of +20 % to -80 %. In addition, the rated output power shall not be over the limits shown below.

Limit (rated output power, upper limit)
10 mW/MHz or less

5.3. Test procedure

1. Connect transmitter output to the spectrum analyzer input port.
2. Configure the spectrum analyzer as below;

–Search for peak power frequency according to below settings

Center frequency : 2 405 MHz, 2 440 MHz, 2 480 MHz
Span : 5 MHz
RBW : 1 MHz
VBW : 3 MHz
Sweep time : Auto
Sweep data points : 1 001 or greater
Detector mode : Positive peak
Indication mode : Max hold

Find the frequency of maximum transmitted power

–Measurement of average antenna power according to below settings

Center frequency : Frequency of peak power
Span : 0 Hz
RBW : 1 MHz
VBW : 1 MHz
Sweep : Minimum time required to make an accurate measurement.
For burst type (intermittent) transmission, sweep time shall be greater than one burst Interval.
Sweep data points : 1 001 or greater
Detector mode : Sample
Indication mode : Max hold

Measure the Average Burst Power of the frequency

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A4(210 mm x 297 mm)

5.4. Test result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

Test voltage(V _{d.c.})	Channel (MHz)	Antenna gain (dB i)	Rated Output Power		E.I.R.P. (dB m)	Average Burst Power		Power Tolerance (%)
V _{Min} = 2.7	Low Ch. (2 405)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.61 mW/MHz	-2.18 dB m/MHz	-39.00
	Middle Ch. (2 440)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.57 mW/MHz	-2.47 dB m/MHz	-43.00
	High Ch. (2 480)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.65 mW/MHz	-1.90 dB m/MHz	-35.00
V _{Nom} = 3.0	Low Ch. (2 405)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.66 mW/MHz	-1.81 dB m/MHz	-34.00
	Middle Ch. (2 440)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.69 mW/MHz	-1.61 dB m/MHz	-31.00
	High Ch. (2 480)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.66 mW/MHz	-1.83 dB m/MHz	-34.00
V _{Max} = 3.3	Low Ch. (2 405)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.72 mW/MHz	-1.43 dB m/MHz	-28.00
	Middle Ch. (2 440)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.59 mW/MHz	-2.26 dB m/MHz	-41.00
	High Ch. (2 480)	-0.22	1.00 mW/MHz	0.00 dB m/MHz	-0.22	0.65 mW/MHz	-1.90 dB m/MHz	-35.00

Note;

Antenna Power (mW/MHz) = Average Burst Power (mW/MHz)

Power Tolerance (%) = {[Antenna Power (mW/MHz) - Rated Output Power (mW/MHz)] ÷ Rated Output Power (mW/MHz)} × 100

E.I.R.P. (dB m) = Antenna gain (dB i) + Rated Output Power (dB m/MHz)

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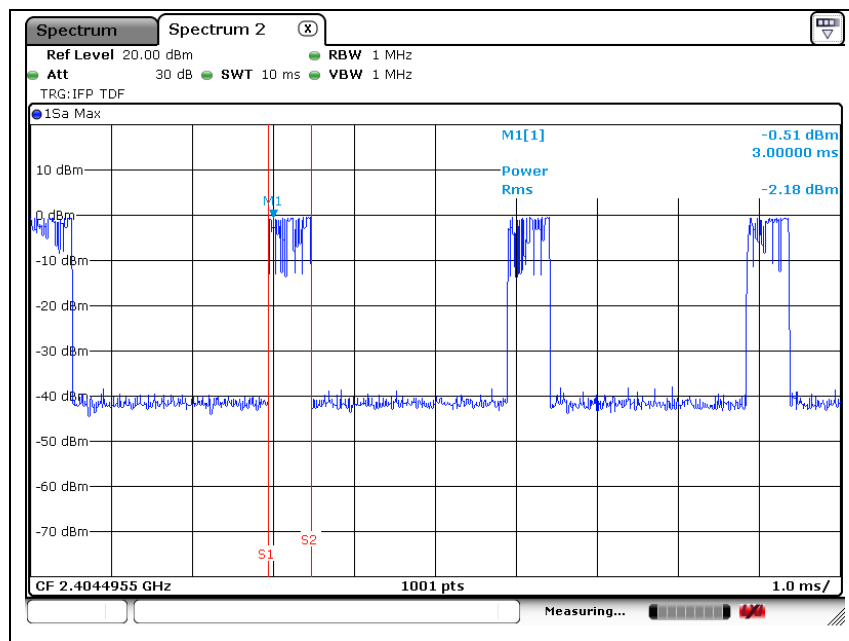
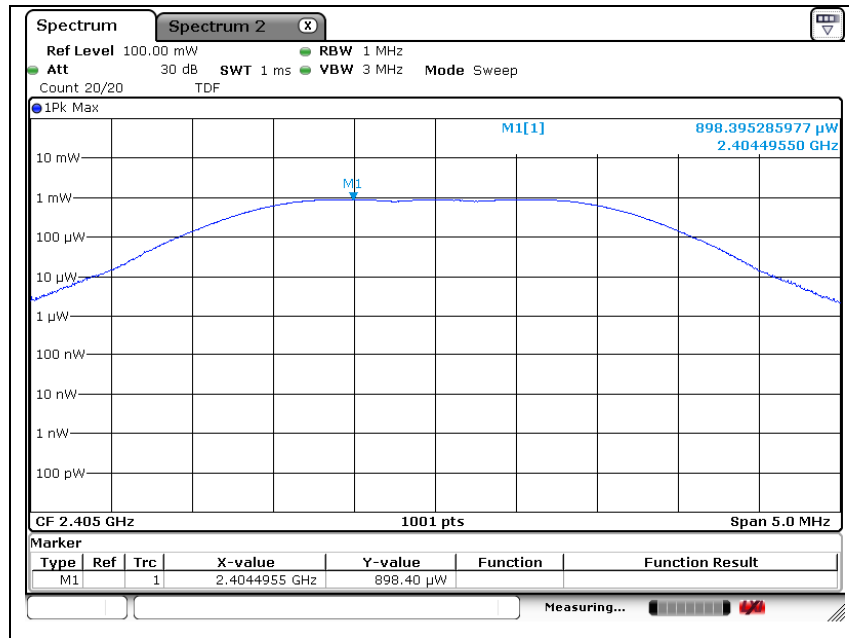
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A4(210 mm × 297 mm)

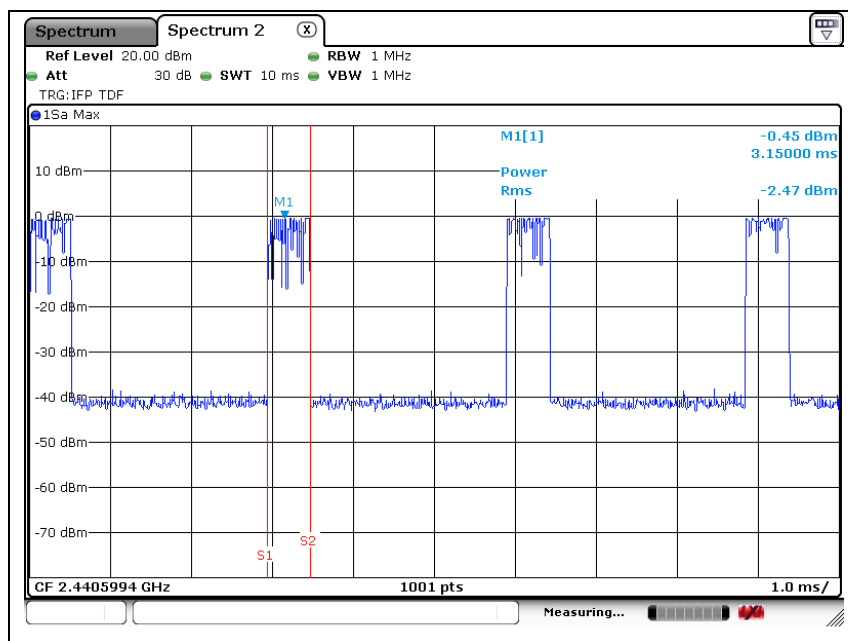
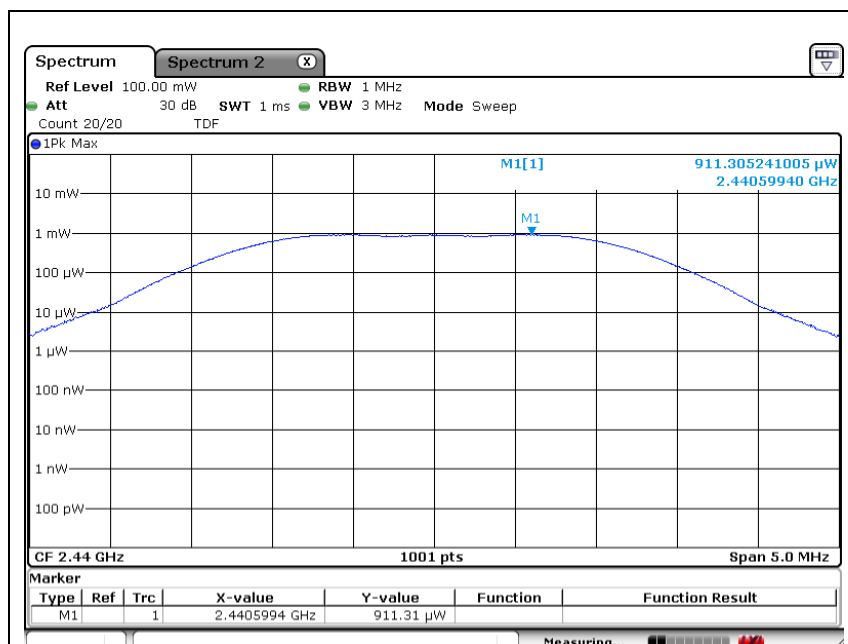
Low voltage

Low channel



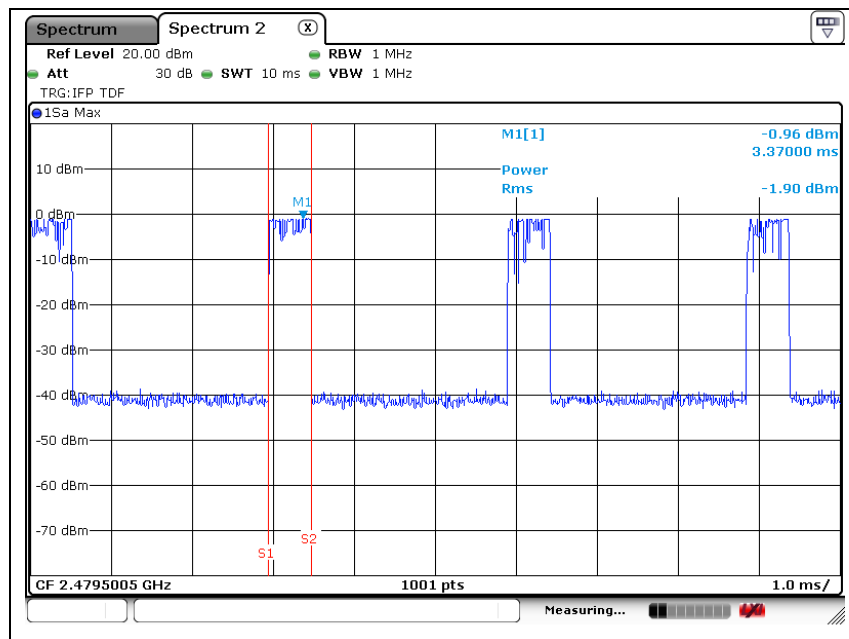
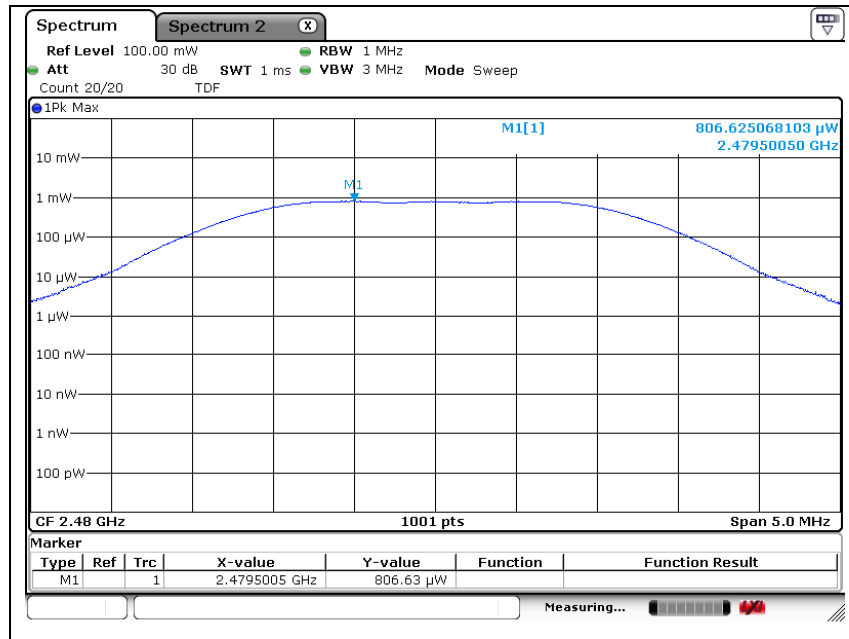
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Middle channel



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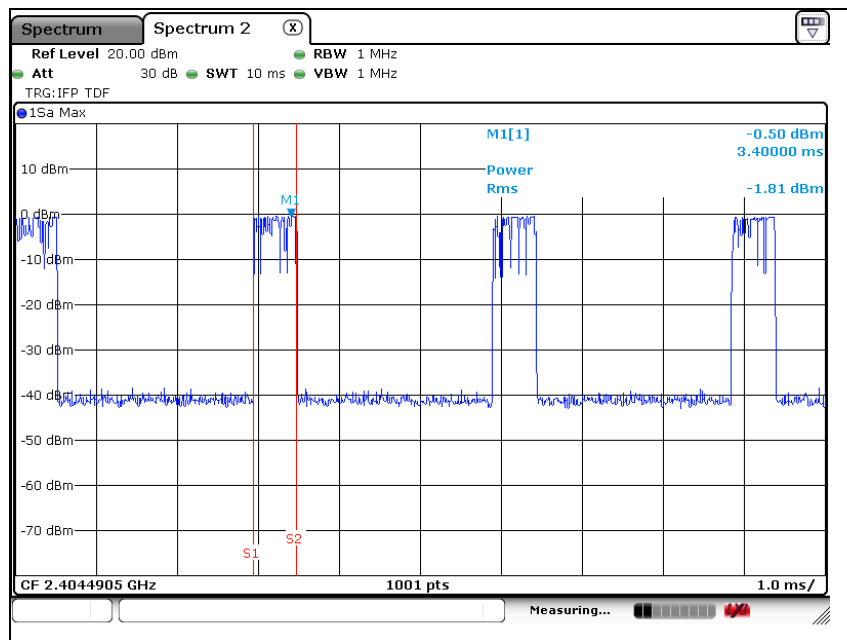
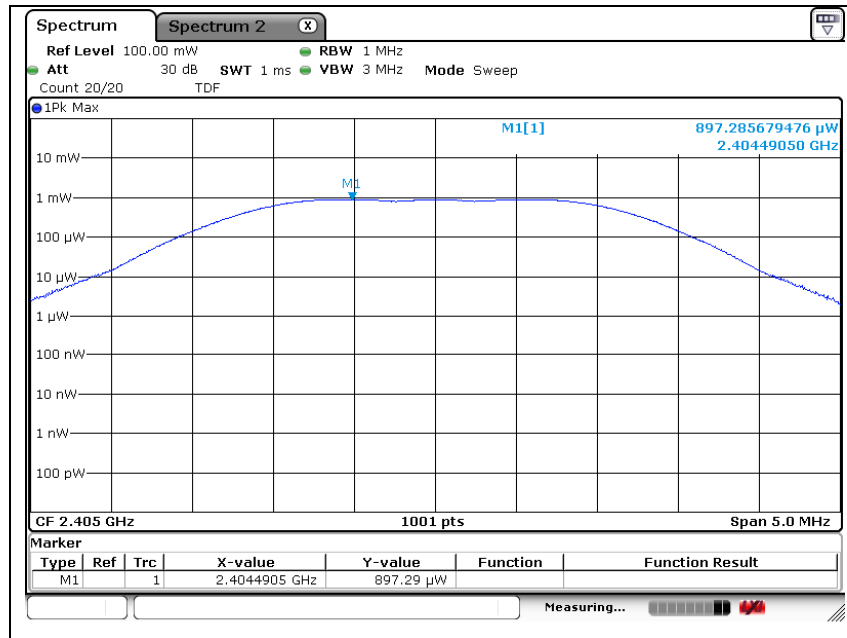
High channel



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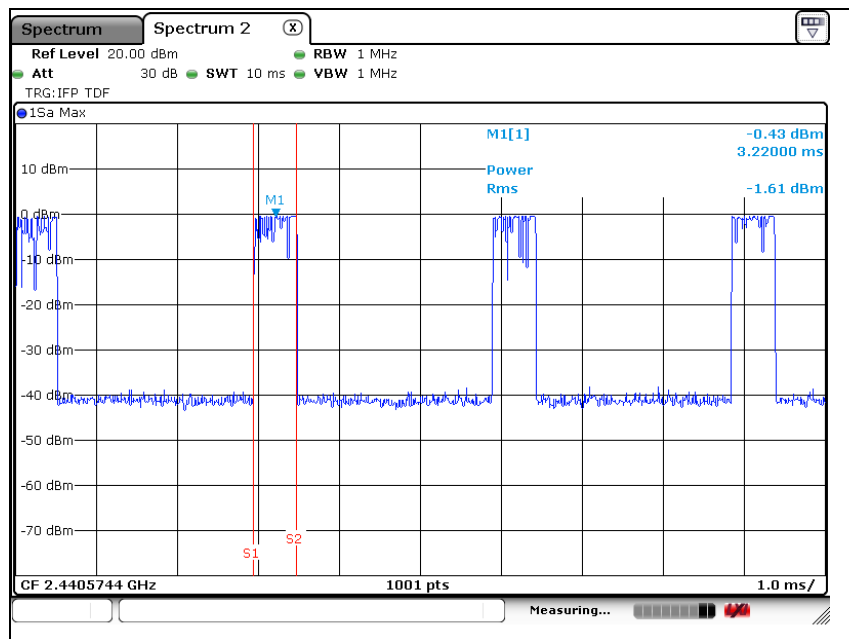
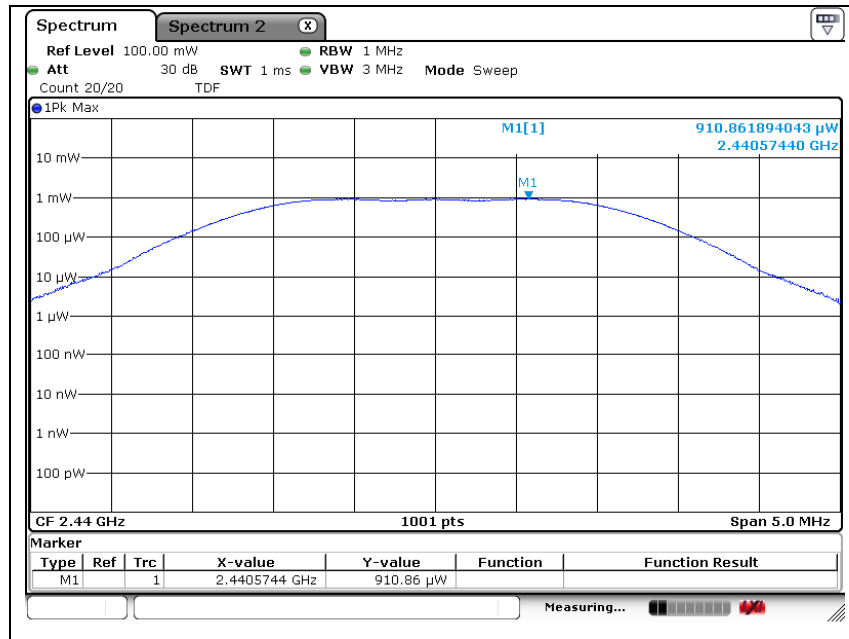
Normal voltage

Low channel



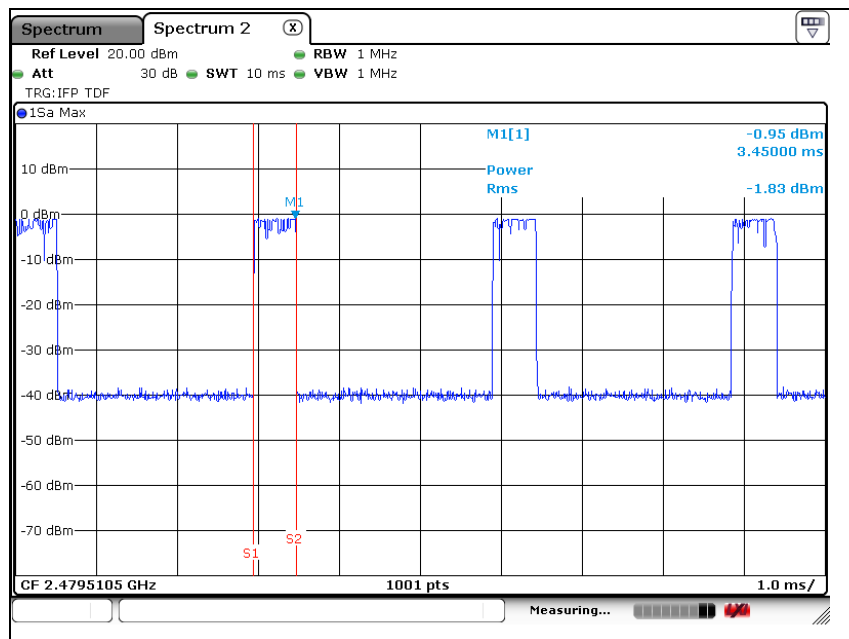
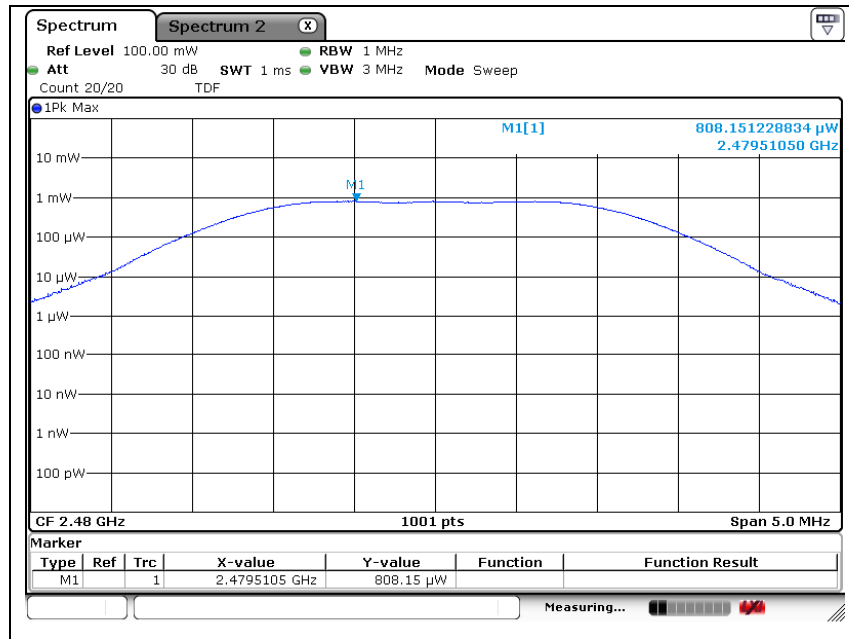
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Middle channel



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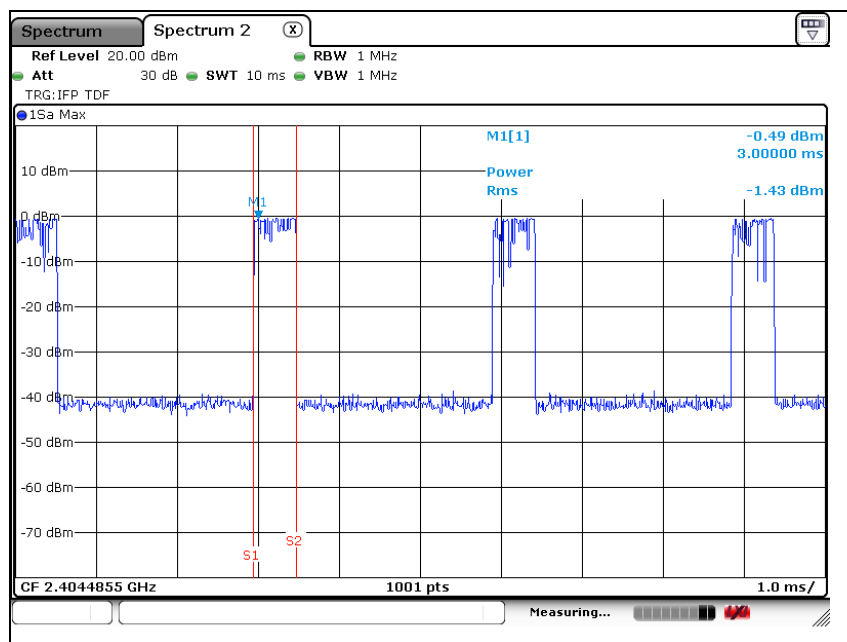
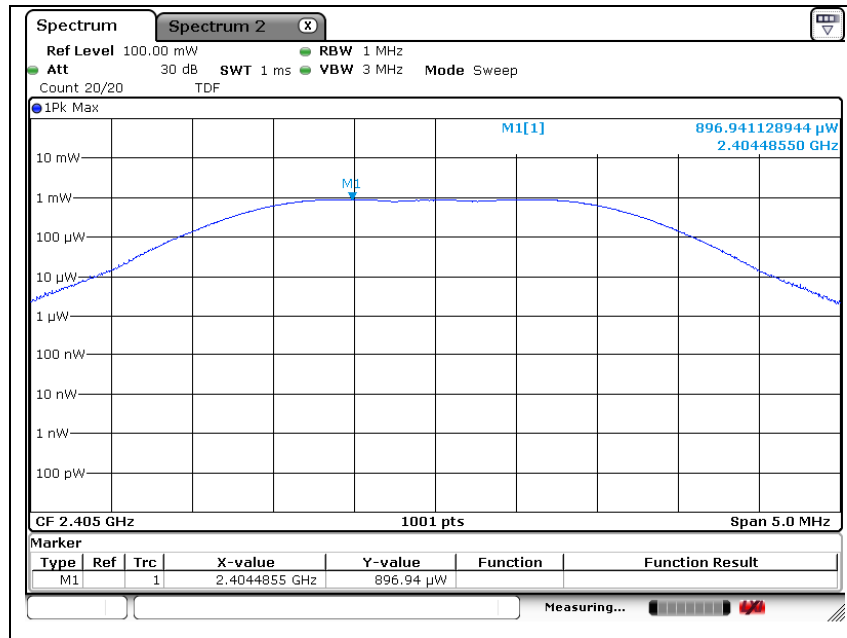
High channel



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High voltage

Low channel



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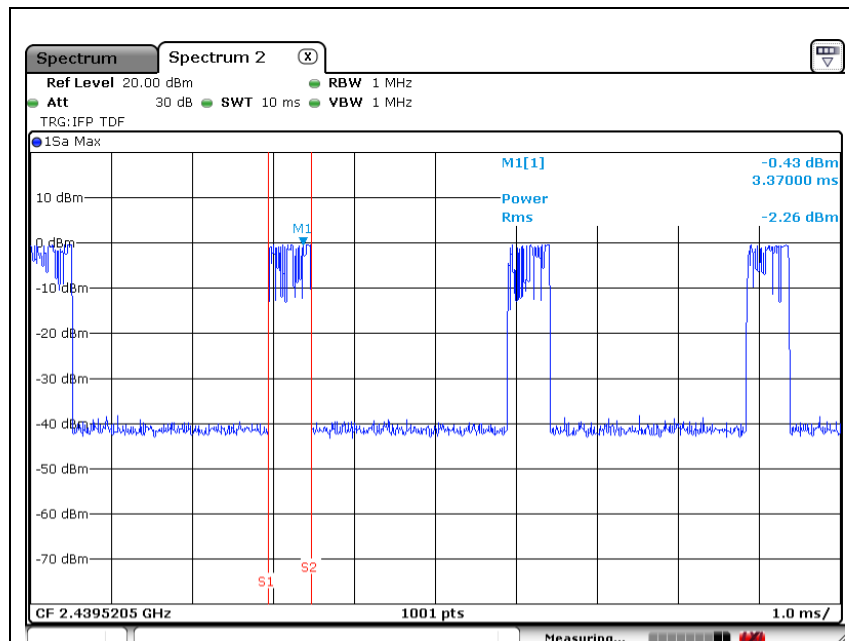
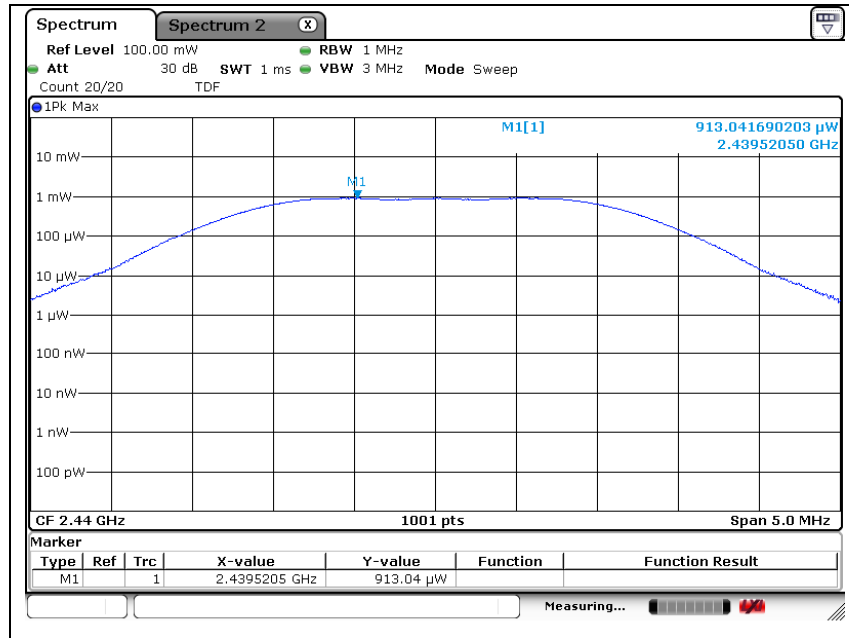
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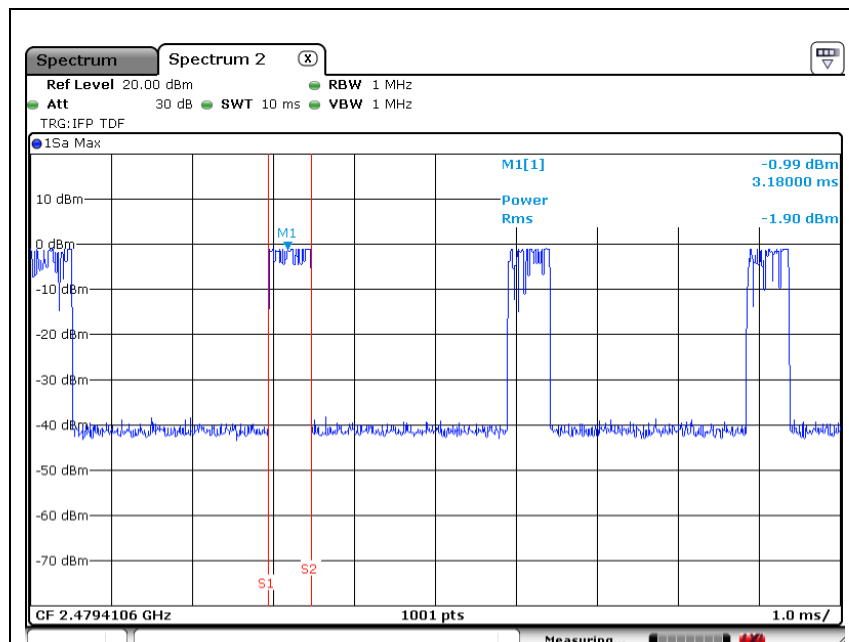
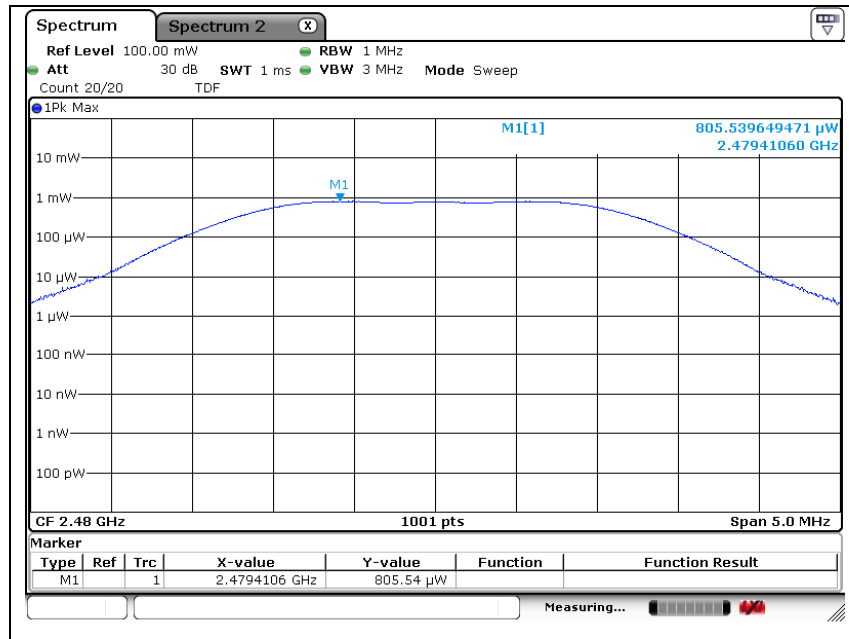
A4(210 mm x 297 mm)

Middle channel



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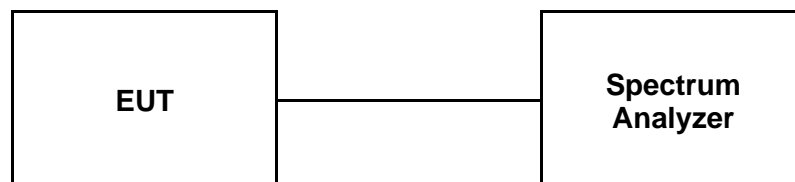
High channel



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6. Secondary Radiated Emissions

6.1. Test Setup



6.2. Limit

Below 1 GHz : 4 nW (-53.98 dB m) or less

Above 1 GHz : 20 nW (-46.99 dB m) or less

6.3. Test Procedure

[Setting 1]

1. Configure the spectrum analyzer as below;

Frequency range : 30 MHz - 12.5 GHz

RBW : Below 1 GHz: 100 kHz

Above 1 GHz: 1 MHz

VBW : Below 1 GHz: 100 kHz

Above 1 GHz: 1 MHz

Sweep time : Auto

Sweep data points : 1 001 or greater

Detector mode : Positive peak

Indication mode : Max hold

Search for spurious emissions in the range 30 MHz to 12.5 GHz.

[Setting 2]

2. Configure the spectrum analyzer as below;

Center frequency: Frequency of spurious emission found using [Setting 1]

Span: 0 Hz

RBW: Below 1 GHz: 100 kHz

Above 1 GHz: 1 MHz

VBW: Below 1 GHz: 100 kHz

Above 1 GHz: 1 MHz

Sweep time: Auto

Sweep data points: 1 001 or greater

Detector mode: Sample

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A4(210 mm x 297 mm)

6.4. Test result

Ambient temperature : (23 ± 1) °C

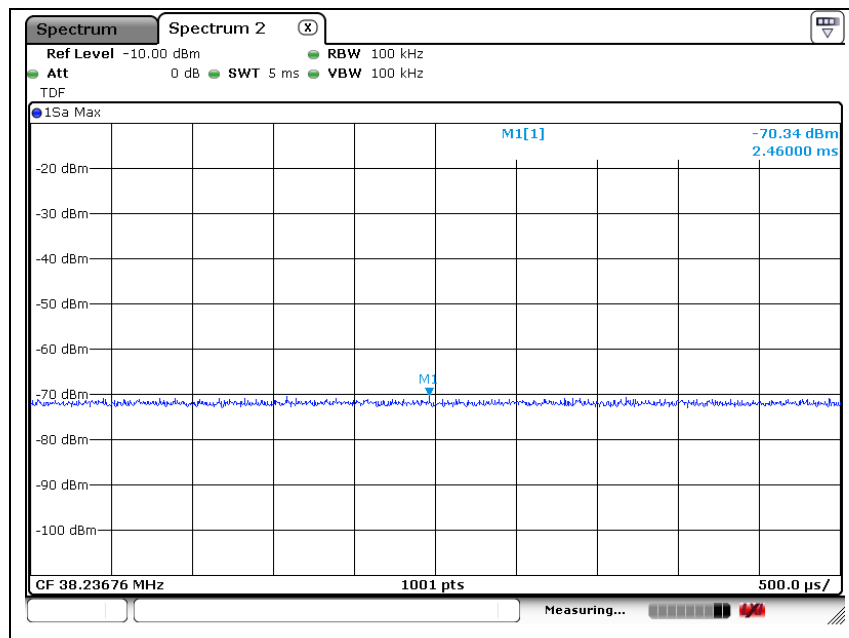
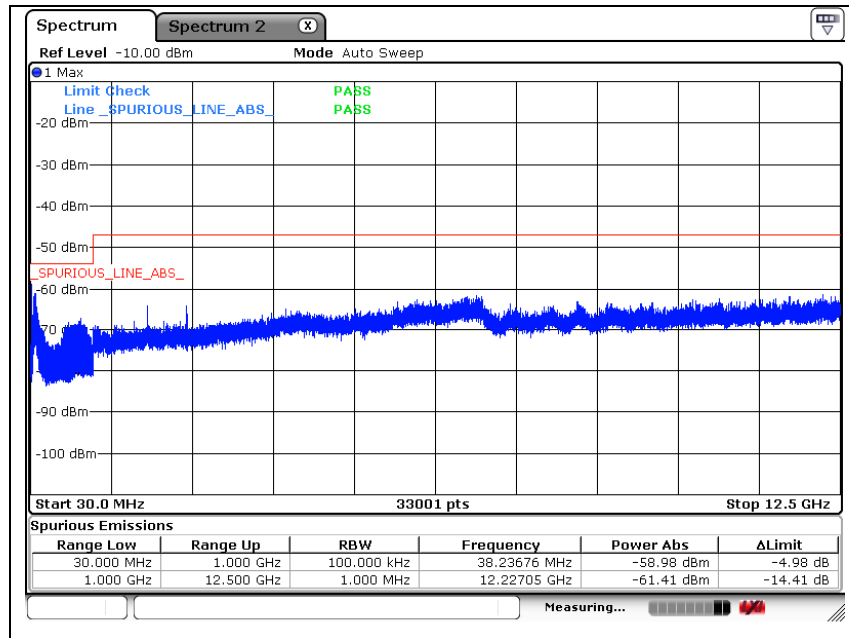
Relative humidity : 47 % R.H.

Test voltage (V _{d.c.})	Frequency Range (MHz)	Measured	Low Ch. (2 405 MHz)	Middle Ch. (2 440 MHz)	High Ch. (2 480 MHz)	Limit
V _{min} = 2.7	Below 1 000	Frequency (GHz)	0.038	0.038	0.038	-
		Level (dB m)	-70.34	-70.76	-70.78	-54.00
		Level (nW)	0.092 470	0.083 946	0.083 560	4.00
	1 000 to 12 500	Frequency (GHz)	12.227	12.153	12.467	-
		Level (dB m)	-61.41	-61.51	-61.39	-47.00
		Level (nW)	0.722 770	0.706 318	0.726 106	20.00
V _{nom} = 3.0	Below 1 000	Frequency (GHz)	0.038	0.038	0.038	-
		Level (dB m)	-70.54	-70.45	-70.13	-54.00
		Level (nW)	0.088 308	0.090 157	0.097 051	4.00
	1 000 to 12 500	Frequency (GHz)	1.829	6.887	12.488	-
		Level (dB m)	-61.19	-61.03	-61.78	-47.00
		Level (nW)	0.760 326	0.788 860	0.726 106	20.00
V _{max} = 3.3	Below 1 000	Frequency (GHz)	0.038	0.038	0.038	-
		Level (dB m)	-70.60	-70.67	-70.00	-54.00
		Level (nW)	0.087 096	0.085 704	0.100 000	4.00
	1 000 to 12 500	Frequency (GHz)	12.273	6.857	6.610	-
		Level (dB m)	-61.12	-61.02	-60.52	-47.00
		Level (nW)	0.772 681	0.790 679	0.726 106	20.00

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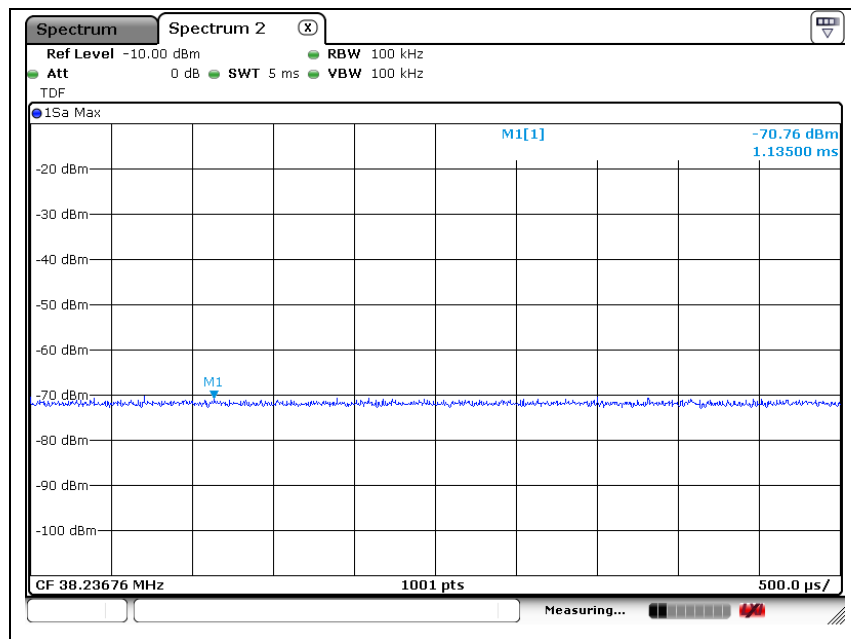
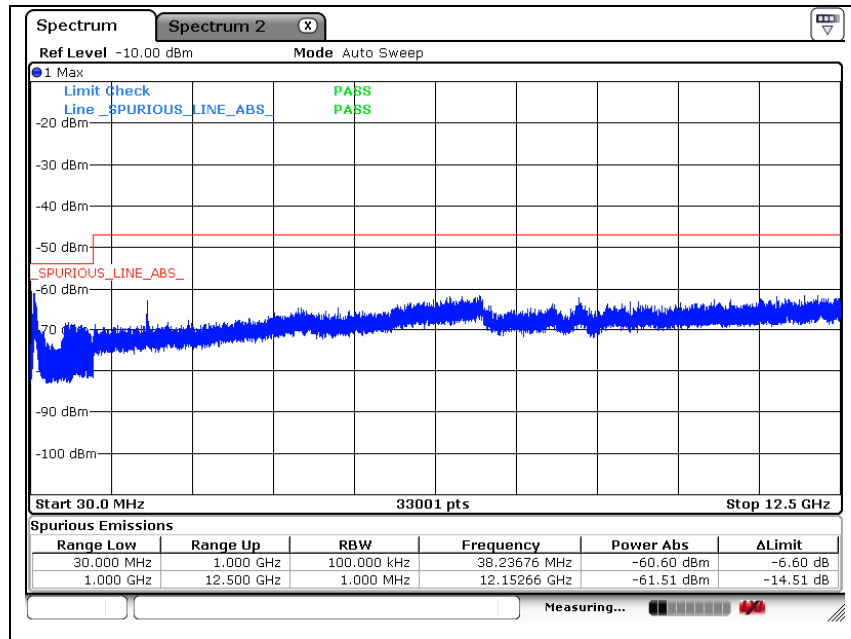
Low voltage

Low channel



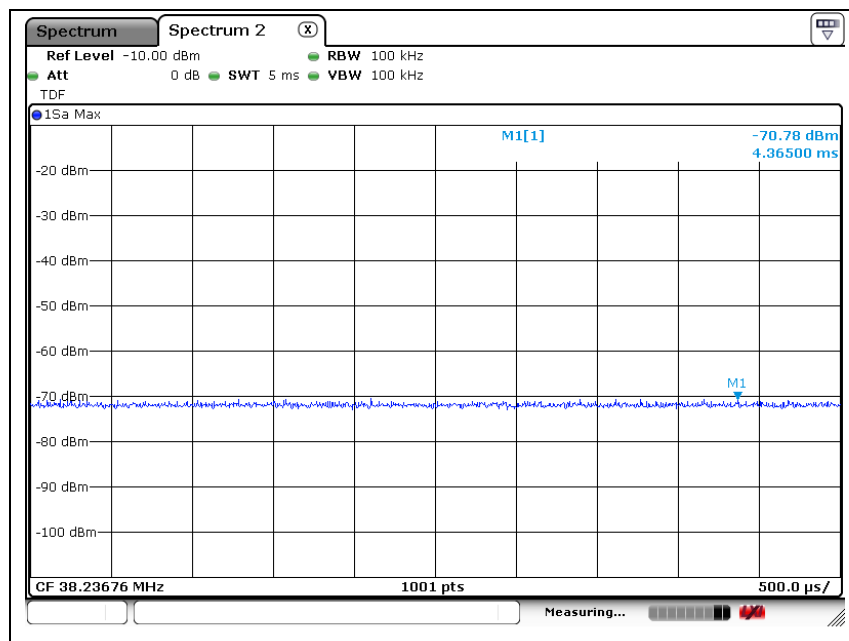
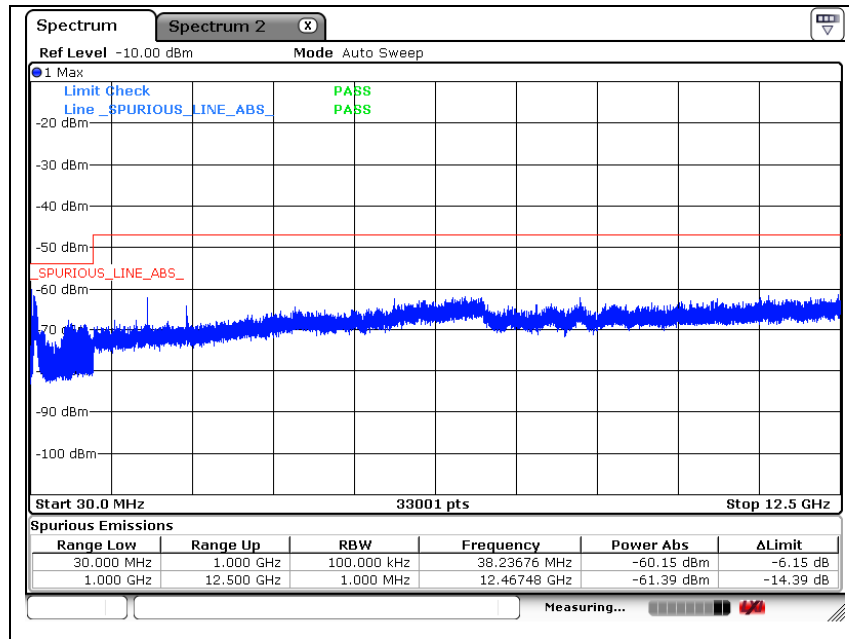
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Middle channel



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High channel



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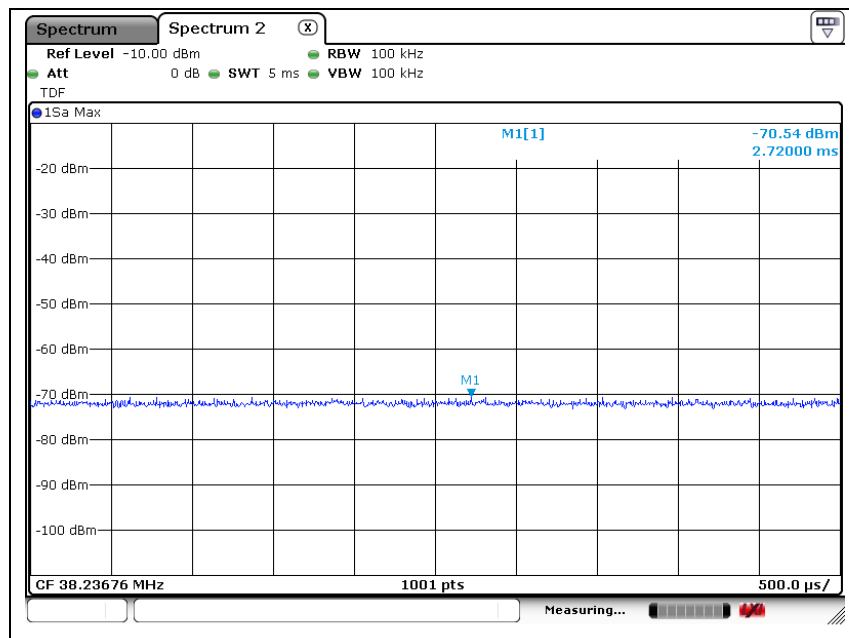
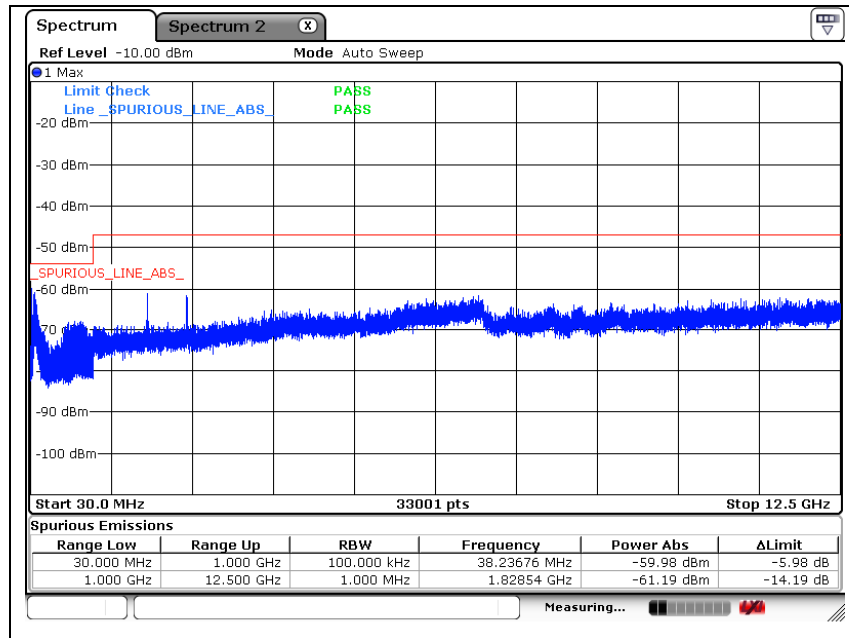
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A4(210 mm x 297 mm)

Normal voltage

Low channel



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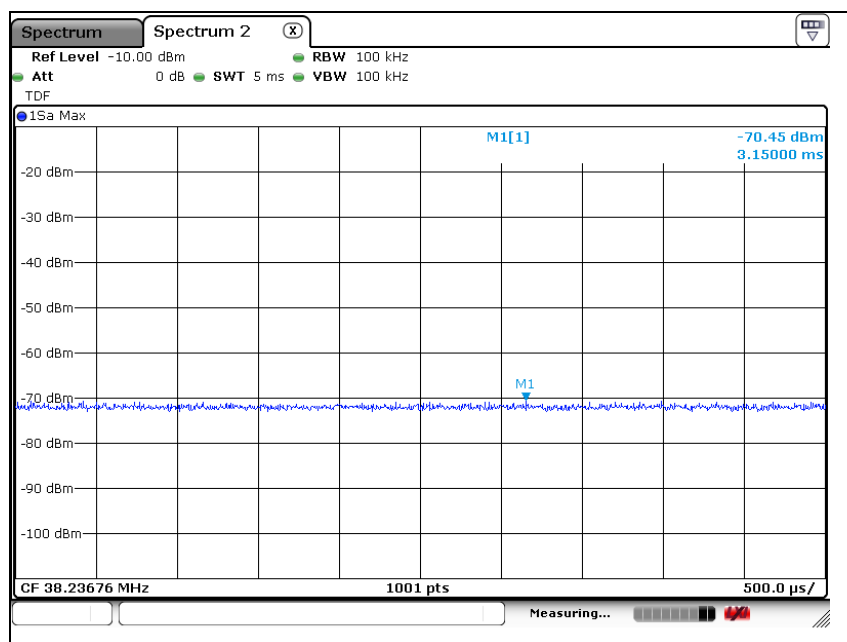
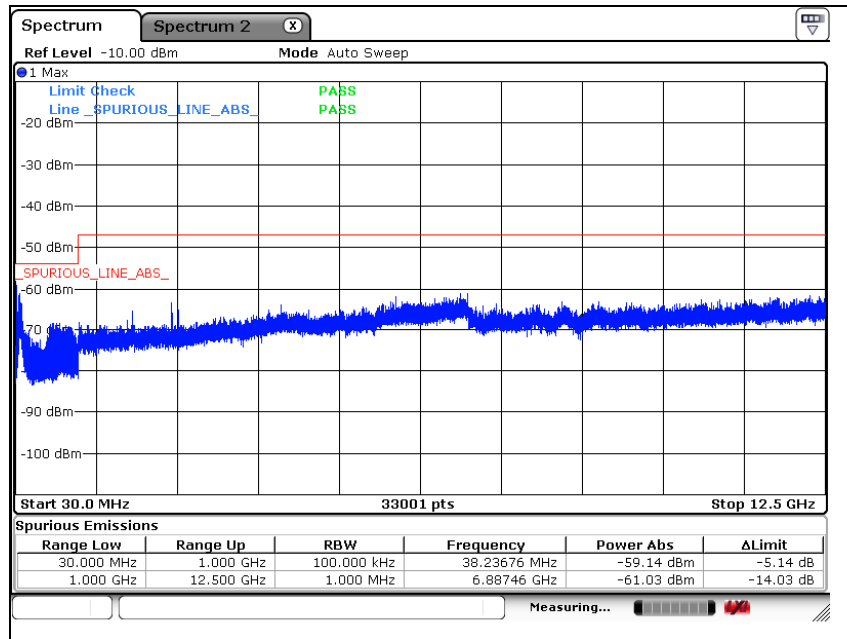
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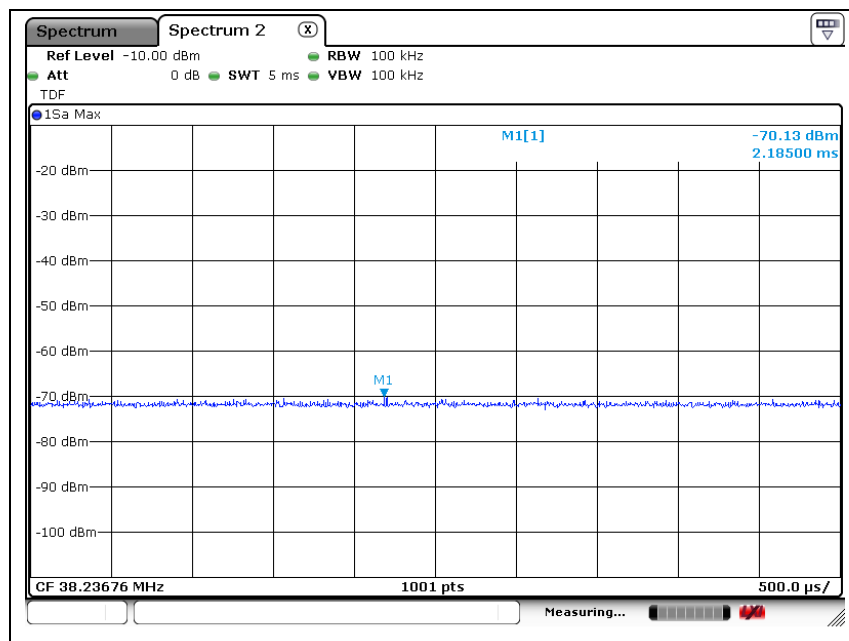
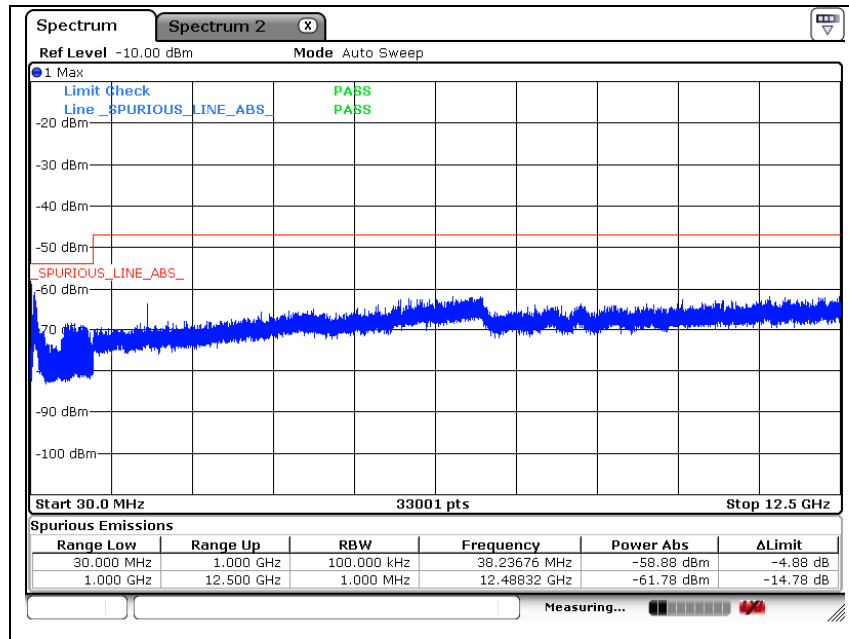
A4(210 mm x 297 mm)

Middle channel



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High channel



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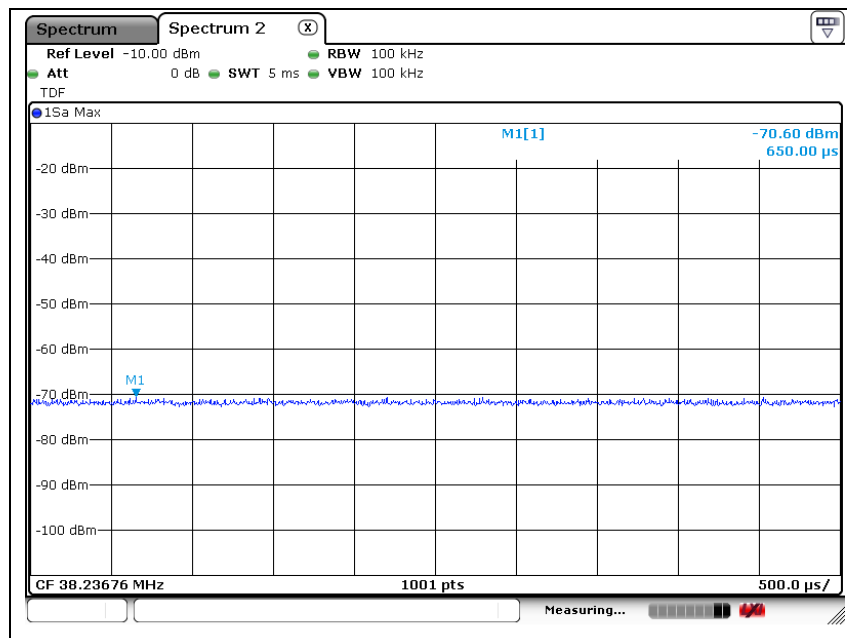
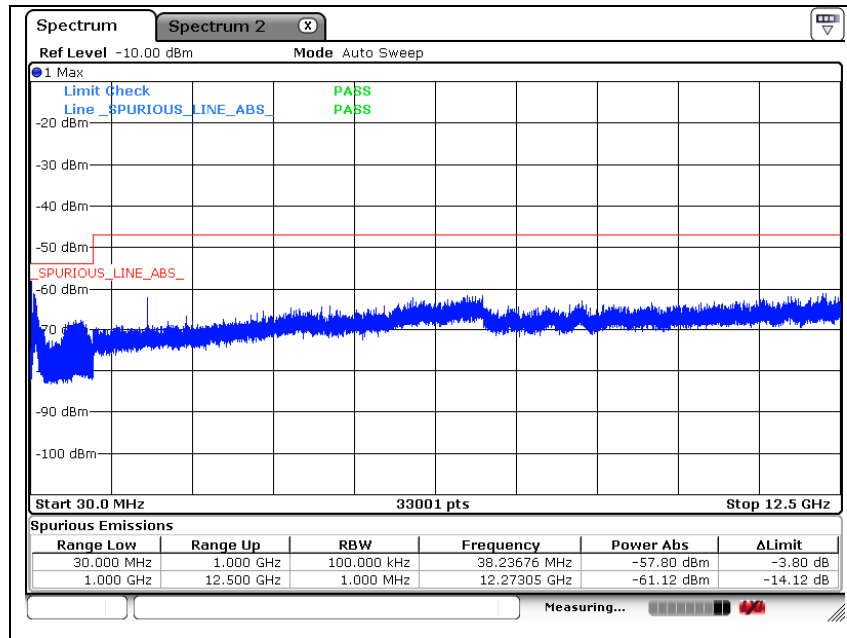
RTT5041-19(2017.07.10)(0)

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A4(210 mm x 297 mm)

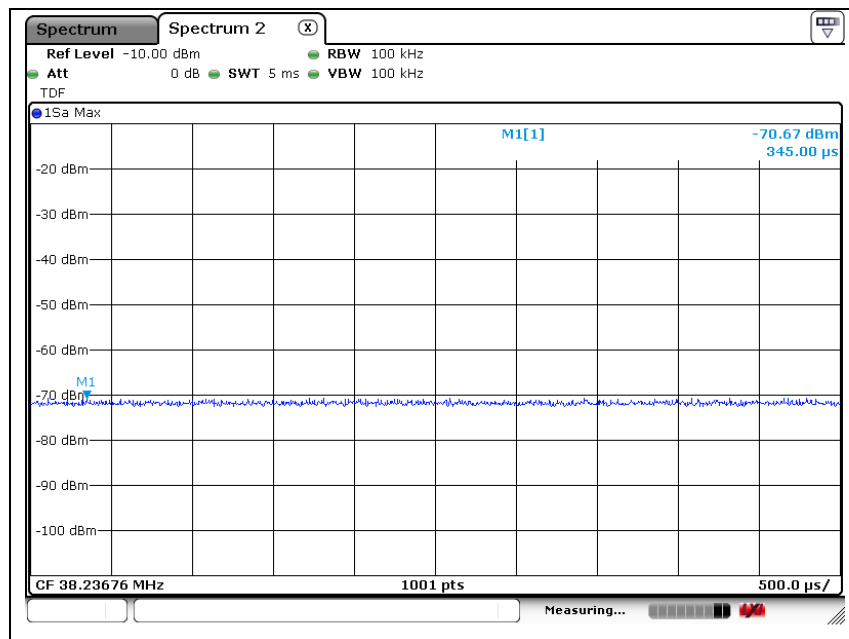
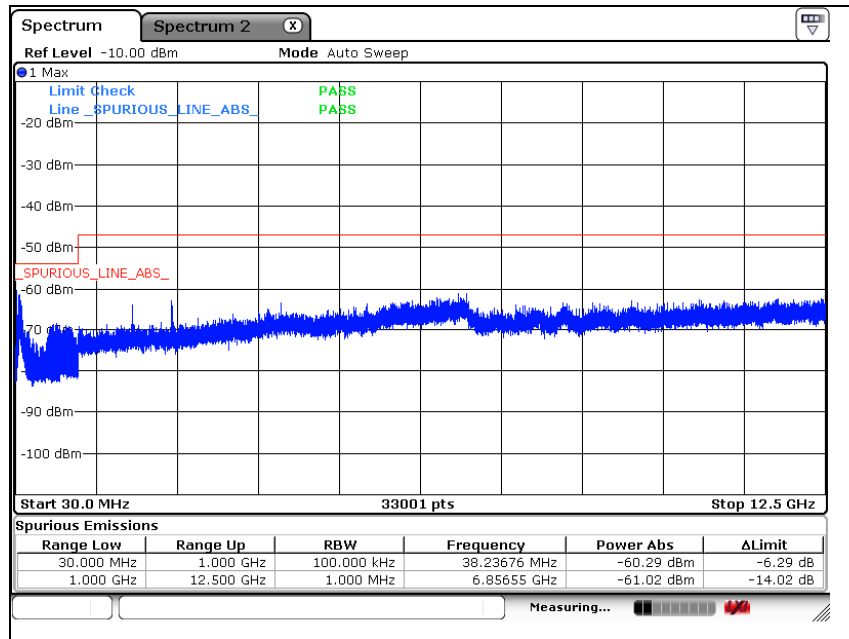
High voltage

Low channel



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Middle channel



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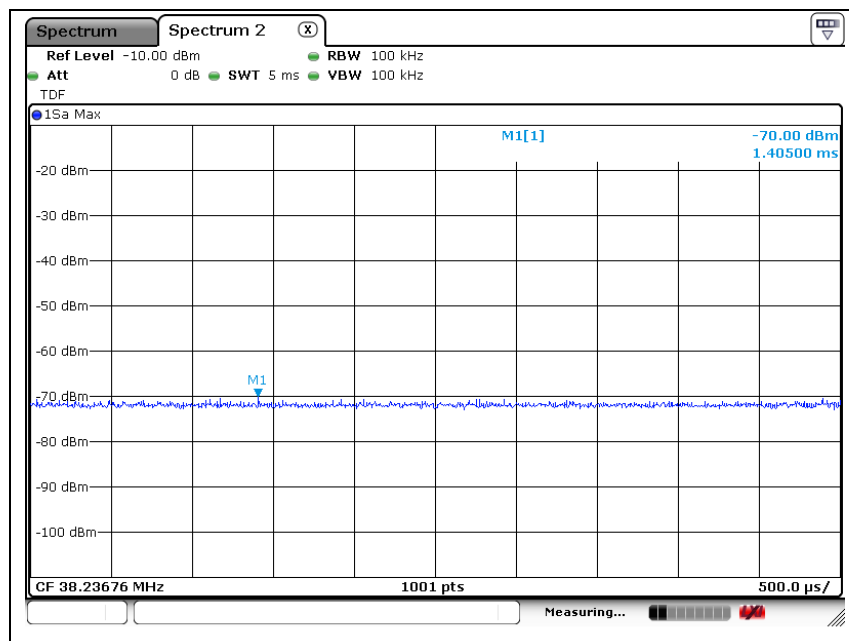
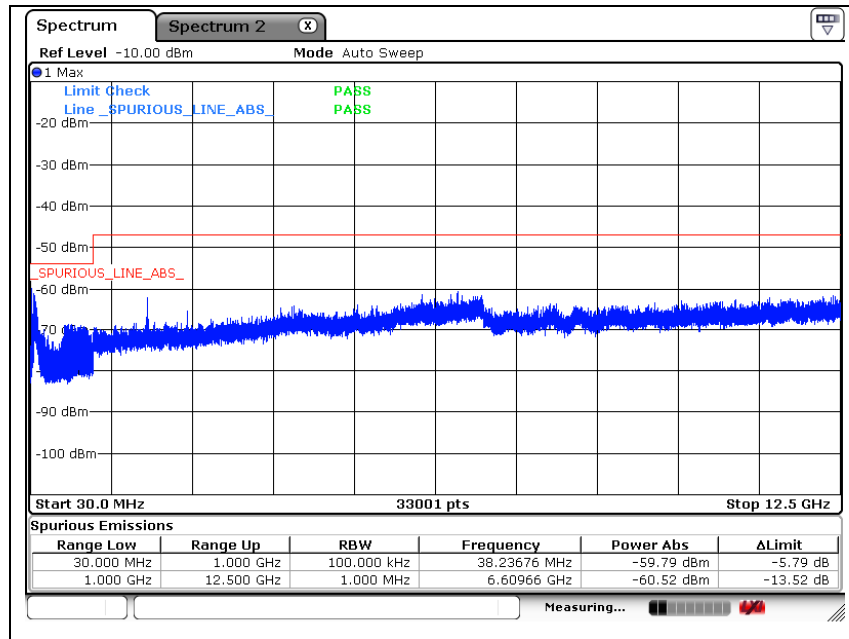
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High channel



- End of the Test Report -

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A4(210 mm x 297 mm)