

TEST REPORT

of

FCC Part 15 Subpart C §15.249

FCC ID: GJJSTP-120L

Equipment Under Test : PT-MASTER
Model Name : STP-120L
Serial No. : N/A
Applicant : SEJIN ELECTRON INC.
Manufacturer : SEJIN ELECTRON INC.
Date of Test(s) : 2013.01.28 ~ 2013.07.02
Date of Issue : 2013.07.02

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

Tested By:



Alvin Kim

Date:

2013.07.02

Approved By:



Feel Jeong

Date:

2013.07.02

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1. General information

1.1 Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 3FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

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>.

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1.2 Details of applicant

Applicant : SEJIN ELECTRON INC.

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1.3. Description of EUT

Kind of Product	PT-MASTER
Model Name	STP-120L
Serial Number	N/A
Power Supply	DC 3.8 V
Frequency Range	2 420 ~ 2 480 MHz
Modulation Technique	GFSK
Number of Channels	13
Antenna Type	Internal type (PCB antenna)

1.4 Declaration of manufacturer

- EUT is not able to transmit during charging mode.
- Channel spacing is 5 MHz

1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal Date	Cal Interval	Cal Due.
Signal Generator	R&S	SMR40	100272	Aug. 23, 2012	Annual	Aug. 23, 2013
Spectrum Analyzer	R&S	FSW	100578	May 8, 2013	Annual	May 8, 2014
Spectrum Analyzer	Agilent	N9030A	US51350132	Oct. 30, 2012	Annual	Oct. 30, 2013
High Pass Filter	Wainwright	WHK3.0/18G-10SS	344	Jun. 08, 2013	Annual	Jun. 08, 2014
High Pass Filter	Wainwright	WHK7.5//26.5G-6SS	11	Jun. 08, 2013	Annual	Jun. 08, 2014
Low Pass Filter	Mini-Circuits	NLP-1200+	V8979400903-1	Jun. 12, 2013	Annual	Jun. 12, 2014
DC power Supply	Agilent	U8002A	MY49030063	Dec. 12, 2012	Annual	Dec. 12, 2013
Preamplifier	H.P.	8447F	2944A03909	Jun. 28, 2013	Annual	Jun. 28, 2014
Preamplifier	R&S	SCU 18	10117	Jan. 14, 2013	Annual	Jan. 14, 2014
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	Jun. 13, 2013	Annual	Jun. 13, 2014
Test Receiver	R&S	ESU26	100109	Feb. 28, 2013	Annual	Feb. 28, 2014
Bilog Antenna	SCHWARZBECK	VULB9163	396	Jun. 04, 2012	Biennial	Jun. 04, 2014
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170431	May 15, 2012	Biennial	May 15, 2014
Horn Antenna	R&S	HF 906	100326	Nov. 23, 2011	Biennial	Nov. 23, 2013
Antenna Master	INN-CO	MM4000	N/A	N/A	N/A	N.C.R.
Turn Table	INN-CO	DS 1200 S	N/A	N/A	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N/A	N/A	N.C.R.

► Support equipment

Equipment	Manufacturer	Model name	S/N
-	-	-	-

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1.6. Summary of test results

The EUT has been tested according to the following specifications:

Applied Standard : FCC Part15, Subpart C		
Standard Section	Test Item	Result
15.209(a) 15.249(a) 15.249(d) 15.205	Fundamental, Spurious emission and edge band radiated emission	Complied

1.7. Test Procedure(s)

The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003) and the guidance provided in KDB 558074 were used in the measurement of the DUT.

1.8. Sample calculation

Where relevant, the following sample calculation is provided:

- Radiation test

Field strength level ($\text{dB}\mu\text{V}/\text{m}$) = Measured level ($\text{dB}\mu\text{V}$) + Antenna factor (dB) + Cable loss (dB) - amplifier gain(dB)

1.9. Test report revision

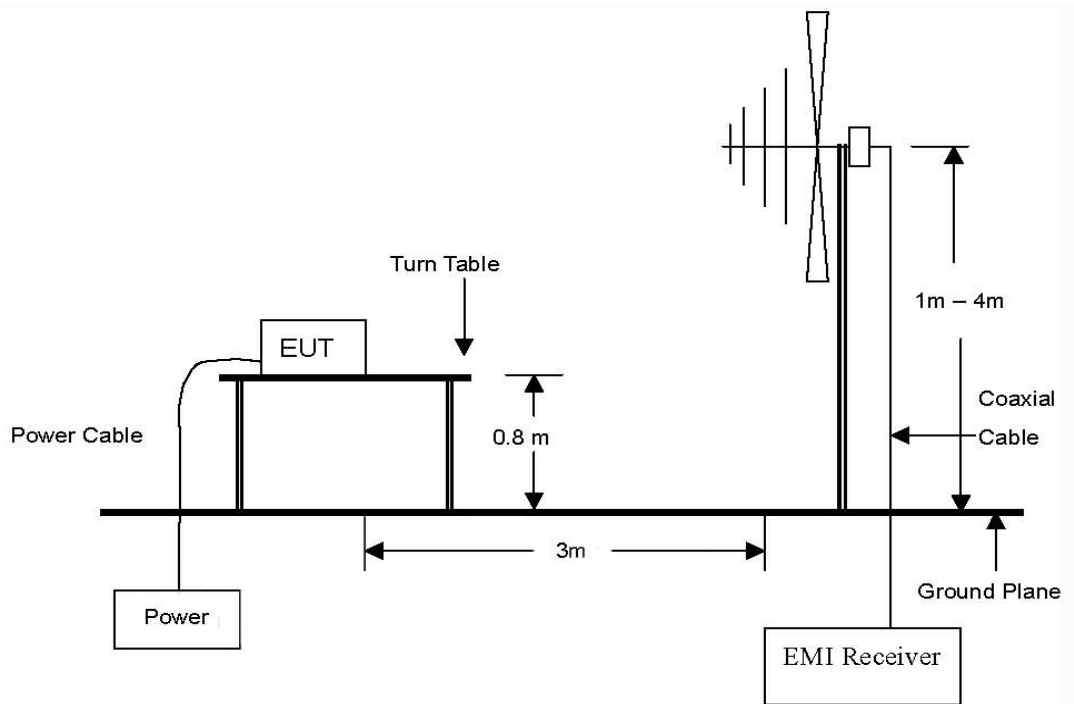
Revision	Report number	Description
0	F690501/RF-RTL006232	Initial
1	F690501/RF-RTL006232-1	Measured spurious emission out of band and modified middle channel
2	F690501/RF-RTL006232-2	Test spurious emission at 2 400 MHz

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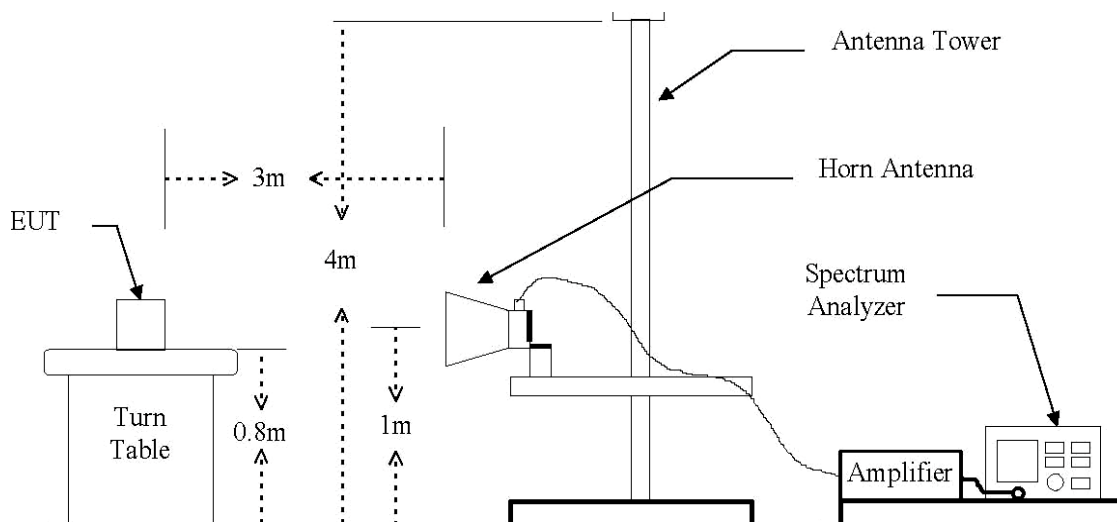
2. Fundamental, Spurious emission and edge band radiated emission

2.1. Test setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated from 1 GHz to the 10th harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



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2.2. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Note :

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.
3. To get a maximum emission level from the EUT, the EUT is manipulated through three orthogonal planes. (x-axis, y-axis and z-axis). Worst cases are x-axis.

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2.3. Limit

In the section 15.249(a) :

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (mV/m)	Field strength of harmonics (μ V/m)
902 ~ 928 MHz	50	500
2 400 ~ 2 483.5 MHz	50	500
5 725 ~ 5 875 MHz	50	500
24.0 ~ 24.25 GHz	250	2 500

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Fundamental frequency (MHz)	Field strength (μ V/m)	Measurement distance (m)
30 ~ 88	100*	3
88 ~ 216	150*	3
216 ~960	200*	3
Above 960	500	3

Remark:

Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

In the above emission table, the tighter limit applies at the band edges.

Fundamental frequency (MHz)	Field strength (μ V/m at 3 meter)	Field strength (dB μ V/m at 3 meter)
30 ~ 88	100	40.0
88 ~ 216	150	43.5
216 ~960	200	46.0
Above 960	500	54.0

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2.4. Test result

Ambient temperature : (23 ± 2) °C
Relative humidity : 47 % R.H.

2.4.1. Radiated Spurious Emission (Below 1 GHz)

The frequency spectrum from 30 MHz to 1 000 MHz was investigated. Emission levels are not reported much lower than the limits by over 30 dB.

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
33.6	45.4	Peak	H	11.8	-26.4	30.8	40.0	9.2
33.8	38.7	Peak	V	12.0	-26.4	24.3	40.0	15.7
884.4	36.1	Peak	H	23.0	-23.5	35.6	46.0	10.4
Above 900.0	Not detected	-	-	-	-	-	-	-

Remark:

1. All spurious emission at channels are almost the same below 1 GHz, so that the middle channel was chosen at representative in final test.
2. Actual = Reading + AF + AMP + CL

2.4.2. Above 1 GHz

Low Channel (2 420 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2 420.02	49.84	Peak	H	28.00	7.58	85.42	114.00	28.58
*2 390.00	24.11	Peak	H	28.05	7.18	59.34	74.00	14.66
*2 390.00	14.38	Average	H	28.05	7.18	49.61	54.00	4.39
2 400.00	24.37	Peak	H	28.06	7.56	59.99	74.00	14.01
2 400.00	14.59	Average	H	28.06	7.56	50.21	54.00	3.79

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2 971.00	33.89	Peak	H	29.69	-35.56	28.02	65.42	37.40
3 452.15	32.83	Peak	H	31.03	-35.54	28.32	65.42	37.10
*4 840.11	50.82	Peak	H	32.53	-33.27	50.08	74.00	23.92
*4 840.11	41.84	Average	H	32.53	-33.27	41.10	54.00	12.91
Above 4 900.00	Not detected	-	-	-	-	-	-	-

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Middle Channel (2 450 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2450.00	50.18	Peak	H	28.12	7.87	86.17	114.00	27.83

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2 935.36	33.05	Peak	H	29.51	-35.89	26.67	66.17	39.50
3 570.49	31.95	Peak	H	31.13	-35.97	27.11	66.17	39.06
*4 900.12	45.13	Peak	H	32.98	-32.50	45.61	74.00	28.39
*4 900.12	38.30	Average	H	32.98	-32.50	38.78	54.00	15.22
Above 5 000.00	Not detected	-	-	-	-	-	-	-

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High Channel (2 480 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2 480.00	49.55	Peak	H	28.30	7.67	85.52	114.00	28.48
*2 483.50	30.99	Peak	H	28.31	7.37	66.67	74.00	7.33
*2 483.50	14.56	Average	H	28.31	7.37	50.24	54.00	3.76

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2 895.37	33.39	Peak	H	29.29	-35.87	26.81	65.52	38.71
3 557.00	33.06	Peak	H	31.10	-35.99	28.17	65.52	37.35
*4 959.91	45.22	Peak	H	33.31	-33.24	45.29	74.00	28.71
*4 959.91	36.41	Average	H	33.31	-33.24	36.48	54.00	17.52
Above 5 000.00	Not detected	-	-	-	-	-	-	-

Remarks:

1. "*" means the restricted band.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using Peak / average detector mode.
3. Actual = Reading + AF + AMP + CL

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3. Bandwidth of operation frequency

3.1. Test setup



3.2. Limit

None; for reporting purpose only

3.3. Test procedure

1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=3 kHz, VBW=3 kHz and Span=3 MHz.

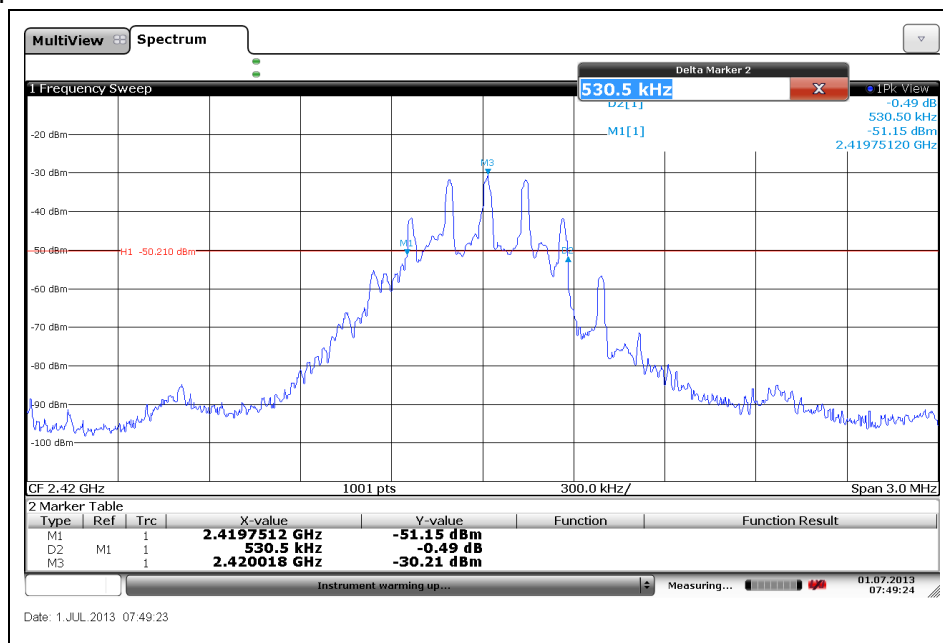
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3.4. Test result

Ambient temperature : (23 ± 2) °C
Relative humidity : 47 % R.H.

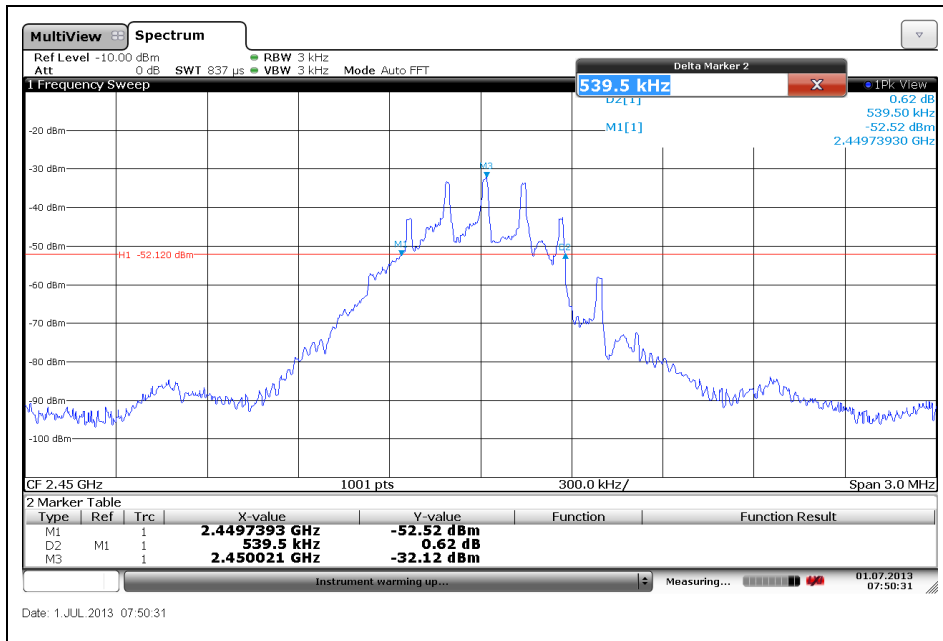
Channel	20 dB Bandwidth (kHz)
Low	0.53
Middle	0.54
High	0.55

Low channel

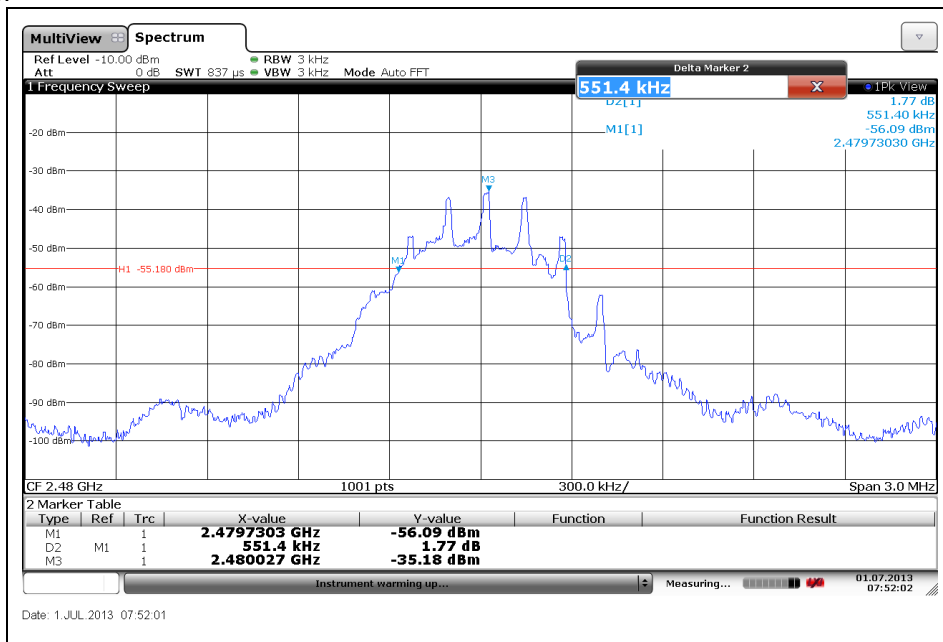


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Middle channel



High channel



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