Delta Electronics, Inc.

TEST REPORT

REPORT NUMBER
180900116TWN-001

ISSUE DATE

Feb. 13, 2019

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44

DOCUMENT CONTROL NUMBER

Radio Spectrum
TEST REPORT

Applicant:	**Delta Electronics, Inc.** **No.39, Sec. 2, Huandong Rd., Shanhua Dist., Tainan City 741, Taiwan**
Product:	**SUB 1G module**
Model No.:	**PPM N3U SB1-C**
Brand Name:	**Delta**
FCC ID:	**2ARTOPPMN3U**
Test Method/ Standard:	**47 CFR FCC Part 15.247 & ANSI C63.10 2013** **KDB 558074 D01 v04** **KDB 662911 D01 v02r01**
Test By:	**Intertek Testing Services Taiwan Ltd.,** **Hsinchu Laboratory** **No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,** **Shiang-Shan District, Hsinchu City, Taiwan**

Testing Laboratory
0597

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Rico Deng
Supervisor

Revision History

Report No.	Issue Date	Revision Summary
180900116TWN-001	Feb. 13, 2019	Original report

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Summary of Test Data

Test Requirement	Applicable Rule (Section 15.247)	Result
Minimum 6 dB Bandwidth	15.247(a)(2)	Pass
Maximum Peak Conducted Output Power	15.247(b)(3)	Pass
Power Spectral Density	15.247(e)	Pass
Emissions In Non-Restricted Frequency Bands	15.247(d)	Pass
Emissions In Restricted Frequency Bands (Radiated emission measurements)	15.247(d), 15.205, 15.209	Pass
Emission On The Band Edge	15.247(d), 15.205	Pass
AC Power Line Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass

1. General Information

1.1 Identification of the EUT

Product:	SUB 1G module
Model No.:	PPM N3U SB1-C
Operating Frequency:	902.7 MHz ~ 927.3 MHz
Access scheme:	DTS
Modulation type:	CSS
Rated Power:	DC 12V from Power supply
Power Cord:	N/A
Sample receiving date:	Sep. 13, 2018
Sample condition:	Workable
Test Date(s):	Sep. 28, 2018 ~ Feb. 11, 2019

1.2 Antenna description

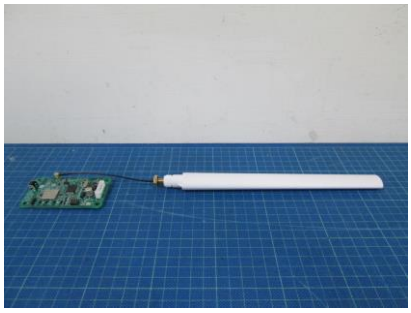
Antenna 1
Antenna Gain : 2.0 dBi
Antenna Type : Dipole Antenna
Connector Type : I-pex

Antenna 2
Antenna Gain : 1.5 dBi
Antenna Type : Dipole Antenna
Connector Type : I-pex

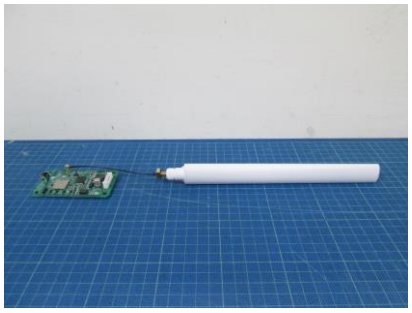
1.3 Operation mode

TX mode: EUT use 「mbpoll v3.5.4.0」 entering test mode , and Touchscreen to change different channel.

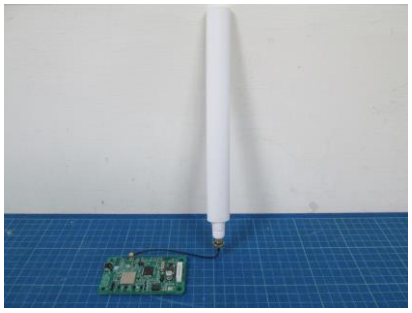
The signal is maximized through rotation and placement in the three orthogonal axes.



X axis



Y axis



Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at X axis. The final test data was executed under this configuration.

1.4 Peripherals equipment

No.	Model no.	Data Cable
Power supply	TP-1603C	N/A

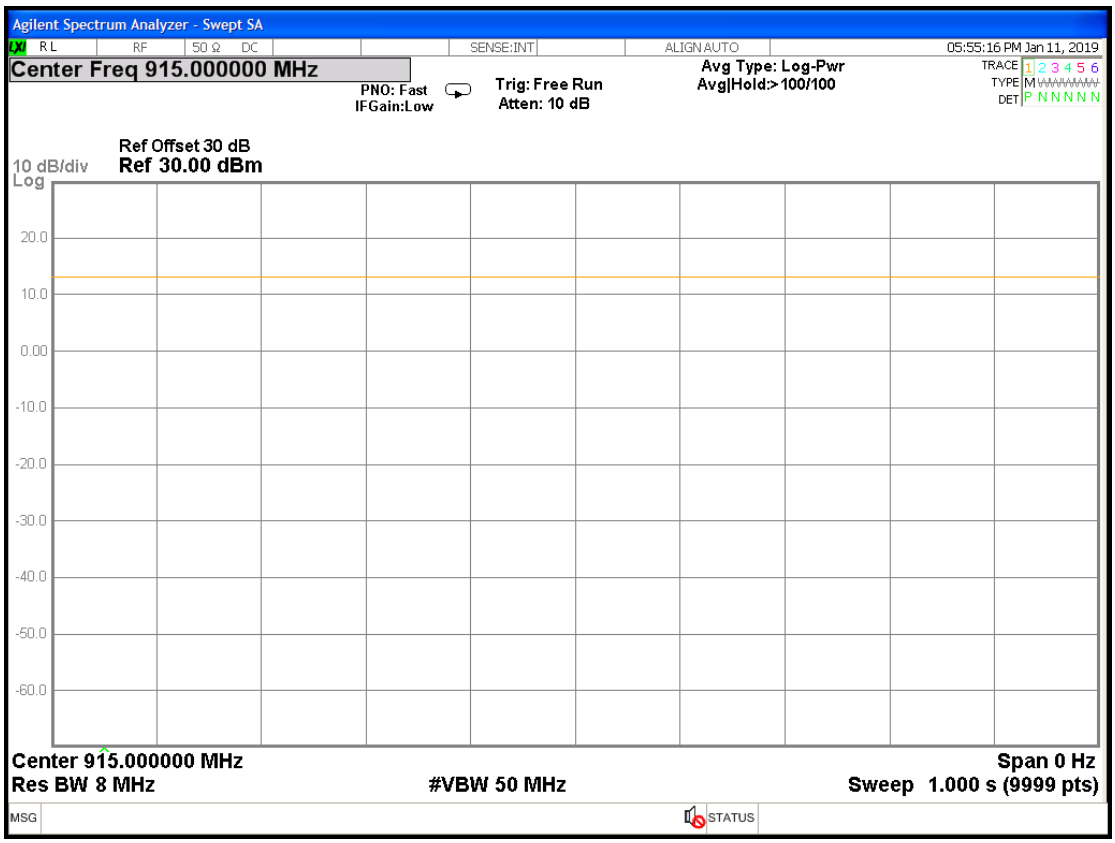
1.5 Applied test modes and channels

Test items	Mode	Channel	Antenna
Minimum 6 dB Bandwidth	DTS	Low , Mid , High	Chain0
Maximum peak conducted output power	DTS	Low , Mid , High	Chain0
Power Spectral Density	DTS	Low , Mid , High	Chain0
RF Antenna Conducted Spurious	DTS	Low , Mid , High	Chain0
Radiated spurious Emission 9kHz~1GHz	Worst Case		
Radiated Spurious Emission 1GHz~10th Harmonic	DTS	Low , Mid , High	Chain0
Emission on the Band Edge	DTS	Low , Mid , High	Chain0
AC Power Line Conducted Emission	Worst Case		

1.6 Power setting of test software

Mode	Channel	Frequency (MHz)	Signal on time(s)	Total signal transmit time(s)	Duty cycle	Duty Cycle factor
DTS	Mid	915	1	1	1.000	0.000

Duty cycle @ Ch Mid



2. Minimum 6 dB Bandwidth

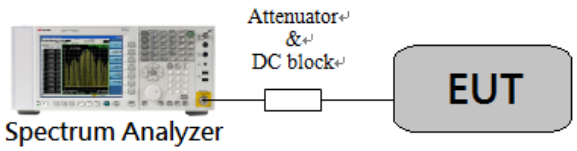
2.1 Instrument Setting

Spectrum Parameter	Setting
Detector	Peak
RBW	100kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace	Allow the trace to stabilize.
Span	Between two times and five times the occupied bandwidth
Attenuation	Auto

2.2 Test Procedure

Step 1	The transmitter output was connected to the spectrum analyzer.
Step 2	Test was performed in accordance with clause 8.1 option1 of KDB 558074 D01.
Step 3	Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

2.3 Test Diagram



2.4 Limit

The minimum 6 dB bandwidth shall be at least 500 kHz.

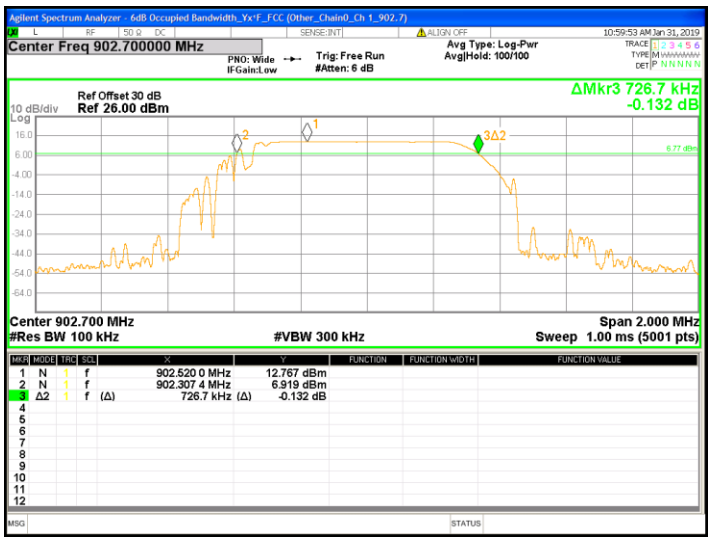
2.5 Operating Environment Condition

Temperature (℃) :	25
Relative Humidity (%) :	50
Atmospheric Pressure (hPa) :	1008
Test Date :	2019/1/31

2.6 Test Results

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
DTS	Low	902.7	0.727	>0.5	Pass
	Mid	915.0	0.705	>0.5	Pass
	High	927.3	0.675	>0.5	Pass

Chain0 : 6dB Bandwidth @ Ch Low



Chain0 : 6dB Bandwidth @ Ch Mid

Chain0 : 6dB Bandwidth @ Ch High

3.Maximum Peak Conducted Output Power

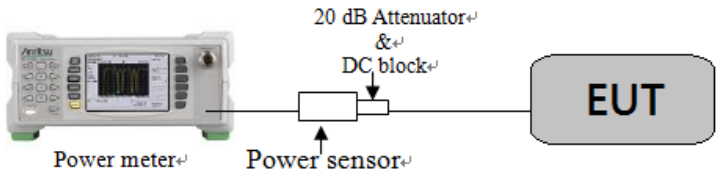
3.1 Instrument Setting

Power Meter Parameter	Setting
Bandwidth	65MHz bandwidth is greater than the EUT emission bandwidth
Detector	Peak & Average

3.2Test Procedure

Test procedures refer to clause 9.1.3 peak power meter method and clause 9.2.3.2 measurement using a gated RF average power meter of KDB 558074 D01.

3.3 Test Diagram



3.4 Limit

For systems using digital modulation in the 2400-2483.5 MHz: 1 Watt (30dBm)

3.5 Operating Environment Condition

Temperature (℃) :	25
Relative Humidity (%) :	50
Atmospheric Pressure (hPa) :	1008
Test Date :	2019/1/31

3.6 Test Results

Mode	Channel	Frequency (MHz)	Output Power (AV) (dBm)	Total Power (AV) (mW)	Maximum power (PK) (dBm)	Maximum power (PK) (mW)	Limit (dBm)	Margin (dB)
DTS	Low	902.7	13.85	24.27	13.94	24.77	30	-16.06
	Mid	915.0	14.08	25.59	14.17	26.12	30	-15.83
	High	927.3	14.29	26.85	14.38	27.42	30	-15.62

4.Power Spectral Density

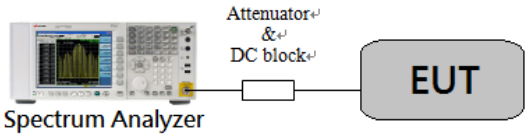
4.1 Instrument Setting

Spectrum Function	Setting
Detector	Peak
RBW	≧3 kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace	Max hold
Span	1.5 times x 6dB bandwidth
Attenuation	Auto

4.2 Test Procedure

Step 1	Test procedure refer to clause 10.2 method PKPSD (peak PSD) of KDB 558074 D01 and clause E) 2) c) of KDB 662911 D01 measure and sum spectral maxima across the outputs.
Step 2	Using the maximum conducted output power in the fundamental emission demonstrates compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
Step 3	Use the peak marker function to determine the maximum amplitude level within the RBW.

4.3 Test Diagram



4.4 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

4.5 Operating Environment Condition

Temperature (℃) :	25
Relative Humidity (%) :	50
Atmospheric Pressure (hPa) :	1008
Test Date :	2019/1/31

4.6 Test Results

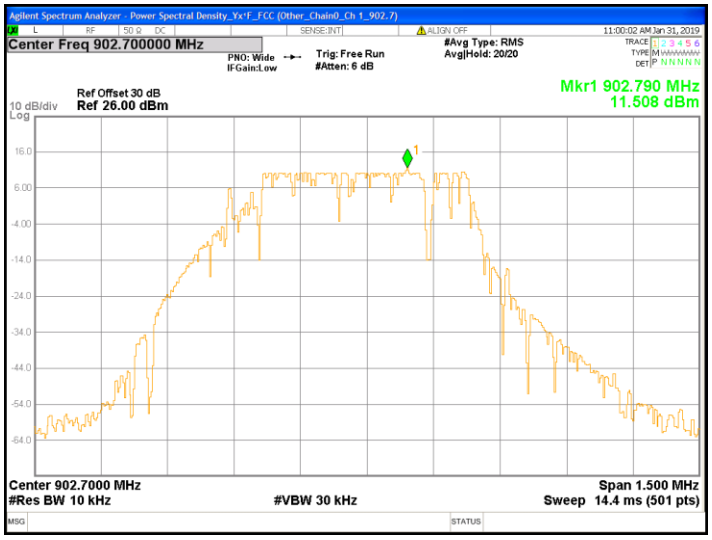
Note1: RBW Correction = 10*log(10kHz/3kHz) = 5.229
Note2: PSD in 3kHz = PSD in 10kHz – RBW Correction
Note3: Because using KDB 662911 v02r01 D01 E) 2) c), we found the peak PSD and add 10 log(N_{ANT}) dB, where N_{ANT} is the number of outputs. Before adding 10 log(N_{ANT}), each PSD was subtracted by RBW factor.

Single TX

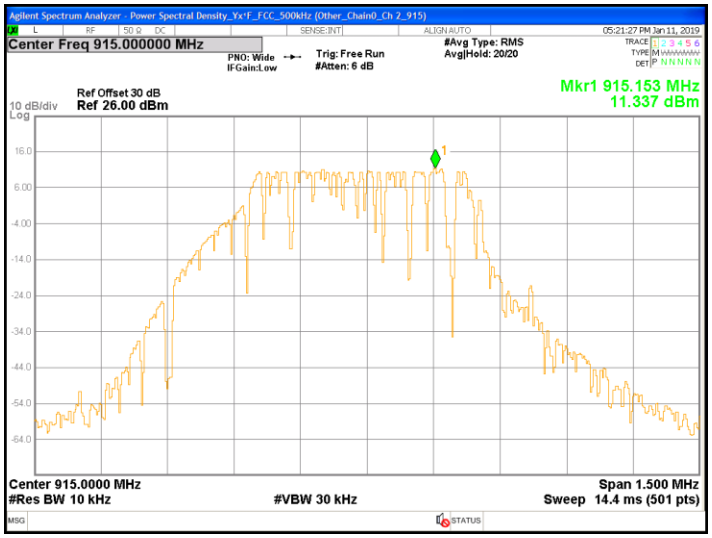
Mode	Channel	Frequency (MHz)	RBW factor	PSD in 10kHz	PSD in 3kHz		Limit (dBm)	Margin (dB)
					(dBm)	(mw)		
DTS	Low	902.7	5.23	11.508	6.28	4.25	8	-1.72
	Mid	915.0	5.23	11.337	6.11	4.08	8	-1.89
	High	927.3	5.23	10.267	5.04	3.19	8	-2.96

Note : RBW Correction: 10*log(10kHz/3kHz)

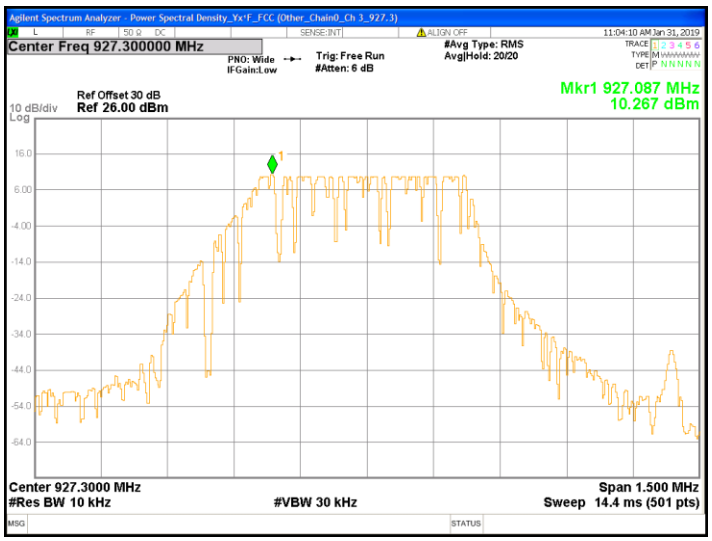
Chain0 : Power Spectral Density @ Ch Low



Chain0 : Power Spectral Density @ Ch Mid



Chain0 : Power Spectral Density @ Ch High



5.Emissions in Non-Restricted Frequency Bands

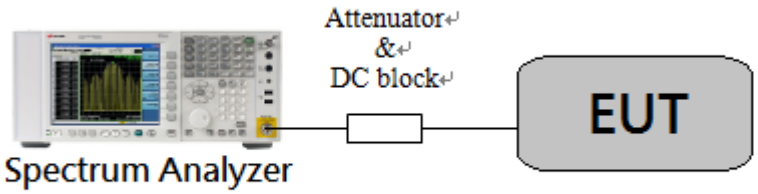
5.1 Instruments Setting

Spectrum Function	Setting (Reference Level)	Setting (Emission Level)
Detector	Peak	Peak
RBW	≧100 kHz	≧100 kHz
VBW	≧3 x RBW	≧3 x RBW
Sweep	Auto couple	Auto couple
Trace	Max hold	Max hold
Span	≧1.5 time 6dB bandwidth	
Attenuation	Auto	Auto

5.2 Test Procedure

Step 1 The procedure was used in antenna-port conducted and connected to the spectrum analyzer.
Step 2 Set instrument center frequency to center frequency.
Step 3 Use the parameter configured in clause 5.1 to measure.
Step 4 Use the peak marker function to determine the maximum amplitude level.

5.3 Test Diagram



5.4 Limit

The peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz

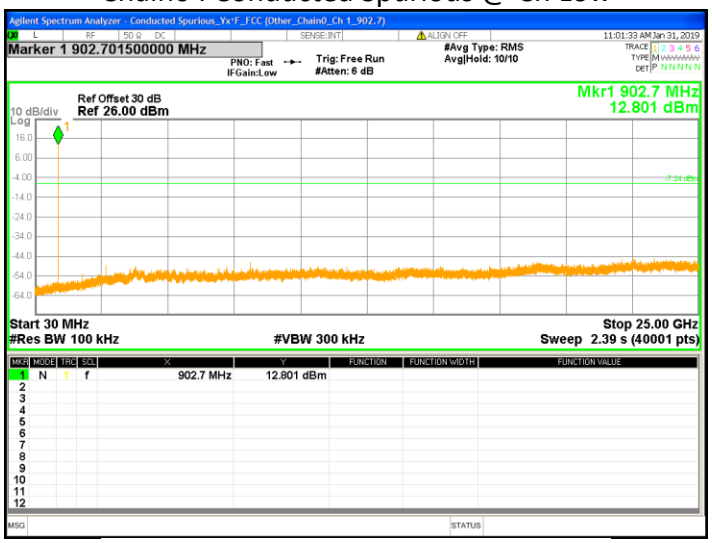
5.5 Operating Environment Condition

Temperature (℃) :	25
Relative Humidity (%) :	50
Atmospheric Pressure (hPa) :	1008
Test Date :	2019/1/31

5.6 Test Results

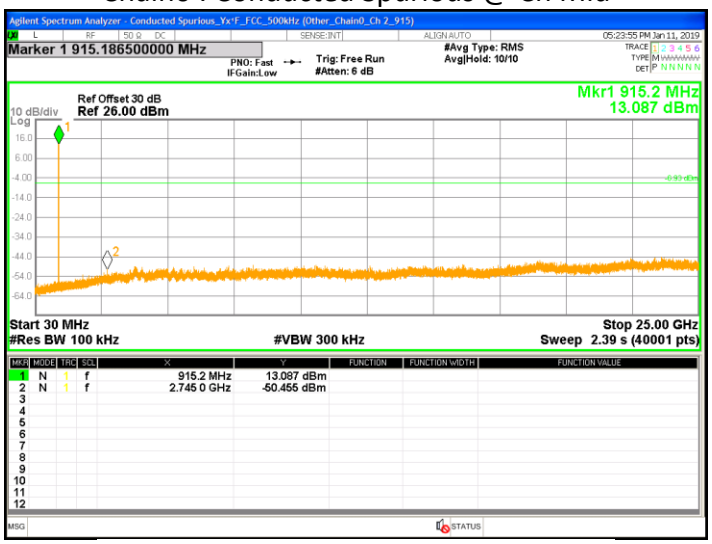
Chain0 : Conducted Spurious @ Ch Low

Chain0 : Conducted Spurious @ Ch Low



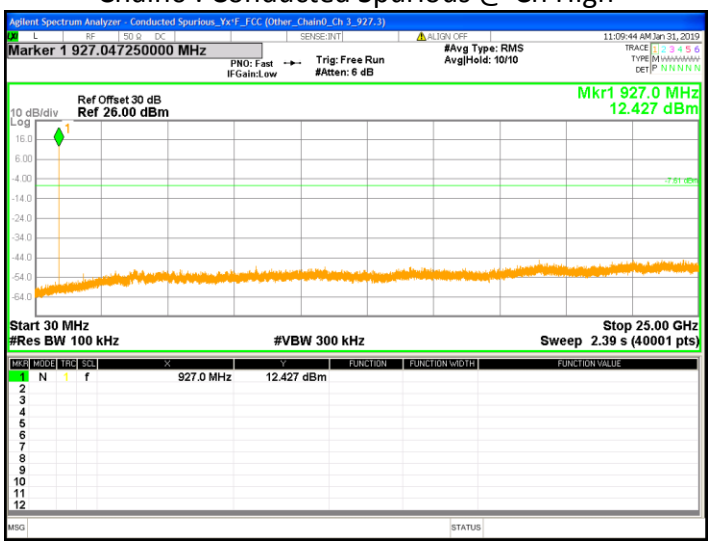
Chain0 : Conducted Spurious @ Ch Mid

Chain0 : Conducted Spurious @ Ch Mid



Chain0 : Conducted Spurious @ Ch High

Chain0 : Conducted Spurious @ Ch High



6.Emissions in Restricted Frequency Bands (Radiated emission measurements)

6.1 Instrument Setting

Receiver Function	Setting (Below 1GHz)	Setting (Above 1GHz)
Detector	QP	Peak and Average
RBW	9-150 kHz ; 200-300 Hz 0.15-30 MHz; 9-10 kHz 30-1000 MHz; 100-120 kHz	1MHz
VBW	≧3 x RBW	3MHz
Sweep	Auto couple	Auto couple
Start Frequency	9 kHz	1GHz
Stop Frequency	1 GHz	Tenth harmonic
Attenuation	Auto	Auto

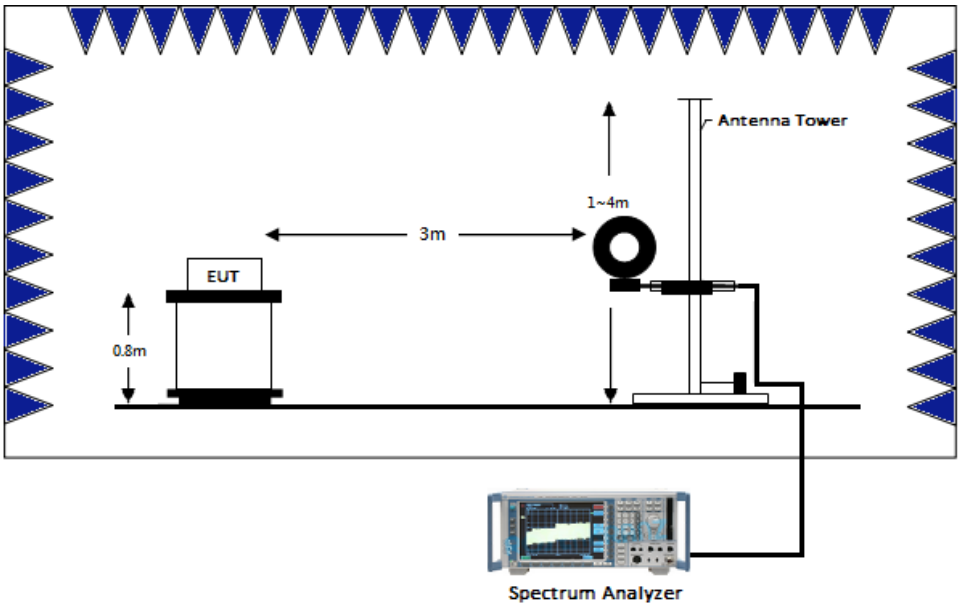
6.2 Test Procedure

Step 1	Configure the EUT according to ANSI C63.10:2013. The EUT was placed on the top of the turntable 0.8 meter (below 1GHz) and 1.5 meter (above 1GHz) above ground. The center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
Step 2	Power on the EUT and all the companion devices. The turntable was rotated by 360 degree to find the position of the maximum emission level.
Step 3	The height of the receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of the both horizontal and vertical polarization.
Step 4	If find the frequencies above the limit or below within 3dB, the antenna tower was scan (from 1m to 4m) and then the turntable was rotated to find the maximum reading.
Step 5	Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.
Step 6	For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
Step 7	If the emissions level of the EUT in peak mode was 3dB lower than the average limit specified then testing will be stopped and peak values of the EUT will be reported. Otherwise, the emissions which do not have 3dB margin will be measured using the quasi-peak method for below 1GHz.
Step 8	For testing above 1GHz, The emissions level of the EUT in peak mode was lower than average limit, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

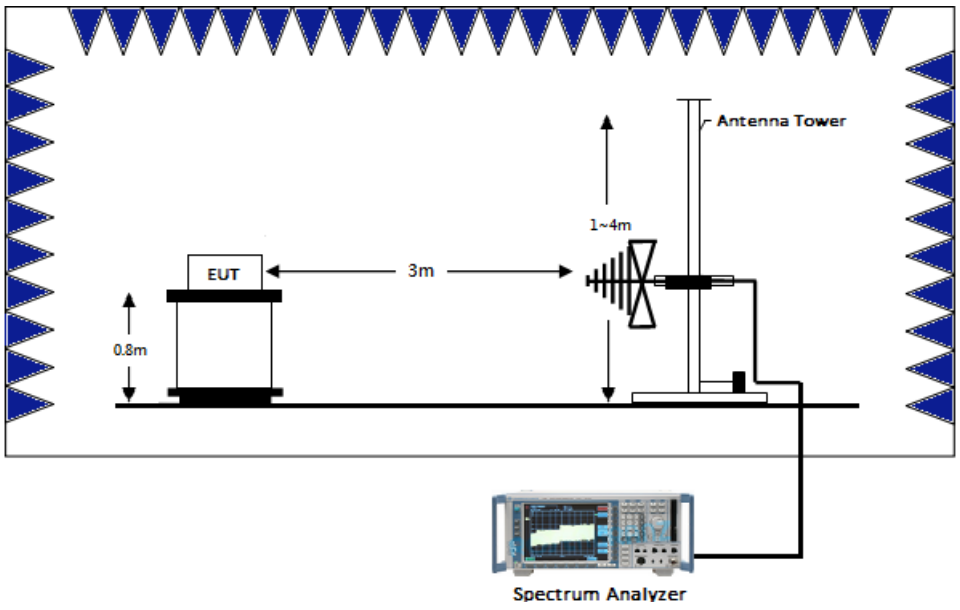
Step 9	In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be quasi-peak measured by receiver.

6.3 Test Diagram

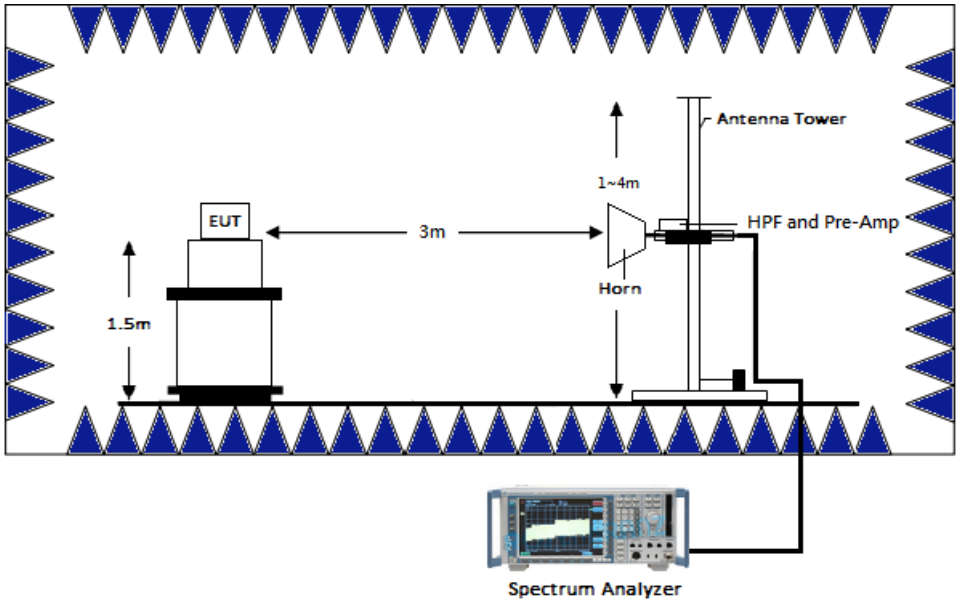
6.3.1 Radiated emission from 9kHz to 30MHz uses Loop Antenna:



6.3.2 Radiated emission below 1GHz using Bilog Antenna



6.3.3 Radiated emission above 1GHz using Horn Antenna



6.4 Limit

Frequency(MHz)	Field Strength(uV/m)	Measurement distance(m)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

6.5 Operating Environment Condition

Temperature (℃) :	25
Relative Humidity (%) :	50
Atmospheric Pressure (hPa) :	1008
Test Date :	2018/9/26~2019/1/12

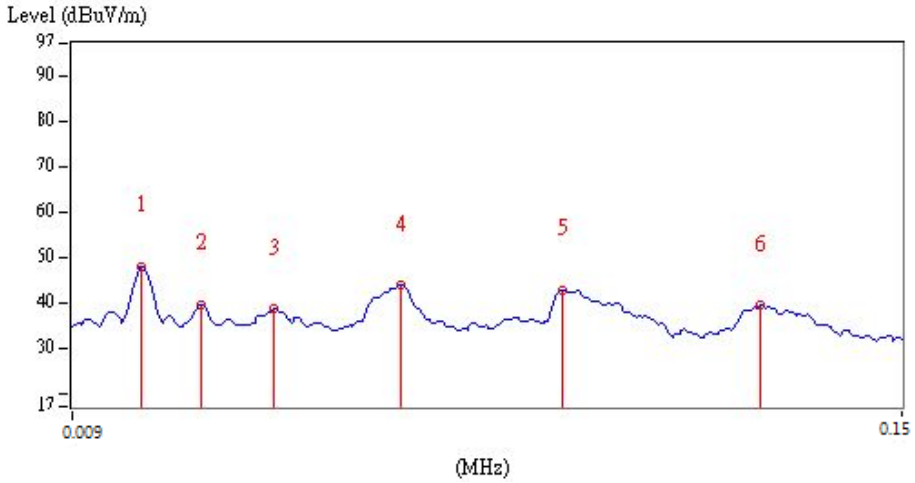
6.6 Test Result

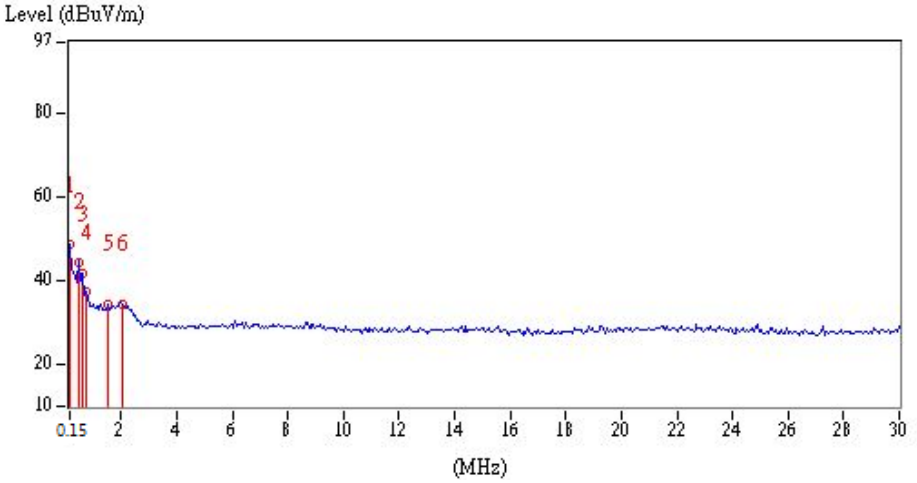
6.6.1 Measurement results: frequencies 9kHz to 30MHz

The test was performed on EUT under Low, Mid, High continuously transmitting mode. The worst case occurred at Channel High

Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
0.02	PK	19.29	28.53	47.82	121.58	-73.76
0.03	PK	19.54	19.90	39.44	118.06	-78.62
0.04	PK	19.23	19.23	38.46	115.56	-77.10
0.06	PK	18.97	24.79	43.76	112.04	-68.28
0.09	PK	18.81	23.83	42.64	108.52	-65.88
0.13	PK	18.77	20.54	39.31	105.33	-66.02
0.15	PK	18.77	29.79	48.56	104.08	-55.52
0.51	QP	18.69	25.77	44.46	73.45	-28.99
0.63	QP	18.69	23.04	41.73	71.62	-29.89
0.75	QP	18.69	18.71	37.40	70.10	-32.70
1.52	QP	18.68	15.73	34.41	63.97	-29.56
2.06	QP	18.67	15.72	34.39	69.54	-35.15

Remark: Corr. Factor = Antenna Factor + Cable Loss

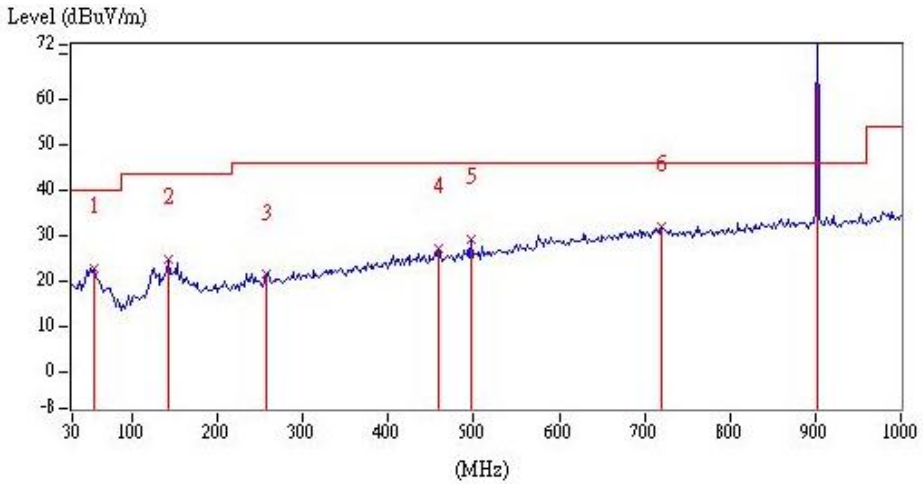

Level (dBuV/m)
97
90
80
70
60
50
40
30
17
1
2
3
4
5
6
0.009
0.15
(MHz)


Level (dBuV/m)
97
80
60
40
20
10
1
2
3
4
5
6
0.15
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
(MHz)

6.6.1 Measurement results: frequencies below 1 GHz

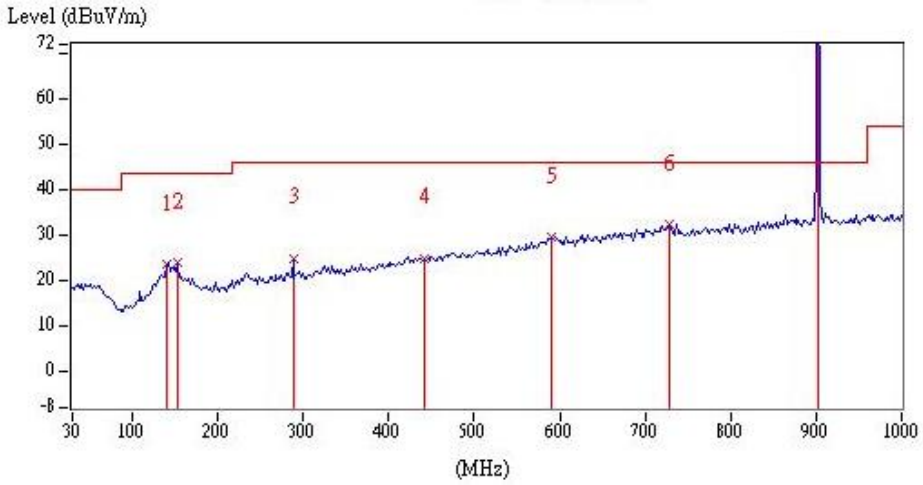
Frequency: 902.7MHz

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Vertical	55.20	QP	20.23	2.67	22.90	40.00	-17.10
Vertical	142.52	QP	19.89	5.01	24.90	43.50	-18.60
Vertical	256.98	QP	20.47	1.03	21.50	46.00	-24.50
Vertical	458.74	QP	25.50	1.89	27.39	46.00	-18.61
Vertical	497.54	QP	26.03	3.35	29.38	46.00	-16.62
Vertical	720.64	QP	30.21	1.85	32.06	46.00	-13.94



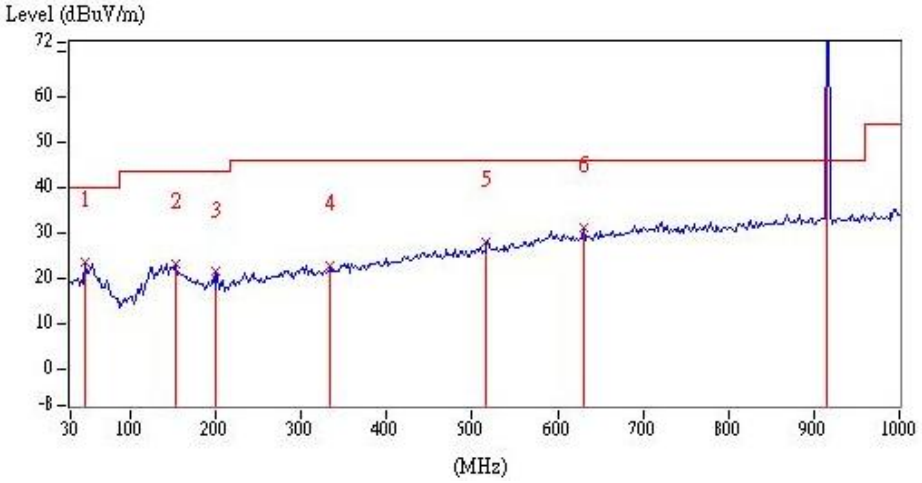
Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Horizontal	140.58	QP	19.81	3.64	23.45	43.50	-20.05
Horizontal	152.22	QP	20.26	3.67	23.93	43.50	-19.57
Horizontal	288.02	QP	21.11	3.85	24.96	46.00	-21.04
Horizontal	441.28	QP	25.14	-0.15	24.99	46.00	-21.01
Horizontal	590.66	QP	28.08	1.46	29.54	46.00	-16.46
Horizontal	728.40	QP	30.37	1.86	32.23	46.00	-13.77

Remark: Corr. Factor = Antenna Factor + Cable Loss



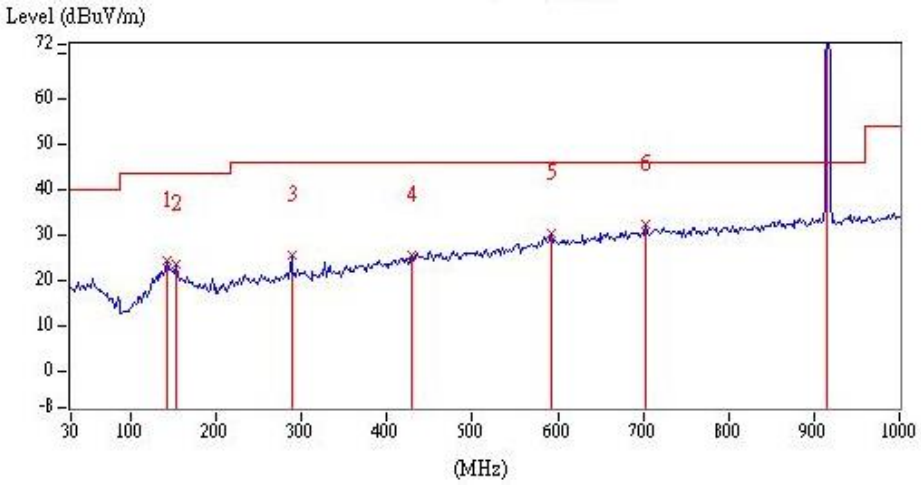
Frequency: 915MHz

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Vertical	47.46	QP	20.37	3.35	23.72	40.00	-16.28
Vertical	154.16	QP	20.29	2.93	23.22	43.50	-20.28
Vertical	200.72	QP	17.92	3.63	21.55	43.50	-21.95
Vertical	334.58	QP	22.27	0.68	22.95	46.00	-23.05
Vertical	516.94	QP	26.38	1.69	28.07	46.00	-17.93
Vertical	631.40	QP	28.73	2.66	31.39	46.00	-14.61



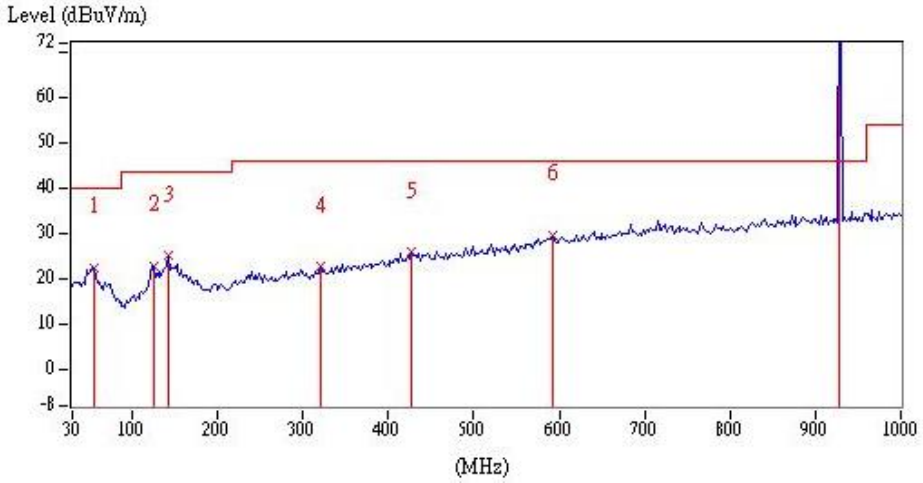
Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Horizontal	142.52	QP	19.89	4.45	24.34	43.50	-19.16
Horizontal	152.22	QP	20.26	3.21	23.47	43.50	-20.03
Horizontal	288.02	QP	21.11	4.46	25.57	46.00	-20.43
Horizontal	429.64	QP	24.82	0.67	25.49	46.00	-20.51
Horizontal	592.60	QP	28.13	2.07	30.20	46.00	-15.80
Horizontal	703.18	QP	29.86	2.38	32.24	46.00	-13.76

Remark: Corr. Factor = Antenna Factor + Cable Loss



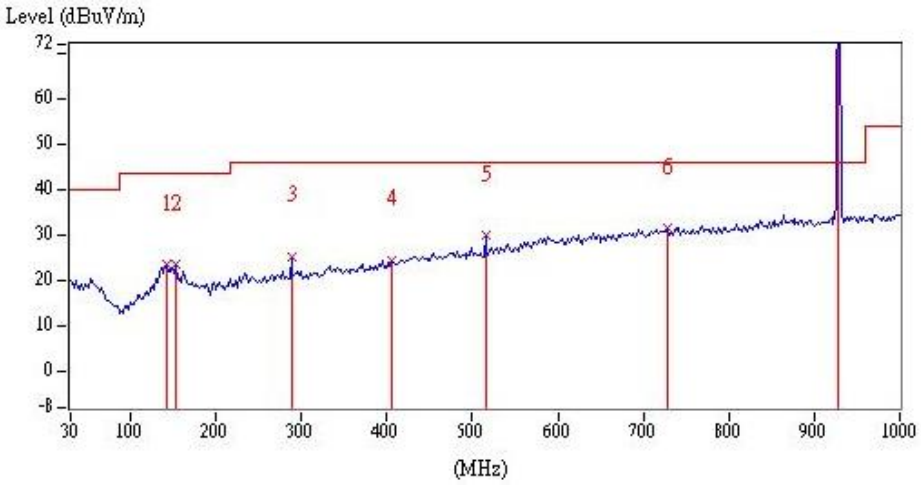
Frequency: 927.3MHz

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Vertical	55.22	QP	20.23	2.27	22.50	40.00	-17.50
Vertical	125.06	QP	18.10	4.87	22.97	43.50	-20.53
Vertical	142.52	QP	19.89	5.23	25.12	43.50	-18.38
Vertical	321.00	QP	21.95	0.71	22.66	46.00	-23.34
Vertical	427.70	QP	24.76	1.21	25.97	46.00	-20.03
Vertical	592.60	QP	28.13	1.54	29.67	46.00	-16.33



Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Horizontal	142.52	QP	19.89	3.69	23.58	43.50	-19.92
Horizontal	152.22	QP	20.26	3.24	23.50	43.50	-20.00
Horizontal	288.02	QP	21.11	4.16	25.27	46.00	-20.73
Horizontal	406.36	QP	24.18	0.33	24.51	46.00	-21.49
Horizontal	515.00	QP	26.34	3.51	29.85	46.00	-16.15
Horizontal	728.40	QP	30.37	1.14	31.51	46.00	-14.49

Remark: Corr. Factor = Antenna Factor + Cable Loss



6.6.2 Measurement results: frequency above 1GHz to 25GHz

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Chanel Low	1804	PK	V	32.73	14.18	46.91	74	-27.09
	2706	PK	V	35.17	21.16	56.33	74	-17.67
	2706	AV	V	35.17	17.60	52.77	54	-1.23
	3608	PK	V	1.72	43.85	45.57	74	-28.43
	4510	PK	V	4.50	45.24	49.74	74	-24.26
	5412	PK	V	7.25	40.03	47.28	74	-26.72
	6314	PK	V	10.12	36.32	46.44	74	-27.56
	7216	PK	V	13.86	38.43	52.29	74	-21.71
	8118	PK	V	15.77	33.99	49.76	74	-24.24
	9020	PK	V	17.05	28.80	45.85	74	-28.15
	1804	PK	H	32.73	15.45	48.18	74	-25.82
	2706	PK	H	35.17	22.38	57.55	74	-16.45
	2706	AV	H	35.17	18.24	53.41	54	-0.59
	3608	PK	H	1.72	44.04	45.76	74	-28.24
	4510	PK	H	4.50	44.47	48.97	74	-25.03
	5412	PK	H	7.25	40.37	47.62	74	-26.38
	6314	PK	H	10.12	34.34	44.46	74	-29.54
	7216	PK	H	13.86	36.97	50.83	74	-23.17
	8118	PK	H	15.77	36.86	52.63	74	-21.37
	9020	PK	H	17.05	27.49	44.54	74	-29.46

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
Chane Mid	1830	PK	V	32.96	14.28	47.24	74	-26.76
	2745	PK	V	35.34	22.44	57.78	74	-16.22
	2745	AV	V	35.34	18.16	53.50	54	-0.50
	3660	PK	V	1.90	43.32	45.22	74	-28.78
	4575	PK	V	4.78	45.42	50.20	74	-23.80
	5490	PK	V	7.36	39.06	46.42	74	-27.58
	6405	PK	V	10.70	35.88	46.58	74	-27.42
	7320	PK	V	14.37	38.65	53.02	74	-20.98
	8235	PK	V	16.01	36.03	52.04	74	-21.96
	9150	PK	V	17.46	27.56	45.02	74	-28.98
	1830	PK	H	32.96	15.17	48.13	74	-25.87
	2745	PK	H	35.33	22.79	58.12	74	-15.88
	2745	AV	H	35.33	18.22	53.55	54	-0.45
	3660	PK	H	1.90	44.88	46.78	74	-27.22
	4575	PK	H	4.78	45.72	50.50	74	-23.50
	5490	PK	H	7.36	38.02	45.38	74	-28.62
	6405	PK	H	10.70	34.46	45.16	74	-28.84
	7320	PK	H	14.37	38.07	52.44	74	-21.56
	8235	PK	H	16.01	36.39	52.40	74	-21.60
	9150	PK	H	17.46	26.05	43.51	74	-30.49

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Chanel High	1856	PK	V	33.18	14.16	47.34	74	-26.66
	2784	PK	V	35.48	22.79	58.27	74	-15.73
	2784	AV	V	35.48	18.10	53.58	54	-0.42
	3712	PK	V	2.08	43.13	45.21	74	-28.79
	4640	PK	V	5.07	45.09	50.16	74	-23.84
	5568	PK	V	7.48	37.83	45.31	74	-28.69
	6496	PK	V	11.27	35.17	46.44	74	-27.56
	7424	PK	V	14.88	37.72	52.60	74	-21.40
	8352	PK	V	16.25	36.84	53.09	74	-20.91
	9280	PK	V	17.86	27.95	45.81	74	-28.19
	1856	PK	H	33.18	15.77	48.95	74	-25.05
	2784	PK	H	35.48	23.24	58.72	74	-15.28
	2784	AV	H	35.48	18.16	53.64	54	-0.36
	3712	PK	H	2.08	43.61	45.69	74	-28.31
	4640	PK	H	5.07	46.76	51.83	74	-22.17
	5568	PK	H	7.48	36.73	44.21	74	-29.79
	6496	PK	H	11.27	35.02	46.29	74	-27.71
	7424	PK	H	14.88	36.61	51.49	74	-22.51
	8352	PK	H	16.25	36.89	53.14	74	-20.86
	9280	PK	H	17.86	28.08	45.94	74	-28.06

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

7.Emission on Band Edge

7.1 Instrument Setting

Spectrum Function	Setting
Detector	Peak and Average
RBW	1MHz
VBW	3MHz
Sweep	Auto couple
Restrict bands	2310 MHz ~ 2390 MHz 2483.5 MHz ~ 2500 MHz
Attenuation	Auto

7.2 Test Procedure

The test procedure is the same as Emissions in Restricted Frequency Bands (Radiated emission measurements).

7.3 Operating Environment Condition

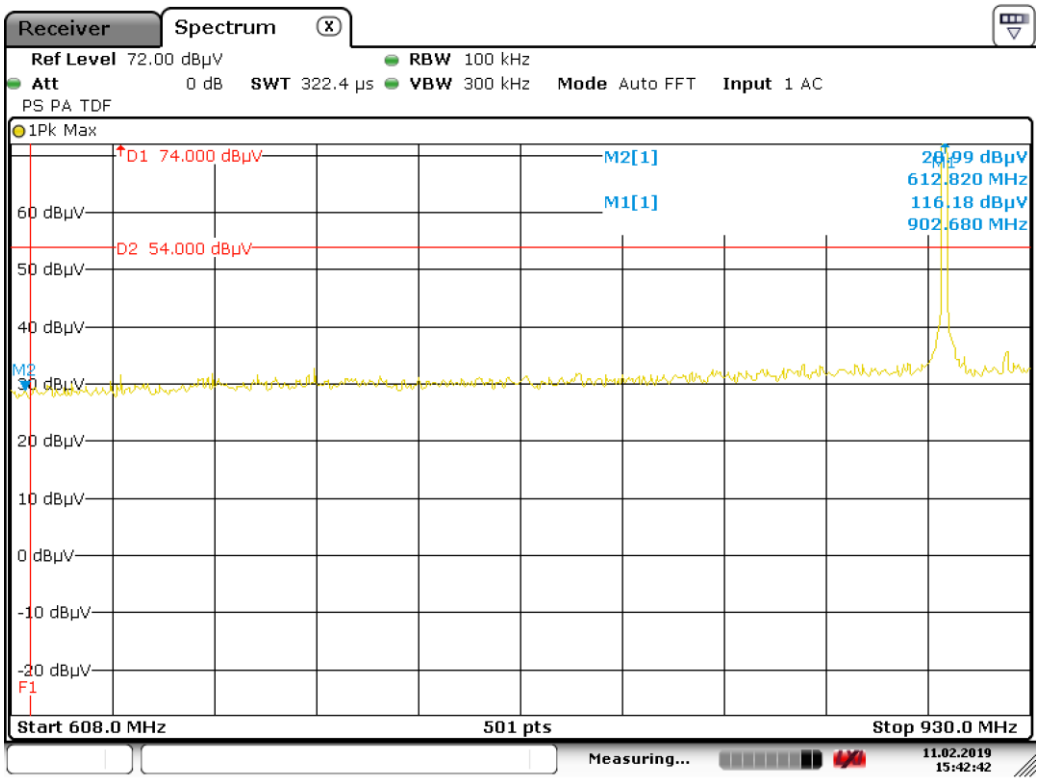
Temperature (℃) :	25
Relative Humidity (%) :	50
Atmospheric Pressure (hPa) :	1008
Test Date :	2019/01/12

7.4 Test Results

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
DTS	612.82	PK	H	28.48	0.51	28.99	74	-45.01	608~614
	608.32	AV	H	28.43	-5.96	22.47	54	-31.53	
	997.68	PK	H	33.82	2.42	36.24	74	-37.76	960~1000
	995.61	AV	H	33.81	-12.32	21.49	54	-32.51	

Remark1: Correction Factor = Antenna Factor + Cable Loss

Restricted Band Bandedge @ Channel Low_Peak



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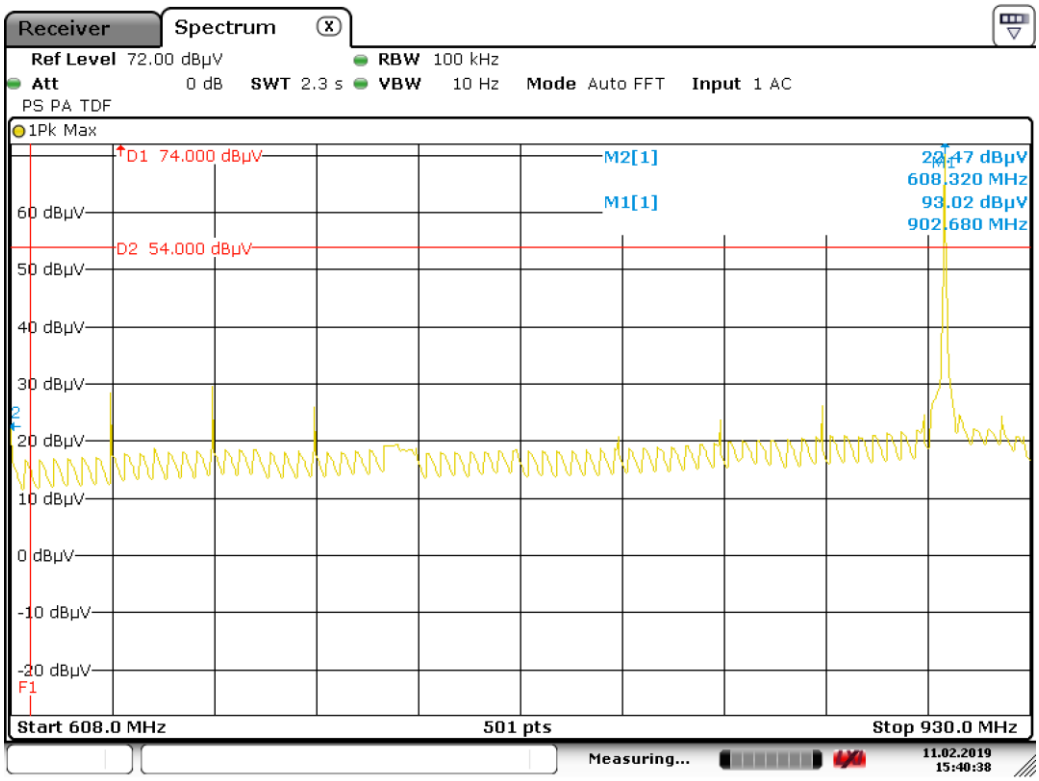
Restricted Band Bandedge @ Channel Low_Average



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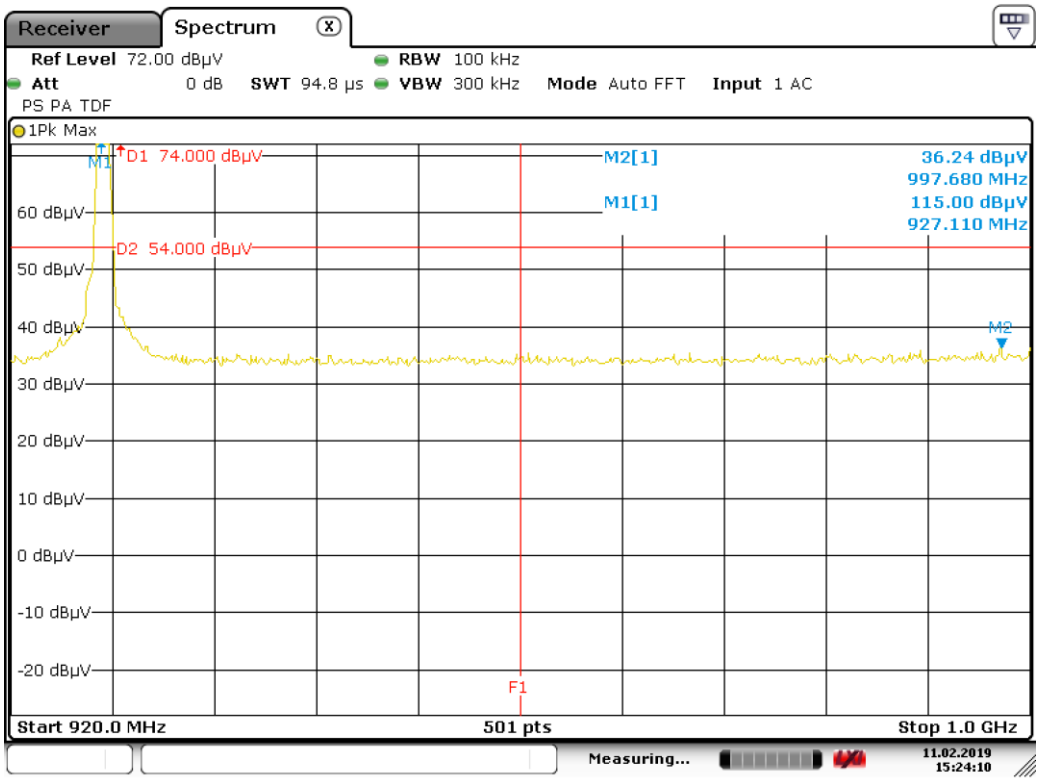
Restricted Band Bandedge @ Channel High_Peak



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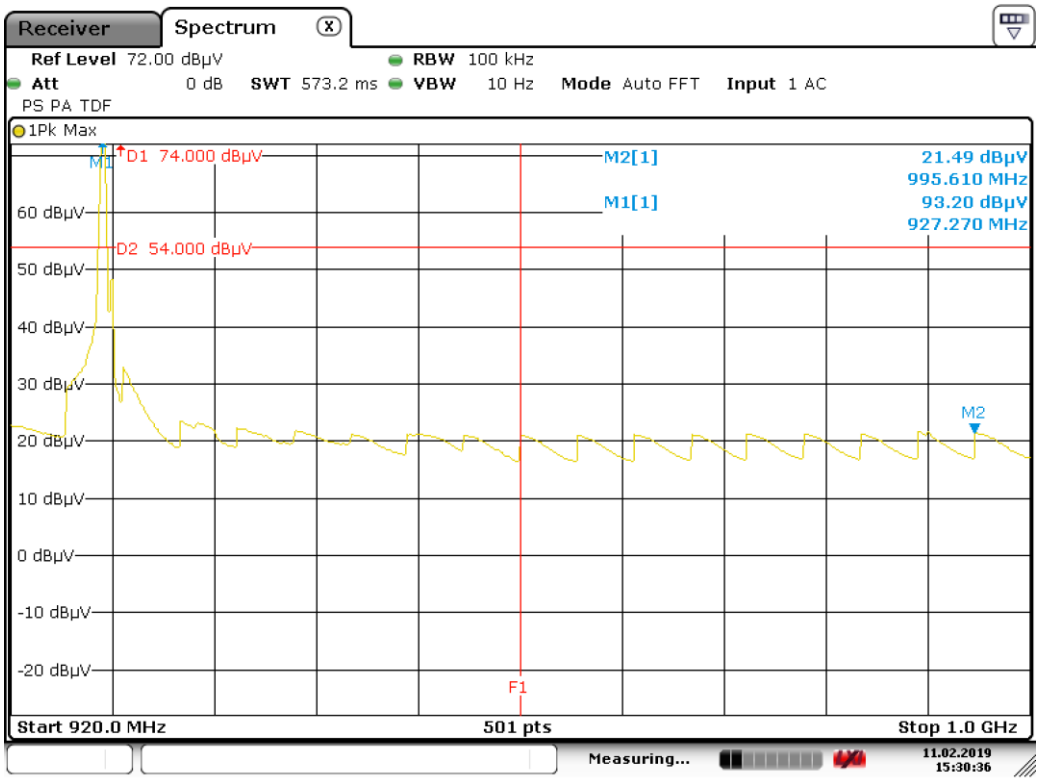
Restricted Band Bandedge @ Channel High_Average



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8.AC Power Line Conducted Emission

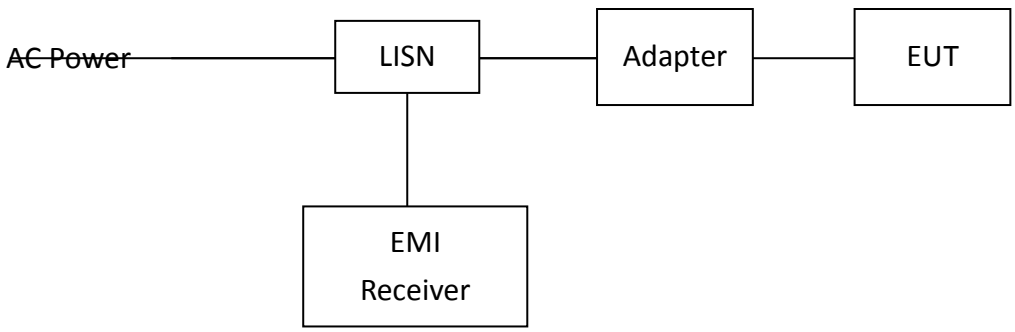
8.1 Measuring instrument setting

Receiver Function	Setting
Detector	QP
Start frequency	0.15MHz
Stop frequency	30MHz
IF bandwidth	9 kHz
Attenuation	10dB

8.2 Test Procedure

Step 1	Configure the EUT according to ANSI C63.10:2013. The EUT or host of EHT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
Step 2	Connect EUT or host of EUT to the power mains through a line impedance stabilization network.
Step 3	All the companion devices are connected to the other LISN. The LISN should provide 50Uh/50ohms coupling impedance.
Step 4	The frequency range from 150 kHz to 30MHz was searched.
Step 5	Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.
Step 6	The measurement has to be done between each power line and ground at the power terminal.

8.3 Test Diagram



8.4 Limit

Frequency (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56	56 – 46
0.50~5.00	56	46
5.00~30.0	60	50

8.5 Operating Environment Condition

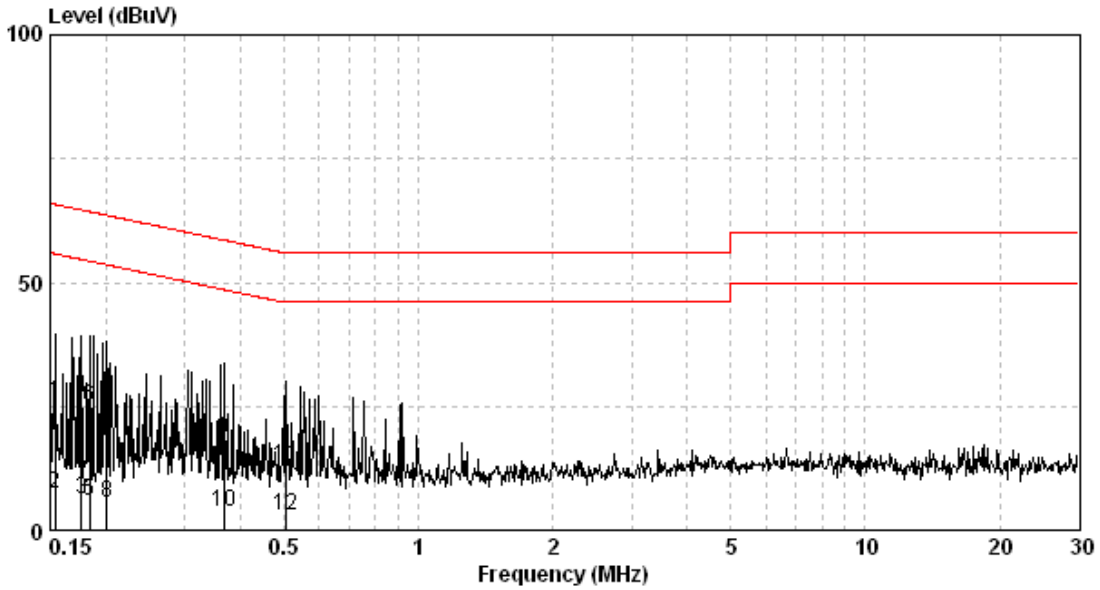
Temperature (℃) :	25
Relative Humidity (%) :	50
Atmospheric Pressure (hPa) :	1009
Test Date :	2018/09/27

8.6 Test Results

Phase: Live Line
Model No.: PPM N3U SB1-C
Test Condition: Tx mode

Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB) QP	Margin (dB) AV
0.154	9.69	16.08	25.77	65.78	-2.27	7.42	55.78	-40.01	-48.36
0.176	9.68	16.99	26.68	64.68	-3.59	6.10	54.68	-38.00	-48.58
0.183	9.68	15.25	24.93	64.33	-3.95	5.73	54.33	-39.40	-48.59
0.201	9.68	14.32	24.00	63.58	-4.29	5.39	53.58	-39.58	-48.19
0.367	9.69	8.52	18.21	58.56	-6.04	3.65	48.56	-40.35	-44.92
0.507	9.69	2.97	12.66	56.00	-6.66	3.03	46.00	-43.34	-42.97

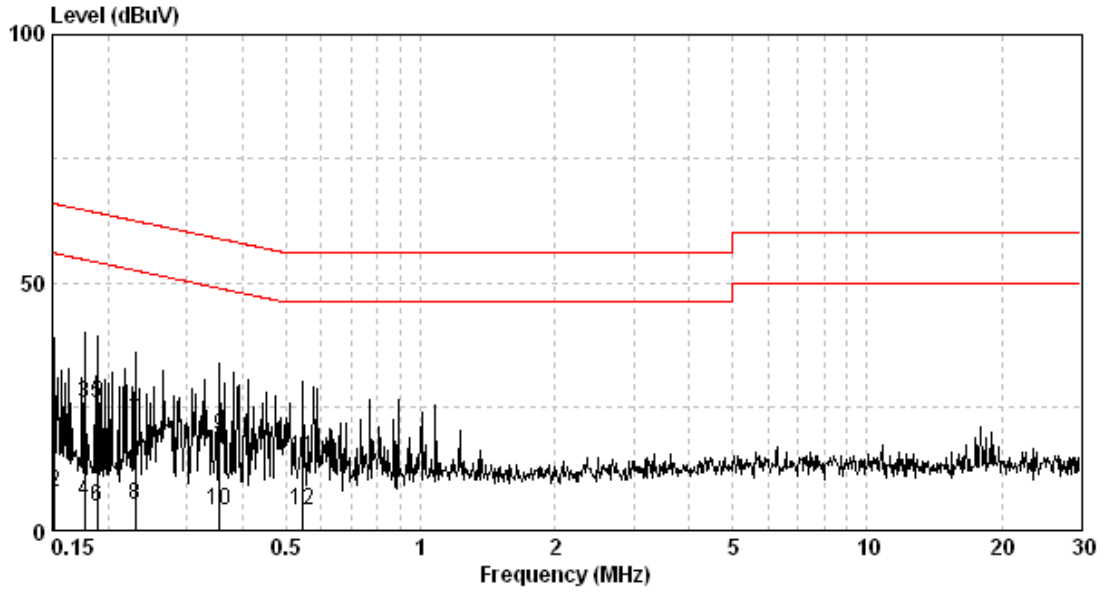
Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral Line
Model No.: PPM N3U SB1-C
Test Condition: Tx mode

Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB) QP	Margin (dB) AV
0.152	9.69	16.21	25.90	65.91	-1.91	7.78	55.91	-40.01	-48.13
0.177	9.68	15.89	25.57	64.64	-3.72	5.96	54.64	-39.07	-48.67
0.189	9.68	15.97	25.65	64.06	-4.74	4.94	54.06	-38.41	-49.12
0.230	9.68	12.22	21.90	62.44	-4.41	5.27	52.44	-40.54	-47.17
0.356	9.68	9.42	19.10	58.83	-5.58	4.10	48.83	-39.72	-44.73
0.546	9.69	4.96	14.65	56.00	-5.81	3.88	46.00	-41.35	-42.12

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)



Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
ESCI EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2018/11/14	2019/11/13
Spectrum Analyzer	Rohde & Schwarz	FSP30	100245	2018/02/23	2019/02/22
Horn Antenna (1-18G)	SHWARZBECK	BBHA 9120 D	9120D-456	2018/01/23	2019/01/22
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2017/09/04	2020/09/02
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2018/04/23	2019/04/22
Pre-Amplifier	EMC Co.	EMC12635SE	980205	2018/12/10	2019/12/09
Pre-Amplifier	MITEQ	JS4-26004000--27-8A	828825	2018/08/28	2019/08/27
Power Meter	Anritsu	ML2495A	0844001	2018/10/29	2019/10/28
Power Sensor	Anritsu	MA2411B	0738452	2018/10/29	2019/10/28
Signal Analyzer	Agilent	N9030A	MY51380492	2018/08/24	2019/08/23
966-2(A) Cable 9kHz~26.5GHz	SUHNER	SMA / EX 100	N/A	2018/08/07	2019/08/06
966-2(B) Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 104P	CB0005	2018/08/07	2019/08/06
RF Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 102	CB0006	2018/05/03	2019/05/02

Note: No Calibration Required (NCR).

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2018/03/28	2019/03/27
High Pass Filter	Wainwright	WHKX3.0/ 18G-12SS	N/A	2018/06/01	2019/05/31
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2018/04/17	2019/04/16
EMI Test Receiver	R&S	ESR7	101822	2018/06/12	2019/06/11
Two-Line V-Network	R&S	ENV216	101160	2018/07/24	2019/07/23
Two-Line -V-Network	R&S	ESH3-Z5	838979/014	2018/09/03	2019/09/02
CON-2 Shielded Room	N/A	N/A	N/A	NCR	NCR
CON-2 Cable	SUHNER	EMCCFD300-BM-NM-6000	170502	2018/05/07	2019/05/06
Test software	Audix	e3	4.20040112L	NCR	NCR

Note: No Calibration Required (NCR).

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of *k*=2.

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.14 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.22 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Vertically polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.68 dB
Horizontally polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.68 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.54 dB
Emission on the Band Edge Test	3.64 dB
Minimum 6dB Bandwidth	0.85 dB
Maximum Conducted Output Power	0.42 dB
Power Spectral Density	0.85 dB
Emissions In Non-Restricted Frequency Bands	0.85 dB
AC Power Line Conducted Emission	2.48 dB