FCC TEST REPORT

FCC ID: 2AHB5-XXL3N

On Behalf of

Zhejiang Hanshow Technology CO.,LTD.

Electronic shelf label

Model No.: Stellar-XXL3N@, Stellar-XXL3YN@,

Stellar-XXLN@

Prepared for	:	Zhejiang Hanshow Technology CO.,LTD.
Address	:	Bld. 33, No. 966 xiuyuan Rd., BeiKeJian Innovation Park, XiuZhou District, Jiaxing, Zhejiang, PRC, PC 314000

Prepared By	:	Shenzhen Alpha Product Testing Co., Ltd.
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Report Number	:	T1881226 01
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TEST REPORT DECLARATION

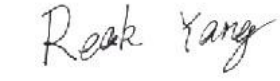
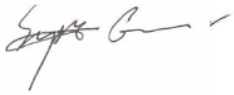
Applicant	:	Zhejiang Hanshow Technology CO.,LTD.
Address	:	Bld. 33, No. 966 xiuyuan Rd., BeiKeJian Innovation Park, XiuZhou District, Jiaxing, Zhejiang, PRC, PC 314000
Manufacturer	:	Zhejiang Hanshow Technology CO.,LTD.
Address	:	Bld. 33, No. 966 xiuyuan Rd., BeiKeJian Innovation Park, XiuZhou District, Jiaxing, Zhejiang, PRC, PC 314000
EUT Description	:	Electronic shelf label
		(A) Model No. : Stellar-XXL3N@, Stellar-XXL3YN@, Stellar-XXLN@
		(B) Trademark : Hanshow

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.249: 2017, ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. Also, this report shows that the EUT is technically compliant with the FCC Part15 requirements.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....…..:	Reak Yang Project Engineer	
Approved by (name + signature)…....:	Simple Guan Project Manager	
Date of issue…… ……..:	August 14, 2018	

Revision History

Revision	Issue Date	Revisions	Revised By
00	August 14, 2018	Initial released Issue	Simple Guan

1. SUMMARY OF STANDARDS AND RESULTS

1.1.Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

EMISSION			
Description of Test Item	**Test Requirement**	**Standard Paragraph**	**Results**
Power Line Conducted Emission Test	FCC Part 15:2017	Section 15.207	**N/A**
Spurious Emission Test	FCC Part 15:2017	Section 15.249&15.209	**P**
Occupied bandwidth	FCC Part 15:2017	Section 15.215	**P**
Band edge Requirement	FCC Part 15:2017	Section 15.249	**P**
Antenna Requirement	FCC Part 15:2017	Section 15.203	**P**

Note: 1. P is an abbreviation for Pass.

2. F is an abbreviation for Fail.

3. N/A is an abbreviation for Not Applicable.

2. GENERAL INFORMATION

2.1.Description of Device (EUT)

Description	:	Electronic shelf label
Model Number	:	Stellar-XXL3N@, Stellar-XXL3YN@, Stellar-XXLN@
Diff	:	There is no difference between all the models, except the model name, so this report performs the model Stellar-XXL3N@.
Trademark	:	Hanshow
Test Voltage	:	DC 3V From battery
Operation frequency	:	2402-2480MHz
Channel No.	:	157
Channel Separation	:	500KHz
Modulation type	:	GFSK
Data Rate	:	Downlink:500K bps Uplink:100K bps
Antenna Type	:	PCB Antenna, max gain 0dBi.
Software version	:	V1.0
Hardware version	:	HS_EL5105_8M_52_01
Sample Type	:	Prototype production

2.2.Accessories of Device (EUT)

Accessories 1 : N/A

2.3.Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
1	N/A	N/A	N/A	N/A	N/A

2.4.Block Diagram of connection between EUT and simulators

2.5.Test Mode Description

Test mode:

Mode	Channel	Frequency (MHz)
GFSK	CH1	2402
	CH80	2441
	CH157	2480
Note:	1. The test was used to control EUT work in Continuous TX mode, and select test channel, wireless mode 2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power. 3. New battery is used during all tests. 4. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω , Cable Loss: 1.0 dB	

Channel list:

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	...	...	154	2478.5
2	2402.5	79	2440.5	155	2479
3	2403	80	2441	156	2479.5
4	2403.5	81	2441.5	157	2480
...	...	..			

2.6.Test Conditions

Temperature range	21-25℃
Humidity range	40-75%
Pressure range	86-106kPa

2.7.Test Facility

Shenzhen Alpha Product Testing Co., Ltd.
Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293961

July 25, 2017 Certificated by IC
Registration Number: 12135A

2.8.Measurement Uncertainty

(95% confidence levels, k=2)

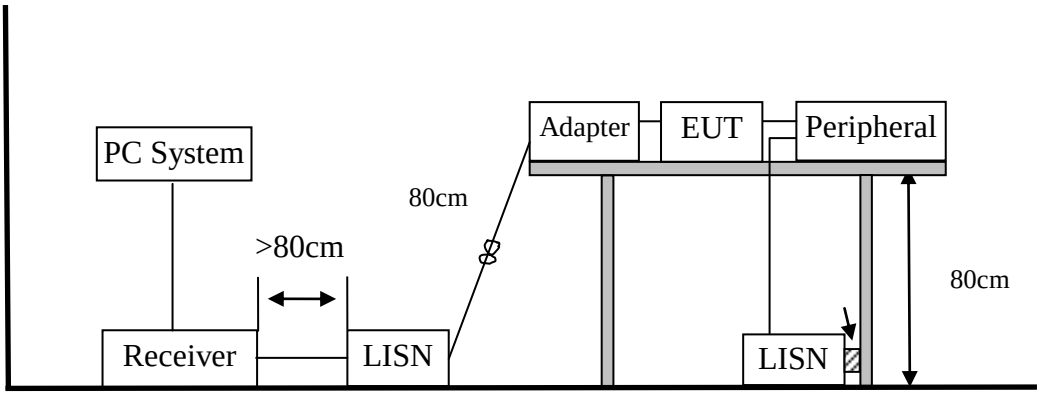
Item	**Uncertainty**
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10-8
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9.Test Equipment List

Equipment	Manufacturer	Model No.	Serial No.	Last cal.	Cal. Due day
Spectrum analyzer	Agilent	E4407B	MY49510055	2017.09.23	2018.09.22
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2016.09.30	2018.09.29
Filter	KANGMAI	ZLPF-LDC-1000- 1959	1209002075	2017.09.22	2018.09.21
Filter	WAINWRIGHT	WHKX2.80 /18G- 12SS	SN1	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 4	N/A	2017.09.22	2018.09.21
Signal Analyzer	Agilent	N9020A	MY499100060	2017.09.23	2018.09.22
Amplifier	HP	HP8347A	2834A00455	2017.09.23	2018.09.22
Amplifier	Agilent	8449B	3008A02664	2017.09.23	2018.09.22
Filter	WAINWRIGHT	WHKX1.0G/15G- 10SS	SN40	2017.09.22	2018.09.21
Test Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2017.09.23	2018.09.22
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2016.09.30	2018.09.29
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2016.07.21	2020.07.20
RF Cable	Resenberger	Cable 1	N/A	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 2	N/A	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 3	N/A	2017.09.28	2018.09.27
Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2016.09.29	2018.09.28
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170294	2017.02.22	2019.02.21
Preamplifier	SCHWARZBECK	BBV9721	9721-031	2017.09.03	2018.09.02
Attenuator	HP	8494B	DC-18G	2017.10.22	2018.10.23
Spectrum analyzer	ROHDE&SCHWARZ	FSQ40	200061	2017.12.28	2018.12.27
20dB Attenuator	ICPROBING	IATS1	82347	2017.09.22	2018.09.21

3. POWER LINE CONDUCTED EMISSION TEST

3.1.Block Diagram of Test Setup



3.2.Test Limits

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. Emission level=Read level + LISN factor-Preamp factor + Cable loss

2. * Decreasing linearly with logarithm of frequency.

3. The lower limit shall apply at the transition frequencies.

3.3.Configuration of EUT on Test

The following equipment are installed on Power Line Conducted Emission Test to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.4.Operating Condition of EUT

（1） Setup the EUT as shown as Section 3.1.

（2） Turn on the power of all equipment.

（3） Let the EUT work in test mode taking the test.

3.5.Test Procedure

（1） The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N.#2). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013 on conducted Emission test.

（2） The frequency range from 150kHz to 30MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 9kHz.

（3） The frequency range from 30MHz to 1000MHz was pre-scanned with a Peak detector and all final readings of measurement from Test Receiver are Quasi-Peak and Average values.

（4） The test results are reported on Section 3.6.

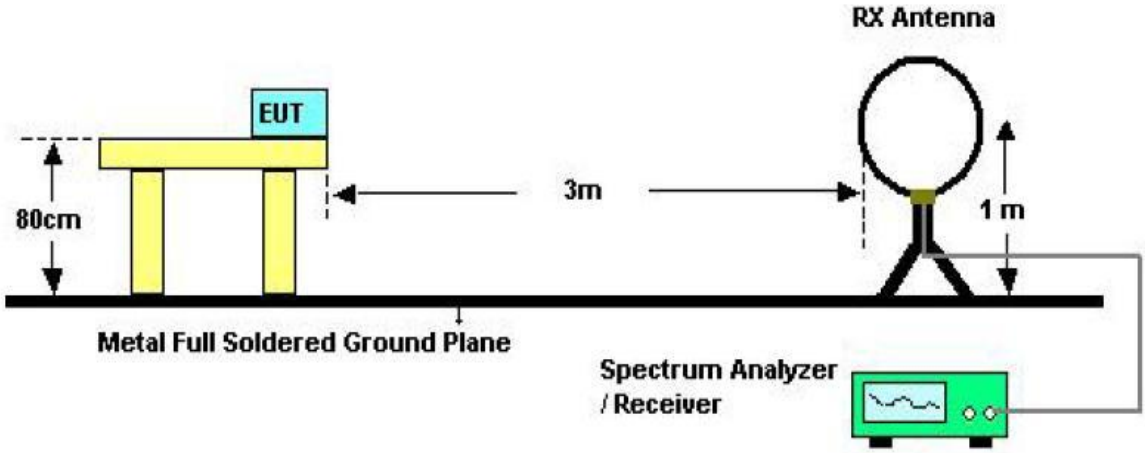
3.6.Test Results

EUT	:	Electronic shelf label	Test Date	:	N/A
M/N	:	Stellar-XXL3N@	Temperature	:	N/A
Test Engineer	:	N/A	Humidity	:	N/A
Test Mode	:	N/A			
Test Results	:	**N/A**			
Note: 1. Not applicable for equipment operated with battery power supply.					

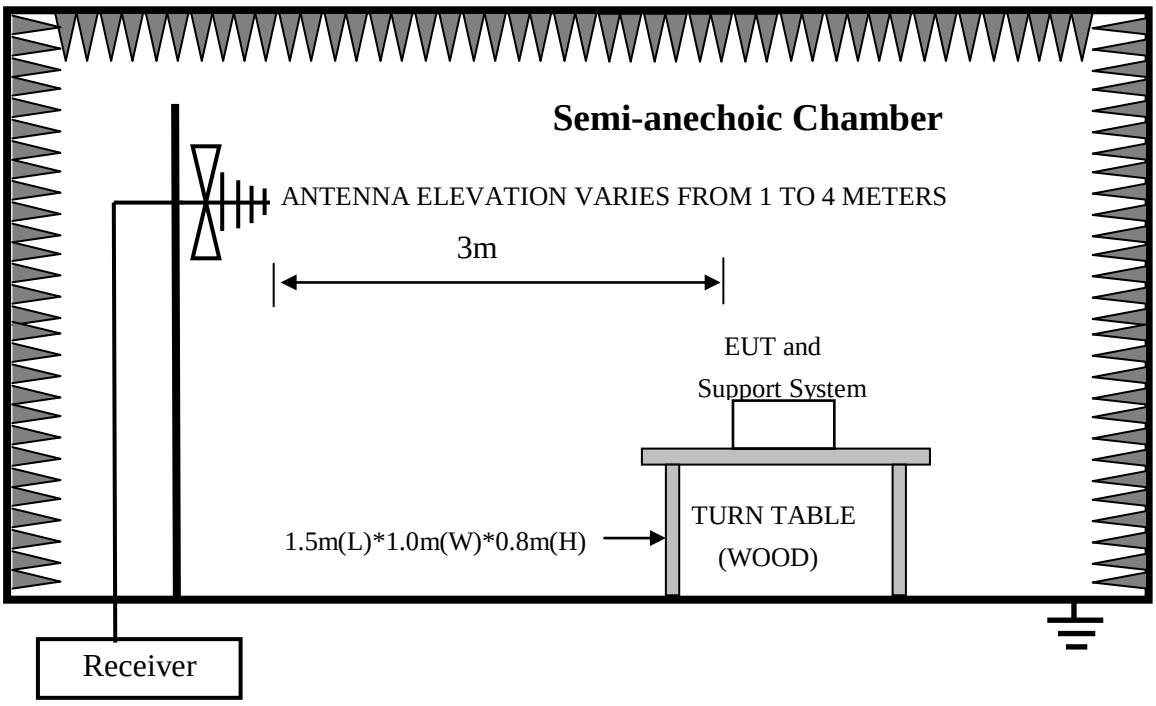
4. RADIATED EMISSION TEST

4.1.Block Diagram of Test Setup

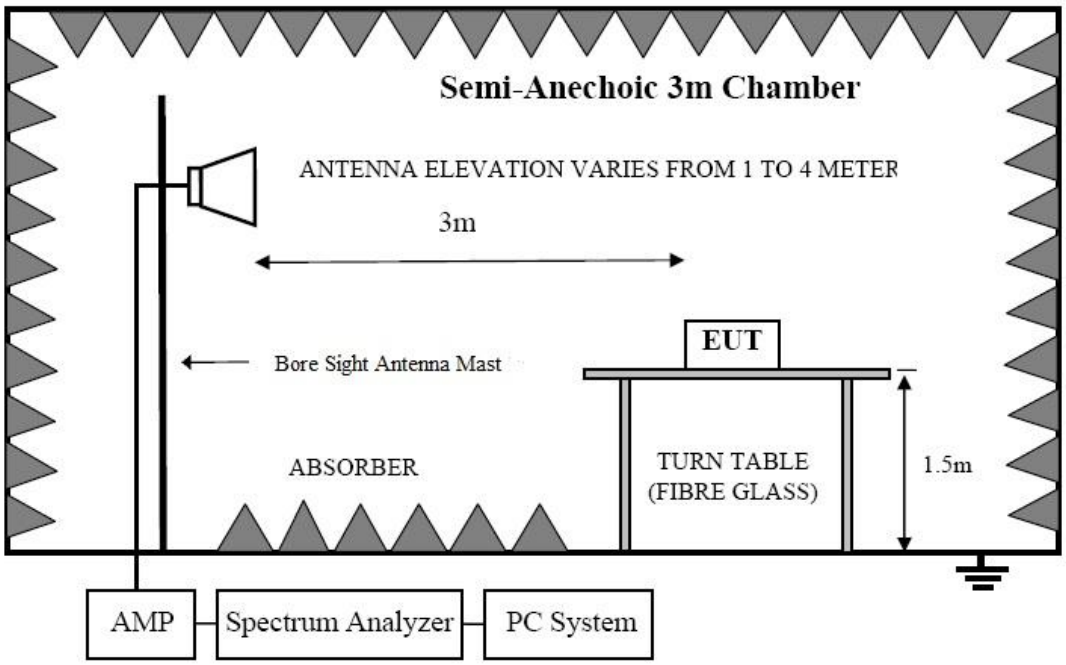
In Semi Anechoic Chamber (3m) Test Setup Diagram for 9KHz~30MHz



In Semi Anechoic Chamber (3m) Test Setup Diagram for 30MHz~1000MHz



In Semi Anechoic Chamber (3m) Test Setup Diagram for Above 1GHz



4.2.Test Limit

Frequency MHz	Distance (Meters)	Field Strengths Limits	
		uV/m	dB uV/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 1.705	30	24000/F(kHz)	----
1.705 30	30	30	29.5
30 88	3	100(3nW)	40
88 216	3	150(6.8nW)	43.5
216 960	3	200(12nW)	46
Above 960	3	500(75nW)	54
Carrier frequency	3	50000(avg)	113.97(peak) 93.97(avg)

Notes: 1. Emission level = Read level + Antenna Factor - Preamp Factor + Cable Loss

2. The smaller limit shall apply at the cross point between two frequency bands.

3. Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

4. For frequencies above 1000 MHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

4.3.Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

4.4.Operating Condition of EUT

（1） Setup the EUT as shown as Section 4.1.

（2） Turn on the power of all equipment.

（3） Let the EUT work in test mode taking the test.

4.5.Test Procedure

（1） The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1GHz and 150 cm above the ground plane inside a semi-anechoic chamber for above 1GHz. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10: 2013 on Radiated Emission test.

（2） For the radiated emission test above 1GHz:

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. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

（3） Test antenna was located 4m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.

(a) Change work frequency or channel of device if practicable.

(b) Change modulation type of device if practicable.

(c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

（4） For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP

（5） The frequency range from 9KHz to 150KHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 200Hz.
The frequency range from 150KHz to 30MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 9KHz.
The frequency range from 30MHz to 1000MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 120kHz.
The frequency range from above 1GHz is checked, the bandwidth of Signal Analyzer (Signal Analyzer N9020A) is set at 1MHz.

（6） The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector and all final readings of measurement from Test Receiver are Quasi-Peak values, the frequency range from 1GHz to 6GHz was pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.

（7） Test for all x, y, z axes is performed and only the worst case of X xes was recorded in the test report.

（8） The test results are reported on Section 4.6.

4.6.Test Results

Frequency Range	:	**9KHz~30MHz**			
EUT	:	Electronic shelf label	Test Date	:	2018.08.03
M/N	:	Stellar-XXL3N@	Temperature	:	24℃
Test Engineer	:	Reak	Humidity	:	56%
Test Mode	:	TX CH1, CH80, CH157			
Test Results	:	**PASS**			
Note:	1. Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.				

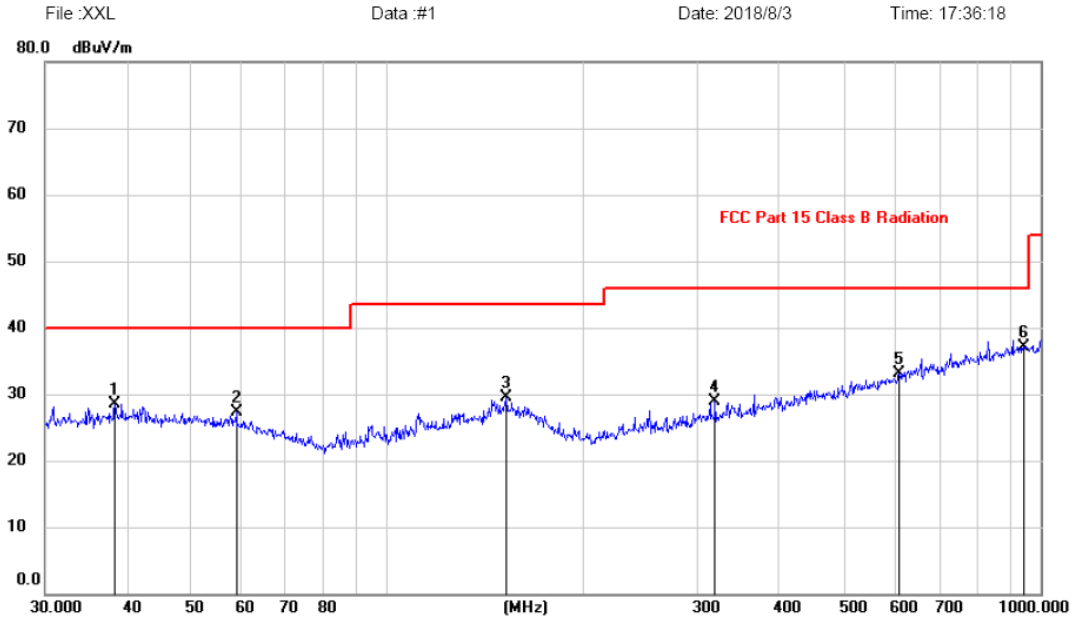
Frequency Range	:	**30MHz~1000MHz**			
EUT	:	Electronic shelf label	Test Date	:	2018.08.03
M/N	:	Stellar-XXL3N@	Temperature	:	24℃
Test Engineer	:	Reak	Humidity	:	56%
Test Mode	:	TX CH1, CH80, CH157			
Test Results	:	**PASS**			
Note:	1. The test results are listed in next pages. 2. TX CH157 mode is worst case mode, and this report only reflected the worst mode. 3. If the limits for the measurement with the quasi-peak detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the quasi-peak detector need not be carried out.				

Site LAB 966-2 Chamber
Limit: FCC Part 15 Class B Radiation
EUT:
M/N:
Mode:2480
Note:
Engineer Signature:

Polarization: *Horizontal*
Power: DC 3V
Distance:

Temperature: 24.8
Humidity: 56 %

Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		38.3462	14.61	13.95	28.56	40.00	-11.44	peak			
2		58.8185	14.13	13.08	27.21	40.00	-12.79	peak			
3		152.1297	14.97	14.56	29.53	43.50	-13.97	peak			
4		317.7011	15.02	13.81	28.83	46.00	-17.17	peak			
5		607.7867	13.35	19.67	33.02	46.00	-12.98	peak			
6	*	942.1305	13.97	23.18	37.15	46.00	-8.85	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

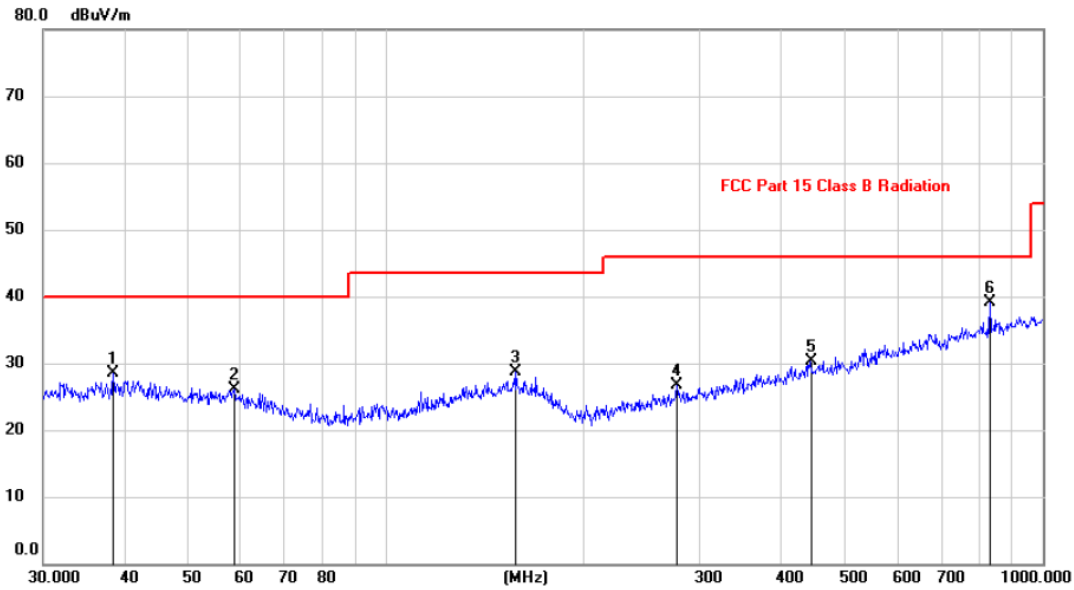
Site LAB 966-2 Chamber
Limit: FCC Part 15 Class B Radiation
EUT:
M/N:
Mode:2480
Note:
Engineer Signature:

Polarization: *Vertical*
Power: DC 3V
Distance:

Temperature: 24.8
Humidity: 56 %

Radiated Emission Measurement

File :XXL Data :#2 Date: 2018/8/3 Time: 17:37:19



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		38.3462	14.52	13.95	28.47	40.00	-11.53	peak			
2		58.6126	13.04	13.10	26.14	40.00	-13.86	peak			
3		157.5588	14.11	14.57	28.68	43.50	-14.82	peak			
4		277.0935	13.84	12.92	26.76	46.00	-19.24	peak			
5		443.2943	13.53	16.73	30.26	46.00	-15.74	peak			
6	*	830.4002	17.12	21.97	39.09	46.00	-6.91	peak			

Note:1. *:Maximum data; x:Over limit; I:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

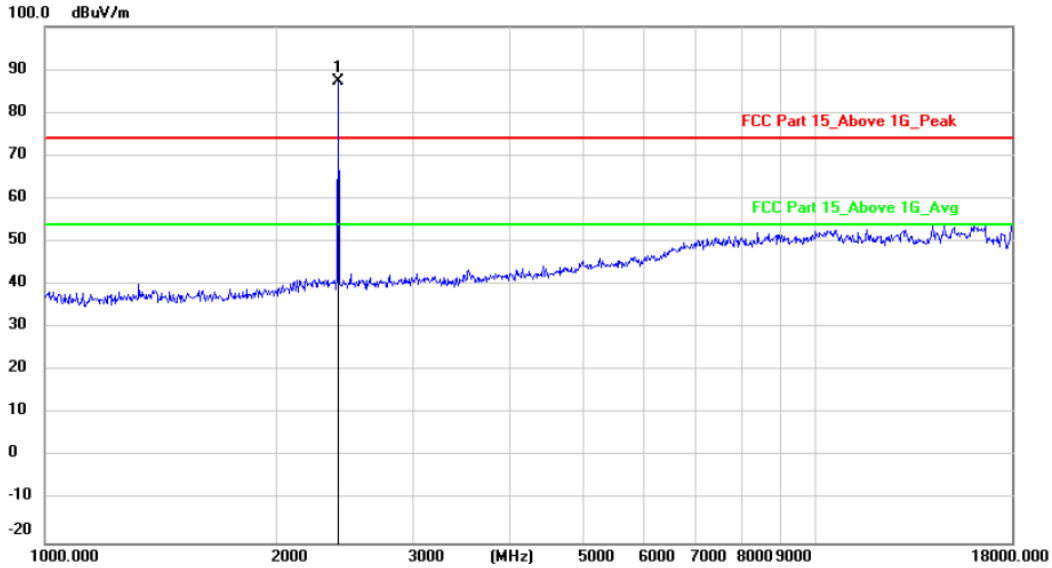
Frequency Range	:	**1GHz~25GHz**			
EUT	:	Electronic shelf label	Test Date	:	2018.08.03
M/N	:	Stellar-XXL3N@	Temperature	:	24℃
Test Engineer	:	Reak	Humidity	:	56%
Test Mode	:	TX CH1, CH80, CH157			
Test Results	:	**PASS**			

Note:
1. The plots only show the test result from 1GHz-18GHz, means the frequency above 18GHz also complies with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.
3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.
4. Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: Avg.
5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

Site LAB	Polarization: *Horizontal*	Temperature: 23.9
Limit: FCC Part 15_Above 1G_Peak	Power:	Humidity: 46 %
EUT:	Distance: 3m	
M/N:		
Mode:2402		
Note:		
Engineer Signature:		

Radiated Emission Measurement

File :XX Data :#9 Date: 2018/8/4 Time: 0:32:50



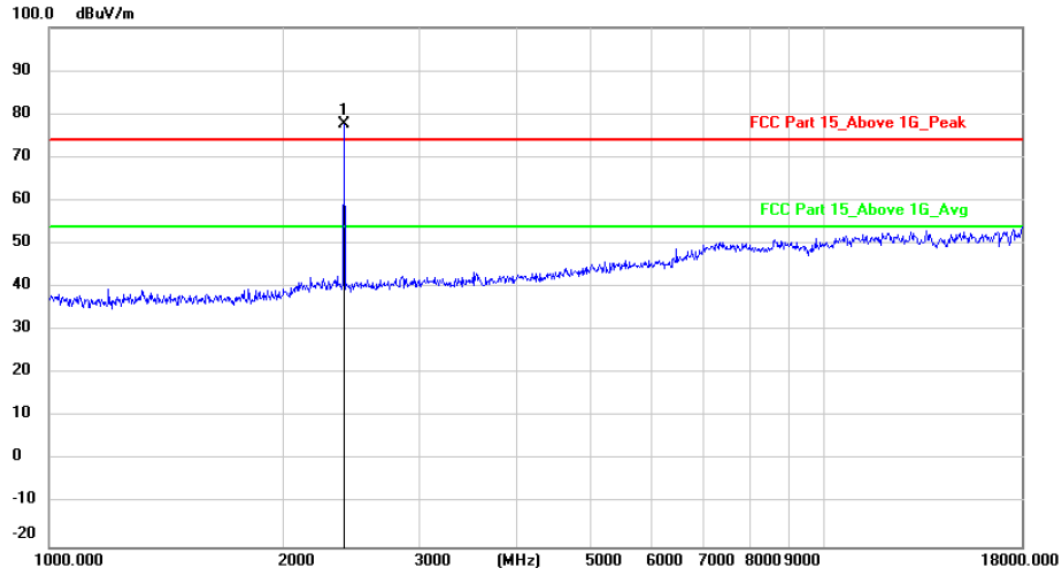
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2400.753	90.74	-3.41	87.33	74.00	13.33	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB	Polarization: *Vertical*	Temperature: 23.9
Limit: FCC Part 15_Above 1G_Peak	Power:	Humidity: 46 %
EUT:	Distance: 3m	
M/N:		
Mode:2402		
Note:		
Engineer Signature:		

Radiated Emission Measurement

File :XX Data :#10 Date: 2018/8/4 Time: 0:33:07



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2400.753	81.20	-3.41	77.79	74.00	3.79	peak			

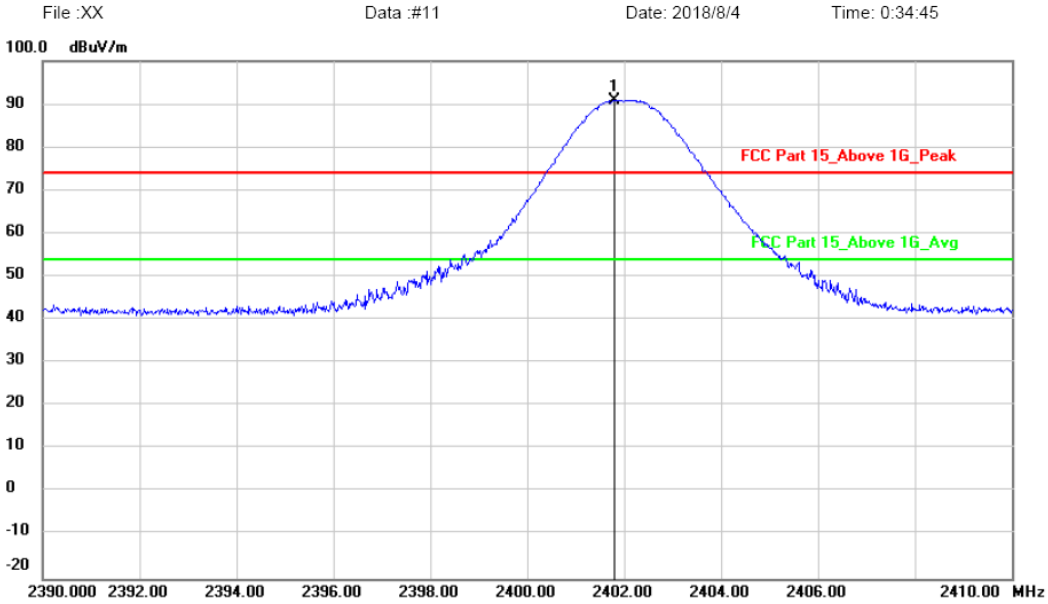
Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2402
Note:
Engineer Signature:

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2401.800	94.35	-3.41	90.94	74.00	16.94	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

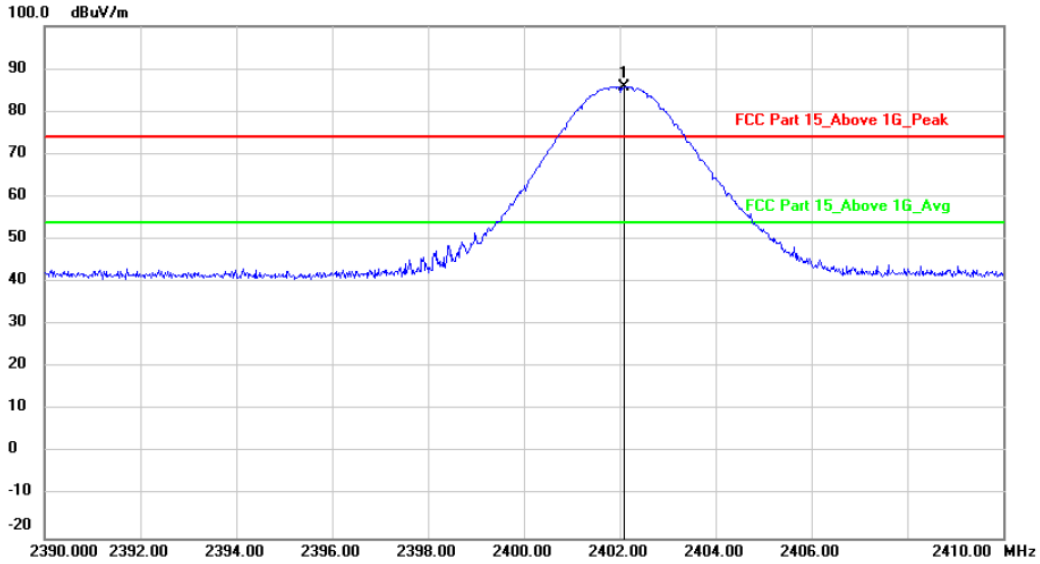
Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2402
Note:
Engineer Signature:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement

File :XX Data :#12 Date: 2018/8/4 Time: 0:36:05



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2402.080	89.07	-3.41	85.66	74.00	11.66	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

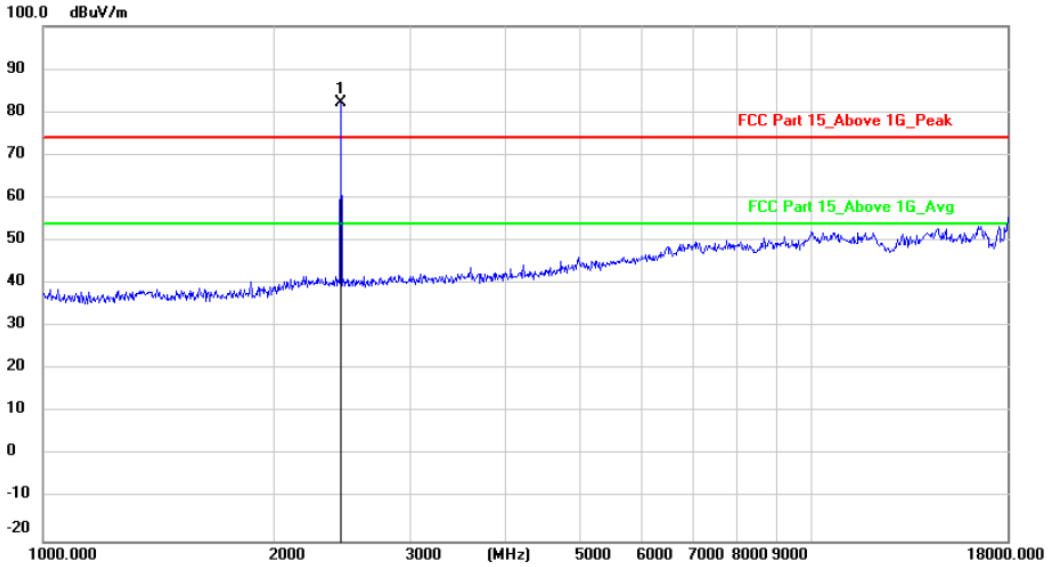
Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2441
Note:
Engineer Signature:

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement

File :XX Data :#15 Date: 2018/8/4 Time: 0:41:48



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2442.751	85.65	-3.40	82.25	74.00	8.25	peak			

Note:1. *:Maximum data; x:Over limit; I:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

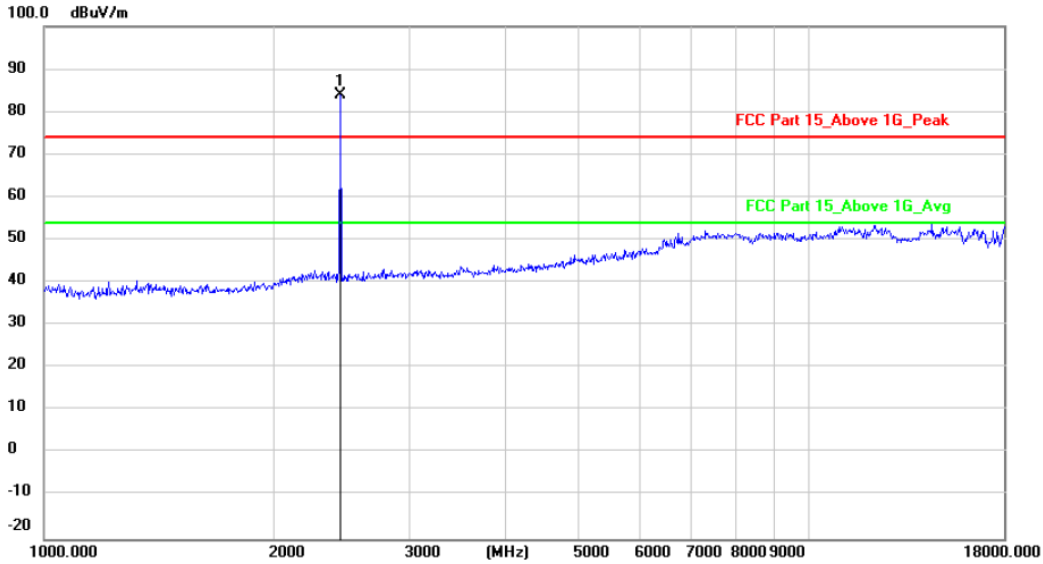
Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2441
Note:
Engineer Signature:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement

File :XX Data :#16 Date: 2018/8/4 Time: 0:42:33



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2442.751	87.23	-3.40	83.83	74.00	9.83	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

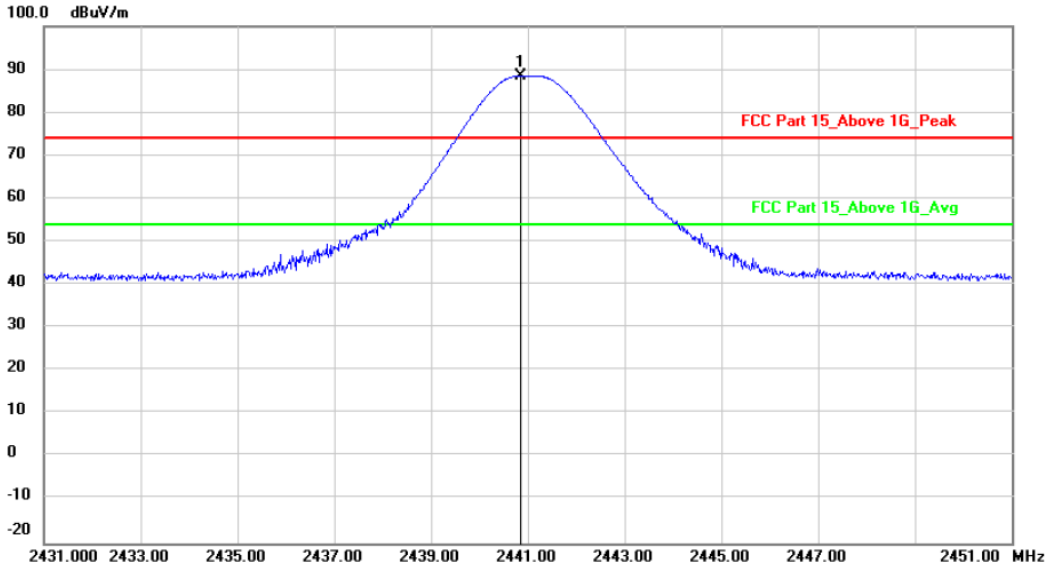
Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2441
Note:
Engineer Signature:

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement

File :XX Data :#14 Date: 2018/8/4 Time: 0:41:13



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2440.840	91.97	-3.40	88.57	74.00	14.57	peak			

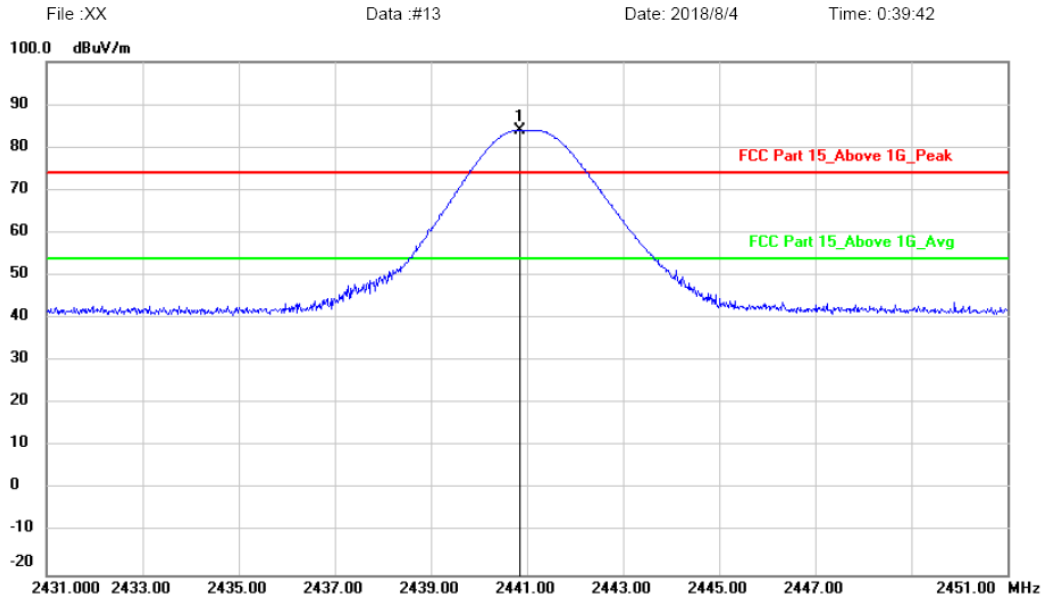
Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2441
Note:
Engineer Signature:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement



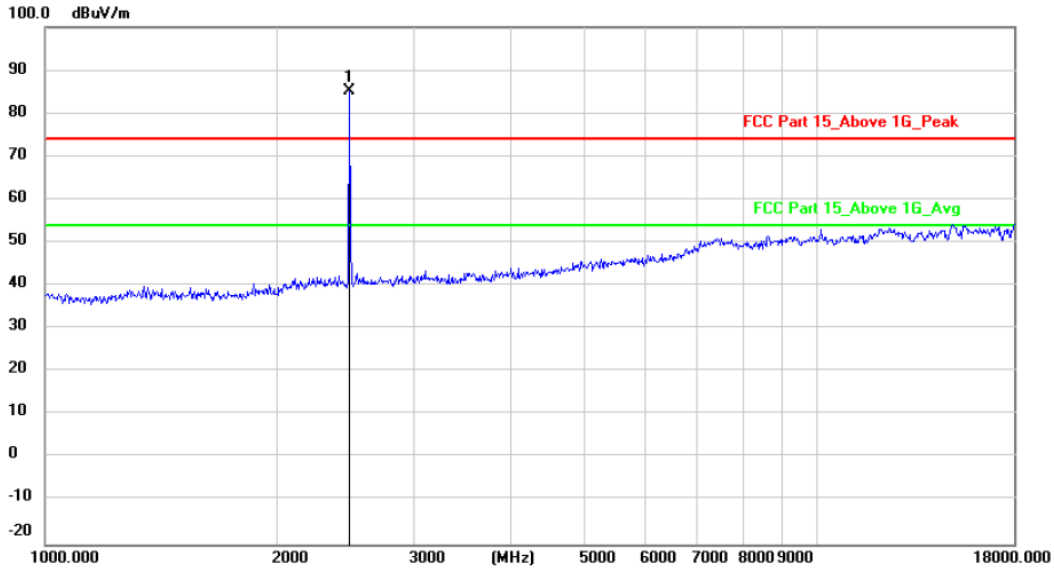
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2440.840	87.42	-3.40	84.02	74.00	10.02	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB	Polarization: *Horizontal*	Temperature: 23.9
Limit: FCC Part 15_Above 1G_Peak	Power:	Humidity: 46 %
EUT:	Distance: 3m	
M/N:		
Mode:2480		
Note:		
Engineer Signature:		

Radiated Emission Measurement

File :XX Data :#1 Date: 2018/8/4 Time: 0:20:26



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2478.310	88.59	-3.39	85.20	74.00	11.20	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

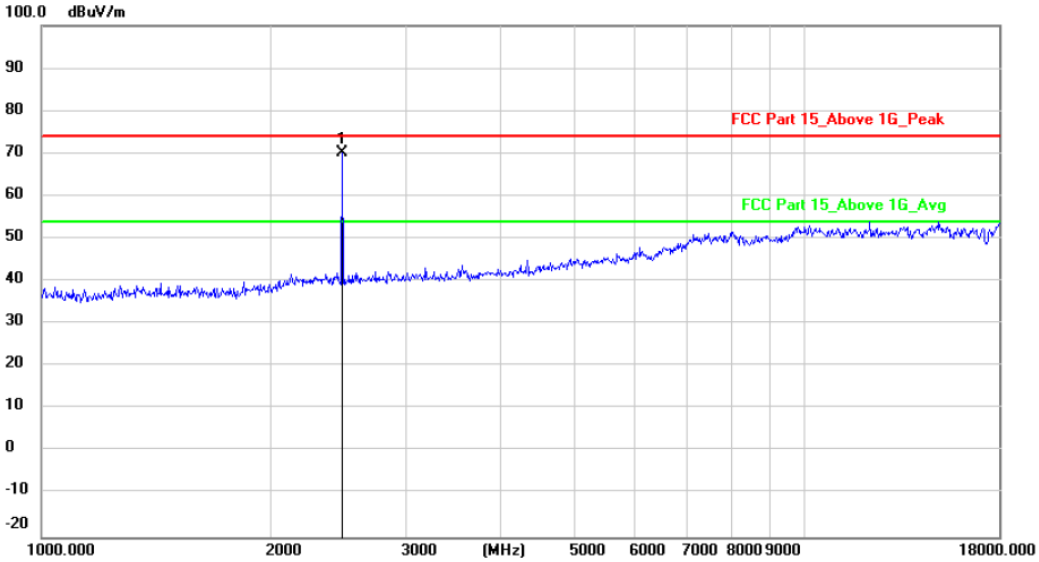
Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2480
Note:
Engineer Signature:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement

File :XX Data :#2 Date: 2018/8/4 Time: 0:20:39



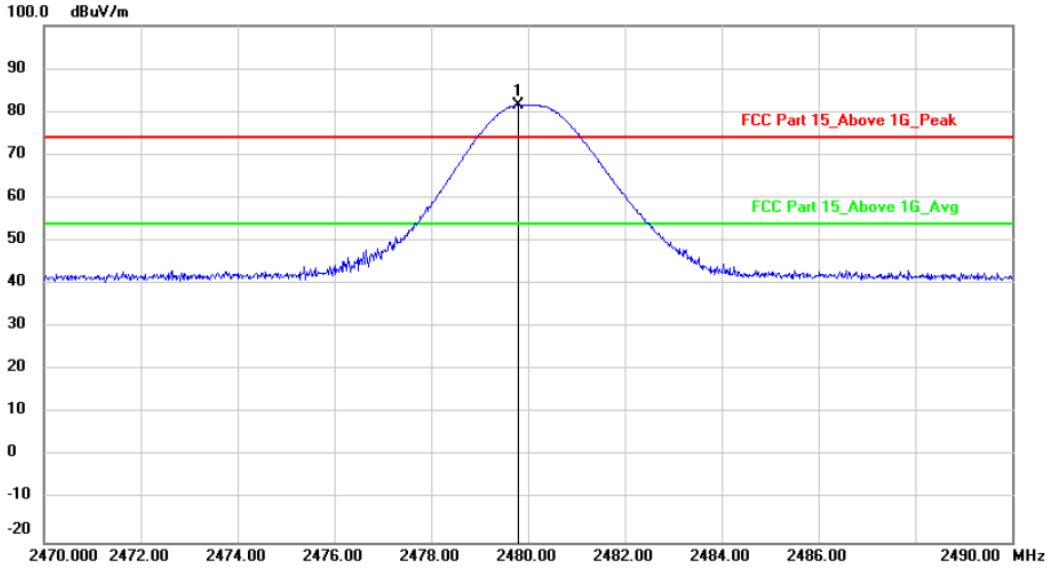
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2478.310	73.48	-3.39	70.09	74.00	-3.91	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB	Polarization: *Vertical*	Temperature:	23.9
Limit: FCC Part 15_Above 1G_Peak	Power:	Humidity:	46 %
EUT:	Distance: 3m		
M/N:			
Mode:2480			
Note:			
Engineer Signature:			

Radiated Emission Measurement

File :XX Data :#3 Date: 2018/8/4 Time: 0:22:24



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2479.800	84.92	-3.38	81.54	74.00	7.54	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

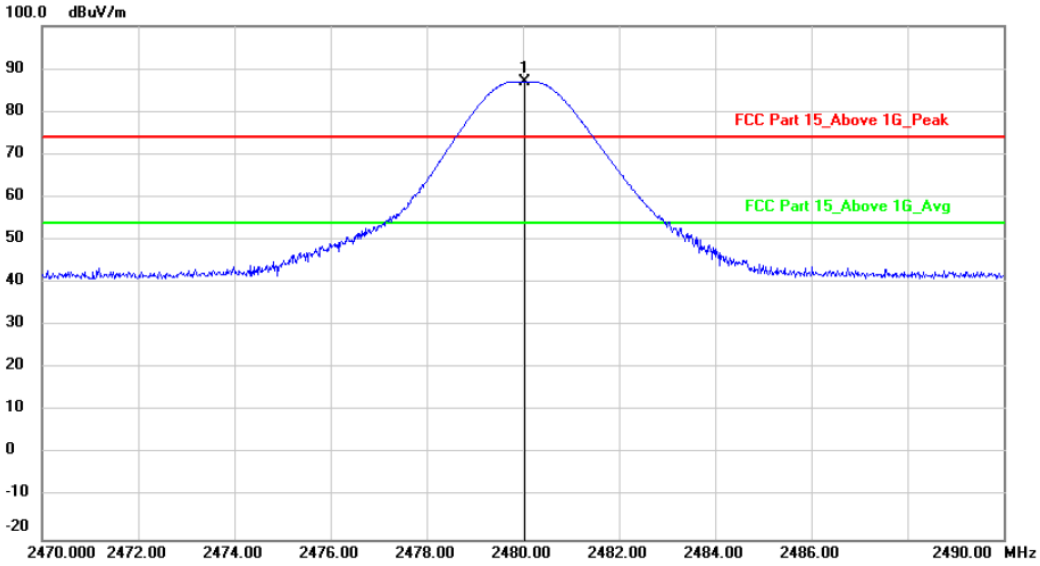
Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2480
Note:
Engineer Signature:

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement

File :XX Data :#4 Date: 2018/8/4 Time: 0:23:44

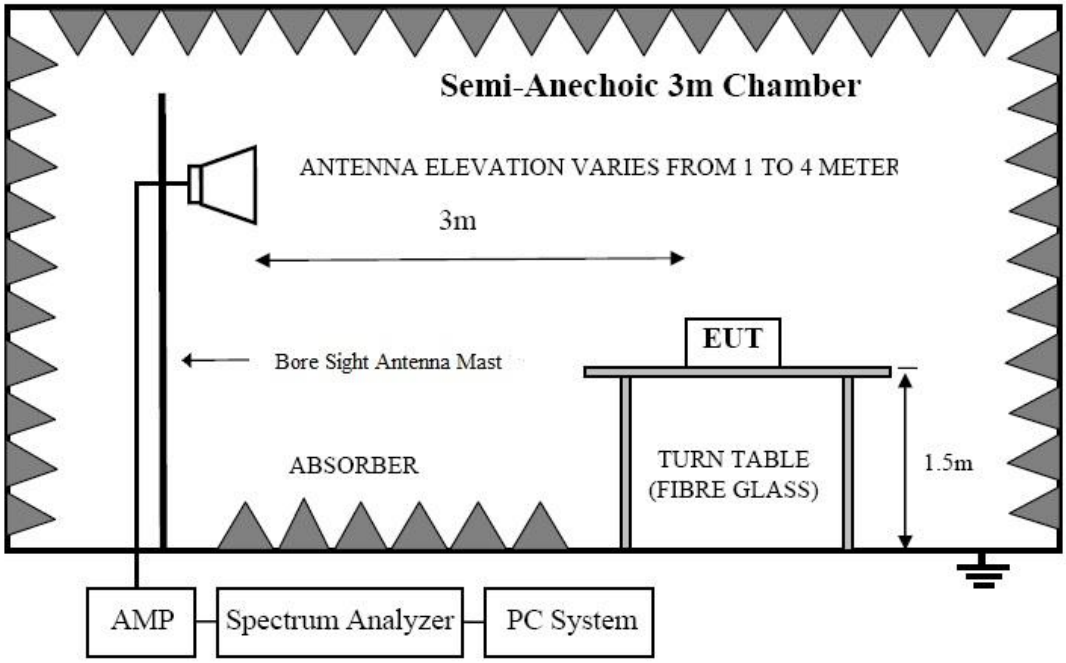


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.040	90.47	-3.38	87.09	74.00	13.09	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

5. BAND EDGE TEST

5.1.Block Diagram of Test Setup



5.2.Test Limit

Please refer section15.249 and section 15.205.

249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

249(e) As show in section 15.35(b), for frequencies above 1000MHz,the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak filed strength shall not exceed 2500 millivolts/meter at 3meters along the antenna azimuth.

5.3.Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

5.4.Operating Condition of EUT

（1） Setup the EUT as shown as Section 5.1.

（2） Turn on the power of all equipment.

（3） Let the EUT work in test mode taking the test.

5.5.Test Procedure

（1） The EUT was placed on a non-metallic table, 150 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10: 2013 on Radiated Emission test.

（2） For the radiated emission test above 1GHz:

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. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

（3） Test antenna was located 4m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.

(a) Change work frequency or channel of device if practicable.

(b) Change modulation type of device if practicable.

(c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

（5） The frequency range from above 1GHz is checked, the bandwidth of Signal Analyzer (Signal Analyzer N9020A) is set at 1MHz.

（6） The frequency range from 1GHz to 6GHz was pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.

（7） Test for all x, y, z axes is performed and only the worst case of X xes was recorded in the test report.

（8） The test results are reported on Section 5.6.

5.6.Test Results

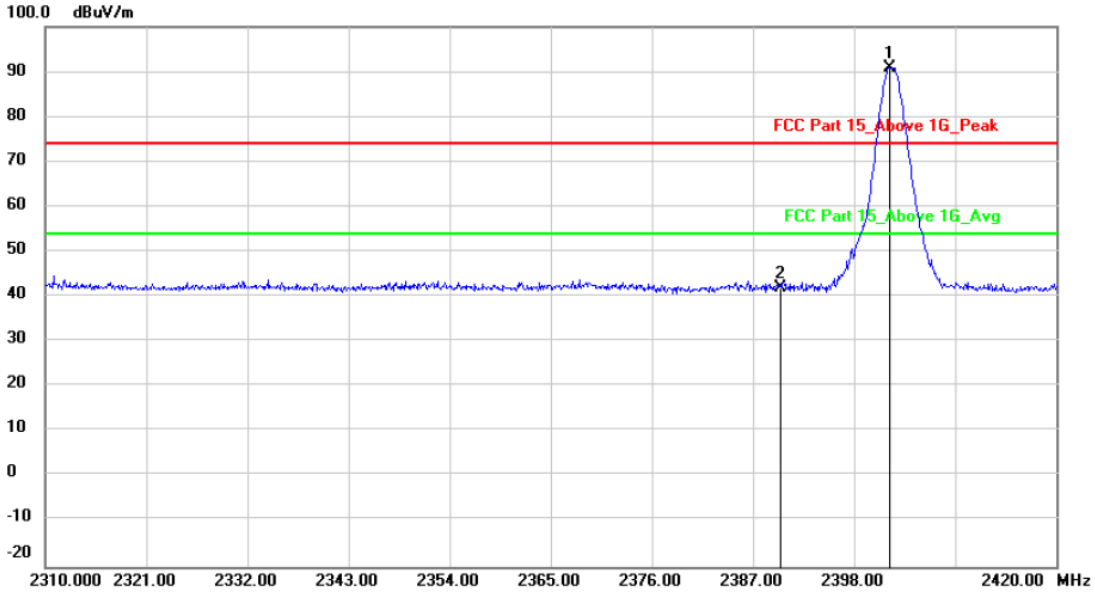
EUT	:	Electronic shelf label	Test Date	:	2018.08.03
M/N	:	Stellar-XXL3N@	Temperature	:	24℃
Test Engineer	:	Reak	Humidity	:	56%
Test Mode	:	TX 2402MHz, TX 2480MHz			
Test Results	:	**PASS**			

Note:
1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.
Result=Reading + Correct Factor.
Margin= Result-Limit.
3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.
4. Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: Avg.
5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

Site LAB	Polarization: *Horizontal*	Temperature: 23.9
Limit: FCC Part 15_Above 1G_Peak	Power:	Humidity: 46 %
EUT:	Distance: 3m	
M/N:		
Mode:2402		
Note:		
Engineer Signature:		

Radiated Emission Measurement

File :XX Data :#8 Date: 2018/8/4 Time: 0:31:55



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2401.850	94.36	-3.41	90.95	74.00	16.95	peak			
2		2390.000	45.33	-3.40	41.93	74.00	-32.07	peak			

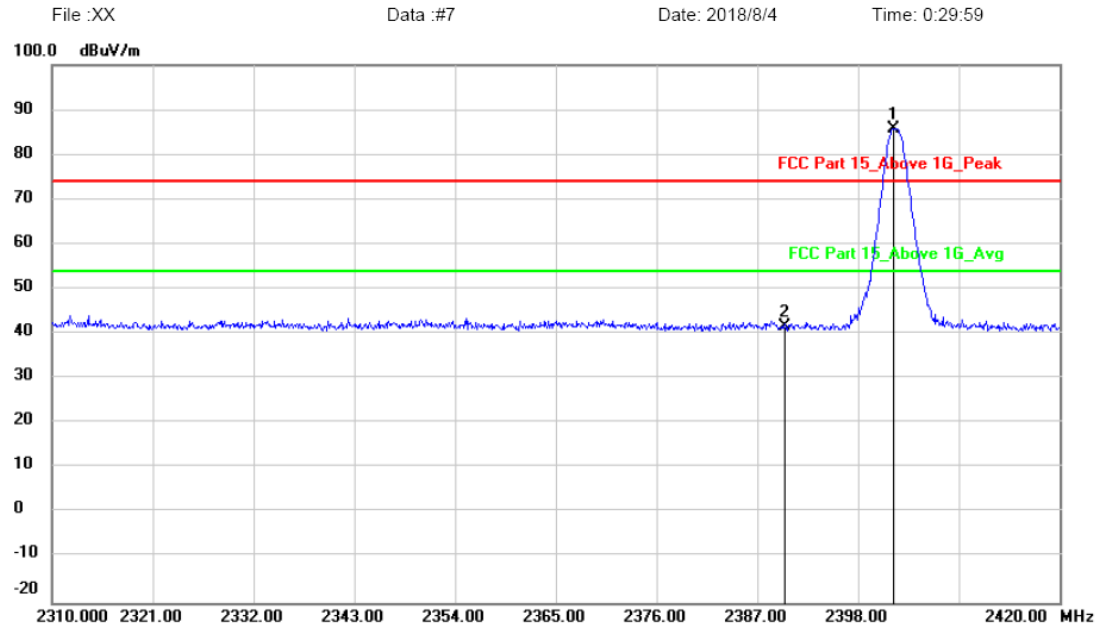
Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2402
Note:
Engineer Signature:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2401.850	89.16	-3.41	85.75	74.00	11.75	peak			
2		2390.000	45.13	-3.40	41.73	74.00	-32.27	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

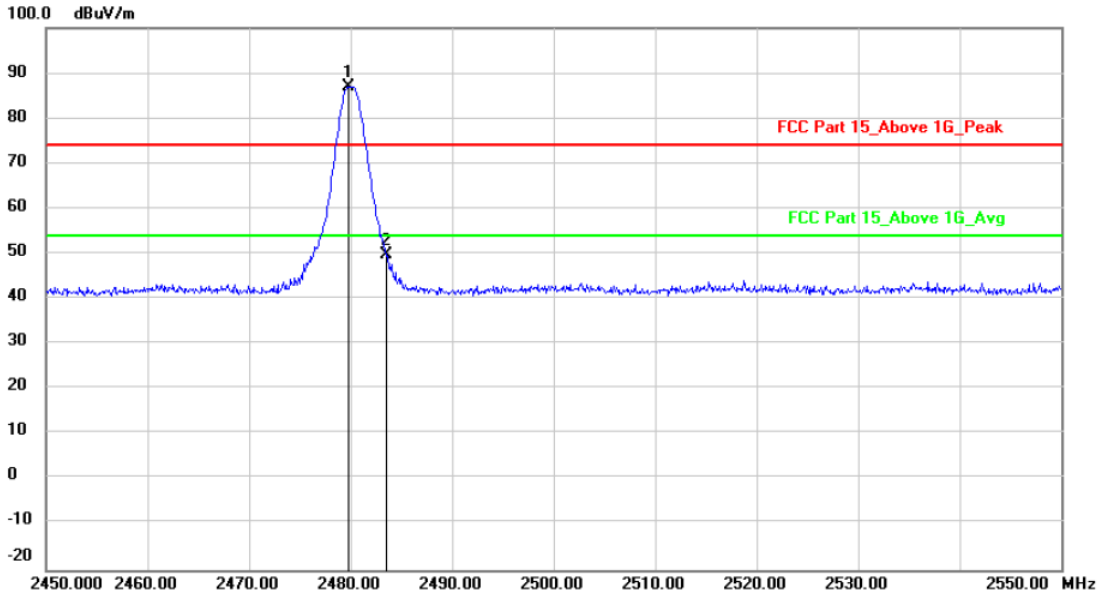
Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode: 2480
Note:
Engineer Signature:

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement

File :XX Data :#5 Date: 2018/8/4 Time: 0:25:21



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2479.800	90.43	-3.38	87.05	74.00	13.05	peak			
2		2483.500	53.12	-3.38	49.74	74.00	-24.26	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

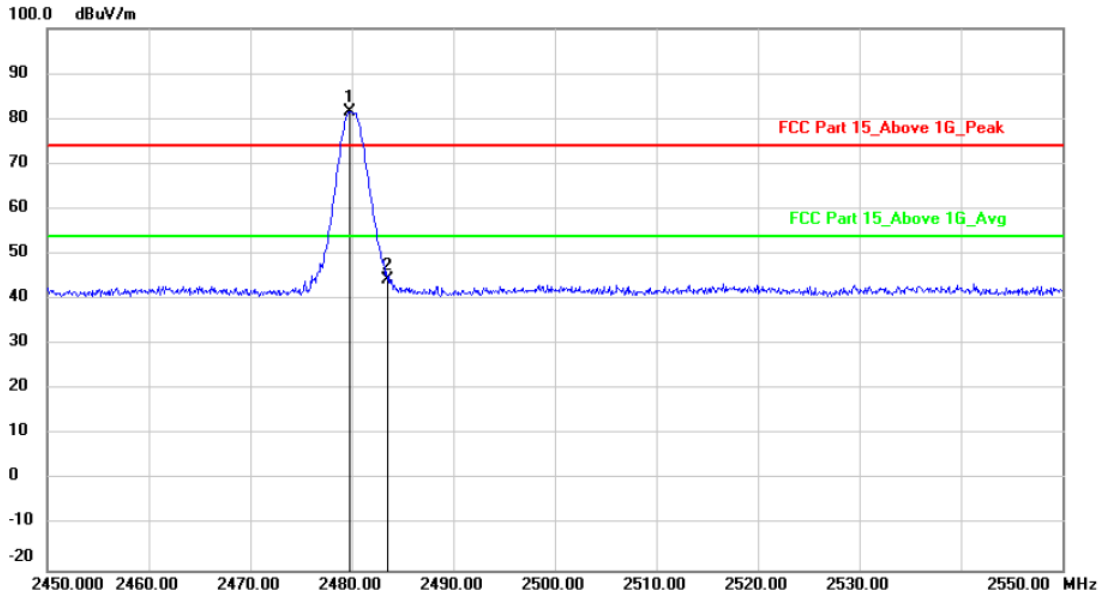
Site LAB
Limit: FCC Part 15_Above 1G_Peak
EUT:
M/N:
Mode:2480
Note:
Engineer Signature:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 23.9
Humidity: 46 %

Radiated Emission Measurement

File :XX Data :#6 Date: 2018/8/4 Time: 0:26:41

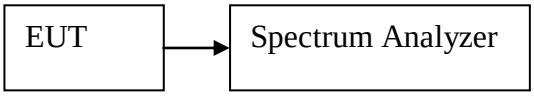


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2479.800	84.85	-3.38	81.47	74.00	7.47	peak			
2		2483.500	47.76	-3.38	44.38	74.00	-29.62	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

6. OCCUPIED BANDWIDTH TEST

6.1.Block Diagram of Test Setup



6.2.Test Limit

Please refer section15.249 and section 15.205.

6.3.Test Procedure

（1） The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

（2） The test receiver RBW set 30KHz,VBW set 100KHz,Sweep time set auto.

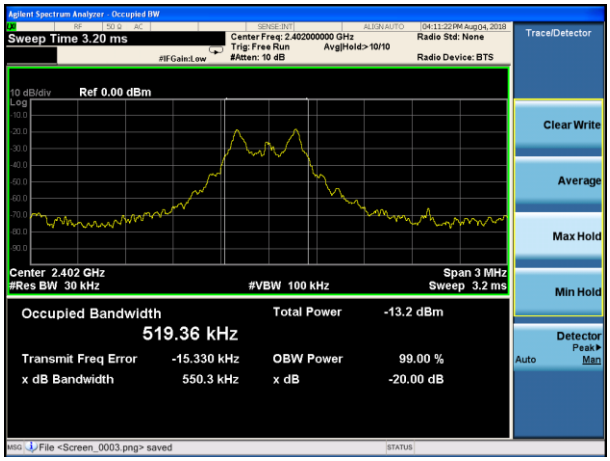
6.4.Test Results

EUT	:	Electronic shelf label		Test Date	:	2018.08.02
M/N	:	Stellar-XXL3N@		Temperature	:	24℃
Test Engineer	:	Reak		Humidity	:	56%
Test Mode	:	TX 2402MHz, TX 2441MHz, TX 2480MHz				
Test Results	:	**PASS**				

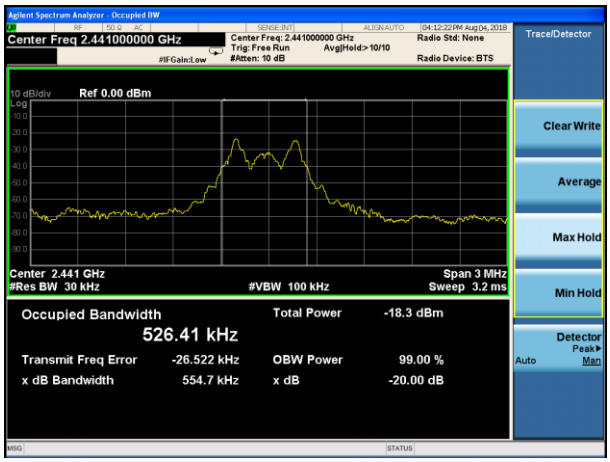
Mode	Frequency MHz	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (kHz)
GFSK	2402	550.3	519.36	/
GFSK	2441	554.7	526.41	/
GFSK	2480	553.9	526.25	/

Note: 1. The test results are listed in next pages.

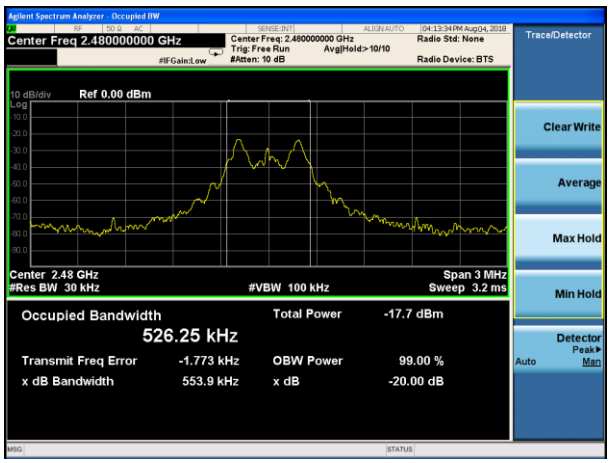
Frequency: 2402MHz



Frequency: 2441MHz



Frequency: 2480MHz



7. ANTENNA REQUIREMENT

7.1.Standard Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

7.2.Antenna Connected Construction

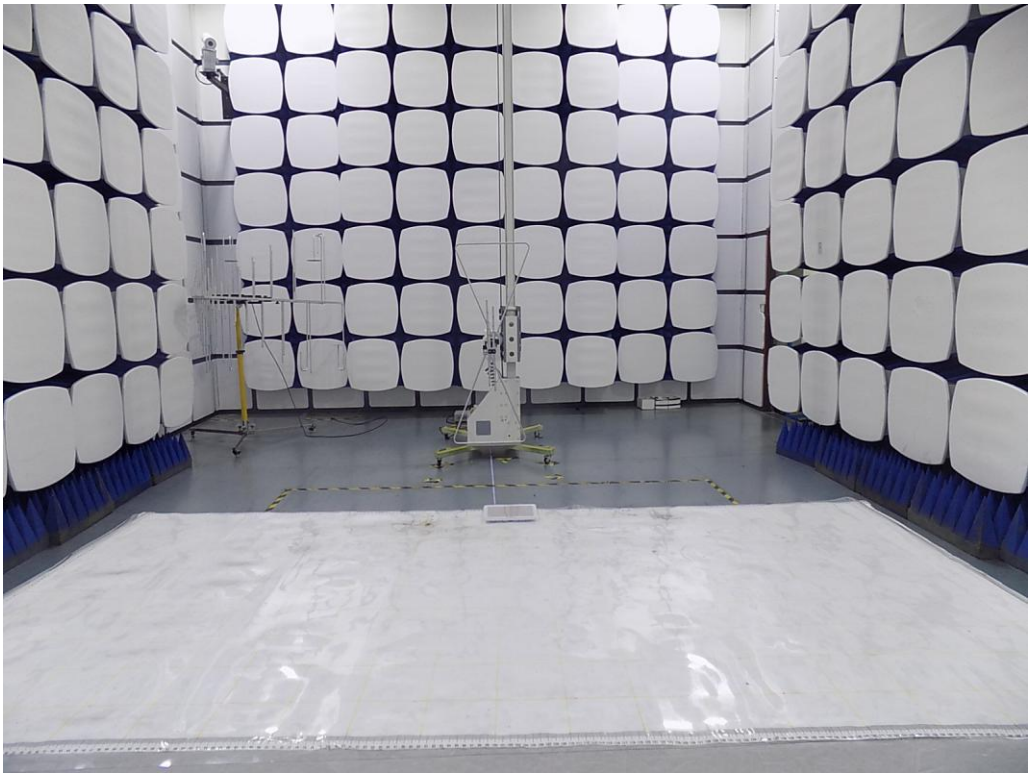
The directional gains of antenna used for transmitting is 0dBi, and the antenna is PCB antenna no consideration of replacement. Please see EUT photo for details.

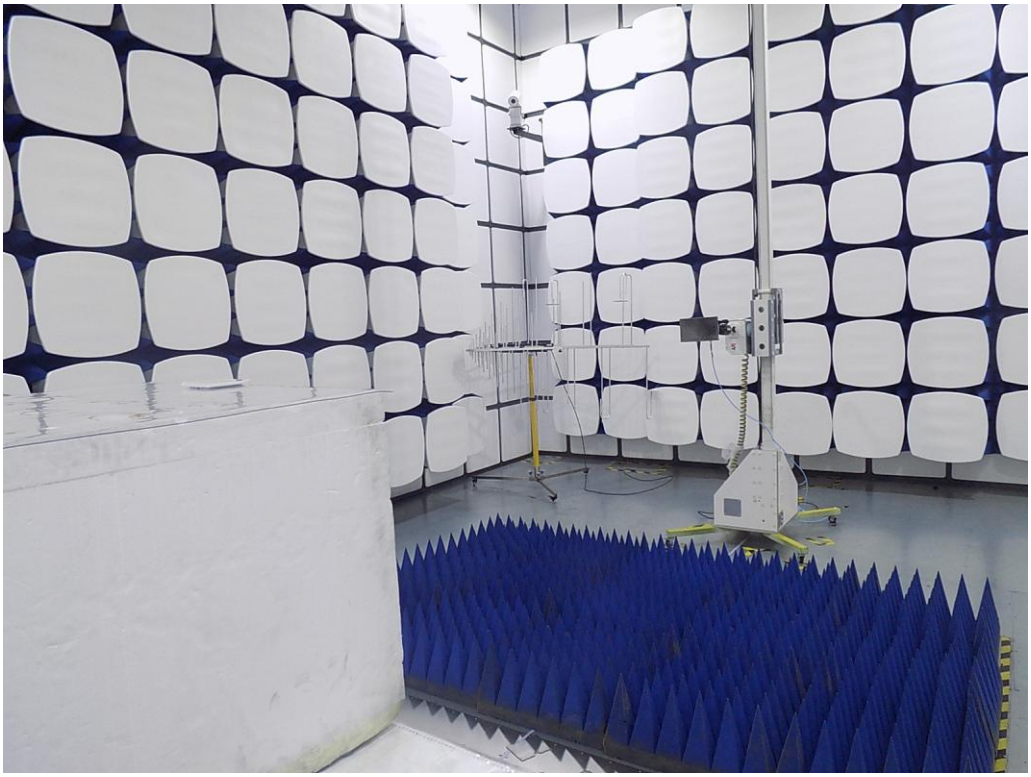
7.3.Results

The EUT antenna is PCB Antenna. It complies with the standard requirement.

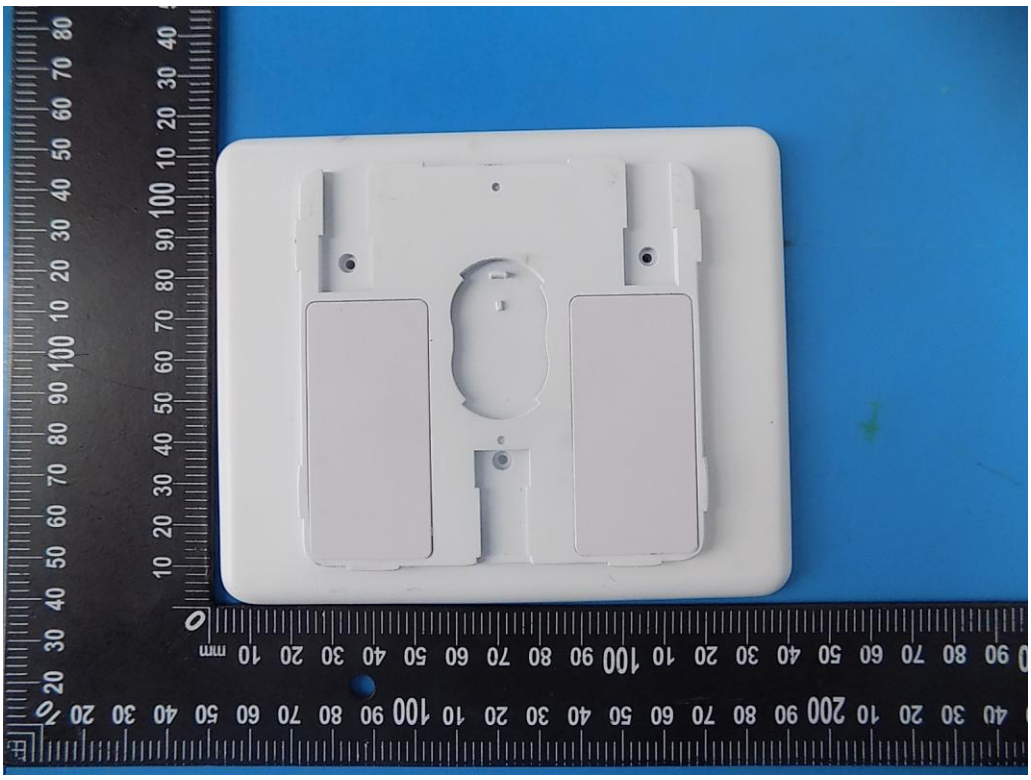
8. PHOTOGRAPH

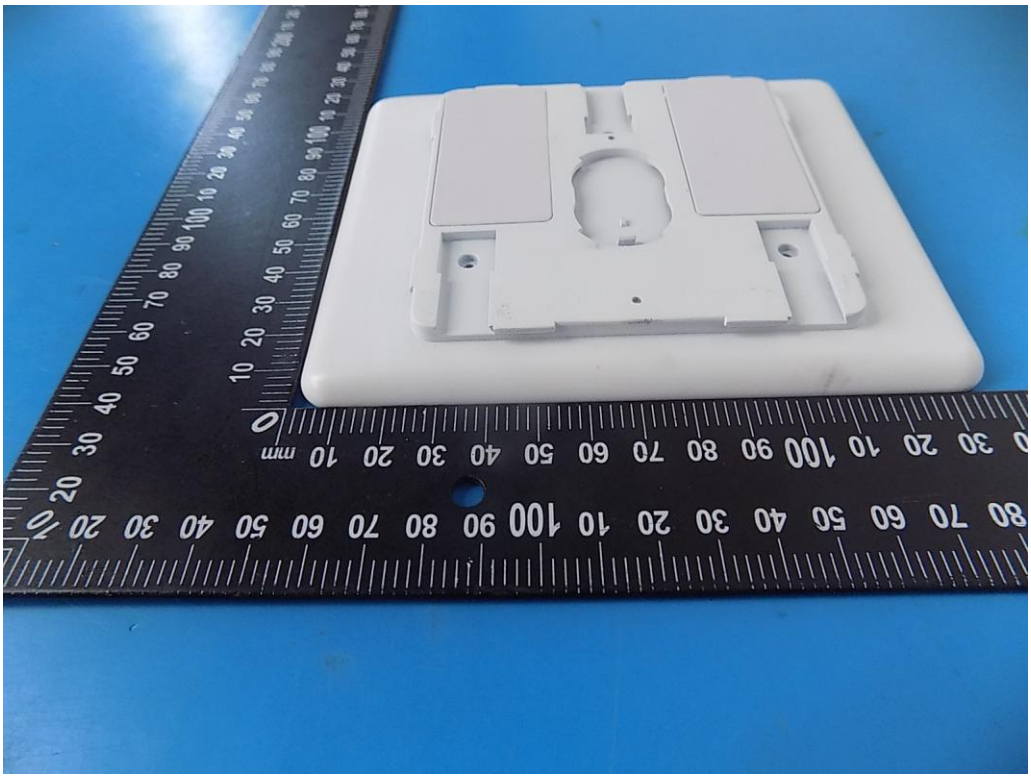
8.1.Photos of Radiated Emission Test (In Semi Anechoic Chamber)

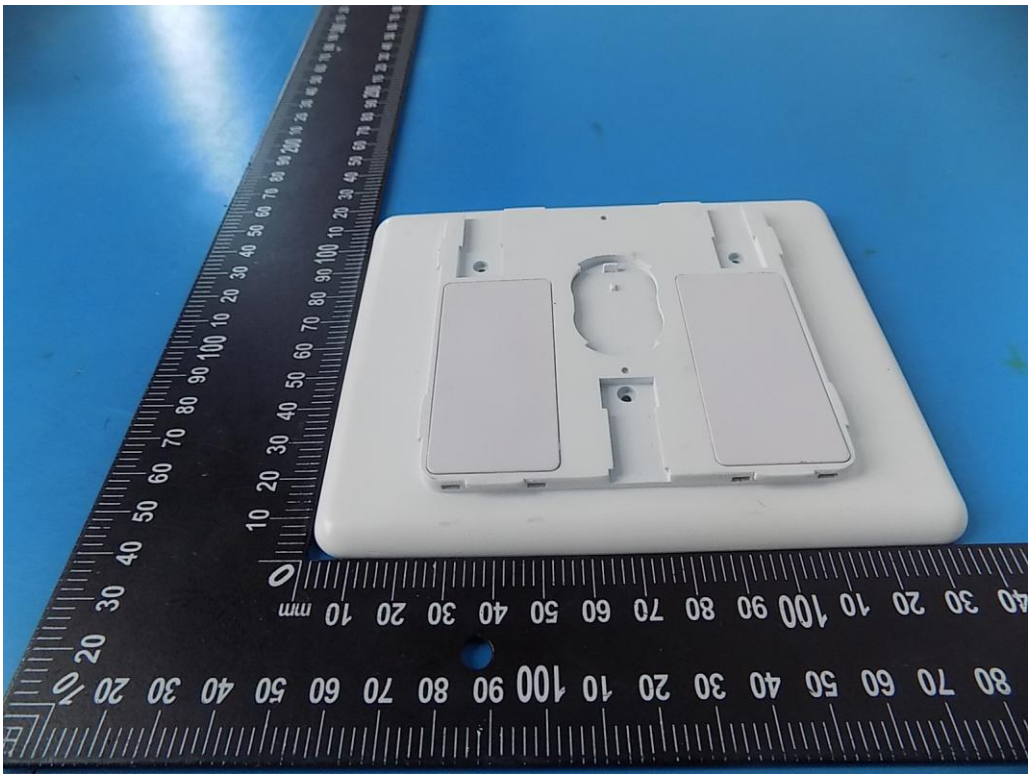


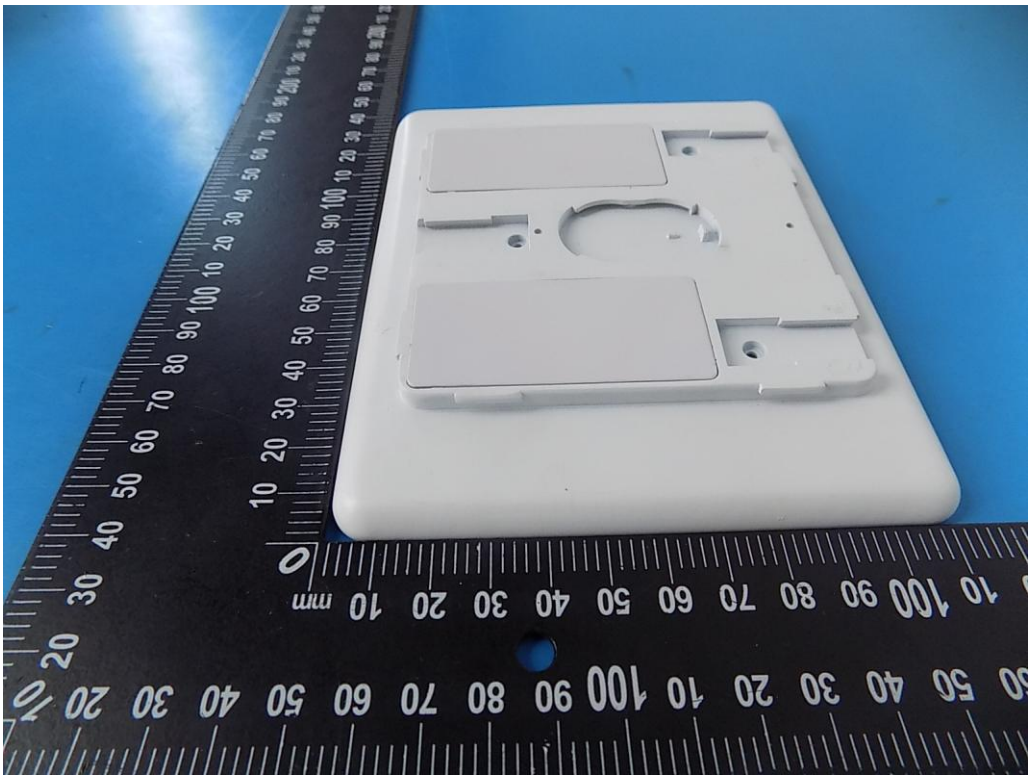


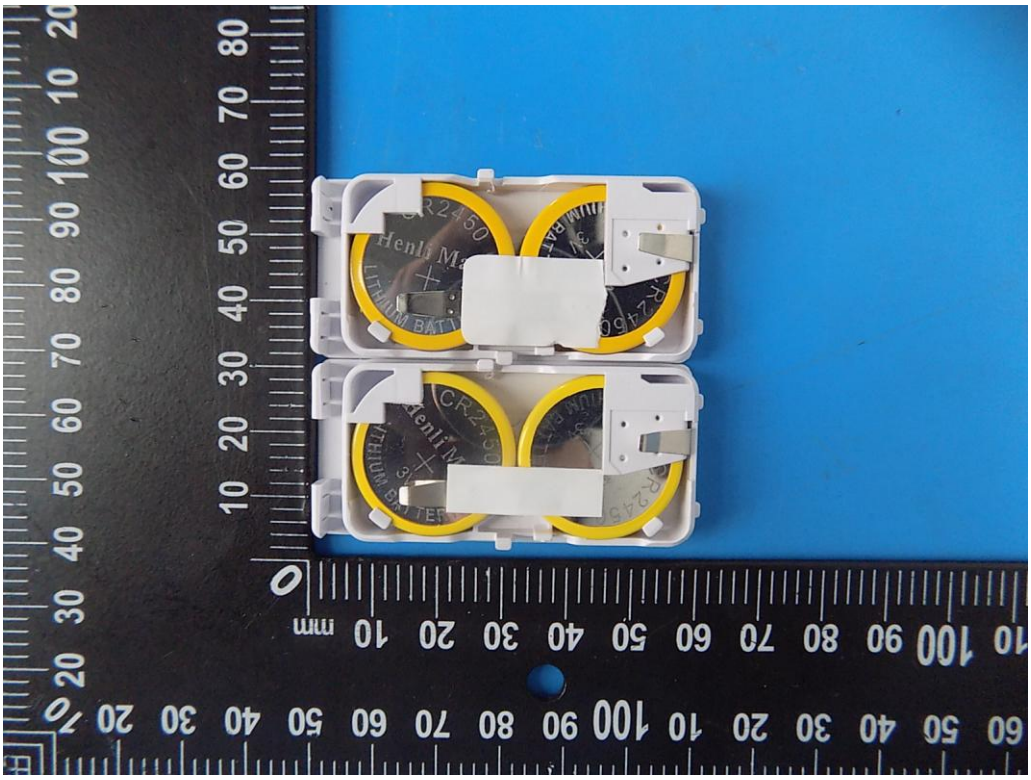
9. PHOTOS OF THE EUT

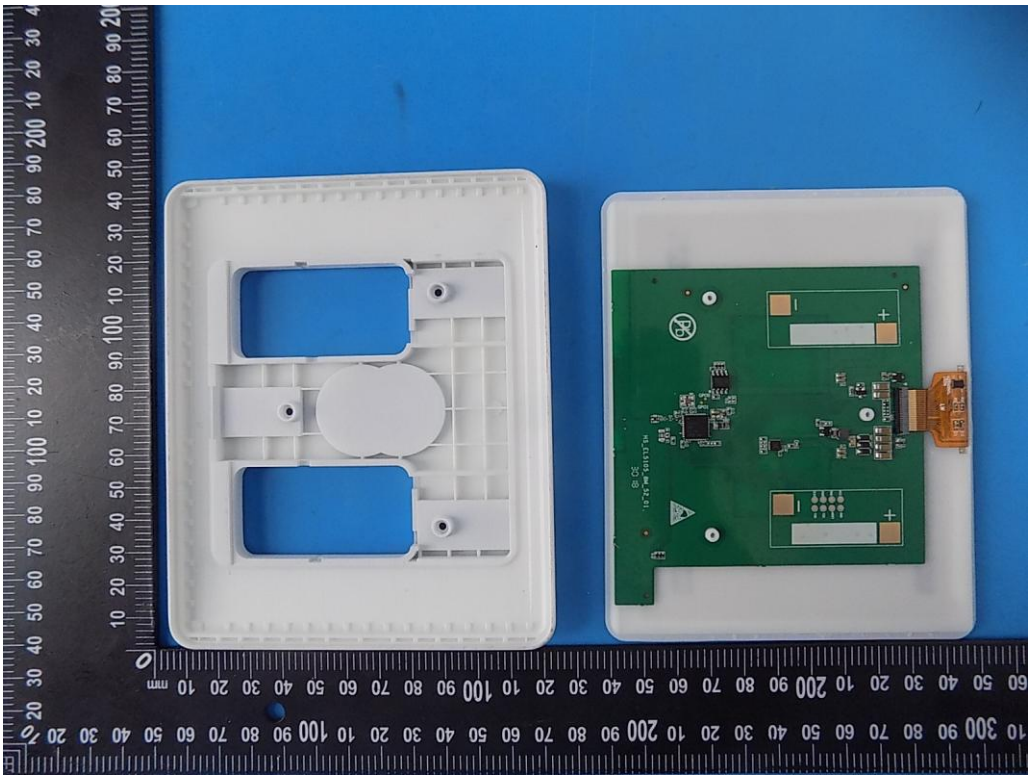


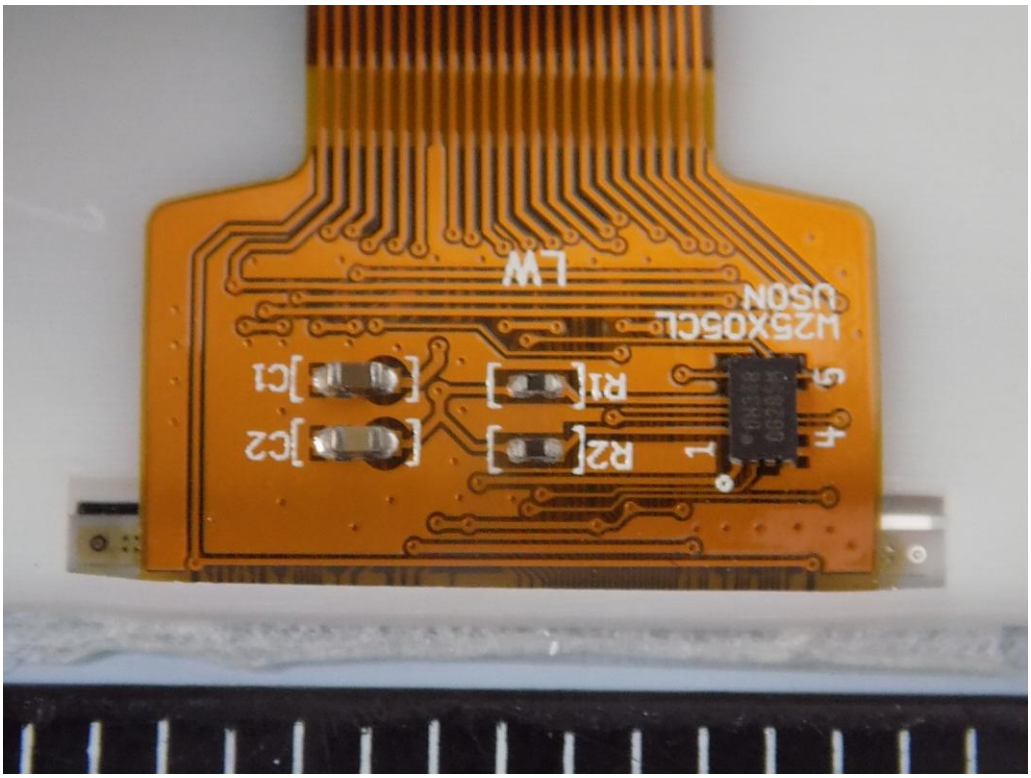


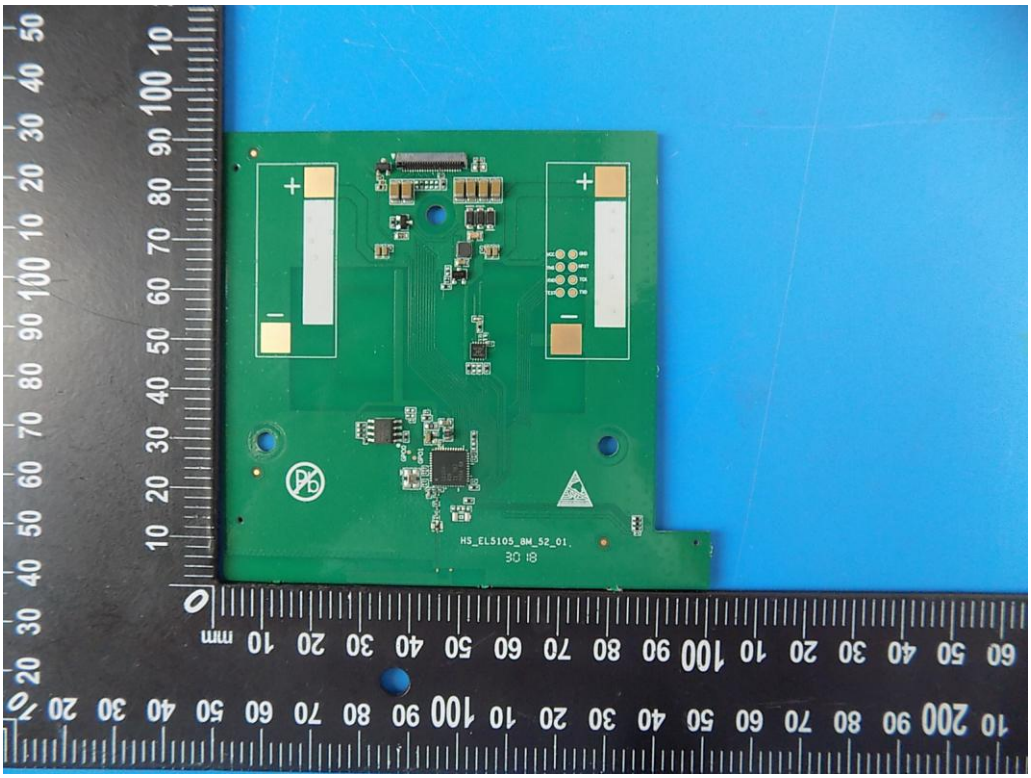


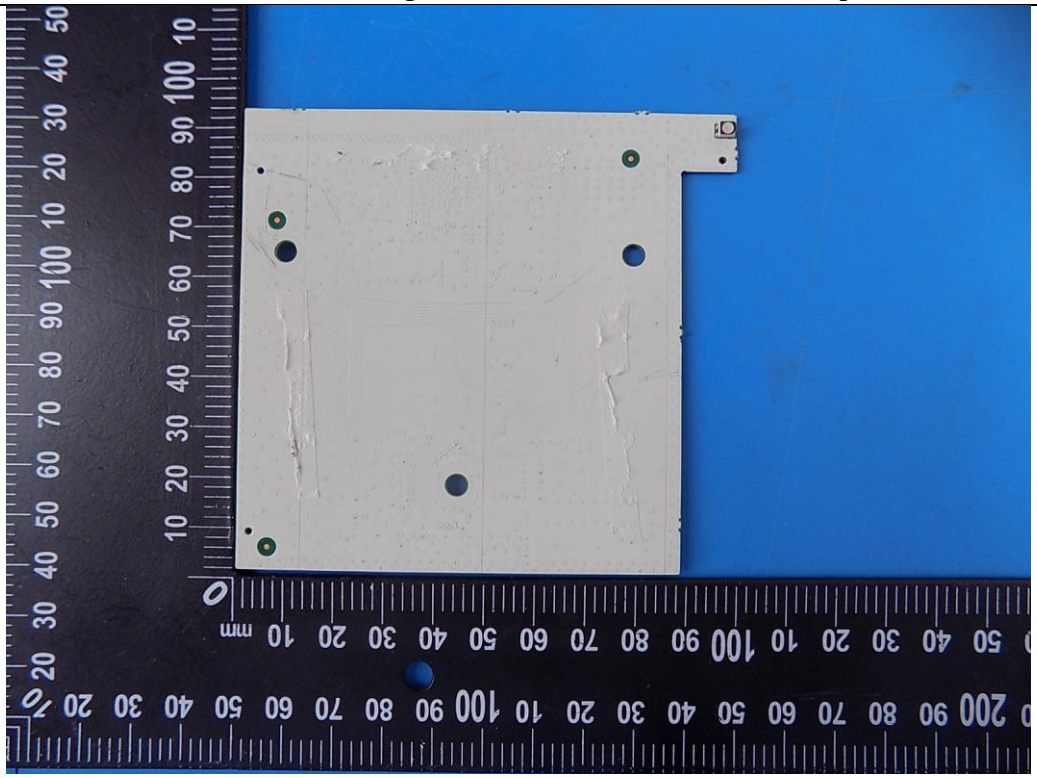







LW
W25X05CL
USON
C1
C2
R1
R2


HS_EL5105_8M_S2_01.



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