TEST REPORT

Applicant:	**DALS Lighting Inc.**
Address of Applicant:	**80 boul. De La Seigneurie Est, Blainville, QC, J7C 4N1, Canada**
Manufacturer/Factory:	**DALS Lighting Inc.**
Address of Manufacturer/Factory:	**80 boul. De La Seigneurie Est, Blainville, QC, J7C 4N1, Canada**
Equipment Under Test (EUT)	
Product Name:	**Smart Plug**
Model No.:	**SM-PLUG, I-SMPLUG**
Trade Mark:	**DALS, ILLUME**
FCC ID:	**2AQSN-SMPLUG**
IC:	**10733A-SMPLUG**
HVIN:	**SM-PLUG,I-SMPLUG**
Applicable standards:	**FCC CFR Title 47 Part 15 Subpart C Section 15.247** **ANSI C63.10:2013** **RSS-247 Issue 2** **RSS-Gen Issue 5**
Date of sample receipt:	**July 19,2021**
Date of Test:	**July 20,2021-August 4,2021**
Date of report issued:	**August 4,2021**
Test Result :	**PASS ***

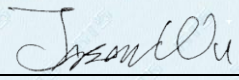
*** In the configuration tested, the EUT complied with the standards specified above.**

Authorized Signature:

Robinson Luo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*2021-8-4*	*Original*

Prepared By:  ***Date:*** *2021-8-4*

Project Engineer

Check By:  ***Date:*** *2021-8-4*

Reviewer

3 Contents

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c) RSS-Gen Section 6.8	Pass
AC Power Line Conducted Emission	15.207 RSS-Gen Section 8.8	Pass
Conducted Peak Output Power	15.247 (b)(3) RSS-247 Section 5.4(d)	Pass
Channel Bandwidth	15.247 (a)(2) RSS-247 Section 5.2(a)	Pass
99% Occupy Bandwidth	RSS-Gen Section 6.7	/
Power Spectral Density	15.247 (e) RSS-247 Section 5.2(b)	Pass
Band Edge	15.247(d) RSS-247 Section 5.5	Pass
Spurious Emission	15.205/15.209 RSS-247 Section 5.5	Pass
Frequency stability	RSS-Gen Section 6.11& Section 8.11	Pass

Remarks:

1. *Pass: The EUT complies with the essential requirements in the standard.*
2. *Test according to ANSI C63.10:2013 and RSS-Gen.*

Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	Smart Plug
Model No.:	SM-PLUG, I-SMPLUG
Test sample(s) ID:	GTSL202107000255-1
Sample(s) Status:	Engineer sample
Serial No.:	N/A
Hardware Version:	1.0.0
Software Version:	1.1.4
Operation Frequency:	2402MHz~2480MHz
Channel Numbers:	40
Channel Separation:	2MHz
Modulation Type:	GFSK
Antenna Type:	PCB Antenna
Antenna Gain:	2.4 dBi
Power Supply:	AC 120V/60Hz

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402 MHz	11	2422 MHz	21	2442 MHz	31	2462 MHz
2	2404 MHz	12	2424 MHz	22	2444 MHz	32	2464 MHz
3	2406 MHz	13	2426 MHz	23	2446 MHz	33	2466 MHz
4	2408 MHz	14	2428 MHz	24	2448 MHz	34	2468 MHz
5	2410 MHz	15	2430 MHz	25	2450 MHz	35	2470 MHz
6	2412 MHz	16	2432 MHz	26	2452 MHz	36	2472 MHz
7	2414 MHz	17	2434 MHz	27	2454 MHz	37	2474 MHz
8	2416 MHz	18	2436 MHz	28	2456 MHz	38	2476 MHz
9	2418 MHz	19	2438 MHz	29	2458 MHz	39	2478 MHz
10	2420 MHz	20	2440 MHz	30	2460 MHz	40	2480 MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2440MHz
The Highest channel	2480MHz

Test Item	Software	Description
Conducted RF Testing and Radiated testing	Beken Wi-Fi Test Tool V1.6.0	Set the EUT to different modulation and channel

Output power setting table:

Test Mode	Set Tx Output Power	Data Rate
BLE	5dBm	1Mbps

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC—Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

● **IC —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.7 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 24 2021	June. 23 2022
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 24 2021	June. 23 2022
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 24 2021	June. 23 2022
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 24 2021	June. 23 2022
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 24 2021	June. 23 2022
9	Coaxial Cable	GTS	N/A	GTS211	June. 24 2021	June. 23 2022
10	Coaxial cable	GTS	N/A	GTS210	June. 24 2021	June. 23 2022
11	Coaxial Cable	GTS	N/A	GTS212	June. 24 2021	June. 23 2022
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 24 2021	June. 23 2022
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 24 2021	June. 23 2022
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 24 2021	June. 23 2022
15	Band filter	Amindeon	82346	GTS219	June. 24 2021	June. 23 2022
16	Power Meter	Anritsu	ML2495A	GTS540	June. 24 2021	June. 23 2022
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 24 2021	June. 23 2022
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 24 2021	June. 23 2022
19	Splitter	Agilent	11636B	GTS237	June. 24 2021	June. 23 2022
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 24 2021	June. 23 2022
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 18 2020	Oct. 17 2021
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 18 2020	Oct. 17 2021
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 18 2020	Oct. 17 2021
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 24 2021	June. 23 2022

Conducted Emission						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 24 2021	June. 23 2022
4	ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	June. 24 2021	June. 23 2022
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 24 2021	June. 23 2022
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 24 2021	June. 23 2022
9	ISN	SCHWARZBECK	NTFM 8158	GTS565	June. 24 2021	June. 23 2022
10	High voltage probe	SCHWARZBECK	TK9420	GTS537	July. 09 2021	July. 08 2022

RF Conducted Test:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 24 2021	June. 23 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 24 2021	June. 23 2022
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 24 2021	June. 23 2022
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 24 2021	June. 23 2022
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 24 2021	June. 23 2022
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 24 2021	June. 23 2022
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 24 2021	June. 23 2022

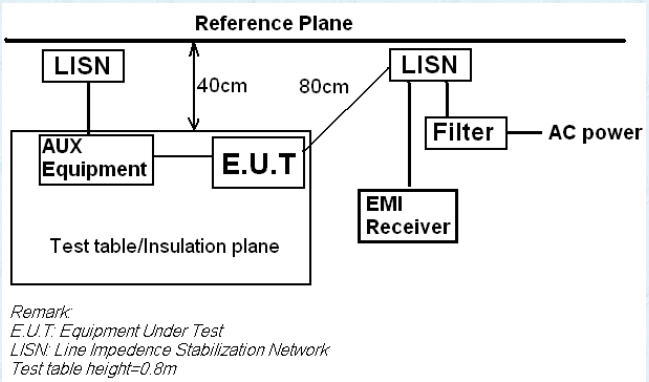
General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 24 2021	June. 23 2022
2	Barometer	ChangChun	DYM3	GTS255	June. 24 2021	June. 23 2022

7 Test results and Measurement Data

7.1 Antenna requirement

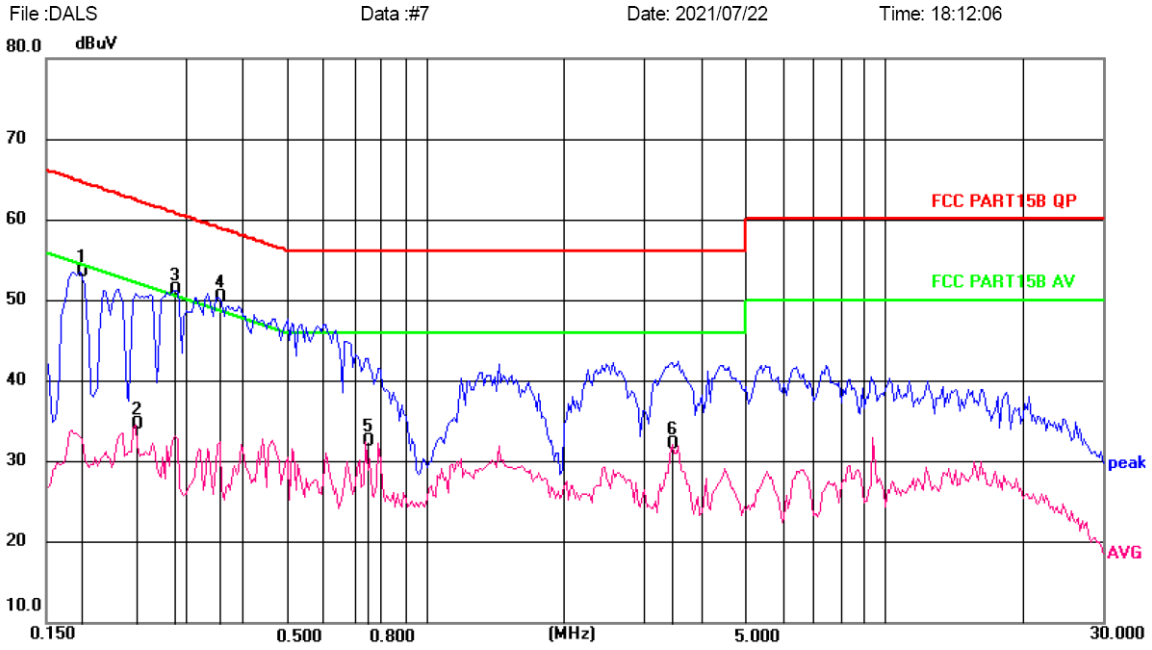
Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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. **15.247(c) (1)(i) requirement:** (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
Standard requirement:	RSS-Gen Section 6.8
A transmitter can only be sold or operated with antennas with which it was approved. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. For transmitters of RF output power of 10 milliwatts or less, only the portion of the antenna gain that is in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power to demonstrate compliance with the radiated power limits specified in the applicable standard. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power	
E.U.T Antenna:	
The antenna is PCB antenna, the best case gain of the is 2.4dBi, reference to the appendix II for details	

7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207 RSS-Gen Section 8.8
Test Method:	ANSI C63.10:2013 and RSS-Gen
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average 0.15-0.5: 66 to 56* / 56 to 46* 0.5-5: 56 / 46 5-30: 60 / 50 * Decreases with the logarithm of the frequency.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2009 on conducted measurement.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test environment:	Temp.: 25 °C / Humid.: 52% / Press.: 1012mbar
Test voltage:	AC 120V, 60Hz
Test results:	Pass

Remark: Both high and low voltages have been tested to show only the worst low voltage test data.

Measurement data
Line:



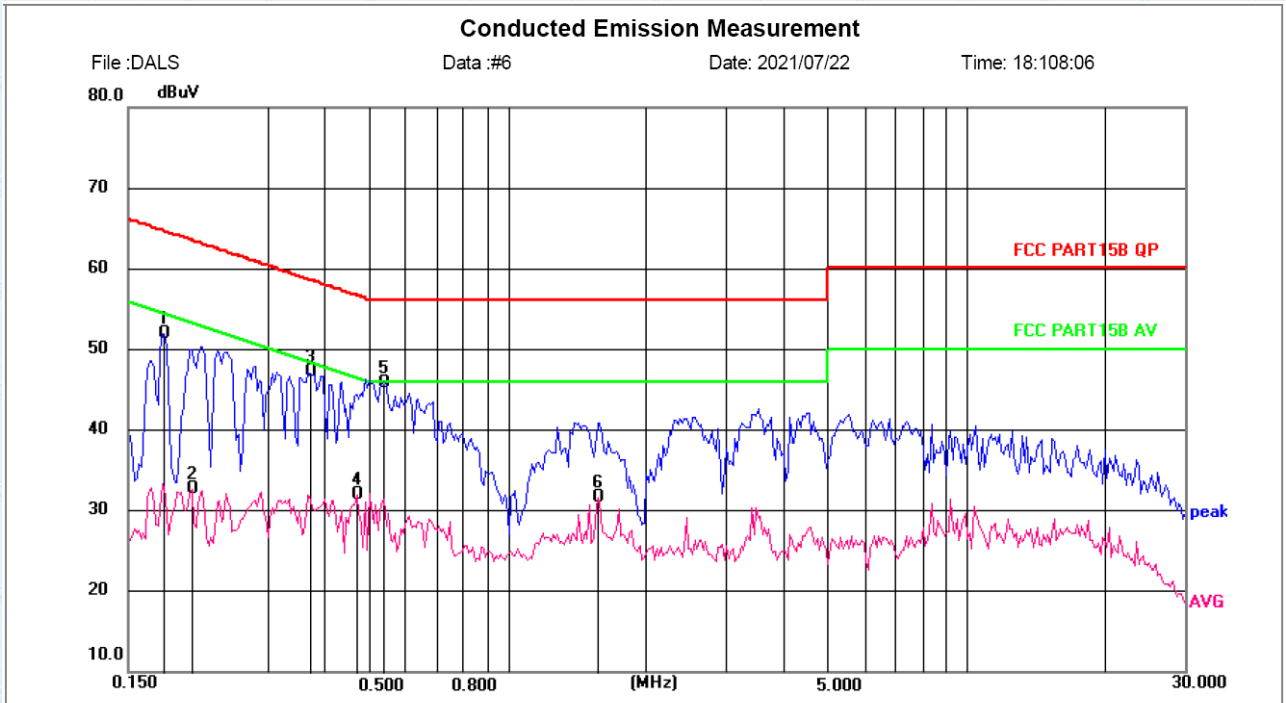
Site Shielding Room
Limit: FCC PART15C
EUT: Smart Plug
M/N: SM-PLUG
Mode: ON WITH BT
Note: DALS Lighting Inc.

Phase: *L1*
Power: AC 120V/60Hz

Temperature: 25(C)
Humidity: 56 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector				
1	0.1777	43.55	10.00	53.55	64.59	11.04	QP				
2	0.2341	24.59	10.00	34.59	52.30	17.71	AVG				
3	0.2833	41.25	10.00	51.25	60.72	9.47	QP				
4 *	0.3539	40.37	10.00	50.37	58.87	8.50	QP				
5	0.7430	22.57	10.00	32.57	46.00	13.43	AVG				
6	3.4538	22.07	10.02	32.09	46.00	13.91	AVG				

Neutral:



Site Shielding Room
Limit: FCC PART15C
EUT: Smart Plug
M/N: SM-PLUG
Mode: ON WITH BT
Note: DALS Lighting Inc.

Phase: *N*
Power: AC 120V/60Hz

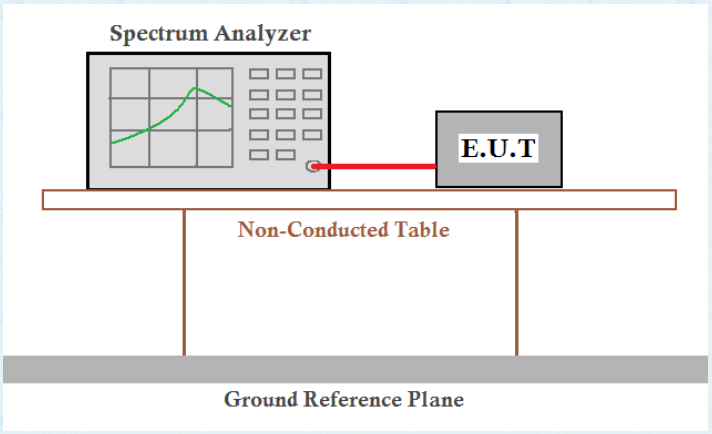
Temperature: 25(C)
Humidity: 56 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector				
1	0.1796	41.97	10.00	51.97	64.50	12.53	QP				
2	0.2061	22.65	10.00	32.65	53.36	20.71	AVG				
3	0.3692	37.12	10.00	47.12	58.52	11.40	QP				
4	0.4711	21.88	10.00	31.88	46.49	14.61	AVG				
5 *	0.5350	35.78	10.00	45.78	56.00	10.22	QP				
6	1.5766	21.69	10.01	31.70	46.00	14.30	AVG				

Notes:

1. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level =Receiver Read level + LISN Factor + Cable Loss*
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

7.3 Conducted Peak Output Power

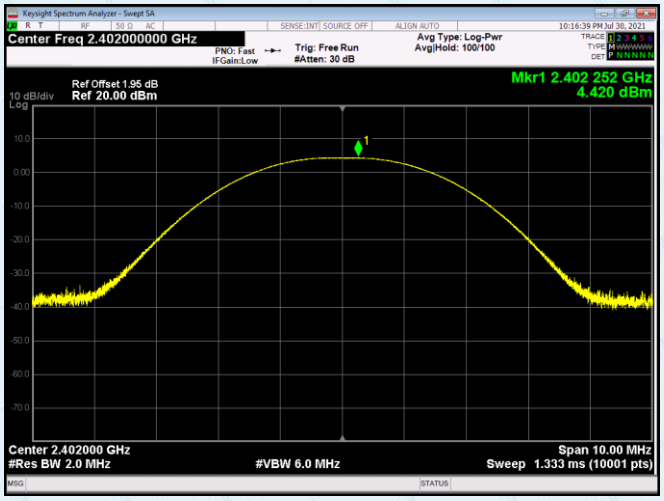
Test Requirement:	FCC Part15 C Section 15.247 (b)(3) RSS-247 Section 5.4(d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02 and RSS-Gen
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

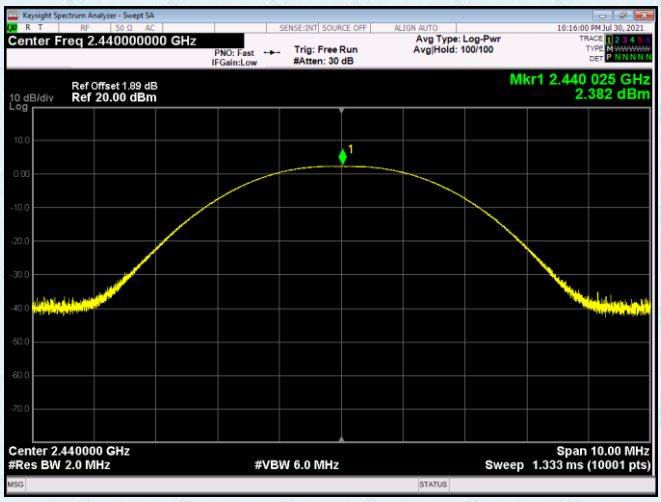
Test channel	Peak Output Power (dBm)	EIRP (dBm)	Output Power Limit(dBm)	EIRP Limit(dBm)	Result
Lowest	4.420	6.82	30.00	36.00	Pass
Middle	2.382	4.782	30.00	36.00	Pass
Highest	1.737	4.137	30.00	36.00	Pass

Test plot as follows:

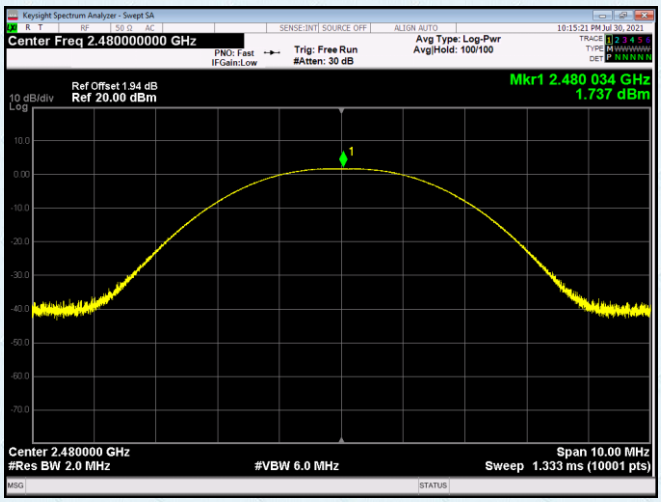
Lowest channel



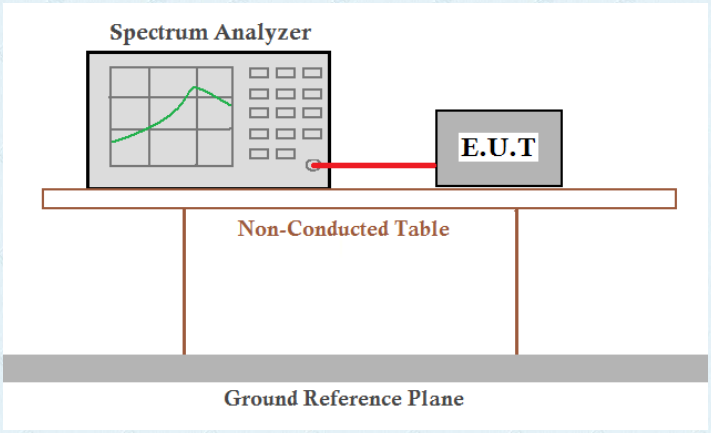
Middle channel



Highest channel



7.4 Channel Bandwidth & 99% Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2) & RSS-247 Section 5.2(a)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02 and RSS-Gen
Limit:	>500KHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

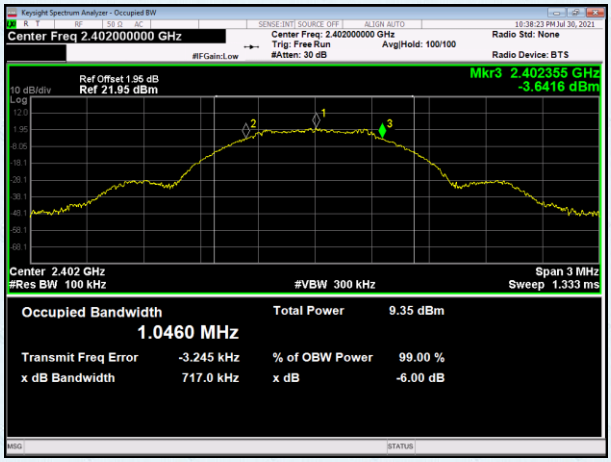
Measurement Data

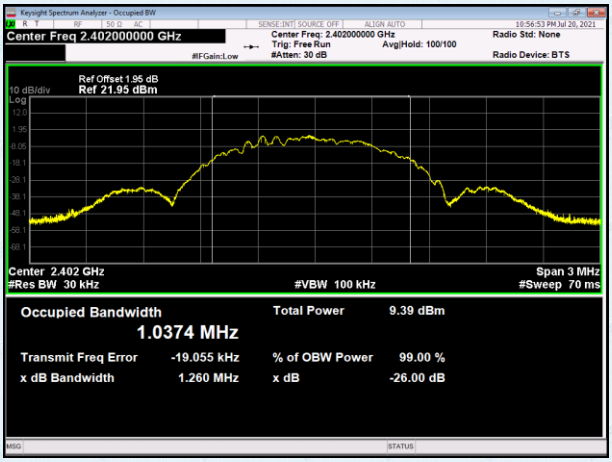
Test channel	Channel Bandwidth (MHz)	Limit(KHz)	Result
Lowest	0.717	>500	Pass
Middle	0.719		
Highest	0.713		

Test channel	99% Bandwidth (MHz)	Result
Lowest	1.037	Pass
Middle	1.038	
Highest	1.037	

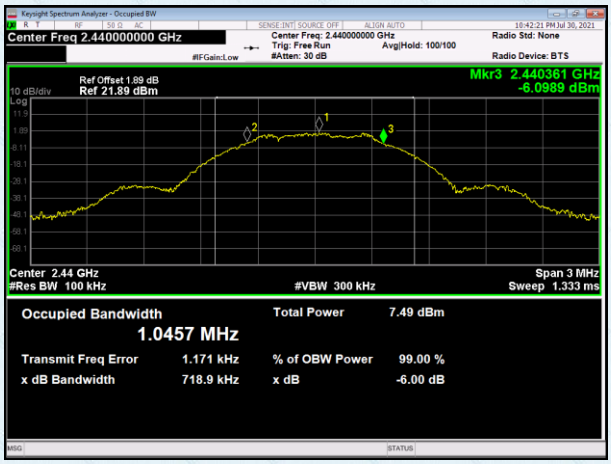
Test plot as follows:

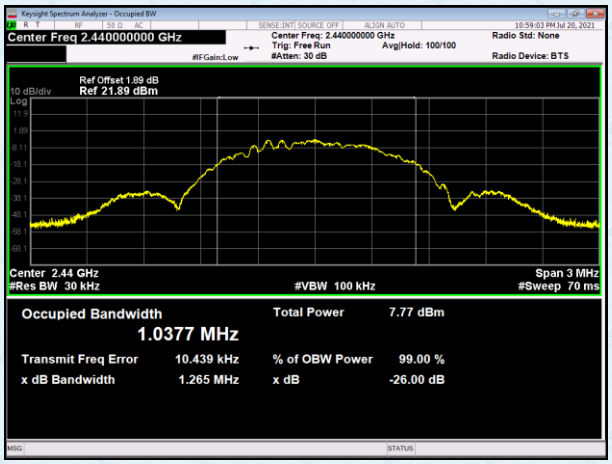
Channel Bandwidth	99% Bandwidth



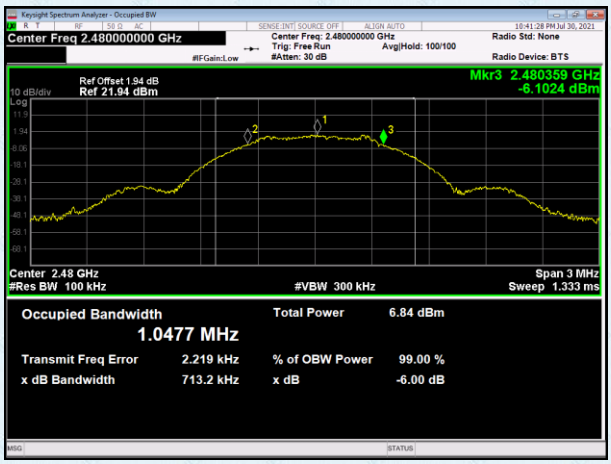


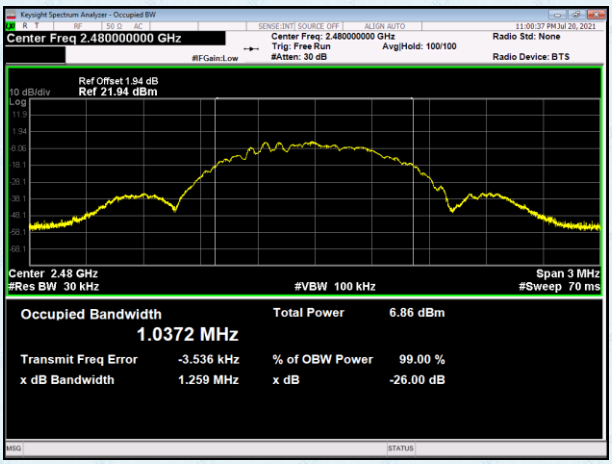
Lowest channel





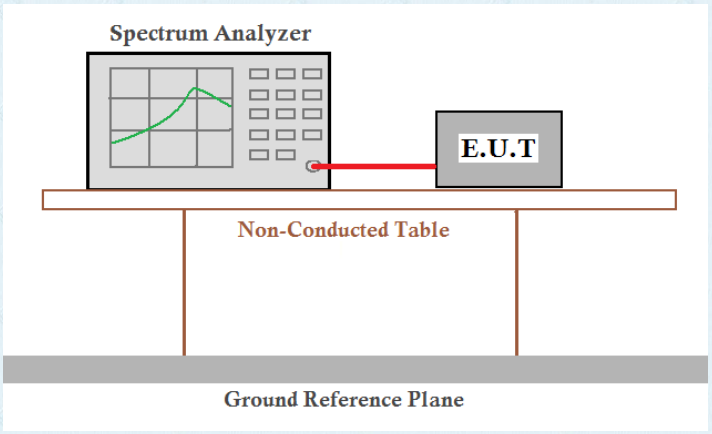
Middle channel





Highest channel

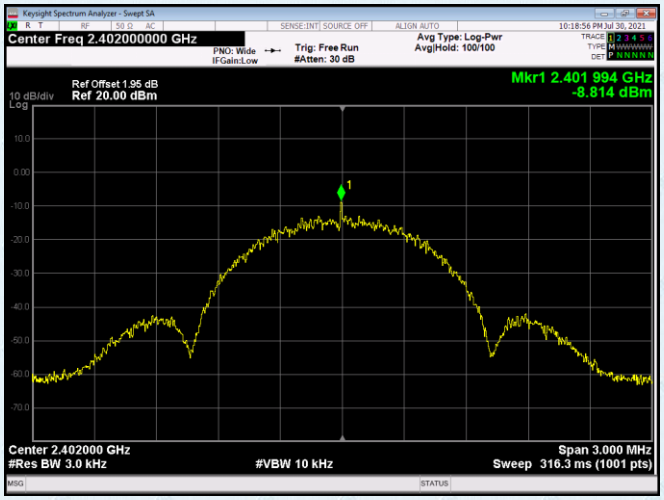
7.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e) RSS-247 Section 5.2(b)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02 and RSS-Gen
Limit:	8dBm/3kHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

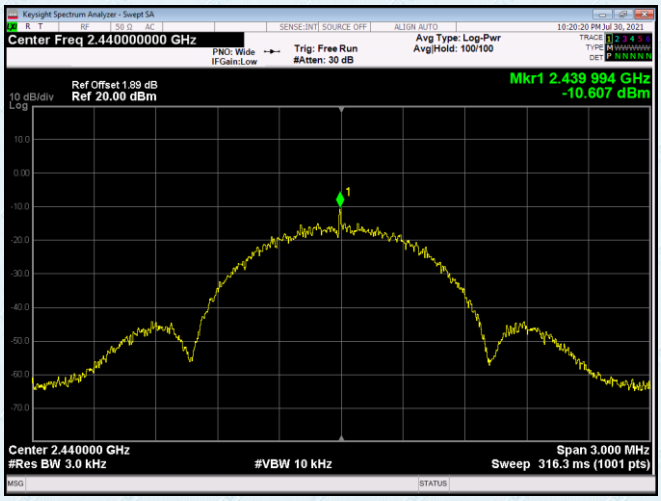
Measurement Data

Test channel	Power Spectral Density (dBm/3kHz)	Limit(dBm/3kHz)	Result
Lowest	-8.814	8.00	Pass
Middle	-10.607		
Highest	-11.521		

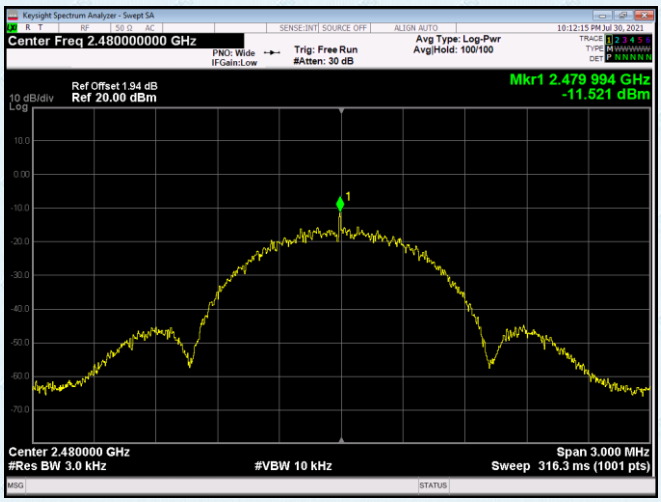
Test plot as follows:



Lowest channel



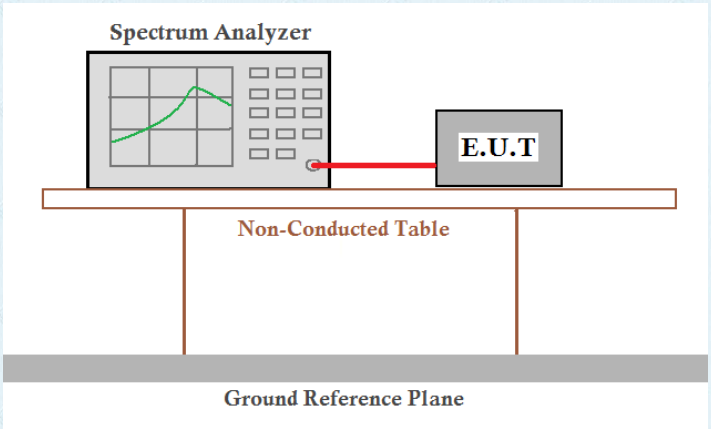
Middle channel



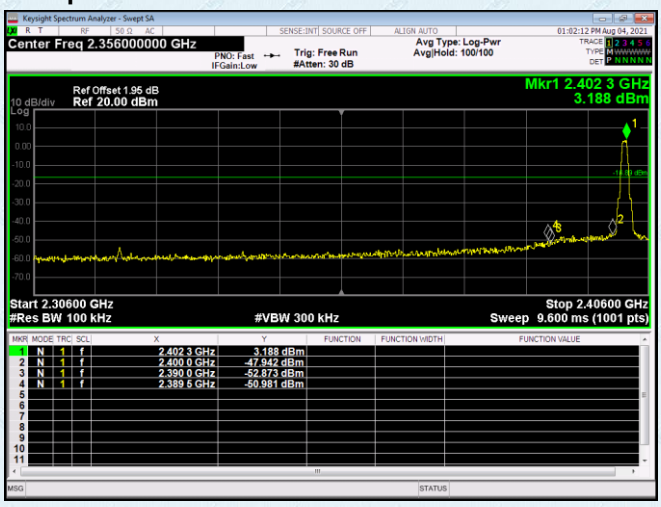
Highest channel

7.6 Band edges

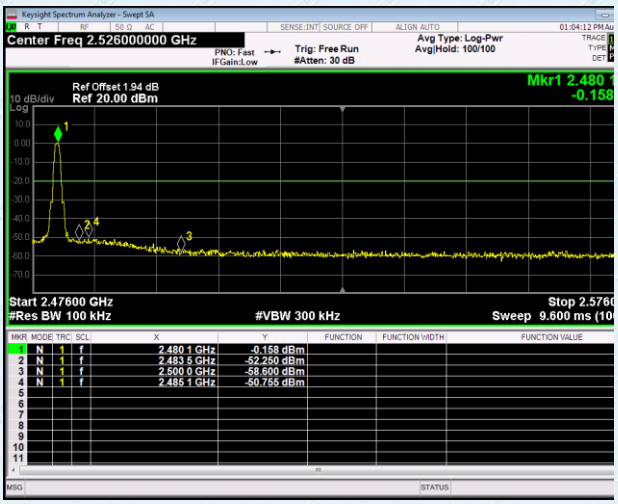
7.6.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d) RSS-247 Section 5.5
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02 & RSS-Gen
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:



Lowest channel



Highest channel

7.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205 RSS-247 Section 3.3 & RSS-Gen Section 8.10
Test Method:	ANSI C63.10:2013 & RSS-Gen
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.
Test site:	Measurement Distance: 3m

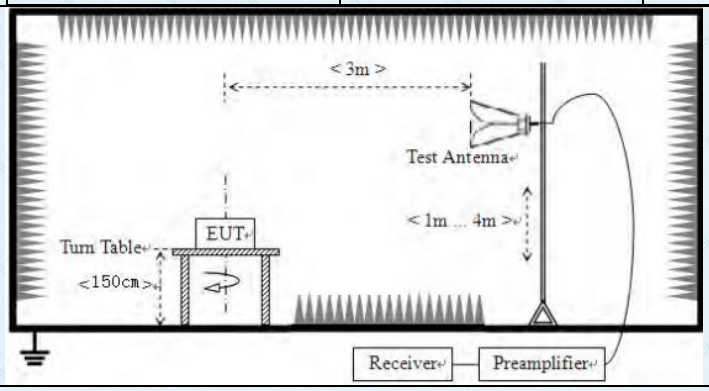
Receiver setup:

Frequency	Detector	RBW	VBW	Value
Above 1GHz	Peak	1MHz	3MHz	Peak
	RMS	1MHz	3MHz	Average

Limit:

Frequency	Limit (dBuV/m @3m)	Value
Above 1GHz	54.00	Average
	74.00	Peak

Test setup:

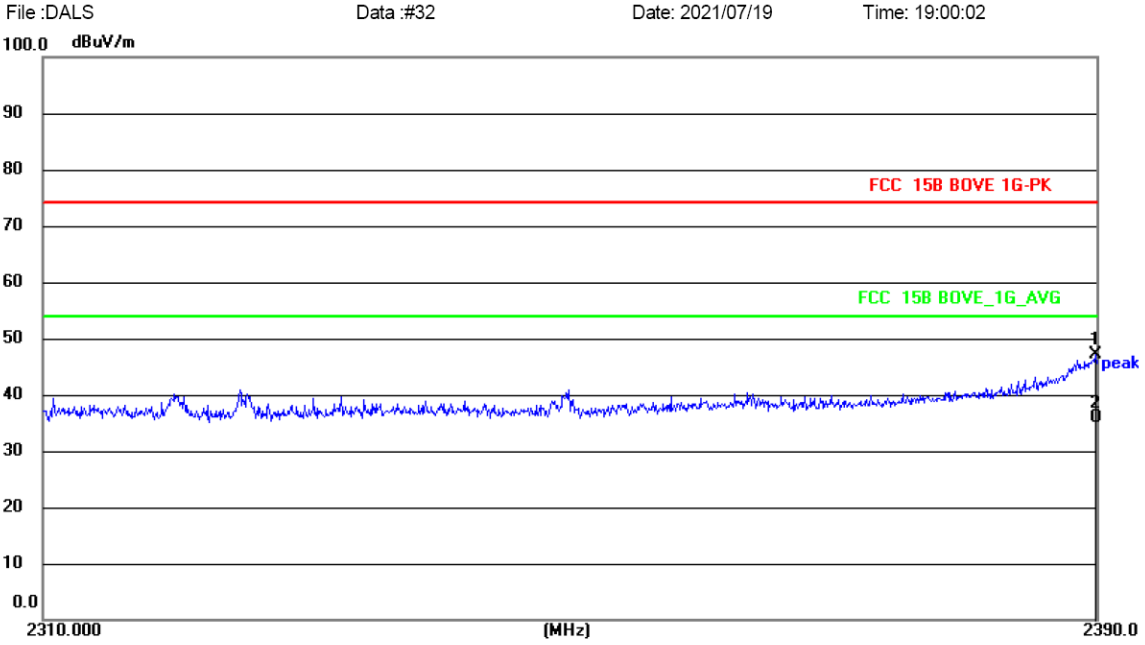


Test Procedure:

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna 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 polarizations 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 rota 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.
6. If the emission level of the EUT in peak mode was 10dB 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 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data



Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2402MHz
Note: DALS Lighting Inc. Operater:Kahn

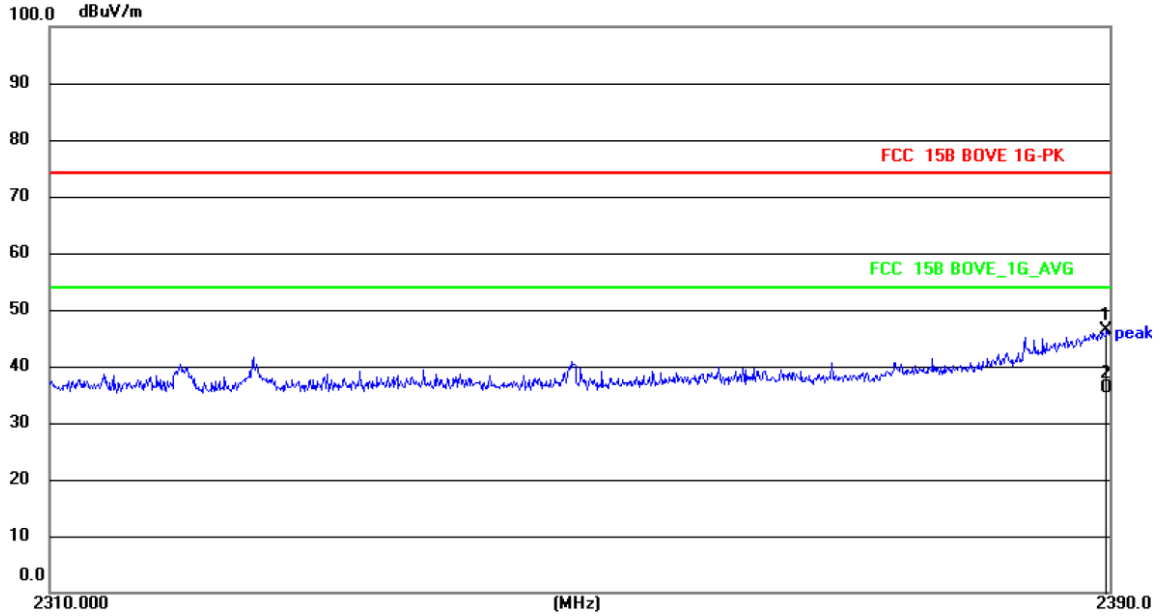
Polarization: *Horizontal*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2389.973	43.11	3.90	47.01	74.00	26.99	peak	171	214	P	
2 *	2389.973	32.02	3.90	35.92	54.00	18.08	AVG	165	189	P	

Radiated Emission Measurement

File :DALS Data :#31 Date: 2021/07/19 Time: 18:57:47



Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2402MHz
Note: DALS Lighting Inc. Operater:Kahn

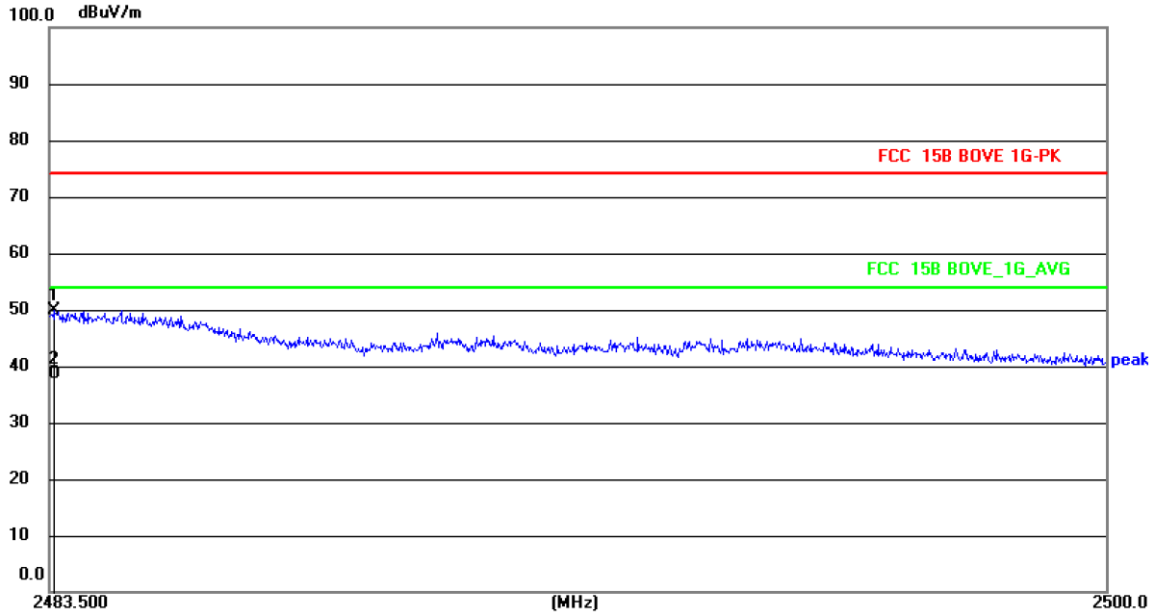
Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2389.813	42.39	3.90	46.29	74.00	27.71	peak	172	132	P	
2 *	2389.813	32.14	3.90	36.04	54.00	17.96	AVG	168	141	P	

Radiated Emission Measurement

File :DALS Data :#33 Date: 2021/07/19 Time: 19:03:36

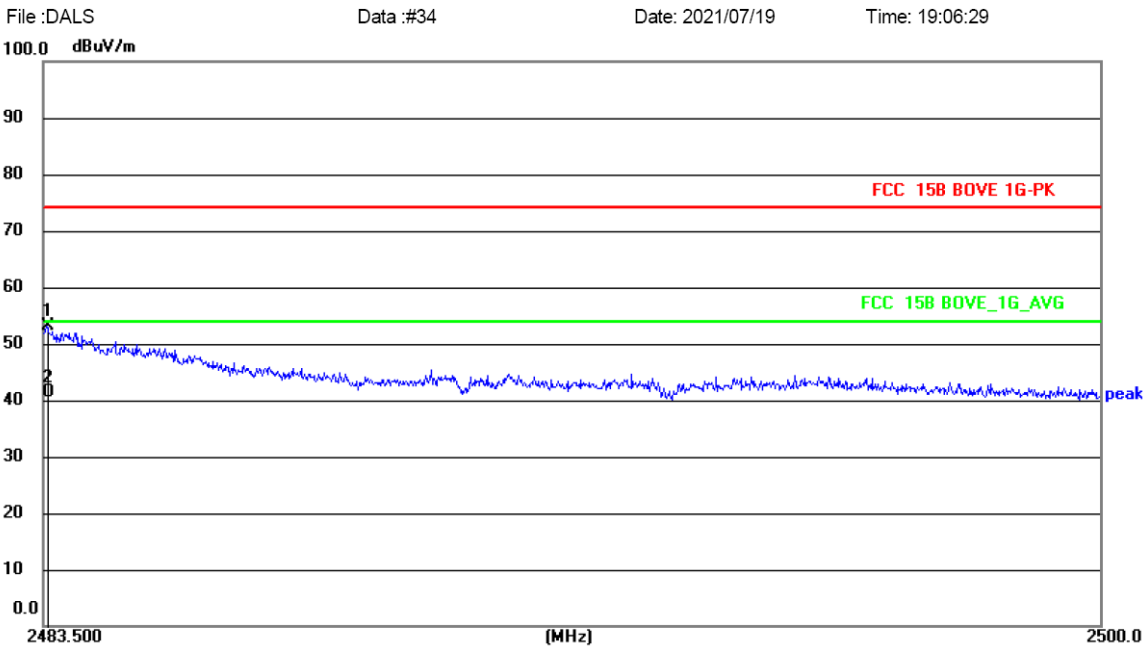


Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2480MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.593	45.67	4.28	49.95	74.00	24.05	peak	137	158	P	
2 *	2483.593	34.28	4.28	38.56	54.00	15.44	AVG	142	164	P	



Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2480MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

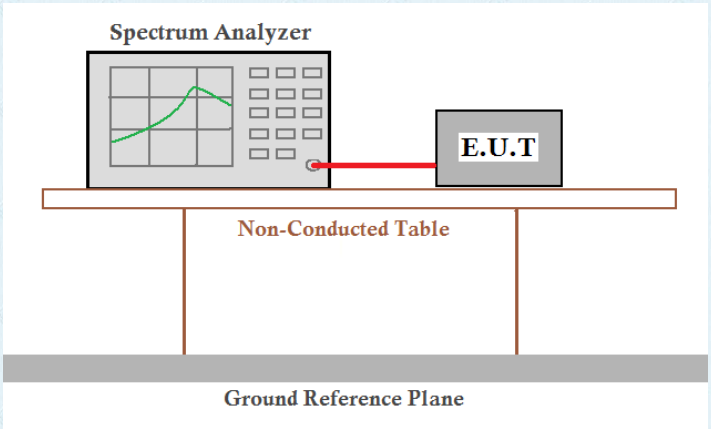
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.561	48.96	4.28	53.24	74.00	20.76	peak	152	113	P	
2 *	2483.561	37.08	4.28	41.36	54.00	12.64	AVG	169	124	P	

Remarks:

1. *Level =Reading + Factor*
2. *Factor= Antenna Gain + Cable Loss – Amplifier Gain*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

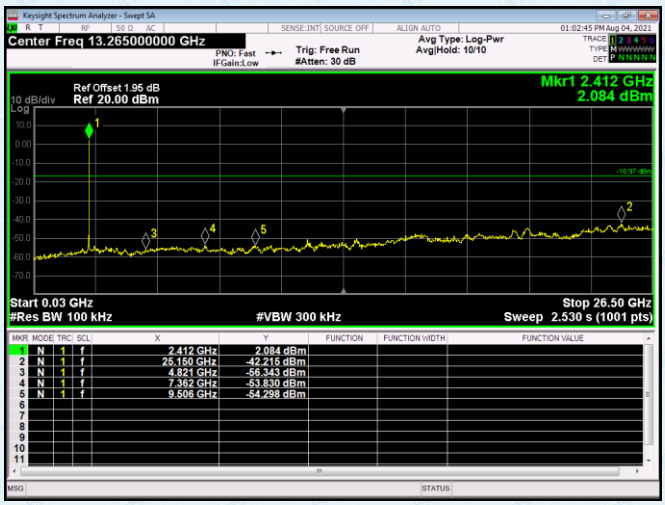
7.7 Spurious Emission

7.7.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d) RSS-247 Section 5.5
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02 & RSS-Gen
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

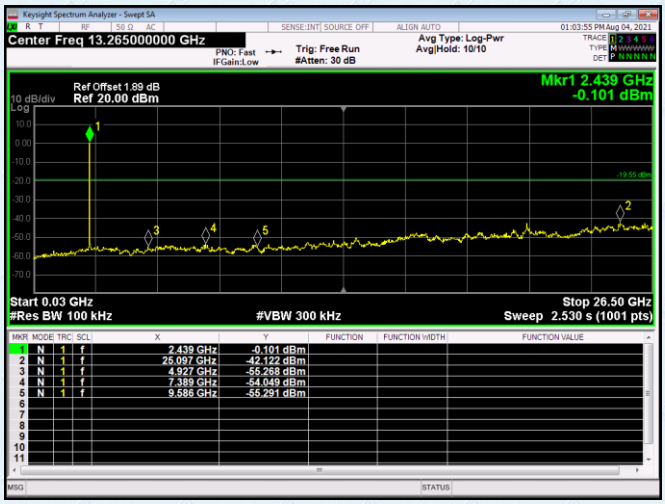
Test plot as follows:

Lowest channel



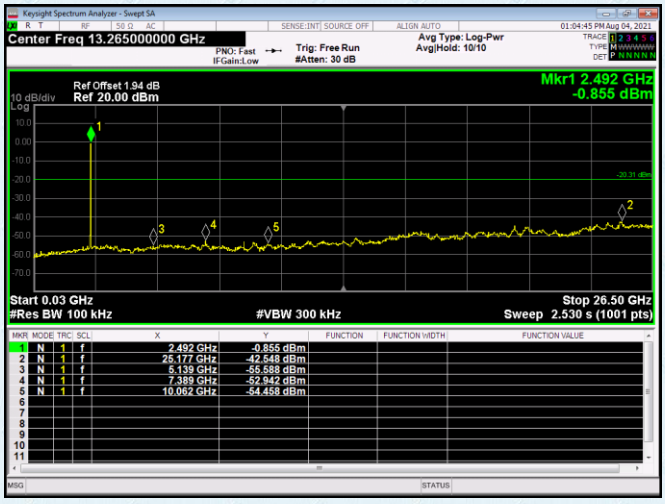
30MHz~26.5GHz

Middle channel



30MHz~26.5GHz

Highest channel



30MHz~26.5GHz

7.7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 RSS-247 Section 3.3 & RSS-Gen Section 8.9
Test Method:	ANSI C63.10:2013 & RSS-Gen
Test Frequency Range:	9kHz to 26.5GHz
Test site:	Measurement Distance: 3m

Receiver setup:

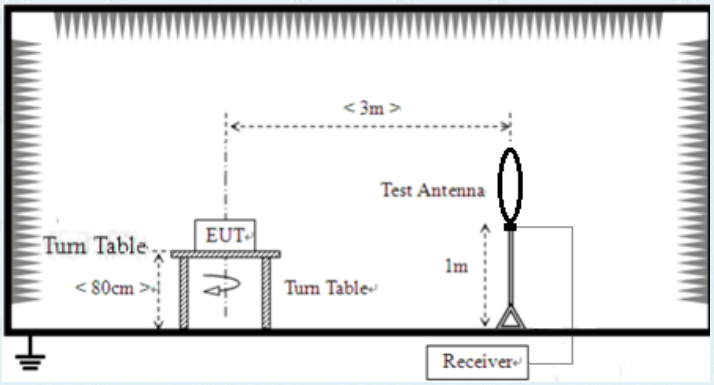
Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

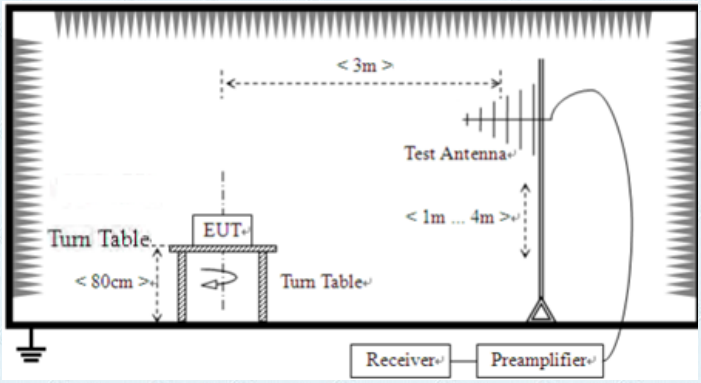
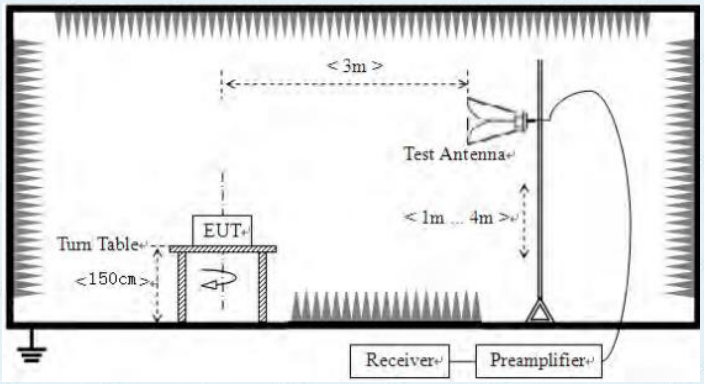
Limit:

Frequency	Limit (uV/m)	Value	Measurement Distance
0.009MHz-0.490MHz	2400/F(KHz)	QP	300m
0.490MHz-1.705MHz	24000/F(KHz)	QP	30m
1.705MHz-30MHz	30	QP	30m
30MHz-88MHz	100	QP	3m
88MHz-216MHz	150	QP	
216MHz-960MHz	200	QP	
960MHz-1GHz	500	QP	
Above 1GHz	500	Average	
	5000	Peak	

Test setup:

For radiated emissions from 9kHz to 30MHz



	For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna 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 polarizations 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 rota 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. 6. If the emission level of the EUT in peak mode was 10dB 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 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details

Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data:

Remark:
Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

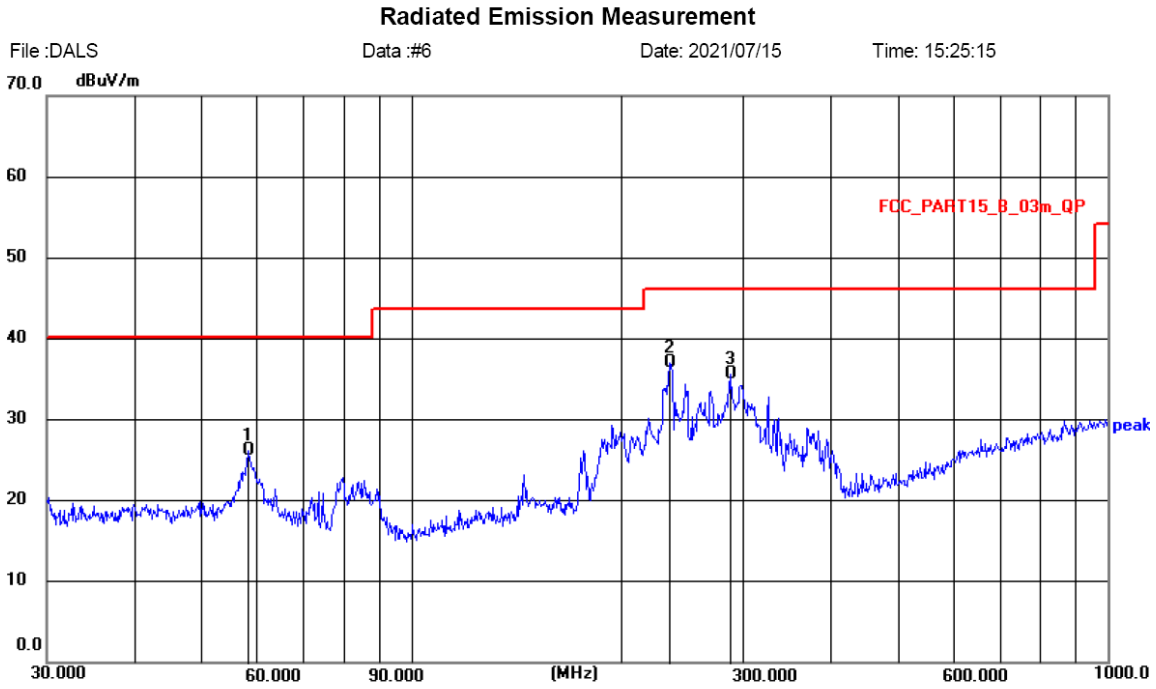
■ **9kHz~30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

■ **Below 1GHz**

Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz

Horizontal:



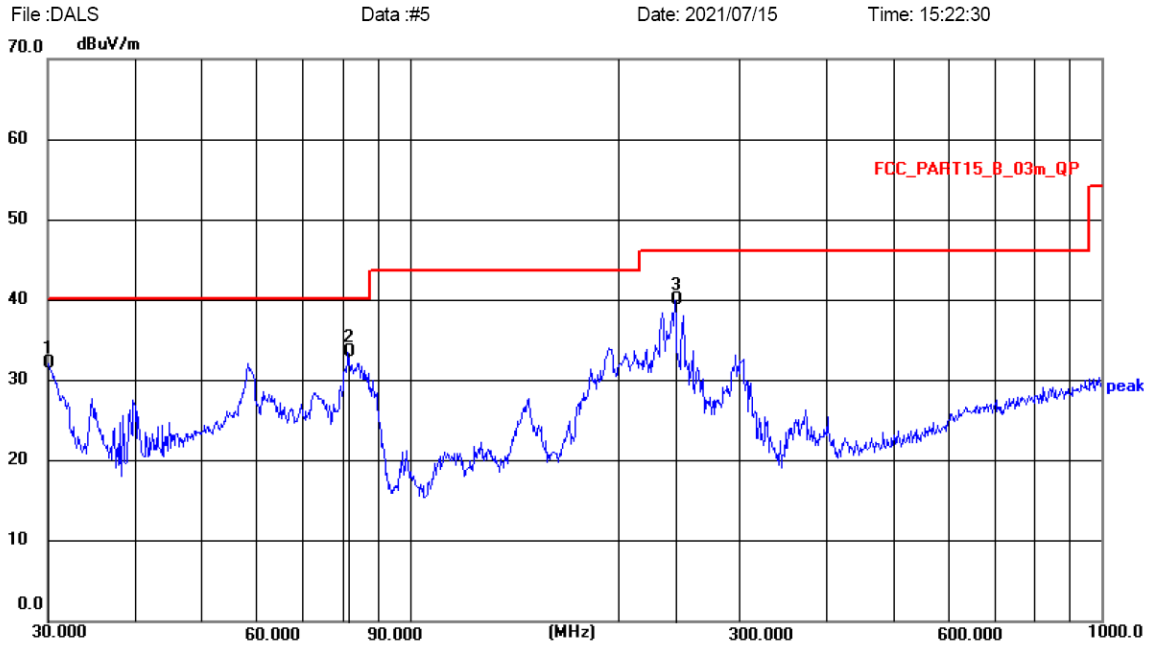
Site 966 Chamber
Limit: FCC_PART15_B_03m_QP
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2480MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Horizontal*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	58.4074	11.91	14.31	26.22	40.00	13.78	QP	132	125	P	
2 *	234.9909	23.90	13.15	37.05	46.00	8.95	QP	218	33	P	
3	287.9904	21.12	14.49	35.61	46.00	10.39	QP	116	58	P	

Vertical:



Site 966 Chamber
Limit: FCC_PART15_B_03m_QP
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2480MHz
Note: DALS Lighting Inc. Operater:Kahn

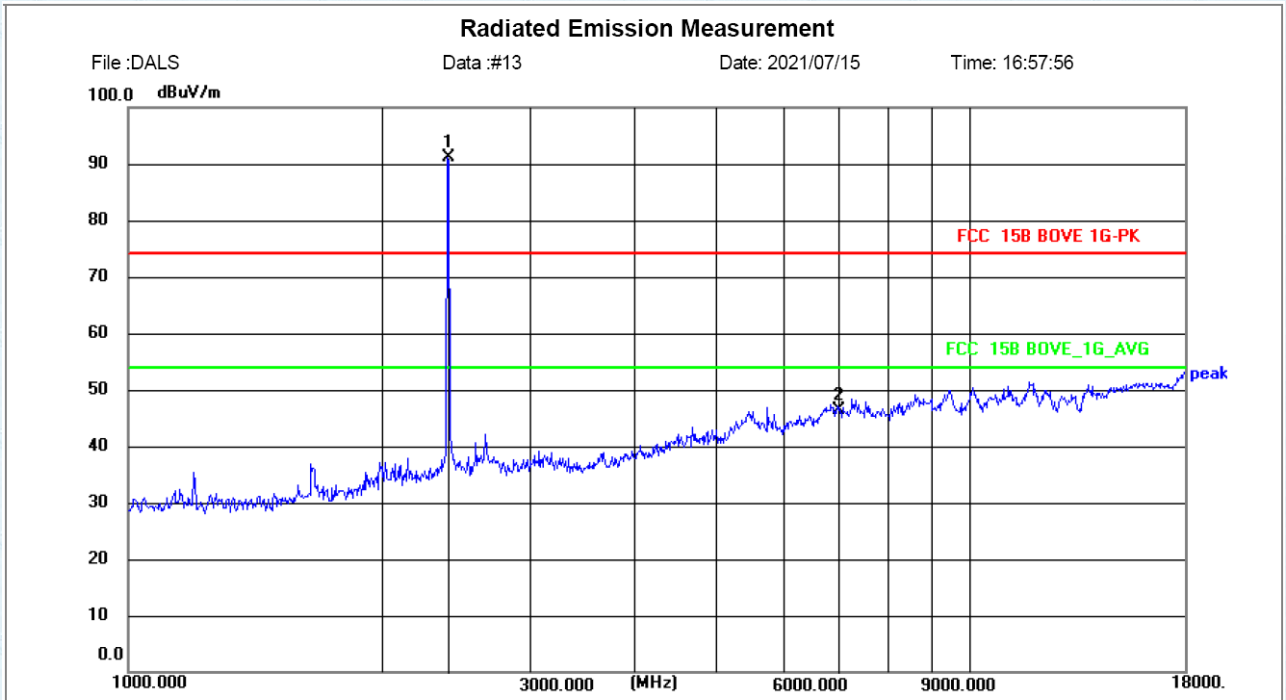
Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	30.1051	17.72	14.40	32.12	40.00	7.88	QP	108	59	P	
2	81.4970	22.59	10.95	33.54	40.00	6.46	QP	137	215	P	
3 *	241.6763	26.56	13.39	39.95	46.00	6.05	QP	112	16	P	

■ **Above 1GHz**

Vertical:



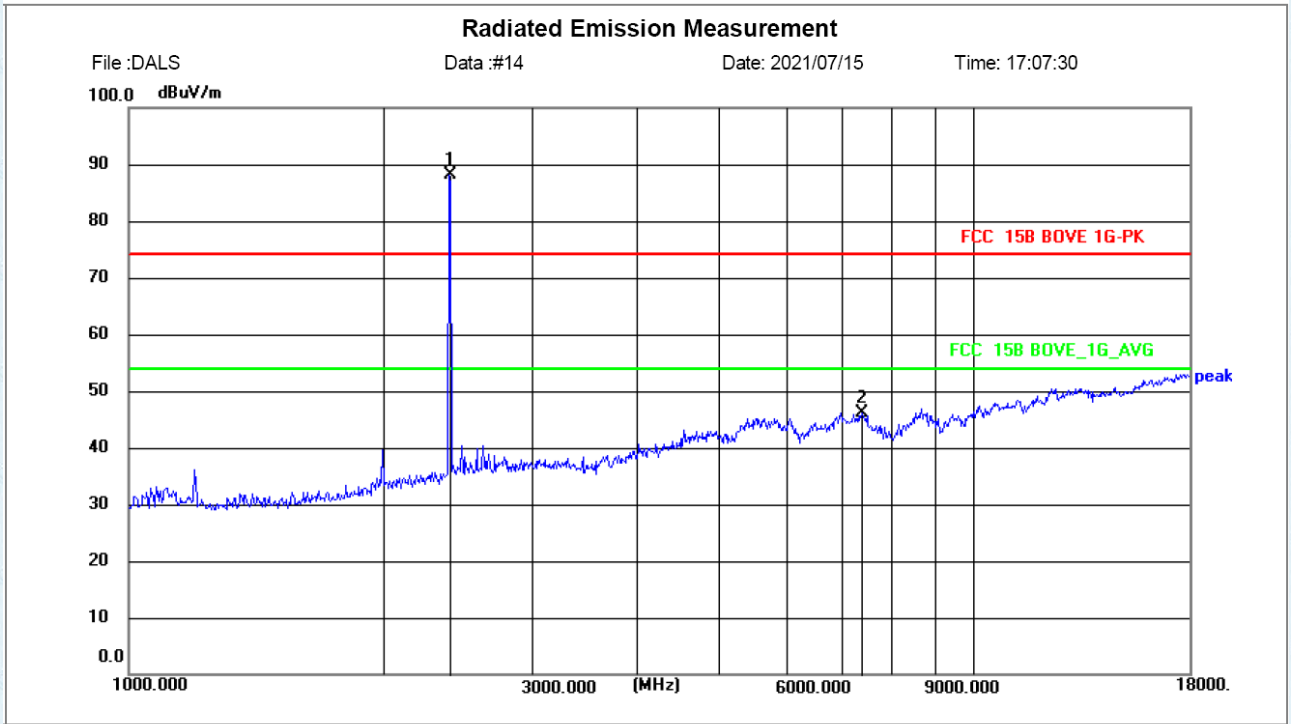
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2402MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	2402.000	87.16	3.94	91.10	/	/	peak	130	245	/	
2	7012.333	26.17	20.14	46.31	74.00	27.69	peak	114	121	P	

Horizontal:



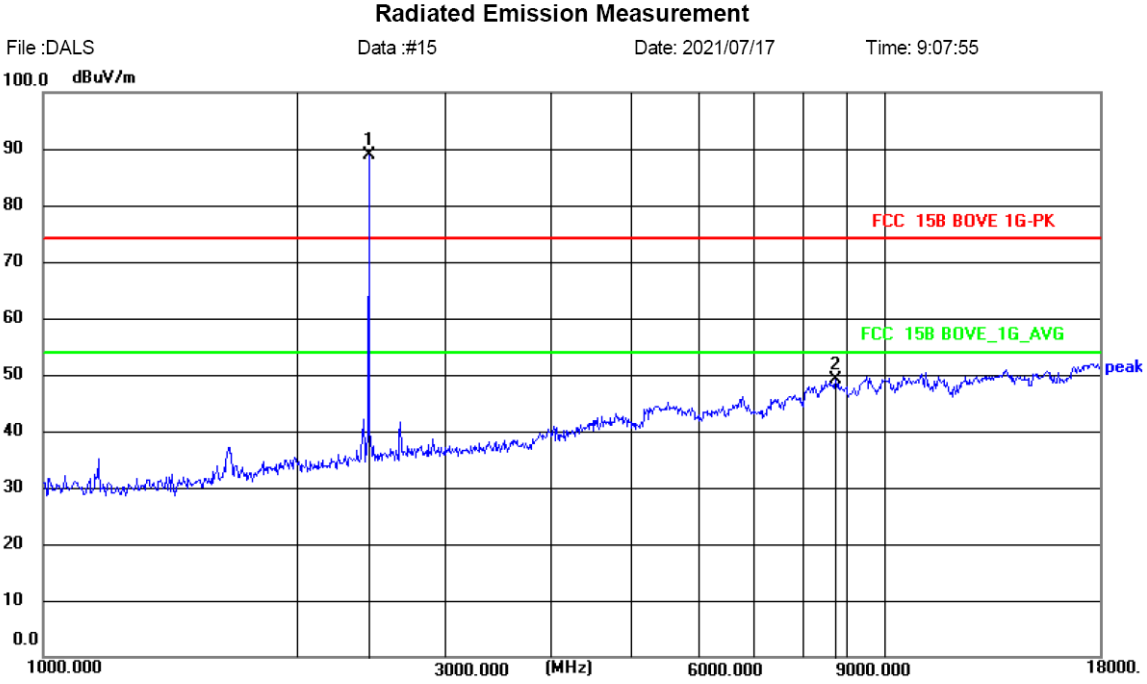
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2402MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Horizontal*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	2399.667	84.18	3.94	88.12	/	/	peak	155	142	/	
2	7369.333	25.63	20.57	46.20	74.00	27.80	peak	104	137	P	

Vertical:



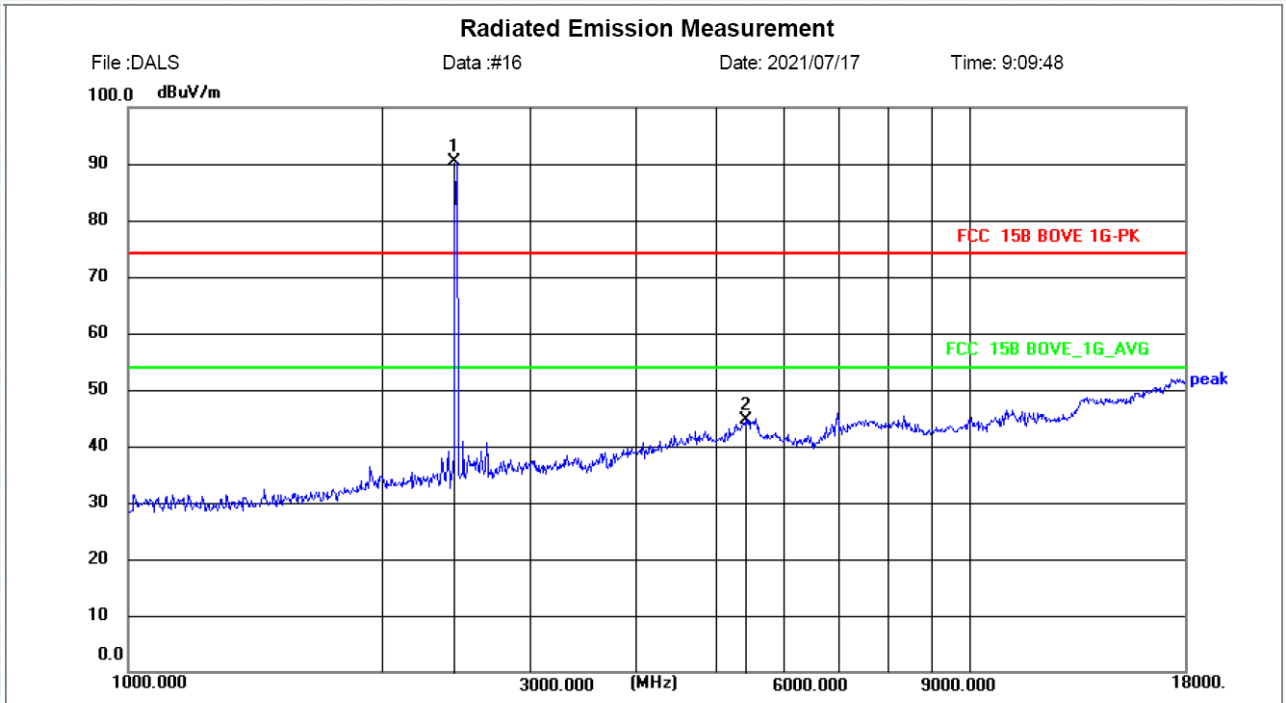
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2440MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	2439.333	84.84	4.10	88.94	/	/	peak	134	236	/	
2	8746.333	27.16	21.89	49.05	74.00	24.95	peak	175	212	P	

Horizontal:



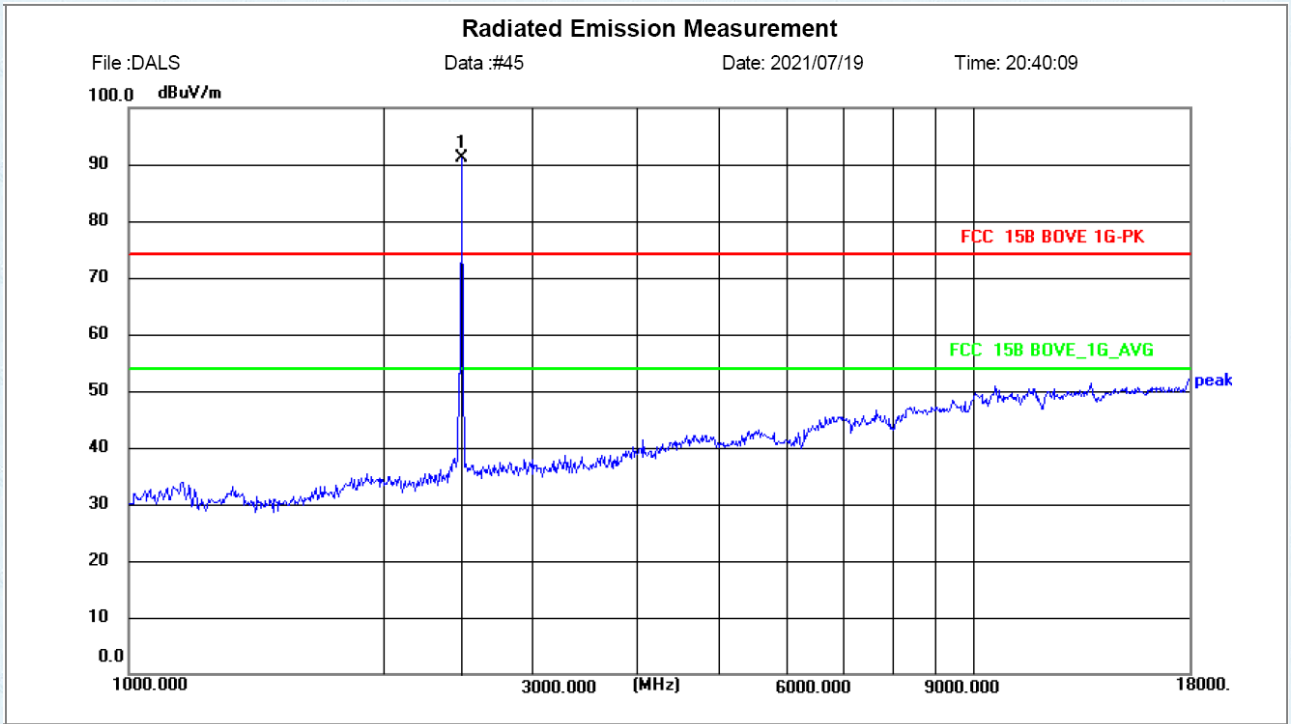
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2440MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Horizontal*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	2440.000	86.37	4.10	90.47	/	/	peak	176	259	/	
2	5420.000	32.86	11.72	44.58	74.00	29.42	peak	108	121	P	

Vertical:



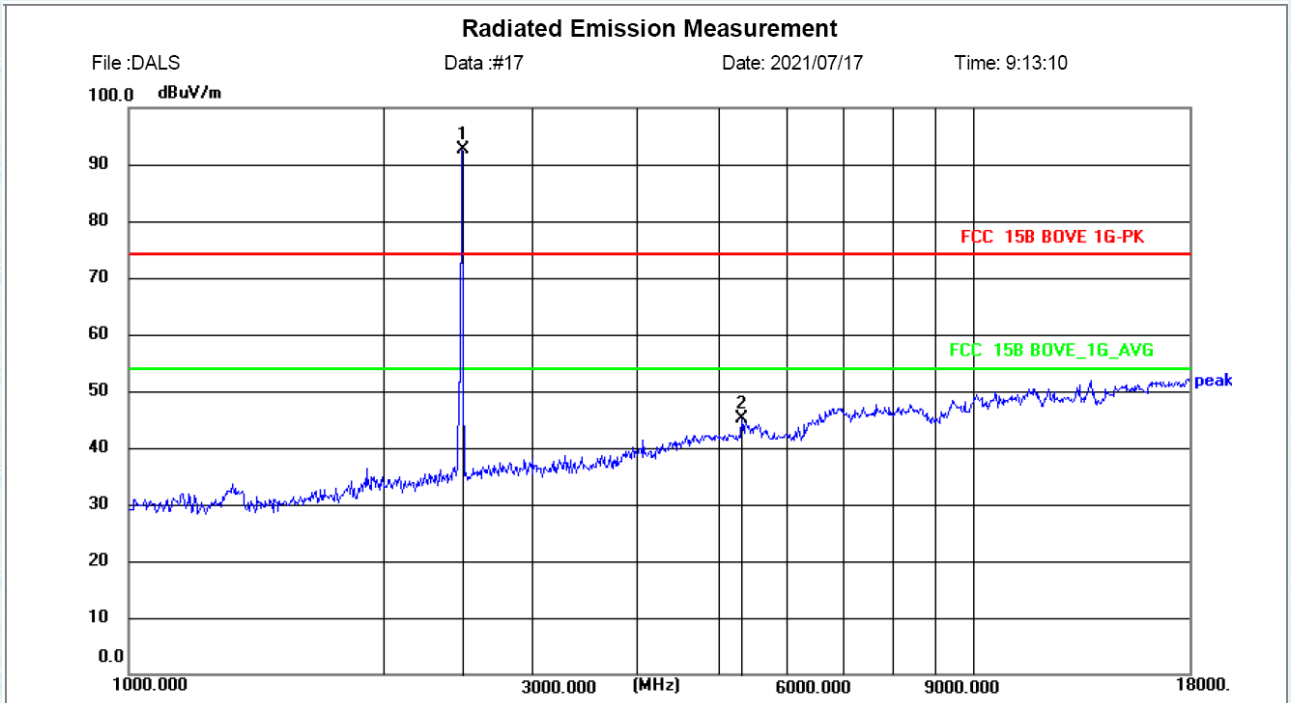
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2480MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	2479.000	86.97	4.26	91.23	/	/	peak	167	183	/	

Horizontal:



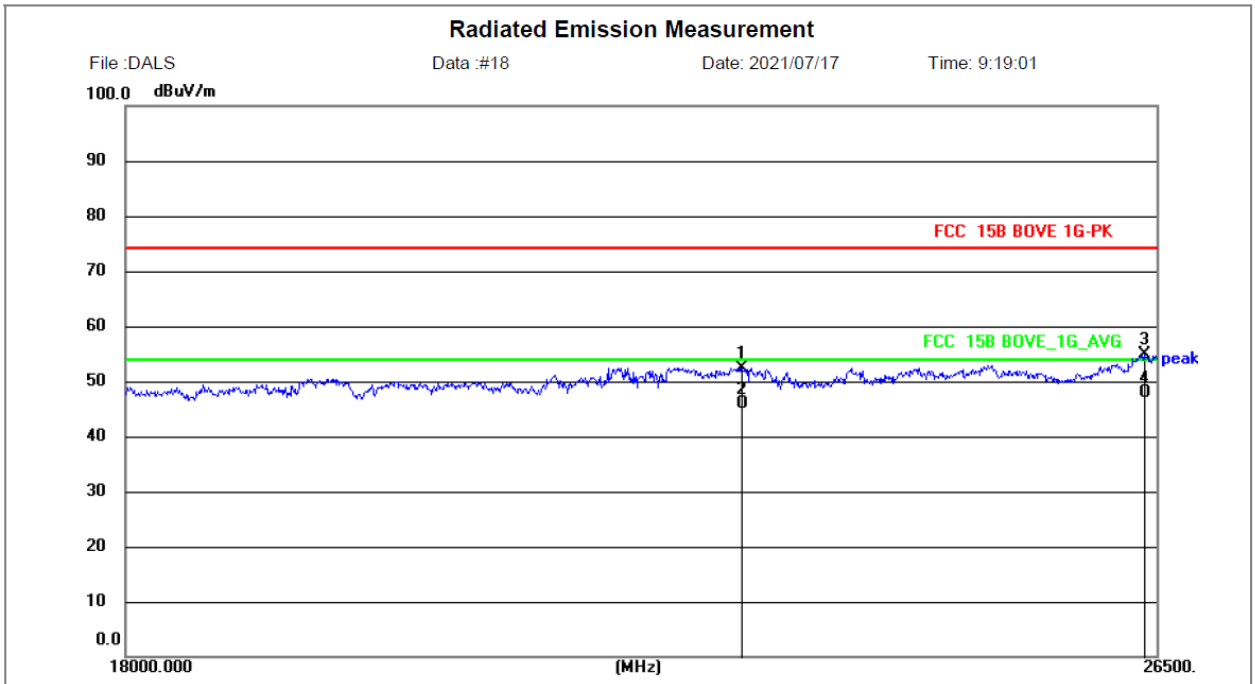
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2480MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Horizontal*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	2480.000	88.44	4.27	92.71	/	/	peak	153	14	/	
2	5318.000	33.65	11.43	45.08	74.00	28.92	peak	168	121	P	

Vertical:



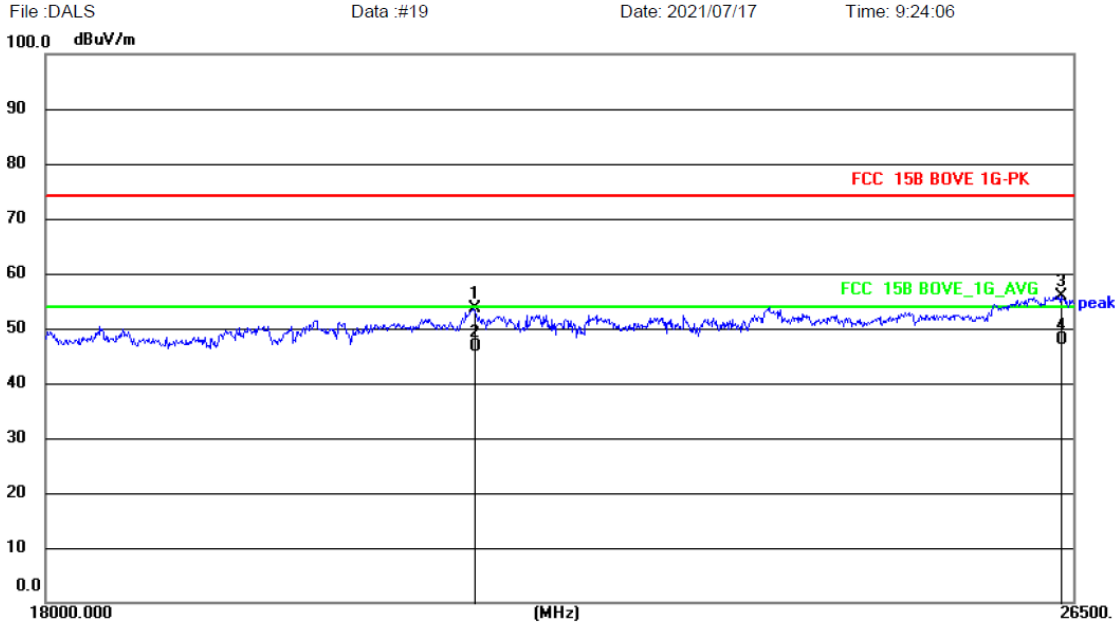
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2402MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	22692.000	61.95	-9.48	52.47	74.00	21.53	peak	102	36	P	
2	22692.000	55.28	-9.48	45.80	54.00	8.20	AVG	113	142	P	
3	26383.833	67.40	-12.48	54.92	74.00	19.08	peak	124	214	P	
4 *	26383.833	60.31	-12.48	47.83	54.00	6.17	AVG	108	57	P	

Horizontal:



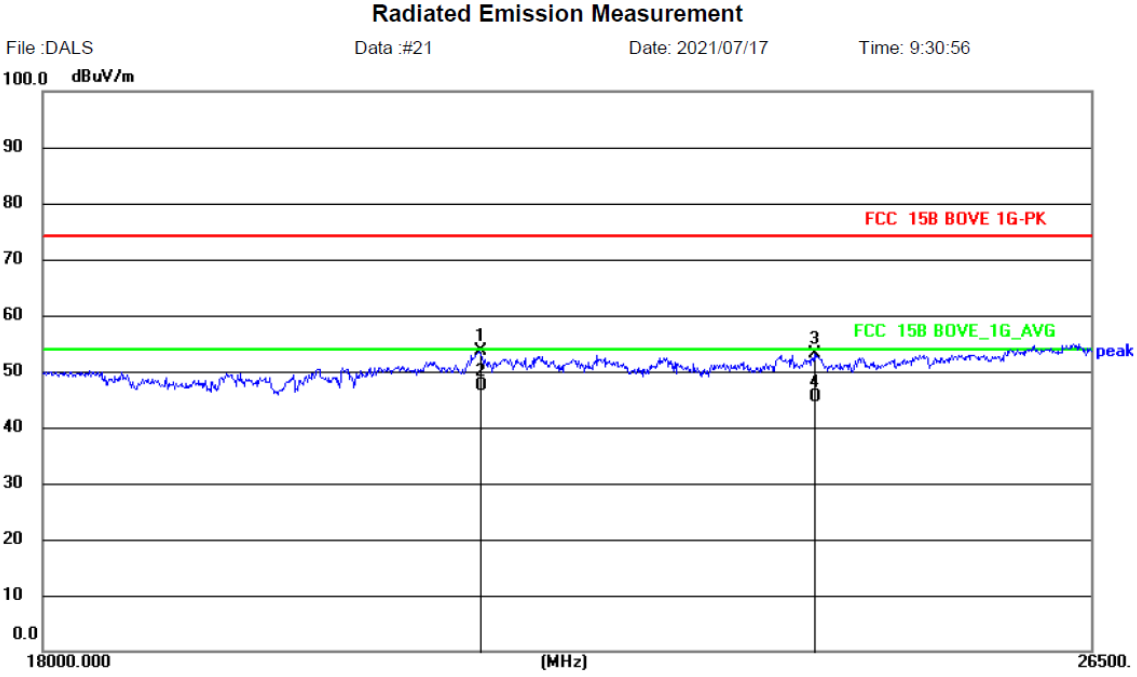
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2402MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Horizontal*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	21150.667	64.13	-10.51	53.62	74.00	20.38	peak	125	189	P	
2	21150.667	57.05	-10.51	46.54	54.00	7.46	AVG	114	175	P	
3	26383.833	68.40	-12.48	55.92	74.00	18.08	peak	105	37	P	
4 *	26383.833	60.39	-12.48	47.91	54.00	6.09	AVG	112	49	P	

Vertical:



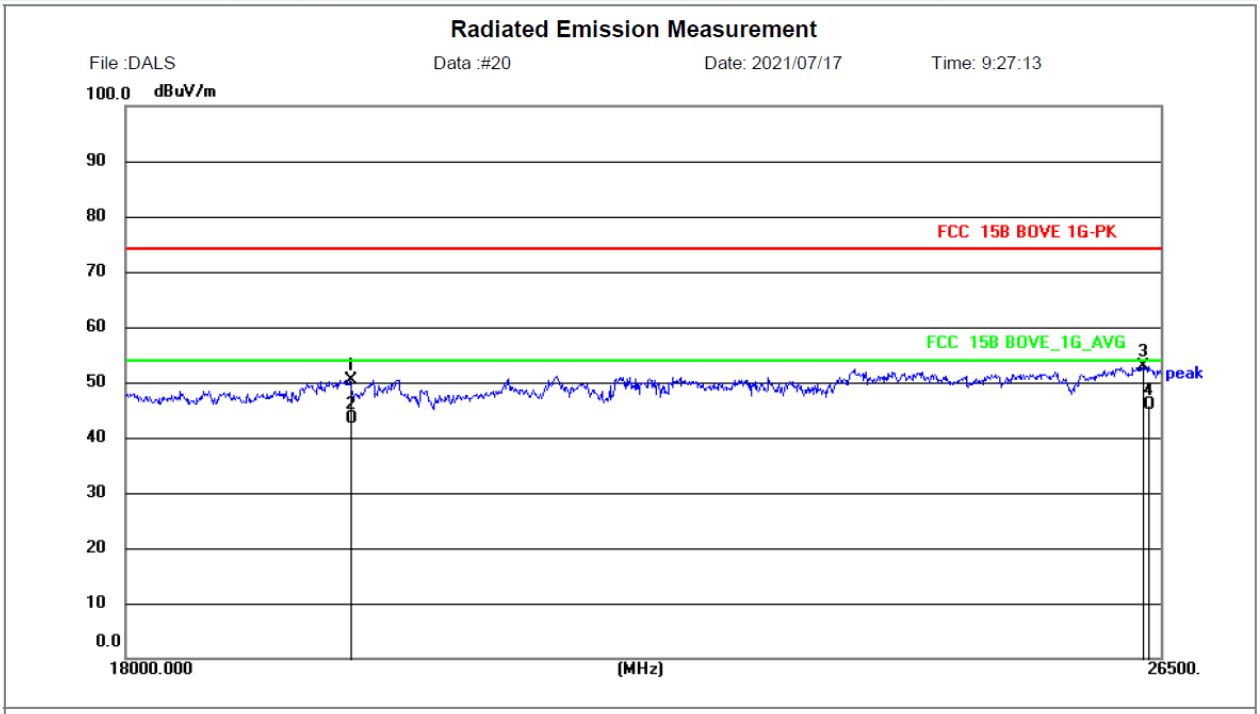
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2440MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	21150.667	64.13	-10.51	53.62	74.00	20.38	peak	148	49	P	
2 *	21150.667	57.85	-10.51	47.34	54.00	6.66	AVG	127	133	P	
3	23935.833	65.16	-11.94	53.22	74.00	20.78	peak	142	315	P	
4	23935.833	57.36	-11.94	45.42	54.00	8.58	AVG	136	302	P	

Horizontal:



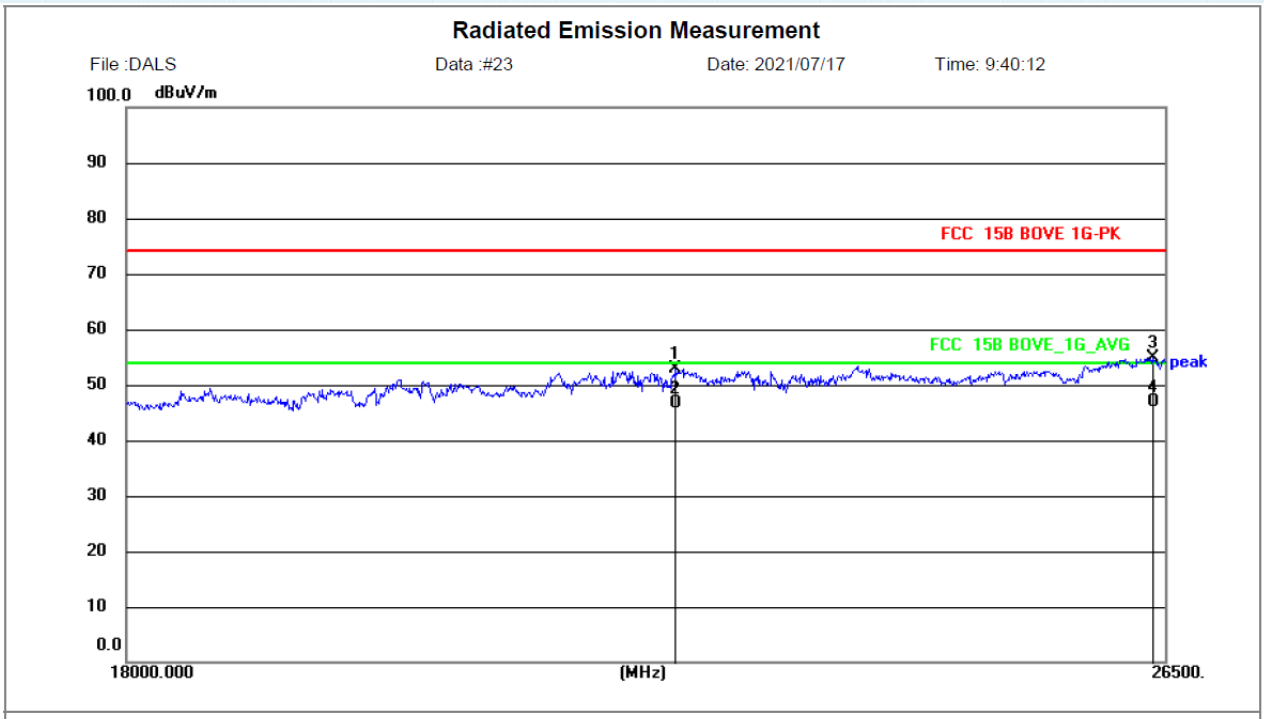
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2440MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Horizontal*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	19578.167	61.26	-10.81	50.45	74.00	23.55	peak	143	126	P	
2	19578.167	54.16	-10.81	43.35	54.00	10.65	AVG	132	147	P	
3	26332.833	65.32	-12.47	52.85	74.00	21.15	peak	113	12	P	
4 *	26383.833	58.48	-12.48	46.00	54.00	8.00	AVG	109	56	P	

Vertical:



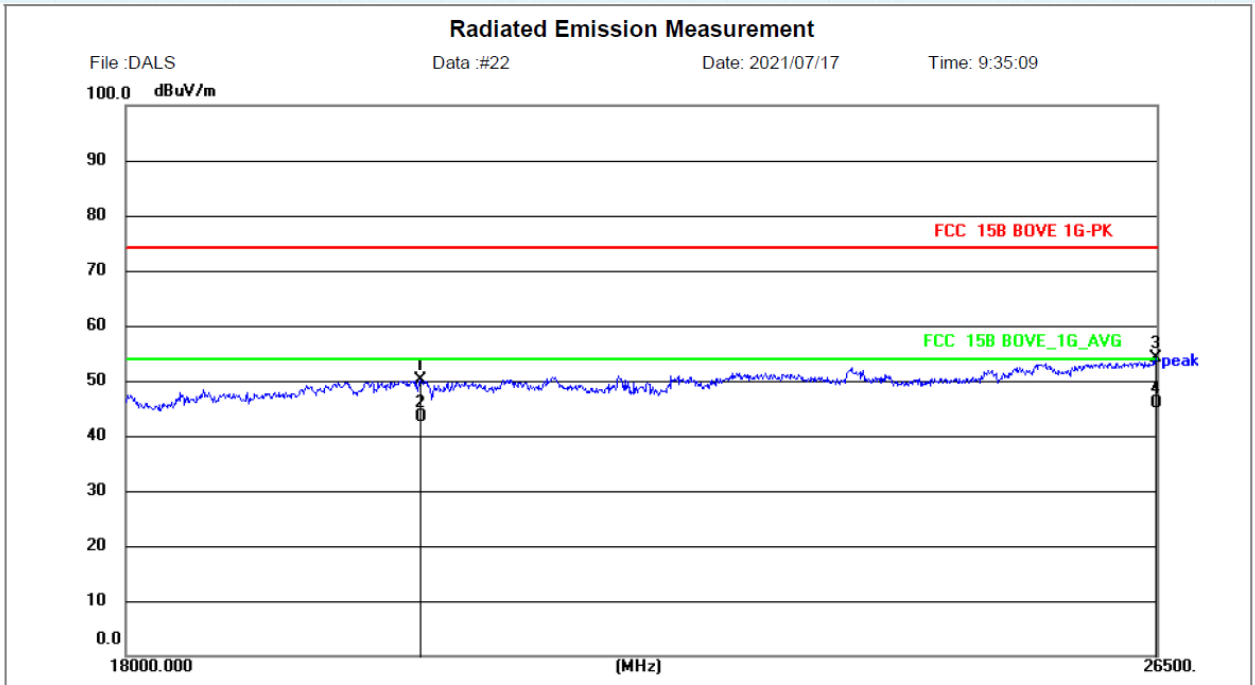
Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2480MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Vertical*
Power: AC120V/60Hz
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	22091.333	62.66	-9.68	52.98	74.00	21.02	peak	104	243	P	
2	22091.333	56.32	-9.68	46.64	54.00	7.36	AVG	112	236	P	
3	26383.833	67.40	-12.48	54.92	74.00	19.08	peak	134	32	P	
4 *	26383.833	59.26	-12.48	46.78	54.00	7.22	AVG	120	78	P	

Horizontal:



Site 966 Chamber
Limit: FCC 15B BOVE 1G-PK
EUT: Smart Plug
M/N: SM-PLUG
Mode: BT 2480MHz
Note: DALS Lighting Inc. Operater:Kahn

Polarization: *Horizontal*
Power: AC120V/60Hz
Distance: 3m

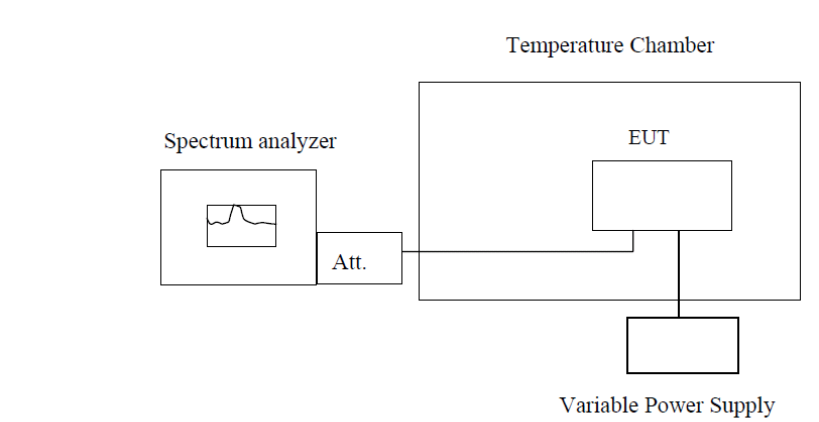
Temperature: 26(C)
Humidity: 54 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	20110.833	60.74	-10.70	50.04	74.00	23.96	peak	161	32	P	
2	20110.833	54.12	-10.70	43.42	54.00	10.58	AVG	154	49	P	
3	26491.500	66.69	-12.50	54.19	74.00	19.81	peak	128	154	P	
4 *	26491.500	58.35	-12.50	45.85	54.00	8.15	AVG	119	107	P	

Remarks:

4. *Level =Reading + Factor*
5. *Factor= Antenna Gain + Cable Loss – Amplifier Gain*
6. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

7.8 Frequency Stability

Test Requirement:	RSS-Gen Section 6.11& Section 8.11
Test Method:	ANSI C63.10: 2013 & RSS-Gen
Limit:	Manufactures of devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified
Test Procedure:	The EUT was setup to ANSI C63.10, 2013; tested to 2.1055 for compliance to RSS-Gen requirements.
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remark: Set the EUT transmits at un-modulation mode to test frequency stability.

Measurement data:

Frequency stability versus Temp.						
Power Supply: AC 120V						
Temp. (°C)	Operating Frequency (MHz)	0 minute Measured Frequency (MHz)	2 minute Measured Frequency (MHz)	5 minute Measured Frequency (MHz)	10 minute Measured Frequency (MHz)	Pass /Fail
-30	2402	2402.001	2402.001	2402.002	2402.002	Pass
	2440	2440.002	2440.001	2440.000	2440.002	Pass
	2480	2479.999	2479.998	2479.999	2480.000	Pass
-20	2402	2402.000	2402.001	2402.001	2402.001	Pass
	2440	2440.001	2440.000	2440.000	2440.001	Pass
	2480	2478.000	2479.999	2479.998	2480.000	Pass
-10	2402	2402.001	2402.001	2402.002	2402.002	Pass
	2440	2440.002	2440.001	2440.000	2440.000	Pass
	2480	2479.999	2479.998	2479.999	2480.000	Pass
0	2402	2402.001	2402.001	2402.002	2402.002	Pass
	2440	2440.002	2440.002	2440.000	2440.001	Pass
	2480	2479.999	2479.998	2479.999	2479.999	Pass
10	2402	2402.001	2402.001	2402.000	2402.002	Pass
	2440	2440.002	2440.001	2440.000	2440.002	Pass
	2480	2479.999	2479.998	2479.999	2480.000	Pass
20	2402	2402.001	2402.001	2402.002	2402.000	Pass
	2440	2440.002	2440.002	2440.000	2440.002	Pass
	2480	2479.998	2479.999	2478.00	2479.999	Pass
30	2402	2402.001	2402.001	2402.002	2402.002	Pass
	2440	2440.002	2440.000	2440.000	2440.002	Pass
	2480	2480.000	2479.998	2479.999	2480.000	Pass
40	2402	2402.001	2402.001	2402.002	2402.002	Pass
	2440	2440.002	2440.001	2440.000	2440.002	Pass
	2480	2479.999	2480.000	2479.999	2480.000	Pass
50	2402	2402.001	2402.001	2402.002	2402.002	Pass
	2440	2440.002	2440.001	2440.000	2440.002	Pass
	2480	2479.999	2479.998	2479.999	2479.999	Pass
Frequency stability versus Voltage						
Temperature: 25°C						
Power Supply (VAC)	Operating Frequency (MHz)	0 minute Measured Frequency (MHz)	2 minute Measured Frequency (MHz)	5 minute Measured Frequency (MHz)	10 minute Measured Frequency (MHz)	Pass /Fail
120	2402	2402.001	2402.001	2402.002	2402.002	Pass
	2440	2440.002	2440.002	2440.000	2440.001	Pass
	2480	2479.999	2479.998	2479.999	2479.999	Pass

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

------End------