Test Report of FCC CFR 47 Part 15 Subpart C

On Behalf of

Collective Minds Gaming Co., Ltd.

FCC ID:	**2AEVWCM00080**
Product Description:	**PS4 Chat Boost**
Model No.:	**CM00080**
Brand Name:	**Collective Minds**
Prepared for:	**Collective Minds Gaming Co., Ltd.** 8515 PLACE DEVONSHIRE,SUITE 205 MOUNT ROYAL QC H4P 2K1 CA
Prepared by:	**Shenzhen Bontek Compliance Testing Laboratory Co., Ltd** 1st-3rd Floor,Building C,Shuanghuan Xin Yi Dai Hi-Tech Industrial Park,No.8 Baoqing Road,Baolong Industrial Zone,Longgang District, Shenzhen, Guangdong, China Tel: 86-755-86337020 Fax: 86-755-86337028
Report No.:	BCT15ER023E
Issue Date:	May 28, 2015
Test Date:	May 21-28, 2015

Tested by: Jiankuai.Li **Reviewed by:** Owen Yang

Approved by: Tony Wu

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	**Collective Minds Gaming Co., Ltd.**
Address of Applicant:	8515 PLACE DEVONSHIRE,SUITE 205 MOUNT ROYAL QC H4P 2K1 CA
Manufacturer:	**Collective Minds Gaming Co., Ltd.**
Address of Manufacturer:	8515 PLACE DEVONSHIRE,SUITE 205 MOUNT ROYAL QC H4P 2K1 CA

General Description of E.U.T

Items	Description
EUT Description:	PS4 Chat Boost
Model No.:	CM00080
Supplementary Model:	N/A
Trade Name:	Collective Minds
Frequency Band:	2402 MHz ~ 2480 MHz
Channel Spacing:	1 MHz
Number of Channels:	79
Modulation Technique:	FHSS
Type of Modulation:	GFSK
Antenna Type:	PCB Antenna
Antenna Gain:	0dBi
Power Supply:	Input: DC 5V ; DC3.7V form Battery.

Remark: * *The test data gathered are from the production sample provided by the manufacturer.*

1.2 Test Standards

The tests were performed based on the Electromagnetic Interference (EMI) tests performed on the EUT. Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 - 2003 Radiated testing was performed at an antenna to EUT distance 3 meters.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.207, 15.209 and 15.247 rules. Test was carried out according to the above mentioned FCC rules and the FCC publication notice DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

1.3 Test Facility

All measurement required was performed at laboratory of Shenzhen CTL Testing Technology Co., Ltd.

at Floor1-A,Baisha Technology Park, No.3011 Shahexi Road, Nanshan District, Shenzhen, China

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

CNAS - Registration No.: L3923

SHENZHEN BONTEK COMPLIANCE TESTING LABORATORY LTD. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. The acceptance letter from the CNAS is maintained in our files: Registration: L3923,March 21,2015.

FCC – Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. 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 our files. Registration 970318, December, 2013.

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9618B on Novmber 13, 2013.

The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 Support Equipment

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 or 10 meters from the leading edge of the turntable.

Support equipments or special accessories in test configuration：

AUX Description:	Manufacturer	Model No.	Certificate	CABLE
Adapter	MI	MI-05001BD	CE, FCC	N/A

2.3 General Test Procedures

Conducted Emissions:The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 7.1 of ANSI C63.4-2003 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

Radiated Emissions: The EUT is a placed on as turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

2.4 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

Uncertainty figures are valid to a confidence level of 95%.

2.5 List of Measuring Equipments Used

Test equipments list of Shenzhen Bontek Compliance Testing Laboratory Co., Ltd.

No.	Instrument no.	Equipment	Manufacturer	Model No.	S/N	Last Calculator	Due Calculator
1	BCT-EMC001	EMI Test Receiver	R&S	ESCI	100687	2015-4-16	2016-4-17
2	BCT-EMC002	EMI Test Receiver	R&S	ESPI	100097	2014-11-1	2015-10-31
3	BCT-EMC003	Amplifier	HP	8447D	1937A02492	2015-4-19	2016-4-18
4	BCT-EMC004	Single Power Conductor Module	R&S	NNBM 8124	242	2015-4-19	2016-4-18
5	BCT-EMC005	Single Power Conductor Module	R&S	NNBM 8124	243	2015-4-19	2016-4-18
6	BCT-EMC006	Power Clamp	SCHWARZBECK	MDS-21	3812	2014-11-5	2015-11-4
7	BCT-EMC007	Positioning Controller	C&C	CC-C-1F	MF7802113	N/A	N/A
8	BCT-EMC008	`Electrostatic Discharge Simulator	TESEQ	NSG437	125	2015-11-2	2016-11-1
9	BCT-EMC009	Fast Transient Burst Generator	SCHAFFNER	MODULA6150	34572	2015-4-16	2016-4-17
10	BCT-EMC010	Fast Transient Noise Simulator	Noiseken	FNS-105AX	10501	2014-6-26	2015-6-25
11	BCT-EMC011	Color TV Pattern Genenator	PHILIPS	PM5418	TM209947	N/A	N/A
12	BCT-EMC012	Power Frequency Magnetic Field Generator	EVERFINE	EMS61000-8K	608002	2015-4-16	2016-4-17
14	BCT-EMC014	Capacitive Coupling Clamp	TESEQ	CDN8014	25096	2015-4-16	2016-4-17
15	BCT-EMC015	High Field Biconical Antenna	ELECTRO-METRICS	EM-6913	166	2014-11-28	2015-11-27
16	BCT-EMC016	Log Periodic Antenna	ELECTRO-METRICS	EM-6950	811	2014-11-28	2015-11-27
17	BCT-EMC017	Remote Active Vertical Antenna	ELECTRO-METRICS	EM-6892	304	2014-11-28	2015-11-27
18	BCT-EMC018	TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB9163	9163-324	2014-5-19	2015-5-18
19	BCT-EMC019	Horn Antenna	SCHWARZBECK	BBHA9120A	0499	2014-11-28	2015-11-27
20	BCT-EMC020	Teo Line Single Phase Module	SCHWARZBECK	NSLK8128	8128247	2014-11-1	2015-10-31
21	BCT-EMC021	Triple-Loop Antenna	EVERFINE	LLA-2	711002	2014-11-15	2015-11-14
22	BCT-EMC022	Electric bridge	Jhai	JK2812C	803024	N/A	N/A
23	BCT-EMC026	RF POWER AMPLIFIER	FRANKONIA	FLL-75	1020A1109	2015-4-17	2016-4-16

24	BCT-EMC027	CDN	FRANKONIA	CDN M2+M3	A3027019	2015-4-17	2016-4-16
25	BCT-EMC029	6DB Attenuator	FRANKONIA	N/A	1001698	2015-4-17	2016-4-16
26	BCT-EMC030	EM Injection clamp	FCC	F-203I-23mm	091536	2015-4-16	2016-4-17
27	BCT-EMC031	9kHz-2.4GHz signal generator 2024	MARCONI	10S/6625-99-457-8730	112260/042	2015-4-16	2016-4-17
28	BCT-EMC032	10dB attenuator	ELECTRO-METRICS	EM-7600	836	2015-4-16	2016-4-17
29	BCT-EMC033	ISN	TESEQ	ISN-T800	30301	2014-11-15	2015-11-14
30	BCT-EMC034	10KV surge generator	SANKI	SKS-0510M	048110003E 321	2014-11-01	2015-10-31
31	BCT-EMC035	HRMONICS&FLICK RE ANALYSER	VOLTECH	PM6000	200006700433	2014-11-20	2015-11-19
32	BCT-EMC036	Spectrum Analyzer	R&S	FSP	100397	2014-11-1	2015-10-31
33	BCT-EMC037	Broadband preamplifier	SCH WARZBECK	BBV9718	9718-182	2015-4-19	2016-4-18

3. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.207	AC Power Line Conducted Emission	Pass
FCC §15.247(a)(1)	Hopping Channel Bandwidth	Pass
FCC §15.247(a)(1)	Hopping Channel Separation	Pass
FCC §15.247(a)(1)	Number of Hopping Frequency Used	Pass
FCC §15.247(a)(1)(iii)	Dwell Time of Each Frequency	Pass
FCC §15.247(b)(1)	Maximum Peak Output Power	Pass
FCC §15.247(d)	Band Edges Emission	Pass
FCC §15.247(d)	Spurious Radiated Emission	Pass
FCC §15.203/15.247(b)/(c)	Antenna Requirement	Pass

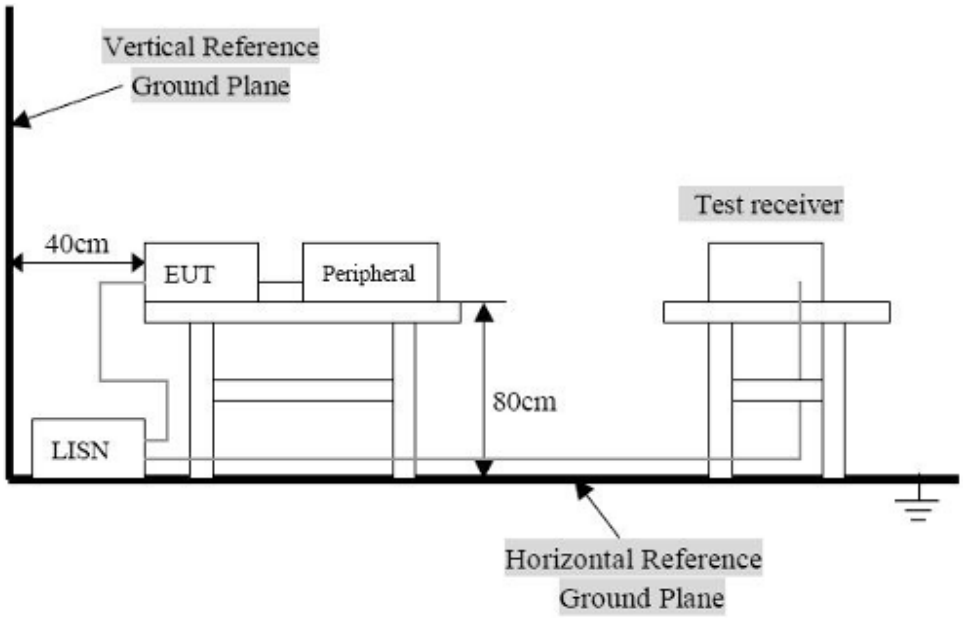
4. TEST OF AC POWER LINE CONDUCTED EMISSION

4.1 Applicable Standard

Refer to FCC §15.207.
For a Low-power Radio-frequency Device is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150～0.500	66～56	56～46
0.500～5.000	56	46
5.000～30.00	60	50

4.2 Test Setup Diagram



Remark: The EUT was connected to a 120 VAC/ 60Hz power source.

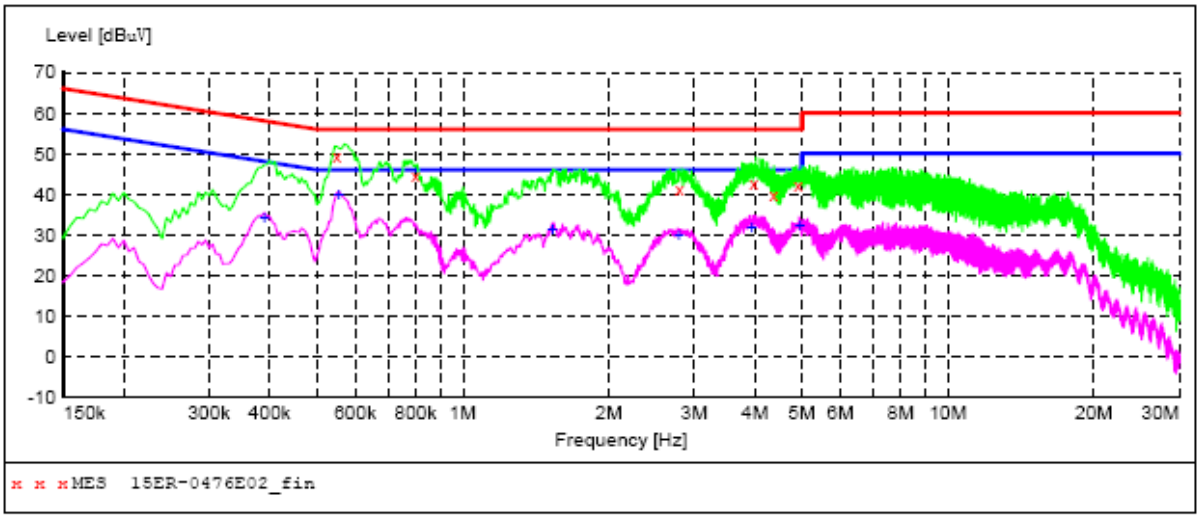
4.3 Test Result

Temperature (℃) : 23~25	EUT: PS4 Chat Boost
Humidity (%RH): 45~58	M/N: CM00080
Barometric Pressure (mbar): 950~1000	Operation Condition: Charging

Conducted Emission:

EUT: PS4 Chat Boost
Operating Condition: Charging
Test Site: Shielded Room
Operator: Andy
Test Specification: AC/DC adapter (AC 120V/60Hz)
Comment: Live Line

SCAN TABLE: "Voltage(150K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "15ER-0476E02_fin"

2015-5-26 11:22

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.550000	49.50	10.3	56	6.5	QP	L1	GND
0.800000	44.50	10.3	56	11.5	QP	L1	GND
2.795000	41.10	10.3	56	14.9	QP	L1	GND
3.980000	42.60	10.4	56	13.4	QP	L1	GND
4.375000	39.70	10.4	56	16.3	QP	L1	GND
4.915000	42.00	10.4	56	14.0	QP	L1	GND

MEASUREMENT RESULT: "15ER-0476E02_fin2"

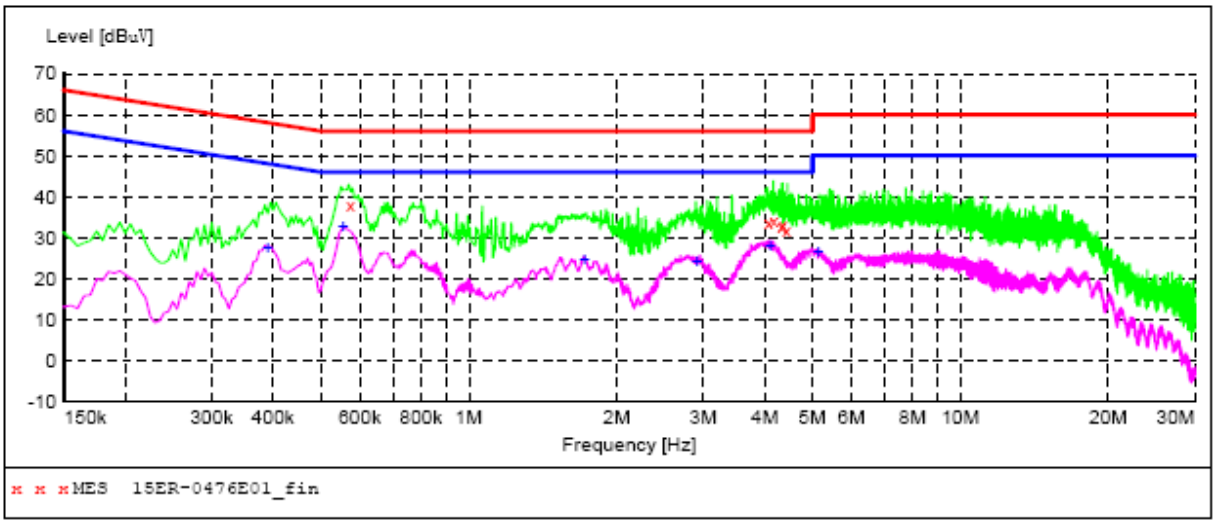
2015-5-26 11:22

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.390000	34.20	10.6	48	13.9	AV	L1	GND
0.555000	39.90	10.3	46	6.1	AV	L1	GND
1.530000	31.10	10.3	46	14.9	AV	L1	GND
2.790000	29.90	10.3	46	16.1	AV	L1	GND
3.945000	31.80	10.4	46	14.2	AV	L1	GND
4.955000	32.30	10.4	46	13.7	AV	L1	GND

Conducted Emission:

EUT: PS4 Chat Boost
Operating Condition: Charging
Test Site: Shielded Room
Operator: Andy
Test Specification: AC/DC adapter (AC 120V/60Hz)
Comment: Neutral Line

SCAN TABLE: "Voltage(150K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "15ER-0476E01_fin"

2015-5-26 11:17

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.575000	37.90	10.3	56	18.1	QP	N	GND
4.070000	33.90	10.4	56	22.1	QP	N	GND
4.175000	34.30	10.4	56	21.7	QP	N	GND
4.330000	32.60	10.4	56	23.4	QP	N	GND
4.355000	33.40	10.4	56	22.6	QP	N	GND
4.435000	31.80	10.4	56	24.2	QP	N	GND

MEASUREMENT RESULT: "15ER-0476E01_fin2"

2015-5-26 11:17

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.390000	27.70	10.6	48	20.4	AV	N	GND
0.555000	32.80	10.3	46	13.2	AV	N	GND
1.720000	24.60	10.3	46	21.4	AV	N	GND
2.915000	24.20	10.3	46	21.8	AV	N	GND
4.105000	28.00	10.4	46	18.0	AV	N	GND
5.145000	26.40	10.4	50	23.6	AV	N	GND

5. Test of Hopping Channel Bandwidth

5.1 Applicable Standard

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.2 EUT Setup

Spectrum Analyzer

5.3 Test Equipment List and Details

See **section 2.5**.

5.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Use the following spectrum analyzer settings:
   Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
   RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

3. The spectrum width with level higher than 20dB below the peak level.

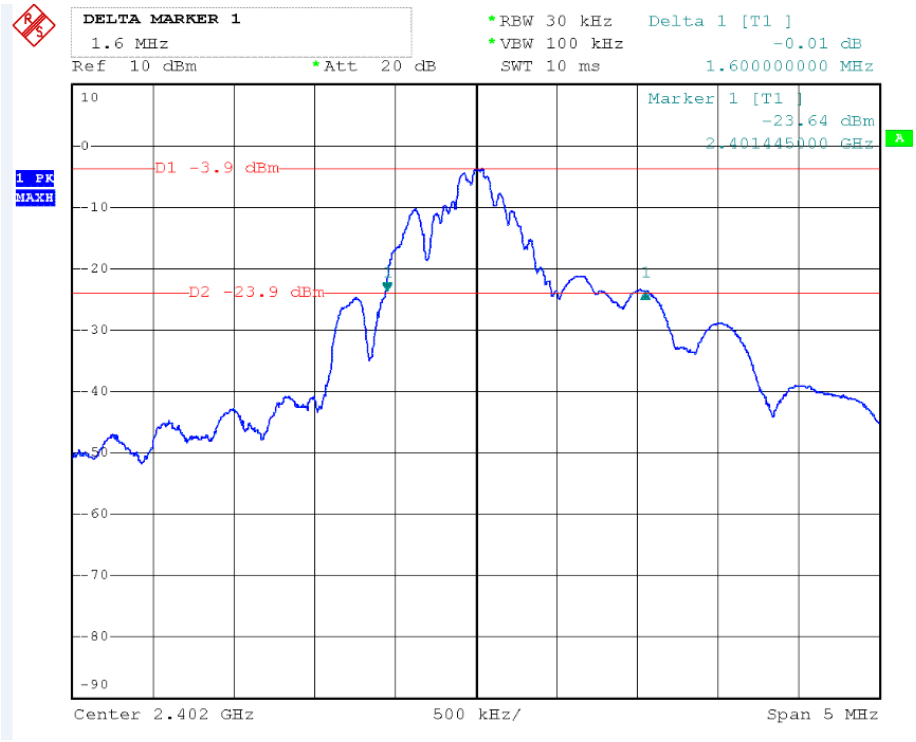
4. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.5 Test Result

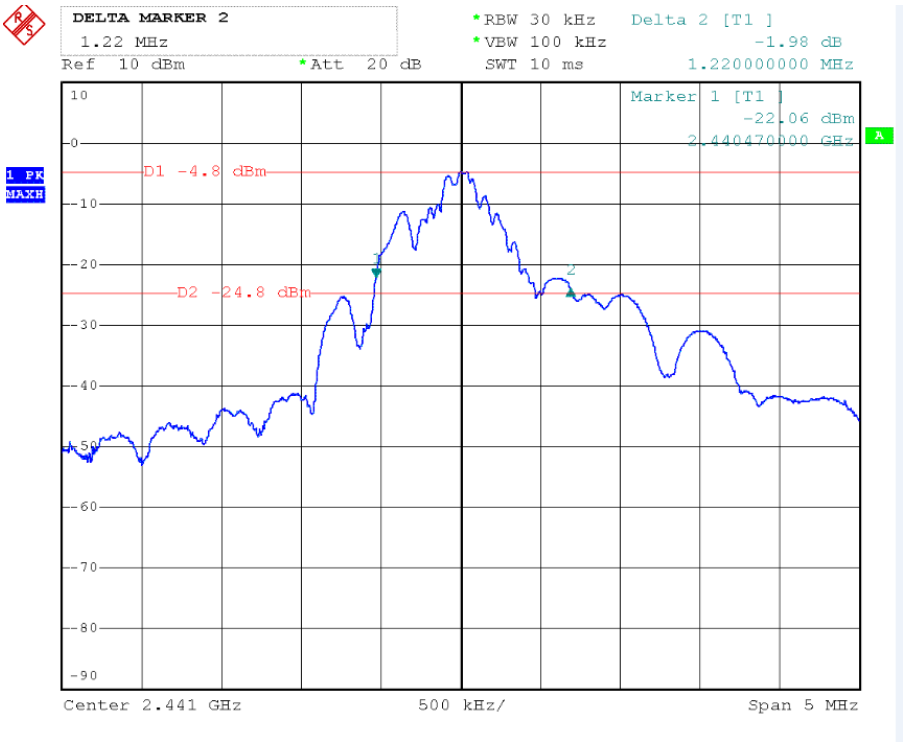
Temperature (℃) : 22~23	EUT: PS4 Chat Boost
Humidity (%RH): 50~54	M/N: CM00080
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

Modulation Type	Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Min. Limit (kHz)
GFSK	Low	2402.00	1600	>25
GFSK	Middle	2441.00	1220	>25
GFSK	High	2480.00	1120	>25

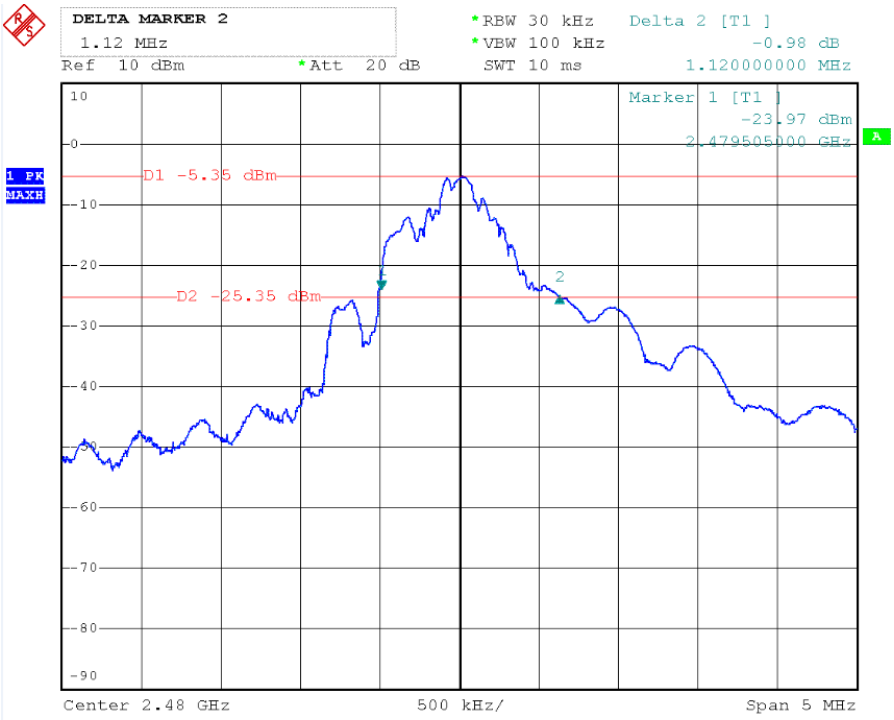
GFSK
Channel Low



Channel Middle



Channel High



6. Test of Hopping Channel Separation

6.1 Applicable Standard

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

6.2 EUT Setup

Spectrum Analyzer

6.3 Test Equipment List and Details

See section 2.5.

6.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels
   RBW ≥ 1% of the span, VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

3. The Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.

4. Repeat above 1~3 points for the middle and highest channel of the EUT.

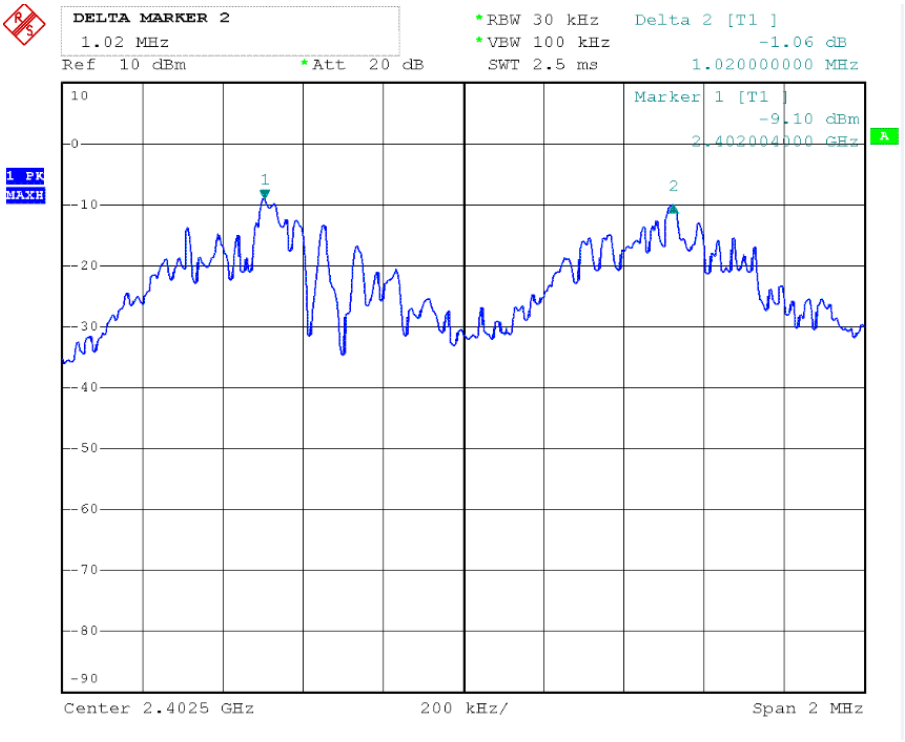
6.5 Test Result

Temperature (℃) : 22~23	EUT: PS4 Chat Boost
Humidity (%RH): 50~54	M/N: CM00080
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

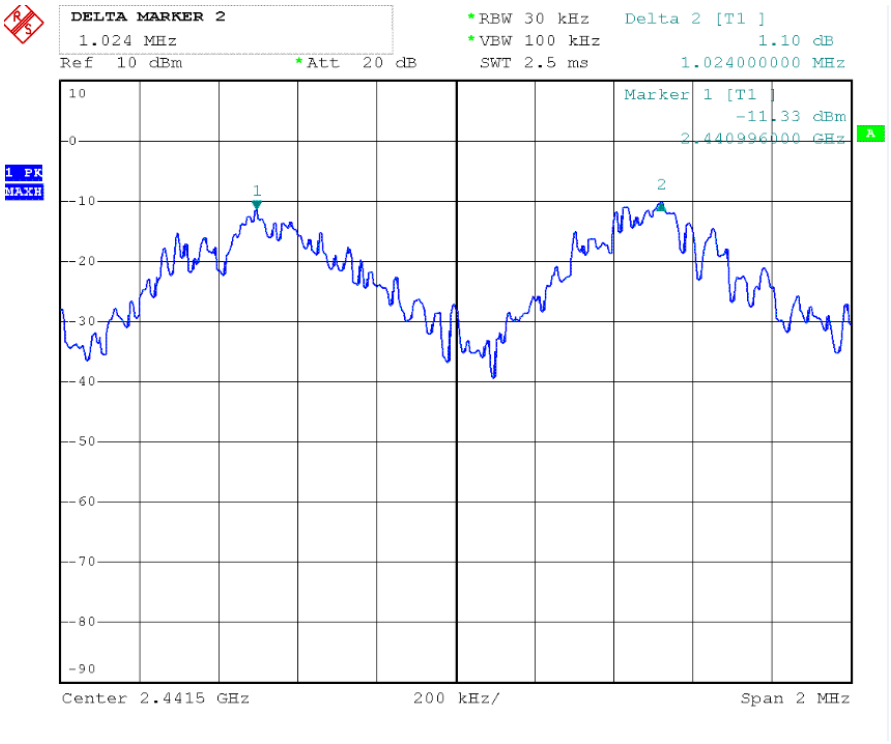
GFSK

Modulation Type	Frequency (MHz)	Channel Separation (MHz)	Min. Limit (kHz)
GFSK	2402~2403	1.020	>25
GFSK	2441~2442	1.024	>25
GFSK	2479~2480	1.004	>25

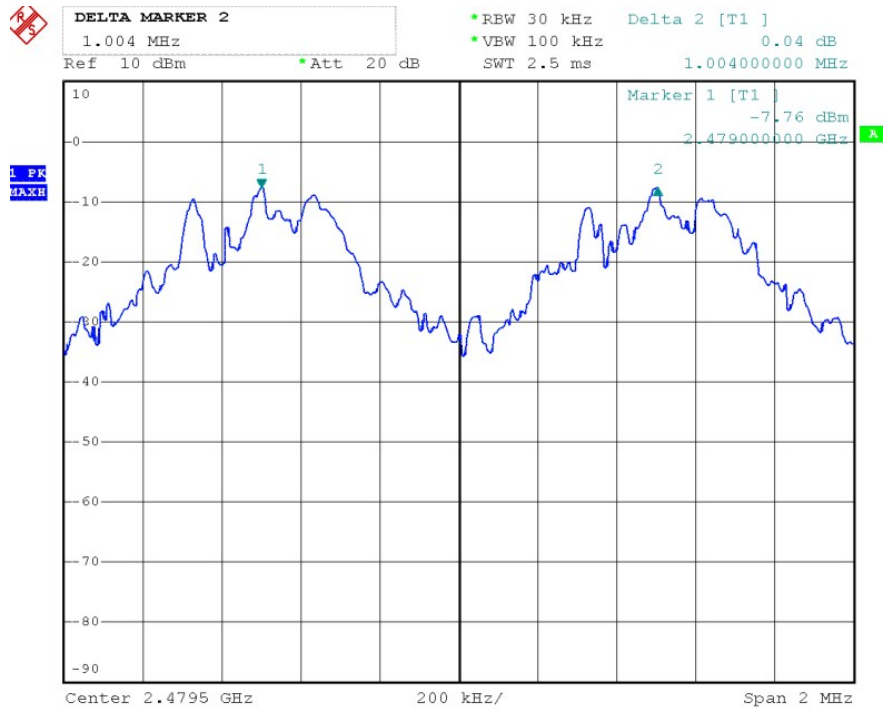
Channel Low



Channel Middle



Channel High



7. Test of Number of Hopping Frequency

7.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 15 non-overlapping hopping channels. Frequency hopping system which use fewer than 75 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping system may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

7.2 EUT Setup

Spectrum Analyzer

7.3 Test Equipment List and Details

See **section 2.5**.

7.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Use the following spectrum analyzer settings:
   Span = the frequency band of operation
   RBW ⩾ 1% of the span, VBW ⩾ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

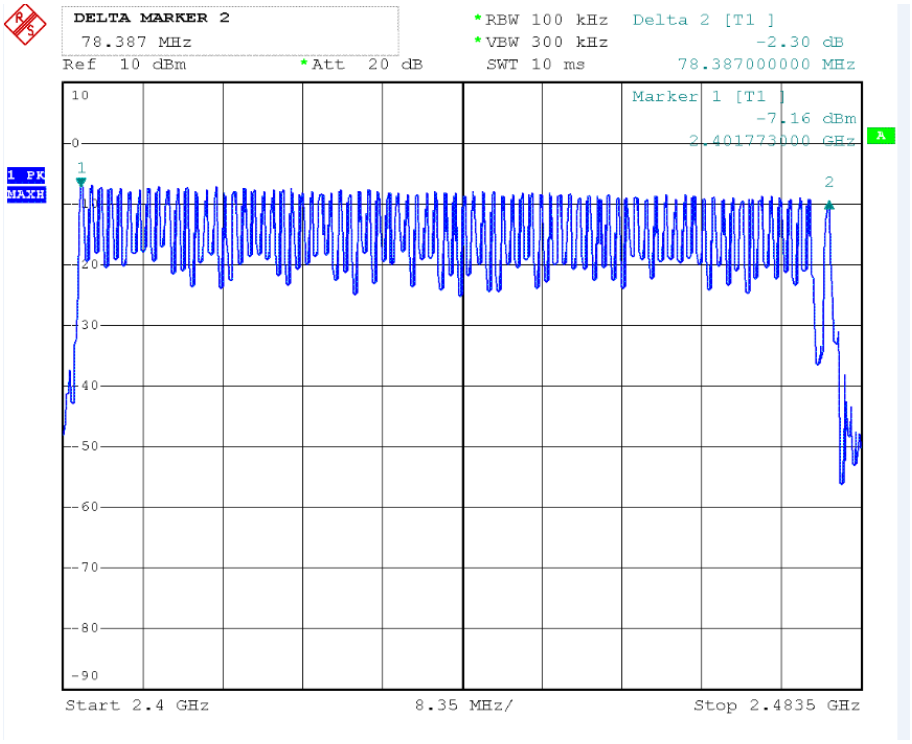
3. Observe frequency hopping in 2400MHz~2483.5MHz, there are at least 32 non-overlapping channels.

4. Repeat above 1~3 points for the middle and highest channel of the EUT.

7.5 Test Result

Temperature (℃) : 22~23	EUT: PS4 Chat Boost
Humidity (%RH): 50~54	M/N: CM00080
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

Modulation Type	Frequency (MHz)	Number of Hopping Channels	Min. Limit
GFSK	2402.0~2480.0	79	>15



8. Test of Dwell Time of Each Frequency

8.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4seconds multiplied by the number of hopping channels employed.

8.2 EUT Setup

Spectrum Analyzer

8.3 Test Equipment List and Details

See **section 2.5**.

8.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Use the following spectrum analyzer settings:
   Span = zero span, centered on a hopping channel
   RBW = 1 MHz, VBW ≥ RBW
   Sweep = as necessary to capture the entire dwell time per hopping channel
   Detector function = peak
   Trace = max hold

3. Set the center frequency on any frequency would be measure and set the frequency span to zero span.

4. Measure the maximum time duration of one single pulse.

8.5 Test Result

Temperature (℃) : 22~23	EUT: PS4 Chat Boost
Humidity (%RH): 50~54	M/N: CM00080
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

DH1

Dwell time= t*(1.6/2/79)*31.6

DH3

Dwell time= t*(1.6/4/79)*31.6

DH5

Dwell time= t*(1.6/6/79)*31.6

DH1

Modulation Type	Channel(MHz)	Reading （ms）	Dwell Time (ms)	Limit (ms)
GFSK	2402	0.300	96.00	400
GFSK	2441	0.298	92.80	400
GFSK	2480	0.298	92.80	400

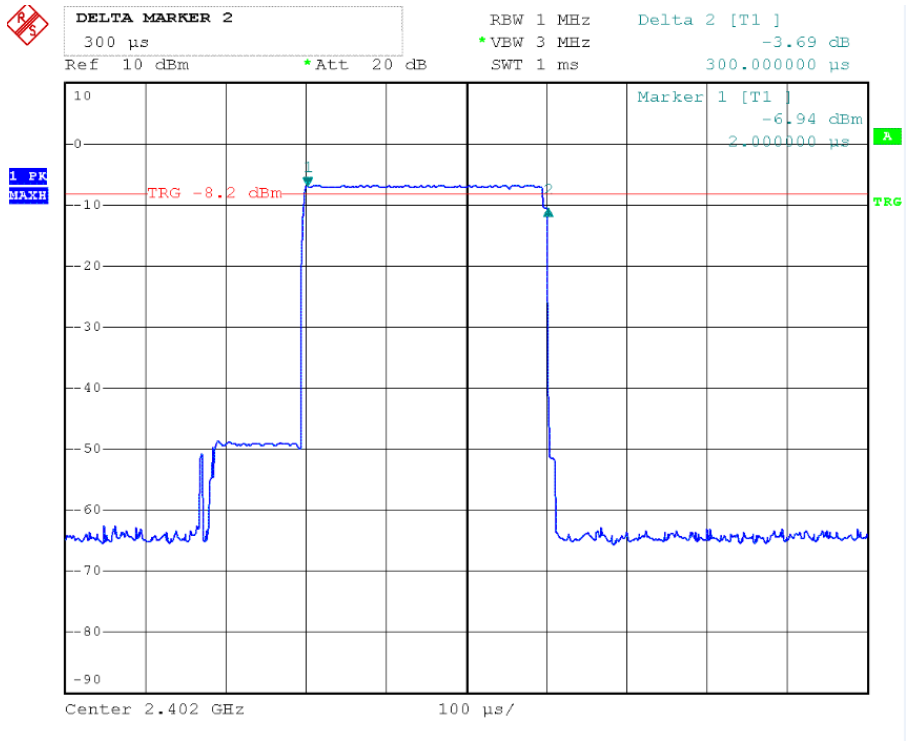
DH3

Modulation Type	Channel(MHz)	Reading （ms）	Dwell Time (ms)	Limit (ms)
GFSK	2402	1.55	247.22	400
GFSK	2441	1.55	247.22	400
GFSK	2480	1.55	247.22	400

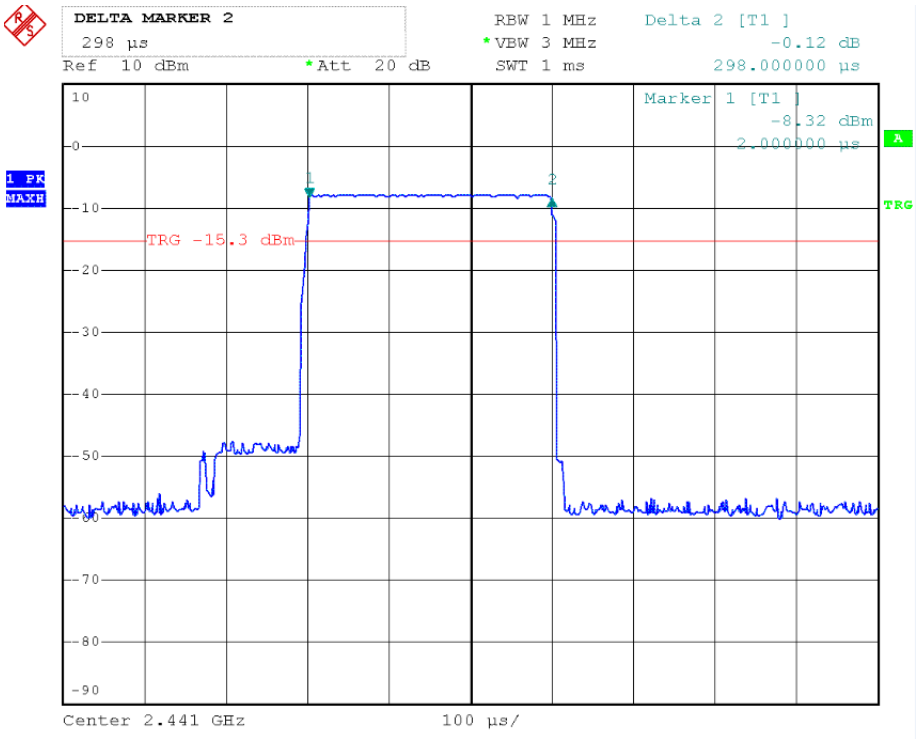
DH5

Modulation Type	Channel(MHz)	Reading （ms）	Dwell Time (ms)	Limit (ms)
GFSK	2402	2.782	296.75	400
GFSK	2441	2.782	296.75	400
GFSK	2480	2.782	296.75	400

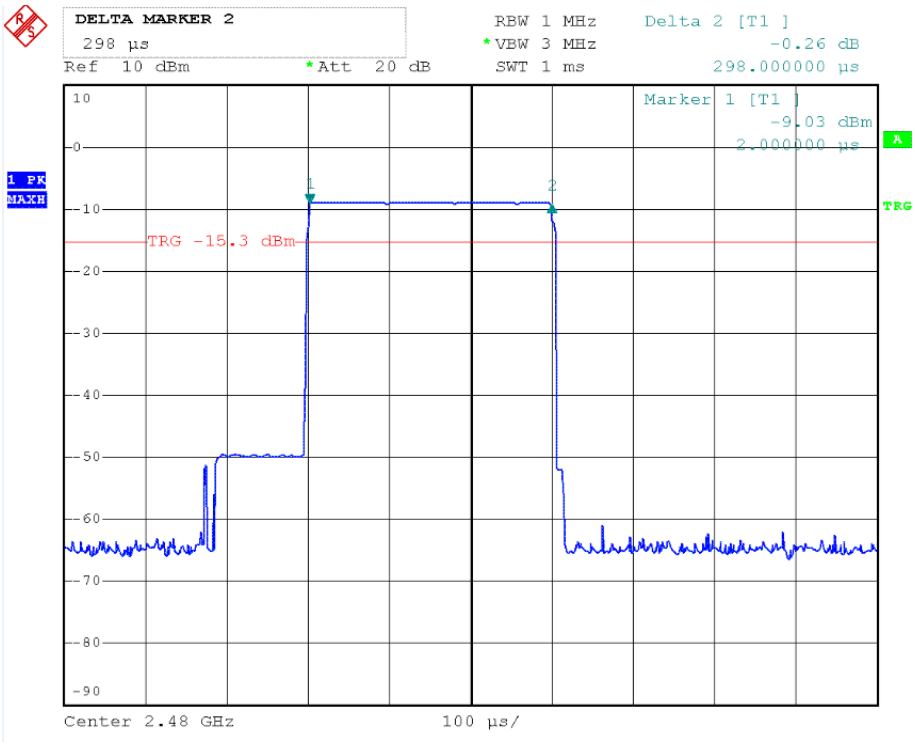
DH1
Channel Low



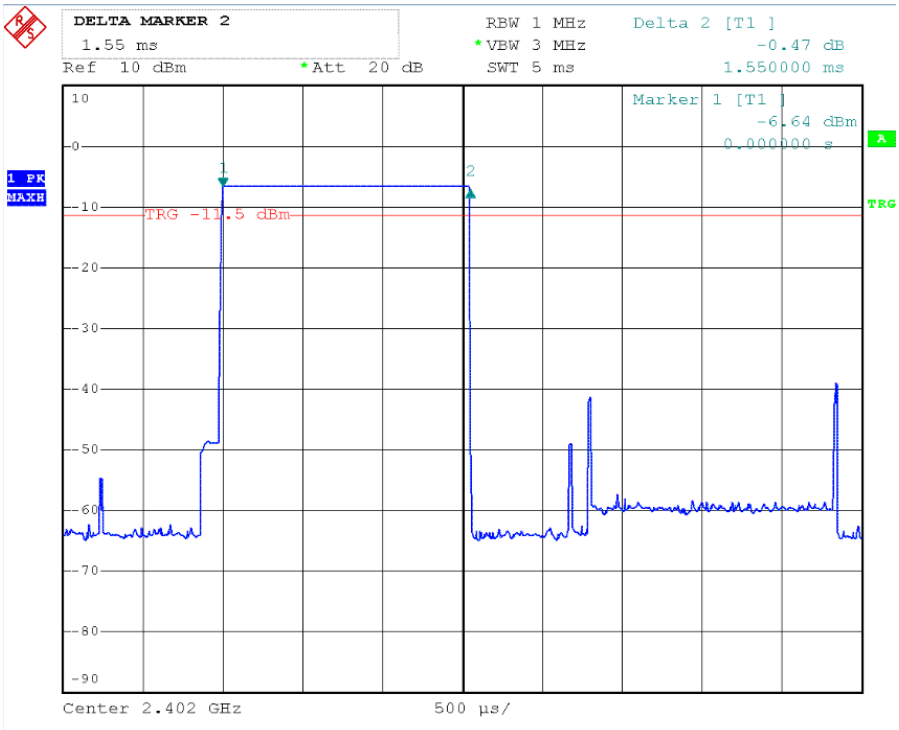
DH1 Channel Middle



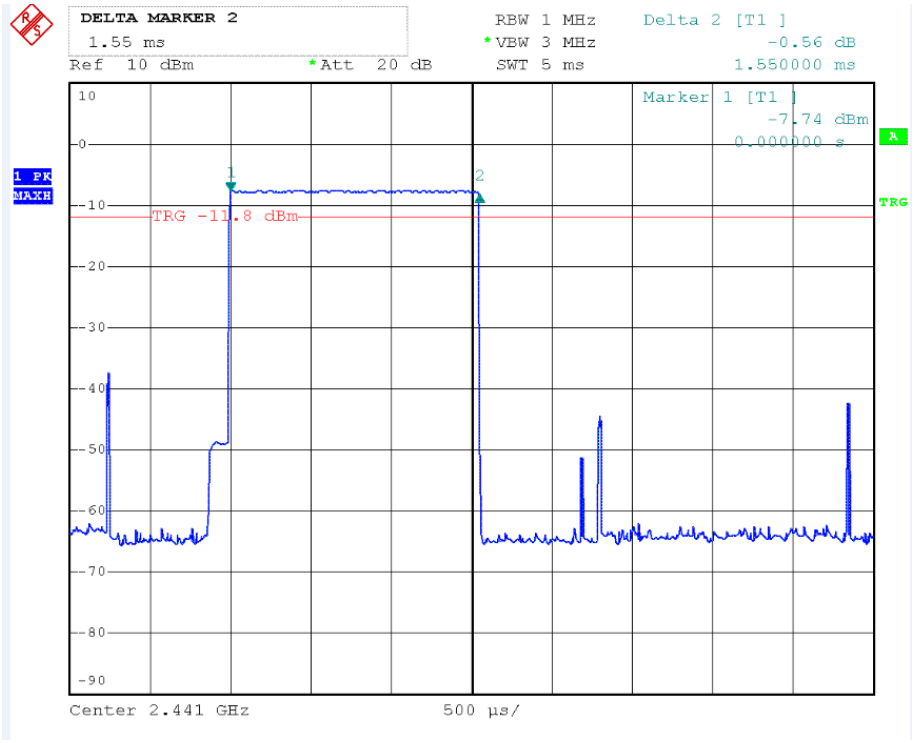
DH1 Channel High



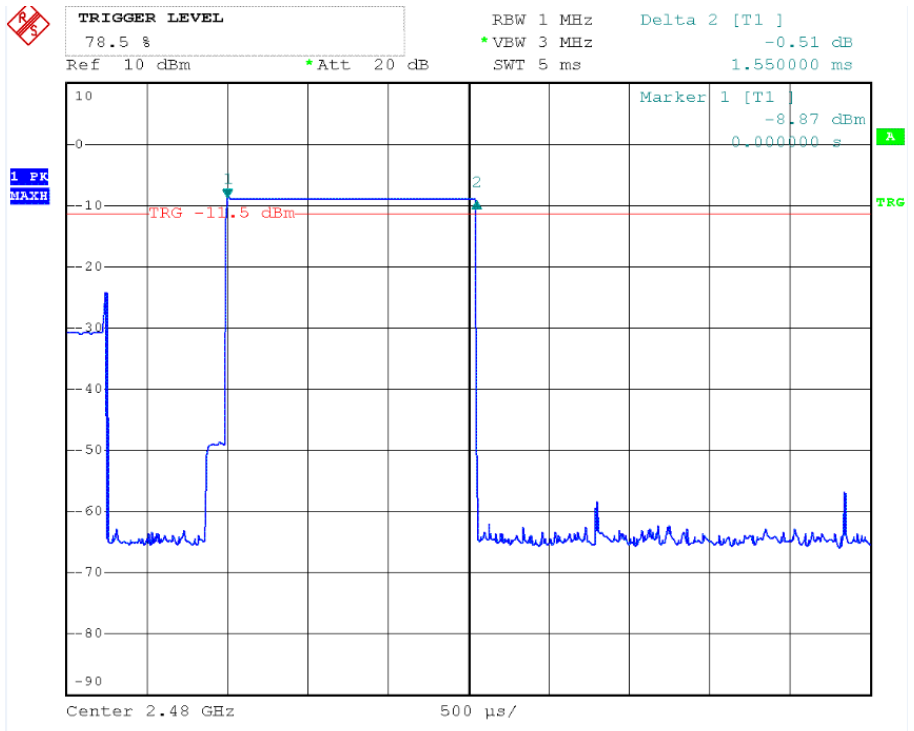
DH3 Channel Low



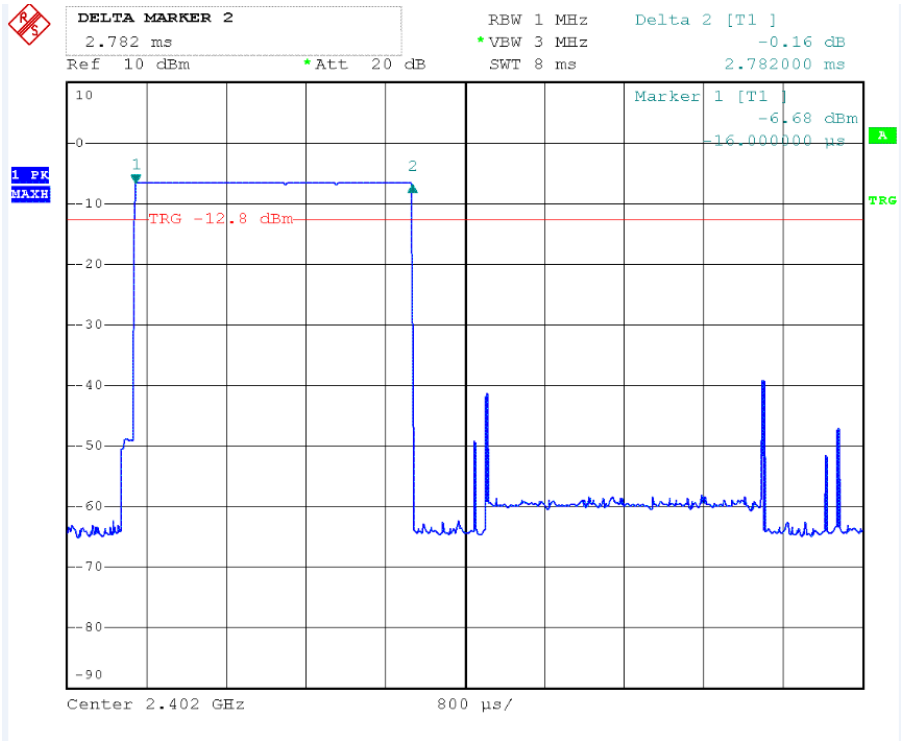
DH3 Channel Mid



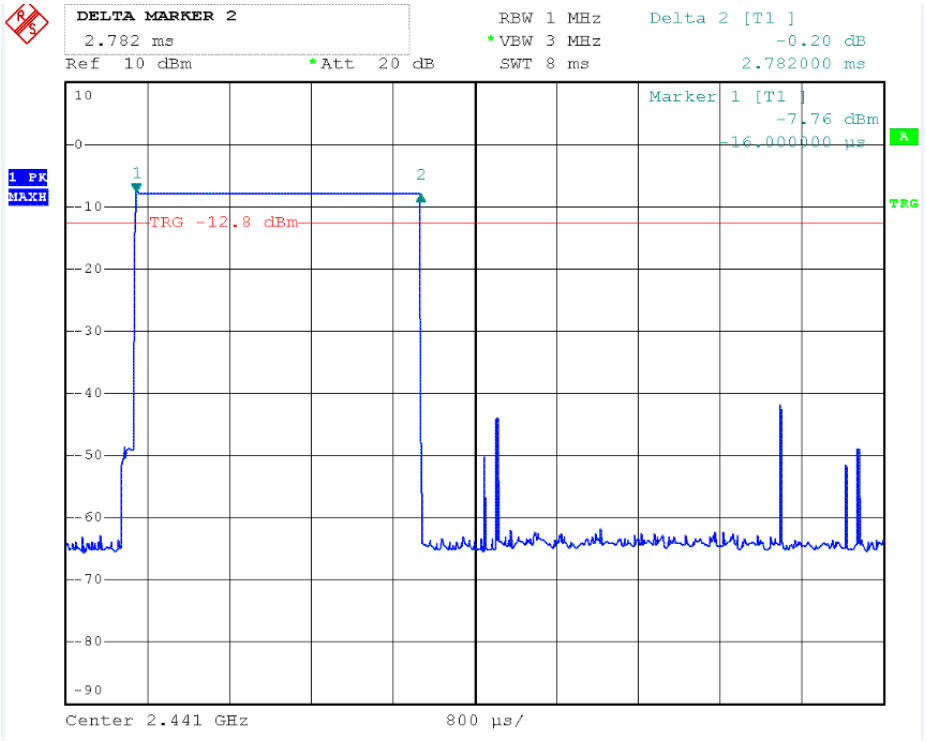
DH3 Channel High



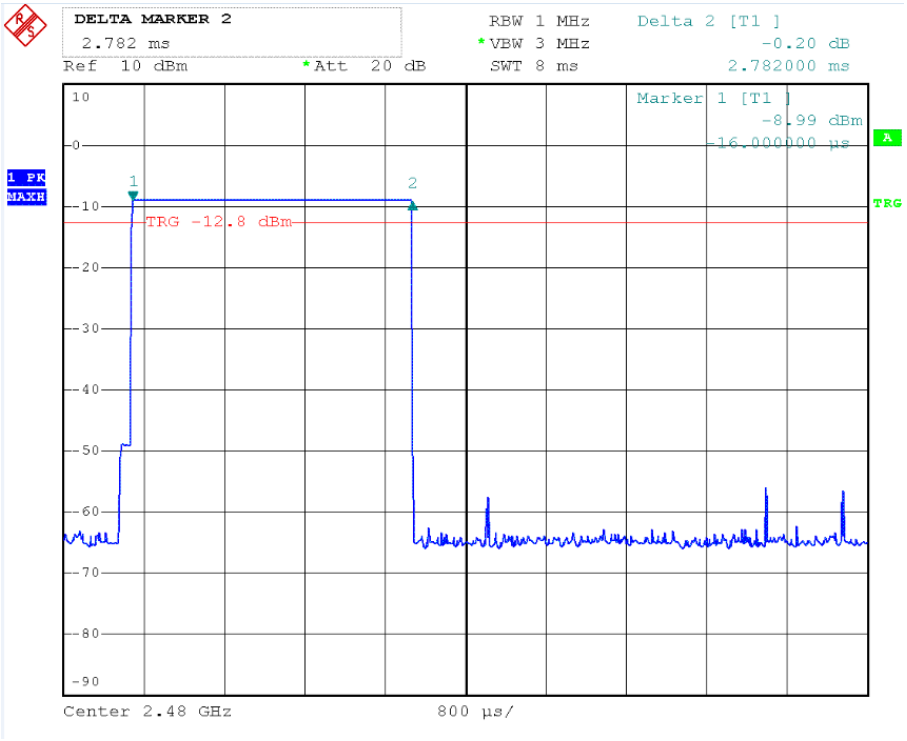
DH5 Channel Low



DH5 Channel Mid



DH5 Channel High



9. Test of Maximum Peak Output Power

9.1 Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels and The maximum peak output power shall not exceed 1 watt. For all other frequency hopping systems in this frequency band, The maximum peak output power shall not exceed 0.125 watt.

9.2 EUT Setup

Spectrum Analyzer

9.3 Test Equipment List and Details

See section 2.5.

9.4 Test Procedure

1. The transmitter output was connected to the peak power meter and recorded the peak value.

2. Peak power meter parameter set to auto attenuator and filter is the same as.

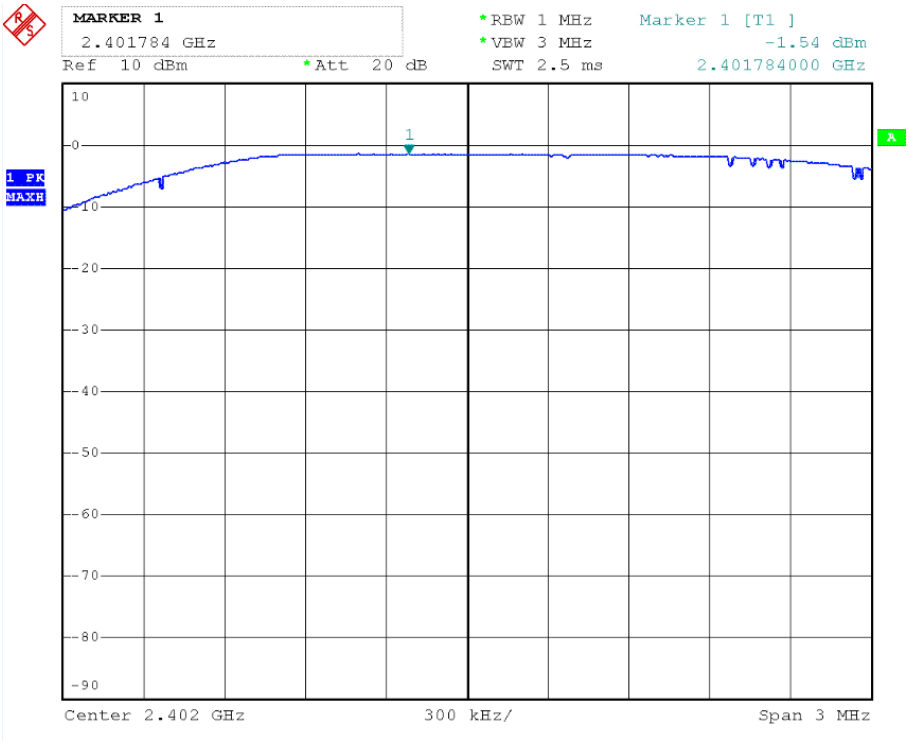
3. Repeated the 1 for the middle and highest channel of the EUT.

9.5 Test Result

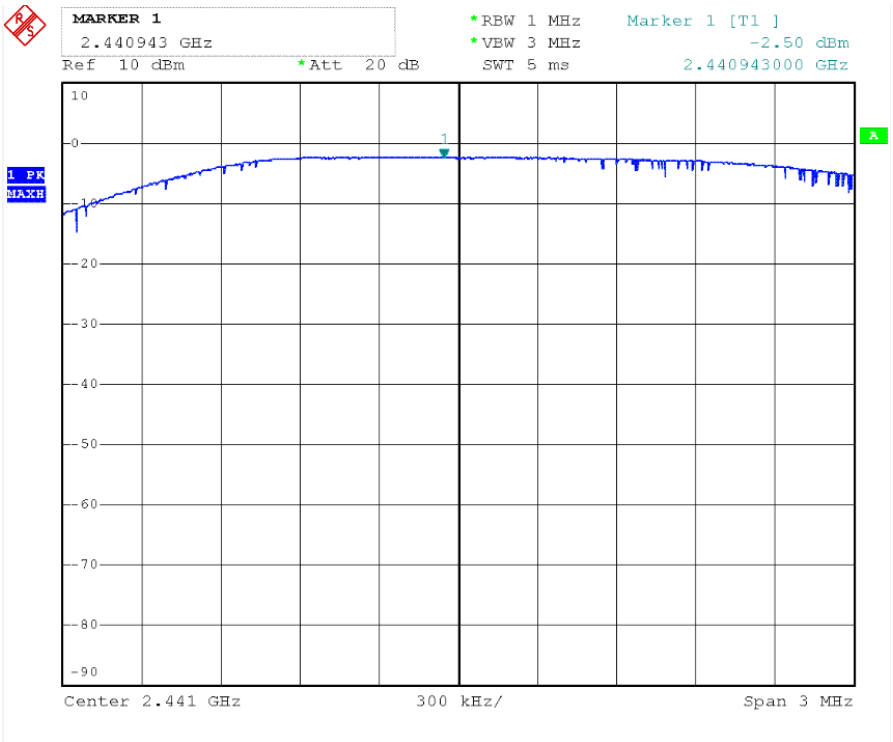
Temperature (℃) : 22~23	EUT: PS4 Chat Boost
Humidity (%RH): 50~54	M/N: CM00080
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)	Margin (dB)
GFSK	Low	2402.00	-1.54	21	-21.54
GFSK	Middle	2441.00	-2.50	21	-23.50
GFSK	High	2480.00	-3.60	21	-24.60

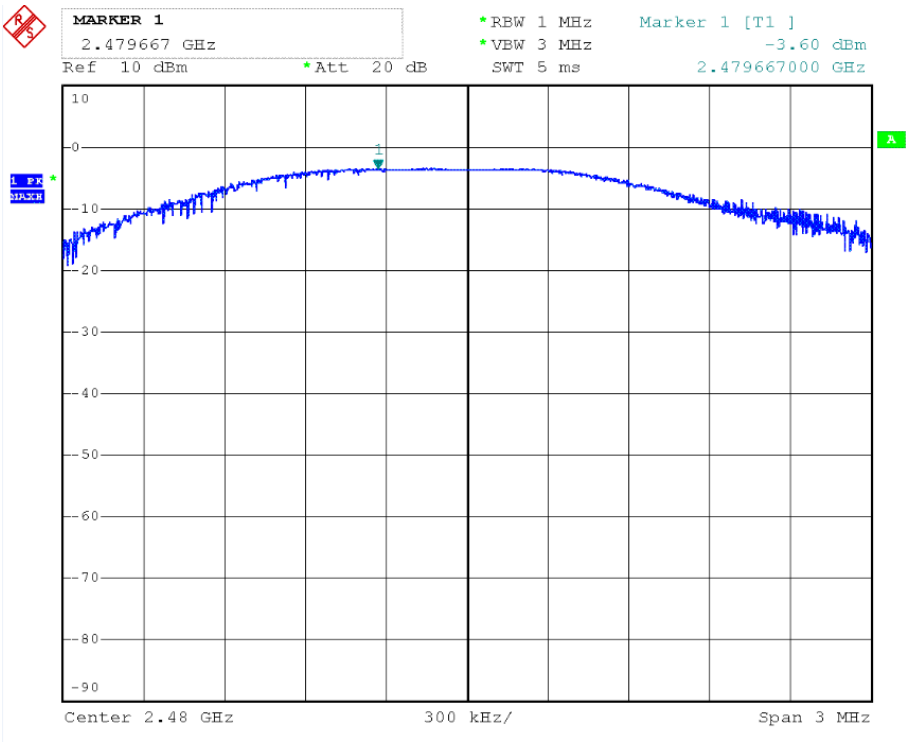
Channel Low



Channel Middle



Channel High



10. Test of Band Edges Emission

10.1 Applicable Standard

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

10.2 EUT Setup

Radiated Measurement Setup

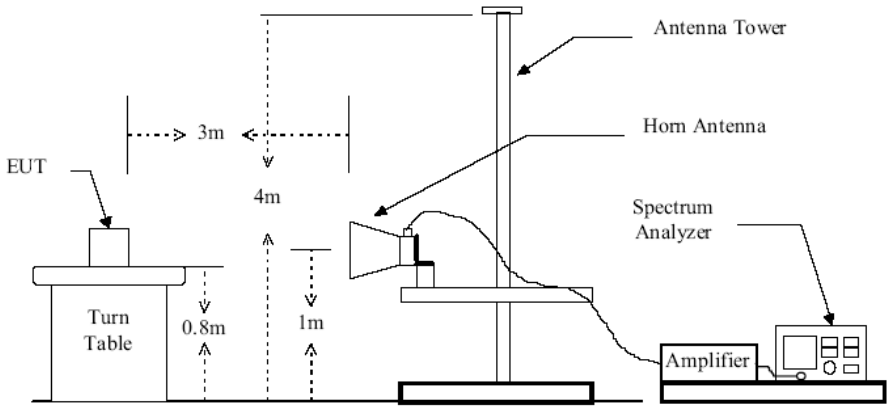


Figure 2 : Frequencies measured above 1 GHz configuration

Conducted Measurement Setup

Spectrum Analyzer

10.3 Test Equipment List and Details

See section 2.5.

10.4 Test Procedure

Conducted Measurement

1. The transmitter is set to the lowest channel.

2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.

3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge. Then detector set to peak and max hold this trace.

4. The lowest band edges emission was measured and recorded.

5. The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2003

2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.

4. For band edge emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.

5. For band edge emission, use 1MHz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1MHz RBW for reading under PK.

10.5 Test Result

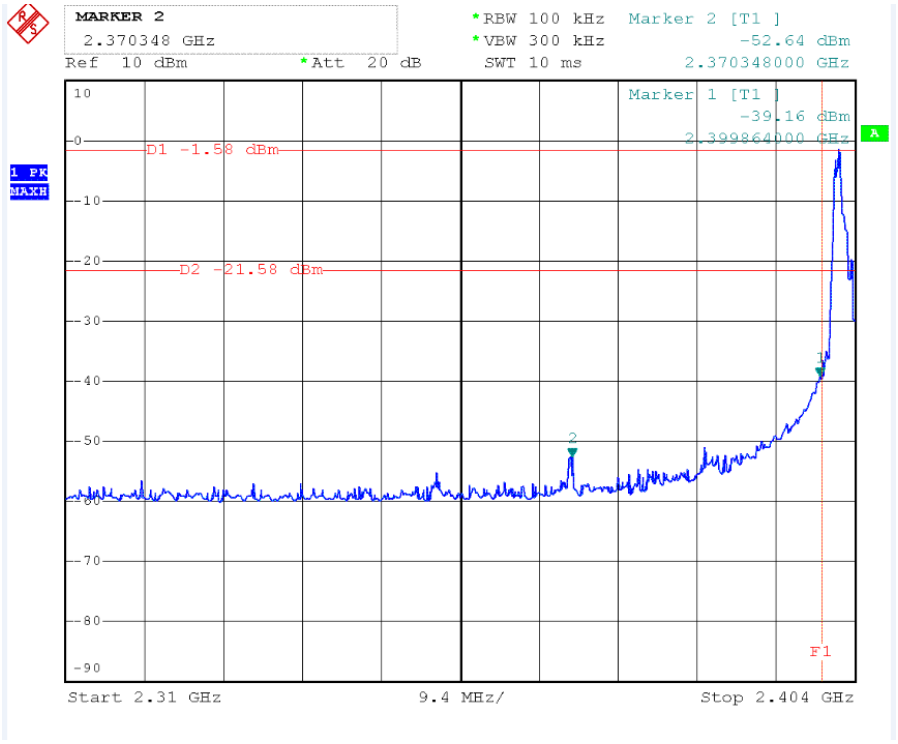
Temperature (℃) : 22~23	EUT: PS4 Chat Boost
Humidity (%RH): 50~54	M/N: CM00080
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

Radiated Test Result

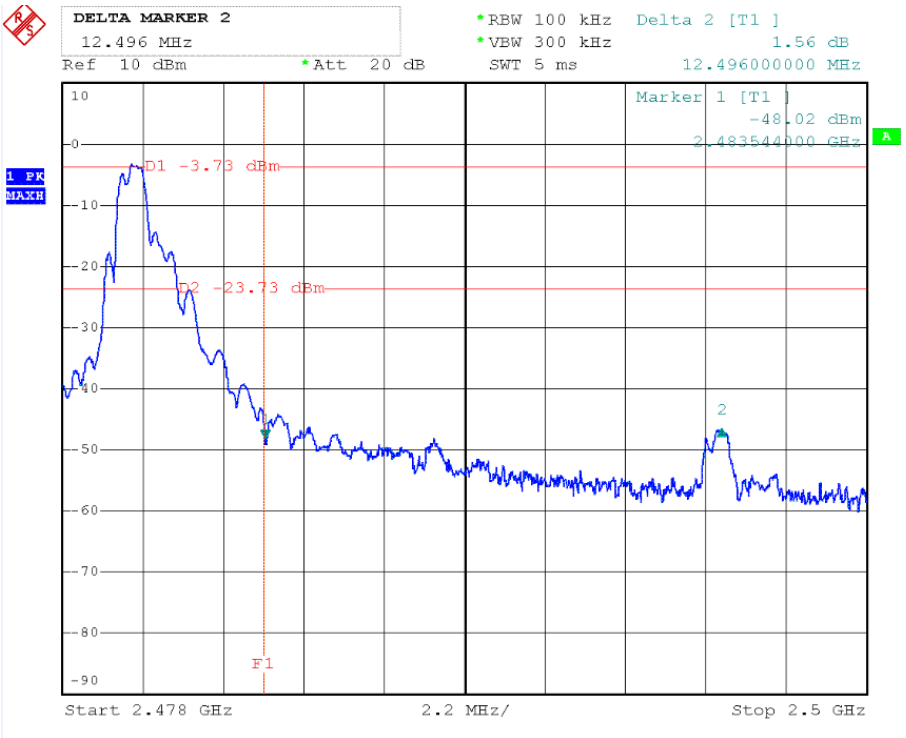
Frequency (MHz)	Antenna Polarization	Emission Read Value (dBμV/m)	Limits (dBμV/m)
2389.5	H	36.24	54
2389.5	V	37.84	54
2483.6	H	35.88	54
2483.6	V	36.24	54

Hopping OFF

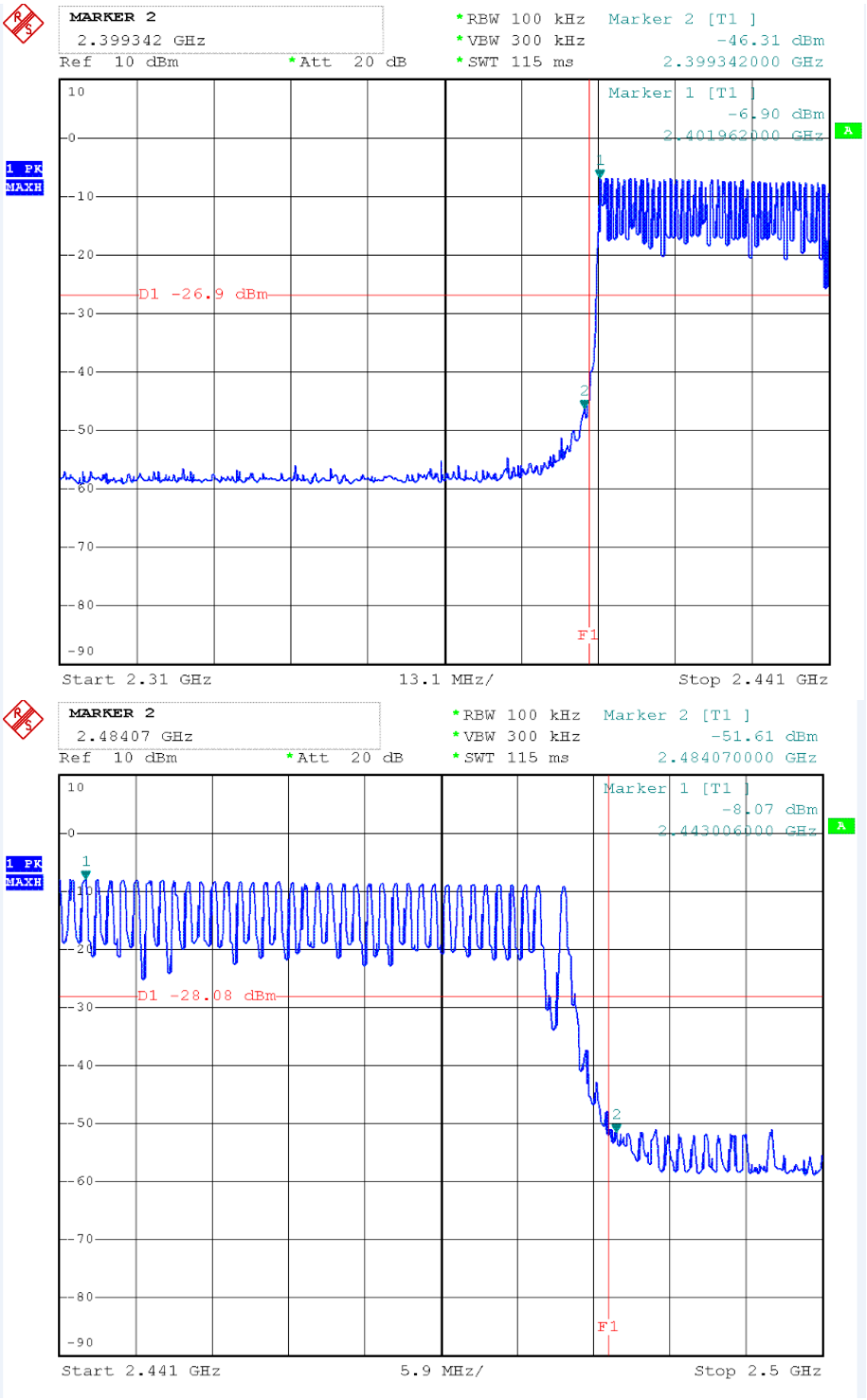
Low Channel



High Channel



Hopping ON


MARKER 2
2.399342 GHz
Ref 10 dBm
*Att 20 dB
*RBW 100 kHz
*VBW 300 kHz
*SWT 115 ms
Marker 2 [T1]
-46.31 dBm
2.399342000 GHz
Marker 1 [T1]
-6.90 dBm
2.401962000 GHz
1 PK MAXH
D1 -26.9 dBm
Start 2.31 GHz
13.1 MHz/
Stop 2.441 GHz
MARKER 2
2.48407 GHz
Ref 10 dBm
*Att 20 dB
*RBW 100 kHz
*VBW 300 kHz
*SWT 115 ms
Marker 2 [T1]
-51.61 dBm
2.484070000 GHz
Marker 1 [T1]
-8.07 dBm
2.443006000 GHz
1 PK MAXH
D1 -28.08 dBm
Start 2.441 GHz
5.9 MHz/
Stop 2.5 GHz

11. Test of Spurious Radiated Emission

11.1 Applicable Standard

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

11.2 EUT Setup

Radiated Measurement Setup

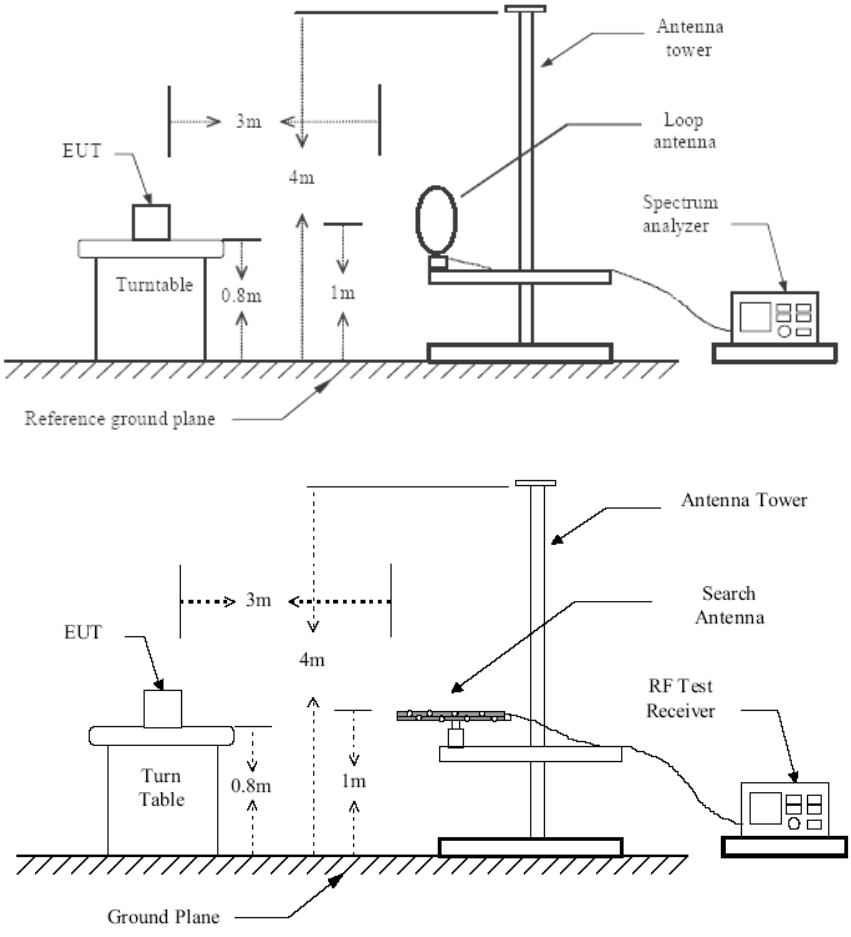


Figure 1 : Frequencies measured below 1 GHz configuration

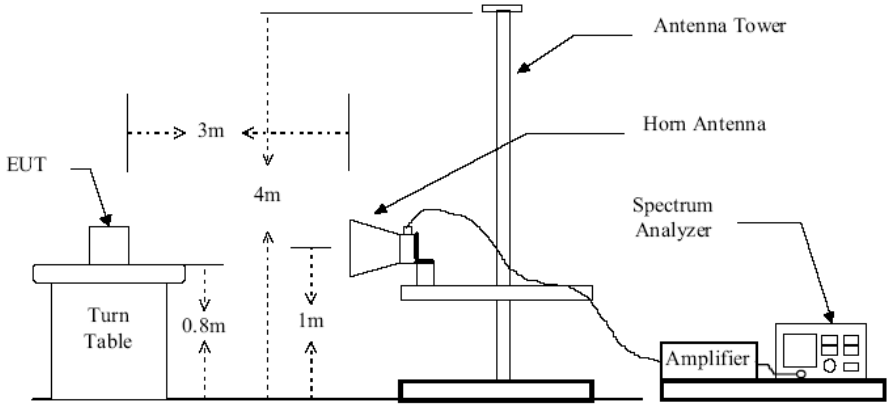


Figure 2 : Frequencies measured above 1 GHz configuration

Conducted Measurement Setup

Spectrum Analyzer

11.3 Test Equipment List and Details

See **section 2.5**.

11.4 Test Procedure

Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2009

2. The EUT was placed on the top of the turntable 0.8 meter above ground.

3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.

4. Power on the EUT and all the supporting units.

5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.

7. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.

8. According to the characteristic of the EUT crystals, the range of frequencies was investigated from 9KHz to 30MHz, 30MHz to 1GHz and 1GHz to 26GHz.

9. For emission below 1GHz, Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.

10. For emission above 1GHz, Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz, VBW=10Hz for Average Detector, Readings are both peak and average values.

11. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos. The worst case data is recorded in the report. All emission not reported are much lower than the prescribed limits.

Conducted Measurement

1. For emission above 1GHz to 26G,conducted measurement method is used.

2. The transmitter is set to the lowest channel.

3. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.

4. Set RBW to 1 MHz and VBW to 3 MHz, Then detector set to peak and max hold this trace.

5. The lowest band edges emission was measured and recorded.

6. The transmitter set to the highest channel and repeated 2~4.

11.5 Test Result

Temperature (℃) : 22~23	EUT: PS4 Chat Boost
Humidity (%RH): 50~54	M/N: CM00080
Barometric Pressure (mbar): 950~1000	Operation Condition: Charging, playing

Note: In this testing, the EUT was respectively tested in three different orientations. That is:

1. EUT was lie vertically, and then its Antenna oriented upward
2. EUT was lie vertically, and then its Antenna oriented downward
3. EUT was lie flatwise, and then its Antenna oriented to the receiving antenna

The worst test data see following pages
When the EUT was lie flatwise, and its Antenna oriented to the receiving antenna, the worst test data was got as following table.

Worst case Spurious Emission (9k~30MHz)

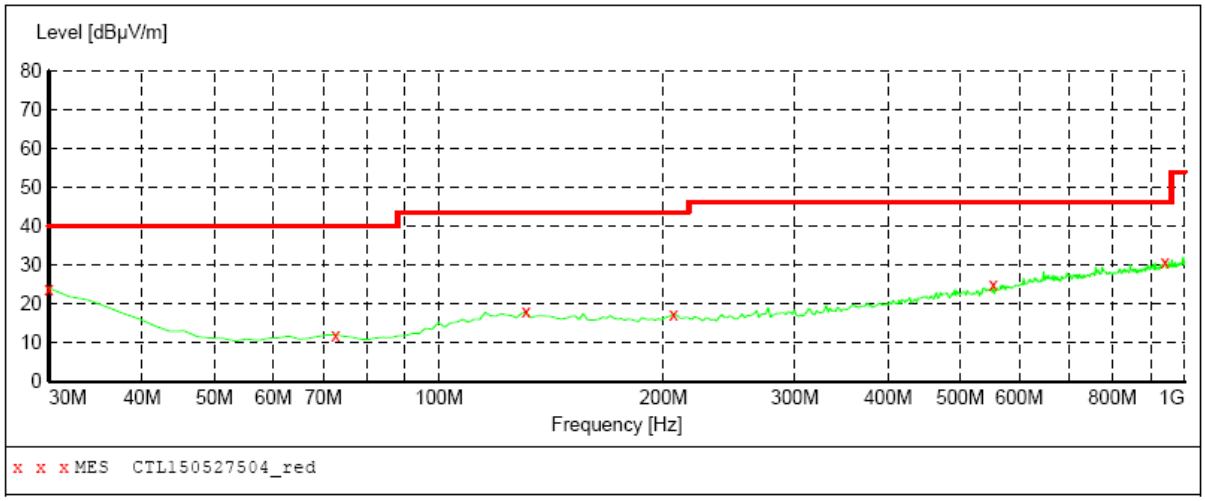
Frequency	Meter Reading	Antenna Factor	Cable Loss	Emission Levels	Limits	Margin	Detector Mode
(MHz)	(dBμV)	(dB/M)	(dB)	(dBμV/M)	(dBμV/M)	(dB)	PK/QP
0.55	24.56	7.81	1.03	31.34	67	-35.66	QP
14.88	25.58	8.21	1.19	32.6	49.5	-16.9	QP
16.25	26.77	8.63	1.08	34.32	49.5	-15.18	QP
22.55	27.69	7.71	1.66	33.74	49.5	-15.76	QP

Spurious Emission (30~1000MHz)

EUT:	PS4 Chat Boost
M/N:	CM00080
Operating Condition:	Tx On
Test Site:	3m CHAMBER
Operator:	Chen
Test Specification:	AC 120V60Hz for PC
Comment:	Polarization: Horizontal
	Tem:25℃ Hum:50%

SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL150527504_red"

5/27/2015 10:31AM

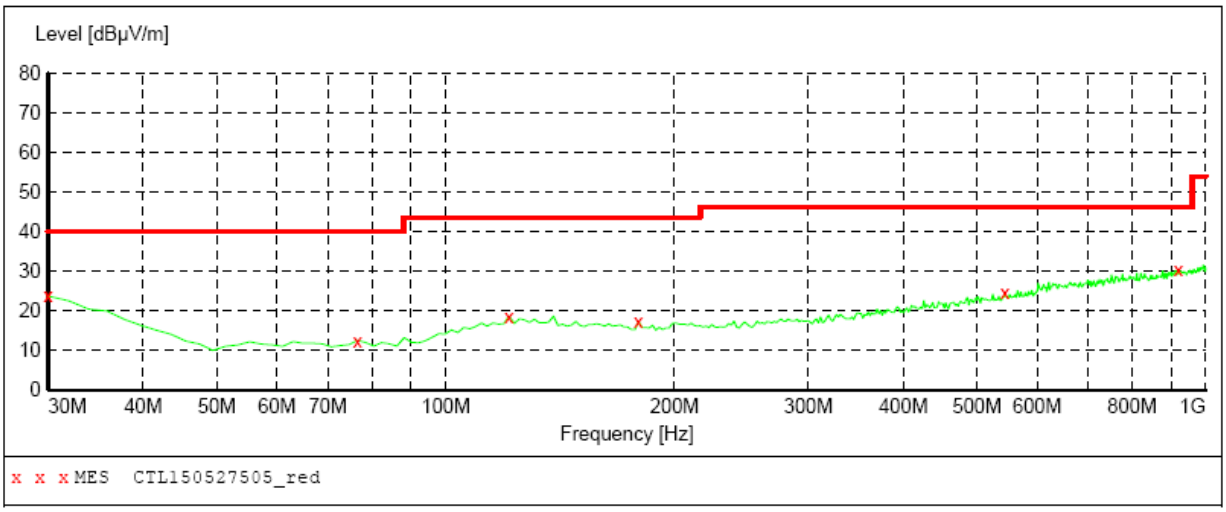
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.00	21.1	40.0	16.0	QP	0.0	0.00	HORIZONTAL
72.680000	12.00	8.5	40.0	28.0	QP	0.0	0.00	HORIZONTAL
130.880000	18.00	14.9	43.5	25.5	QP	0.0	0.00	HORIZONTAL
206.540000	17.20	14.3	43.5	26.3	QP	0.0	0.00	HORIZONTAL
553.800000	24.80	21.1	46.0	21.2	QP	0.0	0.00	HORIZONTAL
941.800000	30.90	26.5	46.0	15.1	QP	0.0	0.00	HORIZONTAL

Spurious Emission (30~1000MHz)

EUT:	PS4 Chat Boost
M/N:	CM00080
Operating Condition:	Tx On
Test Site:	3m CHAMBER
Operator:	Chen
Test Specification:	AC 120V60Hz for PC
Comment:	Polarization: Vertical Tem:25℃ Hum:50%

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL150527505_red"

5/27/2015 10:33AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	23.70	21.1	40.0	16.3	QP	0.0	0.00	VERTICAL
76.560000	12.50	8.6	40.0	27.5	QP	0.0	0.00	VERTICAL
121.180000	18.60	15.1	43.5	24.9	QP	0.0	0.00	VERTICAL
179.380000	17.30	13.3	43.5	26.2	QP	0.0	0.00	VERTICAL
544.100000	24.50	20.9	46.0	21.5	QP	0.0	0.00	VERTICAL
920.460000	30.40	26.3	46.0	15.6	QP	0.0	0.00	VERTICAL

Spurious Emission test data above 1G

Channel Low								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBµV/m)	Margin (dBµV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBµV	Transd	Result dBµV/m			
2346	H	1	43.68	-2.92	40.76	74	-33.24	P
			39.72	-2.92	36.8	54	-17.2	A
2346	V	1	43.17	-2.92	40.25	74	-33.75	P
			39.93	-2.92	37.01	54	-16.99	A
2402	H	1	81.36	-6.61	74.75	---	---	P
			77.1	-6.61	70.49	---	---	A
2402	V	1	77.64	-6.61	71.03	---	---	P
			77.91	-6.61	71.3	---	---	A
4804	H	1	42.21	-0.67	41.54	74	-32.46	P
			38.09	-0.67	37.42	54	-16.58	A
4804	V	1	41.89	-0.67	41.22	74	-32.78	P
			38.77	-0.67	38.1	54	-15.9	A
7206	H	1	42.86	1.35	44.21	74	-29.79	P
			38.74	1.35	40.09	54	-13.91	A
7206	V	1	42.37	1.35	43.72	74	-30.28	P
			38.08	1.35	39.43	54	-14.57	A
9608	H	1	42.15	2.73	44.88	74	-29.12	P
			38.17	2.73	40.9	54	-13.1	A
9608	V	1	41.97	2.73	44.7	74	-29.3	P
			37.87	2.73	40.6	54	-13.4	A
12010.07	---		---	---	---	---	---	
14412.08	---		---	---	---	---	---	
16814.09	---		---	---	---	---	---	
19216.11	---		---	---	---	---	---	
21618.12	---		---	---	---	---	---	
24020.13	---		---	---	---	---	---	

Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier
Margin = Level-Limit
Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value
2. Data of measurement within this frequency range shown " -" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. The test limit distance is 3m limit

Channel Mid								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBµV/m)	Margin (dBµV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBµV	Transd	Result dBµV/m			
2441	H	1	78.3	-6.37	71.93	---	---	P
			78.88	-6.37	72.51	---	---	A
2441	V	1	76.27	-6.37	69.9	---	---	P
			72.91	-6.37	66.54	---	---	A
4882	H	1	44.5	-2.92	41.58	74	-32.42	P
			39.12	-2.92	36.2	54	-17.8	A
4882	V	1	44.87	-2.92	41.95	74	-32.05	P
			39.94	-2.92	37.02	54	-16.98	A
7323	H	1	43.62	0.52	44.14	74	-29.86	P
			39.14	0.52	39.66	54	-14.34	A
7323	V	1	43.66	0.52	44.18	74	-29.82	P
			40.33	0.52	40.85	54	-13.15	A
9764	H	1	42.19	1.48	43.67	74	-30.33	P
			38.32	1.48	39.8	54	-14.2	A
9764	V	1	44.36	1.48	45.84	74	-28.16	P
			39.87	1.48	41.35	54	-12.65	A
12205	---		---	---	---	---	---	
14646	---		---	---	---	---	---	
17087.14	---		---	---	---	---	---	
19528.16	---		---	---	---	---	---	
21969.25	---		---	---	---	---	---	
24410.21	---		---	---	---	---	---	

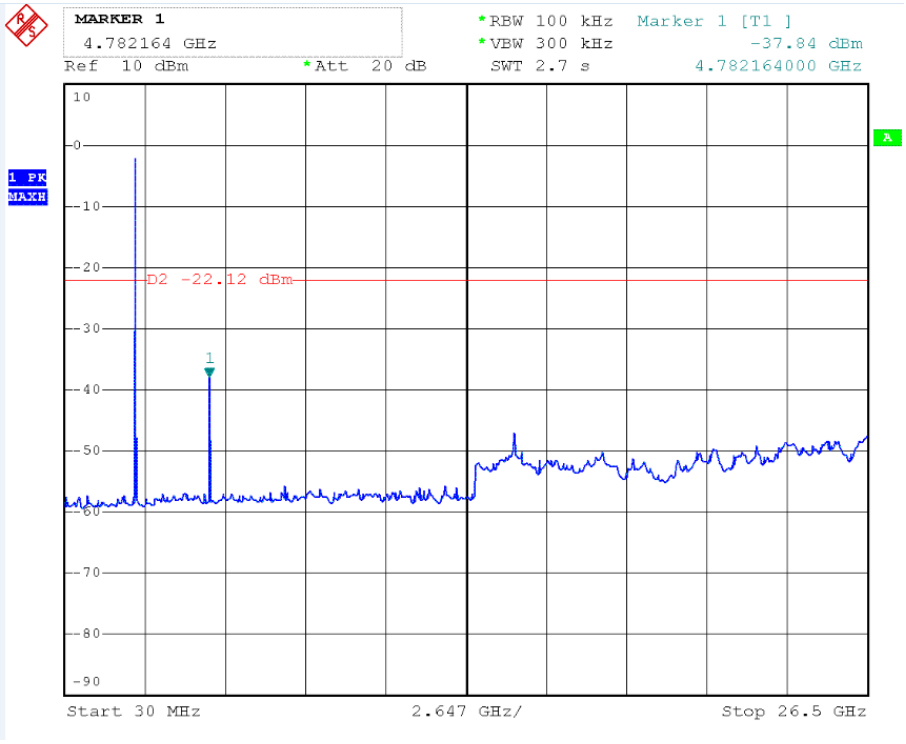
Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier
Margin = Level-Limit
Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value
2. Data of measurement within this frequency range shown " -" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. The test limit distance is 3m limit

Channel High								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBµV/m)	Margin (dBµV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBµV	Transd	Result dBµV/m			
2480	H	1	77.82	-6.28	71.54	---	---	P
			72.74	-6.28	66.46	---	---	A
2480	V	1	80.65	-6.28	74.37	---	---	P
			75.88	-6.28	69.6	---	---	A
2500	H	1	45.57	-2.5	43.07	74	-30.93	P
			41.15	-2.5	38.65	54	-15.35	A
2500	V	1	47.26	-2.5	44.76	74	-29.24	P
			42.88	-2.5	40.38	54	-13.62	A
4960.02	H	1	45.35	1.17	46.52	74	-27.48	P
			40.67	1.17	41.84	54	-12.16	A
4960.02	V	1	44.72	1.17	45.89	74	-28.11	P
			40.33	1.17	41.5	54	-12.5	A
7440.03	H	1	46.02	2.25	48.27	74	-25.73	P
			40.87	2.25	43.12	54	-10.88	A
7440.03	V	1	45.28	2.25	47.53	74	-26.47	P
			40.77	2.25	43.02	54	-10.98	A
9920.04	H	1	48.05	4.53	52.58	74	-21.42	P
			42.52	4.53	47.05	54	-6.95	A
9920.04	V	1	47.91	4.53	52.44	74	-21.56	P
			43.54	4.53	48.07	54	-5.93	A
12400.05	---		---	---	---	---	---	
14880.06	---		---	---	---	---	---	
17360.07	---		---	---	---	---	---	
19840.08	---		---	---	---	---	---	
22320.09	---		---	---	---	---	---	
24800.15	---		---	---	---	---	---	

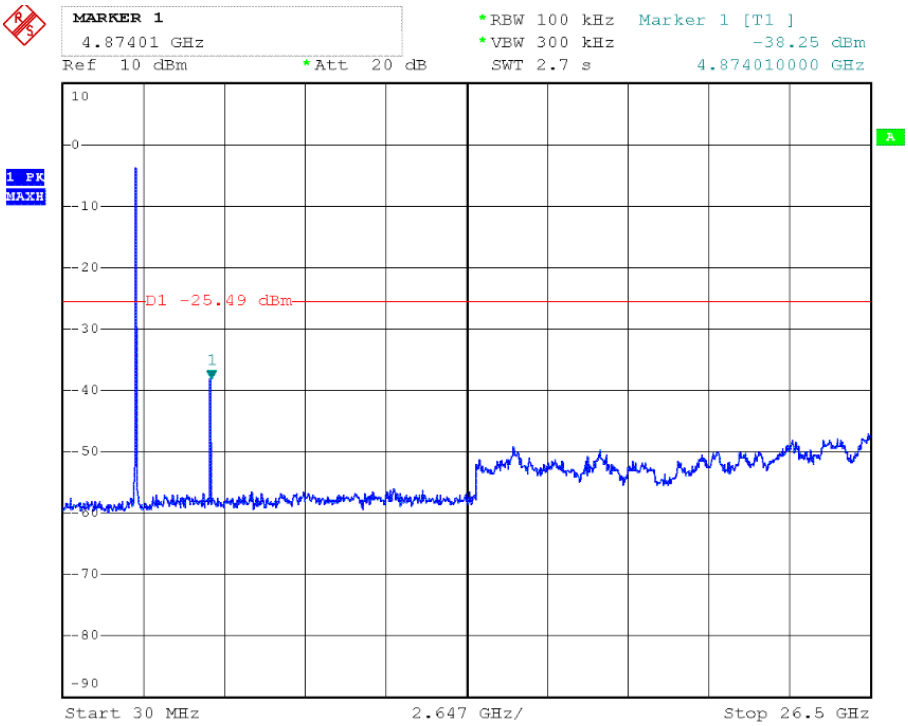
Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier
Margin = Level-Limit
Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value
2. Data of measurement within this frequency range shown " -" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. The test limit distance is 3m limit

Conducted Spurious Emission

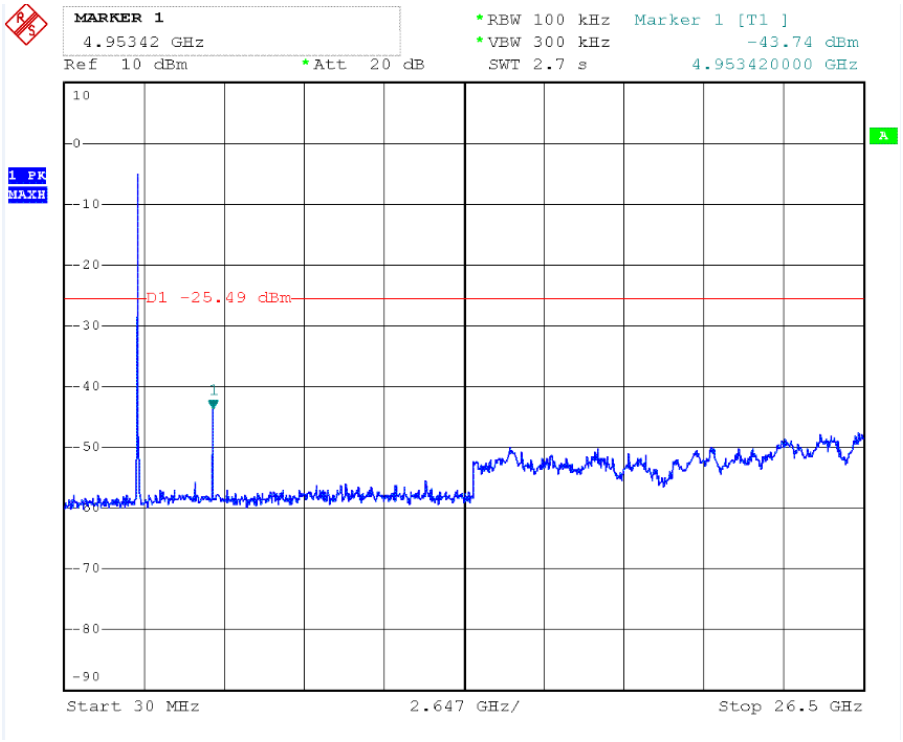
Channel Low



Channel Mid



Channel High



12. ANTENNA REQUIREMENT

12.1 Standard Applicable

Section 15.203:

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.

Section 15.247(b)/(c):

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

12.2 Antenna Connected Construction

The antenna is designed with permanent attachment and no consideration of replacement. The antenna used in this product is complied with Standard. The maximum Gain of the antenna lower than 6.0dBi and have the definite antenna Specification.

13 .Radio Frequency Exposure

13.1 Objective

The objective of the following report is used to demonstrate that EUT operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the relative provisions of FCC 47CFR Part 1.1307

13.2 General Description of Test

Items	Description
EUT Frequency band	☒ FHSS: 2.400GHz ~ 2.483GHz ☐ WLAN: 2.400GHz ~ 2.483GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5825GHz ☐Others: _____
Device category	☒Portable (<20cm separation) ☐Mobile (>20cm separation) ☐Others __ __ ____
Exposure classification	☐Occupational/Controlled exposure (S = 5mW/cm2) ☒General Population/Uncontrolled exposure (S=1mW/cm^2) ☐Others: _____
Antenna diversity	☒Single antenna ☐Multiple antennas: ☐Tx diversity ☐Rx diversity ☐Tx/Rx diversity
Max. output power	-1.54dBm (0.000702W)
Antenna gain (Max)	0dBi (Numeric gain:1)
Evaluation applied	☒MPE Evaluation ☐SAR Evaluation
Note: *1. The maximum output power is* 20.20dBm (0.105W) *at 2402MHz.(with 1 numeric antenna gain.)* *2. For mobile or fixed location transmitters, no SAR consideration applied. The minimum separation generally be used is at least 20 cm, even if the calculations indicate that the MPE distance would be lesser.*	

13.3 Human Exposure Assessment Results

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where E = *Field Strength in Volts / meter*
P = *Power in Watts*
G=*Numeric antenna gain*
d=*Distance in meters*
S=*Power Density in milliwatts / square centimeter*

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and
*d (cm) =100 * d (m)*

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ ***Equation 1***

Where d = *distance in cm*
P = *Power in mW*
G = *Numeric antenna gain*
S = *Power Density in* mW / cm^2

EUT parameter (data from the separate report)	
Given $E=\frac{\sqrt{30\times P\times G}}{d}$ & $S=\frac{E^2}{3770}$	Where G: numerical gain of transmitting antenna; TP: Transmitted power in watt; d: distance from the transmitting antenna in meter
Max average output power in Watt (TP)	-1.54dBm (0.000702W)
Antenna gain (G)	0 dBi (Numeric gain:1)
Exposure classification	S=1mW/cm^2
Minimum distance in meter (d) (from transmitting structure to the human body)	20cm (0.2m)
Yields $S=\frac{30xPxG}{3770d^2}$, P=0.000702W, G=1, d=0.2 S=0.00014mW/cm^2 Or $d=\sqrt{\frac{30xPxG}{3770S}}$, S=1, P=0.000702W, G=1 d=0.0024m	
Conclusion: S=0.00014mW/cm^2 is significant lower than the General Population Exposure Power Density Limit 1mW/cm^2 or except the distance when human body proximity to the antenna is less than 0.24cm then will reach the General Population Exposure Power Density Limit (For mobile or fixed location transmitters, the maximum power density is 1.0 mW / cm^2 even if the calculation indicates that the power density would be larger.)	