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RADIO TEST REPORT

Report No:STS1807294W01

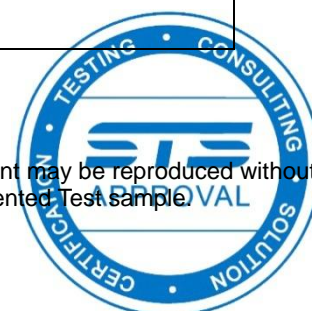
Issued for

FrSky Electronic Co., Ltd.

F-4, Building C, Zhongxiu Technology Park, No.3 Yuanxi Road, Wuxi, 214125, Jiangsu, China

Product Name:	2.4G receiver
Brand Name:	FrSky
Model Name:	RX6R
Series Model:	RX8R PRO, G-RX8, R-XSR, G-RX6, RX4R, RX6R, XSR-SIM, RXSR-FC, G-RX8 PRO, G-RX6 PRO, RS8R, RS6R, RXSRF3OM
FCC ID:	XYFNR2410R
Test Standard:	FCC Part 15.247

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TEST RESULT CERTIFICATION


Applicant's name.....: FrSky Electronic Co., Ltd.
 Address: F-4, Building C, Zhongxiu Technology Park, No.3 Yuanxi Road, Wuxi, 214125, Jiangsu, China
Manufacture's Name: FrSky Electronic Co., Ltd.
 Address: F-4, Building C, Zhongxiu Technology Park, No.3 Yuanxi Road, Wuxi, 214125, Jiangsu, China

Product description

Product Name: 2.4G receiver
 Brand Name: FrSky
 Model Name.....: RX6R
 Series Model: RX8R PRO, G-RX8, R-XSR, G-RX6, RX4R, RX6R, XSR-SIM, RXSR-FC, G-RX8 PRO, G-RX6 PRO, RS8R, RS6R, RXSRF3OM
Test Standards.....: FCC Part15.247
 Test procedure..... ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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Date of Test.....:
 Date (s) of performance of tests.: 01 Aug. 2018~09 Oct. 2018
 Date of Issue: 09 Oct. 2018
 Test Result: Pass

Testing Engineer : 

 (Chris chen)

Technical Manager : 

 (Sean she)

Authorized Signatory : 

 (Vita Li)





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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	09 Oct. 2018	STS1807294W01	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: DA 00-705

FCC Part 15.247, Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	--
15.247(a)(1)	Hopping Channel Separation	PASS	--
15.247(a)(1)&(b)(1)	Output Power	PASS	--
15.247(c)	Radiated Spurious Emission	PASS	--
15.247(d)	Conducted Spurious & Band Edge Emission	PASS	--
15.247(a)(iii)	Number of Hopping Frequency	PASS	--
15.247(a)(iii)	Dwell Time	PASS	--
15.247(a)(1)	Bandwidth	PASS	--
15.205	Restricted Band Edge Emission	PASS	--
Part 15.247(d)/part 15.209(a)	Band Edge Emission	PASS	--
15.203	Antenna Requirement	PASS	--

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.10-2013



1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.

Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

CNAS Registration No.: L7649; FCC Registration No.: 625569

IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{dB}$
3	RF power,conducted	$\pm 0.71\text{dB}$
4	Spurious emissions,conducted	$\pm 0.63\text{dB}$
5	All emissions,radiated (9KHz-30MHz)	$\pm 3.02\text{dB}$
6	All emissions,radiated (30MHz-200MHz)	$\pm 3.80\text{dB}$
7	All emissions,radiated (200MHz-1000MHz)	$\pm 3.97\text{dB}$
8	All emissions,radiated(>1G)	$\pm 3.03\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	2.4G receiver
Trade Name	FrSky
Model Name	RX6R
Series Model	RX8R PRO, G-RX8, R-XSR, G-RX6, RX4R, RX6R, XSR-SIM, RXSR-FC, G-RX8 PRO, G-RX6 PRO, RS8R, RS6R, RXSRF3OM
Model Difference	Only different Model names
Channel List	Please refer to the Note 2.
2.4G	Frequency: 2404~2480.5MHZ Modulation: FSK
Power Rating	Input: DC 3.5V~ 10V(Normal: DC 5V)
Hardware version number	v1.0
Software version number	V1.0
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



2.

Total Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2404	-	-	-	-
02	2404.3	-	-	225	2471.2
03	2404.6	-	-	226	2471.5
04	2404.9	116	2438.5	227	2471.8
05	2405.2	117	2438.8	228	2472.1
06	2405.5	118	2439.1	229	2472.4
07	2405.8	119	2439.4	230	2472.7
08	2406.1	120	2439.7	231	2473
09	2406.4	121	2440	-	-
10	2406.7	122	2440.3	256	2480.5

3.

EUT Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2404	81	2428	161	2452
06	2405.5	86	2429.5	166	2453.5
11	2407	91	2431.6	171	2455
16	2408.5	96	2432.5	176	2456.5
21	2410	101	2434	181	2458
26	2411.5	106	2435.5	186	2459.5
31	2413	111	2437	191	2461
36	2414.5	116	2438.5	196	2462.5
41	2416	121	2440	201	2464
46	2417.5	126	2441.5	206	2465.5
51	2419	131	2443	211	2467
56	2420.5	136	2444.5	216	2468.5
61	2422	141	2446	221	2470.6
66	2423.5	146	2447.5	226	2471.5
71	2425	151	2449	231	2473
76	2426.5	156	2450.5		

The channels of each EUT are different, but they are all selected from the total channel list.

4. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	FrSky	RX6R	Monopole Antenna	N/A	Ant. A: 2 dBi Ant. B: 2 dBi	Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Data Rate/Modulation
Mode 1	TX CH01	1Mbps/FSK
Mode 2	TX CH116	1Mbps/FSK
Mode 3	TX CH231	1Mbps/FSK
Mode 4	TX CH256	1Mbps/FSK

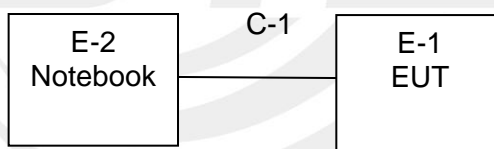
Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Radiated Spurious Emission Test





2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	Notebook	DELL	VOSTRO.3800	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	USB Cable	NO	100cm	N/A

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESCI	102086	2017.10.15	2018.10.14
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2018.11.01
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1343	2017.10.27	2018.10.26
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	N/A	2018.03.11	2019.03.10
Temperature & Humidity	HH660	Mieo	N/A	2017.10.15	2018.10.14
Temperature & Humidity	HH660	Mieo	N/A	2017.10.15	2018.10.14
Pre-mpifier (0.1M-3GHz)	EM	EM330	60538	2018.03.11	2019.03.10
PreAmplifier (1G-26.5GHz)	Agilent	8449B	60538	2017.10.15	2018.10.14
Passive Loop (9K--30MHz)	ZHNAN	ZN3090C	16035	2018.03.11	2019.03.10
Low frequency cable	EM	R01	N/A	2018.03.11	2019.03.10
Low frequency cable	EM	R06	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	R04	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	R02	N/A	2018.03.11	2019.03.10
Semi-anechoic chamber	Changling	966	N/A	2017.10.15	2018.10.14
trun table	EM	SC100_1	60531	N/A	N/A
Antnna mast	EM	SC100	N/A	N/A	N/A
Max-full Antenna Corp	MF	MFA-440H	N/A	N/A	N/A

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2017.10.15	2018.10.14
Power Meter	R&S	NRP	100510	2017.10.15	2018.10.14
Spectrum Analyzer	Agilent	N9020A	MY51110105	2018.03.08	2019.03.07
Signal Analyzer	Agilent	N9020A	MY49100060	2017.10.15	2018.10.14



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emissionlimit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

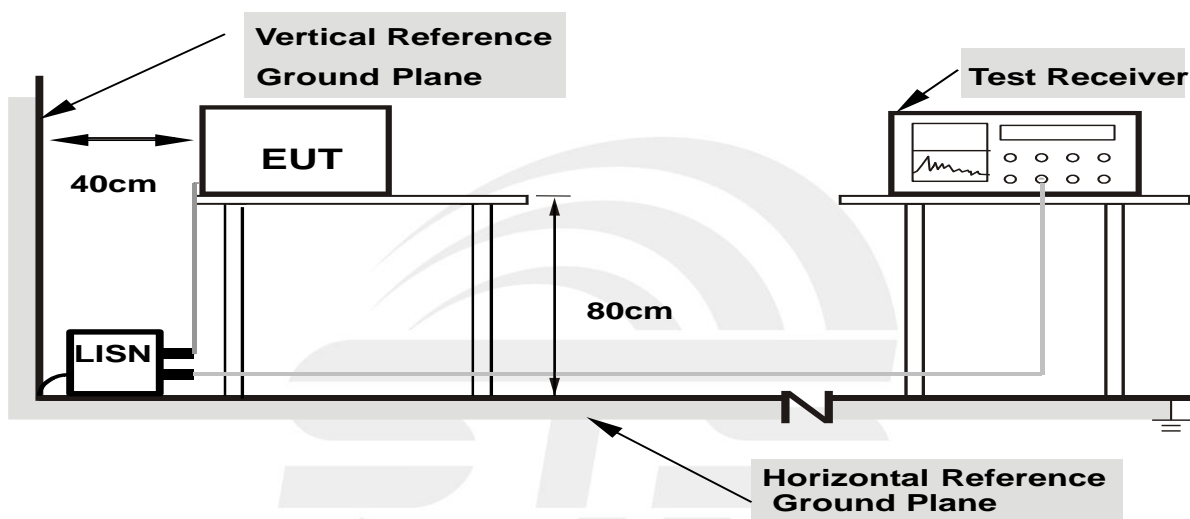
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

- a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



**Note: 1.Support units were connected to second LISN.
 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

3.1.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



3.1.5 TEST RESULT

Temperature:	26 °C	Relative Humidity:	54%
Test Voltage:	N/A	Phase:	L/N
Test Mode:	N/A		

Note: The EUT is power by DC, this test item is not apply.





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/AV
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz / 10 Hz

For Band edge

Spectrum Parameter	Setting
Detector	Peak/AV
Start/Stop Frequency	Lower Band Edge: 2300 to 2403 MHz Upper Band Edge: 2479 to 2500 MHz
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz / 10 Hz



Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- The EUT was placed on the top of a rotating table 0.8 meters (above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m (above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then QuasiPeak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

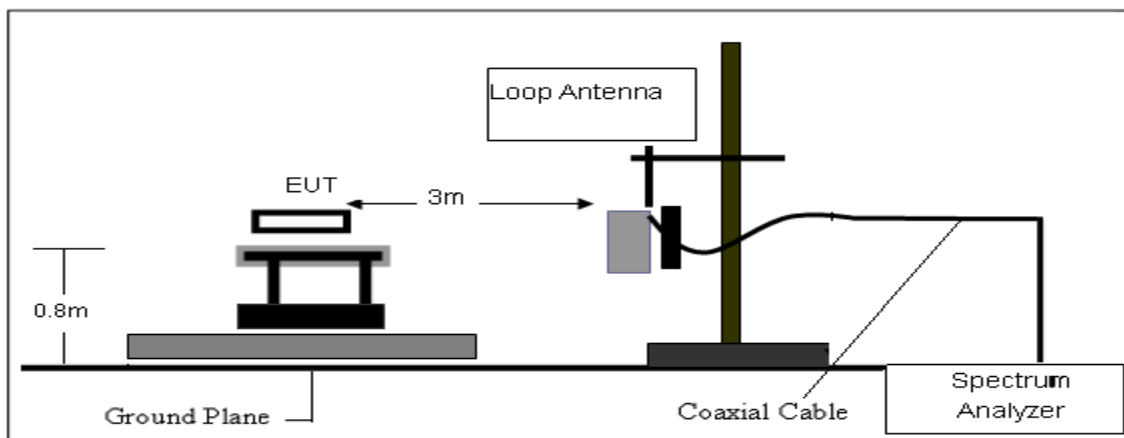
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

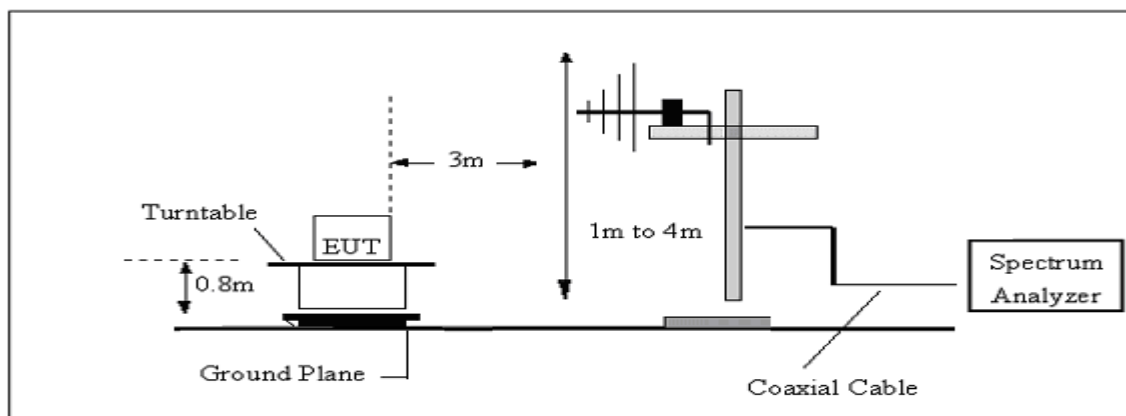
No deviation

3.2.4 TESTSETUP

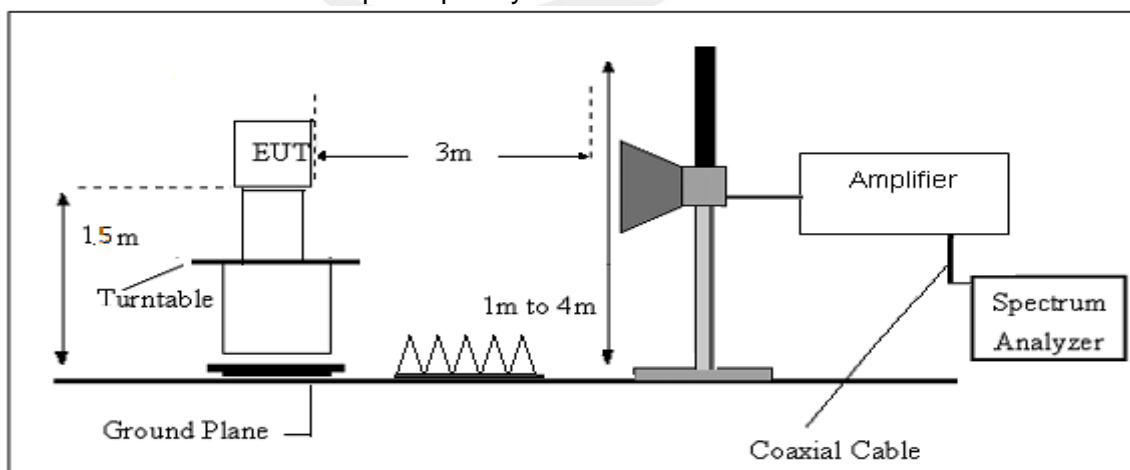
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



3.2.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

Frequency (MHz)	FS (dB μ V/m)	RA (dB μ V/m)	AF (dB)	CL (dB)	AG (dB)	Factor (dB)
300	40	58.1	12.2	1.6	31.9	-18.1

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$





3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	27.4 °C	Relative Humidity:	62%
Test Voltage:	DC 5V	Test Mode:	--

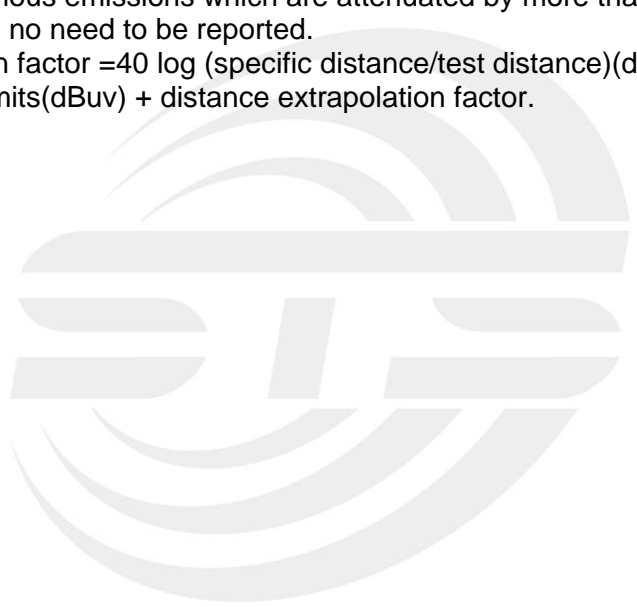
Freq. (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	State P/F	Test Result
--	--	--	--	--	PASS
--	--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log(\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.





(30MHz-1000MHz)

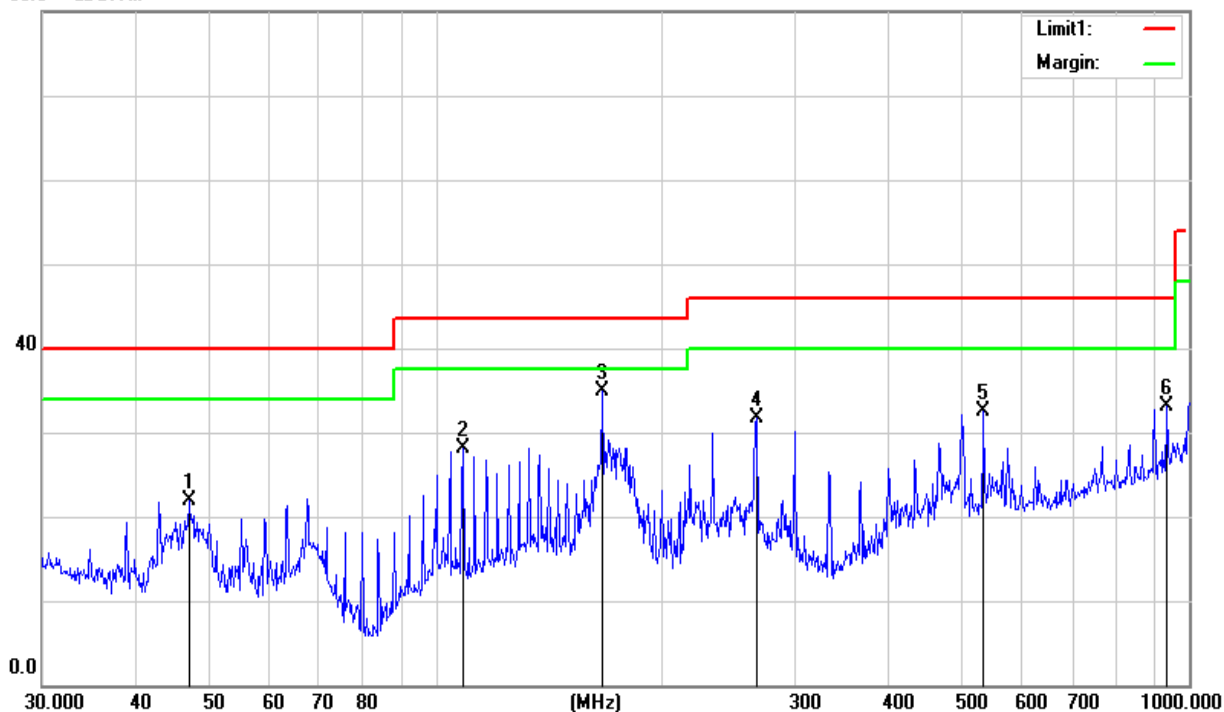
Temperature:	27.4 °C	Relative Humidity:	62%
Test Voltage:	DC 5V	Phase:	Horizontal
Test Mode:	Mode 1/2/3/4 (Mode 1-1M worst mode)		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
46.9948	41.75	-19.94	21.81	40.00	-18.19	QP
108.6470	46.60	-18.46	28.14	43.50	-15.36	QP
166.6514	53.99	-19.05	34.94	43.50	-8.56	QP
266.6090	47.06	-15.33	31.73	46.00	-14.27	QP
533.8321	40.16	-7.58	32.58	46.00	-13.42	QP
935.5463	34.09	-0.90	33.19	46.00	-12.81	QP

Remark:

1. Margin = Result (Result =Reading + Factor)–Limit

80.0 dBuV/m





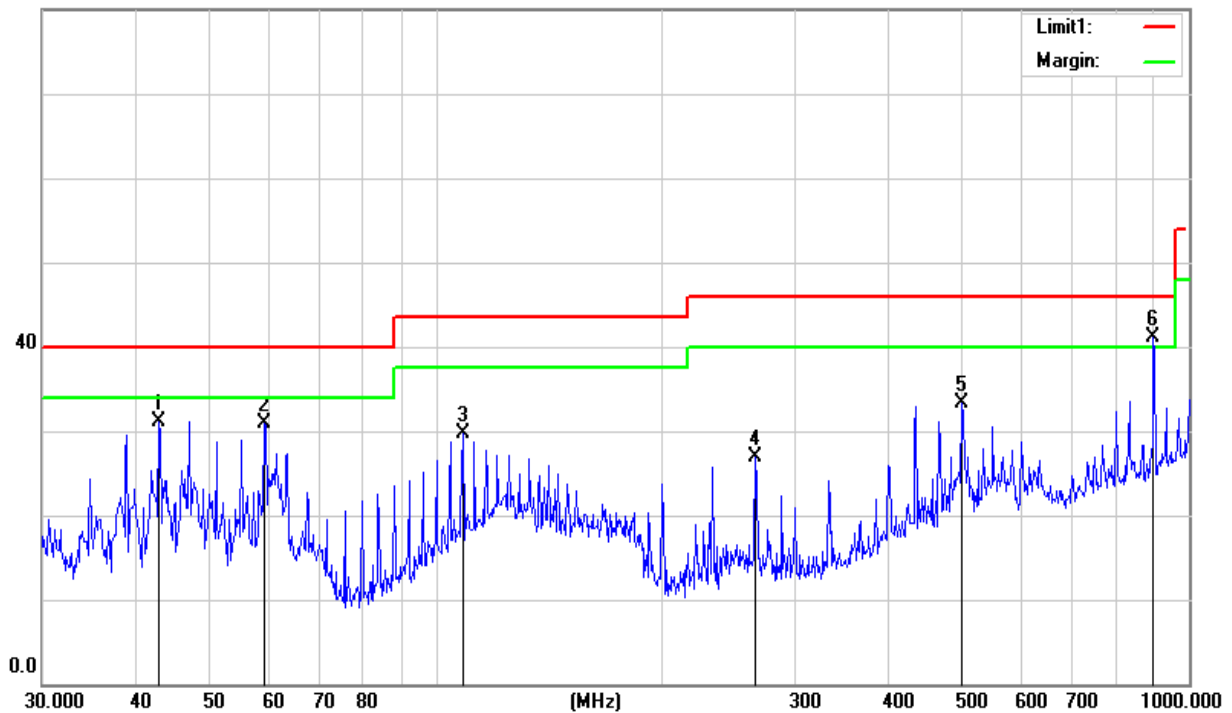
Temperature:	27.4 °C	Relative Humidity:	62%
Test Voltage:	DC 5V	Phase:	Vertical
Test Mode:	Mode 1/2/3/4 (Mode 1-1M worst mode)		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
42.8998	48.89	-17.83	31.06	40.00	-8.94	QP
59.2325	54.93	-24.12	30.81	40.00	-9.19	QP
108.6470	48.19	-18.46	29.73	43.50	-13.77	QP
265.6757	42.22	-15.29	26.93	46.00	-19.07	QP
499.4247	42.13	-8.91	33.22	46.00	-12.78	QP
896.9965	43.31	-2.30	41.01	46.00	-4.99	QP

Remark:

1. Margin = Result (Result =Reading + Factor)–Limit

80.0 dBuV/m





(1GHz~25GHz) Restricted band and Spurious emission Requirements

FSK Low Channel Ant. A

Frequency (MHz)	Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Corrected Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2404 MHz)										
3264.80	61.55	44.70	6.70	28.20	-9.80	51.75	74.00	-22.25	PK	Vertical
3264.80	50.98	44.70	6.70	28.20	-9.80	41.18	54.00	-12.82	AV	Vertical
3264.62	61.90	44.70	6.70	28.20	-9.80	52.10	74.00	-21.90	PK	Horizontal
3264.62	50.01	44.70	6.70	28.20	-9.80	40.21	54.00	-13.79	AV	Horizontal
4808.57	58.52	44.20	9.04	31.60	-3.56	54.96	74.00	-19.04	PK	Vertical
4808.57	50.32	44.20	9.04	31.60	-3.56	46.76	54.00	-7.24	AV	Vertical
4808.35	58.28	44.20	9.04	31.60	-3.56	54.72	74.00	-19.28	PK	Horizontal
4808.35	49.69	44.20	9.04	31.60	-3.56	46.13	54.00	-7.87	AV	Horizontal
5359.71	49.28	44.20	9.86	32.00	-2.34	46.94	74.00	-27.06	PK	Vertical
5359.71	40.02	44.20	9.86	32.00	-2.34	37.68	54.00	-16.32	AV	Vertical
5359.74	47.75	44.20	9.86	32.00	-2.34	45.41	74.00	-28.59	PK	Horizontal
5359.74	39.37	44.20	9.86	32.00	-2.34	37.03	54.00	-16.97	AV	Horizontal
7211.98	54.01	43.50	11.40	35.50	3.40	57.41	74.00	-16.59	PK	Vertical
7211.98	44.63	43.50	11.40	35.50	3.40	48.03	54.00	-5.97	AV	Vertical
7211.88	54.92	43.50	11.40	35.50	3.40	58.32	74.00	-15.68	PK	Horizontal
7211.88	44.78	43.50	11.40	35.50	3.40	48.18	54.00	-5.82	AV	Horizontal



FSK Mid Channel Ant. A

Frequency (MHz)	Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna	Corrected	Emission		Margin (dB)	Detector Type	Comment
				Factor (dB/m)	Factor (dB)	Level (dBμV/m)	Limits (dBμV/m)			
Mid Channel (2438.5 MHz)										
3264.79	61.69	44.70	6.70	28.20	-9.80	51.89	74.00	-22.11	PK	Vertical
3264.79	50.97	44.70	6.70	28.20	-9.80	41.17	54.00	-12.83	AV	Vertical
3264.72	60.78	44.70	6.70	28.20	-9.80	50.98	74.00	-23.02	PK	Horizontal
3264.72	50.06	44.70	6.70	28.20	-9.80	40.26	54.00	-13.74	AV	Horizontal
4877.52	59.17	44.20	9.04	31.60	-3.56	55.61	74.00	-18.39	PK	Vertical
4877.52	49.14	44.20	9.04	31.60	-3.56	45.58	54.00	-8.42	AV	Vertical
4877.39	58.63	44.20	9.04	31.60	-3.56	55.07	74.00	-18.93	PK	Horizontal
4877.39	49.86	44.20	9.04	31.60	-3.56	46.30	54.00	-7.70	AV	Horizontal
5359.87	49.16	44.20	9.86	32.00	-2.34	46.82	74.00	-27.18	PK	Vertical
5359.87	39.18	44.20	9.86	32.00	-2.34	36.84	54.00	-17.16	AV	Vertical
5359.68	47.65	44.20	9.86	32.00	-2.34	45.31	74.00	-28.69	PK	Horizontal
5359.68	38.87	44.20	9.86	32.00	-2.34	36.53	54.00	-17.47	AV	Horizontal
7314.82	54.42	43.50	11.40	35.50	3.40	57.82	74.00	-16.18	PK	Vertical
7314.82	44.77	43.50	11.40	35.50	3.40	48.17	54.00	-5.83	AV	Vertical
7314.80	54.84	43.50	11.40	35.50	3.40	58.24	74.00	-15.76	PK	Horizontal
7314.80	43.64	43.50	11.40	35.50	3.40	47.04	54.00	-6.96	AV	Horizontal



FSK High Channel Ant. A

Frequency (MHz)	Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna	Corrected	Emission	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
				Factor (dB/m)	Factor (dB)	Level (dBμV/m)				
High Channel (2473 MHz)										
3264.73	61.21	44.70	6.70	28.20	-9.80	51.41	74.00	-22.59	PK	Vertical
3264.73	51.07	44.70	6.70	28.20	-9.80	41.27	54.00	-12.73	AV	Vertical
3264.72	61.23	44.70	6.70	28.20	-9.80	51.43	74.00	-22.57	PK	Horizontal
3264.72	50.70	44.70	6.70	28.20	-9.80	40.90	54.00	-13.10	AV	Horizontal
4946.36	58.81	44.20	9.04	31.60	-3.56	55.25	74.00	-18.75	PK	Vertical
4946.36	49.92	44.20	9.04	31.60	-3.56	46.36	54.00	-7.64	AV	Vertical
4946.49	59.09	44.20	9.04	31.60	-3.56	55.53	74.00	-18.47	PK	Horizontal
4946.49	49.29	44.20	9.04	31.60	-3.56	45.73	54.00	-8.27	AV	Horizontal
5359.68	48.86	44.20	9.86	32.00	-2.34	46.52	74.00	-27.48	PK	Vertical
5359.68	39.97	44.20	9.86	32.00	-2.34	37.63	54.00	-16.37	AV	Vertical
5359.58	47.70	44.20	9.86	32.00	-2.34	45.36	74.00	-28.64	PK	Horizontal
5359.58	38.82	44.20	9.86	32.00	-2.34	36.48	54.00	-17.52	AV	Horizontal
7418.76	54.68	43.50	11.40	35.50	3.40	58.08	74.00	-15.92	PK	Vertical
7418.76	43.67	43.50	11.40	35.50	3.40	47.07	54.00	-6.93	AV	Vertical
7418.88	53.82	43.50	11.40	35.50	3.40	57.22	74.00	-16.78	PK	Horizontal
7418.88	43.56	43.50	11.40	35.50	3.40	46.96	54.00	-7.04	AV	Horizontal



FSK High Channel Ant. A

Frequency (MHz)	Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna	Corrected	Emission		Margin (dB)	Detector Type	Comment
				Factor (dB/m)	Factor (dB)	Level (dBμV/m)	Limits (dBμV/m)			
High Channel (2480.5 MHz)										
3264.88	60.96	44.70	6.70	28.20	-9.80	51.16	74.00	-22.84	PK	Vertical
3264.88	50.19	44.70	6.70	28.20	-9.80	40.39	54.00	-13.61	AV	Vertical
3264.75	61.57	44.70	6.70	28.20	-9.80	51.77	74.00	-22.23	PK	Horizontal
3264.75	50.81	44.70	6.70	28.20	-9.80	41.01	54.00	-12.99	AV	Horizontal
4961.48	59.34	44.20	9.04	31.60	-3.56	55.78	74.00	-18.22	PK	Vertical
4961.48	49.13	44.20	9.04	31.60	-3.56	45.57	54.00	-8.43	AV	Vertical
4961.57	59.01	44.20	9.04	31.60	-3.56	55.45	74.00	-18.55	PK	Horizontal
4961.57	50.17	44.20	9.04	31.60	-3.56	46.61	54.00	-7.39	AV	Horizontal
5359.62	48.34	44.20	9.86	32.00	-2.34	46.00	74.00	-28.00	PK	Vertical
5359.62	40.03	44.20	9.86	32.00	-2.34	37.69	54.00	-16.31	AV	Vertical
5359.83	47.86	44.20	9.86	32.00	-2.34	45.52	74.00	-28.48	PK	Horizontal
5359.83	38.25	44.20	9.86	32.00	-2.34	35.91	54.00	-18.09	AV	Horizontal
7440.98	54.44	43.50	11.40	35.50	3.40	57.84	74.00	-16.16	PK	Vertical
7440.98	44.19	43.50	11.40	35.50	3.40	47.59	54.00	-6.41	AV	Vertical
7440.83	53.90	43.50	11.40	35.50	3.40	57.30	74.00	-16.70	PK	Horizontal
7440.83	43.70	43.50	11.40	35.50	3.40	47.10	54.00	-6.90	AV	Horizontal

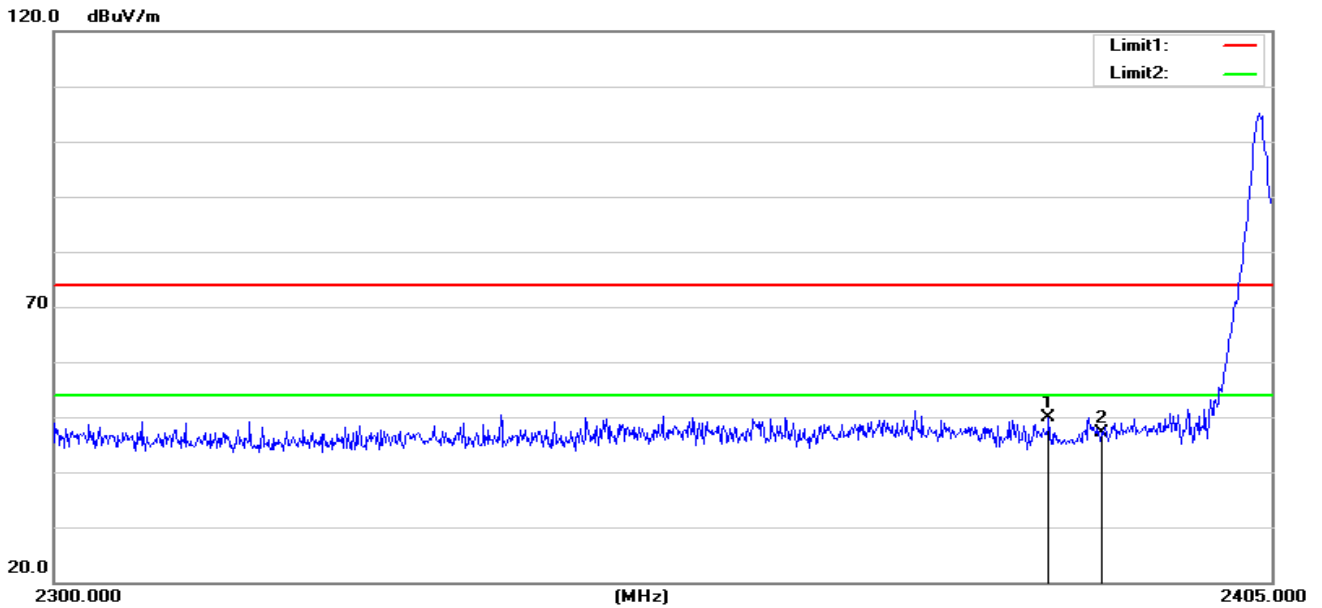
Note:

- 1) FSK of the Antenna A and Antenna B all have test , the worst case is Antenna A, only show the worst case.
- 2) Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor
- 3) The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.



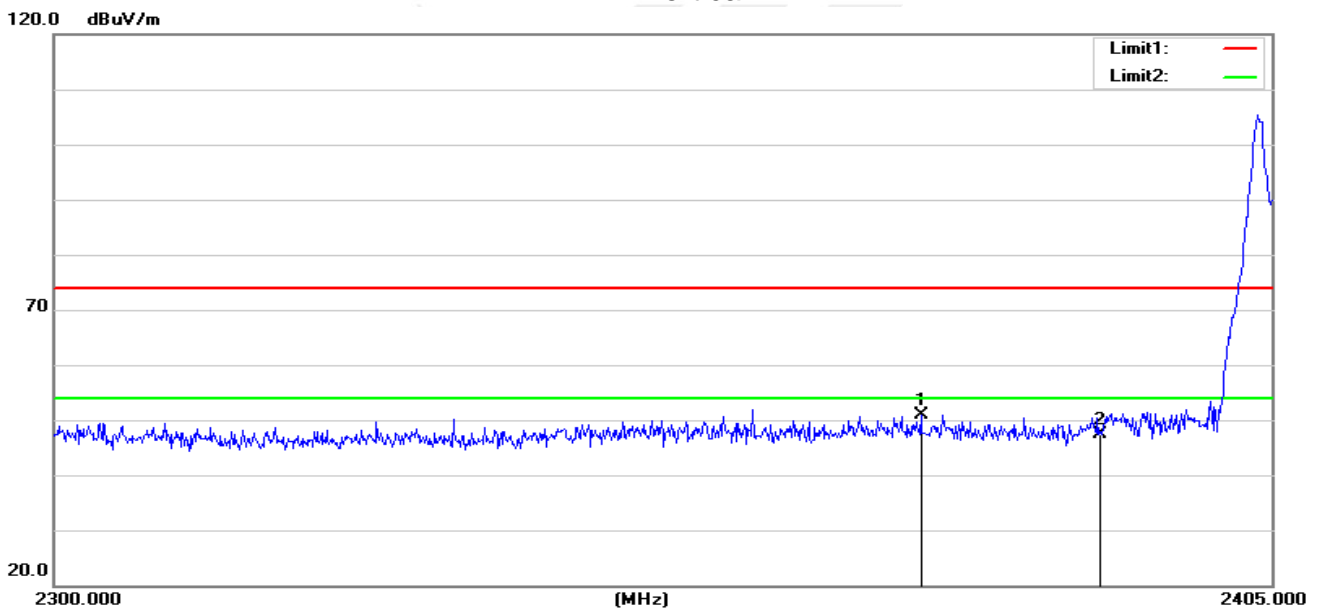
Band edge Requirements

FSK-Low
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2385.470	48.44	1.41	49.85	74.00	-24.15	peak
2	2390.000	45.81	1.43	47.24	74.00	-26.76	peak

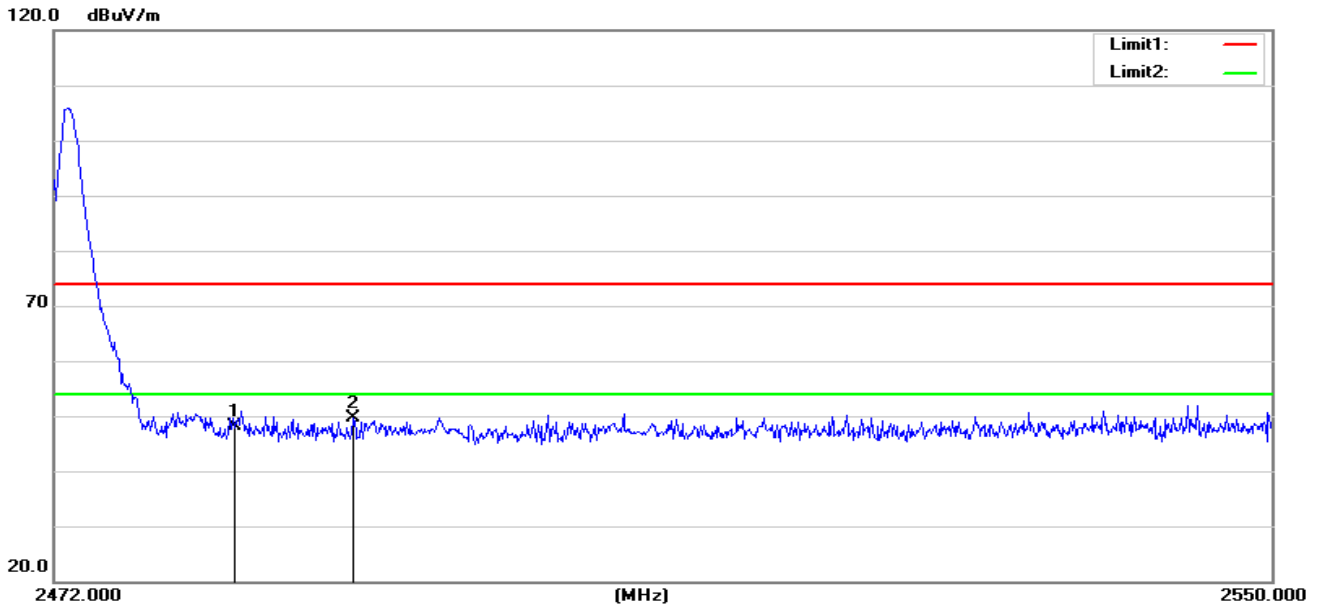
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2374.340	49.49	1.37	50.86	74.00	-23.14	peak
2	2390.000	45.85	1.43	47.28	74.00	-26.72	peak

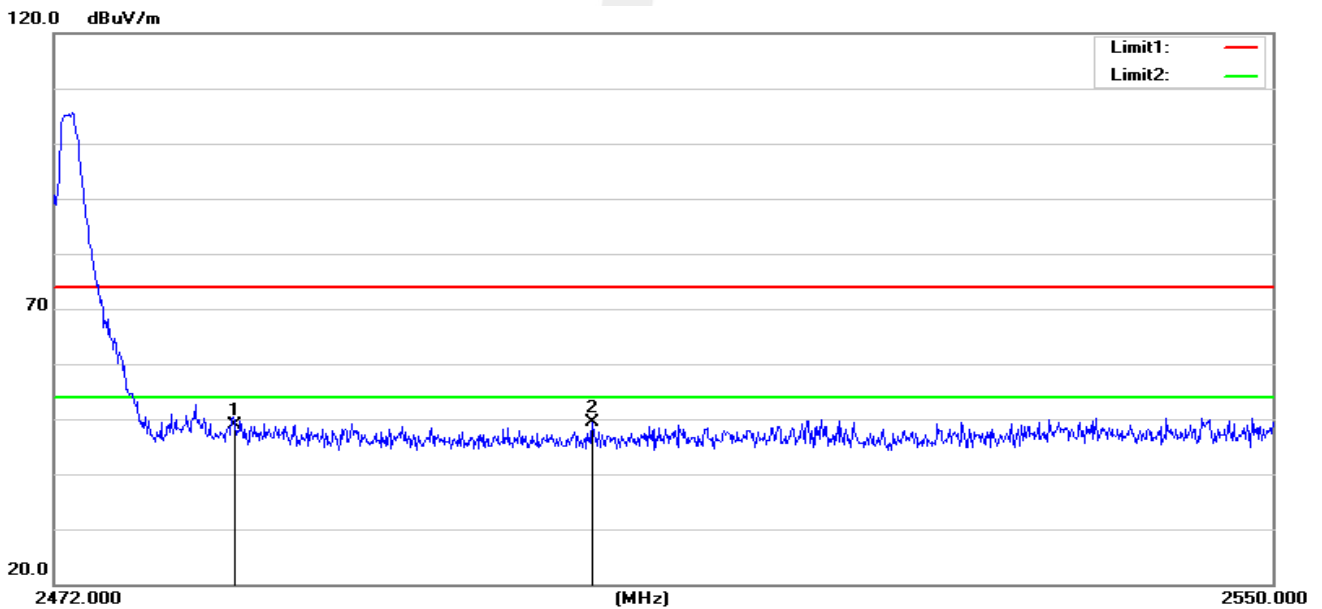


FSK-High
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	46.30	1.76	48.06	74.00	-25.94	peak
2	2491.032	47.73	1.78	49.51	74.00	-24.49	peak

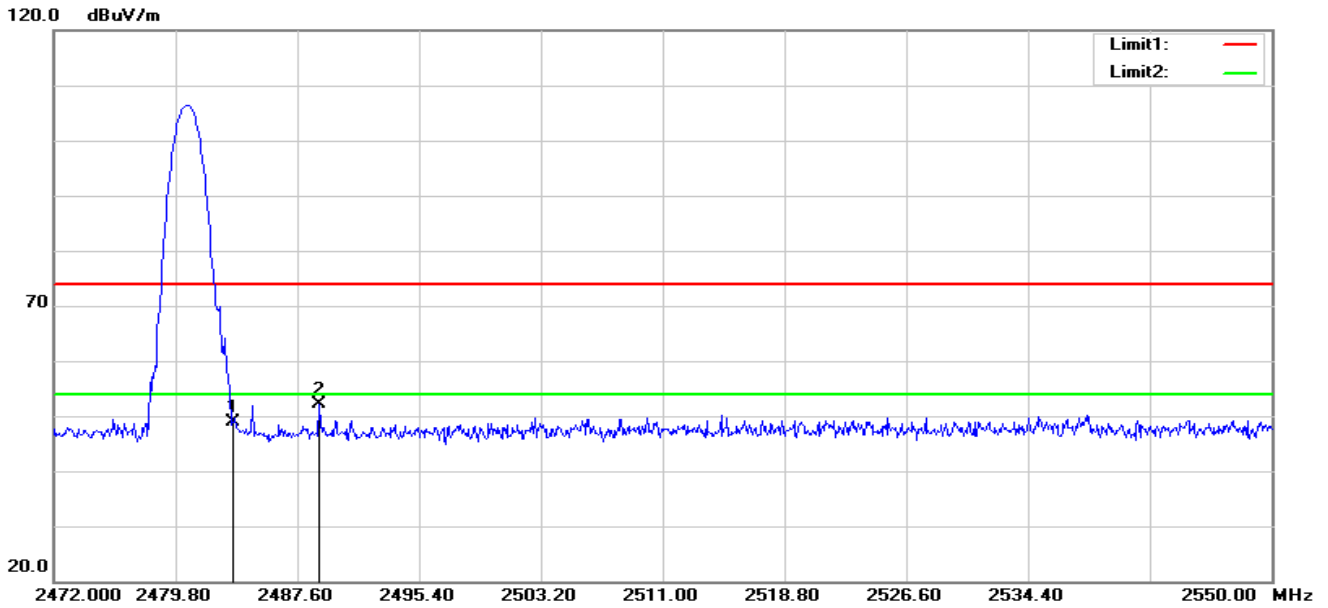
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	47.01	1.76	48.77	74.00	-25.23	peak
2	2506.242	47.47	1.83	49.30	74.00	-24.70	peak

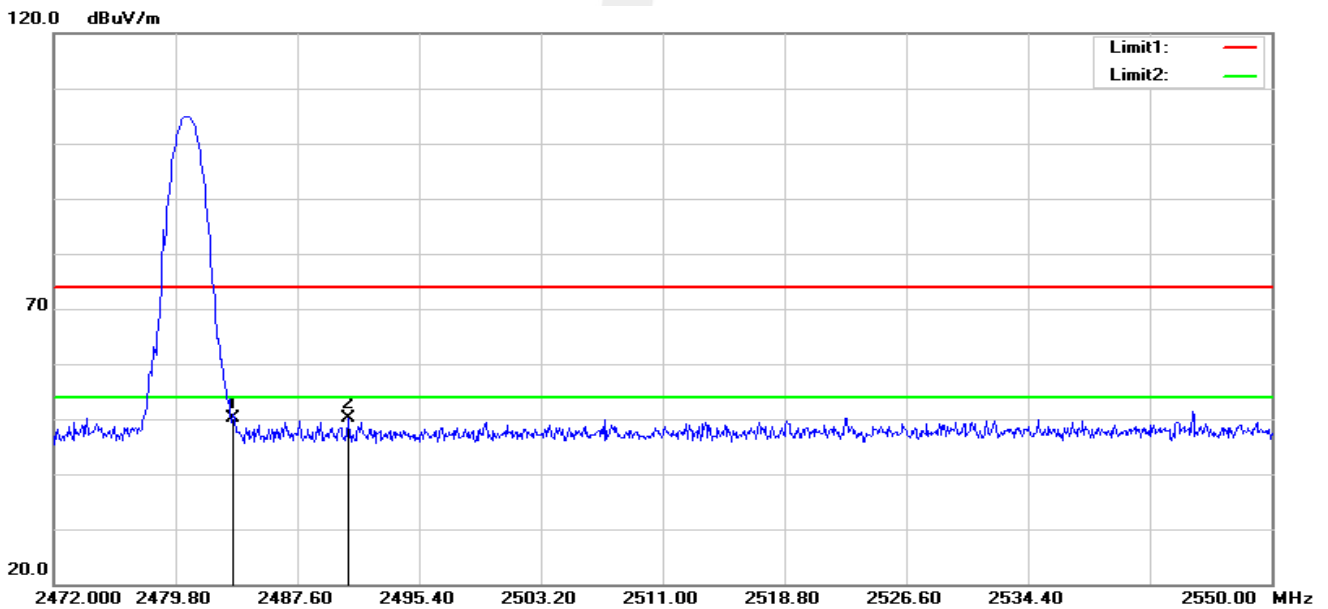


FSK-High
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	58.80	-9.99	48.81	74.00	-25.19	peak
2	2489.004	62.19	-9.97	52.22	74.00	-21.78	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	60.20	-9.99	50.21	74.00	-23.79	peak
2	2490.876	60.03	-9.95	50.08	74.00	-23.92	peak

Note: The nohopping and hopping mode of FSK Antenna A and Antenna B all have been test, Antenna A and Antenna B can't transmit in the same time, the worst case is the nohopping mode of FSK Antenna A, this report only show the worst case.

4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 REQUIREMENT

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

4.2 TEST PROCEDURE

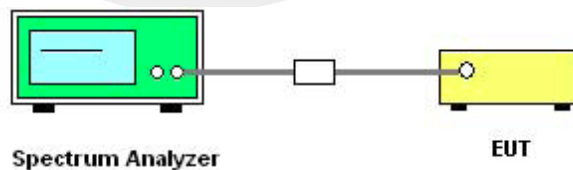
Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2300– 2403 MHz Upper Band Edge: 2479 – 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

Remark : Hopping on and Hopping off mode all have been tested,only worst case hopping off is reported.

4.3 TEST SETUP



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

4.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

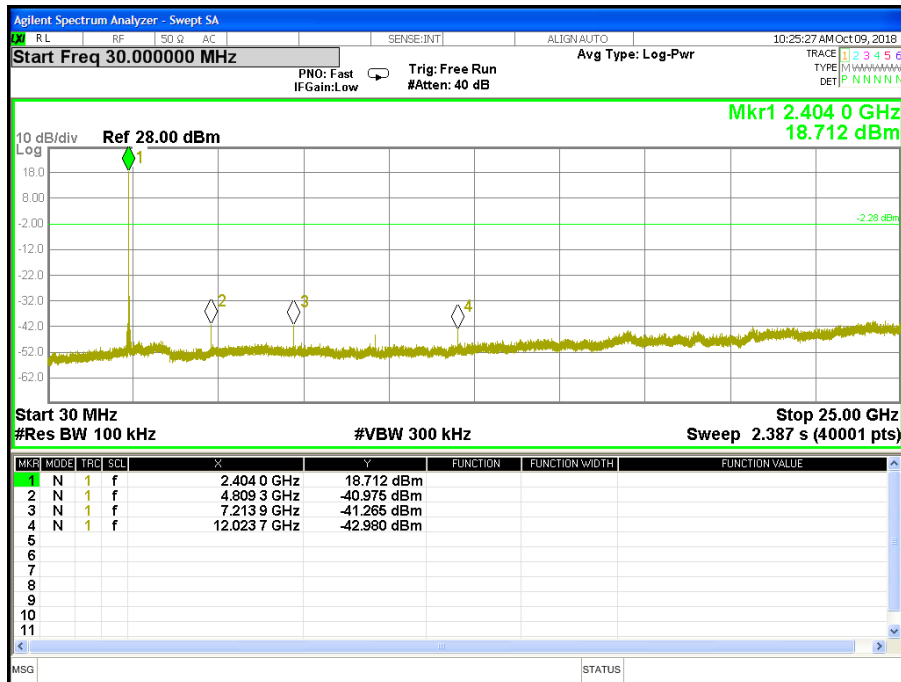


4.5 TEST RESULTS

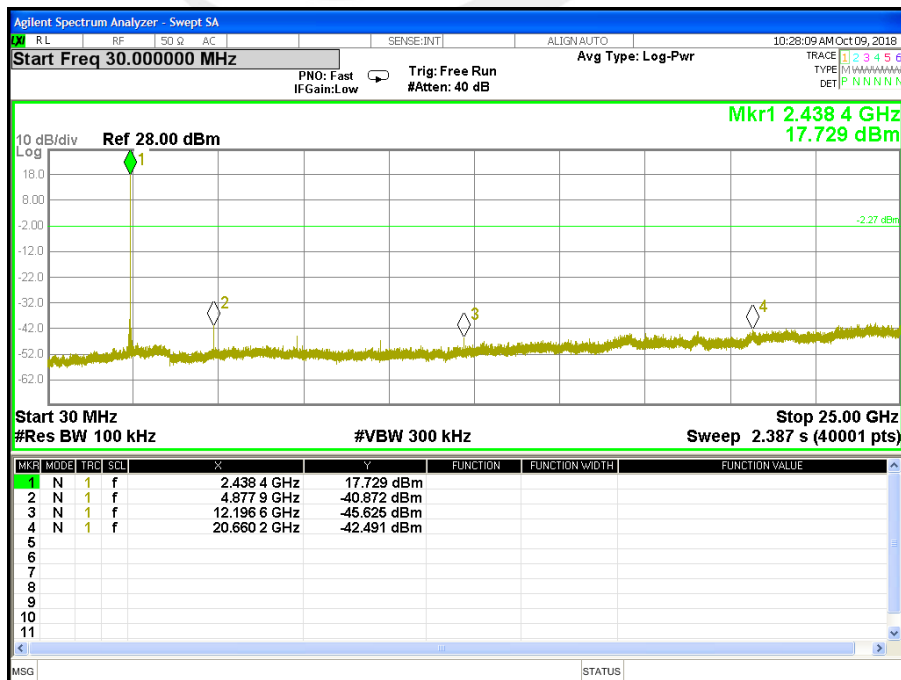
Note: Antenna A power > Antenna B power, Antenna A and Antenna B have test, Antenna A and Antenna B can't transmit in the same time, only provides the worst case of antenna A.

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	FSK(1Mbps)-01/116/231/256 CH	Test Voltage:	DC 5V

Ant. A
01 CH

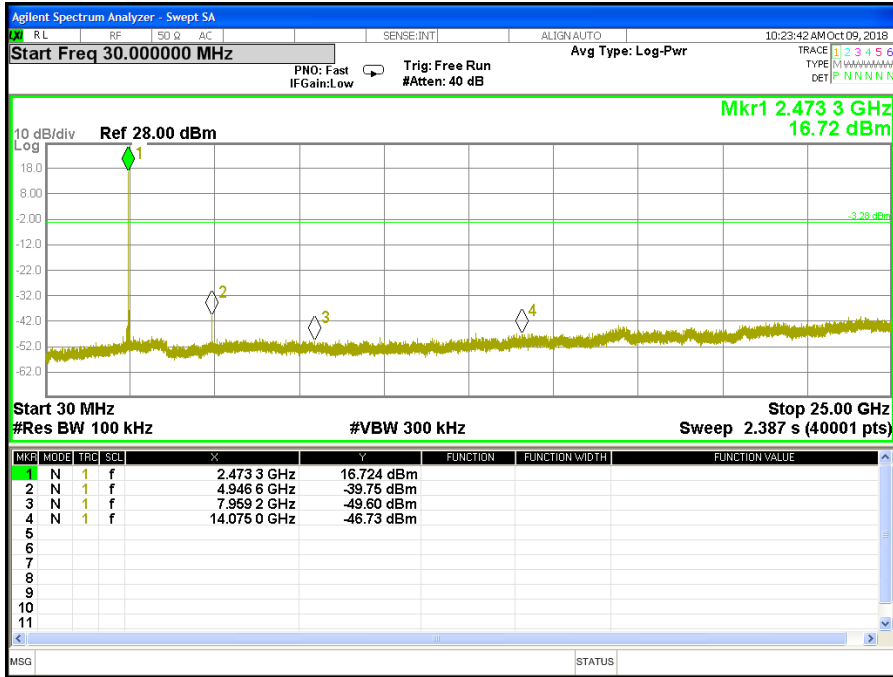


116 CH

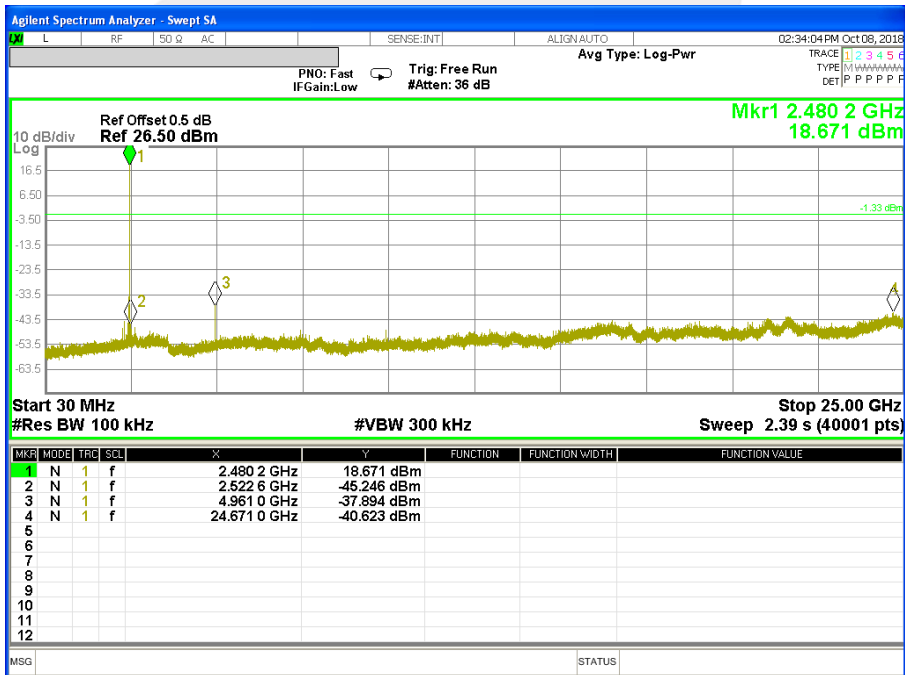




231 CH



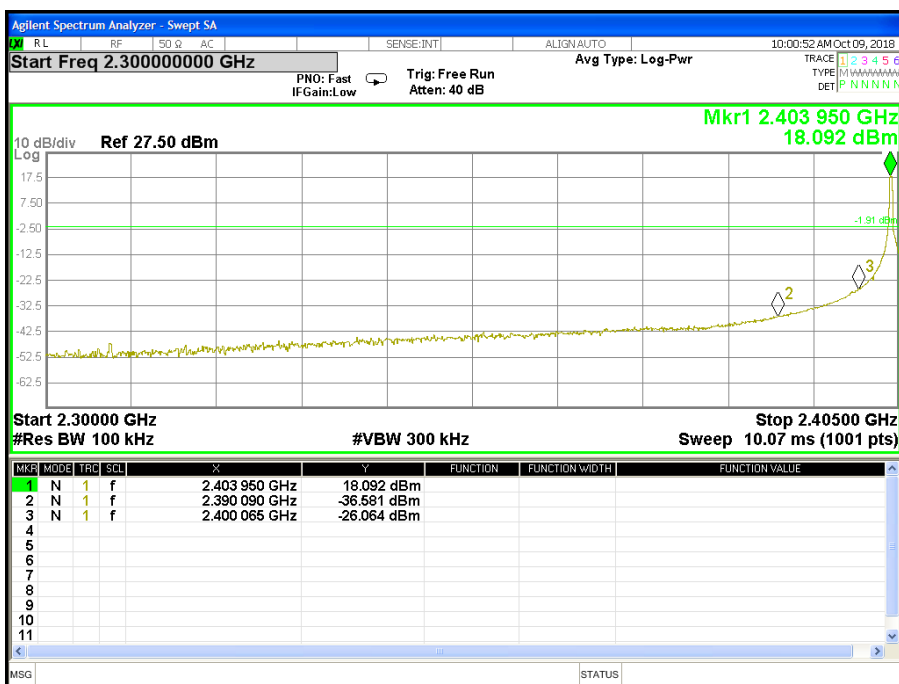
256 CH



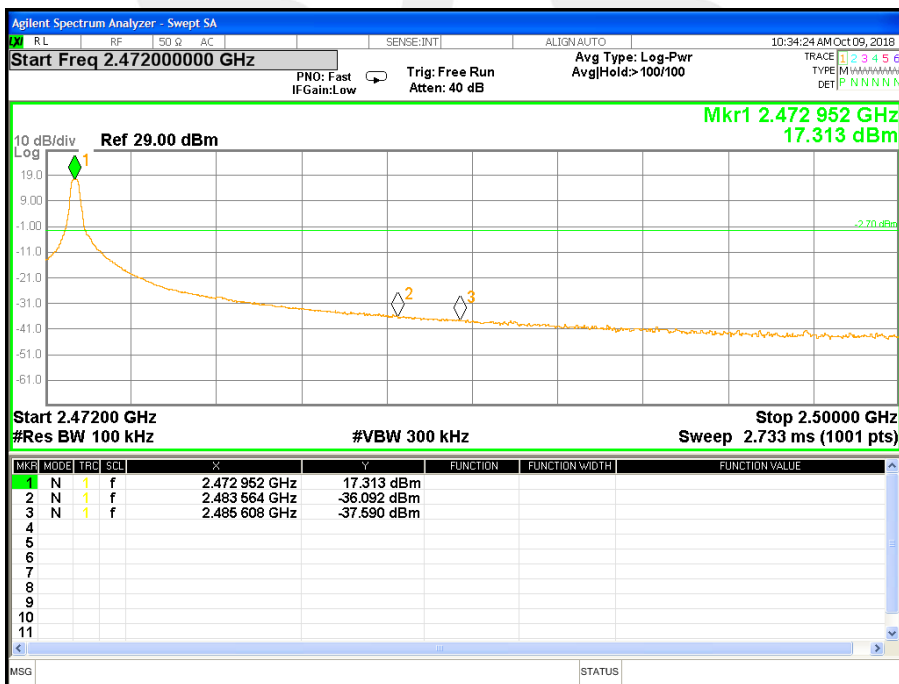


For Band edge

01 CH

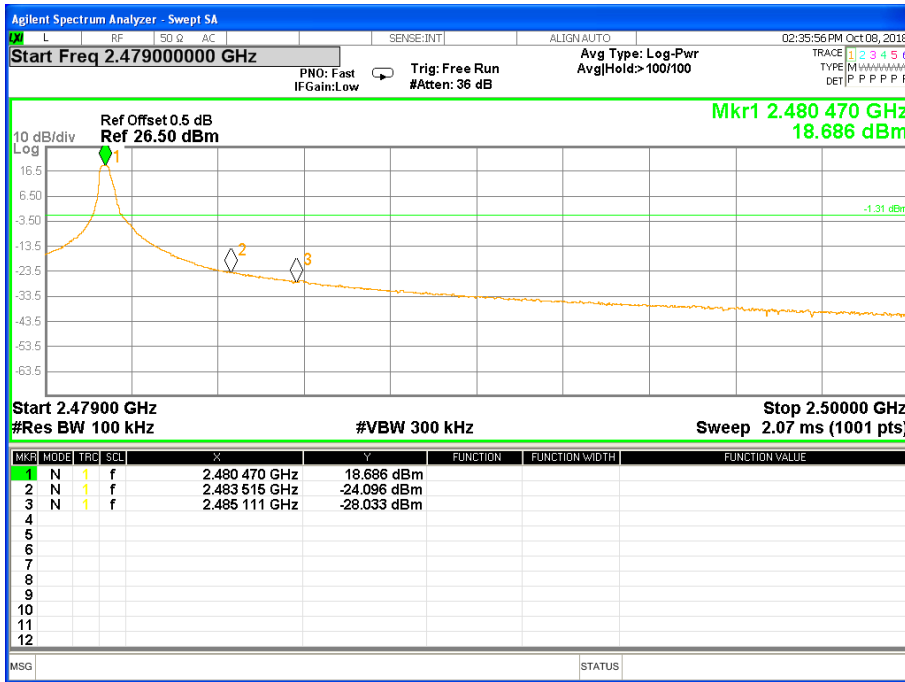


231 CH





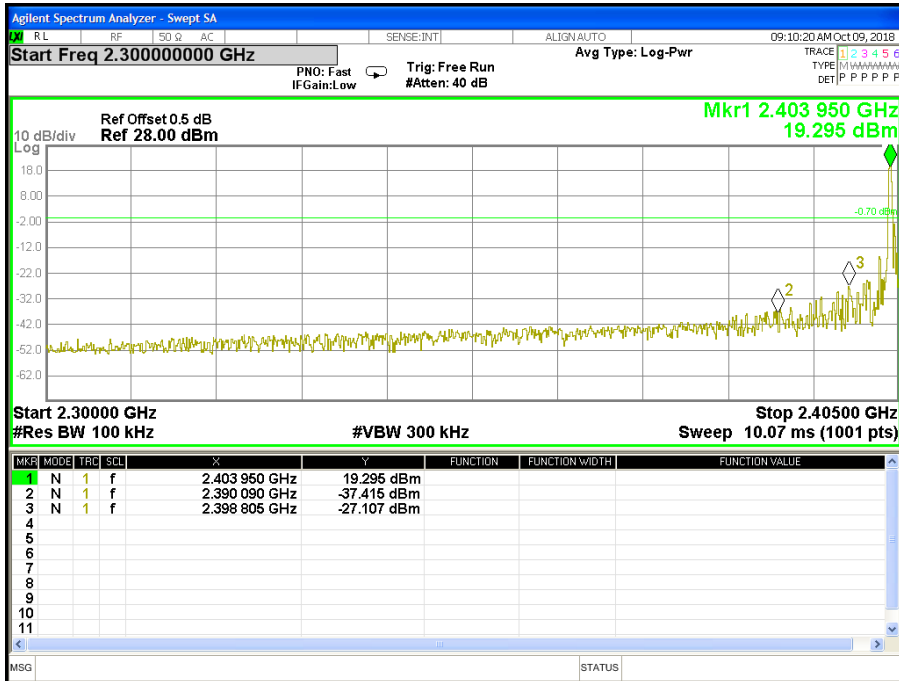
256 CH



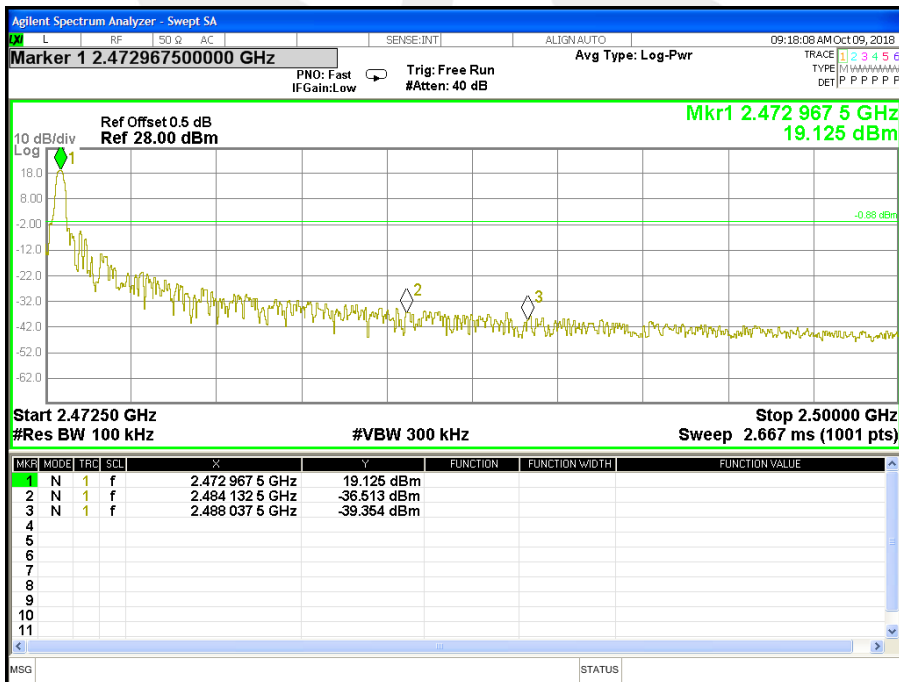


For Hopping Band edge

01 CH



231 CH





5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

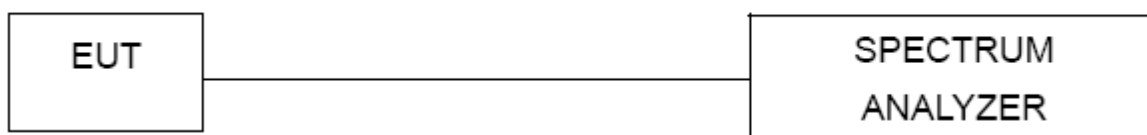
FCC Part 15.247, Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	1MHz
VB	1MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = Auto.

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



5.5 TEST RESULTS

Note: Antenna A power > Antenna B power, Antenna A and Antenna B have test, Antenna A and Antenna B can't transmit in the same time, only provides the worst case of antenna A.

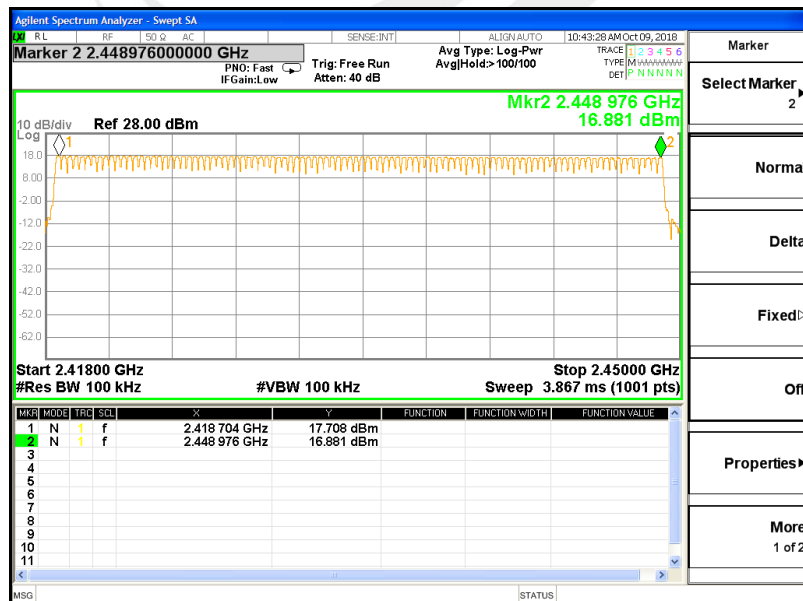
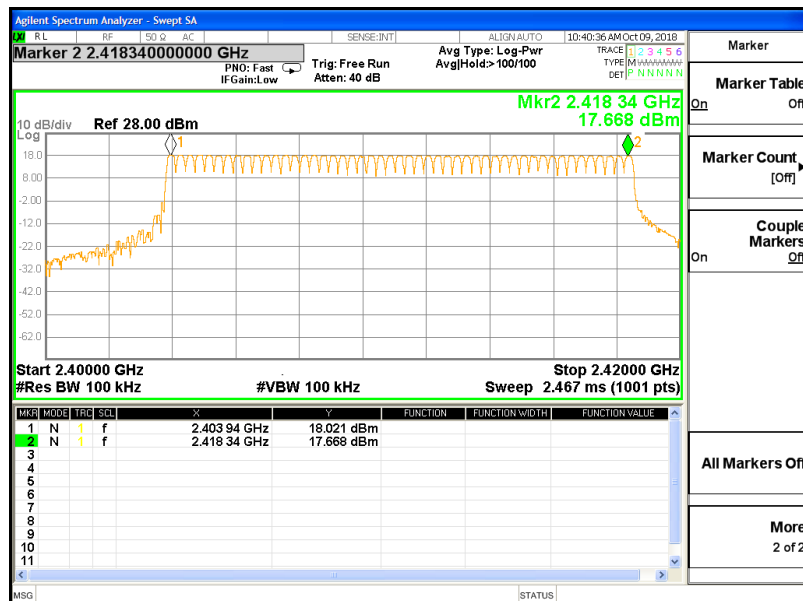
Temperature:	25°C	Relative Humidity:	60%
Test Mode:	Hopping Mode-FSK Mode	Test Voltage:	DC 5V

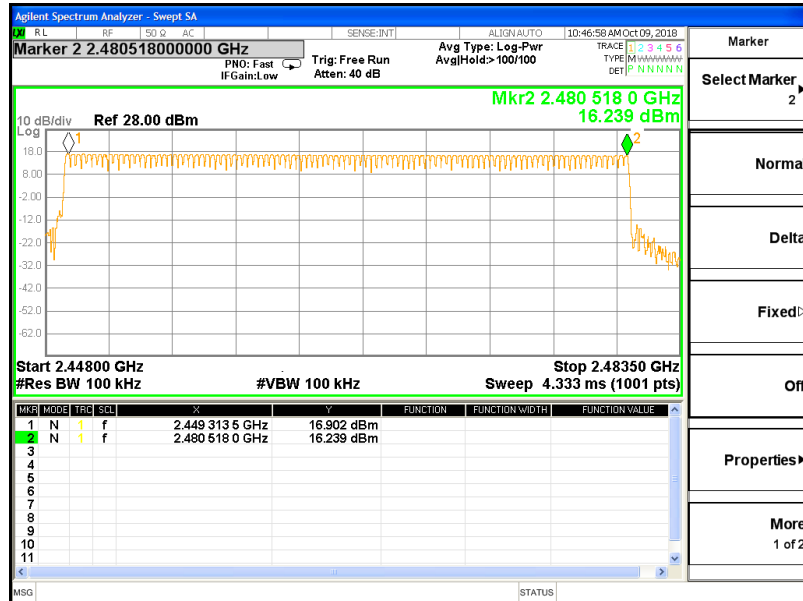
Ant. A

Number of Hopping Channel

256

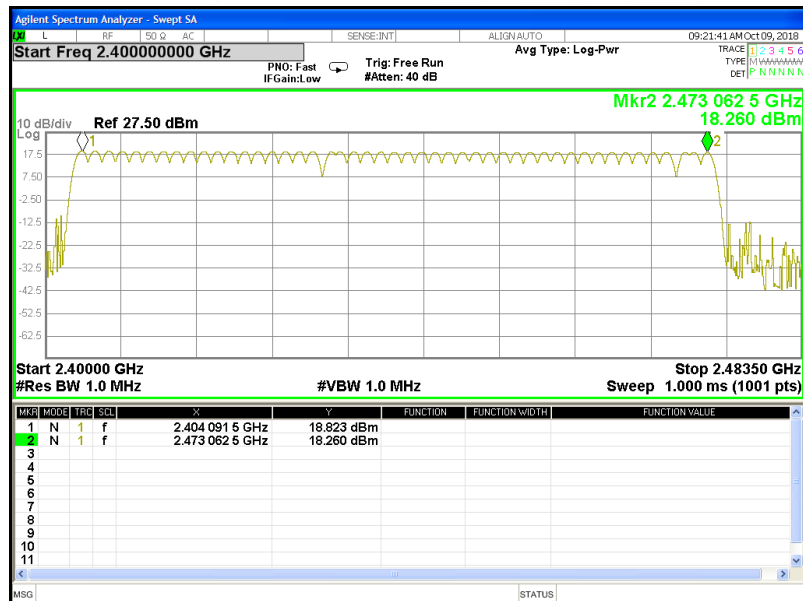
Hopping channel





Number of Hopping Channel 47

Hopping channel



6. AVERAGE TIME OF OCCUPANCY

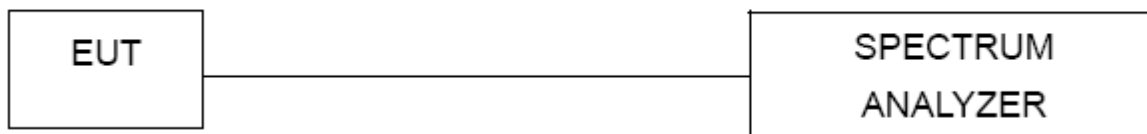
6.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247, Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

6.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyzer
- b. Set RBW =1MHz/VBW =3MHz.
- c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- d. Sweep Time is more than once pulse time.
Set the center frequency on any frequency would be measure and set the frequency span to
- e. zero span.
- f. Measure the maximum time duration of one single pulse.
- g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
- h. Measure the maximum time duration of one single pulse.
- i. DH5 Packet permit maximum $1600 / 79 / 6 = 3.37$ hops per second in each channel (5 time slots RX, 1 time slot TX). So the dwell time is the time duration of the pulse times $3.37 \times 31.6 = 106.6$ within 31.6 seconds.
- j. DH3 Packet permit maximum $1600 / 79 / 4 = 5.06$ hops per second in each channel (3 time slots RX, 1 time slot TX). So the dwell time is the time duration of the pulse times $5.06 \times 31.6 = 160$ within 31.6 seconds.
- k. DH1 Packet permit maximum $1600 / 79 / 2 = 10.12$ hops per second in each channel (1 time slot RX, 1 time slot TX). So the dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



6.5 TEST RESULTS

Note: Antenna A power > Antenna B power, Antenna A and Antenna B have test, only provides the worst case of antenna A.

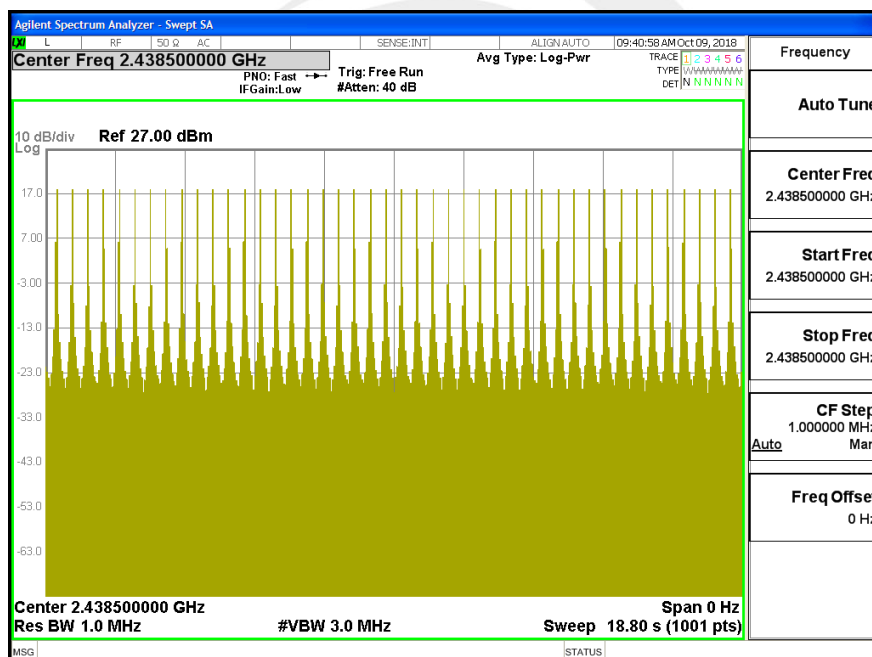
Temperature:	25°C	Relative Humidity:	50%
Test Mode:	FSK(1Mbps)-DH1	Test Voltage:	DC 5V

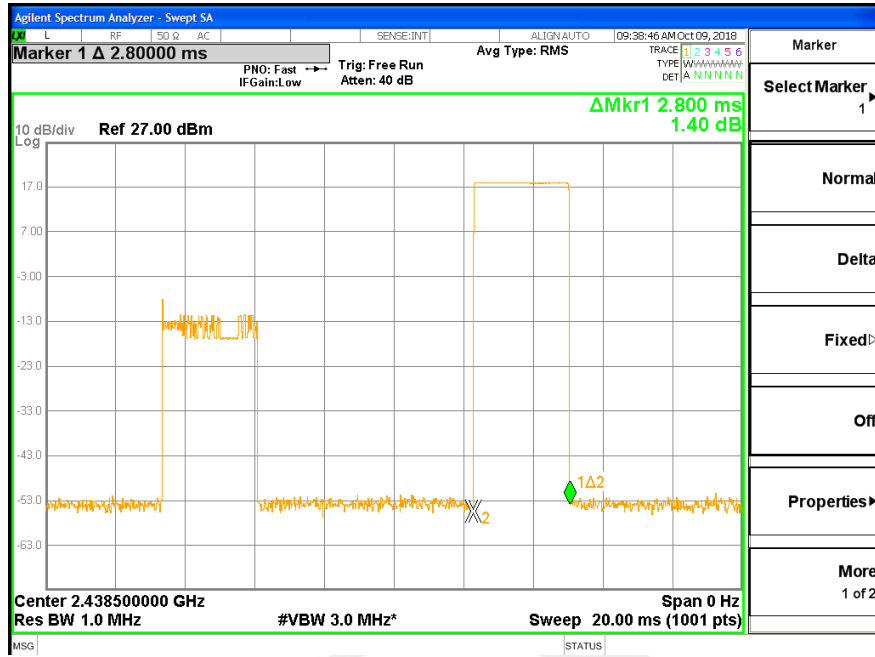
Ant. A

Data Packet	Frequency	Pulse Duration(ms)	Number	Dwell Time(s)	Limits(s)
DH1	2438.5 MHz	2.800	44	0.12320	0.4

Ant. A

CH116-DH1





7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 APPLIED PROCEDURES / LIMIT

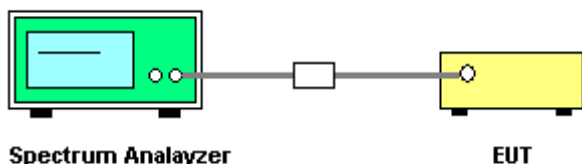
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> 20 dB Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.



7.5 TEST RESULTS

Note: Antenna A power > Antenna B power, Antenna A and Antenna B have test, only provides the worst case of antenna A.

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	CH01 / CH116 / CH231(FSK(1Mbps) Mode)	Test Voltage:	DC 5V

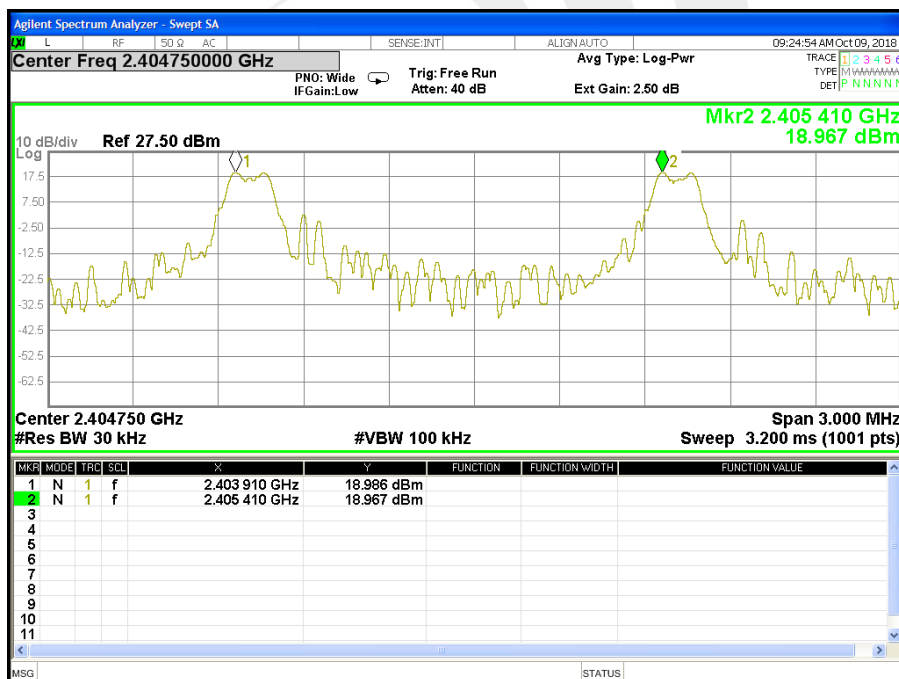
Ant. A

Frequency	Ch. Separation (MHz)	Limit	Result
2404 MHz	1.500	0.293	Complies
2438.5 MHz	1.500	0.315	Complies
2473 MHz	1.503	0.326	Complies

Ant. A

Ch. Separation Limits: > 20dB bandwidth

CH01 -1Mbps





CH116 -1Mbps



CH231 -1Mbps





8. BANDWIDTH TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 15.247, Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

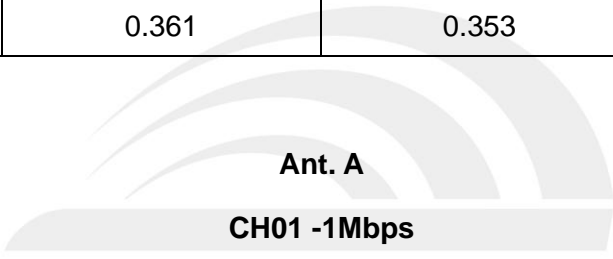


8.5 TEST RESULTS

Note: Antenna A power > Antenna B power, Antenna A and Antenna B have test, only provides the worst antenna of A plot.

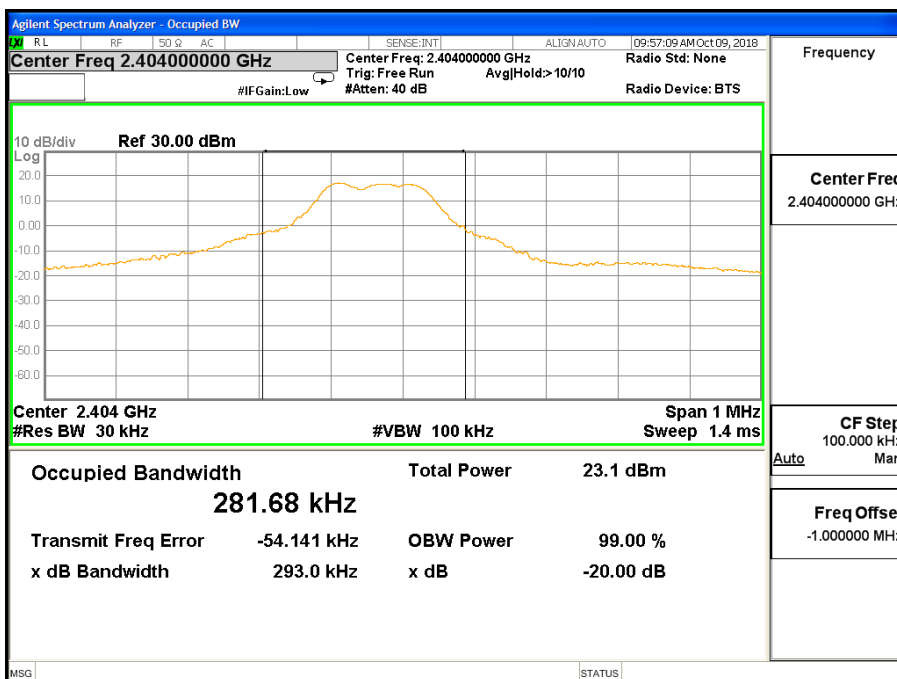
Temperature:	25°C	Relative Humidity:	50%
Test Mode:	FSK(1Mbps) CH01 / CH116/ CH231/CH256	Test Voltage:	DC 5V

Frequency	20dB Bandwidth/Ant. A (MHz)	20dB Bandwidth/Ant. B (MHz)	Result
2404 MHz	0.293	0.290	PASS
2438.5MHz	0.315	0.309	PASS
2473 MHz	0.326	0.321	PASS
2480.5 MHz	0.361	0.353	PASS



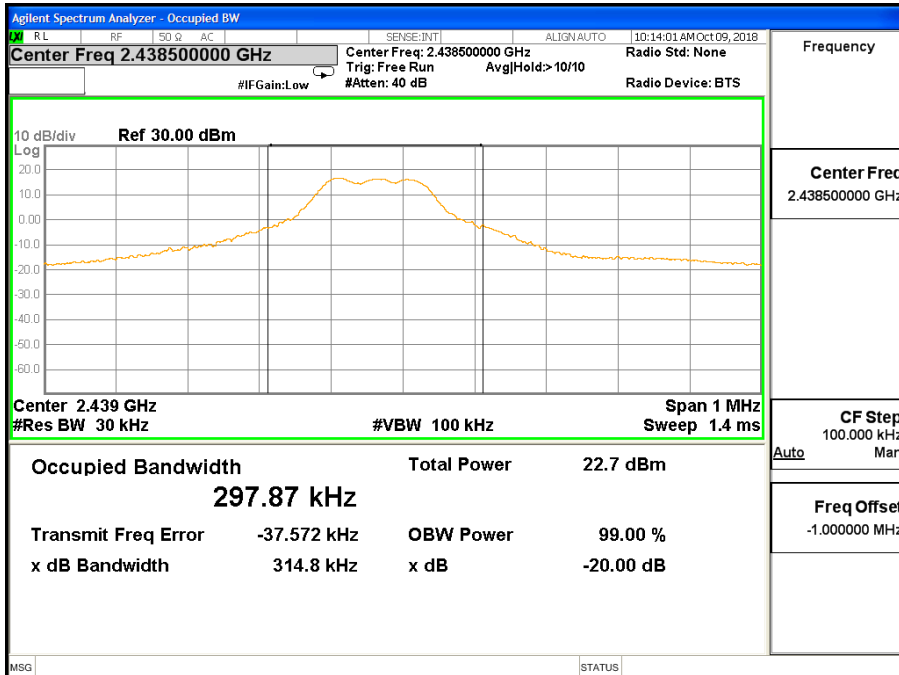
Ant. A

CH01 -1Mbps

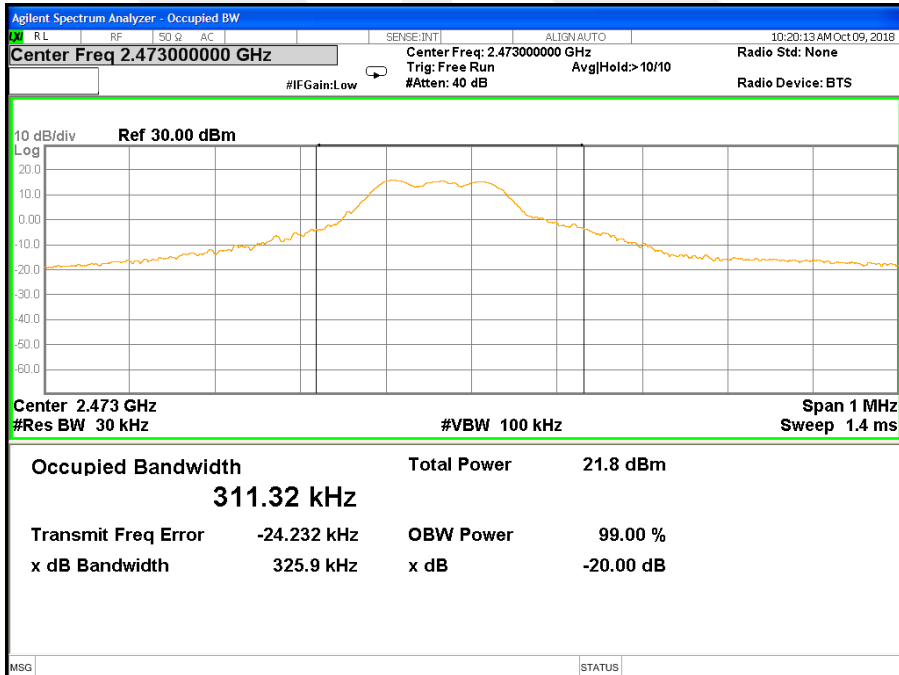




CH116 -1Mbps

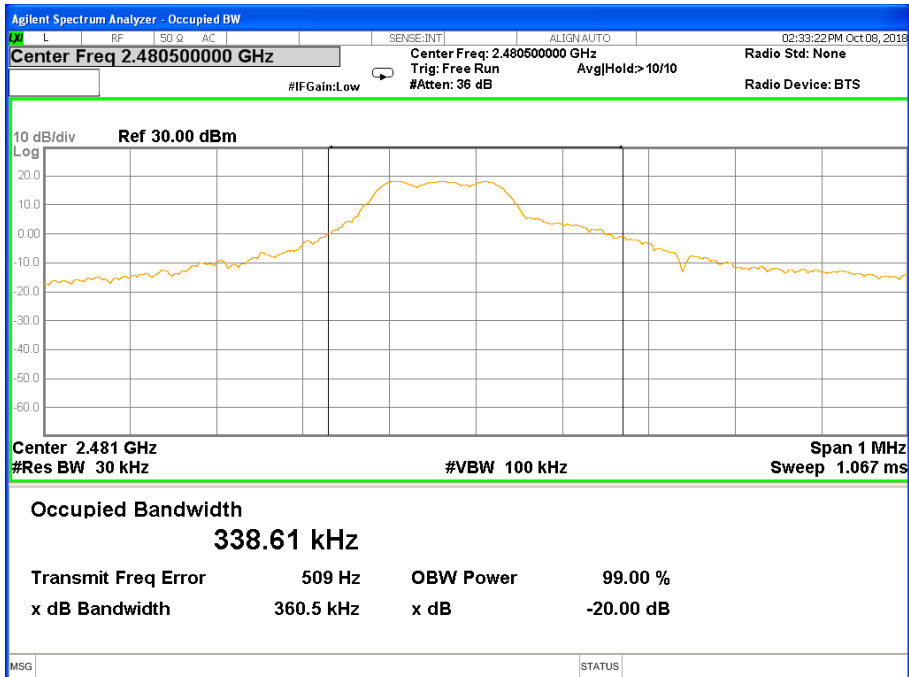


CH231 -1Mbps





CH256 -1Mbps





9. OUTPUT POWER TEST

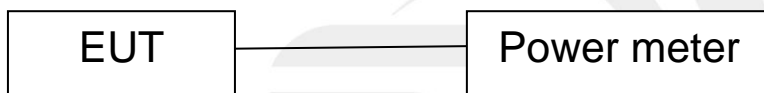
9.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247, Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)&(b)(1)	Output Power	1 W or 0.125W	2400-2483.5	PASS
		if channel separation > 2/3 bandwidth provided the systems operate with an output power no greater than 125 mW (20.97 dBm)		

9.2 TEST PROCEDURE

- a. The EUT was directly connected to the Power Meter

9.3 TEST SETUP



9.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



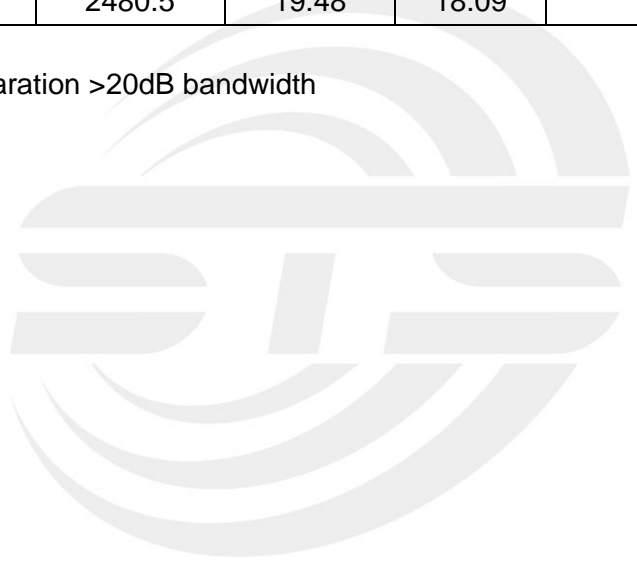
9.5 TEST RESULTS

Note: Antenna A power > Antenna B power, Antenna A and Antenna B can't transmit in the same time.

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 5V		

Mode	Channel Number	Frequency (MHz)	ANT A	ANT B	ANT A+ANT B	Limit
			(dBm)	(dBm)	(dBm)	(dBm)
FSK(1M)	1	2404	20.18	18.77	--	30
	116	2438.5	19.84	18.17	--	30
	231	2473	20.05	18.66	--	30
	256	2480.5	19.48	18.09	--	30

Note: the channel separation >20dB bandwidth





10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

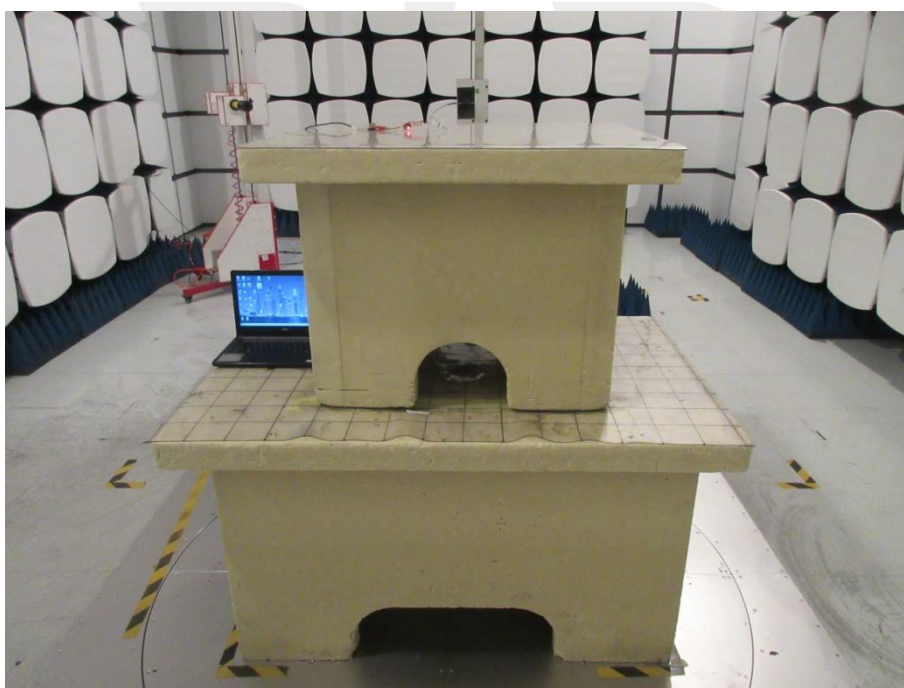
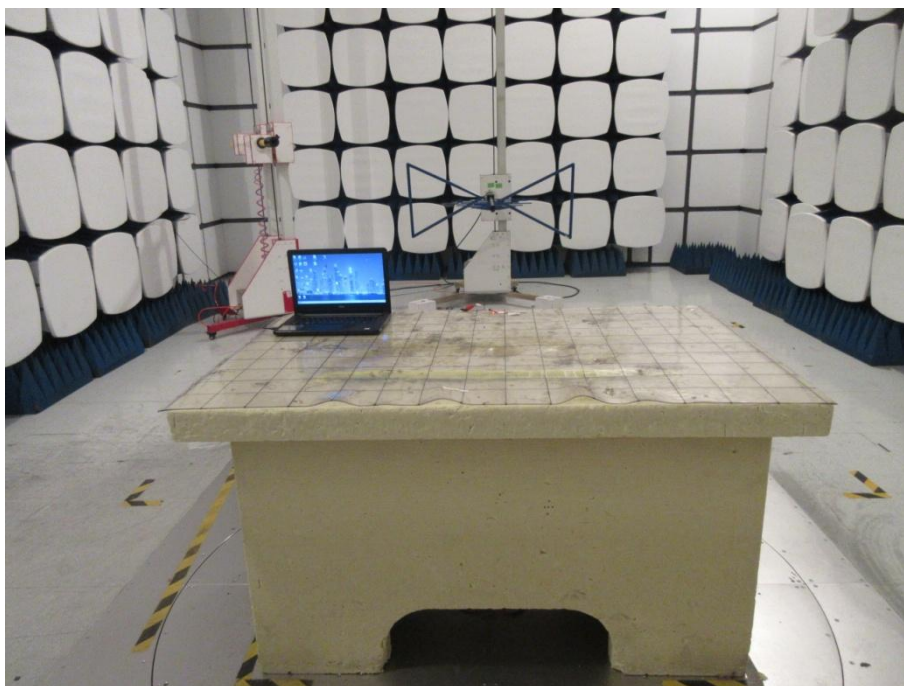
10.2 EUT ANTENNA

The EUT antenna is Dipole Antenna. It comply with the standard requirement.



APPENDIX-PHOTOS OF TEST SETUP

Radiated Measurement Photos



*****END OF THE REPORT*****