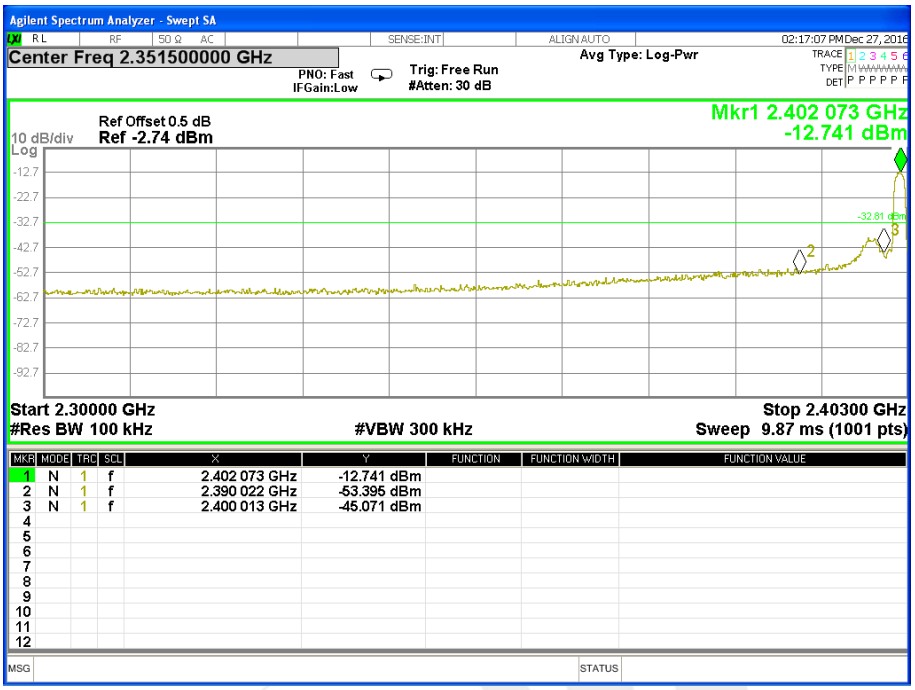
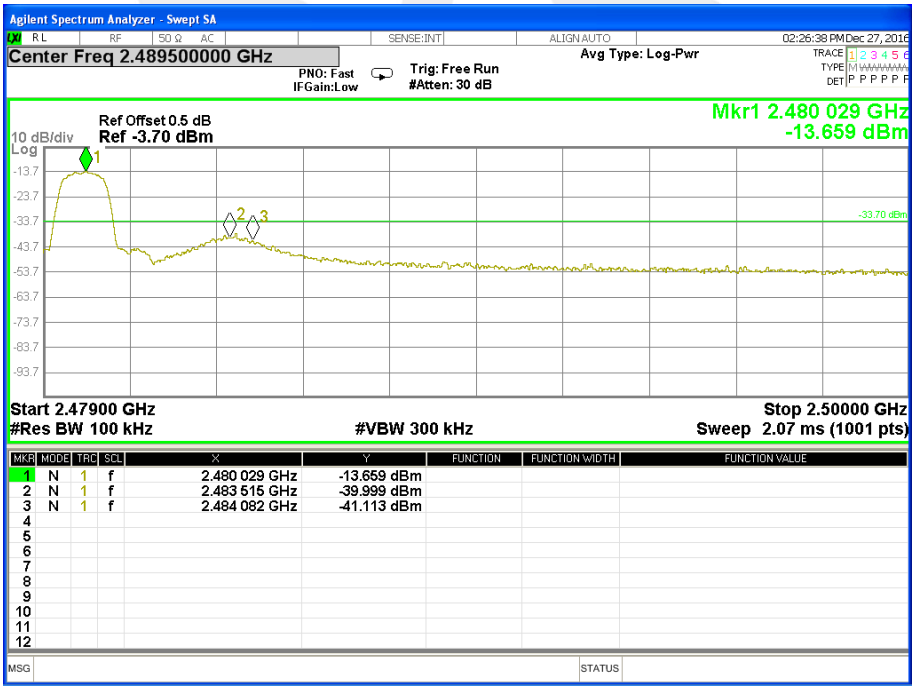
For Band edge

00 CH

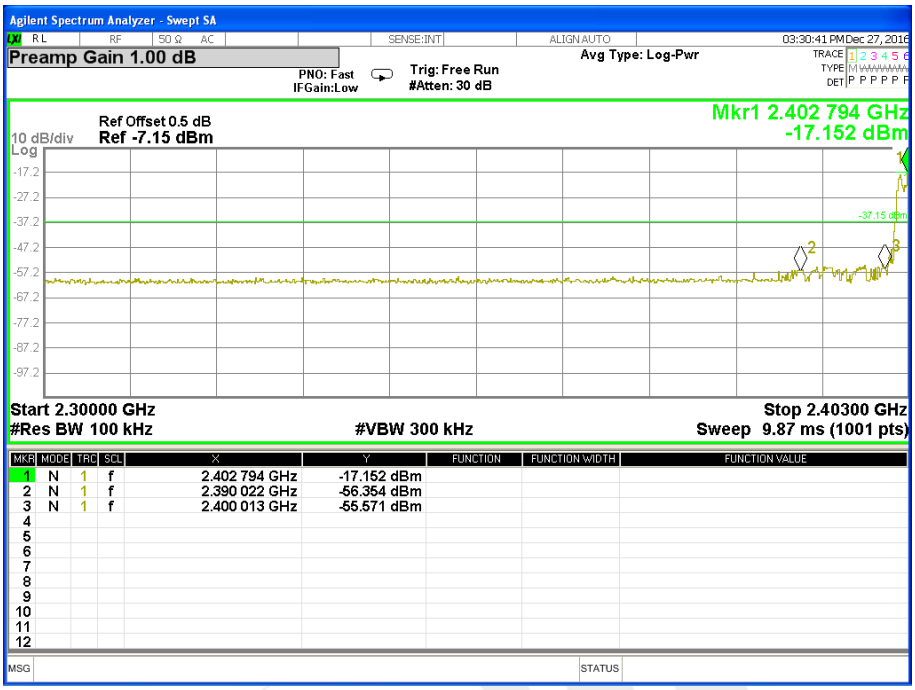


78 CH

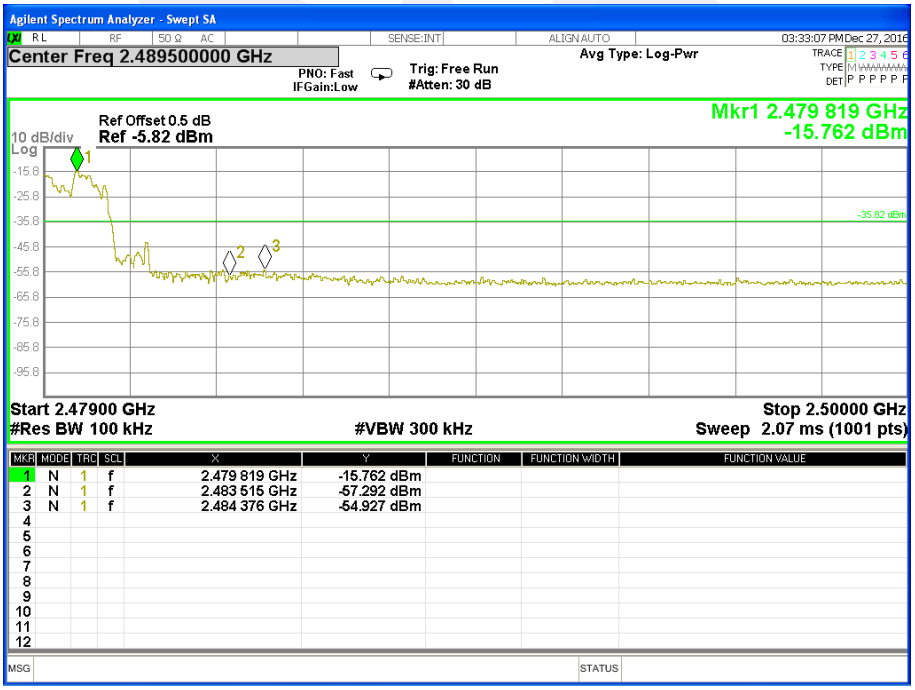


For Hopping Band edge

00 CH

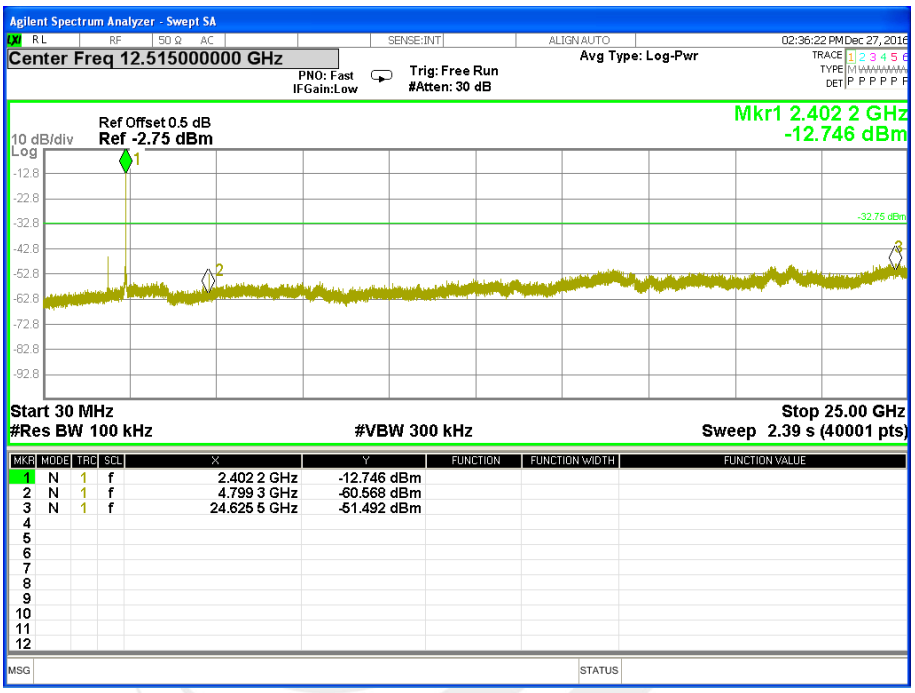


78 CH

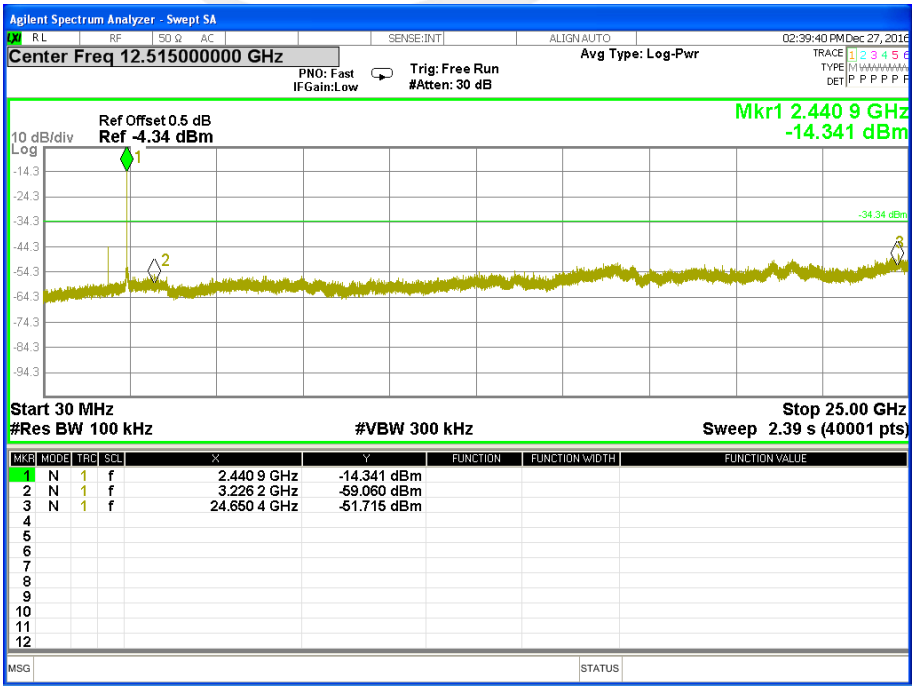


Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	8-DPSK(3Mbps) -00/39/78 CH		

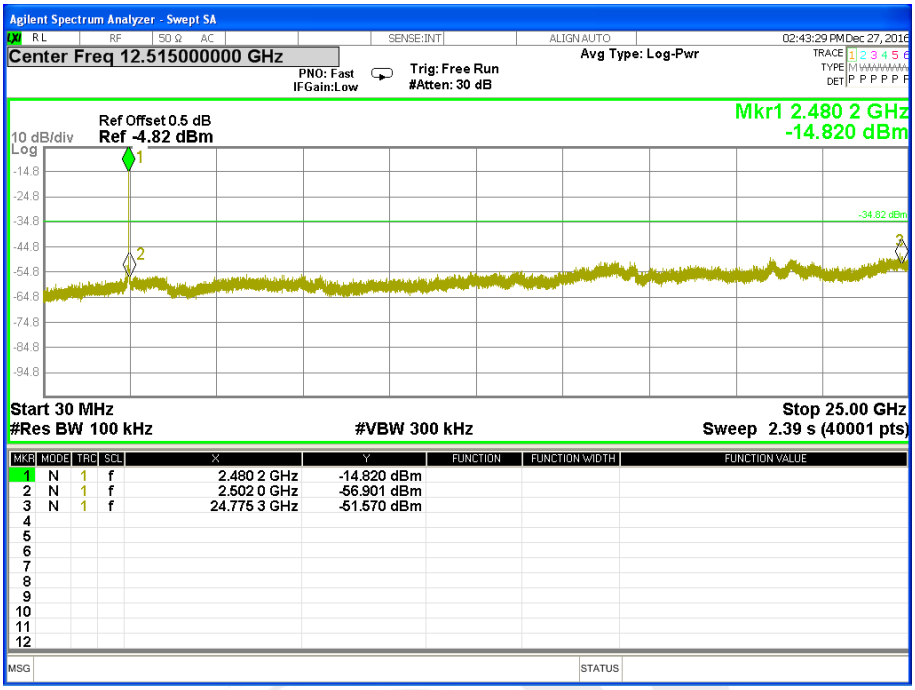
00 CH



39 CH

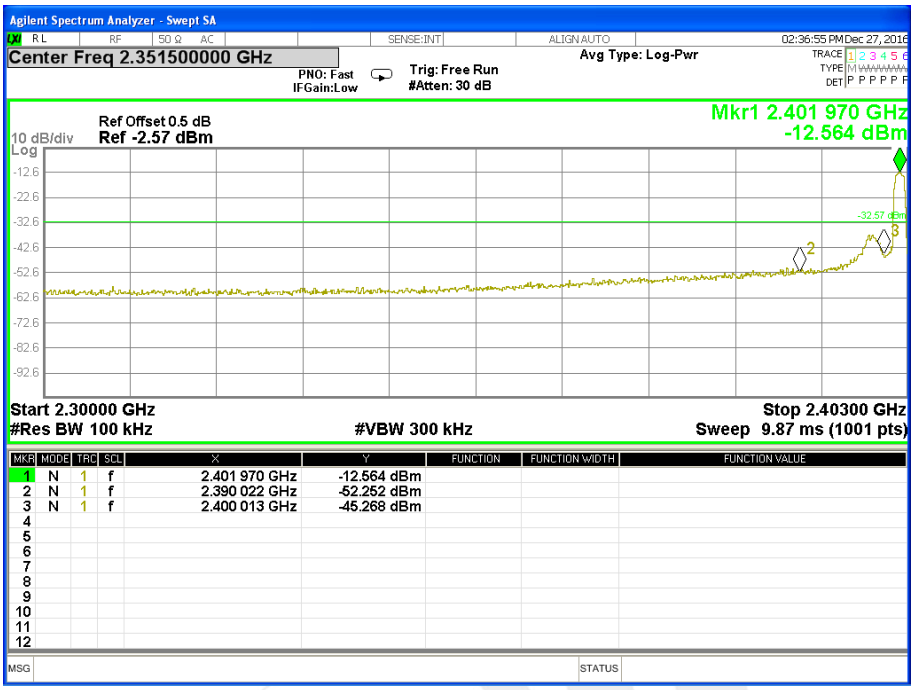


78 CH

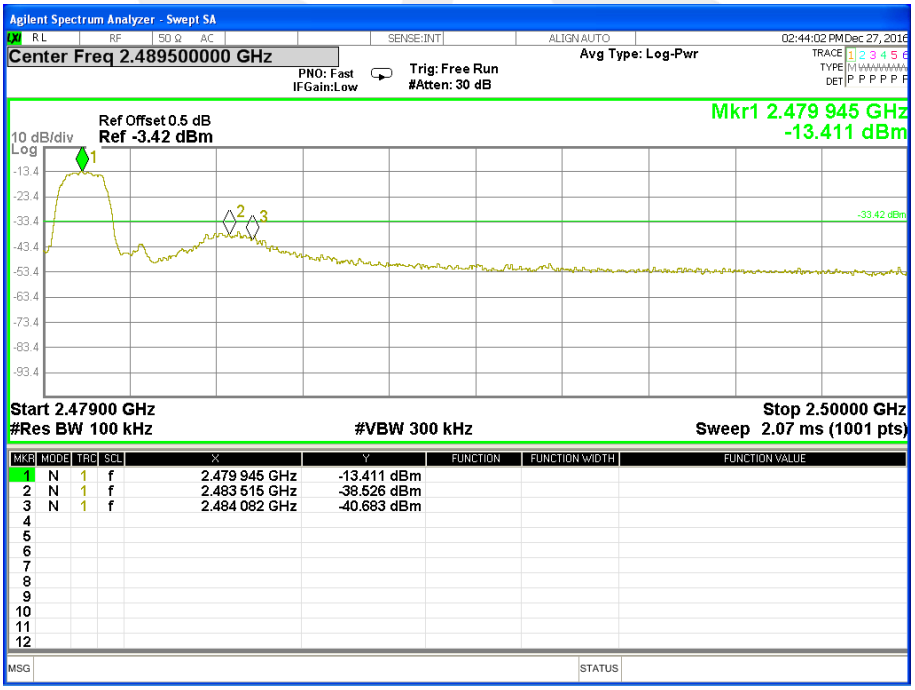

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
02:43:29 PM Dec 27, 2016
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P P P P P
Ref Offset 0.5 dB
10 dB/div
Log
Ref -4.82 dBm
Mkr1 2.480 2 GHz
-14.820 dBm
-14.8
-24.8
-34.8
-44.8
-54.8
-64.8
-74.8
-84.8
-94.8
-34.82 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.39 s (40001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.480 2 GHz -14.820 dBm
2 N 1 f 2.502 0 GHz -56.901 dBm
3 N 1 f 24.775 3 GHz -51.570 dBm
MSG
STATUS

For Band edge

00 CH

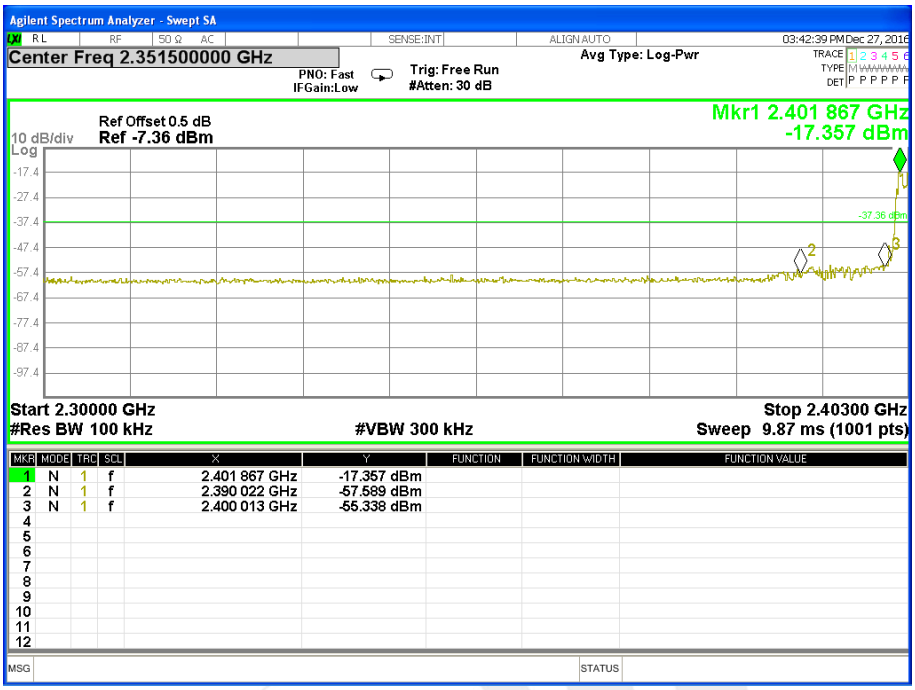


78 CH

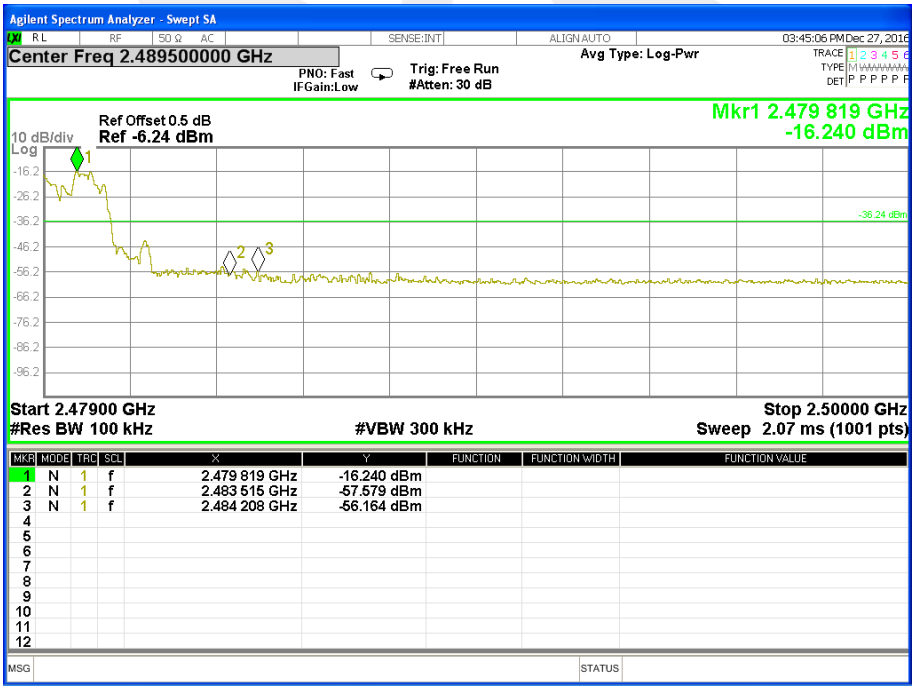


For Hopping Band edge

00 CH



78 CH



5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

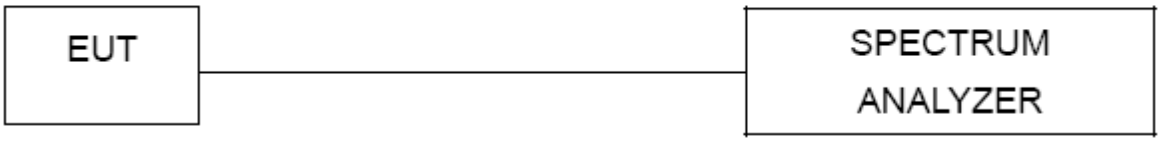
FCC Part 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	100KHz
VB	100KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

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

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

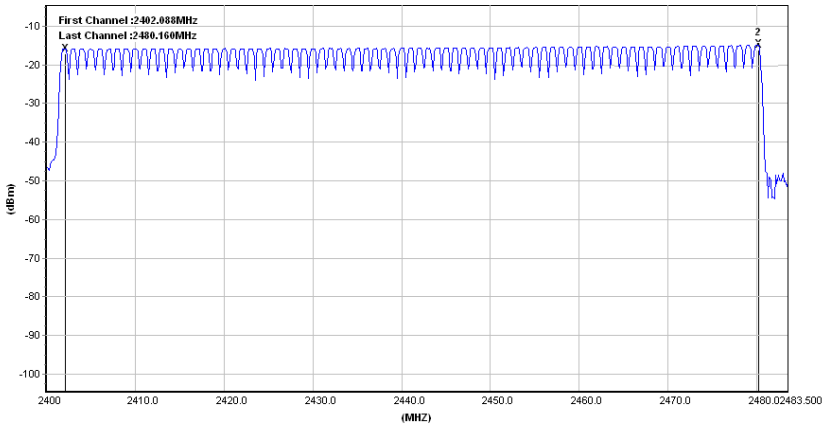
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.5 TEST RESULTS

Temperature：	25℃	Relative Humidity：	60%
Pressure：	1015 hPa	Test Voltage：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	Hopping Mode		

Number of Hopping Channel 79

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.
e. Set the center frequency on any frequency would be measure and set the frequency span to 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). Sothe dwell time is the time duration of the pulse times 3.37 x 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). Sothe dwell time is the time duration of the pulse times 5.06 x 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 x 31.6 = 320 within 31.6 seconds.

6.3 TEST SETUP

6.4 EUT OPERATION CONDITIONS

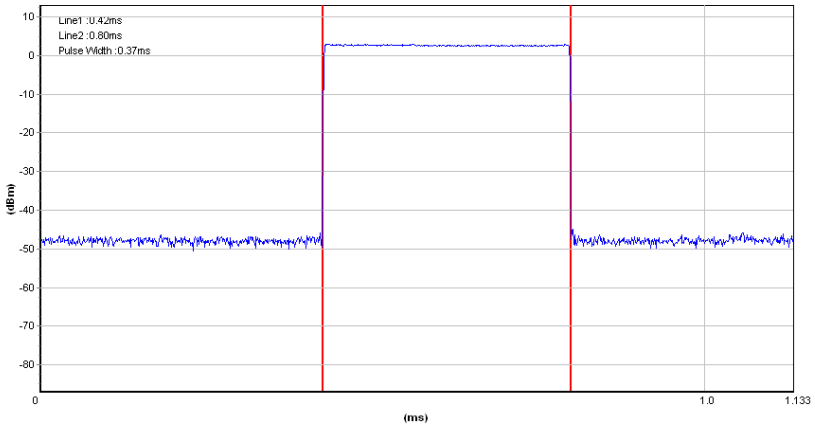
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

6.5 TEST RESULTS

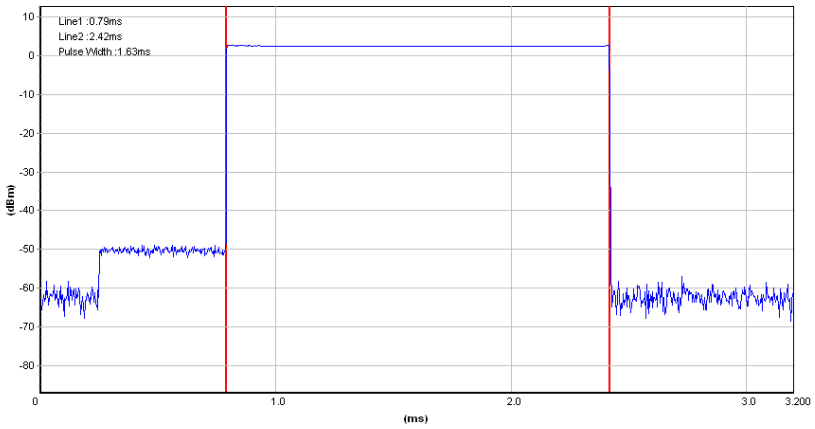
Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	GFSK(1Mbps)-DH1/DH3/DH5		

Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
DH1	2441 MHz	0.370	0.118	0.4
DH3	2441 MHz	1.630	0.261	0.4
DH5	2441 MHz	2.880	0.307	0.4

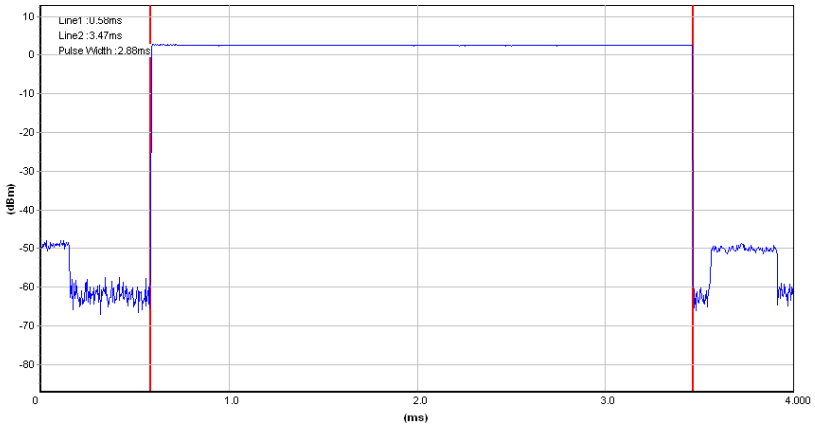
CH39-DH1



CH39-DH3



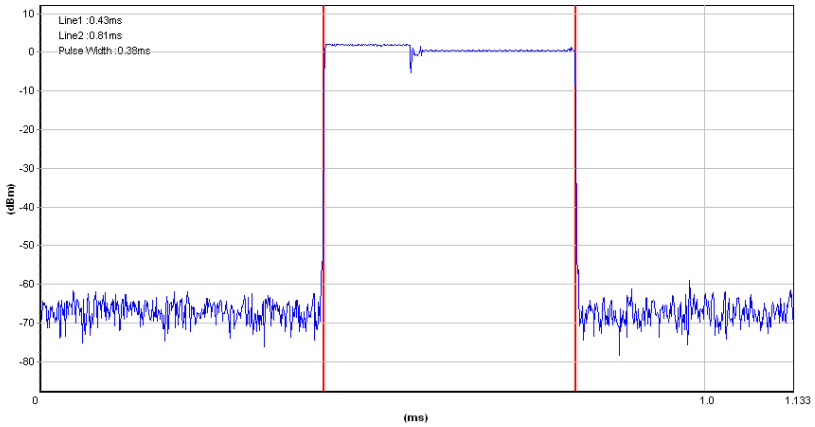
CH39-DH5



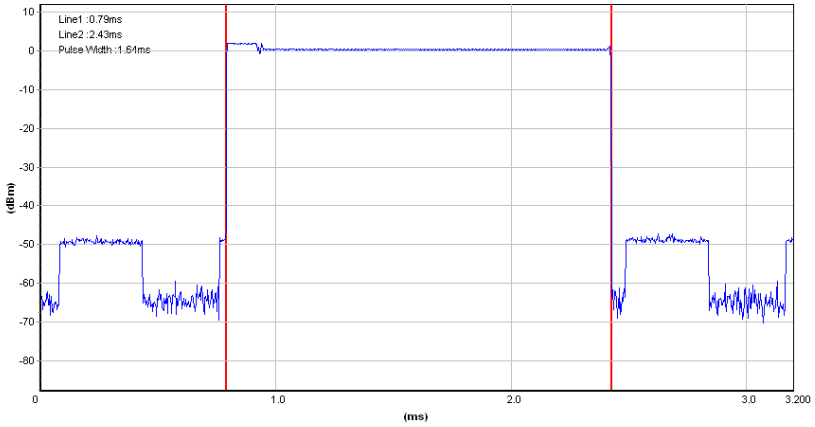
Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	π/4-DQPSK(2Mbps) –2DH1/2DH3/2DH5		

Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
2DH1	2441 MHz	0.380	0.122	0.4
2DH3	2441 MHz	1.640	0.262	0.4
2DH5	2441 MHz	2.880	0.307	0.4

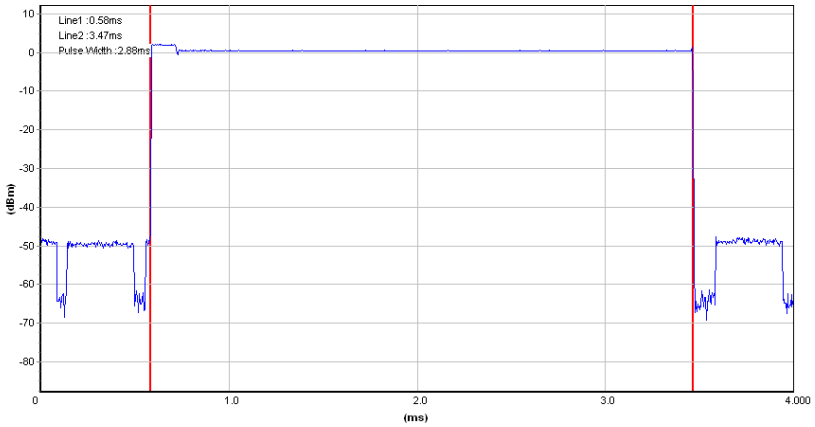
CH39-2DH1



CH39-2DH3



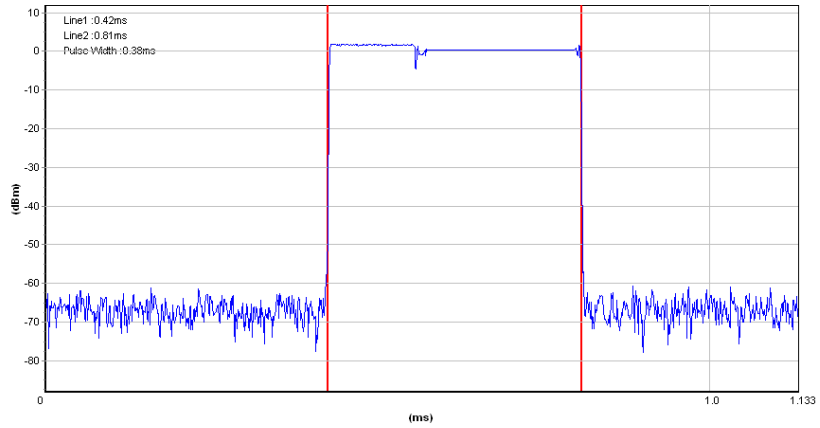
CH39-2DH5



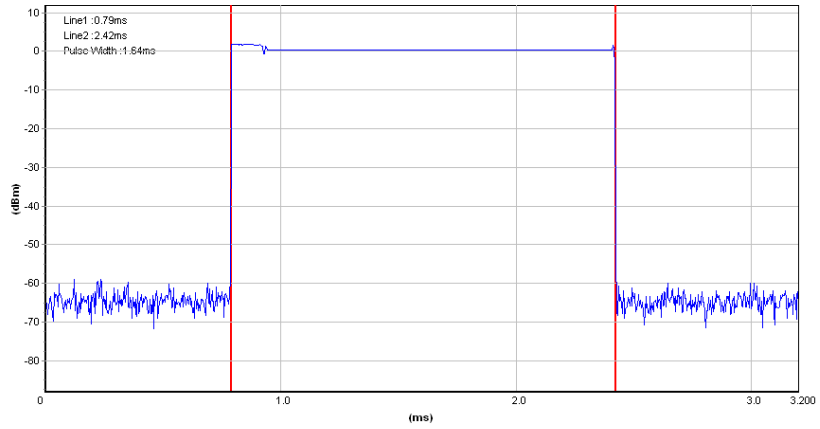
Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	8DPSK(3Mbps) –3DH1/3DH3/3DH5		

Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
3DH1	2441 MHz	0.380	0.122	0.4
3DH3	2441 MHz	1.640	0.262	0.4
3DH5	2441 MHz	2.890	0.308	0.4

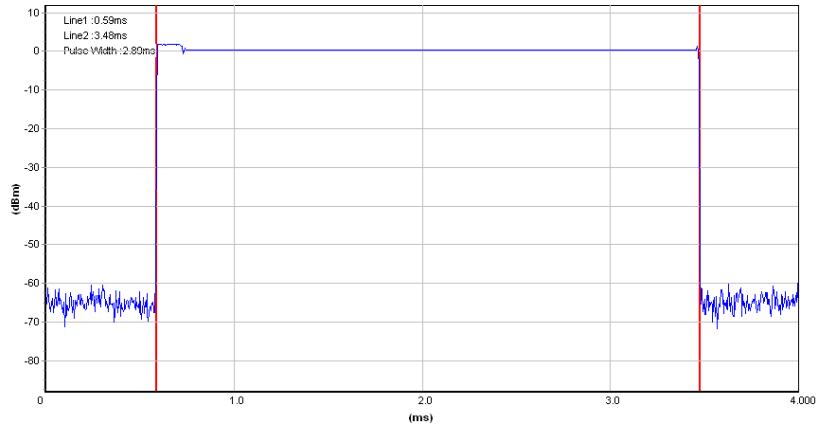
CH39-3DH1



CH39-3DH3



CH39-3DH5



7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 APPLIED PROCEDURES / LIMIT

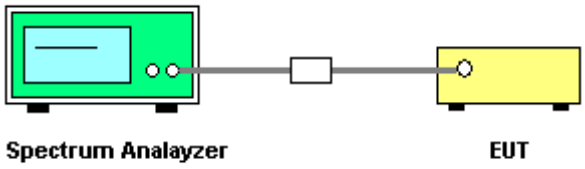
Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 20 dB bandwidth of the hopping channel, whichever is greater.

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

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

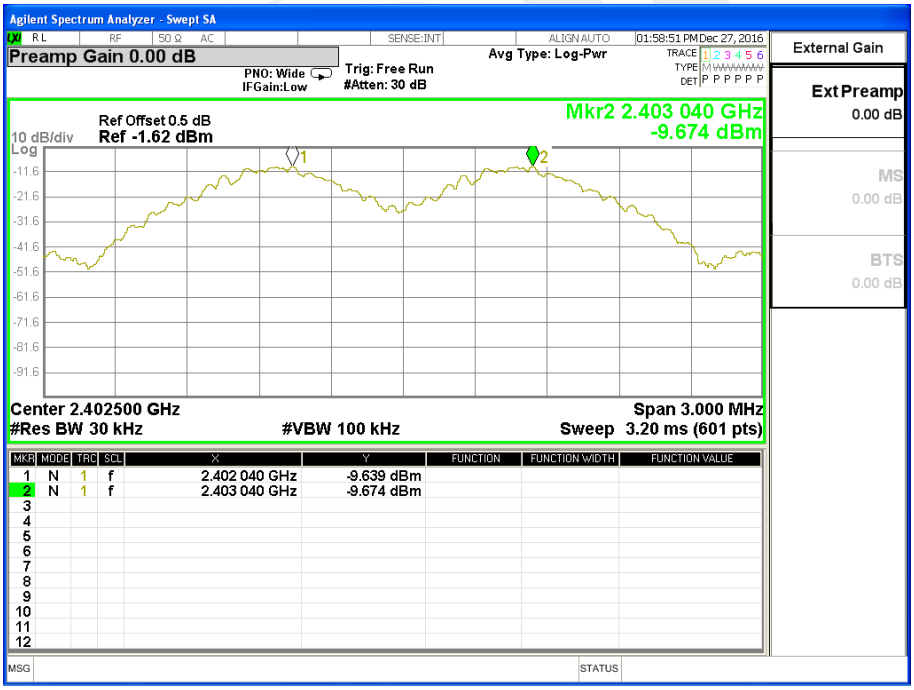
7.5 TEST RESULTS

Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	CH00 / CH39 /CH78 (GFSK(1Mbps) Mode)		

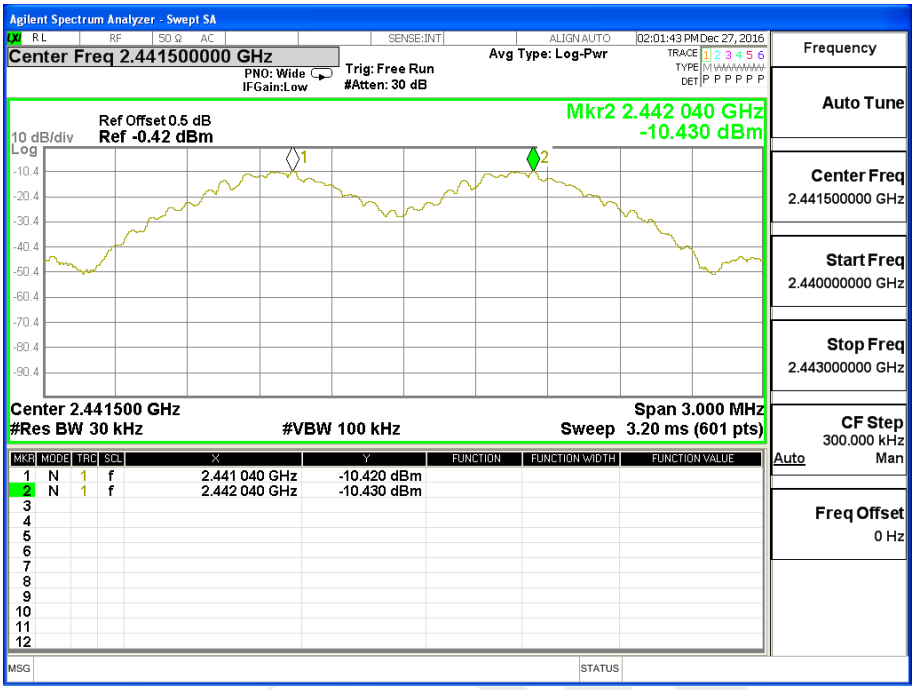
Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	1.000	0.733	Complies
2441 MHz	1.000	0.732	Complies
2480 MHz	1.000	0.733	Complies

For GFSK: Ch. Separation Limits: > two-thirds 20dB bandwidth

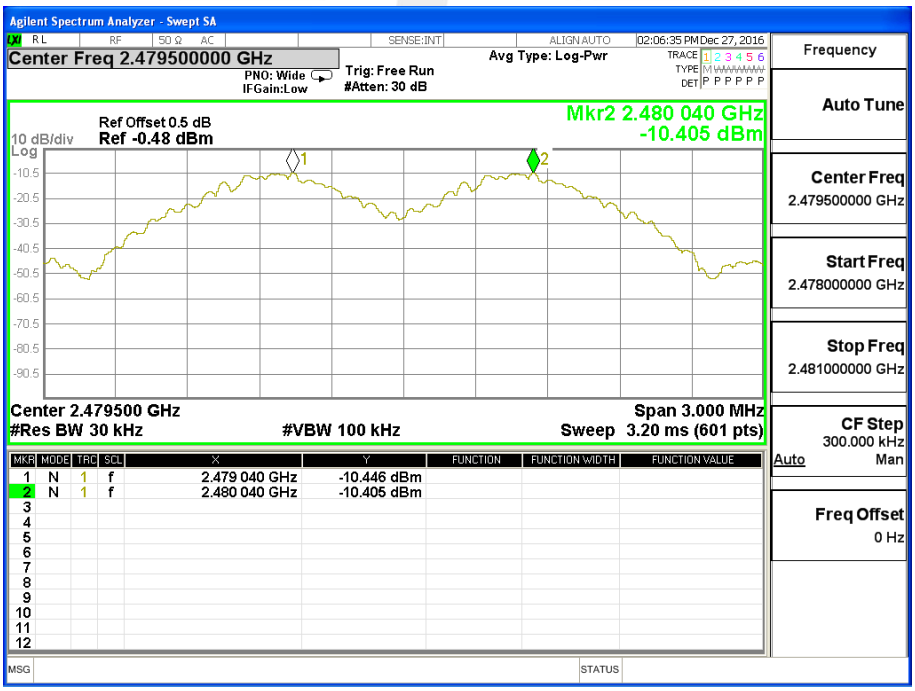
CH00 -1Mbps



CH39 -1Mbps



CH78 -1Mbps

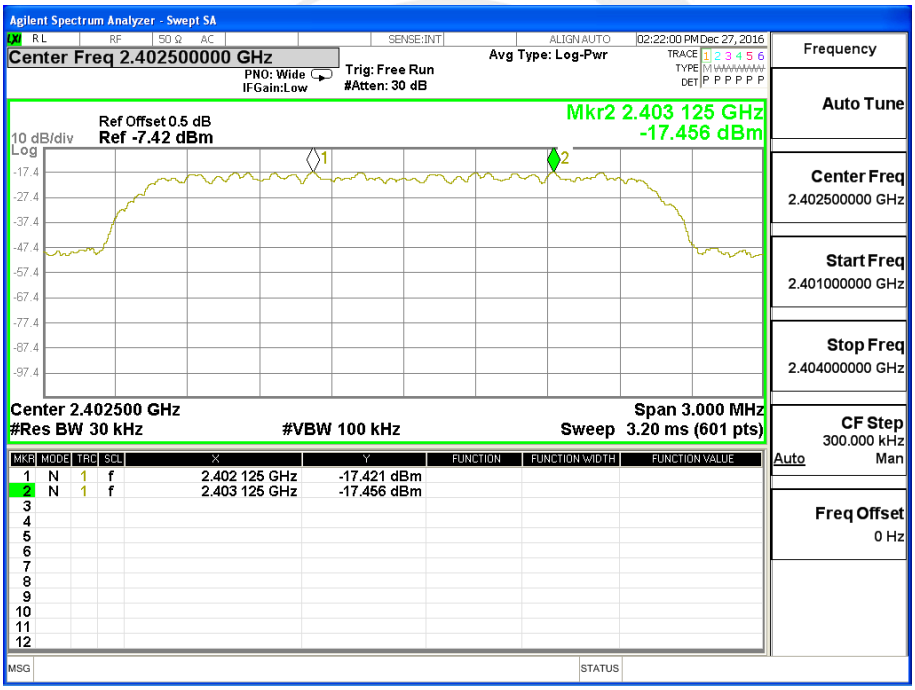


Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	CH00 / CH39 /CH78 (π/4-DQPSK(2Mbps) Mode)		

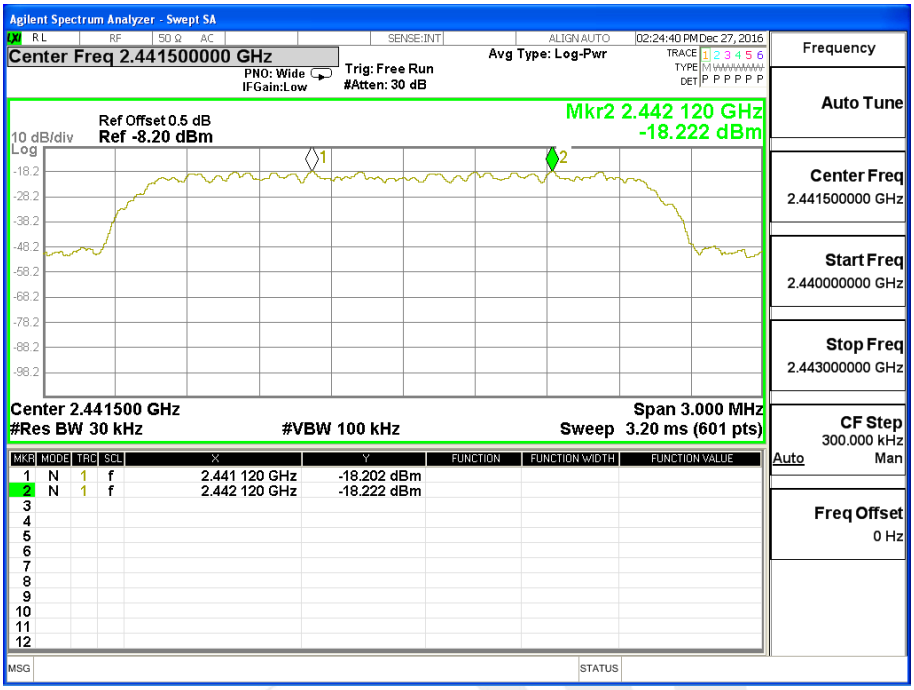
Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	1.000	0.913	Complies
2441 MHz	1.000	0.912	Complies
2480 MHz	1.000	0.913	Complies

For π/4-DQPSK(2Mbps): Ch. Separation Limits: > two-thirds 20dB bandwidth

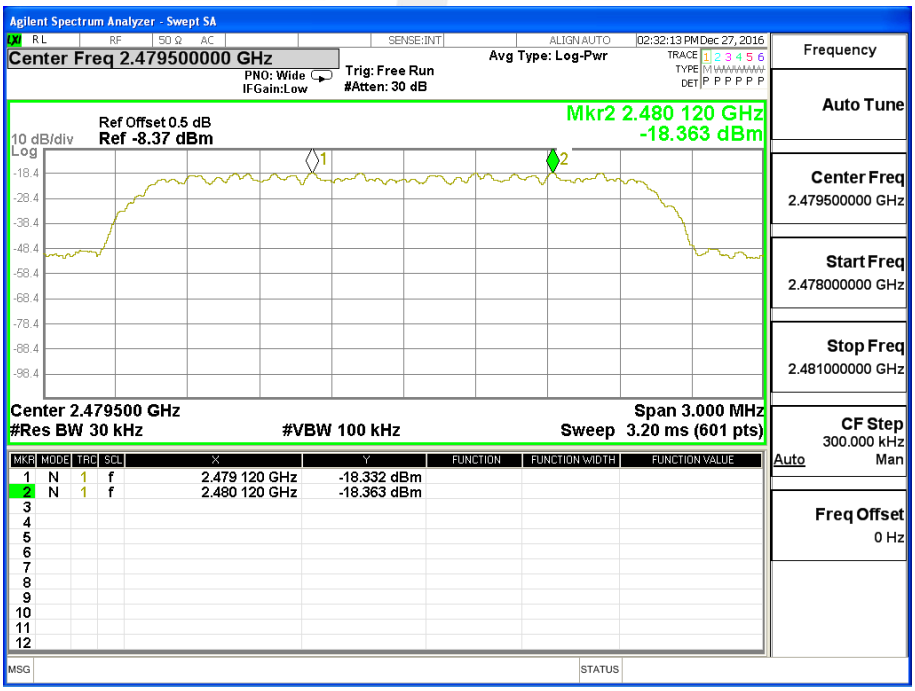
CH00 -2Mbps



CH39 -2Mbps



CH78 -2Mbps

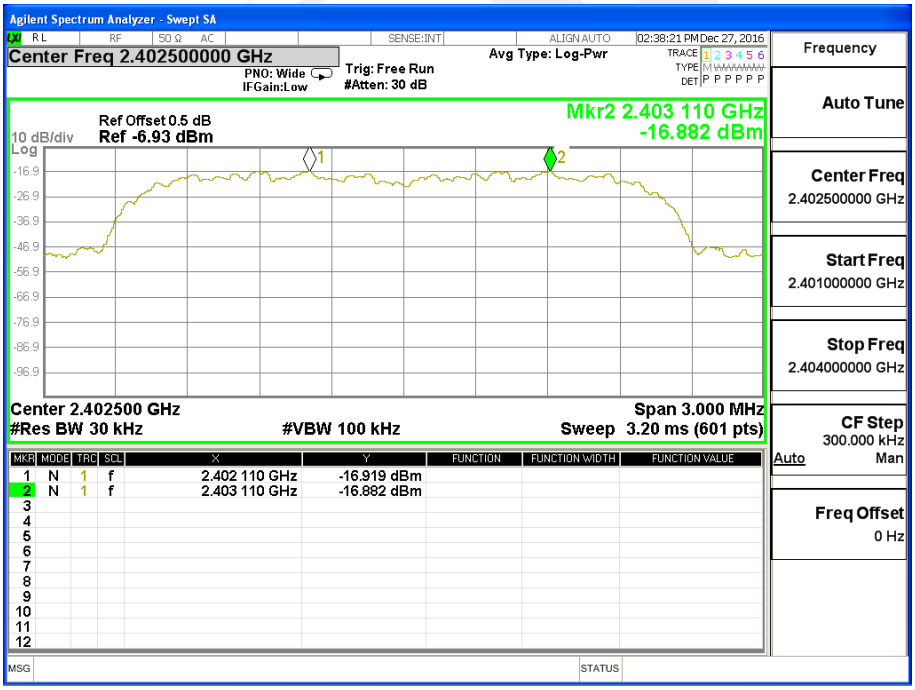


Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	CH00 / CH39 /CH78 (8-DPSK(3Mbps)Mode)		

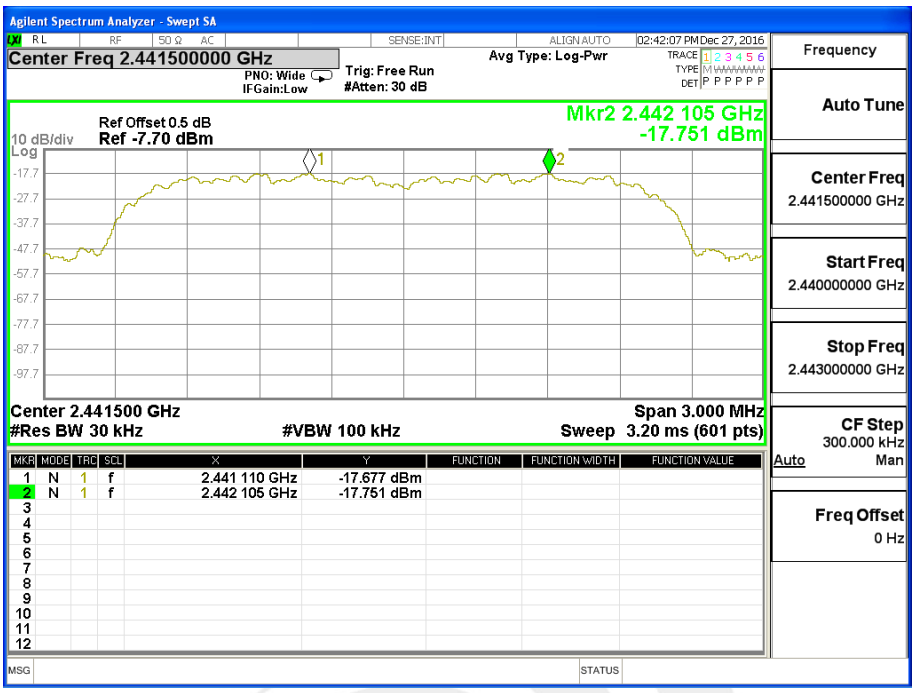
Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	1.000	0.901	Complies
2441 MHz	0.995	0.901	Complies
2480 MHz	1.005	0.901	Complies

For 8-DPSK(3Mbps):Ch. Separation Limits: > two-thirds 20dB bandwidth

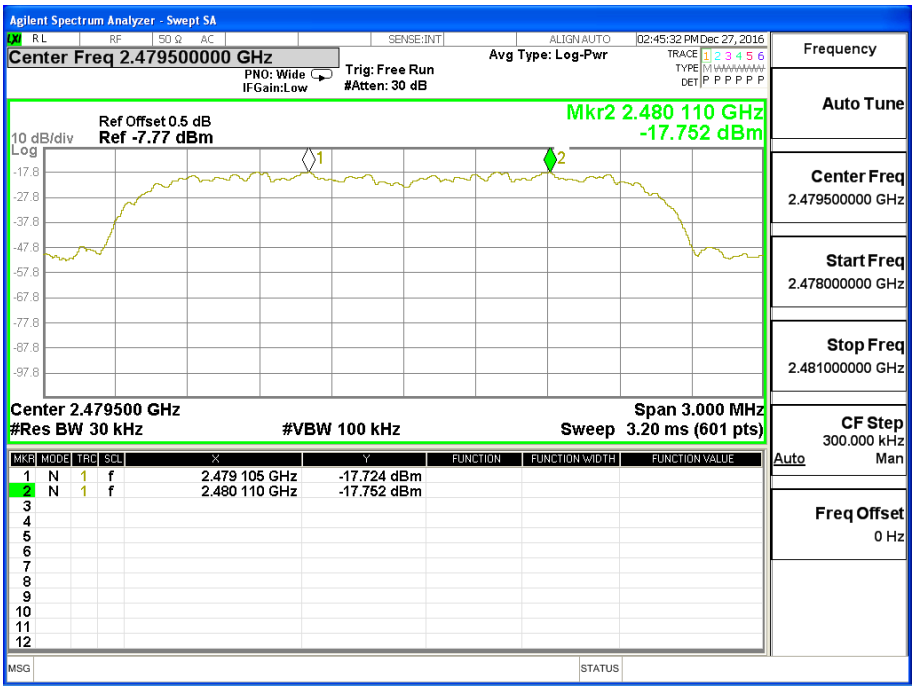
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



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

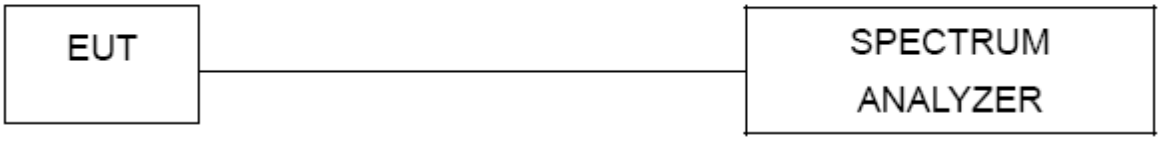
Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

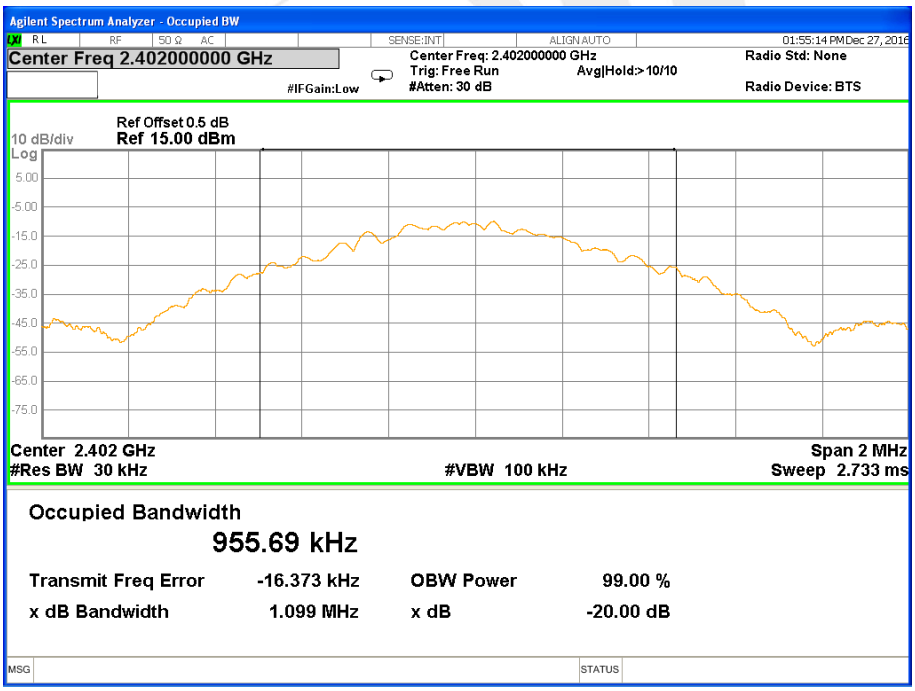
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.5 TEST RESULTS

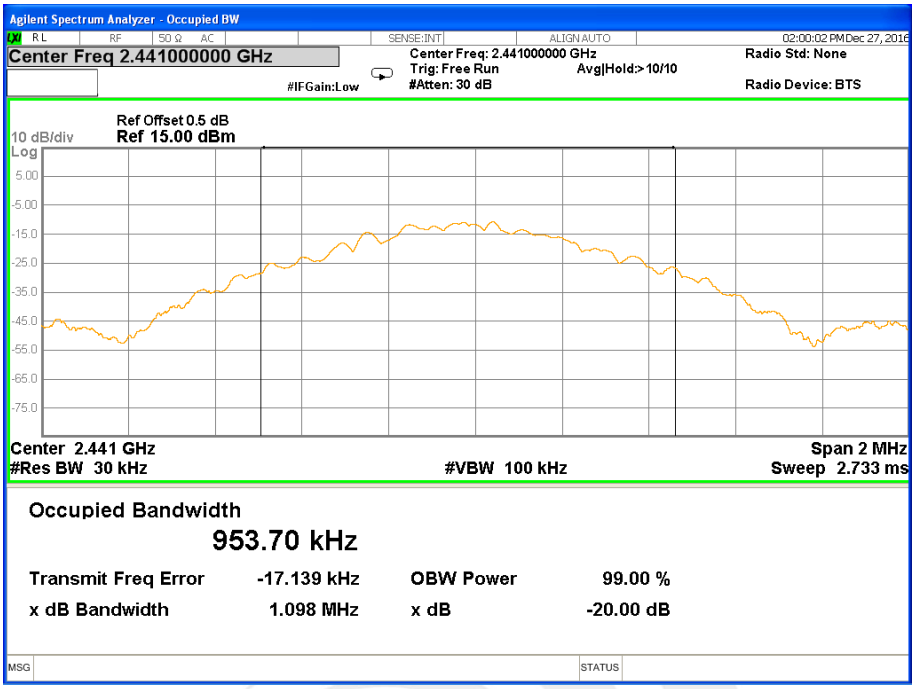
Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	GFSK(1Mbps)CH00 / CH39 /CH78		

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.099	PASS
2441 MHz	1.098	PASS
2480 MHz	1.099	PASS

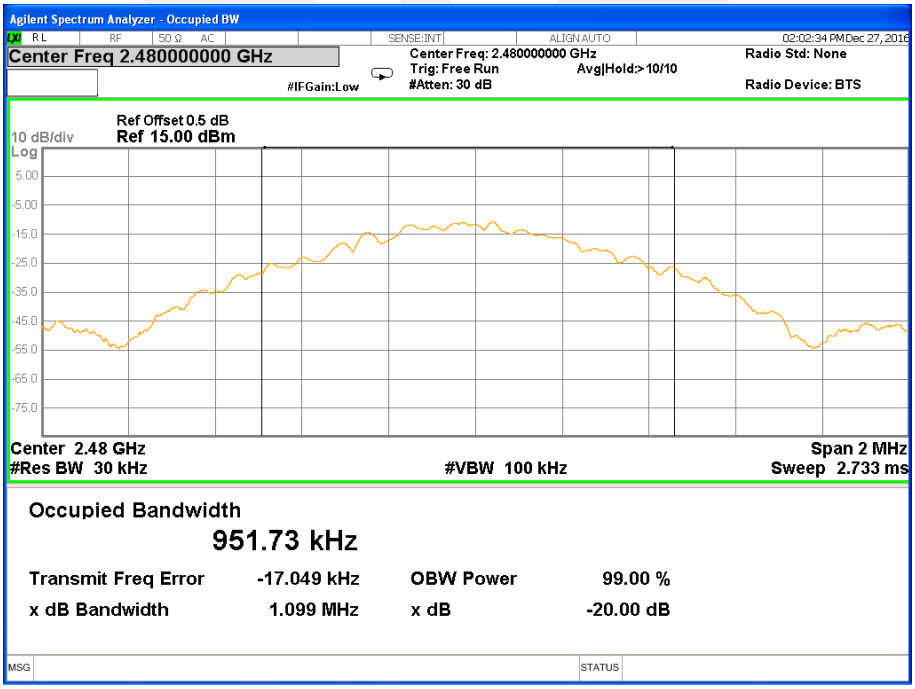
CH00 -1Mbps



CH39 -1Mbps



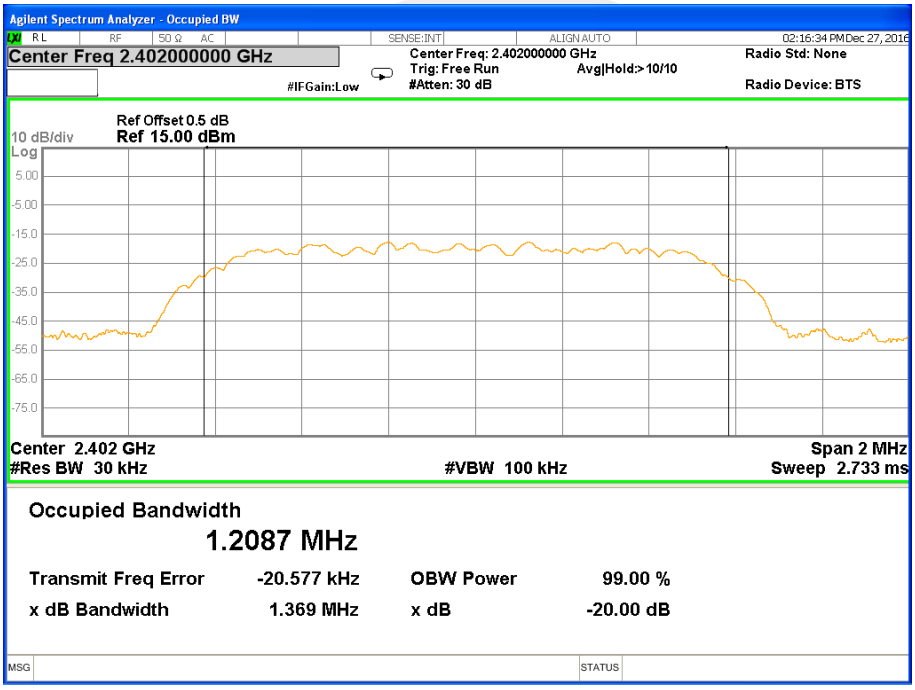
CH78 -1Mbps



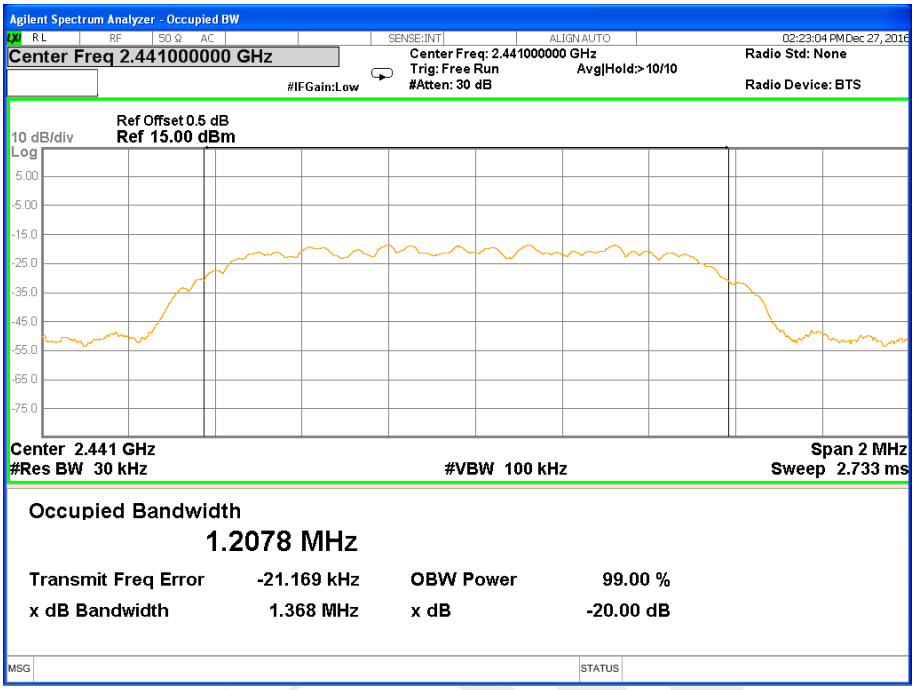
Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	π/4-DQPSK(2Mbps)CH00 / CH39 /C78		

Frequency	20dB Bandwidth(MHz)	Result
2402 MHz	1.369	PASS
2441 MHz	1.368	PASS
2480 MHz	1.370	PASS

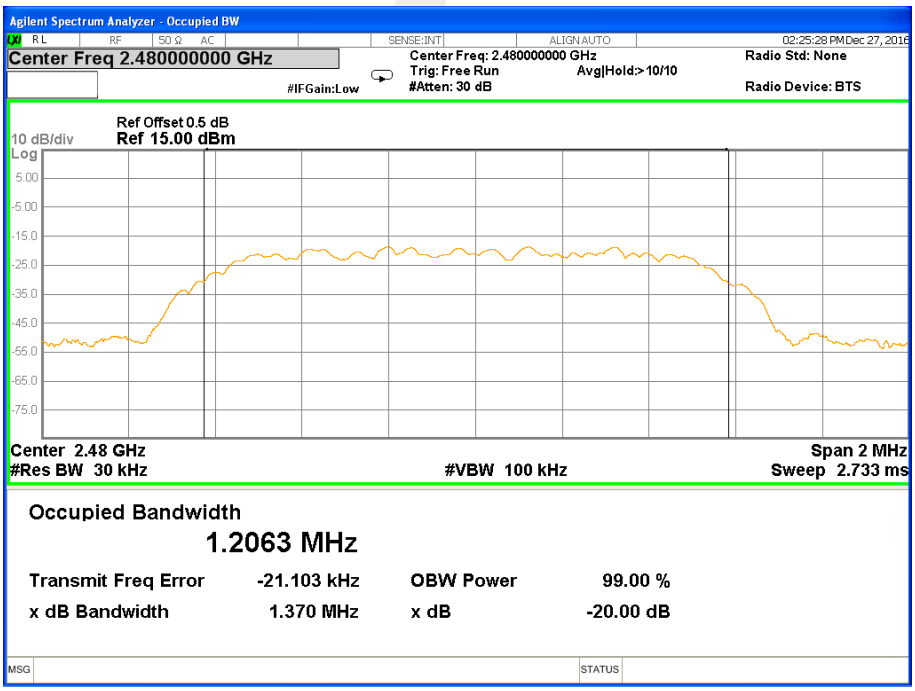
CH00 -2Mbps



CH39 -2Mbps



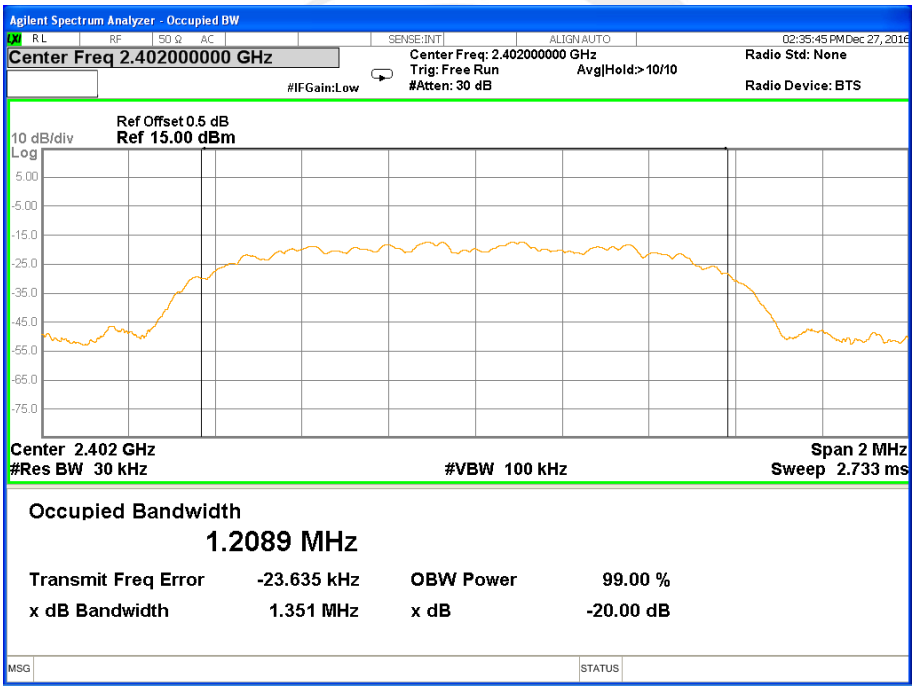
CH78 -2Mbps



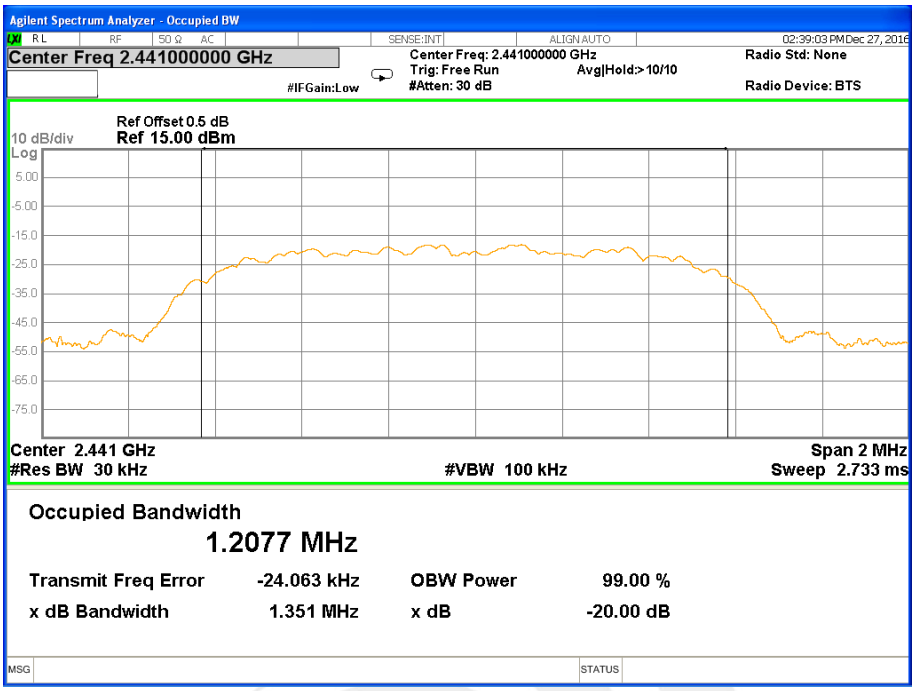
Temperature：	25℃	Relative Humidity：	50%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz
Test Mode ：	8DPSK(3Mbps)CH00 / CH39 / CH78		

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.351	PASS
2441 MHz	1.351	PASS
2480 MHz	1.352	PASS

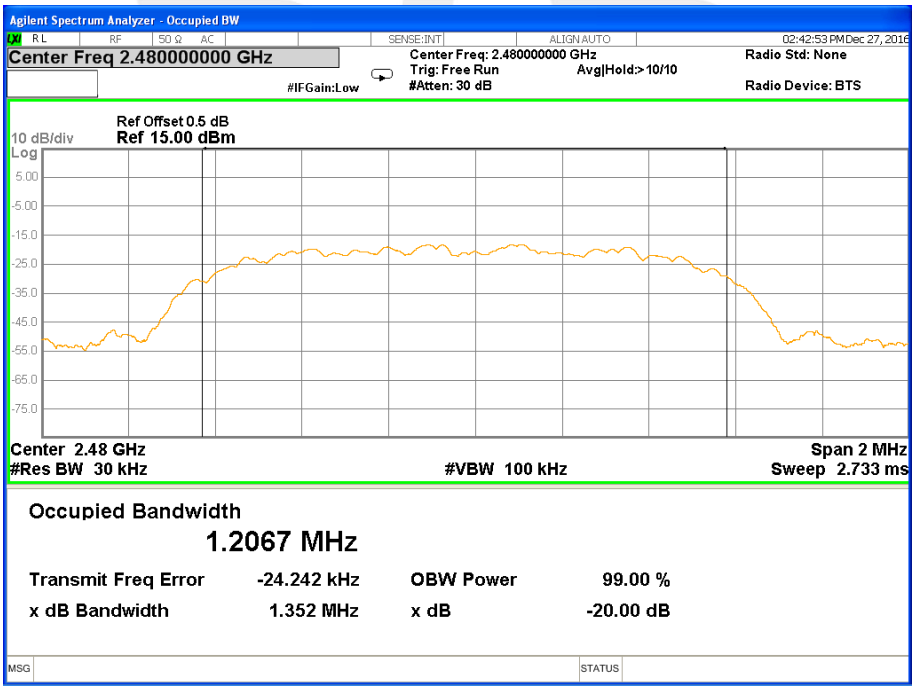
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



9. OUTPUT POWER TEST

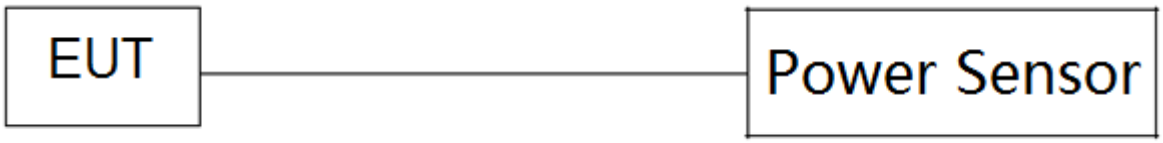
9.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)&(b)(1)	Output Power	1 W or 0.125W	2400-2483.5	PASS
		if channel separation > 2/3 bandwidthprovided thesystems operatewith an output power no greater than125 mW(20.96dBm)		

9.2 TEST PROCEDURE

a. The EUT was directly connected to the Power Sensor&PC

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

Temperature：	25℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 5V from adapter AC 120V/60Hz

GFSK(1Mbps)			
Test Channel	Frequency	Conducted Output Power	LIMIT
	(MHz)	Peak (dBm)	dBm
CH00	2402	-4.90	30.00
CH39	2441	-4.72	30.00
CH78	2480	-4.61	30.00

Note：the channel separation >2/3 bandwidth

π/4QPSK(2Mbps)			
Test Channel	Frequency	Conducted Output Power	LIMIT
	(MHz)	Peak (dBm)	dBm
CH00	2402	-9.30	30.00
CH39	2441	-9.20	30.00
CH78	2480	-9.01	30.00

Note：the channel separation >2/3 bandwidth

8-DPSK(3Mbps)			
Test Channel	Frequency	Conducted Output Power	LIMIT
	(MHz)	Peak (dBm)	dBm
CH00	2402	-9.40	30.00
CH39	2441	-9.31	30.00
CH78	2480	-9.12	30.00

Note：the channel separation >2/3 bandwidth

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

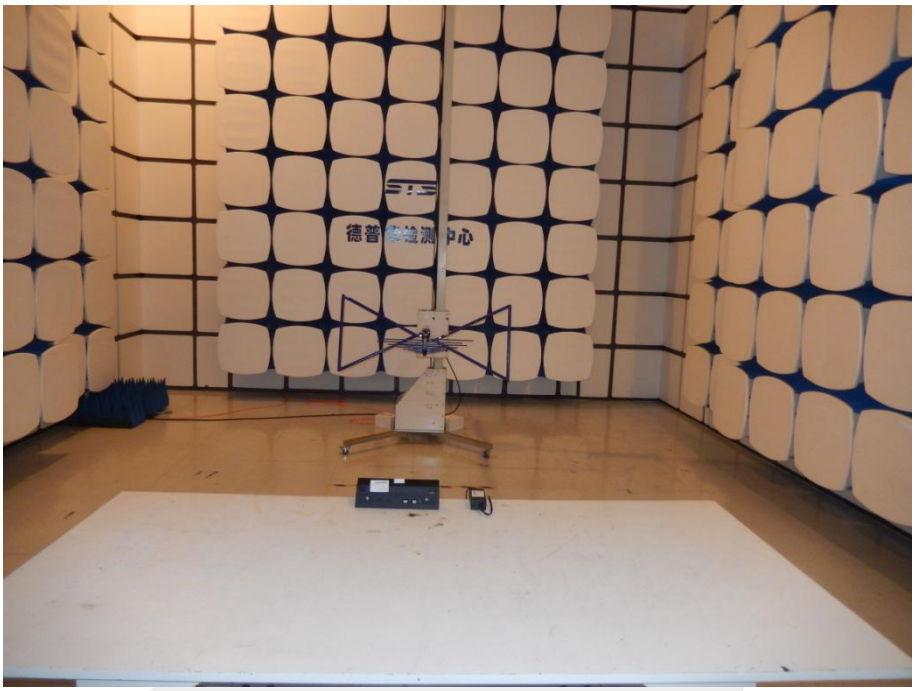
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

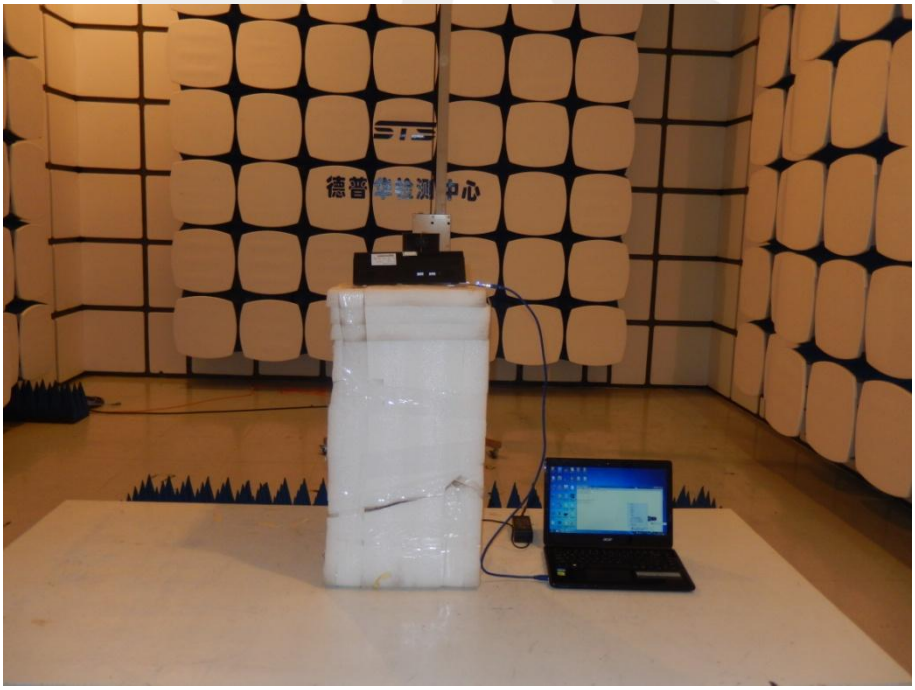
10.2 EUT ANTENNA

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

APPENDIX-PHOTOS OF TEST SETUP

Radiated Measurement Photos





Conducted Measurement Photos

※※※※※END OF THE REPORT※※※※※