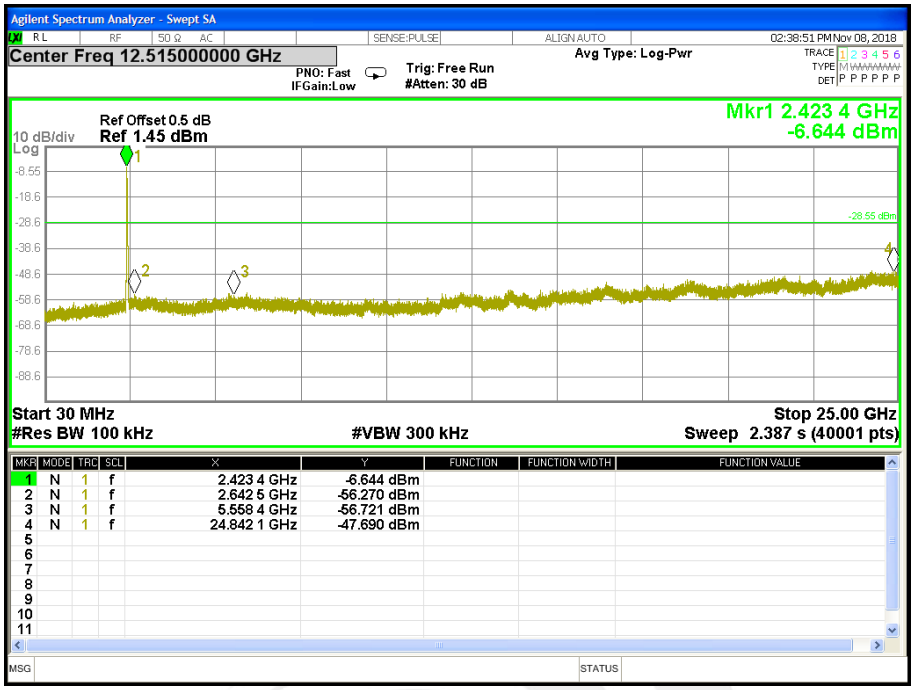
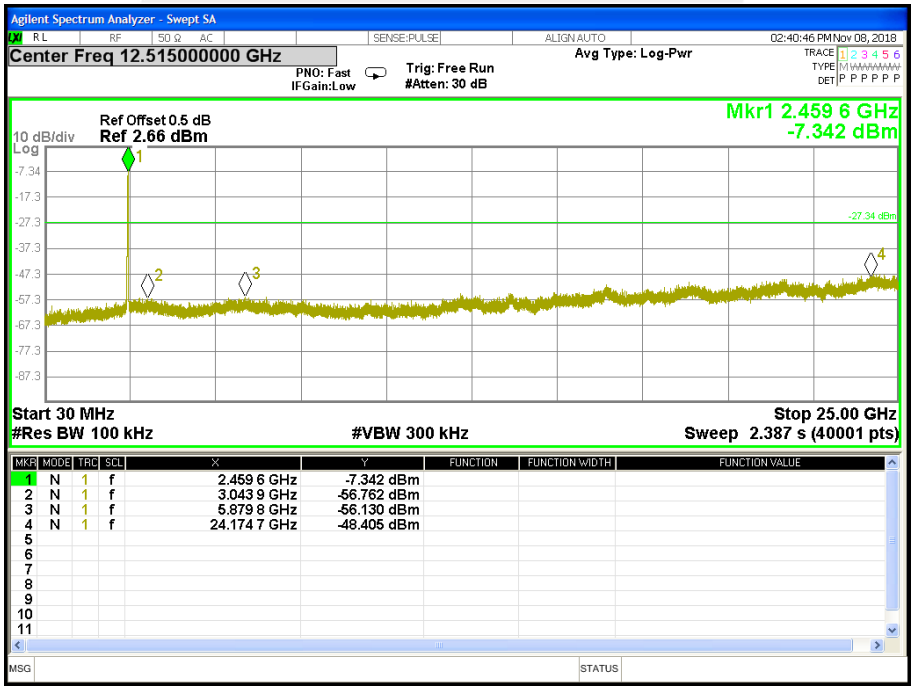
CH06

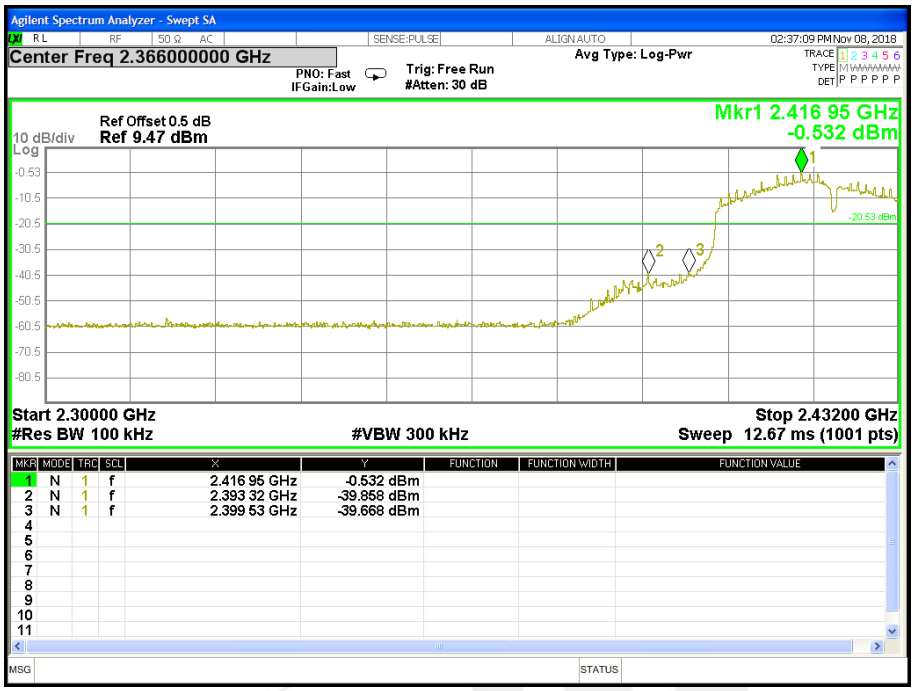

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
02:38:51 PM Nov 08, 2018
Ref Offset 0.5 dB
10 dB/div
Ref 1.45 dBm
Mkr1 2.423 4 GHz
-6.644 dBm
-28.55 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.423 4 GHz -6.644 dBm
2 N 1 f 2.642 5 GHz -56.270 dBm
3 N 1 f 5.558 4 GHz -56.721 dBm
4 N 1 f 24.842 1 GHz -47.690 dBm

CH09

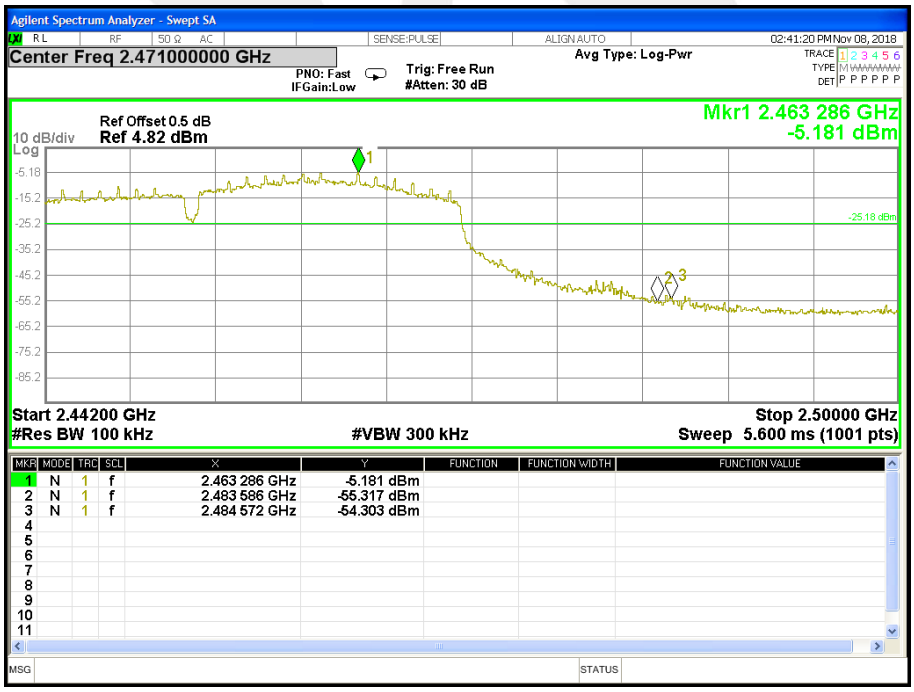

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
02:40:46 PM Nov 08, 2018
Ref Offset 0.5 dB
10 dB/div
Ref 2.66 dBm
Mkr1 2.459 6 GHz
-7.342 dBm
-27.34 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.459 6 GHz -7.342 dBm
2 N 1 f 3.043 9 GHz -56.762 dBm
3 N 1 f 5.879 8 GHz -56.130 dBm
4 N 1 f 24.174 7 GHz -48.405 dBm

Band edge

CH03



CH 09



5. POWER SPECTRAL DENSITY TEST

5.1 LIMIT

FCC Part 15.247,Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e) RSS-247 Issue 2	Power Spectral Density	≤8 dBm (RBW ≥ 3KHz)	2400-2483.5	PASS

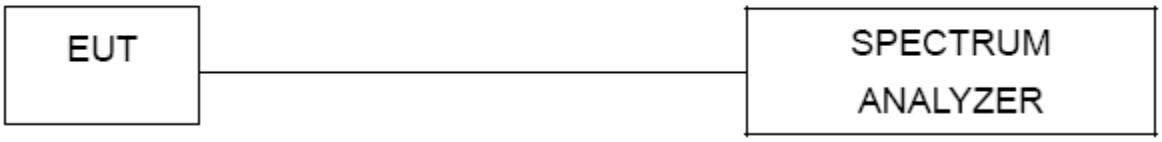
5.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the 100 kHz ≥ RBW ≥ 3 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

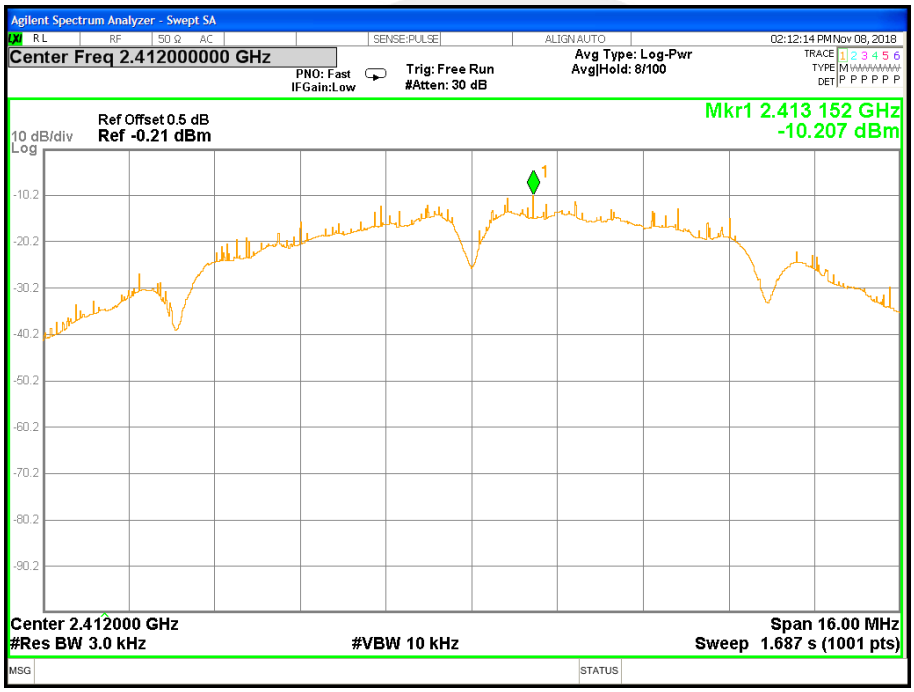
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

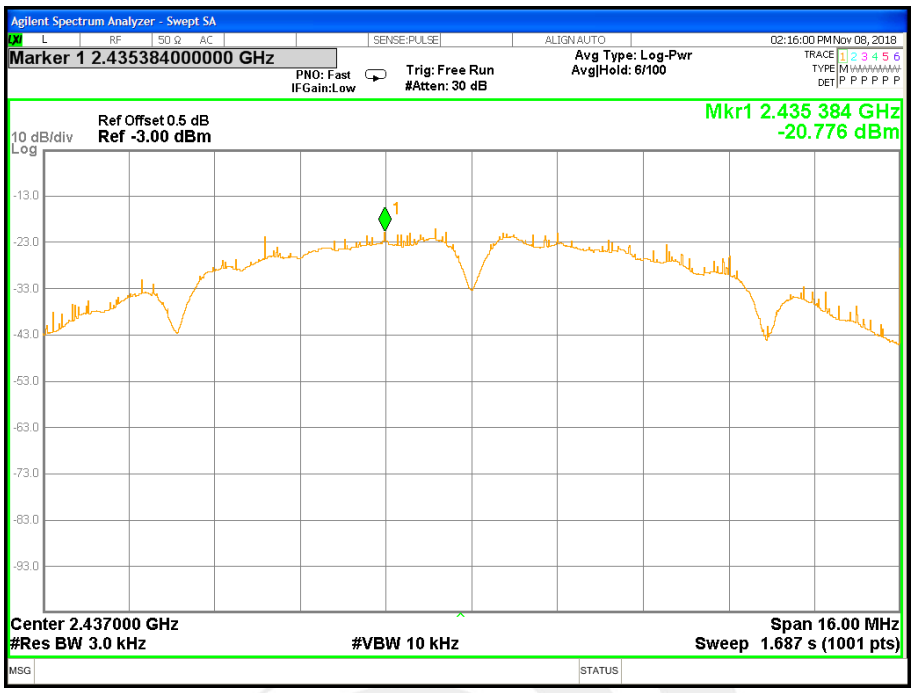
Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V From PC	Test Mode:	TX b Mode /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-10.207	≤8	PASS
2437 MHz	-20.776	≤8	PASS
2462 MHz	-21.101	≤8	PASS

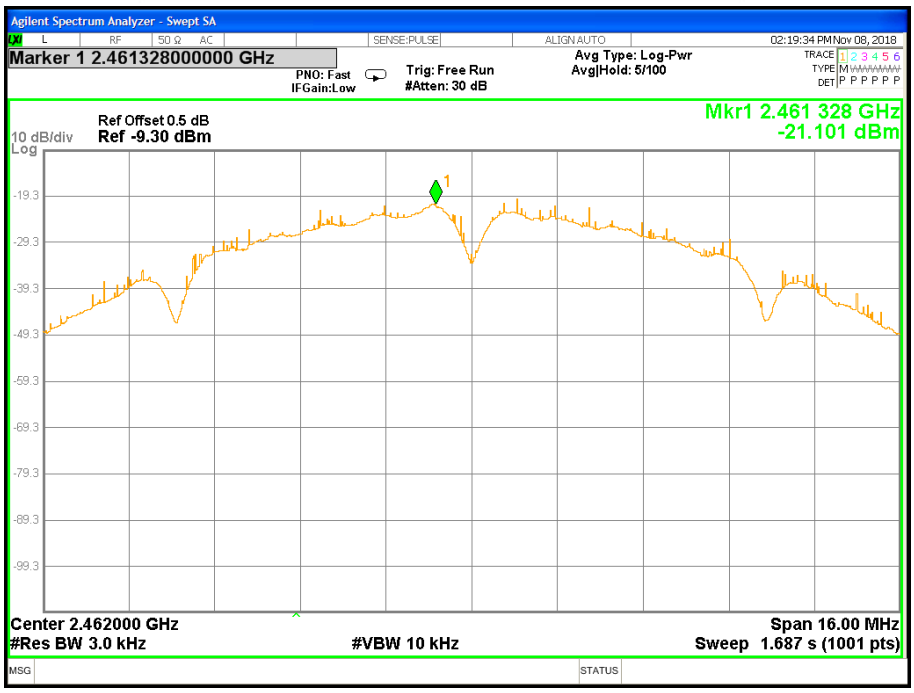
TX CH01



TX CH06



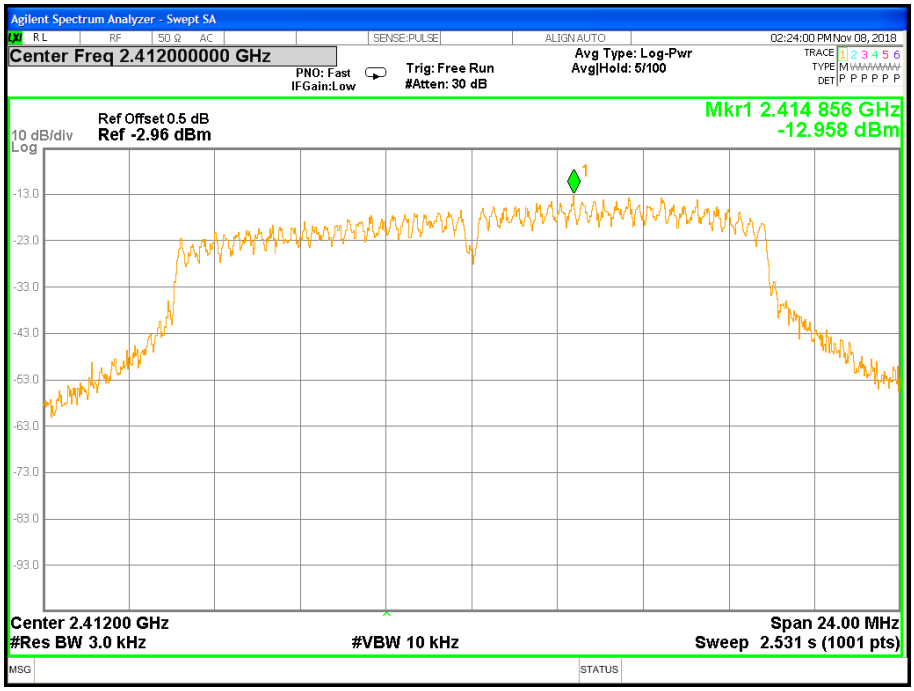
TX CH11



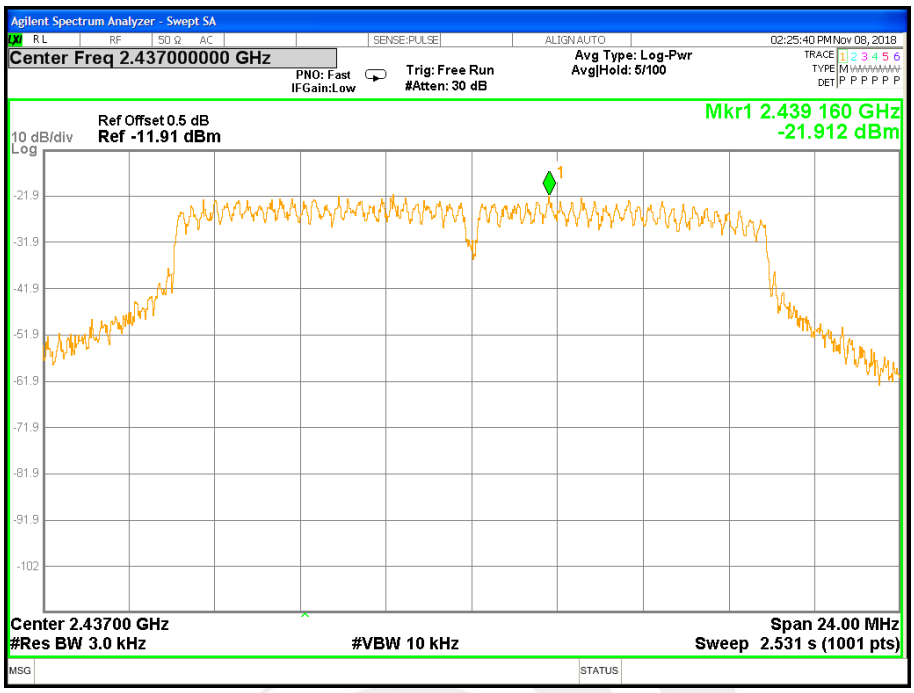
Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V From PC	Test Mode:	TX g Mode /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-12.958	≤8	PASS
2437 MHz	-21.912	≤8	PASS
2462 MHz	-21.573	≤8	PASS

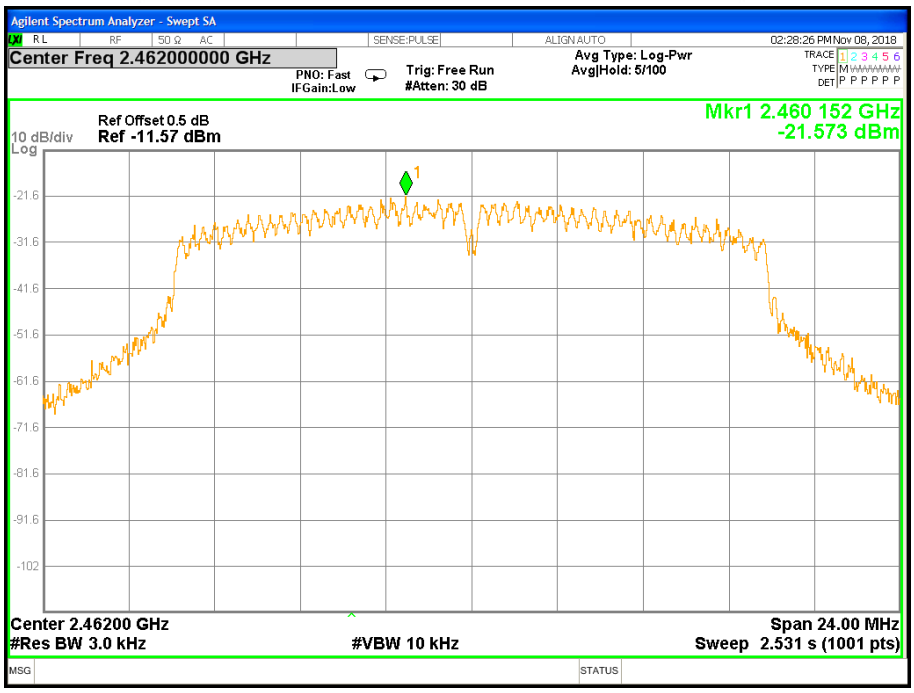
TX CH01



TX CH06



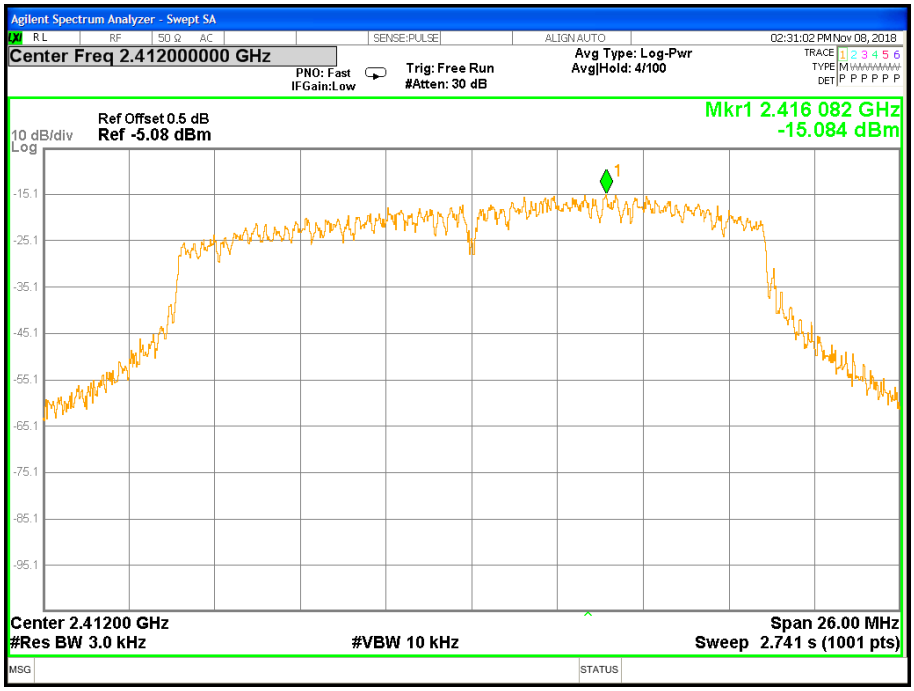
TX CH11



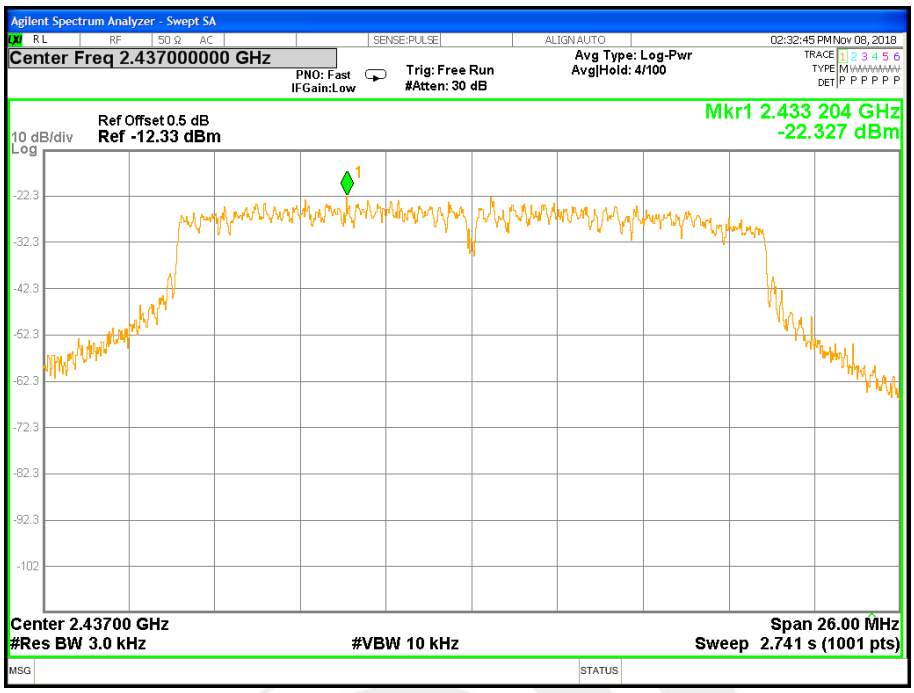
Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V From PC	Test Mode:	TX n Mode(20M) /CH01, CH06, CH11

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2412 MHz	-15.084	≤8	PASS
2437 MHz	-22.327	≤8	PASS
2462 MHz	-22.286	≤8	PASS

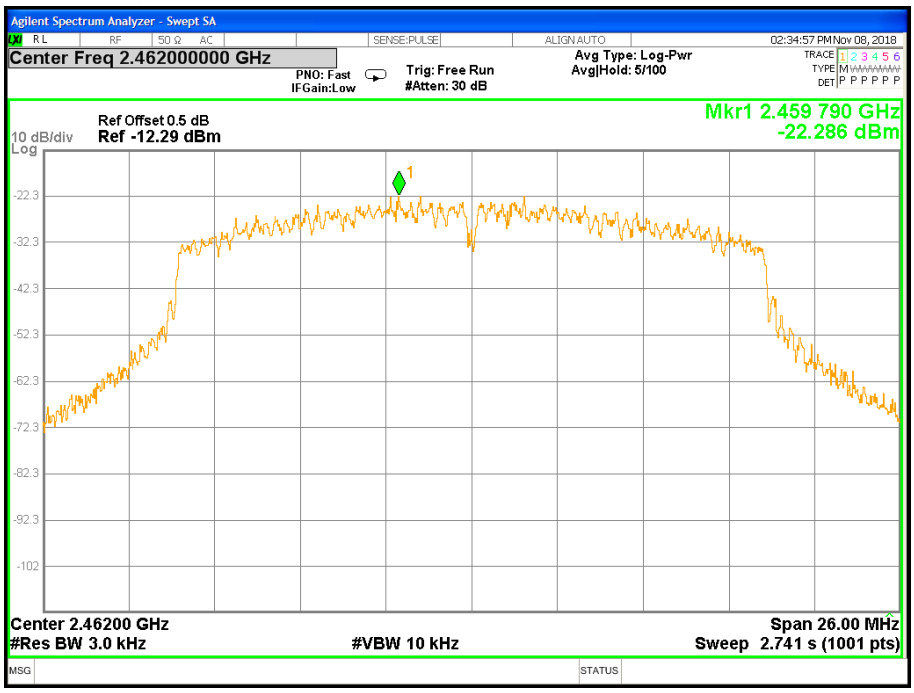
TX CH01



TX CH06



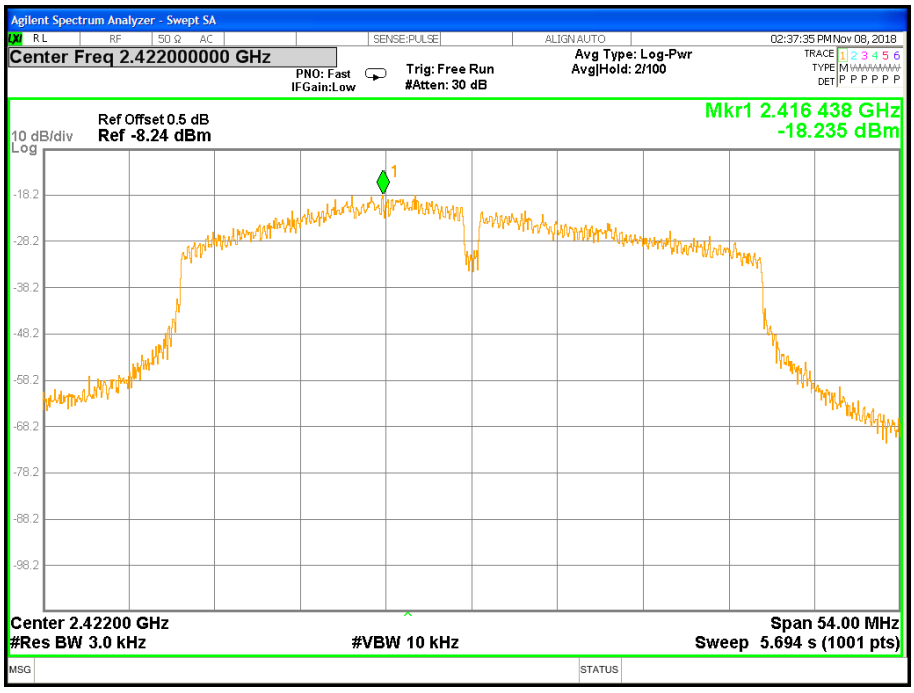
TX CH11



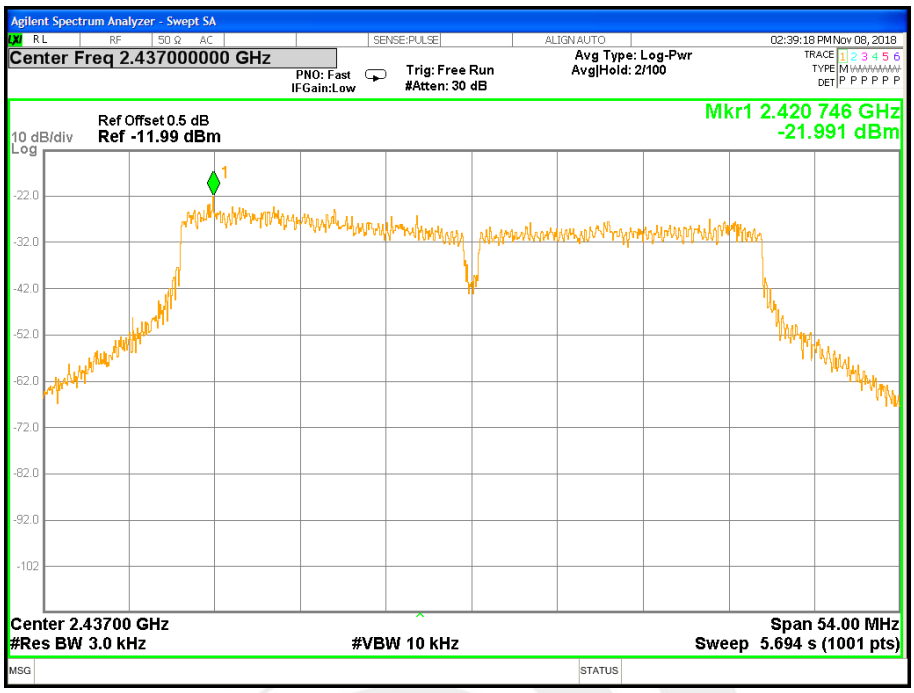
Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V From PC	Test Mode:	TX n Mode(40M) /CH03, CH06, CH09

Frequency	Power Density (dBm/3kHz)	Limit (dBm/3KHz)	Result
2422 MHz	-18.235	≤8	PASS
2437 MHz	-21.991	≤8	PASS
2452 MHz	-21.944	≤8	PASS

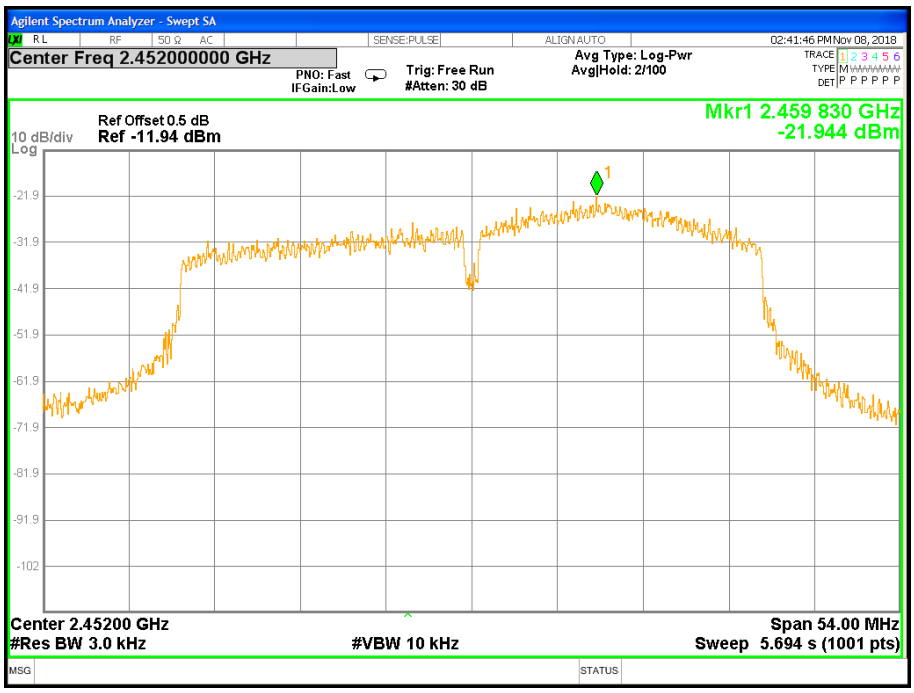
TX CH03



TX CH06



TX CH09



6. BANDWIDTH TEST

6.1 LIMIT

FCC Part 15.247,Subpart C RSS-Gen Clause 6.7				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	≥500KHz (6dB bandwidth)	2400-2483.5	PASS
RSS-Gen Clause 6.7	99% Bandwidth	For reporting purposes only.	2400-2483.5	PASS

6.2 TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

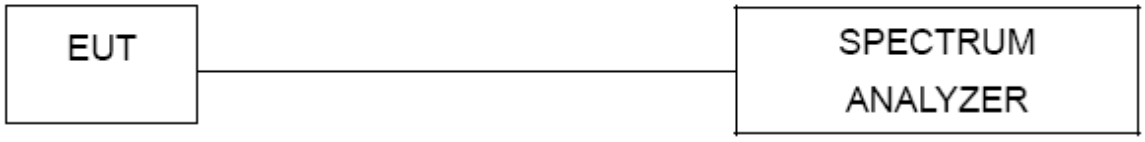
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6 dB Bandwidth :100KHz For 99% Bandwidth :1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : ≥3 × RBW For 99% Bandwidth : approximately 3×RBW
Trace	Max hold
Sweep	Auto

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB and 99% relative to the maximum level measured in the fundamental emission.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 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.

6.6 TEST RESULTS

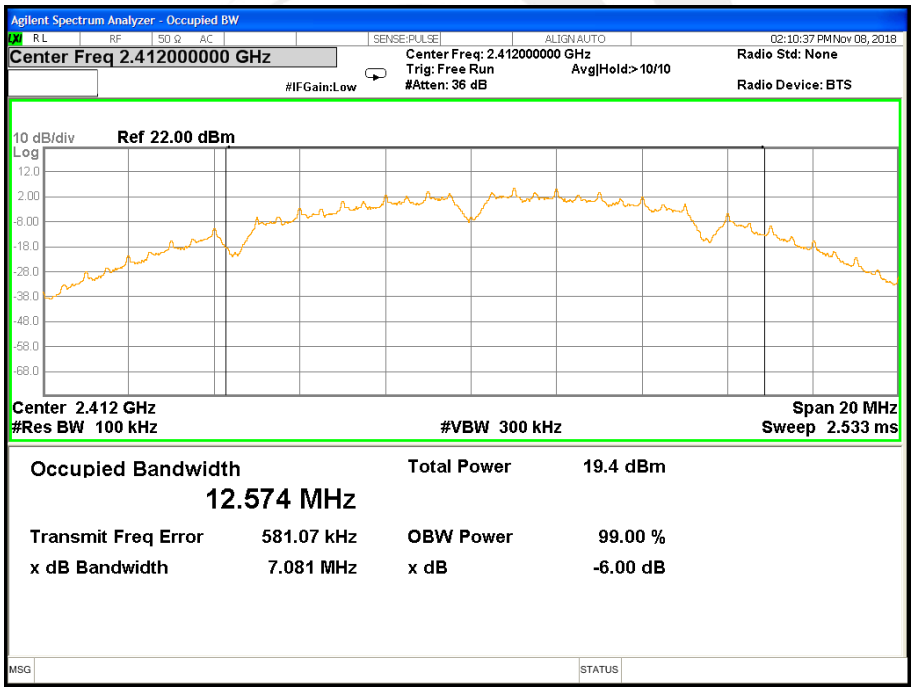
Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.8V	Test Mode:	TX b Mode /CH01, CH06, CH11

Remark: PEAK DETECTOR IS USED

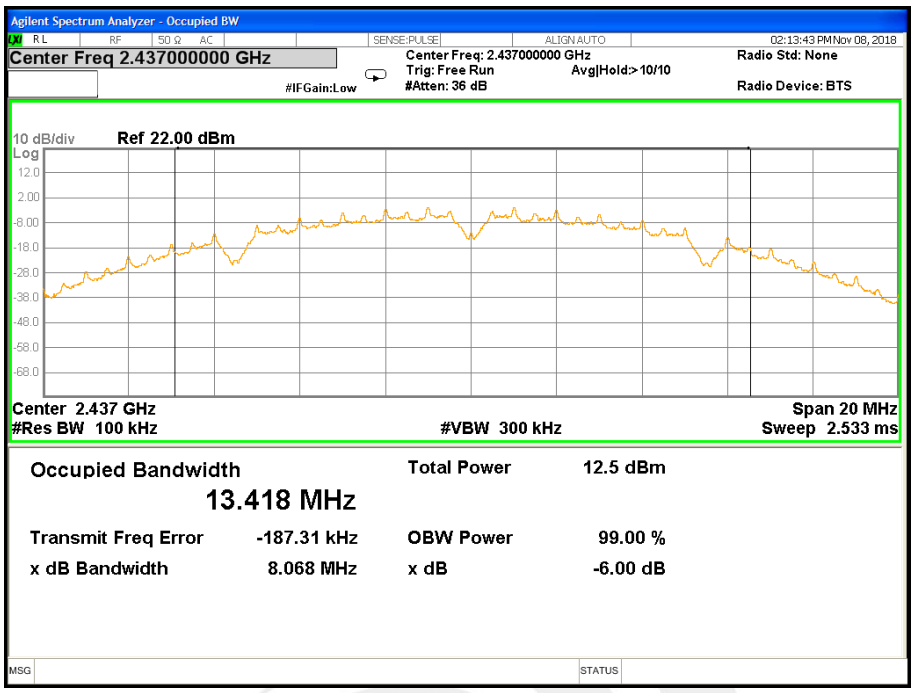
Frequency	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (KHz)	Result
2412 MHz	7.081	12.263	>=500KHz	PASS
2437 MHz	8.068	13.225	>=500KHz	PASS
2462 MHz	6.534	12.086	>=500KHz	PASS

6dB Bandwidth

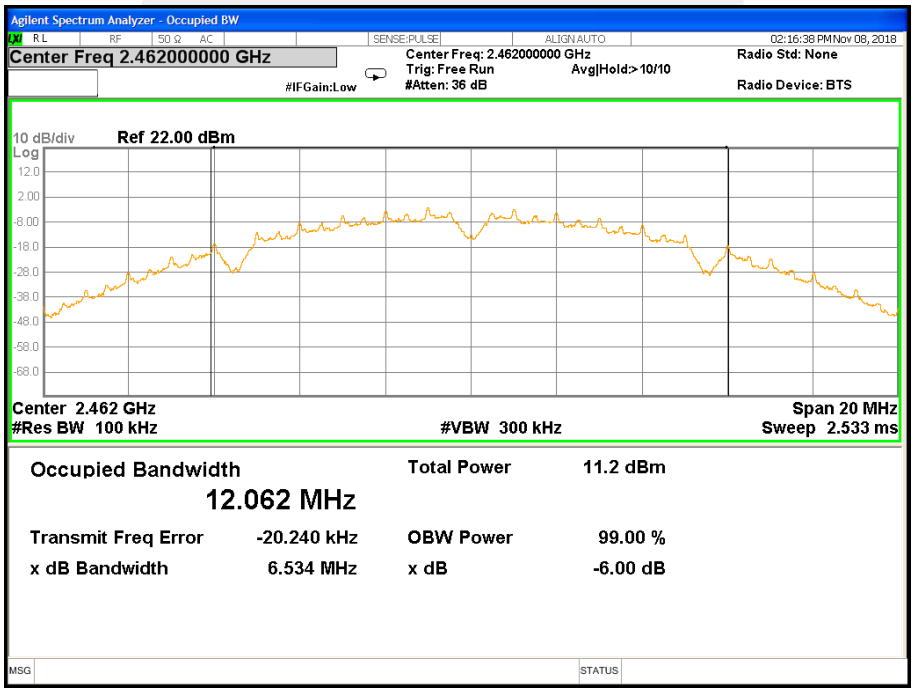
TX CH 01



TX CH 06

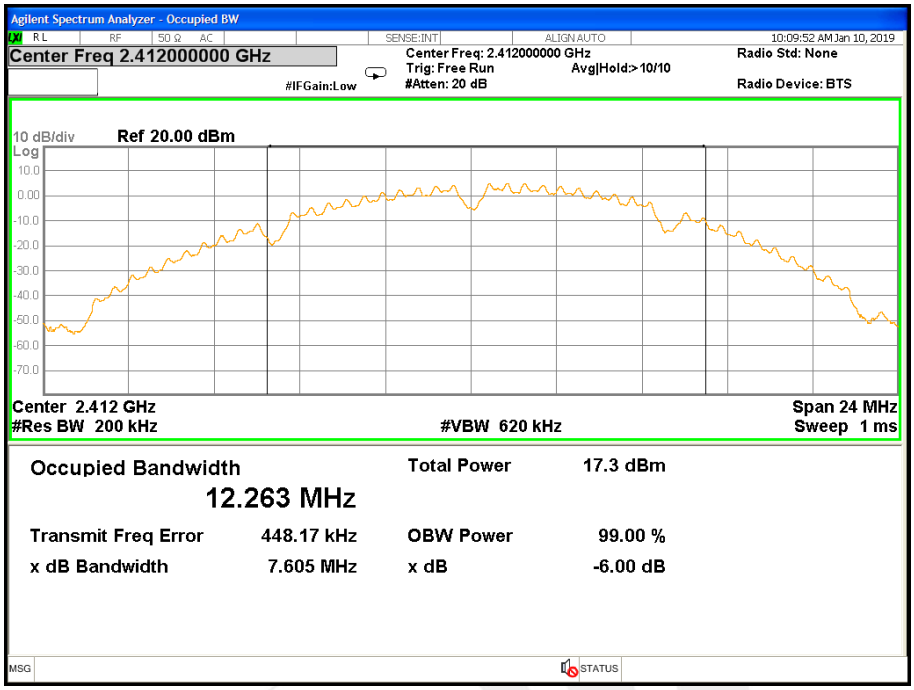


TX CH 11

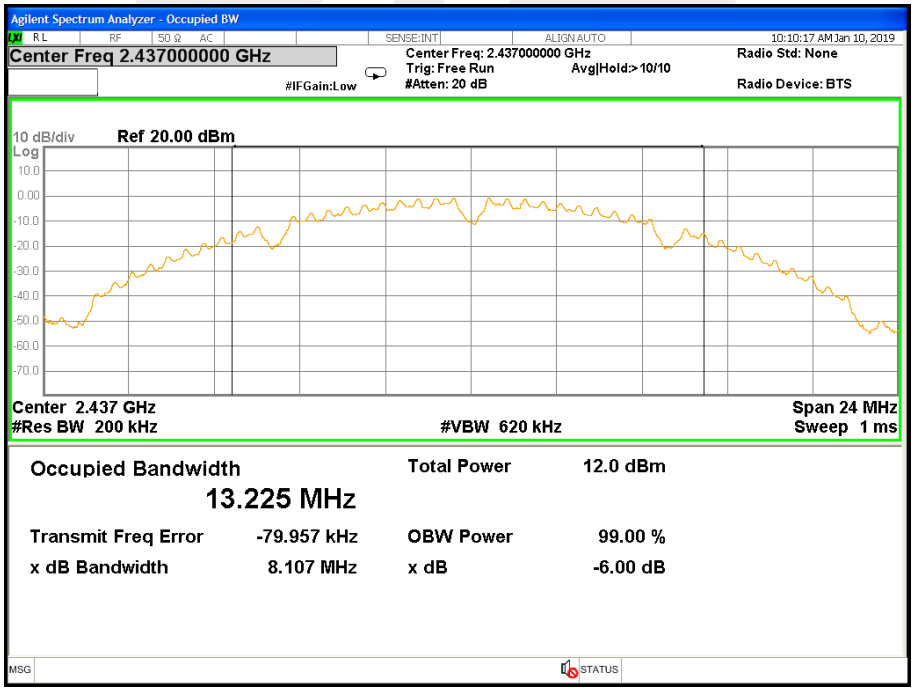


99% Bandwidth

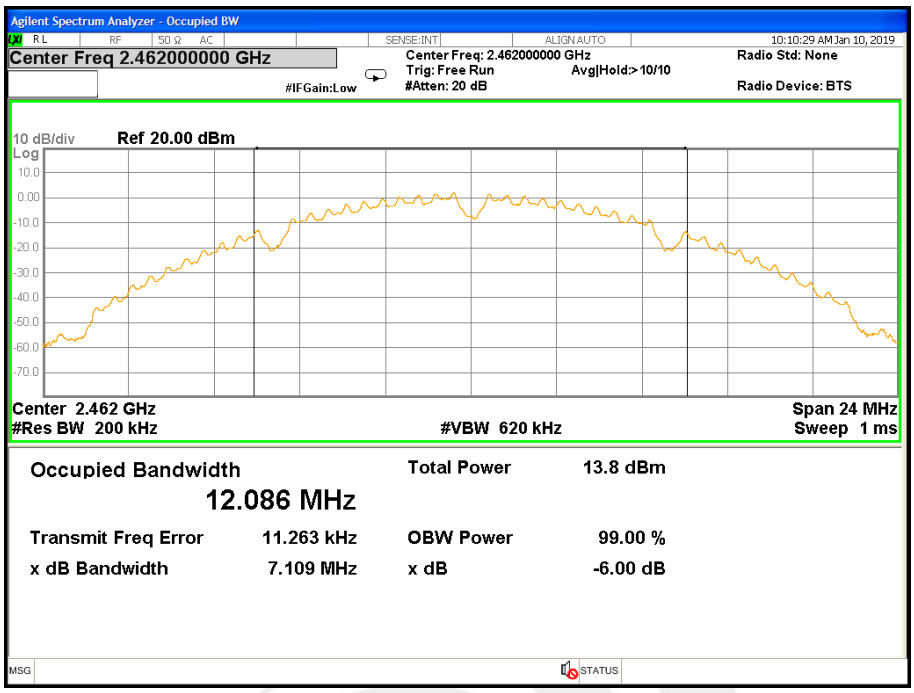
TX CH 01



TX CH 06



TX CH 11

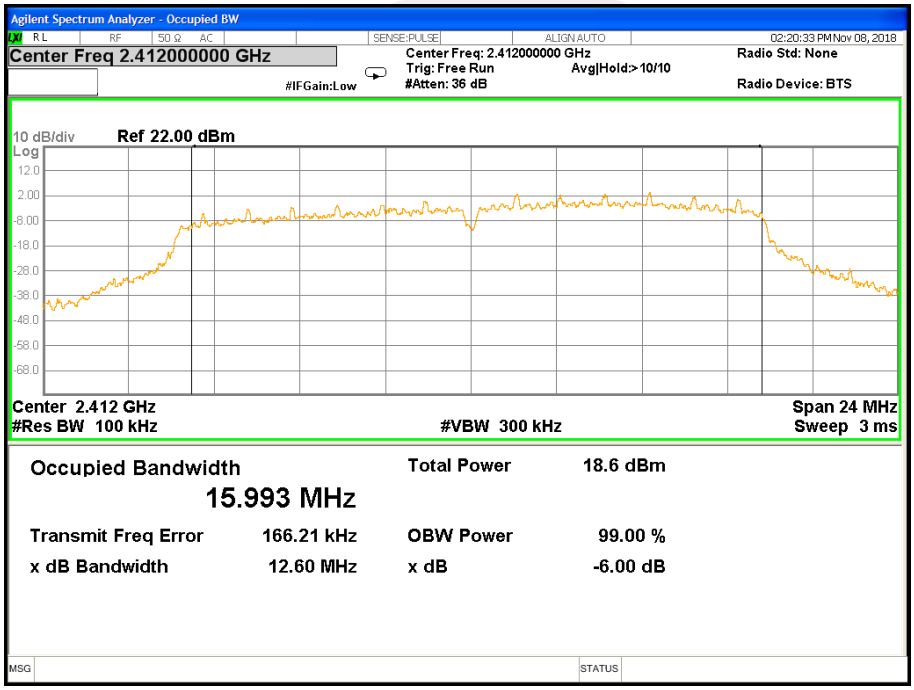

Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 20 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.462 GHz
#Res BW 200 kHz
#VBW 620 kHz
Span 24 MHz
Sweep 1 ms
Occupied Bandwidth
12.086 MHz
Total Power 13.8 dBm
Transmit Freq Error 11.263 kHz
OBW Power 99.00 %
x dB Bandwidth 7.109 MHz
x dB -6.00 dB
MSG
STATUS

Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.8V	Test Mode:	TX g Mode /CH01, CH06, CH11

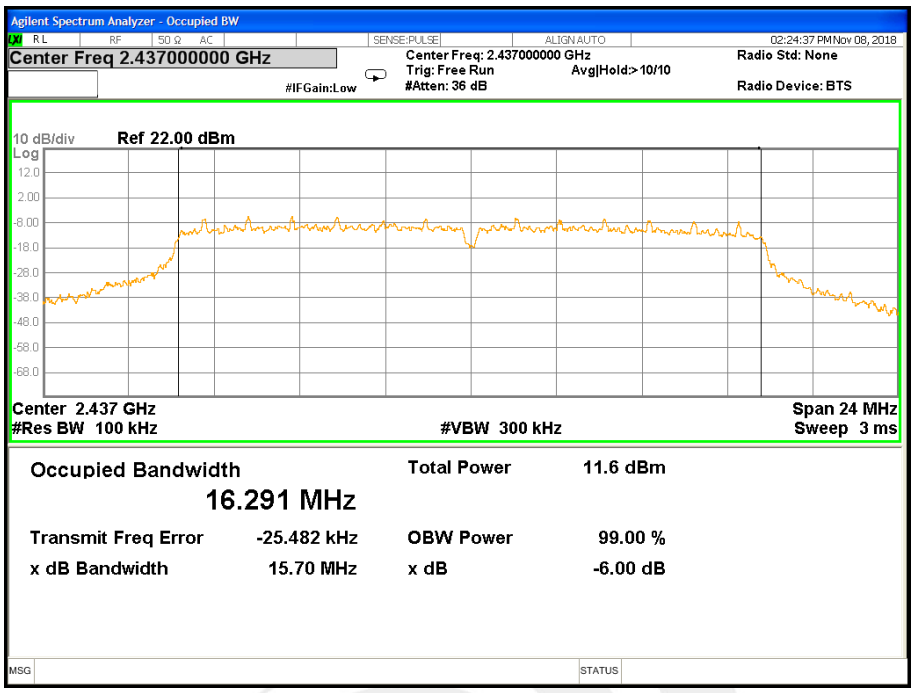
Frequency	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (KHz)	Result
2412 MHz	12.60	17.027	>=500KHz	PASS
2437 MHz	15.70	17.461	>=500KHz	PASS
2462 MHz	12.60	17.000	>=500KHz	PASS

6dB Bandwidth

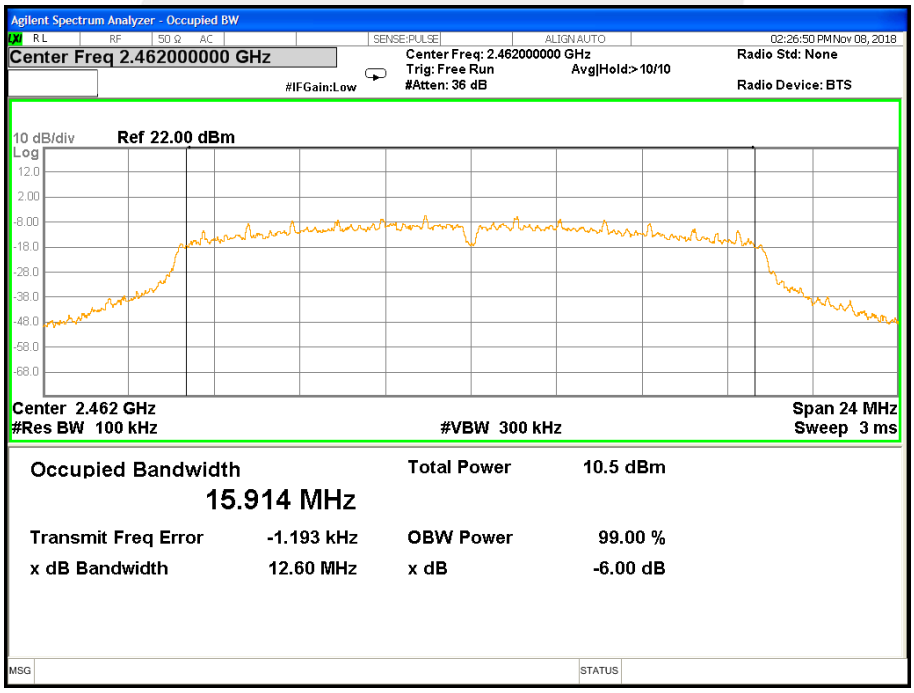
TX CH 01



TX CH 06

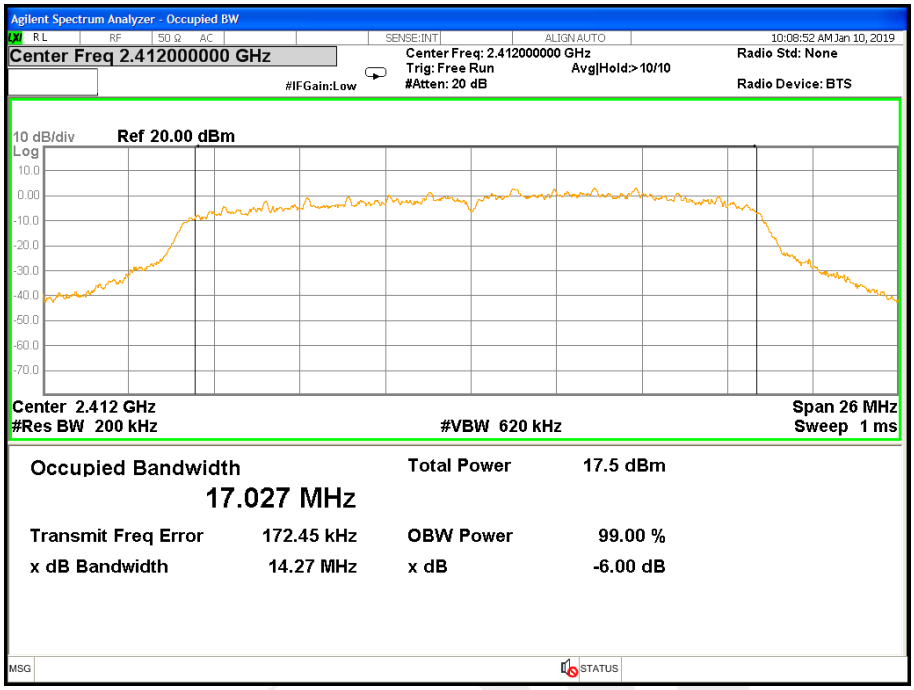


TX CH 11

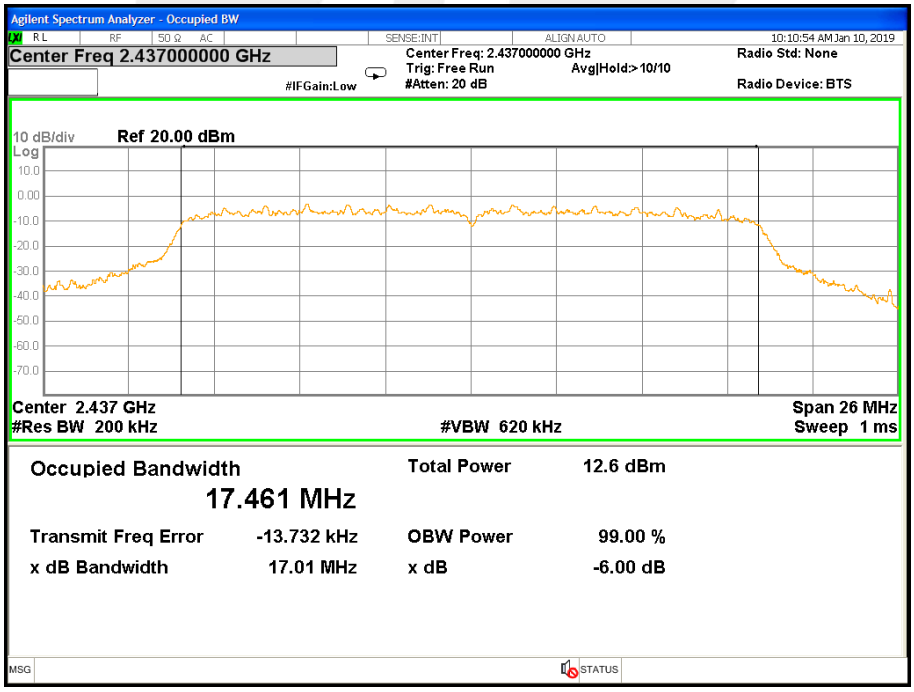


99% Bandwidth

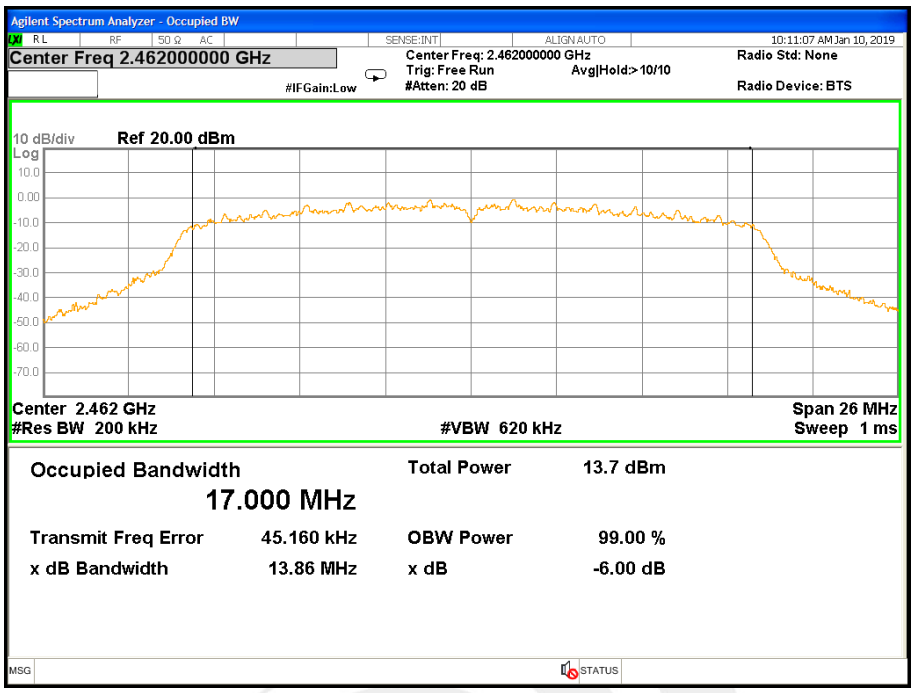
TX CH 01



TX CH 06



TX CH 11

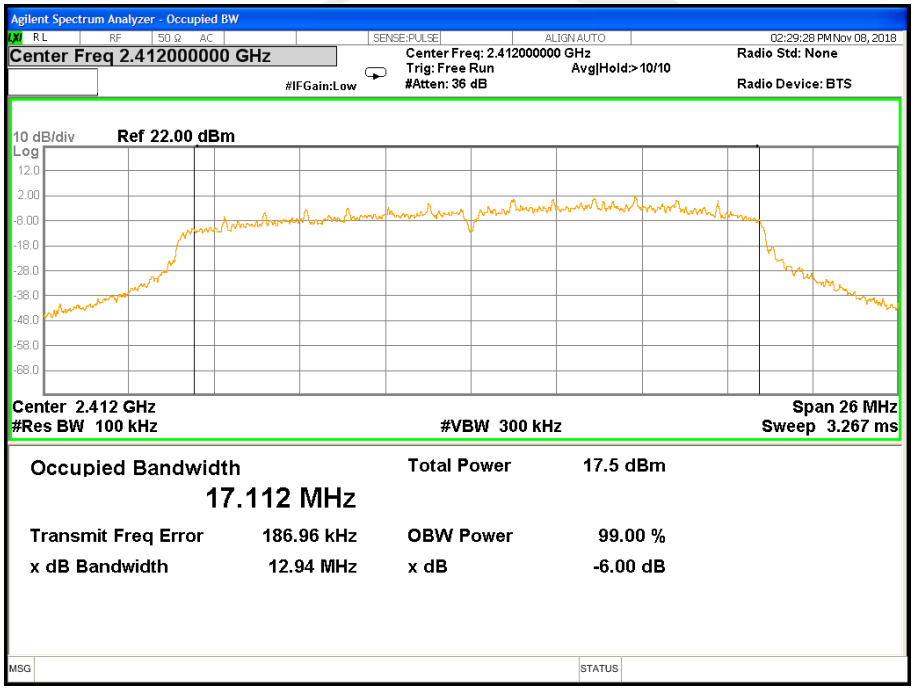

Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 20 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.462 GHz
#Res BW 200 kHz
#VBW 620 kHz
Span 26 MHz
Sweep 1 ms
Occupied Bandwidth
17.000 MHz
Total Power 13.7 dBm
Transmit Freq Error 45.160 kHz
OBW Power 99.00 %
x dB Bandwidth 13.86 MHz
x dB -6.00 dB
MSG
STATUS

Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.8V	Test Mode:	TX n Mode(20M) /CH01, CH06, CH11

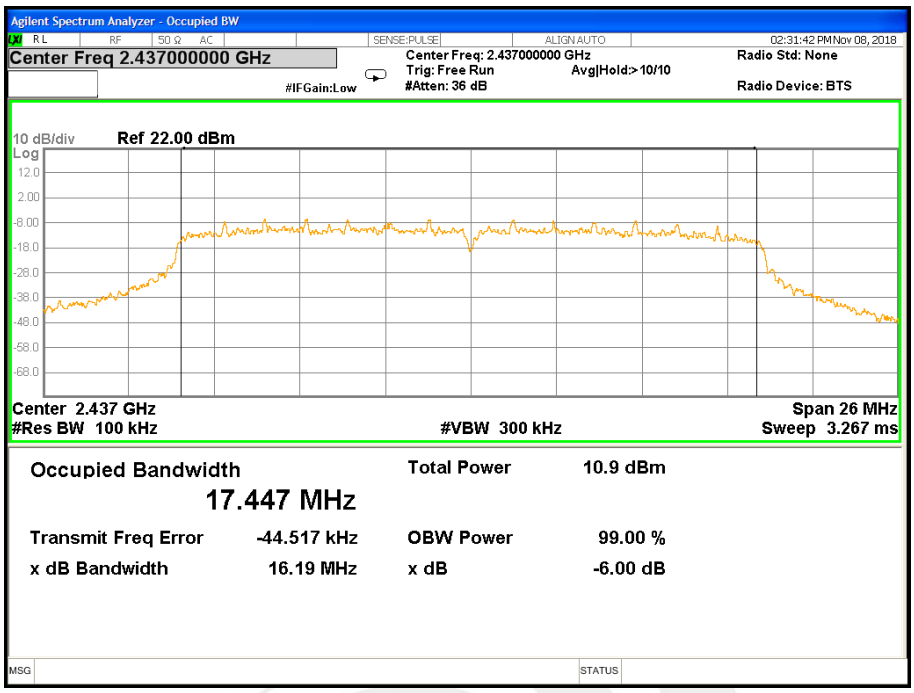
Frequency	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (KHz)	Result
2412 MHz	12.94	17.026	>=500KHz	PASS
2437 MHz	16.19	17.452	>=500KHz	PASS
2462 MHz	15.01	16.980	>=500KHz	PASS

6dB Bandwidth

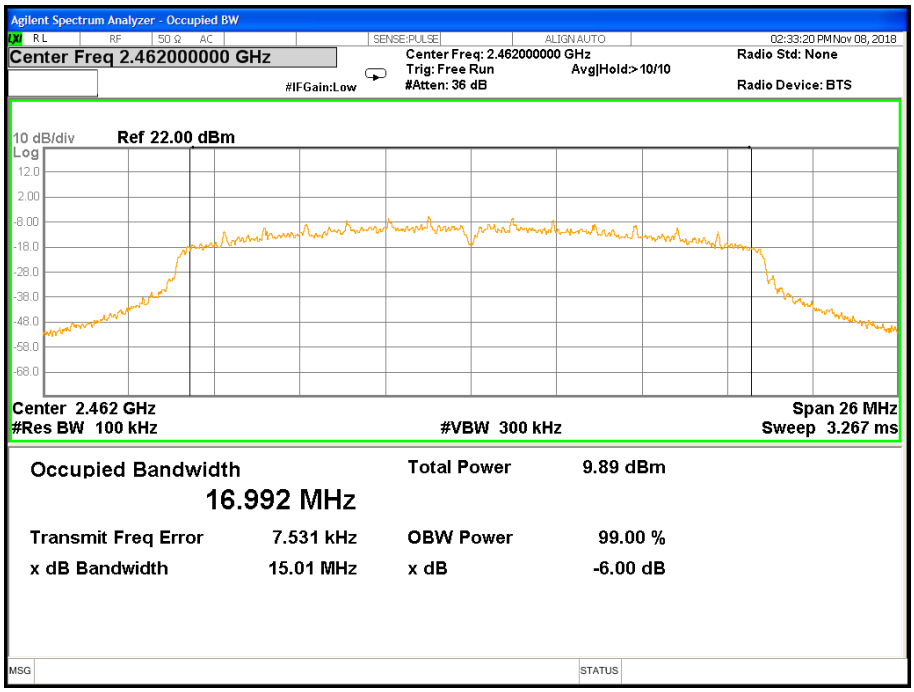
TX CH 01



TX CH 06

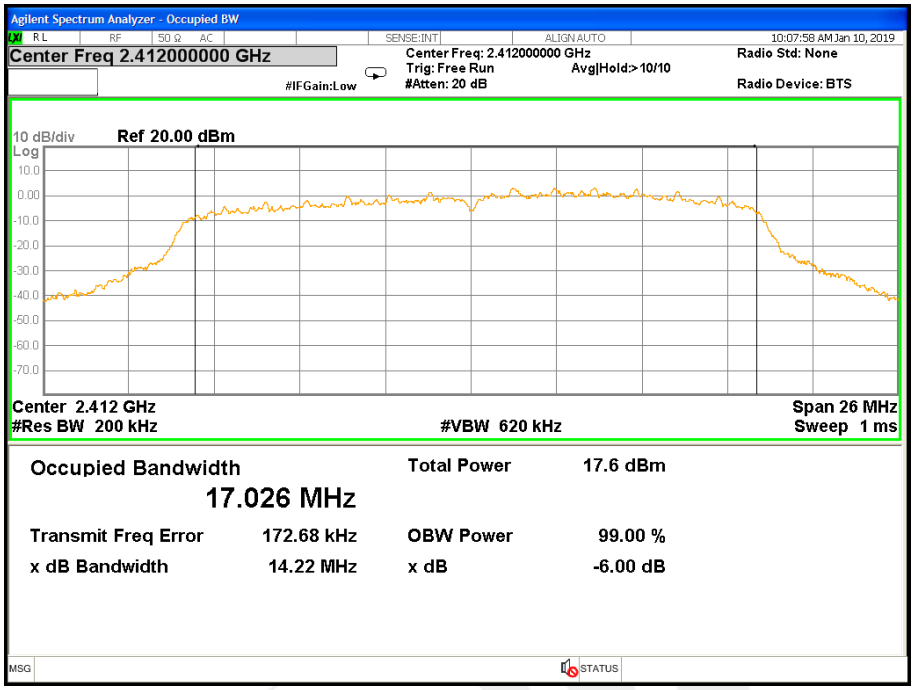


TX CH 11

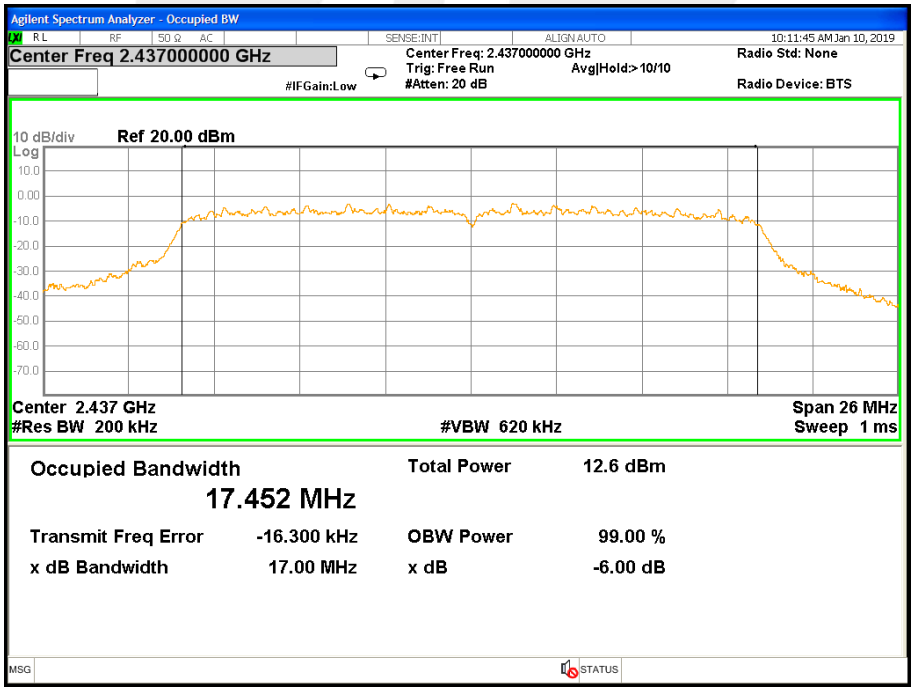


99% Bandwidth

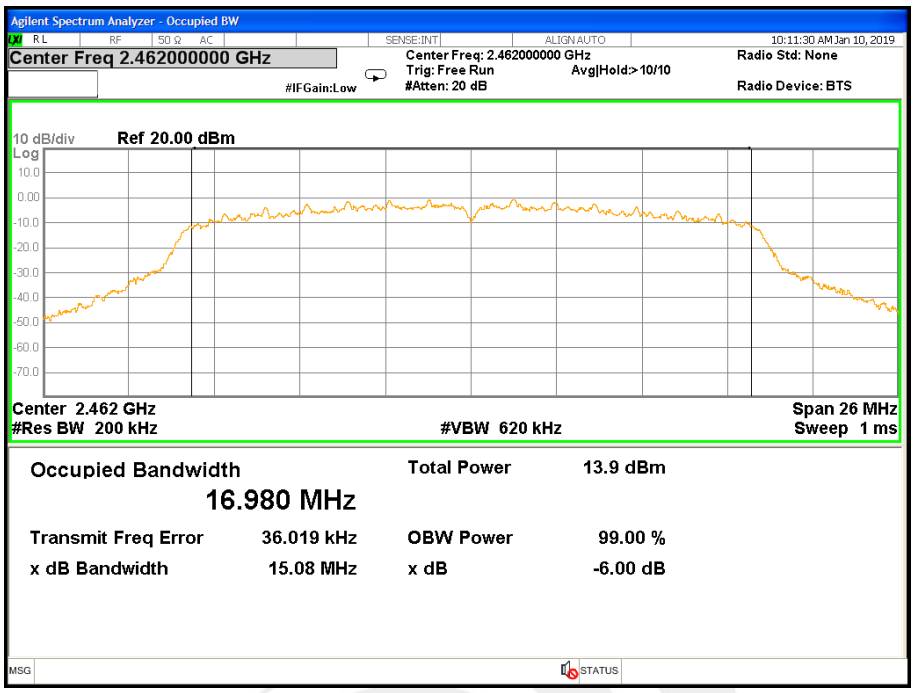
TX CH 01



TX CH 06



TX CH 11

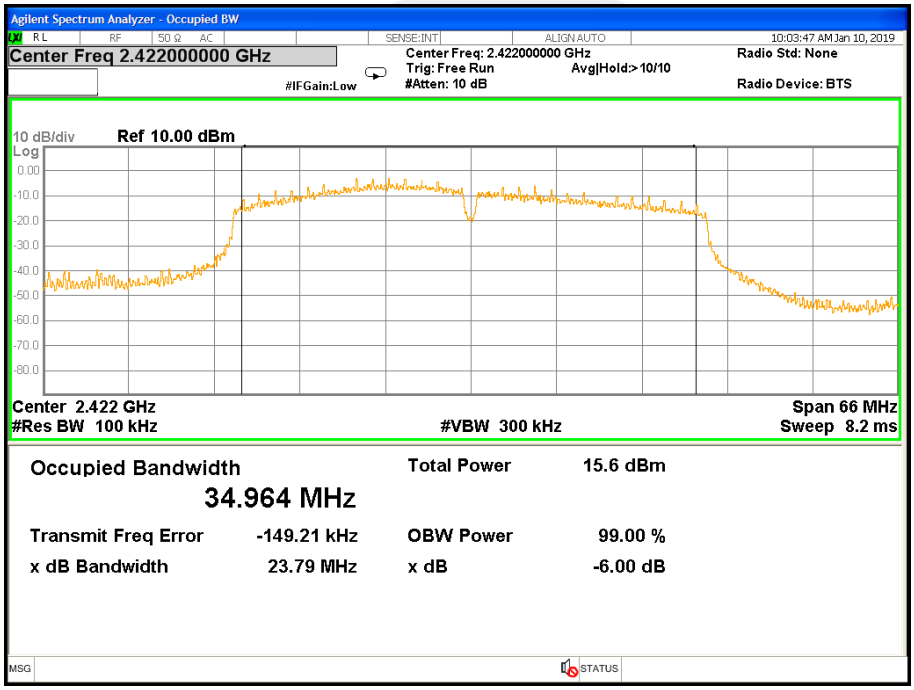

Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 20 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.462 GHz
#Res BW 200 kHz
#VBW 620 kHz
Span 26 MHz
Sweep 1 ms
Occupied Bandwidth
16.980 MHz
Total Power 13.9 dBm
Transmit Freq Error 36.019 kHz
OBW Power 99.00 %
x dB Bandwidth 15.08 MHz
x dB -6.00 dB
MSG
STATUS

Temperature:	25 ℃	Relative Humidity:	60%
Test Voltage:	DC 3.8V	Test Mode:	TX n Mode(40M) /CH03, CH06, CH09

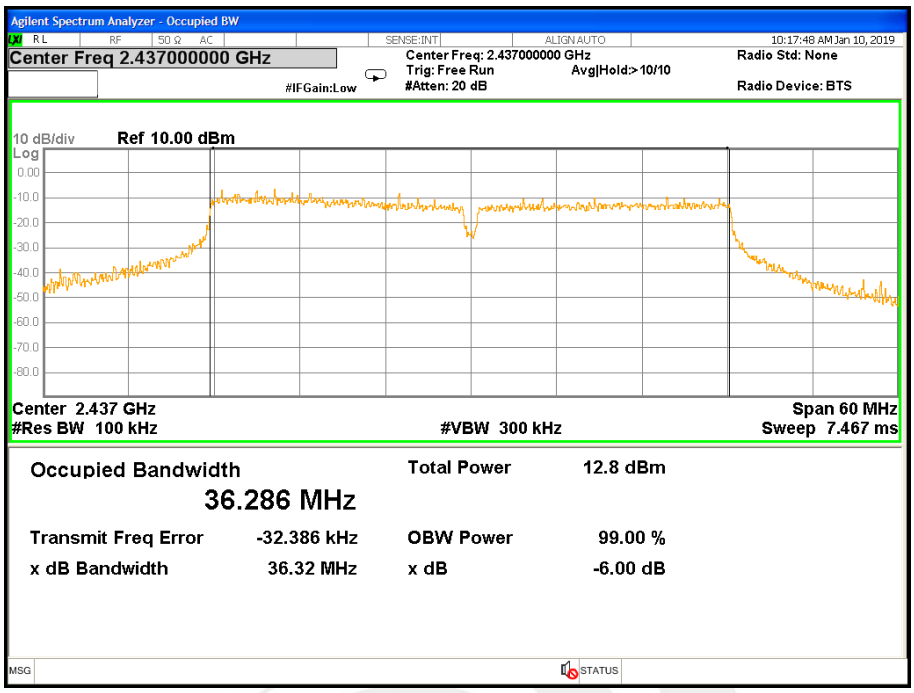
Frequency	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Channel Separation (KHz)	Result
2422 MHz	23.79	34.950	>=500KHz	PASS
2437 MHz	36.32	36.518	>=500KHz	PASS
2452 MHz	25.07	35.363	>=500KHz	PASS

6dB Bandwidth

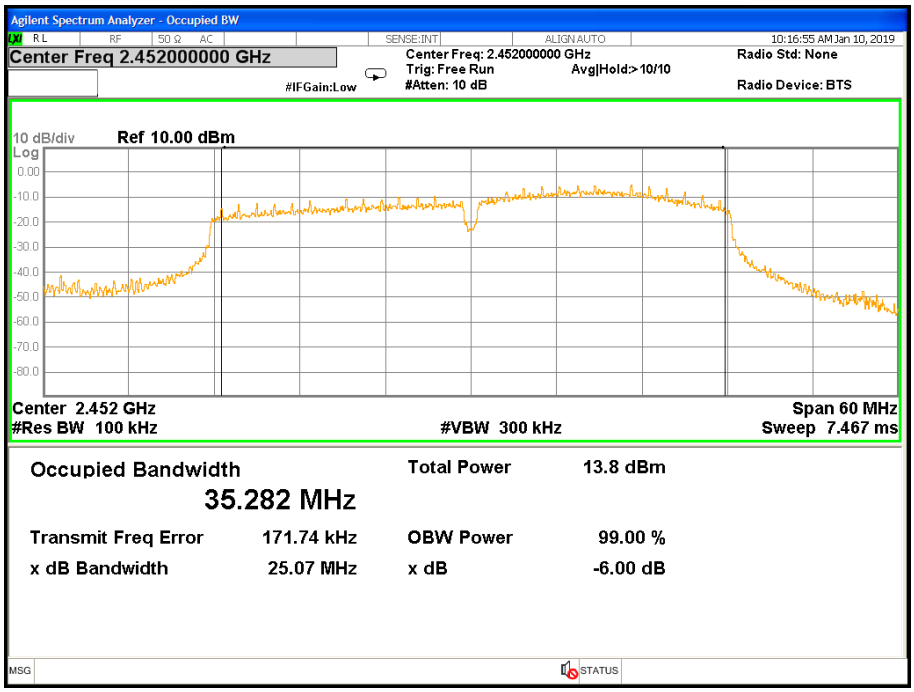
TX CH 03



TX CH 06

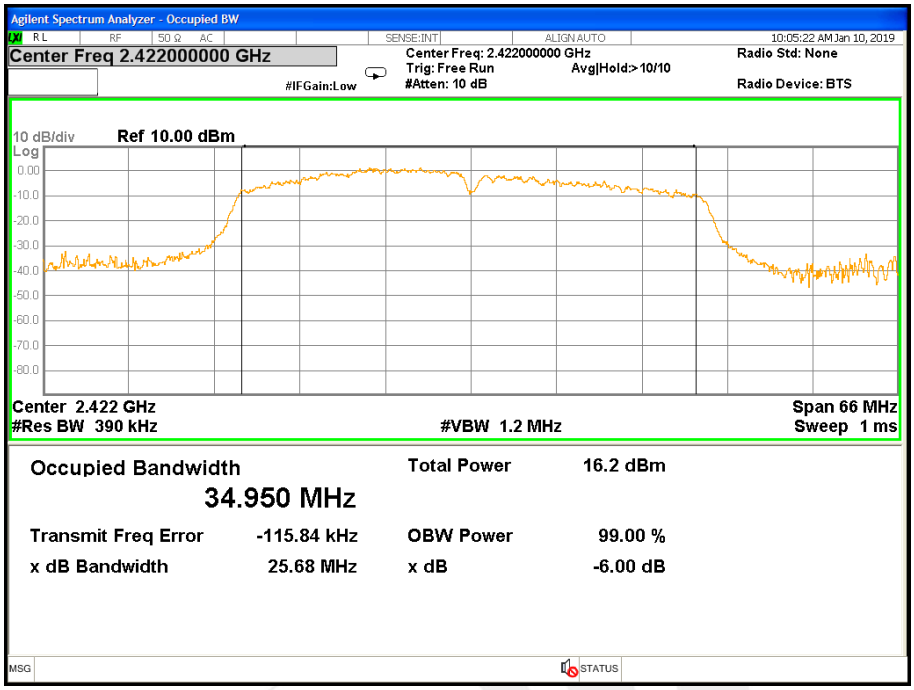


TX CH 09

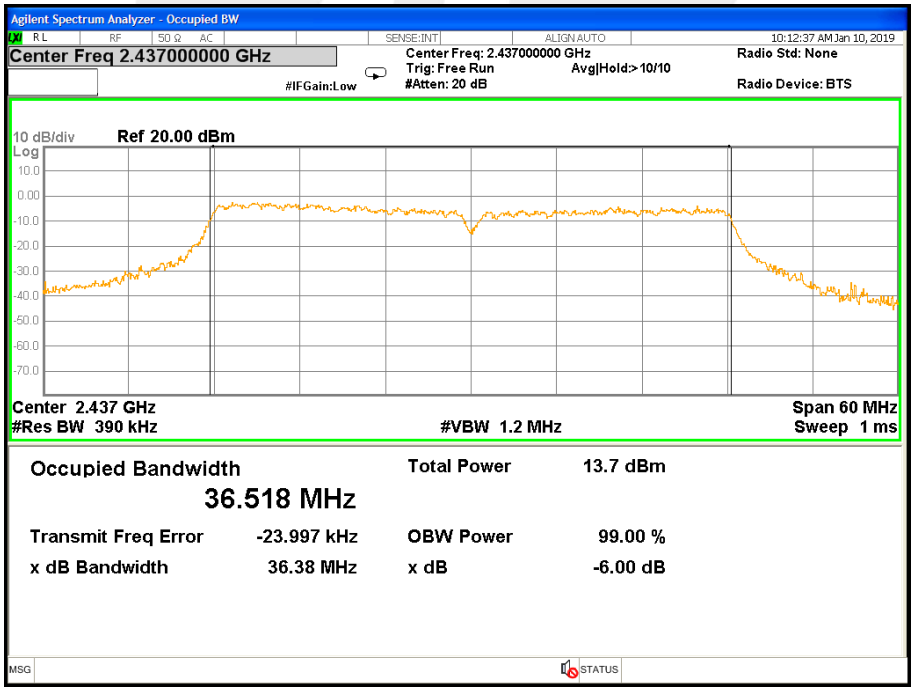


99% Bandwidth

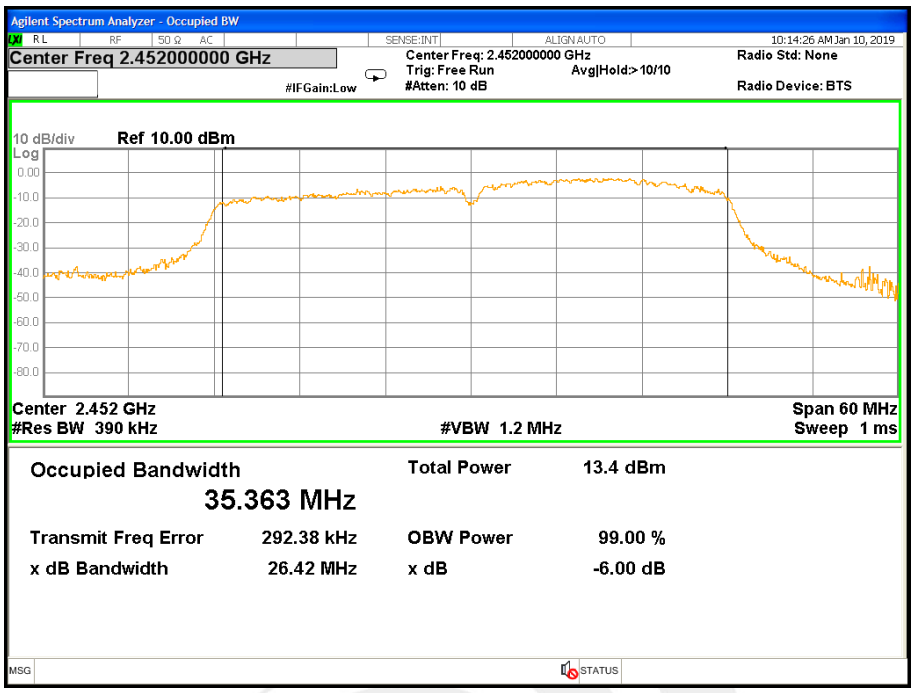
TX CH 01



TX CH 06



TX CH 11


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.452000000 GHz
Center Freq: 2.452000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.452 GHz
#Res BW 390 kHz
#VBW 1.2 MHz
Span 60 MHz
Sweep 1 ms
Occupied Bandwidth
35.363 MHz
Total Power 13.4 dBm
Transmit Freq Error 292.38 kHz
OBW Power 99.00 %
x dB Bandwidth 26.42 MHz
x dB -6.00 dB
MSG
STATUS

7. PEAK OUTPUT POWER TEST

7.1 LIMIT

FCC Part 15.247,Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3) RSS-247 Issue 2	Output Power	1 watt or 30dBm	2400-2483.5	PASS

7.2 TEST PROCEDURE

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

RBW ≥ DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [3 × RBW].
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

Integrated band power method:

The following procedure can be used when the maximum available RBW of the instrument is less than the

DTS bandwidth:

a) Set the RBW = 1 MHz.
b) Set the VBW ≥ [3 × RBW].
c) Set the span ≥ [1.5 × DTS bandwidth].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.

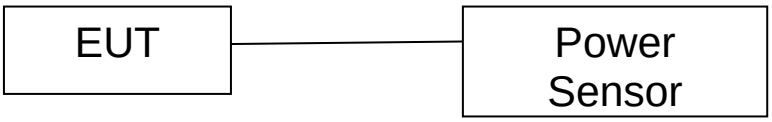
PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 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.

7.6 TEST RESULTS

Temperature：	25 ℃	Relative Humidity：	60%
Test Voltage ：	DC 3.3V		

TX 802.11b Mode				
Test Channel	Frequency	Conducted Output Power		LIMIT
	(MHz)	Peak(dBm)	AVG(dBm)	dBm
CH01	2412	15.96	14.13	30
CH06	2437	8.64	7.43	30
CH11	2462	9.33	8.03	30

TX 802.11g Mode				
Test Channel	Frequency	Conducted Output Power		LIMIT
	(MHz)	Peak(dBm)	AVG(dBm)	dBm
CH01	2412	14.23	11.36	30
CH06	2437	7.42	5.97	30
CH11	2462	8.86	6.43	30

TX 802.11n20 Mode				
Test Channel	Frequency	Conducted Output Power		LIMIT
	(MHz)	Peak(dBm)	AVG(dBm)	dBm
CH01	2412	12.86	10.69	30
CH06	2437	6.64	4.72	30
CH11	2462	7.63	5.93	30

TX 802.11n40 Mode				
Test Channel	Frequency	Conducted Output Power		LIMIT
	(MHz)	Peak(dBm)	AVG(dBm)	dBm
CH03	2422	10.94	8.83	30
CH06	2437	6.64	4.88	30
CH09	2452	6.39	5.83	30

8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

15.203 and RSS-Gen Issue 5 requirement: For intentional device, according to 15.203 and RSS-Gen Issue 5: 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.

8.2 EUT ANTENNA

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

9. FREQUENCY STABILITY

9.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/-0.02% of the operating frequency over a temperature variation of -30 degrees to 50 degrees C at normal supply voltage,and for a variation in primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees.

9.2 TEST PROCEDURE

1.The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2.Turn the EUT on and couple its output to spectrum analyzer.
3.Turn the EUT off and set the chamber to the highest temperature specified.
4.Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize,turn the EUT on and measure the operating frequency after 2,5,and 10 minutes.
5.Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6.The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes.The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

9.3 TEST RESULT

Channel 06 (2437MHz)

Voltage vs. Frequency Stability

Voltage vs. Frequency Stability Voltage(V)	Measurement Frequency(MHz)
3.78	2437.0030
3.3	2437.0026
2.81	2437.0024
Max.Deviation(MHz)	0.0030
Max.Deviation(ppm)	1.23

Rated working voltage:DC 3.3V

Temperature vs. Frequency Stability

Temperature(℃)	Measurement Frequency(MHz)
-30	2437.0033
-20	2437.0030
-10	2437.0028
0	2437.0023
10	2437.0030
20	2437.0024
30	2437.0027
40	2437.0023
50	2437.0027
Max.Deviation(MHz)	0.0033
Max.Deviation(ppm)	1.35

APPENDIX - PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

※※※※※END OF THE REPORT※※※※※