4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 15, 2007

NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

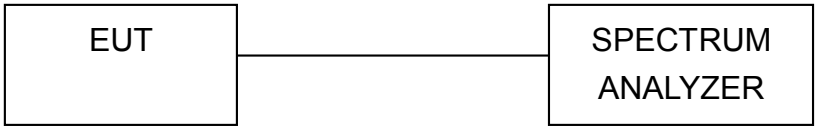
4.5.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time = span/3kHz. The power spectral density was measured and recorded.
The sweep time is allowed to be longer than span/3kHz for a full response of the mixer in the spectrum analyzer.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITION

Same as Item 4.3.6

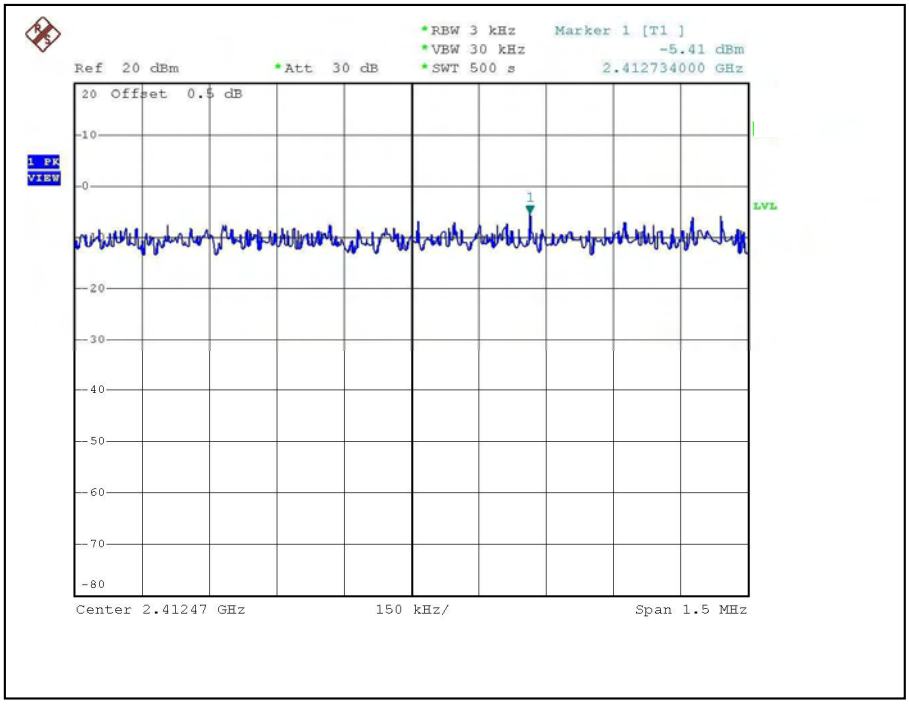
4.5.7 TEST RESULTS

802.11b DSSS MODULATION:

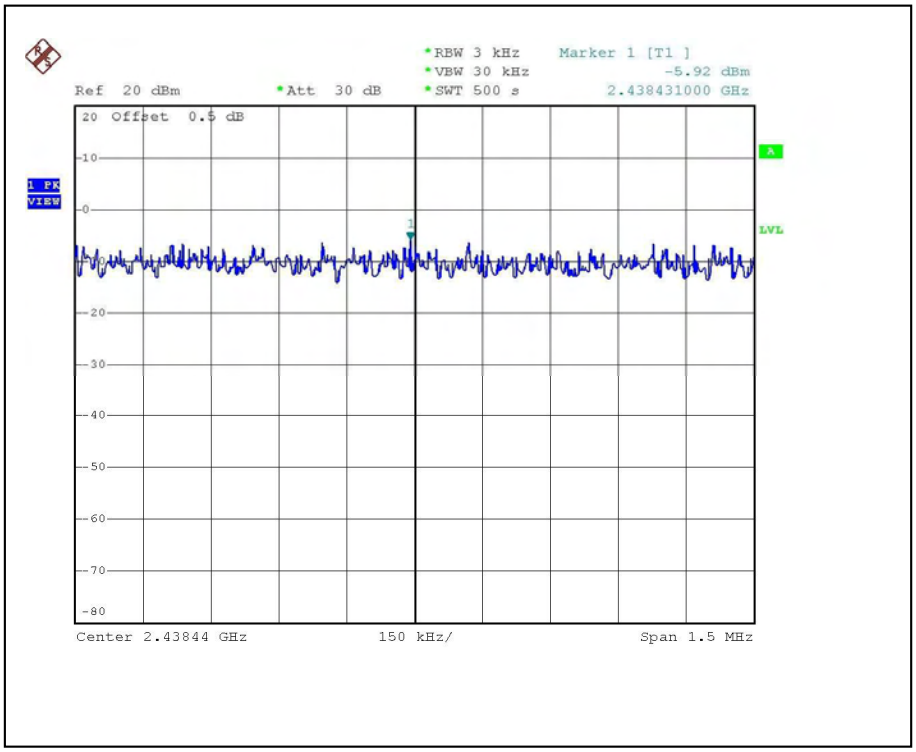
MODULATION TYPE	CCK	TRANSFER RATE	1Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	22deg.C, 65%RH, 971hPa
TESTED BY	Phoenix Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
1	2412	-5.41	8	PASS
6	2437	-5.92	8	PASS
11	2462	-6.58	8	PASS

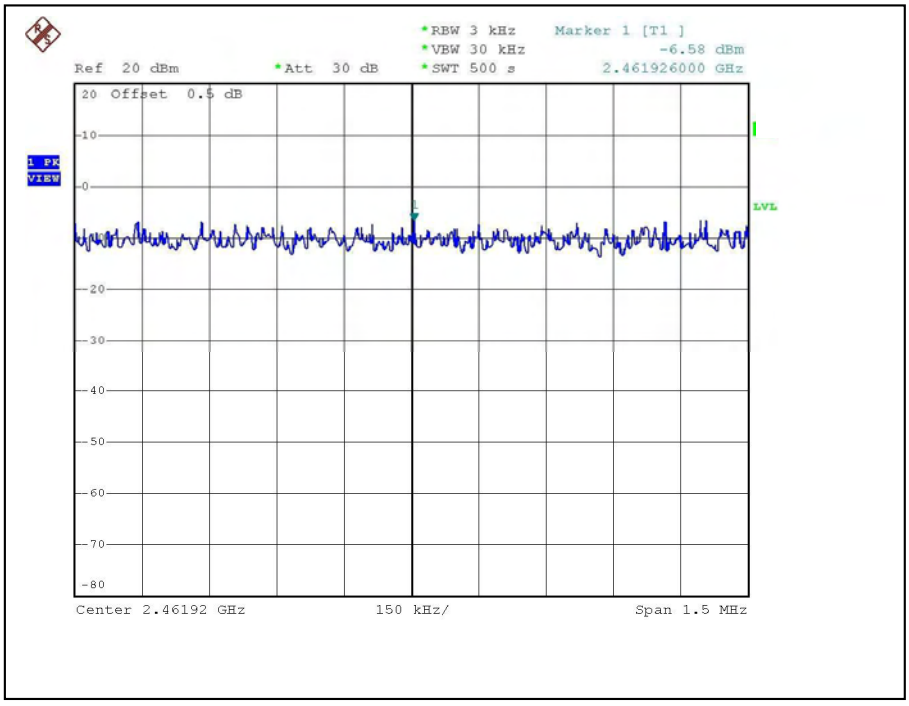
CH1



CH6


RBW 3 kHz
VBW 30 kHz
SWT 500 s
Marker 1 [T1]
-5.92 dBm
2.438431000 GHz
Ref 20 dBm
Att 30 dB
Offset 0.5 dB
1 PK VIEW
LVL
Center 2.43844 GHz
150 kHz/
Span 1.5 MHz

CH11

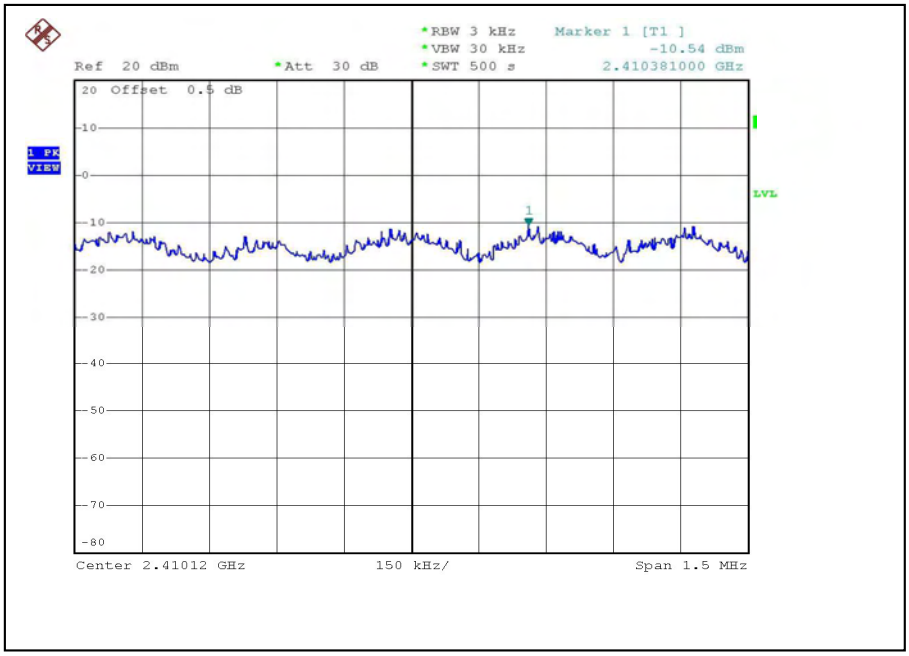

RBW 3 kHz
VBW 30 kHz
SWT 500 s
Marker 1 [T1]
-6.58 dBm
2.461926000 GHz
Ref 20 dBm
Att 30 dB
Offset 0.5 dB
1 PK VIEW
LVL
Center 2.46192 GHz
150 kHz/
Span 1.5 MHz

802.11g OFDM MODULATION:

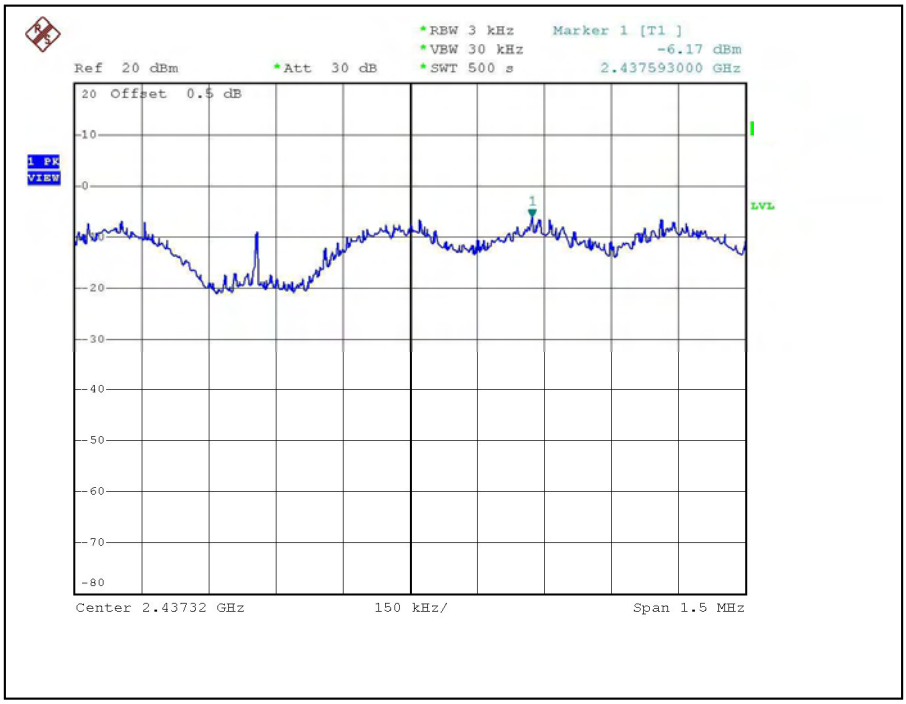
MODULATION TYPE	BPSK	TRANSFER RATE	6Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	22deg.C, 65%RH, 971hPa
TESTED BY	Phoenix Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS / FAIL
1	2412	-10.54	8	PASS
6	2437	-6.17	8	PASS
11	2462	-9.68	8	PASS

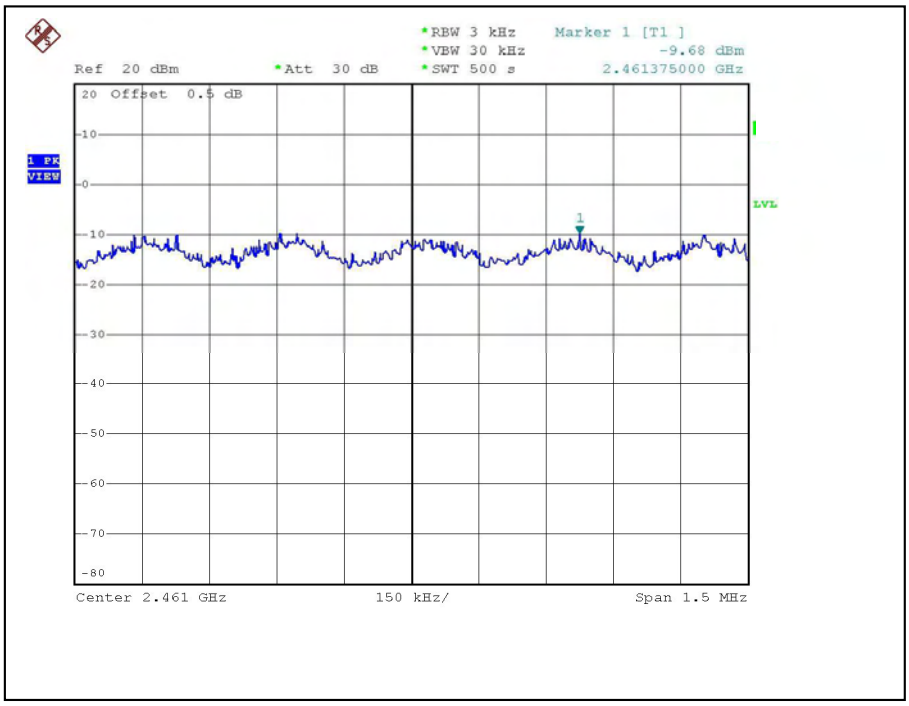
CH1



CH6


RBW 3 kHz
VBW 30 kHz
SWT 500 s
Marker 1 [T1]
-6.17 dBm
2.437593000 GHz
Ref 20 dBm
Att 30 dB
Offset 0.5 dB
1 PK VIEW
LVL
Center 2.43732 GHz
150 kHz/
Span 1.5 MHz

CH11

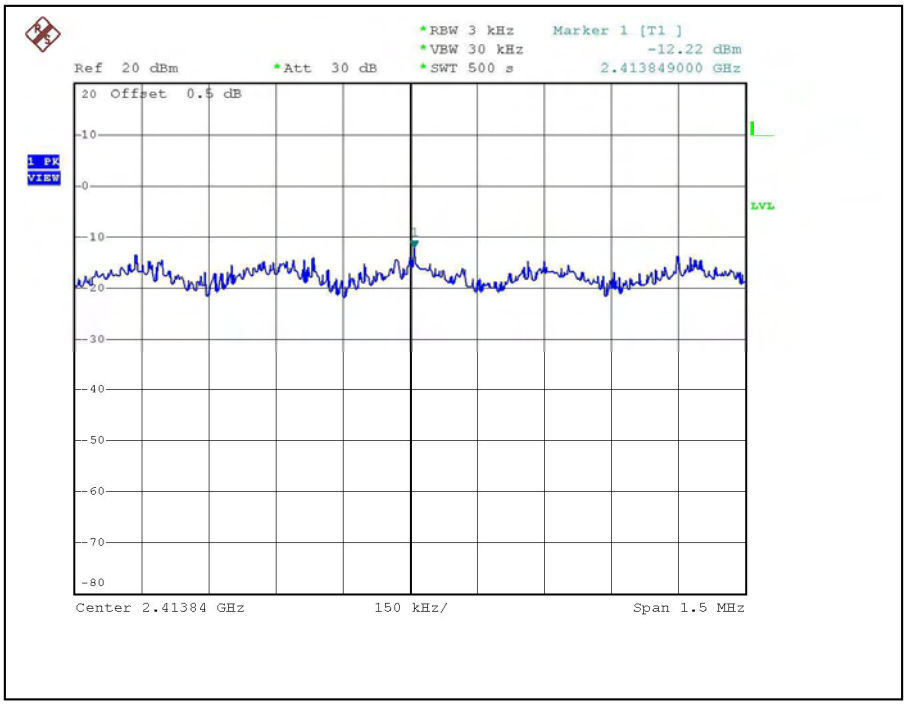

RBW 3 kHz
VBW 30 kHz
SWT 500 s
Marker 1 [T1]
-9.68 dBm
2.461375000 GHz
Ref 20 dBm
Att 30 dB
Offset 0.5 dB
1 PK VIEW
LVL
Center 2.461 GHz
150 kHz/
Span 1.5 MHz

DRAFT 802.11n (20MHz) OFDM MODULATION:

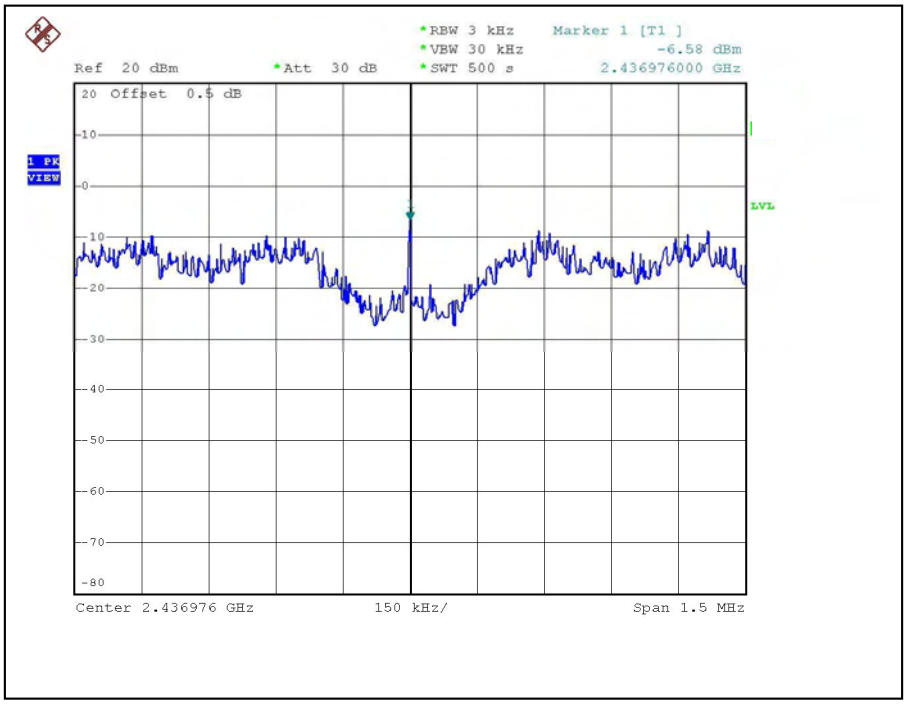
MODULATION TYPE	BPSK	TRANSFER RATE	6.5Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	22 deg.C, 65%RH, 971hPa
TESTED BY	Phoenix Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		MAXIMUM LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(2)		
1	2412	-12.22	-11.73	8	PASS
6	2437	-6.58	-5.91	8	PASS
11	2462	-11.55	-9.67	8	PASS

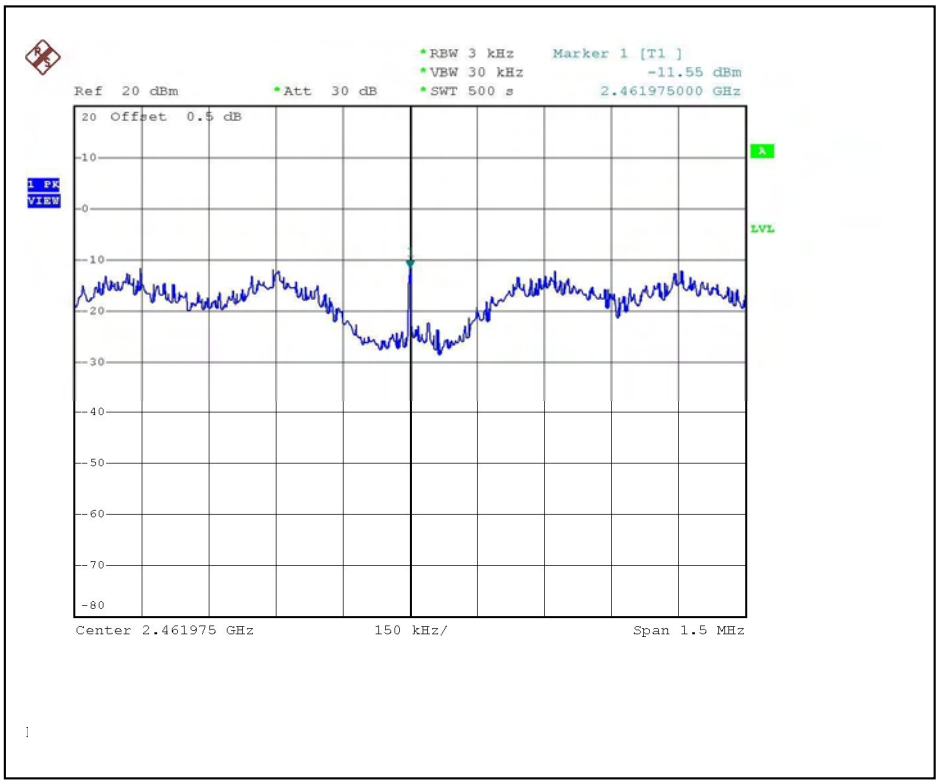
For Chain(0): CH1



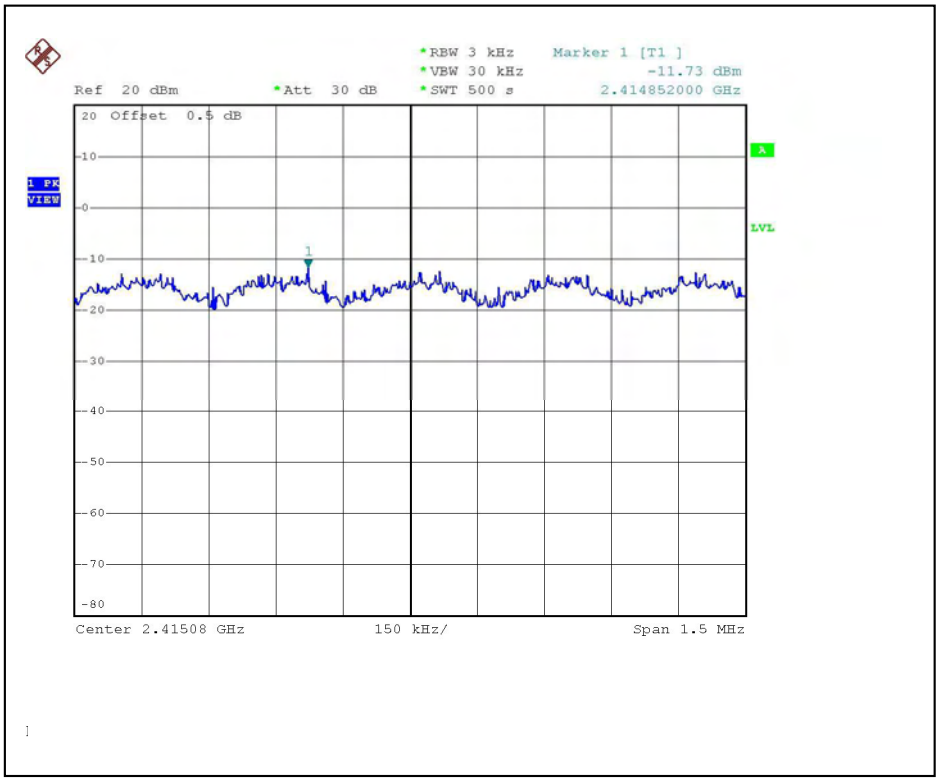
CH6


RBW 3 kHz
VBW 30 kHz
SWT 500 s
Marker 1 [T1]
-6.58 dBm
2.436976000 GHz
Ref 20 dBm
Att 30 dB
Offset 0.5 dB
1 PK VIEW
LVL
Center 2.436976 GHz
150 kHz/
Span 1.5 MHz

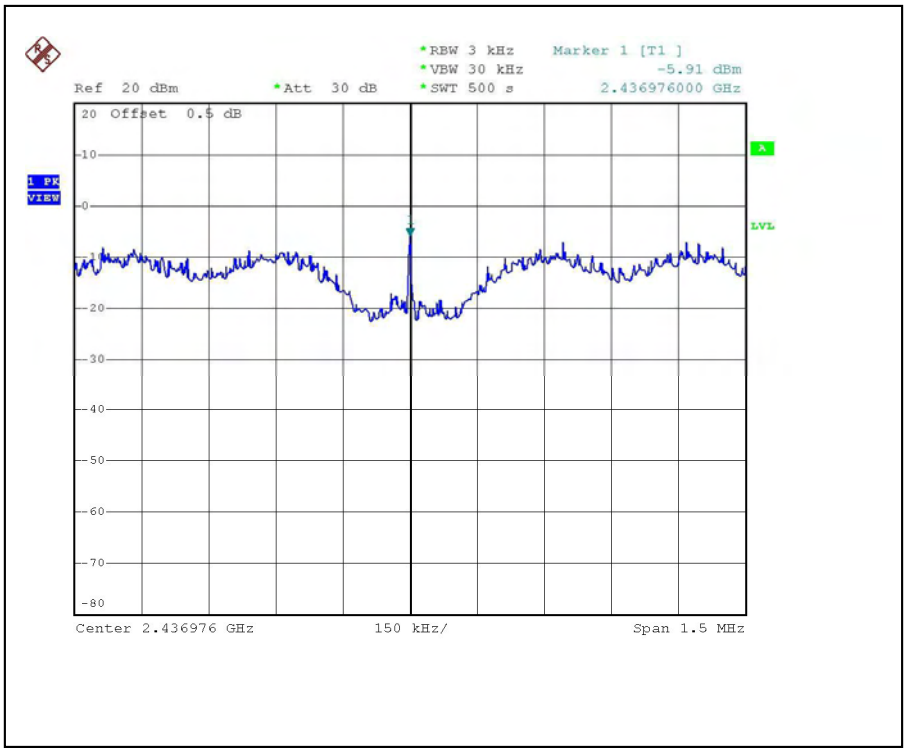
CH11


RBW 3 kHz
VBW 30 kHz
SWT 500 s
Marker 1 [T1]
-11.55 dBm
2.461975000 GHz
Ref 20 dBm
Att 30 dB
Offset 0.5 dB
1 PK VIEW
LVL
Center 2.461975 GHz
150 kHz/
Span 1.5 MHz

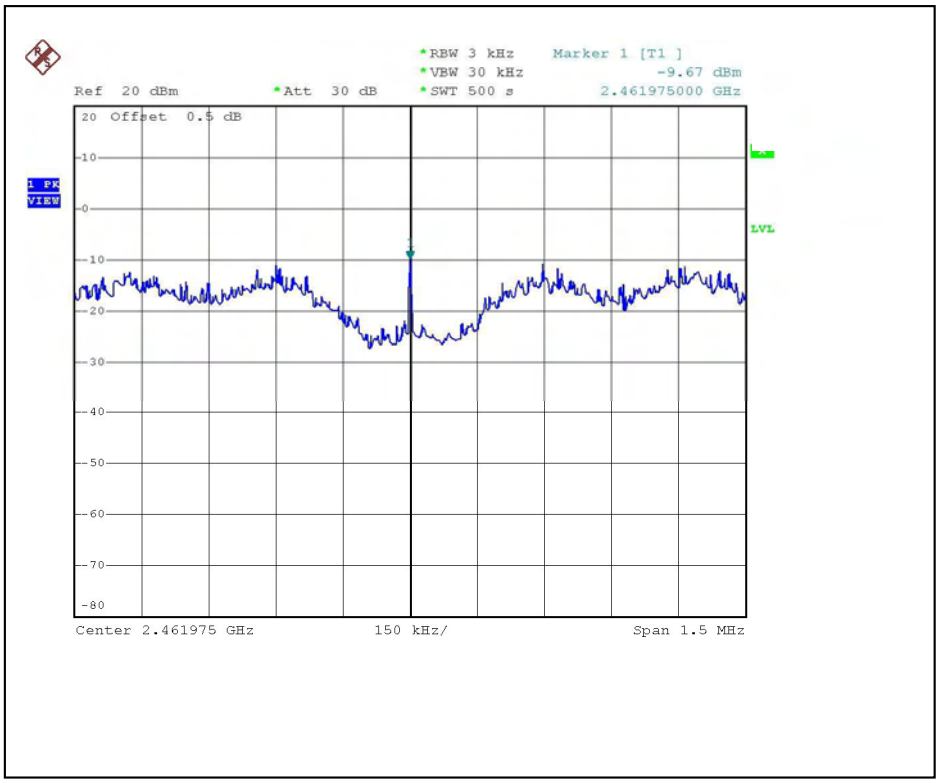
For Chain (2): CH1



CH6



CH11

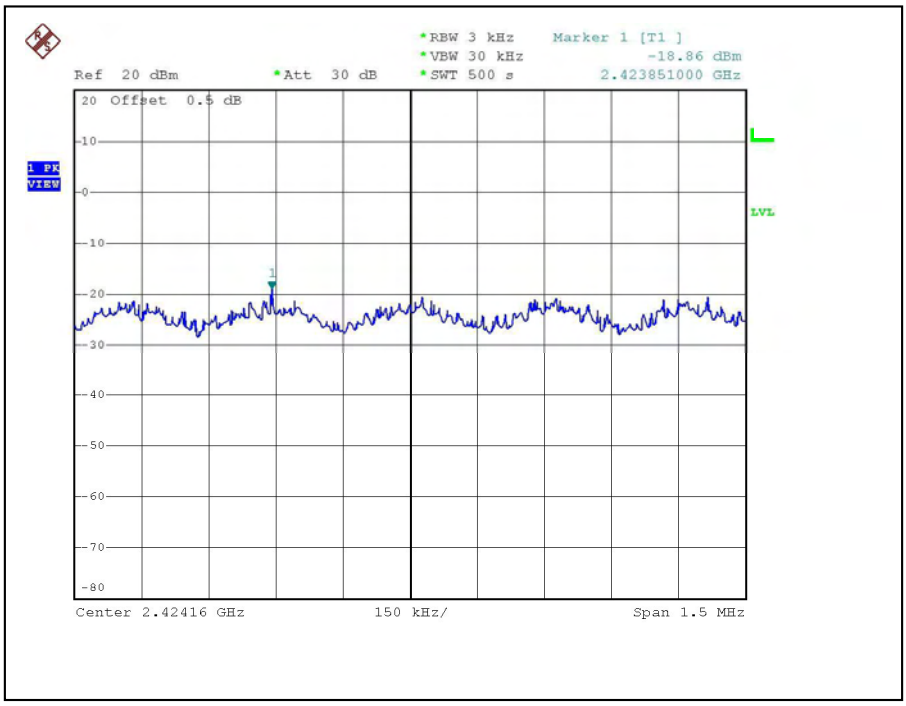

*RBW 3 kHz
*VBW 30 kHz
*SWT 500 s
Marker 1 [T1]
-9.67 dBm
2.461975000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.5 dB
-10
-0
10
20
30
40
50
60
70
-80
LVL
Center 2.461975 GHz
150 kHz/
Span 1.5 MHz

DRAFT 802.11n (40MHz) OFDM MODULATION:

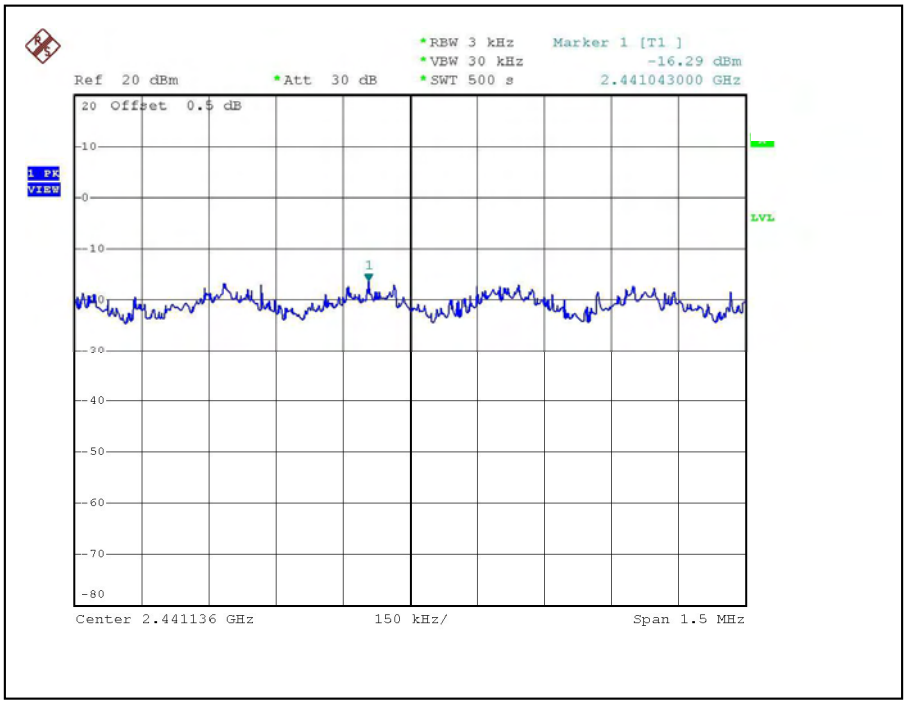
MODULATION TYPE	BPSK	**TRANSFER RATE**	13.5Mbps
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**ENVIRONMENTAL CONDITIONS**	22deg.C, 65%RH, 971hPa
TESTED BY	Phoenix Huang		

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)		MAXIMUM LIMIT (dBm)	PASS / FAIL
		CHAIN(0)	CHAIN(2)		
1	2422	-18.86	-17.42	8	PASS
4	2437	-16.29	-15.85	8	PASS
7	2452	-17.32	-16.91	8	PASS

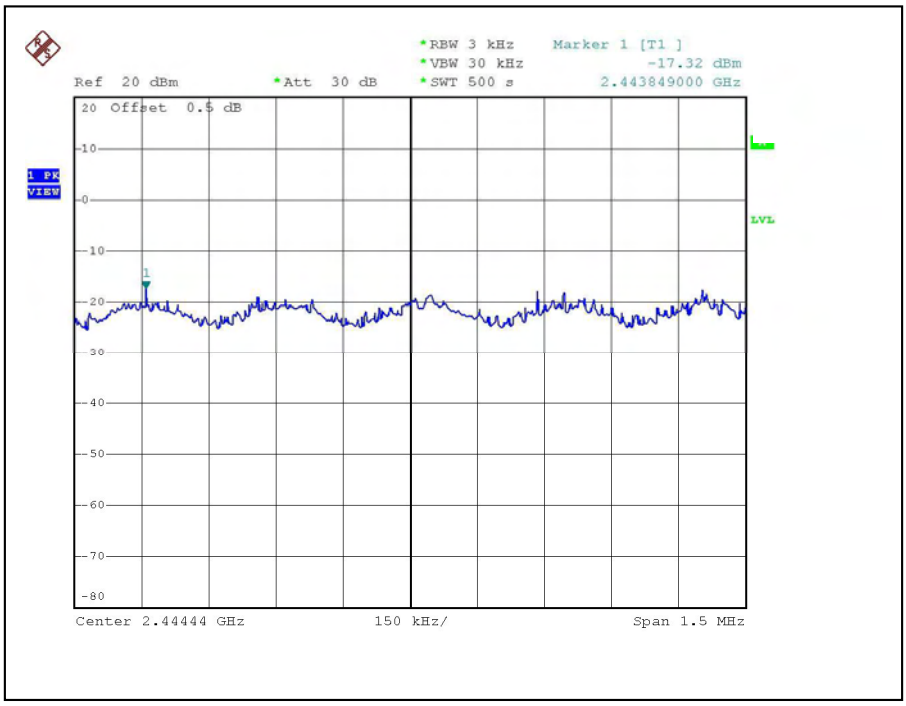
For Chain (0): CH1



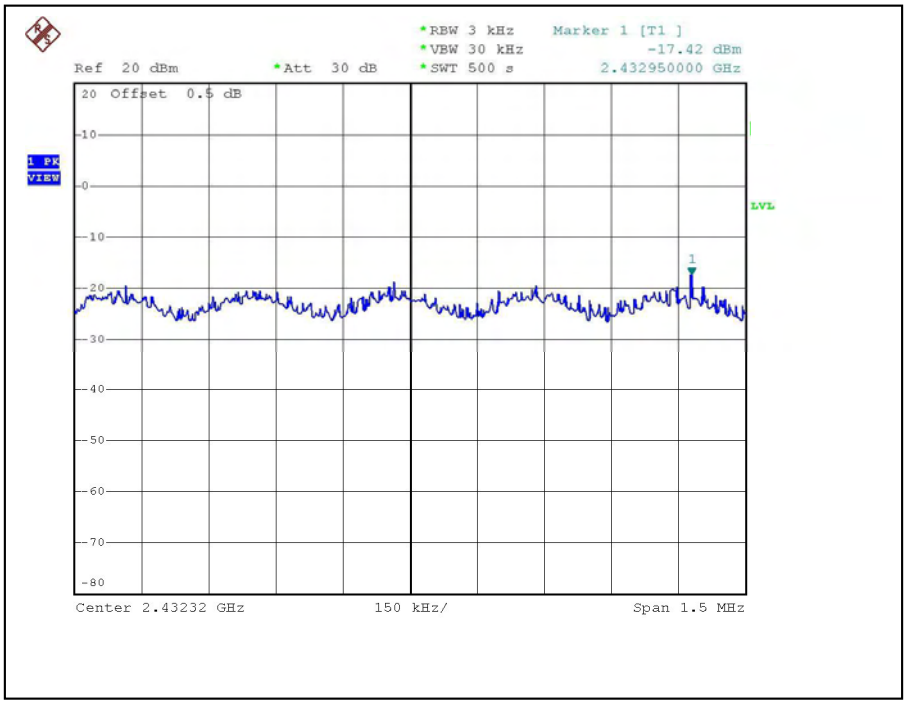
CH4


*RBW 3 kHz
*VBW 30 kHz
*SWT 500 s
Marker 1 [T1]
-16.29 dBm
2.441043000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.5 dB
1 PK VIEW
LVL
Center 2.441136 GHz
150 kHz/
Span 1.5 MHz

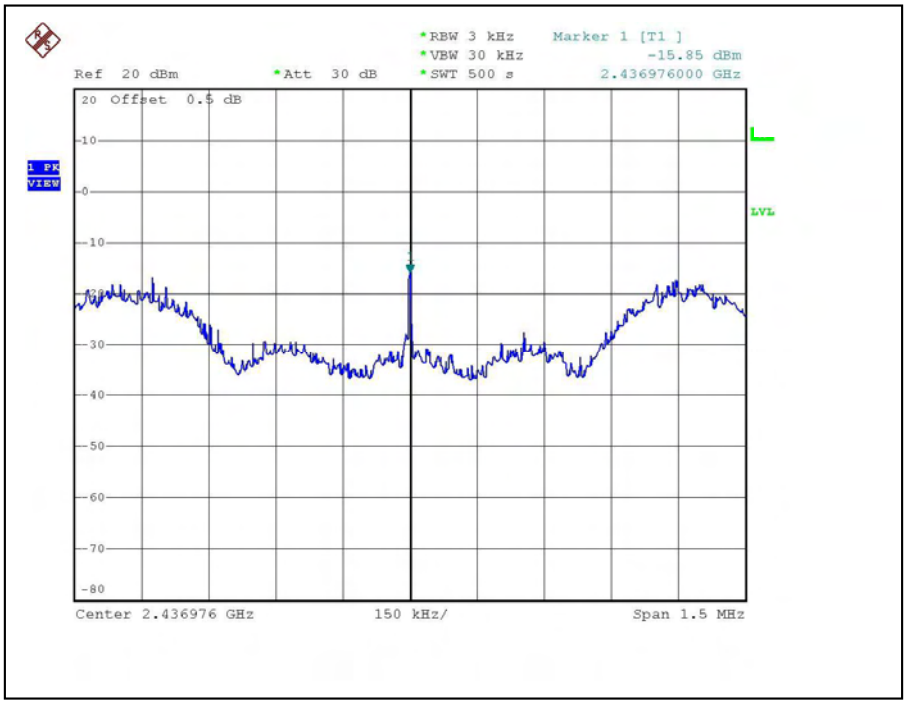
CH7


*RBW 3 kHz
*VBW 30 kHz
*SWT 500 s
Marker 1 [T1]
-17.32 dBm
2.443849000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.5 dB
1 PK VIEW
LVL
Center 2.44444 GHz
150 kHz/
Span 1.5 MHz

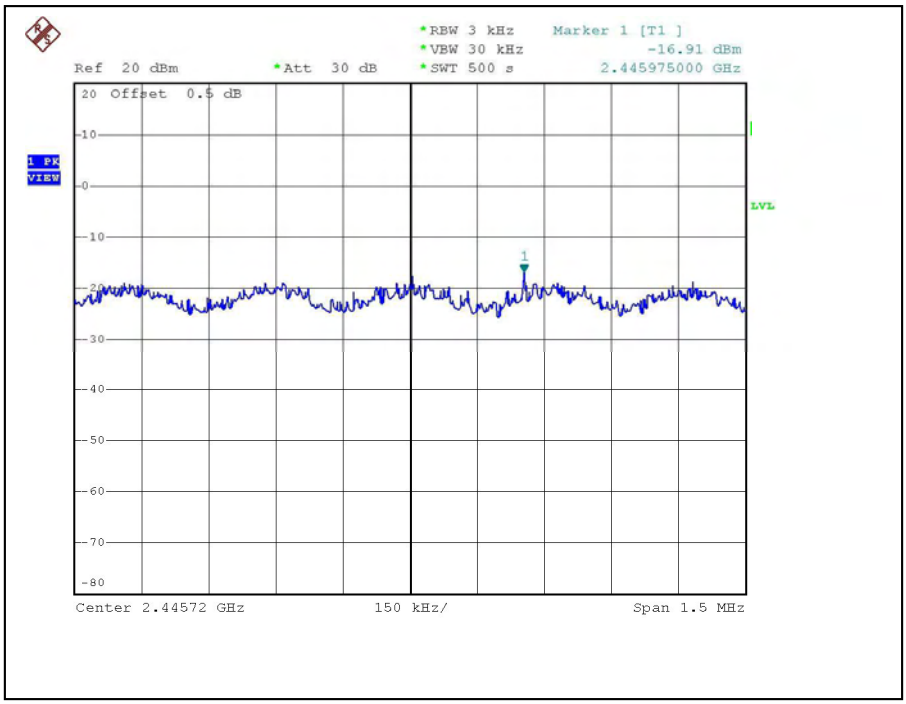
For Chain (2): CH1



CH4



CH7


RBW 3 kHz
VBW 30 kHz
SWT 500 s
Marker 1 [T1]
-16.91 dBm
2.445975000 GHz
Ref 20 dBm
Att 30 dB
Offset 0.5 dB
1 PK VIEW
LVL
Center 2.44572 GHz
150 kHz/
Span 1.5 MHz

4.6 BAND EDGES MEASUREMENT

4.6.1 LIMITS OF BAND EDGES MEASUREMENT

Below –20dB of the highest emission level of operating band (in 1MHz Resolution Bandwidth).

4.6.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 15, 2007

NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.6.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots (RBW = VBW = 100kHz) are attached on the following pages.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 EUT OPERATING CONDITION

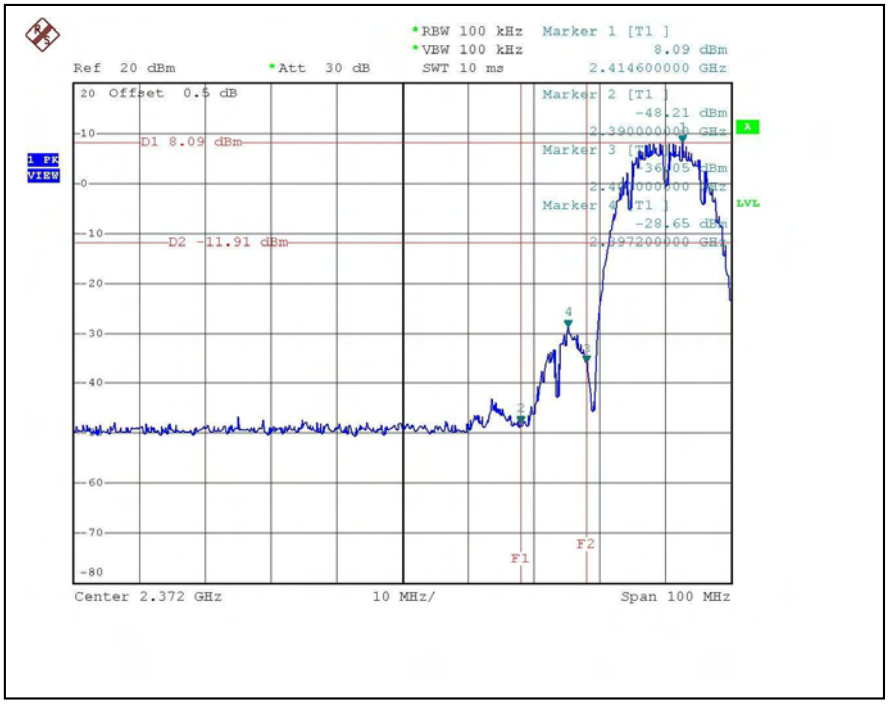
Same as Item 4.3.6

4.6.6 TEST RESULTS

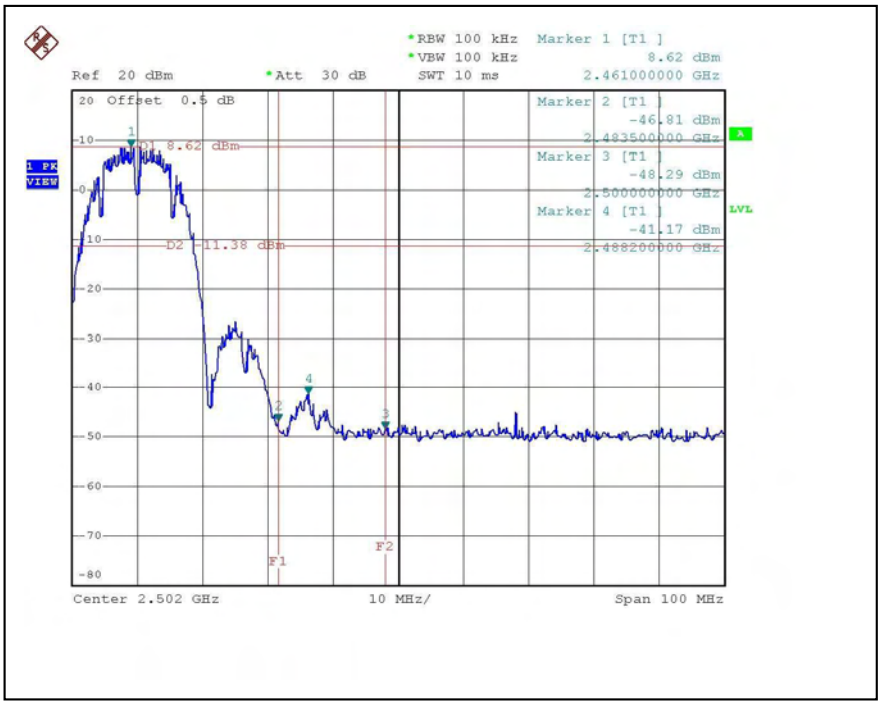
The spectrum plots are attached on the following 12 images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

802.11b DSSS MODULATION:

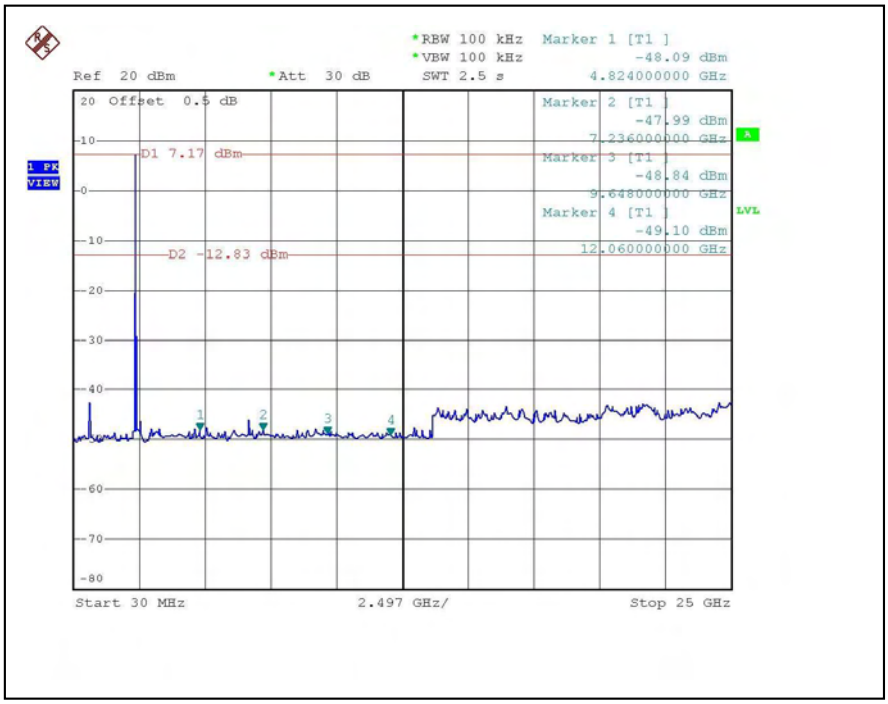
CH1



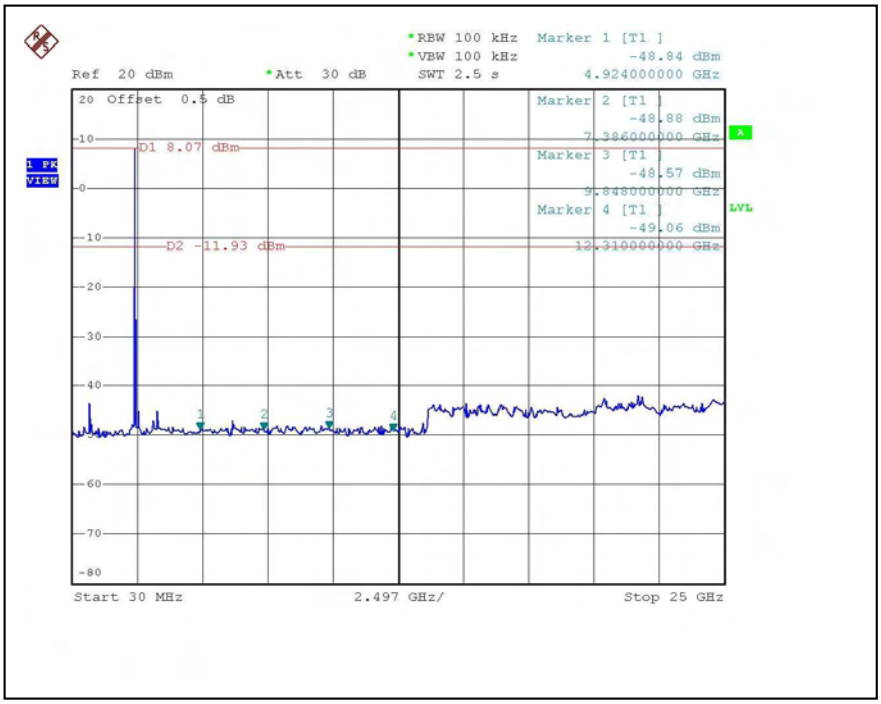
CH11



CH1

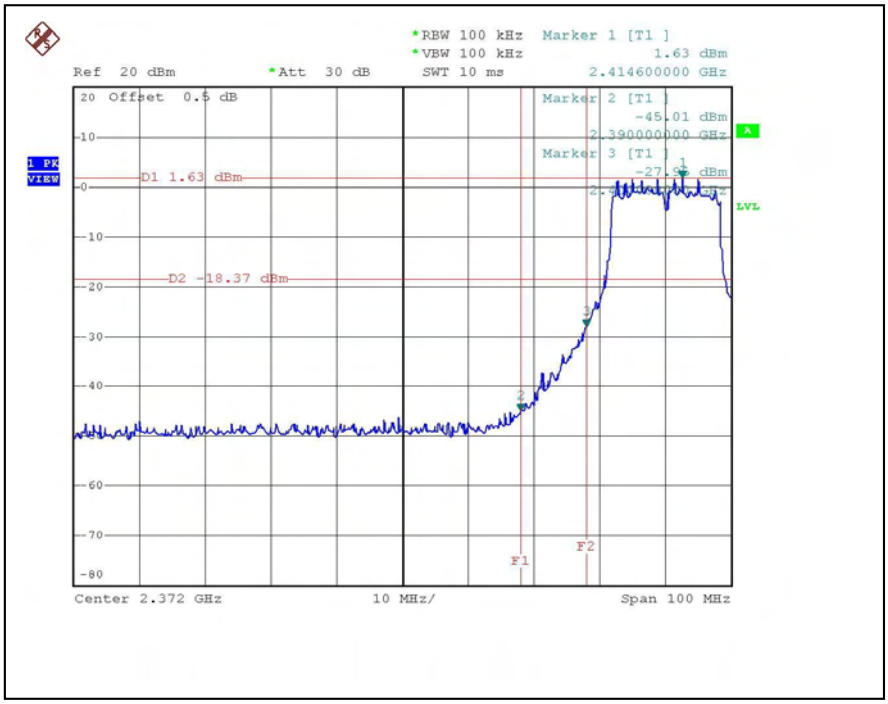

RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-48.09 dBm
4.824000000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 0.5 dB
D1 7.17 dBm
D2 -12.83 dBm
Marker 2 [T1]
-47.99 dBm
7.236000000 GHz
Marker 3 [T1]
-48.84 dBm
9.648000000 GHz
Marker 4 [T1]
-49.10 dBm
12.060000000 GHz
1 PK VIEW
LVL
Start 30 MHz
2.497 GHz/
Stop 25 GHz

CH11

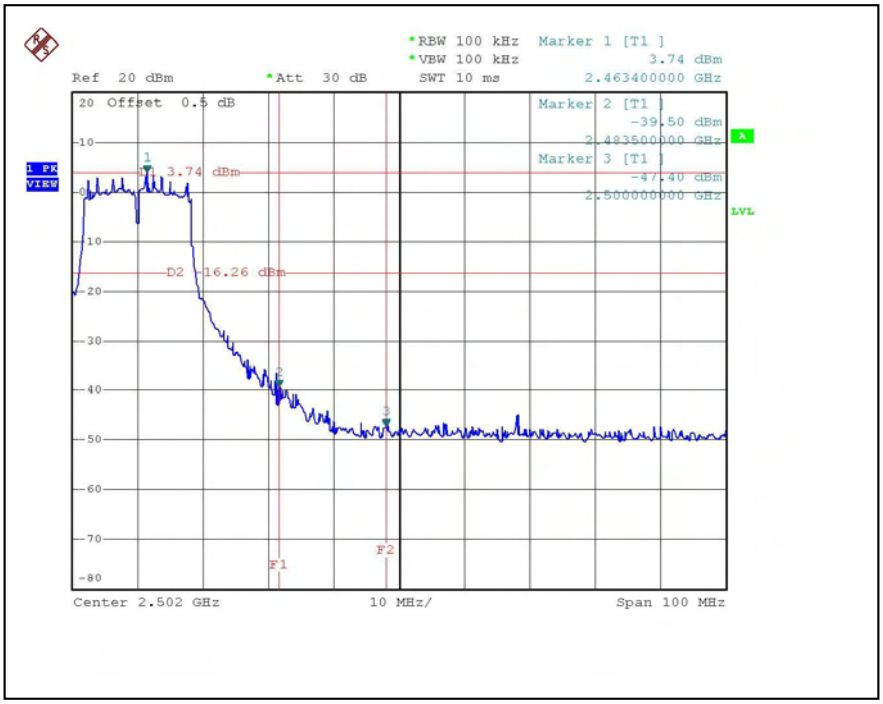

RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-48.84 dBm
4.924000000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 0.5 dB
D1 8.07 dBm
D2 -11.93 dBm
Marker 2 [T1]
-48.88 dBm
7.386000000 GHz
Marker 3 [T1]
-48.57 dBm
9.848000000 GHz
Marker 4 [T1]
-49.06 dBm
12.310000000 GHz
1 PK VIEW
LVL
Start 30 MHz
2.497 GHz/
Stop 25 GHz

802.11g OFDM MODULATION:

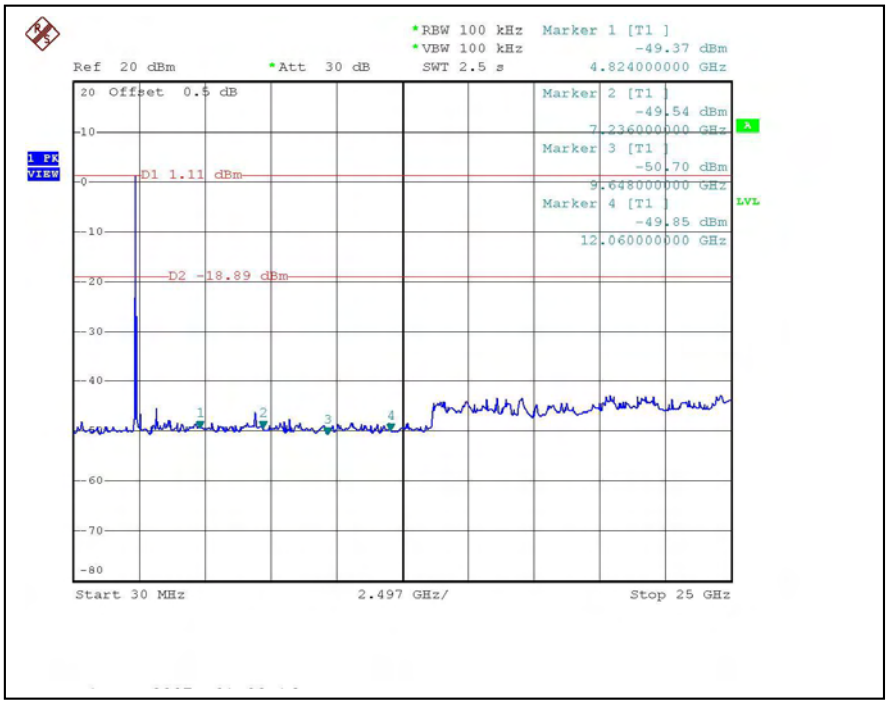
CH 1



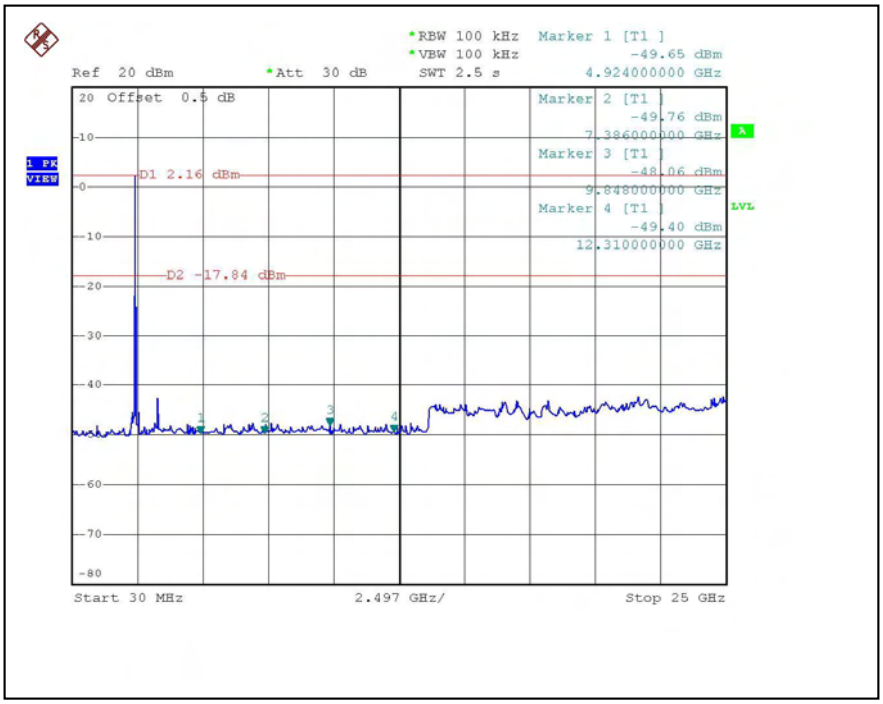
CH11



CH1

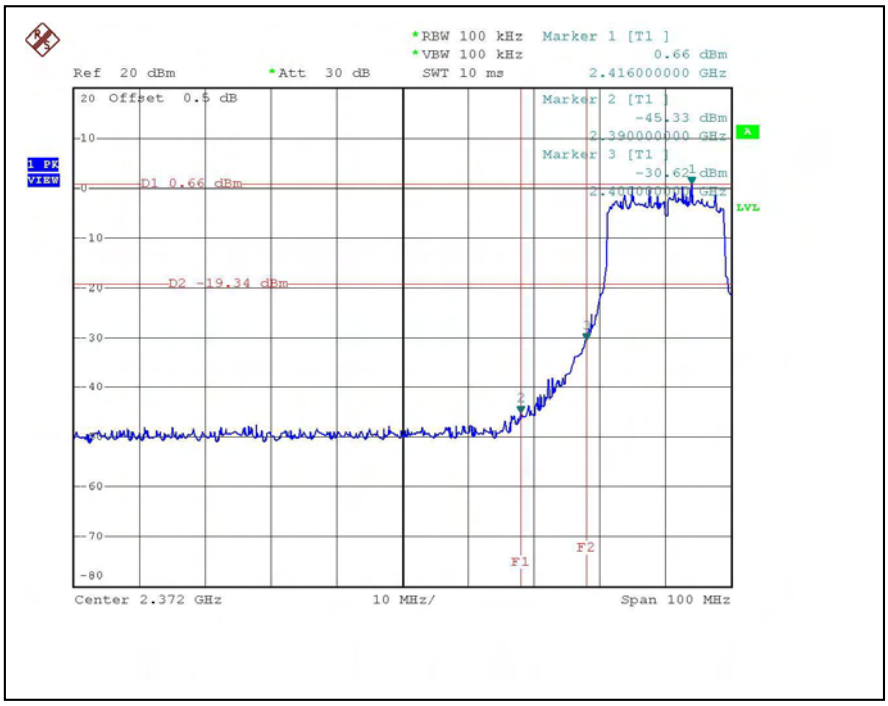

RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-49.37 dBm
4.824000000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-49.54 dBm
7.236000000 GHz
Marker 3 [T1]
-50.70 dBm
9.648000000 GHz
Marker 4 [T1]
-49.85 dBm
12.060000000 GHz
D1 1.11 dBm
D2 -18.89 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

CH11

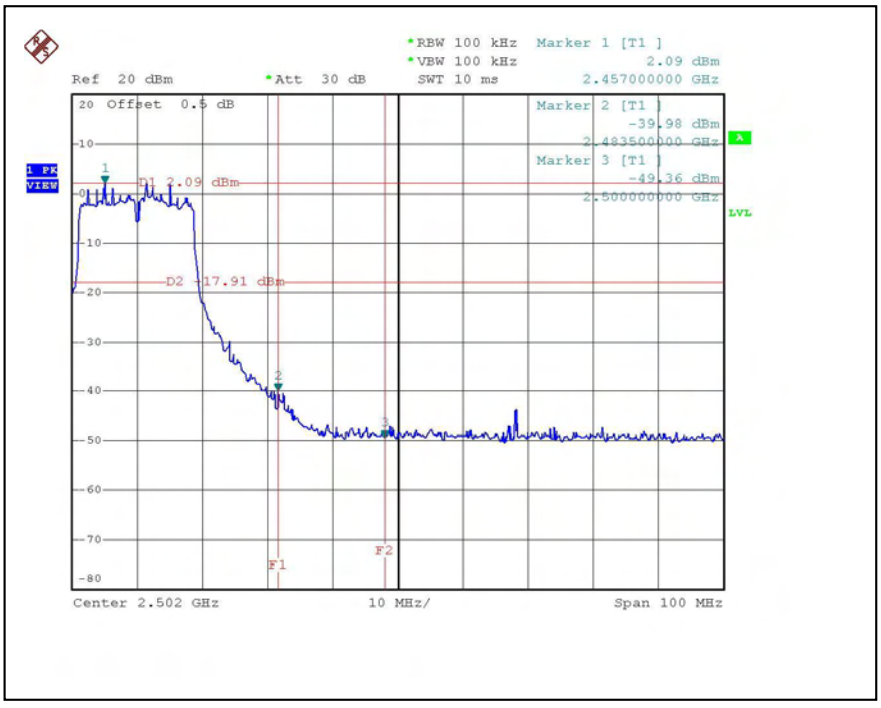

RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-49.65 dBm
4.924000000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-49.76 dBm
7.386000000 GHz
Marker 3 [T1]
-48.06 dBm
9.848000000 GHz
Marker 4 [T1]
-49.40 dBm
12.310000000 GHz
D1 2.16 dBm
D2 -17.84 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

DRAFT 802.11n (20MHz) OFDM MODULATION:

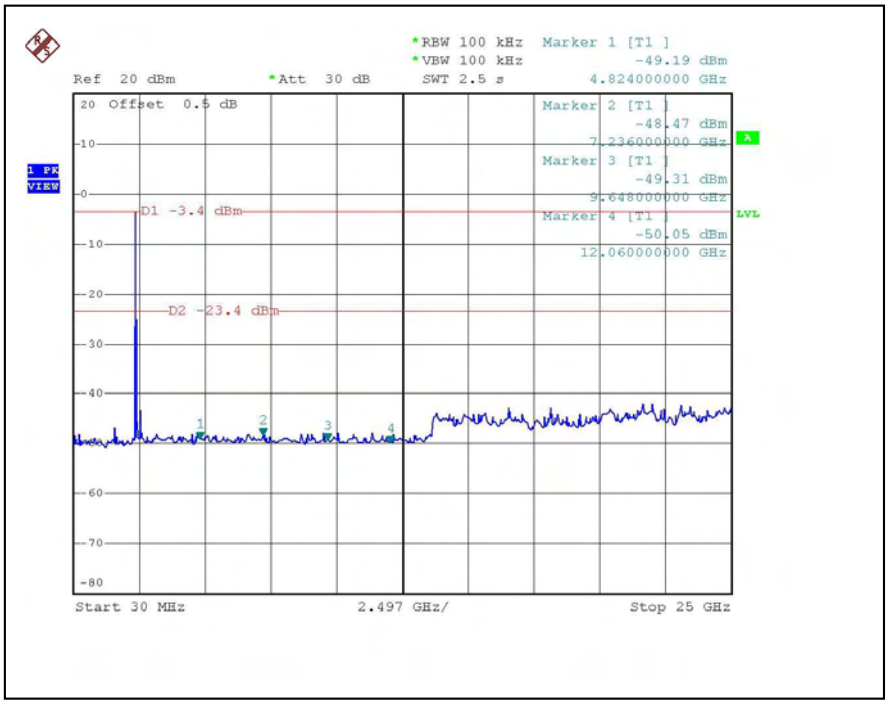
For Chain (0):CH1



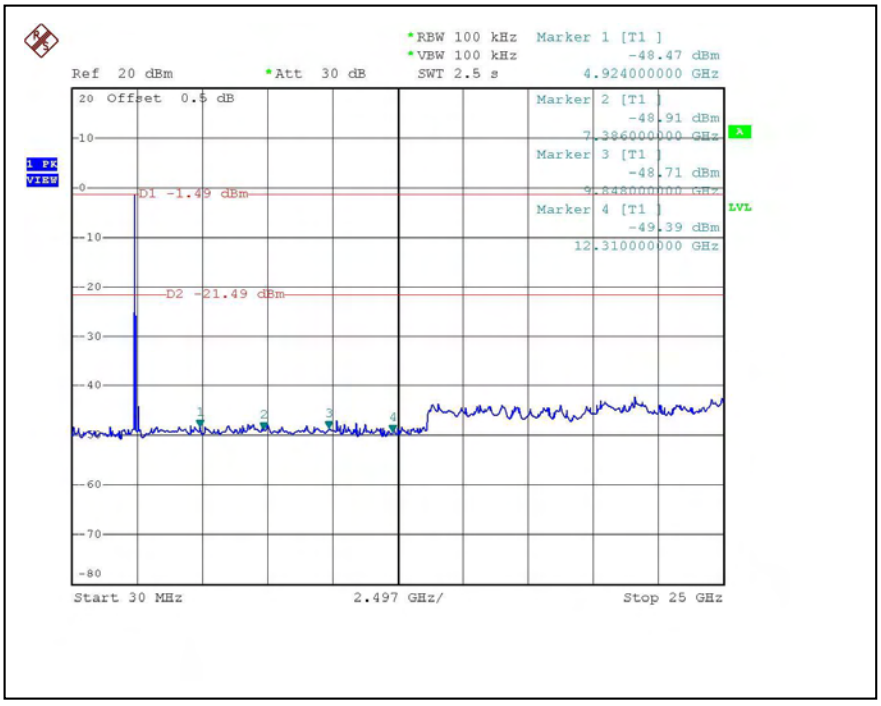
CH11



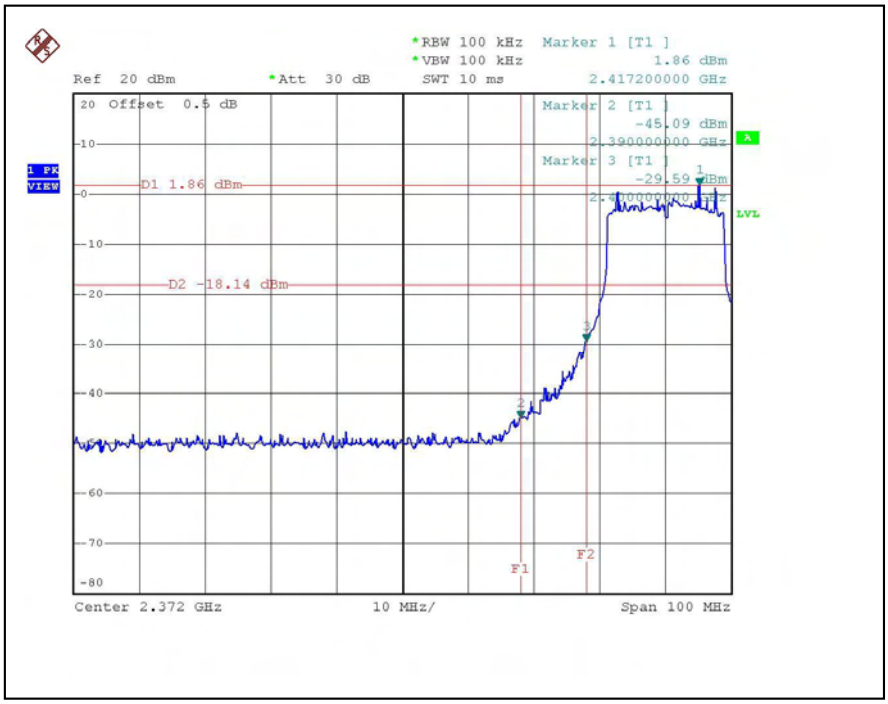
CH1


RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-49.19 dBm
4.824000000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-48.47 dBm
7.236000000 GHz
Marker 3 [T1]
-49.31 dBm
9.648000000 GHz
Marker 4 [T1]
-50.05 dBm
12.060000000 GHz
D1 -3.4 dBm
D2 -23.4 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

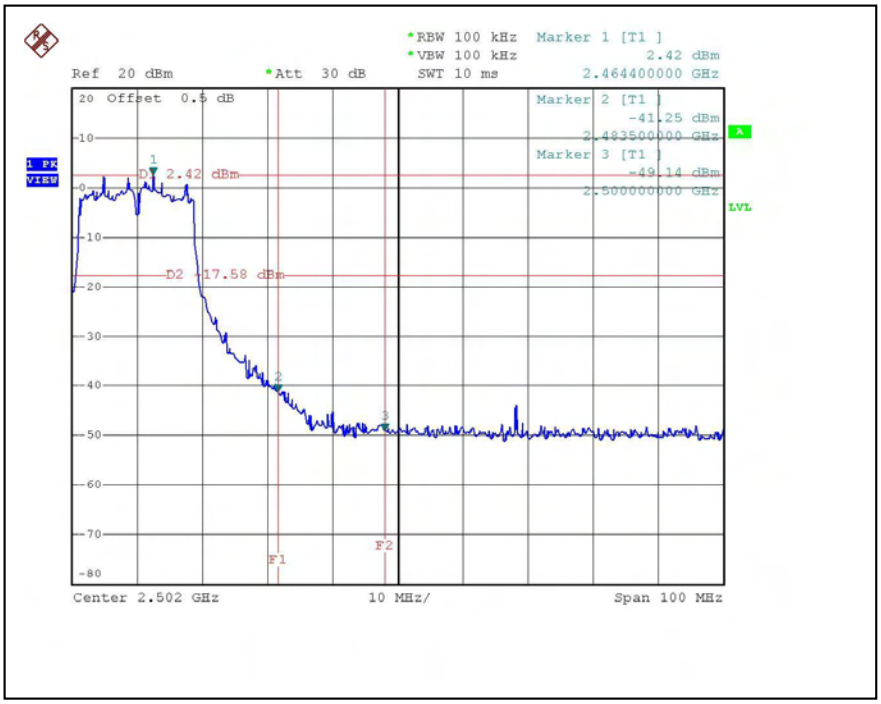
CH11


RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-48.47 dBm
4.924000000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-48.91 dBm
7.386000000 GHz
Marker 3 [T1]
-48.71 dBm
9.848000000 GHz
Marker 4 [T1]
-49.39 dBm
12.310000000 GHz
D1 -1.49 dBm
D2 -21.49 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

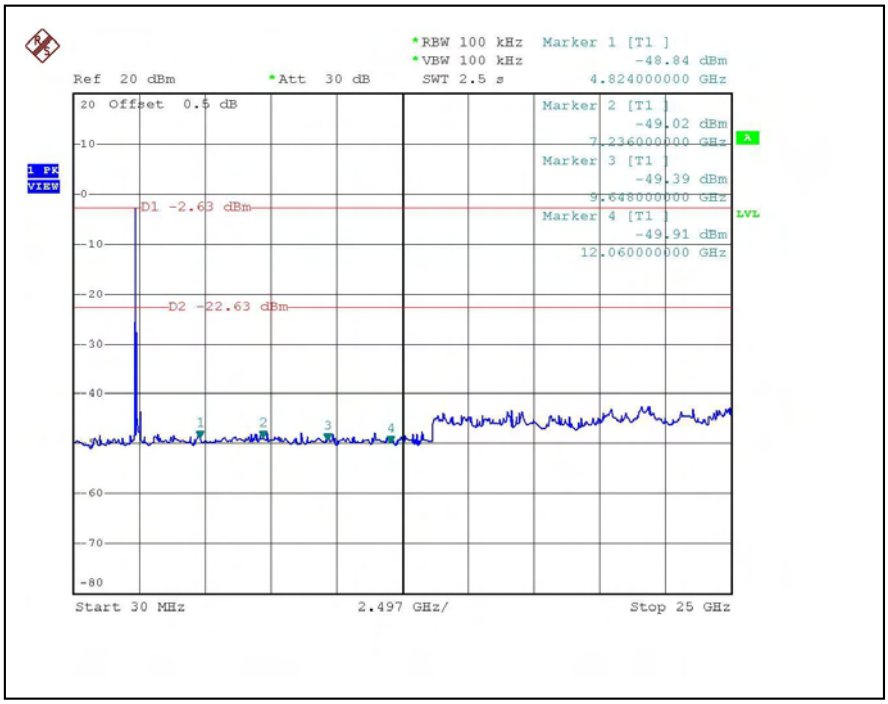
For Chain (2):CH1



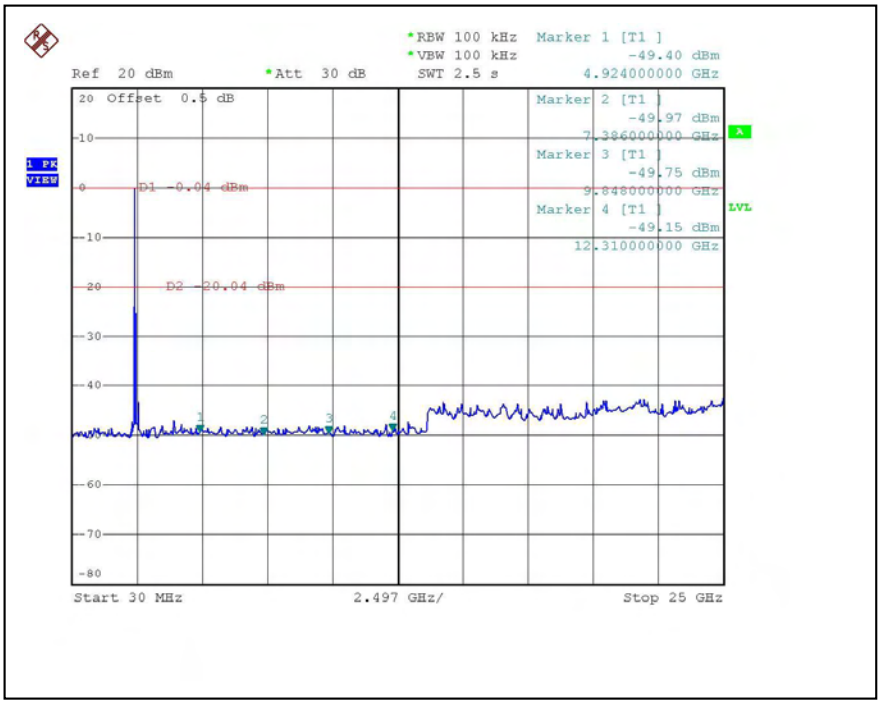
CH11



CH1

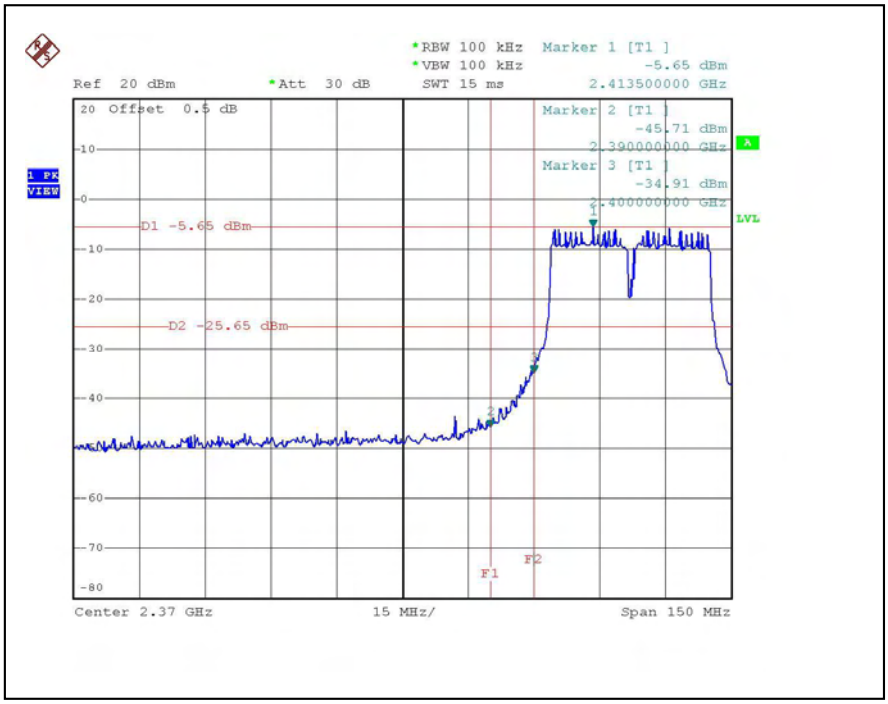

RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-48.84 dBm
4.824000000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-49.02 dBm
7.236000000 GHz
Marker 3 [T1]
-49.39 dBm
9.648000000 GHz
Marker 4 [T1]
-49.91 dBm
12.060000000 GHz
D1 -2.63 dBm
D2 -22.63 dBm
1 PK VIEW
LVL
Start 30 MHz
2.497 GHz/
Stop 25 GHz

CH11

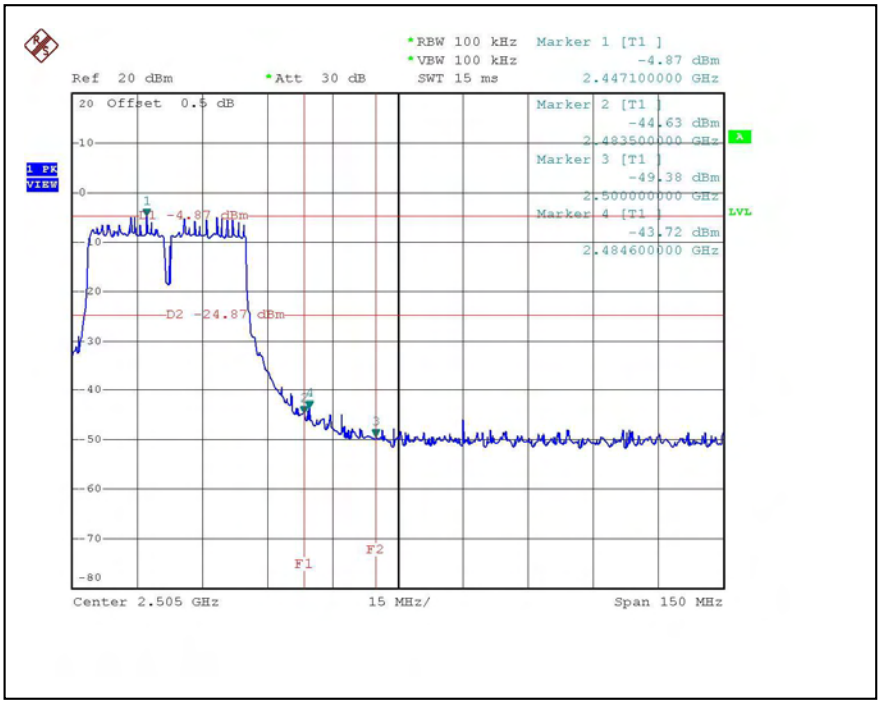

RBW 100 kHz
VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-49.40 dBm
4.924000000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-49.97 dBm
7.386000000 GHz
Marker 3 [T1]
-49.75 dBm
9.848000000 GHz
Marker 4 [T1]
-49.15 dBm
12.310000000 GHz
D1 -0.04 dBm
D2 -20.04 dBm
1 PK VIEW
LVL
Start 30 MHz
2.497 GHz/
Stop 25 GHz

DRAFT 802.11n (40MHz) OFDM MODULATION:

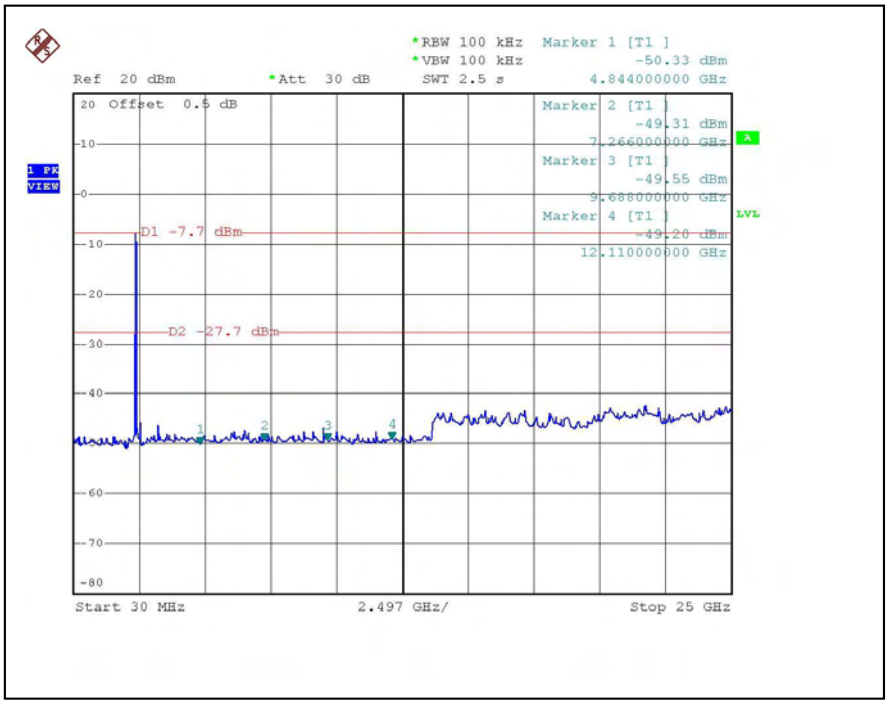
For Chain (0):CH1



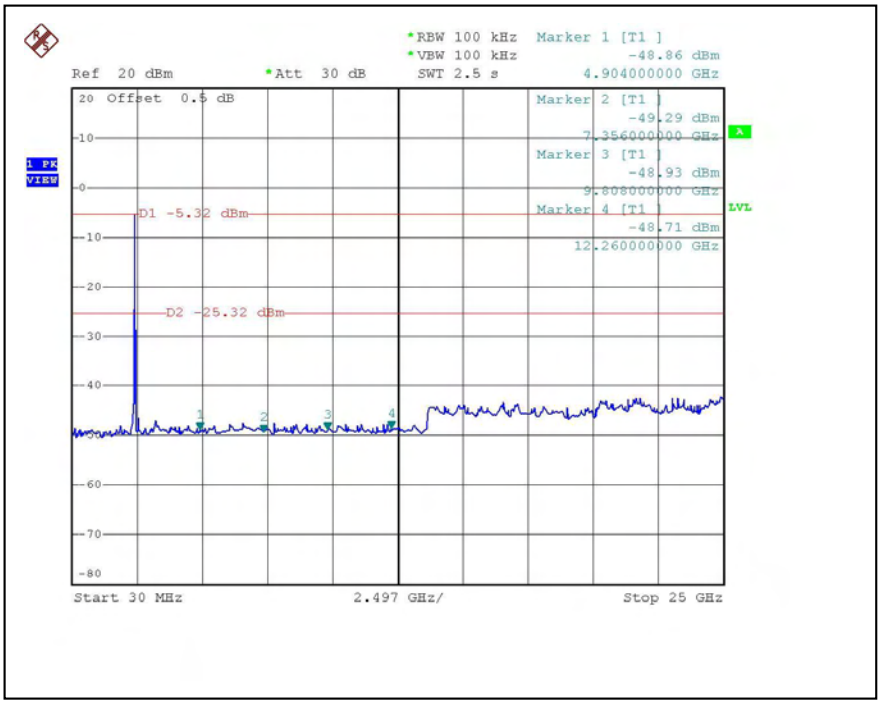
CH7



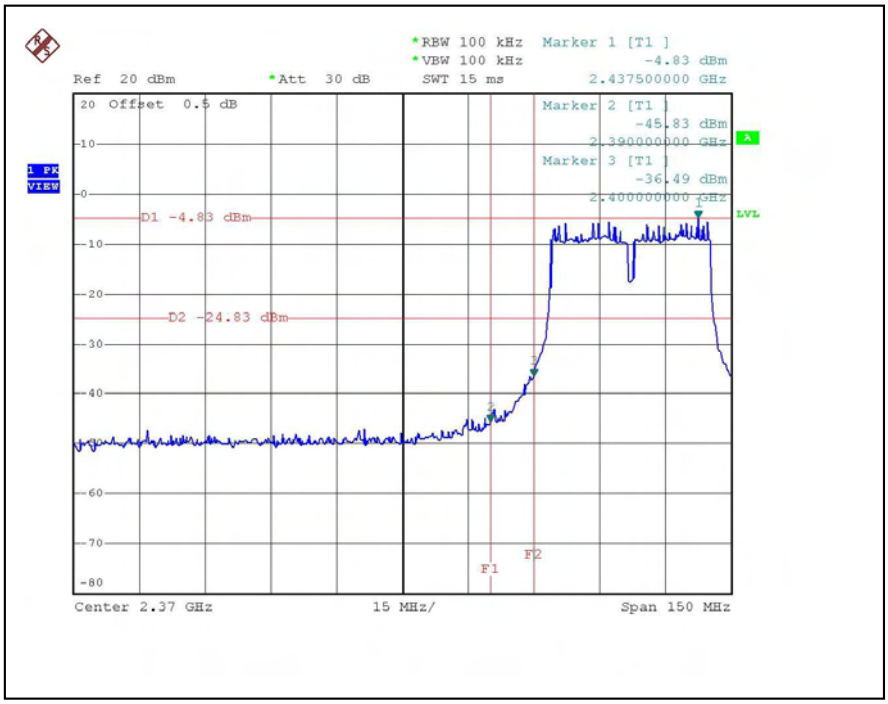
CH1


*RBW 100 kHz
*VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-50.33 dBm
4.844000000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-49.31 dBm
7.266000000 GHz
Marker 3 [T1]
-49.55 dBm
9.688000000 GHz
Marker 4 [T1]
-49.20 dBm
12.110000000 GHz
D1 -7.7 dBm
D2 -27.7 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

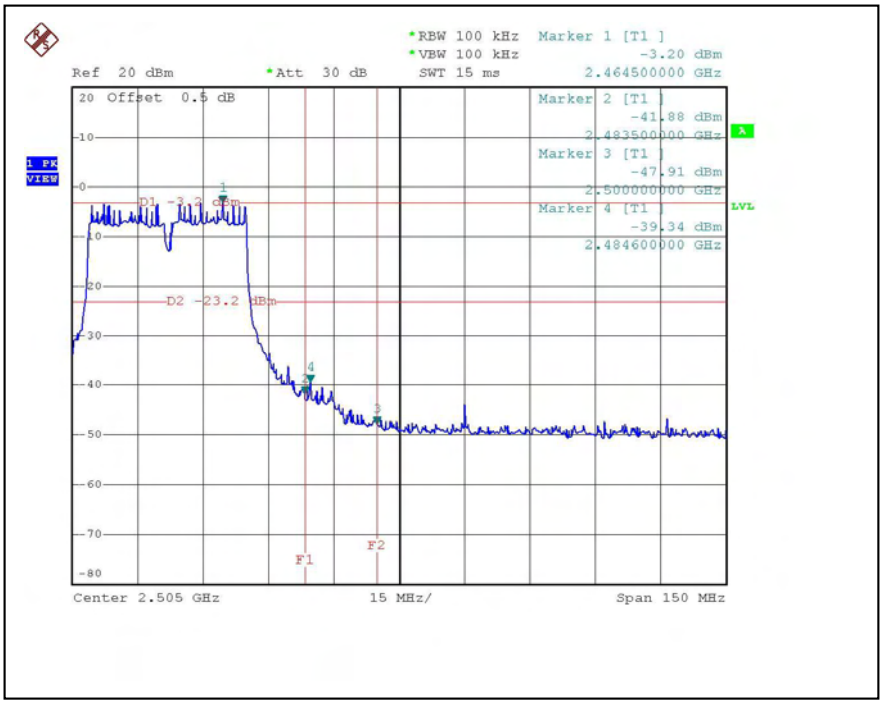
CH7


*RBW 100 kHz
*VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-48.86 dBm
4.904000000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-49.29 dBm
7.356000000 GHz
Marker 3 [T1]
-48.93 dBm
9.808000000 GHz
Marker 4 [T1]
-48.71 dBm
12.260000000 GHz
D1 -5.32 dBm
D2 -25.32 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

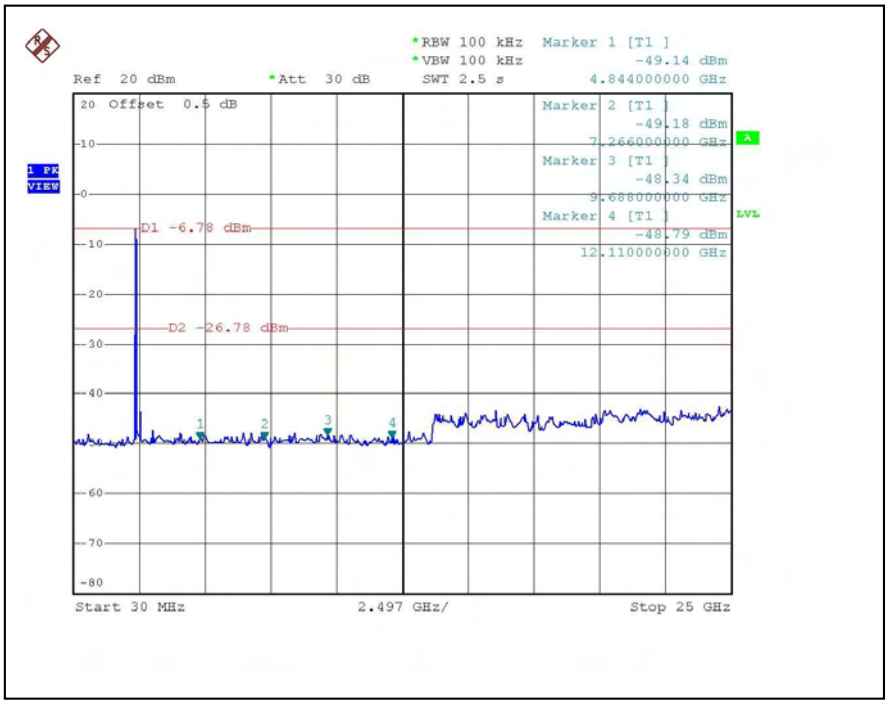
For Chain (2):CH1



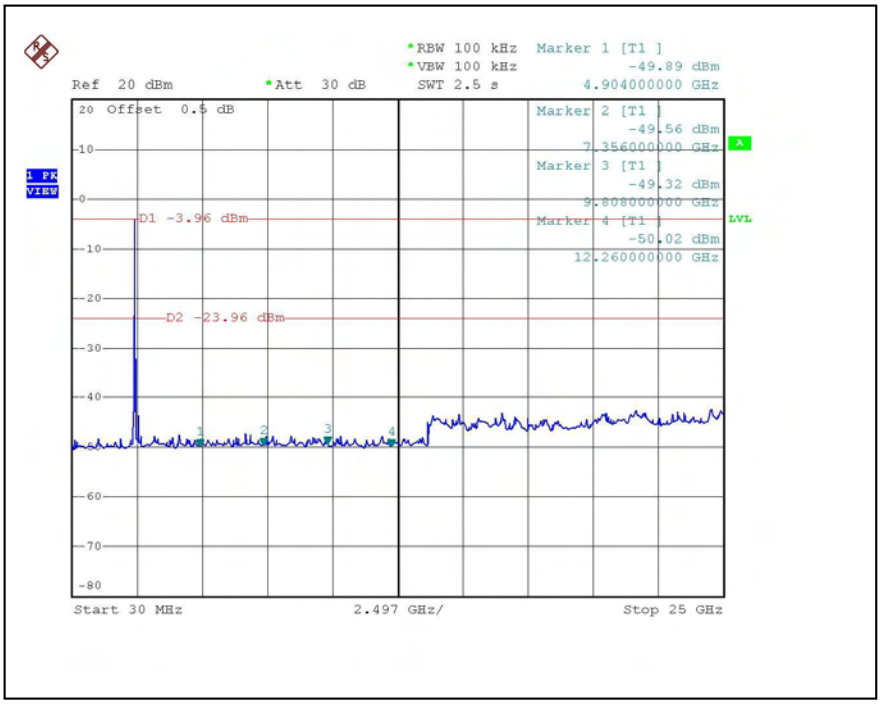
CH7



CH1


*RBW 100 kHz
*VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-49.14 dBm
4.844000000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-49.18 dBm
7.266000000 GHz
Marker 3 [T1]
-48.34 dBm
9.688000000 GHz
Marker 4 [T1]
-48.79 dBm
12.110000000 GHz
1 PK VIEW
D1 -6.78 dBm
D2 -26.78 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

CH7


*RBW 100 kHz
*VBW 100 kHz
SWT 2.5 s
Marker 1 [T1]
-49.89 dBm
4.904000000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.5 dB
Marker 2 [T1]
-49.56 dBm
7.356000000 GHz
Marker 3 [T1]
-49.32 dBm
9.808000000 GHz
Marker 4 [T1]
-50.02 dBm
12.260000000 GHz
1 PK VIEW
D1 -3.96 dBm
D2 -23.96 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

4.7 ANTENNA REQUIREMENT

4.7.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.7.2 ANTENNA CONNECTED CONSTRUCTION

There are three antennas provided to this EUT, please refer to the following table:

Transmitter Circuit	Antenna Type	Antenna Connector	Gain(dBi)		
			2412~2462 (MHz)	5150~5250 (MHz)	5725~5850 (MHz)
Chain(0)	Printed	Reverse SMA	1.5	0.5	-0.86
Chain(1)			-2.5	-11.4	-7.31
Chain(2)			1.28	1.09	-0.43