sPrüfbericht-Nr.: *Test report no.:*	ULR-TC568821300000109F	**Auftrags-Nr.:** *Order no.*:	146600935 0010	Seite 1 von 123 *Page 1 of 123*
Kunden-Referenz-Nr.: *Client reference no.:*	2133653	**Auftragsdatum:** *Order date:*	2021-09-02	
Auftraggeber: *Client:*	ZOLL Medical Corporation 269 Mill Road Chelmsford, MA 01824, USA			
Prüfgegenstand: *Test item:*	ZOLL Mobile Hotspot	**Product Type**	Mobile Hotspot	
Bezeichnung.: *Identification .:*	8016-000117-01			
Auftrags-Inhalt: *Order content*:	Testing and issue of Test Report and Grant Certificate			
Prüfgrundlage: *Test specification:*	FCC Part 15 Subpart C 15.247, 15.207 RSS 247 Issue 2 and RSS GEN Issue 5			
Wareneingangsdatum: *Date of sample receipt:*	2021-09-07			
Prüfmuster-Nr & Serien-Nr.: *Test sample no & serial no.:*	A003124554-001 A003124554-011 ZMCHUS20000001			
Prüfzeitraum: *Testing period:*	2021-09-14 - 2021-09-30			
Ort der Prüfung: *Place of testing:*	Wireless laboratory, Bangalore			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (India) Pvt.Ltd., 27/B, 2nd Cross, Electronic City Phase1 Bangalore -560 100, India FCC Test site registration number: 496599 ISED Test site registration number: 3466E-1			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von: *tested by:*	**Shrinivas Naikar**	**genehmigt von:** *authorized by:*	**Lokesh Ramu**
Datum: *Date:* 2021-10-08		**Ausstellatum:** *Issue date:* 2022-03-22	
Stellung / *Position:*	Engineer	**Stellung** / *Position:*	Manager

Sonstiges / *Other:* FCC ID: ZKP-ZOLLMCH0001
IC: 9702A-ZOLLMCH0001

Zustand des Prüfgegenstandes bei Anlieferung: **Prüfmuster vollständig und unbeschädigt**
Condition of the test item at delivery: ***Test item complete and undamaged***

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST SUMMARY

Test Item	Applicable Standard		Result
	FCC	ISED	
Maximum conducted (average) output power	FCC 15.247(b)(3)	RSS 247 Issue 2, Section 5.4 (d)	Pass
Maximum Power Spectral Density	FCC 15.247(e)	RSS 247 Issue 2, Section 5.2 (b)	Pass
DTS Bandwidth	FCC 15.247(a)(2)	RSS 247 Issue 2, Section 5.2 (a)	Pass
Emissions in non-restricted frequency bands	FCC 15.247(d)	RSS 247 Issue 2, Section 5.5	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	RSS-Gen Issue 5, Section 8.9 /8.10	Pass
Conducted Emissions on a.c Power Lines	FCC 15.207	RSS-Gen Issue 5, Section 8.8	Pass

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

Compliance statement for Part 15.203:

"THE PRODUCT USES INTERNAL PCB CHIP ANTENNA, WITH NO POSSIBILITY OF REPLACEMENT WITH A NON-APPROVED ANTENNA BY THE END-USER. THEREFORE, THE EUT IS CONSIDERED TO COMPLY WITH THIS PROVISION."

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568821300000109F	01	Initial issue of report	2021-12-09
ULR-TC568821300000109F	02	Reviewer comment updated	2022-02-23
ULR-TC568821300000109F	03	Module name updated	2022-03-22

Table of Contents

1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1. TEST SETUP PHOTOS

2: EUT EXTERNAL PHOTOS

3: EUT INTERNAL PHOTOS

4: FCC LABEL AND LABEL LOCATION

5: BLOCK DIAGRAM

6: SPECIFICATION OF EUT

7: SCHEMATIC DIAGRAM

8: BILL OF MATERIAL

9: USER MANUAL

10: MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

2 TEST SITES

2.1 Testing Facilities

1. TÜV Rheinland (India) Pvt.Ltd.,
   27/B, 2nd Cross,
   ElectronicCityPhase1
   Bangalore – 560 100,
   India

   Radiated Measurement site type :
   Fully anechoic chamber (used for above 1 GHz measurements)

2. TUV Rheinland (India) Pvt.Ltd.,
   108 , Beside ISBR Business School,
   Electronic city Phase I
   Bangalore - 560 100.
   India

   Radiated Measurement site type :
   Semi anechoic chamber (used for below 1 GHz measurements)

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
EMI Receiver	Rohde & Schwarz	ESW 44	101732	4.73 SP5	27.01.2022	Yearly	Radiated Spurious Emission
Loop Antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	27.04.2022	Yearly	
Baloon and Bicorical Antenna	Schwarzbeck	BBA 9106+VHBB 9124	9124-1117	-	03.03.2022	Yearly	
Log-Periodic Antenna	Schwarzbeck	VUSLP 9111B	9111B-324	-	04.03.2022	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	11.05.2022	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-0904	-	06.05.2022	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
Radio Communication tester	Rohde & Schwarz	CMW 500	1201.0002 K50	-	24.08.2022	Yearly	
Signal Analyser	Rohde & Schwarz	FSV7	101644	FW 3.40	15.01.2022	Yearly	Antenna-Port Conducted test
OSP	Rohde & Schwarz	OSP120 Incl. B157	OSP120-101323 & B157-100894	-	03.11.2021	Yearly	
Signal Generator	Rohde & Schwarz	SMB100 A	108788	-	13.01.2022	Yearly	
Vector Signal Generator	Rohde & Schwarz	SMBV100	260789	-	13.01.2022	Yearly	
Signal Analyser	Anritsu Corporation	MS2830 A	6261983953	-	03.09.2022	Yearly	
Spectrum Analyser	Agilent	E4407B	US41192772	A.14.06	15.12.2022	Yearly	
USB Peak Power Sensor	AIMIL Ltd	55006	10231	-	27/03/2022	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	29.07.2022	Yearly	Conducted AC Power line Test
LISN	Rohde & Schwarz	ENV216	100022	-	10.07.2022	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in SAC	EMC 32	10.60.00
2	Radiated spurious emission measurement in FAC	EMC 32	10.60.00
3	Antenna Port conducted measurement: TS8997 system	WMS 32	10.60.10

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

ZOLL Mobile Hotspot devices are used to connect portable Defibrillator and ventilator devices to the cloud via Wi-Fi, and then send real-time data to the cloud for processing via cellular network.
It use for relay LTE over Wi-Fi.

3.2 Ratings and System Details of Equipment under Test

Table 3: Ratings and System Details as declared by Client*

Radio Protocol		Wi-Fi
Operating Frequency Range		2412MHz to 2462MHz
No. of Channels		11 (Refer Table 5)
Channel Spacing		5MHz
Transmitting Power Level		Refer clause 11
Maximum Measured Power (e.i.r.p)		19.47dBm (6Mbps 2412MHz)
Modulation		802.11 b: DQPSK, DBPSK, CCK (1/2/5.5/11Mbps) 802.11 g: OFDM/64-QAM, 16-QAM, QPSK, BPSK (6/9/12/18/24/36/48/54Mbps) 802.11 n: OFDM/64-QAM, 16-QAM, QPSK, BPSK (20MHz MCS0 to MCS7)
Number of antennas		1
Antenna Gain		2.2 dBi
Antenna Type		Internal PCB Chip Antenna
Supply Voltage to Product		5V DC, 0.5A Battery and USB Type C Port Powered 1. Primary - Battery (3.7V, 4000mAh) 2. Secondary - USB Type C (5V, 0.5A)
Environmental conditions	Storage	-20° C to 60° C
	Operating	-10° C to 50° C
EUT Dimension		134.2mm x 80.7mm x 27.9mm (LxWxH)

*__Disclaimer__: The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 4: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±3 ℃
Supply Voltages	±3 %
Time	±5 %

Note: The Listed Measurement Uncertainties are the worst-case uncertainty, for the respective test cases. Above Table is for reporting purpose only and not used in determining Final Pass/Fail verdict.

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle on low, mid and high channels

4.2 UUT Operation and Software

Hardware Version Identification number (HVIN) : Rev2.0
Software version : v1.0.3

4.3 Special Accessories and Auxiliary Equipment

-None

4.4 Simultaneous Transmission

Combinationations of Simultaneous Operations performed	**WiFi-LTE**
	WiFi- WCDMA

Note: Simultaneous Operation was performed with the above mentioned combination and worst case test results are mentionrd in this report.

4.5 Countermeasures to achieve EMC Compliance

- None

4.6 List of frequencies

Frequency Band (MHz)	**Channel No.**	**Channel Frequency (MHz)**
2412 – 2462	**1**	**2412**
	2	2417
	3	2422
	4	2427
	5	2432
	6	2442
	7	**2442**
	8	2447
	9	2452
	10	2457
	11	**2462**

Table 5: List of Wi-Fi center Frequencies

Channel used for Wi-Fi 2.4GHz testing

Protocol: WLAN 802.11b
Channel Low : 2412 MHz
Channel Mid : 2442 MHz
Channel High : 2462 MHz

Protocol: WLAN 802.11g
Channel Low : 2412 MHz
Channel Mid : 2442 MHz
Channel High : 2462 MHz

Protocol: WLAN 802.11n_20MHz
Channel Low : 2412 MHz
Channel Mid : 2442 MHz
Channel High : 2462 MHz

Note:

TUV Sample Identification number : A003124554-001 – Radiated test Sample
A003124554-011 – Conducted test Sample

4.7 Report references

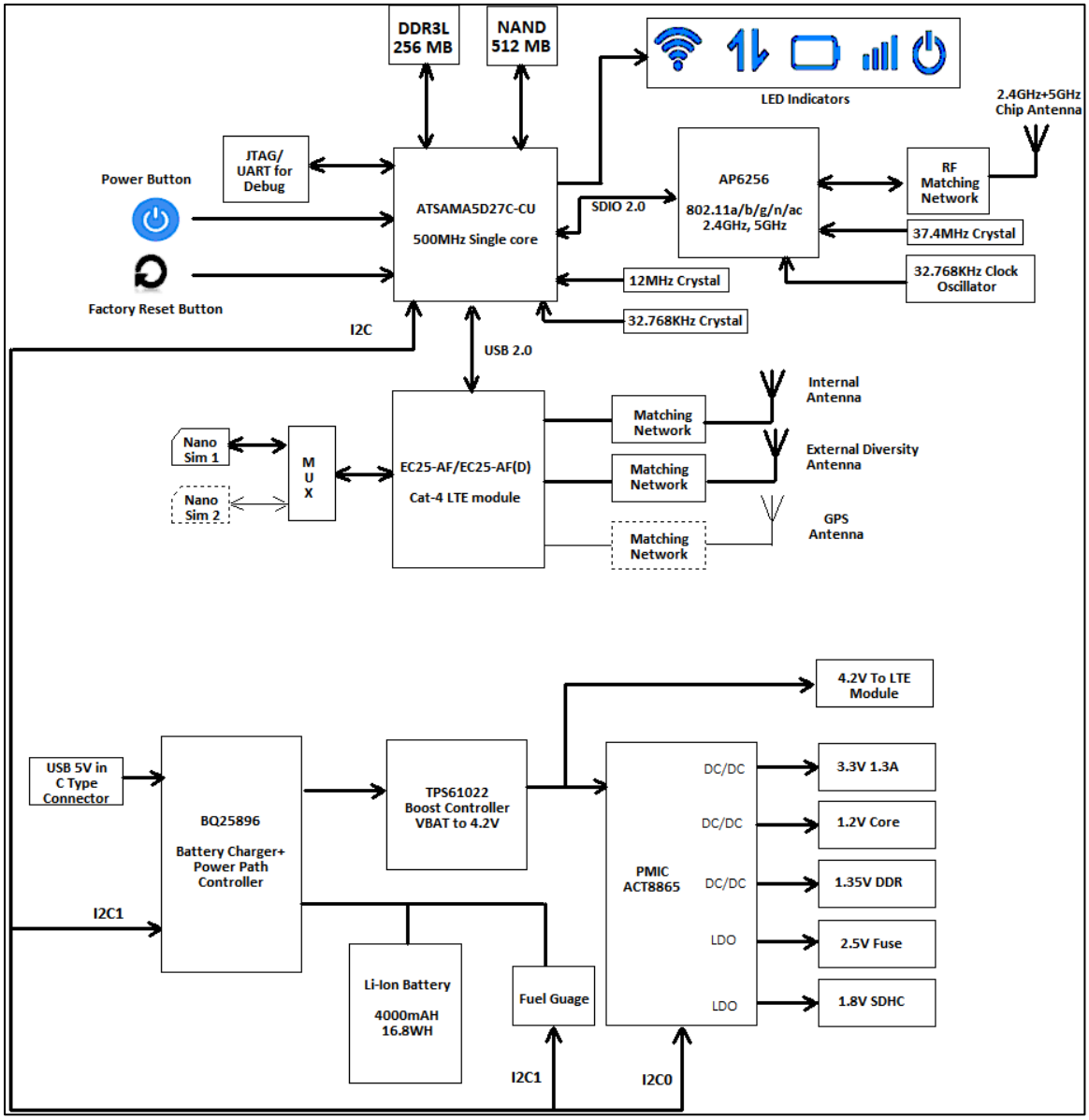
Note: ZOLL Mobile Hotspot has multiple protocols. All the supported wireless protocols and their respective test results are issued in saparate test reports, following table lists the report numbers.

Radio Protocol	**Report Number**
RF test report for Wi-Fi (2.4GHz) – (This report)	ULR-TC568821300000109F
RF test report for Wi-Fi (5GHz)	ULR-TC568821300000110F
RF test report for FCC Part 22	ULR-TC568821300000111F
RF test report for FCC Part 24	ULR-TC568821300000112F
RF test report for FCC Part 27	ULR-TC568821300000113F
RF test report for FCC Part 90	ULR-TC568821300000114F

5 Operational Description

ZOLL Mobile Hotspot design based on Micrchip's ATSAMA5D27C processor. The ZOLL Mobile Hotspot device features a 256 MB of DDR3L RAM and 512 MB of NAND Flash to store the data files and configurations.
The ATSAMA5D27C CPU is powered using the OpenWRT Linux distribution. The " EC25-AF/EC25-AF(D) CAT 4 LTE Module" will be connected to ATSAMA5D27C CPU over the USB 2.0 interface to support the cellular connectivity. The EC25-AF/EC25-AF(D) is Cat4 LTE module supporting AT&T, T-Mobile, Verizon and FirstNet networks. It supports all major US bands. The EC25-AF/EC25-AF(D) module has 2 Antenna connections including external diversity antenna. Here internal antenna is chip antenna and a u.FL connector is on board for an External diversity Antenna. The LTE module also supports GPS and it is optional in current design. ZOLL Mobile Hotspot have dual SIM supports. The system also have Wi-Fi module AP6256 which is interfaced with the processor using SDIO 3.0 interface. Wi-Fi will be used to connect portable Defibrillator and ventilator devices to cloud. It supports 2.4GHz and 5GHz bands.The modem device is battery operated, and the main processor ATSAMA5D27C will be connected to the fuel gauge to monitor the battery status and power consumption of the entire system. The power management section is also responsible for moderating the power drawn from the defibrillator device and comply with the requirement (that the power consumption over USB must not exceed 0.5A at the peak time). Additionally, the power management section is also responsible for generating the necessary input power for several sections of the modem device. The BQ25896 is a Battery Charger with Boost converter to provide constant power to the system with the efficiency greater than 80%. The 4.2V from TPS61022 is given to PMIC which generates 3.3V, 1.25V, 1.8V, 2.5V and 1.35V for Processor, NAND Flash and Wi-Fi module, Core voltage of processor, Fuse voltage and DDR3L power supply.

6 Block Diagram



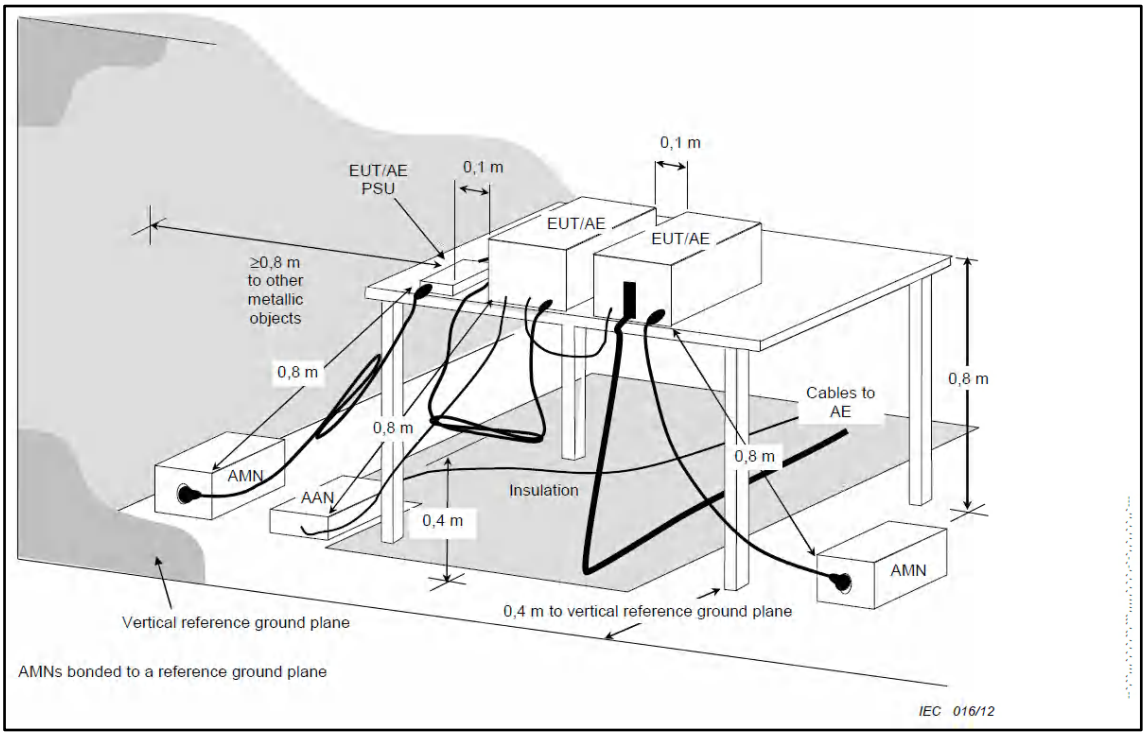
7 TEST METHODOLOGY

7.1 Conducted Spurious Emission Test on AC Power Line

Measured levels of ac power-line conducted emission across the 50Ω LISN port (to which the EUT is connected). All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer.

The device is placed on the test table, raised 80cm above the referance ground plane. The vertical conducting plane is located 40cm to the rear of the device. AC Conducted emission measurement is made over frequency range from 150kHz to 30MHz, this measurement was performed with EUT powered by 2 methods and both method are tested individually, one with an AC adaptor with 110V AC 60Hz supply and second with Wireless charger with supply 110V AC 60Hz.

7.1.1 Test Setup Configuration



7.2 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360˚ for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Baloon and Biconical Antenna, and mesurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded

7.2.1 Test Setup Configuration

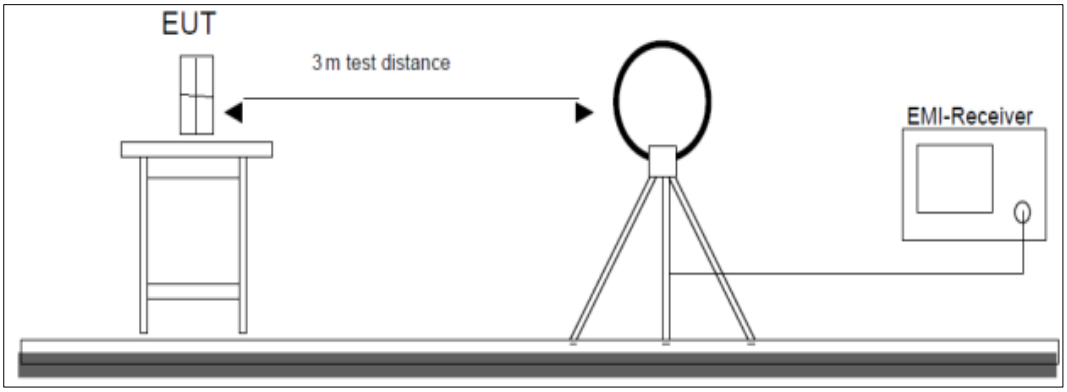


Figure 1: Frequency Range 9 kHz- 30 MHz

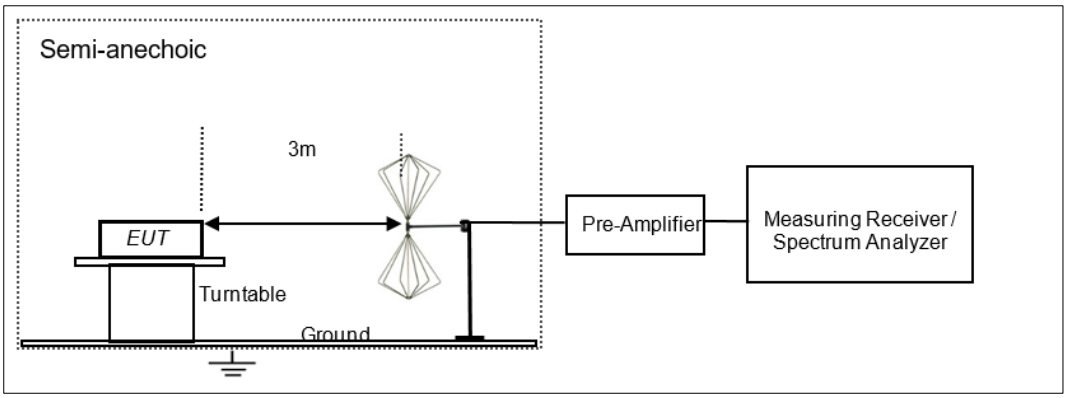


Figure 2: Frequency Range 30 MHz – 200 MHz

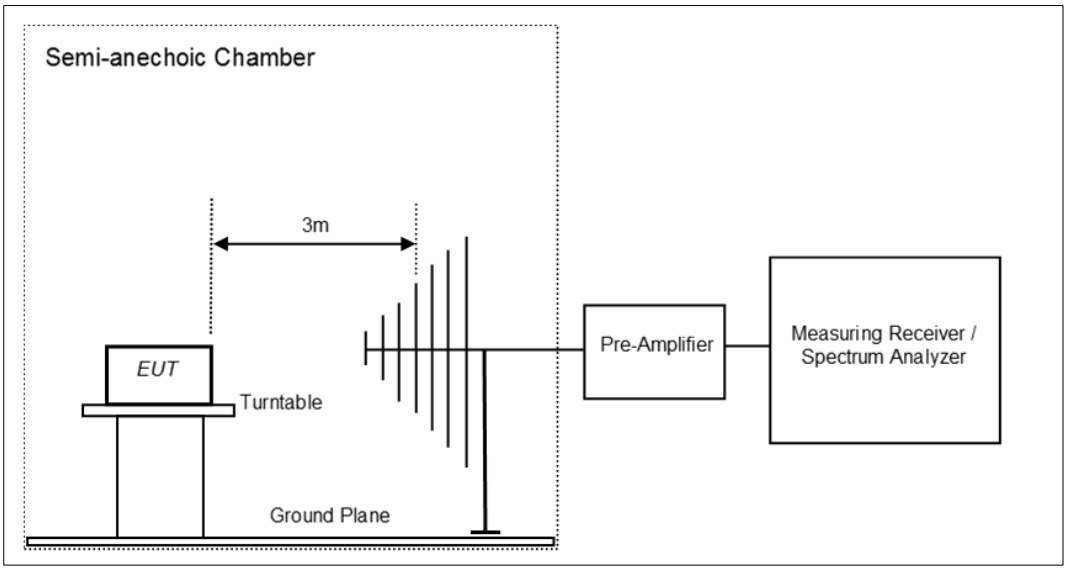


Figure 3: Frequency Range 200 MHz - 1GHz

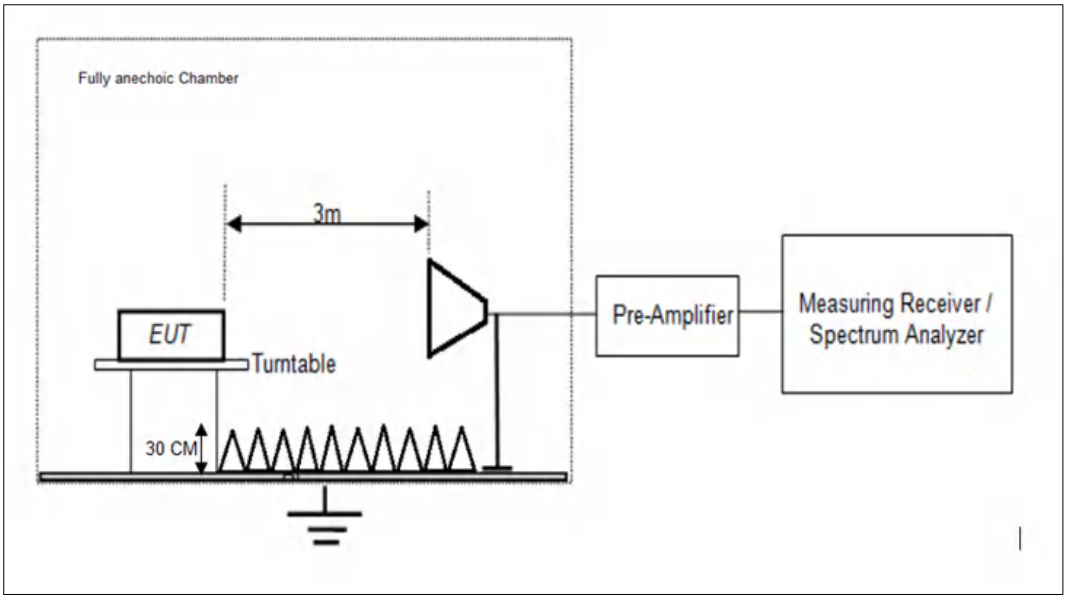


Figure 4: Frequency Range above 1 GHz

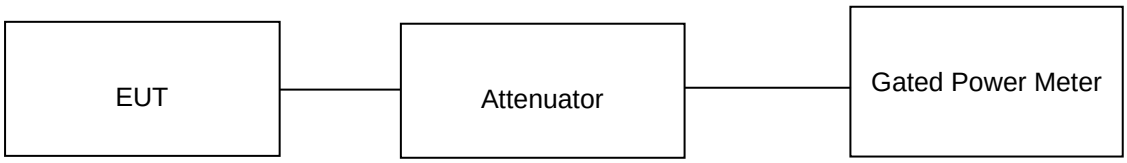
8 TEST RESULTS FOR Wi-Fi

8.1 Maximum Average Conducted Output Power

Result ***Pass***

Test Specification	FCC part 15 Subpart C 15.247 (b)(3) / RSS 247 Issue 2, Section 5.4 (d)
Test Method	Subclause 11.9.2.3.2 of ANSI C63.10
Detector	Average (Gated RMS)
Port of testing	Antenna port
Requirement	Power ≤ 1 W (30 dBm) & e.i.r.p ≤ 4 W (36 dBm)

Test Method



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = Internal Battery + 5.0 V DC Relative humidity: 62%

KDB Guidelines applied:

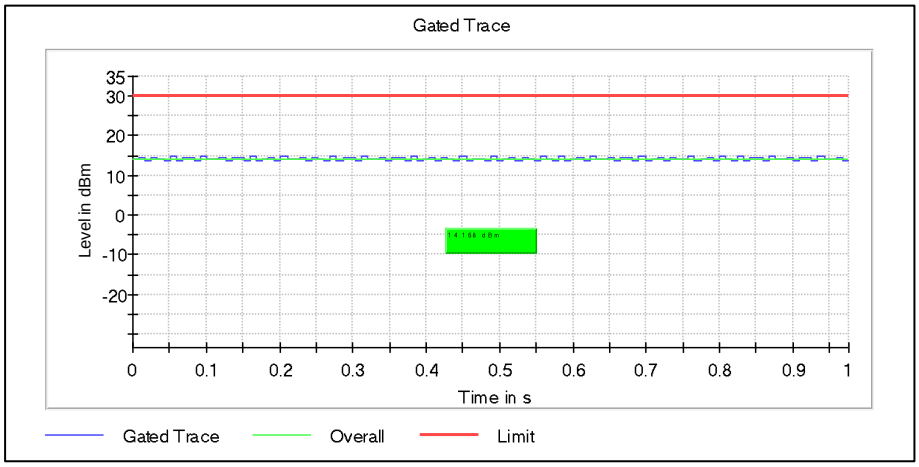
Measurements were made as per section 8.3.2.3 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Test results:

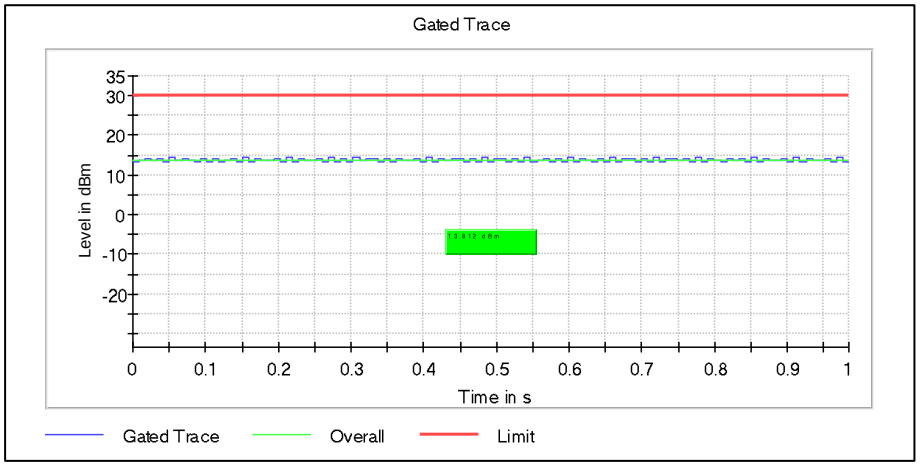
Note:
1. All the losses are included during measurement and final values are mentioned in the test report.
2. Gated RF average power meter method is used to determine the RF output power so the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 2.2 dBi
4. Maximum (e.i.r.p) = Maximum Average output power (dBm) + antenna gain (2.2 dBi)

Modulation: 802.11b

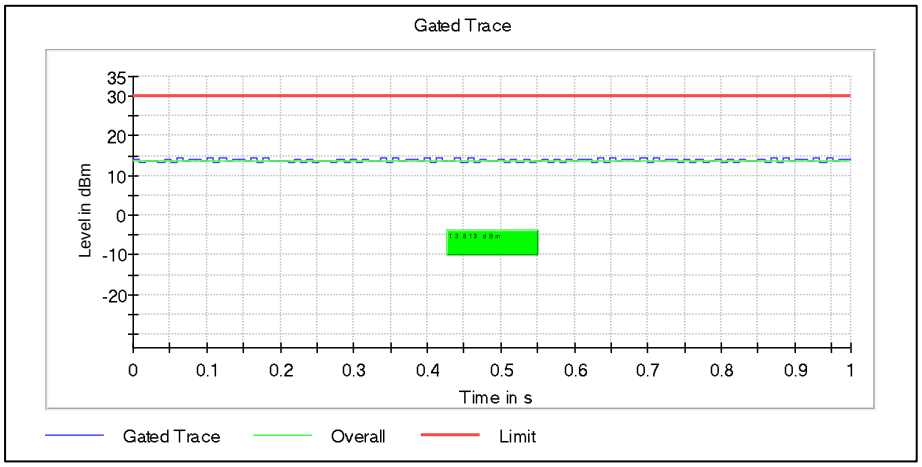
Data rate (Mbps)	Channel Frequency (MHz)	Maximum Average output power (dBm)	Maximum (e.i.r.p) (dBm)	Power Limit (dBm)	e.i.r.p Limit (dBm)
1	2412	14.16	16.36	30	36
	2442	13.81	16.01	30	36
	2462	13.81	16.01	30	36
11	2412	14.44	16.64	30	36
	2442	14.18	16.38	30	36
	2462	14.12	16.32	30	36



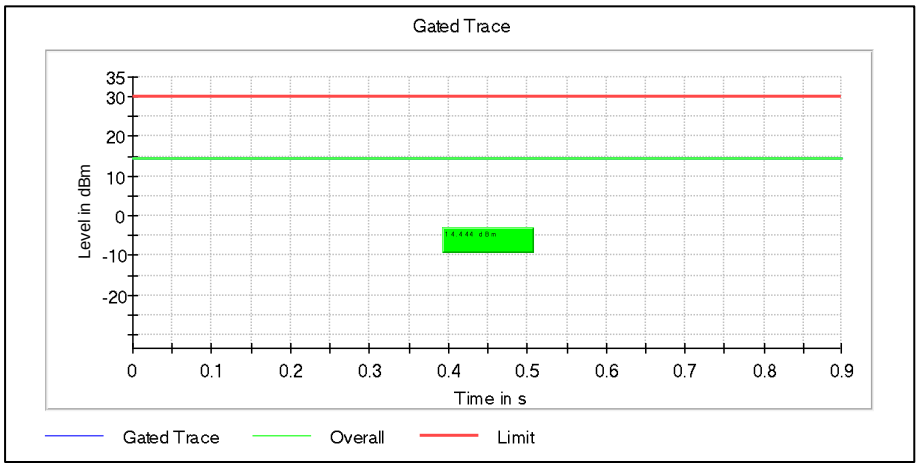
Data Rate: 1Mbps Channel Frequency: 2412MHz



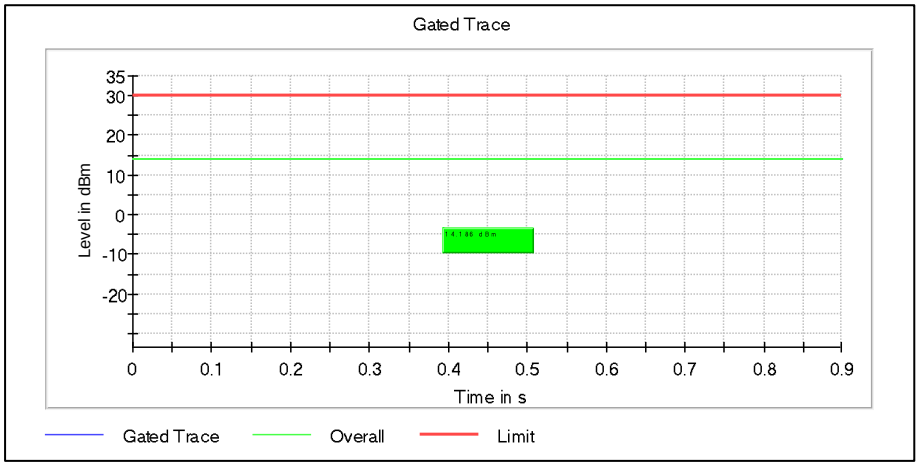
Data Rate: 1Mbps Channel Frequency: 2442MHz



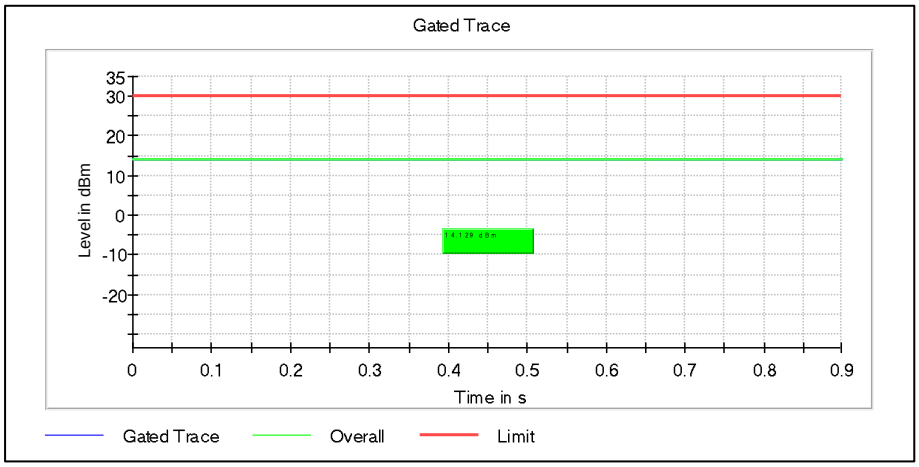
Data Rate: 1Mbps Channel Frequency: 2462MHz



Data Rate: 11Mbps Channel Frequency: 2412MHz



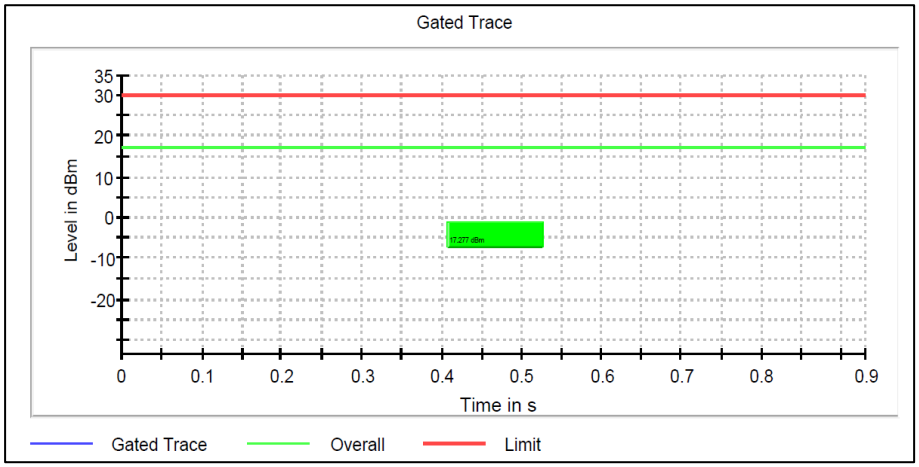
Data Rate: 11Mbps Channel Frequency: 2442MHz



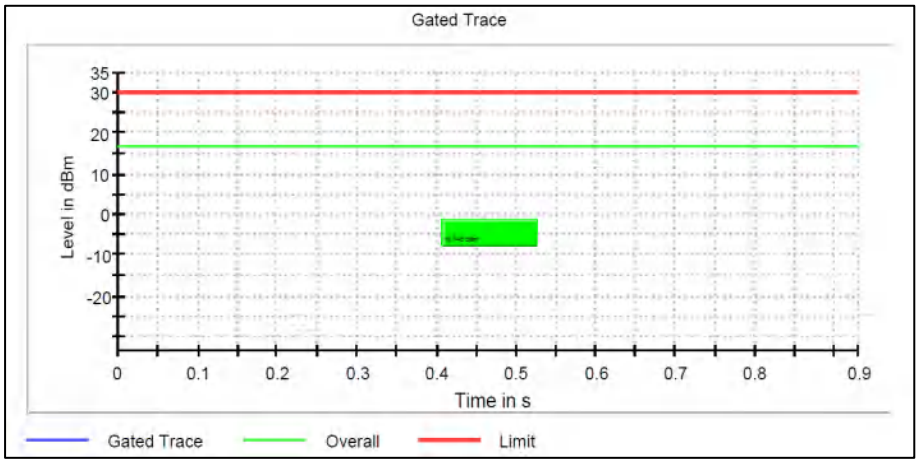
Data Rate: 11Mbps Channel Frequency: 2462MHz

Modulation: 802.11g

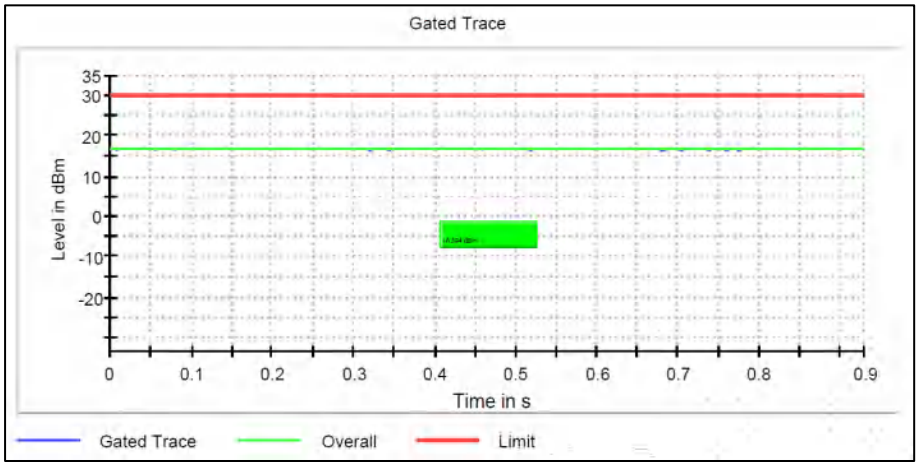
Data rate (Mbps)	Channel Frequency (MHz)	Measured Average Power (dBm)	Maximum (e.i.r.p) (dBm)	Power Limit (dBm)	e.i.r.p Limit (dBm)
6	2412	17.27	19.47	30	36
	2442	16.74	18.94	30	36
	2462	16.59	18.79	30	36
54	2412	15.80	18.00	30	36
	2442	15.40	17.60	30	36
	2462	15.31	17.51	30	36



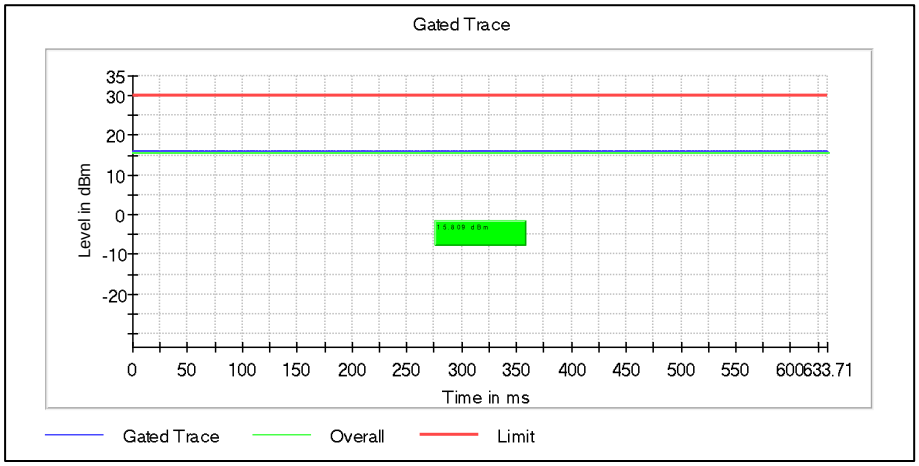
Data Rate: 6Mbps Channel Frequency: 2412MHz



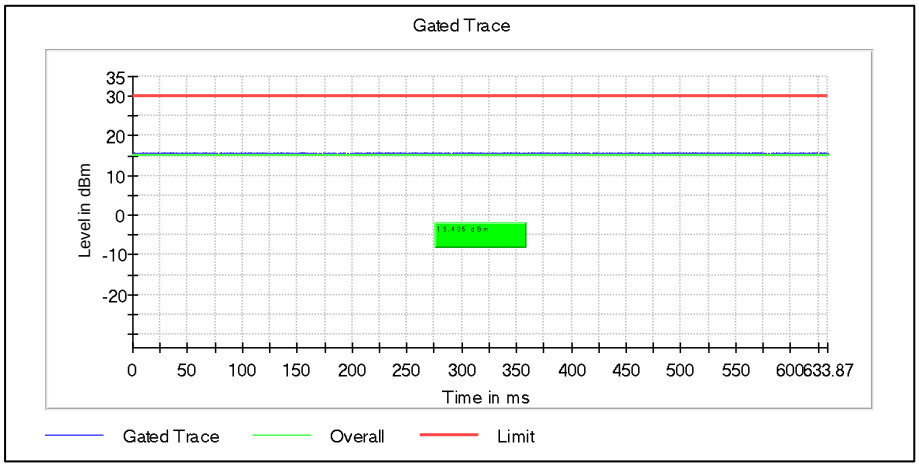
Data Rate: 6Mbps Channel Frequency: 2442MHz



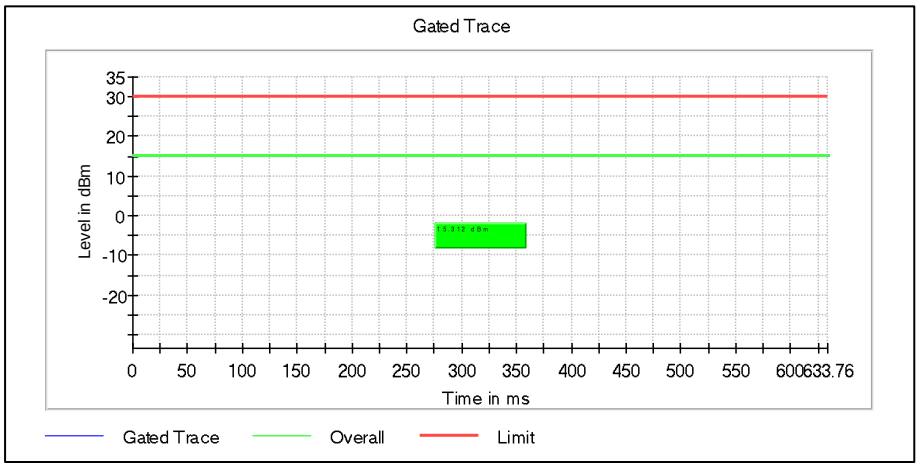
Data Rate: 6Mbps Channel Frequency: 2462MHz



Data Rate: 54Mbps Channel Frequency: 2412MHz



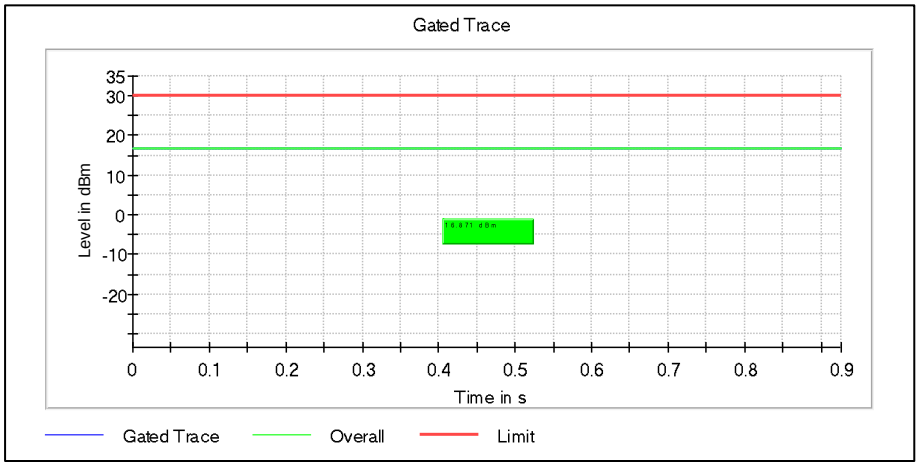
Data Rate: 54Mbps Channel Frequency: 2442MHz



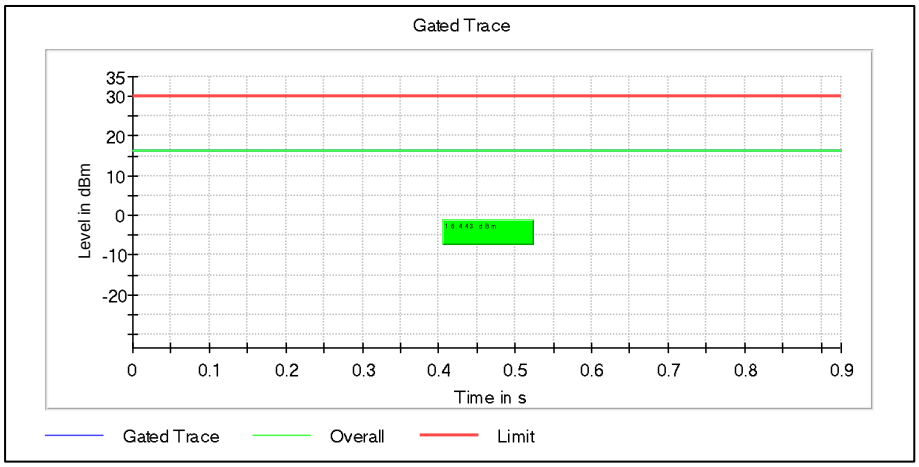
Data Rate: 54Mbps Channel Frequency: 2462MHz

Modulation: 802.11n_20MHz

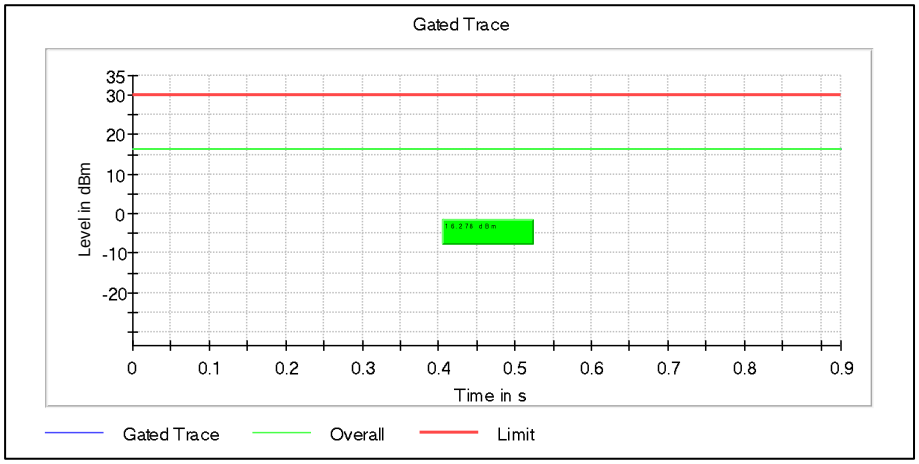
Data rate (Mbps)	Channel Frequency (MHz)	Measured Average Power (dBm)	Maximum (e.i.r.p) (dBm)	Power Limit (dBm)	e.i.r.p Limit (dBm)
MCS0	2412	16.87	19.07	30	36
	2442	16.44	18.64	30	36
	2462	16.27	18.47	30	36
MCS7	2412	14.83	17.03	30	36
	2442	14.54	16.74	30	36
	2462	14.44	16.64	30	36



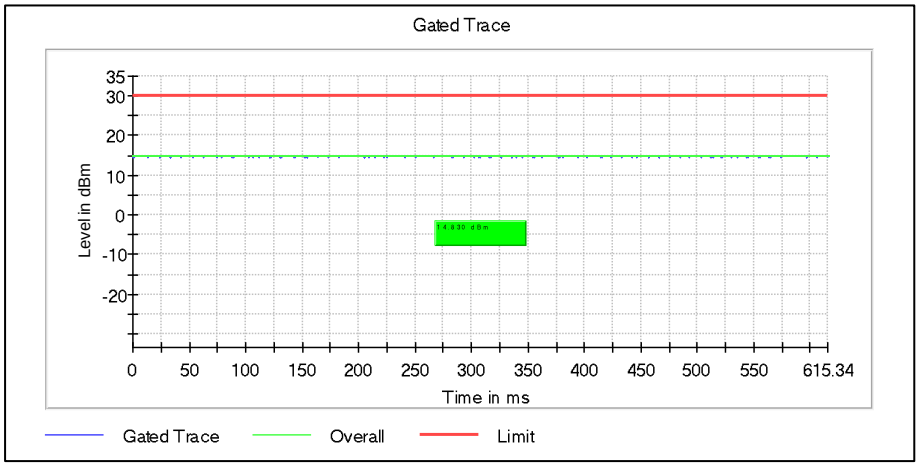
Data Rate: MCS0 Channel Frequency: 2412MHz



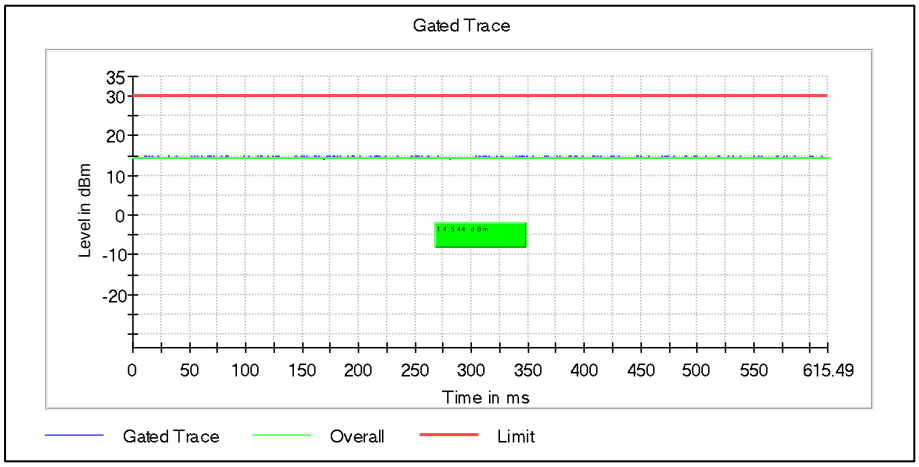
Data Rate: MCS0 Channel Frequency: 2442MHz



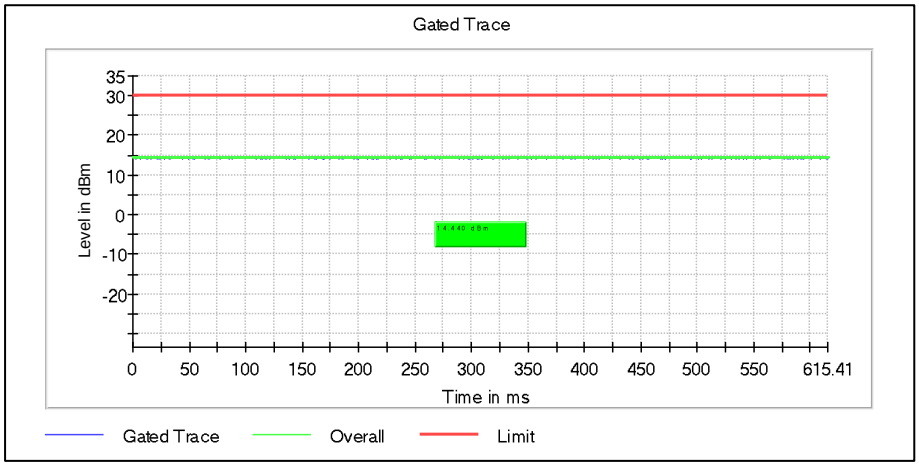
Data Rate: MCS0 Channel Frequency: 2462MHz



Data Rate: MCS7 Channel Frequency: 2412MHz



Data Rate: MCS7 Channel Frequency: 2442MHz



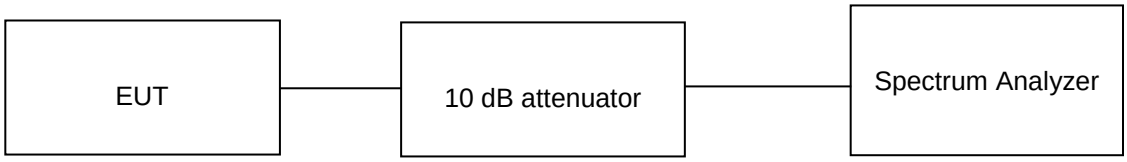
Data Rate: MCS7 Channel Frequency: 2462MHz

8.2 Maximum Power Spectral Density

Result ***Pass***

Test Specification	FCC part 15 Subpart C 15.247 (e) / RSS 247 Issue 2, Section 5.2 (b)
Test Method	Subclause 11.10.4 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Power Average (rms) detector mode
Port of testing	Antenna port
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25°C Voltage = Internal Battery + 5.0 V DC Relative humidity: 62 %

KDB Guidelines applied:

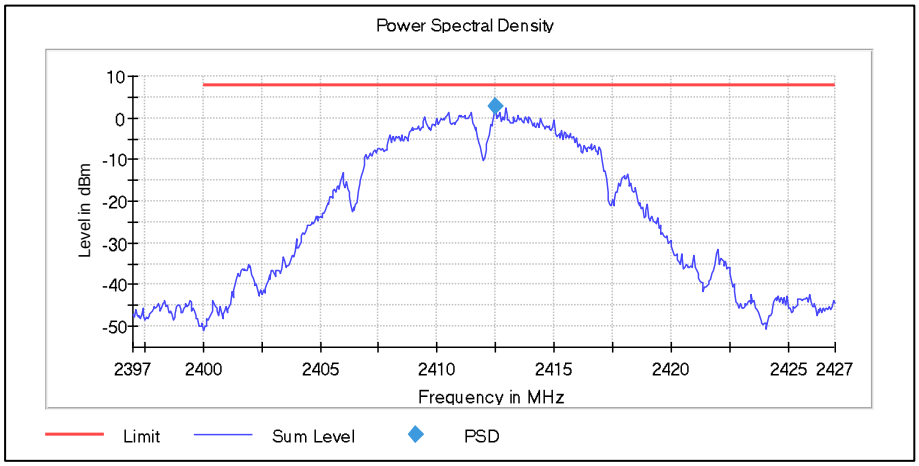
Measurements were made as per section 8.4 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Test results:

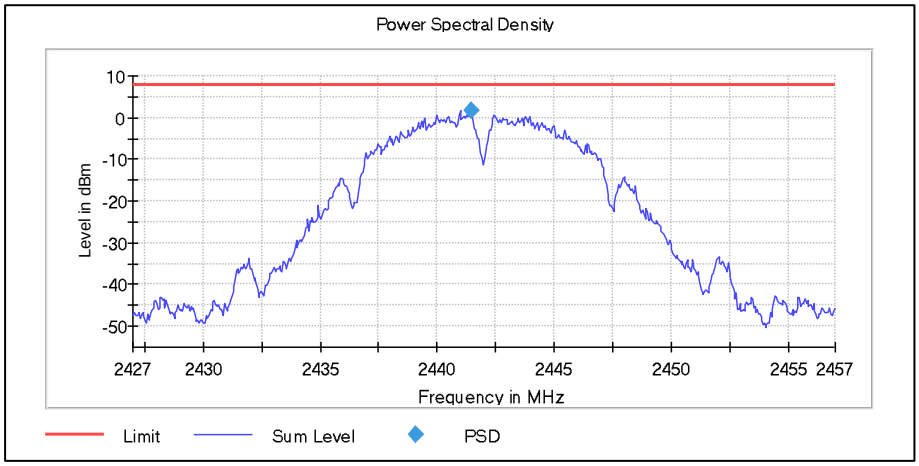
Note:
1. All the losses are included during measurement and final values are mentioned in the test report.

Modulation: 802.11b

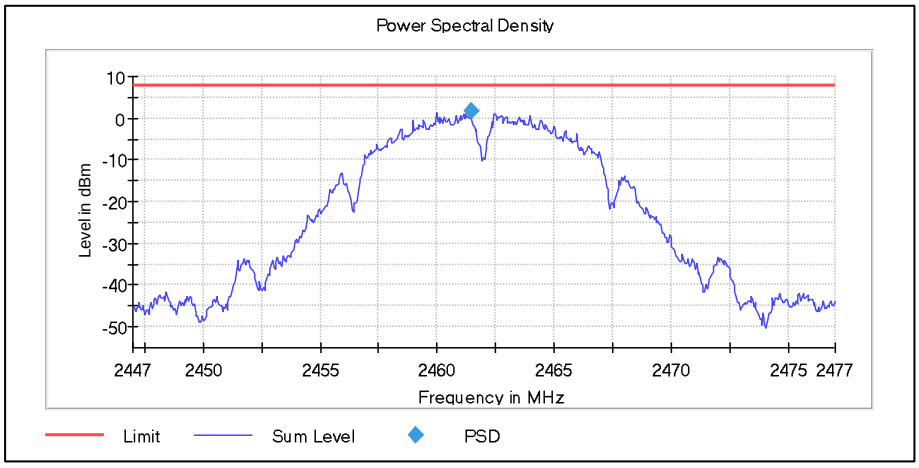
Data rate (Mbps)	Channel Frequency (MHz)	Measured average PSD (dBm/100kHz)	PSD Limit (dBm/100kHz)
1	2412	2.79	8
	2442	1.72	8
	2462	1.82	8
11	2412	2.48	8
	2442	3.94	8
	2462	1.56	8



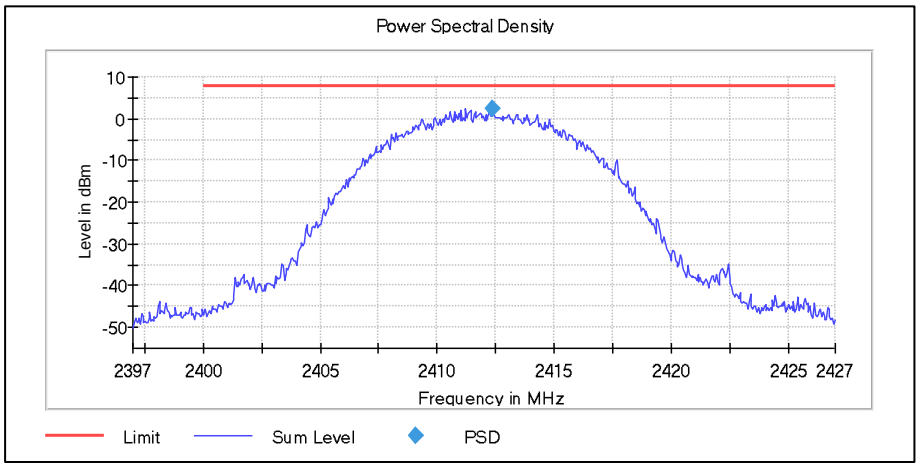
Data Rate: 1Mbps Channel Frequency: 2412MHz



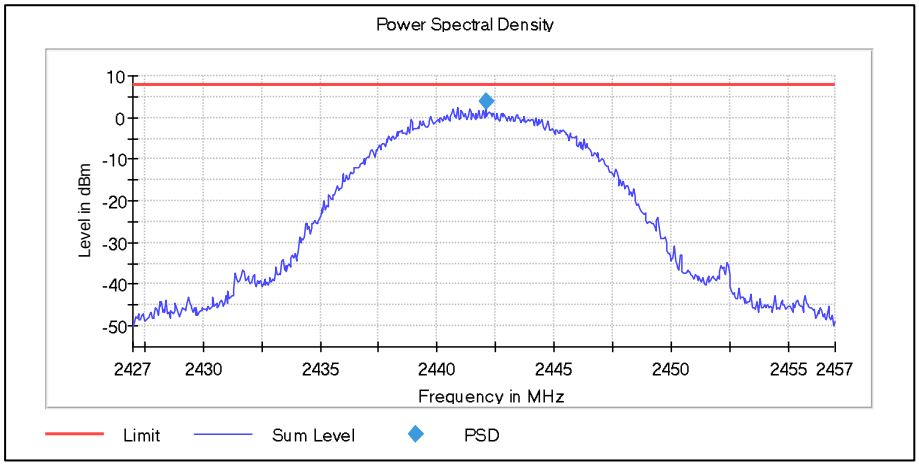
Data Rate: 1Mbps Channel Frequency: 2442MHz



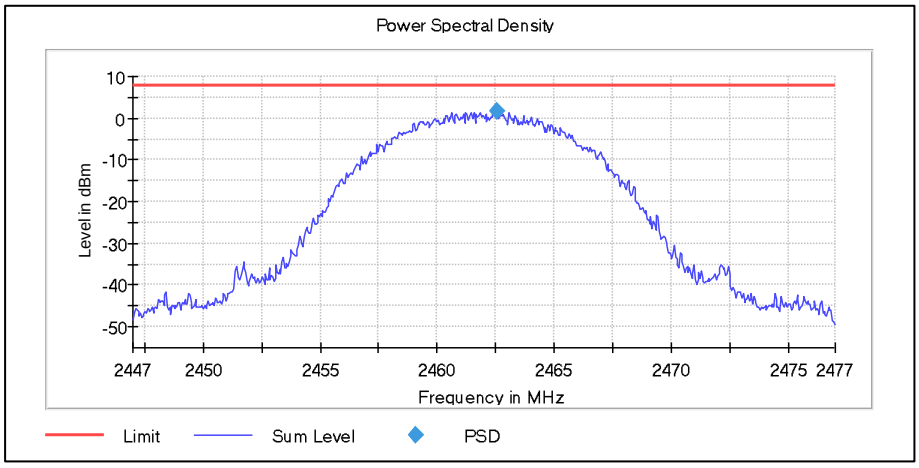
Data Rate: 1Mbps Channel Frequency: 2462MHz



Data Rate: 11Mbps Channel Frequency: 2412MHz



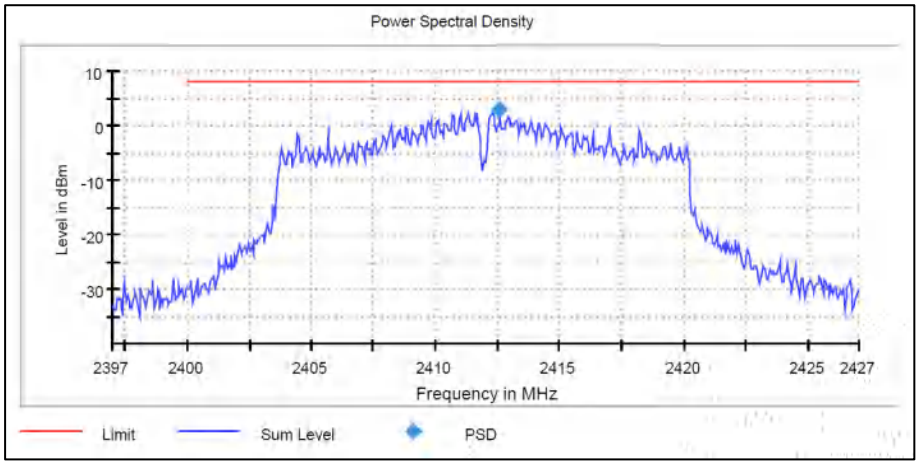
Data Rate: 11Mbps Channel Frequency: 2442MHz



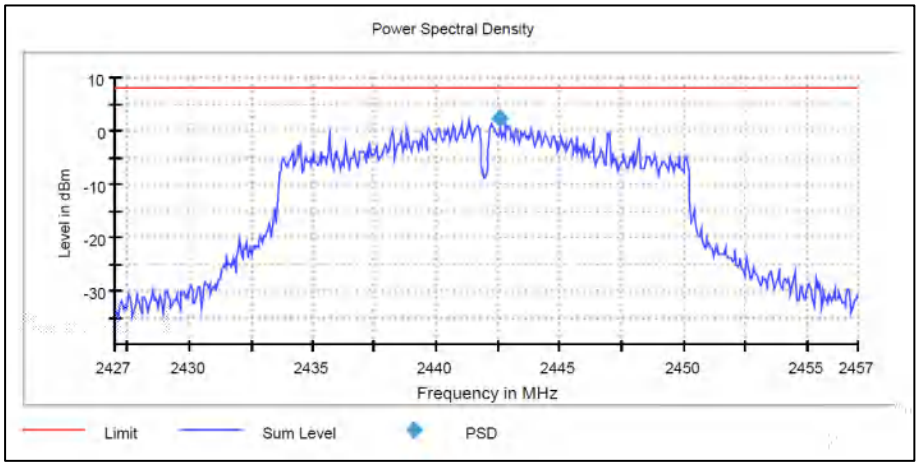
Data Rate: 11Mbps Channel Frequency: 2462MHz

Modulation: 802.11g

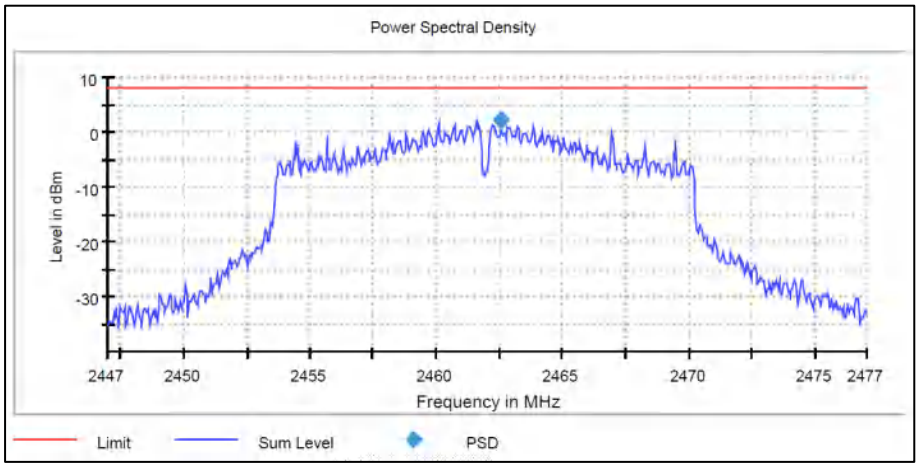
Data rate (Mbps)	Channel Frequency (MHz)	Measured average PSD (dBm/100kHz)	PSD Limit (dBm/100kHz)
6	2412	2.80	8
	2442	2.92	8
	2462	2.49	8
54	2412	1.59	8
	2442	1.20	8
	2462	1.41	8



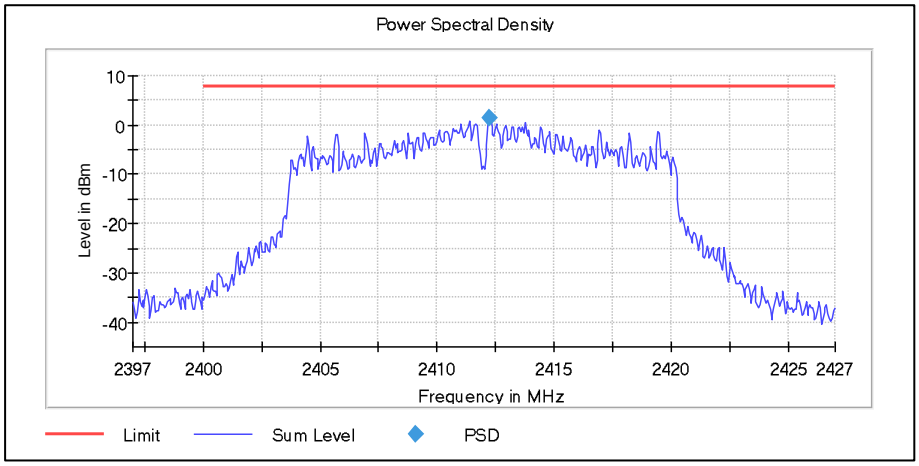
Data Rate: 6Mbps Channel Frequency: 2412MHz



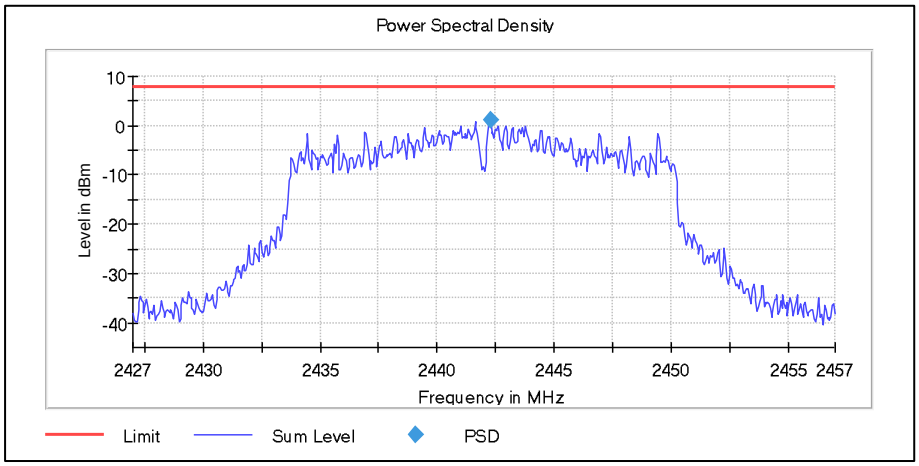
Data Rate: 6Mbps Channel Frequency: 2442MHz



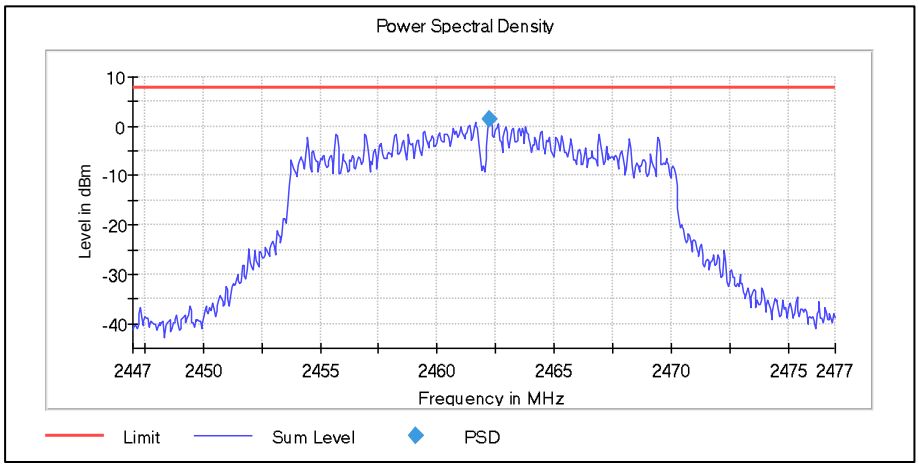
Data Rate: 6Mbps Channel Frequency: 2462MHz



Data Rate: 54Mbps Channel Frequency: 2412MHz



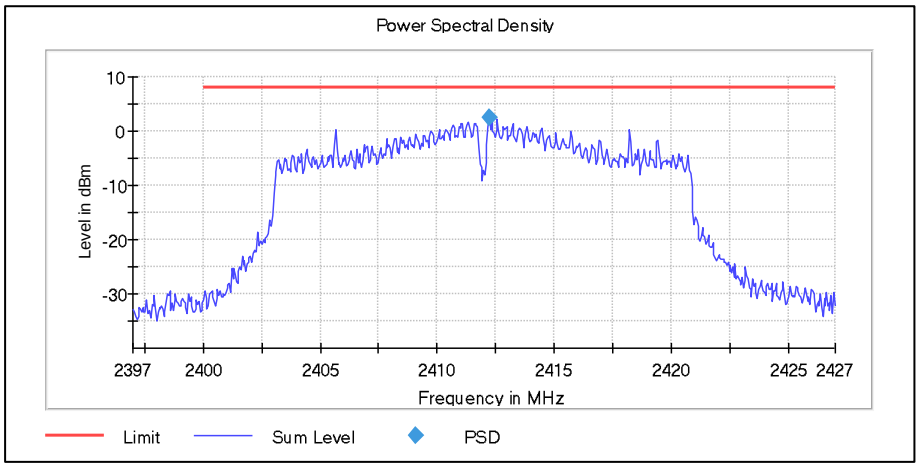
Data Rate: 54Mbps Channel Frequency: 2442MHz



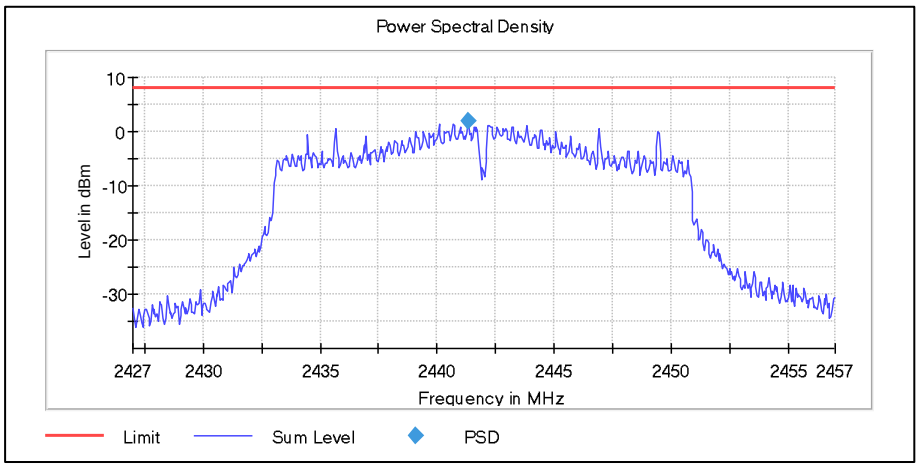
Data Rate: 54Mbps Channel Frequency: 2462MHz

Modulation: 802.11n_20MHz

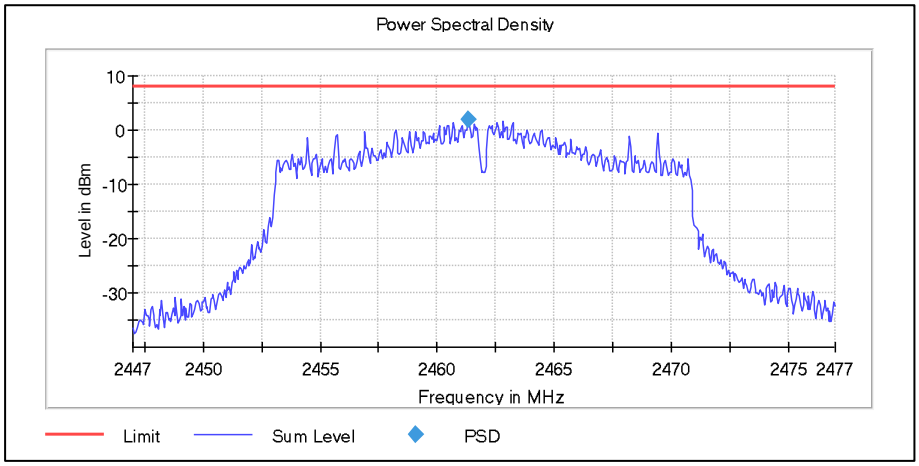
Data rate (Mbps)	Channel Frequency (MHz)	Measured average PSD (dBm/100kHz)	PSD Limit (dBm/100kHz)
MCS0	2412	2.43	8
	2442	1.86	8
	2462	1.82	8
MCS7	2412	0.51	8
	2442	0.41	8
	2462	1.60	8



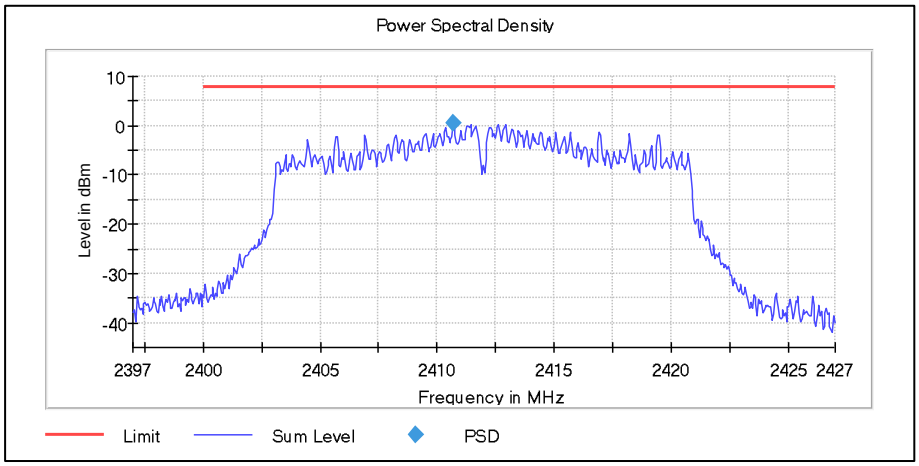
Data Rate: MCS0 Channel Frequency: 2412MHz



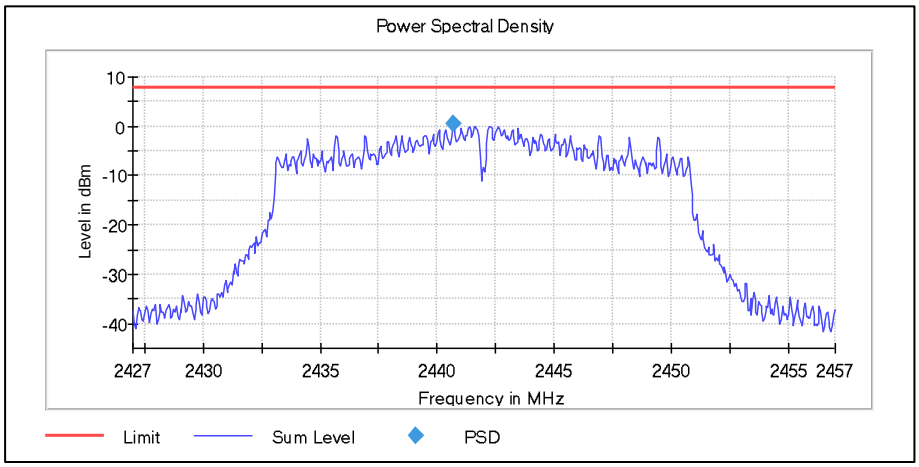
Data Rate: MCS0 Channel Frequency: 2442MHz



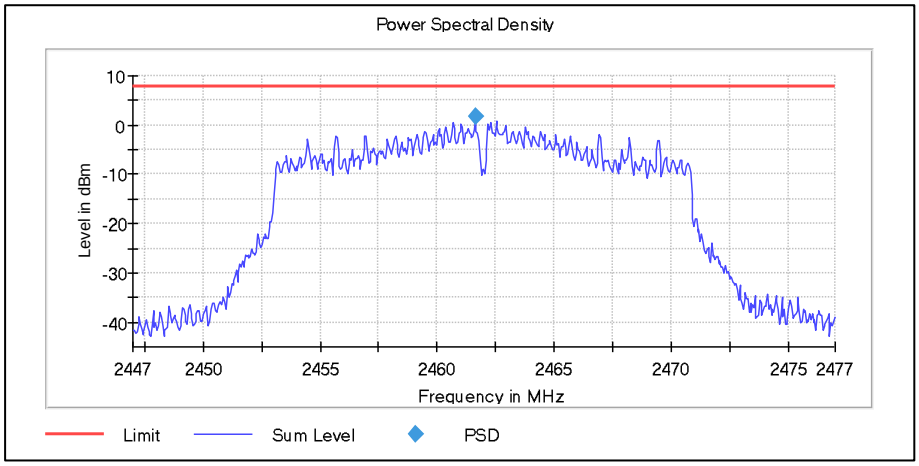
Data Rate: MCS0 Channel Frequency: 2462MHz



Data Rate: MCS7 Channel Frequency: 2412MHz



Data Rate: MCS7 Channel Frequency: 2442MHz

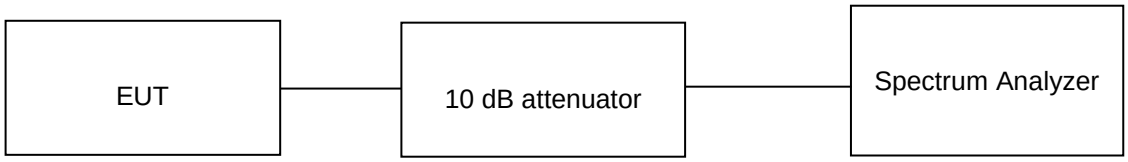


Data Rate: MCS7 Channel Frequency: 2462MHz

8.3 DTS Bandwidth & 99% Bandwidth

Result	***Pass***
Test Specification	FCC part 15 Subpart C 15.247 (a), FCC Part 2.202 / RSS Gen, RSS 247 Issue 2, Section 5.2 (a)
Test Method	Subclause 11.8.1 & 6.9.3 of ANSI C63.10
Measurement Bandwidth	100 kHz for x dB bandwidth 1 to 5% of OCB for 99% bandwidth
Detector	Peak
Port of testing	Antenna port
Requirement	The minimum 6 dB bandwidth shall be at least 500 kHz

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = Internal Battery + 5.0 V DC Relative humidity: 62 %

KDB Guidelines applied:

Measurements were made as per section 8.2 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Test results:

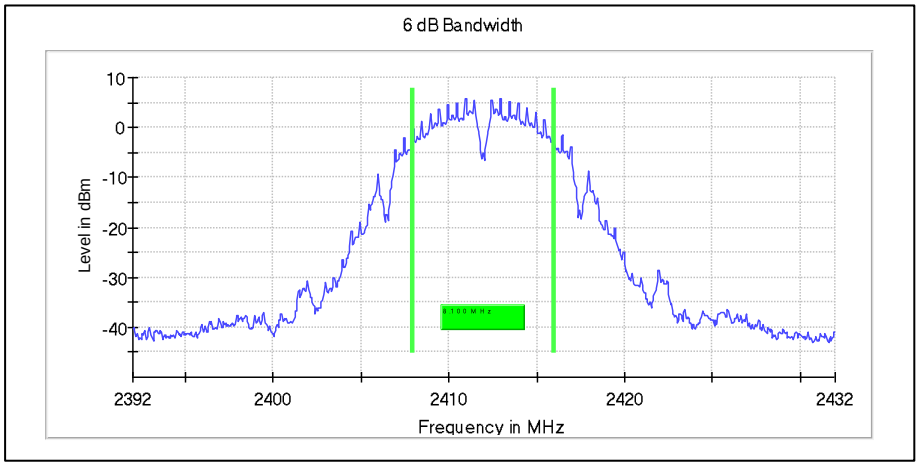
Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. For 6 dB Bandwidth Measurements were made as per section 8.2 in KDB 558074 D01 15.247 Measurement Guidance v05r02.
3. For OCW 99 % Bandwidth measurements were made as per section 6.9.3 ANSI C63.10-2013 & 6.7 RSS GEN issue 5

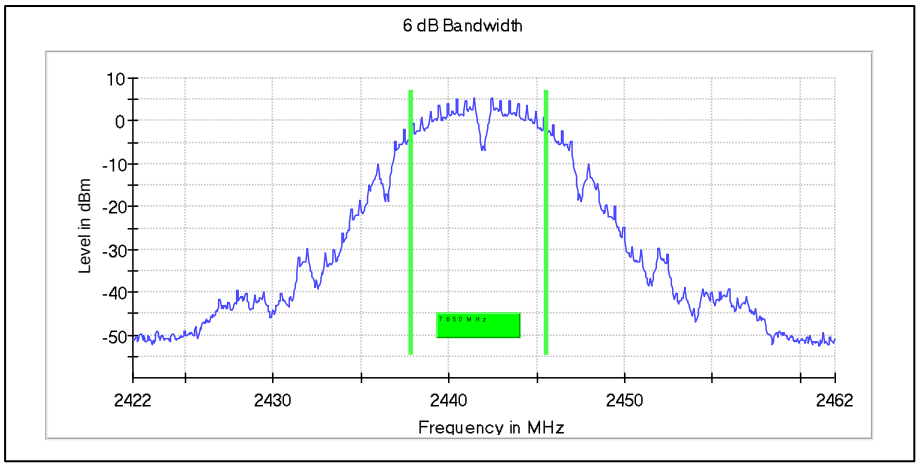
Modulation: 802.11b

Data rate (Mbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)	Minimum Limit (MHz)
1	2412	8.10	11.00	0.5
	2442	7.65	11.00	0.5
	2462	7.65	11.60	0.5
11	2412	7.35	10.90	0.5
	2442	7.55	11.00	0.5
	2462	7.40	11.00	0.5

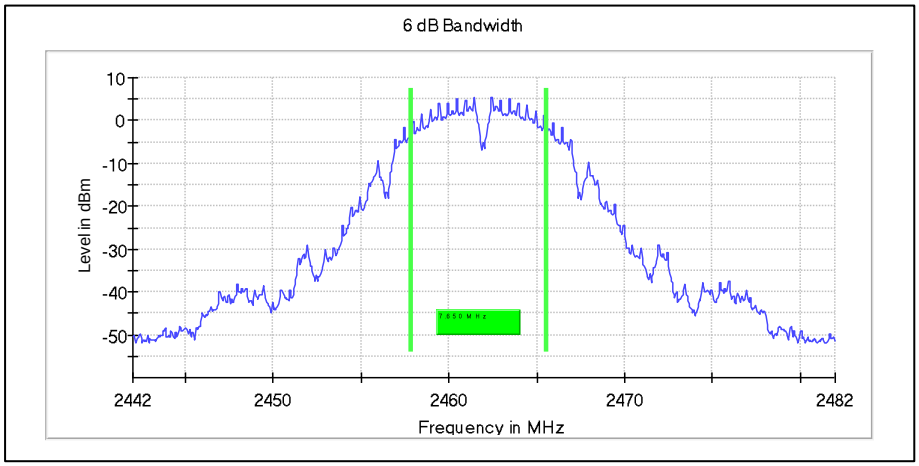
Graphs for 6 dB bandwidth measurement



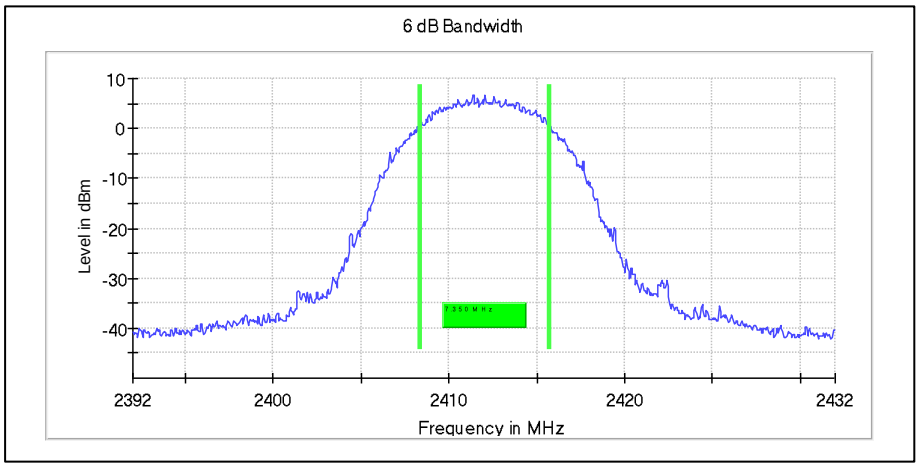
Data Rate: 1Mbps Channel Frequency: 2412MHz



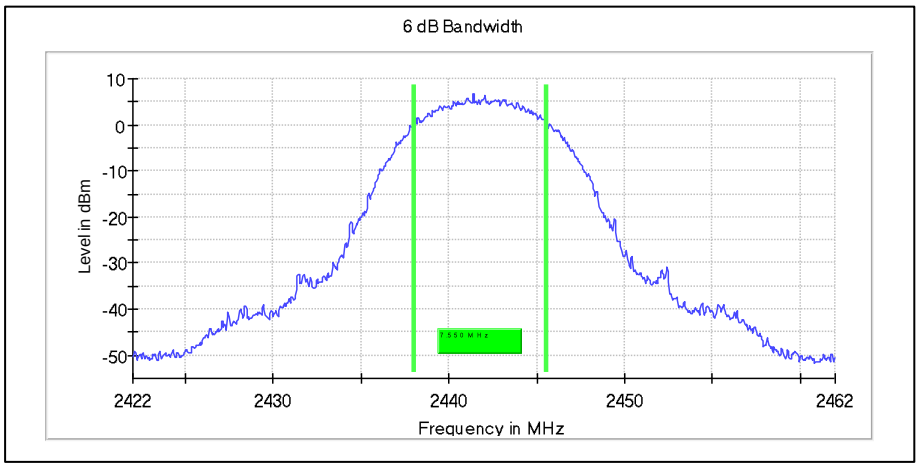
Data Rate: 1Mbps Channel Frequency: 2442MHz



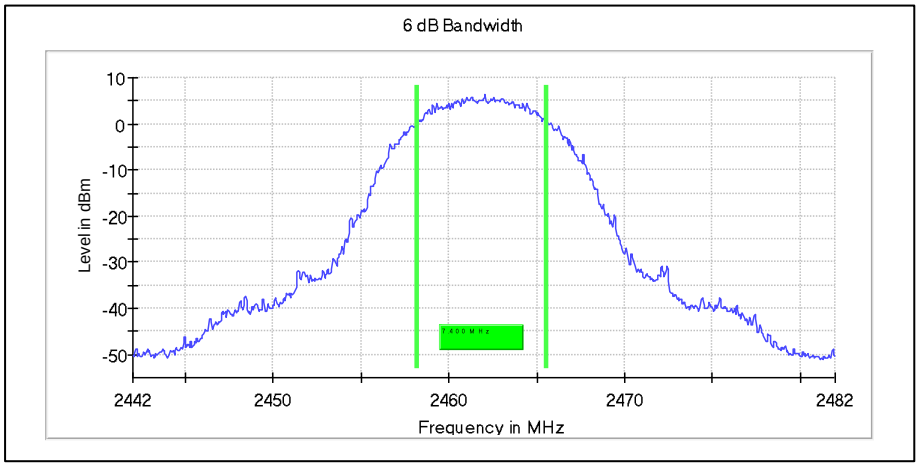
Data Rate: 1Mbps Channel Frequency: 2462MHz



Data Rate: 11Mbps Channel Frequency: 2412MHz

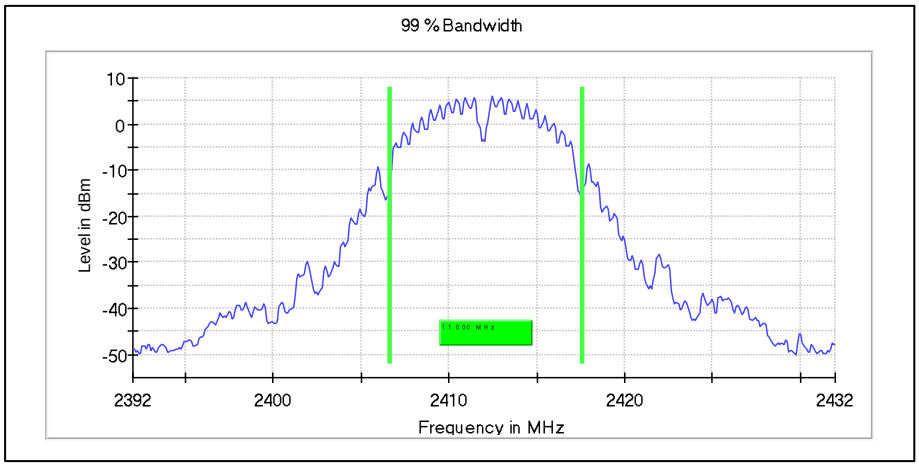


Data Rate: 11Mbps Channel Frequency: 2442MHz

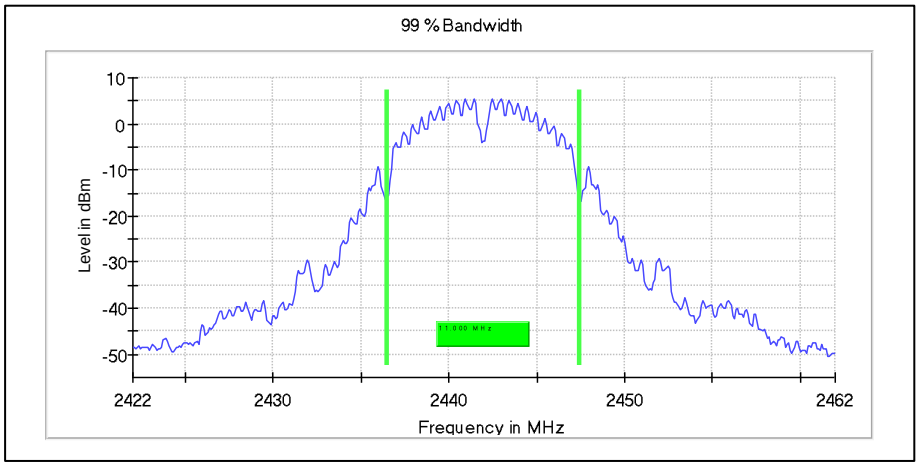


Data Rate: 11Mbps Channel Frequency: 2462MHz

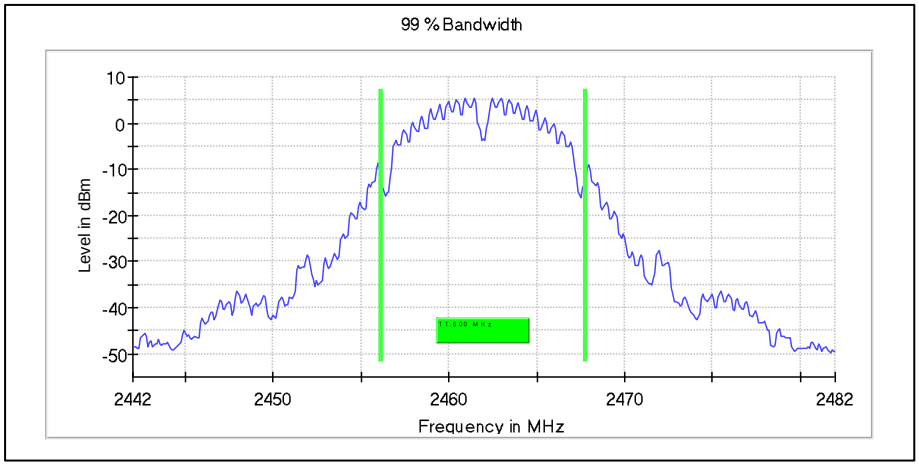
Graphs for OCW 99 % bandwidth measurement



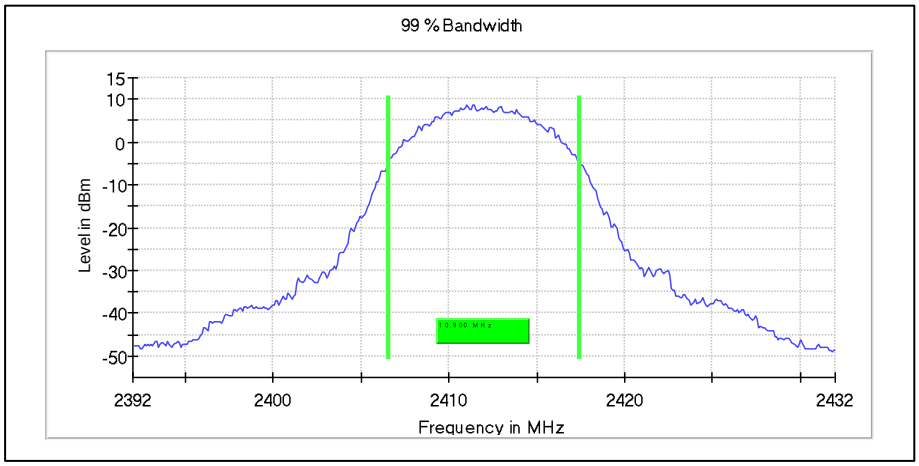
Data Rate: 1Mbps Channel Frequency: 2412MHz



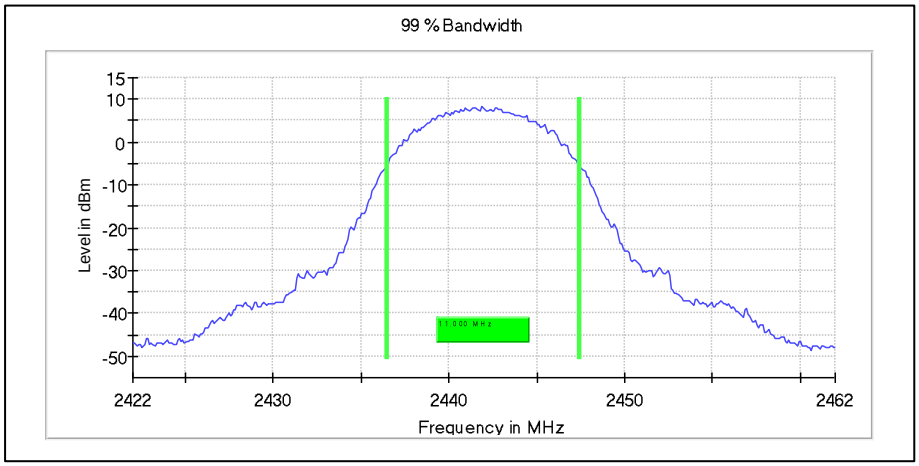
Data Rate: 1Mbps Channel Frequency: 2442MHz



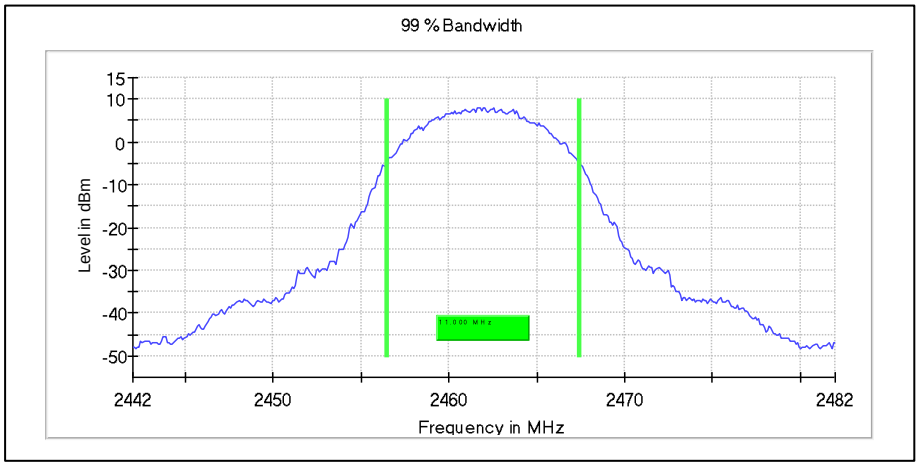
Data Rate: 1Mbps Channel Frequency: 2462MHz



Data Rate: 11Mbps Channel Frequency: 2412MHz



Data Rate: 11Mbps Channel Frequency: 2442MHz

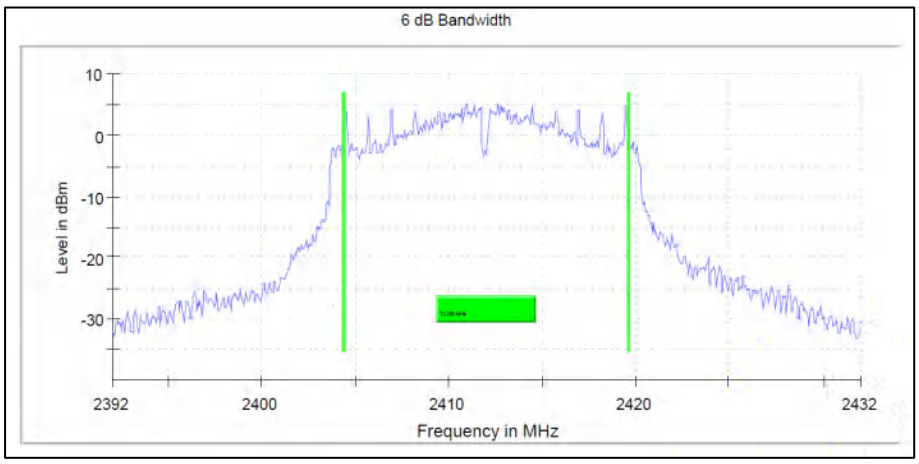


Data Rate: 11Mbps Channel Frequency: 2462MHz

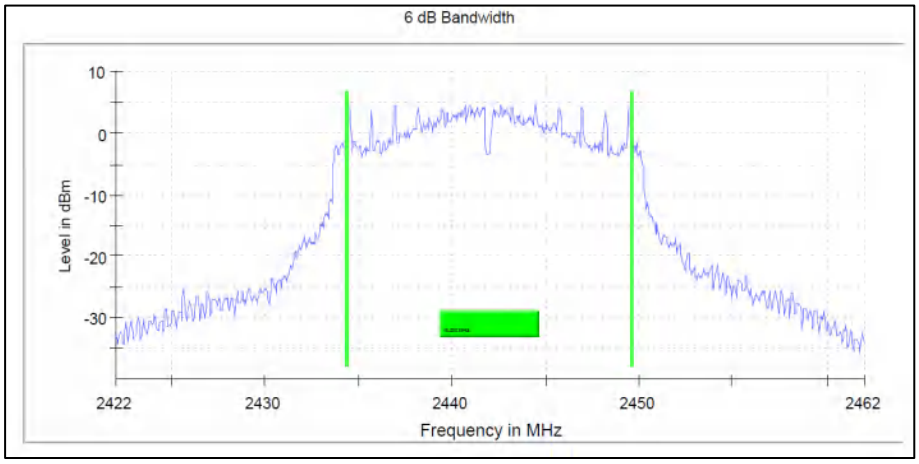
Modulation: 802.11g

Data rate (Mbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)	Minimum Limit (MHz)
6	2412	15.55	16.60	0.5
	2442	15.25	16.60	0.5
	2462	15.25	16.50	0.5
54	2412	15.25	16.4	0.5
	2442	15.25	16.4	0.5
	2462	15.25	16.2	0.5

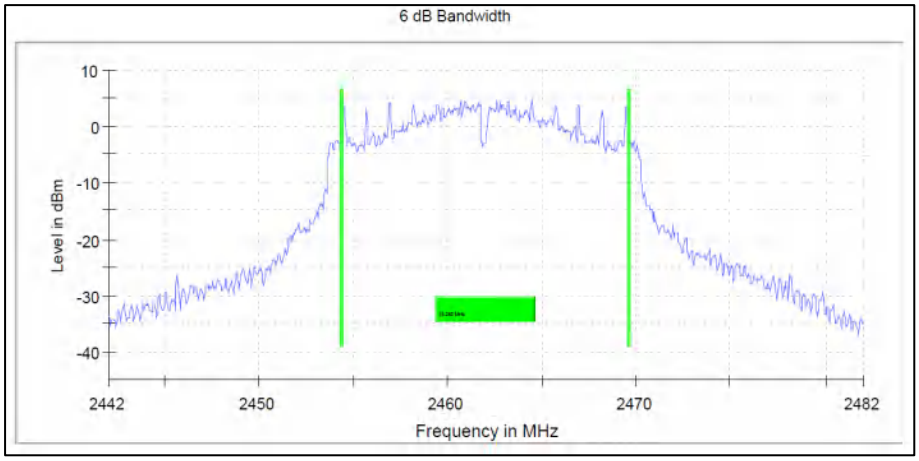
Graphs for 6 dB bandwidth measurement



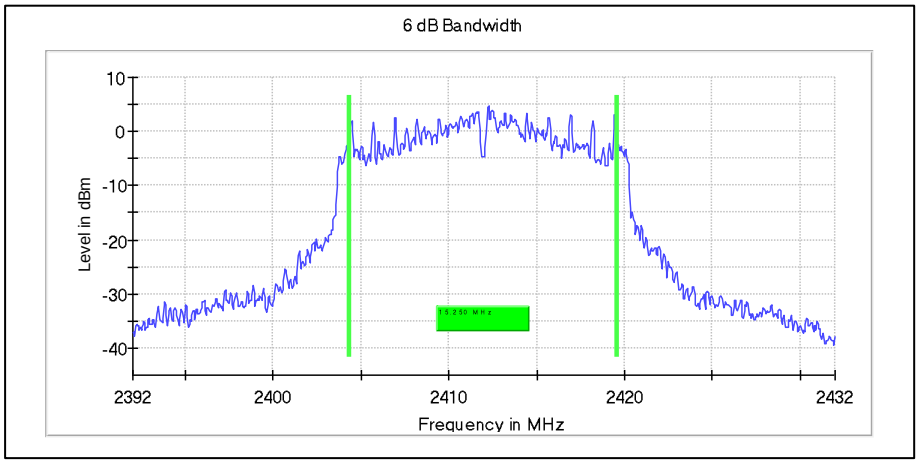
Data Rate: 6Mbps Channel Frequency: 2412MHz



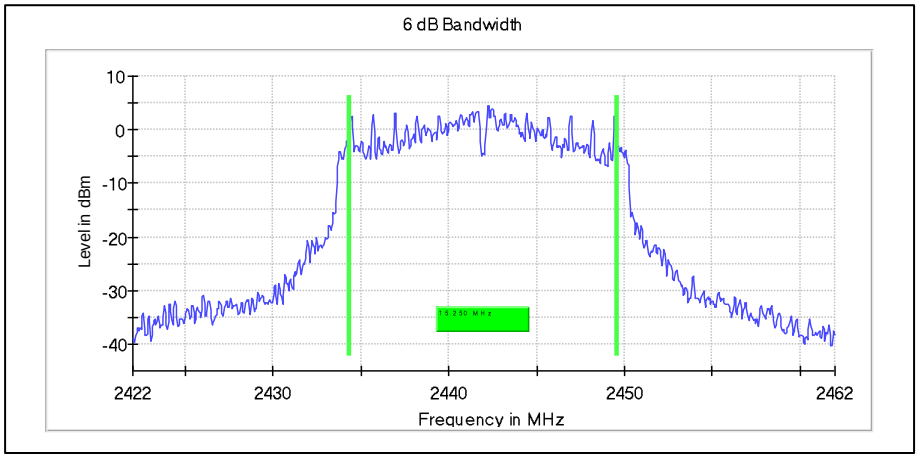
Data Rate: 6Mbps Channel Frequency: 2442MHz



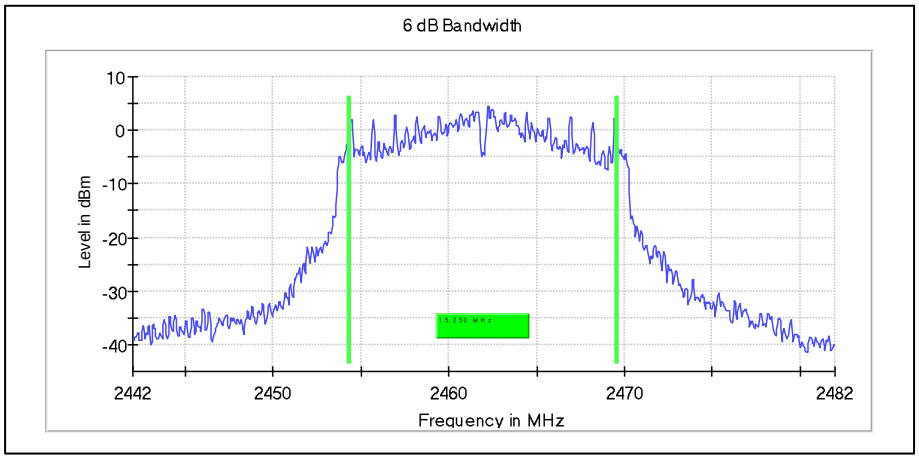
Data Rate: 6Mbps Channel Frequency: 2462MHz



Data Rate: 54Mbps Channel Frequency: 2412MHz

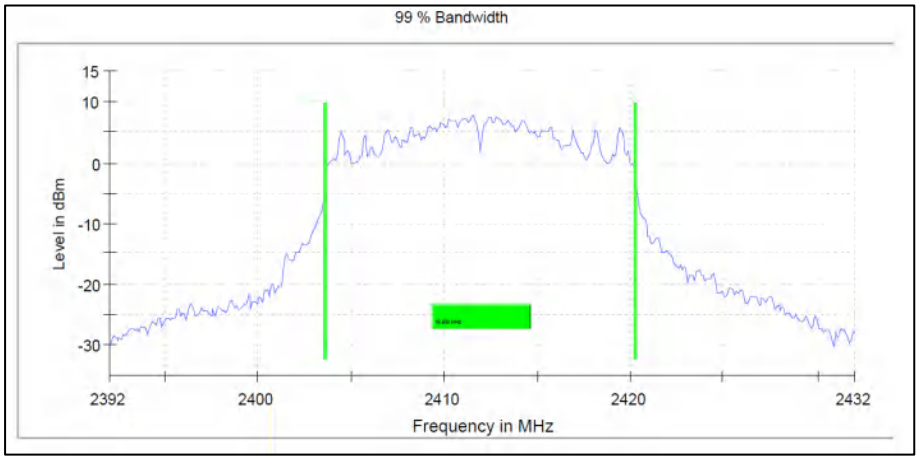


Data Rate: 54Mbps Channel Frequency: 2442MHz

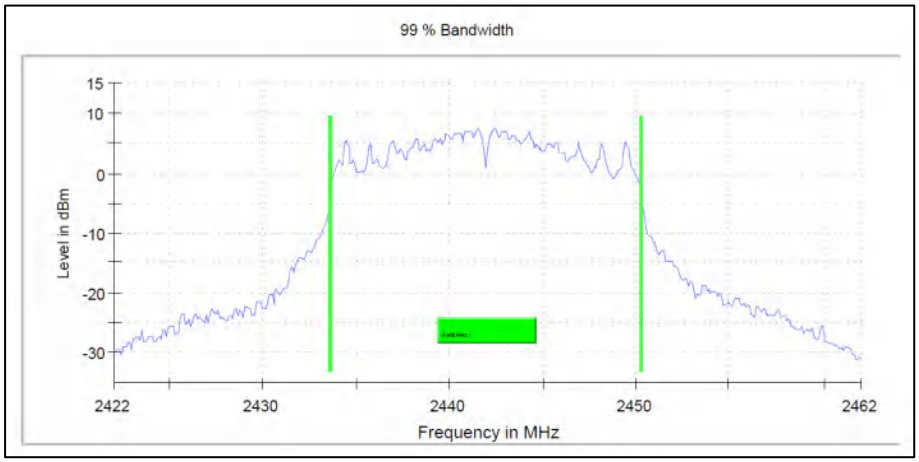


Data Rate: 54Mbps Channel Frequency: 2462MHz

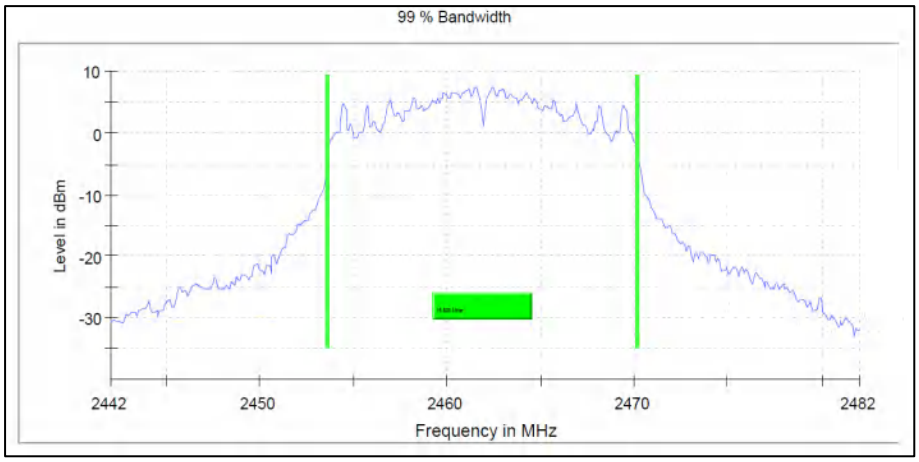
Graphs for OCW 99 % bandwidth measurement



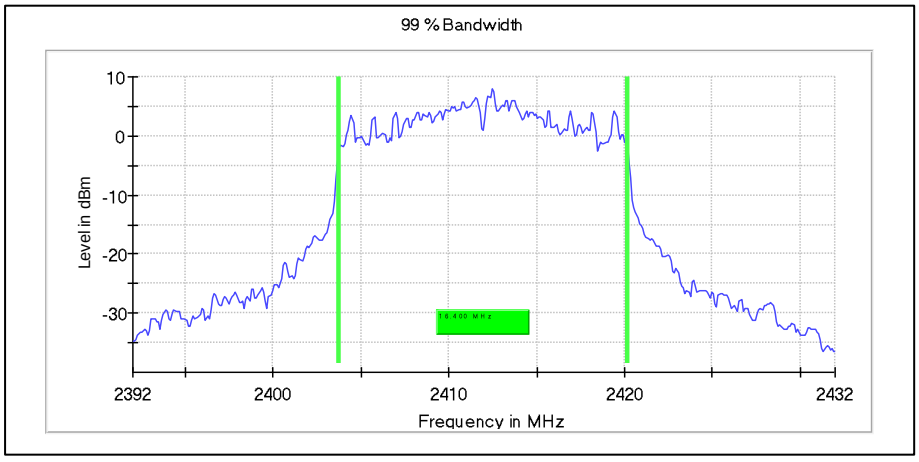
Data Rate: 6Mbps Channel Frequency: 2412MHz



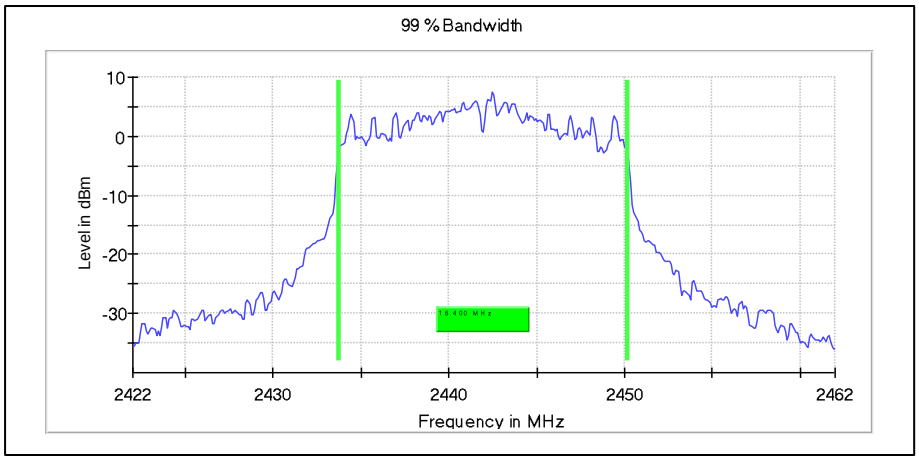
Data Rate: 6Mbps Channel Frequency: 2442MHz



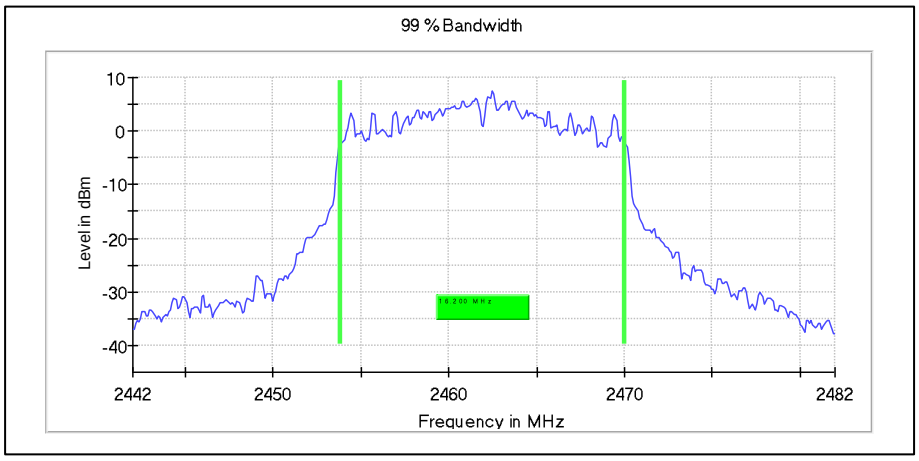
Data Rate: 6Mbps Channel Frequency: 2462MHz



Data Rate: 54Mbps Channel Frequency: 2412MHz



Data Rate: 54Mbps Channel Frequency: 2442MHz

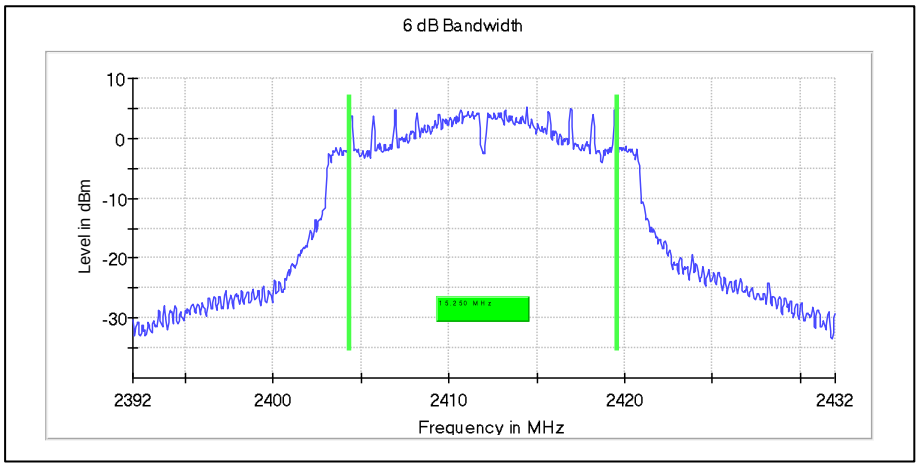


Data Rate: 54Mbps Channel Frequency: 2462MHz

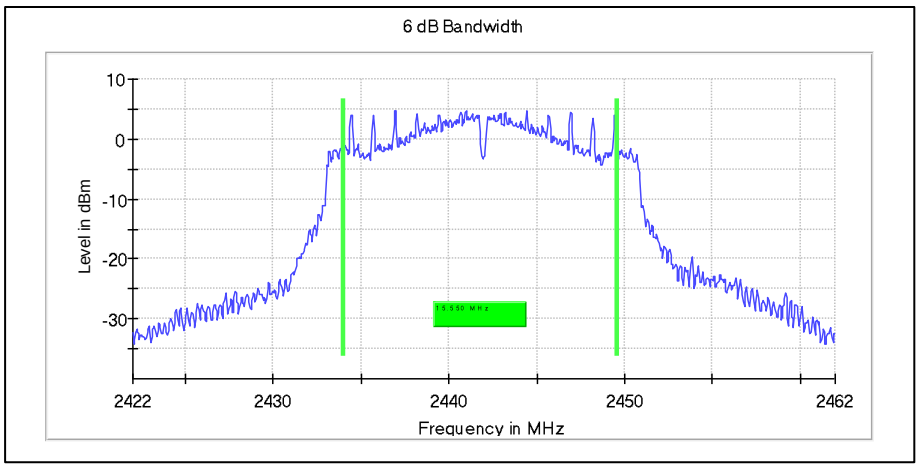
Modulation: 802.11n_20MHz

Data rate (Mbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)	Minimum Limit (MHz)
MCS0	2412	15.25	17.90	0.5
	2442	15.55	17.80	0.5
	2462	15.25	17.60	0.5
MCS7	2412	15.25	17.60	0.5
	2442	15.50	17.60	0.5
	2462	15.25	17.60	0.5

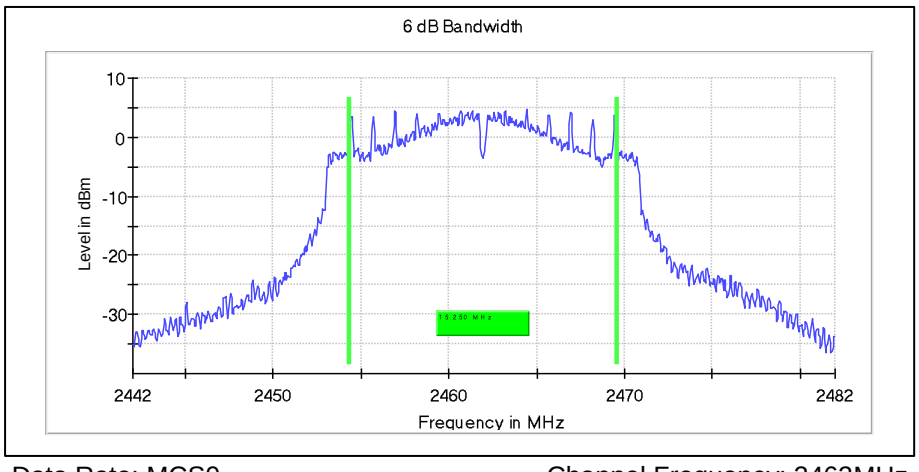
Graphs for 6 dB bandwidth measurement



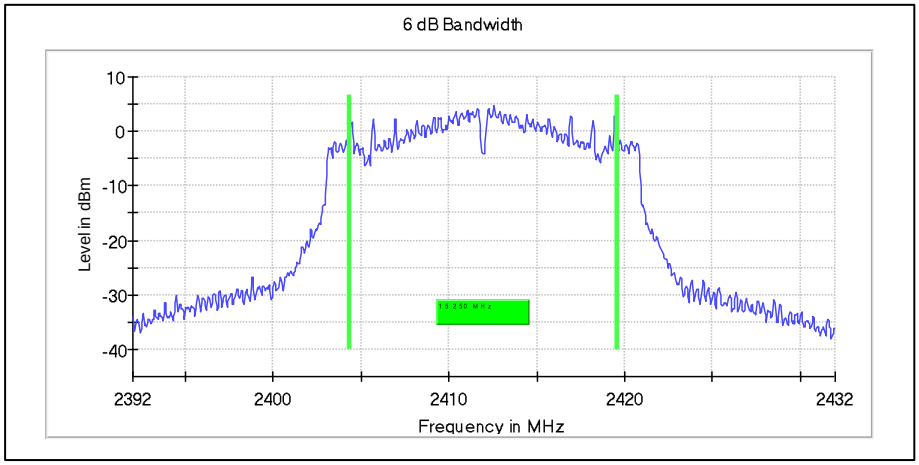
Data Rate: MCS0 Channel Frequency: 2412MHz



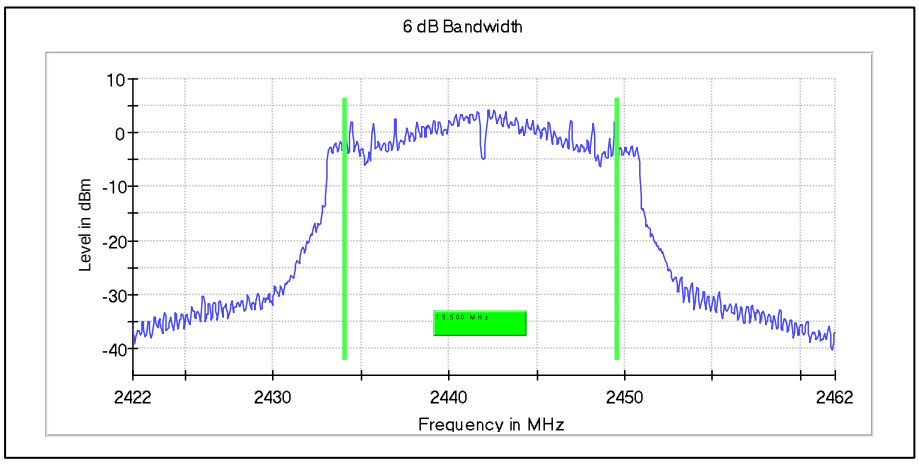
Data Rate: MCS0 Channel Frequency: 2442MHz



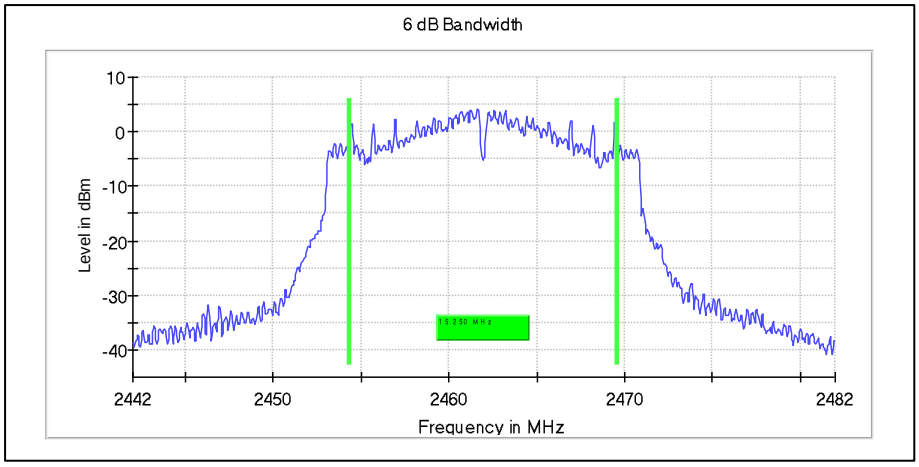
Data Rate: MCS0 Channel Frequency: 2462MHz



Data Rate: MCS7 Channel Frequency: 2412MHz

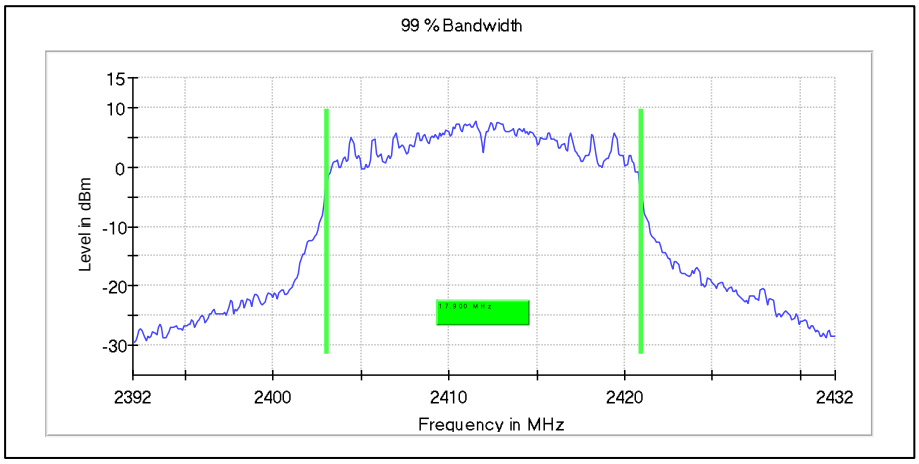


Data Rate: MCS7 Channel Frequency: 2442MHz

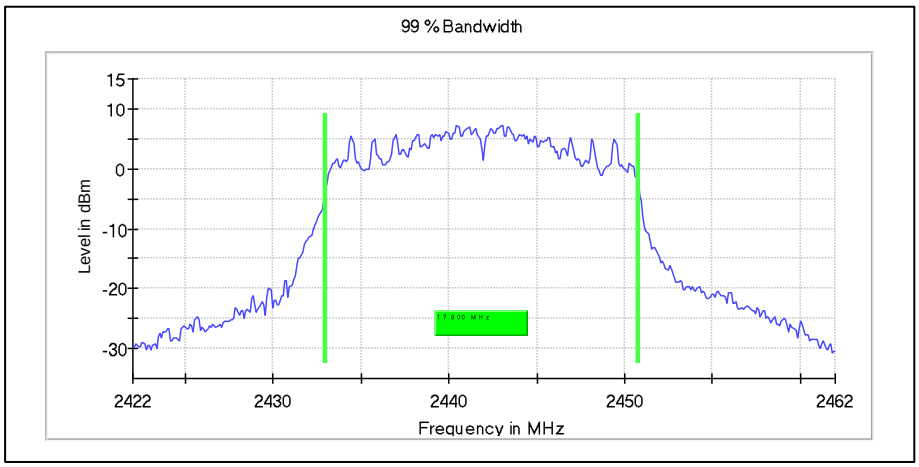


Data Rate: MCS7 Channel Frequency: 2462MHz

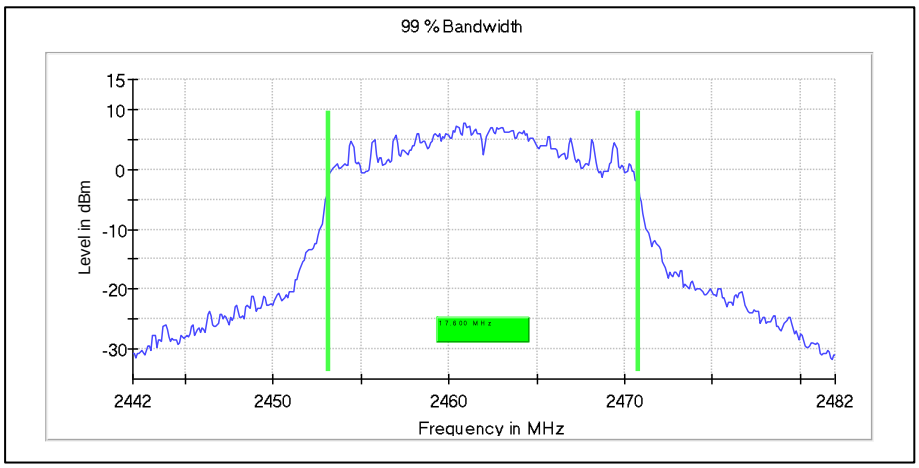
Graphs for OCW 99 % bandwidth measurement



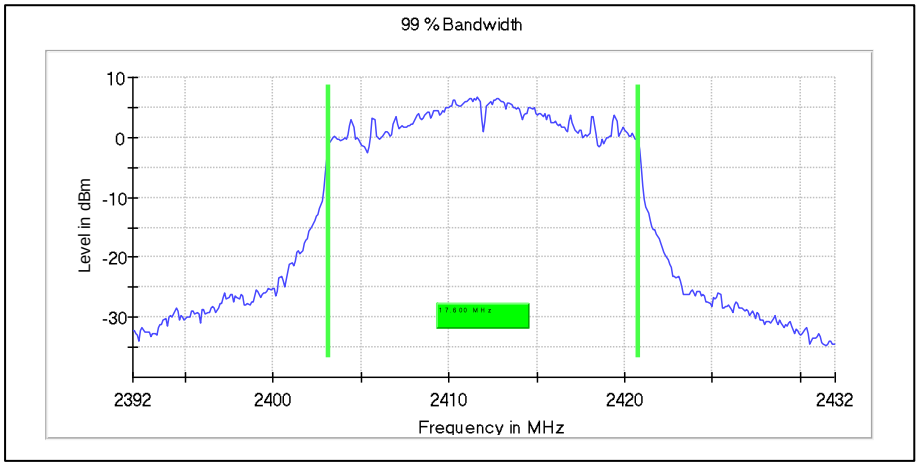
Data Rate: MCS0 Channel Frequency: 2412MHz



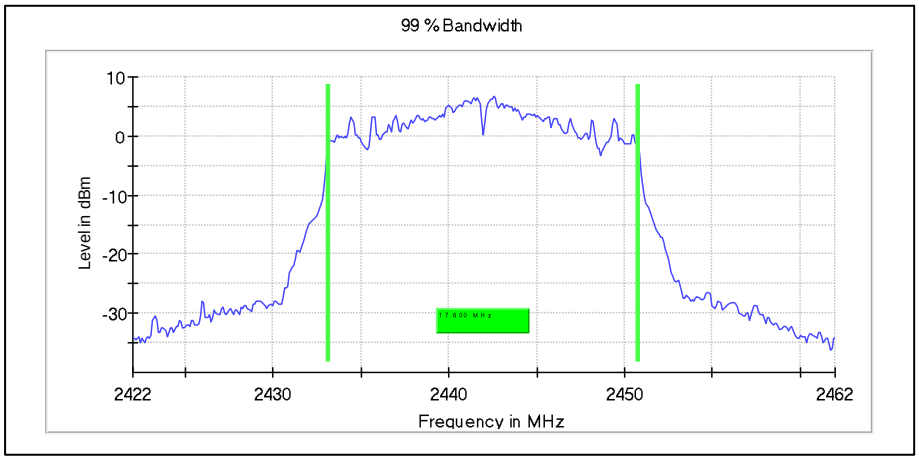
Data Rate: MCS0 Channel Frequency: 2442MHz



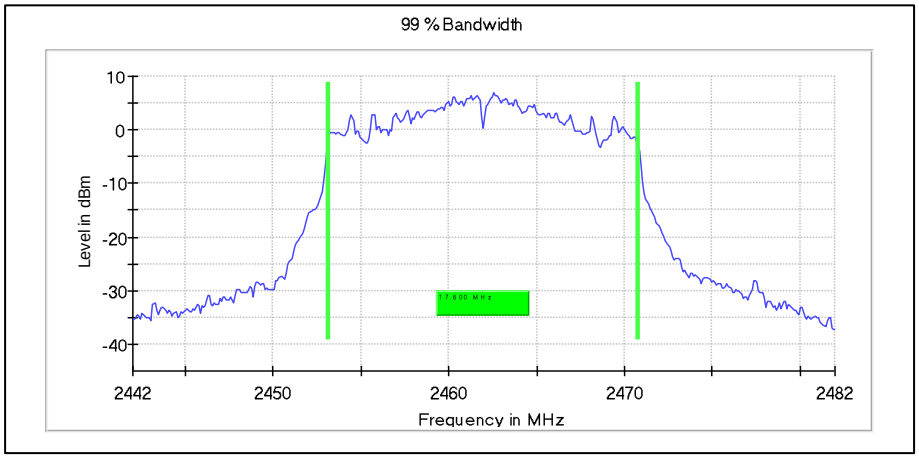
Data Rate: MCS0 Channel Frequency: 2462MHz



Data Rate: MCS7 Channel Frequency: 2412MHz



Data Rate: MCS7 Channel Frequency: 2442MHz



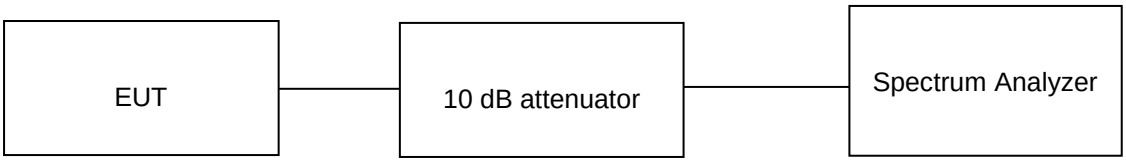
Data Rate: MCS7 Channel Frequency: 2462MHz

8.4 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result ***Pass***

Test Specification	FCC part 15 Subpart C 15.247 (d) / RSS 247 Issue 2, Section 5.5
Test Method	Subclause 11.11 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	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 30dB 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, provided the transmitter demonstrates compliance with the peak conducted power limits

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = +25 °C Voltage = Internal Battery + 5.0 V DC Relative humidity: 62 %

KDB Guidelines applied:

Measurements were made as per section 8.5 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

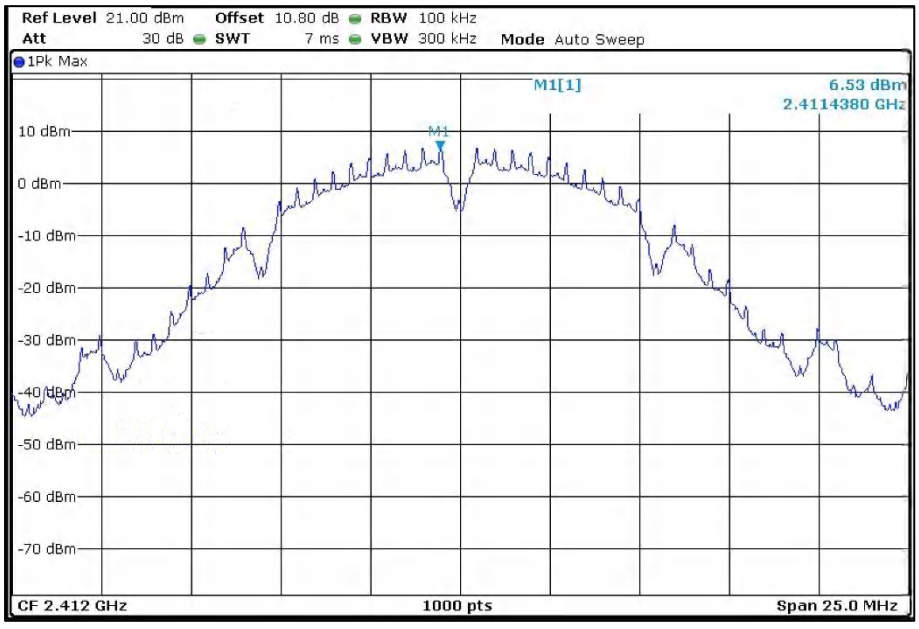
Test results:

Note:
1. All the losses are included during measurement and final values are mentioned in the test report.
2. Final Value (dBm) = Measured Value (dBm) + Attenuator factor (10dB) + Cable loss (0.8dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 2.2 dBi

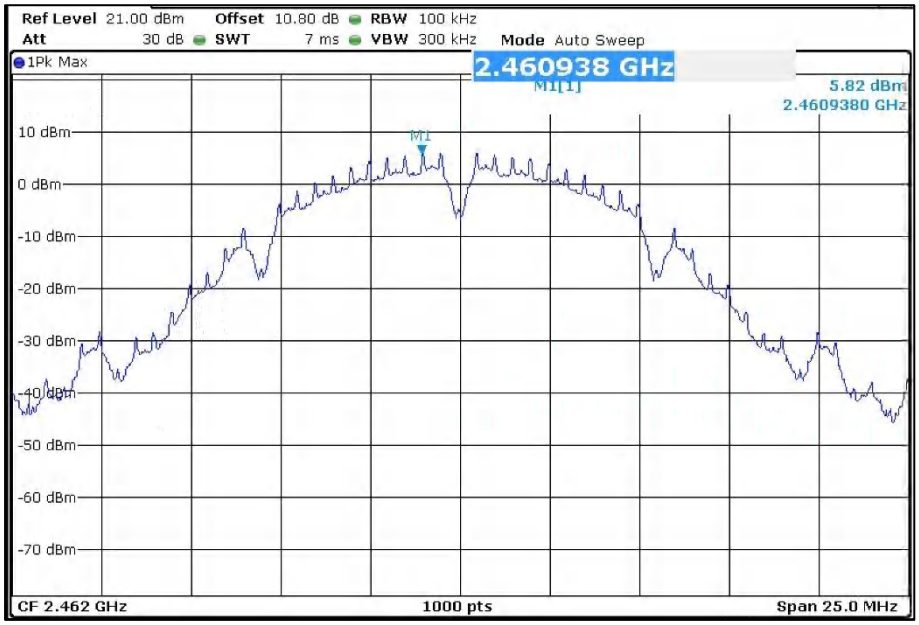
8.4.1 Band edge and reference plots

Modulation: 802.11b

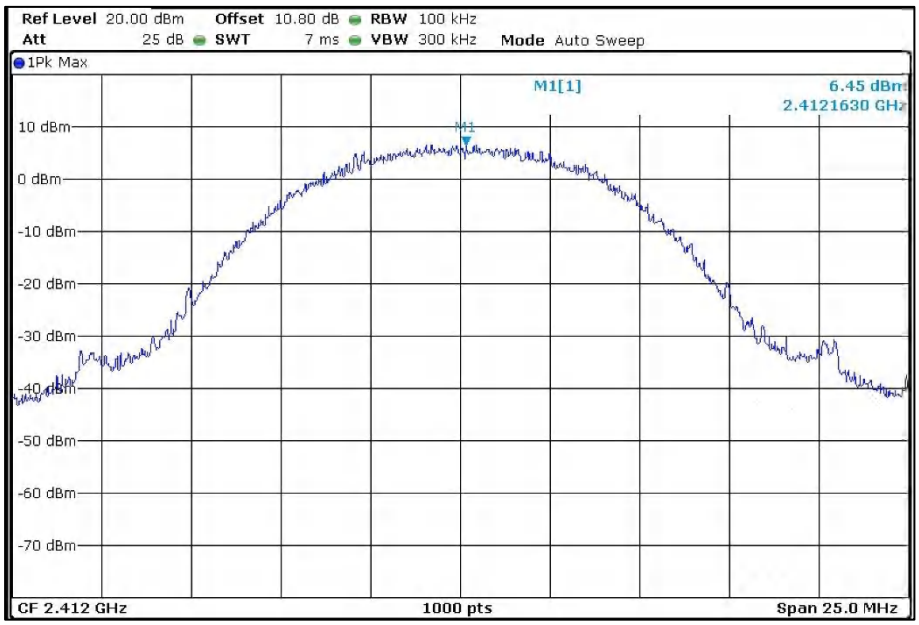
Data Rate (Mbps)	Channel Frequency (MHz)	Band edge Frequency (MHz)	Value at Band edge (A) (dBm)	Reference Value (B) (dBm)	Limit (dBc)	Minimum Limit (dBc)
1	2412	2398.46	-38.22	6.53	-23.47	30
	2462	2483.5	-52.50	5.82	-24.18	30
11	2412	2398.41	-37.51	6.45	-23.55	30
	2462	2483.5	-52.36	6.28	-23.72	30



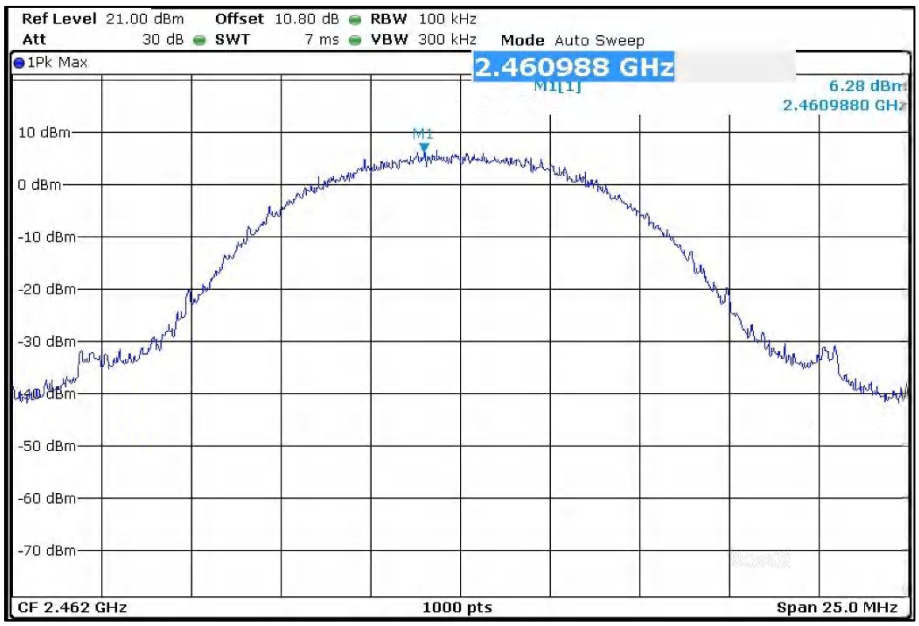
Data Rate: 1Mbps Reference plot for 2412MHz



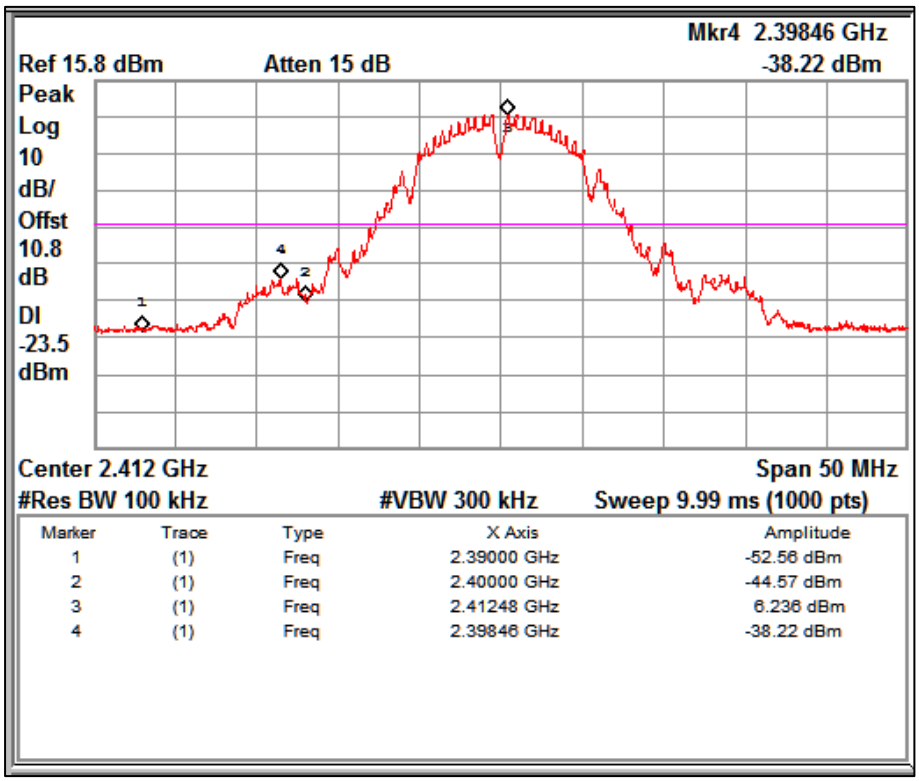
Data Rate: 1Mbps Reference plot for 2462MHz



Data Rate: 11Mbps Reference plot for 2412MHz



Data Rate: 11Mbps Reference plot for 2462MHz



Data Rate: 1Mbps Band edge Channel Frequency 2412MHz