

	    CERTIFICATE 2518.08 MS ISO/IEC 17025 TESTING SAMM NO. 0825																														
MOTOROLA PENANG ADV. COMM. LABORATORY Motorola Solutions Malaysia Sdn. Bhd. Plot 2A Medan Bayan Lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia.	FCC / ISED TEST REPORT Report Revision : Rev.B																														
<table><tr><td>Date/s Tested</td><td>: 24-Aug-2021 - 17-Oct-2021</td></tr><tr><td>Report Issue Date</td><td>: 20-Sep-2021</td></tr><tr><td>Manufacturer/Location</td><td>: Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900, Bayan Lepas, Penang, Malaysia</td></tr><tr><td>Requestor</td><td>: KHOO TEIK KEAN</td></tr><tr><td>Product Type</td><td>: Hand-held</td></tr><tr><td>Product Version (PMN)</td><td>: R7</td></tr><tr><td>Model Number (HVIN)</td><td>: AAH06JDN9RA1AN (IC Model: PMUD3491ABB)</td></tr><tr><td>Frequency Band</td><td>: 2.412-2.462 GHz</td></tr><tr><td>Max RF Output Power</td><td>: 802.11b - 35.48 mWatts 802.11g - 35.48 mWatts 802.11n - 35.48 mWatts</td></tr><tr><td>Applicant Name</td><td>: Motorola Solutions Inc</td></tr><tr><td>Applicant Address</td><td>: 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322</td></tr><tr><td>FCC Registrations</td><td>: 461337</td></tr><tr><td>ISED Registrations</td><td>: MY0001</td></tr><tr><td>Firmware Version (FVIN)</td><td>: D02.21.04.0065</td></tr></table> The equipment was tested accordance to the requirement listed below: <table><tr><td>(2.4GHz Wifi) 47CFR Part 15C ISED RSS 247 Issue 2</td><td>PASS</td></tr></table> 		Date/s Tested	: 24-Aug-2021 - 17-Oct-2021	Report Issue Date	: 20-Sep-2021	Manufacturer/Location	: Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900, Bayan Lepas, Penang, Malaysia	Requestor	: KHOO TEIK KEAN	Product Type	: Hand-held	Product Version (PMN)	: R7	Model Number (HVIN)	: AAH06JDN9RA1AN (IC Model: PMUD3491ABB)	Frequency Band	: 2.412-2.462 GHz	Max RF Output Power	: 802.11b - 35.48 mWatts 802.11g - 35.48 mWatts 802.11n - 35.48 mWatts	Applicant Name	: Motorola Solutions Inc	Applicant Address	: 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322	FCC Registrations	: 461337	ISED Registrations	: MY0001	Firmware Version (FVIN)	: D02.21.04.0065	(2.4GHz Wifi) 47CFR Part 15C ISED RSS 247 Issue 2	PASS
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REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	20-Sep-2021	Gan Boon Teong
Rev. B	Update Power result	17-Oct-2021	Gan Boon Teong

1.0. General Information

EUT Description:

Technologies	2.4GHz Wi-Fi
TX Frequency range	2412MHz – 2462MHz
Modulation Type	DSSS, OFDM
Connector type	PROGRAMMING, TEST & ALIGNMENT CABLE
Antenna type	Internal PCB

1.1. Channel number and frequency information:

There are two bandwidth systems.

For 20MHz Bandwidth systems (802.11b, 802.11g, 802.11n), use channel 1 ~ channel 11

For 40MHz Bandwidth systems (802.11n), use channel 3 ~ channel 9

Channel	Frequency	Channel	Frequency
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

The EUT contains following accessory devices and data cable:

Item	Brand	Model or P/N
BATTERY PACK,BATT IMPRES LIION TIA4950 IP68 3200T	MOTOROLA	PMNN4810A
VHF WHIP ANTENNA (136-174 MHZ) 136 - 174 MHz	MOTOROLA	PMAD4147A
CABLE,PORTABLE PROGRAMMING CABLE	MOTOROLA	PMKN4230A
CHARGER,CHGR DESKTOP SINGLE UNIT IMPRES 2 EXT PS US/NA/CA	MOTOROLA	PMPN4576A
Power Supply	MOTOROLA	25009297001

General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

FCC 47 CFR Part 15 Subpart C
KDB 558074 D01 15.247 Meas Guidance v05
ANSI C63.10-2013

Deviation from standard

Not applicable as no deviation from standard test method

Modifications to EUT

For RF conducted measurements a pigtail was soldered out of the board while for radiated measurements there were no modifications to the device

Selection of test modes

Some reports may contain a limited number of test points/modes, in which case all channels and modulations were evaluated and the worst case performance is presented in the report

Test configuration of EUT

All relevant configurations involving radio models and accessories (including chargers, batteries, antennas) were assessed. Only worst case configurations will be included in this report.

2.0. Summary of Test Results

FCC Clause	IC Clause	Test Item	Result	Remark	Serial number tested	Tested by
15.247 (a)(2)	RSS-247 5.2(a)	DTS & 99% Channel Bandwidth	Pass	Highest 99% OCB: 802.11b: 13.507 MHz(13M5G1D) 802.11g: 16.744 MHz(16M7D1D) 802.11n: 17.710 MHz(17M7D1D)	865TXP0468	Gan
15.247 (b)(3)	RSS-247 5.4(d)	Conducted RF Output Power (Average)	Pass	Highest output power: 802.11b: 14.796 dBm (30.17 mW) 802.11g: 14.704 dBm(29.54 mW) 802.11n: 14.808 dBm(30.26 mW)	865TXP0468	Gan
15.247(e)	RSS-247 5.2(b)	Maximum Power Spectral Density	Pass	References data from AZ489FT7143 / ISED 109U-89FT7143	NA	NA
15.247(d)	RSS-247 5.5	Conducted Spurious Emissions	Pass	References data from AZ489FT7143 / ISED 109U-89FT7143	NA	NA
15.247 (d)	RSS-247 5.5	Band edge Conducted Spurious Emission	Pass	References data from AZ489FT7143 / ISED 109U-89FT7143	NA	NA
15.205, 15.209, 15.247 (d)	RSS-247 5.5	Radiated Emission within Restricted Bands	Pass	Worst case emission: 49.7929dBuV/m (4.7021dB margin)	865TXP0473	Amaluddin& Azil& Qawiman
15.207	RSS-Gen 8.8	AC Power Line Conducted Emission	NA	Meet the limit requirement.	865TXP0473	Alif&Iskandar
15.203		Antenna requirement	NA	Internal antenna is not accessible to the enduser	NA	

***NOTE: The WiFi chipset is identical to FCC ID AZ489FT7143 / ISED 109U-89FT7143. The rest of conducted measurements are by similarity. Only worst case configuration of radiated emission based on AZ489FT7143 / ISED 109U-89FT7143 is tested. As per KDB 484596 D01v01, the applicant takes full responsibility that data referenced represents compliance to the relevant rules for this current FCC ID.**

3.0. Measurement Uncertainty

Measurement	Frequency	Expended Uncertainty (k=1.96) (±)
AC Power Line Conducted Spurious Emission	150kHz ~ 30MHz	3.48 dB
Radiated Emissions up to 1 GHz (Field Strength)	30MHz ~ 1000MHz	5.88 dB
Radiated Emissions above 1 GHz (Field Strength)	1GHz ~ 18GHz	5.84 dB
	18GHz ~ 40GHz	6.02 dB
Conducted Spurious Emissions	9kHz ~ 12.75GHz	2.82 dB

4.0. Equipment List

Bluetooth ATE # 1 (SW Version: Ate Main_3.1.11)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
CHAMBER	SH-641	92002639	8-Dec-20	8-Dec-21
POWER SUPPLY (0-20V / 0-25A)	6652A	3640A02941	22-Jan-21	22-Jan-22
ANALYZER SPECTRUM (PSA 3Hz-26.5GHz)	E4440A	US45303111	14-Jul-21	14-Jul-22
CHAMBER	SH-641	92002639	8-Dec-20	8-Dec-21
N to N RF Cable # 1	SF126/11N/11N	NA	NA	NA

Radiated Emission Station (SW Version: EMC FCC RE v1.6.2)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
DRG HORN FREQ.	SAS-571	720	06-Apr-21	06-Apr-23
DRG HORN FREQ.	SAS-571	566	22-Oct-19	22-Oct-21
POWER SUPPLY	N7976A	MY53410110	24-May-21	24-May-22
SIGNAL GENERATOR	SMB 100A	181117	8-Nov-18	8-Nov-21
EMI TEST RECEIVER	ESW44	101750	15-Jan-21	15-Jan-22
EMI TEST RECEIVER	ESIB26	827769/009	11-Mar-21	11-Mar-22
5m SEMI-ANECHOIC CHAMBER	S800-HX	J2308	Not Required	Not Required
BILOG ANTENNA	CBL6112D	55546	06-Jun-21	06-Jun-22
BILOG ANTENNA	CBL6112B	2964	4-May-21	4-May-22
HYGRO-THERMOMETER	SDL500	A.016800	18-May-21	18-May-22
SYSTEM CONTROLLER	SC104V	050806-1	Not Required	Not Required
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	Not Required	Not Required
ANTENNA POSITIONING TOWER	TLT2	NA	Not Required	Not Required
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170255	4-Feb-21	4-Feb-22
AMPLIFIER	JS44-18004000-33-8P	2034566	12-June-19	12-June-22
PREAMPLIFIER	PAM-0118P	361	11-Sep-20	11-Sep-23
LOOP ANTENNA	6502	00208416	15-Sep-20	15-Sep-21

Power Line Conducted Emission (SW Version: EMC 32 v10.60.10)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
TEMPERATURE & HUMIDITY LOGGER	TM320	11203258	11-Dec-20	11-Dec-21
V-NETWORK 2-LINE	ENV216V	101039	20-July-19	20-Sep-21
EMI TEST RECEIVER	ESIB40	100307	8-Jan-21	8-Jan-22
PROGRAMMABLE AC SOURCE	61604	616040003502	4-Dec-2020	4-Dec-2021

5.0. Test Mode Applicability and Test Channel Detail

The device employs MIMO technology. Below are the possible configurations.

WLAN Configurations		Mode					
		SISO		Spatial Diversity Multiplexing (MIMO)		Cyclic Delay Diversity (MIMO)	
	Antenna	Primary	Secondary	Primary	Secondary	Primary	Secondary
2.4GHz	802.11b	√	√	x	x	x	x
	802.11g	√	√	x	x	x	x
	802.11n (HT20)	√	√	x	x	x	x
	802.11n (HT40)	x	x	x	x	x	x

√ = Support;
 x = NOT Support

Note: This Device supports simultaneous transmission operation, which allows for two SISO or two MIMO channels to operate independent of one another in the 2.4GHz band on each antenna. 802.11n mode is capable of transmitting simultaneously on two antennas using Cyclic Delay Diversity and Spatial Diversity Multiplexing (2x2 MIMO).

The following tables show the worst case configurations determined during testing. The data for these configurations is contained in this test report.

Radiated Emission Test (Above 1GHz)

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	QPSK	1	SISO	23.9°C, 68.7%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	23.9°C, 68.7%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	23.9°C, 68.7%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	6.5	SISO CDD (MIMO)	NA

Radiated Emission Test (Below 1GHz)

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	QPSK	1	SISO	23.9°C, 68.7%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	23.9°C, 68.7%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	23.9°C, 68.7%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	6.5	SISO CDD (MIMO)	NA

Power Line Conducted Emission Test

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Data Rate (Mbps)	Environmental Conditions
Application Mode	802.11bgn mixed	1 to 11	AUTO	DSSS, OFDM	AUTO	AUTO	24.3°C, 71.0%RH

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Data Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	QPSK	1	SISO	25°C, 54.8%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	25°C, 54.8%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	25°C, 54.8%RH
Test Mode	802.11n (HT40)	1 to 11	3,6,9	OFDM	BPSK	6.5	SISO CDD (MIMO)	NA

Duty Cycle of Test Signal

802.11b, 802.11g and 802.11n : Duty cycle of test signal is $\geq 98\%$.

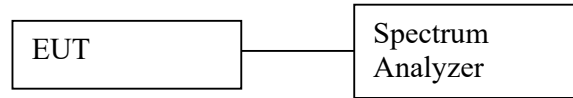
802.11g : Duty cycle of test signal is $\leq 98\%$.

(Refer to Clause 6.3 for duty cycle test signal)

6.0. Transmitter Test Parameters

6.1. 6dB Channel Bandwidth

6.1.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max hold
 - e. Sweep = auto
- e) Measure the freq different of two frequencies that were attenuated 6dB from peak of the emission & record the frequency difference as the emission bandwidth.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

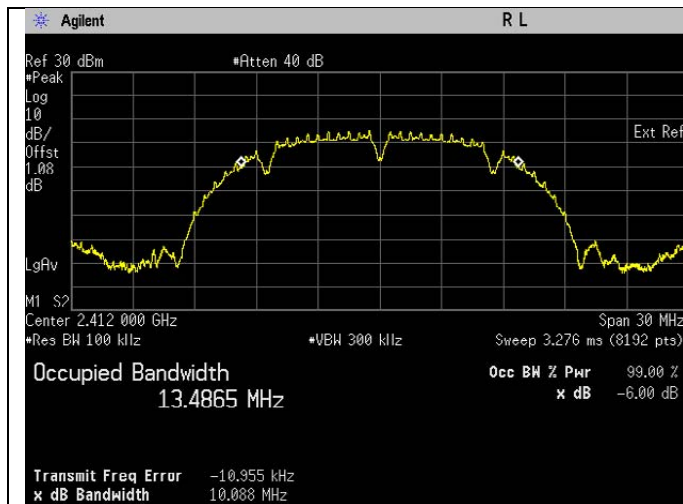
6.1.2. Test Limits:

Normal Condition (25 ° C)
≥ 500 kHz

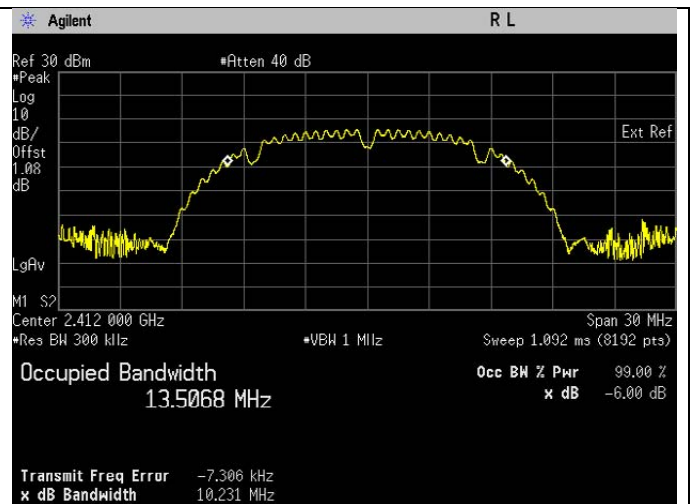
6.1.3. Test Data:

802.11b

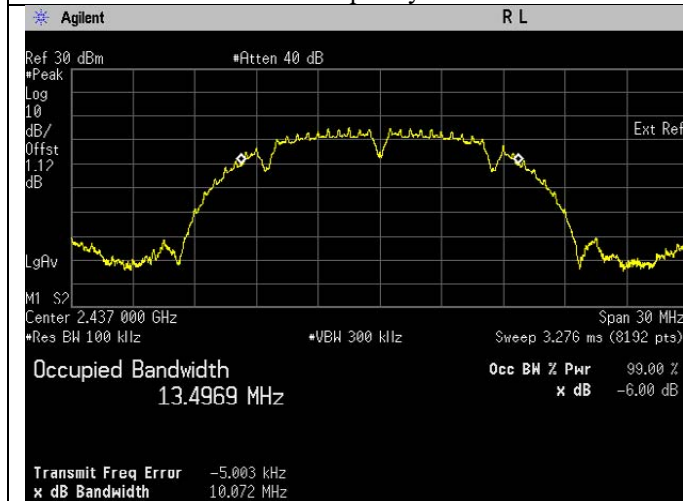
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11b	DSSS	DBPSK	1	2412	10.088	13.507	Pass
802.11b	DSSS	DBPSK	1	2437	10.072	13.493	Pass
802.11b	DSSS	DBPSK	1	2462	10.086	13.483	Pass



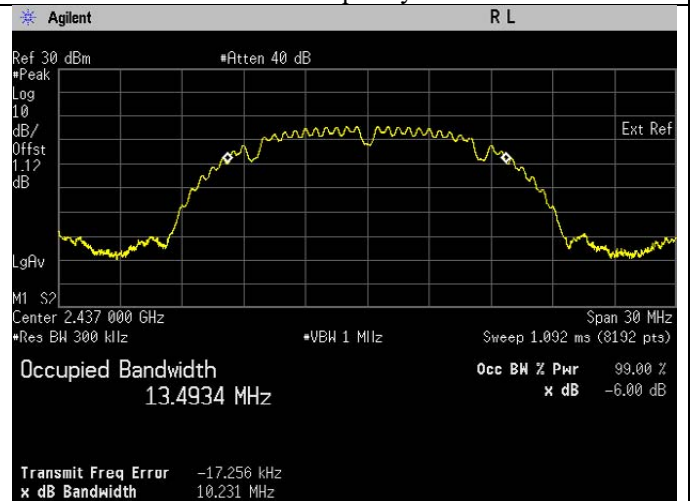
6dB Bandwidth. 802.11b Frequency 2412 MHz



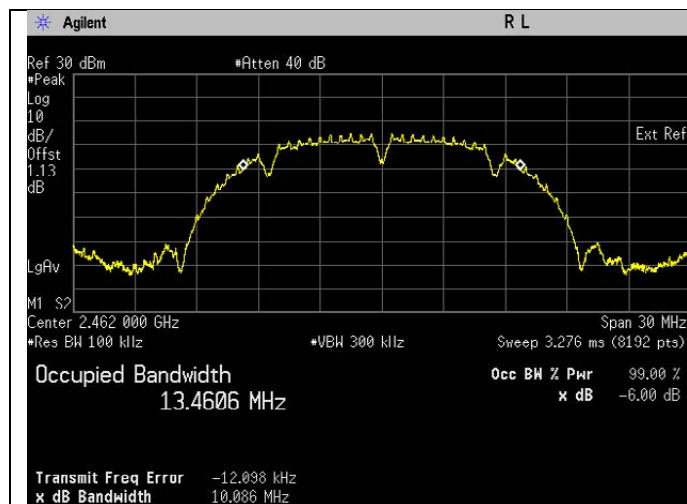
99% Bandwidth. 802.11b Frequency 2412 MHz



6dB Bandwidth. 802.11b Frequency 2437 MHz



99% Bandwidth. 802.11b Frequency 2437 MHz



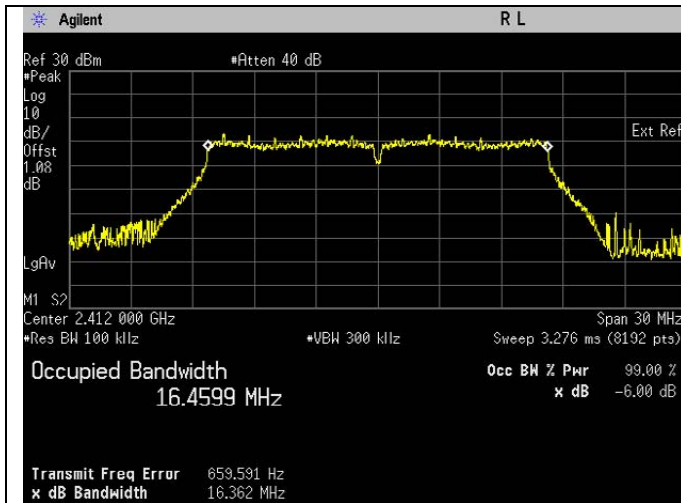
6dB Bandwidth. 802.11b Frequency 2462 MHz



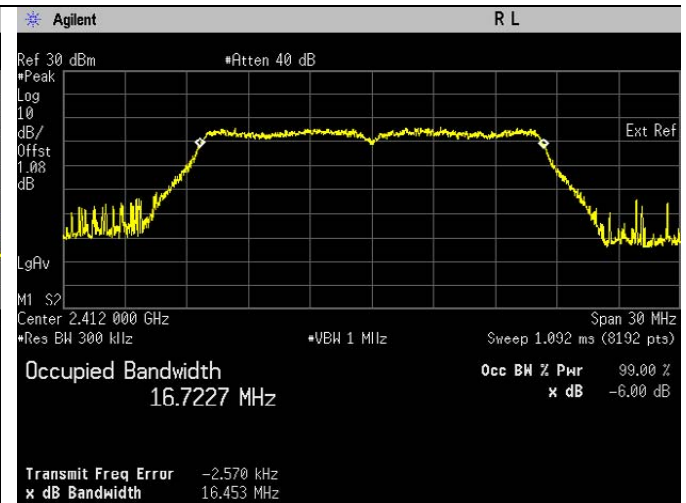
99% Bandwidth. 802.11b Frequency 2462 MHz

802.11 g

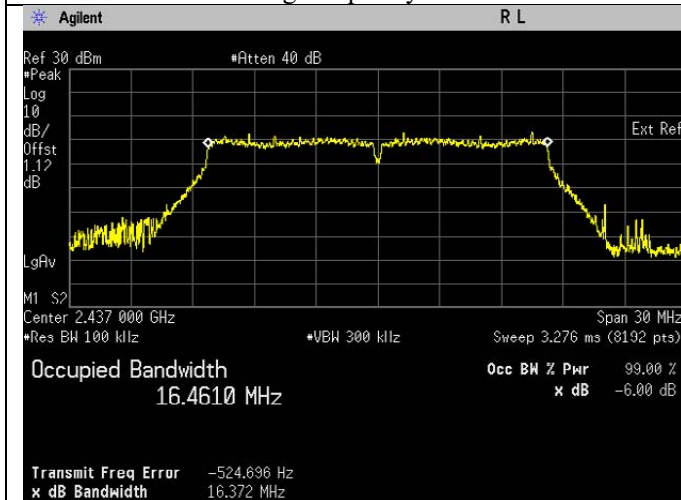
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11g	OFDM	BPSK	6	2412	16.362	16.723	Pass
802.11g	OFDM	BPSK	6	2437	16.372	16.744	Pass
802.11g	OFDM	BPSK	6	2462	16.362	16.729	Pass



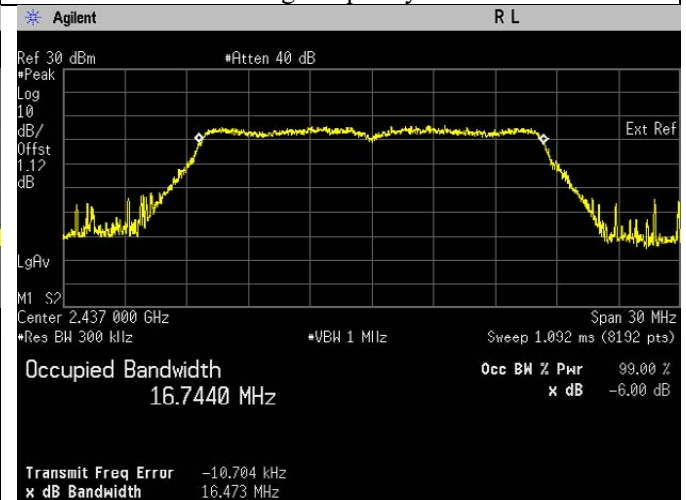
6dB Bandwidth. 802.11g Frequency 2412 MHz



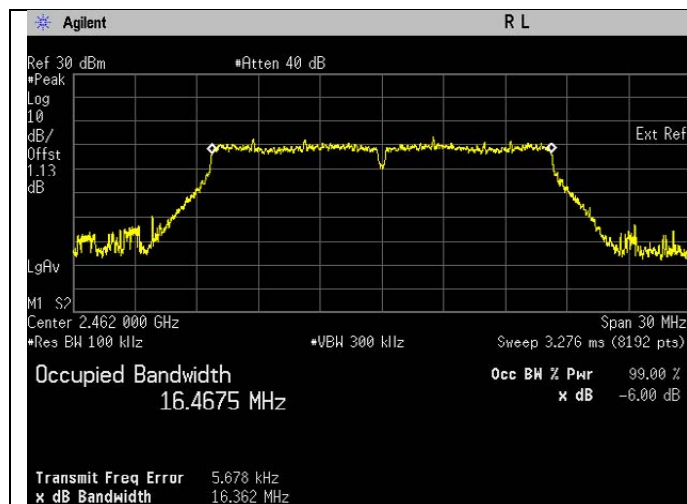
99% Bandwidth. 802.11g Frequency 2412 MHz



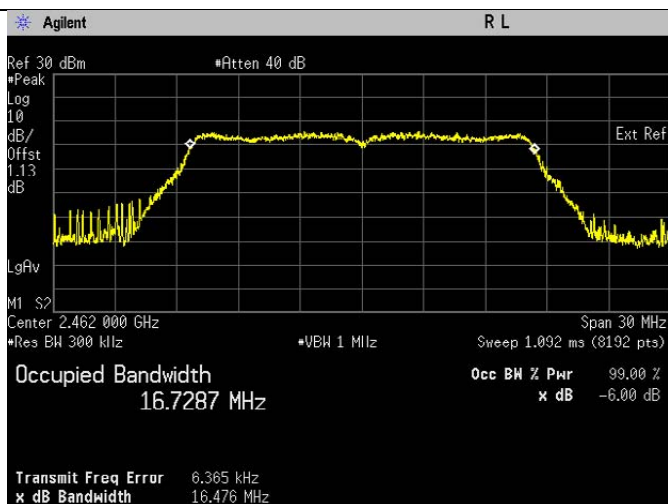
6dB Bandwidth. 802.11g Frequency 2437 MHz



99% Bandwidth. 802.11g Frequency 2437 MHz



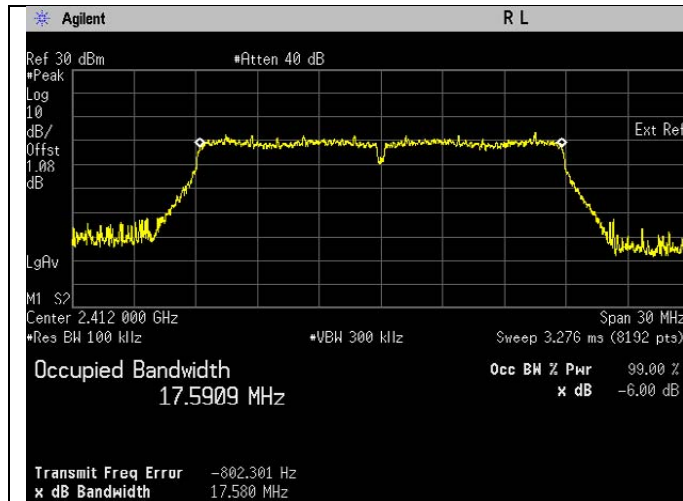
6dB Bandwidth. 802.11g Frequency 2462 MHz



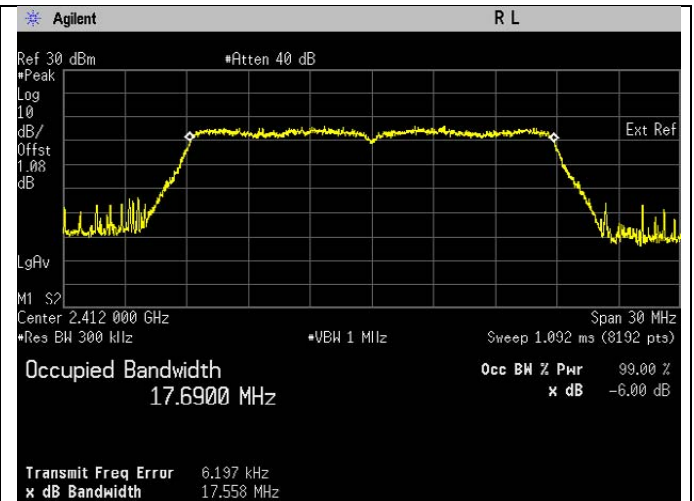
99% Bandwidth. 802.11g Frequency 2462 MHz

802.11n (HT20)

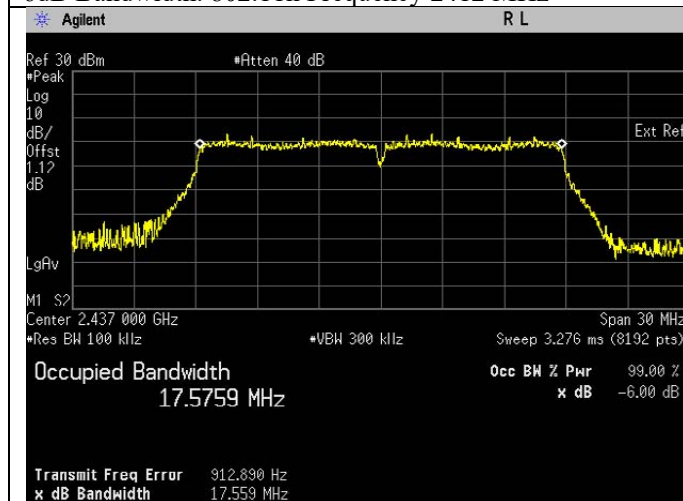
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11n	OFDM	BPSK	6.5	2412	17.580	17.690	Pass
802.11n	OFDM	BPSK	6.5	2437	17.559	17.710	Pass
802.11n	OFDM	BPSK	6.5	2462	17.576	17.707	Pass



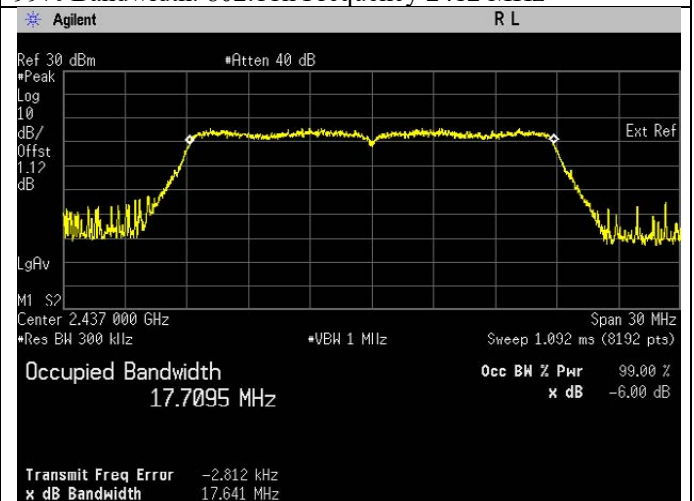
6dB Bandwidth. 802.11n Frequency 2412 MHz



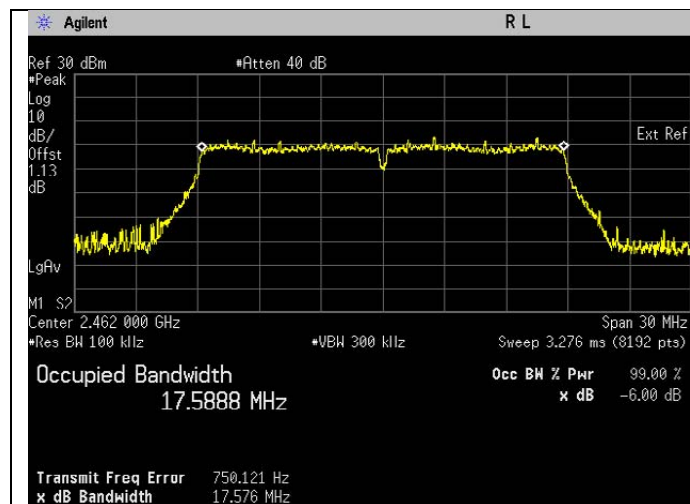
99% Bandwidth. 802.11n Frequency 2412 MHz



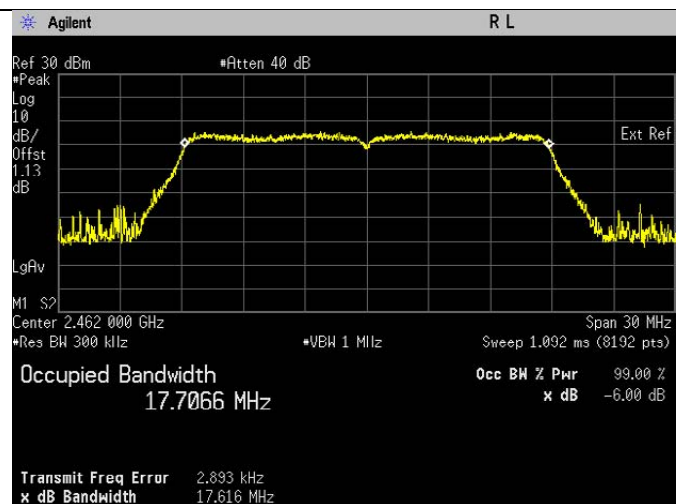
6dB Bandwidth. 802.11n Frequency 2437 MHz



99% Bandwidth. 802.11n Frequency 2437 MHz



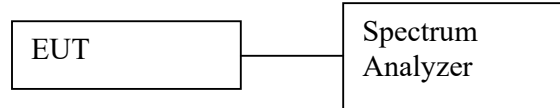
6dB Bandwidth. 802.11n Frequency 2462 MHz



99% Bandwidth. 802.11n Frequency 2462 MHz

6.2. Conducted RF Output Power

6.2.1. Test Setup



Average

- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Measure the duty cycle of transmitter output signal.
- d) Setting of Spectrum analyzer :
 - a. Set the RBW = 1% - 5% OBW.
 - b. Set the VBW $\geq [3 \times \text{RBW}]$.
 - c. Set the span $\geq [1.5 \times \text{OBW bandwidth}]$.
 - d. Detector = Power averaging (RMS).
 - e. Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$
 - f. Sweep time = auto
 - g. Trace average at least 100 traces in power averaging (rms) mode
 - h. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges.
 - i. Add $10 \log (1/x)$, where x is the duty cycle, to the measured power to compute the average power during the actual transmission times
- e) Measure every antenna port by repeat the step above for MIMO measurement.

6.2.2. Test Limits:

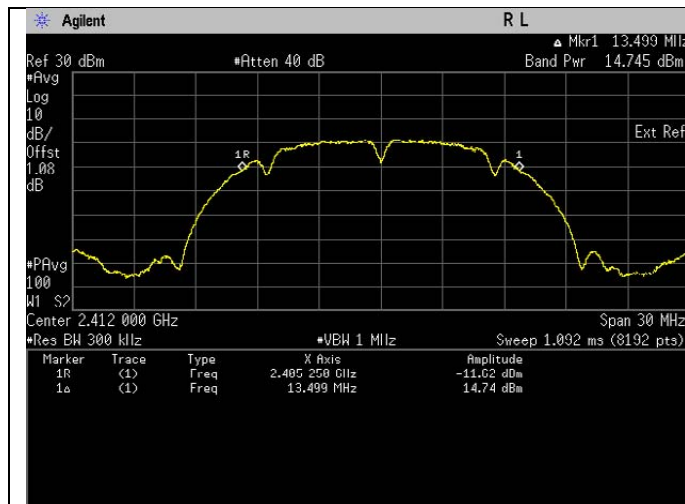
Normal Condition (25 ° C)
$\leq 1 \text{ Watt}(30 \text{ dBm})$

6.2.3. Test Data:

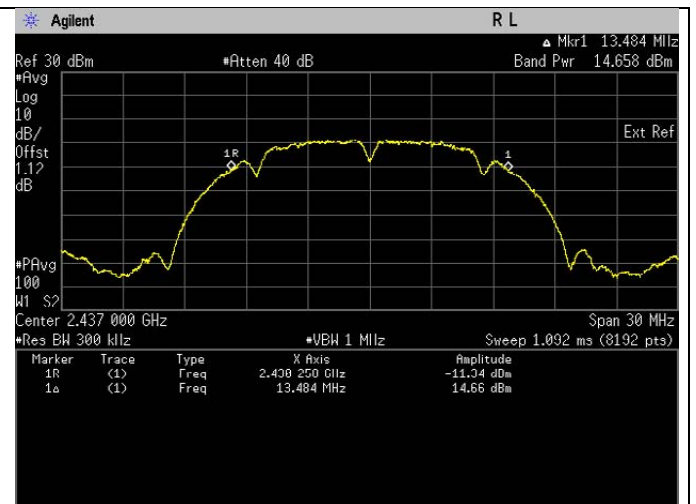
Output Power = Band Power + Duty Cycle Factor

802.11b

Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11b	DSSS	DBPSK	1	2412	14.796	Pass
802.11b	DSSS	DBPSK	1	2437	14.709	Pass
802.11b	DSSS	DBPSK	1	2462	14.525	Pass



Frequency 802.11b MHz



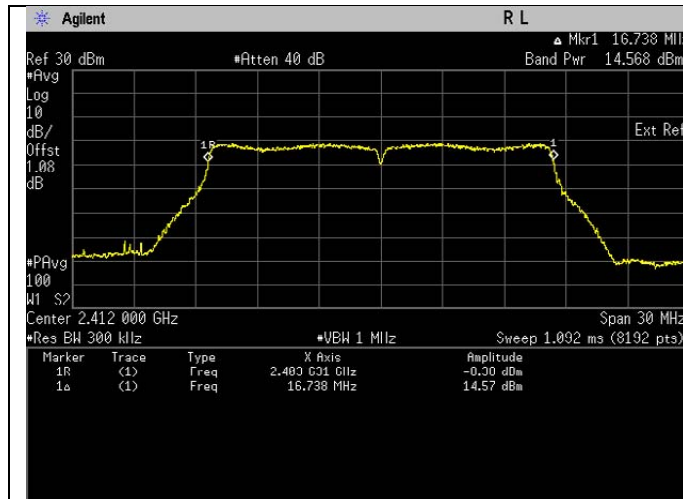
Frequency 802.11b MHz



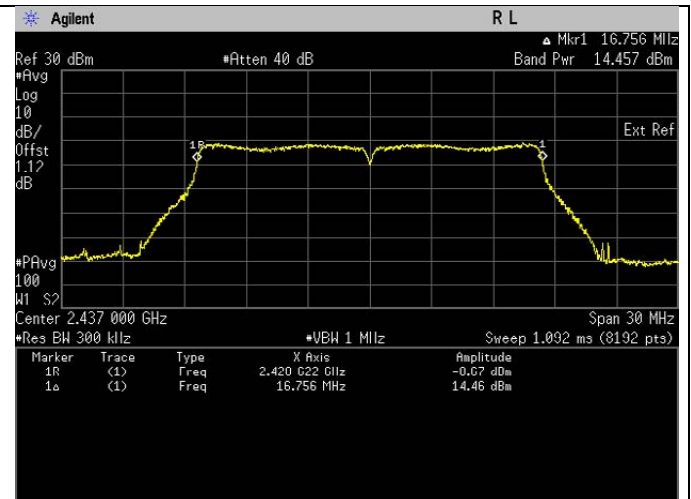
Frequency 802.11b MHz

802.11g

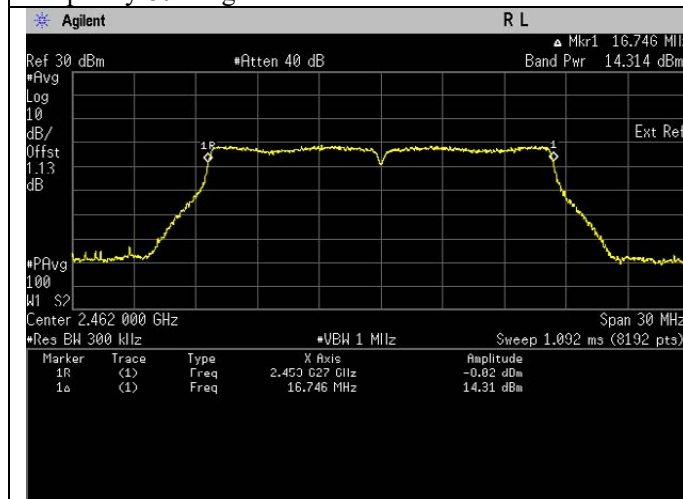
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11g	OFDM	BPSK	6	2412	14.704	Pass
802.11g	OFDM	BPSK	6	2437	14.593	Pass
802.11g	OFDM	BPSK	6	2462	14.450	Pass



Frequency 802.11g MHz



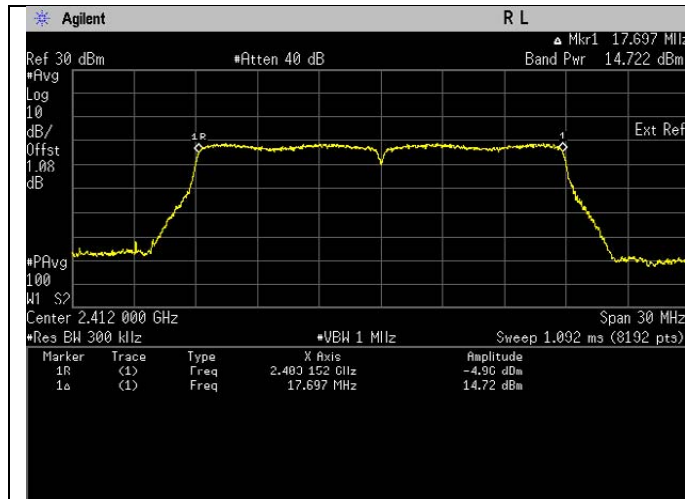
Frequency 802.11g MHz



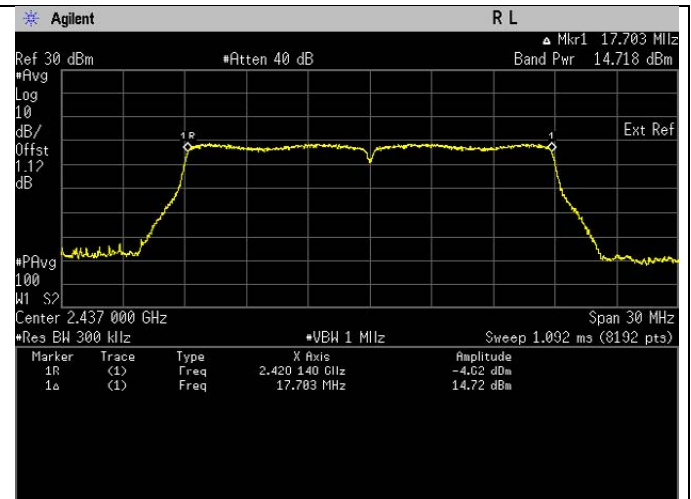
Frequency 802.11g MHz

802.11n (HT20)

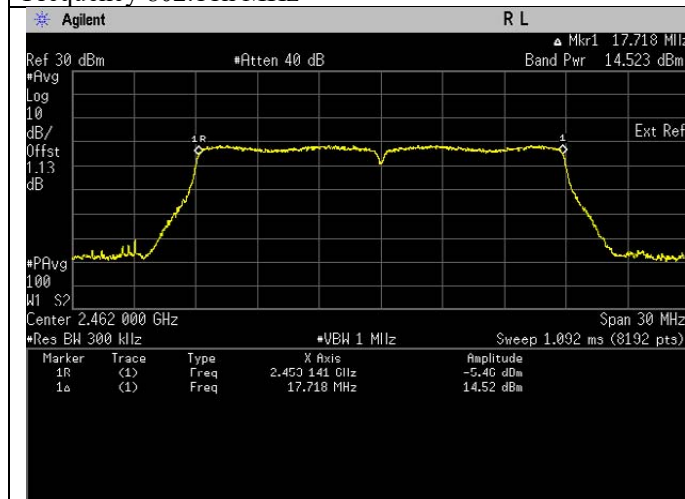
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11n	OFDM	BPSK	6.5	2412	14.808	Pass
802.11n	OFDM	BPSK	6.5	2437	14.804	Pass
802.11n	OFDM	BPSK	6.5	2462	14.609	Pass



Frequency 802.11n MHz



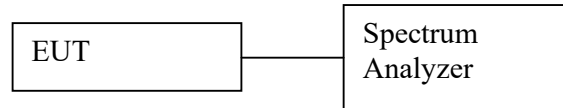
Frequency 802.11n MHz



Frequency 802.11n MHz

6.3.Duty Cycle of the test signal

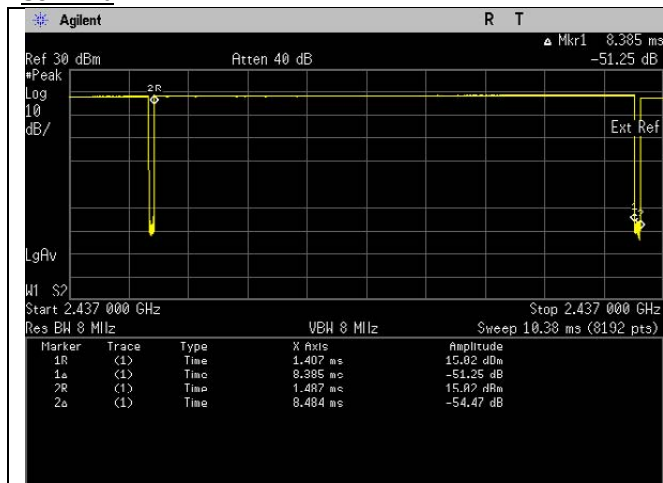
6.3.1. Test Setup



- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
 - a. Set the RBW = 10 MHz or the highest RBW available on spectrum analyzer.
 - b. Set the VBW $\geq$ RBW.
 - c. Set the span $\geq [1.5 \times \text{DTS bandwidth}]$.
 - d. Detector = Peak.
 - e. Sweep time = 10ms or others that allow to measure accurate duty cycle.
 - f. Trace mode = max hold.
 - g. Allow trace to fully stabilize.
- 5) Record the duty cycle as X and save the plot.
- 6) Measure every antenna port by repeat the step above for MIMO measurement.

6.3.2. Test Data

802.11b



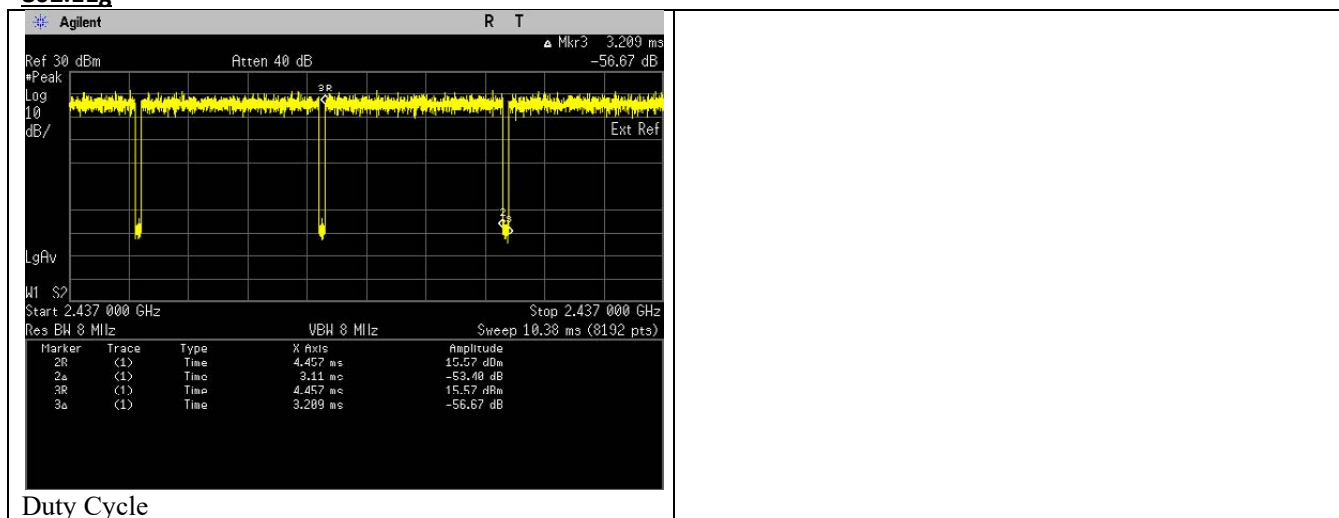
Duty Cycle

On time (ms)	8.385
On + Off Time (ms)	8.484
Duty cycle	0.9883
Duty Cycle factor	0.051

*Duty cycle = On time/ On +off time

*Duty Cycle factor = 10*log(1/Duty Cycle)

802.11g

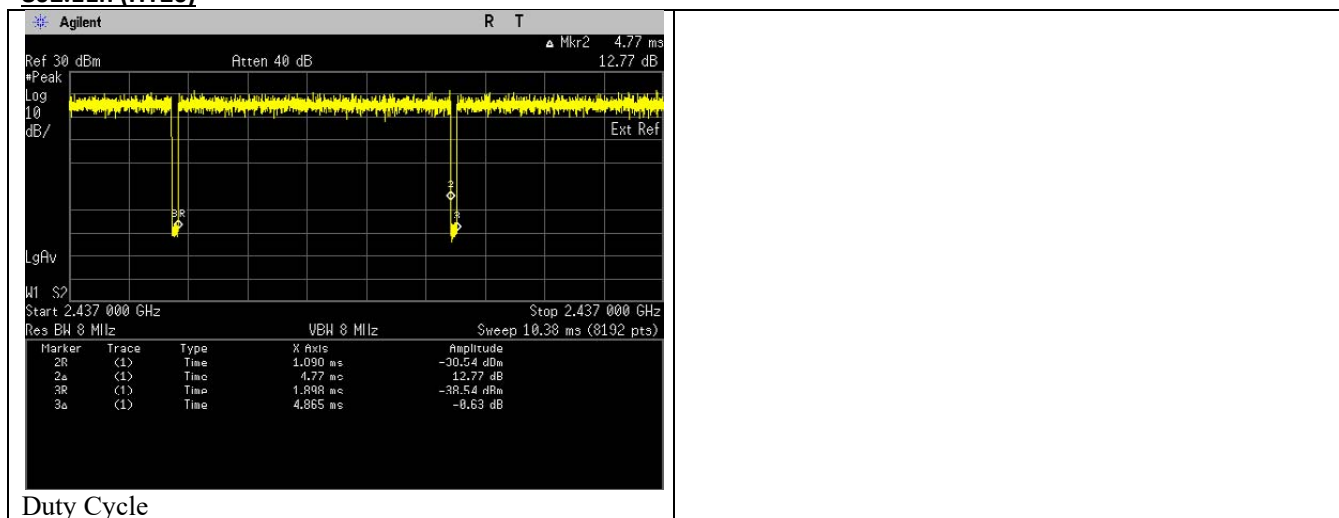


On time (ms)	3.11
On + Off Time (ms)	3.209
Duty cycle	0.9691
Duty Cycle factor	0.136

*Duty cycle = On time/ On +off time

*Duty Cycle factor = 10*log(1/Duty Cycle)

802.11n (HT20)



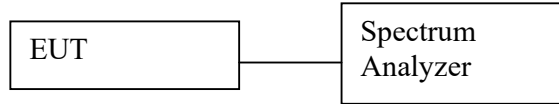
On time (ms)	4.77
On + Off Time (ms)	4.865
Duty cycle	0.9805
Duty Cycle factor	0.086

*Duty cycle = On time/ On +off time

*Duty Cycle factor = $10 \cdot \log(1/\text{Duty Cycle})$

6.4. Maximum Peak Power Spectral Density

6.4.1. Test Setup



Maximum Peak

- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. Set analyzer center frequency to DTS channel center frequency.
 - b. Set the span to 1.5 times the DTS bandwidth.
 - c. Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - d. Set the VBW to $\geq [3 \times \text{RBW}]$.
 - e. Detector = peak.
 - f. Sweep time = auto couple.
 - g. Trace mode = max hold.
 - h. Allow trace to fully stabilize.
 - i. Use the peak marker function to determine the maximum amplitude level within the RBW.
 - j. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
- e) Measure every antenna port by repeat the step above for MIMO measurement.

6.4.2. Test Limits

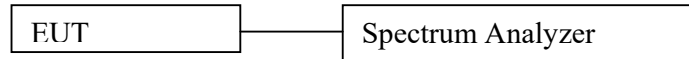
Normal Condition (25 ° C)
$\leq 8 \text{ dBm/3kHz}$

6.4.3. Test Result

Not Applicable

6.5. Conducted Spurious Emission

6.5.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max Hold
 - e. Sweep = auto
- e) Use the peak marker function to measure highest emission and scan up to 10th harmonic.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

6.5.2. Test Limits:

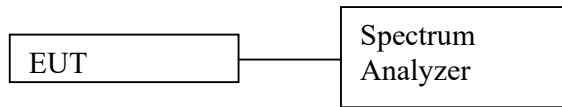
Normal Condition (25 ° C)
Shall be at least 30 dB below peak (max) power.

6.5.3. Test Result

Not Applicable

6.6. Band edge Conducted Spurious Emission

6.6.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max Hold
 - e. Sweep = auto
- e) Use the peak marker function to measure highest emission.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

6.6.2. Test Limits:

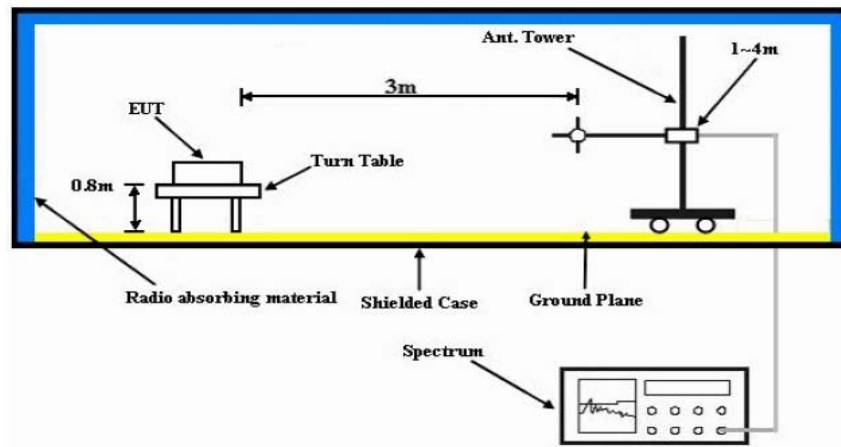
Normal Condition (25 ° C)
Shall be at least 30 dB below peak (max) power.

6.6.3. Test Result

Not Applicable

6.7. Radiated Emission within restricted Bands

6.7.1. Test Setup



- The EUT is placed on the top of a rotating table 0.8m above the ground (<1GHz) and 1.5m above the ground (>1GHz) at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
- The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

6.7.2. Test Limits:

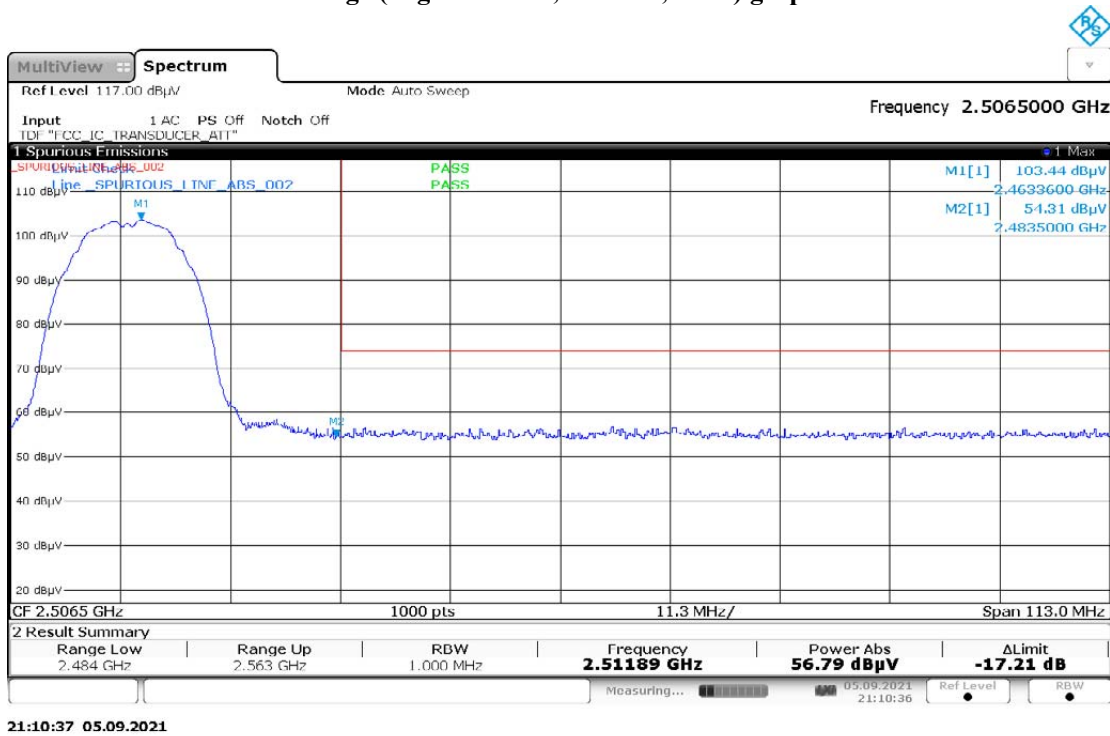
Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

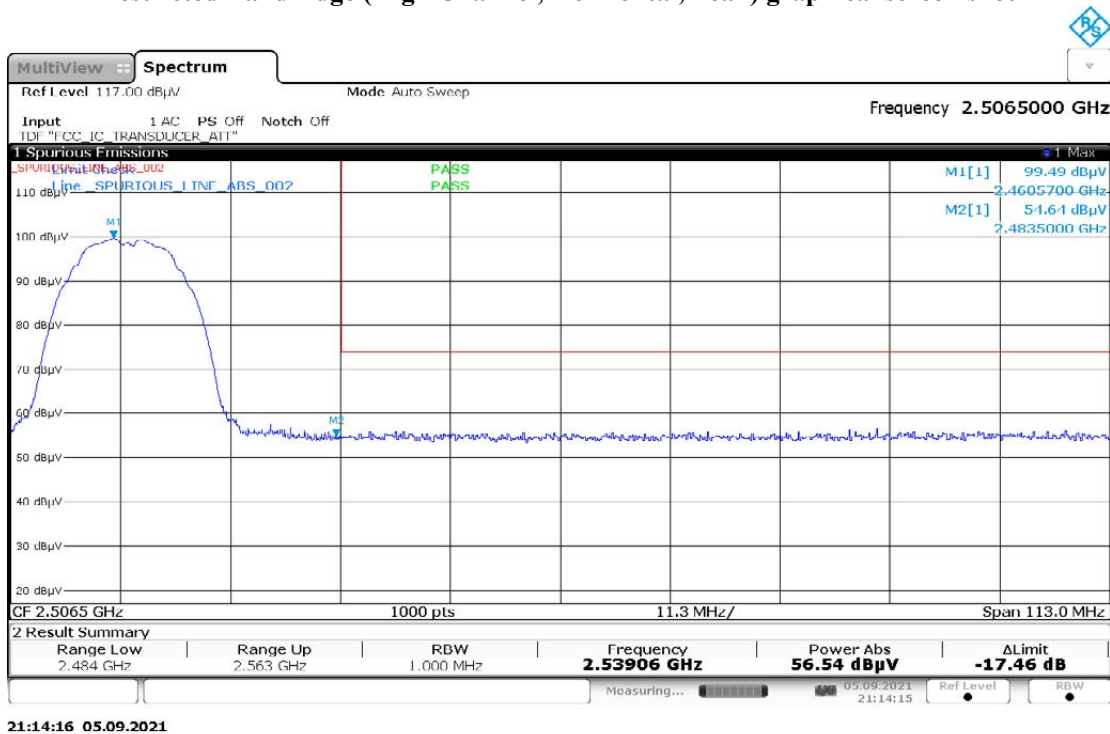
NOTE:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

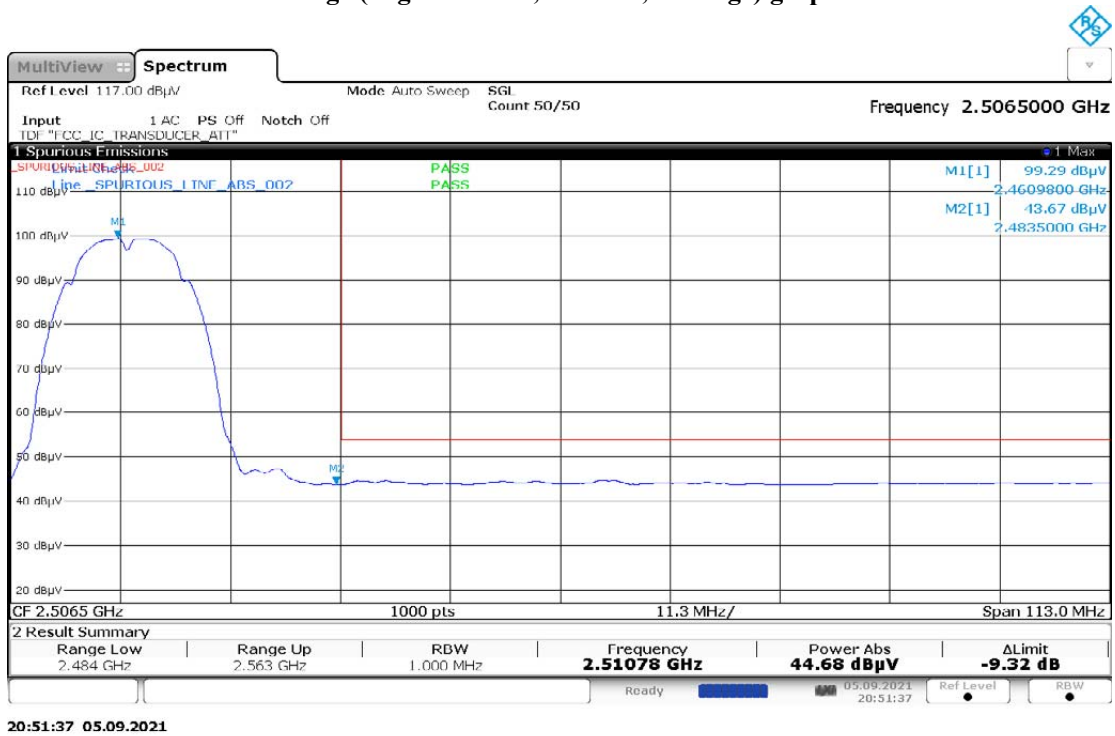
Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



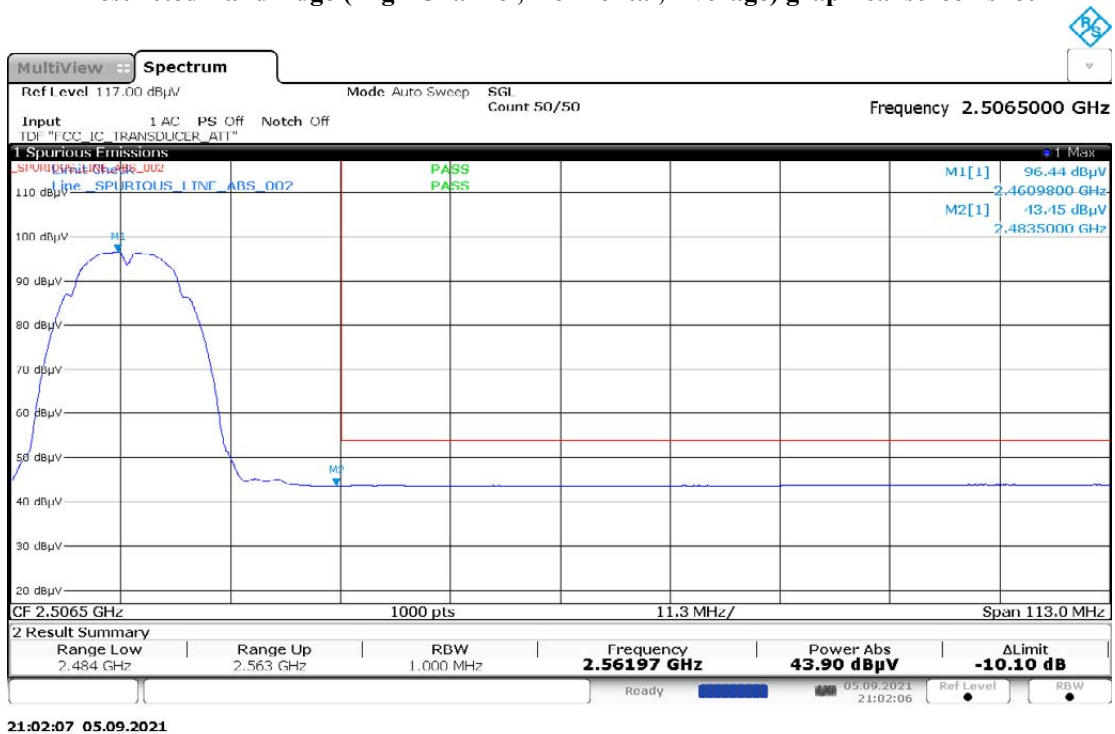
Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



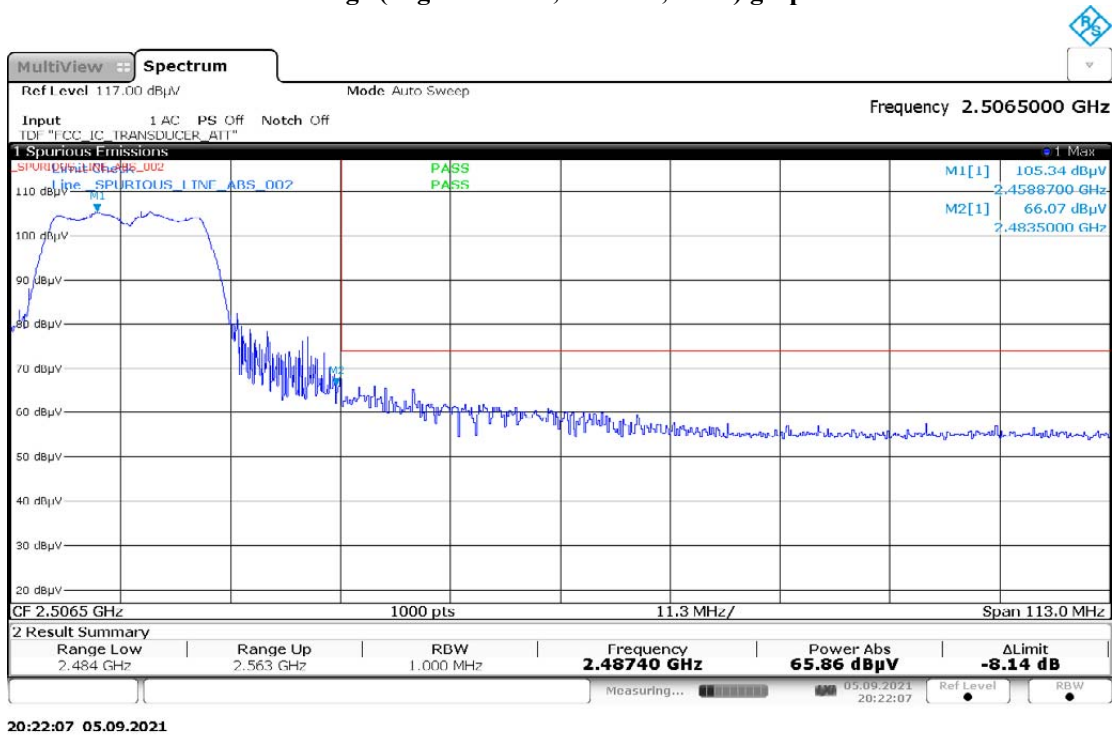
Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot



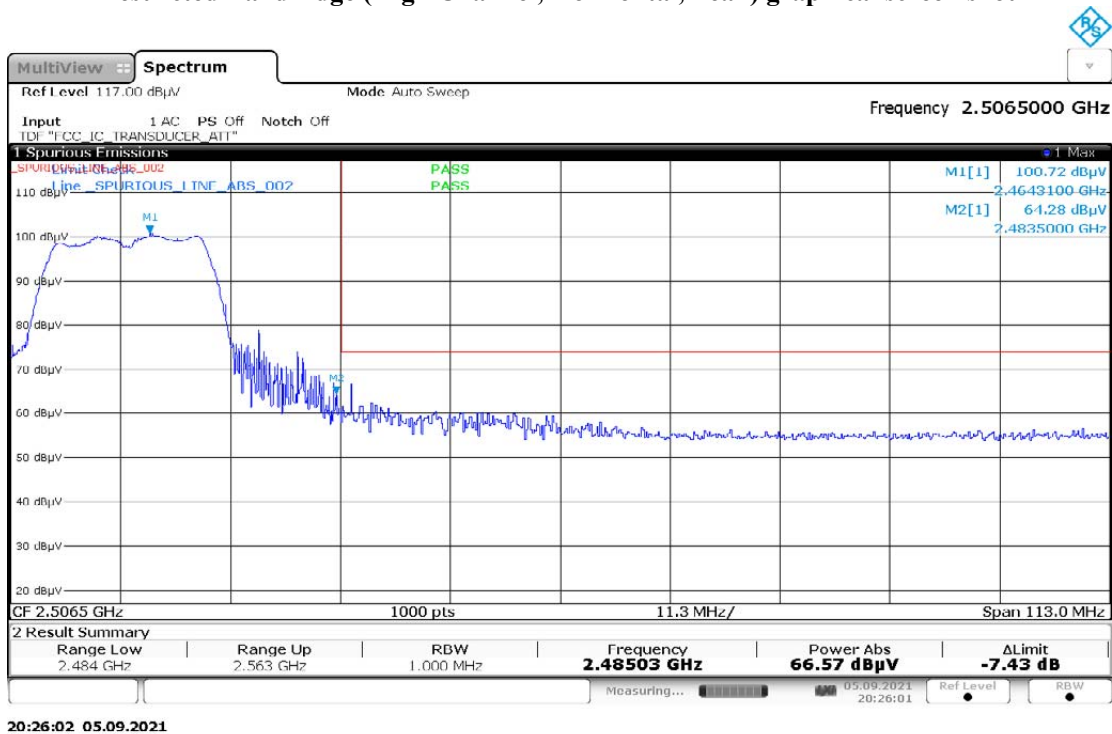
Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot



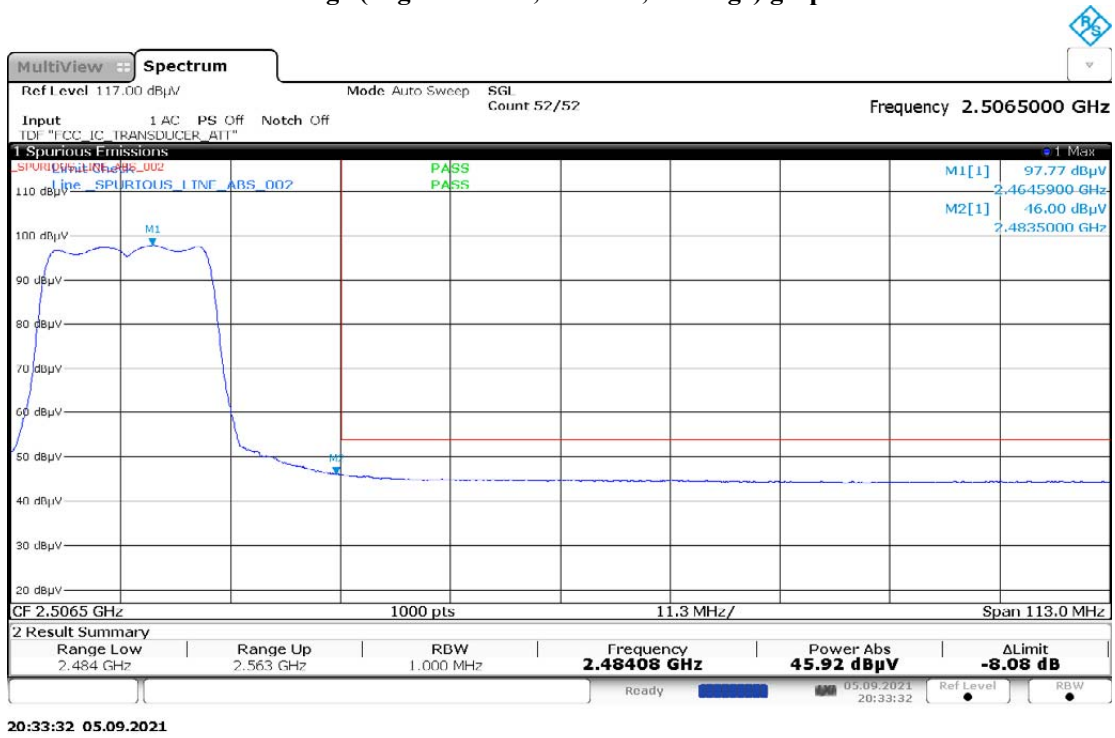
Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



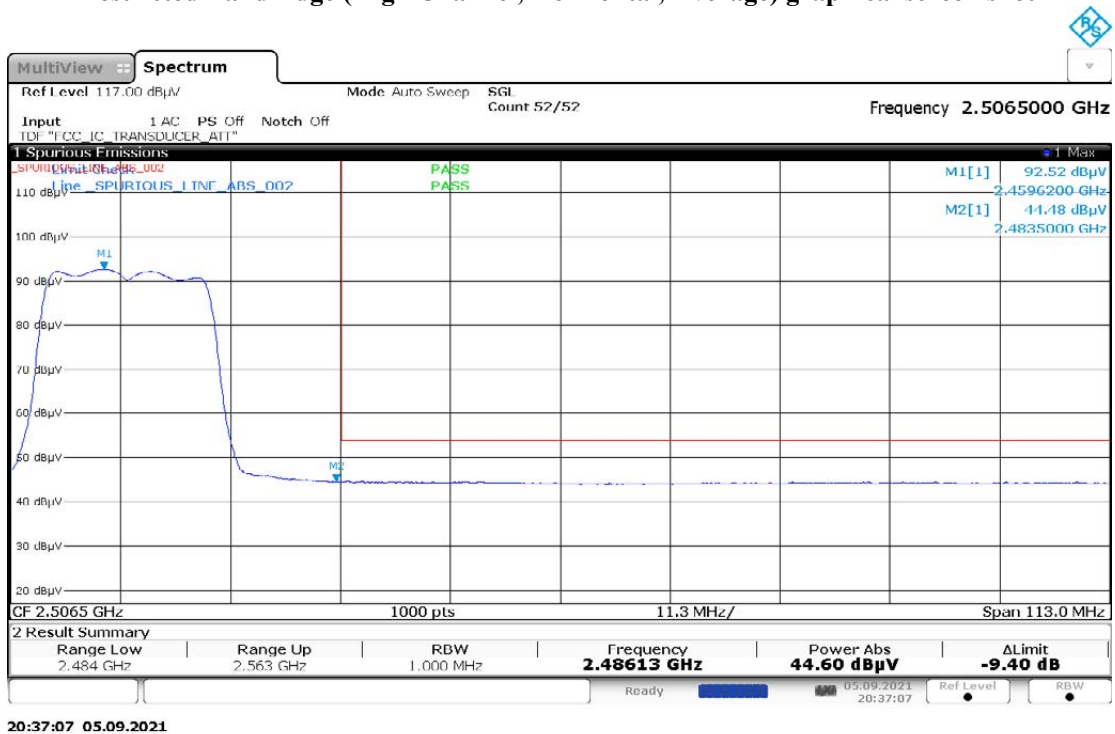
Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



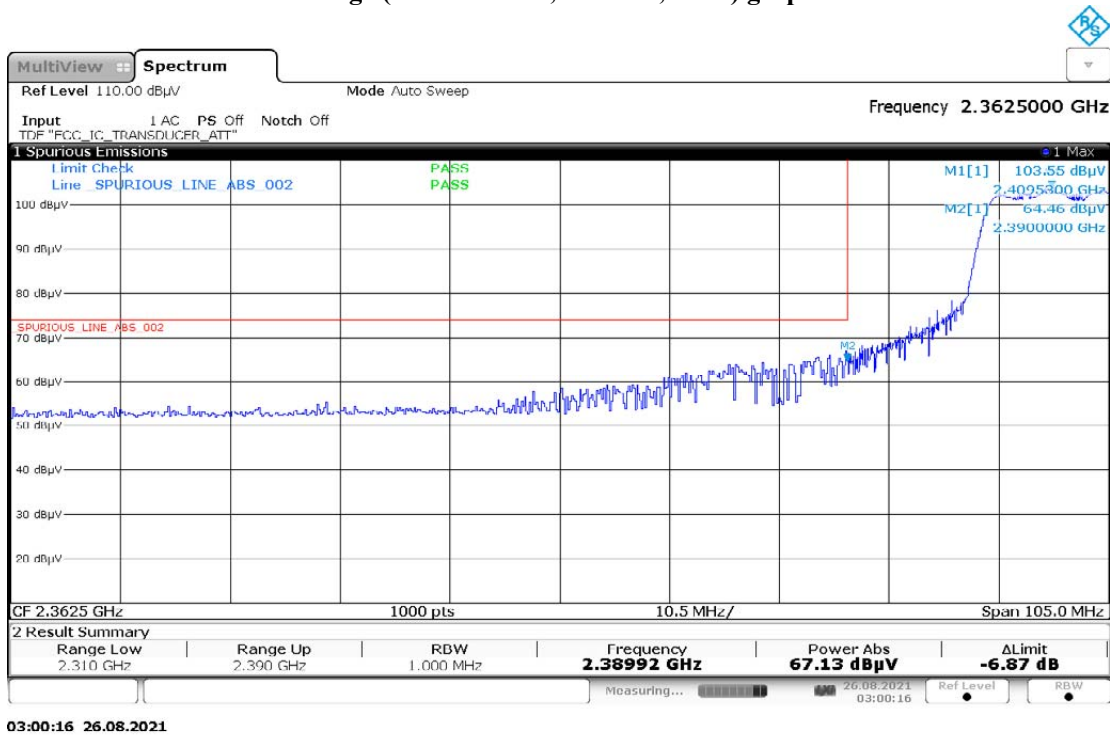
Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot



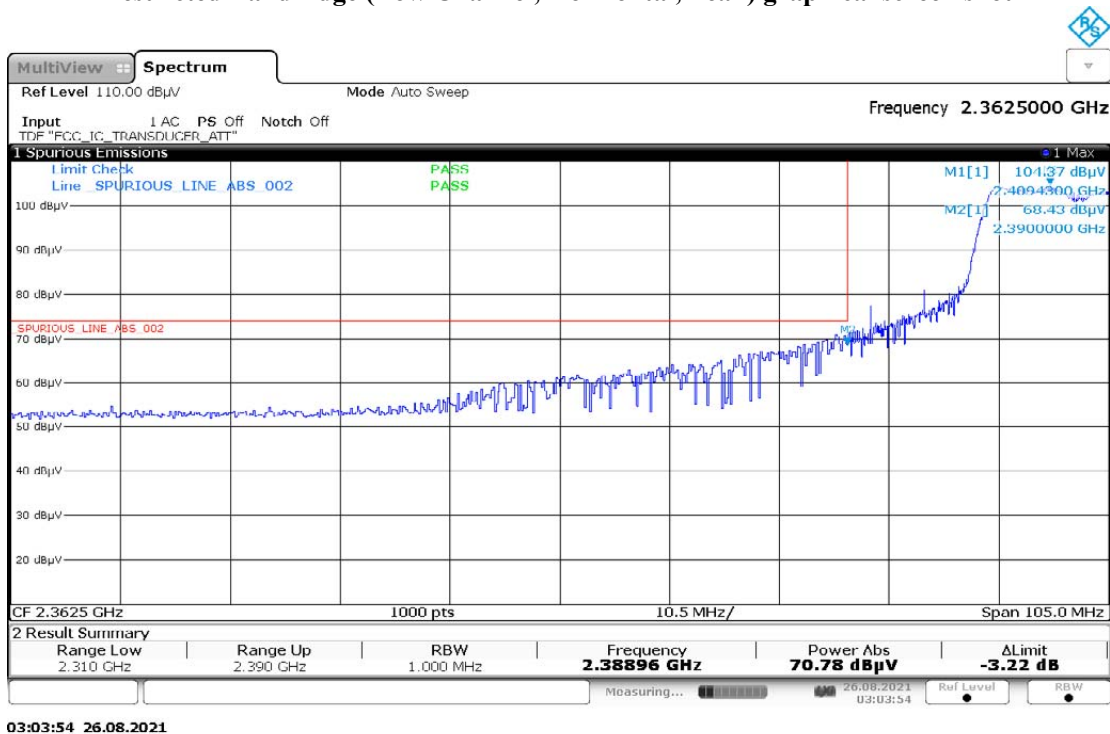
Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot



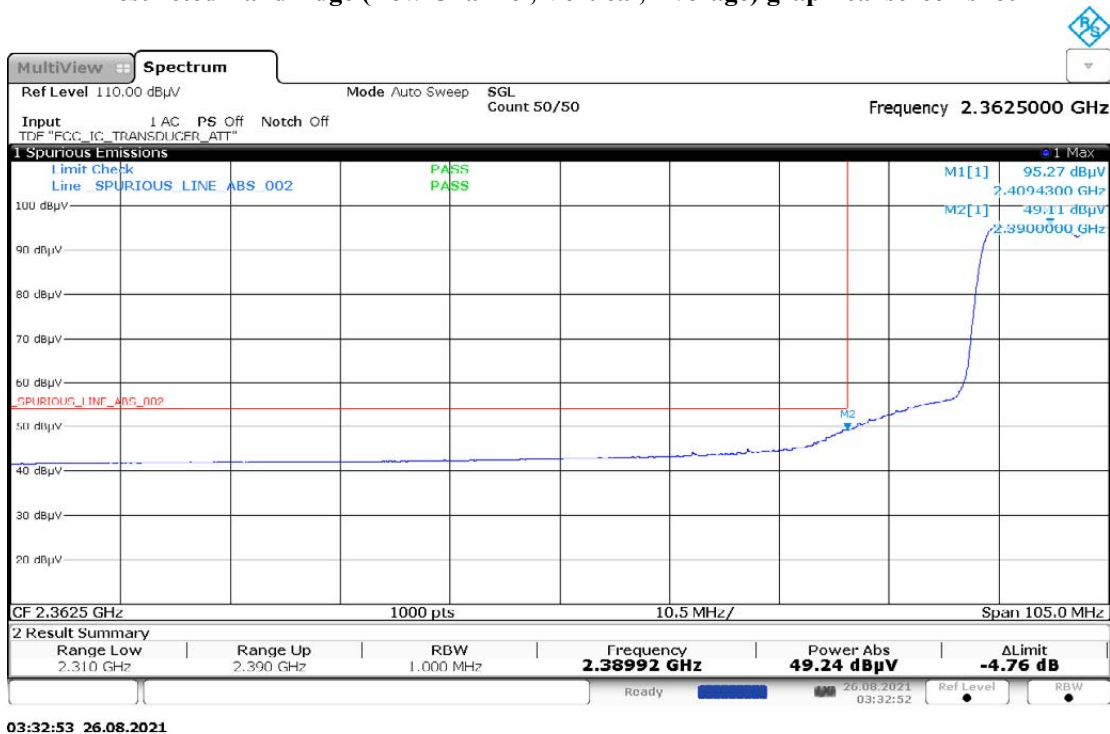
Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



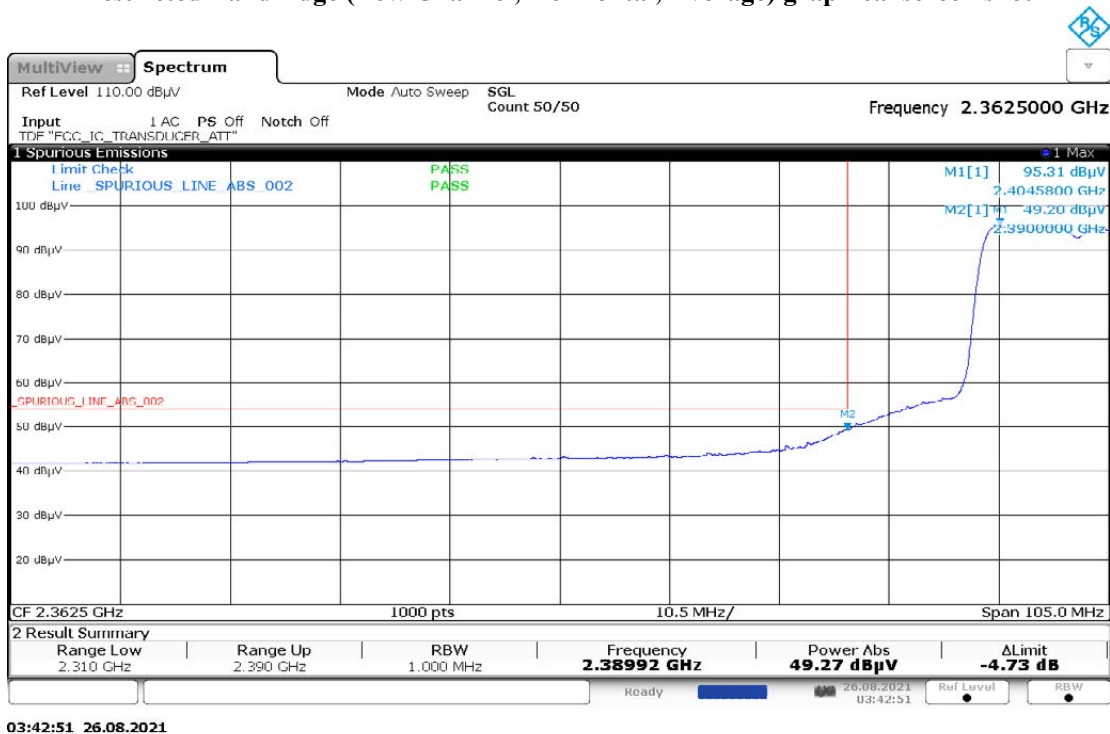
Restricted Band Edge (Low Channel, Horizontal, Peak) graphical screen shot



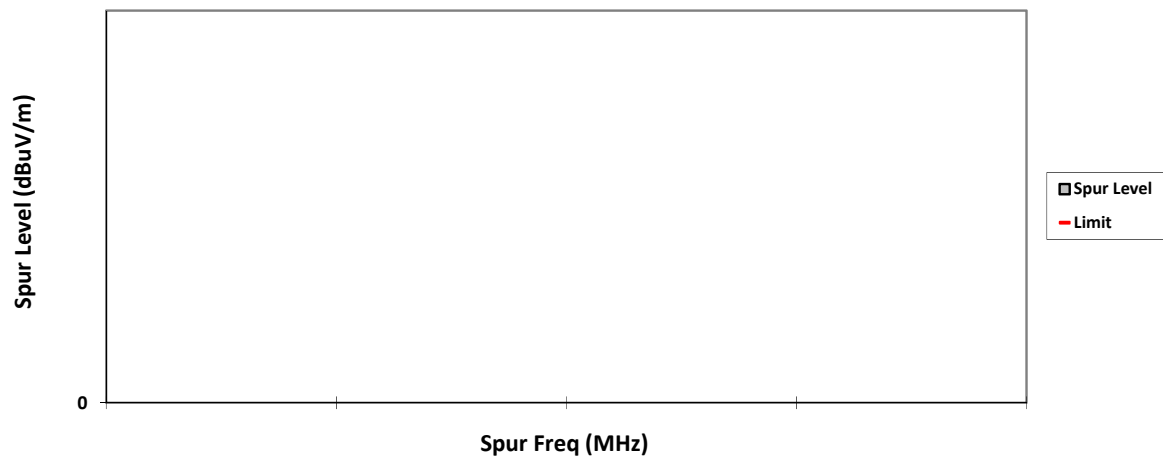
Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot



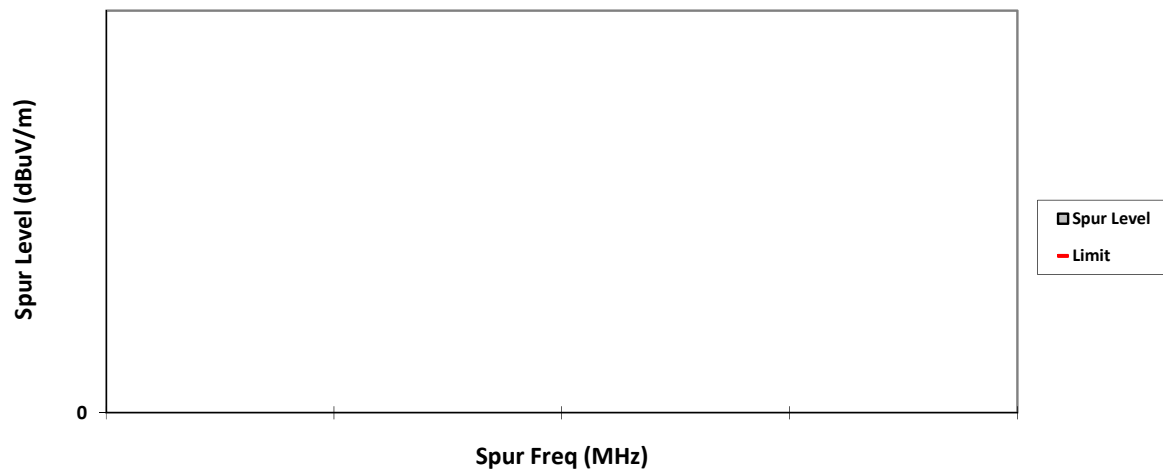
Restricted Band Edge (Low Channel, Horizontal, Average) graphical screen shot



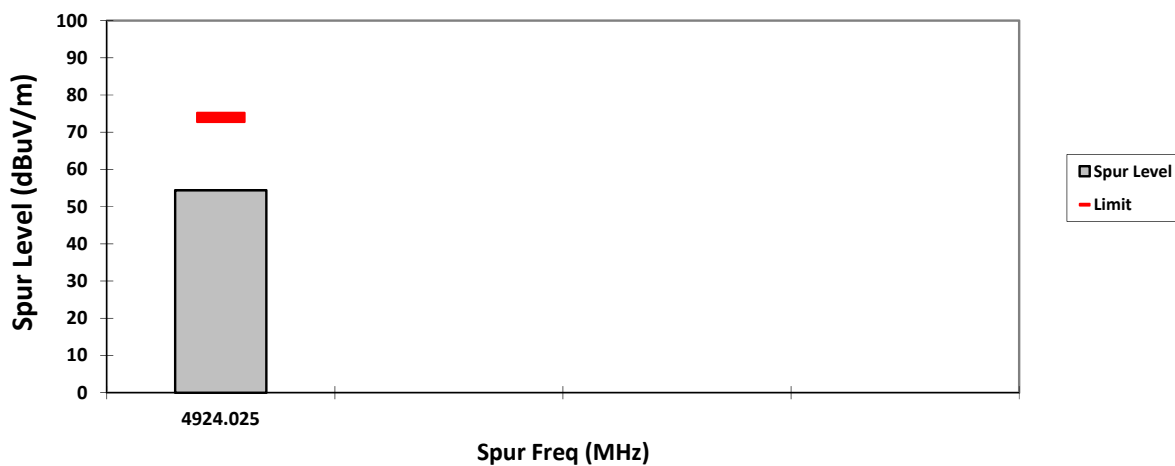
VERTICAL, QPK



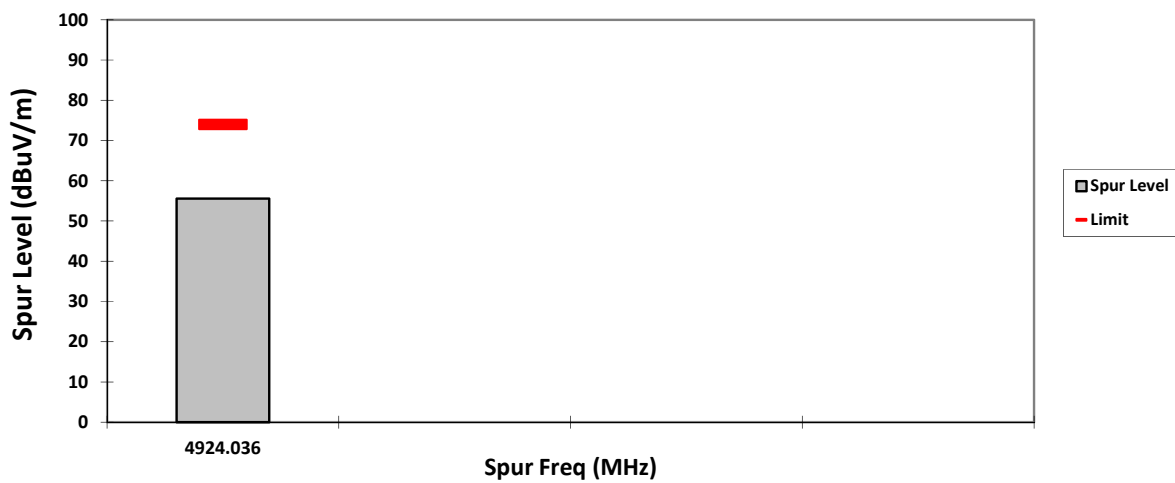
HORIZONTAL, QPK



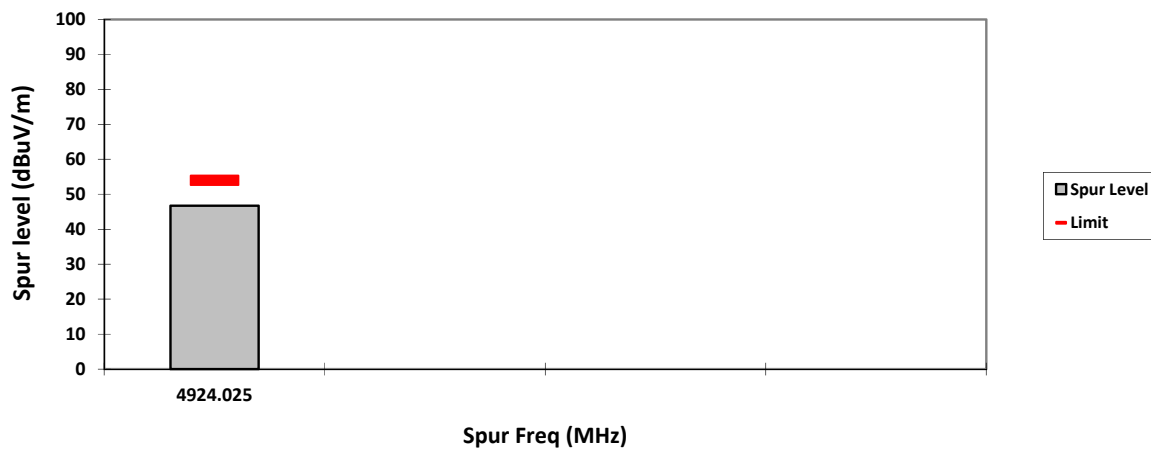
VERTICAL, PK



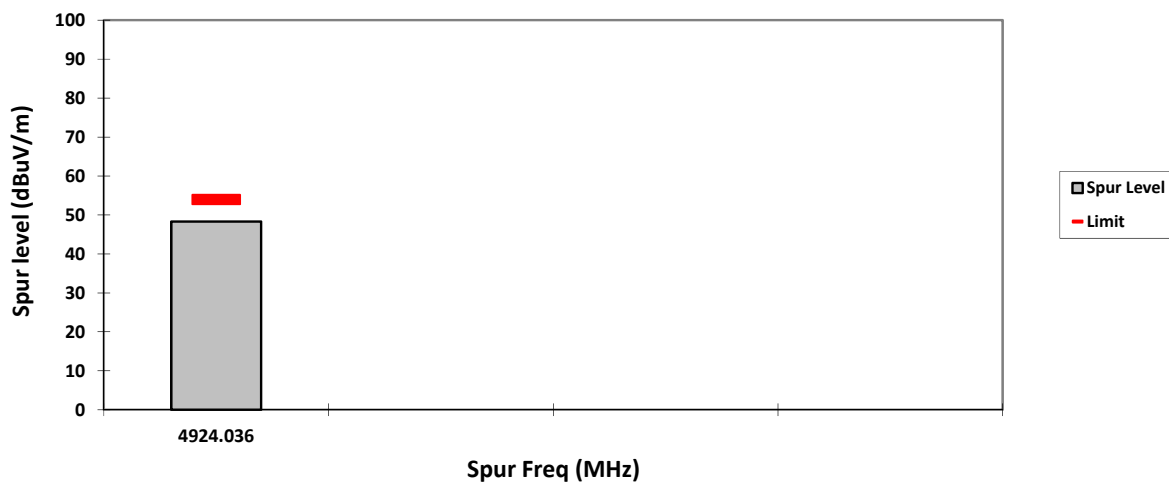
HORIZONTAL, PK



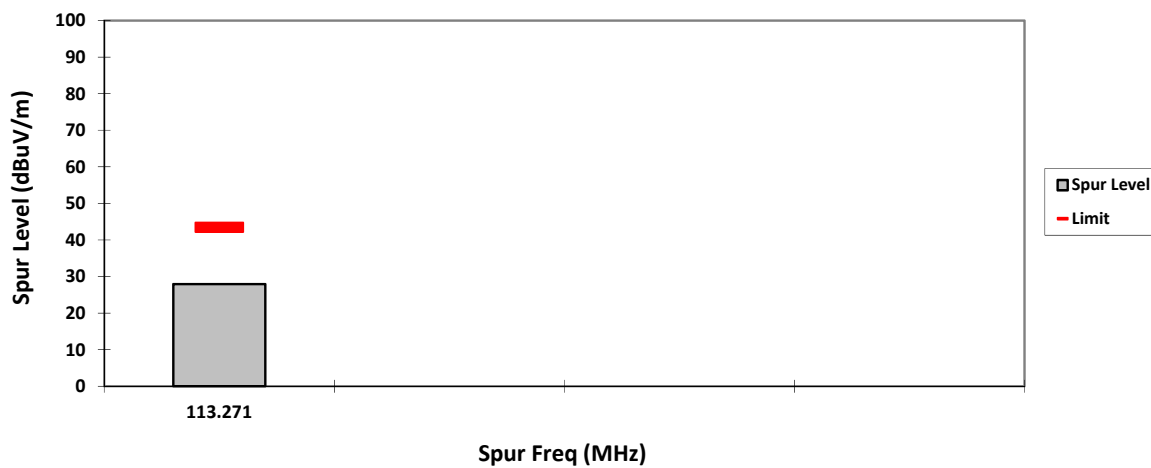
VERTICAL, AV



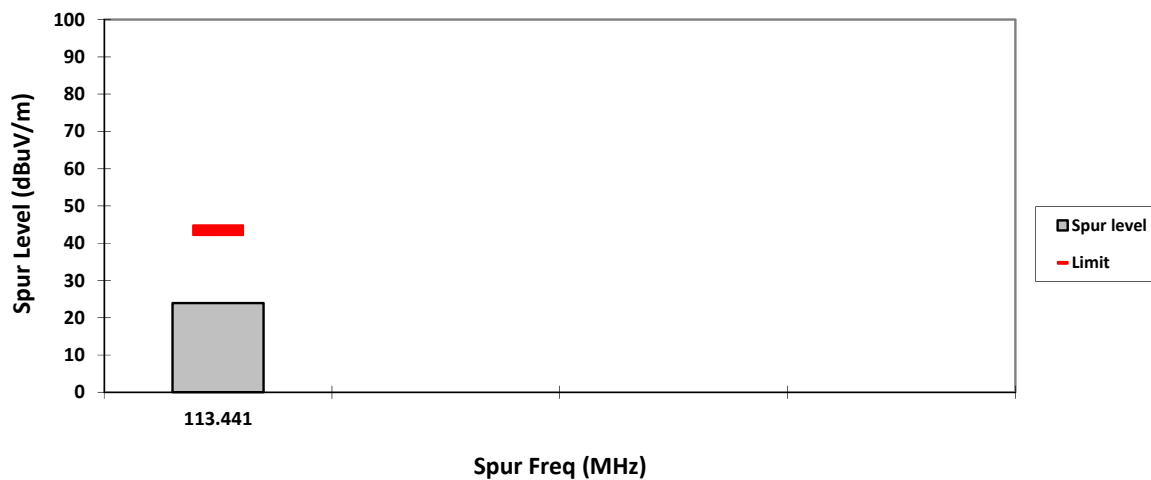
HORIZONTAL, AV



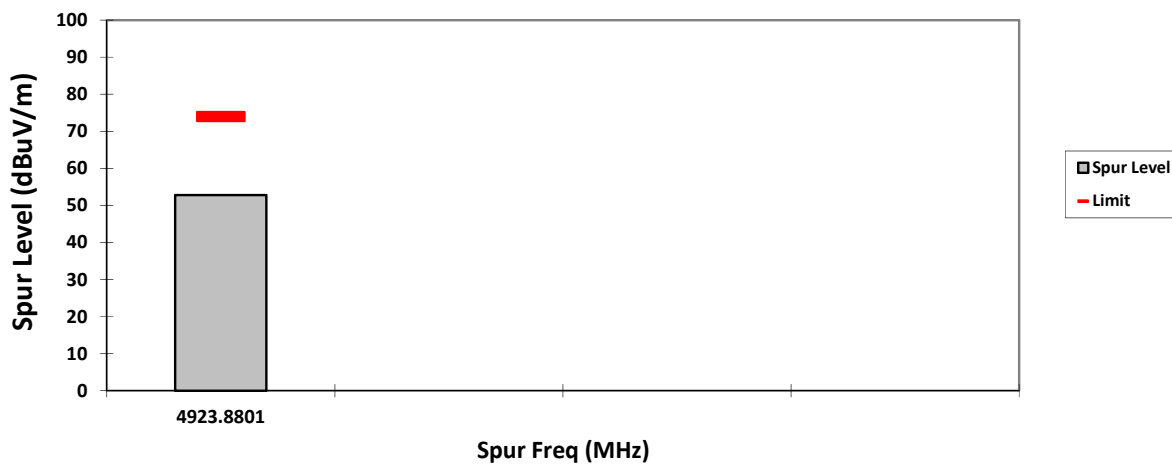
VERTICAL, QPK



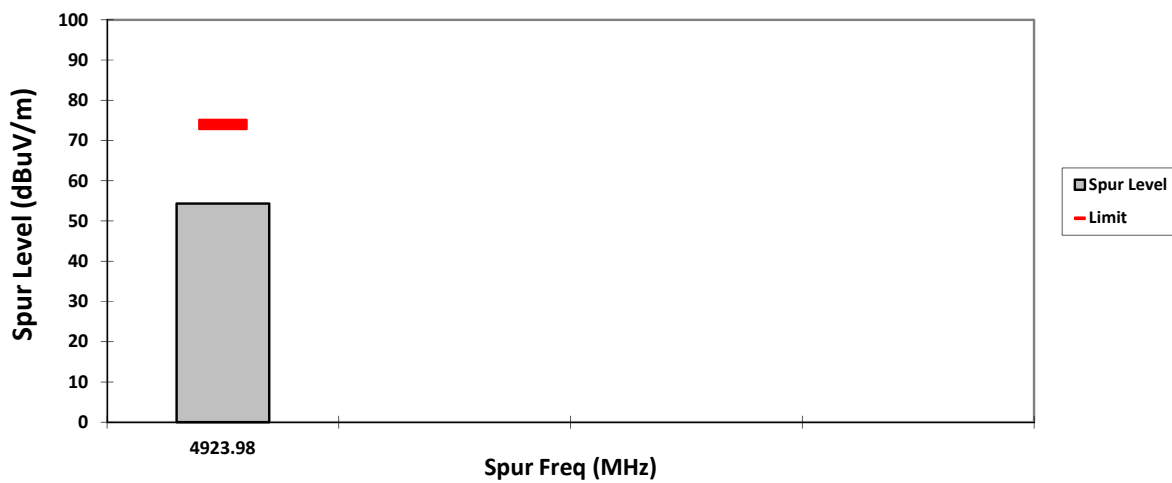
HORIZONTAL, QPK



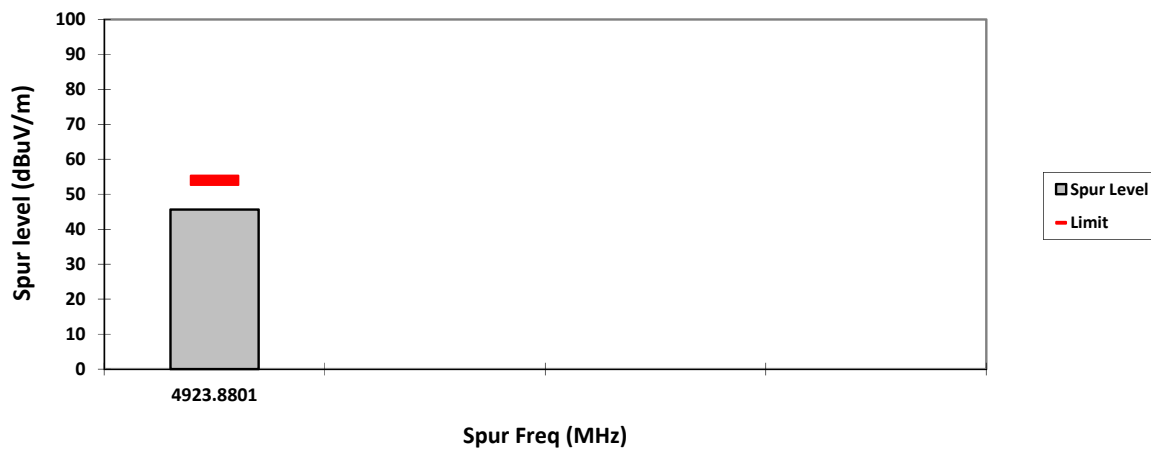
VERTICAL, PK



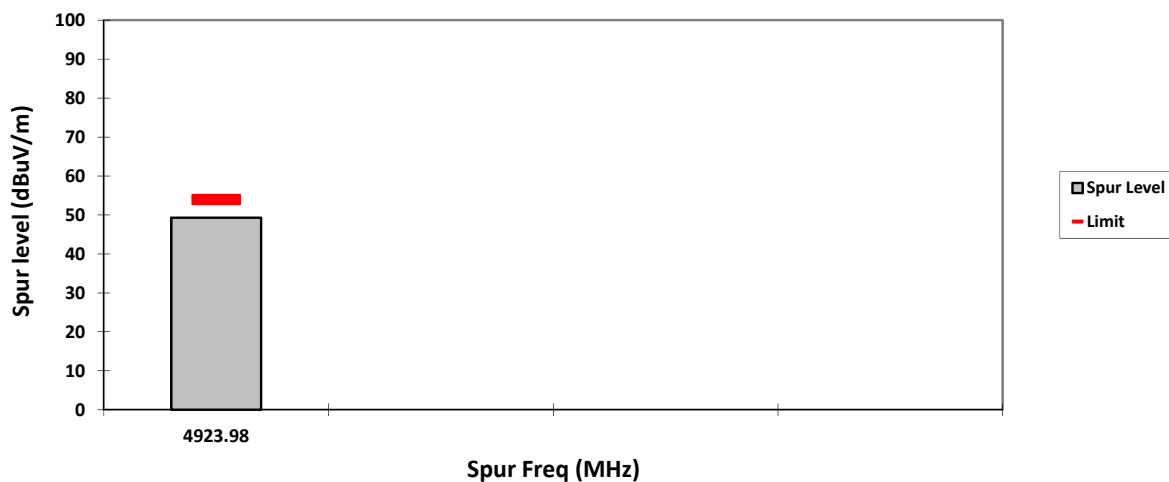
HORIZONTAL, PK



VERTICAL, AV

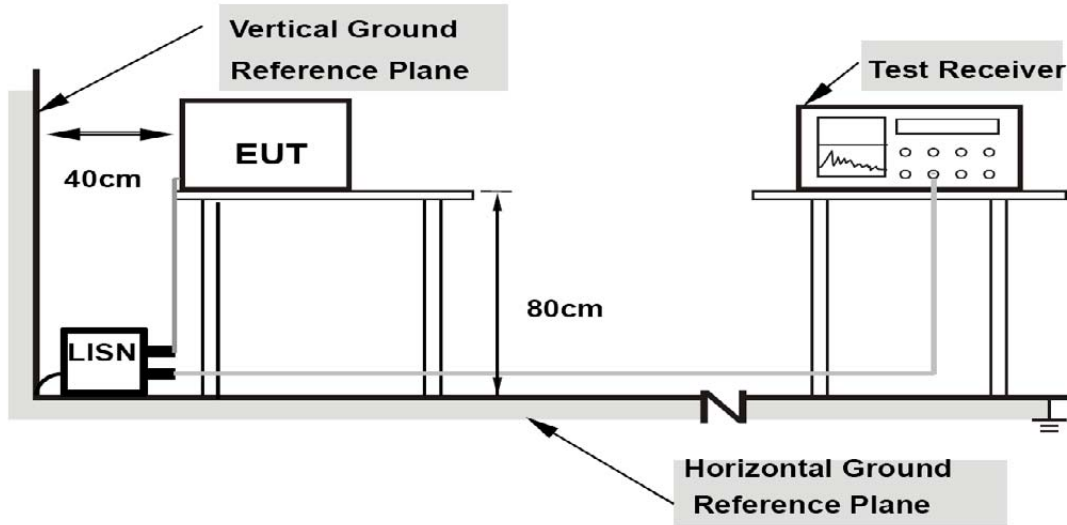


HORIZONTAL, AV



6.8. AC Powerline Conducted Emission

6.8.1. Test Setup



- 1) Tests were conducted for both Receive and Transmit Mode of the EUT.
- 2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- 3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 4) The frequency range from 150 kHz to 30MHz was measured.

6.8.2. Test Limits:

For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.

Limits for conducted disturbance at the mains ports
of class A ITE

Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	79	66
0,50 to 30	73	60
NOTE The lower limit shall apply at the transition frequency.		

Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.

**Limits for conducted disturbance at the mains ports
of class B ITE**

Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies.		
NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

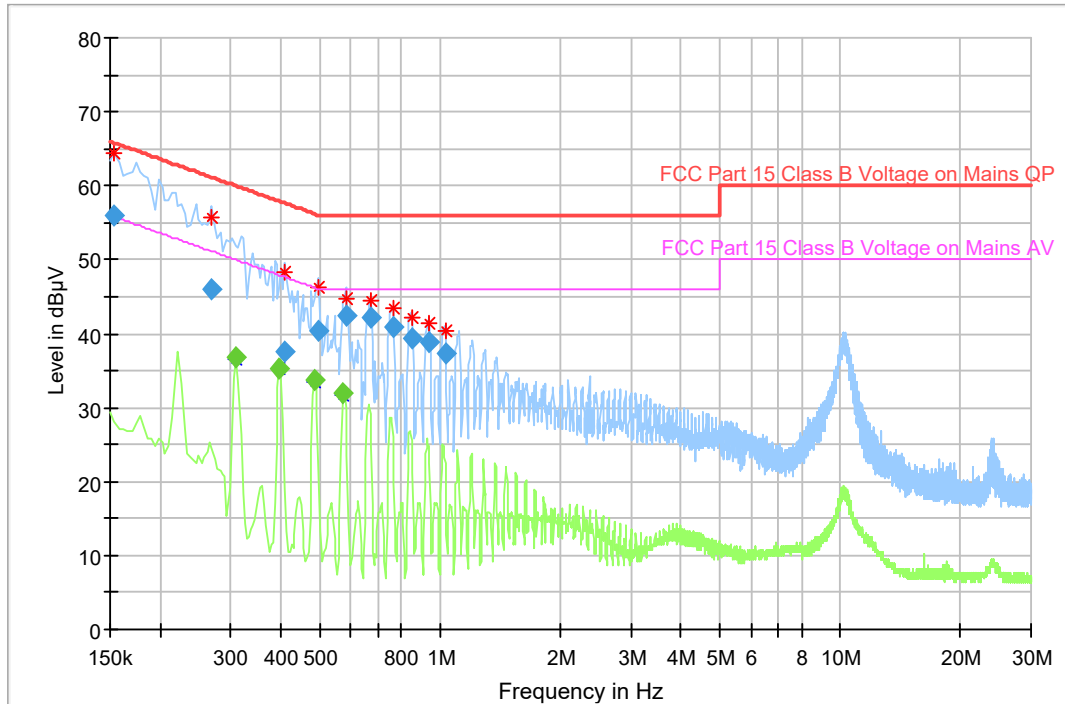
Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE

6.8.3. Test Result

120VAC , 60Hz

1) Charger + Radio in Wifi 2.4G Tx (CH:2462MHz, BW:20MHz, MOD:802.11b)

Full Spectrum



Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.154000	55.89	---	65.78	9.89	1000.0	9.000	N	ON	10.2	PASS
0.270000	45.89	---	61.12	15.22	1000.0	9.000	N	ON	10.2	PASS
0.310000	---	36.73	49.97	13.24	1000.0	9.000	L1	ON	10.1	PASS
0.398000	---	35.34	47.90	12.56	1000.0	9.000	L1	ON	10.1	PASS
0.410000	37.68	---	57.65	19.96	1000.0	9.000	N	ON	10.1	PASS
0.486000	---	33.65	46.24	12.59	1000.0	9.000	L1	ON	10.1	PASS
0.498000	40.33	---	56.03	15.70	1000.0	9.000	L1	ON	10.1	PASS
0.574000	---	31.93	46.00	14.07	1000.0	9.000	L1	ON	10.1	PASS
0.582000	42.49	---	56.00	13.51	1000.0	9.000	L1	ON	10.1	PASS
0.674000	42.19	---	56.00	13.81	1000.0	9.000	L1	ON	10.1	PASS
0.762000	40.85	---	56.00	15.15	1000.0	9.000	L1	ON	10.1	PASS
0.850000	39.45	---	56.00	16.55	1000.0	9.000	L1	ON	10.1	PASS
0.942000	38.85	---	56.00	17.15	1000.0	9.000	L1	ON	10.1	PASS
1.030000	37.25	---	56.00	18.75	1000.0	9.000	L1	ON	10.1	PASS

* Expanded Uncertainty (U) = +/- 3.48dB

END OF TEST REPORT