

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

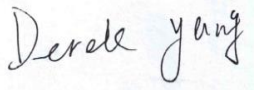
INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Applicant: Sony Mobile Communications INC.**EUT Description:** Mobile Phone**FCC ID:** PY7-50241M**Report Number:** ZR/2018/9002702**FCC Rule Part:** §15.247, Cat: DTS**Issue Date:** 2018/11/28**Date of Test:** 2018/10/19 to 2018/11/14**Date of EUT Received:** 2018/10/18**We hereby certify that:**

The above equipment was tested by SGS Shenzhen Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Authorized for issue by:		
Tested By		2018/11/28
	(Mike Hu) /Project Engineer	Date
Checked By		2018/11/28
	(David Chen) /Reviewer	Date
Approved By		2018/11/28
	(Derek Yang) Wireless Laboratory Manager	Date

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No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057

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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
--	Rev.00	Initial creation of document	All	2018/11/28	--

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1 GENERAL INFORMATION

1.1 Product description

General:

EUT Description:	Mobile Phone
Trade Mark:	Sony
IEEE 802.11 WLAN Mode Supported	☒ 802.11B (20 MHz channel bandwidth), ☒ 802.11G (20 MHz channel bandwidth) ☒ 802.11N (20 MHz channel bandwidth), ☒ 802.11N (40 MHz channel bandwidth)
Operation Frequency:	2402 MHz -2483.5MHz $f_c = 2407 \text{ MHz} + N * 5 \text{ MHz}$, where: - f_c = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 1 to 11 for the 20 MHz channel band width, or 3 to 9 for the 40 MHz channel bandwidth.
Type of Modulation:	IEEE for 802.11B: DSSS IEEE for 802.11G : OFDM IEEE for 802.11N(HT20) : OFDM IEEE for 802.11N(HT40) : OFDM
Transition Rate:	802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps 802.11 n_40MHz: 13.5 - 150.0Mbps
Power Supply:	Lithium-ion battery:3.85V or charge by USB
Sample Type:	☒ Portable Device, ☐ Module
Antenna Type:	☐ External, ☒ Integrated
Antenna Ports	☒ Ant 1, ☐ Ant 2, ☐ Ant 3
Smart System	☒ SISO (for 802.11B/G/N), ☐ MIMO (for 802.11N): Tx & Rx, ☐ Diversity (for 802.11B/G) : Tx & Rx
Antenna Gain:	-2.79dBi

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance v05

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

1.4 Special Accessories

AC Charger, USB cable and Earphone are used while the test is conducted and there is no other accessory attached. This is the worst case condition.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

1.6 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Configuration of Tested System

Fig. 2-1 Conducted Emission Configuration

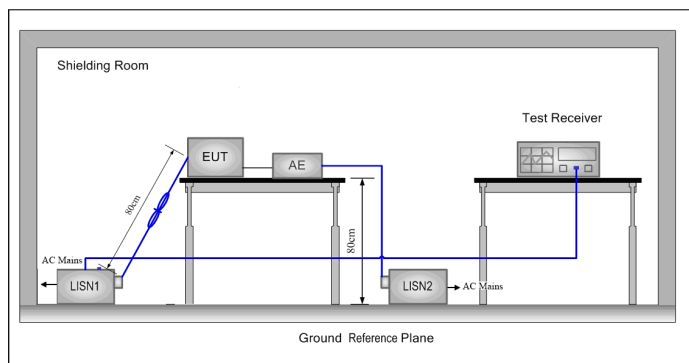


Fig. 2-2 Conducted test Configuration (RF)

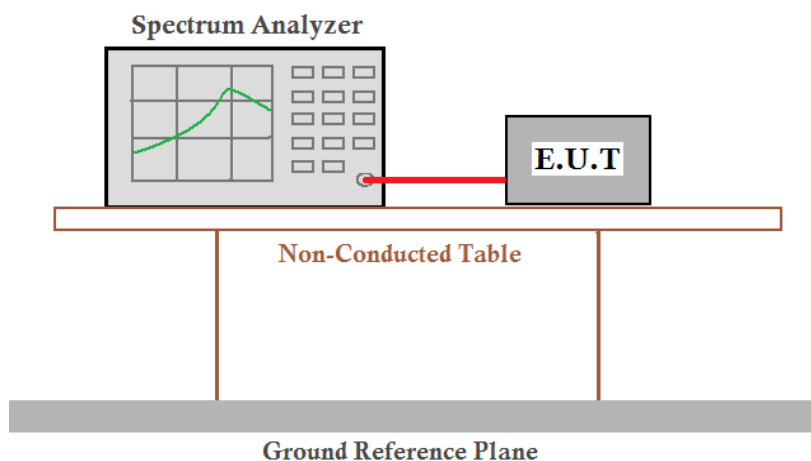


Fig. 2-3 Conducted power Configuration

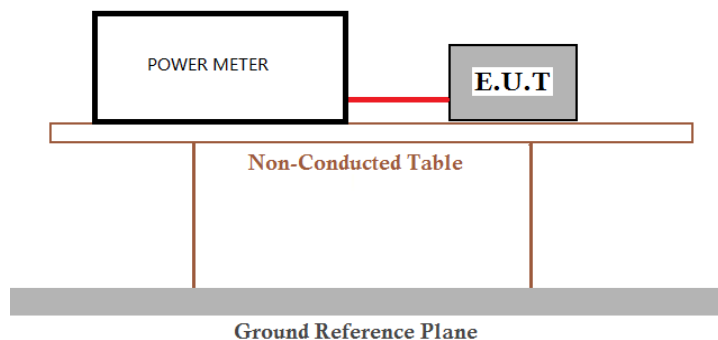
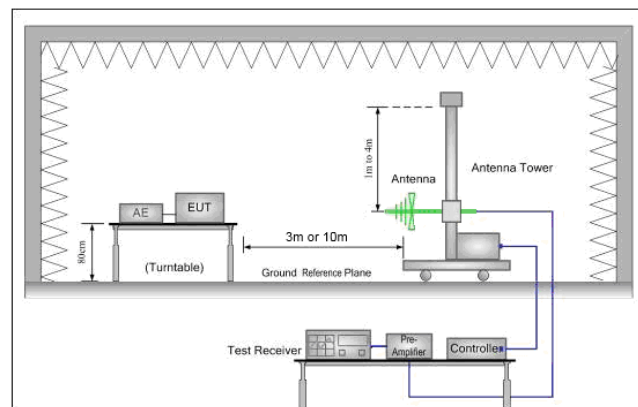
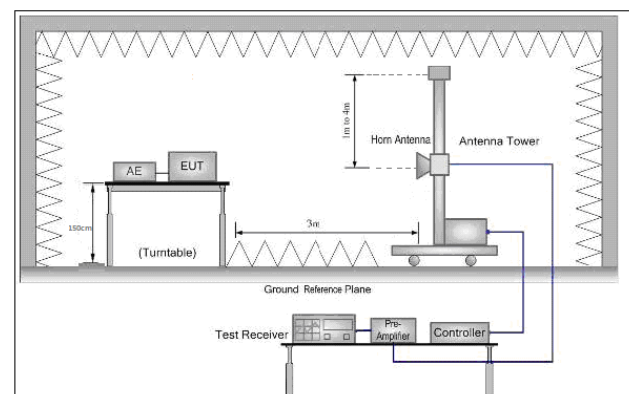


Fig. 2-3 Radiated Emission Configuration



30MHz to 1GHz



Above 1 GHz

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Conducted Output Power	Compliant
§15.247(a)(2)	6dB & 99% Emission Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n HT20

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

7 channels are provided for 802.11n HT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422 MHz	7	2442 MHz
4	2427 MHz	8	2447 MHz
5	2432 MHz	9	2452 MHz
6	2437 MHz		

4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.

4.2.1 RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11g	1 to 11	1,6,11	OFDM	6

RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1
802.11g	1 to 11	1, 6, 11	OFDM	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 0

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case E1 position was reported.

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4.2.2 ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1
802.11g	1 to 11	1, 6, 11	OFDM	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 0

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5 MEASUREMENT UNCERTAINTY

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	$\pm 0.75\text{dB}$
2	RF power density, conducted	$\pm 2.84\text{dB}$
3	Spurious emissions, conducted	$\pm 0.75\text{dB}$
4	Radiated Spurious emission test	$\pm 4.5\text{dB}$ (30MHz-1GHz)
		$\pm 4.8\text{dB}$ (1GHz-25GHz)
5	Conduct emission test	$\pm 3.12\text{ dB}$ (9KHz- 30MHz)
6	Temperature test	$\pm 1^{\circ}\text{C}$
7	Humidity test	$\pm 3\%$
8	DC and low frequency voltages	$\pm 0.5\%$

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	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
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(yyyy-mm-dd)
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2017/5/10	2020/5/9
LISN	Rohde & Schwarz	ENV216	SEM007-01	2018/9/2	2019/9/2
LISN	ETS-LINDGREN	Feb-16	SEM007-02	2018/4/2	2019/4/1
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2018/7/12	2019/7/11
2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	EMC0122	2018/2/14	2019/2/13
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2018/4/2	2019/4/1

6.3 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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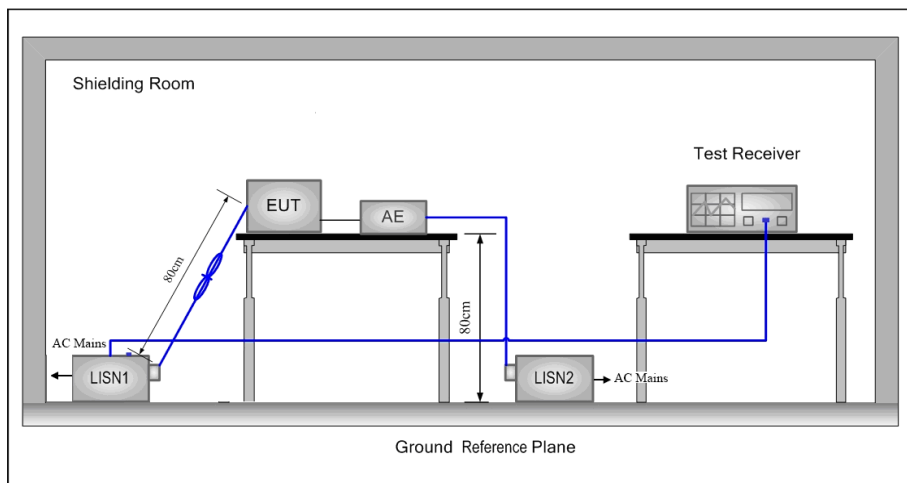
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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

6.6 Measurement Result

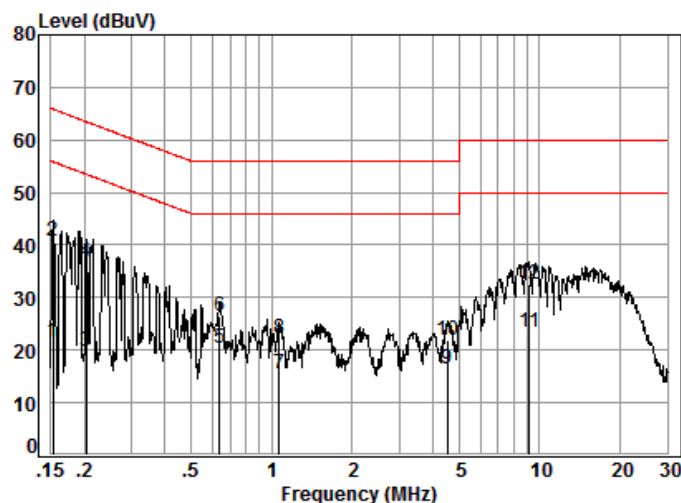
Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit.

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AC POWER LINE CONDUCTED EMISSION TEST DATA : L



Site : Shielding Room
Condition: Line
Job No. : 90027
Test mode: d

	Freq	Cable	LISN	Read	Limit	Over	
	MHz	Loss	Factor	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dB	
1	0.15	0.01	9.66	11.96	21.63	55.82	-34.19 Average
2	0.15	0.01	9.66	31.04	40.71	65.82	-25.11 QP
3	0.20	0.02	9.66	10.02	19.70	53.49	-33.79 Average
4	0.20	0.02	9.66	27.22	36.90	63.49	-26.59 QP
5	0.64	0.07	9.67	10.58	20.32	46.00	-25.68 Average
6	0.64	0.07	9.67	16.62	26.36	56.00	-29.64 QP
7	1.07	0.10	9.74	5.73	15.57	46.00	-30.43 Average
8	1.07	0.10	9.74	12.34	22.18	56.00	-33.82 QP
9	4.53	0.17	9.73	6.54	16.44	46.00	-29.56 Average
10	4.53	0.17	9.73	11.99	21.89	56.00	-34.11 QP
11	9.16	0.17	9.83	13.35	23.35	50.00	-26.65 Average
12	9.16	0.17	9.83	22.43	32.43	60.00	-27.57 QP

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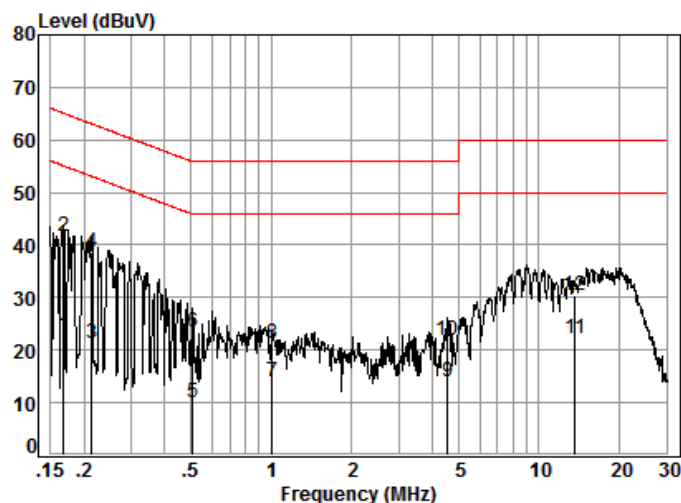
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AC POWER LINE CONDUCTED EMISSION TEST DATA : N



Site : Shielding Room
Condition: Neutral
Job No. : 90027
Test mode: d

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.17	0.01	9.64	13.07	22.72	55.08	-32.36	Average
2	0.17	0.01	9.64	31.93	41.58	65.08	-23.50	QP
3	0.21	0.02	9.64	11.68	21.34	53.10	-31.76	Average
4	0.21	0.02	9.64	29.02	38.68	63.10	-24.42	QP
5	0.51	0.06	9.64	0.38	10.08	46.00	-35.92	Average
6	0.51	0.06	9.64	13.60	23.30	56.00	-32.70	QP
7	1.00	0.09	9.71	4.27	14.07	46.00	-31.93	Average
8	1.00	0.09	9.71	11.59	21.39	56.00	-34.61	QP
9	4.57	0.17	9.70	4.16	14.03	46.00	-31.97	Average
10	4.57	0.17	9.70	12.02	21.89	56.00	-34.11	QP
11	13.62	0.20	10.25	11.86	22.31	50.00	-27.69	Average
12	13.62	0.20	10.25	19.94	30.39	60.00	-29.61	QP

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7 DUTY CYCLE OF TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

$$\text{Duty Cycle} = T_{\text{on}} / (T_{\text{on}} + T_{\text{off}})$$

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

Measurement Procedure:

1. Set span = Zero
2. RBW = 1MHz
3. VBW = 1MHz,
4. Detector = Peak

Duty Cycle:

Test Mode	Duty Cycle[%]	Duty cycle factor
11B	99.52	0.02
11G	95.50	0.20
11N_20	95.91	0.18
11N_40	92.23	0.35

**Refer to next page for plots*

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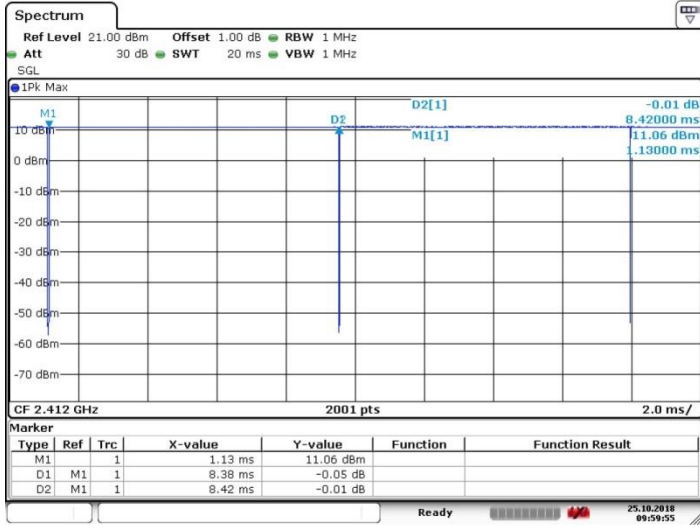
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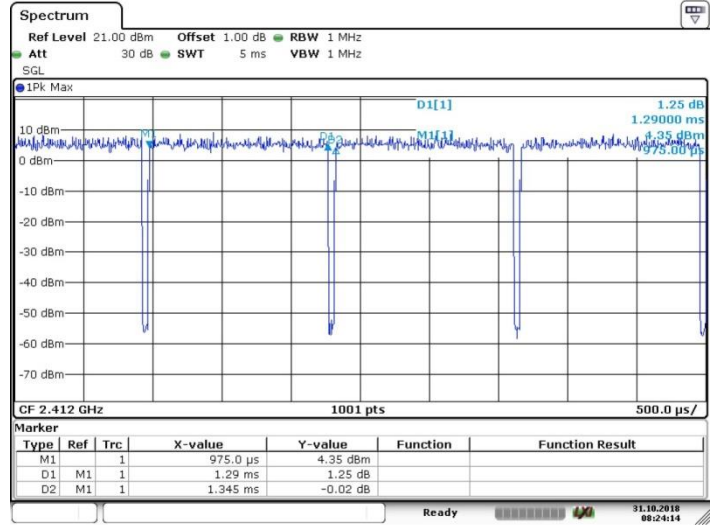
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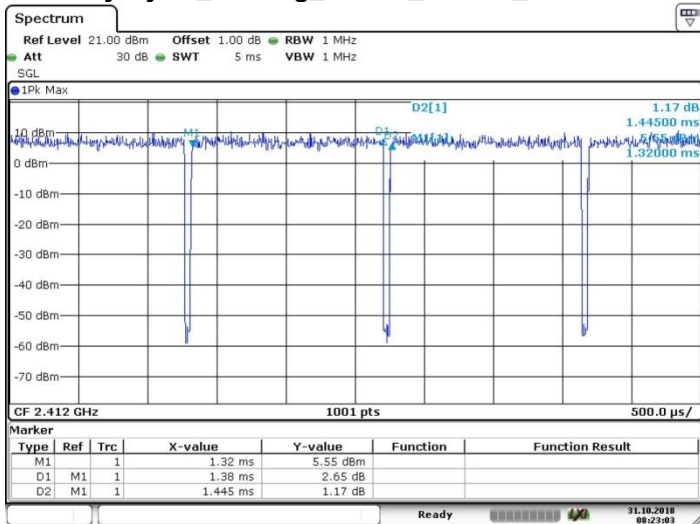
Duty Cycle_802.11b_20MHz_Chain0_2412MHz



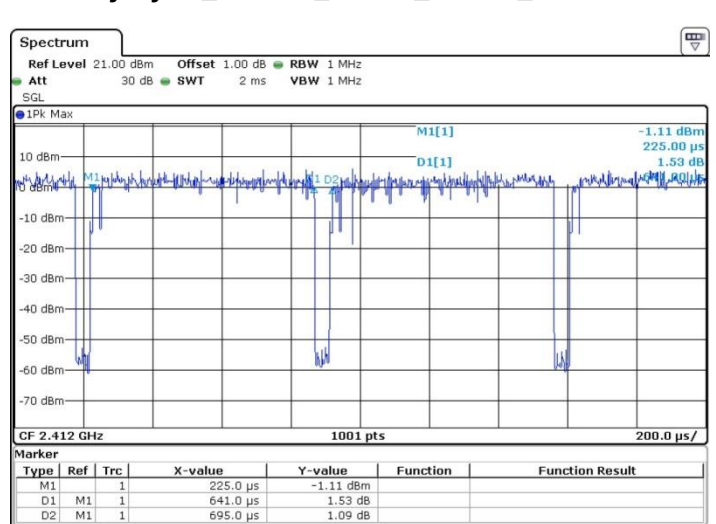
Duty Cycle_802.11n_20MHz_Chain0_2412MHz



Duty Cycle_802.11g_20MHz_Chain0_2412MHz



Duty Cycle_802.11n_40MHz_Chain0_2422MHz



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8 CONDUCTED OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

Frequency (MHz)	Effective Legacy Gain (dBi)	Conducted Power Limit (dBm)
2412~2462	0.00	30.00

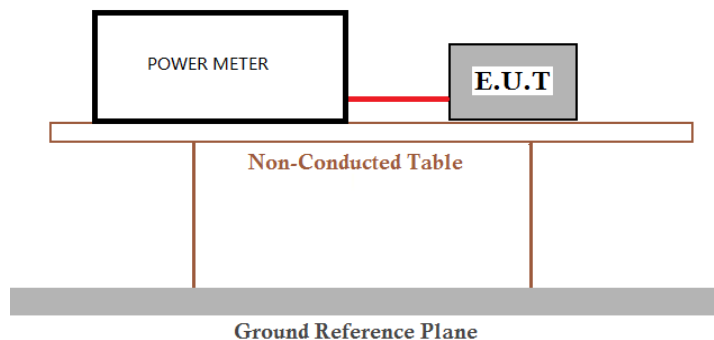
The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

8.2 Measurement Equipment Used

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2018/9/15	2019/9/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2018/3/13	2019/3/12
Coaxial Cable	SGS	N/A	SEM031-01	2018/7/13	2019/7/12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018/9/2	2019/9/2
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2017/12/4	2018/12/4
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018/9/2	2019/9/2

8.3 Test Set-up

Power Meter:



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8.3 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Spectrum or Power Meter.

8.4 Measurement Result

8.4.1 Measurement Data of Average Power:

Mode	Test Channel	Average Output Power (dBm)	Result
802.11B	Lowest	17.25	Report purpose only
	Middle	17.64	Report purpose only
	Highest	17.77	Report purpose only
802.11G	Lowest	14.96	Report purpose only
	Middle	15.49	Report purpose only
	Highest	15.36	Report purpose only
802.11N20	Lowest	13.92	Report purpose only
	Middle	14.51	Report purpose only
	Highest	14.40	Report purpose only
802.11N40	Lowest	14.47	Report purpose only
	Middle	14.68	Report purpose only
	Highest	14.71	Report purpose only

8.4.2 Measurement Data of Peak Power:

Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	20.97	30.00	Pass
	Middle	21.43	30.00	Pass
	Highest	21.52	30.00	Pass
802.11G	Lowest	22.61	30.00	Pass
	Middle	22.95	30.00	Pass
	Highest	23.10	30.00	Pass
802.11N20	Lowest	21.64	30.00	Pass
	Middle	21.96	30.00	Pass
	Highest	22.10	30.00	Pass
802.11N40	Lowest	22.24	30.00	Pass
	Middle	22.34	30.00	Pass
	Highest	22.39	30.00	Pass

*** Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.**

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9 6DB & 99% EMISSION BANDWIDTH MEASUREMENT

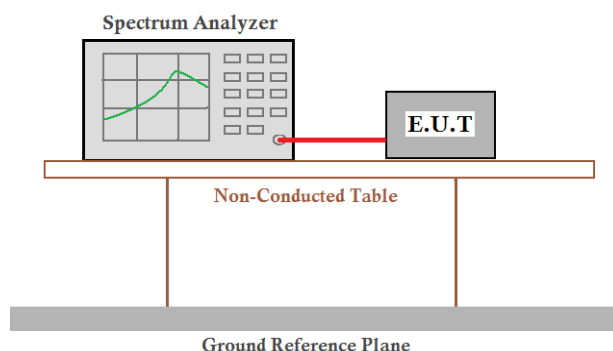
9.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

9.2 Measurement Equipment Used

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2018/9/15	2019/9/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2018/3/13	2019/3/12
Coaxial Cable	SGS	N/A	SEM031-01	2018/7/13	2019/7/12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018/9/2	2019/9/2
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2017/12/4	2018/12/4
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018/9/2	2019/9/2

9.3 Test Set-up



9.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. For 6dB Bandwidth:
Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/60MHz, Detector=peak, Sweep=auto.
5. Mark the peak frequency and -6dB (upper and lower) frequency.
6. For 99% Emission Bandwidth:
Set the spectrum analyzer as RBW=100K, VBW = 3*RBW, Span = 30M/60MHz, Detector=Sample, Sweep=auto.
7. Turn on the 99% bandwidth function, max reading.
8. Repeat above procedures until all frequency of interest measured was complete.

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9.5 Measurement Result

Mode	Test Channel	Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
802.11B	Lowest	13.16	8.03	≥500	Pass
	Middle	13.06	8.06	≥500	Pass
	Highest	13.01	9.06	≥500	Pass
802.11G	Lowest	16.45	15.85	≥500	Pass
	Middle	16.36	15.14	≥500	Pass
	Highest	16.39	15.14	≥500	Pass
802.11N20	Lowest	17.59	15.23	≥500	Pass
	Middle	17.53	15.14	≥500	Pass
	Highest	17.53	15.14	≥500	Pass
802.11N40	Lowest	34.90	35.19	≥500	Pass
	Middle	35.84	33.93	≥500	Pass
	Highest	35.90	35.19	≥500	Pass

*Refer to next page for plots

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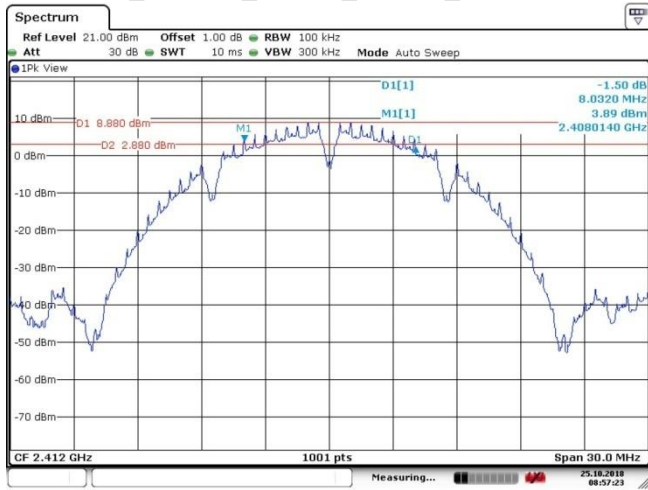
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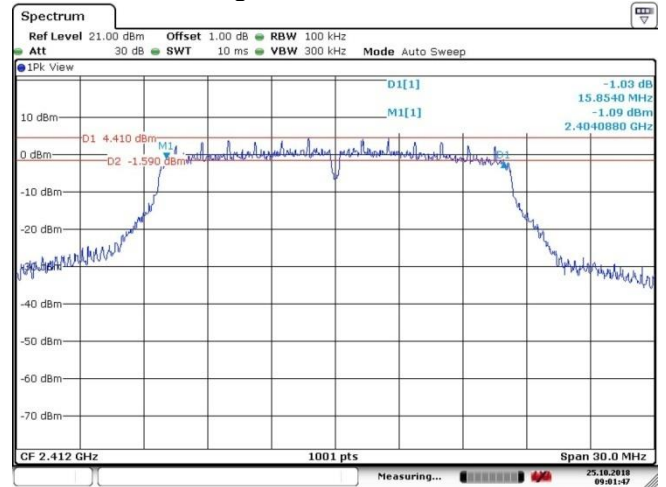
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6dB_802.11b_20MHz_Chain0_2412MHz



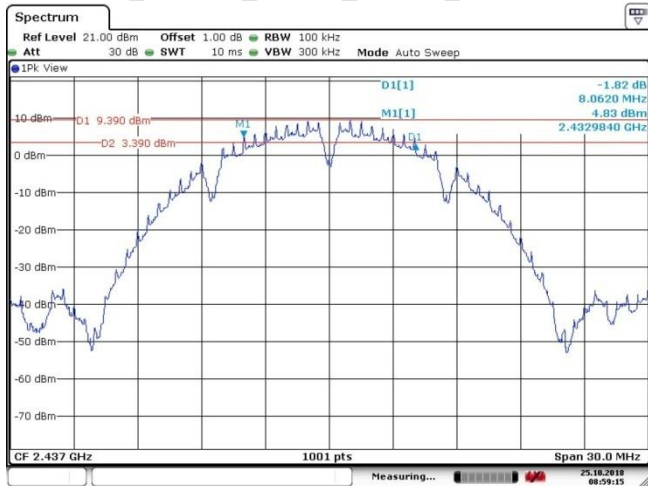
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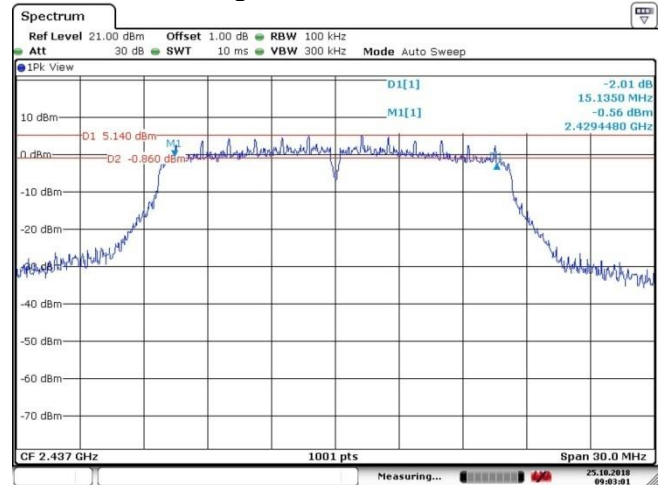
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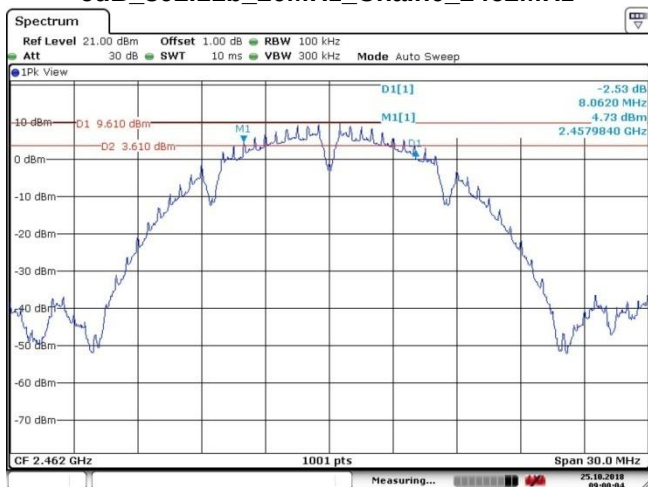
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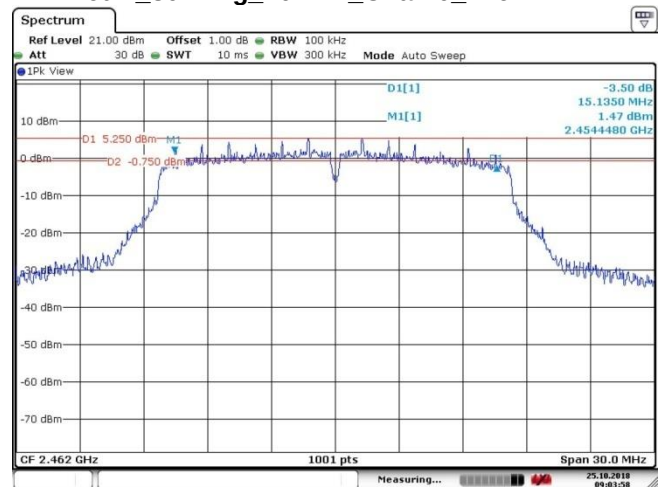
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Date: 25.OCT.2018 09:00:05

6dB_802.11g_20MHz_Chain0_2462MHz



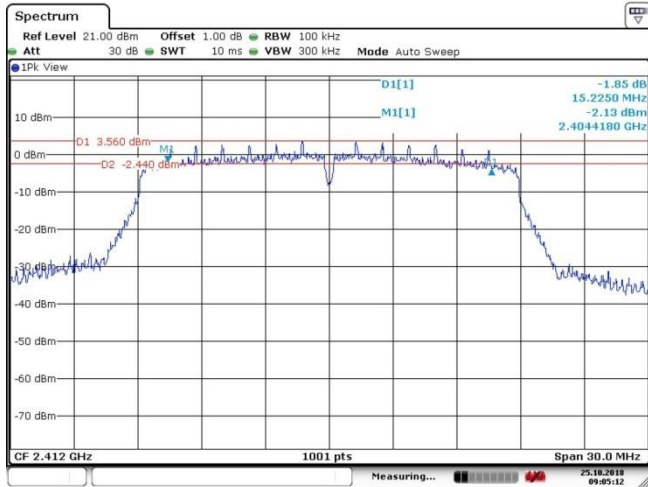
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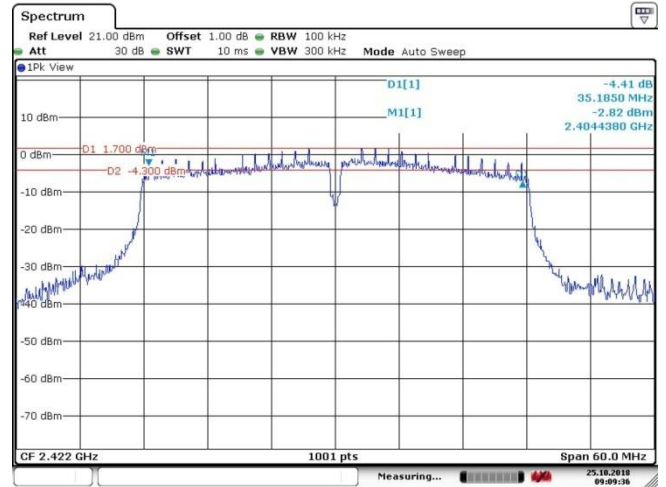
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6dB_802.11n_20MHz_Chain0_2412MHz



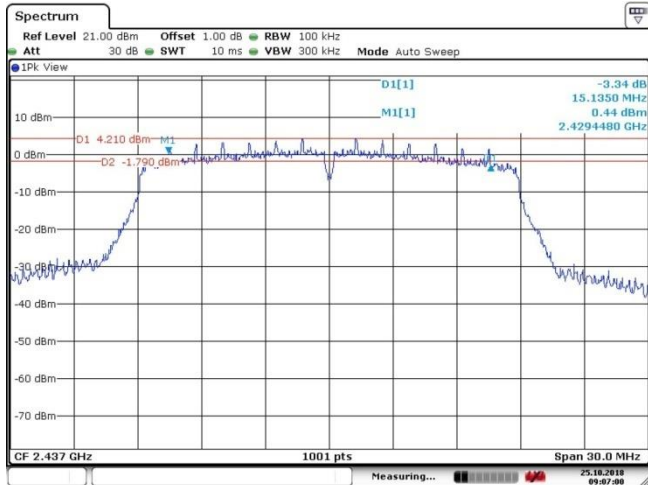
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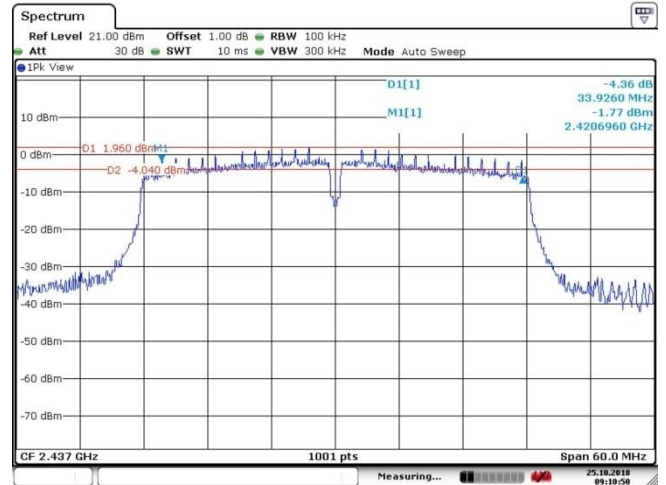
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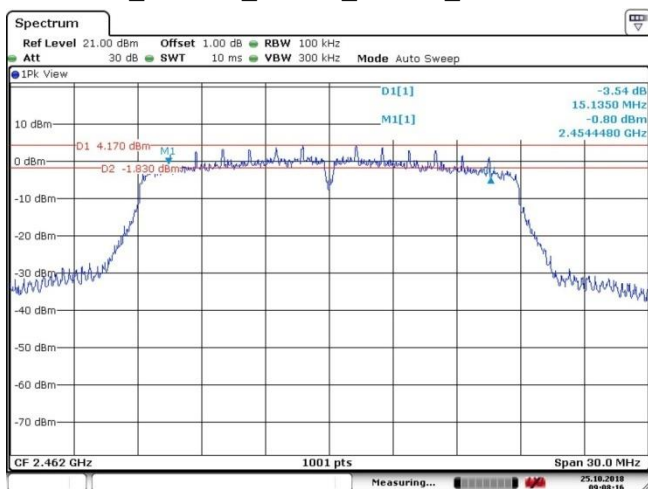
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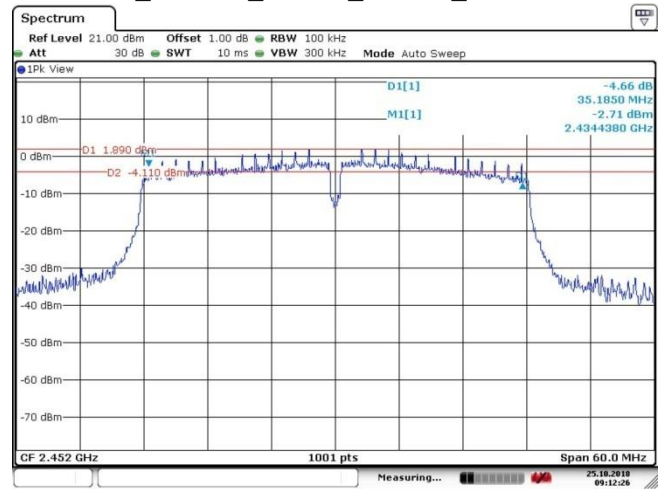
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6dB_802.11n_20MHz_Chain0_2462MHz



Date: 25.OCT.2018 09:08:16

6dB_802.11n_40MHz_Chain0_2452MHz



Date: 25.OCT.2018 09:12:26

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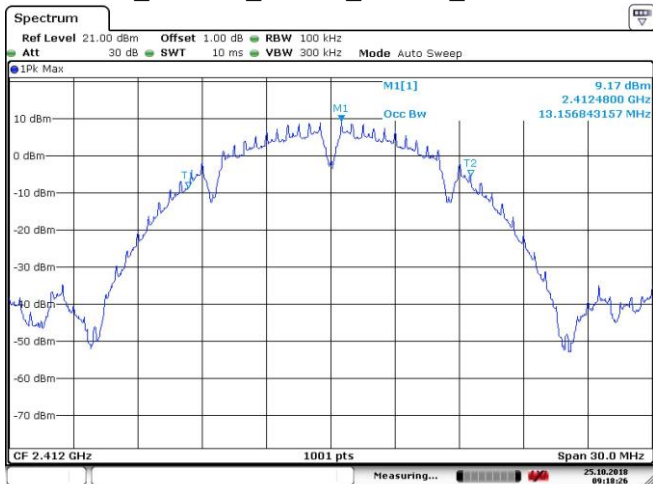
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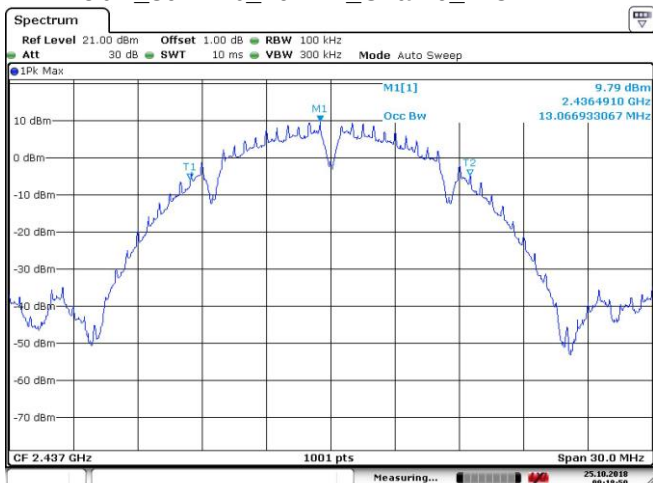
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obw_802.11b_20MHz_Chain0_2412MHz



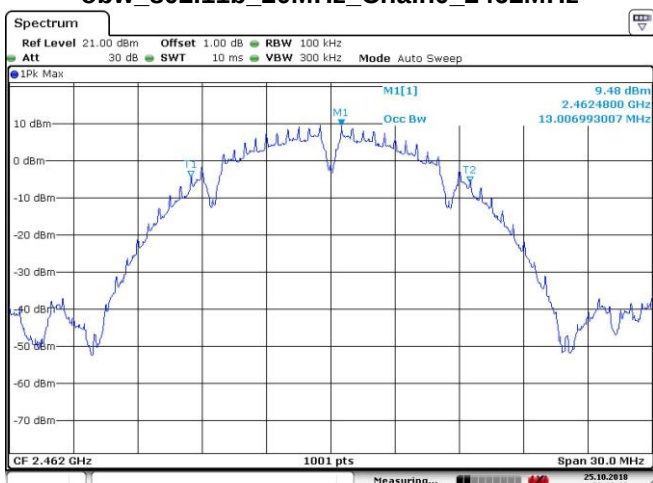
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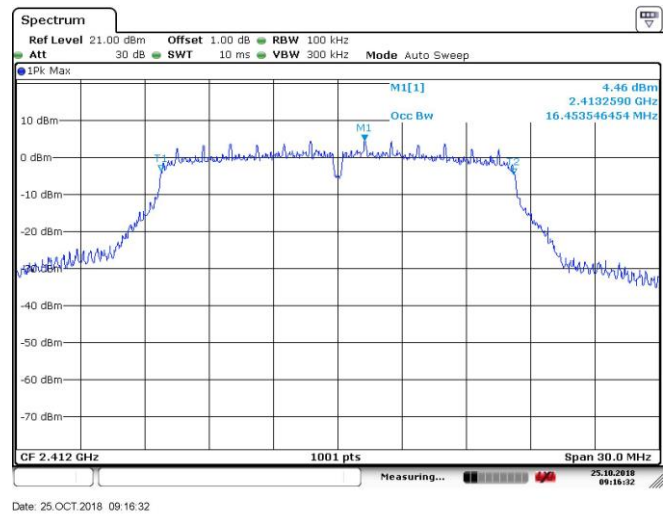
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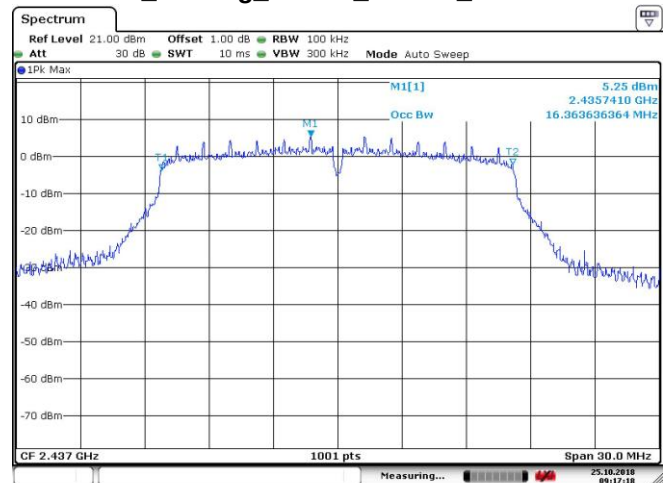
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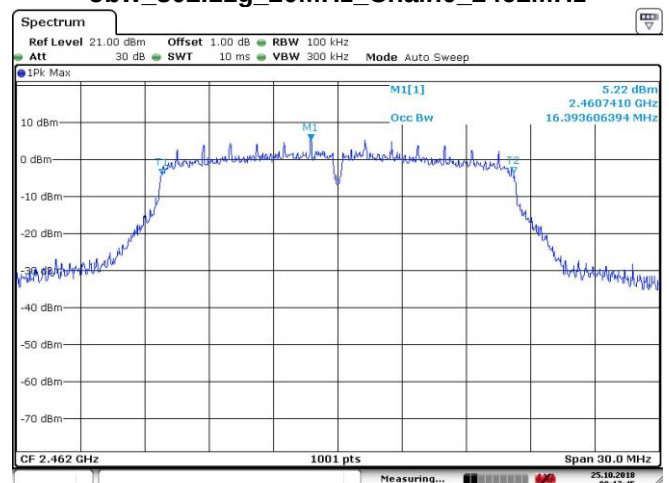
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obw_802.11g_20MHz_Chain0_2462MHz



Date: 25.OCT.2018 09:17:45

obw_802.11n_20MHz_Chain0_2412MHz

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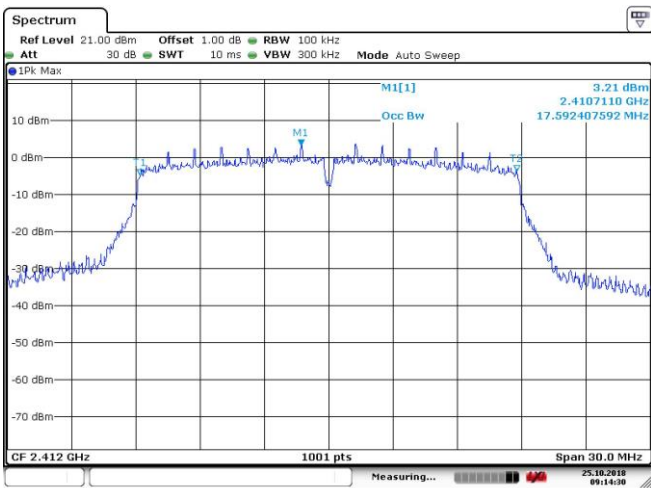
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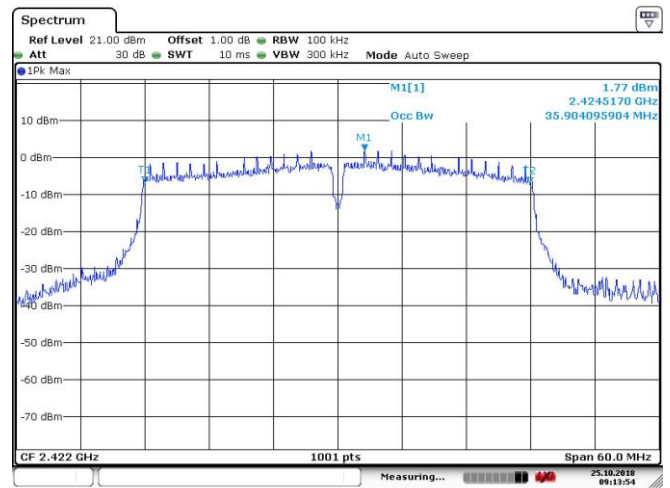
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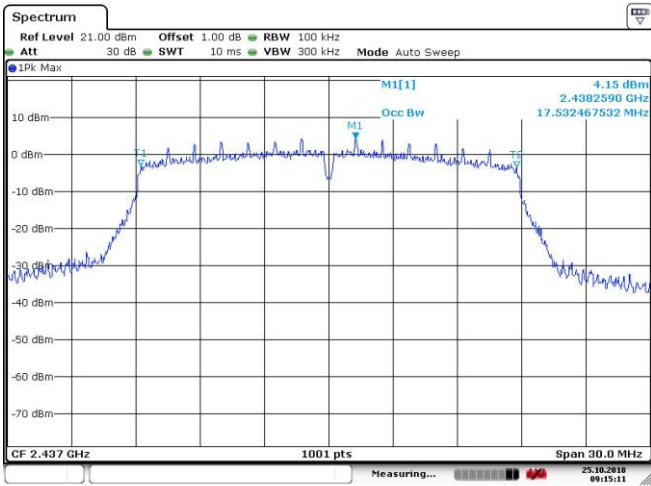
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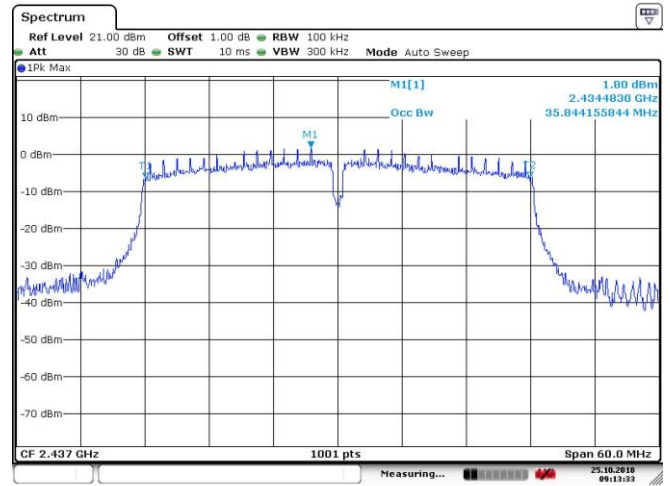
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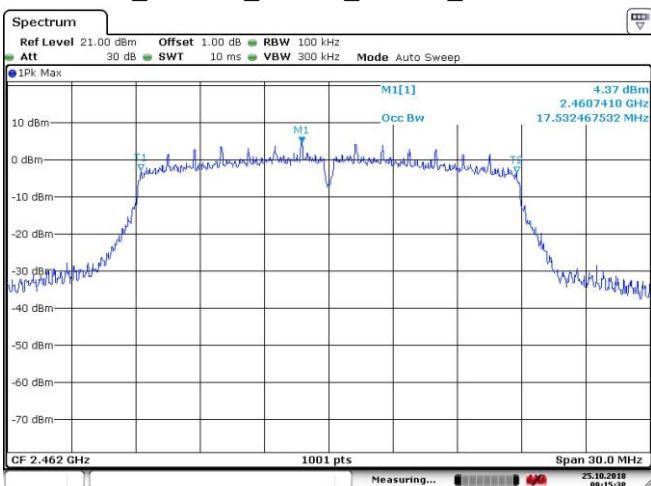
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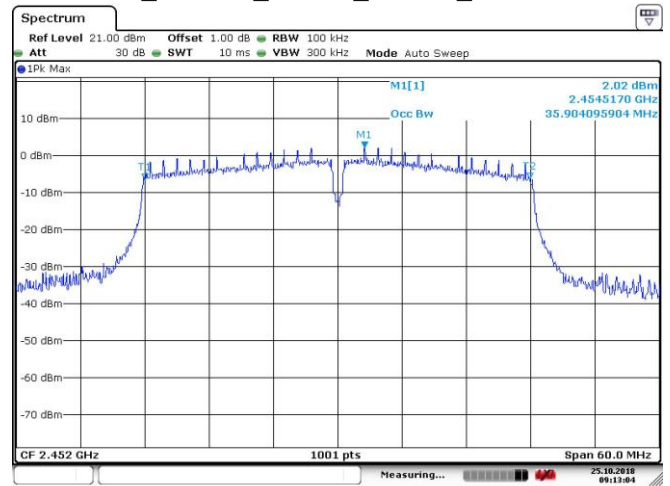
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obw_802.11n_40MHz_Chain0_2452MHz



Date: 25.OCT.2018 09:15:38

obw_802.11n_40MHz_Chain0_2422MHz



Date: 25.OCT.2018 09:13:04

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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

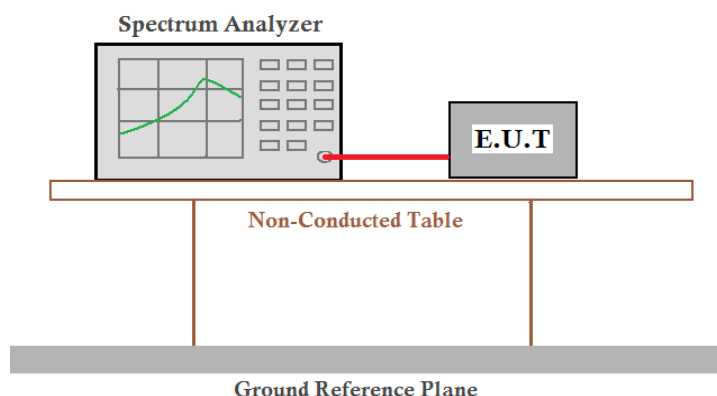
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

10.2 Measurement Equipment Used

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2018/9/15	2019/9/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2018/3/13	2019/3/12
Coaxial Cable	SGS	N/A	SEM031-01	2018/7/13	2019/7/12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018/9/2	2019/9/2
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2017/12/4	2018/12/4
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018/9/2	2019/9/2

10.3 Test SET-UP



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10.4 Measurement Procedure

Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Set DL as the limit = reading on marker 1 – 20dBm
8. Marker on frequency and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Conducted Spurious Emission:

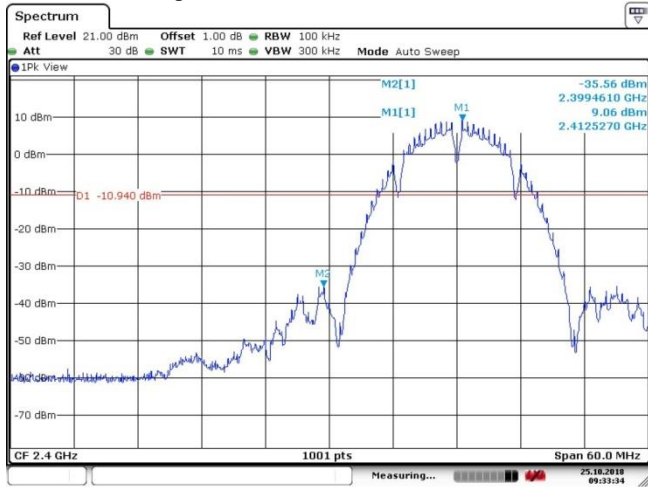
1. To connect Antenna Port of EUT to Spectrum
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set RBW = 100 kHz & VBW= 300 kHz, Detector =Peak, Sweep = Auto.
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

10.5 Measurement Result

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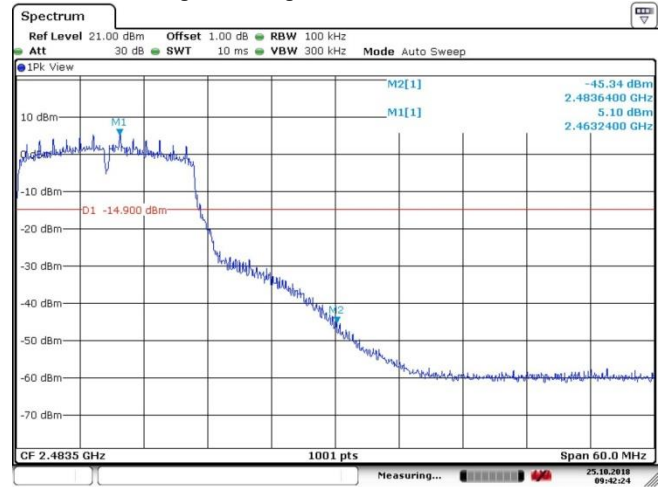
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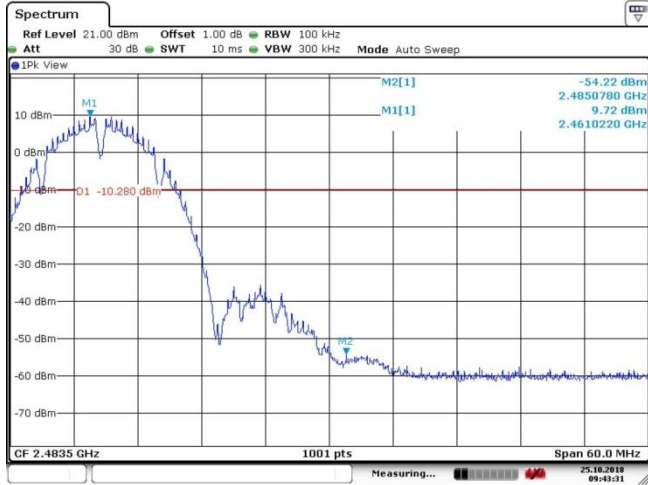
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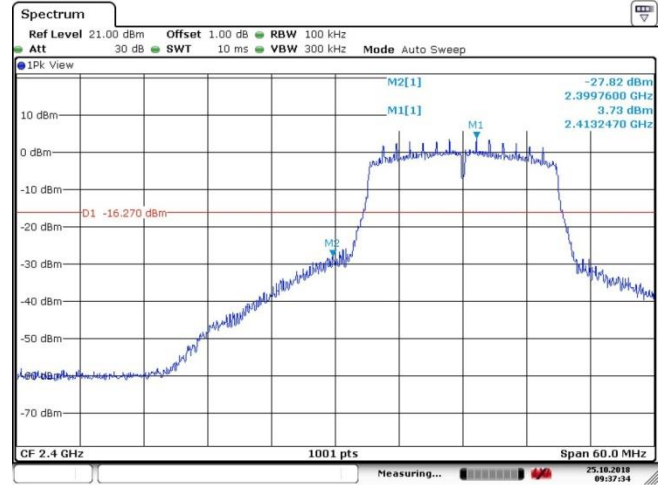
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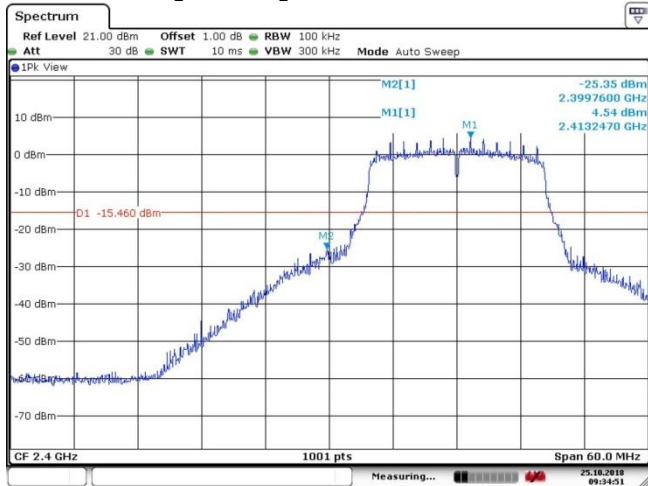
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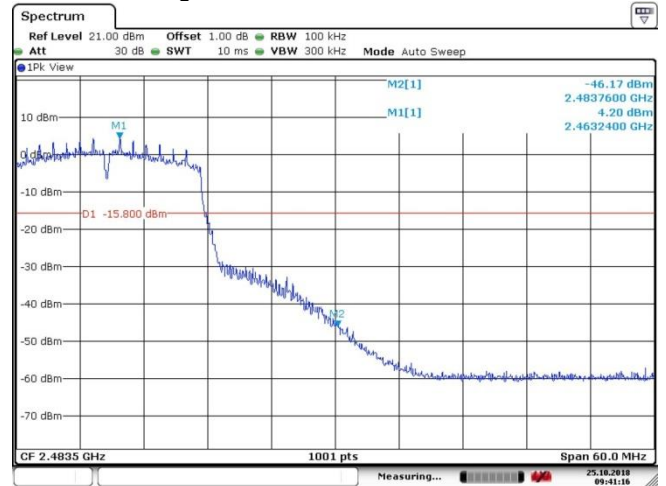
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Bandedge_802.11g_20MHz_Chain0_2412MHz



Date: 25.OCT.2018 09:34:51

Bandedge_802.11n_20MHz_Chain0_2462MHz



Date: 25.OCT.2018 09:41:17

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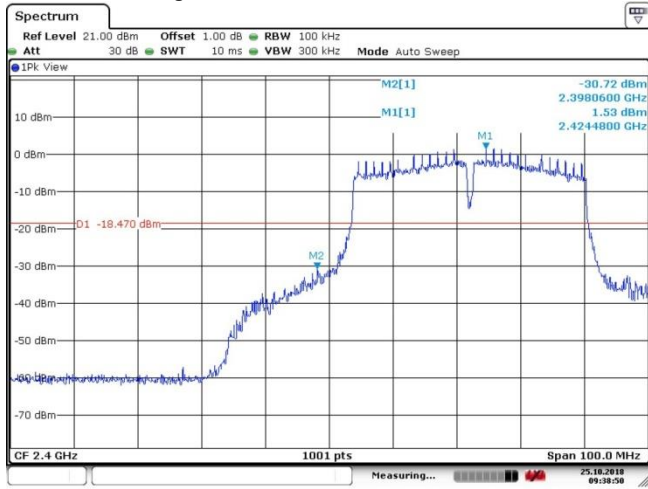
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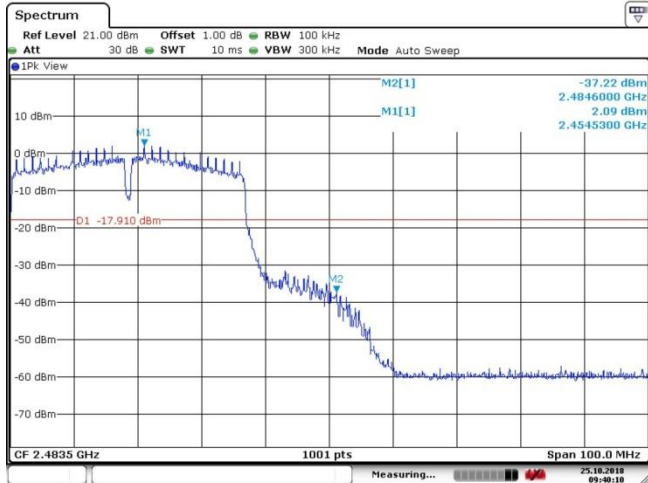
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Bandedge_802.11n_40MHz_Chain0_2422MHz



Date: 25.OCT.2018 09:38:51

Bandedge_802.11n_40MHz_Chain0_2452MHz



Date: 25.OCT.2018 09:40:10

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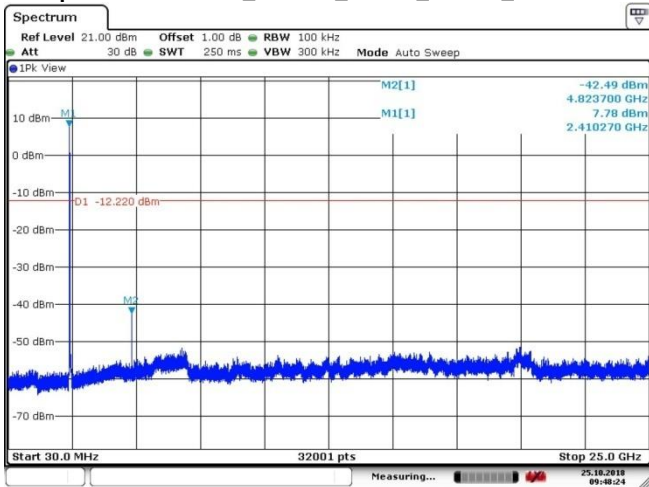
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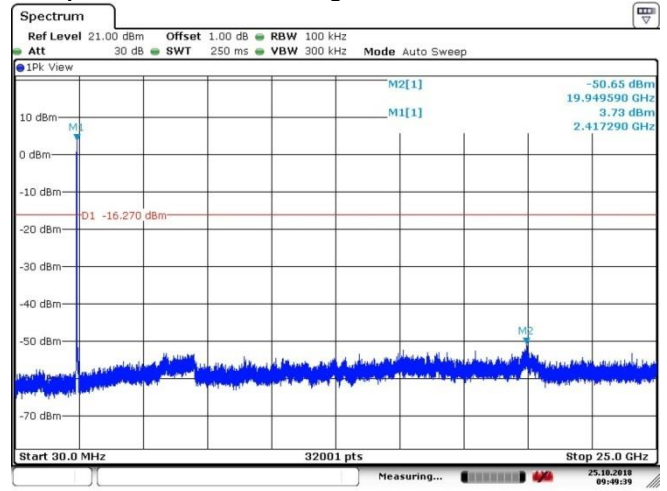
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Spurious Emission_802.11b_20MHz_Chain0_2412MHz



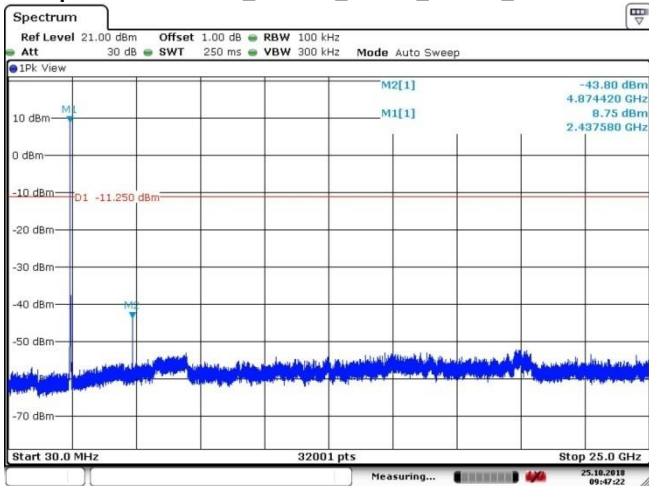
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Spurious Emission_802.11g_20MHz_Chain0_2412MHz



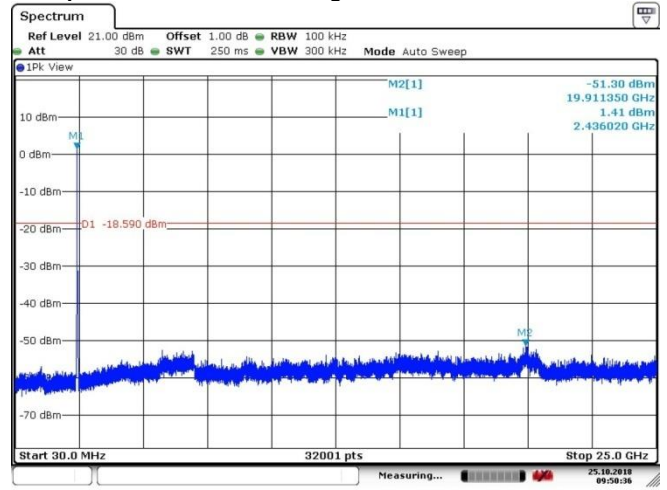
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Spurious Emission_802.11b_20MHz_Chain0_2437MHz



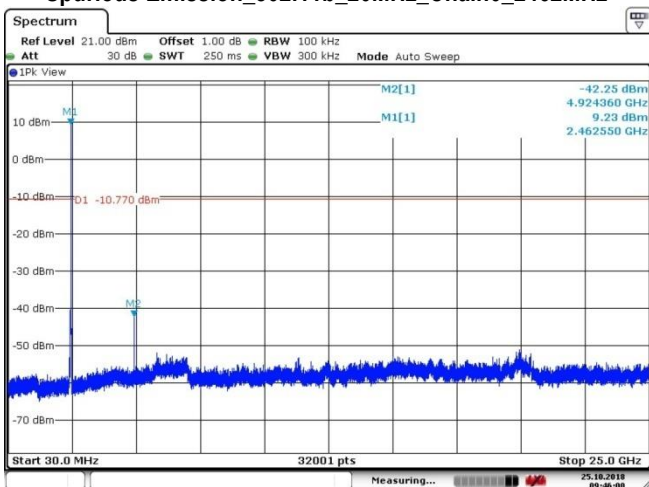
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Spurious Emission_802.11g_20MHz_Chain0_2437MHz



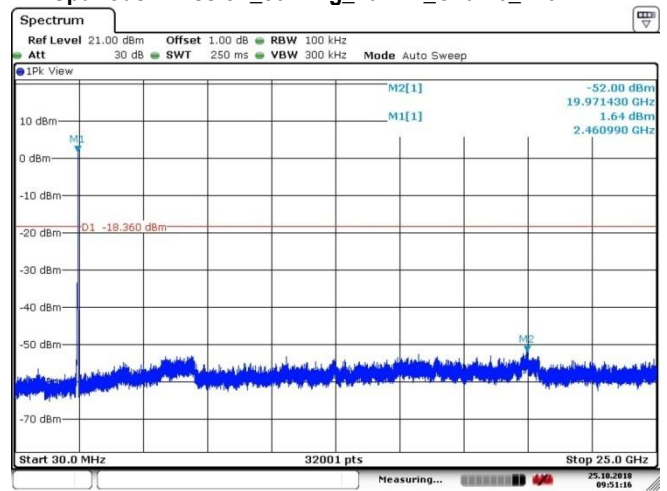
Date: 25.OCT.2018 09:50:37

Spurious Emission_802.11b_20MHz_Chain0_2462MHz



Date: 25.OCT.2018 09:46:00

Spurious Emission_802.11g_20MHz_Chain0_2462MHz



Date: 25.OCT.2018 09:51:16

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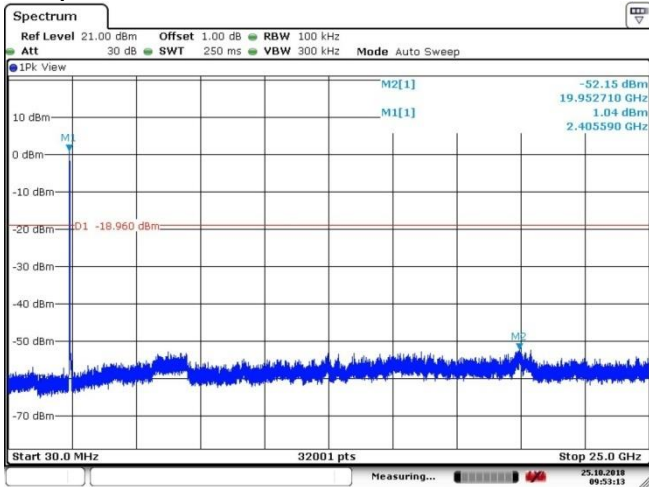
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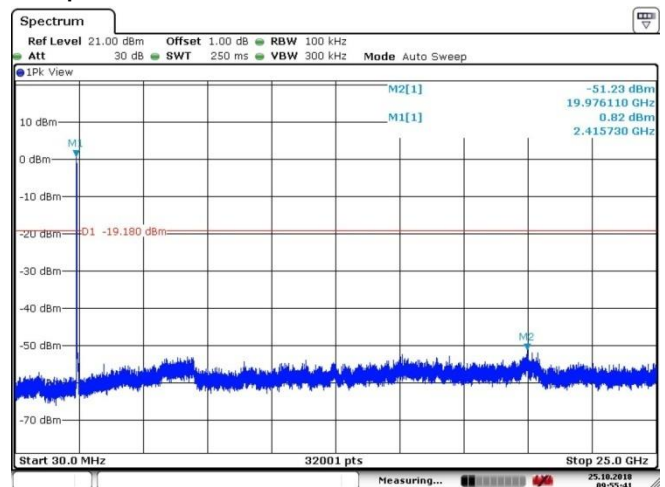
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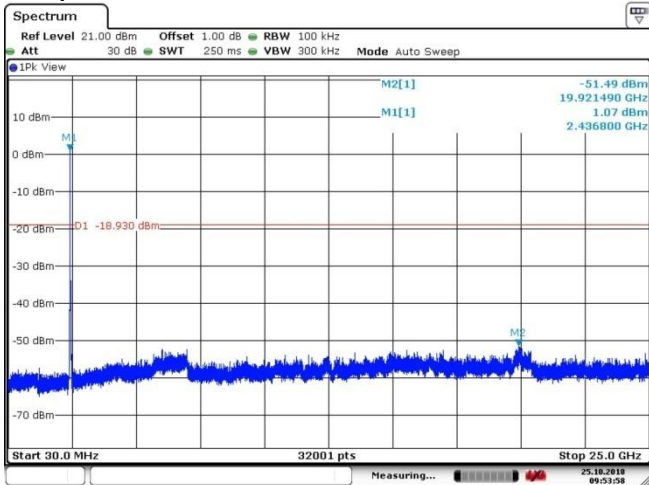
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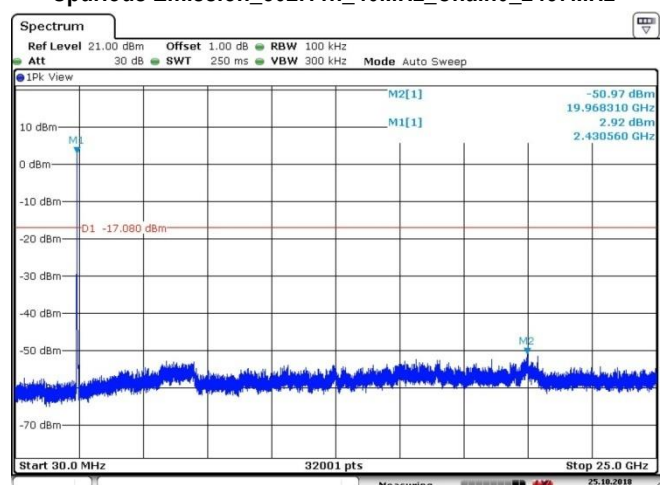
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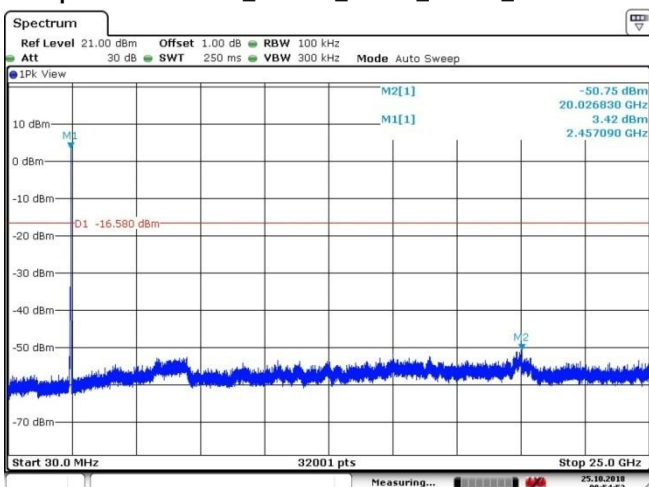
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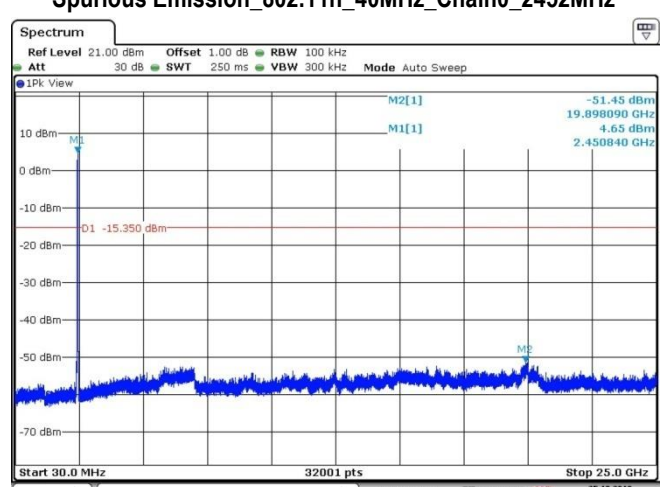
Spurious Emission_802.11n_40MHz_Chain0_2437MHz



Spurious Emission_802.11n_20MHz_Chain0_2462MHz



Spurious Emission_802.11n_40MHz_Chain0_2452MHz



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11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

11.1 Standard Applicable

In any 100 kHz 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 20 dB below that in the 100 kHz 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. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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11.2 Measurement Equipment Used:

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017/8/5	2020/8/4
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2018/7/12	2019/7/11
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2018/9/2	2019/9/2
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017/6/27	2020/6/26
Pre-amplifier (0.1-1.3GHz)	Agilent Technologies	8447D	SEM005-01	2018/4/2	2019/4/1

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018/3/31	2021/3/30
EMI Test Receiver (9k-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2018/4/2	2019/4/1
Trilog-Broadband Antenna(25M-2GHz)	Schwarzbeck	VULB9168	SEM003-18	2016/6/29	2019/6/28
Pre-amplifier (9k-1GHz)	Sonoma	310N	SEM005-03	2018/4/13	2019/4/12
Loop Antenna (9kHz-30MHz)	ETS-Lindgren	6502	SEM003-08	2017/8/22	2020/8/21
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2018/7/12	2019/7/11

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018/3/13	2021/3/12
Measurement Software	AUDIX	e3V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2018/7/12	2019/7/11
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2018/4/13	2019/4/12
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017/6/27	2020/6/26
Horn Antenna (0.8-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018/4/13	2021/4/12
Pre-amplifier(0.1-1.3GHz)	HP	8447D	SEM005-02	2018/9/2	2019/9/2
Low Noise Amplifier(100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2018/9/27	2019/9/27
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2018/4/2	2019/4/1
Band filter	N/A	N/A	SEM023-01	N/A	N/A

NOTE: N/A refers to Not Calibrated Required.

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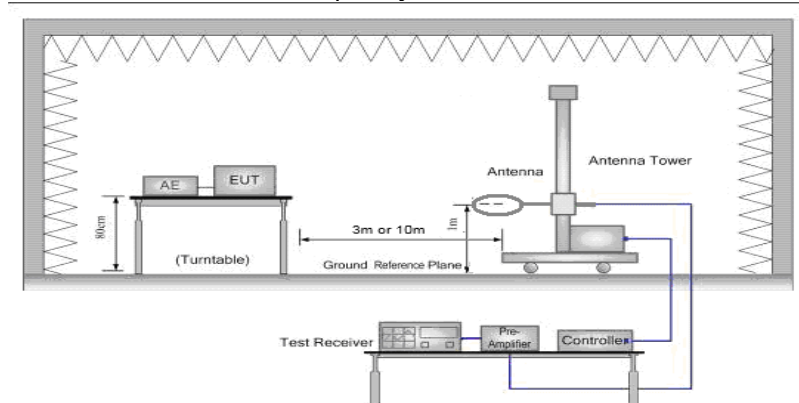
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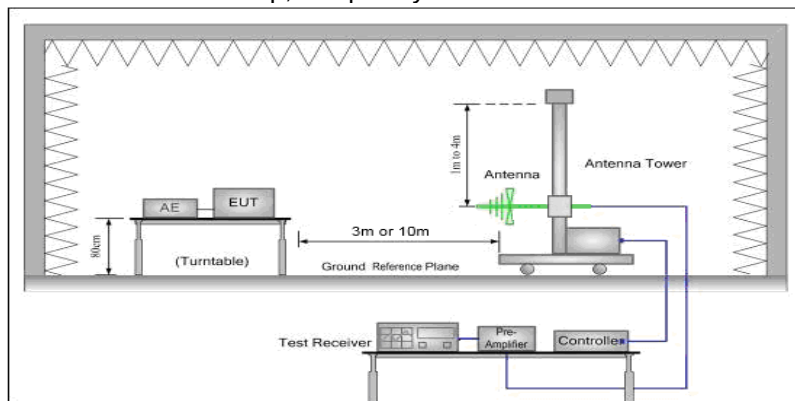
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11.3 Test SET-UP

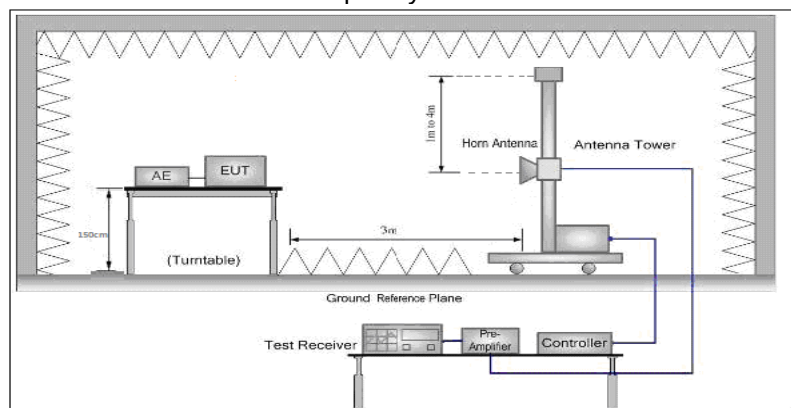
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



11.4 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.

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4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW $\geq 1/T$ (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

11.6 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

11.7 Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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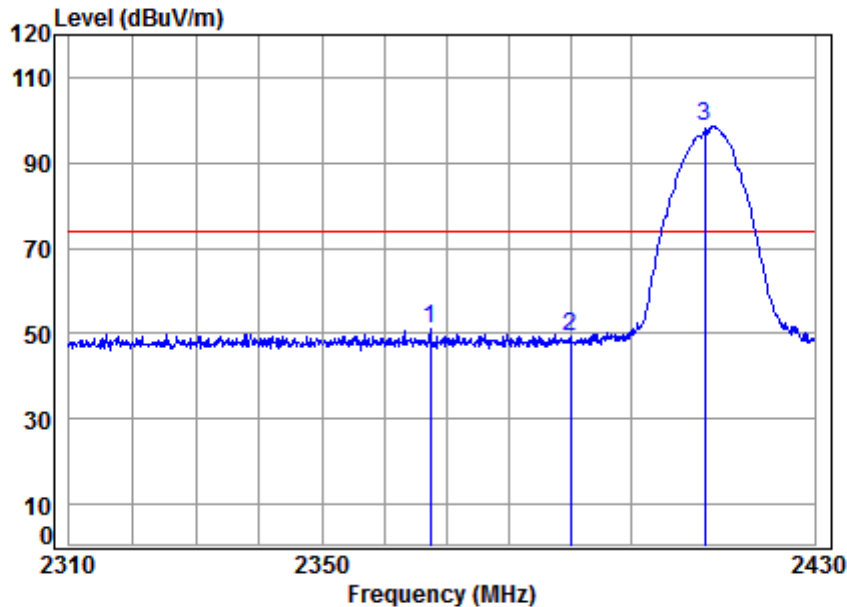
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11.7.1 Radiated Band Edge Measurement Result

11.7.1.1 802.11B_Lowest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2367.321	5.44	28.48	41.86	58.98	51.04	74.00	-22.96	peak
2	2390.000	5.47	28.52	41.87	57.32	49.44	74.00	-24.56	peak
3 *	2412.000	5.50	28.56	41.88	106.25	98.43	74.00	24.43	peak

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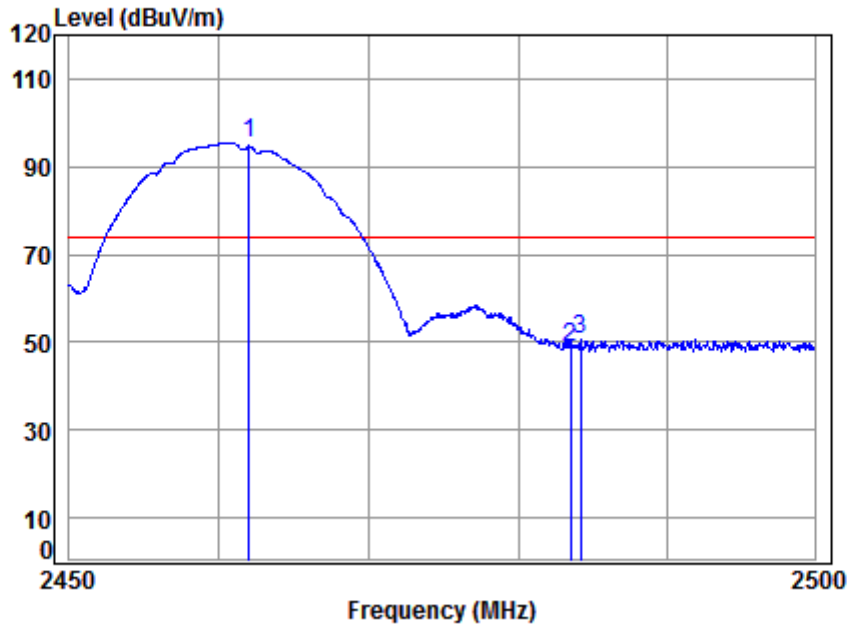
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11.7.1.2 802.11B_Highest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2462.000	5.57	28.64	41.90	103.12	95.43	74.00	21.43	peak
2	2483.500	5.60	28.67	41.91	56.53	48.89	74.00	-25.11	peak
3	2484.191	5.60	28.67	41.91	58.50	50.86	74.00	-23.14	peak

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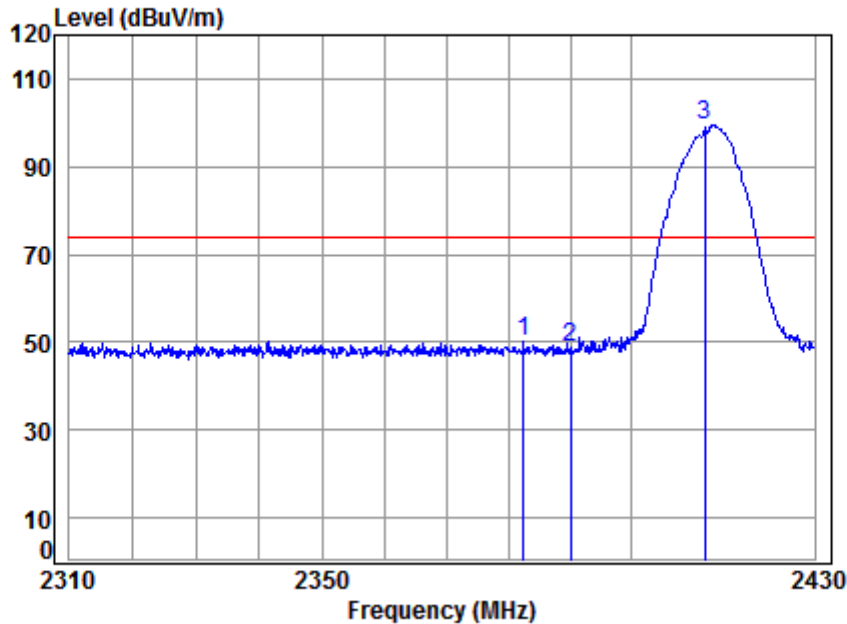
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11.7.1.3 802.11B_Lowest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2382.476	5.46	28.51	41.87	58.08	50.18	74.00	-23.82	peak
2	2390.000	5.47	28.52	41.87	56.72	48.84	74.00	-25.16	peak
3 *	2412.000	5.50	28.56	41.88	107.16	99.34	74.00	25.34	peak

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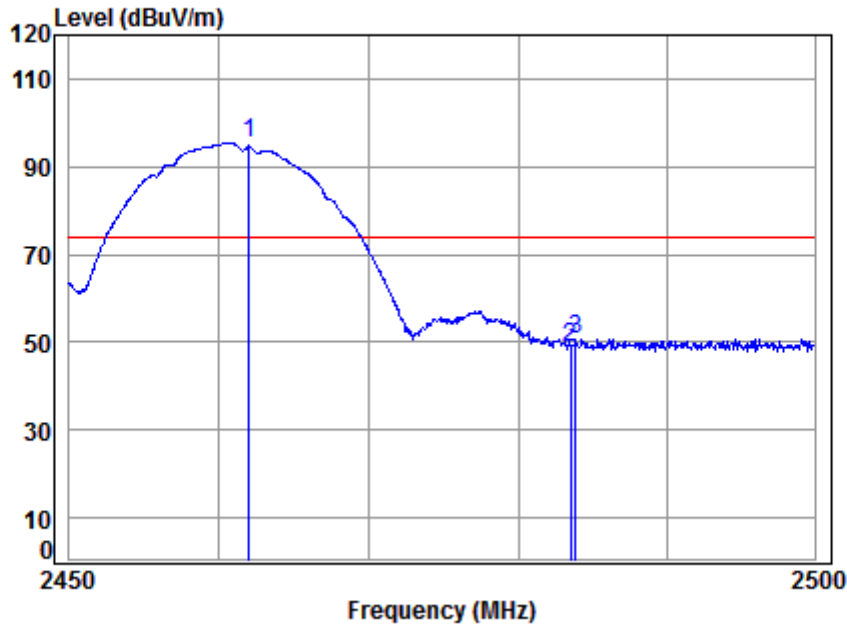
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11.7.1.4 802.11B_Highest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2462.000	5.57	28.64	41.90	102.97	95.28	74.00	21.28	peak
2	2483.500	5.60	28.67	41.91	56.26	48.62	74.00	-25.38	peak
3	2483.890	5.60	28.67	41.91	58.42	50.78	74.00	-23.22	peak

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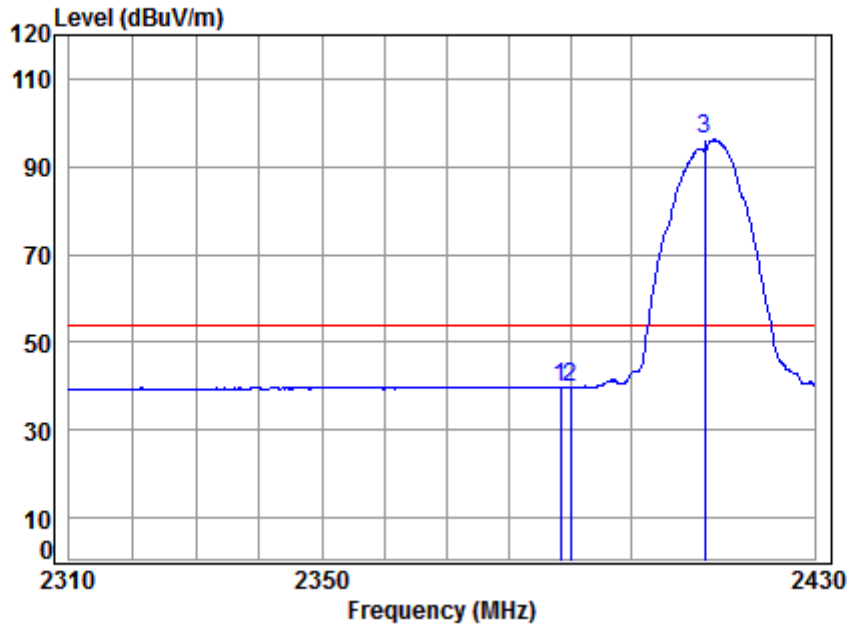
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11.7.1.5 802.11B_Lowest Channel_Average_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2388.395	5.47	28.52	41.87	47.76	39.88	54.00	-14.12	Average
2	2390.000	5.47	28.52	41.87	47.61	39.73	54.00	-14.27	Average
3 *	2412.000	5.50	28.56	41.88	103.87	96.05	54.00	42.05	Average

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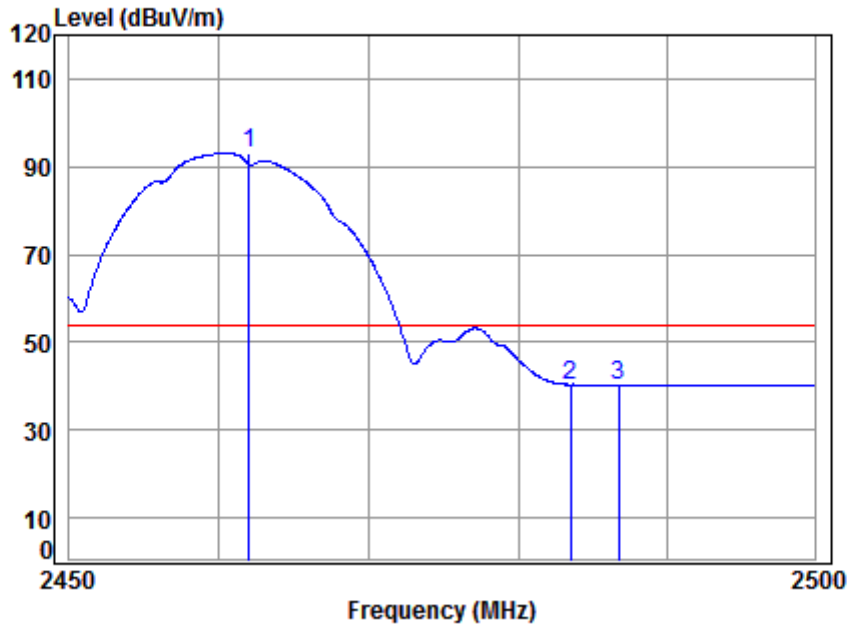
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11.7.1.6 802.11B_Highest Channel_Average_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11B

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2462.000	5.57	28.64	41.90	100.75	93.06	54.00	39.06	Average
2 2483.500	5.60	28.67	41.91	47.98	40.34	54.00	-13.66	Average
3 2486.752	5.60	28.68	41.91	48.01	40.38	54.00	-13.62	Average

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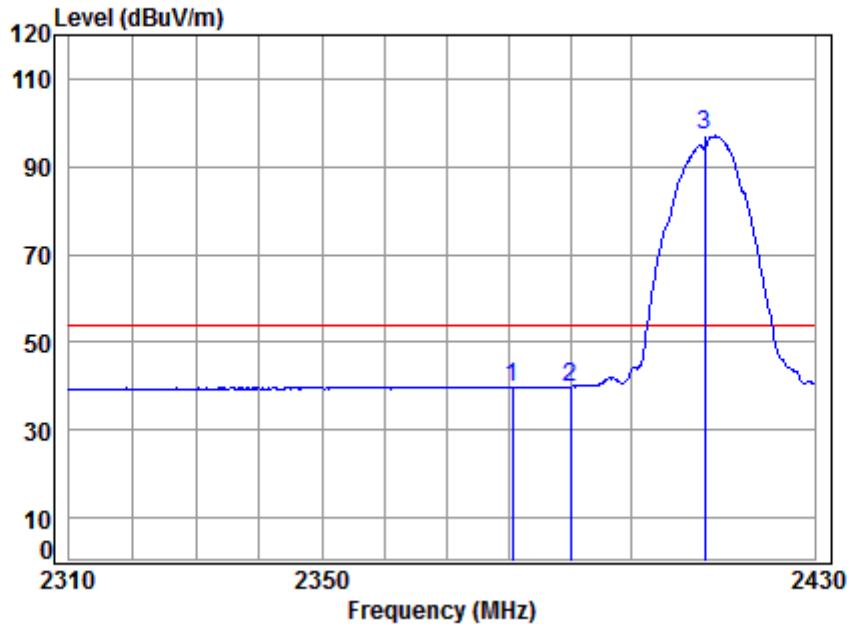
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11.7.1.7 802.11B_Lowest Channel_Average_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2380.667	5.46	28.50	41.87	47.79	39.88	54.00	-14.12	Average
2	2390.000	5.47	28.52	41.87	47.67	39.79	54.00	-14.21	Average
3 *	2412.000	5.50	28.56	41.88	104.78	96.96	54.00	42.96	Average

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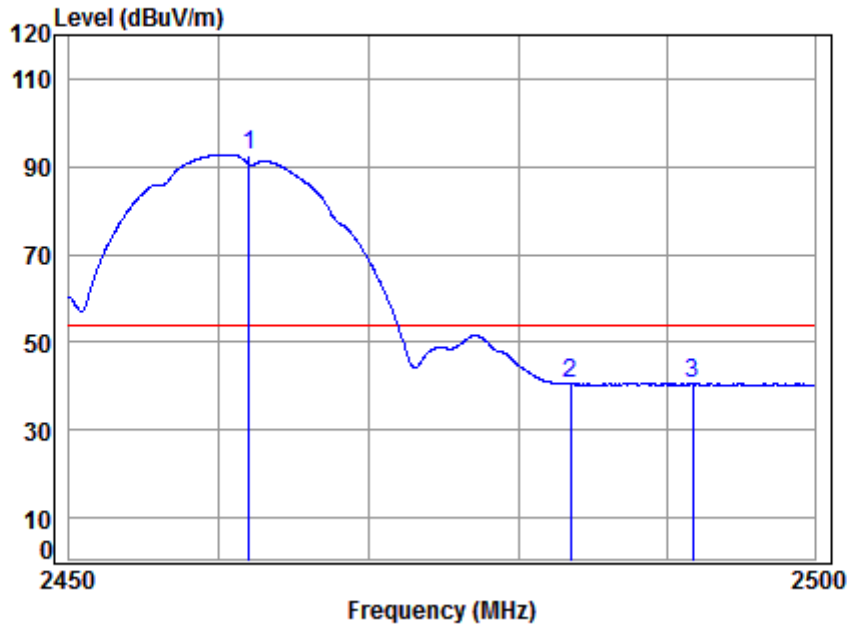
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11.7.1.8 802.11B_Highest Channel_Average_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11B

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2462.000	5.57	28.64	41.90	100.52	92.83	54.00	38.83	Average
2 2483.500	5.60	28.67	41.91	48.22	40.58	54.00	-13.42	Average
3 2491.731	5.61	28.69	41.91	48.13	40.52	54.00	-13.48	Average

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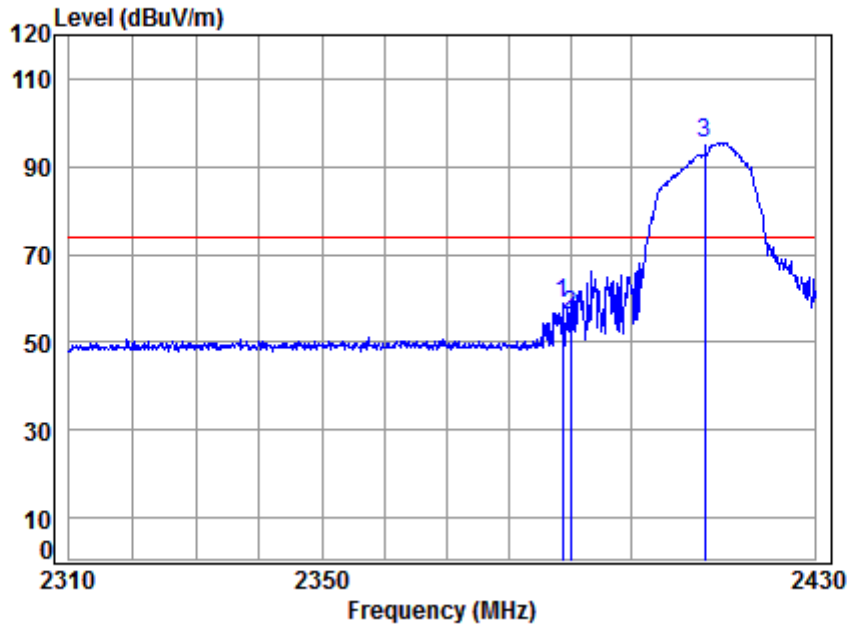
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11.7.1.9 802.11G_Lowest Channel_Peak_Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90027
 Mode : 2412 Band edge
 : 2.4G WIFI 11G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2388.758	5.47	28.52	41.87	66.62	58.74	74.00	-15.26	peak
2	2390.000	5.47	28.52	41.87	64.10	56.22	74.00	-17.78	peak
3 *	2412.000	5.51	28.56	41.88	103.38	95.57	74.00	21.57	peak

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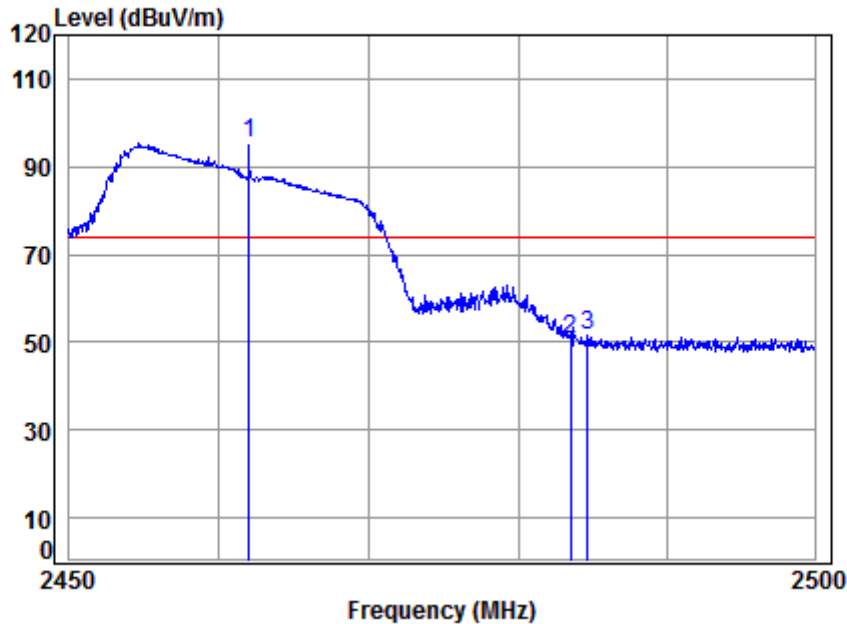
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11.7.1.10 802.11G_Highest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11G

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2462.000	5.57	28.64	41.90	102.86	95.17	74.00	21.17	peak
2 2483.500	5.60	28.67	41.91	58.41	50.77	74.00	-23.23	peak
3 2484.693	5.60	28.68	41.91	59.30	51.67	74.00	-22.33	peak

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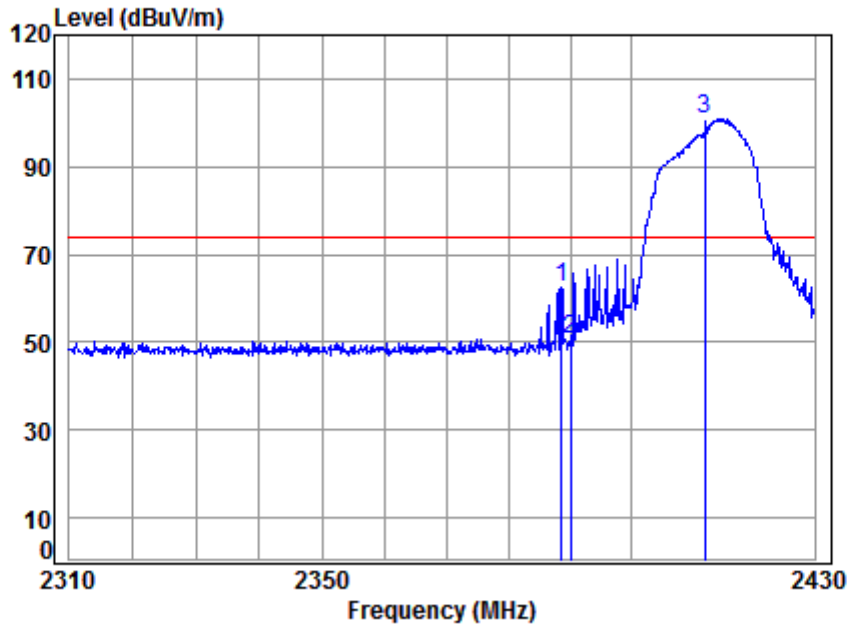
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11.7.1.11 802.11G_Lowest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2388.637	5.47	28.52	41.87	70.34	62.46	74.00	-11.54	peak
2	2390.000	5.47	28.52	41.87	58.58	50.70	74.00	-23.30	peak
3 *	2412.000	5.50	28.56	41.88	108.65	100.83	74.00	26.83	peak

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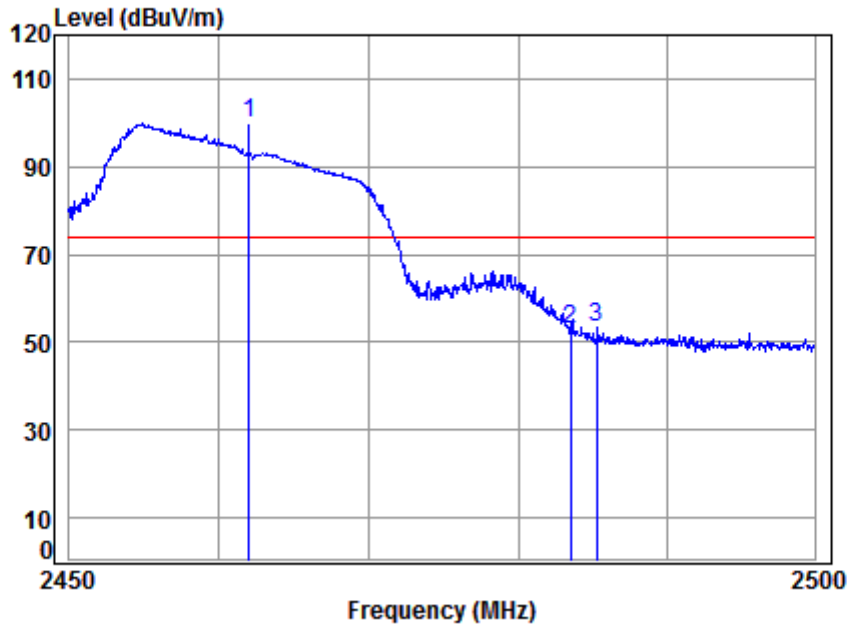
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11.7.1.12 802.11G_Highest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11G

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2462.000	5.57	28.64	41.90	107.46	99.77	74.00	25.77 peak
2	2483.500	5.60	28.67	41.91	60.58	52.94	74.00	-21.06 peak
3	2485.295	5.60	28.68	41.91	61.10	53.47	74.00	-20.53 peak

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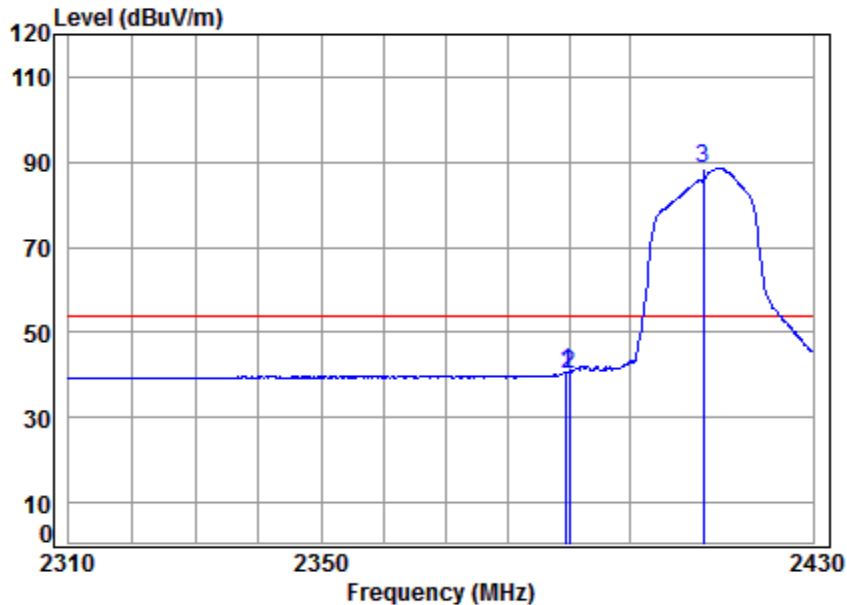
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11.7.1.13 802.11G_Lowest Channel_Average_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11G

		Cable	Ant	Preamp	Read		Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2389.605	5.47	28.52	41.87	48.63	40.75	54.00	-13.25	Average
2	2390.000	5.47	28.52	41.87	48.26	40.38	54.00	-13.62	Average
3 *	2412.000	5.51	28.56	41.88	96.28	88.47	54.00	34.47	Average

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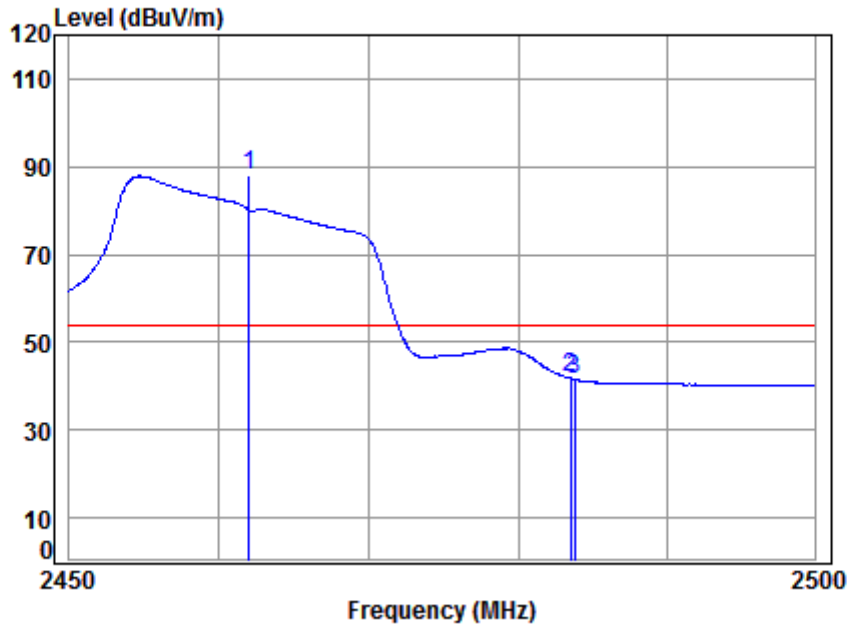
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11.7.1.14 802.11G_Highest Channel_Average_Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90027
 Mode : 2462 Band edge
 : 2.4G WIFI 11G

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2462.000	5.57	28.64	41.90	95.53	87.84	54.00	33.84	Average
2 2483.500	5.60	28.67	41.91	49.44	41.80	54.00	-12.20	Average
3 2483.790	5.60	28.67	41.91	49.16	41.52	54.00	-12.48	Average

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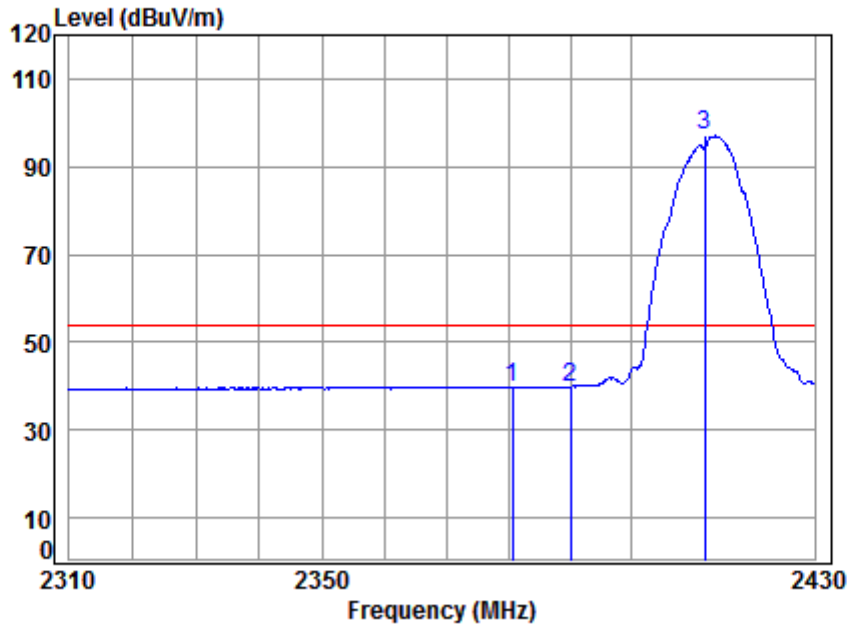
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11.7.1.15 802.11G_Lowest Channel_ Average _ Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90027
 Mode : 2412 Band edge
 : 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2380.667	5.46	28.50	41.87	47.79	39.88	54.00	-14.12	Average
2	2390.000	5.47	28.52	41.87	47.67	39.79	54.00	-14.21	Average
3 *	2412.000	5.50	28.56	41.88	104.78	96.96	54.00	42.96	Average

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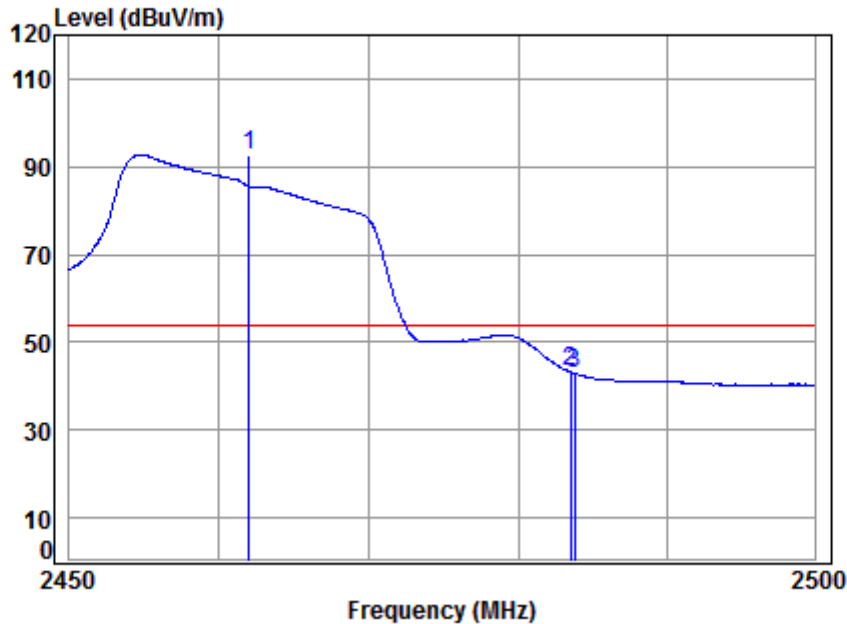
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11.7.1.16 802.11G_Highest Channel_Average_Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90027
 Mode : 2462 Band edge
 : 2.4G WIFI 11G

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2462.000	5.57	28.64	41.90	100.32	92.63	54.00	38.63	Average
2 2483.500	5.60	28.67	41.91	50.92	43.28	54.00	-10.72	Average
3 2483.790	5.60	28.67	41.91	50.55	42.91	54.00	-11.09	Average

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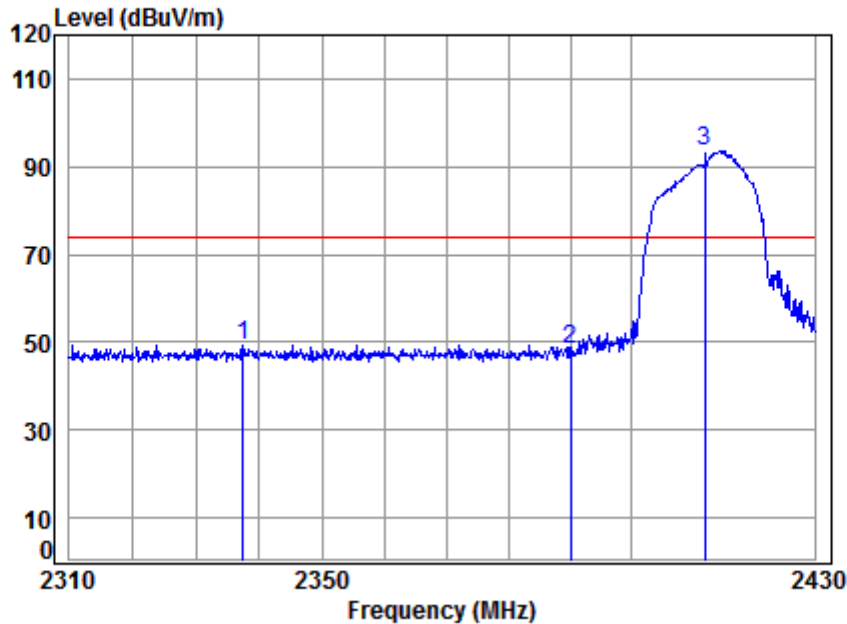
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11.7.1.17 802.11N20_Lowest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2337.419	5.40	28.43	41.85	57.23	49.21	74.00	-24.79	peak
2	2390.000	5.47	28.52	41.87	56.39	48.51	74.00	-25.49	peak
3 *	2412.000	5.50	28.56	41.88	101.56	93.74	74.00	19.74	peak

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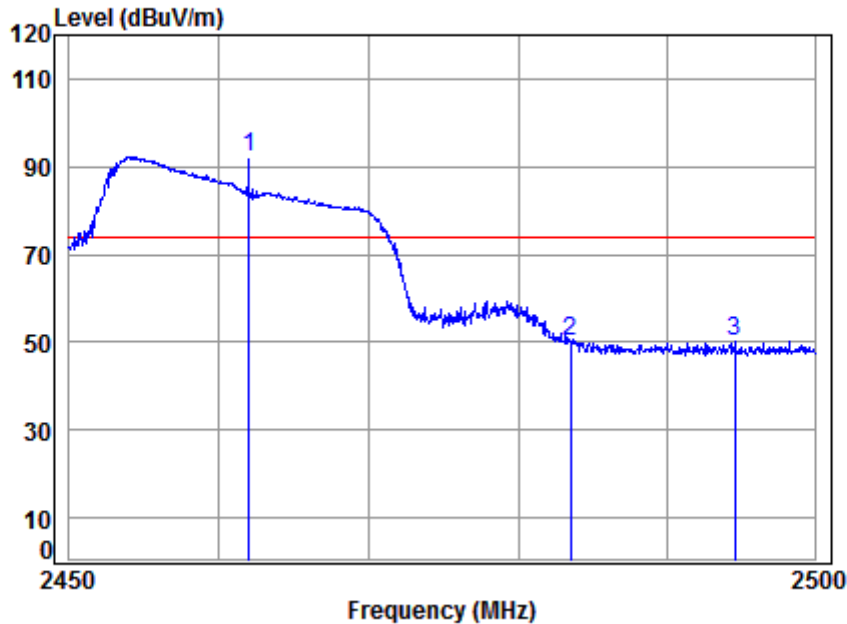
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11.7.1.18 802.11N20_ Highest Channel_ Peak_ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2462.000	5.57	28.64	41.90	99.86	92.17	74.00	18.17	peak
2	2483.500	5.60	28.67	41.91	57.78	50.14	74.00	-23.86	peak
3	2494.602	5.61	28.69	41.92	57.73	50.11	74.00	-23.89	peak

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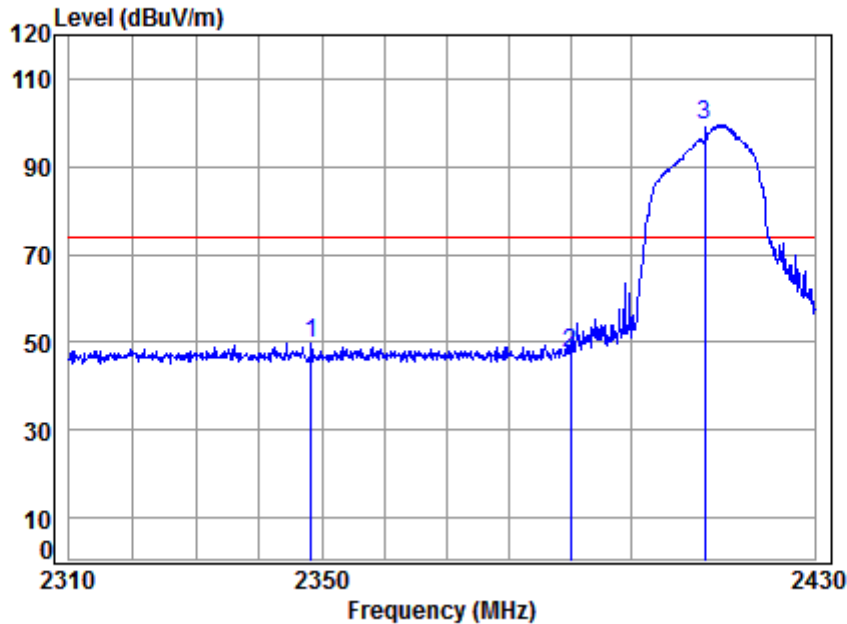
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11.7.1.19 802.11N20_Lowest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2348.335	5.42	28.45	41.85	57.64	49.66	74.00	-24.34	peak
2	2390.000	5.47	28.52	41.87	55.26	47.38	74.00	-26.62	peak
3 *	2412.000	5.50	28.56	41.88	107.46	99.64	74.00	25.64	peak

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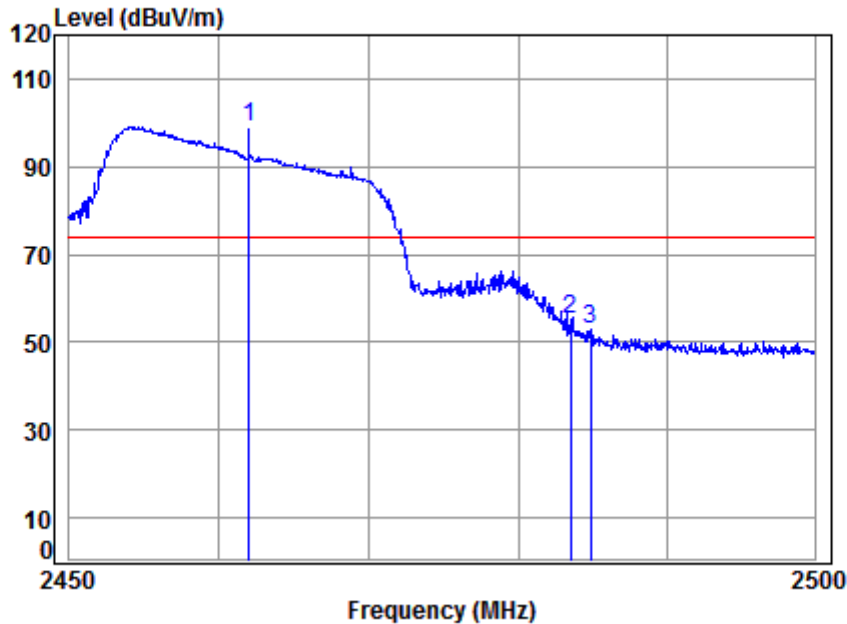
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11.7.1.20 802.11N20_ Highest Channel_ Peak_ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2462.000	5.57	28.64	41.90	106.59	98.90	74.00	24.90	peak
2	2483.500	5.60	28.67	41.91	62.66	55.02	74.00	-18.98	peak
3	2484.844	5.60	28.68	41.91	60.56	52.93	74.00	-21.07	peak

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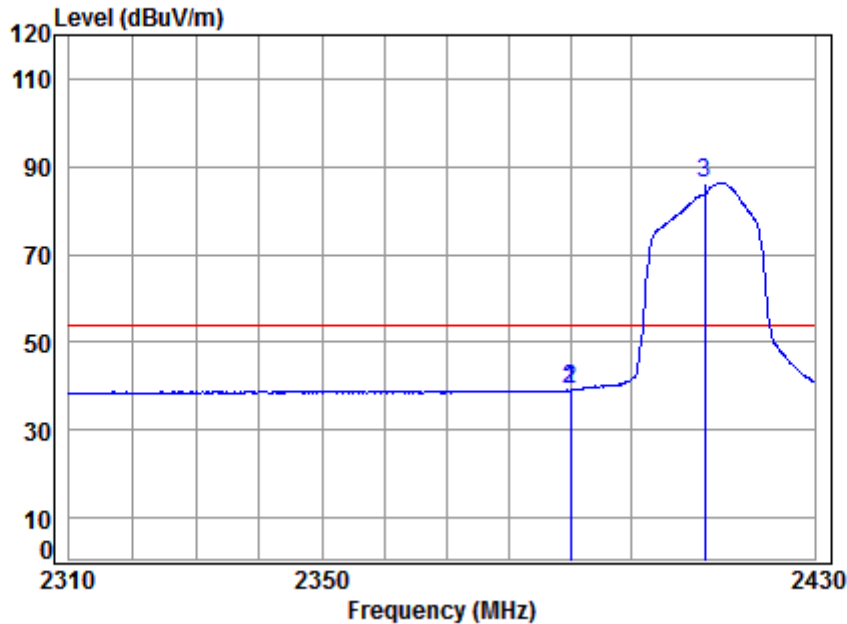
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11.7.1.21 802.11N20_Lowest Channel_ Average_ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2389.968	5.47	28.52	41.87	47.02	39.14	54.00	-14.86	Average
2	2390.000	5.47	28.52	41.87	47.02	39.14	54.00	-14.86	Average
3 *	2412.000	5.50	28.56	41.88	94.09	86.27	54.00	32.27	Average

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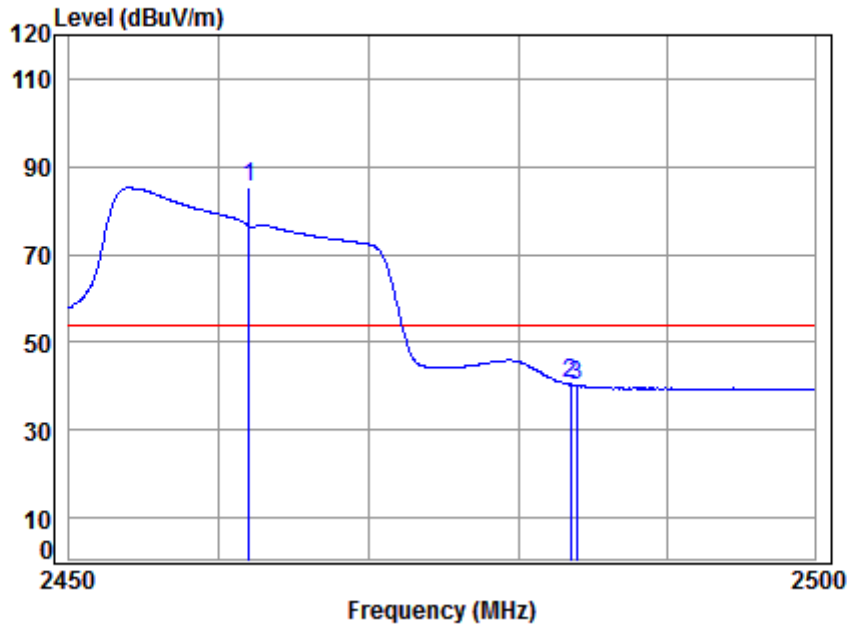
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11.7.1.22 802.11N20_ Highest Channel_ Average _ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2462 Band edge
: 2.4G WIFI 11N20

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2462.000	5.57	28.64	41.90	92.85	85.16	54.00	31.16	Average
2 2483.500	5.60	28.67	41.91	48.04	40.40	54.00	-13.60	Average
3 2483.940	5.60	28.67	41.91	47.90	40.26	54.00	-13.74	Average

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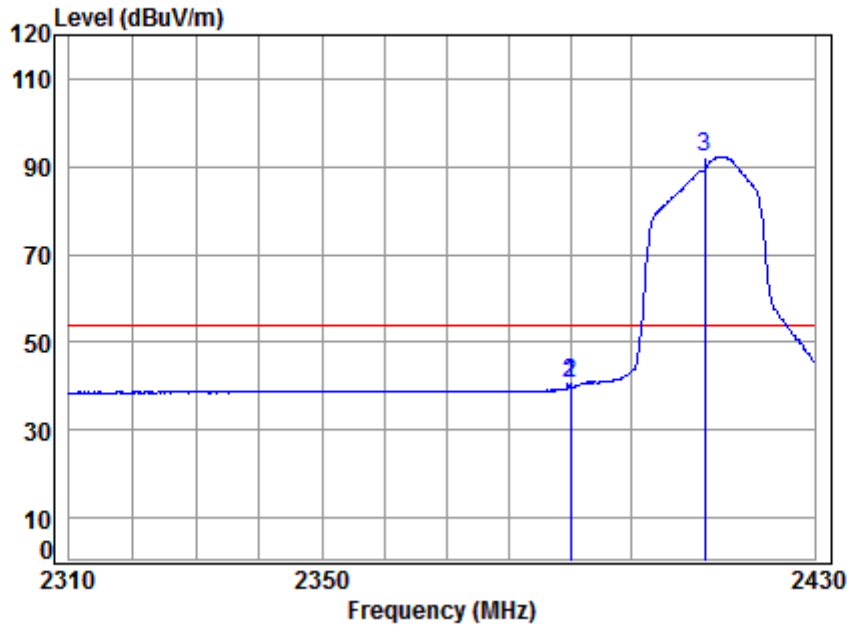
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11.7.1.23 802.11N20_Lowest Channel_ Average _ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2412 Band edge
: 2.4G WIFI 11N20

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2389.968	5.47	28.52	41.87	48.52	40.64	54.00	-13.36	Average
2	2390.000	5.47	28.52	41.87	48.52	40.64	54.00	-13.36	Average
3 *	2412.000	5.50	28.56	41.88	100.20	92.38	54.00	38.38	Average

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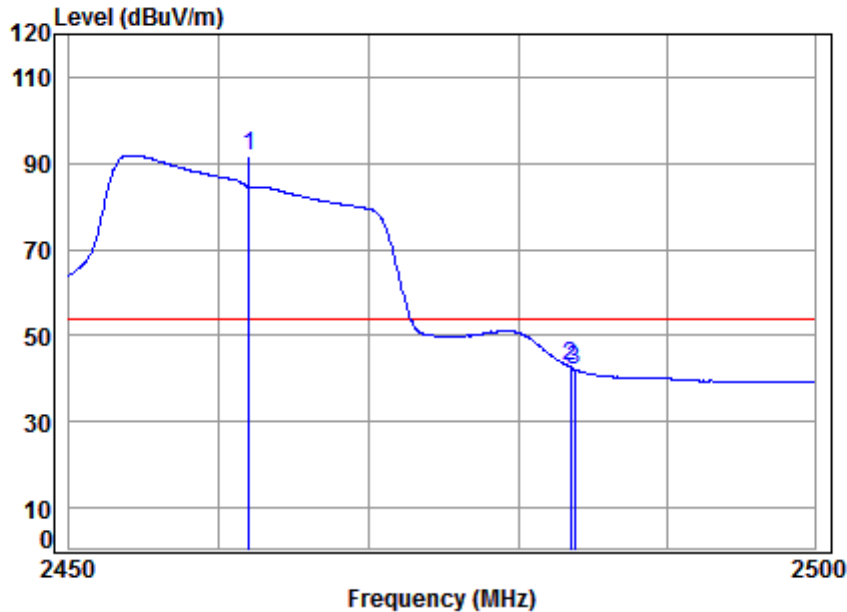
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11.7.1.24 802.11N20_ Highest Channel_ Average_ Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90027
 Mode : 2462 Band edge
 : 2.4G WIFI 11N20

		Cable	Ant	Preamp	Read	Limit	Over	
Freq		Loss	Factor	Factor	Level	Line	Limit	Remark
MHz		dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 *	2462.000	5.57	28.64	41.90	99.56	91.87	54.00	37.87 Average
2	2483.500	5.60	28.67	41.91	50.41	42.77	54.00	-11.23 Average
3	2483.790	5.60	28.67	41.91	49.78	42.14	54.00	-11.86 Average

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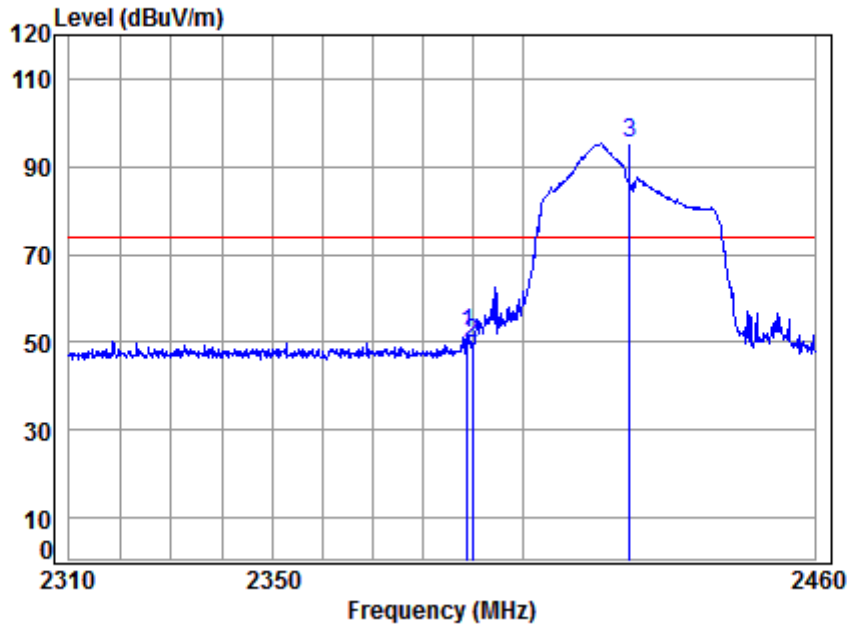
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11.7.1.25 802.11N40_Lowest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2422 Band edge
: 2.4G WIFI 11N40

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2388.925	5.47	28.52	41.87	59.98	52.10	74.00	-21.90	peak
2	2390.000	5.47	28.52	41.87	57.60	49.72	74.00	-24.28	peak
3 *	2422.000	5.52	28.57	41.89	103.04	95.24	74.00	21.24	peak

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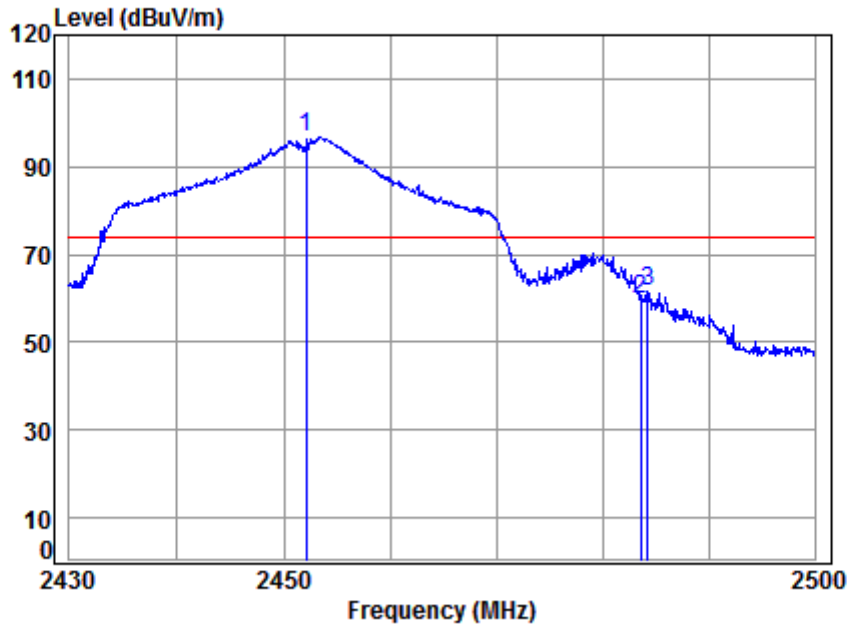
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11.7.1.26 802.11N40_ Highest Channel_ Peak_ Vertical



Site : chamber

Condition: 3m VERTICAL

Job No : 90027

Mode : 2452 Band edge

: 2.4G WIFI 11N40

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2452.000	5.56	28.62	41.90	104.38	96.66	74.00	22.66	peak
2	2483.500	5.60	28.67	41.91	67.39	59.75	74.00	-14.25	peak
3	2484.147	5.60	28.67	41.91	69.05	61.41	74.00	-12.59	peak

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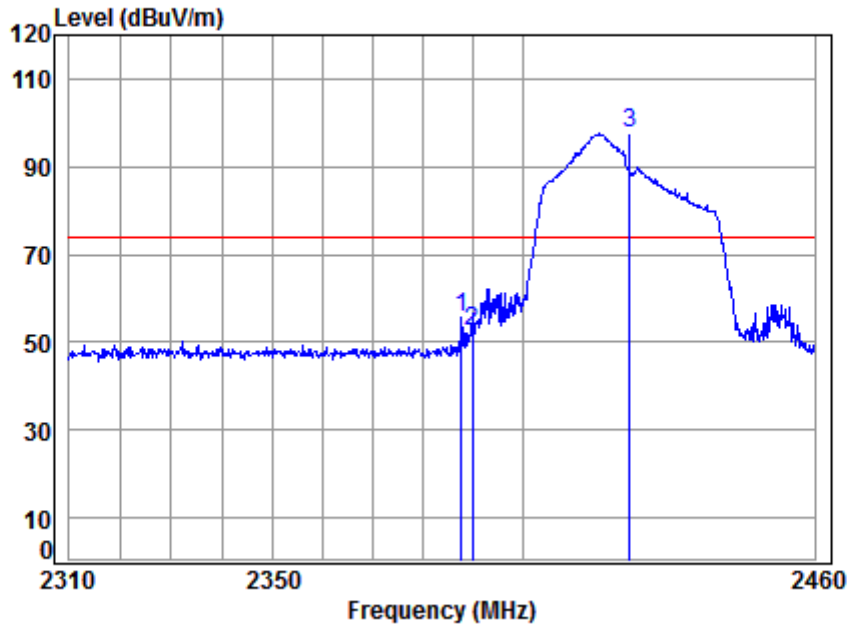
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11.7.1.27 802.11N40_Lowest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2422 Band edge
: 2.4G WIFI 11N40

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2387.723	5.47	28.51	41.87	63.78	55.89	74.00	-18.11	peak
2	2390.000	5.47	28.52	41.87	60.50	52.62	74.00	-21.38	peak
3 *	2422.000	5.52	28.57	41.89	105.47	97.67	74.00	23.67	peak

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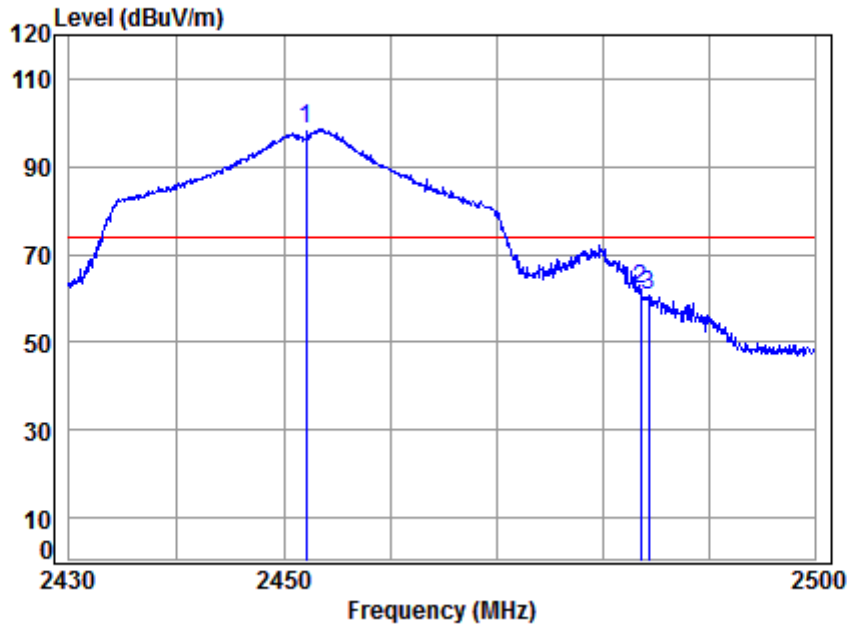
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11.7.1.28 802.11N40_ Highest Channel_ Peak_ Horizontal



Site : chamber

Condition: 3m HORIZONTAL

Job No : 90027

Mode : 2452 Band edge

: 2.4G WIFI 11N40

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2452.000	5.56	28.62	41.90	106.24	98.52	74.00	24.52	peak
2	2483.500	5.60	28.67	41.91	69.80	62.16	74.00	-11.84	peak
3	2484.217	5.60	28.67	41.91	68.20	60.56	74.00	-13.44	peak

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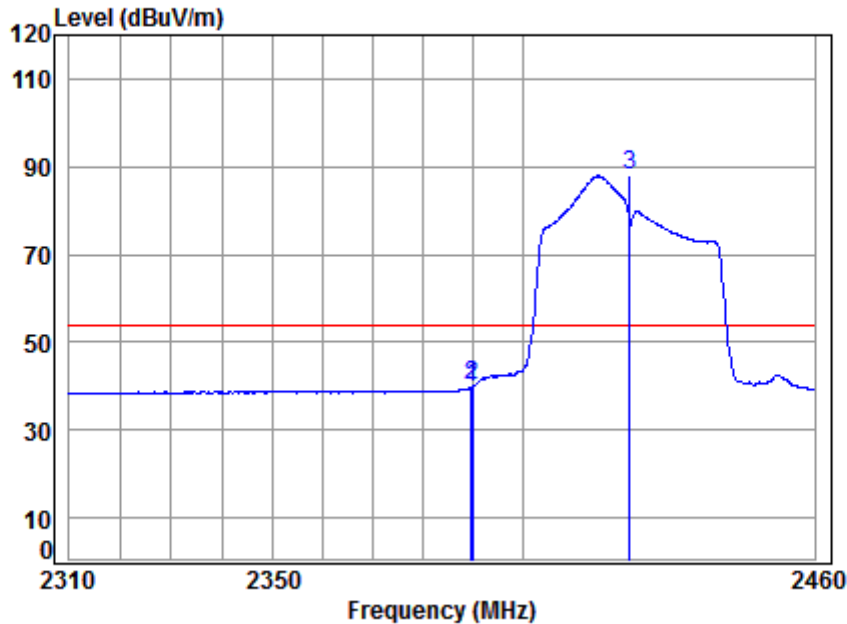
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11.7.1.29 802.11N40_Lowest Channel_ Average_ Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90027
 Mode : 2422 Band edge
 : 2.4G WIFI 11N40

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2389.827	5.47	28.52	41.87	47.70	39.82	54.00	-14.18	Average
2	2390.000	5.47	28.52	41.87	47.86	39.98	54.00	-14.02	Average
3 *	2422.000	5.52	28.57	41.89	95.65	87.85	54.00	33.85	Average

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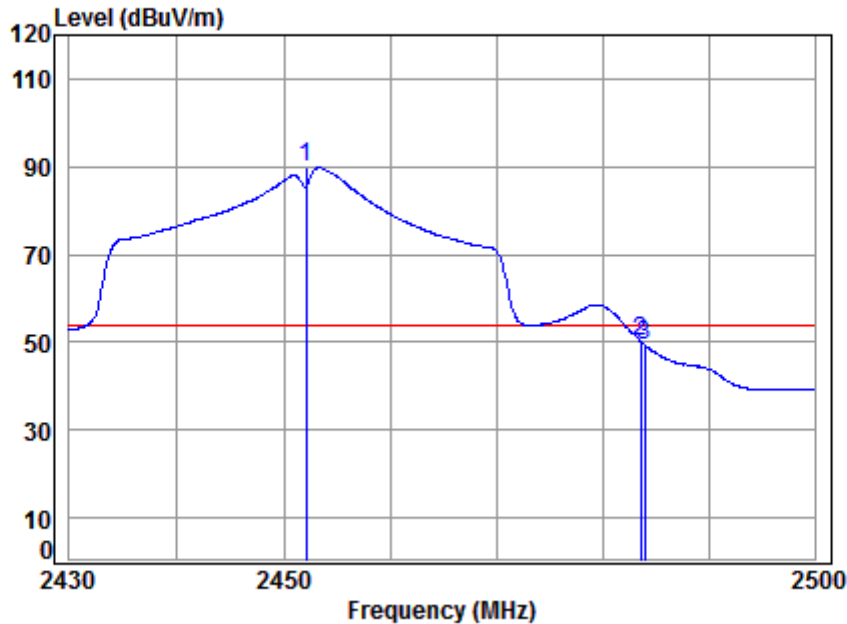
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11.7.1.30 802.11N40_ Highest Channel_ Average _ Vertical



Site : chamber

Condition: 3m VERTICAL

Job No : 90027

Mode : 2452 Band edge

: 2.4G WIFI 11N40

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2452.000	5.56	28.62	41.90	97.48	89.76	54.00	35.76	Average
2 2483.500	5.60	28.67	41.91	57.84	50.20	54.00	-3.80	Average
3 2483.865	5.60	28.67	41.91	57.11	49.47	54.00	-4.53	Average

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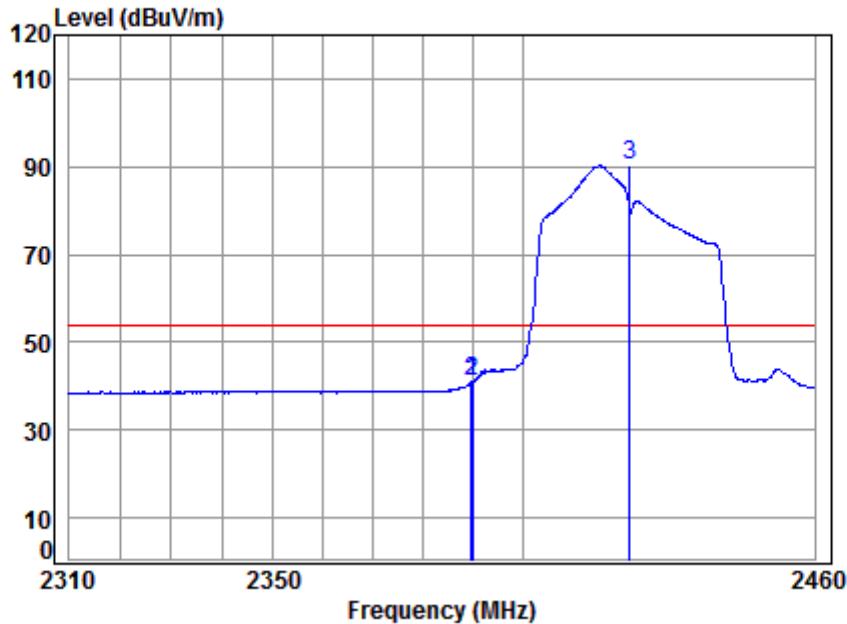
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11.7.1.31 802.11N40_Lowest Channel_ Average _ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2422 Band edge
: 2.4G WIFI 11N40

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2389.827	5.47	28.52	41.87	48.89	41.01	54.00	-12.99	Average
2	2390.000	5.47	28.52	41.87	49.00	41.12	54.00	-12.88	Average
3 *	2422.000	5.52	28.57	41.89	97.93	90.13	54.00	36.13	Average

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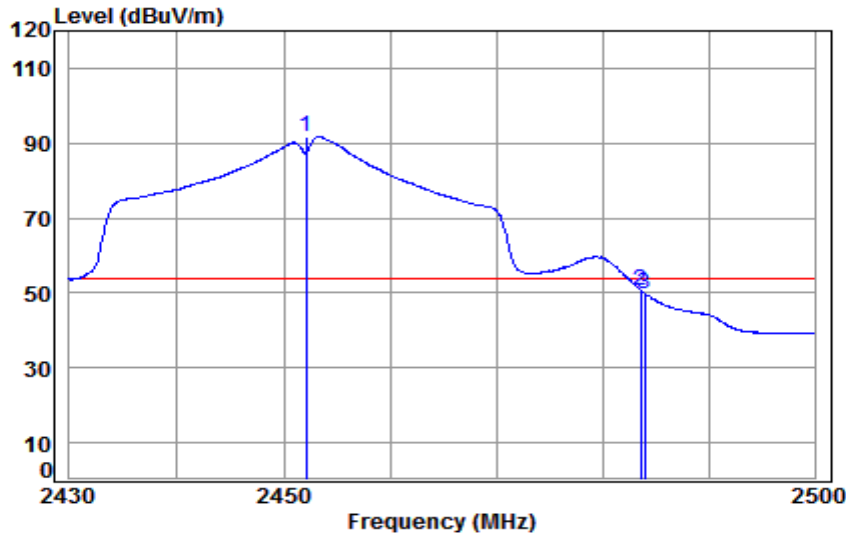
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11.7.1.32 802.11N40_ Highest Channel_ Average_ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2452 Band edge
: 2.4G WIFI 11N40

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2452.000	5.56	28.62	41.90	99.36	91.64	54.00	37.64	Average
2	2483.500	5.60	28.67	41.91	58.34	50.70	54.00	-3.30	Average
3	2483.865	5.60	28.67	41.91	57.50	49.86	54.00	-4.14	Average

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

All Modes have been tested, but only the worst case data displayed in this report.

11.7.2 Radiated emission below 1GHz

The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

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$$L_3 / L_{10} = D_{10} / D_3$$

Remark:

L₃: Level @ 3m distance. Unit: uV/m;

L₁₀: Level @ 10m distance. Unit: uV/m;

D₃: 3m distance. Unit: m

D₁₀: 10m distance. Unit: m

The level at 3m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Over Limit (dB)	Ant. Polarization
47.49	14.7	5.43	18.11	25.16	40	-14.84	V
166.07	14.65	5.40	18.00	25.11	40	-14.89	V
248.55	13.05	4.49	14.98	23.51	43.5	-19.99	V
350.48	16.55	6.72	22.41	27.01	46	-18.99	V
515.44	19.88	9.86	32.88	30.34	46	-15.66	V
912.86	26.39	20.87	69.56	36.85	46	-9.15	V
40.7	13.57	4.77	15.90	24.03	40	-15.97	H
154.82	15.22	5.77	19.23	25.68	40	-14.32	H
283.98	14.12	5.08	16.94	24.58	43.5	-18.92	H
413.27	17.39	7.40	24.68	27.85	46	-18.15	H
638.37	22.55	13.41	44.71	33.01	46	-12.99	H
919.29	26.39	20.87	69.56	36.85	46	-9.15	H

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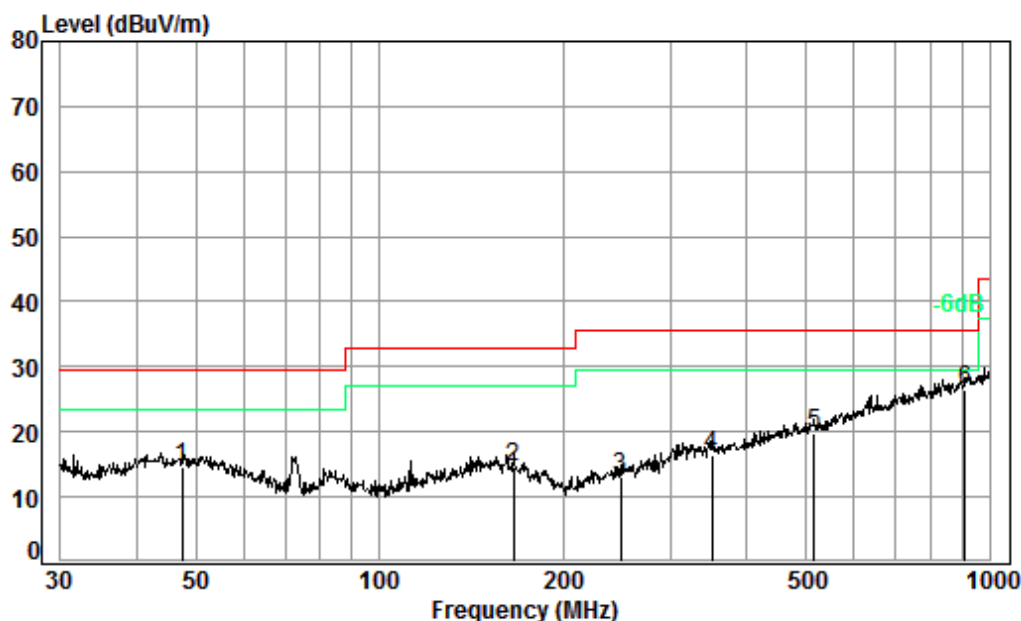
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11.7.2.1 Charge + Transmitting, Vertical



Condition: 10m VERTICAL

Job No. : 90027

Test Mode: d

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	47.49	6.89	12.84	32.45	27.42	14.70	29.50	-14.80
2	166.07	7.50	12.79	32.42	26.78	14.65	33.00	-18.35
3	248.55	7.83	11.22	32.38	26.38	13.05	35.60	-22.55
4	350.48	8.17	13.85	32.35	26.88	16.55	35.60	-19.05
5	515.44	8.65	17.09	32.35	26.49	19.88	35.60	-15.72
6 pp	912.86	9.50	22.40	31.48	25.97	26.39	35.60	-9.21

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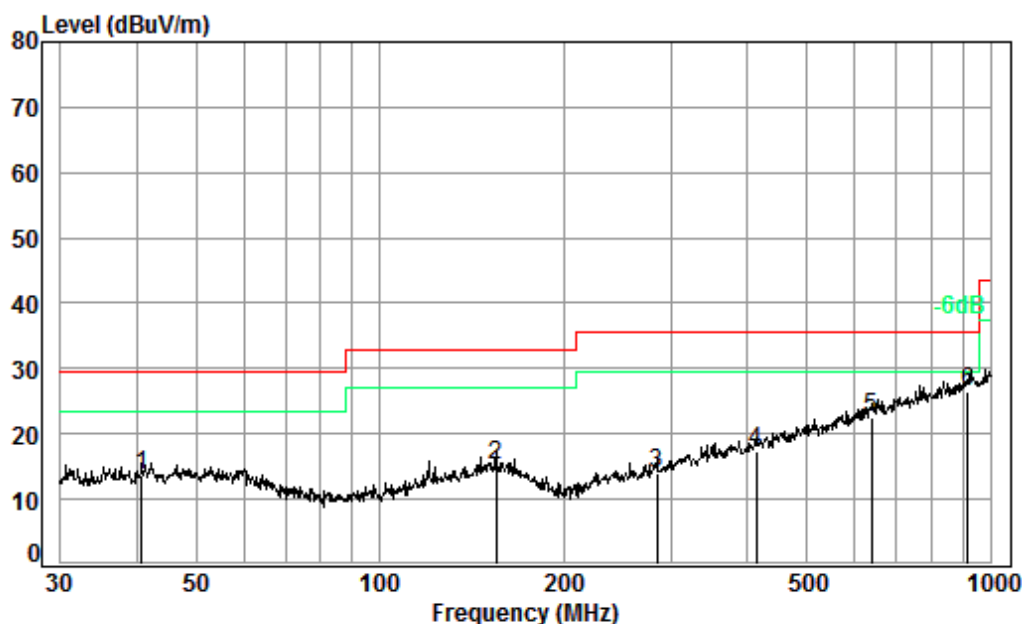
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11.7.2.2 Charge + Transmitting, Horizontal



Condition: 10m HORIZONTAL

Job No. : 90027

Test Mode: d

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	40.70	6.83	13.26	32.46	25.94	13.57	29.50	-15.93
2	154.82	7.46	13.40	32.43	26.79	15.22	33.00	-17.78
3	283.98	7.96	12.26	32.37	26.27	14.12	35.60	-21.48
4	413.27	8.35	15.23	32.34	26.15	17.39	35.60	-18.21
5	638.37	8.96	19.39	32.35	26.55	22.55	35.60	-13.05
6 pp	919.29	9.51	22.48	31.42	25.82	26.39	35.60	-9.21

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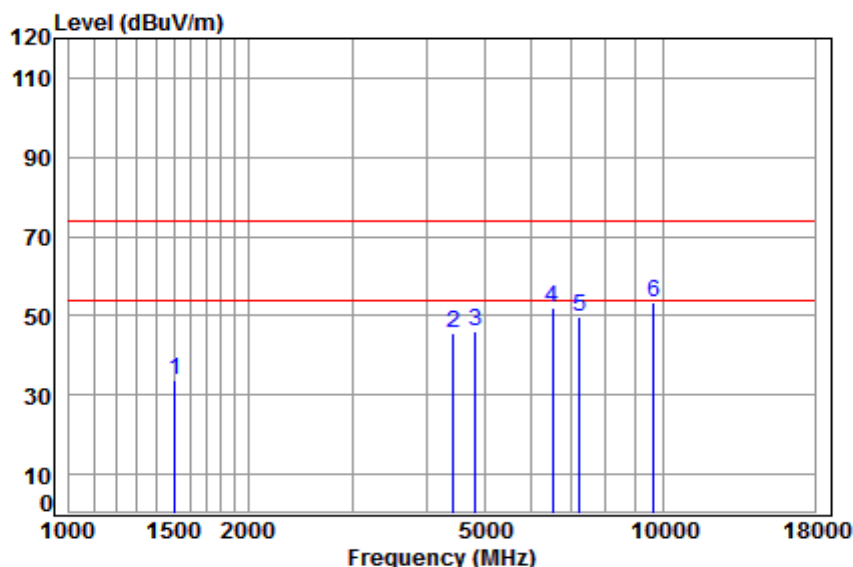
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11.7.3 Transmitter emission above 1GHz

11.7.3.1 802.11B_Lowest Channel_Peak_Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90027
 Mode : 2412 TX RSE
 Note : 2.4G WIFI 11B

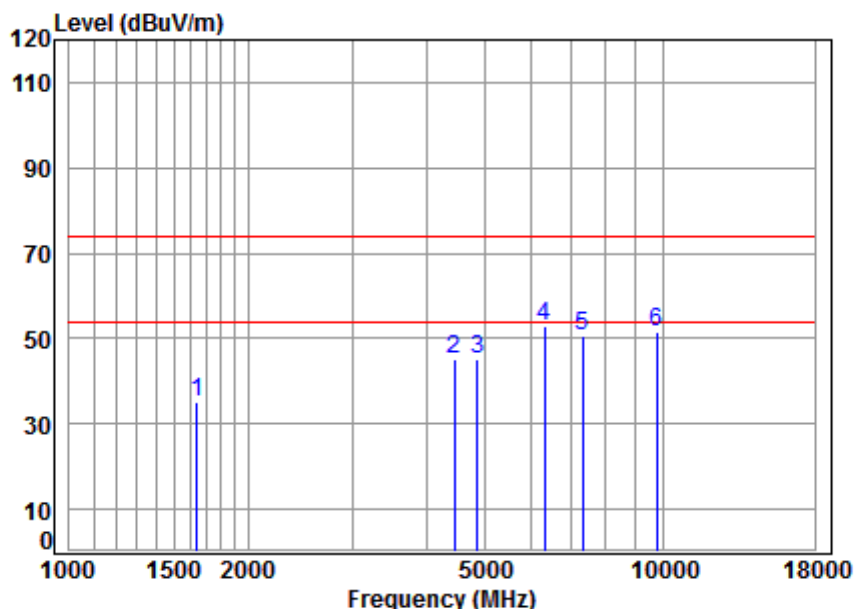
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1507.470	5.47	25.83	41.41	44.02	33.91	74.00	-40.09	peak
2	4443.453	7.50	33.50	42.41	46.94	45.53	74.00	-28.47	peak
3	4824.000	7.91	34.00	42.47	46.84	46.28	74.00	-27.72	peak
4	6507.536	11.52	35.60	41.21	46.29	52.20	74.00	-21.80	peak
5	7236.000	10.07	36.09	40.69	44.28	49.75	74.00	-24.25	peak
6	9648.000	10.77	37.69	37.68	42.53	53.31	74.00	-20.69	peak

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11.7.3.2 802.11B_ Middle Channel_ Peak_ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2437 TX RSE
Note : 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1644.019	5.30	26.44	41.50	44.84	35.08	74.00	-38.92	peak
2	4456.315	7.51	33.53	42.41	46.63	45.26	74.00	-28.74	peak
3	4874.000	7.96	34.05	42.48	45.73	45.26	74.00	-28.74	peak
4	6322.136	11.20	35.43	41.35	47.67	52.95	74.00	-21.05	peak
5	7311.000	10.05	36.15	40.64	45.03	50.59	74.00	-23.41	peak
6	9748.000	10.82	37.75	37.54	40.56	51.59	74.00	-22.41	peak

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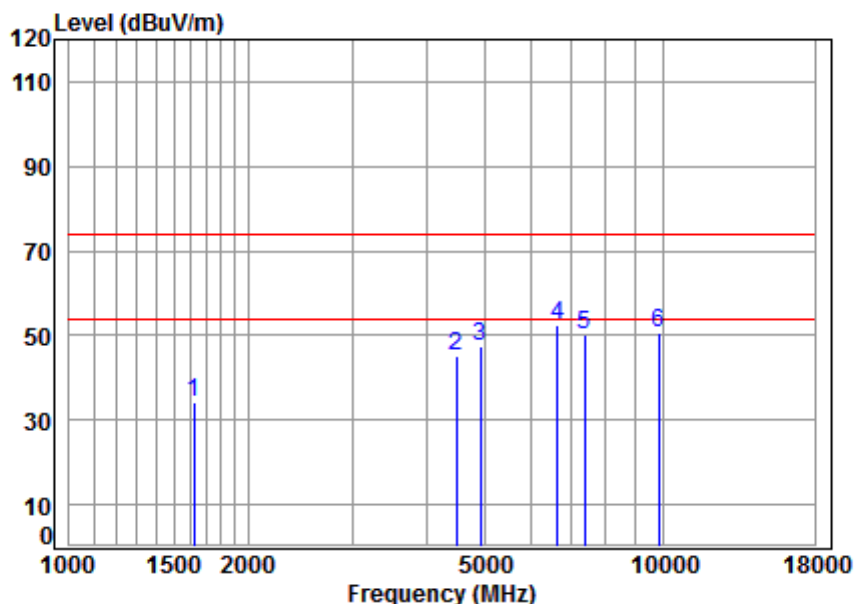
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11.7.3.3 802.11B_ Highest Channel_ Peak_ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2462 TX RSE
Note : 2.4G WIFI 11B

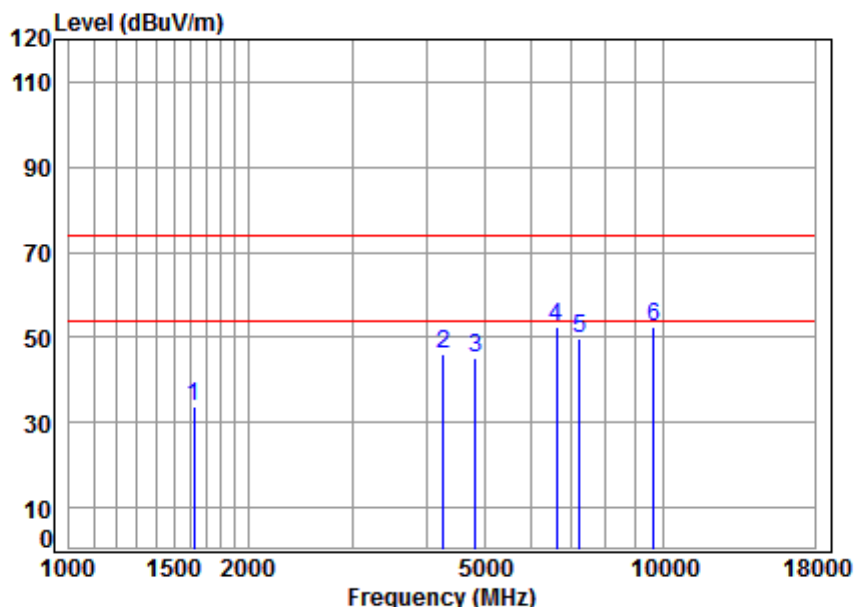
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1620.431	5.32	26.34	41.48	43.98	34.16	74.00	-39.84	peak
2	4495.125	7.55	33.59	42.42	46.31	45.03	74.00	-28.97	peak
3	4924.000	8.01	34.11	42.49	47.69	47.32	74.00	-26.68	peak
4	6640.542	11.13	35.69	41.11	46.91	52.62	74.00	-21.38	peak
5	7386.000	10.03	36.21	40.59	44.55	50.20	74.00	-23.80	peak
6	9848.000	10.87	37.81	37.41	39.53	50.80	74.00	-23.20	peak

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11.7.3.4 802.11B_Lowest Channel_Peak_Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90027
 Mode : 2412 TX RSE
 Note : 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1625.121	5.32	26.36	41.49	43.55	33.74	74.00	-40.26	peak
2	4267.237	7.30	33.19	42.38	47.86	45.97	74.00	-28.03	peak
3	4824.000	7.91	34.00	42.47	45.95	45.39	74.00	-28.61	peak
4	6621.375	11.19	35.67	41.13	46.58	52.31	74.00	-21.69	peak
5	7236.000	10.07	36.09	40.69	44.46	49.93	74.00	-24.07	peak
6	9648.000	10.77	37.69	37.68	41.51	52.29	74.00	-21.71	peak

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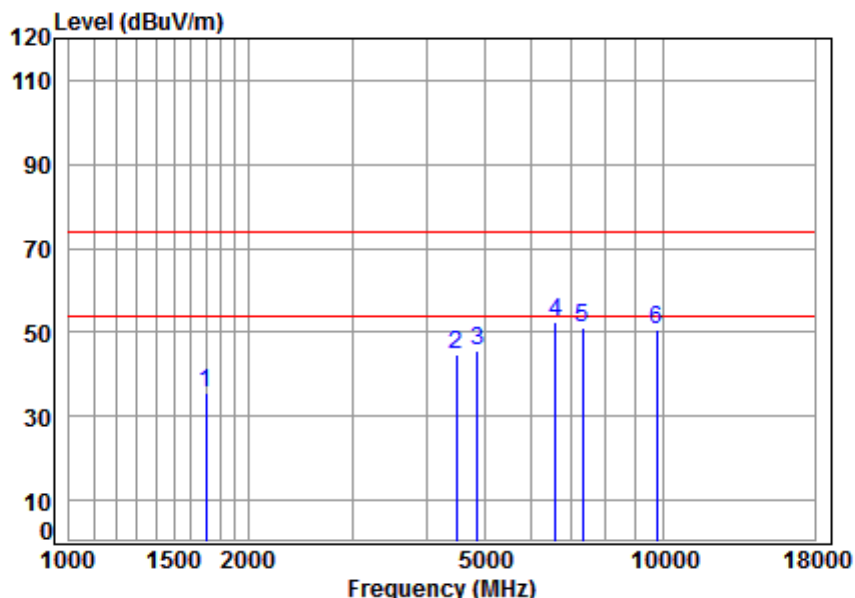
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11.7.3.5 802.11B_ Middle Channel_ Peak_ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2437 TX RSE
Note : 2.4G WIFI 11B

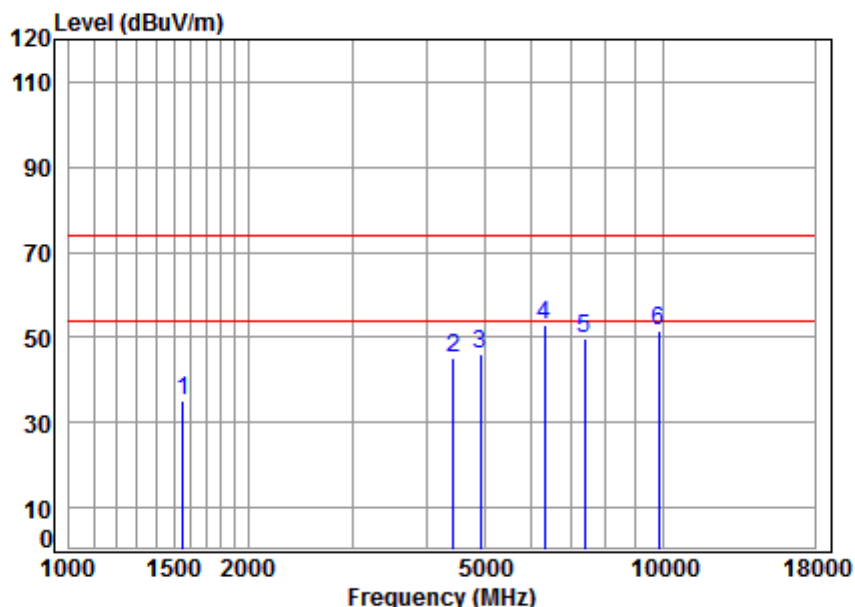
	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1697.129	5.23	26.66	41.53	45.05	35.41	74.00	-38.59	peak
2	4482.150	7.54	33.57	42.41	46.19	44.89	74.00	-29.11	peak
3	4874.000	7.96	34.05	42.48	46.21	45.74	74.00	-28.26	peak
4	6583.209	11.30	35.65	41.15	46.78	52.58	74.00	-21.42	peak
5	7311.000	10.05	36.15	40.64	45.38	50.94	74.00	-23.06	peak
6	9748.000	10.82	37.75	37.54	39.60	50.63	74.00	-23.37	peak

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11.7.3.6 802.11B_ Highest Channel_ Peak_ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2462 TX RSE
Note : 2.4G WIFI 11B

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1556.169	5.41	26.06	41.44	45.05	35.08	74.00	-38.92	peak
2	4430.628	7.48	33.48	42.41	46.62	45.17	74.00	-28.83	peak
3	4924.000	8.01	34.11	42.49	46.39	46.02	74.00	-27.98	peak
4	6322.136	11.20	35.43	41.35	47.49	52.77	74.00	-21.23	peak
5	7386.000	10.03	36.21	40.59	43.92	49.57	74.00	-24.43	peak
6	9848.000	10.87	37.81	37.41	40.50	51.77	74.00	-22.23	peak

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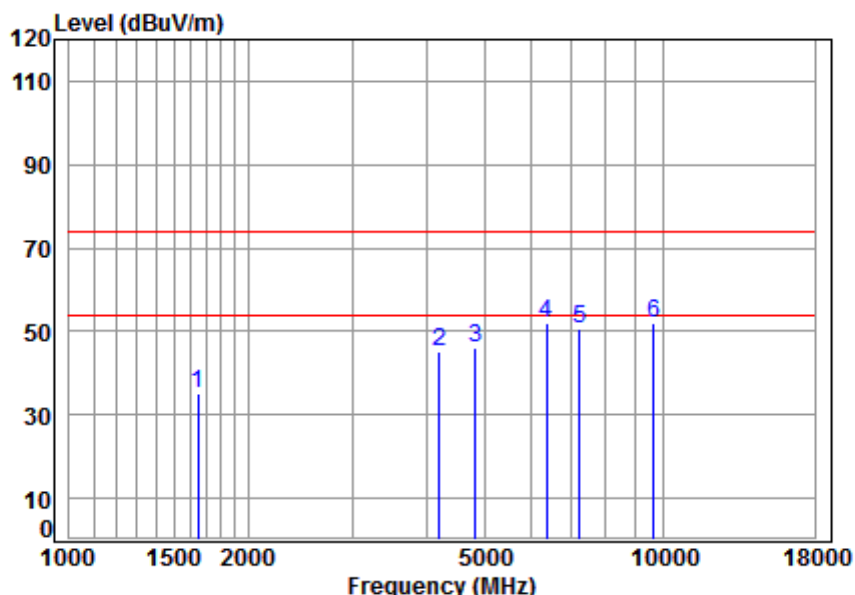
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11.7.3.7 802.11G_Lowest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2412 TX RSE
Note : 2.4G WIFI 11G

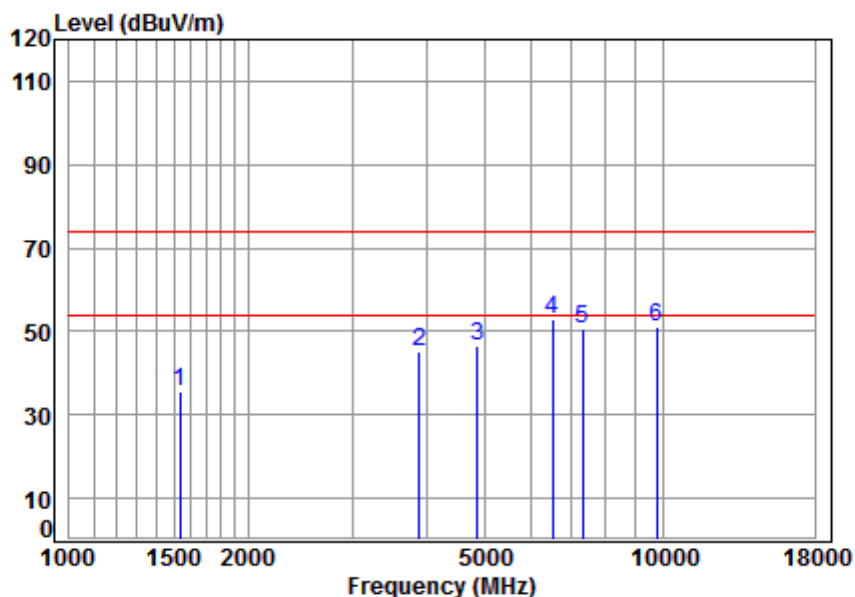
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1648.778	5.29	26.46	41.50	45.11	35.36	74.00	-38.64	peak
2	4193.872	7.21	33.06	42.36	47.36	45.27	74.00	-28.73	peak
3	4824.000	7.91	34.00	42.47	46.74	46.18	74.00	-27.82	peak
4	6377.195	11.31	35.48	41.31	46.69	52.17	74.00	-21.83	peak
5	7236.000	10.07	36.09	40.69	45.21	50.68	74.00	-23.32	peak
6	9648.000	10.77	37.69	37.68	41.19	51.97	74.00	-22.03	peak

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11.7.3.8 802.11G_ Middle Channel_ Peak_ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2437 TX RSE
Note : 2.4G WIFI 11G

	Freq	Cable Loss	Ant Factor	Preamplifier	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1538.281	5.43	25.98	41.43	45.52	35.50	74.00	-38.50	peak
2	3890.255	6.87	32.49	42.30	48.15	45.21	74.00	-28.79	peak
3	4874.000	7.96	34.05	42.48	46.86	46.39	74.00	-27.61	peak
4	6526.373	11.46	35.62	41.20	47.05	52.93	74.00	-21.07	peak
5	7311.000	10.05	36.15	40.64	45.15	50.71	74.00	-23.29	peak
6	9748.000	10.82	37.75	37.54	39.90	50.93	74.00	-23.07	peak

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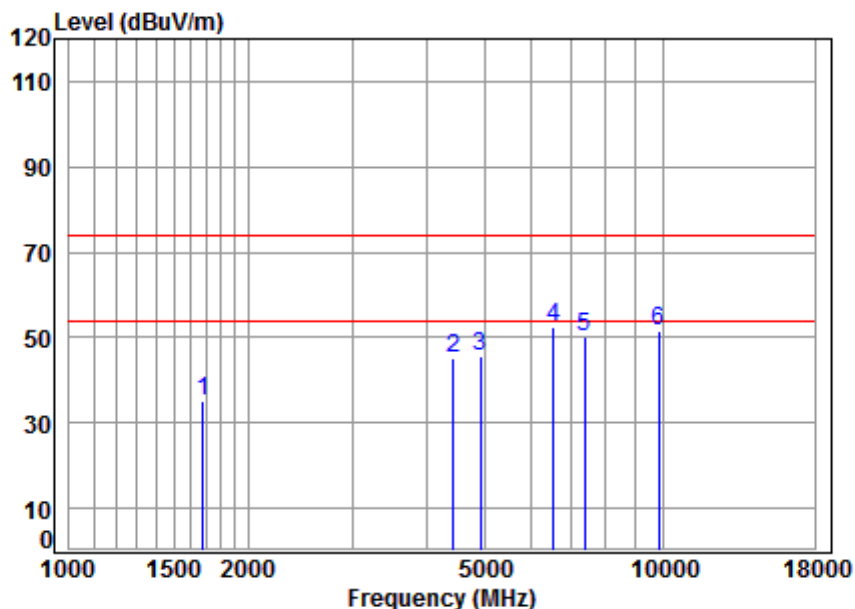
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11.7.3.9 802.11G_Highest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2462 TX RSE
Note : 2.4G WIFI 11G

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1682.477	5.25	26.60	41.52	44.93	35.26	74.00	-38.74	peak
2	4430.628	7.48	33.48	42.41	46.63	45.18	74.00	-28.82	peak
3	4924.000	8.01	34.11	42.49	45.88	45.51	74.00	-28.49	peak
4	6545.263	11.41	35.63	41.18	46.58	52.44	74.00	-21.56	peak
5	7386.000	10.03	36.21	40.59	44.50	50.15	74.00	-23.85	peak
6	9848.000	10.87	37.81	37.41	40.36	51.63	74.00	-22.37	peak

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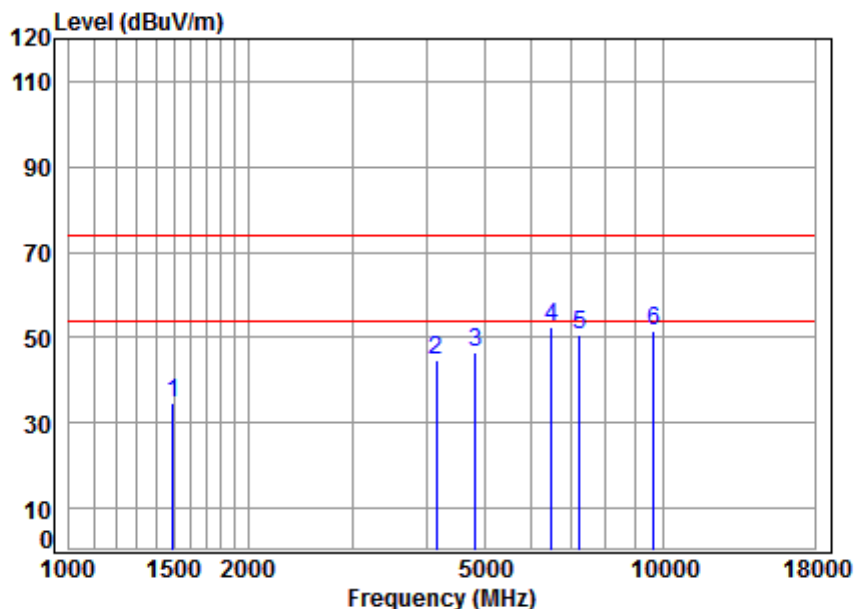
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11.7.3.10 802.11G_Lowest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2412 TX RSE
Note : 2.4G WIFI 11G

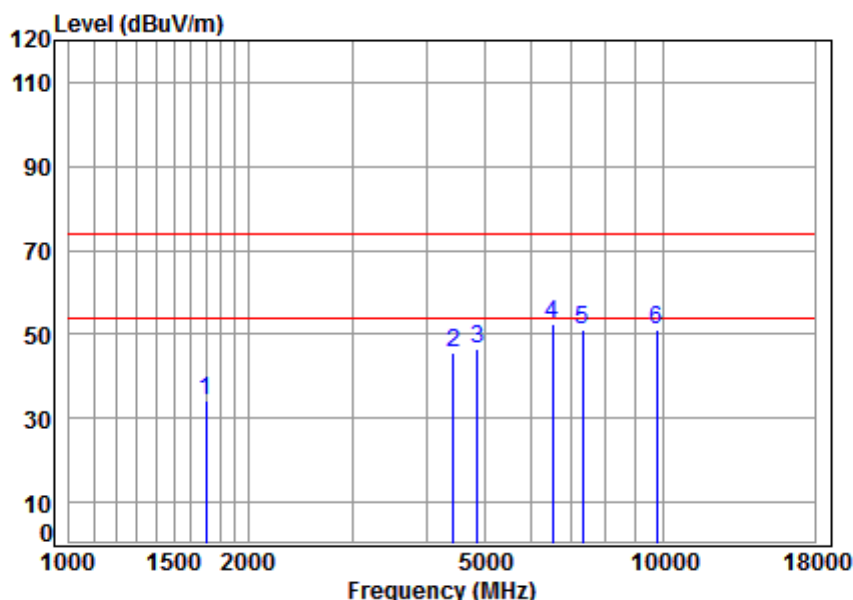
	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1494.455	5.46	25.78	41.40	45.06	34.90	74.00	-39.10	peak
2	4157.664	7.17	33.00	42.36	47.03	44.84	74.00	-29.16	peak
3	4824.000	7.91	34.00	42.47	47.11	46.55	74.00	-27.45	peak
4	6488.754	11.52	35.59	41.22	46.76	52.65	74.00	-21.35	peak
5	7236.000	10.07	36.09	40.69	45.30	50.77	74.00	-23.23	peak
6	9648.000	10.77	37.69	37.68	40.94	51.72	74.00	-22.28	peak

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11.7.3.11 802.11G_ Middle Channel_ Peak_ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2437 TX RSE
Note : 2.4G WIFI 11G

	Freq	Cable Loss	Ant Factor	Preamplifier	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1697.129	5.23	26.66	41.53	44.07	34.43	74.00	-39.57	peak
2	4430.628	7.48	33.48	42.41	47.17	45.72	74.00	-28.28	peak
3	4874.000	7.96	34.05	42.48	46.92	46.45	74.00	-27.55	peak
4	6526.373	11.46	35.62	41.20	46.49	52.37	74.00	-21.63	peak
5	7311.000	10.05	36.15	40.64	45.39	50.95	74.00	-23.05	peak
6	9748.000	10.82	37.75	37.54	39.93	50.96	74.00	-23.04	peak

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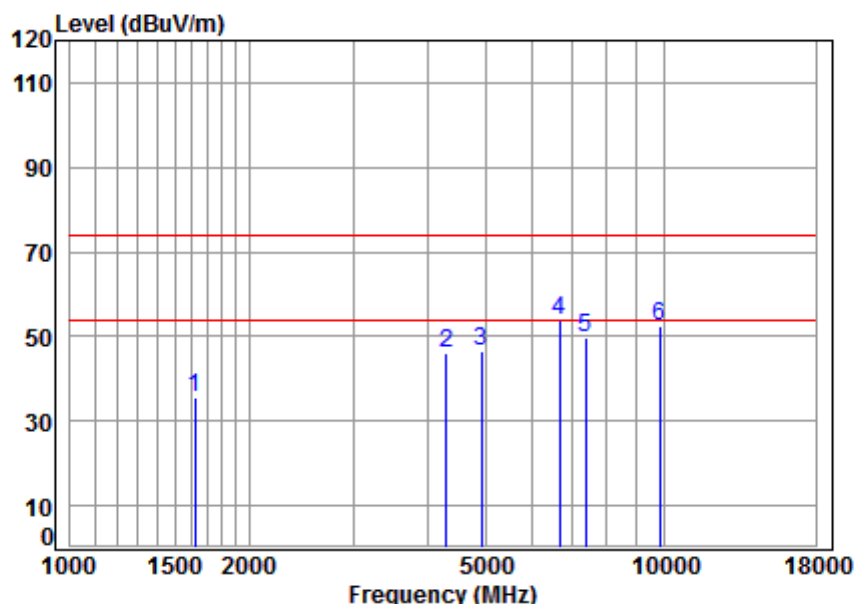
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11.7.3.12 802.11G_ Highest Channel_ Peak_ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2462 TX RSE
Note : 2.4G WIFI 11G

	Freq	Cable Loss	Ant Factor	Preamplifier	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1620.431	5.32	26.34	41.48	45.49	35.67	74.00	-38.33	peak
2	4304.400	7.34	33.26	42.38	47.65	45.87	74.00	-28.13	peak
3	4924.000	8.01	34.11	42.49	47.05	46.68	74.00	-27.32	peak
4	6679.040	11.02	35.71	41.08	48.09	53.74	74.00	-20.26	peak
5	7386.000	10.03	36.21	40.59	44.29	49.94	74.00	-24.06	peak
6	9848.000	10.87	37.81	37.41	41.08	52.35	74.00	-21.65	peak

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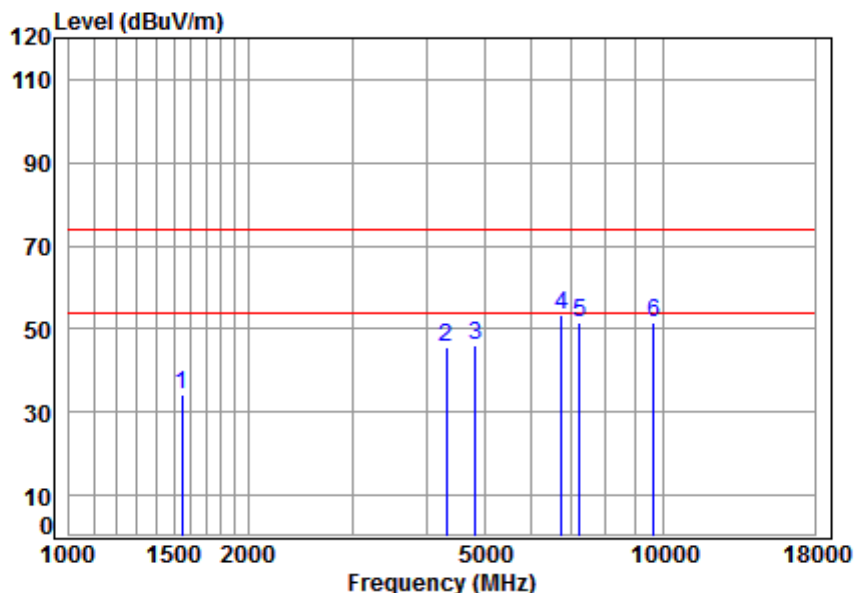
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11.7.3.13 802.11N20_Lowest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2412 TX RSE
Note : 2.4G WIFI 11N 20

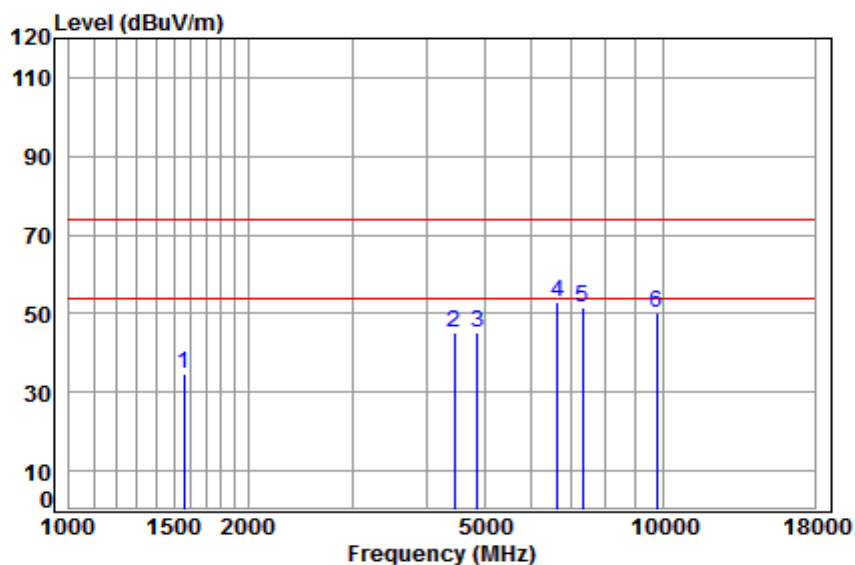
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1547.199	5.42	26.02	41.44	44.32	34.32	74.00	-39.68	peak
2	4316.859	7.36	33.28	42.38	47.53	45.79	74.00	-28.21	peak
3	4824.000	7.91	34.00	42.47	46.62	46.06	74.00	-27.94	peak
4	6737.207	10.86	35.75	41.04	47.64	53.21	74.00	-20.79	peak
5	7236.000	10.07	36.09	40.69	46.28	51.75	74.00	-22.25	peak
6	9648.000	10.77	37.69	37.68	40.99	51.77	74.00	-22.23	peak

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11.7.3.14 802.11N20_ Middle Channel_ Peak_ Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90027
 Mode : 2437 TX RSE
 Note : 2.4G WIFI 11N 20

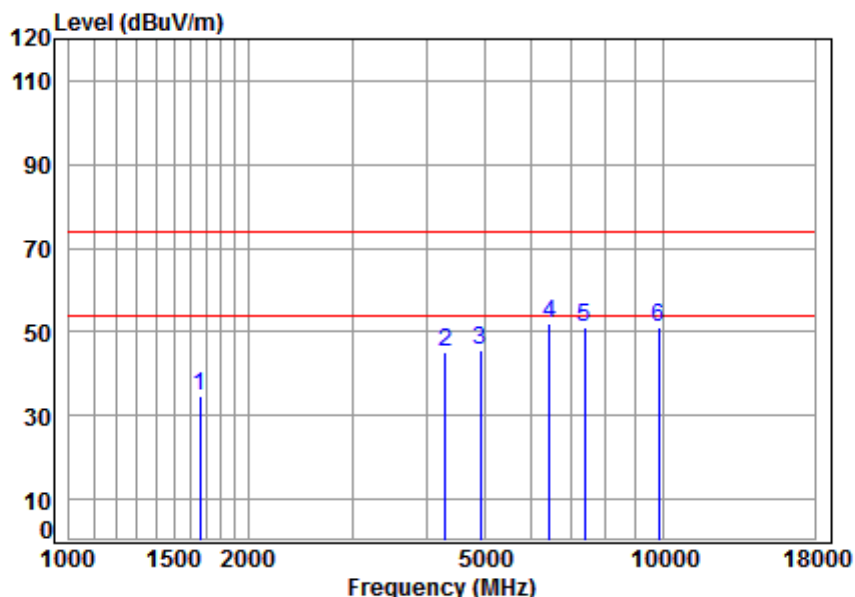
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1560.673	5.40	26.08	41.45	44.61	34.64	74.00	-39.36	peak
2	4456.315	7.51	33.53	42.41	46.57	45.20	74.00	-28.80	peak
3	4874.000	7.96	34.05	42.48	45.68	45.21	74.00	-28.79	peak
4	6640.542	11.13	35.69	41.11	47.04	52.75	74.00	-21.25	peak
5	7311.000	10.05	36.15	40.64	46.04	51.60	74.00	-22.40	peak
6	9748.000	10.82	37.75	37.54	39.36	50.39	74.00	-23.61	peak

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11.7.3.15 802.11N20_ Highest Channel_ Peak_ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2462 TX RSE
Note : 2.4G WIFI 11N 20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1663.137	5.27	26.52	41.51	44.54	34.82	74.00	-39.18	peak
2	4304.400	7.34	33.26	42.38	46.87	45.09	74.00	-28.91	peak
3	4924.000	8.01	34.11	42.49	46.03	45.66	74.00	-28.34	peak
4	6432.732	11.41	35.54	41.27	46.43	52.11	74.00	-21.89	peak
5	7386.000	10.03	36.21	40.59	45.58	51.23	74.00	-22.77	peak
6	9848.000	10.87	37.81	37.41	40.06	51.33	74.00	-22.67	peak

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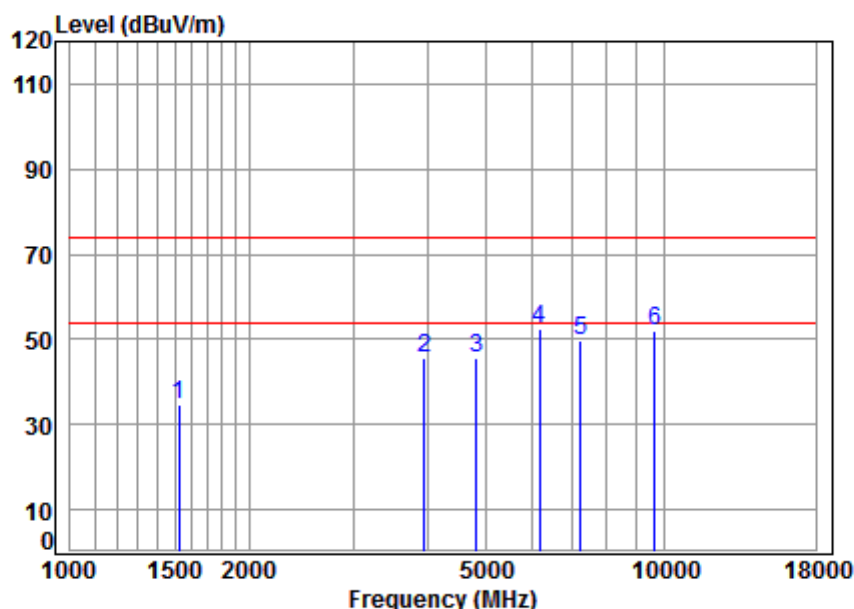
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11.7.3.16 802.11N20_Lowest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2412 TX RSE
Note : 2.4G WIFI 11N 20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1525.000	5.45	25.91	41.42	44.64	34.58	74.00	-39.42	peak
2	3946.885	6.93	32.60	42.31	48.30	45.52	74.00	-28.48	peak
3	4824.000	7.91	34.00	42.47	46.33	45.77	74.00	-28.23	peak
4	6159.797	10.89	35.26	41.48	48.02	52.69	74.00	-21.31	peak
5	7236.000	10.07	36.09	40.69	44.22	49.69	74.00	-24.31	peak
6	9648.000	10.77	37.69	37.68	41.27	52.05	74.00	-21.95	peak

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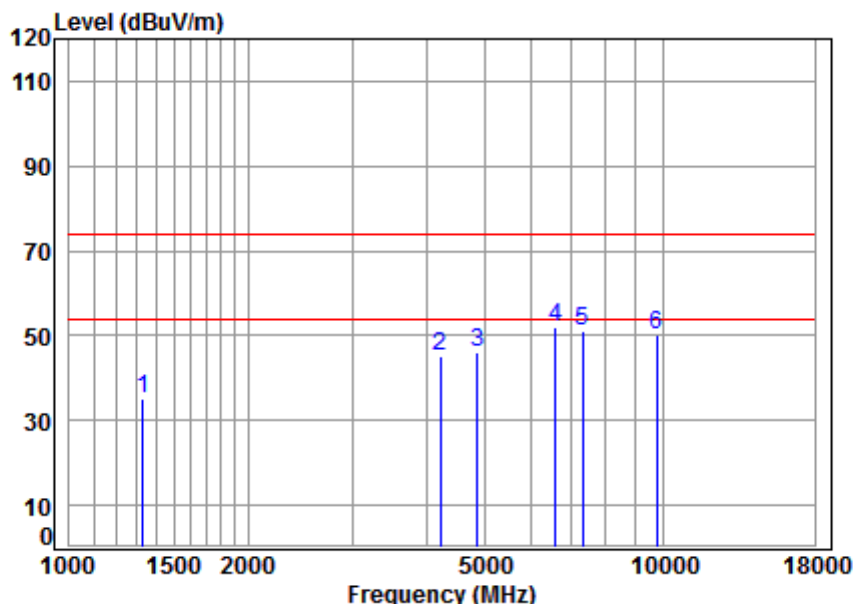
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11.7.3.17 802.11N20_ Middle Channel_ Peak_ Horizontal



Site : chamber

Condition: 3m HORIZONTAL

Job No : 90027

Mode : 2437 TX RSE

Note : 2.4G WIFI 11N 20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1331.288	4.91	25.15	41.29	46.48	35.25	74.00	-38.75	peak
2	4218.186	7.24	33.11	42.37	47.19	45.17	74.00	-28.83	peak
3	4874.000	7.96	34.05	42.48	46.65	46.18	74.00	-27.82	peak
4	6602.265	11.24	35.66	41.14	46.34	52.10	74.00	-21.90	peak
5	7311.000	10.05	36.15	40.64	45.43	50.99	74.00	-23.01	peak
6	9748.000	10.82	37.75	37.54	39.36	50.39	74.00	-23.61	peak

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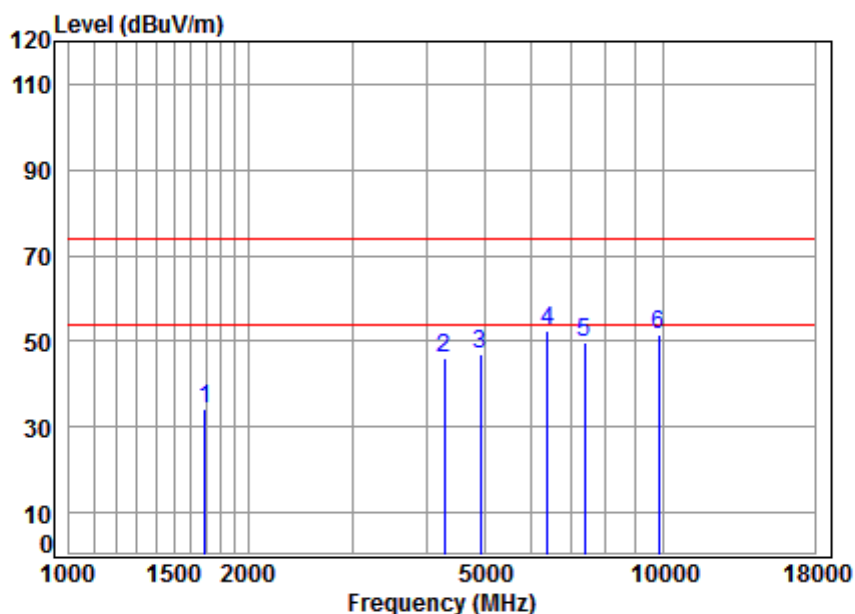
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11.7.3.18 802.11N20_ Highest Channel_ Peak_ Horizontal



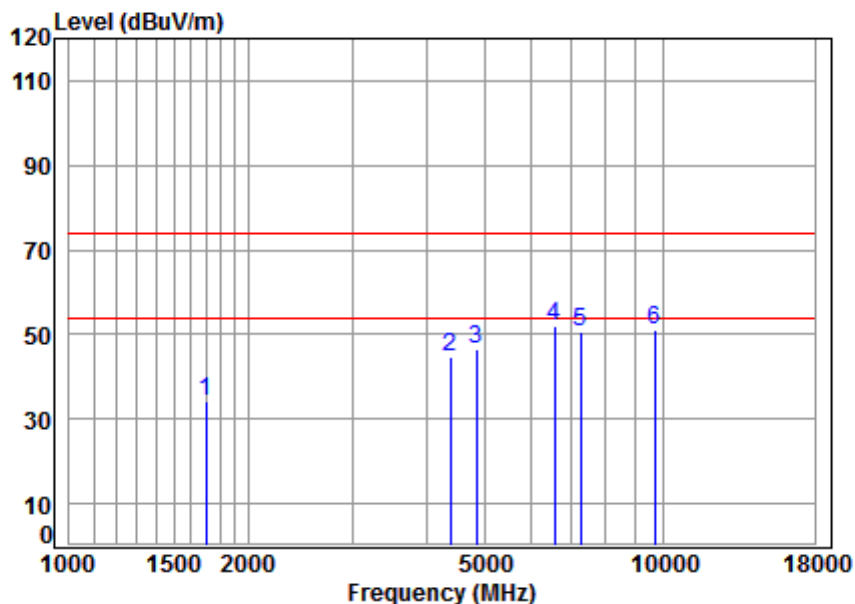
Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2462 TX RSE
Note : 2.4G WIFI 11N 20

	Freq	Cable Loss	Ant Factor	Preamplifier	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1692.231	5.24	26.64	41.53	44.04	34.39	74.00	-39.61	peak
2	4291.977	7.33	33.24	42.38	47.87	46.06	74.00	-27.94	peak
3	4924.000	8.01	34.11	42.49	47.47	47.10	74.00	-26.90	peak
4	6395.654	11.34	35.50	41.30	47.01	52.55	74.00	-21.45	peak
5	7386.000	10.03	36.21	40.59	44.16	49.81	74.00	-24.19	peak
6	9848.000	10.87	37.81	37.41	40.35	51.62	74.00	-22.38	peak

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11.7.3.19 802.11N40_Lowest Channel_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2422 TX RSE
Note : 2.4G WIFI 11N 40

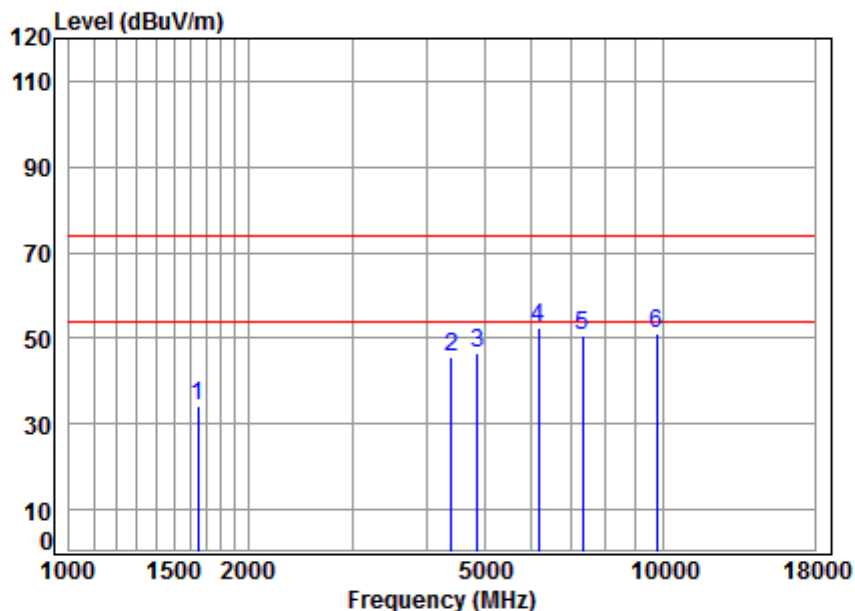
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1702.042	5.23	26.68	41.53	43.73	34.11	74.00	-39.89	peak
2	4392.376	7.44	33.42	42.40	46.34	44.80	74.00	-29.20	peak
3	4844.000	7.93	34.02	42.48	46.93	46.40	74.00	-27.60	peak
4	6564.209	11.35	35.64	41.17	46.27	52.09	74.00	-21.91	peak
5	7266.000	10.06	36.12	40.67	45.36	50.87	74.00	-23.13	peak
6	9688.000	10.79	37.71	37.63	40.29	51.16	74.00	-22.84	peak

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11.7.3.20 802.11N40_ Middle Channel_ Peak_ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2437 TX RSE
Note : 2.4G WIFI 11N 40

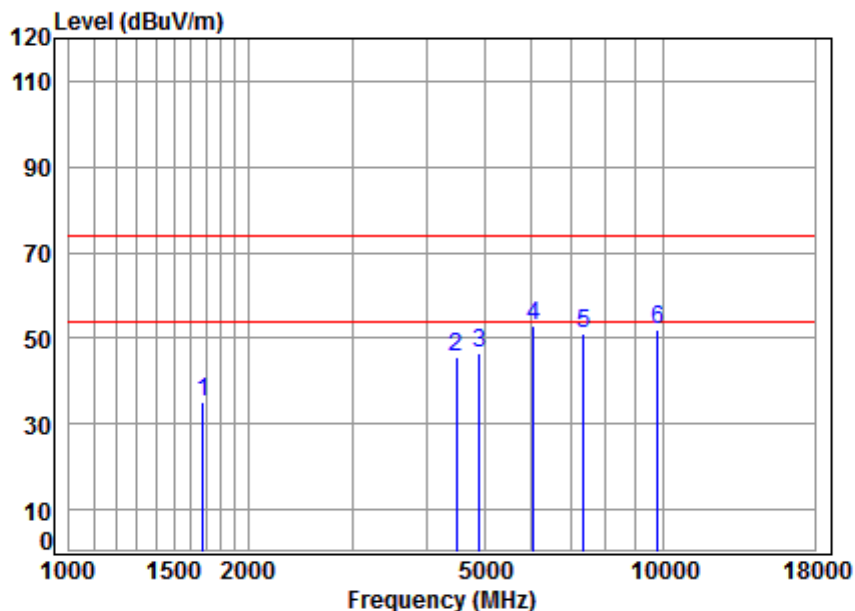
	Freq	Cable Loss	Ant Factor	Preamplifier	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1648.778	5.29	26.46	41.50	44.10	34.35	74.00	-39.65	peak
2	4405.090	7.46	33.44	42.40	47.27	45.77	74.00	-28.23	peak
3	4874.000	7.96	34.05	42.48	47.13	46.66	74.00	-27.34	peak
4	6159.797	10.89	35.26	41.48	47.93	52.60	74.00	-21.40	peak
5	7311.000	10.05	36.15	40.64	45.14	50.70	74.00	-23.30	peak
6	9748.000	10.82	37.75	37.54	40.29	51.32	74.00	-22.68	peak

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11.7.3.21 802.11N40_ Highest Channel_ Peak_ Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 90027
Mode : 2452 TX RSE
Note : 2.4G WIFI 11N 40

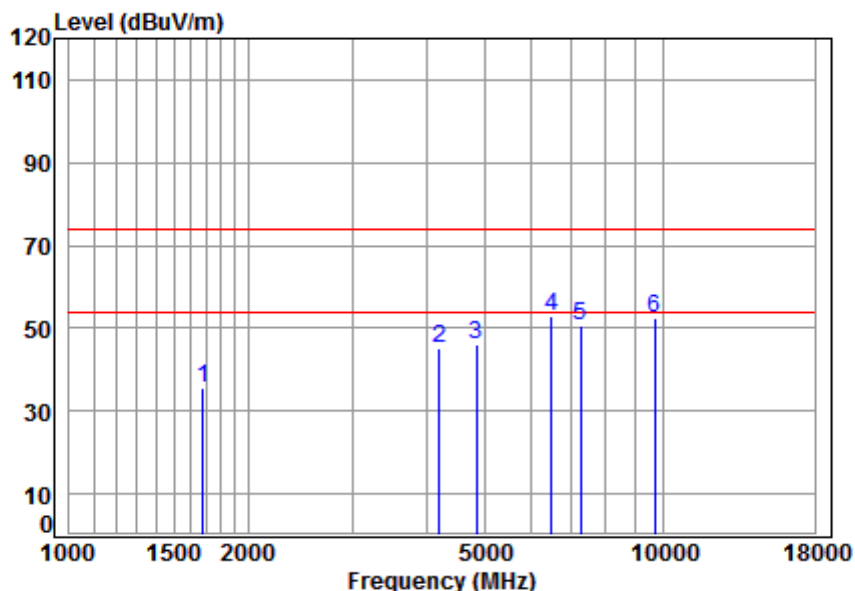
	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1677.621	5.25	26.58	41.52	44.65	34.96	74.00	-39.04	peak
2	4482.150	7.54	33.57	42.41	46.79	45.49	74.00	-28.51	peak
3	4904.000	7.99	34.09	42.48	46.97	46.57	74.00	-27.43	peak
4	6053.894	10.68	35.16	41.56	48.78	53.06	74.00	-20.94	peak
5	7356.000	10.04	36.19	40.61	45.71	51.33	74.00	-22.67	peak
6	9808.000	10.85	37.79	37.46	40.91	52.09	74.00	-21.91	peak

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11.7.3.22 802.11N40_Lowest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2422 TX RSE
Note : 2.4G WIFI 11N 40

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1677.621	5.25	26.58	41.52	45.12	35.43	74.00	-38.57	peak
2	4193.872	7.21	33.06	42.36	47.32	45.23	74.00	-28.77	peak
3	4844.000	7.93	34.02	42.48	46.79	46.26	74.00	-27.74	peak
4	6488.754	11.52	35.59	41.22	46.96	52.85	74.00	-21.15	peak
5	7266.000	10.06	36.12	40.67	45.07	50.58	74.00	-23.42	peak
6	9688.000	10.79	37.71	37.63	41.67	52.54	74.00	-21.46	peak

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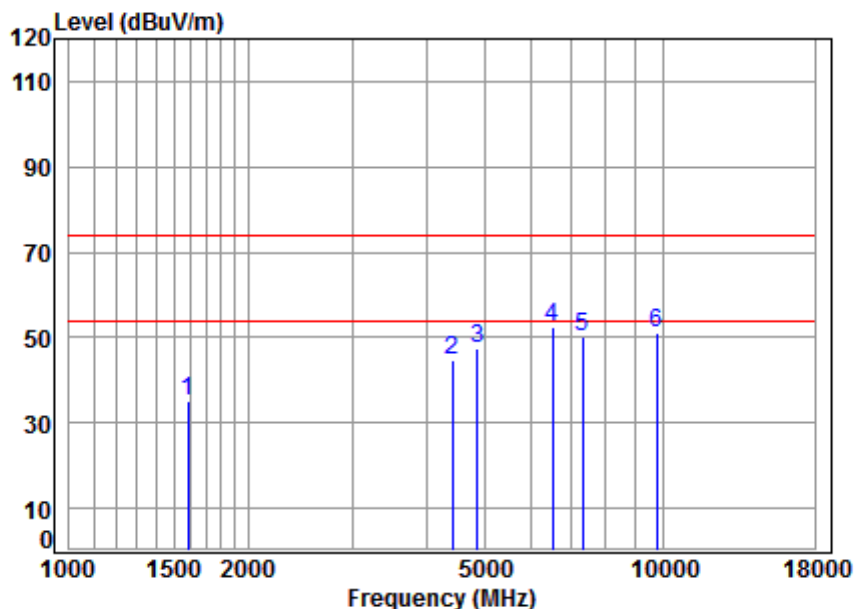
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11.7.3.23 802.11N40_ Middle Channel_ Peak_ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2437 TX RSE
Note : 2.4G WIFI 11N 40

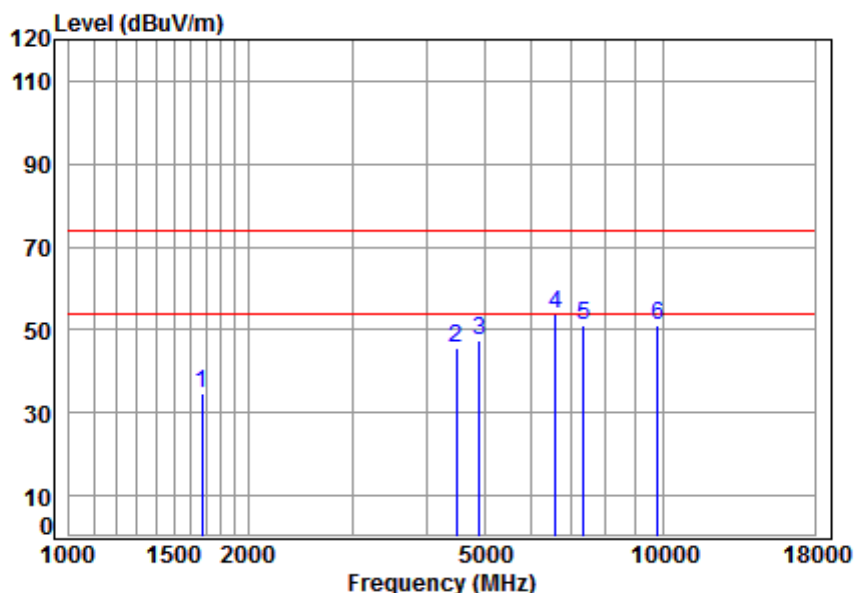
	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1587.975	5.37	26.20	41.46	44.88	34.99	74.00	-39.01	peak
2	4417.841	7.47	33.46	42.40	46.30	44.83	74.00	-29.17	peak
3	4874.000	7.96	34.05	42.48	47.77	47.30	74.00	-26.70	peak
4	6526.373	11.46	35.62	41.20	46.56	52.44	74.00	-21.56	peak
5	7311.000	10.05	36.15	40.64	44.84	50.40	74.00	-23.60	peak
6	9748.000	10.82	37.75	37.54	40.25	51.28	74.00	-22.72	peak

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11.7.3.24 802.11N40_ Highest Channel_ Peak_ Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 90027
Mode : 2452 TX RSE
Note : 2.4G WIFI 11N 40

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1672.779	5.26	26.56	41.52	44.60	34.90	74.00	-39.10	peak
2	4495.125	7.55	33.59	42.42	46.72	45.44	74.00	-28.56	peak
3	4904.000	7.99	34.09	42.48	47.66	47.26	74.00	-26.74	peak
4	6602.265	11.24	35.66	41.14	47.95	53.71	74.00	-20.29	peak
5	7356.000	10.04	36.19	40.61	45.44	51.06	74.00	-22.94	peak
6	9808.000	10.85	37.79	37.46	39.72	50.90	74.00	-23.10	peak

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Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$
- 2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.
- 4) All Modes have been tested, but only the worst case data displayed in this report.

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12 PEAK POWER SPECTRAL DENSITY

12.1 Standard Applicable

Per Part 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Frequency (MHz)	Effective Legacy Gain (dBi)	Peak spectral density (dBm/3kHz)
2412~2462	0.00	8.00

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

Per RSS-247 section 5.4 d

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

12.2 Measurement Equipment Used

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2018/9/15	2019/9/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2018/3/13	2019/3/12
Coaxial Cable	SGS	N/A	SEM031-01	2018/7/13	2019/7/12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018/9/2	2019/9/2
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2017/12/4	2018/12/4
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018/9/2	2019/9/2

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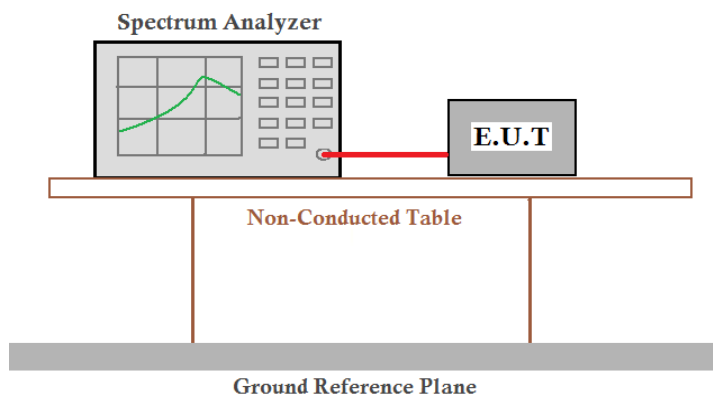
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12.3 Test Set-up



12.4 Measurement Procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 3 kHz & VBW = 10 kHz.
5. For defining Restricted Band Edge Limit:
Set the RBW = 100kHz & VBW = 300 kHz
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.

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12.5 Measurement Result

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11B	Lowest	-3.15	≤8.00	Pass
	Middle	-3.55	≤8.00	Pass
	Highest	-3.70	≤8.00	Pass
802.11G	Lowest	-7.52	≤8.00	Pass
	Middle	-7.01	≤8.00	Pass
	Highest	-7.54	≤8.00	Pass
802.11N20	Lowest	-9.31	≤8.00	Pass
	Middle	-8.61	≤8.00	Pass
	Highest	-8.92	≤8.00	Pass
802.11N40	Lowest	-11.04	≤8.00	Pass
	Middle	-12.01	≤8.00	Pass
	Highest	-11.98	≤8.00	Pass

**Refer to next page for plots*

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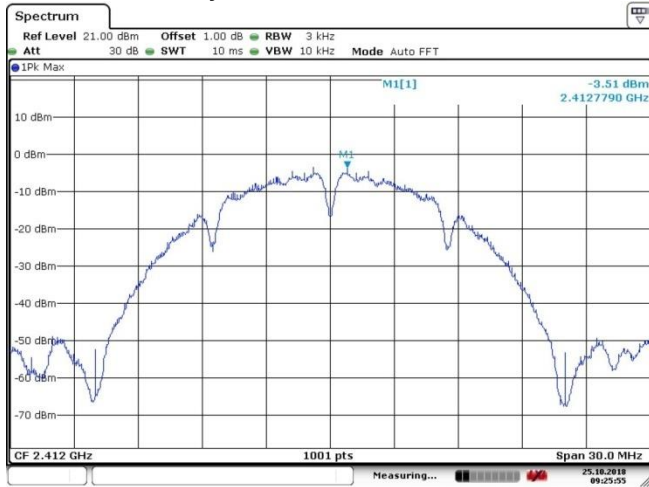
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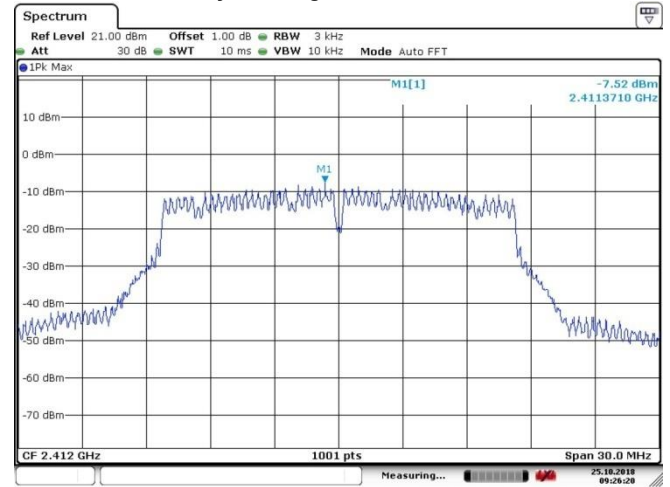
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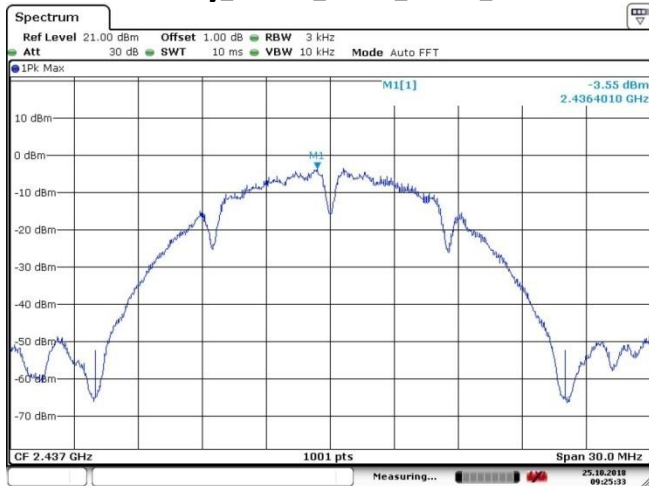
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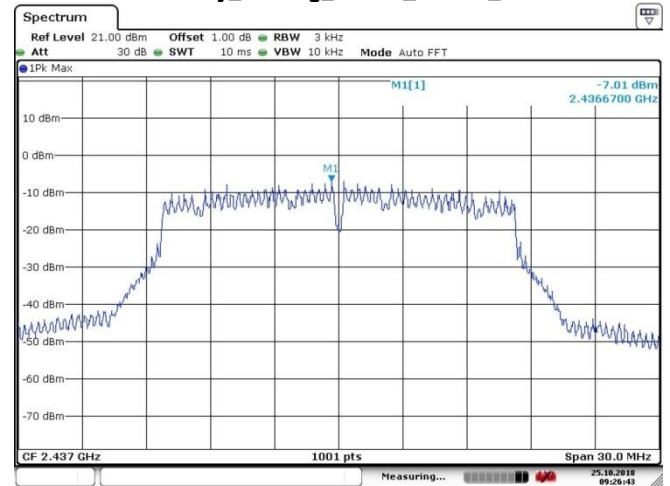
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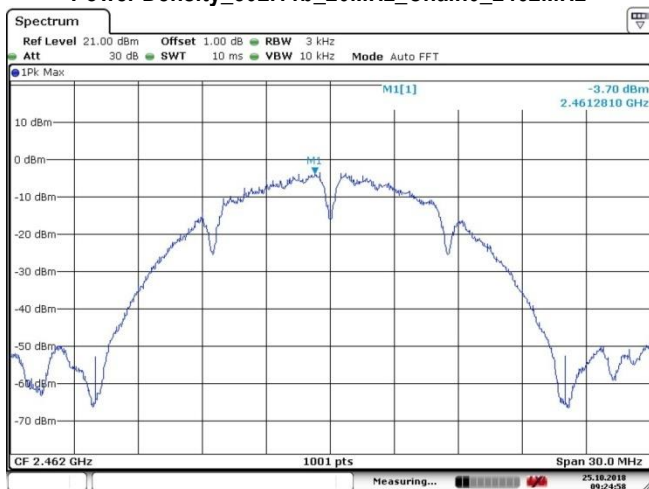
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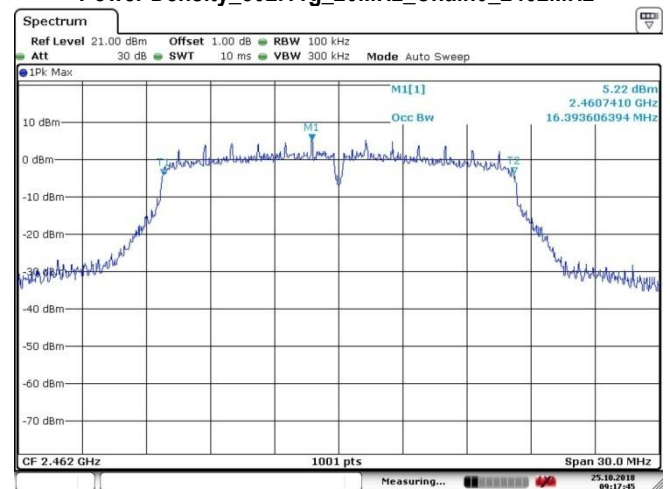
Power Density_802.11g_20MHz_Chain0_2437MHz



Power Density_802.11b_20MHz_Chain0_2462MHz



Power Density_802.11g_20MHz_Chain0_2462MHz

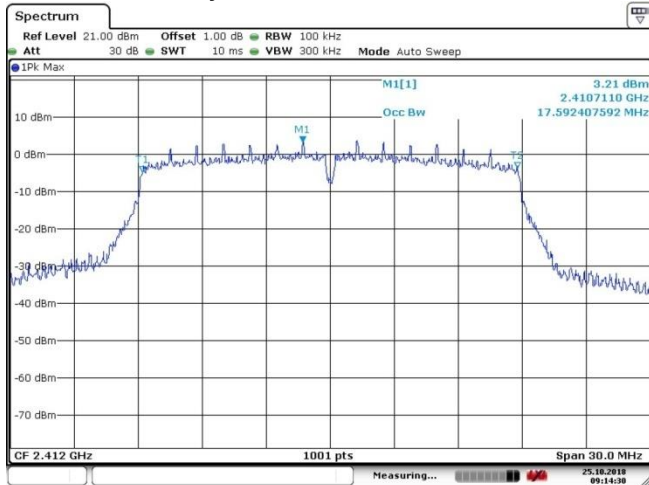


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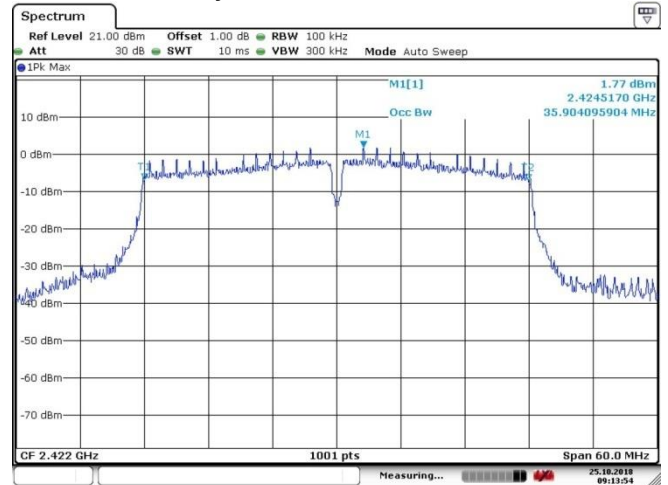
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Power Density_802.11n_20MHz_Chain0_2412MHz



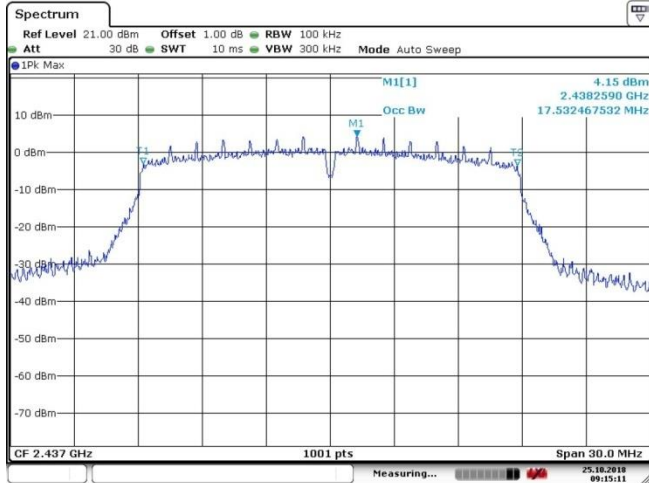
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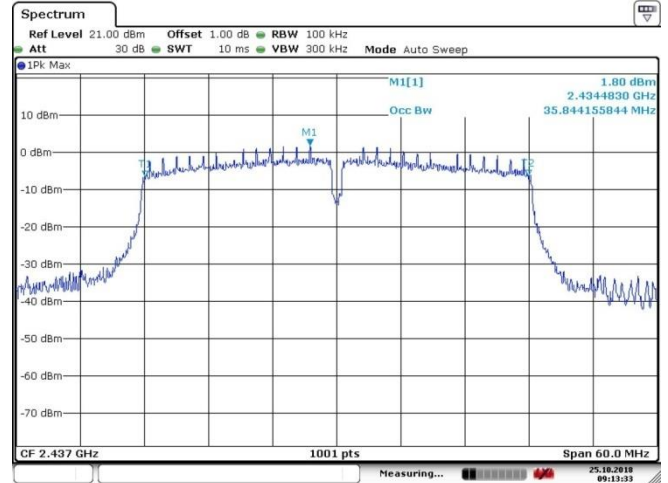
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Power Density_802.11n_20MHz_Chain0_2437MHz



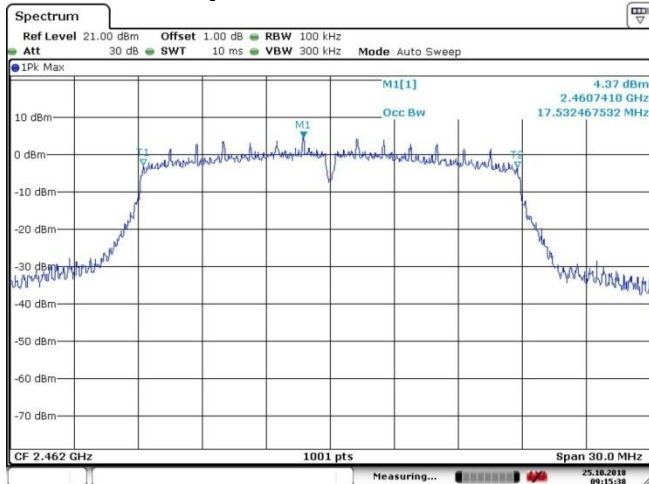
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Power Density_802.11n_40MHz_Chain0_2437MHz



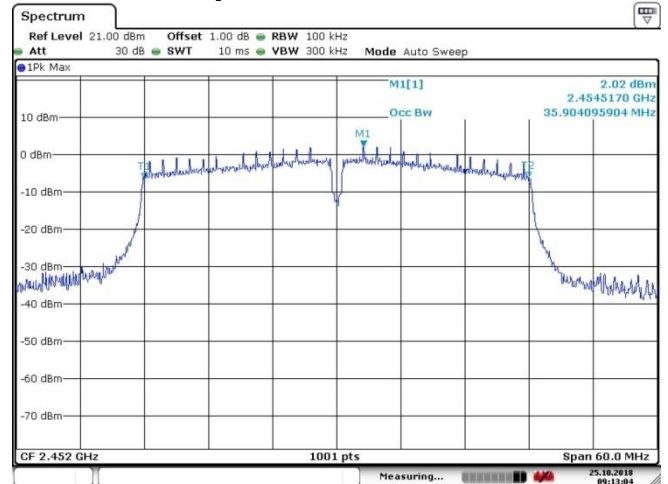
Date: 25.OCT.2018 09:13:33

Power Density_802.11n_20MHz_Chain0_2462MHz



Date: 25.OCT.2018 09:15:38

Power Density_802.11n_40MHz_Chain0_2452MHz



Date: 25.OCT.2018 09:13:04

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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13 ANTENNA REQUIREMENT

13.1 Standard Applicable

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

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

13.2 Antenna Connected Construction

The antenna is designed with unique RF connector / as permanently attached and no consideration of replacement. Please see EUT photo for details.

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SGS Shenzhen Ltd.

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057

t +86 (0) 755 2601 2053

f +86 (0) 755 2671 0594

<https://www.sgsgroup.com.cn/>

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14 PHOTOGRAPHS - EUT TEST SETUP DETAILS

Refer to Appendix A - Photographs of EUT Test Setup Details for ZR/2018/90027.

~ End of Report ~

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