Prüfbericht-Nr.: *Test report no.:*	CN23WJRF (P15C-WiFi) 001	**Auftrags-Nr.:** *Order no.:*	238548394	Seite 1 von 35 *Page 1 of 35*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2022-09-14	
Auftraggeber: *Client:*	Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States			
Prüfgegenstand: *Test item:*	Wireless MCU Module with IEEE® 802.11 b/g/n			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	WFI32E02UC, WFI32E02UE			
Auftrags-Inhalt: *Order content*:	FCC Part 15C Test report (WiFi 2.4GHz)			
Prüfgrundlage: *Test specification:*	FCC 47CFR Part 15: Subpart C Section 15.247			
Wareneingangsdatum: *Date of sample receipt:*	2023-01-03			
Prüfmuster-Nr.: *Test sample no:*	A003397875-016, 018 A003397875-020			
Prüfzeitraum: *Testing period:*	2023-06-13 - 2023-07-12			
Ort der Prüfung: *Place of testing:*	EMC/RF Taipei Testing Site			
Prüflaboratorium: *Testing laboratory:*	Taipei Testing Laboratories			
Prüfergebnis*: *Test result*:*	Pass			

zusammengestellt von: *compiled by:*		**genehmigt von:** authorized by:	
Datum: *Date:* 2023-07-13		**Ausstellungsdatum:** *Issue date:* 2023-07-13	
Stellung / *Position:*	Ryan Chen Senior Project Manager	**Stellung** / *Position:*	Brenda Chen Senior Project Manager

Sonstiges / *Other:*

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

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

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.247(b) & 15.203	Antenna Requirement	Pass
5.1.2	15.247(b)(3)	Peak Output Power	Pass
5.1.3	15.247(a)(2)	6 dB Bandwidth	Pass
5.1.3	2.1049	99% Occupied Bandwidth	Pass
5.1.4	15.247(e)	Power Spectral Density	Pass
5.1.5	15.247(d)	Conducted Spurious Emissions and Band Edges	Pass
5.1.6	15.247(d) & 15.205 & 15.209	Radiated Spurious Emissions and Band Edges	Pass
5.2.1	15.207	Mains Conducted Emission	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Contents

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN23WJRF (P15C-WiFi) 001	Original Release	2023-07-13

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix A - Test Result of Conducted
Appendix B - Test Result of Radiated Emissions & Mains Conducted Emission for WFI32E02UC
Appendix C - Test Result of Radiated Emissions for 2nd Source of WFI32E02UC
Appendix D - Test Result of Radiated Emissions for WFI32E02UE
Appendix SP - Photographs of Test Setup
Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart C Section 15.247
FCC 47CFR Part 2: Subpart J Section 2.1049
ANSI C63.10:2013
KDB 558074 D01 15.247 Meas Guidance v05r02

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 180491
ISED Registration No.: 25563

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of k=2 to indicate a 95% level of confidence.

Emission Measurement Uncertainty

Parameter	Uncertainty
Radiated Emission (9 kHz ~ 30 MHz)	± 1.15 dB
Radiated Emission (30 MHz ~ 200 MHz)	± 1.32 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.31 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.53 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.50 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Wireless MCU Module with IEEE® 802.11 b/g/n. It contains a WLAN compatible module enabling the user to communicate data through a Wireless interface.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Wireless MCU Module with IEEE® 802.11 b/g/n
Type Identification	WFI32E02UC, WFI32E02UE
FCC ID	2ADHKWFI32E02

Technical Specification of EUT

Item	EUT information
Operating Frequency	2412 MHz ~ 2462 MHz
Channel Spacing	5 MHz
Channel Number	802.11b/g/n HT20: 11
Data Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to MCS7
Operation Voltage	3.0Vdc to 3.6Vdc; 3.3V typical (Tested at 3.3Vdc)
Modulation	DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16QAM, 64QAM)
Maximum Output Power (mW)	802.11b: 257.63 802.11g: 361.41 802.11n HT20: 374.11
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.4

Note:
1. All models are listed as below.

Model Type		Model No.	Difference
A	Main	WFI32E02UC	Module with u.FL Connector for External Antenna and Trust & GO
B	2nd Source		The 2nd source (Crystal Biasing Capacitor, Ferrite bead for supply filter, FEM supply filtering and RF front End) has been evaluated in this report, and the parameter of component is the same as the original one. The difference is the manufacturer.
C	Series	WFI32E02UE	Module with u.FL Connector for External Antenna

2. Antenna List: Antenna #1 is selected for RSE measurements for WFI32E01UC and WFI32E01UE.

Sino.	P/N	Vendor	Antenna Gain (dBi)	Antenna Type	Cable Length / Remarks
1	RFA-02-L2H1	Alead/Aristotle	2	Dipole	150 mm
2	RFA-02-C2H1-D034	Alead/Aristotle	2	Dipole	150 mm
3	RFA-02-D3	Alead/Aristotle	2	Dipole	150 mm
4	RFDPA870920IMLB301	WALSIN	1.84	Dipole	200 mm
5	RFDPA870920IMAB302	WALSIN	1.82	Dipole	200 mm / Black
6	RFDPA870920IMAB305	WALSIN	1.82	Dipole	200 mm / Grey
7	RFDPA870910IMAB308	WALSIN	2	Dipole	100 mm
8	RFA-02-C2M2	Alead/Aristotle	2	Dipole	RP-SMA to u.FL cable length of 100 mm (Refer to remark 1 and 2)
9	RN-SMA-S-RP	Microchip	0.56	Dipole	RP-SMA to u.FL cable length of 100 mm (Refer to remark 1 and 2)

*Remark:

1) If the end-product using the Module is designed to have an antenna port that is accessible to the end-user than a unique (non-standard) antenna connector (as permissible by FCC) must be used (e.g. RP (Reverse Polarity)-SMA socket). If an RF coaxial cable is used between the module RF output and the enclosure, then a unique antenna connector must be used in the enclosure wall for interface with antenna.
2) If an RF coaxial cable is used between the module RF output and the enclosure, then a unique (non-standard) antenna connector must be used in the enclosure wall for interface with antenna.

3.3 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.4 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.
During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output expected by the customer and is going to be fixed on the firmware of the final end product.

Table for Parameters of Test Software Setting

802.11b		802.11g		802.11n HT20	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
1	20	1	16.25	1	16
6	22	6	20.25	6	20.25
11	20	11	16.25	10	18.5
				11	15.5

4.2 Carrier Frequency and Channel

802.11b, 802.11g and 802.11n HT20:

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

4.3 Test Operation and Test Software

Setup for testing: Test samples are provided with a USB/UART interface which makes it possible to control them through a test software installed on a notebook computer.
This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed as below.

Test Software	MCHPRT3_Setup.exe

The samples were used as follows:
A003397875-016 (WFI32E02UC) 018 (2nd Source of WFI32E02UC)
A003397875-020 (WFI32E02UE)
Full test was applied on all test modes, but only worst case was shown.

Modulation Mode	Tx Function
802.11b	1TX (SISO)
802.11g	1TX (SISO)
802.11n HT20	1TX (SISO)

EUT Configure Mode	Applicable To				Description
	Antenna Port Conducted Measurement	Radiated Spurious Emissions above 1 GHz	Radiated Spurious Emissions below 1 GHz	Mains Conducted Emission	
A	√	√	√	√	WFI32E02UC
B	-	√	√	-	2nd Source of WFI32E02UC
C	-	√	√	-	WFI32E02UE

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on Z-plane.
2. "-" means no effect.

Antenna Port Conducted Measurement

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Date Rate (Mbps)
A	802.11b	1 to 11	1, 6, 11	1.0
	802.11g	1 to 11	1, 6, 11	6.0
	802.11n HT20	1 to 11	1, 6, 10, 11	MCS0

*B and C Modes are tested output power only.

Radiated Spurious Emissions (Above 1 GHz)

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Date Rate (Mbps)
A	802.11b	1 to 11	1, 6, 11	1.0
	802.11g	1 to 11	1, 6, 11	6.0
	802.11n HT20	1 to 11	1, 6, 11	MCS0
B, C	802.11b	1 to 11	6	1.0
	802.11g	1 to 11	6	6.0
	802.11n HT20	1 to 11	6	MCS0

Radiated Spurious Emissions (Below 1 GHz)

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Date Rate (Mbps)
A, B, C	802.11b	1 to 11	6	1.0

Mains Conducted Emission

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Date Rate (Mbps)
A	802.11b	1 to 11	6	1.0

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Conducted Measurement	24.3-25.2 °C	52-60 %	Blake Wang
Radiated Spurious Emissions above 1 GHz	23.7-24.6 °C	52-55 %	Roger Liao
Radiated Spurious Emissions below 1 GHz	23.7-24.6 °C	52-55 %	Roger Liao
Mains Conducted Emission	19.1-25.9 °C	50.2-58.9 %	Ray Huang

4.4 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Accessory of EUT

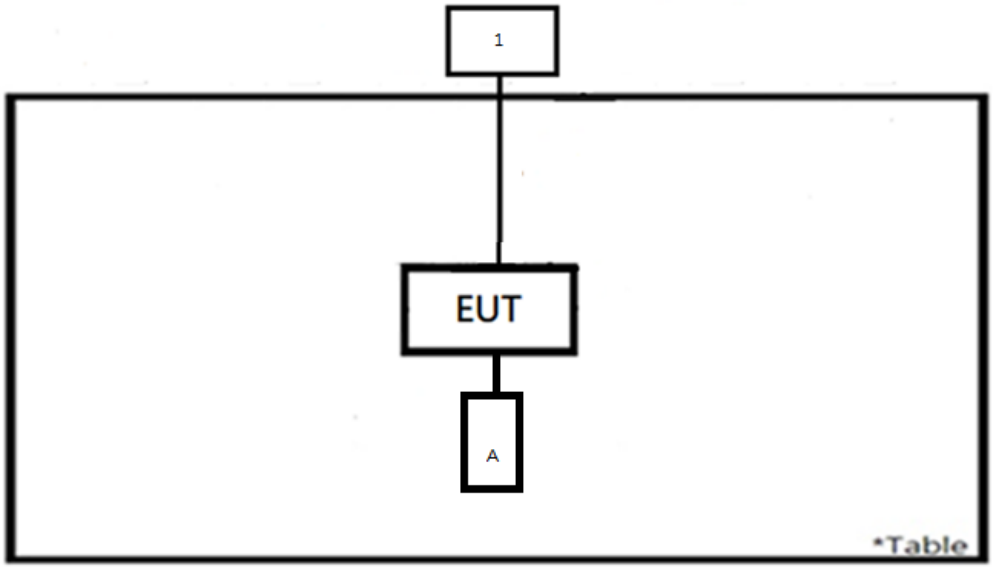
None.

Support Unit

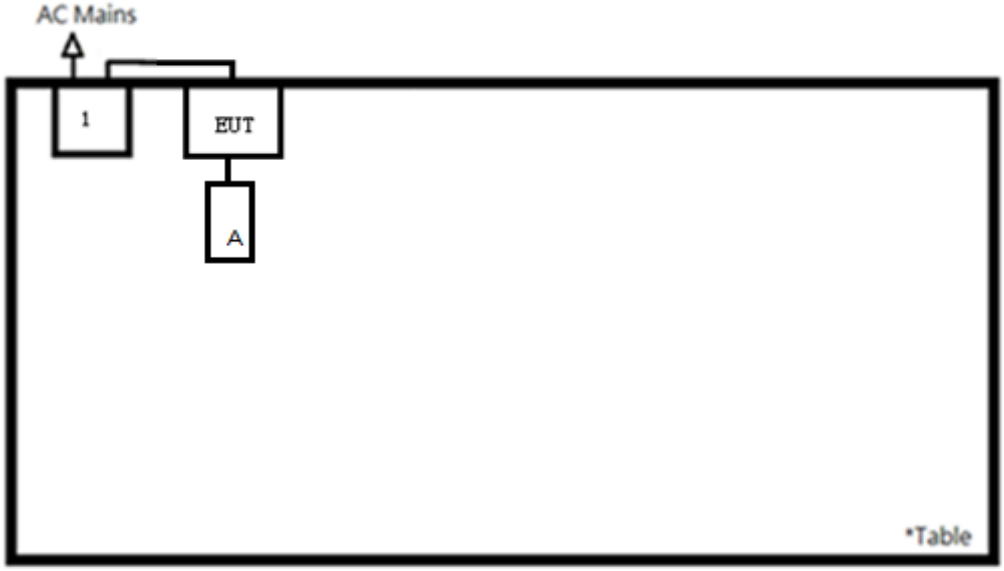
No.	Description	Brand	Model	S/N	Remark
Radiated and Mains Conduction Tests					
A	Dipole Antenna	Alead/Aristotle	RFA-02-L2H1	-	150 mm
1	DC Power Supply	Gwinstek	GPS-3030	-	--
Conducted Test					
-	Notebook	DELL	E7450	HKYHR32	NB-11

4.5 Test Setup Diagram

<Radiated Spurious Emissions Mode>



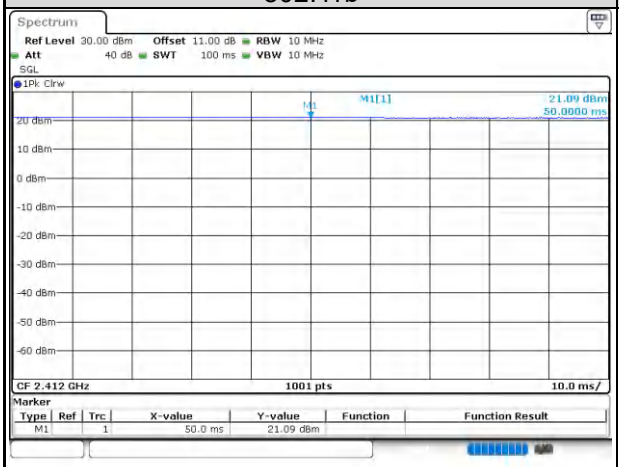
<Mains Conducted Emission Mode>



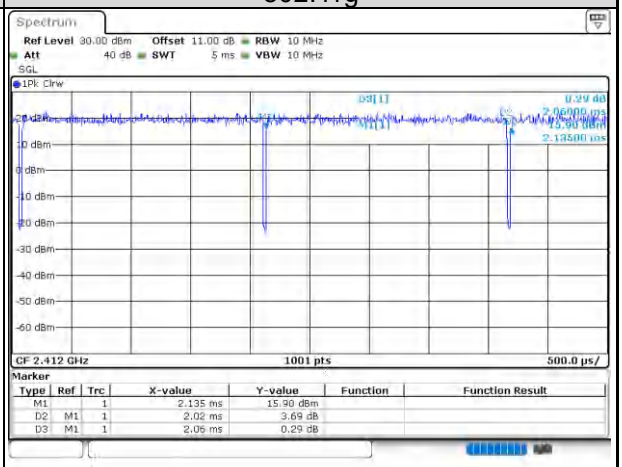
4.6 Duty Cycle of Test Signal

Mode	On + Off Time (ms)	On Time (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b	100.00	100.00	100.00	0.00
802.11g	2.06	2.02	98.06	0.09
802.11n HT20	1.92	1.89	98.44	0.07

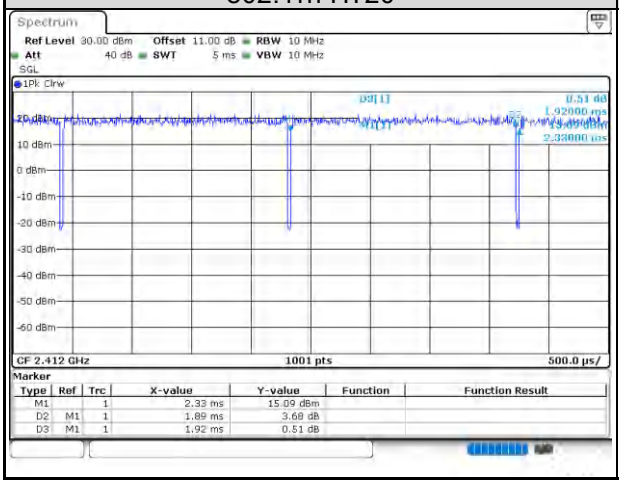
802.11b



802.11g



802.11n HT20



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 2 dBi. The antenna is a dipole antenna with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Peak Output Power

Limit 1 watt (30 dBm)

Kind of Test Site Shielded room

Test Setup

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Power Meter	Anritsu	ML2495A	1901008	2023/3/17	2024/3/15	2023/6/16	2023/7/12
Power Sensor	Anritsu	MA2411B	1725269	2023/3/17	2024/3/15	2023/6/16	2023/7/12

Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

Test Result

Peak Output Power for Model No.: WFI32E02UC

<802.11b>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	22.91	195.43	30
6	2437	24.11	257.63	30
11	2462	22.56	180.30	30

<802.11g>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	24.14	259.42	30
6	2437	25.35	342.77	30
11	2462	24.12	258.23	30

<802.11n HT20>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	24.21	263.63	30
6	2437	25.73	374.11	30
10	2457	23.83	241.55	30
11	2462	22.35	171.79	30

Peak Output Power for 2nd Source of Model No.: WFI32E02UC

<802.11b>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	22.82	191.43	30
6	2437	24.01	251.77	30
11	2462	22.41	174.18	30

<802.11g>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	23.31	214.29	30
6	2437	25.13	325.84	30
11	2462	23.15	206.54	30

<802.11n HT20>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	23.87	243.78	30
6	2437	25.31	339.63	30
10	2457	24.16	260.62	30
11	2462	21.79	151.01	30

Peak Output Power for Model No.: WFI32E02UE

<802.11b>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	22.69	185.78	30
6	2437	23.96	248.89	30
11	2462	22.38	172.98	30

<802.11g>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	23.62	230.14	30
6	2437	25.58	361.41	30
11	2462	24.03	252.93	30

<802.11n HT20>

Channel	Channel Frequency (MHz)	Peak Output Power		Limit (dBm)
		(dBm)	(mW)	
1	2412	23.17	207.49	30
6	2437	25.33	341.19	30
10	2457	24.24	265.46	30
11	2462	22.91	195.43	30

Average Power for Model No.: WFI32E02UC

<802.11b>

Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	20.08	101.86
6	2437	21.66	146.55
11	2462	19.73	93.97

<802.11g>

Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	16.43	43.95
6	2437	19.71	93.54
11	2462	16.06	40.36

<802.11n HT20>

Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	15.78	37.84
6	2437	19.71	93.54
10	2457	15.84	38.37
11	2462	14.98	31.48

Average Power for 2nd Source of Model No.: WFI32E02UC

<802.11b>

Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	20.11	102.57
6	2437	21.51	141.58
11	2462	19.58	90.78

<802.11g>

Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	16.28	42.46
6	2437	19.58	90.78
11	2462	16.15	41.21

<802.11n HT20>

Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	15.78	37.84
6	2437	19.48	88.72
10	2457	17.97	62.66
11	2462	14.72	29.65

Average Power for Model No.: WFI32E02UE

<802.11b>

Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	19.72	93.76
6	2437	21.36	136.77
11	2462	19.79	95.28

<802.11g>

Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	16.29	42.56
6	2437	19.83	96.16
11	2462	15.91	38.99

<802.11n HT20>

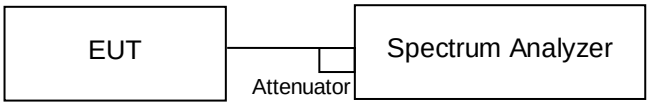
Channel	Channel Frequency (MHz)	Average Power	
		(dBm)	(mW)
1	2412	15.79	37.93
6	2437	19.71	93.54
10	2457	18.17	65.61
11	2462	15.38	34.51

5.1.3 6 dB Bandwidth and 99% Occupied Bandwidth

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

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2023/2/23	2024/2/22	2023/6/16	2023/7/3

Test Procedure

a. Set resolution bandwidth (RBW) = 100 kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
f. For 99% occupied bandwidth measurement, the transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean power of a given emission.

Test Results

Please refer to Appendix A.

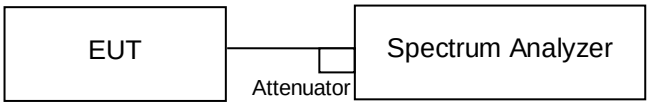
5.1.4 Power Spectral Density

Limit

The power spectral density shall not be greater than 8 dBm in any 3 kHz band.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2023/2/23	2024/2/22	2023/6/16	2023/7/3

Test Procedure

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

Test Results

Please refer to Appendix A.

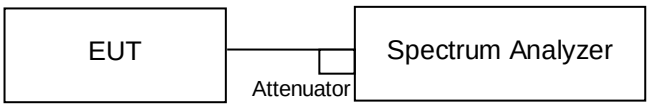
5.1.5 Conducted Spurious Emissions and Frequency Band Edges Measured in 100 kHz Bandwidth

Limit

20 dB (below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.)

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2023/2/23	2024/2/22	2023/6/16	2023/7/3

Test Procedure

Measurement procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement procedure OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

Test Results

Please refer to Appendix A.

5.1.6 Radiated Spurious Emissions and Band Edges

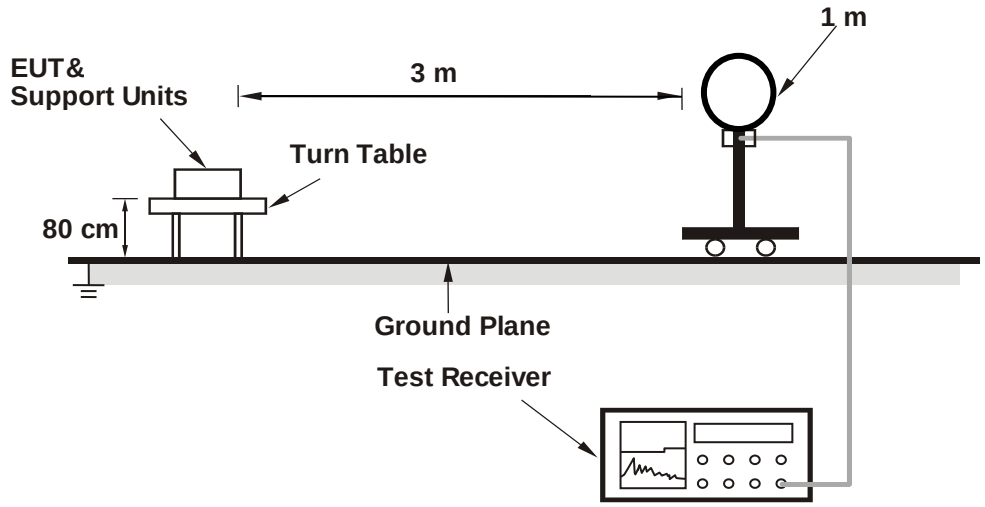
Limit

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).
Emissions radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in §15.247(d).

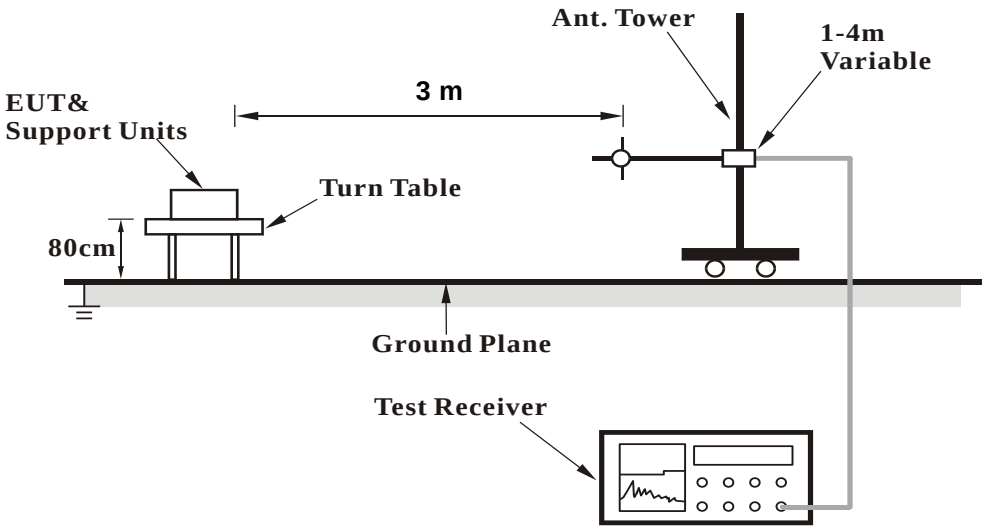
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

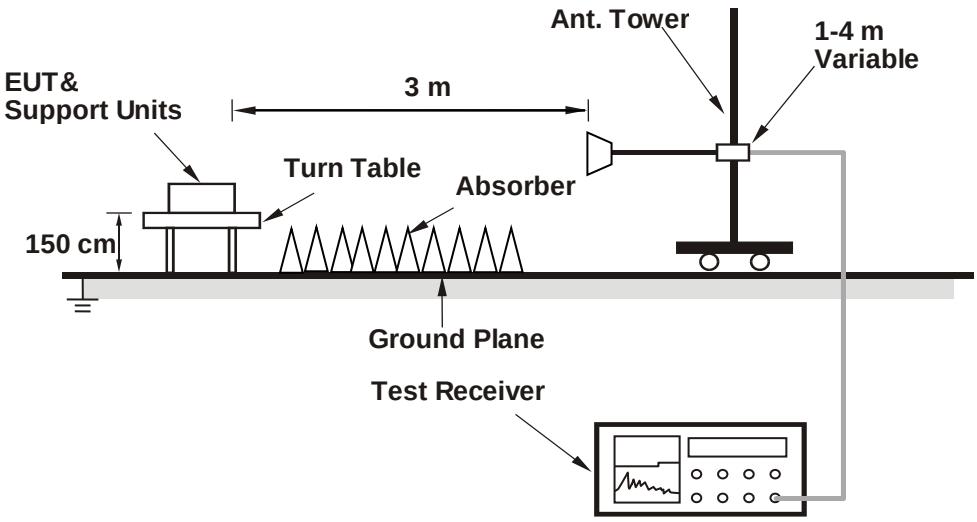
<Radiated Emissions below 30 MHz>



<Radiated Emissions 30 MHz to 1 GHz>



<Radiated Emissions above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Test Instruments

Test Date: 2023/6/13 ~ 2023/6/28

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Above 1GHz					
Signal Analyzer	R&S	FSV40	101509	2023/4/26	2024/4/24
Horn Antenna	ETS-Lindgren	3117	00218929	2022/11/17	2023/11/16
Horn Antenna	SCHWARZBECK	BBHA 9170	00890	2023/5/4	2024/5/2
HF-AMP + AC source	EMCI	EMC051845SE	980635	2023/2/16	2024/2/15
HF-AMP + AC source	EMCI	EMC051845SE	980656	2023/1/16	2024/1/15
30MHz-1GHz					
Receiver	R&S	ESR7	102109	2023/2/24	2024/2/23
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2023/3/31	2024/3/29
LF-AMP	Agilent	8447D	2944A107722	2023/3/22	2024/3/20
Below 30MHz					
Receiver	R&S	ESR7	102109	2023/2/24	2024/2/23
Loop Antenna	SCHWARZBECK	FMZB 1519B	00215	2023/1/4	2024/1/3

Test Procedures

For Radiated Emissions below 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel (OPEN), perpendicular (CLOSE), and ground-parallel (GROUND) orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated Emissions above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. 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.
f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.
6. The emission levels of other frequencies (including the 10th harmonic of the highest fundamental frequency) are very lower than the limit and are not shown in the test report.

Test Results

Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

Please refer to Appendix B for WFI32E02UC, C for 2nd Source and D for WFI32E02UE.

5.2 Mains Emission

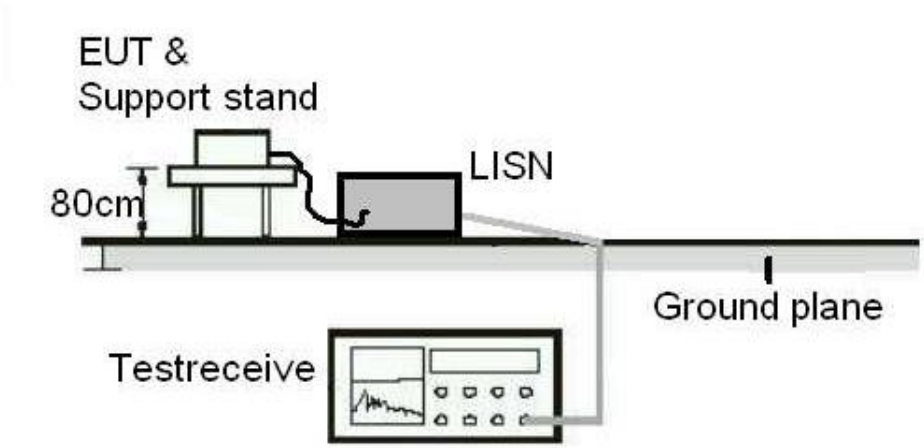
5.2.1 Mains Conducted Emission

Limit

Mains Conducted Emission as defined in §15.207 must comply with the mains conducted emission limits.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Test Date: 2023/7/5

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Two-Line V-Network	Rohde & Schwarz	ENV216	101938	2022/9/22	2023/9/21
EMI Test Receiver	R&S	ESCI	101094	2022/11/24	2023/11/23

Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

Test Results

Please refer to Appendix B.

Appendix A: Test Results of Conducted Test

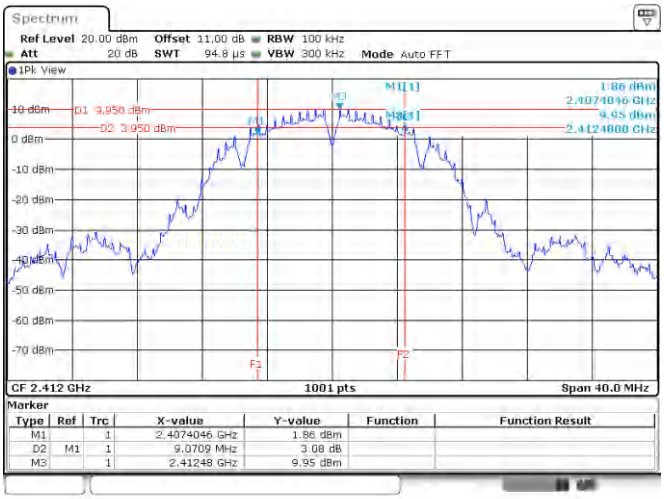
<Model No.: WFI32E02UC>

Test Result of 6 dB Bandwidth

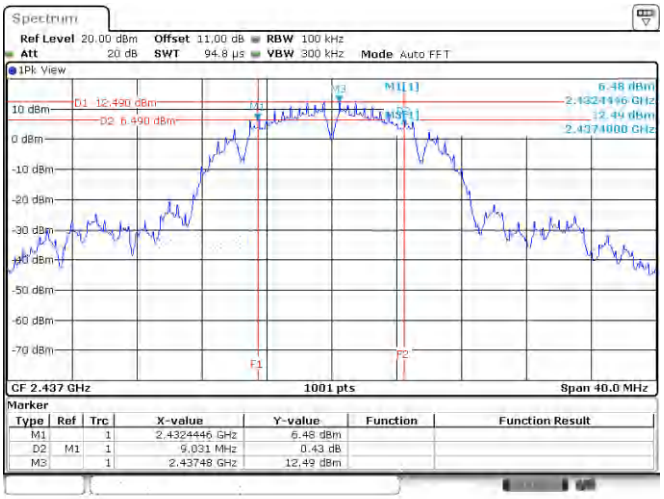
802.11b

Channel	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	9.07	> 0.5	Pass
Middle Channel	2437	9.03	> 0.5	Pass
High Channel	2462	9.07	> 0.5	Pass

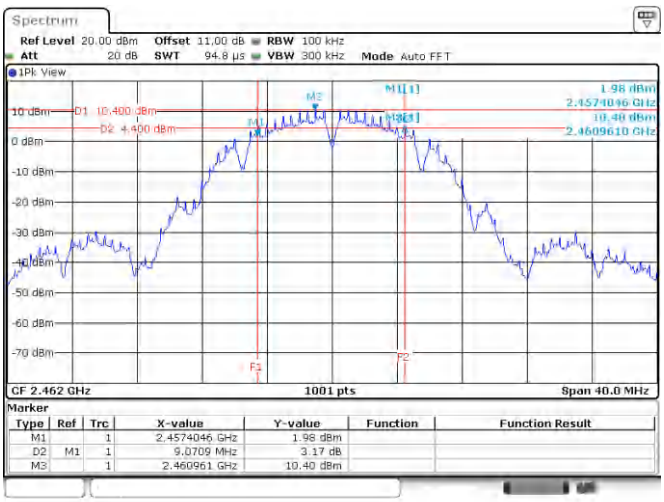
Low Channel



Middle Channel



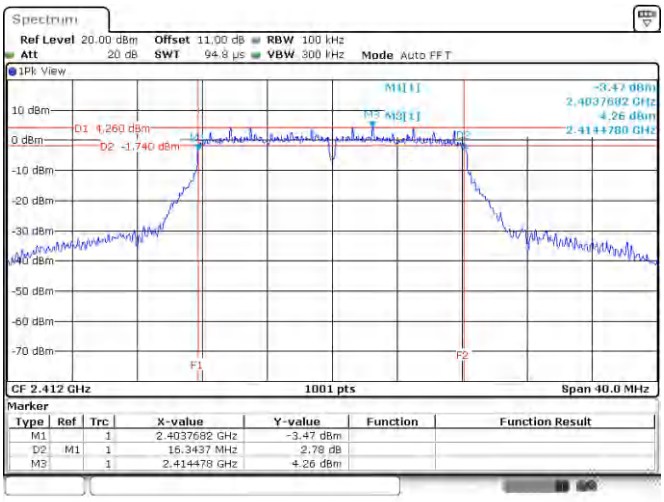
High Channel



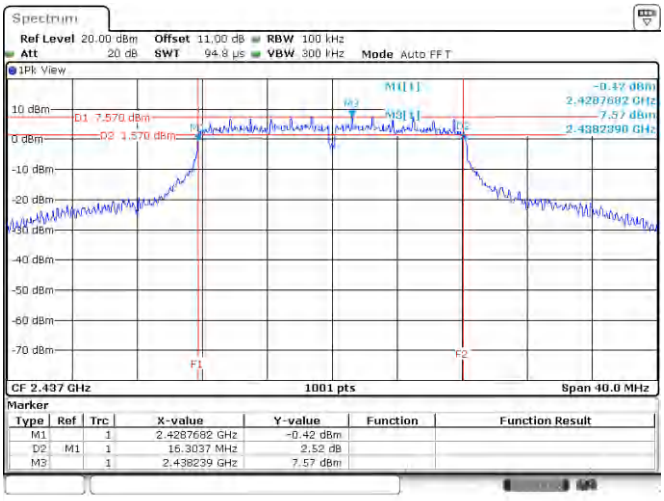
802.11g

Channel	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	16.34	> 0.5	Pass
Middle Channel	2437	16.30	> 0.5	Pass
High Channel	2462	16.30	> 0.5	Pass

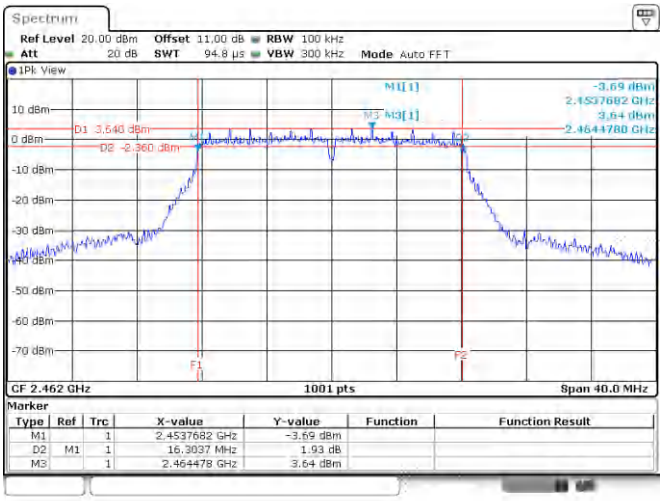
Low Channel



Middle Channel



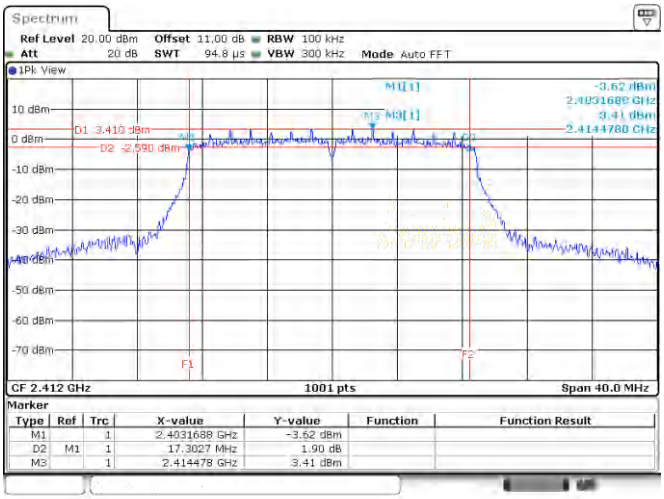
High Channel



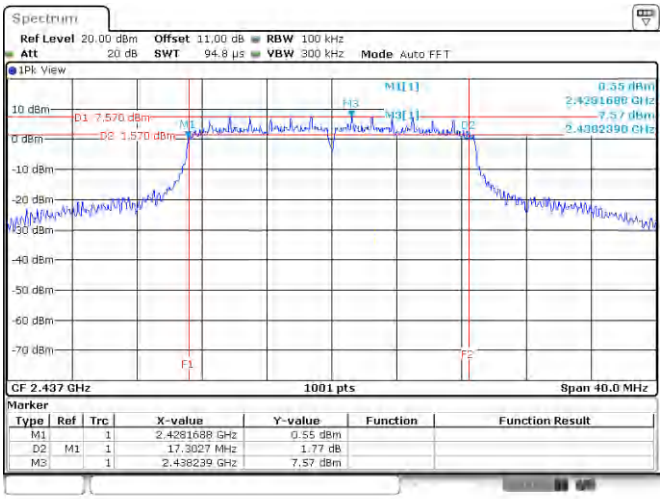
802.11n HT20

Channel	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2412	17.30	> 0.5	Pass
Middle Channel	2437	17.30	> 0.5	Pass
High Channel	2462	17.26	> 0.5	Pass

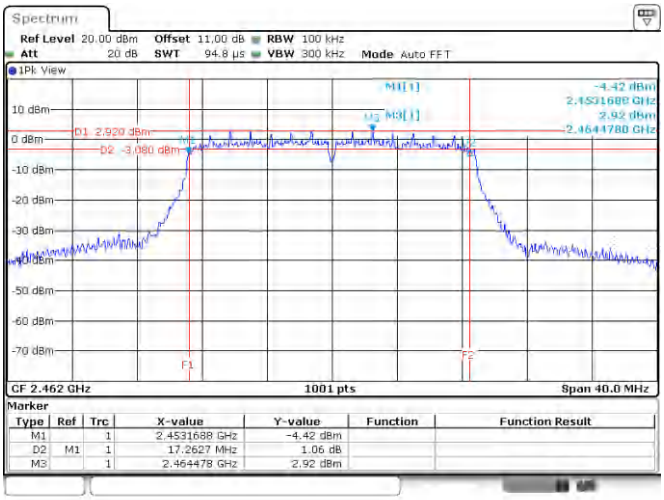
Low Channel



Middle Channel



High Channel

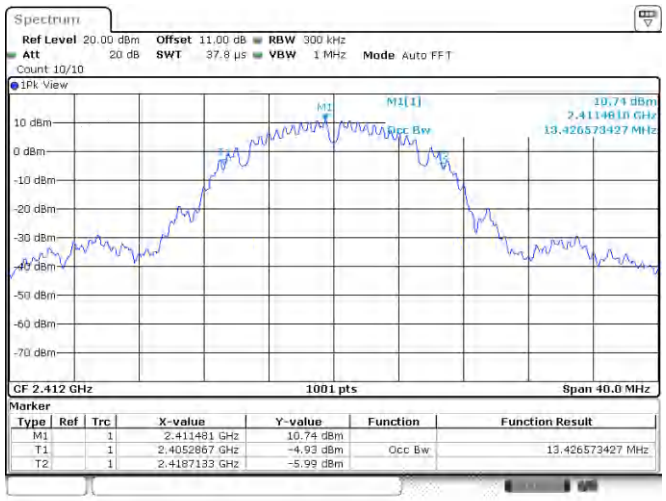


Test Result of 99% Occupied Bandwidth

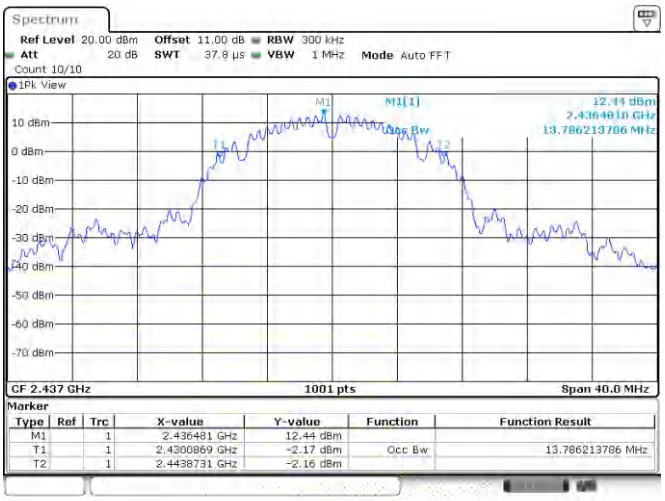
802.11b

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	13.43
Middle Channel	2437	13.79
High Channel	2462	13.39

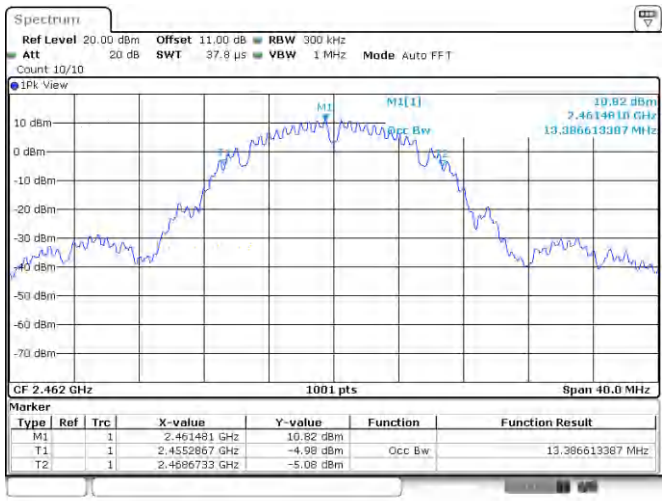
Low Channel



Middle Channel



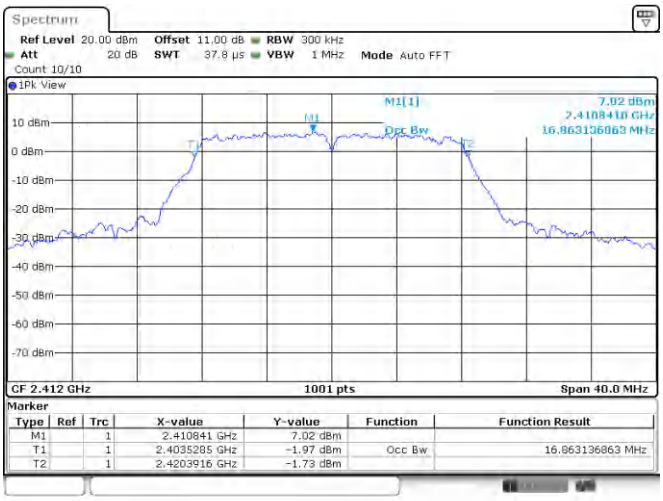
High Channel



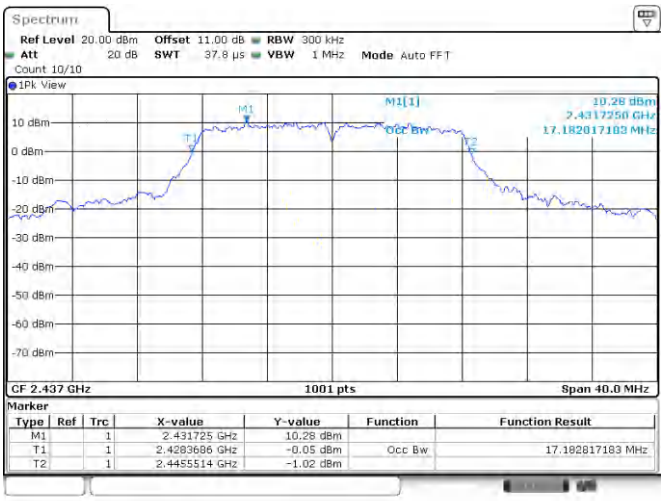
802.11g

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	16.86
Middle Channel	2437	17.18
High Channel	2462	16.70

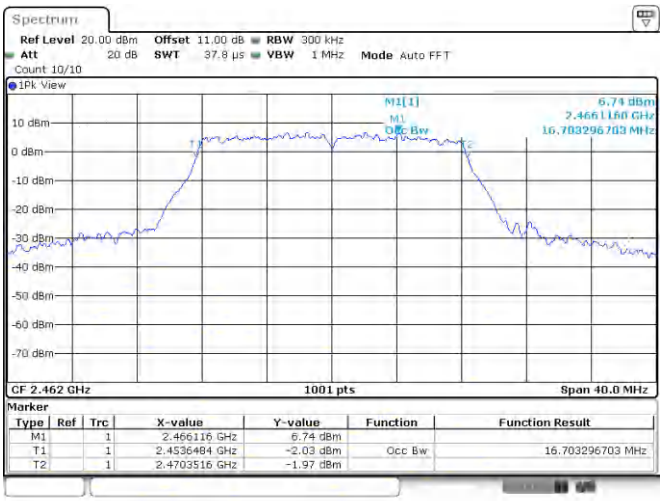
Low Channel



Middle Channel



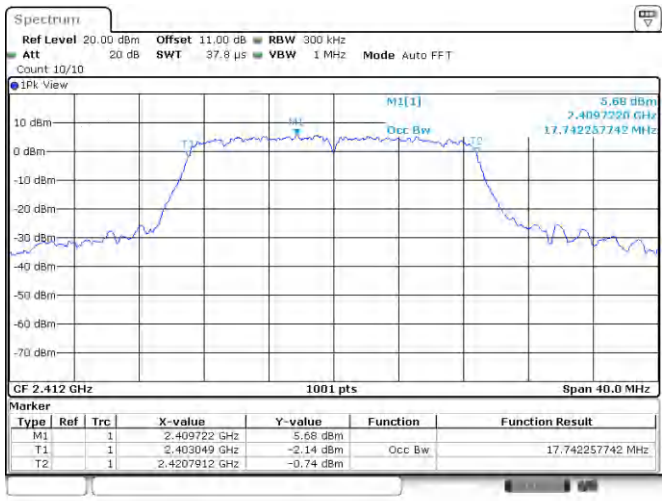
High Channel



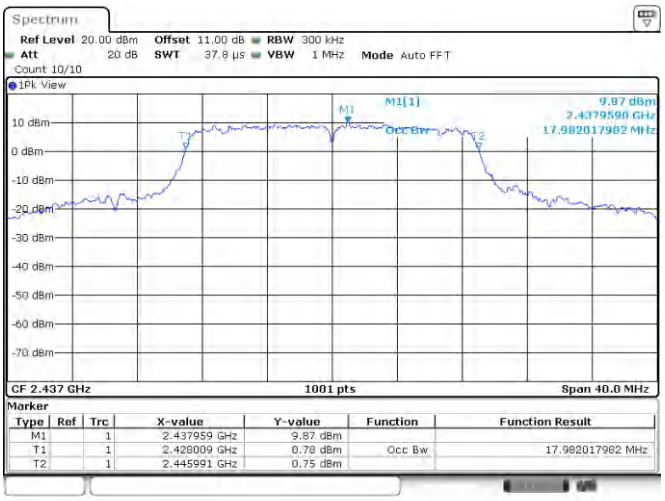
802.11n HT20

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Low Channel	2412	17.74
Middle Channel	2437	17.98
High Channel	2462	17.70

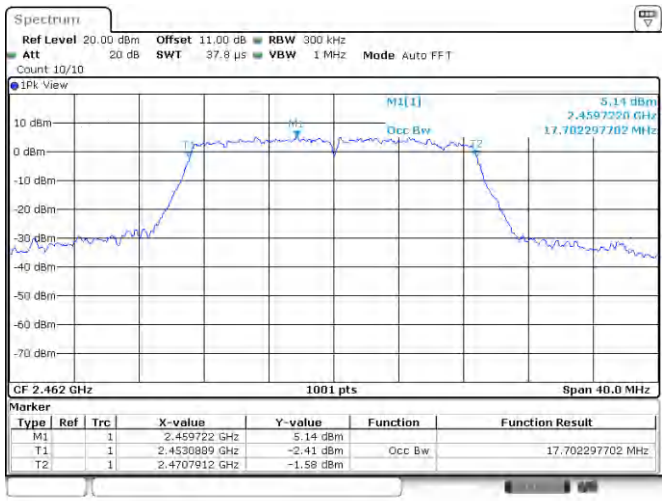
Low Channel



Middle Channel



High Channel

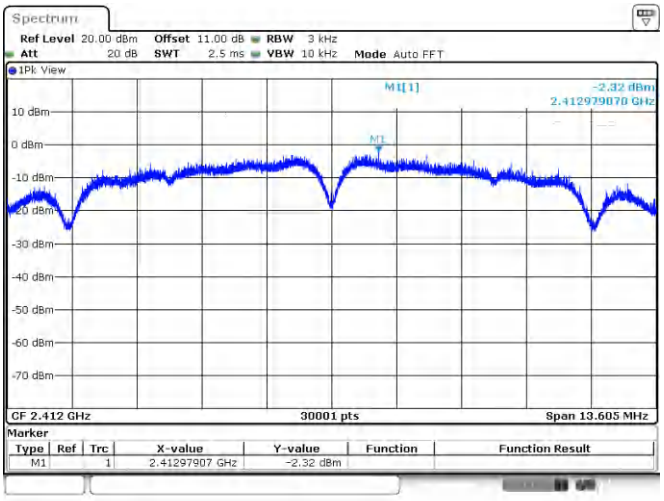


Test Result of Power Spectral Density

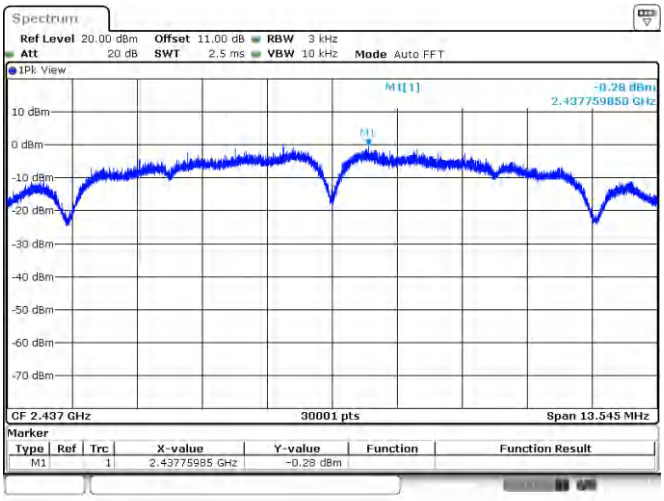
802.11b

Channel	Channel Frequency (MHz)	Power Density (dBm/3kHz)	Limit (dBm/3kHz)
Low Channel	2412	-2.32	8
Middle Channel	2437	-0.28	8
High Channel	2462	-2.84	8

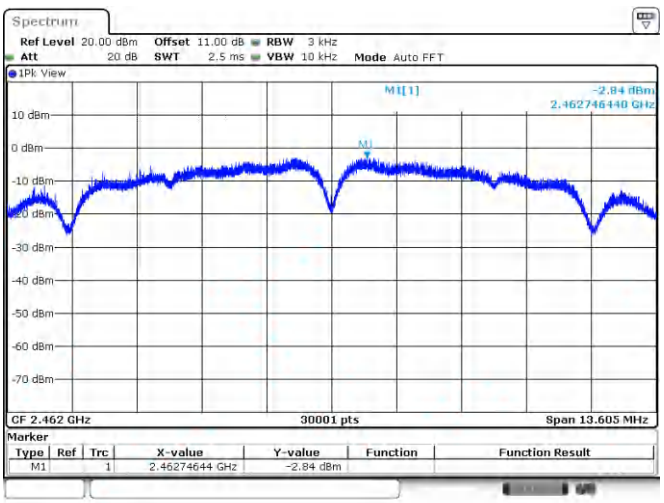
Low Channel



Middle Channel



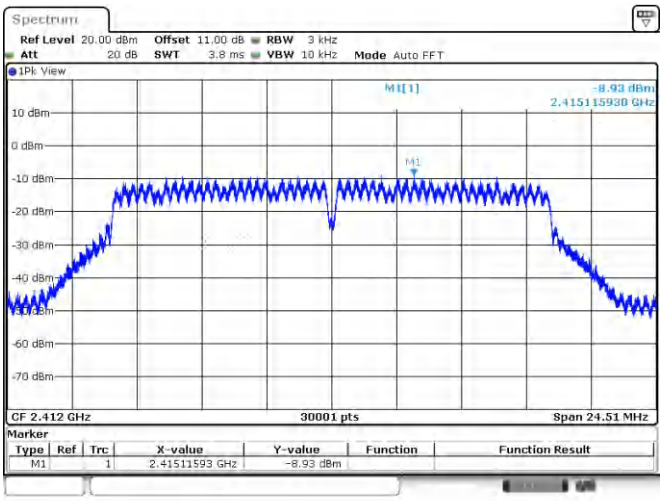
High Channel



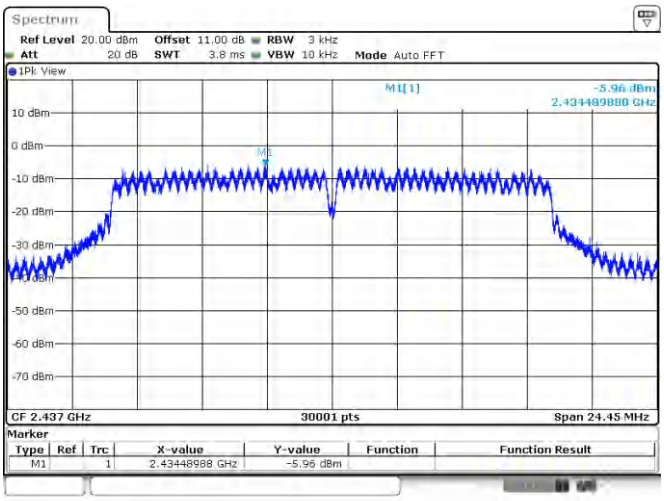
802.11g

Channel	Channel Frequency (MHz)	Power Density (dBm/3kHz)	Limit (dBm/3kHz)
Low Channel	2412	-8.93	8
Middle Channel	2437	-5.96	8
High Channel	2462	-9.17	8

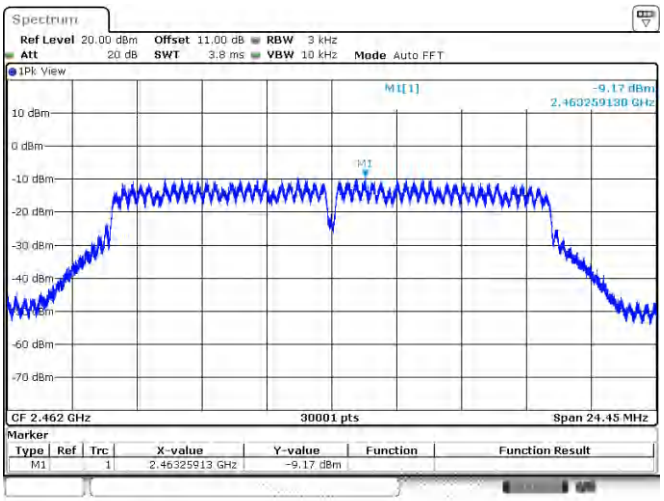
Low Channel



Middle Channel



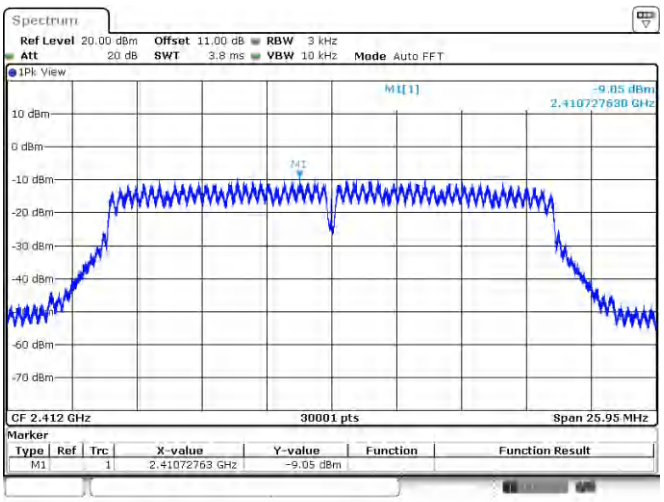
High Channel



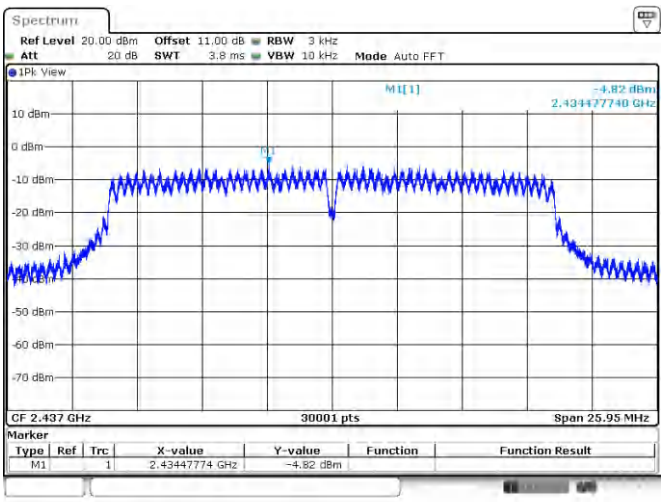
802.11n HT20

Channel	Channel Frequency (MHz)	Power Density (dBm/3kHz)	Limit (dBm/3kHz)
Low Channel	2412	-9.05	8
Middle Channel	2437	-4.82	8
High Channel	2462	-9.44	8

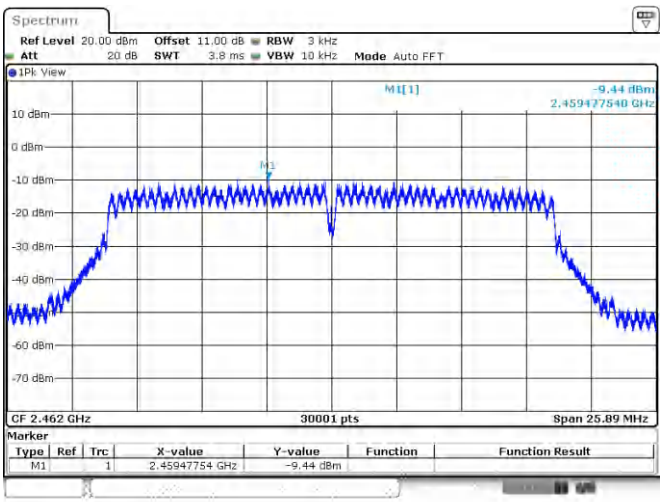
Low Channel



Middle Channel

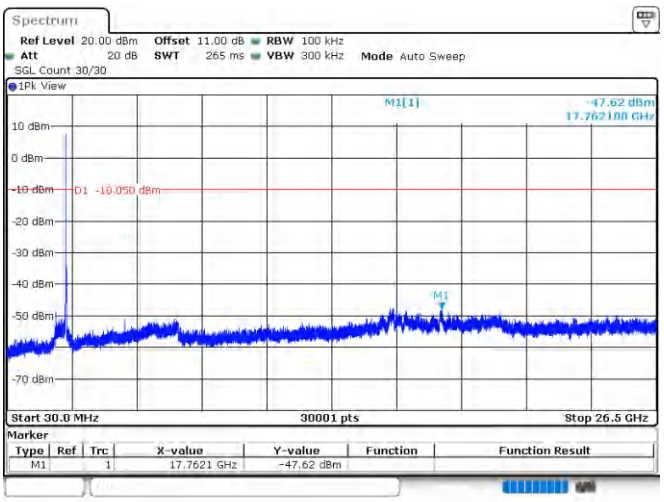
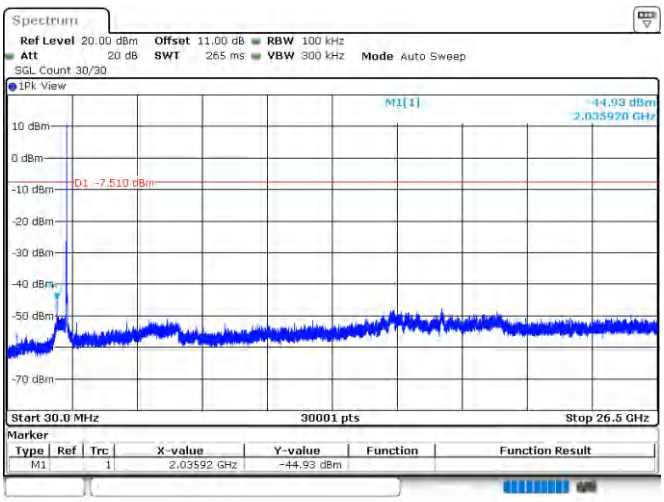
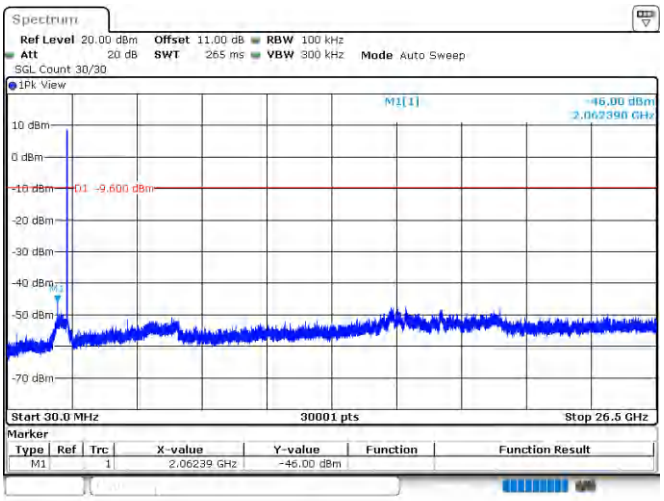


High Channel

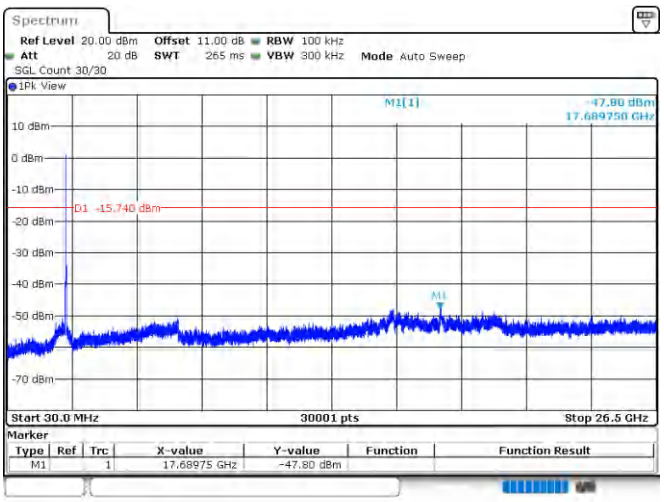
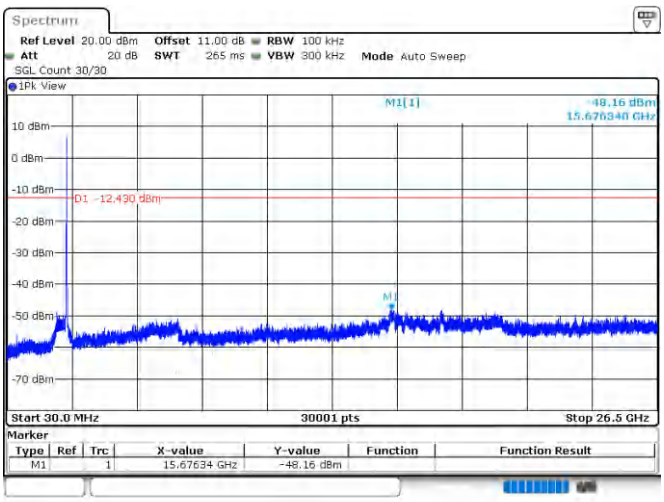
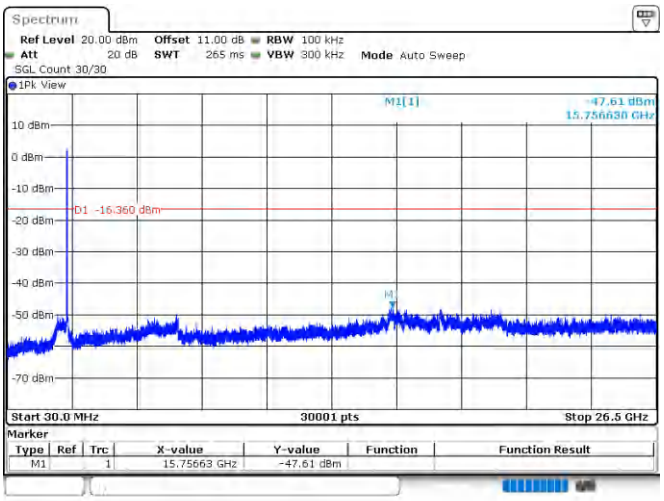


Test Result of Conducted Spurious Emissions

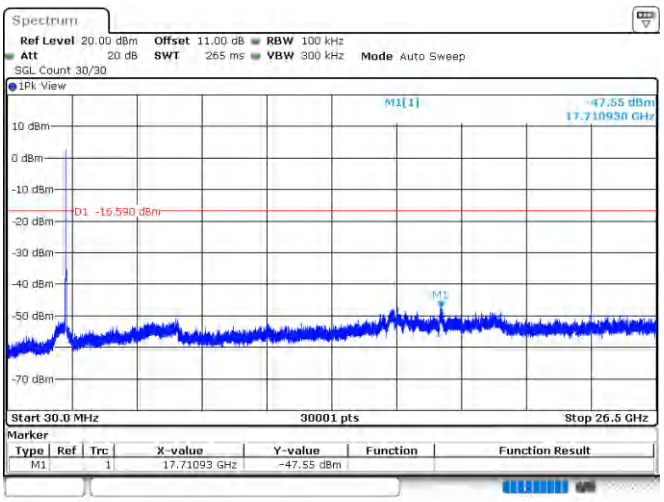
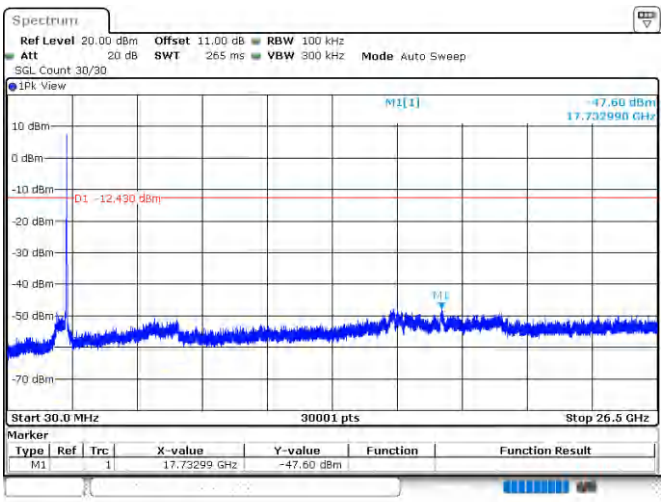
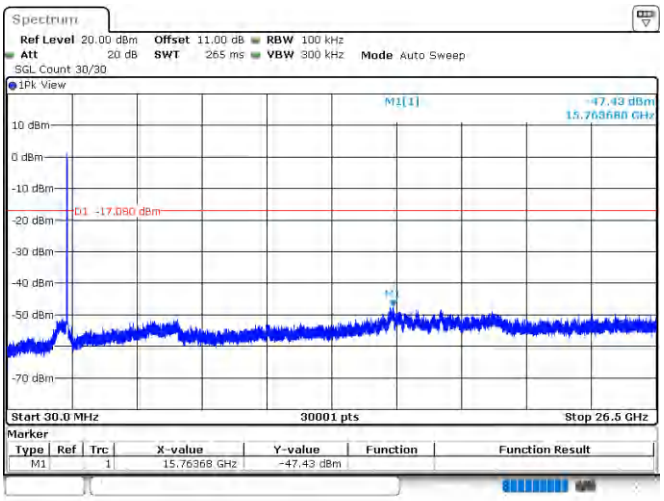
802.11b

Low Channel	Middle Channel
	
High Channel	
	

802.11g

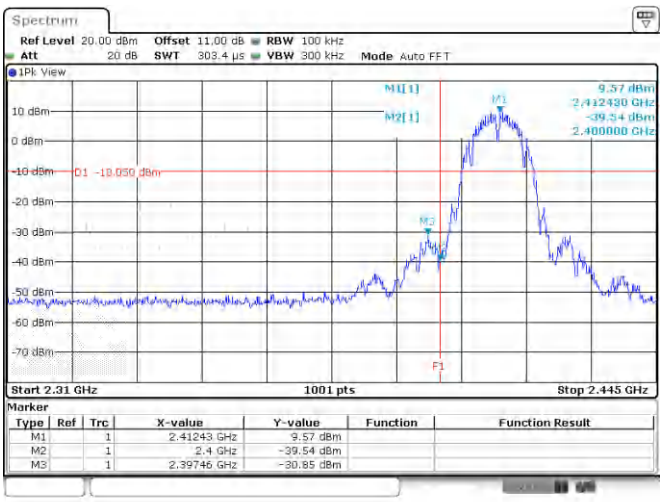
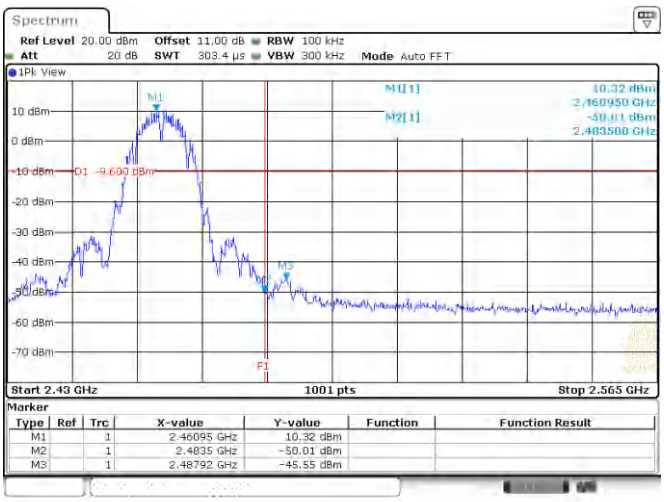
Low Channel	Middle Channel
	
High Channel	
	

802.11n HT20

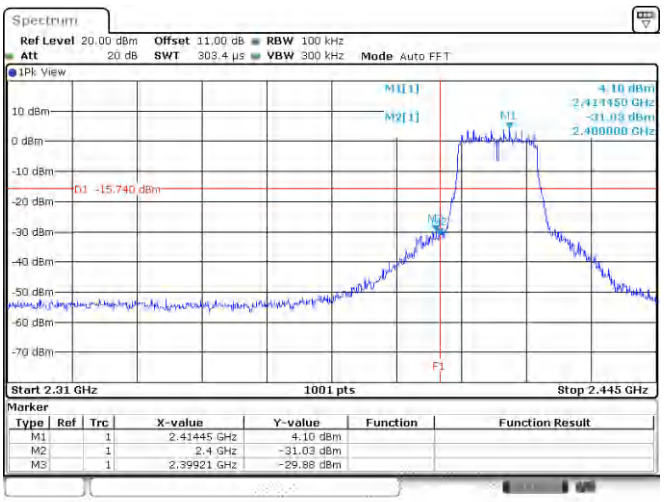
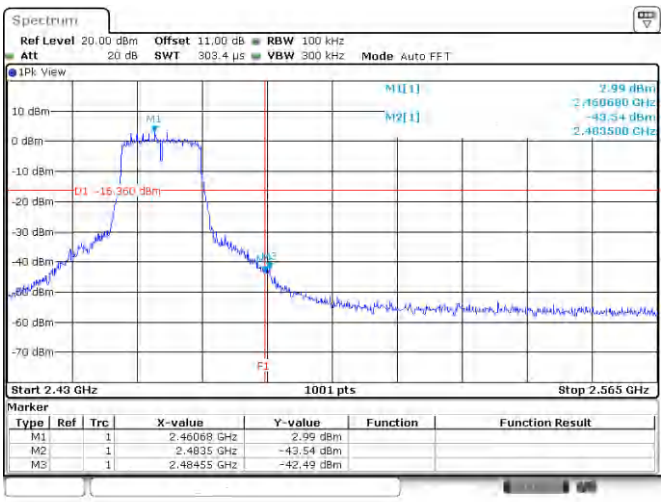
Low Channel	Middle Channel
	
High Channel	
	

Test Result of Conducted Bandedge, Tx Mode

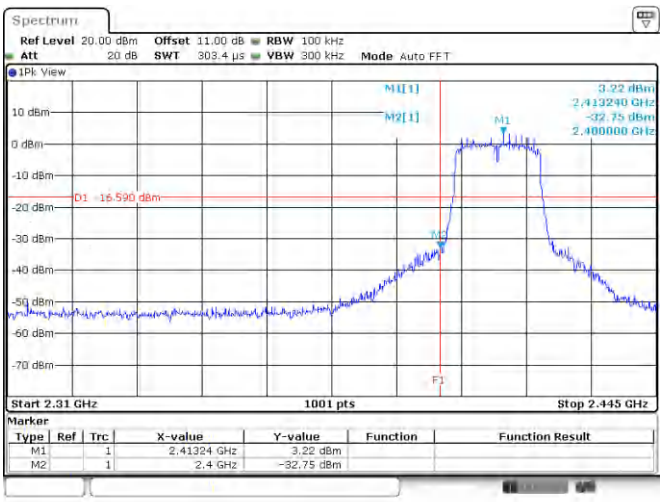
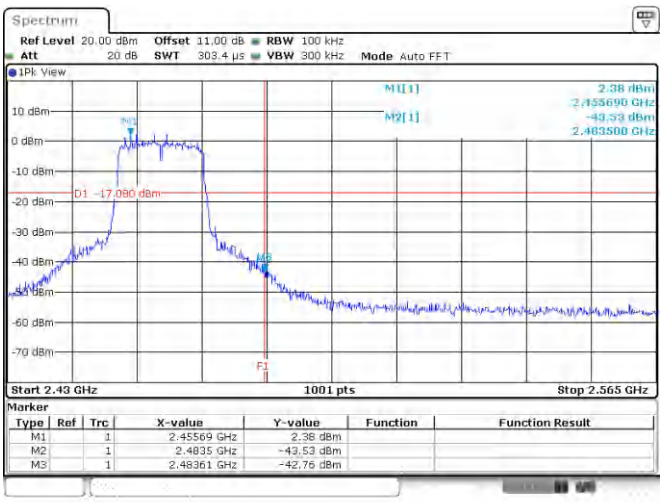
802.11b

Low Channel	High Channel
	

802.11g

Low Channel	High Channel
	

802.11n HT20

Low Channel	High Channel
	

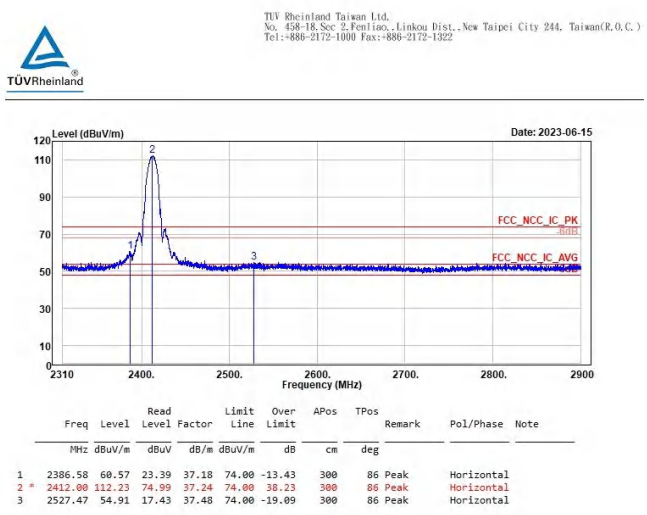
Appendix B: Test Results of Radiated Spurious Emissions & Mains

Conducted Emission Test for WFI32E02UC

Band Edges, 2.31GHz ~ 2.9GHz

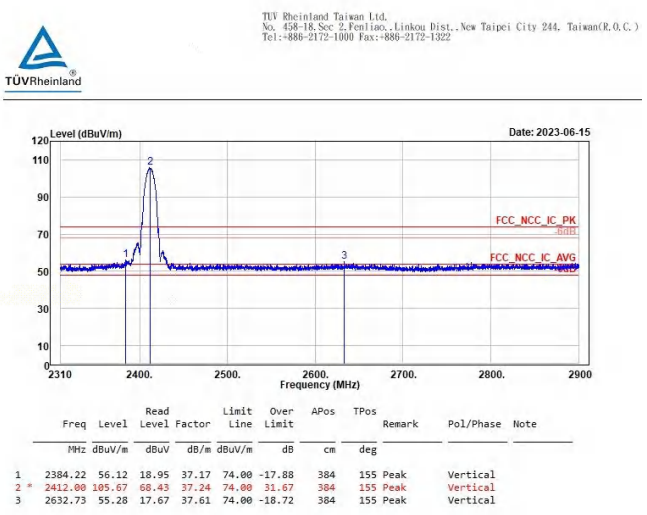
802.11b

Low Channel (Horizontal) Peak



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2386.58	60.57	23.39	37.18	74.00	-13.43	300	86	Peak	Horizontal	
2 *	2412.00	112.23	74.99	37.24	74.00	38.23	300	86	Peak	Horizontal	
3	2527.47	54.91	17.43	37.48	74.00	-19.09	300	86	Peak	Horizontal	

Low Channel (Vertical) Peak

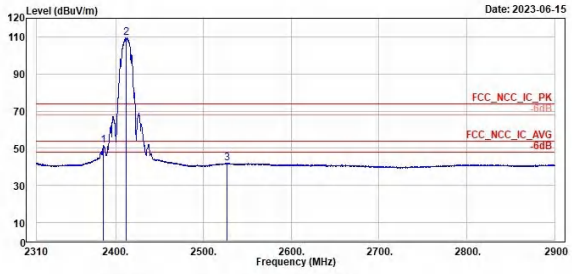


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2384.22	56.12	18.95	37.17	74.00	-17.88	384	155	Peak	Vertical	
2 *	2412.00	105.67	68.43	37.24	74.00	31.67	384	155	Peak	Vertical	
3	2632.73	55.28	17.67	37.61	74.00	-18.72	384	155	Peak	Vertical	

802.11b

Low Channel (Horizontal) Average

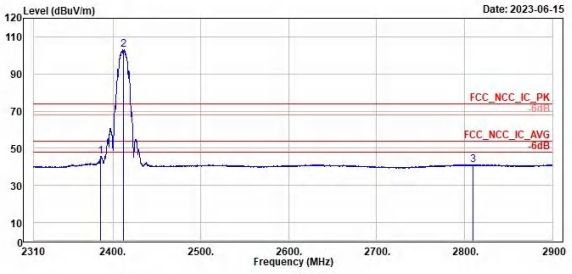
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	2386.23	51.66	14.48	37.18	54.00	-2.34	300	86	Average	Horizontal	
2 *	2412.00	109.71	72.47	37.24	54.00	55.71	300	86	Average	Horizontal	
3	2526.77	41.98	4.51	37.47	54.00	-12.02	300	86	Average	Horizontal	

Low Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2386.23	45.54	8.36	37.18	54.00	-8.46	384	155	Average	Vertical	
2 *	2412.00	103.10	65.86	37.24	54.00	49.10	384	155	Average	Vertical	
3	2809.85	41.26	3.51	37.75	54.00	-12.74	384	155	Average	Vertical	

802.11b

Middle Channel (Horizontal) Peak

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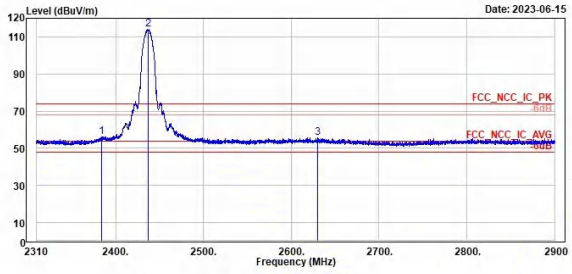
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2384.22	56.14	18.97	37.17	74.00	-17.86	260	78	Peak	Horizontal	
2 *	2437.00	114.09	76.67	37.42	74.00	40.09	260	78	Peak	Horizontal	
3	2630.02	55.67	18.05	37.62	74.00	-18.33	260	78	Peak	Horizontal	

Middle Channel (Vertical) Peak

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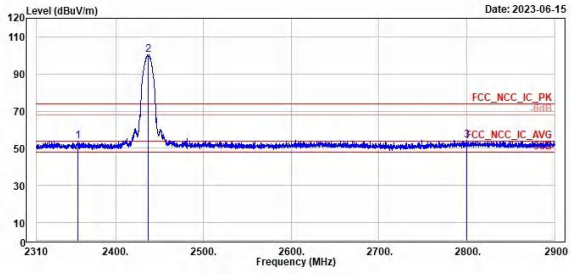
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2357.08	53.93	16.72	37.21	74.00	-20.07	100	259	Peak	Vertical	
2 *	2437.00	100.28	62.86	37.42	74.00	26.28	100	259	Peak	Vertical	
3	2800.05	54.41	16.67	37.74	74.00	-19.59	100	259	Peak	Vertical	

802.11b

Middle Channel (Horizontal) Average

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No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
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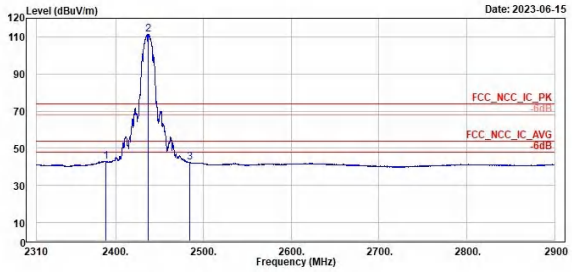

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2389.06	43.00	5.83	37.17	54.00	-11.00	260	78	Average	Horizontal	
2 *	2437.00	111.53	74.11	37.42	54.00	57.53	260	78	Average	Horizontal	
3	2484.29	42.44	4.90	37.54	54.00	-11.56	260	78	Average	Horizontal	

Middle Channel (Vertical) Average

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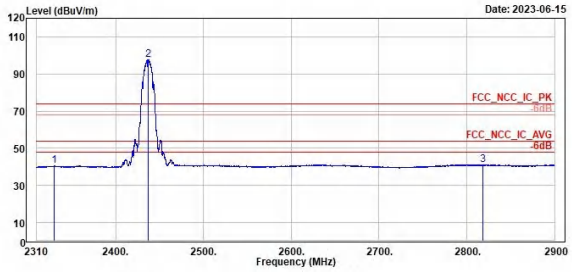
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2329.71	40.52	3.49	37.03	54.00	-13.48	100	259	Average	Vertical	
2 *	2437.00	97.74	60.32	37.42	54.00	43.74	100	259	Average	Vertical	
3	2818.58	41.28	3.53	37.75	54.00	-12.72	100	259	Average	Vertical	

802.11b

High Channel (Horizontal) Peak

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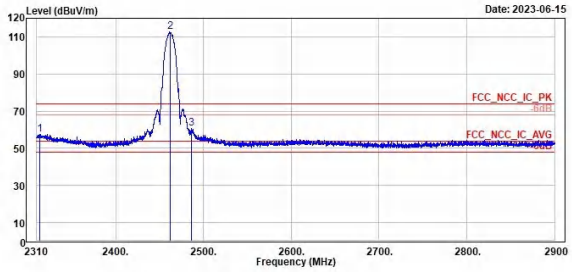
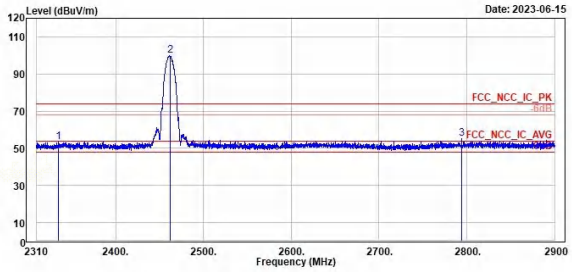
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2314.01	57.52	20.64	36.88	74.00	-16.48	285	79	Peak	Horizontal	
2 *	2462.00	112.48	74.96	37.52	74.00	38.48	285	79	Peak	Horizontal	
3	2486.65	60.73	23.18	37.55	74.00	-13.27	285	79	Peak	Horizontal	

High Channel (Vertical) Peak

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2334.78	53.61	16.54	37.07	74.00	-20.39	131	259	Peak	Vertical	
2 *	2462.00	100.07	62.55	37.52	74.00	26.07	131	259	Peak	Vertical	
3	2794.04	55.17	17.49	37.68	74.00	-18.83	131	259	Peak	Vertical	

802.11b

High Channel (Horizontal) Average

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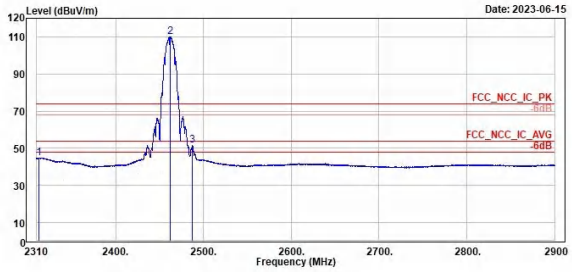
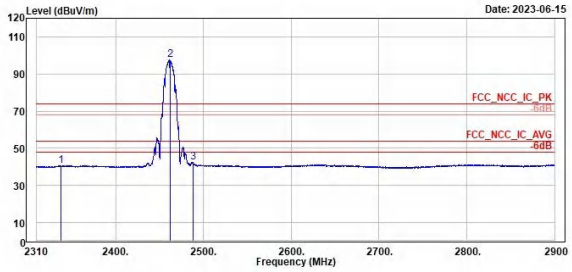
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2312.95	44.90	8.03	36.87	54.00	-9.10	285	79	Average	Horizontal	
2 *	2462.00	109.92	72.40	37.52	54.00	55.92	285	79	Average	Horizontal	
3 !	2487.71	51.35	13.80	37.55	54.00	-2.65	285	79	Average	Horizontal	

High Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

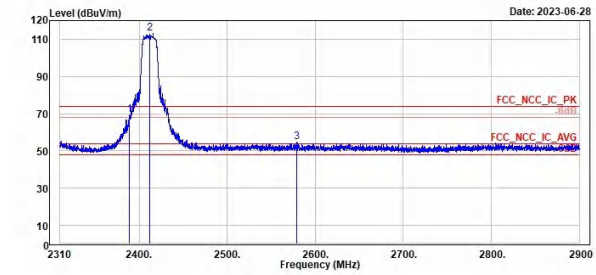


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2337.97	40.69	3.59	37.10	54.00	-13.31	131	259	Average	Vertical	
2 *	2462.00	97.51	59.99	37.52	54.00	43.51	131	259	Average	Vertical	
3	2487.83	42.50	4.95	37.55	54.00	-11.50	131	259	Average	Vertical	

802.11g

Low Channel (Horizontal) Peak

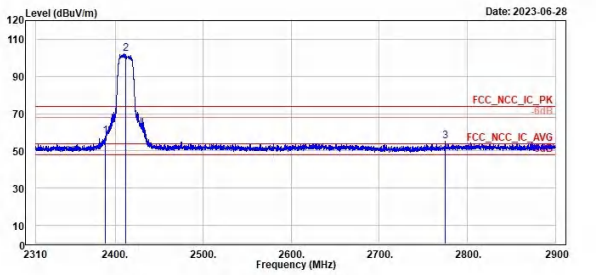
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	2389.30	69.35	32.18	37.17	74.00	-4.65	334	98	Peak	Horizontal	
2 *	2412.00	113.15	75.91	37.24	74.00	39.15	334	98	Peak	Horizontal	
3	2579.39	54.87	17.32	37.55	74.00	-19.13	334	98	Peak	Horizontal	

Low Channel (Vertical) Peak

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

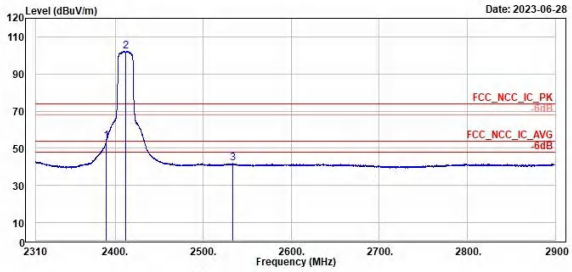


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2389.06	58.15	20.98	37.17	74.00	-15.85	100	300	Peak	Vertical	
2 *	2412.00	102.29	65.05	37.24	74.00	28.29	100	300	Peak	Vertical	
3	2774.45	55.42	17.91	37.51	74.00	-18.58	100	300	Peak	Vertical	

802.11g

Low Channel (Horizontal) Average

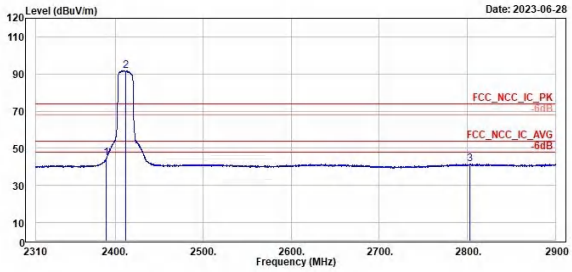
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	2390.00	53.66	16.49	37.17	54.00	-0.34	334	98	Average	Horizontal	
2 *	2412.00	102.41	65.17	37.24	54.00	48.41	334	98	Average	Horizontal	
3	2533.49	41.85	4.39	37.46	54.00	-12.15	334	98	Average	Horizontal	

Low Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

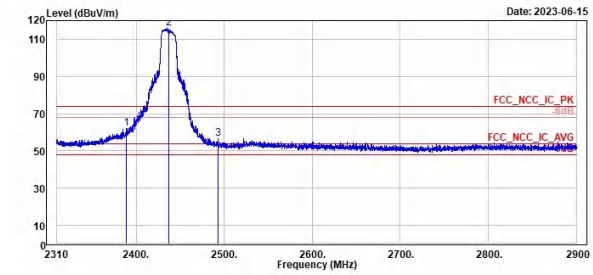


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2390.00	44.66	7.49	37.17	54.00	-9.34	100	300	Average	Vertical	
2 *	2412.00	91.83	54.59	37.24	54.00	37.83	100	300	Average	Vertical	
3	2802.41	41.57	3.83	37.74	54.00	-12.43	100	300	Average	Vertical	

802.11g

Middle Channel (Horizontal) Peak

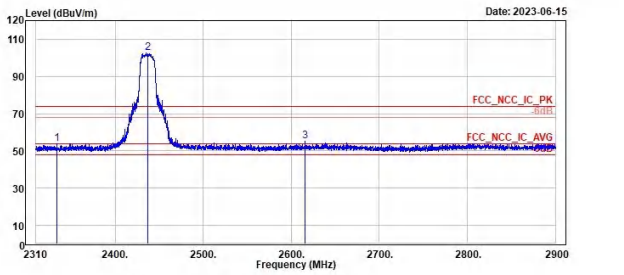
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2388.94	62.11	24.94	37.17	74.00	-11.89	267	290	Peak	Horizontal	
2 *	2437.00	115.90	78.48	37.42	74.00	41.90	267	290	Peak	Horizontal	
3	2492.66	56.71	19.16	37.55	74.00	-17.29	267	290	Peak	Horizontal	

Middle Channel (Vertical) Peak

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

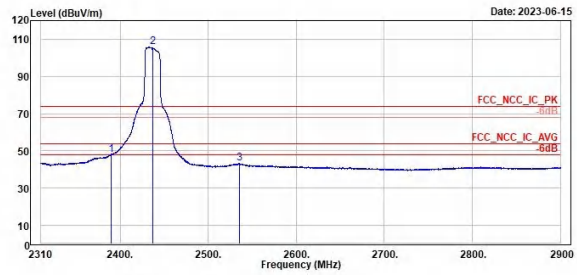


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2334.07	53.91	16.85	37.06	74.00	-20.09	162	260	Peak	Vertical	
2 *	2437.00	102.71	65.29	37.42	74.00	28.71	162	260	Peak	Vertical	
3	2615.97	55.16	17.52	37.64	74.00	-18.84	162	260	Peak	Vertical	

802.11g

Middle Channel (Horizontal) Average

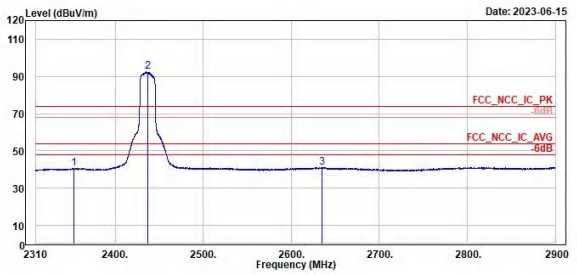
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. ,Linkou Dist. ,New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2389.65	47.89	10.72	37.17	54.00	-6.11	267	290	Average	Horizontal	
2 *	2437.00	105.72	68.30	37.42	54.00	51.72	267	290	Average	Horizontal	
3	2535.50	43.22	5.77	37.45	54.00	-10.78	267	290	Average	Horizontal	

Middle Channel (Vertical) Average

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. ,Linkou Dist. ,New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

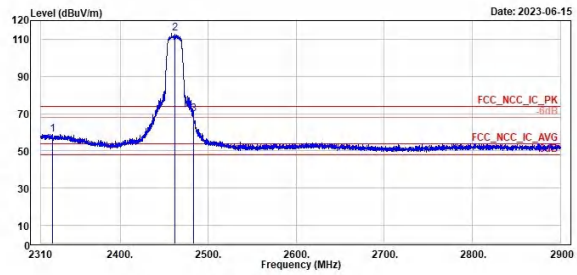


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2352.83	40.56	3.36	37.20	54.00	-13.44	162	260	Average	Vertical	
2 *	2437.00	92.45	55.03	37.42	54.00	38.45	162	260	Average	Vertical	
3	2635.09	41.22	3.61	37.61	54.00	-12.78	162	260	Average	Vertical	

802.11g

High Channel (Horizontal) Peak

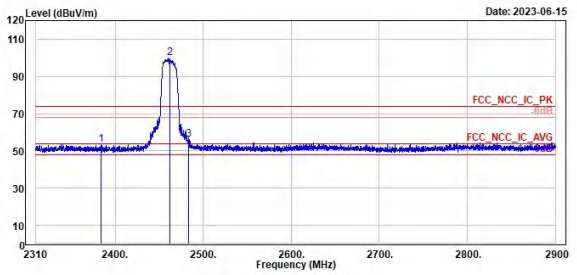
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2322.86	58.98	22.02	36.96	74.00	-15.02	290	290	Peak	Horizontal	
2 *	2462.00	113.12	75.60	37.52	74.00	39.12	290	290	Peak	Horizontal	
3 !	2483.46	69.68	32.14	37.54	74.00	-4.32	290	290	Peak	Horizontal	

High Channel (Vertical) Peak

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

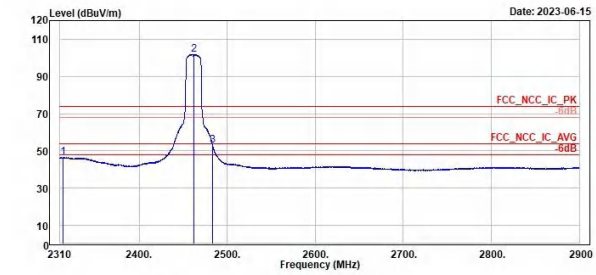


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2383.87	53.55	16.38	37.17	74.00	-20.45	131	260	Peak	Vertical	
2 *	2462.00	99.78	62.26	37.52	74.00	25.78	131	260	Peak	Vertical	
3	2483.70	56.17	18.63	37.54	74.00	-17.83	131	260	Peak	Vertical	

802.11g

High Channel (Horizontal) Average

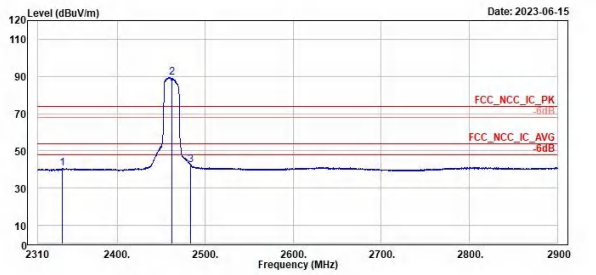
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2313.42	46.62	9.74	36.88	54.00	-7.38	290	290	Average	Horizontal	
2 *	2462.00	101.82	64.30	37.52	54.00	47.82	290	290	Average	Horizontal	
3 !	2483.46	53.11	15.57	37.54	54.00	-0.89	290	290	Average	Horizontal	

High Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

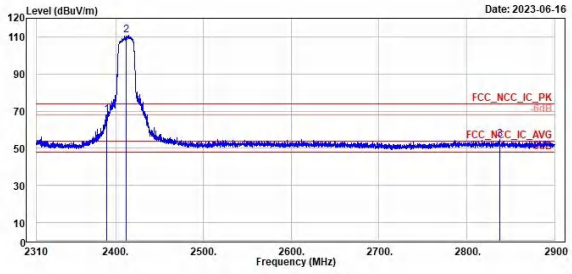


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2338.08	40.47	3.37	37.10	54.00	-13.53	131	260	Average	Vertical	
2 *	2462.00	89.48	51.96	37.52	54.00	35.48	131	260	Average	Vertical	
3	2483.81	42.44	4.90	37.54	54.00	-11.56	131	260	Average	Vertical	

802.11n HT20

Low Channel (Horizontal) Peak

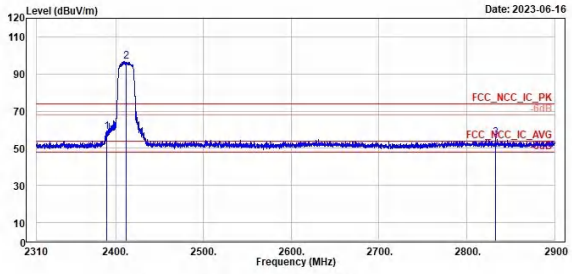
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	2389.65	68.02	30.85	37.17	74.00	-5.98	297	84	Peak	Horizontal	
2 *	2412.00	111.09	73.85	37.24	74.00	37.09	297	84	Peak	Horizontal	
3	2837.58	54.89	17.12	37.77	74.00	-19.11	297	84	Peak	Horizontal	

Low Channel (Vertical) Peak

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2389.53	58.86	21.69	37.17	74.00	-15.14	132	258	Peak	Vertical	
2 *	2412.00	96.88	59.64	37.24	74.00	22.88	132	258	Peak	Vertical	
3	2832.50	55.89	18.12	37.77	74.00	-18.11	132	258	Peak	Vertical	

802.11n HT20

Low Channel (Horizontal) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
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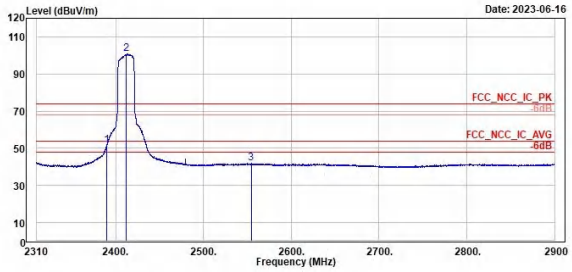
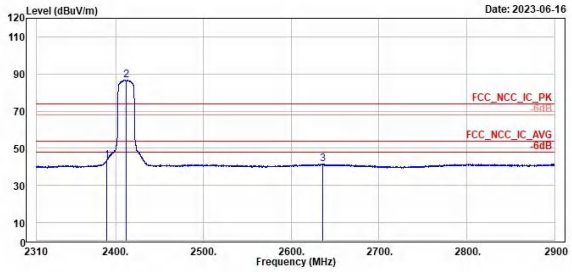


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	2390.00	51.34	14.17	37.17	54.00	-2.66	297	84	Average	Horizontal	
2 *	2412.00	100.71	63.47	37.24	54.00	46.71	297	84	Average	Horizontal	
3	2554.38	41.85	4.42	37.43	54.00	-12.15	297	84	Average	Horizontal	

Low Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

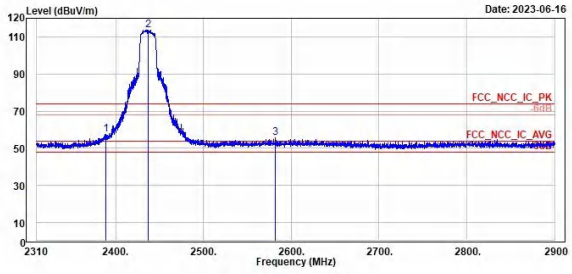


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2390.00	43.44	6.27	37.17	54.00	-10.56	132	258	Average	Vertical	
2 *	2412.00	86.91	49.67	37.24	54.00	32.91	132	258	Average	Vertical	
3	2636.15	41.43	3.81	37.62	54.00	-12.57	132	258	Average	Vertical	

802.11n HT20

Middle Channel (Horizontal) Peak

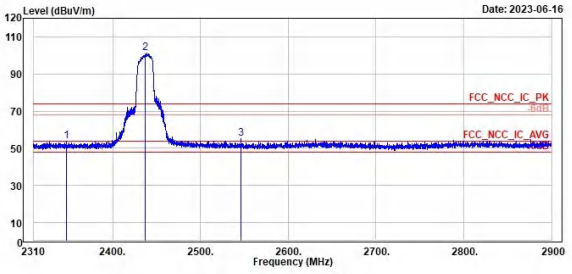
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2389.30	57.58	20.41	37.17	74.00	-16.42	261	76	Peak	Horizontal	
2 *	2437.00	113.77	76.35	37.42	74.00	39.77	261	76	Peak	Horizontal	
3	2581.52	55.46	17.90	37.56	74.00	-18.54	261	76	Peak	Horizontal	

Middle Channel (Vertical) Peak

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2347.05	53.76	16.57	37.19	74.00	-20.24	125	257	Peak	Vertical	
2 *	2437.00	101.24	63.82	37.42	74.00	27.24	125	257	Peak	Vertical	
3	2546.00	55.32	17.90	37.42	74.00	-18.68	125	257	Peak	Vertical	

802.11n HT20

Middle Channel (Horizontal) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
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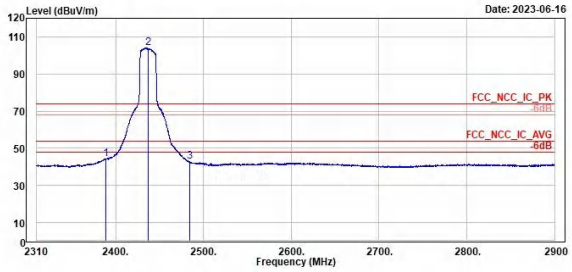
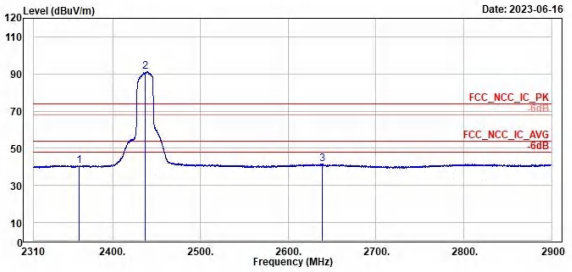


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2388.94	44.44	7.27	37.17	54.00	-9.56	261	76	Average	Horizontal	
2 *	2437.00	104.22	66.80	37.42	54.00	50.22	261	76	Average	Horizontal	
3	2484.17	42.86	5.32	37.54	54.00	-11.14	261	76	Average	Horizontal	

Middle Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

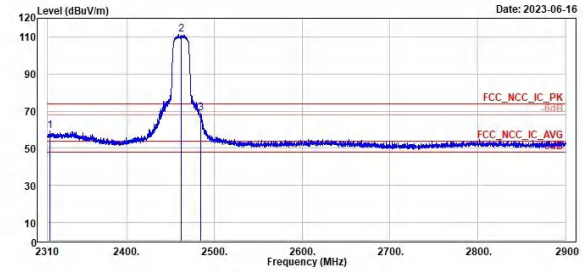


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2361.92	40.75	3.55	37.20	54.00	-13.25	125	257	Average	Vertical	
2 *	2437.00	91.14	53.72	37.42	54.00	37.14	125	257	Average	Vertical	
3	2639.22	41.53	3.92	37.61	54.00	-12.47	125	257	Average	Vertical	

802.11n HT20

High Channel (Horizontal) Peak

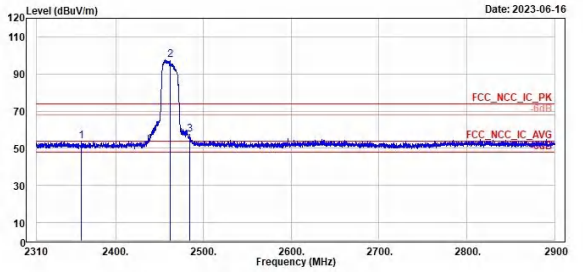
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2312.36	59.17	22.30	36.87	74.00	-14.83	289	289	Peak	Horizontal	
2 *	2462.00	111.11	73.59	37.52	74.00	37.11	289	289	Peak	Horizontal	
3 !	2484.17	68.92	31.38	37.54	74.00	-5.08	289	289	Peak	Horizontal	

High Channel (Vertical) Peak

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

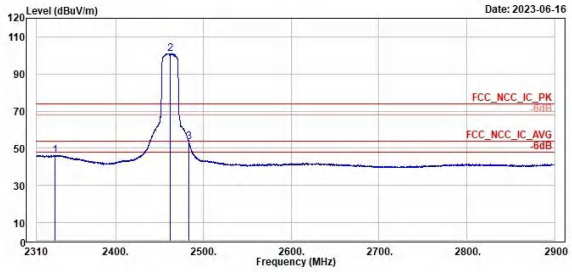


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2361.21	53.73	16.53	37.20	74.00	-20.27	128	259	Peak	Vertical	
2 *	2462.00	97.58	60.06	37.52	74.00	23.58	128	259	Peak	Vertical	
3	2484.17	57.55	20.01	37.54	74.00	-16.45	128	259	Peak	Vertical	

802.11n HT20

High Channel (Horizontal) Average

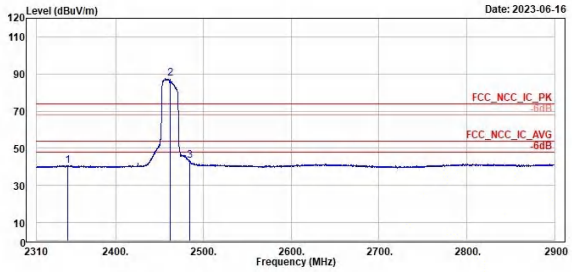
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2330.65	46.18	9.14	37.04	54.00	-7.82	289	289	Average	Horizontal	
2 *	2462.00	101.05	63.53	37.52	54.00	47.05	289	289	Average	Horizontal	
3 !	2483.58	53.18	15.64	37.54	54.00	-0.82	289	289	Average	Horizontal	

High Channel (Vertical) Average

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



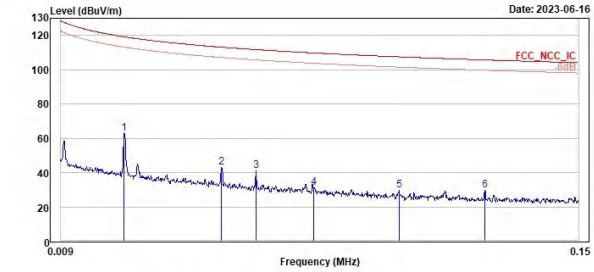
	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	2345.28	40.61	3.44	37.17	54.00	-13.39	128	259	Average	Vertical	
2 *	2462.00	87.40	49.88	37.52	54.00	33.40	128	259	Average	Vertical	
3	2484.17	43.24	5.70	37.54	54.00	-10.76	128	259	Average	Vertical	

Spurious Emissions, Tx Mode, 9kHz ~ 30MHz

802.11b

Middle Channel 9kHz~150kHz(Open)

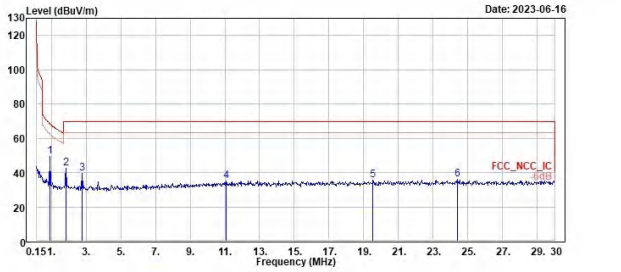
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	0.03	62.89	43.95	18.94	119.18	-56.29	100	103	Peak	Open	
2	0.05	43.21	24.16	19.05	113.13	-69.92	100	202	Peak	Open	
3	0.06	40.79	21.96	18.83	111.72	-70.93	100	42	Peak	Open	
4	0.08	31.21	12.76	18.45	109.76	-78.55	100	263	Peak	Open	
5	0.10	29.46	11.54	17.92	107.50	-78.04	100	42	Peak	Open	
6	0.12	29.67	11.65	18.02	105.70	-76.03	100	270	Peak	Open	

Middle Channel 150kHz~30MHz(Open)

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244. Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



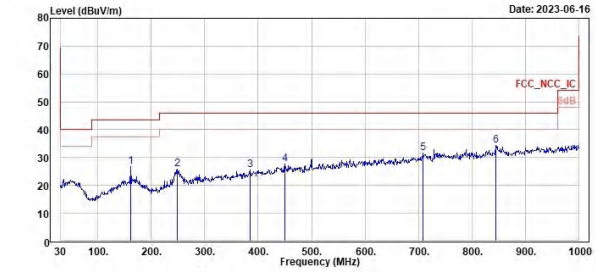
	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	0.93	49.66	30.63	19.03	68.27	-18.61	100	154	Peak	Open	
2	1.85	42.35	23.05	19.30	69.50	-27.15	100	132	Peak	Open	
3	2.78	39.66	20.11	19.55	69.50	-29.84	100	154	Peak	Open	
4	11.08	35.13	13.57	21.56	69.50	-34.37	100	313	Peak	Open	
5	19.52	35.79	13.65	22.14	69.50	-33.71	100	45	Peak	Open	
6	24.42	36.12	13.92	22.20	69.50	-33.38	100	158	Peak	Open	

Spurious Emissions, Tx Mode, 30MHz ~ 1GHz

802.11b

Middle Channel (Horizontal)

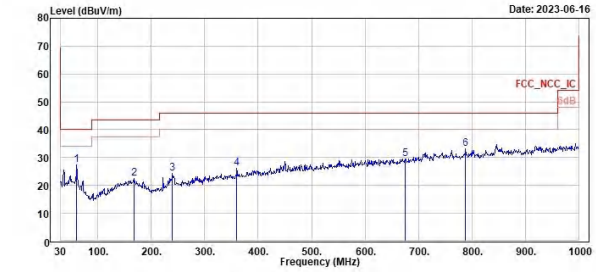
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	161.92	26.72	32.42	-5.70	43.50	-16.78	200	283	Peak	Horizontal	
2	249.22	25.82	32.26	-6.44	46.00	-20.18	200	301	Peak	Horizontal	
3	385.02	25.54	28.61	-3.07	46.00	-20.46	100	198	Peak	Horizontal	
4	450.01	27.67	29.66	-1.99	46.00	-18.33	300	269	Peak	Horizontal	
5	709.00	31.75	29.54	2.21	46.00	-14.25	158	360	Peak	Horizontal	
6	844.80	34.29	30.17	4.12	46.00	-11.71	200	136	Peak	Horizontal	

Middle Channel (Vertical)

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	60.07	27.28	33.71	-6.43	40.00	-12.72	112	42	Peak	Vertical	
2	167.74	22.62	28.34	-5.72	43.50	-20.88	100	260	Peak	Vertical	
3	239.52	24.35	30.95	-6.60	46.00	-21.65	300	259	Peak	Vertical	
4	359.80	26.30	29.86	-3.56	46.00	-19.70	200	330	Peak	Vertical	
5	675.05	29.58	28.17	1.41	46.00	-16.42	100	72	Peak	Vertical	
6	788.54	33.07	29.62	3.45	46.00	-12.93	100	243	Peak	Vertical	

Spurious Emissions, Tx Mode, 1GHz ~ 26.5GHz

802.11b

Low Channel (Horizontal)

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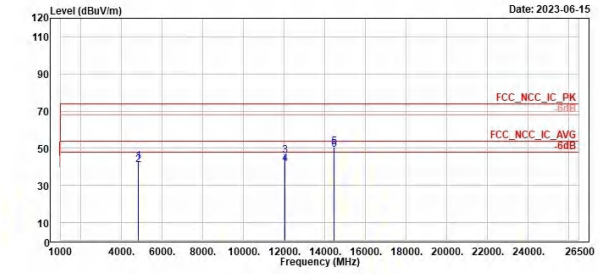

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	4824.00	42.71	51.72	-9.01	74.00	-31.29	100	80	Peak	Horizontal	
2	4824.00	40.87	49.88	-9.01	54.00	-13.13	100	80	Average	Horizontal	
3	12060.00	46.00	46.41	-0.41	74.00	-28.00	100	112	Peak	Horizontal	
4	12060.00	41.57	41.98	-0.41	54.00	-12.43	100	112	Average	Horizontal	
5	14472.00	50.71	48.10	2.61	74.00	-23.29	400	30	Peak	Horizontal	
6 !	14472.00	49.25	46.64	2.61	54.00	-4.75	400	30	Average	Horizontal	

Low Channel (Vertical)

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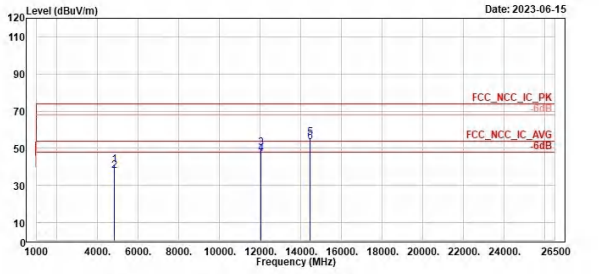

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	4824.00	41.00	50.01	-9.01	74.00	-33.00	297	160	Peak	Vertical	
2	4824.00	37.88	46.89	-9.01	54.00	-16.12	297	160	Average	Vertical	
3	12060.00	50.30	50.71	-0.41	74.00	-23.70	100	115	Peak	Vertical	
4	12060.00	47.01	47.42	-0.41	54.00	-6.99	100	115	Average	Vertical	
5	14472.00	55.77	53.16	2.61	74.00	-18.23	100	112	Peak	Vertical	
6 !	14472.00	53.30	50.69	2.61	54.00	-0.70	100	112	Average	Vertical	