



FCC RF Test Report

APPLICANT : Assured Wireless Corporation
EQUIPMENT : Cellular Wi-Fi Router
BRAND NAME : Assured Wireless
MODEL NAME : AW12Fi
FCC ID : 2A7ABAW12FI
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System
TEST DATE(S) : Oct. 26, 2022 ~ Nov. 15, 2022

We, Sporton International Inc. (ShenZhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (ShenZhen), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia



Sporton International Inc. (ShenZhen)

***1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055
People's Republic of China***



TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant	5
1.2 Manufacturer	5
1.3 Product Feature of Equipment Under Test.....	5
1.4 Product Specification of Equipment Under Test.....	5
1.5 Modification of EUT	6
1.6 Testing Location	6
1.7 Test Software.....	6
1.8 Applicable Standards.....	7
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	8
2.1 Carrier Frequency and Channel	8
2.2 Test Mode.....	9
2.3 Connection Diagram of Test System.....	9
2.4 Support Unit used in test configuration and system	10
2.5 EUT Operation Test Setup	10
2.6 Measurement Results Explanation Example.....	10
3 TEST RESULT	11
3.1 6dB and 99% Bandwidth Measurement	11
3.2 Output Power Measurement.....	13
3.3 Power Spectral Density Measurement	14
3.4 Conducted Band Edges and Spurious Emission Measurement	16
3.5 Radiated Band Edges and Spurious Emission Measurement	41
3.6 AC Conducted Emission Measurement.....	45
3.7 Antenna Requirements.....	47
4 LIST OF MEASURING EQUIPMENT	48
5 UNCERTAINTY OF EVALUATION	49
APPENDIX A. CONDUCTED TEST RESULTS	
APPENDIX B. AC CONDUCTED EMISSION TEST RESULT	
APPENDIX C. RADIATED SPURIOUS EMISSION	
APPENDIX D. DUTY CYCLE PLOTS	
APPENDIX E. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR292702A	Rev. 01	Initial issue of report	Dec. 26, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	99% Bandwidth	-	Report Only	-
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 0.20 dB at 2389.800 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 11.16 dB at 0.150 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

Assured Wireless Corporation

16885 W. Bernardo Dr., Suite 300, San Diego, CA 92127

1.2 Manufacturer

Assured Wireless Corporation

16885 W. Bernardo Dr., Suite 300, San Diego, CA 92127

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Cellular Wi-Fi Router
Brand Name	Assured Wireless
Model Name	AW12Fi
FCC ID	2A7ABAW12FI
HW Version	P2
SW Version	CPEWT_AW12Fi_v1.0.8
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to antenna	<MIMO Ant.1+2> 802.11b : 28.75 dBm (0.7499 W) 802.11g : 29.21 dBm (0.8337 W) 802.11n HT20 : 29.38 dBm (0.8670 W) 802.11n HT40 : 29.64 dBm (0.9204 W)
99% Occupied Bandwidth	802.11b : 14.34MHz 802.11g : 16.83MHz 802.11n HT20 : 17.78MHz 802.11n HT40 : 36.76MHz
Antenna Type / Gain	Ant1: External Antenna type with gain 2.68 dBi Ant2: External Antenna type with gain 2.68 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

Remark:

1. WIFI MIMO only support STBC mode by manufacturer declared.
2. For WLAN SISO & MIMO (STBC) mode, the whole testing has assessed only MIMO mode by referring to the higher normal conducted power.



1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	CO01-SZ TH01-SZ	CN1256	421272

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103 TEL: +86-755-33202398		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH03-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH03-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b



1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 15 Subpart C §15.247
- ♦ FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

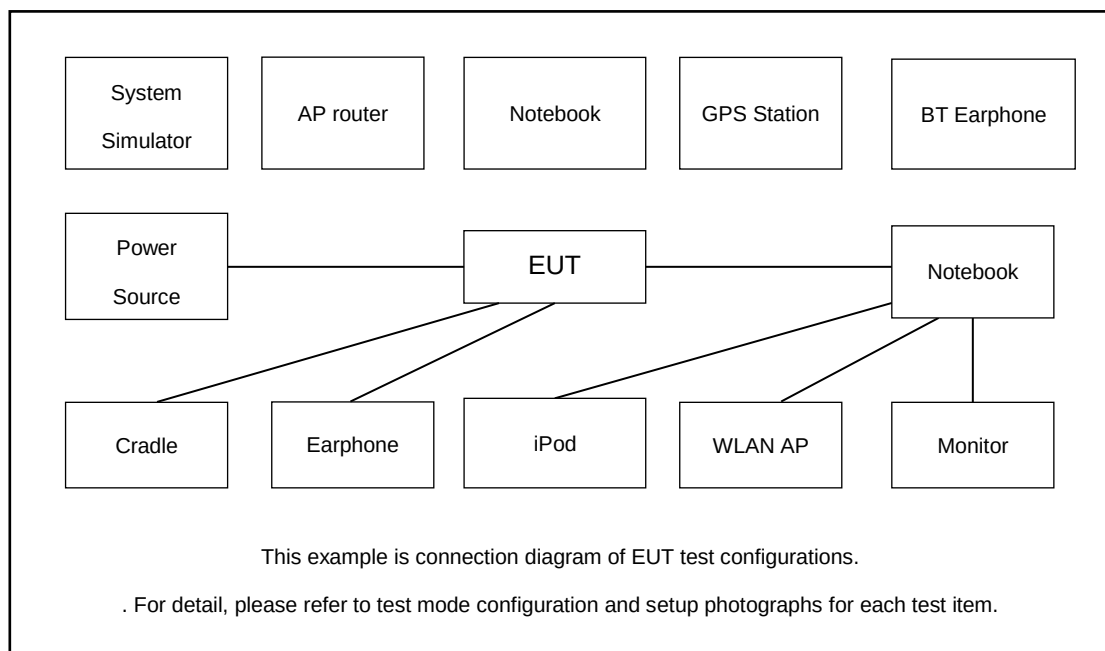
MIMO Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS8
802.11n HT40	MCS8

Test Cases	
AC Conducted Emission	Mode 1 :GSM 850 Idle + WLAN Link(2.4G) + AC Adaptor
Remark: For Radiated Test Cases, The tests were performance with Adapter	

Co-location
802.11n HT20 CH01 Tx + LTE B14 Link

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base Station(LTE)	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Notebook	DELL	Latitude 3400	N/A	N/A	Unshielded,1.8m

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit.

For AC power line conducted emissions, the EUT was set to connect with the Notebook under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 1.0 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 1.0 + 10 = 11.0 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

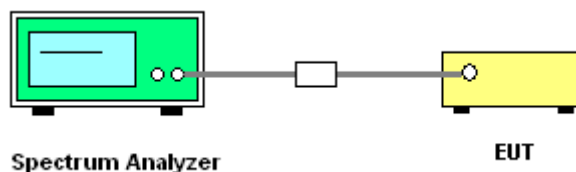
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1%~5% of OBW and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

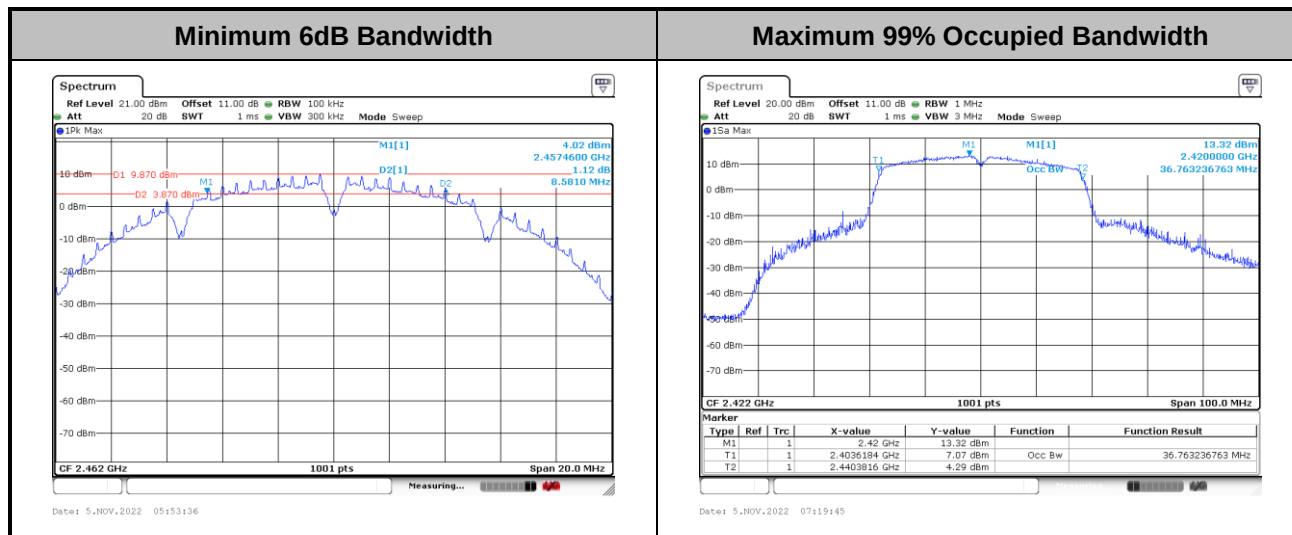
3.1.4 Test Setup





3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.



Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

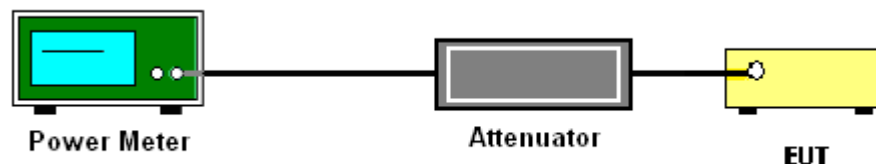
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

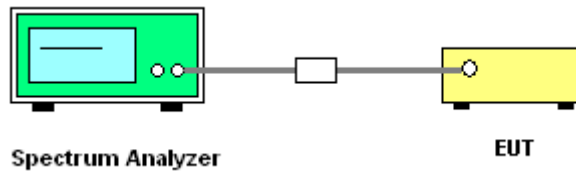
If measurements performed using method (2) plus $10 \log(N)$ exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

Method (1): Measure and sum the spectra across the outputs.

The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

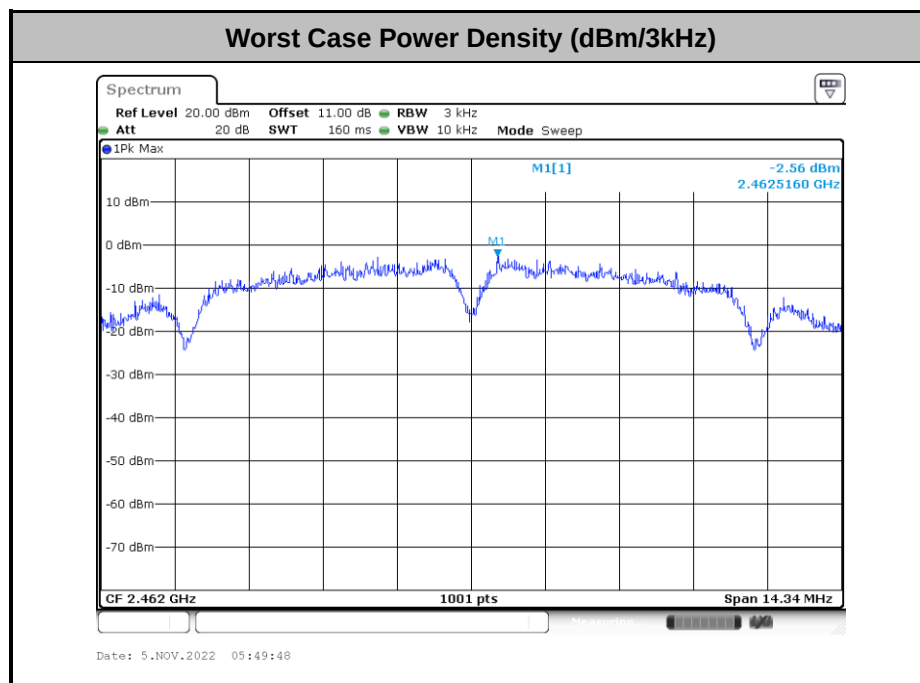
Method (2): Measure and add $10 \log(N)$ dB, where N is the number of outputs. (N=2)

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

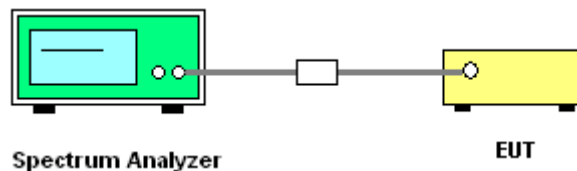
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.13
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



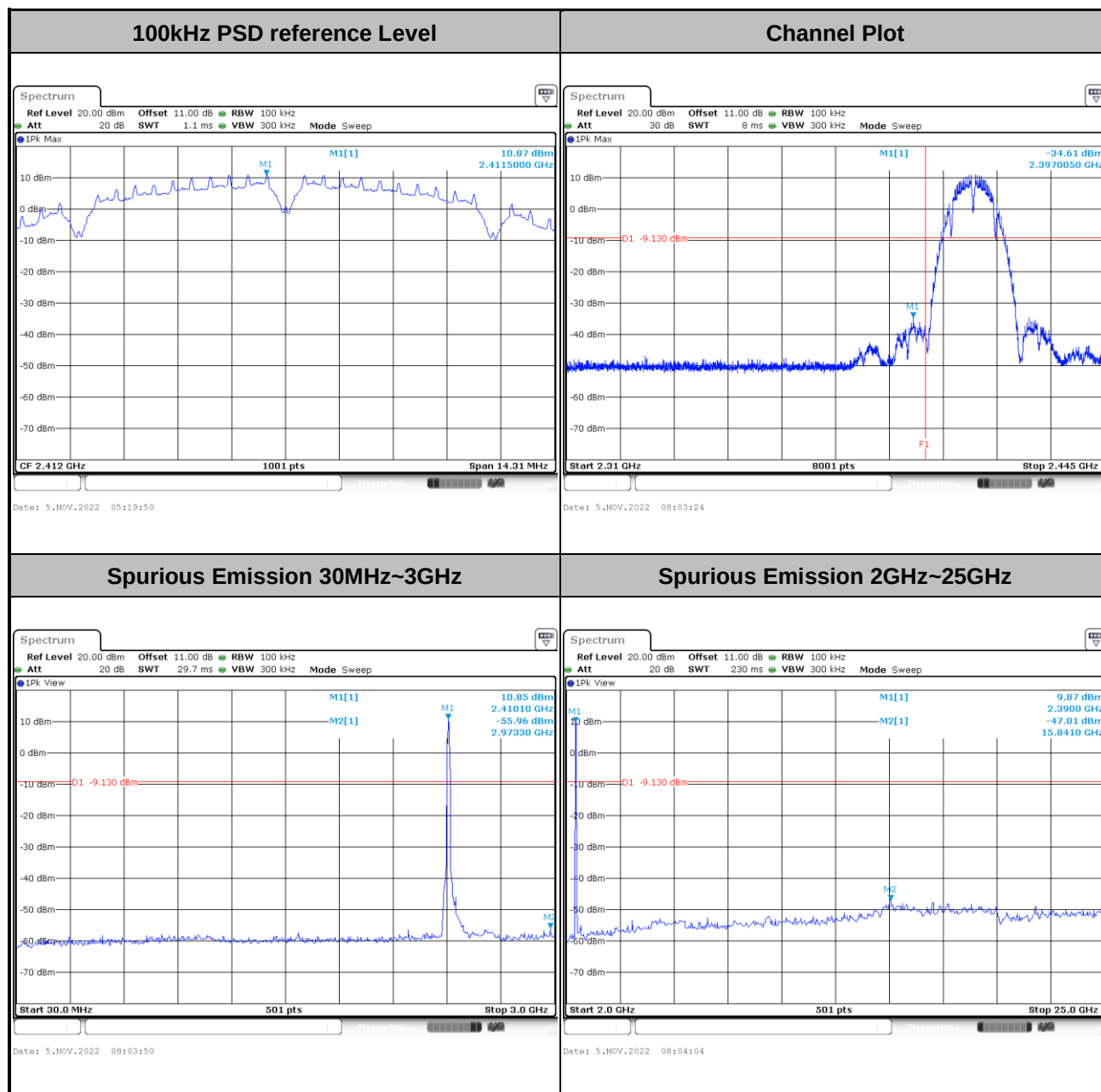


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Engineer :	Chen Ran	Temperature :	21~25°C
		Relative Humidity :	51~54%

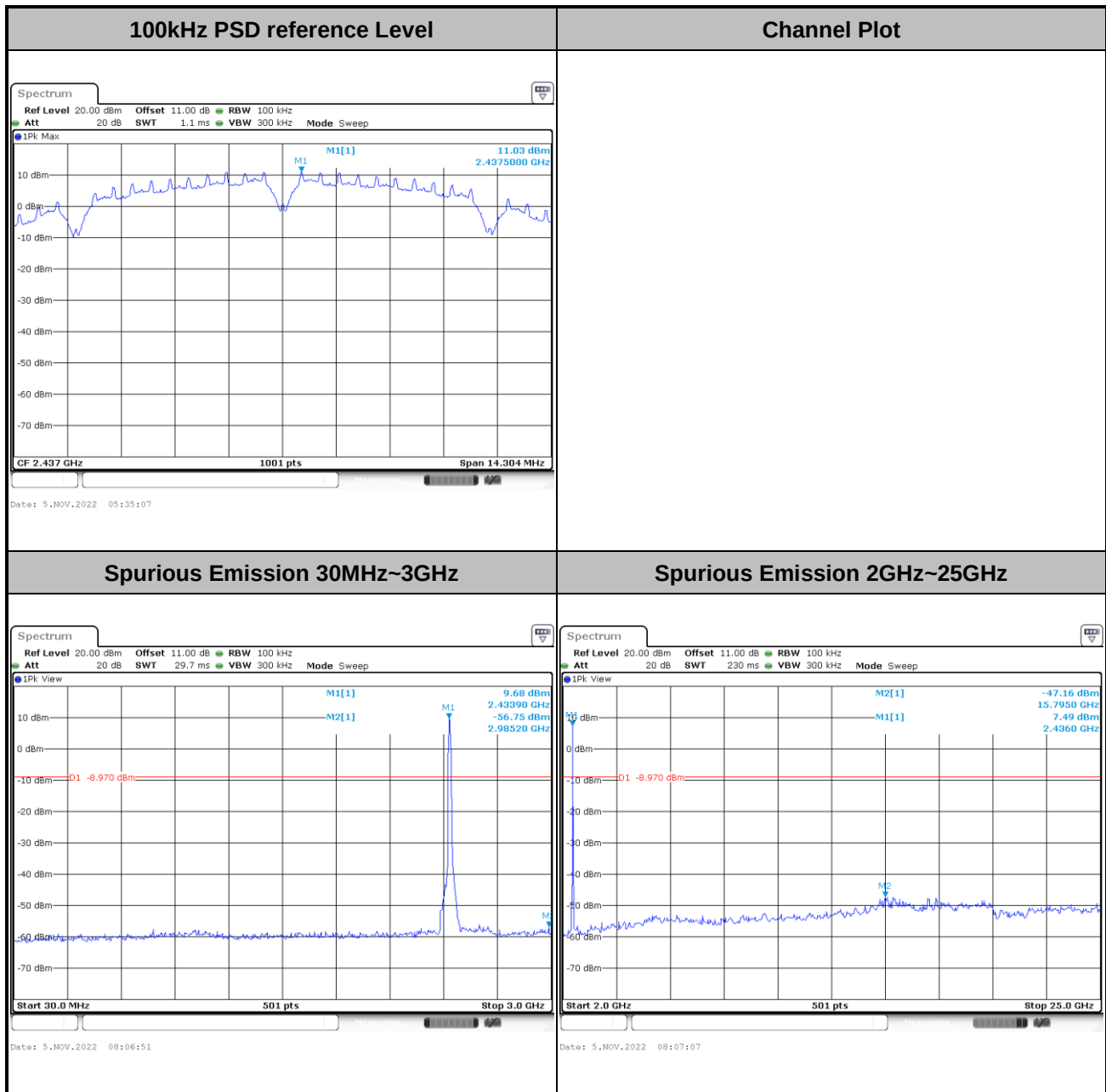
Number of TX = 2, Ant. 1 (Measured)

Test Mode :	802.11b	Test Channel :	01
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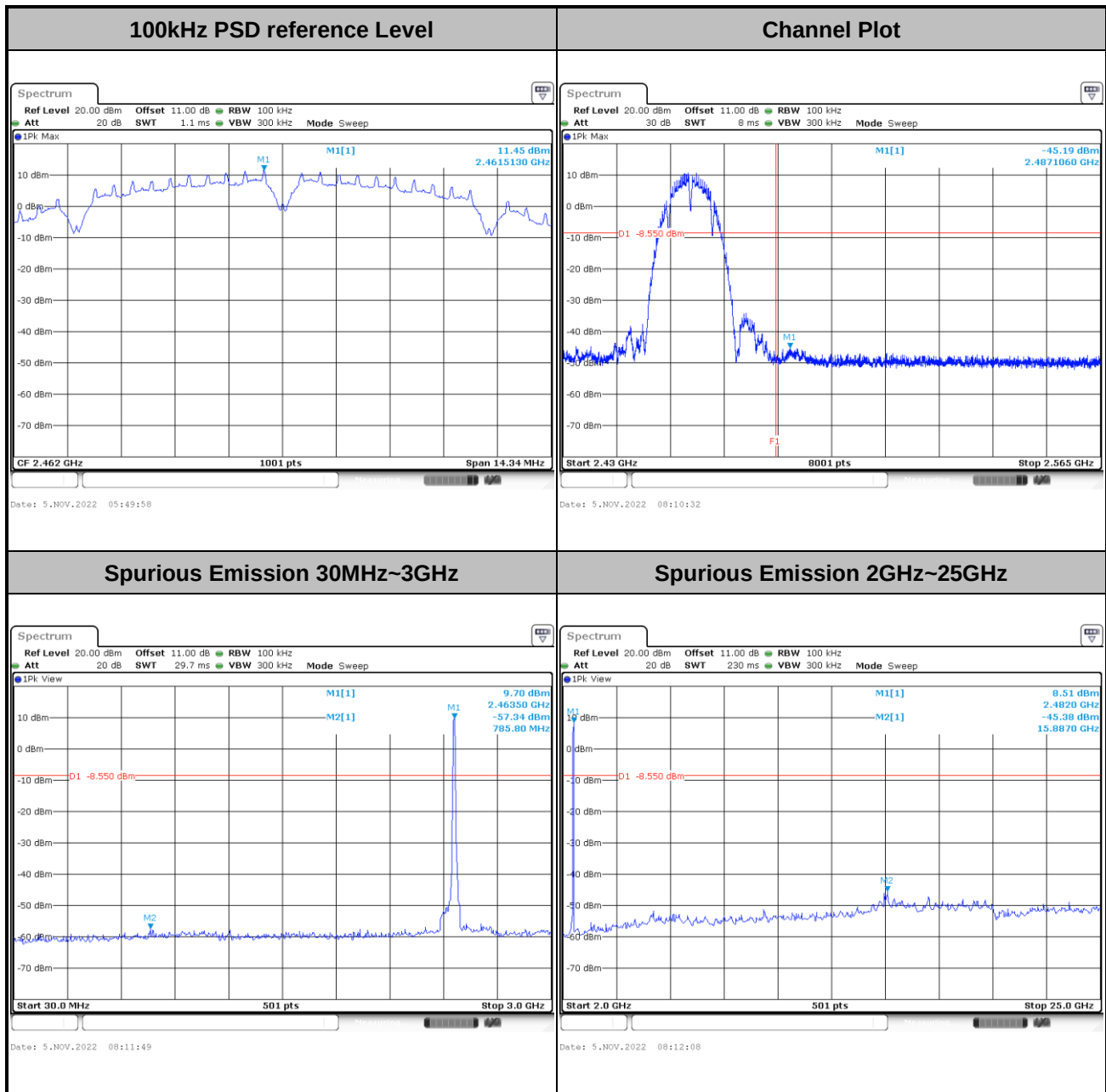


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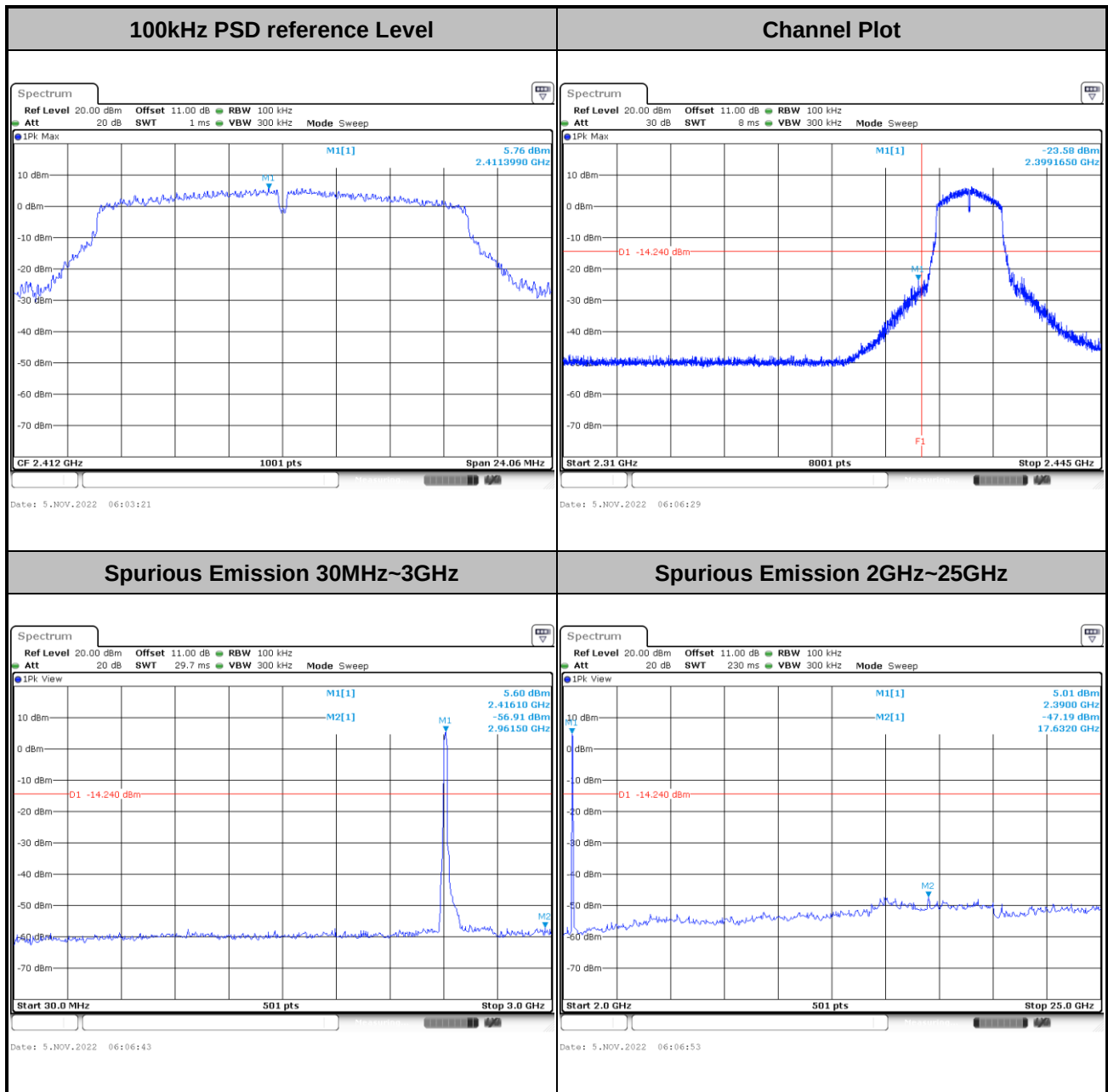


Test Mode :	802.11b	Test Channel :	11
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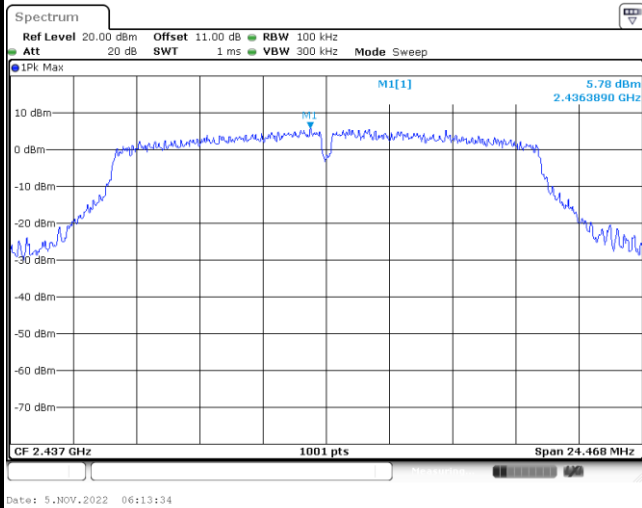
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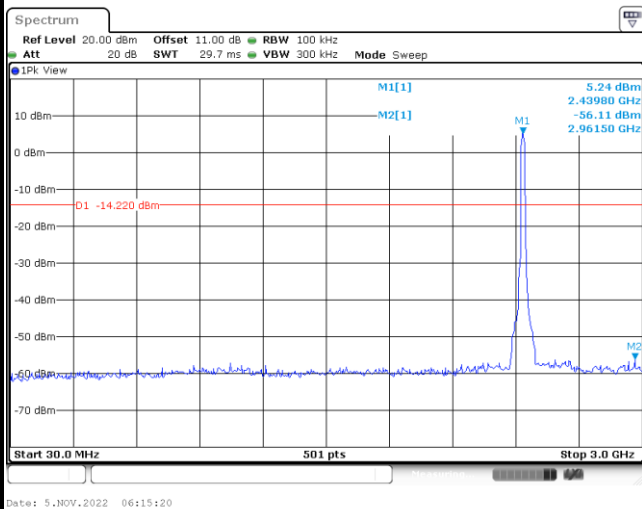
Test Mode :	802.11g	Test Channel :	06
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100kHz PSD reference Level

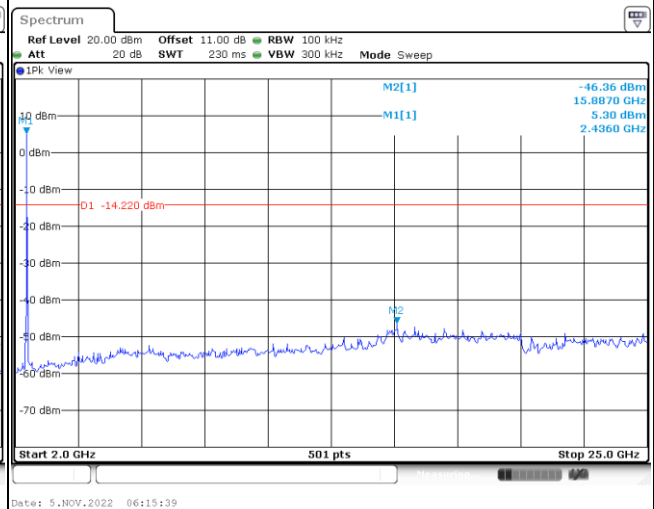


Channel Plot

Spurious Emission 30MHz~3GHz

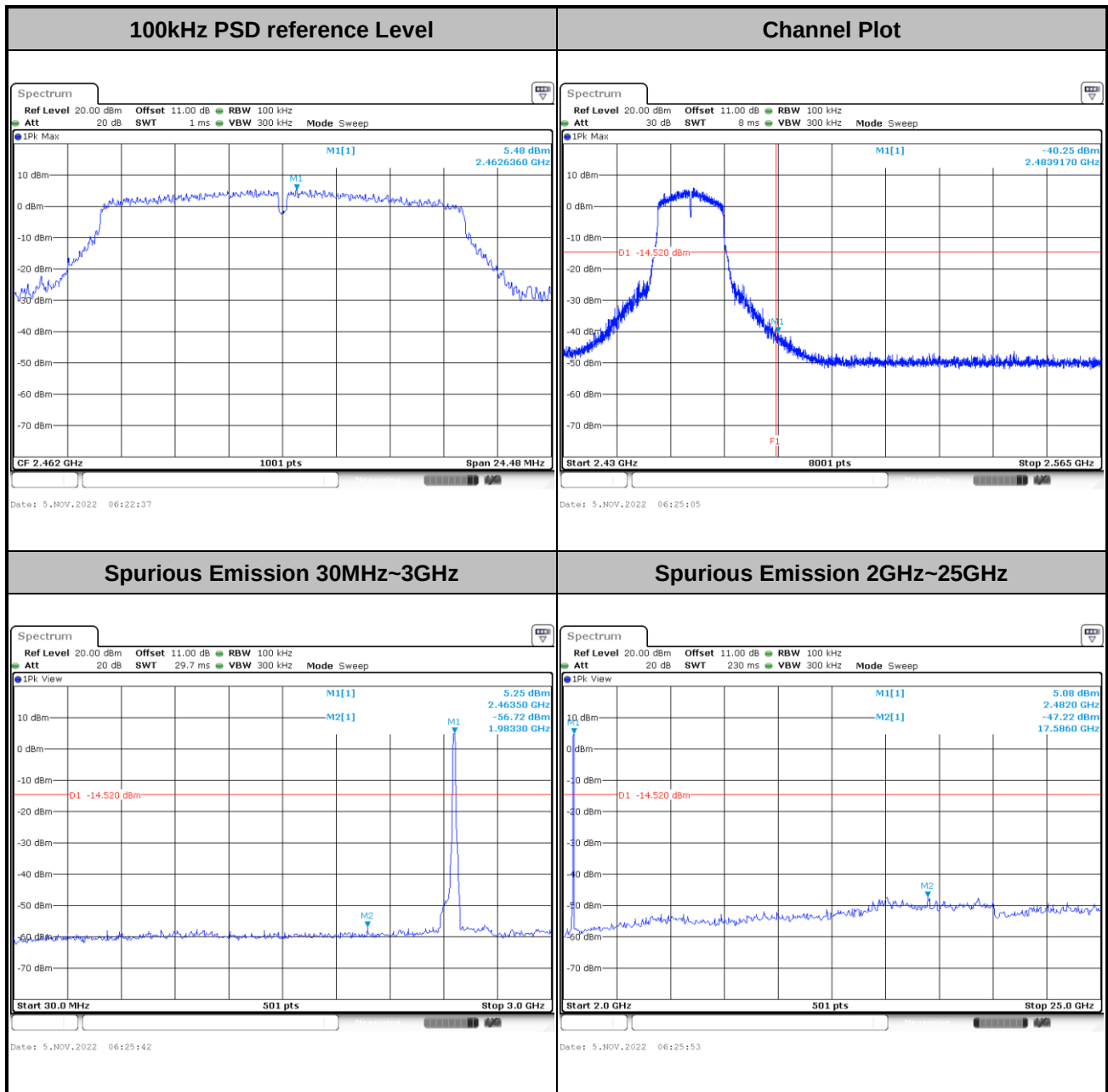


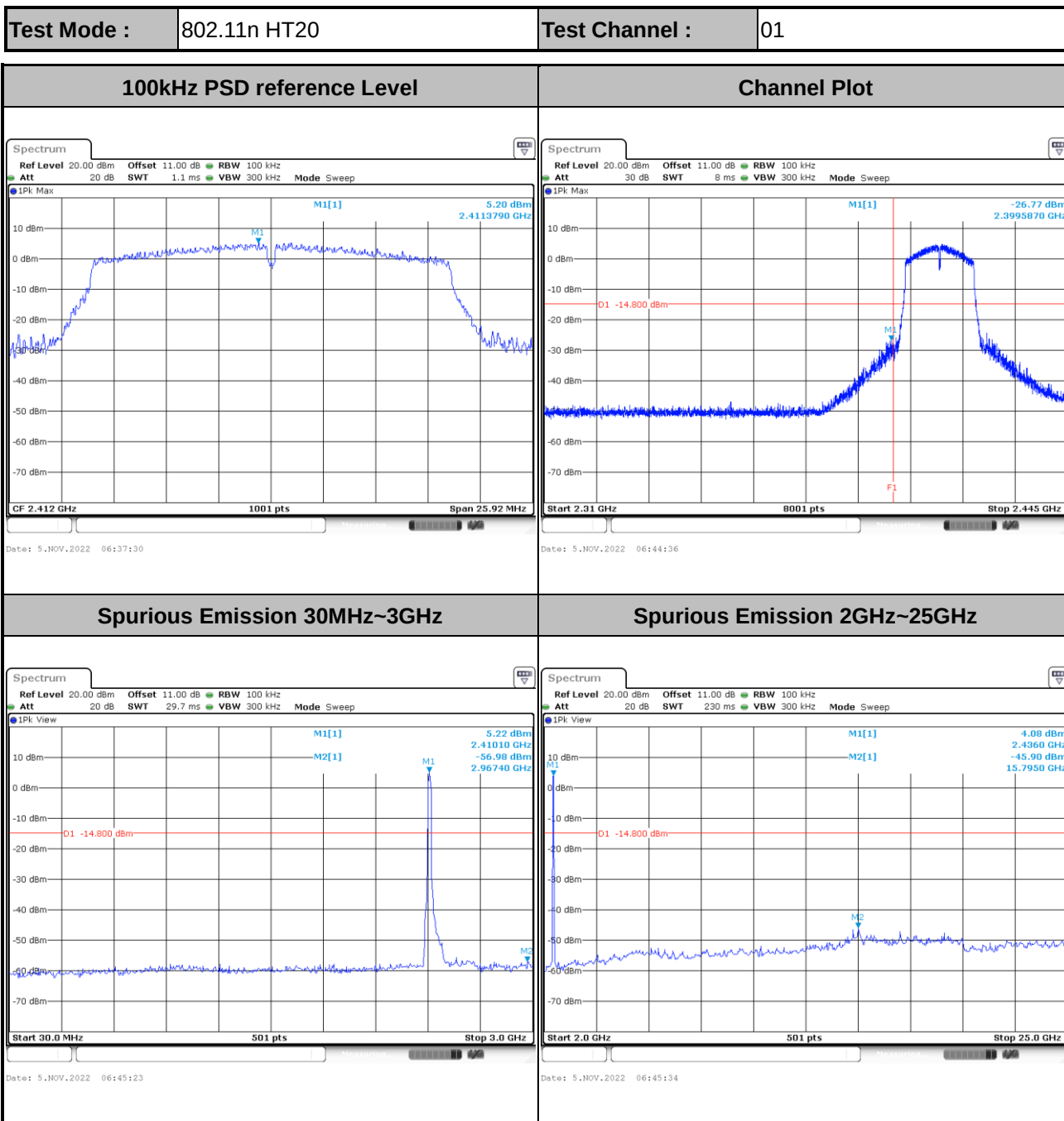
Spurious Emission 2GHz~25GHz

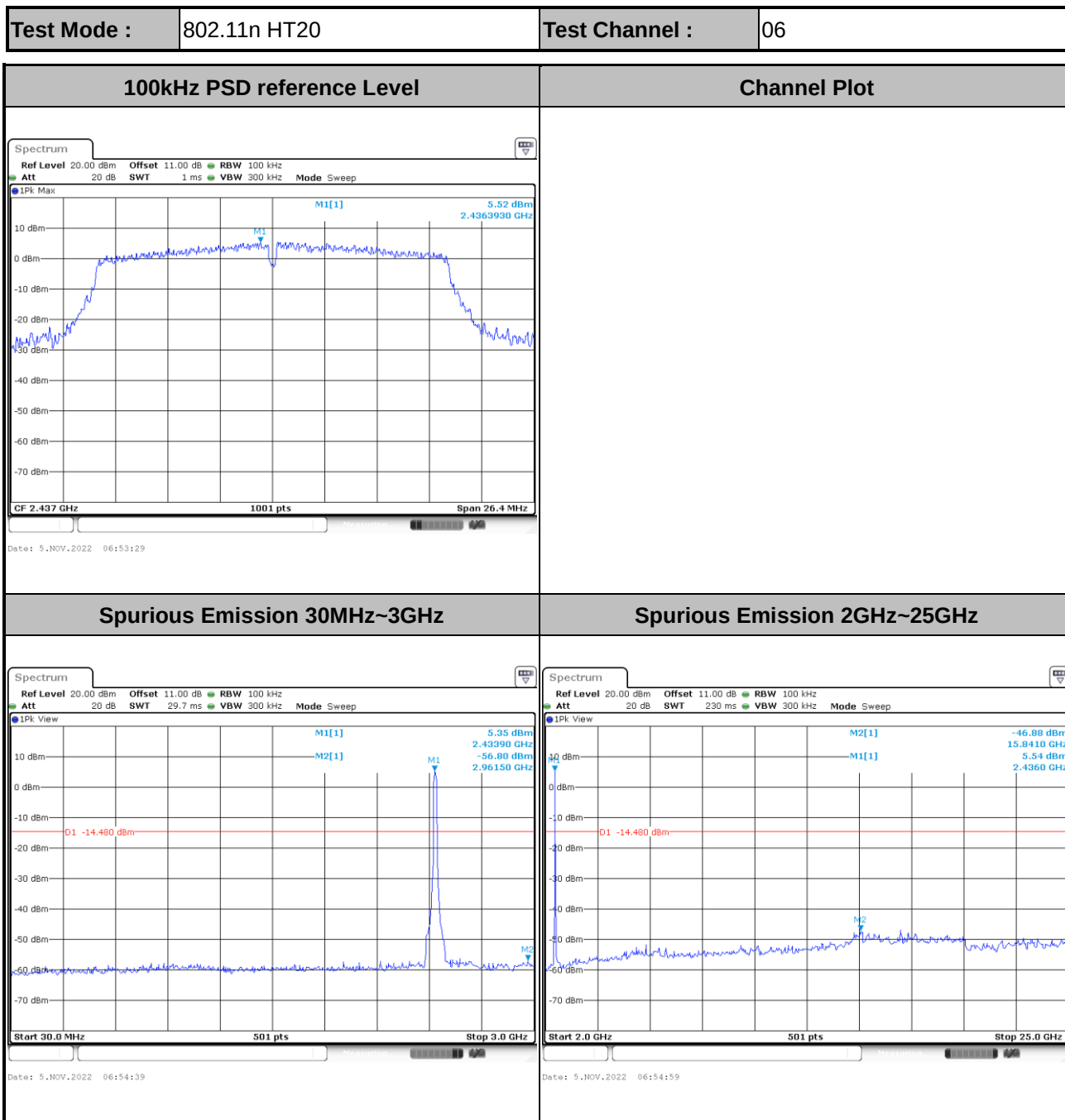


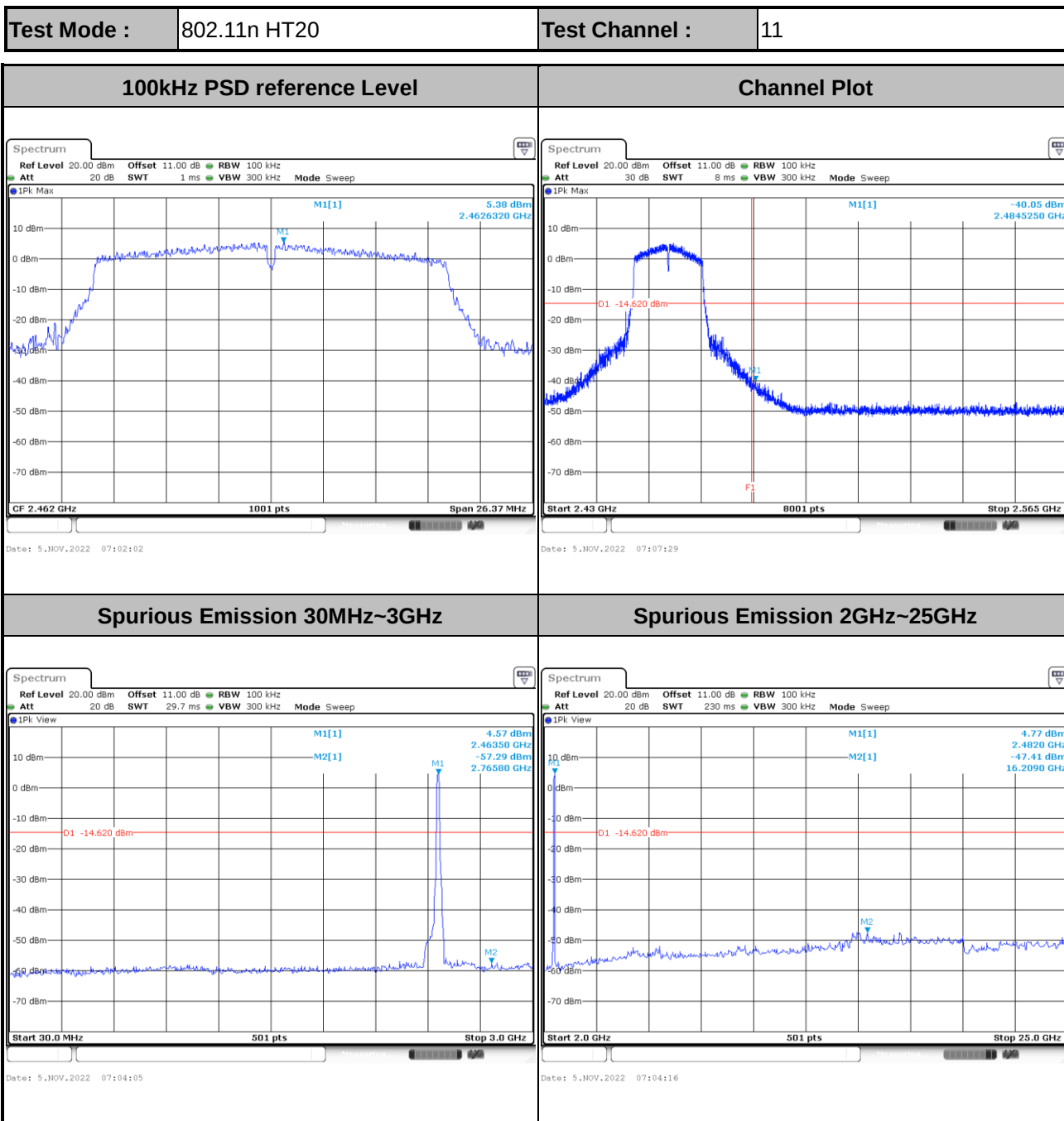


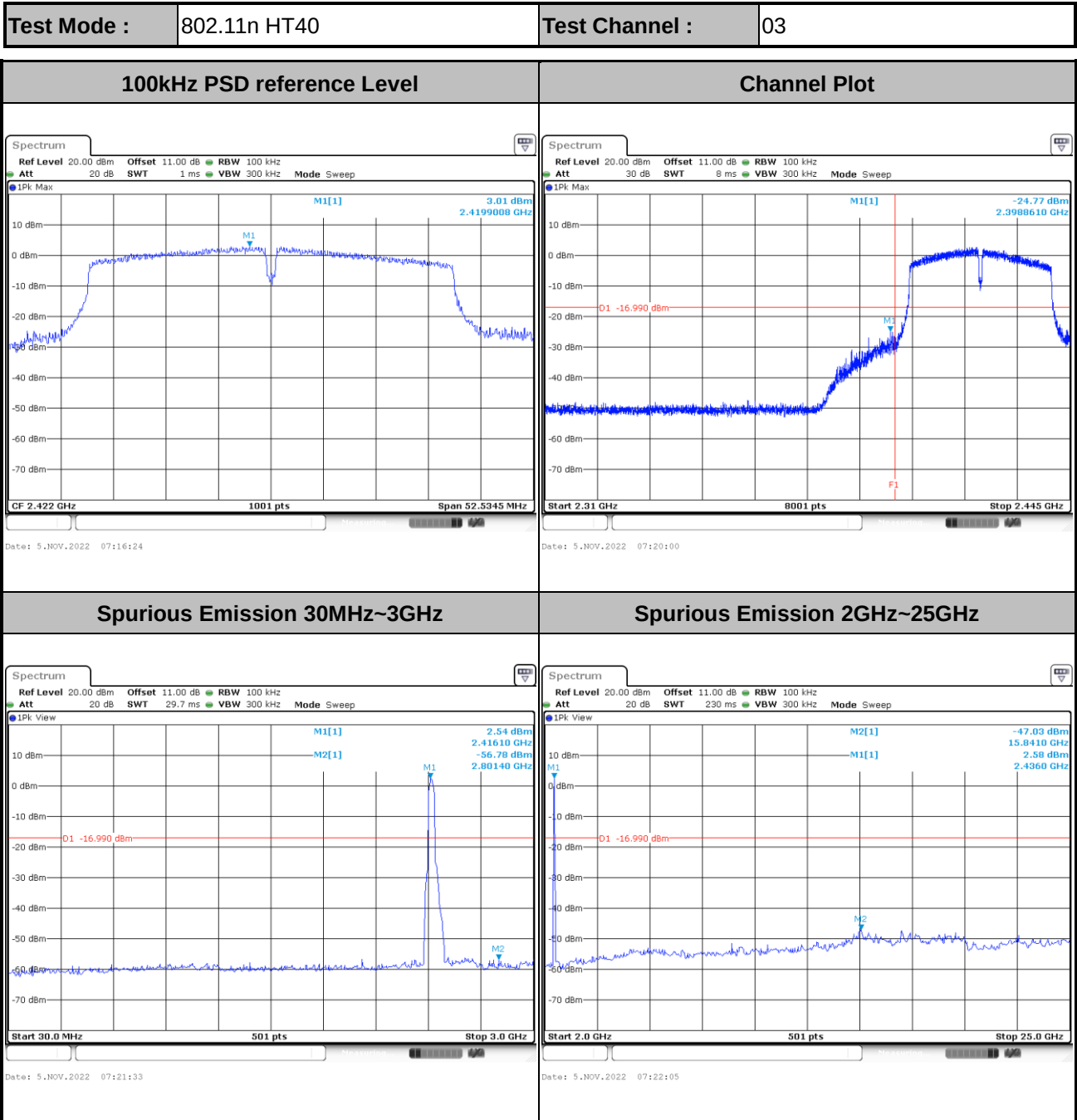
Test Mode :	802.11g	Test Channel :	11
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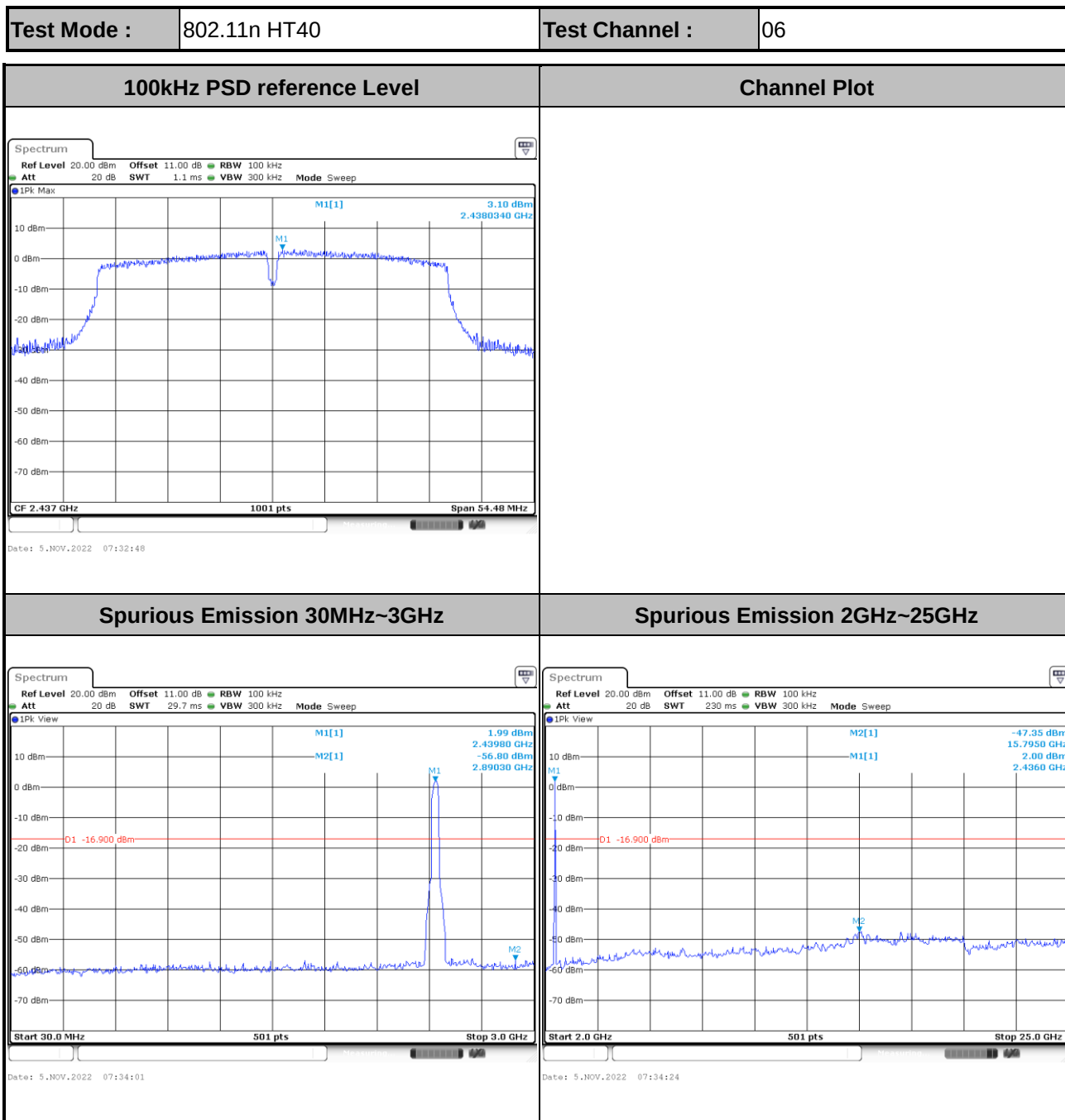










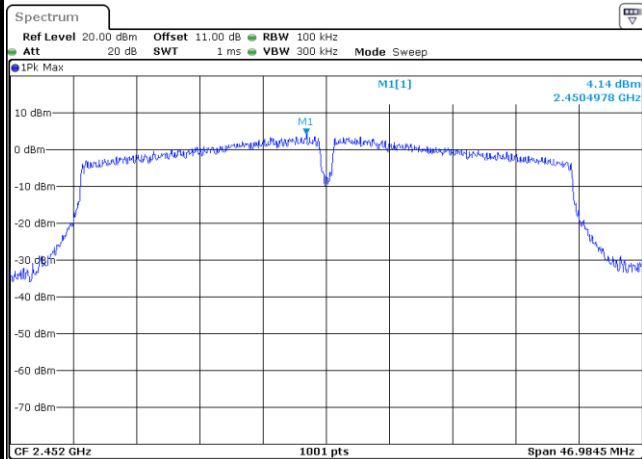




Test Mode : 802.11n HT40

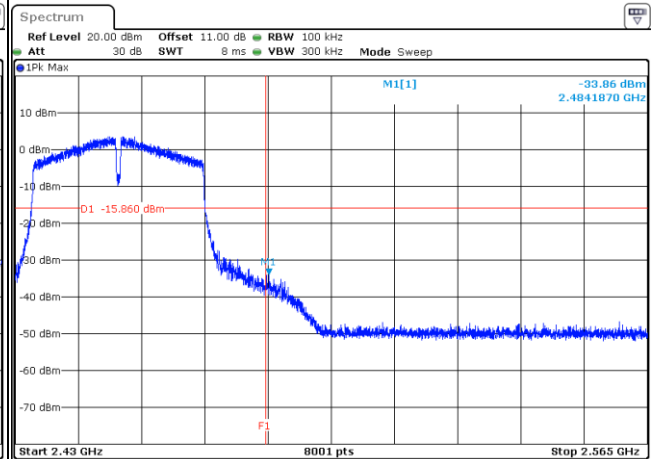
Test Channel : 09

100kHz PSD reference Level



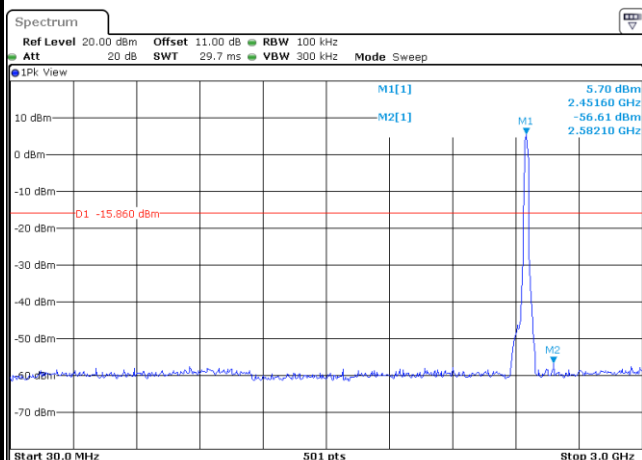
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Channel Plot



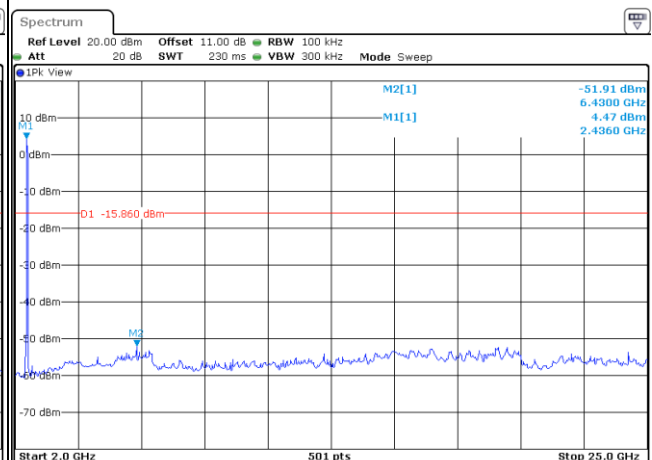
Date: 5.NOV.2022 07:44:42

Spurious Emission 30MHz~3GHz



Date: 15 NOV.2022 15:14:10

Spurious Emission 2GHz~25GHz

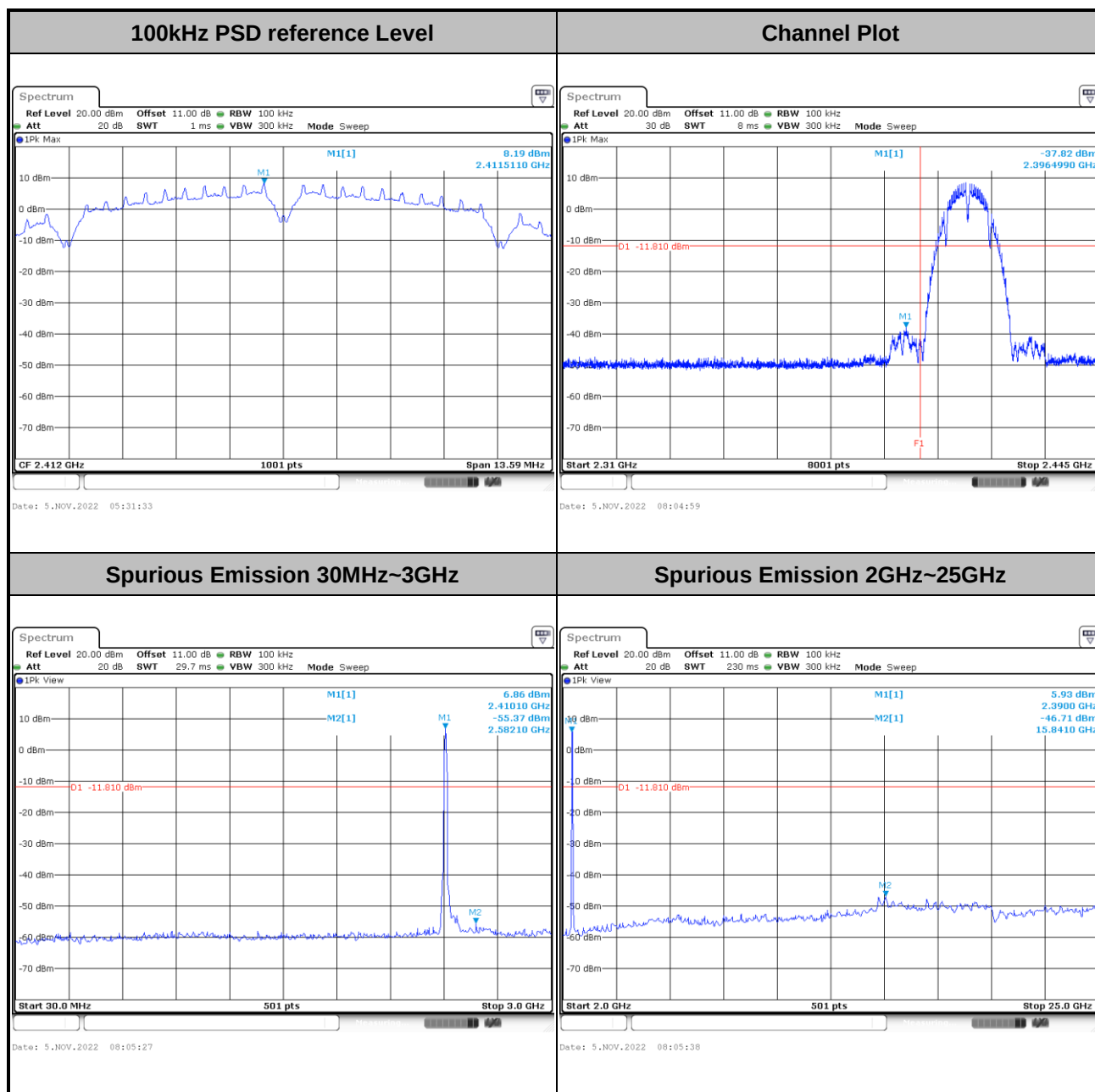


Date: 15 NOV.2022 15:14:33



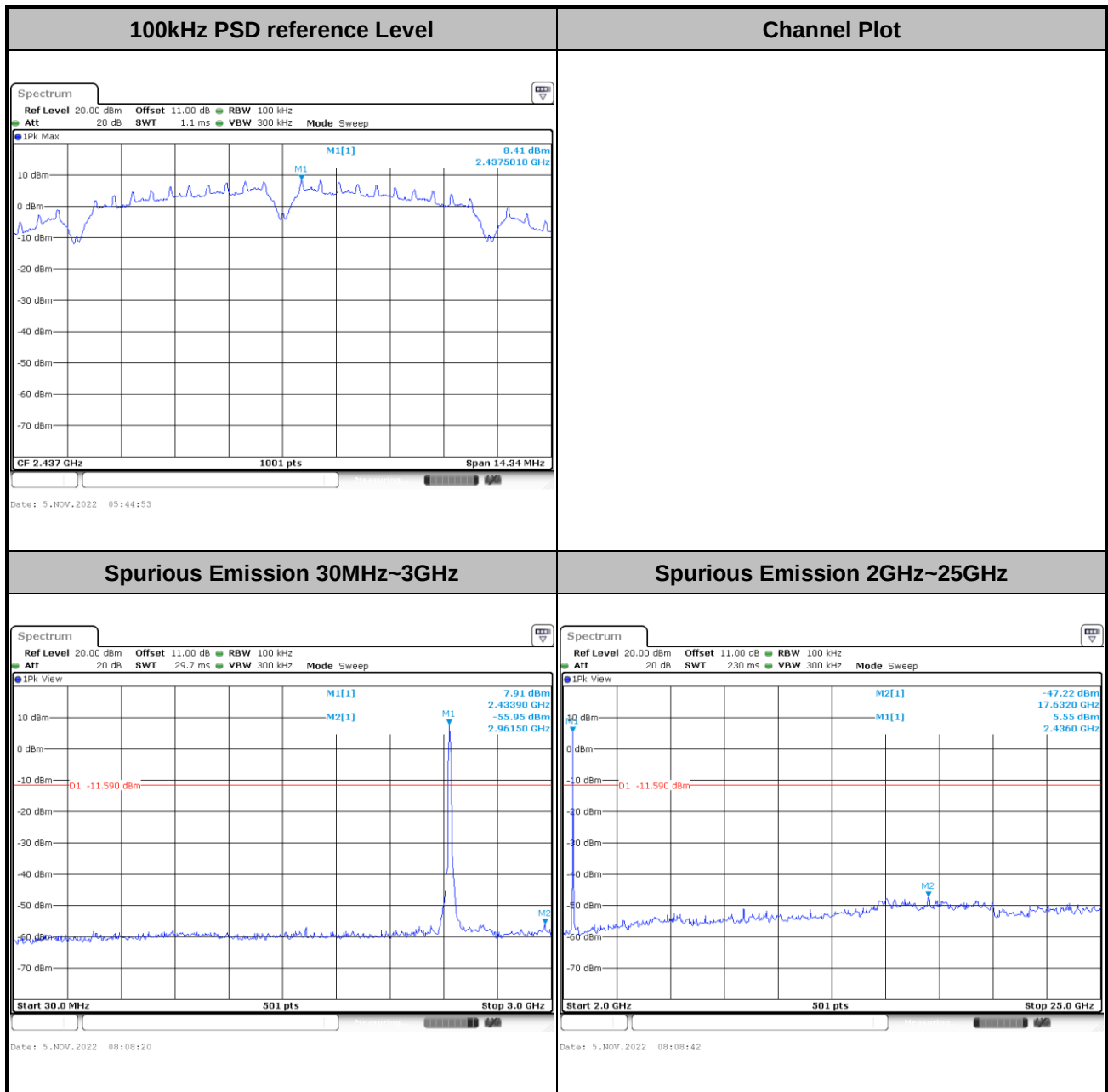
Number of TX = 2, Ant. 2 (Measured)

Test Mode :	802.11b	Test Channel :	01
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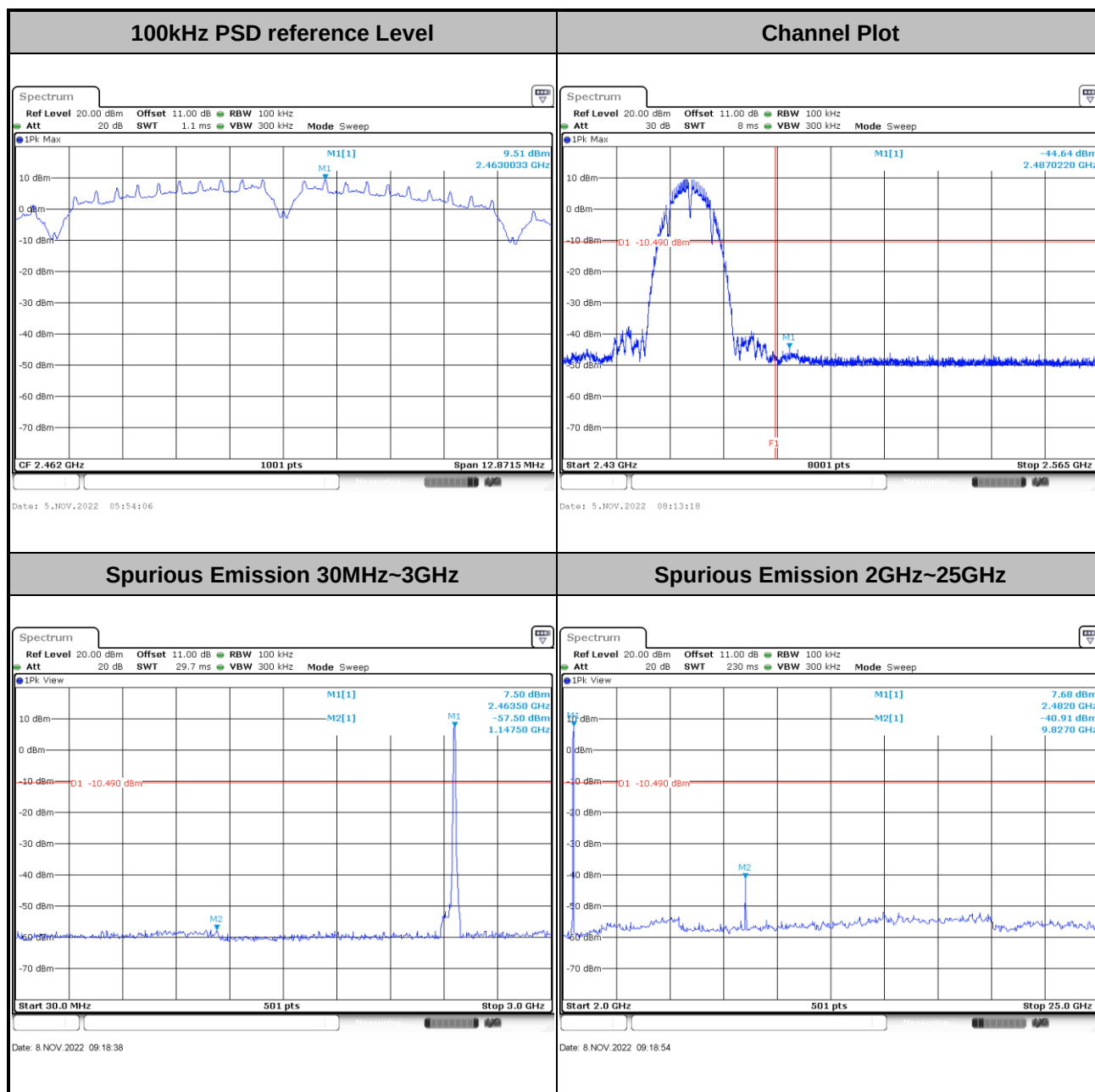


Test Mode :	802.11b	Test Channel :	06
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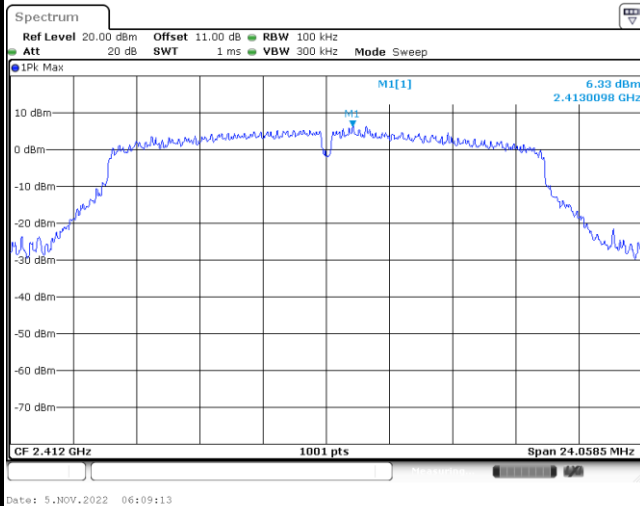
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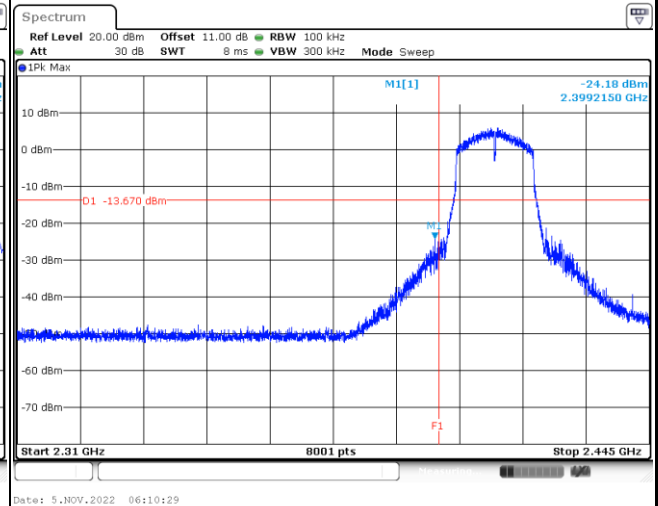


Test Mode :	802.11g	Test Channel :	01
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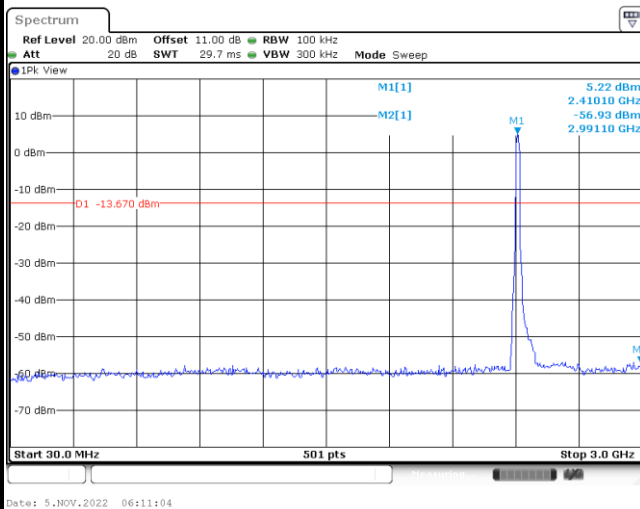
100kHz PSD reference Level



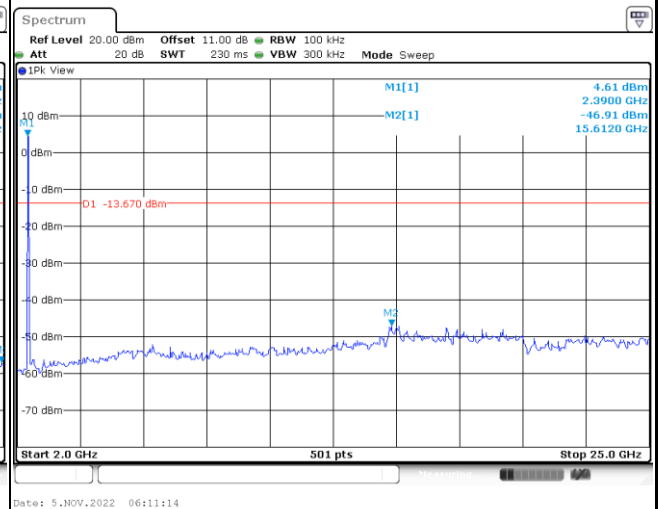
Channel Plot



Spurious Emission 30MHz~3GHz

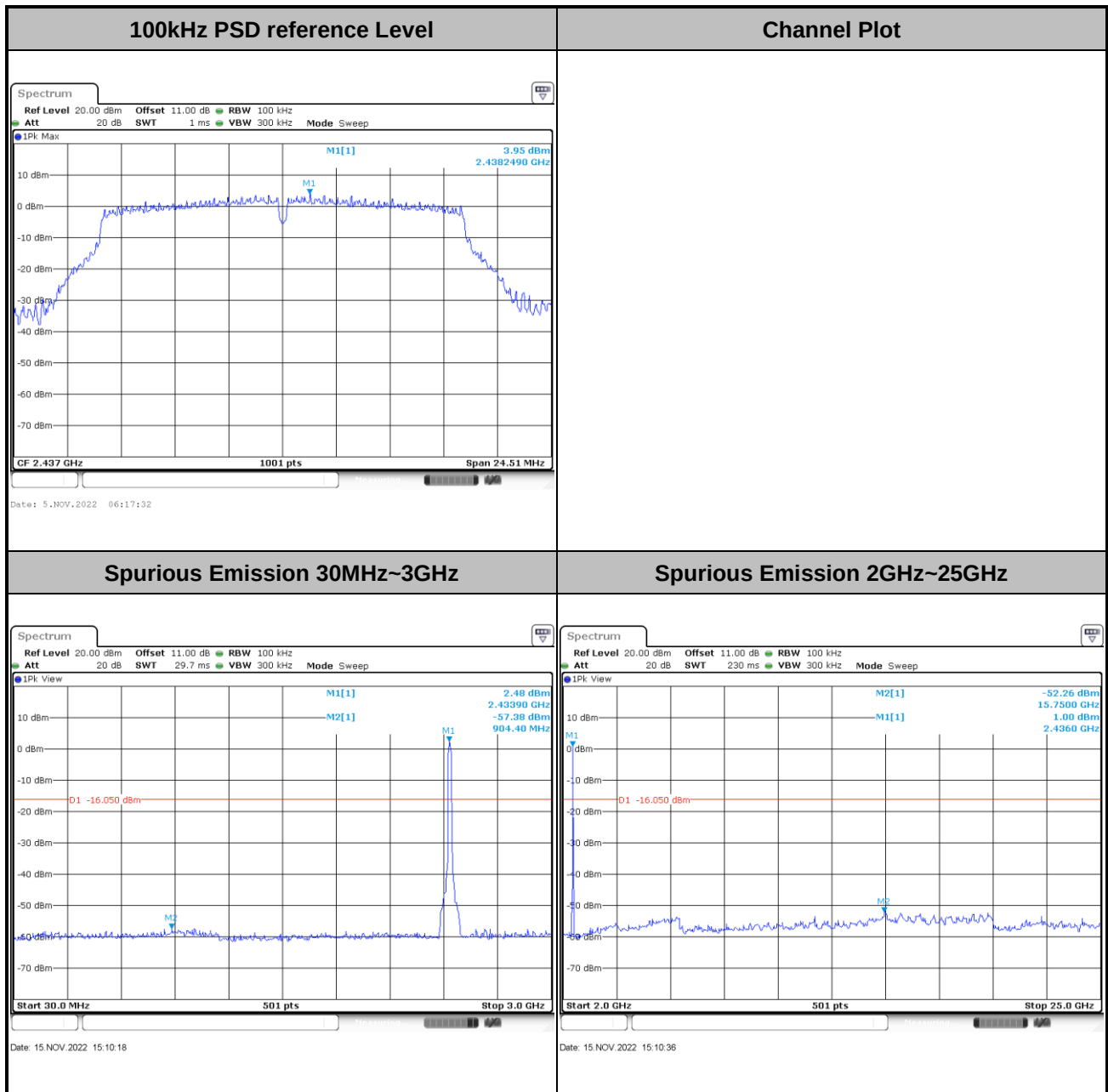


Spurious Emission 2GHz~25GHz



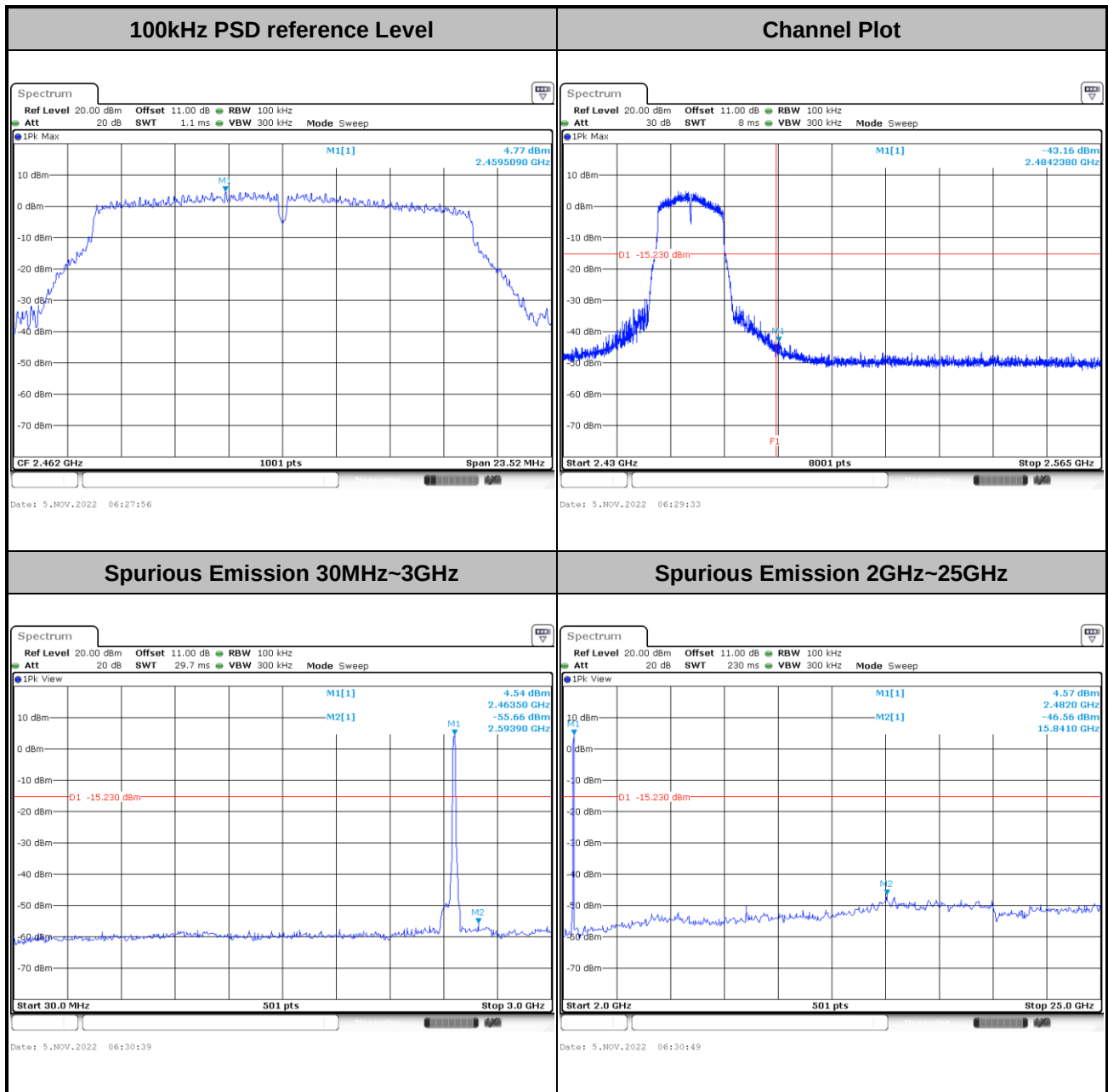


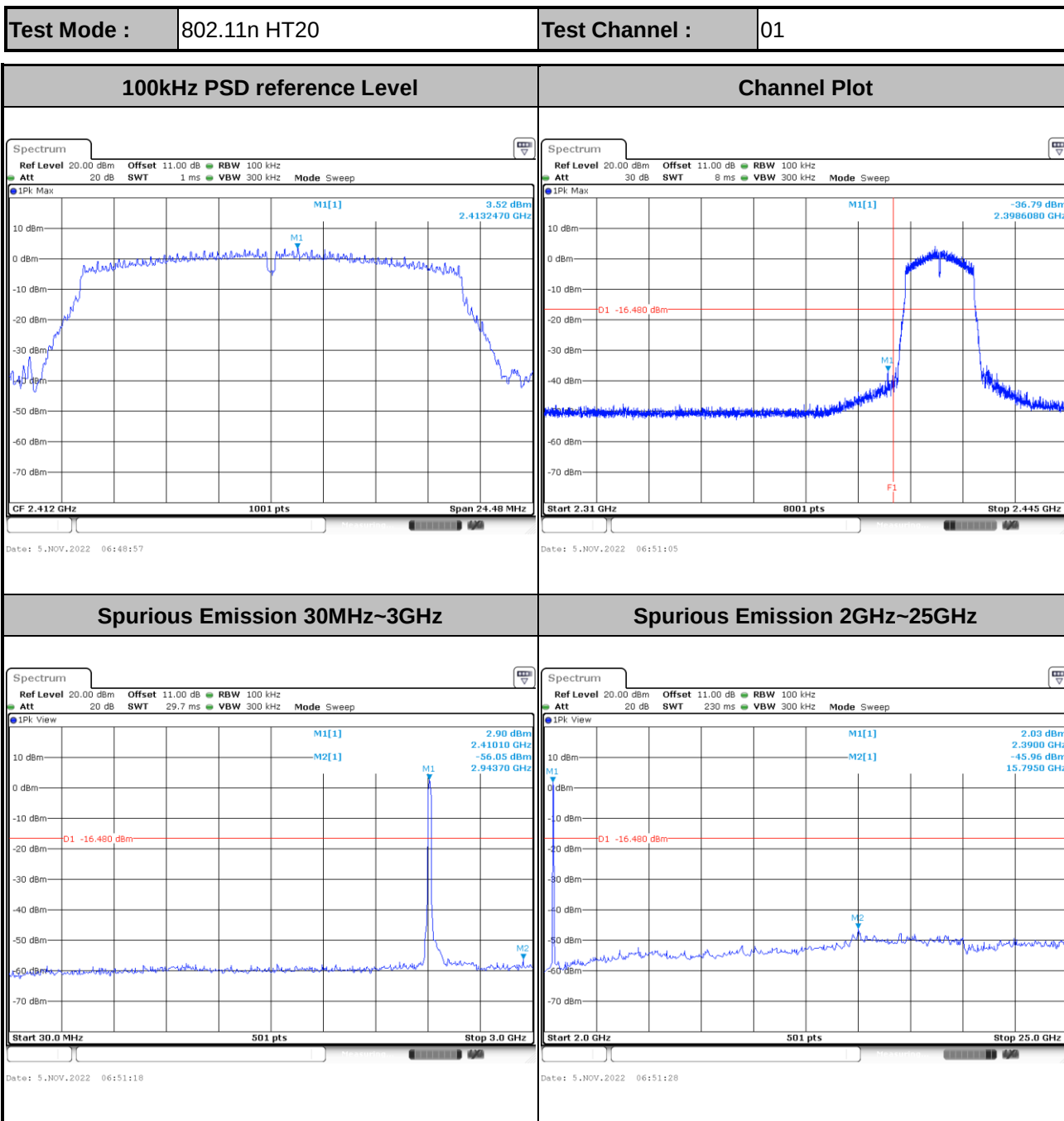
Test Mode :	802.11g	Test Channel :	06
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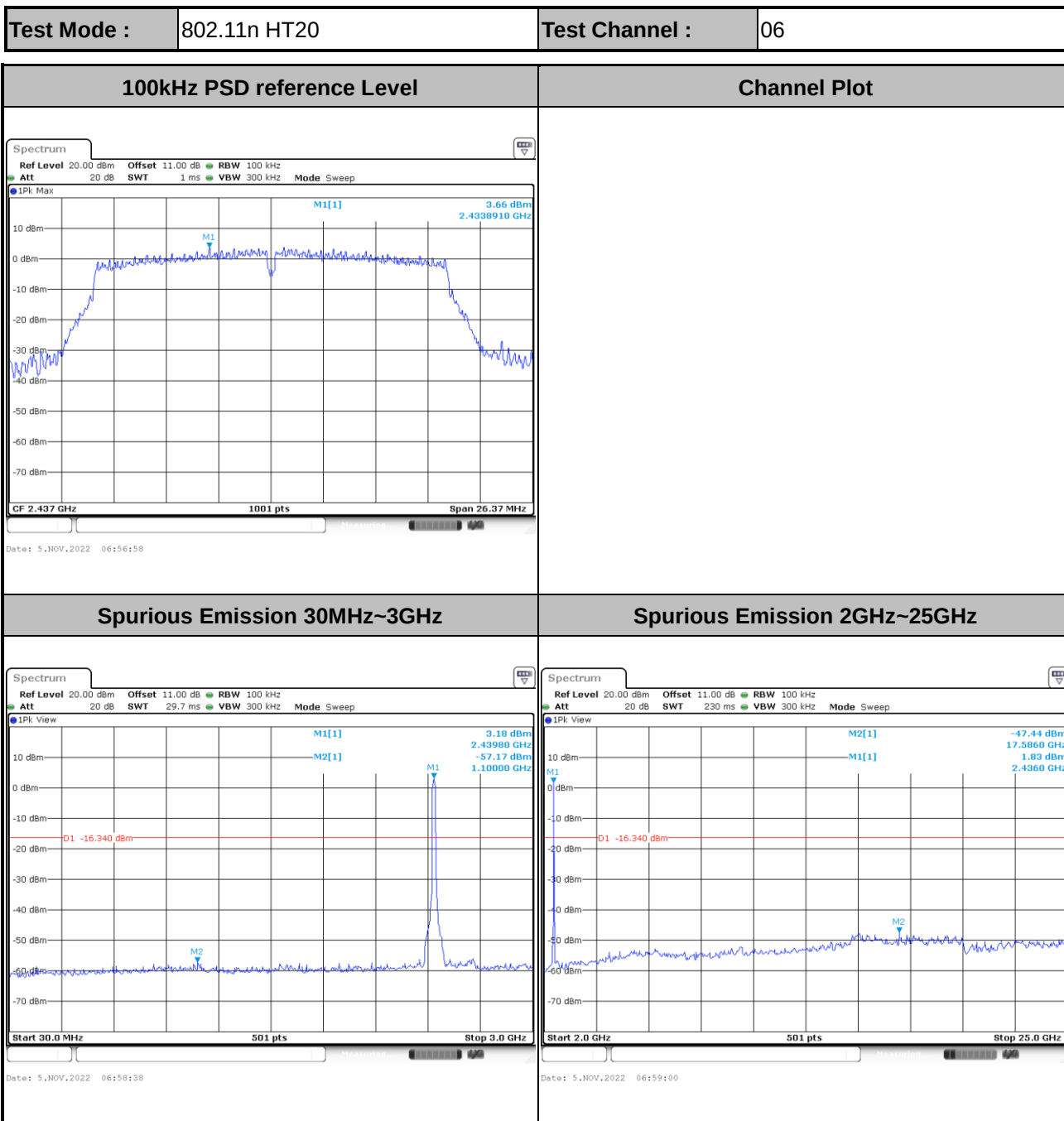


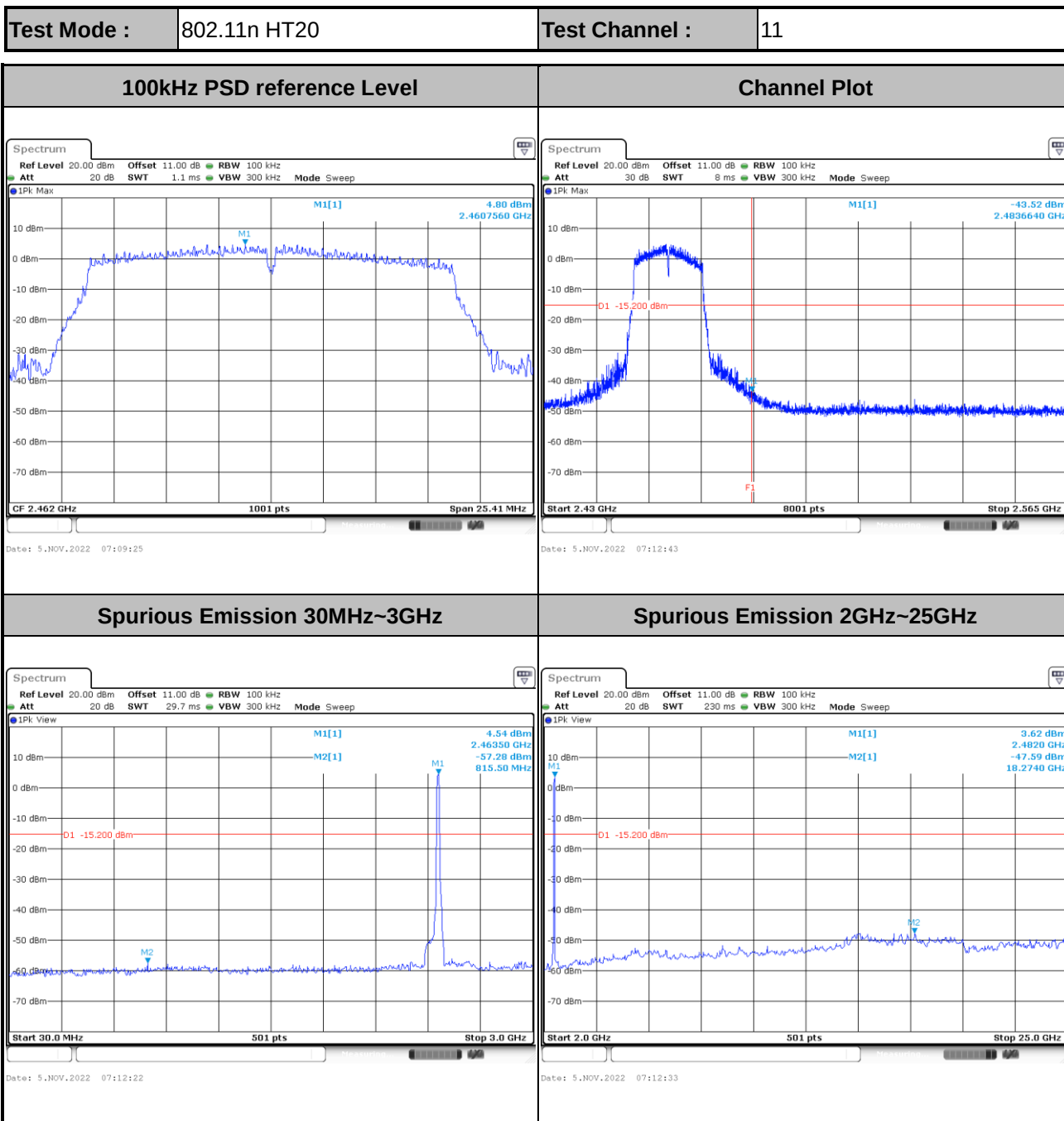


Test Mode :	802.11g	Test Channel :	11
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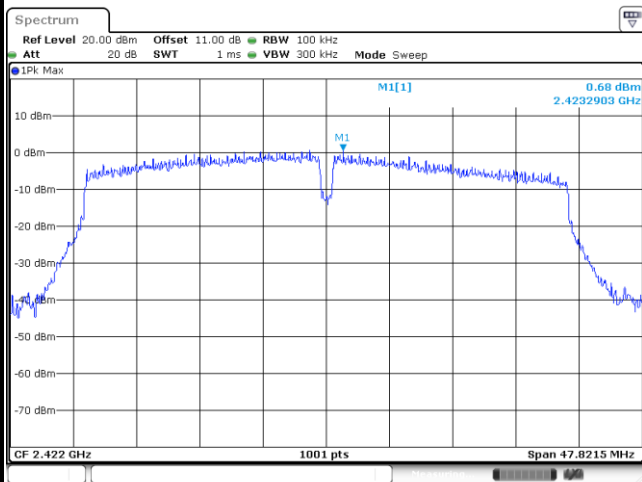




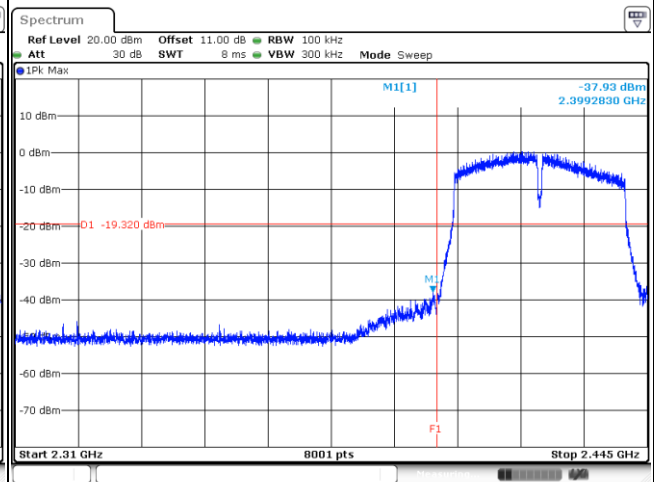
Test Mode : 802.11n HT40

Test Channel : 03

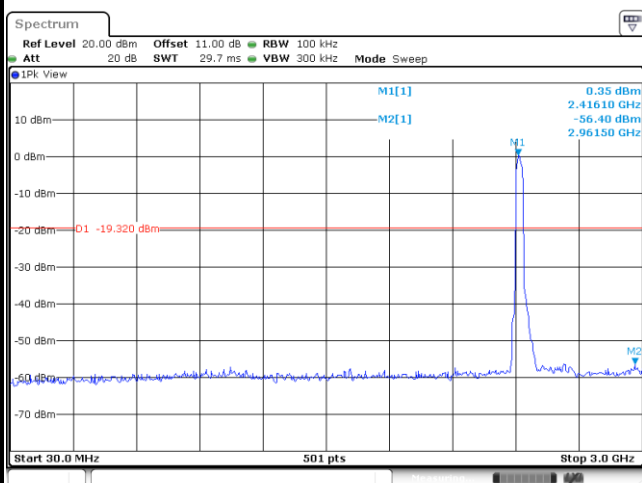
100kHz PSD reference Level



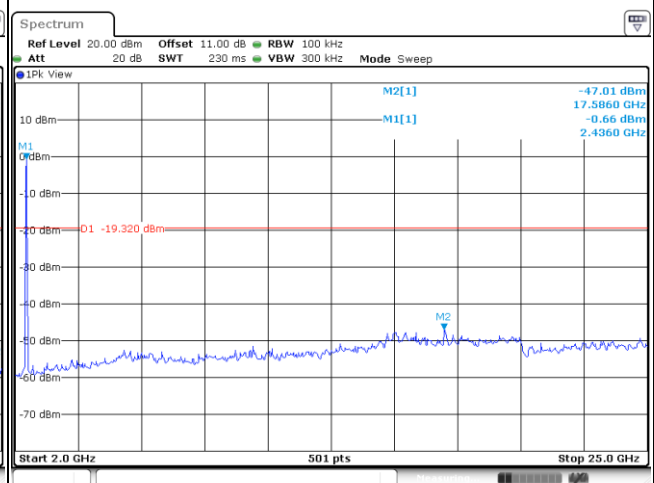
Channel Plot

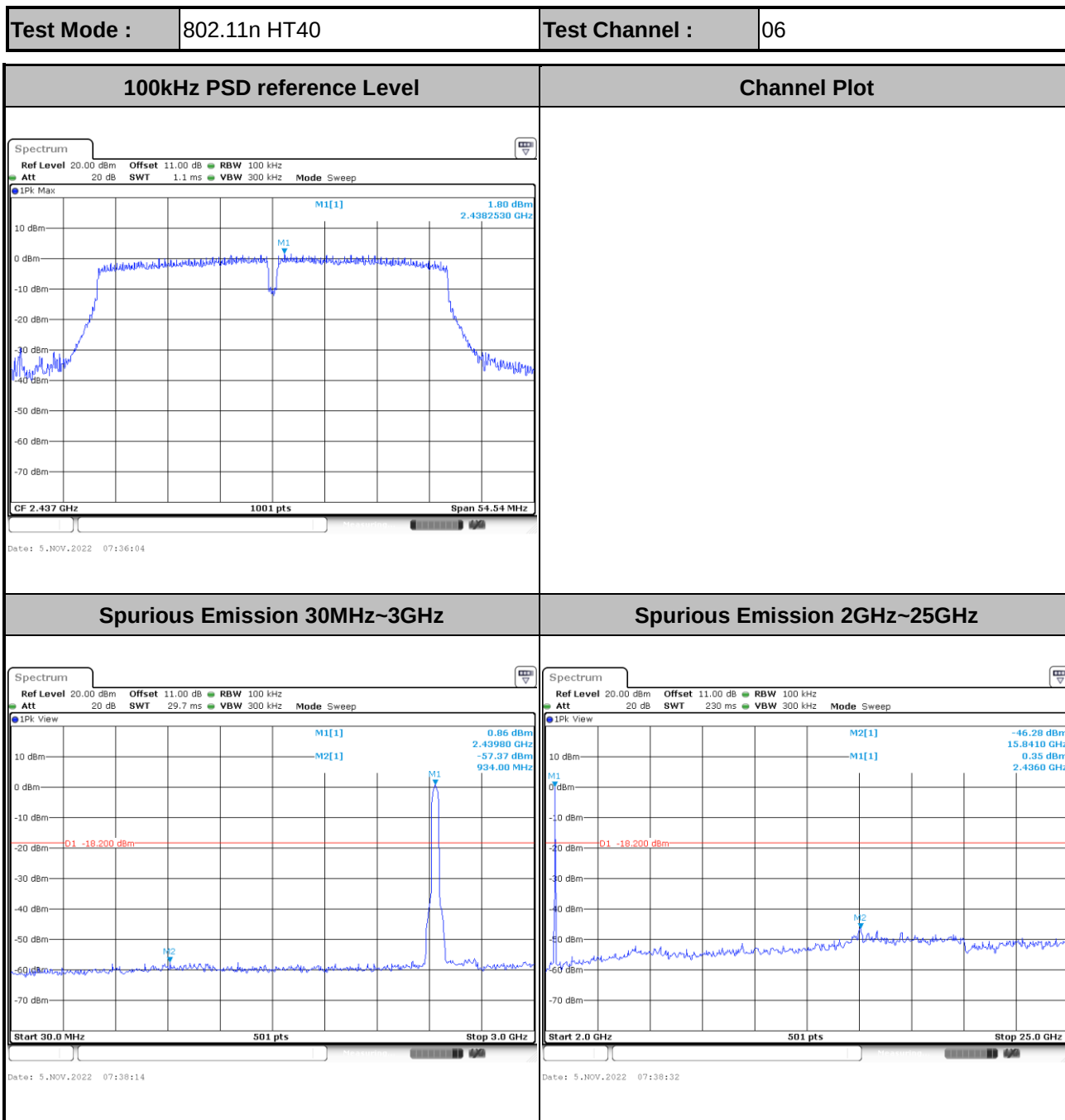


Spurious Emission 30MHz~3GHz



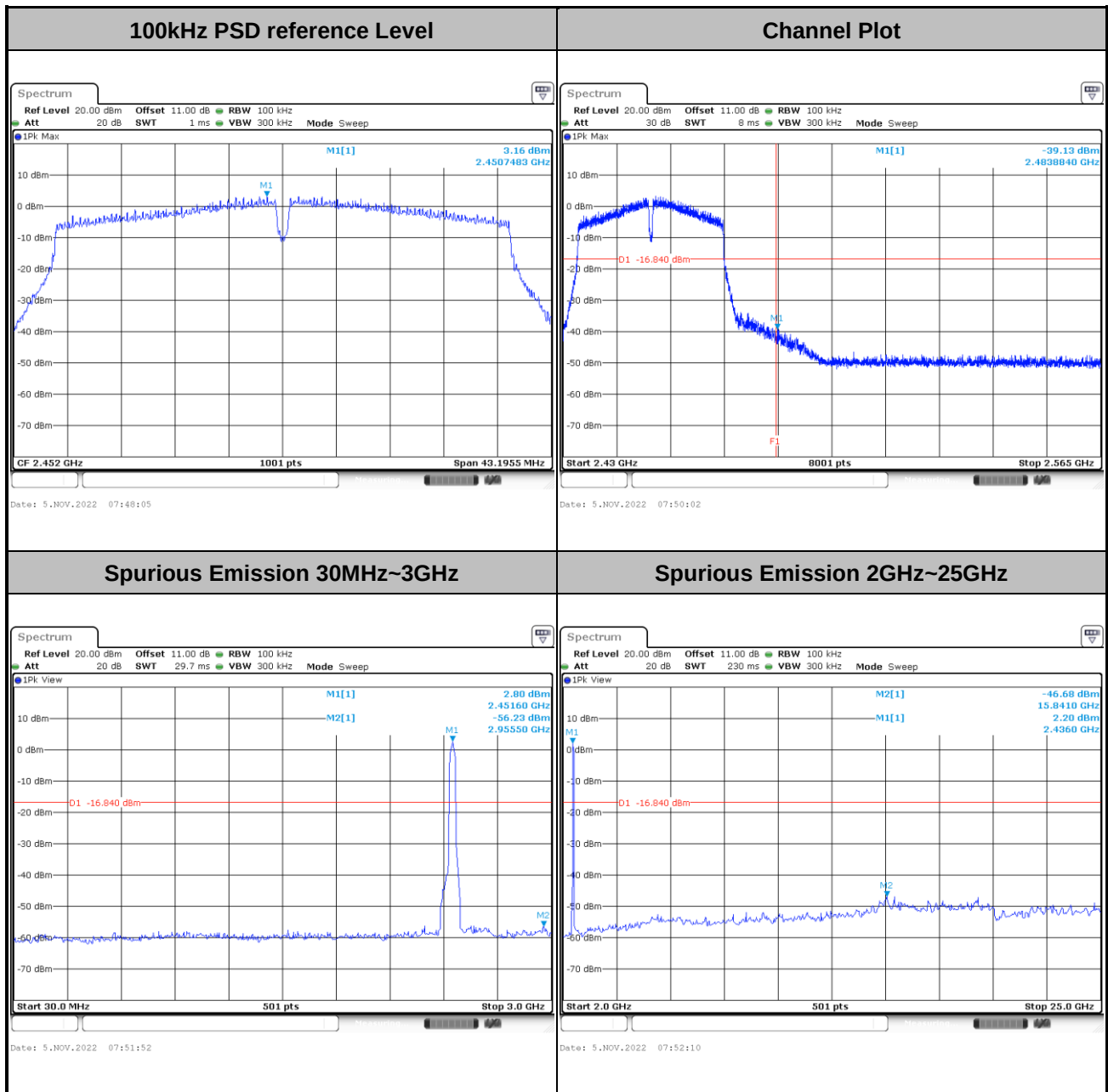
Spurious Emission 2GHz~25GHz







Test Mode :	802.11n HT40	Test Channel :	09
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3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

3.5.2 Measuring Instruments

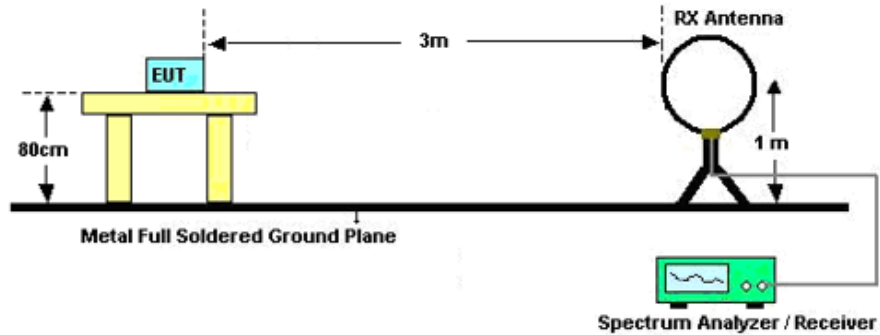
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

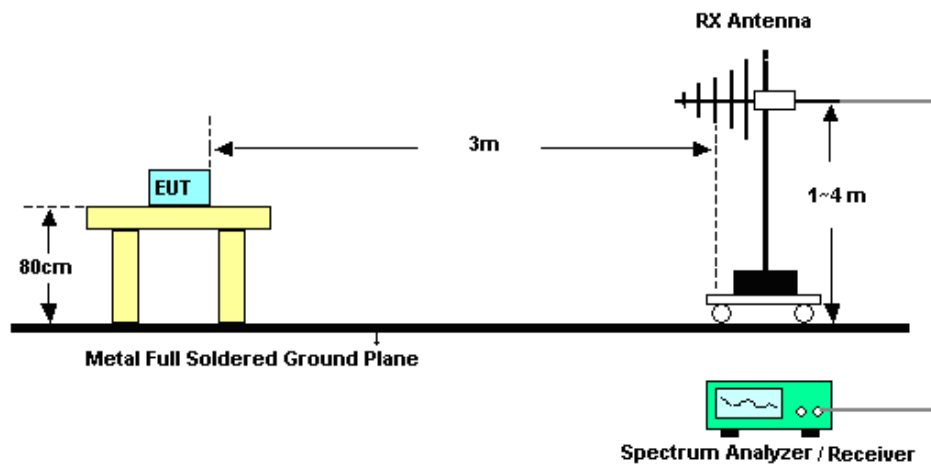
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.
For average measurement:
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

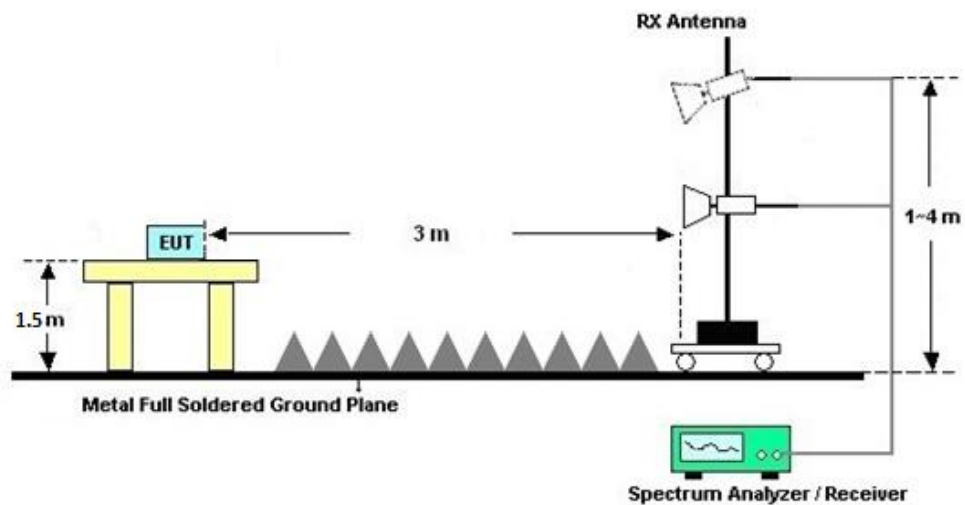
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



**3.5.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)**

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

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

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.5.7 Duty Cycle

Please refer to Appendix D.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

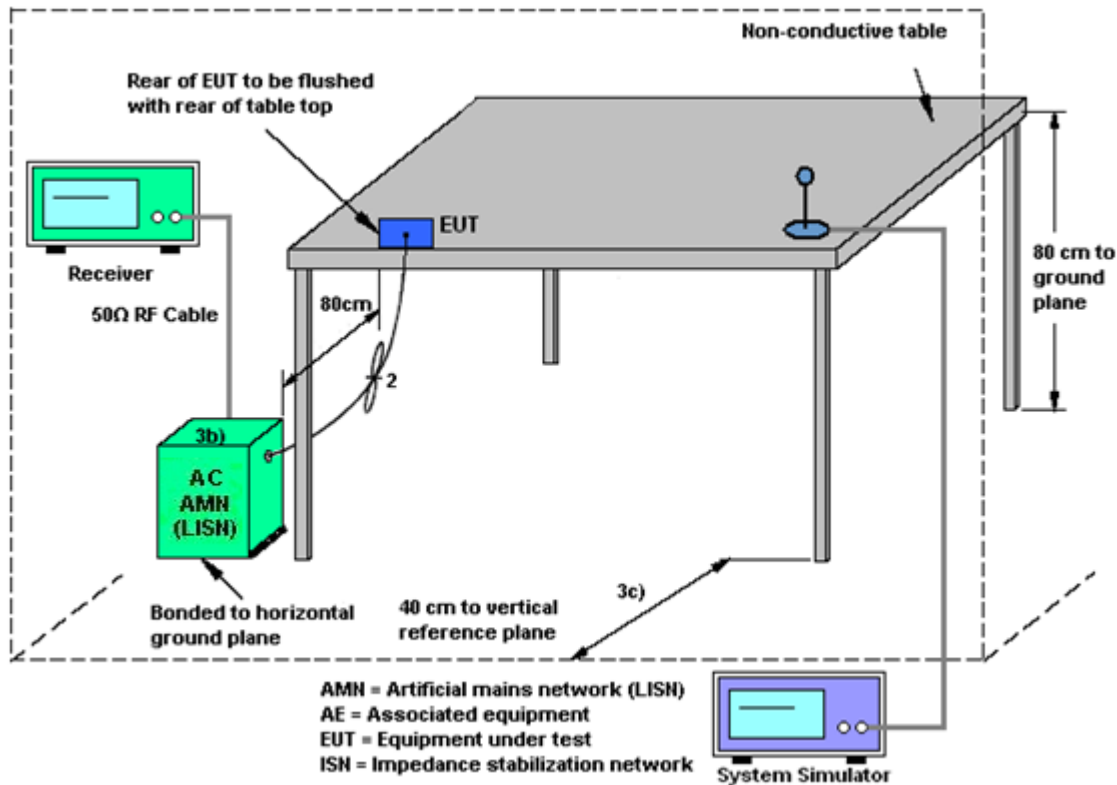
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached Antenna or of an Antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

<STBC Modes>

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

Basic methodology with NANT transmit antennas, each with the same directional gain G_{ANT} dBi, being driven by NANT transmitter outputs of equal power, and If all transmit signals are completely uncorrelated with each other,

Directional gain = G_{ANT}

<STBC Modes>						
			DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	Ant. 1 (dBi)	Ant. 2 (dBi)				
2.4 GHz	2.68	2.68	2.68	2.68	0.00	0.00

$Power\ Limit\ Reduction = DG(Power) - 6dBi, (min = 0)$

$PSD\ Limit\ Reduction = DG(PSD) - 6dBi, (min = 0)$



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 07, 2022	Nov. 05, 2022~ Nov. 15, 2022	Apr. 08, 2023	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Nov. 05, 2022~ Nov. 15, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Nov. 05, 2022~ Nov. 15, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	Apr. 06, 2022	Nov. 11, 2022	Apr. 05, 2023	Radiation (03CH03-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	Apr. 06, 2022	Nov. 11, 2022	Apr. 05, 2023	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 28, 2022	Nov. 11, 2022	Jul. 27, 2024	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz~2GHz	Aug. 09, 2021	Nov. 11, 2022	Aug. 08, 2023	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	Apr. 08, 2022	Nov. 11, 2022	Apr. 07, 2023	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 06, 2022	Nov. 11, 2022	Jul. 05, 2023	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Apr. 10, 2022	Nov. 11, 2022	Apr. 9, 2023	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz~3000MHz	Oct. 19, 2022	Nov. 11, 2022	Oct. 18, 2023	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 19, 2022	Nov. 11, 2022	Oct. 18, 2023	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Dec. 27, 2021	Nov. 11, 2022	Dec. 26, 2022	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010002729	1 N/A	Nov. 10, 2022	Nov. 11, 2022	Nov. 09, 2023	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Nov. 11, 2022	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Nov. 11, 2022	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 07, 2022	Oct. 26, 2022	Jul. 06, 2023	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sep. 15, 2022	Oct. 26, 2022	Sep. 14, 2023	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2022	Oct. 26, 2022	Oct. 16, 2023	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 07, 2022	Oct. 26, 2022	Jul. 06, 2023	Conduction (CO01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	± 1.34 dB
Conducted Emissions	± 1.34 dB
Occupied Channel Bandwidth	± 0.13 %
Conducted Power Spectral Density	± 1.32 dB

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.2dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.9dB
---	-------

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0dB
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----- THE END -----



Appendix A. Conducted Test Results

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Chen Ran	Temperature:	21~25	°C
Test Date:	2022/11/5~2022/11/15	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band										
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2		
11b	1Mbps	2	1	2412	14.04	13.99	9.54	9.06	0.50	Pass
11b	1Mbps	2	6	2437	14.34	14.34	9.54	9.56	0.50	Pass
11b	1Mbps	2	11	2462	14.24	14.14	9.56	8.58	0.50	Pass
11g	6Mbps	2	1	2412	16.63	16.63	16.04	16.04	0.50	Pass
11g	6Mbps	2	6	2437	16.83	16.58	16.31	16.34	0.50	Pass
11g	6Mbps	2	11	2462	16.68	16.48	16.32	15.68	0.50	Pass
HT20	MCS8	2	1	2412	17.63	17.48	17.28	16.32	0.50	Pass
HT20	MCS8	2	6	2437	17.78	17.63	17.60	17.58	0.50	Pass
HT20	MCS8	2	11	2462	17.73	17.58	17.58	16.94	0.50	Pass
HT40	MCS8	2	3	2422	36.76	35.96	35.02	31.88	0.50	Pass
HT40	MCS8	2	6	2437	36.46	36.56	36.32	36.36	0.50	Pass
HT40	MCS8	2	9	2452	36.06	35.86	31.32	28.80	0.50	Pass

TEST RESULTS DATA
Peak Output Power

2.4GHz Band																
Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	2	1	2412	26.14	24.71	28.49	30.00		2.68		31.17		36.00		Pass
11b	1Mbps	2	6	2437	26.58	24.25	28.58	30.00		2.68		31.26		36.00		Pass
11b	1Mbps	2	11	2462	26.65	24.58	28.75	30.00		2.68		31.43		36.00		Pass
11g	6Mbps	2	1	2412	26.42	25.07	28.81	30.00		2.68		31.49		36.00		Pass
11g	6Mbps	2	6	2437	26.66	25.46	29.11	30.00		2.68		31.79		36.00		Pass
11g	6Mbps	2	11	2462	26.33	26.06	29.21	30.00		2.68		31.89		36.00		Pass
HT20	MCS8	2	1	2412	26.33	25.78	29.07	30.00		2.68		31.75		36.00		Pass
HT20	MCS8	2	6	2437	26.86	25.77	29.36	30.00		2.68		32.04		36.00		Pass
HT20	MCS8	2	11	2462	26.56	26.18	29.38	30.00		2.68		32.06		36.00		Pass
HT40	MCS8	2	3	2422	26.00	24.48	28.32	30.00		2.68		31.00		36.00		Pass
HT40	MCS8	2	4	2427	27.70	22.27	28.79	30.00		2.68		31.47		36.00		Pass
HT40	MCS8	2	6	2437	26.86	25.62	29.29	30.00		2.68		31.97		36.00		Pass
HT40	MCS0	2	8	2447	27.54	25.48	29.64	30.00		2.68		32.32		36.00		Pass
HT40	MCS8	2	9	2452	26.38	25.49	28.97	30.00		2.68		31.65		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band									
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)		
					Ant 1	Ant 2	Ant 1	Ant 2	SUM
11b	1Mbps	2	1	2412	0.00	0.00	19.80	16.90	21.60
11b	1Mbps	2	6	2437	0.00	0.00	19.80	16.80	21.56
11b	1Mbps	2	11	2462	0.00	0.00	19.70	18.30	22.07
11g	6Mbps	2	1	2412	0.00	0.00	17.80	14.60	19.50
11g	6Mbps	2	6	2437	0.00	0.00	19.00	16.10	20.80
11g	6Mbps	2	11	2462	0.00	0.00	16.90	15.20	19.14
HT20	MCS8	2	1	2412	0.00	0.00	17.50	14.00	19.10
HT20	MCS8	2	6	2437	0.00	0.00	18.90	16.10	20.73
HT20	MCS8	2	11	2462	0.00	0.00	16.90	15.10	19.10
HT40	MCS8	2	3	2422	0.00	0.00	15.60	11.40	17.00
HT40	MCS8	2	4	2427	0.00	0.00	16.40	12.40	17.86
HT40	MCS8	2	6	2437	0.00	0.00	18.80	16.40	20.77
HT40	MCS8	2	8	2447	0.00	0.00	17.90	16.30	20.18
HT40	MCS8	2	9	2452	0.00	0.00	15.00	12.80	17.05

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Peak Power Spectral Density

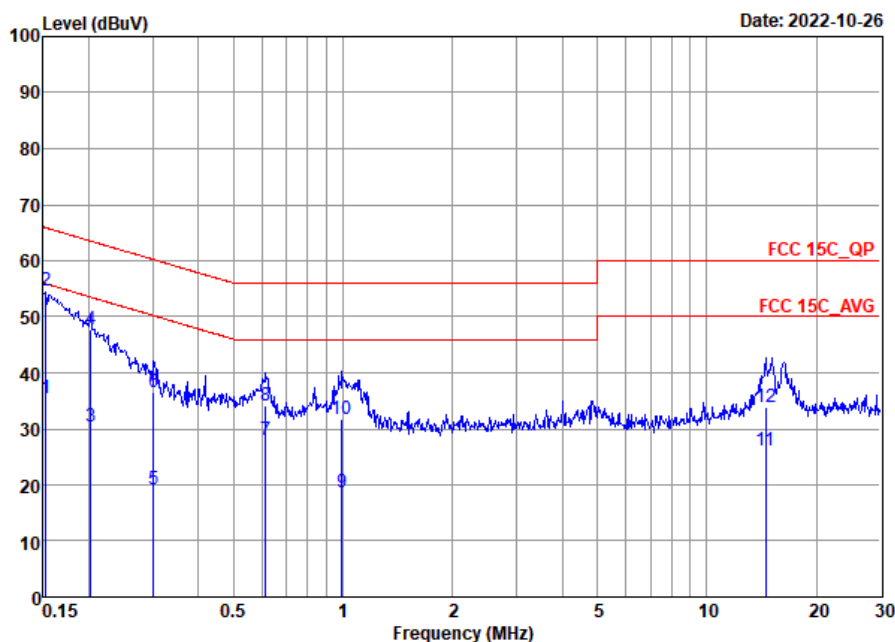
2.4GHz Band												
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant 1	Ant 2	Worse + 3.01	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	2	1	2412	-3.40	-5.97	-0.39	2.68		8.00		Pass
11b	1Mbps	2	6	2437	-2.91	-4.74	0.10	2.68		8.00		Pass
11b	1Mbps	2	11	2462	-2.56	-4.10	0.45	2.68		8.00		Pass
11g	6Mbps	2	1	2412	-4.98	-5.96	-1.97	2.68		8.00		Pass
11g	6Mbps	2	6	2437	-5.95	-8.01	-2.94	2.68		8.00		Pass
11g	6Mbps	2	11	2462	-5.52	-6.64	-2.51	2.68		8.00		Pass
HT20	MCS8	2	1	2412	-4.56	-7.94	-1.55	2.68		8.00		Pass
HT20	MCS8	2	6	2437	-5.79	-7.82	-2.78	2.68		8.00		Pass
HT20	MCS8	2	11	2462	-5.68	-7.53	-2.67	2.68		8.00		Pass
HT40	MCS8	2	3	2422	-8.49	-11.51	-5.48	2.68		8.00		Pass
HT40	MCS8	2	6	2437	-8.16	-11.50	-5.15	2.68		8.00		Pass
HT40	MCS8	2	9	2452	-7.74	-9.52	-4.73	2.68		8.00		Pass

Measured power density (dBm) has offset with cable loss.



Appendix B. AC Conducted Emission Test Results

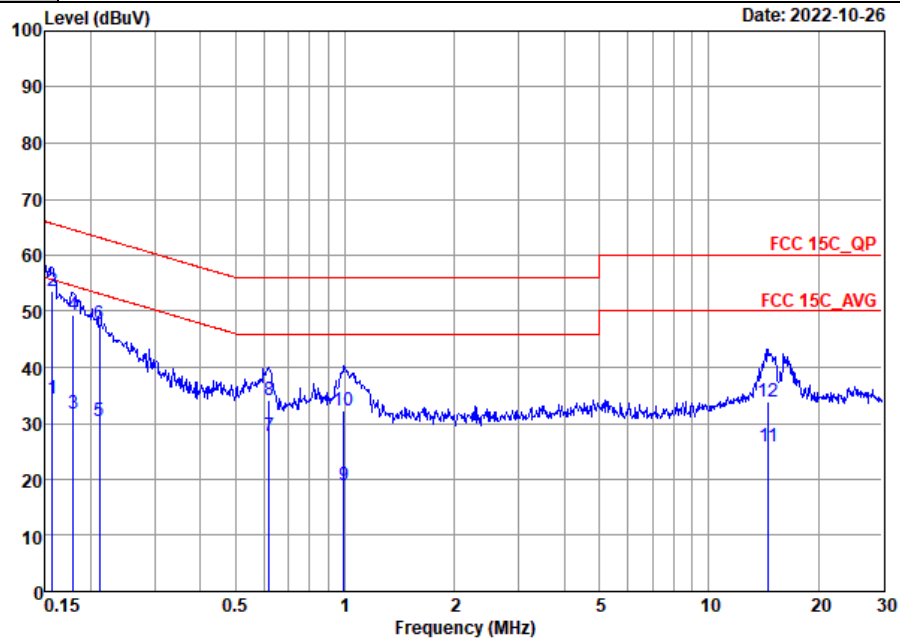
Test Engineer :	Yuki Tang	Temperature :	21~24°C
		Relative Humidity :	42~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-SZ
Condition: FCC 15C QP LISN 20220811_ L LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	35.41	-20.46	55.87	14.40	10.20	10.81	Average
2 *	0.15	54.71	-11.16	65.87	33.70	10.20	10.81	QP
3	0.20	30.38	-23.11	53.49	10.00	10.20	10.18	Average
4	0.20	47.68	-15.81	63.49	27.30	10.20	10.18	QP
5	0.30	19.18	-31.01	50.19	-1.90	10.16	10.92	Average
6	0.30	36.48	-23.71	60.19	15.40	10.16	10.92	QP
7	0.61	28.08	-17.92	46.00	6.60	10.11	11.37	Average
8	0.61	34.18	-21.82	56.00	12.70	10.11	11.37	QP
9	0.99	18.67	-27.33	46.00	-1.70	10.12	10.25	Average
10	0.99	31.77	-24.23	56.00	11.40	10.12	10.25	QP
11	14.52	26.19	-23.81	50.00	6.09	9.76	10.34	Average
12	14.52	33.79	-26.21	60.00	13.69	9.76	10.34	QP

Test Engineer :	Yuki Tang	Temperature :	21~24°C
		Relative Humidity :	42~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_20220811_ N NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16	34.46	-21.19	55.65	13.40	10.31	10.75	Average
2 *	0.16	53.56	-12.09	65.65	32.50	10.31	10.75	QP
3	0.18	31.73	-22.82	54.55	11.00	10.30	10.43	Average
4	0.18	49.23	-15.32	64.55	28.50	10.30	10.43	QP
5	0.21	30.43	-22.71	53.14	9.90	10.27	10.26	Average
6	0.21	47.63	-15.51	63.14	27.10	10.27	10.26	QP
7	0.62	27.60	-18.40	46.00	5.99	10.24	11.37	Average
8	0.62	34.10	-21.90	56.00	12.49	10.24	11.37	QP
9	0.99	19.06	-26.94	46.00	-1.40	10.21	10.25	Average
10	0.99	32.16	-23.84	56.00	11.70	10.21	10.25	QP
11	14.59	25.91	-24.09	50.00	5.69	9.88	10.34	Average
12	14.59	33.81	-26.19	60.00	13.59	9.88	10.34	QP

Note:

- Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
- Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)



Appendix C. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preampl Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2385.495	51.21	-22.79	74	47.86	32.2	4.81	33.66	351	247	P	H
		2385.495	41.8	-12.2	54	38.45	32.2	4.81	33.66	351	247	A	H
	*	2412	101.88	-	-	98.45	32.27	4.81	33.65	351	247	P	H
	*	2412	98.76	-	-	95.33	32.27	4.81	33.65	351	247	A	H
		2386.65	57.79	-16.21	74	54.43	32.21	4.81	33.66	171	294	P	V
		2385.915	50.41	-3.59	54	47.06	32.2	4.81	33.66	171	294	A	V
	*	2412	116.59	-	-	113.16	32.27	4.81	33.65	171	294	P	V
	*	2412	113.47	-	-	110.04	32.27	4.81	33.65	171	294	A	V
802.11b CH 11 2462MHz	*	2462	103.96	-	-	100.33	32.4	4.86	33.63	103	340	P	H
	*	2462	100.89	-	-	97.26	32.4	4.86	33.63	103	340	A	H
		2489.72	52.09	-21.91	74	48.3	32.47	4.92	33.6	103	340	P	H
		2487.84	41.74	-12.26	54	37.97	32.47	4.92	33.62	103	340	A	H
	*	2462	116.82	-	-	113.19	32.4	4.86	33.63	160	304	P	V
	*	2462	113.75	-	-	110.12	32.4	4.86	33.63	160	304	A	V
		2487.96	58.88	-15.12	74	55.11	32.47	4.92	33.62	160	304	P	V
		2487.84	52.35	-1.65	54	48.58	32.47	4.92	33.62	160	304	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	45.98	-28.02	74	56.47	34.67	7.75	52.91	-	-	P	H
		4824	61.86	-12.14	74	72.35	34.67	7.75	52.91	100	36	P	V
802.11b CH 06 2437MHz		4874	43.49	-30.51	74	53.92	34.65	7.76	52.84	-	-	P	H
		7311	43.86	-30.14	74	52.62	36.41	8.95	54.12	-	-	P	H
		4874	46.37	-27.63	74	56.8	34.65	7.76	52.84	-	-	P	V
		7311	44.02	-29.98	74	52.78	36.41	8.95	54.12	-	-	P	V
802.11b CH 11 2462MHz		4924	43.86	-30.14	74	54.21	34.63	7.8	52.78	-	-	P	H
		7386	43.88	-30.12	74	52.26	36.49	9.2	54.07	-	-	P	H
		4924	52.13	-21.87	74	62.48	34.63	7.8	52.78	100	120	P	V
		4924	42.94	-11.06	54	53.29	34.63	7.8	52.78	100	120	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11g (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		2390	59.87	-14.13	74	56.51	32.21	4.81	33.66	100	246	P	H
		2390	44.55	-9.45	54	41.19	32.21	4.81	33.66	100	246	A	H
	*	2412	101.95	-	-	98.52	32.27	4.81	33.65	100	246	P	H
	*	2412	94.59	-	-	91.16	32.27	4.81	33.65	100	246	A	H
		2390	68.38	-5.62	74	65.02	32.21	4.81	33.66	132	332	P	V
		2390	53.63	-0.37	54	50.27	32.21	4.81	33.66	132	332	A	V
	*	2412	116.34	-	-	112.91	32.27	4.81	33.65	132	332	P	V
	*	2412	108.85	-	-	105.42	32.27	4.81	33.65	132	332	A	V
802.11g CH 11 2462MHz	*	2462	103.33	-	-	99.7	32.4	4.86	33.63	100	247	P	H
	*	2462	96.46	-	-	92.83	32.4	4.86	33.63	100	247	A	H
		2486.6	56.6	-17.4	74	52.83	32.47	4.92	33.62	100	247	P	H
		2483.52	42.57	-11.43	54	38.81	32.46	4.92	33.62	100	247	A	H
	*	2462	116.01	-	-	112.38	32.4	4.86	33.63	179	305	P	V
	*	2462	108.46	-	-	104.83	32.4	4.86	33.63	179	305	A	V
		2483.56	69.54	-4.46	74	65.78	32.46	4.92	33.62	179	305	P	V
		2483.52	53.42	-0.58	54	49.66	32.46	4.92	33.62	179	305	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	43.21	-30.79	74	53.7	34.67	7.75	52.91	-	-	P	H
		4824	49.69	-24.31	74	60.18	34.67	7.75	52.91	-	-	P	V
802.11g CH 06 2437MHz		4874	42.93	-31.07	74	53.36	34.65	7.76	52.84	-	-	P	H
		7311	44.53	-29.47	74	53.29	36.41	8.95	54.12	-	-	P	H
		4874	49.88	-24.12	74	60.31	34.65	7.76	52.84	-	-	P	V
		7311	43.84	-30.16	74	52.6	36.41	8.95	54.12	-	-	P	V
802.11g CH 11 2462MHz		4924	43.28	-30.72	74	53.63	34.63	7.8	52.78	-	-	P	H
		7386	45.08	-28.92	74	53.46	36.49	9.2	54.07	-	-	P	H
		4924	47.29	-26.71	74	57.64	34.63	7.8	52.78	-	-	P	V
		7386	44.16	-29.84	74	52.54	36.49	9.2	54.07	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		2390	56.2	-17.8	74	52.84	32.21	4.81	33.66	120	249	P	H
		2390	43.17	-10.83	54	39.81	32.21	4.81	33.66	120	249	A	H
	*	2412	100.54	-	-	97.11	32.27	4.81	33.65	120	249	P	H
	*	2412	93.71	-	-	90.28	32.27	4.81	33.65	120	249	A	H
		2389.59	70.68	-3.32	74	67.32	32.21	4.81	33.66	141	230	P	V
		2390	53.79	-0.21	54	50.43	32.21	4.81	33.66	141	230	A	V
	*	2412	114.56	-	-	111.13	32.27	4.81	33.65	141	230	P	V
	*	2412	107.34	-	-	103.91	32.27	4.81	33.65	141	230	A	V
802.11n HT20 CH 11 2462MHz	*	2462	101.59	-	-	97.96	32.4	4.86	33.63	189	310	P	H
	*	2462	93.8	-	-	90.17	32.4	4.86	33.63	189	310	A	H
		2484.24	56.22	-17.78	74	52.46	32.46	4.92	33.62	189	310	P	H
		2483.52	42.88	-11.12	54	39.12	32.46	4.92	33.62	189	310	A	H
	*	2462	114.8	-	-	111.17	32.4	4.86	33.63	113	228	P	V
	*	2462	108.24	-	-	104.61	32.4	4.86	33.63	113	228	A	V
		2484.08	70.69	-3.31	74	66.93	32.46	4.92	33.62	113	228	P	V
		2483.52	53.34	-0.66	54	49.58	32.46	4.92	33.62	113	228	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		4824	43.38	-30.62	74	53.87	34.67	7.75	52.91	-	-	P	H
		4824	51.02	-22.98	74	61.51	34.67	7.75	52.91	-	-	P	V
802.11n HT20 CH 06 2437MHz		4874	43.53	-30.47	74	53.96	34.65	7.76	52.84	-	-	P	H
		7311	43.86	-30.14	74	52.62	36.41	8.95	54.12	-	-	P	H
		4874	49.34	-24.66	74	59.77	34.65	7.76	52.84	-	-	P	V
		7311	44.18	-29.82	74	52.94	36.41	8.95	54.12	-	-	P	V
802.11n HT20 CH 11 2462MHz		4924	43.04	-30.96	74	53.39	34.63	7.8	52.78	-	-	P	H
		7386	44.07	-29.93	74	52.45	36.49	9.2	54.07	-	-	P	H
		4924	46.27	-27.73	74	56.62	34.63	7.8	52.78	-	-	P	V
		7386	44.91	-29.09	74	53.29	36.49	9.2	54.07	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz		2387.98	57.66	-16.34	74	54.3	32.21	4.81	33.66	268	197	P	H
		2389.66	44.11	-9.89	54	40.75	32.21	4.81	33.66	268	197	A	H
	*	2422	95.92	-	-	92.46	32.3	4.81	33.65	268	197	P	H
	*	2422	88.6	-	-	85.14	32.3	4.81	33.65	268	197	A	H
		2499.58	50.59	-23.41	74	46.77	32.5	4.92	33.6	268	197	P	H
		2483.76	40.51	-13.49	54	36.75	32.46	4.92	33.62	268	197	A	H
		2389.94	73.35	-0.65	74	69.99	32.21	4.81	33.66	110	281	P	V
		2389.8	53.8	-0.2	54	50.44	32.21	4.81	33.66	110	281	A	V
	*	2422	110.25	-	-	106.79	32.3	4.81	33.65	110	281	P	V
	*	2422	103.12	-	-	99.66	32.3	4.81	33.65	110	281	A	V
		2485.79	57.4	-16.6	74	53.64	32.46	4.92	33.62	110	281	P	V
		2483.5	46.02	-7.98	54	42.26	32.46	4.92	33.62	110	281	A	V

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 04 2427MHz		2388.4	54.48	-19.52	74	51.12	32.21	4.81	33.66	347	240	P	H
		2389.94	41.54	-12.46	54	38.18	32.21	4.81	33.66	347	240	A	H
	*	2427	98.24	-	-	94.72	32.31	4.86	33.65	347	240	P	H
	*	2427	90.11	-	-	86.59	32.31	4.86	33.65	347	240	A	H
		2488.45	51.61	-22.39	74	47.84	32.47	4.92	33.62	347	240	P	H
		2483.69	40.76	-13.24	54	37	32.46	4.92	33.62	347	240	A	H
		2388.96	68.16	-5.84	74	64.8	32.21	4.81	33.66	115	331	P	V
		2389.94	53.4	-0.6	54	50.04	32.21	4.81	33.66	115	331	A	V
	*	2427	109.54	-	-	106.02	32.31	4.86	33.65	115	331	P	V
	*	2427	101.76	-	-	98.24	32.31	4.86	33.65	115	331	A	V
		2483.83	59.77	-14.23	74	56.01	32.46	4.92	33.62	115	331	P	V
		2483.5	47.2	-6.8	54	43.44	32.46	4.92	33.62	115	331	A	V



802.11n HT40 CH 08 2447MHz		2388.54	50.26	-23.74	74	46.9	32.21	4.81	33.66	339	239	P	H
		2389.8	40.32	-13.68	54	36.96	32.21	4.81	33.66	339	239	A	H
	*	2447	98.88	-	-	95.29	32.36	4.86	33.63	339	239	P	H
	*	2447	91.27	-	-	87.68	32.36	4.86	33.63	339	239	A	H
		2483.83	57.28	-16.72	74	53.52	32.46	4.92	33.62	339	239	P	H
		2483.5	43.97	-10.03	54	40.21	32.46	4.92	33.62	339	239	A	H
		2389.24	58.02	-15.98	74	54.66	32.21	4.81	33.66	118	346	P	V
		2389.94	48.1	-5.9	54	44.74	32.21	4.81	33.66	118	346	A	V
	*	2447	111.52	-	-	107.93	32.36	4.86	33.63	118	346	P	V
	*	2447	103.78	-	-	100.19	32.36	4.86	33.63	118	346	A	V
		2483.5	69.96	-4.04	74	66.2	32.46	4.92	33.62	118	346	P	V
		2483.5	53.71	-0.29	54	49.95	32.46	4.92	33.62	118	346	A	V
802.11n HT40 CH 09 2452MHz		2385.32	50.72	-23.28	74	47.37	32.2	4.81	33.66	100	198	P	H
		2389.1	39.67	-14.33	54	36.31	32.21	4.81	33.66	100	198	A	H
	*	2452	96.23	-	-	92.62	32.38	4.86	33.63	100	198	P	H
	*	2452	88.36	-	-	84.75	32.38	4.86	33.63	100	198	A	H
		2483.9	54.28	-19.72	74	50.52	32.46	4.92	33.62	100	198	P	H
		2483.62	42.28	-11.72	54	38.52	32.46	4.92	33.62	100	198	A	H
		2389.1	55.58	-18.42	74	52.22	32.21	4.81	33.66	135	285	P	V
		2389.94	46.2	-7.8	54	42.84	32.21	4.81	33.66	135	285	A	V
	*	2452	110.93	-	-	107.32	32.38	4.86	33.63	135	285	P	V
	*	2452	103.72	-	-	100.11	32.38	4.86	33.63	135	285	A	V
		2485.16	65.26	-8.74	74	61.5	32.46	4.92	33.62	135	285	P	V
		2484.46	52.89	-1.11	54	49.13	32.46	4.92	33.62	135	285	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz		4844	42.81	-31.19	74	53.28	34.66	7.76	52.89	-	-	P	H
		7266	44.17	-29.83	74	53.11	36.37	8.83	54.14	-	-	P	H
		4844	44.5	-29.5	74	54.97	34.66	7.76	52.89	-	-	P	V
		7266	44.19	-29.81	74	53.13	36.37	8.83	54.14	-	-	P	V
802.11n HT40 CH 06 2437MHz		4874	43.87	-30.13	74	54.3	34.65	7.76	52.84	-	-	P	H
		7311	44.51	-29.49	74	53.27	36.41	8.95	54.12	-	-	P	H
		4874	47.57	-26.43	74	58	34.65	7.76	52.84	-	-	P	V
		7311	44.14	-29.86	74	52.9	36.41	8.95	54.12	-	-	P	V
802.11n HT40 CH 09 2452MHz		4904	43.7	-30.3	74	54.08	34.64	7.78	52.8	-	-	P	H
		7356	44.37	-29.63	74	52.92	36.46	9.08	54.09	-	-	P	H
		4904	44.54	-29.46	74	54.92	34.64	7.78	52.8	-	-	P	V
		7356	45.29	-28.71	74	53.84	36.46	9.08	54.09	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11n HT20 (LF)

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11n HT20 LF		48.43	22.25	-17.75	40	35.98	19.62	1.63	34.98	-	-	P	H
		123.12	27.44	-16.06	43.5	43.24	16.78	2.17	34.75	-	-	P	H
		303.54	27.69	-18.31	46	39.86	19.2	3.23	34.6	-	-	P	H
		509.18	24.74	-21.26	46	32.33	23.51	3.4	34.5	-	-	P	H
		699.3	28.5	-17.5	46	32.08	27.08	3.74	34.4	-	-	P	H
		826.37	30.8	-15.2	46	32.37	28.35	4.38	34.3	-	-	P	H
		45.52	30.51	-9.49	40	44.25	19.61	1.61	34.96	-	-	P	V
		123.12	37.74	-5.76	43.5	53.54	16.78	2.17	34.75	-	-	P	V
		259.89	23.18	-22.82	46	36.94	17.87	3.05	34.68	-	-	P	V
		511.12	24.52	-21.48	46	32.07	23.54	3.41	34.5	-	-	P	V
		703.18	27.94	-18.06	46	31.47	27.13	3.74	34.4	-	-	P	V
		917.55	30.86	-15.14	46	31.68	29.03	4.45	34.3	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Co-location:

2.4GHz 2400~2483.5MHz

11g(n20)_Tx_Ch01 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preampl Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
11g(n20)_Tx_Ch01 2412MHz & LTE B14 Link	*	2412	102.3	-	-	98.87	32.27	4.81	33.65	292	240	P	H
	*	2412	94.8	-	-	91.37	32.27	4.81	33.65	292	240	A	H
		2390	59.34	-14.66	74	55.98	32.21	4.81	33.66	292	240	P	H
		2390	45.86	-8.14	54	42.5	32.21	4.81	33.66	292	240	A	H
	*	2412	112.34	-	-	108.91	32.27	4.81	33.65	126	225	P	V
	*	2412	105.59	-	-	102.16	32.27	4.81	33.65	126	225	A	V
		2389.485	69.75	-4.25	74	66.39	32.21	4.81	33.66	126	225	P	V
		2390	53.66	-0.34	54	50.3	32.21	4.81	33.66	126	225	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

11g(n20)_Tx_Ch01 (Harmonic @ 3m)

WIFI 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
11g(n20)_Tx_Ch01		4824	43.42	-30.58	74	53.91	34.67	7.75	52.91	-	-	P	H
2412MHz & LTE B14 Link		4824	51.19	-22.81	74	41.41	34.67	7.75	32.64	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is Margin line.
P/A	Peak or Average
H/V	Horizontal or Vertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)

2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Margin (dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Margin (dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Margin (dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

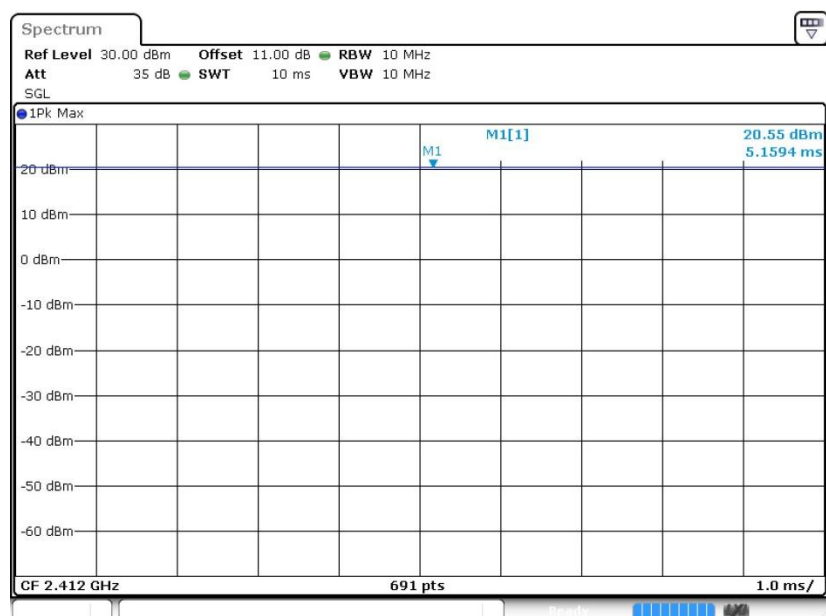
Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix D. Duty Cycle Plots

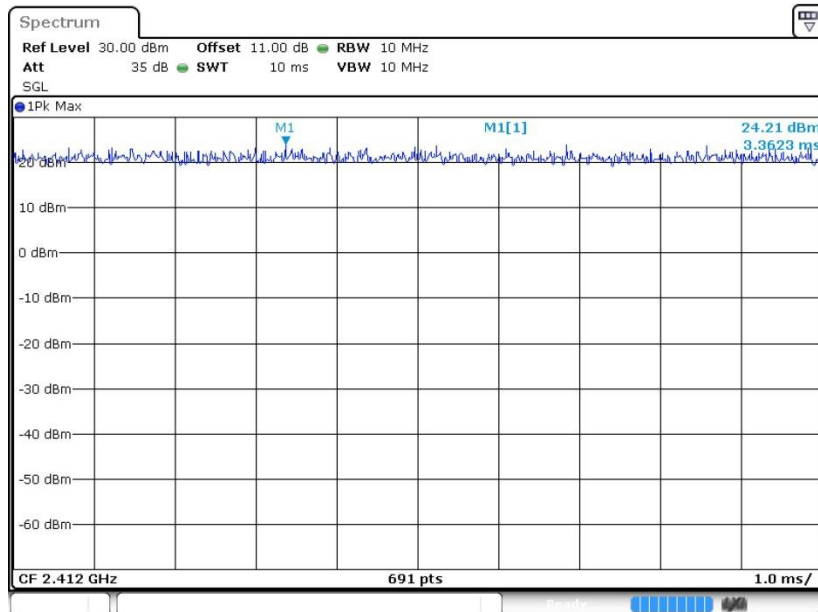
Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11b	100	-	-	10Hz
1+2	802.11g	100			10Hz
1+2	802.11n HT20	100			10Hz
1+2	802.11n HT40	100			10Hz

802.11b

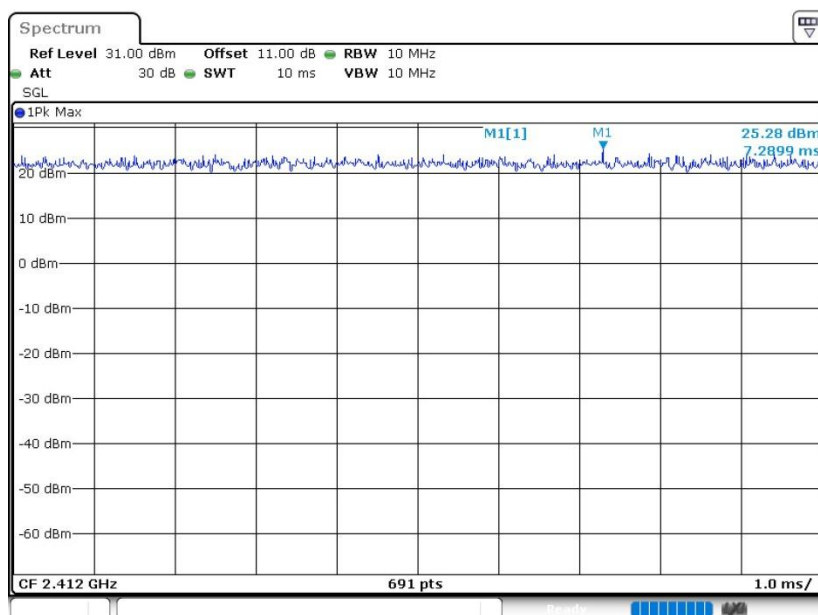




802.11g



802.11n HT20





802.11n HT40

