FCC Test Report

Report No: FCS202504361W01

Issued for

Applicant:	Huizhou Huaxinwei Technology Co.,Ltd.
Address:	Building 3, 6th Floor, Factory Building, No. 280 Wanxiang Avenue, Jinglong Village, Zhenlong Town, Huiyang District, Huizhou City, Guangdong Province, China
Product Name:	Camera
Brand Name:	N/A
Model Name:	HX-D001A-S1
Series Model:	HX-T0008C-A31(A26L), HX-K0004A-S7, HX-K001A-S15(PR), HX-D001A-S1, HX-G0008F-S1, HX-G0008G-S1, HX-H0008E-S2, HX-H0008E-S1, HX-C1006A-S2,HX-C1006A-S1, HX-B3011A-S2, HX-B3011A-S1, HX-H0008G-S2, HX-N0008B-S10, HX-N0008B-S11, HX-T1836E-S13（S6) HX-T0008C-S12（S10), HX-T0008C-S13（S11), HX-S0008A-S8, HX-A1508E-S1, HX-A1508E-S2, HX-A1536B-S1, HX-A1536B-S2, HX-A2508C-S4, HX-A2008D-S4, HX-A1516D-S2, HX-A1516D-S1, HX-A1516D-S4, HX-O020A-S9, HX-O017A-S9, HX-O018A-S9, HX-O015A-S9, HX-O001A-S9, HX-O021A-S9, HX-O003A-S6, HX-O002A-S6, HX-O004A-S6,HX-O004A-S5,HX-O2536A-S5， HX-O2536A-S6, HX-O2536B-S5,HX-O2536B-S6, HX-O1836A-S6, HX-O1836B-S6
FCC ID:	2BEFB-HX-D001A-S1

Issued By: Flux Compliance Service Laboratory
Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan
Tel: 0769-27280901 Fax:0769-27280901 http://www.FCS-lab.com

TEST RESULT CERTIFICATION

Applicant's Name..... :	Huizhou Huaxinwei Technology Co.,Ltd.
Address..... :	Building 3, 6th Floor, Factory Building, No. 280 Wanxiang Avenue, Jinglong Village, Zhenlong Town, Huiyang District, Huizhou City, Guangdong Province, China
Manufacture's Name..... :	Huizhou Huaxinwei Technology Co.,Ltd.
Address..... :	Building 3, 6th Floor, Factory Building, No. 280 Wanxiang Avenue, Jinglong Village, Zhenlong Town, Huiyang District, Huizhou City, Guangdong Province, China

Product Description

Product Name..... :	Camera
Brand Name.....:	N/A
Model Name..... :	HX-D001A-S1
Series Model.....:	Refer to Page One of the report
Test Standards..... :	FCC Part15.247
Test Procedure..... :	ANSI C63.10-2013

This device described above has been tested by Flux Compliance Service Laboratory, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
This report shall not be reproduced except in full, without the written approval of Flux Compliance Service Laboratory, this document may be altered or revised by Flux Compliance Service Laboratory, personal only, and shall be noted in the revision of the document..

Date of Test.....:

Date (s) of performance of tests. :	April 17, 2025 ~ April 22, 2025
Date of Issue.....:	June. 19, 2025
Test Result.....:	Pass

Tested by : Scott Shen
(Scott Shen)

Reviewed by : Duke Qian
(Duke Qian)

Approved by : Jack Wang
(Jack Wang)

Table of Contents Page

1. SUMMARY OF TEST RESULTS 6
1.1 TEST FACTORY 7
1.2 MEASUREMENT UNCERTAINTY 7
2. GENERAL INFORMATION 8
2.1 GENERAL DESCRIPTION OF THE EUT 8
2.2 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED 10
2.3 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS 11
2.4 EQUIPMENTS LIST 12
3. 6DB BANDWIDTH 13
3.1 Limit 13
3.2 Test Procedure 13
3.3 Test setup 13
3.4 Test results 14
4 CONDUCTED OUTPUT POWER 18
4.1 limit 18
4.2 test procedure 18
4.3 TEST SETUP 18
4.5 test results 18
5. POWER SPECTRAL DENSITY 19
5.1 LIMIT 19
5.2 TEST PROCEDURE 19
5.3 TEST SETUP 19
5.4 TEST RESULTS 20
5.5 original test data 21
6. Band edge and spurious(conducted) 23
6.1 LIMIT 23
6.2 TEST PROCEDURE 23
6.3 TEST SETUP 23
6.5 TEST RESULTS 24
6.5 Original test data 24
6.6 Spurious emissions 26

Table of Contents **Page**

7 RADIATED EMISSION MEASUREMENT 28

8 CONDUCTED EMISSION TEST 44

9. ANTENNA REQUIREMENT 48

9.1 STANDARD REQUIREMENT 48

9.2 RESULT 48

Revision History

Rev.	Issue Date	Effect Page	Contents
00	June 19, 2025	N/A	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02

FCC Part 15.247,Subpart C			
Standard Section	Test Item	Judgment	Remark
FCC 15.247 (a) (2)	6dB Bandwidth	PASS	--
FCC 15.247 (b) (3)	Conducted Output Power	PASS	--
FCC 15.247 (e)	Power Spectral Density	PASS	--
FCC 15.247 (d)	Band-edge and Spurious Emissions (Conducted)	PASS	--
FCC 15.247 (d) FCC 15.209 FCC 15.205	Radiated Spurious Emissions	PASS	--
FCC 15.247 (d) FCC 15.209 FCC 15.205	Radiated Band Edge Compliance	PASS	--
FCC 15.207	Power Line Conducted Emission	PASS	--
FCC 15.203	Antenna requirement	PASS	--
15.205	Restricted Band Edge Emission	PASS	--

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.10-2013

1.1 TEST FACTORY

Company Name:	Flux Compliance Service Laboratory
Address:	Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan
Telephone:	+86-769-27280901
Fax:	+86-769-27280901
Laboray Accreditations：	
FCC Test Firm Registration Number:	514908
CNAS Number:	L15566
Designation number:	CN0127
A2LA accreditation number:	5545.01
ISED Number:	25801
CAB ID：	CN0097

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ±**U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	RF output power, conducted	±0.71dB
2	Unwanted Emissions, conducted	±2.988 dB
3	Conducted Emission (9KHz-150KHz)	±4.13 dB
4	Conducted Emission (150KHz-30MHz)	±4.74 dB
5	All emissions radiated (9KHz -30MHz)	±3.1 dB
6	All emissions,radiated(<1G) 30MHz-1000MHz	±5.2 dB
7	All emissions,radiated 1GHz -18GHz	±4.66 dB
8	All emissions,radiated 18GHz -40GHz	±4.31 dB
9	Occupied bandwidth	±0.3 MHz
10	PSD	±0.48dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	Camera
Trade Name	N/A
Model Name	HX-D001A-S1
Series Model	Refer to Page One of the report
Model Difference	We (Huizhou Huaxinwei Technology Co.,Ltd.) hereby state that all the models are electrical identical including the same software parameter and hardware design (i.e., circuit design, PCB Layout, RF module/circuit, antenna type(s) and antenna location, components on PCB, etc.,), same mechanical structure and design (including product enclosure, materials, etc.,), the only difference is the model name and appearance color.
Channel List	Please refer to the Note 2.
Operation frequency	IEEE 802.11b: 2412MHz-2462MHz IEEE 802.11g: 2412MHz-2462MHz IEEE 802.11n HT20: 2412MHz-2462MHz
Modulation:	IEEE 802.11b: DSSS (CCK, QPSK, BPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20,: OFDM (64QAM, 16QAM, QPSK, BPSK)
Transmitter rate:	IEEE 802.11b: 1, 2, 5.5, 11 Mbps IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE 802.11n HT20: up to 20MHz max 65Mbps
Power supply	Input:AC110-240V~,12W,60Hz
Battery	N/A
Sample number	FCS202504361
Hardware version number	V1.0
Software version number	V1.0
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	05	2432	09	2452
02	2417	06	2437	10	2457
03	2422	07	2442	11	2462
04	2427	08	2447		

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	2.4G to 5.8G-3DB-100MM	FPC Internal antenna	N/A	2.65	Antenna

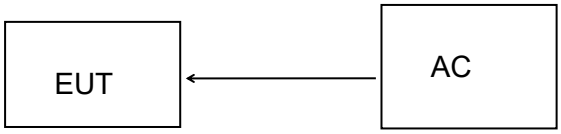
1

2.2 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & 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 power expected by the customer and is going to be fixed on the firmware of the final end product.

Block diagram of EUT configuration for test

Mode 1



Test software: The rtwpriv wlan0 mp_start

The test softeware was used to control EUT work in continuous TX mode, and select test channel, Wireless mode as below table

Tested mode, channel, and data rate information

Mode	Setting Tx Power	data rate (Mbps) (see Note)	Channel	Frequency (MHz)
IEEE 802.11b	8	1	LCHCH1	2412
	8	1	MCH: CH6	2437
	8	1	HCH:CH11	2462
IEEE 802.11g	20	6	LCH: CH1	2412
	20	6	MCH: CH6	2437
	20	6	HCH: CH11	2462
IEEE 802.11n HT20	20	MCS8	LCH:CH1	2412
	20	MCS8	MCH: CH6	2437
	20	MCS8	HCHCH11	2462

Note:

(1) According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test,

(2) During the test, the dutycycle>98%, the test voltage was tuned from 85% to 115% of the Nominal rate supply votage, and found that the worst case was the nominal rated supply condition, So the report just shows that condition's data

2.3 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.4 EQUIPMENTS LIST

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESRP 3	FCS-E001	2024. 08.28	2025. 08.27
Signal Analyzer	R&S	FSV40-N	FCS-E012	2024. 08.28	2025. 08.27
Active loop Antenna	ZHINAN	ZN30900C	FCS-E013	2024. 08.28	2025. 08.27
Bilog Antenna	SCHWARZBECK	VULB 9168	FCS-E002	2024. 08.28	2025. 08.27
Horn Antenna	SCHWARZBECK	BBHA 9120D	FCS-E003	2024. 08.28	2025. 08.27
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	FCS-E018	2024. 08.28	2025. 08.27
Pre-Amplifier(0.1M-3G Hz)	EMCI	EM330N	FCS-E004	2024. 08.28	2025. 08.27
Pre-Amplifier (1G-18GHz)	N/A	TSAMP-0518SE	FCS-E014	2024. 08.28	2025. 08.27
Pre-Amplifier (18G-40GHz)	TERA-MW	TRLA-0400	FCS-E019	2024. 08.28	2025. 08.27
Temperature & Humidity	HTC-1	victor	FCS-E005	2024. 08.28	2025. 08.27

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	FCS-E020	2024. 08.28	2025. 08.27
LISN	R&S	ENV216	FCS-E007	2024. 08.28	2025. 08.27
LISN	ETS	3810/2NM	FCS-E009	2024. 08.28	2025. 08.27
Temperature & Humidity	HTC-1	victor	FCS-E008	2024. 08.28	2025. 08.27

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
MXA SIGNAL Analyzer	Keysight	N9020A	FCS-E015	2024. 08.28	2025. 08.27
Spectrum Analyzer	Agilent	E4447A	MY50180039	2024. 08.28	2025. 08.27
Spectrum Analyzer	R&S	FSV-40	101499	2024. 08.28	2025. 08.27
Power Sensor	Agilent	UX2021XA	FCS-E021	2024. 08.28	2025. 08.27

3. 6DB BANDWIDTH

3.1 Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz

3.2 Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6 dB Bandwidth :100KHz For 99% Bandwidth :1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : ≥3 × RBW For 99% Bandwidth : approximately 3×RBW
Trace	Max hold
Sweep	Auto

(3) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

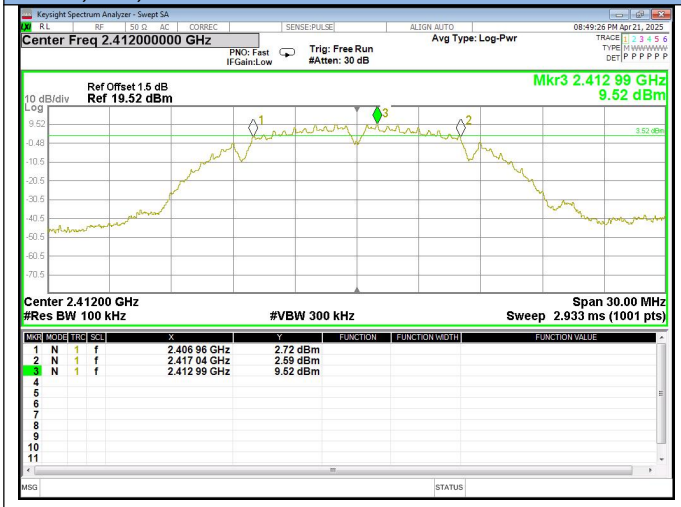
3.3 Test setup

3.4 Test results

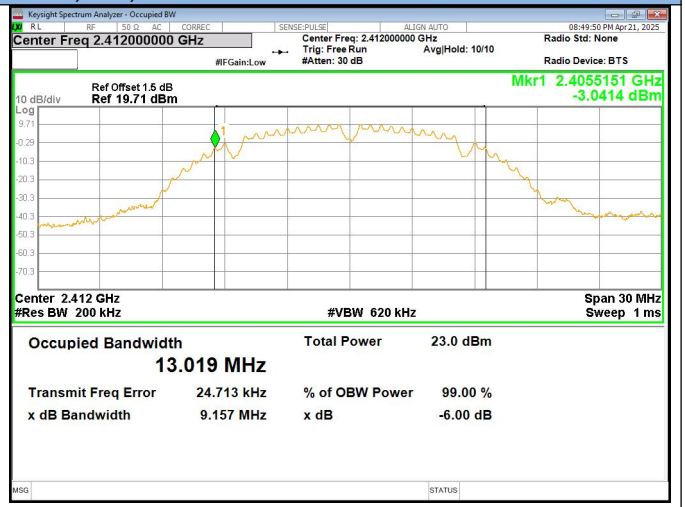
TestMode	Channel (MHz)	99%OBW (MHz)	6dB Bandwidth (MHz)	limit (MHz)	Verdict
802.11b	2412MHz	13.019	10.080	0.5	Pass
802.11b	2437MHz	13.038	10.110	0.5	Pass
802.11b	2462MHz	13.082	9.630	0.5	Pass
802.11g	2412MHz	16.748	16.380	0.5	Pass
802.11g	2437MHz	16.809	16.380	0.5	Pass
802.11g	2462MHz	16.891	16.410	0.5	Pass
802.11n 20	2412MHz	17.861	17.640	0.5	Pass
802.11n 20	2437MHz	17.907	17.640	0.5	Pass
802.11n 20	2462MHz	17.958	17.640	0.5	Pass

3.5 Original Test Data

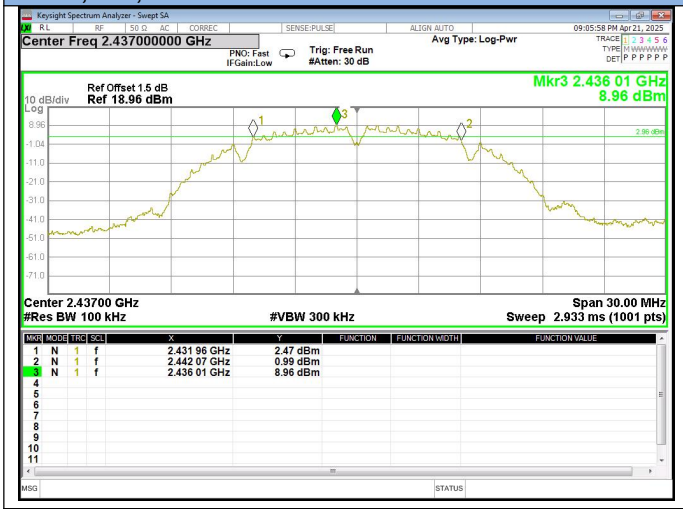
6BW,11b,Lowest



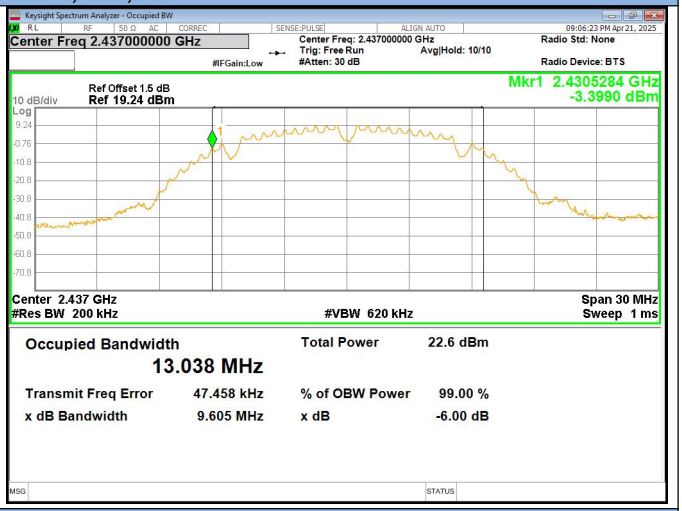
OCB,11b,Lowest



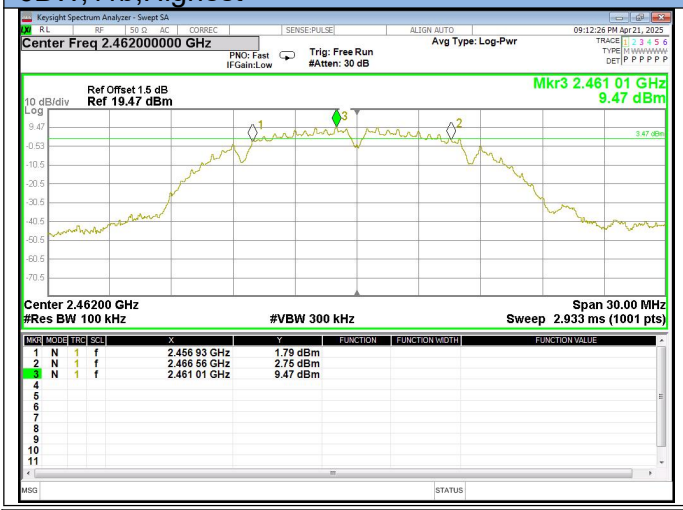
6BW,11b,Middle



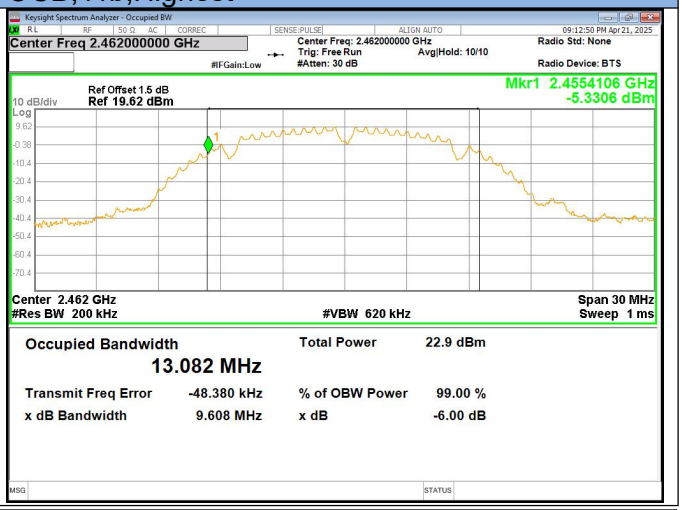
OCB,11b,Middle



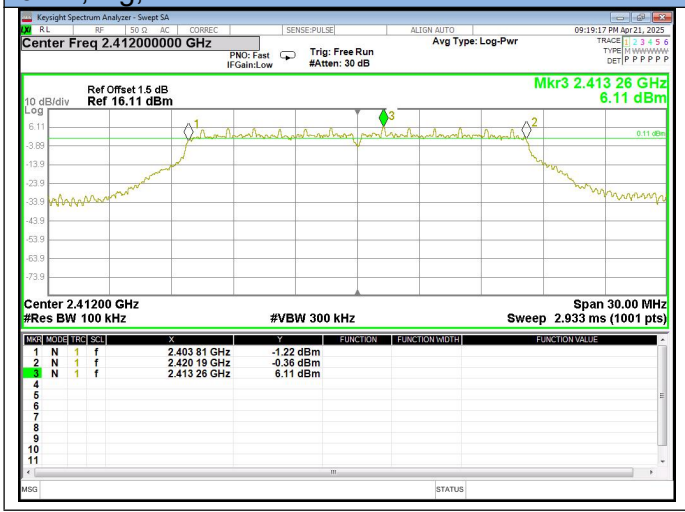
6BW,11b,Highest



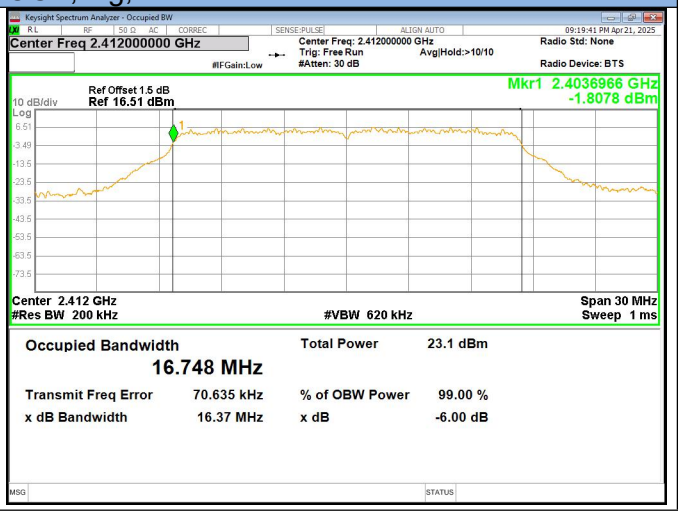
OCB,11b,Highest



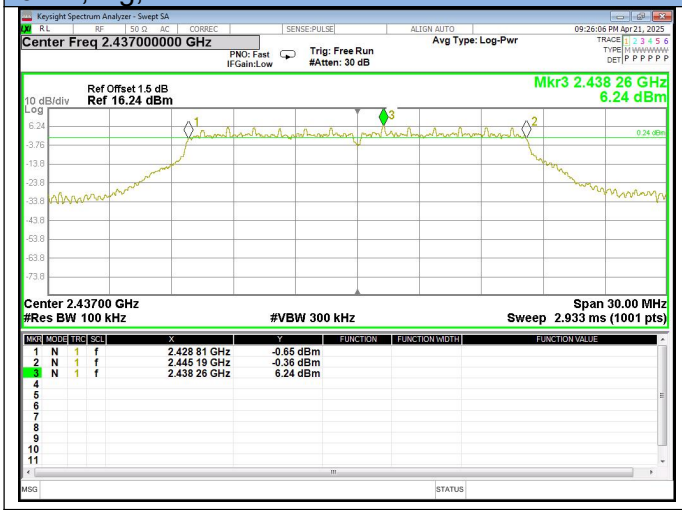
6BW,11g,Lowest



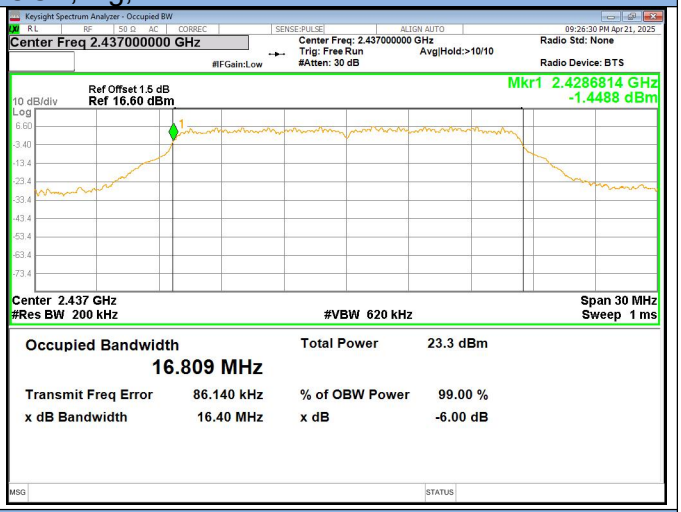
OCB,11g,Lowest



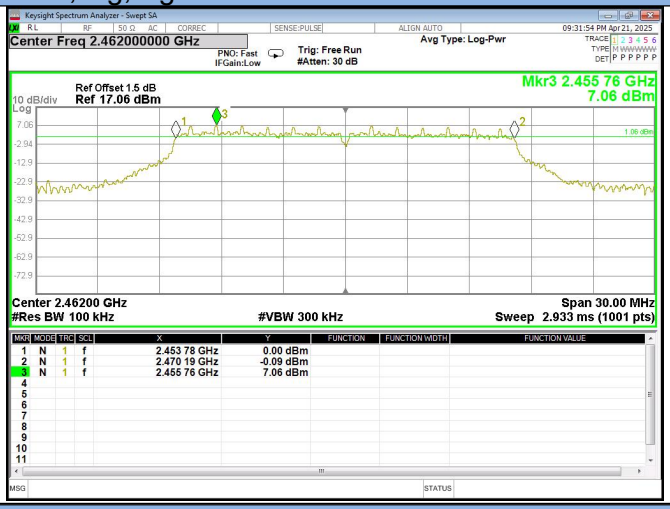
6BW,11g,Middle



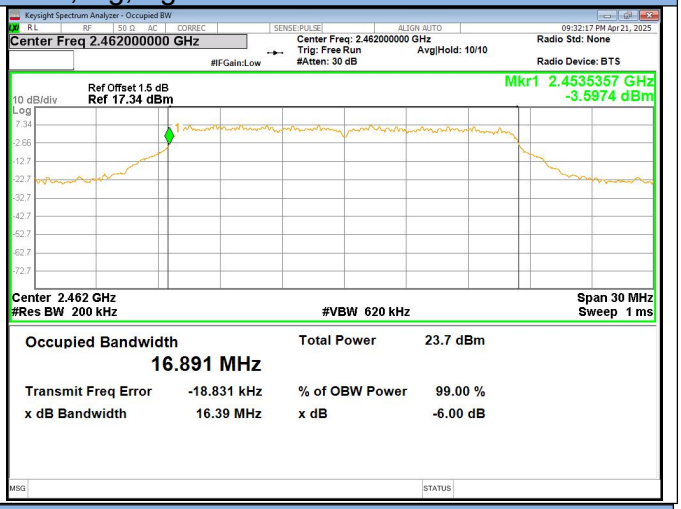
OCB,11g,Middle



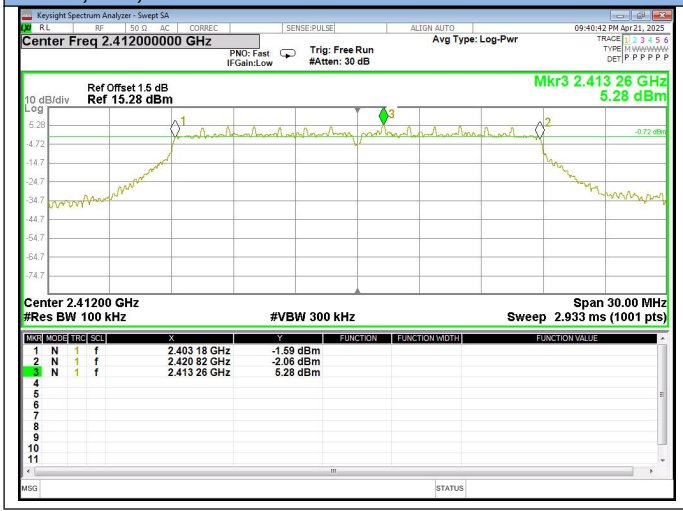
6BW,11g,Highest



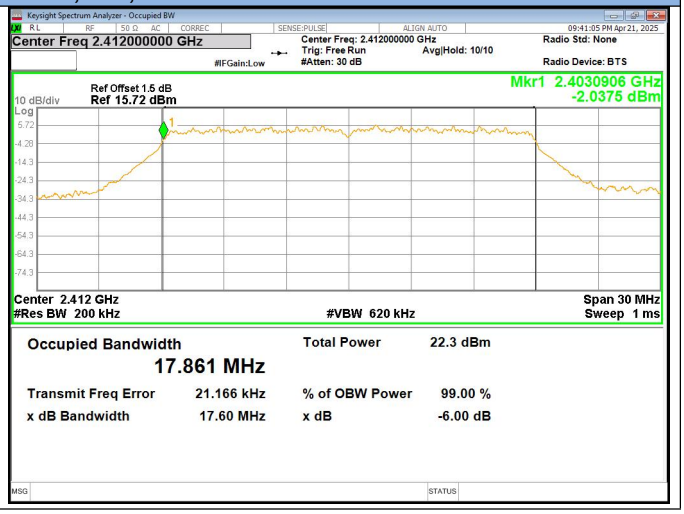
OCB,11g,Highest



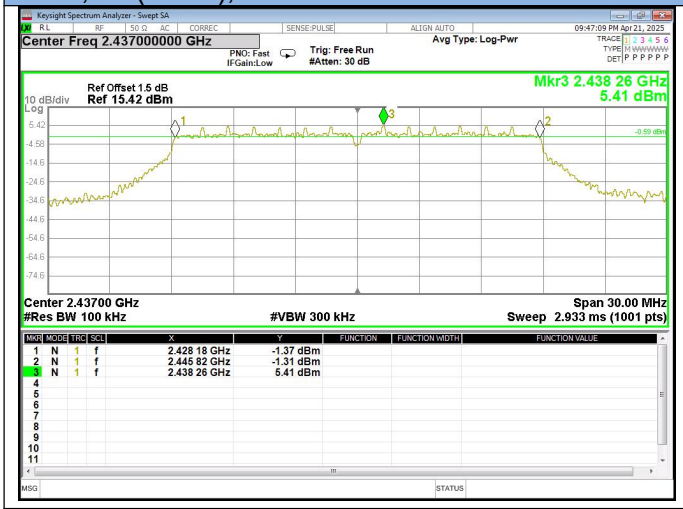
6BW,11n,Lowest



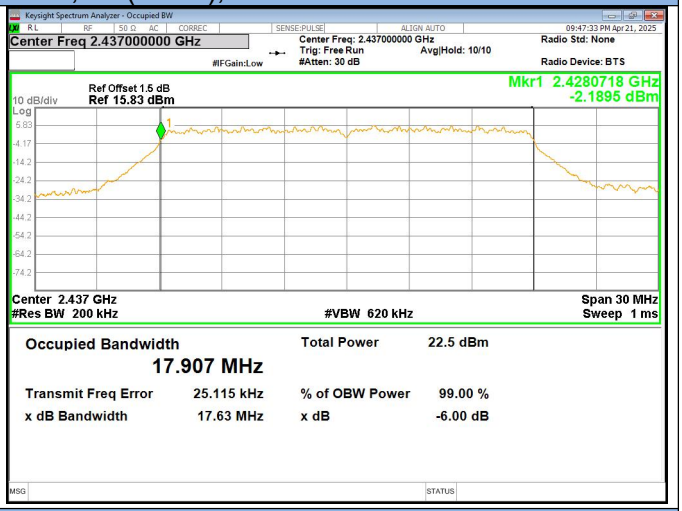
OCB,11n,Lowest



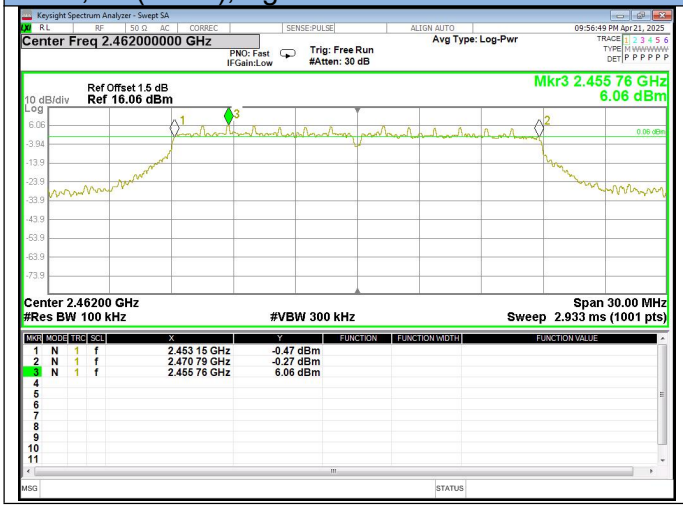
6BW,11n(HT20),Middle



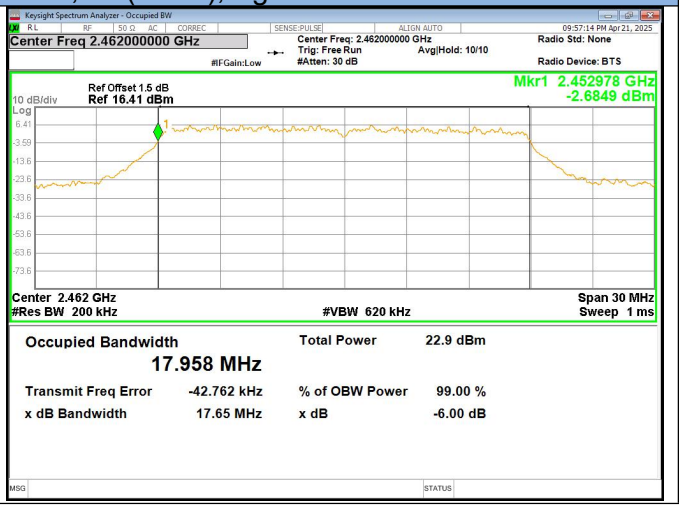
OCB,11n(HT20),Middle



6BW,11n(HT20),Highest



OCB,11n(HT20),Highest



4 CONDUCTED OUTPUT POWER

4.1 limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2 test procedure

a. Connect each EUT's antenna output to power sensor by RF cable and attenuator

b. Measure the PK output power of each antenna port by power sensor.

4.3 TEST SETUP

4.5 test results

TestMode	Channel (MHz)	Result (dBm)	Limit (dBm)	Verdict
802.11b	2412MHz	18.26	30	Pass
802.11b	2437MHz	18.21	30	Pass
802.11b	2462MHz	17.67	30	Pass
802.11g	2412MHz	17.52	30	Pass
802.11g	2437MHz	18.61	30	Pass
802.11g	2462MHz	18.10	30	Pass
802.11n 20	2412MHz	17.67	30	Pass
802.11n 20	2437MHz	17.87	30	Pass
802.11n 20	2462MHz	17.40	30	Pass

5. POWER SPECTRAL DENSITY

5.1 LIMIT

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

5.2 TEST PROCEDURE

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

Center frequency	DTS Channel center frequency
RBW:	3 kHz ≤ RBW ≤ 100 kHz
VBW:	≥ 3RBW
Span	1.5 times the DTS bandwidth
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW

(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

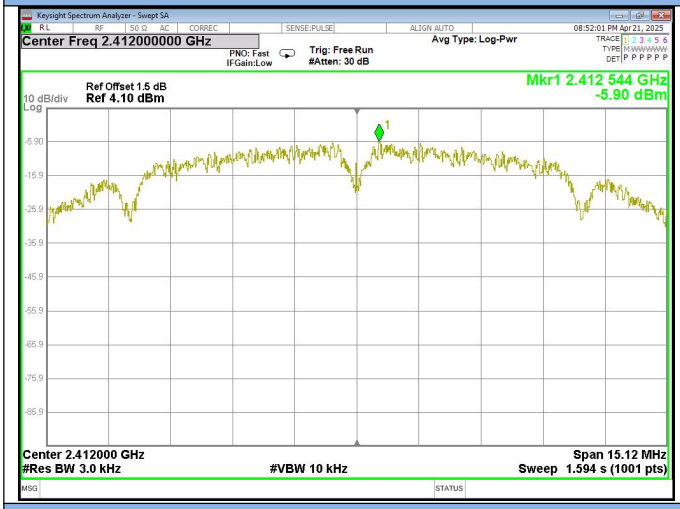
5.3 TEST SETUP

5.4 TEST RESULTS

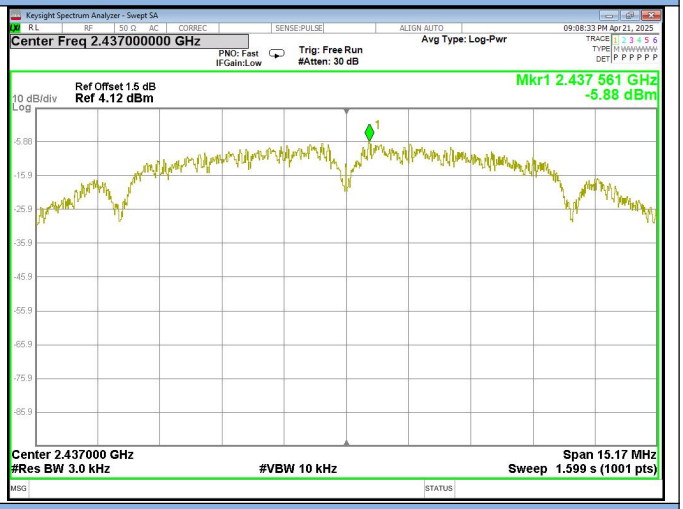
TestMode	Channel (MHz)	Result (dBm/3KHz)	Limit (dBm/3KHz)	Verdict
802.11b	2412MHz	-5.90	8	Pass
802.11b	2437MHz	-5.88	8	Pass
802.11b	2462MHz	-5.72	8	Pass
802.11g	2412MHz	-8.87	8	Pass
802.11g	2437MHz	-8.90	8	Pass
802.11g	2462MHz	-7.94	8	Pass
802.11n 20	2412MHz	-9.00	8	Pass
802.11n 20	2437MHz	-8.97	8	Pass
802.11n 20	2462MHz	-8.62	8	Pass

5.5 original test data

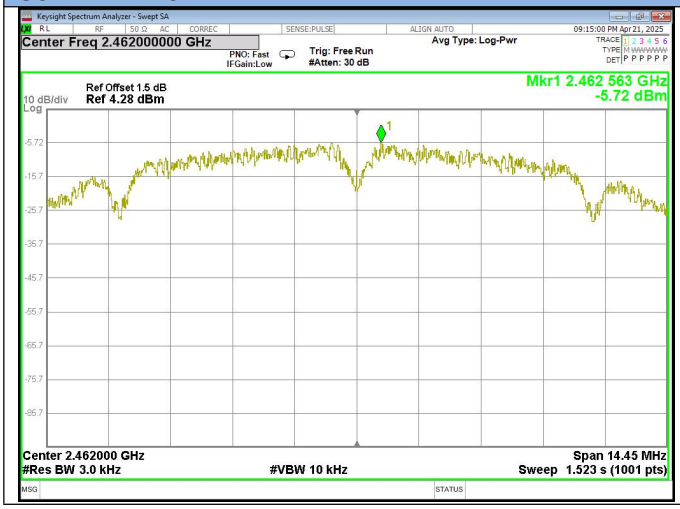
802.11b-2412MHz



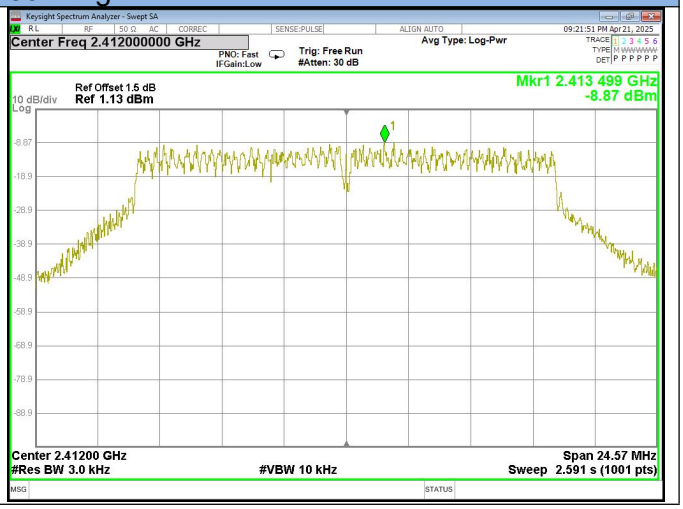
802.11b-2437MHz



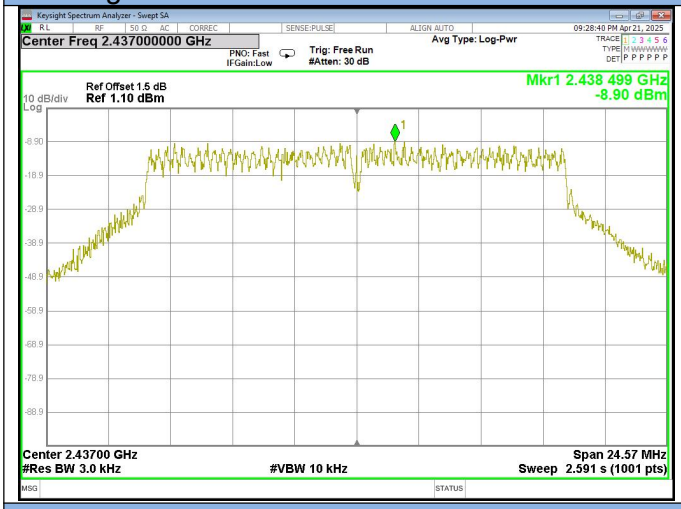
802.11b-2462MHz



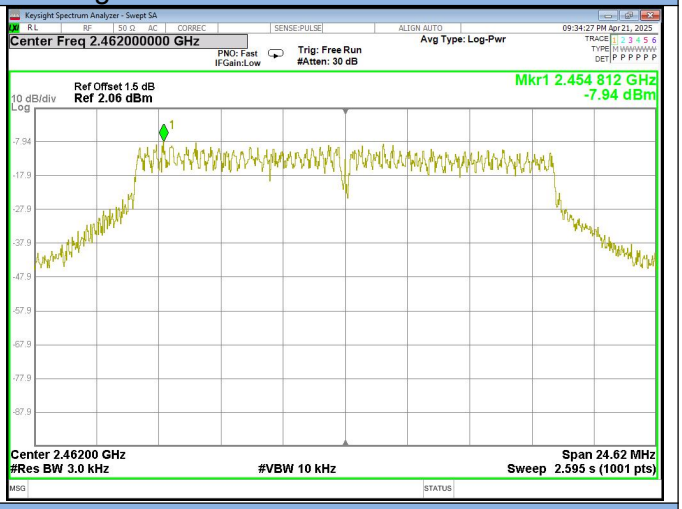
802.11g-2412MHz



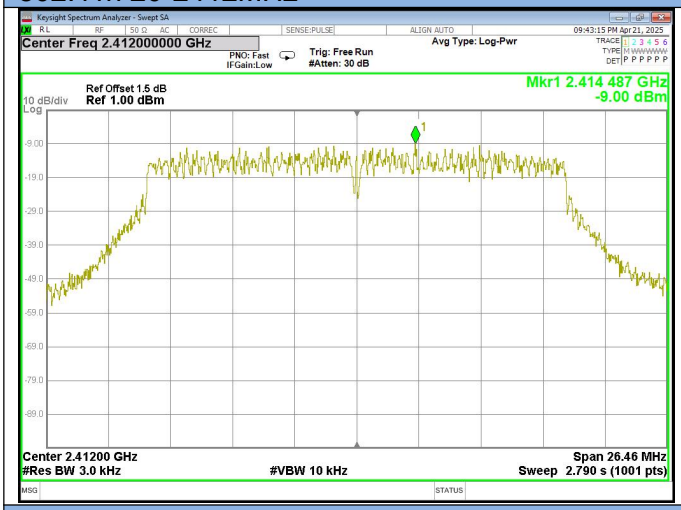
802.11g-2437MHz



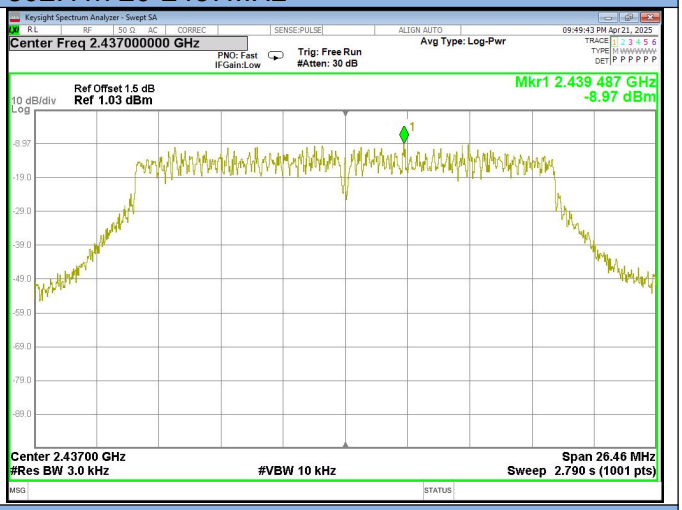
802.11g-2462MHz



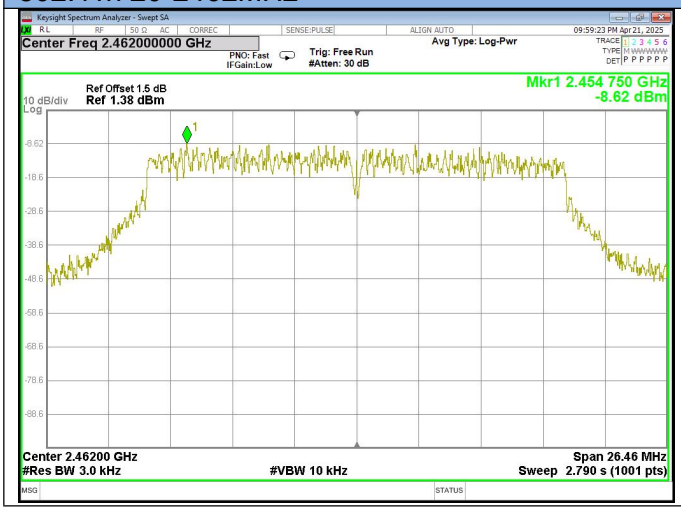
802.11n 20-2412MHz



802.11n 20-2437MHz



802.11n 20-2462MHz



6. Band edge and spurious(conducted)

6.1 LIMIT

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 30dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

6.2 TEST PROCEDURE

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

Center frequency	DTS Channel center frequency
RBW:	100kHz
VBW:	300kHz
Span	1.5times the DTS bandwidth
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

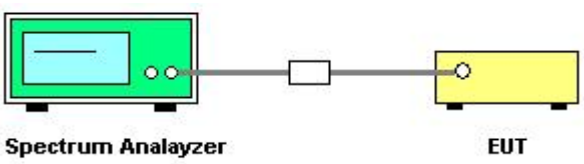
(3) Establish Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100kHz
VBW:	300kHz
Span	Encompass frequency range to be measured
Number of measurement points	≥span/RBW
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

6.3 TEST SETUP

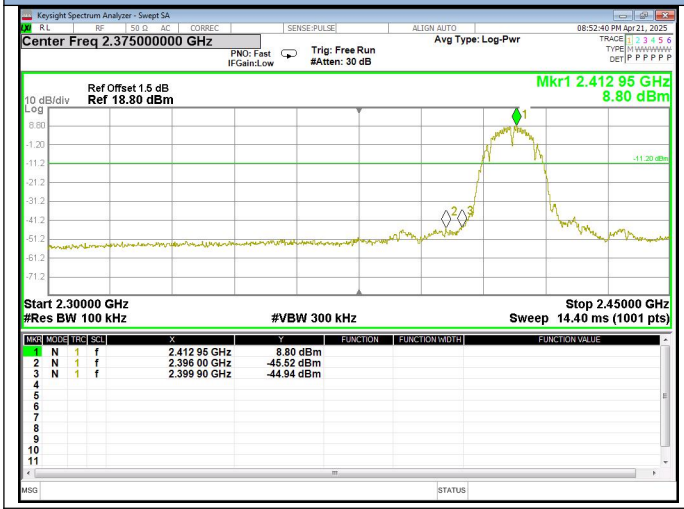


6.5 TEST RESULTS

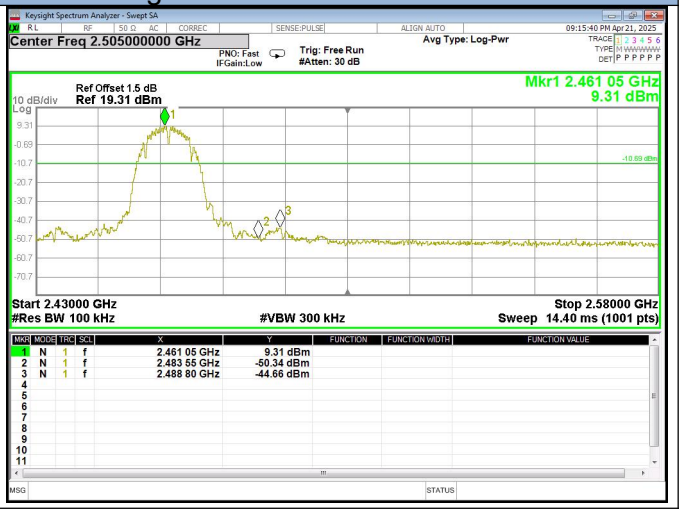
Eut set mode	CH or Frequency	Result
802.11b	CH1	Pass
	CH11	Pass
802.11g	CH1	Pass
	CH11	Pass
802.11n 20	CH1	Pass
	CH11	Pass

6.5 Original test data

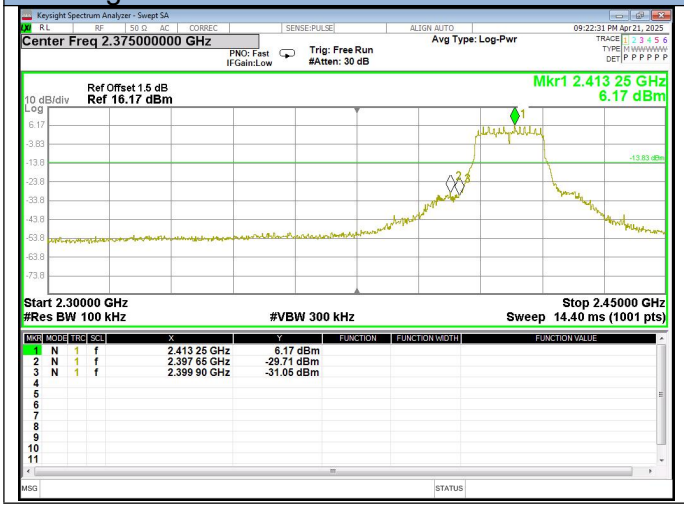
802.11b Low CH



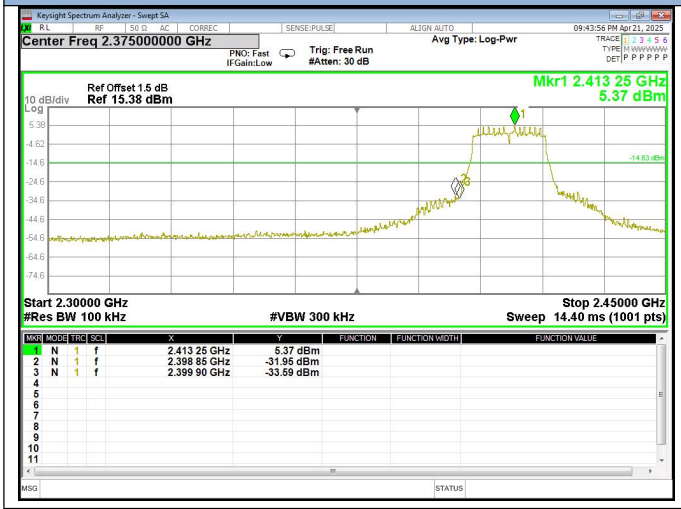
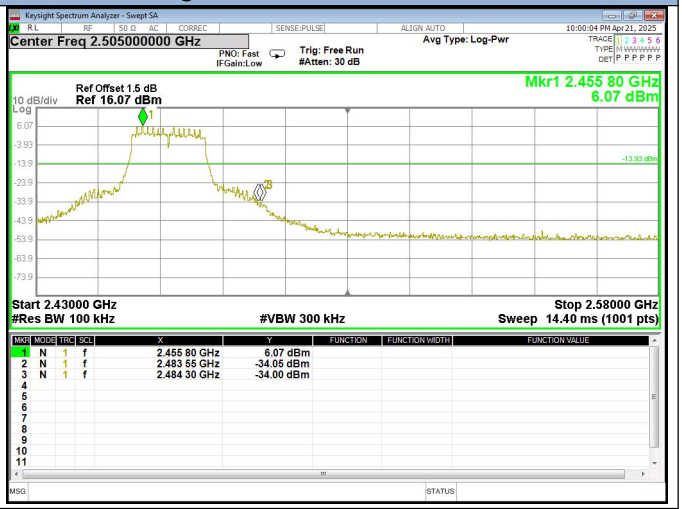
802.11b High CH



802.11g low CH

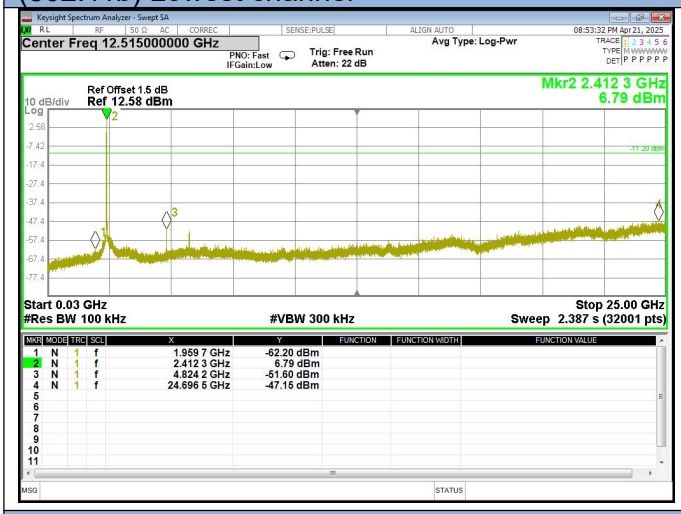


802.11g high CH

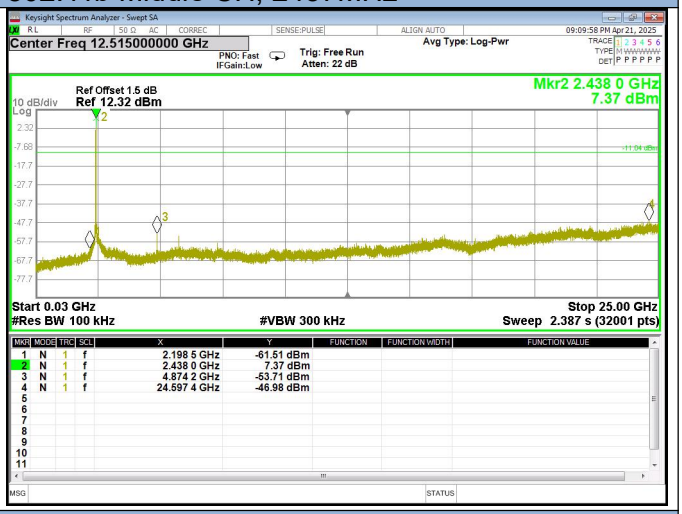
802.11n20 Low CH	802.11n20 High CH
	

6.6 Spurious emissions

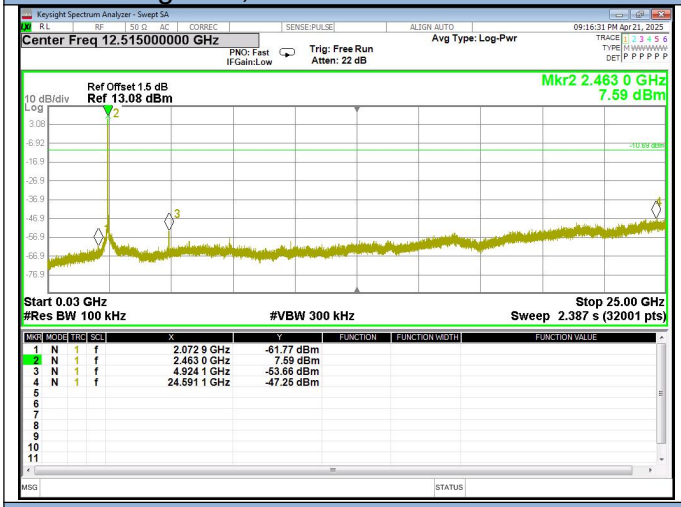
(802.11b) Lowest channel



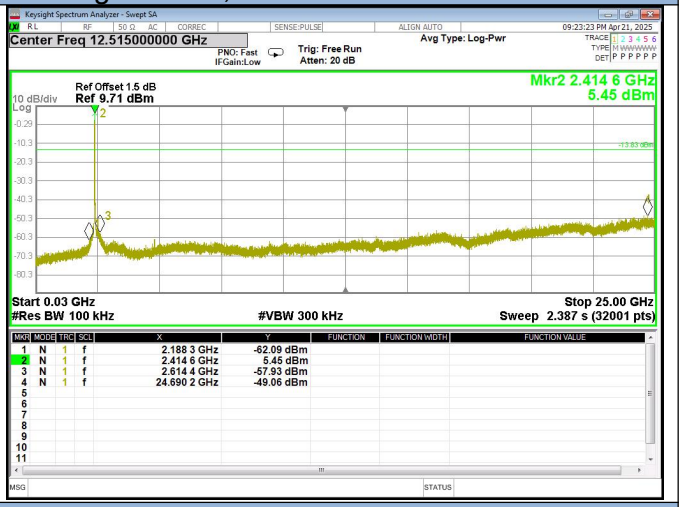
802.11b Middle CH, 2437MHz



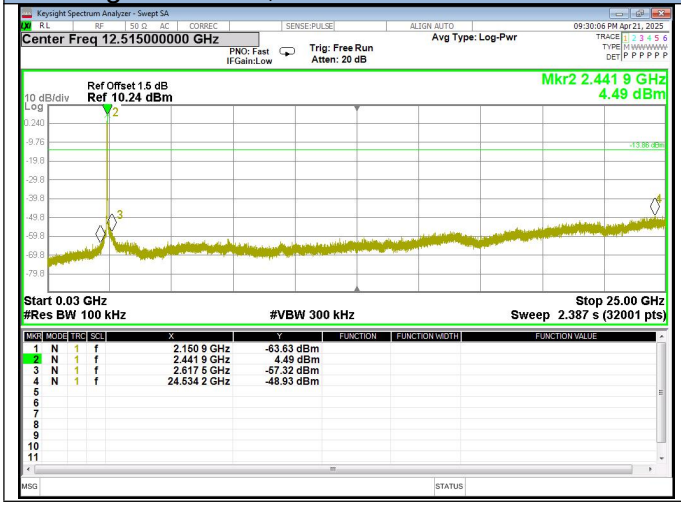
802.11b High CH, 2462MHz



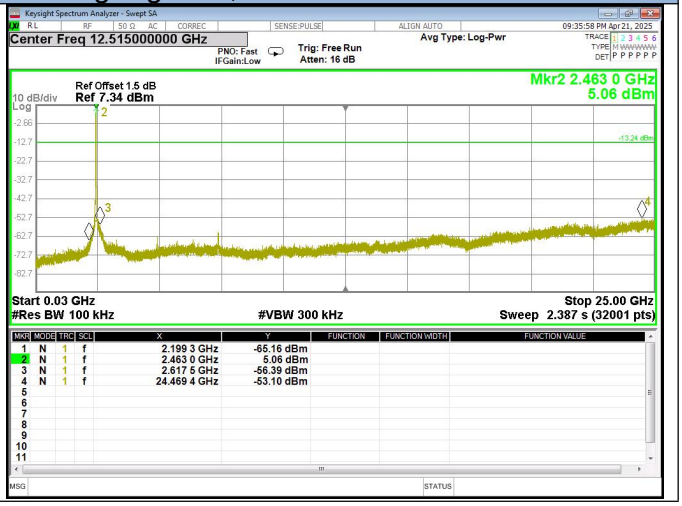
802.11g Low CH, 2412MHz



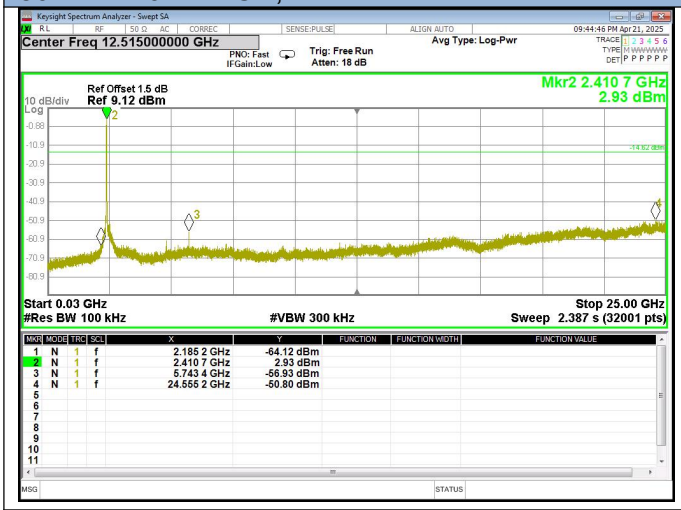
802.11g Middle CH, 2437MHz



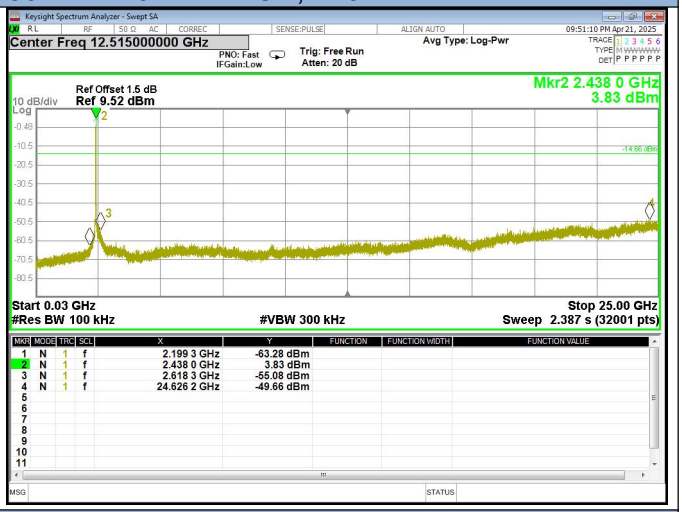
802.11g High CH, 2462MHz



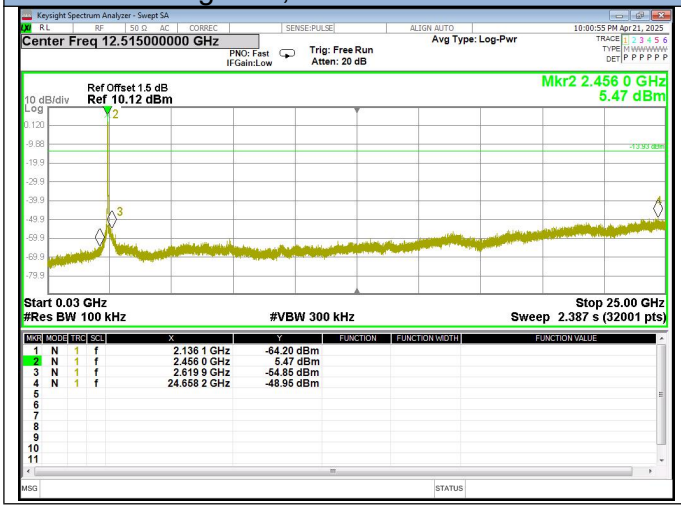
802.11n 20 Low CH, 2412MHz



802.11n 20 Middle CH, 2437MHz



802.11n 20 High CH, 2462MHz



7 RADIATED EMISSION MEASUREMENT

7.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/AV
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz /10 Hz

For Band edge

Spectrum Parameter	Setting
Detector	Peak/AV
Start/Stop Frequency	Lower Band Edge: 2300 to 2403 MHz Upper Band Edge: 2479 to 2500 MHz
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz / 10 Hz

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

7.2 TEST PROCEDURE

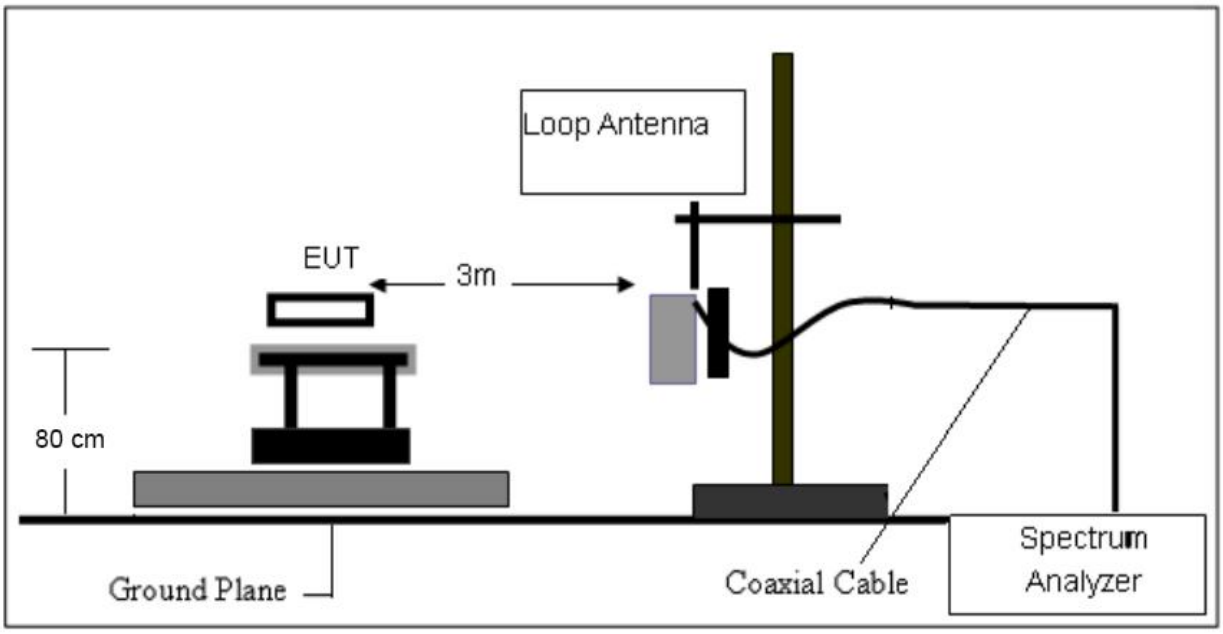
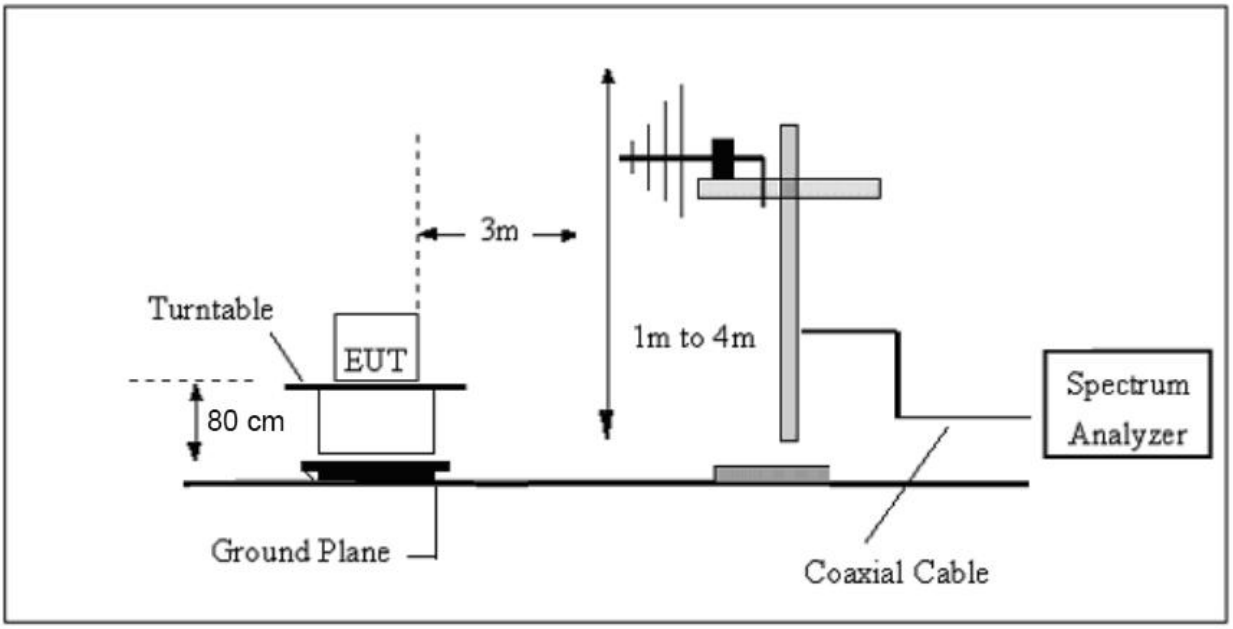
a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz,and above 1GHz.
b. The EUT was placed on the top of a rotating table 0.8 meters (above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then QuasiPeak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

7.3 TESTSETUP

（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz