



FCC RF Test Report

APPLICANT : Motorola Mobility LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola
MODEL NAME : XT2205-3
FCC ID : IHDT56AE8
STANDARD : FCC Part 15 Subpart E §15.407
CLASSIFICATION : (NII) Unlicensed National Information Infrastructure
TEST DATE(S) : Jun. 07, 2022

We, Sporton International Inc. (Kunshan), 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.

This report contains data that were produced under subcontract by Sporton International Inc. (ShenZhen).

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

Jason Jia

Approved by: Jason Jia



Sporton International Inc. (Kunshan)

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China**



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SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
4.1	15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	Pass	-
4.2	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) & 15.209(a)	Pass	Under limit 4.12 dB at 5642.400 MHz
4.3	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

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

Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2205-3
FCC ID	IHDT56AE8
IMEI Code	Conducted: N/A Radiation: 351397430011580
HW Version	DVT2
SW Version	S2ST32.37
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	5745 MHz ~ 5825 MHz		
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac/ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)		
Antenna Type / Gain	<Ant. 1> : Loop Antenna with gain -8.5 dBi <Ant. 2> : ILA Antenna with gain -7.3 dBi		
Antenna Function Description		Ant. 1	Ant. 2
	802.11 a/n/ac/ax MIMO	V	V

Note:

- For 802.11n HT20/HT40 & 802.11ac VHT20/VHT40 mode, the whole testing have assessed only 802.11n HT20/HT40 by referring to the higher output power.
- 802.11ax support OFDMA full RU tone and partial RU tone, both full RU and partial RU-left (for low CH) and partial RU-right (for high CH) test power/RSE, the full RU power > partial RU, therefore the full RU perform full test and Partial RU verified power/RSE.
- WIFI MIMO only support STBC by manufacturer declared.



4. WLAN 5G Ant. 1 / Ant. 2 corresponding to EUT Photo Ant. 2 / Ant. 9.

1.5 Modification of EUT

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

1.6 Specification of Accessory

Specification of Accessory				
AC Adapter 1	Brand Name	Motorola(Salom)	Model Name	MC-301
AC Adapter 2	Brand Name	Motorola(Acbel)	Model Name	MC-301
Battery	Brand Name	Motorola(ATL)	Model Name	NF50
USB Cable 1	Brand Name	Motorola(Saibao)	Model Name	SC18D13215
USB Cable 2	Brand Name	Motorola(Cabletech)	Model Name	SC18D13216
USB Cable 3	Brand Name	Motorola(Luxshare)	Model Name	SC18D13217

1.7 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH04-KS 03CH05-KS 03CH08-KS	CN1257	314309

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.
	TH01-SZ	CN1256	421272

Test data subcontracted: conducted power of this report.



1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24a
2.	03CH05-KS	AUDIX	E3	6.2009-8-24al
3.	03CH08-KS	AUDIX	E3	6.2009-8-24

1.9 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 E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ 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 Re-use of Measured Data

2.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: XT2205-3, FCC ID: IHDT56AE8) is electrically identical to the reference device (Model: XT2205-1, XT2205-2, FCC ID: IHDT56AE7) for the portions of the circuitry corresponding to the data being re-used. Based on their similarity, the FCC Part 15E, U-NII-3 reuse the original model's result do spot-check, following the FCC KDB 484596 D01 v01.

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID: IHDT56AE8 .

2.2 Model Difference Information

The main difference between FCC ID: IHDT56AE7 and FCC ID: IHDT56AE8 is as below:

- Add mmWave function.
- Remove some band

Other differences and all the details of similarity and difference can be found in the confidential documents (XT2205-3_Operational Description of Product Equality Declaration).

The re-used RF data includes the following bands provided in Appendix D (Sporton RF Report No. FR240834G for the reference device Model: XT2205-1, XT2205-2, FCC ID: IHDT56AE7).

2.3 Reference detail Section:

Rule Part	Equipment Class	Frequency Band (MHz)	Reference FCC ID(Parent)	Type Grant/ Permissive Change	Reference Title	FCC ID Filling (Variant)	Report Title/Section
15E	NII	5745~5825	IHDT56AE7	Original Grant	FR240834G	IHDT56AE8	All sections applicable except for RSE



2.4 Spot Check Verification Data Section

Conducted power test and radiated spurious emission for re-testing against the variant model based on the original model was performed in this filing.

Summary for power spot check for rule entry and technology is listed as below:

Test Item	Mode	IHDT56AE7 Parent Worst Result	IHDT56AE8 Variant Check Result	Difference (dB)
Conducted Power (dBm)	11a CH157	20.83	20.37	-0.46
	11an20 CH157	20.84	20.24	-0.6
	11an40 CH151	20.73	20.13	-0.6
	11ac20 CH157	20.79	20.25	-0.54
	11ac40 CH151	20.66	20.06	-0.6
	11ac80 CH155	20.61	19.69	-0.92
	11ax20 CH157	18.7	18.2	-0.5
	11ax40 CH159	18.86	18.57	-0.29
	11ax80 CH155	18.59	18.16	-0.43

Conclusion:

We confirm that the test data reuse policy of FCC KDB 484596 D01 Referencing Test Data v01 has been followed and the test data for AC Conduction and Conducted test items except Conducted Power as referenced from the parent model report represents compliance with new FCC ID.



3 Test Configuration of Equipment Under Test

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: 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 (X plane) were recorded in this report.

3.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5745-5825 MHz U-NII-3	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155#	5775	165	5825

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "#n" were 802.11ac VHT80.



3.2 Test Mode

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

MIMO Mode

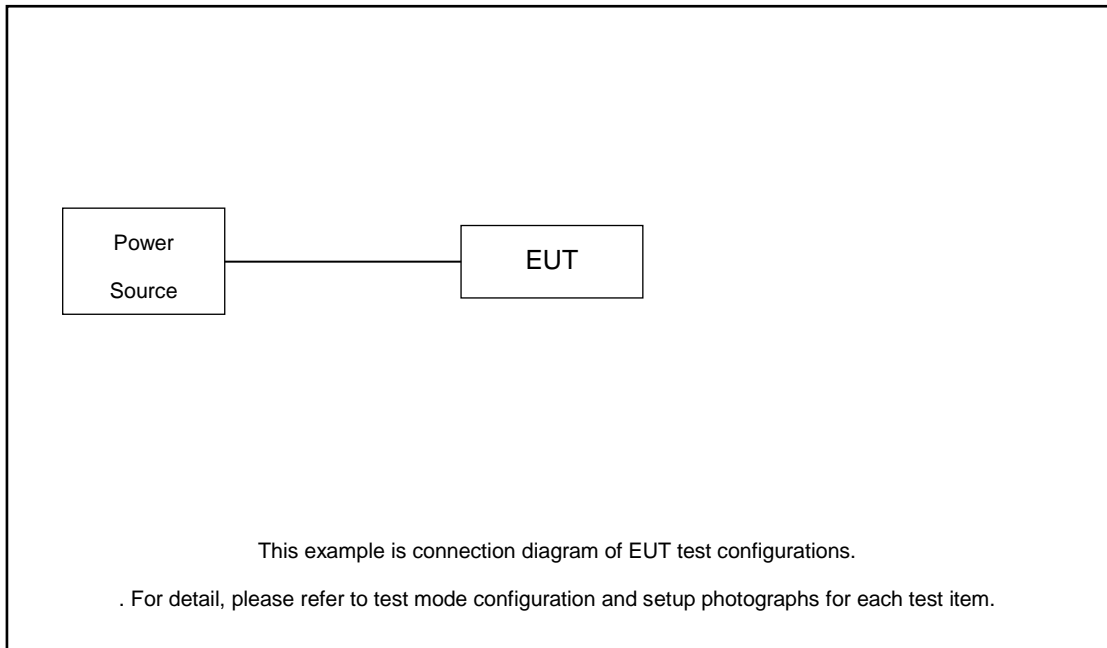
Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT80	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0

Ch. #		U-NII-3 : 5745-5825 MHz			
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

Ch. #		U-NII-3 : 5745-5825 MHz		
		802.11ax HE20	802.11ax HE40	802.11ax HE80
L	Low	149	151	-
M	Middle	157	-	155
H	High	165	159	-

Remark: For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.

3.3 Connection Diagram of Test System



3.4 EUT Operation Test Setup

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

4 Test Result

4.1 Maximum Conducted Output Power Measurement

4.1.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.1.2 Measuring Instruments

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

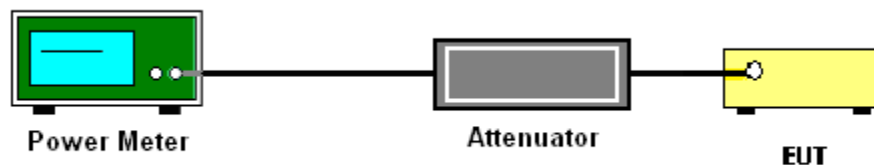
4.1.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, $10 \log(1/x)$, where x is the duty cycle.
4. For MIMO mode, the measure-and-sum technique should be used for measuring the in-band transmit power of a device.

4.1.4 Test Setup



4.1.5 Test Result of Maximum Conducted Output Power

Please refer to Spot Check Verification Data Section



4.2 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

4.2.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5.725-5.85 GHz band:

15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

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

EIRP (dBm)	Field Strength at 3m (dBµV/m)
- 27	68.3

Note: The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBµV/m

d_{Meas} is the measurement distance, in m

4.2.2 Measuring Instruments

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

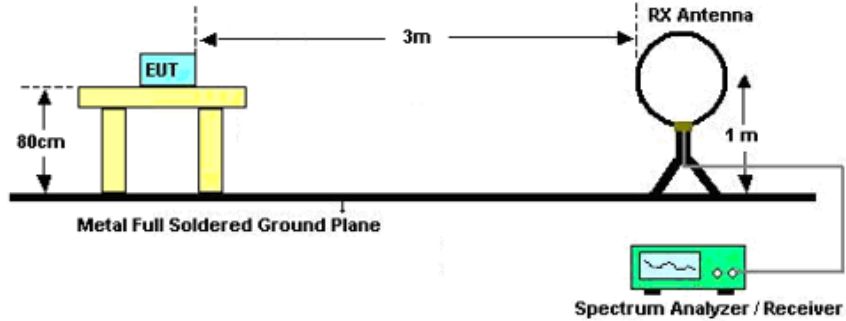


4.2.3 Test Procedures

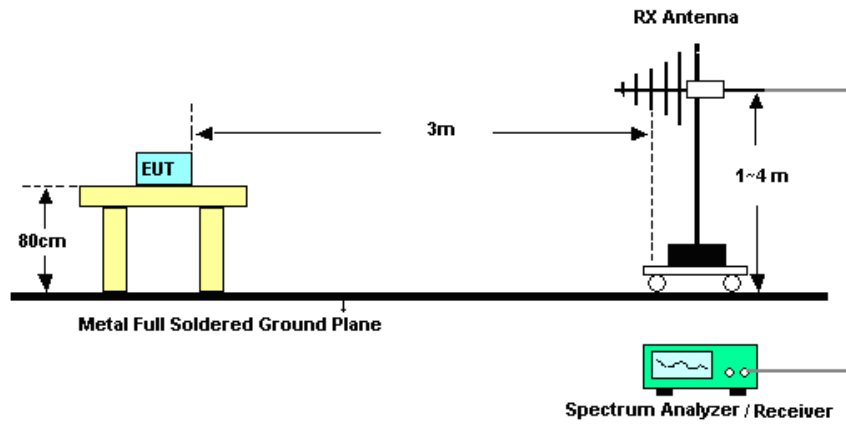
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.
 - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
 - (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
 - RBW = 1 MHz
 - VBW \geq 3 MHz
 - Detector = Peak
 - Sweep time = auto
 - Trace mode = max hold
 - (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
 - RBW = 1 MHz
 - 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.
2. 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.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
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.

4.2.4 Test Setup

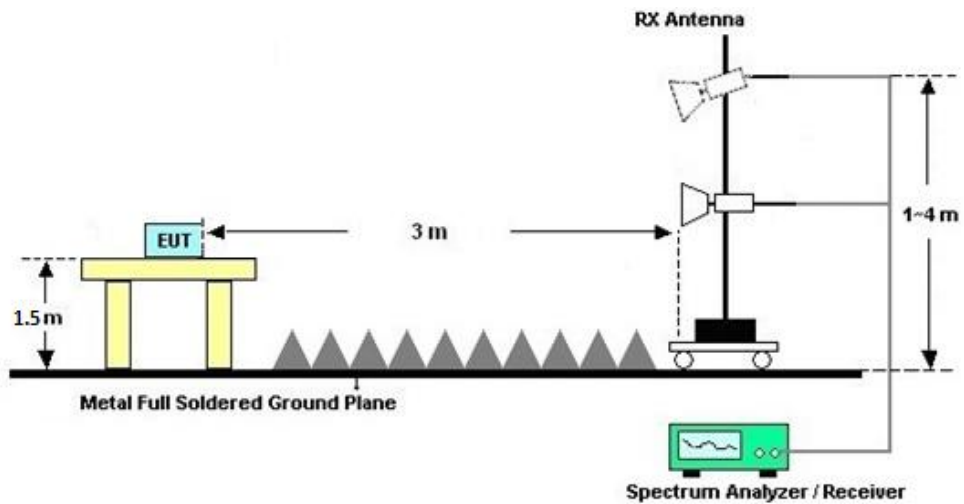
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





4.2.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit 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.

4.2.6 Test Result of Radiated Band Edges

Please refer to Appendix A.

4.2.7 Duty Cycle

Please refer to Appendix B.

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

Please refer to Appendix A.



4.3 Antenna Requirements

4.3.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

4.3.3 Antenna Gain

<STBC Modes>

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

Basic methodology with NANT transmit antennas, each with the same directional gain GANT dBi, being driven by NANT transmitter outputs of equal power, and If antenna gains are not equal and each transmit antenna can be driven by more than one spatial stream, directional gain may be calculated by either of the following two formulas:

Directional gain = GANT MAX + 10 log(NANT/Nss) dBi, where NANT=2, Nss =2.

Directional gain = GANT Max

<STBC Modes>						
	Ant. 1	Ant. 2	DG for Power	DG for PSD	Power Limit Reduction	PSD Limit Reduction
	(dBi)	(dBi)	(dBi)	(dBi)	(dB)	(dB)
Band IV	-8.50	-7.30	-7.30	-7.30	0.00	0.00

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)



5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Pulse Power Sensor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Jun. 07, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Jun. 07, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Oct. 16, 2021	Jun. 07, 2022	Oct. 15, 2022	Radiation (03CH08-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471084	10Hz-44G,MAX 30dB	Jul. 12, 2021	Jun. 07, 2022	Jul. 11, 2022	Radiation (03CH08-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Jun. 07, 2022	Oct. 29, 2022	Radiation (03CH08-KS)
Bilog Ante1ma	TESEQ& VGT	CBL 61110	59915	30MHz-1GHz	Sep. 02, 2021	Jun. 07, 2022	Sep. 01, 2022	Radiation (03CH08-KS)
Amplifier	SONOMA	310N	413741	9KHz-1GHz	Jan. 05, 2022	Jun. 07, 2022	Jan. 04, 2023	Radiation (03CH08-KS)
Amplifier	Keysight	83017A	MY53270389	500MHz~26.5GHz	Jan. 05, 2022	Jun. 07, 2022	Jan. 04, 2023	Radiation (03CH08-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Jun. 07, 2022	NCR	Radiation (03CH08-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Jun. 07, 2022	NCR	Radiation (03CH08-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Jun. 07, 2022	NCR	Radiation (03CH08-KS)
EMI Test Receiver	Keysight	N9038A	MY57290151	3Hz~8.5GHz;Max 30dBm	Jul. 12, 2021	Jun. 07, 2022	Jul. 11, 2022	Radiation (03CH04-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57541079	10Hz-44G,MAX 30dB	Oct. 14, 2021	Jun. 07, 2022	Oct. 13, 2022	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1284	1GHz~18GHz	Oct. 18, 2021	Jun. 07, 2022	Oct. 18, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Jun. 07, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GG A	060728	18~40GHz	Jan. 05, 2022	Jun. 07, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2025788	1Ghz-18Ghz	Jul. 30, 2021	Jun. 07, 2022	Jul. 29, 2022	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jun. 07, 2022	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jun. 07, 2022	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jun. 07, 2022	NCR	Radiation (03CH04-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 16, 2021	Jun. 07, 2022	Oct. 15, 2022	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471084	10Hz-44G,MAX 30dB	Jul. 12, 2021	Jun. 07, 2022	Jul. 11, 2022	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 08, 2021	Jun. 07, 2022	Nov. 07, 2022	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Jun. 07, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40GG A	060728	18~40GHz	Jan. 05, 2022	Jun. 07, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2012228	1Ghz-18Ghz	Oct. 16, 2021	Jun. 07, 2022	Oct. 15, 2022	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jun. 07, 2022	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jun. 07, 2022	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jun. 07, 2022	NCR	Radiation (03CH05-KS)

NCR: No Calibration Required



6 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.

For 03CH08-KS

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

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

For 03CH04-KS

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1dB
---	-------

For 03CH05-KS

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

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

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

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

----- THE END -----



Appendix A. Radiated Spurious Emission

UNII-3 - 5725~5850MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
2+9		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT20 CH 157 5785MHz		5625.2	50.17	-18.13	68.3	40.79	34.84	11.03	36.49	100	116	P	H
		5693.6	50.9	-49.68	100.58	41.4	34.93	11.13	36.56	100	116	P	H
		5720	52.79	-58.11	110.9	43.26	34.97	11.16	36.6	100	116	P	H
		5724	55.38	-64.64	120.02	45.83	34.97	11.18	36.6	100	116	P	H
		5788	111.12	-	-	101.48	35.05	11.26	36.67	100	116	P	H
		5788	104.15	-	-	94.51	35.05	11.26	36.67	100	116	A	H
		5854	52.81	-60.37	113.18	43.09	35.13	11.33	36.74	100	116	P	H
		5860.4	53.04	-56.35	109.39	43.31	35.13	11.34	36.74	100	116	P	H
		5909.6	51.37	-28.29	79.66	41.58	35.2	11.38	36.79	100	116	P	H
		5945.2	51.67	-16.63	68.3	41.84	35.24	11.42	36.83	100	116	P	H
		5648.8	49.63	-18.67	68.3	40.19	34.87	11.08	36.51	352	95	P	V
		5660.4	50.15	-25.87	76.02	40.71	34.89	11.08	36.53	352	95	P	V
		5714.4	50.42	-58.91	109.33	40.89	34.95	11.16	36.58	352	95	P	V
		5722	50.2	-65.26	115.46	40.65	34.97	11.18	36.6	352	95	P	V
		5788	106.23	-	-	96.59	35.05	11.26	36.67	352	95	P	V
		5788	97.93	-	-	88.29	35.05	11.26	36.67	352	95	A	V
		5851.6	50.92	-67.73	118.65	41.2	35.11	11.33	36.72	352	95	P	V
		5863.6	51.14	-57.35	108.49	41.41	35.13	11.34	36.74	352	95	P	V
	5881.2	51.61	-49.08	100.69	41.85	35.16	11.36	36.76	352	95	P	V	
	5936.8	52.17	-16.13	68.3	42.34	35.22	11.42	36.81	352	95	P	V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



UNII-3 5725~5850MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include test data for 802.11n HT20 and CH 157 5785MHz, and a Remark section.



UNII-3 5725~5850MHz
WIFI 802.11n HT40 (Band Edge @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include frequencies from 5647.6 to 5930.8 MHz and 5752, 5758 MHz.

Remark

- 1. No other spurious found.
2. All results are PASS against Peak and Average limit line.



UNII-3 5725~5850MHz
WIFI 802.11n HT40 (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include 802.11n HT40 and CH 151 5755MHz, and a Remark section.



UNII-3 5725~5850MHz
WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 2+9	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)
802.11ac VHT80 CH 155 5775MHz	!	5642.4	64.18	-4.12	68.3	54.77	34.87	11.05	36.51	108	114	P	H
		5684.4	79.24	-14.55	93.79	69.74	34.93	11.13	36.56	108	114	P	H
		5712.8	79.93	-28.96	108.89	70.4	34.95	11.16	36.58	108	114	P	H
		5720	78.86	-32.04	110.9	69.33	34.97	11.16	36.6	108	114	P	H
		5770	102.79	-	-	93.17	35.03	11.24	36.65	108	114	P	H
		5770	95.86	-	-	86.24	35.03	11.24	36.65	108	114	A	H
		5852.8	75.57	-40.35	115.92	65.85	35.11	11.33	36.72	108	114	P	H
		5864	77.92	-30.46	108.38	68.19	35.13	11.34	36.74	108	114	P	H
		5876.8	69.54	-34.42	103.96	59.78	35.16	11.36	36.76	108	114	P	H
		5926.8	60.46	-7.84	68.3	50.65	35.22	11.4	36.81	108	114	P	H
		5635.2	58.62	-9.68	68.3	49.21	34.87	11.05	36.51	334	100	P	V
		5681.2	71.91	-19.52	91.43	62.44	34.91	11.11	36.55	334	100	P	V
		5712.4	73.58	-35.19	108.77	64.05	34.95	11.16	36.58	334	100	P	V
		5720.4	74.77	-37.04	111.81	65.24	34.97	11.16	36.6	334	100	P	V
		5788	95.78	-	-	86.14	35.05	11.26	36.67	334	100	P	V
		5788	88.84	-	-	79.2	35.05	11.26	36.67	334	100	A	V
		5850	68.99	-53.31	122.3	59.27	35.11	11.33	36.72	334	100	P	V
		5860.8	70.86	-38.41	109.27	61.13	35.13	11.34	36.74	334	100	P	V
	5880	62.42	-39.17	101.59	52.66	35.16	11.36	36.76	334	100	P	V	
	5939.6	54.57	-13.73	68.3	44.74	35.24	11.42	36.83	334	100	P	V	

Remark

- No other spurious found.
- All results are PASS against Peak and Average limit line.



UNII-3 5725~5850MHz
WIFI 802.11ac VHT80 (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Contains two data rows and a Remark section.



UNII-3 5725~5850MHz
WIFI 802.11ax HE20_Full (Band Edge @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include data for 802.11ax HE20 Full CH 165 5825MHz and a Remark section.



UNII-3 5725~5850MHz
WIFI 802.11ax HE20 Full (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include test results for 802.11ax HE20 Full and CH 165 5825MHz, and a Remark section.



UNII-3 5725~5850MHz
WIFI 802.11ax HE20_Partial 106 (Band Edge @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include test results for frequencies 5852.8, 5856.8, 5885.2, 5939.2, 5830, 5830, 5853.6, 5855.2, 5910, 5955.6, 5830, 5830.

Remark

- 1. No other spurious found.
2. All results are PASS against Peak and Average limit line.



UNII-3 5725~5850MHz
WIFI 802.11ax HE40_Full (Band Edge @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include frequencies from 5640.8 to 5972 MHz.

Remark

- 1. No other spurious found.
2. All results are PASS against Peak and Average limit line.



UNII-3 5725~5850MHz
WIFI 802.11ax HE40_Full (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include 802.11ax HE40 Full and CH 151 5755MHz.

Remark

- 1. No other spurious found.
2. All results are PASS against Peak and Average limit line.



UNII-3 5725~5850MHz
WIFI 802.11ax HE40_Partial 242 (Band Edge @ 3m)

WIFI Ant. 2+9	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)
802.11ax HE40 Partial 262/62 CH 159 5795MHz		5602	49.83	-18.47	68.3	40.49	34.82	11	36.48	100	199	P	H
		5698	50.3	-53.53	103.83	40.8	34.93	11.13	36.56	100	199	P	H
		5718.4	50.16	-60.29	110.45	40.63	34.97	11.16	36.6	100	199	P	H
		5723.6	49.54	-69.57	119.11	39.99	34.97	11.18	36.6	100	199	P	H
		5812	106.83	-	-	97.16	35.07	11.29	36.69	100	199	P	H
		5812	98.14	-	-	88.47	35.07	11.29	36.69	100	199	A	H
		5854.4	52.81	-59.46	112.27	43.09	35.13	11.33	36.74	100	199	P	H
		5856.8	53.2	-57.2	110.4	43.47	35.13	11.34	36.74	100	199	P	H
		5880	52.11	-49.48	101.59	42.35	35.16	11.36	36.76	100	199	P	H
		5931.2	51.64	-16.66	68.3	41.81	35.22	11.42	36.81	100	199	P	H
		5613.6	48.89	-19.41	68.3	39.52	34.82	11.03	36.48	303	96	P	V
		5687.6	49.77	-46.38	96.15	40.27	34.93	11.13	36.56	303	96	P	V
		5708	50.54	-57	107.54	41.01	34.95	11.16	36.58	303	96	P	V
		5721.6	49.48	-65.07	114.55	39.93	34.97	11.18	36.6	303	96	P	V
		5812	100.56	-	-	90.89	35.07	11.29	36.69	303	96	P	V
		5812	92.74	-	-	83.07	35.07	11.29	36.69	303	96	A	V
		5852	51.2	-66.54	117.74	41.48	35.11	11.33	36.72	303	96	P	V
		5860.8	50.39	-58.88	109.27	40.66	35.13	11.34	36.74	303	96	P	V
	5877.6	51.14	-52.23	103.37	41.38	35.16	11.36	36.76	303	96	P	V	
	5960	50.2	-18.1	68.3	40.35	35.26	11.43	36.84	303	96	P	V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



UNII-3 5725~5850MHz
WIFI 802.11ax HE80_Full (Band Edge @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include frequencies from 5630.4 to 5934.4 MHz.

Remark
1. No other spurious found.
2. All results are PASS against Peak and Average limit line.



UNII-3 5725~5850MHz
WIFI 802.11ax HE80_Full (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). It contains two data rows and a Remark section.



UNII-3 5725~5850MHz
WIFI 802.11ax HE80_Partial 484 (Band Edge @ 3m)

Table with 14 columns: WIFI Ant. 2+9, 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). Rows include frequency measurements from 5646 to 5934.4 MHz.

Remark
1. No other spurious found.
2. All results are PASS against Peak and Average limit line.



Emission below 1GHz
5GHz WIFI 802.11ac VHT80 (LF)

Table with 14 columns: WIFI, Note, Frequency, Level, Over, Limit, Read, Antenna, Path, Preamp, Ant, Table, Peak, Pol. It contains 11 rows of test data for 5GHz WIFI 802.11ac VHT80 LF and a Remark section at the bottom.



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 over limit 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	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2+9		(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. Over Limit(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. Over Limit(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. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

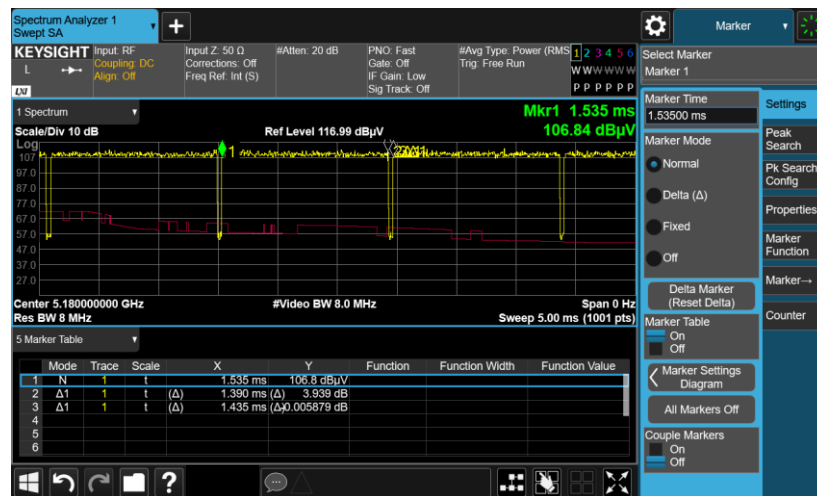
Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix B. Duty Cycle Plots

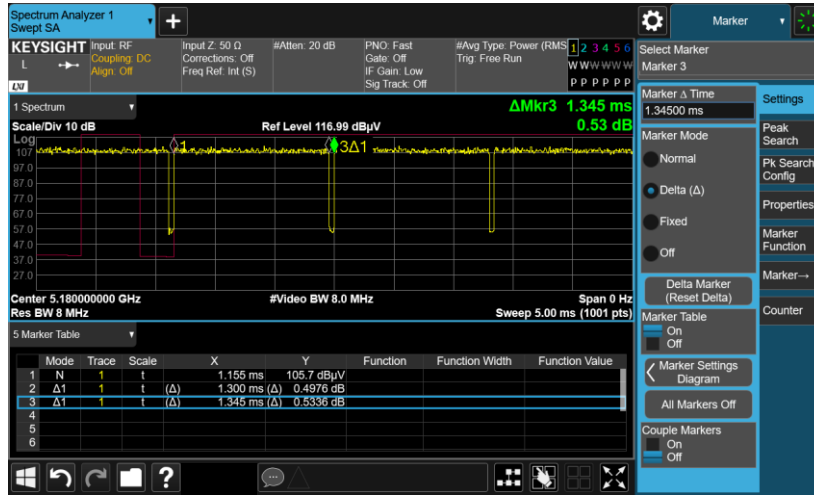
Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11a	96.86	1.390	0.719	0.75KHz
1+2	802.11an HT20	96.65	1.300	0.769	0.82KHz
1+2	802.11an HT40	93.60	0.644	1.553	1.6KHz
1+2	802.11ac VHT80	88.01	0.323	3.096	3.3KHz
1+2	802.11ax HE20	96.02	1.014	0.986	1KHz
1+2	802.11ax HE40	92.39	0.534	1.873	2KHz
1+2	802.11ax HE80	86.71	0.287	3.484	3.6KHz

802.11a

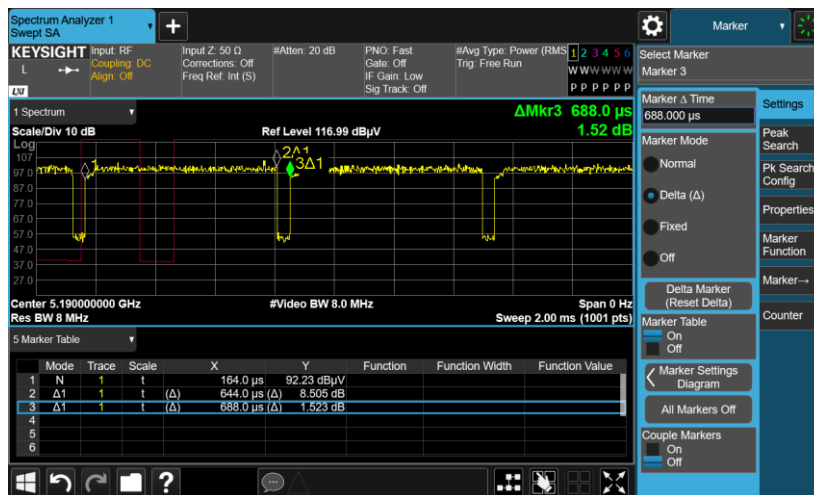




802.11an HT20

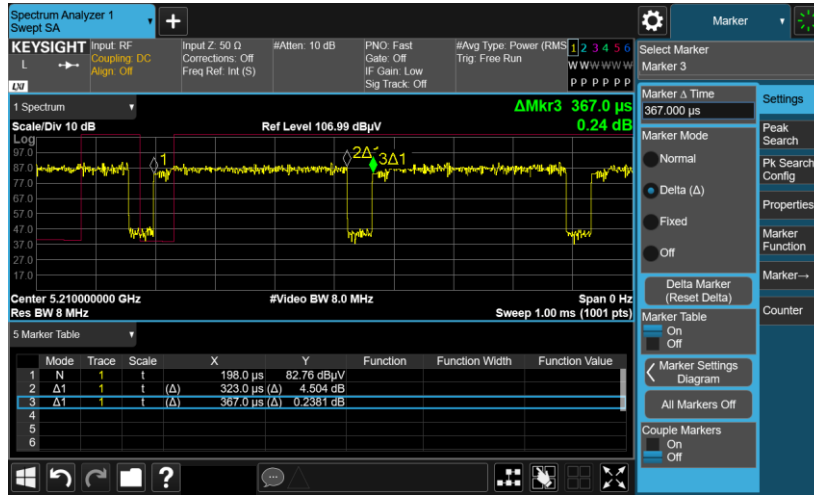


802.11an HT40

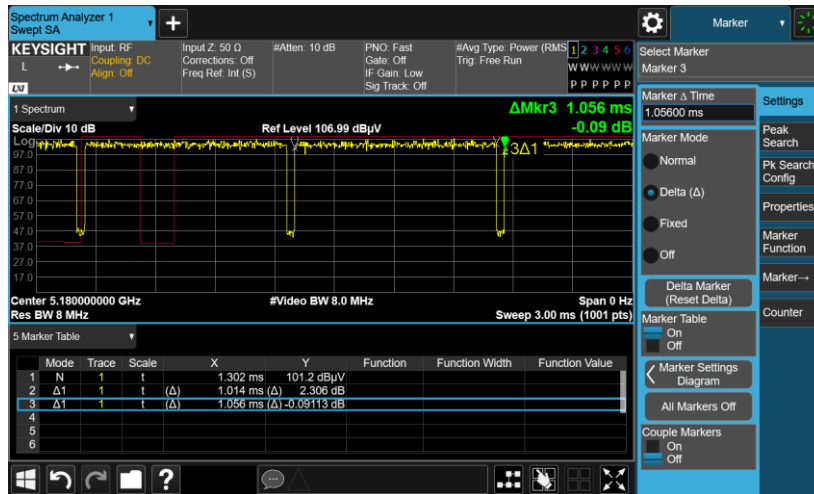




802.11ac VHT80

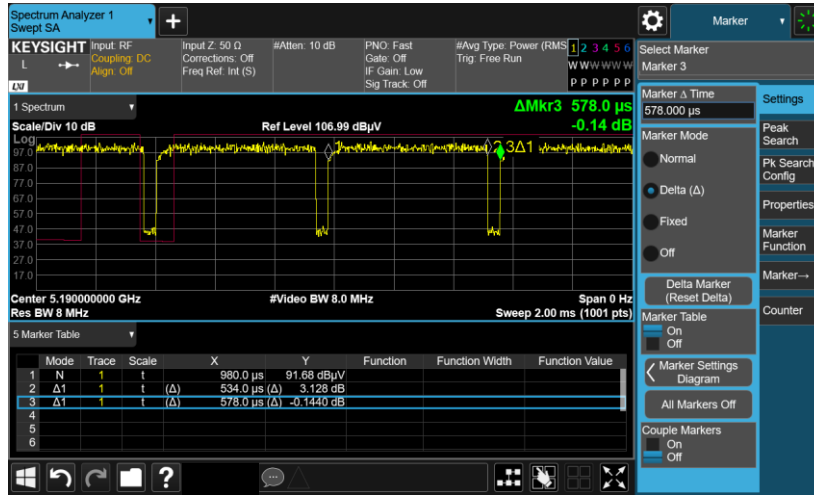


802.11ax HE20

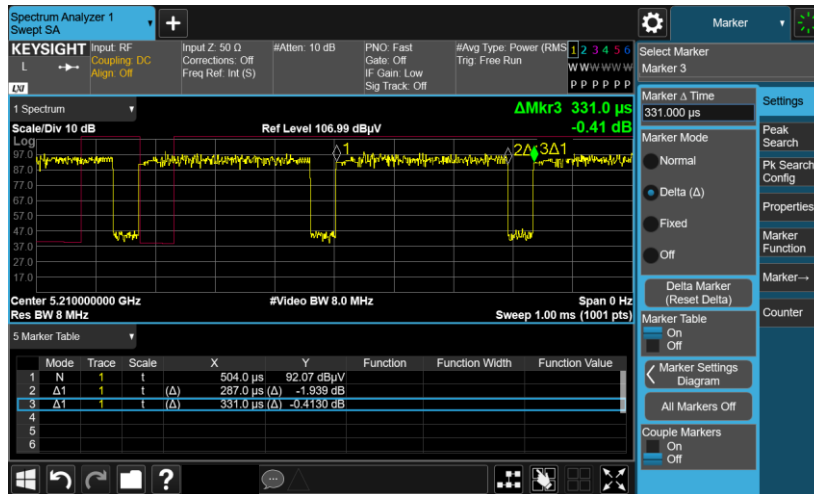




802.11ax HE40



802.11ax HE80





Appendix D. Reference Report

Please refer to Sporton report number FR240834G which is issued separately.