TEST REPORT

Report Number. : 14586572-E5V3

Applicant	:	SAMSUNG ELECTRONICS CO., LTD. 129, SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
Model	:	SM-A145M/DS, SM-A145M, SM-A145MB/DS and SM-A145MB
FCC ID	:	A3LSMA145M
EUT Description	:	GSM/WCDMA/LTE Phone with BT/BLE, DTS/UNII a/b/g/n/ac
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART E (EXCLUDE DFS)

Date Of Issue:
2023-01-31

Prepared by:
UL VERIFICATION SERVICES
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
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CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-01-18	Initial Issue	
V2	2023-01-26	Updated Section 9.4 and 10.2	Kiya Kedida
V	2023-01-31	Updated Section 7	Kiya Kedida

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD. 129, SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
EUT DESCRIPTION:	GSM/WCDMA/LTE Phone with BT/BLE, DTS/UNII a/b/g/n/ac
MODEL:	SM-A145M/DS, SM-A145M, SM-A145MB/DS and SM-A145MB
SERIAL NUMBER:	Conducted: R93TA00067A Radiated: R93TA0007MT
DATE TESTED:	2022-12-06 to 2023-01-11

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E (Exclude DFS)	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document.

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2. TEST RESULT SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

Below is a list of the data provided by the customer:

1. Antenna gain and type (see section 6.3)

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 12.2.
See Comment	26dB BW/99% OBW	Reporting purposes only	Per ANSI C63.10 Sections 6.9.2 and 6.9.3
15.407 (e)	6 dB BW	Compliant	None.
15.407 (a) (1-4), (h) (1)	Output Power	Compliant	None.
15.407 (a) (1-3, 5)	PSD	Compliant	None.
15.209, 15.205, 15.407 (b)	Radiated Emissions	Compliant	None.
15.207	AC Mains Conducted Emissions	Compliant	None.

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with:

- FCC CFR 47 Part 2
- FCC CFR 47 Part 15
- FCC KDB 905462 D02 v02/D03 v01r02/D06 v02
- FCC KDB 789033 D02 v02r01
- KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, Certificate Number 0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	FCC Registration
☐	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	550739
☐	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	550739
☒	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	550739

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22%
Power Spectral Density	2.47 dB
RF Power Measurement Direct Method Using Power Meter	1.3 dB (PK) / 0.45 dB (AV)
Unwanted Emissions, Conducted	1.94 dB
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB
Time Domain Measurements	3.39%
Temperature	0.57˚C
Humidity	3.39%
DC Supply Voltages	0.57%

Uncertainty figures are valid to a confidence level of 95%.

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5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE Phone with BT/BLE, DTS/UNII a/b/g/n/ac.
The model SM-A145M/DS was used for final testing and is representative of the test results in this report.

The models are electronically equivalent the only differences is as follows:

1) SM-A145M/DS : Dual SIM

2) SM-A145M : Single SIM

3) SM-A145MB/DS : Dual SIM with KNOX Security Platform

4) SM-A145MB : Single SIM with KNOX Security Platform

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6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.2 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2 GHz band, 1TX			
5180-5240	802.11a	15.67	36.90
5180-5240	802.11n HT20	15.67	36.90
5190-5230	802.11n HT40	14.20	26.30
5210	802.11ac VHT80	12.67	18.49

5.3 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.3 GHz band, 1TX			
5260 - 5320	802.11a	15.82	38.19
5260 - 5320	802.11n HT20	15.83	38.28
5270 - 5310	802.11n HT40	14.54	28.44
5290	802.11ac VHT80	8.02	6.34

5.6 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.6 GHz band, 1TX			
5500-5720	802.11a	15.64	36.64
5500-5720	802.11n HT20	15.61	36.39
5510-5710	802.11n HT40	14.80	30.20
5530-5690	802.11ac VHT80	12.78	18.97

5.8 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.8 GHz band, 1TX			
5745-5825	802.11a	15.79	37.93
5745-5825	802.11n HT20	15.71	37.24
5755-5795	802.11n HT40	14.58	28.71
5775	802.11ac VHT80	12.83	19.19

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6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

The radio utilizes an LDS antenna, with a maximum gain as follows:

Frequency Range (MHz)	Peak Antenna Gain (dBi)
5180-5240	-4.87
5260-5320	-4.04
5500-5720	-3.11
5745-5825	-2.98

6.4. SOFTWARE

The test utility software used during testing was A145M.001.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle, and high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

Worst-case data rates as provided by the manufacturer were:

802.11a mode: 6 Mbps
802.11n HT20mode: MCS0
802.11n HT40mode: MCS0
802.11ac VHT80 mode: MCS0

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	Samsung	EP-TA800	R37MAMT21J2SE3	N/A
Earphone	Samsung	N/A	N/A	N/A

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	1	RF	Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Un-shielded	1	EUT to AC Mains

I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	USB	Shielded	1	N/A
2	Earphone	1	3.5mm	Un-shielded	1	N/A

TEST SETUP

The EUT is a stand-alone unit. Test software exercised the radio card.

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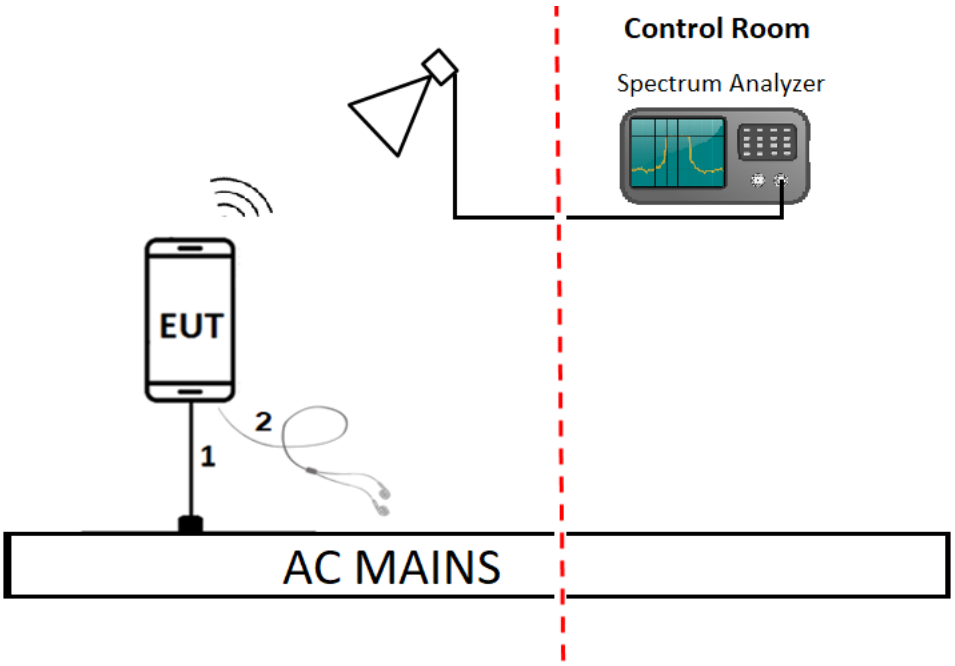
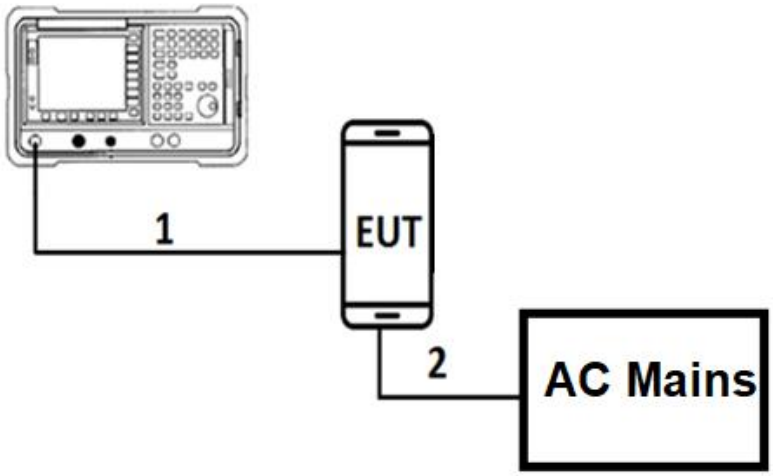
SETUP DIAGRAM

Radiated Configuration



Conducted Configuration



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7. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 789033 D02 v02r01, Section B.

6 dB Emission BW: KDB 789033 D02 v02r01, Section C.2

26 dB Emission BW: KDB 789033 D02 v02r01, Section C.1

Conducted Output Power: KDB 789033 D02 v02r01, Section E.3.b (Method PM-G) and KDB 789033 D02 v02r01, Section E.2.b (Method SA-1)

Power Spectral Density: KDB 789033 D02 v02r01, Section F

Unwanted emissions in restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, and G.5.

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

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8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
Antenna, Broadband Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	80706	2023-07-28	2022-07-28
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	2023-02-03	2022-02-08
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	29654	2023-04-24	2022-04-24
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	223083	2023-07-05	2022-07-05
RF Filter Box, 1-18GHz	UL-FR1	n/a	171875	2023-08-12	2022-08-12
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169937	2023-02-20	2022-02-20
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169927	2023-02-13	2022-02-13
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	172364	2023-03-08	2023-03-08
Amplifier 18-26.5GHz, +5Vdc, 60dB min	AMPLICAL	AMP18G26.5-60	215705	2023-02-26	2022-02-26
Antenna, Horn 26 to 40GHz	ARA	MWH-2640/B	172365	2023-03-08	2023-03-08
Amplifier 26-40GHz, +5Vdc, -62dBm P1dB	AMPLICAL	AMP26G40-65	220537	2023-06-12	2022-06-12
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	219909	2023-05-10	2022-05-10
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	219911	2023-05-10	2022-05-10
Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent Technologies	N4440A	80386	2023-03-02	2022-03-02
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1268	2023-02-03	2022-02-03
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90419	2023-03-02	2022-03-02
10dB Fixed Attenuator	Pasternack Enterprises	PE7087-10	N/A	Verified	Verified
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Ver 2022-10-25, 2022-05-18, 2020-06-04, 2020-06-05, 2020-06-14, 2014-07-15,		
Antenna Port Software	UL	UL RF	Ver 2022-08-16		
AC Line Software	UL	UL EMC	Ver. 2022-02-17		

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11a	1.428	1.551	0.921	92.07	0.36	0.700
802.11n HT20	1.336	1.441	0.927	92.71	0.33	0.749
802.11n HT40	0.664	0.779	0.852	85.22	0.69	1.506
802.11ac VHT80	0.331	0.437	0.757	75.67	1.21	3.025

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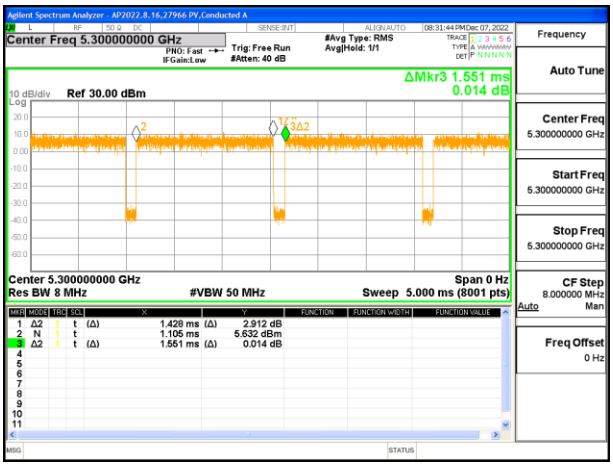
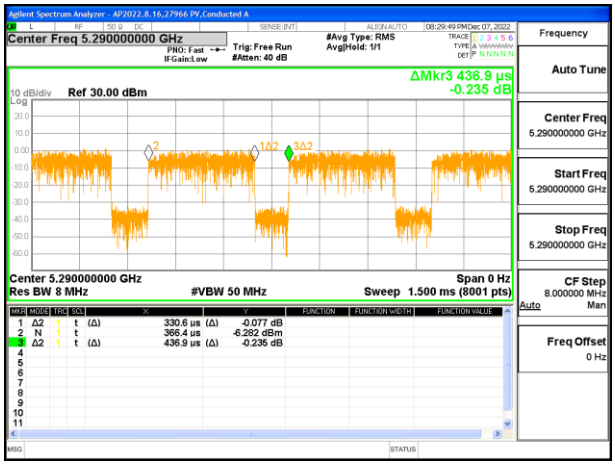
DUTY CYCLE PLOTS



802.11a MODE

802.11n HT20 MODE

802.11n HT40 MODE



802.11ac VHT80 MODE

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9.2. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

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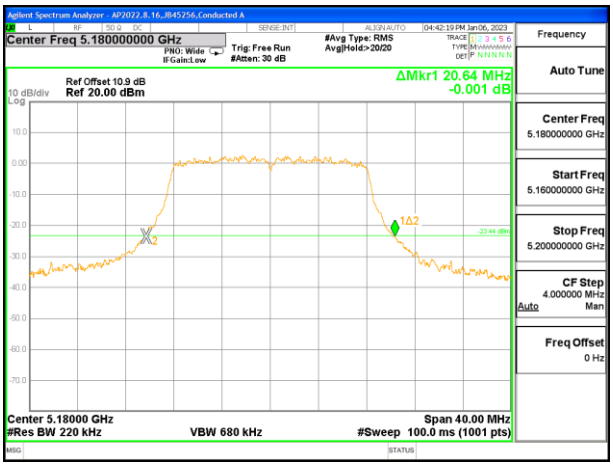
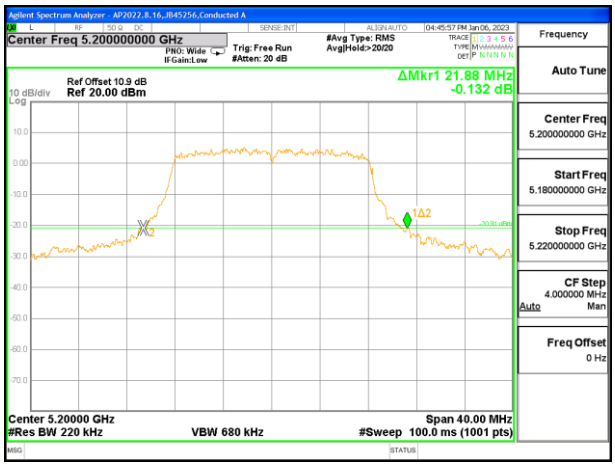
9.2.1. 802.11a MODE IN THE 5.2 GHz BAND

1TX Antenna 1 MODE

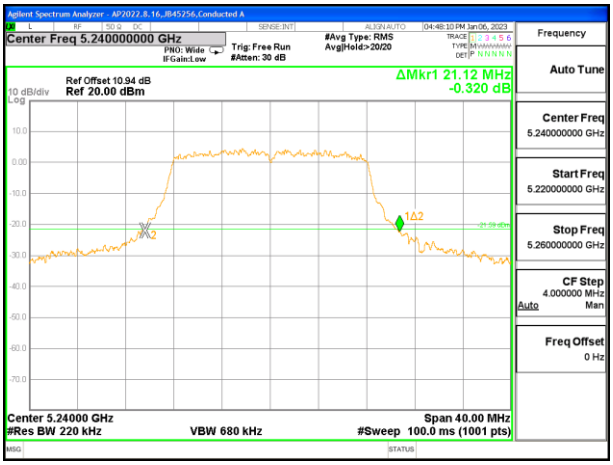
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	20.64
Mid	5200	21.88
High	5240	21.12



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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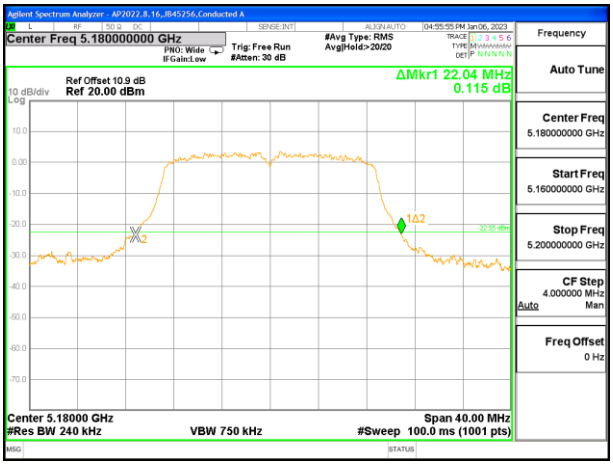
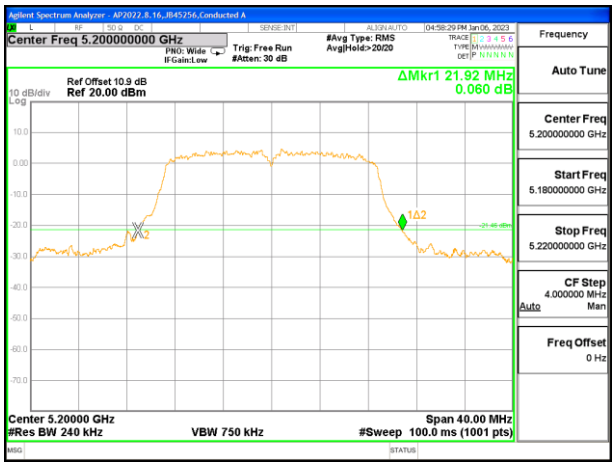
9.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	22.04
Mid	5200	21.92
High	5240	22.08



LOW CHANNEL



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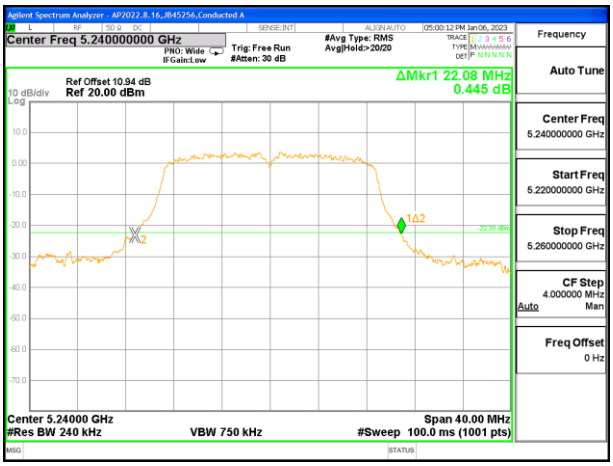

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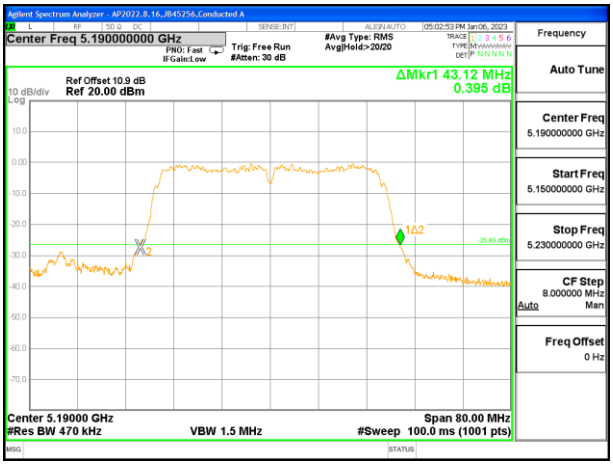
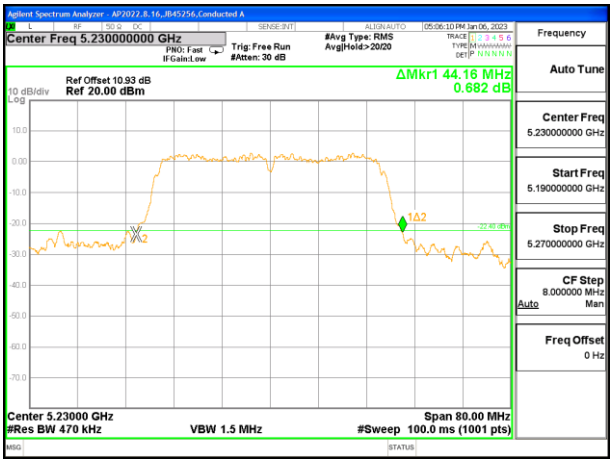
9.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	43.12
High	5230	44.16



LOW CHANNEL



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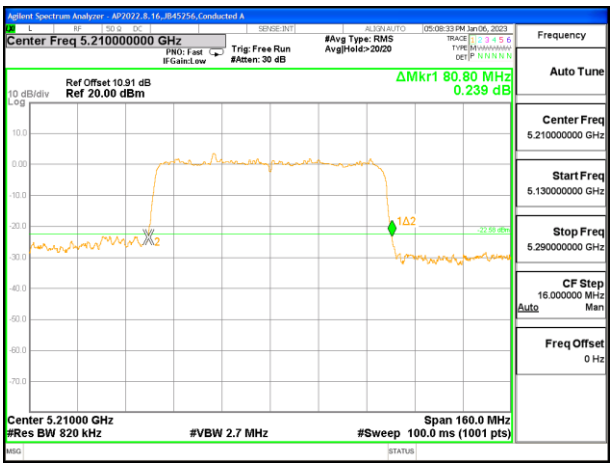
9.2.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Mid	5210	80.80



MID CHANNEL

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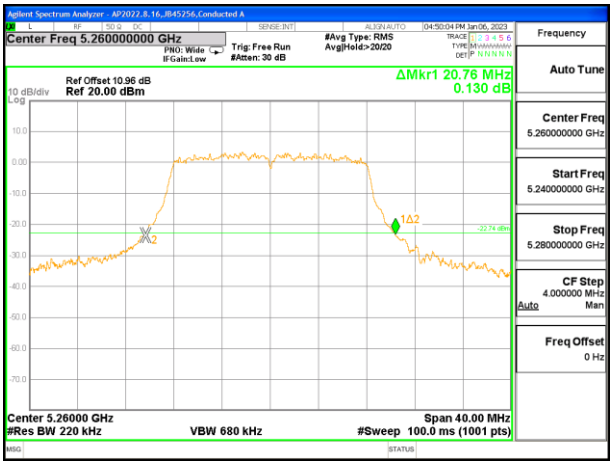
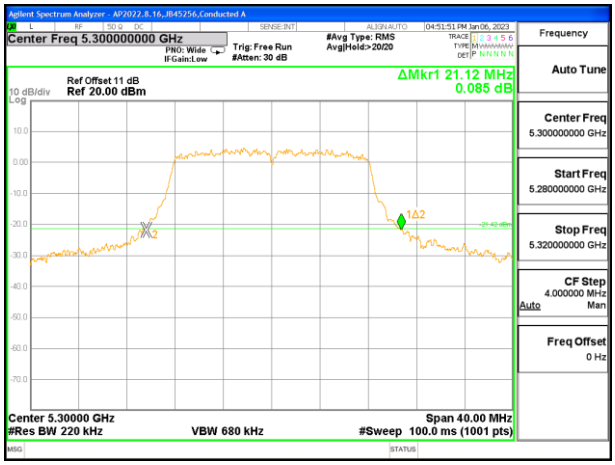
9.2.5. 802.11a MODE IN THE 5.3 GHz BAND

1TX Antenna 1 MODE

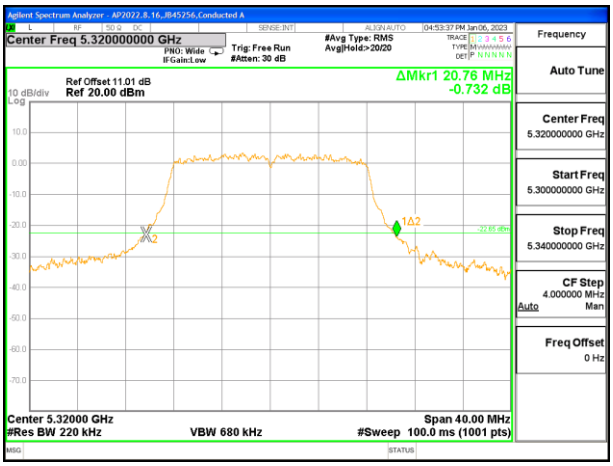
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5260	20.76
Mid	5300	21.12
High	5320	20.76



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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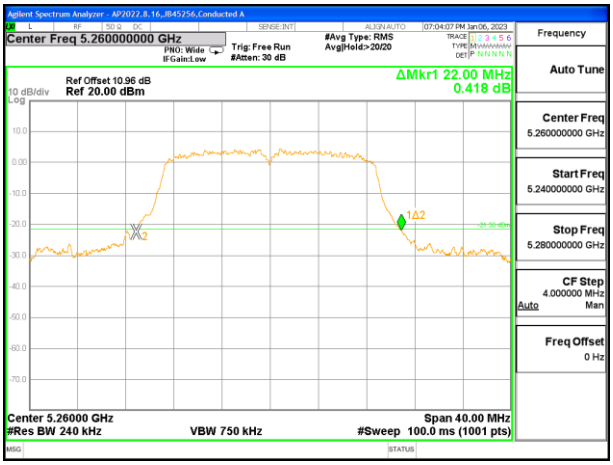
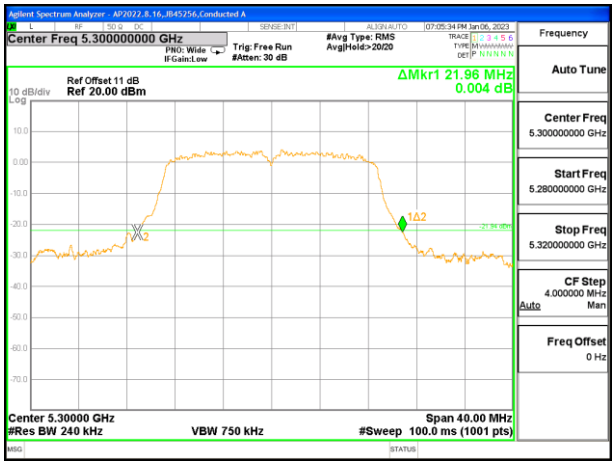
9.2.6. 802.11n HT20 MODE IN THE 5.3 GHz BAND

1TX Antenna 1 MODE

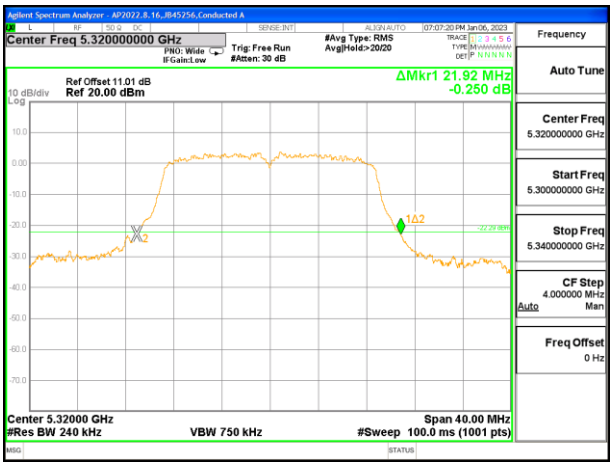
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5260	22.00
Mid	5300	21.96
High	5320	21.92



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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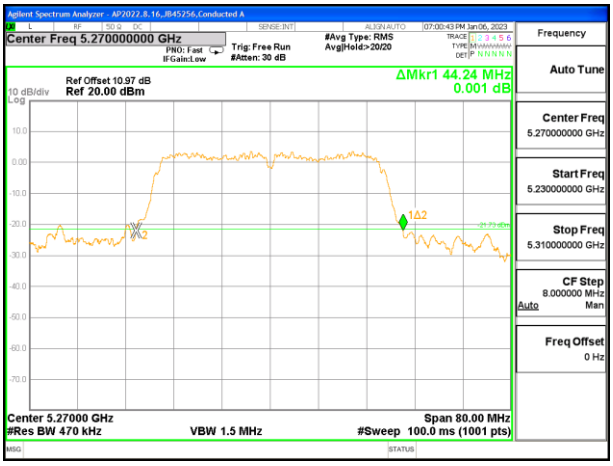
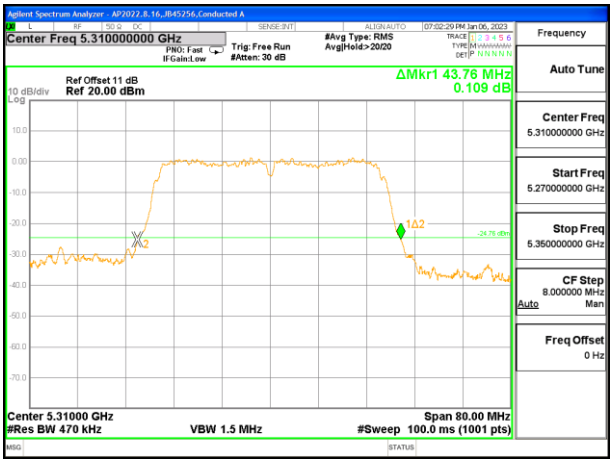
9.2.7. 802.11n HT40 MODE IN THE 5.3 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5270	44.24
High	5310	43.76



LOW CHANNEL



HIGH CHANNEL

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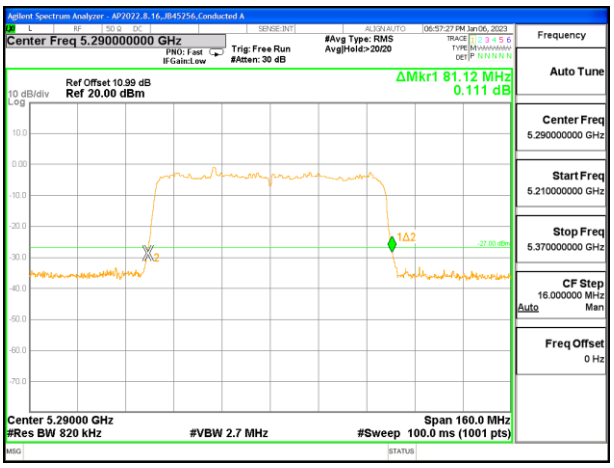
9.2.8. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Mid	5290	81.12



MID CHANNEL

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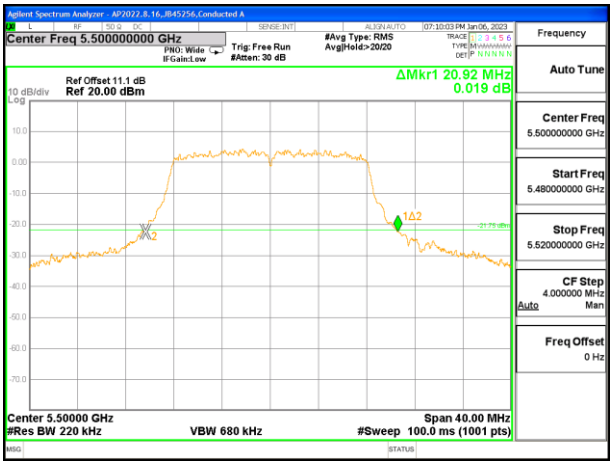
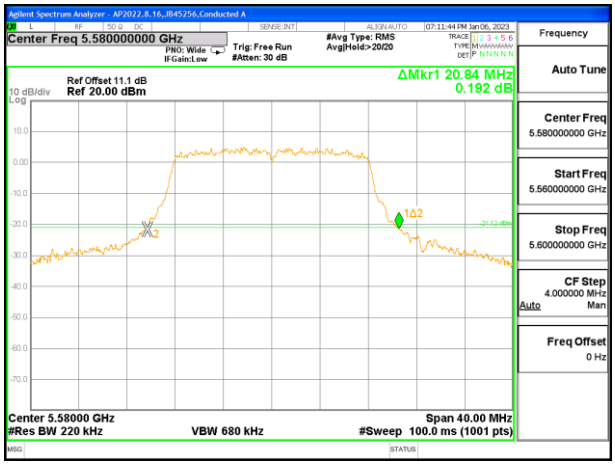
9.2.9. 802.11a MODE IN THE 5.6 GHz BAND

1TX Antenna 1 MODE

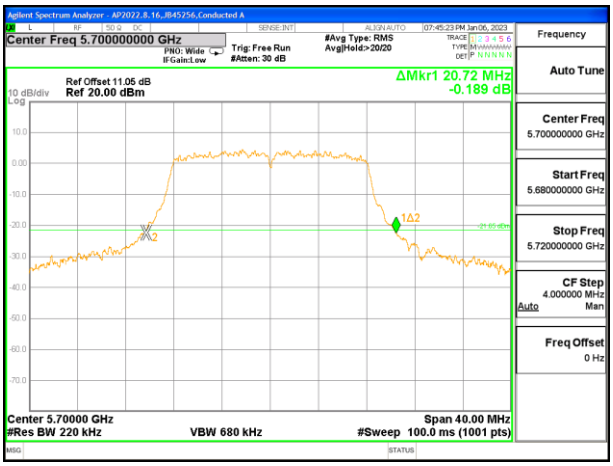
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5500	20.92
Mid	5580	20.84
High	5700	20.72
144	5720	20.76



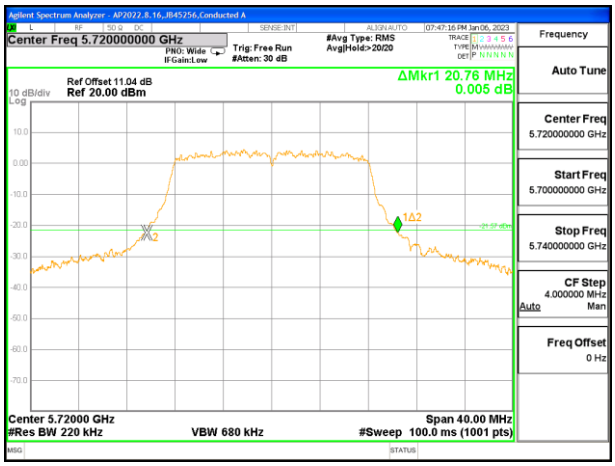
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



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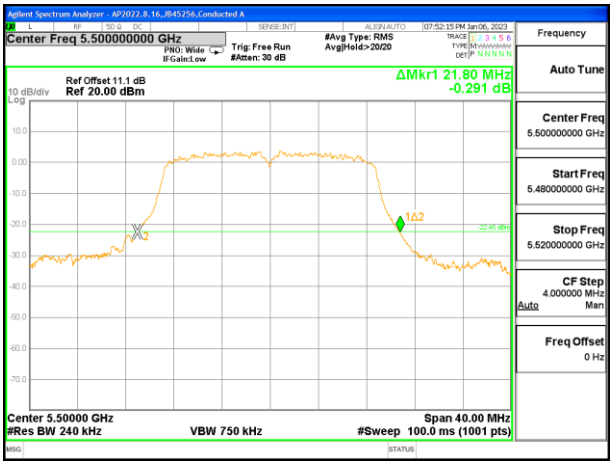
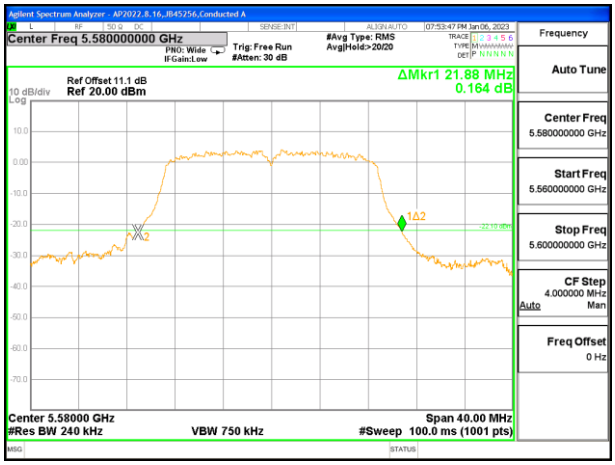
9.2.10. 802.11n HT20 MODE IN THE 5.6 GHz BAND

1TX Antenna 1 MODE

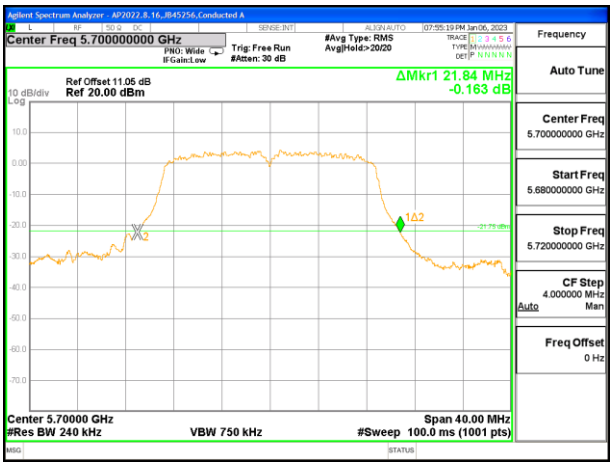
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5500	21.80
Mid	5580	21.88
High	5700	21.84
144	5720	21.76



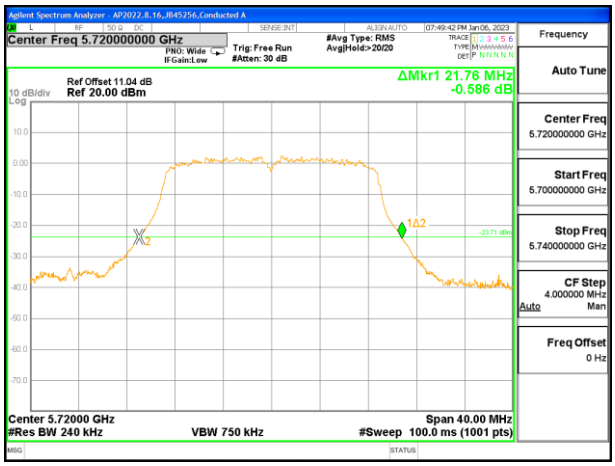
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



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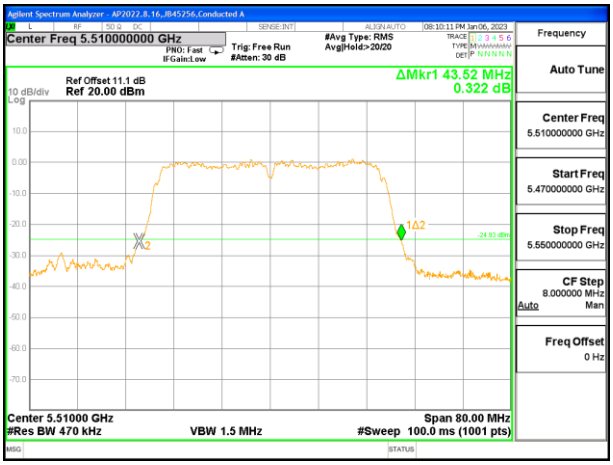
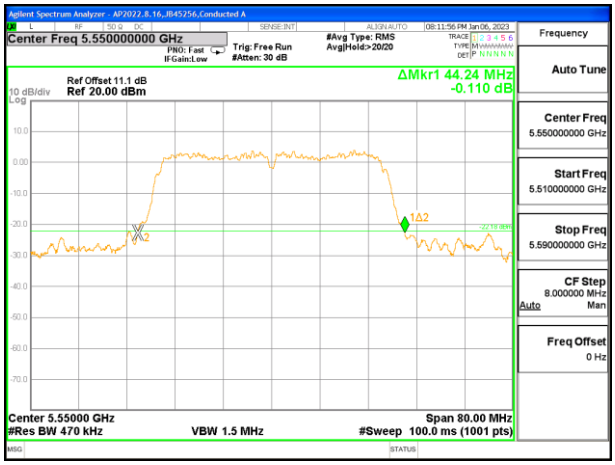
9.2.11. 802.11n HT40 MODE IN THE 5.6 GHz BAND

1TX Antenna 1 MODE

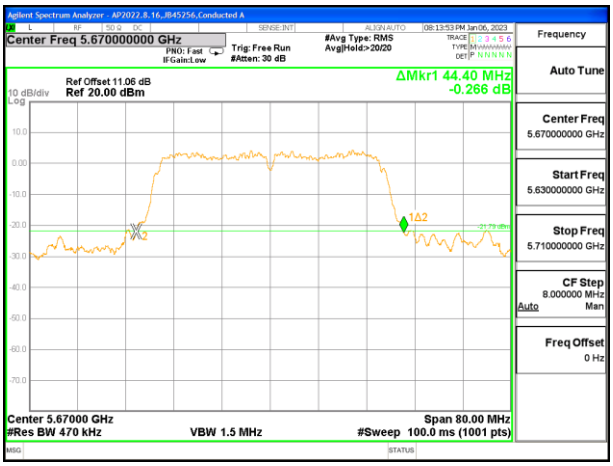
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5510	43.52
Mid	5550	44.24
High	5670	44.40
142	5710	44.56



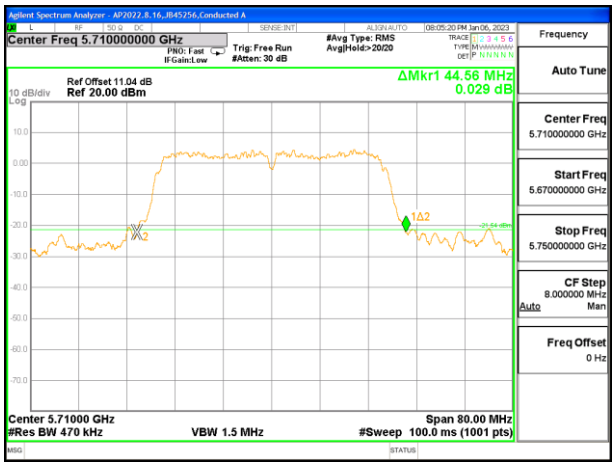
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



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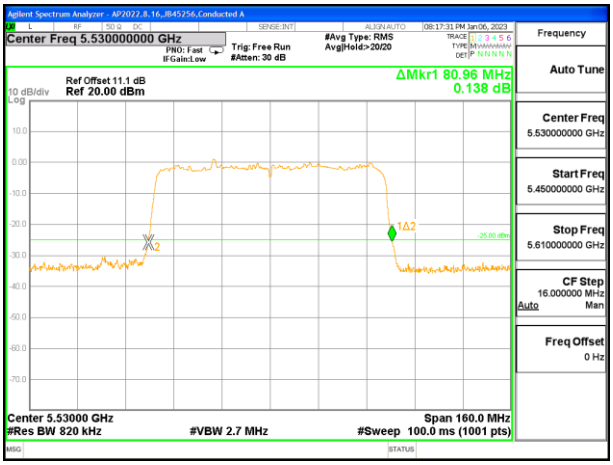
9.2.12. 802.11ac VHT80 MODE IN THE 5.6 GHz BAND

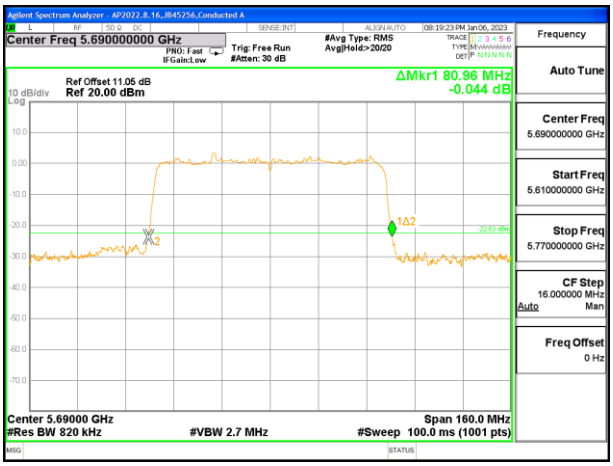
1TX Antenna 1 MODE

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5530	80.96
High	5610	80.96
138	5690	80.96



LOW CHANNEL

HIGH CHANNEL



CHANNEL 138

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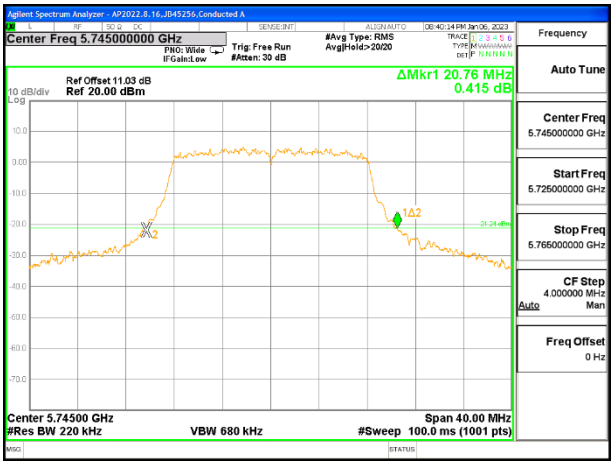
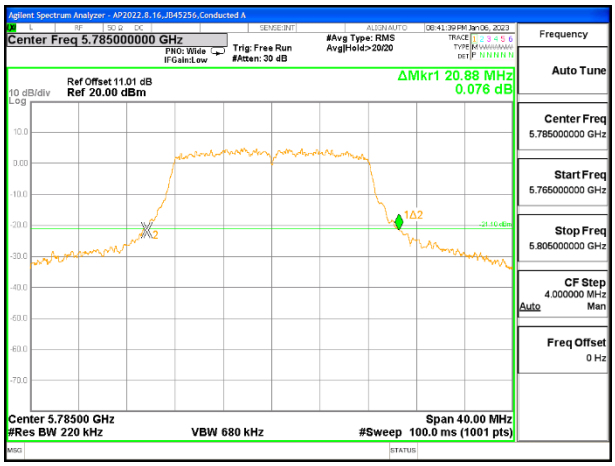
9.2.13. 802.11a MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

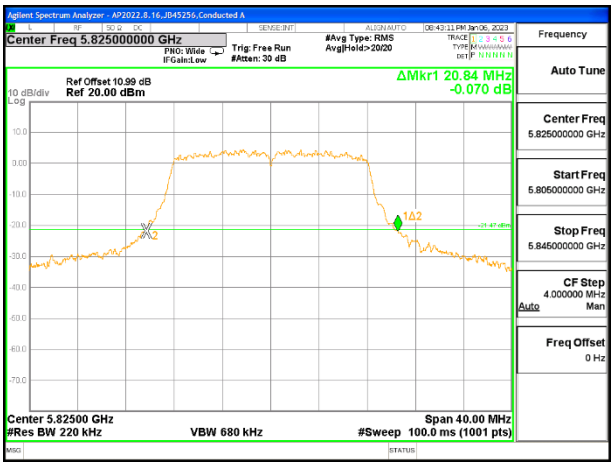
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5745	20.76
Mid	5785	20.88
High	5825	20.84



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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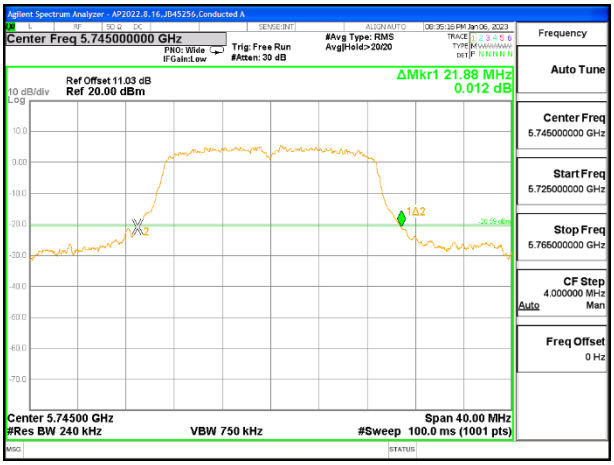
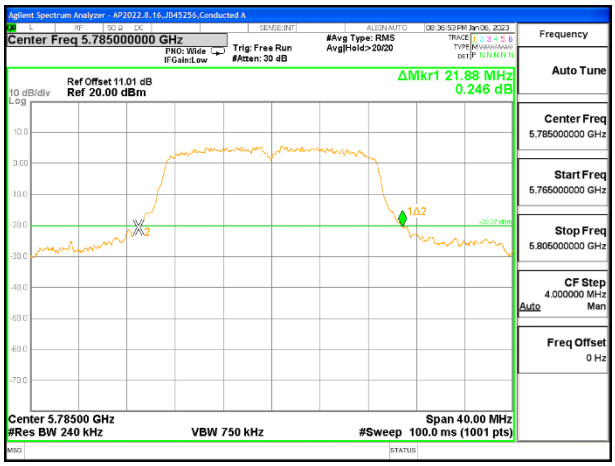
9.2.14. 802.11n HT20 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

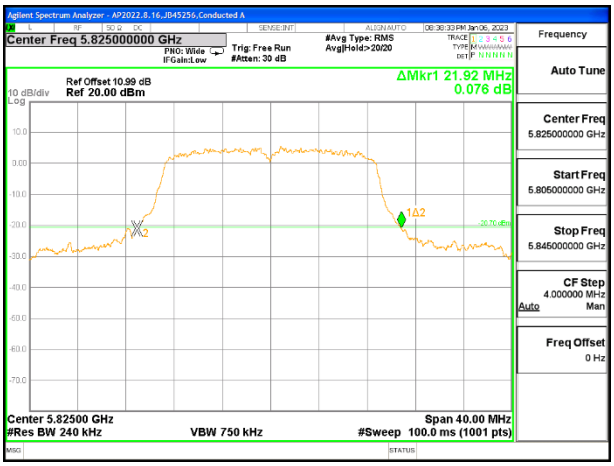
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5745	21.88
Mid	5785	21.88
High	5825	21.92



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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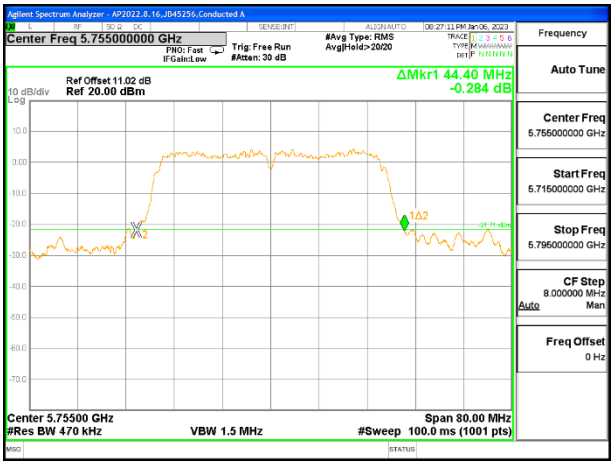
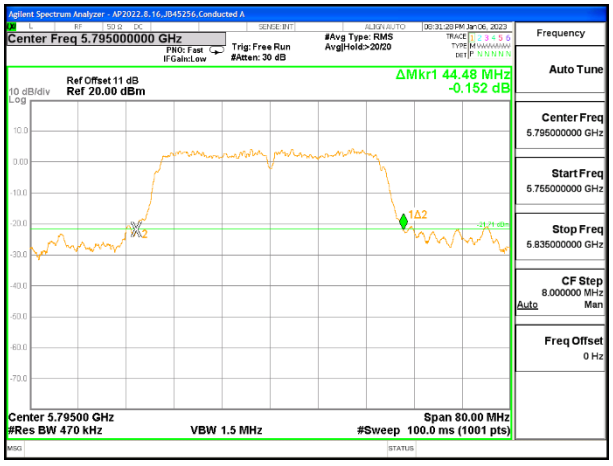
9.2.15. 802.11n HT40 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5755	44.40
High	5795	44.48



LOW CHANNEL



HIGH CHANNEL

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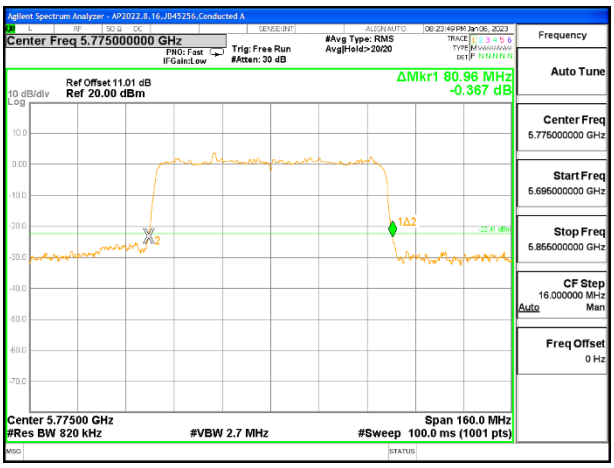
9.2.16. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Mid	5775	80.96



MID CHANNEL

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9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.407 (e)

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

RESULTS

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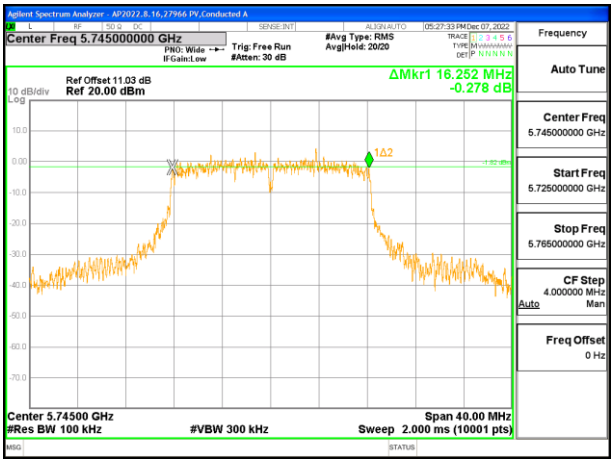
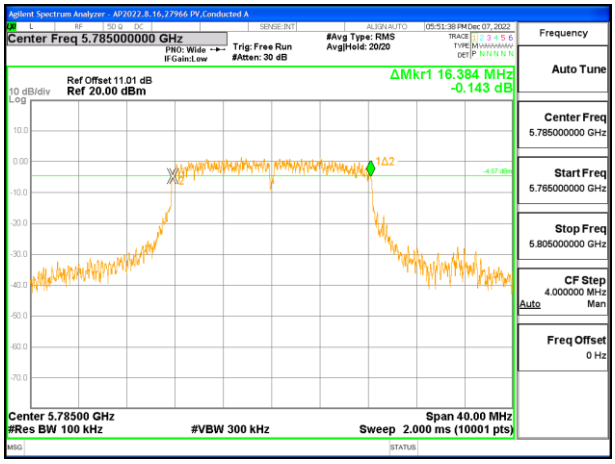
9.3.1. 802.11a MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

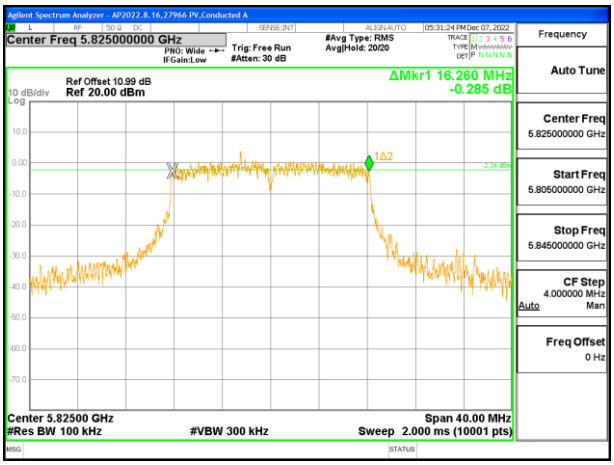
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	16.252	0.5
Mid	5785	16.384	0.5
High	5825	16.260	0.5
144	5720	3.216	0.5



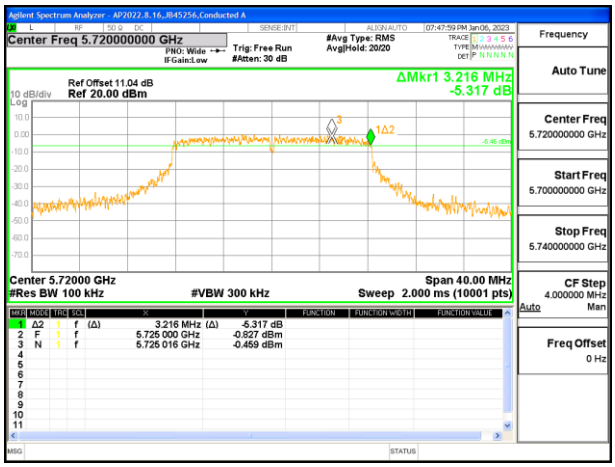
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



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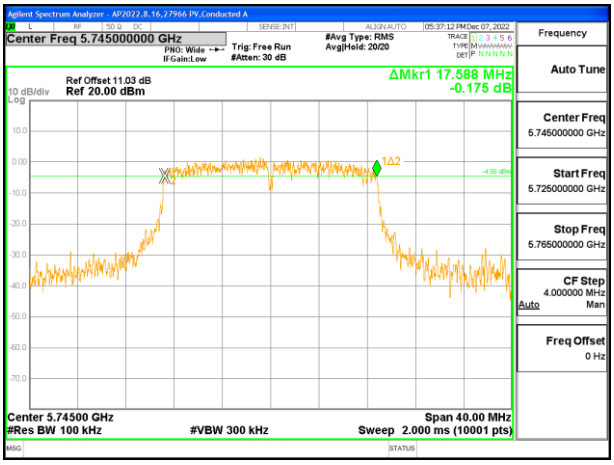
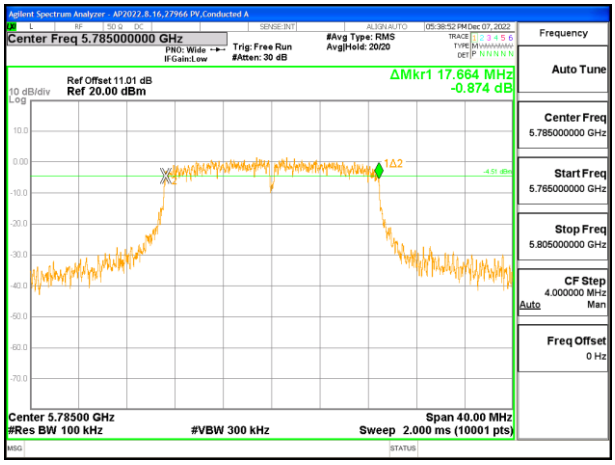
9.3.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

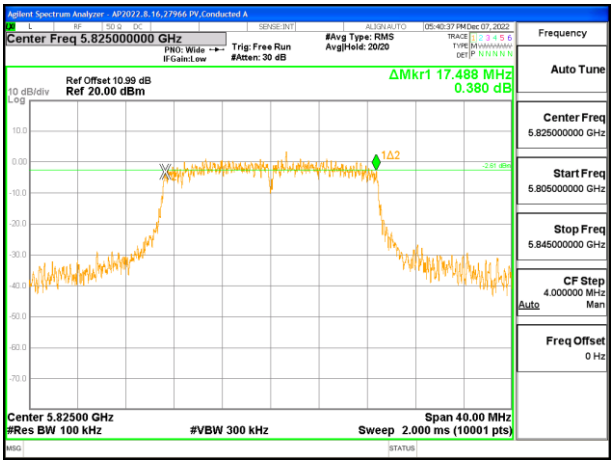
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	17.588	0.5
Mid	5785	17.664	0.5
High	5825	17.488	0.5
144	5720	3.896	0.5



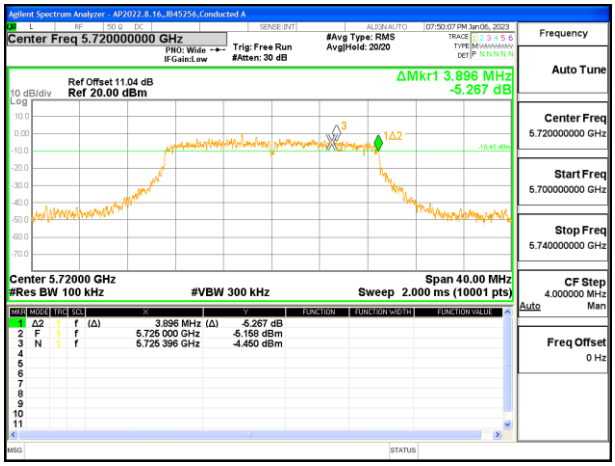
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



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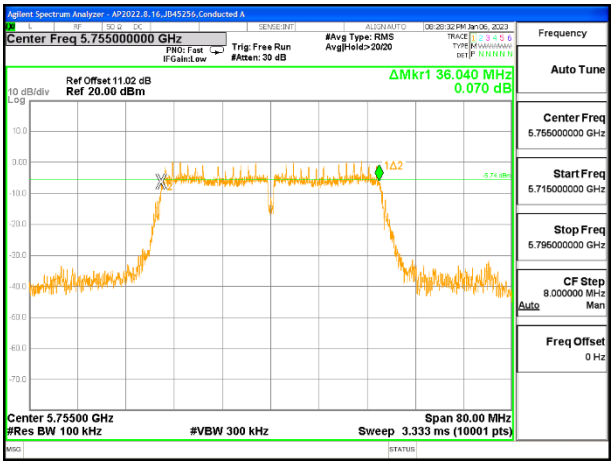
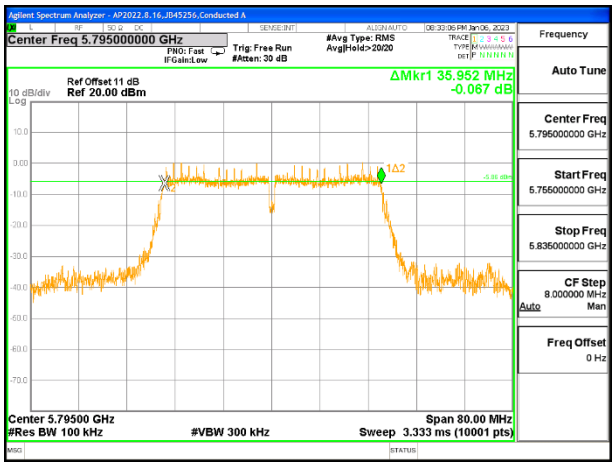
9.3.3. 802.11n HT40 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

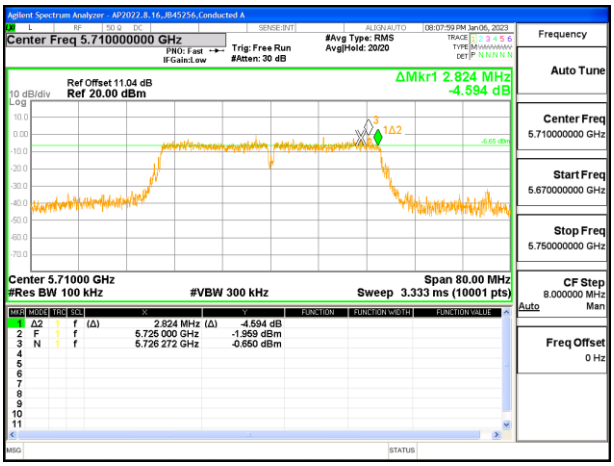
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5755	36.040	0.5
High	5795	35.952	0.5
142	5710	2.824	0.5



LOW CHANNEL



HIGH CHANNEL



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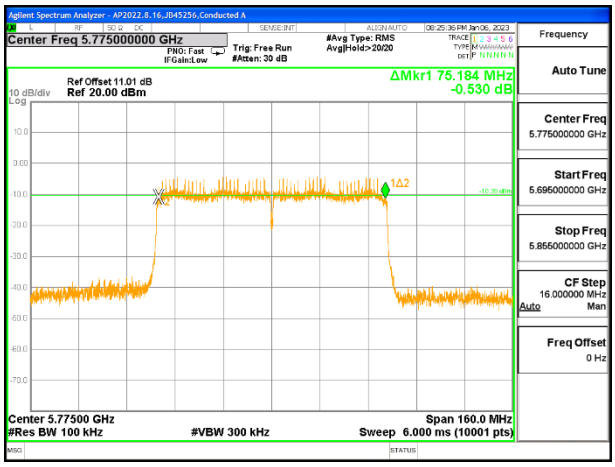
9.3.4. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND

1TX Antenna 1 MODE

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Mid	5775	75.184	0.5
138	5690	2.600	0.5



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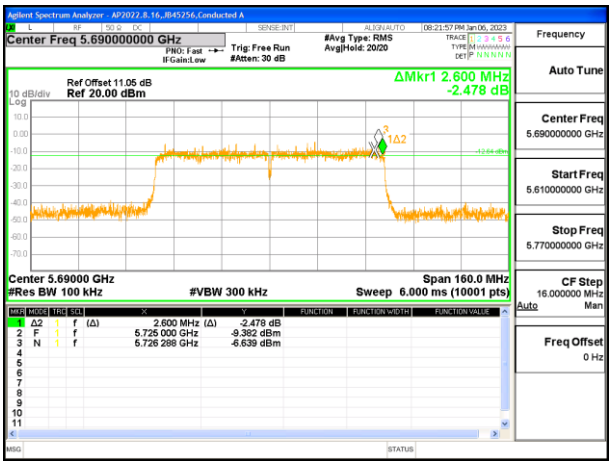

CHANNEL 138

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9.4. OUTPUT POWER AND PSD

LIMITS

FCC §15.407

Band 5.15–5.25 GHz

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Bands 5.25-5.35 GHz and 5.47-5.725 GHz
The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Band 5.725-5.85 GHz

The maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02 v02r01, Section E.3.b (Method PM-G) and for straddles channels KDB 789033 D02 v02r01, Section E.2.b (Method SA-1) was used.

The measurement method used for power spectral density is KDB 789033 D02 v02r01, Section F

For all straddle channels, full bandwidth power is reported in the 5.6GHz section. The combined 5.6GHz and 5.8GHz power already passed the worst case 5.6GHz 24dBm limit, therefore there is no need to provide the 5.8GHz power.

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The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Gated average output power was read directly from power meter.

DIRECTIONAL ANTENNA GAIN

For 1 TX:
There is only one transmitter output therefore the directional gain is equal to the antenna gain.

Frequency Range (MHz)	Peak Antenna Gain (dBi)
5180-5240	-4.87
5260-5320	-4.04
5500-5720	-3.11
5745-5825	-2.98

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RESULTS

9.4.1. 802.11a MODE IN THE 5.2 GHz BAND

1TX Antenna 1 MODE

Test Engineer:	ZS16080 and PV27966
Test Date:	2022-12-06 to 2022-12-15

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/1MHz)
Low	5180	-4.87	24.00	11.00
Mid	5200	-4.87	24.00	11.00
High	5240	-4.87	24.00	11.00

Duty Cycle CF (dB)	0.36	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	13.54	13.54	24.00	-10.46
Mid	5200	15.67	15.67	24.00	-8.33
High	5240	15.16	15.16	24.00	-8.84

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm/1MHz)	Total Corr'd PSD (dBm/1MHz)	PSD Limit (dBm/1MHz)	PSD Margin (dB)
Low	5180	1.718	2.08	11.00	-8.92
Mid	5200	3.686	4.05	11.00	-6.95
High	5240	2.772	3.13	11.00	-7.87

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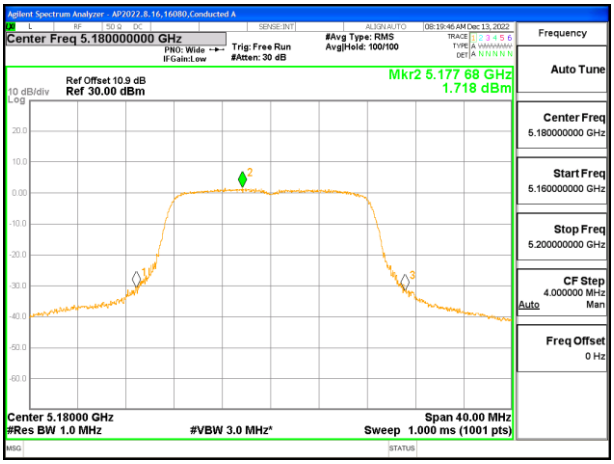

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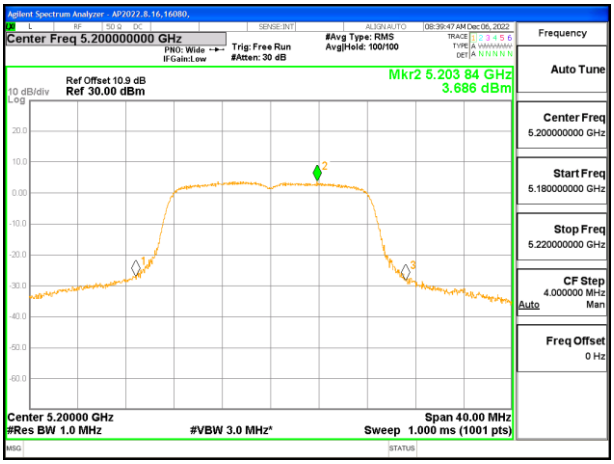

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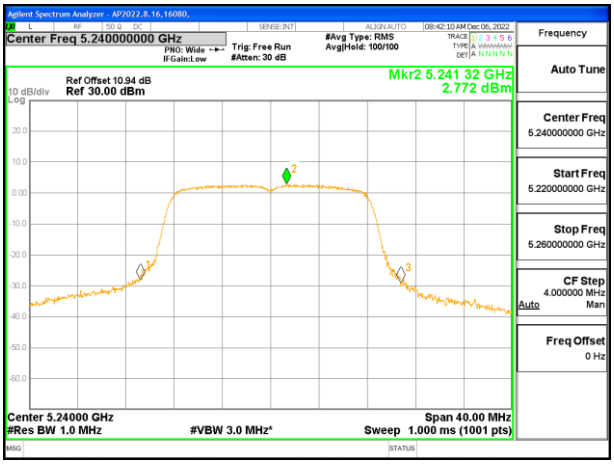

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9.4.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

1TX Antenna 1 MODE

Test Engineer:	ZS16080 and PV27966
Test Date:	2022-12-06 to 2022-12-15

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/ 1MHz)
Low	5180	-4.87	24.00	11.00
Mid	5200	-4.87	24.00	11.00
High	5240	-4.87	24.00	11.00

Duty Cycle CF (dB)	0.33	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	13.91	13.91	24.00	-10.09
Mid	5200	15.67	15.67	24.00	-8.33
High	5240	15.07	15.07	24.00	-8.93

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm/1MHz)	Total Corr'd PSD (dBm/1MHz)	PSD Limit (dBm/ 1MHz)	PSD Margin (dB)
Low	5180	1.585	1.92	11.00	-9.09
Mid	5200	3.353	3.68	11.00	-7.32
High	5240	2.713	3.04	11.00	-7.96

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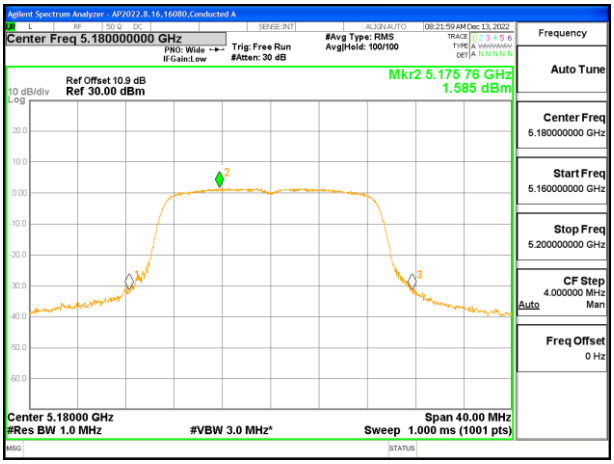

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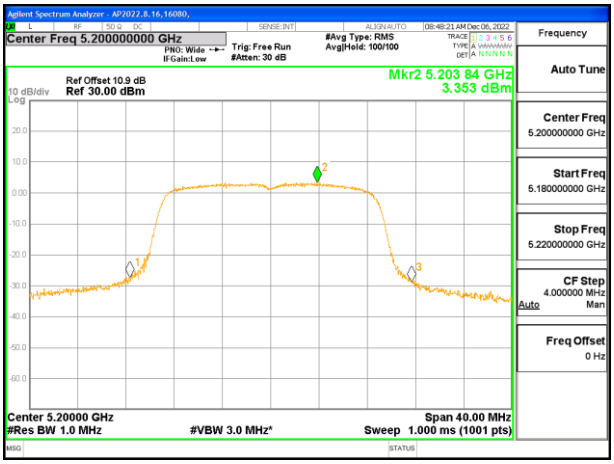

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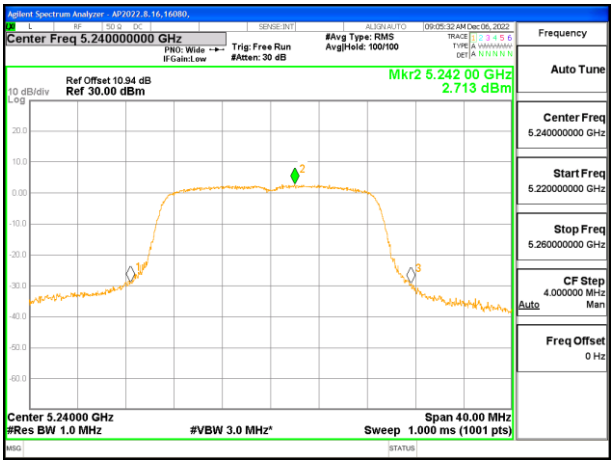

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9.4.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

1TX Antenna 1 MODE

Test Engineer:	ZS16080 and PV27966
Test Date:	2022-12-06 to 2022-12-15

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Power Limit (dBm)	PSD Limit (dBm/ 1MHz)
Low	5190	-4.87	24.00	11.00
High	5230	-4.87	24.00	11.00

Duty Cycle CF (dB)	0.69	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	10.07	10.07	24.00	-13.93
High	5230	14.20	14.20	24.00	-9.80

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm/1MHz)	Total Corr'd PSD (dBm/1MHz)	PSD Limit (dBm/ 1MHz)	PSD Margin (dB)
Low	5190	-5.951	-5.26	11.00	-16.26
High	5230	-1.793	-1.10	11.00	-12.10

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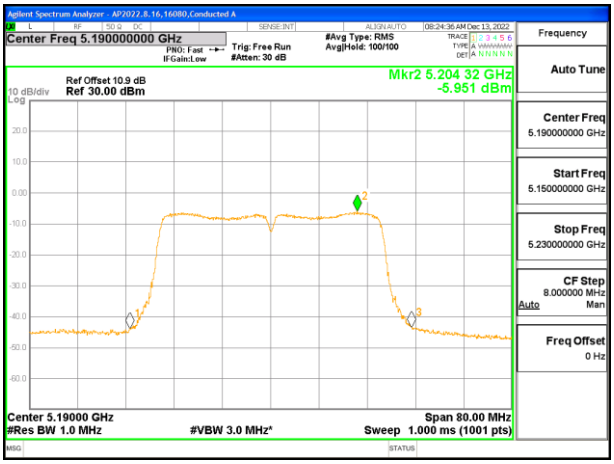

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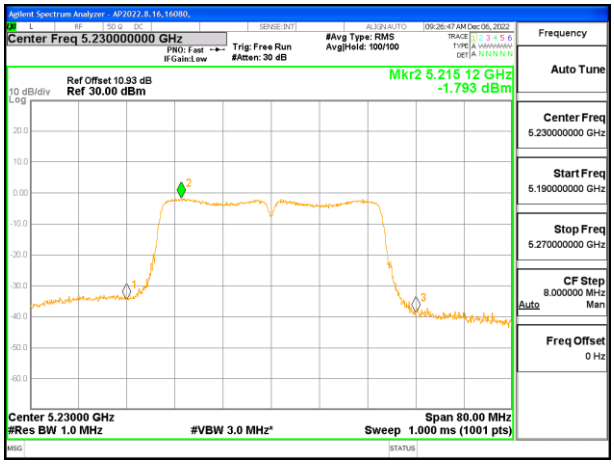

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9.4.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

1TX Antenna 1 MODE

Test Engineer:	ZS16080 and PV27966
Test Date:	2022-12-06 to 2022-12-15

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/ 1MHz)
Mid	5210	-4.87	24.00	11.00

Duty Cycle CF (dB)	1.21	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5210	12.67	12.67	24.00	-11.33

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm/ 1MHz)	Total Corr'd PSD (dBm/ 1MHz)	PSD Limit (dBm/ 1MHz)	PSD Margin (dB)
Mid	5210	-6.542	-5.33	11.00	-16.33

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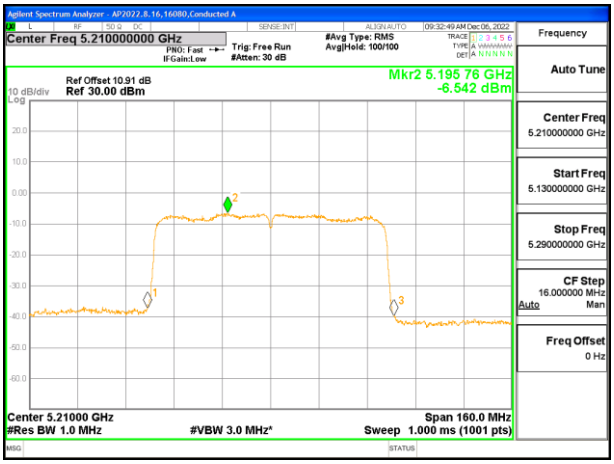

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9.4.5. 802.11a MODE IN THE 5.3 GHz BAND

1TX Antenna 1 MODE

Test Engineer:	ZS16080 and PV27966
Test Date:	2022-12-06 to 2022-12-15

Bandwidth, Antenna Gain, and Limits

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/1MHz)
Low	5260	20.76	-4.04	24.00	11.00
Mid	5300	21.12	-4.04	24.00	11.00
High	5320	20.76	-4.04	24.00	11.00

Duty Cycle CF (dB)	0.36	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	15.82	15.82	24.00	-8.18
Mid	5300	15.74	15.74	24.00	-8.26
High	5320	14.34	14.34	24.00	-9.66

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm/1MHz)	Total Corr'd PSD (dBm/1MHz)	PSD Limit (dBm/1MHz)	PSD Margin (dB)
Low	5260	3.673	4.03	11.00	-6.97
Mid	5300	3.121	3.48	11.00	-7.52
High	5320	1.625	1.99	11.00	-9.02

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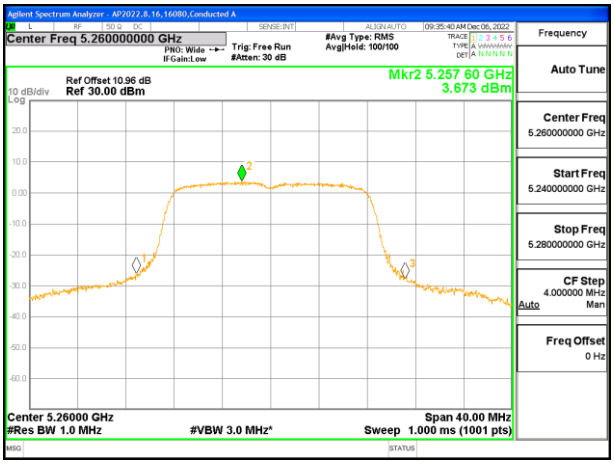

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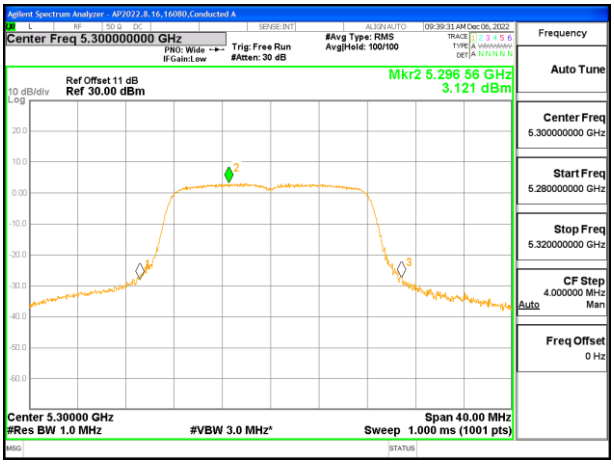

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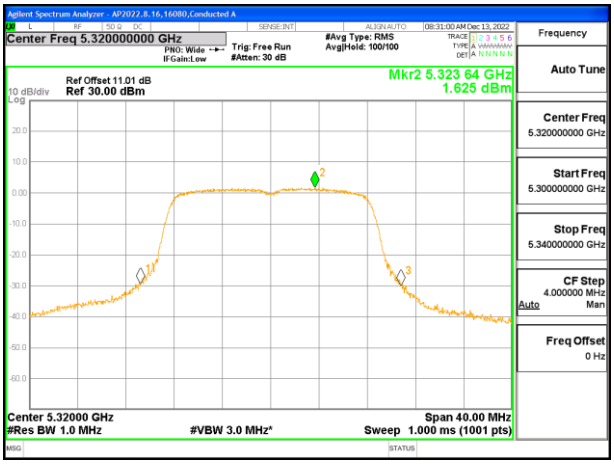

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9.4.6. 802.11n HT20 MODE IN THE 5.3 GHz BAND

1TX Antenna 1 MODE

Test Engineer:	ZS16080 and PV27966
Test Date:	2022-12-06 to 2022-12-15

Bandwidth, Antenna Gain, and Limits

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/1MHz)
Low	5260	22.00	-4.04	24.00	11.00
Mid	5300	21.96	-4.04	24.00	11.00
High	5320	21.92	-4.04	24.00	11.00

Duty Cycle CF (dB)	0.33	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5260	15.83	15.83	24.00	-8.17
Mid	5300	15.70	15.70	24.00	-8.30
High	5320	15.36	15.36	24.00	-8.64

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm/1MHz)	Total Corr'd PSD (dBm/1MHz)	PSD Limit (dBm/1MHz)	PSD Margin (dB)
Low	5260	3.374	3.70	11.00	-7.30
Mid	5300	2.813	3.14	11.00	-7.86
High	5320	2.375	2.71	11.00	-8.30

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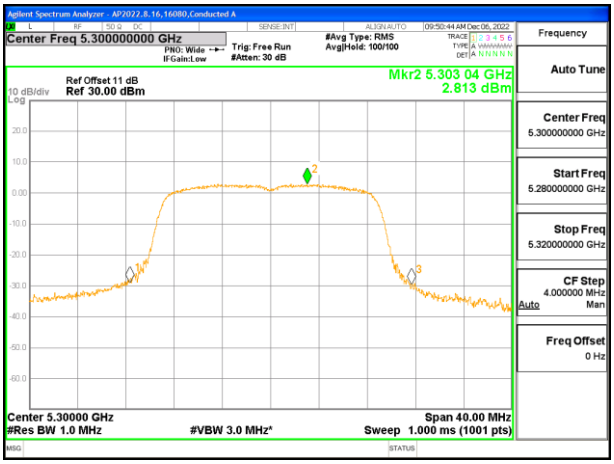
LOW CHANNEL



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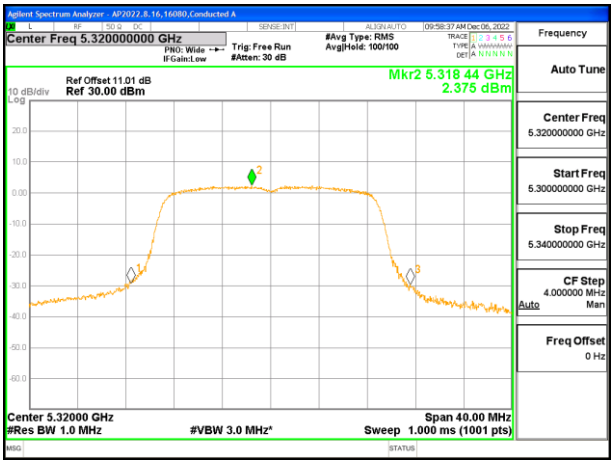

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9.4.7. 802.11n HT40 MODE IN THE 5.3 GHz BAND

1TX Antenna 1 MODE (FCC)

Test Engineer:	ZS16080 and PV27966
Test Date:	2022-12-06 to 2022-12-15

Bandwidth, Antenna Gain, and Limits

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/1MHz)
Low	5270	44.24	-4.04	24.00	11.00
High	5310	43.76	-4.04	24.00	11.00

Duty Cycle CF (dB)	0.69	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5270	14.54	14.54	24.00	-9.46
High	5310	12.02	12.02	24.00	-11.98

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm/1MHz)	Total Corr'd PSD (dBm/1MHz)	PSD Limit (dBm/1MHz)	PSD Margin (dB)
Low	5270	-1.870	-1.18	11.00	-12.18
High	5310	-4.614	-3.92	11.00	-14.92

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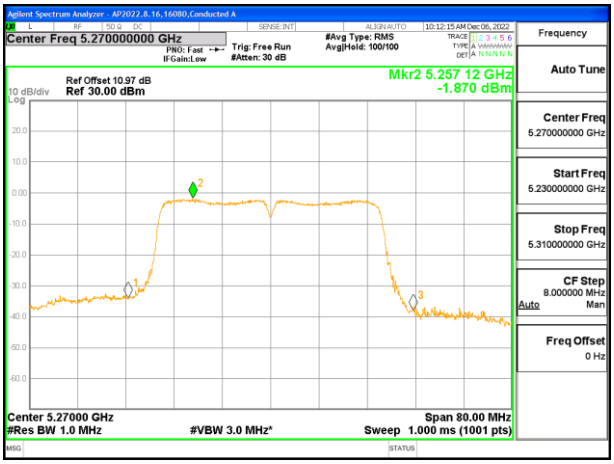

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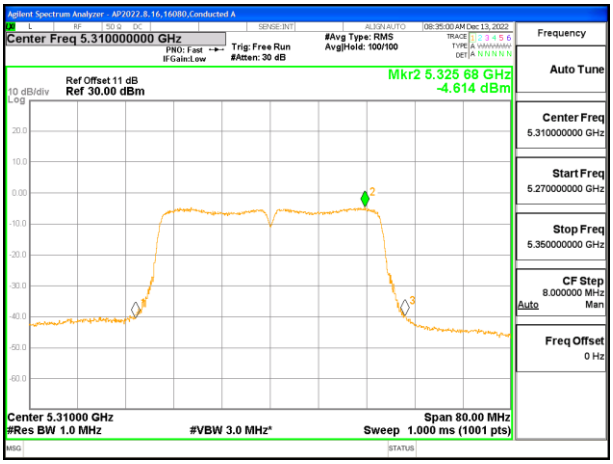

HIGH CHANNEL

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9.4.8. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

1TX Antenna 1 MODE

Test Engineer:	ZS16080 and PV27966
Test Date:	2022-12-06 to 2022-12-15

Bandwidth, Antenna Gain, and Limits

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Directional Gain (dBi)	Power Limit (dBm)	PSD Limit (dBm/1MHz)
Mid	5290	81.12	-4.04	24.00	11.00

Duty Cycle CF (dB)	1.21	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Mid	5290	8.02	8.02	24.00	-15.98

PSD Results

Channel	Frequency (MHz)	Meas PSD (dBm/1MHz)	Total Corr'd PSD (dBm/1MHz)	PSD Limit (dBm/1MHz)	PSD Margin (dB)
Mid	5290	-11.615	-10.41	11.00	-21.41

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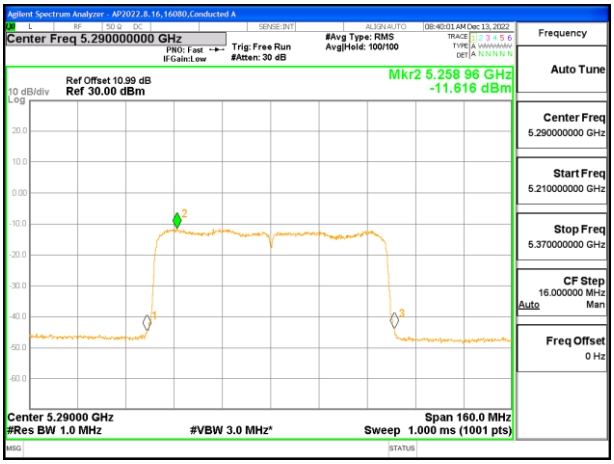

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