

EVALUATION REPORT ***for Certification***

Manufacturer: S-Tech Won Inc.

Date of Issue: Jun. 21, 2024

Sanggadong-303, 423, Sanho-daero, Gumi-si,

Order Number: GETEC-C1-24-229

Gyeongsangbuk-do, Republic of Korea

Test Report Number: GETEC-E3-24-084

Attn: Mr. Sang-Tae Kim / CEO

Test Site: GUMI UNIVERSITY EMC CENTER

CAB Designation Number: KR0033

APPLICANT : Summit Technology

ADDRESS : 130, Digital-ro, Namsung Plaza suite 611, Geumcheon-gu, Seoul, South Korea

CONTACT PERSON : Mr. Yong-seong Park / Senior Director

Rule Part(s) : FCC Part 15 Subpart E-UNII Devices § 15.407

Test Method : ANSI C63.10 (2020)

Equipment Class : Unlicensed National Information Infrastructure(NII)

EUT Type : Touch Screen Controller

Type of Authority : Certification

Model Name : TDC-8300

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10 (2020)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the vest of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,

Reviewed by,



Jong-Wook Park, Senior Engineer
GUMI UNIVERSITY EMC CENTER



Hyun Kim, Technical Manager
GUMI UNIVERSITY EMC CENTER

GETEC-QP-16-008 (Rev.01)

EMC CENTER

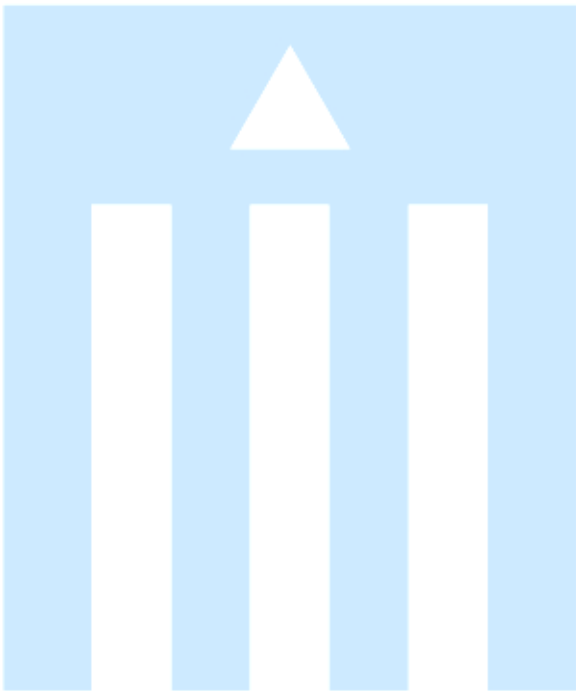
This test report only contains the result of a specific sample supplied by applicant for the testing.
It is not allowed to copy this report even partly without the approval of EMC center

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Version

Test Report No.	Date	Description
GETEC-E3-24-084	Jun. 21, 2024	- First Approval Report





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Scope: Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.

1. General Information

Applicant: Summit Technology

Applicant Address: 130, Digital-ro, Namsung Plaza suite 611, Geumcheon-gu, Seoul, South Korea

Manufacturer: S-Tech Won Inc.

Manufacturer Address: Sanggadong-303, 423, Sanho-daero, Gumi-si, Gyeongsangbuk-do, Republic of Korea

Contact Person: Mr. Sang-Tae Kim / CEO

● FCC ID.	2AT6QTDC8300
● Equipment Class	Unlicensed National Information Infrastructure(NII)
● EUT Type	Touch Screen Controller
● Model Name	TDC-8300
● Rule Part(s)	FCC Part 15 Subpart E-UNII Devices § 15.407
● Test Method	ANSI C63.10 (2020)
● Type of Authority	Certification
● Test Procedure(s)	ANSI C63.10 (2020), KDB 789033 D02 General U-NII Test Procedures New Rules v02r01(Dec. 14,2017)
● Dates of Test	May 13, 2024 ~ Jun. 21, 2024
● Place of Test	GUMI UNIVERSITY EMC CENTER (FCC Test firm Registration No.: 269701) 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea
● Test Report Number	GETEC-E3-24-083
● Dates of Issue	Jun. 21, 2024



2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **Summit Technology Touch Screen Controller (Model name: TDC-8300)**

These measurement tests were conducted at **GUMI UNIVERSITY EMC CENTER**.

The site address is 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea

This test site is one of the highest point of GUMI UNIVERSITY at about 200 kilometers away from Seoul city and 40 kilometers away from Daegu city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.10 (2020)

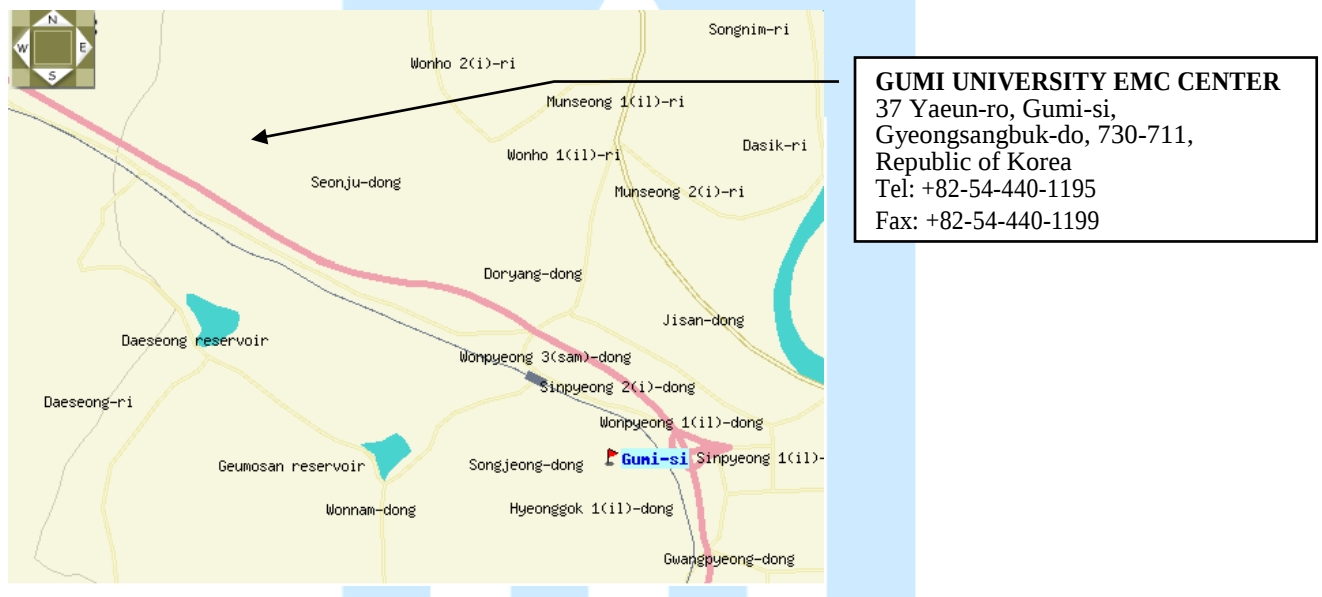


Fig 1. The map above shows the Gumi University in vicinity area.



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **Summit Technology Touch Screen Controller (Model Name: TDC-8300)**
FCC ID.: 2AT6QTDC8300

- Equipment	: Touch Screen Controller						
- Model name	: TDC-8300						
- Serial number	: Proto type						
- Electrical Rating	: DC 3.7 V (Lithium-polymer battery)						
- Manufacturer	: S-Tech Won Inc.						
- Frequency Range (DTS band)	TX 20 MHz BW:	2412 MHz - 2462 MHz					
	40 MHz BW:	2422 MHz - 2462 MHz					
	RX 20 MHz BW:	2412 MHz - 2462 MHz					
	40 MHz BW	2422 MHz - 2462 MHz					
- Frequency Range (UNII band)	TX 20 MHz BW:	5180 MHz - 5240 MHz (UNII 1) / 5260 MHz - 5320 MHz (UNII 2A) 5500 MHz - 5720 MHz (UNII 2C) / 5745 MHz - 5825 MHz (UNII 3)					
	40 MHz BW:	5190 MHz - 5230 MHz (UNII 1) / 5270 MHz - 5310 MHz (UNII 2A) 5510 MHz - 5710 MHz (UNII 2C) / 5755 MHz - 5795 MHz (UNII 3)					
	80 MHz BW:	5210 Mhz (UNII 1) / 5290 MHz (UNII 2A) / 5530 MHz - 5690 MHz (UNII 2C) / 5775 MHz (UNII 3)					
	RX 20 MHz BW:	5180 MHz - 5240 MHz (UNII 1) / 5260 MHz - 5320 MHz (UNII 2A) 5500 MHz - 5720 MHz (UNII 2C) / 5745 MHz - 5825 MHz (UNII 3)					
	40 MHz BW:	5190 MHz - 5230 MHz (UNII 1) / 5270 MHz - 5310 MHz (UNII 2A) 5510 MHz - 5710 MHz (UNII 2C) / 5755 MHz - 5795 MHz (UNII 3)					
	80 MHz BW:	5210 Mhz (UNII 1) / 5290 MHz (UNII 2A) / 5530 MHz - 5690 MHz (UNII 2C) / 5775 MHz (UNII 3)					
- Modulation	: BPSK, QPSK, QAM, CCK, OFDM						
- Antenna Specification	: Antenna type : FPCB antenna Gain :						
	Freq. (MHz)	2400	2420	2440	2460	2480	2500
	Gain (dBi)	0.73	1.23	1.88	2.22	2.25	1.25
	Freq. (MHz)	5150	5250	5350	5490	5725	5825
	Gain (dBi)	1.22	1.07	0.26	1.41	2.24	2.07
- Type (DFS)	: Client (without radar detection)						

3.2 Definition of models

-None.



3.3 Support Equipment / Cables used

3.3.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
Notebook Computer ¹⁾	SAMSUNG	NT500R3W	S/N: 0Q2V91JJ100096T FCC ID.: N/A

Note)

1) The Support Equipment use only setting to the test mode.

3.3.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
AC/DC adapter ¹⁾	DEE VAN ENTERPRISE CO., LTD.	DSA-18QFB FUS A	N/A
AC/DC adapter ²⁾	DEE VAN ENTERPRISE CO., LTD.	DSA-10PF06-05 FUS 050200	N/A

1) Input: 100-240 V, 50/60 Hz, 0.8 A
Output: DC 5 V, 3 A / DC 9 V, 2 A / DC 12 V, 1.5 A

2) Input: 100-240 V, 50/60 Hz, 0.3 A
Output: DC 5 V, 2 A, 10W

3.3.3 Used Cable(s)

Cable Name	Condition	Description
USB cable	Connected to EUT and AC/DC adapter	1.5 m shielded with a ferrite core

3.4 Modification Item(s)

-. None



4. Antenna Requirement - §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the applicant can be used with the device. The use of permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement.

4.1 Description of Antenna

The **Summit Technology Touch Screen Controller**, comply with the requirement of §15.203 with a FPCB antenna permanently attached to the transmitter.

5. Description of tests

5.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used. The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency: 3.7 V / DC
- Operating condition during the test(s) :
 - Continuous RF transmitting mode with nominal maximum RF output power.
 - Operating channel frequency and modulation technology

	Mode	Available channel	Frequency	Modulation Technology
NII	802.11a	36 ~ 165	5 180 ~ 5 825 MHz	OFDM
	802.11n	36 ~ 165	5 180 ~ 5 825 MHz	OFDM
	802.11ac	36 ~ 165	5 180 ~ 5 825 MHz	OFDM

- EUT set condition (Test Software)

Test Software	Android Debug Bridge
Test Software version	N/A

6. References Standards

- FCC Part 15 (2009) Subpart E-UNII Devices §15.407
- ANSI C63.10 (2020): American National Standard for Testing Unlicensed Wireless Devices
- KDB 789033 D02 General UNII Test Procedures New Rules v01r04 (May 2, 2017): Guidance for compliance testing of unlicensed national information infrastructure (UNII) devices (Part 15, Subpart E)



7. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Result
§15.407 (for Power Measurement)	26 dB Bandwidth	Pass
§15.407(e)	6 dB Bandwidth	Pass
§15.407(a)	Maximum Conducted Output Power	Pass
§15.407(h)1	Transmit Power Control (TPC)	N/A ¹⁾
§15.407(a)	Peak Power Spectral Density	Pass
§15.407(g)	Frequency Stability	Pass
§15.207	AC Conducted Emissions 150 kHz - 30 MHz	Pass
§15.407(b)	Undesirable Emissions	Pass
§15.205, § 15.407(b)(5),(6)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Pass

1) E.I.R.P of EUT is less than the 500 mW.

Therefore, TPC test is not required for systems with an e.i.r.p of less than 500 mW

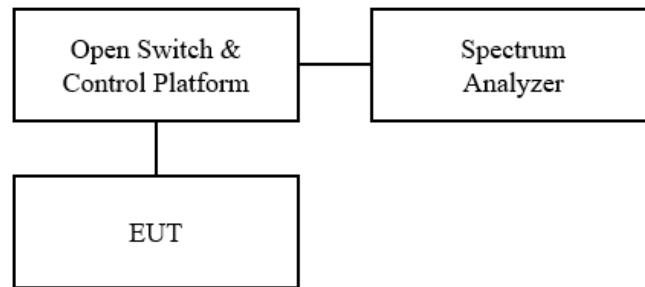


8. 26 dB Bandwidth Measurement

8.1 Operating environment

Temperature : 22.3 °C
Relative Humidity : 49.7 % R.H.

8.2 Test Set-up (Layout)



8.3 Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

8.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSV	Rohde & Schwarz	Spectrum Analyzer	101552	Apr. 04, 2025
■ - OSP120	Rohde & Schwarz	Open Switch and control platform	101329	Apr. 05, 2025
■ - J12J103539-00-2	JUNFLON	RF Test Cable (OSP_DUT1)	AUG-03-21-066	N/A
■ - J12J103539-00-3	JUNFLON	RF Test Cable (OSP_RX)	AUG-03-21-074	N/A
■ - WMS 32	Rohde & Schwarz	Testing Software	VER11.70.00	N/A

8.5 Test Test Procedure

- Set RBW = 200 kHz
- Set the video bandwidth (VBW) $\geq$ 600 kHz
- Detector = Max Peak
- Trace mode = Max Hold
- Sweep = Auto
- Allow the trace to stabilize
- Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.



8.6 Test result

- Test Date : Jun. 21, 2024
- Reference Standard : Part 15 Subpart E, Sec. 15.407(for power measurement)
- Test Procedure(s) : ANSI C63.10 (2020), KDB 789033 D02 General U-NII Test Procedures New Rules v02r01(Dec. 14,2017)
- Operating Condition : 802.11a/n/ac
- Power Source : DC 3.7 V

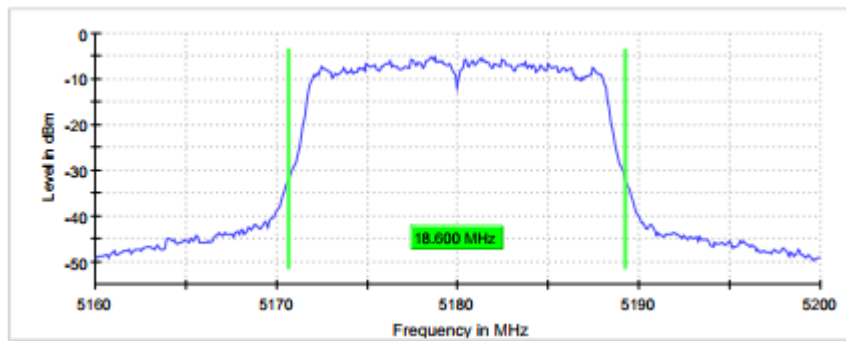
802.11a

Frequency (MHz)	Channel No.	26 dB Bandwidth (MHz)	Min. Limit (MHz)	Result
5180	36	18.60	N/A	Complies
5200	40	18.40	N/A	Complies
5240	48	18.60	N/A	Complies
5260	52	18.60	N/A	Complies
5300	60	18.40	N/A	Complies
5320	64	18.50	N/A	Complies
5500	100	18.40	N/A	Complies
5580	116	18.40	N/A	Complies
5720	144	18.60	N/A	Complies
5745	149	18.50	N/A	Complies
5785	157	18.60	N/A	Complies
5825	165	18.70	N/A	Complies

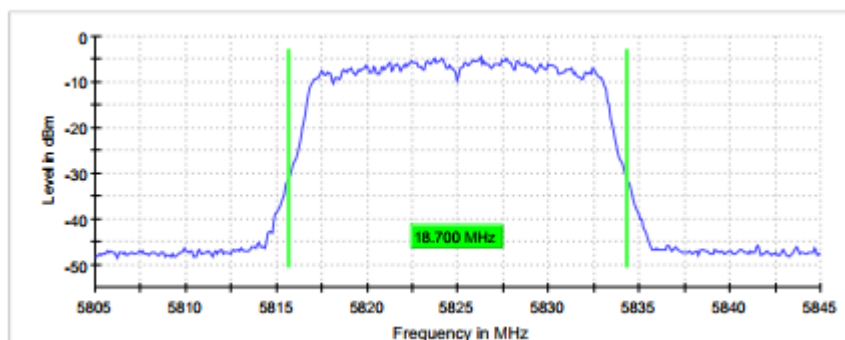


Test Plot on Configuration : 802.11a

5180 MHz (36 ch)



5825 MHz (165 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

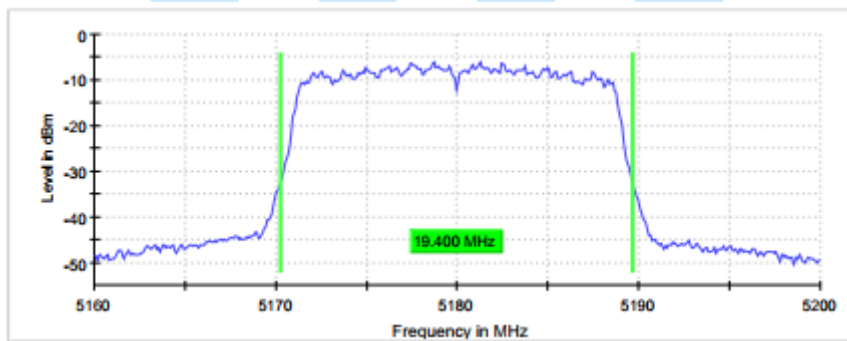


802.11n

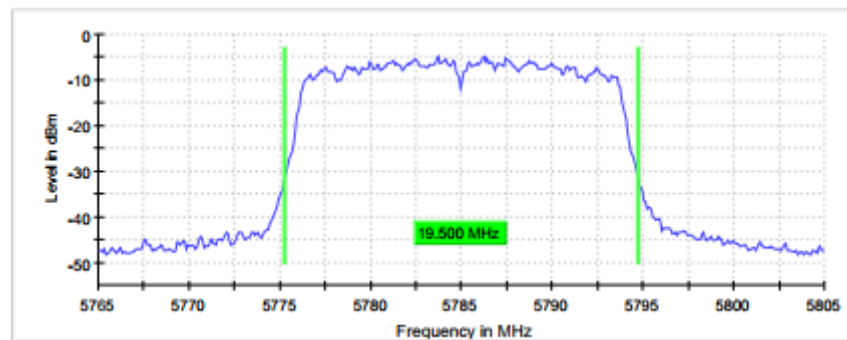
Frequency (MHz)	Channel No.	26 dB Bandwidth (MHz)	Min. Limit (MHz)	Result
5180	36	19.40	N/A	Complies
5200	40	19.40	N/A	Complies
5240	48	19.40	N/A	Complies
5260	52	19.40	N/A	Complies
5300	60	19.30	N/A	Complies
5320	64	19.40	N/A	Complies
5500	100	19.40	N/A	Complies
5580	116	19.40	N/A	Complies
5720	144	19.40	N/A	Complies
5745	149	19.20	N/A	Complies
5785	157	19.50	N/A	Complies
5825	165	19.30	N/A	Complies

Test Plot on Configuration : 802.11n

5180 MHz (36 ch)



5785 MHz (157 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

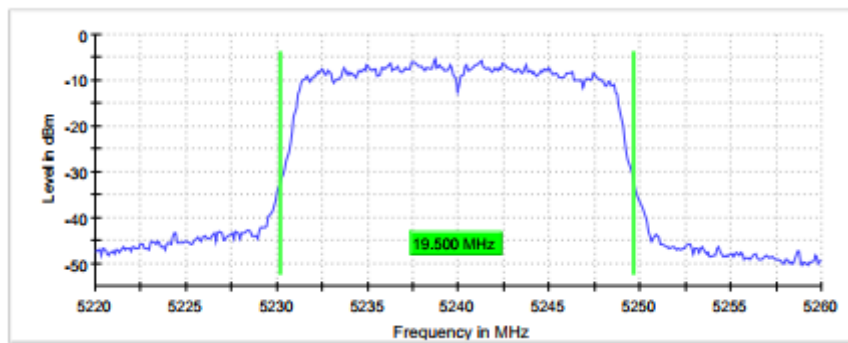


802.11ac

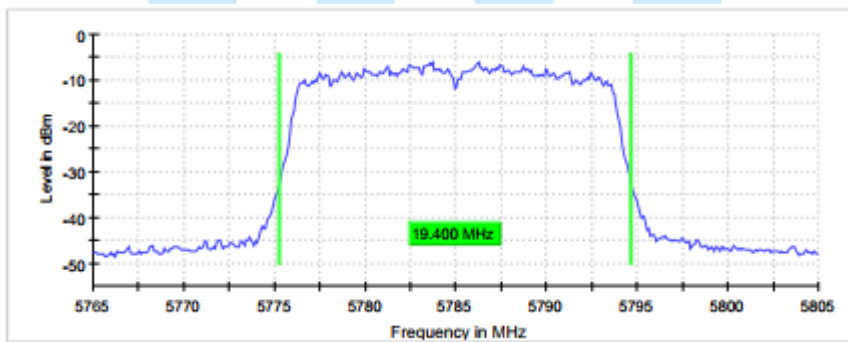
Frequency (MHz)	Channel No.	26 dB Bandwidth (MHz)	Min. Limit (MHz)	Result
5180	36	19.40	N/A	Complies
5200	40	19.40	N/A	Complies
5240	48	19.50	N/A	Complies
5260	52	19.40	N/A	Complies
5300	60	19.40	N/A	Complies
5320	64	19.30	N/A	Complies
5500	100	19.40	N/A	Complies
5580	116	19.40	N/A	Complies
5720	144	19.40	N/A	Complies
5745	149	19.40	N/A	Complies
5785	157	19.40	N/A	Complies
5825	165	19.40	N/A	Complies

Test Plot on Configuration : 802.11n

5240 MHz (48 ch)



5785 MHz (157 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

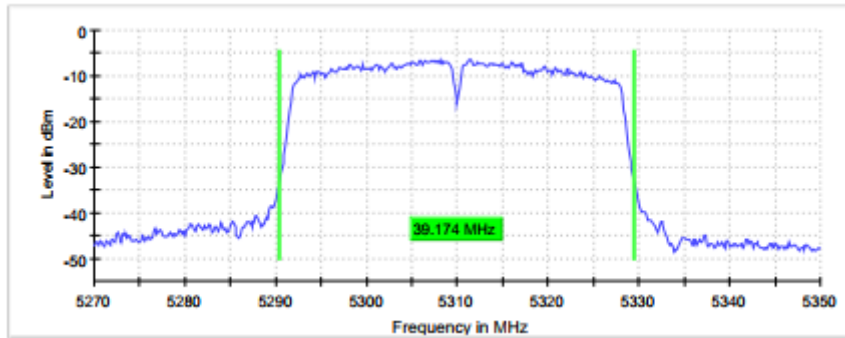


802.11n_HT40

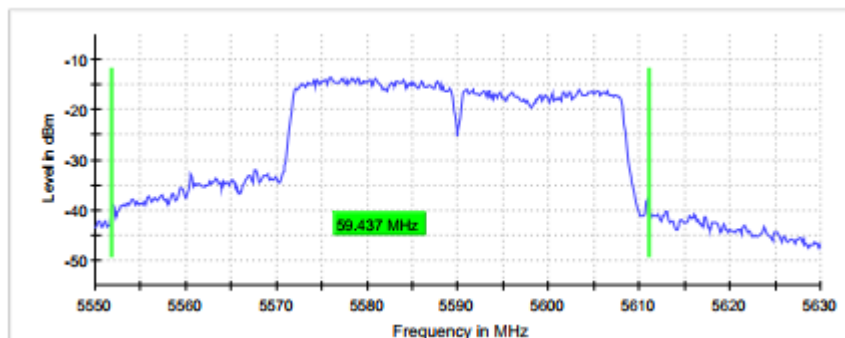
Frequency (MHz)	Channel No.	26 dB Bandwidth (MHz)	Min. Limit (MHz)	Result
5190	38	39.024	N/A	Complies
5230	46	38.874	N/A	Complies
5270	54	38.874	N/A	Complies
5310	62	39.174	N/A	Complies
5510	102	39.024	N/A	Complies
5590	110	56.437	N/A	Complies
5710	142	38.874	N/A	Complies
5755	151	38.574	N/A	Complies
5795	159	39.174	N/A	Complies

Test Plot on Configuration : 802.11n_HT40

5310 MHz (62 ch)



5590 MHz (110 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

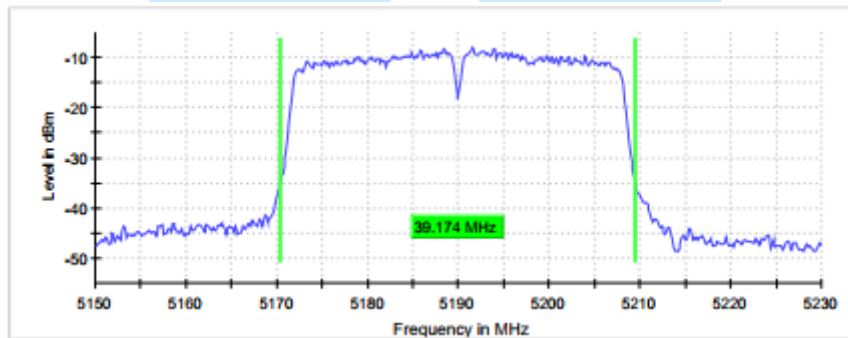


802.11ac_VHT40

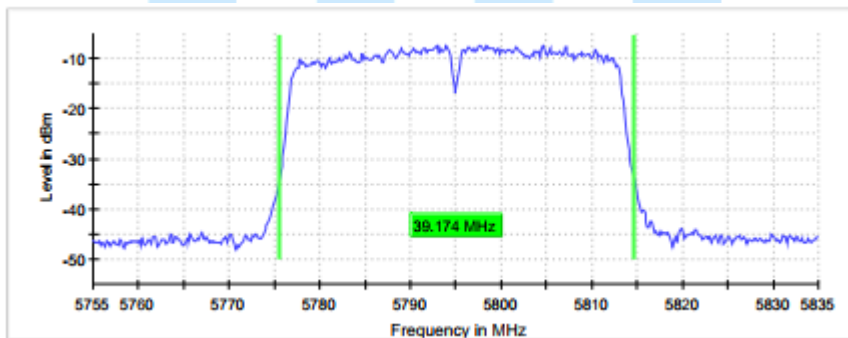
Frequency (MHz)	Channel No.	26 dB Bandwidth (MHz)	Min. Limit (MHz)	Result
5190	38	39.174	N/A	Complies
5230	46	39.024	N/A	Complies
5270	54	39.174	N/A	Complies
5310	62	38.874	N/A	Complies
5510	102	39.174	N/A	Complies
5590	110	38.874	N/A	Complies
5710	142	38.724	N/A	Complies
5755	151	38.874	N/A	Complies
5795	159	39.174	N/A	Complies

Test Plot on Configuration : 802.11n_HT40

5190 MHz (38 ch)



5795 MHz (159 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

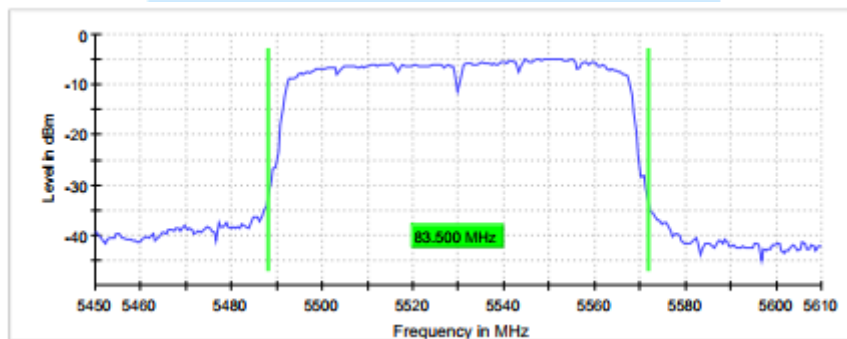


802.11ac_VHT80

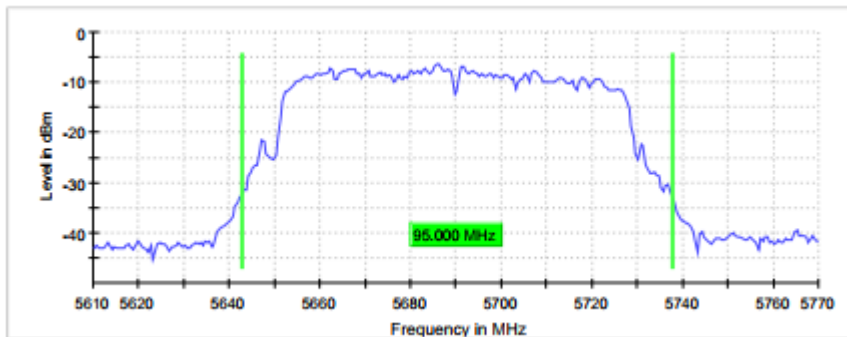
Frequency (MHz)	Channel No.	26 dB Bandwidth (MHz)	Min. Limit (MHz)	Result
5210	42	82.50	N/A	Complies
5290	58	82.50	N/A	Complies
5530	106	83.50	N/A	Complies
5610	122	83.50	N/A	Complies
5690	138	95.00	N/A	Complies
5775	155	82.50	N/A	Complies

Test Plot on Configuration : 802.11n_HT40

5530 MHz (106 ch)



5690 MHz (138 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

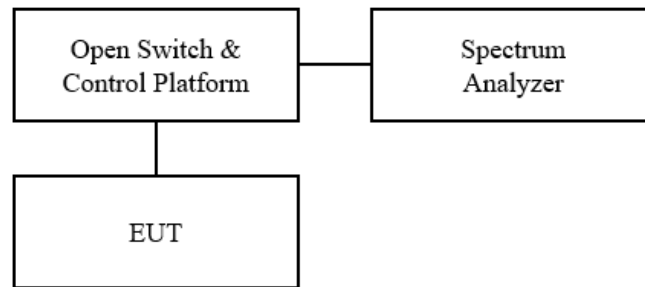


9. 6 dB Bandwidth Measurement

9.1 Operating environment

Temperature : 22.3 °C
Relative Humidity : 49.7 % R.H.

9.2 Test Set-up (Layout)



9.3 Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

9.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSV	Rohde & Schwarz	Spectrum Analyzer	101552	Apr. 04, 2025
■ - OSP120	Rohde & Schwarz	Open Switch and control platform	101329	Apr. 05, 2025
■ - J12J103539-00-2	JUNFLON	RF Test Cable (OSP_DUT1)	AUG-03-21-066	N/A
■ - J12J103539-00-3	JUNFLON	RF Test Cable (OSP_RX)	AUG-03-21-074	N/A
■ - WMS 32	Rohde & Schwarz	Testing Software	VER11.70.00	N/A

9.5 Test Procedure

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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.



9.6 Test result

- Test Date : Jun. 21, 2024
- Reference Standard : Part 15 Subpart E, Sec. 15.407(e)
- Test Procedure(s) : ANSI C63.10 (2020), KDB 789033 D02 General U-NII Test Procedures New Rules v02r01(Dec. 14,2017)
- Operating Condition : 802.11a/n/ac
- Power Source : DC 3.7 V

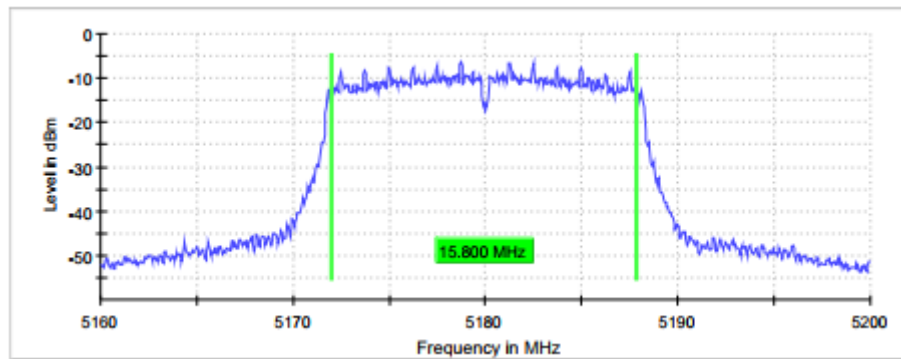
802.11a

Frequency (MHz)	Channel No.	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
5180	36	15.80	N/A	Complies
5200	40	15.40	N/A	Complies
5240	48	15.75	N/A	Complies
5260	52	15.75	N/A	Complies
5300	60	15.40	N/A	Complies
5320	64	15.40	N/A	Complies
5500	100	15.55	N/A	Complies
5580	116	15.40	N/A	Complies
5720	144	15.80	N/A	Complies
5745	149	15.55	N/A	Complies
5785	157	15.75	N/A	Complies
5825	165	15.40	N/A	Complies

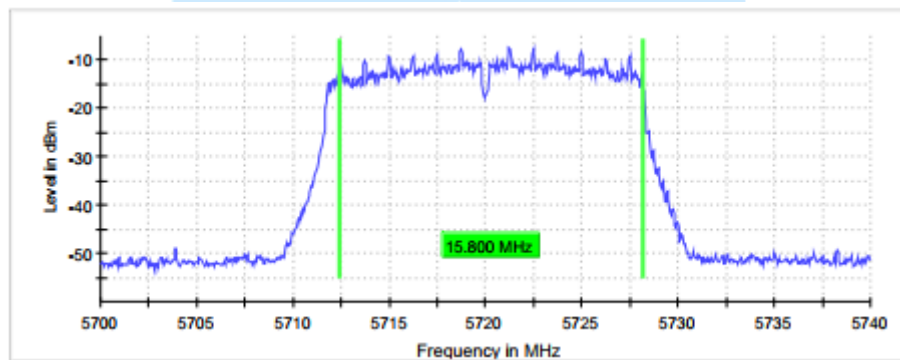


Test Plot on Configuration : 802.11a

5180 MHz (36 ch)



5720 MHz (144 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

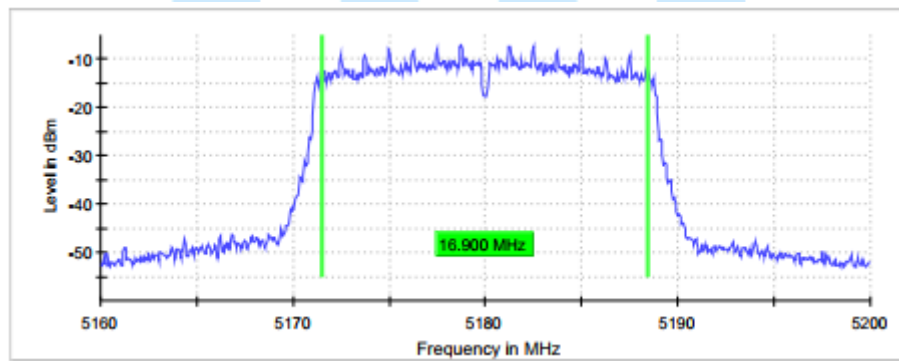


802.11n

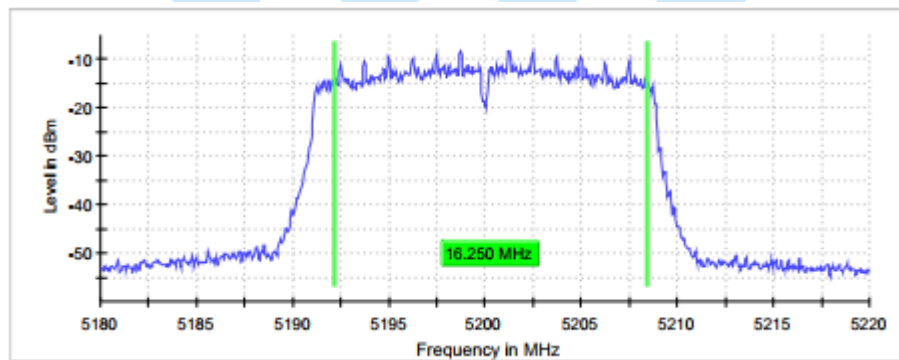
Frequency (MHz)	Channel No.	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
5180	36	16.90	N/A	Complies
5200	40	16.25	N/A	Complies
5240	48	15.55	N/A	Complies
5260	52	16.00	N/A	Complies
5300	60	15.40	N/A	Complies
5320	64	16.05	N/A	Complies
5500	100	15.75	N/A	Complies
5580	116	15.40	N/A	Complies
5720	144	16.05	N/A	Complies
5745	149	15.75	N/A	Complies
5785	157	16.65	N/A	Complies
5825	165	16.05	N/A	Complies

Test Plot on Configuration : 802.11n

5180 MHz (36 ch)



5200 MHz (40 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

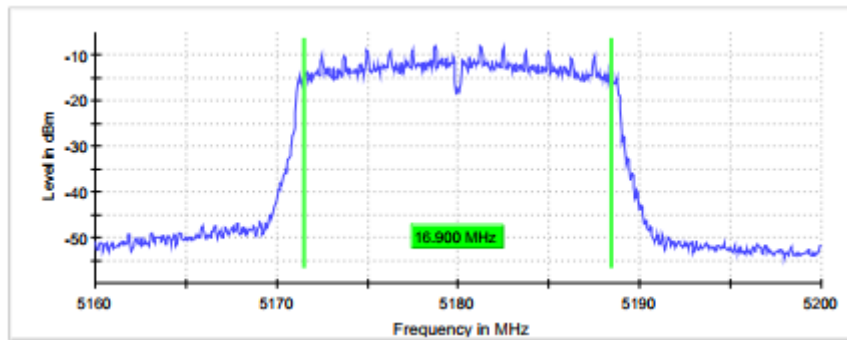


802.11ac

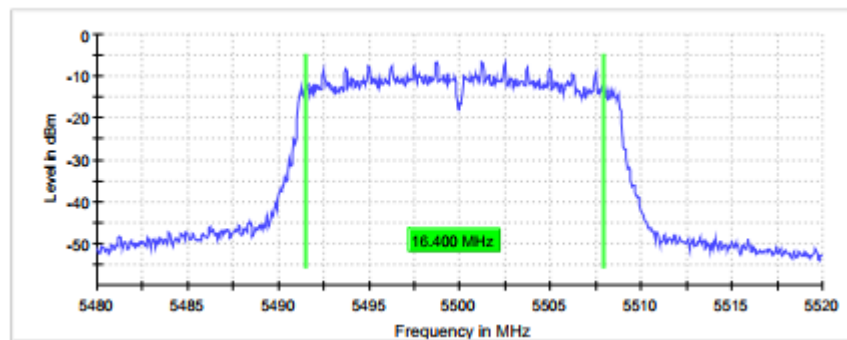
Frequency (MHz)	Channel No.	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
5180	36	16.90	N/A	Complies
5200	40	16.40	N/A	Complies
5240	48	16.00	N/A	Complies
5260	52	16.05	N/A	Complies
5300	60	15.20	N/A	Complies
5320	64	16.00	N/A	Complies
5500	100	16.40	N/A	Complies
5580	116	16.05	N/A	Complies
5720	144	16.15	N/A	Complies
5745	149	15.20	N/A	Complies
5785	157	16.05	N/A	Complies
5825	165	16.05	N/A	Complies

Test Plot on Configuration : 802.11n

5180 MHz (36 ch)



5500 MHz (100 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

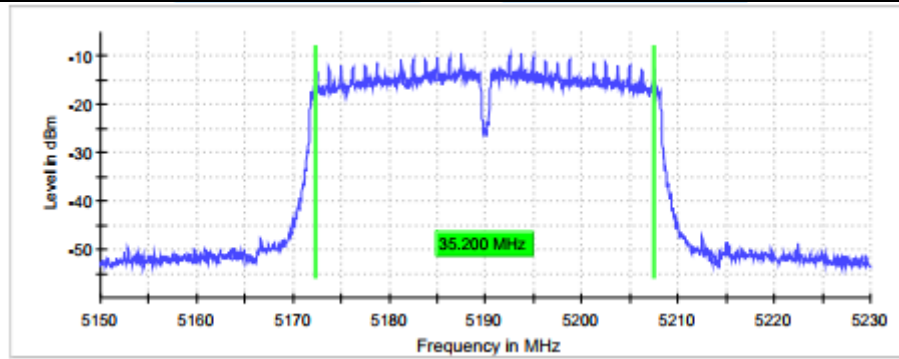


802.11n_HT40

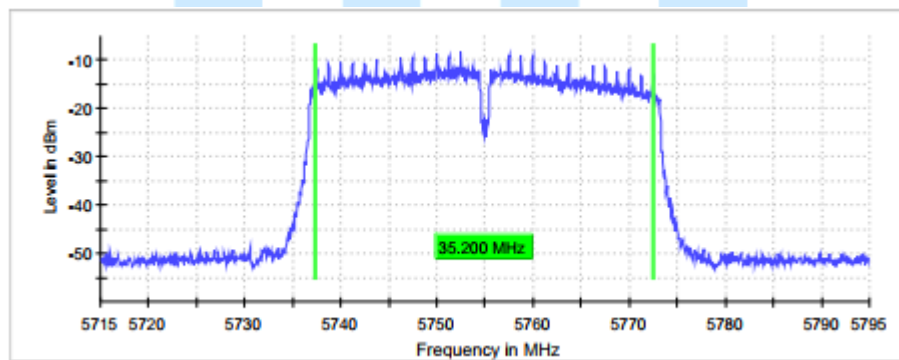
Frequency (MHz)	Channel No.	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
5190	38	35.20	N/A	Complies
5230	46	35.20	N/A	Complies
5270	54	35.20	N/A	Complies
5310	62	35.20	N/A	Complies
5510	102	35.20	N/A	Complies
5550	110	35.80	N/A	Complies
5710	142	35.15	N/A	Complies
5755	151	35.20	N/A	Complies
5795	159	35.20	N/A	Complies

Test Plot on Configuration : 802.11n_HT40

5190 MHz (38 ch)



5755 MHz (151 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

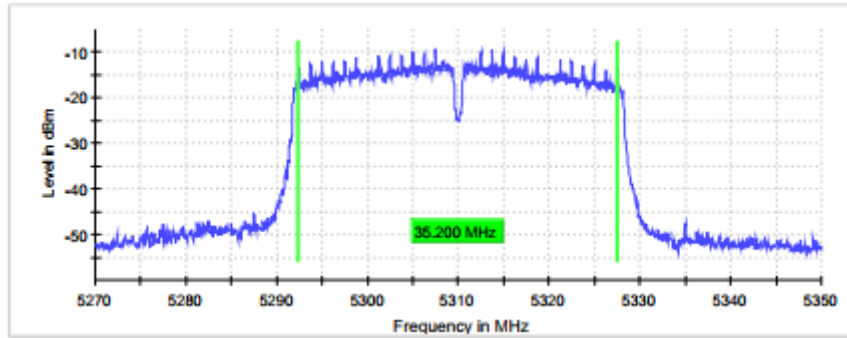


802.11ac_VHT40

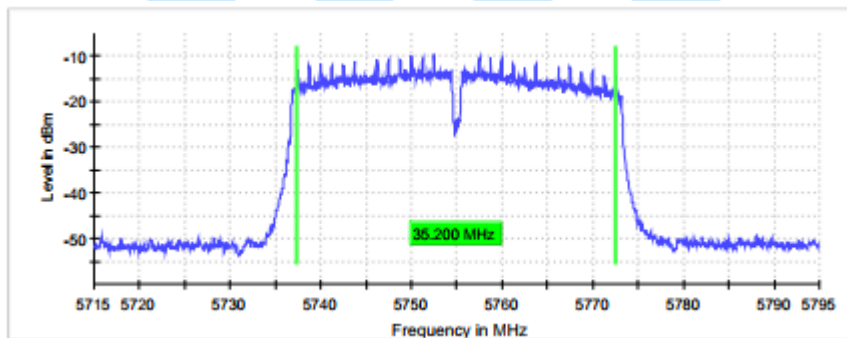
Frequency (MHz)	Channel No.	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
5190	38	35.20	N/A	Complies
5230	46	35.20	N/A	Complies
5270	54	35.20	N/A	Complies
5310	62	35.20	N/A	Complies
5510	102	35.20	N/A	Complies
5590	110	35.20	N/A	Complies
5710	142	35.15	N/A	Complies
5755	151	35.20	N/A	Complies
5795	159	35.20	N/A	Complies

Test Plot on Configuration : 802.11n_HT40

5310 MHz (62 ch)



5755 MHz (151 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

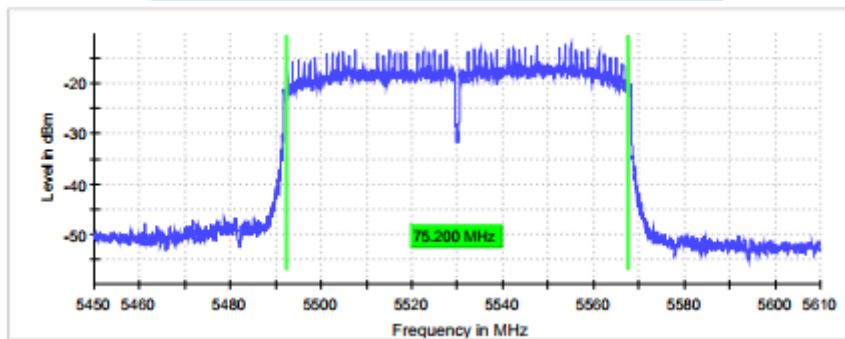


802.11ac_VHT80

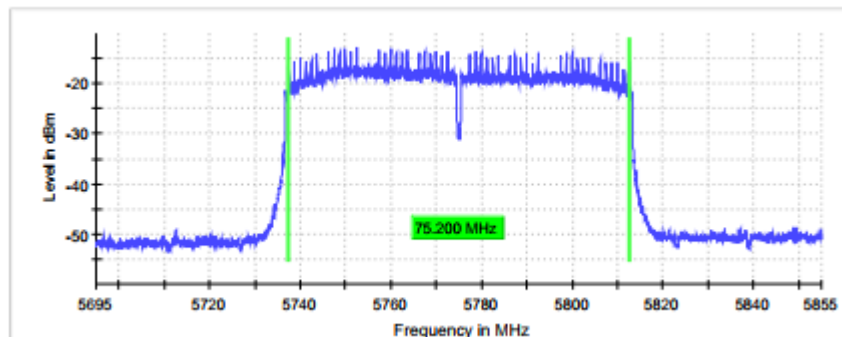
Frequency (MHz)	Channel No.	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Result
5210	42	75.15	N/A	Complies
5290	58	75.15	N/A	Complies
5530	106	75.20	N/A	Complies
5610	122	75.20	N/A	Complies
5690	138	67.65	N/A	Complies
5775	155	75.20	N/A	Complies

Test Plot on Configuration : 802.11n_HT40

5530 MHz (106 ch)



5775 MHz (48 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

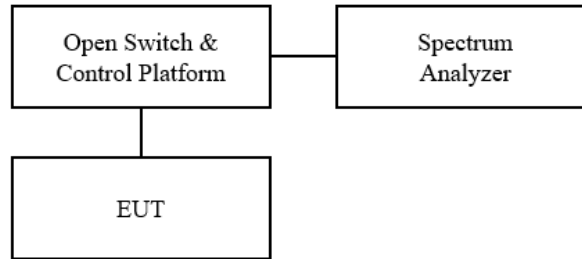


10. Maximum Conducted Output Power

10.1 Operating environment

Temperature : 22.3 °C
Relative Humidity : 49.7 % R.H.

10.2 Test Set-up (Layout)



10.3 Limit

For the 5.15-5.25 GHz band, 5.25-5.35 GHz and 5.47-5.725 GHz the maximum conducted output power over the frequency band of operation shall not exceed 250 mW.

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

10.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSV	Rohde & Schwarz	Spectrum Analyzer	101552	Apr. 04, 2025
■ - OSP120	Rohde & Schwarz	Open Switch and control platform	101329	Apr. 05, 2025
■ - J12J103539-00-2	JUNFLON	RF Test Cable (OSP_DUT1)	AUG-03-21-066	N/A
■ - J12J103539-00-3	JUNFLON	RF Test Cable (OSP_RX)	AUG-03-21-074	N/A
■ - WMS 32	Rohde & Schwarz	Testing Software	VER11.70.00	N/A

10.5 Test Procedure

- Measure the duty cycle.
- Set span to encompass the 26 dB EBW of the signal.
- RBW = 1 MHz.
- VBW $\geq$ 3 MHz.
- Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$.
- Sweep time = auto.
- Detector = RMS.
- Do not use sweep triggering. Allow the sweep to “free run”.
- Trace average at least 100 traces in power averaging(RMS) mode
- Integrated bandwidth = OBW
- Add $10\log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.



10.6 Test Result

- Test Date : Jun. 21, 2024
- Reference Standard : Part 15 Subpart E, Sec. 15.407(a)
- Test Procedure(s) : ANSI C63.10 (2020), KDB 789033 D02 General U-NII Test Procedures New Rules v02r01(Dec. 14,2017)
- Operating Condition : 802.11a/n/ac
- Power Source : DC 3.7 V

802.11a

Frequency (MHz)	Channel No.	Measured Power (dBm)	DutyCycle (%)	Limit (dBm)	Result
5180	36	5.4	92.927	23.98	Complies
5200	40	4.5	92.740	23.98	Complies
5240	48	4.7	92.714	23.98	Complies
5260	52	4.9	92.627	23.98	Complies
5300	60	5.2	92.626	23.98	Complies
5320	64	4.7	92.643	23.98	Complies
5500	100	4.4	92.676	23.98	Complies
5580	116	6.1	92.683	23.98	Complies
5720	144	4.0	92.800	23.98	Complies
5745	149	4.5	92.676	30	Complies
5785	157	4.1	92.904	30	Complies
5825	165	5.4	92.626	30	Complies

802.11n_HT20

Frequency (MHz)	Channel No.	Measured Power (dBm)	DutyCycle (%)	Limit (dBm)	Result
5180	36	4.4	92.251	23.98	Complies
5200	40	3.7	92.313	23.98	Complies
5240	48	3.7	92.304	23.98	Complies
5260	52	4.1	92.296	23.98	Complies
5300	60	3.8	92.329	23.98	Complies
5320	64	3.9	92.253	23.98	Complies
5500	100	3.5	92.329	23.98	Complies
5580	116	5.2	92.274	23.98	Complies
5720	144	5.6	92.232	23.98	Complies
5745	149	5.8	92.095	30	Complies
5785	157	5.3	92.274	30	Complies
5825	165	6.8	92.233	30	Complies



802.11ac_VHT20

Frequency (MHz)	Channel No.	Measured Power (dBm)	DutyCycle (%)	Limit (dBm)	Result
5180	36	3.2	92.285	23.98	Complies
5200	40	4.5	92.288	23.98	Complies
5240	48	4.9	92.292	23.98	Complies
5260	52	2.8	92.352	23.98	Complies
5300	60	5.2	92.250	23.98	Complies
5320	64	5.2	92.177	23.98	Complies
5500	100	4.6	92.314	23.98	Complies
5580	116	3.6	92.297	23.98	Complies
5720	144	4.1	92.268	23.98	Complies
5745	149	4.6	92.281	30	Complies
5785	157	4.3	92.311	30	Complies
5825	165	5.5	92.324	30	Complies

802.11n_HT40

Frequency (MHz)	Channel No.	Measured Power (dBm)	DutyCycle (%)	Limit (dBm)	Result
5190	38	4.8	84.954	23.98	Complies
5230	46	6.5	85.152	23.98	Complies
5270	54	4.4	84.990	23.98	Complies
5310	62	6.0	81.912	23.98	Complies
5510	102	3.0	84.960	23.98	Complies
5590	118	4.1	85.185	23.98	Complies
5710	142	5.0	84.918	23.98	Complies
5755	151	5.6	85.121	30	Complies
5795	159	6.0	85.365	30	Complies

802.11ac_VHT40

Frequency (MHz)	Channel No.	Measured Power (dBm)	DutyCycle (%)	Limit (dBm)	Result
5190	38	3.6	83.391	23.98	Complies
5230	46	5.5	83.280	23.98	Complies
5270	54	2.8	83.479	23.98	Complies
5310	62	5.1	83.494	23.98	Complies
5510	102	4.1	83.411	23.98	Complies
5590	118	2.6	83.426	23.98	Complies
5710	142	3.0	83.524	23.98	Complies
5755	151	4.1	83.603	30	Complies
5795	159	4.7	83.333	30	Complies



802.11ac_VHT80

Frequency (MHz)	Channel No.	Measured Power (dBm)	DutyCycle (%)	Limit (dBm)	Result
5210	42	4.1	71.406	23.98	Complies
5290	58	3.5	71.398	23.98	Complies
5530	106	4.7	71.481	23.98	Complies
5610	122	5.3	71.545	23.98	Complies
5690	138	2.0	71.677	23.98	Complies
5775	155	4.3	71.493	30	Complies



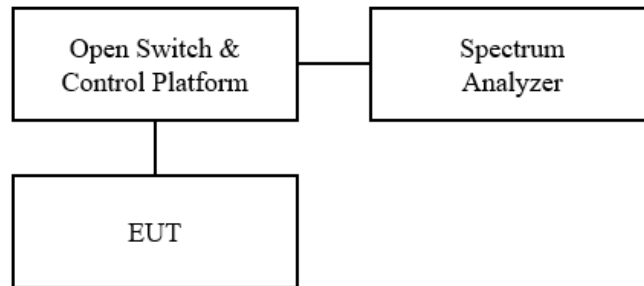


11. Power Spectral Density Measurement

11.1 Operating Environment

Temperature : 22.3 °C
Relative Humidity : 49.7 % R.H.

11.2 Test Set-up (Layout)



11.3 Limit

For the 5.15-5.25 GHz band, 5.25-5.35 GHz and 5.47-5.725 GHz the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

5.725-5.85 GHz the maximum power spectral density shall not exceed 30 dBm in any 1 megahertz band.

11.4 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - FSV	Rohde & Schwarz	Spectrum Analyzer	101552	Apr. 04, 2025
■ - OSP120	Rohde & Schwarz	Open Switch and control platform	101329	Apr. 05, 2025
■ - J12J103539-00-2	JUNFLON	RF Test Cable (OSP_DUT1)	AUG-03-21-066	N/A
■ - J12J103539-00-3	JUNFLON	RF Test Cable (OSP_RX)	AUG-03-21-074	N/A
■ - WMS 32	Rohde & Schwarz	Testing Software	VER11.70.00	N/A

11.5 Test Procedure

- Set span to encompass the entire emission bandwidth(EBW) of the signal.
- RBW = 1 MHz(510 kHz for UNII 3)
- VBW $\geq$ 3 MHz
- Number of points in sweep $\geq$ 2*span/RBW.
- Sweep time = auto.
- Detector = RMS(i.e., power averaging), if available. Otherwise, use sample detector mode.
- Do not use sweep triggering. Allow the sweep to “free run”.
- Trace average at least 100 traces in power averaging(RMS) mode
- Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
- If Method SA-2 was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.



11.6 Test Result

- Test Date : Jun. 21, 2024
- Reference Standard : Part 15 Subpart E, Sec. 15.407(a)
- Test Procedure(s) : ANSI C63.10 (2020), KDB 789033 D02 General U-NII Test Procedures New Rules v02r01(Dec. 14,2017)
- Operating Condition : 802.11a/n/ac
- Power Source : DC 3.7 V

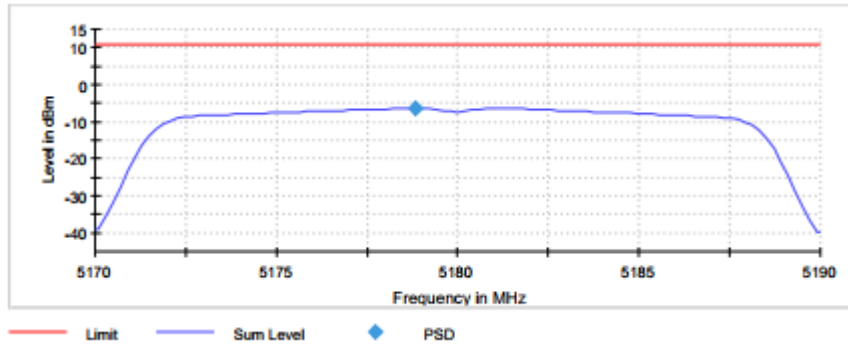
802.11a

Frequency (MHz)	Channel No.	Measured Power Density (dBm)	Limit (dBm)	Result
5180	36	-6.347	11	Complies
5200	40	-6.648	11	Complies
5240	48	-7.120	11	Complies
5260	52	-6.877	11	Complies
5300	60	-6.755	11	Complies
5320	64	-6.816	11	Complies
5500	100	-7.022	11	Complies
5580	116	-5.657	11	Complies
5720	144	-7.611	11	Complies
5745	149	-9.962	30	Complies
5785	157	-10.268	30	Complies
5825	165	-8.733	30	Complies

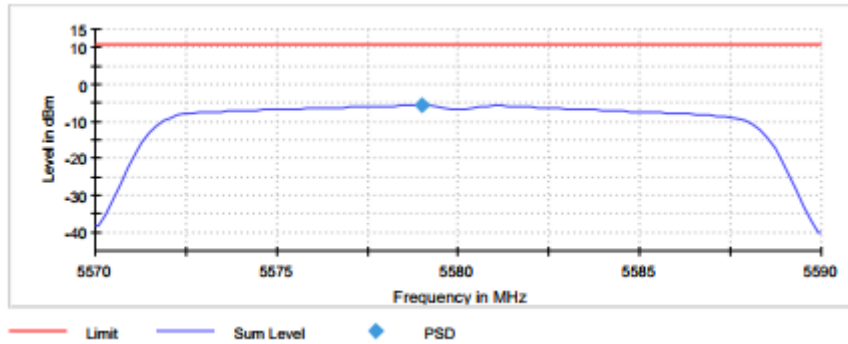


Test Plot on Configuration : 802.11a

5180 MHz (36 ch)



5580 MHz (116 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

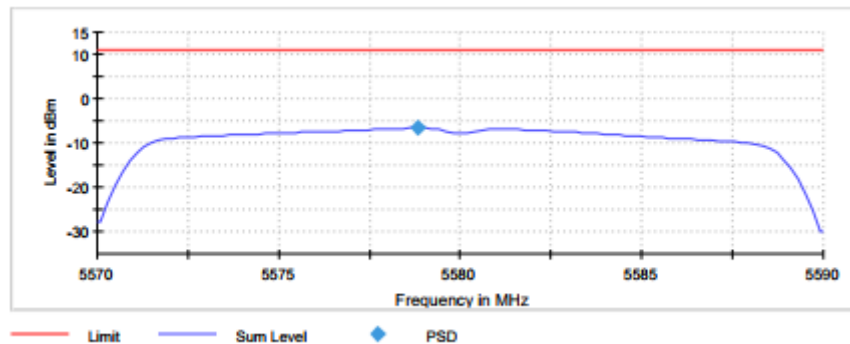


802.11n_HT20

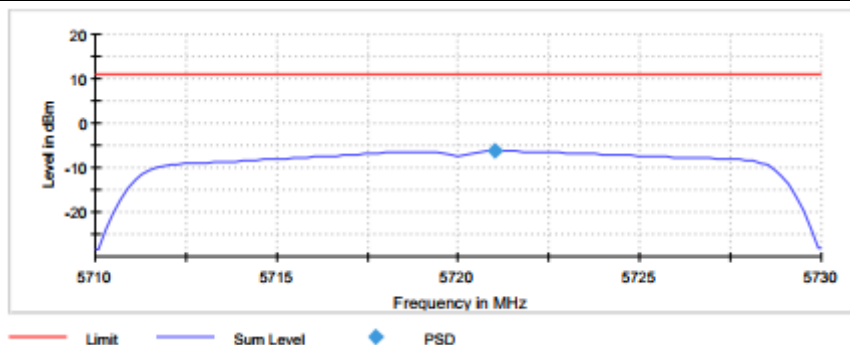
Frequency (MHz)	Channel No.	Measured Power Density (dBm)	Limit (dBm)	Result
5180	36	-7.360	11	Complies
5200	40	-8.601	11	Complies
5240	48	-8.413	11	Complies
5260	52	-8.294	11	Complies
5300	60	-8.105	11	Complies
5320	64	-8.289	11	Complies
5500	100	-8.046	11	Complies
5580	116	-6.653	11	Complies
5720	144	-6.231	11	Complies
5745	149	-8.835	30	Complies
5785	157	-9.280	30	Complies
5825	165	-7.835	30	Complies

Test Plot on Configuration : 802.11n_HT40

5580 MHz (116 ch)



5720 MHz (144 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

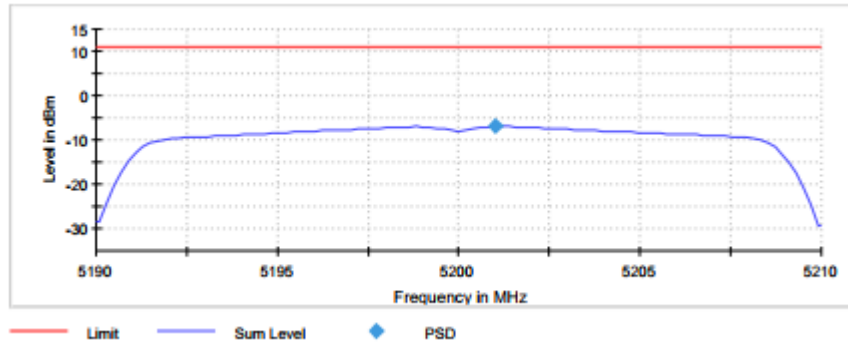


802.11ac_VHT20

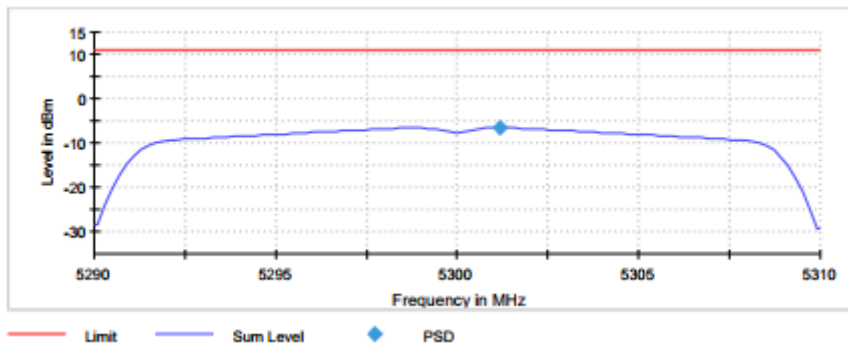
Frequency (MHz)	Channel No.	Measured Power Density (dBm)	Limit (dBm)	Result
5180	36	-8.191	11	Complies
5200	40	-6.925	11	Complies
5240	48	-7.063	11	Complies
5260	52	-9.074	11	Complies
5300	60	-6.545	11	Complies
5320	64	-6.931	11	Complies
5500	100	-7.036	11	Complies
5580	116	-8.248	11	Complies
5720	144	-7.734	11	Complies
5745	149	-10.052	30	Complies
5785	157	-10.469	30	Complies
5825	165	-8.949	30	Complies

Test Plot on Configuration : 802.11n_HT40

5200 MHz (40 ch)



5300 MHz (60 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

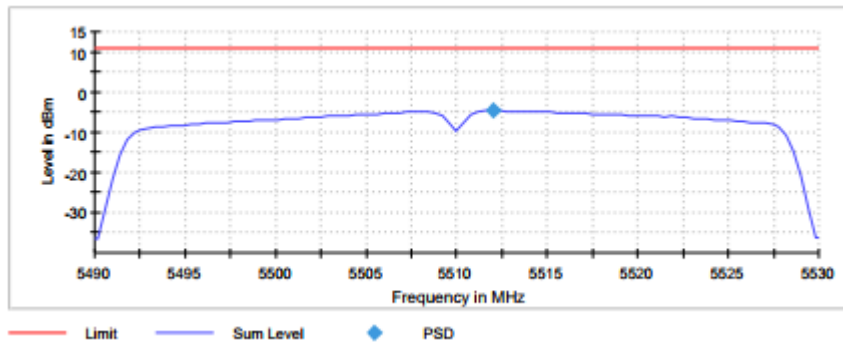


802.11n_HT40

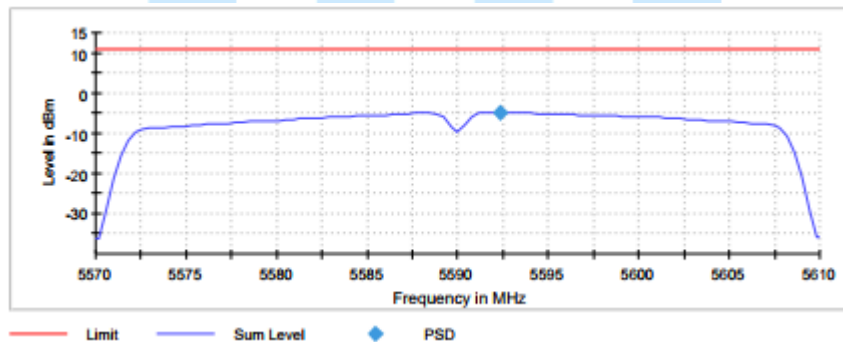
Frequency (MHz)	Channel No.	Measured Power Density (dBm)	Limit (dBm)	Result
5190	38		11	Complies
5230	46		11	Complies
5270	54		11	Complies
5310	62		11	Complies
5510	102		11	Complies
5590	110		11	Complies
5710	142		11	Complies
5755	151		30	Complies
5795	159		30	Complies

Test Plot on Configuration : 802.11n_HT40

5510 MHz (102 ch)



5590 MHz (110 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

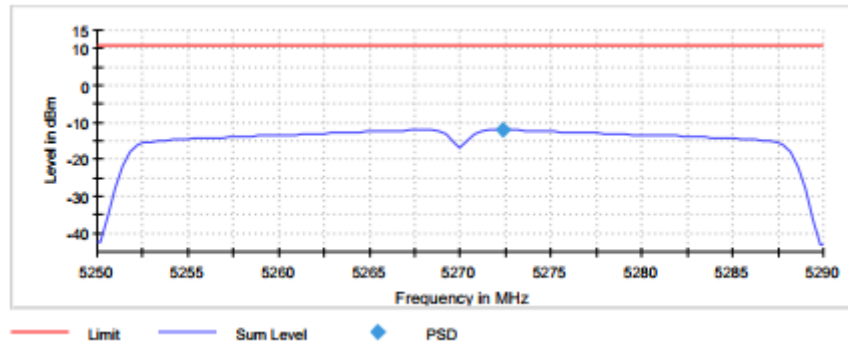


802.11ac_VHT40

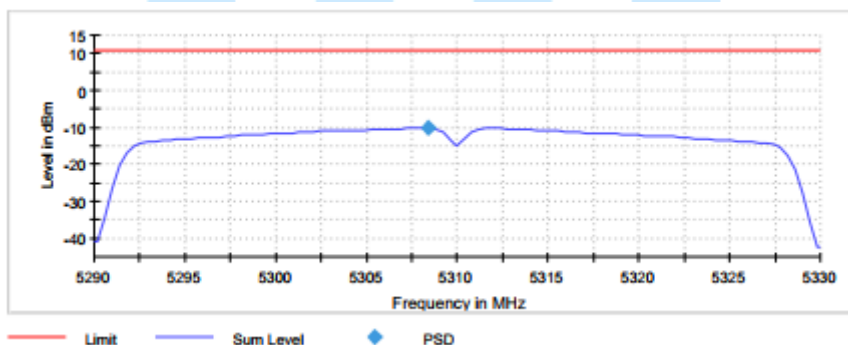
Frequency (MHz)	Channel No.	Measured Power Density (dBm)	Limit (dBm)	Result
5190	38	-11.303	11	Complies
5230	46	-9.728	11	Complies
5270	54	-12.053	11	Complies
5310	62	-10.152	11	Complies
5510	102	-10.709	11	Complies
5590	110	-12.280	11	Complies
5710	142	-11.158	11	Complies
5755	151	-13.642	30	Complies
5795	159	-13.234	30	Complies

Test Plot on Configuration : 802.11n_HT40

5230 MHz (46 ch)



5310 MHz (62 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.

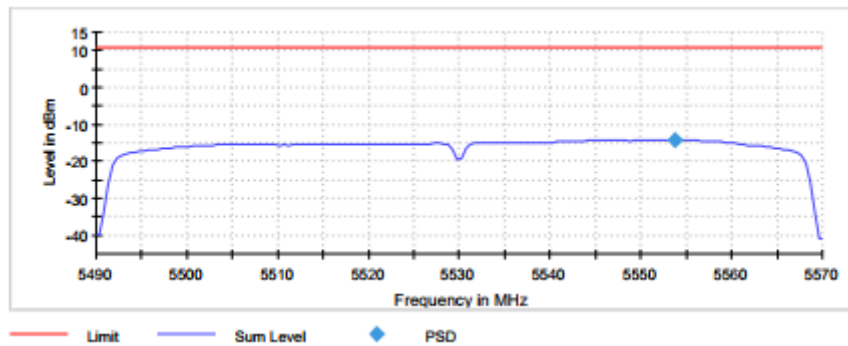


802.11ac_VHT80

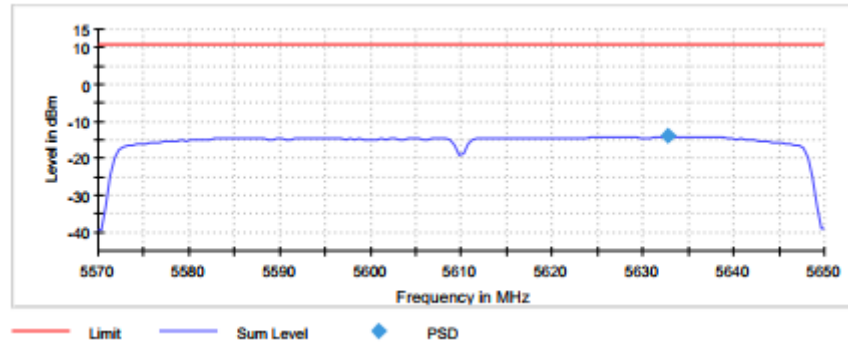
Frequency (MHz)	Channel No.	Measured Power Density (dBm)	Limit (dBm)	Result
5210	42	-14.862	11	Complies
5290	58	-15.384	11	Complies
5530	106	-14.129	11	Complies
5610	122	-14.025	11	Complies
5690	138	-16.497	11	Complies
5775	155	-17.506	30	Complies

Test Plot on Configuration : 802.11n_HT40

5530 MHz (106 ch)



5610 MHz (122 ch)



Note: In order to simplify the report, attached plots were only the most wide channel.



12. Frequency Stability

The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between 0 °C and 50 °C. The temperature was incremented by 10 °C intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

802.11a_Sartup (UNII 1 / 5 180 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	3.7	0	5180019103	19103
		10	5180002605	2605
		20	5179999132	-868
		30	5179988712	-11288
		40	5179980029	-19971
Min.	3.7 ¹⁾	20	5179979161	-20839
Max	4.2	20	5179999132	-868

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

1) This EUT enters low-power mode at 3.6V and powers down.



802.11a_2 minutes (UNII 1 / 5 180 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	3.7	0	5180019971	19971
		10	5180005210	5210
		20	5179998263	-1737
		30	5179986975	-13025
		40	5179980029	-19971
Min.	3.7	20	5179979161	-20839
Max	4.2	20	5179987844	-12156

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

802.11a_5 minutes (UNII 1 / 5 180 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	3.7	0	5180022576	22576
		10	5180007815	7815
		20	5179997395	-2605
		30	5179986975	-13025
		40	5179980029	-19971
Min.	3.7	20	5179979161	-20839
Max	4.2	20	5179985239	-14761

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



802.11a_10 minutes (UNII 1 / 5 180 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	3.7	0	5180020839	20839
		10	5180009551	9551
		20	5179997395	-2605
		30	5179986975	-13025
		40	5179980029	-19971
Min.	3.7	20	5179979161	-20839
Max	4.2	20	5179983502	-16498

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

802.11a_Startup (UNII 2A / 5 260 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	3.7	0	5260019971	19971
		10	5260002605	2605
		20	5259998263	-1737
		30	5259987844	-12156
		40	5259980029	-19971
Min.	3.7	20	5259979161	-20839
Max	4.2	20	5259987844	-12156

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



802.11a_2 minutes (UNII 2A / 5 260 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	3.7	0	5260020839	20839
		10	5260005210	5210
		20	5259997395	-2605
		30	5259986975	-13025
		40	5259979161	-20839
Min.	3.7	20	5259979161	-20839
Max	4.2	20	5259987844	-12156

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

802.11a_5 minutes (UNII 2A / 5 260 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	3.7	0	5260021708	21708
		10	5260007815	7815
		20	5259997395	-2605
		30	5259986107	-13893
		40	5259979161	-20839
Min.	3.7	20	5259979161	-20839
Max	4.2	20	5259984370	-15630

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



802.11a_10 minutes (UNII 2A / 5 260 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	3.7	0	5260020839	20839
		10	5260010420	10420
		20	5259997395	-2605
		30	5259986107	-13893
		40	5259980029	-19971
Min.	3.7	20	5259979161	-20839
Max	4.2	20	5259982634	-17366

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

802.11a_Startup (UNII 2C / 5 500 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	5	0	5500019971	19971
		10	5500001737	1737
		20	5499997395	-2605
		30	5499986107	-13893
		40	5499978292	-21708
Min.	3.7	20	5499978292	-21708
Max	4.2	20	5499985239	-14761

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



802.11a_2 minutes (UNII 2C / 5 500 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	5	0	5500020839	20839
		10	5500005210	5210
		20	5499994790	-5210
		30	5499985239	-14761
		40	5499978292	-21708
Min.	3.7	20	5499978292	-21708
Max	4.2	20	5499987844	-12156

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

802.11a_5 minutes (UNII 2C / 5 500 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	5	0	5500021708	21708
		10	5500006946	6946
		20	5499995658	-4342
		30	5499985239	-14761
		40	5499978292	-21708
Min.	3.7	20	5499978292	-21708
Max	4.2	20	5499984370	-15630

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



802.11a_10 minutes (UNII 2C / 5 500 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	5	0	5500020839	20839
		10	5500009551	9551
		20	5499995658	-4342
		30	5499985239	-14761
		40	5499978292	-21708
Min.	3.7	20	5499978292	-21708
Max	4.2	20	5499981766	-18234

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

802.11a_Startup (UNII 3 / 5 745 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	5	0	5745021708	21708
		10	5745002605	2605
		20	5744997395	-2605
		30	5744985239	-14761
		40	5744977424	-22576
Min.	3.7	20	5744977424	-22576
Max	4.2	20	5744985239	-14761

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



802.11a_2 minutes (UNII 3 / 5 745 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	5	0	5745021708	21708
		10	5745005078	5078
		20	5744995658	-4342
		30	5744985239	-14761
		40	5744977424	-22576
Min.	3.7	20	5744977424	-22576
Max	4.2	20	5744989580	-10420

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

802.11a_5 minutes (UNII 3 / 5 745 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	5	0	5745022576	22576
		10	5745008683	8683
		20	5744995658	-4342
		30	5744984370	-15630
		40	5744977424	-22576
Min.	3.7	20	5744977424	-22576
Max	4.2	20	5744984370	-15630

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



802.11a_10 minutes (UNII 3 / 5 745 000 000 Hz)

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)
100	5	0	5745022576	22576
		10	5745001420	1420
		20	5744996527	-3473
		30	5744984370	-15630
		40	5744977424	-22576
Min.	3.7	20	5744977424	-22576
Max	4.2	20	5744981766	-18234

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.



13. AC Power line Conducted emission

-Test Description

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (Test firm Registration Number: 269701)

The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.8 m in height and 0.4 m away from the vertical wall of the shielded enclosure.

The EUT is powered from the Rohde & Schwarz LISN (ENV216) and the support equipment is powered from the Rohde & Schwarz LISN (ENV216). Powers to the LISN are filtered by high-current high insertion loss power line filter.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCI).

Exploratory measurements were conducted to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Exploratory measurements were scanned using Peak mode of EMI Test receiver from 150 kHz to 30 MHz with 20 ms sweep time. The final measurements were measured with Quasi-Peak and Average mode.

The bandwidth of EMI Test Receiver was set to 9 kHz. Interface cables were connected to the available interface ports of the test unit. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

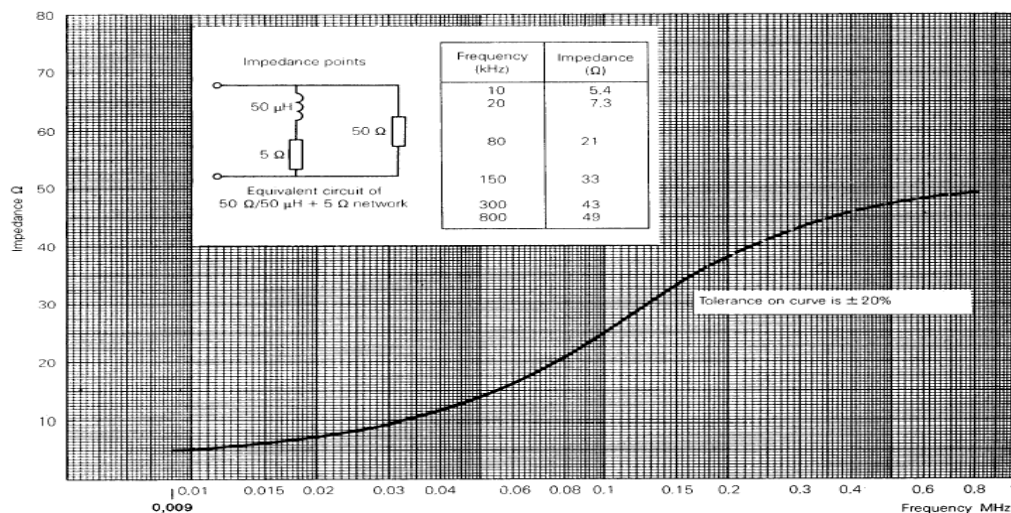


Fig 2. Impedance of LISN



13.1 Operating Environment

Temperature : 23.2 °C
Relative Humidity : 44.1 % R.H.

13.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.8 m heights above the floor, 0.4 m from the reference ground plane (GRP) wall and 0.8 m from AMN & ISN.

AMN is bonded on horizontal reference ground plane.

The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, were filtered.

13.3 Measurement Uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement.”

The measurement uncertainty was given with a confidence of 95 %.

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	3.69 dB	Confidence level of approximately 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	3.32 dB	Confidence level of approximately 95 % ($k = 2$)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



13.4 Limit

RFI Conducted	FCC Limit(dBμV/m) Class B	
Freq. Range	Quasi-Peak	Average
150 kHz ~ 0.5 MHz	66 ~ 56*	56 ~ 46*
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50
*Limits decreases linearly with the logarithm of frequency.		

13.5 Test Equipment used

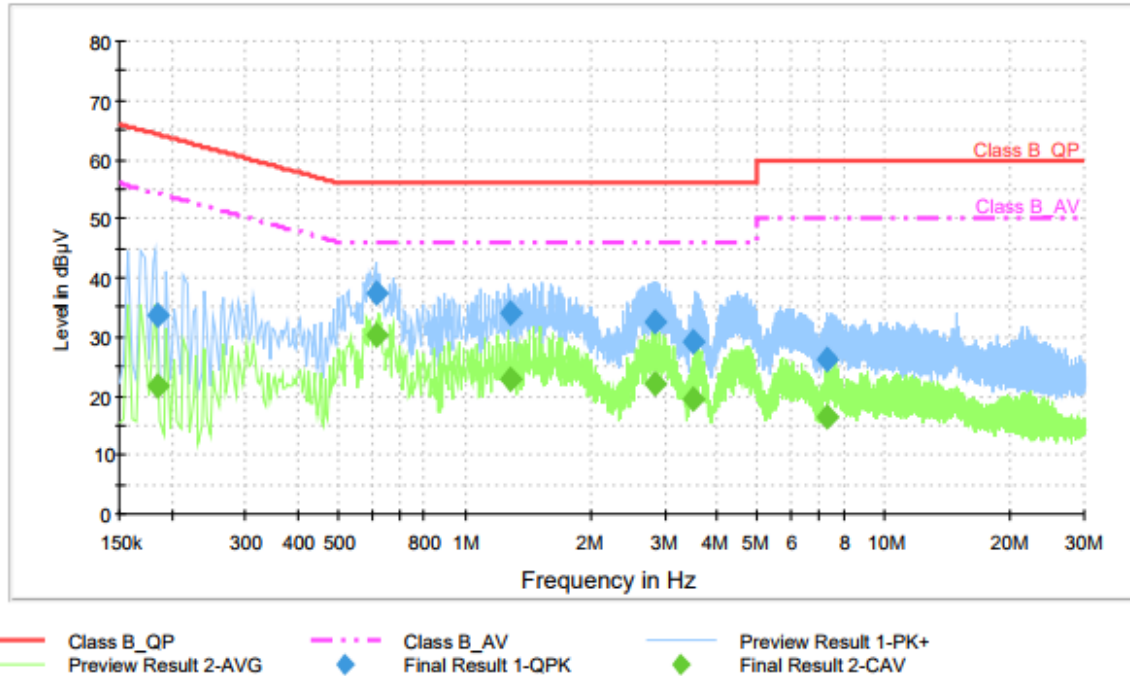
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■- ESCI	Rohde & Schwarz	EMI test receiver	100237	Apr. 03, 2025
□- ENV216	Rohde & Schwarz	LISN	100172	Apr. 03, 2025
■- ENV216	Rohde & Schwarz	LISN	100173	Apr. 03, 2025
■- EMC 32	Rohde & Schwarz	Testing Software	VER8.53	N/A

13.6 Test data for Conducted Emission

- Test Date : May 31, 2024
- Reference Standard : Part 15 Subpart C, Sec. 15.207
- Test Procedure(s) : ANSI C63.10 (2020)
- Operating Condition : Charging mode
- Power Source : AC 120 V / 60 Hz
- Frequency rage : 0.15 MHz to 30 MHz
- Line : AC Power Line (Live and Neutral)
- Comment :



EUT with cradle_Adaptor: DSA-10PF06-05 FUS



Final Result 1

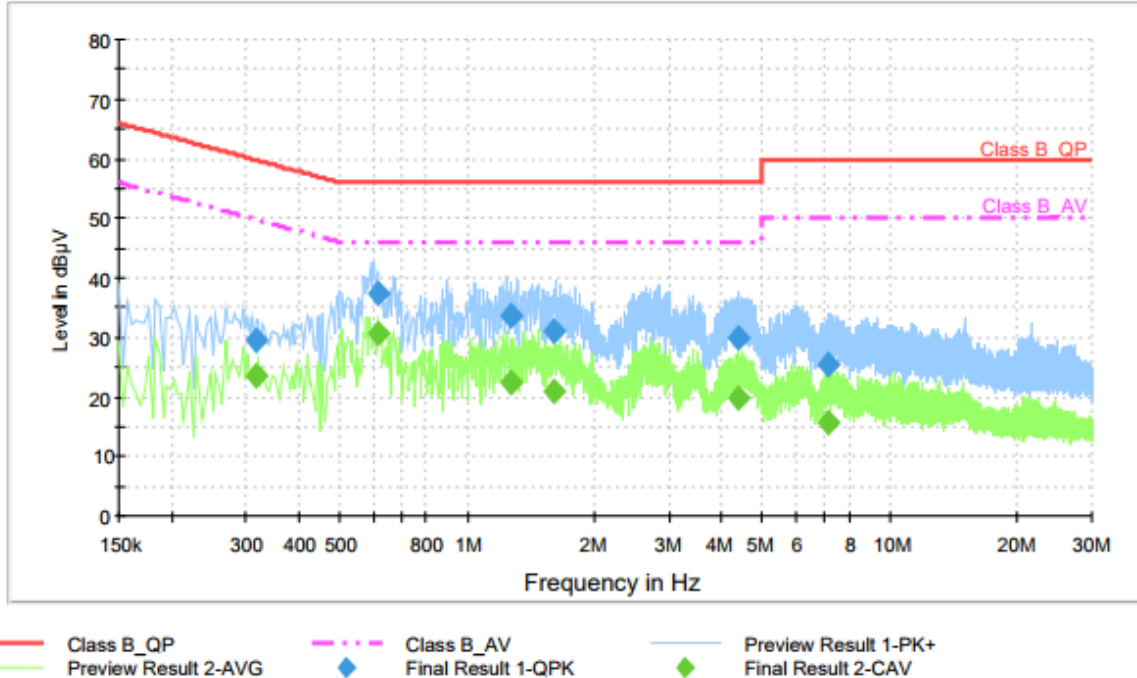
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.184081	33.8	1000.0	9.000	Off	N	9.4	30.5	64.3	
0.613175	37.4	1000.0	9.000	Off	N	9.5	18.6	56.0	
1.278144	34.0	1000.0	9.000	Off	L1	9.5	22.0	56.0	
2.832194	32.3	1000.0	9.000	Off	L1	9.5	23.7	56.0	
3.510744	29.2	1000.0	9.000	Off	L1	9.5	26.8	56.0	
7.344350	26.3	1000.0	9.000	Off	L1	9.6	33.7	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.184081	21.7	1000.0	9.000	Off	N	9.4	32.6	54.3	
0.613175	30.2	1000.0	9.000	Off	N	9.5	15.8	46.0	
1.278144	22.7	1000.0	9.000	Off	L1	9.5	23.3	46.0	
2.832194	22.0	1000.0	9.000	Off	L1	9.5	24.0	46.0	
3.510744	19.4	1000.0	9.000	Off	L1	9.5	26.6	46.0	
7.344350	16.3	1000.0	9.000	Off	L1	9.6	33.7	50.0	



EUT without cradle_Adaptor: DSA-10PF06-05 FUS



Final Result 1

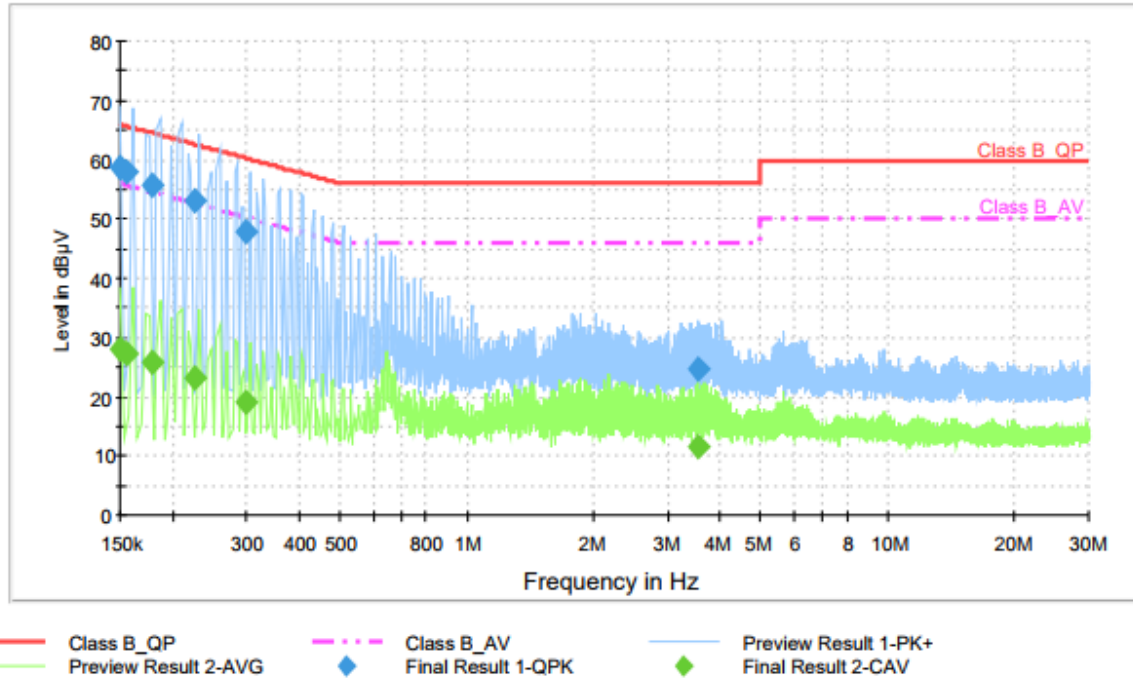
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.316019	29.7	1000.0	9.000	Off	N	9.4	30.1	59.8	
0.614519	37.6	1000.0	9.000	Off	N	9.5	18.4	56.0	
1.274756	33.5	1000.0	9.000	Off	L1	9.5	22.5	56.0	
1.600075	31.0	1000.0	9.000	Off	L1	9.5	25.0	56.0	
4.380662	29.7	1000.0	9.000	Off	L1	9.5	26.3	56.0	
7.176712	25.3	1000.0	9.000	Off	L1	9.6	34.7	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.316019	23.6	1000.0	9.000	Off	N	9.4	26.2	49.8	
0.614519	30.5	1000.0	9.000	Off	N	9.5	15.5	46.0	
1.274756	22.5	1000.0	9.000	Off	L1	9.5	23.5	46.0	
1.600075	21.0	1000.0	9.000	Off	L1	9.5	25.0	46.0	
4.380662	19.7	1000.0	9.000	Off	L1	9.5	26.3	46.0	
7.176712	15.7	1000.0	9.000	Off	L1	9.6	34.3	50.0	



EUT with cradle_Adaptor: DSA-18QFB FUS A



Final Result 1

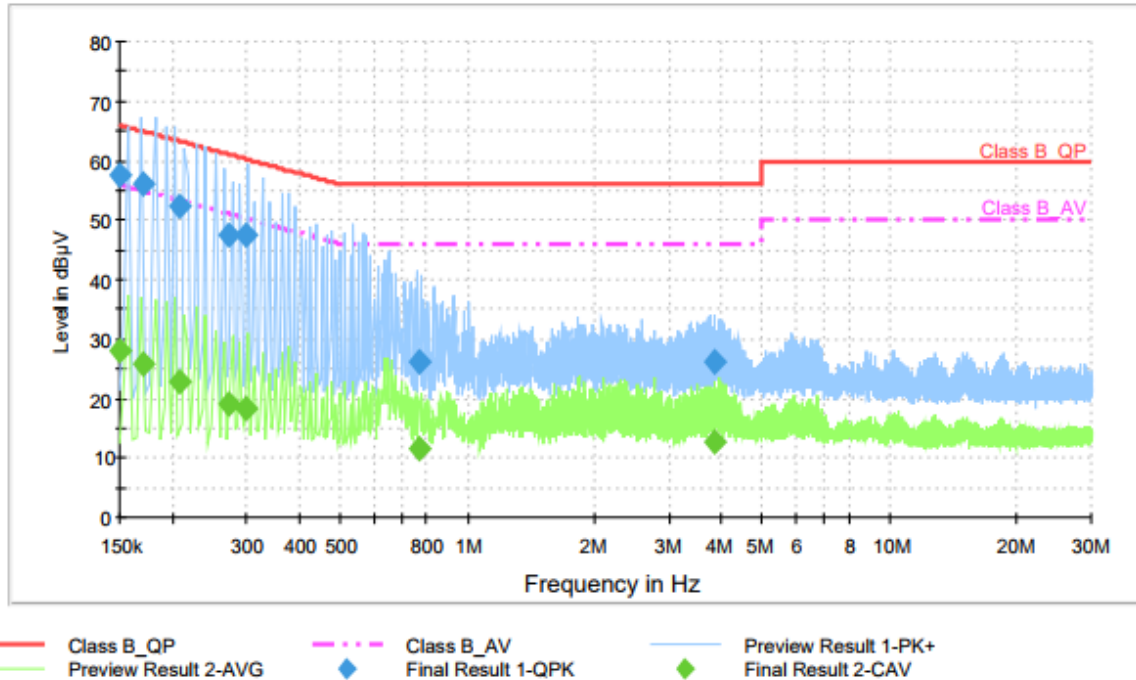
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	58.6	1000.0	9.000	Off	N	9.4	7.4	66.0	
0.155812	57.8	1000.0	9.000	Off	N	9.4	7.9	65.7	
0.178200	55.8	1000.0	9.000	Off	N	9.4	8.7	64.6	
0.226706	53.0	1000.0	9.000	Off	N	9.4	9.6	62.6	
0.297600	47.9	1000.0	9.000	Off	N	9.4	12.4	60.3	
3.540594	24.6	1000.0	9.000	Off	N	9.5	31.4	56.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	27.9	1000.0	9.000	Off	N	9.4	28.1	56.0	
0.155812	27.4	1000.0	9.000	Off	N	9.4	28.2	55.7	
0.178200	25.7	1000.0	9.000	Off	N	9.4	28.9	54.6	
0.226706	23.3	1000.0	9.000	Off	N	9.4	29.3	52.6	
0.297600	19.1	1000.0	9.000	Off	N	9.4	31.2	50.3	
3.540594	11.4	1000.0	9.000	Off	N	9.5	34.6	46.0	



EUT without cradle_Adaptor: DSA-18QFB FUS A



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	57.7	1000.0	9.000	Off	N	9.4	8.3	66.0	
0.170738	56.2	1000.0	9.000	Off	N	9.4	8.7	64.9	
0.208050	52.2	1000.0	9.000	Off	N	9.4	11.1	63.3	
0.271481	47.4	1000.0	9.000	Off	N	9.4	13.7	61.1	
0.297600	47.4	1000.0	9.000	Off	N	9.4	12.9	60.3	
0.766694	26.0	1000.0	9.000	Off	N	9.5	30.0	56.0	
3.847900	26.0	1000.0	9.000	Off	N	9.5	30.0	56.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	28.2	1000.0	9.000	Off	N	9.4	27.8	56.0	
0.170738	26.0	1000.0	9.000	Off	N	9.4	29.0	54.9	
0.208050	22.7	1000.0	9.000	Off	N	9.4	30.6	53.3	
0.271481	19.1	1000.0	9.000	Off	N	9.4	32.0	51.1	
0.297600	18.3	1000.0	9.000	Off	N	9.4	32.0	50.3	
0.766694	11.6	1000.0	9.000	Off	N	9.5	34.4	46.0	
3.847900	12.7	1000.0	9.000	Off	N	9.5	33.3	46.0	



14. Radiated Spurious & Restricted Band Edge Emission

Exploratory Radiated measurements were conducted at the 3m semi anechoic chamber in order to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Final measurements of below 1GHz were made at 3m or 10 m Chamber that complies with CISPR 16/ANSI C63.10. Above 1GHz final measurements were conducted at the 3m Chamber only.

For measurements above 1GHz, the bottom side of 3m chamber was installed with absorbers in order to meet SVSWR Limit.

Exploratory measurements were scanned using Peak mode of EMI Test receiver and final measurements were measured with Quasi-Peak mode (Below 1GHz) and Peak & Average mode (Above 1GHz).

The measurements were performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity.

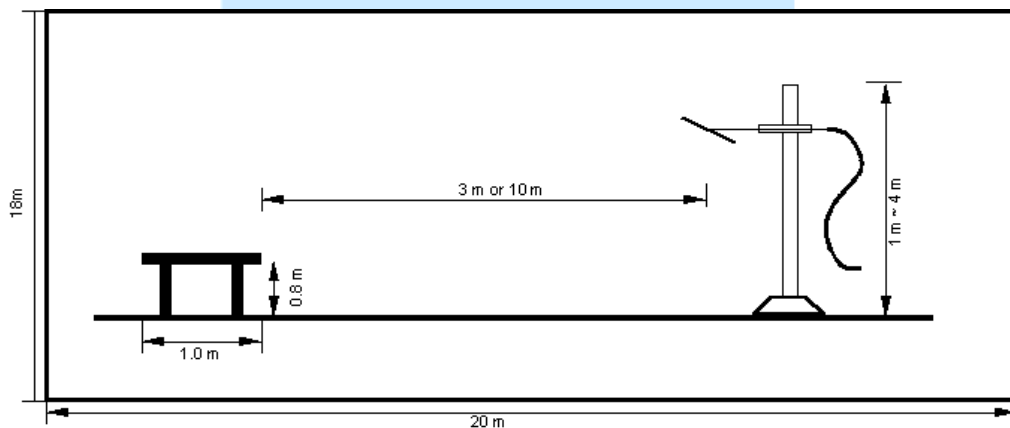


Fig 3. Dimensions of test site (Below 1GHz)

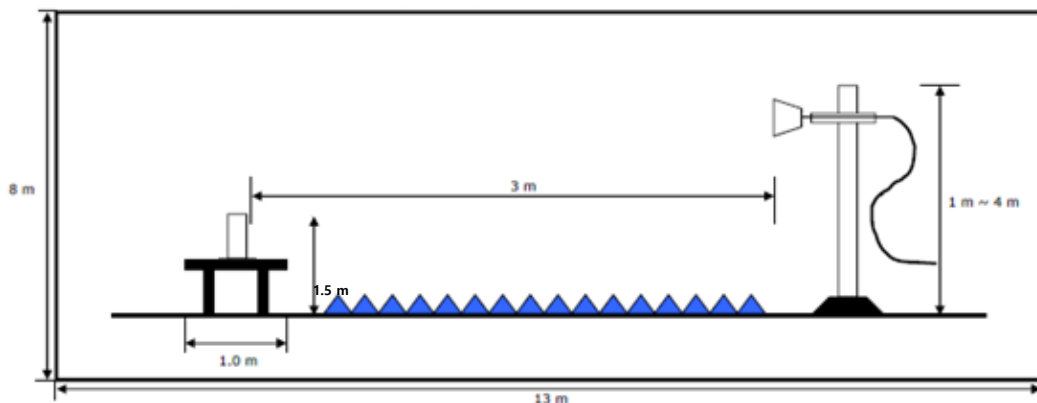


Fig 4. Dimensions of test site (Above 1GHz)



14.1 Operating environment

Temperature : 28.4 °C
Relative humidity : 50.8 % R.H.

14.2 Test set-up

A preliminary and final measurement was at 3 m anechoic chamber.

The EUT was placed on a non-conducting table.

For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane.

For emission measurements above 1 GHz, the table height is 1.5 m above the reference ground plane.

The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels.

This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

14.3 Measurement uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.

The measurement uncertainty was given with a confidence of 95 %.

Test items(Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	4.78 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	4.77 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	6.20 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	5.12 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m, V/H)	5.77 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (6 000 MHz ~ 18 000 MHz, 3 m, V/H)	4.88 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (18 000 MHz ~ 26 000 MHz, 3 m, V/H)	5.03 dB	Confidence level of approximately 95 % ($k = 2$)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



14.4 Limit

20 dB in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2 400/F (kHz)	300
0.490 ~ 1.705	2 400/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

14.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESW44	Rohde & Schwarz	EMI Test Receiver	103354	Apr. 03, 2025
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	100041	Apr. 05, 2025
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3313	Apr. 19, 2025
■ - HF907	Rohde & Schwarz	Horn Antenna	103197	Jan. 24, 2025
■ - BBHA9170	Schwarzbeck	Horn Antenna	766	Apr. 09, 2025
■ - MCU066	maturo GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ - CO3000	Innco system GmbH	Position Controller	CO3000/1804/4 2760218/P	N/A
■ - MA4640-XP-ET	Innco system GmbH	Antenna Mast	5580916	N/A
■ - 310N	Sonoma Instrument	Amplifier	187164	Apr. 03, 2025
■ - TK-PA18H	TESTEK	Low Noise Amplifier	220107L	Apr. 02, 2025
■ - TK-PA1840H	TESTEK	Amplifier	170007-L	Apr. 08, 2025
■ - WHKX3.0/18G-10SS	WAINWRIGHT INSTRUMENTS	High pass filter	SN31	Apr. 04, 2025
■ - EMC 32	Rohde & Schwarz	Testing Software	VER10.50.10	N/A



14.6 Test data for Radiated Spurious Emission & Radiated Restricted Band Edge Emission

- Test Date : May 21 , 2024 ~ Jun. 17, 2024
- Reference Standard : Part 15 Subpart E, Sec. 15.407(b)
- Measuring Distance : 3 m
- Resolution Bandwidth : 200 Hz, 9 kHz(Below 30 MHz) / 120 kHz(30 MHz ~ 1GHz) / 1 MHz(Above 1GHz)
- Detector mode : Quasi Peak detector mode / Peak detector mode / Average detector mode
- Power Source : DC 3.7 V
- Note : Through three orthogonal axes were investigated and the worst case is report

Radiated Spurious Emission (9 kHz to 30 MHz)

※ The reading of emissions are attenuated more than 10 dB below the permissible limits.

Radiated Spurious Emission (30 MHz to 1 000 MHz)

802.11 Standard	Ch.	Frequency [MHz]	Pol.	Reading [dBuV]	Transducer Factor [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
a	60	248.99	H	59.44	-17.20	42.24	46.02	3.78	QPK
	48	799.97	H	46.46	-3.40	43.06	46.02	2.96	QPK
n (HT20)	60	248.99	H	59.44	-17.20	42.24	46.02	3.81	QPK
	48	799.97	H	46.53	-3.40	43.13	46.02	2.89	QPK
n (HT40)	151	248.99	H	58.89	-17.20	41.69	46.02	4.33	QPK
	38	799.97	H	45.97	-3.40	42.57	46.02	3.45	QPK
ac (VHT20)	40	248.98	H	59.42	-17.20	42.22	46.02	3.80	QPK
	144	799.97	H	45.9	-3.40	42.50	46.02	3.52	QPK
ac (VHT40)	142	248.99	H	58.88	-17.20	41.68	46.02	4.34	QPK
	151	799.97	H	46.03	-3.40	42.63	46.02	3.39	QPK
ac (VHT80)	42	248.99	H	58.81	-17.20	41.61	46.02	4.41	QPK
	42	799.97	H	46.42	-3.40	43.02	46.02	3.00	QPK

Note:

Test Result = Reading + AF+AMP / CL

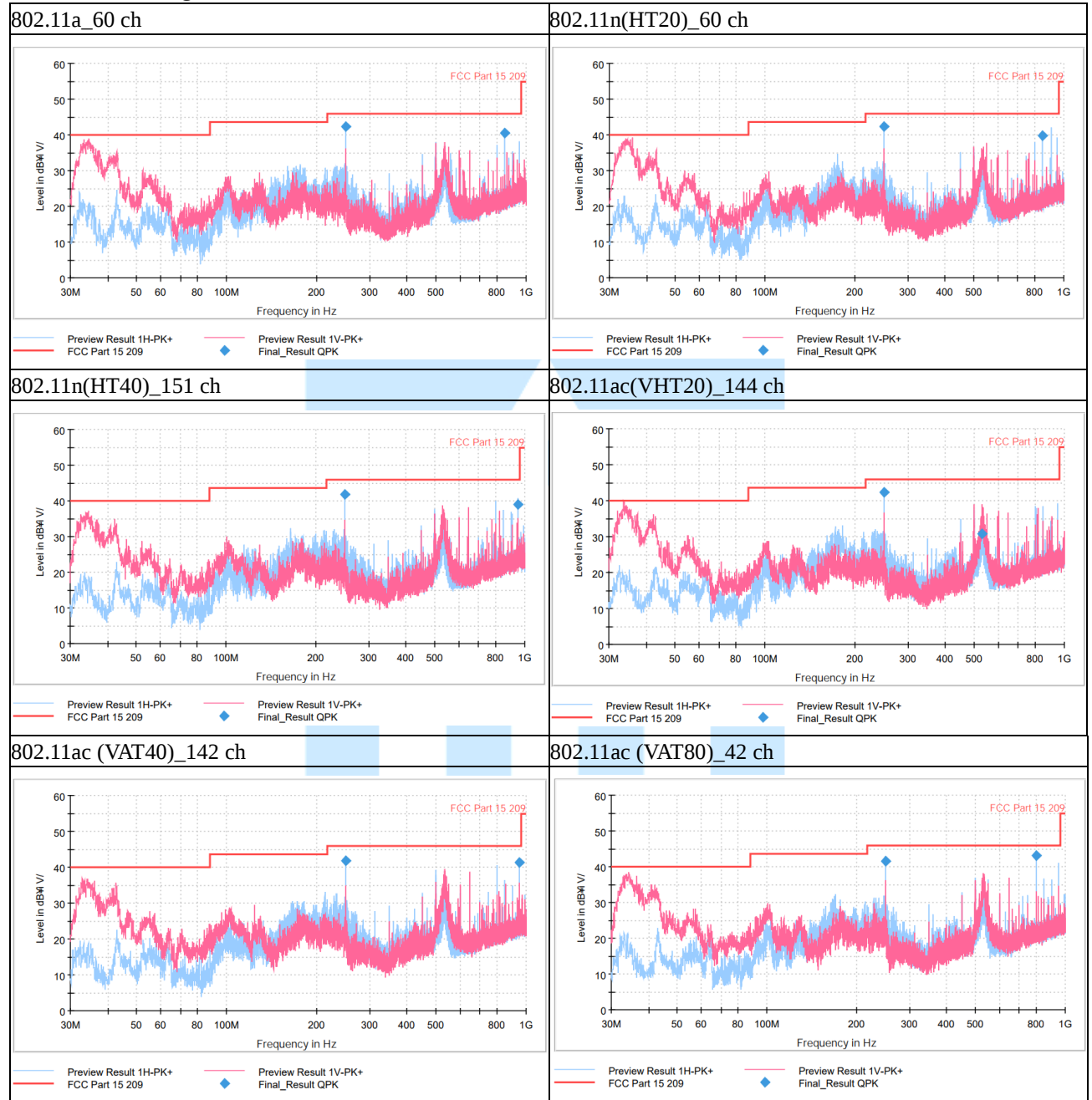
Where, AF : Antenna Collection Factor,

AMP / CL = Cable loss + Preamplifier gain + High Pass Filter

Pol.: H(Horizontal), V(Vertical)



Test Plot on Configuration



Note 1): To simplify the report, only plots of representative channels are attached.



Radiated Spurious Emission (1 GHz to 40 GHz)

802.11 Standard	Ch.	Frequency [MHz]	Pol.	Reading [dBuV]	Transducer Factor [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
a	116	11156.30	V	42.20	7.80	50.00	54.00	4.00	AV
n (HT20)	116	11164.63	V	42.55	7.70	50.25	54.00	3.75	AV
n (HT40)	110	11184.03	V	41.81	7.50	49.31	54.00	4.69	AV
ac (VHT20)	116	11164.36	V	42.78	7.70	50.48	54.00	3.52	AV
ac (VHT40)	110	11174.40	V	41.91	7.60	49.51	54.00	4.49	AV
ac (VHT80)	106	11058.06	V	35.27	7.50	42.77	54.00	11.23	AV

Note:

Test Result = Reading + AF+AMP / CL

Where, AF : Antenna Collection Factor,

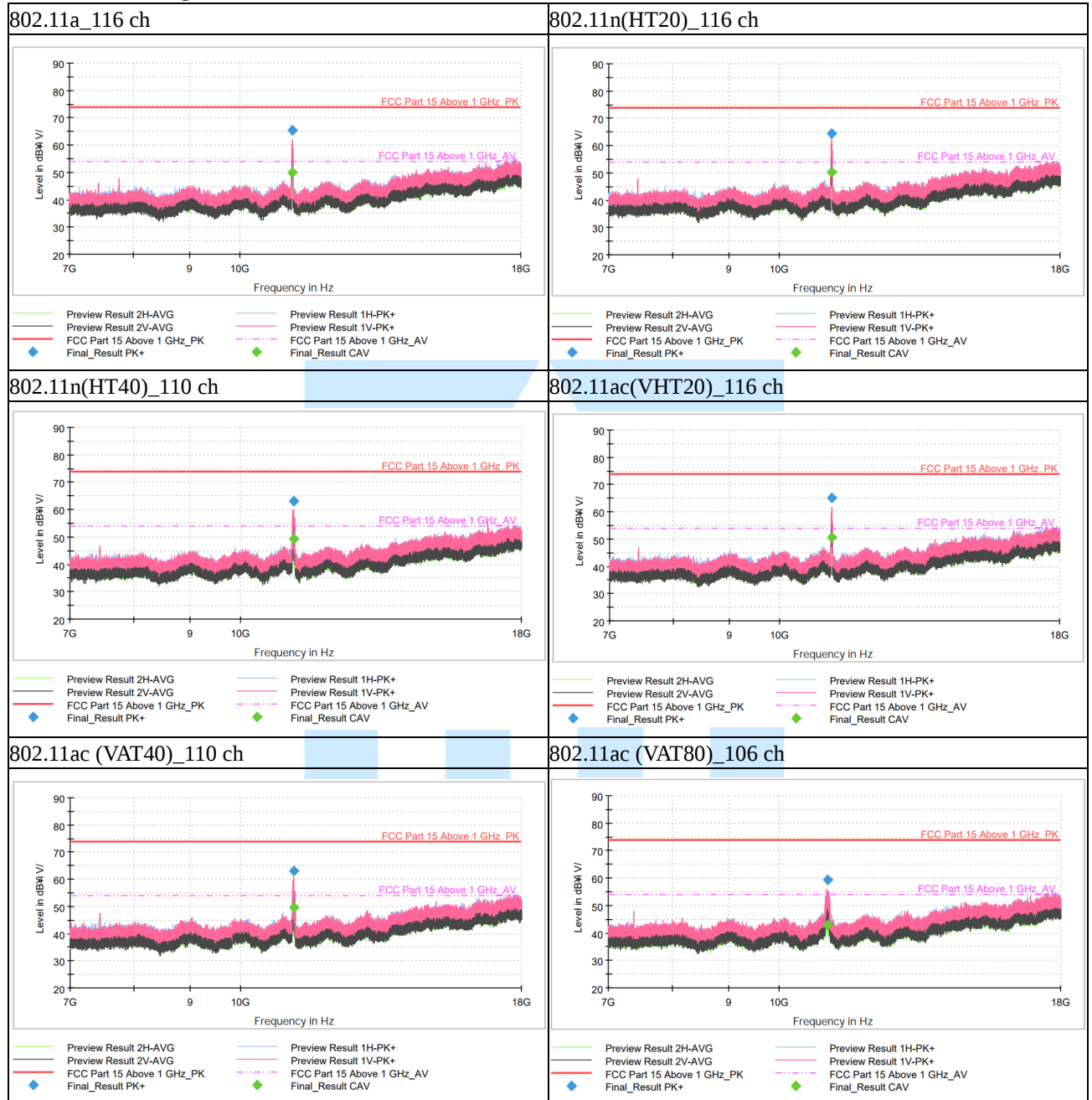
AMP / CL = Cable loss + Preamplifier gain + High Pass Filter

Pol.: H(Horizontal), V(Vertical)

※ If the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.



Test Plot on Configuration



Note 1): To simplify the report, only plots of representative channels are attached.



Radiated Restricted Band Edge Emission

- Test Date : Jun. 13-17, 2024
- Reference Standard : Part 15 subpart E, Sec. 15.407(b)
- Measuring Distance : 3 m
- Resolution Bandwidth : 1 MHz
- Detector mode : Peak detector mode / Average detector mode
- Power Source : DC 3.7 V
- Note : Through three orthogonal axes were investigated and the worst case is report

802.11 Standard	Ch.	Frequency [MHz]	Pol.	Reading [dBuV]	Transducer Factor [dB]	Test Result [dBuV/m]	Limits [dBuV/m]	Margin [dB]	Detector Type
a	36	N/A							
	64	5351.20	V		-0.20	64.65	74.00	9.35	PK
	100	5468.48	V		0.40	48.66	54.00	5.34	AV
n (HT20)	36	N/A							
	64	5352.40	V		-0.20	64.22	74.00	9.78	PK
	100	5469.68	V		0.40	49.69	54.00	4.31	AV
n (HT40)	38	5150.00	V		0.20	42.93	54.00	11.07	AV
	62	5350.00	V		-0.20	50.44	54.00	3.56	AV
	102	5467.28	V		0.30	49.16	54.00	4.84	AV
ac (VHT20)	36	N/A							
	64	5350.00	V		-0.20	42.34	54.00	11.66	AV
	100	5469.83	V		0.40	41.57	54.00	12.43	AV
ac (VHT40)	38	5148.80	V		0.10	38.01	54.00	15.99	AV
	62	5350.00	V		-0.20	46.37	54.00	7.63	AV
	102	5469.97	V		0.40	46.69	54.00	7.31	AV
ac (VHT80)	42	5149.27	V		0.20	41.78	54.00	12.22	AV
	58	5352.00	V		-0.20	49.08	54.00	4.92	AV
	106	5467.43	V		0.30	48.48	54.00	5.52	AV

Note:

Test Result = Reading + AF+AMP / CL

Where, AF : Antenna Collection Factor,

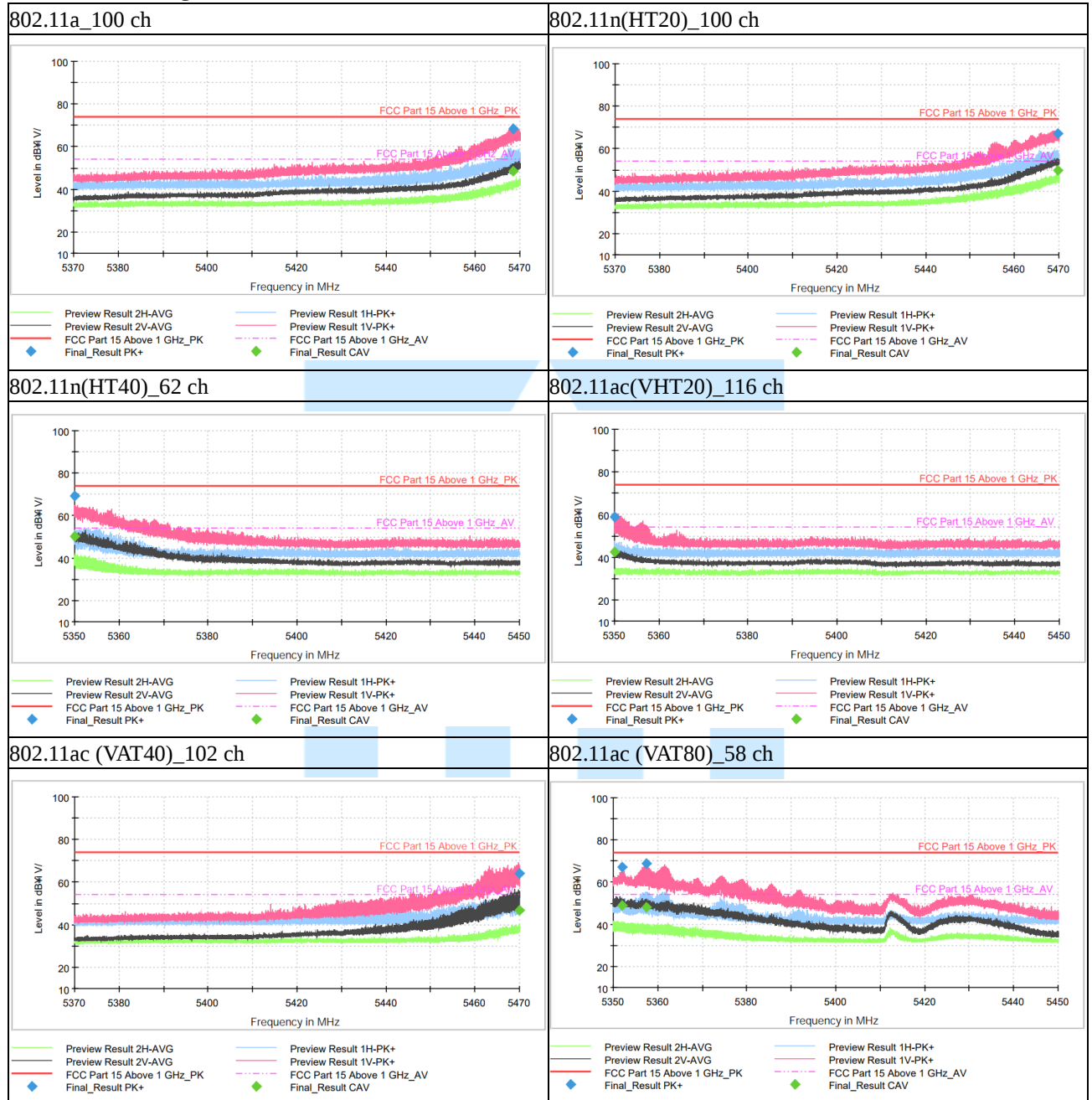
AMP / CL = Cable loss + Preamplifier gain + High Pass Filter

Pol.: H(Horizontal), V(Vertical)

※ If the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.



Test Plot on Configuration



Note 1): To simplify the report, only plots of representative channels are attached.



15. Sample Calculations

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \text{ Log}_{10}(\mu\text{V}/\text{m}) \\ \text{dB}\mu\text{V} &= \text{dBm} + 107 \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

15.1 Example 1 :

■ 20.3 MHz

Class B Limit	= 250 μV = 48 dB μV
Reading	= 39.2 dB μV
10 ^(39.2dBμV/20)	= 91.2 μV
Margin	= 48 dB μV - 39.2 dB μV
	= 8.8 dB

15.2 Example 2 :

■ 66.7 MHz

Class B Limit	= 100 $\mu\text{V}/\text{m}$ = 40.0 dB $\mu\text{V}/\text{m}$
Reading	= 31.0 dB μV
Antenna Factor + Cable Loss	= 5.8 dB
Total	= 36.8 dB $\mu\text{V}/\text{m}$
Margin	= 40.0 dB $\mu\text{V}/\text{m}$ – 36.8 dB $\mu\text{V}/\text{m}$
	= 3.2 dB



16. Recommendation & Conclusion

The data collected shows that the **Summit Technology Touch Screen Controller (Model Name: TDC-8300)** was complies with §15.407 of the FCC Rules.

- The end -

