Prüfbericht-Nr.: *Test report no.:*	CN25K6BL 001	**Auftrags-Nr.:** *Order no.*:	48251419	Seite 1 von 49 *Page 1 of 49*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2024-08-23	
Auftraggeber: *Client:*	Toast, Incorporated 333 Summer Street, Boston, MA 02210 United States Of America			
Prüfgegenstand: *Test item:*	Toast Terminal			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	TT300			
Auftrags-Inhalt: *Order content*:	FCC Part 15E Test report (WiFi 5GHz)			
Prüfgrundlage: *Test specification:*	FCC 47CFR Part 15: Subpart E Section 15.407			
Wareneingangsdatum: *Date of sample receipt:*	2024-10-07			
Prüfmuster-Nr.: *Test sample no:*	A003831983-001 A003858647-001			
Prüfzeitraum: *Testing period:*	2024-10-24 - 2025-02-06			
Ort der Prüfung: *Place of testing:*	EMC/RF Taipei Testing Site			
Prüflaboratorium: *Testing laboratory:*	Taipei Testing Laboratories			
Prüfergebnis*: *Test result*:*	Pass			

überprüft von: *compiled by:*	David Huang	**genehmigt von:** authorized by:	Brenda Chen
Datum: *Date:* 2025-02-06		**Ausstellungsdatum:** *Issue date:* 2025-02-06	
Stellung / *Position:*	David Huang Project Manager	**Stellung** / *Position:*	Senior Project Manager

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature *As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature*
3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.407(a) & 15.203	Antenna Requirement	Pass
5.1.2	15.407(a)	Maximum Conducted Output Power	Pass
5.1.3	15.407(h)(1)	Transmit Power Control (TPC)	Pass
5.1.4	15.407(a)	26 dB Bandwidth	Pass
5.1.4	2.1049	99% Occupied Bandwidth	Pass
5.1.5	15.407(e)	6 dB Bandwidth (U-NII-3 Band only)	Pass
5.1.6	15.407(g)	Frequency Stability	Pass
5.1.7	15.407(a)	Power Spectral Density	Pass
5.1.8	15.407(b) & 15.205 & 15.209	Radiated Spurious Emissions and Band Edges	Pass
5.1.9	15.407(h) & KDB 905462 D02	Dynamic Frequency Selection	Pass
5.2.1	15.207	Mains Conducted Emission	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Contents

HISTORY OF THIS TEST REPORT

Revision	Description	Date Issued
R01	Original Release	2025-02-06

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix A - Test Result of Conducted
Appendix B - Test Result of Radiated Emissions & Mains Conducted Emission
Appendix SP - Photographs of Test Setup
Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart E Section 15.407
FCC 47CFR Part 2: Subpart J Section 2.1049
ANSI C63.10:2013
KDB 789033 D02 General UNII Test Procedures New Rules v02r01
KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
KDB 662911 D01 Multiple Transmitter Output v02r01

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 180491
ISED Registration No.: 25563

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of k=2 to indicate a 95% level of confidence.

Emission Measurement Uncertainty

Parameter	Uncertainty
Radiated Emission (9 kHz ~ 30 MHz)	± 1.15 dB
Radiated Emission (30 MHz ~ 200 MHz)	± 1.30 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.30 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.54 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.52 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Toast Terminal. It contains a WLAN compatible module enabling the user to communicate data through a Wireless interface.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Toast Terminal
Type Identification	TT300
FCC ID	2AMNG-TT300

Technical Specification of EUT

Item	EUT information
Operating Frequency	U-NII-1: 5150 MHz ~ 5250 MHz U-NII-2A: 5250 MHz ~ 5350 MHz U-NII-2C: 5470 MHz ~ 5725 MHz U-NII-3: 5725 MHz ~ 5850 MHz
Channel Number	<5150 MHz ~ 5350 MHz> 8 for 802.11a/n/ac/ax HT20/VHT20/HE20 4 for 802.11n/ac/ax HT40/VHT40/HE40 2 for 802.11ac/ax VHT80/HE80 1 for 802.11ac/ax VHT160/HE160 <5470 MHz ~ 5725 MHz> 12 for 802.11a/n/ac/ax HT20/VHT20/HE20 6 for 802.11n/ac/ax HT40/VHT40/HE40 3 for 802.11ac/ax VHT80/HE80 1 for 802.11ac/ax VHT160/HE160 <5725 MHz ~ 5850 MHz> 5 for 802.11a/n/ac/ax HT20/VHT20/HE20 2 for 802.11n/ac/ax HT40/VHT40/HE40 1 for 802.11ac/ax VHT80/HE80
Data Rate	802.11a: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to MCS7 802.11ac: up to MCS9 802.11ax: up to MCS11
Operation Voltage	12 Vdc
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) OFDMA (1024QAM)

Item	EUT information
Maximum Output Power (mW)	5180 ~ 5240 MHz: 81.76 5260 ~ 5320 MHz: 90.12 5500 ~ 5720 MHz: 65.79 5745 ~ 5825 MHz: 73.89
Maximum EIRP (mW)	5260 ~ 5320 MHz: 201.75 5500 ~ 5720 MHz: 181.20
DFS Mode	Slave without radar detection
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.4

3.3 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.4 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.
During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output expected by the customer and is going to be fixed on the firmware of the final end product.

Table for Parameters of Test Software Setting

802.11a		802.11n HT20 802.11ac VHT20 802.11ax HE20		802.11n HT40 802.11ac VHT40 802.11ax HE40		802.11ac VHT80 802.11ax HE80		802.11ac VHT160 802.11ax HE160	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
36	16	36	15	38	12	42	11.5	50	9.5
40	16	40	16	46	15.5	58	11	114	9.5
48	16	48	16	54	15	106	9		
52	16	52	16	62	12	122	12.5		
60	16	60	16	102	11.5	138	15		
64	16	64	13	110	15	155	13		
100	16	100	13	134	12				
116	16	116	16	142	15.5				
140	16	140	11	151	15.5				
144	16	144	16	159	15.5				
149	16	149	16						
157	16	157	16						
165	16	165	16						

<Partial RU>

802.11ax HE20						
Channel	RU Config.	Power Setting	RU Config.	Power Setting	RU Config.	Power Setting
36	26/0	5	52/37	8	106/53	11
40	26/0	6	52/37	9	106/53	12
48	26/8	6.5	52/40	9.5	106/54	12.5
52	26/0	6	52/37	9	106/53	12
60	26/0	5.5	52/37	8.5	106/53	11.5
64	26/8	3.5	52/40	6.5	106/54	9
100	26/0	4	52/37	6.5	106/53	9
116	26/0	6	52/37	9	106/53	12
140	26/8	3.5	52/40	5	106/54	7.5
144	26/8	6	52/40	9	106/54	12
149	26/0	6	52/37	9	106/53	12
157	26/0	6	52/37	9	106/53	12
165	26/8	6.5	52/40	9.5	106/54	12

802.11ax HE40			802.11ax HE80			802.11ax HE160		
Channel	RU Config.	Power Setting	Channel	RU Config.	Power Setting	Channel	RU Config.	Power Setting
38	242/61	10.5	42	484/65	11.5	50	996/67	9
46	242/62	14	58	484/65	10.5	114	996/67	8
54	242/61	13.5	106	484/65	8			
62	242/62	10.5	122	484/66	11			
102	242/61	10.5	138	484/66	8.5			
110	242/61	13.5	155	484/65	12			
134	242/62	10						
142	242/62	10						
151	242/61	13						
159	242/62	13						

4.2 Carrier Frequency and Channel

Band	Channel	Frequency (MHz)	802.11a 802.11n HT20 802.11ac VHT20 802.11ax HE20	802.11n HT40 802.11ac VHT40 802.11ax HE40	802.11ac VHT80 802.11ax HE80	802.11ac VHT160 802.11ax HE160
U-NII-1 (Band 1)	36	5180	V			
	38	5190		V		
	40	5200	V			
	42	5210			V	
	44	5220	V			
	46	5230		V		
	48	5240	V			
U-NII-2A (Band 2)	50	5250				V
	52	5260	V			
	54	5270		V		
	56	5280	V			
	58	5290			V	
	60	5300	V			
	62	5310		V		
	64	5320	V			
U-NII-2C (Band 3)	100	5500	V			
	102	5510		V		
	104	5520	V			
	106	5530			V	
	108	5540	V			
	110	5550		V		
	112	5560	V			
	114	5570				V
	116	5580	V			
	118	5590		V		
	120	5600	V			
	122	5610			V	
	124	5620	V			
	126	5630		V		
	128	5640	V			
	132	5660	V			
	134	5670		V		
	136	5680	V			
	140	5700	V			
Straddle Channel	138	5690			V	
	142	5710		V		
	144	5720	V			
U-NII-3 (Band 4)	149	5745	V			
	151	5755		V		
	153	5765	V			
	155	5775			V	
	157	5785	V			
	159	5795		V		
	161	5805	V			
	165	5825	V			

4.3 Test Operation and Test Software

Setup for testing: Test samples are provided with a USB interface which makes it possible to control them through a test software installed on a notebook computer.
This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed as below.

Test Software	QRCT

The samples were used as follows:
A003831983-001
A003858647-001
Full test was applied on all test modes, but only worst case was shown.

Modulation Mode	Tx Function
802.11b	2TX
802.11g	2TX
802.11n HT20	2TX
802.11n HT40	2TX
802.11ac VHT20	2TX
802.11ac VHT40	2TX
802.11ac VHT80	2TX
802.11ac VHT160	2TX
802.11ax HE20	2TX
802.11ax HE40	2TX
802.11ax HE80	2TX
802.11ax HE160	2TX

* The modulation and bandwidth are similar for 802.11n mode HT20/HT40 and 802.11ac mode VHT20/VHT40/VHT80/VHT160 and 802.11ax mode HE20/HE40/HE80/HE160, therefore, only investigated worse case as representative mode in test report.
** All modes for Full RU and Partial RU had been pre-tested, and Full RU is found as the worst case for the final tests.

EUT Configure Mode	Applicable To				Description
	Antenna Port Conducted Measurement	Radiated Spurious Emissions above 1 GHz	Radiated Spurious Emissions below 1 GHz	Mains Conducted Emission	
-	√	√	√	√	-

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on **Y-plane**.
2. "-" means no effect.

Antenna Port Conducted Measurement

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
-	802.11a	5180-5250	36 to 48	36, 40, 48	6.0
-		5250-5320	52 to 64	52, 60, 64	
-		5500-5720	100 to 144	100, 116, 140, 144	
-		5745-5825	149 to 165	149, 157, 165	
-	802.11n HT20 (Power only)	5180-5250	36 to 48	36, 40, 48	MCS0
-		5250-5320	52 to 64	52, 60, 64	
-		5500-5720	100 to 144	100, 116, 140, 144	
-		5745-5825	149 to 165	149, 157, 165	
-	802.11n HT40 (Power only)	5180-5250	38 to 46	38, 46	MCS0
-		5250-5320	54 to 62	54, 62	
-		5500-5720	102 to 142	102, 110, 134, 142	
-		5745-5825	151 to 159	151, 159	
-	802.11ac VHT20 (Power only)	5180-5250	36 to 48	36, 40, 48	NSS1 MCS0
-		5250-5320	52 to 64	52, 60, 64	
-		5500-5720	100 to 144	100, 116, 140, 144	
-		5745-5825	149 to 165	149, 157, 165	
-	802.11ac VHT40 (Power only)	5180-5250	38 to 46	38, 46	NSS1 MCS0
-		5250-5320	54 to 62	54, 62	
-		5500-5720	102 to 142	102, 110, 134, 142	
-		5745-5825	151 to 159	151, 159	
-	802.11ac VHT80 (Power only)	5180-5250	42	42	NSS1 MCS0
-		5250-5320	58	58	
-		5500-5720	106 to 138	106, 122, 138	
-		5745-5825	155	155	
-	802.11ac VHT160 (Power only)	5180-5320	50	50	NSS1 MCS0
-		5500-5720	114	114	
-	802.11ax HE20	5180-5250	36 to 48	36, 40, 48	NSS1 MCS0
-		5250-5320	52 to 64	52, 60, 64	
-		5500-5720	100 to 144	100, 116, 140, 144	
-		5745-5825	149 to 165	149, 157, 165	
-	802.11ax HE40	5180-5250	38 to 46	38, 46	NSS1 MCS0
-		5250-5320	54 to 62	54, 62	
-		5500-5720	102 to 142	102, 110, 134, 142	
-		5745-5825	151 to 159	151, 159	
-	802.11ax HE80	5180-5250	42	42	NSS1 MCS0
-		5250-5320	58	58	
-		5500-5720	106 to 138	106, 122, 138	
-		5745-5825	155	155	
-	802.11ax HE160	5180-5320	50	50	NSS1 MCS0
-		5500-5720	114	114	

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
-	802.11ax HE20_RU26 / RU52 / RU106 (Power & PSD only)	5180-5250	36 to 48	36, 40, 48	NSS1 MCS0
-		5250-5320	52 to 64	52, 60, 64	
-		5500-5720	100 to 144	100, 116, 140, 144	
-		5745-5825	149 to 165	149, 157, 165	
-	802.11ax HE40_RU242 (Power & PSD only)	5180-5250	38 to 46	38, 46	NSS1 MCS0
-		5250-5320	54 to 62	54, 62	
-		5500-5720	102 to 142	102, 110, 134, 142	
-		5745-5825	151 to 159	151, 159	
-	802.11ax HE80_RU484 (Power & PSD only)	5180-5250	42	42	NSS1 MCS0
-		5250-5320	58	58	
-		5500-5720	106 to 138	106, 122, 138	
-		5745-5825	155	155	
-	802.11ax HE160_RU996 (Power & PSD only)	5180-5320	50	50	NSS1 MCS0
-		5500-5720	114	114	

Radiated Spurious Emissions (Above 1 GHz)

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
EUT only	802.11a	5180-5240	36 to 48	36, 40, 48	6.0
		5260-5320	52 to 64	52, 60, 64	
		5500-5720	100 to 144	100, 116, 140, 144	
		5745-5825	149 to 165	149, 157, 165	
	802.11ax HE20	5180-5240	36 to 48	36, 40, 48	MCS0
		5260-5320	52 to 64	52, 60, 64	
		5500-5720	100 to 144	100, 116, 140, 144	
		5745-5825	149 to 165	149, 157, 165	
	802.11ax HE40	5180-5240	38 to 46	38, 46	NSS1 MCS0
		5260-5320	54 to 62	54, 62	
		5500-5720	102 to 142	102, 110, 134, 142	
		5745-5825	151 to 159	151, 159	
	802.11ax HE80	5180-5240	42	42	NSS1 MCS0
		5260-5320	58	58	
		5500-5720	106 to 138	106, 122, 138	
		5745-5825	155	155	
	802.11ax HE160	5180-5320	50	50	NSS1 MCS0
		5500-5720	114	114	
	802.11ax HE20 RU106	5180-5240	36 to 48	48	NSS1 MCS0
		5260-5320	52 to 64	52	
		5500-5720	100 to 144	144	
		5745-5825	149 to 165	165	

Radiated Spurious Emissions (Below 1 GHz)

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
EUT only	802.11a	5250-5320	52 to 64	52	6.5
EUT with Base	802.11a	5250-5320	52 to 64	52	6.5

Mains Conducted Emission Test

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Frequency (MHz)	Available Channel	Tested Channel	Date Rate (Mbps)
EUT only	802.11a	5250-5320	52 to 64	52	6.5
EUT with Base	802.11a	5250-5320	52 to 64	52	6.5

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Conducted Measurement	21.2-24.0 °C	45-61 %	Andy Chen
Radiated Spurious Emissions above 1 GHz	23.6-25.7 °C	55-56 %	Chuan Chu
Radiated Spurious Emissions below 1 GHz	23.6-25.7 °C	55-56 %	Chuan Chu
Mains Conducted Emission	21.2 °C	59 %	Chuan Chu

4.4 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Accessory of EUT

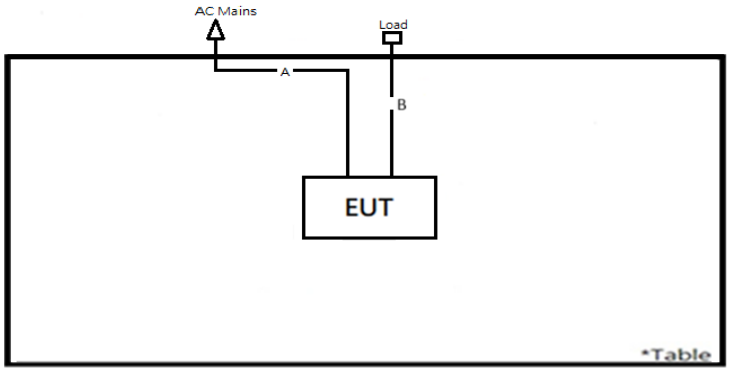
No.	Product	Brand	Model	Description
A	Adapter	HFE	FC065P17-200325D	--
B	LAN Cable	Nienyi	Ethernet Cable	--

Support Unit

Support Unit								
No	Description	Brand	Model	S/N	Shielded	Ferrite Core (Qty)	Length (cm)	Remark
-	Notebook	DELL	Latitude 7490	887V7Y2	-	-	-	--
-	USB Cable	TUV	TUV-07	1	NO	NO	150	--

4.5 Test Setup Diagram

<Radiated Spurious Emissions mode>

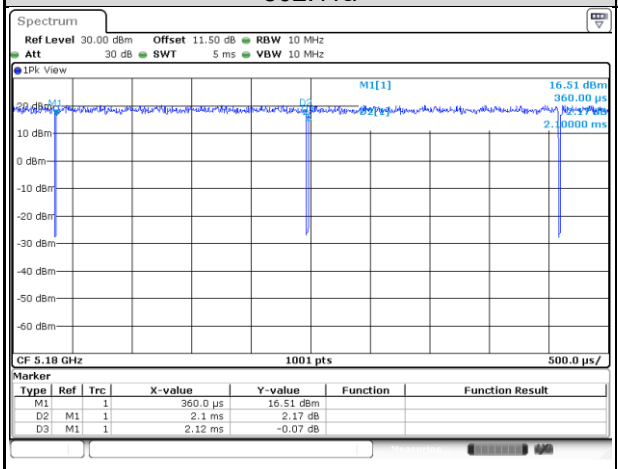


<Mains Conducted Emission mode>

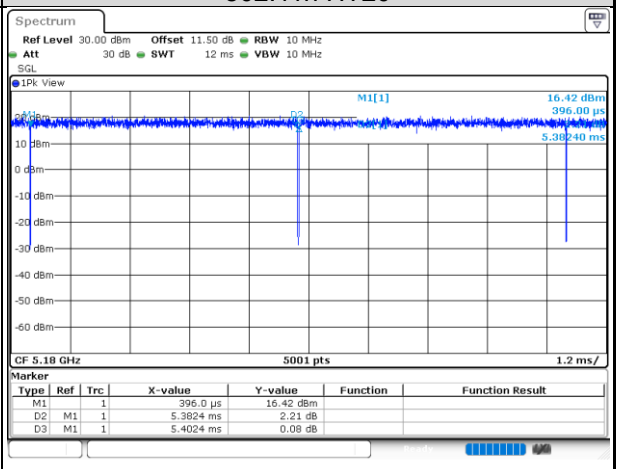
4.6 Duty Cycle of Test Signal

Mode	On + Off Time (ms)	On Time (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11a	2.120	2.100	99.06	0.04
802.11n HT20	5.402	5.382	99.63	0.02
802.11n HT40	5.421	5.402	99.66	0.01
802.11ac VHT20	5.405	5.387	99.67	0.01
802.11ac VHT40	5.424	5.407	99.68	0.01
802.11ac VHT80	5.443	5.424	99.65	0.02
802.11ac VHT160	5.432	5.414	99.68	0.01
802.11ax HE20	2.778	2.762	99.42	0.03
802.11ax HE40	1.428	1.411	98.77	0.05
802.11ax HE80	0.730	0.712	97.59	0.11
802.11ax HE160	0.742	0.724	97.57	0.11

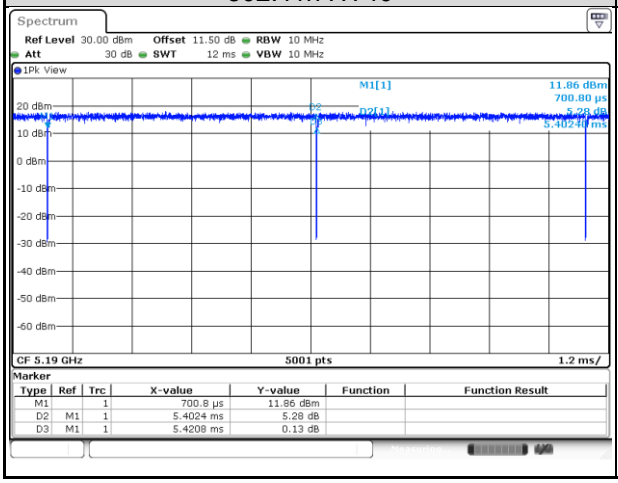
802.11a



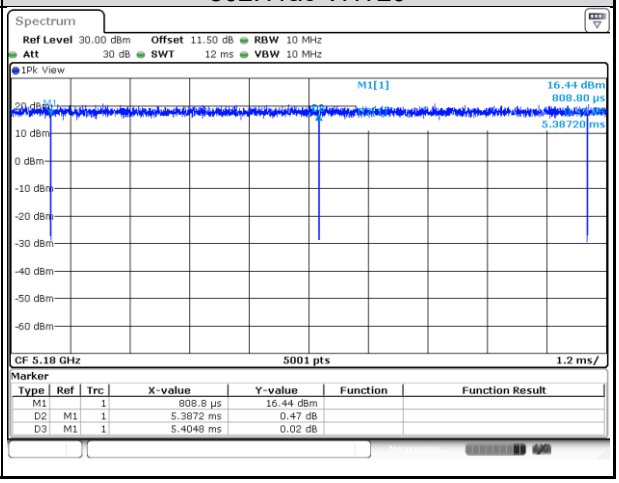
802.11n HT20



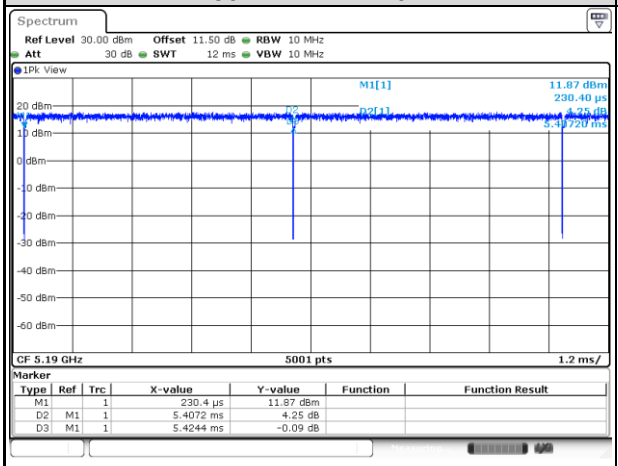
802.11n HT40



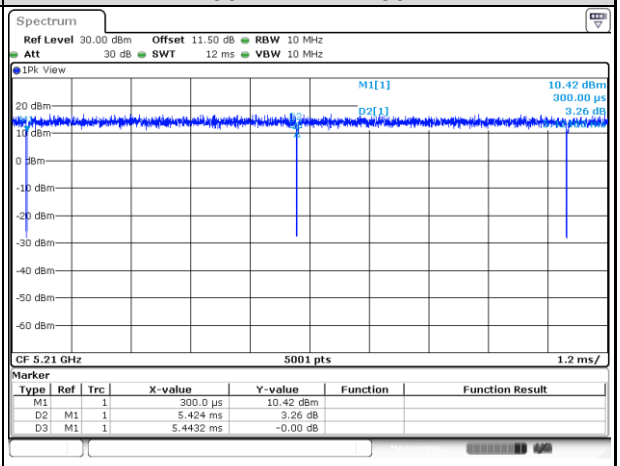
802.11ac VHT20



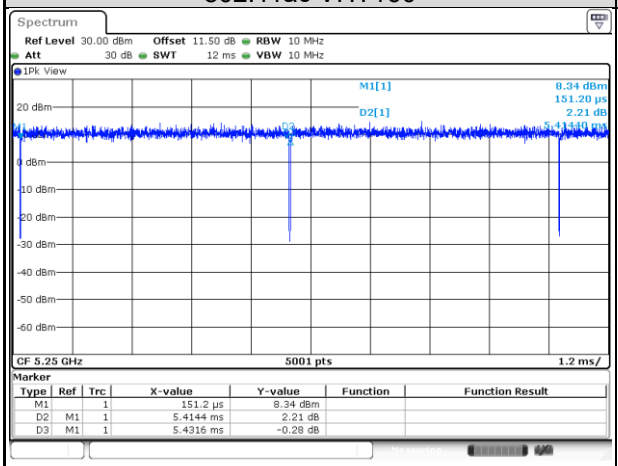
802.11ac VHT40



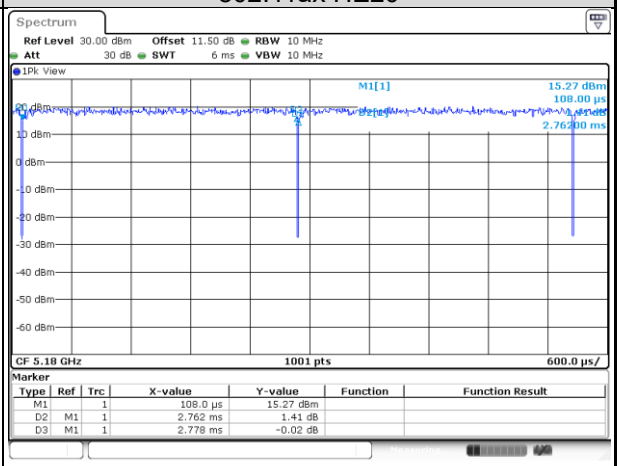
802.11ac VHT80



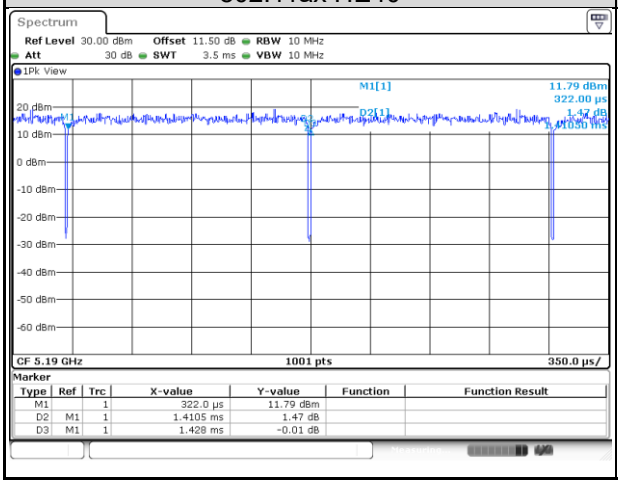
802.11ac VHT160



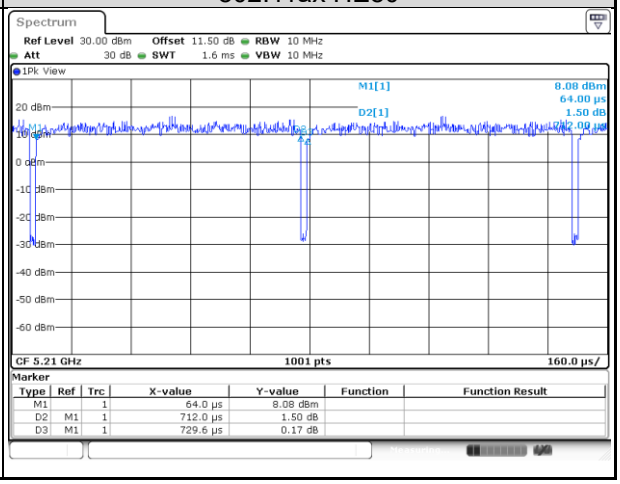
802.11ax HE20

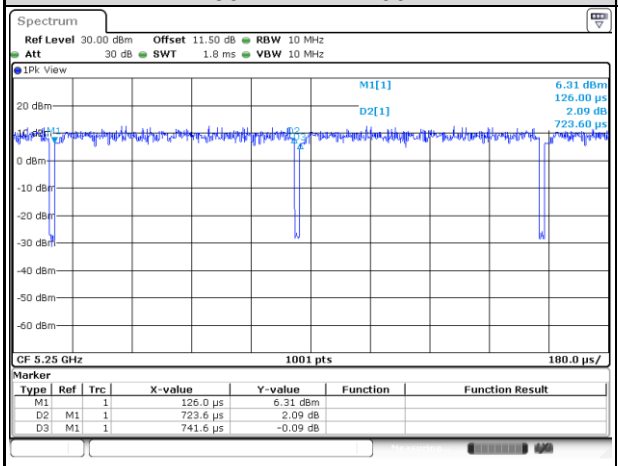


802.11ax HE40



802.11ax HE80



802.11ax HE160	
	

5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only

The gain value is derived from Antenna datasheet, the EUT's antenna specifications are described as below. The antenna is used with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

ANT	Gain (dBi)				Antenna Type
	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3	
0	4.70	3.00	4.40	4.00	PIFA
1	3.90	3.50	3.60	2.50	PIFA
Max Peak Gain	4.70	3.50	4.40	4.00	-
Power Directional Gain	4.70	3.50	4.40	4.00	-
PSD Directional Gain	7.32	6.26	7.02	6.29	-

Note: PSD Directional Gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots. + 10^{GN/20})^2 / N_{ANT}]$

Refer to EUT photo for details.

5.1.2 Maximum Conducted Output Power

Limit

Operation Band	EUT Category	Limit
U-NII-1	Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125 mW (21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
	Fixed point-to-point Access Point	1 Watt (30 dBm)
	Indoor Access Point	1 Watt (30 dBm)
	Mobile and Portable client device	250 mW (24 dBm)
U-NII-2A	---	250 mW (24 dBm) or 11 dBm + 10 log B*
U-NII-2C	---	250 mW (24 dBm) or 11 dBm + 10 log B*
U-NII-3	---	1 Watt (30 dBm)

Note: B* is the 26 dB emission bandwidth in megahertz

Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20 MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

Kind of Test Site Shielded room

Test Setup

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Power Meter	Anritsu	ML2495A	1901008	2024/03/12	2025/03/11	2024/10/24	2024/12/9
Power Sensor	Anritsu	MA2411B	1725269	2024/03/12	2025/03/11	2024/10/24	2024/12/9

Test Procedures

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst and set the detector to AVERAGE. Duty factor is not added to measured value.

Test Result

<802.11a>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
36	5180	15.14	15.48	18.32	67.98	24.00
40	5200	15.36	15.87	18.63	72.99	24.00
48	5240	15.96	16.26	19.12	81.71	24.00
52	5260	16.27	16.79	19.55	90.12	24.00
60	5300	16.24	16.49	19.38	86.64	23.85
64	5320	15.98	16.23	19.12	81.60	23.81
100	5500	15.28	15.06	18.18	65.79	23.82
116	5580	14.41	14.17	17.30	53.73	23.86
140	5700	14.67	14.79	17.74	59.44	23.86
144	5720 (U-NII-2C)	14.86	14.98	17.93	62.10	22.76
144	5720 (U-NII-3)	14.86	14.98	17.93	62.10	30.00
149	5745	15.12	15.28	18.21	66.24	30.00
157	5785	15.53	15.65	18.60	72.46	30.00
165	5825	15.61	15.74	18.69	73.89	30.00

Note:
For U-NII-2A, U-NII-2C Band:
1. 11 dBm + 10log (21.10) = 24.24 dBm > 24 dBm.
2. 11 dBm + 10log (19.26) = 23.85 dBm < 24 dBm.
3. 11 dBm + 10log (19.10) = 23.81 dBm < 24 dBm.
4. 11 dBm + 10log (19.14) = 23.82 dBm < 24 dBm.
5. 11 dBm + 10log (19.34) = 23.86 dBm < 24 dBm.
6. 11 dBm + 10log (19.30) = 23.86 dBm < 24 dBm.
7. 11 dBm + 10log (14.99) = 22.76 dBm < 24 dBm.

<802.11n HT20>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
36	5180	13.87	14.29	17.10	51.23	24.00
40	5200	15.33	15.73	18.54	71.53	24.00
48	5240	15.90	16.00	18.96	78.72	24.00
52	5260	16.17	16.33	19.26	84.35	24.00
60	5300	15.97	16.27	19.13	81.90	24.00
64	5320	13.17	13.28	16.24	42.03	24.00
100	5500	11.96	11.50	14.75	29.83	24.00
116	5580	14.48	14.12	17.31	53.88	24.00
140	5700	9.81	9.94	12.89	19.43	24.00
144	5720 (U-NII-2C)	14.70	14.80	17.76	59.71	23.20
144	5720 (U-NII-3)	14.70	14.78	17.75	59.57	30.00
149	5745	14.97	15.07	18.03	63.54	30.00
157	5785	15.32	15.54	18.44	69.85	30.00
165	5825	15.83	15.20	18.54	71.40	30.00

<802.11n HT40>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
38	5190	11.18	11.51	14.36	27.28	24.00
46	5230	15.35	15.82	18.60	72.47	24.00
54	5270	15.13	15.84	18.51	70.95	24.00
62	5310	12.22	12.37	15.31	33.93	24.00
102	5510	10.68	10.19	13.45	22.14	24.00
110	5550	13.65	13.36	16.52	44.85	24.00
134	5670	10.57	10.46	13.53	22.52	24.00
142	5710 (U-NII-2C)	14.35	14.28	17.33	54.02	24.00
142	5710 (U-NII-3)	14.38	14.29	17.35	54.27	30.00
151	5755	14.88	14.70	17.80	60.27	30.00
159	5795	15.27	15.01	18.15	65.35	30.00

<802.11ac VHT20>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
36	5180	13.96	14.36	17.17	52.18	24.00
40	5200	15.40	15.81	18.62	72.78	24.00
48	5240	15.98	16.09	19.05	80.27	24.00
52	5260	16.24	16.40	19.33	85.72	24.00
60	5300	16.04	16.34	19.20	83.23	24.00
64	5320	13.25	13.37	16.32	42.86	24.00
100	5500	12.05	11.58	14.83	30.42	24.00
116	5580	14.55	14.19	17.38	54.75	24.00
140	5700	9.89	10.01	12.96	19.77	24.00
144	5720 (U-NII-2C)	14.77	14.88	17.84	60.75	23.20
144	5720 (U-NII-3)	14.77	14.86	17.83	60.61	30.00
149	5745	15.05	15.14	18.11	64.65	30.00
157	5785	15.41	15.61	18.52	71.15	30.00
165	5825	15.91	15.27	18.61	72.65	30.00

<802.11ac VHT40>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
38	5190	11.26	11.58	14.43	27.75	24.00
46	5230	15.42	15.91	18.68	73.83	24.00
54	5270	15.20	15.85	18.55	71.57	24.00
62	5310	12.29	12.46	15.39	34.56	24.00
102	5510	10.75	10.27	13.53	22.53	24.00
110	5550	13.72	13.44	16.59	45.63	24.00
134	5670	10.65	10.53	13.60	22.91	24.00
142	5710 (U-NII-2C)	14.42	14.35	17.40	54.90	24.00
142	5710 (U-NII-3)	14.45	14.37	17.42	55.21	30.00
151	5755	14.95	14.78	17.88	61.32	30.00
159	5795	15.34	15.08	18.22	66.41	30.00

<802.11ac VHT80>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
42	5210	10.62	10.98	13.81	24.07	24.00
58	5290	11.04	11.23	14.15	25.98	24.00
106	5530	7.41	7.07	10.25	10.60	24.00
122	5610	10.75	10.59	13.68	23.34	24.00
138	5690 (U-NII-2C)	13.16	13.24	16.21	41.79	24.00
138	5690 (U-NII-3)	13.17	13.23	16.21	41.79	30.00
155	5775	11.81	11.93	14.88	30.77	30.00

<802.11ac VHT160>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
50	5250	9.39	9.72	12.57	18.07	24.00
114	5570	7.93	7.65	10.80	12.03	24.00

<802.11ax HE20>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
36	5180	14.05	14.43	17.25	53.14	24.00
40	5200	15.47	15.89	18.70	74.05	24.00
48	5240	16.07	16.16	19.13	81.76	24.00
52	5260	16.32	16.47	19.41	87.22	24.00
60	5300	16.12	16.41	19.28	84.68	24.00
64	5320	13.33	13.45	16.40	43.66	24.00
100	5500	12.13	11.66	14.91	30.99	24.00
116	5580	14.63	14.26	17.46	55.71	24.00
140	5700	9.96	10.09	13.04	20.12	24.00
144	5720 (U-NII-2C)	14.84	14.95	17.91	61.74	23.20
144	5720 (U-NII-3)	14.84	14.95	17.91	61.74	30.00
149	5745	15.13	15.21	18.18	65.77	30.00
157	5785	15.48	15.69	18.60	72.39	30.00
165	5825	15.98	15.34	18.68	73.83	30.00

Note:
For U-NII-2A, U-NII-2C Band:
1. 11 dBm + 10log (23.26) = 24.67 dBm > 24 dBm.
2. 11 dBm + 10log (26.85) = 25.29 dBm > 24 dBm.
3. 11 dBm + 10log (23.66) = 24.74 dBm > 24 dBm.
4. 11 dBm + 10log (23.42) = 24.70 dBm > 24 dBm.
5. 11 dBm + 10log (23.82) = 24.77 dBm > 24 dBm.
6. 11 dBm + 10log (23.22) = 24.66 dBm > 24 dBm.
7. 11 dBm + 10log (16.59) = 23.20 dBm < 24 dBm.

<802.11ax HE40>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
38	5190	11.35	11.66	14.52	28.30	24.00
46	5230	15.49	15.98	18.75	75.03	24.00
54	5270	15.28	15.94	18.63	72.99	24.00
62	5310	12.37	12.54	15.47	35.21	24.00
102	5510	10.84	10.36	13.62	23.00	24.00
110	5550	13.81	13.52	16.68	46.53	24.00
134	5670	10.73	10.64	13.70	23.42	24.00
142	5710 (U-NII-2C)	14.53	14.44	17.50	56.18	24.00
142	5710 (U-NII-3)	14.53	14.44	17.50	56.18	30.00
151	5755	15.03	14.85	17.95	62.39	30.00
159	5795	15.41	15.15	18.29	67.49	30.00

Note:
For U-NII-2A, U-NII-2C Band:
1. 11 dBm + 10log (40.28) = 27.05 dBm > 24 dBm.
2. 11 dBm + 10log (40.20) = 27.04 dBm > 24 dBm.
3. 11 dBm + 10log (40.12) = 27.03 dBm > 24 dBm.
4. 11 dBm + 10log (40.12) = 27.03 dBm > 24 dBm.
5. 11 dBm + 10log (40.28) = 27.05 dBm > 24 dBm.
6. 11 dBm + 10log (35.06) = 26.45 dBm > 24 dBm.

<802.11ax HE80>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
42	5210	10.71	11.06	13.90	24.54	24.00
58	5290	11.12	11.31	14.23	26.46	24.00
106	5530	7.49	7.16	10.34	10.81	24.00
122	5610	10.85	10.68	13.78	23.86	24.00
138	5690 (U-NII-2C)	13.24	13.31	16.29	42.52	24.00
138	5690 (U-NII-3)	13.24	13.31	16.29	42.52	30.00
155	5775	11.89	12.02	14.97	31.37	30.00

Note:
For U-NII-2A, U-NII-2C Band:
1. 11 dBm + 10log (81.36) = 30.10 dBm > 24 dBm.
2. 11 dBm + 10log (81.20) = 30.10 dBm > 24 dBm.
3. 11 dBm + 10log (81.84) = 30.13 dBm > 24 dBm.
4. 11 dBm + 10log (75.92) = 29.80 dBm > 24 dBm.

<802.11ax HE160>

Channel	Channel Frequency (MHz)	Average Output Power (dBm)		Total Power		Limit (dBm)
		Chain 0	Chain 1	(dBm)	(mW)	
50	5250	9.47	9.79	12.64	18.38	24.00
114	5570	8.02	7.73	10.89	12.27	24.00

Note:
For U-NII-2A, U-NII-2C Band:
1. 11 dBm + 10log (81.84) = 30.13 dBm > 24 dBm.
2. 11 dBm + 10log (164.00) = 33.15 dBm > 24 dBm.

<802.11ax HE20_Partial RU>

Channel	Channel Frequency (MHz)	RU Config.	Average Output Power (dBm)		Total Power		Limit (dBm)
			Chain 0	Chain 1	(dBm)	(mW)	
36	5180	26/0	4.13	4.52	7.34	5.42	24.00
40	5200	26/0	5.29	5.73	8.53	7.12	24.00
48	5240	26/8	6.73	6.85	9.80	9.55	24.00
52	5260	26/0	6.38	6.53	9.47	8.84	24.00
60	5300	26/0	5.98	6.59	9.31	8.52	24.00
64	5320	26/8	3.65	4.78	7.26	5.32	24.00
100	5500	26/0	2.56	2.84	5.71	3.73	24.00
116	5580	26/0	4.96	4.47	7.73	5.93	24.00
140	5700	26/8	1.62	1.73	4.69	2.94	24.00
144	5720 (U-NII-2C)	26/8	5.02	5.14	8.09	6.44	24.00
144	5720 (U-NII-3)	26/8	5.02	5.14	8.09	6.44	30.00
149	5745	26/0	5.34	5.49	8.43	6.96	30.00
157	5785	26/0	5.53	5.74	8.65	7.32	30.00
165	5825	26/8	6.27	6.81	9.56	9.03	30.00
36	5180	52/37	7.69	7.78	10.75	11.87	24.00
40	5200	52/37	8.98	8.89	11.95	15.65	24.00
48	5240	52/40	9.21	10.05	12.66	18.45	24.00
52	5260	52/37	9.97	10.08	13.04	20.12	24.00
60	5300	52/37	9.94	9.47	12.72	18.71	24.00
64	5320	52/40	6.72	6.93	9.84	9.63	24.00
100	5500	52/37	6.24	5.22	8.77	7.53	24.00
116	5580	52/37	7.79	7.83	10.82	12.08	24.00
140	5700	52/40	3.95	3.89	6.93	4.93	24.00
144	5720 (U-NII-2C)	52/40	7.89	7.71	10.81	12.05	24.00
144	5720 (U-NII-3)	52/40	7.89	7.71	10.81	12.05	30.00
149	5745	52/37	8.98	8.41	11.71	14.84	30.00
157	5785	52/37	9.22	8.78	12.02	15.91	30.00
165	5825	52/40	9.06	9.32	12.20	16.60	30.00
36	5180	106/53	10.53	10.77	13.66	23.24	24.00
40	5200	106/53	11.57	11.93	14.76	29.95	24.00
48	5240	106/54	12.19	12.93	15.59	36.19	24.00
52	5260	106/53	12.43	13.12	15.80	38.01	24.00
60	5300	106/53	12.49	12.34	15.43	34.88	24.00
64	5320	106/54	9.46	9.57	12.53	17.89	24.00
100	5500	106/53	8.56	7.81	11.21	13.22	24.00
116	5580	106/53	10.77	10.62	13.71	23.47	24.00
140	5700	106/54	6.62	6.50	9.57	9.06	24.00
144	5720 (U-NII-2C)	106/54	11.12	10.93	14.04	25.33	24.00
144	5720 (U-NII-3)	106/54	11.12	10.93	14.04	25.33	30.00
149	5745	106/53	11.41	11.48	14.46	27.90	30.00
157	5785	106/53	11.97	11.86	14.93	31.09	30.00
165	5825	106/54	11.92	12.06	15.00	31.63	30.00

<802.11ax HE40_Partial RU>

Channel	Channel Frequency (MHz)	RU Config.	Average Output Power (dBm)		Total Power		Limit (dBm)
			Chain 0	Chain 1	(dBm)	(mW)	
38	5190	242/61	9.74	9.29	12.53	17.91	24.00
46	5230	242/62	13.62	12.68	16.19	41.55	24.00
54	5270	242/61	14.36	13.22	16.84	48.28	24.00
62	5310	242/62	10.98	9.73	13.41	21.93	24.00
102	5510	242/61	9.07	7.63	11.42	13.87	24.00
110	5550	242/61	12.06	11.28	14.70	29.50	24.00
134	5670	242/62	8.11	8.64	11.39	13.78	24.00
142	5710 (U-NII-2C)	242/62	8.37	8.79	11.60	14.44	24.00
142	5710 (U-NII-3)	242/62	8.37	8.79	11.60	14.44	30.00
151	5755	242/61	12.26	12.42	15.35	34.28	30.00
159	5795	242/62	12.11	12.69	15.42	34.83	30.00

<802.11ax HE80_Partial RU>

Channel	Channel Frequency (MHz)	RU Config.	Average Output Power (dBm)		Total Power		Limit (dBm)
			Chain 0	Chain 1	(dBm)	(mW)	
42	5210	484/65	10.76	10.01	13.41	21.94	24.00
58	5290	484/65	10.64	9.73	13.22	20.99	24.00
106	5530	484/65	6.74	5.85	9.33	8.57	24.00
122	5610	484/66	9.59	9.83	12.72	18.72	24.00
138	5690 (U-NII-2C)	484/66	7.15	7.41	10.29	10.70	24.00
138	5690 (U-NII-3)	484/66	7.15	7.41	10.29	10.70	30.00
155	5775	484/65	11.12	11.26	14.20	26.31	30.00

<802.11ax HE160_Partial RU>

Channel	Channel Frequency (MHz)	RU Config.	Average Output Power (dBm)		Total Power		Limit (dBm)
			Chain 0	Chain 1	(dBm)	(mW)	
50	5250	996/67	10.76	10.01	13.41	21.94	24.00
114	5570	996/67	10.64	9.73	13.22	20.99	24.00

5.1.3 Transmit Power Control (TPC)

U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p of less than 500 mW.

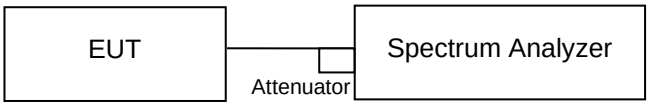
Maximum EIRP of this device is 201.75 mW which is less than 500 mW, therefor, TPC function is not required.

TPC	E.I.R.P	15.407(h)(1)
	> 500mW	The TPC mechanism is required for system with an E.I.R.P. of above 500mW
V	< 500mW	-

5.1.4 26 dB Bandwidth and 99% Occupied Bandwidth

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2024/02/22	2025/02/21	2024/10/24	2024/12/9

Test Procedure

a. Set RBW = approximately 1% of the emission bandwidth.
b. Set the VBW > RBW.
c. Detector = Peak.
d. Trace mode = max hold.
e. Measure the maximum width of the emission that is 26 dB down from the peak 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%.
f. For 99% Bandwidth Measurement, the transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean power of a given emission.

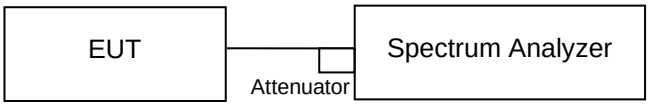
Test Results

Please refer to Appendix A

5.1.5 6 dB Bandwidth (5725-5850MHz)

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2024/02/22	2025/02/21	2024/10/24	2024/12/9

Test Procedure

MEASUREMENT PROCEDURE REF

a. Set resolution bandwidth (RBW) = 100 kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

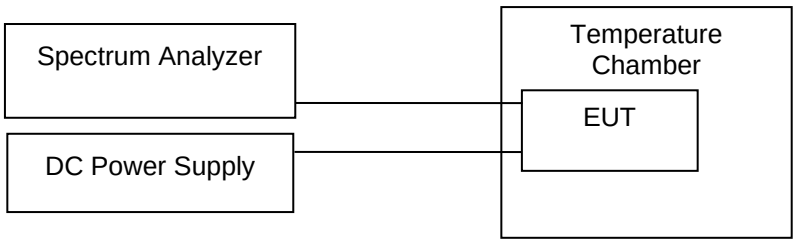
Test Results

Please refer to Appendix A

5.1.6 Frequency Stability Measurement

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2024/02/22	2025/02/21	2024/10/24	2024/12/9
Thermal Chamber	Giant Force	GHT-150-40-CP-SD	MAA1902-011	2024/04/12	2025/04/11	2024/10/24	2024/12/9

Test Procedure

a. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
b. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10 dB lower than the measured peak value.
c. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

Test Results

Frequency (MHz)	5180			
Voltage (V)	Measurement Frequency (MHz)			Max. Deviation (ppm)
132	5179.99566			0.838
120	5179.99566			0.838
108	5179.99566			0.838
Temperature (°C)	Measurement Frequency (MHz)			
	0 Minute	2 Minute	5 Minute	10 Minute
50	5179.99204	5179.99132	5179.9877	5179.99132
40	5179.99132	5179.99059	5179.98842	5179.98987
30	5179.99855	5179.99711	5179.99566	5179.99566
20	5179.99566	5179.99493	5179.99421	5179.99421
10	5180.01809	5180.01881	5180.02026	5180.02098
0	5180.03763	5180.03618	5180.03546	5180.03546
-10	5180.04414	5180.04414	5180.04414	5180.04414
-20	5180.04776	5180.04776	5180.04776	5180.04776
Max. Deviation (ppm)	9.220	9.220	9.220	9.220

5.1.7 Power Spectral Density

Limit

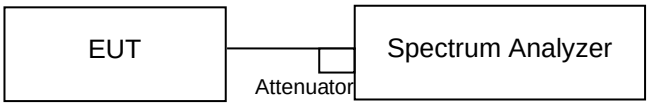
For the 5.15~5.25GHz Bands:
For mobile and portable client devices in the 5.15~5.25GHz band, the Maximum Power spectral density shall not exceed 11dBm/MHz. For an indoor access point operating in the band 5.15~5.25GHz, the maximum power spectral density shall not exceed 17dBm/MHz.

For the 5.25~5.35GHz and 5.47~5.725GHz Bands:
The maximum power spectral density shall not exceed 11dBm/MHz.

For the 5.745~5.85GHz Bands:
The maximum power spectral density shall not exceed 30dBm/500kHz.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2024/02/22	2025/02/21	2024/10/24	2024/12/9

Test Procedure

For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-1

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to “free run”.
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value

Using method SA-2

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW ≥ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to “free run”.
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value and add 10 log (1/duty cycle)

※For U-NII-3:

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 500 kHz, Set VBW ≥ 3 RBW, Detector = RMS
3. Use the peak marker function to determine the maximum power level in any 500 kHz band segment within the fundamental EBW.
4. Sweep time = auto, trigger set to “free run”.
5. Trace average at least 100 traces in power averaging mode.
6. Record the max value or/and add 10 log (1/duty cycle)

For MIMO mode, calculation method follows FCC KDB 662911 Method 2) a) of power density measurement using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

Test Results

Please refer to Appendix A

5.1.8 Radiated Spurious Emissions

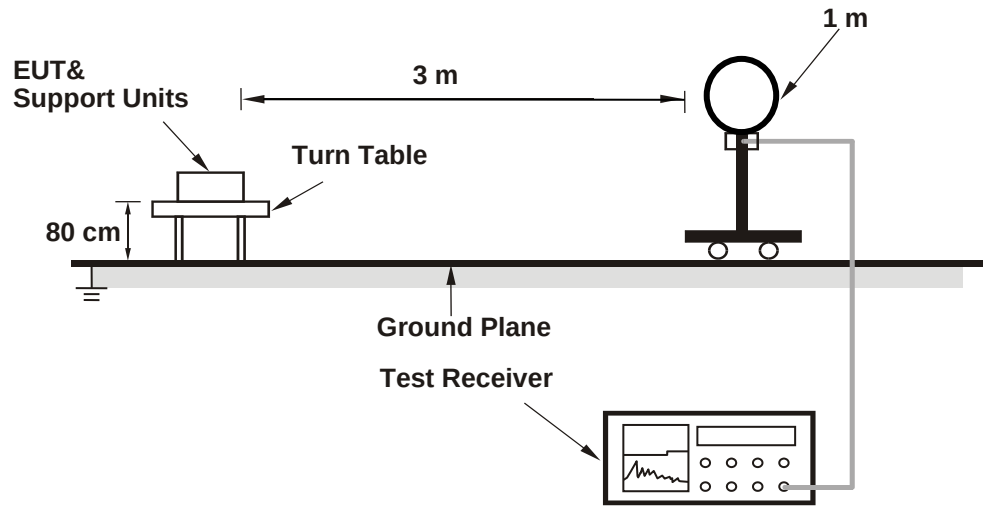
Limit

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).
Emissions radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in §15.407(b).

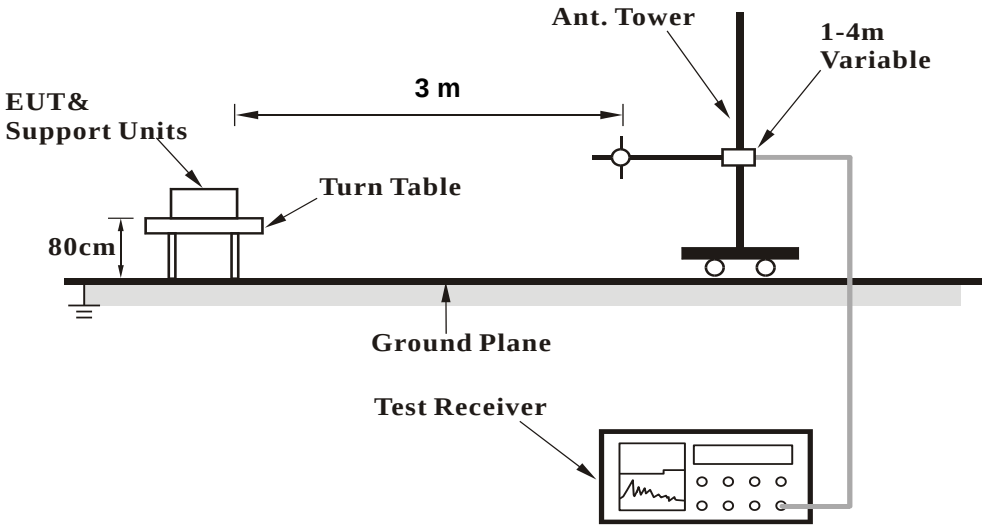
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

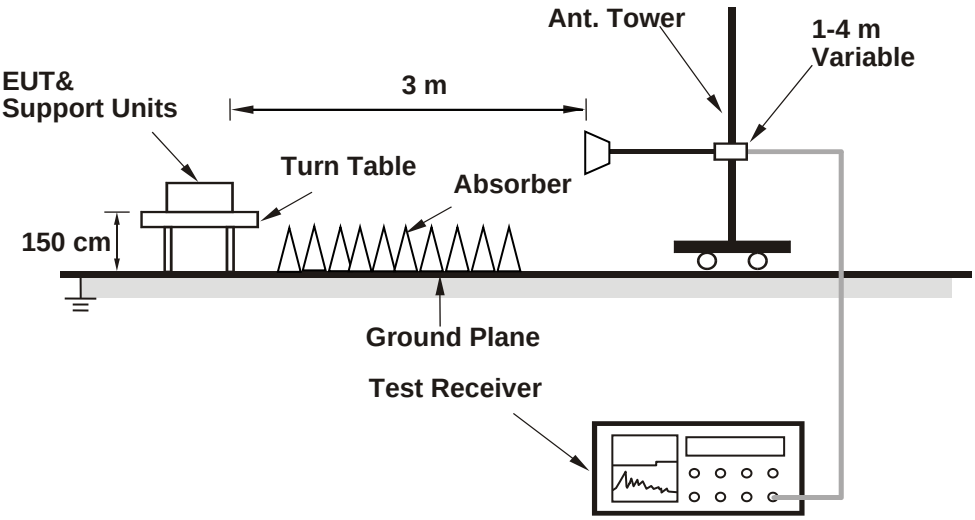
<Radiated Emissions below 30 MHz>



<Radiated Emissions 30 MHz to 1 GHz>



<Radiated Emissions above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Above 1 GHz (Teste Period: 2024-11-19 ~ 2025-01-13)					
Signal Analyzer	R&S	FSV40	101509	2024/4/24	2025/4/23
Horn Antenna	ETS-Lindgren	3117	00218930	2023/12/7	2024/12/5
			00218929	2024/11/21	2025/11/20
Amplifier	EM	EM01G18GA	60967	2024/4/2	2025/4/1
HF-AMP + AC source	EMCI	EMC184045SE	980657	2024/1/24	2025/1/22
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2024/4/1	2025/3/31
Test Software	Audix E3	15914a_20191106 tuv	PK-001087	N/A	N/A
30 MHz ~ 1 GHz (Teste Period: 2025-01-07 ~ 2025-02-04)					
Receiver	R&S	ESR7	102109	2024/2/23	2025/2/21
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2024/3/29	2025/3/28
LF-AMP	Agilent	8447D	2944a107722	2024/3/21	2025/3/20
Test Software	Audix E3	15914a_20191106 tuv	PK-001087	N/A	N/A
Below 30 MHz (Teste Period: 2025-01-07 ~ 2025-02-04)					
Receiver	R&S	ESR7	102109	2024/2/23	2025/2/21
Loop Antenna	SCHWARZBECK	FMZB 1513	1513-076	2024/12/16	2025/12/15
Test Software	Audix E3	15914a_20191106 tuv	PK-001087	N/A	N/A

Test Procedures

For Radiated Emissions below 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel (OPEN), perpendicular (CLOSE), and ground-parallel (GROUND) orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated Emissions above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.
6. The emission levels of other frequencies (including the 10th harmonic of the highest fundamental frequency) are very lower than the limit and are not shown in the test report.

Test Results

Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier (dB)
Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

Please refer to Appendix B.

5.1.9 Dynamic Frequency Selection

Limit

<DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection>

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note 3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

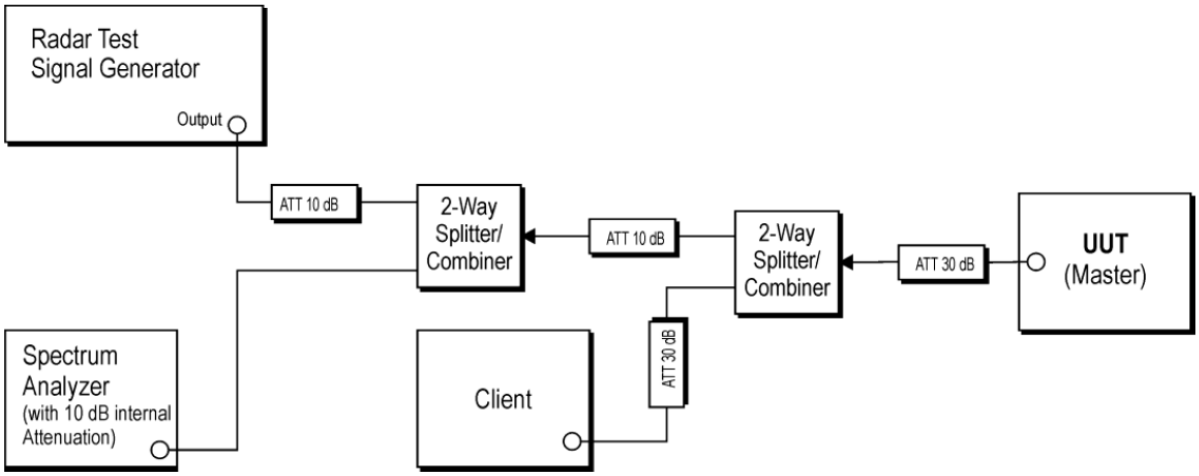
<DFS Response Requirement Values>

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: *Channel Move Time and the Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

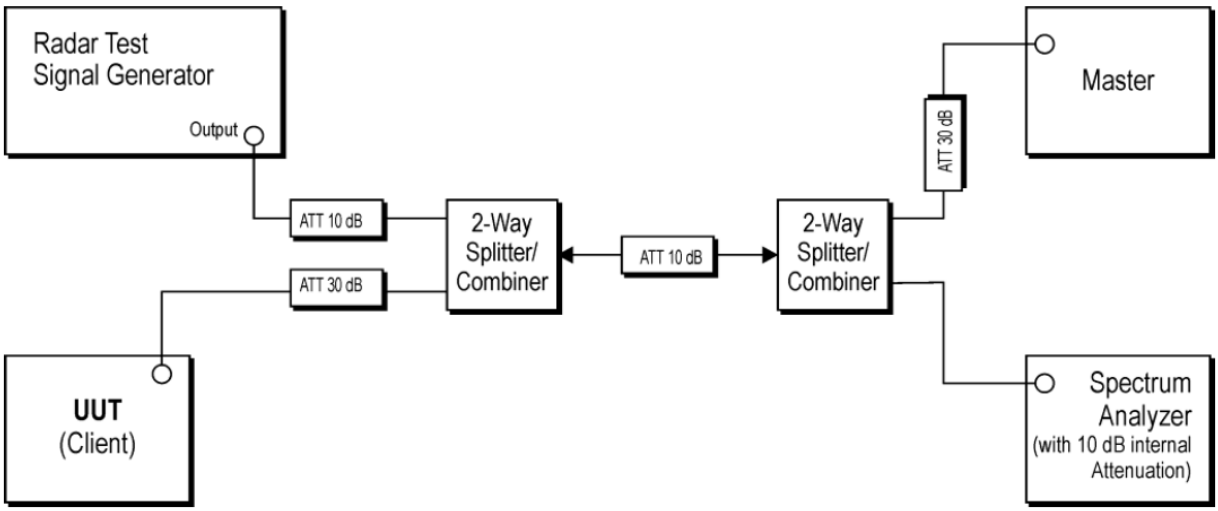
Kind of Test Site Shielded room

Test Setup

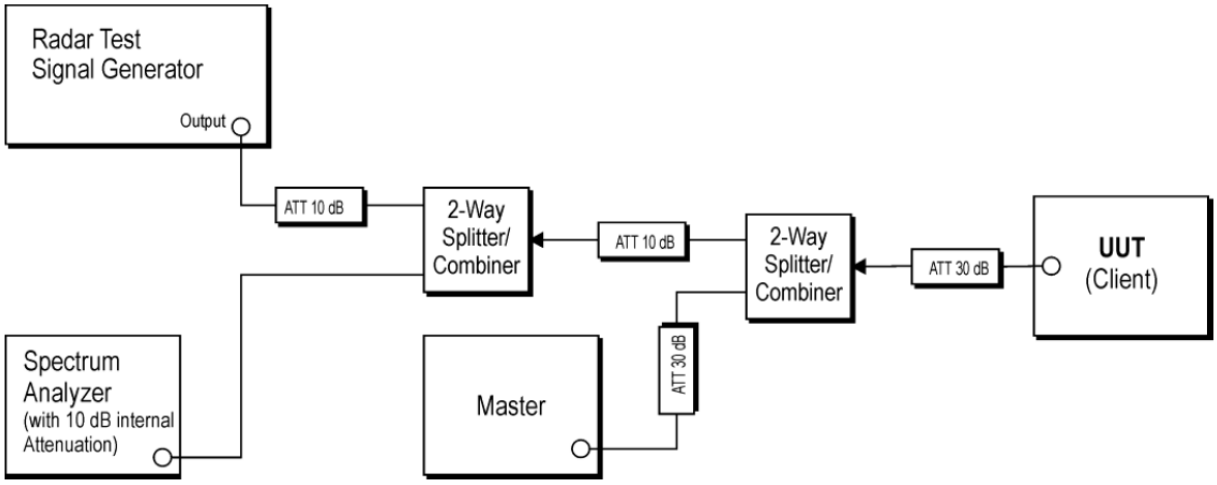
<Setup for Master with injection at the Master>



<Setup for Client with injection at the Master>



<Setup for Client with injection at the Client>



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	Keysight	N9000B	MY62361339	2024/01/25	2025/01/24	2024/11/21	2024/11/21
EXG Vector Signal Generator	Keysight	N5172B	MY61253270	2023/12/22	2024/12/21	2024/11/21	2024/11/21
Frequency Extender	Keysight	N5182BX07	MY61500182	2023/12/22	2024/12/21	2024/11/21	2024/11/21

Requirement

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

Test Results

<802.11ax HE160>

Non-occupancy period

Channel (MHz)	Limit (minute)	Result
5570	30	Pass

Band 3

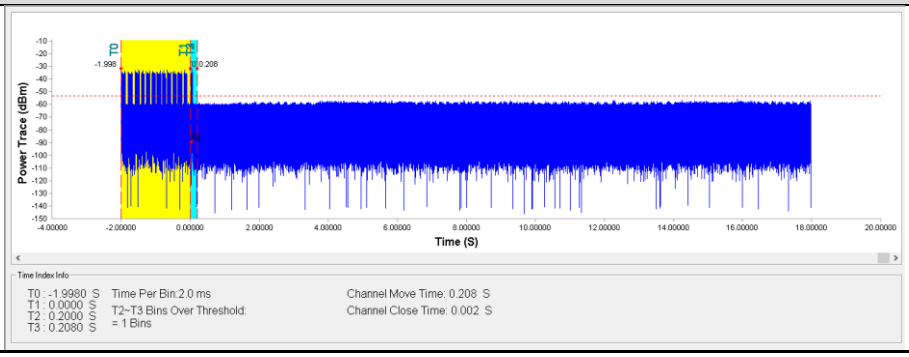
Channel Moving Time

Channel (MHz)	Channel Move Time (s)	Limit (s)	Result
5570	0.208	10	Pass

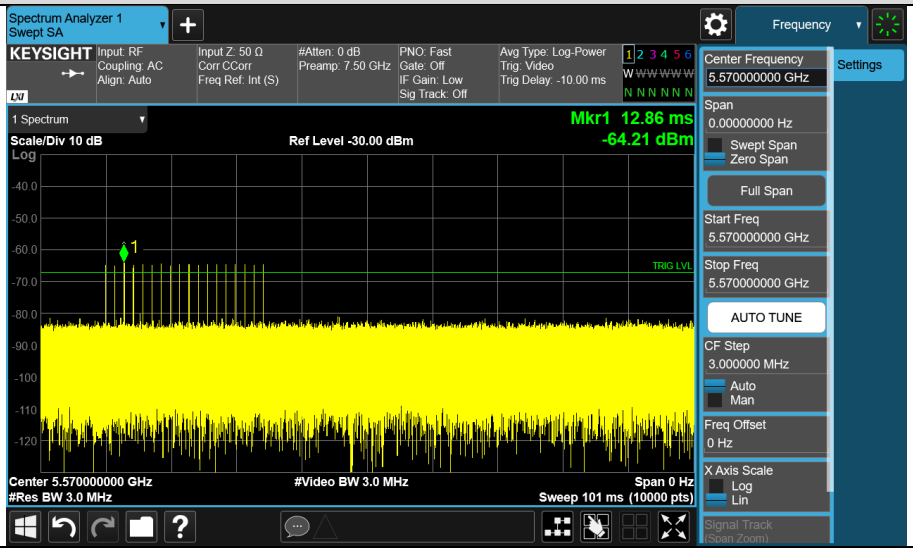
Channel Closing Transmission Time

Channel (MHz)	Channel Closing Transmission Time (ms)	Limit (ms)	Result
5570	2	60	Pass

Channel Shutdown



Radar Level

Band 3


5.2 Mains Emission

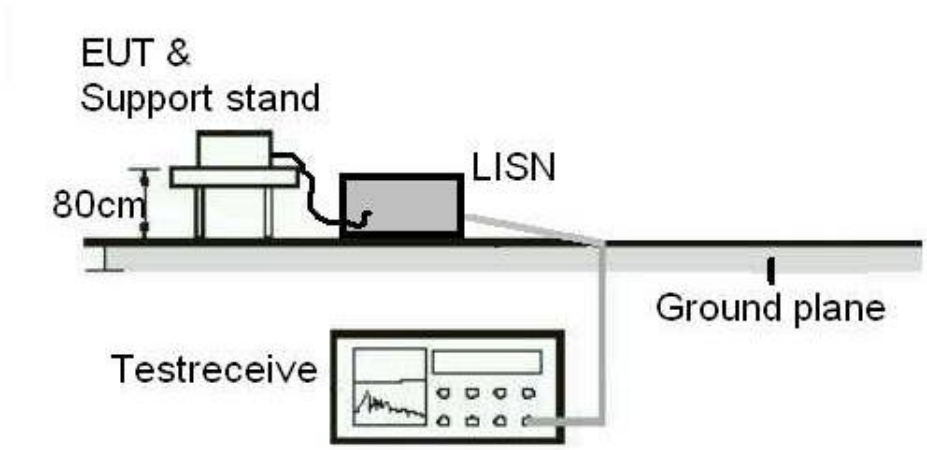
5.2.1 Mains Conducted Emission

Limit

Mains Conducted emissions as defined in §15.207 must comply with the mains conducted emission limits.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Two-Line V-Network	Rohde & Schwarz	ENV216	101243	2024/09/03	2025/9/2
EMI Test Receiver	R&S	ESCI 7	100797	2024/7/23	2025/7/22

Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

Test Results

Please refer to Appendix B.