

Prüfbericht-Nr.: <i>Test report no.:</i>	CN248SY7 001	Auftrags-Nr.: <i>Order no.:</i>	48251548	Seite 1 von 42 Page 1 of 42
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2024-08-28	
Auftraggeber: <i>Client:</i>	KAGA FEI Co., Ltd. Gunseisha ANNEX Building 5th floor, 382-1 Kaminamie-machi, Takasaki, Gunma, Japan			
Prüfgegenstand: <i>Test item:</i>	CPU Embedded Wireless LAN Module			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	WKR612			
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15E Test report (WiFi 5GHz)			
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart E Section 15.407			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-10-01			
Prüfmuster-Nr.: <i>Test sample no:</i>	A003830641-004&006 A003830641-007&008			
Prüfzeitraum: <i>Testing period:</i>	2024-10-28 - 2024-12-31			
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Taipei Testing Site			
Prüflaboratorium: <i>Testing laboratory:</i>	Taipei Testing Laboratories			
Prüfergebnis*: <i>Test result*:</i>	Pass			
überprüft von: <i>compiled by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i>	2025-01-07	Ausstellungsdatum: <i>Issue date:</i>	2025-01-07	
Stellung / Position:	Senior Project Manager	Stellung / Position:	Senior Project Manager	
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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Anmerkungen
Remarks

- | | |
|----------|--|
| 1 | <p>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.</p> <p><i>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.</i></p> |
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| 3 | <p>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.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described 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.</i></p> |
| 4 | <p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen 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 bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>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.</i></p> |

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.

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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

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HISTORY OF THIS TEST REPORT

Revision	Description	Date Issued
R01	Original Release	2025-01-07

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

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 basis 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 CPU Embedded Wireless LAN Module. 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	CPU Embedded Wireless LAN Module
Type Identification	WKR612
FCC ID	2A6NFWKR612

Technical Specification of EUT

Item	EUT information
Operating Frequency	Band 1: 5180 MHz ~ 5240 MHz Band 2: 5260 MHz ~ 5320 MHz Band 3: 5500 MHz ~ 5720 MHz Band 4: 5745 MHz ~ 5825 MHz
Channel Number	Band 1: 4 for 802.11a/n/ac/ax HT20/VHT20/HE20 Band 2: 4 for 802.11a/n/ac/ax HT20/VHT20/HE20 Band 3: 12 for 802.11a/n/ac/ax HT20/VHT20/HE20 Band 4: 5 for 802.11a/n/ac/ax HT20/VHT20/HE20
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 MCS8 802.11ax: up to MCS9
Operation Voltage	3.3 Vdc
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Maximum Output Power (mW)	5180 ~ 5240 MHz: 13.55 5260 ~ 5320 MHz: 19.01 5500 ~ 5720 MHz: 21.68 5745 ~ 5825 MHz: 19.10
Maximum EIRP (mW)	5260 ~ 5320 MHz: 58.75 5500 ~ 5720 MHz: 66.99
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	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
36	13	36	13	36	13	36	13
40	13	40	13	40	13	40	13
48	13	48	13	48	13	48	13
52	14	52	13	52	13	52	13
60	14	60	13	60	13	60	13
64	14	64	13	64	13	64	13
100	14	100	13	100	13	100	13
116	14	116	13	116	13	116	13
140	14	140	13	140	13	140	13
144	14	144	13	144	13	144	13
149	14	149	13	149	13	149	13
157	14	157	13	157	13	157	13
165	14	165	13	165	13	165	13

<Partial RU>

802.11ax HE20						
Channel	RU Tone	Power Setting	RU Tone	Power Setting	RU Tone	Power Setting
36	26	-3	52	-1	106	3
40	26	-3	52	-1	106	3
48	26	-3	52	-1	106	3
52	26	-6	52	-4	106	0
60	26	-6	52	-4	106	0
64	26	-6	52	-4	106	0
100	26	-6	52	-4	106	0
116	26	-6	52	-4	106	0
140	26	-6	52	-4	106	0
144	26	-6	52	-4	106	0
149	26	-6	52	-4	106	0
157	26	-6	52	-4	106	0
165	26	-6	52	-4	106	0

4.2 Carrier Frequency and Channel

Band	Channel	Frequency (MHz)	802.11a 802.11n HT20 802.11ac VHT20 802.11ax HE20
U-NII-1 (Band 1)	36	5180	V
	38	5190	
	40	5200	V
	42	5210	
	44	5220	V
	46	5230	
	48	5240	V
U-NII-2A (Band 2)	52	5260	V
	54	5270	
	56	5280	V
	58	5290	
	60	5300	V
	62	5310	
	64	5320	V
U-NII-2C (Band 3)	100	5500	V
	102	5510	
	104	5520	V
	106	5530	
	108	5540	V
	110	5550	
	112	5560	V
	116	5580	V
	118	5590	
	120	5600	V
	122	5610	
	124	5620	V
	126	5630	
	128	5640	V
	132	5660	V
	134	5670	
	136	5680	V
	140	5700	V
Straddle Channel	138	5690	
	142	5710	
	144	5720	V
U-NII-3 (Band 4)	149	5745	V
	151	5755	
	153	5765	V
	155	5775	
	157	5785	V
	159	5795	
	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	DutApiSisoApApp_RW610
---------------	-----------------------

The samples were used as follows:

A003830641-004&006

A003830641-007&008

Full test was applied on all test modes, but only worst case was shown.

* The modulation and bandwidth are similar for 802.11n mode HT20 and 802.11ac mode VHT20 and 802.11ax mode HE20, 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:

- The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on **Z-plane**.
- "-" 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	5180-5240	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	
-	802.11n HT20 (Power only)	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	
-	802.11ac VHT20 (Power only)	5180-5240	36 to 48	36, 40, 48	NSS1 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 HE20	5180-5240	36 to 48	36, 40, 48	NSS1 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 HE20_RU26 & RU52 & RU106 (Power & PSD only)	5180-5240	36 to 48	36, 40, 48	NSS1 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	

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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)
Antenna 1_Kaga	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	NSS1 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 HE20_RU26 & RU52 & RU106	5180-5240	36 to 48	48	NSS1 MCS0
		5260-5320	52 to 64	52	
		5500-5720	100 to 144	100	
		5745-5825	149 to 165	149	
Antenna 2_Molex	802.11a	5180-5240	36 to 48	40	6.0
		5260-5320	52 to 64	64	
		5500-5720	100 to 144	140	
		5745-5825	149 to 165	157	
Antenna 3_TE	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	NSS1 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 HE20_RU26 & RU52 & RU106	5180-5240	36 to 48	48	NSS1 MCS0
		5260-5320	52 to 64	52	
		5500-5720	100 to 144	100	
		5745-5825	149 to 165	149	

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)
Antenna 1_Kaga	802.11a	5500-5720	100 to 144	116	6.0

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)
Antenna 1_Kaga	802.11a	5500-5720	100 to 144	116	6.0

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Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Conducted Measurement	21-24.3 °C	56-65 %	Andy Chen / Nick Hsu
Radiated Spurious Emissions above 1 GHz	24.1-25.2 °C	55-56 %	Roger Liao
Radiated Spurious Emissions below 1 GHz	24.1-25.2 °C	55-56 %	Roger Liao
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

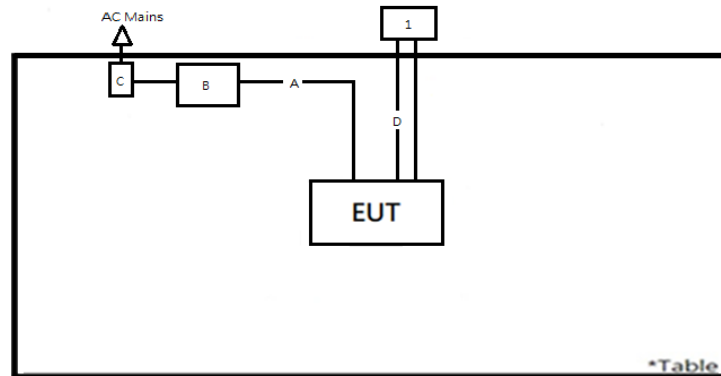
None

Support Unit

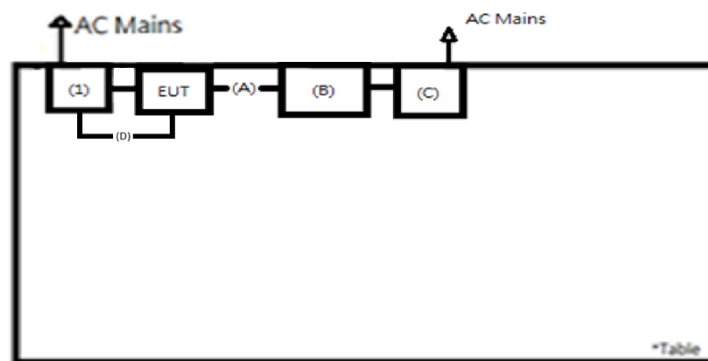
Support Unit								
No	Description	Brand	Model	S/N	Shielded	Ferrite Core (Qty)	Length (cm)	Remark
A	USB Cable	TUV JP	TUV JP-01	N/A	NO	NO	100	--
B	Notebook	Fujitsu	FMVS02003	N/A	-	-	-	--
C	AC Adapter	Fujitsu	A13-065N2A	N/A	NO	NO	210	--
D	Banana Plug Cable	TUV JP	TUV JP-02	N/A	NO	NO	45	--
1	DC Power Supply	Gwinstek	GPS-3030	N/A	-	-	-	--
-	Notebook	DELL	Latitude 7490	13047Y2	-	-	-	--
-	Power Supply	GWINSTEK	GPS-3303	GEU915620	-	-	-	--
-	USB Cable	TUV	TUV-08	1	NO	NO	150	--

4.5 Test Setup Diagram

<Radiated Spurious Emissions mode>



<Mains Conducted Emission mode>

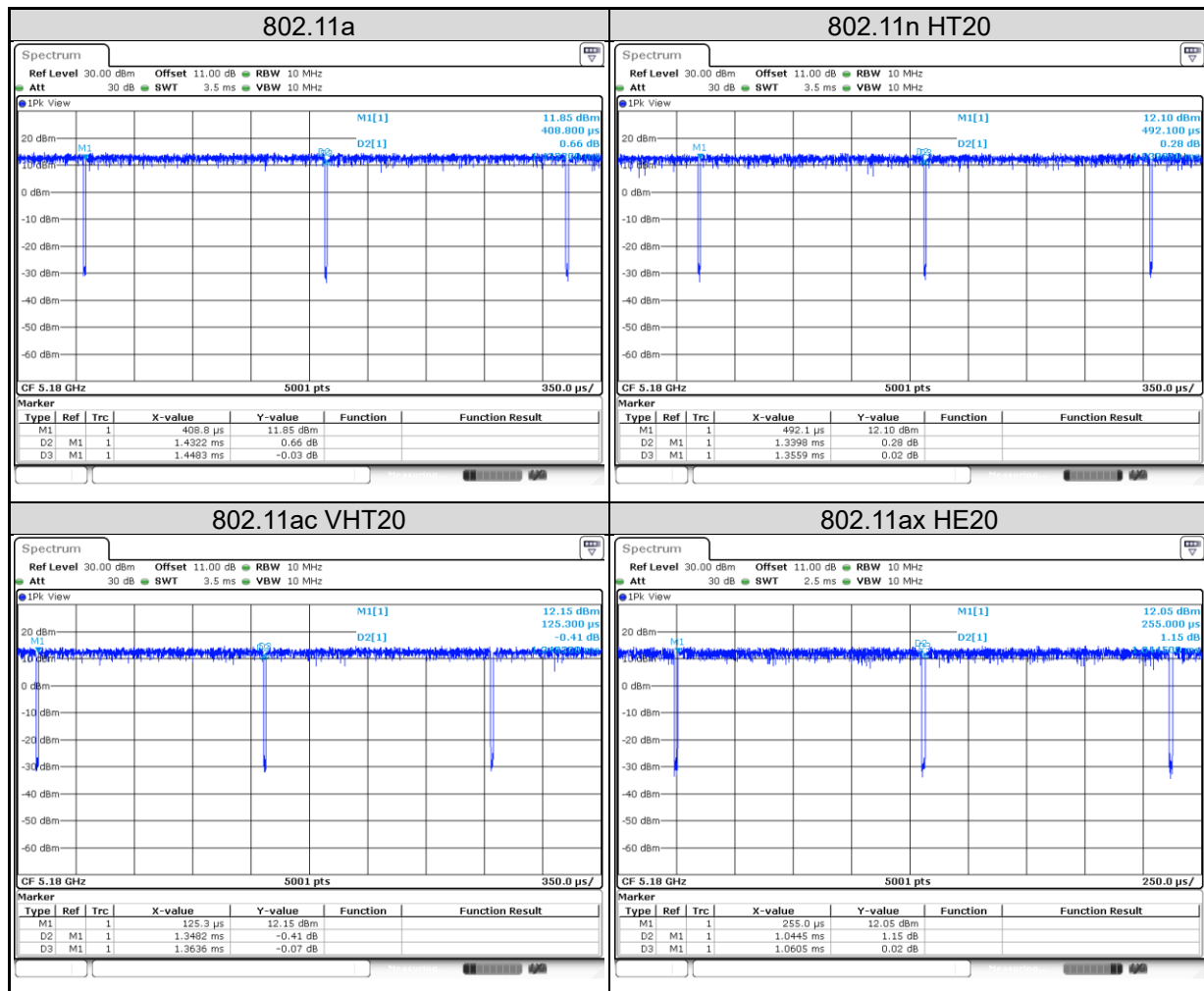


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4.6 Duty Cycle of Test Signal

Mode	On + Off Time (ms)	On Time (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11a	1.448	1.432	98.89	0.05
802.11n HT20	1.356	1.340	98.81	0.05
802.11ac VHT20	1.364	1.348	98.87	0.05
802.11ax HE20	1.061	1.045	98.49	0.07



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only

According to the manufacturer declaration, the antenna information is as listed below. The antenna is with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Antenna No.	Manufacturer	Antenna Type	Antenna Gain (dBi)
1	Kaga FEI	Monopole	3.2
2	Molex	Dipole	4.5
3	TE Connectivity	Dipole	4.9

Refer to EUT photo for details.

5.1.2 Maximum Conducted Output Power

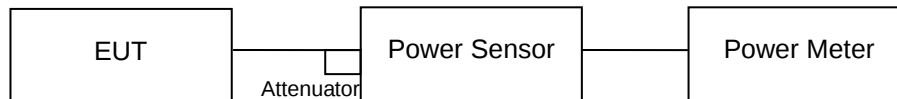
Limit

Operation Band	EUT Category	Limit
U-NII-1	Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p $\leq$ 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

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	2024/10/28	2024/12/30
Power Sensor	Anritsu	MA2411B	1725269	2024/03/12	2025/03/11	2024/10/28	2024/12/30

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		Limit (dBm)
		(dBm)	(mW)	
36	5180	11.18	13.12	24.00
40	5200	11.32	13.55	24.00
48	5240	11.26	13.37	24.00
52	5260	12.79	19.01	24.00
60	5300	12.59	18.16	24.00
64	5320	12.53	17.91	24.00
100	5500	13.23	21.04	24.00
116	5580	13.36	21.68	24.00
140	5700	12.38	17.30	24.00
144	5720 (U-NII-2C)	12.45	17.58	22.88
144	5720 (U-NII-3)	12.45	17.58	30.00
149	5745	12.48	17.70	30.00
157	5785	11.88	15.42	30.00
165	5825	12.81	19.10	30.00

Note:

For U-NII-2A, U-NII-2C Band:

1. $11 \text{ dBm} + 10\log(20.78) = 24.18 \text{ dBm} > 24 \text{ dBm}$.
2. $11 \text{ dBm} + 10\log(20.58) = 24.13 \text{ dBm} > 24 \text{ dBm}$.
3. $11 \text{ dBm} + 10\log(20.74) = 24.17 \text{ dBm} > 24 \text{ dBm}$.
4. $11 \text{ dBm} + 10\log(20.82) = 24.18 \text{ dBm} > 24 \text{ dBm}$.
5. $11 \text{ dBm} + 10\log(20.78) = 24.18 \text{ dBm} > 24 \text{ dBm}$.
6. $11 \text{ dBm} + 10\log(20.78) = 24.18 \text{ dBm} > 24 \text{ dBm}$.
7. $11 \text{ dBm} + 10\log(15.43) = 22.88 \text{ dBm} < 24 \text{ dBm}$.

<802.11n HT20>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
36	5180	11.16	13.06	24.00
40	5200	11.01	12.62	24.00
48	5240	11.03	12.68	24.00
52	5260	11.19	13.15	24.00
60	5300	11.10	12.88	24.00
64	5320	11.08	12.82	24.00
100	5500	12.05	16.03	24.00
116	5580	12.06	16.07	24.00
140	5700	11.28	13.43	24.00
144	5720 (U-NII-2C)	11.13	12.97	22.91
144	5720 (U-NII-3)	11.12	12.94	30.00
149	5745	11.51	14.16	30.00
157	5785	10.94	12.42	30.00
165	5825	11.25	13.34	30.00

<802.11ac VHT20>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
36	5180	11.20	13.18	24.00
40	5200	11.06	12.76	24.00
48	5240	11.08	12.82	24.00
52	5260	11.24	13.30	24.00
60	5300	11.16	13.06	24.00
64	5320	11.14	13.00	24.00
100	5500	12.12	16.29	24.00
116	5580	12.14	16.37	24.00
140	5700	11.35	13.65	24.00
144	5720 (U-NII-2C)	11.19	13.15	22.91
144	5720 (U-NII-3)	11.19	13.15	30.00
149	5745	11.57	14.35	30.00
157	5785	11.01	12.62	30.00
165	5825	11.31	13.52	30.00

<802.11ax HE20>

Channel	Channel Frequency (MHz)	Average Output Power		Limit (dBm)
		(dBm)	(mW)	
36	5180	11.27	13.40	24.00
40	5200	11.13	12.97	24.00
48	5240	11.14	13.00	24.00
52	5260	11.31	13.52	24.00
60	5300	11.24	13.30	24.00
64	5320	11.21	13.21	24.00
100	5500	12.18	16.52	24.00
116	5580	12.20	16.60	24.00
140	5700	11.41	13.84	24.00
144	5720 (U-NII-2C)	11.26	13.37	22.91
144	5720 (U-NII-3)	11.26	13.37	30.00
149	5745	11.65	14.62	30.00
157	5785	11.09	12.85	30.00
165	5825	11.38	13.74	30.00

Note:

For U-NII-2A, U-NII-2C Band:

1. $11 \text{ dBm} + 10\log(21.06) = 24.23 \text{ dBm} > 24 \text{ dBm}$.
2. $11 \text{ dBm} + 10\log(21.06) = 24.23 \text{ dBm} > 24 \text{ dBm}$.
3. $11 \text{ dBm} + 10\log(20.94) = 24.21 \text{ dBm} > 24 \text{ dBm}$.
4. $11 \text{ dBm} + 10\log(20.94) = 24.21 \text{ dBm} > 24 \text{ dBm}$.
5. $11 \text{ dBm} + 10\log(20.94) = 24.21 \text{ dBm} > 24 \text{ dBm}$.
6. $11 \text{ dBm} + 10\log(21.02) = 24.23 \text{ dBm} > 24 \text{ dBm}$.
7. $11 \text{ dBm} + 10\log(15.51) = 22.91 \text{ dBm} < 24 \text{ dBm}$.

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<802.11ax HE20_Partial RU>

Channel	Channel Frequency (MHz)	RU Tone	Average Output Power		Limit (dBm)
			(dBm)	(mW)	
36	5180	26	-4.45	0.36	24.00
40	5200	26	-4.37	0.37	24.00
48	5240	26	-4.31	0.37	24.00
52	5260	26	-7.28	0.19	24.00
60	5300	26	-7.35	0.18	24.00
64	5320	26	-7.56	0.18	24.00
100	5500	26	-6.52	0.22	24.00
116	5580	26	-6.38	0.23	24.00
140	5700	26	-7.23	0.19	24.00
144	5720 (U-NII-2C)	26	-7.39	0.18	24.00
144	5720 (U-NII-3)	26	-7.39	0.18	30.00
149	5745	26	-7.06	0.20	30.00
157	5785	26	-7.68	0.17	30.00
165	5825	26	-7.22	0.19	30.00
36	5180	52	-2.67	0.54	24.00
40	5200	52	-2.59	0.55	24.00
48	5240	52	-2.73	0.53	24.00
52	5260	52	-4.81	0.33	24.00
60	5300	52	-4.98	0.32	24.00
64	5320	52	-5.31	0.29	24.00
100	5500	52	-4.17	0.38	24.00
116	5580	52	-4.02	0.40	24.00
140	5700	52	-4.95	0.32	24.00
144	5720 (U-NII-2C)	52	-5.11	0.31	24.00
144	5720 (U-NII-3)	52	-5.11	0.31	30.00
149	5745	52	-4.69	0.34	30.00
157	5785	52	-5.37	0.29	30.00
165	5825	52	-5.05	0.31	30.00
36	5180	106	1.81	1.52	24.00
40	5200	106	1.88	1.54	24.00
48	5240	106	1.93	1.56	24.00
52	5260	106	-0.87	0.82	24.00
60	5300	106	-1.04	0.79	24.00
64	5320	106	-1.21	0.76	24.00
100	5500	106	0.05	1.01	24.00
116	5580	106	0.10	1.02	24.00
140	5700	106	-0.76	0.84	24.00
144	5720 (U-NII-2C)	106	-0.83	0.83	24.00
144	5720 (U-NII-3)	106	-0.83	0.83	30.00
149	5745	106	-0.31	0.93	30.00
157	5785	106	-1.17	0.76	30.00
165	5825	106	-0.79	0.83	30.00

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 66.99 mW which is less than 500mW, therefore 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	-

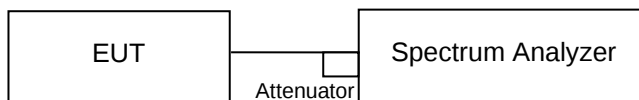
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5.1.4 26 dB Bandwidth and 99% Occupied Bandwidth

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	2024/10/28	2024/12/30

Test Procedure

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- 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%.
- 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

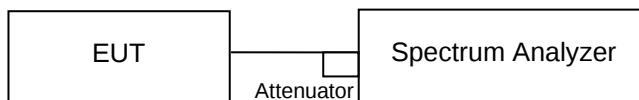
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5.1.5 6 dB Bandwidth (5725-5850MHz)

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	2024/10/28	2024/12/30

Test Procedure

MEASUREMENT PROCEDURE REF

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

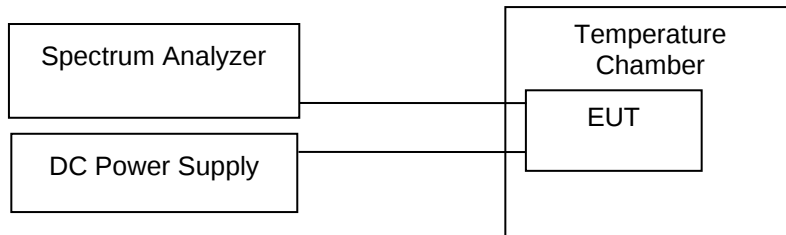
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5.1.6 Frequency Stability Measurement

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	2024/10/28	2024/12/30
Thermal Chamber	Giant Force	GHT-150-40-CP-SD	MAA1902-011	2024/04/12	2025/04/11	2024/10/28	2024/12/30

Test Procedure

- 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.
- 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.
- 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.

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Test Results

Frequency (MHz)	5180			
Voltage (V)	Measurement Frequency (MHz)			Max. Deviation (ppm)
3.46	5179.9974			0.502
3.3	5179.99595			0.782
3.14	5179.99913			0.168
Temperature (°C)	Measurement Frequency (MHz)			
	0 Minute	2 Minute	5 Minute	10 Minute
50	5179.95774	5179.95774	5179.95861	5179.95803
40	5179.96729	5179.96729	5179.96874	5179.96758
30	5179.95051	5179.94501	5179.94703	5179.9453
20	5179.99595	5179.98929	5179.98582	5179.93979
10	5179.97829	5179.97829	5179.97974	5179.98061
0	5179.99219	5179.99276	5179.99392	5179.99508
-10	5180.00347	5180.00347	5180.00347	5180.00347
-20	5180.00376	5180.00376	5180.00347	5180.00347
Max. Deviation (ppm)	9.554	10.616	10.226	11.624

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:

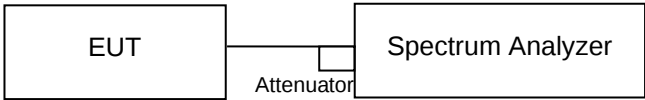
The maximum power spectral density shall not exceed 11dBm/MHz.

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	2024/10/28	2024/12/30

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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 $\geq$ 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

※For U-NII-3:

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 500 kHz, Set VBW $\geq$ 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

Test Results

Please refer to Appendix A

5.1.8 Radiated Spurious Emissions

Limit

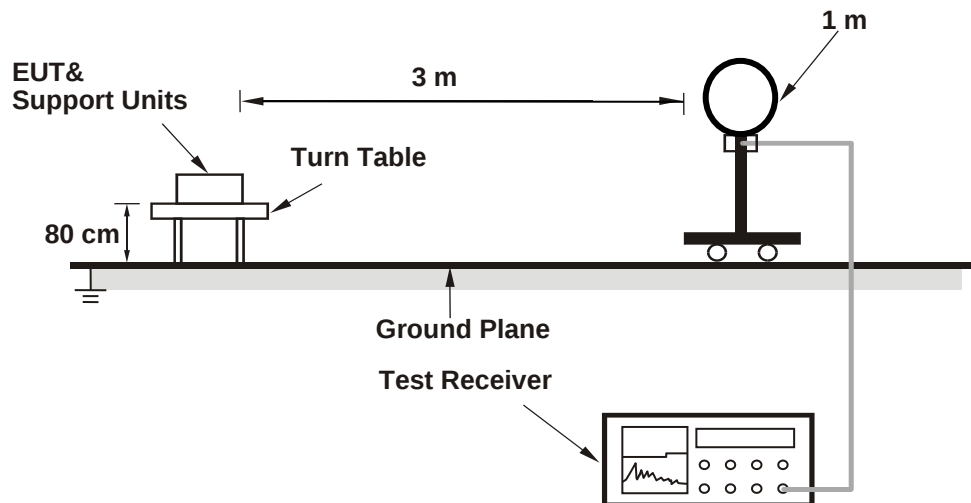
Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).

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).

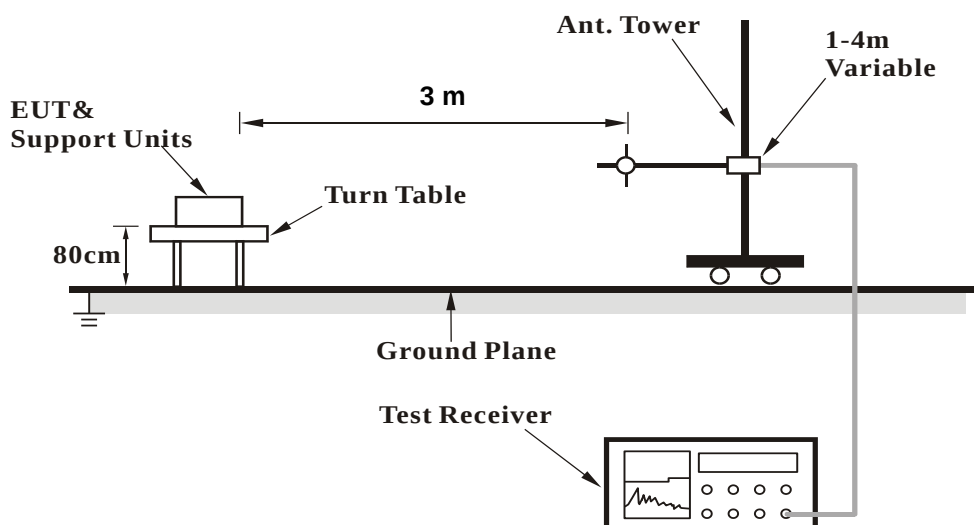
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

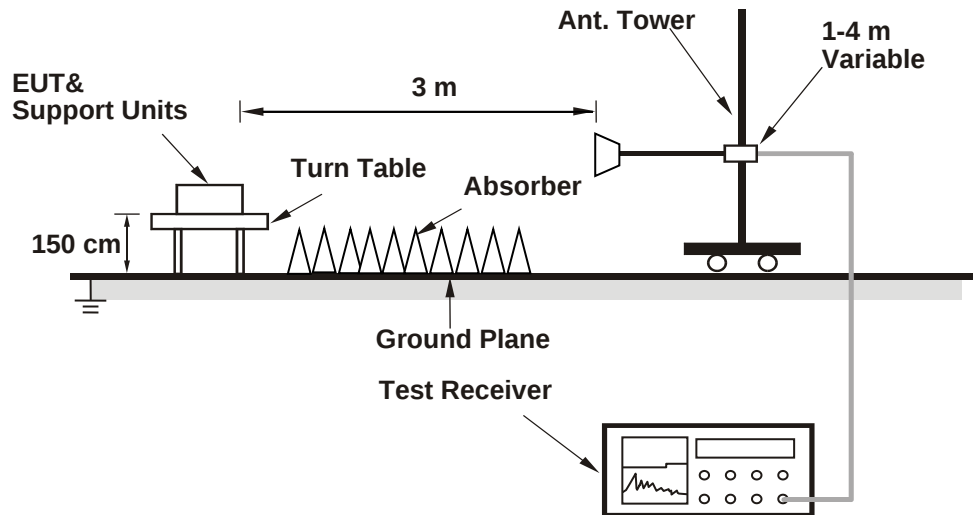
<Radiated Emissions below 30 MHz>



<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).

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Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Above 1 GHz					
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					
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					
Receiver	R&S	ESR7	102109	2024/2/23	2025/2/21
Loop Antenna	SCHWARZBECK	FMZB 1519B	00215	2024/1/4	2025/1/2
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 $\geq 1/T$ (Duty cycle $< 98\%$) or 10 Hz (Duty cycle $\geq 98\%$) 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.

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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 $\geq$ 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.	

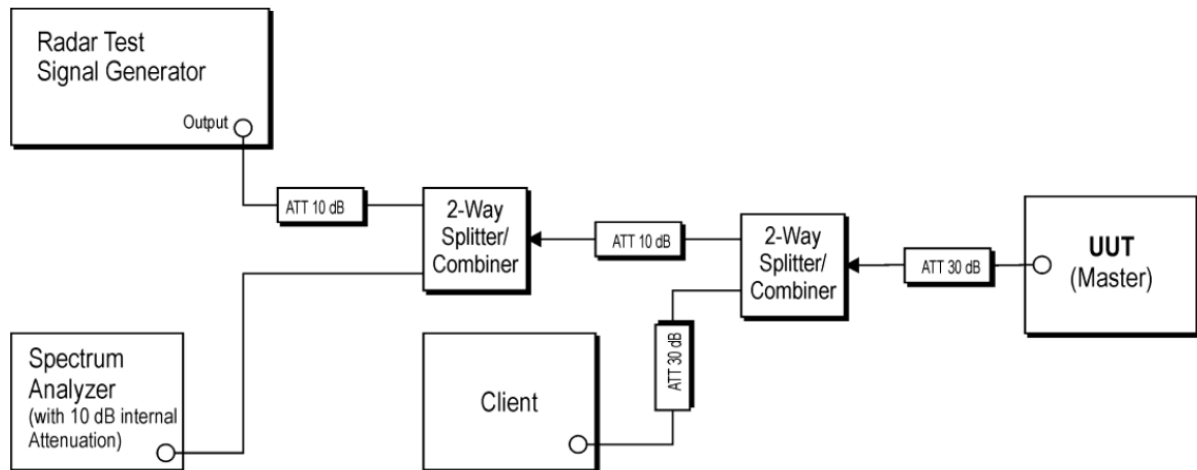
<DFS Response Requirement Values>

Parameter	Value
<i>Non-occupancy period</i>	Minimum 30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds See Note 1.
<i>Channel Closing Transmission Time</i>	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
<i>U-NII Detection Bandwidth</i>	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> 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 <i>U-NII Detection Bandwidth</i> 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.	

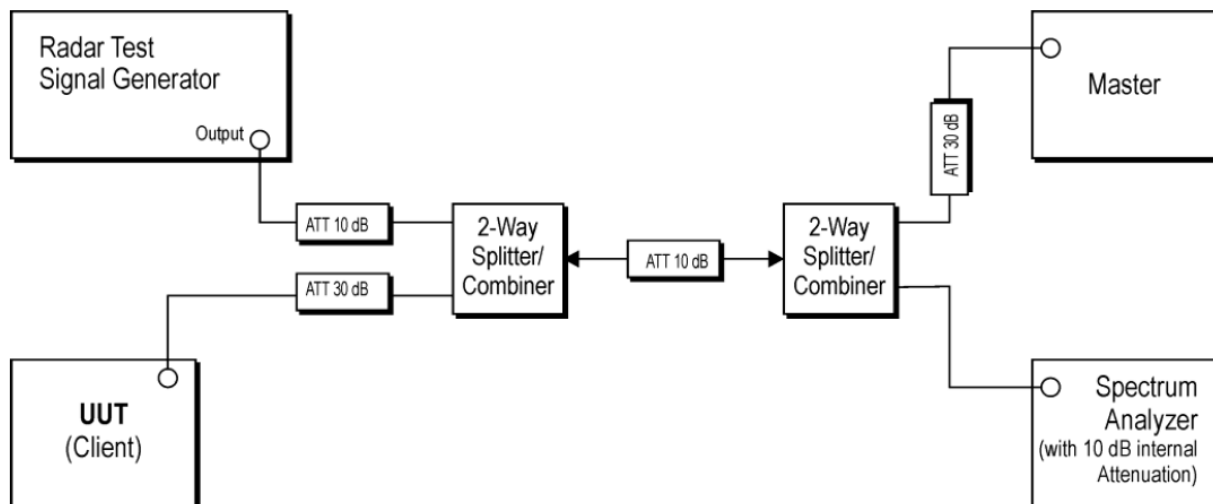
Kind of Test Site Shielded room

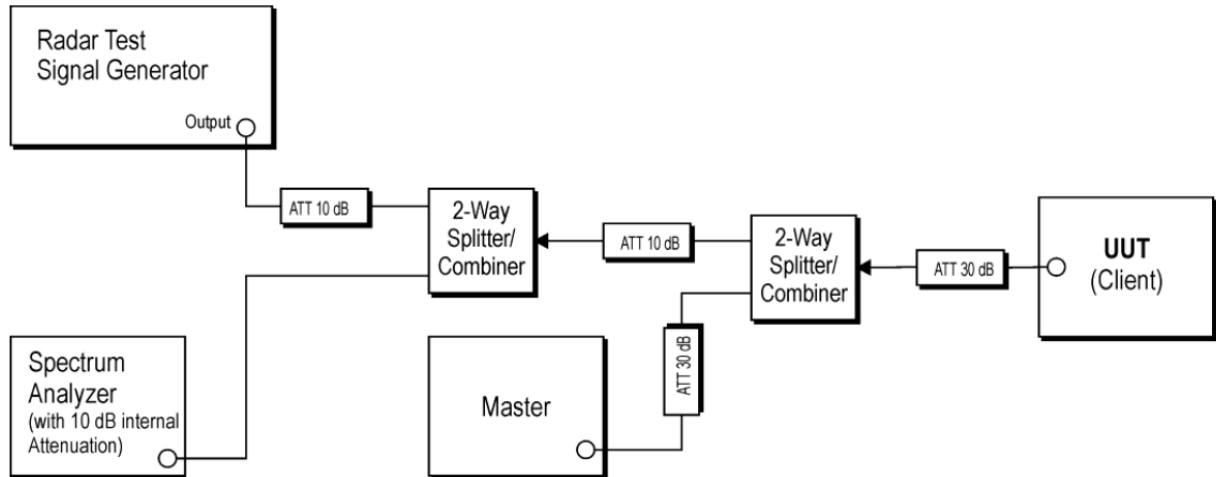
Test Setup

<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	2024/11/11	2024/11/11
EXG Vector Signal Generator	Keysight	N5172B	MY61253270	2023/12/22	2024/12/21	2024/11/11	2024/11/11
Frequency Extender	Keysight	N5182BX07	MY61500182	2023/12/22	2024/12/21	2024/11/11	2024/11/11

Requirement

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

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
<i>U-NII Detection Bandwidth and Statistical Performance Check</i>	All BW modes must be tested	Not required
<i>Channel Move Time and Channel Closing Transmission Time</i>	Test using widest BW mode available	Test using the widest BW mode available for the link
<i>All other tests</i>	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.

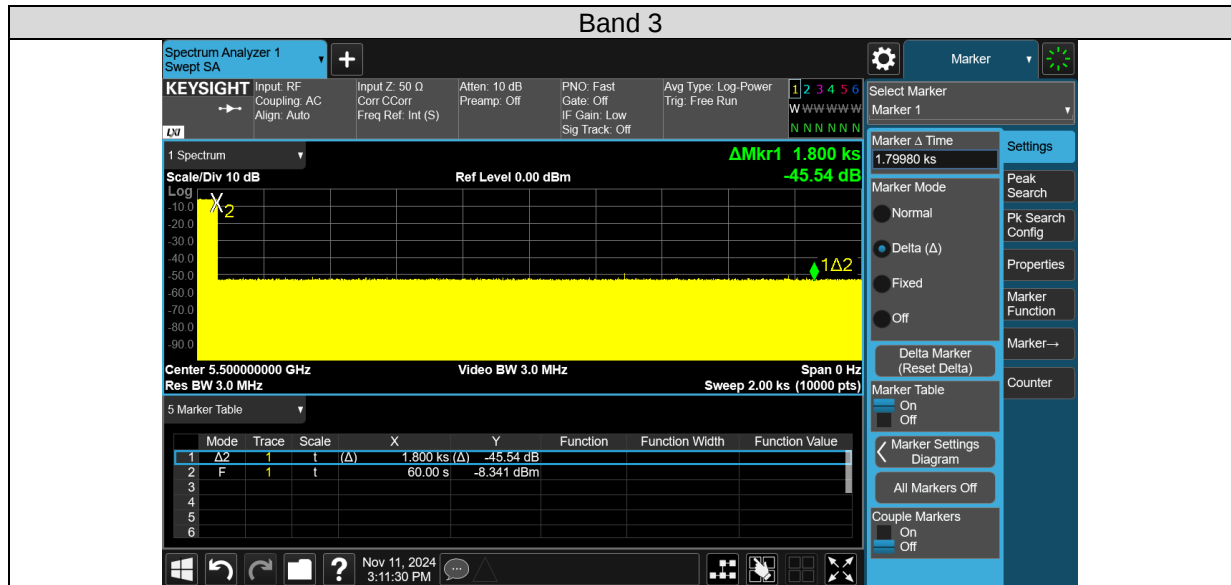
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Test Results
<802.11ax HE20>

Non-occupancy period

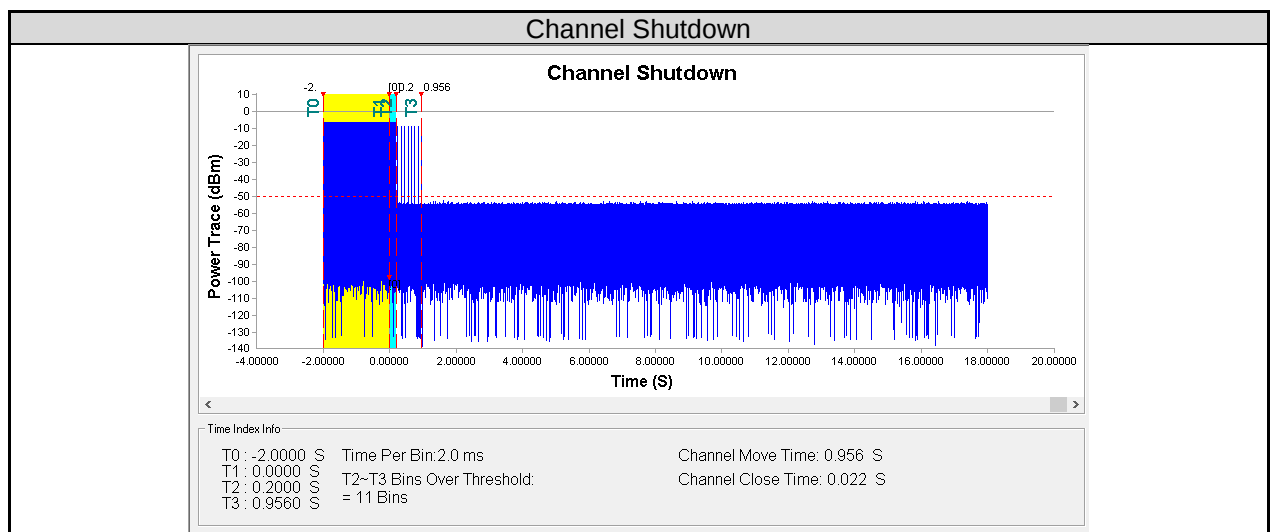
Channel (MHz)	Limit (minute)	Result
5500	30	Pass


Channel Moving Time

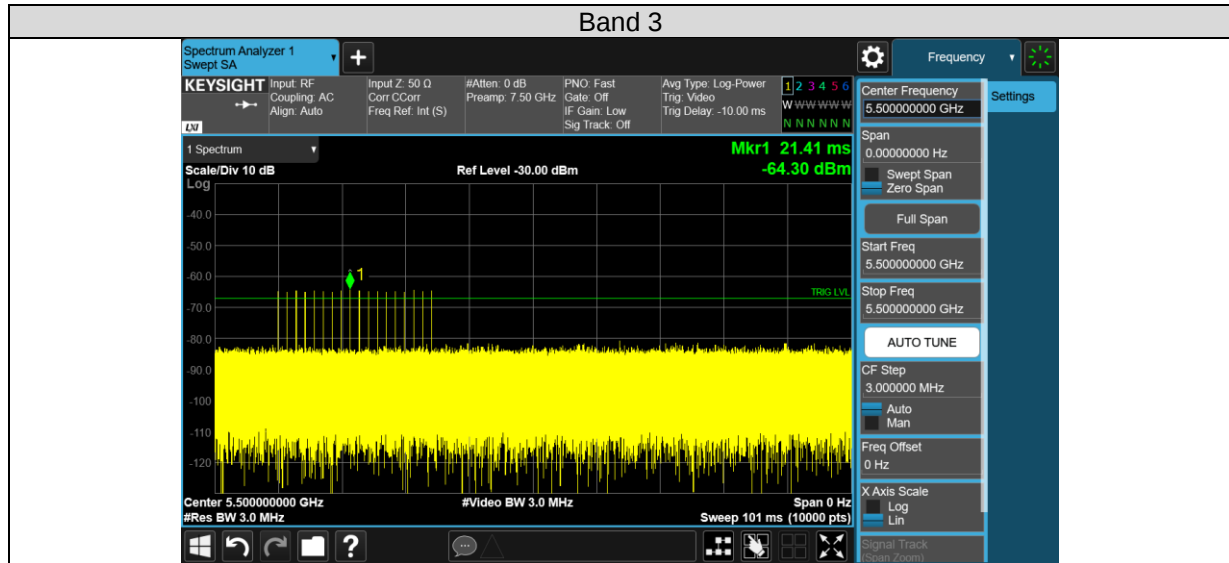
Channel (MHz)	Channel Move Time (s)	Limit (s)	Result
5500	0.956	10	Pass

Channel Closing Transmission Time

Channel (MHz)	Channel Closing Transmission Time (ms)	Limit (ms)	Result
5500	22	60	Pass



Radar Level



5.2 Mains Emission

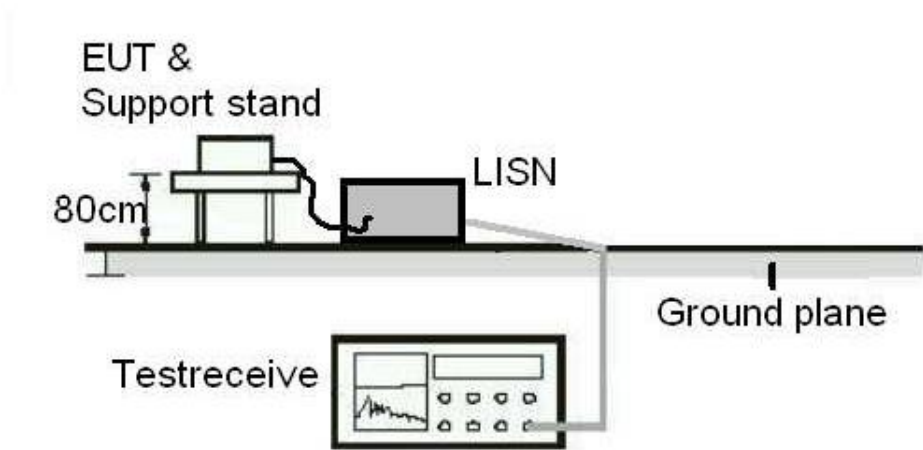
5.2.1 Mains Conducted Emission

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

Test Period: 2024-11-21

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Two-Line V-Network	Rohde & Schwarz	ENV216	101262	2023/12/27	2024/12/25
EMI Test Receiver	R&S	ESCI	101094	2023/11/27	2024/11/25

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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.