

Test report no.: <i>Prüfbericht-Nr.:</i>	CN23L252 003	Order No.: <i>Auftragsnr.:</i>	168426958	Page 1 of 28 <i>Seite 1 von 28</i>	
Client reference no.: <i>Kunden-Referenz-Nr.:</i>	N/A	Order date: <i>Auftragsdatum:</i>	2023-05-16		
Client: <i>Auftraggeber:</i>	Guangzhou Lango Electronics Technology Co., Ltd. 15/F, Building B1, NO.11, Guangpu Road, Huangpu District, Guangzhou, Guangdong, P.R. China				
Test item: <i>Prüfgegenstand:</i>	OPS-8195A				
Identification / Type no.: <i>Bezeichnung / Typ-Nr.:</i>	OPS-8195A-4R64S, OPS-8195A-8R128S, OPS-8195A-16R256S				
Order content: <i>Auftrags-Inhalt:</i>	Test Report				
Test specification <i>Prüfgrundlage:</i>	CFR47 FCC Part 15: Subpart E Section 15.407 RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 March 2019				
Date of sample receipt: <i>Wareneingangsdatum:</i>	2023-05-20	Please refer to Photo Document			
Test sample no: <i>Prüfmuster-Nr.:</i>	A003490153 001~003 A003473530-001,003 A003473530-006~007				
Testing period: <i>Prüfzeitraum:</i>	2023-05-21 to 2023-06-24				
Place of testing: <i>Ort der Prüfung:</i>	Refer to section 2.1				
Testing laboratory: <i>Prüflaboratorium:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.				
Test result*: <i>Prüfergebnis*:</i>	Pass				
tested by: <i>geprüft von:</i>			authorized by: <i>genehmigt von:</i>		
Date: 2023-07-13 <i>Datum:</i>	Signed by: Bell Hu		Issue date: 2023-07-13 <i>Ausstellungsdatum:</i>	Signed by: Lin Lin	
Position / Stellung:	Expert/Sachverständige(r)		Position / Stellung:	Expert/Sachverständige(r)	
Other: <i>Sonstiges:</i>	FCC ID: 2BA840001 IC: 21669-0001 HVIN: OPS-8195A-4R64S, OPS-8195A-8R128S, OPS-8195A-16R256S This report is for 5GHz Wi-Fi only.				
Condition of the test item at delivery: <i>Zustand des Prüfgegenstandes bei Anlieferung:</i>	Test item complete and undamaged Prüfmuster vollständig und unbeschädigt				
* Legend: P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested * Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet					
This test report only relates to the above mentioned 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>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>					

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Remarks
Anmerkungen

- | | |
|----------|--|
| 1 | <p>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.</p> <p><i>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.</i></p> <p><i>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</i></p> |
| 2 | <p>As contractually agreed, this document has been signed digitally only. TÜV 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, TÜV 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.</p> <p><i>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.</i></p> |
| 3 | <p>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.</p> <p><i>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.</i></p> |
| 4 | <p>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.</p> <p><i>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.</i></p> |

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

RESULT: Pass

5.1.3 CONDUCTED POWER SPECTRAL DENSITY

RESULT: Pass

5.1.4 FREQUENCY STABILITY

RESULT: Pass

5.1.5 26dB BANDWIDTH AND 99% BANDWIDTH

RESULT: Pass

5.1.6 6dB BANDWIDTH

RESULT: Pass

5.1.7 RADIATED SPURIOUS EMISSION

RESULT: Pass

5.1.8 DYNAMIC FREQUENCY SELECTION (DFS)

RESULT: Pass

5.1.9 CONDUCTED EMISSION ON AC MAINS

RESULT: Pass

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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 Results of 5GHz Wi-Fi

Appendix B: Photographs of the Test Set-up

1.2 TEST METHODOLOGY

KDB 789033 D02 General U-NII Test Procedures New Rules.

KDB 905462 D02 UNII DFS Compliance Procedures New Rules.

KDB 905462 D03 Client without DFS New Rules.

KDB 905462 D04 Test Mode New Rules.

KDB 662911 D01 Multiple Transmitter Output

ANSI C63.10:2013: American National Standard for Testing Unlicensed Wireless Devices

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No.362, Huanguan Middle Road, Songyuansha Community, Guanhu Subdistrict, Longhua District, Shenzhen 518110, Guangdong, China

FCC Registration No.: 694916

ISED wireless device testing laboratory: 25069

TÜV Rheinland (Guangdong) Ltd. EMC Laboratory

No.102, 1F of Southwest and No.205, 2F of West Warehouse Building, No.767 Tianyuan Road, Tianhe District, Guangzhou, Guangdong, P.R.China

FCC Registration No.: CN1207

ISED wireless device testing laboratory: 2932C

Note: Except for AC power-line conducted emissions, all test items performed in TÜV Rheinland (Shenzhen) Co., Ltd.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing (TS8997-R&S)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
Wireless Connectivity Tester	R&S	CMW270	101375	02.08.2023
Signal Analyzer	R&S	FSV 40	101441	01.08.2023
Vector Signal Generator	R&S	SMBV100A	263301	01.08.2023
Signal Generator	R&S	SMB100A	115186	01.08.2023
OSP	R&S	OSP 150	101017	21.11.2023
Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A
Test Software	R&S	WMS32 (V11.00.00)	N/A	N/A
Power Meter	R&S	NRP2	107105	21.11.2023
Power Sensor	R&S	NRP-Z81	105677	01.08.2023
Humid & Temp Programmable Tester	BOST	NTH090-60	19040801	15.03.2024
Shielding Room 8#	Albatross	SR8	APC17151-SR8	22.06.2024
Unwanted Emission Testing (TS9975)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
EMI Test Receiver	R&S	ESR 7	102021	2023-08-02
Signal Analyzer	R&S	FSV 40	101439	2023-08-01
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	2023-08-01
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2023-08-02
Amplifier	R&S	SCU-18F	180070	2023-08-02

Amplifier	R&S	SCU40A	100475	2023-08-02
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2024-08-06
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2024-08-06
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2024-08-27
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2023-08-06
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2024-06-22

Conducted Emission				
Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
EMI Test Receiver	R&S	ESU 26	100209	2024-03-01
Artificial Mains Network	R&S	ENV216	100195	2024-05-25
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Parameter	Uncertainty (k=2)
RF output power, conducted	± 0.99 dB
Occupied Channel Bandwidth	± 2.08 %
RF power density, conducted	± 0.99 dB
Unwanted Emissions, conducted	± 0.89 dB
All emissions, radiated	±4.17 dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	± 3.70 dB / ± 3.30 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. File for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No.362, Huanguan Middle Road, Songyuansha Community, Guanhu Subdistrict, Longhua District, Shenzhen 518110, Guangdong, China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The Product is OPS-8195A, which supports Bluetooth(dual mode), 2.4GHz Wi-Fi 802.11 b/g/n/ax and 5GHz Wi-Fi 802.11a/n/ac/ax wireless technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	OPS-8195A
Type Designation:	OPS-8195A-4R64S, OPS-8195A-8R128S, OPS-8195A-16R256S
FCC ID:	2BA840001
IC ID:	21669-0001
PMN:	OPS-8195A
HVIN:	OPS-8195A-4R64S, OPS-8195A-8R128S, OPS-8195A-16R256S
Operating Voltage:	12V~19V DC input via panel JAE port
Testing Voltage:	AC 120V, 60Hz
Technical Specification of Bluetooth (dual mode)	
Operating Frequency:	2402 MHz to 2480 MHz
Type of Modulation:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Channel Number:	BDR & EDR mode:79 channels; Low Energy mode:40 channels
Channel Separation:	BDR & EDR mode: 1MHz, 2MHz; Low Energy mode: 2MHz
Data Rate:	BDR & EDR mode: 1Mbps, 2Mbps, 3Mbps Low Energy mode: 1Mbps, 2Mbps
Antenna Type:	External Antenna
Antenna Gain of Bluetooth:	5.0 dBi Max(As detailed in Antenna spec)
Technical Specification of Wi-Fi 802.11 b/g/n/ax	
Operating Frequency:	2412 - 2462 MHz for 802.11b/g/n(HT20)/ax(HE20) 2422 - 2452 MHz for 802.11n(HT40)/ax(HE40)
Type of Modulation:	802.11b: CCK, DQPSK, DBPSK 802.11g/n : BPSK, QPSK, 16QAM, 64QAM 802.11ax: BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM
Data Rate:	1/2/5.5/11 Mbps for 802.11b 6/9/12/18/24/36/48/54 Mbps for 802.11g MCS0~MCS 7 for 802.11n(HT20/40) MCS0~MCS11 for 802.11ax(HE20/40) (All data rates considered, only the Worst-cases reported)
Channel Number:	11 channels for 802.11b/g/n(HT20)/ax(HE20) 7 channels for 802.11n(HT40)/ax(HE40)
Channel Separation:	5 MHz
Antenna Type:	External Antenna
Number of Antenna:	2

Antenna Gain:	5.0 dBi Max(As detailed in Antenna spec)
Note: WLAN 2.4GHz 802.11n and 802.11ax support. For directional gain: Array Gain = $10 \log(NANT/NSS)$ dB. So the Directional gain = GANT + $10 \log(NANT)$ dBi (The worst case directional gain will occur when NSS = 1).	
Technical Specification of Wi-Fi 802.11 a/n/ac/ax	
Operating Frequency:	5180-5320MHz, 5500-5720MHz, 5745-5825MHz
Type of Modulation:	802.11n/a: BPSK, QPSK, 16QAM, 64QAM 802.11ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM 802.11ax: BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM
Protocol:	802.11 a/n20/n40/ac20/ac40/ac80/ ax20/ax40/ax80
Data Rate:	6/9/12/18/24/36/48/54 Mbps for 802.11a MCS0~MCS7 for 802.11n MCS0~MCS9 for 802.11ac MCS0~MCS11 for 802.11ax (All data rates considered, only the Worst-cases reported)
Channel Separation	5 MHz
Antenna Type:	External Antenna
Number of Antenna:	2
Antenna Gain:	5.0 dBi Max (As detailed in Antenna spec)
Type of Device	Slave Device without Radar Detection
Note: WLAN 5GHz 802.11n/802.11ac/802.11ax. For directional gain: Array Gain = $10 \log(NANT/NSS)$ dB. So the Directional gain = GANT + $10 \log(NANT)$ dBi (The worst case directional gain will occur when NSS = 1).	

Note: all required modes tested for all items, and only the worst-case reported.

* All the models share the same circuit design and PCB layout, the different in RAM and ROM. RSE considered for all models, only the worst-case reported.

Model number	RAM and ROM configuration
OPS-8195A-4R64S	4GB/64GB
OPS-8195A-8R128S	8GB/128GB
OPS-8195A-16R256S	16GB/256GB

Table 3: RF Channel and Frequency of 5GHz Wi-Fi 802.11 a/n/ac/ax

U-NII-1					
20MHz Bandwidth		40MHz Bandwidth		80MHz Bandwidth	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

U-NII-2A					
20MHz Bandwidth		40MHz Bandwidth		80MHz Bandwidth	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	54	5270	58	5290
56	5280	62	5310		
60	5300				
64	5320				

U-NII-2C					
20MHz Bandwidth		40MHz Bandwidth		80MHz Bandwidth	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590	138	5690
112	5560	126	5630		
116	5580	134	5670		
120	5600	142	5710		
124	5620				
128	5640				
132	5660				
136	5680				
140	5700				
144	5720				

Note: Per RSS-247 section 6.2.3, transmission on channels which overlap **5600-5650MHz** is prohibited for ISM.

U-NII-3					
20MHz Bandwidth		40MHz Bandwidth		80MHz Bandwidth	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Wi-Fi 802.11 a/n wireless transmitting mode
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel
- B. On, Normal operation with Wi-Fi & Bluetooth connected.
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- | | |
|------------------------------|-------------------------|
| - Application Form | - User Manual |
| - ID Label and Location Info | - Operation Description |

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model OPS-8195A-4R64S in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	Remark
Laptop	Lenovo	T480	PF-16A6N8
Laptop	Lenovo	T14	PF-35VTG1
Monitor	Lenovo	T24s-20	1S62A5MCR4CSULA20286
Router	HUAWEI	WS7200	L5KEQ20B02002259
Headset	Logitech	H110	/
Keyboard	DELL	KB212-B	DP/N ON291F
Mouse	A4TECH	OP-520NU	/
USB Disk	KingSton	8GB	/
Test Board	Lango	/	SN: 02K1150315A0
AC/DC Adapter	/	SWPP-12000-US	Input: 100-240V AC, 50/60Hz, 1.0A MAX Output: DC 12V/1A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

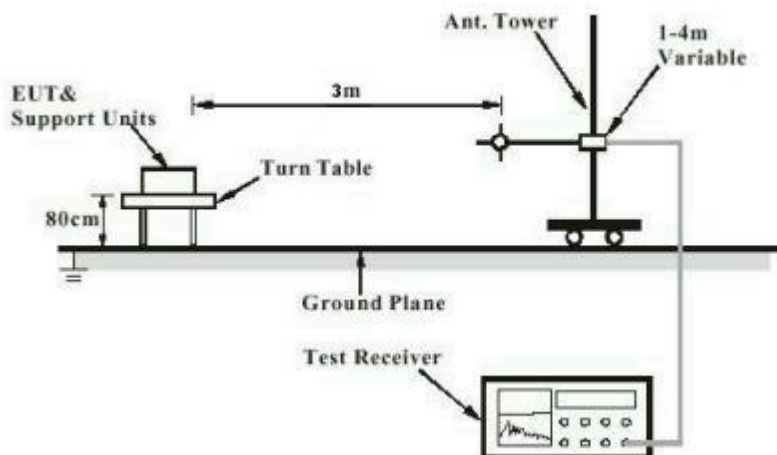


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

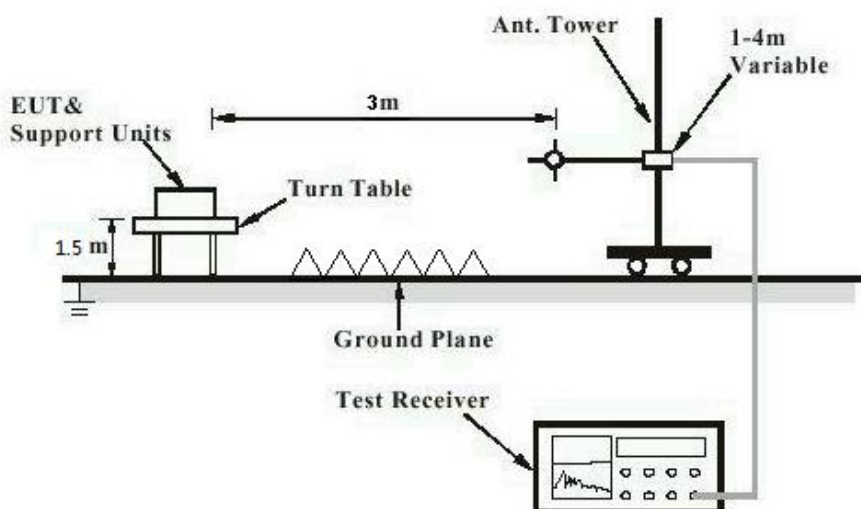


Diagram of Measurement Configuration for Mains Conduction Measurement

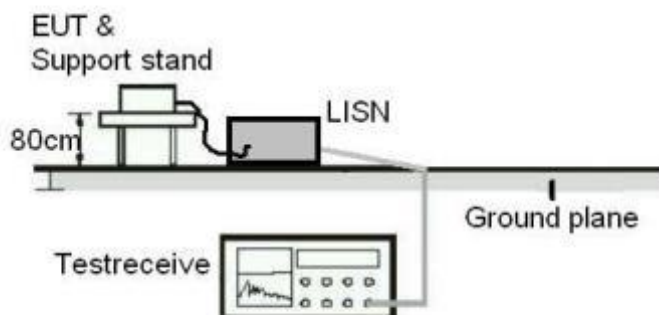


Diagram of Measurement Configuration for Conducted Transmitter Measurement

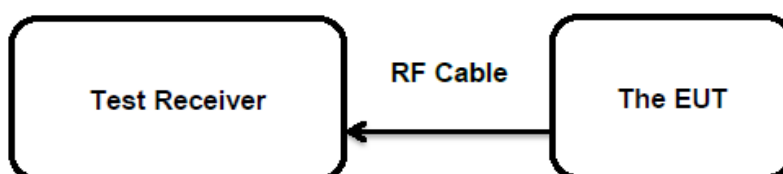
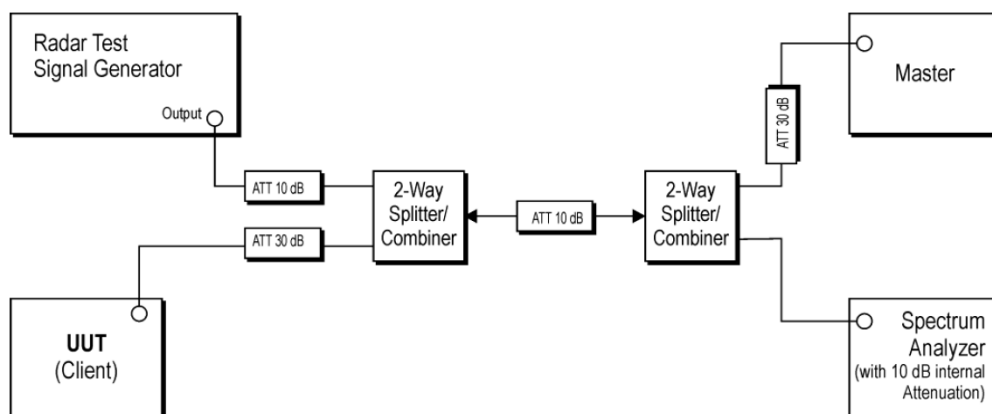


Diagram of Measurement Configuration for Dynamic Frequency Selection (DFS)



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:

Pass

Test Specification

Test standard : FCC Part 15.203
RSS-Gen Clause 6.8

The EUT have External Antennas, the Maximum antenna gain of antenna is 5.0 dBi, and Non-standard connector (RP-SMA) designed, no consideration of replacement.

Therefore, the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Maximum Conducted Output Power

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.407(a)(1)&(2)&(4) RSS-247 clause 6.2
Basic standard	: ANSI C63.10: 2013
Limits	: FCC: <250mW (23.98dBm) (5150-5250MHz) * <250mW (23.98dBm) (5250-5350MHz, 5470-5725MHz) * 250 mW (23.98dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz, where is lesser. <1W (30dBm) (5725-5850MHz) IC: * Max e.i.r.p. < 200mW (5150-5250MHz) * 200 mW (23dBm) or 10 dBm + 10 log B, where B is the 99% emission bandwidth in MHz, where is lesser. * Max conducted output power < 250mW (5250-5350MHz, 5470-5600 MHz and 5650-5725 MHz) * 250 mW (23.98dBm) or 11 dBm + 10 log B, where B is the 99% emission bandwidth in MHz, where is lesser. * Max e.i.r.p. < 1W (30dBm) (5250-5350MHz, 5470-5600 MHz and 5650-5725 MHz) * 1 W (30dBm) or 17 dBm + 10 log B, where B is the 99% emission bandwidth in MHz, where is lesser. Max conducted output power < 1W (30dBm) (5725-5850MHz)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2023-06-04 to 2023-06-20
Input voltage	: AC 120V, 60Hz
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 24.1 °C
Relative humidity	: 61 %
Atmospheric pressure	: 101 kPa

Note: Per RSS-247 section 6.2.3, transmission on channels which overlap 5600-5650MHz is prohibited for ISCED.

SISO Mode, 802.11A:

Test Mode	Antenna	Frequency [MHz]	Measured conducted average Power Result [dBm]	FCC limit Limit [dBm] (conducted power)	IC limit Limit [dBm] (conducted power&EIRP)	Verdict
11A	Ant1	5180	15.007	≤23.98	e.i.r.p.<23dBm	PASS
		5220	15.033	≤23.98		PASS
		5240	14.553	≤23.98		PASS
		5260	14.556	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5300	14.851	≤23.98		PASS
		5320	14.822	≤23.98		PASS
		5500	14.783	≤23.98		PASS
		5580	14.403	≤23.98		PASS
		5700	14.827	≤23.98		PASS
		5720	14.387	≤23.98		PASS
		5745	14.692	≤30.00	Conducted output power < 30dBm	PASS
		5785	14.471	≤30.00		PASS
		5825	15.108	≤30.00		PASS

*The antenna gain is 5dBi. The Duty Cycle Factor is compensated in the tables.
 TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW(27dBm).
 Both the Ant 1 and ant 2 tested, only worst-case reported.

MIMO Mode:

Test Mode	Antenna	Frequency [MHz]	Measured conducted average Power Result [dBm]	FCC limit Limit [dBm] (conducted power)	IC limit Limit [dBm] (conducted power&EIRP)	Verdict
11N20	MIMO	5180	14.332	≤23.98	e.i.r.p.<23dBm	PASS
		5220	14.184	≤23.98		PASS
		5240	14.816	≤23.98		PASS
		5260	18.552	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5300	18.089	≤23.98		PASS
		5320	18.679	≤23.98		PASS
		5500	18.676	≤23.98		PASS
		5580	18.954	≤23.98		PASS
		5700	18.443	≤23.98		PASS
		5720	18.184	≤23.98		PASS
		5745	19.228	≤30.00	Conducted output power < 30dBm	PASS
		5785	18.723	≤30.00		PASS
		5825	18.928	≤30.00		PASS
11N40	MIMO	5190	14.255	≤23.98	e.i.r.p.<23dBm	PASS
		5230	14.206	≤23.98		PASS
		5270	17.368	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5310	17.784	≤23.98		PASS
		5510	17.662	≤23.98		PASS
		5550	17.978	≤23.98		PASS
		5670	17.159	≤23.98		PASS
		5710	17.202	≤23.98		PASS
		5755	18.094	≤30.00	Conducted output power < 30dBm	PASS
		5795	17.699	≤30.00		PASS
11AC20	MIMO	5180	14.314	≤23.98	e.i.r.p.<23dBm	PASS
		5220	14.542	≤23.98		PASS
		5240	14.322	≤23.98		PASS
		5260	17.504	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5300	17.74	≤23.98		PASS
		5320	18.371	≤23.98		PASS
		5500	18.459	≤23.98		PASS
		5580	18.783	≤23.98		PASS
		5700	18.214	≤23.98		PASS
		5720	18.200	≤23.98		PASS
		5745	19.133	≤30.00	Conducted output power < 30dBm	PASS
		5785	18.559	≤30.00		PASS
		5825	18.789	≤30.00		PASS
11AC40	MIMO	5190	14.276	≤23.98	e.i.r.p.<23dBm	PASS
		5230	14.107	≤23.98		PASS
		5270	17.381	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5310	17.77	≤23.98		PASS
		5510	17.727	≤23.98		PASS
		5550	17.967	≤23.98		PASS
		5670	17.32	≤23.98		PASS
		5710	17.30	≤23.98		PASS
		5755	17.972	≤30.00	Conducted output	PASS

		5795	17.645	≤30.00	power < 30dBm	PASS
11AC80	MIMO	5210	14.453	≤23.98	e.i.r.p.<23dBm	PASS
		5290	17.004	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5530	17.105	≤23.98		PASS
		5610	17.377	≤23.98		PASS
		5690	16.90	≤23.98		PASS
		5775	16.87	≤30.00	Conducted output power < 30dBm	PASS
11AX20	MIMO	5180	14.258	≤23.98	e.i.r.p.<23dBm	PASS
		5220	14.518	≤23.98		PASS
		5240	14.436	≤23.98		PASS
		5260	17.902	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5300	18.139	≤23.98		PASS
		5320	18.789	≤23.98		PASS
		5500	18.666	≤23.98		PASS
		5580	19.054	≤23.98		PASS
		5700	18.511	≤23.98		PASS
		5720	18.500	≤23.98		PASS
		5745	19.338	≤30.00	Conducted output power < 30dBm	PASS
		5785	18.883	≤30.00		PASS
		5825	19.082	≤30.00		PASS
11AX40	MIMO	5190	14.255	≤23.98	e.i.r.p.<23dBm	PASS
		5230	14.195	≤23.98		PASS
		5270	17.474	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5310	17.751	≤23.98		PASS
		5510	17.794	≤23.98		PASS
		5550	18.009	≤23.98		PASS
		5670	17.379	≤23.98		PASS
		5710	17.382	≤23.98		PASS
		5755	19.344	≤30.00	Conducted output power < 30dBm	PASS
		5795	18.038	≤30.00		PASS
11AX80	MIMO	5210	14.816	≤23.98	e.i.r.p.<23dBm	PASS
		5290	17.003	≤23.98	Conducted output power < 23.98dBm, and e.i.r.p.<30dBm	PASS
		5530	17.314	≤23.98		PASS
		5610	17.62	≤23.98		PASS
		5690	17.10	≤23.98		PASS
		5775	17.102	≤30.00	Conducted output power < 30dBm	PASS

*For the WLAN 5GHz 802.11n/802.11ac/802.11ax, the directional gain is 8dBi for MIMO mode, thus the power limit should be reduced by 2dB.

The Duty Cycle Factor is compensated in the tables.

TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW(27dBm).

Both SISO and MIMO tested, only the higher power mode MIMO reported.

Antenna gain(G): 5.0 dBi

e.i.r.p.=P(Average power)+ G (directional gain)

5.1.3 Conducted Power Spectral Density

RESULT:**Pass****Test Specification**

Test standard	: FCC part 15.407(a) RSS-247 clause 6.2
Basic standard	: ANSI C63.10: 2013 KDB 789033 D02 v01r03
Limits	: FCC: <11dBm/MHz (5150-5250MHz 5250-5350MHz, 5470-5725MHz) <30dBm/500KHz (5725-5850MHz) IC: e.i.r.p. spectral density <10dBm/MHz (5150-5250MHz) <11dBm/1MHz (5250-5350MHz) <30dBm/500KHz (5725-5850MHz)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2023-06-04 to 2023-06-20
Input voltage	: AC 120V, 60Hz
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 24.1 °C
Relative humidity	: 61 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix A.

5.1.4 Frequency Stability

RESULT:**Pass****Test Specification**

Test standard : FCC Part 15.407(g)
RSS-Gen Clause 6.11
Basic standard : ANSI C63.10: 2013
Limits : Within assigned bands
Kind of test site : Shielded Room

Test Setup

Date of testing : 2023-06-04 to 2023-06-20
Input voltage : AC 120V, 60Hz
Operation mode : A
Test channel : Low / Middle / High
Ambient temperature : 24.1 °C
Relative humidity : 61 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.

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Page 23 of 28**5.1.5 26dB Bandwidth and 99% Bandwidth****RESULT:****Pass****Test Specification**

Test standard : FCC Part 15.407(e)
RSS-Gen Clause 6.6
Basic standard : ANSI C63.10: 2013
Limits : N/A
Kind of test site : Shielded Room

Test Setup

Date of testing : 2023-06-04 to 2023-06-20
Input voltage : AC 120V, 60Hz
Operation mode : A
Test channel : Low / Middle / High
Ambient temperature : 24.1 °C
Relative humidity : 61 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.

5.1.6 6dB Bandwidth**RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.407(e) RSS-Gen Clause 6.6
Basic standard	: ANSI C63.10: 2013
Limits	: At least 500KHz (5725-5850MHz)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2023-06-04 to 2023-06-20
Input voltage	: AC 120V, 60Hz
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 24.1 °C
Relative humidity	: 61 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix A.

5.1.7 Radiated Spurious Emission

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.407(b) & FCC Part 15.205 & FCC Part 15.209 RSS-247 clause 6.2 & RSS-GEN clause 8.9 and 8.10
Basic standard	: ANSI C63.10: 2013 KDB 789033 D02 v01r03
Limits	: • For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz. • For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz. • For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz. Emissions outside the band 5470-5600 MHz and 5650-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p. • For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. • Restricted Bands meet the requirement of 15.209 limit and RSS-GEN
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: 2023-06-04 to 2023-06-20
Input voltage	: AC 120V, 60Hz
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: Refer to test result
Relative humidity	: Refer to test result
Atmospheric pressure	: 101 kPa

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix A.

5.1.8 Dynamic Frequency Selection (DFS)

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.407(h) RSS-247 clause 6.3
Basic standard	: ANSI C63.10: 2013
Limits	: 5250-5350MHz, 5470-5725MHz Channel Move Time: Within 10 seconds. Channel Closing Transmission Time: 200ms+aggregate of 60ms over remaining 10s period; Non-Occupancy Period: at least 30 minutes.
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2023-06-04 to 2023-06-20
Input voltage	: AC 120V, 60Hz
Operation mode	: A
Test channel	: CH 58, CH 106
Ambient temperature	: 24.1 °C
Relative humidity	: 61 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix A.

5.1.9 Conducted Emission on AC Mains

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.207(a) RSS-Gen Clause 8.8
Basic standard	: ANSI C63.10: 2013
Frequency range	: 0.15 – 30MHz
Limits	: FCC Part 15.207(a) RSS-Gen Table 4
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2023-06-07
Input voltage	: AC 120V, 60Hz
Operation mode	: B
Earthing	: Not connected
Ambient temperature	: 23.2 °C
Relative humidity	: 50.6 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix A.

6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix B.

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