

EN 300 440 RF Test Report (WLAN)

Report No.: RE200522E04-2

Test Model: RTL8852AE

Received Date: May 22, 2020

Test Date: June 22 to Sep. 17, 2020

Issued Date: Oct. 05, 2020

Applicant: Realtek Semiconductor Corp.

Address: No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan



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Release Control Record

Issue No.	Description	Date Issued
RE200522E04-2	Original release.	Oct. 05, 2020

1 Certificate of Conformity

Product: 11ax RTL8852AE Combo module

Brand: REALTEK

Test Model: RTL8852AE

Sample Status: ENGINEERING SAMPLE

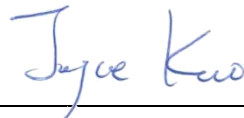
Applicant: Realtek Semiconductor Corp.

Test Date: June 22 to Sep. 17, 2020

Standards: EN 300 440 V2.1.1 (2017-03)

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :



Joyce Kuo / Specialist

Date:

Oct. 05, 2020

Approved by :



Clark Lin / Technical Manager

Date:

Oct. 05, 2020

2 Summary of Test Results

The EUT has been tested according to the following specifications:

EN 300 440 V2.1.1		
Clause	Test Parameter	Result
Transmitter Parameters		
4.2.2	Equivalent Isotropic Radiated Power (e.i.r.p)	Pass
4.2.3	Permitted Range of Operating Frequencies	Pass
4.2.4	Unwanted Emission in the Spurious Domain	Pass
Receiver Parameters		
4.3.5	Receiver spurious radiations	Pass
4.3.3	Adjacent channel selectivity (Applied to Receiver Category 1)	Pass
4.3.4	Blocking or desensitization (Applied to Receiver Category 1 and 2)	Pass

- Note: 1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. The radiated spurious emission of the transmitter on standby mode is equal to that of receiver mode.

2.1 Test Instruments

For spurious emissions test: (below 1GHz)

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Keysight	N9030A	MY54490570	June 16, 2020	June 15, 2021
Pre_Amplifier Agilent	8447D	2944A10663	Apr. 28, 2020	Apr. 27, 2021
TRILOG Antenna SCHWARZBECK	VULB9168	9168-162	Nov. 11, 2019	Nov. 10, 2020
Software	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208411	NA	NA
Power meter Anritsu	ML2495A	1529002	July 26, 2019	July 25, 2020
Power sensor Anritsu	MA2411B	1339443	July 26, 2019	July 25, 2020
Power meter Anritsu	ML2496A	1529003	Aug. 07, 2019	Aug. 06, 2020
Power sensor Anritsu	MA2411B	1339442	Aug. 07, 2019	Aug. 06, 2020
ESG Vector signal generator Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	Nov. 14, 2019	Nov. 13, 2020

- NOTE:**
1. The test was performed in RF Fully Chamber No. 1.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: July 10, 2020

For spurious emissions test: (above 1GHz)

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Keysight	N9030A	MY54490570	June 16, 2020	June 15, 2021
Pre_Amplifier HP	8449B	3008A01281	Jan. 09, 2020	Jan. 08, 2021
Preamplifier EMCi	EMC184045	980143	Jan. 09, 2020	Jan. 08, 2021
Horn_Antenna SCHWARZBECK	BBHA9120-D1	D124	Nov. 24, 2019	Nov. 23, 2020
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
Software	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208411	NA	NA
Power meter Anritsu	ML2495A	1529002	July 26, 2019	July 25, 2020
Power sensor Anritsu	MA2411B	1339443	July 26, 2019	July 25, 2020
Power meter Anritsu	ML2496A	1529003	Aug. 07, 2019	Aug. 06, 2020
Power sensor Anritsu	MA2411B	1339442	Aug. 07, 2019	Aug. 06, 2020
ESG Vector signal generator Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	Nov. 14, 2019	Nov. 13, 2020

- NOTE:**
1. The test was performed in RF Fully Chamber No. 1.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: June 22 to July 06, 2020

For spurious emissions test (for TX emission for RU mode):

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Keysight	N9030A	MY55410176	June 30, 2020	June 29, 2021
Pre_Amplifier HP	8449B	3008A01923	Oct. 09, 2019	Oct. 08, 2020
Pre_Amplifier EMCi	EMC184045	980143	Jan. 09, 2020	Jan. 08, 2021
Horn_Antenna SCHWARZBECK	BBHA 9120 D	9120D-1592	Nov. 24, 2019	Nov. 23, 2020
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
Software	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208542	NA	NA
Power meter Anritsu	ML2495A	1529002	July 22, 2020	July 21, 2021
Power sensor Anritsu	MA2411B	1339443	July 22, 2020	July 21, 2021
Power meter Anritsu	ML2496A	1529003	Aug. 07, 2019	Aug. 06, 2020
Power sensor Anritsu	MA2411B	1339442	Aug. 07, 2019	Aug. 06, 2020
ESG Vector signal generator Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	Nov. 14, 2019	Nov. 13, 2020

- NOTE:**
1. The test was performed in RF Fully Chamber No. 2.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: July 23, 2020

For spurious emissions test (for TX emission above 1GHz):

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Keysight	N9030A	MY55410176	July 03, 2019	July 02, 2020
Pre_Amplifier HP	8449B	3008A01923	Oct. 09, 2019	Oct. 08, 2020
Pre_Amplifier EMCi	EMC184045	980143	Jan. 09, 2020	Jan. 08, 2021
Horn_Antenna SCHWARZBECK	BBHA 9120 D	9120D-1592	Nov. 24, 2019	Nov. 23, 2020
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
Software	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208542	NA	NA
Power meter Anritsu	ML2495A	1529002	July 26, 2019	July 25, 2020
Power sensor Anritsu	MA2411B	1339443	July 26, 2019	July 25, 2020
Power meter Anritsu	ML2496A	1529003	Aug. 07, 2019	Aug. 06, 2020
Power sensor Anritsu	MA2411B	1339442	Aug. 07, 2019	Aug. 06, 2020
ESG Vector signal generator Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	Nov. 14, 2019	Nov. 13, 2020

- NOTE:**
1. The test was performed in RF Fully Chamber No. 2.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: June 24, 2020

For receiver blocking & adaptivity test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Keysight	N9030A	MY55410176	June 30, 2020	June 29, 2021
AD1AD191XA one box tester	MT8860C	1705001	Feb. 15, 2020	Feb. 14, 2021
Bluetooth Simulator Anritsu	MT8852B	1218002	May 19, 2020	May 18, 2021
ESG Vector signal generator Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	Nov. 14, 2019	Nov. 13, 2020
Upgrade the software license on current E4438C ESG Agilent	E4438CK-403	ESG E4_010001	NA	NA
MXG X-Series RF Vector Signal Generator Agilent	N5182B	MY53052700	July 14, 2020	July 13, 2021
Direct Coupler EMCI	CS20-18-436/16	1139	NA	NA
Power Splitter/combiner Mini-Circuits	ZN4PD-642W-S+	408501327_03	Oct. 04, 2019	Oct. 03, 2020
Power Splitter/combiner Mini-Circuits	ZN4PD-642W-S+	408501327_04	Oct. 04, 2019	Oct. 03, 2020

- NOTE:**
1. The test was performed in Adaptivity room.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: Sep. 10 to 17, 2020

For other test items (For RU mode):

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Spectrum Analyzer Keysight	N9030A	MY54490570	June 16, 2020	June 15, 2021
AC Power Source Extech Electronics	6502	1140503	NA	NA
Temperature & Humidity Chamber TERCHY	MHU-225AU	911033	Nov. 26, 2019	Nov. 25, 2020
DC Power Supply GOOD WILL INSTRUMENT CO., LTD.	GPC - 3030D	7700087	NA	NA
ESG Vector signal generator Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	Nov. 14, 2019	Nov. 13, 2020
Power meter Anritsu	ML2495A	0824006	Apr. 28, 2020	Apr. 27, 2021
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA
MXG X-Series RF Vector Signal Generator Agilent	N5182B	MY53052700	July 14, 2020	July 13, 2021
MIMO Powermeasurement Test set (4X4) Agilent	U2021XA	U2021XA_01	Sep. 18, 2019	Sep. 17, 2020
MIMO Powermeasurement Test set (4X4) Agilent	U2021XA	U2021XA_02	Nov. 14, 2019	Nov. 13, 2020
Switch Box Agilent	PS-X10-100	PS-X10-100_01	Sep. 18, 2019	Sep. 17, 2020

- NOTE:**
1. The test was performed in Oven room 1.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: July 25, 2020

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Spectrum Analyzer Keysight	N9030A	MY54490570	June 16, 2020	June 15, 2021
AC Power Source Extech Electronics	6502	1140503	NA	NA
Temperature & Humidity Chamber TERCHY	MHU-225AU	911033	Nov. 26, 2019	Nov. 25, 2020
DC Power Supply GOOD WILL INSTRUMENT CO., LTD.	GPC - 3030D	7700087	NA	NA
ESG Vector signal generator Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	Nov. 14, 2019	Nov. 13, 2020
Power meter Anritsu	ML2495A	0824006	Apr. 28, 2020	Apr. 27, 2021
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA
MXG X-Series RF Vector Signal Generator Agilent	N5182B	MY53052700	July 17, 2019	July 16, 2020
MIMO Powermeasurement Test set (4X4) Agilent	U2021XA	U2021XA_01	Sep. 18, 2019	Sep. 17, 2020
MIMO Powermeasurement Test set (4X4) Agilent	U2021XA	U2021XA_02	Nov. 14, 2019	Nov. 13, 2020
Switch Box Agilent	PS-X10-100	PS-X10-100_01	Sep. 18, 2019	Sep. 17, 2020

- NOTE:**
1. The test was performed in Oven room 1.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: July 08 to 09, 2020

2.2 Measurement Uncertainty

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

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Parameter	Uncertainty
Radio frequency	$\pm 1 \times 10^{-7}$
RF power (conducted)	± 1.2 dB
Radiated emission of transmitter, valid up to 26.5GHz	± 4.9 dB
Radiated emission of transmitter, valid between 26.5 GHz and 66 GHz	± 4.9 dB
Radiated emission of receivers, valid up to 26.5GHz	± 4.9 dB
Radiated emission of receiver, valid between 26.5 GHz and 66 GHz	± 4.9 dB
Temperature	± 0.4 °C
Humidity	± 0.6 %
Voltages(DC)	± 0.05 %
Voltages(AC, <10kHz)	± 0.05 %
NOTE: For radiated emissions above 26,5 GHz it may not be possible to achieve measurement uncertainties complying with the levels specified in this table. In these cases alone it is acceptable to employ the alternative interpretation procedure specified in clause 10.1.	

2.3 Maximum Measurement Uncertainty

For the test methods, according to ETSI EN 300 440 standard, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028, in particular in annex D of the ETSI TR 100 028-2.

Maximum measurement uncertainty

Parameter	Uncertainty
Radio frequency	$\pm 1 \times 10^{-7}$
RF power (conducted)	± 2.5 dB
Radiated emission of transmitter, valid up to 26.5GHz	± 6.0 dB
Radiated emission of transmitter, valid between 26,5 GHz and 66 GHz	± 8.0 dB
Radiated emission of receivers, valid up to 26.5GHz	± 6.0 dB
Radiated emission of receiver, valid between 26,5 GHz and 66 GHz	± 8.0 dB
Temperature	± 1 °C
Humidity	± 5.0 %
Voltages(DC)	± 1.0 %
Voltages(AC, <10kHz)	± 2.0 %
NOTE: For radiated emissions above 26,5 GHz it may not be possible to achieve measurement uncertainties complying with the levels specified in this table. In these cases alone it is acceptable to employ the alternative interpretation procedure specified in clause 10.1.	

2.4 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (WLAN)

Product	11ax RTL8852AE Combo module
Brand	REALTEK
Test Model	RTL8852AE
Status of EUT	ENGINEERING SAMPLE
Nominal Voltage	3.3Vdc from host equipment
Voltage Operation Range	Vnom= 3.3Vdc Vmin= 2.805Vdc Vmax= 3.795Vdc
Temperature Operating Range	-20°C ~ 70°C
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz 1024QAM for OFDMA in 11ax HE mode
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 866.7 Mbps 802.11ax: up to 1201 Mbps
Operating Frequency	2.4GHz: 2.412 ~ 2.472GHz 5GHz: 5.18 ~ 5.24 GHz, 5.26 ~ 5.32 GHz, 5.50 ~ 5.70 GHz, 5.745 ~ 5.825 GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20): 13, 802.11n (HT40), VHT40, 802.11ax (HE40): 9 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 24 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 11 802.11ac (VHT80), 802.11ax (HE80): 5
EIRP Power (Measured Max. Average)	For 2TX CDD Mode: 2.4 GHz: 19.98 dBm 5.18 ~ 5.24 GHz: 22.97 dBm 5.26 ~ 5.32 GHz: 22.90 dBm 5.5 ~ 5.70 GHz: 22.96 dBm 5.745 ~ 5.825 GHz: 13.96 dBm Beamforming Mode: 2.4 GHz: 19.98 dBm 5.18 ~ 5.24 GHz: 22.84 dBm 5.26 ~ 5.32 GHz: 22.94 dBm 5.5 ~ 5.70 GHz: 22.92 dBm 5.745 ~ 5.825 GHz: 13.96 dBm For 1TX 2.4 GHz: 19.90 dBm 5.18 ~ 5.24 GHz: 22.96 dBm 5.26 ~ 5.32 GHz: 22.90 dBm 5.5 ~ 5.70 GHz: 22.97 dBm 5.745 ~ 5.825 GHz: 13.95 dBm
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Beamforming Factor	3 dB by manufacturer's declaration

Receiver Category	☒ Category 1 ☐ Category 2 ☐ Category 3
-------------------	--

Note:

1. The EUT has below HW SKU configuration, as below table:

SKU No.	Interface	Description
1	PCIe + USB	Single antenna port
2	PCIe + USB	Dual antenna port
3	PCIe + UART	Dual antenna port

Note: From the above HW SKUs, **SKU No.: 3** was selected as representative model for the test and its data was recorded in this report.

2. Simultaneously transmission condition.

Condition	Technology		
1	WLAN 2.4GHz	WLAN 5GHz	Bluetooth
2	WLAN 2.4GHz	WLAN 5GHz	-
3	WLAN 5GHz	Bluetooth	-

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

3. The antennas provided to the EUT, please refer to the following table:

Antenna Set	Chain NO.	Brand	Model	Antenna Gain (dBi)	Frequency range (GHz)	Antenna Type	Connector Type	Cable Length (mm)
1	Chain 0	LYNwave	ALA110-222050-300011	3.5	2.4~2.5	PIFA	i-pex(MHF)	300
				5	5.15~5.85			
	Chain 1	LYNwave	ALA110-222050-300011	3.5	2.4~2.5	PIFA	i-pex(MHF)	300
				5	5.15~5.85			
2	Chain 0	PSA	RFDPA171320EMLB301	3.14	2.4~2.5	Dipole	i-pex(MHF)	200
				5	5.15~5.85			
	Chain 1	PSA	RFDPA171320EMLB301	3.14	2.4~2.5	Dipole	i-pex(MHF)	200
				5	5.15~5.85			

Note:

- From the above transmission chains, the worse case was found in transmission on Chain 1 for 1TX mode. Therefore only the test data of the mode was recorded in this report.
- The Bluetooth technology will fix transmission on Chain 1.
- From the above antennas, antenna set 1 and 2 was selected as representative antenna for the test.

4. The EUT incorporates a MIMO function:

2.4GHZ BAND		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	2TX/1TX Diversity	2RX
802.11g	2TX/1TX Diversity	2RX
802.11n (HT20)	2TX/1TX Diversity	2RX
802.11n (HT40)	2TX/1TX Diversity	2RX
VHT20	2TX/1TX Diversity	2RX
VHT40	2TX/1TX Diversity	2RX
802.11ax (HE20)	2TX/1TX Diversity	2RX
802.11ax (HE40)	2TX/1TX Diversity	2RX
5GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11a	2TX/1TX Diversity	2RX
802.11n (HT20)	2TX/1TX Diversity	2RX
802.11n (HT40)	2TX/1TX Diversity	2RX
802.11ac (VHT20)	2TX/1TX Diversity	2RX
802.11ac (VHT40)	2TX/1TX Diversity	2RX
802.11ac (VHT80)	2TX/1TX Diversity	2RX
802.11ax (HE20)	2TX/1TX Diversity	2RX
802.11ax (HE40)	2TX/1TX Diversity	2RX
802.11ax (HE80)	2TX/1TX Diversity	2RX

Note:

1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and CDD mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.
3. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz), 802.11ac mode for 20MHz (40MHz, 80MHz) and 802.11ax mode for 20MHz (40MHz, 80MHz), therefore the manufacturer will control the power for 802.11n mode as same as the 802.11ac mode and ax mode or more lower than it and investigated worst case to representative mode in test report. (Final test mode refer to section 3.2.1)

5. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Description of Test Modes

5 channels are provided for 802.11a and 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz		

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80), 802.11ax (HE80):

Channel	Frequency
155	5775 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to						Description
	EIRP	PR	SE<1G	SE≥1G	ACS	BD	
1	√	√	√	√	√	√	2TX
2	√	√	√	√	-	-	1TX

Where **EIRP**: Equivalent Isotropic Radiated Power **PR**: Permitted Range
SE<1G: Spurious Emissions below 1GHz **SE≥1G**: Spurious Emissions above 1GHz
ACS: Adjacent channel selectivity **BD**: Blocking or desensitization

Note: 1. The EUT's PIFA antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Y-plane.

2. For 20MHz bandwidth, 40MHz bandwidth and 80MHz bandwidth of RU mode, the worst case was found in 20MHz bandwidth. Therefore only the test data of the mode was recorded in this report

Equivalent Isotropic Radiated Power:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rate, RU configurations and antenna ports (if EUT with antenna diversity architecture).

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

2TX (CDD Mode)						
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	54Mb/s	-
802.11ac (VHT20)	149 to 165	149, 157, 165	OFDM	BPSK	MCS0	-
802.11ac (VHT40)	151 to 159	151, 159	OFDM	BPSK	MCS0	-
802.11ac (VHT80)	155	155	OFDM	BPSK	MCS0	-
802.11ax (HE20)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	-
802.11ax (HE40)	151 to 159	151, 159	OFDMA	BPSK	MCS0	-
802.11ax (HE80)	155	155	OFDMA	BPSK	MCS0	-
802.11ax (RU26)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	26/0, 26/4, 26/8
802.11ax (RU52)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	52/37, 52/38, 52/40
802.11ax (RU106)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	106/53, 106/53, 106/54
2TX (Beamforming Mode)						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	
802.11ac (VHT20)	149 to 165	149, 157, 165	OFDM	BPSK	6.5	
802.11ac (VHT40)	151 to 159	151, 159	OFDM	BPSK	13.5	
802.11ac (VHT80)	155	155	OFDM	BPSK	29.3	
802.11ax (HE20)	149 to 165	149, 157, 165	OFDMA	BPSK	6.5	
802.11ax (HE40)	151 to 159	151, 159	OFDMA	BPSK	13.5	
802.11ax (HE80)	155	155	OFDMA	BPSK	29.3	

1TX						
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	54Mb/s	-
802.11ac (VHT20)	149 to 165	149, 157, 165	OFDM	BPSK	MCS0	-
802.11ac (VHT40)	151 to 159	151, 159	OFDM	BPSK	MCS0	-
802.11ac (VHT80)	155	155	OFDM	BPSK	MCS0	-
802.11ax (HE20)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	-
802.11ax (HE40)	151 to 159	151, 159	OFDMA	BPSK	MCS0	-
802.11ax (HE80)	155	155	OFDMA	BPSK	MCS0	-
802.11ax (RU26)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	26/0, 26/4, 26/8
802.11ax (RU52)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	52/37, 52/38, 52/40
802.11ax (RU106)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	106/53, 106/53, 106/54

Permitted Range Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, RU configurations and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

2TX (CDD Mode)						
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	54Mb/s	-
802.11ax (HE20)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	-
802.11ax (HE40)	151 to 159	151, 159	OFDMA	BPSK	MCS0	-
802.11ax (HE80)	155	155	OFDMA	BPSK	MCS0	-
802.11ax (RU26)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	26/0, 26/4, 26/8
802.11ax (RU52)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	52/37, 52/38, 52/40
802.11ax (RU106)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	106/53, 106/53, 106/54
1TX						
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	54Mb/s	-
802.11ax (HE20)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	-
802.11ax (HE40)	151 to 159	151, 159	OFDMA	BPSK	MCS0	-
802.11ax (HE80)	155	155	OFDMA	BPSK	MCS0	-
802.11ax (RU26)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	26/0, 26/4, 26/8
802.11ax (RU52)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	52/37, 52/38, 52/40
802.11ax (RU106)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	106/53, 106/53, 106/54

Spurious Emissions Test (Below 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, RU configurations and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

2TX (CDD Mode)					
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter
802.11ax (HE20)	149 to 165	159	OFDMA	BPSK	MCS0
Receiver	149 to 165	159	-	-	-
1TX					
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter
802.11ax (HE20)	149 to 165	159	OFDMA	BPSK	MCS0

Spurious Emissions Test (Above 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, RU configurations and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

2TX (CDD Mode)						
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11ax (HE20)	149 to 165	149, 165	OFDMA	BPSK	MCS0	-
802.11ax (RU26)	149 to 165	149, 165	OFDMA	BPSK	MCS0	26/0, 26/4, 26/8
Receiver	149 to 165	149, 165	-	-	-	-
1TX						
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11ax (HE20)	149 to 165	149, 165	OFDMA	BPSK	MCS0	-
802.11ax (RU26)	149 to 165	149, 165	OFDMA	BPSK	MCS0	26/0, 26/4, 26/8

Adjacent Channel Selectivity Test:

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY
802.11a	149 to 165	157	OFDM

Blocking or Desensitization:

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11a	149 to 165	157	OFDM	BPSK	54Mb/s

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
EIRP	25deg. C, 60%RH	3.3Vdc	Angus Peng
PR	25deg. C, 60%RH	3.3Vdc	Angus Peng
SE<1G	23deg. C, 62%RH	230Vac, 50Hz (System)	Angus Peng
SE≥1G	23deg. C, 62%RH	230Vac, 50Hz (System)	Angus Peng
ACS	25deg. C, 63%RH	3.3Vdc	Zoey Peng
BD	25deg. C, 63%RH	3.3Vdc	Zoey Peng

3.3 Description of Support Units

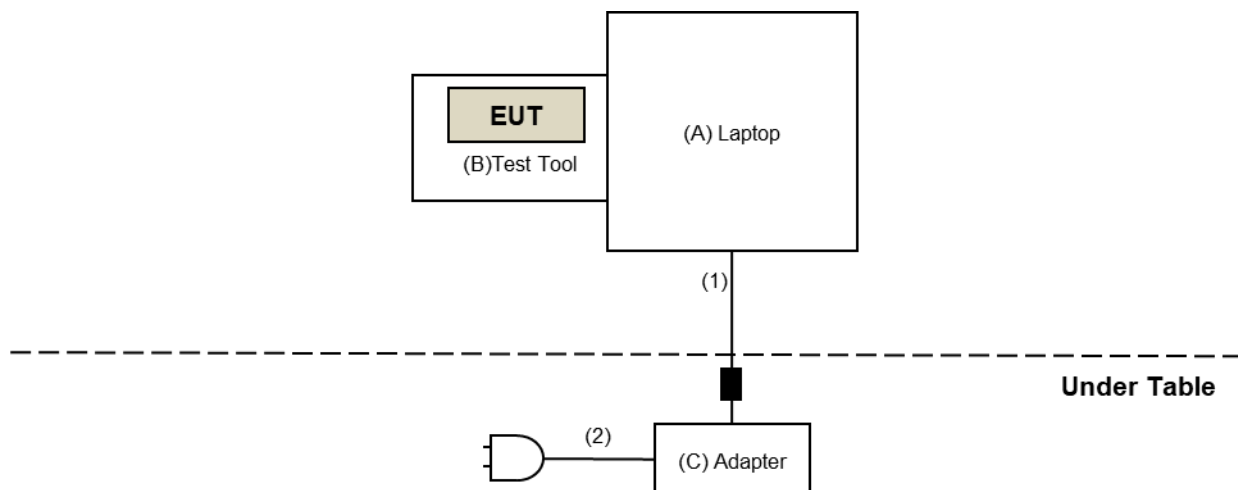
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	P88G	G1WJL42	NA	Provided by Lab
B.	Test Tool	Realtek	NA	NA	NA	Supplied by client
C.	Adapter	DELL	FA65NE0-00	NA	NA	Provided by Lab

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Cable	1	1.6	No	1	Provided by Lab
2	AC Cable	1	1	No	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

Configuration of System under Test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

EN 300 440 V2.1.1 (2017-03)

All test items have been performed and recorded as per the above standard.

4 Test Types and Results

Transmitter Parameters

4.1 Equivalent Isotropic Radiated Power

4.1.1 Limits of Equivalent Isotropic Radiated Power

The transmitter maximum e.i.r.p. under normal and extreme test conditions shall not exceed the values given below table.

Maximum radiated peak power (e.i.r.p.)

Frequency Bands	Power	Application	The EUT Application
2400MHz to 2483.5MHz	10 mW e.i.r.p.	Non-specific short range devices	-
2400MHz to 2483.5MHz	25 mW e.i.r.p.	Radio determination devices	-
(a)2446MHz to 2454MHz	500 mW e.i.r.p.	Radio Frequency Identification (RFID) devices	-
(b)2446MHz to 2454MHz	4 W e.i.r.p.	Radio Frequency Identification (RFID) devices	-
5725MHz to 5875MHz	25 mW e.i.r.p.	Non-specific short range devices	√
9200MHz to 9500MHz	25 mW e.i.r.p.	Radio determination devices	-
9500MHz to 9975MHz	25 mW e.i.r.p.	Radio determination devices	-
10.5GHz to 10.6GHz	500 mW e.i.r.p.	Radio determination devices	-
13.4GHz to 14GHz	25 mW e.i.r.p.	Radio determination devices	-
17.1GHz to 17.3GHz	400 mW e.i.r.p.	Radio determination devices	-
24GHz to 24.25GHz	100 mW e.i.r.p.	Non-specific short range devices and Radio determination devices	-

For Extreme temperature ranges

Category	Temperature range	The EUT Category
I (General)	-20°C to +55°C	-
II (Portable)	-10°C to +55°C	-
III (Equipment for normal indoor use)	5°C to +35°C	-
Declared by the manufacturer	-20°C ~ 70°C	√

4.1.2 Test Procedures

Refer to EN 300 440 V2.1.1 clause 4.2.2.3

4.1.3 Deviation from Test Standard

No deviation

4.1.4 Test Setup

The test setup has been constructed as the normal use condition. Controlling software (RTL8852A MP Toolkit V1.0.21) has been activated to set the EUT on specific status.

4.1.5 Test Results (Mode 1)

CDD Mode

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
802.11a					
T _{nom} (°C)	25	V _{nom} (V)	13.76	13.77	13.76
T _{min} (°C)	-20	V _{min} (V)	13.57	13.54	13.53
		V _{max} (V)	13.53	13.52	13.52
T _{max} (°C)	70	V _{min} (V)	13.86	13.89	13.87
		V _{max} (V)	13.90	13.92	13.89
802.11ac (VHT20)					
T _{nom} (°C)	25	V _{nom} (V)	13.73	13.68	13.63
T _{min} (°C)	-20	V _{min} (V)	13.54	13.30	13.42
		V _{max} (V)	13.50	13.27	13.39
T _{max} (°C)	70	V _{min} (V)	13.92	13.92	13.75
		V _{max} (V)	13.94	13.96	13.75
Test Condition			Maximum EIRP (dBm)		
			(CH 151) 5755 MHz		(CH 159) 5795 MHz
802.11ac (VHT40)					
T _{nom} (°C)	25	V _{nom} (V)	13.67		13.68
T _{min} (°C)	-20	V _{min} (V)	13.60		13.54
		V _{max} (V)	13.56		13.54
T _{max} (°C)	70	V _{min} (V)	13.90		13.79
		V _{max} (V)	13.92		13.81
Test Condition			Maximum EIRP (dBm)		
			(CH 155) 5775 MHz		
802.11ac (VHT80)					
T _{nom} (°C)	25	V _{nom} (V)	13.81		
T _{min} (°C)	-20	V _{min} (V)	13.61		
		V _{max} (V)	13.59		
T _{max} (°C)	70	V _{min} (V)	13.93		
		V _{max} (V)	13.95		

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
802.11ax (HE20)					
T _{nom} (°C)	25	V _{nom} (V)	13.74	13.75	13.77
T _{min} (°C)	-20	V _{min} (V)	13.53	13.62	13.62
		V _{max} (V)	13.51	13.59	13.58
T _{max} (°C)	70	V _{min} (V)	13.92	13.91	13.95
		V _{max} (V)	13.94	13.94	13.96
Test Condition			Maximum EIRP (dBm)		
			(CH 151) 5755 MHz		(CH 159) 5795 MHz
802.11ax (HE40)					
T _{nom} (°C)	25	V _{nom} (V)	13.76		13.78
T _{min} (°C)	-20	V _{min} (V)	13.59		13.58
		V _{max} (V)	13.55		13.56
T _{max} (°C)	70	V _{min} (V)	13.84		13.80
		V _{max} (V)	13.87		13.83
Test Condition			Maximum EIRP (dBm)		
			(CH 155) 5775 MHz		
802.11ax (HE80)					
T _{nom} (°C)	25	V _{nom} (V)	13.56		
T _{min} (°C)	-20	V _{min} (V)	13.41		
		V _{max} (V)	13.41		
T _{max} (°C)	70	V _{min} (V)	13.78		
		V _{max} (V)	13.78		

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
			RU Configuration		
802.11ax (RU26)			26/0	26/4	26/8
T _{nom} (°C)	25	V _{nom} (V)	13.78	13.88	13.85
T _{min} (°C)	-20	V _{min} (V)	13.91	13.95	13.85
		V _{max} (V)	13.91	13.93	13.80
T _{max} (°C)	70	V _{min} (V)	13.93	13.91	13.92
		V _{max} (V)	13.97	13.93	13.93
802.11ax (RU52)			52/37	52/38	52/40
T _{nom} (°C)	25	V _{nom} (V)	13.59	13.78	13.80
T _{min} (°C)	-20	V _{min} (V)	13.84	13.75	13.73
		V _{max} (V)	13.79	13.74	13.70
T _{max} (°C)	70	V _{min} (V)	13.92	13.91	13.90
		V _{max} (V)	13.93	13.94	13.91
802.11ax (RU106)			106/53	106/53	106/54
T _{nom} (°C)	25	V _{nom} (V)	13.73	13.67	13.58
T _{min} (°C)	-20	V _{min} (V)	13.80	13.55	13.63
		V _{max} (V)	13.76	13.52	13.60
T _{max} (°C)	70	V _{min} (V)	13.86	13.91	13.75
		V _{max} (V)	13.88	13.95	13.75

Beamforming Mode

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
802.11ac (VHT20)					
T _{nom} (°C)	25	V _{nom} (V)	13.54	13.61	13.59
T _{min} (°C)	-20	V _{min} (V)	13.40	13.46	13.43
		V _{max} (V)	13.36	13.43	13.40
T _{max} (°C)	70	V _{min} (V)	13.85	13.85	13.71
		V _{max} (V)	13.87	13.89	13.71
Test Condition			Maximum EIRP (dBm)		
			(CH 151) 5755 MHz	(CH 159) 5795 MHz	
802.11ac (VHT40)					
T _{nom} (°C)	25	V _{nom} (V)	13.58	13.60	
T _{min} (°C)	-20	V _{min} (V)	13.47	13.30	
		V _{max} (V)	13.43	13.27	
T _{max} (°C)	70	V _{min} (V)	13.88	13.86	
		V _{max} (V)	13.90	13.90	
Test Condition			Maximum EIRP (dBm)		
			(CH 155) 5775 MHz		
802.11ac (VHT80)					
T _{nom} (°C)	25	V _{nom} (V)	13.52		
T _{min} (°C)	-20	V _{min} (V)	13.40		
		V _{max} (V)	13.38		
T _{max} (°C)	70	V _{min} (V)	13.63		
		V _{max} (V)	13.65		

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
802.11ax (HE20)					
T _{nom} (°C)	25	V _{nom} (V)	13.56	13.73	13.65
T _{min} (°C)	-20	V _{min} (V)	13.39	13.37	13.46
		V _{max} (V)	13.35	13.34	13.43
T _{max} (°C)	70	V _{min} (V)	13.87	13.90	13.77
		V _{max} (V)	13.89	13.94	13.77
Test Condition			Maximum EIRP (dBm)		
			(CH 151) 5755 MHz	(CH 159) 5795 MHz	
802.11ax (HE40)					
T _{nom} (°C)	25	V _{nom} (V)	13.61	13.76	
T _{min} (°C)	-20	V _{min} (V)	13.45	13.43	
		V _{max} (V)	13.44	13.38	
T _{max} (°C)	70	V _{min} (V)	13.88	13.95	
		V _{max} (V)	13.91	13.96	
Test Condition			Maximum EIRP (dBm)		
			(CH 155) 5775 MHz		
802.11ax (HE80)					
T _{nom} (°C)	25	V _{nom} (V)	13.54		
T _{min} (°C)	-20	V _{min} (V)	13.34		
		V _{max} (V)	13.34		
T _{max} (°C)	70	V _{min} (V)	13.65		
		V _{max} (V)	13.65		

4.1.6 Test Results (Mode 2)

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
802.11a					
T _{nom} (°C)	25	V _{nom} (V)	13.52	13.58	13.51
T _{min} (°C)	-20	V _{min} (V)	13.39	13.39	13.25
		V _{max} (V)	13.39	13.37	13.20
T _{max} (°C)	70	V _{min} (V)	13.72	13.77	13.67
		V _{max} (V)	13.76	13.79	13.68
802.11ac (VHT20)					
T _{nom} (°C)	25	V _{nom} (V)	13.51	13.50	13.51
T _{min} (°C)	-20	V _{min} (V)	13.39	13.32	13.26
		V _{max} (V)	13.39	13.30	13.21
T _{max} (°C)	70	V _{min} (V)	13.69	13.67	13.65
		V _{max} (V)	13.73	13.69	13.66
Test Condition			Maximum EIRP (dBm)		
			(CH 151) 5755 MHz		(CH 159) 5795 MHz
802.11ac (VHT40)					
T _{nom} (°C)	25	V _{nom} (V)	13.58		13.51
T _{min} (°C)	-20	V _{min} (V)	13.19		13.48
		V _{max} (V)	13.16		13.47
T _{max} (°C)	70	V _{min} (V)	13.82		13.70
		V _{max} (V)	13.82		13.72
Test Condition			Maximum EIRP (dBm)		
			(CH 155) 5775 MHz		
802.11ac (VHT80)					
T _{nom} (°C)	25	V _{nom} (V)	13.58		
T _{min} (°C)	-20	V _{min} (V)	13.48		
		V _{max} (V)	13.44		
T _{max} (°C)	70	V _{min} (V)	13.84		
		V _{max} (V)	13.86		

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
802.11ax (HE20)					
T _{nom} (°C)	25	V _{nom} (V)	13.55	13.52	13.53
T _{min} (°C)	-20	V _{min} (V)	13.56	13.25	13.22
		V _{max} (V)	13.51	13.24	13.19
T _{max} (°C)	70	V _{min} (V)	13.71	13.58	13.79
		V _{max} (V)	13.72	13.61	13.80
Test Condition			Maximum EIRP (dBm)		
			(CH 151) 5755 MHz		(CH 159) 5795 MHz
802.11ax (HE40)					
T _{nom} (°C)	25	V _{nom} (V)	13.72		13.61
T _{min} (°C)	-20	V _{min} (V)	13.53		13.39
		V _{max} (V)	13.52		13.34
T _{max} (°C)	70	V _{min} (V)	13.92		13.79
		V _{max} (V)	13.95		13.80
Test Condition			Maximum EIRP (dBm)		
			(CH 155) 5775 MHz		
802.11ax (HE80)					
T _{nom} (°C)	25	V _{nom} (V)	13.60		
T _{min} (°C)	-20	V _{min} (V)	13.35		
		V _{max} (V)	13.32		
T _{max} (°C)	70	V _{min} (V)	13.93		
		V _{max} (V)	13.93		

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
			RU Configuration		
802.11ax (RU26)			26/0	26/4	26/8
T _{nom} (°C)	25	V _{nom} (V)	13.51	13.59	13.53
T _{min} (°C)	-20	V _{min} (V)	13.64	13.66	13.53
		V _{max} (V)	13.64	13.64	13.48
T _{max} (°C)	70	V _{min} (V)	13.88	13.95	13.86
		V _{max} (V)	13.92	13.97	13.87
802.11ax (RU52)			52/37	52/38	52/40
T _{nom} (°C)	25	V _{nom} (V)	13.61	13.60	13.52
T _{min} (°C)	-20	V _{min} (V)	13.86	13.57	13.45
		V _{max} (V)	13.81	13.56	13.42
T _{max} (°C)	70	V _{min} (V)	13.94	13.83	13.95
		V _{max} (V)	13.95	13.86	13.96
802.11ax (RU106)			106/53	106/53	106/54
T _{nom} (°C)	25	V _{nom} (V)	13.47	13.49	13.46
T _{min} (°C)	-20	V _{min} (V)	13.40	13.51	13.61
		V _{max} (V)	13.39	13.48	13.60
T _{max} (°C)	70	V _{min} (V)	13.79	13.83	13.76
		V _{max} (V)	13.82	13.83	13.79

4.2 Permitted Range of Operating Frequencies

4.2.1 Limits of Permitted Range of Operating Frequencies

The width of the power envelope is $f_H - f_L$ for a give operating frequency. In equipment that allows adjustment or selection of different frequencies, the power envelope take up different positions in the allowed band. The frequency range is determined by the lowest value of f_L and the highest value of f_H resulting from the adjustment of the equipment to the lowest and highest operating frequency.

For all equipment the frequency range shall lie within the frequency band given by below table

Frequency Bands	Application	The EUT Application
2400MHz to 2483.5MHz	Non-specific short range devices	-
2400MHz to 2483.5MHz	Radio determination devices	-
(a)2446MHz to 2454MHz	Radio Frequency Identification (RFID) devices	-
(b)2446MHz to 2454MHz	Radio Frequency Identification (RFID) devices	-
5725MHz to 5875MHz	Non-specific short range devices	√
9200MHz to 9500MHz	Radio determination devices	-
9500MHz to 9975MHz	Radio determination devices	-
10.5GHz to 10.6GHz	Radio determination devices	-
13.4GHz to 14GHz	Radio determination devices	-
17.1GHz to 17.3GHz	Radio determination devices	-
24GHz to 24.25GHz	Non-specific short range devices and Radio determination devices	-

For non-harmonized frequency bands the available frequency range may differ between national administrations.

4.2.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.2.3.3

4.2.3 Deviation from Test Standard

No deviation.

4.2.4 Test Setup

The EUT has been placed in an environment where the temperature can be controlled. The power source should be replaced by a power supply for voltage change. Before testing, the transmitter has to be able to send signal to receiver.

4.2.5 Test Results (Mode 1)

CDD Mode

802.11a

Test Condition			Frequency (MHz)	
			Lowest	Highest
T _{nom} (°C)	25	V _{nom} (V)	5736.39	5833.49
T _{min} (°C)	-20	V _{min} (V)	5736.31	5833.60
		V _{max} (V)	5736.28	5833.57
T _{max} (°C)	70	V _{min} (V)	5736.49	5833.36
		V _{max} (V)	5736.49	5833.35
Measured frequency (lowest and highest)			FL = 5736.28	FH = 5833.6

802.11ax (HE20)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T _{nom} (°C)	25	V _{nom} (V)	5735.32	5834.58
T _{min} (°C)	-20	V _{min} (V)	5735.17	5834.68
		V _{max} (V)	5735.17	5834.70
T _{max} (°C)	70	V _{min} (V)	5735.45	5834.49
		V _{max} (V)	5735.49	5834.48
Measured frequency (lowest and highest)			FL = 5735.17	FH = 5834.7

802.11ax (HE40)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T _{nom} (°C)	25	V _{nom} (V)	5735.78	5814.09
T _{min} (°C)	-20	V _{min} (V)	5735.66	5814.13
		V _{max} (V)	5735.67	5814.15
T _{max} (°C)	70	V _{min} (V)	5735.91	5814.02
		V _{max} (V)	5735.95	5814.05
Measured frequency (lowest and highest)			FL = 5735.66	FH = 5814.15

802.11ax (HE80)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T _{nom} (°C)	25	V _{nom} (V)	5735.91	5814.03
T _{min} (°C)	-20	V _{min} (V)	5735.91	5814.03
		V _{max} (V)	5735.94	5813.99
T _{max} (°C)	70	V _{min} (V)	5735.91	5814.03
		V _{max} (V)	5735.88	5814.05
Measured frequency (lowest and highest)			FL = 5735.88	FH = 5814.05

802.11ax (RU26)

Test Condition			Frequency (MHz)	
			Lowest	Highest
RU Configuration			26/0	26/8
T _{nom} (°C)	25	V _{nom} (V)	5734.87	5835.07
T _{min} (°C)	-20	V _{min} (V)	5734.73	5835.14
		V _{max} (V)	5734.74	5835.15
T _{max} (°C)	70	V _{min} (V)	5734.97	5834.99
		V _{max} (V)	5734.96	5834.95
Measured frequency (lowest and highest)			FL = 5734.73	FH = 5835.15

802.11ax (RU52)

Test Condition			Frequency (MHz)	
			Lowest	Highest
RU Configuration			52/37	52/40
T _{nom} (°C)	25	V _{nom} (V)	5735.15	5834.78
T _{min} (°C)	-20	V _{min} (V)	5735.00	5834.93
		V _{max} (V)	5735.02	5834.88
T _{max} (°C)	70	V _{min} (V)	5735.24	5834.65
		V _{max} (V)	5735.25	5834.61
Measured frequency (lowest and highest)			FL = 5735	FH = 5834.93

802.11ax (RU106)

Test Condition			Frequency (MHz)	
			Lowest	Highest
RU Configuration			106/53	106/54
T _{nom} (°C)	25	V _{nom} (V)	5735.16	5834.63
T _{min} (°C)	-20	V _{min} (V)	5735.11	5834.75
		V _{max} (V)	5735.14	5834.77
T _{max} (°C)	70	V _{min} (V)	5735.23	5834.59
		V _{max} (V)	5735.18	5834.58
Measured frequency (lowest and highest)			FL = 5735.11	FH = 5834.77

4.2.6 Test Results (Mode 2)

802.11a

Test Condition			Frequency (MHz)	
			Lowest	Highest
T _{nom} (°C)	25	V _{nom} (v)	5736.39	5833.50
T _{min} (°C)	-20	V _{min} (v)	5736.39	5833.50
		V _{max} (v)	5736.40	5833.51
T _{max} (°C)	70	V _{min} (v)	5736.39	5833.50
		V _{max} (v)	5736.38	5833.46
Measured frequency (lowest and highest)			FL = 5736.38	FH = 5833.51

802.11ax (HE20)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T _{nom} (°C)	25	V _{nom} (V)	5735.32	5834.59
T _{min} (°C)	-20	V _{min} (V)	5735.32	5834.59
		V _{max} (V)	5735.34	5834.54
T _{max} (°C)	70	V _{min} (V)	5735.32	5834.59
		V _{max} (V)	5735.33	5834.55
Measured frequency (lowest and highest)			FL = 5735.32	FH = 5834.59

802.11ax (HE40)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T _{nom} (°C)	25	V _{nom} (V)	5736.58	5813.32
T _{min} (°C)	-20	V _{min} (V)	5736.58	5813.32
		V _{max} (V)	5736.56	5813.27
T _{max} (°C)	70	V _{min} (V)	5736.58	5813.32
		V _{max} (V)	5736.56	5813.31
Measured frequency (lowest and highest)			FL = 5736.56	FH = 5813.32

802.11ax (HE80)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T _{nom} (°C)	25	V _{nom} (V)	5735.92	5814.03
T _{min} (°C)	-20	V _{min} (V)	5735.92	5814.03
		V _{max} (V)	5735.94	5814.03
T _{max} (°C)	70	V _{min} (V)	5735.92	5814.03
		V _{max} (V)	5735.92	5814.03
Measured frequency (lowest and highest)			FL = 5735.92	FH = 5814.03

802.11ax (RU26)

Test Condition			Frequency (MHz)	
			Lowest	Highest
RU Configuration			26/0	26/8
T _{nom} (°C)	25	V _{nom} (V)	5734.86	5835.06
T _{min} (°C)	-20	V _{min} (V)	5734.72	5835.13
		V _{max} (V)	5734.73	5835.14
T _{max} (°C)	70	V _{min} (V)	5734.96	5834.98
		V _{max} (V)	5734.95	5834.94
Measured frequency (lowest and highest)			FL = 5734.72	FH = 5835.14

802.11ax (RU52)

02.11x (R032)

Test Condition			Frequency (MHz)	
			Lowest	Highest
RU Configuration			52/37	52/40
T _{nom} (°C)	25	V _{nom} (V)	5735.15	5834.75
T _{min} (°C)	-20	V _{min} (V)	5735.00	5834.90
		V _{max} (V)	5735.02	5834.85
T _{max} (°C)	70	V _{min} (V)	5735.24	5834.62
		V _{max} (V)	5735.25	5834.58
Measured frequency (lowest and highest)			FL = 5735	FH = 5834.9

802.11ax (RU106)

Test Condition			Frequency (MHz)	
			Lowest	Highest
RU Configuration			106/53	106/54
T _{nom} (°C)	25	V _{nom} (V)	5735.18	5834.63
T _{min} (°C)	-20	V _{min} (V)	5735.13	5834.75
		V _{max} (V)	5735.09	5834.78
T _{max} (°C)	70	V _{min} (V)	5735.25	5834.59
		V _{max} (V)	5735.23	5834.54
Measured frequency (lowest and highest)			FL = 5735.09	FH = 5834.78

4.3 Unwanted Emissions in the Spurious Domain

4.3.1 Limit of Unwanted Emissions in the Spurious Domain

Frequency Range	47MHz to 74MHz 87.5MHz to 108MHz 174MHz to 230MHz 470MHz to 862MHz	Other Frequencies Below 1GHz	>1GHz
Limit (Operating)	4nW (–54dBm)	250nW (–36dBm)	1 μ W (–30dBm)
Limit (Standby)	2nW (–57dBm)	2nW (–57dBm)	20nW (–47dBm)

4.3.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.2.4.3

4.3.3 Deviation from Test Standard

No deviation.

4.3.4 Test Setup

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The test setup has been constructed as the normal use condition. Controlling software (RTL8852A MP Toolkit V1.0.21) has been activated to set the EUT on specific status.

4.3.5 Test Results (Mode 1)

Dipole Antenna

Below 1GHz Worst-Case Data

802.11ax (HE20)

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	159
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
87.72	V	-65.98	-54.00	-11.98
90.49	H	-63.28	-54.00	-9.28
99.63	V	-59.96	-54.00	-5.96
199.19	H	-61.85	-54.00	-7.85
199.19	V	-65.87	-54.00	-11.87
298.75	H	-47.09	-36.00	-11.09
497.87	V	-67.26	-54.00	-13.26
497.93	H	-64.73	-54.00	-10.73
557.28	V	-69.01	-54.00	-15.01
600.00	V	-65.77	-54.00	-11.77
622.61	H	-64.22	-54.00	-10.22
666.44	H	-62.18	-54.00	-8.18
666.44	V	-64.43	-54.00	-10.43
699.76	H	-58.23	-54.00	-4.23
699.76	V	-61.41	-54.00	-7.41
726.45	V	-65.44	-54.00	-11.44
734.84	H	-66.85	-54.00	-12.85
765.25	V	-63.93	-54.00	-9.93
768.56	H	-65.99	-54.00	-11.99
801.33	H	-65.16	-54.00	-11.16

Above 1GHz Worst-Case Data

802.11ax (HE20)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149, 165
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Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11490.00	H	-51.33	-30.00	-21.33
	11490.00	V	-50.57	-30.00	-20.57
	17235.00	H	-48.43	-30.00	-18.43
	17235.00	V	-49.90	-30.00	-19.90
	22980.00	H	-50.01	-30.00	-20.01
	22980.00	V	-51.20	-30.00	-21.20
165	11650.00	H	-52.37	-30.00	-22.37
	11650.00	V	-51.12	-30.00	-21.12
	17475.00	H	-50.77	-30.00	-20.77
	17475.00	V	-51.94	-30.00	-21.94
	23300.00	H	-52.02	-30.00	-22.02
	23300.00	V	-49.83	-30.00	-19.83

802.11ax (RU26)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149
		RU CONFIGURATION	26/0

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11472.80	H	-50.53	-30.00	-20.53
	11473.04	V	-46.26	-30.00	-16.26
	17210.26	H	-57.47	-30.00	-27.47
	17210.26	V	-52.59	-30.00	-22.59
	22945.60	H	-52.71	-30.00	-22.71
	22945.60	V	-53.54	-30.00	-23.54

802.11ax (RU26)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	165
		RU CONFIGURATION	26/8

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
165	11632.71	H	-48.06	-30.00	-18.06
	11632.71	V	-44.94	-30.00	-14.94
	17448.60	H	-60.23	-30.00	-30.23
	17448.60	V	-60.02	-30.00	-30.02
	23264.80	H	-52.20	-30.00	-22.20
	23264.80	V	-53.73	-30.00	-23.73

PIFA Antenna

Below 1GHz Worst-Case Data

802.11ax (HE20)

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	159
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
89.93	V	-65.21	-54.00	-11.21
99.58	V	-57.77	-54.00	-3.77
99.93	H	-63.34	-54.00	-9.34
199.90	H	-64.38	-54.00	-10.38
497.87	H	-63.69	-54.00	-9.69
527.98	V	-68.91	-54.00	-14.91
553.31	V	-70.25	-54.00	-16.25
599.95	H	-66.90	-54.00	-12.90
600.00	V	-64.69	-54.00	-10.69
624.83	V	-65.11	-54.00	-11.11
666.44	H	-64.34	-54.00	-10.34
666.44	V	-63.25	-54.00	-9.25
697.05	H	-58.67	-54.00	-4.67
697.05	V	-61.21	-54.00	-7.21
723.63	V	-65.01	-54.00	-11.01
738.91	H	-62.45	-54.00	-8.45
747.10	H	-62.80	-54.00	-8.80
783.09	V	-65.24	-54.00	-11.24
794.95	H	-63.94	-54.00	-9.94
807.81	H	-64.57	-54.00	-10.57

Above 1GHz Worst-Case Data

802.11ax (HE20)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149, 165
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Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11490.00	H	-50.78	-30.00	-20.78
	11490.00	V	-50.98	-30.00	-20.98
	17234.00	H	-51.24	-30.00	-21.24
	17235.00	V	-48.41	-30.00	-18.41
	22980.00	H	-51.53	-30.00	-21.53
	22980.00	V	-50.46	-30.00	-20.46
165	11650.00	H	-49.27	-30.00	-19.27
	11650.00	V	-50.35	-30.00	-20.35
	17475.00	H	-48.59	-30.00	-18.59
	17475.00	V	-50.23	-30.00	-20.23
	23300.00	H	-49.29	-30.00	-19.29
	23300.00	V	-50.74	-30.00	-20.74

802.11ax (RU26)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149
		RU CONFIGURATION	26/0

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11473.00	H	-49.54	-30.00	-19.54
	11473.00	V	-50.50	-30.00	-20.50
	17210.39	H	-52.85	-30.00	-22.85
	17210.39	V	-56.93	-30.00	-26.93
	22945.60	H	-55.00	-30.00	-25.00
	22945.60	V	-53.79	-30.00	-23.79

802.11ax (RU26)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	165
		RU CONFIGURATION	26/8

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
165	11632.70	H	-50.55	-30.00	-20.55
	11632.70	V	-49.34	-30.00	-19.34
	17448.60	H	-60.96	-30.00	-30.96
	17448.60	V	-58.84	-30.00	-28.84
	23264.80	H	-53.33	-30.00	-23.33
	23264.80	V	-53.03	-30.00	-23.03

4.3.6 Test Results (Mode 2)

Dipole Antenna

Below 1GHz Worst-Case Data

802.11ax (HE20)

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	159
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
99.68	H	-64.01	-54.00	-10.01
99.78	V	-59.60	-54.00	-5.60
199.90	H	-64.21	-54.00	-10.21
498.98	H	-64.66	-54.00	-10.66
538.53	H	-65.37	-54.00	-11.37
576.08	V	-65.79	-54.00	-11.79
600.00	V	-65.84	-54.00	-11.84
623.07	V	-65.08	-54.00	-11.08
663.83	H	-64.67	-54.00	-10.67
666.44	V	-62.77	-54.00	-8.77
697.05	H	-58.67	-54.00	-4.67
697.05	V	-61.17	-54.00	-7.17
713.68	H	-64.23	-54.00	-10.23
745.34	V	-64.68	-54.00	-10.68
745.80	H	-60.69	-54.00	-6.69
775.15	V	-67.25	-54.00	-13.25
793.74	V	-65.53	-54.00	-11.53
832.14	H	-63.95	-54.00	-9.95
835.86	V	-66.45	-54.00	-12.45
845.31	H	-64.01	-54.00	-10.01

Above 1GHz Worst-Case Data

802.11ax (HE20)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149, 165
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Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11490.00	H	-52.43	-30.00	-22.43
	11490.00	V	-50.74	-30.00	-20.74
	17235.00	H	-50.92	-30.00	-20.92
	17235.00	V	-51.57	-30.00	-21.57
	22980.00	H	-51.84	-30.00	-21.84
	22980.00	V	-51.78	-30.00	-21.78
165	11650.00	H	-51.87	-30.00	-21.87
	11650.00	V	-51.30	-30.00	-21.30
	17475.00	H	-51.32	-30.00	-21.32
	17475.00	V	-51.94	-30.00	-21.94
	23300.00	H	-51.41	-30.00	-21.41
	23300.00	V	-52.45	-30.00	-22.45

802.11ax (RU26)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149
		RU CONFIGURATION	26/0

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11473.00	H	-50.72	-30.00	-20.72
	11473.00	V	-49.55	-30.00	-19.55
	17210.39	H	-57.45	-30.00	-27.45
	17210.39	V	-58.48	-30.00	-28.48
	22945.60	H	-54.67	-30.00	-24.67
	22945.60	V	-53.52	-30.00	-23.52

802.11ax (RU26)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	165
		RU CONFIGURATION	26/8

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
165	11632.71	H	-48.71	-30.00	-18.71
	11633.30	V	-46.91	-30.00	-16.91
	17448.60	H	-59.53	-30.00	-29.53
	17448.60	V	-59.31	-30.00	-29.31
	23264.80	H	-55.23	-30.00	-25.23
	23264.80	V	-52.62	-30.00	-22.62

PIFA Antenna

Below 1GHz Worst-Case Data

802.11ax (HE20)

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	159
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
89.98	H	-63.73	-54.00	-9.73
99.78	H	-63.40	-54.00	-9.40
99.93	V	-60.04	-54.00	-6.04
199.19	H	-61.89	-54.00	-7.89
497.93	H	-64.42	-54.00	-10.42
499.78	V	-67.74	-54.00	-13.74
539.99	V	-72.27	-54.00	-18.27
575.02	V	-71.73	-54.00	-17.73
600.00	V	-65.18	-54.00	-11.18
621.31	V	-66.25	-54.00	-12.25
624.83	H	-64.17	-54.00	-10.17
666.44	H	-61.64	-54.00	-7.64
666.44	V	-63.16	-54.00	-9.16
697.05	H	-58.04	-54.00	-4.04
697.05	V	-63.86	-54.00	-9.86
735.09	H	-61.92	-54.00	-7.92
743.64	H	-60.87	-54.00	-6.87
751.73	V	-66.88	-54.00	-12.88
790.63	H	-62.03	-54.00	-8.03
811.99	V	-68.60	-54.00	-14.60

Above 1GHz Worst-Case Data

802.11ax (HE20)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149, 165
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Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11490.00	H	-49.64	-30.00	-19.64
	11490.00	V	-50.27	-30.00	-20.27
	17235.00	H	-51.82	-30.00	-21.82
	17235.00	V	-52.42	-30.00	-22.42
	22980.00	H	-53.08	-30.00	-23.08
	22980.00	V	-50.65	-30.00	-20.65
165	11650.00	H	-49.50	-30.00	-19.50
	11650.00	V	-52.39	-30.00	-22.39
	17475.00	H	-51.87	-30.00	-21.87
	17475.00	V	-51.19	-30.00	-21.19
	23300.00	H	-50.08	-30.00	-20.08
	23300.00	V	-52.49	-30.00	-22.49

802.11ax (RU26)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149
		RU CONFIGURATION	26/0

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11473.00	H	-49.07	-30.00	-19.07
	11473.04	V	-47.71	-30.00	-17.71
	17210.39	H	-57.53	-30.00	-27.53
	17210.39	V	-54.37	-30.00	-24.37
	22945.60	H	-54.78	-30.00	-24.78
	22945.60	V	-53.95	-30.00	-23.95

802.11ax (RU26)

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	165
		RU CONFIGURATION	26/8

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
165	11632.70	H	-51.18	-30.00	-21.18
	11632.70	V	-51.76	-30.00	-21.76
	17448.60	H	-60.80	-30.00	-30.80
	17448.60	V	-59.51	-30.00	-29.51
	23264.80	H	-53.11	-30.00	-23.11
	23264.80	V	-53.28	-30.00	-23.28

Receiver Parameters

4.4 Receiver Spurious Emissions

4.4.1 Limits of Receiver Spurious Emissions

Frequency Range	Frequencies below 1GHz	Frequencies above 1GHz
Limit	2nW (–57dBm)	20nW (–47dBm)

4.4.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.3.5.3

4.4.3 Deviation from Test Standard

No deviation.

4.4.4 Test Setup

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The test setup has been constructed as the normal use condition. Controlling software (RTL8852A MP Toolkit V1.0.21) has been activated to set the EUT on specific status.

4.4.5 Test Results

Dipole Antenna

Below 1GHz worst-Case Data:

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	159
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
25.00	V	-61.56	-57.00	-4.56
99.58	H	-63.29	-57.00	-6.29
144.01	H	-62.12	-57.00	-5.12
157.03	H	-62.72	-57.00	-5.72
199.19	H	-61.41	-57.00	-4.41
243.42	V	-69.62	-57.00	-12.62
298.75	V	-61.35	-57.00	-4.35
373.99	H	-60.89	-57.00	-3.89
498.18	V	-65.11	-57.00	-8.11
539.99	V	-70.57	-57.00	-13.57
600.00	V	-65.27	-57.00	-8.27
624.88	H	-62.86	-57.00	-5.86
663.88	H	-61.15	-57.00	-4.15
666.44	V	-63.61	-57.00	-6.61
697.05	V	-60.22	-57.00	-3.22
736.15	H	-62.64	-57.00	-5.64
759.97	H	-60.09	-57.00	-3.09
798.67	V	-60.63	-57.00	-3.63
806.61	V	-63.67	-57.00	-6.67
871.24	H	-63.49	-57.00	-6.49

Above 1GHz worst-Case Data:

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149, 165
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Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11489.70	H	-50.83	-47.00	-3.83
	11490.25	V	-51.39	-47.00	-4.39
165	11649.73	V	-50.80	-47.00	-3.80
	11650.39	H	-50.89	-47.00	-3.89

PIFA Antenna

Below 1GHz worst-Case Data:

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	159
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
25.00	V	-60.98	-57.00	-3.98
99.93	H	-63.34	-57.00	-6.34
144.01	H	-62.42	-57.00	-5.42
157.18	H	-62.52	-57.00	-5.52
199.19	H	-61.39	-57.00	-4.39
199.90	V	-65.95	-57.00	-8.95
373.84	H	-61.00	-57.00	-4.00
374.19	V	-62.91	-57.00	-5.91
499.84	V	-65.94	-57.00	-8.94
533.11	H	-63.70	-57.00	-6.70
663.83	H	-61.77	-57.00	-4.77
663.83	V	-63.16	-57.00	-6.16
697.05	V	-60.27	-57.00	-3.27
735.74	V	-63.97	-57.00	-6.97
748.26	V	-60.64	-57.00	-3.64
770.77	H	-63.36	-57.00	-6.36
783.74	H	-63.33	-57.00	-6.33
786.96	V	-63.36	-57.00	-6.36
830.93	V	-62.30	-57.00	-5.30
874.81	H	-62.99	-57.00	-5.99

Above 1GHz worst-Case Data:

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 40GHz	OPERATING CHANNEL	149, 165
--	--------------	------------------------------	----------

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
149	11490.16	V	-50.26	-47.00	-3.26
	11490.35	H	-50.35	-47.00	-3.35
165	11649.64	H	-50.48	-47.00	-3.48
	11650.03	V	-51.04	-47.00	-4.04

4.5 Adjacent Channel Selectivity

This requirement applies to Equipment Category 1 receivers.

4.5.1 Limits of Adjacent Channel Selectivity

The adjacent channel selectivity of the equipment under specified conditions shall not be less than the levels of the unwanted signal as stated in table.

Receiver category	Limit
1	-30 dBm + k
2	No limit
3	No limit

The correction factor, k, is as follows:

$$k = -20 \log f - 10 \log BW$$

Where:

- f is the frequency in GHz;
- BW is the channel bandwidth in MHz.

The factor k is limited within the following:

- $-40 \text{ dB} < k < 0 \text{ dB}$.

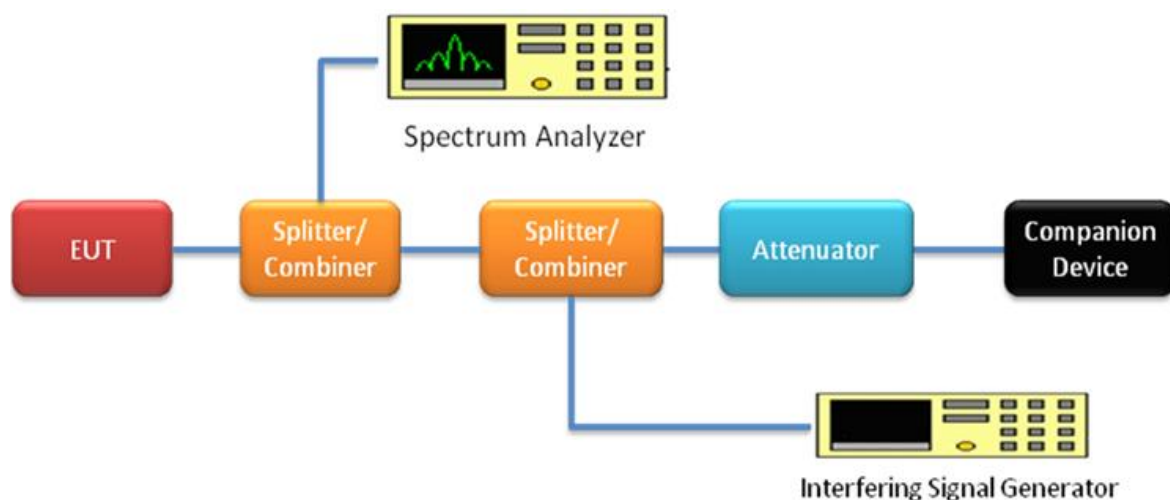
4.5.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.3.3.3

4.5.3 Deviation from Test Standard

No deviation.

4.5.4 Test Setup



4.5.5 Test Results

Adjacent channel selectivity measure of the capability					
P _{min} : -89 dBm					
Adjacent signal power (Note 1)			☒ at the antenna connector		
			☐ in front of the antenna		
Note 1: For the conducted measurements, the same levels should be used at the antenna connector irrespective of antenna gain.					
Operation Mode	Channel	Wanted signal mean power from companion device (dBm)	Adjacent signal frequency (MHz)	Adjacent signal power (dBm)	Pass/Fail
802.11a	157	-86	Upper adjacent channel	-58.26	Pass
			Lower adjacent channel		Pass

4.6 Blocking or Desensitization

4.6.1 Limits of Blocking or Desensitization

The blocking level, for any frequency within the specified ranges, shall not be less than the values given in table, except at frequencies on which spurious responses are found.

Receiver category	Limit
1	-30 dBm + k
2	-45 dBm + k
3	No limit

The correction factor, k, is as follows:

$$k = -20 \log f - 10 \log BW$$

Where:

- f is the frequency in GHz;
- BW is the channel bandwidth in MHz.

The factor k is limited within the following:

- $-40 \text{ dB} < k < 0 \text{ dB}$.

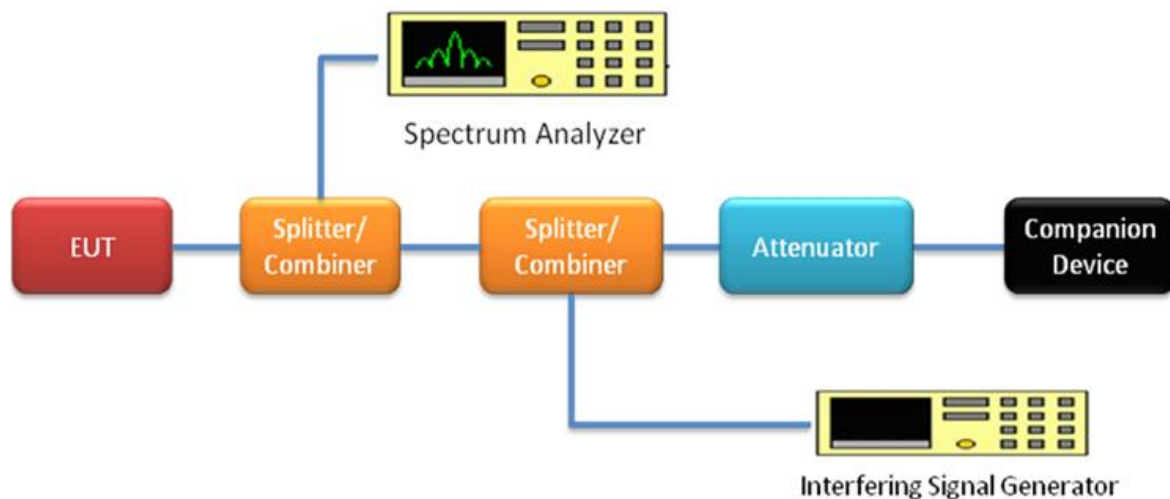
4.6.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.3.4.3

4.6.3 Deviation from Test Standard

No deviation.

4.6.4 Test Setup



4.6.5 Test Results

Blocking measure of the capability						
P _{min} : -89 dBm						
Unwanted signal power (Note 1)				☒ at the antenna connector		
				☐ in front of the antenna		
Note 1: For the conducted measurements, the same levels should be used at the antenna connector irrespective of antenna gain.						
Operation Mode	Channel	Wanted signal mean power from companion device (dBm)	Measurement points: offset from centre frequency (Times)	Blocking signal frequency (MHz)	Unwanted signal power (dBm)	Pass/Fail
802.11a	157	-86	-10	5585	-58.26	Pass
			-20	5385		Pass
			-50	4785		Pass
			10	5985		Pass
			20	6185		Pass
			50	6785		Pass

5 Photographs of the Test Configuration

TX / RX Spurious Emission Test Dipole Antenna



PIFA Antenna



Appendix - Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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