

## EN 300 440 RF Test Report (WLAN)

**Report No.:** REBBUI-WTW-P22100653-8

**Test Model:** RTL8851BE

**Received Date:** 2022/10/25

**Test Date:** 2022/12/15 ~ 2023/4/20

**Issued Date:** 2023/5/3

**Applicant:** Realtek Semiconductor Corp.

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

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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
REBBUI-WTW-P22100653-8	Original release.	2023/5/3

## 1 Certificate of Conformity

**Product:** 11ax RTL8851BE Combo module

**Brand:** REALTEK

**Test Model:** RTL8851BE

**Sample Status:** Engineering sample

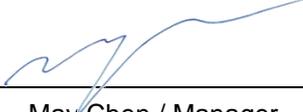
**Applicant:** Realtek Semiconductor Corp.

**Test Date:** 2022/12/15 ~ 2023/4/20

**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 :**                     Luna Yu                     , **Date:**                     2023/5/3                      
Luna Yu / Specialist

**Approved by :**                                          , **Date:**                     2023/5/3                      
May Chen / Manager

## 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 below 1 GHz test

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208411	N/A	N/A
Power Meter Anritsu	ML2495A	0824006	2022/5/9	2023/5/8
		1529002	2022/6/22	2023/6/21
Preamplifier Agilent	8447D	2944A10663	2022/4/25	2023/4/24
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2022/6/21	2023/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2022/5/29	2023/5/28
		1726432	2022/5/29	2023/5/28
PXA Signal Analyzer(3 Hz to 50 GHz) Keysight	N9030A	MY54490570	2022/6/20	2023/6/19
Software	ADT_Radiated_V7.6.15.9.5	N/A	N/A	N/A
Trilog Broadband Antenna Schwarzbeck	VULB 9168	9168-162	2022/10/20	2023/10/19

- 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: 2022/12/30

**For spurious emissions above 1 GHz test**

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208542	N/A	N/A
Horn Antenna Schwarzbeck	BBHA 9120 D	9120D-1479	2022/11/13	2023/11/12
Power Meter Anritsu	ML2495A	1529002	2022/6/22	2023/6/21
	ML2496A	1529003	2022/8/8	2023/8/7
Pre-Amplifier Agilent 8449B (1 to 26.5GHz) Agilent	8449B	3008A01922	2022/8/15	2023/8/14
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2022/6/21	2023/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2022/5/29	2023/5/28
		1726432	2022/5/29	2023/5/28
Software	ADT_Radiated_V7.6.15.9.5	N/A	N/A	N/A
Spectrum Analyzer Keysight	N9030A	MY54490520	2022/8/5	2023/8/4

- 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: 2022/12/15 ~ 2023/1/30

**For adjacent channel selectivity & receiver blocking test:**

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
N9030B - PXA Signal Analyzer KEYSIGHT	N9030B	MY57140938	2022/3/15	2023/3/14
Spectrum Analyzer R&S	FSV40	100979	2022/3/25	2023/3/24
MXG Vector signal generator KEYSIGHT	N5182B	MY53052282	2023/1/6	2024/1/5
PXA KEYSIGHT	N9030B	MY57140953	2022/7/1	2023/6/30
Combiner / Splitter (Model:ZN2PD-9G) Mini-Circuits	ZN2PD-9G	ZN2PD-9G	2022/6/9	2023/6/8
Signal Analyzer R&S	FSV7	104056	2022/5/20	2023/5/19
Radio Communication Analyzer Anritsu	MT8860C	1702001	2022/5/10	2023/5/9

- 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: 2023/2/22

**For other test items:**

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
PXA Signal Analyzer(3 Hz to 50 GHz) Keysight	N9030A	MY54490570	2022/6/20	2023/6/19
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2022/6/21	2023/6/20
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA
MXG X-Series RF Vector Signal Generator Keysight	N5182B	MY53052700	2022/7/18	2023/7/17
Power Meter Anritsu	ML2495A	1529002	2022/6/22	2023/6/21
Temperature & Humidity Chamber TERCHY	MHU-225AU	911033	2022/11/18	2023/11/17
DC POWER SUPPLY GOOD WILL INSTRUMENT CO. LTD.	GPC-3030D	7700087	NA	NA

- 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: 2023/4/20

## 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)	$\pm 1.2$ dB
Radiated emission of transmitter, valid up to 26.5GHz	$\pm 4.9$ dB
Radiated emission of transmitter, valid between 26,5 GHz and 66 GHz	$\pm 4.9$ dB
Radiated emission of receivers, valid up to 26.5GHz	$\pm 4.9$ dB
Radiated emission of receiver, valid between 26,5 GHz and 66 GHz	$\pm 4.9$ dB
Temperature	$\pm 0.4$ °C
Humidity	$\pm 0.6$ %
Voltages(DC)	$\pm 0.05$ %
Voltages(AC, <10kHz)	$\pm 0.05$ %

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)	$\pm 2.5$ dB
Radiated emission of transmitter, valid up to 26.5GHz	$\pm 6.0$ dB
Radiated emission of transmitter, valid between 26,5 GHz and 66 GHz	$\pm 8.0$ dB
Radiated emission of receivers, valid up to 26.5GHz	$\pm 6.0$ dB
Radiated emission of receiver, valid between 26,5 GHz and 66 GHz	$\pm 8.0$ dB
Temperature	$\pm 1$ °C
Humidity	$\pm 5.0$ %
Voltages(DC)	$\pm 1.0$ %
Voltages(AC, <10kHz)	$\pm 2.0$ %

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 RTL8851BE Combo module
Brand	REALTEK
Test Model	RTL8851BE
Status of EUT	Engineering sample
Nominal Voltage	3.3 Vdc from host equipment
Voltage Operation Range	Vnom = 3.3 Vdc    Vmin= 2.8 Vdc    Vmax= 3.8 Vdc
Temperature Operating Range	-20 °C ~ 70 °C
Modulation Type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode 1024QAM for OFDMA in 11ax mode
Modulation Technology	OFDM, OFDMA
Transfer Rate	802.11a: up to 54 Mbps 802.11n: up to 150 Mbps 802.11ac: up to 433.3 Mbps 802.11ax: up to 600.4 Mbps
Operating Frequency	5.745 ~ 5.825 GHz
Number of Channel	802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 5 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 2 802.11ac (VHT80), 802.11ax (HE80): 1
EIRP Power (Measured Max. Average)	13.88 dBm
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA
Receiver Category	<input checked="" type="checkbox"/> Category 1 <input type="checkbox"/> Category 2 <input type="checkbox"/> Category 3

Note:

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

SKU No.	Product name	HW Configuration
1	11ax RTL8851BE Combo module	PCIe + USB interface + Dual antenna port
2		PCIe + USB interface + Single antenna port

Note: For spurious emissions: From the above HW SKUs, the worse case was found in **SKU No.: 2**.  
Therefore only the test data of the SKU was recorded in this report.

2. There are Bluetooth and WLAN (2.4 GHz & 5 GHz) technology used for the EUT.

3. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (5 GHz)	Bluetooth
2	WLAN (2.4 GHz)	Bluetooth

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

4. The EUT support OFDMA and Partial RU mode, therefore partial RU combination were investigated and the worst case scenario was identified.

5. The antenna information is listed as below.

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)
1	Chain 1	REALTEK	RTK-ANT-0022	3.4	2.4~2.4835GHz	PIFA	IPEX4	300
				5	5.15~5.85GHz			
	Chain 2	REALTEK	RTK-ANT-0022	3.4	2.4~2.4835GHz	PIFA	IPEX4	
				5	5.15~5.85GHz			
2	Chain 1	Aristotle	RFA-27-C38H1-MHF4300	3	2.4~2.4835GHz	Dipole	IPEX4	300
				5	5.15~5.85GHz			
	Chain 2	Aristotle	RFA-27-C38H1-MHF4300	3	2.4~2.4835GHz	Dipole	IPEX4	
				5	5.15~5.85GHz			
3	Chain 1	LYNwave	ALX22F-120AA0-00	3.2	2.4~2.4835GHz	Monopole	IPEX4	200
				4	5.15~5.85GHz			
	Chain 2	LYNwave	ALX22F-120AA0-00	3.2	2.4~2.4835GHz	Monopole	IPEX4	
				4	5.15~5.85GHz			

Note:

1. Max. gain was selected for the final test, except for Spurious Emissions.

6. The EUT incorporates a SISO function.

5 GHz Band		
Modulation Mode	TX & RX Configuration	
802.11a	1TX Diversity	1RX
802.11n (HT20)	1TX Diversity	1RX
802.11n (HT40)	1TX Diversity	1RX
802.11ac (VHT20)	1TX Diversity	1RX
802.11ac (VHT40)	1TX Diversity	1RX
802.11ac (VHT80)	1TX Diversity	1RX
802.11ax (HE20)	1TX Diversity	1RX
802.11ax (HE40)	1TX Diversity	1RX
802.11ax (HE80)	1TX Diversity	1RX
802.11ax (RU26/52/106/242/484/996)	1TX Diversity	1RX

Note:

1. The modulation and bandwidth are similar for 802.11n mode for 20 MHz (40 MHz), 802.11ac mode for 20 MHz (40 MHz, 80 MHz) and 802.11ax mode for 20 MHz (40 MHz, 80 MHz), therefore the manufacturer will control the power for 802.11n/ac mode is the same as the 802.11ax or more lower than it and investigated worst case to representative mode in test report.

7. 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.

8. 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.

### 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	
-	√	√	√	√	√	√	-

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 **Z-plane**.
2. The EUT's Monopole antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.

#### 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.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6Mb/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	-
20 MHz Preamble 802.11ax (RU26)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	26/0, 26/4, 26/8
20 MHz Preamble 802.11ax (RU52)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	52/37, 52/39, 52/40
20 MHz Preamble 802.11ax (RU106)	149 to 165	149, 157, 165	OFDMA	BPSK	MCS0	106/53, 106/54, 106/54

#### Permitted Range Test:

- 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.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11a	149 to 165	149, 165	OFDM	BPSK	6Mb/s	-
802.11ax (HE20)	149 to 165	149, 165	OFDMA	BPSK	MCS0	-
802.11ax (HE40)	151 to 159	151, 159	OFDMA	BPSK	MCS0	-
802.11ax (HE80)	155	155	OFDMA	BPSK	MCS0	-
20 MHz Preamble 802.11ax (RU26)	149 to 165	149, 165	OFDMA	BPSK	MCS0	26/0, 26/8
20 MHz Preamble 802.11ax (RU52)	149 to 165	149, 165	OFDMA	BPSK	MCS0	52/37, 52/40
20 MHz Preamble 802.11ax (RU106)	149 to 165	149, 165	OFDMA	BPSK	MCS0	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 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.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11ax (HE40)	151 to 159	159	OFDMA	BPSK	MCS0	-
20 MHz Preamble 802.11ax (RU106)	149 to 165	165	OFDMA	BPSK	MCS0	106/54
Receiver	149 to 165	165	-	-	-	-

### 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 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.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate Parameter	RU Configuration
802.11a	149 to 165	149, 165	OFDM	BPSK	6.5Mb/s	-
20 MHz Preamble 802.11ax (RU26)	149 to 165	149, 165	OFDMA	BPSK	MCS0	26/0, 26/8
Receiver	149 to 165	149, 165	-	-	-	-

### 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	6.5Mb/s

### Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
EIRP	25deg. C, 60%RH	3.3 Vdc	Bella Yeh
PR	25deg. C, 60%RH	3.3 Vdc	Bella Yeh
SE<1G	23deg. C, 67%RH 24deg. C, 69%RH	230Vac, 50Hz (System)	Jeff Hsieh Ethan Hsu
SE≥1G	24deg. C, 70%RH 26deg. C, 66%RH 25deg. C, 68%RH 22deg. C, 62%RH	230Vac, 50Hz (System)	Ethan Hsu Spencer Liao
ACS	25deg. C, 60%RH	3.3 Vdc	Thomas Liao
BD	25deg. C, 60%RH	3.3 Vdc	Thomas Liao

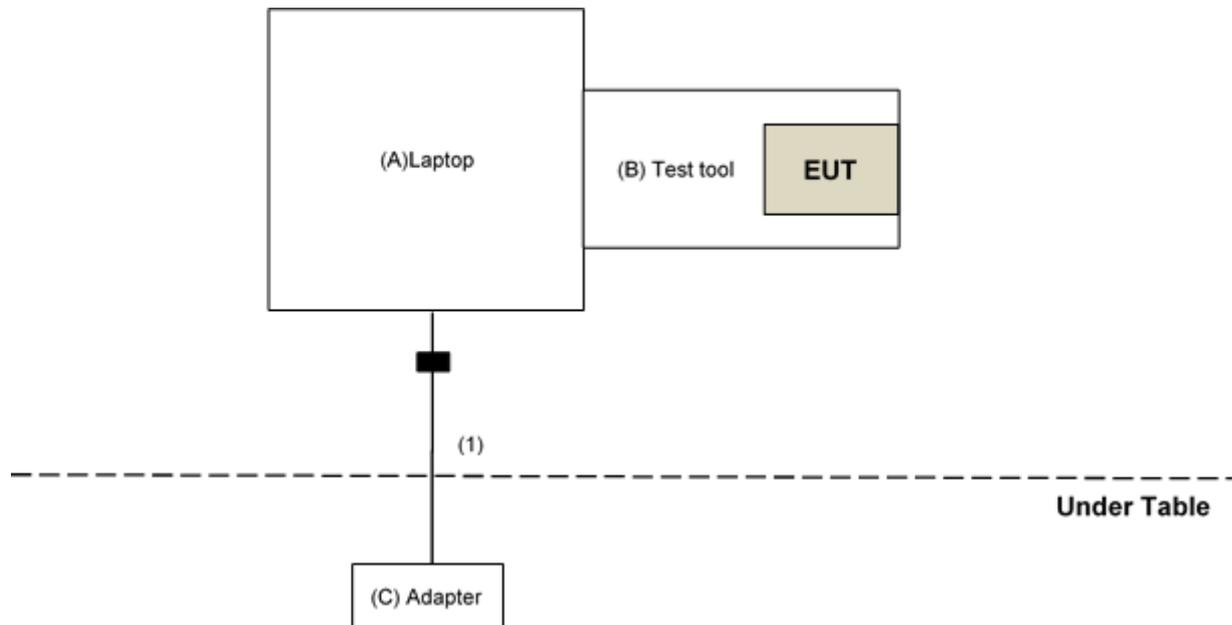
### 3.3 Description of Support Units

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	Latitude 7430	8C19NN3	N/A	Provided by Lab
B	Test tool	Realtek	N/A	N/A	N/A	Supplied by applicant
C	Adapter	DELL	LA90PM111	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Cable	1	1.8	NO	1	Provided by Lab

#### 3.3.1 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 standard:

**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

#### 4.4 Equivalent Isotropic Radiated Power

##### 4.4.1 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 10.6GMHz	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	√

##### 4.4.2 Test Procedures

Refer to EN 300 440 V2.1.1 clause 4.2.2.3

##### 4.4.3 Deviation from Test Standard

No deviation

##### 4.4.4 Test Setup

The test setup has been constructed as the normal use condition. Controlling software (RTL8851B\_PCIE\_MP\_Package\_ALPHA\_v2.0.23\_homologation(98236)) has been activated to set the EUT on specific status.

#### 4.4.5 Test Results

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
<b>802.11a</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.56	13.54	13.57
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.82	13.81	13.80
		V <sub>max</sub> (V)	13.79	13.79	13.79
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.35	13.30	13.32
		V <sub>max</sub> (V)	13.39	13.31	13.33
<b>802.11ac (VHT20)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.44	13.57	13.51
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.75	13.87	13.88
		V <sub>max</sub> (V)	13.71	13.84	13.85
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.25	13.39	13.34
		V <sub>max</sub> (V)	13.27	13.43	13.34
<b>802.11ax (HE20)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.52	13.62	13.61
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.80	13.88	13.86
		V <sub>max</sub> (V)	13.76	13.85	13.83
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.38	13.48	13.46
		V <sub>max</sub> (V)	13.40	13.52	13.46
<b>20 MHz Preamble 802.11ax (RU26)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.57	13.60	13.62
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.85	13.86	13.87
		V <sub>max</sub> (V)	13.81	13.83	13.84
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.43	13.46	13.47
		V <sub>max</sub> (V)	13.45	13.50	13.47
<b>20 MHz Preamble 802.11ax (RU52)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.58	13.56	13.54
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.86	13.82	13.79
		V <sub>max</sub> (V)	13.82	13.79	13.76
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.44	13.42	13.39
		V <sub>max</sub> (V)	13.46	13.46	13.39

Test Condition			Maximum EIRP (dBm)		
			(CH 149) 5745 MHz	(CH 157) 5785 MHz	(CH 165) 5825 MHz
<b>20 MHz Preamble 802.11ax (RU106)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.55	13.57	13.52
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.83	13.83	13.77
		V <sub>max</sub> (V)	13.79	13.80	13.74
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.41	13.43	13.37
		V <sub>max</sub> (V)	13.43	13.47	13.37
Test Condition			Maximum EIRP (dBm)		
			(CH 151) 5755 MHz	(CH 159) 5795 MHz	
<b>802.11ac (VHT40)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.47	13.53	
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.72	13.86	
		V <sub>max</sub> (V)	13.68	13.83	
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.16	13.27	
		V <sub>max</sub> (V)	13.18	13.31	
<b>802.11ax (HE40)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.56	13.58	
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.80	13.87	
		V <sub>max</sub> (V)	13.77	13.83	
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.29	13.38	
		V <sub>max</sub> (V)	13.31	13.39	
Test Condition			Maximum EIRP (dBm)		
			(CH 155) 5775 MHz		
<b>802.11ac (VHT80)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.46		
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.81		
		V <sub>max</sub> (V)	13.77		
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.08		
		V <sub>max</sub> (V)	13.10		
<b>802.11ax (HE80)</b>					
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	13.54		
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	13.87		
		V <sub>max</sub> (V)	13.86		
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	13.23		
		V <sub>max</sub> (V)	13.26		

## 4.5 Permitted Range of Operating Frequencies

### 4.5.1 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 10.6GMHz	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.

### 4.5.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.2.3.3

### 4.5.3 Deviation from Test Standard

No deviation.

### 4.5.4 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.

#### 4.5.5 Test Results

##### 802.11a

Test Condition			Frequency (MHz)	
			Lowest	Highest
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	5736.44	5833.50
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	5736.38	5833.65
		V <sub>max</sub> (V)	5736.41	5833.67
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	5736.49	5833.38
		V <sub>max</sub> (V)	5736.44	5833.37
Measured frequency (lowest and highest)			FL = 5736.38	FH = 5833.67

##### 802.11ax (HE20)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	5735.33	5834.62
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	5735.25	5834.69
		V <sub>max</sub> (V)	5735.28	5834.71
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	5735.49	5834.52
		V <sub>max</sub> (V)	5735.44	5834.51
Measured frequency (lowest and highest)			FL = 5735.25	FH = 5834.71

##### 802.11ax (HE40)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	5735.81	5814.13
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	5735.73	5814.19
		V <sub>max</sub> (V)	5735.71	5814.17
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	5735.87	5814.04
		V <sub>max</sub> (V)	5735.90	5814.07
Measured frequency (lowest and highest)			FL = 5735.71	FH = 5814.19

##### 802.11ax (HE80)

Test Condition			Frequency (MHz)	
			Lowest	Highest
T <sub>nom</sub> (°C)	25	V <sub>nom</sub> (V)	5735.87	5814.06
T <sub>min</sub> (°C)	-20	V <sub>min</sub> (V)	5735.78	5814.10
		V <sub>max</sub> (V)	5735.76	5814.05
T <sub>max</sub> (°C)	70	V <sub>min</sub> (V)	5736.01	5813.93
		V <sub>max</sub> (V)	5735.99	5813.92
Measured frequency (lowest and highest)			FL = 5735.76	FH = 5814.10

**20 MHz Preamble 802.11ax (RU26)**

Test Condition			Frequency (MHz)	
			Lowest	Highest
$T_{nom}(^{\circ}C)$	25	$V_{nom}(V)$	5734.98	5834.97
$T_{min}(^{\circ}C)$	-20	$V_{min}(V)$	5734.90	5835.03
		$V_{max}(V)$	5734.93	5835.05
$T_{max}(^{\circ}C)$	70	$V_{min}(V)$	5735.04	5834.88
		$V_{max}(V)$	5734.99	5834.87
Measured frequency (lowest and highest)			FL = 5734.9	FH = 5835.05

**20 MHz Preamble 802.11ax (RU52)**

Test Condition			Frequency (MHz)	
			Lowest	Highest
$T_{nom}(^{\circ}C)$	25	$V_{nom}(V)$	5735.22	5834.70
$T_{min}(^{\circ}C)$	-20	$V_{min}(V)$	5735.15	5834.77
		$V_{max}(V)$	5735.18	5834.79
$T_{max}(^{\circ}C)$	70	$V_{min}(V)$	5735.31	5834.65
		$V_{max}(V)$	5735.26	5834.64
Measured frequency (lowest and highest)			FL = 5735.15	FH = 5834.79

**20 MHz Preamble 802.11ax (RU106)**

Test Condition			Frequency (MHz)	
			Lowest	Highest
$T_{nom}(^{\circ}C)$	25	$V_{nom}(V)$	5735.28	5834.66
$T_{min}(^{\circ}C)$	-20	$V_{min}(V)$	5735.19	5834.81
		$V_{max}(V)$	5735.22	5834.83
$T_{max}(^{\circ}C)$	70	$V_{min}(V)$	5735.44	5834.53
		$V_{max}(V)$	5735.39	5834.52
Measured frequency (lowest and highest)			FL = 5735.19	FH = 5834.83

## 4.6 Unwanted Emissions in the Spurious Domain

### 4.6.1 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 $\mu$ W (-30dBm)
Limit (Standby)	2nW (-57dBm)	2nW (-57dBm)	20nW (-47dBm)

### 4.6.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.2.4.3

### 4.6.3 Deviation from Test Standard

No deviation.

### 4.6.4 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 (RTL8851B\_PCIE\_MP\_Package\_ALPHA\_v2.0.23\_homologation(98236)) has been activated to set the EUT on specific status.

#### 4.6.5 Test Results

##### Below 1GHz Worst-Case Data

##### With Dipole Antenna

##### 802.11ax (HE40)

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	159
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
49.40	H	-63.14	-54.00	-9.14
58.80	H	-68.98	-54.00	-14.98
58.80	V	-71.43	-54.00	-17.43
99.70	V	-70.10	-54.00	-16.10
210.05	H	-66.60	-54.00	-12.60
219.70	V	-70.22	-54.00	-16.22
497.90	V	-73.87	-54.00	-19.87
497.95	H	-72.52	-54.00	-18.52
543.50	H	-72.19	-54.00	-18.19
543.60	V	-73.03	-54.00	-19.03
566.65	H	-72.93	-54.00	-18.93
566.70	V	-73.63	-54.00	-19.63
589.75	V	-72.97	-54.00	-18.97
610.95	V	-72.88	-54.00	-18.88
705.45	V	-72.74	-54.00	-18.74
717.75	H	-73.22	-54.00	-19.22
762.20	H	-72.55	-54.00	-18.55
802.35	H	-71.81	-54.00	-17.81
841.95	V	-69.42	-54.00	-15.42
856.85	H	-70.98	-54.00	-16.98

**802.11ax 106-tone RU**

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	165
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<b>Spurious Emission Level</b>				
<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
49.40	H	-63.37	-54.00	-9.37
58.80	H	-69.26	-54.00	-15.26
58.80	V	-71.96	-54.00	-17.96
99.80	H	-69.49	-54.00	-15.49
208.00	H	-67.17	-54.00	-13.17
219.75	V	-69.10	-54.00	-15.10
224.00	V	-67.12	-54.00	-13.12
499.85	H	-71.33	-54.00	-17.33
543.55	V	-72.99	-54.00	-18.99
543.60	H	-72.52	-54.00	-18.52
612.90	V	-74.64	-54.00	-20.64
678.00	V	-74.83	-54.00	-20.83
760.60	V	-69.84	-54.00	-15.84
774.90	H	-72.62	-54.00	-18.62
796.00	V	-70.77	-54.00	-16.77
804.40	H	-71.68	-54.00	-17.68
807.45	V	-68.47	-54.00	-14.47
833.90	H	-71.11	-54.00	-17.11
838.05	V	-69.39	-54.00	-15.39
848.85	H	-70.83	-54.00	-16.83

With PIFA Antenna

802.11ax (HE40)

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	159
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
49.40	H	-65.98	-54.00	-11.98
58.80	H	-71.71	-54.00	-17.71
58.80	V	-75.63	-54.00	-21.63
194.35	V	-73.89	-54.00	-19.89
213.60	H	-74.54	-54.00	-20.54
499.85	H	-77.86	-54.00	-23.86
547.70	H	-77.66	-54.00	-23.66
587.50	V	-75.92	-54.00	-21.92
612.75	V	-75.93	-54.00	-21.93
701.15	V	-75.48	-54.00	-21.48
721.20	H	-75.32	-54.00	-21.32
728.65	V	-74.73	-54.00	-20.73
761.70	H	-74.07	-54.00	-20.07
772.15	V	-74.64	-54.00	-20.64
785.20	V	-73.46	-54.00	-19.46
800.95	H	-73.14	-54.00	-19.14
813.50	H	-73.44	-54.00	-19.44
826.30	V	-74.08	-54.00	-20.08
855.00	H	-72.71	-54.00	-18.71
856.05	V	-73.39	-54.00	-19.39

**802.11ax 106-tone RU**

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	165
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<b>Spurious Emission Level</b>				
<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
49.40	H	-65.73	-54.00	-11.73
58.80	H	-70.97	-54.00	-16.97
99.65	H	-71.04	-54.00	-17.04
192.30	V	-75.04	-54.00	-21.04
196.35	H	-71.70	-54.00	-17.70
543.40	V	-77.29	-54.00	-23.29
589.55	V	-76.09	-54.00	-22.09
648.70	V	-75.89	-54.00	-21.89
678.35	H	-75.37	-54.00	-21.37
704.60	V	-75.64	-54.00	-21.64
710.80	H	-75.77	-54.00	-21.77
735.40	V	-74.90	-54.00	-20.90
747.15	V	-73.73	-54.00	-19.73
759.15	H	-74.53	-54.00	-20.53
787.10	V	-74.74	-54.00	-20.74
802.00	H	-73.96	-54.00	-19.96
813.65	H	-74.03	-54.00	-20.03
819.15	V	-73.86	-54.00	-19.86
844.00	H	-73.65	-54.00	-19.65
854.90	V	-73.00	-54.00	-19.00

**With Monopole Antenna**

**802.11ax (HE40)**

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	159
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<b>Spurious Emission Level</b>				
<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
49.19	H	-66.00	-54.00	-12.00
58.69	H	-71.92	-54.00	-17.92
58.69	V	-75.84	-54.00	-21.84
194.14	V	-74.11	-54.00	-20.11
213.41	H	-74.75	-54.00	-20.75
499.64	H	-78.07	-54.00	-24.07
547.51	H	-77.88	-54.00	-23.88
587.29	V	-76.13	-54.00	-22.13
612.54	V	-76.14	-54.00	-22.14
700.94	V	-75.69	-54.00	-21.69
721.09	H	-75.54	-54.00	-21.54
728.44	V	-74.94	-54.00	-20.94
761.49	H	-74.28	-54.00	-20.28
771.94	V	-74.85	-54.00	-20.85
785.09	V	-73.67	-54.00	-19.67
800.74	H	-73.35	-54.00	-19.35
813.29	H	-73.65	-54.00	-19.65
826.09	V	-74.29	-54.00	-20.29
854.88	H	-72.92	-54.00	-18.92
855.84	V	-73.60	-54.00	-19.60

**802.11ax 106-tone RU**

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	165
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<b>Spurious Emission Level</b>				
<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
49.19	H	-65.95	-54.00	-11.95
58.59	H	-71.28	-54.00	-17.28
99.44	H	-71.25	-54.00	-17.25
192.09	V	-75.25	-54.00	-21.25
196.14	H	-72.01	-54.00	-18.01
543.19	V	-77.50	-54.00	-23.50
589.43	V	-76.30	-54.00	-22.30
648.51	V	-76.10	-54.00	-22.10
678.13	H	-75.58	-54.00	-21.58
704.39	V	-75.85	-54.00	-21.85
710.58	H	-75.98	-54.00	-21.98
735.18	V	-75.11	-54.00	-21.11
746.94	V	-73.94	-54.00	-19.94
758.94	H	-74.74	-54.00	-20.74
786.91	V	-74.95	-54.00	-20.95
801.89	H	-74.17	-54.00	-20.17
813.54	H	-74.24	-54.00	-20.24
819.04	V	-74.07	-54.00	-20.07
843.89	H	-73.86	-54.00	-19.86
854.69	V	-73.31	-54.00	-19.31

**Above 1GHz Worst-Case Data**  
**With Dipole Antenna**

**802.11a**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	11490.00	H	-45.67	-30.00	-15.67
	11490.00	V	-35.72	-30.00	-5.72
	17235.00	H	-50.58	-30.00	-20.58
	17235.00	V	-47.67	-30.00	-17.67
	22980.00	H	-51.63	-30.00	-21.63
	22980.00	V	-52.19	-30.00	-22.19
165	11650.00	H	-44.27	-30.00	-14.27
	11650.00	V	-39.18	-30.00	-9.18
	17475.00	H	-50.62	-30.00	-20.62
	17475.00	V	-49.07	-30.00	-19.07
	23300.00	H	-52.17	-30.00	-22.17
	23300.00	V	-52.83	-30.00	-22.83

**802.11ax 26-tone RU**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	11473.28	H	-41.51	-30.00	-11.51
	11473.28	V	-41.26	-30.00	-11.26
	17210.47	H	-50.62	-30.00	-20.62
	17210.47	V	-38.85	-30.00	-8.85
	22980.00	H	-52.36	-30.00	-22.36
	22980.00	V	-53.46	-30.00	-23.46
165	11633.35	H	-37.00	-30.00	-7.00
	11633.40	V	-33.68	-30.00	-3.68
	17462.88	H	-48.71	-30.00	-18.71
	17462.88	V	-39.17	-30.00	-9.17
	23300.00	H	-53.71	-30.00	-23.71
	23300.00	V	-53.04	-30.00	-23.04

**With PIFA Antenna**

**802.11a**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	11490.00	H	-49.28	-30.00	-19.28
	11490.00	V	-33.97	-30.00	-3.97
	17235.00	H	-51.44	-30.00	-21.44
	17235.00	V	-47.85	-30.00	-17.85
	22980.00	H	-52.07	-30.00	-22.07
	22980.00	V	-51.72	-30.00	-21.72
165	11650.00	H	-48.36	-30.00	-18.36
	11650.00	V	-44.91	-30.00	-14.91
	17475.00	H	-51.76	-30.00	-21.76
	17475.00	V	-50.61	-30.00	-20.61
	23300.00	H	-51.16	-30.00	-21.16
	23300.00	V	-54.37	-30.00	-24.37

**802.11ax 26-tone RU**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	11472.60	H	-39.32	-30.00	-9.32
	11472.60	V	-35.35	-30.00	-5.35
	17209.11	H	-44.32	-30.00	-14.32
	17209.66	V	-36.52	-30.00	-6.52
	22980.00	H	-51.08	-30.00	-21.08
	22980.00	V	-50.29	-30.00	-20.29
165	11633.00	H	-37.11	-30.00	-7.11
	11633.40	V	-35.14	-30.00	-5.14
	17448.52	H	-45.88	-30.00	-15.88
	17451.36	V	-38.27	-30.00	-8.27
	23300.00	H	-50.87	-30.00	-20.87
	23300.00	V	-50.12	-30.00	-20.12

**With Monopole Antenna**

**802.11a**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	11490.00	H	-49.47	-30.00	-19.47
	11490.00	V	-33.97	-30.00	-3.97
	17235.00	H	-51.14	-30.00	-21.14
	17235.00	V	-47.87	-30.00	-17.87
	22980.00	H	-52.04	-30.00	-22.04
	22980.00	V	-51.80	-30.00	-21.80
165	11650.00	H	-48.30	-30.00	-18.30
	11650.00	V	-44.87	-30.00	-14.87
	17475.00	H	-51.36	-30.00	-21.36
	17475.00	V	-50.80	-30.00	-20.80
	23300.00	H	-51.06	-30.00	-21.06
	23300.00	V	-54.28	-30.00	-24.28

**802.11ax 26-tone RU**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	11472.96	H	-44.90	-30.00	-14.90
	11473.02	V	-36.11	-30.00	-6.11
	17209.30	H	-44.47	-30.00	-14.47
	17209.90	V	-36.68	-30.00	-6.68
	22980.00	H	-51.88	-30.00	-21.88
	22980.00	V	-51.23	-30.00	-21.23
165	11632.22	H	-36.54	-30.00	-6.54
	11633.42	V	-34.23	-30.00	-4.23
	17448.60	H	-46.08	-30.00	-16.08
	17451.15	V	-38.14	-30.00	-8.14
	23300.00	H	-50.06	-30.00	-20.06
	23300.00	V	-51.25	-30.00	-21.25

## Receiver Parameters

### 4.7 Receiver Spurious Emissions

#### 4.7.1 Limits of Receiver Spurious Emissions

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

#### 4.7.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.3.5.3

#### 4.7.3 Deviation from Test Standard

No deviation.

#### 4.7.4 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 (RTL8851B\_PCIE\_MP\_Package\_ALPHA\_v2.0.23\_homologation(98236)) has been activated to set the EUT on specific status.

#### 4.7.5 Test Results

RX Below 1GHz Data:  
With Dipole Antenna

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	165
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Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
28.75	V	-60.48	-57.00	-3.48
49.40	H	-63.29	-57.00	-6.29
58.80	H	-68.94	-57.00	-11.94
99.70	H	-68.18	-57.00	-11.18
138.75	V	-67.83	-57.00	-10.83
151.00	H	-65.69	-57.00	-8.69
166.00	V	-63.94	-57.00	-6.94
166.60	H	-63.27	-57.00	-6.27
204.00	H	-67.74	-57.00	-10.74
223.20	V	-64.77	-57.00	-7.77
233.20	H	-66.12	-57.00	-9.12
299.65	H	-68.98	-57.00	-11.98
299.70	V	-68.56	-57.00	-11.56
466.50	H	-68.26	-57.00	-11.26
811.45	V	-67.15	-57.00	-10.15
843.60	V	-66.08	-57.00	-9.08
894.65	V	-67.83	-57.00	-10.83
913.70	V	-68.29	-57.00	-11.29
990.25	V	-68.05	-57.00	-11.05
995.05	H	-68.95	-57.00	-11.95

**With PIFA Antenna**

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	165
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<b>Spurious Emission Level</b>				
<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
25.20	V	-62.50	-57.00	-5.50
25.85	H	-65.11	-57.00	-8.11
58.80	H	-71.60	-57.00	-14.60
166.00	H	-63.08	-57.00	-6.08
233.25	H	-66.59	-57.00	-9.59
299.85	H	-71.79	-57.00	-14.79
739.65	V	-75.57	-57.00	-18.57
751.70	V	-75.28	-57.00	-18.28
785.80	V	-75.19	-57.00	-18.19
794.00	H	-70.71	-57.00	-13.71
814.45	H	-71.75	-57.00	-14.75
826.95	V	-75.99	-57.00	-18.99
853.45	V	-75.04	-57.00	-18.04
865.50	H	-71.32	-57.00	-14.32
890.85	H	-71.38	-57.00	-14.38
900.45	V	-74.11	-57.00	-17.11
921.20	V	-73.88	-57.00	-16.88
945.55	H	-70.33	-57.00	-13.33
964.40	V	-73.34	-57.00	-16.34
990.55	V	-73.36	-57.00	-16.36

**With Monopole Antenna**

<b>Spurious Emission Frequency Range</b>	25MHz ~ 1GHz	<b>Operating Channel</b>	165
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<b>Spurious Emission Level</b>				
<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
25.09	V	-62.61	-57.00	-5.61
25.64	H	-65.33	-57.00	-8.33
58.58	H	-71.81	-57.00	-14.81
165.89	H	-63.29	-57.00	-6.29
233.04	H	-66.80	-57.00	-9.80
299.74	H	-72.00	-57.00	-15.00
739.54	V	-75.78	-57.00	-18.78
751.51	V	-75.49	-57.00	-18.49
785.61	V	-75.40	-57.00	-18.40
793.79	H	-70.92	-57.00	-13.92
814.24	H	-71.96	-57.00	-14.96
826.76	V	-76.20	-57.00	-19.20
853.24	V	-75.25	-57.00	-18.25
865.39	H	-71.44	-57.00	-14.44
890.74	H	-71.59	-57.00	-14.59
900.24	V	-74.32	-57.00	-17.32
921.08	V	-74.09	-57.00	-17.09
945.44	H	-70.54	-57.00	-13.54
964.18	V	-73.55	-57.00	-16.55
990.34	V	-73.57	-57.00	-16.57

**RX Above 1GHz Data:**  
**With Dipole Antenna**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	7660.00	H	-58.61	-47.00	-11.61
	7660.00	V	-57.84	-47.00	-10.84
165	7766.00	H	-55.67	-47.00	-8.67
	7766.00	V	-54.69	-47.00	-7.69

**With PIFA Antenna**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	7660.00	H	-56.88	-47.00	-9.88
	7660.00	V	-56.49	-47.00	-9.49
165	7766.00	H	-56.74	-47.00	-9.74
	7766.00	V	-56.27	-47.00	-9.27

**With Monopole Antenna**

<b>Spurious Emission Frequency Range</b>	1GHz ~ 40GHz	<b>Operating Channel</b>	149, 165
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<b>Spurious Emission Level</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Antenna Polarization</b>	<b>Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
149	7660.00	H	-56.83	-47.00	-9.83
	7660.00	V	-56.52	-47.00	-9.52
165	7766.00	H	-56.77	-47.00	-9.77
	7766.00	V	-56.29	-47.00	-9.29

## 4.8 Adjacent Channel Selectivity

This requirement applies to Equipment Category 1 receivers.

### 4.8.1 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:

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

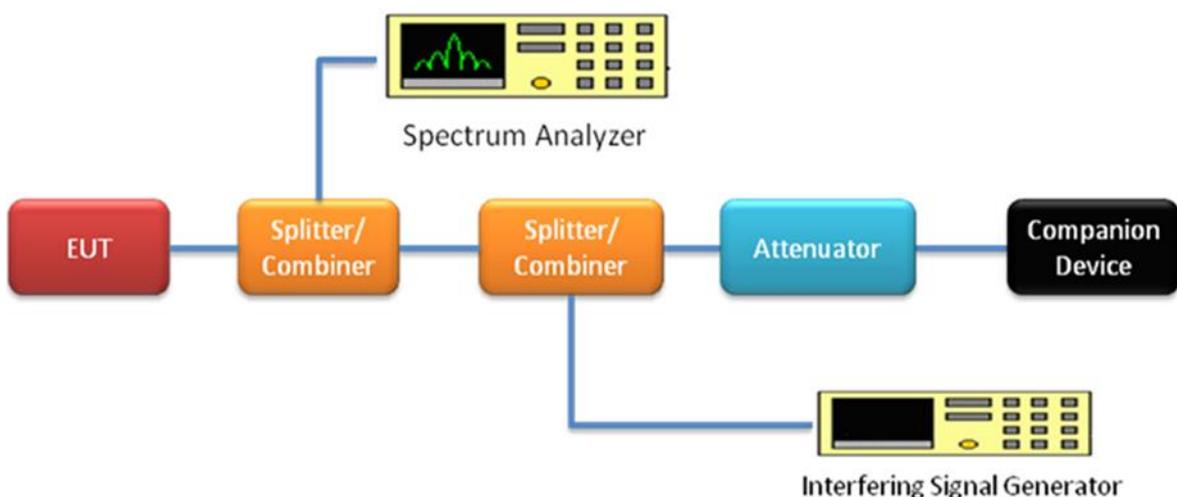
### 4.8.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.3.3.3

### 4.8.3 Deviation from Test Standard

No deviation.

### 4.8.4 Test Setup



#### 4.8.5 Test Results

Measurement Method						
<input checked="" type="checkbox"/> Conducted measurement				<input type="checkbox"/> Radiated measurement		
Receiver Category :		1		Acceptance ratio :		≥80%
Occupied Bandwidth (MHz) :		20				
Adjacent Channel Selectivity Measure Of The Capability				Adjacent Signal Power		
Pmin (dBm):		-93		<input checked="" type="checkbox"/> at the antenna connector		
				<input type="checkbox"/> in front of the antenna		
Operation Mode	Channel Number	Wanted Signal Mean Power From Companion Device (dBm)	Adjacent Signal Frequency (MHz)	Adjacent Signal Power (dBm) (Note 1)	Wanted criteria are met (dBm)	Test Result
11a	157	-90	5765	-58.25	-58.25	Pass
			5805	-58.25	-58.25	Pass

Note:

1. In case of conducted measurements, the same levels should be used at the antenna connector irrespective of antenna gain.
2. Receiver Category 3 Limit = -30 dBm + k = -58.25 dBm
3.  $k = -20\text{Log}(F) - 10\text{Log}(BW) = -20\text{Log}(5.785 \text{ GHz}) - 10\text{Log}(20 \text{ MHz}) = -28.25 \text{ dB}$

#### 4.9 Blocking or Desensitization

This requirement applies to Equipment Category 1 and Category 2 receivers.

##### 4.9.1 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:

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

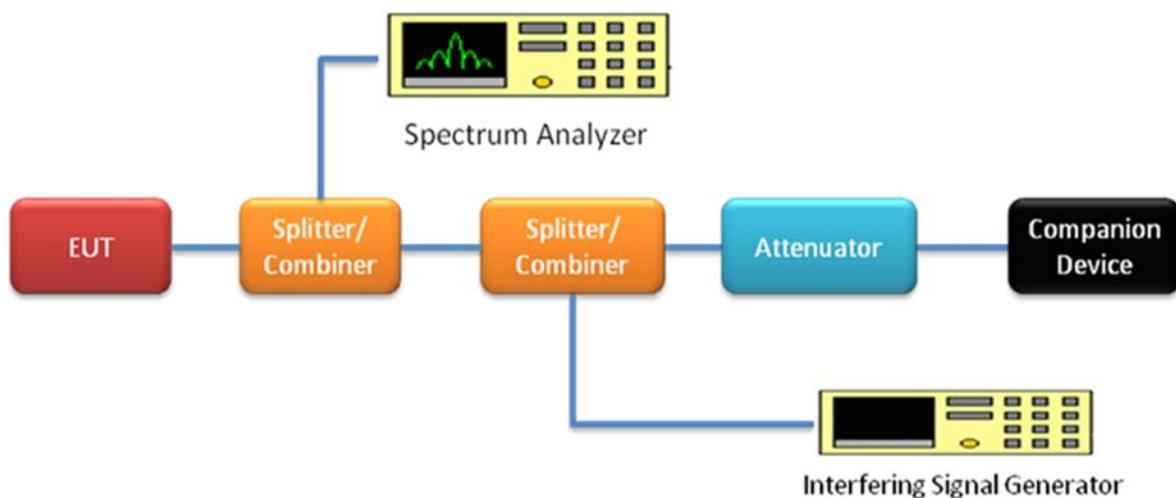
##### 4.9.2 Test Procedure

Refer to EN 300 440 V2.1.1 clause 4.3.4.3

##### 4.9.3 Deviation from Test Standard

No deviation.

##### 4.9.4 Test Setup



#### 4.9.5 Test Results

Measurement Method							
<input checked="" type="checkbox"/> Conducted measurement				<input type="checkbox"/> Radiated measurement			
Receiver Category :		1		Acceptance ratio :		≥80%	
Occupied Bandwidth (MHz) :		20					
Blocking Measure Of The Capability				Blocking Signal Power			
Pmin (dBm):		-93		<input checked="" type="checkbox"/> at the antenna connector			
				<input type="checkbox"/> in front of the antenna			
Operation Mode	Channel Number	Wanted Signal Mean Power From Companion Device (dBm)	Measurement Points: Offset From Centre Frequency (Times)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (Note 1)	Wanted criteria are met (dBm)	Test Result
11a	157	-90	-10	5575	-58.25	-58.25	Pass
			-20	5375	-58.25	-58.25	Pass
			-50	4775	-58.25	-58.25	Pass
			10	5995	-58.25	-58.25	Pass
			20	6195	-58.25	-58.25	Pass
			50	6795	-58.25	-58.25	Pass

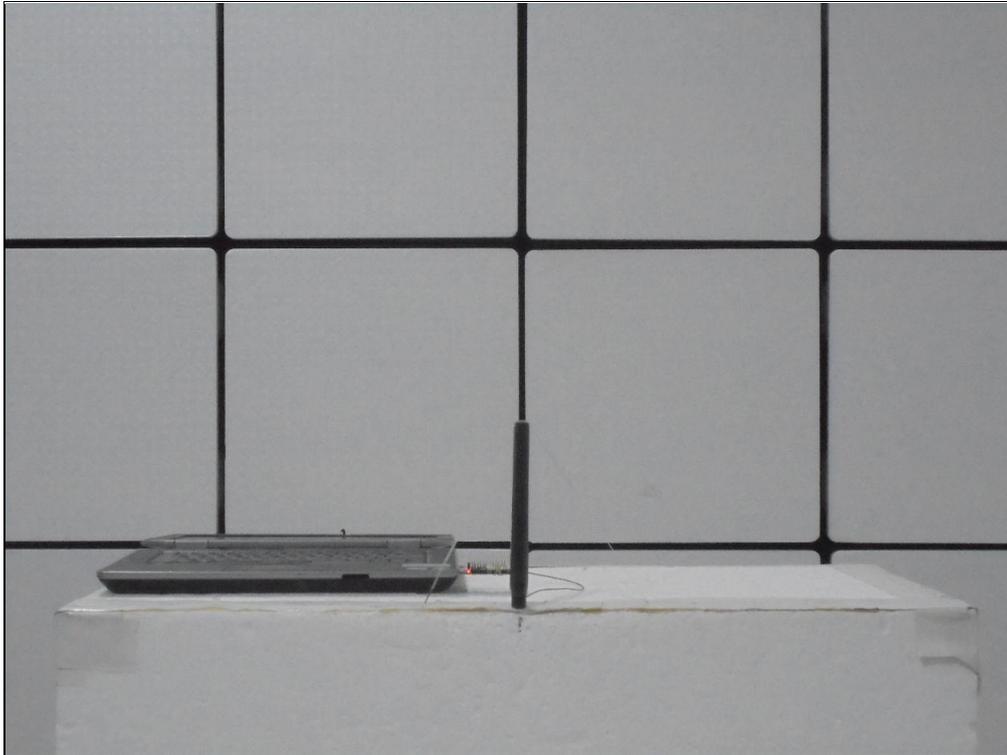
Note:

1. In case of conducted measurements, the same levels should be used at the antenna connector irrespective of antenna gain.
2. Receiver Category 1 Limit = -30 dBm + k = -58.25 dBm
3.  $k = -20\text{Log}(F) - 10\text{Log}(BW) = -20\text{Log}(5.785 \text{ GHz}) - 10\text{Log}(20 \text{ MHz}) = -28.25 \text{ dB}$

## 5 Photographs of the Test Configuration

TX / RX Spurious Emission Test

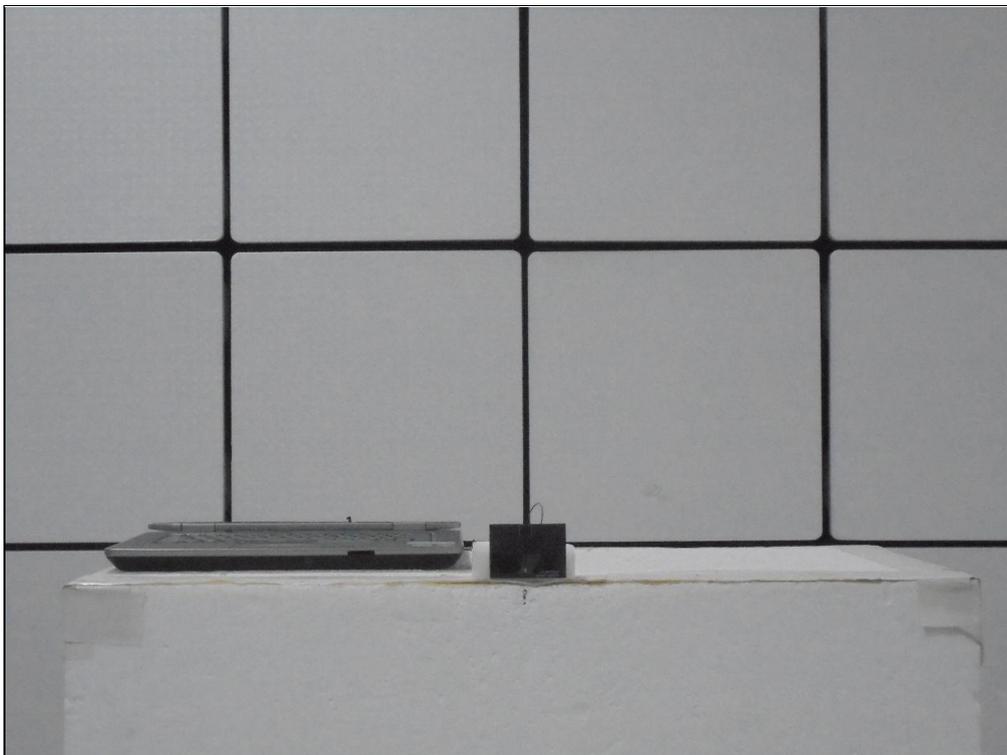
With Dipole Antenna



With PIFA Antenna



With Monopole 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:

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**Web Site:** [www.bureauveritas-adt.com](http://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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