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# TEST REPORT FOR WLAN TESTING

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Report No: SRTC2019-9004(F)-19012902(G)

Product Name: TD-LTE Wireless Data Terminal

Marketing Name: easytrans 900

Product Model: easytrans 900

Applicant: IFLYTEK CO.,LTD.

Manufacturer: IFLYTEK CO.,LTD

Specification: FCC Part 15, Subpart C (2019)

FCC ID: 2AMI5-EASYTRANS-900

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## **1. GENERAL INFORMATION**

### **1.1 Notes of the test report**

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### **1.2 Information about the testing laboratory**

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, P.R.China
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### **1.3 Applicant's details**

Company:	IFLYTEK CO.,LTD.
Address:	National Intelligent Speech High-tech Industrialization Base, No. 666, Wangjiang Road West, Hefei City, Anhui Province, China
City:	Hefei
Country or Region:	China
Contacted person:	Yumei Tao
Tel:	+86-0-15056085095
Fax:	---
Email:	ymtao3@iflytek.com

### **1.4 Manufacturer's details**

Company:	IFLYTEK CO.,LTD.
Address:	National Intelligent Speech High-tech Industrialization Base, No. 666, Wangjiang Road West, Hefei City, Anhui Province, China
City:	Hefei
Country or Region:	China
Contacted person:	Yumei Tao
Tel:	+86-0-15056085095
Fax:	---
Email:	ymtao3@iflytek.com

## 1.5 Test Environment

Date of Receipt of test sample at SRTC:	2019-01-29
Testing Start Date:	2019-05-11
Testing End Date:	2019-05-25

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	30
Maximum Extreme	50	---
Minimum Extreme	-10	---

Normal Supply Voltage (V d.c.):	3.80
Maximum Extreme Supply Voltage (V d.c.):	4.35
Minimum Extreme Supply Voltage (V d.c.):	3.60

## 2. DESCRIPTION OF THE DEVICE UNDER TEST

### 2.1 Final Equipment Build Status

Frequency Band(s)	U-NII-1:5150MHz-5250MHz U-NII-2A:5250MHz-5350MHz U-NII-2B:5475MHz-5725MHz U-NII-3:5725MHz-5850MHz
Modulation Type	802.11a 802.11n (HT20/HT40)
Antenna Type	Fixed Internal Antenna
Antenna Gain	0.59 dBi
Power Supply	Battery/AC adapter
IMEI	865531040033670

EUT	EUT1	EUT2	EUT3	EUT4	EUT5
Model	easytrans 900	JT-BLUE-DATA	JT-BLUE-WIFI	JT-GREY-DATA	JT-GREY-WIFI
Software Version	V8.1	V9.1	V9.2	V9.1	V9.2
Hardware Version	V1.0	V1.0	V1.0	V1.0	V1.0

Note: The software version, Model and Shell color are only a difference in user experience, the software differences, Model and Shell color listed above will not affect the RF performance of this products.

### 2.2 Wireless Technology and Frequency Range

Wireless Technology		Bandwidth	Channel	Frequency(MHz)
Wi-Fi	U-NII-1	20MHz	36	5180
			40	5200
			44	5220
			48	5240
	40MHz	38	5190	
		46	5230	
U-NII-2A	20MHz	52	5260	
		56	5280	
		60	5300	

			64	5320	
		40MHz	54	5270	
			62	5310	
	U-NII-2C	20MHz	100	5500	
			104	5520	
			108	5540	
			112	5560	
			116	5580	
			120	5600	
			124	5620	
			128	5640	
			132	5660	
			136	5680	
			140	5700	
			40MHz	102	5510
				110	5550
				118	5590
	126	5630			
	134	5670			
	U-NII-3	20MHz	149	5745	
			153	5765	
			157	5785	
			161	5805	
			165	5825	
40MHz		151	5755		
	159	5795			

### Duty Cycle Result

Mode	Duty Cycle (%)	Correction Factor(dB)
11a	87.42%	0.582
11n HT20	86.71%	0.619
11n HT40	76.34%	1.172

### Note

Mode	Frequency (MHz)	99%BW (MHz)	Max frequency edge(MHz)	Max frequency edge limit(MHz)
802.11a	5240	16.660	5248.330	5250
802.11n HT20	5240	17.772	5248.886	5250
802.11n HT40	5230	36.063	5248.032	5250

Max frequency edge(MHz)= Frequency(MHz)+ 99%BW(MHz)/2

### 2.3 Support Equipment

The following support equipment was used to exercise the DUT during testing:

Equipment	Battery
Manufacturer	DONGGUAN DRN NEW ENERGYCO.,LTD
Model Number	EASYTRANS 808
Serial Number	---

Equipment	Charger
Manufacturer	SHENZHEN EAST SUN ELECTRONIC CO.,LTD.
Model Number	ES568-U050200XYC
Serial Number	---



## 2.4 Note

<b>Automatically Discontinue Transmission</b>	
<b>Description</b>	The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.
<b>Result</b>	While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

The antenna provide to the EUT, please refer to the following table:

Brand	Model	Antenna gain	Frequency Bands(GHz)	Antenna type	Connecter Type
N/A	N/A	0.59dBi	5150MHz-5350MHz 5470 MHz-5850MHz	Fixed Internal Antenna	N/A

Manufacturers ensure that their designs will not be modified by the user or third parties arbitrary antenna parameters and performance.

### **3 REFERENCE SPECIFICATION**

Specification	Version	Title
15.35	2019	Measurement detector functions and bandwidths.
15.209	2019	Radiated emission limits; general requirements.
15.205	2019	Restricted bands of operation.
15.207	2019	Conducted limits.
15.407	2019	General technical requirements
ANSI C63.10	2013	Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 644545 D03	August 14, 2014	GUIDANCE FOR IEEE Std 802.11acTM DEVICES EMISSION TESTING
KDB 905462 D03	August 22, 2016	U-NII CLIENT DEVICES WITHOUT RADAR DETECTION CAPABILITY
KDB 905462 D02	April 8, 2016	COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION
KDB 662911 D01	October 31, 2013	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
KDB 789033 D02	December 14, 2017	GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E

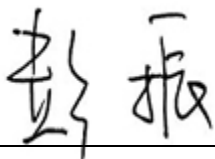

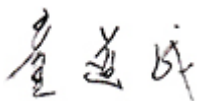
### **4 KEY TO NOTES AND RESULT CODES**

The following are the definition of the test result.

Code	Meaning
PASS	Test result shows that the requirements of the relevant specification have been met.
FAIL	Test result shows that the requirements of the relevant specification have not been met.

## 5. RESULT SUMMARY

No.	Test case	FCC reference	Verdict
1.	Average Conducted Output Power	15.407(a)	Pass
2.	Occupied Bandwidth	15.407(e)	Pass
3.	Transmitter Power Spectral Density	15.407(a)	Pass
4.	Unwanted Conducted Emission Measurement	15.407(b)	Pass
5.	Frequency Stability	15.407(g)	Pass
6.	Unwanted Radiated Emission Measurement	15.205 15.209 15.35(b)	Pass
7.	AC Power line Conducted Emission	15.207	Pass
8.	DFS	15.407(h)	Pass
9.	Automatically Discontinue Transmission	15.407(c)	Pass(See 2.4Note)
10.	Antenna Requirements	15.407(a) &15.203	Pass(See 2.4Note)

This Test Report Is Issued by: Mr. Peng Zhen 	Checked by: Mr. Li Bin 
Tested by: Tong Daocheng 	Issued date:  20190628

## **6 TEST RESULT**

### **6.1 Average Conducted Output Power**

#### **6.1.1 Ambient condition**

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

#### **6.1.2 Test Description**

A transmitter antenna terminal of EUT is connected to the power meter. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle (>98%), at maximum power, and at the appropriate frequencies.

#### **6.1.3 Test limit**

FCC Part15.407 (a)(1) ,

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC Part15.407 (a)(2) ,

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11.0 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11.0 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC Part15.407 (a)(3) ,

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30.0 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 6.1.4 Test Procedure Used

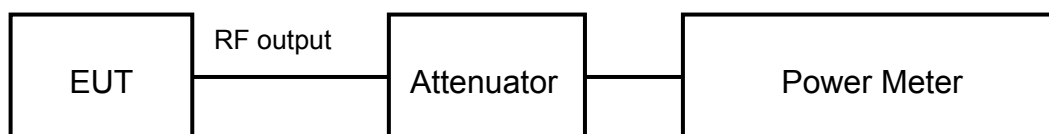
KDB 789033 D02 v02r01, Section E.3.b (Method PM-G).

#### 6.1.5 Test Settings

Measurements perform using a wideband gated RF power meter.

#### 6.1.6 Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



#### 6.1.7 Test result

The test results are shown in Appendix A.

## 6.2 Occupied Bandwidth

### 6.2.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

### 6.2.2 Test Description

A transmitter antenna terminal of EUT is connected to the Spectrum Analyzer. This connected to the transmitter antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies.

### 6.2.3 Test limit

Rule FCC Part §15.407(e)

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### 6.2.4 Test Procedure Used

KDB 789033 D02 v02r01, Section D.

### 6.2.5 Test Settings

For U-NII-1, set  $RBW \approx 1\%$  OCB kHz,  $VBW \geq 3 \times RBW$ , measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.

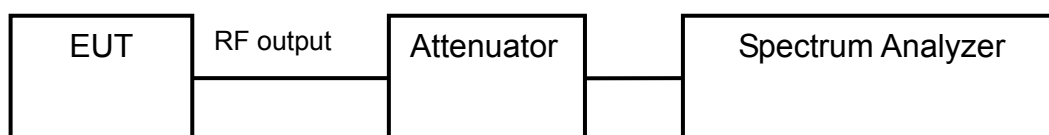
For U-NII-3, Set  $RBW = 100$  kHz,  $VBW \geq 3 \times RBW$ , measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

Use the 99 % power bandwidth function of the instrument.

### 6.2.6 Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



### 6.2.7 Test result

The test results are shown in Appendix A .

## 6.3 Transmitter Power Spectral Density

### 6.3.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

### 6.3.2 Test Description

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle (>98%), at maximum power, and at the appropriate frequencies. All data rates were investigated and the worst case configuration results are reported in this section.

### 6.3.3 Test limit

FCC Part15.407 (a)(1) ,

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power

over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC Part15.407 (a)(2) ,

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11.0 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11.0 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC Part15.407 (a)(3) ,

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30.0 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 6.3.4 Test Procedure Used

KDB 789033 D02 v02r01, Section F.

### 6.3.5 Test Settings

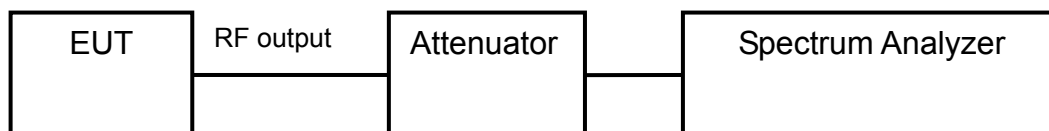
Set RBW = 500 kHz, VBW =1.5MHz for the band 5.725-5.85 GHz

Set RBW = 1 MHz, VBW =3MHz for the band 5.150-5.250 GHz, 5.250-5.350 GHz and 5.470-5.725 GHz.

The conducted PSD is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

### 6.3.6 Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



### 6.3.7 Test result

The test results are shown in Appendix A.



## 6.4 Unwanted Conducted Emission Measurement

### 6.4.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	40%	101.5kPa

### 6.4.2 Test Description

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle (>98%), at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration.

### 6.4.3 Test limit

FCC Part 15.407(b),

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

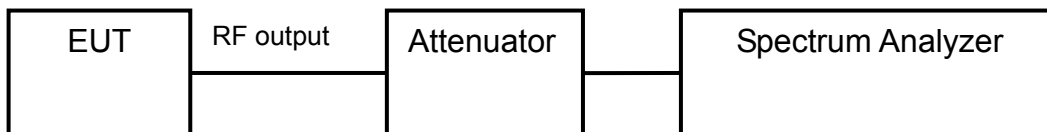
### 6.4.4 Test Procedure Used

KDB 789033 D02 v02r01, Section G.

### 6.4.5 Test Settings

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 1 MHz.
- c) Set the VBW  $\geq$  3 MHz.
- d) Detector = peak.
- e) Set span to encompass the spectrum to be examined
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level.

### 6.4.6 Test Setup



### 6.4.7 Test result

The test results are shown in Appendix A.

## 6.5 Frequency Stability

### 6.5.1 Ambient condition

Temperature	Relative humidity	Pressure
20.8°C	36.5%	100.9kPa

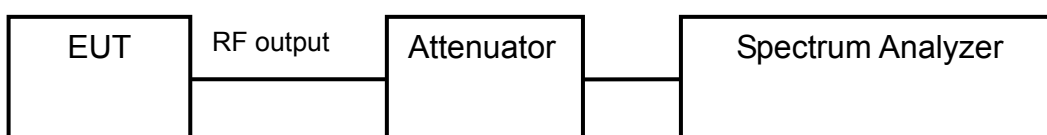
### 6.5.2 Test limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

### 6.5.3 Test Procedure Used

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

### 6.5.4 Test Setup



### 6.5.5 Test result

The test results are shown in Appendix A.

## 6.6 Unwanted Radiated Emission Measurement

### 6.6.1 Ambient condition

Temperature	Relative humidity	Pressure
20.8°C	36.5%	100.9kPa

### 6.6.2 Test Description

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

### 6.6.3 Test limit

FCC Part15.205, 15.209,;

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in below Table per Section 15.209.

Frequency [MHz]	Field strength [ $\mu\text{V/m}$ ]	Measured Distance [meters]
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

**Radiated Limits**

FCC Part15.35(b):

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit

**Used conversion factor: Limit (dB $\mu\text{V/m}$ ) = 20 log (Limit ( $\mu\text{V/m}$ )/1 $\mu\text{V/m}$ )**

Frequency [MHz]	Detector	Unit (dB $\mu\text{V/m}$ )
30~88	Quasi-peak	40.0
88~216	Quasi-peak	43.5
216~960	Quasi-peak	46.0
960~1000	Quasi-peak	54.0
1000~5th harmonic of the highest frequency or 40GHz, whichever is lower	Average	54.0
	Peak	74.0

**Conversion Radiated limits**

#### 6.6.4 Test Procedure Used

KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6.

#### 6.6.5 Test Settings

Average Field Strength Measurements

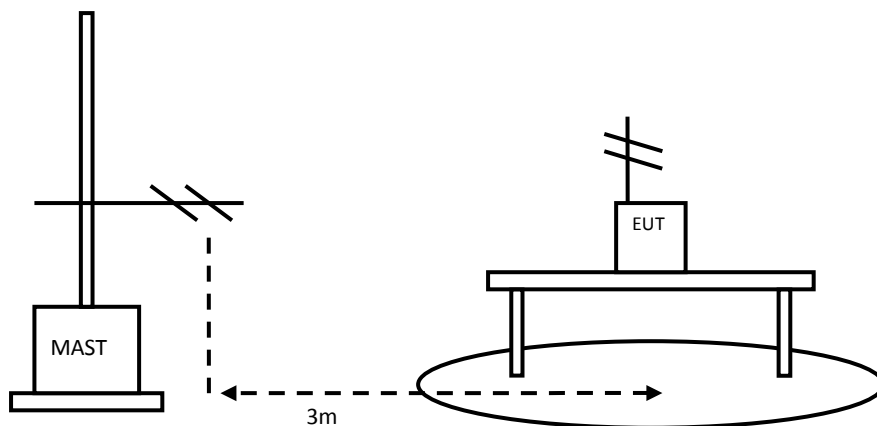
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be  $> 2 \times \text{span}/\text{RBW}$ )
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

#### 6.6.6 Test Setup

The EUT and measurement equipment were set up as shown in the diagram below



The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration. Then start the test software ES-K1. Sweep the whole frequency band through the range from 30MHz to 1GHz or above, using receive log period antenna HL562 or Ridge horn antenna HF906.

During the test, the antenna height and EUT azimuth were varied in order to identify the

maximum level of emission from the EUT. The height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees. The measurements shall be repeated with orthogonal polarization of the test antenna. The results shall be showed the worst case of the three orthogonal axes.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

### 6.6.7 Test result

The test results are shown in Appendix B.

## 6.7 AC Power line Conducted Emission

### 6.7.1 Ambient condition

Temperature	Relative humidity	Pressure
24°C	36%	100.9kPa

### 6.7.2 Test limit

FCC Part 15.207(a),

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

The measurement is made according to ANSI C63.10-2013

### 6.7.3 Test result

The test results are shown in Appendix B.

## 6.8 Dynamic Frequency Selection

### 6.8.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

### 6.8.2 Test limit

FCC Part 15.407(h) and FCC 06-96 APPENDIX “COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION”.

### 6.8.3 DFS Overview

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
<i>Non-Occupancy Period</i>	Yes	Not required	Yes
<i>DFS Detection Threshold</i>	Yes	Not required	Yes
<i>Channel Availability Check Time</i>	Yes	Not required	Not required
<i>U-NII Detection Bandwidth</i>	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

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

Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP $\geq$ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
<p><b>Note 1:</b> This is the level at the input of the receiver assuming a 0 dBi receive antenna.</p> <p><b>Note 2:</b> Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.</p> <p><b>Note3:</b> EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.</p>	

Table 4: DFS Response Requirement Values

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

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup $\left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
<b>Note 1:</b> Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

Table 6 – Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

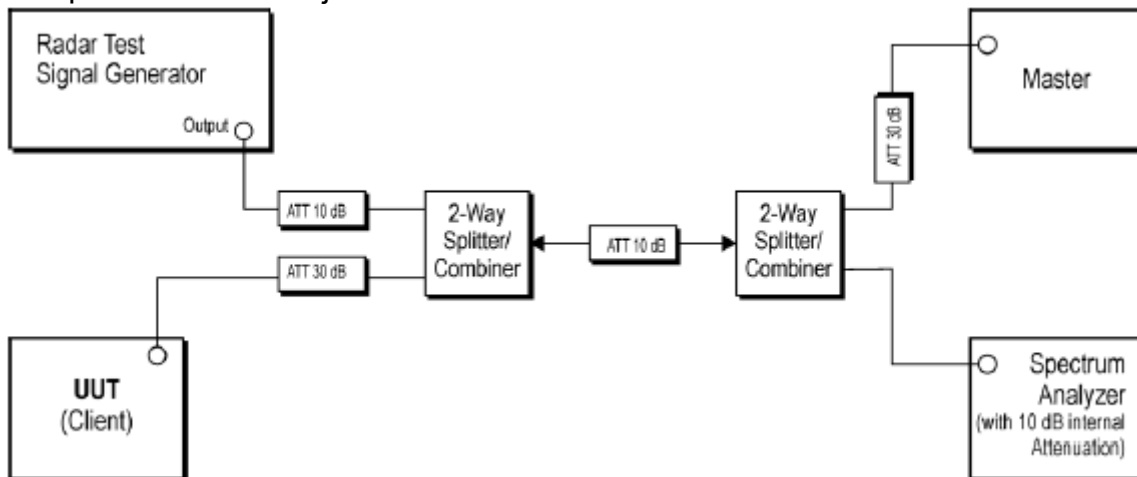
Table 7 – Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

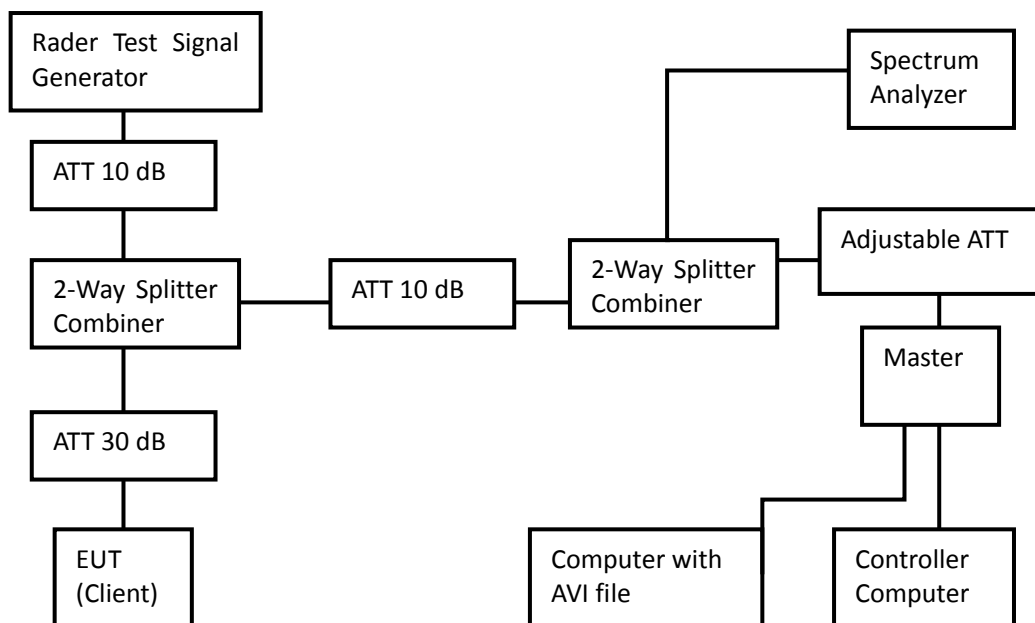


### 6.8.4 TEST AND MEASUREMENT SYSTEM

Setup for Client with injection at the Master



Setup of EUT  
CLIENT MODE:



Test Setup Operation

System testing was performed with the designated MPEG-4 (1080P,WEBRip,DD5.1.x264-btbt) test file that streams full motion video from the Access Point to the Client in full motion video mode using the media player with the V2.61 Codec package.

This file is used by IP and Frame based systems for loading the test channel during the In-service compliance testing of the device.

The waveform parameters from within the bounds of the signal type are selected randomly using uniform distribution.

A spectrum analyzer is used as a monitor to verify that the EUT has vacated the Channel within the (Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and Channel move. It is also used to monitor EUT transmissions during the Channel Availability Check Time.

### 6.8.5 Test Procedure Used

(i) Operational Modes. The DFS requirement applies to the following operational modes:

(A) The requirement for channel availability check time applies in the master operational mode.

(B) The requirement for channel move time applies in both the master and slave operational modes.

(ii) Channel Availability Check Time. A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

(iii) Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

(iv) Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

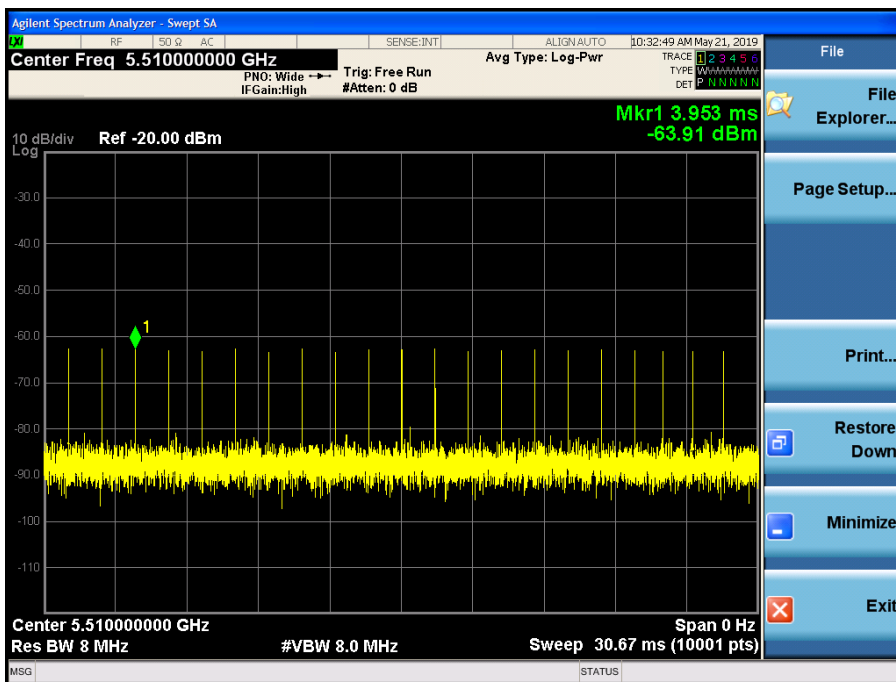
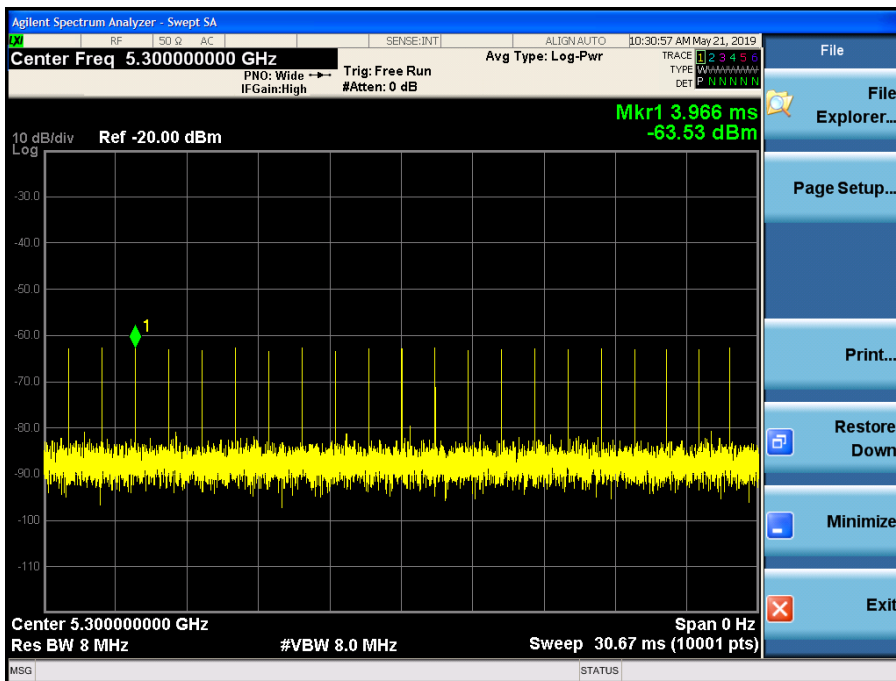
### 6.8.6 DESCRIPTION OF Master Device

The Master Device is a SKSpruce Technologies Co., Ltd., Indoor Access Point, FCC ID: 2AHKT-WIA3300-20. The minimum antenna gain for the Master Device is 3 dBi.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is  $-64 + 1 = -63$  dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

### 6.8.6 RADAR WAVEFORM



### 6.8.7 Test result

The test results are shown in Appendix A.

## **7 MEASUREMENT UNCERTAINTIES**

Items	Uncertainty	
Occupied Bandwidth	3kHz	
Output Power	0.67dB	
Transmitter Power Spectral Density	0.75dB	
Spurious emissions	30MHz~1GHz	2.83dB
	1GHz~12.75GHz	2.50dB
	12.75GHz~40GHz	2.75dB

## **8 TEST EQUIPMENTS**

No	Name/ Model	Manufacturer	S/N	Cal date	Cal Due date
1.	Spectrum Analyzer FSV	ROHDE&SCHWARZ	101065	2018.08.20	2019.08.19
2.	Signal Analyzer N9020A	Agilent	MY48010771	2018.08.20	2019.08.19
3.	Chamber SH-241	ESPEC	92013758	2018.08.20	2019.08.19
4.	DC Power Apply E3645A	Agilent	MY40000741	2019.03.01	2020.02.29
5.	Power Meter E4416A	Agilent	MY52370013	2019.03.01	2020.02.29
6.	Power Sensor E9327A	Agilent	MY52420006	2019.03.01	2020.02.29
7.	12.65m×8.03m×7.50m Fully-Anechoic Chamber	FRANKONIA	----	----	----
8.	23.18m×16.88m×9.60m Semi-Anechoic Chamber	FRANKONIA	---	----	----
9.	Turn table Diameter:1m	HD	----	----	----
10.	Turn table Diameter:5m	HD	----	----	----
11.	Antenna master FAC(MA4.0)	MATURO	----	----	----
12.	Antenna master SAC(MA4.0)	MATURO	----	----	----
13.	9.080m×5.255m×3.525 m Shielding room	FRANKONIA	----	----	----
14.	HF 906 Double-Ridged Waveguide Horn Antenna	R&S	100030	2018.08.20	2019.08.19
15.	HF 906 Double-Ridged Waveguide Horn Antenna	R&S	100029	2018.08.20	2019.08.19
16.	HL562 Ultra log antenna	R&S	100016	2018.08.20	2019.08.19
17.	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2018.08.20	2019.08.19
18.	ESI 40 EMI test receiver	R&S	100015	2018.08.20	2019.08.19
19.	Radio tester	CMU 200	114667	2018.08.20	2019.08.19
20.	ESCS30 EMI test receiver	R&S	100029	2018.08.20	2019.08.19

21.	HL562 Receive antenna	R&S	100167	2018.08.20	2019.08.19
22.	ESH3-Z5 LISN	R&S	100020	2018.08.20	2019.08.19
23.	Spectrum Analyzer N9020A	Agilent	MY48010771	2018.08.20	2019.08.19
24.	Signal Generator SMBV100A	R&S	260910	2018.08.20	2019.08.19
25.	Bluetooth Test Set MT8852B	Anritsu	1142010	2019.03.01	2020.02.28
26.	Cable 104EA	SUCOFLEX	9272/4EA	2019.03.01	2020.02.28
27.	Cable 104EA	SUCOFLEX	9266/4EA	2019.03.01	2020.02.28
28.	WLAN AP WIA3300-20	SKSpruce	81520170607003 39	---	---
29.	Notebook E470c	Lenovo	PF10UZW7	---	---

## **APPENDIX A – TEST DATA OF CONDUCTED EMISSION**

Please refer to the attachment.

## **APPENDIX B – TEST DATA OF RADIATED EMISSION**

Please refer to the attachment.