



# RF TEST REPORT

**Applicant** Huawei Technologies Co., Ltd.  
**FCC ID** QISANE-LX2J  
**Product** Smart Phone  
**Model** ANE-LX2J, HWV32  
**Report No.** R1803H0031-R2  
**Issue Date** March 29, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15E (2018)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Xianqing Li

Approved by: Kai Xu

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## TA Technology (Shanghai) Co., Ltd.

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## Summary of measurement results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	DFS Detection Threshold	15.407/KDB 905462 5.2	NA
2	U-NII Detection Bandwidth	15.407/KDB 905462 7.8.1	NA
3	Channel Availability Check Time	15.407/KDB 905462 7.8.2	NA
4	In-Service Monitoring for Channel Move Time	15.407/KDB 905462 7.8.3	pass
5	In-Service Monitoring for Channel Closing Transmission Time	15.407/KDB 905462 7.8.3	pass
6	In-Service Monitoring for Non-Occupancy Period(NOP)	15.407/KDB 905462 7.8.3	pass
7	Statistical Performance Check	15.407/KDB 905462 7.8.4	NA

Date of Testing: March 16, 2018 ~ March 22, 2018

## 1. Test Laboratory

### 1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

### 1.2. Test facility

#### **CNAS (accreditation number: L2264)**

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

#### **FCC (Designation number: CN1179, Test Firm Registration Number: 446626)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

#### **IC (recognition number is 8510A)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

#### **VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

#### **A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



### 1.3. Testing Location

Company: TA Technology (Shanghai) Co., Ltd.  
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong  
City: Shanghai  
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## 2. General Description of Equipment under Test

### Client Information

<b>Applicant</b>	Huawei Technologies Co., Ltd.
<b>Applicant address</b>	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.
<b>Manufacturer</b>	Huawei Technologies Co., Ltd.
<b>Manufacturer address</b>	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.

### General information

EUT Description	
Model	ANE-LX2J, HWV32
IMEI	/
Hardware Version	HL3ANNEM
Software Version	ANE-LX2J 8.0.0.46(C900)
Power Supply	Battery/AC adapter
Antenna Type	Internal Antenna
Test Mode	U-NII-2A(5250MHz-5350MHz) U-NII-2C(5470MHz-5725MHz without 5600MHz -5650MHz)
Modulation Type	802.11a(HT20) : OFDM 802.11n(HT20/HT40) : OFDM 802.11ac (HT20/HT40/HT80):OFDM
Operating Mode	<input type="checkbox"/> Master <input type="checkbox"/> Client with radar detection <input checked="" type="checkbox"/> Client without radar detection
Operating Frequency Range(s)	U-NII-2A: 5250MHz-5350MHz U-NII-2C: 5470MHz-5725MHz

<b>EUT Accessory</b>	
Adapter 1	Manufacture: HW-059200UHQ Model : Salcomp (Shenzhen) Co., Ltd.
Adapter 2	Manufacture: HW-059200UHQ Model : HUIZHOU BYD ELECTRONIC CO., LTD.
Adapter 3	Manufacture: HW-059200AHQ Model : Salcomp (Shenzhen) Co., Ltd.
Adapter 4	Manufacture: HW-059200AHQ Model : HUIZHOU BYD ELECTRONIC CO., LTD.
Adapter 5	Manufacture: HW-059200JHQ Model : Salcomp (Shenzhen) Co., Ltd.
Adapter 6	Manufacture: HW-059200JHQ Model : HUIZHOU BYD ELECTRONIC CO., LTD.
Adapter 7	Manufacture: HW-090200UH0 Model : Salcomp (Shenzhen) Co., Ltd.
Adapter 8	Manufacture: HW-090200UH0 Model : SHENZHEN HUNTKEY ELECTRIC CO., LTD
Adapter 9	Manufacture: HW-090200AH0 Model : Salcomp (Shenzhen) Co., Ltd.
Adapter 10	Manufacture: HW-090200JH0 Model : Salcomp (Shenzhen) Co., Ltd.
Adapter 11	Manufacture: HW-090200JH0 Model : SHENZHEN HUNTKEY ELECTRIC CO., LTD
Battery 1	Manufacture: SCUD (FUJIAN) Electronics Co., Ltd. Model : HB366481ECW
Battery 2	Manufacture: Sunwoda Electronic CO., LTD. Model : HB366481ECW
Battery 3	Manufacture: Huizhou Desay Battcry Co.,Ltd Model : HB366481ECW
Earphone 1	Manufacture: Jiangxi Lianchuang Hongsheng Electronic Co. ,LTD Model : MEMD1532B528A00
Earphone 2	Manufacture: GoerTek Inc. Model : HA1-3W
Earphone 3	Manufacture: FOXCONN INTERCONNECT TECHNOLOGY LIMITED Model : EPAB542-2WH03-DH
Earphone 4	Manufacture: Boluo County Quancheng Electronic Co.,Ltd Model : 1293-3283-3.5mm-300
USB Cable 1	Manufacture: Ningbo Broad Telecommunication Co., Ltd Model : WA0002
USB Cable 2	Manufacture: LUXSHARE Precision Industry Co., Ltd. Model : L99UC093-CS-H



USB Cable 3	Manufacture: HUIZHOU DEHONG TECHNOLOGY CO.,LTD. Model : 330-50362
USB Cable 4	Manufacture: HUIZHOU DEHONG TECHNOLOGY CO.,LTD. Model : 130-26988
USB Cable 5	Manufacture: LUXSHARE Precision Industry Co., Ltd. Model : L99UC001-CS-H
USB Cable 6	Manufacture: Dongguan Fuqiang Electronics Co.,Ltd Model : 6691-10YZ-0183
USB Cable 7	Manufacture: HONGFUJIN PRECISION INDUSTRIAL (SHENZHEN).LTD. Model : CUDU01B-HC288-EH
Note: The information of the EUT is declared by the manufacturer.	





## Wireless Technology and Frequency Range

Wireless Technology		Bandwidth	Channel	Frequency	
Wi-Fi	U-NII-2A	20 MHz	52	5260MHz	
			56	5280MHz	
			60	5300MHz	
			64	5320MHz	
		40 MHz	54	5270MHz	
			62	5310MHz	
			80 MHz	58	5290MHz
		U-NII-2C	20 MHz	100	5500MHz
				104	5520MHz
	108			5540MHz	
	112			5560MHz	
	116			5580MHz	
	120			5600MHz	
	124			5620MHz	
	128			5640MHz	
	132			5660MHz	
	136			5680MHz	
	140			5700MHz	
	144			5720MHz	
	40 MHz		102	5510MHz	
			110	5550MHz	
			118	5590MHz	
			126	5630MHz	
			134	5670MHz	
			142	5710MHz	
	80 MHz		106	5530MHz	
			122	5610MHz	
138			5690MHz		
Does this device support TPC Function? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
Does this device support TDWR Band? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					



### 3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC CFR47 Part 15E (2018) Unlicensed National Information Infrastructure Devices**

**FCC KDB 905462 D02UNII DFS Compliance Procedures New Rules v02**

**FCC KDB 905462 D03 Client Without DFS New Rules v01r02**

## 4. DFS Technical Requirements and Radar Test Waveforms

### 4.1. 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
Non-Occupancy Period	Yes	Yes	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	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
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	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>
U-NII Detection Bandwidth	All BW modes must be tested	Not required
Statistical Performance Check	All BW modes must be tested	Not required
Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
Channel Move Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
<p><b>Note:</b> Frequencies selected for statistical performance check 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.</p>		

## 4.2. DFS Detection Thresholds

**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 ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm

**Note 1:** This is the level at the input of the receiver assuming a 0 dBi receive antenna.

**Note 2:** Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

**Note 3:** EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

**Table 4 DFS Response Requirement Values**

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.

**Note 1:** Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

**Note 2:** The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

**Note 3:** During the U-NII Detection Bandwidth 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

### 4.3. RADAR TEST WAVEFORMS

**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	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 5a Pulse Repetition Intervals Values for Test A**

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

The aggregate is the average of the percentage of successful detections of Short Pulse Radar Types 1-4. For example, the following table indicates how to compute the aggregate of percentage of successful detections.

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detection
1	35	29	82.9%
2	30	18	60%
3	30	27	90%
4	50	44	88%
Aggregate $(82.9\% + 60\% + 90\% + 88\%)/4 = 80.2\%$			

**Table6 Long Pulse Radar Test Waveform**

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

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type waveforms, then each additional waveform must also be unique and not repeated from the previous waveforms.

**Table7 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

For the Frequency Hopping Radar Type, the same Burst parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined by the following algorithm: The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

### 4.4. Test set-ups

#### Setup for Master with injection at the Master

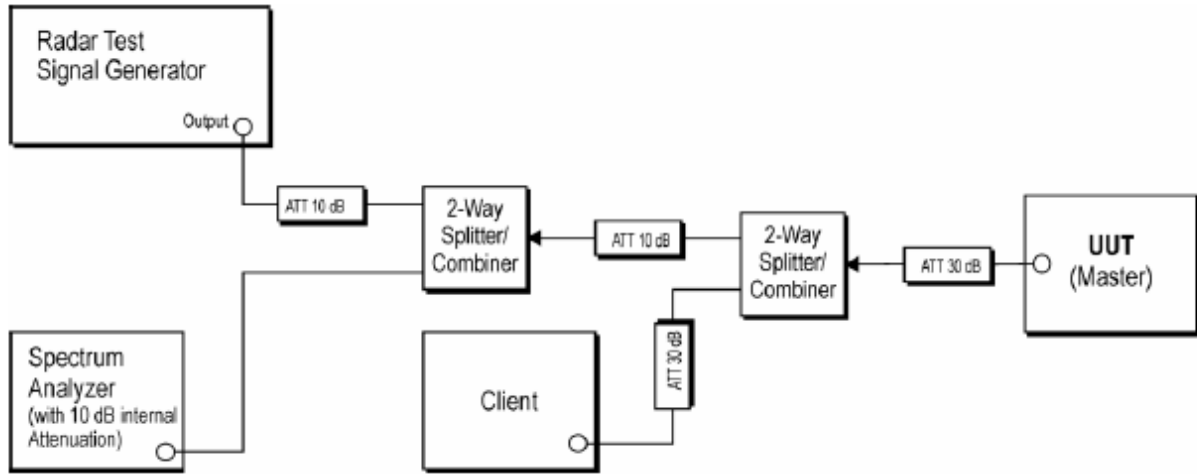


Figure 2: Example Conducted Setup where UUT is a Master and Radar Test Waveforms are injected into the Master

#### Setup for Client with injection at the Master

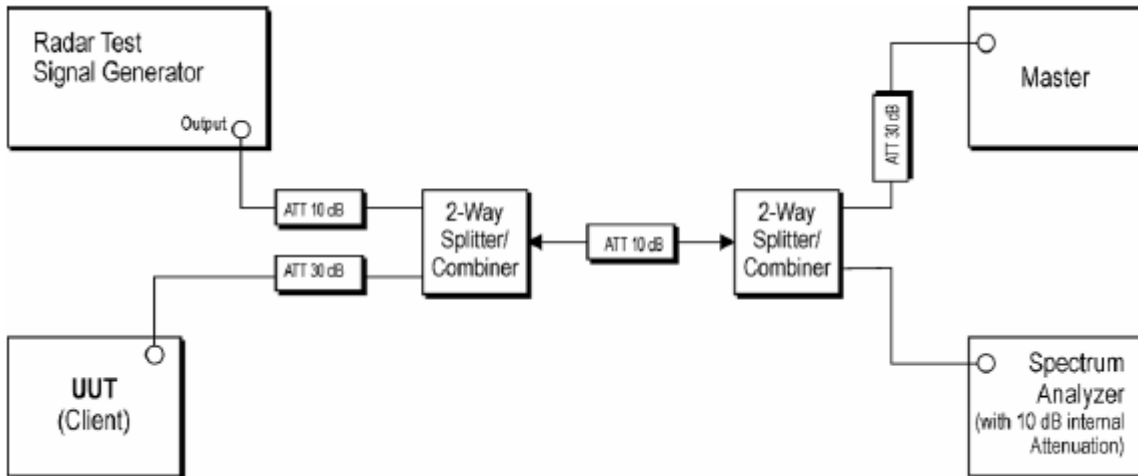


Figure 3: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Master



**Setup for Client with injection at the Client**

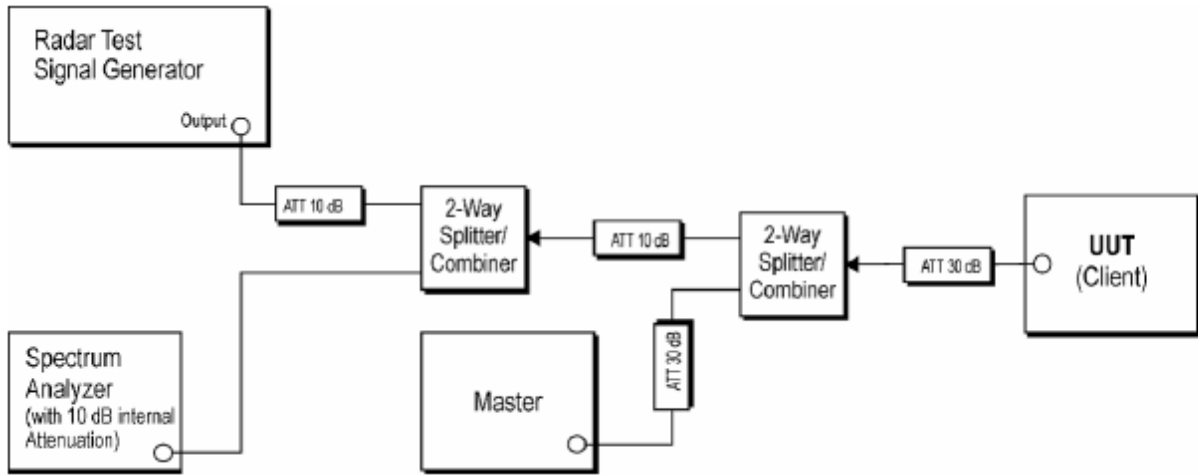


Figure 4: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Client

## 5. Test Case Results

### 5.1. In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period

#### Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### Methods of Measurement

These tests define how the following DFS parameters are verified during In-Service Monitoring;

- Channel Closing Transmission Time
- Channel Move Time
- Non-Occupancy Period

The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold + 1dB is generated on the Operating Channel of the U-NII device (In- Service Monitoring).

1. One frequency will be chosen from the Operating Channels of the EUT within the 5250-5350 MHz or 5470-5725 MHz bands. For 802.11 devices, the test frequency must contain control signals. This can be verified by disabling channel loading and monitoring the spectrum analyzer. If no control signals are detected, another frequency must be selected within the emission bandwidth where control signals are detected.
2. In case the EUT is a U-NII device operating as a Client Device (with or without DFS), a U-NII device operating as a Master Device will be used to allow the EUT (Client device) to Associate with the Master Device. In case the EUT is a Master Device, a U-NII device operating as a Client Device will be used and it is assumed that the Client will Associate with the EUT (Master). In both cases for conducted tests, the Radar Waveform generator will be connected to the Master Device. For radiated tests, the emissions of the Radar Waveform generator will be directed towards the Master Device. If the Master Device has antenna gain, the main beam of the antenna will be directed toward the radar emitter. Vertical polarization is used for testing.
3. Stream the channel loading test file from the Master Device to the Client Device on the test Channel for the entire period of the test.
4. At time  $T_0$  the Radar Waveform generator sends a Burst of pulses for one of the Radar Type 0 in Table 5 at levels defined in Table 3, on the Operating Channel. An additional 1 dB is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
5. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the

observation time (Channel Move Time). Measure and record the Channel Move Time and Channel Closing Transmission Time if radar detection occurs. Figure 17 illustrates Channel Closing Transmission Time.

6. When operating as a Master Device, monitor the EUT for more than 30 minutes following instant  $T_2$  to verify that the EUT does not resume any transmissions on this Channel. Perform this test once and record the measurement result.

7. In case the EUT is a U-NII device operating as a Client Device with In-Service Monitoring, perform steps 1 to 6.

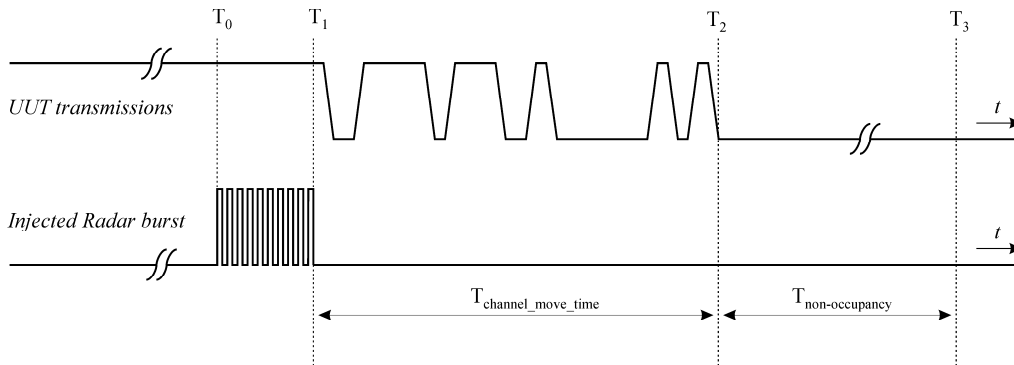


Figure 17: Example of Channel Closing Transmission Time & Channel Closing Time

**Limits**

Channel Move Time	$\leq 10s$
Channel Closing Transmission Time	$\leq 200ms + 60ms$ (over remaining 10s period)
Non-Occupancy Period	$\geq 30min$

**Note 1:** Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

**Note 2:** The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel 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.

**Measurement Uncertainty**

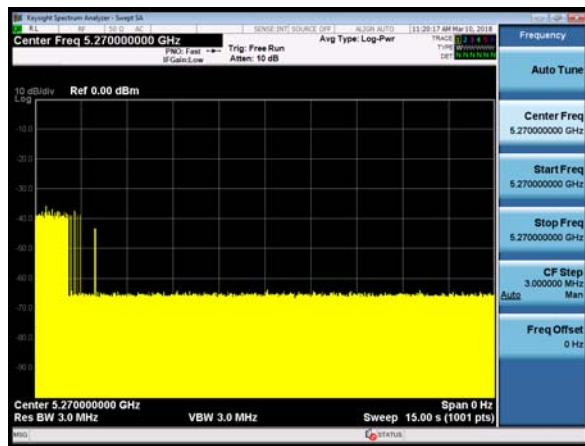
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ ,  $U = 2.69$  dB.



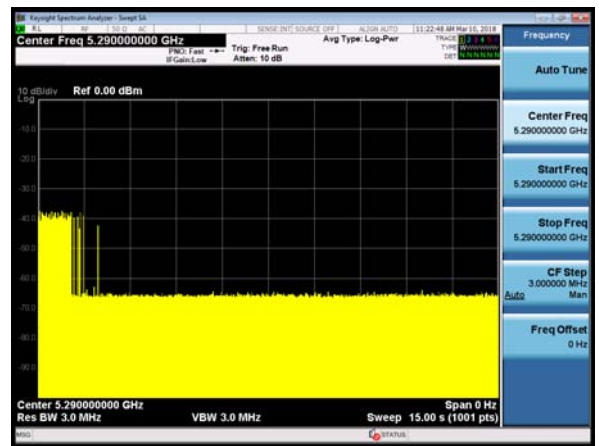
Test Results:

In-Service Monitoring for Channel Move Time

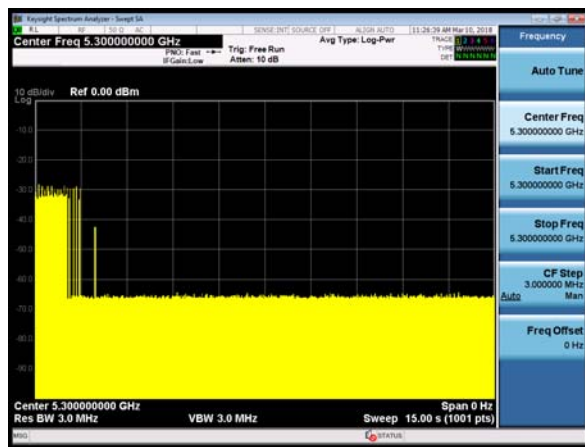
Central Frequency: 5270 MHz



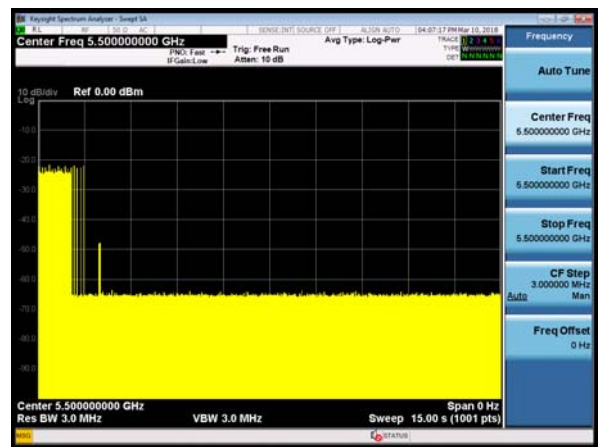
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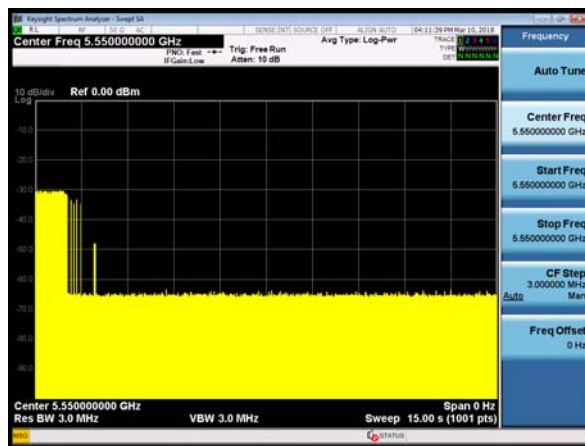
Central Frequency: 5300 MHz



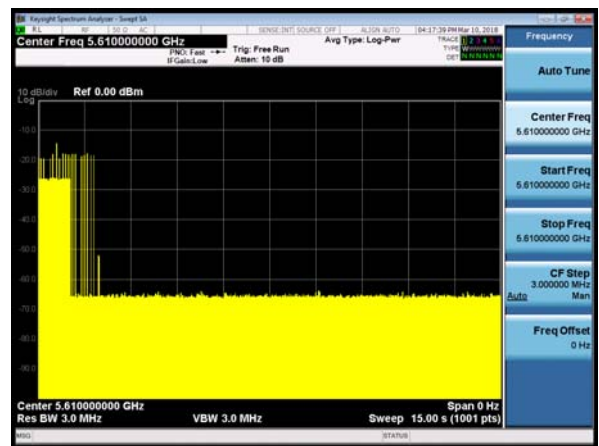
Central Frequency: 5500 MHz



Central Frequency: 5550 MHz

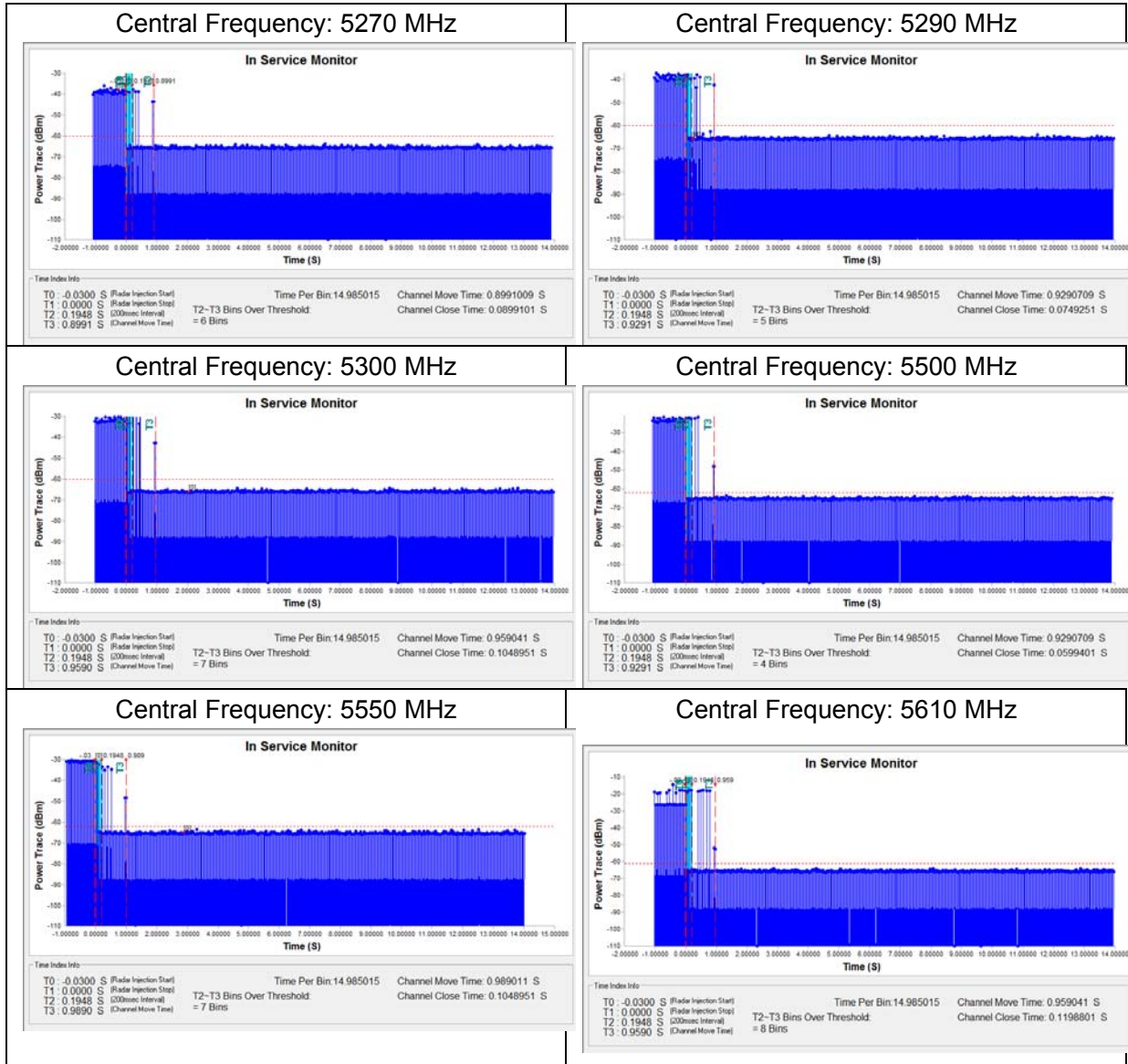


Central Frequency: 5610 MHz



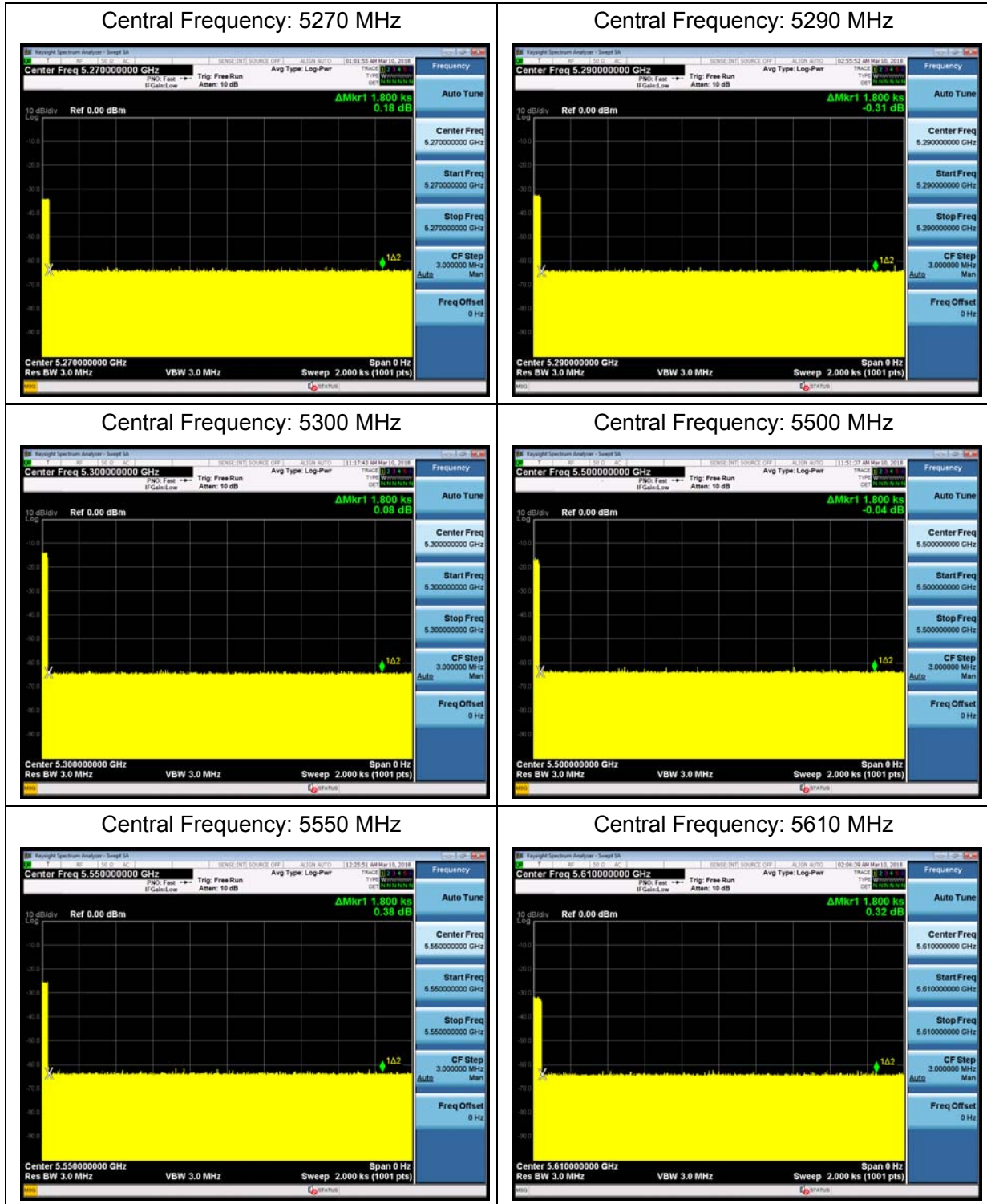


### In-Service Monitoring for Channel Closing Transmission Time





### In-Service Monitoring for Non-Occupancy Period



## 6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Splitter	UCL Microwave	2 way	UCL-PD0512-2S	2015-08-21	2018-08-20
Spectrum Analyzer	Agilent	N9020A	MY52330084	2017-12-17	2018-12-16
Signal Generator	Agilent	N5182B	MY51350303	2017-05-14	2018-05-13
Software	Agilent	N7607B V3.0.0.0	/	/	/
WLAN AP	Cisco	Air-AP1262 N-A-K9	LDK102073 (FCC ID)	/	/
RF Cable	Agilent	SMA 15cm	0001	/	/
RF Cable	Agilent	SMA 15cm	0002	/	/
RF Cable	Agilent	SMA 15cm	0003	/	/
RF Cable	Agilent	SMA 15cm	0004	/	/

\*\*\*\*\*END OF REPORT \*\*\*\*\*