

Page: 1 of 27

## **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E AND INDUSTRY CANADA RSS 247 REQUIREMENT DFS TEST REPORT

OF

**FCC Applicant:** Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co.,

Ltd., Bantian, Longgang District, Shenzhen, 518129, China

**IC Applicant:** Huawei Technologies Co., Ltd.

> Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, China(Peoples

Republic Of)

**Product Name:** Notebook Computer **Brand Name:** HUAWEI, HONOR

FCC Model No.: KPR-W19, KPR-W29, KPR-WXXXXX (X Can be 0-9, A-Z, a-z, blank

or symbol "-")

KPR-W19, KPR-W29 IC Model No.:

**Model Difference:** For the marketing purpose, only different model designations on the

marking plate for different markets. No RF concern.

T190305W03-RP5 **Report Number:** 

FCC ID: QISKPR-WX9 IC: 6369A-KPRWX9 **FCC Rule Part:** §15.407, Cat: NII

IC Rule Part: RSS-247 issue 2 Feb. 2017

**Issue Date:** Mar. 21, 2019

Date of Test: Mar. 07, 2019 ~ Mar. 14, 2019

Date of EUT Received: Mar. 07, 2019

Issued by Compliance Certification Services Inc. Wugu Lab.

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan.

service@ccsrf.com

Note: The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in AN-SI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory).

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Page: 2 of 27

Tested By:

Henry Chiang / Engineer

Approved By:

Kevin Tsai / Deputy Manager





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Page: 3 of 27

# **Revision History**

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
T190305W03-RP5	Rev.00	Initial creation of docu- ment	All	Mar. 21, 2019	Violetta Tang

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Page: 4 of 27

#### **Table of Contents**

1	GENERAL INFORMATION	5
2	SUMMARY OF TEST RESULT	9
3	MEASUREMENT UNCERTAINTY	9
4	TPC and DFS MEASUREMENT	. 10

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Page: 5 of 27

#### **GENERAL INFORMATION**

#### 1.1 Product Description

Product Name:	Notebook	Computer	
Brand Name:	HUAWEI, HONOR		
FCC Model No.:	KPR-W19, KPR-W29, KPR-WXXXXX (X Can be 0-9, A-Z, a-z, blank or symbol "-")		
IC Model No.:	KPR-W19	, KPR-W29	
Model Difference:		For the marketing purpose, only different model designations on the marking plate for different markets. No RF concern.	
Product SW/HW version:	1809 (OS Build 17763.194) / B3A		
Radio SW/HW version:	Wi-Fi Component: 20 / Wi-Fi Component: 8265		
Test SW Version:	N/A		
RF power setting in TEST SW:	N/A		
	7.6Vdc from Rechargeable Li-ion Battery or 5Vdc / 9Vdc 12Vdc / 15Vdc / 20Vdc from AC/DC Adapter.		
Power Supply:	Battery:	Model No.: HB4593R1ECW, Supplier: HUAWEI	
	Adapter:	Model No.: HW-200325YYY (Y=0-9, A-Z or blank) Supplier: HUAWEI	



Page: 6 of 27

#### **FCC WLAN 5GHz:**

Wi-Fi	Frequency Range	Channels	Avg. Power (dBm)	Modulation Technology
	5150~5250	4	13.95	
44 00	5250~5350	4	13.96	OFDM
11a_20	5470~5725	12	13.00	
	5725~5850	5	12.98	
	5150~5250	4	HT: 13.99	
11n_HT /	5250~5350	4	HT: 13.99	OFDM
ac_VHT 20M	5470~5725	12	HT: 13.00	OFDIVI
	5725~5850	5	HT: 13.00	
	5150~5250	2	HT: 13.95	
11n_HT /	5250~5350	2	HT: 13.93	OFDM
ac_VHT 40M 5470~5725 5725~5850		6	HT: 12.94	OFDIVI
		2	HT: 12.95	
	5150~5250	1	11.00	
11ac 5250~5350 VHT80M 5470~5725		1	10.99	OFDM
		3	12.99	OFDM
	5725~5850	1	13.00	
Antenna Designation:		5250~5350M 5470~5725M 5725~5850M Aux Antenna 5150~5250M 5250~5350M 5470~5725M	a: Hz Peak Gain: 1.8dB Hz Peak Gain: 1.8dB Hz Peak Gain: 1.84d Hz Peak Gain: 1.84d	i Bi Bi Bi Bi

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Page: 7 of 27

#### IC WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Avg. or EIRP	Rated Power(dBm)	Modulation Technology	
	5180~5240	4	EIRP	17.62		
	5260~5320	4	Avg.	13.96		
11a	5500~5580	5	Avg.	13.00	OFDM	
	5660~5700	3	Avg.	11.94		
	5745~5825	5	Avg.	12.98		
	5180~5240	4	EIRP	HT: 17.66		
11n HT/	5260~5320	4	Avg.	HT: 13.99		
ac_VHT	5500~5580	5	Avg.	HT: 13.00	OFDM	
20M	5660~5720	4	Avg.	HT: 12.00		
	5745~5825	5	Avg.	HT: 13.00		
	5190~5230	2	EIRP	HT: 17.63		
11n HT/	5270~5310	2	Avg.	HT: 13.93	OFDM	
ac_VHT	5510~5550	2	Avg.	HT: 12.94		
40M	5670~5710	2	Avg.	HT: 12.94		
	5755~5795	2	Avg.	HT: 12.95		
	5210~5210	1	EIRP	14.64		
44	5290~5290	1	Avg.	10.99	OFDM	
11ac VHT80M	5530~5530	1	Avg.	11.00	OFDIVI	
VIIIOOW	5690~5690	1	Avg.	12.19		
	5775~5775	1	Avg.	13.00		
Modulation type		64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only				
Transition Rate:		802.11 a: 802.11 n_ 802.11 n_ 802.11 ac 802.11 ac	6/9/12/18/ _20MHz: 6. _40MHz: 1; c_20MHz: 6; _40MHz: 7	24/36/48/54 Mbps .5 – 144.4Mbps 3.5 - 300.0Mbps 6.5 –144.4Mbps 13.5 -300.0Mbps 29.3 – 650Mbps	6	

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Page: 8 of 27

### 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02

FCC KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02

RSS-247 issue 2 Feb. 2017

All test items have been performed and record as per the above standards.

### 1.3 Test Facility

Compliance Certification Services Inc. Wugu Lab. No.11, Wugong 6th Rd.,

Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.) (TAF code 1309)

FCC Designation number: TW1309

Canada Registration number: 2324G

#### 1.4 Special Accessories

There are no special accessories used while test was conducted.

#### 1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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Page: 9 of 27

### **SUMMARY OF TEST RESULT**

FCC / IC Rules	Description Of Test	Result
§15.407(h) IC RSS-247 issue 1 §6.3	TPC and DFS Measurement	Compliant

#### **MEASUREMENT UNCERTAINTY**

Test Items	Uncertainty	
TPC and DFS Measurement	+/- 123.36 Hz	

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



Page: 10 of 27

### TPC AND DFS MEASUREMENT

#### 4.1 TPC: Standard Applicable

According to §15.407(h)(1), Transmit power control (TPC). U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

#### 4.1.1 Result: N/A, The output power is less than 500mW.

#### 4.2 DFS: Standard Applicable

According to §15.407(h)(2) and FCC KDB 905462 D02, Radar Detection Function of Dynamic Frequency Selection (DFS).

Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. Operators shall only use equipment with a DFS mechanism that is turned on when operating in these bands. The device must sense for radar signals at 100 percent of its emission bandwidth. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is -64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is −62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna. For the initial channel setting, the manufacturers shall be permitted to provide for either random channel selection or manual channel selection.

- (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.

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Page: 11 of 27

(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.

According to RSS 247 §6.3), Note: For the band 5600-5650 MHz, no operation is permitted. Until further notice, devices subject to this annex shall not be capable of transmitting in the band 5600-5650 MHz. This restriction is for the protection of Environment Canada weather radars operating in this band. Devices operating in the bands 5250-5350 MHz, 5470-5600 MHz and 5650-5725 MHz band shall comply with the following:

(a) Devices shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems (see Note below). The minimum DFS radar signal detection threshold is -62 dBm for devices with a maximum e.i.r.p. less than 200 mW, and -64 dBm for devices with a maximum e.i.r.p. of 200 mW to 1 W. The detection threshold power is the received power, averaged over a 1-microsecond reference to a 0 dBi antenna. The DFS process shall provide a uniform spreading of the loading over all the available channels.



Page: 12 of 27

Note: Test procedures for demonstrating compliance with the DFS radar detection requirements set out in this section are being evaluated by Industry Canada. As an interim measure, the Department will, until further notice, accept utilization of the DFS test procedures published by the U.S. Federal Communications Commission (FCC)3 to demonstrate compliance with the requirements of this section.

- Operational requirements: the requirement for channel availability check time applies in (b) the master operational mode. The requirement for channel move time applies in both the master and slave operational modes.
- (i) In-service monitoring: an LE-LAN device should be able to monitor the operating channel to check that a co-channel radar has not moved or started operation within range of the LE-LAN device. During in-service monitoring, the LE-LAN radar detection function continuously searches for radar signals between normal LE-LAN transmissions.
- (ii) Channel availability check time: the device shall check if there is a radar system already operating on the channel before it initiates a transmission on a channel and when it moves to a channel. The device may start using the channel if no radar signal with a power level greater than the interference threshold value specified in A9.3 (a) above is detected within 60 seconds.
- (iii) Channel move time: after a radar's signal is detected, the device shall cease all transmissions on the operating channel within 10 seconds. Transmission during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. Intermittent management and control signals may also be sent during the remaining time to facilitate vacating the operating channel.
- (iv)Channel closing time: the maximum channel closing time is 260 ms. (v) Non-occupancy period: a channel that has been flagged as containing a radar signal, either by a channel availability check or in-service monitoring, is subject to a 30-minute non-occupancy period where the channel cannot be used by the LE-LAN device. The non-occupancy period starts from the time that the radar signal is detected.

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Page: 13 of 27

#### 4.2.1 Limit

Table 1: Applicability of DFS requirements prior to use of a channel

	Operational Mode			
Requirement	Master	Client(without radar detection)	Client(with radar detection)	
Non-occupancy Period	Yes	Not required	Yes	
DFS Detection Thresh- old	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

	Operational Mode		
Requirement	Master Device or Client with Radar Detection	Client Without Radar Detection	
DFS Detection Threshold	Yes	Not required	
Cannel Closing Transmission time	Yes	Yes	
Channel Move time	Yes	Yes	
U-NII Detection Bandwidth	Yes	Not required	

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Page: 14 of 27

Additional requirements for devices with multiple bandwidth mode	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Band- width and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Trans- mission 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

Note: 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: Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value
	(See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and	-62 dBm
power spectral density < 10 dBm/MHz	
EIRP < 200 milliwatt that do not meet the power spectral	-64 dBm
density requirement	

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.

Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911

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Page: 15 of 27

### 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.



Page: 16 of 27

# **Table 5: Radar Test Waveforms Short Pulse Radar**

D - 1	D. 1	DDI	N 1 CD -1	16.1	1 C					
Radar	Pulse	PRI	Number of Pulses	Minimum	Minimum					
Type	Width	(µsec)		Percentage of	Number					
	(µsec)			Successful	of					
				Detection	Trials					
0	1	1428	18	See Note 1	See Note					
					1					
1	1	Test A: 15 unique PRI values	$\left[\left(\frac{1}{360}\right)\right]$ .	60%	30					
			(360)							
		randomly selected from the list of 23	Roundup (19.106)							
		I								
		PRI values in	$\left(\left  \overline{\text{PRI}}_{\mu \text{sec}} \right  \right)$							
		Table 5a								
		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		·	80%	120					
37 / 3 01										

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

#### Long Pulse Radar

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

### **Frequency Hopping Radar**

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

The applicant of this given application confirms that information regarding the parameters of the detected Radar Waveforms is not available to the end user.

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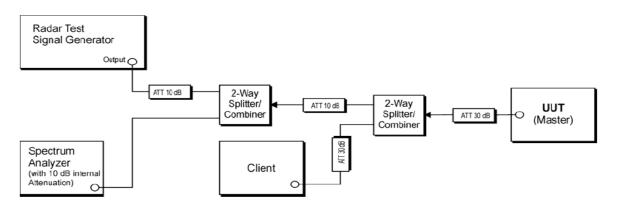


Page: 17 of 27

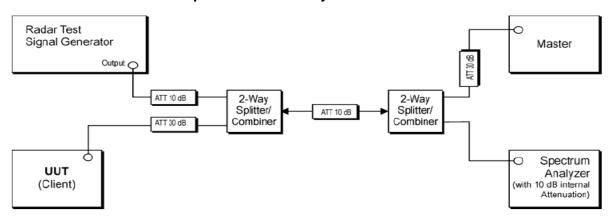


#### 4.2.2 **Test Setup**

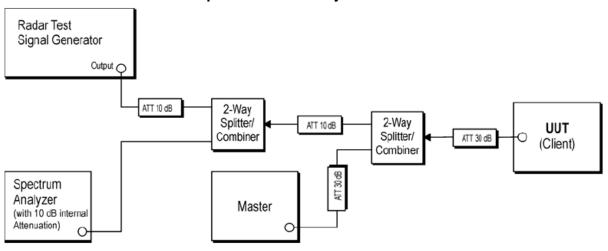
#### Setup for Master with injection at the Master



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



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



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Page: 18 of 27

#### **Test Equipment Used:** 4.2.3

Conducted Emission Test Site									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
PXA Spectrum Ana- lyzer	Agilent	Agilent N9030A		2018/04/09	2019/04/08				
Signal Generator	Agilent	ent N5182B MY56200007		2018/08/13	2019/08/12				
Splitter	RF-LAMBAD	RFLT4W1G18G	SPCD10-004	2019/01/02	2020/01/01				
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-02 0	2019/01/02	2020/01/01				
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-01 7	2019/01/02	2020/01/01				
Attenuator	Agilent	8494B	MY42152151	2019/01/02	2020/01/01				
Attenuator	Agilent	8496B	MY42147434	2019/01/02	2020/01/01				
Splitter	WOKEN	DOM35LW1A2	RF36	2018/12/26	2019/12/25				
Accece Ponit	LINKSYS	WRT3200ACM	1981060B6149 86 FCC ID:Q87-WRT32 00ACM IC:3839A-WRT 3200ACM	N/A	N/A				
Software	e3 V6.11-20180413								

#### 4.2.4 **Description of EUT:**

EUT operates over the 5250-5350MHz and 5470-5725MHz ranges and EUT is a slave device (client equipment) w/o radar detection and DFS capability.

EUT has no TPC mechanism implemented with no adjustment of lowest, and highest power, but the level of power emission stays at fixed level.

WLAN traffic is generated by streaming the mpeg file from the master to slave in full monitor video mode using the media player.

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Page: 19 of 27

The rated output power of the master unit is >23dBm(EIRP).therefore the required interference threshold level is -64dBm.after correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is -64dBm, and the master device as employed for the applicable DFS test is LINKSYS router.

While calibrate the path on antenna port of DFS test equipment (master), measurements equipments (spectrum) is ensured to be 50 Ohms, and therefore verification on antenna gain measurement can be ignored.

Conducted test was performed with appropriate adjustment, and calibration to ensure power from DFS simulator injects to antenna port of DFS test equipment (DFS) is -64dBm

#### Message or files that is used for communication between Master and Client:

IP based system:

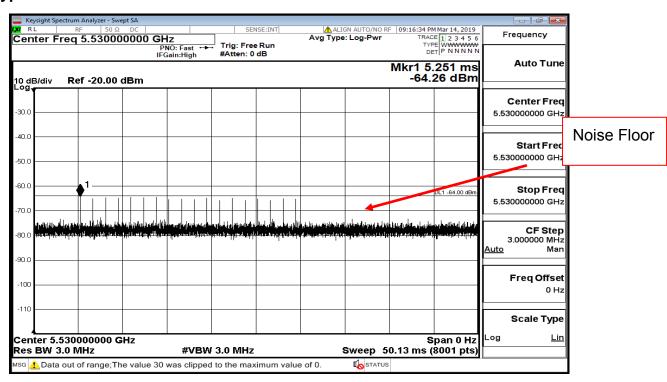
For the required channel loading, the full motion, 30 frames per second MPEG video file from http://ntiacsd.ntia.doc.gov/dfs/ was streamed from a network on a test bench (server of the storage to download the mandatory format of Video file), via the DFS Master device, to the UE (mobile phone).



Page: 20 of 27

#### 4.2.5 **Test results**

### Calibration plots for each of the required radar waveforms Radar type 0



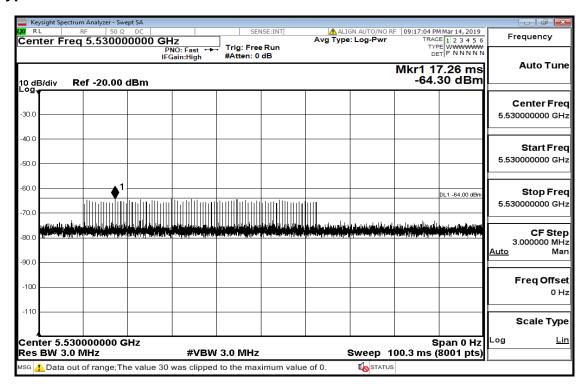
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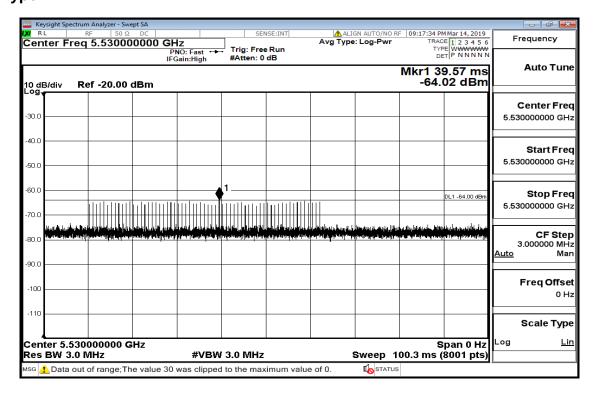


Page: 21 of 27

#### Radar type 1 A



#### Radar type 1 B



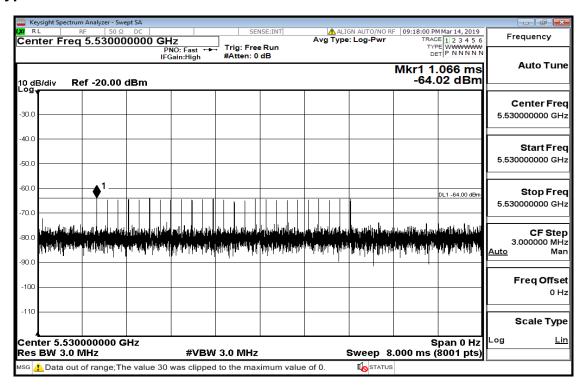
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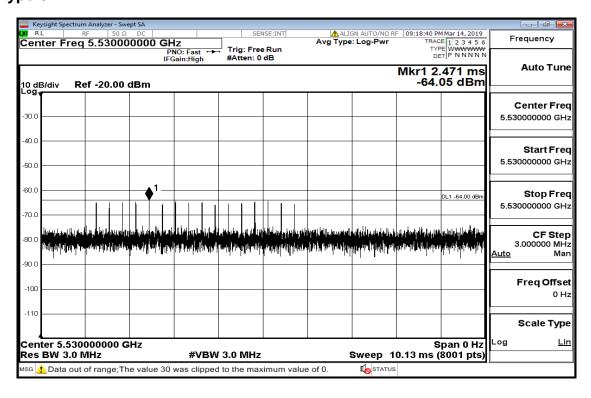


Page: 22 of 27

#### Radar type 2



#### Radar type 3



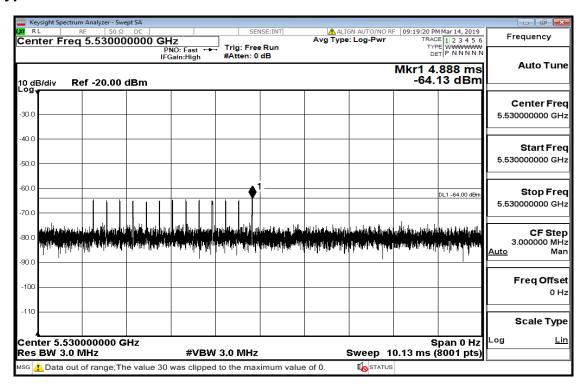
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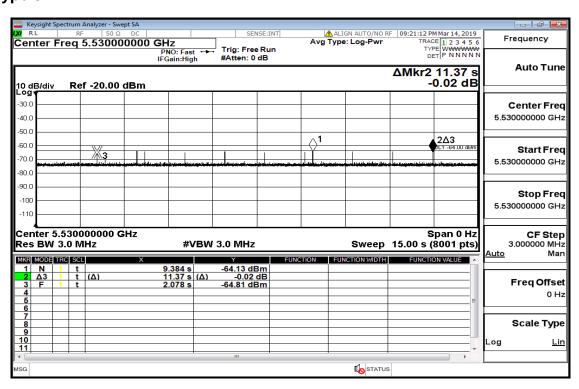


Page: 23 of 27

#### Radar type 4



#### Radar type 5



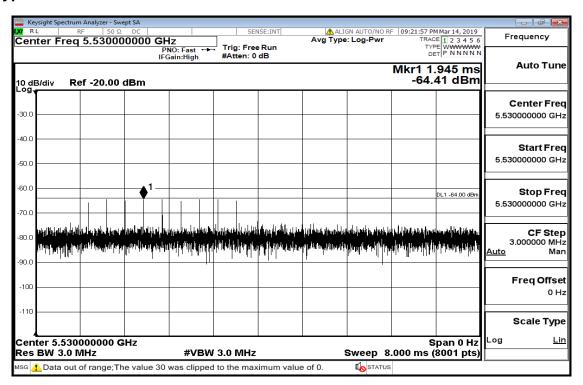
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Page: 24 of 27

#### Radar type 6



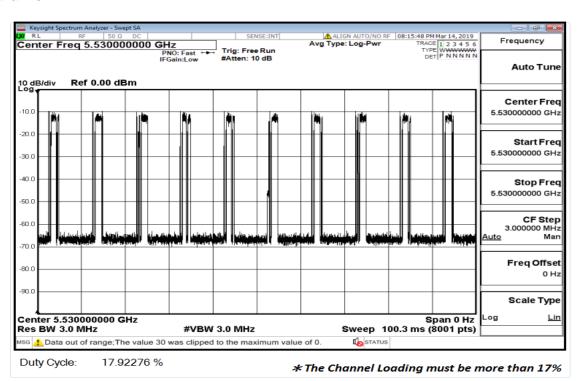
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Page: 25 of 27

#### **WLAN** traffic



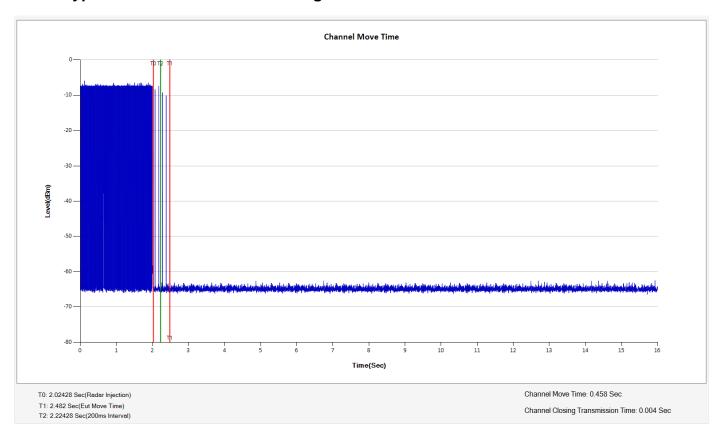
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Page: 26 of 27

#### Radar Type 1 Channel Move and Closing Transmission Time - 1



Verdict: Note: narrowing the sweep time as the good engineering process for the verification of transmission closing in 200ms

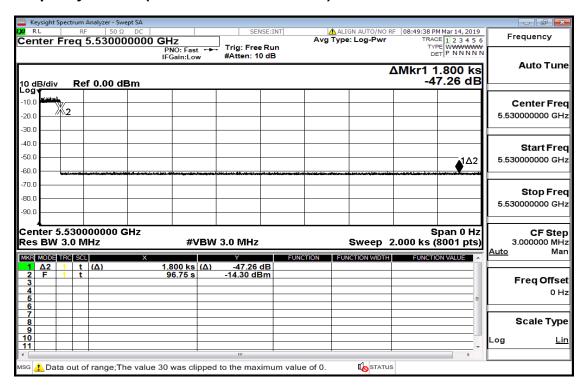
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Page: 27 of 27

#### **Non-occupancy Period (without radar detection)**



**Verdict:** To verify whether channel is unavailable to be operated in 30 minutes.

1.8ks = 1800s = 1800 s/min /60 = 30minute

~ End of Report ~

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