

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT DFS TEST REPORT

	UF
Applicant:	Quanta Computer Inc.
	No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City
	33377, Taiwan
Product Name:	7 inch POS Terminal
Brand Name:	Quanta, CASTLES
Model No.:	KI1, SATURN7000
Model Difference:	Marketing Purpose
FCC ID:	HFS-KI1
Report Number:	E2/2018/70097
FCC Rule Part:	§15.407, Cat: NII
Issue Date:	Oct. 24, 2018
Date of Test:	Aug. 08, 2018 ~ Oct. 19, 2018
Date of EUT Received:	Aug. 08, 2018

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

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

Tested By:

Approved By:

Vito Pei / Sr. Engineer

Jim Chang / Manager



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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/70097	Rev.00	Initial creation of docu- ment	All	Oct. 24, 2018	Elle Chang

No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號 SGS Taiwan Ltd.



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GENERAL INFORMATION 1

1.1 Product Description

General:

Product Name:	7 inch POS Terminal		
Brand Name:	Quanta, CA	ASTLES	
Model No.:	KI1, SATUF	RN7000	
Model Difference:	Marketing F	Purpose	
Hardware Version:	B2		
Software Version:	01.000		
	3.8V from F	Rechargeable Li-ion Battery or 5V from AC/DC Adapter	
Power Supply:	Battery:	Model no.: KI1 Supplier: Ningbo Veken Battery Co., Ltd.	
	Adapter:	Model No.: CYSF12G-050200U, Supplier: JIANGSU CHENYANG ELECTRON Co., LTD	



WLAN 5GHz:

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (Avg.) (dBm)	Modulation Technology
	5150~5250	4	15.37	
а	5250~5350	4	16.49	OFDM
a	5470~5725	12	13.42	
	5725-5850	5	16.48	
	5150~5250	4	HT: 15.46 (Worst Case)	
n_HT	5250~5350	4	HT: 16.49 (Worst Case)	OFDM
ac_VHT 20M	5470~5725	11	HT: 13.39 (Worst Case)	OFDIM
	5725-5850	5	HT: 16.48 (Worst Case)	
	5150~5250	2	HT: 15.49 (Worst Case)	
n_HT	5250~5350	2	HT: 16.48 (Worst Case)	OFDM
ac_VHT 40M	5470~5725	5	HT: 13.32 (Worst Case)	
	5725-5850	2	HT: 16.49 (Worst Case)	
	5150~5250	1	11.32	
ac_VHT	5250~5350	1	11.66	OFDM
80M	5470~5725	2	13.45	OFDIM
	5725-5850	1	16.46	
Modulation type		64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only		
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps		
			MHz: 6.5 – 144.4Mbps	
		802.11 n_40MHz: 13.5 - 300Mbps		
		802.11 ac_20MHz: 6.5 –144.4Mbps 802.11 ac_40MHz: 13.5 –300Mbps		
			0MHz: 29.3 – 650Mbps	

Antenna Designation:

Antenna Type	Part Number	Supplier	Frequency (MHz)	Peak Antenna Gain(dBi)
	L64RF019-CS-H		5150~5250	3.2 dBi
PIFA		Luvebare ICT	5250~5350	3.0 dBi
PIFA	L04KF019-C3-N	Luxshare-ici	5470~5725	4.0 dBi
			5725~5850	3.1 dBi



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

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513) FCC Registration Number and Designation are: 735305 / TW0002.

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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SUMMARY OF TEST RESULT 2

FCC Rules	Description Of Test	Result
§15.407(h)	TPC and DFS Measurement	Compliant

MEASUREMENT UNCERTAINTY 3

Test Items	Uncertainty
TPC and DFS Measurement	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

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

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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.

(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

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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.

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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 Yes Yes		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 Transmis- sion time	Yes	Yes	
Channel Move time	Yes	Yes	
U-NII Detection Bandwidth	Yes	Not required	

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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)		
$EIRP \ge 200 \text{ milliwatt}$	-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			
Note3: EIRP is based on the highest antenna gain. For MIMO device	es refer to KDB Publication 662911		

D01

Devices	DFS Threshold					
Devices with an e.i.r.p. < 200 mW AND a	-62 dBm					
Power Spectral Density < 10 dBm/MHz						
Devices with	-64 dBm					
$200 \text{ mW} \le \text{e.i.r.p.} \le 1 \text{ W}$						
Note: The detection threshold power is the received power, averaged over a 1-microsecond						
reference to a 0 dBi antenna.						

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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

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.

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Table 5: Radar Test Waveforms Short Pulse Radar

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	$\left(\begin{array}{c} 1 \end{array} \right)$	60%	30
		PRI values	360		
		randomly selected	Roundun		
		from the list of 23	[19·10°]		
		PRI values in	$\left(\overline{\mathbf{PRI}_{\mu \text{sec}}} \right)$		
		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	1-4)		80%	120
			sed for the detection ba	ndwidth test, ch	annel move
time, and cl	nannel closing	time tests.			

Long Pulse Radar

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

Frequency Hopping Radar

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

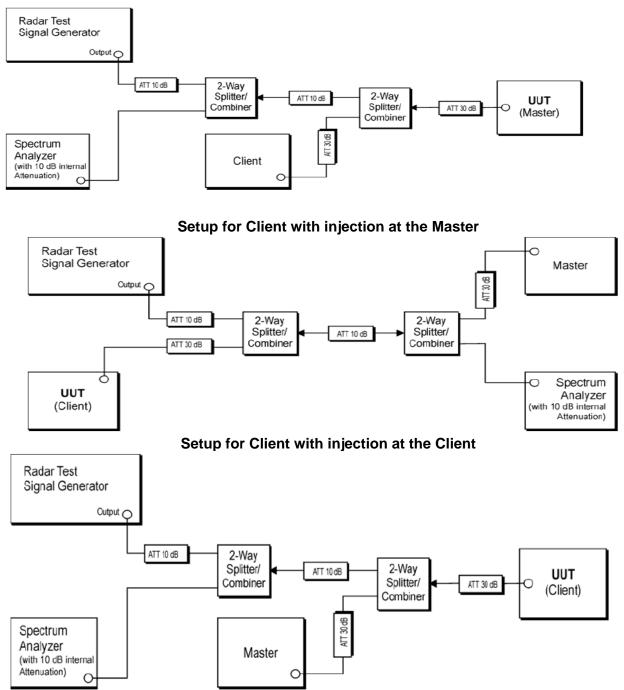
The applicant of this given application confirms that information regarding the parameters of the detected Radar Waveforms is not available to the end user.

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4.2.2. Test Setup



Setup for Master with injection at the Master

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4.2.3. Test Equipment Used:

Conducted Emission Test Site										
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.					
TYPE		NUMBER	NUMBER	CAL.						
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19					
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25					
Notebook	Lenovo	L420	S0011721	N/A	N/A					
DC Power Supply	Agilent	E3640A	MY53140006	2018/05/30	2019/05/29					
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25					
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02					
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02					
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02					

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.

The EUT utilizes the 802.11a/n 40M architecture, with a nominal channel bandwidth of 40MHz WLAN traffic is generated by streaming the mpeg file from the master to slave in full monitor video mode using the media player.

The rated output power of the master unit is >23dBm(EIRP).therefore the required interference threshold level is -62dBm.after correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is -62dBm, and the master device as employed for the applicable DFS test is CISCO router whose FCC ID= 2APLAGC317271

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 -62dBm

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).

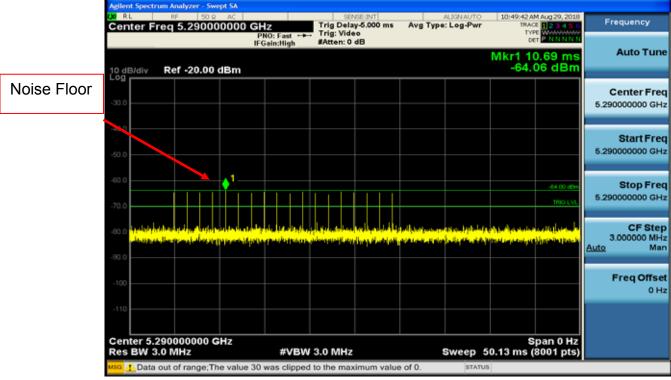
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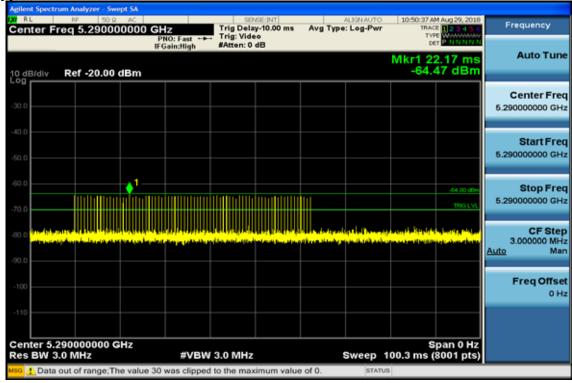


4.2.5. Test results

5290 Calibration plots for each of the required radar waveforms Radar type 0



Radar type 1-A



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Radar type 1-B



Radar type 2



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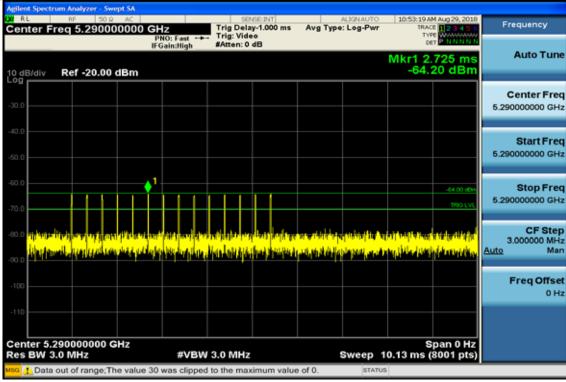
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Radar type 3

a RL RF 50 Q AC SERVE:INT ALLONAUTO 10:52:40 AM Aug 29, 2010 Center Freq 5.290000000 GHz Trig Delay-1.000 ms Avg Type: Log-Pwr TRACE 123 4 15 c PNO: Fast →→ Trig: Video Type IFGain/Iligh #Atten: 0 dB Detromotion
PNO: Fast +++ frig. fract
10 dB/div Ref -20.00 dBm -64.07 dBm Auto T
00g 30.0 Center F 5.290000000
0.0 Start F 0.0 5.290000000
0.0
Freq Of
Center 5.290000000 GHz Span 0 Hz
Res BW 3.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)

Radar type 4



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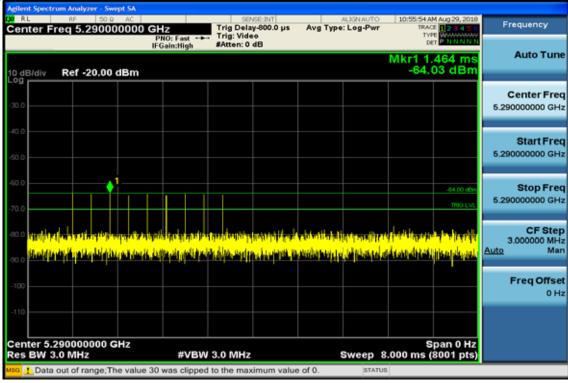
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Radar type 5



Radar type 6



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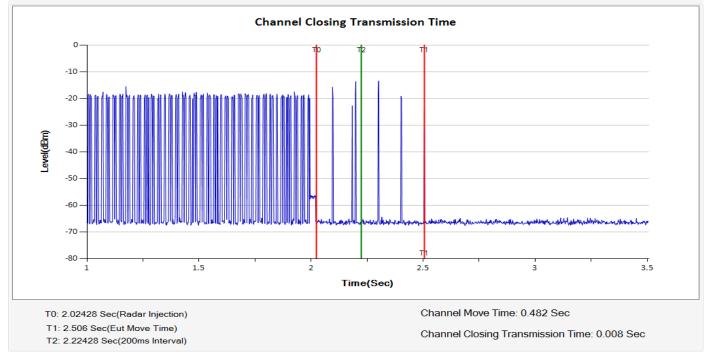
WLAN Payload



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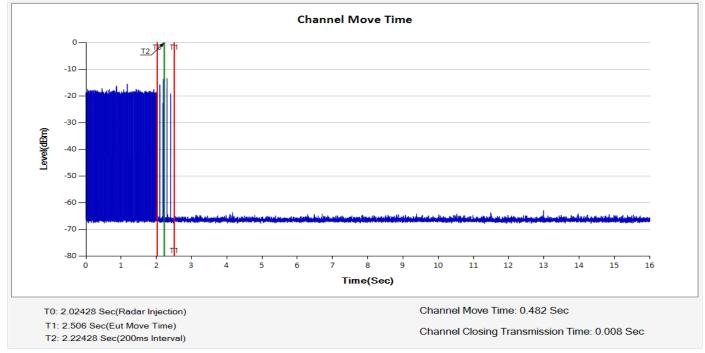
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Radar Type 1 Channel Move and Closing Transmission Time - 1





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

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Non-occupancy Period (without radar detection)

Agilent Spectrum Analyzer - Swept SA				
Center Freg 5.290000000	GHz	ALIGNAUTO 1 Avg Type: Log-Pwr	2:12:05 PM Aug 29, 2018 TRACE 12:04 5 6	Frequency
	PN0: Fast Trig: Free Run IFGain:Low #Atten: 10 dB		ber P NNNNN	Auto Tune
10 dB/div Ref 0.00 dBm			-45.27 dB	
-20.0 X2				Center Freq 5.290000000 GHz
-30.0 -40.0 -50.0			1∆2	Start Freq 5.290000000 GHz
-70.0				Stop Freq 5.290000000 GHz
Center 5.290000000 GHz Res BW 3.0 MHz	#VBW 3.0 MHz		Span 0 Hz 00 ks (8001 pts)	CF Step 3.000000 MHz Auto Man
MKR MODE TRC SCL X	1.800 ks (Δ) -45.27 dB	TION FUNCTION WIDTH	FUNCTION VALUE	
2 F 1 t 3 4 6 6 6 6	96.25 s -19.94 dBm			Freq Offset 0 Hz
7 8 9 10				
sc s	πi	STATUS	*	

Verdict:

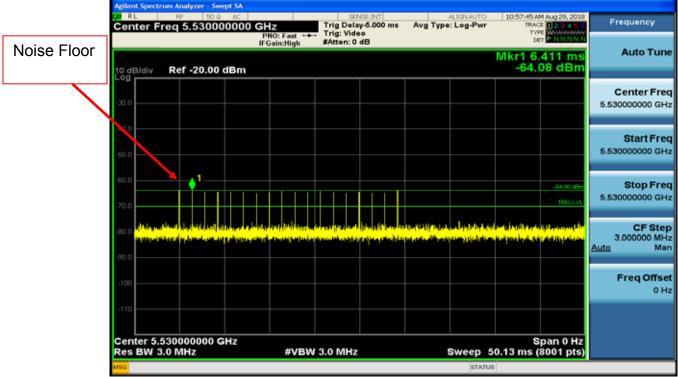
To verify whether channel is unavailable to be operated in 30 minutes. 1.8ks = 1800s = 1800 s/min /60 = 30minute

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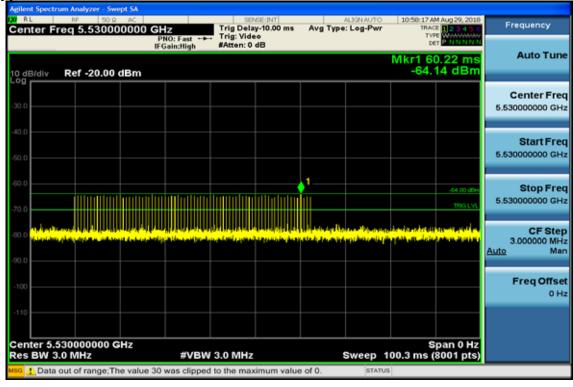
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5530 Calibration plots for each of the required radar waveforms Radar type 0



Radar type 1-A

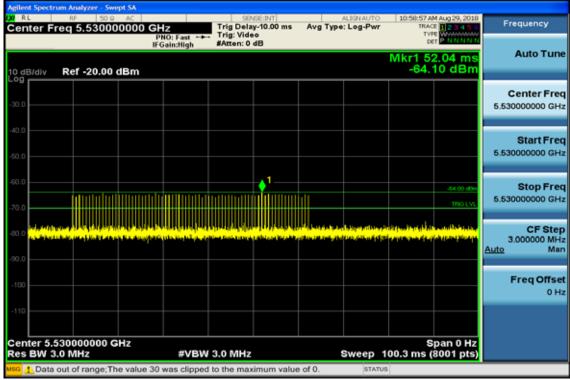


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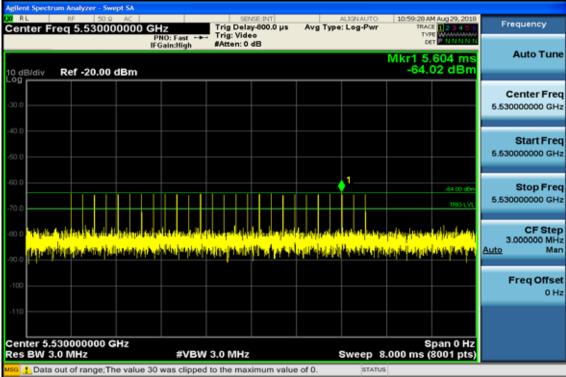
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Radar type 1-B



Radar type 2



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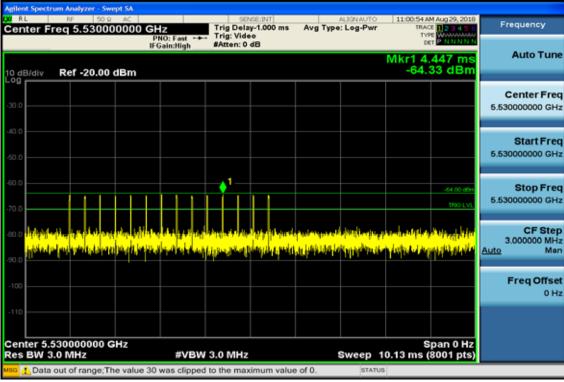
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Radar type 3

RL R S Center Freq 5.530	000000 G	Hz PNO: Fast ↔	Trig Dela Trig: Vide			Log-Pwr	TRAC	M Aug 29, 2010 E 2 3 4 5 6 R	Frequency
0 dB/div Ref -20.0	IF	Gain:High	#Atten: 0	dB			Mkr1 1.	686 ms 08 dBm	Auto Tune
30.0									Center Freq 5.530000000 GHz
40.0 50.0									Start Freq 5.530000000 GHz
50.0 70.0	1							-84.00 dBm TRIO LVL	Stop Freq 5.530000000 GHz
00.0 <mark>verske statel</mark> ationer 1997 - Statelander statelander 1997 - Statelander statelander statelander statelander statelander statelander st	nin dilanta dur Maryana pada	u u laika ar Vijugelaet ar	ure te de des alpais e dige		ala ana ana ana ana ana ana ana ana ana	da blar na Vir die sek	laatoobaliya wheeler	and to di mijuri an	CF Step 3.000000 MHz <u>Auto</u> Man
-100									Freq Offset 0 Hz
Center 5.530000000	GHz		(3.0 MHz				S 0.13 ms (pan 0 Hz	

Radar type 4



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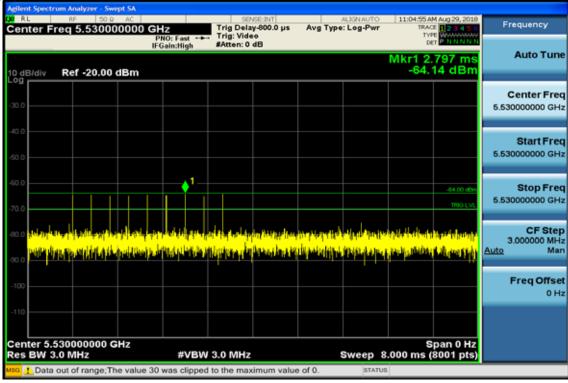
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Radar type 5

gilent Spectrum Analyzer - Swept SA							
RL № 50 Ω AC Center Freq 5.530000000	GHz PNO: Fast	SINSEINT Trig Delay-150, Trig: Video		ALIGNAUTO E: Log-Pwr	11:03:20 AM TRACE TYPE	Aug 29, 2010	Frequency
0 dB/div Ref -20.00 dBm	IFGain:High	#Atten: 0 dB			ΔMkr2 1 0	1.28 s 19 dB	Auto Tune
1.0							Center Free 5.530000000 GH:
X3			^1	24	3 41	ISK 00 ADM TROD LVL	Start Free 5.530000000 GH
0 0 0							Stop Free 5.53000000 GH;
nter 5.530000000 GHz s BW 3.0 MHz	#VBW	3.0 MHz		Sweep	Sp 15.00 s (8		CF Step 3.000000 MH
R MODE TRC SCL X	9.293 s	√ -64.16 dBm	FUNCTION FUN	NCTION WIDTH	FUNCTION	VALUE ^	Auto Man
2 Δ3 1 t (Δ) 3 F 1 t 4	11.28 s (Δ) 144.4 ms	0.19 dB -65.06 dBm					Freq Offset 0 Ha
6 7 8 9							
10		el constante		STATUS		×	

Radar type 6



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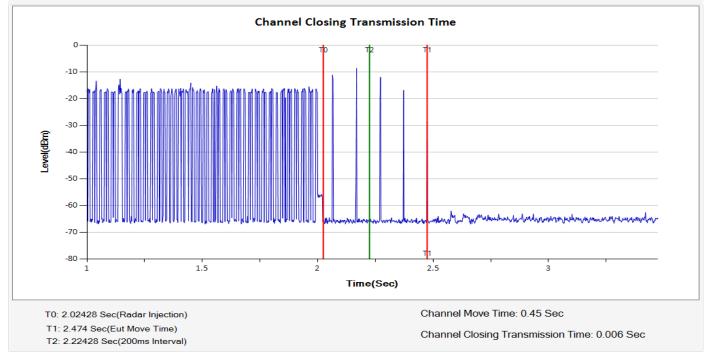
WLAN Payload



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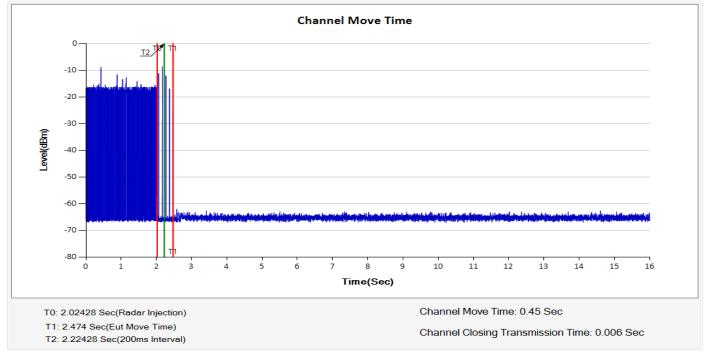
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Radar Type 1 Channel Move and Closing Transmission Time - 1





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

~ End of Report ~

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