TEST REPORT

Application No.:	SZCR2408003329TL
Applicant:	GL Technologies (Hong Kong) Limited
Address of Applicant:	Unit 601, Building 5W Hong Kong Science Park, Shatin, N.T., Hong Kong
Manufacturer:	GL Technologies (Hong Kong) Limited
Address of Manufacturer:	Unit 601, Building 5W Hong Kong Science Park, Shatin, N.T., Hong Kong
Factory:	Shenzhen Guanglian Zhitong Technology Co., LTD
Address of Factory:	Room 305-306, Skyworth Digital Building, Shiyan Street, Baoan District, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	4G LTE Wi-Fi 6 Router
Model No.:	GL-XE2000
Trade Mark:	GL.iNET
FCC ID:	2AFIW-XE2000
Standard(s) :	47 CFR Part 15, Subpart E KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 KDB 905462 D04 Operational Modes for DFS Testing New Rules v01
Date of Receipt:	2024-08-27
Date of Test:	2024-09-24 to 2024-10-12
Date of Issue:	2024-10-30
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2024-10-30		Original

Authorized for issue by:				
		Benson Wang		
		Benson Wang/Project Engineer		
		Eric Fu		
		Eric Fu/Reviewer		

2 Test Summary

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Non-occupancy period	47 CFR Part 15, Subpart E	KDB 905462 D02 Section 7.8.3	KDB 905462 D02 Section 5.1	Pass
Channel Availability Check Time		KDB 905462 D02 Section 7.8.2	KDB 905462 D02 Section 5.1	Pass
Channel Move Time		KDB 905462 D02 Section 7.8.3	KDB 905462 D02 Section 5.1	Pass
Channel Closing Transmission Time		KDB 905462 D02 Section 7.8.3	KDB 905462 D02 Section 5.1	Pass
U-NII Detection Bandwidth		KDB 905462 D02 Section 7.8.1	KDB 905462 D02 Section 5.1	Pass
Statistical Performance Check		KDB 905462 D02 Section 7.8.4	KDB 905462 D02 Section 5.1	Pass

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	Rechargeable battery: xxV xxxxmAh (Charged by adapter) Adapter model: GQ24-120250-AX Input: 100-240V, 50/60Hz 1.0A Max output: DC 12V,2.5A
Cable(s):	cable of adapter: 185cm unshielded cable of Network: 82cm unshielded
Operation Frequency (20MHz):	U-NII-1: 5180-5240MHz; U-NII-2A: 5260-5320MHz; U-NII-2C: 5500-5700MHz; U-NII-3: 5745-5825MHz
Operation Frequency (40MHz):	U-NII-1: 5190-5230MHz; U-NII-2A: 5270-5310MHz; U-NII-2C: 5510-5670MHz; U-NII-3: 5755-5795MHz
Operation Frequency (80MHz):	U-NII-1: 5210MHz; U-NII-2A: 5290MHz; U-NII-2C: 5530-5610MHz; U-NII-3: 5775MHz
Operation Frequency (160MHz):	5250MHz/5570MHz
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK); 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM); 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA(16QAM, 64QAM, 256QAM, 1024QAM, QPSK, BPSK)
DFS Function:	Master
TPC Function:	Support
Cable Loss (for RF conducted test):	0.8dB
Antenna Type:	Dipole Antenna;
Antenna Gain:	Antenna 1&2: 2.86dBI; direction gain: 5.87dBi

Remark:The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	T430u	REF. No.SEA1800
iPhone	Apple	MG472ZP/A	C34NHTMFG5MN

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Channel Availability Check Time	± 5.4 x 10-8
Detection threshold	± 5.4 x 10-8
Non-occupancy period	± 5.4 x 10-8
Channel Move Time	± 5.4 x 10-8
Detection bandwidth	± 5.4 x 10-8
Channel Closing Transmission Time	± 5.4 x 10-8

Remark:
The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

DFS					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Manual Step Attenuator	KEYSIGHT	8494B	SEM021-05	2024-03-27	2025-03-26
Manual Step Attenuator	KEYSIGHT	8496B	SEM021-06	2024-03-27	2025-03-26
Measurement Software	KEYSIGHT	Signal Studio for DFS Radar Profiles V2.2.0.0	N/A	N/A	N/A
Measurement Software	Agilent	ISMonitor10	N/A	N/A	N/A
MXG Vector Signal Generator	Agilent	N5182A	SEM006-21	2024-03-27	2025-03-26
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-22	2024-03-14	2025-03-13

General used equipment					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	deli	8838	SEM002-32	2024-07-24	2025-07-23
Humidity/ Temperature Indicator	deli	8838	SEM002-33	2024-07-24	2025-07-23
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2024-03-18	2025-03-17

6 Requirements and Parameters for DFS test

6.1 Applicability of DFS requirements

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	Not required	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

Additional requirements for devices with multiple bandwidth modes	☒Master Device or Client with Radar Detection	☐Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission 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.		

6.2 DFS Detection Thresholds

Table 3 below provides the DFS Detection Thresholds for Master Devices as well as Client Devices incorporating In-Service Monitoring.

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.	

6.3 DFS Response Requirements

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 facilitating 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.	

6.4 RADAR TEST WAVEFORMS

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

6.4.1 Short Pulse 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**	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
		Test B			
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

Note 1:	Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.
Test A:	15 unique PRI values randomly selected from the list of 23 PRI values in 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

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

The aggregate is the average of the percentage of successful detections of Short Pulse Radar Types 1-4.

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

6.4.2 Long Pulse Radar Test Waveforms

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

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.

Each waveform is defined as follows:

1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
2) There are a total of 8 to 20 *Bursts* in the 12 second period, with the number of *Bursts* being randomly chosen. This number is *Burst Count*.
3) Each *Burst* consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each *Burst* within the 12 second sequence may have a different number of pulses.
4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a *Burst* will have the same pulse width. Pulses in different *Bursts* may have different pulse widths.
5) Each pulse has a linear frequency modulated chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a *transmission period* will have the same chirp width. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.
6) If more than one pulse is present in a *Burst*, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a *Burst*, the random time interval between the first and second pulses is chosen independently of the random time interval between the second and third pulses.
7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to *Burst Count*. Each interval is of length (12,000,000 / *Burst Count*) microseconds. Each interval contains one *Burst*. The start time for the *Burst*, relative to the beginning of the interval, is between 1 and [(12,000,000 / *Burst Count*) – (Total *Burst* Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each *Burst* is chosen randomly.

A representative example of a Long Pulse Radar Type waveform:

1) The total test waveform length is 12 seconds.
2) Eight (8) *Bursts* are randomly generated for the *Burst Count*.
3) *Burst* 1 has 2 randomly generated pulses.
4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.
5) The PRI is randomly selected to be at 1213 microseconds.
6) *Bursts* 2 through 8 are generated using steps 3 – 5.
7) Each *Burst* is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, *Burst* 1 is randomly generated (1 to 1,500,000 minus the total *Burst* 1 length + 1 random PRI interval) at the 325,001 microsecond step. *Bursts* 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. *Burst* 2 falls

in the 1,500,001 – 3,000,000 microsecond range).

6.4.3 Frequency Hopping Radar Test Waveforms

Table 7 – Frequency Hopping 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
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:

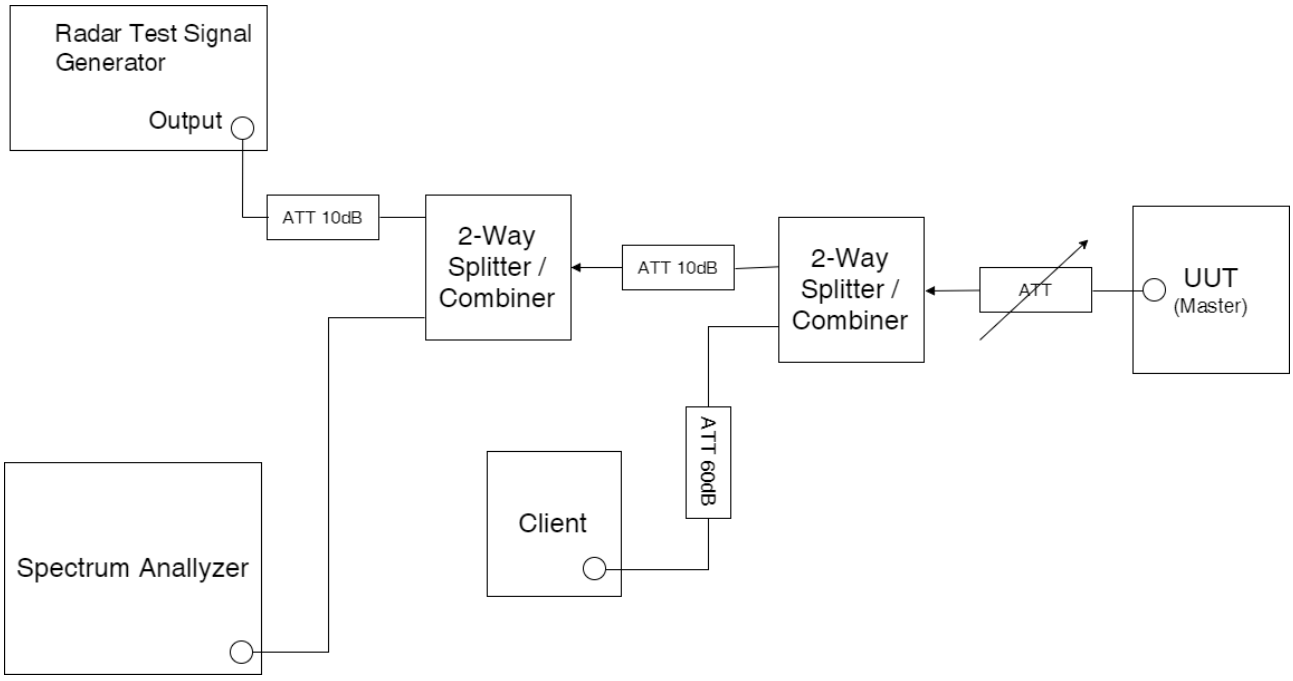
The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues 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.

7 Calibration of Radar Waveform

7.1 Radar Waveform Calibration Procedure

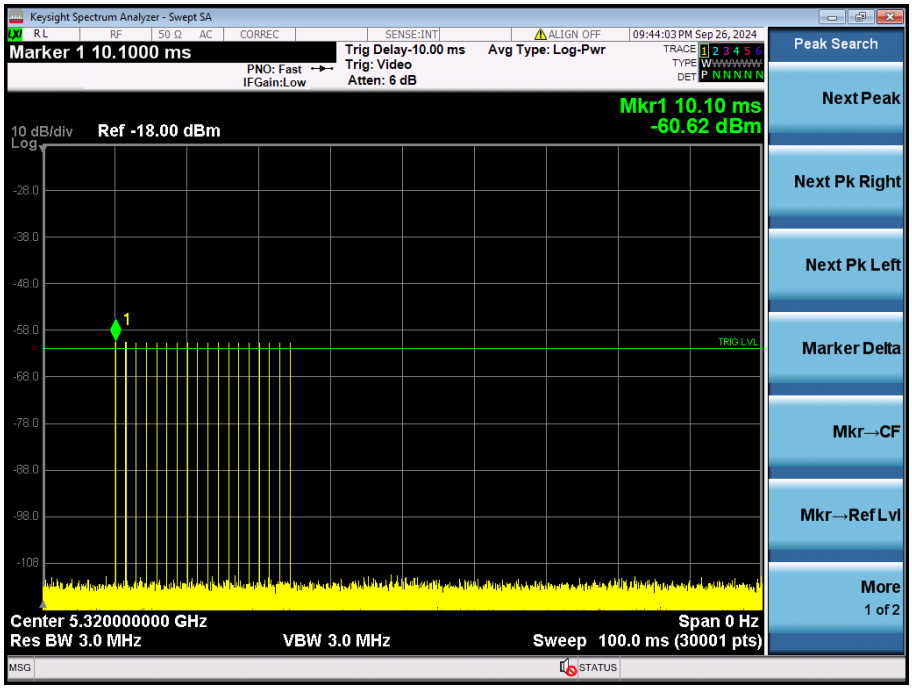
1) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master
2) The interference Radar Detection Threshold Level is -64dBm + 2.73dBi +1dB = -60.27dBm that had been taken into account the output power range and antenna gain.
3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process, there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.
4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was -64dBm + 2.73dBi +1dB = -60.27dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

7.2 Conducted Calibration Setup

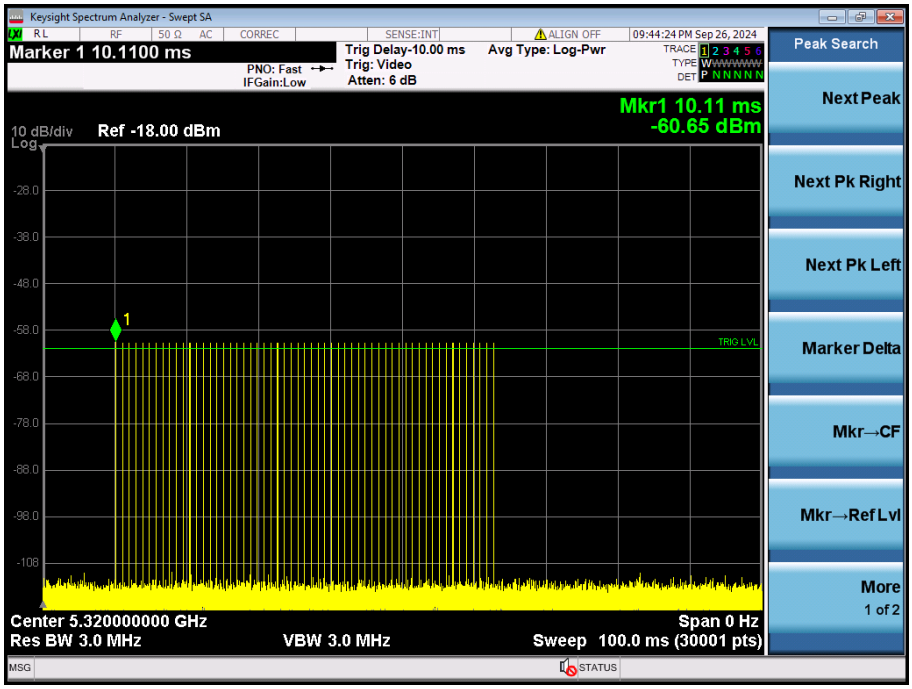


7.3 Radar Waveform Calibration Result

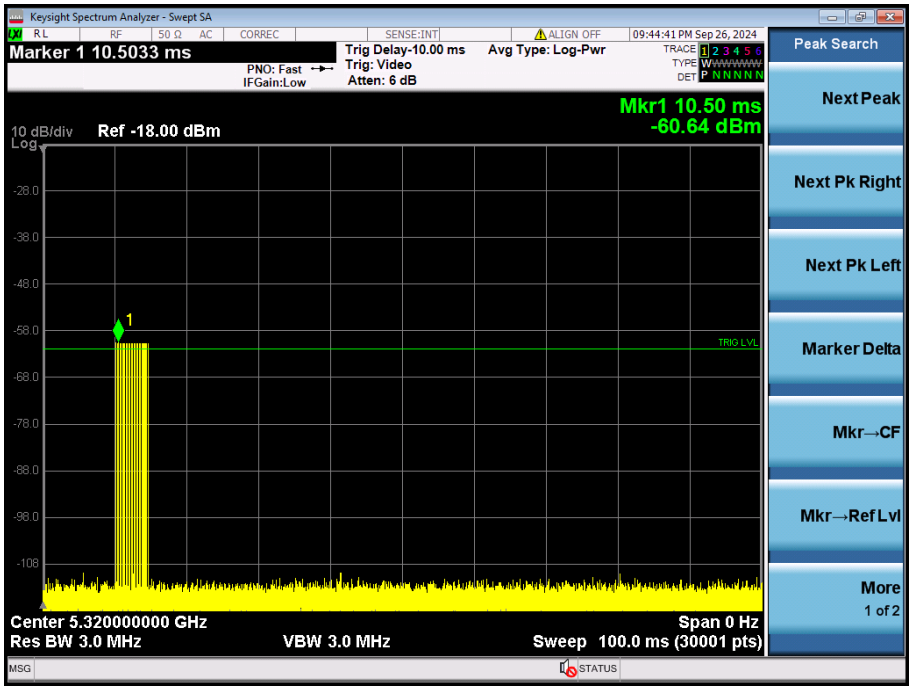
Radar Type 0



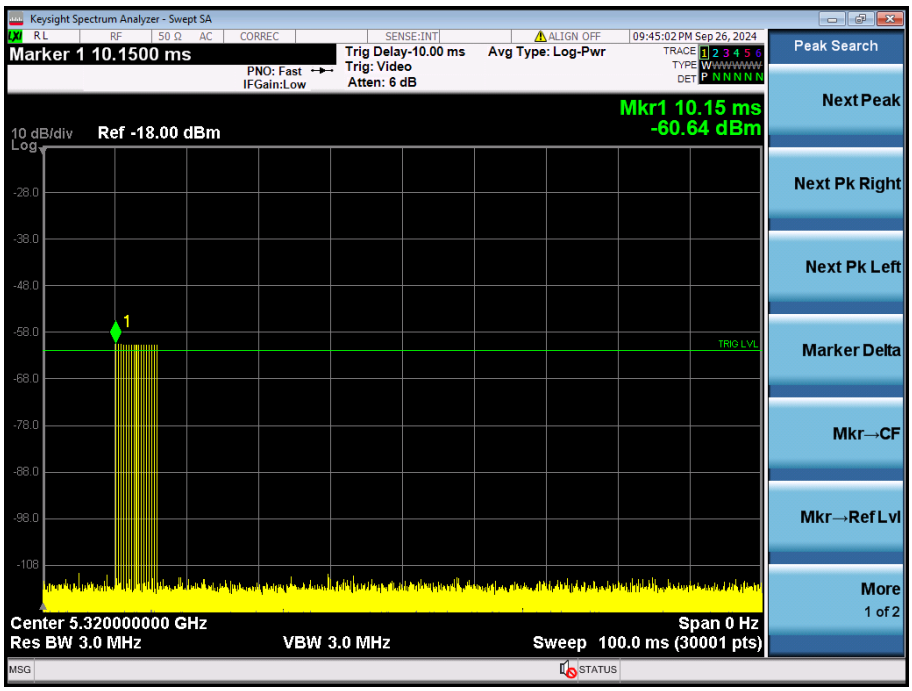
Radar Type 1



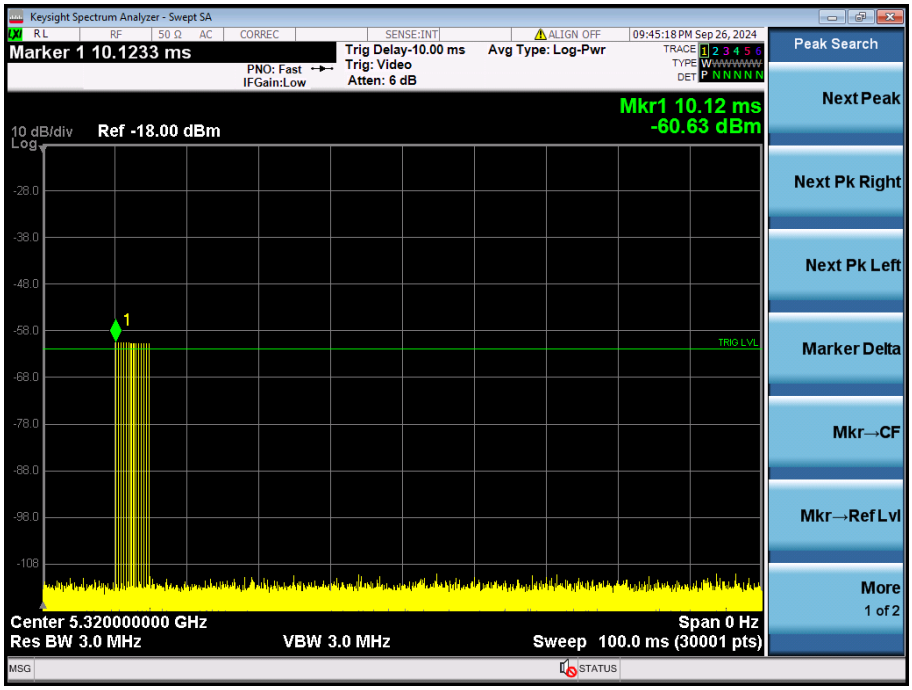
Radar Type 2



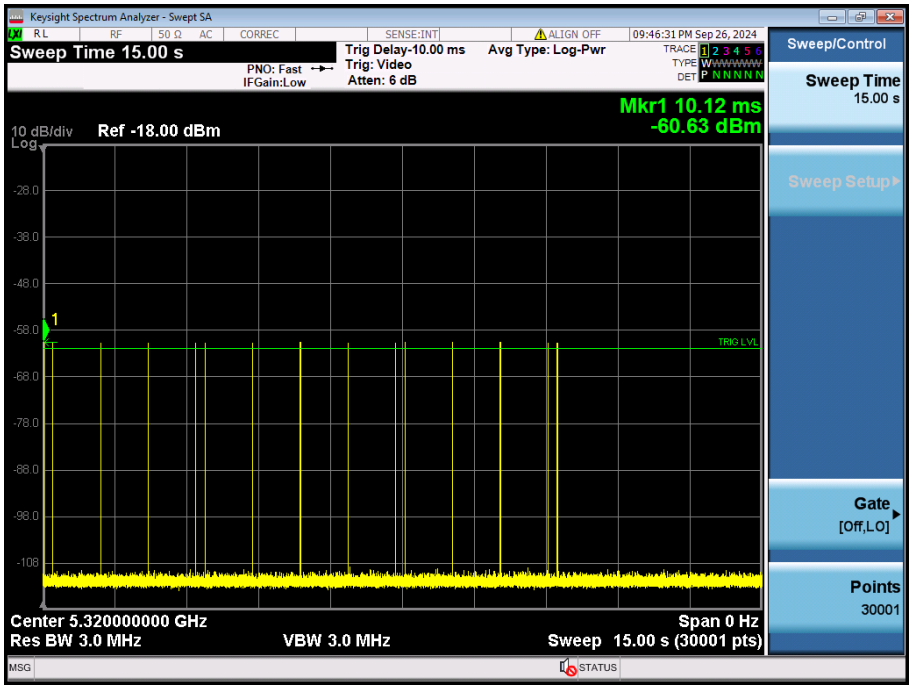
Radar Type 3



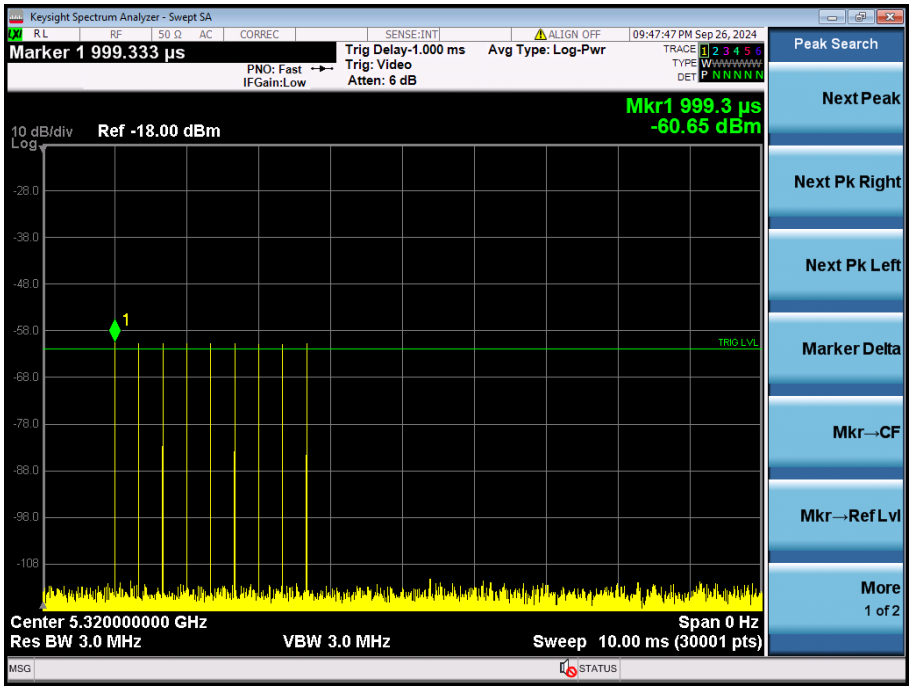
Radar Type 4



Radar Type 5

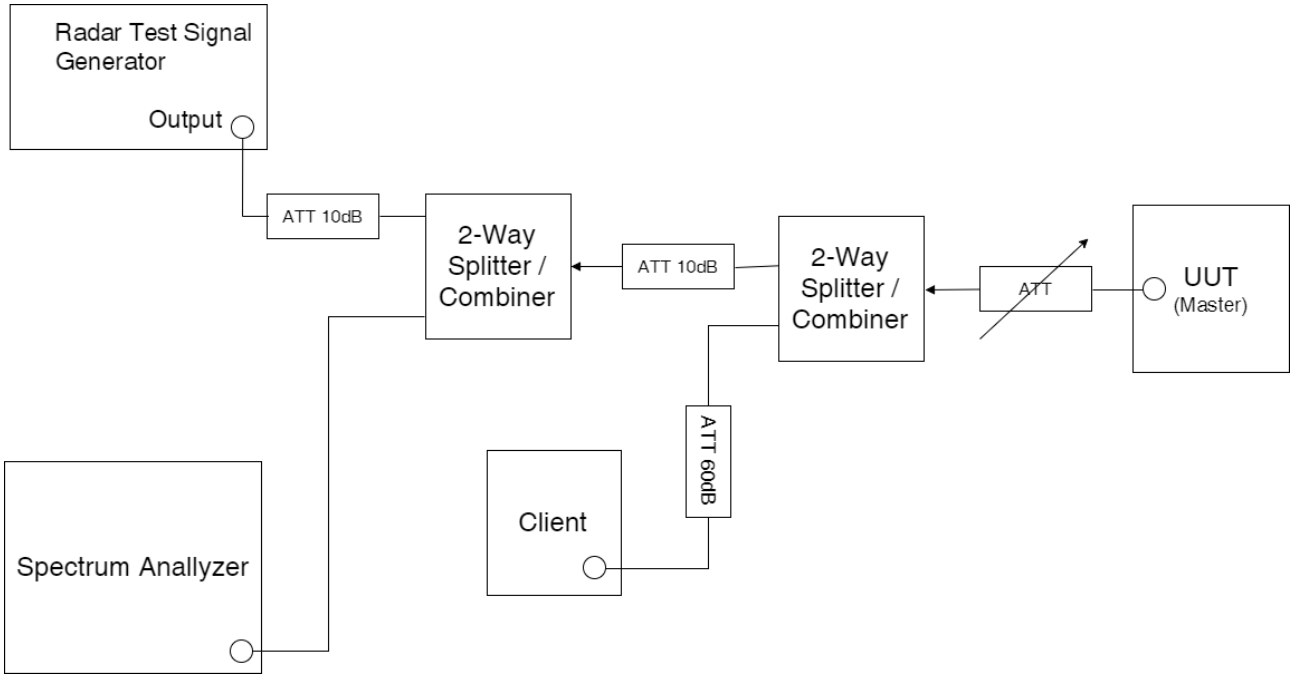


Radar Type 6



8 DFS Test Results

8.1 Conducted Test Setup Configuration



Channel Loading

System testing will be performed with channel-loading using means appropriate to the data types that are used by the unlicensed device. The following requirements apply:

☒	a) The data file must be of a type that is typical for the device (i.e., MPEG-2, MPEG-4, WAV, MP3, MP4, AVI, etc.) and must generally be transmitting in a streaming mode.
☒	b) Software to ping the client is permitted to simulate data transfer but must have random ping intervals.
☒	c) Timing plots are required with calculations demonstrating a minimum channel loading of approximately 17% or greater. For example, channel loading can be estimated by setting the spectrum analyzer for zero span and approximate the Time On/ (Time On + Off Time). This can be done with any appropriate channel BW and modulation type.
☒	d) Unicast or Multicast protocols are preferable but other protocols may be used. The appropriate protocol used must be described in the test procedures.

8.2 U-NII Detection Bandwidth (7.8.1)

8.2.1 Limit of U-NII Detection Bandwidth

The U-NII Detection Bandwidth shall contain minimum 100% of the 99% power bandwidth.

8.2.2 Test Procedure

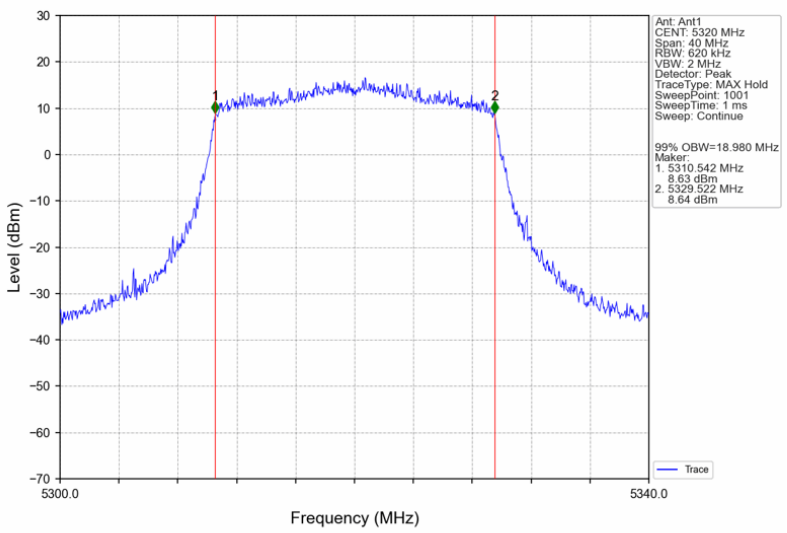
1. Adjust the equipment to produce a single *Burst* of any one of the Short Pulse Radar Types 0 – 4 in **Table 5** at the center frequency of the UUT *Operating Channel* at the specified *DFS Detection Threshold* level found in **Table 3**.
2. Set the UUT up as a standalone device (no associated Client or Master, as appropriate) and no traffic. Frame based systems will be set to a talk/listen ratio reflecting the worst case (maximum) that is user configurable during this test.
3. Generate a single radar *Burst*, and note the response of the UUT. Repeat for a minimum of 10 trials. The UUT must detect the *Radar Waveform* within the DFS band using the specified *U-NII Detection Bandwidth* criterion shown in **Table 4**. In cases where the channel bandwidth may exceed past the DFS band edge on specific channels (i.e., 802.11ac or wideband frame based systems) select a channel that has the entire emission bandwidth within the DFS band. If this is not possible, test the detection BW to the DFS band edge.
4. Starting at the center frequency of the UUT operating *Channel*, increase the radar frequency in 5 MHz steps, repeating the above test sequence, until the detection rate falls below the *U-NII Detection Bandwidth* criterion specified in **Table 4**. Repeat this measurement in 1MHz steps at frequencies 5 MHz below where the detection rate begins to fall. Record the highest frequency (denote as F_H) at which detection is greater than or equal to the *U-NII Detection Bandwidth* criterion. Recording the detection rate at frequencies above F_H is not required to demonstrate compliance.
5. Starting at the center frequency of the UUT operating *Channel*, decrease the radar frequency in 5 MHz steps, repeating the above test sequence, until the detection rate falls below the *U-NII Detection Bandwidth* criterion specified in **Table 4**. Repeat this measurement in 1MHz steps at frequencies 5 MHz above where the detection rate begins to fall. Record the lowest frequency (denote as F_L) at which detection is greater than or equal to the *U-NII Detection Bandwidth* criterion. Recording the detection rate at frequencies below F_L is not required to demonstrate compliance.
   The *U-NII Detection Bandwidth* is calculated as follows:
   U-NII Detection Bandwidth = $F_H - F_L$

8.2.3 Measurement Data

During the test, radar type 0 is used and for each frequency step the minimum percentage of detection is 90%.

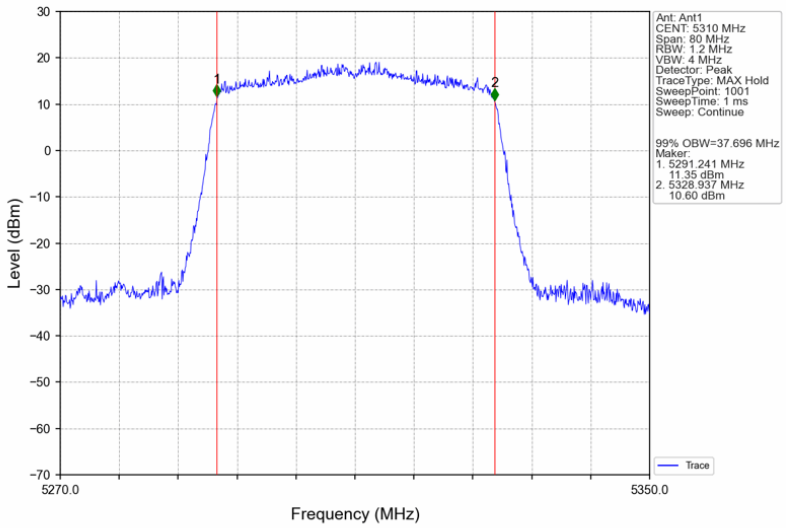
Test Channel: 5320MHz		Channel Bandwidth: 20MHz										Detection Rate (%)	F_L/F_H
Freq. (MHz)		Trial Number and Detection result (Y: Detected; N: Non-detected)											
	Fc	0	1	2	3	4	5	6	7	8	9		
5309	-11	N	N	N	N	N	N	N	N	N	N	0	
5310	-10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	F_L
5315	-5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5320	0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5325	+5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5330	+10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	F_H
5331	+11	N	N	N	N	N	N	N	N	N	N	0	
Detection Bandwidth = F_H - F_L = 5330MHz - 5310MHz = 20MHz													
EUT 99% Bandwidth = 18.980MHz													

802.11ax(HEW20)_HCH_5320MHz_RU242_Left_Ant1_NTNV



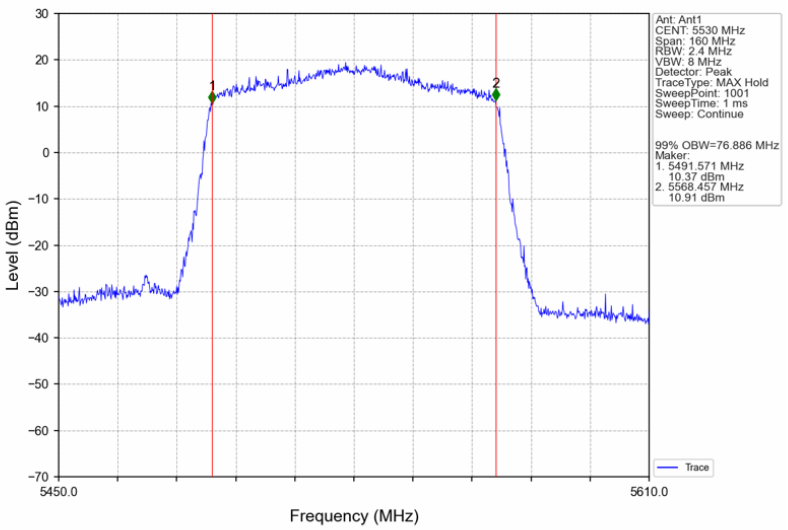
Test Channel: 5310MHz		Channel Bandwidth: 40MHz										Detection Rate (%)	F_L/F_H
Freq. (MHz)	Fc	Trial Number and Detection result (Y: Detected; N: Non-detected)											
		0	1	2	3	4	5	6	7	8	9		
5289	-21	N	N	N	N	N	N	N	N	N	N	0	
5290	-20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	F_L
5295	-15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5300	-10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5305	-5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5310	0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5315	+5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5320	+10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5325	+15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5330	+20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	F_H
Detection Bandwidth = F_H - F_L = 5330MHz - 5290MHz = 40MHz													
EUT 99% Bandwidth = 37.696MHz													

802.11ax(HEW40)_HCH_5310MHz_RU484_Left_Ant1_NTNV



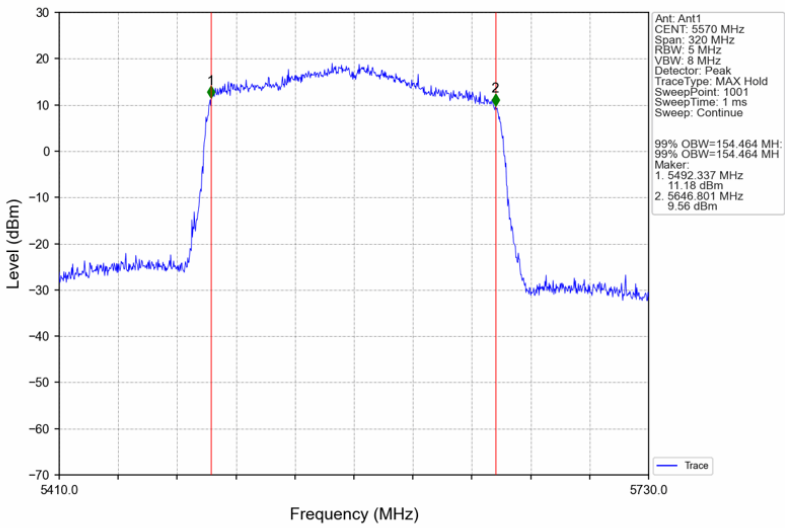
Test Channel: 5530MHz		Channel Bandwidth: 80MHz										Detection Rate (%)	F_L/F_H
Freq.		Trial Number and Detection result (Y: Detected; N: Non-detected)											
(MHz)	Fc	0	1	2	3	4	5	6	7	8	9		
5490	-40	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	F_L
5495	-35	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5500	-30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5505	-25	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5510	-20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5515	-15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5520	-10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5525	-5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5530	0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5535	+5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5540	+10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5545	+15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5550	+20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5555	+25	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5560	+30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5565	+35	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5570	+40	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	90	F_H
Detection Bandwidth = F_H - F_L = 5570MHz - 5490MHz = 80MHz													
EUT 99% Bandwidth = 76.886MHz													

802.11ax(HEW80)_LCH_5530MHz_RU996_Left_Ant1_NTNV



Test Channel: 5570MHz		Channel Bandwidth: 160MHz										Detection Rate (%)	F_L/F_H
Freq.		Trial Number and Detection result (Y: Detected; N: Non-detected)											
(MHz)	Fc	0	1	2	3	4	5	6	7	8	9		
5490	-80	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	F_L
5500	-70	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5510	-60	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5520	-50	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5530	-40	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5540	-30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5550	-20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5560	-10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5570	0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5580	+10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5590	+20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5600	+30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5610	+40	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5620	+50	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5630	+60	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5640	+70	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100	
5650	+80	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	90	F_H
Detection Bandwidth = F_H - F_L = 5650MHz - 5490MHz = 160MHz													
EUT 99% Bandwidth = 154.464 MHz													

802.11ax(HEW160)_MCH_5570MHz_2xRU996_Left_Ant1_NTNV



8.3 Channel Availability Check (7.8.2)

8.3.1 Limit of Channel Availability Check

The Initial *Channel Availability Check Time* tests that the UUT does not emit beacon, control, or data signals on the test *Channel* until the power-up sequence has been completed and the U-NII device checks for *Radar Waveforms* for one minute on the test *Channel*.

8.3.2 Test Procedure

This test does not use any *Radar Waveforms* and only needs to be performed one time.

1. The U-NII devices will be powered on and be instructed to operate on the appropriate U-NII *Channel* that must incorporate DFS functions. At the same time the UUT is powered on, the spectrum analyzer will be set to zero span mode with a 3 MHz RBW and 3 MHz VBW on the *Channel* occupied by the radar (Chr) with a 2.5 minute sweep time. The spectrum analyzer's sweep will be started at the same time power is applied to the U-NII device.
2. The UUT should not transmit any beacon or data transmissions until at least 1 minute after the completion of the power-on cycle.
3. Confirm that the UUT initiates transmission on the channel

A) Radar Burst at the Beginning of the Channel Availability Check Time

The steps below define the procedure to verify successful radar detection on the test *Channel* during a period equal to the *Channel Availability Check Time* and avoidance of operation on that *Channel* when a radar *Burst* with a level equal to the *DFS Detection Threshold* + 1 dB occurs at the beginning of the *Channel Availability Check Time*. This is illustrated in **Figure 15**.

1. The *Radar Waveform* generator and UUT are connected using the applicable test setup described in the sections on configuration for Conducted Tests (7.2) or Radiated Tests (7.3) and the power of the UUT is switched off.
2. The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence (Tpower_up). The *Channel Availability Check Time* commences on Chr at instant T1 and will end no sooner than T1 + Tch_avail_check.
3. A single *Burst* of one of the Short Pulse Radar Types 0-4 will commence within a 6 second window starting at T1. 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.
4. Visual indication or measured results on the UUT of successful detection of the radar *Burst* will be recorded and reported. Observation of Chr for UUT emissions will continue for 2.5 minutes after the radar *Burst* has been generated.
5. Verify that during the 2.5 minute measurement window no UUT transmissions occurred on Chr. The *Channel Availability Check* results will be recorded.

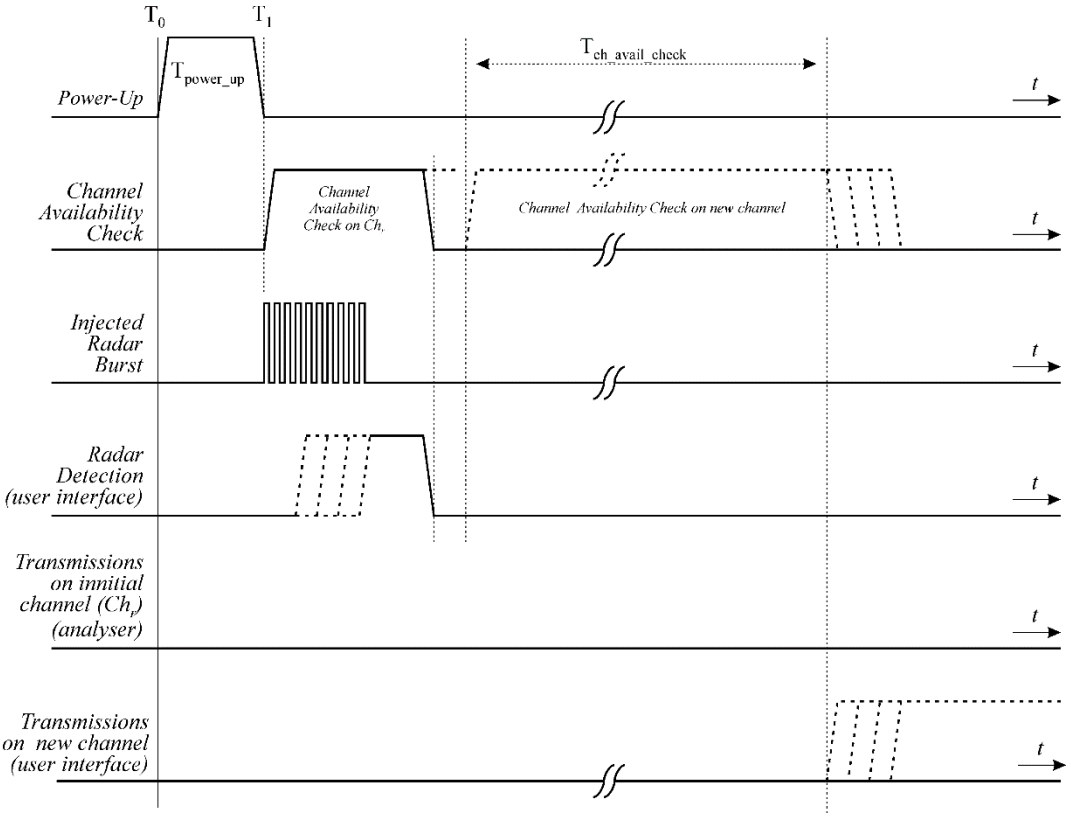


Figure 15: Example of timing for radar testing at the beginning of the Channel Availability Check Time

B) Radar Burst at the End of the Channel Availability Check Time

The steps below define the procedure to verify successful radar detection on the test Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar *Burst* with a level equal to the *DFS Detection Threshold* + 1dB occurs at the end of the *Channel Availability Check Time*. This is illustrated in **Figure 16**.

1. The *Radar Waveform* generator and UUT are connected using the applicable test setup described in the sections for Conducted Tests (7.2) or Radiated Tests (7.3) and the power of the UUT is switched off.
2. The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence (Tpower_up). The *Channel Availability Check Time* commences on Chr at instant T1 and will end no sooner than T1 + Tch_avail_check.
3. A single *Burst* of one of the Short Pulse Radar Types 0-4 will commence within a 6 second window starting at T1 + 54 seconds. 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.
4. Visual indication or measured results on the UUT of successful detection of the radar *Burst* will be recorded and reported. Observation of Chr for UUT emissions will continue for 2.5 minutes after the radar *Burst* has been generated.
5. Verify that during the 2.5 minute measurement window no UUT transmissions occurred on Chr. The *Channel Availability Check* results will be recorded.

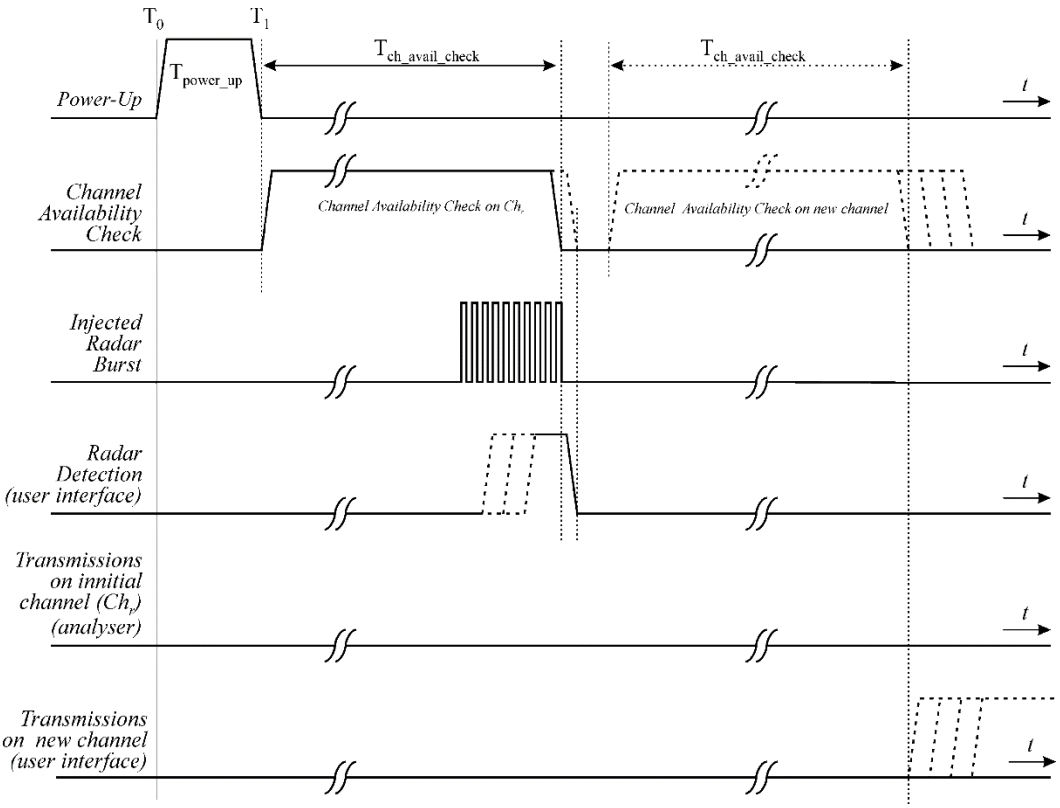
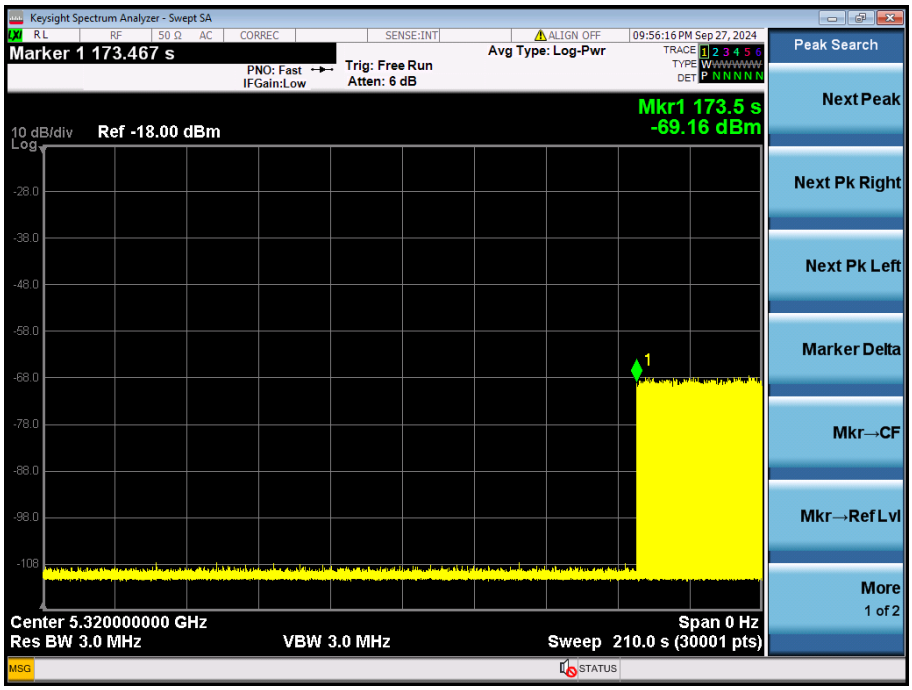


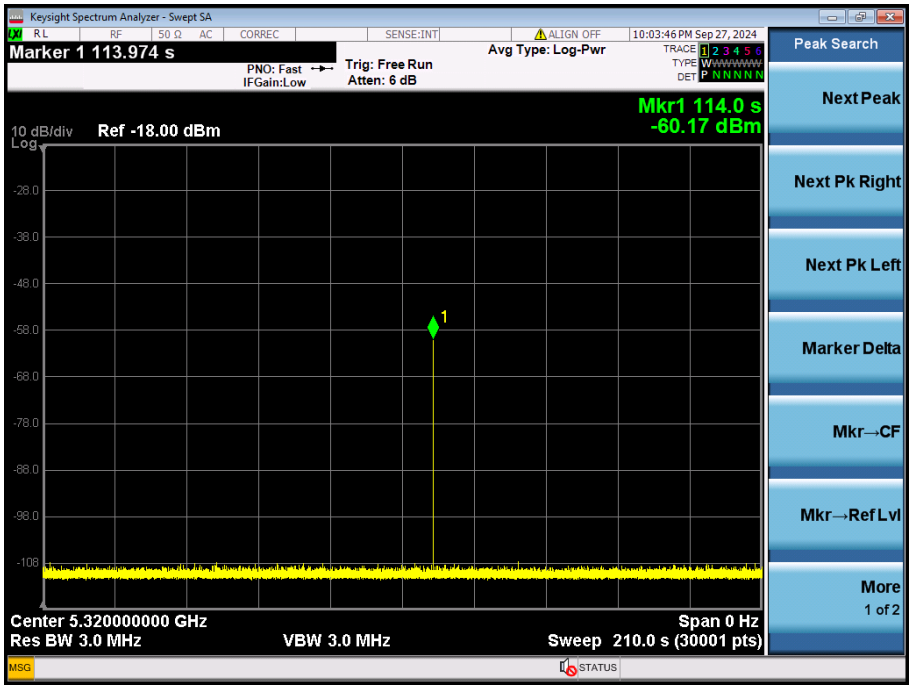
Figure 16: Example of timing for radar testing towards the end of the Channel Availability Check Time

8.3.3 Measurement Data

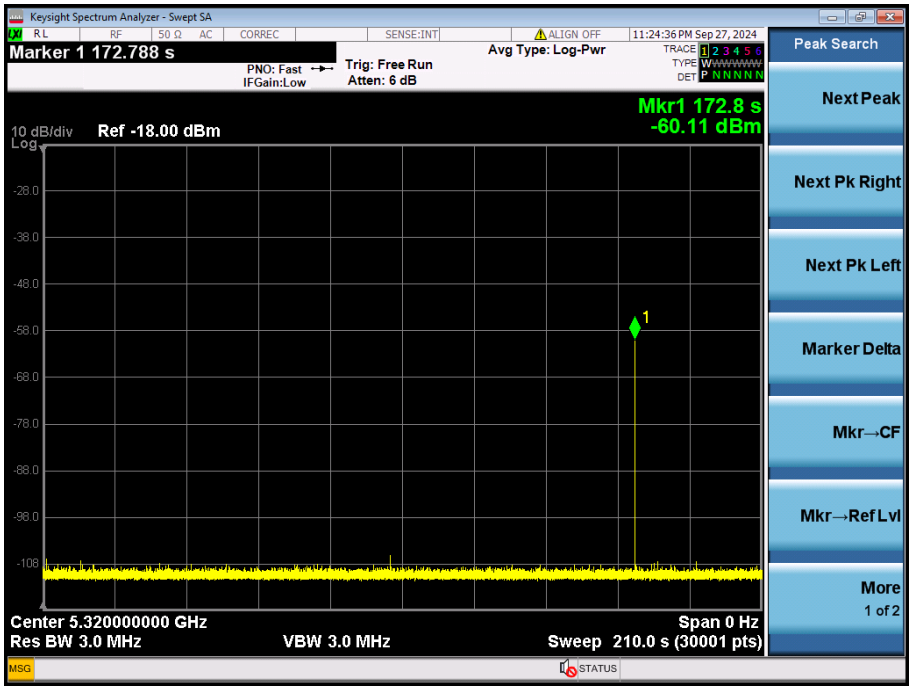
5320 MHz



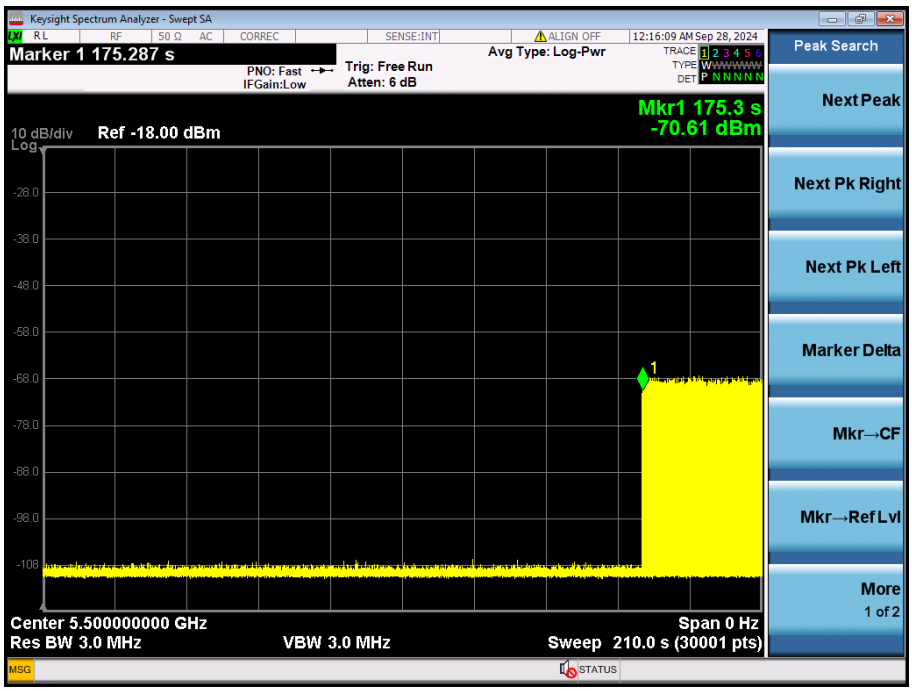
Radar Burst at the Beginning of the Channel Availability Check Time



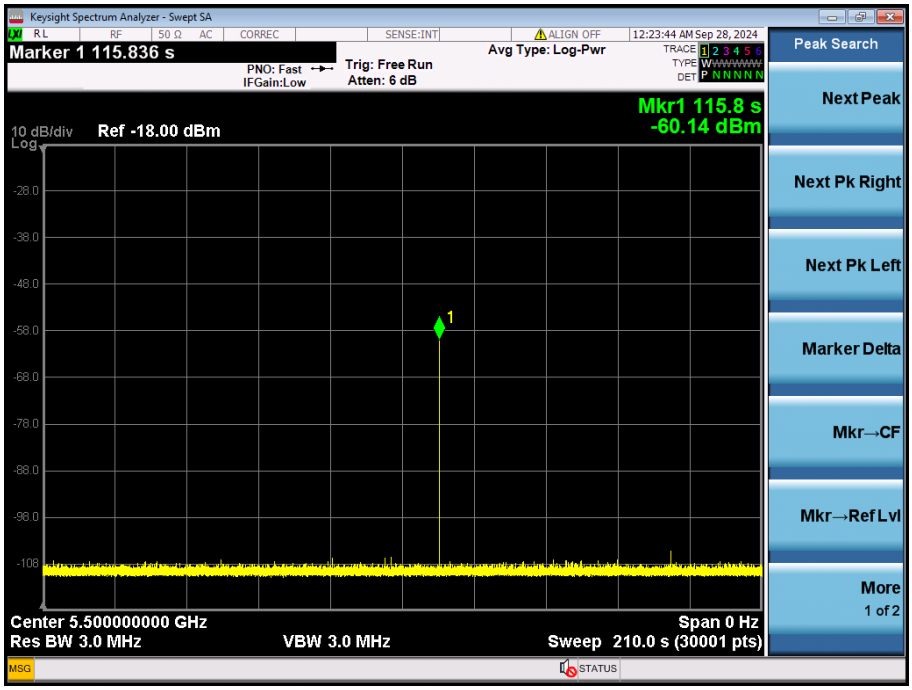
Radar Burst at the End of the Channel Availability Check Time



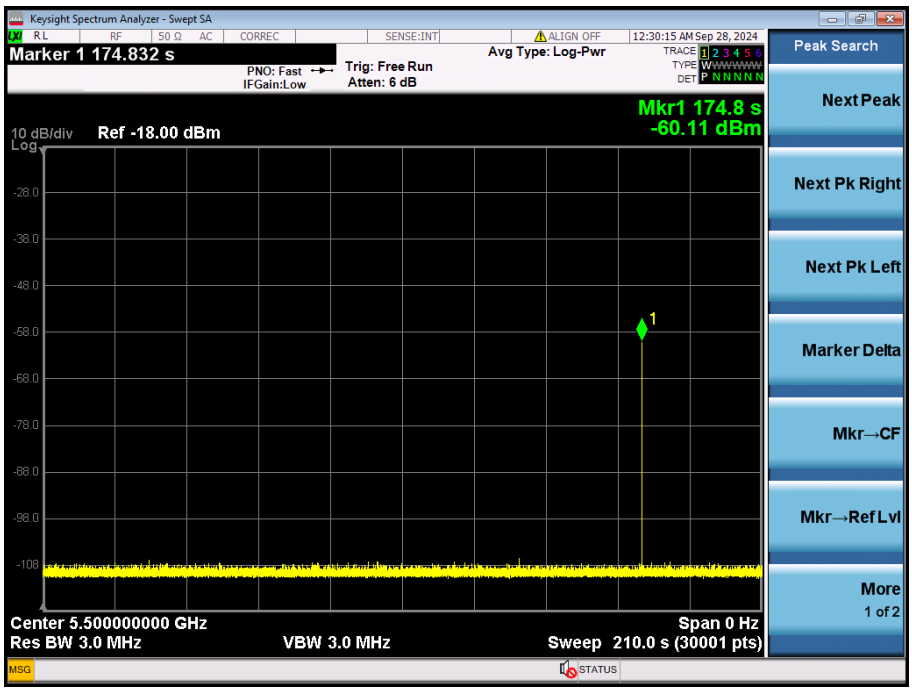
5500 MHz



Radar Burst at the Beginning of the Channel Availability Check Time



Radar Burst at the End of the Channel Availability Check Time



8.4 In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period (7.8.3)

8.4.1 Limit of In-Service Monitoring

The EUT has In-Service Monitoring function to continuously monitor the radar signals. If radar is detected, it must leave the channel (Shutdown). The Channel Move Time to cease all transmissions on the current Channel upon detection of a Radar Waveform above the DFS Detection Threshold within 10 sec.

The total duration of 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 facilitating Channel changes (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.

Non-Occupancy Period time is 30 minutes during which a Channel will not be utilized after a Radar Waveform is detected on that Channel.

8.4.2 Test Procedure

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 UUT 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 UUT 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 UUT (Client device) to *Associate* with the *Master Device*. In case the UUT 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 UUT (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 T0 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 UUT at the end of the radar *Burst* on the *Operating Channel* for duration greater than 10 seconds. Measure and record the transmissions from the UUT 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 UUT for more than 30 minutes following instant T2 to verify that the UUT does not resume any transmissions on this *Channel*. Perform this test once and record the measurement result.
7. In case the UUT is a U-NII device operating as a *Client Device* with *In-Service Monitoring*, perform steps 1 to 6.

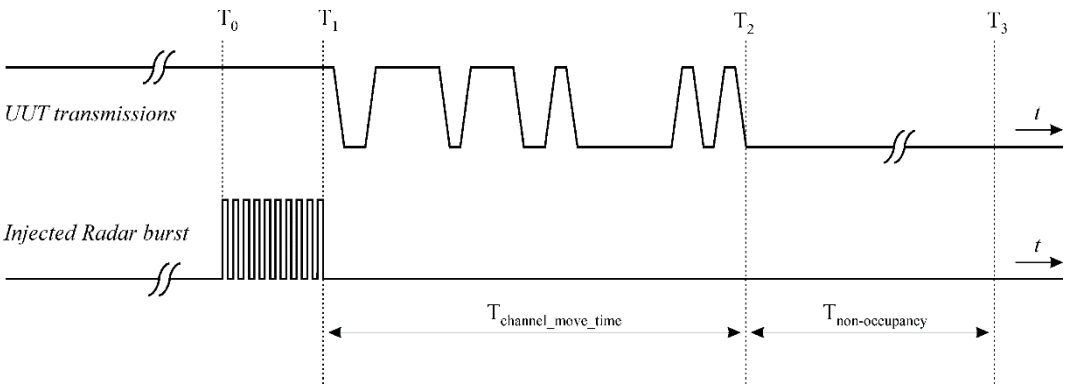
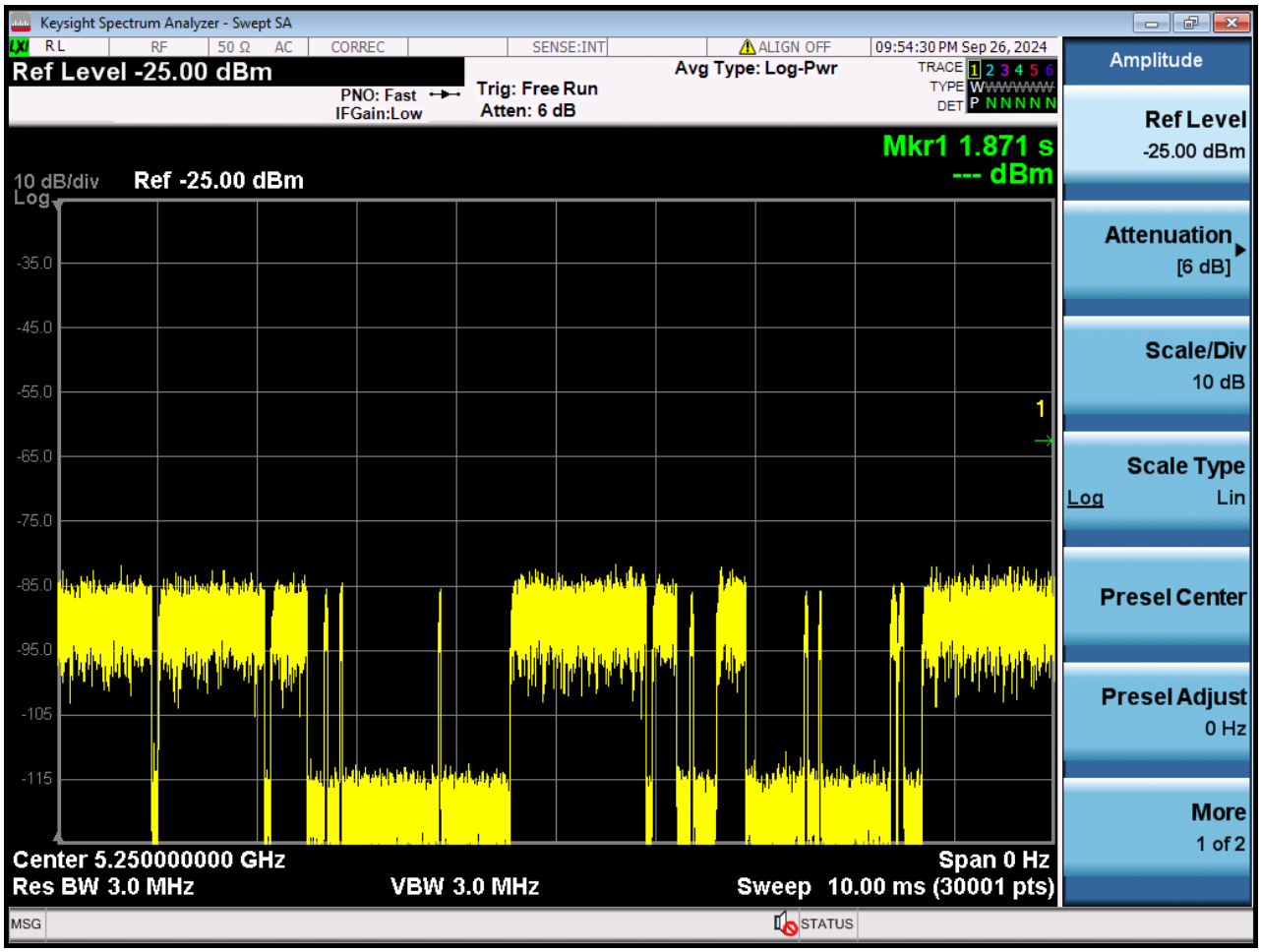


Figure 17: Example of Channel Closing Transmission Time & Channel Closing Time

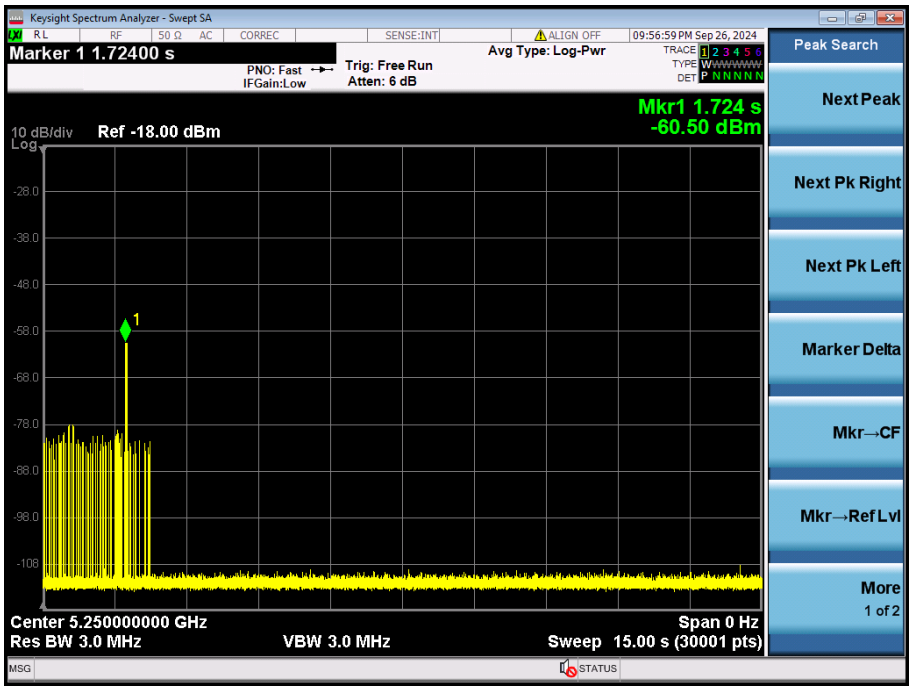
8.4.3 Measurement Data

Payload 58.91%



5250MHz

Channel Move Time and Channel Closing Transmission Time

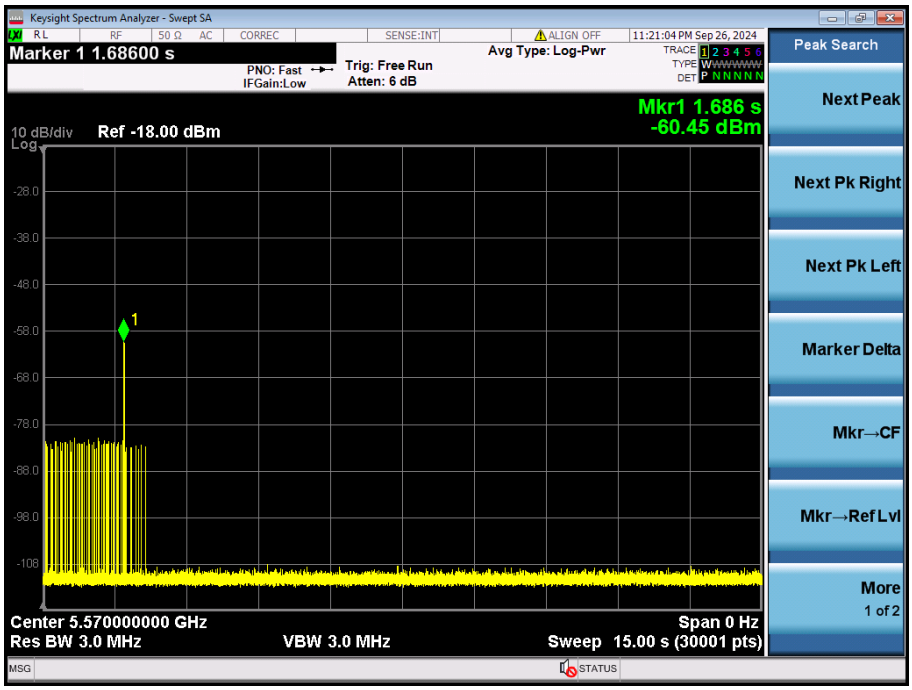


Channel Move Time: 1.260sec

Channel Closing Transmission Time: 0.013 sec

5570MHz

Channel Move Time and Channel Closing Transmission Time

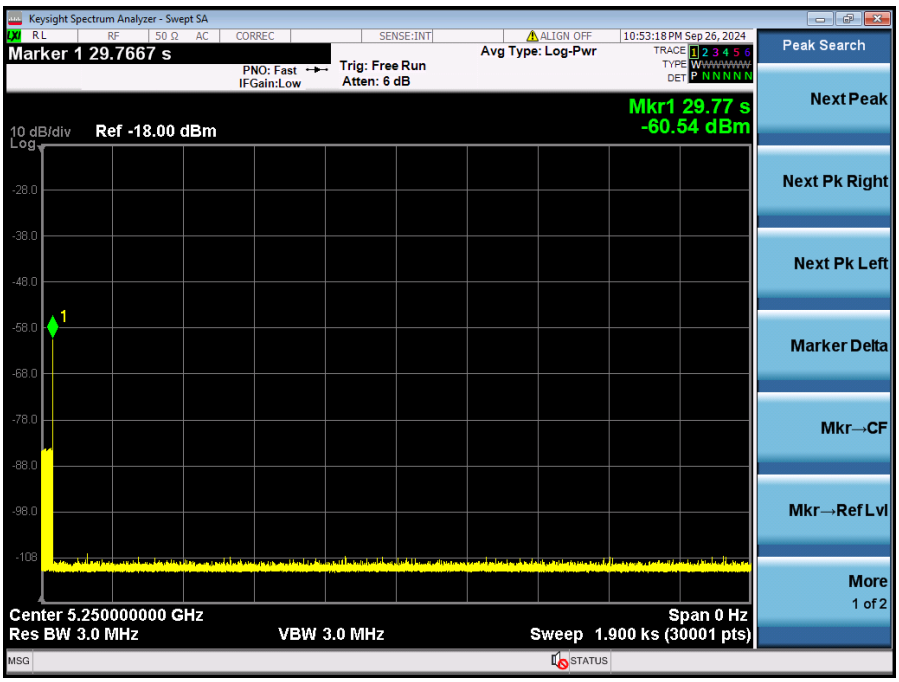


Channel Move Time: 1.281 sec

Channel Closing Transmission Time: 0.012 sec

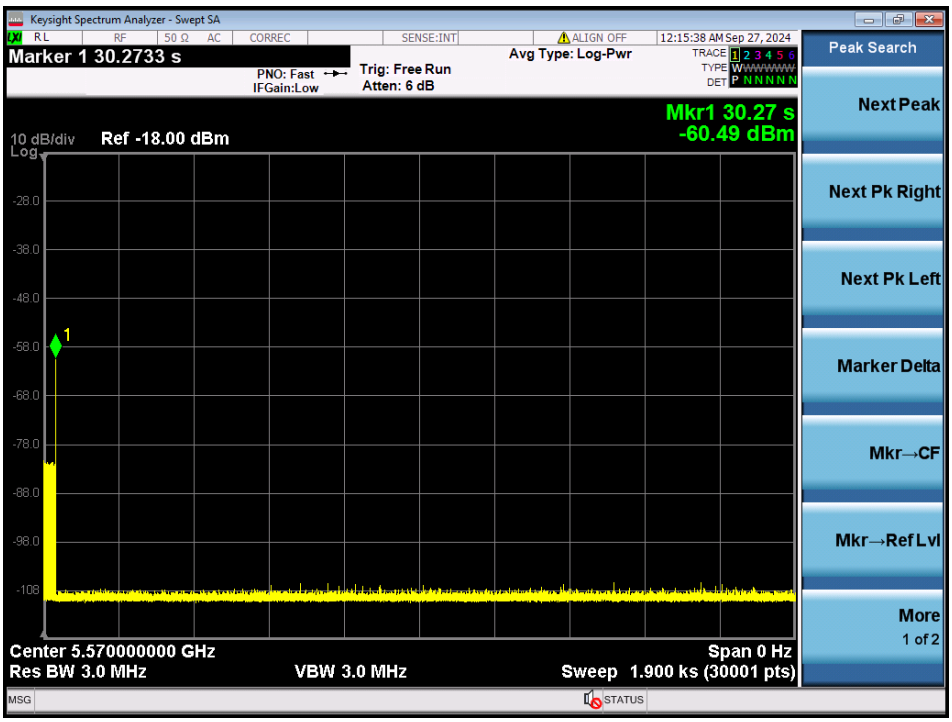
5250MHz

Non-occupancy Period



5570MHz

Non-occupancy Period



8.5 Statistical Performance Check (7.8.4)

8.5.1 Limit of Statistical Performance Check

Refer to Table 5, 5a, 6, 7

8.5.2 Test Procedure

The steps below define the procedure to determine the minimum percentage of successful detection requirements found in **Tables 5-7** 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 UUT within the 5250-5350 MHz or 5470-5725 MHz bands.
2. In case the UUT is a U-NII device operating as a *Client Device* (with or without Radar Detection), a U-NII device operating as a *Master Device* will be used to allow the UUT (Client device) to *Associate* with the *Master Device*. In case the UUT 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 UUT (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 T0 the *Radar Waveform* generator sends the individual waveform for each of the Radar Types 1- 6 in **Tables 5-7**, 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 UUT at the end of the Burst on the *Operating Channel* for duration greater than 10 seconds for Radar Type 0 to ensure detection occurs.
6. Observe the transmissions of the UUT at the end of the Burst on the *Operating Channel* for duration greater than 22 seconds for Long Pulse Radar Type 5 to ensure detection occurs.
7. In case the UUT is a U-NII device operating as a *Client Device* with *In-Service Monitoring*, perform steps 1 to 6.

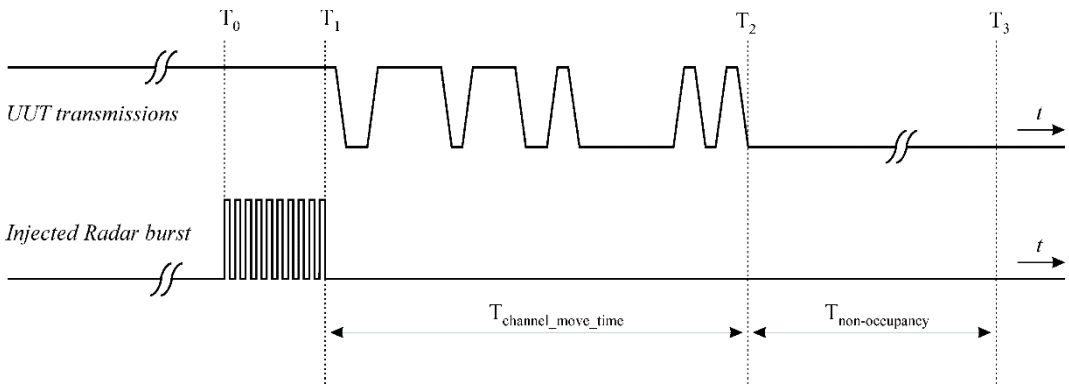


Figure 17: Example of Channel Closing Transmission Time & Channel Closing Time

8.5.3 Measurement Data

Test Channel: 5320MHz; Channel Bandwidth: 20MHz

Remark: Y: Detected; N: Non-detected.

	Radar Signal Type					
Trial No.	**1**	**2**	**3**	**4**	**5**	**6**
0	Y	Y	Y	Y	Y	Y
1	Y	Y	Y	Y	Y	Y
2	Y	Y	Y	Y	Y	Y
3	Y	Y	Y	Y	Y	Y
4	Y	Y	Y	N	Y	Y
5	Y	Y	Y	Y	N	Y
6	Y	Y	Y	Y	Y	Y
7	Y	N	N	Y	Y	N
8	N	Y	Y	Y	Y	Y
9	Y	Y	Y	N	Y	Y
10	Y	Y	Y	Y	Y	Y
11	Y	Y	Y	Y	Y	Y
12	Y	Y	Y	Y	Y	Y
13	N	Y	Y	Y	Y	Y
14	Y	Y	Y	Y	Y	N
15	Y	Y	Y	Y	Y	Y
16	Y	N	Y	Y	Y	Y
17	Y	Y	Y	Y	Y	Y
18	Y	Y	Y	N	N	Y
19	Y	Y	Y	Y	Y	Y
20	Y	Y	Y	Y	Y	Y
21	Y	Y	N	Y	Y	N
22	Y	Y	Y	Y	Y	Y
23	N	Y	Y	Y	Y	Y
24	Y	Y	Y	Y	Y	Y
25	Y	N	Y	Y	Y	Y
26	Y	Y	Y	Y	Y	Y
27	N	Y	Y	Y	N	Y
28	Y	Y	Y	Y	Y	Y
29	Y	Y	Y	Y	Y	Y
Detection Probability (%)	**86.67**	**90.00**	**93.33**	**90.00**	**90.00**	**90.00**
Aggregate Detection Probability of Type 1 ~ Type 4 (%)	**90.00**					
Result	Pass	Pass	Pass	Pass	Pass	Pass

Test Channel: 5310MHz; Channel Bandwidth: 40MHz

Remark: Y: Detected; N: Non-detected.

	Radar Signal Type					
Trial No.	**1**	**2**	**3**	**4**	**5**	**6**
0	Y	Y	Y	Y	Y	Y
1	Y	Y	Y	Y	Y	Y
2	Y	Y	Y	Y	Y	Y
3	Y	Y	Y	Y	Y	Y
4	Y	Y	Y	Y	Y	Y
5	Y	Y	Y	Y	Y	Y
6	Y	Y	Y	Y	Y	N
7	Y	N	N	Y	N	Y
8	Y	Y	Y	Y	Y	Y
9	Y	Y	Y	N	Y	Y
10	Y	Y	Y	Y	Y	Y
11	Y	Y	Y	Y	Y	N
12	N	Y	Y	Y	Y	Y
13	Y	N	Y	Y	N	Y
14	Y	Y	Y	Y	Y	Y
15	Y	Y	Y	N	Y	Y
16	Y	Y	Y	Y	Y	N
17	Y	Y	N	Y	Y	Y
18	Y	N	Y	Y	Y	Y
19	Y	Y	Y	Y	Y	Y
20	Y	Y	Y	N	Y	Y
21	Y	Y	Y	Y	Y	Y
22	Y	Y	Y	Y	Y	Y
23	N	Y	Y	Y	Y	Y
24	Y	Y	Y	Y	Y	Y
25	Y	Y	Y	N	Y	Y
26	Y	Y	Y	Y	Y	Y
27	Y	Y	Y	Y	Y	Y
28	Y	Y	Y	Y	Y	Y
29	Y	Y	Y	Y	Y	Y
Detection Probability (%)	**93.33**	**90.00**	**93.33**	**86.67**	**93.33**	**90.00**
Aggregate Detection Probability of Type 1 ~ Type 4 (%)	**90.83**					
Result	Pass	Pass	Pass	Pass	Pass	Pass

Test Channel: 5290MHz; Channel Bandwidth: 80MHz

Remark: Y: Detected; N: Non-detected.

	Radar Signal Type					
Trial No.	**1**	**2**	**3**	**4**	**5**	**6**
0	Y	Y	Y	Y	Y	Y
1	Y	Y	Y	Y	Y	Y
2	Y	Y	Y	Y	Y	Y
3	Y	Y	Y	Y	Y	Y
4	N	N	Y	Y	N	Y
5	Y	Y	N	Y	Y	Y
6	Y	Y	Y	Y	Y	Y
7	N	Y	Y	Y	Y	Y
8	Y	Y	N	N	Y	Y
9	Y	Y	Y	Y	Y	Y
10	Y	Y	Y	Y	Y	N
11	Y	Y	Y	Y	Y	Y
12	Y	N	Y	Y	Y	Y
13	Y	Y	Y	Y	Y	Y
14	Y	Y	Y	Y	Y	Y
15	Y	Y	N	Y	N	Y
16	Y	Y	Y	Y	Y	Y
17	Y	Y	Y	N	Y	N
18	Y	Y	Y	Y	Y	Y
19	Y	N	Y	Y	Y	Y
20	Y	Y	Y	Y	Y	Y
21	Y	Y	Y	Y	Y	Y
22	Y	Y	Y	Y	Y	Y
23	Y	Y	Y	N	N	Y
24	Y	Y	Y	Y	Y	Y
25	Y	Y	Y	Y	Y	Y
26	Y	Y	Y	Y	Y	Y
27	N	Y	Y	Y	Y	Y
28	Y	Y	Y	Y	Y	Y
29	Y	Y	Y	Y	Y	Y
Detection Probability (%)	**90.00**	**90.00**	**90.00**	**90.00**	**90.00**	**93.33**
Aggregate Detection Probability of Type 1 ~ Type 4 (%)	**90.00**					
Result	Pass	Pass	Pass	Pass	Pass	Pass

Test Channel: 5250MHz; Channel Bandwidth: 160MHz

Remark: Y: Detected; N: Non-detected.

	Radar Signal Type					
Trial No.	**1**	**2**	**3**	**4**	**5**	**6**
0	Y	Y	Y	Y	Y	Y
1	Y	Y	Y	Y	Y	Y
2	Y	Y	Y	Y	Y	Y
3	Y	Y	Y	Y	N	Y
4	Y	Y	Y	Y	Y	Y
5	Y	Y	Y	Y	Y	Y
6	Y	Y	Y	Y	Y	Y
7	Y	Y	Y	Y	Y	Y
8	Y	Y	N	Y	Y	Y
9	N	Y	Y	N	Y	Y
10	Y	Y	Y	Y	Y	N
11	Y	Y	Y	Y	Y	Y
12	Y	Y	Y	Y	Y	Y
13	Y	Y	Y	Y	Y	Y
14	Y	N	Y	Y	Y	Y
15	Y	Y	Y	Y	Y	Y
16	Y	Y	Y	Y	N	N
17	Y	Y	Y	Y	Y	Y
18	Y	Y	N	Y	Y	Y
19	Y	Y	Y	Y	Y	Y
20	Y	Y	Y	Y	Y	Y
21	N	Y	Y	Y	Y	Y
22	Y	Y	Y	Y	Y	Y
23	Y	Y	Y	Y	Y	Y
24	Y	Y	Y	Y	Y	Y
25	Y	Y	N	Y	N	Y
26	Y	Y	Y	Y	Y	Y
27	Y	Y	Y	Y	Y	Y
28	Y	Y	Y	Y	Y	Y
29	Y	Y	Y	Y	Y	Y
Detection Probability (%)	**93.33**	**96.67**	**90.00**	**96.67**	**90.00**	**93.33**
Aggregate Detection Probability of Type 1 ~ Type 4 (%)	**94.17**					
Result	Pass	Pass	Pass	Pass	Pass	Pass

9 Photographs

9.1 Test Setup

Refer to Appendix - Test Setup Photo for SZCR2408003329TL

- End of the Report -