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Report On

DFS (Dynamic Frequency Selection) testing of the
Nextivity Inc.
Cel-Fi PRO Cellular Repeater

FCC Part 15 Subpart E §15.407 (h)

Report No. SD72117098-0516C **September 2016**

REPORT ON	DFS Testing of the Nextivity Inc. Cellular Repeater
TEST REPORT NUMBER	SD72117098-0516C
PREPARED FOR	Nextivity Inc. 12230 World Trade Drive, Suite 250 San Diego, CA 92128
CONTACT PERSON	CK Li Sr. Principal Engineer, Regulatory (858) 829-1692 CLi@NextivityInc.com
PREPARED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: EMC/Senior Wireless Test Engineer
APPROVED BY	Juan Manuel Gonzalez Name Authorized Signatory Title: EMC SL Manager West Region
DATED	September 02, 2016

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

Revision History

SD72117098-0516C Nextivity Inc. Cel-Fi PRO Cellular Repeater					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
09/02/2016	Initial Release				Juan Manuel Gonzalez

CONTENTS

SECTION 1

REPORT SUMMARY

DFS Testing of the
Nextivity Inc.
Cellular Repeater

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Nextivity Inc. Cellular Repeater to the requirements of FCC Part 15 Subpart E §15.407 (h).

Objective	To perform DFS Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Nextivity Inc.
Model Number(s)	P34-2/4/5/12NU and P34-2/4/5/12CU
FCC ID Number	YETP24512NU (NU) and YETP24512CU (CU)
Serial Number(s)	900610000028 (NU) 900610000028 (CU)
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC Part 15 Subpart E §15.407 (h) (October 1, 2015). • KDB905462 D02 UNII DFS Compliance Procedures New Rules v02. Compliance Measurement Procedures For Unlicensed-National Information Infrastructure Devices Operating In The 5250-5350 MHz And 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection (April 8, 2016).
Start of Test	July 25, 2016
Finish of Test	August 31, 2016
Name of Engineer(s)	Ferdinand Custodio
Related Document(s)	• Test Report No. R95055 Industry Canada RSS-Gen Issue 3 / RSS-210 Issue 8 FCC Part 15, Subpart E for Model: P34-2/4/5/12 NU and P34-2/4/5/12CU (issued by NTS Silicon Valley, Fremont CA May 02, 2014) • Conformance Test Setup PRO24512EXA_v1.0.pdf

1.2 BRIEF SUMMARY OF RESULTS (MASTER DEVICE)

DFS requirement prior to use of a channel					
Section	***Test Description***	***Radar Type***	***EUT Frequency***	***Requirement***	***Compliance***
2.8	Non-Occupancy Period	Type 0	5280MHz and 5540 MHz	>30 minutes	Complies
2.9	DFS Detection Threshold	Type 1,2,3,4,5 and 6	5280MHz	-60 dBm	Complies
2.4, 2.5 and 2.6	Channel Availability Check Time	Type 0	5280MHz and 5540MHz	60 seconds	Complies
2.3	U-NII Detection Bandwidth	Type 0	5280MHz and 5540 MHz	Min. 100% of the U-NII 99% transmission power bandwidth	Complies
DFS requirements during normal operation					
Section	***Test Description***	***Radar Type***	***EUT Frequency***	***Requirement***	***Compliance***
2.9	DFS Detection Threshold	Type 1,2,3,4,5 and 6	5280MHz	-60 dBm	Complies
2.7	Channel Closing Transmission Time	Type 0	5280MHz and 5540 MHz	≤ 260 ms	Complies
2.7	Channel Move Time	Type 0	5280MHz and 5540 MHz	10 seconds	Complies
2.3	U-NII Detection Bandwidth	Type 0	5280MHz and 5540 MHz	Min. 100% of the U-NII 99% transmission power bandwidth	Complies

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Nextivity Inc. Cel-Fi PRO Cellular Repeater as shown in the photograph below. The EUT is a WCDMA/LTE Cellular Repeater for indoor residential use. The system is composed of two units, the Network Unit (NU) and the Coverage Unit (CU) that connects wirelessly over a full-duplex wireless link in the RLAN band using a mixed OFDM and muxed cellular signal (up to three 5MHz cellular channels) over a 30 MHz and 40 MHz channel in each direction. The 5 GHz UNII band DFS functions of the EUT were verified in this test report.

Equipment Under Test

1.3.2 EUT General Description

EUT Description	Cellular Repeater
Model Name	Cel-Fi PRO
Model Number(s)	P34-2/4/5/12NU and P34-2/4/5/12CU
Rated Voltage	12V DC ±20% via external AC/DC adapter.
Frequency Range	5260 to 5293 MHz (NU) 5525 to 5580 MHz then 5715 to 5735 MHz (CU)* **The EUT is still configured not to transmit in the 5600 to 5650 MHz (TDWR Band) as in the original filing*
Operating Mode	Network Unit (NU) as a Master Coverage Unit (CU) as a Master
Bridge Mode Support	☐ Yes ☒ No
MESH Mode Support	☐ Yes ☒ No

EUT EIRP (dBm)

Lowest	***Highest***
See TPC below	18.9 dBm*

**This is based from the worst case measured conducted power in the original filing plus the declared antenna gain below.*

Antenna

	NU	***CU***
Type	Dipole	PCB Monopole
Gain	2 dBi	2 dBi

Test Configuration	Conducted. Manufacturer provided samples with a temporary antenna test port (50Ω impedance).
Transmit Power Control (TPC)	The output power level on the uplink of the system is monitored and if it crosses the maximum specified output power, the system will automatically back off the transmit power levels to ensure that no noise is sent into the network. The system is also calibrated to ensure that this condition should never be met.
System Architecture	☐ IP Based ☒ Frame Based
U-NII Channel Bandwidths	30MHz and 40MHz
Modulation Used	Proprietary Digitally Modulated OFDM

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Fast and Freeze Up mode. Short CAC and then froze to selected channel. Channel will not be changed when radar detected. Radar detection monitored through "Radar Events" window of the DFS Conformance Testing application. Radar injected to NU (Test Configuration Diagram A).
B	Fast and Freeze Up mode. Short CAC and then froze to selected channel. Channel will not be changed when radar detected. Radar detection monitored through "Radar Events" window of the DFS Conformance Testing application. Radar injected to CU (Test Configuration Diagram B).
C	Fast UP mode. Short CAC and then lock to selected channel initially. Channel will be changed when radar detected. Radar injected to NU (Test Configuration Diagram A).
D	Fast UP mode. Short CAC and then lock to selected channel initially. Channel will be changed when radar detected. Radar injected to CU (Test Configuration Diagram B).
E	Auto Channel Select. Normal CAC, auto selects a free channel. Channel will be changed when Radar is detected. Output of CU (HB) monitored (Test Configuration Diagram A).
F	Auto Channel Select. Normal CAC, auto selects a free channel. Channel will be changed when Radar is detected. Output of NU (LB) monitored (Test Configuration Diagram B).
G	Auto Channel Select. Normal CAC, auto selects a free channel. Channel will be changed when Radar is detected. Radar injected to TX Output port of NU. NU is the Master for both LB and HB before CU comes on-line. NU will do HB ISM and detect all Radars. Output of CU (HB) monitored (Test Configuration Diagram C).

1.4.2 EUT Exercise Software

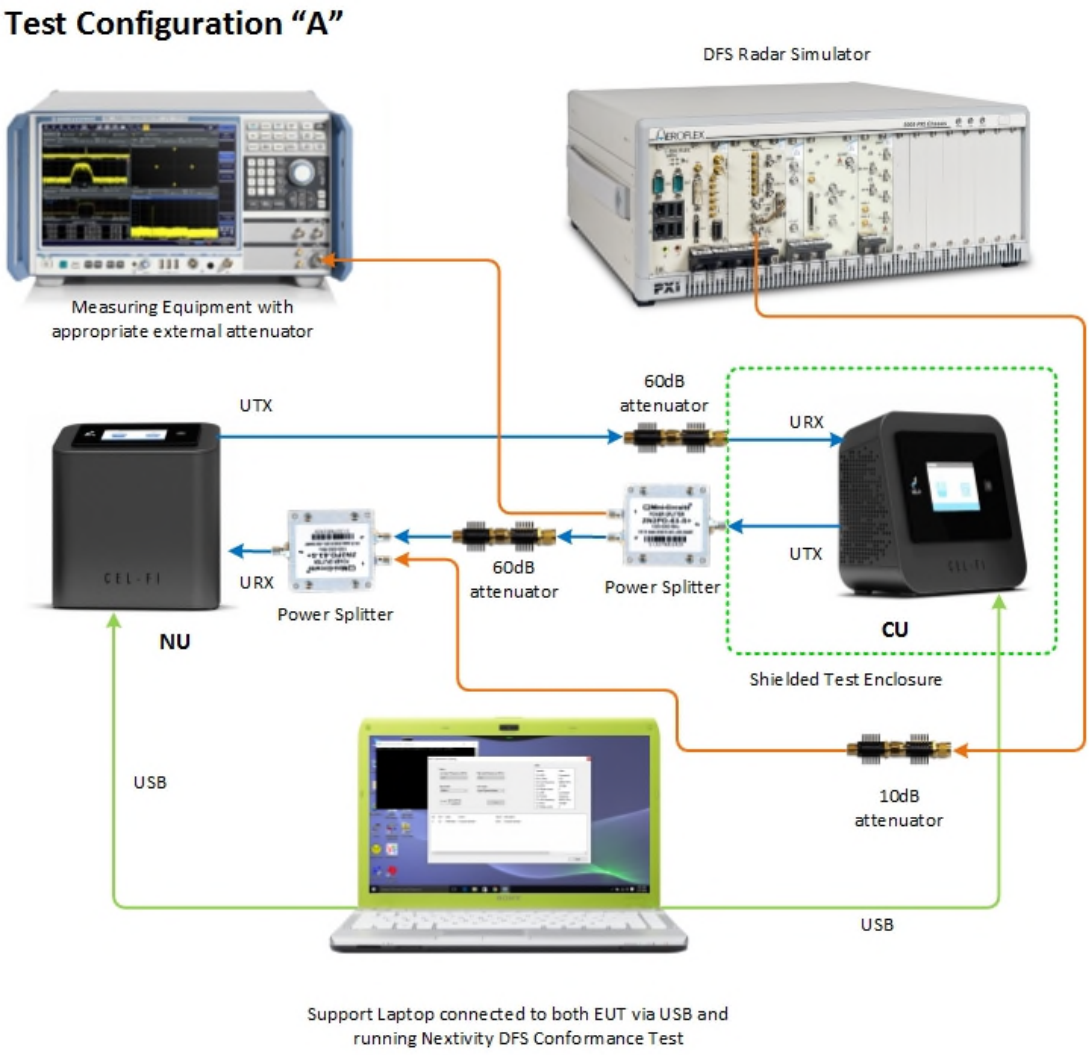
Manufacturer provided a configuration software (ConformanceTest.exe) running from a support laptop where both EUT are connected via USB.

1.4.1 Support Equipment and I/O cables

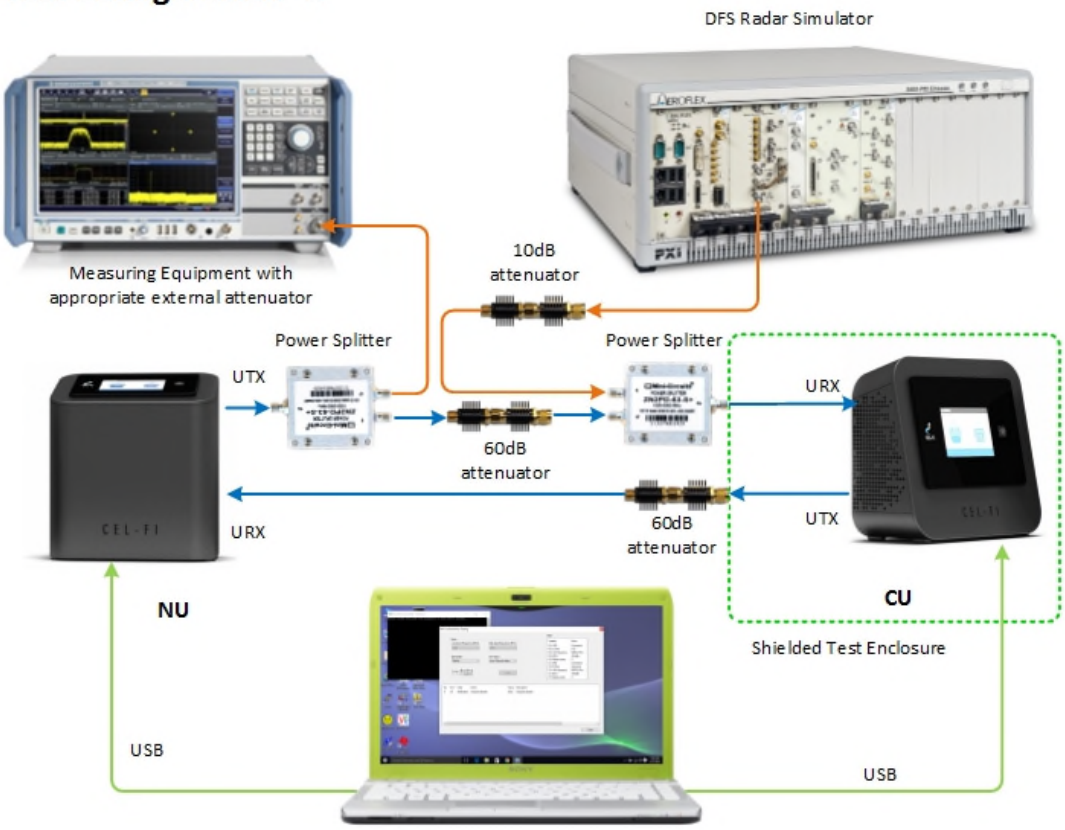
Manufacturer	Equipment/Cable	Description
Lenovo	Support Laptop (T410S)	P/N 0A31972 S/N R9-92MH0 10/11

Laptop used during programming is generic and can be different brand and model.

1.4.2 Simplified Test Configuration Diagram

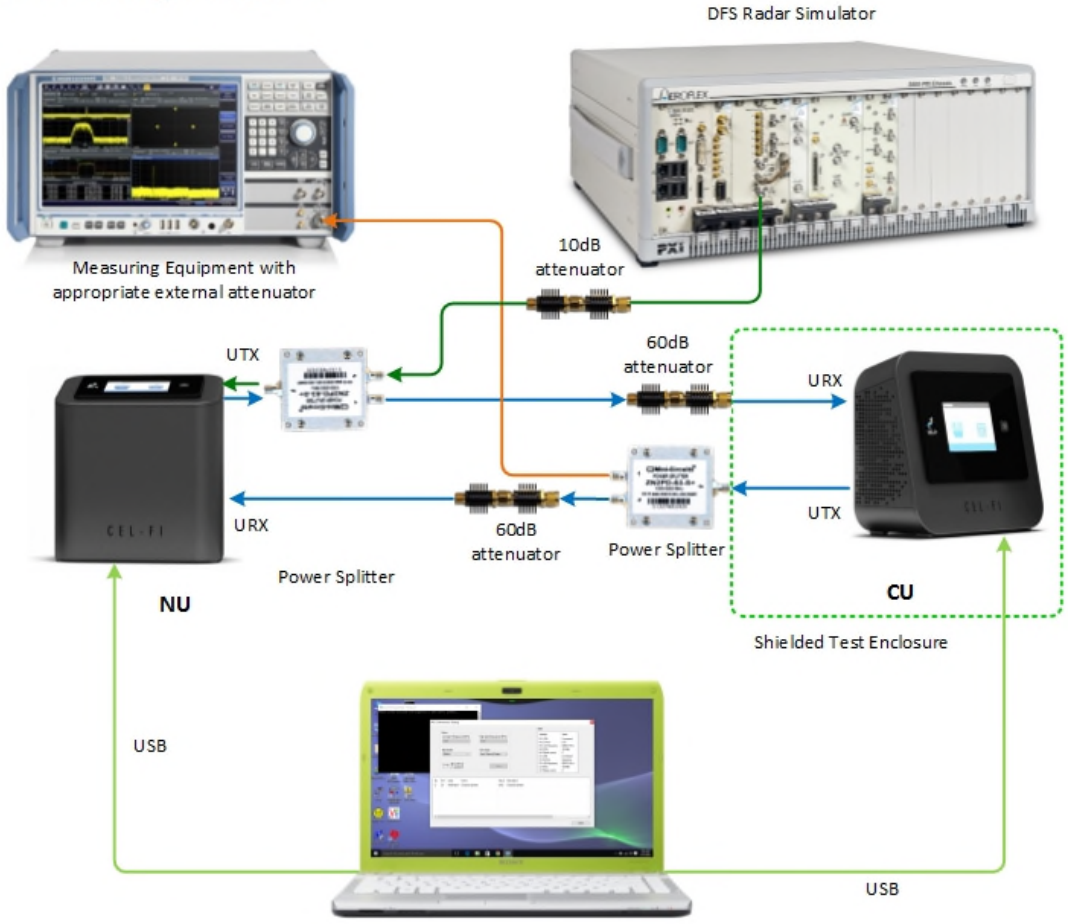


Test Configuration "B"



Support Laptop connected to both EUT via USB and running Nextivity DFS Conformance Test

Test Configuration "C"



Support Laptop connected to both EUT via USB and running Nextivity DFS Conformance Test

1.5 DEVIATIONS FROM THE STANDARD

At the time of verification, the DFS Radar Simulator and Analyzer does not have the latest updates according to Clause 7.8.4.2 of KDB905462 D02 UNII DFS Compliance Procedures New Rules v02. The procedure was followed but instead of using single pulse width for each trial on the edges, random pulse widths were used as generated by the simulator. The test frequency was calculated according to the most dominant chirp width within the trial. For example in a given trial with 10 burst segments with the following chirp widths (MHz): 6, 8, 14, 18, 5, 10, 12, 8, 12 and 15. The most dominant chirp width is 12MHz, therefore 12MHz will be used in the formula: F_L + (0.4 x Chirp Width) or F_L + (0.4 x Chirp Width).

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
900610000028 (NU) and 900610000028 (CU)		
N/A		

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted in accordance with KDB905462 D02 UNII DFS Compliance Procedures New Rules v02. Compliance Measurement Procedures For Unlicensed-National Information Infrastructure Devices Operating In The 5250-5350 MHz And 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection (April 8, 2016).

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678 1466 FAX: 858-546 0364

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.

1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A.

1.10 DFS TEST SYSTEM

The DFS system consists of hardware and software. The Hardware uses a PXI chassis with PXI instruments populating the chassis. The instruments used are a Vector Signal Generator, a Digitiser, Frequency References and a Dual Core PC (Windows 7 Professional). The Measurement and Analysis software runs on the PC and controls the instruments within the mainframe via commands on the PXI bus. Various markers are contained within the generated waveforms. The markers are used to trigger the measurement system at the appropriate points. An external trigger is also provided at the SMB output on the Vector Signal Generator which is employed where a Spectrum Analyzer is used in place of the Aeroflex Digitiser. These are described within the test procedure for the applicable test.

The Aeroflex DFS software generates the pulses in accordance with KDB905462.

1.10.1 Short Pulse Radar Test Waveforms (Types 0-4)

The short pulse radar simulation is a conventional amplitude pulse with varying pulse widths, pulse rate intervals (PRI) and number of pulses. General characteristics for these types and number of repetitions required by the standard are as follows:

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses
0	1	1428	18
1	1	**Test A**: 15 unique PRI values randomly selected	Roundup((1/360)x(19x10^6/ $PRI_{µsec}$)
		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
3	6-10	200-500	16-18
4	11-20	200-500	12-16

1.10.2 Long Pulse Radar Test Waveforms (Types 5)

The long pulse radar simulation is a 12 second concatenated series of chirps, chosen randomly. The general characteristics for Type 5 and number of repetitions required by the standard are as follows:

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses/Burst	Number of Burst
5	50-100	5-20	1000-2000	1-3	8-20

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 Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. 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.

1.10.3 Frequency Hopping Radar Test Waveform (Types 6)

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulse per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)
6	1	333	9	5-20	300

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.

SECTION 2

CALIBRATION AND TEST DETAILS

DFS Testing of the
Nextivity Inc.
Cellular Repeater

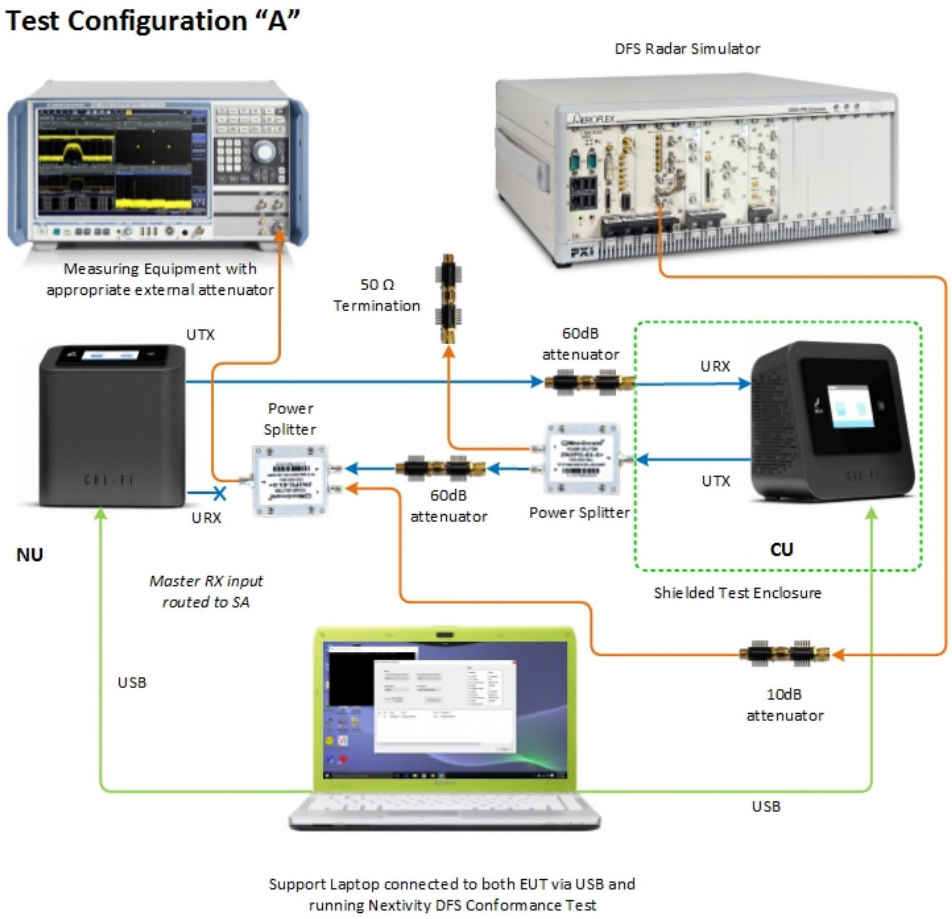
2.1 RADAR WAVEFORM CALIBRATION

2.1.1 Requirement

Clause 8.2 of KDB905462 D02 UNII DFS Compliance Procedures New Rules v02

2.1.2 Description of Calibration Setup

Conducted method was used. Test Configurations "A" and "B" (Section 1.4.2) were modified so that the Master RX input (NU for Test Configuration "A" and CU for Test Configuration "B") was replaced by a spectrum analyzer:



Calibration for CU RX input will be identical since the setup will be reversed when verifying CU as a Master (Test Configuration "B"). Both EUTs (NU and CU) were "off" during calibration.

2.1.3 DFS Detection Threshold

Reported EIRP using the highest antenna gain (2 dBi) is 18.9 dBm or 77.62 mW. Highest reported power spectral density is 2.9 dBm/MHz (from Test Report No. R95055 Industry Canada RSS-Gen Issue 3 / RSS-210 Issue 8 FCC Part 15, Subpart E for Model: P34-2/4/5/12 NU and P34-2/4/5/12CU (issued by NTS Silicon Valley, Fremont CA May 02, 2014)). Therefore the DFS Detection Threshold is -61 dBm (-62 dBm + 1 dB).

2.1.4 Date of Test/Initial of test personnel who performed the test

July 25, 2016/FSC

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions

Calibration performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.6 °C
Relative Humidity	45.8 %
ATM Pressure	100.0 kPa

2.1.7 Additional Observations

- Two frequencies were verified: 5280 MHz for Low Band and 5540 MHz for High Band.
- RBW and VBW were set to 3MHz.
- Sweep time was adjusted to show one complete burst.
- Trigger offset was -3ms to show start of the burst.
- The -2dB offset accounts for the connectors and insertion loss of the SMA pigtail at 5GHz.

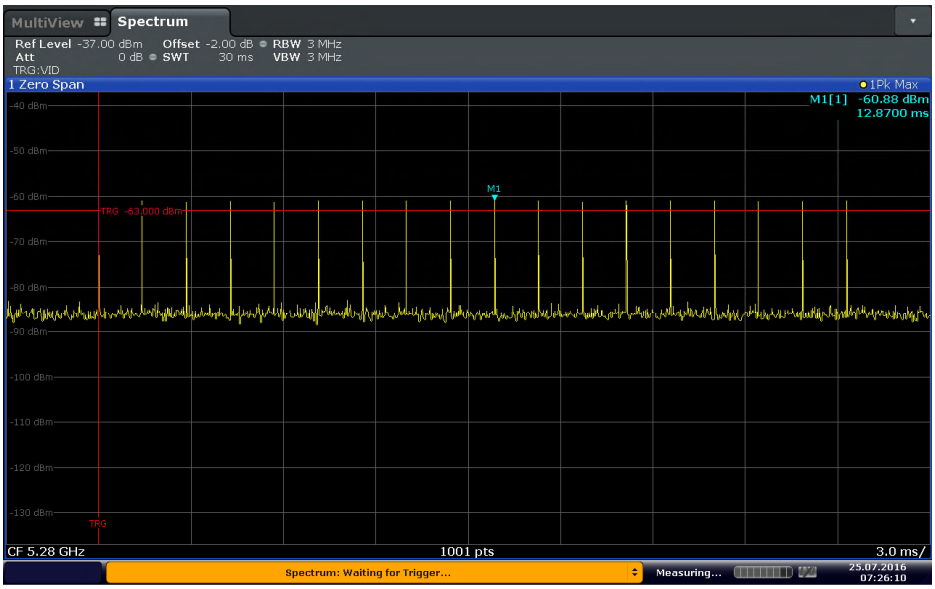
2.1.8 Calibration Level Results

These settings will be used during actual verification:

Frequency	Radar Type	Radar Simulator Level Setting (dBm)	Radar Simulator Path Loss (dB)
5280 MHz	0 to 5	-61.00	16
5540 MHz	0 to 5	-61.00	16
5280 MHz	6	-56.0*	16
5540 MHz	6	-52.0*	16

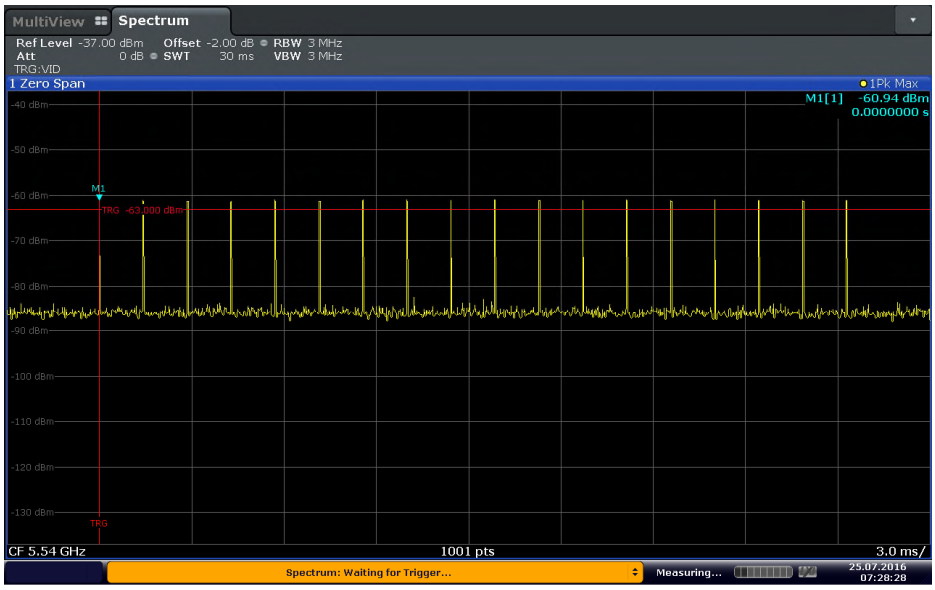
**This is the Radar generator level setting necessary to produce -61.0 dBm Radar at the RX input of both NU and CU when configured as a Master device when using radar Type 6.*

2.1.9 Calibration Plots



07:26:10 25.07.2016

Radar Type 0 @ 5280 MHz



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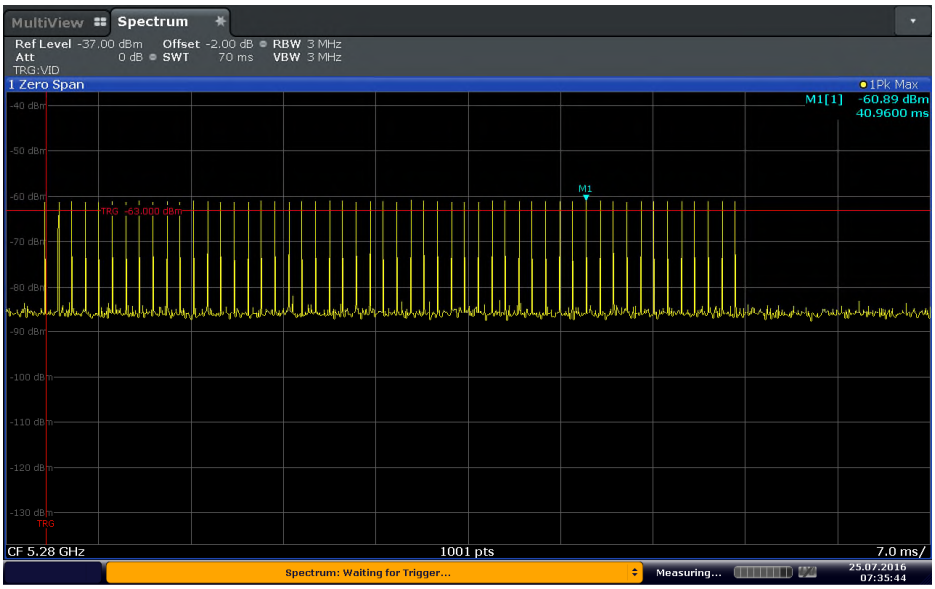
Radar Type 0 @ 5540 MHz



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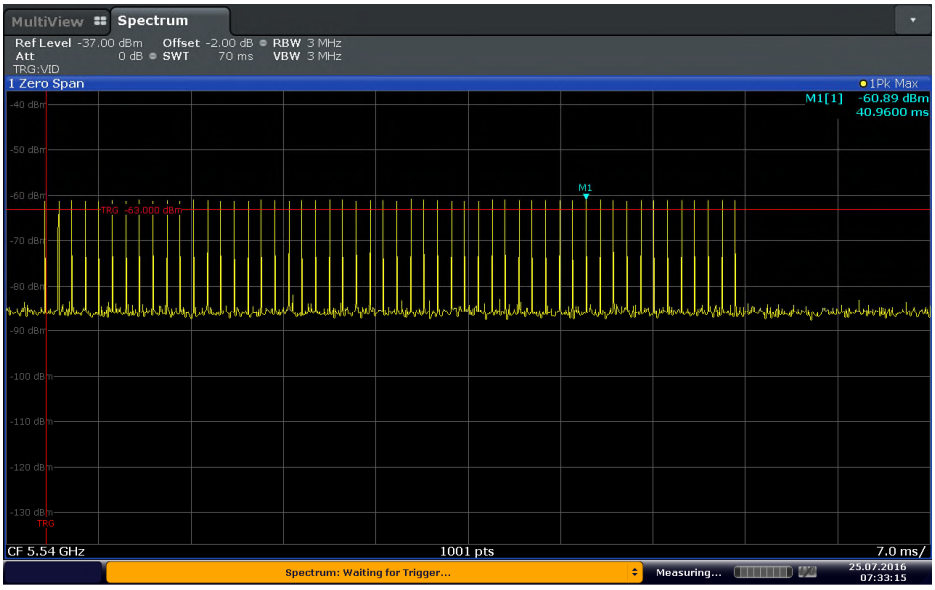
Radar Type 1 @ 5280 MHz



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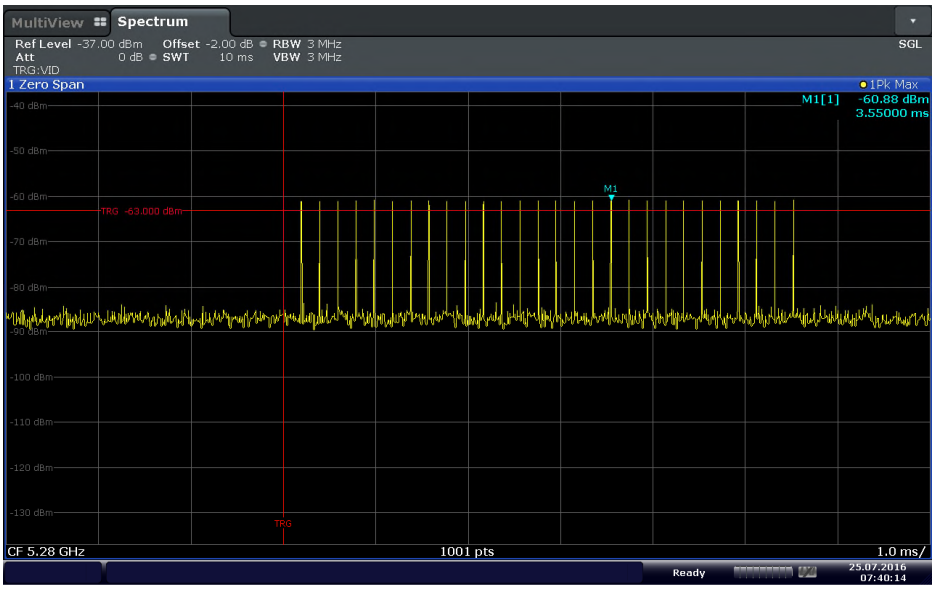
Radar Type 1 @ 5540 MHz



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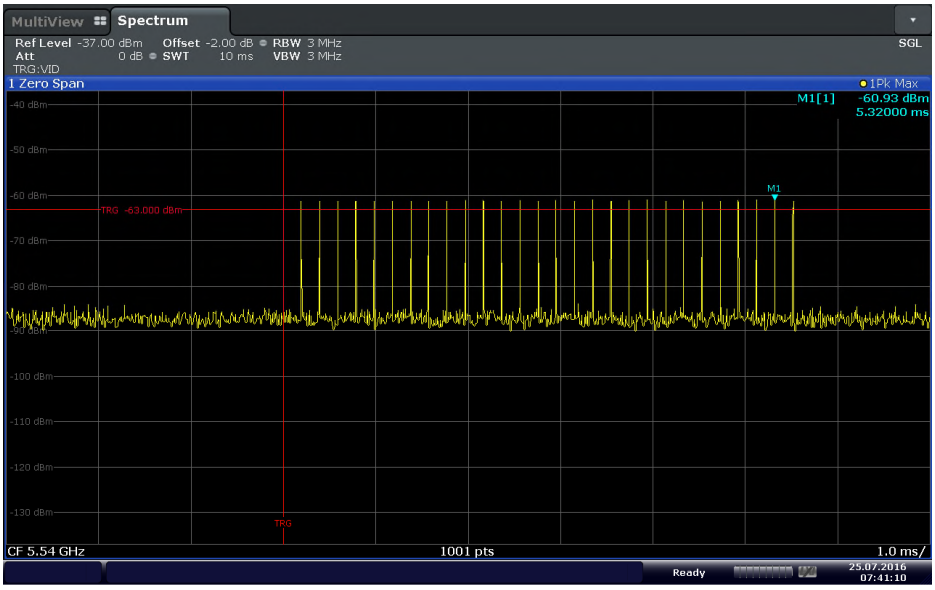
Radar Type 2 @ 5280 MHz



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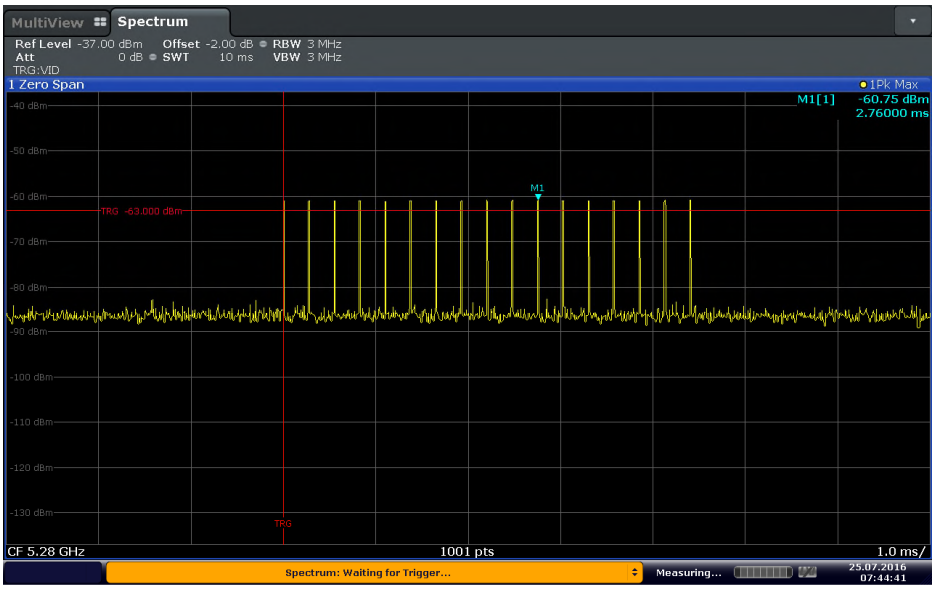
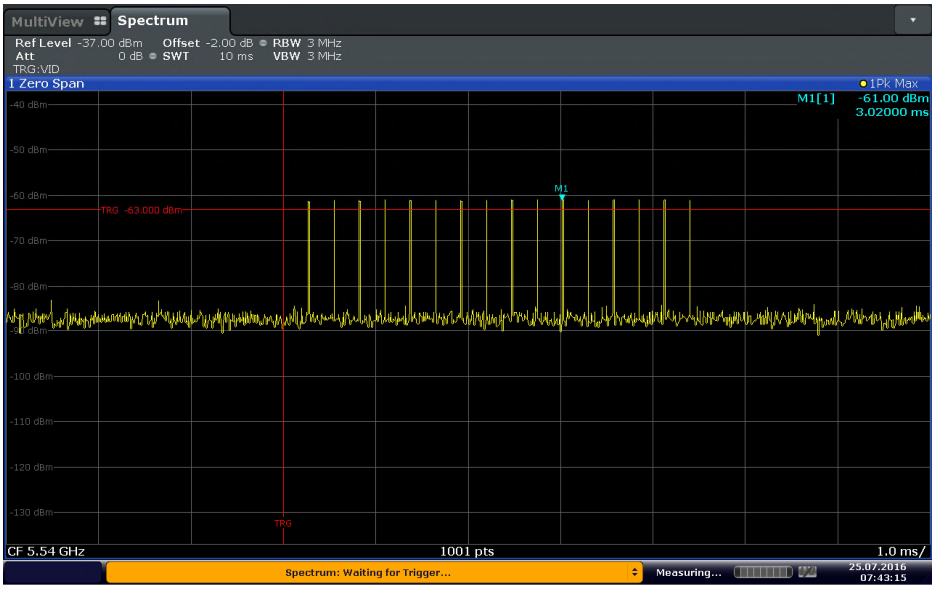
Radar Type 2 @ 5540 MHz



07:44:41 25.07.2016

Radar Type 3 @ 5280 MHz



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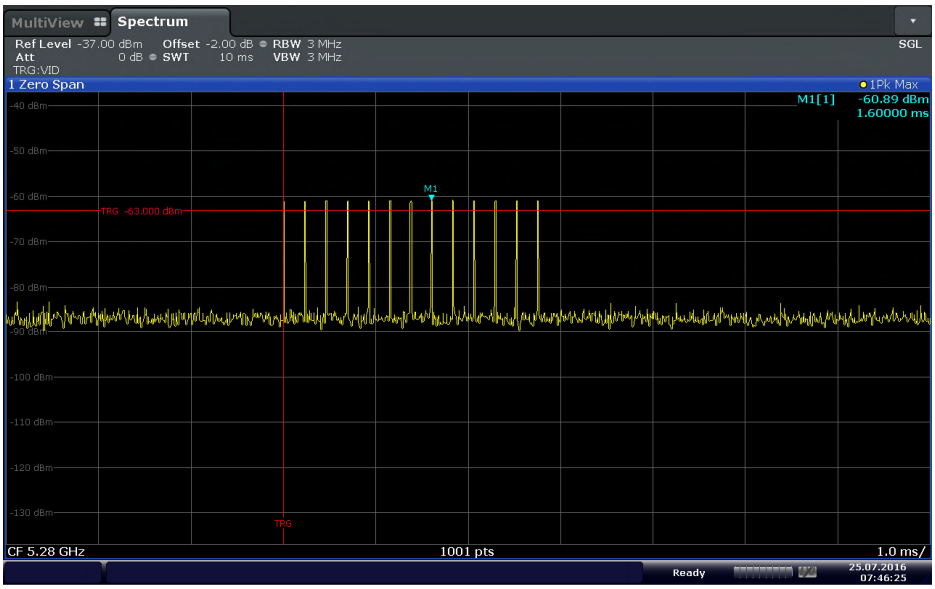
Radar Type 3 @ 5540 MHz



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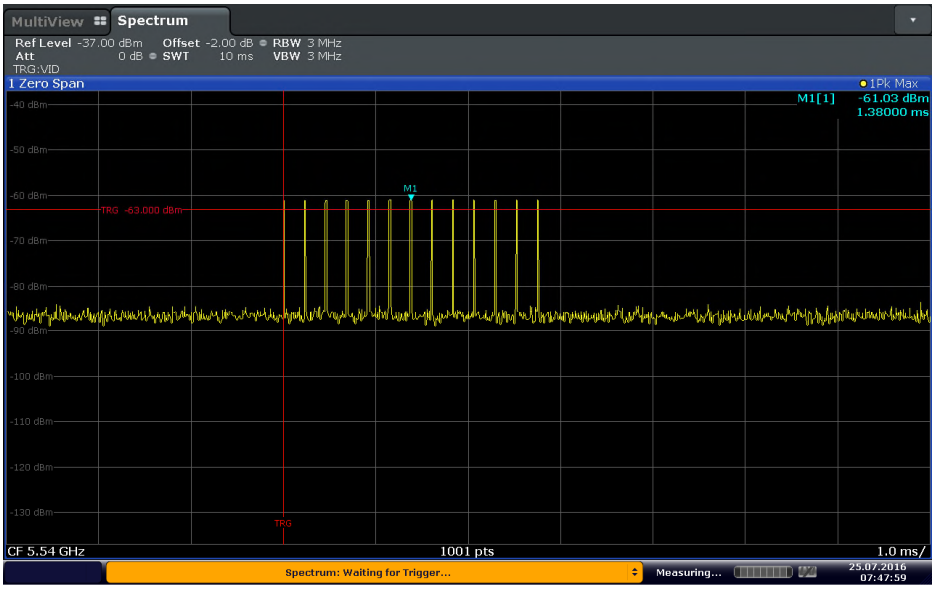
Radar Type 4 @ 5280 MHz



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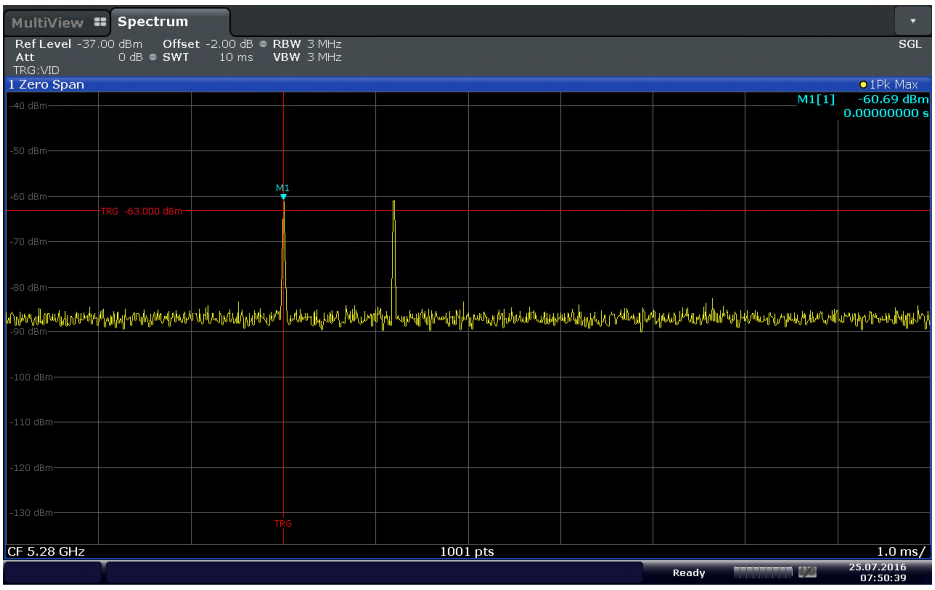
Radar Type 4 @ 5540 MHz



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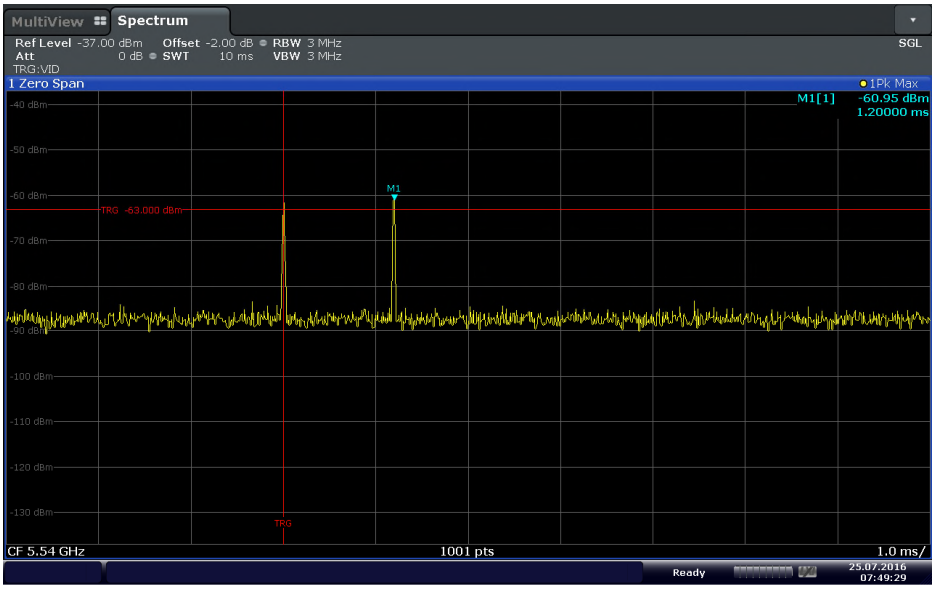
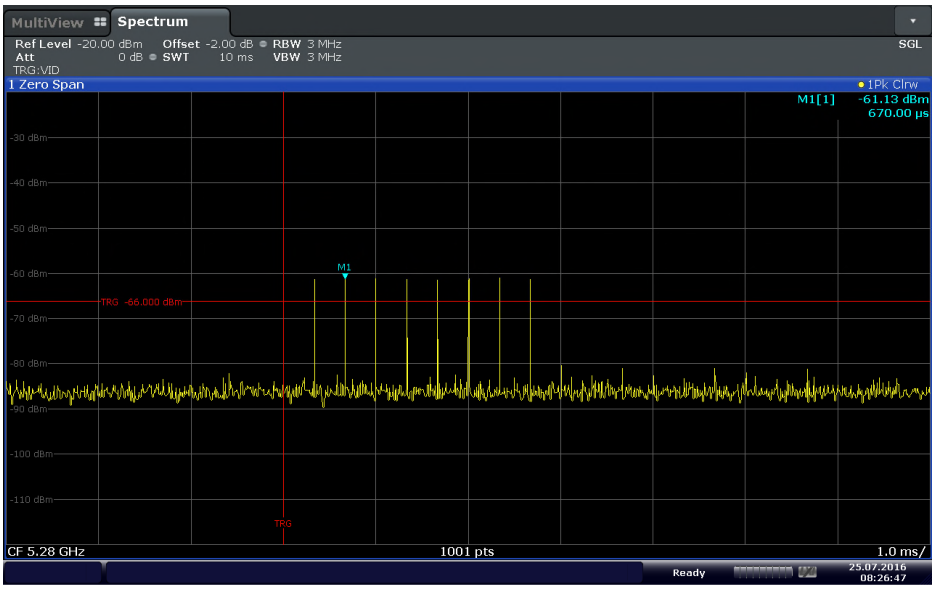
Radar Type 5 @ 5280 MHz (showing single burst with 1-3 pulses)



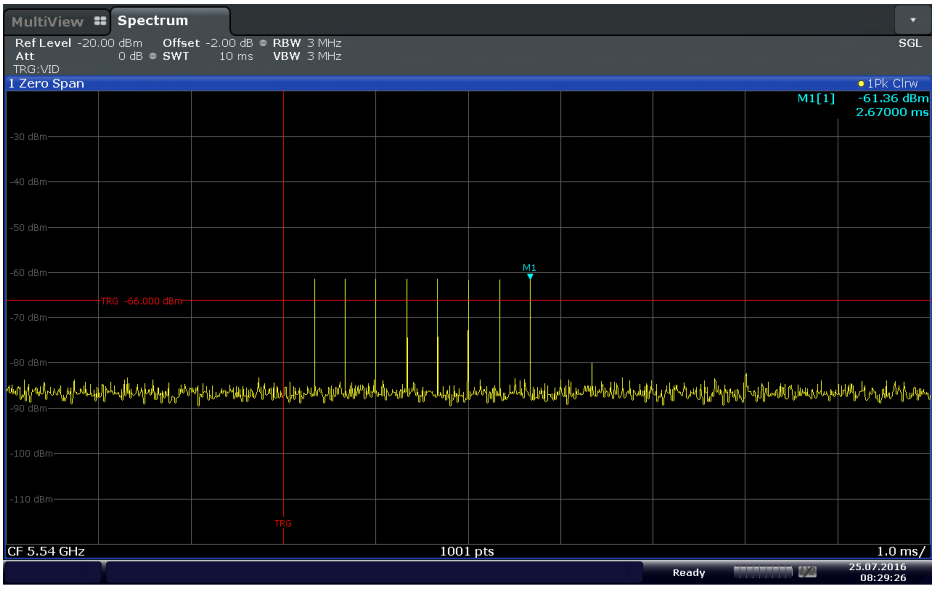
07:49:30 25.07.2016

Radar Type 5 @ 5540 MHz (showing single burst with 1-3 pulses)



08:26:48 25.07.2016

Radar Type 6 @ 5280 MHz (showing 9 pulses within the U-NII Detection Bandwidth)



08:29:27 25.07.2016

Radar Type 6 @ 5540 MHz (showing 9 pulses within the U-NII Detection Bandwidth)

2.1.10 Calibration Setup Photo

2.2 CHANNEL LOADING

2.2.1 Requirement

Clause 7.7 of KDB905462 D02 UNII DFS Compliance Procedures New Rules v02

2.2.2 Equipment Under Test and Modification State

Serial No: 900610000028 (NU) and 900610000028 (CU) **/** Test Configuration A and B

2.2.3 Date of Test/Initial of test personnel who performed the test

July 25, 2016/FSC

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Environmental Conditions

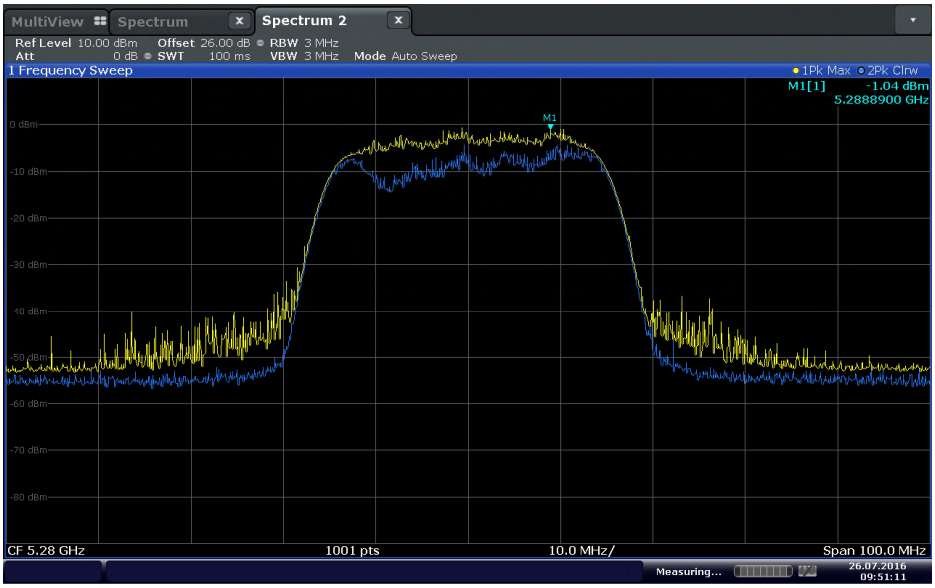
Calibration performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.6 °C
Relative Humidity	45.8 %
ATM Pressure	100.0 kPa

2.2.6 Channel Loading Verification

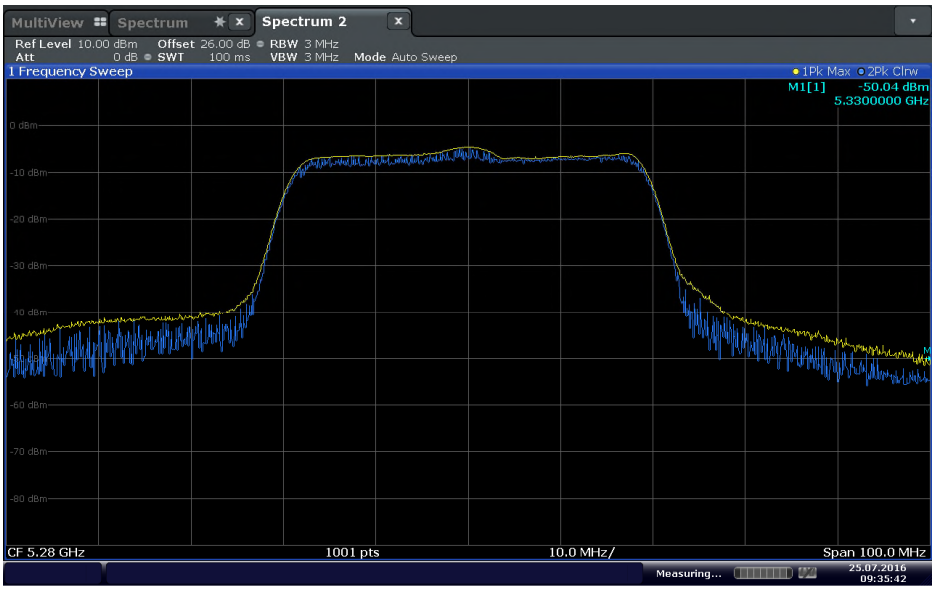
Channel Loading Description	Test Mode. NU and CU are connected over a full-duplex link. The manufacturer provided a test mode wherein a 100% duty cycle signal are transmitted on both the Low Band (NU) and High Band (CU).
Data Type	Mixed OFDM and muxed cellular signal
Timing Plots	See attached Channel Loading plots
Channel Loading Percentage	100%
Protocol	Proprietary communication protocol design

2.2.7 Channel Loading Plots



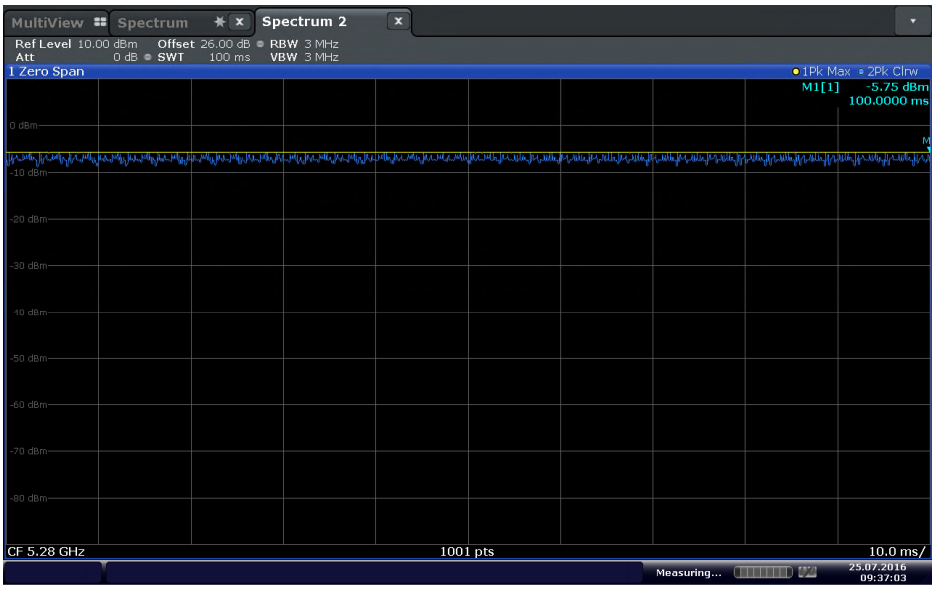
09:51:12 26.07.2016

30 MHz BW 5280 MHz



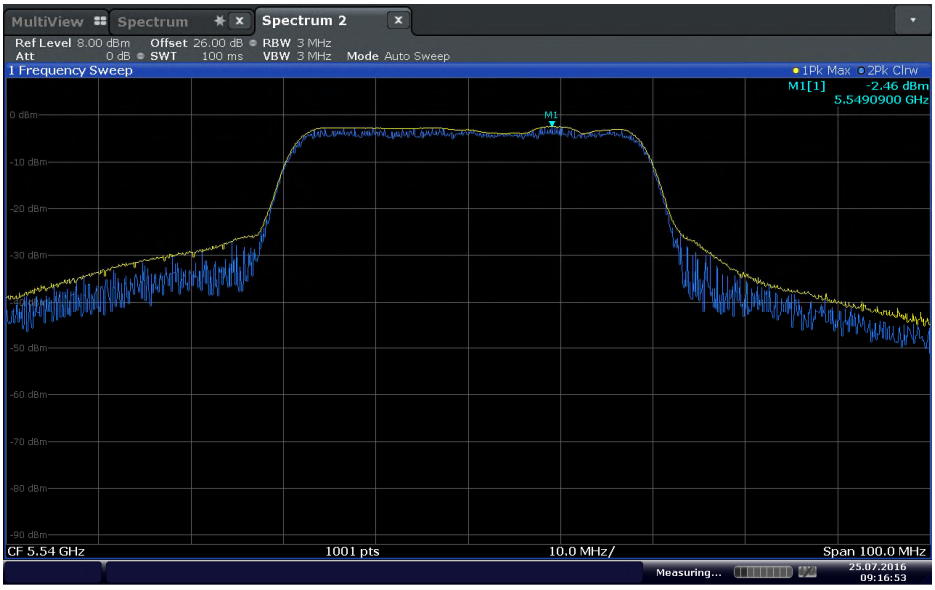
09:35:43 25.07.2016

40 MHz BW 5280 MHz



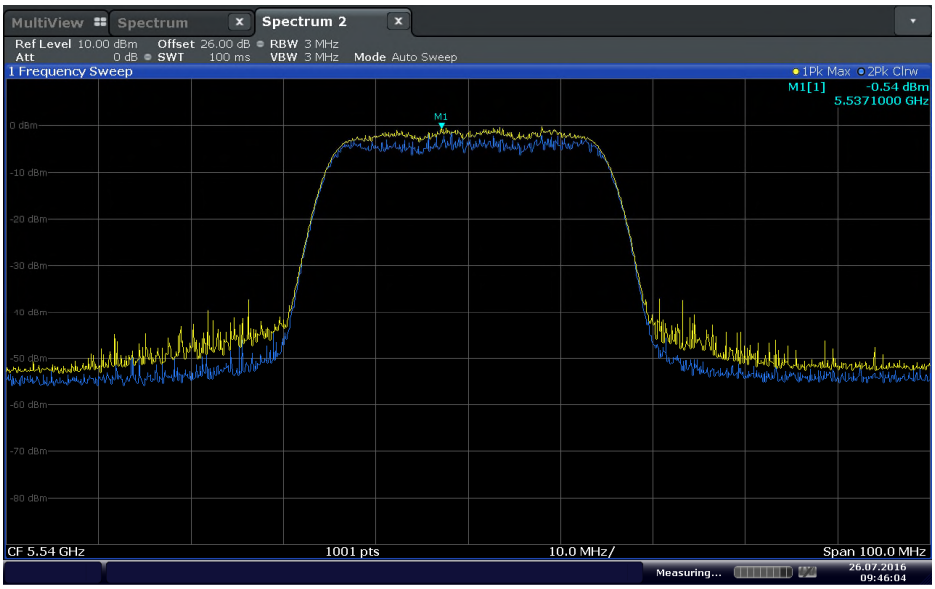
09:37:04 25.07.2016

40 MHz BW 5280 MHz showing 100% loading (Channel loading is the same between 30 MHz and 40MHz BW)



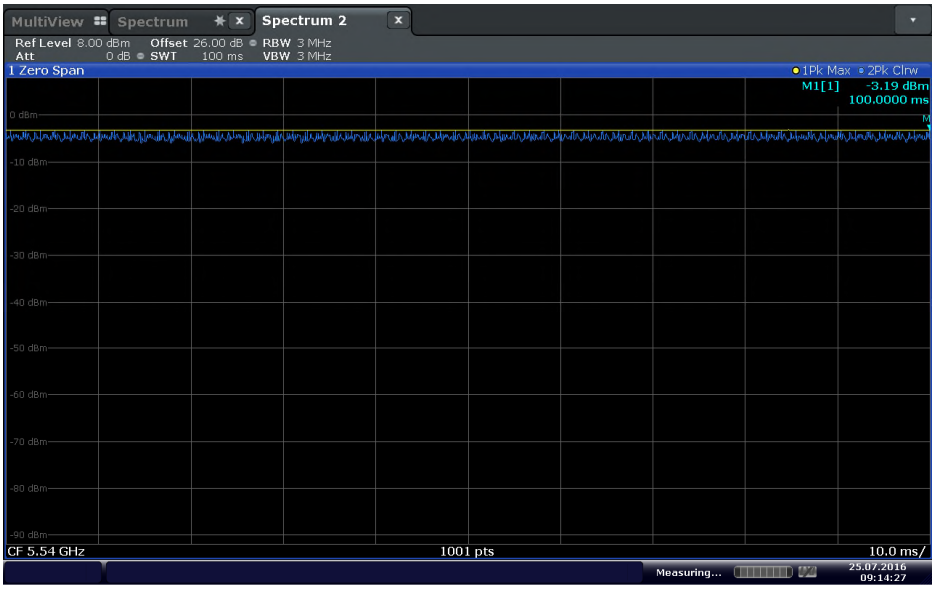
09:16:54 25.07.2016

40 MHz BW 5540 MHz



09:46:05 26.07.2016

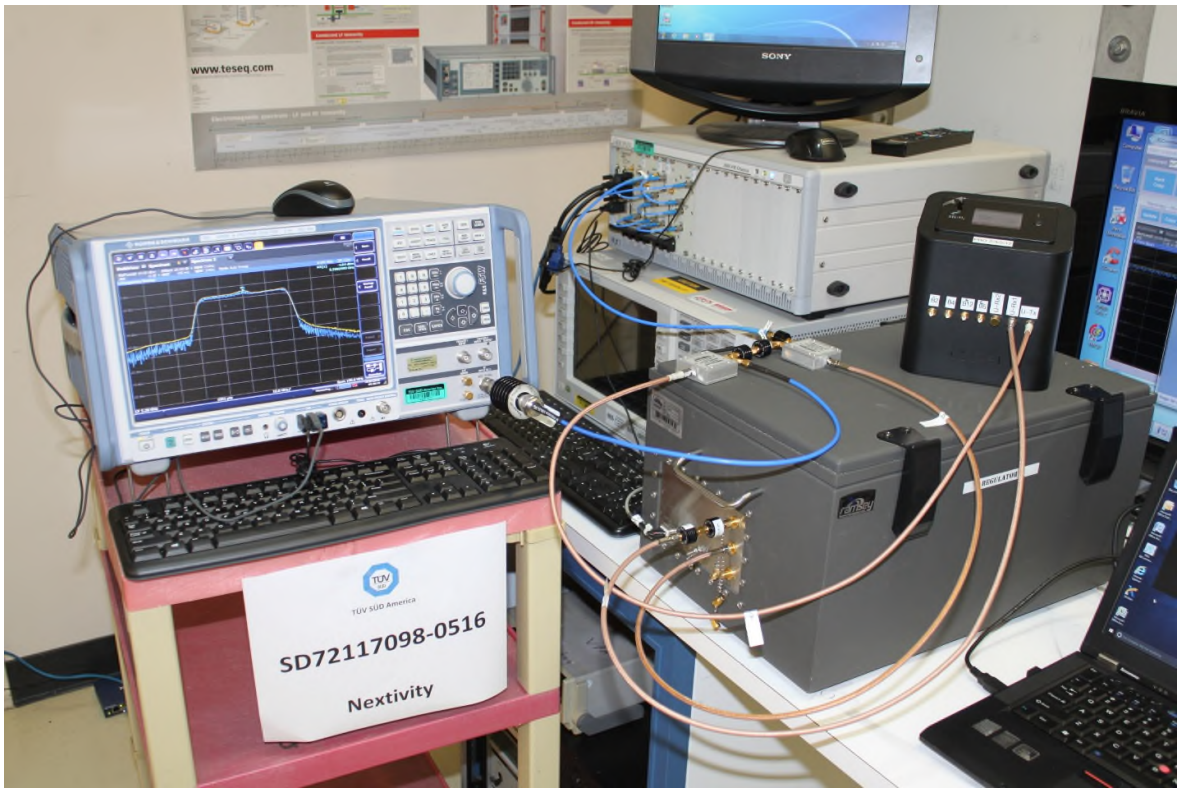
30 MHz BW 5540 MHz

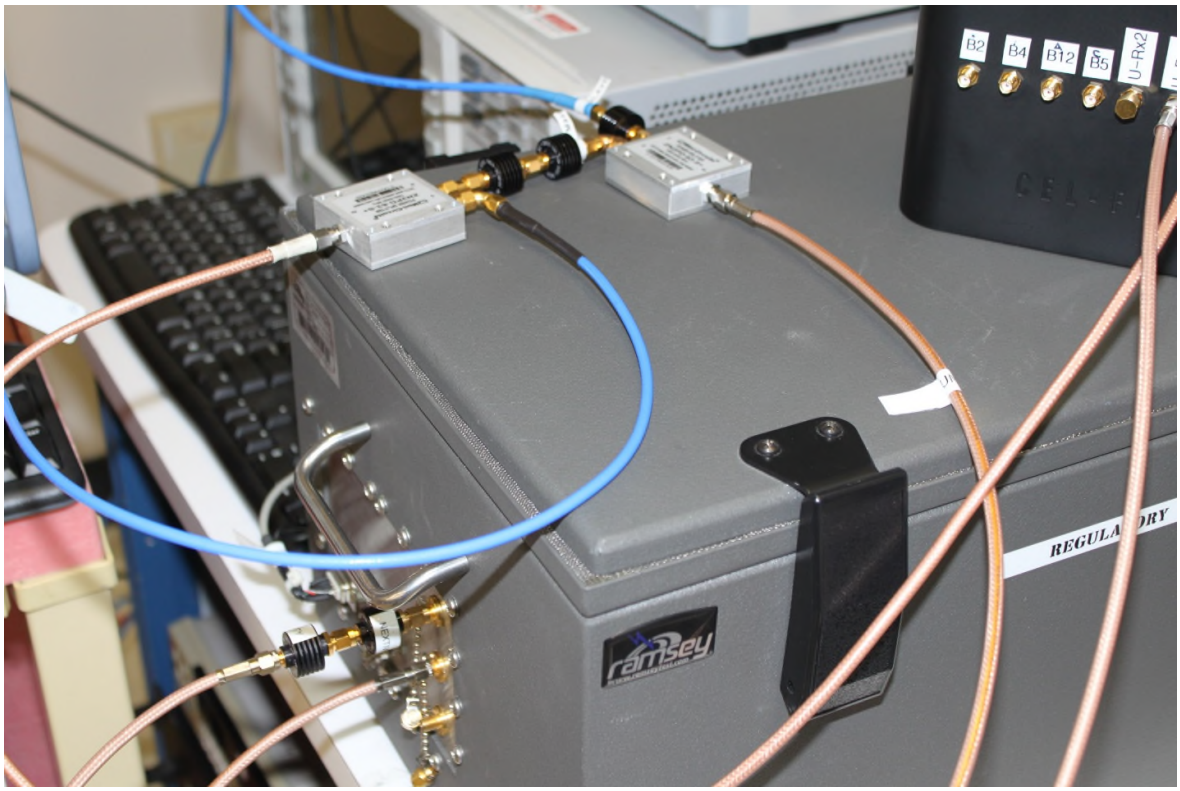


09:14:28 25.07.2016

40 MHz BW 5540 MHz showing 100% loading (Channel loading is identical between 30 MHz and 40MHz BW)

2.2.8 Test Setup Photo





2.3 U-NII DETECTION BANDWIDTH

2.3.1 Test Methodology

Clause 7.8.1 of KDB905462 D02 UNII DFS Compliance Procedures New Rules v02

2.3.2 Requirement

U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission bandwidth
Minimum percentage of detection per trial	90%
BW modes to be tested	All supported

2.3.3 Equipment Under Test and Modification State

Serial No: 900610000028 (NU) and 900610000028 (CU) **/** Test Configuration A and B

2.3.4 Date of Test/Initial of test personnel who performed the test

July 25 and August 31, 2016/FSC

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.6 - 26.7°C
Relative Humidity	45.8 - 51.7%
ATM Pressure	98.7 - 100.0 kPa

2.3.7 Additional Observations

- Once systems are synchronized, both NU and CU are Master Devices. Test Configuration A and B were used to verify U-NII detection bandwidth of both units.
- Frequencies verified were 5280 MHz for NU and 5540 MHz for CU.
- Both 30MHz and 40MHz BW modes were verified, however the detection bandwidth is identical for both modes.
- Fast and Freeze Up Mode was used for this test. This allows monitoring of Radar events while staying on the same channel. Radar events were observed using the DFS Conformance Testing application provided by the manufacturer.
- Radar Type 0 was used for this test with calibration level as per Section 2.1.8 of this test report.
- Test setup photos are identical with Section 2.2.8 of this test report.

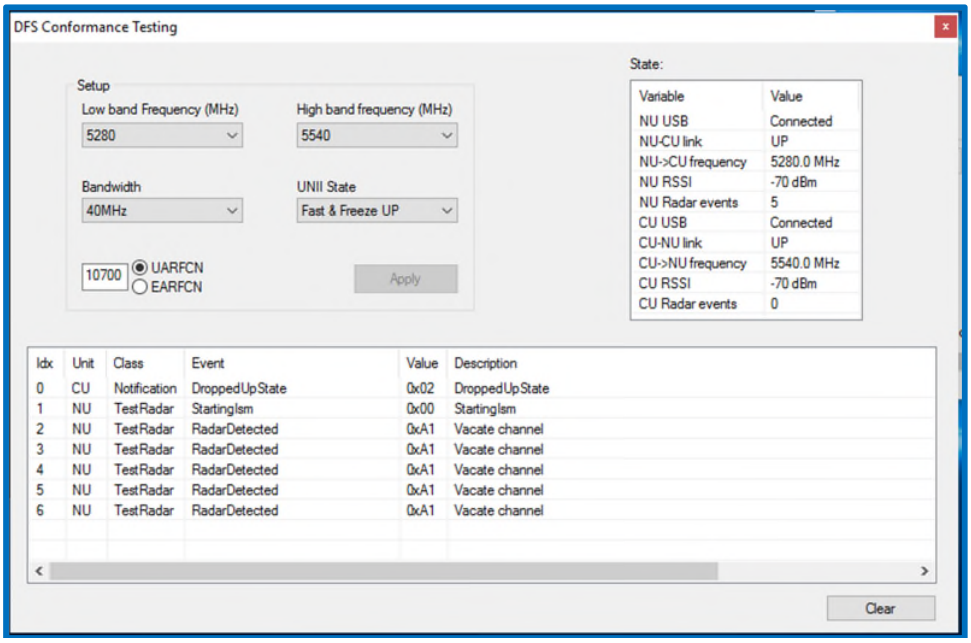
2.3.8 Test Results

CU 30MHz BW (5280 MHz RX 5540MHz TX)											
Radar Frequency (MHz)	DFS Detection Trials (1 = Detection, 0 = No Detection)										
	1	2	3	4	5	6	7	8	9	10	Detection Rate in % (Limit is 90%)
5261 (F_L)	1	1	1	1	1	1	1	1	1	1	100
5260	0	0	0	0	0	0	0	0	0	0	0
5265	1	1	1	1	1	1	1	1	1	1	100
5270	1	1	1	1	1	1	1	1	1	1	100
5275	1	1	1	1	1	1	1	1	1	1	100
5280	1	1	1	1	1	1	1	1	1	1	100
5285	1	1	1	1	1	1	1	1	1	1	100
5290	1	1	1	1	1	1	1	1	1	1	100
5295	1	1	1	1	1	1	1	1	1	1	100
5300	0	0	0	0	0	0	0	0	0	0	0
5299 (F_H)	1	1	1	1	1	1	1	1	1	1	100
U-NII Detection Bandwidth = FH – FL = 5299MHz – 5261MHz = 38 MHz											
EUT 30MHz 99% Bandwidth = 29.10 MHz (99% EBW for 5280MHz as reported from Test Report No. R95055 Industry Canada RSS-Gen Issue 3 / RSS-210 Issue 8 FCC Part 15, Subpart E for Model: P34-2/4/5/12 NU and P34-2/4/5/12CU (issued by NTS Silicon Valley, Fremont CA May 02, 2014))											
U-NII Detection Bandwidth Min. Limit (MHz): Minimum 100% of the U-NII 99% transmission power bandwidth. Since 29.10 MHz < 38 MHz, EUT complies.											

CU 40MHz BW (5280 MHz RX 5540MHz TX)											
Radar Frequency (MHz)	DFS Detection Trials (1 = Detection, 0 = No Detection)										
	1	2	3	4	5	6	7	8	9	10	Detection Rate in % (Limit is 90%)
5261 (F_L)	1	1	1	1	1	1	1	1	1	1	100
5260	0	0	0	0	0	0	0	0	0	0	0
5265	1	1	1	1	1	1	1	1	1	1	100
5270	1	1	1	1	1	1	1	1	1	1	100
5275	1	1	1	1	1	1	1	1	1	1	100
5280	1	1	1	1	1	1	1	1	1	1	100
5285	1	1	1	1	1	1	1	1	1	1	100
5290	1	1	1	1	1	1	1	1	1	1	100
5295	1	1	1	1	1	1	1	1	1	1	100
5300	0	0	0	0	0	0	0	0	0	0	0
5299 (F_H)	1	1	1	1	1	1	1	1	1	1	100
U-NII Detection Bandwidth = FH – FL = 5299MHz – 5261MHz = 38 MHz											
EUT 40MHz 99% Bandwidth = 37.08 MHz (99% EBW for 5280MHz as reported from Test Report No. R95055 Industry Canada RSS-Gen Issue 3 / RSS-210 Issue 8 FCC Part 15, Subpart E for Model: P34-2/4/5/12 NU and P34-2/4/5/12CU (issued by NTS Silicon Valley, Fremont CA May 02, 2014))											
U-NII Detection Bandwidth Min. Limit (MHz): Minimum 100% of the U-NII 99% transmission power bandwidth. Since 37.08 MHz < 38 MHz, EUT complies.											

NU 30MHz BW (5540 MHz RX 5280MHz TX)											
Radar Frequency (MHz)	DFS Detection Trials (1 = Detection, 0 = No Detection)										
	1	2	3	4	5	6	7	8	9	10	Detection Rate in % (Limit is 90%)
5521(F_L)	0	1	1	1	1	1	1	1	1	1	90
5520	0	0	0	0	0	0	0	0	0	0	0
5525	1	1	1	1	1	1	1	1	1	1	100
5530	1	1	1	1	1	1	1	1	1	1	100
5535	1	1	1	1	1	1	1	1	1	1	100
5540	1	1	1	1	1	1	1	1	1	1	100
5545	1	1	1	1	1	1	1	1	1	1	100
5550	1	1	1	1	1	1	1	1	1	1	100
5555	1	1	1	1	1	1	1	1	1	1	100
5560	0	0	0	0	0	0	0	0	0	0	0
5559(F_H)	1	1	1	1	1	1	1	1	1	1	100
U-NII Detection Bandwidth = FH – FL = 5559MHz – 5521MHz = 38 MHz											
EUT 30MHz 99% Bandwidth = 29.10 MHz (99% EBW for representative channel in U-NII-2C band (5525MHz) as reported from Test Report No. R95055 Industry Canada RSS-Gen Issue 3 / RSS-210 Issue 8 FCC Part 15, Subpart E for Model: P34-2/4/5/12 NU and P34-2/4/5/12CU (issued by NTS Silicon Valley, Fremont CA May 02, 2014))											
U-NII Detection Bandwidth Min. Limit (MHz): Minimum 100% of the U-NII 99% transmission power bandwidth. Since 29.09 MHz < 38 MHz, EUT complies.											

NU 40MHz BW (5540 MHz RX 5280MHz TX)											
Radar Frequency (MHz)	DFS Detection Trials (1 = Detection, 0 = No Detection)										
	1	2	3	4	5	6	7	8	9	10	Detection Rate in % (Limit is 90%)
5521(F_L)	0	1	1	1	1	1	1	1	1	1	90
5520	0	0	0	0	0	0	0	0	0	0	0
5525	1	1	1	1	1	1	1	1	1	1	100
5530	1	1	1	1	1	1	1	1	1	1	100
5535	1	1	1	1	1	1	1	1	1	1	100
5540	1	1	1	1	1	1	1	1	1	1	100
5545	1	1	1	1	1	1	1	1	1	1	100
5550	1	1	1	1	1	1	1	1	1	1	100
5555	1	1	1	1	1	1	1	1	1	1	100
5560	0	0	0	0	0	0	0	0	0	0	0
5559(F_H)	1	1	1	1	1	1	1	1	1	1	100
U-NII Detection Bandwidth = FH – FL = 5559MHz – 5521MHz = 38 MHz											
EUT 40MHz 99% Bandwidth = 37.20 MHz (99% EBW for representative channel in U-NII-2C band (5525MHz) as reported from Test Report No. R95055 Industry Canada RSS-Gen Issue 3 / RSS-210 Issue 8 FCC Part 15, Subpart E for Model: P34-2/4/5/12 NU and P34-2/4/5/12CU (issued by NTS Silicon Valley, Fremont CA May 02, 2014))											
U-NII Detection Bandwidth Min. Limit (MHz): Minimum 100% of the U-NII 99% transmission power bandwidth. Since 37.20 MHz < 38 MHz, EUT complies.											



Sample window of DFS Conformance Testing application showing detected Radar events on NU (5280 MHz)

2.4 INITIAL CHANNEL AVAILABILITY CHECK TIME

2.4.1 Specification Reference

Part 15 Subpart E §15.407(h)(2)(ii)

2.4.2 Standard Applicable

(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.

2.4.3 Test Methodology

Clause 7.8.2.1 of 905462 D02 UNII DFS Compliance Procedures New Rules v02

2.4.4 Equipment Under Test and Modification State

Serial No: 900610000028 (NU) and 900610000028 (CU) **/** Test Configuration E and F

2.4.5 Date of Test/Initial of test personnel who performed the test

July 26, 2016 / FSC

2.4.6 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.7 Environmental Conditions

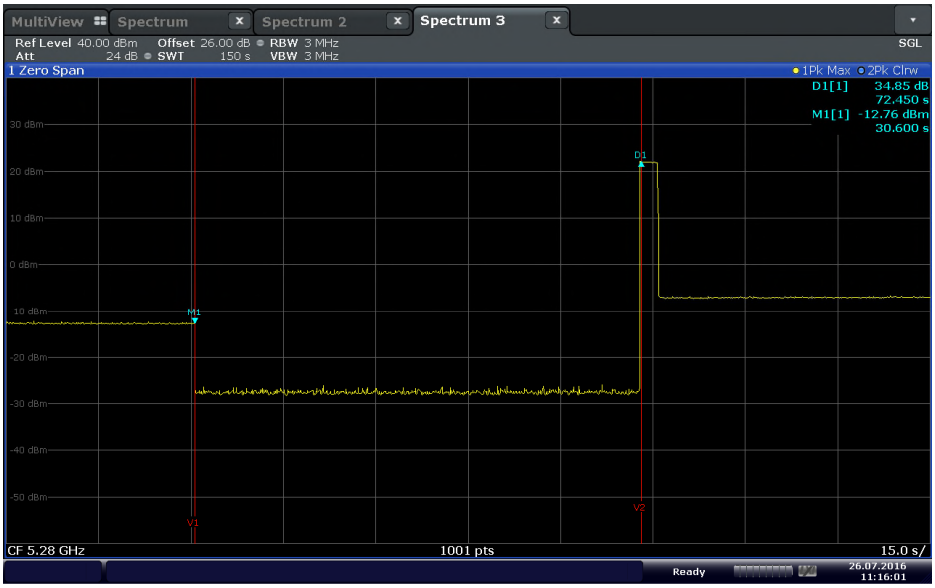
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	27.6 °C
Relative Humidity	43.8 %
ATM Pressure	98.8 kPa

2.4.8 Additional Observations

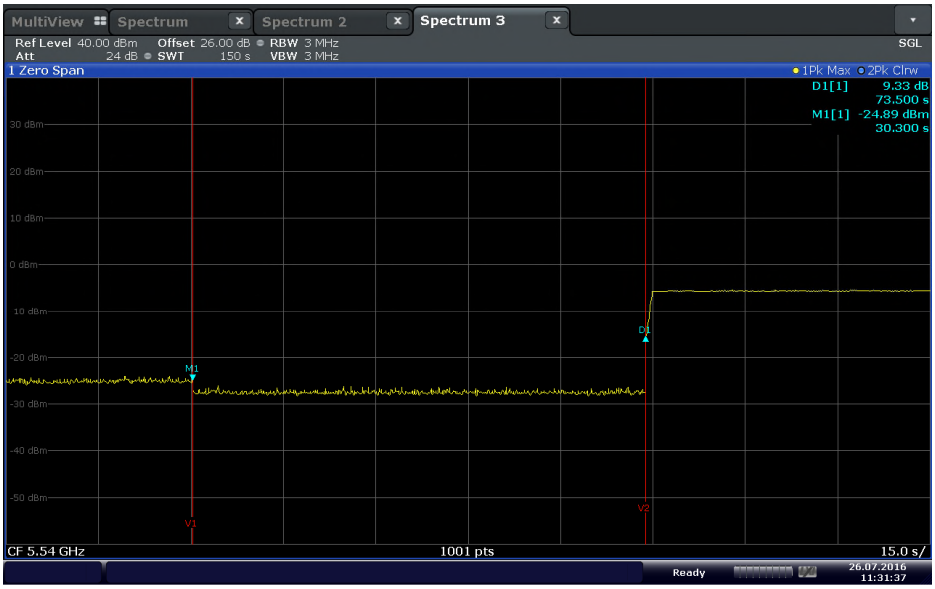
- 5280 MHz (NU) and 5540 MHz (CU) verified.
- EUT in Auto Channel Select Mode. This allows normal CAC and normal operation while using DFS test mode.
- RBW and VBW set to 3MHz while sweep time was set to 150 seconds.
- In DFS test mode, the EUT normally retains the last setting. In order to accurately measure the initial channel availability time, the EUT was initially set to Fast Up mode on a channel ± two (2) channel frequency away from 5280 MHz and/or 5540 MHz. Once Auto Channel Select mode is initiated on these wanted frequencies, normal CAC should commence with noticeable dip on the spectrum. This is the start of CAC and will be marked as M1.
- D1 on the test plots is the time the EUT started transmitting on the channel. The delta between M1 and D1 should be greater than 60 seconds.

2.4.9 Test Results Plots



11:16:01 26.07.2016

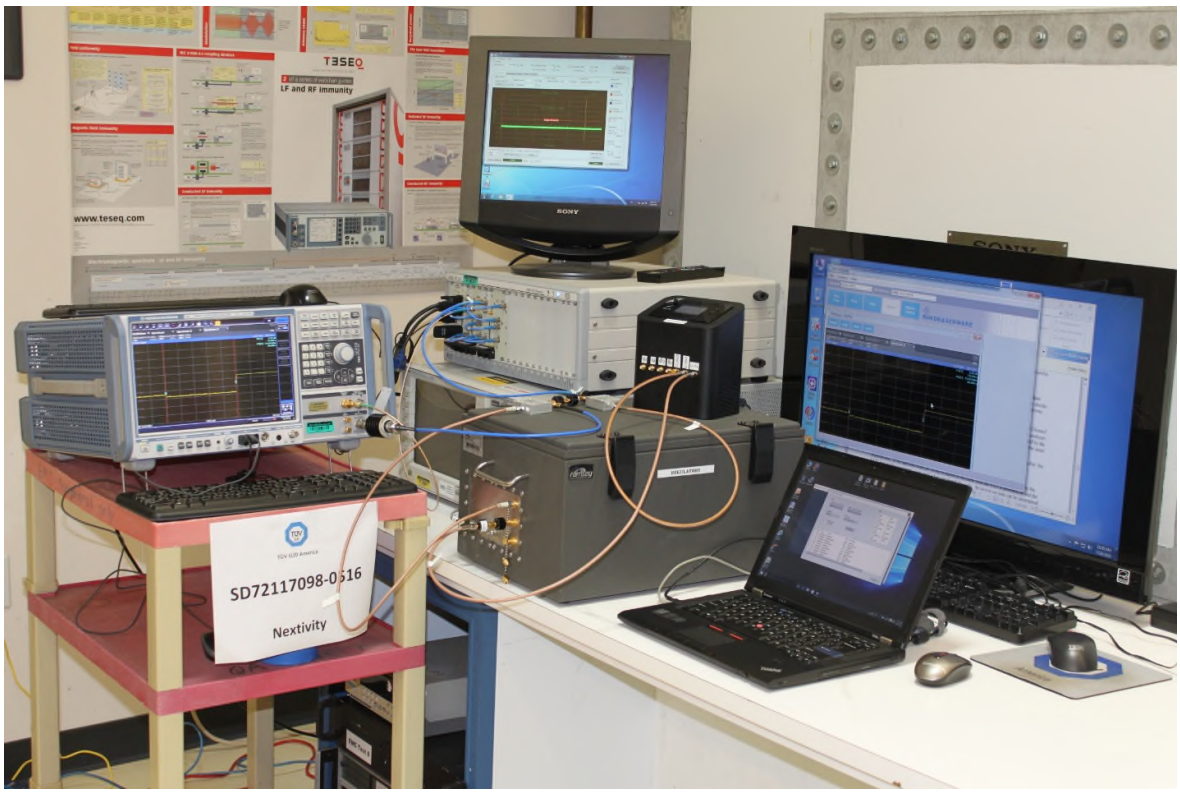
Initial Channel Availability Check Time of 72.450 seconds for Low Band. EUT complies.



11:31:38 26.07.2016

Initial Channel Availability Check Time of 73.5 seconds for High Band. EUT complies.

2.4.10 Test Setup Photo



2.5 RADAR BURST AT THE BEGINNING OF THE CHANNNEL AVAILABILITY CHECK TIME

2.5.1 Specification Reference

Part 15 Subpart E §15.407(h)(2)(ii)

2.5.2 Standard Applicable

(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.

2.5.3 Test Methodology

Clause 7.8.2.2 of 905462 D02 UNII DFS Compliance Procedures New Rules v02

2.5.4 Equipment Under Test and Modification State

Serial No: 900610000028 (NU) and 900610000028 (CU) **/** Test Configuration G

2.5.5 Date of Test/Initial of test personnel who performed the test

July 26, 2016 / FSC

2.5.6 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.7 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

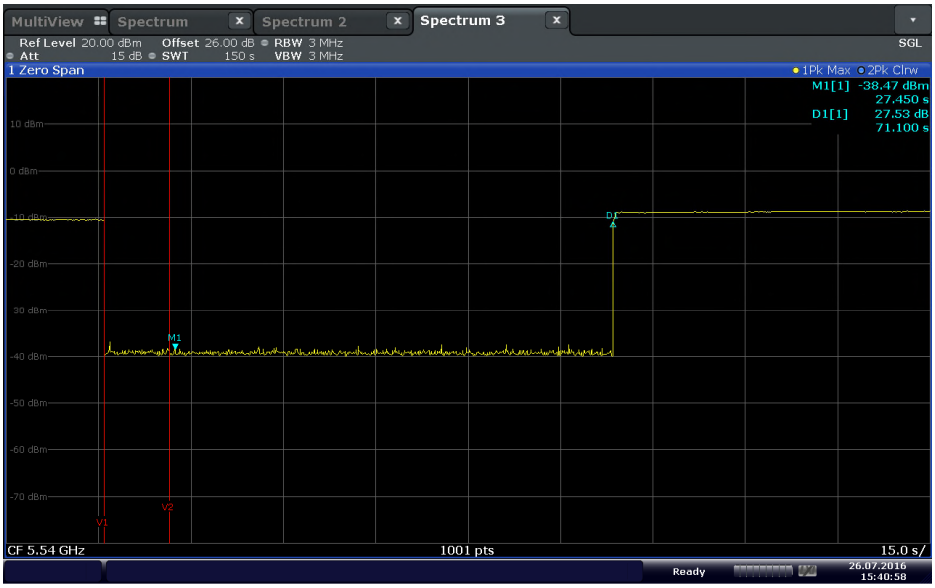
Ambient Temperature	27.6 °C
Relative Humidity	43.8 %
ATM Pressure	98.8 kPa

2.5.8 Additional Observations

- Test mode allows injection of Low Band (LB) Radar signal to the TX RF port of NU during normal CAC (Test Configuration Diagram C Section 1.4.2 of this test report).
- NU is the Master for both LB and HB before CU comes on-line. NU will do HB ISM and detect all Radars.
- A LB Type 0 Radar was injected on the TX port of NU at the beginning of CAC time (within a 6 seconds window).
- V1 on the test plots indicates when Auto Channel Select Mode was activated.
- V2 correspond to when CAC started ("State" window on DFS Conformance Testing application started to populate with information, from blank screen). While M1 is when the Radar burst was injected (within 6 seconds of CAC.

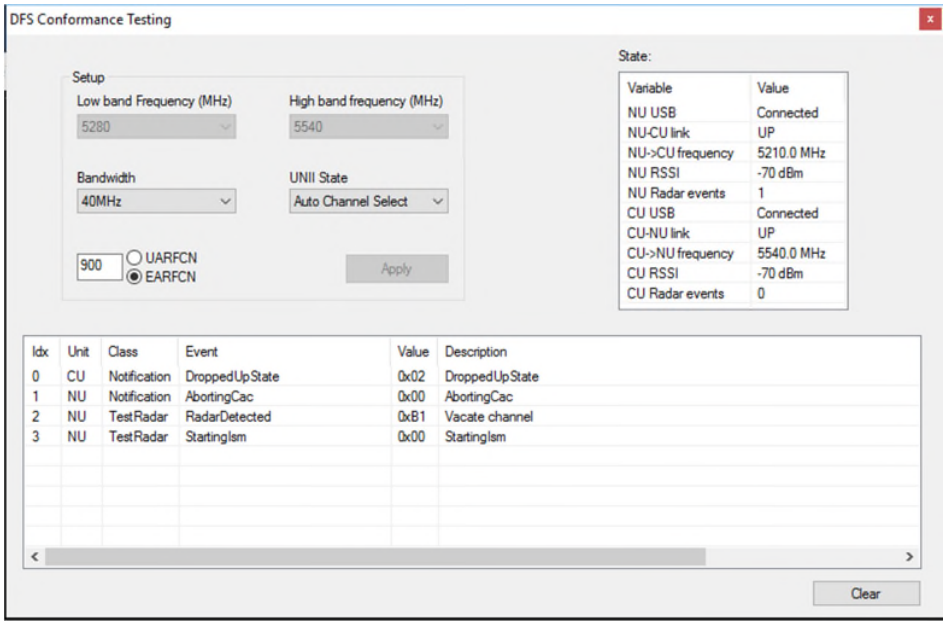
- The delta between the two markers indicates the time CU started transmitting after CAC. At the same time NU started transmitting on a different channel (from 5280MHz to 5210MHz).

2.5.9 Test Results Plots



15:40:58 26.07.2016

Plot showing channel activity at CU TX port while a Low Band Radar burst was injected at NU TX port at the beginning of CAC time



Configuration window showing original channels, radar detection during CAC time and alternative channel (5210 MHz) the NU moved to after detecting the 5280 MHz Type 0 Radar

2.5.10 Test Setup Photo

2.6 RADAR BURST AT THE END OF THE CHANNNEL AVAILABILITY CHECK TIME

2.6.1 Specification Reference

Part 15 Subpart E §15.407(h)(2)(ii)

2.6.2 Standard Applicable

(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.

2.6.3 Test Methodology

Clause 7.8.2.3 of 905462 D02 UNII DFS Compliance Procedures New Rules v02

2.6.4 Equipment Under Test and Modification State

Serial No: 900610000028 (NU) and 900610000028 (CU) **/** Test Configuration E

2.6.5 Date of Test/Initial of test personnel who performed the test

July 27, 2016 / FSC

2.6.6 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.7 Environmental Conditions

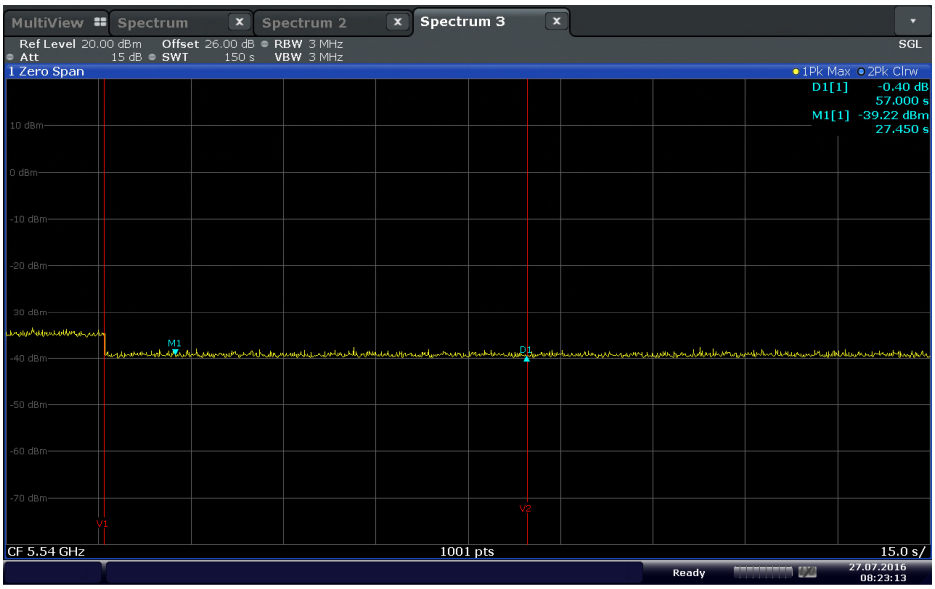
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	27.7 °C
Relative Humidity	47.7 %
ATM Pressure	98.9 kPa

2.6.8 Additional Observations

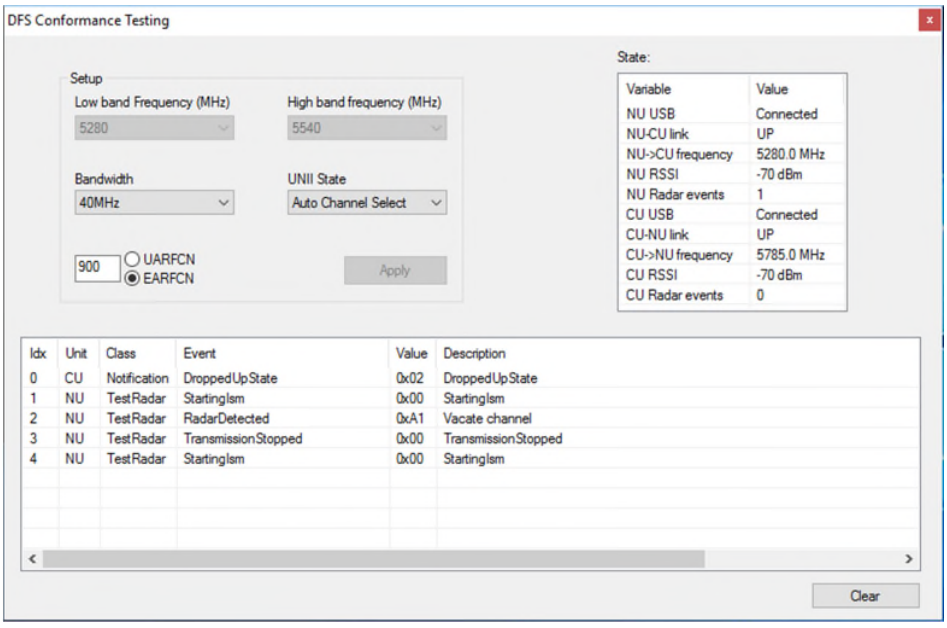
- Test Configuration E and Test Setup Configuration A was used for this test. Type 0 Radar was injected at the end of CAC time (57 seconds after the start of CAC) at the input of NU. HB was monitored for this test.
- V1 on the test plot is identical to T_0 of the test procedure. M1 on the other hand is identical to T_1.
- V2 and D1 correspond to the application of a single Type 0 Radar Burst (54 seconds after T_1 ,applied within 6 seconds, 57 seconds in this case).
- Radar Burst was detected at this time and the EUT moved from 5540MHz to 5785 MHz and the whole process of CAC was repeated. No activity was recorded on the original channel (5540 MHz).
- Test setup photos are identical with Section 2.2.8 of this test report.

2.6.9 Test Results Plots



08:23:14 27.07.2016

Plot showing channel activity at NU TX port while a High Band Radar burst was injected at NU RX port at the end of CAC time



Configuration window showing original channels, radar detection at the end of CAC time and the alternative channel (5785 MHz) the CU moved to after NU detected the 5540 MHz Type 0 Radar

2.7 IN-SERVICE MONITORING FOR CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

2.7.1 Specification Reference

Part 15 Subpart E §15.407(h)(2)(iii)

2.7.2 Standard Applicable

(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.

2.7.3 Limits

Channel Closing Transmission Time	200 ms
Channel Move Time	within 10 seconds

2.7.4 Test Methodology

Clause 7.8.3 of 905462 D02 UNII DFS Compliance Procedures New Rules v02

2.7.5 Equipment Under Test and Modification State

Serial No: 900610000028 (NU) and 900610000028 (CU) **/** Test Configuration C and D

2.7.6 Date of Test/Initial of test personnel who performed the test

July 27, 2016 / FSC

2.7.7 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.8 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	27.7 °C
Relative Humidity	47.7 %
ATM Pressure	98.9 kPa

2.7.9 Additional Observations

- Test procedure is per Section 7.8.3 of KDB905462 D02 UNII DFS Compliance Procedures New Rules v02.
- All requirements from Section 2.1 (Radar Type 0 calibration) and Section 2.2 (Channel Loading) of this test report were met.

- Using Test Configuration C, the NU will be the Master and CU is the Slave device. Test Configuration D on the other hand will be the opposite wherein the CU is the Master while NU is the Slave.
- Using the Aeroflex DFS test system signal generator, a radar type 0 test signal was injected into the configured Master device antenna port on the operating channel. The Aeroflex DFS test system signal analyser measurement sweep was triggered upon the radar injection to the configured Master device and the resultant data from the Master device and Slave device was collected (response to radar burst injection).
- A level detection threshold was set on the Aeroflex DFS test system signal analyzer, such that all signals from the EUT were assessed using the Aeroflex DFS test system and both the channel closing transmission time and channel move time were measured and recorded.
- The markers on the captured trace data correspond to the following time periods:

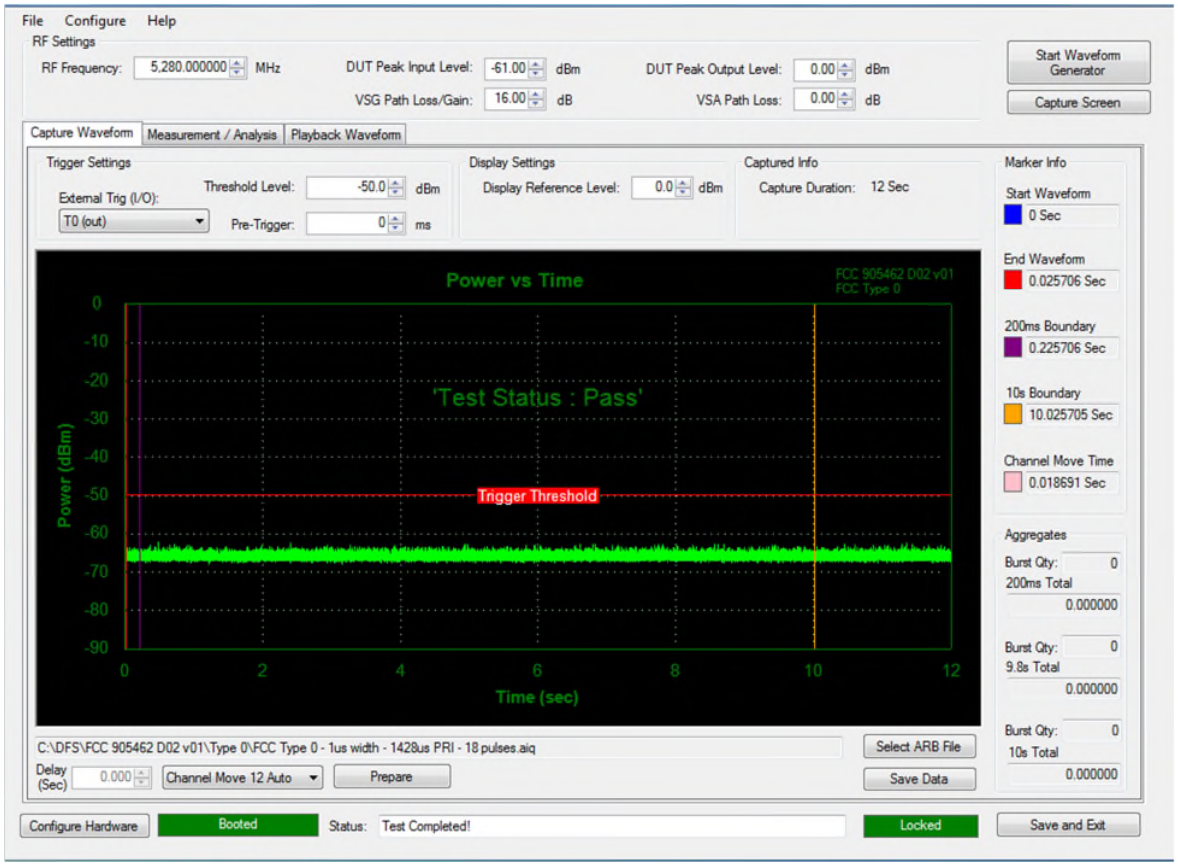
  Red - End of the injected radar burst: Time T1
  Purple - End of the Channel Closing Transmission Time: Time T1 + 200 ms
  Yellow - End of the Channel Move Time: T1 + 10 seconds

- Only the widest BW mode (40MHz) tested.
- Since >60dB of attenuation needs to be in between the two units, the injected Radar and the channel activity can't be shown on the same plot (separate injection and measurement points).

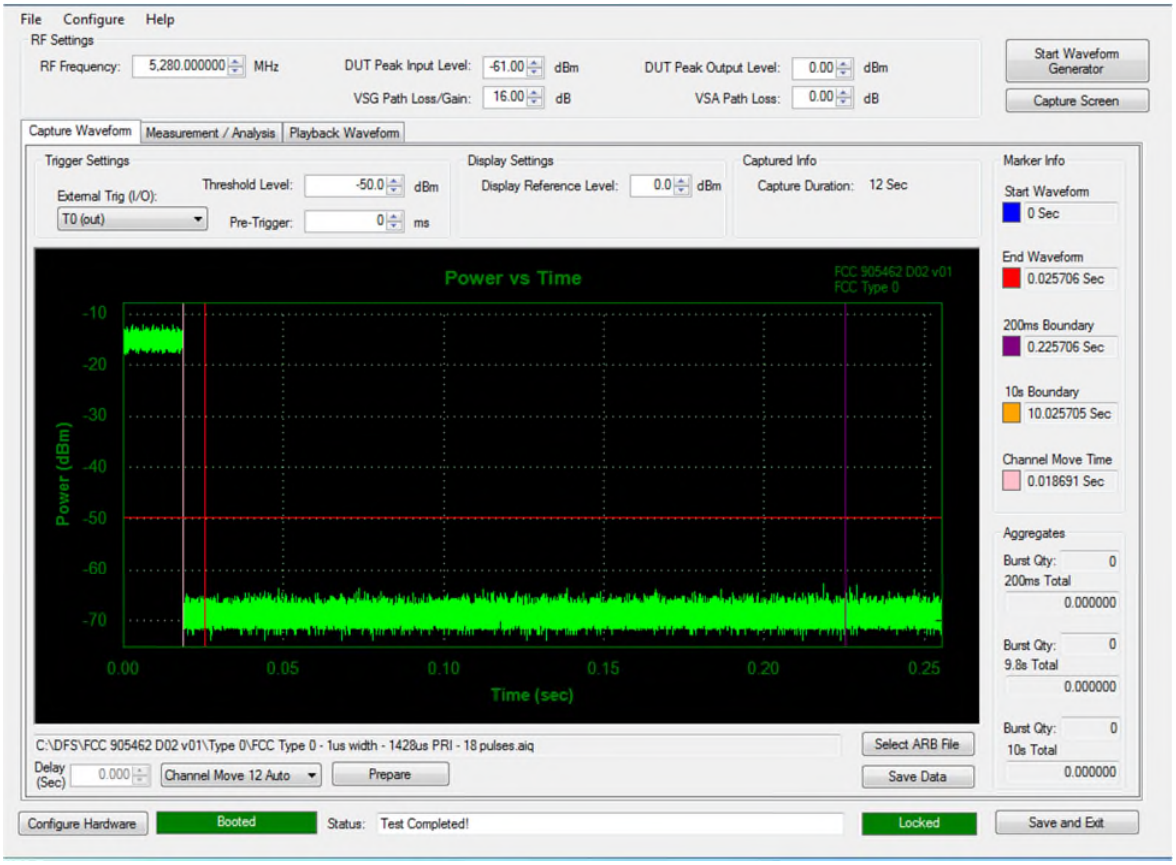
2.7.10 Test Results

NU as the Master (40MHz BW @ 5280MHz) Complies	
Channel Move Time	18.691 ms
Channel Closing Time (Aggregate Time During 200ms)	No activity from end of radar burst to 200ms
Channel Closing Time (Aggregate Time +200ms to 10s)	No activity from 200ms to 10s
Channel Closing Time (Aggregate Time During 10s)	Not applicable since no activity from end of radar burst to 10s
CU as the Master (40MHz BW @ 5540 MHz) Complies	
Channel Move Time	178.396 ms
Channel Closing Time (Aggregate Time During 200ms)	152.690 ms
Channel Closing Time (Aggregate Time +200ms to 10s)	No activity from 200ms to 10s
Channel Closing Time (Aggregate Time During 10s)	152.690 ms

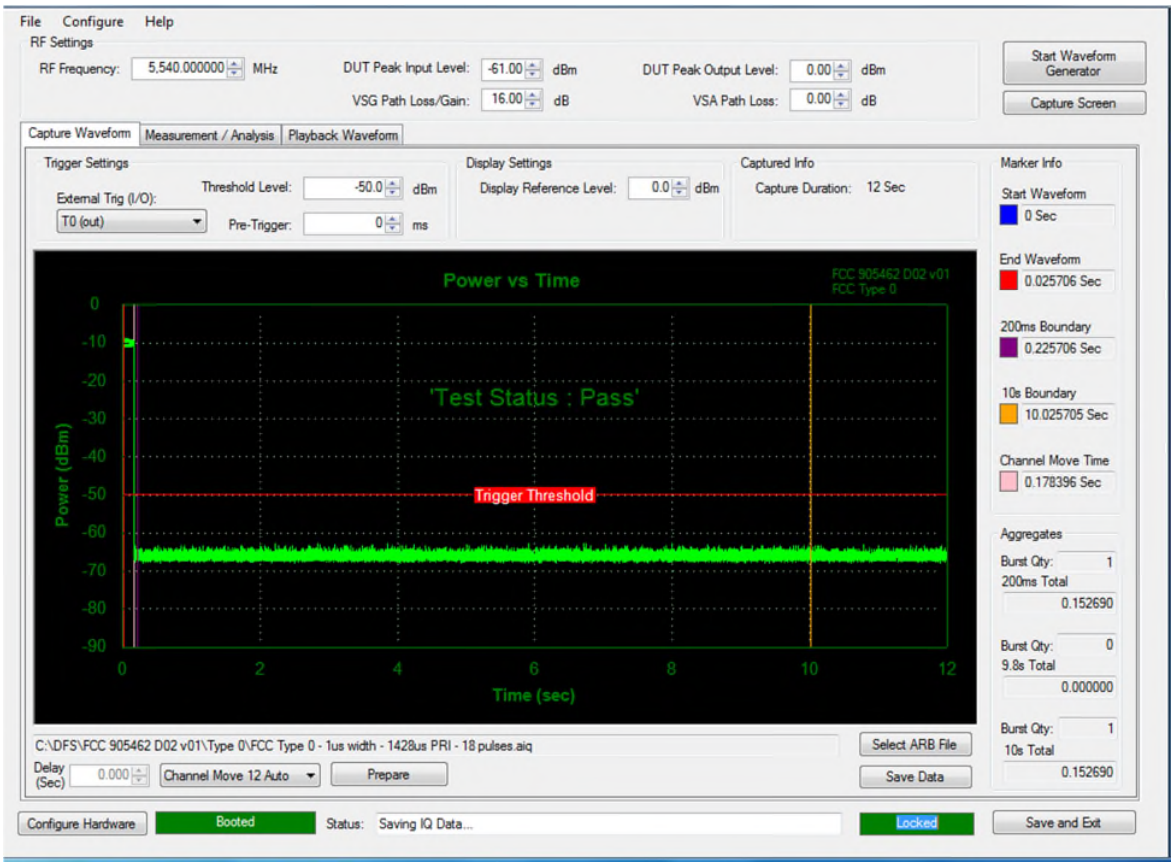
2.7.11 Test Results Plots



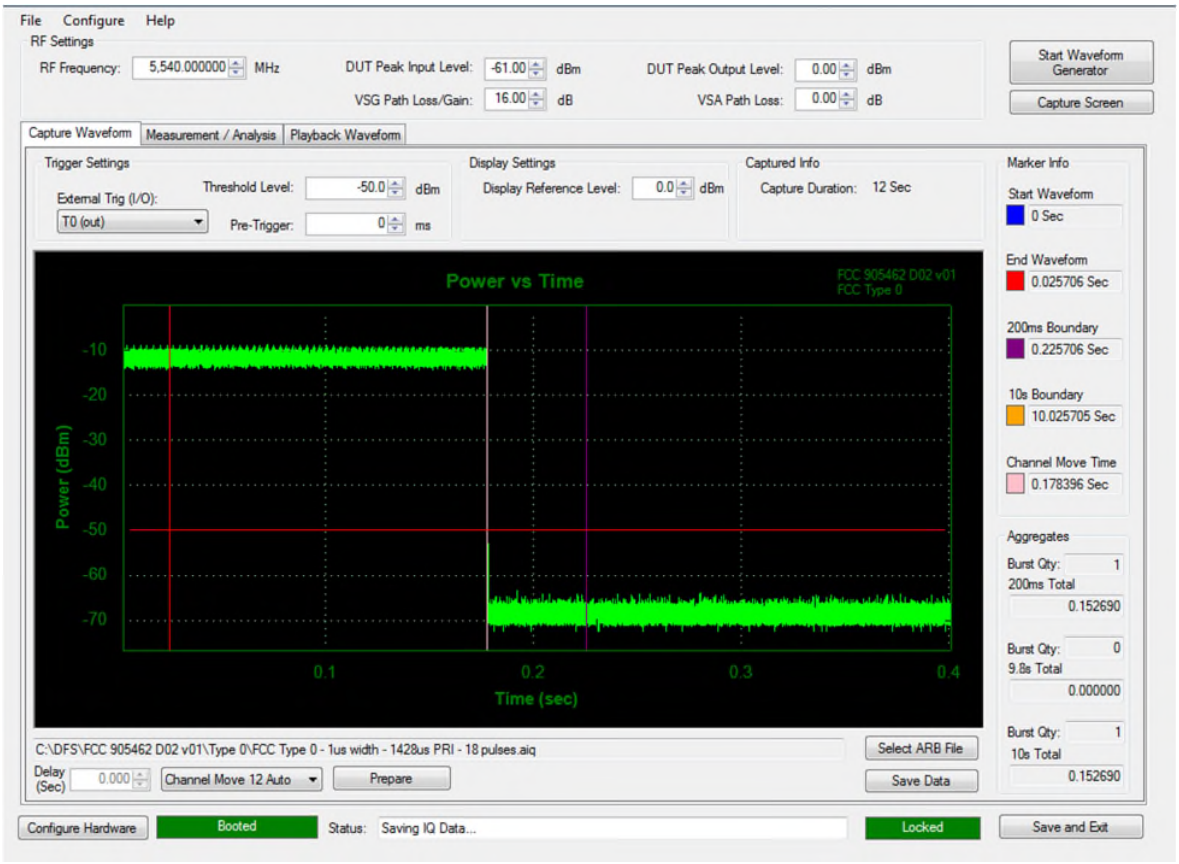
5280 MHz Overall Power vs Time Display, showing 10 seconds observation time



5280 MHz Zoomed In Overall Power vs Time Display, showing Channel Move Time (Pink), end of Radar Burst (Red) and the 200 ms boundary (Purple)

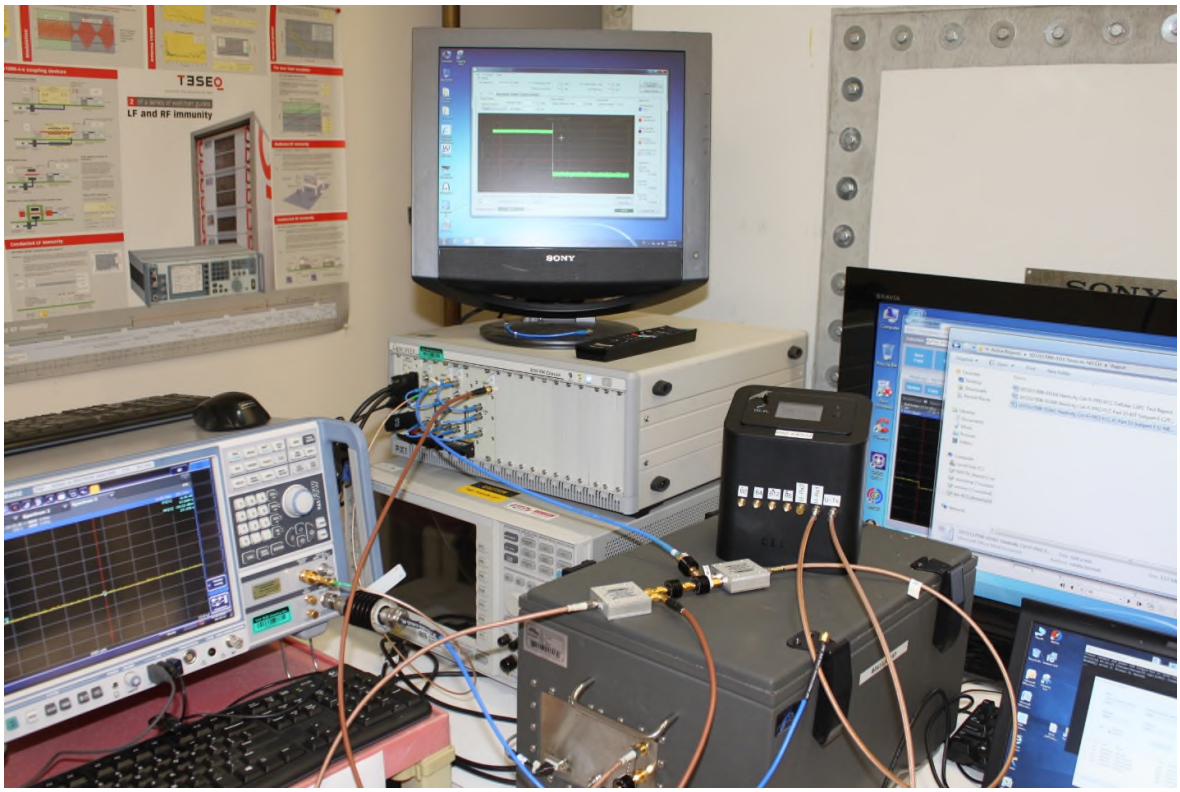


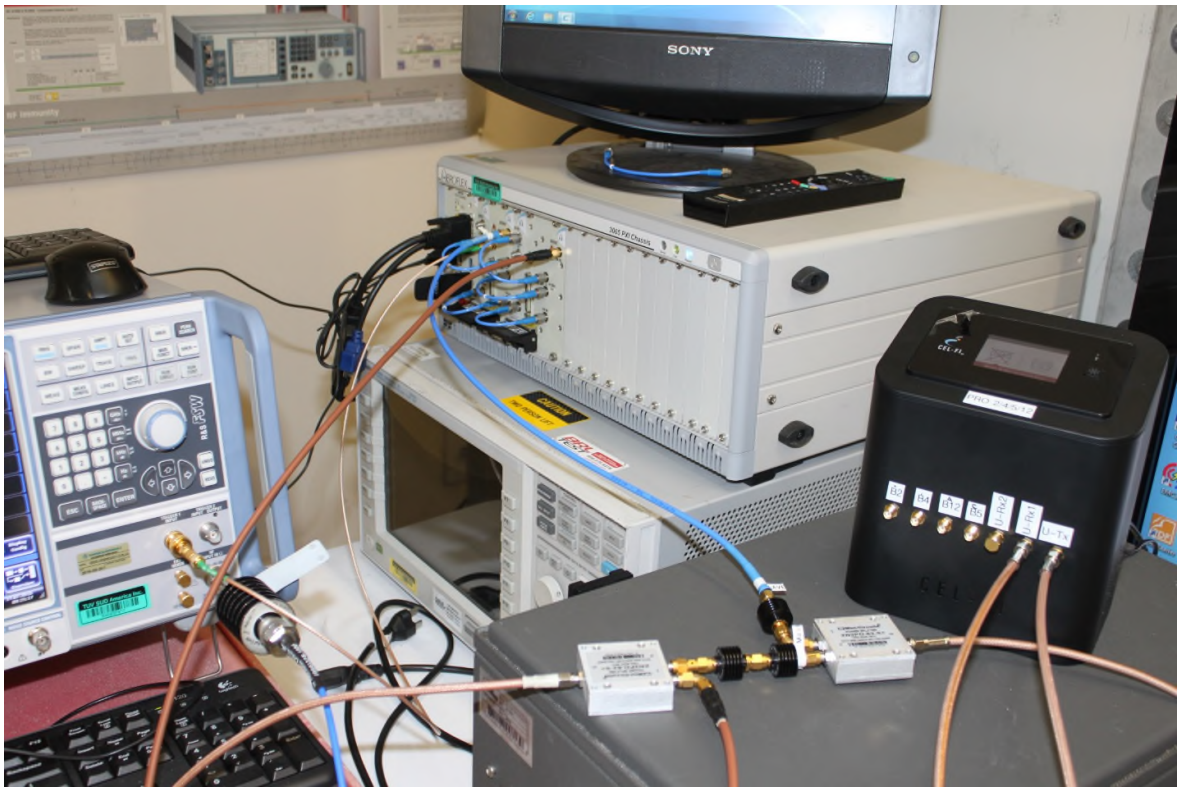
5540 MHz Overall Power vs Time Display, showing 10 seconds observation time



5540 MHz Zoomed In Overall Power vs Time Display, showing Channel Move Time (Pink), end of Radar Burst (Red) and the 200 ms boundary (Purple)

2.7.12 Test Setup Photo





2.8 NON-OCCUPANCY PERIOD

2.8.1 Specification Reference

Part 15 Subpart E §15.407(h)(2)(iv)

2.8.2 Standard Applicable

(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.

2.8.3 Test Methodology

Clause 7.8.3 of 905462 D02 UNII DFS Compliance Procedures New Rules v02

2.8.4 Equipment Under Test and Modification State

Serial No: 900610000028 (NU) and 900610000028 (CU) **/** Test Configuration C and D

2.8.5 Date of Test/Initial of test personnel who performed the test

July 27, 2016 / FSC

2.8.6 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.7 Environmental Conditions

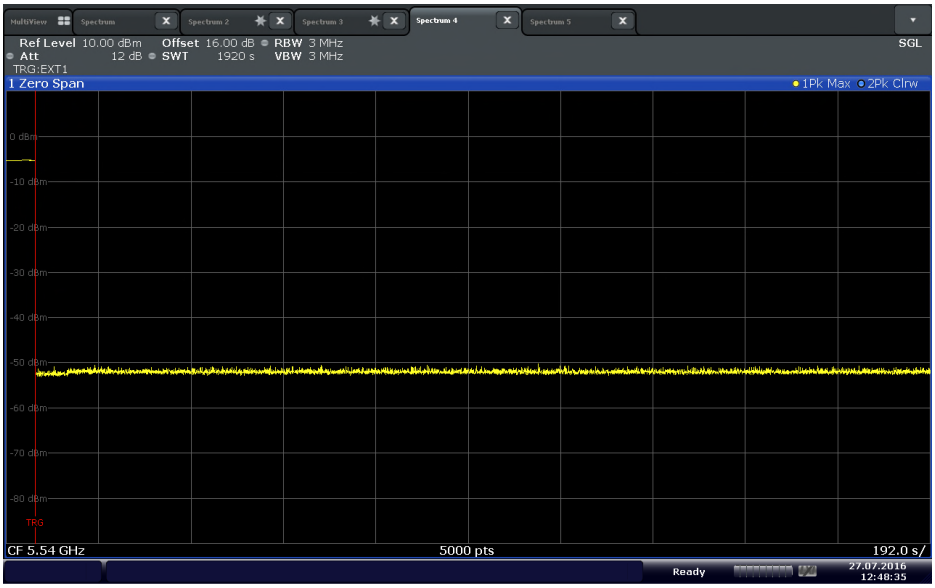
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	27.7 °C
Relative Humidity	47.7 %
ATM Pressure	98.9 kPa

2.8.8 Additional Observations

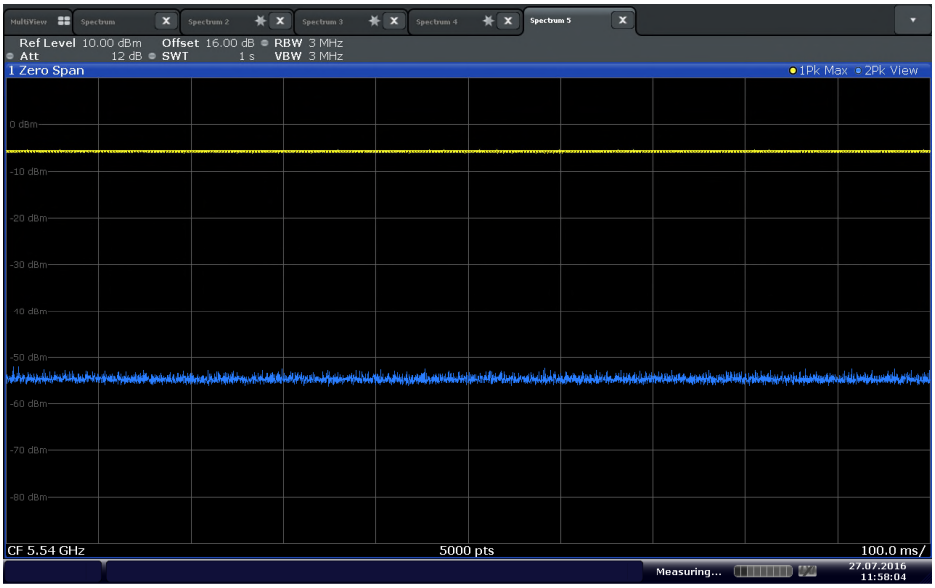
- Both High Band (CU @ 5540 MHz) and Low Band (NU @ 5280 MHz) frequencies verified.
- Only 40MHz BW verified.
- The spectrum analyzer was triggered at T_1 (end of injected radar burst) instead of T_2 (end of channel move time). Since channel move time is <10 seconds, the difference in results between the two trigger points is negligible with a sweep time of 32 minutes.
- Trigger offset was set to -60 seconds in order to show initial data traffic on the original channel.
- Noise floor to signal ratio plots were provided as per Clause 8.3 (d) (3) of KDB905462 D02 UNII DFS Compliance Procedures New Rules v02.
- There was no activity observed on the original channel during the 30 minutes observation period after the channel was vacated due to the injected radar burst (Type 0). EUT complies.

2.8.9 Test Results Plots



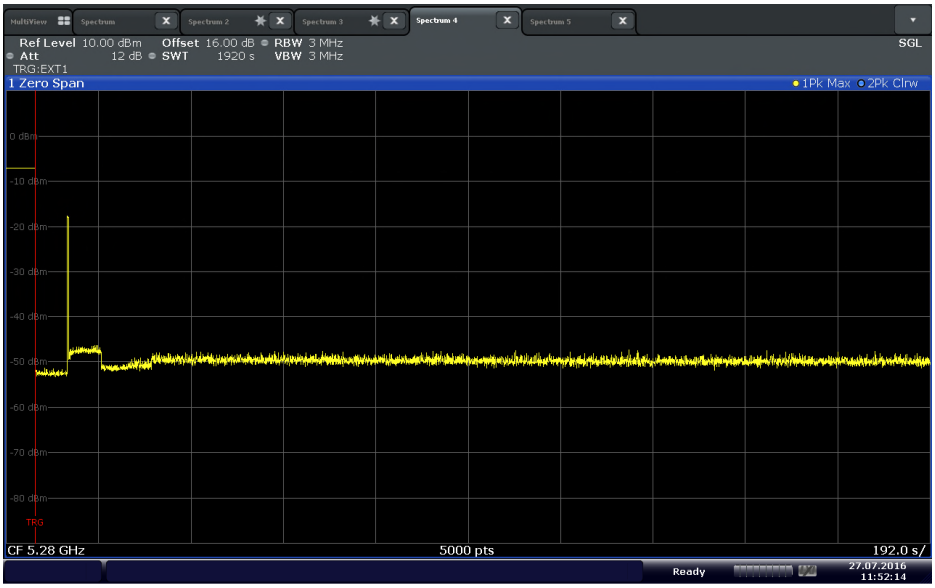
12:48:36 27.07.2016

High Band (CU) 32 minutes sweep showing no activity on the original channel after it was vacated when Radar was detected



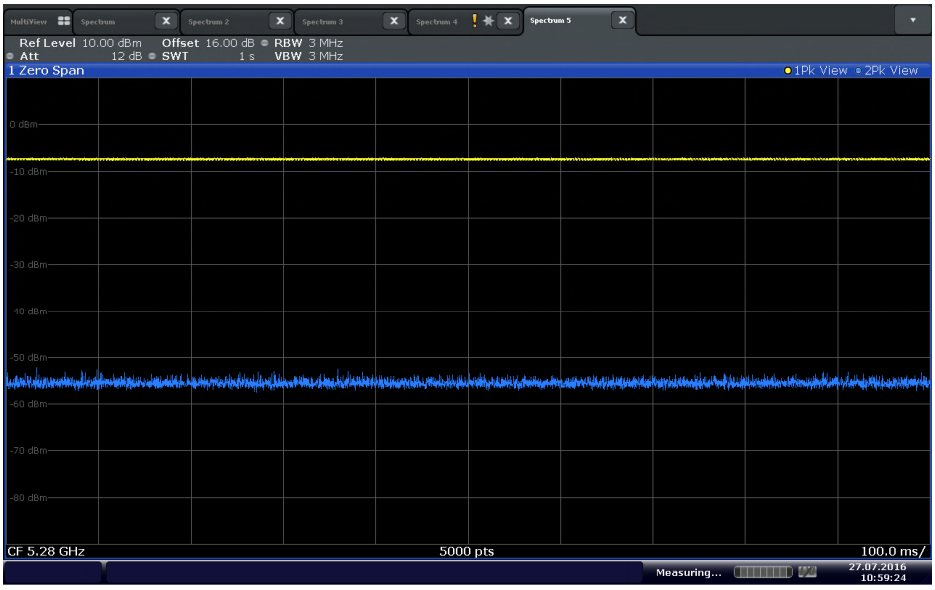
11:58:04 27.07.2016

Noise Floor to Signal Ratio during verification (5540 MHz)



11:52:14 27.07.2016

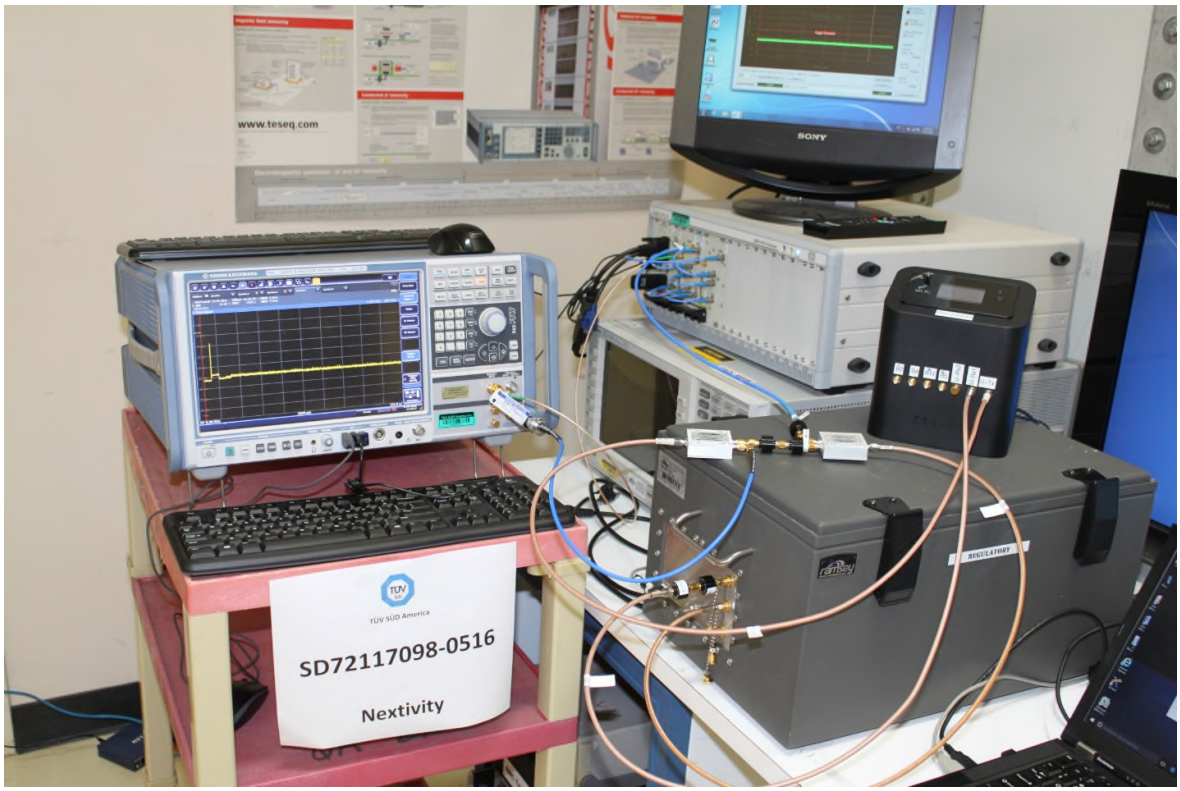
Low Band (NU) 32 minutes sweep showing no activity on the original channel after it was vacated when Radar was detected. Plot shows beacon and transmission on another channel where the EUT moved



10:59:25 27.07.2016

Noise Floor to Signal Ratio during verification (5280 MHz)

2.8.10 Test Setup Photo



2.9 STATISTICAL PERFORMANCE CHECK

2.9.1 Standard Applicable

To determine the minimum percentage of successful detection requirements found in Tables 5, 6 and 7 of KDB905462 D02 UNII DFS Compliance Procedures New Rules v02 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).

2.9.2 Test Methodology

Clause 7.8.4 of 905462 D02 UNII DFS Compliance Procedures New Rules v02

2.9.3 Limits

Radar Type	Number of Trials	Number of Successful Detections	Minimum Percentage of Successful Detection
1	35	≥21	60.0%
2	30	≥18	60.0%
3	30	≥18	60.0%
4	50	≥30	60.0%
5	30	≥24	80.0%
6	30	≥21	70.0%

2.9.4 Equipment Under Test and Modification State

Serial No: 900610000028 (NU) and 900610000028 (CU) **/** Test Configuration B

2.9.5 Date of Test/Initial of test personnel who performed the test

July 28, 2016 and August 23, 2016 / FSC

2.9.6 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.7 Environmental Conditions

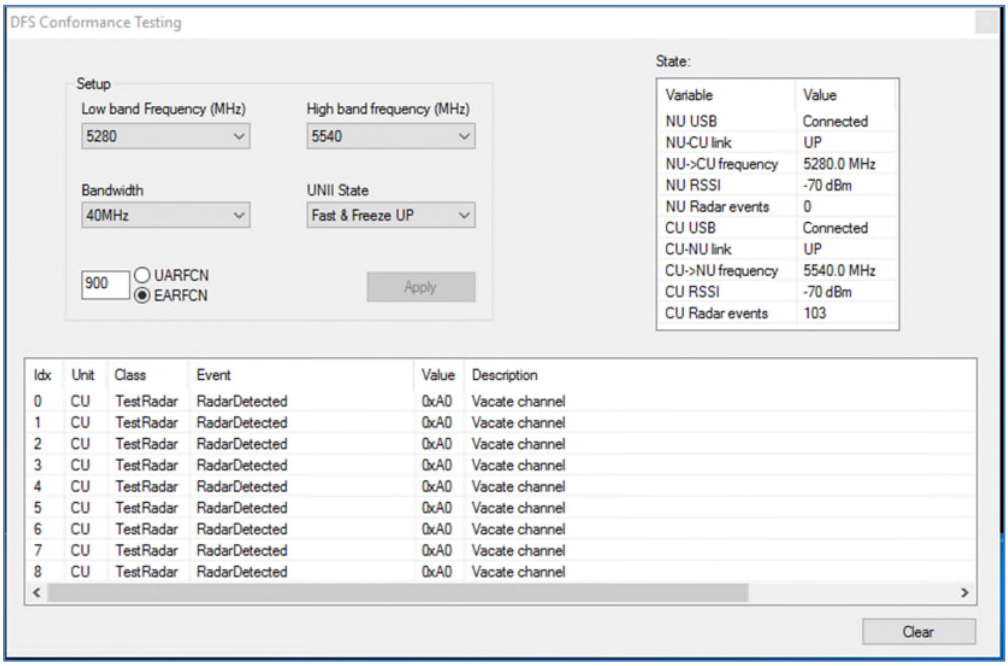
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.1 - 26.2 °C
Relative Humidity	45.5 – 51.1 %
ATM Pressure	98.8 – 100.5 kPa

2.9.8 Additional Observations

- Verification performed on 5280 MHz since the requirement is one frequency from the operating channels on either Low Band or High Band.

- Test Configuration B used. Radar was injected to the RX port of CU (5280 MHz) while in Fast and Freeze Up mode.
- Radar detection was monitored on the DFS Conformance Testing application window:



- Only 40MHz BW presented since Radar Detection Bandwidth of the EUT is identical for both 30MHz and 40MHz (Radar Detection Bandwidth is 38MHz for both 30MHz and 40MHz BW setting). Radar detection for 30MHz BW setting with detection BW of 38 MHz was 100%.
- See Section 1.5 of this test report for more details regarding Bin 5 Radar Chirp testing.
- Test setup photo is identical to Section 2.2.8 of this test report.

2.9.9 Summary of Test Results

Radar Type	Number of Trials	Number of Succesful Detection	Limit (% Detection)	Percentage of Successful Detection
1	35	35	60%	100%
2	30	30		100%
3	30	29		90.0%
4	50	50		100%
Limit for Aggregate = **80 %**				
Aggregate (100% + 100% + 96.7% + 100%) / 4 = **97.5% (EUT Complies)**				

Radar Type	Number of Trials	Number of Succesful Detection	Percentage of Successful Detection	Minimum Percentage of Successful Detection	Compliance
5	30	26	86.7%	80%	Complies
6	30	30	100%	70%	Complies

2.9.10 Radar Parameters

Radar Type 1			
Trial#	**Pulse Repetition Frequency Number (1 to 23 for Test A)**	**Pulse Repetition Frequency (Pulse per Second)**	**Pulse Repetition Interval (Microseconds)**
1	16	1222.5	818
2	3	1792.1	558
3	19	1139	878
4	15	1253.1	798
5	12	1355	738
6	21	1089.3	918
7	1	1930.5	518
8	10	1432.7	698
9	23	326.2	3066
10	11	1392.8	718
11	2	1858.7	538
12	13	1319.3	758
13	22	1066.1	938
14	4	1730.1	578
15	5	1672.2	598
16	Test B	383	2608
17		416	2404
18		591	1693
19		1068	936
20		934	1071
21		358	2793
22		1592	628
23		332	3010
24		835	1198
25		438	2284
26		1905	525
27		549	1822
28		752	1330

29		719	1391
30		760	1315
31		618	1619
32		627	1594
33		476	2103
34		337	2968
35		1065	939

Radar Type 2			
Trial#	**Number of Pulses per Burst**	**Pulse Width (µs)**	**PRI (µs)**
1	29	4.7	166
2	24	2.8	211
3	23	1.9	203
4	26	4.4	214
5	27	3	164
6	25	1.4	164
7	25	1.3	173
8	24	4	198
9	29	3.3	226
10	23	4	212
11	27	3.4	169
12	29	4.5	151
13	25	1.5	150
14	28	3.6	190
15	23	1.2	180
16	28	3.3	228
17	28	3.5	196
18	23	1.8	169
19	27	4.6	163
20	28	3.7	221
21	29	1.8	189
22	26	1.1	169
23	24	4.6	201
24	24	3.7	228
25	28	4.6	185
26	24	3.5	204
27	29	1.4	150
28	24	1.7	159
29	23	1.9	182
30	28	3.2	228

Radar Type 3			
Trial#	**Number of Pulses per Burst**	**Pulse Width (µs)**	**PRI (µs)**
1	16	7.4	342
2	16	8.4	334
3	16	9.6	212
4	17	8.2	406
5	17	8.5	486
6	18	8.7	296
7	17	7	279
8	18	7.5	370
9	17	9.5	202
10	18	8.9	435
11	17	8.2	304
12	17	7.2	293
13	18	6.1	286
14	17	9.1	419
15	16	6.3	368
16	16	8.5	368
17	16	8.3	375
18	18	6.8	282
19	18	7.5	494
20	17	7	424
21	16	8.6	257
22	17	7.2	497
23	17	8.7	293
24	16	6.4	388
25	17	9.3	345
26	16	9.5	291
27	17	8.2	269
28	16	6.8	237
29	16	9.1	307
30	16	9.9	485

Radar Type 4			
Trial#	**Number of Pulses per Burst**	**Pulse Width (µs)**	**PRI (µs)**
1	14	16.4	431
2	14	16	243
3	14	14.3	435
4	13	19.9	482
5	16	15.7	344
6	15	11.4	314

7	15	12.5	354
8	14	19.1	416
9	12	19.9	328
10	15	11.5	362
11	13	13.3	418
12	16	13.8	353
13	13	15.4	279
14	14	20	344
15	13	14.9	368
16	15	12.8	405
17	16	13.2	414
18	14	13.5	436
19	12	16.9	408
20	15	11.2	369
21	13	15.2	295
22	13	19.5	417
23	16	19	264
24	12	11.8	367
25	12	15.1	252
26	12	12.3	339
27	15	13	435
28	16	14.8	444
29	16	16.9	495
30	16	19.4	395
31	15	11.4	370
32	15	15.4	429
33	14	19.3	452
34	12	17.6	308
35	12	15.6	224
36	12	16.7	253
37	12	16.5	248
38	13	14.7	384
39	15	11.5	445
40	15	11.3	469
41	16	18.9	456
42	13	16.5	279
43	15	12.9	288
44	13	16.1	361
45	14	16.1	217
46	16	12.7	363
47	15	11.8	230
48	16	18.3	456
49	16	18.3	392
50	16	14.9	330

Radar Type 5						
Trial Number: 1 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 18						
Chirp Center Frequency: 5280 MHz						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	85	0.071	1440.0	0.0	109531.0
2	1	75	0.056	0.0	0.0	51011.0
3	1	73	0.067	0.0	0.0	99237.0
4	1	93	0.056	0.0	0.0	408515.0
5	2	75	0.125	1814.0	0.0	535679.0
6	3	99	0.200	1406.0	1313.0	184558.0
7	3	64	0.050	1499.0	1091.0	191526.0
8	1	71	0.056	0.0	0.0	432315.0
9	3	94	0.050	1231.0	1052.0	307657.0
10	1	88	0.067	0.0	0.0	448124.0
11	3	57	0.100	1466.0	1088.0	387031.0
12	3	83	0.053	1560.0	1392.0	437951.0
13	3	61	0.167	1740.0	1301.0	601890.0
14	2	93	0.200	1348.0	0.0	656717.0
15	3	77	0.067	1195.0	1486.0	438030.0
16	1	85	0.111	0.0	0.0	561421.0
17	3	74	0.071	1876.0	1361.0	276536.0
18	2	68	0.083	1429.0	0.0	129724.0

Radar Type 5						
Trial Number: 2 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 10						
Chirp Center Frequency: 5280 MHz						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	50	0.063	0.0	0.0	278938.0
2	2	55	0.100	1172.0	0.0	961349.0
3	2	68	0.143	1294.0	0.0	1182742.0
4	2	65	0.100	1931.0	0.0	721426.0
5	3	58	0.056	1069.0	1689.0	606982.0
6	3	97	0.083	1851.0	1395.0	744524.0
7	3	90	0.059	1238.0	1536.0	642175.0

8	1	66	0.125	0.0	0.0	402658.0
9	1	52	0.143	0.0	0.0	141722.0
10	2	79	0.083	1824.0	0.0	313267.0

Radar Type 5						
Trial Number: 3 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 8						
Chirp Center Frequency: 5280 MHz (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	95	0.111	907.0	0.0	584210.0
2	3	100	0.063	1394.0	1075.0	1311359.0
3	1	65	0.050	0.0	0.0	622597.0
4	2	79	0.067	1810.0	0.0	1159367.0
5	1	84	0.091	0.0	0.0	908625.0
6	1	89	0.050	0.0	0.0	942263.0
7	1	63	0.083	0.0	0.0	881089.0
8	3	74	0.143	976.0	1465.0	1180659.0

Radar Type 5						
Trial Number: 4 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 20						
Chirp Center Frequency: 5280 MHz (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	3	77	0.071	1744.0	964.0	274475.0
2	3	87	0.143	1616.0	954.0	9994.0
3	3	50	0.083	1936.0	1712.0	303033.0
4	2	96	0.071	1786.0	0.0	216161.0
5	2	61	0.063	1227.0	0.0	355202.0
6	3	91	0.100	1747.0	1692.0	429216.0
7	1	61	0.091	0.0	0.0	516446.0
8	2	57	0.111	990.0	0.0	513454.0
9	3	52	0.125	1637.0	1521.0	118558.0
10	2	71	0.077	1820.0	0.0	527567.0
11	1	94	0.143	0.0	0.0	581656.0
12	2	67	0.143	1136.0	0.0	539378.0
13	1	67	0.125	0.0	0.0	140414.0

14	1	94	0.111	0.0	0.0	338406.0
15	3	58	0.077	1549.0	1507.0	14233.0
16	2	79	0.050	929.0	0.0	428312.0
17	2	67	0.091	1757.0	0.0	566443.0
18	3	70	0.111	971.0	1381.0	162319.0
19	1	99	0.167	0.0	0.0	87861.0
20	2	79	0.056	933.0	0.0	370255.0

Radar Type 5						
Trial Number: 5 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 17						
Chirp Center Frequency: 5280 MHz (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	3	97	0.077	1281.0	1292.0	193537.0
2	3	92	0.063	1290.0	1512.0	236079.0
3	2	91	0.071	1848.0	0.0	362140.0
4	1	67	0.067	0.0	0.0	419592.0
5	1	55	0.067	0.0	0.0	114698.0
6	2	76	0.091	1421.0	0.0	597957.0
7	3	99	0.091	914.0	1357.0	283131.0
8	3	72	0.077	1553.0	1560.0	306292.0
9	1	53	0.067	0.0	0.0	469240.0
10	2	64	0.071	1524.0	0.0	51241.0
11	2	84	0.050	1023.0	0.0	507002.0
12	3	95	0.125	1767.0	1670.0	241016.0
13	2	95	0.067	1537.0	0.0	665916.0
14	2	67	0.143	994.0	0.0	49046.0
15	3	86	0.200	1072.0	1841.0	30786.0
16	3	75	0.200	1147.0	1764.0	639210.0
17	3	57	0.111	1392.0	1850.0	517687.0

Radar Type 5						
Trial Number: 6 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 15						
Chirp Center Frequency: 5280 MHz (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	3	61	0.063	1800.0	1227.0	73445.0

2	2	71	0.200	1648.0	0.0	60785.0
3	3	71	0.077	932.0	1821.0	773483.0
4	3	98	0.059	1677.0	1827.0	571905.0
5	3	77	0.077	1357.0	1046.0	389857.0
6	2	75	0.077	1540.0	0.0	463428.0
7	1	92	0.200	0.0	0.0	678339.0
8	3	53	0.077	1563.0	1874.0	620067.0
9	3	64	0.091	1319.0	1709.0	207822.0
10	1	78	0.050	0.0	0.0	754839.0
11	3	53	0.077	1790.0	1264.0	624751.0
12	2	63	0.050	1635.0	0.0	177340.0
13	2	66	0.056	1388.0	0.0	129762.0
14	3	56	0.143	1827.0	1203.0	126563.0
15	3	97	0.053	1160.0	983.0	40429.0

Radar Type 5						
Trial Number: 7 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 12						
Chirp Center Frequency: 5280 MHz (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	50	0.050	0.0	0.0	578037.0
2	3	89	0.200	1241.0	1069.0	529230.0
3	3	70	0.111	1607.0	1158.0	554765.0
4	2	99	0.071	1831.0	0.0	609317.0
5	2	60	0.091	1015.0	0.0	683210.0
6	2	53	0.071	1869.0	0.0	60214.0
7	3	80	0.053	1631.0	1604.0	276535.0
8	3	83	0.167	1365.0	1750.0	728503.0
9	2	58	0.083	1937.0	0.0	480604.0
10	3	69	0.077	1224.0	1423.0	121257.0
11	3	93	0.056	1439.0	1409.0	984215.0
12	1	97	0.059	0.0	0.0	237142.0

Radar Type 5
Trial Number: 8 Subset 1 (Center Frequency)
Number of Bursts in Trial: 14
Chirp Center Frequency: 5280 MHz (Detected)

Burst	Number of Pulses	Pulse Width (µs)	Chirp Width (µsec)	Pulse 1 to 2 Spacing (µsec)	Pulse 2 to 3 Spacing (µsec)	Starting Location Within Interval (µsec)
1	1	90	0.100	0.0	0.0	828369.0
2	2	64	0.091	1250.0	0.0	450094.0
3	2	89	0.067	1520.0	0.0	209442.0
4	2	85	0.143	1212.0	0.0	160581.0
5	2	89	0.125	1397.0	0.0	151909.0
6	3	94	0.063	1366.0	1569.0	804098.0
7	2	53	0.083	1068.0	0.0	769049.0
8	3	83	0.077	1143.0	1021.0	84809.0
9	3	99	0.067	1864.0	1118.0	174214.0
10	1	95	0.111	0.0	0.0	816695.0
11	2	79	0.056	1624.0	0.0	49044.0
12	1	58	0.167	0.0	0.0	576949.0
13	2	99	0.067	1485.0	0.0	830153.0
14	3	57	0.083	1289.0	1872.0	35854.0

Radar Type 5						
Trial Number: 9 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 16						
Chirp Center Frequency: 5280 MHz (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	54	0.111	0.0	0.0	591721.0
2	1	93	0.125	0.0	0.0	477600.0
3	3	73	0.077	1292.0	1916.0	648585.0
4	2	83	0.091	1758.0	0.0	267349.0
5	2	70	0.077	1501.0	0.0	96501.0
6	1	69	0.067	0.0	0.0	193136.0
7	1	86	0.050	0.0	0.0	728507.0
8	1	65	0.071	0.0	0.0	366087.0
9	2	96	0.059	1375.0	0.0	714243.0
10	2	50	0.167	1361.0	0.0	214429.0
11	2	55	0.125	1442.0	0.0	51445.0
12	2	79	0.071	1172.0	0.0	387245.0
13	2	58	0.083	1807.0	0.0	130140.0
14	3	78	0.050	1439.0	1510.0	81380.0
15	3	65	0.200	1032.0	1440.0	22264.0
16	3	76	0.053	1471.0	1419.0	536178.0

Radar Type 5						
Trial Number: 10 Subset 1 (Center Frequency)						
Number of Bursts in Trial: 8						
Chirp Center Frequency: 5280 MHz (Not Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	3	79	0.200	1494.0	1569.0	652339.0
2	2	85	0.200	968.0	0.0	1462144.0
3	2	73	0.050	1224.0	0.0	1493376.0
4	3	52	0.077	1772.0	1125.0	1356679.0
5	3	59	0.091	1505.0	1416.0	1025510.0
6	1	66	0.050	0.0	0.0	27135.0
7	2	71	0.167	1534.0	0.0	1352937.0
8	3	65	0.167	1123.0	1352.0	959848.0

Radar Type 5						
Trial Number: 11 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 11 (chirp width used for calculation = 13 MHz)						
Chirp Center Frequency: 5266.66 MHz (F_L = 5261.46 MHz) (Not Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	86	0.200	0.0	0.0	90616.0
2	2	76	0.200	1415.0	0.0	1018626.0
3	3	94	0.053	1672.0	1772.0	188276.0
4	1	98	0.063	0.0	0.0	709830.0
5	3	54	0.050	1888.0	976.0	944213.0
6	3	54	0.053	1700.0	1425.0	690993.0
7	3	63	0.077	1087.0	1627.0	555059.0
8	2	54	0.077	1254.0	0.0	522442.0
9	1	78	0.077	0.0	0.0	217354.0
10	3	51	0.056	1167.0	1069.0	515184.0
11	3	96	0.143	984.0	1673.0	24609.0

Radar Type 5
Trial Number: 12 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW
Number of Bursts in Trial: 10 (chirp width used for calculation = 8 MHz)
Chirp Center Frequency: 5264.66 MHz (F_L = 5261.46 MHz)

Burst	Number of Pulses	Pulse Width (µs)	Chirp Width (µsec)	Pulse 1 to 2 Spacing (µsec)	Pulse 2 to 3 Spacing (µsec)	Starting Location Within Interval (µsec)
1	3	72	0.167	1666.0	1384.0	310265.0
2	1	81	0.125	0.0	0.0	858467.0
3	2	79	0.071	1540.0	0.0	163827.0
4	2	80	0.056	1309.0	0.0	566764.0
5	3	93	0.200	1003.0	1442.0	429123.0
6	1	100	0.100	0.0	0.0	477765.0
7	1	96	0.083	0.0	0.0	212700.0
8	1	54	0.125	0.0	0.0	890505.0
9	2	64	0.083	1521.0	0.0	759518.0
10	1	67	0.067	0.0	0.0	662795.0

Radar Type 5						
Trial Number: 13 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 19 (chirp width used for calculation = 13 MHz)						
Chirp Center Frequency: 5266.66 MHz (F_L = 5261.46 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	75	0.077	1131.0	0.0	239162.0
2	2	77	0.200	1300.0	0.0	2650.0
3	1	54	0.167	0.0	0.0	69141.0
4	1	91	0.067	0.0	0.0	354860.0
5	1	69	0.091	0.0	0.0	35401.0
6	1	93	0.125	0.0	0.0	61197.0
7	1	54	0.125	0.0	0.0	464180.0
8	3	95	0.059	1213.0	1269.0	531381.0
9	3	94	0.077	1844.0	1537.0	95209.0
10	3	60	0.077	1469.0	1135.0	217134.0
11	1	92	0.067	0.0	0.0	489384.0
12	2	58	0.091	1516.0	0.0	185820.0
13	3	98	0.111	1434.0	1365.0	520061.0
14	2	62	0.111	1230.0	0.0	497320.0
15	3	71	0.050	1712.0	949.0	93454.0
16	3	63	0.100	941.0	1259.0	452355.0
17	3	84	0.059	1308.0	975.0	619210.0
18	1	82	0.053	0.0	0.0	498816.0
19	2	57	0.053	1202.0	0.0	255981.0

Radar Type 5						
Trial Number: 14 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 10 (chirp width used for calculation = 6 MHz)						
Chirp Center Frequency: 5263.86 MHz (F_L = 5261.46 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	53	0.050	0.0	0.0	273236.0
2	1	70	0.071	0.0	0.0	1075873.0
3	3	95	0.059	1314.0	1307.0	193549.0
4	1	64	0.100	0.0	0.0	287772.0
5	2	93	0.063	1342.0	0.0	698154.0
6	1	99	0.067	0.0	0.0	1095511.0
7	3	94	0.056	1785.0	1667.0	888222.0
8	2	98	0.111	947.0	0.0	112947.0
9	2	75	0.167	1794.0	0.0	638854.0
10	1	61	0.053	0.0	0.0	291207.0

Radar Type 5						
Trial Number: 15 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 17 (chirp width used for calculation = 17 MHz)						
Chirp Center Frequency: 5268.26 MHz (F_L = 5261.46 MHz)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	63	0.059	1602.0	0.0	618497.0
2	2	74	0.053	1405.0	0.0	491697.0
3	1	80	0.083	0.0	0.0	454302.0
4	1	51	0.200	0.0	0.0	701484.0
5	3	91	0.125	1841.0	1154.0	196520.0
6	3	95	0.059	1734.0	1807.0	292344.0
7	1	52	0.091	0.0	0.0	140156.0
8	2	81	0.200	1132.0	0.0	621867.0
9	1	56	0.200	0.0	0.0	572169.0
10	2	93	0.053	909.0	0.0	302744.0
11	3	75	0.143	1160.0	1181.0	304403.0
12	2	82	0.200	1409.0	0.0	638647.0
13	3	88	0.067	1899.0	975.0	468858.0
14	1	59	0.111	0.0	0.0	180746.0

15	2	100	0.059	1011.0	0.0	332376.0
16	3	58	0.167	1841.0	1376.0	607833.0
17	3	68	0.050	1338.0	1197.0	559133.0

Radar Type 5						
Trial Number: 16 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 18 (chirp width used for calculation = 6 MHz)						
Chirp Center Frequency: 5263.86 MHz (F_L = 5261.46 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	3	85	0.059	1514.0	1475.0	203604.0
2	3	72	0.083	998.0	1676.0	451471.0
3	2	86	0.063	1087.0	0.0	286907.0
4	2	67	0.167	1718.0	0.0	494669.0
5	2	76	0.167	981.0	0.0	27631.0
6	1	70	0.067	0.0	0.0	387496.0
7	3	94	0.091	1119.0	1501.0	335419.0
8	3	71	0.083	1150.0	967.0	139388.0
9	1	69	0.125	0.0	0.0	519320.0
10	1	58	0.143	0.0	0.0	369009.0
11	3	96	0.067	920.0	1132.0	238493.0
12	1	74	0.077	0.0	0.0	176902.0
13	3	51	0.056	1438.0	1899.0	535955.0
14	1	75	0.167	0.0	0.0	445382.0
15	2	54	0.056	1849.0	0.0	496125.0
16	2	62	0.143	1836.0	0.0	185207.0
17	3	97	0.125	1007.0	1589.0	585942.0
18	1	69	0.050	0.0	0.0	157263.0

Radar Type 5						
Trial Number: 17 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 11 (chirp width used for calculation = 14 MHz)						
Chirp Center Frequency: 5267.06 MHz (F_L = 5261.46 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	97	0.125	0.0	0.0	482254.0
2	1	69	0.071	0.0	0.0	462163.0

3	2	76	0.067	986.0	0.0	560678.0
4	3	91	0.200	1677.0	1178.0	754502.0
5	1	54	0.071	0.0	0.0	243798.0
6	2	93	0.059	1625.0	0.0	874329.0
7	1	80	0.053	0.0	0.0	556429.0
8	3	70	0.111	1090.0	1557.0	501299.0
9	3	57	0.067	1662.0	1431.0	829969.0
10	1	94	0.063	0.0	0.0	182911.0
11	3	91	0.091	1014.0	1200.0	141044.0

Radar Type 5						
Trial Number: 18 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 10 (chirp width used for calculation = 12 MHz)						
Chirp Center Frequency: 5266.26 MHz (F_L = 5261.46 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	3	85	0.056	1513.0	1119.0	803050.0
2	3	68	0.059	1559.0	1084.0	221764.0
3	1	83	0.067	0.0	0.0	519333.0
4	1	77	0.077	0.0	0.0	543165.0
5	2	54	0.083	1105.0	0.0	1165181.0
6	1	78	0.053	0.0	0.0	292369.0
7	1	89	0.125	0.0	0.0	896817.0
8	1	77	0.083	0.0	0.0	934829.0
9	3	77	0.083	1781.0	1285.0	819422.0
10	1	53	0.067	0.0	0.0	709645.0

Radar Type 5						
Trial Number: 19Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 14 (chirp width used for calculation = 6 MHz)						
Chirp Center Frequency: 5263.66 MHz (F_L = 5261.46 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	69	0.143	0.0	0.0	490266.0
2	3	84	0.059	1563.0	1156.0	587653.0
3	2	55	0.167	1814.0	0.0	96768.0
4	2	93	0.053	1345.0	0.0	768356.0
5	1	59	0.067	0.0	0.0	380431.0

6	1	53	0.071	0.0	0.0	9133.0
7	2	66	0.167	1218.0	0.0	432688.0
8	1	85	0.056	0.0	0.0	40415.0
9	1	74	0.167	0.0	0.0	354160.0
10	3	61	0.167	1177.0	1363.0	302557.0
11	3	62	0.200	1230.0	1073.0	213317.0
12	3	70	0.200	1667.0	1613.0	487287.0
13	3	54	0.059	1179.0	1862.0	510345.0
14	2	80	0.167	1087.0	0.0	222448.0

Radar Type 5						
Trial Number: 20 Subset 2 (90% of the Radar Type 5 frequency modulation is within the low edge of the UUT Occupied BW						
Number of Bursts in Trial: 15 (chirp width used for calculation = 12 MHz)						
Chirp Center Frequency: 5266.26 MHz (F_L = 5261.46 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	73	0.100	1412.0	0.0	169729.0
2	3	78	0.125	1499.0	1641.0	483330.0
3	3	68	0.200	1887.0	966.0	647295.0
4	2	83	0.167	1282.0	0.0	511483.0
5	3	100	0.071	1562.0	1204.0	393253.0
6	3	91	0.111	1730.0	1899.0	376449.0
7	2	84	0.053	1124.0	0.0	158139.0
8	1	58	0.083	0.0	0.0	795227.0
9	3	74	0.200	1802.0	1810.0	511994.0
10	1	90	0.083	0.0	0.0	401524.0
11	1	61	0.050	0.0	0.0	523204.0
12	2	94	0.077	1571.0	0.0	55225.0
13	1	88	0.083	0.0	0.0	628495.0
14	3	95	0.100	1182.0	1057.0	481392.0
15	2	80	0.050	1809.0	0.0	515854.0

Radar Type 5
Trial Number: 21 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW
Number of Bursts in Trial: 19 (chirp width used for calculation = 5 MHz)
Chirp Center Frequency: 5296.54 MHz (F_H = 5298.54 MHz) (Detected)

Burst	Number of Pulses	Pulse Width (µs)	Chirp Width (µsec)	Pulse 1 to 2 Spacing (µsec)	Pulse 2 to 3 Spacing (µsec)	Starting Location Within Interval (µsec)
1	2	79	0.059	1342.0	0.0	535809.0
2	2	51	0.059	1268.0	0.0	533085.0
3	1	84	0.200	0.0	0.0	318046.0
4	2	82	0.091	1022.0	0.0	105305.0
5	1	75	0.063	0.0	0.0	164932.0
6	3	76	0.100	1077.0	1110.0	28367.0
7	3	60	0.100	1285.0	1742.0	543439.0
8	1	89	0.125	0.0	0.0	138170.0
9	3	86	0.067	1381.0	1841.0	395688.0
10	3	62	0.067	1199.0	1714.0	123671.0
11	3	86	0.091	1267.0	1739.0	203256.0
12	3	96	0.083	1341.0	1751.0	472112.0
13	2	82	0.053	1241.0	0.0	139412.0
14	2	53	0.053	1105.0	0.0	558537.0
15	2	76	0.056	1146.0	0.0	210973.0
16	2	91	0.167	1413.0	0.0	582336.0
17	1	86	0.100	0.0	0.0	383867.0
18	3	72	0.200	1887.0	1898.0	210761.0
19	3	64	0.056	1842.0	986.0	176839.0

Radar Type 5						
Trial Number: 22 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW						
Number of Bursts in Trial: 17 (chirp width used for calculation = 20 MHz)						
Chirp Center Frequency: 5290.54 MHz (F_H = 5298.54 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	51	0.200	1150.0	0.0	630057.0
2	1	98	0.111	0.0	0.0	626646.0
3	2	80	0.050	1356.0	0.0	69520.0
4	2	97	0.053	1386.0	0.0	499689.0
5	1	66	0.091	0.0	0.0	545089.0
6	2	55	0.053	1767.0	0.0	106779.0
7	1	82	0.053	0.0	0.0	121310.0
8	1	83	0.091	0.0	0.0	56296.0
9	2	86	0.100	1582.0	0.0	289711.0
10	2	52	0.053	1386.0	0.0	683048.0

11	2	62	0.100	1286.0	0.0	670745.0
12	2	67	0.050	1319.0	0.0	701231.0
13	1	71	0.167	0.0	0.0	692574.0
14	1	90	0.167	0.0	0.0	172078.0
15	2	71	0.053	1709.0	0.0	470977.0
16	1	72	0.125	0.0	0.0	76123.0
17	1	94	0.050	0.0	0.0	235258.0

Radar Type 5						
Trial Number: 23 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW						
Number of Bursts in Trial: 18 (chirp width used for calculation = 19 MHz)						
Chirp Center Frequency: 5290.94 MHz (F_H = 5298.54 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	56	0.091	0.0	0.0	389972.0
2	3	91	0.063	1422.0	1740.0	35858.0
3	1	72	0.056	0.0	0.0	54778.0
4	2	70	0.083	1542.0	0.0	152782.0
5	3	68	0.200	966.0	1686.0	377153.0
6	1	96	0.059	0.0	0.0	210049.0
7	1	56	0.091	0.0	0.0	441385.0
8	2	62	0.050	1540.0	0.0	420055.0
9	1	64	0.077	0.0	0.0	41802.0
10	2	94	0.077	1140.0	0.0	314608.0
11	2	79	0.063	1512.0	0.0	172299.0
12	3	76	0.083	1075.0	1021.0	415500.0
13	1	86	0.053	0.0	0.0	626294.0
14	1	77	0.053	0.0	0.0	578413.0
15	3	70	0.056	1584.0	1722.0	543298.0
16	2	98	0.111	1201.0	0.0	272265.0
17	1	62	0.100	0.0	0.0	397923.0
18	2	58	0.071	1651.0	0.0	578233.0

Radar Type 5
Trial Number: 24 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW
Number of Bursts in Trial: 16 (chirp width used for calculation = 17 MHz)
Chirp Center Frequency: 5291.74 MHz (F_H = 5298.54 MHz) (Detected)

Burst	Number of Pulses	Pulse Width (µs)	Chirp Width (µsec)	Pulse 1 to 2 Spacing (µsec)	Pulse 2 to 3 Spacing (µsec)	Starting Location Within Interval (µsec)
1	1	98	0.167	0.0	0.0	653036.0
2	3	81	0.111	1294.0	1531.0	645968.0
3	1	98	0.067	0.0	0.0	346882.0
4	1	76	0.053	0.0	0.0	691865.0
5	3	83	0.059	1188.0	1091.0	554628.0
6	3	69	0.067	1053.0	1290.0	571379.0
7	2	91	0.200	1127.0	0.0	476275.0
8	2	87	0.059	1729.0	0.0	152951.0
9	1	79	0.067	0.0	0.0	325486.0
10	2	60	0.071	1811.0	0.0	387837.0
11	1	62	0.067	0.0	0.0	702501.0
12	1	92	0.056	0.0	0.0	582790.0
13	2	97	0.071	1835.0	0.0	125732.0
14	1	93	0.111	0.0	0.0	184052.0
15	3	71	0.056	1565.0	1727.0	104328.0
16	1	78	0.100	0.0	0.0	179843.0

Radar Type 5						
Trial Number: 25 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW						
Number of Bursts in Trial: 16 (chirp width used for calculation = 6 MHz)						
Chirp Center Frequency: 5296.14 MHz (F_H = 5298.54 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	3	70	0.063	1707.0	1743.0	451001.0
2	2	76	0.053	1810.0	0.0	631442.0
3	2	89	0.067	1282.0	0.0	641505.0
4	1	63	0.143	0.0	0.0	415543.0
5	3	58	0.167	1238.0	1123.0	33237.0
6	3	61	0.167	1510.0	1308.0	645066.0
7	2	62	0.200	1896.0	0.0	133759.0
8	3	56	0.071	1625.0	1279.0	260549.0
9	2	52	0.200	1003.0	0.0	726724.0
10	2	64	0.053	1230.0	0.0	154177.0
11	3	92	0.071	1213.0	1359.0	444725.0
12	3	86	0.167	1314.0	1262.0	385909.0
13	3	89	0.077	1540.0	1324.0	506514.0

14	2	57	0.071	1817.0	0.0	343864.0
15	3	87	0.125	1049.0	1903.0	681208.0
16	3	92	0.067	983.0	1566.0	683399.0

Radar Type 5						
Trial Number: 26 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW						
Number of Bursts in Trial: 13 (chirp width used for calculation = 7 MHz)						
Chirp Center Frequency: 5295.74 MHz (F_H = 5298.54 MHz) (Not Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	83	0.063	1141.0	0.0	323458.0
2	3	79	0.053	921.0	1764.0	69587.0
3	1	76	0.100	0.0	0.0	12371.0
4	2	74	0.143	1554.0	0.0	748544.0
5	2	88	0.071	1122.0	0.0	422979.0
6	3	91	0.111	1480.0	1574.0	405805.0
7	1	94	0.143	0.0	0.0	153751.0
8	3	98	0.143	1705.0	1638.0	275301.0
9	2	91	0.053	1073.0	0.0	801439.0
10	2	79	0.059	1146.0	0.0	179956.0
11	3	51	0.167	980.0	1655.0	76774.0
12	2	89	0.071	943.0	0.0	247113.0
13	2	67	0.091	1686.0	0.0	372004.0

Radar Type 5						
Trial Number: 27 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW						
Number of Bursts in Trial: 13 (chirp width used for calculation = 7 MHz)						
Chirp Center Frequency: 5295.74 MHz (F_H = 5298.54 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	1	62	0.067	0.0	0.0	288834.0
2	2	95	0.077	1754.0	0.0	866148.0
3	3	52	0.071	1260.0	1187.0	476929.0
4	2	73	0.077	1220.0	0.0	701351.0
5	1	73	0.067	0.0	0.0	399280.0
6	2	61	0.063	970.0	0.0	147096.0
7	2	75	0.091	1391.0	0.0	68528.0

8	2	77	0.071	1806.0	0.0	551003.0
9	1	80	0.143	0.0	0.0	706285.0
10	2	74	0.143	1186.0	0.0	731636.0
11	3	50	0.056	1846.0	1410.0	591235.0
12	1	86	0.071	0.0	0.0	204708.0
13	3	55	0.125	1427.0	1634.0	423384.0

Radar Type 5						
Trial Number: 28 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW						
Number of Bursts in Trial: 10 (chirp width used for calculation = 8 MHz)						
Chirp Center Frequency: 5295.34 MHz (F_H = 5298.54 MHz) (Not Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	56	0.125	1787.0	0.0	1178057.0
2	3	79	0.053	1075.0	1092.0	1095036.0
3	3	63	0.050	1170.0	1909.0	1088756.0
4	1	57	0.071	0.0	0.0	715032.0
5	3	91	0.059	1591.0	1869.0	417267.0
6	3	75	0.050	1032.0	1419.0	365105.0
7	1	92	0.200	0.0	0.0	27187.0
8	3	89	0.125	1191.0	1899.0	364674.0
9	2	69	0.200	1237.0	0.0	313134.0
10	3	56	0.111	1144.0	1493.0	1014495.0

Radar Type 5						
Trial Number: 29 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW						
Number of Bursts in Trial: 15 (chirp width used for calculation = 15 MHz)						
Chirp Center Frequency: 5292.54 MHz (F_H = 5298.54 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	3	65	0.083	1096.0	959.0	340013.0
2	2	71	0.125	993.0	0.0	335974.0
3	2	52	0.167	1129.0	0.0	757648.0
4	3	76	0.053	1257.0	1532.0	516365.0
5	2	70	0.067	1583.0	0.0	69900.0
6	1	68	0.067	0.0	0.0	725941.0
7	3	73	0.067	1085.0	1678.0	449558.0

8	3	87	0.056	1585.0	1485.0	79820.0
9	2	98	0.067	1162.0	0.0	111310.0
10	2	59	0.100	1626.0	0.0	520877.0
11	2	99	0.200	1851.0	0.0	48630.0
12	2	68	0.100	1231.0	0.0	45812.0
13	2	57	0.083	1877.0	0.0	328051.0
14	3	71	0.091	1098.0	1702.0	62429.0
15	2	51	0.077	1894.0	0.0	348776.0

Radar Type 5						
Trial Number: 30 Subset 3 (90% of the Radar Type 5 frequency modulation is within the high edge of the UUT Occupied BW						
Number of Bursts in Trial: 8 (chirp width used for calculation = 18 MHz)						
Chirp Center Frequency: 5291.34 MHz (F_H = 5298.54 MHz) (Detected)						
Burst	**Number of Pulses**	**Pulse Width (µs)**	**Chirp Width (µsec)**	**Pulse 1 to 2 Spacing (µsec)**	**Pulse 2 to 3 Spacing (µsec)**	**Starting Location Within Interval (µsec)**
1	2	98	0.056	1074.0	0.0	528705.0
2	1	64	0.050	0.0	0.0	982124.0
3	1	90	0.077	0.0	0.0	438203.0
4	2	74	0.100	1441.0	0.0	850477.0
5	1	74	0.063	0.0	0.0	1273413.0
6	1	53	0.059	0.0	0.0	224305.0
7	3	79	0.056	1866.0	1406.0	7657.0
8	2	73	0.050	1317.0	0.0	718286.0

2.9.11 Test Results (40 MHz BW)

Radar Type	Trial #	Detection		Trial #	Detection	
		Yes	No		Yes	No
1	1	✓		19	✓	
	2	✓		20	✓	
	3	✓		21	✓	
	4	✓		22	✓	
	5	✓		23	✓	
	6	✓		24	✓	
	7	✓		25	✓	
	8	✓		26	✓	
	9	✓		27	✓	
	10	✓		28	✓	
	11	✓		29	✓	
	12	✓		30	✓	
	13	✓		31	✓	
	14	✓		32	✓	
	15	✓		33	✓	

	16	✓		34	✓	
	17	✓		35	✓	
	18	✓				
Percentage of Successful detection = **100%**						

Radar Type	Trial #	Detection		Trial #	Detection	
		Yes	No		Yes	No
2	1	✓		19	✓	
	2	✓		20	✓	
	3	✓		21	✓	
	4	✓		22	✓	
	5	✓		23	✓	
	6	✓		24	✓	
	7	✓		25	✓	
	8	✓		26	✓	
	9	✓		27	✓	
	10	✓		28	✓	
	11	✓		29	✓	
	12	✓		30	✓	
	13	✓				
	14	✓				
	15	✓				
	16	✓				
	17	✓				
	18	✓				
Percentage of Successful detection = **100%**						

Radar Type	Trial #	Detection		Trial #	Detection	
		Yes	No		Yes	No
3	1	✓		19	✓	
	2	✓		20	✓	
	3	✓		21	✓	
	4	✓		22	✓	
	5	✓		23	✓	
	6		✓	24	✓	
	7	✓		25	✓	
	8	✓		26	✓	
	9	✓		27	✓	
	10	✓		28	✓	
	11	✓		29		✓
	12	✓		30	✓	
	13	✓				

3	14		✓			
	15	✓				
	16	✓				
	17	✓				
	18	✓				
Percentage of Successful detection = (Total Waveform Detections/Total Waveform Trials) x 100 = (27/30) x 100 = **90.0%** (Radar injected at 5280MHz only). Detection is 100% if Radar is injected at 5281MHz (See justification under Radar Type 4 below)						

Radar Type	Trial #	Detection		Trial #	Detection	
		Yes	No		Yes	No
4	1	✓		26	✓	
	2	✓		27	✓	
	3	✓		28	✓	
	4	✓		29	✓	
	5	✓		30	✓	
	6	✓		31	✓	
	7	✓		32	✓	
	8	✓		33	✓	
	9	✓		34	✓	
	10	✓		35	✓	
	11	✓		36	✓	
	12	✓		37	✓	
	13	✓		38	✓	
	14	✓		39	✓	
	15	✓		40	✓	
	16	✓		41	✓	
	17	✓		42	✓	
	18	✓		43	✓	
	19	✓		44	✓	
	20	✓		45	✓	
	21	✓		46	✓	
	22	✓		47	✓	
	23	✓		48	✓	
	24	✓		49	✓	
	25	✓		50	✓	
Percentage of Successful detection = **100%** (Radar injected on 5280 MHz and 5281 MHz. When Radar was not detected on the center frequency, the Radar frequency was increased by 1MHz which always results on Radar detection. This is due to Zero IF (ZIF) receiver architecture of the EUT. In a randomly placed system, the radar signal has equal probability to appear anywhere within the detection bandwidth. The probability that the radar signal lands on or near (e.g. within the DC cancelation bandwidth) the carrier frequency is almost negligible).						

Radar Type	Trial #	Detection		Trial #	Detection	
		Yes	No		Yes	No
5	1	✓		19	✓	
	2	✓		20	✓	
	3	✓		21	✓	
	4	✓		22	✓	
	5	✓		23	✓	
	6	✓		24	✓	
	7	✓		25	✓	
	8	✓		26		✓
	9	✓		27	✓	
	10		✓	28		✓
	11		✓	29	✓	
	12	✓		30	✓	
	13	✓				
	14	✓				
	15	✓				
	16	✓				
	17	✓				
	18	✓				

Trial 1-10 (Center Frequency Subset 1, Radar injected on both 5280MHz and/or 5280 ±1 MHz)
Trial 11-20 (FL + 0.4*Chirp Width (MHz)) Subset 2
Trial 21-30 (FL + 0.4*Chirp Width (MHz)) Subset 3
Percentage of Successful detection = (Total Waveform Detections/Total Waveform Trials) x 100
= (26/30) x 100
= **86.7%**

Radar Type	Trial #	Detection		Trial #	Detection	
		Yes	No		Yes	No
6	1	✓		19	✓	
	2	✓		20	✓	
	3	✓		21	✓	
	4	✓		22	✓	
	5	✓		23	✓	
	6	✓		24	✓	
	7	✓		25	✓	
	8	✓		26	✓	
	9	✓		27	✓	
	10	✓		28	✓	
	11	✓		29	✓	
	12	✓		30	✓	
	13	✓				
	14	✓				
	15	✓				
	16	✓				

	17	✓				
	18	✓				
Percentage of Successful detection = **100%** (Radar injected at 5280MHz only)						

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Radiated Test Setup						
-	Coaxial SMA Fixed Attenuator (x2)	VAT-30W2	N/A	MCL	Verified by 7608 and 7582	
-	Coaxial SMA Fixed Attenuator	VAT-10W2	N/A	MCL	Verified by 7608 and 7582	
-	Coaxial SMA Fixed Attenuator	VAT-10+	N/A	Mini-Circuits	Verified by 7608 and 7582	
-	Power Splitter (2x)	ZN2PD-63-S+	N/A	Mini-Circuits	Verified by 7608 and 7582	
-	Low loss RF cable (x2)	JX50172-24	N/A	RF Precision Cables, Inc.	Verified by 7608 and 7582	
	Low loss RF cable (x2)	70032199	N/A	Allied Electronics	Verified by 7608 and 7582	
7610	DFS Radar Simulator and Analyzer	Aeroflex 3005	30050A/09L	Aeroflex international LTD. UK	06/30/16	06/30/17
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	07/29/15	07/29/16*
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/05/15	10/05/16
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	09/03/15	09/03/16
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16*
7560	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	Omega	10/19/15	10/19/16
	Test Software	DFS Radar Simulator and Analyzer	V2.6.0	Cobham	N/A	

* *Verification of the test setup were performed at the start of the project (July 25, 2016, therefore calibration was still valid)*

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 DFS

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.08	0.05	0.00
2	Cables	Rectangular	0.30	0.17	0.03
3	Combiners	Rectangular	1.20	0.69	0.48
4	Attenuators	Rectangular	0.80	0.46	0.21
5	EUT Setup	Rectangular	0.50	0.29	0.08
				Combined Uncertainty (u_c):	0.90
				Coverage Factor (k):	1.96
				Expanded Uncertainty:	1.76

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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