



# TEST REPORT

**Test Report No. :** UL-RPT-RP10266608JD01A V3.0

**Manufacturer** : Siemens AG  
**Model No.** : MSN-W1-RJ-E2 and MSN-W1-M12-E2  
**FCC ID** : LYHMSN1V1  
**IC Certification No.** : 267AA-MSN1V1  
**Technology** : WLAN (802.11 a/n)  
**Test Standard(s)** : FCC Part 15.407(h)(2) & Industry Canada RSS-210 A9.3

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 3.0 supersedes all previous versions.

**Date of Issue:** 15 May 2014

**Checked by:**

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Engineer, Radio Laboratory

**Issued by :**

pp

John Newell  
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Basingstoke,  
UL VS LTD



This laboratory is accredited by UKAS.  
The tests reported herein have been  
performed in accordance with its' terms  
of accreditation.

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**1. Customer Information**












<b>Company Name:</b>	Siemens AG
<b>Address:</b>	Sector Industry Automation Division, Oestliche Rheinbrueckenstr. 50, D-76181-Karlsruhe, Germany

## **2. Summary of Testing**

### **2.1. General Information**

<b>Specification Reference:</b>	47CFR15.407
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) - Section 15.407
<b>Specification Reference:</b>	Industry Canada RSS-210 Issue 8 December 2010
<b>Specification Title:</b>	Low-power Licence-exempt Radio communication Devices (All Frequency Bands): Category I Equipment.
<b>Site Registration:</b>	FCC: 209735; Industry Canada: 3245B-2
<b>Test Dates:</b>	14 April 2014 to 28 April 2014

### **2.2. Summary of Test Results**

<b>FCC Reference (47CFR)</b>	<b>IC Reference</b>	<b>Measurement</b>	<b>Result</b>
Part 15.407(h)(2)	RSS-210 A9.3(a)	U-NII Detection Bandwidth	
Part 15.407(h)(2)(ii)	RSS-210 A9.3(b)(ii)	Initial Channel Availability Check Time	
Part 15.407(h)(2)(ii)	RSS-210 A9.3(b)(ii)	Radar Burst at the Beginning of the Channel Availability Check Time	
Part 15.407(h)(2)(ii)	RSS-210 A9.3(b)(ii)	Radar Burst at the End of the Channel Availability Check Time	
Part 15.407(h)(2)(iii)	RSS-210 A9.3(b)(iii)(iv)	Channel Closing Transmission Time and Channel Move Time	
Part 15.407(h)(2)(iv)	RSS-210 A9.3(b)(v)	Non-occupancy Period	
Part 15.407(h)(2)	RSS-210 A9.3(a)	Statistical Performance Check – Short Pulse Radar Types 1-4	
Part 15.407(h)(2)	RSS-210 A9.3(a)	Statistical Performance Check – Long Pulse Radar Type 5	
Part 15.407(h)(2)	RSS-210 A9.3(a)	Statistical Performance Check – Frequency Hopping Radar Type 6	
<b>Key to Results</b>			
 = Complied  = Did not comply			

#### **Note(s):**

1. Only DFS tests at the lowest EUT bandwidth (20 MHz) are required in accordance with clause 8.3)18) of FCC 06-96. Tests for detection bandwidth were additionally performed at 40 MHz to ensure the EUT also detected radars across the entire frequency range of the wider bandwidth setting.
2. The Manufacturer confirms that information regarding the parameters of the radar waveforms is not available to the end user.

**2.3. Methods and Procedures**

<b>Reference:</b>	FCC 06-96
<b>Title:</b>	Compliance Measurement Procedures for Unlicensed-National Information Infrastructure Devices Operating in the 5250-5350 MHz and 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection

**2.4. Deviations from the Test Specification**

There were no deviations from, additions to, or exclusions from the test specification identified above.

### **3. Equipment Under Test (EUT)**

#### **3.1. Identification of Equipment Under Test (EUT)**

<b>Brand Name:</b>	Siemens
<b>Model Name or Number:</b>	MSN-W1-RJ-E2
<b>Serial Number:</b>	VPE1191429 ( <i>Master</i> )
<b>Hardware Version Number:</b>	1
<b>Software Version Number:</b>	3.2
<b>FCC ID:</b>	LYHMSN1V1
<b>Industry Canada Certification Number:</b>	267AA-MSN1V1

<b>Brand Name:</b>	Siemens
<b>Model Name or Number:</b>	MSN-W1-RJ-E2
<b>Serial Number:</b>	VPE1191436 ( <i>Client</i> )
<b>Hardware Version Number:</b>	1
<b>Software Version Number:</b>	3.2
<b>FCC ID:</b>	LYHMSN1V1
<b>Industry Canada Certification Number:</b>	267AA-MSN1V1

#### **3.2. Description of EUT**

The equipment under test was an 802.11a/b/g/n Wi-Fi Access Point.

Two variants of the equipment exist: the MSN-W1-RJ-E2, and the MSN-W1-M12-E2. The manufacturer has declared the radio parts to be identical, with the only difference being their wired interfaces. Testing was performed on the MSN-W1-RJ-E2 (with RJ45 Ethernet interface) and is therefore deemed to also cover the MSN-W1-M12-E2 (with M12 interface). The M12 variant is the same hardware and software version as detailed in the RJ variant table.

The EUT can be operated in either Master or Client mode depending on the firmware configuration. Client mode does not feature radar detection.

The 802.11n mode supports both 20 MHz and 40 MHz bandwidths. It has two antenna ports and therefore supports SISO and 2x2 MIMO data rates (MCS0-15).

#### **3.3. Modifications Incorporated in the EUT**

No modifications were made to the EUT during testing.

**3.4. Additional Information Related to Testing**

<b>Technology Tested:</b>	Unlicensed National Information Infrastructure Devices (U-NII)	
<b>Type of Unit:</b>	Access Point	
<b>Modulation:</b>	802.11a, 802.11n (MCS0-15)	
<b>Minimum Specified Antenna Gain:</b>	5 dBi	
<b>Power Supply Requirement:</b>	Nominal	24 VDC
<b>Transmit &amp; Receive Frequency Range:</b>	5150 MHz to 5850 MHz (excluded 5600 MHz to 5650 MHz)	
<b>Channel Spacing:</b>	20 MHz	
<b>Transmit &amp; Receive Channels Tested:</b>	<b>Channel Frequency Master (MHz):</b>	5500
	<b>Channel Frequency Client (MHz):</b>	5580
<b>Channel Spacing:</b>	40 MHz	
<b>Transmit &amp; Receive Channels Tested:</b>	<b>Channel Frequency (MHz):</b>	5510

**3.5. Support Equipment**

The following support equipment was used to exercise the EUT during testing:

<b>Description:</b>	FCC Approved DFS Master (for Client Testing)
<b>Brand Name:</b>	Cisco
<b>Model Name or Number:</b>	Aironet IOS Access Point AIR-AP1252AG-A-K9
<b>Serial Number:</b>	FGL1547Z00U
<b>FCC ID:</b>	LDK102061
<b>Industry Canada Certification Number:</b>	2461B-102061

<b>Description:</b>	Laptop Computer (on Master Device)
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Lattitude D610
<b>Serial Number:</b>	GN20Q1J

<b>Description:</b>	Laptop Computer (on Client Device)
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Lattitude D610
<b>Serial Number:</b>	3SCJ02J



## **4. Operation and Monitoring of the EUT during Testing**

### **4.1. Operating Modes**

The EUT was tested in the following operating modes, unless otherwise stated:

- The EUT was tested as a Master or Client, transmitting on full power.
- The EUT was tested with 802.11n MCS7 modulation (65 Mbps data rate).
- The EUT has two MIMO channels which normally connect to external antennas. The radar signal was applied to Port R1 A1 (Radio 1, Antenna 1) only, at the levels defined in FCC 06-96.
- The unused antenna port was left unterminated during testing. It was not physically possible to terminate the unused antenna port whilst the serial interface was connected (used for detection of the radars).
- The device was tested with a power level of 20 dBm (100 mW). This was designed to simulate the use of an antenna with the minimum specified gain of +5 dBi.
- The DFS detection threshold of -62 dBm was used throughout, as the maximum transmit power was <200 mW.
  - The customer declared the lowest gain of the antennas used in the product to be 5 dBi. Since the test is performed conducted, this additional gain which would normally be present in the signal is added to the radar test level.
  - The radar level to be presented at the antenna ports was calculated as:  
-62 dBm + 5 dBi antenna gain + 1 dB to account for variations = -56.0 dBm radar level at antenna ports.

### **FCC 06-96 Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection**

<b>Maximum Transmit Power</b>	<b>Value (See Notes 1 and 2)</b>
< 200 milliwatt	-62 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.	

### **4.2. Configuration and Peripherals**

The EUT was tested in the following configuration(s):

- All measurements were made using a conducted link.
- A laptop PC was used to configure the EUT parameters during the testing using a standard web browser and via a terminal application. The laptop was connected to the EUT via Ethernet and serial connections to set EUT parameters.
- The EUT's serial interface was used to report radar detection events.
- When the system required channel loading, a MPEG video file that streamed full motion video at 30 frames per second was downloaded from <http://ntiacsd.ntia.doc.gov/dfs/> and played between 2 laptops. The file was transferred from the master device to the client device during this testing.

## **5. Measurements, Examinations and Derived Results**

### **5.1. General Comments**

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

**5.2. Test Results****5.2.1. U-NII Detection Bandwidth****Test Summary:**

<b>Test Engineer:</b>	Philip Harrison	<b>Test Date:</b>	14 April 2014
<b>Test Sample Serial Number:</b>	VPE1191429 (Master)		

<b>FCC Reference:</b>	Part 15.407(h)(2)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(a)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	28

**Note(s):**

1. The device was not connected to a client and no data transfer was performed during the test (so the detection probability was not reduced due to data load of the channel) in accordance with FCC 06-96.
2. The EUT was tested at 1 MHz steps out from centre frequency of 5500 MHz (HT20) or 5510 MHz (HT40) until the entire 99% bandwidth was covered.
3. 99% bandwidth was measured using the OBW function of the Rohde & Schwarz FSV30 spectrum analyser.

**U-NII Detection Bandwidth (continued)****Results: 20 MHz**

Bandwidth setting (MHz)	Measured 99% Bandwidth (MHz)
20	18.0

Offset from centre frequency (MHz)	Detection attempts successful from 10 attempts at each frequency	Detection Rate (%)	Result (>90% detection)
-10.0	10	100	Complied (<F <sub>L</sub> )
-9.0	10	100	Complied
-8.0	10	100	Complied
-7.0	10	100	Complied
-6.0	10	100	Complied
-5.0	10	100	Complied
-4.0	10	100	Complied
-3.0	10	100	Complied
-2.0	10	100	Complied
-1.0	10	100	Complied
+1.0	10	100	Complied
+2.0	10	100	Complied
+3.0	10	100	Complied
+4.0	10	100	Complied
+5.0	10	100	Complied
+6.0	10	100	Complied
+7.0	10	100	Complied
+8.0	10	100	Complied
+9.0	10	100	Complied
+10.0	10	100	Complied (>F <sub>H</sub> )

The detection bandwidth of 20 MHz covers the whole channel bandwidth, and is therefore greater than 80% of the 99% bandwidth of 18.0 MHz.

**U-NII Detection Bandwidth (continued)****Results: 40 MHz**

Bandwidth setting (MHz)	Measured 99% Bandwidth (MHz)
40	37.4

Offset from centre frequency (MHz)	Detection attempts successful from 10 attempts at each frequency	Detection Rate (%)	Result (>90% detection)
-19.0	10	100	Complied (<F <sub>L</sub> )
-18.0	10	100	Complied
-17.0	10	100	Complied
-16.0	10	100	Complied
-15.0	10	100	Complied
-14.0	10	100	Complied
-13.0	10	100	Complied
-12.0	10	100	Complied
-11.0	10	100	Complied
-10.0	10	100	Complied
-9.0	10	100	Complied
-8.0	10	100	Complied
-7.0	10	100	Complied
-6.0	10	100	Complied
-5.0	10	100	Complied
-4.0	10	100	Complied
-3.0	10	100	Complied
-2.0	10	100	Complied
-1.0	10	100	Complied
+1.0	10	100	Complied
+2.0	10	100	Complied
+3.0	10	100	Complied
+4.0	10	100	Complied
+5.0	10	100	Complied
+6.0	10	100	Complied
+7.0	10	100	Complied
+8.0	10	100	Complied
+9.0	10	100	Complied
+10.0	10	100	Complied
+11.0	10	100	Complied

**U-NII Detection Bandwidth (continued)****Results: 40 MHz (continued)**

Offset from centre frequency (MHz)	Detection attempts successful from 10 attempts at each frequency	Detection Rate (%)	Result (>90% detection)
+12.0	10	100	Complied
+13.0	10	100	Complied
+14.0	10	100	Complied
+15.0	10	100	Complied
+16.0	10	100	Complied
+17.0	10	100	Complied
+18.0	10	100	Complied
+19.0	10	100	Complied (> $F_H$ )

The detection bandwidth of 38 MHz covers the whole channel bandwidth, and is therefore greater than 80% of the 99% bandwidth of 37.4 MHz.

**Limits:****Table 4: DFS Response Requirement Values**

Parameter	Value
<i>U-NII Detection Bandwidth</i>	Minimum 80% of the U-NII 99% transmission power bandwidth. See Note 3.
<b>Note 3:</b> During the U-NII Detection Bandwidth detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

**5.2.2. Initial Channel Availability Check Time**

**Test Summary:**

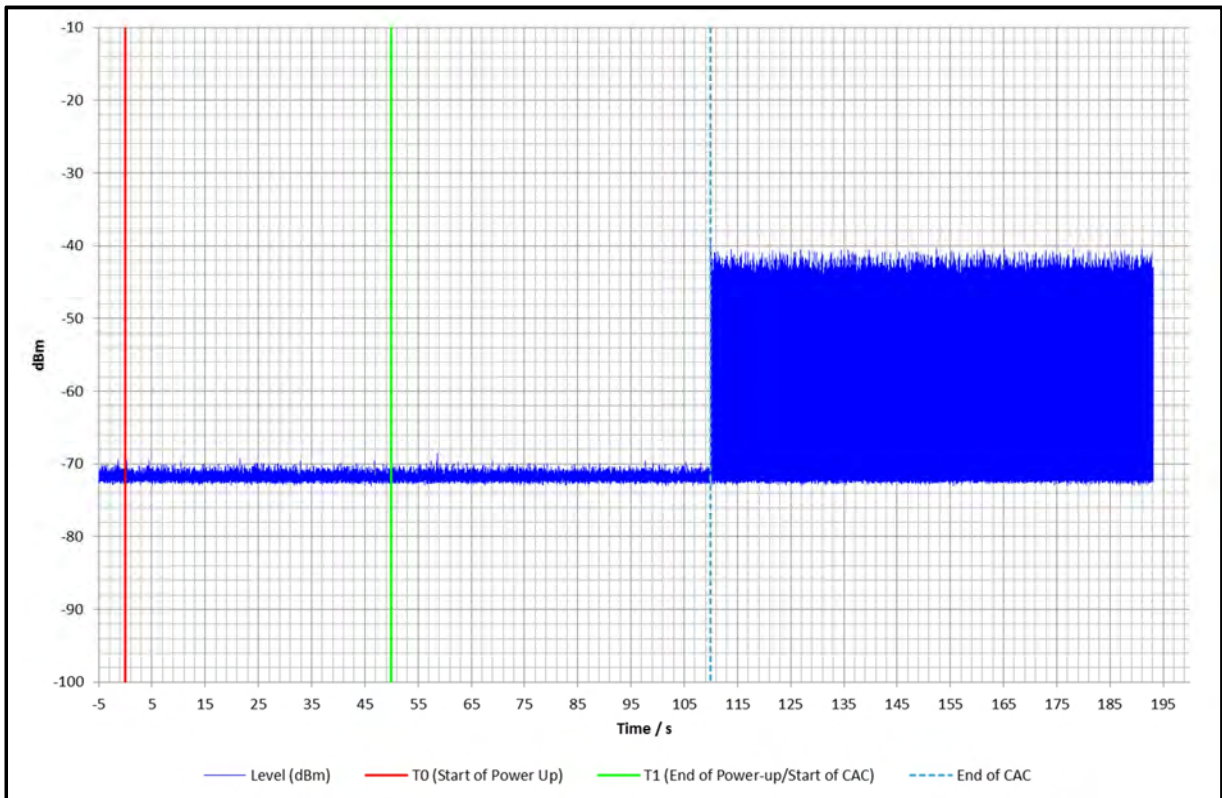
<b>Test Engineer:</b>	Philip Harrison	<b>Test Date:</b>	28 April 2014
<b>Test Sample Serial Number:</b>	VPE1191429 (Master)		

<b>FCC Reference:</b>	Part 15.407(h)(2)(ii)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(b)(ii)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.2.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	34

**Results: 20 MHz**



Power up time is 50 s. CAC length is 60 s. Transmissions occurred at 110 s after power on.

No beacon or data transmission seen during channel availability check time.

**Limit:**

Parameter	Value
Channel Availability Check Time	60 seconds

**5.2.3. Radar Burst at the Beginning of the Channel Availability Check Time**

**Test Summary:**

<b>Test Engineer:</b>	Philip Harrison	<b>Test Date:</b>	28 April 2014
<b>Test Sample Serial Number:</b>	VPE1191429 (Master)		

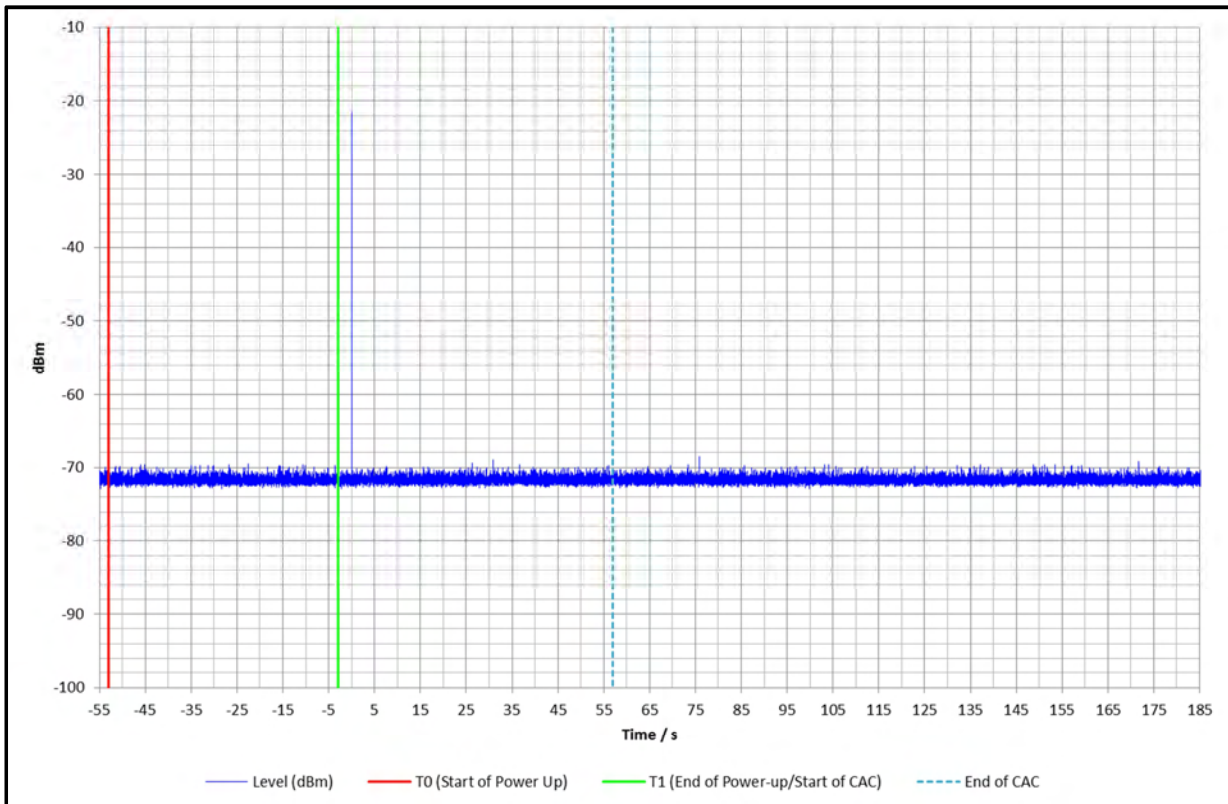
<b>FCC Reference:</b>	Part 15.407(h)(2)(ii)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(b)(ii)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.2.2

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	39

**Results: 20 MHz**

Radar burst type 1 was detected and no beacon or data transmission seen.



Radar Pulse 3 s after the beginning of CAC

**Limit:**

Parameter	Value
Channel Availability Check Time	60 seconds



**5.2.4. Radar Burst at the End of the Channel Availability Check Time****Test Summary:**

<b>Test Engineer:</b>	Philip Harrison	<b>Test Date:</b>	28 April 2014
<b>Test Sample Serial Number:</b>	VPE1191429 (Master)		

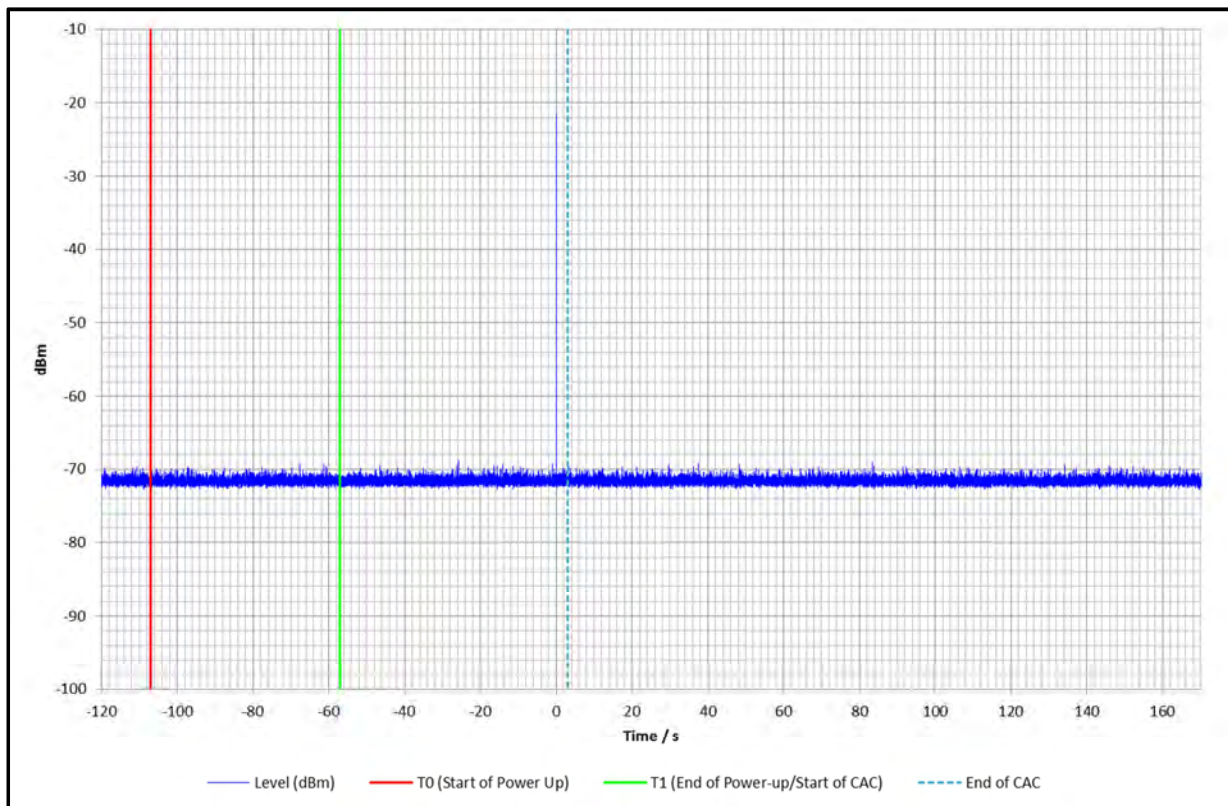
<b>FCC Reference:</b>	Part 15.407(h)(2)(ii)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(b)(ii)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.2.3

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	39

**Results: 20 MHz**

Radar burst type 3 was detected and no beacon or data transmission seen.



Radar Pulse 3 s before end of CAC

**Limit:**

Parameter	Value
<i>Channel Availability Check Time</i>	60 seconds

**5.2.5. Channel Closing Transmission Time and Channel Move Time**

**Test Summary:**

<b>Test Engineer:</b>	Philip Harrison	<b>Test Dates:</b>	14 April 2014 & 28 April 2014
<b>Test Sample Serial Numbers:</b>	VPE1191429 (Master) VPE1191436 (Client)		

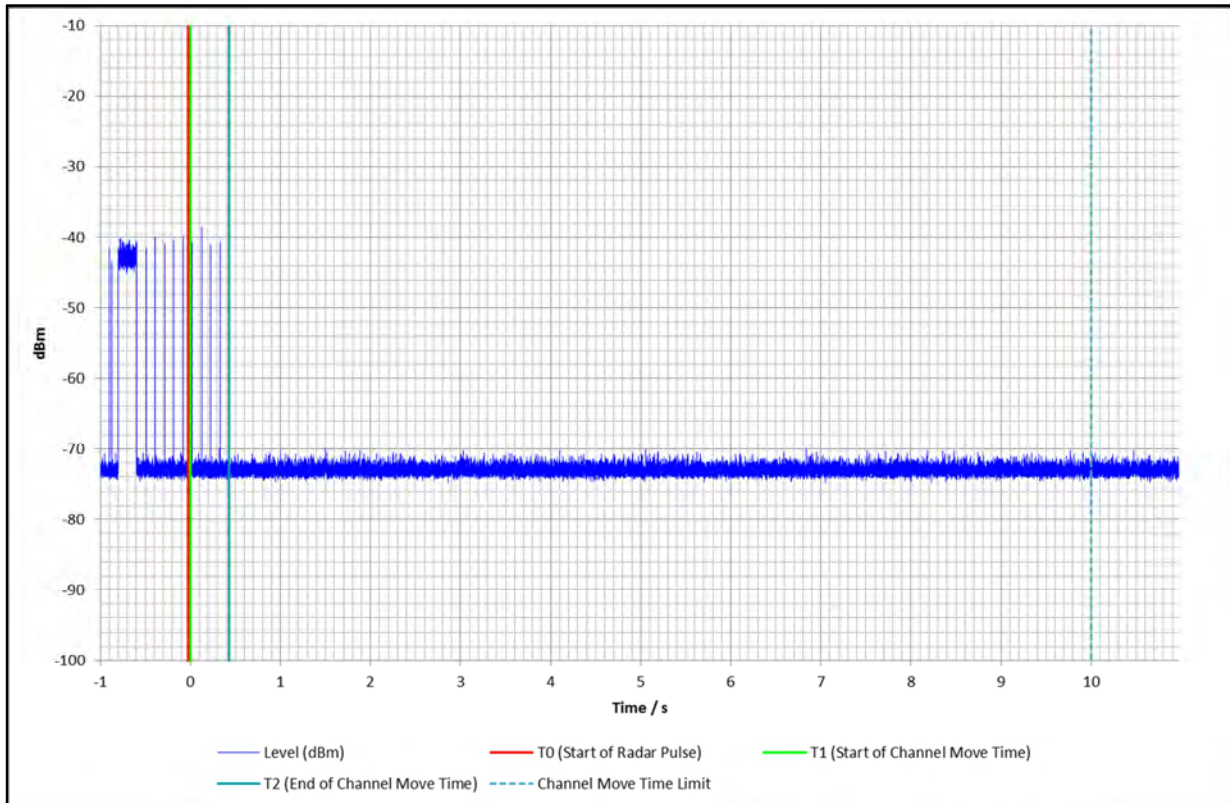
<b>FCC Reference:</b>	Part 15.407(h)(2)(iii)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(b)(iii)(iv)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.3

**Environmental Conditions:**

<b>Temperature (°C):</b>	26 to 28
<b>Relative Humidity (%):</b>	28 to 31

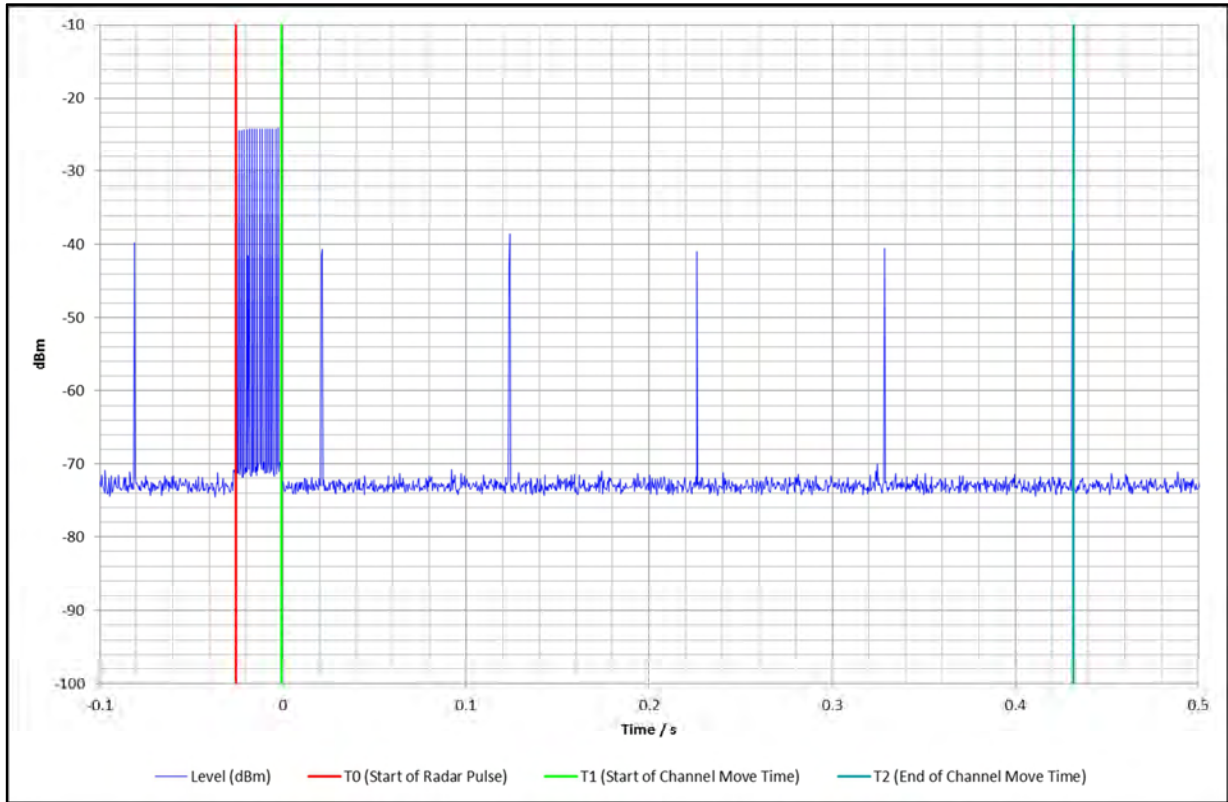
**Results: 20 MHz Master – Short Radar Type**

Radar burst type 1 was detected and channel move occurred.



Plot Showing 10 sec Move Time Limit

**Channel Closing Transmission Time and Channel Move Time (continued)**

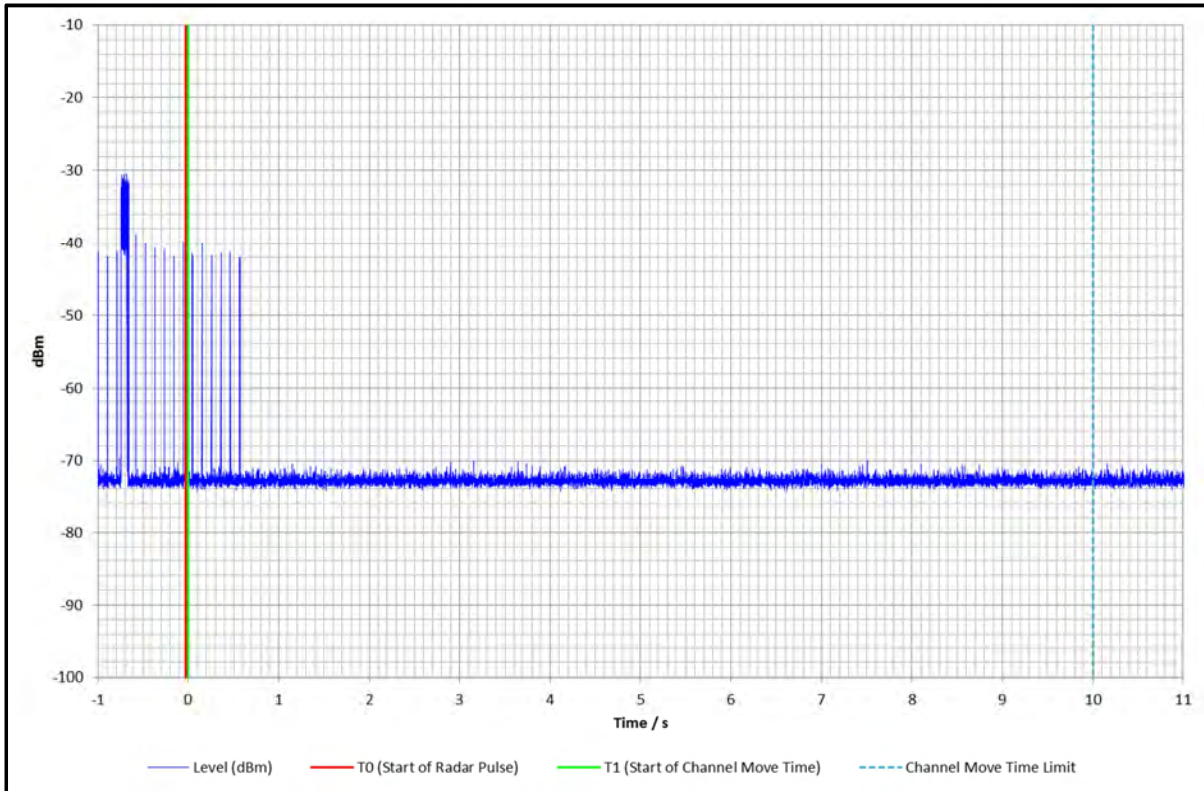


Zoomed Plot Showing Radar Pulse and end of Channel Move Time

Analysis of Response to Type 1 Radar	
Channel Move Time / ms	432
Total Transmit Time after end of radar / ms	2.625
Total Transmit time after 200 ms from the end of the radar / ms	1.125

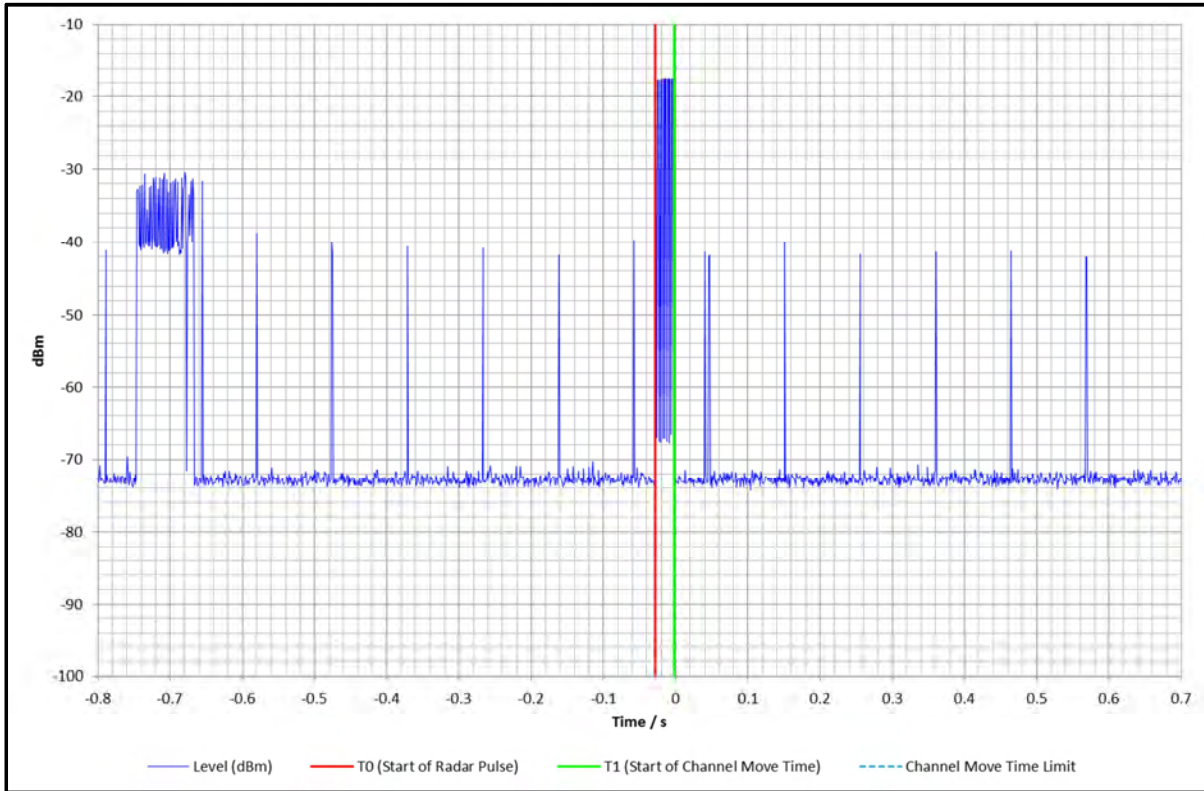
**Channel Closing Transmission Time and Channel Move Time (continued)**

**Results: 20 MHz Client – Short Radar Type**



Plot Showing 10 sec Move Time Limit

**Channel Closing Transmission Time and Channel Move Time (continued)**

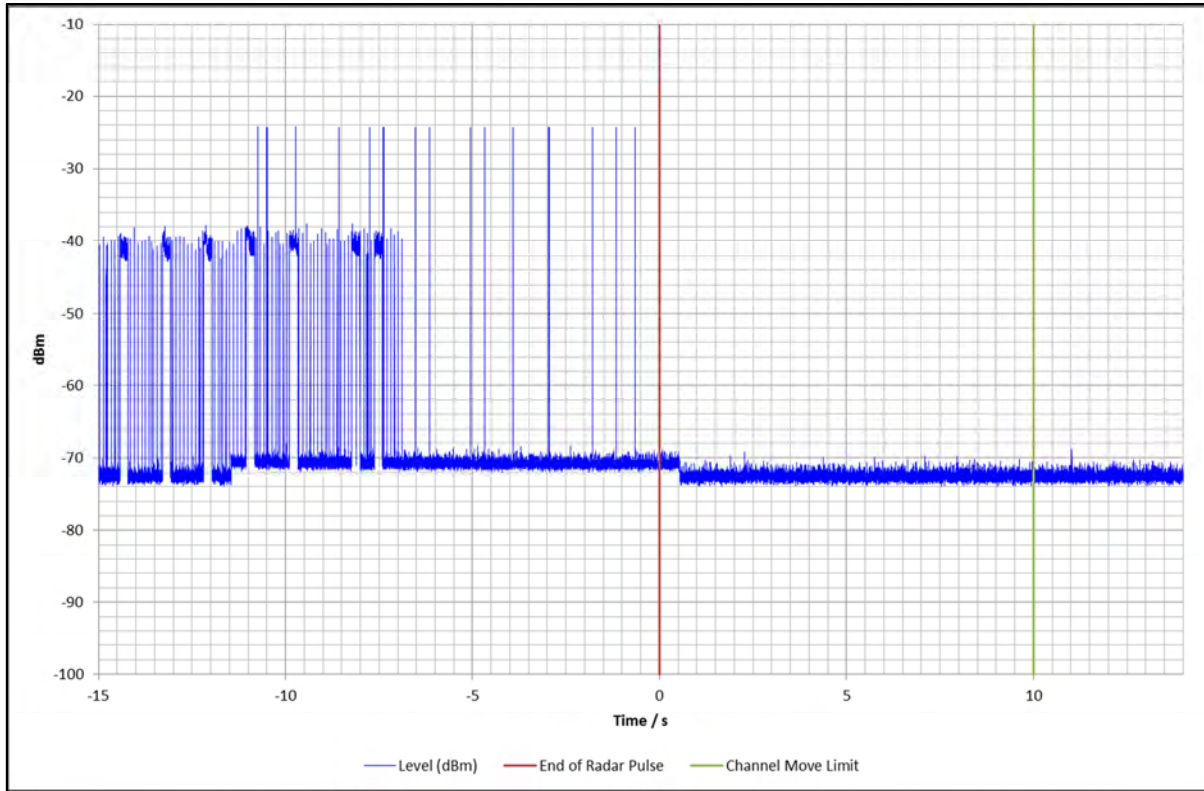


Zoomed Plot Showing Radar Pulse and end of Channel Move Time

Analysis of Response to Type 1 Radar	
Channel Move Time / ms	0 (EUT stop transmitting before end of radar burst)
Total Transmit Time after end of radar / ms	0 (EUT stop transmitting before end of radar burst)
Total Transmit time after 200 ms from the end of the radar / ms	0 (EUT stop transmitting before end of radar burst)

**Channel Closing Transmission Time and Channel Move Time (continued)**

**Results: 20 MHz Master – Long Radar Type**



Radar burst type 5 was detected and channel move occurred.

No time limits apply for the long radar type; this plot is included for reference only.

**Limits:**

**Table 4: DFS Response Requirement Values**

Parameter	Value
<i>Channel Move Time</i>	10 seconds See Note 1.
<i>Channel Closing Transmission Time</i>	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.

**Note 1:** The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:

- For the Short Pulse Radar Test Signals this instant is the end of the *Burst*.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated.
- For the Long Pulse Radar Test Signal this instant is the end of the 12 second period defining the *Radar Waveform*.

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

**5.2.6. Non-occupancy Period**

**Test Summary:**

<b>Test Engineer:</b>	Philip Harrison	<b>Test Date:</b>	14 April 2014
<b>Test Sample Serial Numbers:</b>	VPE1191429 (Master) VPE1191436 (Client)		

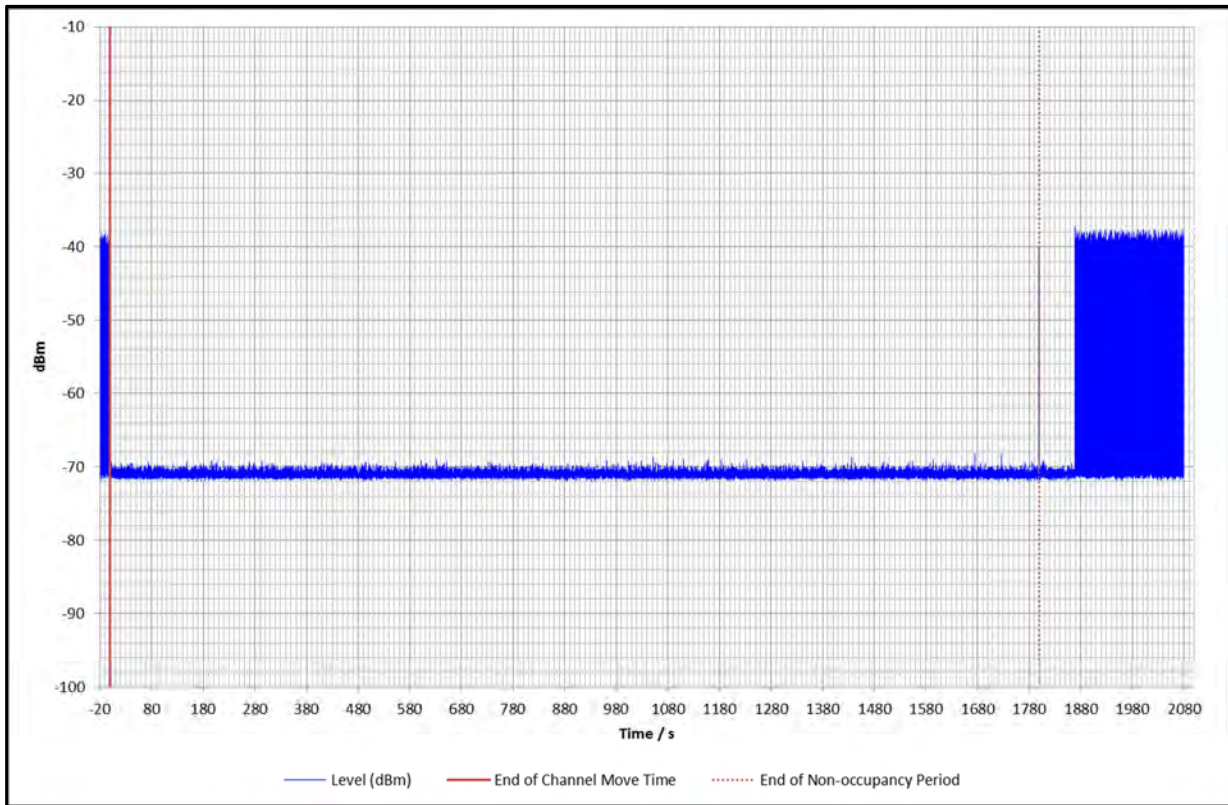
<b>FCC Reference:</b>	Part 15.407(h)(iv)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(b)(v)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.3

**Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	28

**Results: 20 MHz**

Radar burst type 1 detected and channel was vacated for >30 minutes.



**Limit:**

**Table 4: DFS Response Requirement Values**

Parameter	Value
<i>Non-occupancy period</i>	Minimum 30 minutes

**5.2.7. Statistical Performance Check – Short Pulse Radar Types 1 - 4****Test Summary:**

<b>Test Engineer:</b>	Philip Harrison	<b>Test Date:</b>	25 April 2014
<b>Test Sample Serial Number:</b>	VPE1191429 (Master)		

<b>FCC Reference:</b>	Part 15.407(h)(2)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(a)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.4.1

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	35

**Note(s):**

1. The aggregate detection probability was 106 detected of 120 trials, resulting in an aggregate detection of 88.3 %.

**Results: 20 MHz / Radar Type 1 / Master Mode**

Radar Type	Trial Number	Detected?	Trial Number	Detected?
1	1	Yes	16	Yes
	2	Yes	17	Yes
	3	Yes	18	Yes
	4	Yes	19	Yes
	5	Yes	20	Yes
	6	Yes	21	Yes
	7	Yes	22	Yes
	8	Yes	23	Yes
	9	Yes	24	Yes
	10	Yes	25	Yes
	11	Yes	26	Yes
	12	Yes	27	Yes
	13	Yes	28	Yes
	14	Yes	29	Yes
	15	No	30	Yes
<b>Detection level</b>			96.7 %	



**Statistical Performance Check – Short Pulse Radar Types 1 - 4 (continued)****Results: 20 MHz / Radar Type 2 / Master Mode**

Radar Type	Trial Number	Number Pulses per Burst	Pulse Width (µs)	PRI (µs)	Detected?
2	1	24	1.0	158	Yes
	2	27	1.1	226	Yes
	3	29	1.2	167	Yes
	4	23	1.4	185	Yes
	5	28	1.6	192	Yes
	6	23	1.7	224	Yes
	7	28	1.8	153	Yes
	8	28	1.8	184	Yes
	9	25	1.8	192	Yes
	10	26	1.9	169	Yes
	11	27	2.1	208	Yes
	12	27	2.2	209	No
	13	29	2.3	221	Yes
	14	24	2.4	170	Yes
	15	25	2.4	200	Yes
	16	29	2.7	230	No
	17	29	3.1	193	Yes
	18	25	3.3	192	Yes
	19	23	3.4	158	Yes
	20	26	3.4	194	Yes
	21	26	3.6	184	Yes
	22	25	3.9	150	Yes
	23	29	4.0	156	Yes
	24	29	4.1	230	Yes
	25	24	4.3	208	Yes
	26	26	4.6	197	No
	27	27	4.7	196	No
	28	24	4.7	199	Yes
	29	26	4.7	223	Yes
	30	25	5.0	192	Yes
<b>Detection Level</b>				86.7 %	

**Statistical Performance Check – Short Pulse Radar Types 1 - 4 (continued)****Results: 20 MHz / Radar Type 3 / Master Mode**

Radar Type	Trial Number	Number Pulses per Burst	Pulse Width ( $\mu$ s)	PRI ( $\mu$ s)	Detected?
3	1	17	10.0	489	Yes
	2	16	6.1	219	Yes
	3	16	6.1	342	Yes
	4	16	6.2	300	Yes
	5	16	6.4	275	Yes
	6	17	6.6	338	Yes
	7	18	6.7	337	Yes
	8	17	7.0	288	Yes
	9	16	7.1	230	Yes
	10	16	7.1	477	No
	11	17	7.3	412	Yes
	12	18	7.4	205	Yes
	13	18	7.4	290	Yes
	14	16	7.6	216	Yes
	15	18	7.7	210	Yes
	16	18	7.7	339	Yes
	17	16	7.7	495	Yes
	18	17	7.8	272	Yes
	19	16	8.0	317	Yes
	20	17	8.4	384	Yes
	21	16	8.5	322	Yes
	22	17	8.8	305	Yes
	23	17	8.9	214	Yes
	24	16	8.9	289	No
	25	16	9.1	398	Yes
	26	18	9.3	211	Yes
	27	16	9.3	368	Yes
	28	16	9.5	334	Yes
	29	16	9.7	390	Yes
	30	17	9.9	226	Yes
<b>Detection Level</b>				93.3 %	

**Statistical Performance Check – Short Pulse Radar Types 1 - 4 (continued)****Results: 20 MHz / Radar Type 4 / Master Mode**

Radar Type	Trial Number	Number Pulses per Burst	Pulse Width ( $\mu$ s)	PRI ( $\mu$ s)	Detected?
4	1	16	11.0	258	Yes
	2	13	12.3	434	No
	3	15	12.5	216	Yes
	4	16	12.8	206	Yes
	5	12	13.5	247	Yes
	6	16	14.0	265	Yes
	7	13	14.0	394	Yes
	8	15	14.6	443	No
	9	15	14.7	227	Yes
	10	15	15.1	281	Yes
	11	12	15.3	217	No
	12	16	15.4	373	Yes
	13	12	16.0	358	Yes
	14	14	16.2	298	Yes
	15	14	16.6	311	No
	16	14	16.6	388	Yes
	17	12	17.4	256	No
	18	12	17.7	367	Yes
	19	14	18.1	267	No
	20	12	18.2	490	Yes
	21	14	18.6	274	Yes
	22	12	18.8	497	Yes
	23	13	19.1	398	Yes
	24	16	19.2	450	Yes
	25	12	19.6	346	No
	26	14	19.6	404	Yes
	27	15	19.6	473	Yes
	28	14	19.7	201	Yes
	29	14	19.7	414	Yes
	30	14	20.0	233	Yes
<b>Detection Level</b>				<b>76.7 %</b>	

**Statistical Performance Check – Short Pulse Radar Types 1 - 4 (continued)****Limits:****Table 5 – Short Pulse Radar Test Waveforms**

<b>Radar Type</b>	<b>Pulse Width (<math>\mu</math>sec)</b>	<b>PRI (<math>\mu</math>sec)</b>	<b>Number of Pulses</b>	<b>Minimum Percentage of Successful Detection</b>	<b>Minimum Number of Trials</b>
1	1	1428	18	60%	30
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

**5.2.8. Statistical Performance Check – Long Pulse Radar Type 5****Test Summary:**

<b>Test Engineer:</b>	Philip Harrison	<b>Test Date:</b>	25 April 2014
<b>Test Sample Serial Number:</b>	VPE1191429 (Master)		

<b>FCC Reference:</b>	Part 15.407(h)(2)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(a)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.4.2

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	35

**Results: 20 MHz / Radar Type 5 / Master Mode**

Radar Type	Trial Number	Detected?	Trial Number	Detected?
5	1	Yes	16	Yes
	2	Yes	17	Yes
	3	Yes	18	Yes
	4	Yes	19	Yes
	5	Yes	20	Yes
	6	Yes	21	Yes
	7	Yes	22	Yes
	8	Yes	23	Yes
	9	Yes	24	Yes
	10	Yes	25	Yes
	11	Yes	26	Yes
	12	Yes	27	Yes
	13	Yes	28	Yes
	14	Yes	29	Yes
	15	Yes	30	Yes
<b>Detection level</b>			100 %	

**Statistical Performance Check – Long Pulse Radar Type 5 (continued)****Notes:**

Further details of all parameters on which the trials using Radar Type 5 were created and can be found in Appendix 5: Statistical Performance Check– Radar Type 5 Trial Records.

**Limits:****Table 6 – Long Pulse Radar Test Waveform**

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

**5.2.9. Statistical Performance Check – Frequency Hopping Radar Type 6****Test Summary:**

<b>Test Engineer:</b>	Philip Harrison	<b>Test Date:</b>	25 April 2014
<b>Test Sample Serial Number:</b>	VPE1191429 (Master)		

<b>FCC Reference:</b>	Part 15.407(h)(2)
<b>Industry Canada Reference:</b>	RSS-210 A9.3(a)
<b>Test Method Used:</b>	FCC 06-96 Section 7.8.4.3

**Environmental Conditions:**

<b>Temperature (°C):</b>	26
<b>Relative Humidity (%):</b>	35

**Results: 20 MHz / Radar Type 6 / Master Mode**

Radar Type	Trial Number	Detected?	Trial Number	Detected?
6	1	Yes	16	Yes
	2	Yes	17	Yes
	3	Yes	18	Yes
	4	Yes	19	Yes
	5	Yes	20	Yes
	6	Yes	21	Yes
	7	Yes	22	Yes
	8	Yes	23	Yes
	9	Yes	24	Yes
	10	Yes	25	Yes
	11	Yes	26	Yes
	12	Yes	27	Yes
	13	Yes	28	Yes
	14	Yes	29	Yes
	15	Yes	30	Yes
Detection level			100 %	

**Limits:****Table 7 – Frequency Hopping Radar Test Waveform**

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

## **6. Measurement Uncertainty**

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

<b>Measurement Type</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
Dynamic Frequency Selection (DFS) – Radar Amplitude	95%	2.17 dB
Dynamic Frequency Selection (DFS) – CAC Plot Timing	95%	± 918 ms
Dynamic Frequency Selection (DFS) – Channel Shutdown Timing	95%	± 450 µs
Dynamic Frequency Selection (DFS) – Non-Occupancy Timing	95%	± 79.25 ms

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.



**Appendix 1. Test Equipment Used**

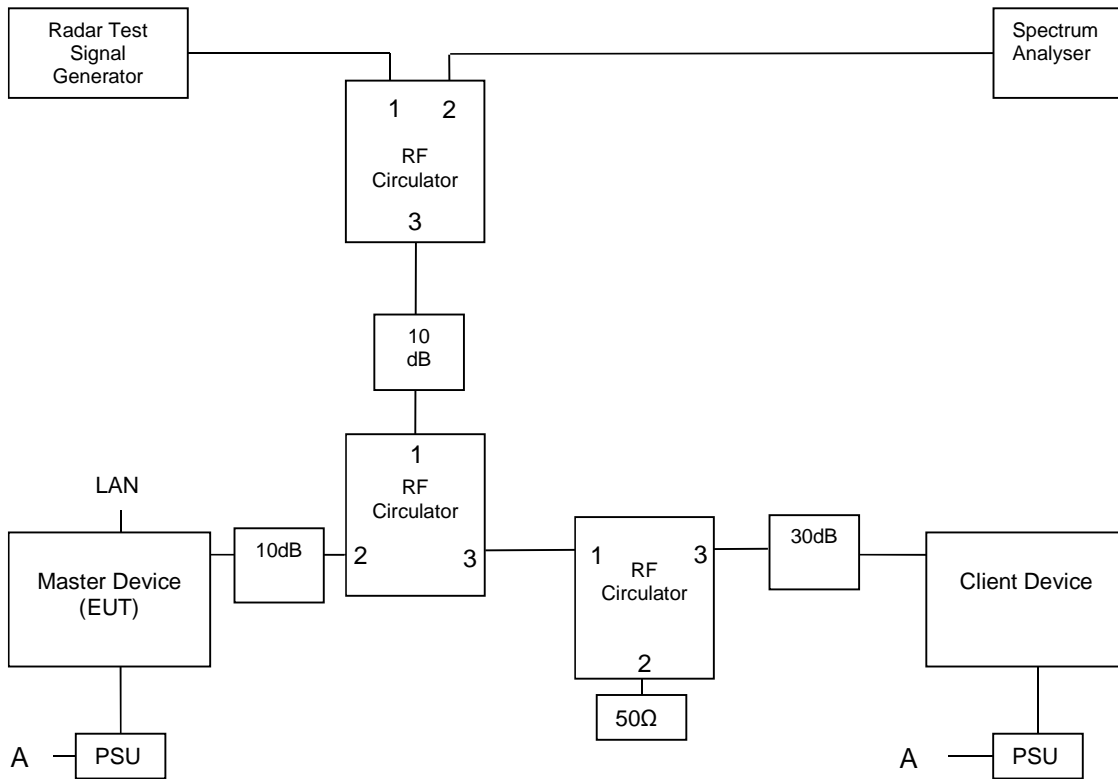
Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1631	DFS Test System	Aeroflex	PXI 3000	300110/291	11 Jun 2015	24
L1028	Spectrum Analyser	Rohde & Schwarz	FSV30	100233	23 May 2014	12
A2141	10 dB Attenuator	AtlanTecRF	AN18-10	090918-04	Calibrated before use	-
A030	Step Attenuator	Narda	445-69	01544	Calibrated before use	-
A090	Step Attenuator	Narda	743-80	01057	Calibrated before use	-
A2179	Coaxial Circulator 4-18GHz	AtlanTecRF	ACC-20130-SF-SF-SF	120409230	Calibrated before use	-
A2180	Coaxial Circulator 4-18GHz	AtlanTecRF	ACC-20130-SF-SF-SF	120409231	Calibrated before use	-
A2181	Coaxial Circulator 4-18GHz	AtlanTecRF	ACC-20130-SF-SF-SF	120409232	Calibrated before use	-
G0608	Signal Generator	Rohde & Schwarz	SMIQ 06B	838341/033	14 Feb 2015	12
M1590	Test Receiver	Rohde & Schwarz	ESU26	1000239	31 Jul 2014	12

**NB** In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.

## Appendix 2. Monitoring Methods Diagrams

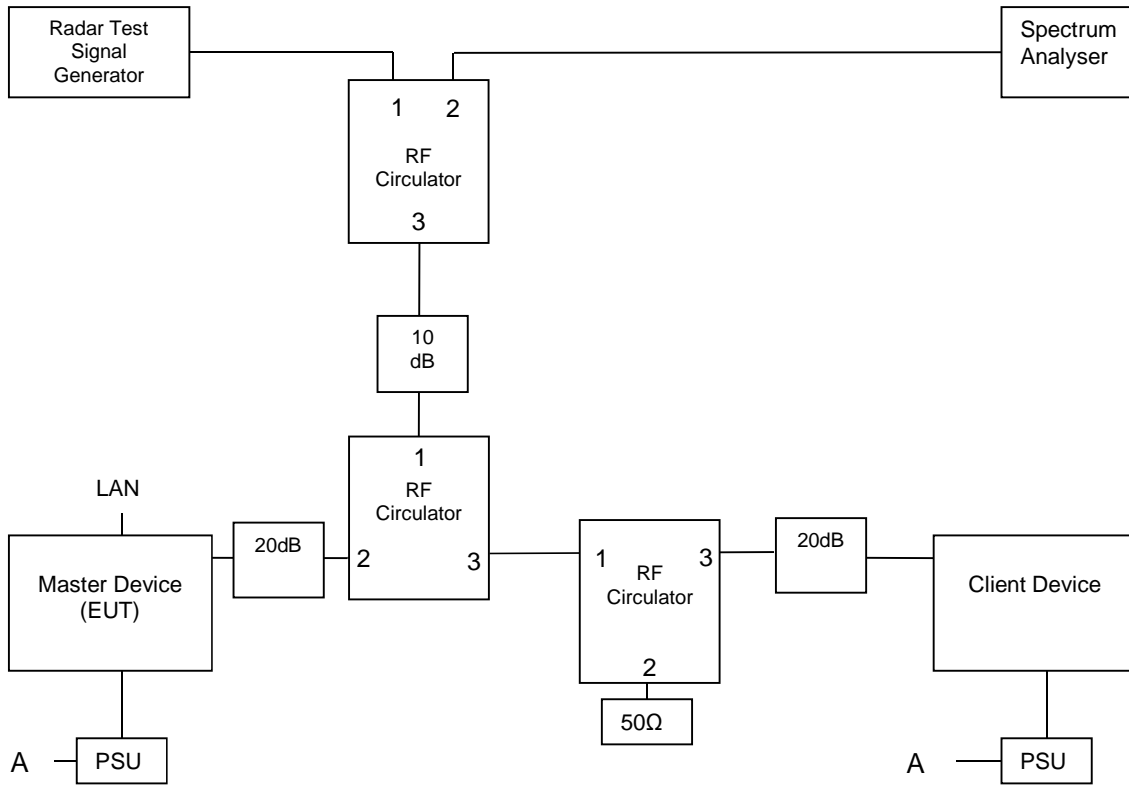
All tests were performed as conducted measurements using the setups as shown below

### Setup Diagram – EUT – Master, Radar Injection at Master



Note: The circulators are stated to have approximately 18 dB loss in the reverse direction. The bottom right circulator is to provide the same path loss in both directions between the master and client device.

**Setup Diagram – EUT – Client, Radar Injection at Master**



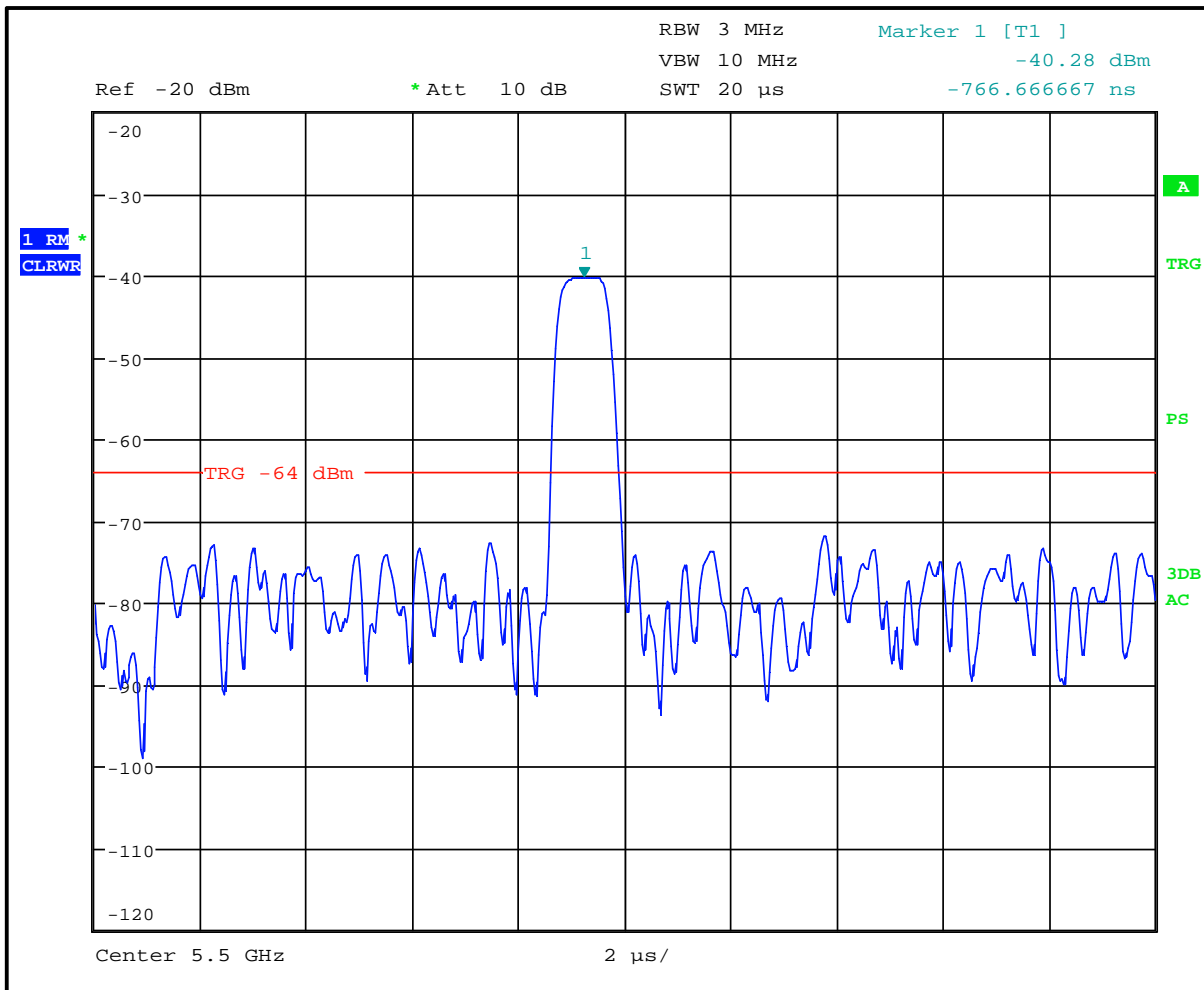
Note: The circulators are stated to have approximately 18 dB loss in the reverse direction. The bottom right circulator is to provide the same path loss in both directions between the master and client device.

### Appendix 3. Radar Type 1-6 Calibration and Verification Data

All radars were generated and produced by a calibrated Aeroflex DFS test system. The radar pulse generation of this system has previously been verified by the FCC (see Appendix 4). However, an amplitude verification plot and example plots of each radar have been included.

#### Amplitude Verification

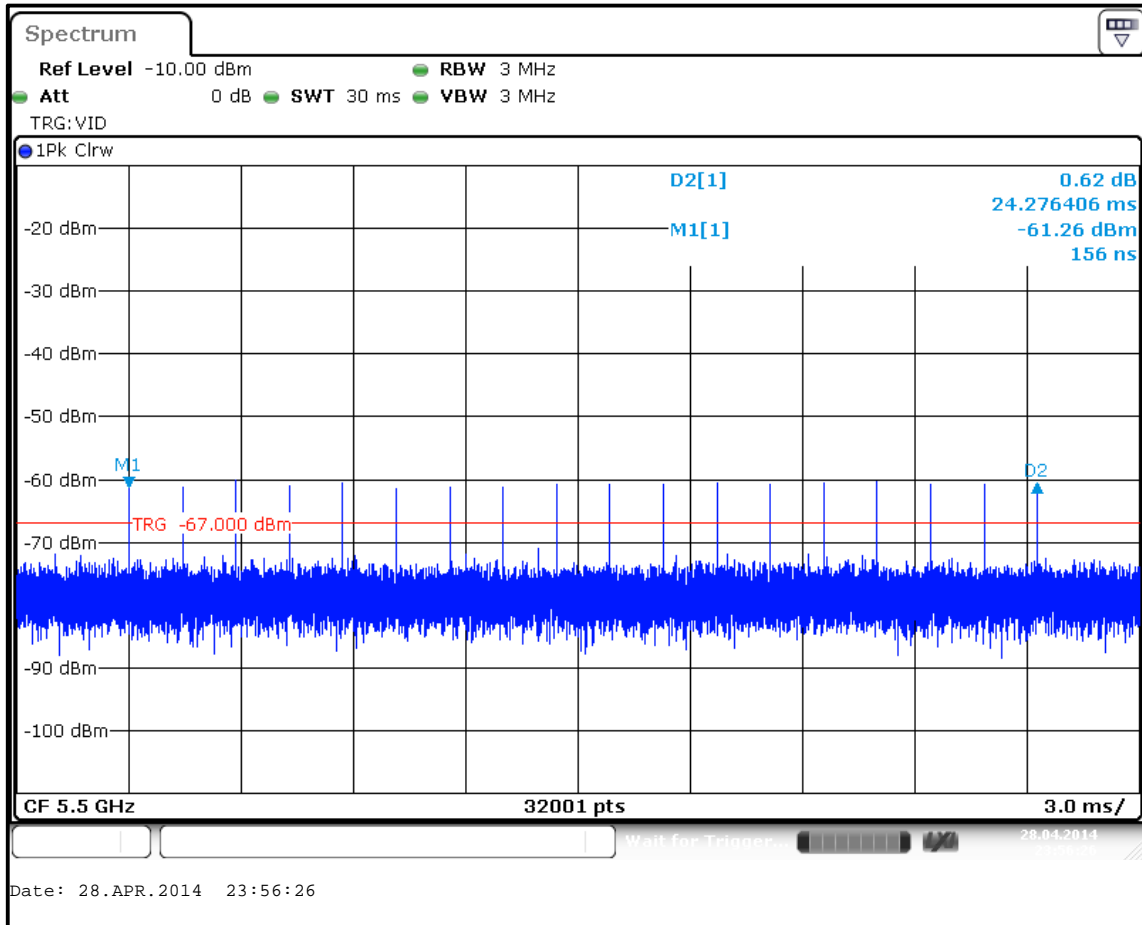
Plots were taken at the EUT port of the test network with spectrum analyser replaced with a 50 Ω load, and the EUT replaced with the spectrum analyser. Amplitude verification was done with an “output level” of -40 dBm to improve the distance from the noise floor. This is offset by the test network path loss compensation value of 39.8 dB which was calibrated with a CW signal. This should therefore result in a measured value of -40.0 dBm at the EUT. The amplitude requirement of *average power per 1 μs* was achieved by using an RMS detector and a sampling time of 66.6 ns (noticeably shorter than 1 μs) so the RMS averaging of the type 1 radar’s 1 μs pulse did not include large amounts of off-period dependant on the radar versus sampling synchronicity.



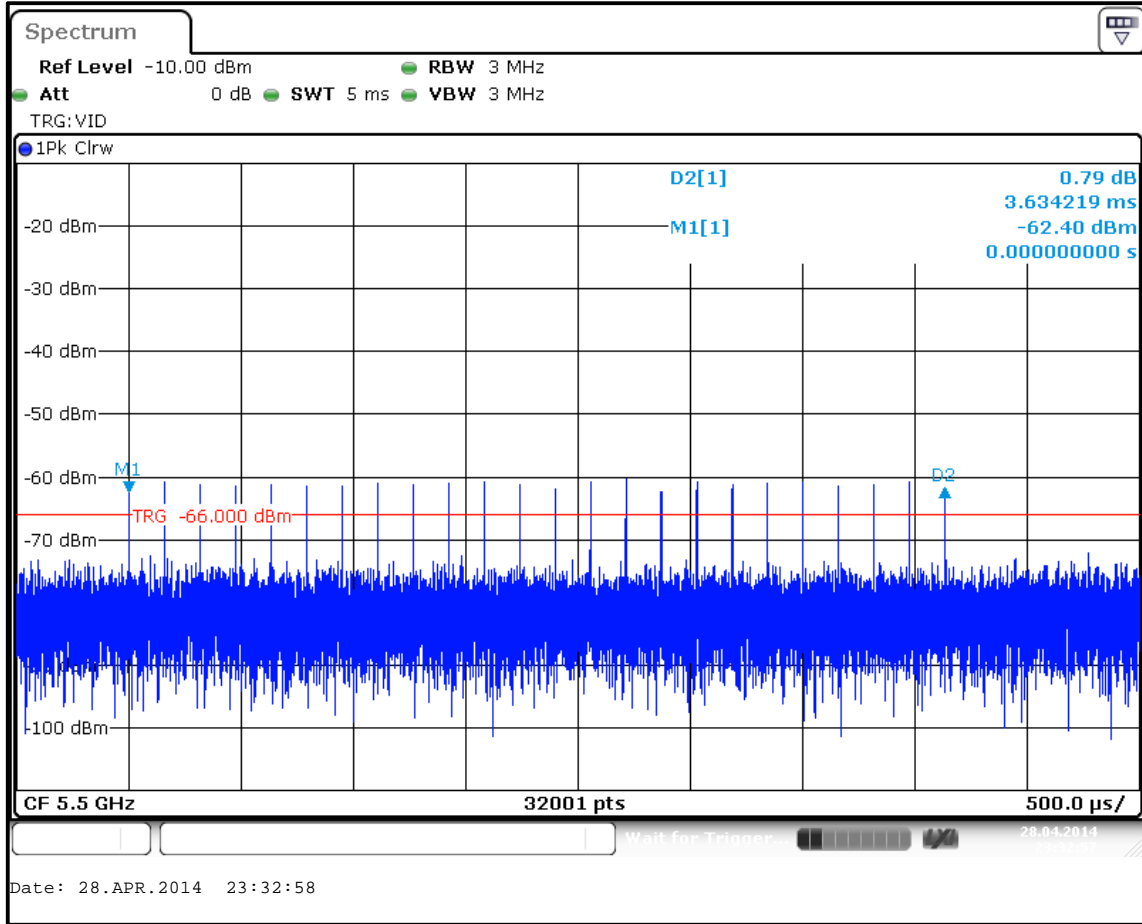
Radar Amplitude Verification

### Radar Verification

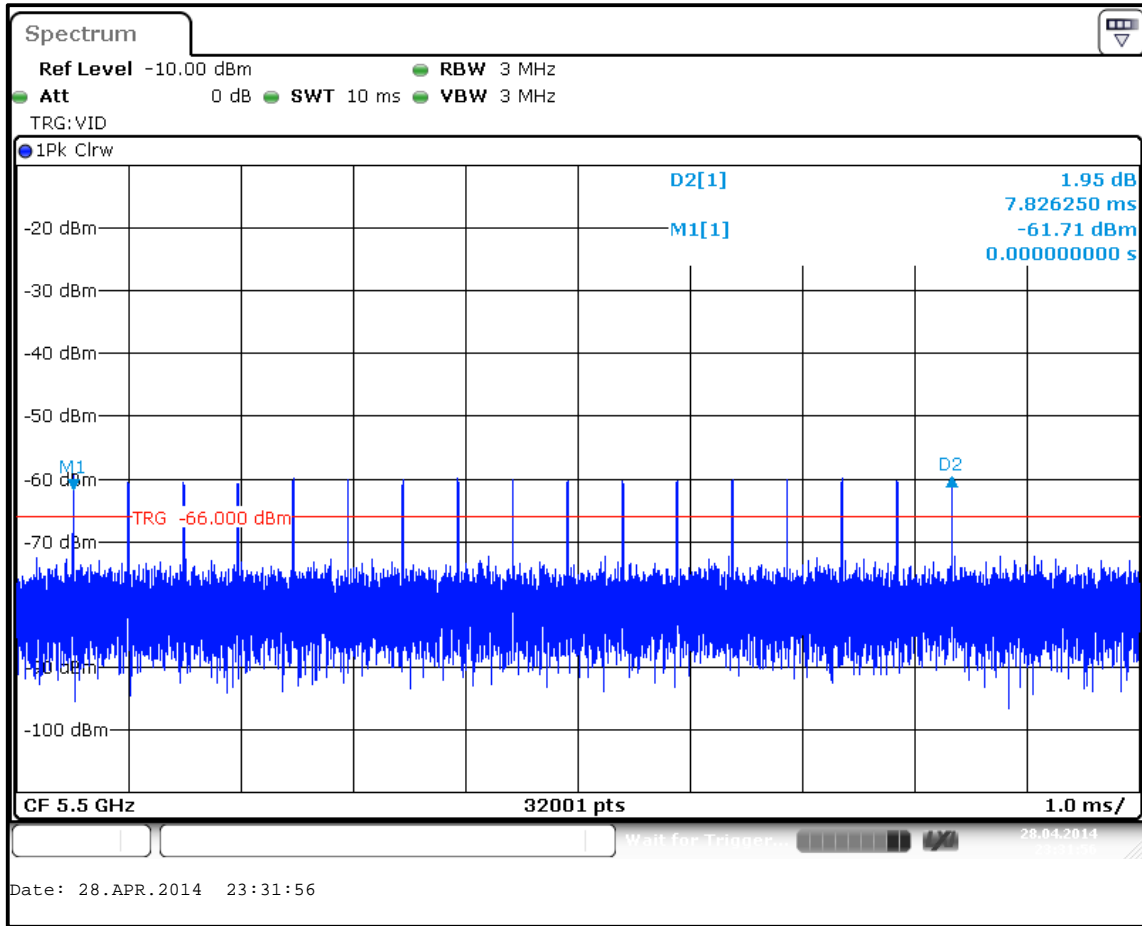
The following plots show examples of the radar timing and number of pulses. Due to the sampling limitations of a spectrum analyser plot over the duration of the radar capture, the amplitude of the pulses will not appear correct using an RMS detector and a sample size (averaging time) greater than a radar pulse. Therefore they were taken for timing validation only, using a peak detector.



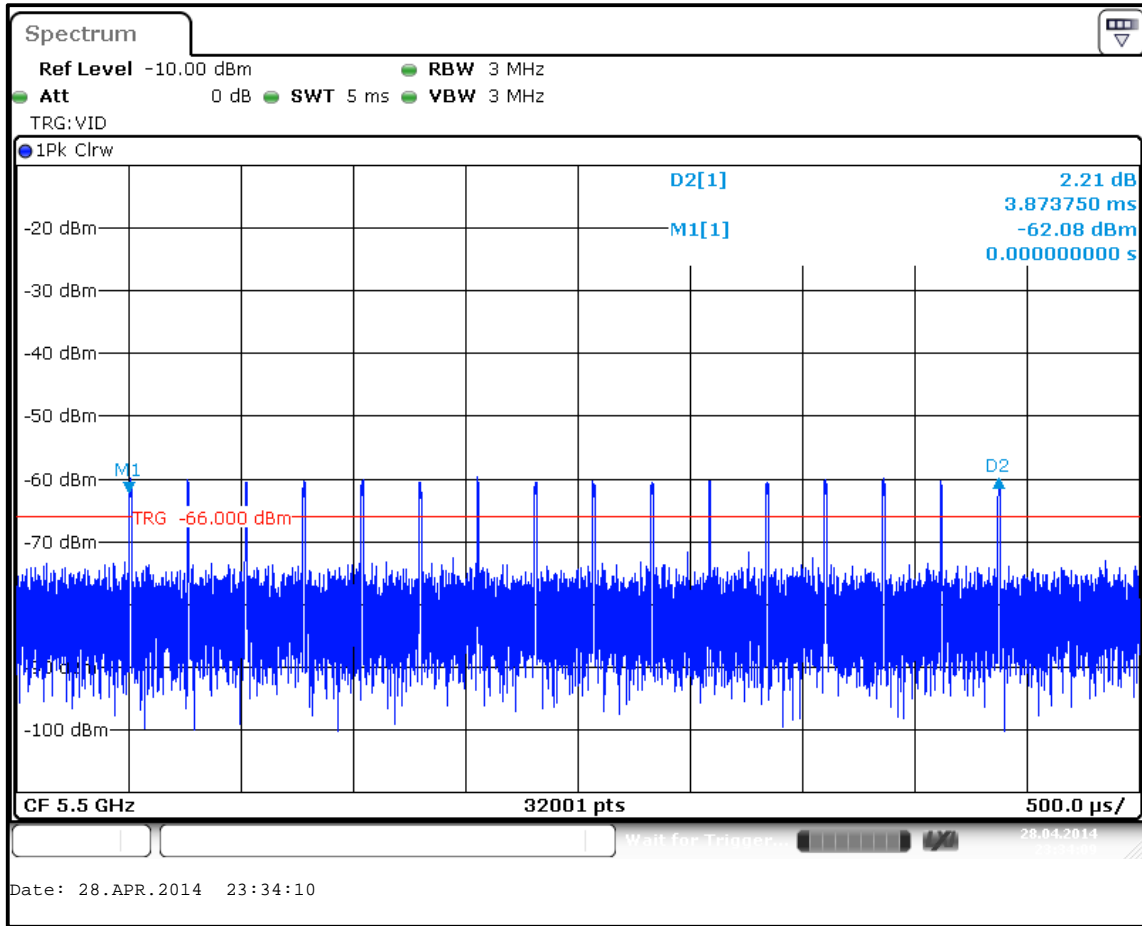
Radar Pulse 1



Radar Pulse 2

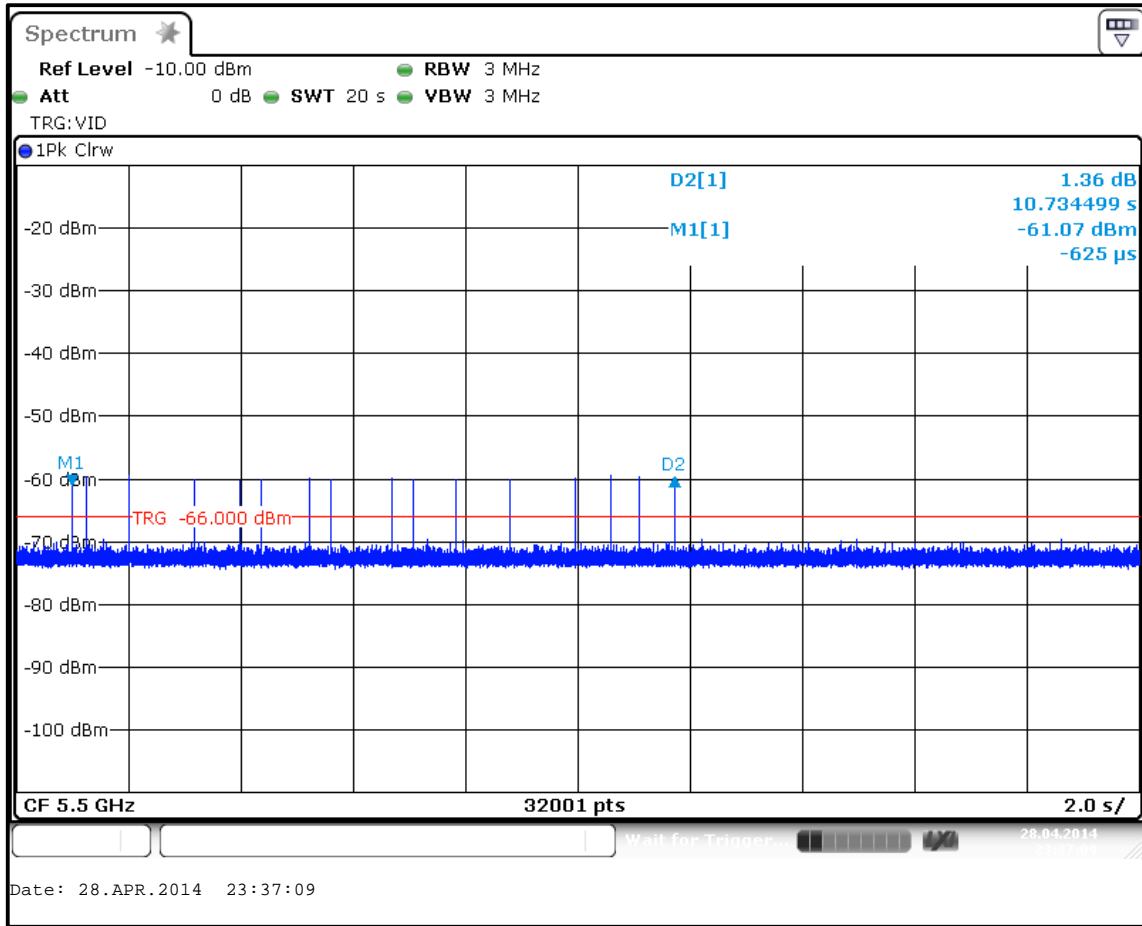


Radar Pulse 3

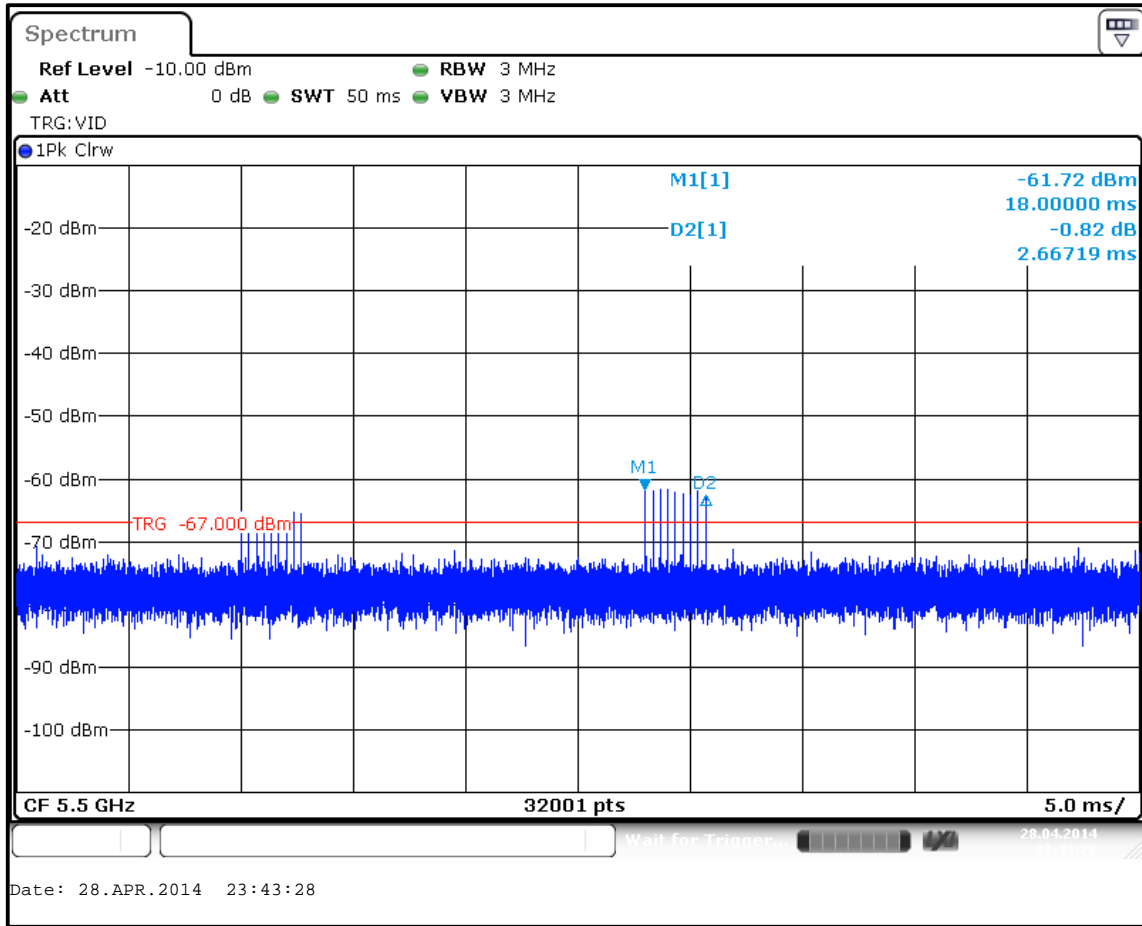


Radar Pulse 4





Long Radar Pulse 5



Hopping Radar Pulse 6

**Appendix 4. Test platform confirmation email**

From: Andrew Leimer [<mailto:Andrew.Leimer@fcc.gov>]  
Sent: Friday, September 23, 2011 4:24 PM  
To: Chisham, Steve  
Cc: Carey, Tim; Hack, Barry; Rashmi Doshi; Joe Dichoso  
Subject: RE: Certification for Aeroflex DFS solution

Hello Steve,

The Aeroflex "DXI based DFS test solution" system used for DFS alternative radar signal generation has been approved by the FCC and NTIA.

This approval permits the system to be used by labs in the testing of DFS devices for equipment authorization Certification. It is recommended that applicants that use your system for testing include a statement in the Test Report or a Letter Exhibit stating that the system has FCC and NTIA approval. This E-mail is your record of this approval.

Note that the appropriate term for your system is Approved as the term Certification is reserved for devices gaining equipment authorization through the FCC or a TCB.

Regards,  
Andy Leimer

FCC/OET/EACB

## **Appendix 5. Statistical Performance Check– Radar Type 5 Trial Records**

### **20 MHz - Master Mode - Trial 1**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	52	14	-	-	721793
2	3	67	18	1526	1822	210138
3	1	51	8	-	-	231032
4	1	59	5	-	-	643743
5	3	85	14	1578	1746	704553
6	2	73	8	1103	-	327043
7	3	89	8	1997	1312	430968
8	2	100	14	1351	-	61469
9	1	62	6	-	-	412151
10	3	65	11	1919	1579	30612
11	2	77	6	1022	-	45910
12	2	65	15	1303	-	249011
13	1	86	6	-	-	676448
14	2	99	5	1930	-	546461
15	3	60	12	1508	1644	308957
16	1	74	8	-	-	205951

### **20 MHz - Master Mode - Trial 2**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	64	13	-	-	395743
2	2	61	7	1974	-	250541
3	1	61	10	-	-	261647
4	1	98	13	-	-	164759
5	1	51	16	-	-	281830
6	2	59	19	1840	-	952751
7	1	72	14	-	-	732169
8	1	55	10	-	-	952085
9	1	93	8	-	-	693001
10	2	64	17	1053	-	677537
11	3	72	18	1202	1489	689460
12	3	58	9	1159	1576	68877

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 3**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	81	13	-	-	436752
2	1	86	10	-	-	415032
3	3	56	20	1309	1747	86569
4	2	74	17	1748	-	711919
5	1	90	12	-	-	372323
6	3	88	13	1749	1755	452187
7	3	98	17	1883	1686	593402
8	2	56	18	1101	-	66964
9	3	58	17	1313	1855	711479
10	3	79	12	1693	1515	327805
11	3	92	17	1620	1154	451739
12	3	82	20	1610	1951	147902
13	1	61	11	-	-	48191
14	2	90	10	1931	-	516231
15	3	77	15	1721	1152	107522

**20 MHz - Master Mode - Trial 4**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	3	58	9	1876	1252	337405
2	1	52	19	-	-	79272
3	2	79	5	1461	-	68593
4	1	60	14	-	-	85442
5	2	73	15	1219	-	428461
6	2	79	17	1876	-	188756
7	1	95	5	-	-	272744
8	3	92	17	1337	1075	587342
9	2	56	11	1163	-	149870
10	2	89	18	1186	-	440707
11	2	71	7	1017	-	312913
12	2	56	20	1593	-	325984
13	3	89	8	1743	1745	142374
14	2	57	7	1625	-	188599
15	3	56	15	1495	1519	52106
16	2	100	9	1593	-	450501
17	2	58	18	1724	-	471782
18	3	97	13	1715	1864	467024
19	2	63	18	1899	-	403388

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 5**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	99	15	-	-	685556
2	2	70	16	1295	-	471894
3	2	99	9	1602	-	888321
4	1	97	20	-	-	179090
5	1	96	5	-	-	440818
6	2	60	14	1911	-	401551
7	3	79	10	1627	1621	406612
8	1	99	10	-	-	891871
9	3	50	17	1118	1428	218274
10	2	98	8	1113	-	828889
11	2	82	10	1674	-	786050
12	3	70	13	1549	1424	146344
13	2	99	16	1721	-	129926

**20 MHz - Master Mode - Trial 6**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	94	13	1994	-	620665
2	3	99	7	1269	1787	372745
3	1	99	8	-	-	221247
4	3	77	13	1942	1056	598365
5	3	86	16	1437	1766	340568
6	3	68	17	1396	1707	60384
7	2	80	10	1612	-	570454
8	2	84	10	1497	-	368080
9	3	91	9	1585	1180	508316
10	3	71	7	1780	1084	593197
11	2	58	17	1556	-	138631
12	2	58	17	1457	-	245871
13	3	57	11	1643	1985	116285
14	2	55	9	1721	-	286430
15	1	88	19	-	-	91188
16	1	68	5	-	-	323779
17	2	61	19	1011	-	392447
18	1	60	18	-	-	220800
19	1	63	7	-	-	433945

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 7**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	96	7	1186	-	715904
2	3	84	17	1068	1513	483501
3	2	70	11	1899	-	548130
4	1	52	7	-	-	396778
5	1	58	20	-	-	177172
6	3	82	17	1371	1281	1147108
7	1	78	17	-	-	74011
8	1	100	20	-	-	1327144
9	3	59	18	1589	1161	550907

**20 MHz - Master Mode - Trial 8**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	80	17	-	-	686855
2	3	60	8	1007	1389	41994
3	2	98	5	1410	-	679631
4	1	65	13	-	-	154424
5	2	91	16	1350	-	154429
6	3	71	5	1229	1981	338465
7	2	100	13	1485	-	480702
8	1	99	12	-	-	257543
9	2	90	13	1378	-	747939
10	3	51	20	1585	1917	100810
11	2	53	20	1908	-	625897
12	2	63	14	1999	-	390364
13	1	99	5	-	-	702057
14	2	70	11	1531	-	574621
15	3	53	18	1171	1542	526841
16	1	67	10	-	-	305132

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 9**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	73	9	1846	-	570858
2	2	52	15	1648	-	144981
3	3	69	12	1822	1509	517999
4	2	72	11	1400	-	382823
5	2	91	5	1068	-	443747
6	3	71	8	1570	1069	569801
7	1	55	6	-	-	440127
8	2	59	5	1165	-	223805
9	3	95	13	1121	1684	242858
10	2	51	19	1750	-	567541
11	3	50	9	1987	1641	176650
12	3	60	13	1630	1435	49227
13	1	93	8	-	-	222620
14	3	91	7	1336	1412	163757
15	1	92	14	-	-	176585
16	3	69	10	1553	1382	202353
17	3	58	20	1181	1817	62431
18	1	69	11	-	-	522102
19	2	86	10	1805	-	237041

**20 MHz - Master Mode - Trial 10**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	51	14	1219	-	784653
2	2	74	15	1961	-	497782
3	2	68	10	1393	-	964263
4	3	62	6	1258	1994	954278
5	1	77	15	-	-	824858
6	3	97	14	1601	1320	530359
7	3	96	15	1897	1283	1020287
8	1	80	11	-	-	740627
9	1	61	10	-	-	740610
10	3	50	5	1942	1707	518097
11	1	77	11	-	-	419929



**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 11**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	99	12	1944	-	411175
2	3	53	15	1970	1659	390684
3	3	75	14	1014	1086	436736
4	3	66	13	1794	1177	817352
5	1	89	19	-	-	552023
6	3	93	9	1215	1520	223885
7	2	90	20	1699	-	563424
8	3	89	9	1580	1389	17356
9	1	64	13	-	-	291539
10	3	69	16	1694	1068	703800
11	3	66	5	1403	1177	476991
12	1	58	17	-	-	610117
13	2	97	12	1072	-	697870
14	1	69	18	-	-	794513

**20 MHz - Master Mode - Trial 12**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	60	17	-	-	749377
2	3	74	11	1304	1203	361741
3	2	76	12	1438	-	594765
4	2	97	9	1481	-	292967
5	2	54	17	1678	-	460966
6	1	92	12	-	-	419767
7	2	50	18	1767	-	422994
8	2	73	13	1084	-	462868
9	3	57	20	1967	1343	137856
10	3	74	5	1327	1350	92919
11	1	68	13	-	-	17409
12	1	72	6	-	-	287410
13	2	83	20	1779	-	451688
14	2	84	17	1922	-	735867
15	1	97	18	-	-	572894

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 13**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	78	6	-	-	293164
2	2	83	18	1800	-	76327
3	1	76	19	-	-	330665
4	1	75	9	-	-	22101
5	2	86	5	1043	-	122005
6	1	70	19	-	-	334037
7	1	78	6	-	-	31248
8	2	63	11	1588	-	227993
9	2	55	20	1605	-	467199
10	3	93	18	1604	1045	359882
11	1	77	11	-	-	420154
12	1	76	7	-	-	440064
13	3	51	11	1718	1548	2310
14	2	62	16	1068	-	504374
15	1	77	19	-	-	575832
16	1	59	5	-	-	544935
17	1	67	8	-	-	221109
18	2	68	10	1325	-	410423

**20 MHz - Master Mode - Trial 14**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	90	19	1134	-	953790
2	3	65	6	1388	1443	800720
3	1	73	7	-	-	1044870
4	3	90	5	1267	1685	485559
5	2	60	16	1105	-	418328
6	2	85	18	1363	-	265425
7	3	94	6	1225	1268	1131966
8	1	91	5	-	-	739677
9	3	90	14	1215	1812	1177123

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 15**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	86	14	1340	-	86338
2	3	90	5	1594	1214	42580
3	2	65	14	1260	-	37304
4	1	97	10	-	-	545636
5	3	76	20	1665	1191	310221
6	1	69	15	-	-	911117
7	2	65	11	1522	-	230929
8	1	90	18	-	-	930948

**20 MHz - Master Mode - Trial 16**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	60	15	-	-	381552
2	1	71	17	-	-	568653
3	3	89	10	1292	1474	311169
4	1	51	16	-	-	540642
5	1	93	17	-	-	237273
6	2	100	16	1734	-	581924
7	3	73	7	1227	1385	180914
8	2	52	16	1842	-	215037
9	2	89	12	1182	-	405061
10	3	62	7	1821	1908	253297
11	1	68	19	-	-	426156
12	3	57	19	1818	1688	535533
13	2	72	20	1495	-	325011
14	2	99	20	1078	-	280431
15	2	59	10	1331	-	222877
16	2	81	16	1507	-	438861
17	2	96	6	1349	-	198218
18	3	66	15	1533	1256	82074
19	3	57	12	1209	1334	270436
20	3	56	10	1284	1196	443323

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 17**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	97	20	-	-	521640
2	2	68	13	1196	-	286481
3	3	67	12	1377	1641	150715
4	3	60	9	1456	1823	304309
5	2	51	19	1121	-	35304
6	3	97	14	1177	1450	328627
7	1	81	9	-	-	369980
8	3	89	10	1169	1737	865589
9	2	60	6	1762	-	881639
10	3	76	11	1115	1989	680201
11	3	55	14	1893	1079	408084
12	1	70	14	-	-	564053
13	1	75	20	-	-	255395

**20 MHz - Master Mode - Trial 18**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	88	19	1447	-	674834
2	1	54	11	-	-	592122
3	3	90	10	1081	1143	288538
4	1	53	12	-	-	435912
5	1	76	15	-	-	358525
6	3	66	5	1762	1151	231812
7	2	85	7	1485	-	145028
8	2	88	12	1669	-	21633
9	2	92	16	1778	-	38755
10	1	54	8	-	-	187285
11	1	71	6	-	-	30766
12	2	51	8	1685	-	179569
13	1	56	19	-	-	370698
14	3	53	10	1142	1664	615122
15	3	84	15	1688	1393	302132
16	1	71	17	-	-	629302
17	2	73	8	1819	-	349190

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 19**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	3	70	15	1759	1460	580007
2	3	75	10	1545	1109	553982
3	3	83	11	1913	1624	124320
4	2	79	13	1740	-	405737
5	2	60	14	1435	-	474655
6	3	86	19	1102	1029	573493
7	1	99	12	-	-	543166
8	2	96	19	1145	-	213542
9	3	66	8	1519	1140	286204
10	2	92	5	1475	-	548415
11	2	58	16	1038	-	330949
12	3	77	20	1703	1624	393458
13	1	95	20	-	-	299962
14	2	71	16	1793	-	263201
15	2	69	11	1830	-	175168
16	3	54	9	1314	1261	522673
17	3	82	6	1510	1997	143673
18	2	67	14	1365	-	559096
19	2	87	8	1314	-	202451
20	2	82	5	1118	-	68303

**20 MHz - Master Mode - Trial 20**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	62	6	-	-	848647
2	3	88	14	1764	1243	723720
3	2	88	17	1379	-	856291
4	2	75	8	1969	-	398028
5	1	53	16	-	-	1023859
6	2	82	20	1631	-	553553
7	2	64	7	1761	-	671440
8	2	93	12	1219	-	378640
9	3	89	17	1122	1269	812
10	3	69	19	1552	1150	149463
11	3	57	16	1007	1961	564064

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 21**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	62	17	-	-	1271075
2	1	80	11	-	-	397577
3	3	59	17	1924	1989	377705
4	3	63	14	1431	1952	615904
5	3	83	9	1043	1078	475761
6	2	73	20	1012	-	811204
7	2	67	9	1091	-	126567
8	3	91	13	1533	1886	934133
9	3	59	7	1628	1162	1135101

**20 MHz - Master Mode - Trial 22**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	3	57	14	1008	1055	115238
2	2	100	16	1875	-	537127
3	1	97	9	-	-	584928
4	2	57	14	1679	-	115247
5	3	66	17	1888	1419	344253
6	1	84	6	-	-	537254
7	2	59	15	1494	-	63032
8	3	51	14	1288	1117	376483
9	1	61	20	-	-	386950
10	2	99	11	1021	-	367908
11	3	52	12	1661	1199	338733
12	2	85	14	1478	-	572915
13	3	97	18	1425	1703	244325
14	2	60	6	1548	-	318616
15	1	78	13	-	-	398718
16	1	92	8	-	-	574839
17	2	92	15	1449	-	540004
18	2	86	5	1294	-	321970
19	2	67	5	1810	-	95563
20	3	58	11	1516	1942	30369

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 23**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	96	6	-	-	394739
2	3	97	6	1535	1465	452708
3	2	82	18	1120	-	123776
4	2	97	5	1992	-	347850
5	1	83	14	-	-	175382
6	2	74	11	1725	-	424694
7	3	66	9	1908	1082	545969
8	3	69	12	1647	1789	772079
9	3	53	20	1897	1400	808234
10	1	85	15	-	-	400080
11	2	98	15	1397	-	459148
12	1	93	20	-	-	234194
13	2	69	5	1755	-	175488
14	1	86	17	-	-	411879

**20 MHz - Master Mode - Trial 24**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	74	11	-	-	187248
2	2	69	14	1665	-	283674
3	1	77	10	-	-	28565
4	3	62	18	1350	1263	630967
5	1	73	13	-	-	444224
6	2	63	13	1721	-	293332
7	3	88	15	1166	1559	265774
8	2	100	6	1748	-	130618
9	1	98	14	-	-	511418
10	3	87	7	1343	1226	469598
11	2	90	12	1094	-	348351
12	3	79	5	1002	1936	893517
13	2	63	19	1557	-	390215

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 25**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	3	87	8	1260	1716	601412
2	1	83	7	-	-	838790
3	3	81	15	1108	1188	492817
4	3	69	20	1214	1071	180945
5	2	50	20	1114	-	811120
6	1	68	15	-	-	707893
7	3	72	10	1357	1601	995208
8	1	83	8	-	-	339987
9	2	61	6	1616	-	380659
10	2	92	17	1160	-	461660
11	2	80	8	1297	-	619949
12	2	61	9	1602	-	789896

**20 MHz - Master Mode - Trial 26**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	1	74	7	-	-	581116
2	1	63	17	-	-	352523
3	2	78	16	1765	-	522988
4	2	98	8	1387	-	359881
5	3	100	11	1205	1215	107031
6	2	61	6	1737	-	119532
7	3	99	5	1400	1389	79312
8	3	99	15	1199	1099	45593
9	1	83	19	-	-	482808
10	3	67	15	1663	1168	501228
11	3	93	17	1564	1092	156535
12	3	79	20	1196	1014	231708
13	3	79	15	1364	1485	303387
14	1	62	16	-	-	241454
15	2	96	8	1541	-	185848
16	2	78	19	1415	-	44253
17	1	97	9	-	-	121006
18	2	92	5	1484	-	15590
19	1	62	19	-	-	37232
20	3	98	10	1137	1472	507070



**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 27**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	96	6	1273	-	275957
2	3	68	13	1952	1577	16142
3	1	89	20	-	-	474767
4	3	64	12	1770	1660	621447
5	3	61	15	1157	1744	1126269
6	2	80	20	1237	-	116791
7	1	63	14	-	-	157751
8	3	51	20	1697	1454	651054
9	2	72	5	1185	-	162400

**20 MHz - Master Mode - Trial 28**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	57	5	1671	-	935437
2	1	84	16	-	-	912695
3	2	55	12	1050	-	1315516
4	3	99	10	1925	1014	685249
5	1	62	20	-	-	351032
6	2	53	8	1978	-	262225
7	3	80	20	1622	1725	1240026
8	2	98	14	1385	-	1139253
9	2	96	11	1398	-	1209093

**Statistical Performance Check– Radar Type 5 Trial Records (continued)****20 MHz - Master Mode - Trial 29**

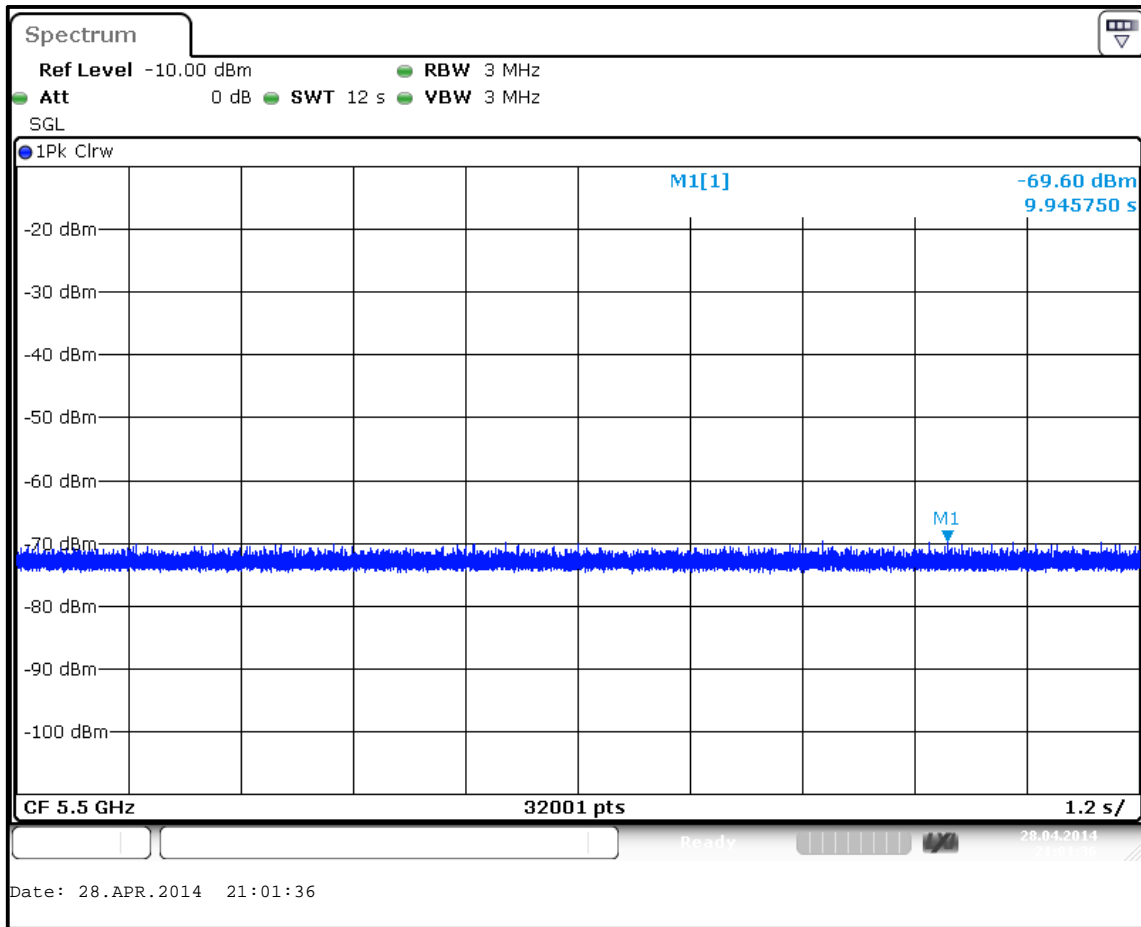
Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	2	73	13	1571	-	93128
2	1	58	14	-	-	690303
3	1	59	17	-	-	170761
4	2	100	16	1524	-	773747
5	3	57	18	1326	1055	430479
6	1	89	13	-	-	136639
7	3	71	17	1560	1355	803314
8	2	87	12	1626	-	574082
9	2	90	5	1920	-	614497
10	1	59	10	-	-	647822
11	3	95	11	1529	1567	651989
12	3	66	11	1033	1568	286715
13	2	50	15	1392	-	350670
14	2	71	9	1202	-	208599

**20 MHz - Master Mode - Trial 30**

Burst Segment	Number of Pulses	Pulse Width (usec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (usec)	Pulse 2-to-3 Spacing (usec)	Starting Location Within Interval (usec)
1	3	61	10	1343	1827	442015
2	2	62	18	1406	-	853469
3	1	52	5	-	-	299763
4	3	80	9	1107	1328	443234
5	1	67	18	-	-	861872
6	2	76	9	1625	-	843610
7	1	78	15	-	-	676898
8	2	65	8	1421	-	939439
9	3	53	17	1754	1930	886249
10	3	82	10	1135	1638	894579
11	1	54	19	-	-	932595

### Appendix 6. System Noise floor Reference Plots

As required by section 8.3.18(iii) of FCC 06-96, the following plots show the reference noise floor of the system used during measurement.



Noise floor of test system