Test of NuTune MRX 2010

To: FCC 47 CFR Part 15.407

Test Report Serial No.: TELE02-B8 Rev B





Test of NuTune MRX 2010

To: FCC 47 CFR Part 15.407

Test Report Serial No.: TELE02-B8 Rev B

This report supersedes TELE02-B8 Rev A

Applicant:	NuTune
	High Tech Campus 32
	Eindhoven, NL-5656AE
	The Netherlands

Product Function: Wireless Access Point – Client Device without Radar Detection

Copy No: pdf Issue Date: 10th October 2008





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ACCREDITATION, LISTINGS & RECOGNITION

MiCOM Labs, Inc. an accredited laboratory complies with the international standard BS EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) <u>www.a2la.org</u> test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; <u>http://www.a2la.org/scopepdf/2381-01.pdf</u>



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LISTINGS

MiCOM Labs test facilities are listed by the following organizations;

North America

United States of America

Federal Communications Commission (FCC) Listing #: 102167

Canada

Industry Canada (IC) Listing #:4143A-2

RECOGNITION

APEC MRA (Asia-Pacific Economic Community Mutual Recognition Agreement)

Conformity Assessment Body (CAB) – MiCOM Labs

Test data generated by MiCOM Labs is accepted in the following countries under the APEC MRA.

Country	Recognition Body		CAB Identification No.	
Australia	Australian Communications and Media Authority (ACMA)	Ι		
Hong Kong	Office of the Telecommunication Authority I (OFTA)			
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)		US0159	
Singapore	e Infocomm Development Authority (IDA)			
Taiwan	Directorate General of Telecommunications (DGT)	I		
	Bureau of Standards, Metrology and Inspection (BSMI)	I		

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DOCUMENT HISTORY

Document History			
Revision	Date	Comments	
Draft			
A	8 th October 2008	Initial release.	
В	10 th October 2008	Clarification of monitoring of beacons in Section 5.1.4.	



1. TEST RESULT CERTIFICATE

Applicant:	pplicant: NuTune		MiCOM Labs, Inc.	
	High Tech Campus 32		440 Boulder Court	
	Eindhoven, NL-5656AE		Suite 200	
	The Netherlands		Pleasanton	
			California, 94566, USA	
EUT:	Wireless Access Point	Telephone:	+1 925 462 0304	
Model:	MRX 2010 Configured as Client Device without Radar detection	Fax:	+1 925 462 0306	
S/N:	006037800 87C			
Test Date(s):	21st to 26th August 2008	Website:	www.micomlabs.com	

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.407	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

- 1. This document reports conditions under which testing was conducted and the results of testing performed.
- 2. Details of test methods used have been recorded and kept on file by the laboratory.
- 3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve Quality Manager MiCOM Labs,

ACCREDITED CERTIFICATE #2381.01

Gordon Hurst President & CEO MiCOM Labs, Inc.



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2. <u>REFERENCES AND MEASUREMENT UNCERTAINTY</u>

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 15.407	2007	Code of Federal Regulations
(ii)	FCC 06-96	June 2006	Memorandum Opinion and Order
(iii)	ANSI C63.4	2003	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
(iv)	CISPR 22/ EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(v)	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
(vi)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(vii)	ETSI TR 100 028	2001	Parts 1 and 2
			Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(viii)	A2LA	14 th September 2005	Reference to A2LA Accreditation Status – A2LA Advertising Policy
(ix)	FCC Public Notice – DA 02-2138	2002	Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices

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2.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.



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3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the NuTune MRX 2010 as a Client Device without Radar detection in the frequency ranges 5250 to 5350 MHz, and 5470 to 5725 MHz to FCC Part 15.407 DFS requirements only
Applicant:	NuTune High Tech Campus 32 Eindhoven, NL-5656AE The Netherlands
Manufacturer:	As applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	TELE02-B8 Rev B
Date EUT received:	21 st July 2008
Standard(s) applied:	FCC 47 CFR Part 15.407
Dates of test (from - to):	21st to 26th August 2008
No of Units Tested:	1
Type of Equipment:	802.11a/b/g/n Wireless Access Point, 2x3 Spatial Multiplexing MIMO configuration
Location for Use:	Indoor and outdoor operation
Applicants Trade Name:	NuTune
Model(s):	MRX 2010
FCC ID	WOPMRX2010C2
Software Release	2.3.5
Hardware Release	C2
Location for use:	Indoor Only
Declared Frequency Range(s):	5,250 to 5,350 MHz 5,470 to 5,725 MHz,
Type of Modulation:	Per 802.11 – OFDM
Declared Nominal Output Power: (Average Power)	+18 dBm
EUT Modes of Operation:	802.11a/b/g/n (20 & 40 MHz)
Transmit/Receive Operation:	Time Division Duplex
Rated Input Voltage and Current:	3.3 Vdc 0.9 A
Operating Temperature Range:	Declared range 0 to +60°C
Frequency Stability:	±15 ppm max
Equipment Dimensions:	50.8 mm X 56.2 mm X 4.2 mm
Weight:	14g
Primary function of equipment:	Transmission of Video (HD TV), data and voice

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3.2. Scope of Test Program

The scope of this program was to test the NuTune MRX 2010 wireless Access Point as a Client Device without Radar detection in Channel Bandwidths 20 MHz, and 40MHz configurations for compliance with the Dynamic Frequency Selection (DFS) requirements of FCC 47 CFR Part 15.407 and the FCC specification Memorandum Opinion and Order FCC 06-96. The Client configured device was tested with another NuTune MRX 2010 wireless Access Point configured as a Master device with full radar detection.

The antennas used with the MRX 2010 are detailed in section 3.4 "Antenna Details".

One frequency was chosen (5,500 MHz) from the operating channels of the UUT within 5,470 – 5,725 MHz band for DFS testing per the requirements of FCC specification "Memorandum Opinion and Order FCC 06-96", Section 7.8 "DFS Conformance Test Procedures".

U-NII devices operating in the 5,250 - 5,350 MHz and 5,470 - 5,725 MHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems.

DFS performance testing was completed conductively.



NuTune MRX 2010 Wireless Access Point



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3.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
Client (EUT)	Access Point	NuTune	MRX 2010	006037800 87C
Master	Access Point	NuTune	MRX 2010	006037800 87D
Support	Power Supply	VOLTCRAFT/Amplus	9935	20082954
Support	Laptop PC	IBM	Thinkpad	None

3.4. Antenna Details

a. Rubber Ducky 2.5 dBi @ 2.4GHz / 5.5 dBi @ 5GHz

3.5. Cabling and I/O Ports

Number and type of I/O ports

- 1. 10/100 Ethernet X 2
- 2. USB Port
- 3. 4mm socket for 18 Vdc supply

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3.6. <u>Test Configurations</u>

Matrix of test configurations

Operational Mode	Test Frequency (MHz)	Band Width Variant (MHz)
802.11a	5500	20 MHz
	5510	40 MHz

DFS testing was performed on the customer equipment configured as;-

1). Client device without radar detection;- in accordance with the following table.

Requirement	Operational Modes		
	Client Without Radar Detection		
DFS Detection Threshold	Not Required		
Channel Closing Transmission Time	Yes		
Channel Move Time	Yes		
U-NII Detection Bandwidth	Not Required		

3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

3.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE



4. TEST SUMMARY

List of Measurements - Dynamic Frequency Selection (DFS)

The following table represents the list of measurements required under the FCC CFR47 Part 15.407(h)(2) and FCC Memorandum Opinion and Order FCC 06-96 (Compliance Measurement procedures for Unlicensed National Information Infrastructure devices operating in the 5250-5350 MHz and 5470-5725 MHz bands incorporating dynamic frequency selection).

Tests performed on NuTune MRX-2010 Master Device

Section	Test Items	Description	Condition	Result	Test Report Section
7.8.3	In-Service Monitoring	In-Service Monitoring for Channel Move Time and Channel Closing Transmission Time	Conducted	Complies	5.1.3

Note 1: Test results reported in this document relate only to the items tested

Note 2: The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria

Note 3:Section 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix



5. Dynamic Frequency Selection (DFS)

5.1. Test Procedure and Setup

FCC, Part 15 Subpart C §15.407(h) FCC 06-96 Memorandum Opinion and Order

5.1.1. DFS Response requirement values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds
	See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 80% of the 99% power bandwidth See Note 3.

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 transmission.

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 *Channel* changes (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

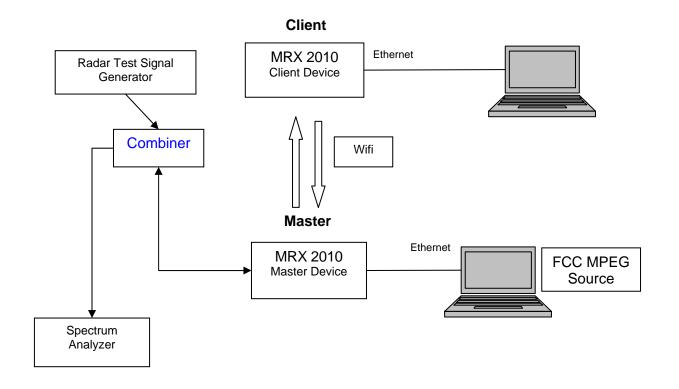
Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.

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5.1.2. Test Set Up:

Block Diagram(s) of Test Setup



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5.1.3. <u>Client Device - In-Service Monitoring for Channel Move Time, Channel Closing</u> <u>Transmission Time FCC §15.407(h)(2)(iii)</u>

Tests Performed on Client Device (without radar detection)

Requirement	Operational Mode Client Without Radar Detection
DFS Detection Threshold	Not Required
Channel Closing Transmission Time	Yes
Channel Move Time	Yes
U-NII Detection Bandwidth	Not Required

The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold is generated on the Operating Channel of the U-NII device.

A U-NII device operating as a Master Device was associated with the EUT (Client). The requisite MPEG video file ("TestFile.mpg" available on the NTIA website at the following link http://ntiacsd.ntia.doc.gov/dfs/) is streamed from the master device (AP) to the client.

20 MHz Bandwidth Channel Closing Transmission Time - Measurement

A Type 1 waveform was introduced to the EUT, from which a 12 second transmission record was digitally captured, collecting nearly 250M samples of data, which included in excess of 600 ms of pre-trigger data. This Type 1 waveform had an integral marker built into its construction, marking the start of the radar waveform play, which directly triggered the PXI digitizer's data capture via the PXI backplane trigger bus.

The test system was set-up to capture all transmission data for access point events above a threshold level of -50 dBm. The test equipment time stamps all captured events with respect to T0 (zero time indicating the start of the measurements sequence) starting the 612.1 ms pre-trigger period followed by the radar type 1 burst period.

Radar (Type 1) Pre-trigger period 612.1 ms

Type 1 burst period25.705 ms

(The period of the 18 pulse burst includes [18 pulses *1.428mS PRI] = 25.704 ms. Then add 1 µs pulse width for the final pulse.)

Channel Closing Transmission Time starts immediately after the last radar pulse is transmitted i.e. 637.8 ms after the start of the trace capture period.

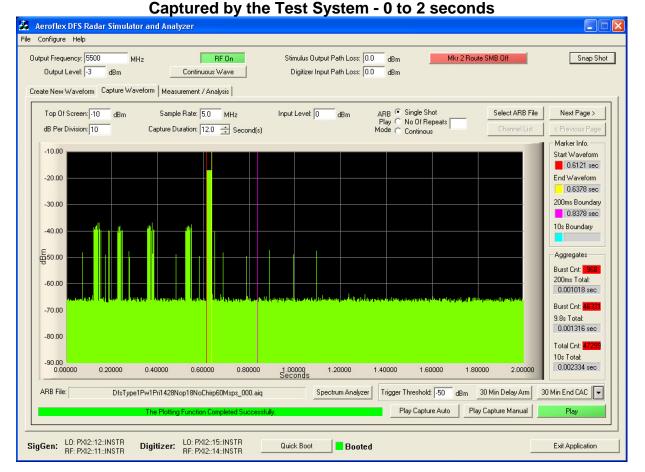


Therefore, pulses seen after this 637.8 ms boundary are identified and totaled to provide an aggregate total of transmissions in order to determine whether the EUT is compliant with the Channel Closing Transmission Time requirements as described in MO&O FCC 06-96. In this case, it was found that an aggregate total of <u>2.334 ms</u> of transmission time accrued. This value is found at the right hand side at the foot of the following plot (10s Total).

Channel Closing Transmission Time = 2

2.334 mSecs (limit 260 mSecs)

Client Device 20 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar



From the plot above it can be seen that the transmission activity within the 200 mS window is1.018 ms (see 200 ms Total). From the following plots which shows all additional activity within the remainder of the 10 sec measurement window it can be determined that the aggregate transmission is 1.316 ms. this is less than the 60 mS limit.



Last Transmitter Activity = 1.100 Seconds Last Radar Activity = 0.6378 Seconds Channel Move Time = Last Transmitter Activity – Last Radar Activity = 1.100 – 0.6378 **Channel Move Time =** 0.4622 secs (Limit 10 secs)

Client Device 20 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar

🤹 Aeroflex DFS Radar Simulator and Analyzer	
File Configure Help	
Output Frequency: 5500 MHz RF On Stimulus Output Path Loss: 0.0 dBm Mkr 2 Route SMB Off Output Level: -3 dBm Continuous Wave Digitizer Input Path Loss: 0.0 dBm	Snap Shot
Play C No Of Repeats	Page >
-10.00 -20.00	/aveform 5121 sec aveform
-30.00	5378 sec Boundary 3378 sec undary
-40.00	gates
-7000 9.8s To	otal: 316 sec
10s Tot	
ARB File: DfsType1Pw1Pri1428Nop18NoChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: 50 dBm 30 Min Delay Arm 30 Min End	
SigGen: LO: PXI2::12:INSTR Digitizer: LO: PXI2::15:INSTR Quick Boot Exit App	plication

Captured by the Test System - 2 to 4 seconds

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Client Device 20 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar Captured by the Test System - 4 to 6 seconds

Captured by the rest System - 4 to 0 seconds	
eroflex DFS Radar Simulator and Analyzer	
Configure Help	
tput Frequency: 5500 MHz RF On Stimulus Output Path Loss: 0.0 dBm Mkr 2 Route SMB Off Output Level: 3 dBm Continuous Wave Digitizer Input Path Loss: 0.0 dBm	Snap Shot
Top Df Screen: 10 dBm Sample Rate: 5.0 MHz Input Level: 0 dBm ARB Single Shot Select ARB Fill dB Per Division: 10 Capture Duration: 12.0 3 Second(s) Mode Continous Channel List	< Previous Page Marker Info.
-20.00	Start Waveform 0.6121 sec End Waveform 0.6378 sec 200ms Boundary
-40.00 	0.8378 sec 10s Boundary
	Burst Cnt: 968 200ms Total: 0.001018 sec
-70.00	Burst Cnt: 46331 9.8s Total: 0.001316 sec Total Cnt: 47299
-90.00 4.00000 4.20000 4.40000 4.60000 4.80000 5.00000 5.20000 5.40000 5.60000 5.80000 6.00000 Seconds	10s Total: 0.002334 sec
ARB File: DfsType1Pw1Pri1428Nop18NoChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: 50 dBm 30 Min Delay Arm	30 Min End CAC 🔽
IGen: L0: PXI2::12::INSTR Digitizer: L0: PXI2::15::INSTR Quick Boot Be: PXI2::11::INSTR BE: PXI2::11::INSTR	Exit Application

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Client Device 20 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar Captured by the Test System - 6 to 8 seconds

	ouptured by the	Tool eyelen	010030001103	
Aeroflex DFS Radar Simulator	and Analyzer			
e Configure Help				
Output Frequency: 5500 MHz Output Level: 3 dBm Create New Waveform Capture Wave	Continuous Wave	Stimulus Output Path Loss: 0.0 Digitizer Input Path Loss: 0.0	dBm Mkr 2 Route SMB Off dBm	Snap Shot
	The association of Analysis			
Top Of Screen: -10 dBm	Sample Rate: 5.0 MHz		ARB Single Shot Select ARB F	ile Next Page >
dB Per Division: 10	Capture Duration: 12.0 🐳 Second(s)		Play C No Of Repeats Channel Lis	< Previous Page
				Marker Info.
-10.00				Start Waveform
				0.6121 sec
-20.00				End Waveform 0.6378 sec
and the second se				
-30.00				200ms Boundary 0.8378 sec
				10s Boundary
-40.00				
E50.00				Aggregates
8				Burst Cnt: 968
-60.00				200ms Total: 0.001018 sec
and the second state of the second state	والمستعلمان والمستعر أستنا أعرابهم ومحروق ومحتملة المتاريد ومتطوعا فالمستع	والمربوعين والمتحرين أشتتهم والمطبر أكروه ومانتك والمراكز	والمتحر والمراجع والمتحر والمراجع والمراجع والمتابع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع	
-70.00				Burst Cnt: 46331
				9.8s Total: 0.001316 sec
-80.00				
				Total Cnt: <mark>47299</mark> 10s Total:
-90.00 6.00000 6.20000	6.40000 6.60000 6.80000	7.00000 7.20000 7 Seconds	7.40000 7.60000 7.80000 8.0000	0.000004
ARB File: DfsType1F	Pw1Pri1428Nop18NoChirp60Msps_000.aiq	Spectrum Analyzer	Trigger Threshold: -50 dBm30 Min Delay Arm	30 Min End CAC 🔻
	The Plotting Function Completed Successfully		Play Capture Auto Play Capture Manual	Play
SigGen: L0: PXI2::12::INSTR [RF: PXI2::11::INSTR [Digitizer: LO: PXI2::15::INSTR BF: PXI2::14::INSTR	Quick Boot		Exit Application

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Client Device 20 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar Captured by the Test System - 8 to 10 seconds

	ouptured by the	Test bystem - 0		
Aeroflex DFS Radar Simulator	and Analyzer			
Configure Help				
utput Frequency: 5500 MHz Output Level: -3 dBm reate New Waveform Capture Wavef	Continuous Wave	Stimulus Output Path Loss: 0.0 dE Digitizer Input Path Loss: 0.0 dE		Snap Sho
Top Of Screen: 10 dBm dB Per Division: 10	Sample Rate: 5.0 MHz Capture Duration: 12.0 📑 Second(s)	Play	Single Shot Select ARB File Continous	Next Page > < Previous Page Marker Info.
-20.00				Start Waveform 0.6121 sec End Waveform 0.6378 sec
-40.00				200ms Boundary 0.8378 sec 10s Boundary
튣50.00				Aggregates Burst Cnt: 968 200ms Total:
-60.00	en ne en far med et en and fet en anten andere en anten a	જનન થય તેમાં આવ્ય કરવા છે. તેમાં પ્રાથમિક પ્રાથમિક છે. તેમાં પ્રાથમિક જીવન વિજય નિવાય કરવા છે. તેમાં પ્રાથમિક જ	(sloven en stadau) na filisi kan en na filmen na filmen en stadau en sen en s	0.001018 sec Burst Cnt: <mark>46331</mark> 9.8s Total:
-80.00				0.001316 sec Total Cnt: 47299 10s Total:
	8.40000 8.60000 8.80000	9.00000 9.20000 9.40000 Seconds	0 9.60000 9.80000 10.00000	0.002334 sec
ARB File: DfsType1P	w1Pri1428Nop18NoChirp60Msps_000.aiq The Plotting Function Completed Successfu		Play Capture Auto	30 Min End CAC 👻 Play
gGen: L0: PXI2::12::INSTR D RF: PXI2::11::INSTR D	ligitizer: LO: PXI2::15::INSTR RF: PXI2::14::INSTR	Quick Boot		Exit Application

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Client Device 20 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar

Captured by the rest System - 10 to 12 seconds	
Aeroflex DFS Radar Simulator and Analyzer	
Configure Help	
tput Frequency: 5500 MHz RF 0n Stimulus Output Path Loss: 0.0 dBm Mkr 2 Route SMB Off Output Level 3 dBm Continuous Wave Digitizer Input Path Loss: 0.0 dBm	Snap Shot
Top Of Screen: 10 dBm Sample Rate: 5.0 MHz Input Level: 0 dBm ARB Single Shot Select ARB File dB Per Division: 10 Capture Duration: 12.0 Second(s) Mode Continuous Channel List	Next Page >
-10.00	Marker Info. Start Waveform 0.6121 sec End Waveform
-30.00	0.6378 sec 200ms Boundary 0.8378 sec
-40.00	10s Boundary 10.6378 sec Aggregates
	Burst Cnt: 968 200ms Total: 0.001018 sec
-70.00	Burst Cnt: 46331 9.8s Total: 0.001316 sec
-90.00 10.00000 10.20000 10.40000 10.60000 10.80000 <u>11.00000</u> 11.20000 11.40000 11.60000 11.80000 12.00000	Total Cnt: <mark>47299</mark> 10s Total: 0.002334 sec
) Min End CAC 💌 Play
Gen: L0: PX12:11:INSTR Digitizer: L0: PX12:15:INSTR R: Quick Boot Booted	Exit Application

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40MHz Bandwidth

Channel Closing Transmission Time =

2.326 mSecs (limit 260 mSecs)

Client Device 40 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar

Aeroflex DFS Radar Simulato	r and Analyzer	
Configure Help		
Dutput Frequency: 5500 MH Output Level: -3 dBm Create New Waveform Capture Wave	Continuous Wave Digitizer Input Path Loss: 0.0 dBm	Snap Shot
reate New Waveform Capitale Wave	nom Measurement / Analysis	
Top Of Screen: -10 dBm dB Per Division: 10	Sample Rate: 5.0 MHz Input Level: 0 dBm ARB Single Shot Select ARB File Capture Duration: 12.0 ⇒ Second(s) Mode ⊂ Continuous Channel List	Next Page > < Previous Page
		Marker Info.
-10.00		Start Waveform
-20.00		0.6121 sec End Waveform
-20.00		0.6378 sec
-30.00		200ms Boundary
		0.8378 sec
-40.00		10s Boundary
튣 <u>50.00</u>		Aggregates
		Burst Cnt: 963
-60.00		200ms Total:
and a state of the		0.001006 sec
-70.00		Burst Cnt: 22714
		9.8s Total: 0.001320 sec
-80.00		
		Total Cnt: 23677
-90.00	0.40000 0.60000 0.80000 1.00000 1.20000 1.40000 1.60000 1.80000 2.00000	10s Total: 0.002326 sec
0.0000 0.20000	0.40000 0.60000 0.80000 1.00000 1.20000 1.40000 1.60000 1.80000 2.00000 Seconds	
ARB File: DfsType1	Pw1Pri1428Nop18NoChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: 50 dBm 30 Min Delay Arm 3	80 Min End CAC 💌
	The Plotting Function Completed Successfully. Play Capture Auto Play Capture Manual	Play
aGent LO: PXI2::12::INSTR		

Captured by the Test System - 0 to 2 seconds

From the plot above it can be seen that the transmission activity within the 200 mS window is 1.006 ms (see 200 ms Total). From the following plots which show all additional activity within the remainder of the 10 sec measurement window it can be determined that the aggregate transmission is 1.320 ms. This is less than the 60 mS limit.

Last Transmitter Activity = 1.090 Seconds Last Radar Activity = 0.6378 Seconds Channel Move Time = Last Transmitter Activity – Last Radar Activity = 1.090 – 0.6378

Channel Move Time = 0.4522 secs (Limit 10 secs)



Client Device 40 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar Captured by the Test System - 2 to 4 seconds

		Fiest Oystelli - 2 to		
Aeroflex DFS Radar Simulato	r and Analyzer			
Configure Help				
utput Frequency: 5500 MH Output Level: -3 dBm reate New Waveform Capture Wave	Continuous Wave	Stimulus Output Path Loss: 0.0 dBm Digitizer Input Path Loss: 0.0 dBm	Mkr 2 Route SMB Off	Snap Sho
eate New Waveform Capture wave	Homm Measurement / Analysis			
Top Of Screen: -10 dBm	Sample Rate: 5.0 MHz	Input Level: 0 dBm ARB	Single Shot Select ARB File	Next Page >
dB Per Division: 10	Capture Duration: 12.0 🛨 Second(s)	Play C N Mode C (Vo Of Repeats Channel List	< Previous Page
				Marker Info.
-10.00				Start Waveform
				0.6121 sec
-20.00				End Waveform 0.6378 sec
-30.00				200ms Boundary
-30.00				0.8378 sec
-40.00				10s Boundary
-40.00				
ឝ <u></u> 50.00				Aggregates
5				Burst Cnt: 963
-60.00				200ms Total:
المحجلا بالمتحدث فالمحمولة بالرائلات	ومعاليها المراجع للمعرف ليتحد والعربية والمراجع والمراجع والمراجع	المرابع المرابع المتعادية المتعادية والمتعادية والمتعادية المتعادية والمتعادية والمتعادية والمعاد	naktisa alta sa dala termelu adari kabatisan da sebelah sanan sa kan tarke	0.001006 sec
-70.00				Burst Cnt: 22714
				9.8s Total: 0.001320 sec
-80.00				
				Total Cnt: 23677 10s Total:
-90.00 2.20000 2.20000	2.40000 2.60000 2.80000	_3.00000 3.20000 3.40000	3.60000 3.80000 4.00000	0.002326 sec
	2.0000 2.0000	3.00000 3.20000 3.40000 Seconds	1.1113 0.0000 4.00000	
ARB File: DfsType1	Pw1Pri1428Nop18NoChirp60Msps_000.aiq	Spectrum Analyzer Trigger T	hreshold: -50 dBm 30 Min Delay Arm 3	30 Min End CAC 💌
	The Plotting Function Completed Successfu	Pla	ay Capture Auto Play Capture Manual	Play
JGen: LO: PXI2::12::INSTR BF: PXI2::11::INSTR	Digitizer: LO: PXI2::15::INSTR	Quick Boot		Exit Application

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Client Device 40 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar Captured by the Test System - 4 to 6 seconds

	Suptaired by the	Fiest Oystelli - 4 to	0.00001140	
Aeroflex DFS Radar Simulator	and Analyzer			
Configure Help				
utput Frequency: 5500 MH2 Output Level: -3 dBm reate New Waveform Capture Wave	Continuous Wave	Stimulus Output Path Loss: 0.0 dBm Digitizer Input Path Loss: 0.0 dBm	Mkr 2 Route SMB Off	Snap Sho
Top Of Screen: -10 dBm dB Per Division: 10	Sample Rate: 50 MHz Capture Duration: 12.0 🛨 Second(s)		Single Shot Select ARB File No 0f Repeats Continous Channel List	Next Page > < Previous Page Marker Info. Start Waveform
-20.00				C.6121 sec End Waveform O.6378 sec 200ms Boundary
-40.00				0.8378 sec 10s Boundary Aggregates
-60.00	n ja kalada ya ka pereti atamara na ka pereti atamara na ka pereti	Nie With term fallower verse, where is the state barres of specific states, a	na kon de a konstant ser ser ser ser ser konstant fordet ser konstant ser	Burst Cnt: 963 200ms Total: 0.001006 sec
-70.00				Burst Cnt: 22714 9.8s Total: 0.001320 sec Total Cnt: 23677
-90.00 4.00000 4.20000	4.40000 4.60000 4.80000	5.00000 5.20000 5.40000 Seconds	5.60000 5.80000 6.00000	10s Total: 0.002326 sec
ARB File: DfsType1F	Pw1Pri1428Nop18NoChirp60Msps_000.aiq The Plotting Function Completed Successfu		hreshold: 50 dBm 30 Min Delay Arm 3 ay Capture Auto Play Capture Manual	30 Min End CAC 🔻 Play
gGen: LO: PXI2::12::INSTR [RF: PXI2::11::INSTR]	Digitizer: L0: PXI2::15::INSTR RF: PXI2::14::INSTR	Quick Boot		Exit Application

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Client Device 40 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar Captured by the Test System - 6 to 8 seconds

Configure Help put Frequency: 5500 MHz BF On Stimulus Dutput Path Loss: 0.0 dBm Mix 2 Route SMB 0ff Snap Shc Dutput Level: 3 dBm Continuous Wave Digitizer Input Path Loss: 0.0 dBm Mix 2 Route SMB 0ff Snap Shc ase New Waveform Despute Waveform Measurement / Analysis Select ARB File Net Page 10 dBm Sample Rate: 5.0 MHz Input Level: 0 dBm ARB Single Shck Select ARB File Net Page 10.00 Capture Duration: 12.0 Second(s) Input Level: 0 dBm ARB Single Shck Select ARB File Net Page -0.00 Capture Duration: 12.0 Second(s) Input Level: 0 dBm ARB Single Shck Select ARB File Net Page -0.00 Capture Duration: 12.0 Second(s) Input Level: 0 dBm ARB Single Shck Select ARB GB Single Shck Select ARB GB Single Shck Select ARB GB Single Shck Select ARB		Ouptured by the		010030001103	
Dur Frequency: 5500 MHz RE On Stimulus Output Path Loss: 0.0 dBm Mir 2 Route SMB DH Snap Since Output Level: 3 dBm Continuous Wave Digitzer Input Path Loss: 0.0 dBm Mir 2 Route SMB DH Snap Since Top UI Screent: 10 dBm Sample Rate: 5.0 MHz Input Level: 0 dBm Select ARB File Next Page: 10.00 Capture Duration: 12.0 Scoond(s) Input Level: 0 dBm ABg C. Single Shot Select ARB File Next Page: 10.00 Capture Duration: 12.0 Scoond(s) Input Level: 0 dBm ABg C. Single Shot Select ARB File Next Page: 10.00 Capture Duration: Capture Duration: Capture Duration: Capture Duration: Capture Duration: Capture All All All All All All All All All Al	Aeroflex DFS Radar Simulat	or and Analyzer			
Dutput Levet 3 dBm Continuous Wave Digitizer Input Path Loss: 00 dBm ale New Waveform Capture Waveform Measurement / Analysis Top 0f Screen: 10 dBm Sample Rate: 50 MHz Input Levet 0 dBm APB Single Shot BP eD Ivision: 10 Capture Duration: 120 Second(s) MHz Continous Make Info 2000 2000 2000 2000 4000 50000 60000 7000 70000 70000 70000 70000 70000 70	Configure Help				
Top 01 Screen: 10 dBm Sample Rate: 50 MHz Input Levet 0 dBm ARB Single Shot Select ARB File Next Page> dB Per Division: 10 Capture Duration: 12.0 ± Second(s) Mode Continuous Chernel List Cherel Cist Chernel List Ch	Output Level: -3 dBm	Continuous Wave	· · · ·		Snap Shot
d8 Per Division 10 Capture Duration 12.0 Second(s) Mode Continues Previous Page -1000	ireate New Waveform Capture Wa	veform Measurement / Analysis			
10.00 Statt Waveform 20.00 0.5121 sec 30.00 0.6378 sec 40.00 0.6000 sec Burst Crit 0.6378 sec 10.001006 sec 0.001006 sec Burst Crit 0.00120 sec 70.00 6.0000 6.80000 7.00007 7.0000 7.0000 9.00 6.20000 6.80000 7.00007 7.0000 7.0000 8.0000 0.001202 sec <			, je abin	Play C No Of Repeats	
20.00 30.00 40.00 50	-10.00				
A000 -000					
-30.00 -30.00	-20.00				End Waveform
Aggregates Burst Cht: 108 Boundary Common Completed Successfully. AfB File: DfsType1Pw1Pir1428Nop18NoChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: 50 dBm 30 Min Delay Arm 30 Min End CAC Y					
-40.00 -40.00	-30.00				
40.00 E <td></td> <td></td> <td></td> <td></td> <td></td>					
-60.00 At d an ext pendigit i bit is out it the only if the ext of the third in a second bit is the ext of the third in a second bit is the ext of the e	-40.00				
-60.00 At d an ext pendigit i bit is out it the only if the ext of the third in a second bit is the ext of the third in a second bit is the ext of the e	E50.00				Aggregates
-50.00 -70.00 -80.00	88				Burst Cnt: 963
ARB File: DfsType1Pw1Pir1428Nop18NocChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: 50 dBm 30 Min Delay Arm 30 Min End CAC V	-60.00				
-70.00 -70.00 -80.00 -80.00 -80.00 -70.000 7.0000 7.0000 7.0000 7.0000 7.0000 7.0000 7.0000 7.0000 7.0000 7.0000 7.0000 7.0000 8.0000 9.000.20	a del a de la constance de la del de la constante de la constante de la constante de la constante de la constan	a sea dhaa ah Brancaada ka mara dha a kana ay na	- and with the ball in a man state of a state of the sector	and a state of the state of the state of the space of the the state of	
-80.00 -90.00 6.00000 6.20000 6.40000 6.60000 6.80000 7.00000 7.20000 7.40000 7.60000 7.80000 8.0000 ARB File: DfsType1Pw1Piri428Nop18NoChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: 50 dBm 30 Min Delay Arm 30 Min End CAC The Plotting Function Completed Successfully. Play Capture Auto Play Capture Manual Play	-70.00				
-90.00 6.20000 6.40000 6.60000 6.80000 7.00000 7.40000 7.60000 7.80000 8.00000 -90.00 6.20000 6.40000 6.60000 6.80000 7.00000 7.40000 7.60000 7.80000 8.00000 ARB File: DfsType1Pw1Pri1428Nop18NoChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: 50 dBm 30 Min Delay Arm 30 Min End CAC Image: Spectrum Analyzer The Plotting Function Completed Successfully.					
-90.00 6.20000 6.40000 6.60000 7.0000 7.40000 7.60000 7.80000 8.00000 0.002326 sec ARB File: DfsType1Pw1Pir1428Nop18NoChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: -50 dBm 30 Min Delay Arm 30 Min End CAC Image: Spectrum Analyzer Play Capture Auto Play Capture Manual Play	-80.00				Total Cnt: 23677
ARB File: DfsType1Pw1Pir1428Nop18NoChirp60Msps_000.aiq Spectrum Analyzer Trigger Threshold: [-50 dBm 30 Min Delay Arm 30 Min End CAC V The Plotting Function Completed Successfully. Play Capture Auto Play Capture Manual Play	-90.00				
The Plotting Function Completed Successfully. Play Capture Auto Play Capture Manual Play Play Play Play Play Play Play Pl	6.00000 6.20000	6.40000 6.60000 6.80000	7.00000 7.20000 7 Seconds	7.40000 7.60000 7.80000 8.0000	ງ 0.002326 sec
	ARB File: DfsType	1Pw1Pri1428Nop18NoChirp60Msps_000.aiq	Spectrum Analyzer		30 Min End CAC 🔻
Gen: L0: PXI2::12::INSTR Digitizer: L0: PXI2::15::INSTR Quick Boot Booted Exit Application		The Plotting Function Completed Successfu	lly.	Play Capture Auto Play Capture Manual	Play
Gen: pp M2:12:INSTR Digitizer: pp PM2:15:INSTR Quick Boot Exit Application Exit Application					
	gGen: L0: PXI2::12::INSTR BF: PXI2::11::INSTR	Digitizer: L0: PXI2::15::INSTR BF: PXI2::14::INSTR	Quick Boot		Exit Application

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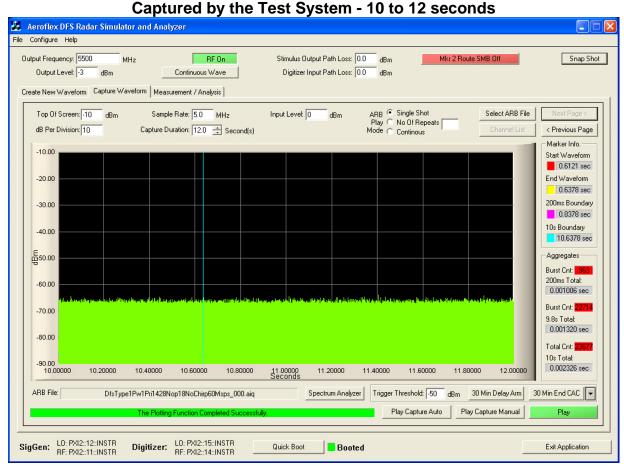
Client Device 40 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar

		Capture	su by the	Test by	Stem -	0101030	conus	
Aeroflex DFS R	adar Simulator	and Analyzer						
Configure Help								
utput Frequency: 5	500 MH:		RF On	Stimulus Outp	ut Path Loss: 0.0	dBm N	Ikr 2 Route SMB Off	Snap Sho
Output Level:	3 dBm	Contin	uous Wave	Digitizer Inp	ut Path Loss: 0.0	dBm		
	Capture Maria	form Measurement						
eate New Wavefor		IOIIII Measurement	7 Analysis					
Top Of Screen:	-10 dBm	Sample Rate:	5.0 MHz	Input Level: 0		RB 🖲 Single Shot	Select ARB File	Next Page >
dB Per Division:	10	Capture Duration:	12.0 ÷ Second(s)		F Mi	Play C No Of Repeats	Channel List	< Previous Page
						Continuouo		Marker Info.
-10.00								Start Waveform
								0.6121 sec
-20.00								End Waveform
								0.6378 sec
-30.00								200ms Boundary 0.8378 sec
								10s Boundary
-40.00								
E								Aggregates
E50.00								Burst Cnt: 963
-60.00								200ms Total:
-00.00								0.001006 sec
-70.00	and to define the statistic second of a st	هر بل يكن التلكم فالد بأرار بعرية.			n (na salad na san ni sa ni sa ni sa sa sa sa	a li ponte de la constante de La constante de la constante de		Burst Cnt: 22714
10.00								9.8s Total:
-80.00								0.001320 sec
								Total Cnt: 23677
-90.00								10s Total:
8.00000	8.20000	8.40000 8.6	0000 8.80000	9.00000 Seconds	9.20000 9.4	0000 9.60000	9.80000 10.00000	0.002326 sec
ARB File:	DfsTupe1F	w1Pri1428Nop18Nc	Chirp60Msps_000.aig	Sc	ectrum Analyzer	Trigger Threshold: -50	dBm 30 Min Delay Arm	30 Min End CAC 🔽
	Distypen	•				,		
		The Plotting Function	on Completed Successi	ully.		Play Capture Auto	Play Capture Manual	Play
Gen: LO: PXI2	2::12::INSTR	Digitizer: LO: P	<12::15::INSTR	Quick Boot	Booted			Exit Application
BF: PXI2	2::11::INSTR	BF: P	<12::14::INSTR _					

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Client Device 40 MHz BW - Channel Move Time, Channel Closing Transmission Time for Type 1 Radar

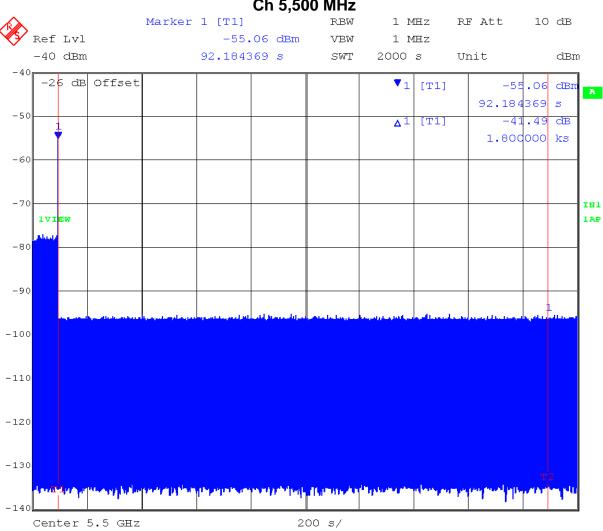


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5.1.4. 30 Minute Non-Occupancy Period

The EUT is monitored for more than 30 minutes following the channel close/move time to verify no transmissions, including beacons, resume on this Channel.

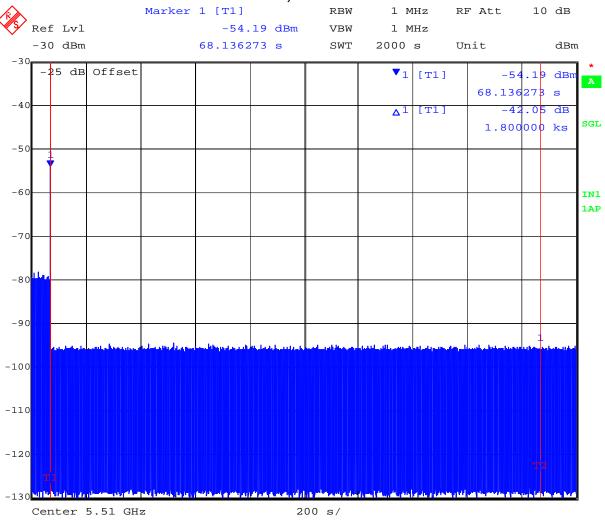


20 MHz Band Width 30 Minute Non-Occupancy Period Type 1 Radar Ch 5,500 MHz

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40 MHz Band Width 30 Minute Non-Occupancy Period Type 1 Radar Ch 5,510 MHz



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Measurement Uncertainty Time/Power				
Measurement uncertainty				
	- Time	4%		
	- Power	1.33dB		

Traceability

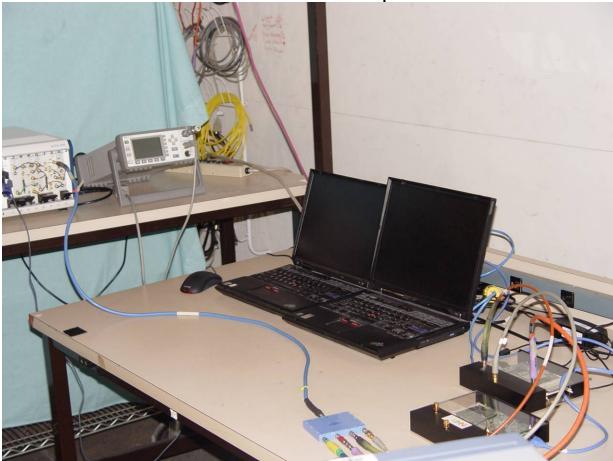
Test Equipment Used

0072, 0083, 0098, 0116, 0132, 0158, 0313, 0314, 0193, 0223, 0252, 0253, 0251, 0256, 0328, 0329



6. PHOTOGRAPHS

6.1. Dynamic Frequency Selection – Conducted Test Set-Up

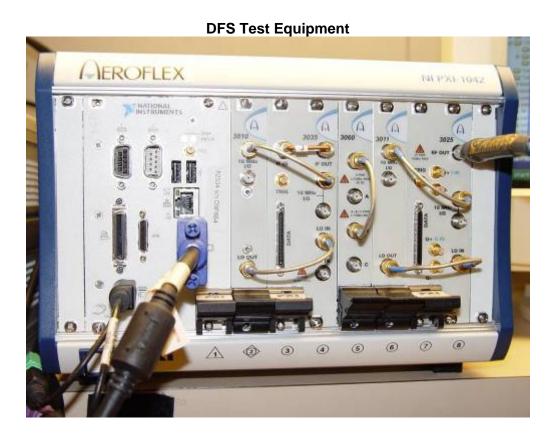


General DFS Test Setup

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Title:NuTune MRX 2010To:FCC 47 CFR Part 15.407Serial #:TELE02-B8 Rev BIssue Date:10th October 2008Page:36 of 38



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7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #
0158	Barometer /Thermometer	Control Co.	4196	E2846
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007
0252	SMA Cable	Megaphase	Sucoflex 104	None
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787- 3G03G0	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181- 3G0300	209092-001
0313	Coupler	Hewlett Packard	86205A	3140A01285
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623
0070	Power Meter	Hewlett Packard	437B	3125U11552
0116	Power Sensor	Hewlett Packard	8485A	3318A19694
0117	Power Sensor	Hewlett Packard	8487D	3318A00371
0184	Pulse Limiter	Rhode & Schwartz	ESH3Z2	357.8810.52
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002

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