



Etherios Design Solutions

ConnectCore6 (i.MX6)

FCC 15.407:2014

Report # ETHE0008.11



NVLAP Lab Code: 200630-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety

Last Date of Test: August 25, 2014
Etherios Design Solutions
Model: ConnectCore6 (i.MX6)

Radio Equipment Testing

Standards

Specification	Method
FCC 15.407:2014	ANSI C63.10:2009

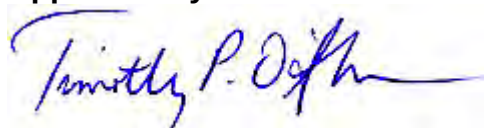
Results

Method Clause	Test Description	Applied	Results	Comments
KDB 905462	Channel Loading/Channel Utilization	Yes	Pass	
KDB 905462	Move Time	Yes	Pass	
KDB 905462	Closing Time	Yes	Pass	
KDB 905462	Non Occupancy Period	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Tim O'Shea, Operations Manager

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

KCC / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Hong Kong

OFTA – Recognized by OFTA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

Russia

GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

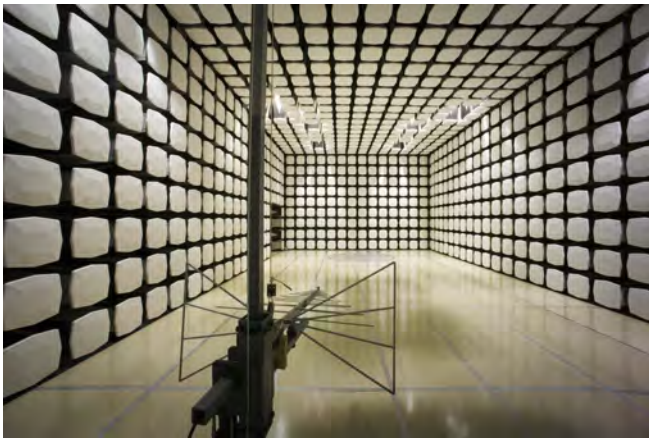
SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>



Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Minnesota Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Washington Labs NC01-05, SU02, SU07 19201 120 th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834F-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0



Client and Equipment Under Test (EUT) Information

Company Name:	Etherios Design Solutions
Address:	110 N 5th Street, Suite 400
City, State, Zip:	Minneapolis, MN 55413
Test Requested By:	Moshe Peri
Model:	ConnectCore6 (i.MX6)
First Date of Test:	August 25, 2014
Last Date of Test:	August 25, 2014
Receipt Date of Samples:	August 05, 2014
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):

The EUT is a client device and has no radar detection and no ad-hoc capability. The module contains an IEEE 802.11a/b/g/n radio (BT not populated), Dual Core i.MX6 processor, 1GB DDR3, 4GB eMMC

Hardware, Firmware, and OS Versions:

Hardware version: 55001766-05

Firmware version: DUB-2.2.2.1

OS versions: 3.10.40-dey+g82b582da

The operating frequency band(s) of the equipment.

The radio operates on channel center frequencies of 5.18–5.32 GHz, 5.50–5.70 GHz, and 5.745-5.825 GHz with Maximum occupied channel bandwidth of 20 MHz

The operating modes (Master and/or Client) of the U-NII device.

Client device with no radar detection and no ad-hoc capability

For Client devices, indicate whether or not it has DFS capabilities and indicate the FCC (and IC) identifier for the Master U-NII Device that is used with it for DFS testing.

The client does not have radar detection and no ad-hoc capability. A DFS-compliant Master device was used for testing. It's the CISCO Model AIR-SAP2602E-A-K9. FCC ID: LDK102080, IC: 2461B-102080

List the highest and the lowest possible power level (equivalent isotropic radiated power (EIRP) of the equipment.

The maximum EIRP of the 5 GHz equipment is 18.1 dBm.

Test sequences or messages that should be used for communication between Master and Client Devices, which are used for loading the Channel.

1. Stream the test file from the Master Device to the Client Device for IP based systems or frame based systems which dynamically allocate the talk/listen ratio.
2. For frame based systems with fixed talk/listen ratio, set the ratio to 45%/55% and stream the test file from the Master to the Client.
3. For other system architectures, supply appropriate Channel loading methodology.

Testing was performed with an audio file streamed from the Master Device to the Client Device. Channel loading was greater than 64%.

Transmit Power Control description.

This device does not exceed 27dBm EIRP, so no transmit power control is implemented.

System architectures, data rates, U-NII Channel bandwidths.

1. Indicate the type(s) of system architecture (e.g. IP based or Frame based) that the U-NII device employs. Each type of unique architecture must be tested.

IP / Load based system w/spectrum sharing mechanism based on IEEE 802.11 standard

The time required for the Master Device and/or Client Device to complete its power-on cycle.

The Master device used in this test setup requires 1.44 minutes to complete its power-on cycle. The client device (EUT) does not have radar detection so its power-on time is not applicable.

Manufacturer statement confirming that information regarding the parameters of the detected Radar Waveforms is not available to the end user.

The client device (EUT) does not have radar detection, so the parameters of the Radar Waveforms are not available to the end user.

Uniform Channel Spreading requirement for Master Devices. For Master Devices, indicate how the master provides, on aggregate, uniform Channel loading of the spectrum across all Channels.

The client device (EUT) does not have radar detection, so this requirement is not applicable.

List all antenna assemblies and their corresponding gains.

1. If radiated tests are to be performed, the U-NII Device should be tested with the lowest gain antenna assembly (regardless of antenna type). The report should indicate which antenna assembly was used for the tests. For devices with adjustable output power, list the output power range and the maximum EIRP for each antenna assembly.
2. If conducted tests are to be performed, indicate which antenna port/connection was used for the tests and the antenna assembly gain that was used to set the DFS Detection Threshold level during calibration of the test setup.
 - a. Indicate the calibrated conducted DFS Detection Threshold level.
 - b. For devices with adjustable output power, list the output power range and the maximum EIRP for each antenna assembly.
 - c. Indicate the antenna connector impedance. Ensure that the measurement instruments match (usually 50 Ohms) or use a minimum loss pad and take into account the conversion loss.
3. Antenna gain measurement verification for tested antenna.
 - a. Describe procedure
 - b. Describe the antenna configuration and how it is mounted
 - c. If an antenna cable is supplied with the device, cable loss needs to be taken into account. Indicate the maximum cable length and either measure the gain with this cable or adjust the measured gain accordingly. State the cable loss.

The EUT utilizes two antennas on two separate, identical antenna ports. The highest gain antennas to be used with the EUT are the Ethertronics 1001932 magnetic dipole with 5.0 dBi gain in the DFS bands. The DFS testing was done as a conducted setup on Port 1 which had provided the highest output power during FCC 15.407 certification testing.

Configuration ETHE0008- 6

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Module	Etherios Design Solutions	50001876-05	00409D7B8C9C

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	HP	6701b	CNU8312CSS
Laptop Supply	HP	PPP017L	7Y00871803
Power Supply	Agilent	U8002A	TPZ

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB To Serial	Yes	2.2m	No	Module	Laptop
DC Power	No	1.5m	Yes	Module	Power Supply
DC Power	No	1.8m	Yes	Laptop	Laptop Supply
AC Power	No	1.8m	No	Power Supply	AC Mains
AC Power	No	1.8m	No	Laptop Supply	AC Mains

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	8/25/2014	Channel Loading/Channel Utilization	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	8/25/2014	Move Time	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	8/25/2014	Closing Time	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	8/25/2014	Non Occupancy Period	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

INTRODUCTION & CLIENT DEVICE DFS CONFORMANCE

Overview

For a Client Device without DFS, the Channel Move Time and Channel Closing Transmission Time requirements are verified with one Short Pulse Radar and one Long Pulse Radar. Non-occupancy period can be confirmed with either short or long pulses.

Channel Closing Transmission Time: The total duration of transmissions, consisting of data signals and the aggregate of control signals, by a U-NII device during the Channel Move Time.

Channel Move Time: The time to cease all transmissions on the current Channel upon detection of a Radar Waveform above the DFS Detection Threshold. A Client Device will not transmit before having received appropriate control signals from a Master Device. A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.

Non-Occupancy Period: Time during which both the client and master device shall not make any transmissions on a channel after a radar signal was detected on that channel. It should at least the minimum requirements but it can be more.

Applicability of DFS Requirements Prior to Use of a Channel

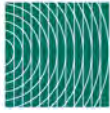
Requirement	Operational Mode		
	Master	Client (without DFS)	Client (with DFS)
Non-Occupancy Period	Yes	Yes	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Applicability of DFS requirements during normal operation

Requirement	Operational Mode		
	Master	Client (without DFS)	Client (with DFS)
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

DFS Response Requirement Values

Parameter	Value
Non-occupancy	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 UNII 99% transmission power bandwidth. (See Note 3).



INTRODUCTION & CLIENT DEVICE DFS CONFORMANCE

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.

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 percent. Measurements are performed with no data traffic.

INTRODUCTION & CLIENT DEVICE DFS CONFORMANCE

DFS Detection Thresholds for Master or Client Devices Incorporating DFS

Maximum Transmit Power	Value (See Notes 1 and 2)
≥ 200 milliwatt	-64 dBm
< 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.	

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
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

Long Pulse Radar Test Waveforms

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

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

Setting the Test Signal Level

The radar test signal level is set at the Master Device, or the Client Device with In-Service Monitoring, as appropriate for the particular test. This device is known as the Radar Detection Device (RDD).

- When a Client Device without In-Service Monitoring is the UUT, the Master Device is the RDD.
- When a Client Device with In-Service Monitoring is the UUT, and is tested for response to the Master Device detections, the Master Device is the RDD.
- When a Client Device with In-Service Monitoring is the UUT, and is tested for independent response to detections by the Client Device, the Client Device is the RDD.

A spectrum analyzer is used to establish the test signal level for each radar type. During this process, there are no transmissions by either the Master Device or Client Device. The spectrum analyzer is switched to the zero span (time domain) mode at the frequency of the Radar Waveform generator. The peak detector function of the spectrum analyzer is utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) are set to at least 3 MHz. The signal generator amplitude and/or step attenuators are set so that the power level measured at the spectrum analyzer is equal to the DFS Detection Threshold that is required for the tests. The signal generator and attenuator settings are recorded for use during the test.

7.2.2 Setup for Client with injection at the Master

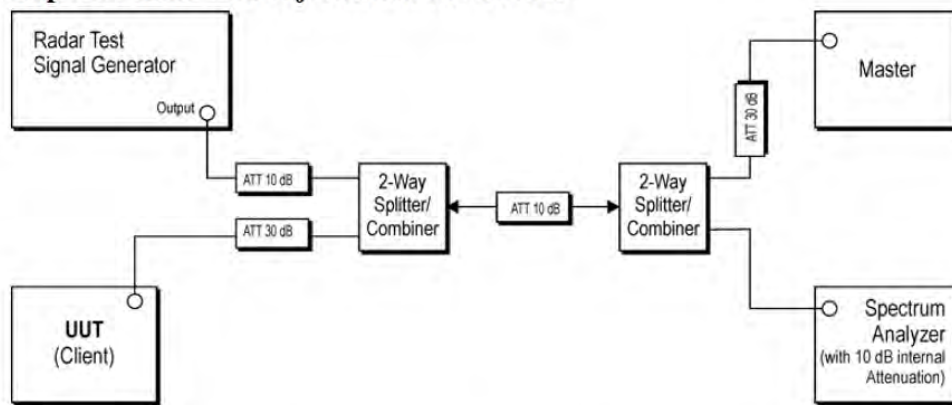


Figure 3: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Master

Channel Loading/Channel Utilization

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
Power Sensor	Agilent	E9300H	SQO	4/29/2013	36
Power Meter	Agilent	N1913A	SQR	4/29/2013	36
DFS Access Point	Cisco	AIR-SAP2602E-A-K9	TIY	NCR	0
Step Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
Step Attenuator	Aeroflex/Weinschel	3053	RKF	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
DFS Signal Generator	Benchforge Manufacturing	Colt	TIN	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
40GHz DC Block	Miteq	DCB4000	AMD	5/16/2013	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Spectrum Analyzer	Agilent	E4440	AFE	11/4/2013	24

TEST DESCRIPTION

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain as further described by the sweep times listed in the test data. A direct connection was made between the RF output of the master and client system setup which used the conducted method described in the FCC KDB 905462 test procedure via a series of splitters and attenuators.



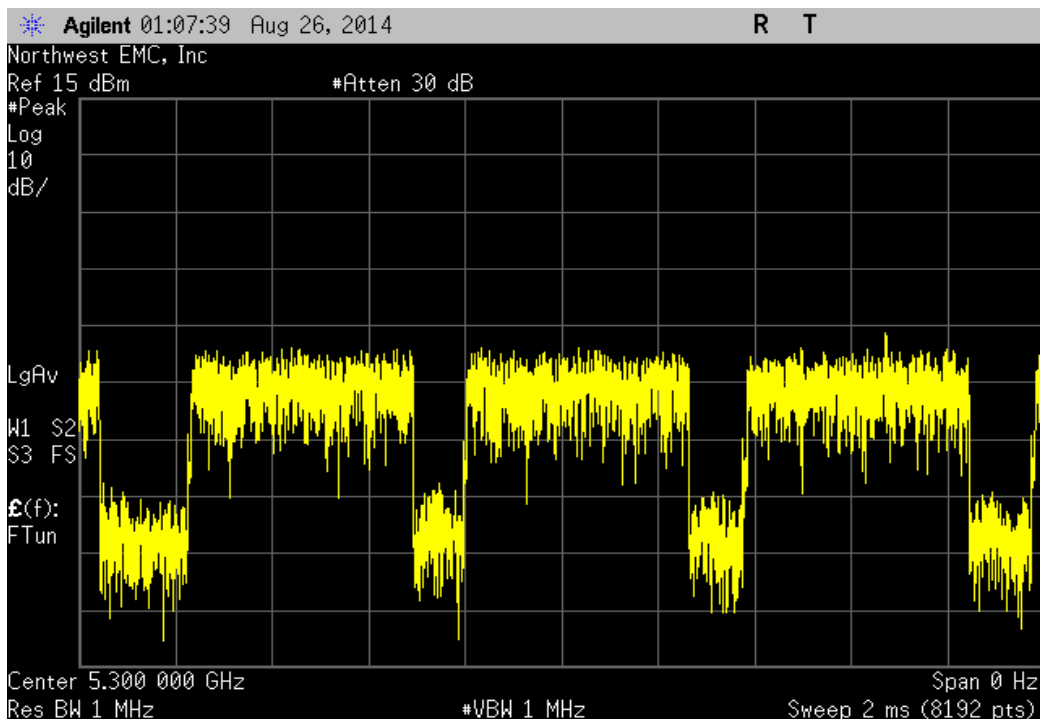
Channel Loading/Channel Utilization

XMit 2014.02.07

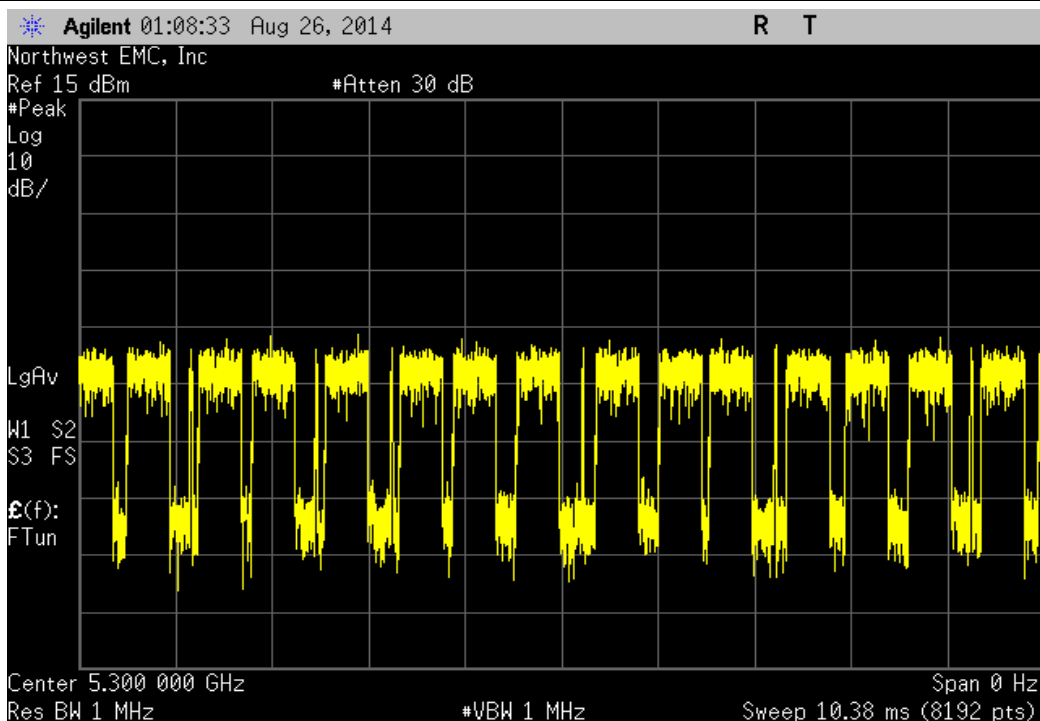
EUT: ConnectCore6 (i.MX6)		Work Order: ETHE0008				
Serial Number: 00409D7B8C9C		Date: 08/25/14				
Customer: Etherios Design Solutions		Temperature: 22°C				
Attendees: None		Humidity: 47%				
Project: None		Barometric Pres.: 1018.6				
Tested by: Jared Ison		Power: 5 VDC				
		Job Site: EV06				
TEST SPECIFICATIONS		Test Method				
FCC 15.407:2014		ANSI C63.10:2009				
COMMENTS						
Test performed on antenna Port 1, the antenna port that produced the highest output power during FCC 15.407 certification testing. The mode of operation was provided by the client.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	6	Signature 				
		Pulse Width (ms)	Pulses (#)	Duty Cycle (%)	Limit (%)	Result
5250 - 5350 MHz Band						
Ch. 60: 5300MHz						
2ms Period		0.45	3	64	>45	Pass
10ms Period		0.45	15	64	>45	Pass
25ms Period		0.45	36	64	>45	Pass
100ms Period		0.45	144	64	>45	Pass
10 s Period		N/A	N/A	N/A	N/A	N/A
5470 - 5725 MHz Band						
Ch. 112: 5560MHz						
2ms Period		0.45	3	64	>45	Pass
10ms Period		0.45	14	64	>45	Pass
25ms Period		0.45	36	64	>45	Pass
100ms Period		0.45	144	64	>45	Pass
10 s Period		N/A	N/A	N/A	N/A	N/A

Channel Loading/Channel Utilization

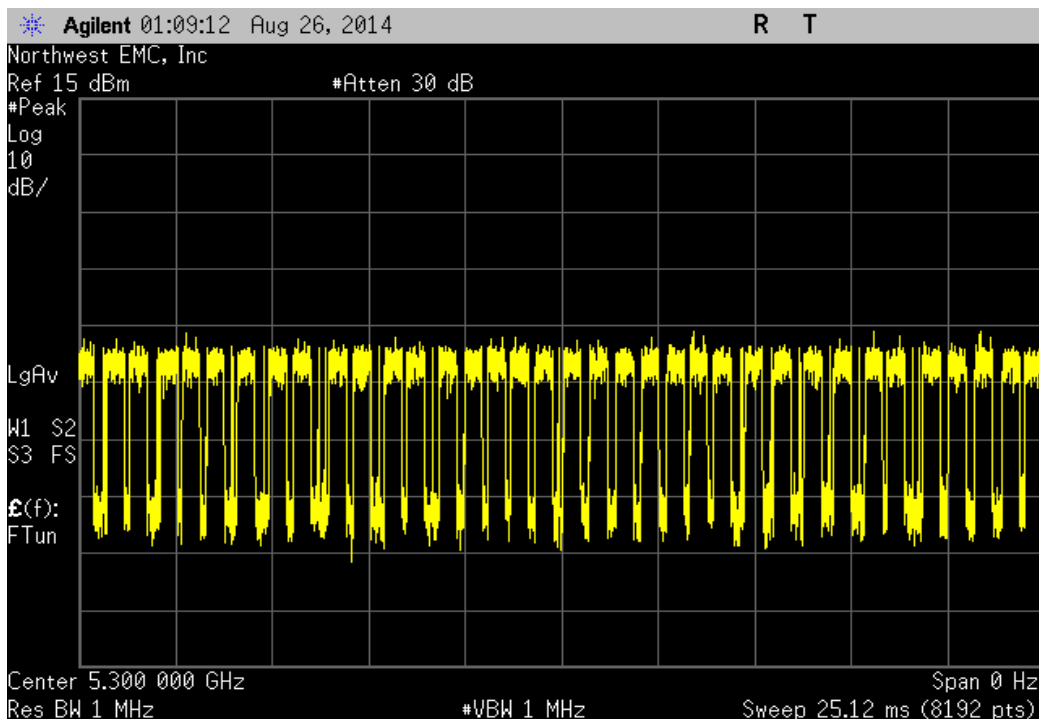
5250 - 5350 MHz Band, Ch. 60: 5300MHz, 2ms Period						
	Pulse Width	Pulses	Duty Cycle	Limit	Result	
	(ms)	(#)	(%)	(%)		
	0.45	3	64	>45	Pass	



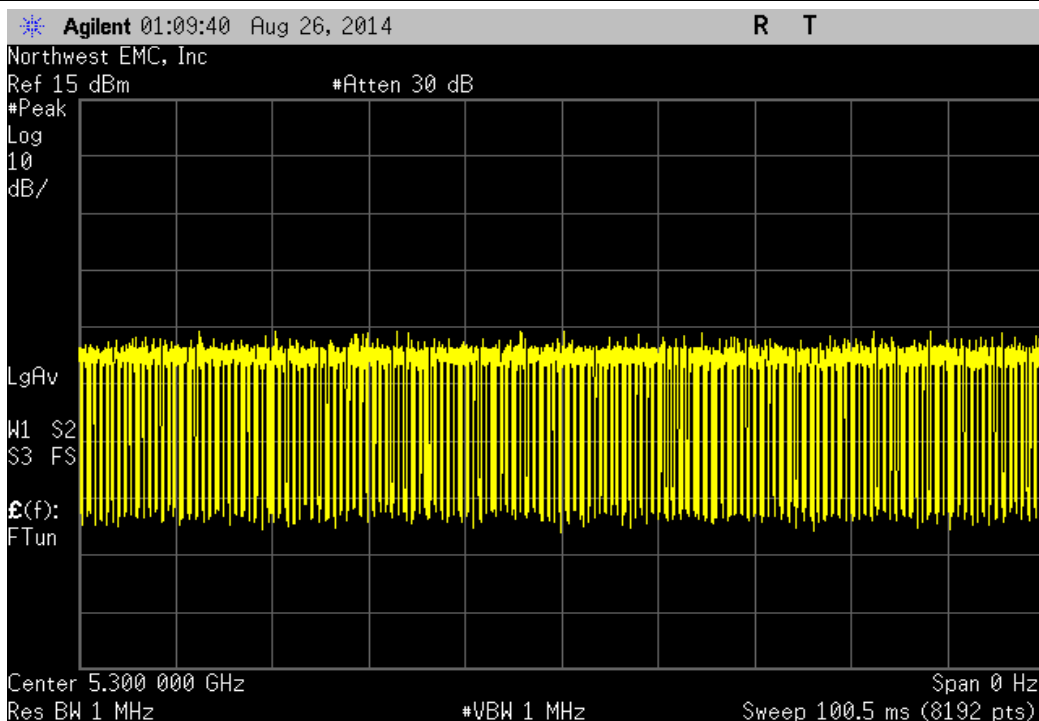
5250 - 5350 MHz Band, Ch. 60: 5300MHz, 10ms Period						
	Pulse Width	Pulses	Duty Cycle	Limit	Result	
	(ms)	(#)	(%)	(%)		
	0.45	15	64	>45	Pass	



5250 - 5350 MHz Band, Ch. 60: 5300MHz, 25ms Period						
Pulse Width	Pulses	Duty Cycle	Limit			
(ms)	(#)	(%)	(%)	Result		
0.45	36	64	>45	Pass		

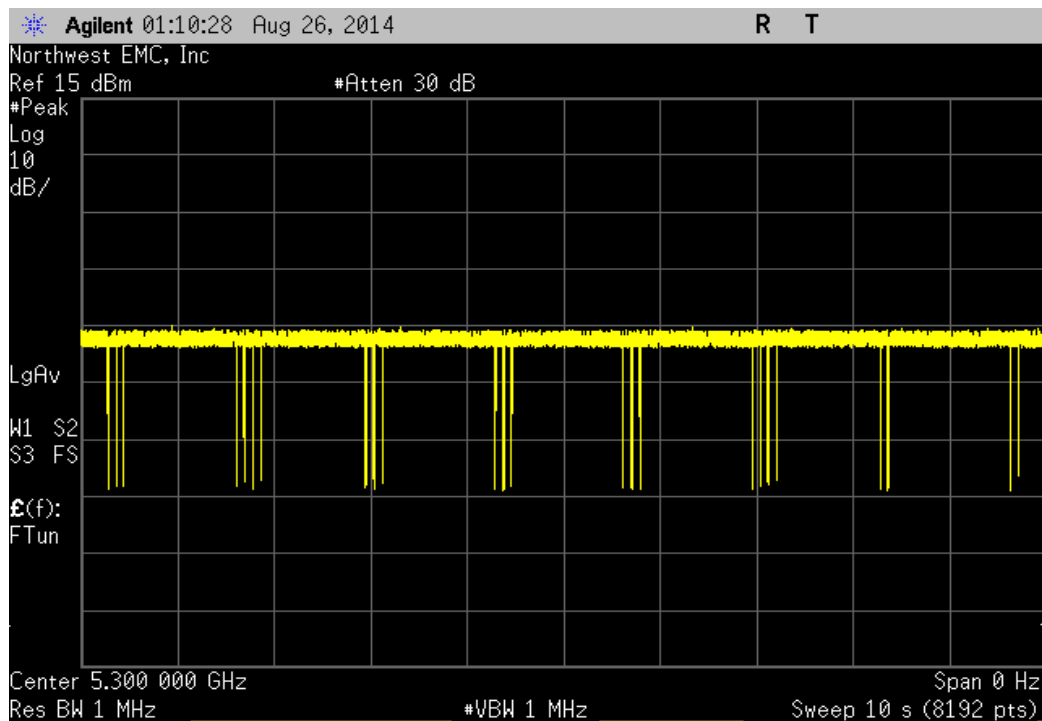


5250 - 5350 MHz Band, Ch. 60: 5300MHz, 100ms Period						
Pulse Width	Pulses	Duty Cycle	Limit			
mS / pulse	(#)	(%)	(%)	Result		
0.45	144	64	>45	Pass		

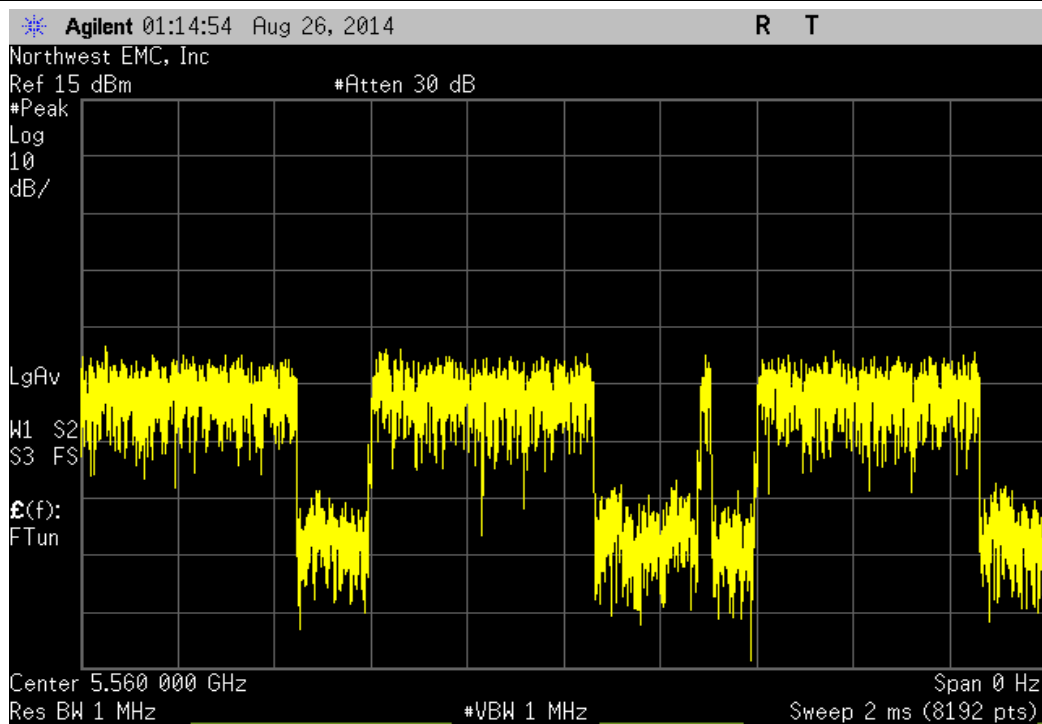


Channel Loading/Channel Utilization

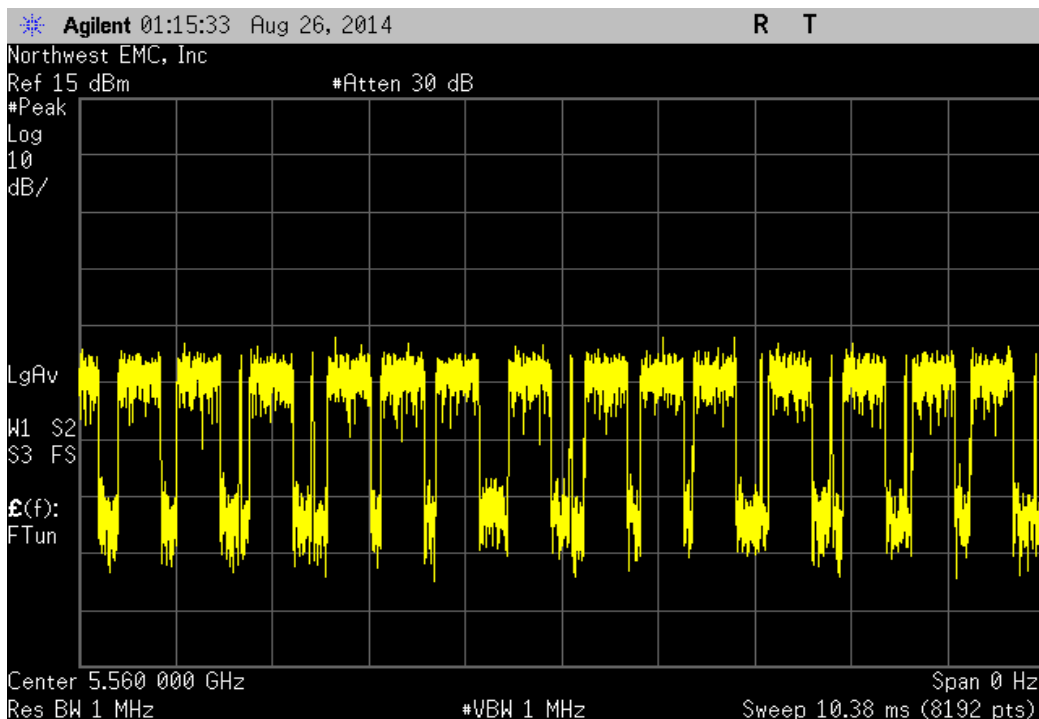
5250 - 5350 MHz Band, Ch. 60: 5300MHz, 10 s Period						
Pulse Width	Pulses	Duty Cycle	Limit			
(ms)	(#)	(%)	(%)	Result		
N/A	N/A	N/A	N/A	N/A		



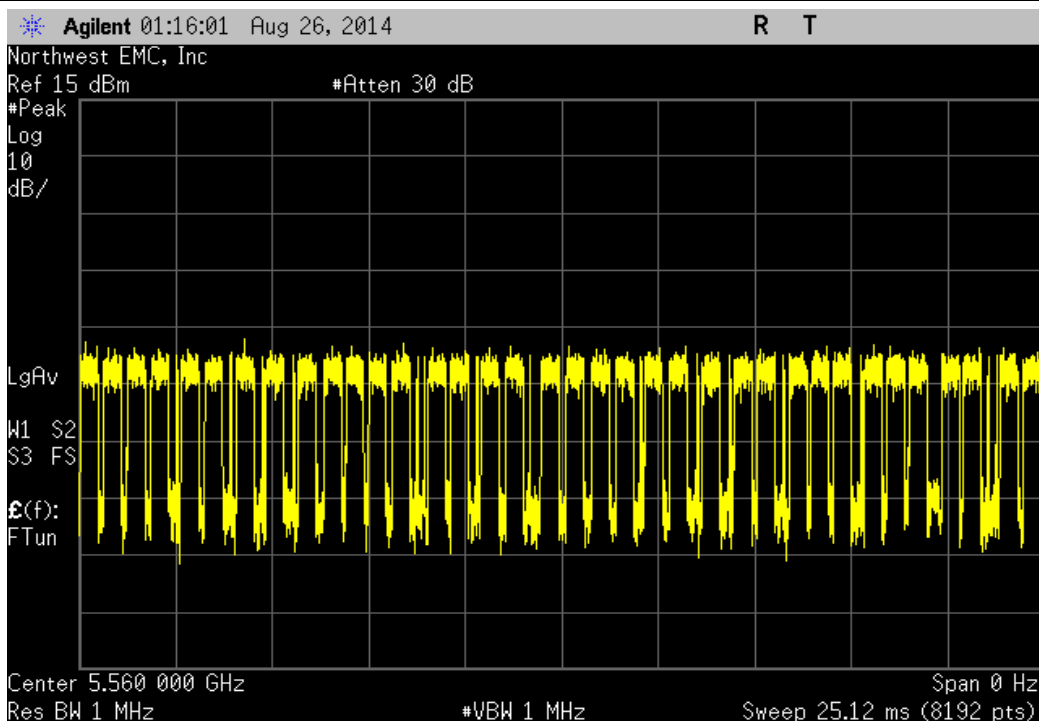
5470 - 5725 MHz Band, Ch. 112: 5560MHz, 2ms Period						
Pulse Width	Pulses	Duty Cycle	Limit			
(ms)	(#)	(%)	(%)	Result		
0.45	3	64	>45	Pass		



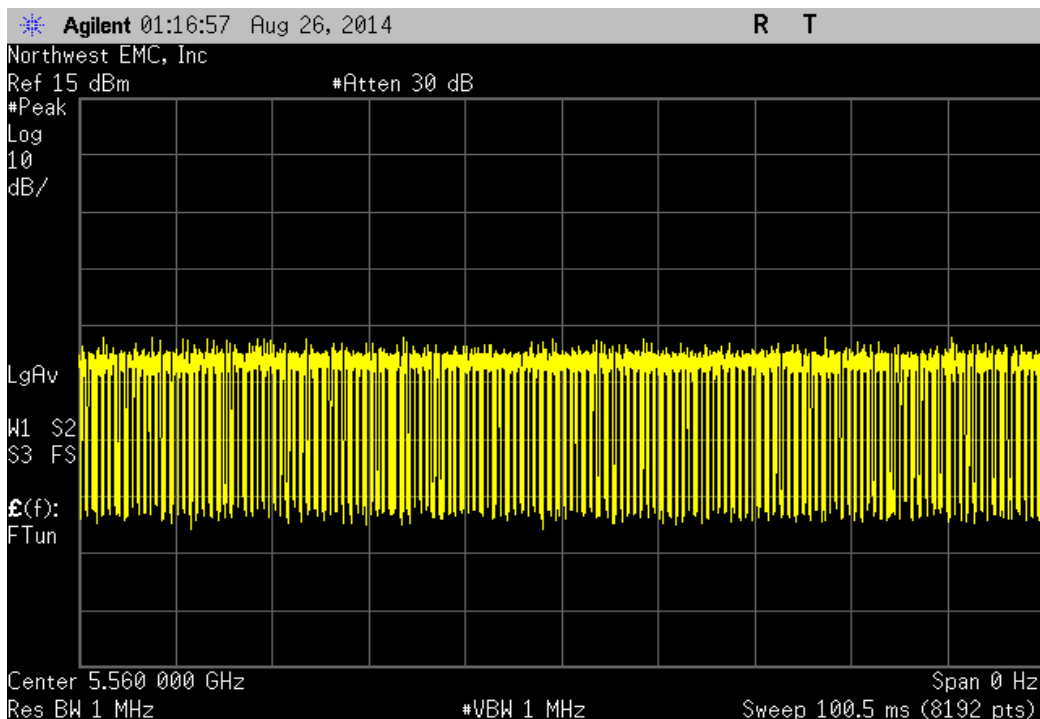
5470 - 5725 MHz Band , Ch. 112: 5560MHz, 10ms Period						
Pulse Width	Pulses	Duty Cycle	Limit			
(ms)	(#)	(%)	(%)	Result		
0.45	14	64	>45	Pass		



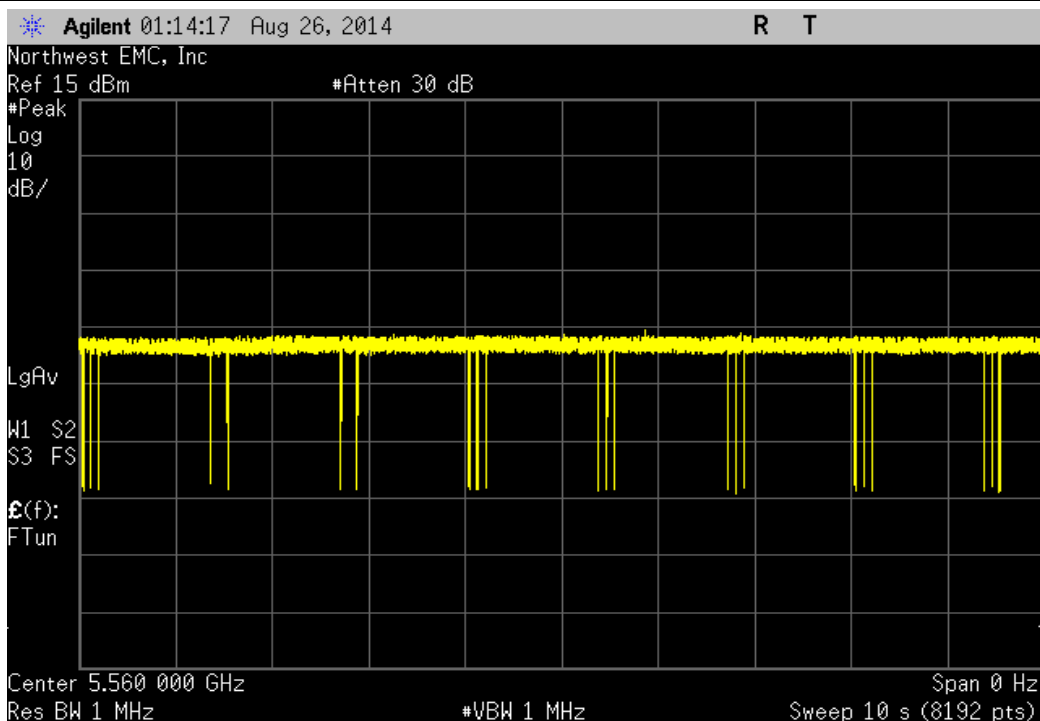
5470 - 5725 MHz Band , Ch. 112: 5560MHz, 25ms Period						
Pulse Width	Pulses	Duty Cycle	Limit			
(ms)	(#)	(%)	(%)	Result		
0.45	36	64	>45	Pass		



5470 - 5725 MHz Band , Ch. 112: 5560MHz, 100ms Period						
	Pulse Width (ms)	Pulses (#)	Duty Cycle (%)	Limit (%)	Result	
	0.45	144	64	>45	Pass	



5470 - 5725 MHz Band , Ch. 112: 5560MHz, 10 s Period						
	Pulse Width (ms)	Pulses (#)	Duty Cycle (%)	Limit (%)	Result	
	N/A	N/A	N/A	N/A	N/A	



MOVE TIME

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Spectrum Analyzer	Agilent	E4440	AFE	11/4/2013	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
40GHz DC Block	Miteq	DCB4000	AMD	4/28/2014	12
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
DFS Signal Generator	Benchforge Manufacturing	Colt	TIN	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Step Attenuator	Aeroflex/Weinschel	3053	RKF	NCR	0
Step Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
DFS Access Point	Cisco	AIR-SAP2602E-A-K9	TIY	NCR	0
Power Meter	Agilent	N1913A	SQR	4/29/2013	36
Power Sensor	Agilent	E9300H	SQO	4/29/2013	36
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0

TEST DESCRIPTION

FCC KDB 905462 describes the compliance measurement procedures including acceptable instrument system configurations for performing Dynamic Frequency Selection (DFS) tests under FCC Part 15 Subpart E Rules required for Unlicensed - National Information Infrastructure (U-NII) equipment that operates in the frequency bands 5.25 GHz to 5.35 GHz and/or 5.47 GHz to 5.725 GHz. The master and client were connected using the conducted method described in the procedure via a series of splitters and attenuators which allows the radar signals to be injected and monitored. Where required, an approved Media file was streamed through the master and client or an alternative method to load the channel may be used instead. Configuration and status of the master and client devices were monitored. The Move Time test was performed by starting a transmission between the Master and Slave device, and then injecting the appropriate radar signals and making sure both the Master and Slave device vacate the DFS channel within the time specified by the standard.



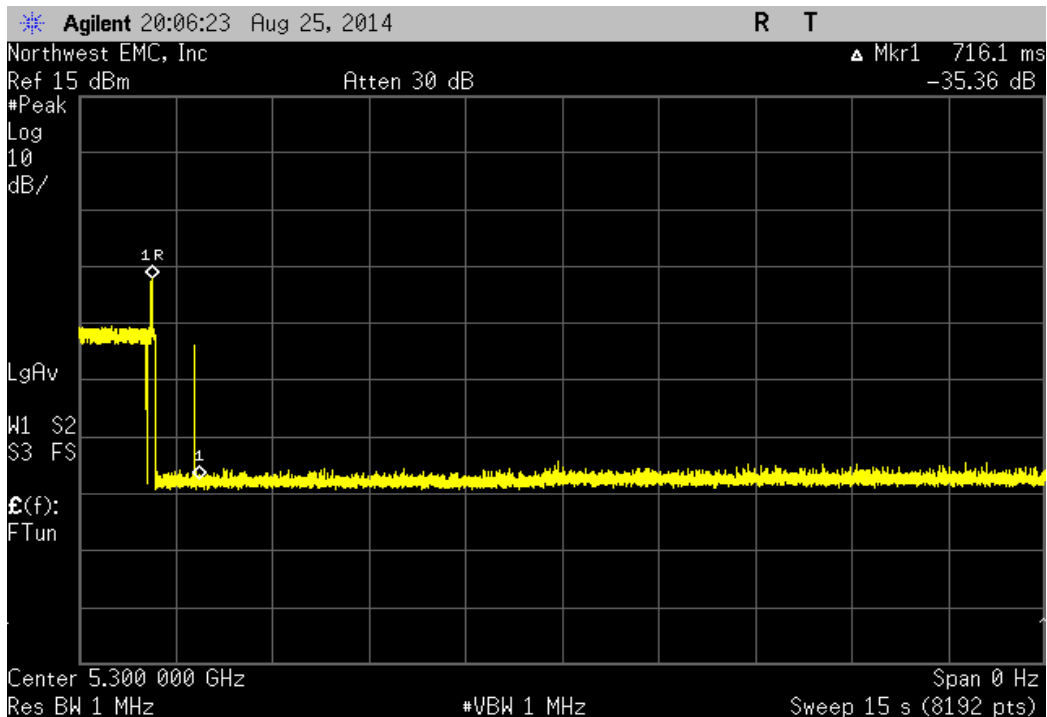
MOVE TIME

XMit 2014.02.07

EUT: ConnectCore6 (i.MX6)		Work Order: ETHE0008	
Serial Number: 00409D7B8CA2		Date: 08/25/14	
Customer: Etherios Design Solutions		Temperature: 22°C	
Attendees: None		Humidity: 41%	
Project: None		Barometric Pres.: 1013	
Tested by: Jared Ison		Power: 5 VDC	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.407:2014		ANSI C63.10:2009	
COMMENTS			
Test performed on antenna Port 1, the antenna port that produced the highest output power during FCC 15.407 certification testing. The mode of operation was provided by the client.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature 	
		Value	Limit
20MHz			Result
Ch. 60: 5300 MHz			
Radar Type 1		716.1 ms	< 10 s
Ch. 112: 5560 MHz			
Radar Type 1		835.3 ms	< 10 s
			Pass

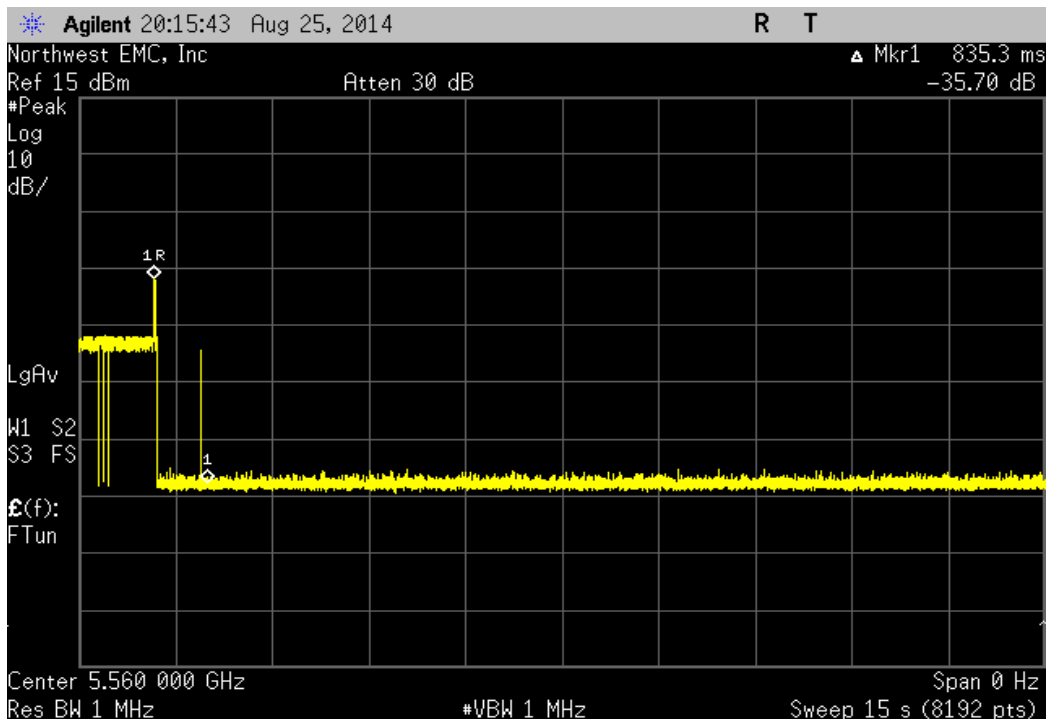
20MHz, Ch. 60: 5300 MHz, Radar Type 1

Value	Limit	Result
716.1 ms	< 10 s	Pass



20MHz, Ch. 112: 5560 MHz, Radar Type 1

Value	Limit	Result
835.3 ms	< 10 s	Pass



CLOSING TIME

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
Power Sensor	Agilent	E9300H	SQO	4/29/2013	36
Power Meter	Agilent	N1913A	SQR	4/29/2013	36
DFS Access Point	Cisco	AIR-SAP2602E-A-K9	TIY	NCR	0
Step Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
Step Attenuator	Aeroflex/Weinschel	3053	RKF	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
DFS Signal Generator	Benchforge Manufacturing	Colt	TIN	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
40GHz DC Block	Miteq	DCB4000	AMD	5/16/2013	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Spectrum Analyzer	Agilent	E4440	AFE	11/4/2013	24

TEST DESCRIPTION

FCC KDB 905462 describes the compliance measurement procedures including acceptable instrument system configurations for performing Dynamic Frequency Selection (DFS) tests under FCC Part 15 Subpart E Rules required for Unlicensed - National Information Infrastructure (U-NII) equipment that operates in the frequency bands 5.25 GHz to 5.35 GHz and/or 5.47 GHz to 5.725 GHz. The master and client were connected using the conducted method described in the procedure via a series of splitters and attenuators which allows the radar signals to be injected and monitored. Where required, an approved Media file was streamed through the master and client or an alternative method to load the channel may be used instead. Configuration and status of the master and client devices were monitored. The Closing Time test was performed by starting a transmission between the Master and Client device, and then injecting the appropriate radar signals. All transmission signals between the Master and Client in the first 200mS are allowed. After this time period, the number of transmissions signals are counted and multiplied by the pulse width value. This aggregate is then added to the 200mS allowance for the final value.



CLOSING TIME

XMit 2014.02.07

EUT: ConnectCore6 (i.MX6)		Work Order: ETHE0008				
Serial Number: 00409D7B8CA2		Date: 08/25/14				
Customer: Etherios Design Solutions		Temperature: 22°C				
Attendees: None		Humidity: 41%				
Project: None		Barometric Pres.: 1013				
Tested by: Jared Ison		Power: 5 VDC				
		Job Site: EV06				
TEST SPECIFICATIONS		Test Method				
FCC 15.407:2014		ANSI C63.10:2009				
COMMENTS						
Test performed on antenna Port 1, the antenna port that produced the highest output power during FCC 15.407 certification testing. The mode of operation was provided by the client.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	6	Signature 				
		Pulses (#)	Pulse Width (ms)	Value (ms)	Limit (ms)	Result
20MHz						
Ch. 60: 5300 MHz						
Radar 1 Control Signal Pulse Width						
Radar 1 200ms + Aggregate						
N/A						
1						
0.05648						
N/A						
200.05648						
N/A						
260						
N/A						
Pass						
Ch. 112: 5560 MHz						
Radar 1 Control Signal Pulse Width						
Radar 1 200ms + Aggregate						
N/A						
1						
0.05632						
N/A						
200.05632						
N/A						
260						
N/A						
Pass						

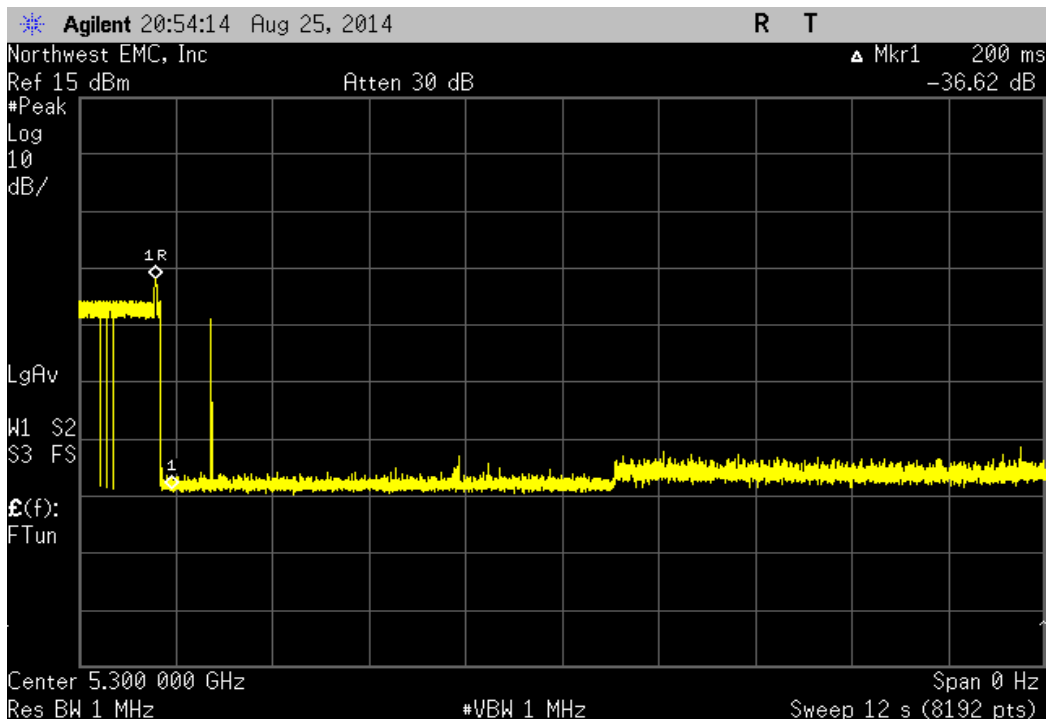
20MHz, Ch. 60: 5300 MHz, Radar 1 Control Signal Pulse Width

Pulses (#)	Pulse Width (ms)	Value (ms)	Limit (ms)	Result
N/A	0.05648	N/A	N/A	N/A



20MHz, Ch. 60: 5300 MHz, Radar 1 200ms + Aggregate

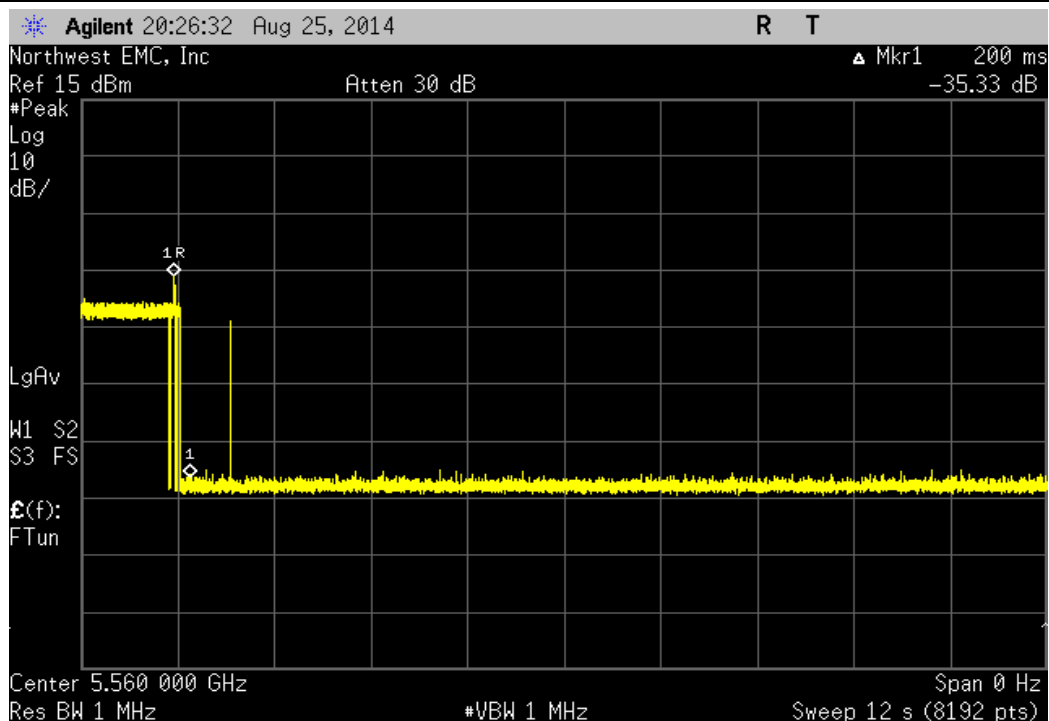
Pulses (#)	Pulse Width (ms)	Value (ms)	Limit (ms)	Result
1	0.05648	200.05648	260	Pass



20MHz, Ch. 112: 5560 MHz, Radar 1 Control Signal Pulse Width						
Pulses (#)	Pulse Width (ms)	Value (ms)	Limit (ms)	Result		
N/A	0.05632	N/A	N/A	N/A		



20MHz, Ch. 112: 5560 MHz, Radar 1 200ms + Aggregate						
Pulses (#)	Pulse Width (ms)	Value (ms)	Limit (ms)	Result		
1	0.05632	200.05632	260	Pass		



NON OCCUPANCY PERIOD

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440	AFE	11/4/2013	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
40GHz DC Block	Miteq	DCB4000	AMD	4/28/2014	12
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
DFS Signal Generator	Benchforge Manufacturing	Colt	TIN	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Step Attenuator	Aeroflex/Weinschel	3053	RKF	NCR	0
Step Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
DFS Access Point	Cisco	AIR-SAP2602E-A-K9	TIY	NCR	0
Power Meter	Agilent	N1913A	SQR	4/29/2013	36
Power Sensor	Agilent	E9300H	SQO	4/29/2013	36
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0

TEST DESCRIPTION

FCC KDB 905462 describes the compliance measurement procedures including acceptable instrument system configurations for performing Dynamic Frequency Selection (DFS) tests under FCC Part 15 Subpart E Rules required for Unlicensed - National Information Infrastructure (U-NII) equipment that operates in the frequency bands 5.25 GHz to 5.35 GHz and/or 5.47 GHz to 5.725 GHz. The master and client were connected using the conducted method described in the procedure via a series of splitters and attenuators which allows the radar signals to be injected and monitored. Where required, an approved Media file was streamed through the master and client or an alternative method to load the channel may be used instead. Configuration and status of the master and client devices were monitored. The Move Time test was performed by starting a transmission between the Master and Slave device, and then injecting the appropriate radar signals and making sure both the Master and Slave device vacate the DFS channel within the time specified by the standard.



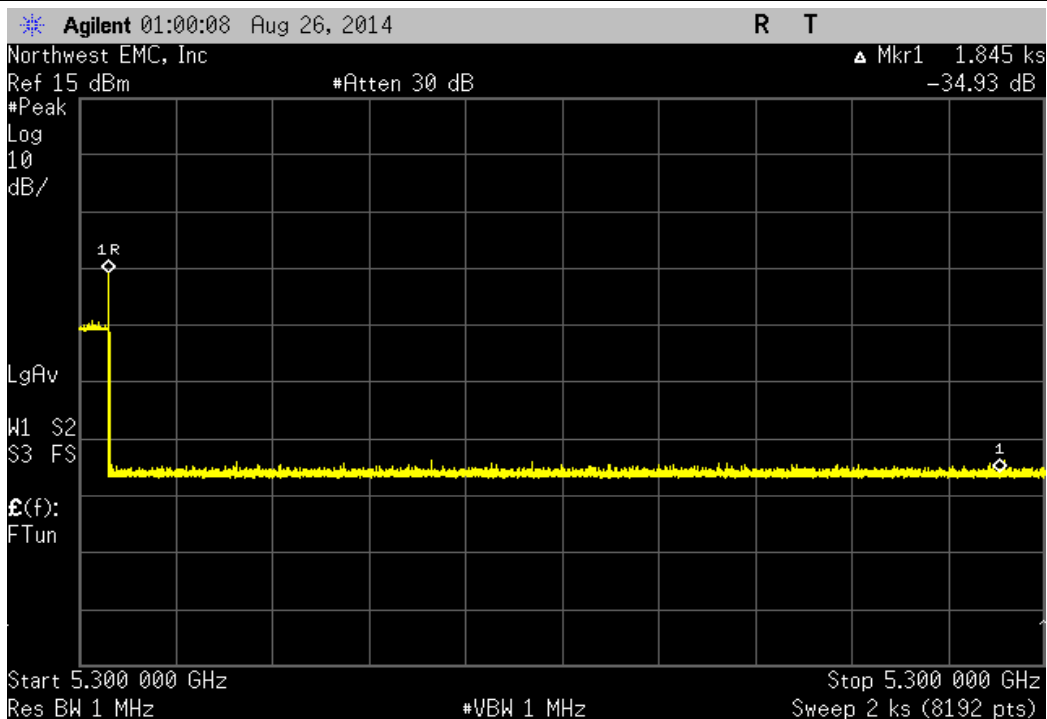
NON OCCUPANCY PERIOD

XMit 2014.02.07

EUT: ConnectCore6 (i.MX6)		Work Order: ETHE0008	
Serial Number: 00409D7B8CA2		Date: 08/25/14	
Customer: Etherios Design Solutions		Temperature: 22.°C	
Attendees: None		Humidity: 41%	
Project: None		Barometric Pres.: 1013	
Tested by: Jared Ison		Power: 5 VDC	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.407:2014		ANSI C63.10:2009	
COMMENTS			
Test performed on antenna Port 1, the antenna port that produced the highest output power during FCC 15.407 certification testing. The mode of operation was provided by the client.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature 	
		Value	Limit
20MHz			Result
Ch. 60: 5300 MHz			
30min Non Occupancy Period		> 30 min	≥ 30 min
Ch. 112: 5560 MHz			
30min Non Occupancy Period		> 30 min	≥ 30 min
			Pass

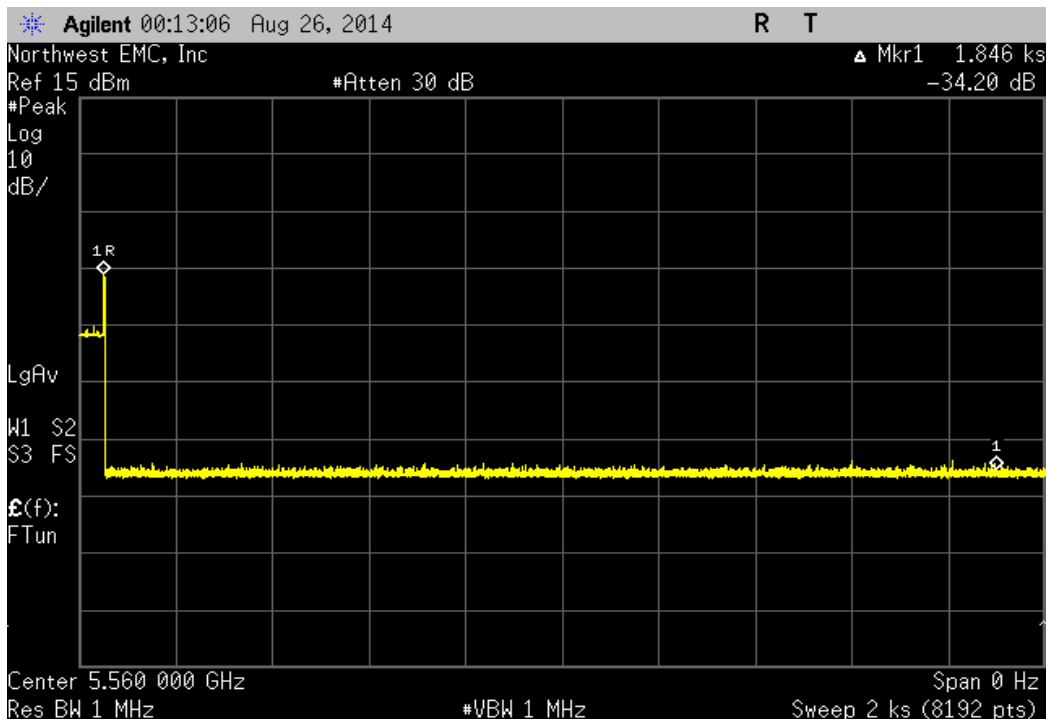
20MHz, Ch. 60: 5300 MHz, 30min Non Occupancy Period

Value	Limit	Result
> 30 min	≥ 30 min	Pass



20MHz, Ch. 112: 5560 MHz, 30min Non Occupancy Period

Value	Limit	Result
> 30 min	≥ 30 min	Pass





DFS CLIENT TEST SETUP

