

NORTHWEST EMC

Summit Semiconductor LLC

Athena4XD (Extended Distance)

FCC 15.407:2015

802.11a Radio

Report # FOCU0214.2



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

CERTIFICATE OF TEST

Last Date of Test: September 17, 2015
Summit Semiconductor LLC
Model: Athena4XD (Extended Distance)

Radio Equipment Testing

Standards

Specification	Method
FCC 15.407:2015	ANSI C63.10:2013

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	
KDB 905462	Test Signal Levels	Yes	Pass	
KDB 905462	Channel Availability Check	No	N/A	Not required when the device is a "Client without radar detection".
KDB 905462	Detection Bandwidth	No	N/A	Not required when the device is a "Client without radar detection".
KDB 905462	Statistical Performance	No	N/A	Not required when the device is a "Client without radar detection".

Deviations From Test Standards

None

Approved By:



Kyle Holgate, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

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 17065 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

MSIP / 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.

Israel

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

Hong Kong

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

Vietnam

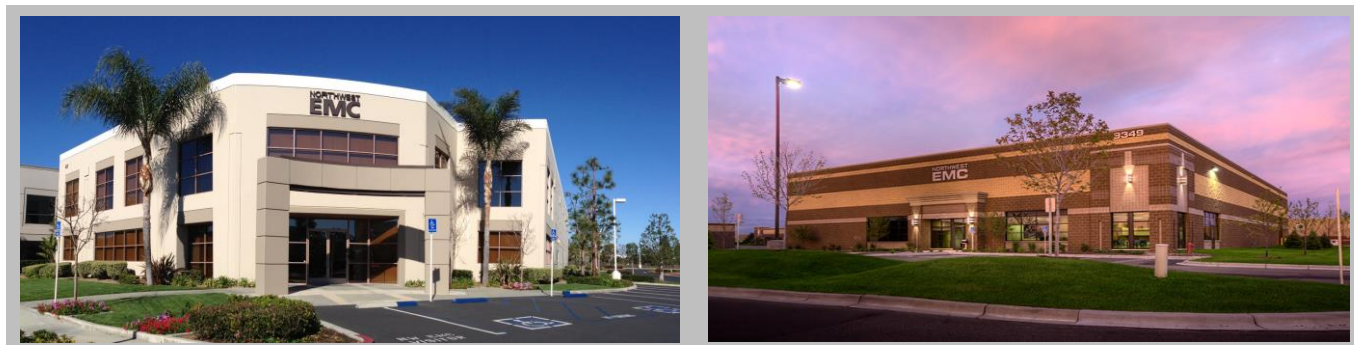
MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

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

<http://www.nwemc.com/accreditations/>
<http://gsi.nist.gov/global/docs/cabs/designations.html>

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



DFS PRODUCT INFORMATION

Client and Equipment Under Test (EUT) Information

Company Name:	Summit Semiconductor LLC
Address:	20575 NW Von Neumann Dr., Suite 100
City, State, Zip:	Beaverton, OR 97006
Test Requested By:	Kenneth Boehlke
Model:	Athena4XD (Extended Distance)
First Date of Test:	September 17, 2015
Last Date of Test:	September 17, 2015
Receipt Date of Samples:	August 21, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

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 client has four integrated 50 Ohm antennas that are switch selected for best reception. The integrated antenna gain was measured, and shown to have maximum gain of 1dBi.

Functional Description of the EUT (Equipment Under Test):

Proprietary 802.11a SISO radio with 4 identical ports / antennas

The operating modes of the U-NII device.

Client device with no radar detection capability. 20MHz bandwidth only.

For Client devices, indicate whether or not it has DFS Radar detection capabilities.

Client does not have radar detection capability. Ad-hoc capability does not apply.

DFS PRODUCT INFORMATION

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.

System is load based.

Data Rates:

Client = 6Mb/S & 18Mb/S

All channels utilize only the 20MHz bandwidth mode of operation.

Applicable only to devices with Radar detection capabilities: The time required for the Master Device or Client Device (with radar detection) to complete its power-on cycle.

Less than 4 seconds.

Hardware, Firmware, and OS Versions:

Hardware version:

Athena4XD Client, PN:444-2253, R105.01.

Firmware version: FW197.3

OS versions: N/A

The operating frequency band(s) of the equipment.

The radio operates on channel center frequencies within the ranges of 5.18–5.32 GHz, 5.50–5.70 GHz, and 5.745–5.825 GHz with a maximum occupied channel bandwidth of 20 MHz.

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

The client maximum EIRP is +24dBm (23dBm +1dBi).

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 is performed with an audio streams of 48kHz/96kHz from the master to the client. Channel loading is approximately 70%.

Transmit Power Control description.

TPC is implemented

DFS PRODUCT INFORMATION

Applicable only to devices with Radar detection capabilities: Manufacturer statement confirming that information regarding the parameters of the detected Radar Waveforms is not available to the end user.

Client device with no radar detection capability.

Applicable only to Master devices: 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.

Not applicable as the EUT is a client device.

For Client devices, indicate the FCC (and IC) identifier for the Master U-NII Device that is used with it for DFS testing.

Client does not have radar detection capability. A DFS-compliant Master device was used for testing - Sherwood XD Master, PN:444-2254, version R203.02.). *The Master FCCID number (pending) is UA9805*

CONFIGURATIONS

Configuration FOCU0214- 6

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Radio Board (Athena4XD) Extended Distance	Summit Semiconductor LLC	Athena4XD / 444-2253	02EA4CD00042

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board (Athena)	Summit Semiconductor LLC	None	None
Radio Module (Sherwood)	Summit Semiconductor LLC	SherwoodXD / 444-2254	02EA4FD0010F
AC/DC Adapter (Athena)	CONDOR	STD-1836P	SA-183A6IV
Laptop DFS (Dell)	Dell	Latitude D820	None
AC/DC Adapter DFS (DELL)	Replacement AC Adaptor	AC-PA-10	None
Laptop DFS (Dell 2)	Dell	Latitude D820	CN-0GF470-48643-739-1438
AC/DC Adapter DFS (DELL 2)	Dell	LA90PS0-00	CN-0DF266-71615-81L-3CBS
Sherwood-Bridge	Summit Semiconductor LLC	None	None
USB to I2c Converter	Summit Semiconductor LLC	DIOLAN	None
USB Audio Converter	TeraLink	TeraLink2	None
Power Supply (Master)	CONDOR	STD-1836P	SA-183A6IV

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Cat 5 to I/O cable	Yes	.5m	No	USB Audio Converter	Development Board (Sherwood)
AC Power Cable (Athena)	No	1.5m	No	AC mains	Development Board (Athena)
DC Power Cable (Athena)	Unknown	1.5m	Yes	AC/DC Adapter (Athena)	Development Board (Athena)
USB Cable	Yes	1.2m	No	Laptop	Development Board (Athena)
AC Power Cable Laptop DFS x2	No	0.9m	No	AC/DC Power Adapter	AC mains
DC Power Cable Laptop DFS x2	No	1.2m	No	Laptop	AC/DC Power Adapter
Ethernet to I/O	Yes	.6m	No	Teralink 2	USB to I2C Converter
USB Cable	Yes	1.2m	No	Laptop DFS	Teralink 2
USB Cable	Yes	1.5m	No	Laptop DFS	USB to I2C Converter
Serial Cable	No	1.6m	No	Sherwood-Bridge	Laptop DFS
AC Power Cable (Sherwood)	No	.8m	No	AC/DC Power Adapter	AC mains
DC Power Cable (Sherwood)	No	1.6m	Yes	Sherwood-Bridge	AC/DC Power Adapter

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	9/17/2015	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	9/17/2015	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	9/17/2015	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	9/17/2015	Non Occupancy Period	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.
5	9/17/2015	Test Signal Levels	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

INTRODUCTION

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

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.

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)
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	36
Attenuator	S.M. Electronics	SA18N-06/SM4032	REE	10/20/2014	12
Meter - Power	Gigatronics	8651A	SPM	5/25/2015	12
Power Sensor	Gigatronics	80701A	SPL	5/25/2015	12
Attenuator	Weinschel Corp	3330A-6	AUF	1/6/2015	12
Directional Coupler	Fairview Microwave	MC2047-10	RGT	NCR	0
Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
Attenuator	Aeroflex/Weinschel	3053	RKF	NCR	0
Attenuator	Fairview Microwave	SA26B-06	TWF	5/12/2015	12
Attenuator	Mini Circuits	BW-S10W2	RKI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Attenuator	Fairview Microwave	SA26B-10	TWH	5/12/2015	12
Attenuator	S.M. Electronics	SA26B-6	AUX	7/15/2015	12
Block - DC	Fairview Microwave	SD3379	AMP	6/18/2015	12
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

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.

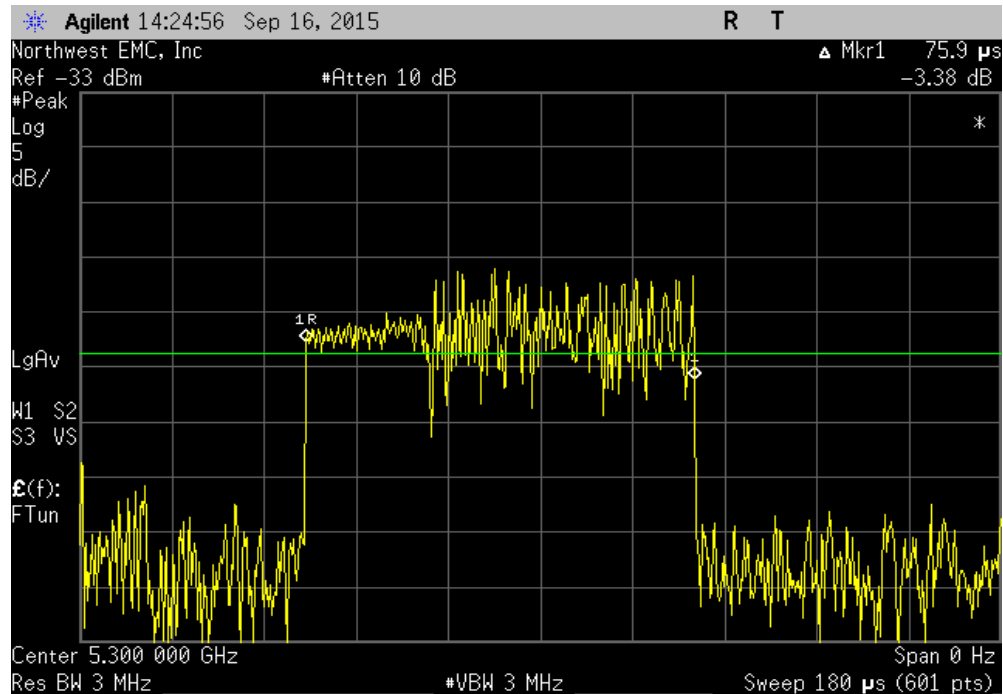
The client device can only transmit short control signals while under a receiving load from the master device. These short control signals were captured while the master device was under a transmit loading condition of greater than 30%. The client device can not transmit a true data load to the master by manufacturers design, so therefore the client will not have a valid loading condition as shown in the data provided.

CHANNEL LOADING/CHANNEL UTILIZATION

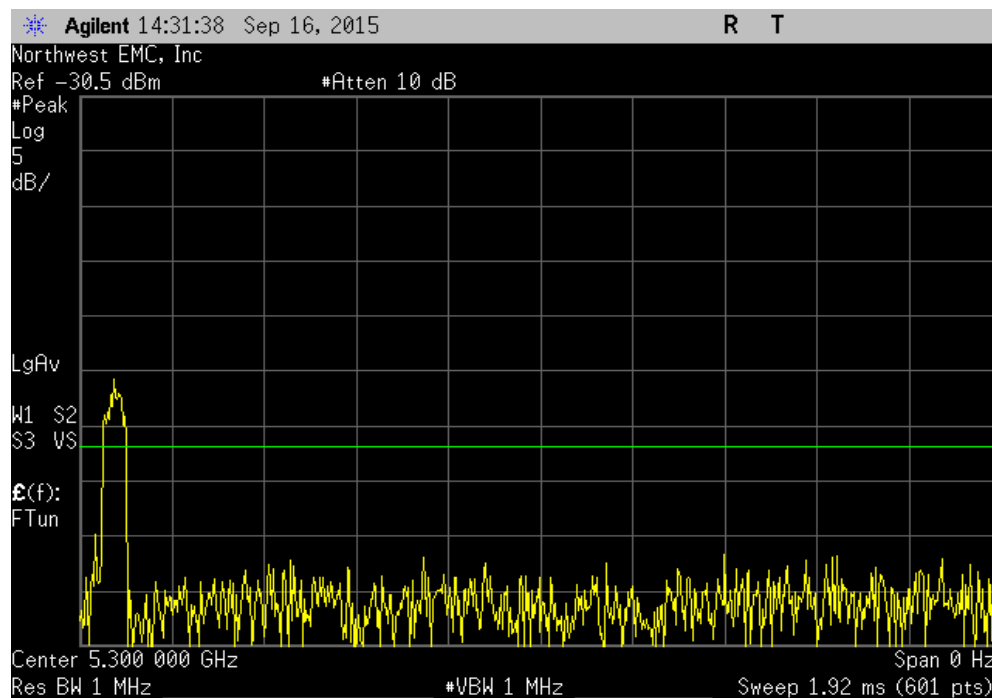
EUT: Athena4XD (Extended Distance)		Work Order: FOCU0214	
Serial Number: 02EA4CD00042		Date: 09/17/15	
Customer: Summit Semiconductor LLC		Temperature: 22.2°C	
Attendees: David Schilling		Humidity: 42%	
Project: None		Barometric Pres.: 1009.2	
Tested by: Brandon Hobbs		Power: 3.3/1.2 VDC Nominal	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.407:2015		ANSI C63.10:2013	
COMMENTS			
The EUT was tested in ISOC mode. Streaming NITA MPEG at sample rate of 48kHz from Master to the Client. The client device only transmits "Short Control Signals". No true loading is provided by the client device as shown in the testing below. When connected and streaming from the master device channel loading is approximately 70% (see FOCU0216)			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature 	
		Pulse Width (µsec)	Loading Value (%)
		Limit	Result
Working Radio			
	5300 MHz		
	Pulse Width	75.9	N/A
	2mS	75.9	4.0
	10mS	75.9	3.0
	25mS	75.9	1.8
	100mS	75.9	1.1
	10Sec	75.9	N/A

CHANNEL LOADING/CHANNEL UTILIZATION

Working Radio, 5300 MHz, Pulse Width						
			Pulse Width (μ sec)	Loading Value (%)	Limit	Result
			75.9	N/A	N/A	N/A

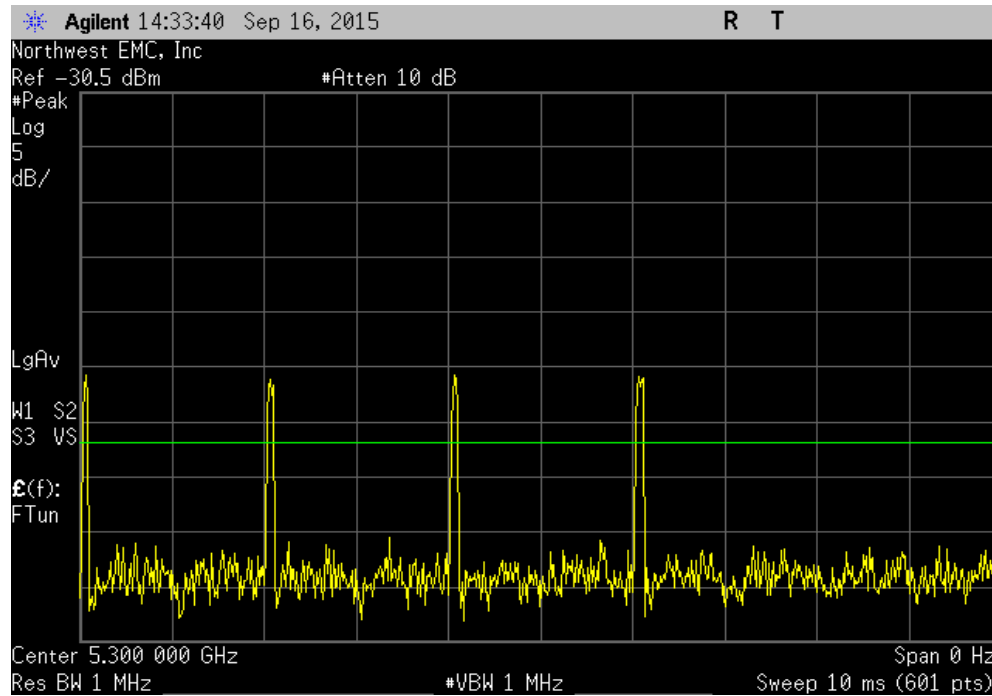


Working Radio, 5300 MHz, 2mS						
			Pulse Width (μ sec)	Loading Value (%)	Limit	Result
			75.9	4.0	N/A	N/A

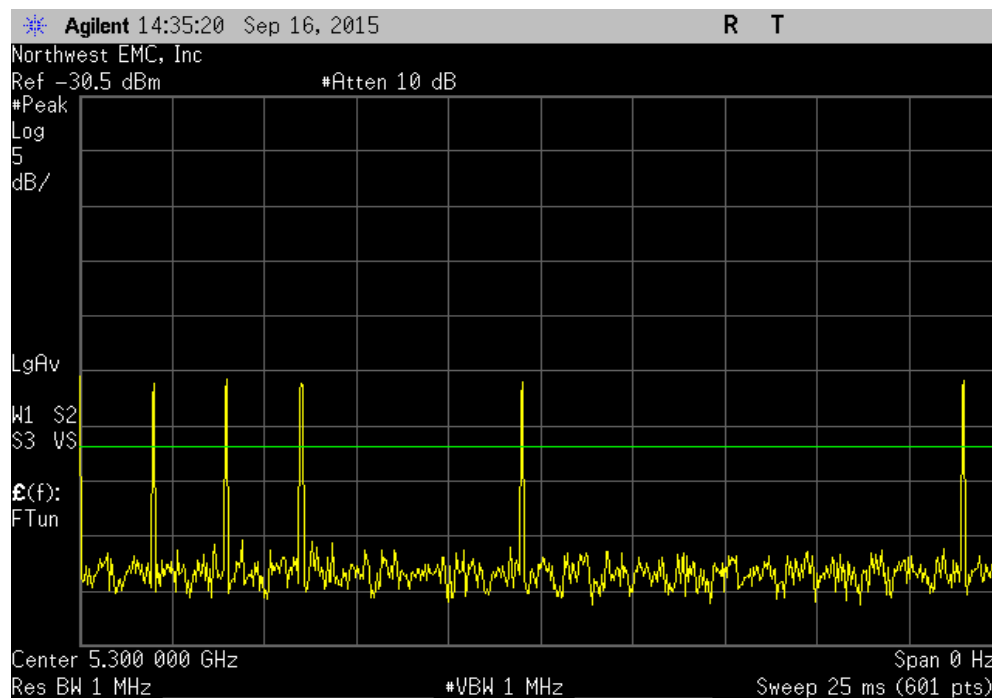


CHANNEL LOADING/CHANNEL UTILIZATION

Working Radio, 5300 MHz, 10mS						
			Pulse Width (μ sec)	Loading Value (%)	Limit	Result
			75.9	3.036	N/A	N/A

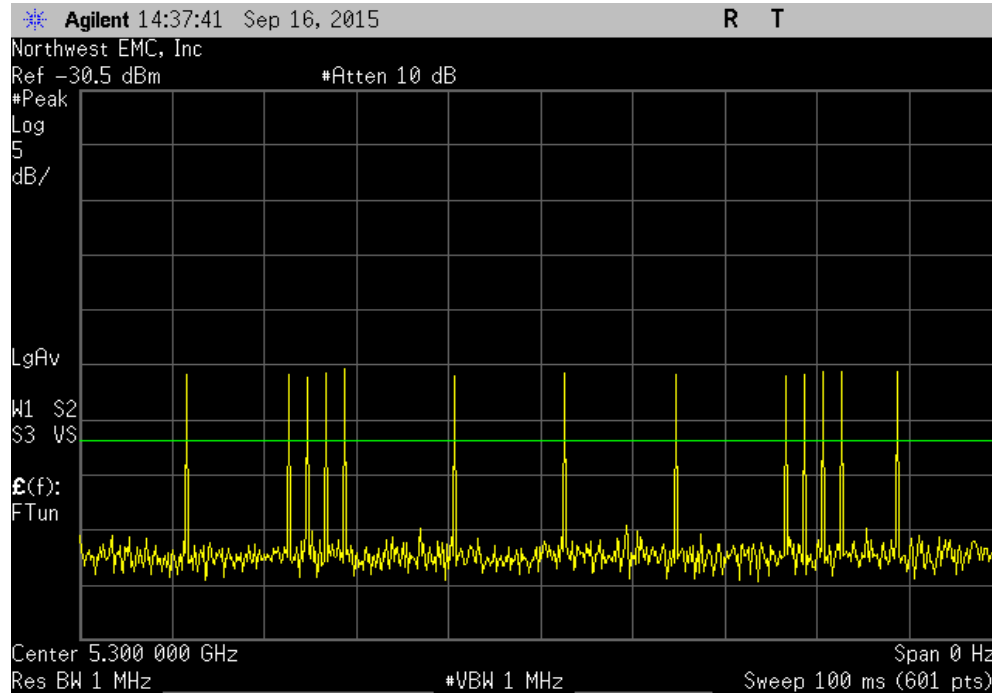


Working Radio, 5300 MHz, 25mS						
			Pulse Width (μ sec)	Loading Value (%)	Limit	Result
			75.9	1.8216	N/A	N/A

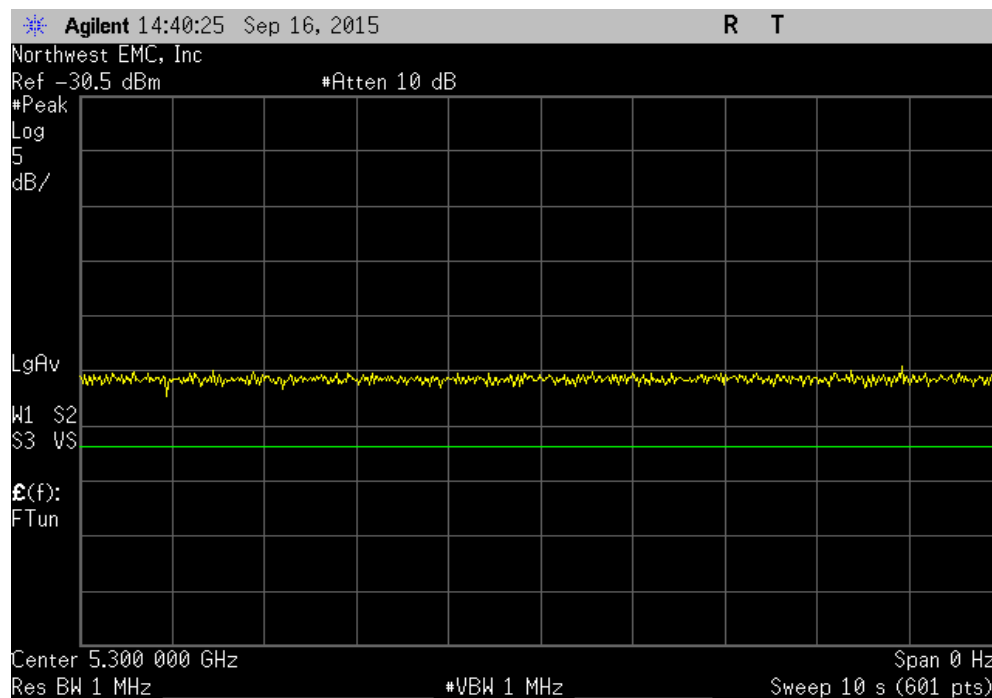


CHANNEL LOADING/CHANNEL UTILIZATION

Working Radio, 5300 MHz, 100mS						
			Pulse Width (µsec)	Loading Value (%)	Limit	Result
			75.9	1.0626	N/A	N/A



Working Radio, 5300 MHz, 10Sec						
			Pulse Width (µsec)	Loading Value (%)	Limit	Result
			75.9	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)
Generator - Signal	Benchforge Manufacturing	Colt	TIN	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	36
Attenuator	S.M. Electronics	SA18N-06/SM4032	REE	10/20/2014	12
Meter - Power	Gigatronics	8651A	SPM	5/25/2015	12
Power Sensor	Gigatronics	80701A	SPL	5/25/2015	12
Attenuator	Weinschel Corp	3330A-6	AUF	1/6/2015	12
Directional Coupler	Fairview Microwave	MC2047-10	RGT	NCR	0
Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
Attenuator	Aeroflex/Weinschel	3053	RKF	NCR	0
Attenuator	Fairview Microwave	SA26B-06	TWF	5/12/2015	12
Attenuator	Mini Circuits	BW-S10W2	RKI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Attenuator	Fairview Microwave	SA26B-10	TWH	5/12/2015	12
Attenuator	S.M. Electronics	SA26B-6	AUX	7/15/2015	12
Block - DC	Fairview Microwave	SD3379	AMP	6/18/2015	12
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

TEST DESCRIPTION

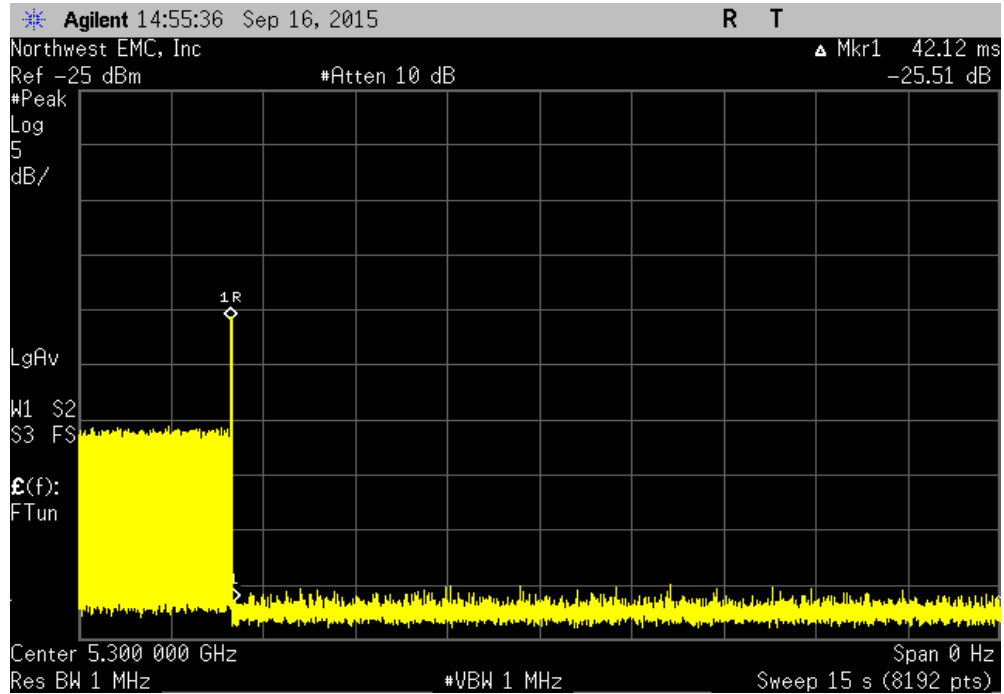
The master and client were connected using the conducted method described in the FCC KDB procedure via a series of splitters and attenuators which allows the radar signals to be injected and monitored. For master devices, the detection level was set prior to testing by temporarily replacing the master device with the analyzer and setting the power level according to Table 3 and Section 7.5. Where required, an approved Media file was streamed between the master and client or an alternative method to load the channel may be used instead. Channel loading requirements were also verified prior to testing. Configuration and status of the master and client devices were then monitored using the spectrum analyzer. The Move Time test was performed by starting a transmission between the master and client device, and then injecting the appropriate radar signals and making sure both the master and client device vacate the DFS channel within the time specified by the standard.

MOVE TIME

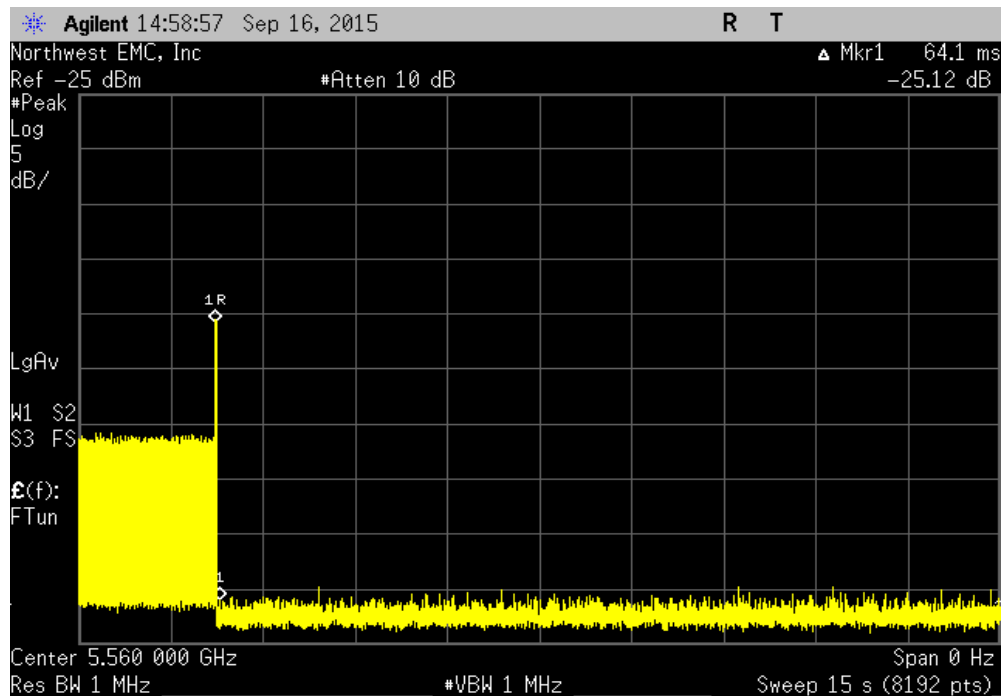
EUT: Athena4XD (Extended Distance)		Work Order: FOCU0214	
Serial Number: 02EA4CD00042		Date: 09/17/15	
Customer: Summit Semiconductor LLC		Temperature: 22.2°C	
Attendees: David Schilling		Humidity: 42%	
Project: None		Barometric Pres.: 1009.2	
Tested by: Brandon Hobbs	Power: 3.3/1.2 VDC Nominal	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.407:2015		ANSI C63.10:2013	
COMMENTS			
The EUT was tested in ISOC mode. Streaming NITA MPEG at sample rate of 48kHz from Master to the Client.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature 	
		Value	Limit
Working Radio			Result
5300 MHz			
Radar Type 0		42.1 ms	< 10 s Pass
5560 MHz			
Radar Type 0		64.1 ms	< 10 s Pass

MOVE TIME

Working Radio, 5300 MHz, Radar Type 0						
				Value	Limit	Result
				42.1 ms	< 10 s	Pass



Working Radio, 5560 MHz, Radar Type 0						
				Value	Limit	Result
				64.1 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)
Generator - Signal	Benchforge Manufacturing	Colt	TIN	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	36
Attenuator	S.M. Electronics	SA18N-06/SM4032	REE	10/20/2014	12
Meter - Power	Gigatronics	8651A	SPM	5/25/2015	12
Power Sensor	Gigatronics	80701A	SPL	5/25/2015	12
Attenuator	Weinschel Corp	3330A-6	AUF	1/6/2015	12
Directional Coupler	Fairview Microwave	MC2047-10	RGT	NCR	0
Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
Attenuator	Aeroflex/Weinschel	3053	RKF	NCR	0
Attenuator	Fairview Microwave	SA26B-06	TWF	5/12/2015	12
Attenuator	Mini Circuits	BW-S10W2	RKI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Attenuator	Fairview Microwave	SA26B-10	TWH	5/12/2015	12
Attenuator	S.M. Electronics	SA26B-6	AUX	7/15/2015	12
Block - DC	Fairview Microwave	SD3379	AMP	6/18/2015	12
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

TEST DESCRIPTION

The master and client were connected using the conducted method described in the FCC KDB procedure via a series of splitters and attenuators which allows the radar signals to be injected and monitored. For master devices, the detection level was set prior to testing by temporarily replacing the master device with the analyzer and setting the power level according to Table 3 and Section 7.5. 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. Channel loading requirements were also verified prior to testing.

Configuration and status of the master and client devices were then monitored using the spectrum analyzer. 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(s). This aggregate is then added to the 200mS allowance for the final value and compared to the specified limit.

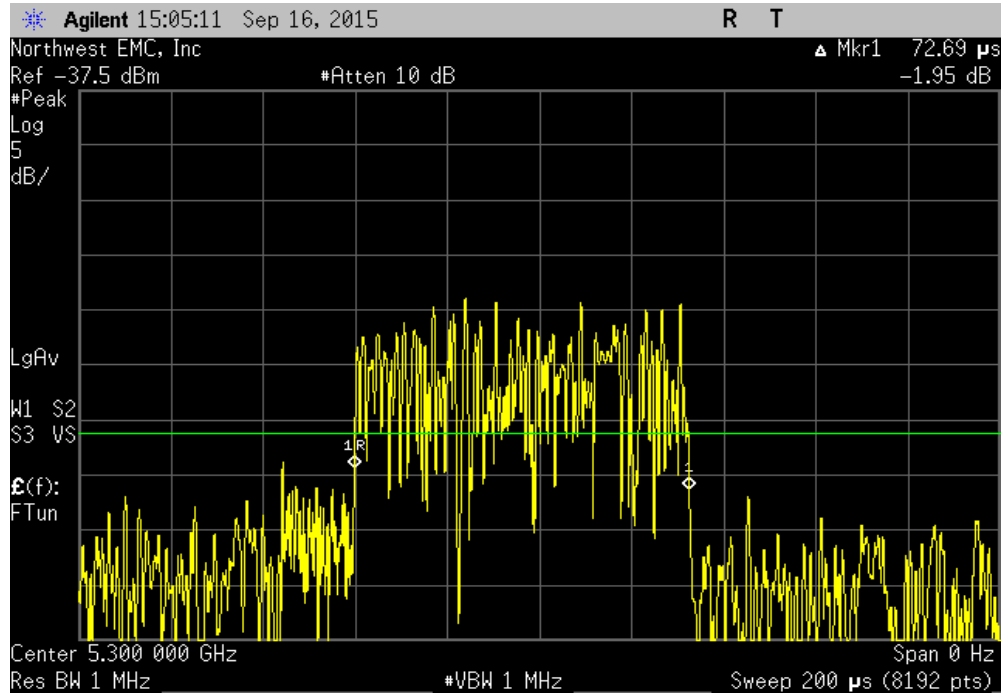
CLOSING TIME

EUT: Athena4XD (Extended Distance)		Work Order: FOCU0214	
Serial Number: 02EA4CD00042		Date: 09/17/15	
Customer: Summit Semiconductor LLC		Temperature: 22.2°C	
Attendees: David Schilling		Humidity: 42%	
Project: None		Barometric Pres.: 1009.2	
Tested by: Brandon Hobbs		Power: 3.3/1.2 VDC Nominal	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.407:2015		ANSI C63.10:2013	
COMMENTS			
The EUT was tested in ISOC mode. Streaming NITA MPEG at sample rate of 48kHz from Master to the Client.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature 	
		# of Pulses	PW (mSec)
Working Radio	5300 MHz		
	Radar Type 0		
	Control Signal Pulse Width	N/A	0.07269
	200ms + Aggregate	0	0.07269
		N/A	200
		N/A	260
		N/A	N/A
			Pass
	5560 MHz		
	Radar Type 0		
	Control Signal Pulse Width	N/A	0.0765
	200ms + Aggregate	0	0.0765
		N/A	200
		N/A	260
		N/A	N/A
			Pass

CLOSING TIME

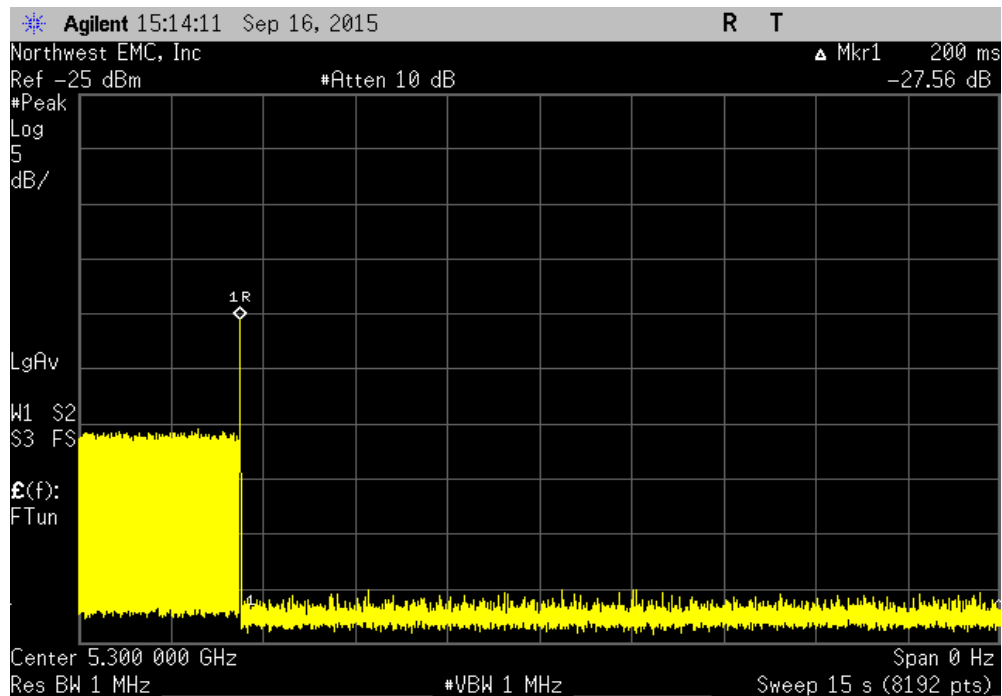
Working Radio, 5300 MHz, Radar Type 0, Control Signal Pulse Width

# of Pulses	PW (mSec)	Value	Limit (mSec)	Result
N/A	0.07269	N/A	N/A	N/A



Working Radio, 5300 MHz, Radar Type 0, 200ms + Aggregate

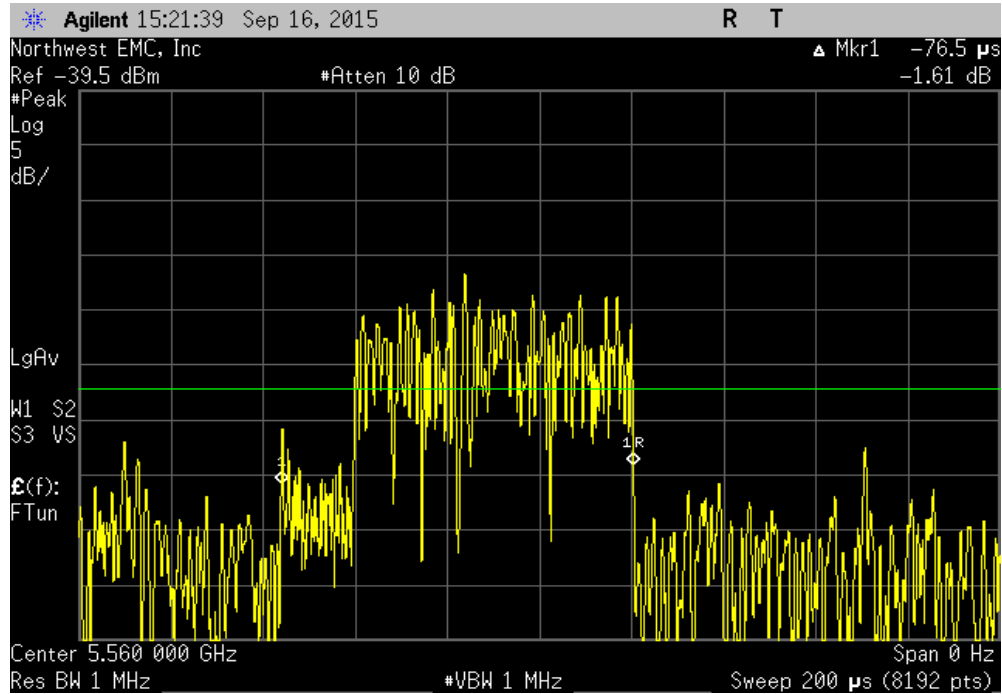
# of Pulses	PW (mSec)	Value	Limit (mSec)	Result
0	0.07269	200	260	Pass



CLOSING TIME

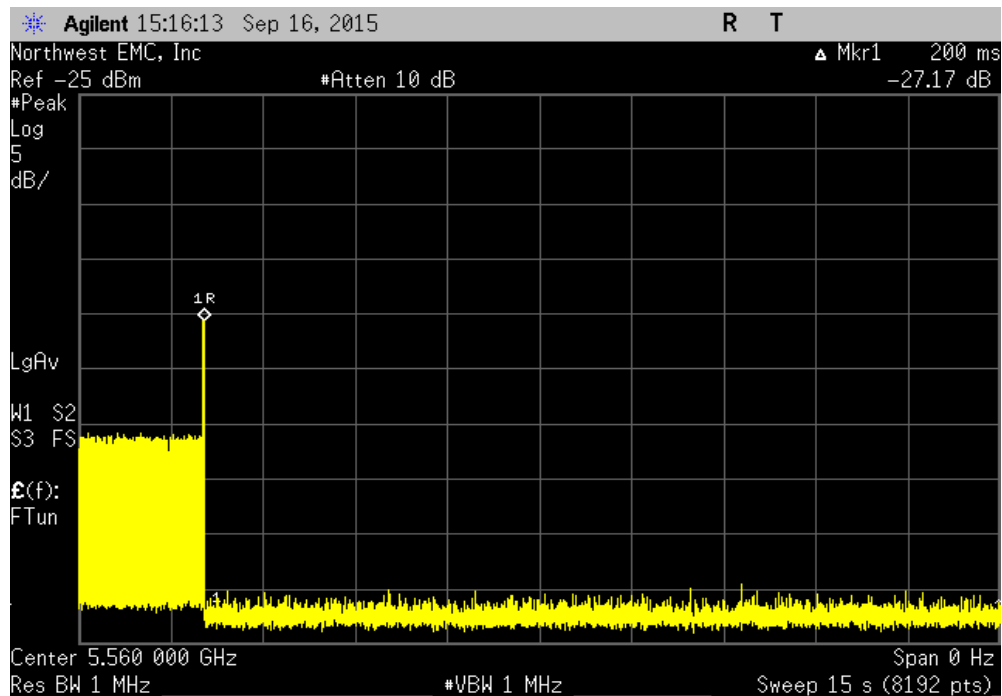
Working Radio, 5560 MHz, Radar Type 0, Control Signal Pulse Width

# of Pulses	PW (mSec)	Value	Limit (mSec)	Result
N/A	0.0765	N/A	N/A	N/A



Working Radio, 5560 MHz, Radar Type 0, 200ms + Aggregate

# of Pulses	PW (mSec)	Value	Limit (mSec)	Result
0	0.0765	200	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 (mo)
Generator - Signal	Benchforge Manufacturing	Colt	TIN	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	36
Attenuator	S.M. Electronics	SA18N-06/SM4032	REE	10/20/2014	12
Meter - Power	Gigatronics	8651A	SPM	5/25/2015	12
Power Sensor	Gigatronics	80701A	SPL	5/25/2015	12
Attenuator	Weinschel Corp	3330A-6	AUF	1/6/2015	12
Directional Coupler	Fairview Microwave	MC2047-10	RGT	NCR	0
Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
Attenuator	Aeroflex/Weinschel	3053	RKG	NCR	0
Attenuator	Fairview Microwave	SA26B-06	TWF	5/12/2015	12
Attenuator	Mini Circuits	BW-S10W2	RKI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Attenuator	Fairview Microwave	SA26B-10	TWH	5/12/2015	12
Attenuator	S.M. Electronics	SA26B-6	AUX	7/15/2015	12
Block - DC	Fairview Microwave	SD3379	AMP	6/18/2015	12
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

TEST DESCRIPTION

The master and client were connected using the conducted method described in the FCC KDB procedure via a series of splitters and attenuators which allows the communication and injected radar signals to be monitored simultaneously. The spectrum analyzer was configured to sweep the frequency for at least 30 minutes. The appropriate radar signal was injected and the channel was monitored to make sure the master and client devices vacated the channel and did not use it again for a period of time equal to or greater than 30 minutes.

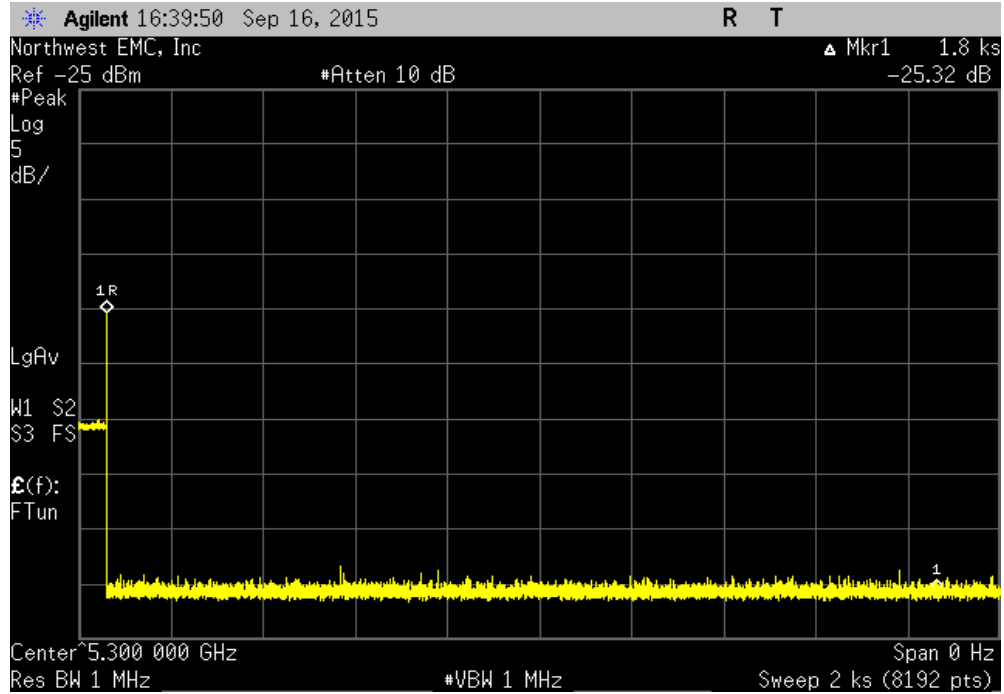
As fully described earlier in this report, the measured and verified -64dBm threshold short pulse radar type 0 was used to illustrate 30 minutes of non occupancy as defined in the FCC KDB procedure.

NON OCCUPANCY PERIOD

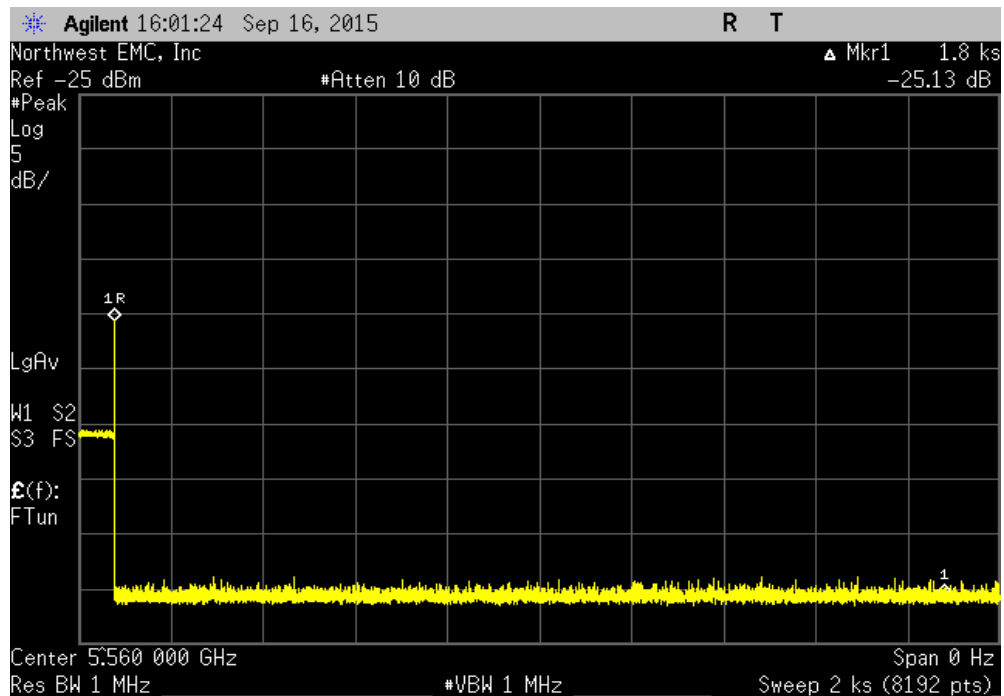
EUT: Athena4XD (Extended Distance)		Work Order: FOCU0214	
Serial Number: 02EA4CD00042		Date: 09/17/15	
Customer: Summit Semiconductor LLC		Temperature: 22.2°C	
Attendees: David Schilling		Humidity: 42%	
Project: None		Barometric Pres.: 1009.2	
Tested by: Brandon Hobbs	Power: 3.3/1.2 VDC Nominal	Job Site: EV06	
TEST SPECIFICATIONS			
FCC 15.407:2015		Test Method: ANSI C63.10:2013	
COMMENTS			
The EUT was tested in ISOC mode. Streaming NITA MPEG at sample rate of 48kHz from Master to the Client.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature 	
		Value	Limit
Working Radio			
5300 MHz			
30min Non Occupancy Period		> 30 min	≥ 30 min Pass
5560 MHz			
30min Non Occupancy Period		> 30 min	≥ 30 min Pass

NON OCCUPANCY PERIOD

Working Radio, 5300 MHz, 30min Non Occupancy Period						
				Value	Limit	Result
				> 30 min	≥ 30 min	Pass



Working Radio, 5560 MHz, 30min Non Occupancy Period						
				Value	Limit	Result
				> 30 min	≥ 30 min	Pass



TEST SIGNAL LEVEL

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)
Generator - Signal	Benchforge Manufacturing	Colt	TIN	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	36
Attenuator	S.M. Electronics	SA18N-06/SM4032	REE	10/20/2014	12
Meter - Power	Gigatronics	8651A	SPM	5/25/2015	12
Power Sensor	Gigatronics	80701A	SPL	5/25/2015	12
Attenuator	Weinschel Corp	3330A-6	AUF	1/6/2015	12
Directional Coupler	Fairview Microwave	MC2047-10	RGT	NCR	0
Attenuator	Fairview Microwave	SA26B-06	TWF	5/12/2015	12
Attenuator	Mini Circuits	BW-S10W2	RKI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAI	NCR	0
Power Divider/Combiner	Fairview Microwave	MP0208-2	IAJ	NCR	0
Attenuator	Fairview Microwave	SA26B-10	TWH	5/12/2015	12
Attenuator	S.M. Electronics	SA26B-6	AUX	7/15/2015	12
Block - DC	Fairview Microwave	SD3379	AMP	6/18/2015	12
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

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. A spectrum analyzer was used to measure and record the test signal level for each radar type (1-6) as defined in the test procedure.

RBW: $\geq 3\text{MHz}$

VBW: $\geq 3\text{MHz}$


Detector: Peak

SPAN: Zero

The measurement was taken using the transmission path from the signal generator to the master. The test signal level was then set equal to the DFS Detection Threshold that is required for testing.

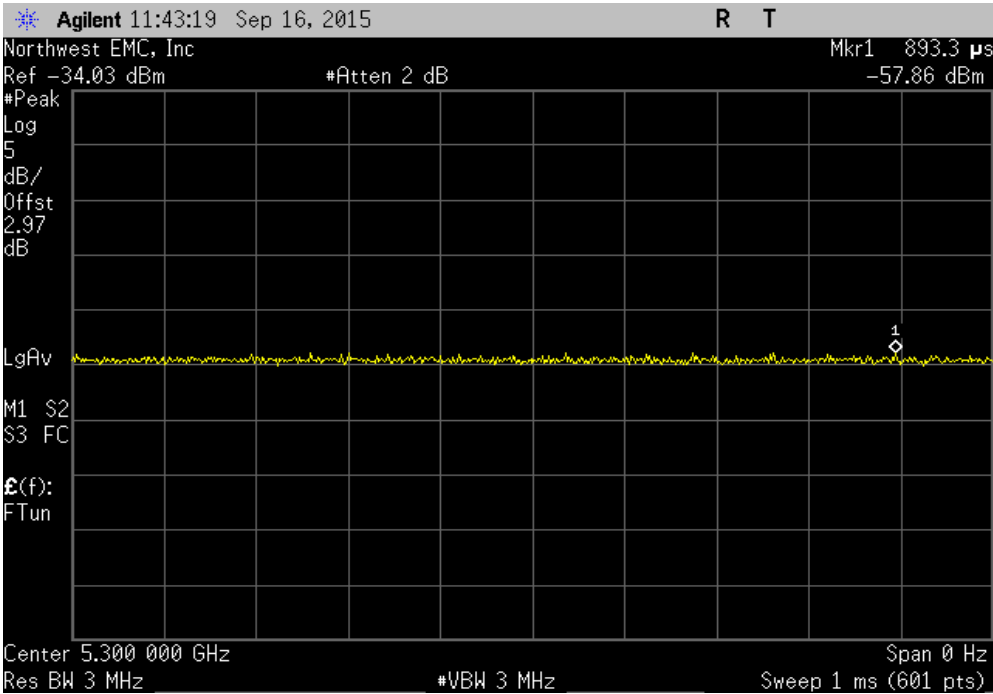
$-64\text{dBm} + 1\text{dB}(\text{spec allowance}) + -1\text{dBi} (\text{lowest client provided antenna gain}) + 6.24\text{dB} (\text{measured internal EUT loss}) =$
 -57.76dBm final threshold limit.

TEST SIGNAL LEVEL

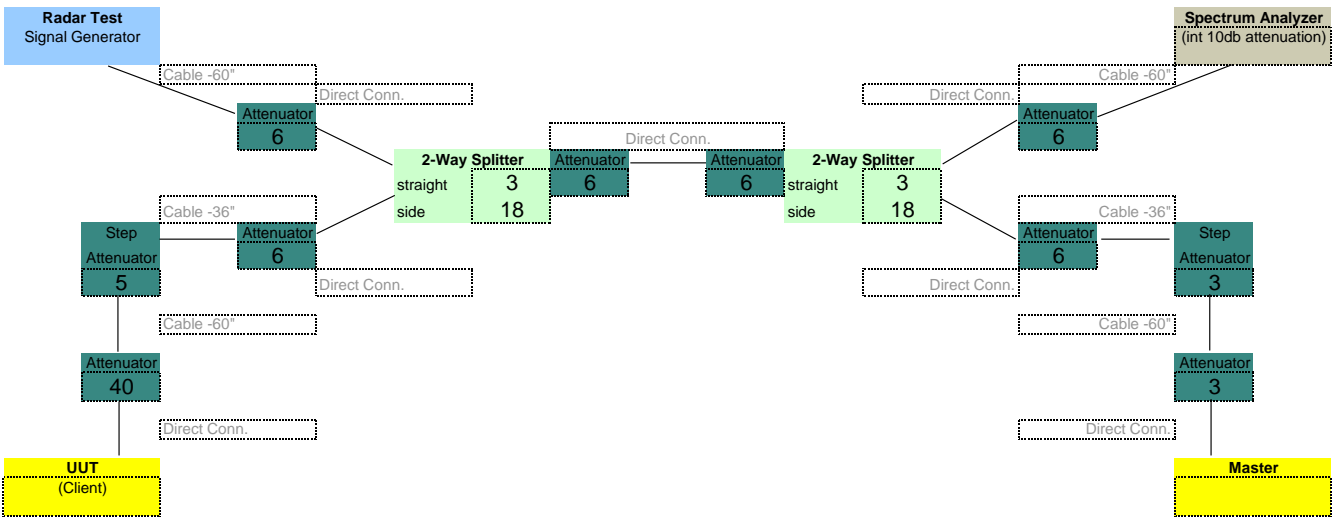
EUT: Athena4XD (Extended Distance)		Work Order: FOCU0214	
Serial Number: 02EA4CD00042		Date: 09/17/15	
Customer: Summit Semiconductor LLC		Temperature: 22.2°C	
Attendees: David Schilling		Humidity: 42%	
Project: None		Barometric Pres.: 1009.2	
Tested by: Brandon Hobbs		Power: 3.3/1.2 VDC Nominal	Job Site: EV06
TEST SPECIFICATIONS			
FCC 15.407:2015		ANSI C63.10:2013	
COMMENTS			
The EUT was tested in ISOC mode. Streaming NITA MPEG at sample rate of 48kHz from Master to the Client.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature 	
		Value (dBm)	Limit (dBm)
Radar Type 0		-57.86	-57.76
			Result
			N/A

TEST SIGNAL LEVEL

Radar Type 0						
				Value (dBm)	Limit (dBm)	Result
				-57.86	-57.76	N/A



DFS Test Setup



Attenuation

Master Radar Sim	Master Spec. Anal.	Client Spec. Anal.	Client Radar Sim	Master Client	Radar Sim Spec. Anal.
3	3	40	40	3	6
3	3	5	5	3	3
6	6	6	6	6	6
3	18	3	18	3	6
6	6	6	6	6	3
6		6		6	6
3		3		3	
6		6		6	
				5	
				40	
=====	=====	=====	=====	=====	=====
36	36	75	75	81	30