NORTHWEST EMC

Summit Semiconductor LLC

Athena UFL

FCC 15.407:2016

802.11a SISO Radio Module

Report # FOCU0209

NVLAP Lab Code: 200630-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: May 12, 2016
Summit Semiconductor LLC
Model: Athena UFL

Radio Equipment Testing

Standards

Specification	Method
FCC 15.407:2016	ANSI C63.10:2013, KDB 789033, KDB 905462

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for permissive change
6.5, 6.6, 12.7	Spurious Radiated Emissions	Yes	Pass	
6.8	Frequency Stability	No	N/A	Not required for permissive change
12.2	Duty Cycle	Yes	N/A	
12.3.2.4	Maximum Conducted Output Power	Yes	Pass	
12.4.1	Emission Bandwidth	No	N/A	Not required for permissive change
12.4.2	Occupied Bandwidth	Yes	Pass	
12.4.2	Band Edge	Yes	Pass	
12.5	Maximum Power Spectral Density	Yes	Pass	
KDB 789033 -H	Measurement of Emission at Elevation Angle Higher Than 30 Degrees From Horizon	No	N/A	Not required unless the EUT is a Master device used outdoors.

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

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

NORTHWEST EMC
REV 2016.3.22

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 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

MEASUREMENT UNCERTAINTY

TMU.2015.07.10

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

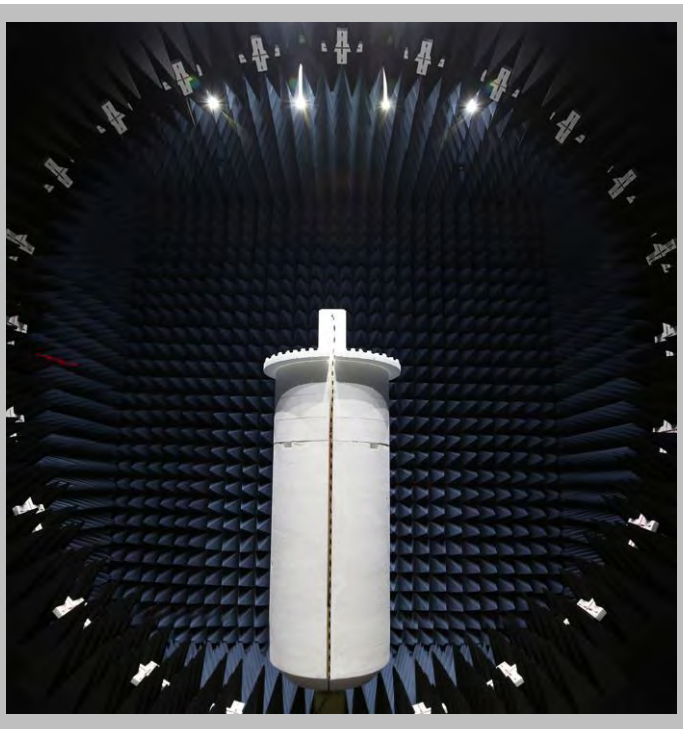
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

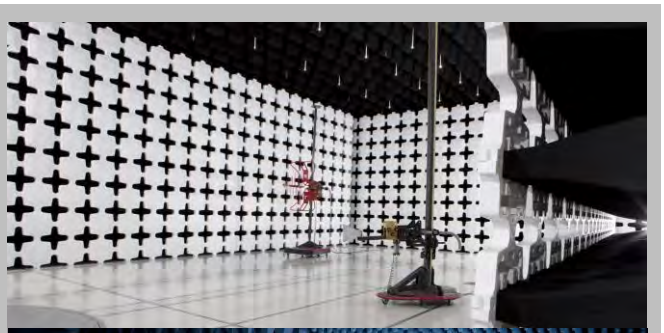
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

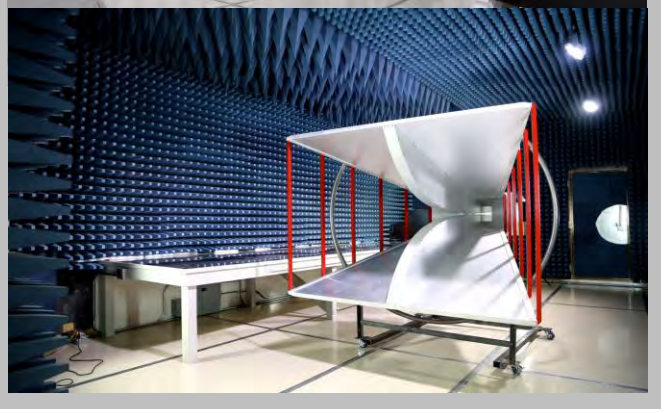
FACILITIES

NORTHWEST EMC
REV 2015.2.19

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (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/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







PRODUCT DESCRIPTION

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:	Athena UFL
First Date of Test:	May 11, 2016
Last Date of Test:	May 12, 2016
Receipt Date of Samples:	May 11, 2016
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Digital wireless audio device operating in the UNII bands as a client device. Radio module with 4 identical SISO ports.

Testing Objective:
To demonstrate compliance of the radio under FCC 15.407 for operation in the 5.8 GHz band.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration FOCU0209- 1

Software/Firmware Running during test	
Description	**Version**
RA	2.4.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Digital Wireless Client Module (Athena UFL)	Summit Semiconductor LLC	444-2225	02EA3D00DBCA

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Development Board	Summit Semiconductor LLC	Robini_Slave	None
I.T.E Power Supply	Triad	WSU050-3000	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC Adapter	Unknown	AC-PA-10	None
Remote Laptop	Dell	Latitude D820	CN-0GF470-48643-74S-1041

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power Cable	No	0.8m	No	AC Mains	AC Adapter
DC Power Cable	No	1.7m	No	I.T.E Power Supply	Development Board
DC Power Cable	No	1.1m	Yes	AC Adapter (AC-PA-10)	Remote Laptop
USB Cable	Yes	1.0m	No	Development Board	Remote Laptop

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration FOCU0209- 2

Software/Firmware Running during test	
Description	**Version**
RA	2.4.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Digital Wireless Client Module (Athena UFL)	Summit Semiconductor LLC	444-2225	02EA3D00DBCA

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Client supply	Summit Semiconductor LLC	Shanako Amp.	None
RS232 Level Translator	Acroname	Brainstem	None
AC Adapter	Condor	SA-1836P	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC Adapter	Unknown	AC-PA-10	None
Remote Laptop	Dell	Latitude D820	CN-0GF470-48643-74S-1041

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power Cable	No	0.8m	No	AC Mains	AC Adapter
DC Power Cable	No	1.1m	Yes	AC Adapter (AC-PA-10)	Remote Laptop
UART Data Cable	No	0.2m	No	Client Supply	RS232 level translator
RS232	Unknown	1.8m	No	RS232 Level Translator	Remote Laptop
DC Power Cable	No	1.0m	Yes	AC Adapter (SA-1836P)	Client supply

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration FOCU0209- 3

Software/Firmware Running during test	
Description	**Version**
Oly Dbg	30

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Digital Wireless Client Module (Athena UFL)	Summit Semiconductor LLC	444-2225	02EA3D00DBCA

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC Adapter	Condor	SA-1836P	None
Universal Antenna	TE Connectivity	P/N: 1513472-5	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power Cable	No	0.8m	No	AC Mains	AC Adapter
DC Power Cable	No	1.0m	Yes	AC Adapter (SA-1836P)	Client supply

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	5/11/2016	Duty Cycle	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	5/11/2016	Maximum Conducted Output Power	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	5/11/2016	Occupied Bandwidth	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	5/11/2016	Band Edge	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	5/11/2016	Maximum Power Spectral Density	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.
6	5/12/2016	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Please reference comments section for EUT orientation and operating mode

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

FOCU0209 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	40000 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	4/22/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2/3/2016	24 mo
Cable	ESM Cable Corp.	TTBJ-141-KMKM-72	EV3	6/24/2015	12 mo
Generator - Signal	Keysight	N5182B	TFU	NCR	0 mo
Power Sensor	Gigatronics	80701A	SPL	5/25/2015	12 mo
Meter - Power	Gigatronics	8651A	SPM	5/25/2015	12 mo
Attenuator	S.M. Electronics	SA18N-06/SM4032	REE	10/1/2015	12 mo
Cable	ESM Cable Corp.	KMKM-72	EVE	6/6/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	JSW45-26004000-40-5P	PAE	6/6/2015	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-10	AIW	NCR	0 mo
Cable	ESM Cable Corp.	KMKM-72	EVY	11/4/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	11/4/2015	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AIV	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	3/11/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHV	NCR	0 mo
Cable	None	Standard Gain Horns Cable	EVF	3/11/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	3/11/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Cable	N/A	Double Ridge Horn Cables	EVB	3/11/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	3/11/2016	12 mo
Antenna - Double Ridge	EMCO	3115	AHC	6/13/2014	24 mo
Cable	N/A	Bilog Cables	EVA	3/11/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	3/11/2016	12 mo
Antenna - Biconilog	EMCO	3141	AXE	8/29/2014	24 mo

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT were tested. The EUT was configured for the lowest, a middle, and the highest transmit frequency in each operational band. For each configuration, the spectrum was scanned throughout the specified range. Measurements were made to satisfy the three requirements of 47 CFR 15.407: Field strength under 1GHz, Restricted Bands of 47 CFR 15.205, and EIRP of 47 CFR 15.407.

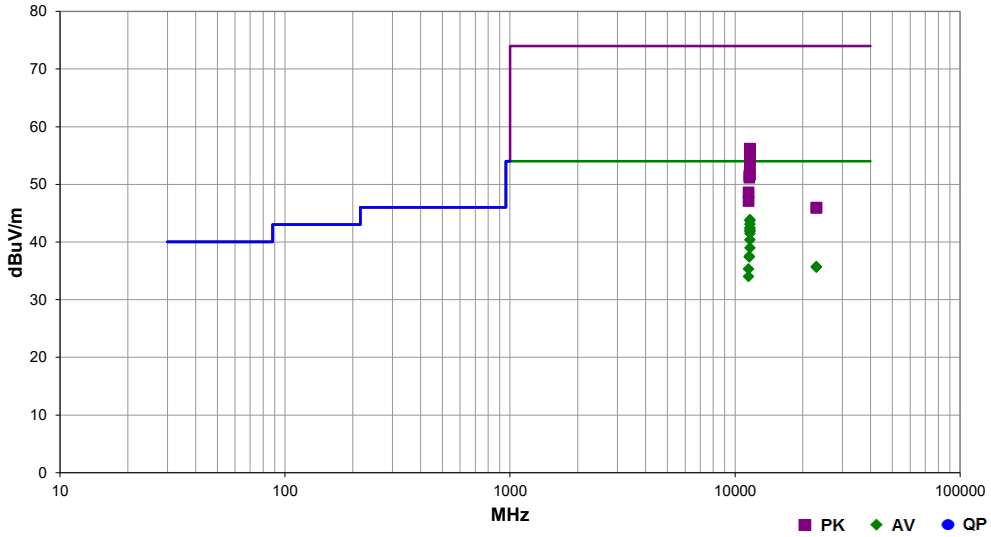
While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10:2009). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

SPURIOUS RADIATED EMISSIONS

Work Order:	FOCU0209	**Date:**	05/12/16		
Project:	None	**Temperature:**	22.8 °C		
Job Site:	EV01	**Humidity:**	40.7% RH		
Serial Number:	02EA3D00DBCA	**Barometric Pres.:**	1019 mbar	**Tested by:**	Luke Richardson, Rod Peloquin
EUT:	Athena UFL				
Configuration:	3				
Customer:	Summit Semiconductor LLC				
Attendees:	Dave Schilling				
EUT Power:	110VAC/60Hz				
Operating Mode:	Please see comments section for EUT orientation and operating mode.				
Deviations:	None				
Comments:	All four antennas were investigated for spurious emissions. The worst case was determined to be: EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12).				

Test Specifications	**Test Method**
FCC 15.407:2016	ANSI C63.10:2013

Run #	18	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



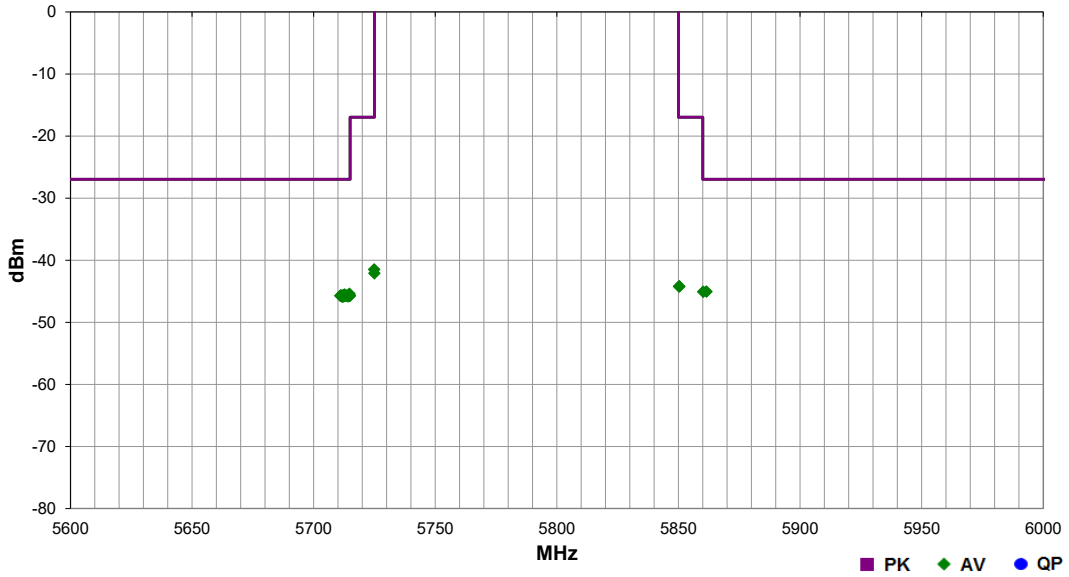
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
11647.850	41.9	2.0	2.6	170.0	3.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11648.520	41.7	2.0	2.6	180.0	3.0	0.0	Horz	AV	0.0	43.7	54.0	-10.3	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 1 (J11)
11649.060	41.1	2.0	1.9	247.0	3.0	0.0	Horz	AV	0.0	43.1	54.0	-10.9	EUT Horizontal, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11647.880	40.5	2.0	2.6	177.0	3.0	0.0	Horz	AV	0.0	42.5	54.0	-11.5	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 4 (J14)
11648.570	40.3	2.0	2.7	178.0	3.0	0.0	Horz	AV	0.0	42.3	54.0	-11.7	EUT Vertical, High Channel (5825 MHz), 18 Mbps, Ant. 2 (J12)
11647.760	40.0	2.0	1.0	149.0	3.0	0.0	Vert	AV	0.0	42.0	54.0	-12.0	EUT Horizontal, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11647.980	39.9	2.0	1.0	228.0	3.0	0.0	Horz	AV	0.0	41.9	54.0	-12.1	EUT On Side, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11647.720	39.5	2.0	3.1	172.0	3.0	0.0	Horz	AV	0.0	41.5	54.0	-12.5	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 3 (J13)
11648.900	38.4	2.0	3.9	154.0	3.0	0.0	Vert	AV	0.0	40.4	54.0	-13.6	EUT On Side, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11648.630	37.0	2.0	1.0	33.0	3.0	0.0	Vert	AV	0.0	39.0	54.0	-15.0	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11569.150	36.3	1.2	1.0	152.0	3.0	0.0	Vert	AV	0.0	37.5	54.0	-16.5	EUT Horizontal, Mid Channel (5785 MHz), 6 Mbps, Ant. 2 (J12)
11569.080	36.2	1.2	2.0	222.0	3.0	0.0	Horz	AV	0.0	37.4	54.0	-16.6	EUT Vertical, Mid Channel (5785 MHz), 6 Mbps, Ant. 2 (J12)
11648.070	54.2	2.0	2.6	170.0	3.0	0.0	Horz	PK	0.0	56.2	74.0	-17.8	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 1 (J11)
11653.700	53.9	2.0	2.6	180.0	3.0	0.0	Horz	PK	0.0	55.9	74.0	-18.1	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
22979.000	34.1	1.6	1.7	171.0	3.0	0.0	Horz	AV	0.0	35.7	54.0	-18.3	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
22981.280	34.0	1.6	1.7	9.0	3.0	0.0	Vert	AV	0.0	35.6	54.0	-18.4	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
11648.180	53.6	2.0	1.9	109.0	3.0	0.0	Horz	PK	0.0	55.6	74.0	-18.4	EUT Horizontal, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11487.750	34.9	0.4	2.0	155.0	3.0	0.0	Vert	AV	0.0	35.3	54.0	-18.7	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
11648.120	53.3	2.0	2.6	177.0	3.0	0.0	Horz	PK	0.0	55.3	74.0	-18.7	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 4 (J14)
11648.270	52.9	2.0	2.7	178.0	3.0	0.0	Horz	PK	0.0	54.9	74.0	-19.1	EUT Vertical, High Channel (5825 MHz), 18 Mbps, Ant. 2 (J12)
11648.180	52.7	2.0	1.0	148.0	3.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	EUT Horizontal, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11648.020	52.6	2.0	1.0	228.0	3.0	0.0	Horz	PK	0.0	54.6	74.0	-19.4	EUT On Side, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11648.100	52.4	2.0	3.1	172.0	3.0	0.0	Horz	PK	0.0	54.4	74.0	-19.6	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 3 (J13)
11488.030	33.6	0.4	4.0	168.0	3.0	0.0	Horz	AV	0.0	34.0	54.0	-20.0	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
11653.720	51.4	2.0	3.9	154.0	3.0	0.0	Vert	PK	0.0	53.4	74.0	-20.6	EUT On Side, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11653.720	49.7	2.0	1.0	33.0	3.0	0.0	Vert	PK	0.0	51.7	74.0	-22.3	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
11573.600	50.3	1.3	2.0	222.0	3.0	0.0	Horz	PK	0.0	51.6	74.0	-22.4	EUT Vertical, Mid Channel (5785 MHz), 6 Mbps, Ant. 2 (J12)
11573.500	49.9	1.3	1.0	152.0	3.0	0.0	Vert	PK	0.0	51.2	74.0	-22.8	EUT Horizontal, Mid Channel (5785 MHz), 6 Mbps, Ant. 2 (J12)
11488.130	48.2	0.4	2.0	155.0	3.0	0.0	Vert	PK	0.0	48.6	74.0	-25.4	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
11488.180	46.7	0.4	4.0	168.0	3.0	0.0	Horz	PK	0.0	47.1	74.0	-26.9	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
22983.830	44.3	1.6	1.7	9.0	3.0	0.0	Vert	PK	0.0	45.9	74.0	-28.1	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
22980.580	44.3	1.6	1.7	171.0	3.0	0.0	Horz	PK	0.0	45.9	74.0	-28.1	EUT Vedrtical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)

SPURIOUS RADIATED EMISSIONS

Work Order:	FOCU0209	**Date:**	05/12/16		
Project:	None	**Temperature:**	22.8 °C		
Job Site:	EV01	**Humidity:**	40.7% RH		
Serial Number:	02EA3D00DBCA	**Barometric Pres.:**	1019 mbar	**Tested by:**	Luke Richardson, Rod Peloquin
EUT:	Athena UFL				
Configuration:	3				
Customer:	Summit Semiconductor LLC				
Attendees:	Dave Schilling				
EUT Power:	110VAC/60Hz				
Operating Mode:	Please see comments section for EUT orientation and operating mode.				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.407:2016	ANSI C63.10:2013

Run #	24	**Test Distance (m)**	1	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



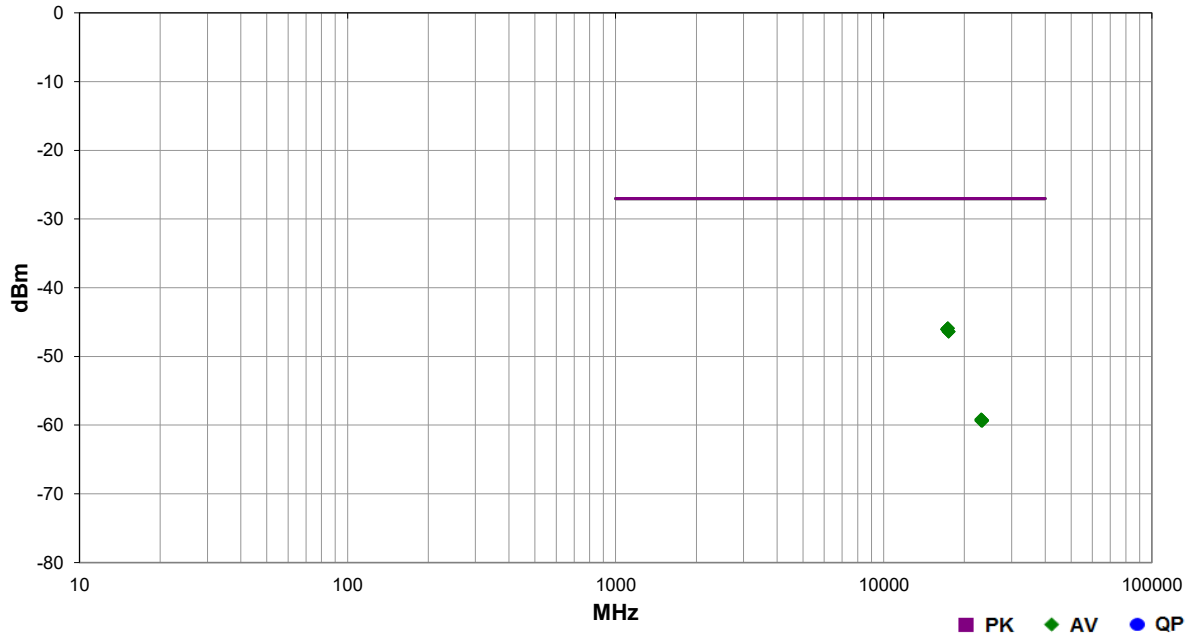
	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	5861.540	1.7	106.0	Vert	AV	3.10E-08	-45.1	-27.0	-18.1	EUT Horizontal, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
	5860.207	1.6	23.0	Horz	AV	3.10E-08	-45.1	-27.0	-18.1	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
	5714.733	1.6	149.0	Horz	AV	2.86E-08	-45.4	-27.0	-18.4	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 1 (J11)
	5712.707	1.6	101.0	Vert	AV	2.79E-08	-45.5	-27.0	-18.5	EUT On side, Low Channel (5745 MHz), 6 Mbps, Ant. 1 (J11)
	5714.400	1.6	126.0	Horz	AV	2.73E-08	-45.6	-27.0	-18.6	EUT On side, Low Channel (5745 MHz), 6 Mbps, Ant. 1 (J11)
	5714.307	1.6	109.0	Horz	AV	2.73E-08	-45.6	-27.0	-18.6	EUT On side, Low Channel (5745 MHz), 6 Mbps, Ant. 4 (J14)
	5712.700	1.6	321.0	Vert	AV	2.72E-08	-45.6	-27.0	-18.6	EUT On side, Low Channel (5745 MHz), 6 Mbps, Ant. 3 (J13)
	5714.953	1.6	215.0	Vert	AV	2.67E-08	-45.7	-27.0	-18.7	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 3 (J13)
	5714.873	1.6	338.0	Horz	AV	2.67E-08	-45.7	-27.0	-18.7	EUT On side, Low Channel (5745 MHz), 6 Mbps, Ant. 3 (J13)
	5714.340	1.6	72.0	Horz	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 4 (J14)
	5713.747	1.7	109.0	Horz	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 4 (J14)
	5713.613	1.6	338.0	Horz	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 3 (J13)
	5712.993	1.6	194.0	Vert	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 4 (J14)
	5712.660	1.6	209.0	Vert	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 1 (J11)
	5712.460	1.6	212.0	Vert	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5711.987	1.7	228.0	Horz	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 1 (J11)
	5711.920	1.6	269.0	Horz	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 3 (J13)
	5711.320	1.6	189.0	Vert	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 4 (J14)
	5711.327	1.6	144.0	Vert	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 1 (J11)
	5711.353	1.6	77.0	Vert	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5711.107	1.6	189.0	Vert	AV	2.66E-08	-45.7	-27.0	-18.7	EUT On side, Low Channel (5745 MHz), 6 Mbps, Ant. 4 (J14)
	5711.100	1.6	180.0	Vert	AV	2.66E-08	-45.7	-27.0	-18.7	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 3 (J13)
	5714.187	1.6	213.0	Horz	AV	2.60E-08	-45.8	-27.0	-18.8	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5712.353	1.7	170.0	Vert	AV	2.60E-08	-45.8	-27.0	-18.8	EUT On side, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5711.933	1.6	158.0	Horz	AV	2.60E-08	-45.8	-27.0	-18.8	EUT On side, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5711.853	1.6	253.0	Vert	AV	2.60E-08	-45.8	-27.0	-18.8	EUT Horizontal, Low Channel (5745 MHz), 18 Mbps, Ant. 2 (J12)
	5711.800	1.6	264.0	Horz	AV	2.60E-08	-45.8	-27.0	-18.8	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5724.953	1.7	31.0	Horz	AV	7.04E-08	-41.5	-17.0	-24.5	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5724.967	1.7	71.0	Vert	AV	6.13E-08	-42.1	-17.0	-25.1	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5850.420	1.7	167.0	Horz	AV	3.77E-08	-44.2	-17.0	-27.2	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	5850.267	1.7	318.0	Vert	AV	3.77E-08	-44.2	-17.0	-27.2	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)

SPURIOUS RADIATED EMISSIONS

Work Order:	FOCU0209	**Date:**	05/11/16		
Project:	None	**Temperature:**	22.8 °C		
Job Site:	EV01	**Humidity:**	40.7% RH		
Serial Number:	02EA3D00DBCA	**Barometric Pres.:**	1019 mbar	**Tested by:**	Luke Richardson, Rod Peloquin
EUT:	Athena UFL				
Configuration:	3				
Customer:	Summit Semiconductor LLC				
Attendees:	Dave Schilling				
EUT Power:	110VAC/60Hz				
Operating Mode:	Please see comments section for EUT orientation and operating mode.				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.407:2016	ANSI C63.10:2013

Run #	11	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	17357.420	1.0	224.0	Vert	AV	2.55E-08	-45.9	-27.0	-18.9	EUT Horizontal, Mid Channel (5785 MHz), 6 Mbps, Ant. 2 (J12)
	17357.150	1.0	171.0	Horz	AV	2.55E-08	-45.9	-27.0	-18.9	EUT Vertical, Mid Channel (5785 MHz), 6 Mbps, Ant. 2 (J12)
	17234.580	1.0	259.0	Horz	AV	2.47E-08	-46.1	-27.0	-19.1	EUT Vertical, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	17236.690	1.0	14.0	Vert	AV	2.47E-08	-46.1	-27.0	-19.1	EUT Horizontal, Low Channel (5745 MHz), 6 Mbps, Ant. 2 (J12)
	17476.970	2.6	305.0	Vert	AV	2.29E-08	-46.4	-27.0	-19.4	EUT Horizontal, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
	17476.700	1.0	153.0	Horz	AV	2.29E-08	-46.4	-27.0	-19.4	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
	23138.960	1.7	357.0	Horz	AV	1.21E-09	-59.2	-27.0	-32.2	EUT Vertical, Mid Channel (5785 MHz), 6 Mbps, Ant. 2 (J12)
	23300.680	1.6	27.0	Vert	AV	1.18E-09	-59.3	-27.0	-32.3	EUT Horizontal, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)
	23138.940	1.6	190.0	Vert	AV	1.16E-09	-59.4	-27.0	-32.4	EUT Horizontal, Mid Channel (5785 MHz), 6 Mbps, Ant. 2 (J12)
	23301.680	1.6	337.0	Horz	AV	1.15E-09	-59.4	-27.0	-32.4	EUT Vertical, High Channel (5825 MHz), 6 Mbps, Ant. 2 (J12)

DUTY CYCLE

XMit 2015.01.14

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	Keysight	N5182B	TFU	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Block - DC	Fairview Microwave	SD3379	AMQ	6/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	AWT	NCR	0
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2/13/2016	12

TEST DESCRIPTION

Per ANSI C63.10, all measurements are to be performed with the EUT operating at 100% duty cycle at its maximum power level. In the event the EUT cannot be operated at 100% duty cycle, the transmission pulse duration (T) and Duty Cycle (x) are required to be measured for each of the EUT operating modes.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, a duty cycle correction factor in dB can be calculated to add to power measurements if required in the test method guidance using the following formula

10 * LOG (1/D) = dB

Where D is duty cycle of the radio transmissions

DUTY CYCLE

NORTHWEST EMC

XMit 2015.01.14

EUT:	Athena UFL			**Work Order:**	FOCU0209
Serial Number:	02EA3D00DBCA			**Date:**	05/11/16
Customer:	Summit Semiconductor LLC			**Temperature:**	24°C
Attendees:	Dave Schilling			**Humidity:**	36%
Project:	None			**Barometric Pres.:**	1017.5
Tested by:	Jeff Alcoke and Rod Peloquin	**Power:**	5.0 VDC	**Job Site:**	EV06

TEST SPECIFICATIONS	**Test Method**
FCC 15.407:2016	ANSI C63.10:2013

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

Configuration #	2	*Signature*

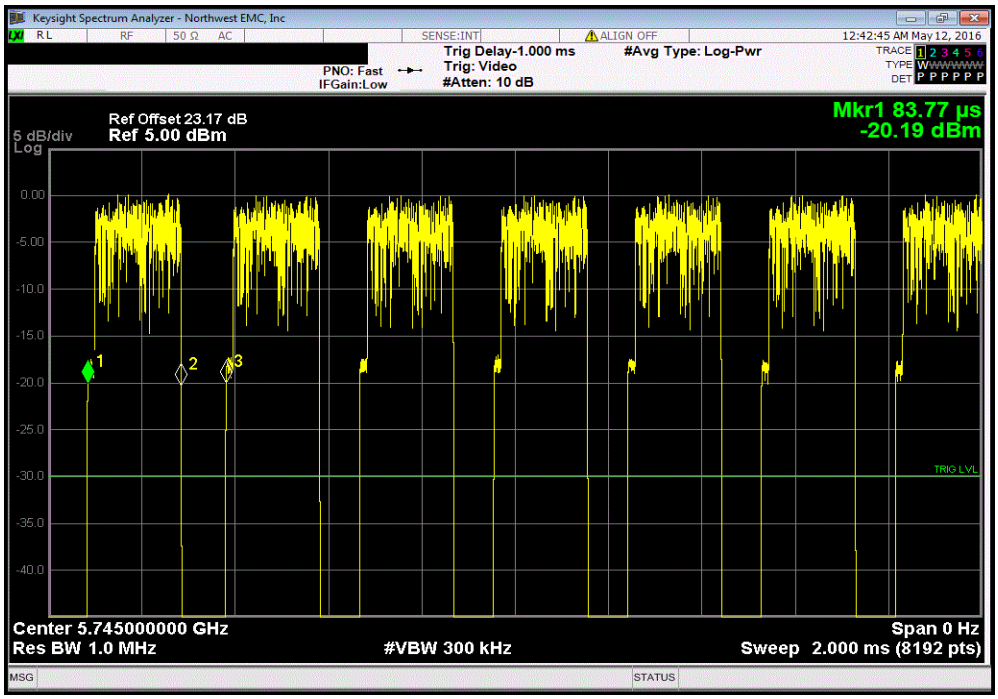
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
Antenna Port 2						
5725 - 5785 MHz Band						
Low Channel, Ch 149 - 5745 MHz						
802.11(a) 6 Mbps	200.206 us	296.4 us	1	67.5	N/A	N/A
802.11(a) 6 Mbps	N/A	N/A	5	N/A	N/A	N/A
802.11(a) 18 Mbps	88.338 us	175.288 us	1	50.4	N/A	N/A
802.11(a) 18 Mbps	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, Ch 157 - 5785 MHz						
802.11(a) 6 Mbps	200.206 us	286.4 us	1	69.9	N/A	N/A
802.11(a) 6 Mbps	N/A	N/A	5	N/A	N/A	N/A
802.11(a) 18 Mbps	87.906 us	174.856 us	1	50.3	N/A	N/A
802.11(a) 18 Mbps	N/A	N/A	5	N/A	N/A	N/A
High Channel, Ch 165 - 5825 MHz						
802.11(a) 6 Mbps	200.45 us	287.1 us	1	69.8	N/A	N/A
802.11(a) 6 Mbps	N/A	N/A	5	N/A	N/A	N/A
802.11(a) 18 Mbps	88.15 us	175.1 us	1	50.3	N/A	N/A
802.11(a) 18 Mbps	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

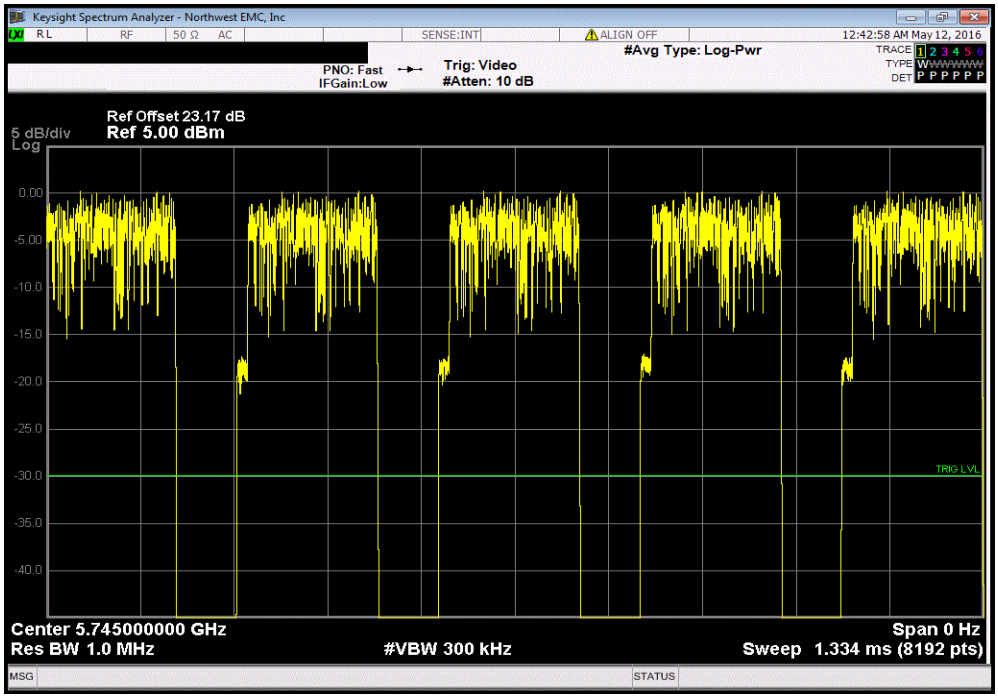
NORTHWEST EMC

XMit 2015.01.14

Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 6 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	200.206 us	296.4 us	1	67.5	N/A	N/A



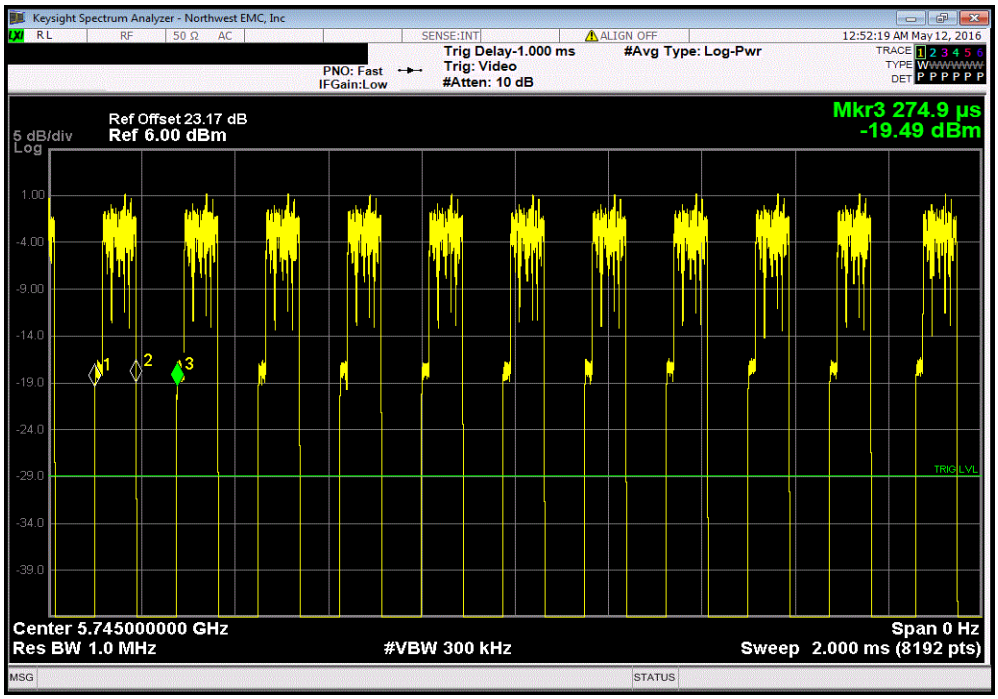
Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 6 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



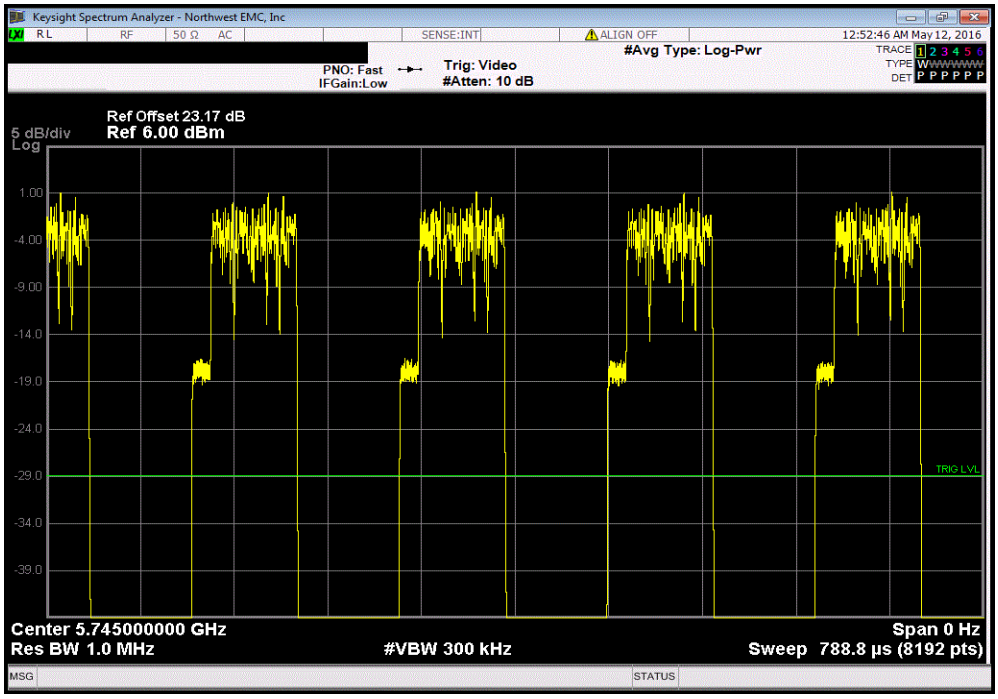
DUTY CYCLE

XMit 2015.01.14

Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 18 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	88.338 us	175.288 us	1	50.4	N/A	N/A



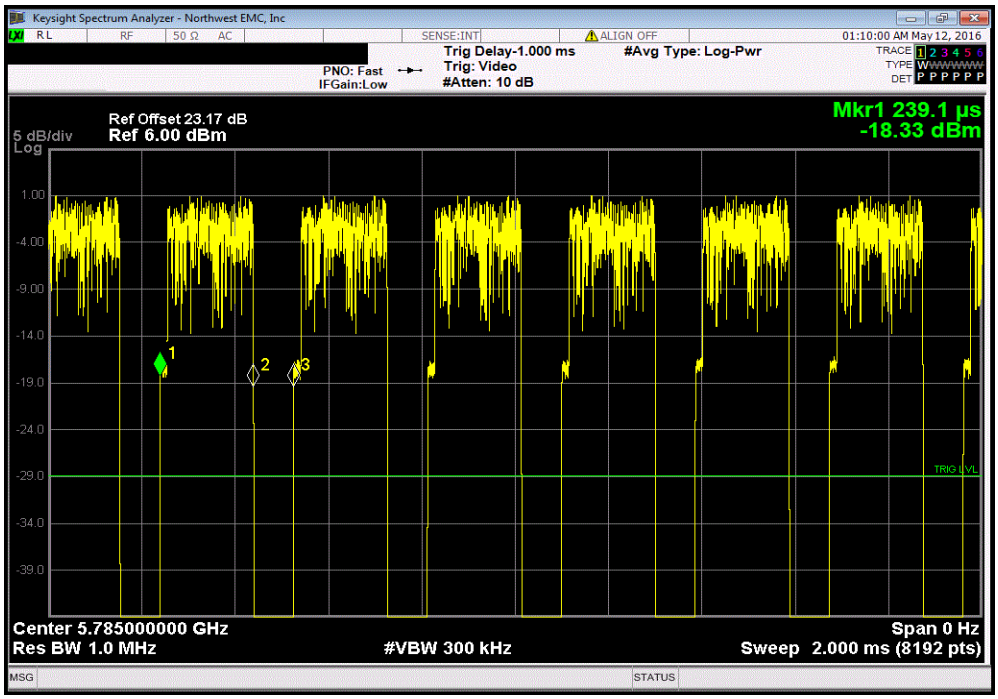
Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 18 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



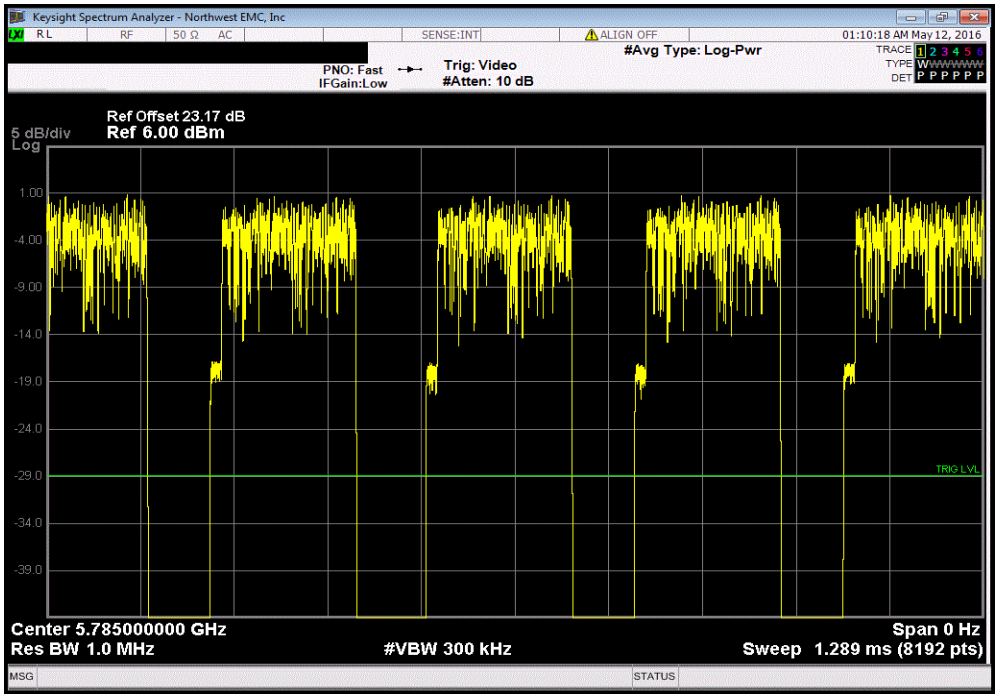
DUTY CYCLE

XMit 2015.01.14

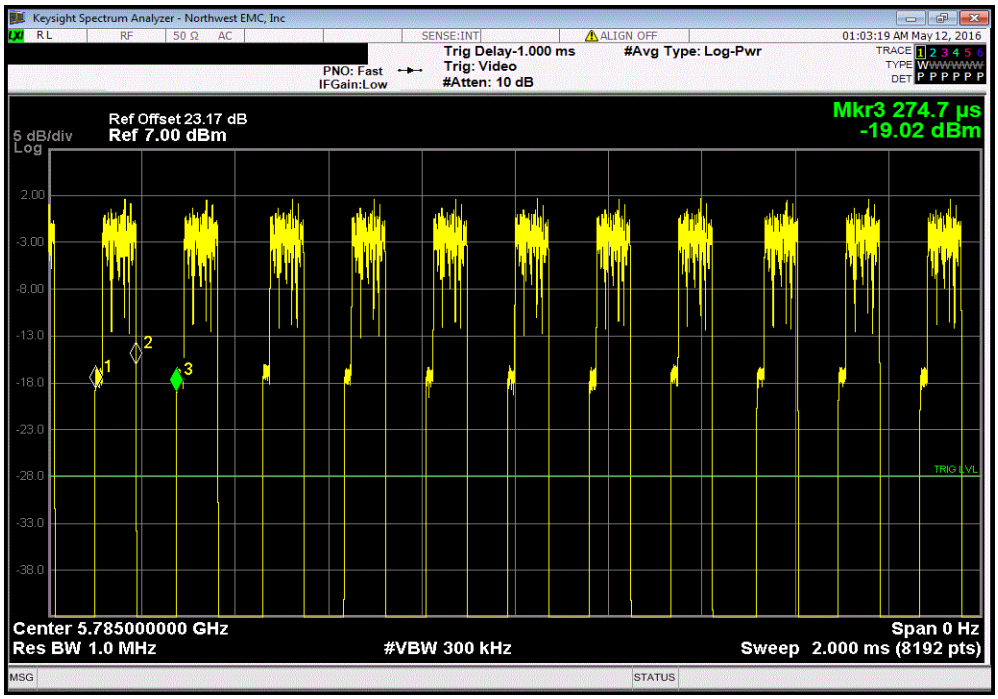
Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 6 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	200.206 us	286.4 us	1	69.9	N/A	N/A



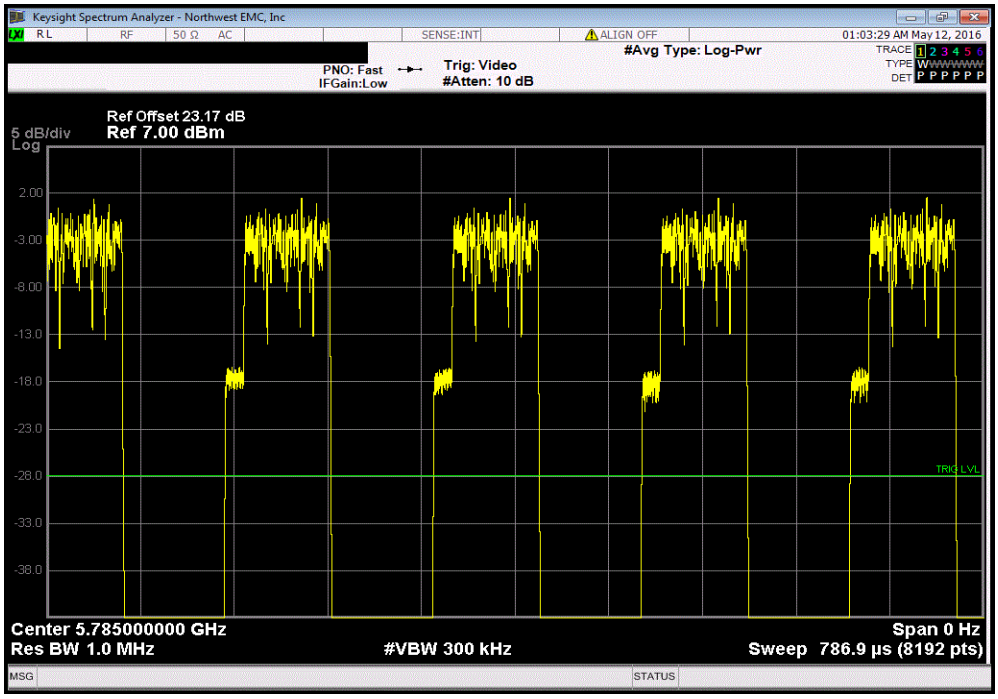
Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 6 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 18 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	87.906 us	174.856 us	1	50.3	N/A	N/A

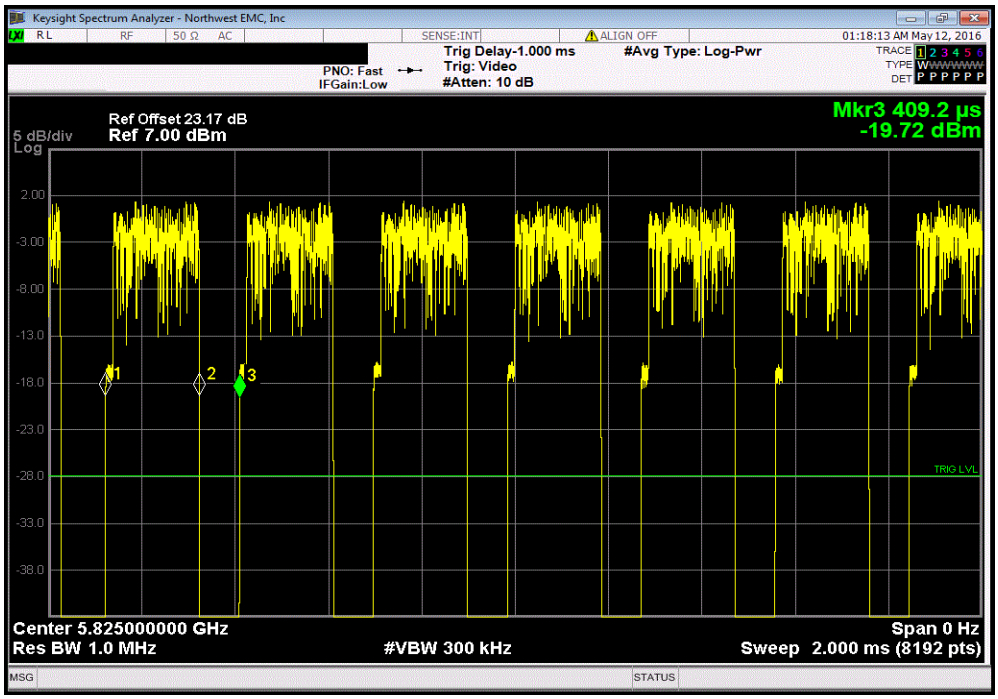


Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 18 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

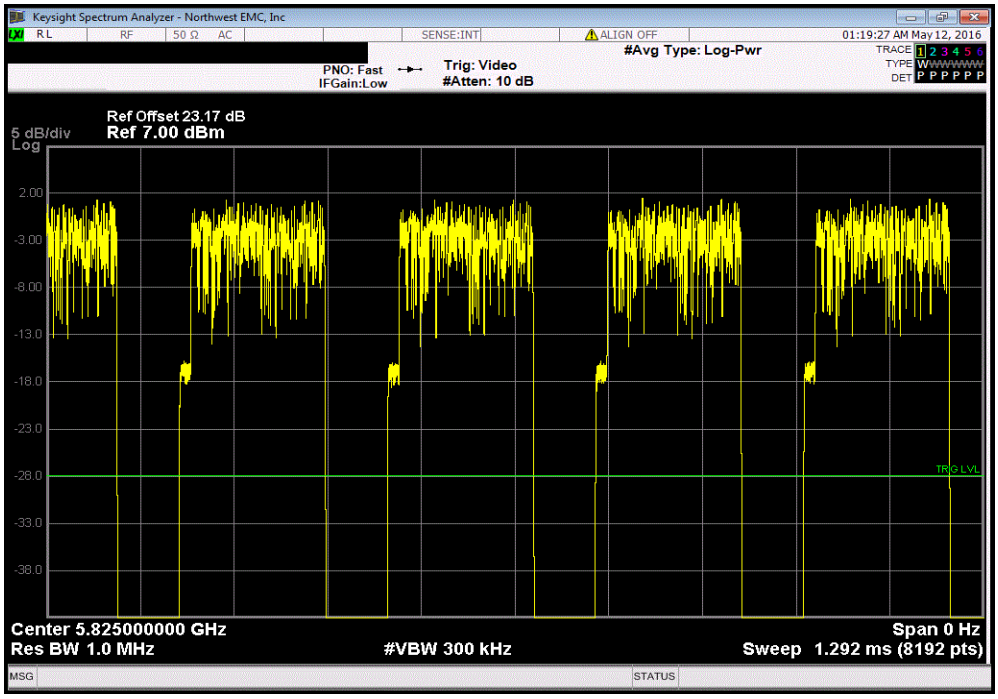


DUTY CYCLE

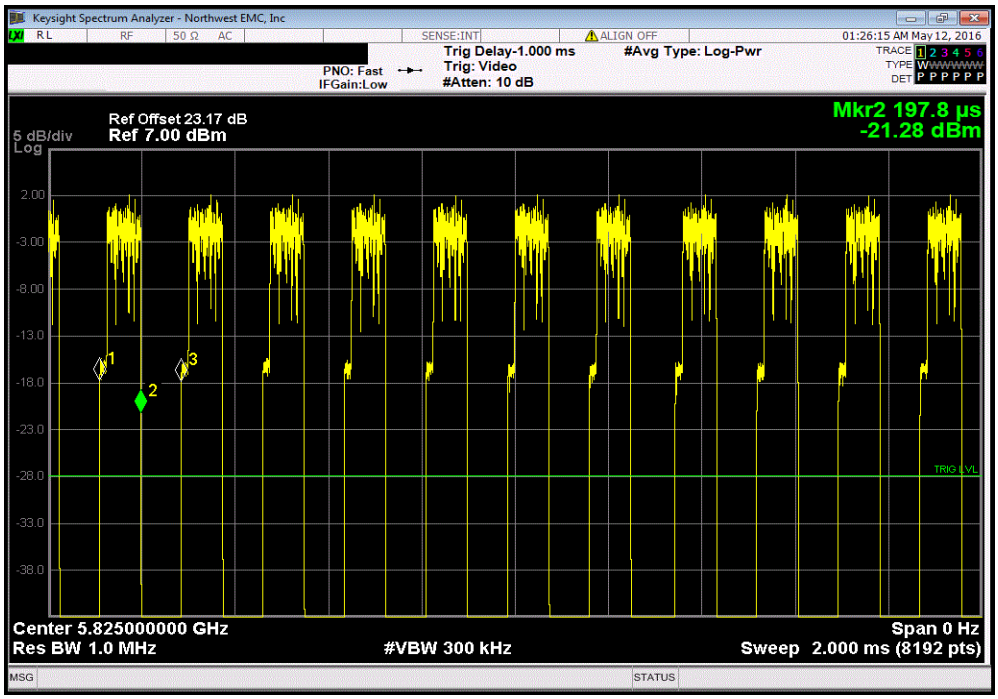
Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 6 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	200.45 us	287.1 us	1	69.8	N/A	N/A



Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 6 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 18 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	88.15 us	175.1 us	1	50.3	N/A	N/A



Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 18 Mbps						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

MAXIMUM CONDUCTED OUTPUT POWER

XMit 2015.01.14

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	Keysight	N5182B	TFU	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Block - DC	Fairview Microwave	SD3379	AMQ	6/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	AWT	NCR	0
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2/13/2016	12

TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum. The radio was operated in the modes as shown in the following data sheets.

A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer.

Prior to measuring maximum transmit power; the emission bandwidth (B) and the transmission pulse duration (T) were measured. The method of measuring the emission bandwidth and the associated data are found elsewhere in this test report. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The maximum conducted output power was measured using ANSI C63.10, Method SA-2 (RMS detection and trace averaging across the on and off times of the EUT transmission and use of a duty cycle correction factor).

The spectrum analyzer settings were set per the guidance as well as the following specifics:

-RMS Detector

-Trace average 100 traces in power averaging mode.

-Power was integrated across “B”, by using the channel power function of the analyzer.

A duty cycle correction factor was added to the measurement using the results of the formula of 10*LOG(1/D) where D is the duty cycle.

MAXIMUM CONDUCTED OUTPUT POWER

NORTHWEST EMC

XMit 2015.01.14

EUT:	Athena UFL			**Work Order:**	FOCU0209
Serial Number:	02EA3D00DBCA			**Date:**	05/11/16
Customer:	Summit Semiconductor LLC			**Temperature:**	24°C
Attendees:	Dave Schilling			**Humidity:**	36%
Project:	None			**Barometric Pres.:**	1017.5
Tested by:	Jeff Alcoke and Rod Peloquin	**Power:**	5.0 VDC	**Job Site:**	EV06

TEST SPECIFICATIONS	**Test Method**
FCC 15.407:2016	ANSI C63.10:2013

COMMENTS

None

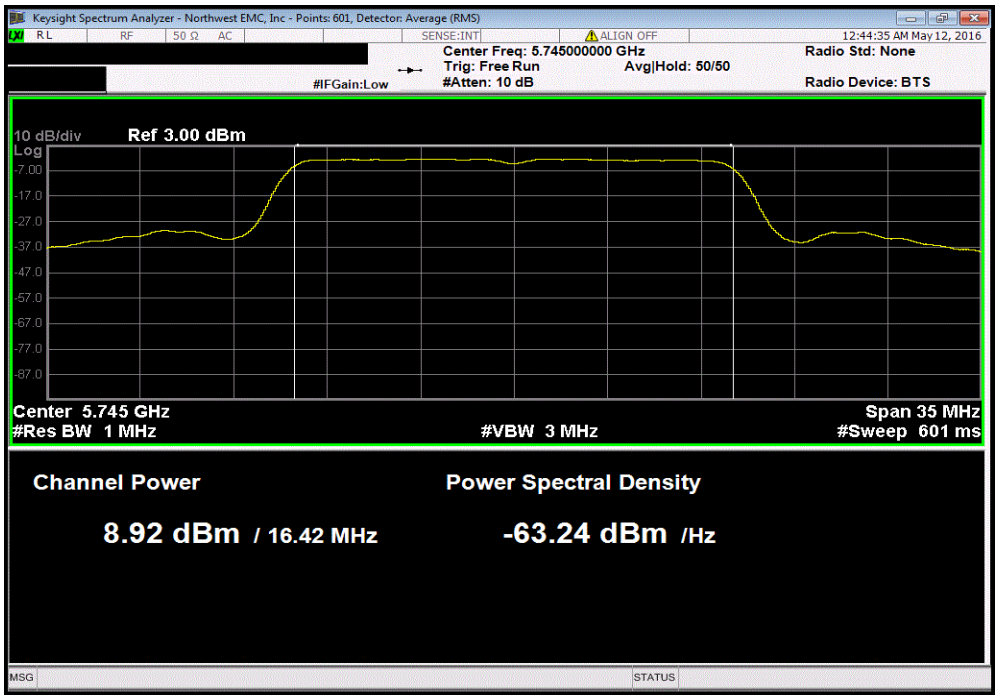
DEVIATIONS FROM TEST STANDARD

None

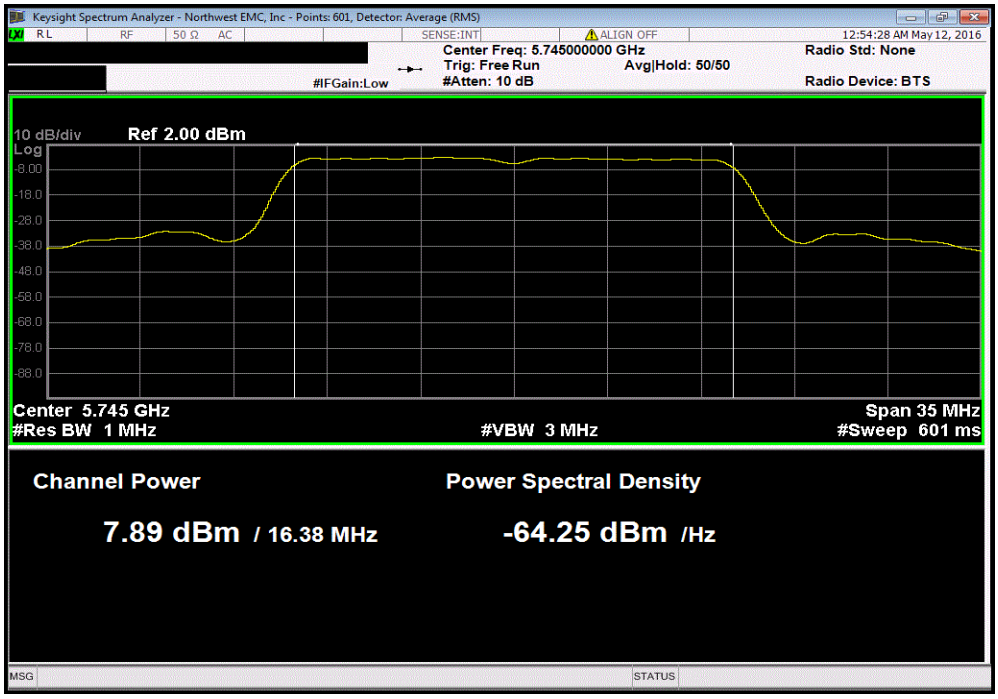
Configuration #	2	*Signature*

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (dBm)	Results
Antenna Port 2					
5725 - 5785 MHz Band					
Low Channel, Ch 149 - 5745 MHz					
802.11(a) 6 Mbps	8.915	1.7	10.6	30	Pass
802.11(a) 18 Mbps	7.892	3	10.9	30	Pass
Mid Channel, Ch 157 - 5785 MHz					
802.11(a) 6 Mbps	9.325	1.6	10.9	30	Pass
802.11(a) 18 Mbps	8.169	3	11.2	30	Pass
High Channel, Ch 165 - 5825 MHz					
802.11(a) 6 Mbps	9.796	1.6	11.4	30	Pass
802.11(a) 18 Mbps	8.857	3	11.8	30	Pass

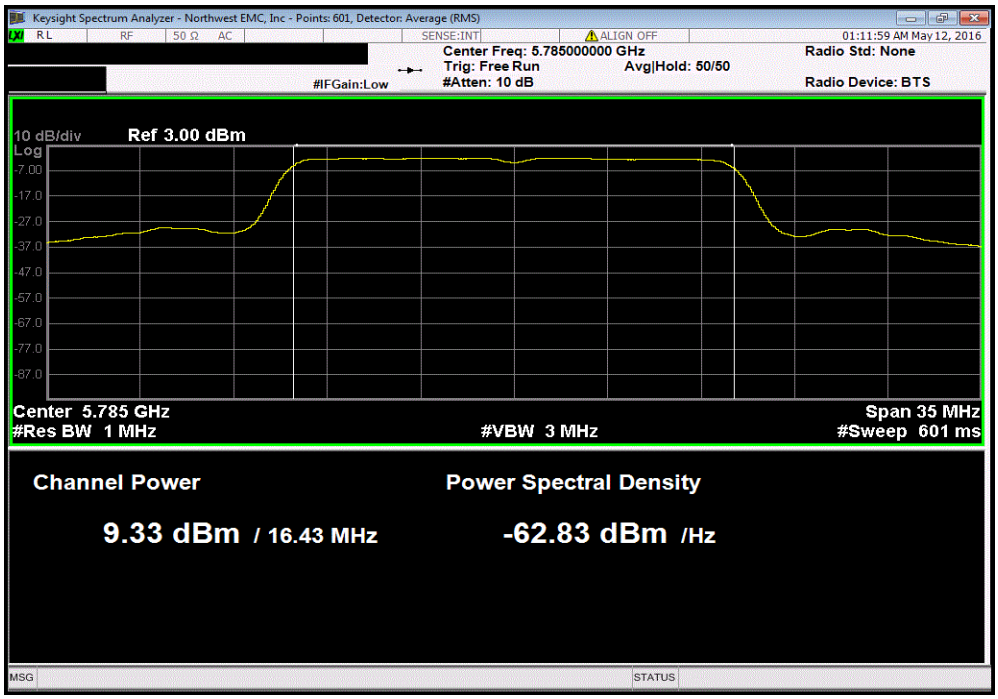
Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 6 Mbps						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (dBm)	Results
	8.915	1.7		10.6	30	Pass



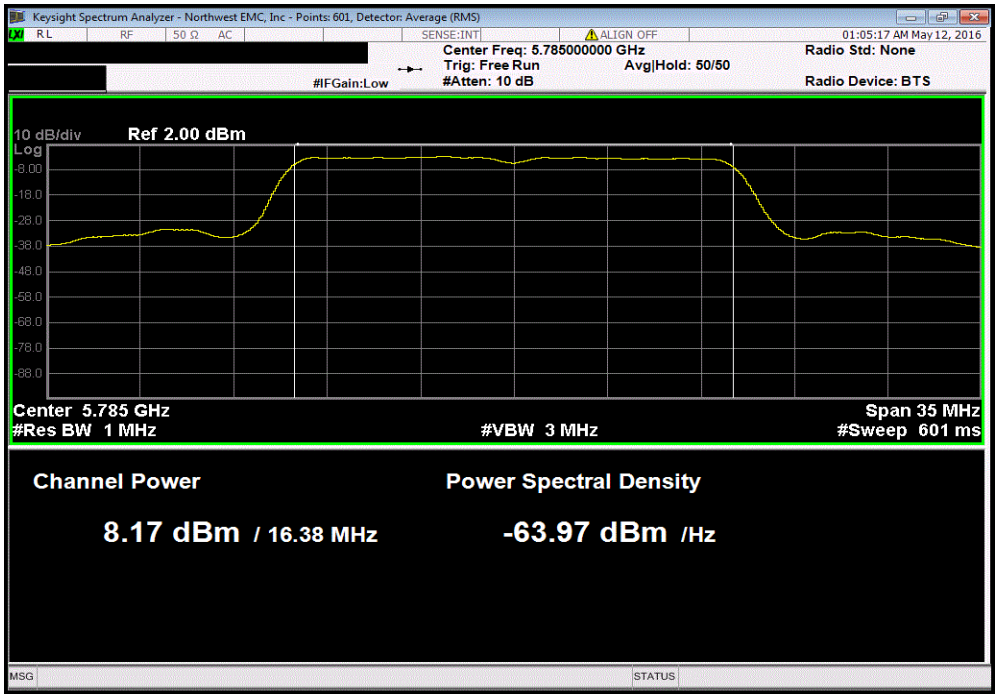
Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 18 Mbps						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (dBm)	Results
	7.892	3		10.9	30	Pass



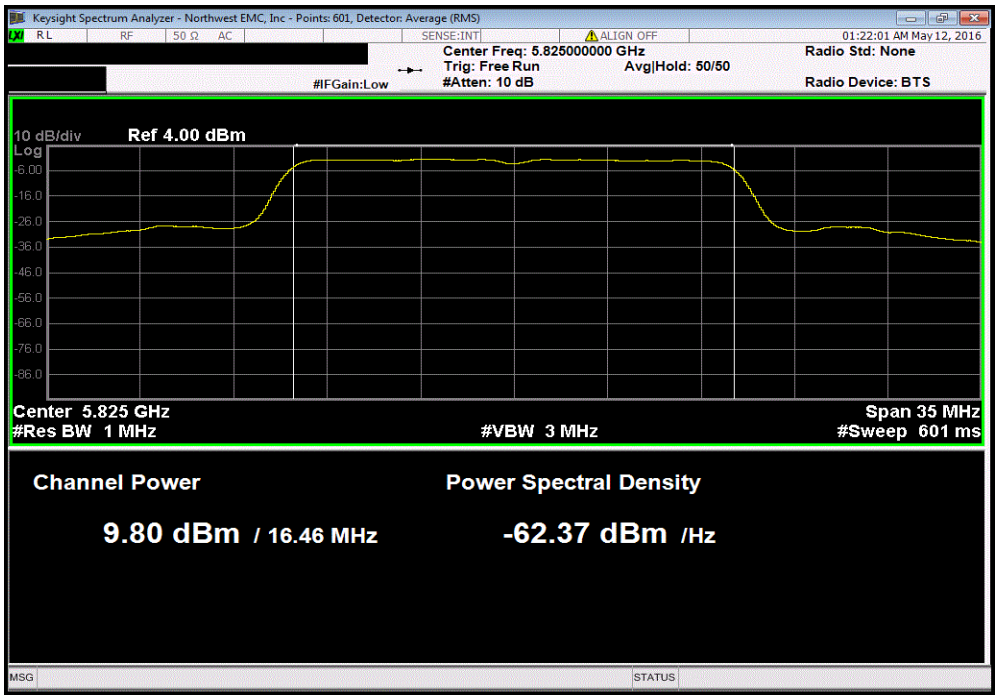
Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 6 Mbps						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (dBm)	Results
	9.325	1.6		10.9	30	Pass



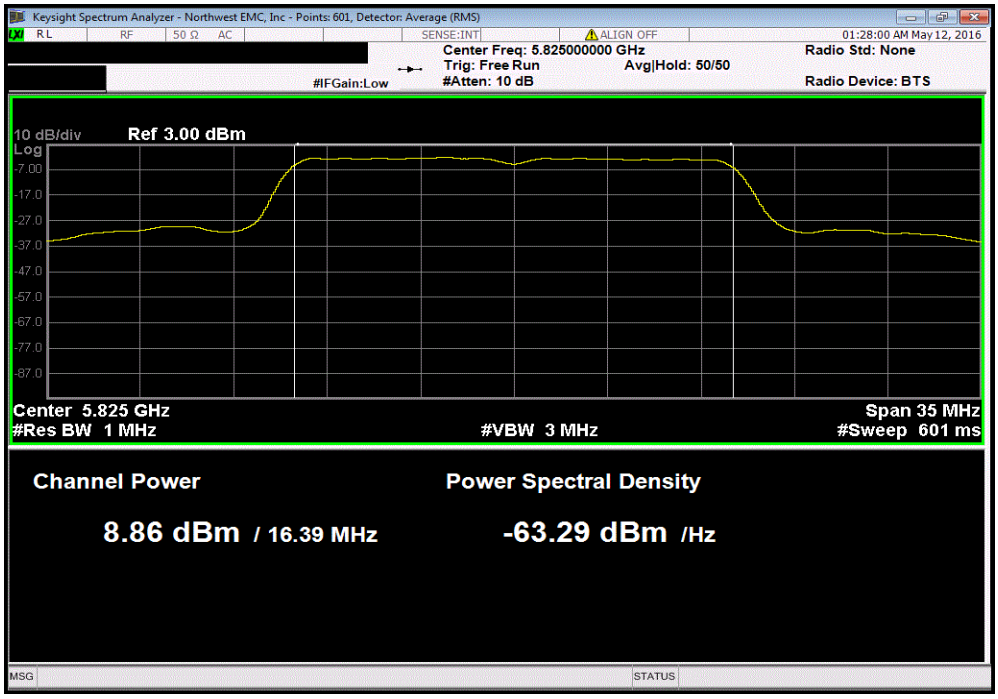
Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 18 Mbps						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (dBm)	Results
	8.169	3		11.2	30	Pass



Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 6 Mbps						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (dBm)	Results
	9.796	1.6		11.4	30	Pass



Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 18 Mbps						
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)		Value (dBm)	Limit (dBm)	Results
	8.857	3		11.8	30	Pass



OCCUPIED BANDWIDTH

XMit 2015.01.14

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)
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2/13/2016	12
Generator - Signal	Keysight	N5182B	TFU	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Attenuator	S.M. Electronics	SA26B-20	AWT	NCR	0
Block - DC	Fairview Microwave	SD3379	AMQ	6/18/2015	12

TEST DESCRIPTION

The transmit frequencies and data rates listed in the datasheet were measured in each band utilized by the radio. The transmit power was set to its default maximum.

A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

Per ANSI C63.10, the spectrum analyzer settings were as follows:

-RBW = 100 kHz

-VBW = ≥ 3x RBW

-Detector = Peak

-Trace mode = max hold

The spectrum analyzer occupied bandwidth measurement function was then used to measure the 6 dB emission bandwidth.

The 99.0% occupied bandwidth was also measured at the same time to be used for setting the channel power integration bandwidth during conducted output power testing.

OCCUPIED BANDWIDTH

NORTHWEST EMC

XMit 2015.01.14

EUT:	Athena UFL			**Work Order:**	FOCU0209
Serial Number:	02EA3D00DBCA			**Date:**	05/11/16
Customer:	Summit Semiconductor LLC			**Temperature:**	24°C
Attendees:	Dave Schilling			**Humidity:**	36%
Project:	None			**Barometric Pres.:**	1017.5
Tested by:	Jeff Alcoke and Rod Peloquin	**Power:**	5.0 VDC	**Job Site:**	EV06

TEST SPECIFICATIONS	**Test Method**
FCC 15.407:2016	ANSI C63.10:2013

COMMENTS

None

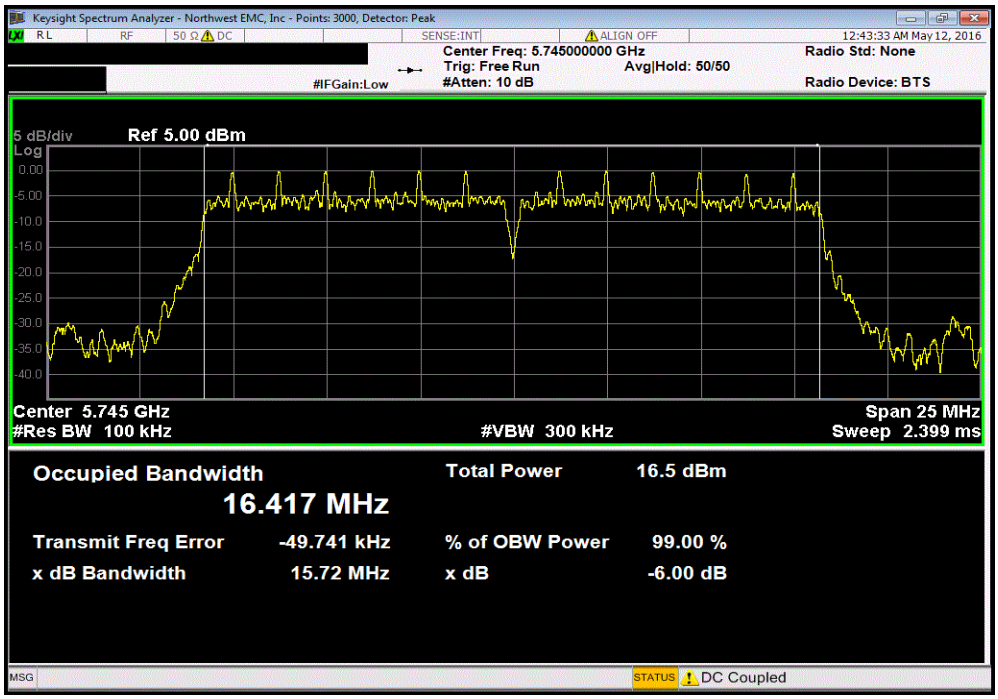
DEVIATIONS FROM TEST STANDARD

None

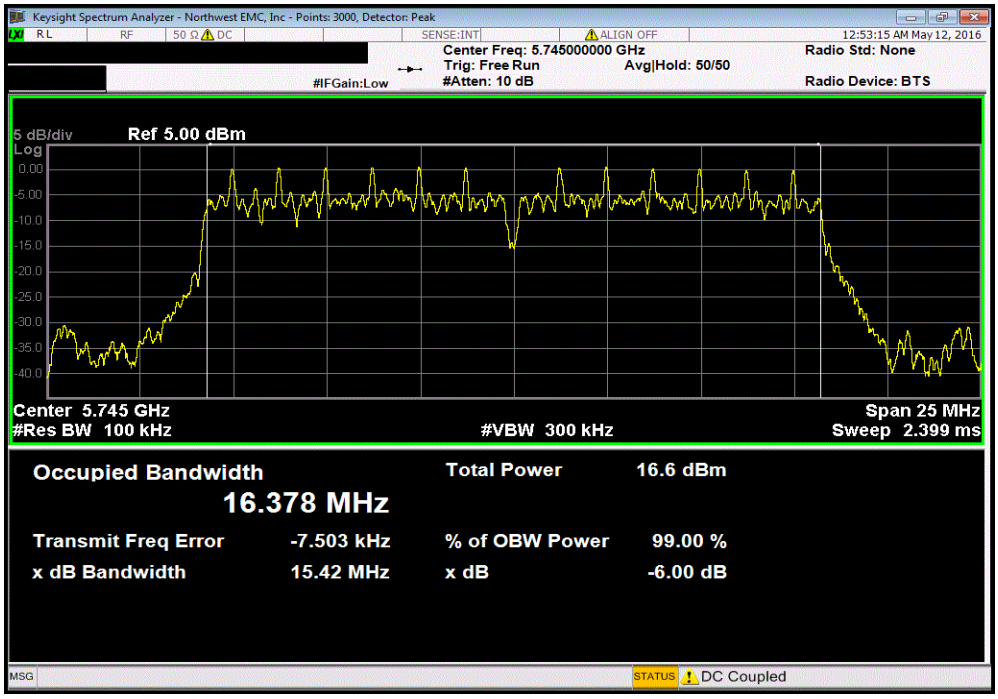
Configuration #	2	*Signature*

		Value	Limit (>)	Result
Antenna Port 2				
	5725 - 5785 MHz Band			
	Low Channel, Ch 149 - 5745 MHz			
	802.11(a) 6 Mbps	15.723 MHz	500 kHz	Pass
	802.11(a) 18 Mbps	15.416 MHz	500 kHz	Pass
	Mid Channel, Ch 157 - 5785 MHz			
	802.11(a) 6 Mbps	15.723 MHz	500 kHz	Pass
	802.11(a) 18 Mbps	15.408 MHz	500 kHz	Pass
	High Channel, Ch 165 - 5825 MHz			
	802.11(a) 6 Mbps	15.724 MHz	500 kHz	Pass
	802.11(a) 18 Mbps	15.409 MHz	500 kHz	Pass

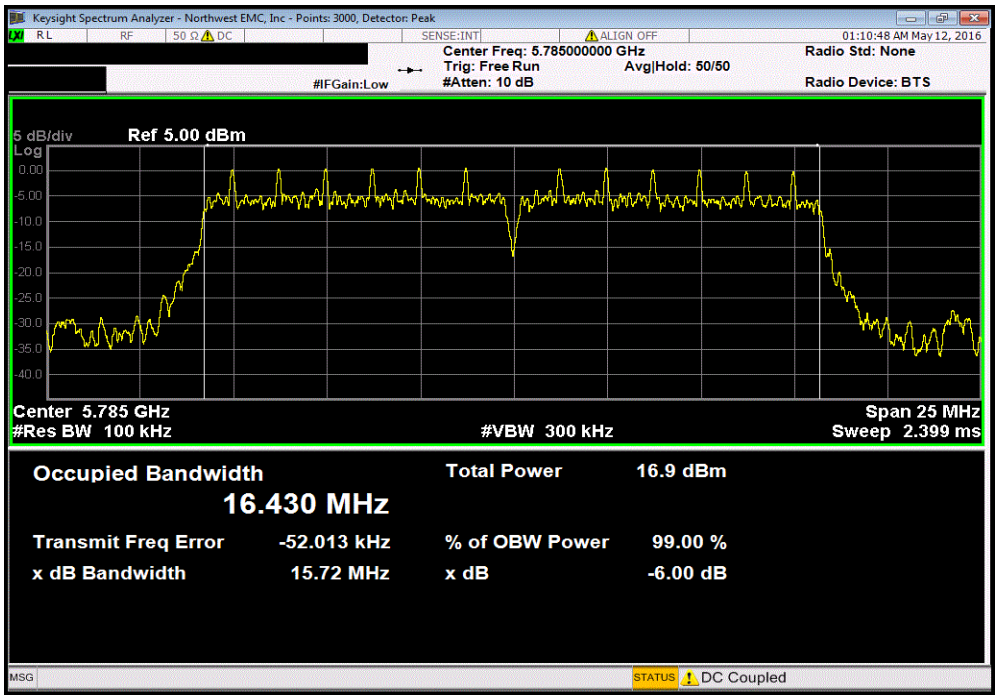
Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 6 Mbps						
				Value	Limit (>)	Result
				15.723 MHz	500 kHz	Pass



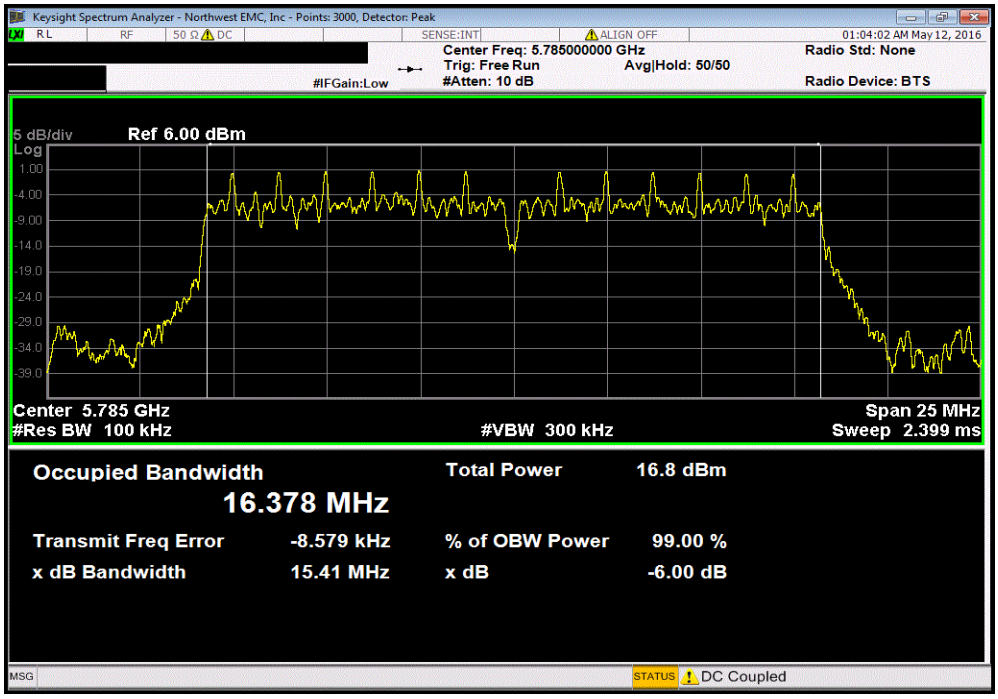
Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 18 Mbps						
				Value	Limit (>)	Result
				15.416 MHz	500 kHz	Pass



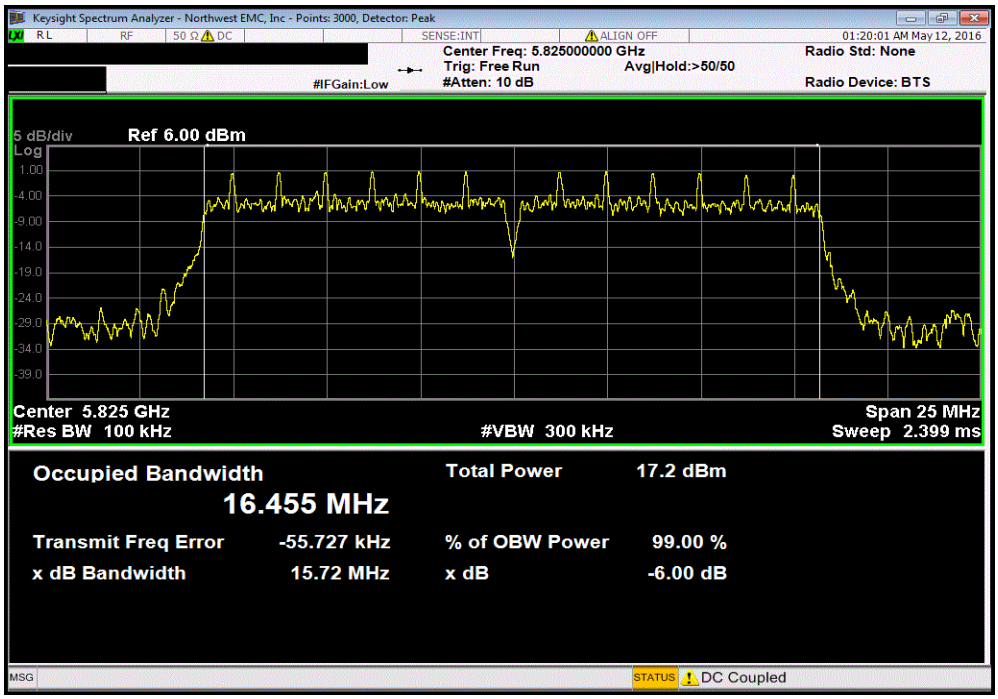
Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 6 Mbps						
				Value	Limit (>)	Result
				15.723 MHz	500 kHz	Pass



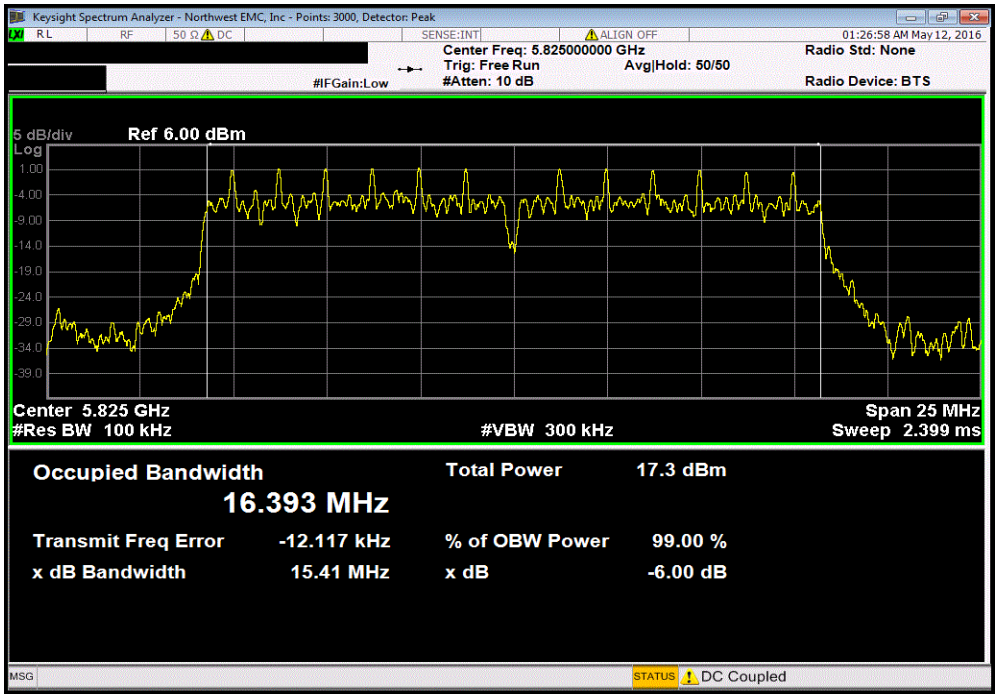
Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 18 Mbps						
				Value	Limit (>)	Result
				15.408 MHz	500 kHz	Pass



Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 6 Mbps						
				Value	Limit (>)	Result
				15.724 MHz	500 kHz	Pass



Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 18 Mbps						
				Value	Limit (>)	Result
				15.409 MHz	500 kHz	Pass



BAND EDGE

XMit 2015.01.14

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	Keysight	N5182B	TFU	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Block - DC	Fairview Microwave	SD3379	AMQ	6/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	AWT	NCR	0
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2/13/2016	12

TEST DESCRIPTION

The 99% emission bandwidth of the carrier was measured to ensure that no part of the emission of the carrier operating in a non-DFS band was operating in a band where DFS testing is required. This test is done with the U-NII-1 band (5.2 GHz band) to ensure no portion of the carrier is contained within the U-NII-2A band and with the U-NII-3 band (5.8 GHz band) to ensure no portion of the carrier is contained in the U-NII-2C band.

The transmit frequencies and data rates listed in the datasheet were measured.

The transmit power was set to its default maximum.

A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

BAND EDGE

NORTHWEST EMC

XMit 2015.01.14

EUT:	Athena UFL			**Work Order:**	FOCU0209
Serial Number:	02EA3D00DBCA			**Date:**	05/11/16
Customer:	Summit Semiconductor LLC			**Temperature:**	24°C
Attendees:	Dave Schilling			**Humidity:**	36%
Project:	None			**Barometric Pres.:**	1017.5
Tested by:	Jeff Alcoke and Rod Peloquin	**Power:**	5.0 VDC	**Job Site:**	EV06

TEST SPECIFICATIONS	**Test Method**
FCC 15.407:2016	ANSI C63.10:2013

COMMENTS

None

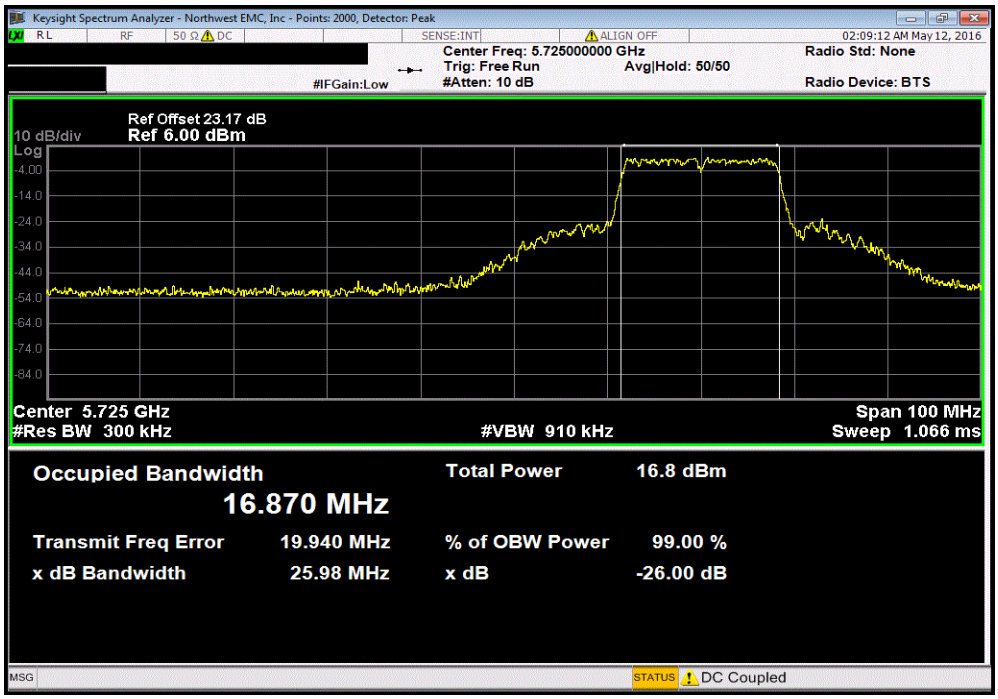
DEVIATIONS FROM TEST STANDARD

None

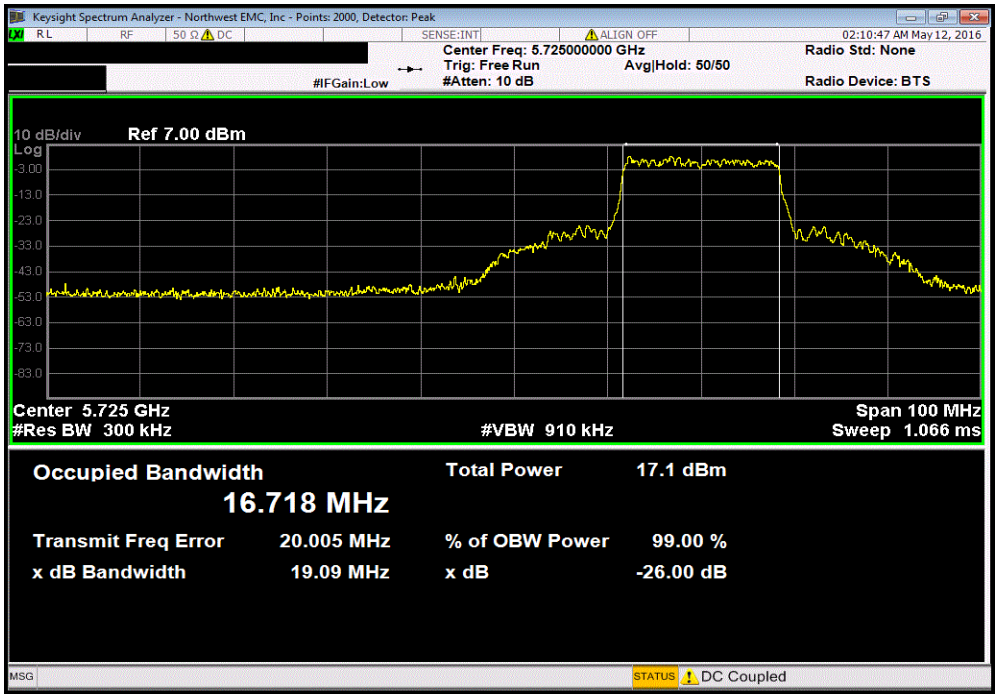
Configuration #	2	*Signature*

	OBW Within Band	Band Edge (MHz)	Result
Antenna Port 2			
5725 - 5785 MHz Band			
Low Channel, Ch 149 - 5745 MHz			
802.11(a) 6 Mbps	Yes	5725	Pass
802.11(a) 18 Mbps	Yes	5725	Pass

Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 6 Mbps						
				OBW Within Band	Band Edge (MHz)	Result
				Yes	5725	Pass



Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 18 Mbps						
				OBW Within Band	Band Edge (MHz)	Result
				Yes	5725	Pass



MAXIMUM POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2015.01.14

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	Keysight	N5182B	TFU	NCR	0
Cable	ESM Cable Corp.	TT	EV1	NCR	0
Block - DC	Fairview Microwave	SD3379	AMQ	6/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	AWT	NCR	0
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2/13/2016	12

TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum. The radio was operated in the modes as shown in the following data sheets.

A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

Prior to measuring maximum power spectral density, the emission bandwidth (B) was measured. The method of measuring the emission bandwidth and the associated data are found elsewhere in this test report

The maximum power spectral density was measured using ANSI C63.10, Method SA-2 (RMS detection and trace averaging across the on and off times of the EUT transmission and use of a duty cycle correction factor), consistent with the method used for maximum conducted output power.

The spectrum analyzer settings were set per the guidance as well as the following specifics:

-Resolution Bandwidth of 510 kHz

-RMS Detector

-Trace average 100 traces in power averaging mode

The peak power spectral density (PPSD) was determined to be the highest level found across the emission in the reference bandwidth after 100 sweeps of power averaging (not video averaging).

A duty cycle correction factor was added to the measurement using the results of the formula of 10*LOG(1/D) where D is the duty cycle.

MAXIMUM POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2015.01.14

EUT:	Athena UFL			**Work Order:**	FOCU0209
Serial Number:	02EA3D00DBCA			**Date:**	05/11/16
Customer:	Summit Semiconductor LLC			**Temperature:**	24°C
Attendees:	Dave Schilling			**Humidity:**	36%
Project:	None			**Barometric Pres.:**	1017.5
Tested by:	Jeff Alcoke and Rod Peloquin	**Power:**	5.0 VDC	**Job Site:**	EV06

TEST SPECIFICATIONS	**Test Method**
FCC 15.407:2016	ANSI C63.10:2013

COMMENTS

None

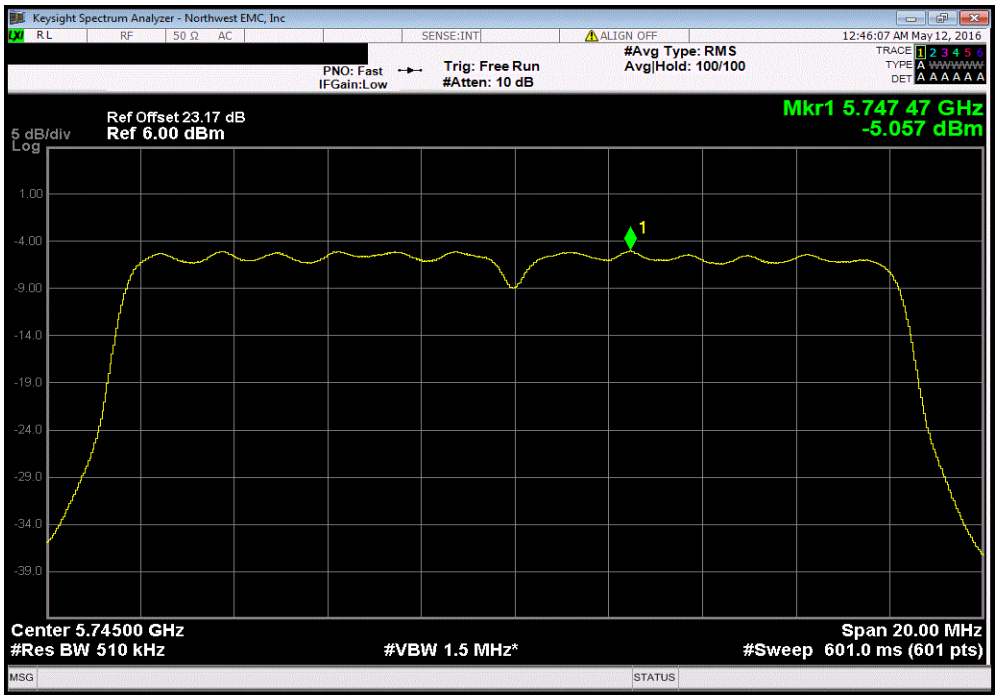
DEVIATIONS FROM TEST STANDARD

None

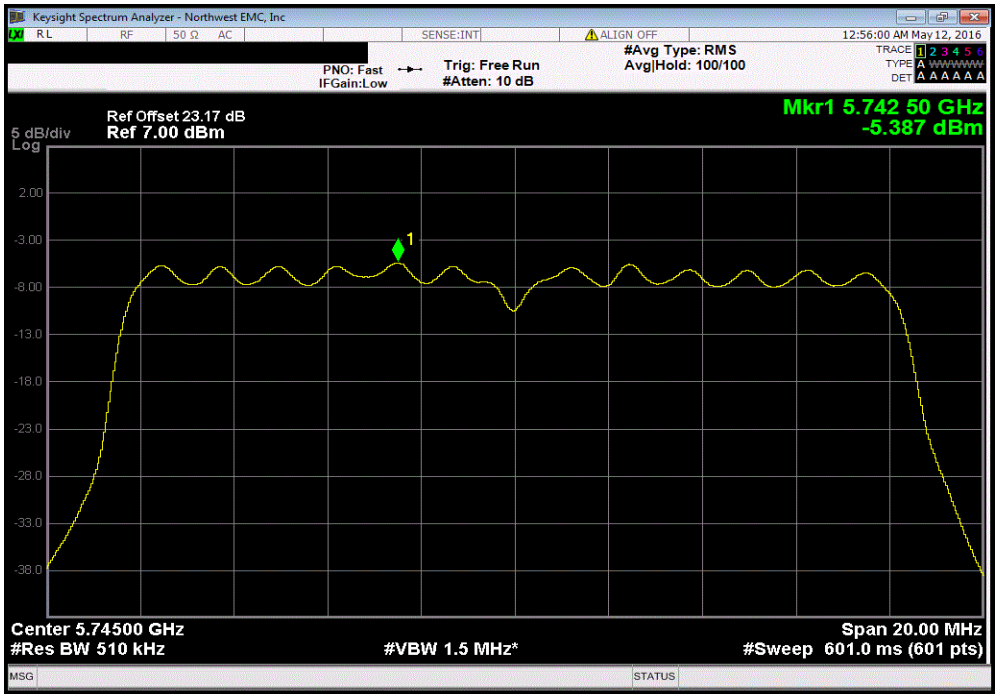
Configuration #	2	*Signature*

	Power (dBm/MHz)	Duty Cycle Factor (dB)	Density (dBm/MHz)	Limit ≤ (dBm / Ref BW)	Results
Antenna Port 2					
5725 - 5785 MHz Band					
Low Channel, Ch 149 - 5745 MHz					
802.11(a) 6 Mbps	-5.057	1.7	-3.4	30	Pass
802.11(a) 18 Mbps	-5.387	3	-2.4	30	Pass
Mid Channel, Ch 157 - 5785 MHz					
802.11(a) 6 Mbps	-4.768	1.6	-3.2	30	Pass
802.11(a) 18 Mbps	-5.088	3	-2.1	30	Pass
High Channel, Ch 165 - 5825 MHz					
802.11(a) 6 Mbps	-4.113	1.6	-2.6	30	Pass
802.11(a) 18 Mbps	-4.406	3	-1.4	30	Pass

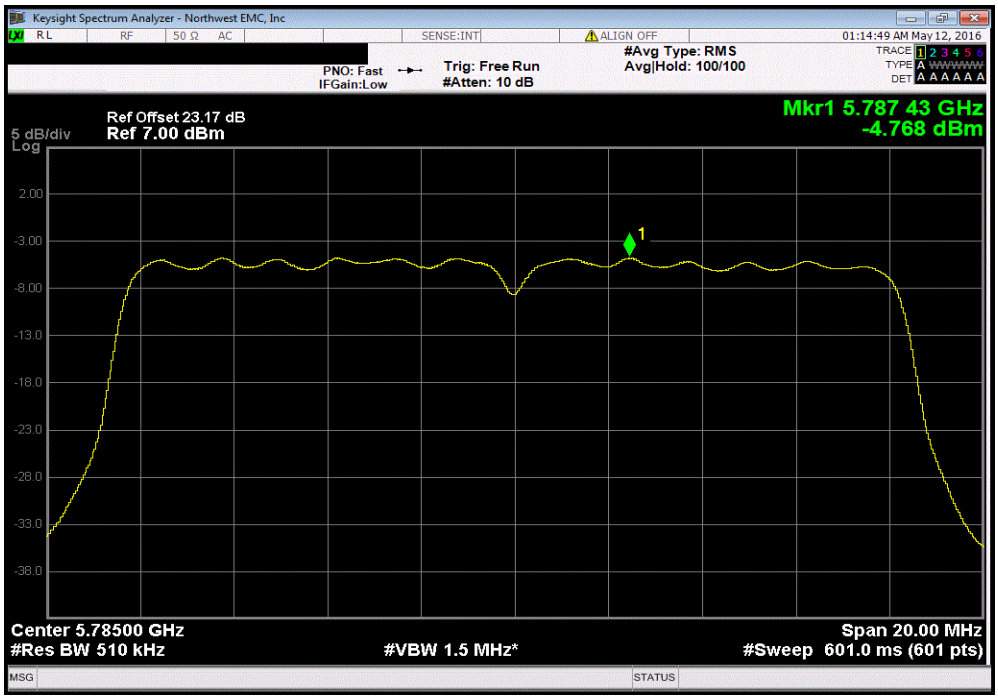
Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 6 Mbps						
	Power (dBm/MHz)	Duty Cycle Factor (dB)		Density (dBm/MHz)	Limit (dBm / Ref BW	Results
	-5.057	1.7		-3.4	30	Pass



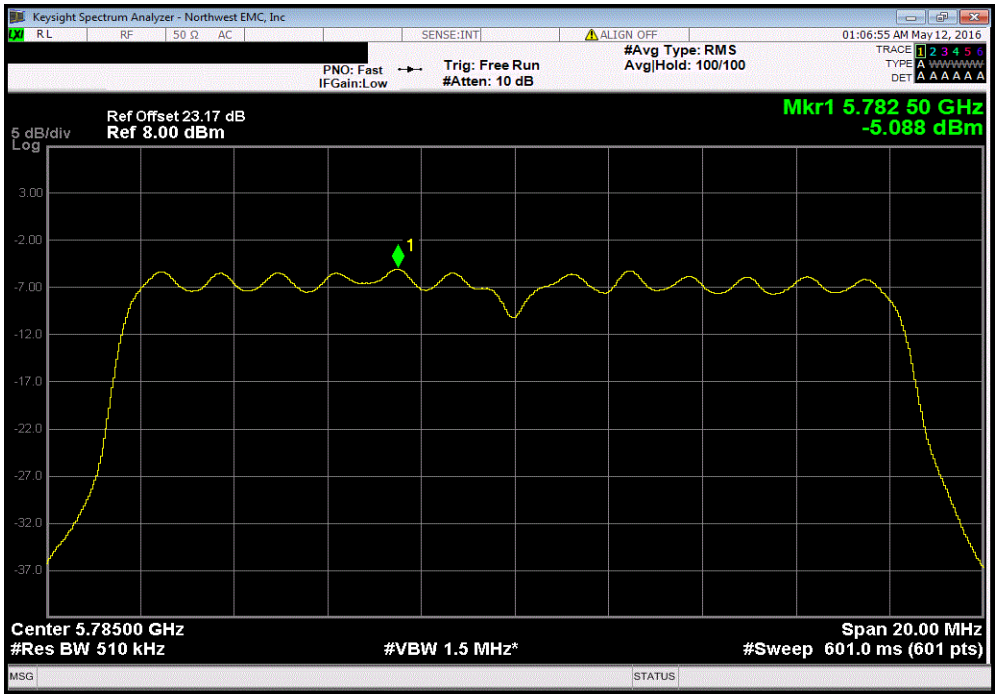
Antenna Port 2, 5725 - 5785 MHz Band, Low Channel, Ch 149 - 5745 MHz, 802.11(a) 18 Mbps						
	Power (dBm/MHz)	Duty Cycle Factor (dB)		Density (dBm/MHz)	Limit (dBm / Ref BW	Results
	-5.387	3		-2.4	30	Pass



Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 6 Mbps						
	Power (dBm/MHz)	Duty Cycle Factor (dB)		Density (dBm/MHz)	Limit (dBm / Ref BW	Results
	-4.768	1.6		-3.2	30	Pass



Antenna Port 2, 5725 - 5785 MHz Band, Mid Channel, Ch 157 - 5785 MHz, 802.11(a) 18 Mbps						
	Power (dBm/MHz)	Duty Cycle Factor (dB)		Density (dBm/MHz)	Limit (dBm / Ref BW	Results
	-5.088	3		-2.1	30	Pass

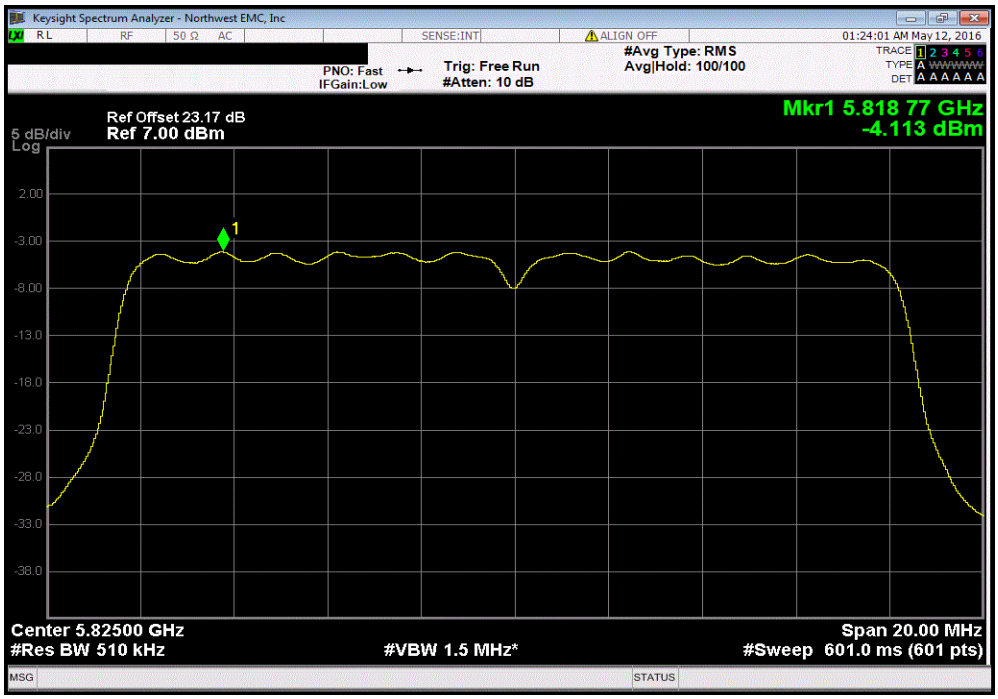


MAXIMUM POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2015.01.14

Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 6 Mbps						
	Power (dBm/MHz)	Duty Cycle Factor (dB)		Density (dBm/MHz)	Limit (dBm / Ref BW	Results
	-4.113	1.6		-2.6	30	Pass



Antenna Port 2, 5725 - 5785 MHz Band, High Channel, Ch 165 - 5825 MHz, 802.11(a) 18 Mbps						
	Power (dBm/MHz)	Duty Cycle Factor (dB)		Density (dBm/MHz)	Limit (dBm / Ref BW	Results
	-4.406	3		-1.4	30	Pass