

NORTHWEST EMC

AMX LLC

SAA5968-03

FCC 15.207:2015

FCC 15.225:2015

Report # XNTE0039.8



NVLAP Lab Code: 200881-0

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: May 08, 2015
AMX LLC
Models: SAA5968-03

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2015	ANSI C63.10:2009
FCC 15.225:2015	ANSI C63.10:2009

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.4	Field Strength of Fundamental	Yes	Pass	
6.4	Field Strength of Spurious Emissions < 30 MHz	Yes	Pass	
6.5	Field Strength of Spurious Emissions > 30 MHz	Yes	Pass	
6.8	Frequency Stability	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Jeremiah Darden, 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.

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>

MEASUREMENT UNCERTAINTY

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 WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. 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.

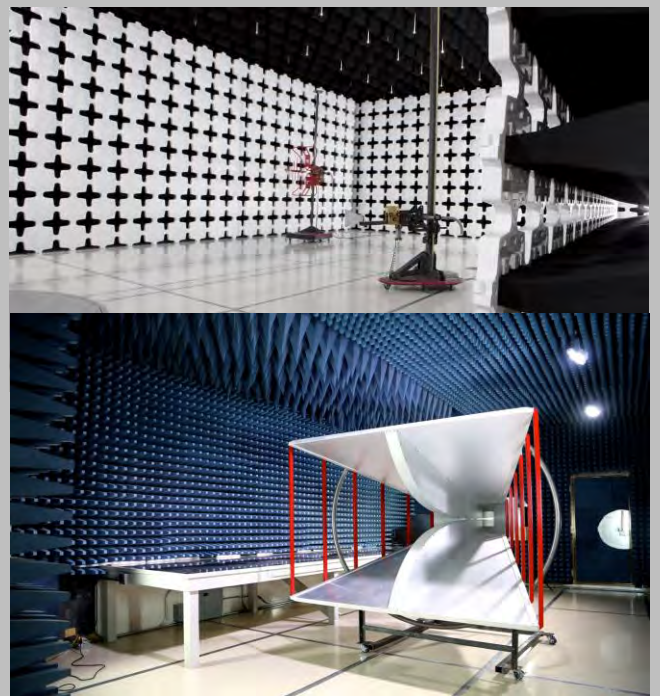
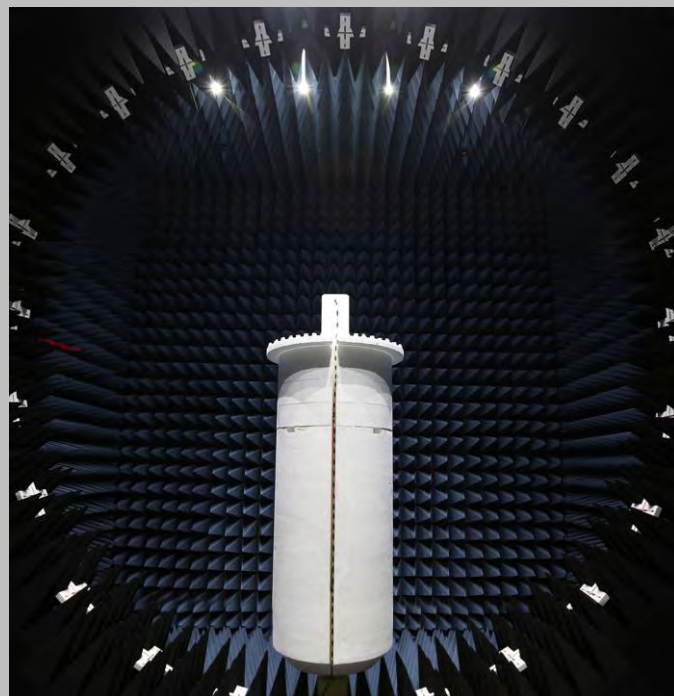
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

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)	4.7 dB	-4.7 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

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



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	AMX LLC
Address:	3000 Research Drive
City, State, Zip:	Richardson, TX 75082
Test Requested By:	Heath Sharp
Model:	SAA5968-03
First Date of Test:	May 04, 2014
Last Date of Test:	May 08, 2015
Receipt Date of Samples:	May 04, 2014
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
RF Module with 13.56MHz NFC radio with 1 antenna inside MXD-2000XL-PAN host display touch panel
Testing Objective:
To demonstrate compliance to FCC Part 15.225 specifications.

CONFIGURATIONS

Configuration XNTE0039- 3

Software/Firmware Running during test	
Description	Version
PuTTY	Release 0.62

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
RF Module (inside host touch panel)	AMX LLC	SAA5968-03	None
Host Touch Panel	AMX LLC	MXD-2000XL-PAN	596811PX37E0136

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Dell	Dell Latitude D630	None
AC/DC Adapter (Laptop)	Dell	LA90PS0-00	CN-0DF266-71615-7CE-6228
Router	TP-Link	TL-R860	12778102492
AC/DC Adapter (Router)	TP-Link	T090060-2B1	None
ITE Power Supply	AMX	FG423-46	42346AU16E2621

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power	No	2 m	Yes	Laptop	AC/DC Adapter (Laptop)
AC Power	No	2 m	No	Laptop	AC Mains
Ethernet Cable	No	3 m	No	Laptop	Router
AC Power	No	2 m	No	AC Mains	ITE Power Supply
DC Power	No	2 m	No	Host Touch Panel	ITE Power Supply
Ethernet Cable	No	10 m	Yes	Router	Host Touch Panel

CONFIGURATIONS

Configuration XNTE0039- 6

Software/Firmware Running during test	
Description	Version
PuTTY	Release 0.62

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
RF Module (inside host touch panel)	AMX LLC	SAA5968-03	None
Host Touch Panel	AMX LLC	MXD-2000XL-PAN	596811PX37E0136

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
ITE Power Supply	AMX	FG423-46	42346AU16E2621
USB Flash Drive	NWEMC	None	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	2 m	No	AC Mains	ITE Power Supply
DC Power	No	2 m	No	Host Touch Panel	ITE Power Supply
USB Cable	No	2.8m	No	Host Touch Panel	USB Flash Drive

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	5/4/2015	Field Strength of Fundamental	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	5/4/2015	Field Strength of Spurious Emissions > 30 MHz	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	5/5/2015	Field Strength of Spurious Emissions < 30 MHz	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	5/7/2015	Frequency Stability	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	5/8/2015	Power Line Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50 Ω .

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable, Standard LISN	Northwest EMC	CE 9kHz-108MHz	TXA	9/14/2014	09/14/2015
LISN	Solar Electronics	9252-50-R-24-BNC	LJK	9/14/2014	09/14/2015
LISN	Solar Electronics	9252-50-R-24-BNC	LJL	9/14/2014	09/14/2015
High Pass Filter	TTE	H97-100K-50-720B	HHZ	9/13/2014	09/13/2015
Attenuator	Fairview Microwave	SA6B10W-20	TQR	9/13/2014	09/13/2015
Receiver	Rohde & Schwarz	ESCI	ARF	5/27/2014	05/27/2015

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

XNTE0039-6

MODES INVESTIGATED

Transmitting 13.56 MHz

POWERLINE CONDUCTED EMISSIONS

EUT:	SAA5968-03	Work Order:	XNTE0039
Serial Number:	None	Date:	05/08/2015
Customer:	AMX LLC	Temperature:	24.2°C
Attendees:	None	Relative Humidity:	51.7%
Customer Project:	None	Bar. Pressure:	1015 mb
Tested By:	Frank Sun	Job Site:	TX01
Power:	13.5VDC via 110VAC/60Hz	Configuration:	XNTE0039-6

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	15	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

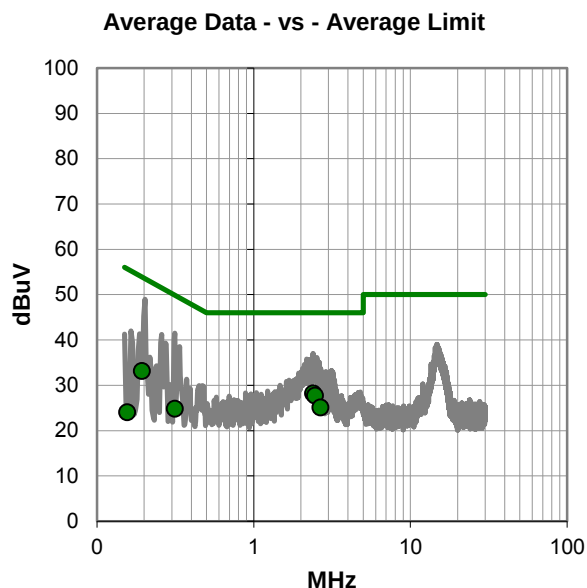
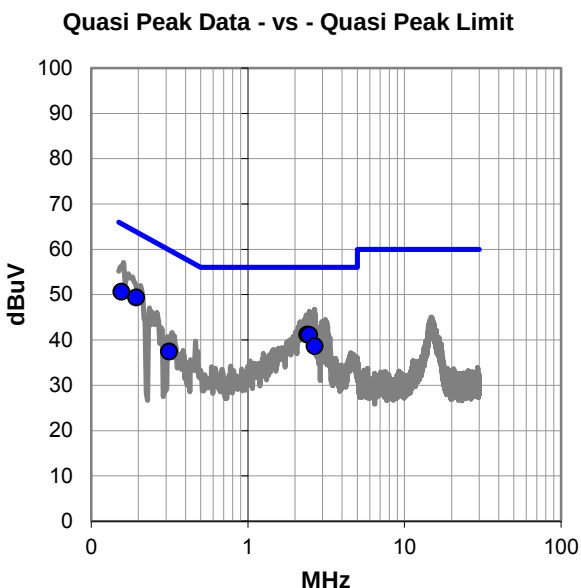
With antenna terminated.

EUT OPERATING MODES

Transmitting 13.56 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #15

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.193	29.3	20.0	49.3	63.9	-14.6
2.393	21.0	20.2	41.2	56.0	-14.8
2.465	20.9	20.2	41.1	56.0	-14.9
0.156	30.5	20.1	50.6	65.7	-15.1
2.671	18.4	20.2	38.6	56.0	-17.4
0.315	17.4	20.0	37.4	59.8	-22.4

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
2.393	8.0	20.2	28.2	46.0	-17.8
2.465	7.5	20.2	27.7	46.0	-18.3
0.193	13.1	20.0	33.1	53.9	-20.8
2.671	4.9	20.2	25.1	46.0	-20.9
0.315	4.8	20.0	24.8	49.8	-25.0
0.156	3.9	20.1	24.0	55.7	-31.7

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	SAA5968-03	Work Order:	XNTE0039
Serial Number:	None	Date:	05/08/2015
Customer:	AMX LLC	Temperature:	24.2°C
Attendees:	None	Relative Humidity:	51.7%
Customer Project:	None	Bar. Pressure:	1015 mb
Tested By:	Frank Sun	Job Site:	TX01
Power:	13.5VDC via 110VAC/60Hz	Configuration:	XNTE0039-6

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	16	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

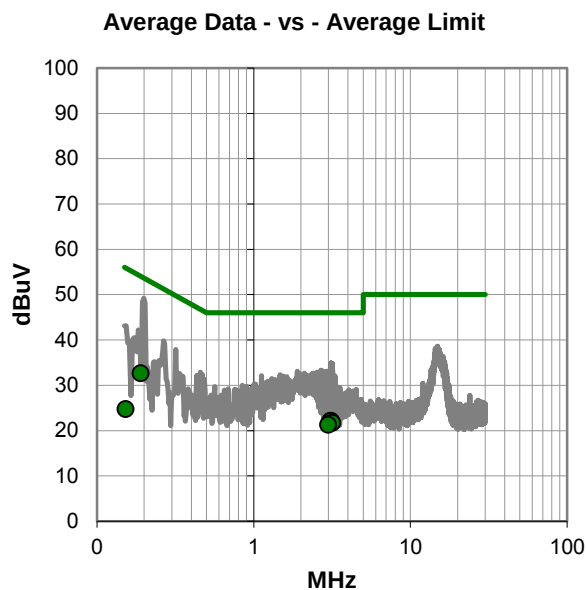
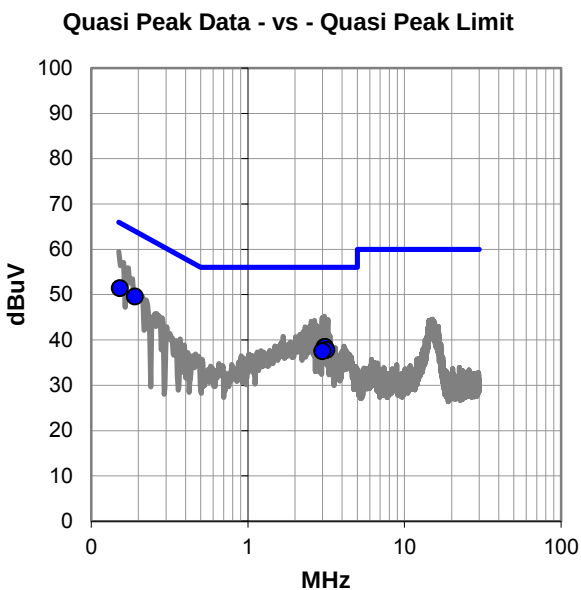
With antenna terminated.

EUT OPERATING MODES

Transmitting 13.56 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #16

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.153	31.3	20.1	51.4	65.9	-14.5
0.190	29.5	20.0	49.5	64.0	-14.5
3.098	18.2	20.2	38.4	56.0	-17.6
3.120	18.2	20.2	38.4	56.0	-17.6
3.183	17.6	20.2	37.8	56.0	-18.2
2.991	17.3	20.2	37.5	56.0	-18.5

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.190	12.6	20.0	32.6	54.0	-21.4
3.098	1.9	20.2	22.1	46.0	-23.9
3.120	1.9	20.2	22.1	46.0	-23.9
3.183	1.5	20.2	21.7	46.0	-24.3
2.991	1.1	20.2	21.3	46.0	-24.7
0.153	4.6	20.1	24.7	55.9	-31.2

CONCLUSION

Pass



Tested By

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

Transmitting 13.56 MHz

POWER SETTINGS INVESTIGATED

13.5VDC via 110VAC/60Hz

CONFIGURATIONS INVESTIGATED

XNTE0039 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency 10 kHz

Stop Frequency 30 MHz

SAMPLE CALCULATIONS

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

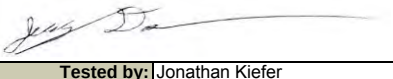
TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Antenna, Loop	ETS Lindgren	6502	AZM	6/18/2014	24 mo
TX02 Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	9/22/2014	12 mo
Spectrum Analyzer	Agilent	N9010A	AFL	6/20/2014	12 mo

TEST DESCRIPTION

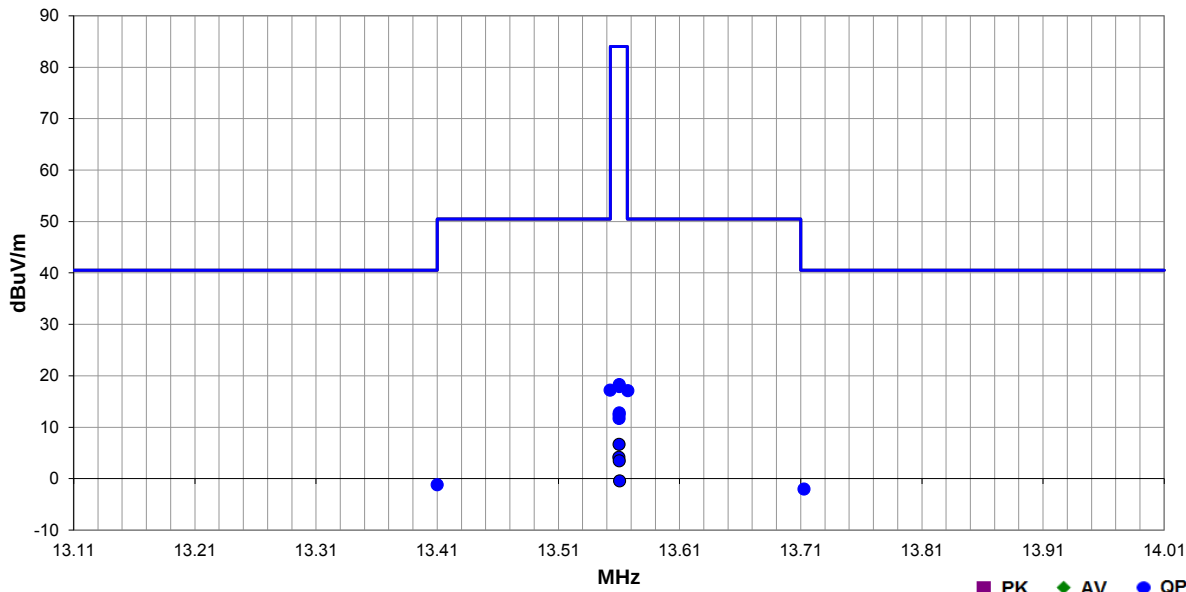
The H-field produced by the equipment shall be measured at the standard distance of 10 m. The H-field is measured with a shielded loop antenna connected to the measurement device. The measuring bandwidth and detector type are in accordance with the specification.

The carrier emission was maximized by rotating the EUT on a turntable and adjusting the measurement antenna. The EUT was investigated in 3 orthogonal orientations to maximize emissions.

Work Order:	XNTE0039	Date:	05/04/15	
Project:	None	Temperature:	24.4 °C	
Job Site:	TX02	Humidity:	44.9% RH	
Serial Number:	None	Barometric Pres.:	1020 mbar	
Tested by: Jonathan Kiefer				
EUT:	SAA5968-03			
Configuration:	3			
Customer:	AMX LLC			
Attendees:	Heath Sharp			
EUT Power:	13.5VDC via 110VAC/60Hz			
Operating Mode:	Transmitting 13.56 MHz			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.225:2015	ANSI C63.10:2009

Run #	3	Test Distance (m)	10	Antenna Height(s)	1 to 4(m)	Results	Pass
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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
13.553	25.1	11.2	1.0	73.0	10.0	0.0	Perp/Ground, Perp/EUT	QP	-19.1	17.2	50.5	-33.3	EUT Vertical.
13.567	25.0	11.2	1.0	76.9	10.0	0.0	Perp/Ground, Perp/EUT	QP	-19.1	17.1	50.5	-33.4	EUT Vertical.
13.410	6.7	11.2	1.0	3.0	10.0	0.0	Perp/Ground, Perp/EUT	QP	-19.1	-1.2	40.5	-41.7	EUT Vertical.
13.713	5.9	11.2	1.0	328.9	10.0	0.0	Perp/Ground, Perp/EUT	QP	-19.1	-2.0	40.5	-42.5	EUT Vertical.
13.560	26.2	11.2	1.0	88.9	10.0	0.0	Perp/Ground, Perp/EUT	QP	-19.1	18.3	84.0	-65.7	EUT Vertical.
13.560	25.8	11.2	1.0	357.0	10.0	0.0	Perp/Ground, Perp/EUT	QP	-19.1	17.9	84.0	-66.1	EUT On Side.
13.560	20.7	11.2	1.0	141.0	10.0	0.0	Perp/Ground, Par/EUT	QP	-19.1	12.8	84.0	-71.2	EUT Vertical.
13.560	20.3	11.2	1.0	33.9	10.0	0.0	Perp/Ground, Par/EUT	QP	-19.1	12.4	84.0	-71.6	EUT On Side.
13.560	19.6	11.2	1.0	189.9	10.0	0.0	Perp/Ground, Perp/EUT	QP	-19.1	11.7	84.0	-72.3	EUT Horizontal.
13.560	14.6	11.2	1.0	194.0	10.0	0.0	Perp/Ground, Par/EUT	QP	-19.1	6.7	84.0	-77.3	EUT Horizontal.

FIELD STRENGTH OF SPURIOUS EMISSIONS < 30 MHZ

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

Transmitting 13.56 MHz

POWER SETTINGS INVESTIGATED

13.5VDC via 110VAC/60Hz

CONFIGURATIONS INVESTIGATED

XNTE0039 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency 10 kHz

Stop Frequency 30 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
Antenna, Loop	ETS Lindgren	6502	AZM	6/18/2014	24 mo
TX02 Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	9/22/2014	12 mo
Spectrum Analyzer	Agilent	N9010A	AFL	6/20/2014	12 mo

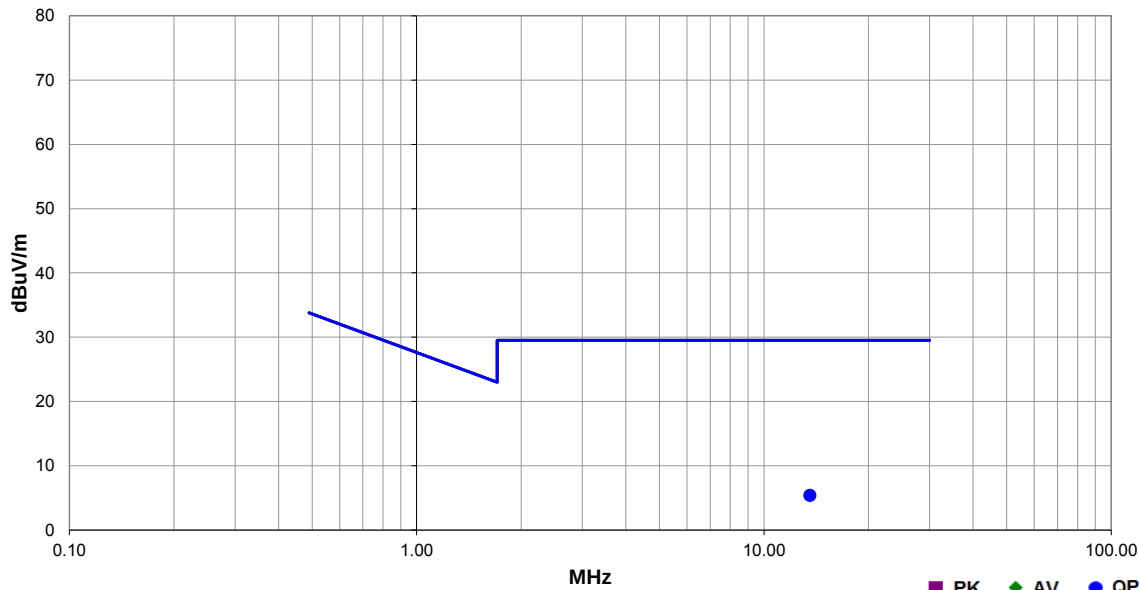
TEST DESCRIPTION

The EUT was operated in a worst-case configuration in transmit mode. Per the test standard, the EUT was placed in its typical orientation for the manufactures declared use. The spectrum was scanned from 10kHz-30MHz with the EUT set to the transmit frequency. The EUT was transmitting at its only modulation type and data rate. While scanning, emissions from the EUT were maximized by rotating the EUT and antenna polarization. The amplitude and frequency of the highest emissions were noted. An active loop antenna with an internal preamp was used for this test in order to achieve sufficient measurement sensitivity

Work Order:	XNTE0039	Date:	05/04/15	
Project:	None	Temperature:	24.7 °C	
Job Site:	TX02	Humidity:	45.5% RH	
Serial Number:	None	Barometric Pres.:	1022 mbar	
Tested by: Jonathan Kiefer				
EUT:	SAA5968-03			
Configuration:	3			
Customer:	AMX LLC			
Attendees:	Heath Sharp			
EUT Power:	13.5VDC via 110VAC/60Hz			
Operating Mode:	Transmitting 13.56 MHz			
Deviations:	None			
Comments:	Worst case orientation: EUT On Side, Antenna On Side.			

Test Specifications	Test Method
FCC 15.225:2015	ANSI C63.10:2009

Run #	31	Test Distance (m)	10	Antenna Height(s)	1 m	Results	Pass
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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
13.560	13.3	11.2	1.0	338.0	10.0	0.0	Par/Ground, Perp/EUT	QP	-19.1	5.4	29.5	-24.1	EUT On Side. Antenna On Side.

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

Transmitting 13.56 MHz

POWER SETTINGS INVESTIGATED

13.5VDC via 110VAC/60Hz

CONFIGURATIONS INVESTIGATED

XNTE0039 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz

Stop Frequency 1000 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 (mo)
Spectrum Analyzer	Agilent	N9010A	AFL	6/20/2014	12
TX02 Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	9/22/2014	12
Antenna, Biconilog	ETS Lindgren	3143B	AYF	4/7/2014	24
Pre-Amplifier	Miteq	AM-1551	PAH	9/13/2014	12

TEST DESCRIPTION

The EUT was operated in a worst-case configuration in transmit mode. Per the test standard, the EUT was placed in its typical orientation for the manufactures declared use. The spectrum was scanned from 30 MHz to 1GHz with the EUT set to the transmit frequency. The EUT was transmitting at its only modulation type and data rate. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization. If applicable, a preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity. The amplitude and frequency of the highest emissions were noted.

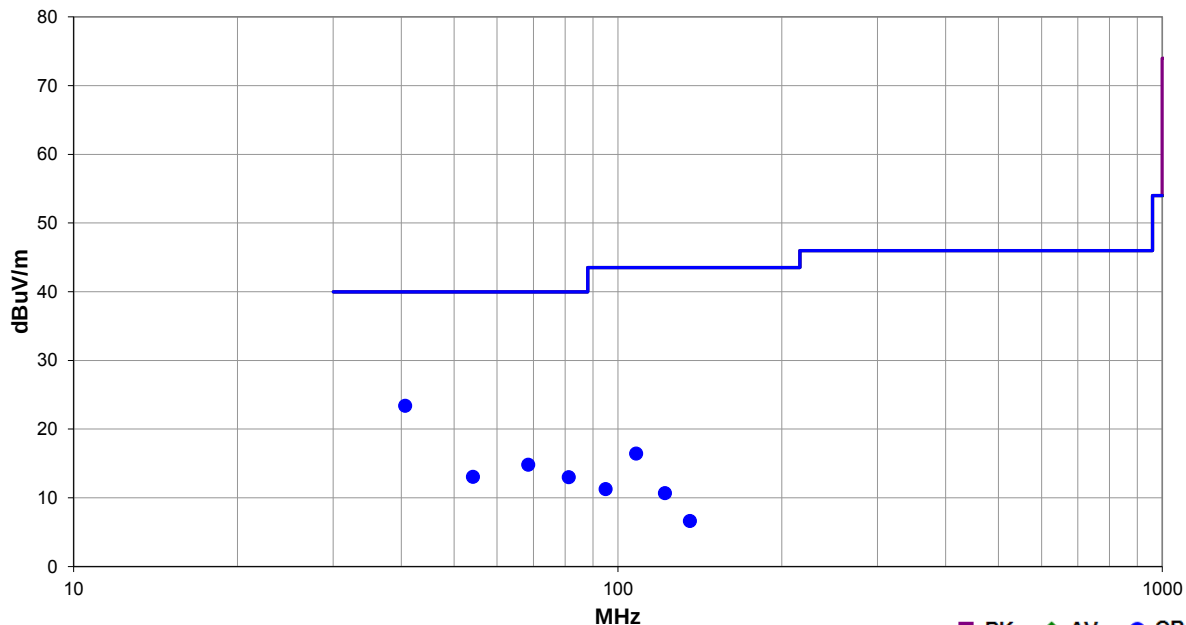
FIELD STRENGTH OF SPURIOUS EMISSIONS > 30 MHz

PSA-ESCI 2015.03.03
EmiR5 2015.03.19.1

Work Order:	XNTE0039	Date:	05/05/15	
Project:	None	Temperature:	24.3 °C	
Job Site:	TX02	Humidity:	45% RH	
Serial Number:	None	Barometric Pres.:	1019 mbar	
EUT:	SAA5968-03			
Configuration:	3			
Customer:	AMX LLC			
Attendees:	Heath Sharp			
EUT Power:	13.5VDC via 110VAC/60Hz			
Operating Mode:	Transmitting 13.56 MHz			
Deviations:	None			
Comments:	Worst Case Orientation: EUT On Side, Antenna Vertical.			

Test Specifications	Test Method
FCC 15.225:2015	ANSI C63.10:2009

Run #	41	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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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
40.668	52.5	-29.1	1.0	110.0	3.0	0.0	Vert	QP	0.0	23.4	40.0	-16.6	EUT On Side.
68.458	47.1	-32.3	1.0	87.9	3.0	0.0	Vert	QP	0.0	14.8	40.0	-25.2	EUT On Side.
54.177	45.9	-32.8	1.0	99.0	3.0	0.0	Vert	QP	0.0	13.1	40.0	-26.9	EUT On Side.
81.220	45.3	-32.3	1.9	147.9	3.0	0.0	Vert	QP	0.0	13.0	40.0	-27.0	EUT On Side.
108.003	46.9	-30.5	1.0	16.9	3.0	0.0	Vert	QP	0.0	16.4	43.5	-27.1	EUT On Side.
94.925	42.6	-31.3	1.0	271.0	3.0	0.0	Vert	QP	0.0	11.3	43.5	-32.2	EUT On Side.
122.047	41.6	-30.9	1.1	247.0	3.0	0.0	Vert	QP	0.0	10.7	43.5	-32.8	EUT On Side.
135.610	37.0	-30.4	1.0	234.0	3.0	0.0	Vert	QP	0.0	6.6	43.5	-36.9	EUT On Side.

FREQUENCY STABILITY

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)
Near Field Probe	ETS Lindgren	7405	IPS	NCR	0
Thermometer	Omegatette	HH311	DTX	4/3/2015	36
Humidity and Temperature Chamber	Cincinnati Sub Zero (CSZ)	ZPH-8-2-SCT/AC	TBH	NCR	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	12

TEST DESCRIPTION

Variation of Supply Voltage

The primary supply voltage was varied from 85% to 115% of nominal. An AC lab supply was used to vary the supply voltage from 115% to 85% of 110 V, 60 Hz.

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (-20° to +50° C) and at 10°C intervals.

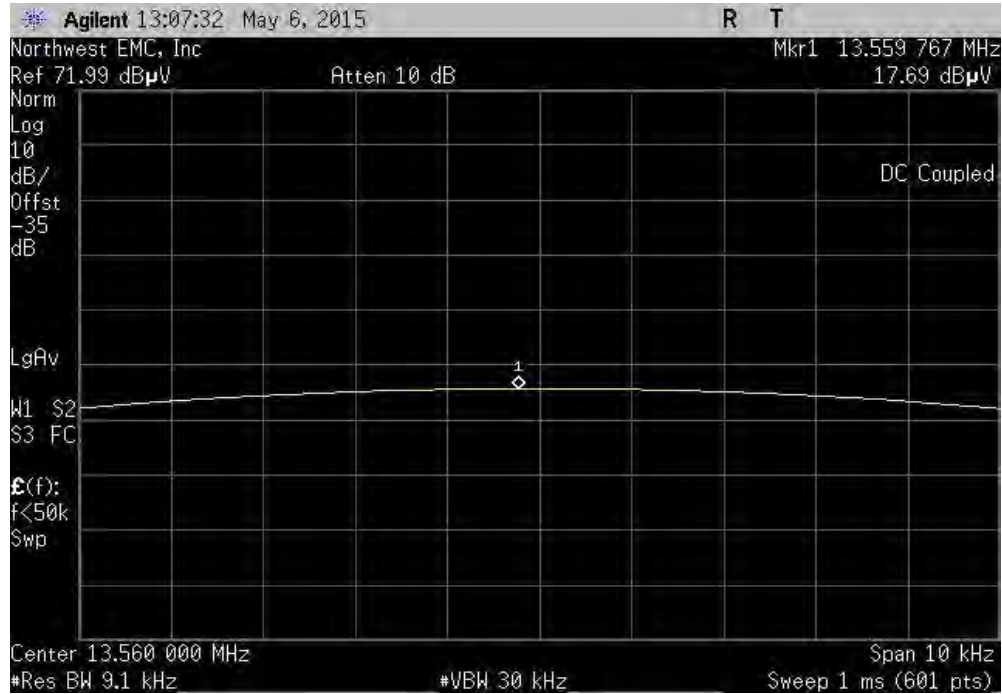
Measurements were made at the single transmit frequency. The antenna is integral to the EUT, so a radiated measurement was made using a spectrum analyzer and a near field probe. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

FREQUENCY STABILITY

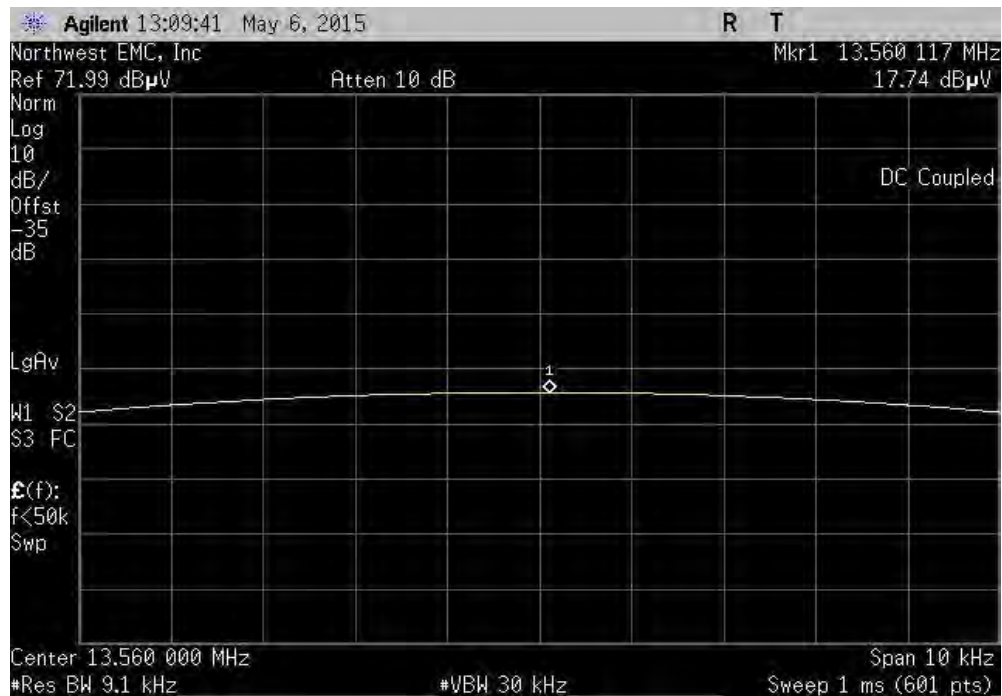
EUT: SAA5968-03		Work Order: XNTE0039				
Serial Number: None		Date: 05/07/15				
Customer: AMX LLC		Temperature: 24.3°C				
Attendees: None		Humidity: 48%				
Project: None		Barometric Pres.: 1012				
Tested by: Frank Sun		Job Site: TX09				
Power: see table						
TEST SPECIFICATIONS		Test Method				
FCC 15.225:2015		ANSI C63.10:2009				
Comments						
None						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	3	Signature 				
		Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result
13.56 MHz						
Temperature Variation						
-20 °C (Low)						
	Start Up	13.559767	13.56	-0.002%	±0.01%	Pass
	After 2 Minutes	13.560117	13.56	0.001%	±0.01%	Pass
	After 5 Minutes	13.559850	13.56	-0.001%	±0.01%	Pass
	After 10 Minutes	13.559850	13.56	-0.001%	±0.01%	Pass
-10 °C						
	Start Up	13.560067	13.56	0.000%	±0.01%	Pass
	After 2 Minutes	13.560117	13.56	0.001%	±0.01%	Pass
	After 5 Minutes	13.559800	13.56	-0.001%	±0.01%	Pass
	After 10 Minutes	13.560183	13.56	0.001%	±0.01%	Pass
0 °C						
	Start Up	13.560017	13.56	0.000%	±0.01%	Pass
	After 2 Minutes	13.560100	13.56	0.001%	±0.01%	Pass
	After 5 Minutes	13.559800	13.56	-0.001%	±0.01%	Pass
	After 10 Minutes	13.560417	13.56	0.003%	±0.01%	Pass
10 °C						
	Start Up	13.560000	13.56	0.000%	±0.01%	Pass
	After 2 Minutes	13.560000	13.56	0.000%	±0.01%	Pass
	After 5 Minutes	13.559883	13.56	-0.001%	±0.01%	Pass
	After 10 Minutes	13.560117	13.56	0.001%	±0.01%	Pass
20 °C (Nominal)						
	Start Up	13.560000	13.56	0.000%	±0.01%	Pass
	After 2 Minutes	13.560067	13.56	0.000%	±0.01%	Pass
	After 5 Minutes	13.559850	13.56	-0.001%	±0.01%	Pass
	After 10 Minutes	13.560150	13.56	0.001%	±0.01%	Pass
30 °C						
	Start Up	13.560117	13.56	0.001%	±0.01%	Pass
	After 2 Minutes	13.559917	13.56	-0.001%	±0.01%	Pass
	After 5 Minutes	13.560000	13.56	0.000%	±0.01%	Pass
	After 10 Minutes	13.559833	13.56	-0.001%	±0.01%	Pass
40 °C						
	Start Up	13.559767	13.56	-0.002%	±0.01%	Pass
	After 2 Minutes	13.559767	13.56	-0.002%	±0.01%	Pass
	After 5 Minutes	13.559850	13.56	-0.001%	±0.01%	Pass
	After 10 Minutes	13.559867	13.56	-0.001%	±0.01%	Pass
50 °C (High)						
	Start Up	13.559750	13.56	-0.002%	±0.01%	Pass
	After 2 Minutes	13.559700	13.56	-0.002%	±0.01%	Pass
	After 5 Minutes	13.559950	13.56	0.000%	±0.01%	Pass
	After 10 Minutes	13.560150	13.56	0.001%	±0.01%	Pass
Voltage Variation						
93.5 VAC (Low)						
	Start Up	13.559733	13.56	-0.002%	±0.01%	Pass
110 VAC (Nominal)						
	Start Up	13.560100	13.56	0.001%	±0.01%	Pass
126.5 VAC (High)						
	Start Up	13.560067	13.56	0.000%	±0.01%	Pass

FREQUENCY STABILITY

13.56 MHz, Temperature Variation, -20 °C (Low), Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559767	13.56	-0.002%	±0.01%	Pass	

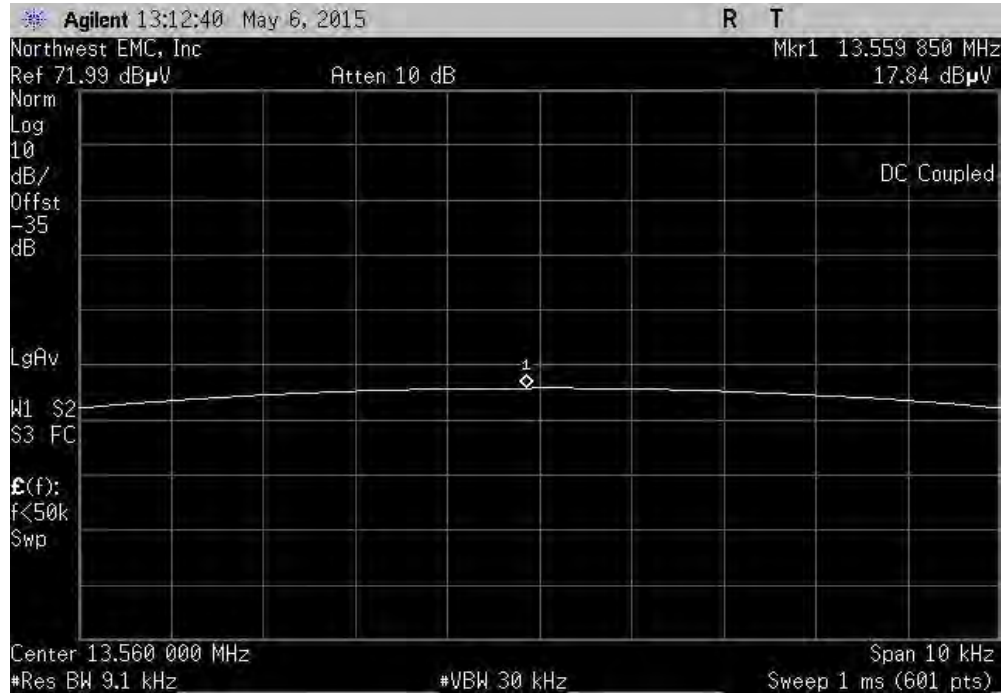


13.56 MHz, Temperature Variation, -20 °C (Low), After 2 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560117	13.56	0.001%	±0.01%	Pass	

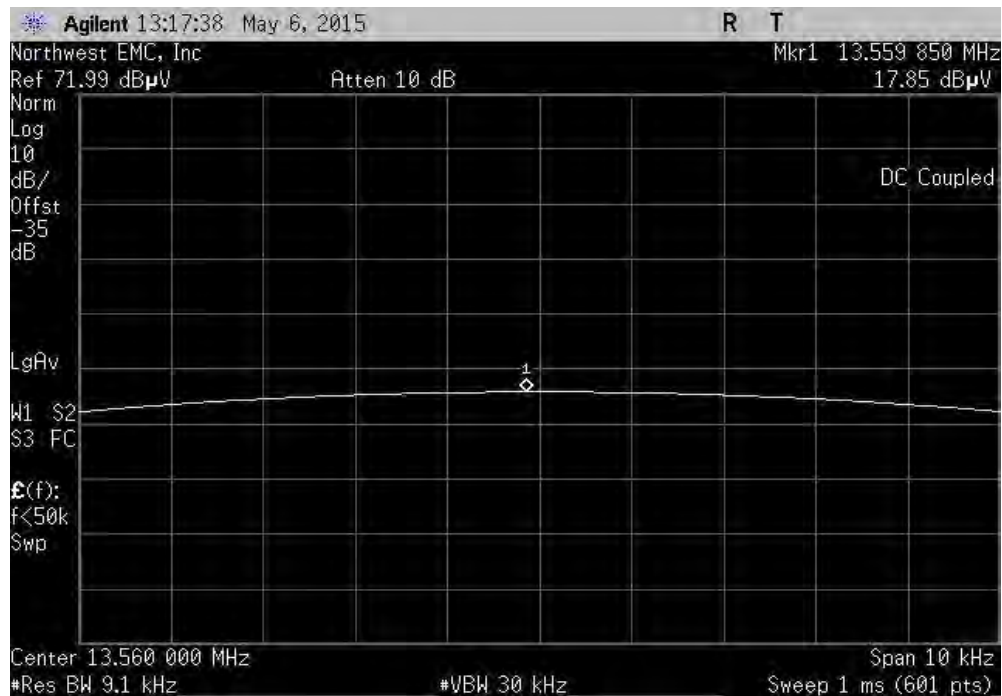


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, -20 °C (Low), After 5 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559850	13.56	-0.001%	±0.01%	Pass	

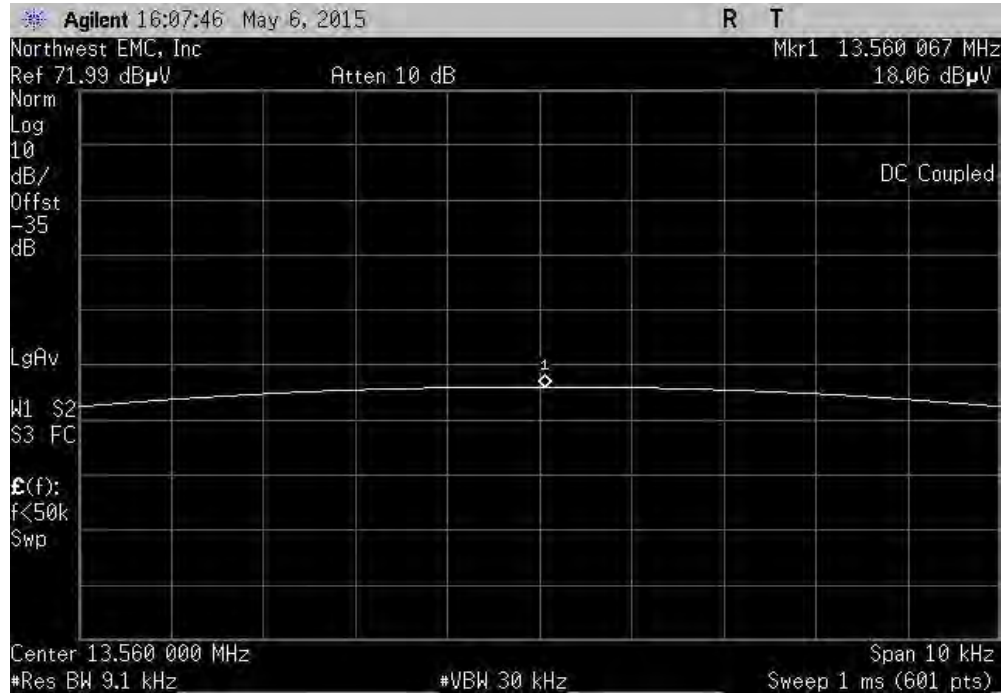


13.56 MHz, Temperature Variation, -20 °C (Low), After 10 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559850	13.56	-0.001%	±0.01%	Pass	

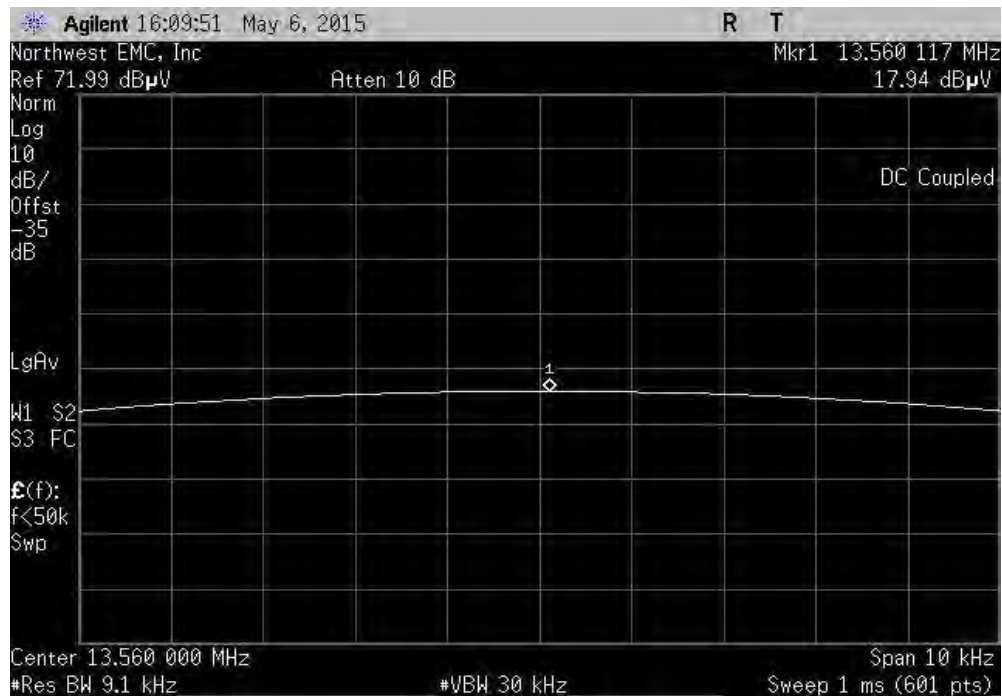


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, -10 °C, Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560067	13.56	0.000%	±0.01%	Pass	

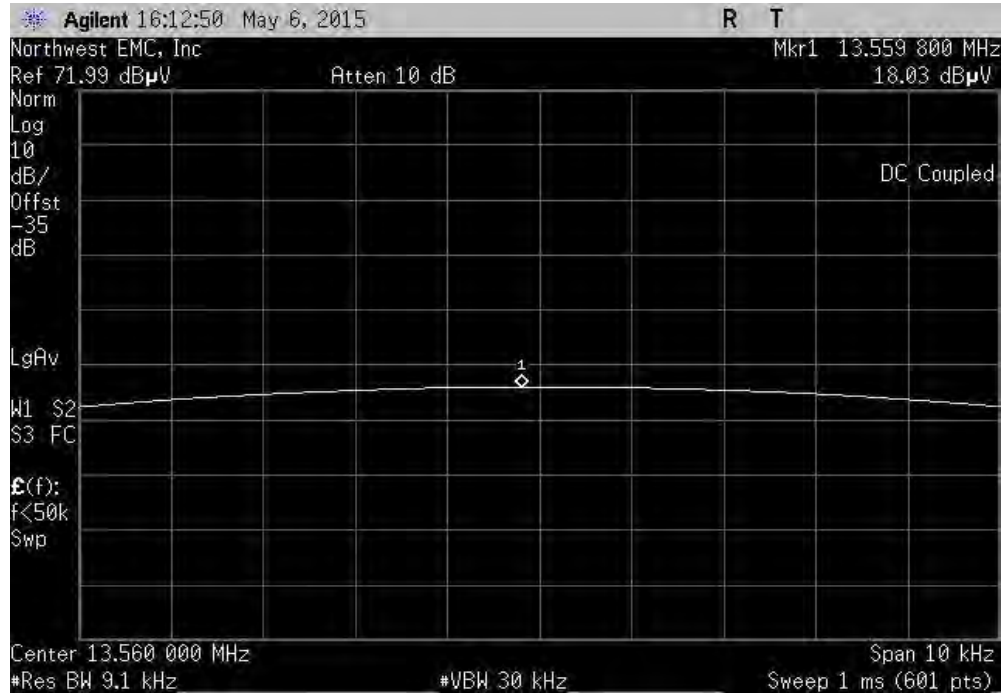


13.56 MHz, Temperature Variation, -10 °C, After 2 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560117	13.56	0.001%	±0.01%	Pass	

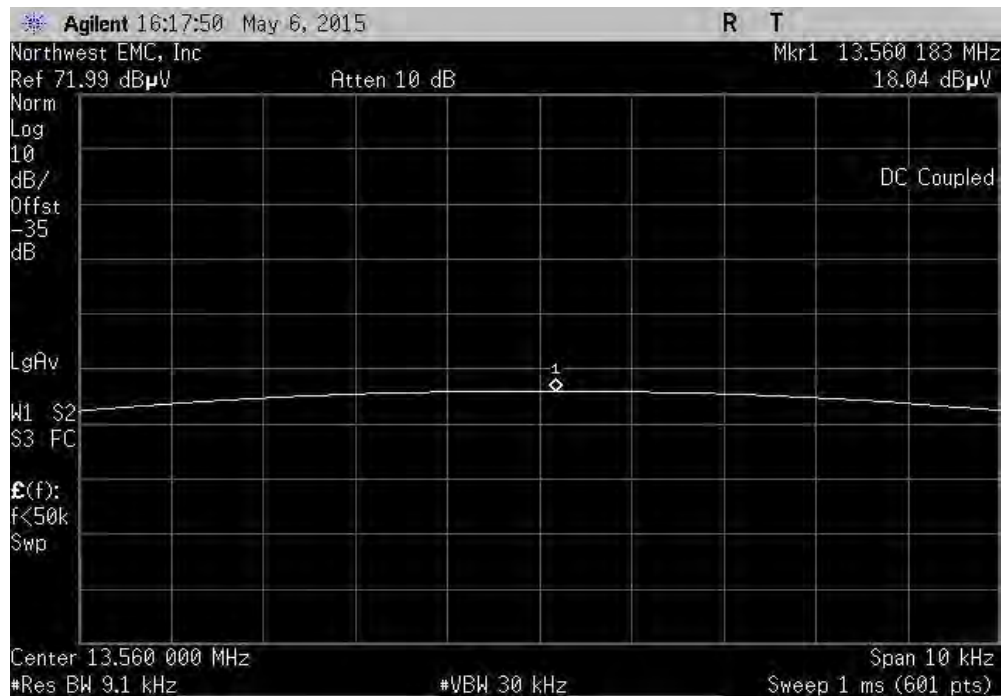


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, -10 °C, After 5 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559800	13.56	-0.001%	±0.01%	Pass	

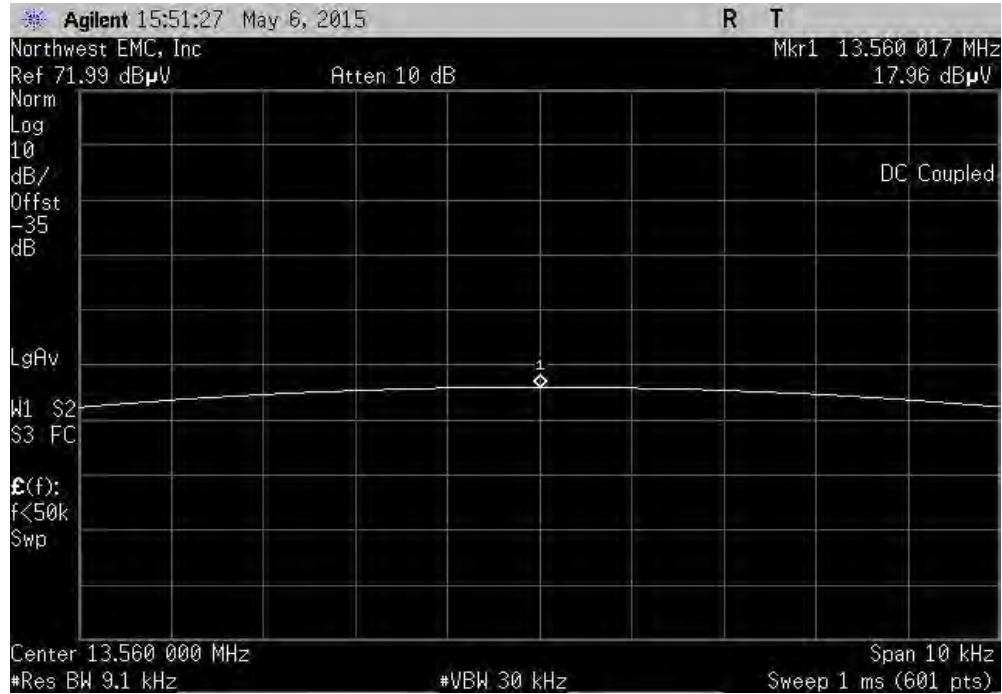


13.56 MHz, Temperature Variation, -10 °C, After 10 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560183	13.56	0.001%	±0.01%	Pass	

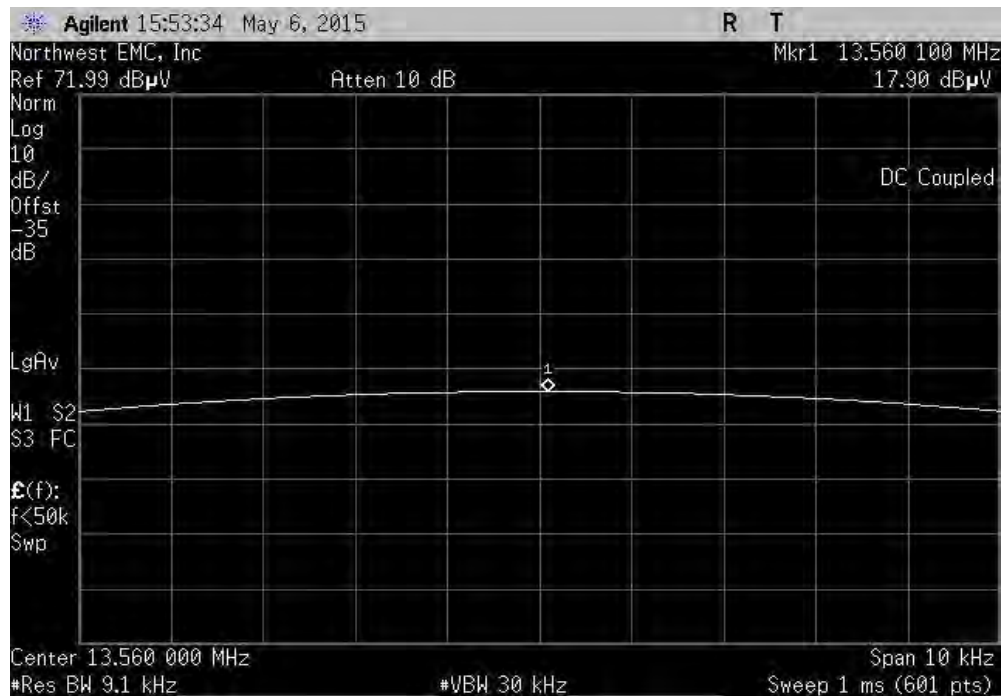


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 0 °C, Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560017	13.56	0.000%	±0.01%	Pass	

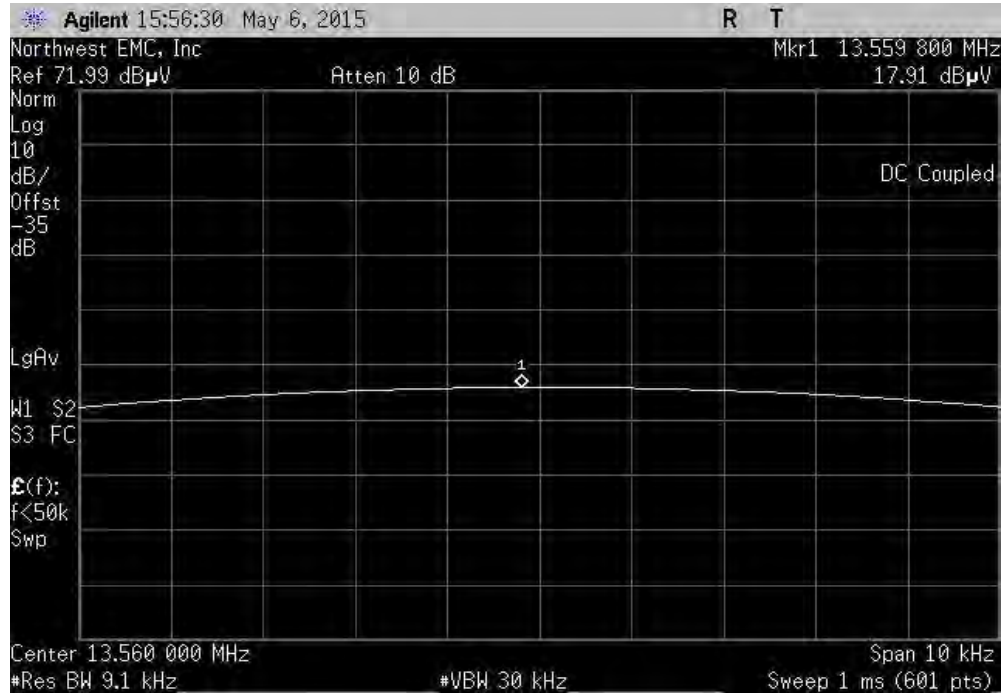


13.56 MHz, Temperature Variation, 0 °C, After 2 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560100	13.56	0.001%	±0.01%	Pass	

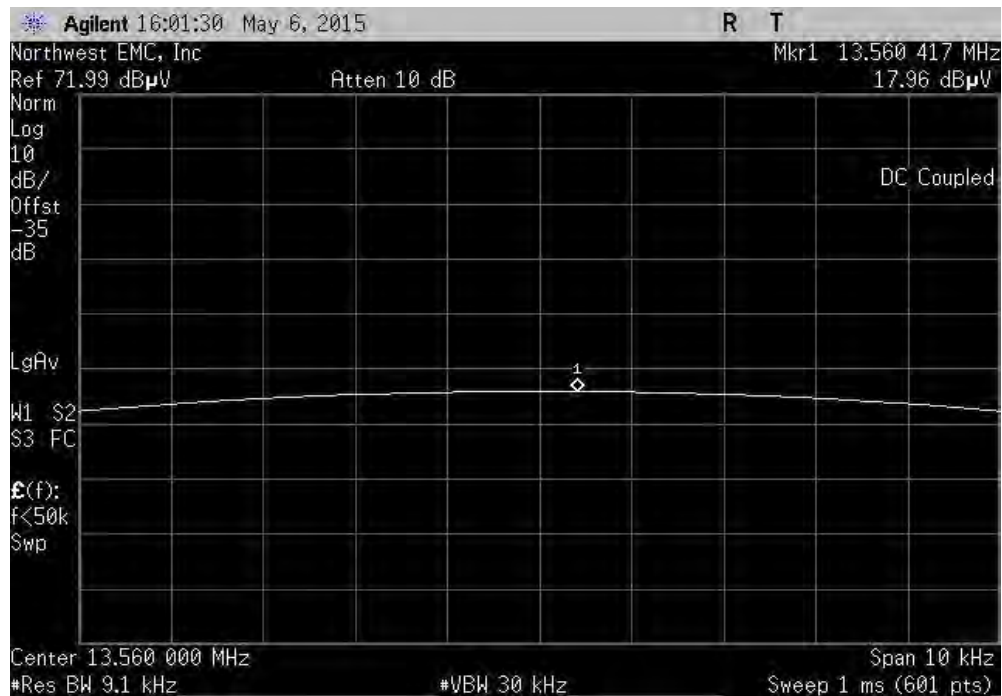


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 0 °C, After 5 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559800	13.56	-0.001%	±0.01%	Pass	

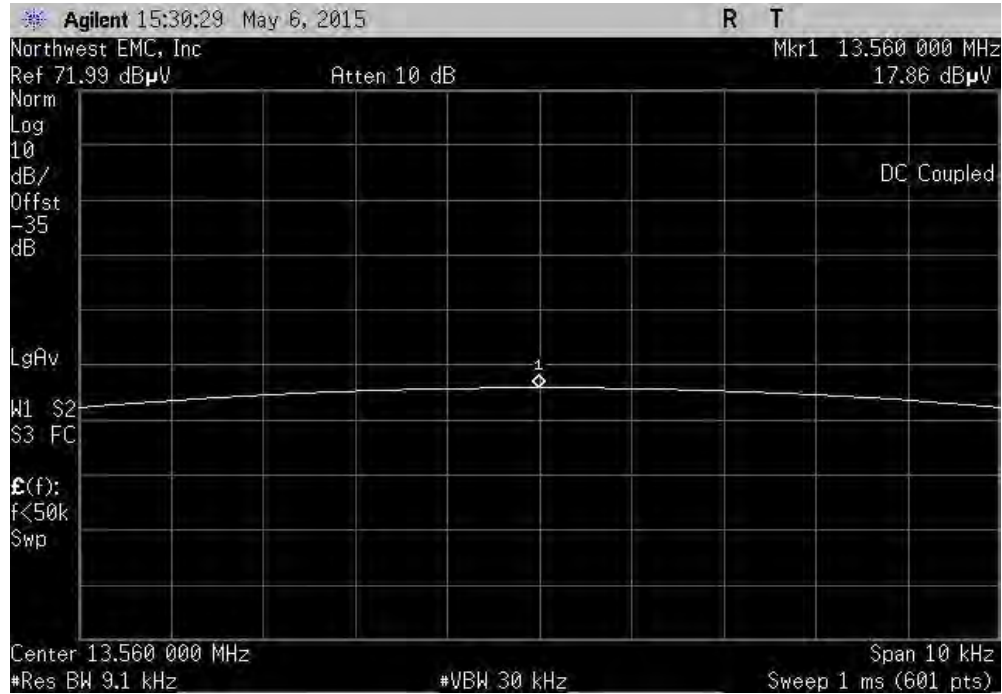


13.56 MHz, Temperature Variation, 0 °C, After 10 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560417	13.56	0.003%	±0.01%	Pass	

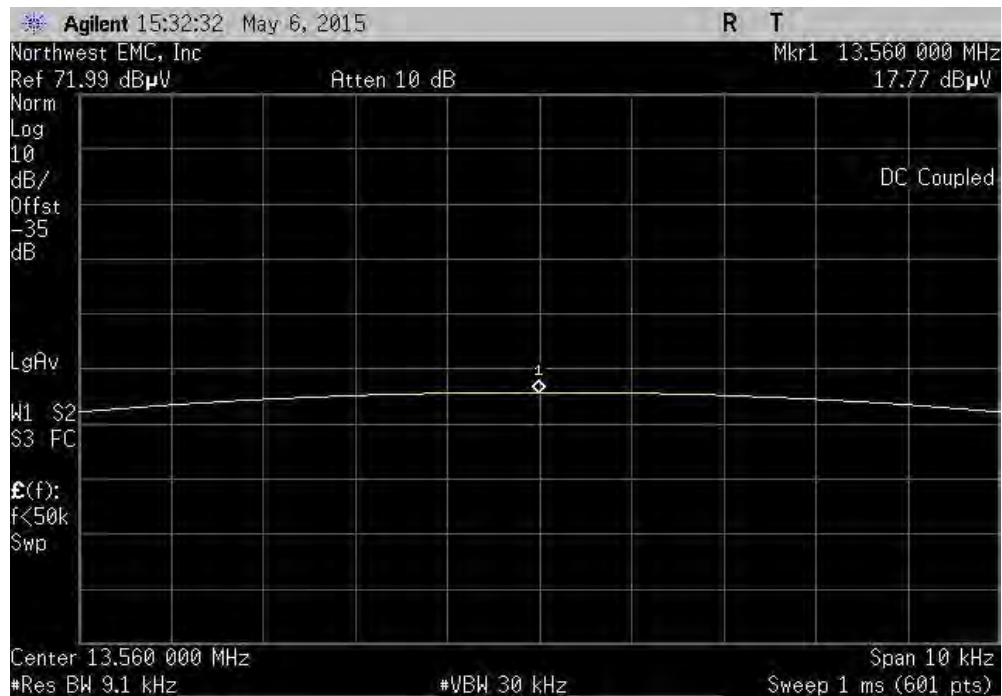


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 10 °C, Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560000	13.56	0.000%	±0.01%	Pass	

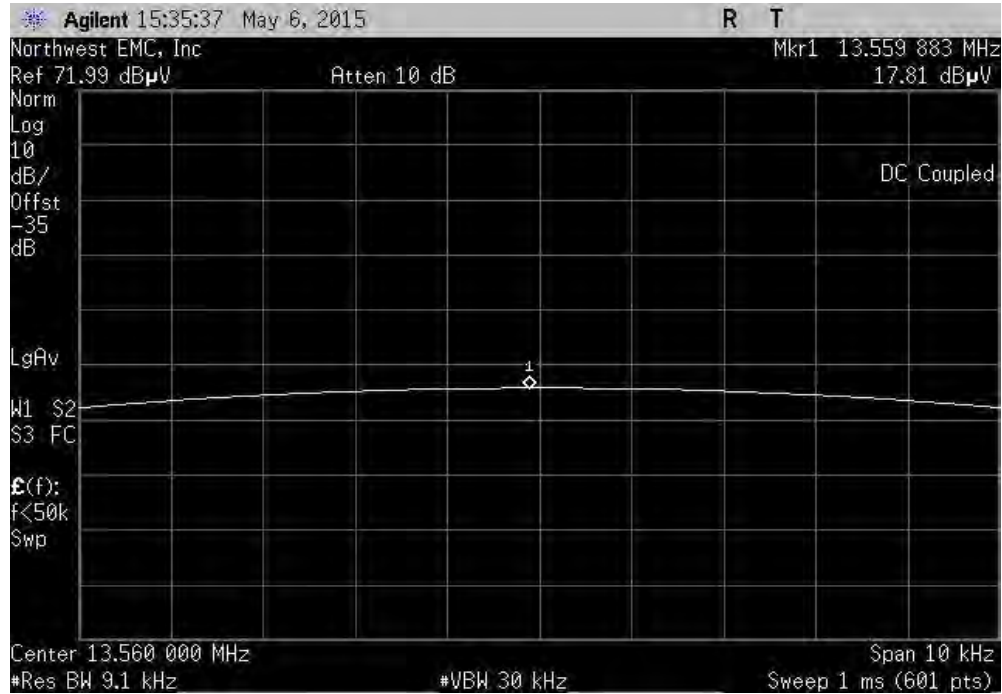


13.56 MHz, Temperature Variation, 10 °C, After 2 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560000	13.56	0.000%	±0.01%	Pass	

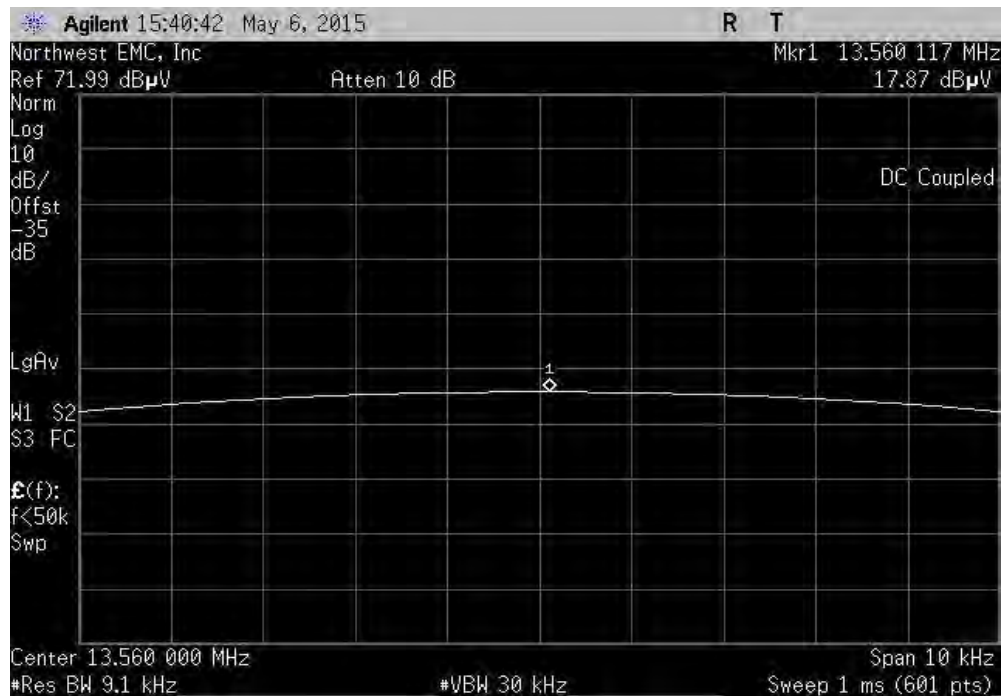


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 10 °C, After 5 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559883	13.56	-0.001%	±0.01%	Pass	

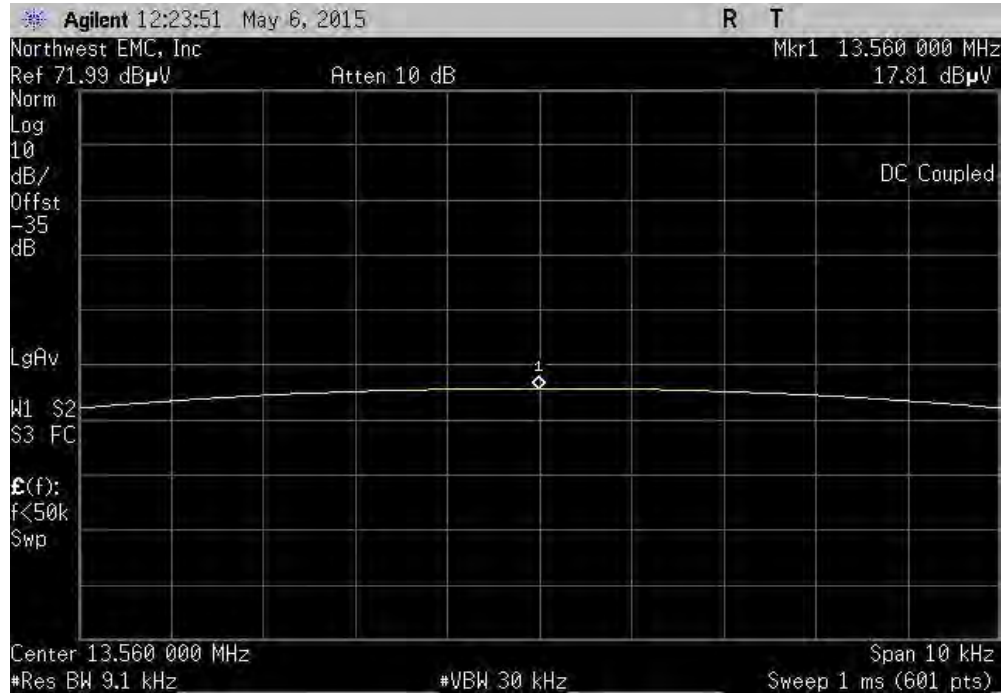


13.56 MHz, Temperature Variation, 10 °C, After 10 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560117	13.56	0.001%	±0.01%	Pass	

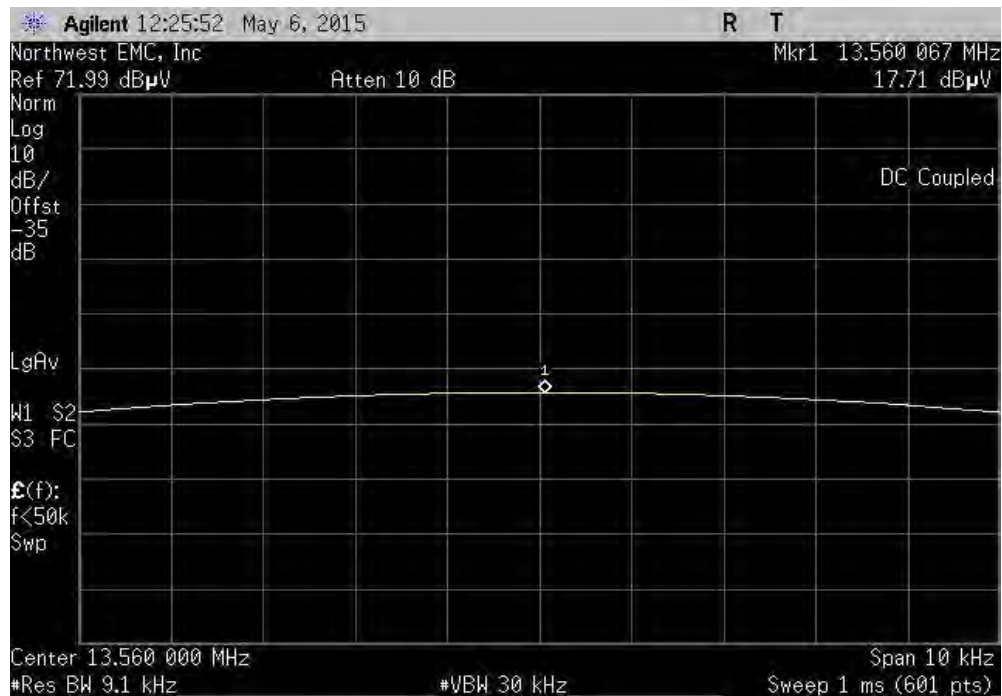


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 20 °C (Nominal), Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560000	13.56	0.000%	±0.01%	Pass	

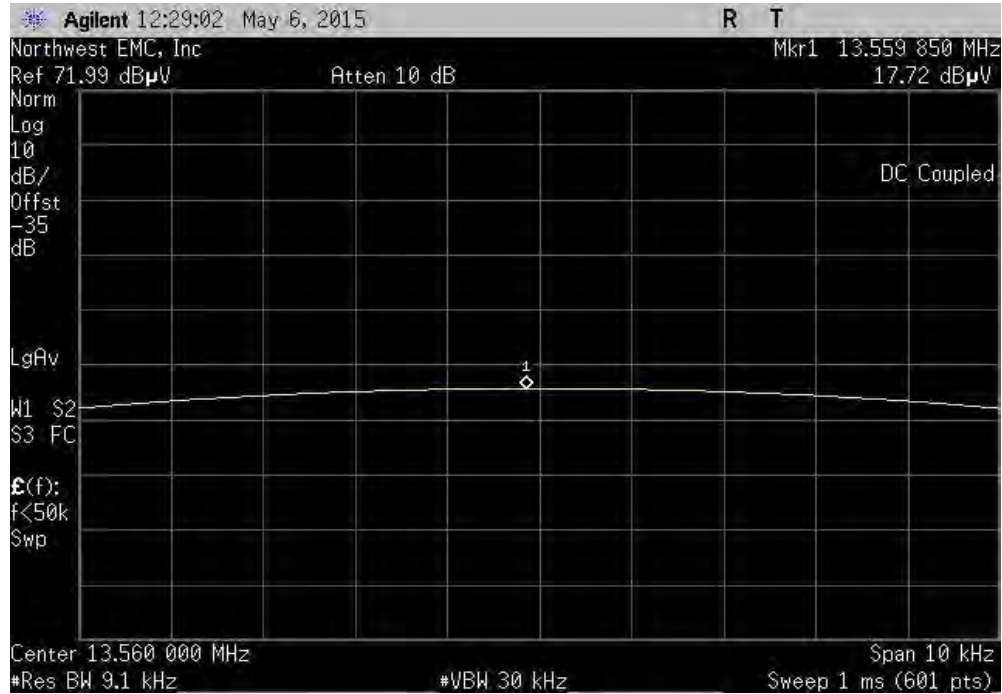


13.56 MHz, Temperature Variation, 20 °C (Nominal), After 2 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560067	13.56	0.000%	±0.01%	Pass	

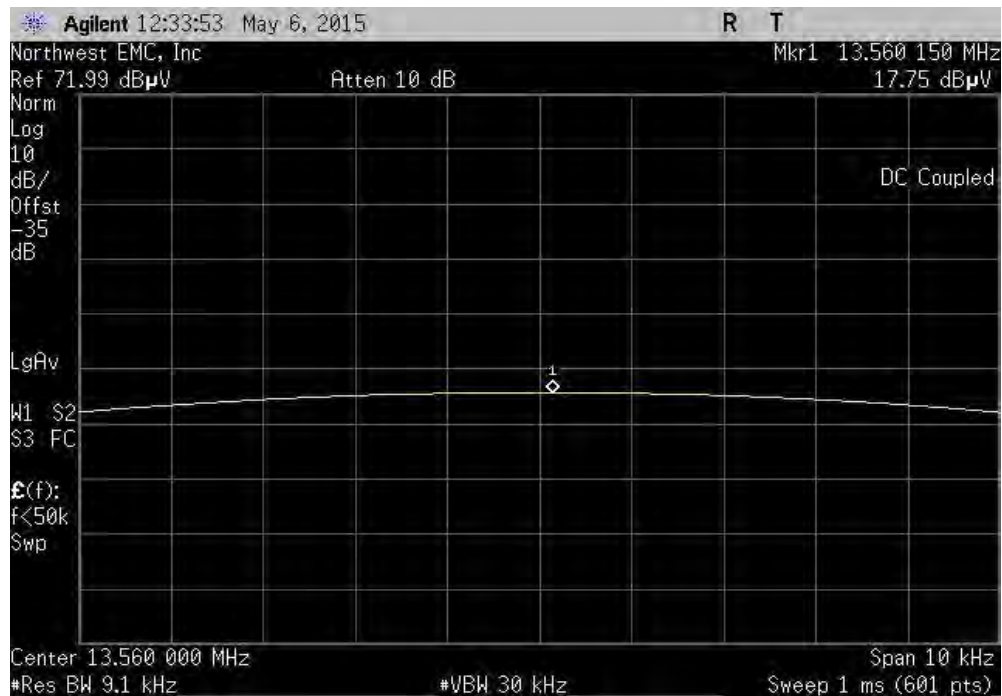


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 20 °C (Nominal), After 5 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559850	13.56	-0.001%	±0.01%	Pass	

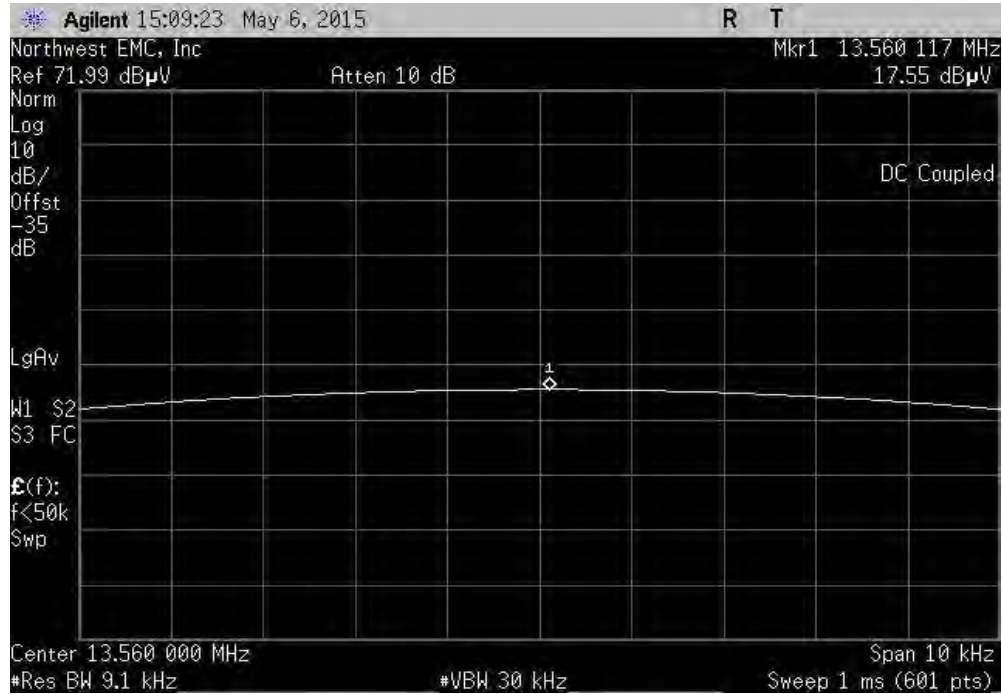


13.56 MHz, Temperature Variation, 20 °C (Nominal), After 10 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560150	13.56	0.001%	±0.01%	Pass	

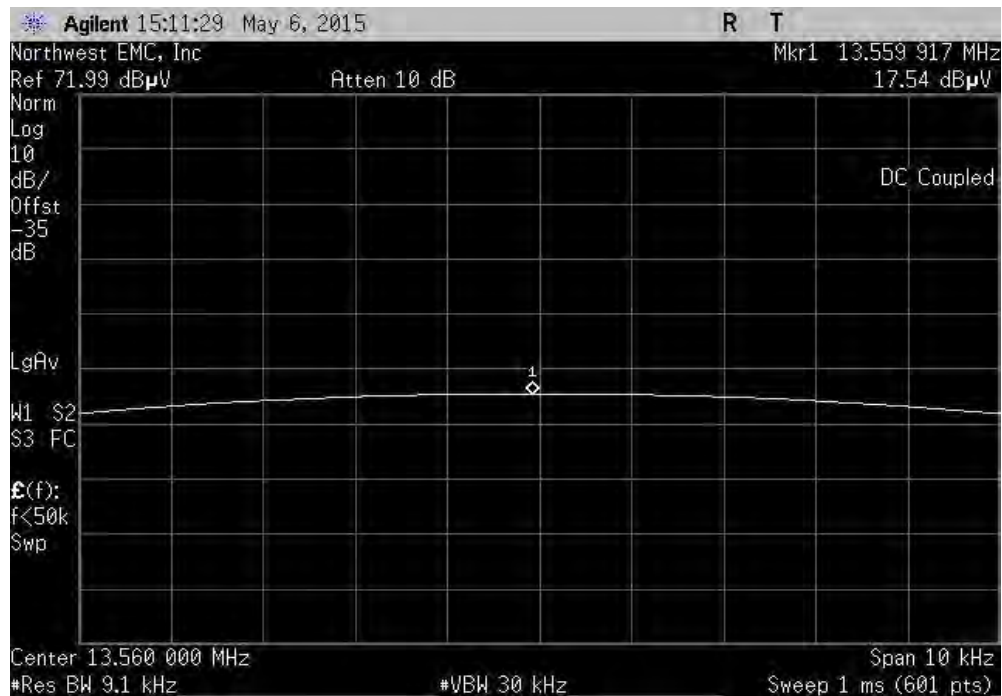


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 30 °C, Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560117	13.56	0.001%	±0.01%	Pass	

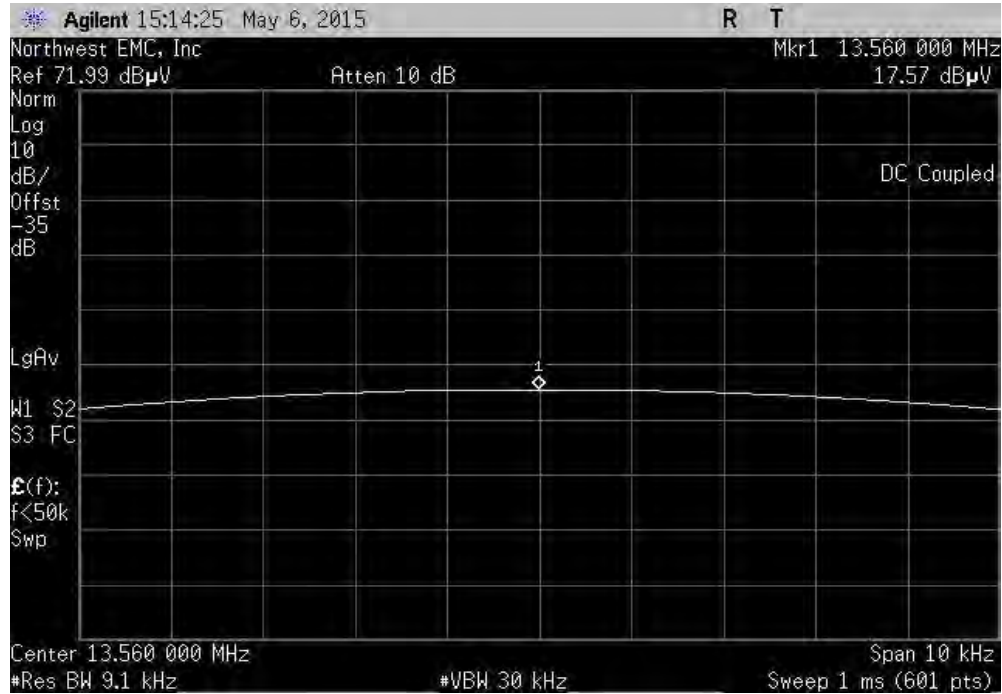


13.56 MHz, Temperature Variation, 30 °C, After 2 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559917	13.56	-0.001%	±0.01%	Pass	

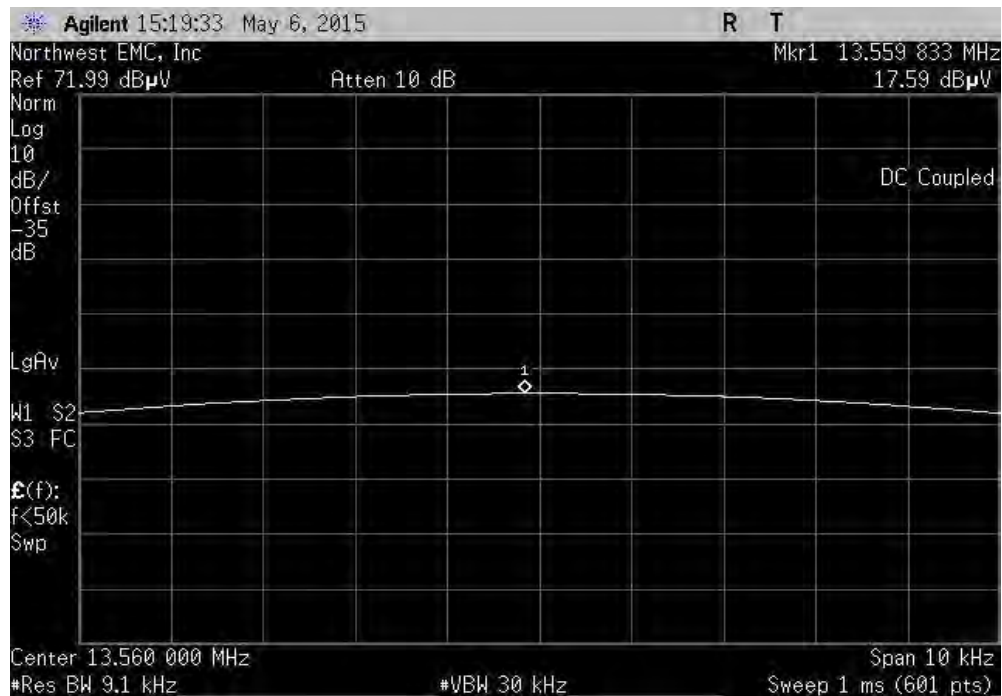


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 30 °C, After 5 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560000	13.56	0.000%	±0.01%	Pass	

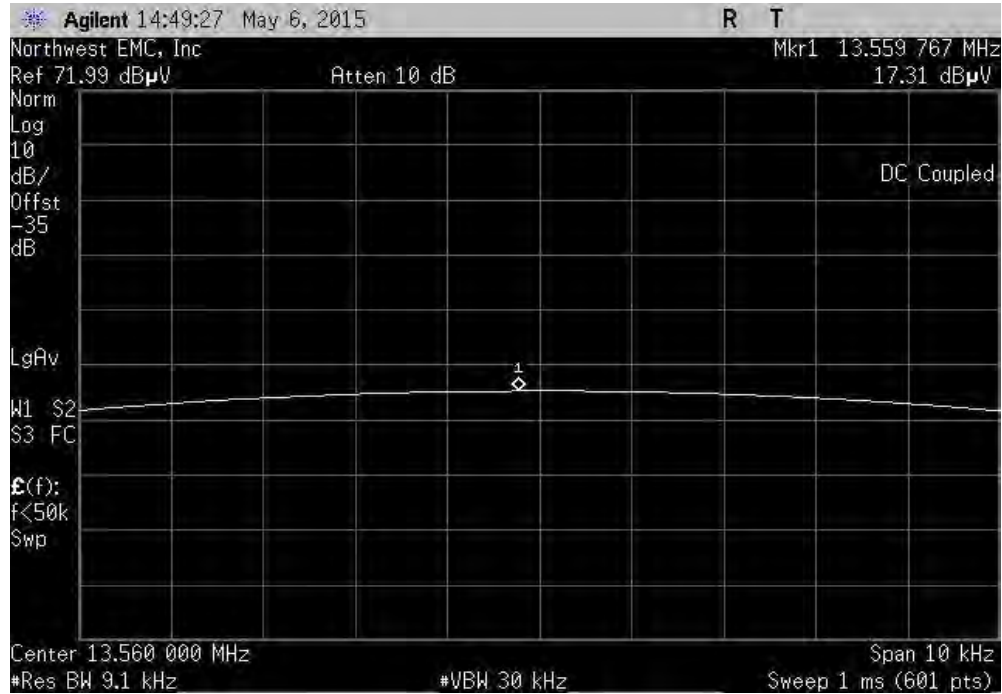


13.56 MHz, Temperature Variation, 30 °C, After 10 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559833	13.56	-0.001%	±0.01%	Pass	

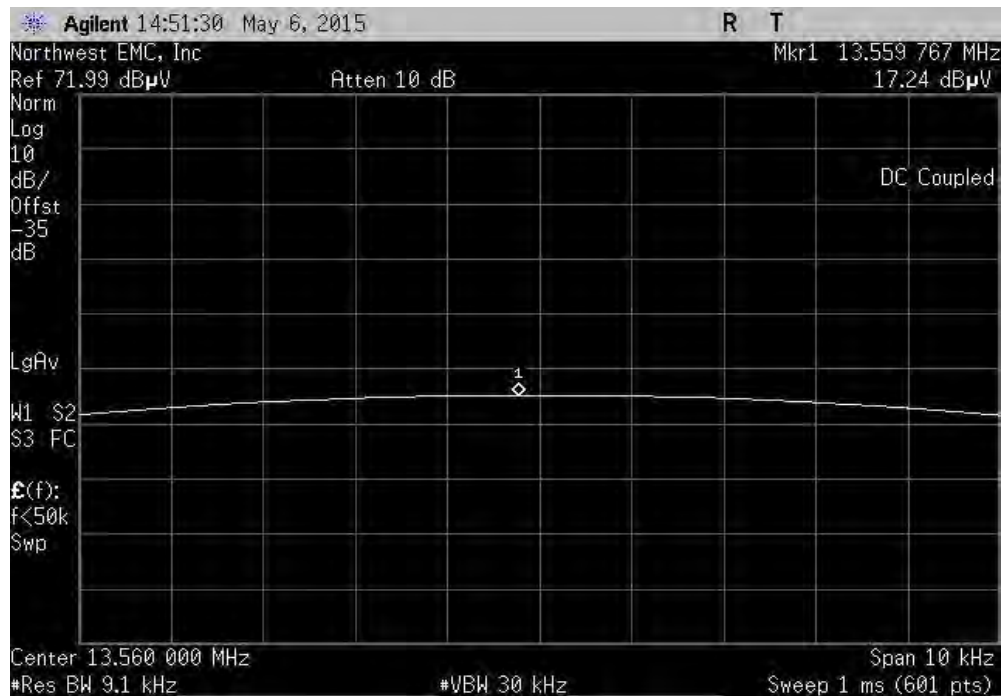


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 40 °C, Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559767	13.56	-0.002%	±0.01%	Pass	

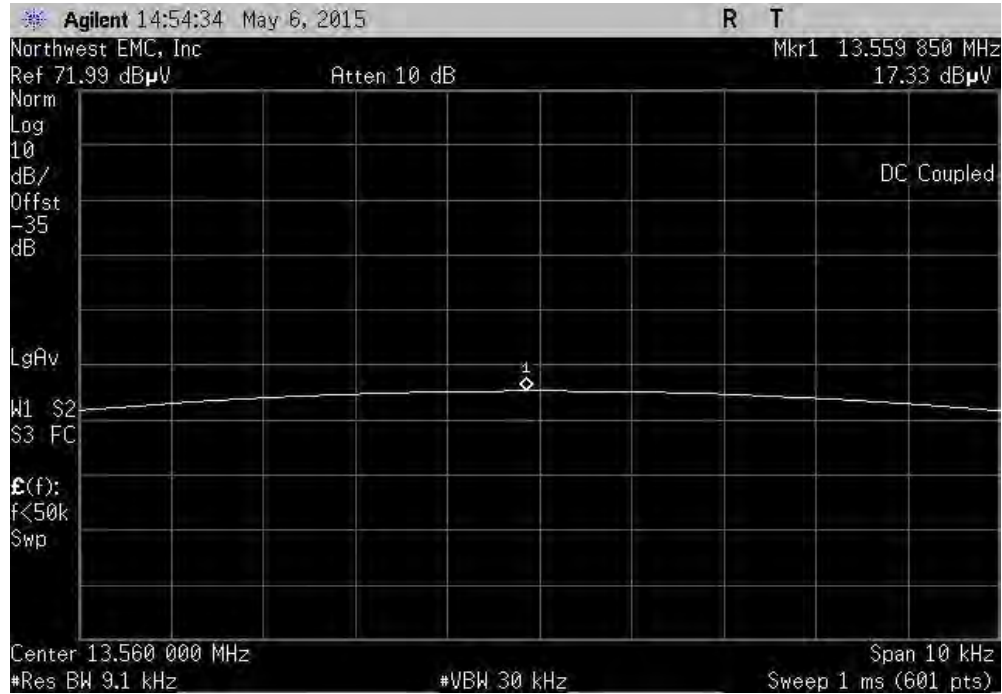


13.56 MHz, Temperature Variation, 40 °C, After 2 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559767	13.56	-0.002%	±0.01%	Pass	

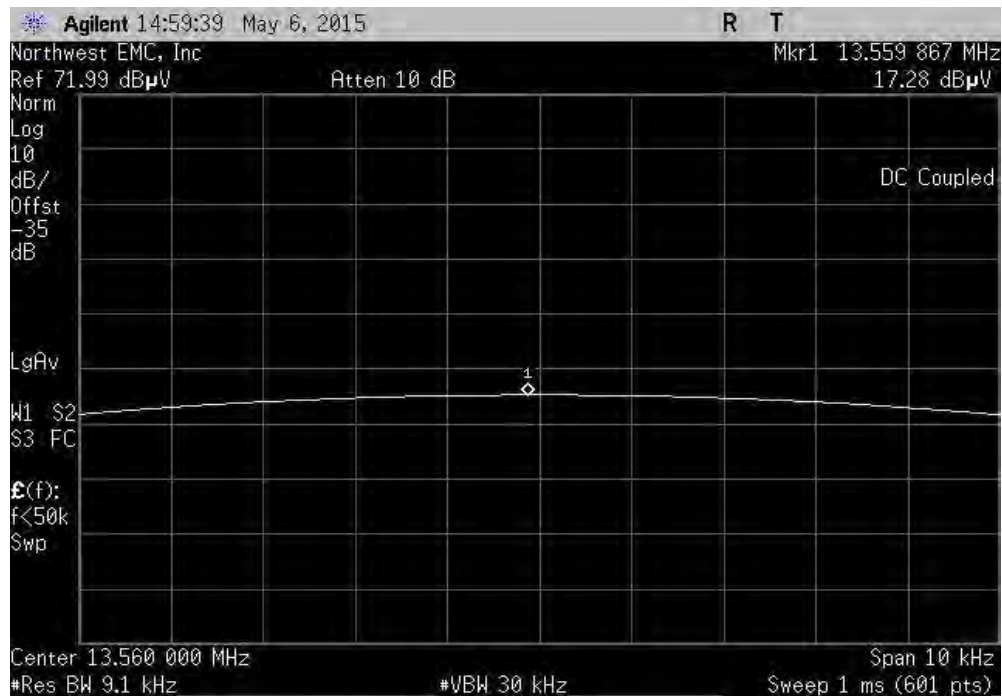


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 40 °C, After 5 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559850	13.56	-0.001%	±0.01%	Pass	

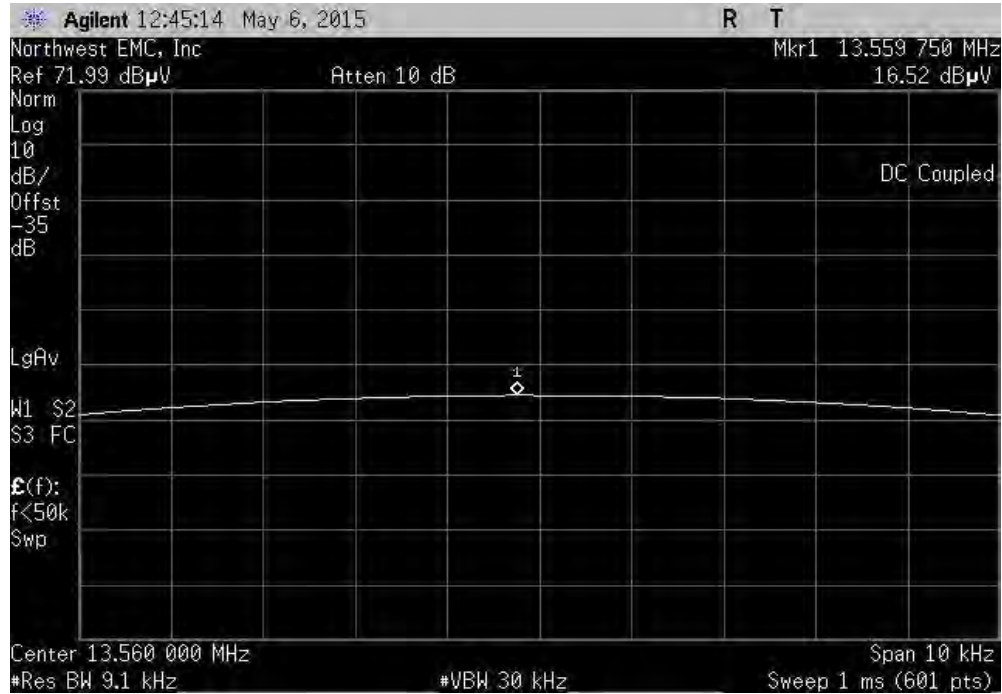


13.56 MHz, Temperature Variation, 40 °C, After 10 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559867	13.56	-0.001%	±0.01%	Pass	

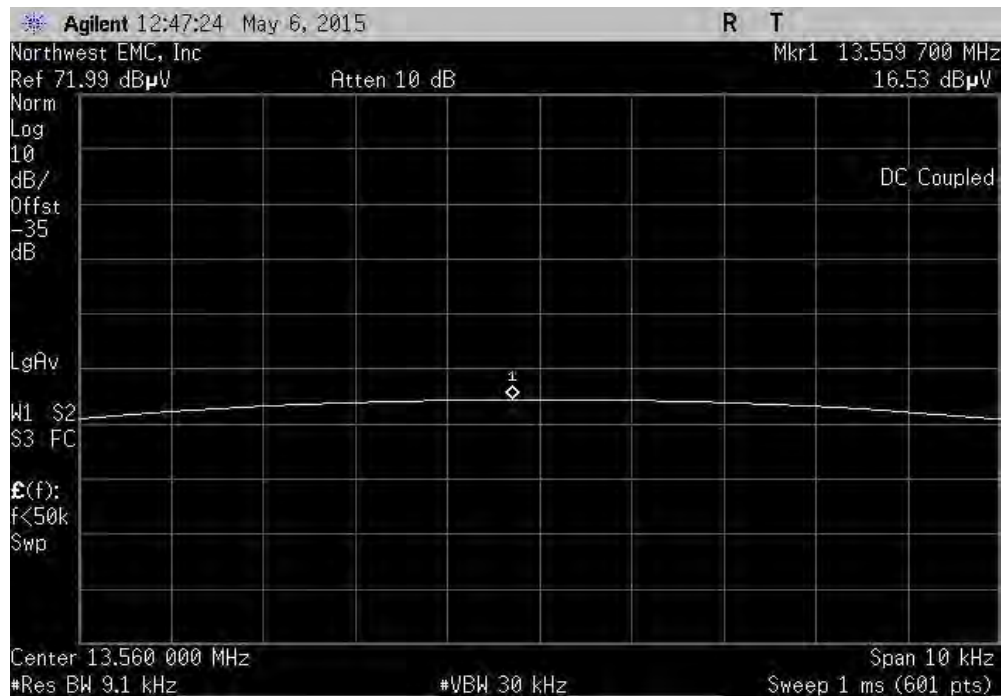


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 50 °C (High), Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559750	13.56	-0.002%	±0.01%	Pass	

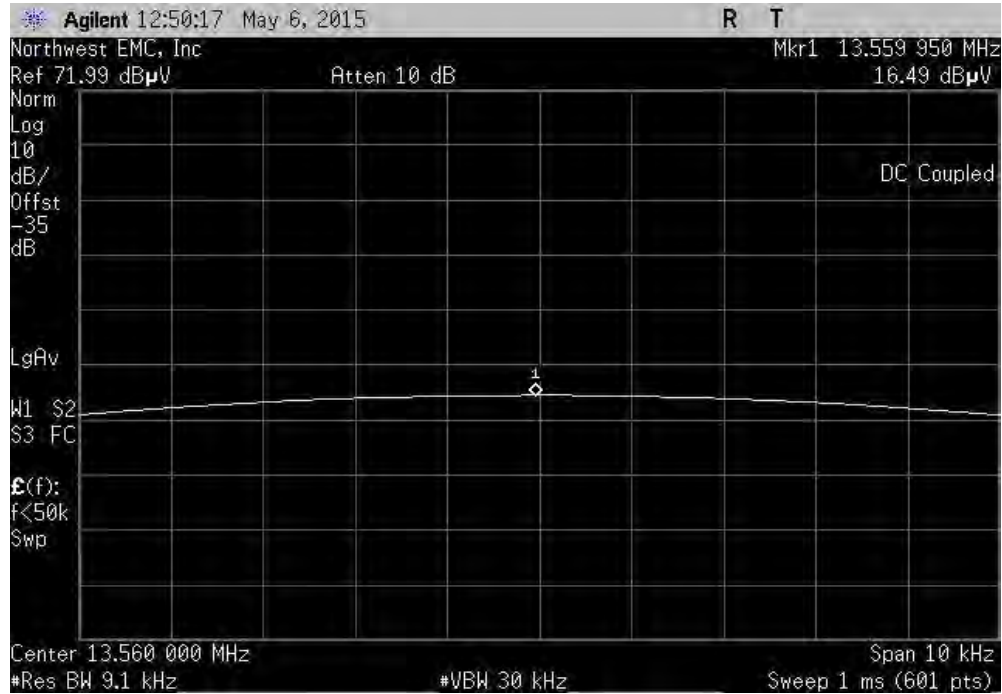


13.56 MHz, Temperature Variation, 50 °C (High), After 2 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559700	13.56	-0.002%	±0.01%	Pass	

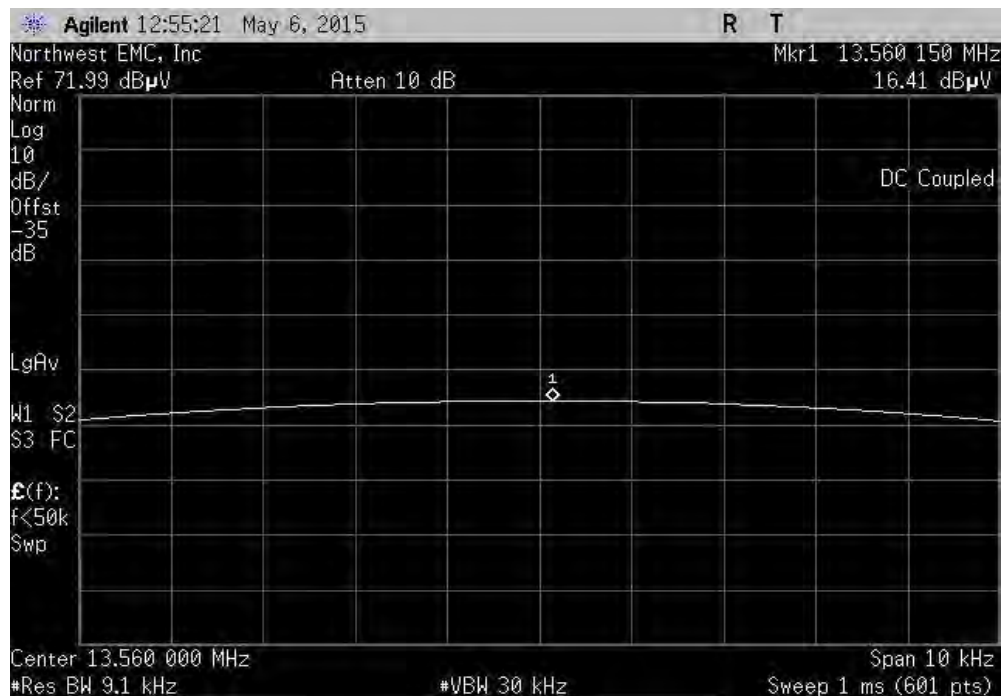


FREQUENCY STABILITY

13.56 MHz, Temperature Variation, 50 °C (High), After 5 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559950	13.56	0.000%	±0.01%	Pass	

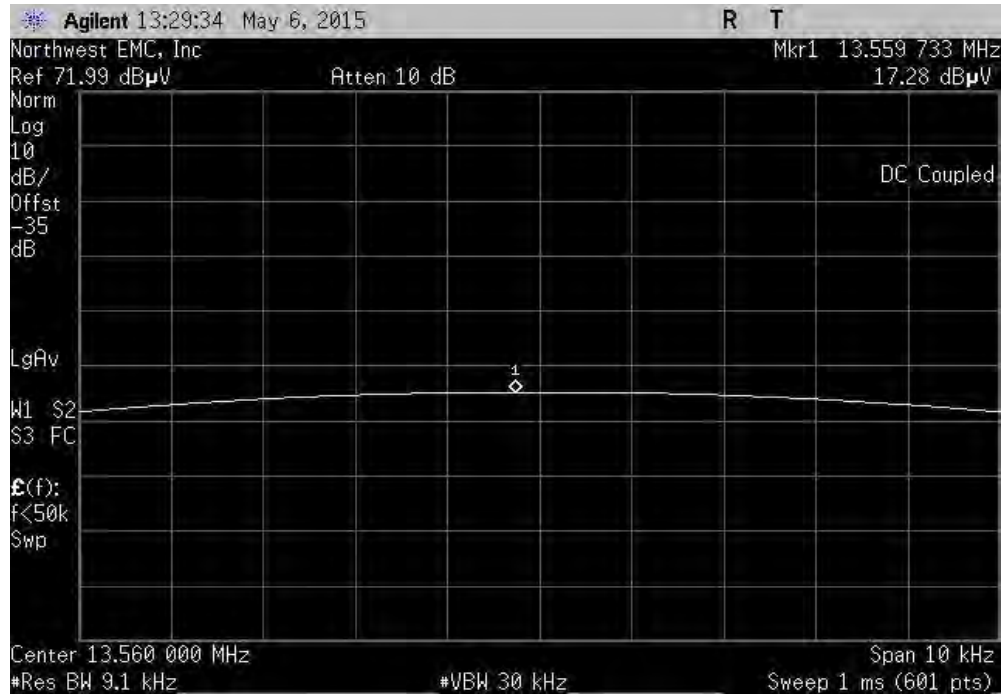


13.56 MHz, Temperature Variation, 50 °C (High), After 10 Minutes						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560150	13.56	0.001%	±0.01%	Pass	

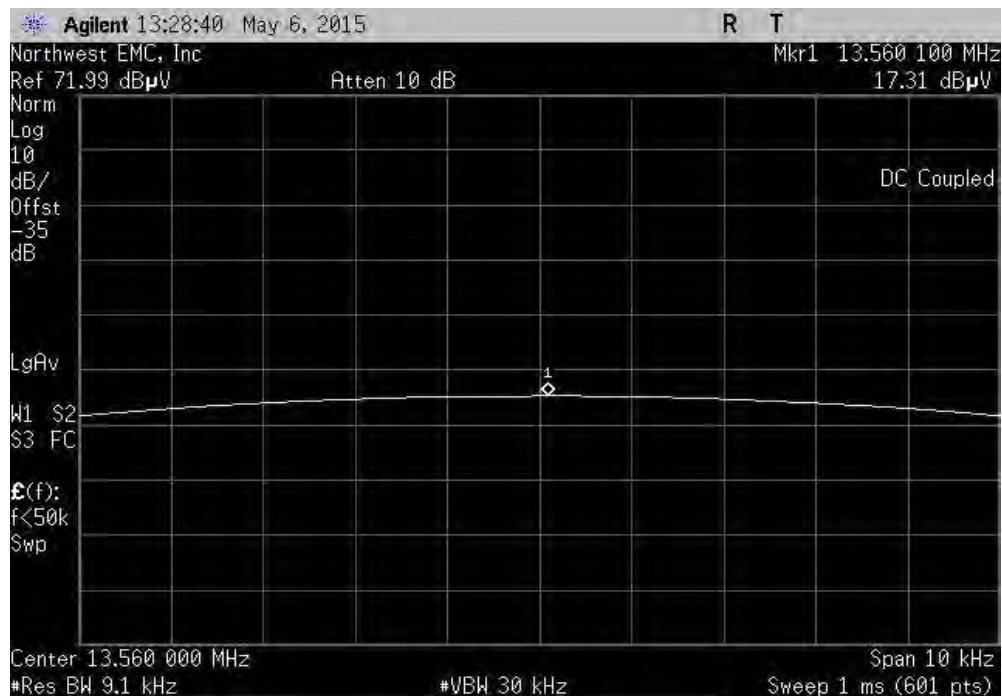


FREQUENCY STABILITY

13.56 MHz, Voltage Variation, 93.5 VAC (Low), Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.559733	13.56	-0.002%	±0.01%	Pass	

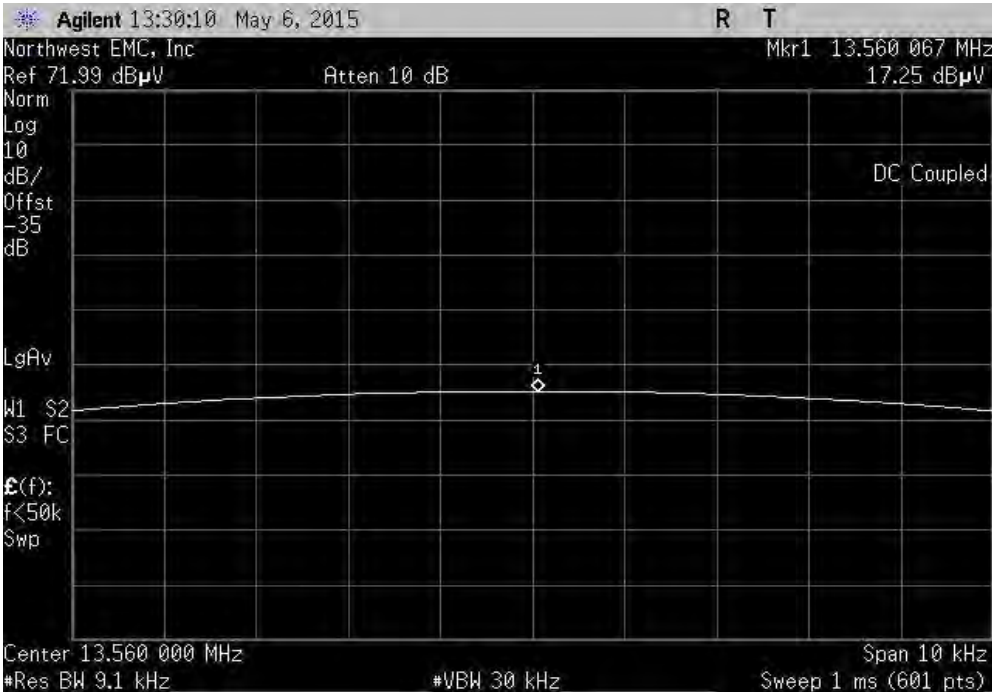


13.56 MHz, Voltage Variation, 110 VAC (Nominal), Start Up						
	Measured Value (MHz)	Desired Value (MHz)	Difference	Limit	Result	
	13.560100	13.56	0.001%	±0.01%	Pass	



FREQUENCY STABILITY

13.56 MHz, Voltage Variation, 126.5 VAC (High), Start Up						
Measured		Desired Value		Difference	Limit	Result
Value (MHz)		(MHz)				
13.560067		13.56		0.000%	±0.01%	Pass



13.560000

APPENDIX

Model and Host Information

Host Model Tested	Model Name for NFC Module
MXD-430	SAA5968-07
MXD-1000	SAA5968-05
MXD-2000XL-PAN	SAA5968-03

MODEL	NFC CIRCUITRY/LAYOUT COMMONALITY	MINIMUM FIRMWARE VERSION	OPERATING SYSTEM
MXT-2001-PAN	A	1.3.14	Android
MXD-2001-PAN-L	A	1.3.14	Android
MXD-2001-PAN-P	A	1.3.14	Android
MXT-2000XL-PAN	A	2.104.68	Linux
MXD-2000XL-PAN-L	A	2.104.68	Linux
MXD-2000XL-PAN-P	A	2.104.68	Linux
MXT-1901-PAN	A	1.3.14	Android
MXD-1901-PAN-L	A	1.3.14	Android
MXD-1901-PAN-P	A	1.3.14	Android
MXT-1900L-PAN	A	2.104.68	Linux
MXD-1900L-PAN-L	A	2.104.68	Linux
MXD-1900L-PAN-P	A	2.104.68	Linux
MXT-1001	B	1.3.14	Android
MXD-1001-L	B	1.3.14	Android
MXD-1001-P	B	1.3.14	Android
MXT-1000	B	2.104.68	Linux
MXD-1000-L	B	2.104.68	Linux
MXD-1000-P	B	2.104.68	Linux
MXT-701	B	1.3.14	Android
MXD-701-L	B	1.3.14	Android
MXD-701-P	B	1.3.14	Android
MXT-700	B	2.104.68	Linux
MXD-700-L	B	2.104.68	Linux
MXD-700-P	B	2.104.68	Linux
MXD-430	C	2.104.68	Linux