Graphic Products, Inc.

DLKodiak

FCC 15.207:2017

FCC 15.225:2017

13.56 MHz Radio

Report # GRAP0056.1

NVLAP Lab Code: 200630-0

CERTIFICATE OF TEST

Last Date of Test: May 23, 2017
Graphic Products, Inc.
Model: DLKodiak

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2017	ANSI C63.10:2013
FCC 15.225:2017	

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 Less Than 30 MHz	Yes	Pass	
6.5	Field Strength of Spurious Emissions Greater Than 30 MHz	Yes	Pass	
6.8	Frequency Stability	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Kyle Holgate, Operations Manager

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

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

2017.5.15

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 Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Validated by the European Commission as a Notified Body under the R&TTE Directive. Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

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.

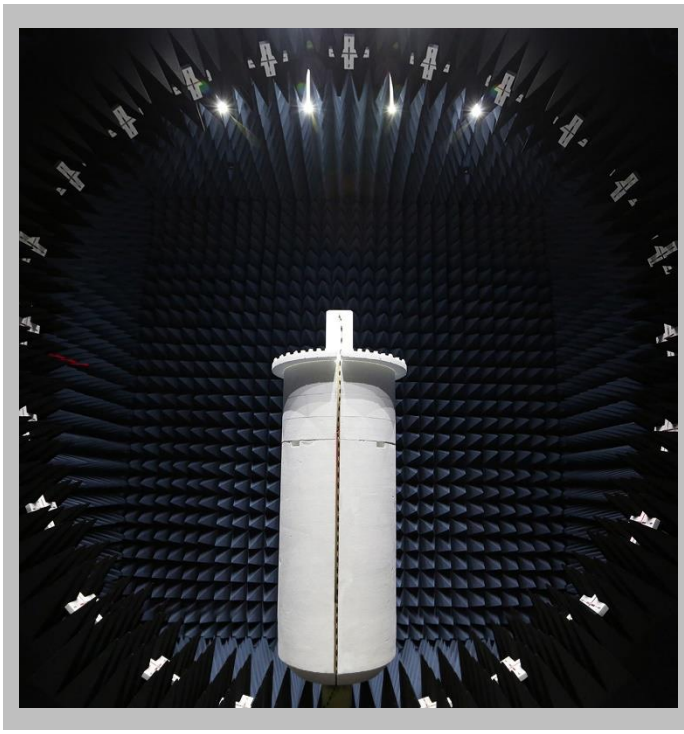
SCOPE

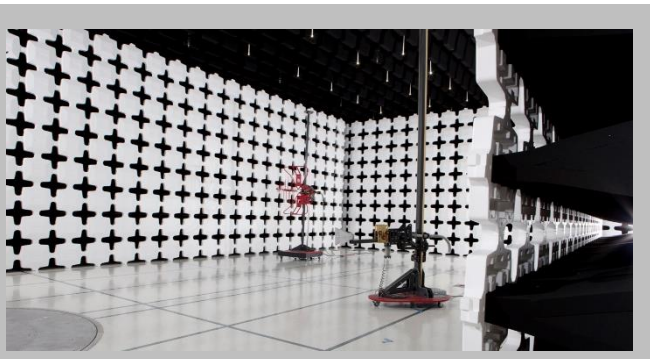
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

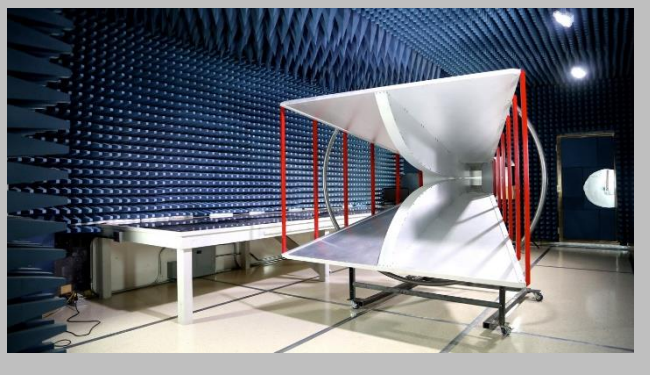
FACILITIES

2017.3.2

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
Innovation, Science and Economic Development 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







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.

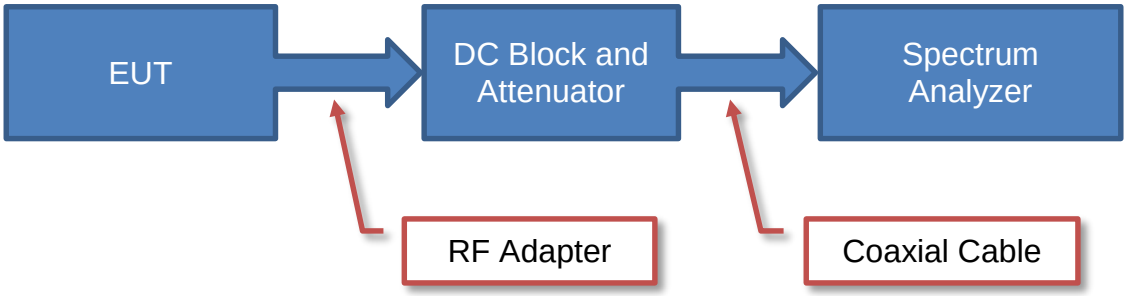
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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.

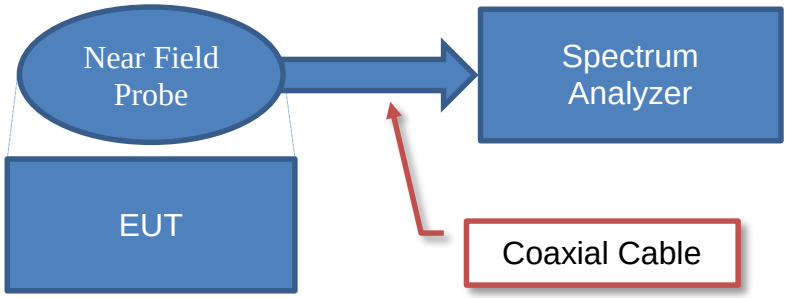
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

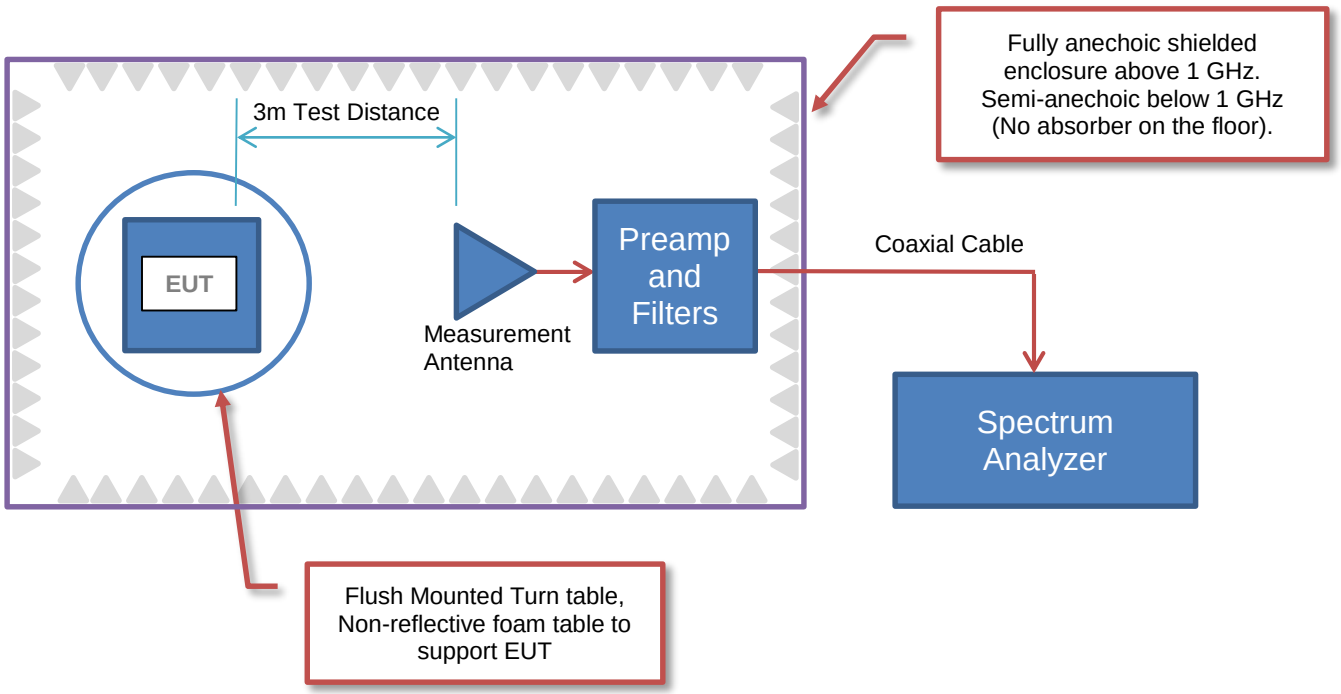
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Graphic Products, Inc.
Address:	PO Box 4030
City, State, Zip:	Beaverton, OR 97076-4030
Test Requested By:	Bob Martell
Model:	DLKodiak
First Date of Test:	May 22, 2017
Last Date of Test:	May 23, 2017
Receipt Date of Samples:	May 22, 2017
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Desktop Industrial sign and label printer utilizing a 13.56 MHZ RFID radio.

Testing Objective:
To demonstrate compliance of the 13.56 MHz radio to FCC Part 15.225 specifications.

CONFIGURATIONS

Configuration GRAP0056- 2

Software/Firmware Running during test	
Description	**Version**
EMI Test Software	14

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Thermal Transfer Printer	Graphic Products, Inc.	DLKodiak	A9

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
USB Keyboard	Dell	KB212-B	CN-0DJ454-71581-45H-02RY-A01
USB Mouse	Dell	XN966	Unknown
USB Bluetooth Radio	Microchip	RN42U-I	0006666CA518
USB Wifi Module	TP-LINK	TL-WN725N	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Remote Laptop	Dell	Latitude 2120	Unknown

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	1.8 m	No	AC Mains	Thermal Transfer Printer
USB	Yes	1.8 m	No	Thermal Transfer Printer	Remote Laptop
Ethernet	No	1.8 m	No	Thermal Transfer Printer	Remote Laptop
USB (Keyboard)	Yes	1.8m	No	Thermal Transfer Printer	USB Keyboard
USB (Mouse)	Yes	1.8m	No	Thermal Transfer Printer	USB Mouse

MODIFICATIONS

2017-1-25

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	5/22/2017	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	5/22/2017	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	5/22/2017	Field Strength of Spurious Emissions Less Than 30 MHz	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	5/22/2017	Field Strength of Spurious Emissions Greater Than 30 MHz	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	5/23/2017	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

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. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. 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 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESCI	ARH	3/27/2017	3/27/2018
Cable	None	10m Test Distance Cable	EVL	4/17/2017	4/17/2018
LISN	Solar Electronics	9252-50-R-24-BNC	LIP	10/4/2016	10/4/2018

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

GRAP0056-2

MODES INVESTIGATED

Continuous Tx/Rx 13.56 MHz RFID

POWERLINE CONDUCTED EMISSIONS

EUT:	DLKodiak	Work Order:	GRAP0056
Serial Number:	A9	Date:	05/22/2017
Customer:	Graphic Products, Inc.	Temperature:	22.8°C
Attendees:	Bob Martell and Mark Thueson	Relative Humidity:	46.8%
Customer Project:	None	Bar. Pressure:	1021 mb
Tested By:	Jeff Alcoke	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0056-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	10	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

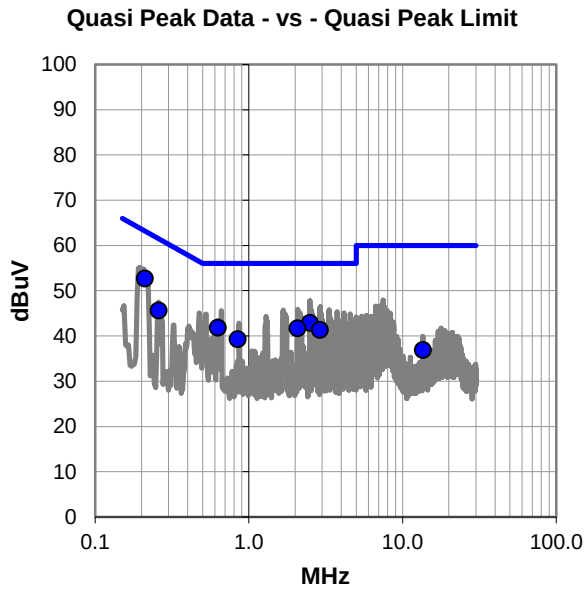
1 turn antenna ferrite.

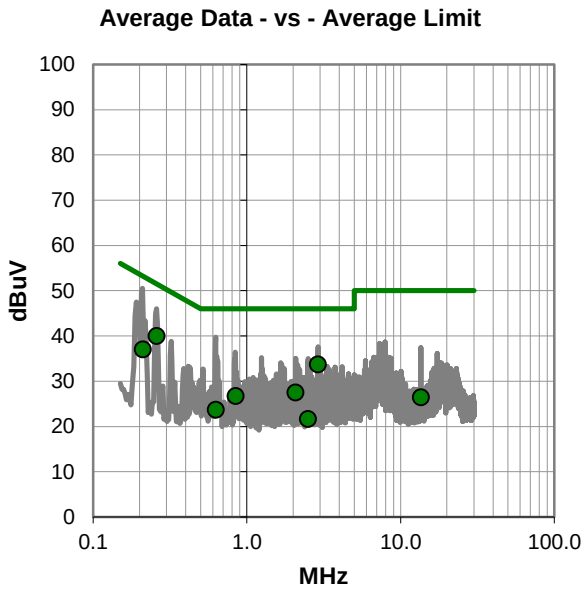
EUT OPERATING MODES

Continuous Tx/Rx 13.56 MHz RFID

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

RESULTS - Run #10

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.210	33.1	19.6	52.7	63.2	-10.5
2.500	23.2	19.7	42.9	56.0	-13.1
0.628	22.3	19.5	41.8	56.0	-14.2
2.079	22.1	19.6	41.7	56.0	-14.3
2.904	21.6	19.7	41.3	56.0	-14.7
0.260	26.0	19.6	45.6	61.4	-15.8
0.845	19.8	19.5	39.3	56.0	-16.7
13.560	16.7	20.2	36.9	60.0	-23.1

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.260	20.4	19.6	40.0	51.4	-11.4
2.904	14.0	19.7	33.7	46.0	-12.3
0.210	17.4	19.6	37.0	53.2	-16.2
2.079	7.9	19.6	27.5	46.0	-18.5
0.845	7.2	19.5	26.7	46.0	-19.3
0.628	4.2	19.5	23.7	46.0	-22.3
13.560	6.2	20.2	26.4	50.0	-23.6
2.500	1.9	19.7	21.6	46.0	-24.4

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

EUT:	DLKodiak	Work Order:	GRAP0056
Serial Number:	A9	Date:	05/22/2017
Customer:	Graphic Products, Inc.	Temperature:	22.8°C
Attendees:	Bob Martell and Mark Thueson	Relative Humidity:	46.8%
Customer Project:	None	Bar. Pressure:	1021 mb
Tested By:	Jeff Alcoke	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0056-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	11	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

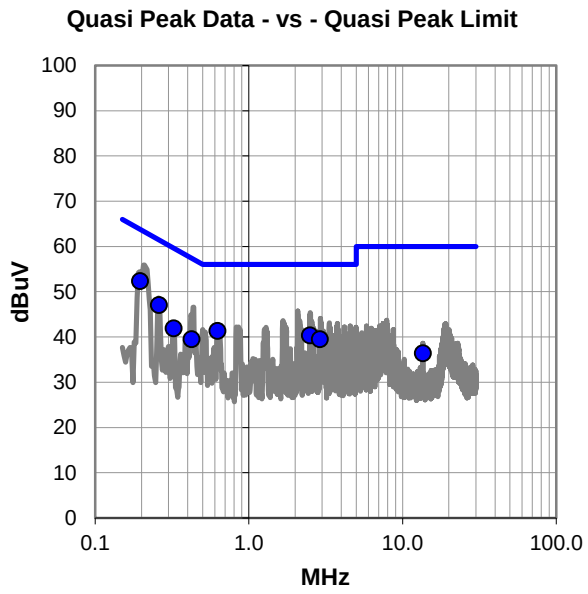
1 turn antenna ferrite.

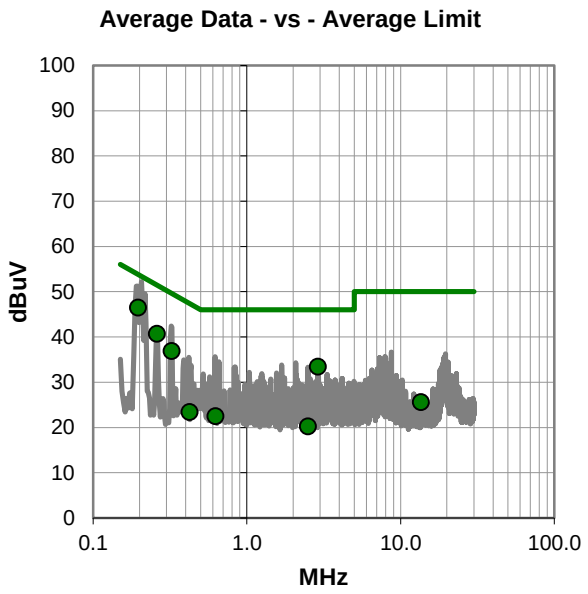
EUT OPERATING MODES

Continuous Tx/Rx 13.56 MHz RFID

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

WTD.2017.03.21

RESULTS - Run #11

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.196	32.7	19.6	52.3	63.8	-11.5
0.260	27.4	19.6	47.0	61.4	-14.4
0.625	21.8	19.5	41.3	56.0	-14.7
2.502	20.6	19.7	40.3	56.0	-15.7
2.904	19.8	19.7	39.5	56.0	-16.5
0.325	22.4	19.5	41.9	59.6	-17.7
0.425	20.0	19.5	39.5	57.3	-17.8
13.561	16.2	20.2	36.4	60.0	-23.6

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.196	26.9	19.6	46.5	53.8	-7.3
0.260	21.1	19.6	40.7	51.4	-10.7
2.904	13.7	19.7	33.4	46.0	-12.6
0.325	17.4	19.5	36.9	49.6	-12.7
0.625	3.0	19.5	22.5	46.0	-23.5
0.425	3.9	19.5	23.4	47.3	-23.9
13.561	5.4	20.2	25.6	50.0	-24.4
2.502	0.5	19.7	20.2	46.0	-25.8

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF FUNDAMENTAL

PSA-ESCI 2017.01.26

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

Continuous Tx/Rx 13.56MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

GRAP0056 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	12.9 MHz	Stop Frequency	14.3 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	EMCO	6502	AOA	7/6/2016	24 mo
Cable	None	10m Test Distance Cable	EVL	4/17/2017	12 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	4/25/2017	12 mo

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was 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). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The center of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.4, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

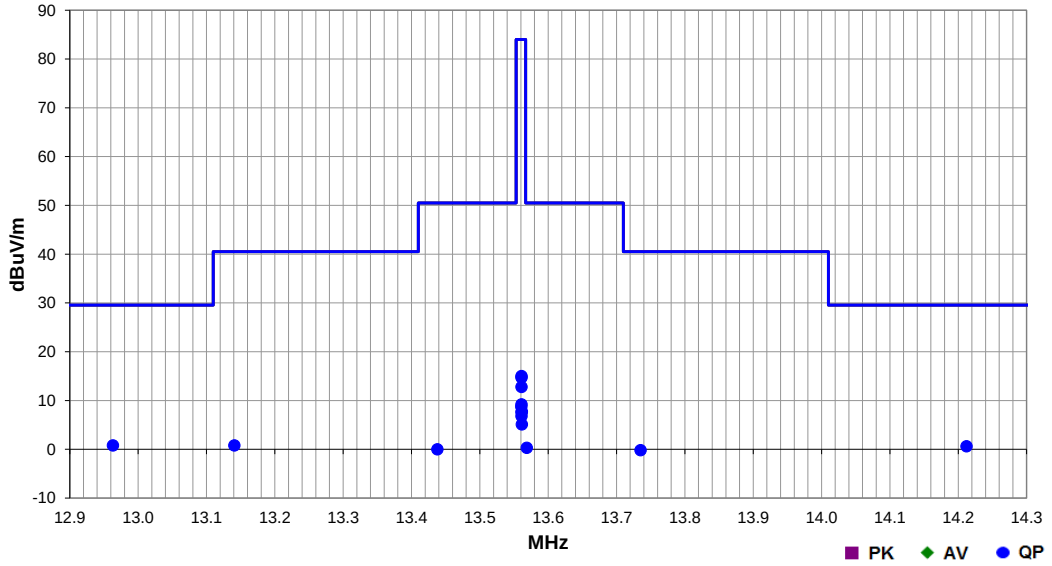
FIELD STRENGTH OF FUNDAMENTAL

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	GRAP0056	**Date:**	05/22/17		
Project:	None	**Temperature:**	22.2 °C		
Job Site:	EV11	**Humidity:**	41.7% RH		
Serial Number:	A9	**Barometric Pres.:**	1022 mbar	**Tested by:**	Jeff Alcoke and Rod Peloquin
EUT:	DLKodiak				
Configuration:	2				
Customer:	Graphic Products, Inc.				
Attendees:	Bob Martell and Mark Thueson				
EUT Power:	110VAC/60Hz				
Operating Mode:	Continuous Tx/Rx 13.56MHz				
Deviations:	None				
Comments:	See comments below for Antenna and EUT orientations.				

Test Specifications	**Test Method**
FCC 15.225:2017	ANSI C63.10:2013

Run #	14	**Test Distance (m)**	10	**Antenna Height(s)**	1(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
12.963	8.8	11.1	1.0	356.0	10.0	0.0	Horz	QP	-19.1	0.8	29.5	-28.7	Ant Perp to EUT, Perp to Ground, EUT Vertical
14.212	8.6	11.1	1.0	-5.0	10.0	0.0	Horz	QP	-19.1	0.6	29.5	-28.9	Ant Perp to EUT, Perp to Ground, EUT Vertical
13.141	8.8	11.1	1.0	242.0	10.0	0.0	Horz	QP	-19.1	0.8	40.5	-39.7	Ant Perp to EUT, Perp to Ground, EUT Vertical
13.735	7.8	11.1	1.0	255.0	10.0	0.0	Horz	QP	-19.1	-0.2	40.5	-40.7	Ant Perp to EUT, Perp to Ground, EUT Vertical
13.569	8.3	11.1	1.0	254.0	10.0	0.0	Horz	QP	-19.1	0.3	50.5	-50.2	Ant Perp to EUT, Perp to Ground, EUT Vertical
13.438	8.0	11.1	1.0	222.0	10.0	0.0	Horz	QP	-19.1	0.0	50.5	-50.5	Ant Perp to EUT, Perp to Ground, EUT Vertical
13.561	23.0	11.1	1.0	190.0	10.0	0.0	Horz	QP	-19.1	15.0	84.0	-69.0	Ant Perp to EUT, Perp to Ground, EUT Vertical
13.561	22.7	11.1	1.0	177.0	10.0	0.0	Horz	QP	-19.1	14.7	84.0	-69.3	Ant Perp to EUT, Perp to Ground, EUT on side
13.561	20.8	11.1	1.0	241.0	10.0	0.0	Horz	QP	-19.1	12.8	84.0	-71.2	Ant Perp to EUT, Perp to Ground, EUT Horizontal.
13.561	17.2	11.1	1.0	300.0	10.0	0.0	Vert	QP	-19.1	9.2	84.0	-74.8	Ant Perp to EUT, Para to Ground, EUT Vertical
13.561	16.7	11.1	1.0	254.0	10.0	0.0	Vert	QP	-19.1	8.7	84.0	-75.3	Ant Perp to EUT, Para to Ground, EUT on side
13.561	15.7	11.1	1.0	242.0	10.0	0.0	Horz	QP	-19.1	7.7	84.0	-76.3	Ant Para to EUT, Perp to Ground, EUT on side
13.561	15.6	11.1	1.0	354.0	10.0	0.0	Horz	QP	-19.1	7.6	84.0	-76.4	Ant Para to EUT, Perp to Ground, EUT Vertical
13.561	14.8	11.1	1.0	142.0	10.0	0.0	Horz	QP	-19.1	6.8	84.0	-77.2	Ant Para to EUT, Perp to Ground, EUT Horizontal.
13.562	13.1	11.1	1.0	108.0	10.0	0.0	Vert	QP	-19.1	5.1	84.0	-78.9	Ant Perp to EUT, Para to Ground, EUT Horizontal.

FIELD STRENGTH OF SPURIOUS EMISSIONS LESS THAN 30 MHZ

PSA-ESCI 2017.01.26

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

Continuous Tx/Rx 13.56MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

GRAP0056 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	0.1 MHz	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
Cable	None	10m Test Distance Cable	EVL	4/17/2017	12 mo
Antenna	EMCO	6502	AOA	7/6/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	4/25/2017	12 mo

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual 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 if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.4, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

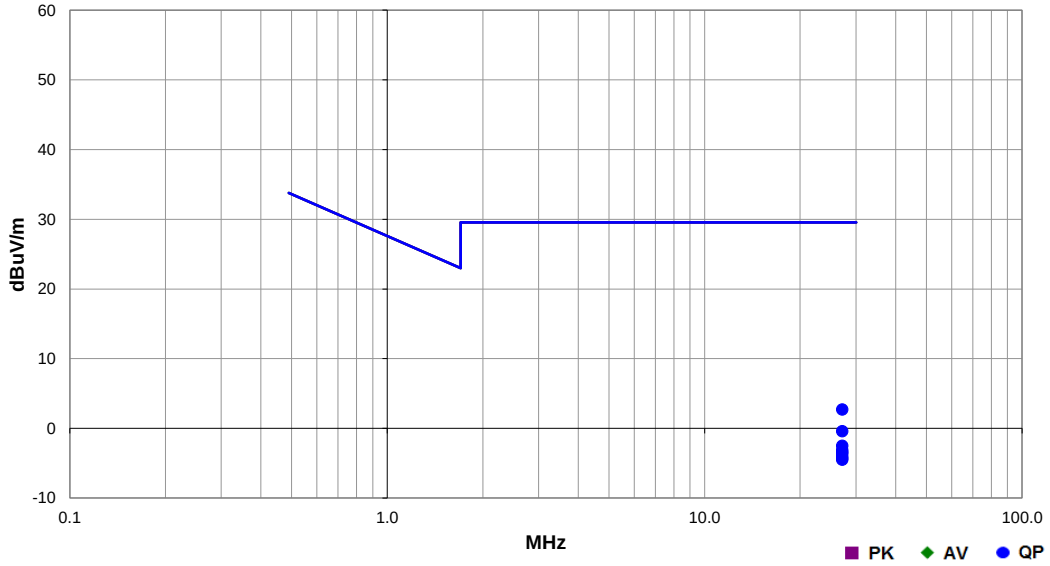
FIELD STRENGTH OF SPURIOUS EMISSIONS LESS THAN 30 MHZ

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	GRAP0056	**Date:**	05/22/17		
Project:	None	**Temperature:**	22.2 °C		
Job Site:	EV11	**Humidity:**	41.7% RH		
Serial Number:	A9	**Barometric Pres.:**	1022 mbar	**Tested by:**	Jeff Alcoke
EUT:	DLKodiak				
Configuration:	2				
Customer:	Graphic Products, Inc.				
Attendees:	Bob Martell and Mark Thueson				
EUT Power:	110VAC/60Hz				
Operating Mode:	Continuous Tx/Rx 13.56MHz				
Deviations:	None				
Comments:	See comments below for Antenna and EUT orientations.				

Test Specification	**Test Method**
FCC 15.225:2017	ANSI C63.10:2013

Run #	13	**Test Distance (m)**	10	**Antenna Height(s)**	1(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
27.126	12.5	9.3	1.0	65.0	10.0	0.0	Horz	QP	-19.1	2.7	29.5	-26.8	Ant Perp to EUT, Perp to Ground, EUT Vertical
27.124	9.4	9.3	1.0	328.0	10.0	0.0	Horz	QP	-19.1	-0.4	29.5	-29.9	Ant Perp to EUT, Perp to Ground, EUT on side
27.124	7.3	9.3	1.0	292.0	10.0	0.0	Horz	QP	-19.1	-2.5	29.5	-32.0	Ant Perp to EUT, Perp to Ground, EUT Horizontal.
27.126	6.7	9.3	1.0	35.0	10.0	0.0	Vert	QP	-19.1	-3.1	29.5	-32.6	Ant Perp to EUT, Para to Ground, EUT Vertical
27.116	6.4	9.3	1.0	303.0	10.0	0.0	Vert	QP	-19.1	-3.4	29.5	-32.9	Ant Perp to EUT, Para to Ground, EUT Horizontal.
27.119	6.2	9.3	1.0	70.0	10.0	0.0	Horz	QP	-19.1	-3.6	29.5	-33.1	Ant Para to EUT, Perp to Ground, EUT Horizontal.
27.118	5.8	9.3	1.0	83.0	10.0	0.0	Vert	QP	-19.1	-4.0	29.5	-33.5	Ant Perp to EUT, Para to Ground, EUT on side
27.126	5.5	9.3	1.0	14.0	10.0	0.0	Horz	QP	-19.1	-4.3	29.5	-33.8	Ant Para to EUT, Perp to Ground, EUT Vertical
27.120	5.3	9.3	1.0	3.0	10.0	0.0	Horz	QP	-19.1	-4.5	29.5	-34.0	Ant Para to EUT, Perp to Ground, EUT on side

FIELD STRENGTH OF SPURIOUS EMISSIONS GREATER THAN 30 MHZ

PSA-ESCI 2017.01.26

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

Continuous Tx/Rx 13.56MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

GRAP0056 - 2

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
Cable	N/A	Bilog Cables	EVA	2/6/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	2/6/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	6/30/2016	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	4/13/2017	12 mo

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting while set at the operating channel.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual 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). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

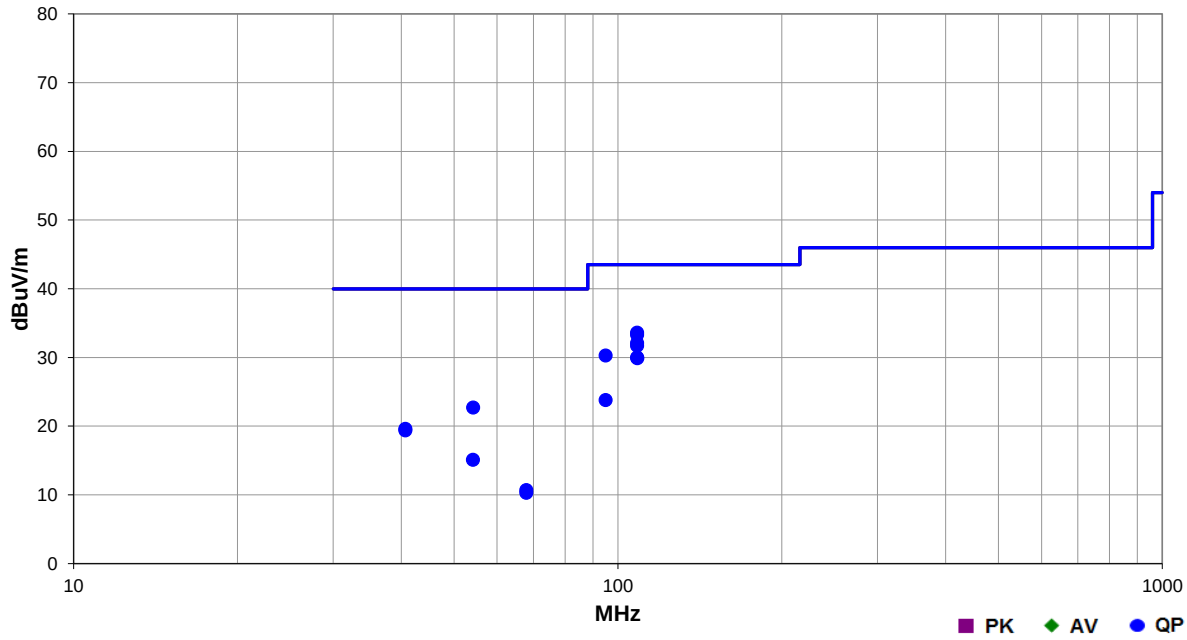
FIELD STRENGTH OF SPURIOUS EMISSIONS GREATER THAN 30 MHZ

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	GRAP0056	**Date:**	05/22/17		
Project:	None	**Temperature:**	24 °C		
Job Site:	EV01	**Humidity:**	46.6% RH		
Serial Number:	A9	**Barometric Pres.:**	1019 mbar	**Tested by:**	Jeff Alcoke and Rod Peloquin
EUT:	DLKodiak				
Configuration:	2				
Customer:	Graphic Products, Inc.				
Attendees:	Bob Martell				
EUT Power:	110VAC/60Hz				
Operating Mode:	Continuous Tx/Rx 13.56MHz				
Deviations:	None				
Comments:	See comments below for EUT orientation.				

Test Specifications	**Test Method**
FCC 15.225:2017	ANSI C63.10:2013

Run #	1	**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
108.496	40.5	-6.9	1.0	305.0	3.0	0.0	Vert	QP	0.0	33.6	43.5	-9.9	EUT Horizontal
108.498	40.2	-6.9	3.0	264.0	3.0	0.0	Horz	QP	0.0	33.3	43.5	-10.2	EUT Horizontal
108.496	39.0	-6.9	1.8	359.0	3.0	0.0	Horz	QP	0.0	32.1	43.5	-11.4	EUT On Side
108.499	38.6	-6.9	1.0	271.0	3.0	0.0	Vert	QP	0.0	31.7	43.5	-11.8	EUT On Side
94.941	38.6	-8.3	1.4	298.0	3.0	0.0	Vert	QP	0.0	30.3	43.5	-13.2	EUT Horizontal
108.495	36.9	-6.9	1.7	355.0	3.0	0.0	Vert	QP	0.0	30.0	43.5	-13.5	EUT Vertical
108.502	36.8	-6.9	2.1	28.0	3.0	0.0	Horz	QP	0.0	29.9	43.5	-13.6	EUT Vertical
54.198	27.7	-5.0	3.4	354.0	3.0	0.0	Vert	QP	0.0	22.7	40.0	-17.3	EUT Horizontal
94.944	32.1	-8.3	2.5	281.0	3.0	0.0	Horz	QP	0.0	23.8	43.5	-19.7	EUT Horizontal
40.683	19.0	0.6	1.5	73.0	3.0	0.0	Horz	QP	0.0	19.6	40.0	-20.4	EUT Horizontal
40.688	18.8	0.6	4.0	30.0	3.0	0.0	Vert	QP	0.0	19.4	40.0	-20.6	EUT Horizontal
54.165	20.1	-5.0	1.0	224.0	3.0	0.0	Horz	QP	0.0	15.1	40.0	-24.9	EUT Horizontal
67.894	19.0	-8.3	2.5	90.0	3.0	0.0	Horz	QP	0.0	10.7	40.0	-29.3	EUT Horizontal
67.907	18.6	-8.3	4.0	130.0	3.0	0.0	Vert	QP	0.0	10.3	40.0	-29.7	EUT Horizontal

FREQUENCY STABILITY

XMit 2017.02.08

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.	Cal. Due
Probe - Near Field Set	EMCO	7405	IPD	NCR	NCR
Power Supply - AC	Instek	APS-9050	TPK	NCR	NCR
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPH-8-2-SCT/AC	TBI	NCR	NCR
Thermometer	Omegaette	HH311	DTY	1/21/2015	1/21/2018
Attenuator	Fairview Microwave	SA18N5WA-30	TLE	10/11/2016	10/11/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

Measurements were made on the single transmit frequency as called out on the data sheets. Testing was done while the EUT was continuously polling.

The primary supply voltage was varied from 85 % to 115% of the nominal voltage while at ambient temperature. Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range of -20 ° to +50° C and at 10°C intervals.

The requirement of a frequency tolerance of ±0.01% is equivalent to 100 ppm
The formula to check for compliance is:

ppm = (Measured Frequency / Measured Nominal Frequency - 1) * 1,000,000

FREQUENCY STABILITY

XMit 2017.02.08

EUT:	**DLKodiak**			**Work Order:**	**GRAP0056**
Serial Number:	**A9**			**Date:**	**05/23/17**
Customer:	**Graphic Products, Inc.**			**Temperature:**	**23.3 °C**
Attendees:	**Bob Martell**			**Humidity:**	**46.6% RH**
Project:	**None**			**Barometric Pres.:**	**1018 mbar**
Tested by:	**Jeff Alcoke and Rod Peloquin**	**Power:**	**110VAC/60Hz**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	**Test Method**
FCC 15.225:2017	ANSI C63.10:2013

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

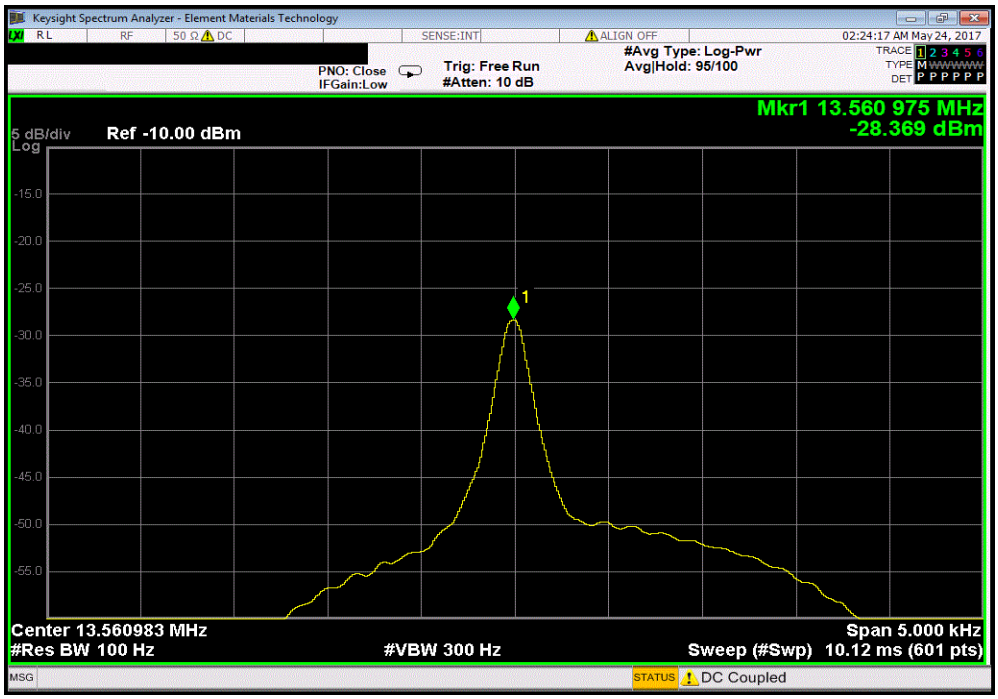
Configuration #	**2**	*Signature*

		Measured Value (MHz)	**Assigned Value (MHz)**	**Error (ppm)**	**Limit (ppm)**	**Result**
RFID 13.56 MHz						
	126.5VAC/60Hz, 115% of Nominal, 20°C	13.560975	13.56	71.9	100	Pass
	110VAC/60Hz, 100% of Nominal, 20°C	13.560983	13.56	72.5	100	Pass
	93.5VAC/60Hz, 85% of Nominal, 20°C	13.560967	13.56	71.3	100	Pass
	Nominal Voltage, 50°C	13.560900	13.56	66.4	100	Pass
	Nominal Voltage, 40°C	13.560900	13.56	66.4	100	Pass
	Nominal Voltage, 30°C	13.560917	13.56	67.6	100	Pass
	Nominal Voltage, 20°C	13.560950	13.56	70.1	100	Pass
	Nominal Voltage, 10°C	13.560992	13.56	73.2	100	Pass
	Nominal Voltage, 0°C	13.561025	13.56	75.6	100	Pass
	Nominal Voltage, -10°C	13.56105	13.56	77.4	100	Pass
	Nominal Voltage, -20°C	13.561058	13.56	78	100	Pass

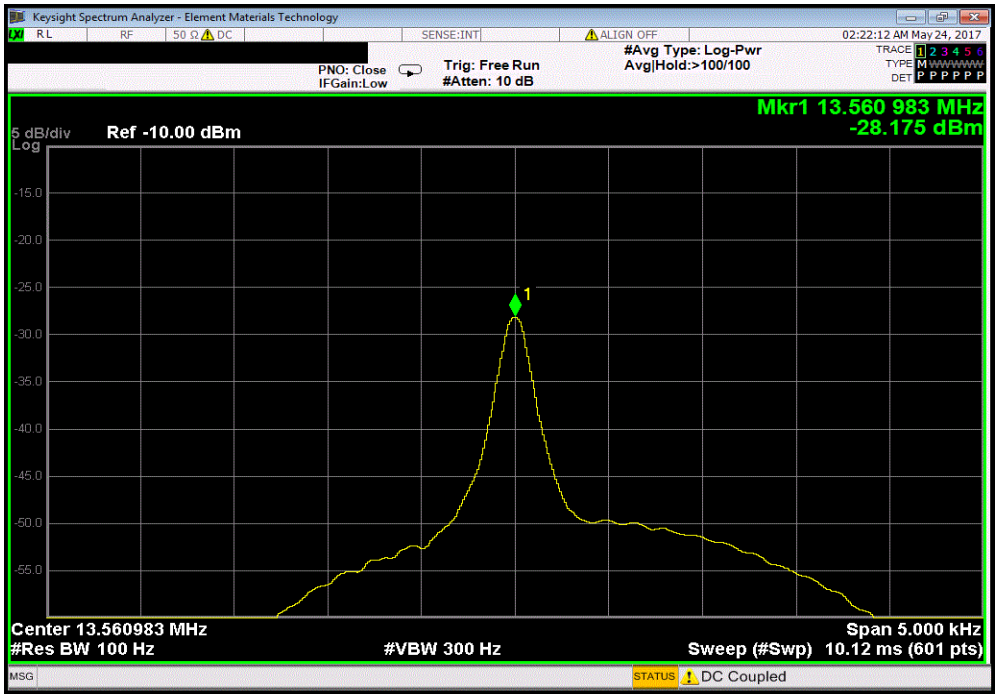
FREQUENCY STABILITY

XMit 2017.02.08

RFID 13.56 MHz, 126.5VAC/60Hz, 115% of Nominal, 20°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.560975	13.56	71.9	100	Pass



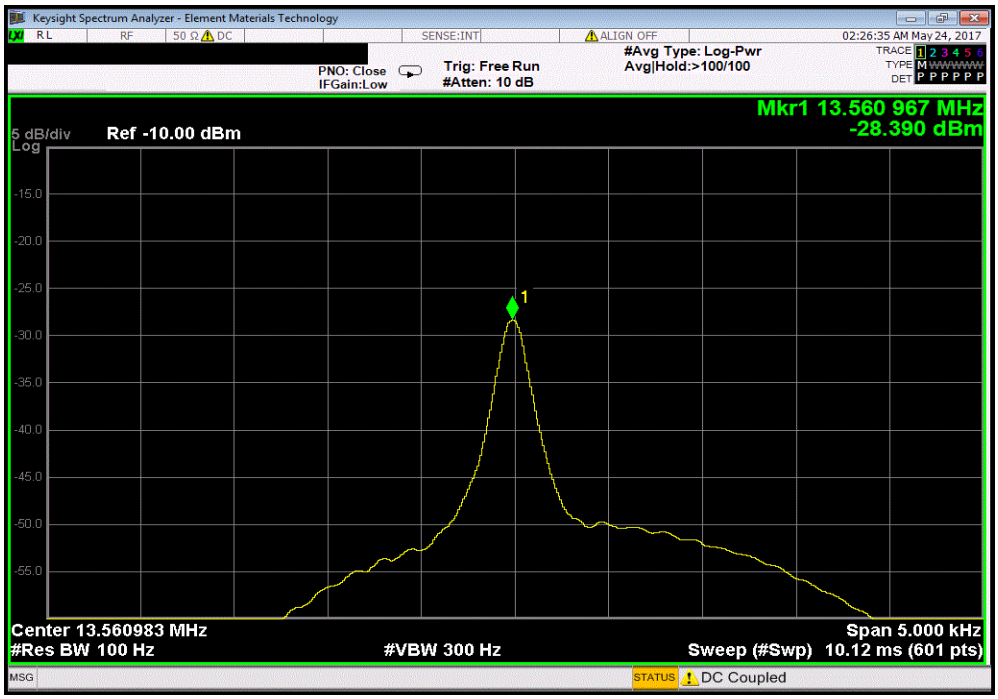
RFID 13.56 MHz, 110VAC/60Hz, 100% of Nominal, 20°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.560983	13.56	72.5	100	Pass



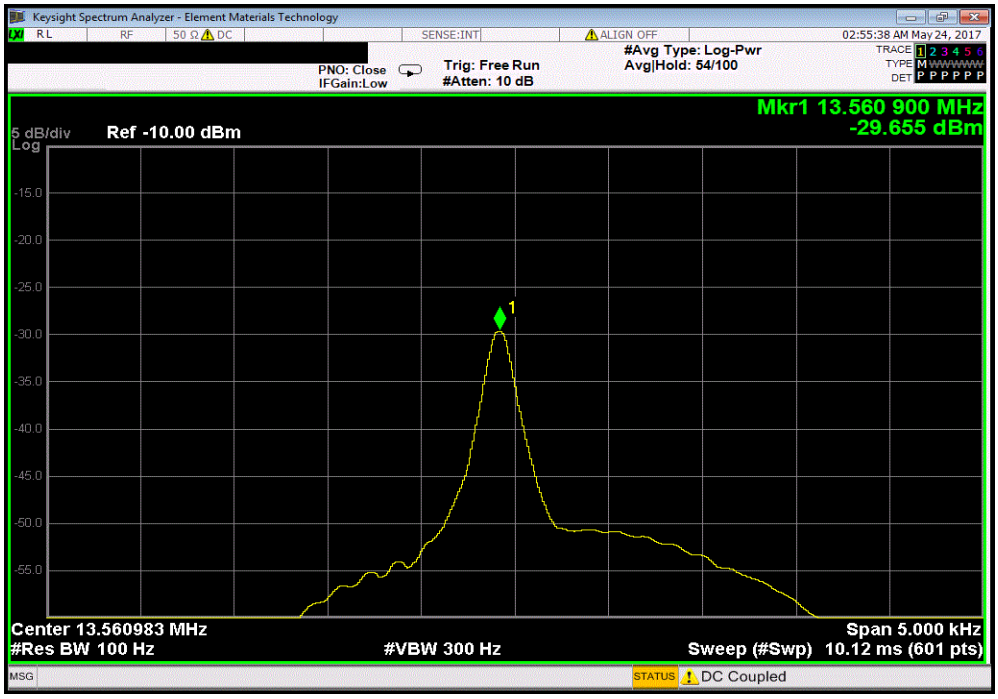
FREQUENCY STABILITY

XMit 2017.02.08

RFID 13.56 MHz, 93.5VAC/60Hz, 85% of Nominal, 20°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.560967	13.56	71.3	100	Pass



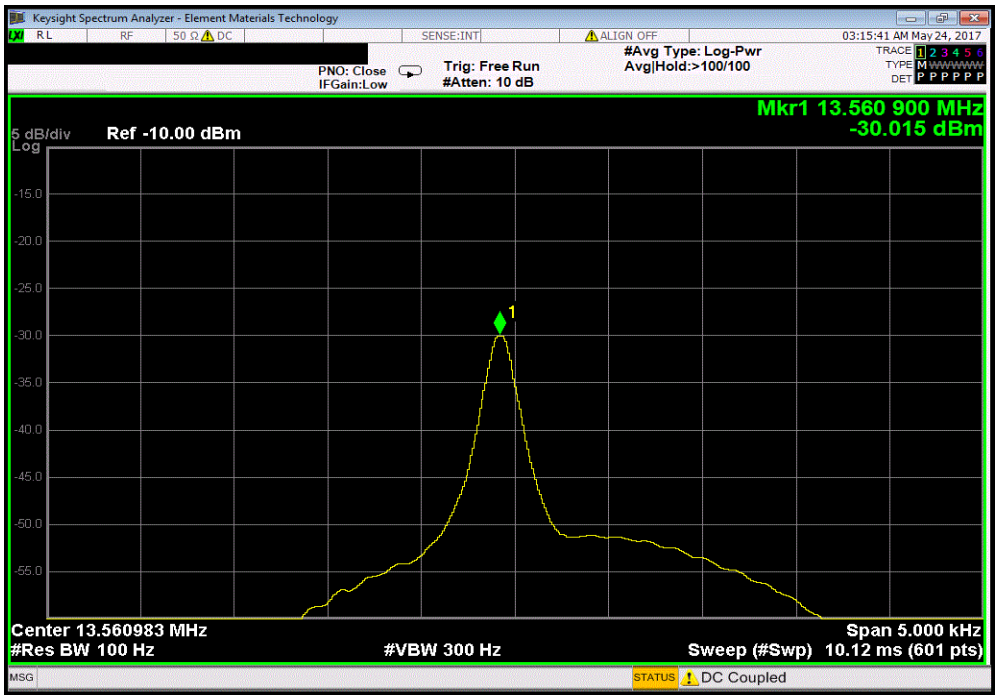
RFID 13.56 MHz, Nominal Voltage, 50°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.5609	13.56	66.4	100	Pass



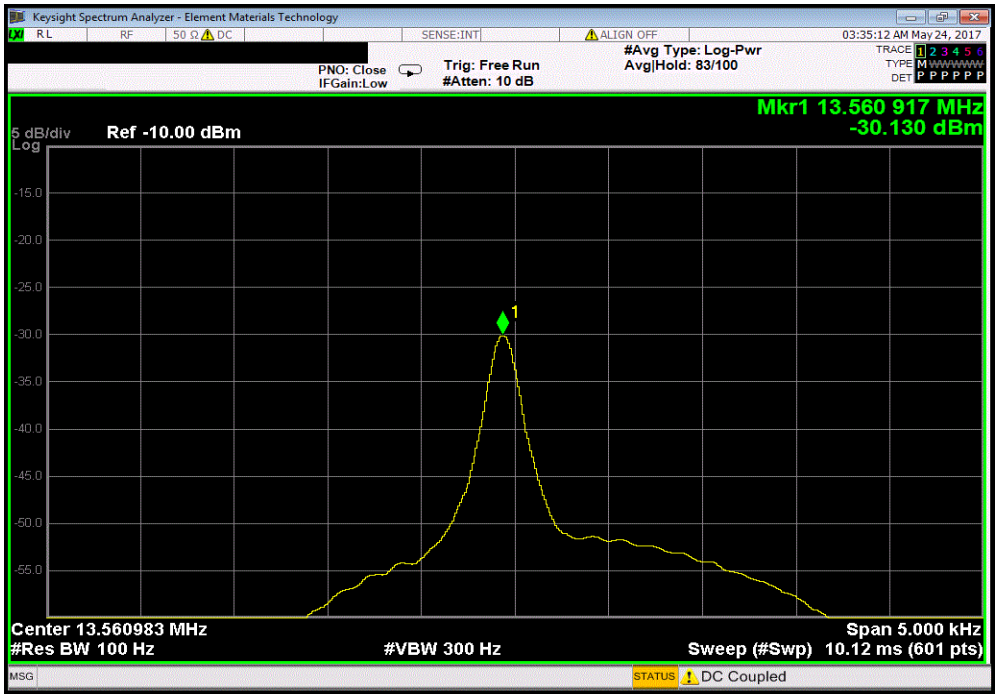
FREQUENCY STABILITY

XMit 2017.02.08

RFID 13.56 MHz, Nominal Voltage, 40°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.5609	13.56	66.4	100	Pass



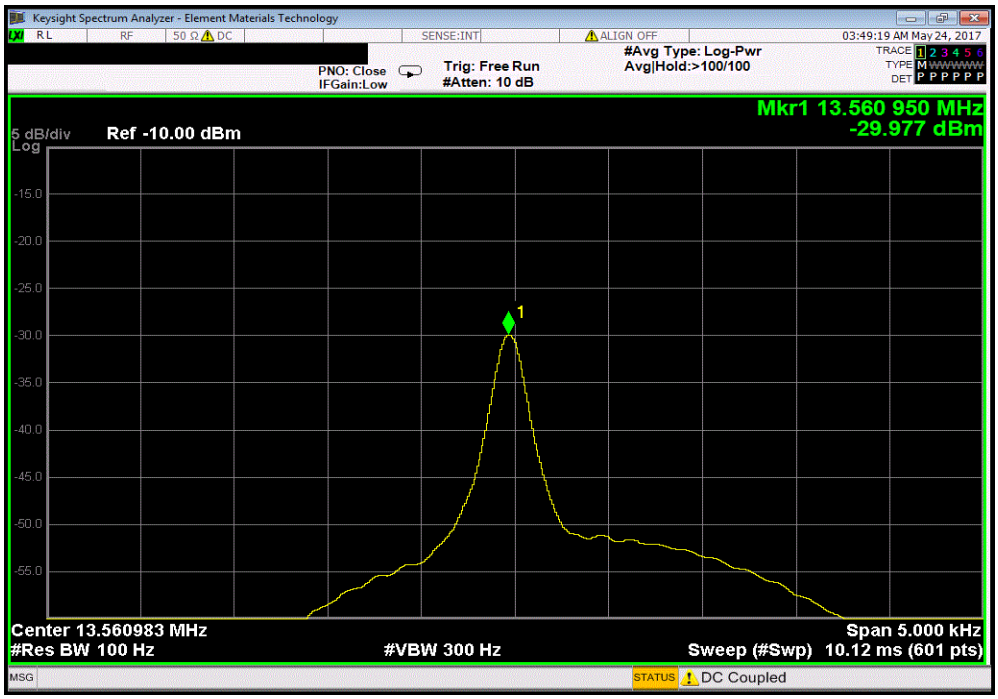
RFID 13.56 MHz, Nominal Voltage, 30°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.560917	13.56	67.6	100	Pass



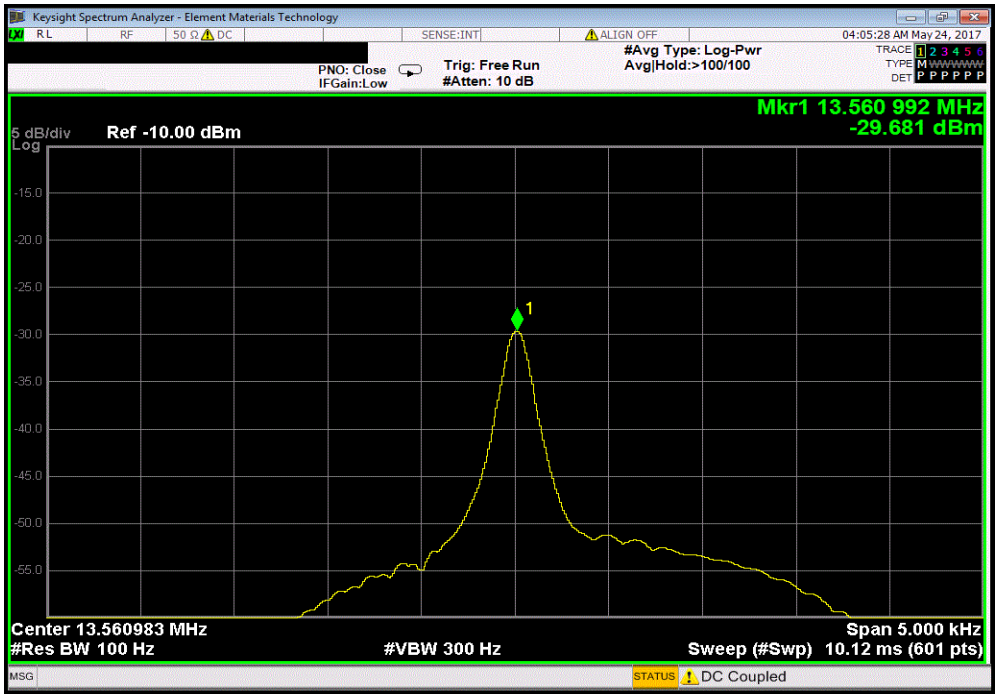
FREQUENCY STABILITY

XMit 2017.02.08

RFID 13.56 MHz, Nominal Voltage, 20°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.56095	13.56	70.1	100	Pass



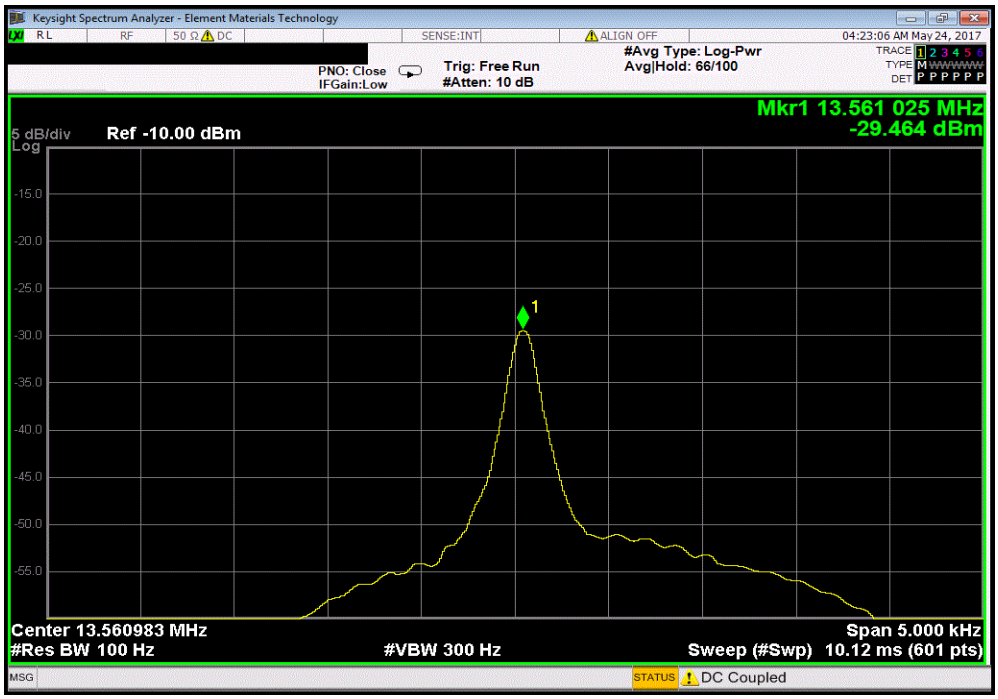
RFID 13.56 MHz, Nominal Voltage, 10°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.560992	13.56	73.2	100	Pass



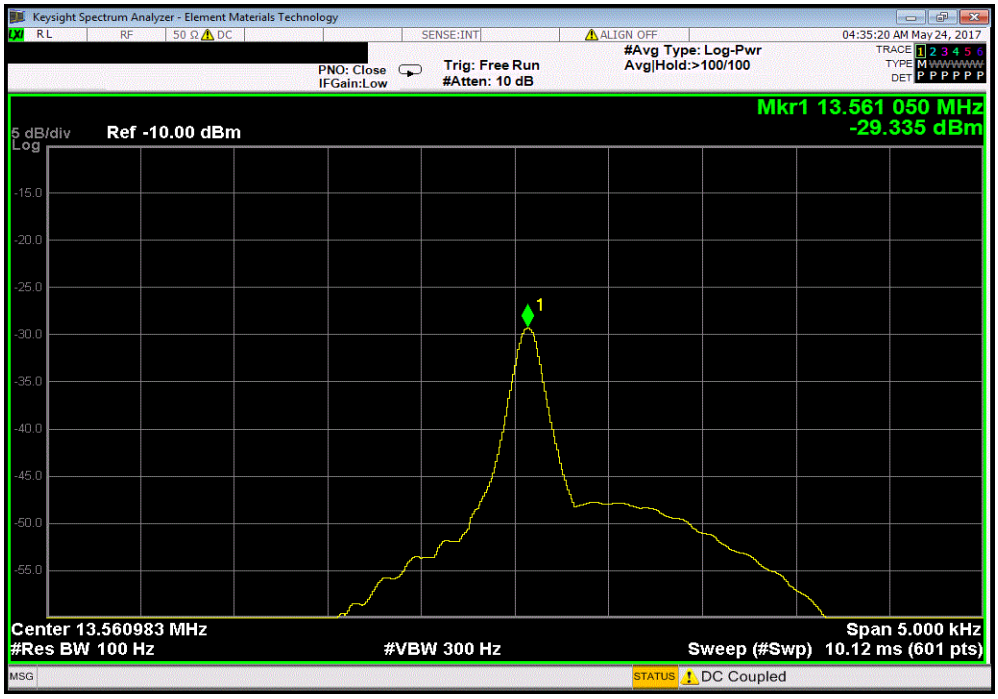
FREQUENCY STABILITY

XMit 2017.02.08

RFID 13.56 MHz, Nominal Voltage, 0°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.561025	13.56	75.6	100	Pass



RFID 13.56 MHz, Nominal Voltage, -10°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.56105	13.56	77.4	100	Pass



FREQUENCY STABILITY

XMit 2017.02.08

RFID 13.56 MHz, Nominal Voltage, -20°C						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.561058	13.56	78.0	100	Pass