



# element

**GSL Solutions, INC.**

**RFID IntelliPad REV B**

**FCC 15.225:2020**

**13.56MHz**

**Report: GSLS0015, Issue Date: December 8, 2020**



NVLAP LAB CODE: 200630-0



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# CERTIFICATE OF TEST



Last Date of Test: December 4, 2020  
GSL Solutions, INC.  
EUT: RFID IntelliPad REV B

## Radio Equipment Testing

### Standards

Specification	Method
FCC 15.207:2020	ANSI C63.10:2013
FCC 15.225:2020	

### 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. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.*

# REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

# ACCREDITATIONS AND AUTHORIZATIONS



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## 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

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## Canada

**ISED** - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

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## European Union

**European Commission** – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

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## Australia/New Zealand

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

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## Korea

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

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## Japan

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

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## 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.

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## Singapore

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

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## Israel

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

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## Hong Kong

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

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## Vietnam

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

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## SCOPE

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

<https://www.nwemc.com/emc-testing-accreditations>

# FACILITIES



<b>California</b> Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	<b>Minnesota</b> Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	<b>Oregon</b> Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	<b>Texas</b> Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	<b>Washington</b> Labs NC01-05 19201 120 <sup>th</sup> Ave NE Bothell, WA 98011 (425)984-6600
<b>NVLAP</b>				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
<b>Innovation, Science and Economic Development Canada</b>				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
<b>BSMI</b>				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
<b>VCCI</b>				
A-0029	A-0109	A-0108	A-0201	A-0110
<b>Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA</b>				
US0158	US0175	US0017	US0191	US0157



# 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 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	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 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)	2.6 dB	-2.6 dB

# Test Setup Block Diagrams

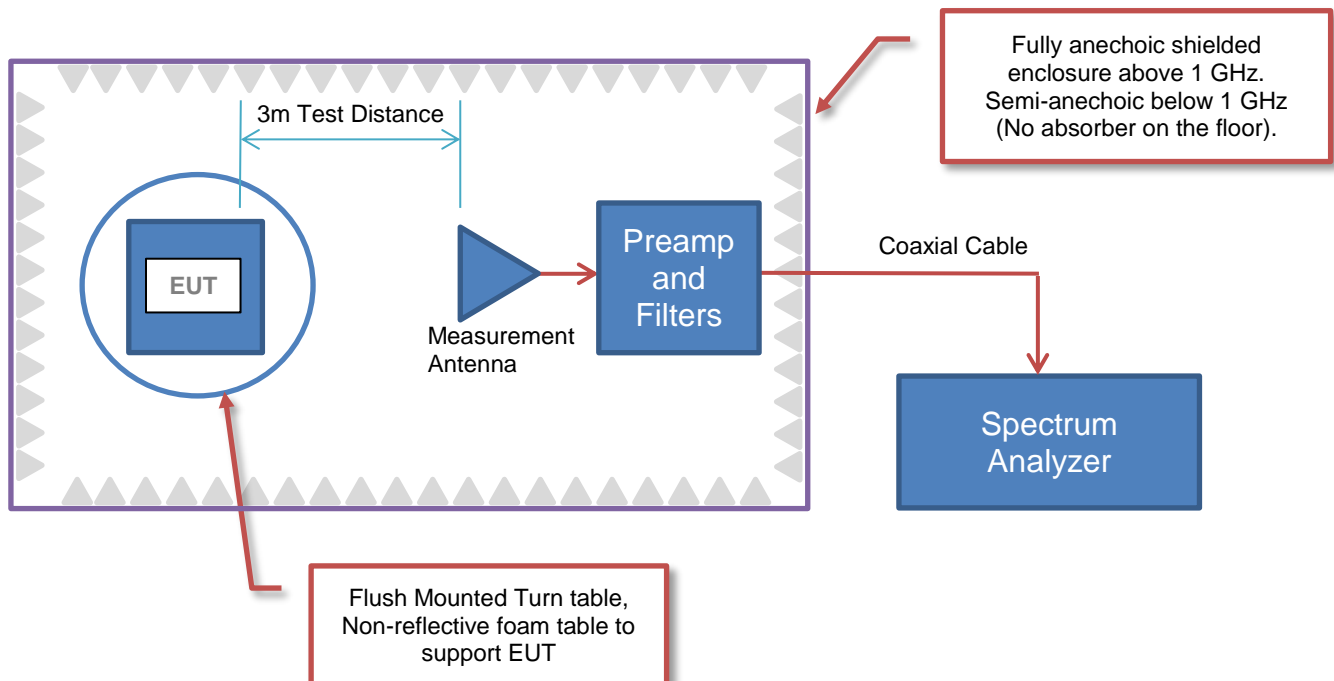
## Antenna Port Conducted Measurements



## Near Field Test Fixture Measurements



## Spurious Radiated Emissions





# PRODUCT DESCRIPTION



## Client and Equipment Under Test (EUT) Information

Company Name:	GSL Solutions, INC.
Address:	2414 SE 125th Avenue
City, State, Zip:	Vancouver, WA 98683
Test Requested By:	Joe Intile
EUT:	RFID IntelliPad REV B
First Date of Test:	November 12, 2020
Last Date of Test:	December 4, 2020
Receipt Date of Samples:	November 5, 2020
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

## Information Provided by the Party Requesting the Test

Functional Description of the EUT:
RFID Reader
Testing Objective:
To demonstrate compliance to FCC Part 15.225 specifications.



# CONFIGURATIONS

## Configuration GSLS0015- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
RFID Reader	GSL Solutions, INC.	IntelliPad REV B	CT2909

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	HP	EliteBook 8570p	5CB3061RPX
AC Adapter	HP	PPP12D-S	WCNXF0AAR3XCBA

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	1.8m	No	AC Mains	AC Adapter
DC Power	No	1.5m	No	AC Adapter	Laptop
USB	Yes	1.2m	No	Laptop	RFID Reader
USB	Yes	1.0m	No	RFID Reader	Unterminated

## Configuration GSLS0015- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
RFID Reader	GSL Solutions, INC.	IntelliPad REV B	CT2909

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	HP	EliteBook 8570p	5CB3061RPX
AC Adapter	HP	PPP12D-S	WCNXF0AAR3XCBA

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	1.8m	No	AC Mains	AC Adapter
DC Power	No	1.5m	No	AC Adapter	Laptop
USB	Yes	1.2m	No	Laptop	RFID Reader

# MODIFICATIONS

## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-11-12	Frequency Stability	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	2020-11-12	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.
3	2020-11-13	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.
4	2020-12-04	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.
5	2020-12-04	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.	Scheduled testing was completed.

# POWER SETTINGS AND ANTENNAS



The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information.

## ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
Loop	Manufacturer	13.56 MHz	N/A

No adjustable power settings were provided. The EUT was tested using power settings pre-defined by the manufacturer.

# POWERLINE CONDUCTED EMISSIONS



## TEST DESCRIPTION

The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT.

The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.10.

In the event that the operating frequency of 13.56 MHz is causing the product to fail the FCC 15.207 limits, the following guidance can be used:

FCC KDB 174176 D01 AC Conducted FAQ v01r01, June 3, 2015 Section Q5:

For a device with a permanent or detachable antenna operating at or below 30 MHz, the FCC will accept measurements performed with a suitable dummy load in lieu of the antenna under the following conditions:

(1) perform the AC power-line conducted tests with the antenna connected to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band;

(2) retest with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network which simulates the antenna in the fundamental frequency band.

All measurements must be performed as specified in clause 6.2 of ANSI C63.10-2013.

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESCI	ARH	2020-05-13	2021-05-13
Cable - Conducted Cable Assembly	Northwest EMC	EVG, HHD, RKT	EVGA	2020-01-06	2021-01-06
LISN	Solar Electronics	9252-50-R-24-BNC	LIN	2019-11-20	2020-11-20

## MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.6 dB	-2.6 dB

## CONFIGURATIONS INVESTIGATED

GSLS0015-1
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## MODES INVESTIGATED

RFID Continuous TX, 13.56 MHz
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# POWERLINE CONDUCTED EMISSIONS

EUT:	RFID IntelliPad REV B	Work Order:	GSLS0015
Serial Number:	CT2909	Date:	2020-11-13
Customer:	GSL Solutions, INC.	Temperature:	23.2°C
Attendees:	Tyler Seitz, Joe Intile	Relative Humidity:	36.7%
Customer Project:	None	Bar. Pressure:	1014 mb
Tested By:	Jeff Alcock	Job Site:	EV07
Power:	USB via 110VAC/60HZ	Configuration:	GSLS0015-1

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2020	ANSI C63.10:2013

## TEST PARAMETERS

Run #:	4	Line:	High Line	Add. Ext. Attenuation (dB):	0
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## COMMENTS

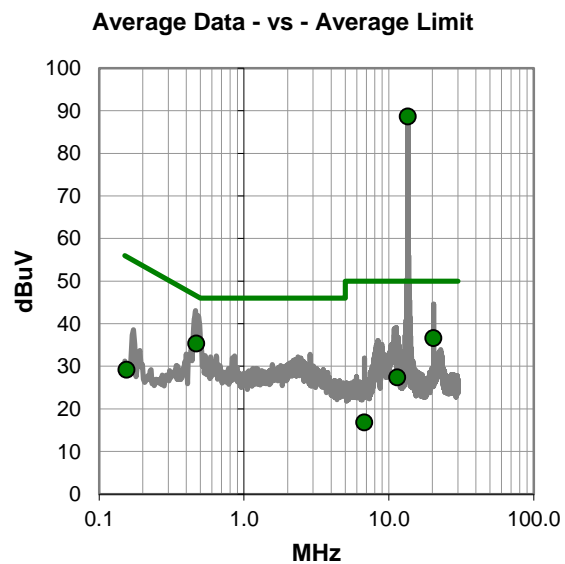
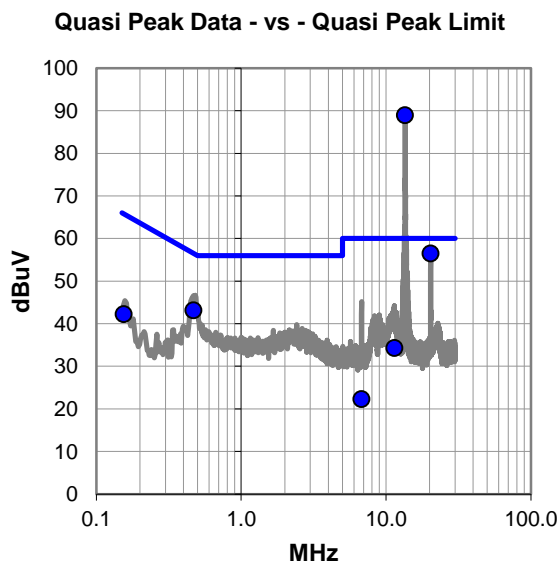
None

## EUT OPERATING MODES

RFID Continuous TX, 13.56 MHz

## DEVIATIONS FROM TEST STANDARD

None



# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #4

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	68.5	20.4	88.9	60.0	28.9
20.340	35.8	20.7	56.5	60.0	-3.5
0.470	23.2	19.9	43.1	56.5	-13.4
0.154	22.2	20.0	42.2	65.8	-23.6
11.416	14.0	20.3	34.3	60.0	-25.7
6.770	2.2	20.1	22.3	60.0	-37.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	68.2	20.4	88.6	50.0	38.6
0.470	15.4	19.9	35.3	46.5	-11.2
20.340	15.9	20.7	36.6	50.0	-13.4
11.416	7.1	20.3	27.4	50.0	-22.6
0.154	9.2	20.0	29.2	55.8	-26.6
6.770	-3.3	20.1	16.8	50.0	-33.2

## CONCLUSION

Fail



Tested By

# POWERLINE CONDUCTED EMISSIONS



EUT:	RFID IntelliPad REV B	Work Order:	GSLS0015
Serial Number:	CT2909	Date:	2020-11-13
Customer:	GSL Solutions, INC.	Temperature:	23.2°C
Attendees:	Tyler Seitz, Joe Intile	Relative Humidity:	36.7%
Customer Project:	None	Bar. Pressure:	1014 mb
Tested By:	Jeff Alcock	Job Site:	EV07
Power:	USB via 110VAC/60HZ	Configuration:	GSLS0015-1

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2020	ANSI C63.10:2013

## TEST PARAMETERS

Run #:	5	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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## COMMENTS

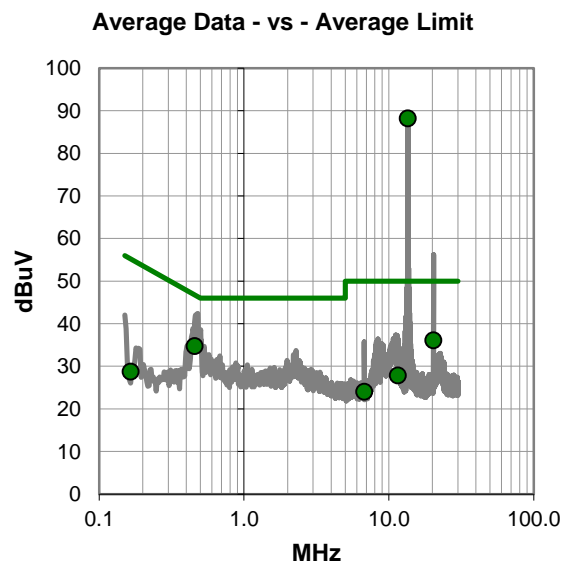
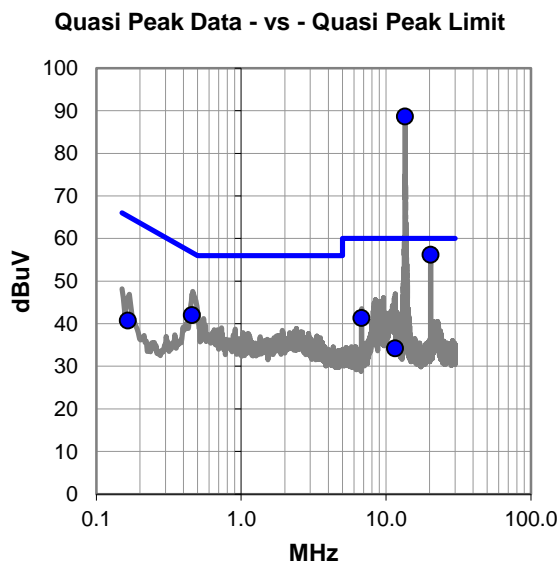
None

## EUT OPERATING MODES

RFID Continuous TX, 13.56 MHz

## DEVIATIONS FROM TEST STANDARD

None





# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #5

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.559	68.2	20.4	88.6	60.0	28.6
20.339	35.5	20.7	56.2	60.0	-3.8
0.457	22.1	19.9	42.0	56.8	-14.8
6.780	21.2	20.1	41.3	60.0	-18.7
0.165	20.8	19.9	40.7	65.2	-24.5
11.568	13.9	20.3	34.2	60.0	-25.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.559	67.8	20.4	88.2	50.0	38.2
0.457	14.8	19.9	34.7	46.8	-12.1
20.339	15.4	20.7	36.1	50.0	-13.9
11.568	7.5	20.3	27.8	50.0	-22.2
6.780	3.9	20.1	24.0	50.0	-26.0
0.165	8.8	19.9	28.7	55.2	-26.5

## CONCLUSION

Fail



Tested By

# POWERLINE CONDUCTED EMISSIONS

EUT:	RFID IntelliPad REV B	Work Order:	GSLS0015
Serial Number:	CT2909	Date:	2020-11-13
Customer:	GSL Solutions, INC.	Temperature:	23.2°C
Attendees:	Tyler Seitz, Joe Intile	Relative Humidity:	36.7%
Customer Project:	None	Bar. Pressure:	1014 mb
Tested By:	Jeff Alcock	Job Site:	EV07
Power:	USB via 110VAC/60HZ	Configuration:	GSLS0015-1

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2020	ANSI C63.10:2013

## TEST PARAMETERS

Run #:	7	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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## COMMENTS

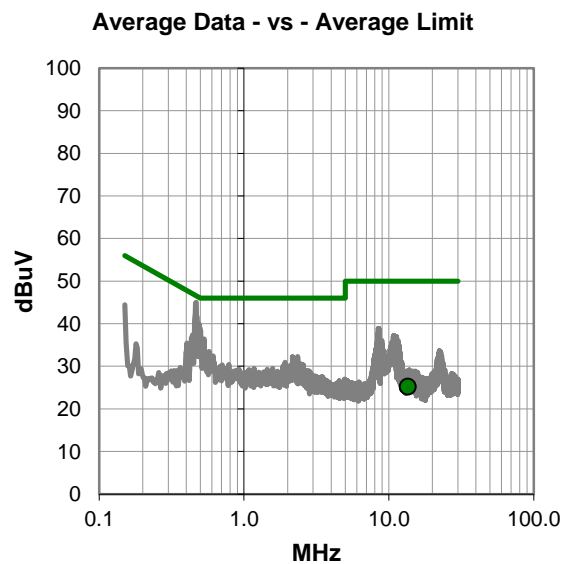
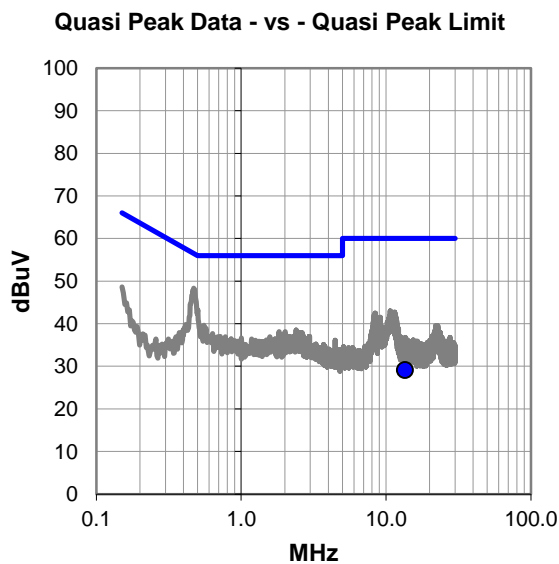
Antenna trace cut on PCB.

## EUT OPERATING MODES

RFID Continuous TX, 13.56 MHz.

## DEVIATIONS FROM TEST STANDARD

None



# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #7

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.559	8.7	20.4	29.1	60.0	-30.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.559	4.8	20.4	25.2	50.0	-24.8

## CONCLUSION

Pass



Tested By

# POWERLINE CONDUCTED EMISSIONS

EUT:	RFID IntelliPad REV B	Work Order:	GSLS0015
Serial Number:	CT2909	Date:	2020-11-13
Customer:	GSL Solutions, INC.	Temperature:	23.2°C
Attendees:	Tyler Seitz, Joe Intile	Relative Humidity:	36.7%
Customer Project:	None	Bar. Pressure:	1014 mb
Tested By:	Jeff Alcock	Job Site:	EV07
Power:	USB via 110VAC/60HZ	Configuration:	GSLS0015-1

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2020	ANSI C63.10:2013

## TEST PARAMETERS

Run #:	8	Line:	High Line	Add. Ext. Attenuation (dB):	0
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## COMMENTS

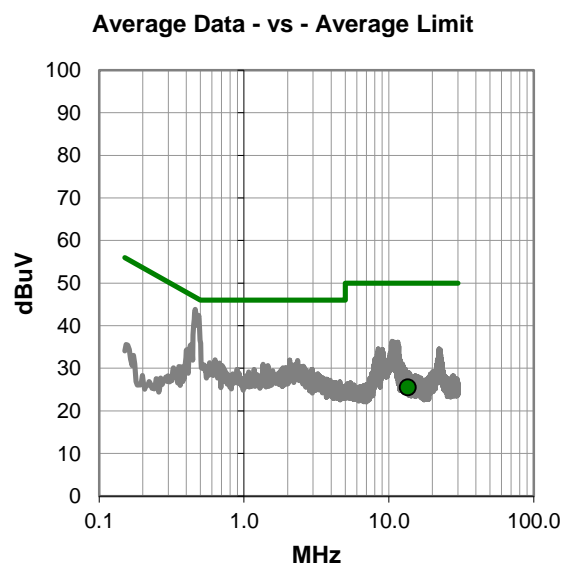
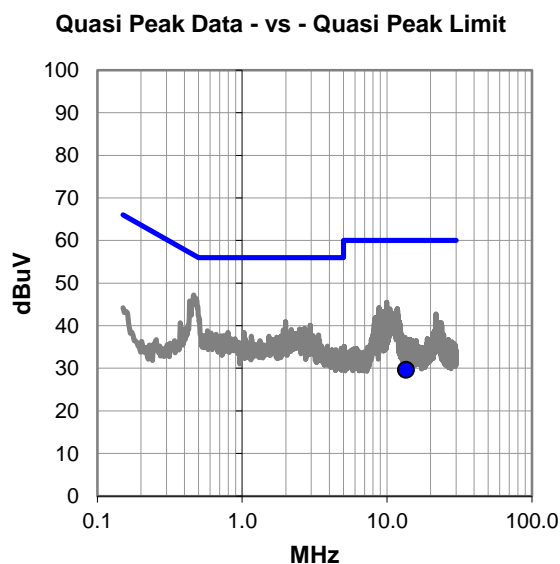
Antenna trace cut on PCB.

## EUT OPERATING MODES

RFID Continuous TX, 13.56 MHz.

## DEVIATIONS FROM TEST STANDARD

None



# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #8

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.561	9.2	20.4	29.6	60.0	-30.4

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.561	5.1	20.4	25.5	50.0	-24.5

## CONCLUSION

Pass



Tested By

# FIELD STRENGTH OF FUNDAMENTAL



PSA-ESCI 2020.06.24.2

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

RFID Continuous TX, 13.56 MHz.

## POWER SETTINGS INVESTIGATED

USB via 110VAC/60HZ

## CONFIGURATIONS INVESTIGATED

GSLS0015 - 1

## FREQUENCY RANGE INVESTIGATED

Start Frequency 12 MHz Stop Frequency 15 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	3m Test Distance Cable	EVM	2020-02-28	12 mo
Antenna - Loop	EMCO	6502	AOA	2020-07-06	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2020-02-28	12 mo

## MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

## 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 reference point 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, 6.5, 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

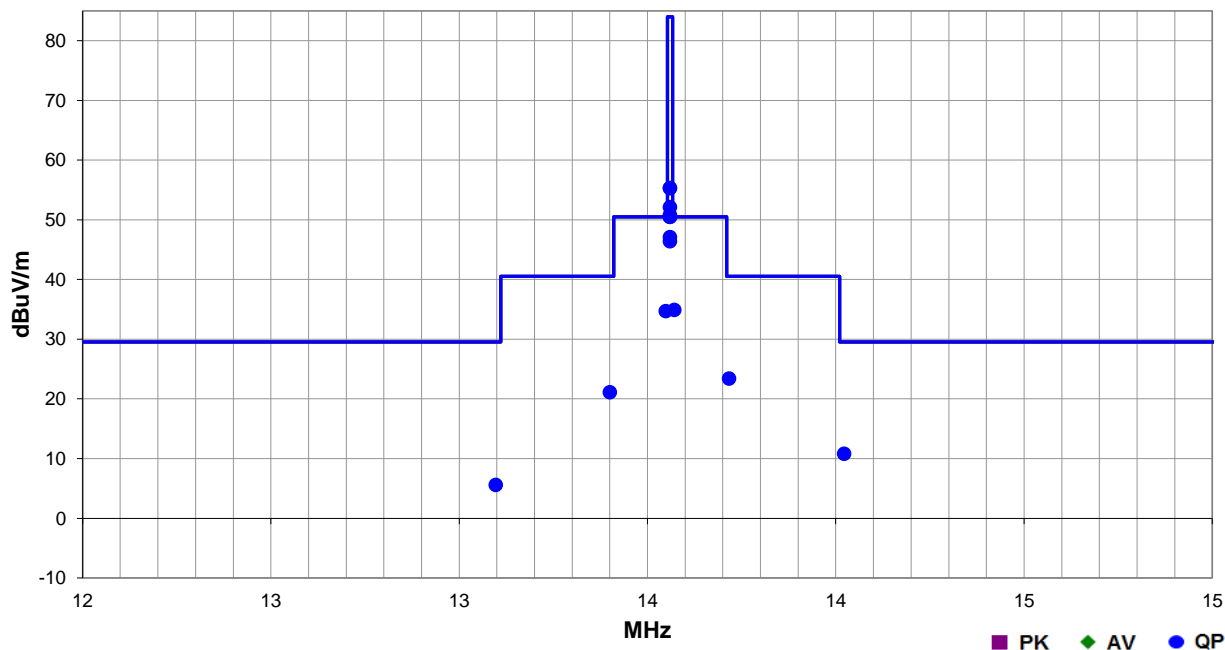


EmiR5 2020.06.24.4 PSA-ESCI 2020.06.24.2

Work Order:	GSL0015	Date:	2020-12-04	
Project:	None	Temperature:	22.1 °C	
Job Site:	EV11	Humidity:	29.6% RH	
Serial Number:	CT2909	Barometric Pres.:	1035 mbar	
	EUT:	RFID IntelliPad REV B		
	Configuration:	1		
	Customer:	GSL Solutions, INC.		
	Attendees:	Tyler Seitz, and Joe Intile		
	EUT Power:	USB via 110VAC/60HZ		
	Operating Mode:	RFID Continuous TX, 13.56 MHz.		
	Deviations:	None		
	Comments:	Antenna Parallel floor EUT		

Test Specifications	Test Method
FCC 15.225:2020	ANSI C63.10:2013

Run #	8	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
13.571	41.9	12.1	1.0	111.0	10.0	0.0	Perp EUT	QP	-19.1	34.9	50.5	-15.6	EUT Vertical
13.549	41.7	12.1	1.0	111.0	10.0	0.0	Perp EUT	QP	-19.1	34.7	50.5	-15.8	EUT Vertical
13.716	30.4	12.1	1.0	111.0	10.0	0.0	Perp EUT	QP	-19.1	23.4	40.5	-17.1	EUT Vertical
14.022	17.8	12.1	1.0	111.0	10.0	0.0	Perp EUT	QP	-19.1	10.8	29.5	-18.7	EUT Vertical
13.400	28.0	12.2	1.0	111.0	10.0	0.0	Perp EUT	QP	-19.1	21.1	40.5	-19.4	EUT Vertical
13.097	12.5	12.2	1.0	111.0	10.0	0.0	Perp EUT	QP	-19.1	5.6	29.5	-23.9	EUT Vertical
13.560	62.3	12.1	1.0	300.0	10.0	0.0	Perp EUT	QP	-19.1	55.3	84.0	-28.7	EUT Vertical
13.560	62.3	12.1	1.0	287.0	10.0	0.0	Perp EUT	QP	-19.1	55.3	84.0	-28.7	EUT On Side
13.560	59.1	12.1	1.0	185.0	10.0	0.0	Perp EUT	QP	-19.1	52.1	84.0	-31.9	EUT Horizontal
13.560	57.8	12.1	1.0	254.0	10.0	0.0	Para Floor	QP	-19.1	50.8	84.0	-33.2	EUT Vertical
13.560	57.6	12.1	1.0	275.0	10.0	0.0	Para Floor	QP	-19.1	50.6	84.0	-33.4	EUT On Side
13.560	57.5	12.1	1.0	201.0	10.0	0.0	Para EUT	QP	-19.1	50.5	84.0	-33.5	EUT On Side
13.560	57.5	12.1	1.0	219.0	10.0	0.0	Para EUT	QP	-19.1	50.5	84.0	-33.5	EUT Vertical
13.560	54.1	12.1	1.0	224.0	10.0	0.0	Para EUT	QP	-19.1	47.1	84.0	-36.9	EUT Horizontal
13.560	53.4	12.1	1.0	208.0	10.0	0.0	Para Floor	QP	-19.1	46.4	84.0	-37.6	EUT Horizontal



# FIELD STRENGTH OF SPURIOUS EMISSIONS LESS THAN 30 MHZ



PSA-ESCI 2020.06.24.2

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

RFID Continuous TX, 13.56 MHz.

## POWER SETTINGS INVESTIGATED

USB via 110VAC/60HZ

## CONFIGURATIONS INVESTIGATED

GSL0015 - 1

## FREQUENCY RANGE INVESTIGATED

Start Frequency 9 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
Cable	None	3m Test Distance Cable	EVM	2020-02-28	12 mo
Antenna - Loop	EMCO	6502	AOA	2020-07-06	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2020-02-28	12 mo

## MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

## 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.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, 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



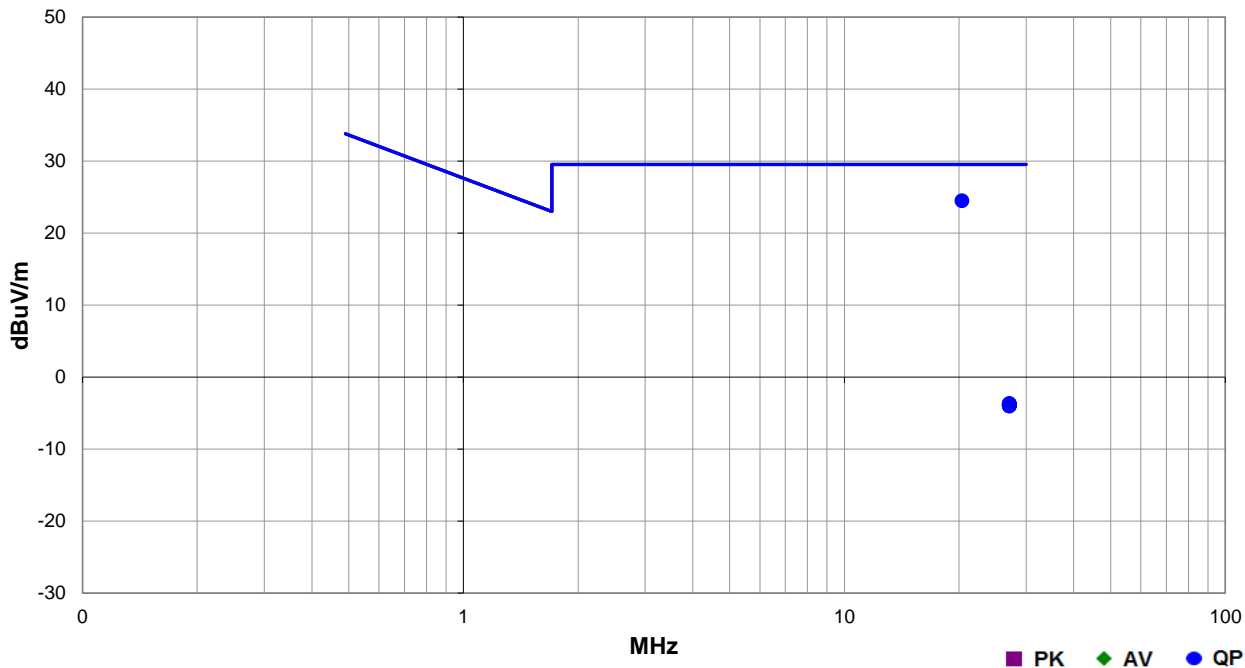
EmiR5 2020.06.24.4

PSA-ESCI 2020.06.24.2

Work Order:	GSL0015	Date:	2020-12-04	
Project:	None	Temperature:	22.1 °C	
Job Site:	EV11	Humidity:	29.6% RH	
Serial Number:	CT2909	Barometric Pres.:	1035 mbar	
EUT:	RFID IntelliPad REV B			Tested by: Cole Ghizzone
Configuration:	1			
Customer:	GSL Solutions, INC.			
Attendees:	Tyler Seitz, and Joe Intile			
EUT Power:	USB via 110VAC/60HZ			
Operating Mode:	RFID Continuous TX, 13.56 MHz.			
Deviations:	None			
Comments:	See data comments for EUT orientation.			

Test Specifications	Test Method
FCC 15.225:2020	ANSI C63.10:2013

Run #	8	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
20.339	31.8	11.8	1.0	285.0	10.0	0.0	Perp EUT	QP	-19.1	24.5	29.5	-5.0	EUT Vertical
27.099	5.0	10.4	1.0	323.0	10.0	0.0	Perp EUT	QP	-19.1	-3.7	29.5	-33.2	EUT Vertical
27.102	5.0	10.4	1.0	282.0	10.0	0.0	Perp EUT	QP	-19.1	-3.7	29.5	-33.2	EUT On Side
27.100	5.0	10.4	1.0	219.0	10.0	0.0	Perp EUT	QP	-19.1	-3.7	29.5	-33.2	EUT Horizontal
27.095	4.8	10.4	1.0	221.0	10.0	0.0	Para Floor	QP	-19.1	-3.9	29.5	-33.4	EUT Vertical
27.098	4.8	10.4	1.0	325.0	10.0	0.0	Para EUT	QP	-19.1	-3.9	29.5	-33.4	EUT Horizontal
27.102	4.8	10.4	1.0	93.0	10.0	0.0	Para EUT	QP	-19.1	-3.9	29.5	-33.4	EUT On Side
27.098	4.8	10.4	1.0	234.0	10.0	0.0	Para EUT	QP	-19.1	-3.9	29.5	-33.4	EUT Vertical
27.099	4.7	10.4	1.0	341.0	10.0	0.0	Para Floor	QP	-19.1	-4.0	29.5	-33.5	EUT Horizontal
27.098	4.7	10.4	1.0	299.0	10.0	0.0	Para Floor	QP	-19.1	-4.0	29.5	-33.5	EUT On Side

# FIELD STRENGTH OF SPURIOUS EMISSIONS GREATER THAN 30 MHZ



PSA-ESCI 2020.06.24.2

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

RFID Continuous TX, 13.56 MHz

## POWER SETTINGS INVESTIGATED

USB via 110VAC/60HZ

## CONFIGURATIONS INVESTIGATED

GSLS0015 - 1

## 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
Filter - Low Pass	Micro-Tronics	LPM50004	LFD	2020-02-15	12 mo
Cable	N/A	Double Ridge Horn Cables	EVB	2019-11-18	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	2019-11-18	12 mo
Antenna - Biconilog	EMCO	3141	AXG	2019-07-23	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	2019-12-13	12 mo

## MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

## 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.

# FIELD STRENGTH OF SPURIOUS EMISSIONS GREATER THAN 30 MHZ



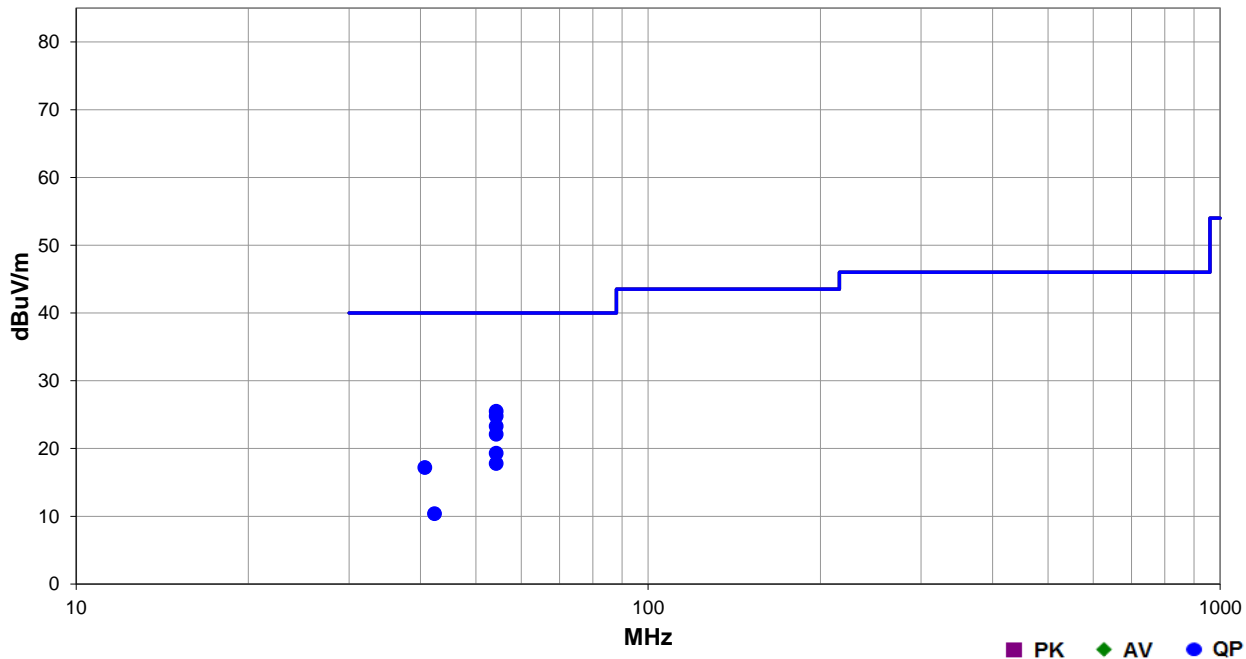
EmiR5 2020.06.24.4

PSA-ESCI 2020.06.24.2

Work Order:	GSL0015	Date:	2020-11-12	
Project:	None	Temperature:	21.6 °C	
Job Site:	EV01	Humidity:	35% RH	
Serial Number:	CT2909	Barometric Pres.:	1022 mbar	Tested by: Cole Ghizzone
EUT:	RFID IntelliPad REV B			
Configuration:	1			
Customer:	GSL Solutions, INC.			
Attendees:	Tyler Seitz, Joe Intile			
EUT Power:	USB via 110VAC/60HZ			
Operating Mode:	RFID Continuous TX, 13.56 MHz			
Deviations:	None			
Comments:	See data comments for EUT orientation.			

Test Specifications	Test Method
FCC 15.225:2020	ANSI C63.10:2013

Run #	5	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
54.250	34.1	-8.6	3.83	129.0	3.0	0.0	Horz	QP	0.0	25.5	40.0	-14.5	EUT Horizontal
54.250	33.4	-8.6	1.0	203.0	3.0	0.0	Vert	QP	0.0	24.8	40.0	-15.2	EUT Horizontal
54.250	31.9	-8.6	3.2	151.0	3.0	0.0	Horz	QP	0.0	23.3	40.0	-16.7	EUT On Side
54.250	30.7	-8.6	1.0	225.0	3.0	0.0	Vert	QP	0.0	22.1	40.0	-17.9	EUT On Side
54.248	27.8	-8.5	4.0	1.0	3.0	0.0	Horz	QP	0.0	19.3	40.0	-20.7	EUT Vertical
54.248	26.3	-8.5	1.0	223.0	3.0	0.0	Vert	QP	0.0	17.8	40.0	-22.2	EUT Vertical
40.688	21.5	-4.3	1.0	306.0	3.0	0.0	Vert	QP	0.0	17.2	40.0	-22.8	EUT Horizontal
42.300	15.5	-5.1	1.0	9.0	3.0	0.0	Horz	QP	0.0	10.4	40.0	-29.6	EUT Horizontal

# 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.	Cal. Due
Probe - Near Field Set	EMCO	7405	IPD	NCR	NCR
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPH-8-2-SCT/AC	TBI	NCR	NCR
Attenuator	Fairview Microwave	18B5W-26	RFZ	24-Jul-20	24-Jul-21
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	13-Mar-20	13-Mar-21
Thermometer	Omegaette	HH311	DTY	5-Jan-18	5-Jan-21
Meter - Multimeter	Tektronix	DMM912	MMH	15-Feb-19	15-Feb-22
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAT	28-Oct-20	28-Oct-21

## TEST DESCRIPTION

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  $\pm 0.01\%$  is equivalent to 100 ppm

The formula to check for compliance is:

$$\text{ppm} = (\text{Measured Frequency} / \text{Measured Nominal Frequency} - 1) * 1,000,000$$

# FREQUENCY STABILITY



TstTx 2019.08.30.0 XMI 2020.03.25.0

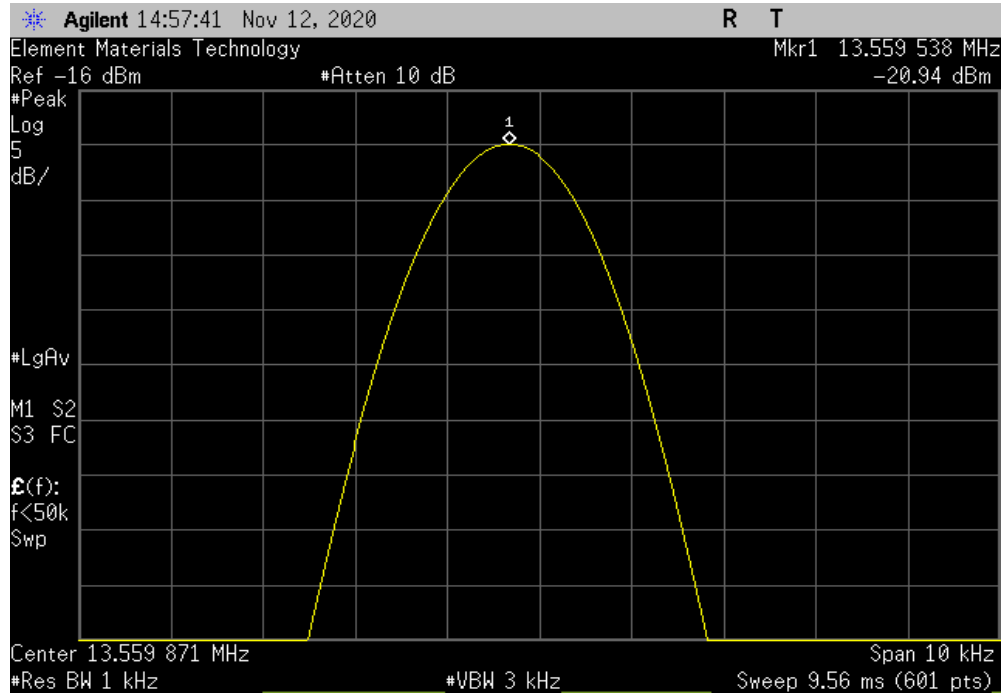
EUT: RFID IntelliPad REV B		Work Order: GSLS0015	
Serial Number: None		Date: 12-Nov-20	
Customer: GSL Solutions, INC.		Temperature: 24.1 °C	
Attendees: Joe Intile		Humidity: 32.4% RH	
Project: None		Barometric Pres.: 1017 mbar	
Tested by: Cole Ghizzone		Power: 5.0VDC	
Job Site: EV06			
TEST SPECIFICATIONS		Test Method	
FCC 15.225:2020		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature <i>Cole Ghizzone</i>	
		Measured Value (MHz)	Assigned Value (MHz)
		Error (ppm)	Limit (ppm)
			Results
Extreme Temperature, 50°C			
	Nominal Voltage 5.0VDC	13.559538	13.56
		34.1	100
			Pass
Extreme Temperature, 40°C			
	Nominal Voltage 5.0VDC	13.559571	13.56
		31.6	100
			Pass
Extreme Temperature, 30°C			
	Nominal Voltage 5.0VDC	13.559605	13.56
		29.1	100
			Pass
Nominal Temperature, 20°C			
	Nominal Voltage 5.0VDC	13.559671	13.56
	Extreme Voltage +15%, 5.75VDC	13.559638	13.56
		24.3	100
		26.7	100
	Extreme Voltage -15%, 4.25VDC	13.559621	13.56
		28	100
			Pass
Extreme Temperature, 10°C			
	Nominal Voltage 5.0VDC	13.559705	13.56
		21.8	100
			Pass
Extreme Temperature, 0°C			
	Nominal Voltage 5.0VDC	13.559738	13.56
		19.3	100
			Pass
Extreme Temperature, -10°C			
	Nominal Voltage 5.0VDC	13.559755	13.56
		18.1	100
			Pass
Extreme Temperature, -20°C			
	Nominal Voltage 5.0VDC	13.559755	13.56
		18.1	100
			Pass

# FREQUENCY STABILITY

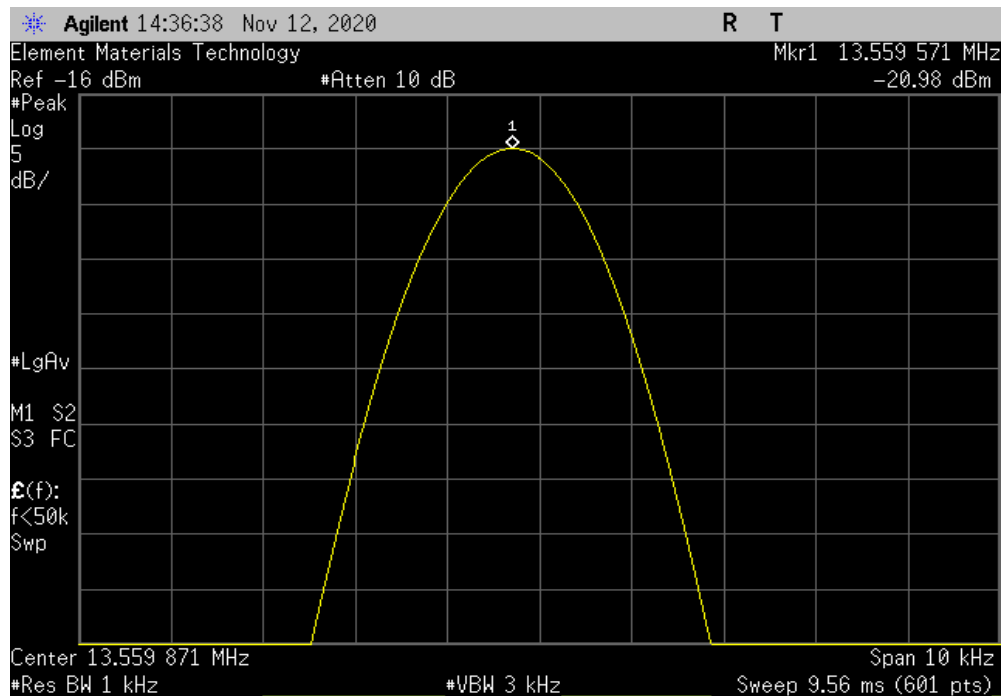


TuTx 2019.08.30.0 XMt 2020.03.25.0

Extreme Temperature, 50°C, Nominal Voltage 5.0VDC						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.559538	13.56	34.1	100	Pass	



Extreme Temperature, 40°C, Nominal Voltage 5.0VDC						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.559571	13.56	31.6	100	Pass	



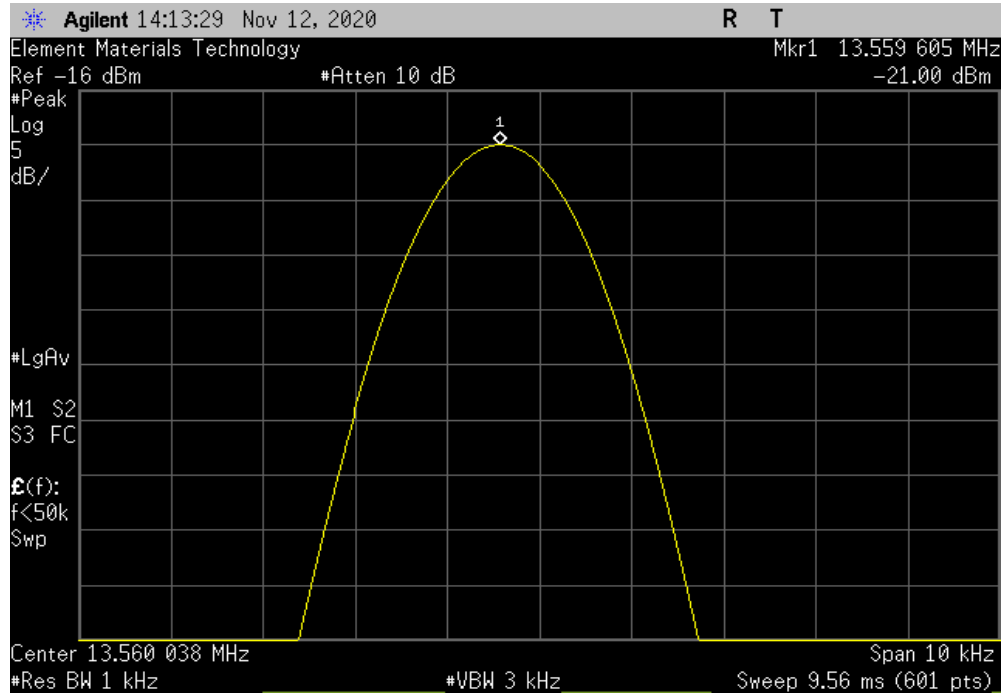


# FREQUENCY STABILITY

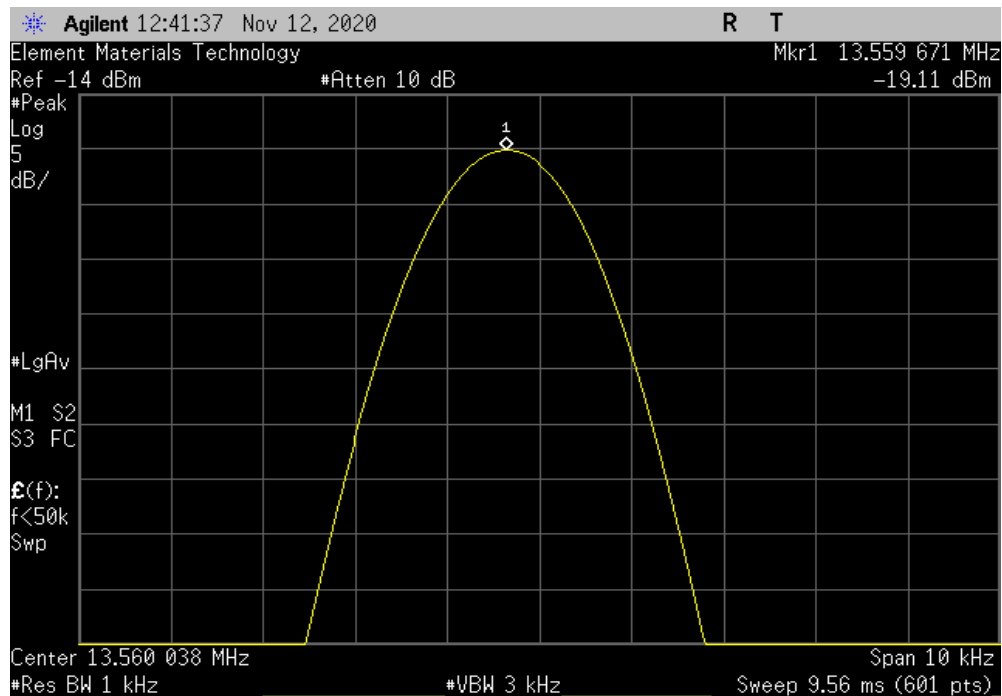


TbTx 2019.08.30.0 XMt 2020.03.25.0

Extreme Temperature, 30°C, Nominal Voltage 5.0VDC						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.559605	13.56	29.1	100	Pass	



Nominal Temperature, 20°C, Nominal Voltage 5.0VDC						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.559671	13.56	24.3	100	Pass	

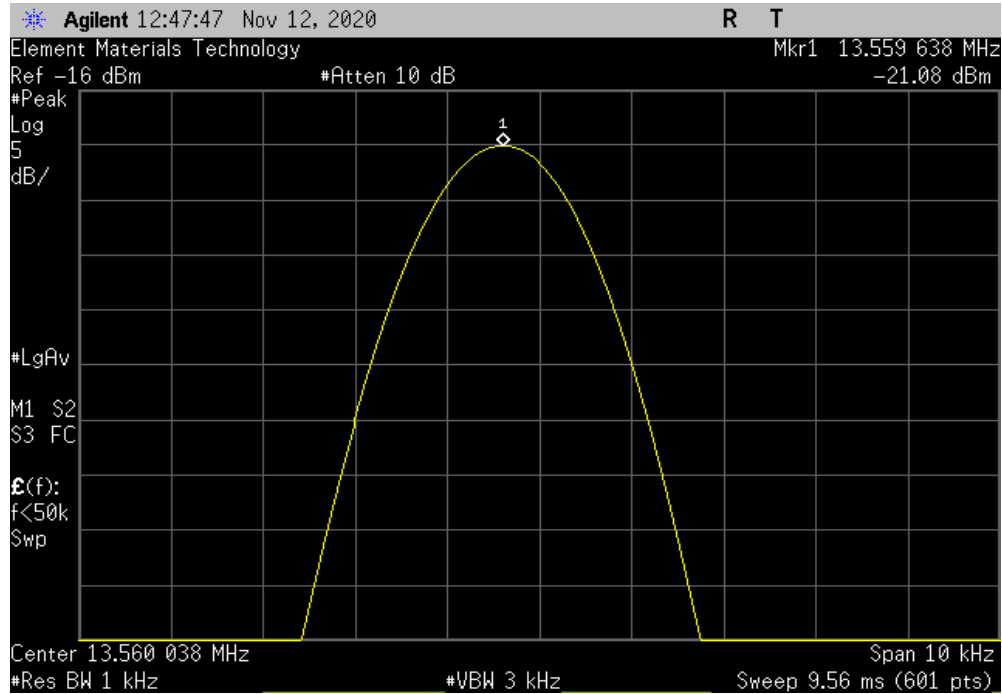


# FREQUENCY STABILITY

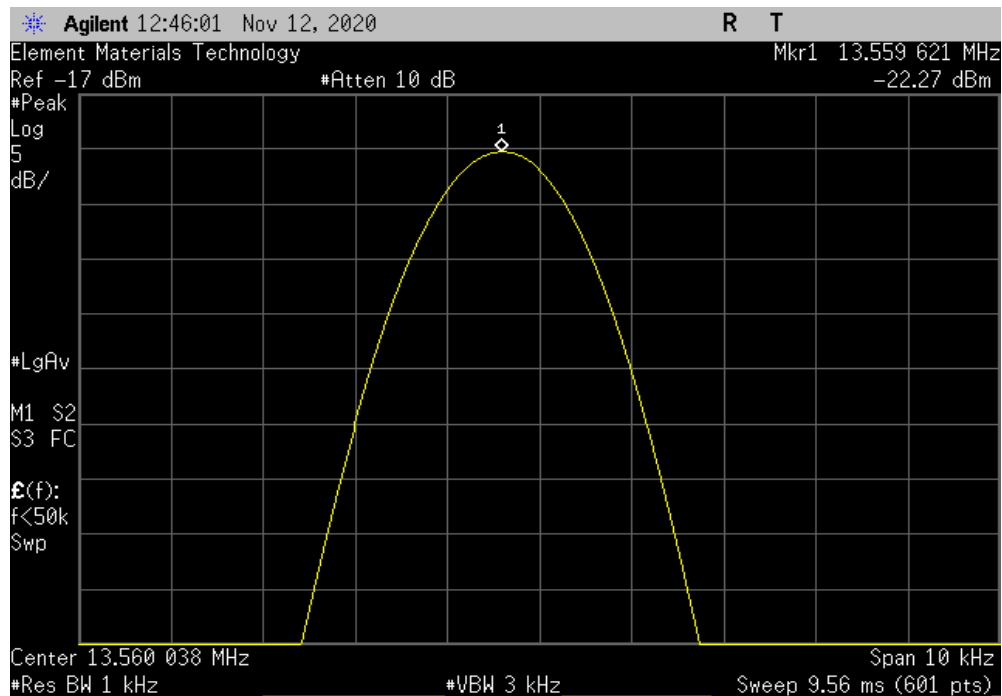


TbTx 2019.08.30.0 XMI 2020.03.25.0

Nominal Temperature, 20°C, Extreme Voltage +15%, 5.75VDC						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.559638	13.56	26.7	100	Pass	



Nominal Temperature, 20°C, Extreme Voltage -15%, 4.25VDC						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.559621	13.56	28	100	Pass	

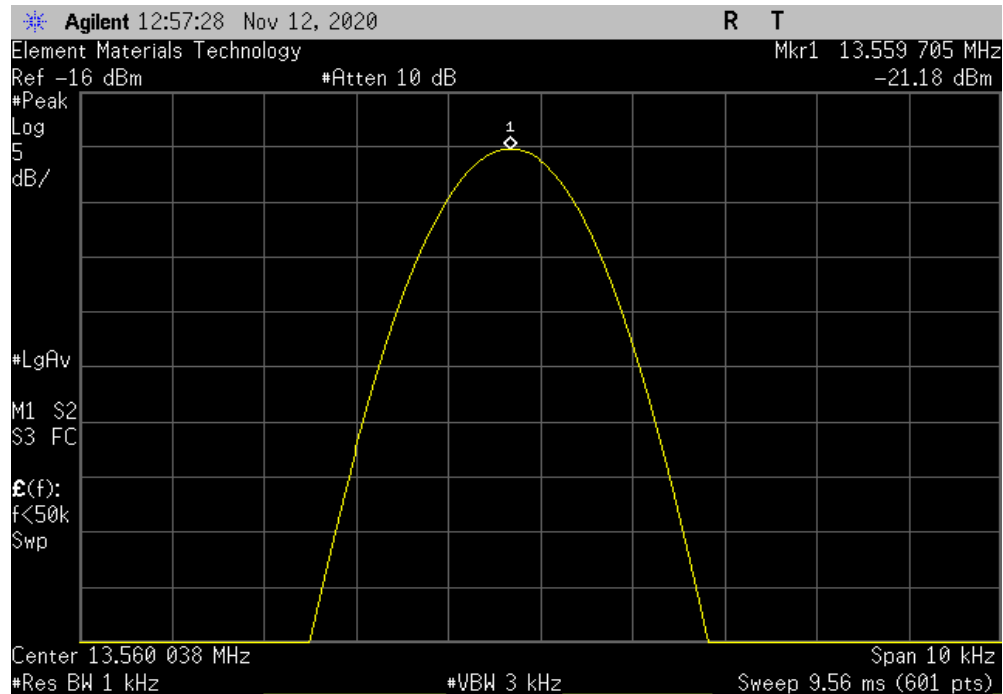


# FREQUENCY STABILITY

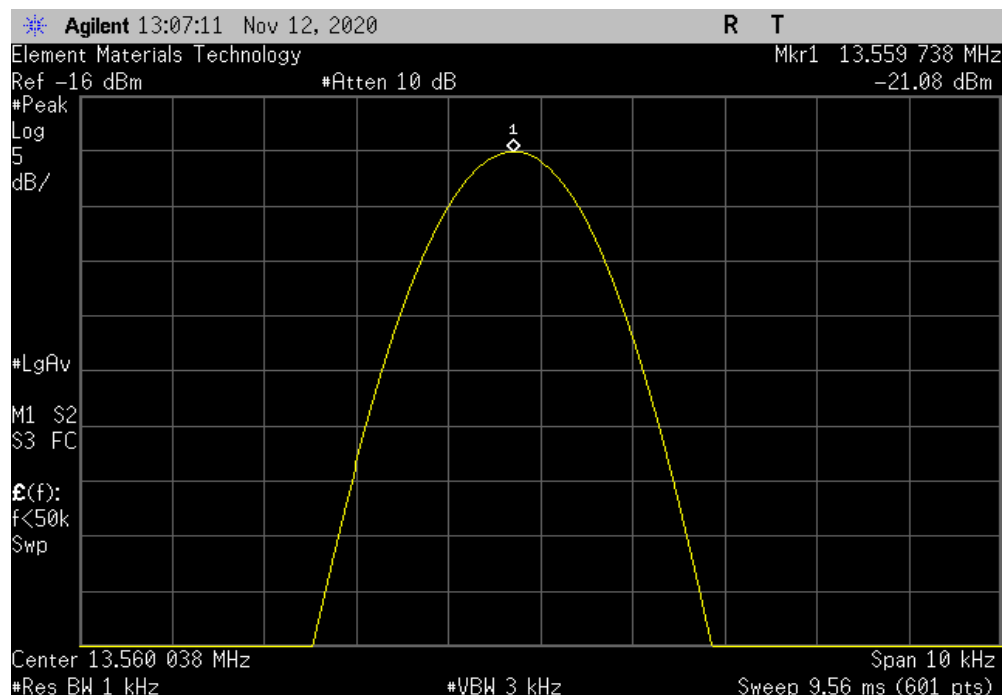


TuTx 2019.08.30.0 XMt 2020.03.25.0

Extreme Temperature, 10°C, Nominal Voltage 5.0VDC					
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
	13.559705	13.56	21.8	100	Pass



Extreme Temperature, 0°C, Nominal Voltage 5.0VDC					
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
	13.559738	13.56	19.3	100	Pass

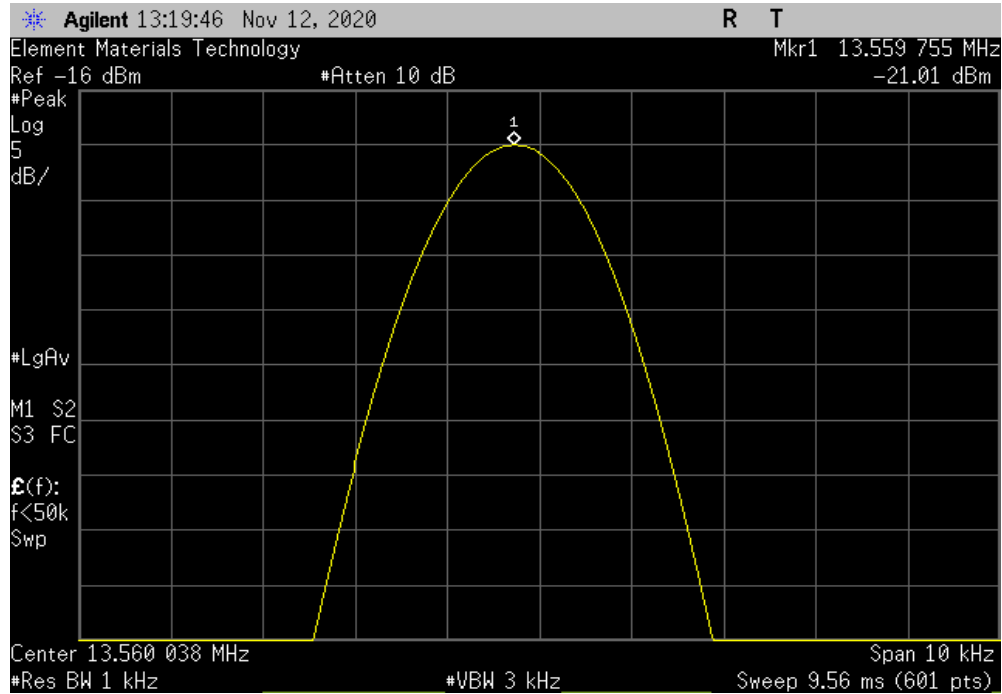


# FREQUENCY STABILITY



TutTx 2019.08.30.0 XMt 2020.03.25.0

Extreme Temperature, -10°C, Nominal Voltage 5.0VDC						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.559755	13.56	18.1	100	Pass	



Extreme Temperature, -20°C, Nominal Voltage 5.0VDC						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.559755	13.56	18.1	100	Pass	

