



element

Graphic Products, Inc.

Toro Max

**FCC 15.207:2021, FCC 15.225:2021
13.56MHz**

Report: GRAP0077.1 Rev. 1, Issue Date: October 26, 2021



NVLAP LAB CODE: 200630-0



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CERTIFICATE OF TEST



Last Date of Test: August 9, 2021
Graphic Products, Inc.
EUT: Toro Max

Radio Equipment Testing

Standards

Specification	Method
FCC 15.107:2021	ANSI C63.4:2014
FCC 15.207:2021	
FCC 15.225:2021	ANSI C63.10:2013

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		
01	Updated last day of testing	2021-08-17	2, 8, 12
01	Added new configurations	2021-08-17	11
01	Replaced data	2021-08-17	31-34

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 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) and as a CAB for the acceptance of test data.

European Union

European Commission – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

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

Korea

MSIT / 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

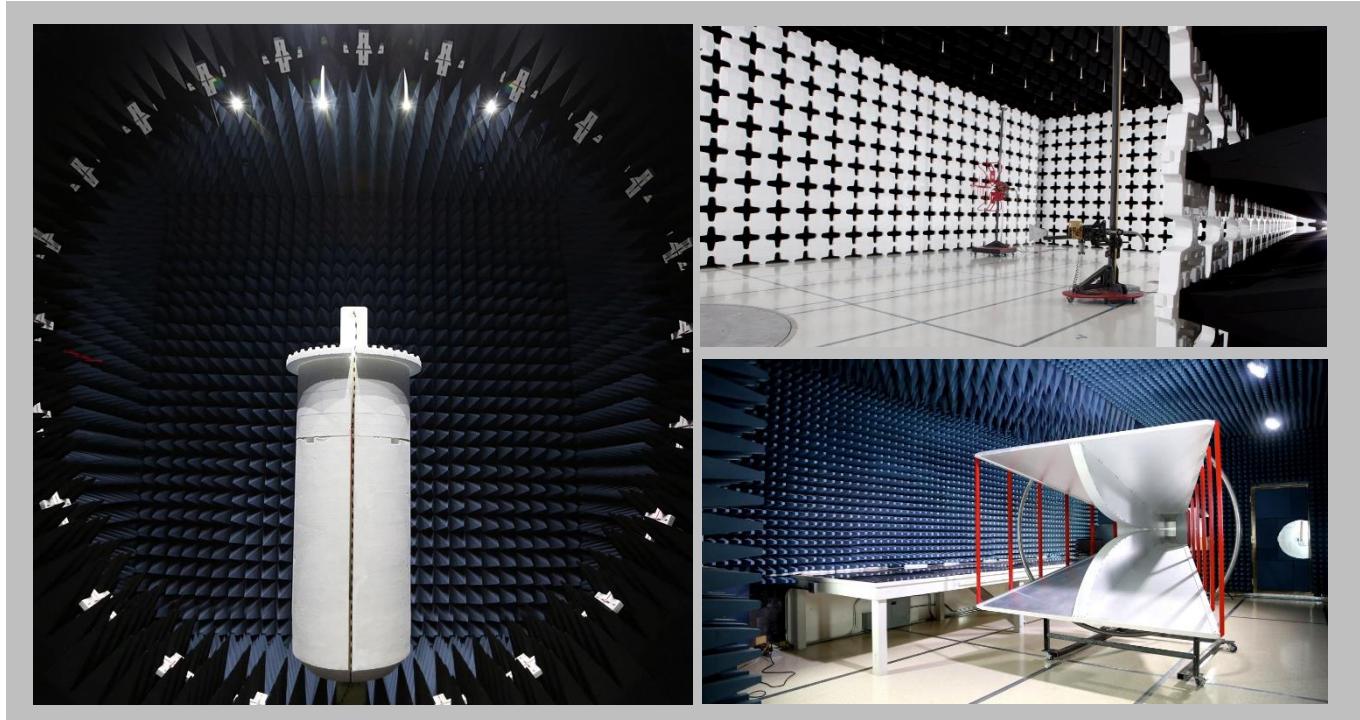
For details on the Scopes of our Accreditations, please visit:

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

FACILITIES



California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 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 120th Ave NE Bothell, WA 98011 (425) 984-6600
NVLAP				
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
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
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.

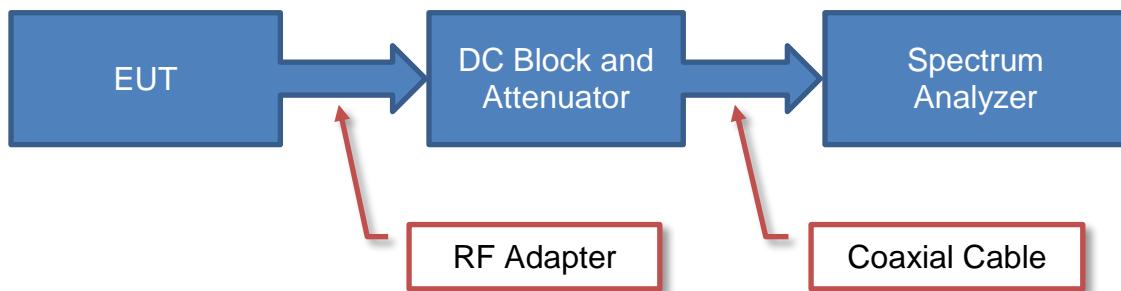
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

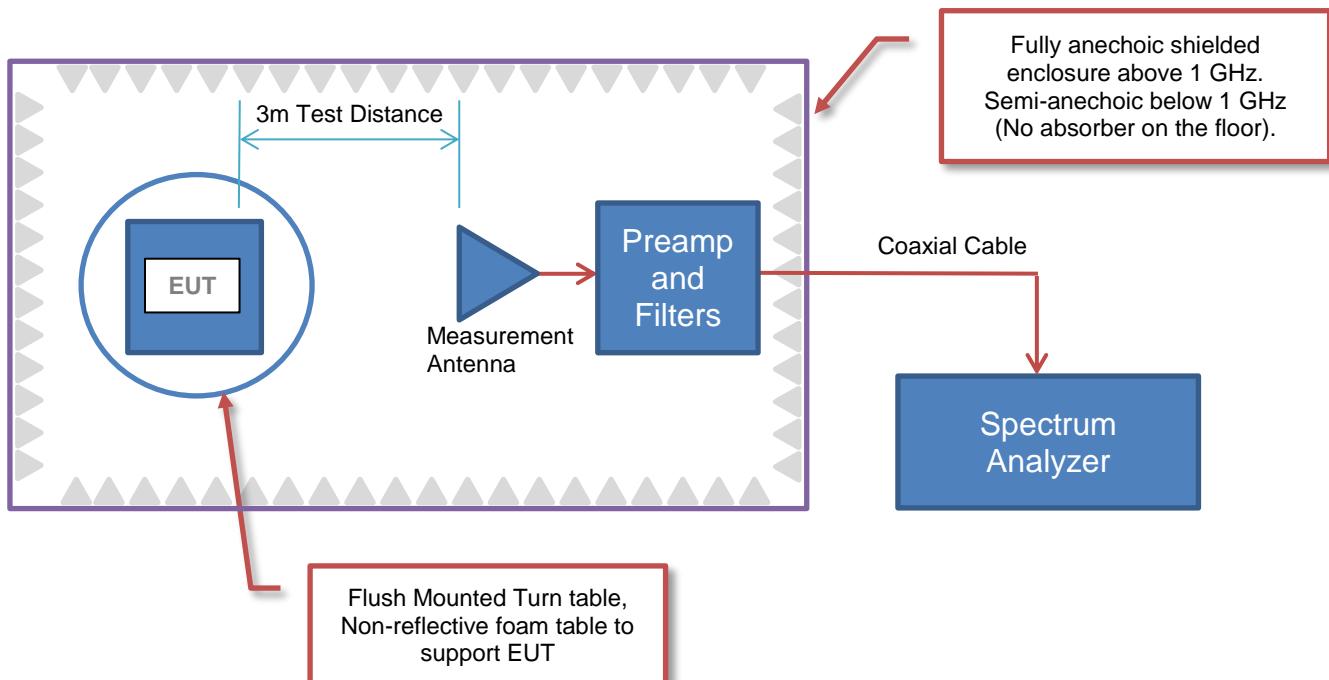
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Graphic Products, Inc.
Address:	9825 SW Sunshine Court
City, State, Zip:	Beaverton, OR 97005
Test Requested By:	Michael Noble
EUT:	Toro Max
First Date of Test:	February 10, 2021
Last Date of Test:	August 9, 2021
Receipt Date of Samples:	February 5, 2021
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

The Toro Max is a standalone thermal transfer printer with a display and keyboard.

Testing Objective:

To demonstrate compliance to FCC Part 15.225 specifications.

CONFIGURATIONS



Configuration GRAP0077- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Thermal Transfer Printer	Graphic Products, Inc.	Toro Max	Cert 2

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Keyboard 4	Solidtek USA	ASK-3100U	0711001155
Keyboard 1	Dell	KB-212B	None
Keyboard 3	Dell	KB-212B	None
Keyboard 2	Dell	KB-212B	None
Power Supply	Wearnes	WDS5150240	200400000014

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop PC	Acer	V5-131-2887	3340294334

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Keyboard Cable 1	Yes	1.8 m	No	Thermal Transfer Printer	Keyboard 1
Keyboard Cable 2	Yes	1.8 m	Yes	Thermal Transfer Printer	Keyboard 2
Keyboard Cable 3	Yes	1.8 m	No	Thermal Transfer Printer	Keyboard 3
Keyboard Cable 4	Yes	1.8 m	Yes	Thermal Transfer Printer	Keyboard 4
AC Power Cable	No	1.8 m	No	Power Supply	AC Mains
CAT 5	No	4.6 m	No	Laptop PC	Thermal Transfer Printer
USB	Yes	4.6 m	No	Laptop PC	Thermal Transfer Printer
DC Power Cable	Yes	1 m	Yes	Power Supply	Thermal Transfer Printer

CONFIGURATIONS



Configuration GRAP0077- 3

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Thermal Transfer Printer	Graphic Products, Inc.	Toro Max	Cert 2	

Peripherals in test setup boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
Keyboard 4	Solidtek USA	ASK-3100U	0711001155	
Keyboard 1	Dell	KB-212B	None	
Keyboard 3	Dell	KB-212B	None	
Keyboard 2	Dell	KB-212B	None	
Power Supply	Wearnes	WDS5150240	200400000014	

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Keyboard Cable 1	Yes	1.8 m	No	Thermal Transfer Printer	Keyboard 1
Keyboard Cable 2	Yes	1.8 m	Yes	Thermal Transfer Printer	Keyboard 2
Keyboard Cable 3	Yes	1.8 m	No	Thermal Transfer Printer	Keyboard 3
Keyboard Cable 4	Yes	1.8 m	Yes	Thermal Transfer Printer	Keyboard 4
AC Power Cable	No	1.8 m	No	Power Supply	AC Mains
CAT 5	No	4.6 m	No	Laptop PC	Thermal Transfer Printer
USB	Yes	4.6m	No	Thermal Transfer Printer	Unterminated
CAT 5	No	4.6m	No	Thermal Transfer Printer	Unterminated

CONFIGURATIONS



Configuration GRAP0085- 1

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Thermal Transfer Printer	Graphic Products, Inc.	Toro Max	Cert 2	

Peripherals in test setup boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
Keyboard 4	Solidtek USA	ASK-3100U	0711001155	
Keyboard 1	Dell	KB-212B	None	
Keyboard 3	Dell	KB-212B	None	
Keyboard 2	Dell	KB-212B	None	
Power Supply	Wearnes	WDS5150240	200400000014	

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Keyboard Cable 1	Yes	1.8 m	No	Thermal Transfer Printer	Keyboard 1
Keyboard Cable 2	Yes	1.8 m	Yes	Thermal Transfer Printer	Keyboard 2
Keyboard Cable 3	Yes	1.8 m	No	Thermal Transfer Printer	Keyboard 3
Keyboard Cable 4	Yes	1.8 m	Yes	Thermal Transfer Printer	Keyboard 4
AC Power Cable	No	1.8 m	No	Power Supply	AC Mains
CAT 5	No	4.6 m	No	Laptop PC	Thermal Transfer Printer
USB	Yes	4.6m	No	Thermal Transfer Printer	Unterminated
CAT 5	No	4.6m	No	Thermal Transfer Printer	Unterminated

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-02-10	Field Strength of Spurious Emissions greater than 30MHz	Modified from delivered configuration.	A ferrite was added to the battery cable.	EUT remained at Element following the test.
2	2021-02-11	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT was taken home by the client before the next scheduled test.
3	2021-02-11	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.
4	2021-08-09	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	2021-08-09	Field Strength of Spurious Emissions less than 30MHz	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	ESR7	ARI	2020-07-09	2021-07-09
LISN	Solar Electronics	9252-50-R-24-BNC	LIN	2021-01-08	2022-01-08
Cable - Conducted Cable Assembly	Northwest EMC	EVG, HHD, RKT	EVGA	2021-01-05	2022-01-05

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.6 dB	-2.6 dB

CONFIGURATIONS INVESTIGATED

GRAP0077-3

MODES INVESTIGATED

On, RFID off
On, continuous transmit 13.56MHz RFID

POWERLINE CONDUCTED EMISSIONS



EUT:	Toro Max	Work Order:	GRAP0077
Serial Number:	Cert 2	Date:	2021-02-11
Customer:	Graphic Products, Inc.	Temperature:	21.5°C
Attendees:	Chad Schaffer	Relative Humidity:	31.3%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	Cole Ghizzone	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0077-3

TEST SPECIFICATIONS

Specification: Equipment Class A	Method:
FCC 15.107:2021	ANSI C63.4:2014

TEST PARAMETERS

Run #:	12	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

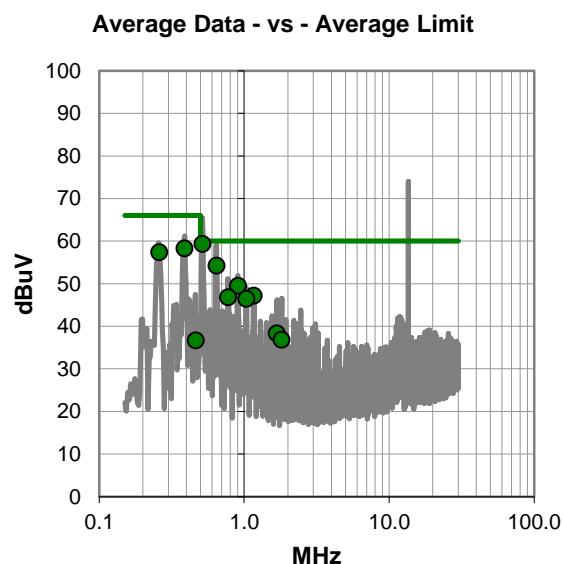
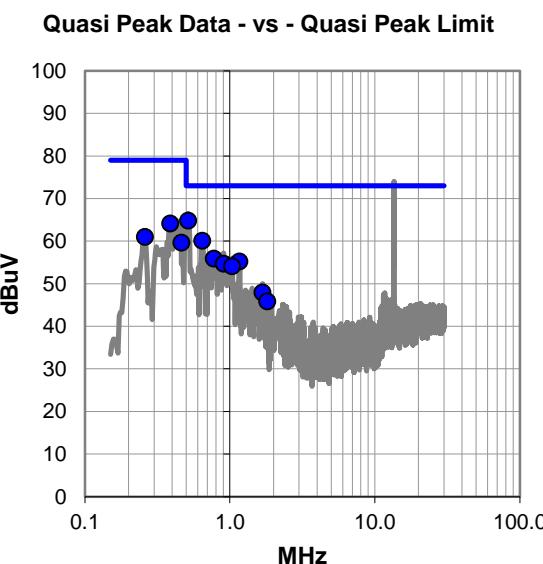
This is a class A device and the unintentional emissions meet the class A limits.

EUT OPERATING MODES

On, continuous transmit 13.56MHz RFID

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #12

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.516	44.8	20.0	64.8	73.0	-8.2
0.389	44.1	20.0	64.1	79.0	-14.9
0.646	40.1	20.0	60.1	73.0	-12.9
0.464	39.6	20.0	59.6	79.0	-19.4
0.777	35.9	20.0	55.9	73.0	-17.1
0.259	41.0	20.0	61.0	79.0	-18.0
1.165	35.2	20.0	55.2	73.0	-17.8
0.906	34.7	20.0	54.7	73.0	-18.3
1.038	34.1	20.0	54.1	73.0	-18.9
1.680	27.9	20.0	47.9	73.0	-25.1
1.815	25.8	20.0	45.8	73.0	-27.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.516	39.3	20.0	59.3	60.0	-0.7
0.389	38.3	20.0	58.3	66.0	-7.7
0.646	34.2	20.0	54.2	60.0	-5.8
0.259	37.4	20.0	57.4	66.0	-8.6
0.906	29.5	20.0	49.5	60.0	-10.5
1.165	27.2	20.0	47.2	60.0	-12.8
0.777	26.8	20.0	46.8	60.0	-13.2
1.038	26.4	20.0	46.4	60.0	-13.6
1.680	18.3	20.0	38.3	60.0	-21.7
1.815	16.8	20.0	36.8	60.0	-23.2
0.464	16.7	20.0	36.7	66.0	-29.3

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Toro Max	Work Order:	GRAP0077
Serial Number:	Cert 2	Date:	2021-02-11
Customer:	Graphic Products, Inc.	Temperature:	21.5°C
Attendees:	Chad Schaffer	Relative Humidity:	31.3%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	Cole Ghizzone	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0077-3

TEST SPECIFICATIONS

Specification: Equipment Class A	Method:
FCC 15.107:2021	ANSI C63.4:2014

TEST PARAMETERS

Run #:	13	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

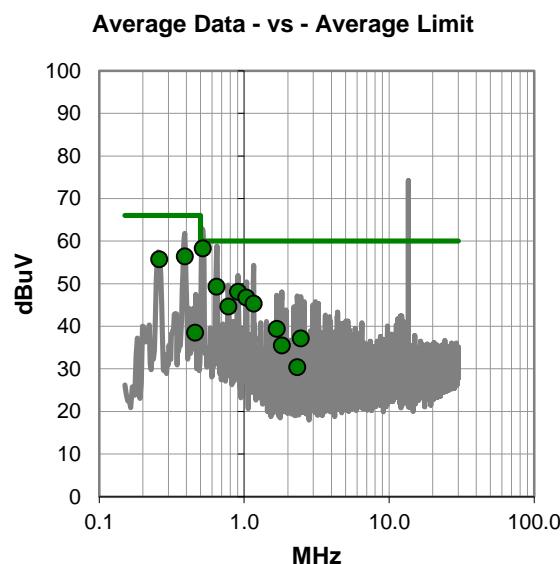
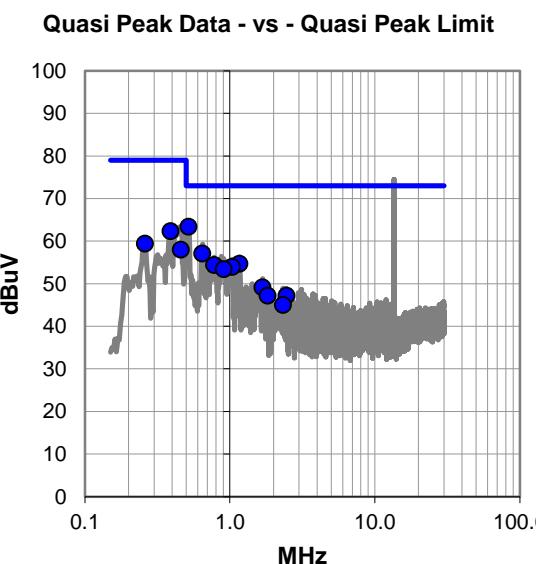
This is a class A device and the unintentional emissions meet the class A limits.

EUT OPERATING MODES

On, continuous transmit 13.56MHz RFID

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #13

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.518	43.4	20.0	63.4	73.0	-9.6
0.389	42.3	20.0	62.3	79.0	-16.7
0.459	38.0	20.0	58.0	79.0	-21.0
0.644	37.1	20.0	57.1	73.0	-15.9
1.163	34.7	20.0	54.7	73.0	-18.3
0.781	34.4	20.0	54.4	73.0	-18.6
0.259	39.4	20.0	59.4	79.0	-19.6
1.038	33.9	20.0	53.9	73.0	-19.1
0.908	33.4	20.0	53.4	73.0	-19.6
1.683	29.1	20.0	49.1	73.0	-23.9
1.822	27.2	20.0	47.2	73.0	-25.8
2.463	27.2	20.0	47.2	73.0	-25.8
2.322	25.0	20.0	45.0	73.0	-28.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.518	38.3	20.0	58.3	60.0	-1.7
0.389	36.4	20.0	56.4	66.0	-9.6
0.259	35.7	20.0	55.7	66.0	-10.3
0.644	29.3	20.0	49.3	60.0	-10.7
0.908	28.1	20.0	48.1	60.0	-11.9
1.038	26.7	20.0	46.7	60.0	-13.3
1.163	25.3	20.0	45.3	60.0	-14.7
0.781	24.6	20.0	44.6	60.0	-15.4
1.683	19.4	20.0	39.4	60.0	-20.6
0.459	18.5	20.0	38.5	66.0	-27.5
2.463	17.1	20.0	37.1	60.0	-22.9
1.822	15.5	20.0	35.5	60.0	-24.5
2.322	10.4	20.0	30.4	60.0	-29.6

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Toro Max	Work Order:	GRAP0077
Serial Number:	Cert 2	Date:	2021-02-11
Customer:	Graphic Products, Inc.	Temperature:	21.5°C
Attendees:	Chad Schaffer	Relative Humidity:	31.3%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	Cole Ghizzone	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0077-3

TEST SPECIFICATIONS

Specification: Equipment Class A	Method:
FCC 15.107:2021	ANSI C63.4:2014

TEST PARAMETERS

Run #:	14	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

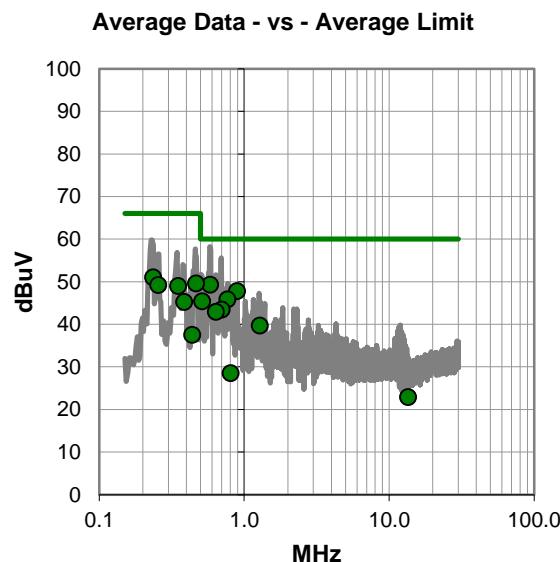
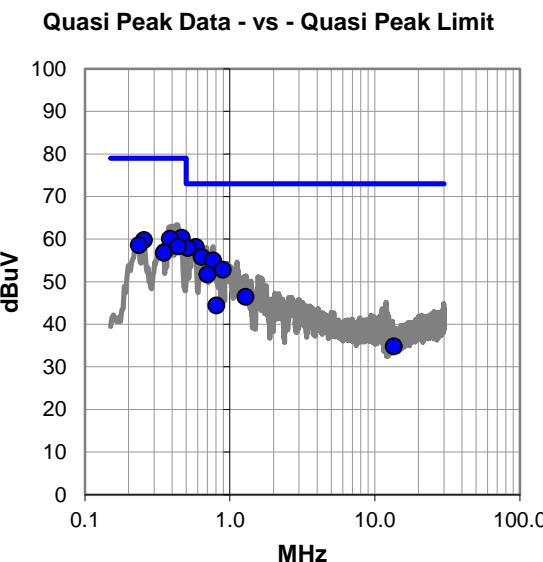
RFID module is off and unintentional emissions don't change.

EUT OPERATING MODES

On, RFID off

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #14

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.466	40.3	20.0	60.3	79.0	-18.7
0.582	38.1	20.0	58.1	73.0	-14.9
0.385	40.1	20.0	60.1	79.0	-18.9
0.512	37.9	20.0	57.9	73.0	-15.1
0.438	38.3	20.0	58.3	79.0	-20.7
0.640	35.8	20.0	55.8	73.0	-17.2
0.766	35.0	20.0	55.0	73.0	-18.0
0.256	39.8	20.0	59.8	79.0	-19.2
0.351	36.8	20.0	56.8	79.0	-22.2
0.895	32.8	20.0	52.8	73.0	-20.2
0.235	38.6	20.0	58.6	79.0	-20.4
0.700	31.7	20.0	51.7	73.0	-21.3
1.282	26.4	20.0	46.4	73.0	-26.6
0.806	24.4	20.0	44.4	73.0	-28.6
13.542	14.5	20.3	34.8	73.0	-38.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.582	29.3	20.0	49.3	60.0	-10.7
0.466	29.6	20.0	49.6	66.0	-16.4
0.895	27.8	20.0	47.8	60.0	-12.2
0.351	29.0	20.0	49.0	66.0	-17.0
0.766	25.8	20.0	45.8	60.0	-14.2
0.512	25.4	20.0	45.4	60.0	-14.6
0.235	31.0	20.0	51.0	66.0	-15.0
0.256	29.2	20.0	49.2	66.0	-16.8
0.700	23.4	20.0	43.4	60.0	-16.6
0.385	25.2	20.0	45.2	66.0	-20.8
0.640	22.9	20.0	42.9	60.0	-17.1
1.282	19.7	20.0	39.7	60.0	-20.3
0.438	17.5	20.0	37.5	66.0	-28.5
0.806	8.5	20.0	28.5	60.0	-31.5
13.542	2.6	20.3	22.9	60.0	-37.1

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Toro Max	Work Order:	GRAP0077
Serial Number:	Cert 2	Date:	2021-02-11
Customer:	Graphic Products, Inc.	Temperature:	21.5°C
Attendees:	Chad Schaffer	Relative Humidity:	31.3%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	Cole Ghizzone	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0077-3

TEST SPECIFICATIONS

Specification: Equipment Class A	Method:
FCC 15.107:2021	ANSI C63.4:2014

TEST PARAMETERS

Run #:	15	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

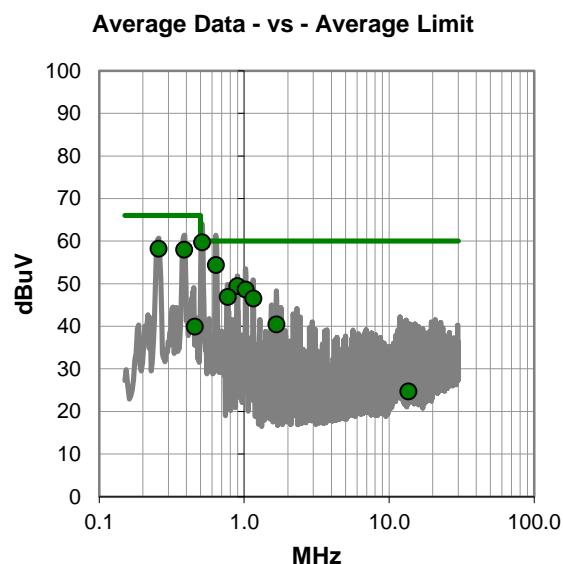
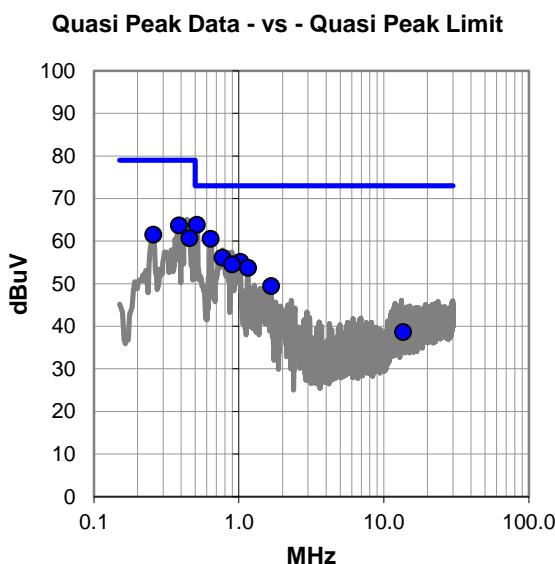
RFID module is off and unintentional emissions don't change.

EUT OPERATING MODES

On, RFID off

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)
0.513	43.8	20.0	63.8	73.0	-9.2
0.385	43.7	20.0	63.7	79.0	-15.3
0.639	40.5	20.0	60.5	73.0	-12.5
0.456	40.7	20.0	60.7	79.0	-18.3
0.771	36.1	20.0	56.1	73.0	-16.9
0.257	41.5	20.0	61.5	79.0	-17.5
1.028	35.1	20.0	55.1	73.0	-17.9
0.898	34.5	20.0	54.5	73.0	-18.5
1.157	33.7	20.0	53.7	73.0	-19.3
1.669	29.4	20.0	49.4	73.0	-23.6
13.572	18.3	20.3	38.6	73.0	-34.4

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.513	39.7	20.0	59.7	60.0	-0.3
0.385	38.0	20.0	58.0	66.0	-8.0
0.639	34.4	20.0	54.4	60.0	-5.6
0.257	38.2	20.0	58.2	66.0	-7.8
0.898	29.4	20.0	49.4	60.0	-10.6
1.028	28.6	20.0	48.6	60.0	-11.4
0.771	26.9	20.0	46.9	60.0	-13.1
1.157	26.5	20.0	46.5	60.0	-13.5
1.669	20.4	20.0	40.4	60.0	-19.6
0.456	19.9	20.0	39.9	66.0	-26.1
13.572	4.4	20.3	24.7	60.0	-35.3

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Toro Max	Work Order:	GRAP0077
Serial Number:	Cert 2	Date:	2021-02-11
Customer:	Graphic Products, Inc.	Temperature:	21.5°C
Attendees:	Chad Schaffer	Relative Humidity:	31.3%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	Cole Ghizzone	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0077-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	12	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

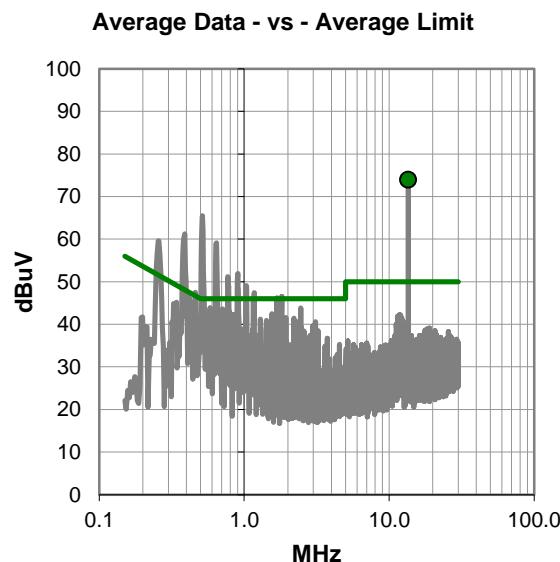
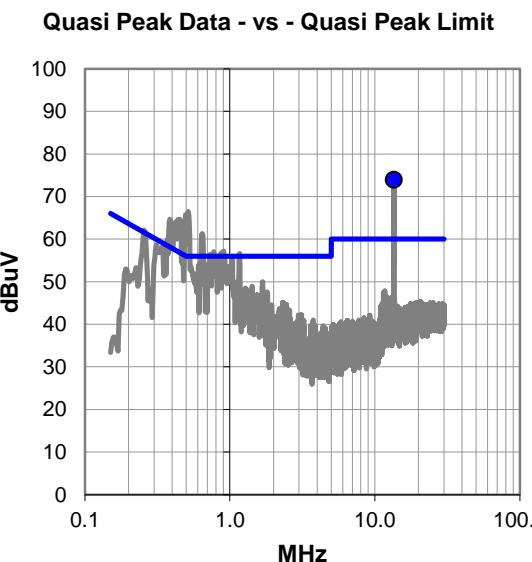
None

EUT OPERATING MODES

On, continuous transmit 13.56MHz RFID

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #12

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	53.6	20.3	73.9	60.0	13.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	53.6	20.3	73.9	50.0	23.9

CONCLUSION

Fail

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Toro Max	Work Order:	GRAP0077
Serial Number:	Cert 2	Date:	2021-02-11
Customer:	Graphic Products, Inc.	Temperature:	21.5°C
Attendees:	Chad Schaffer	Relative Humidity:	31.3%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	Cole Ghizzone	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0077-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	13	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

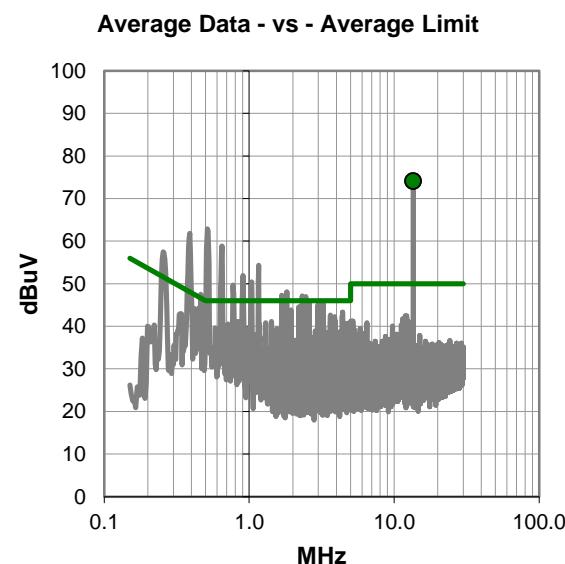
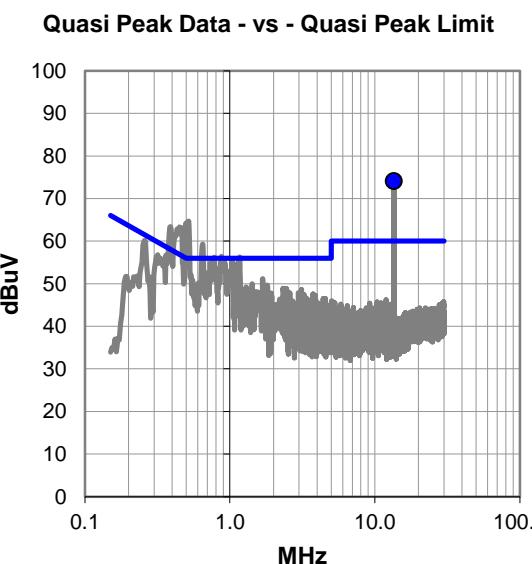
None

EUT OPERATING MODES

On, continuous transmit 13.56MHz RFID

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #13

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	53.8	20.3	74.1	60.0	14.1

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	53.8	20.3	74.1	50.0	24.1

CONCLUSION

Fail

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Toro Max	Work Order:	GRAP0077
Serial Number:	Cert 2	Date:	2021-02-11
Customer:	Graphic Products, Inc.	Temperature:	21.5°C
Attendees:	Chad Schaffer	Relative Humidity:	31.3%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	Cole Ghizzone	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0077-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	16	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

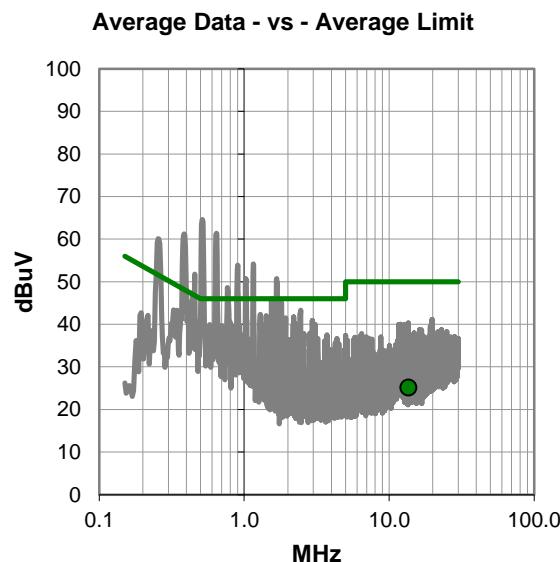
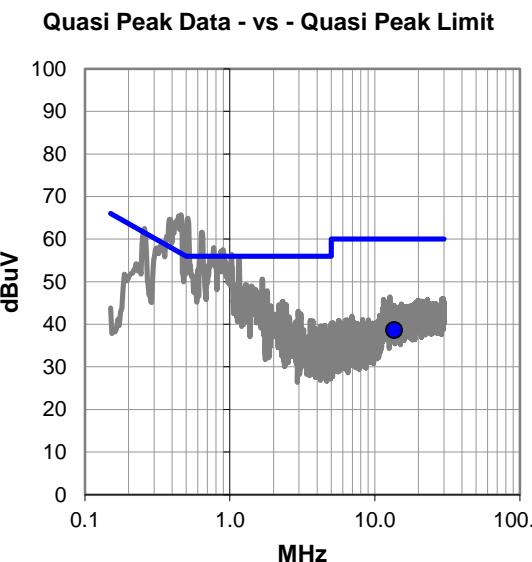
RFID antenna removed with the radio transmitting. Meets FCC 15.207 limits.

EUT OPERATING MODES

On, continuous transmit 13.56MHz RFID

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)
13.569	18.3	20.3	38.6	60.0	-21.4

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.569	4.8	20.3	25.1	50.0	-24.9

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Toro Max	Work Order:	GRAP0077
Serial Number:	Cert 2	Date:	2021-02-11
Customer:	Graphic Products, Inc.	Temperature:	21.5°C
Attendees:	Chad Schaffer	Relative Humidity:	31.3%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	Cole Ghizzone	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	GRAP0077-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	17	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

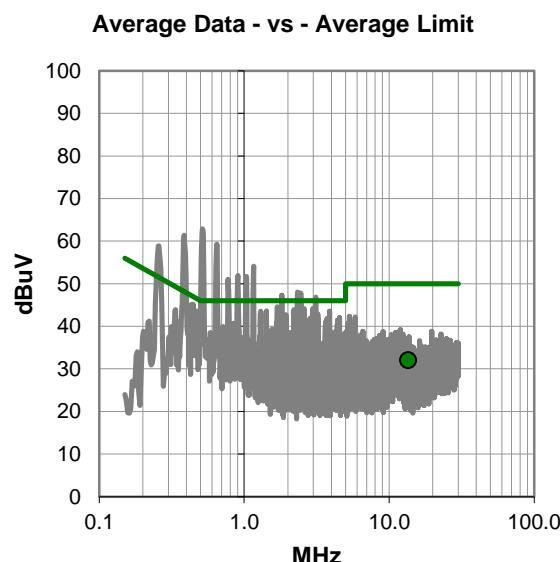
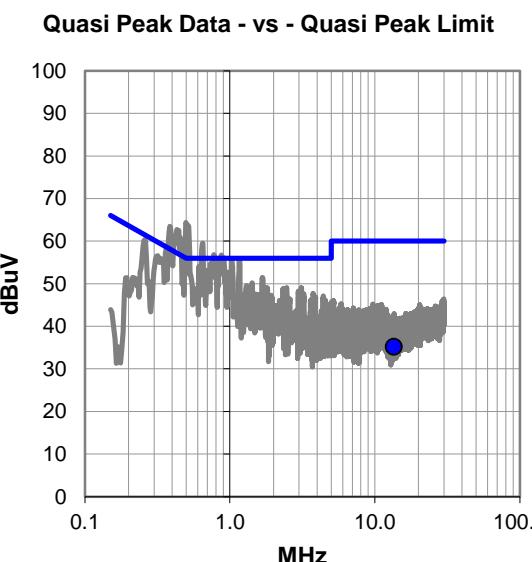
RFID antenna removed with the radio transmitting. Meets FCC 15.207 limits.

EUT OPERATING MODES

On, continuous transmit 13.56MHz RFID

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #17

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.563	14.9	20.3	35.2	60.0	-24.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.563	11.7	20.3	32.0	50.0	-18.0

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF FUNDAMENTAL

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

On, continuous transmit RFID at 13.56MHz, reading tag.

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

GRAP0085 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz
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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.	Cal. Due
Cable	None	10m Test Distance Cable	EVL	2021-02-02	2022-02-02
Antenna - Loop	EMCO	6502	AOA	2020-07-06	2022-07-06
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAW	2020-12-16	2021-12-16

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.

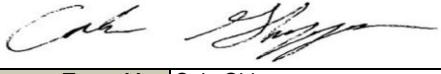
FIELD STRENGTH OF FUNDAMENTAL



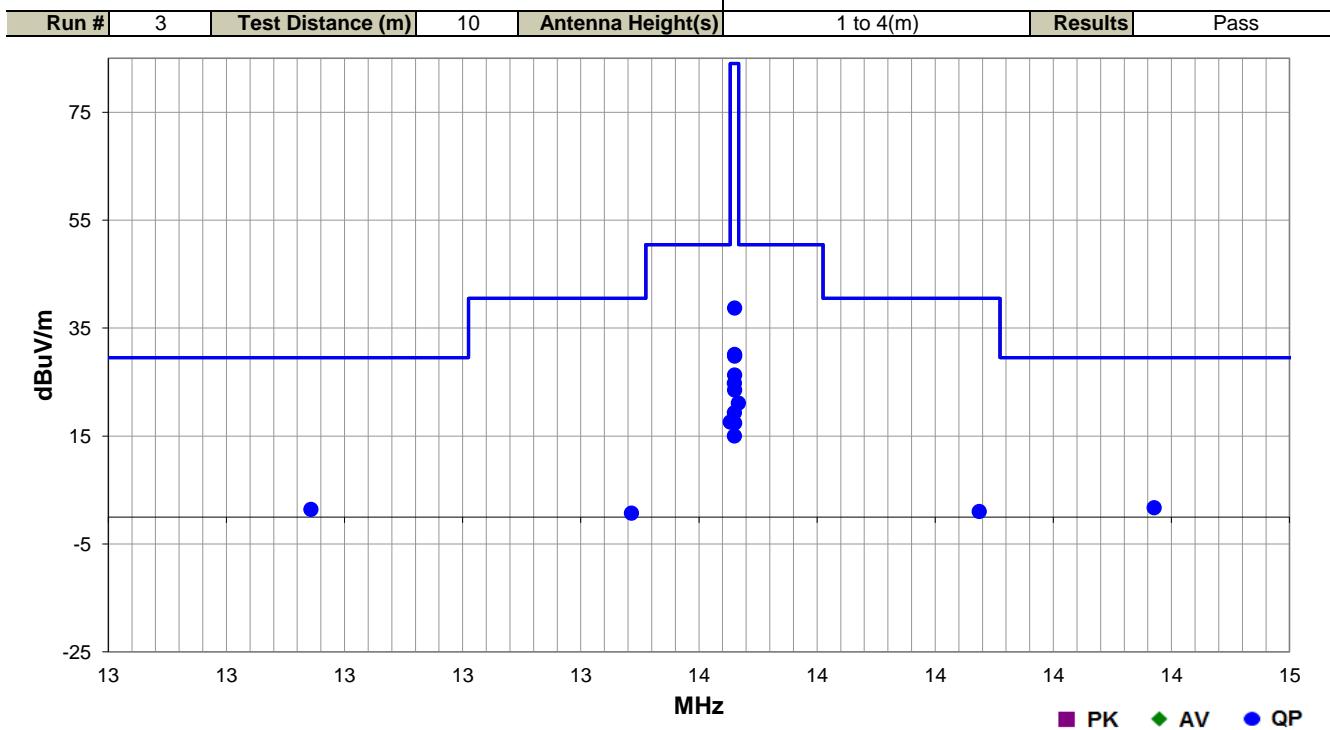
element

EmiR5 2021.06.24.0

PSA-ESCI 2021.03.17.0

Work Order:	GRAP0085	Date:	2021-08-09		Tested by:
Project:	None	Temperature:	23.4 °C		
Job Site:	EV11	Humidity:	45.1% RH		
Serial Number:	Cert 2	Barometric Pres.:	1021 mbar		
EUT:	Toro Max				
Configuration:	1				
Customer:	Graphic Products, Inc.				
Attendees:	Chad Shaffer				
EUT Power:	110VAC/60Hz				
Operating Mode:	On, continuous transmit RFID at 13.56MHz, reading tag.				
Deviations:	None				
Comments:	See Data comments for EUT orientation.				

Test Specifications	Test Method
FCC 15.225:2021	ANSI C63.10:2013



Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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)
14.271	8.8	12.0	1.0	-5.0	10.0	0.0	Perp EUT	QP	-19.1	1.7	29.5	-27.8
12.843	8.4	12.1	1.0	-5.0	10.0	0.0	Perp EUT	QP	-19.1	1.4	29.5	-28.1
13.553	24.7	12.0	1.0	-5.0	10.0	0.0	Perp EUT	QP	-19.1	17.6	50.5	-32.9
13.975	8.1	12.0	1.0	-5.0	10.0	0.0	Perp EUT	QP	-19.1	1.0	40.5	-39.5
13.386	7.7	12.1	1.0	-5.0	10.0	0.0	Perp EUT	QP	-19.1	0.7	40.5	-39.8
13.567	28.2	12.0	1.0	-5.0	10.0	0.0	Perp EUT	QP	-19.1	21.1	84.0	-62.9
13.560	45.8	12.0	1.0	170.0	10.0	0.0	Perp EUT	QP	-19.1	38.7	84.0	-45.3
13.560	37.2	12.0	1.0	252.0	10.0	0.0	Para EUT	QP	-19.1	30.1	84.0	-53.9
13.560	36.9	12.0	1.0	85.0	10.0	0.0	Perp EUT	QP	-19.1	29.8	84.0	-54.2
13.560	33.4	12.0	1.0	198.0	10.0	0.0	Para EUT	QP	-19.1	26.3	84.0	-57.7
13.560	31.9	12.0	1.0	300.0	10.0	0.0	Perp EUT	QP	-19.1	24.8	84.0	-59.2

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHZ)



PSA-ESCI 2021.03.17.0

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

On, continuous transmit RFID at 13.56MHz, reading tag.

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

GRAP0085 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz	Stop Frequency 30 MHz
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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.	Cal. Due
Cable	None	10m Test Distance Cable	EVL	2021-02-02	2022-02-02
Antenna - Loop	EMCO	6502	AOA	2020-07-06	2022-07-06
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAW	2020-12-16	2021-12-16

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)

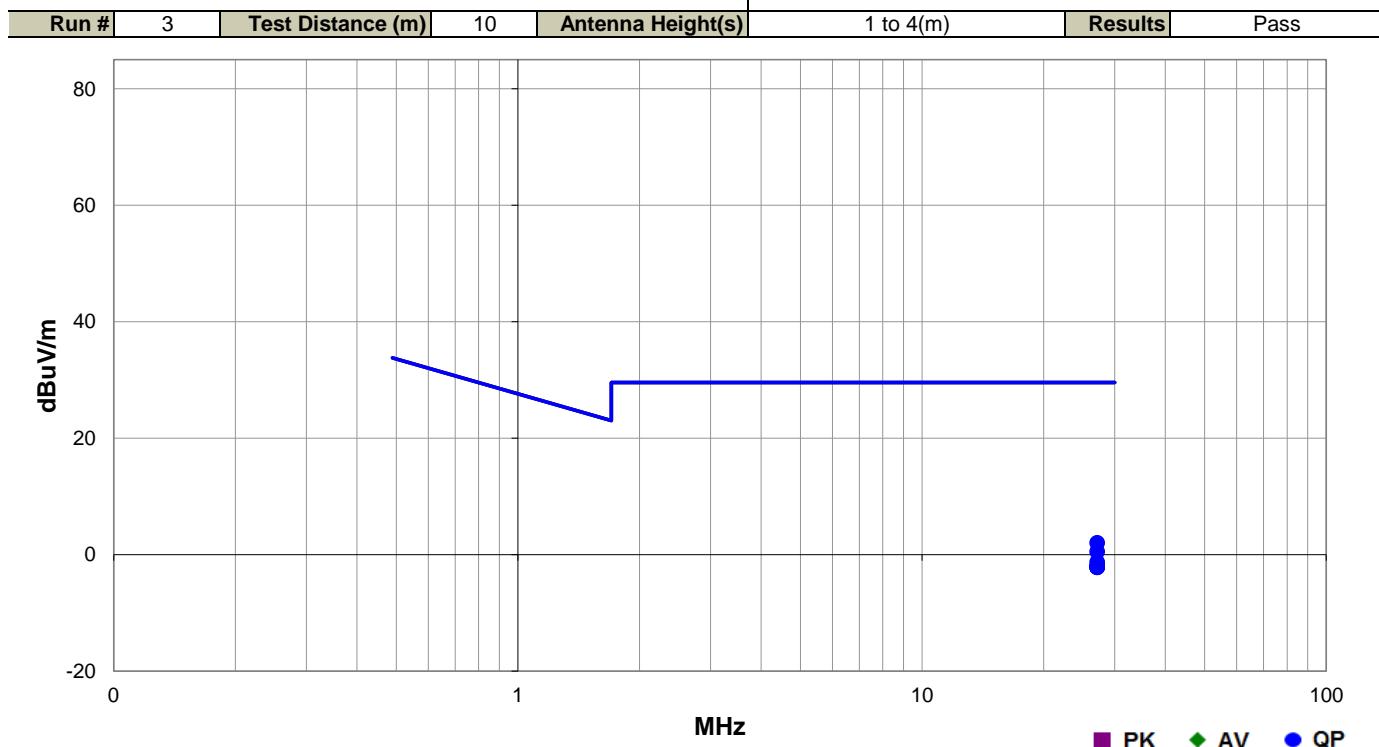


EmiR5 2021.06.24.0

PSA-ESCI 2021.03.17.0

Work Order:	GRAP0085	Date:	2021-08-09	
Project:	None	Temperature:	23.4 °C	
Job Site:	EV11	Humidity:	45.1% RH	
Serial Number:	Cert 2	Barometric Pres.:	1021 mbar	Tested by: Cole Ghizzone
EUT:	Toro Max			
Configuration:	1			
Customer:	Graphic Products, Inc.			
Attendees:	Chad Shaffer			
EUT Power:	110VAC/60Hz			
Operating Mode:	On, continuous transmit RFID at 13.56MHz, reading tag.			
Deviations:	None			
Comments:	See data comments for EUT orientation.			

Test Specifications	Test Method
FCC 15.225:2021	ANSI C63.10:2013



Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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)
27.121	10.9	10.2	1.0	306.0	10.0	0.0	Perp EUT	QP	-19.1	2.0	29.5	-27.5
27.120	9.4	10.2	1.0	123.0	10.0	0.0	Perp EUT	QP	-19.1	0.5	29.5	-29.0
27.120	7.6	10.2	1.0	277.0	10.0	0.0	Perp EUT	QP	-19.1	-1.3	29.5	-30.8
27.115	6.9	10.2	1.0	158.0	10.0	0.0	Para Floor	QP	-19.1	-2.0	29.5	-31.5
27.118	6.9	10.2	1.0	360.0	10.0	0.0	Para Floor	QP	-19.1	-2.0	29.5	-31.5
27.117	6.8	10.2	4.0	85.0	10.0	0.0	Para Floor	QP	-19.1	-2.1	29.5	-31.6
27.122	6.7	10.2	1.0	49.0	10.0	0.0	Para EUT	QP	-19.1	-2.2	29.5	-31.7
27.123	6.7	10.2	1.0	275.0	10.0	0.0	Para EUT	QP	-19.1	-2.2	29.5	-31.7
27.121	6.7	10.2	0.0	343.0	10.0	0.0	Para EUT	QP	-19.1	-2.2	29.5	-31.7

FIELD STRENGTH OF SPURIOUS EMISSIONS GREATER THAN 30 MHZ



PSA-ESCI 2021.01.22.0

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

On, continuous transmit 13.56MHz RFID

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

GRAP0077 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 140 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.	Cal. Due
Antenna - Biconilog	EMCO	3141	AXG	2019-07-23	2021-07-23
Filter - Low Pass	Micro-Tronics	LPM50004	LFD	2020-02-15	2021-02-15
Cable	N/A	Bilog Cables	EVA	2020-11-17	2021-11-17
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	2020-11-17	2021-11-17
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAW	2020-12-16	2021-12-16

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 2021.01.08.0

PSA-ESCI 2021.01.22.0

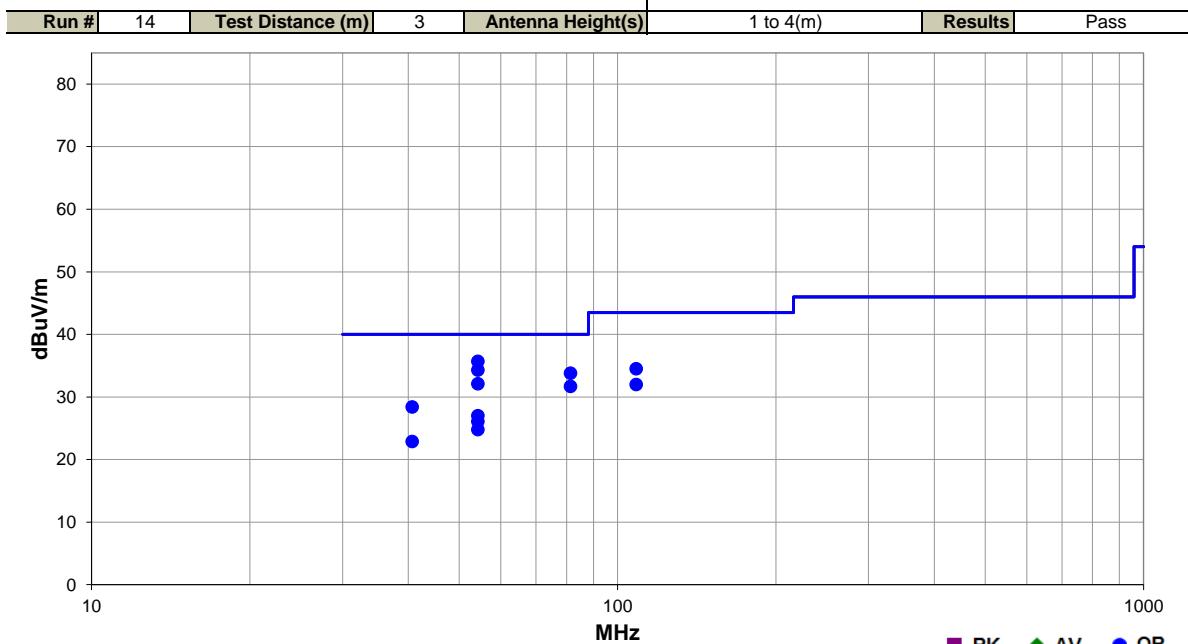
Work Order:	GRAP0077	Date:	2021-02-10	
Project:	None	Temperature:	21.7 °C	
Job Site:	EV01	Humidity:	31.2% RH	
Serial Number:	Cert 2	Barometric Pres.:	1019 mbar	Tested by: Cole Ghizzone
EUT:	Toro Max			
Configuration:	3			
Customer:	Graphic Products, Inc.			
Attendees:	Chad Schaffer			
EUT Power:	110VAC/60Hz			
Operating Mode:	On, continuous transmit 13.56MHz RFID			
Deviations:	None			
Comments:	Ferrite on the battery cable.			

Test Specifications

FCC 15.225:2021

Test Method

ANSI C63.10:2013



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
54.248	44.0	-8.3	0.99	196.0	3.0	0.0	Vert	QP	0.0	35.7	40.0	-4.3	EUT On Side (Screen face up)
54.248	42.6	-8.3	4.0	326.0	3.0	0.0	Horz	QP	0.0	34.3	40.0	-5.7	EUT On Side (Screen face up)
81.367	43.9	-10.1	1.0	12.0	3.0	0.0	Vert	QP	0.0	33.8	40.0	-6.2	EUT On Side (Screen face up)
54.248	40.4	-8.3	1.0	181.0	3.0	0.0	Vert	QP	0.0	32.1	40.0	-7.9	EUT Vertical (Cables up)
81.372	41.8	-10.1	4.0	356.0	3.0	0.0	Horz	QP	0.0	31.7	40.0	-8.3	EUT On Side (Screen face up)
108.498	42.7	-8.2	1.0	235.0	3.0	0.0	Vert	QP	0.0	34.5	43.5	-9.0	EUT On Side (Screen face up)
108.497	40.2	-8.2	2.74	22.0	3.0	0.0	Horz	QP	0.0	32.0	43.5	-11.5	EUT On Side (Screen face up)
40.677	32.5	-4.1	1.0	-1.0	3.0	0.0	Vert	QP	0.0	28.4	40.0	-11.6	EUT On Side (Screen face up)
54.247	35.3	-8.3	3.94	130.0	3.0	0.0	Horz	QP	0.0	27.0	40.0	-13.0	EUT Horizontal
54.248	34.4	-8.3	3.9	85.0	3.0	0.0	Horz	QP	0.0	26.1	40.0	-13.9	EUT Vertical (Cables up)
54.248	33.1	-8.3	1.0	196.0	3.0	0.0	Vert	QP	0.0	24.8	40.0	-15.2	EUT Horizontal
40.683	27.0	-4.1	3.36	291.0	3.0	0.0	Horz	QP	0.0	22.9	40.0	-17.1	EUT On Side (Screen face up)

FREQUENCY STABILITY



XMit 2020.12.30.0

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
Transformer	Powerstat	236B	XFI	NCR	NCR
Probe - Near Field Set	EMCO	7405	IPD	NCR	NCR
Thermometer	Omegaette	HH311	DTY	2021-02-04	2024-02-04
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPH-8-2-SCT/AC	TBI	NCR	NCR
Meter - Multimeter	Tektronix	DMM912	MMH	2019-02-15	2022-02-15
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	2020-03-13	2021-03-13
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2020-02-28	2021-02-28

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



TbTx 2019.08.30.0 XMII 2020.12.30.0

EUT:	Toro Max		Work Order:	GRAP0077			
Serial Number:	Cert 2		Date:	11-Feb-21			
Customer:	Graphic Products, Inc.		Temperature:	21.4 °C			
Attendees:	Chad Schaffer		Humidity:	29.7% RH			
Project:	None		Barometric Pres.:	1016 mbar			
Tested by:	Jeff Alcock	Power:	110VAC/60Hz	Job Site:	EV06		
TEST SPECIFICATIONS		Test Method					
FCC 15.225:2021		ANSI C63.10:2013					
COMMENTS							
None							
DEVIATIONS FROM TEST STANDARD							
None							
Configuration #	1	Signature	Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
Continuous Tx, RFID, 13.56 MHz							
Battery Voltage: Fully charged, 26 VDC Battery Voltage: Nominal 100%, 25 VDC Battery Voltage: 85%, 21.25 VDC AC Voltage: 115% AC Voltage: 100% AC Voltage: 85% Temperature: +50° Temperature: +40° Temperature: +30° Temperature: +20° Temperature: +10° Temperature: 0° Temperature: -10° Temperature: -20°							
13.560306 13.560306 0.00 100 Pass 13.560306 13.560306 0.00 100 Pass 13.560306 13.560306 0.00 100 Pass 13.560308 13.560306 0.15 100 Pass 13.560306 13.560306 0.00 100 Pass 13.560306 13.560306 0.00 100 Pass 13.560328 13.560306 1.62 100 Pass 13.560307 13.560306 0.07 100 Pass 13.560308 13.560306 0.15 100 Pass 13.560316 13.560306 0.74 100 Pass 13.560328 13.560306 1.62 100 Pass 13.560346 13.560306 2.95 100 Pass 13.560359 13.560306 3.91 100 Pass 13.560346 13.560306 2.95 100 Pass							

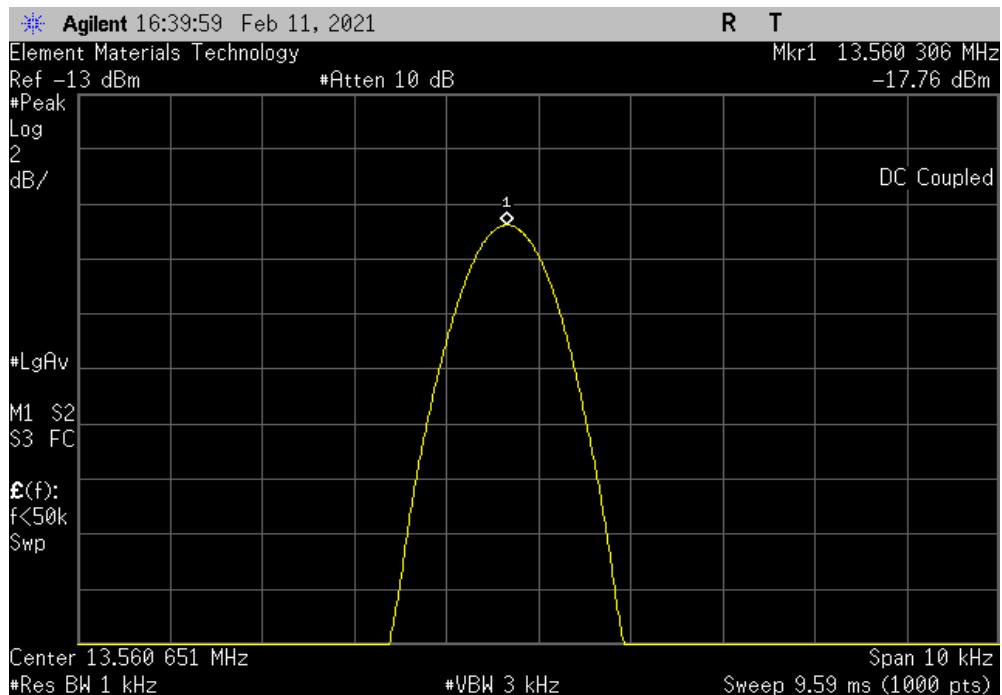
FREQUENCY STABILITY



TbtTx 2019.08.30.0 XMit 2020.12.30.0

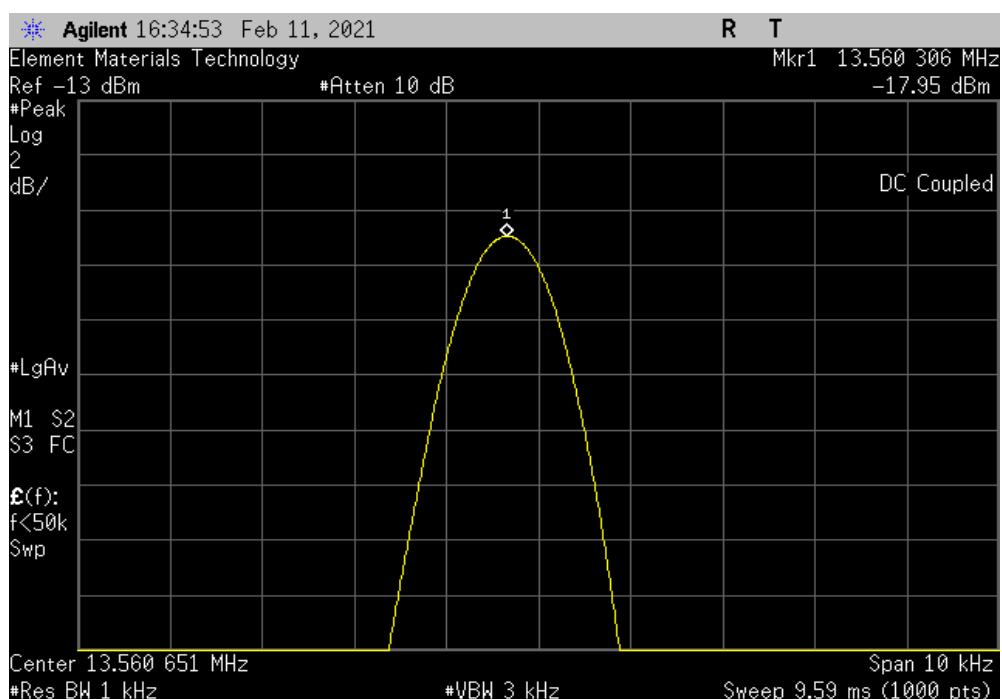
Continuous Tx, RFID, 13.56 MHz, Battery Voltage: Fully charged, 26 VDC

Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
13.560306	13.560306	0.00	100	Pass



Continuous Tx, RFID, 13.56 MHz, Battery Voltage: Nominal 100%, 25 VDC

Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
13.560306	13.560306	0.00	100	Pass



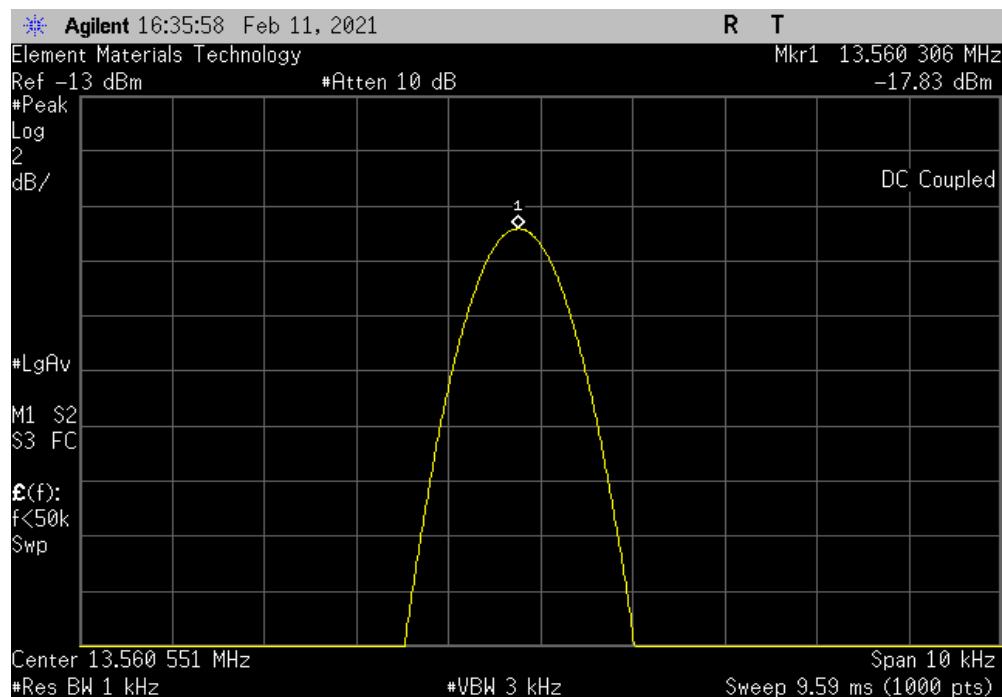
FREQUENCY STABILITY



TbtTx 2019.08.30.0 XMit 2020.12.30.0

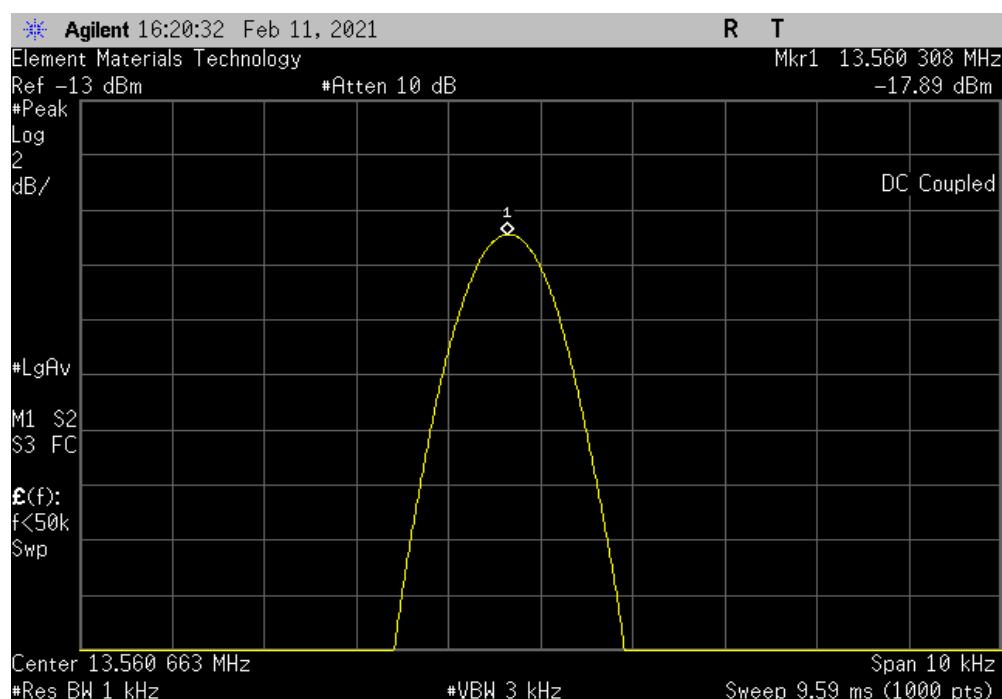
Continuous Tx, RFID, 13.56 MHz, Battery Voltage: 85%, 21.25 VDC

Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
13.560306	13.560306	0.00	100	Pass



Continuous Tx, RFID, 13.56 MHz, AC Voltage: 115%

Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
13.560308	13.560306	0.15	100	Pass



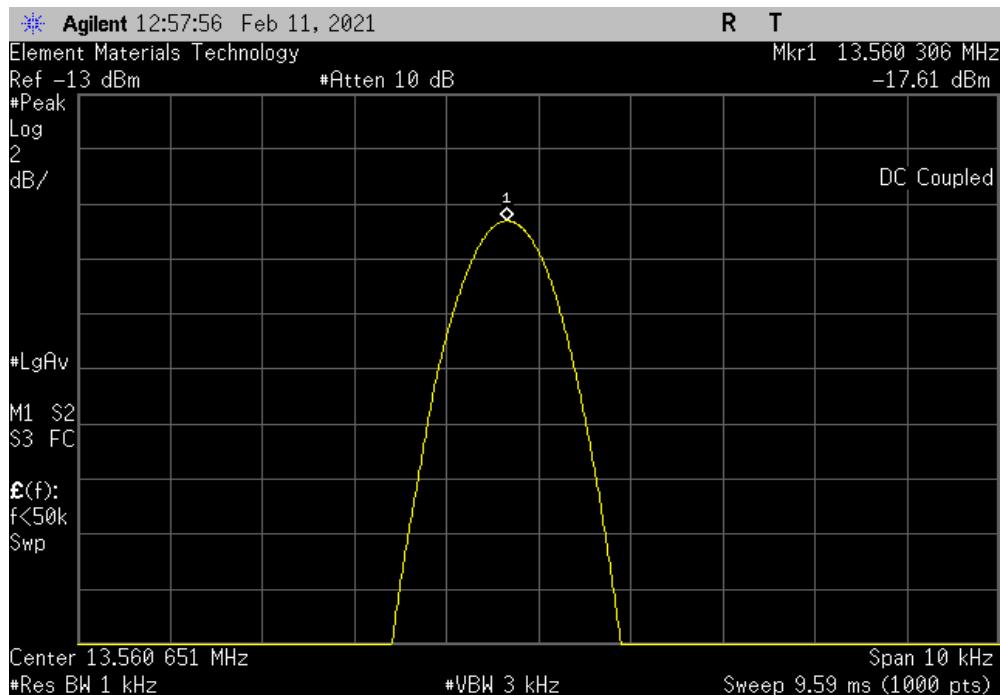
FREQUENCY STABILITY



TbtTx 2019.08.30.0 XMit 2020.12.30.0

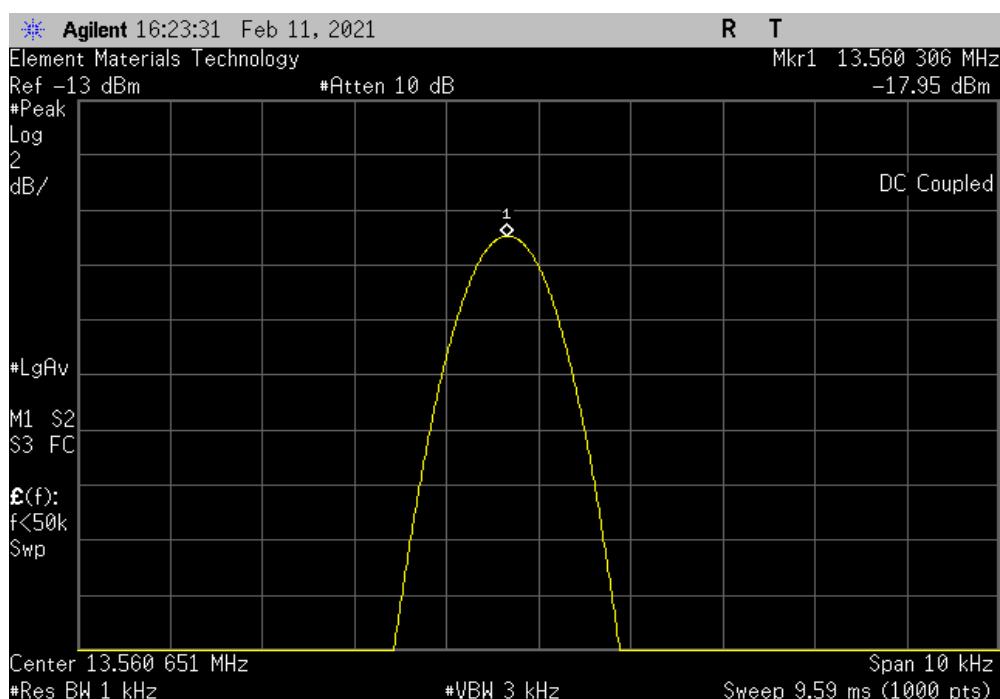
Continuous Tx, RFID, 13.56 MHz, AC Voltage: 100%

Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
13.560306	13.560306	0.00	100	Pass



Continuous Tx, RFID, 13.56 MHz, AC Voltage: 85%

Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
13.560306	13.560306	0.00	100	Pass

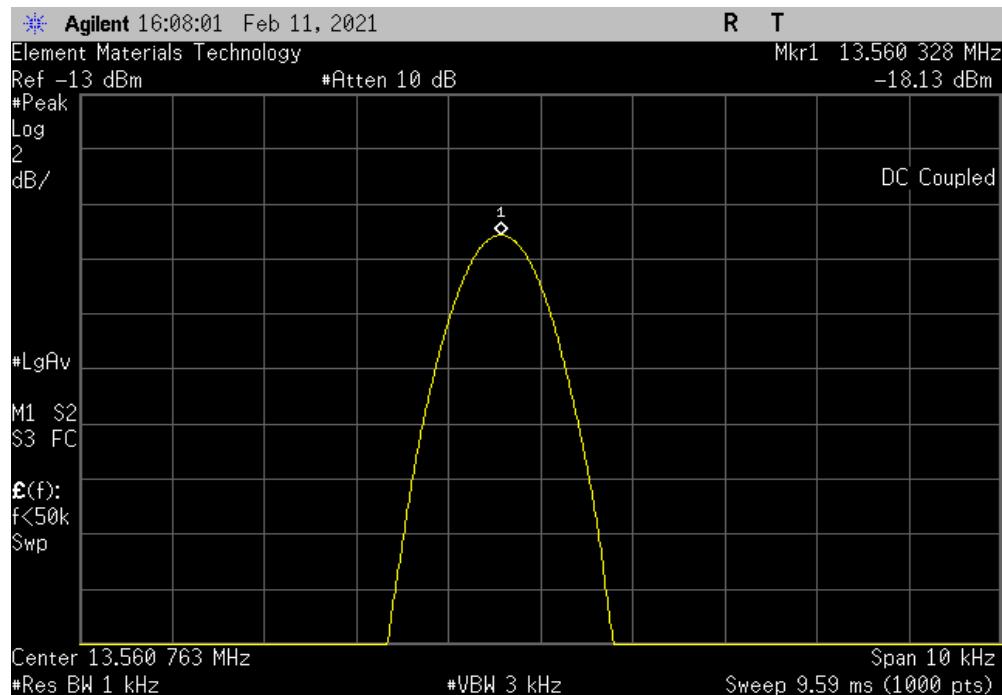


FREQUENCY STABILITY

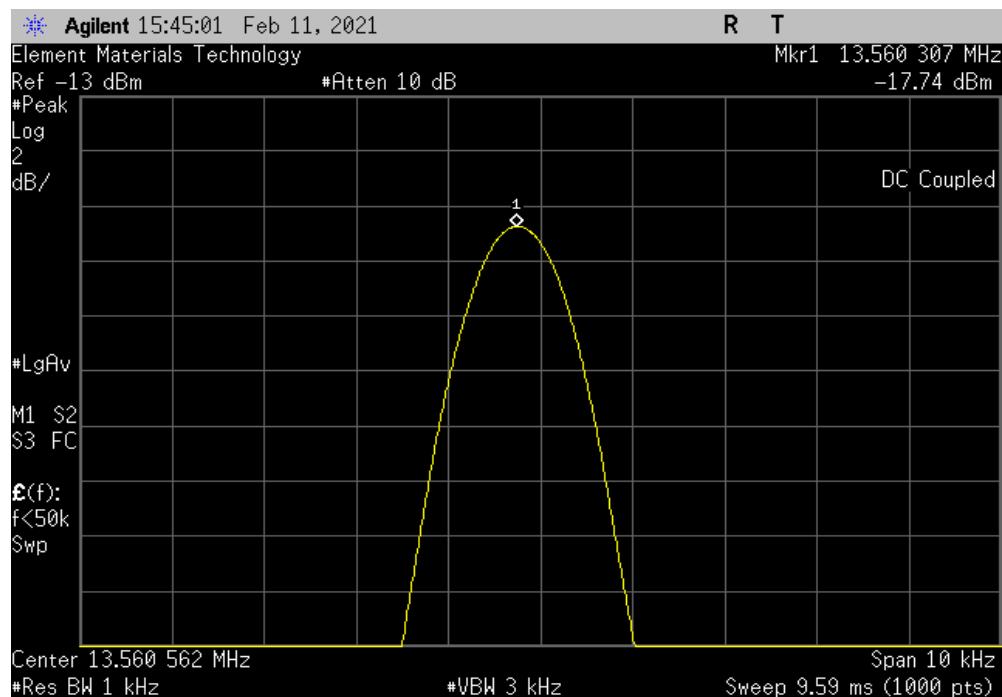


TbtTx 2019.08.30.0 XMit 2020.12.30.0

Continuous Tx, RFID, 13.56 MHz, Temperature: +50°					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.560328	13.560306	1.62	100	Pass	



Continuous Tx, RFID, 13.56 MHz, Temperature: +40°					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.560307	13.560306	0.07	100	Pass	

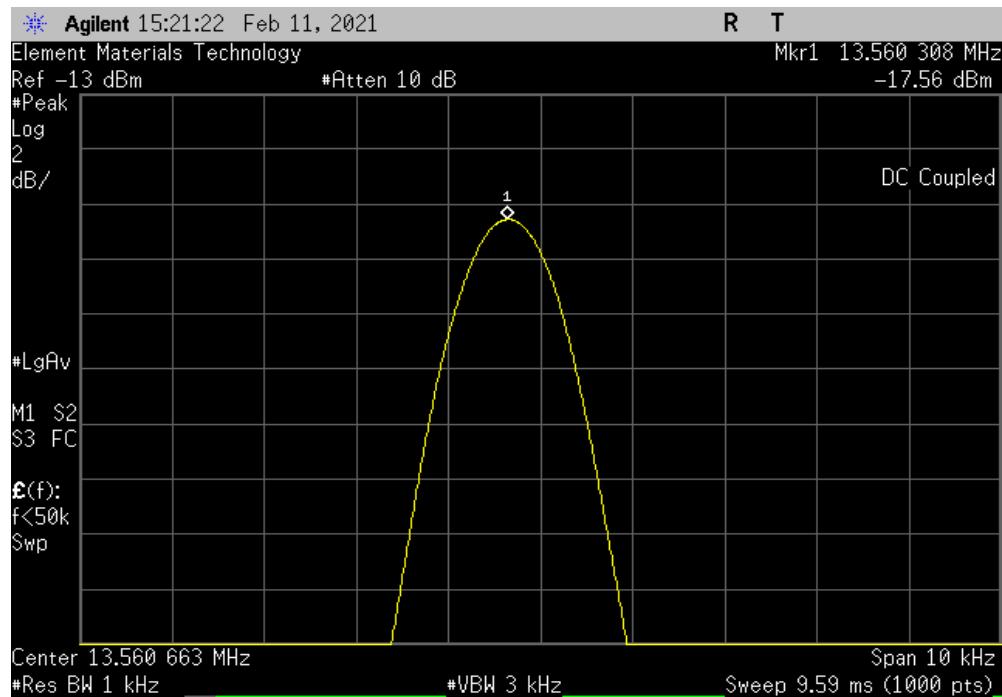


FREQUENCY STABILITY

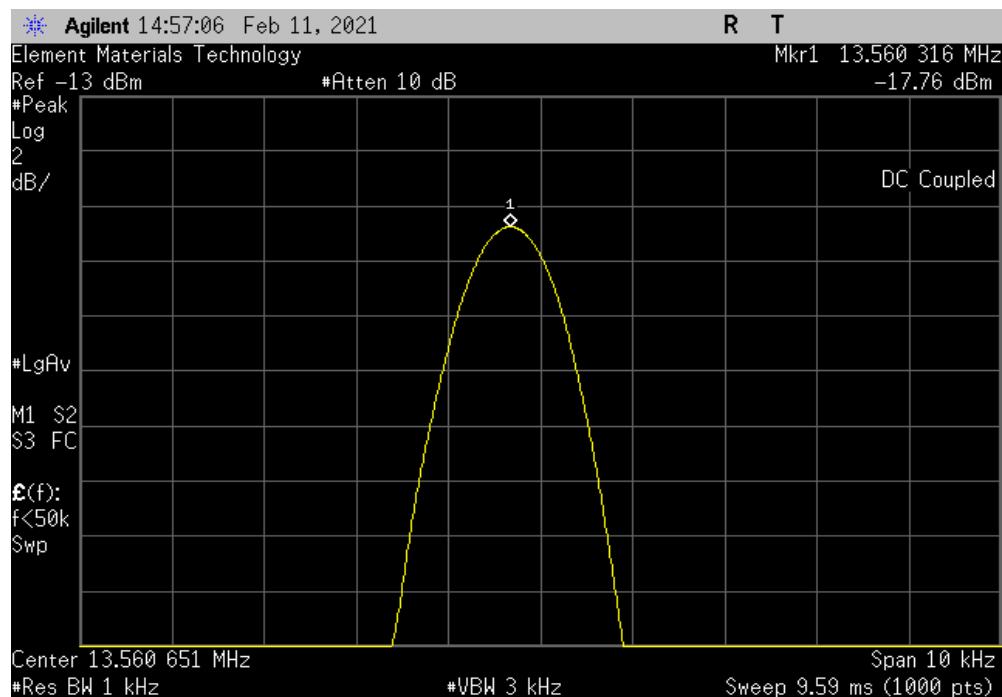


TbtTx 2019.08.30.0 XMit 2020.12.30.0

Continuous Tx, RFID, 13.56 MHz, Temperature: +30°					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.560308	13.560306	0.15	100	Pass	



Continuous Tx, RFID, 13.56 MHz, Temperature: +20°					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.560316	13.560306	0.74	100	Pass	

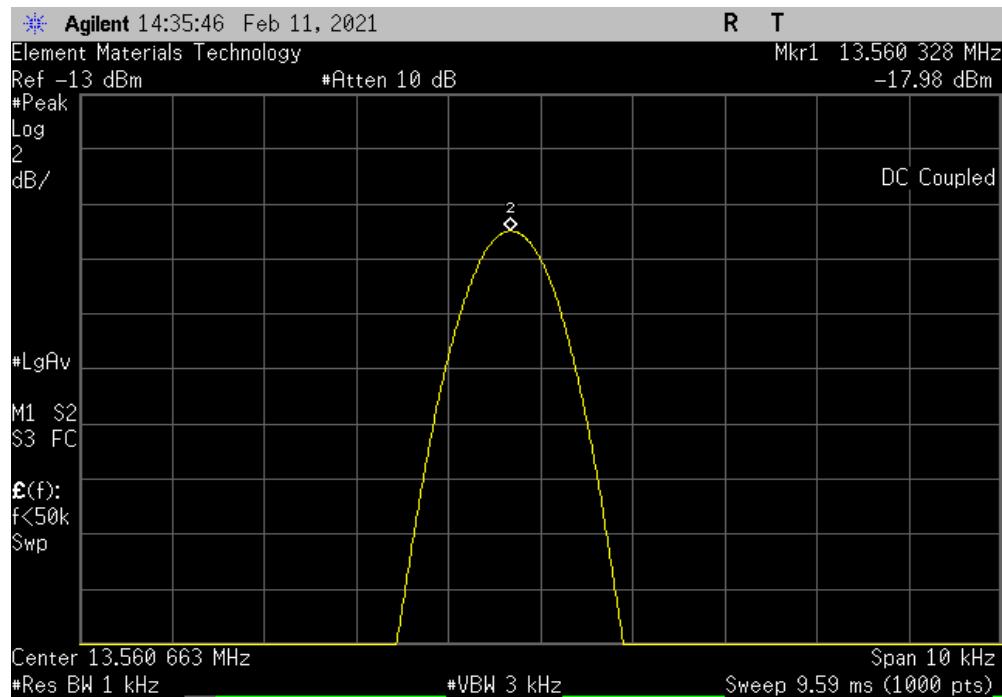


FREQUENCY STABILITY

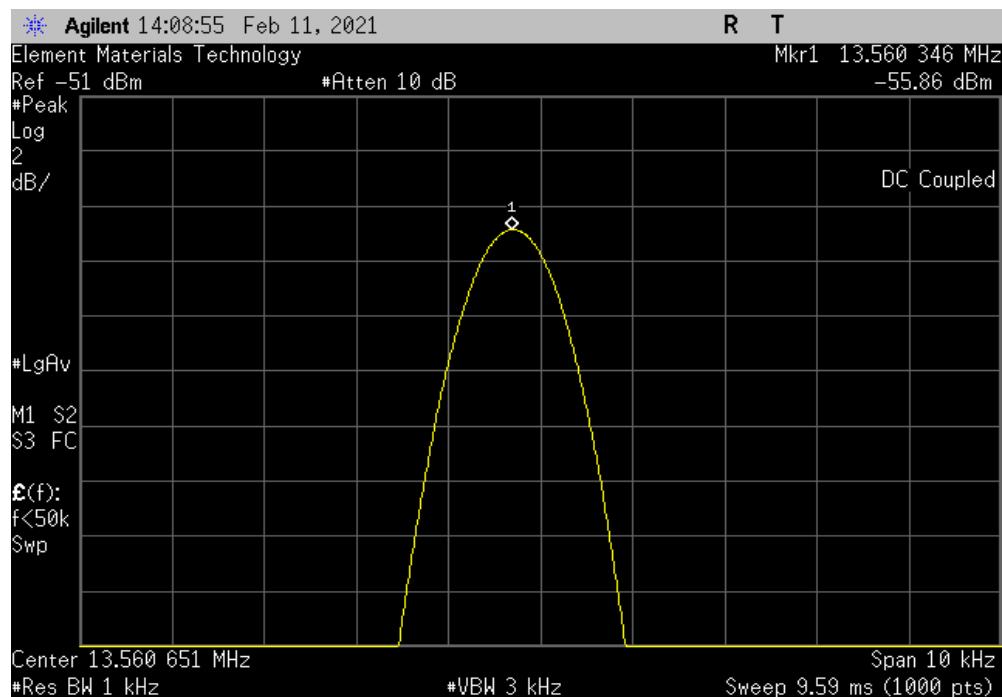


TbtTx 2019.08.30.0 XMit 2020.12.30.0

Continuous Tx, RFID, 13.56 MHz, Temperature: +10°					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.560328	13.560306	1.62	100	Pass	



Continuous Tx, RFID, 13.56 MHz, Temperature: 0°					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.560346	13.560306	2.95	100	Pass	

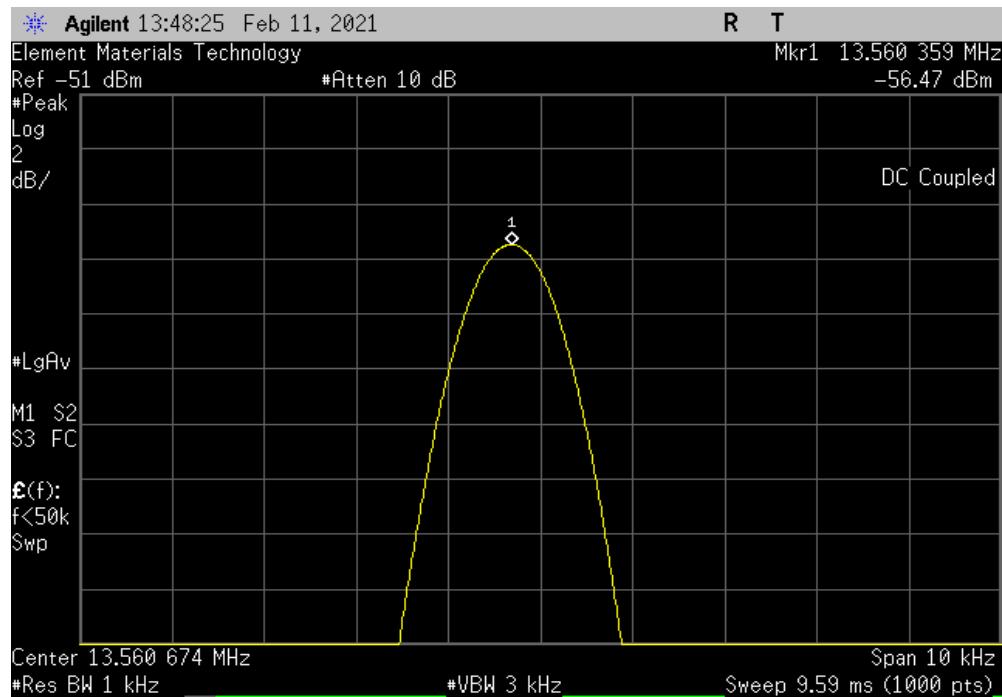


FREQUENCY STABILITY



TbtTx 2019.08.30.0 XMit 2020.12.30.0

Continuous Tx, RFID, 13.56 MHz, Temperature: -10°					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.560359	13.560306	3.91	100	Pass	



Continuous Tx, RFID, 13.56 MHz, Temperature: -20°					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.560346	13.560306	2.95	100	Pass	

