



element

Graco, Inc.

SDP Meter

FCC 15.225:2019

13.56 MHz Radio

Report # GRAC0283.1



NVLAP LAB CODE: 200881-0



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CERTIFICATE OF TEST

Last Date of Test: March 21, 2019

Graco, Inc.

Model: SDP Meter

Radio Equipment Testing

Standards

Specification	Method
FCC 15.225:2019	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
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:



Matt Nuernberg, 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



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

Australia/New Zealand

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

Korea

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

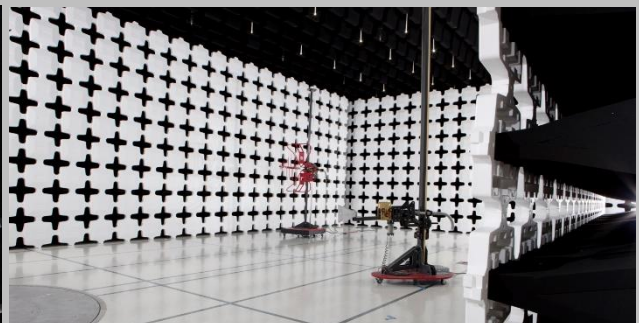
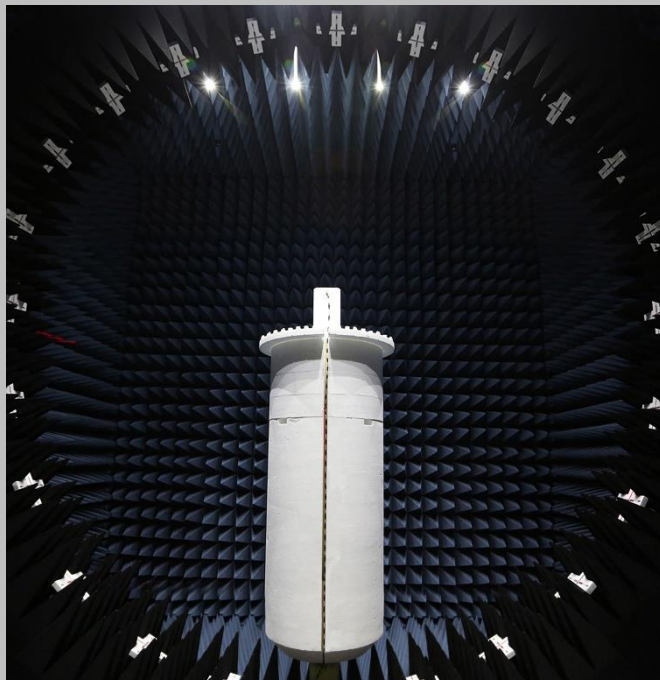
For details on the Scopes of our Accreditations, please visit:

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

FACILITIES



California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-10 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 120 th 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/RRR, 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.

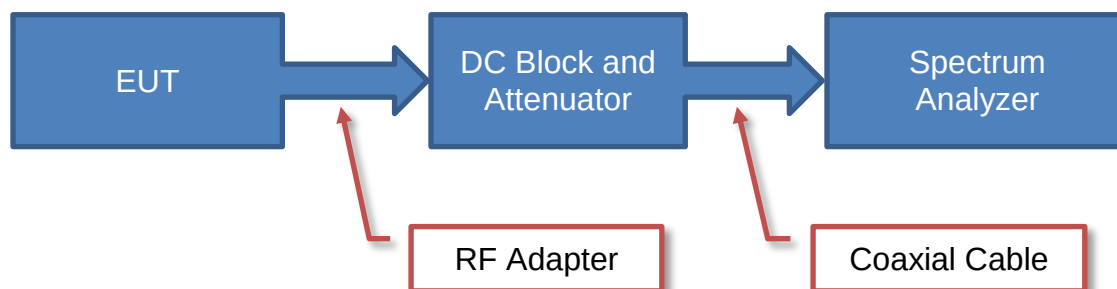
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

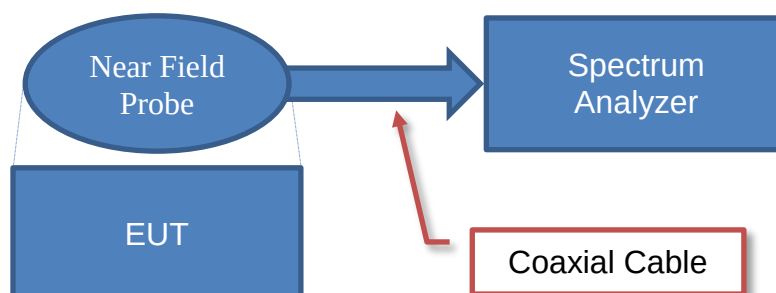
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

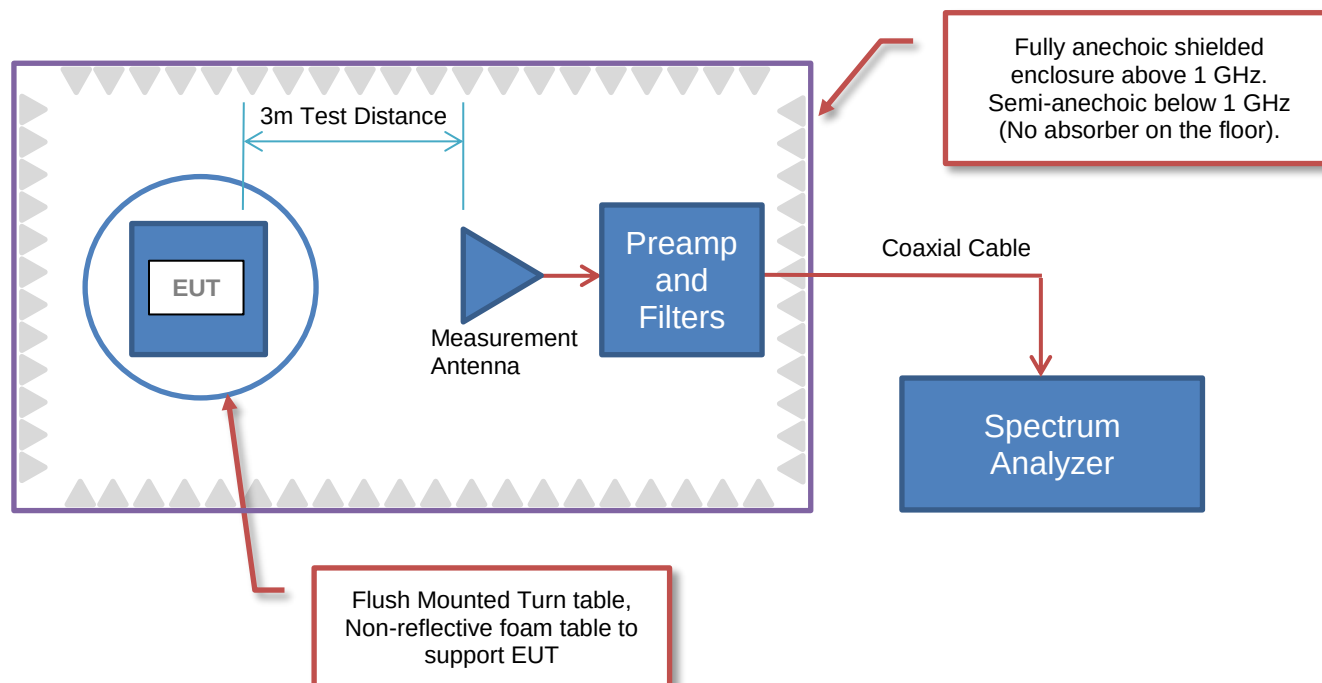
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	Graco, Inc.
Address:	PO Box 1441
City, State, Zip:	Minneapolis, MN 55440
Test Requested By:	Greg Sieckert
Model:	SDP Meter
First Date of Test:	March 19, 2019
Last Date of Test:	March 21, 2019
Receipt Date of Samples:	March 19, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Mechanical metering valve with digital display and NFC. NFC is activated to both read and write NFC tags while mechanical meter is not functioning.

Testing Objective:

To demonstrate compliance to FCC Part 15.225 specifications.

CONFIGURATIONS



Configuration GRAC0283- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
SDP Meter	Graco Inc.	SDP	08J18A

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-03-19	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.
2	2019-03-19	Field Strength of Spurious Emissions Less Than 30 MHz	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2019-03-20	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.
4	2019-03-21	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

FIELD STRENGTH OF FUNDAMENTAL



PSA-ESCI 2019.02.26

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Tx at 13.56 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

GRAC0283 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	13.56 MHz	Stop Frequency	13.56 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.	Interval
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	26-Mar-2018	12 mo
Cable	ESM Cable Corp.	Antenna Loop Cable	MNE	16-Feb-2019	12 mo
Antenna - Loop	ETS Lindgren	6502	AOB	16-May-2017	24 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, 6.4, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

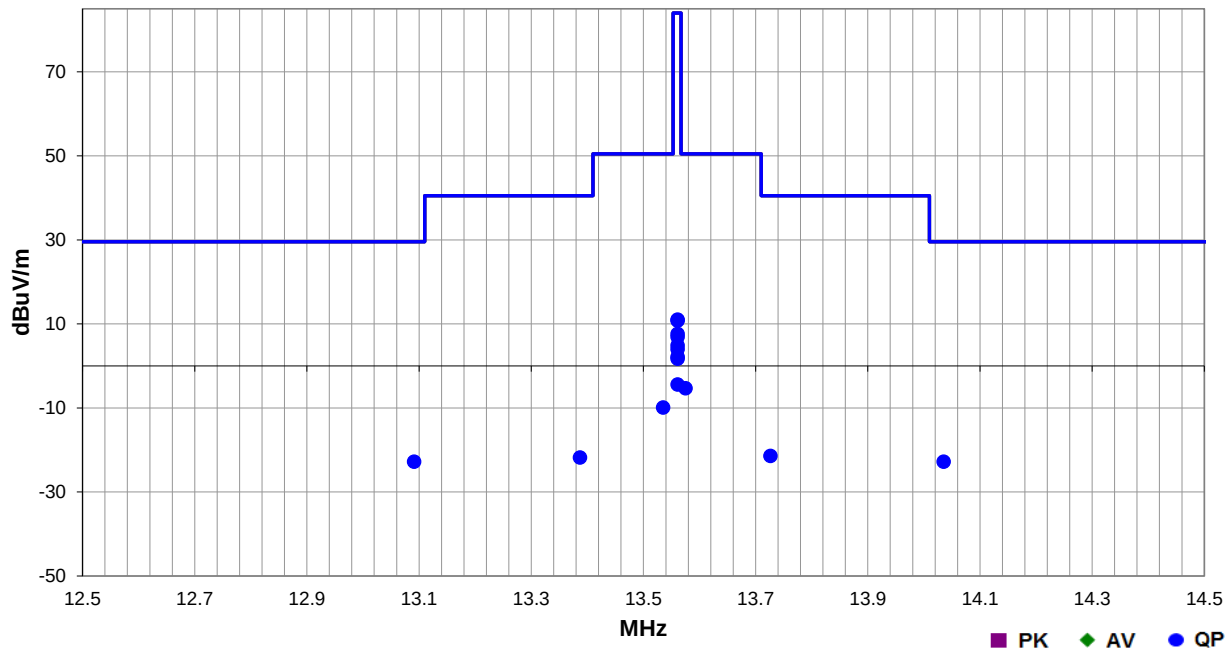
FIELD STRENGTH OF FUNDAMENTAL



Work Order:	GRAC0283	Date:	19-Mar-2019	 Tested by: Chris Patterson
Project:	None	Temperature:	22.5 °C	
Job Site:	MN04	Humidity:	26.5% RH	
Serial Number:	08J18A	Barometric Pres.:	1026 mbar	
EUT:	SDP Meter			
Configuration:	1			
Customer:	Graco, Inc.			
Attendees:	Greg Sieckert			
EUT Power:	Battery			
Operating Mode:	Tx at 13.56 MHz			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.225:2019	ANSI C63.10:2013

Run #	2	Test Distance (m)	3	Antenna Height(s)	1(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
13.091	6.1	11.1	1.0	359.0	3.0	0.0	Para to EUT	QP	-40.0	-22.8	29.5	-52.3	EUT On Side
14.035	6.1	11.1	1.0	216.0	3.0	0.0	Para to EUT	QP	-40.0	-22.8	29.5	-52.3	EUT On Side
13.575	23.6	11.1	1.0	30.0	3.0	0.0	Para to EUT	QP	-40.0	-5.3	50.5	-55.8	EUT On Side
13.535	19.0	11.1	1.0	13.0	3.0	0.0	Para to EUT	QP	-40.0	-9.9	50.5	-60.4	EUT On Side
13.726	7.5	11.1	1.0	200.0	3.0	0.0	Para to EUT	QP	-40.0	-21.4	40.5	-61.9	EUT On Side
13.387	7.1	11.1	1.0	352.0	3.0	0.0	Para to EUT	QP	-40.0	-21.8	40.5	-62.3	EUT On Side
13.561	39.9	11.1	1.0	207.0	3.0	0.0	Para to EUT	QP	-40.0	11.0	84.0	-73.0	EUT On Side
13.561	39.7	11.1	1.0	261.0	3.0	0.0	Para to EUT	QP	-40.0	10.8	84.0	-73.2	EUT Vert
13.561	36.5	11.1	1.0	295.0	3.0	0.0	Perp to EUT	QP	-40.0	7.6	84.0	-76.4	EUT On Side
13.561	35.8	11.1	1.0	358.0	3.0	0.0	Perp to EUT	QP	-40.0	6.9	84.0	-77.1	EUT Vert
13.561	33.8	11.1	1.0	229.0	3.0	0.0	Para to GND	QP	-40.0	4.9	84.0	-79.1	EUT Horz
13.561	32.9	11.1	1.0	71.0	3.0	0.0	Para to GND	QP	-40.0	4.0	84.0	-80.0	EUT Vert
13.561	31.1	11.1	1.0	187.0	3.0	0.0	Para to GND	QP	-40.0	2.2	84.0	-81.8	EUT On Side
13.561	30.6	11.1	1.0	252.0	3.0	0.0	Para to EUT	QP	-40.0	1.7	84.0	-82.3	EUT Horz
13.561	24.5	11.1	1.0	356.0	3.0	0.0	Perp to EUT	QP	-40.0	-4.4	84.0	-88.4	EUT Horz

FIELD STRENGTH OF SPURIOUS EMISSIONS LESS THAN 30 MHz



PSA-ESCI 2019.02.26

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Tx at 13.56 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

GRAC0283 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	490 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.	Interval
Cable	ESM Cable Corp.	Antenna Loop Cable	MNE	16-Feb-2019	12 mo
Antenna - Loop	ETS Lindgren	6502	AOB	16-May-2017	24 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 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 axes 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, 6.4, measurements may be performed at a distance closer than 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



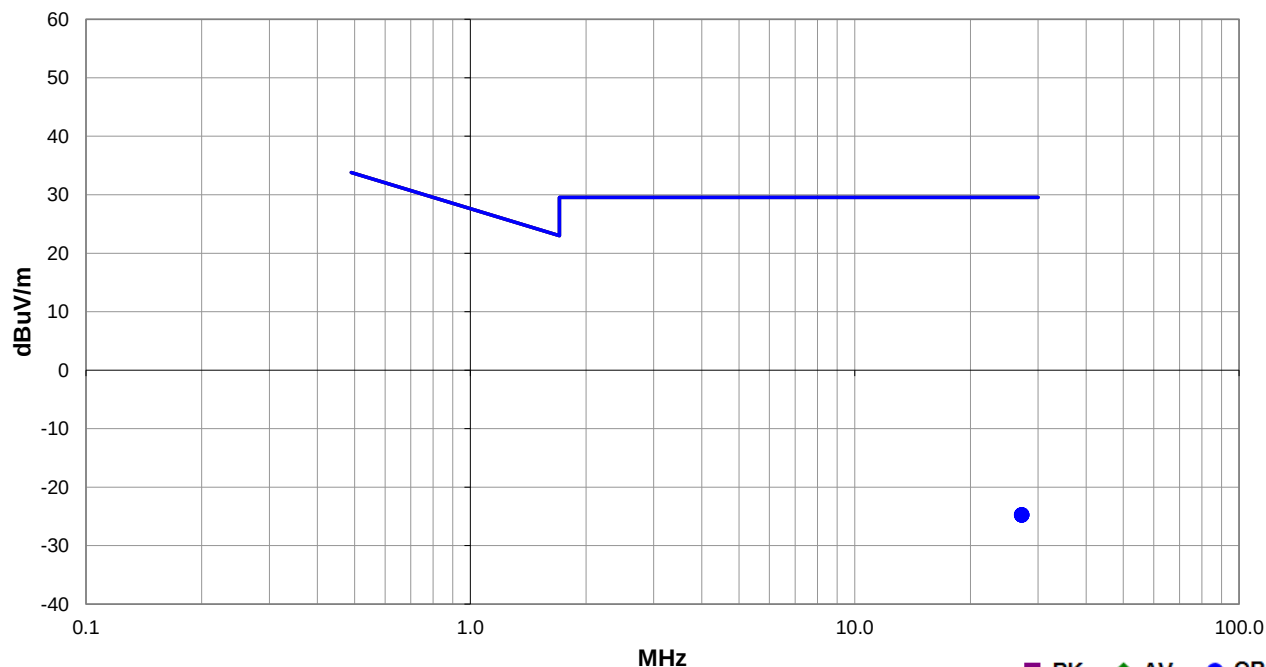
EmiRS 2018.09.26

PSA-ESCI 2019.02.26

Work Order:	GRAC0283	Date:	19-Mar-2019	
Project:	None	Temperature:	22.6 °C	
Job Site:	MN04	Humidity:	26.5% RH	
Serial Number:	08J18A	Barometric Pres.:	1026 mbar	Tested by: Chris Patterson
EUT:	SDP Meter			
Configuration:	1			
Customer:	Graco, Inc.			
Attendees:	Greg Sieckert			
EUT Power:	Battery			
Operating Mode:	Tx at 13.56 MHz			
Deviations:	None			
Comments:	None			

Test Specifications	FCC 15.225:2019	Test Method	ANSI C63.10:2013
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Run #	7	Test Distance (m)	3	Antenna Height(s)	1(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
27.195	5.7	9.6	1.0	122.0	3.0	0.0	Para to GND	QP	-40.0	-24.7	29.5	-54.2	EUT Horz
27.144	5.7	9.6	1.0	170.0	3.0	0.0	Perp to EUT	QP	-40.0	-24.7	29.5	-54.2	EUT Horz
27.227	5.7	9.6	1.0	2.0	3.0	0.0	Para to EUT	QP	-40.0	-24.7	29.5	-54.2	EUT Horz
27.181	5.7	9.6	1.0	233.0	3.0	0.0	Para to EUT	QP	-40.0	-24.7	29.5	-54.2	EUT Vert
27.202	5.7	9.6	1.0	170.0	3.0	0.0	Para to EUT	QP	-40.0	-24.7	29.5	-54.2	EUT On Side
27.184	5.6	9.6	1.0	335.0	3.0	0.0	Perp to EUT	QP	-40.0	-24.8	29.5	-54.3	EUT On Side
27.201	5.6	9.6	1.0	348.0	3.0	0.0	Para to GND	QP	-40.0	-24.8	29.5	-54.3	EUT On Side
27.161	5.6	9.6	1.0	36.0	3.0	0.0	Perp to EUT	QP	-40.0	-24.8	29.5	-54.3	EUT Vert
27.198	5.6	9.6	1.0	238.0	3.0	0.0	Para to GND	QP	-40.0	-24.8	29.5	-54.3	EUT Vert

FIELD STRENGTH OF SPURIOUS EMISSIONS GREATER THAN 30 MHZ



PSA-ESCI 2019.02.26

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Tx at 13.56 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

GRAC0283 - 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
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	27-Apr-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2-Nov-2018	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	2-Nov-2018	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	25-Jan-2018	24 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

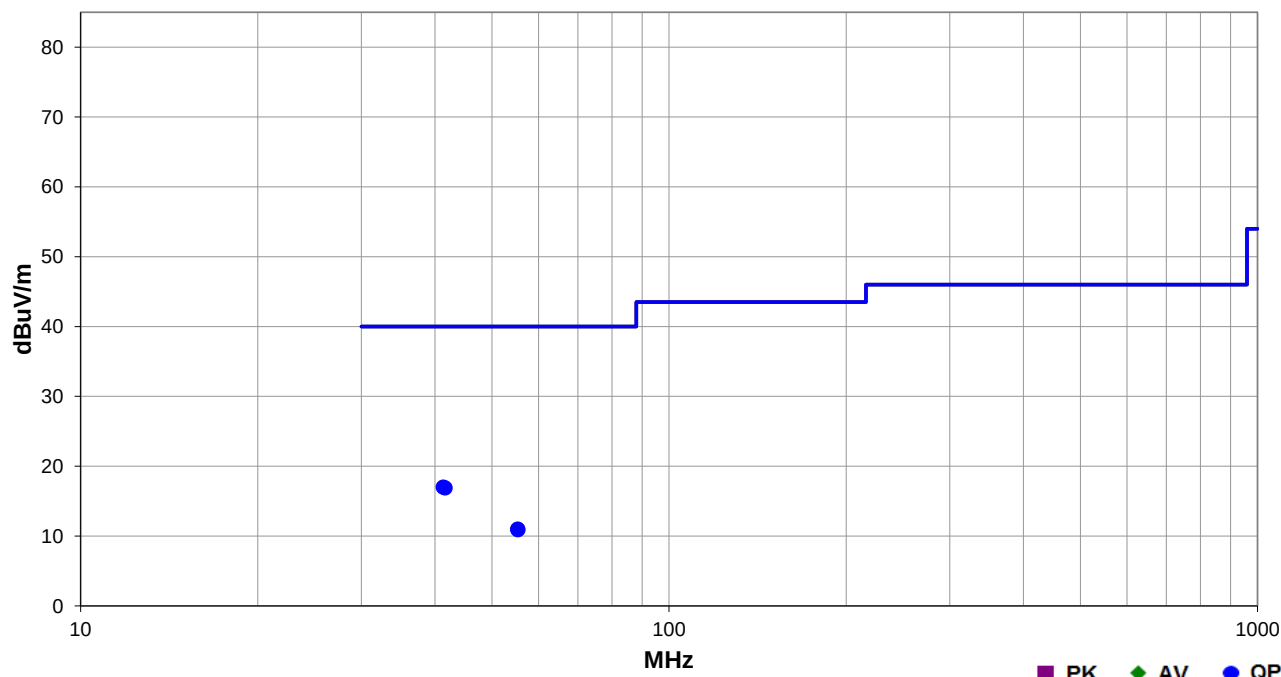


EmiRS 2018.09.26

PSA-ESCI 2019.02.26

Work Order:	GRAC0283	Date:	20-Mar-2019	
Project:	None	Temperature:	21.9 °C	
Job Site:	MN05	Humidity:	29.1% RH	
Serial Number:	08J18A	Barometric Pres.:	1015 mbar	Tested by: Chris Patterson
EUT:	SDP Meter			
Configuration:	1			
Customer:	Graco, Inc.			
Attendees:	Greg Sieckert			
EUT Power:	Battery			
Operating Mode:	Tx at 13.56 MHz			
Deviations:	None			
Comments:	None			

Test Specifications				Test Method			
FCC 15.225:2019				ANSI C63.10:2013			
Run #	1	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
41.308	16.9	0.1	1.0	131.0	3.0	0.0	Vert	QP	0.0	17.0	40.0	-23.0	EUT Horz
41.618	16.9	0.0	1.0	189.0	3.0	0.0	Horz	QP	0.0	16.9	40.0	-23.1	EUT Horz
55.307	17.0	-6.0	1.2	52.9	3.0	0.0	Vert	QP	0.0	11.0	40.0	-29.0	EUT Horz
55.327	16.9	-6.0	1.0	106.0	3.0	0.0	Horz	QP	0.0	10.9	40.0	-29.1	EUT Horz

FREQUENCY STABILITY



XMIT 2019.02.26

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Meter - Multimeter	Fluke	117	MLS	23-Jan-17	23-Jan-20
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPH-32-3.5-SCT/AC	TBF	NCR	NCR
Thermometer	Omega Engineering, Inc.	HH311	DUB	10-Nov-17	10-Nov-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	27-Apr-18	27-Apr-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNO	12-Jun-18	12-Jun-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	5-Jul-2018	5-Jul-2019
Attenuator	Fairview Microwave	SA4014-20	AQI	7-Sep-18	7-Sep-19

TEST DESCRIPTION

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

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

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

The requirement of a frequency tolerance of $\pm 0.01\%$ 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 2018.09.13 XMt 2019.02.26

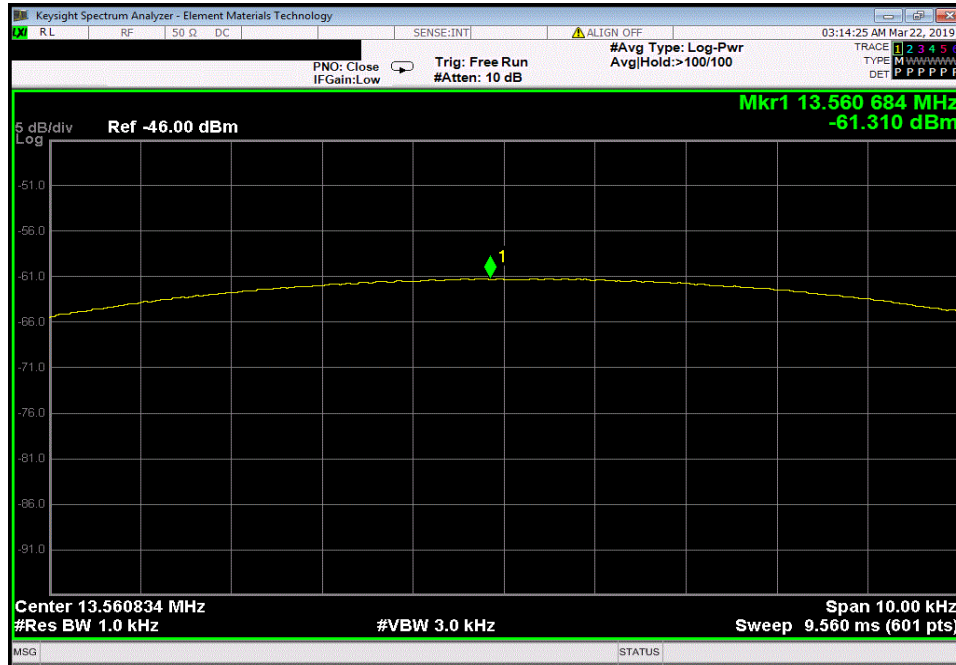
EUT: SDP Meter		Work Order: GRAC0283	
Serial Number: 08J18A		Date: 21-Mar-19	
Customer: Graco, Inc.		Temperature: 22.8 °C	
Attendees: Greg Sieckert		Humidity: 27.6% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Andrew Rogstad		Power: Battery	
		Job Site: MN05, MN09	
TEST SPECIFICATIONS		Test Method	
FCC 15.225:2019		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Andrew Rogstad</i>	
		Measured Value (MHz)	Assigned Value (MHz)
		Error (ppm)	Limit (ppm)
			Results
13.56 MHz, Modulated			
Ambient (20 C)			
	Nominal (6.0 VDC)	13.560684	13.56
	Battery operating end point (4.5 VDC)	13.560958	13.56
		50.4	100
		70.7	100
+50 C	Nominal (6.0 VDC)	13.560767	13.56
+40 C	Nominal (6.0 VDC)	13.56070033	13.56
+30 C	Nominal (6.0 VDC)	13.560817	13.56
+20 C	Nominal (6.0 VDC)	13.5609	13.56
+10 C	Nominal (6.0 VDC)	13.56086667	13.56
0 C	Nominal (6.0 VDC)	13.56103333	13.56
-10 C	Nominal (6.0 VDC)	13.56105033	13.56
-20 C	Nominal (6.0 VDC)	13.56096733	13.56
		56.6	100
		51.7	100
		60.3	100
		66.4	100
		63.9	100
		76.2	100
		77.5	100
		71.3	100
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass

FREQUENCY STABILITY

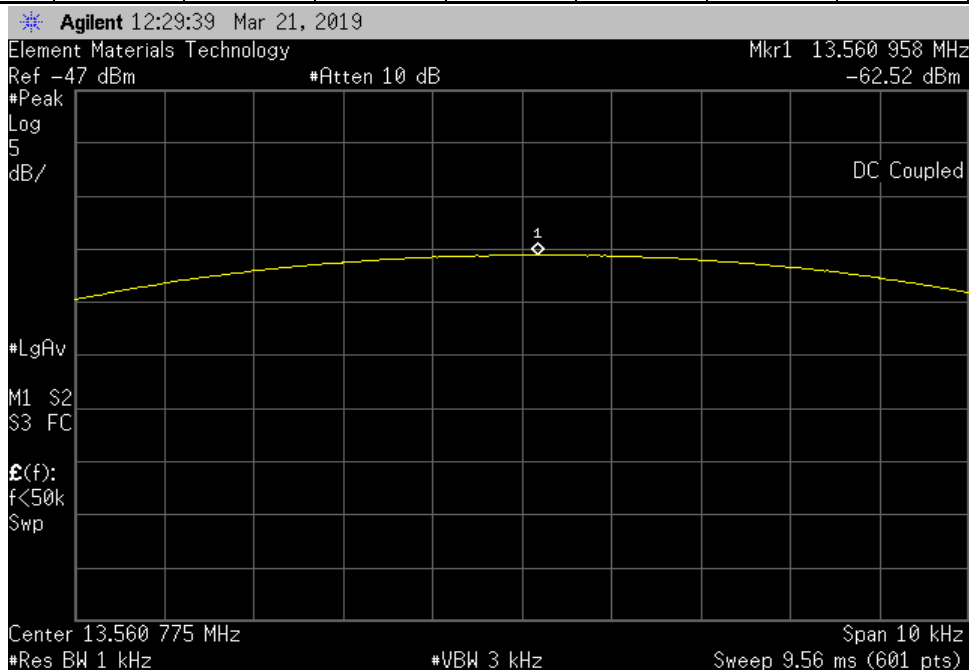


TMTx 2018.09.13 XMt 2019.02.26

13.56 MHz, Modulated, Ambient (20 C), Nominal (6.0 VDC)						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.560684	13.56	50.4	100	Pass	



13.56 MHz, Modulated, Ambient (20 C), Battery operating end point (4.5 VDC)						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.560958	13.56	70.7	100	Pass	



FREQUENCY STABILITY

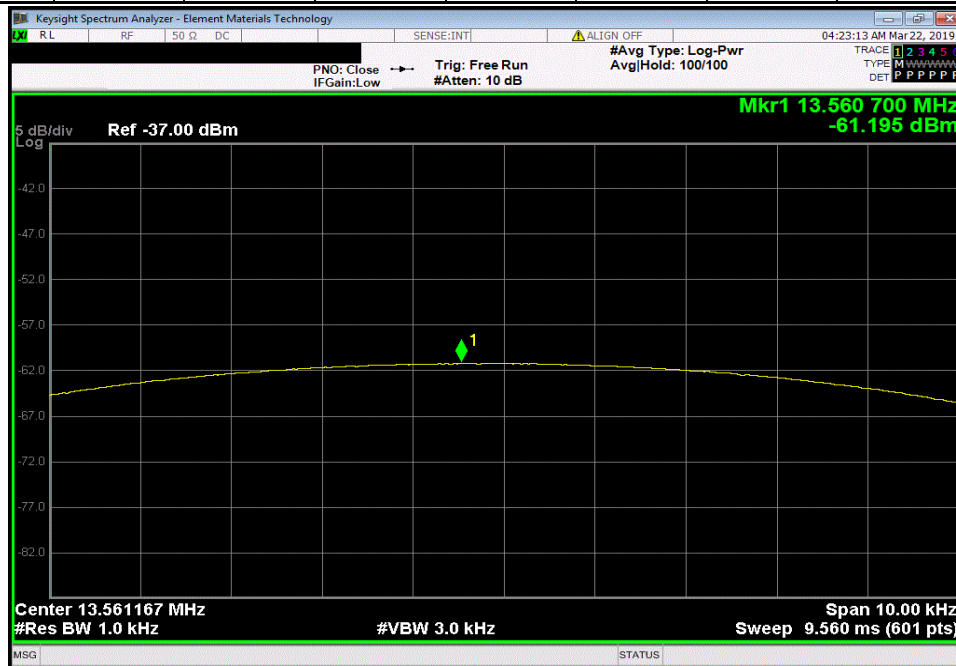


TMTx 2018.09.13 XMt 2019.02.26

13.56 MHz, Modulated, +50 C, Nominal (6.0 VDC)						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.560767	13.56	56.6	100	Pass	



13.56 MHz, Modulated, +40 C, Nominal (6.0 VDC)						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.56070033	13.56	51.7	100	Pass	

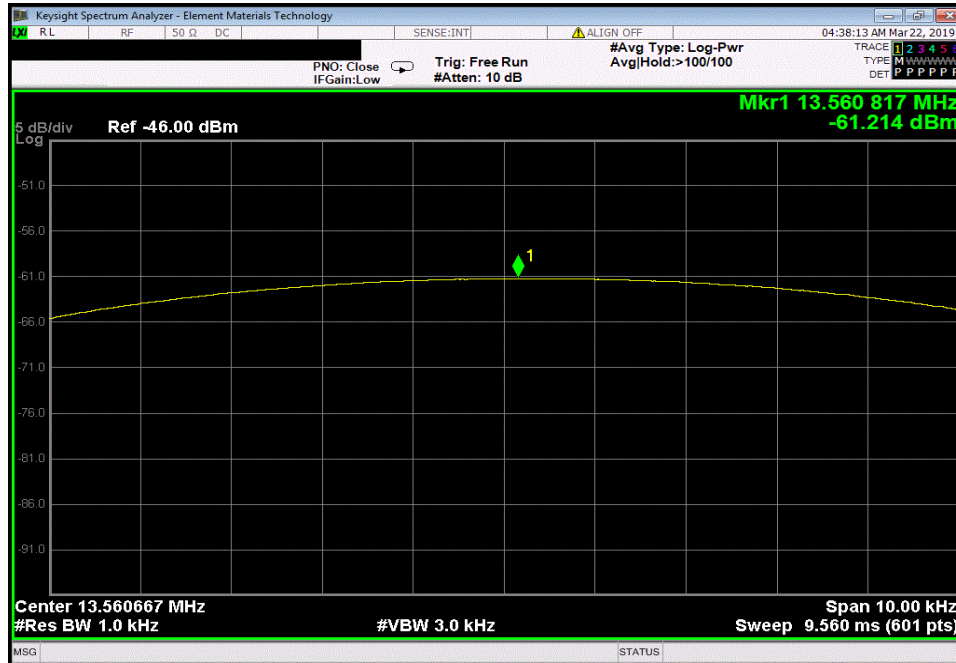


FREQUENCY STABILITY

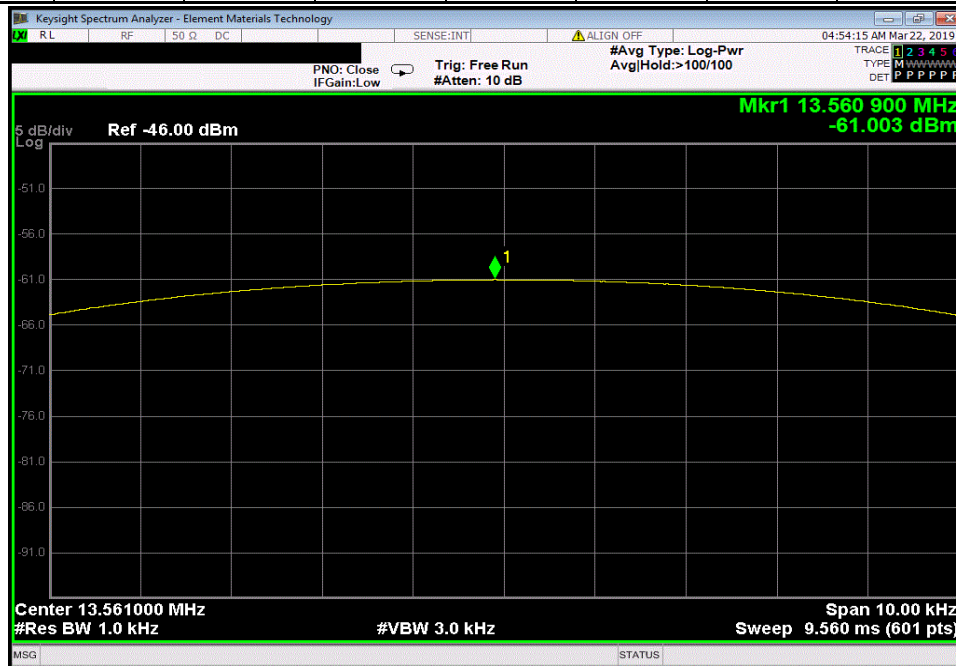


TMTx 2018.09.13 XMt 2019.02.26

13.56 MHz, Modulated, +30 C, Nominal (6.0 VDC)						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.560817	13.56	60.3	100	Pass	



13.56 MHz, Modulated, +20 C, Nominal (6.0 VDC)						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.5609	13.56	66.4	100	Pass	

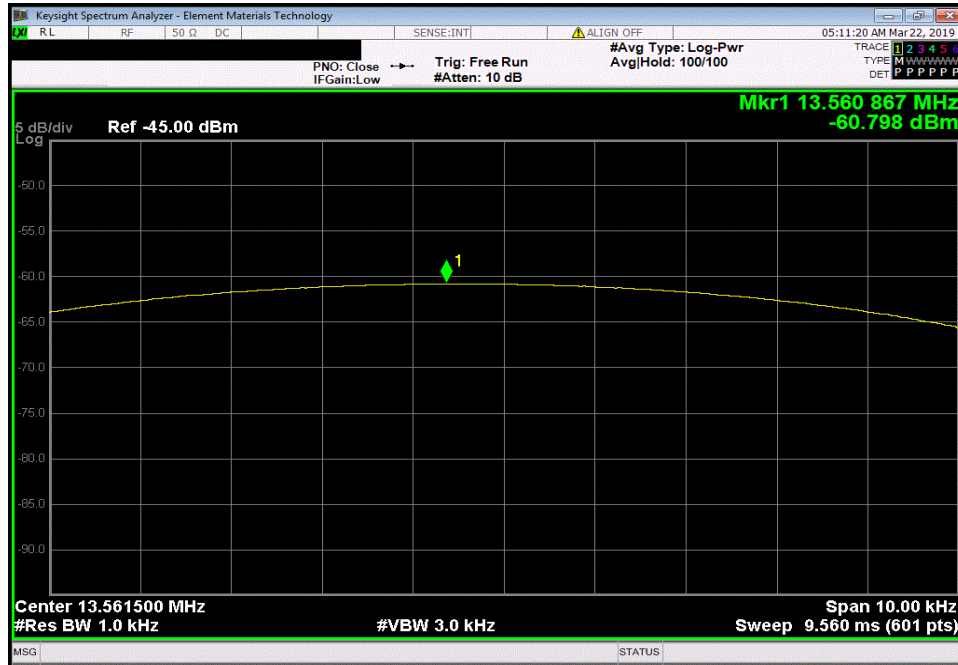


FREQUENCY STABILITY



TMTx 2018.09.13 XMt 2019.02.26

13.56 MHz, Modulated, +10 C, Nominal (6.0 VDC)					
Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.5608667	13.56	63.9	100	Pass	



13.56 MHz, Modulated, 0 C, Nominal (6.0 VDC)					
Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.5610333	13.56	76.2	100	Pass	

