



element

MSA Innovation, LLC

ioDock

**FCC 15.225:2022
13.56 MHz Radio**

Report: MSAS0023.4, Issue Date: March 30, 2022



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CERTIFICATE OF TEST

Last Date of Test: March 24, 2022
MSA Innovation, LLC
EUT: ioDock

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2022	ANSI C63.10:2013
FCC 15.225:2022	

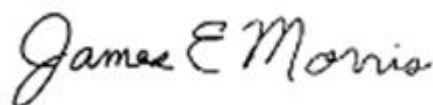
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.9.2	Occupied Bandwidth	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:



James Morris, 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 - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

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:

[California](#)

[Minnesota](#)

[Oregon](#)

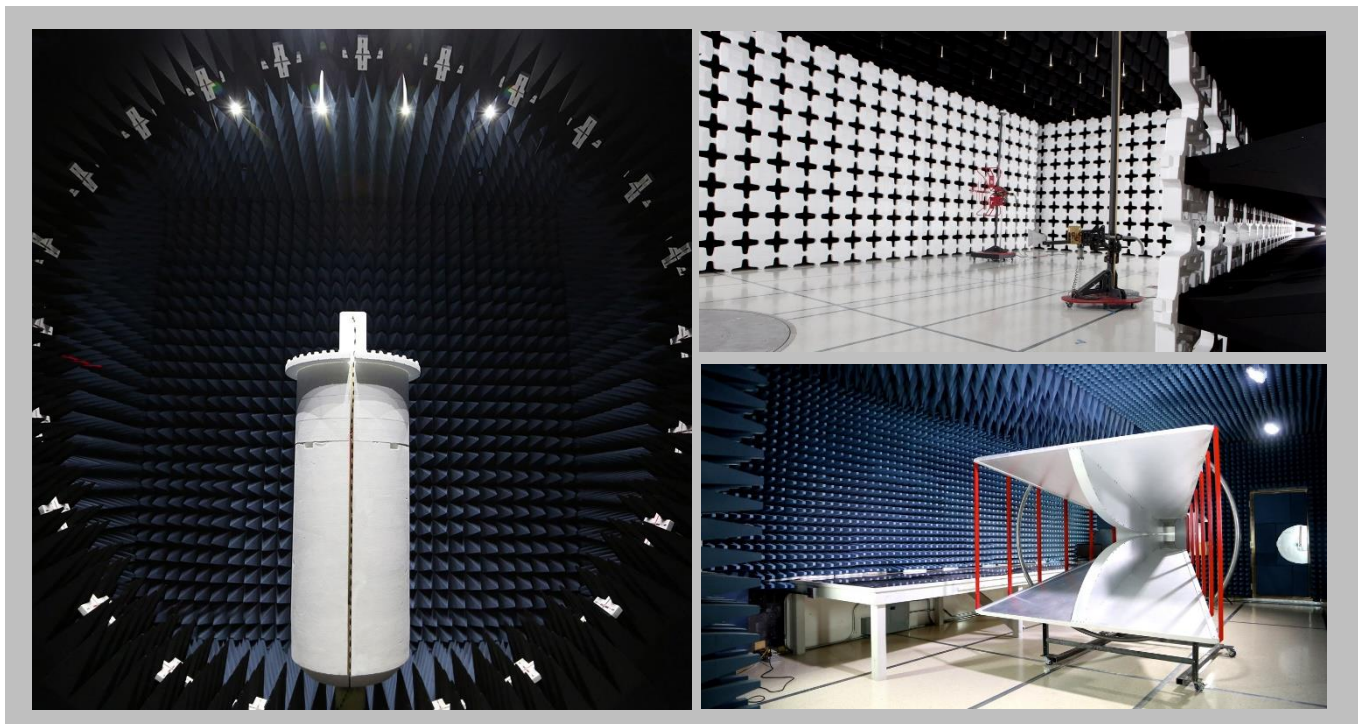
[Texas](#)

[Washington](#)

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 120 th Ave NE Bothell, WA 98011 (425)984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
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 in the table below. A lab specific value may also be found in the applicable test description section. 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)	3.2 dB	-3.2 dB

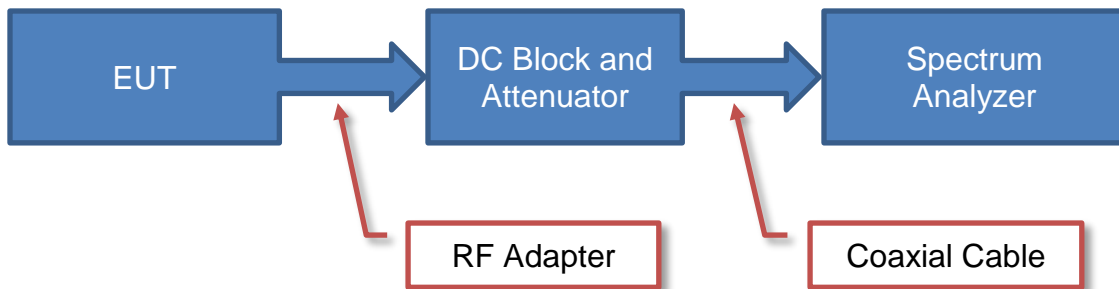
TEST SETUP BLOCK DIAGRAMS

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

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

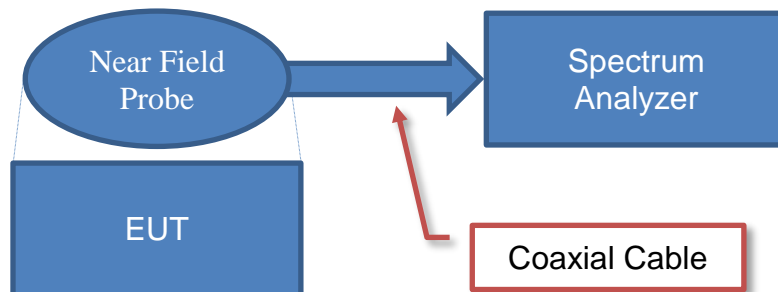
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

$$\begin{array}{r}
 \text{Measured Value} \\
 71.2
 \end{array}
 =
 \begin{array}{r}
 \text{Measured Level} \\
 42.6
 \end{array}
 +
 \begin{array}{r}
 \text{Reference Level Offset} \\
 28.6
 \end{array}$$

Near Field Test Fixture Measurements

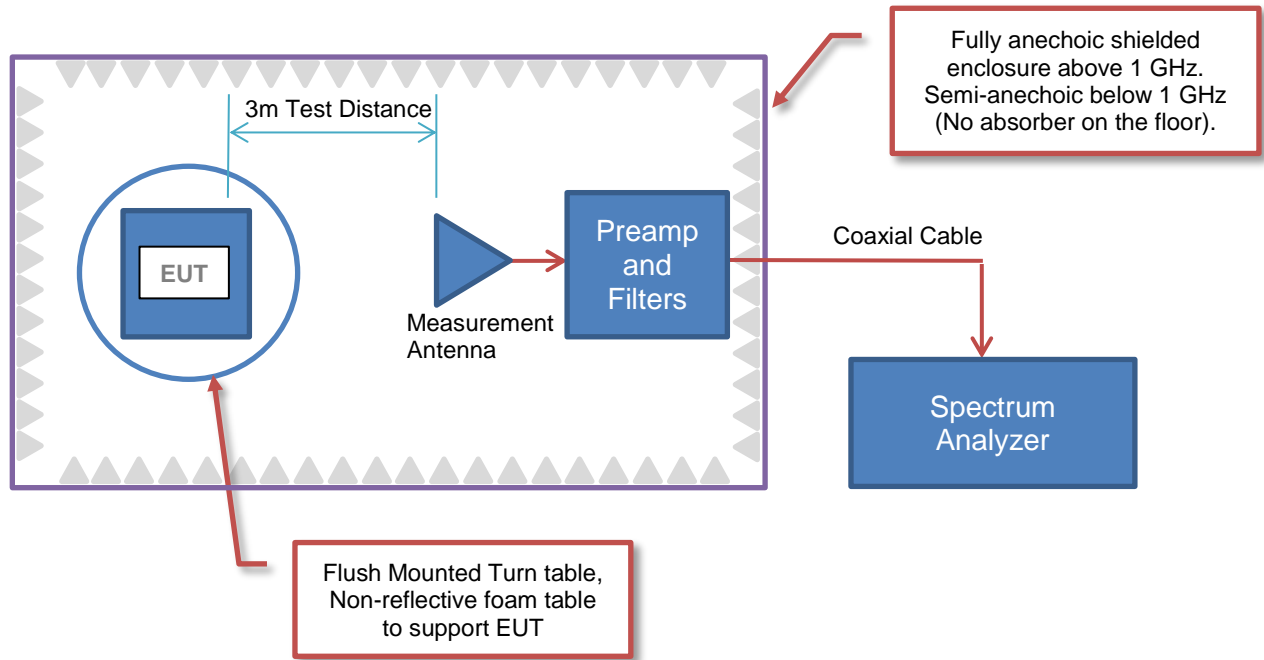


Sample Calculation (logarithmic units)

$$\begin{array}{r}
 \text{Measured Value} \\
 71.2
 \end{array}
 =
 \begin{array}{r}
 \text{Measured Level} \\
 42.6
 \end{array}
 +
 \begin{array}{r}
 \text{Reference Level Offset} \\
 28.6
 \end{array}$$

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

Measured Level (Amplitude)	Factor			Distance Adjustment Factor	External Attenuation	Field Strength
	Antenna Factor	Cable Factor	Amplifier Gain			
42.6	28.6	3.1	40.8	0.0	0.0	33.5

42.6 + 28.6 + 3.1 - 40.8 + 0.0 + 0.0 = 33.5

Conducted Emissions:

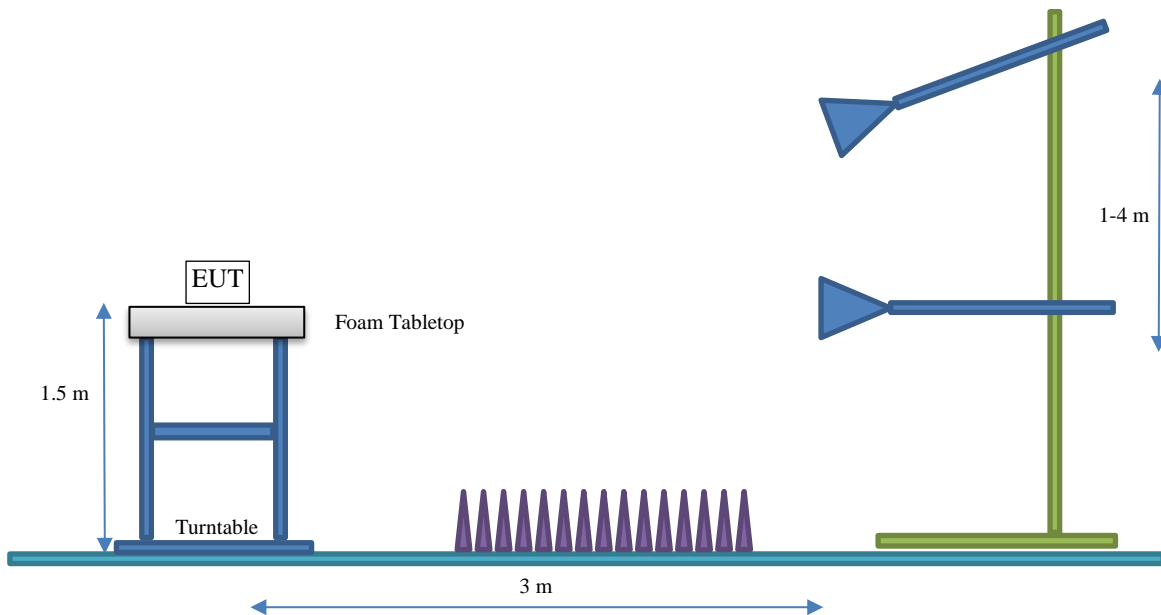
Measured Level (Amplitude)	Factor		External Attenuation	Adjusted Level
	Transducer Factor	Cable Factor		
26.7	0.3	0.1	20.0	47.1

26.7 + 0.3 + 0.1 + 20.0 = 47.1

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	MSA Innovation, LLC
Address:	1100 Cranberry Woods Road
City, State, Zip:	Cranberry Township, PA 16066
Test Requested By:	Dustin Morris
EUT:	ioDock
First Date of Test:	January 25, 2022
Last Date of Test:	March 24, 2022
Receipt Date of Samples:	January 20, 2022
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
io4 Gas Calibration Device 13.56 MHz radio using RFID with one antenna type
Testing Objective:
To demonstrate compliance to FCC Part 15.225 specifications.

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)
PCB Coil	MSA Safety	13.56	None

POWER SETTINGS

Radio	Modulation	Channel	Power Setting (dBm)
RFID	All	All	+18

CONFIGURATIONS



Configuration MSAS0023- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
io4 Gas Calibration Device	MSA Innovation, LLC	ioDock	0020008001590010
ioDock Cylinder Holder	MSA Innovation, LLC	ioDock	00200010015B0016

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply (ioDock)	Mean Well Enterprises Co., LTD.	GSM40A05	SC123E8504

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable (ioDock)	No	1.8 m	No	AC Mains	Power Supply (ioDock)
DC Cable (ioDock)	No	1.0 m	Yes	Power Supply (ioDock)	ioDock

Configuration MSAS0023- 7

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
io4 Gas Calibration Device	MSA Innovation, LLC	ioDock	0020008001590010
ioDock Cylinder Holder	MSA Innovation, LLC	ioDock	00200010015B0016

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Dell	Latitude E7250	3D3MR72
Power Supply (ioDock)	Mean Well Enterprises Co., LTD.	GSM40A05	SC123E8504

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable (ioDock)	No	1.8 m	No	AC Mains	Power Supply (ioDock)
DC Cable (ioDock)	No	1.0 m	Yes	Power Supply (ioDock)	ioDock
USB Cable	Yes	1.8 m	No	Laptop	Serial Cable
Serial Cable	No	0.25 m	No	USB Cable	ioDock (RFID)

CONFIGURATIONS



Configuration MSAS0023- 14

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
io4 Gas Calibration Device	MSA Safety	ioDock	0020008001590010
ioDock Cylinder Holder	MSA Safety	ioDock	00200010015B0040

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply (ioDock)	Mean Well Enterprises Co., LTD.	GSM40A05	SC123E8504

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable (ioDock)	No	1.8 m	No	AC Mains	Power Supply (ioDock)
DC Cable (ioDock)	No	1.0 m	Yes	Power Supply (ioDock)	ioDock

Configuration MSAS0023- 15

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
io4 Gas Calibration Device	MSA Innovation, LLC	ioDock	0020008001590010
ioDock Cylinder Holder	MSA Innovation, LLC	ioDock	00200010015C0004

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply (ioDock)	Mean Well Enterprises Co., LTD.	GSM40A05	SC123E8504

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable (ioDock)	No	1.8 m	No	AC Mains	Power Supply (ioDock)
DC Cable (ioDock)	No	1.0 m	Yes	Power Supply (ioDock)	ioDock

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-01-25	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	2022-01-25	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	2022-01-25	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	2022-02-01	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.
5	2022-02-02	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2022-02-02	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.
7	2022-03-21	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.
8	2022-03-24	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.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS



TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

The following steps were taken to show compliance:

- 1) Scans were taken with the RFID transmitting using the nondetachable antenna and all out of the transmitter band emissions met RSS-210 Issue 10 limits
- 2) Scans were taken with the RFID transmitting using a suitable dummy load having the same electrical properties as the intended antenna except will not radiate emissions. The dummy load measurement had identical signals compared to the measurements with the antenna connected. Compliance was then determined within the transmitter's fundamental emissions band.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Gauss Instruments	TDEMI 30M	ARS	2021-04-06	2022-04-06
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	2022-03-07	2023-03-07
LISN	Solar Electronics	9252-50-R-24-BNC	LIO	2021-09-26	2022-09-26

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.2 dB	-3.2 dB

CONFIGURATIONS INVESTIGATED

MSAS0023-2
MSAS0023-14

MODES INVESTIGATED

RFID idle (antenna attached)
RFID active (antenna attached)
RFID active (dummy load attached)

POWERLINE CONDUCTED EMISSIONS



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200010015B0016	Date:	2022-02-01
Customer:	MSA Safety	Temperature:	22.5°C
Attendees:	None	Relative Humidity:	21.9%
Customer Project:	None	Bar. Pressure (PMSL):	1010 mb
Tested By:	Chris Patterson	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

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

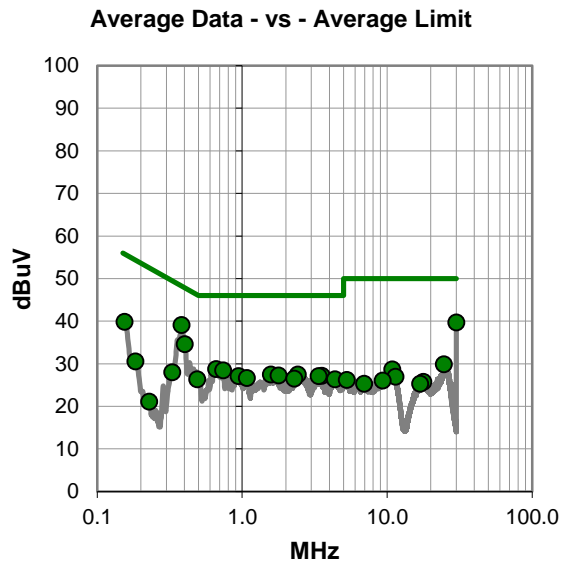
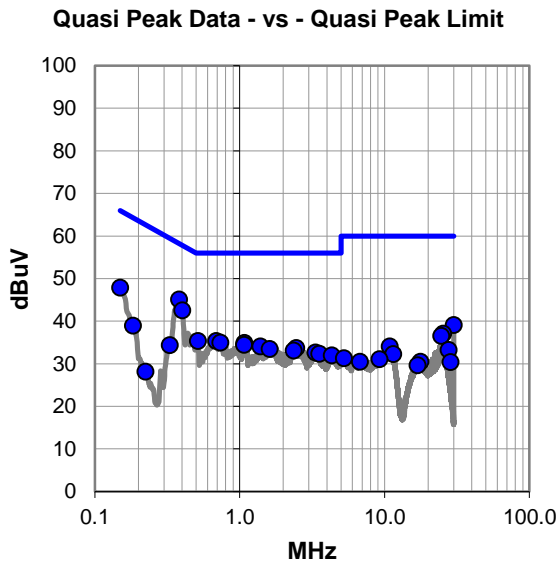
Run to show compliance at all other frequencies besides fundamental with attached antenna

EUT OPERATING MODES

RFID idle (antenna attached)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #11

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.382	24.6	20.5	45.1	58.2	-13.1
0.402	22.1	20.5	42.6	57.8	-15.2
0.150	26.9	21.0	47.9	66.0	-18.1
0.514	14.9	20.5	35.4	56.0	-20.6
0.688	15.0	20.4	35.4	56.0	-20.6
29.998	17.5	21.6	39.1	60.0	-20.9
0.737	14.5	20.5	35.0	56.0	-21.0
1.080	14.4	20.5	34.9	56.0	-21.1
1.072	14.0	20.5	34.5	56.0	-21.5
1.388	13.6	20.5	34.1	56.0	-21.9
2.453	13.1	20.6	33.7	56.0	-22.3
1.607	13.0	20.5	33.5	56.0	-22.5
25.432	15.8	21.3	37.1	60.0	-22.9
2.358	12.5	20.6	33.1	56.0	-22.9
3.332	12.1	20.6	32.7	56.0	-23.3
24.596	15.3	21.3	36.6	60.0	-23.4
3.540	11.8	20.6	32.4	56.0	-23.6
4.326	11.4	20.6	32.0	56.0	-24.0
0.329	13.9	20.5	34.4	59.5	-25.1
0.183	18.2	20.8	39.0	64.3	-25.3
10.869	13.2	20.9	34.1	60.0	-25.9
27.700	11.9	21.4	33.3	60.0	-26.7
11.463	11.4	20.9	32.3	60.0	-27.7
5.259	10.7	20.6	31.3	60.0	-28.7
9.238	10.3	20.8	31.1	60.0	-28.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.382	18.6	20.5	39.1	48.2	-9.1
29.998	18.1	21.6	39.7	50.0	-10.3
0.402	14.1	20.5	34.6	47.8	-13.2
0.154	19.0	20.9	39.9	55.8	-15.9
0.662	8.4	20.4	28.8	46.0	-17.2
0.738	8.0	20.5	28.5	46.0	-17.5
1.580	7.0	20.5	27.5	46.0	-18.5
2.418	6.9	20.6	27.5	46.0	-18.5
1.783	6.8	20.5	27.3	46.0	-18.7
3.539	6.6	20.6	27.2	46.0	-18.8
0.943	6.6	20.5	27.1	46.0	-18.9
3.361	6.5	20.6	27.1	46.0	-18.9
1.076	6.2	20.5	26.7	46.0	-19.3
2.292	5.9	20.6	26.5	46.0	-19.5
4.355	5.8	20.6	26.4	46.0	-19.6
0.489	5.9	20.5	26.4	46.2	-19.8
24.626	8.6	21.3	29.9	50.0	-20.1
10.868	7.8	20.9	28.7	50.0	-21.3
0.329	7.5	20.5	28.0	49.5	-21.5
11.439	6.1	20.9	27.0	50.0	-23.0
0.183	9.8	20.8	30.6	54.3	-23.7
5.262	5.6	20.6	26.2	50.0	-23.8
9.324	5.3	20.8	26.1	50.0	-23.9
17.730	4.7	21.1	25.8	50.0	-24.2
6.927	4.5	20.8	25.3	50.0	-24.7

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200010015B0016	Date:	2022-02-01
Customer:	MSA Safety	Temperature:	22.5°C
Attendees:	None	Relative Humidity:	21.9%
Customer Project:	None	Bar. Pressure (PMSL):	1010 mb
Tested By:	Chris Patterson	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

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

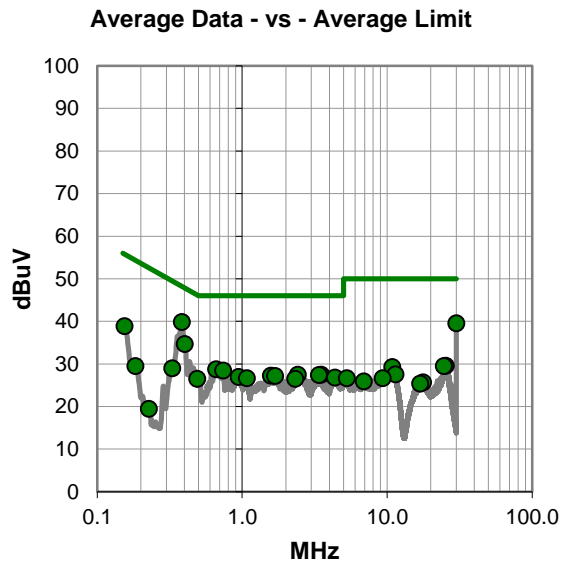
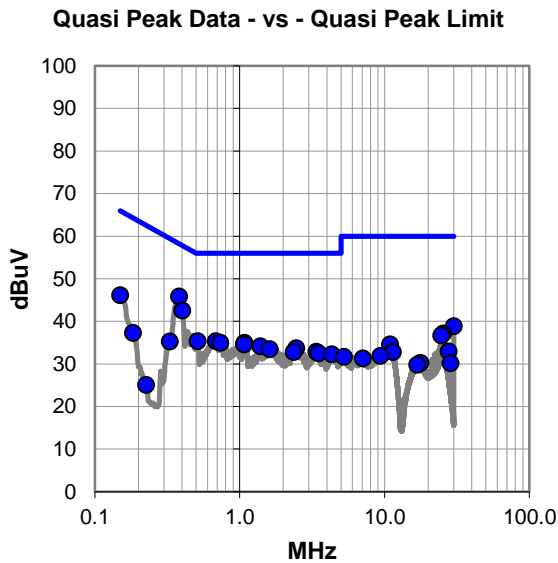
Run to show compliance at all other frequencies besides fundamental with attached antenna

EUT OPERATING MODES

RFID idle (antenna attached)

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)
0.382	25.4	20.5	45.9	58.2	-12.3
0.402	22.1	20.5	42.6	57.8	-15.2
0.150	25.2	21.0	46.2	66.0	-19.8
0.513	14.9	20.5	35.4	56.0	-20.6
0.687	15.0	20.4	35.4	56.0	-20.6
0.737	14.5	20.5	35.0	56.0	-21.0
1.080	14.5	20.5	35.0	56.0	-21.0
29.998	17.3	21.6	38.9	60.0	-21.1
1.072	14.1	20.5	34.6	56.0	-21.4
1.388	13.7	20.5	34.2	56.0	-21.8
2.453	13.1	20.6	33.7	56.0	-22.3
1.607	13.0	20.5	33.5	56.0	-22.5
25.432	15.9	21.3	37.2	60.0	-22.8
3.390	12.3	20.6	32.9	56.0	-23.1
2.358	12.2	20.6	32.8	56.0	-23.2
24.596	15.4	21.3	36.7	60.0	-23.3
3.513	11.9	20.6	32.5	56.0	-23.5
4.326	11.7	20.6	32.3	56.0	-23.7
0.329	14.8	20.5	35.3	59.5	-24.2
10.898	13.7	20.9	34.6	60.0	-25.4
27.670	11.6	21.4	33.0	60.0	-27.0
0.183	16.5	20.8	37.3	64.3	-27.0
11.439	11.9	20.9	32.8	60.0	-27.2
9.382	11.1	20.8	31.9	60.0	-28.1
5.259	11.1	20.6	31.7	60.0	-28.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.384	19.4	20.5	39.9	48.2	-8.3
29.998	18.0	21.6	39.6	50.0	-10.4
0.402	14.2	20.5	34.7	47.8	-13.1
0.154	18.0	20.9	38.9	55.8	-16.9
0.662	8.4	20.4	28.8	46.0	-17.2
0.738	8.0	20.5	28.5	46.0	-17.5
2.420	6.9	20.6	27.5	46.0	-18.5
3.513	6.9	20.6	27.5	46.0	-18.5
3.390	6.8	20.6	27.4	46.0	-18.6
1.578	6.8	20.5	27.3	46.0	-18.7
1.681	6.7	20.5	27.2	46.0	-18.8
0.943	6.5	20.5	27.0	46.0	-19.0
4.357	6.2	20.6	26.8	46.0	-19.2
1.076	6.2	20.5	26.7	46.0	-19.3
2.319	5.9	20.6	26.5	46.0	-19.5
0.489	6.0	20.5	26.5	46.2	-19.7
25.370	8.3	21.3	29.6	50.0	-20.4
0.329	8.5	20.5	29.0	49.5	-20.5
24.626	8.2	21.3	29.5	50.0	-20.5
10.866	8.4	20.9	29.3	50.0	-20.7
11.439	6.7	20.9	27.6	50.0	-22.4
5.263	6.1	20.6	26.7	50.0	-23.3
9.295	5.9	20.8	26.7	50.0	-23.3
6.899	5.1	20.8	25.9	50.0	-24.1
17.702	4.6	21.1	25.7	50.0	-24.3

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200010015B0016	Date:	2022-02-01
Customer:	MSA Safety	Temperature:	22.5°C
Attendees:	None	Relative Humidity:	21.9%
Customer Project:	None	Bar. Pressure (PMSL):	1010 mb
Tested By:	Chris Patterson	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

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

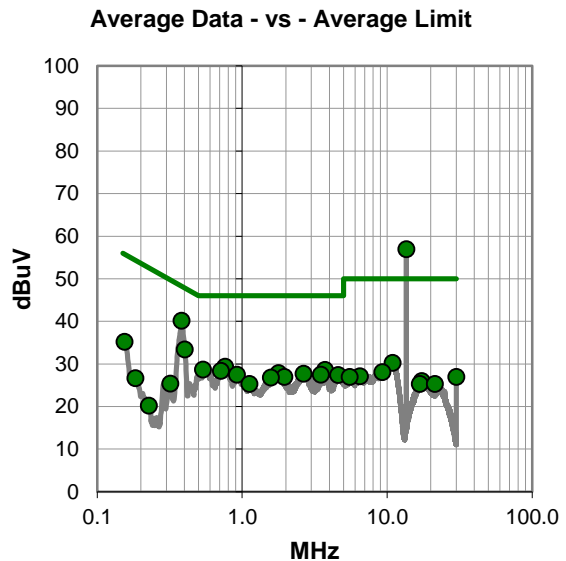
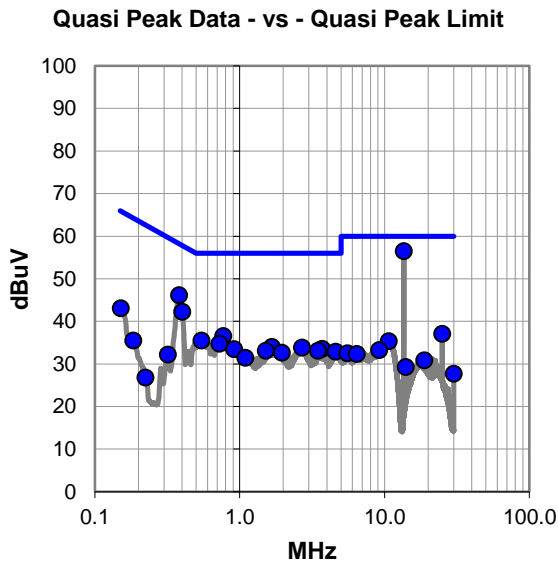
Transmitting with attached antenna

EUT OPERATING MODES

RFID active (antenna attached)

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 (fundamental)	35.6	20.9	56.5	N/A	No Limit
0.382	25.7	20.5	46.2	58.2	-12.0
0.402	21.8	20.5	42.3	57.8	-15.5
0.769	16.1	20.5	36.6	56.0	-19.4
0.546	15.0	20.5	35.5	56.0	-20.5
0.724	14.3	20.5	34.8	56.0	-21.2
1.667	13.5	20.5	34.0	56.0	-22.0
2.700	13.3	20.6	33.9	56.0	-22.1
3.714	13.0	20.6	33.6	56.0	-22.4
0.915	13.0	20.5	33.5	56.0	-22.5
0.151	22.2	20.9	43.1	65.9	-22.8
24.996	15.8	21.3	37.1	60.0	-22.9
1.518	12.6	20.5	33.1	56.0	-22.9
3.482	12.5	20.6	33.1	56.0	-22.9
4.585	12.3	20.6	32.9	56.0	-23.1
1.954	12.2	20.5	32.7	56.0	-23.3
1.093	11.0	20.5	31.5	56.0	-24.5
10.671	14.5	20.9	35.4	60.0	-24.6
9.170	12.5	20.8	33.3	60.0	-26.7
0.320	11.7	20.5	32.2	59.7	-27.5
5.553	11.9	20.6	32.5	60.0	-27.5
6.419	11.7	20.7	32.4	60.0	-27.6
0.185	14.7	20.8	35.5	64.3	-28.8
18.775	9.8	21.1	30.9	60.0	-29.1
13.984	8.3	21.0	29.3	60.0	-30.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560 (fundamental)	36.1	20.9	57.0	N/A	No Limit
0.382	19.7	20.5	40.2	48.2	-8.0
0.402	12.9	20.5	33.4	47.8	-14.4
0.763	8.9	20.5	29.4	46.0	-16.6
0.535	8.2	20.5	28.7	46.0	-17.3
3.718	8.0	20.6	28.6	46.0	-17.4
0.713	7.9	20.5	28.4	46.0	-17.6
1.783	7.4	20.5	27.9	46.0	-18.1
2.646	7.1	20.6	27.7	46.0	-18.3
0.918	7.0	20.5	27.5	46.0	-18.5
3.483	6.9	20.6	27.5	46.0	-18.5
4.583	6.8	20.6	27.4	46.0	-18.6
1.956	6.5	20.5	27.0	46.0	-19.0
1.578	6.3	20.5	26.8	46.0	-19.2
10.875	9.4	20.9	30.3	50.0	-19.7
0.154	14.3	20.9	35.2	55.8	-20.6
1.119	4.8	20.5	25.3	46.0	-20.7
9.268	7.3	20.8	28.1	50.0	-21.9
6.494	6.4	20.7	27.1	50.0	-22.9
29.998	5.4	21.6	27.0	50.0	-23.0
5.526	6.4	20.6	27.0	50.0	-23.0
17.345	4.9	21.1	26.0	50.0	-24.0
0.320	4.9	20.5	25.4	49.7	-24.3
16.811	4.2	21.1	25.3	50.0	-24.7
21.313	4.0	21.3	25.3	50.0	-24.7

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200010015B0016	Date:	2022-02-01
Customer:	MSA Safety	Temperature:	22.5°C
Attendees:	None	Relative Humidity:	21.9%
Customer Project:	None	Bar. Pressure (PMSL):	1010 mb
Tested By:	Chris Patterson	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

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

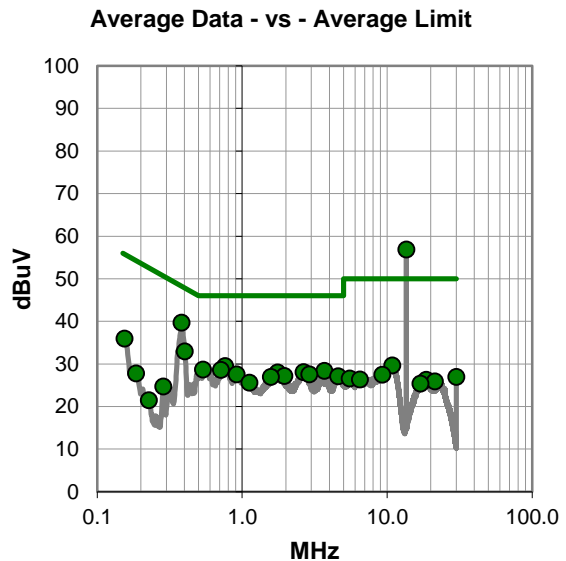
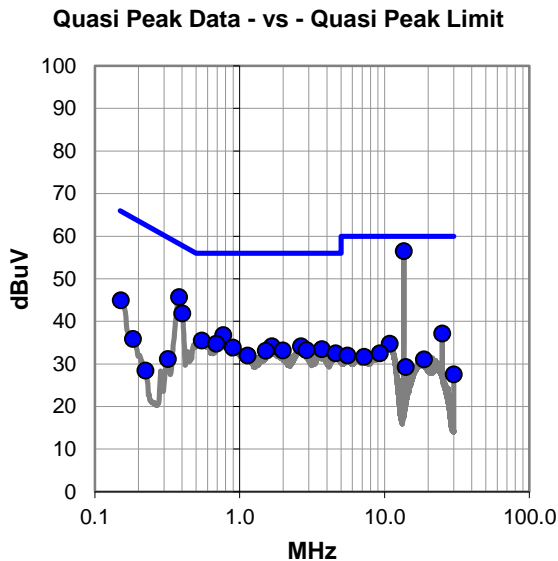
Transmitting with attached antenna

EUT OPERATING MODES

RFID active (antenna attached)

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)
13.560 (fundamental)	35.6	20.9	56.5	N/A	No Limit
0.382	25.2	20.5	45.7	58.2	-12.5
0.402	21.4	20.5	41.9	57.8	-15.9
0.769	16.3	20.5	36.8	56.0	-19.2
0.548	15.0	20.5	35.5	56.0	-20.5
0.151	24.1	20.9	45.0	65.9	-20.9
0.690	14.4	20.4	34.8	56.0	-21.2
1.667	13.7	20.5	34.2	56.0	-21.8
2.649	13.6	20.6	34.2	56.0	-21.8
0.900	13.4	20.5	33.9	56.0	-22.1
3.684	12.9	20.6	33.5	56.0	-22.5
2.894	12.7	20.6	33.3	56.0	-22.7
1.987	12.7	20.5	33.2	56.0	-22.8
24.999	15.9	21.3	37.2	60.0	-22.8
1.518	12.6	20.5	33.1	56.0	-22.9
4.585	11.9	20.6	32.5	56.0	-23.5
1.132	11.5	20.5	32.0	56.0	-24.0
10.848	13.9	20.9	34.8	60.0	-25.2
9.296	11.7	20.8	32.5	60.0	-27.5
5.553	11.4	20.6	32.0	60.0	-28.0
7.234	10.9	20.8	31.7	60.0	-28.3
0.183	15.1	20.8	35.9	64.3	-28.4
0.320	10.7	20.5	31.2	59.7	-28.5
18.686	10.0	21.1	31.1	60.0	-28.9
13.984	8.3	21.0	29.3	60.0	-30.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560 (fundamental)	36.0	20.9	56.9	N/A	No Limit
0.382	19.2	20.5	39.7	48.2	-8.5
0.402	12.5	20.5	33.0	47.8	-14.8
0.763	9.0	20.5	29.5	46.0	-16.5
0.535	8.2	20.5	28.7	46.0	-17.3
0.713	8.1	20.5	28.6	46.0	-17.4
3.691	7.8	20.6	28.4	46.0	-17.6
2.646	7.5	20.6	28.1	46.0	-17.9
1.756	7.5	20.5	28.0	46.0	-18.0
0.916	7.1	20.5	27.6	46.0	-18.4
2.898	7.0	20.6	27.6	46.0	-18.4
1.956	6.7	20.5	27.2	46.0	-18.8
4.583	6.5	20.6	27.1	46.0	-18.9
1.578	6.5	20.5	27.0	46.0	-19.0
0.154	15.1	20.9	36.0	55.8	-19.8
10.847	8.8	20.9	29.7	50.0	-20.3
1.119	5.1	20.5	25.6	46.0	-20.4
9.270	6.7	20.8	27.5	50.0	-22.5
29.998	5.4	21.6	27.0	50.0	-23.0
5.501	6.0	20.6	26.6	50.0	-23.4
6.493	5.7	20.7	26.4	50.0	-23.6
18.624	5.2	21.1	26.3	50.0	-23.7
21.372	4.6	21.3	25.9	50.0	-24.1
16.961	4.3	21.1	25.4	50.0	-24.6
0.285	4.2	20.5	24.7	50.7	-26.0

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200010015B0040	Date:	2022-03-16
Customer:	MSA Safety	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	28.4%
Customer Project:	None	Bar. Pressure (PMSL):	1010 mb
Tested By:	Christopher Heintzleman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MSAS0023-14

TEST SPECIFICATIONS

Specification	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	24	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

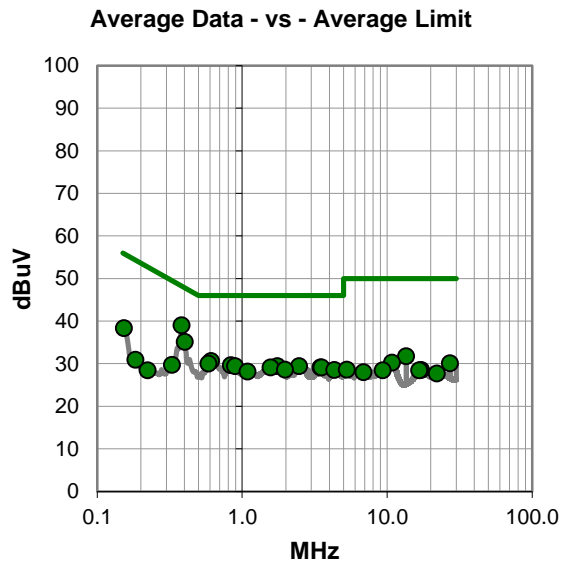
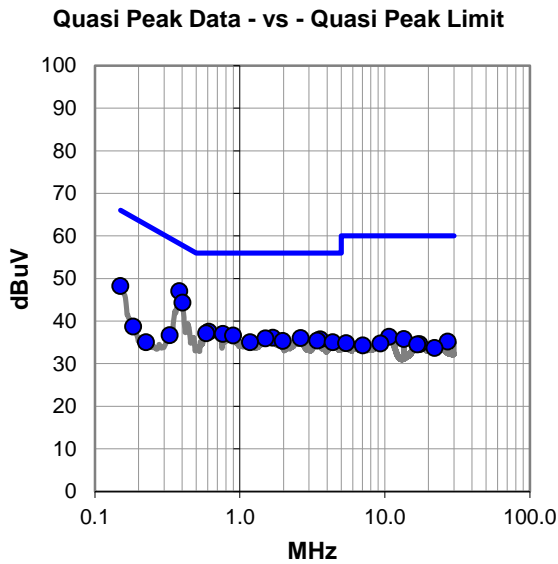
Scans were taken using the Dummy load on RFID radio antenna port.

EUT OPERATING MODES

RFID active (dummy load attached)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #24

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.382	26.8	20.2	47.0	58.2	-11.2
0.402	24.1	20.2	44.3	57.8	-13.5
0.150	27.8	20.4	48.2	66.0	-17.8
0.611	17.3	20.2	37.5	56.0	-18.5
0.585	16.9	20.2	37.1	56.0	-18.9
0.763	16.8	20.2	37.0	56.0	-19.0
0.899	16.4	20.2	36.6	56.0	-19.4
1.691	15.8	20.3	36.1	56.0	-19.9
2.632	15.7	20.3	36.0	56.0	-20.0
1.500	15.6	20.3	35.9	56.0	-20.1
3.595	15.3	20.4	35.7	56.0	-20.3
3.429	15.0	20.4	35.4	56.0	-20.6
1.982	15.0	20.3	35.3	56.0	-20.7
1.177	14.8	20.2	35.0	56.0	-21.0
4.384	14.6	20.4	35.0	56.0	-21.0
0.329	16.5	20.2	36.7	59.5	-22.8
10.728	15.5	20.8	36.3	60.0	-23.7
13.560	14.8	21.0	35.8	60.0	-24.2
27.119	13.0	22.2	35.2	60.0	-24.8
5.416	14.4	20.4	34.8	60.0	-25.2
9.358	14.0	20.7	34.7	60.0	-25.3
17.355	13.3	21.3	34.6	60.0	-25.4
16.734	13.2	21.3	34.5	60.0	-25.5
0.184	18.4	20.3	38.7	64.3	-25.6
7.068	13.7	20.6	34.3	60.0	-25.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.382	18.8	20.2	39.0	48.2	-9.2
0.402	14.9	20.2	35.1	47.8	-12.7
0.611	10.4	20.2	30.6	46.0	-15.4
0.585	9.8	20.2	30.0	46.0	-16.0
0.838	9.4	20.2	29.6	46.0	-16.4
0.896	9.2	20.2	29.4	46.0	-16.6
1.752	9.1	20.3	29.4	46.0	-16.6
2.468	9.1	20.3	29.4	46.0	-16.6
1.574	8.8	20.3	29.1	46.0	-16.9
3.481	8.7	20.4	29.1	46.0	-16.9
3.536	8.7	20.4	29.1	46.0	-16.9
1.982	8.3	20.3	28.6	46.0	-17.4
0.153	17.9	20.4	38.3	55.8	-17.5
4.320	8.1	20.4	28.5	46.0	-17.5
1.091	7.9	20.2	28.1	46.0	-17.9
13.560	10.7	21.0	31.7	50.0	-18.3
0.329	9.5	20.2	29.7	49.5	-19.8
10.832	9.4	20.8	30.2	50.0	-19.8
27.120	7.9	22.2	30.1	50.0	-19.9
5.289	8.2	20.4	28.6	50.0	-21.4
17.169	7.2	21.3	28.5	50.0	-21.5
9.357	7.7	20.7	28.4	50.0	-21.6
16.703	7.1	21.3	28.4	50.0	-21.6
6.889	7.5	20.5	28.0	50.0	-22.0
22.073	6.0	21.7	27.7	50.0	-22.3

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200010015B0040	Date:	2022-03-16
Customer:	MSA Safety	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	28.4%
Customer Project:	None	Bar. Pressure (PMSL):	1010 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MSAS0023-14

TEST SPECIFICATIONS

Specification	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	25	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

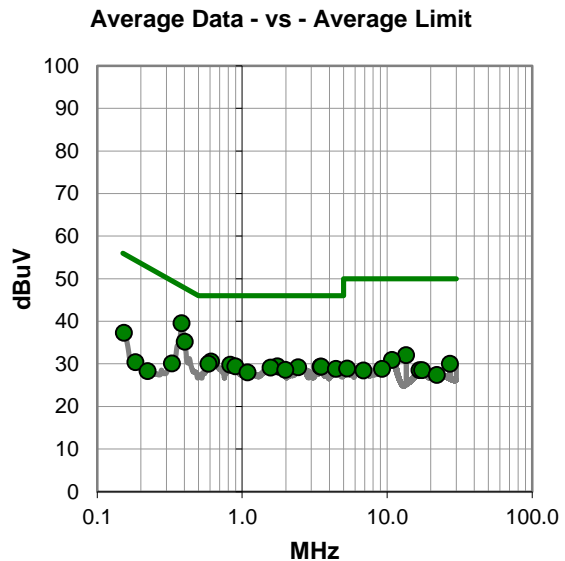
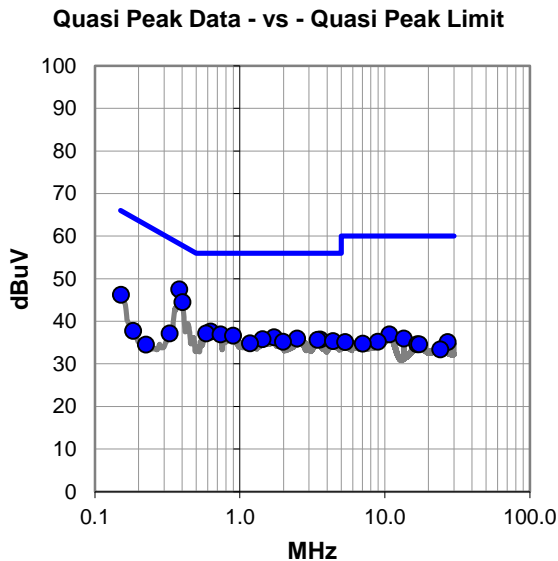
Scans were taken using the Dummy load on RFID radio antenna port.

EUT OPERATING MODES

RFID active (dummy load attached)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #25

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.382	27.3	20.2	47.5	58.2	-10.7
0.402	24.3	20.2	44.5	57.8	-13.3
0.631	17.4	20.2	37.6	56.0	-18.4
0.585	16.9	20.2	37.1	56.0	-18.9
0.737	16.7	20.2	36.9	56.0	-19.1
0.899	16.4	20.2	36.6	56.0	-19.4
0.152	25.8	20.4	46.2	65.9	-19.7
1.722	15.9	20.3	36.2	56.0	-19.8
2.491	15.6	20.3	35.9	56.0	-20.1
1.435	15.5	20.3	35.8	56.0	-20.2
3.594	15.3	20.4	35.7	56.0	-20.3
3.449	15.2	20.4	35.6	56.0	-20.4
4.386	14.9	20.4	35.3	56.0	-20.7
1.984	14.9	20.3	35.2	56.0	-20.8
1.177	14.6	20.2	34.8	56.0	-21.2
0.329	16.9	20.2	37.1	59.5	-22.4
10.757	16.1	20.8	36.9	60.0	-23.1
13.560	14.9	21.0	35.9	60.0	-24.1
8.977	14.6	20.6	35.2	60.0	-24.8
5.341	14.7	20.4	35.1	60.0	-24.9
27.119	12.9	22.2	35.1	60.0	-24.9
7.071	14.1	20.6	34.7	60.0	-25.3
16.732	13.3	21.3	34.6	60.0	-25.4
17.242	13.3	21.3	34.6	60.0	-25.4
0.184	17.4	20.3	37.7	64.3	-26.6

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.382	19.3	20.2	39.5	48.2	-8.7
0.402	15.0	20.2	35.2	47.8	-12.6
0.611	10.3	20.2	30.5	46.0	-15.5
0.585	9.8	20.2	30.0	46.0	-16.0
0.831	9.6	20.2	29.8	46.0	-16.2
0.898	9.2	20.2	29.4	46.0	-16.6
1.752	9.1	20.3	29.4	46.0	-16.6
3.481	8.9	20.4	29.3	46.0	-16.7
3.508	8.9	20.4	29.3	46.0	-16.7
2.442	8.9	20.3	29.2	46.0	-16.8
1.575	8.8	20.3	29.1	46.0	-16.9
4.450	8.4	20.4	28.8	46.0	-17.2
1.984	8.3	20.3	28.6	46.0	-17.4
13.560	11.0	21.0	32.0	50.0	-18.0
1.091	7.8	20.2	28.0	46.0	-18.0
0.153	16.9	20.4	37.3	55.8	-18.5
10.808	10.1	20.8	30.9	50.0	-19.1
0.329	9.9	20.2	30.1	49.5	-19.4
27.120	7.8	22.2	30.0	50.0	-20.0
5.315	8.5	20.4	28.9	50.0	-21.1
9.259	8.1	20.7	28.8	50.0	-21.2
16.734	7.2	21.3	28.5	50.0	-21.5
17.418	7.2	21.3	28.5	50.0	-21.5
6.891	7.9	20.5	28.4	50.0	-21.6
22.073	5.7	21.7	27.4	50.0	-22.6

CONCLUSION

Pass

Tested By



XMIT 2020.12.30.0

OCCUPIED BANDWIDTH

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
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The EUT was set to the channels and modes listed in the datasheet.

The 20 dB occupied bandwidth (OBW) was measured using a RBW of 6% deviating from 1%-5% of the measured OBW in order to get a consistent measurement. The span of the analyzer shall be set to 2-5 times the measured OBW.

OCCUPIED BANDWIDTH



XMIT 2020.12.30.0

EUT: ioDock		Work Order: MSAS0023				
Serial Number: 00200010015B0016		Date: 2-Feb-22				
Customer: MSA Innovation, LLC		Temperature: 21.9 °C				
Attendees: None		Humidity: 17.1% RH				
Project: None		Barometric Pres.: 1036 mbar				
Tested by: Andrew Rogstad		Power: 110VAC/60Hz				
		Job Site: MN08				
TEST SPECIFICATIONS		Test Method				
FCC 15.225:2022		ANSI C63.10:2013				
COMMENTS						
A RBW higher than 5% of the measured OBW was used in order to achieve a stable measurement with the RFID modulation type.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	7	Signature <i>Andrew Rogstad</i>				
		Lower OBW Value (MHz)	Lower OBW Limit (MHz)	Upper OBW Value (MHz)	Upper OBW Limit (MHz)	Result
		13.509	13.11	13.61	14.01	Pass

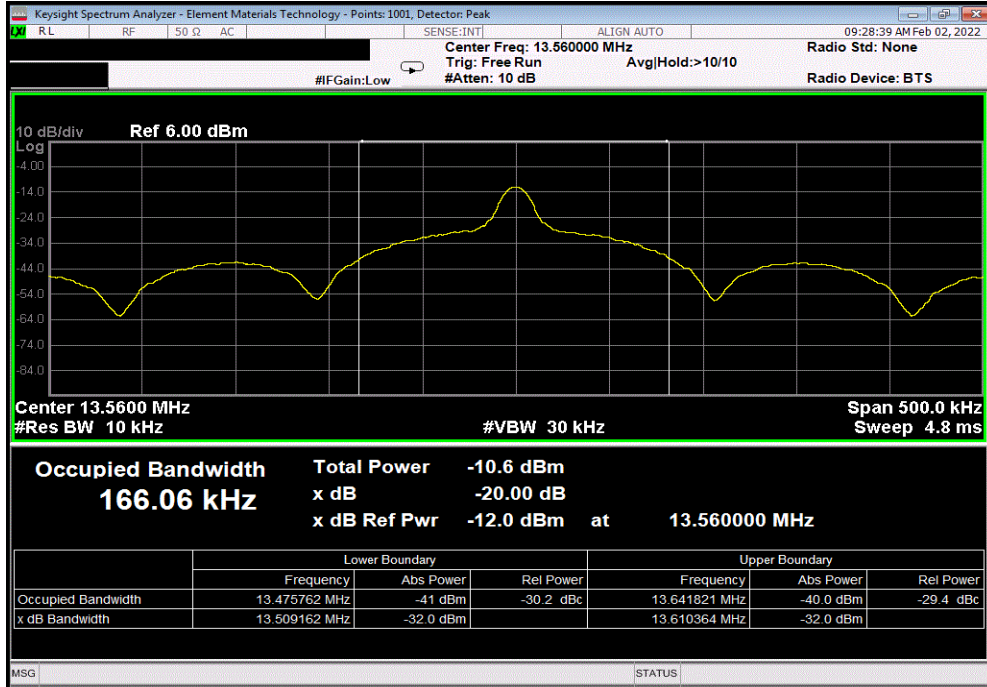
RFID, 13.56 MHz, Modulated

OCCUPIED BANDWIDTH



XMI 2020.12.30.0

RFID, 13.56 MHz, Modulated						
Lower OBW Value (MHz)	Lower OBW Limit (MHz)	Upper OBW Value (MHz)	Upper OBW Limit (MHz)	Result		
13.509	13.11	13.61	14.01	Pass		



FIELD STRENGTH OF FUNDAMENTAL



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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Loop	ETS Lindgren	6502	AOB	2021-06-01	2023-06-01
Cable	ESM Cable Corp.	Antenna Loop Cable	MNE	2021-02-17	2022-02-17
Receiver	Rohde & Schwarz	ESR26	ARP	2021-04-08	2022-04-08

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

10 MHz TO 15 MHz

POWER INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MSAS0023-2

MODES INVESTIGATED

Transmitting RFID 13.56 MHz, Modulated

FIELD STRENGTH OF FUNDAMENTAL



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200080015C0010	Date:	2022-01-25
Customer:	MSA Innovation, LLC	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	16.3%
Customer Project:	None	Bar. Pressure (PMSL):	1031 mb
Tested By:	Christopher Heintzelman	Job Site:	MN04
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	5	Test Distance (m):	3	Ant. Height(s) (m):	1(m)
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COMMENTS

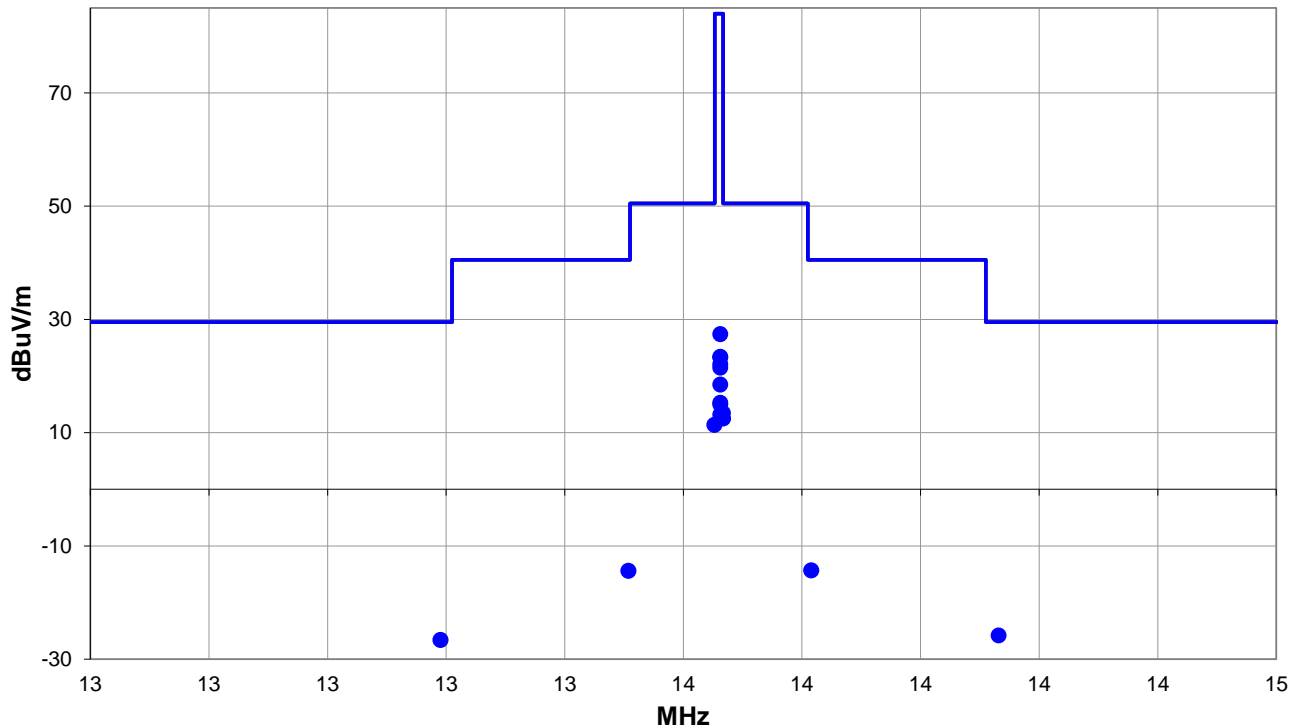
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz, Modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 5

■ PK ◆ AV ● QP

FIELD STRENGTH OF FUNDAMENTAL

RESULTS - Run #5

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)	Comments
13.552	40.4	11.0	1.0	214.0	3.0	0.0	Perp to GND	QP	-40.0	11.4	50.5	-39.1	EUT Horz
11.068	4.2	11.1	1.0	359.0	3.0	0.0	Perp to GND	QP	-40.0	-24.7	29.5	-54.2	EUT Horz
13.716	14.7	11.0	1.0	223.0	3.0	0.0	Perp to GND	QP	-40.0	-14.3	40.5	-54.8	EUT Horz
13.407	14.5	11.1	1.0	163.0	3.0	0.0	Perp to GND	QP	-40.0	-14.4	40.5	-54.9	EUT Horz
14.032	3.2	11.0	1.0	359.0	3.0	0.0	Perp to GND	QP	-40.0	-25.8	29.5	-55.3	EUT Horz
16.002	3.1	10.9	1.0	360.0	3.0	0.0	Perp to GND	QP	-40.0	-26.0	29.5	-55.5	EUT Horz
13.090	2.3	11.1	1.0	318.0	3.0	0.0	Perp to GND	QP	-40.0	-26.6	29.5	-56.1	EUT Horz
13.562	56.4	11.0	1.0	191.0	3.0	0.0	Perp to GND	QP	-40.0	27.4	84.0	-56.6	EUT Horz
13.562	52.4	11.0	1.0	21.0	3.0	0.0	Perp to GND	QP	-40.0	23.4	84.0	-60.6	EUT Vert
13.562	52.3	11.0	1.0	197.0	3.0	0.0	Perp to GND	QP	-40.0	23.3	84.0	-60.7	EUT On Side
13.562	51.1	11.0	1.0	266.0	3.0	0.0	Para to EUT	QP	-40.0	22.1	84.0	-61.9	EUT Horz
13.562	50.5	11.0	1.0	296.0	3.0	0.0	Para to EUT	QP	-40.0	21.5	84.0	-62.5	EUT On Side
13.562	47.5	11.0	1.0	300.0	3.0	0.0	Para to GND	QP	-40.0	18.5	84.0	-65.5	EUT On Side
13.562	44.3	11.0	1.0	63.0	3.0	0.0	Para to GND	QP	-40.0	15.3	84.0	-68.7	EUT Horz
13.562	44.0	11.0	1.0	105.0	3.0	0.0	Para to EUT	QP	-40.0	15.0	84.0	-69.0	EUT Vert
13.567	42.5	11.0	1.0	193.0	3.0	0.0	Para to GND	QP	-40.0	13.5	84.0	-70.5	EUT Horz
13.562	42.2	11.0	1.0	82.0	3.0	0.0	Perp to GND	QP	-40.0	13.2	84.0	-70.8	EUT Vert
13.567	41.5	11.0	1.0	193.0	3.0	0.0	Perp to GND	QP	-40.0	12.5	84.0	-71.5	EUT Horz

CONCLUSION

Pass



Tested By

FIELD STRENGTH OF FUNDAMENTAL



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200080015C0010	Date:	2022-01-25
Customer:	MSA Innovation, LLC	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	16.3%
Customer Project:	None	Bar. Pressure (PMSL):	1031 mb
Tested By:	Christopher Heintzelman	Job Site:	MN04
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	6	Test Distance (m):	10	Ant. Height(s) (m):	1(m)
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COMMENTS

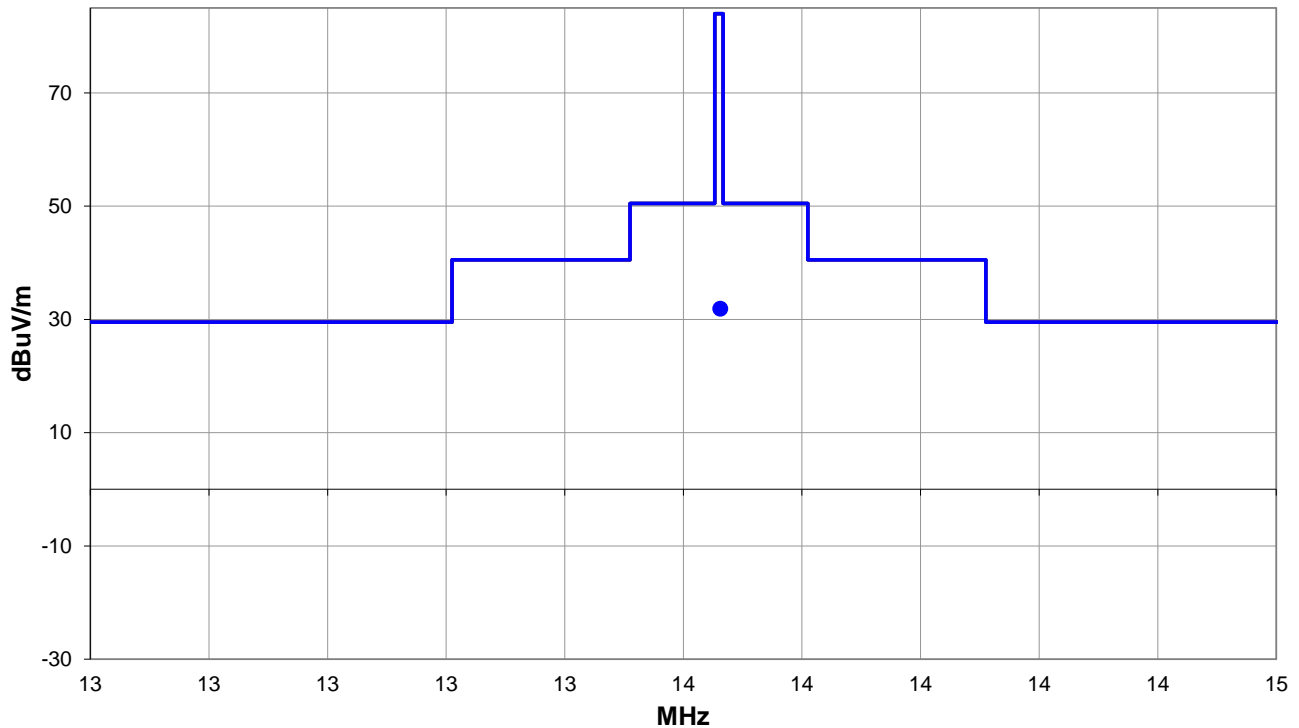
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz, Modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 6

■ PK ◆ AV ● QP

FIELD STRENGTH OF FUNDAMENTAL



RESULTS - Run #6

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)	Comments
13.562	40.0	11.0	1.0	180.0	10.0	0.0	Perp to GND	QP	-19.1	31.9	84.0	-52.1	EUT Horz

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHZ)



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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Loop	ETS Lindgren	6502	AOB	2021-06-01	2023-06-01
Cable	ESM Cable Corp.	Antenna Loop Cable	MNE	2021-02-17	2022-02-17
Receiver	Rohde & Schwarz	ESR26	ARP	2021-04-08	2022-04-08

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

9 kHz TO 140 MHz

POWER INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MSAS0023-2

MODES INVESTIGATED

Transmitting RFID 13.56 MHz, Modulated

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200080015C0010	Date:	2022-01-25
Customer:	MSA Innovation, LLC	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	15.6%
Customer Project:	None	Bar. Pressure (PMSL):	1032 mb
Tested By:	Christopher Heintzelman	Job Site:	MN04
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	8	Test Distance (m):	3	Ant. Height(s) (m):	1(m)
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COMMENTS

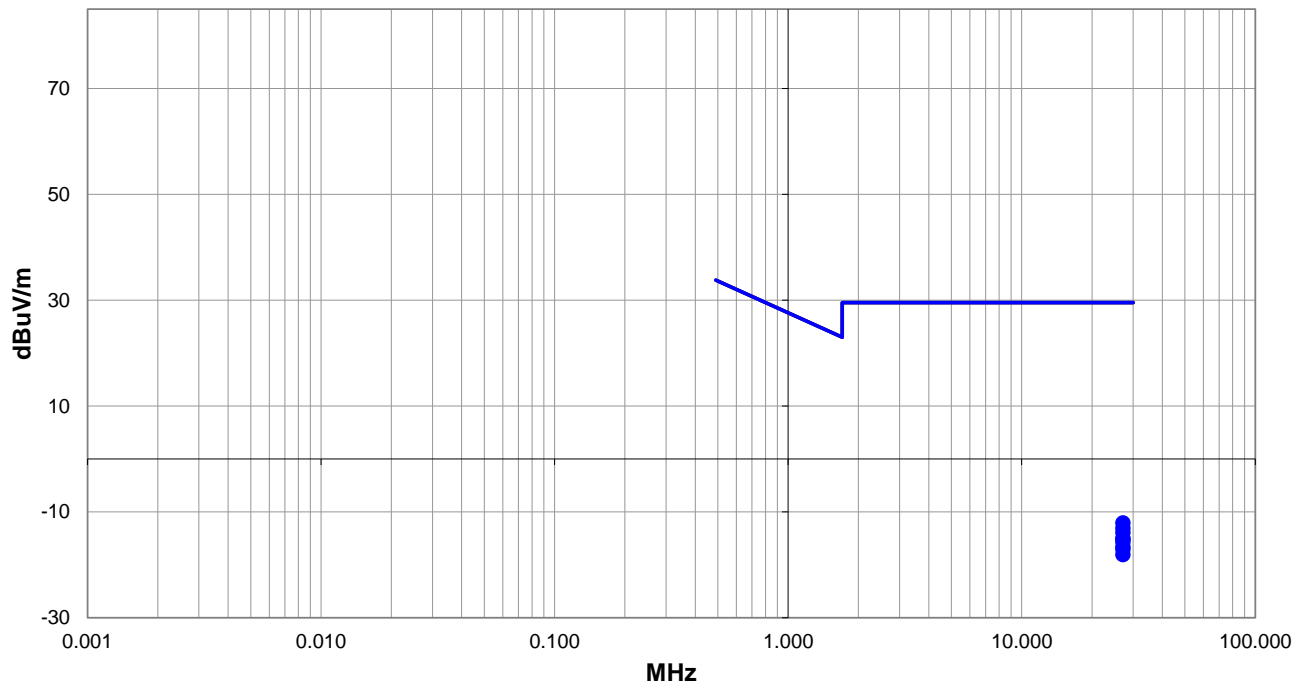
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz, Modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 8

■ PK ◆ AV ● QP

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)

RESULTS - Run #8

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)	Comments
27.122	18.4	9.5	1.0	57.0	3.0	0.0	Para to GND	QP	-40.0	-12.1	29.5	-41.6	EUT Horz
27.122	17.4	9.5	1.0	3.0	3.0	0.0	Para to EUT	QP	-40.0	-13.1	29.5	-42.6	EUT Vert
27.122	16.6	9.5	1.0	154.0	3.0	0.0	Perp to GND	QP	-40.0	-13.9	29.5	-43.4	EUT Vert
27.122	15.5	9.5	1.0	0.0	3.0	0.0	Para to EUT	QP	-40.0	-15.0	29.5	-44.5	EUT Horz
27.122	15.3	9.5	1.0	88.0	3.0	0.0	Perp to GND	QP	-40.0	-15.2	29.5	-44.7	EUT Horz
27.122	14.8	9.5	1.0	288.0	3.0	0.0	Para to GND	QP	-40.0	-15.7	29.5	-45.2	EUT Vert
27.122	13.9	9.5	1.0	65.0	3.0	0.0	Para to EUT	QP	-40.0	-16.6	29.5	-46.1	EUT On Side
27.122	13.4	9.5	1.0	220.0	3.0	0.0	Perp to GND	QP	-40.0	-17.1	29.5	-46.6	EUT On Side
27.122	12.4	9.5	1.0	291.0	3.0	0.0	Para to GND	QP	-40.0	-18.1	29.5	-47.6	EUT On Side

CONCLUSION

Pass



Tested By

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	00200080015C0010	Date:	2022-01-25
Customer:	MSA Innovation, LLC	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	15.6%
Customer Project:	None	Bar. Pressure (PMSL):	1032 mb
Tested By:	Christopher Heintzelman	Job Site:	MN04
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	9	Test Distance (m):	10	Ant. Height(s) (m):	1(m)
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COMMENTS

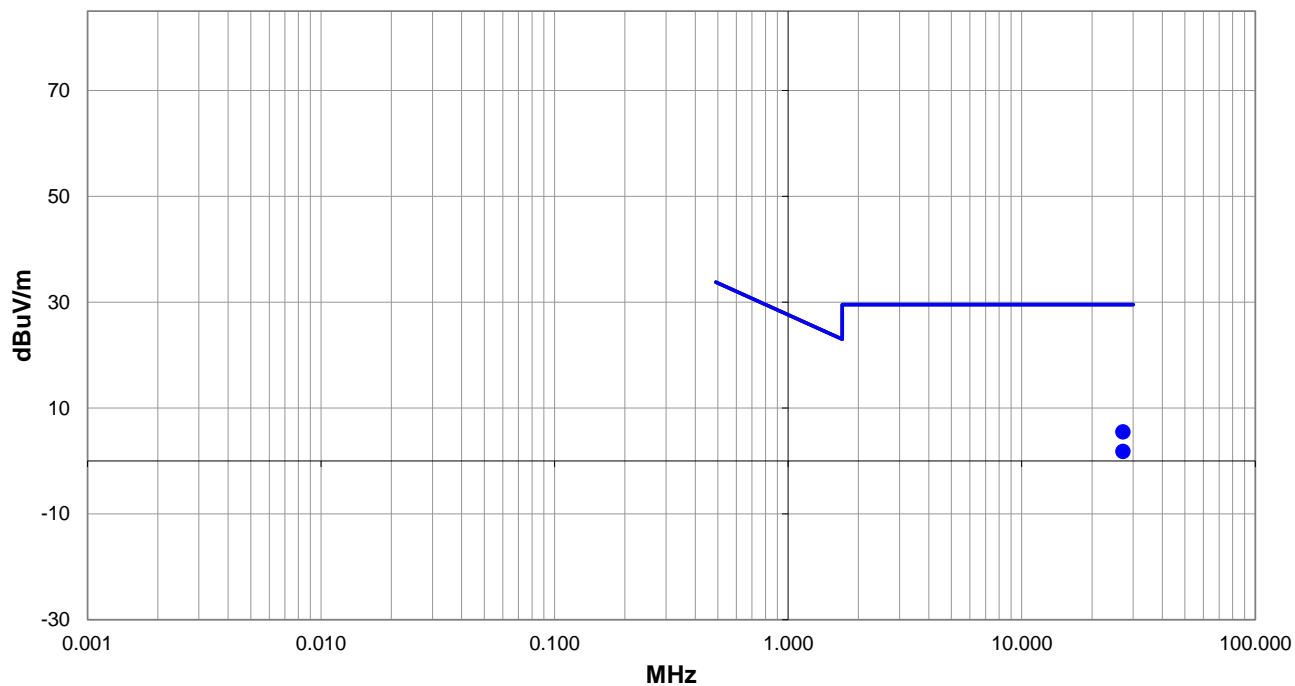
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz, Modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 9

■ PK ◆ AV ● QP

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)

RESULTS - Run #9

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)	Comments
27.122	15.1	9.5	1.0	215.0	10.0	0.0	Para to GND	QP	-19.1	5.5	29.5	-24.0	EUT Horz
27.122	11.4	9.5	1.0	206.0	10.0	0.0	Perp to GND	QP	-19.1	1.8	29.5	-27.7	EUT Horz

CONCLUSION

Pass



Tested By

FIELD STRENGTH OF SPURIOUS EMISIONS (GREATER THAN 30MHZ)



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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	2021-05-21	2022-05-21
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2021-03-09	2023-03-09
Cable	ESM Cable Corp.	Bilog Cables	MNH	2021-10-13	2022-10-13
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2021-10-13	2022-10-13

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	4.6 dB	-4.6 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 140 MHz

POWER INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MSAS0023-2

MODES INVESTIGATED

Transmitting RFID 13.56 MHz, Modulated

FIELD STRENGTH OF SPURIOUS EMISIONS (GREATER THAN 30MHz)



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	0020008001590010	Date:	2022-01-25
Customer:	MSA Innovation, LLC	Temperature:	22.1°C
Attendees:	None	Relative Humidity:	14.9%
Customer Project:	None	Bar. Pressure (PMSL):	1031 mb
Tested By:	Christopher Heintzelman	Job Site:	MN05
Power:	110VAC/60Hz	Configuration:	MSAS0023-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	147	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

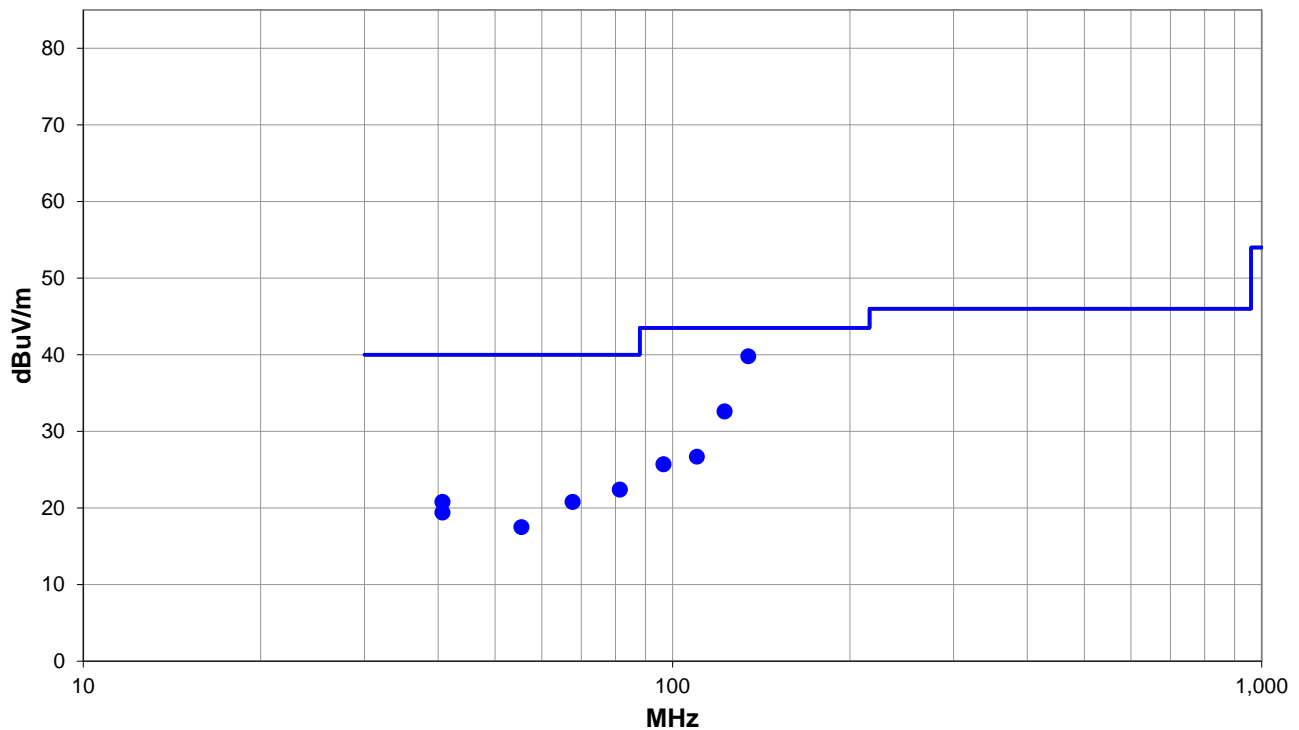
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz, Modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 147

■ PK ◆ AV ● QP

FIELD STRENGTH OF SPURIOUS EMISIONS (GREATER THAN 30MHZ)

RESULTS - Run #147

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)	Comments
134.472	44.4	-4.6	2.05	103.9	3.0	0.0	Horz	QP	0.0	39.8	43.5	-3.7	EUT Horz
122.530	37.5	-4.9	2.8	167.0	3.0	0.0	Horz	QP	0.0	32.6	43.5	-10.9	EUT Horz
110.000	32.4	-5.7	1.0	127.0	3.0	0.0	Vert	QP	0.0	26.7	43.5	-16.8	EUT Horz
81.367	32.2	-9.8	2.03	360.0	3.0	0.0	Horz	QP	0.0	22.4	40.0	-17.6	EUT Horz
96.523	33.4	-7.7	2.13	340.9	3.0	0.0	Horz	QP	0.0	25.7	43.5	-17.8	EUT Horz
67.683	30.3	-9.5	3.83	26.0	3.0	0.0	Horz	QP	0.0	20.8	40.0	-19.2	EUT Horz
40.683	20.2	0.6	1.81	311.0	3.0	0.0	Vert	QP	0.0	20.8	40.0	-19.2	EUT Horz
40.688	18.8	0.6	2.7	38.9	3.0	0.0	Horz	QP	0.0	19.4	40.0	-20.6	EUT Horz
55.401	23.6	-6.1	3.04	180.0	3.0	0.0	Horz	QP	0.0	17.5	40.0	-22.5	EUT Horz

CONCLUSION

Pass



Tested By

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30MHZ)



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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2021-03-09	2023-03-09
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Cable	Element	Biconilog Cable	MNX	2022-01-24	2023-01-24
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	2022-01-24	2023-01-24

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	4.7 dB	-4.7 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 1000 MHz

POWER INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MSAS0023-15

MODES INVESTIGATED

RFID transmitting 13.56 MHz, modulated.

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30MHZ)



EUT:	ioDock	Work Order:	MSAS0023
Serial Number:	0020008001590010	Date:	2022-03-23
Customer:	MSA Safety	Temperature:	23.2°C
Attendees:	Dustin Morris	Relative Humidity:	29.5%
Customer Project:	None	Bar. Pressure (PMSL):	1009 mb
Tested By:	Christopher Heintzelman	Job Site:	MN09
Power:	110VAC/60Hz	Configuration:	MSAS0023-15

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	18	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

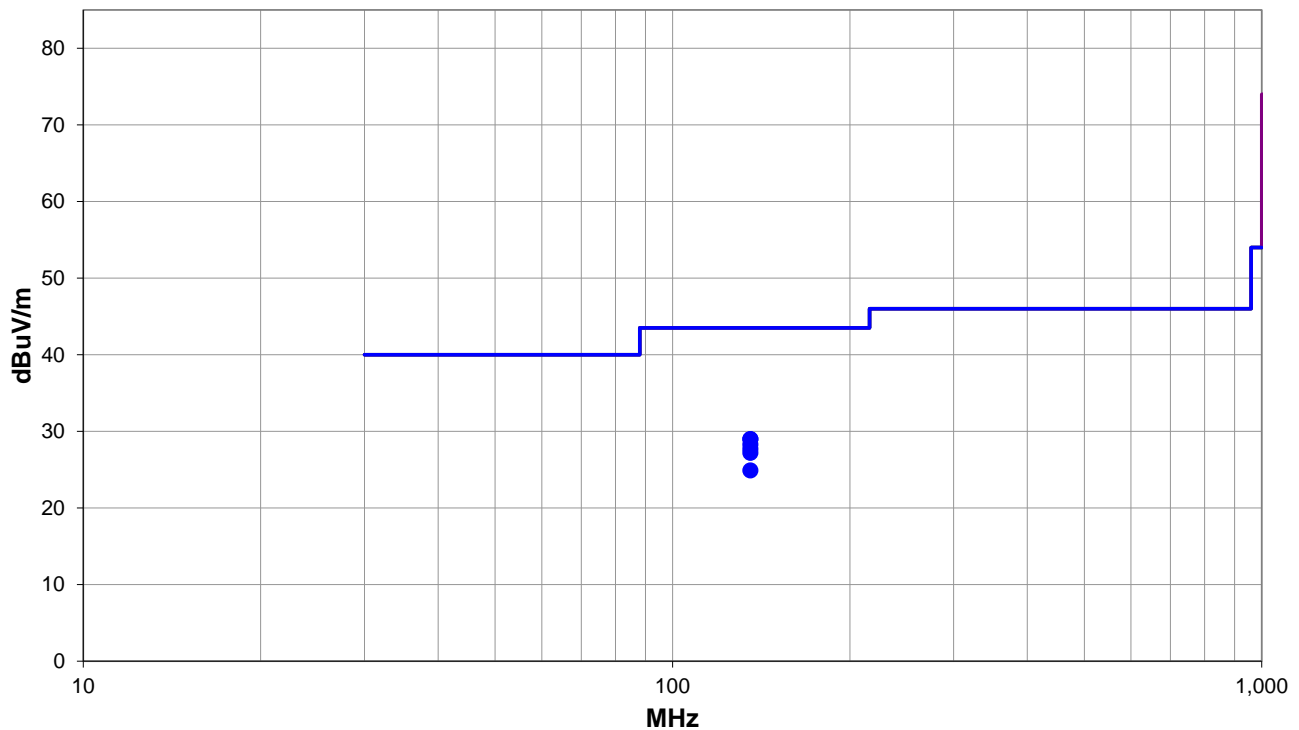
BT/WiFi module removed from unit.

EUT OPERATING MODES

RFID transmitting 13.56 MHz, modulated.

DEVIATIONS FROM TEST STANDARD

None



Run #: 18

■ PK ◆ AV ● QP

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30MHZ)



RESULTS - Run #18

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)	Comments
135.599	33.7	-4.7	1.42	273.0	3.0	0.0	Vert	QP	0.0	29.0	43.5	-14.5	EUT Vert
135.597	33.7	-4.7	1.85	308.0	3.0	0.0	Vert	QP	0.0	29.0	43.5	-14.5	EUT On Side
135.598	33.0	-4.7	2.31	9.0	3.0	0.0	Horz	QP	0.0	28.3	43.5	-15.2	EUT Horz
135.599	32.4	-4.7	2.25	360.0	3.0	0.0	Horz	QP	0.0	27.7	43.5	-15.8	EUT Vert
135.600	31.9	-4.7	2.49	263.0	3.0	0.0	Horz	QP	0.0	27.2	43.5	-16.3	EUT On Side
135.598	29.6	-4.7	1.0	262.0	3.0	0.0	Vert	QP	0.0	24.9	43.5	-18.6	EUT Horz

CONCLUSION

Pass

Tested By

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
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPH-32-3.5-SCT/AC	TBF	NCR	NCR
Thermometer	Omega Engineering, Inc.	HH311	DUB	2020-10-05	2023-10-05
Meter - Multimeter	Fluke	114	MMU	2020-07-20	2023-07-20
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

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



TelTx 2021.10.29.2 XMt 2020.12.30.0

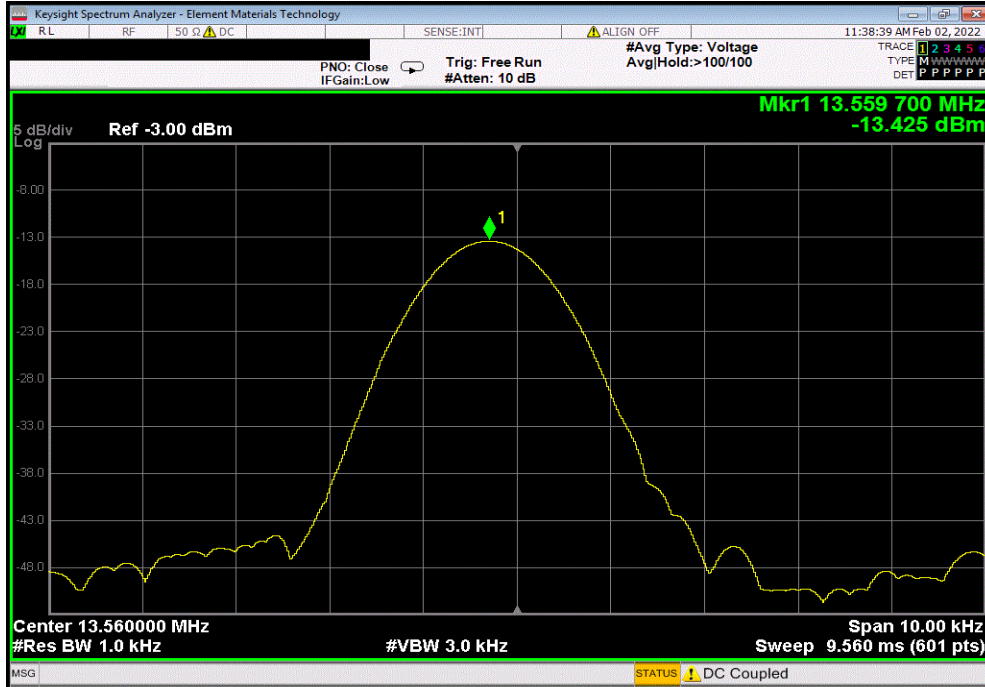
EUT: ioDock		Work Order: MSAS0023				
Serial Number: See Configurations		Date: 2-Feb-22				
Customer: MSA Innovation, LLC		Temperature: 21.9 °C				
Attendees: None		Humidity: 17.9% RH				
Project: None		Barometric Pres.: 1036 mbar				
Tested by: Andrew Rogstad		Power: 120VAC/60Hz				
		Job Site: MN08				
TEST SPECIFICATIONS						
FCC 15.225:2022		ANSI C63.10:2013				
TEST METHOD						
COMMENTS						
None						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	7	Signature <i>Andrew Rogstad</i>				
		Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
RFID, 13.56 MHz, Modulated						
+50°C	Nominal Voltage, 120 VAC/60 Hz	13.5597	13.55974933	3.64	100	Pass
+40°C	Nominal Voltage, 120 VAC/60 Hz	13.5597	13.55974933	3.64	100	Pass
+30°C	Nominal Voltage, 120 VAC/60 Hz	13.55971667	13.55974933	2.41	100	Pass
+20°C	Nominal Voltage, 120 VAC/60 Hz	13.55974933	N/A	N/A	N/A	N/A
	-15% Extreme Voltage, 102 VAC/60 Hz	13.55975	13.55974933	0.05	100	Pass
	+15% Extreme Voltage, 138 VAC/60 Hz	13.55976667	13.55974933	1.28	100	Pass
+10°C	Nominal Voltage, 120 VAC/60 Hz	13.55978333	13.55974933	2.51	100	Pass
0°C	Nominal Voltage, 120 VAC/60 Hz	13.55978267	13.55974933	2.46	100	Pass
-10°C	Nominal Voltage, 120 VAC/60 Hz	13.55978267	13.55974933	2.46	100	Pass
-20°C	Nominal Voltage, 120 VAC/60 Hz	13.55975	13.55974933	0.05	100	Pass

FREQUENCY STABILITY

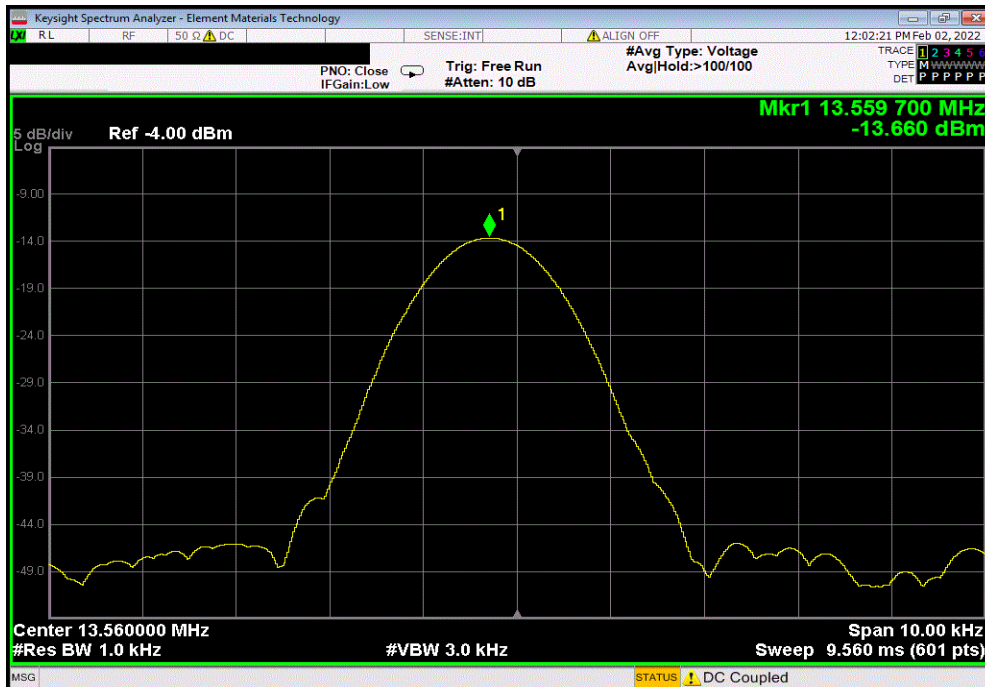


TbTx 2021.10.29.2 XMI 2020.12.30.0

RFID, 13.56 MHz, Modulated, +50°C, Nominal Voltage, 120 VAC/60 Hz					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.5597	13.55974933	3.64	100	Pass	



RFID, 13.56 MHz, Modulated, +40°C, Nominal Voltage, 120 VAC/60 Hz					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.5597	13.55974933	3.64	100	Pass	

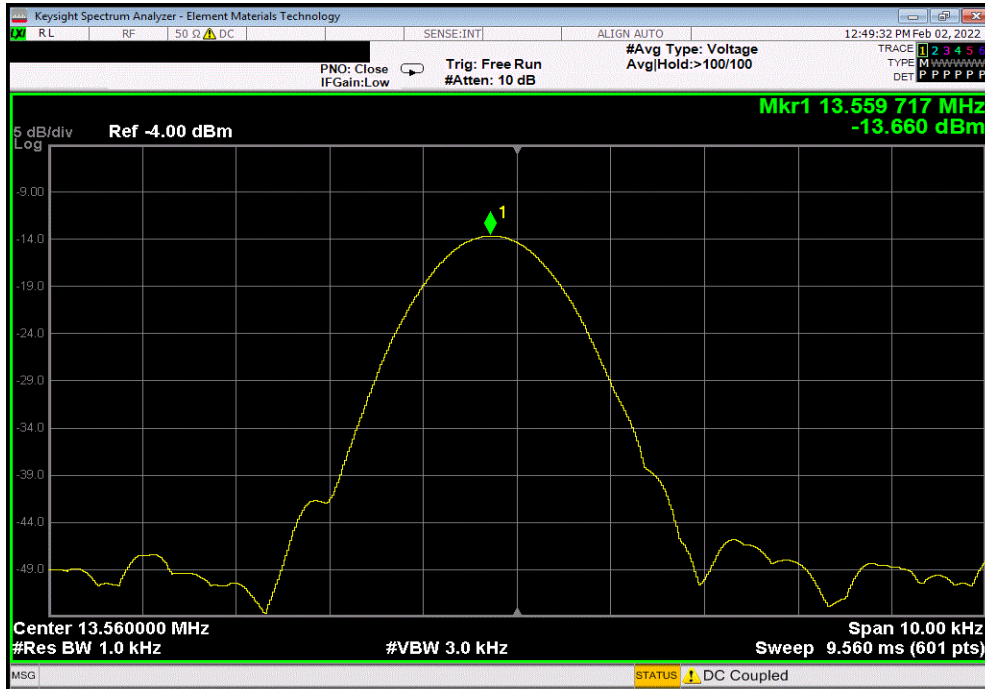


FREQUENCY STABILITY

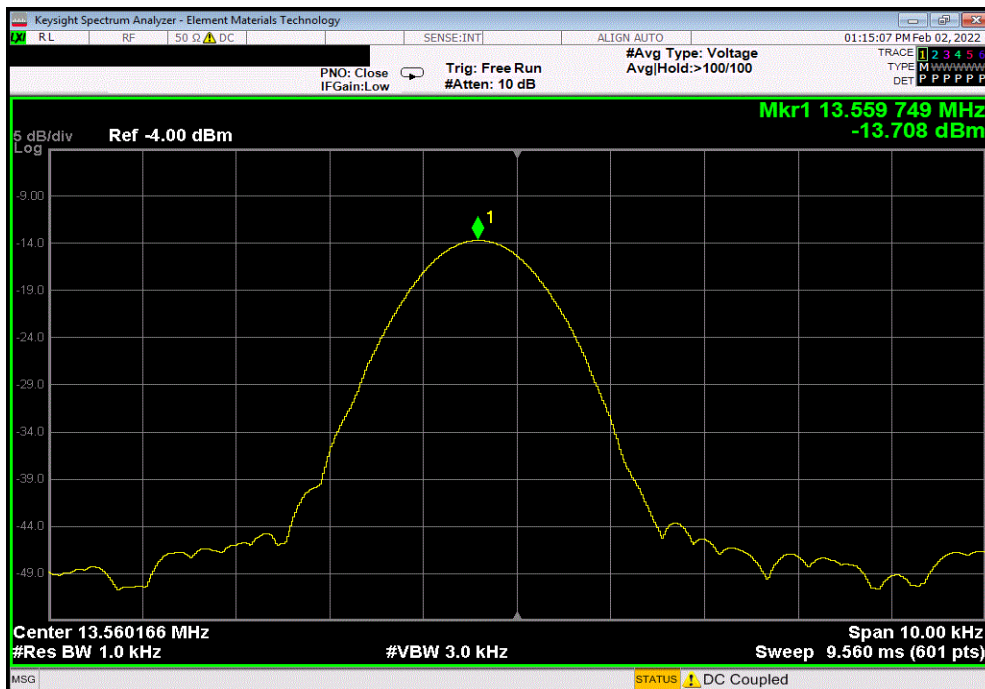


TbTx 2021.10.29.2 XMI 2020.12.30.0

RFID, 13.56 MHz, Modulated, +30°C, Nominal Voltage, 120 VAC/60 Hz						
	Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.55971667	13.55974933	2.41	100	Pass	



RFID, 13.56 MHz, Modulated, +20°C, Nominal Voltage, 120 VAC/60 Hz						
	Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.55974933	N/A	N/A	N/A	N/A	

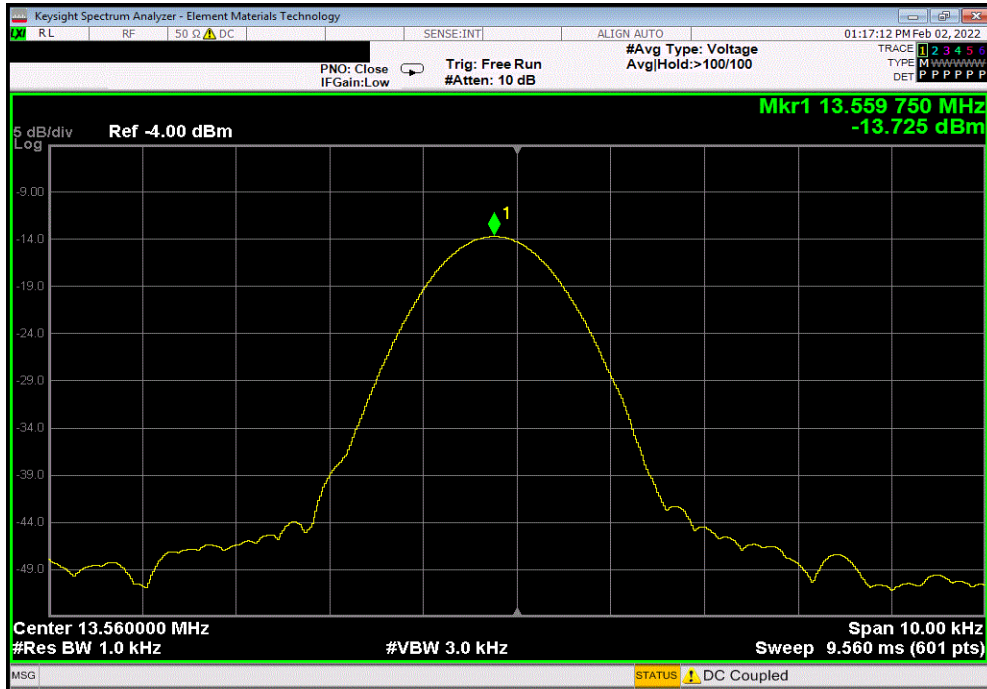


FREQUENCY STABILITY

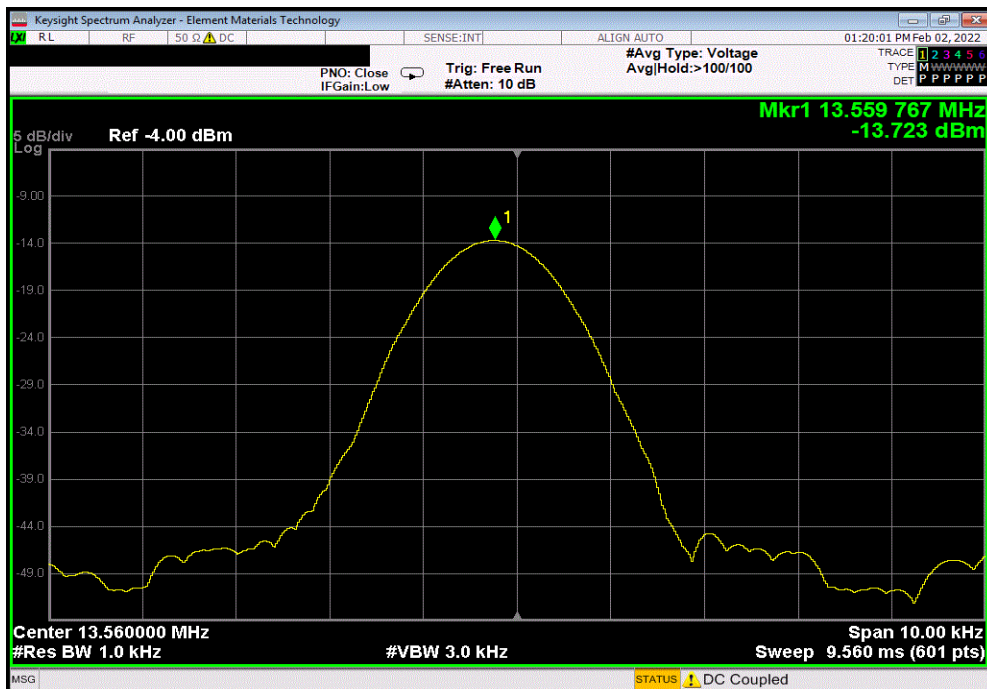


TbTx 2021.10.29.2 XMI 2020.12.30.0

RFID, 13.56 MHz, Modulated, +20°C, -15% Extreme Voltage, 102 VAC/60 Hz					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.55975	13.55974933	0.05	100	Pass	



RFID, 13.56 MHz, Modulated, +20°C, +15% Extreme Voltage, 138 VAC/60 Hz					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.55976667	13.55974933	1.28	100	Pass	

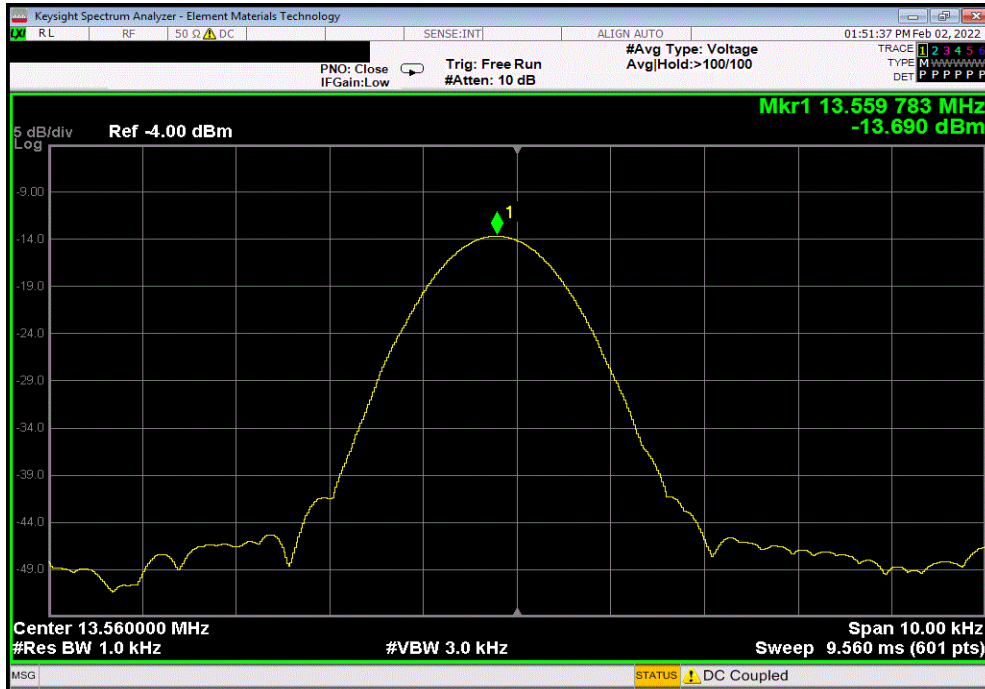


FREQUENCY STABILITY

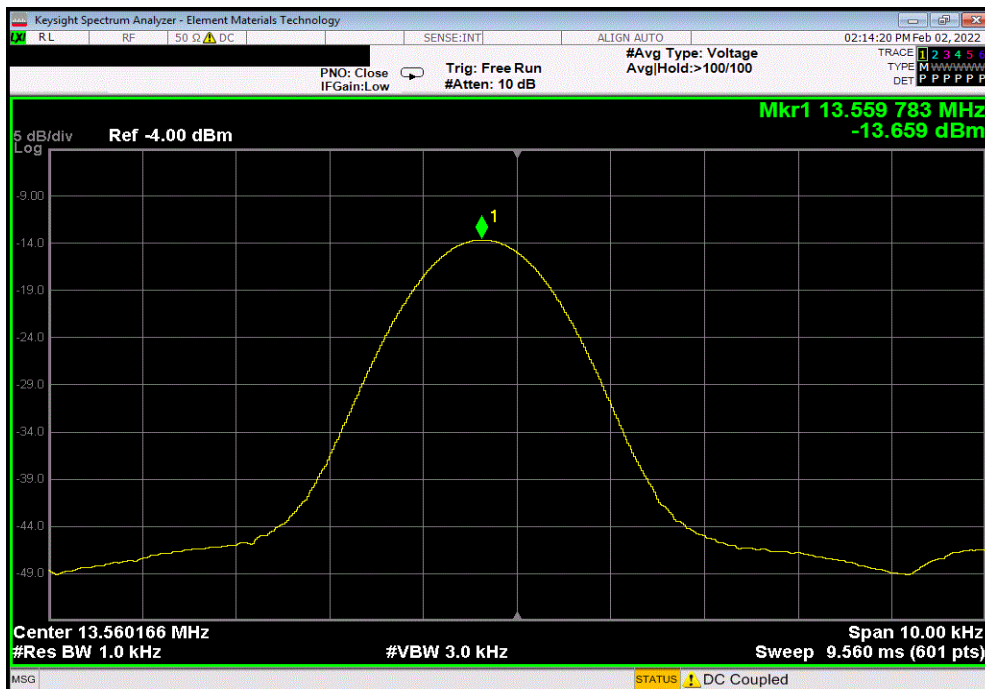


TbTx 2021.10.29.2 XMI 2020.12.30.0

RFID, 13.56 MHz, Modulated, +10°C, Nominal Voltage, 120 VAC/60 Hz					
	Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
	13.55978333	13.55974933	2.51	100	Pass



RFID, 13.56 MHz, Modulated, 0°C, Nominal Voltage, 120 VAC/60 Hz					
	Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
	13.55978267	13.55974933	2.46	100	Pass

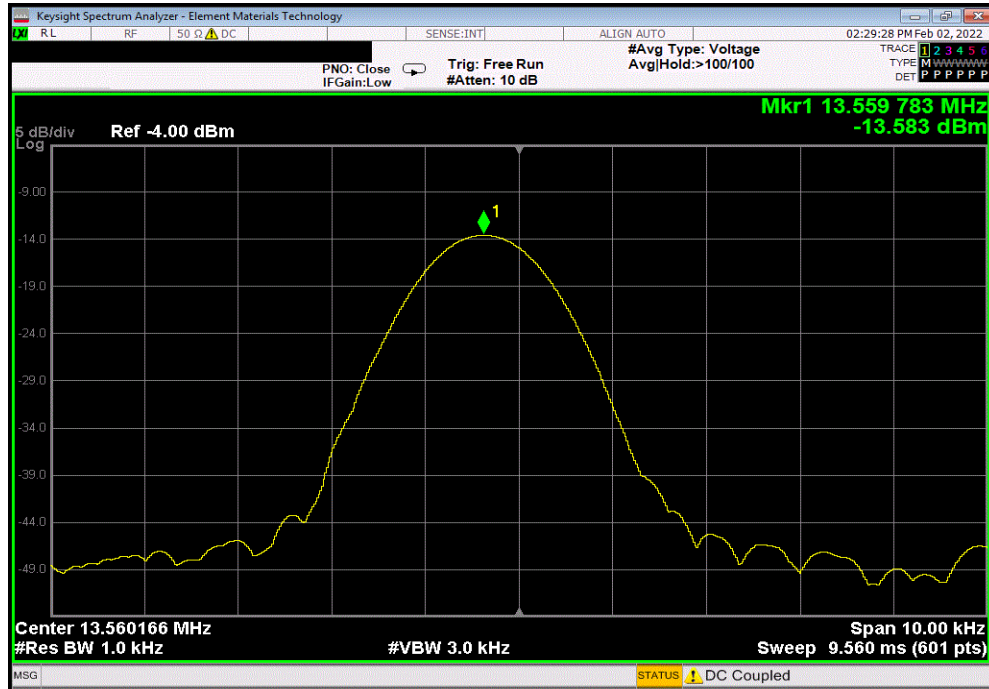


FREQUENCY STABILITY

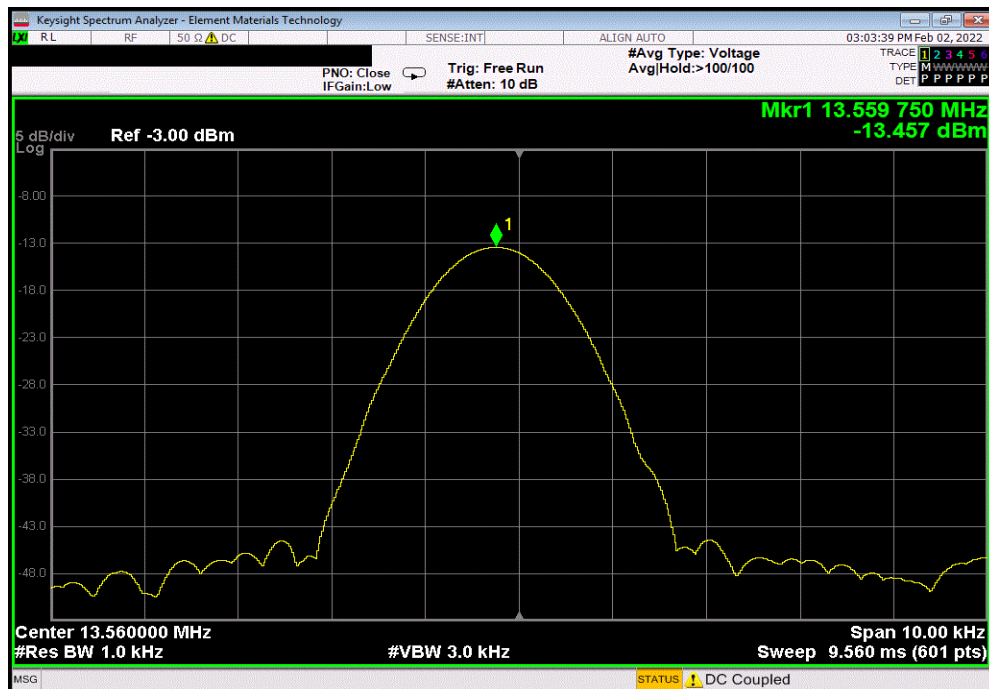


TuTx 2021.10.29.2 XMI 2020.12.30.0

RFID, 13.56 MHz, Modulated, -10°C, Nominal Voltage, 120 VAC/60 Hz					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.55978267	13.55974933	2.46	100	Pass	



RFID, 13.56 MHz, Modulated, -20°C, Nominal Voltage, 120 VAC/60 Hz					
Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results	
13.55975	13.55974933	0.05	100	Pass	



End of Test Report