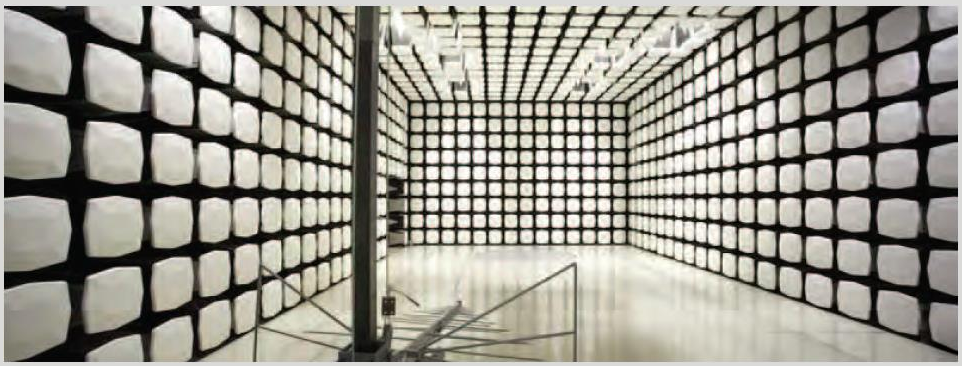
Covidien LLC.

Secure RFID Reader (PT00170793)

FCC 15.225:2023

13.56 MHz radio using RFID with 1 antenna type(s)

Report: COVI0201.0 Rev. 0, Issue Date: September 22, 2023



CERT #3310.04

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element
2023.04.17

Section	Page Number

CERTIFICATE OF TEST

Last Date of Test: August 2, 2023
Covidien LLC.
EUT: Secure RFID Reader (PT00170793)

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2023	ANSI C63.10:2013
FCC 15.225:2023	

Results

Test Description	Result	Specification Section(s)	Method Section(s)	Comments
Powerline Conducted Emissions	Pass	15.207	6.2	
Emissions Bandwidth (20 dB)	N/A	15.215(c)	6.9.2	See Data
Field Strength of Fundamental	Pass	15.225(a)-(c)	6.4	
Field Strength of Spurious Emissions (Less Than 30 MHz)	Pass	15.225(d), 15.209	6.4	
Field Strength of Spurious Emissions (Greater Than 30 MHz)	Pass	15.225(d), 15.209	6.5	
Frequency Stability	N/A	15.225(e), 15.31(e), 15.215(c), 2.1055	6.8	See Data

Deviations From Test Standards

None

Approved By:

Johnny Candelas, 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

element
2021.09.01

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

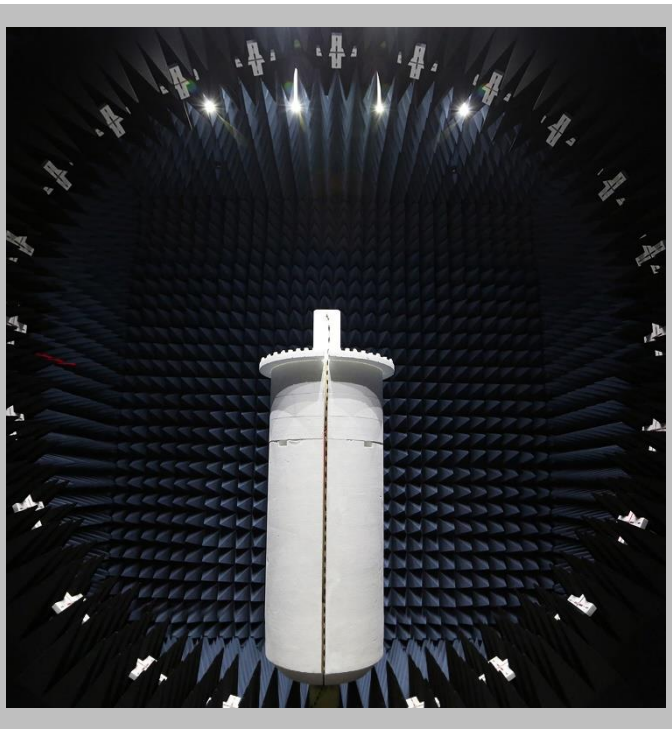
For details on the Scopes of our Accreditations, please visit:

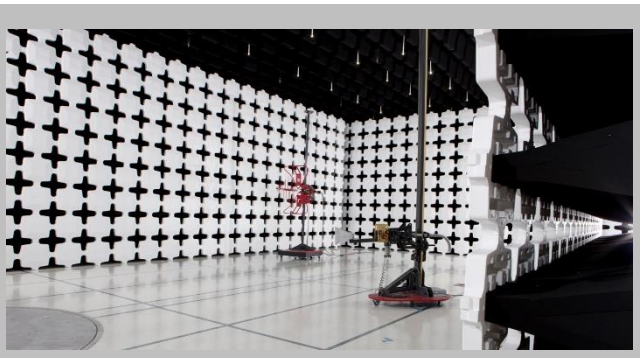
California Minnesota Oregon Texas Washington

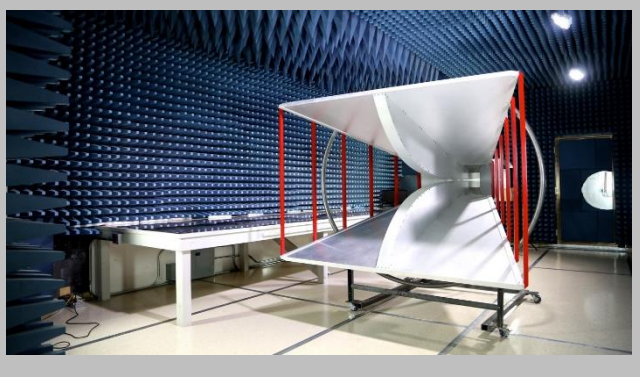
FACILITIES

element
2020.12.15

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425) 984-6600
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

element
RP.2023.05.08.0

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 Location: California

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)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	3.2 dB	-3.2 dB

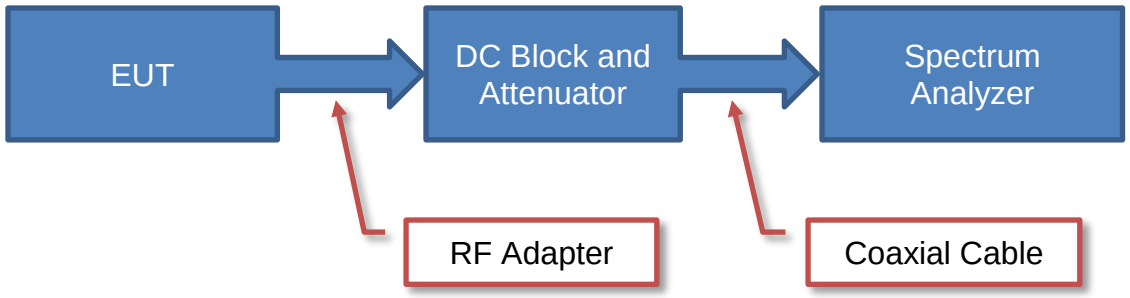
TEST SETUP BLOCK DIAGRAMS

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.

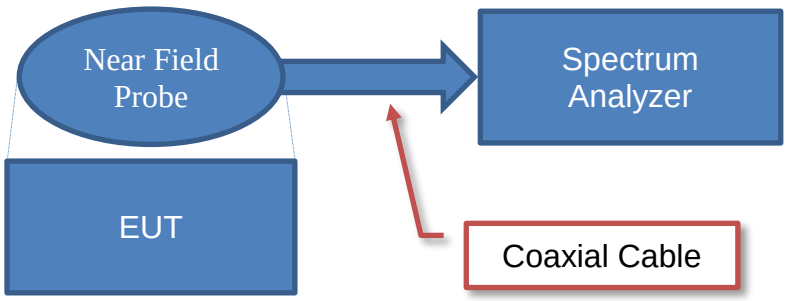
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

Near Field Test Fixture Measurements

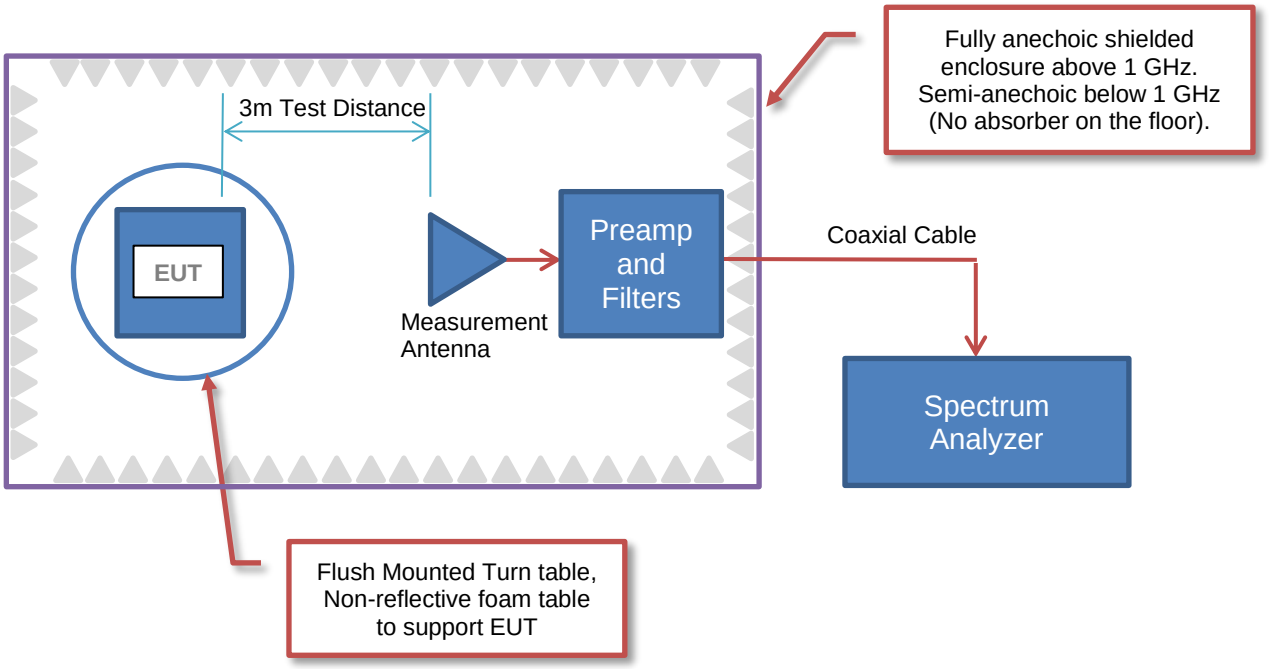


Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

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

Conducted Emissions:

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

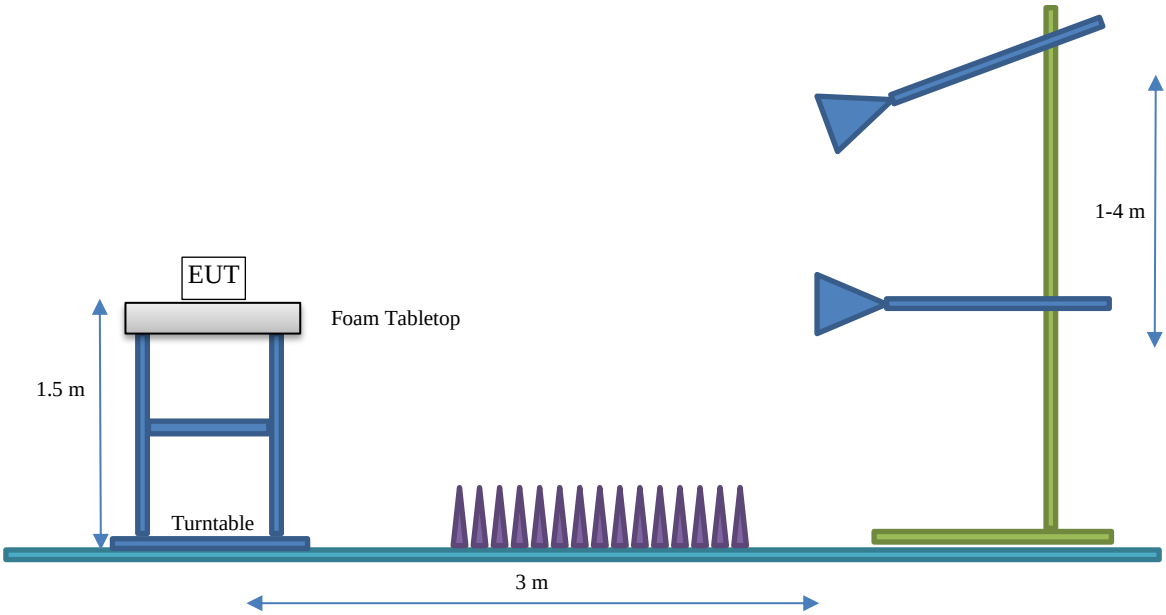
Radiated Power (ERP/EIRP) – Substitution Method:

Measured Level into Substitution Antenna (Amplitude dBm)		Substitution Antenna Factor (dBi)		EIRP to ERP (if applicable)		Measured power (dBm ERP/EIRP)
10.0	+	6.0	-	2.15	=	**13.9/16.0**

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:	Covidien LLC.
Address:	200 Medtronic Dr.
City, State, Zip:	Lafayette, CO 80026
Test Requested By:	Chris Valentine
EUT:	Secure RFID Reader (PT00170793)
First Date of Test:	July 10, 2023
Last Date of Test:	August 2, 2023
Receipt Date of Samples:	July 10, 2023
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
13.56 MHz RFID radio module

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. The power settings below reflect the maximum power that the EUT is allowed to transmit at during normal operation.

ANTENNA INFORMATION

Type	Provided by:	Frequency	Dimensions (Length x Width)	Number of Turns
PCB	Covidien LLC.	13.56 MHz	23mm x 20mm	5

The EUT was tested using the power settings provided by the manufacturer which were based upon: Test software settings

Test software/firmware installed on EUT: FW-SCHZMX01-01-M1.0.0.143

SETTINGS FOR ALL TESTS IN THIS REPORT

Radio	Modulation	Protocol	Power Setting
RFID	ASK	ISO15693	200 mW

CONFIGURATIONS

Configuration COVI0201-1

Software/Firmware Running During Test	
Description	**Version**
rfid_test	1.0.0.0
PuTTY	Release 0.78

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Secure RFID Reader (1)	Covidien LLC.	PT00170793	E231400007

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Scholz RS485 Adapter	Covidien LLC.	None	3
Laptop PC	HP	BOUSIRD-017	2B838469-06E04A89-809D-7F82A9A87403
AC Adapter	HP	HSTNN-LA12	WBGUC0ALLZ901N

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Micro USB Cable	Yes	60 cm	Yes	Secure RFID Reader	Scholz RS485 Adapter
AC Cable (AC Adapter)	No	1.8 m	No	AC Adapter	AC Mains
DC Cable (AC Adapter)	No	1.8 m	No	AC Adapter	Laptop PC
USB Extension Cable	Yes	3 m	No	Micro USB Cable	Laptop PC

Configuration COVI0201-2

Software/Firmware Running During Test	
Description	**Version**
rfid_test	1.0.0.0
PuTTY	Release 0.78

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Secure RFID Reader (2)	Covidien LLC.	PT00170793	E231400022

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Scholz RS485 Adapter	Covidien LLC.	None	3
Laptop PC	HP	BOUSIRD-017	2B838469-06E04A89-809D-7F82A9A87403
AC Adapter	HP	HSTNN-LA12	WBGUC0ALLZ901N

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Micro USB Cable	Yes	60 cm	Yes	Secure RFID Reader	Scholz RS485 Adapter
AC Cable (AC Adapter)	No	1.8 m	No	AC Adapter	AC Mains
DC Cable (AC Adapter)	No	1.8 m	No	AC Adapter	Laptop PC
USB Extension Cable	Yes	3 m	No	Micro USB Cable	Laptop PC

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2023-07-10	Frequency Stability	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2023-07-11	Emissions Bandwidth (20 dB)	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	2023-07-13	Field Strength of Spurious Emissions (Less Than 30 MHz)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2023-07-13	Field Strength of Fundamental	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2023-07-20	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.
6	2023-08-02	Powerline Conducted Emissions	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

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

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

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

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

> For a device with a permanent or detachable antenna operating at or below 30 MHz, the FCC will accept measurements performed with a suitable dummy load in lieu of the antenna under the following conditions:
>
> (1) perform the AC power-line conducted tests with the antenna connected to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band;
>
> (2) retest with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network which simulates the antenna in the fundamental frequency band.
>
> All measurements must be performed as specified in clause 6.2 of ANSI C63.10-2013.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Gauss Instruments	TDEMI 30M	ARO	2023-04-25	2024-04-25
Power Supply	Pacific Power	3120AFX-2L	SMT	NCR	NCR
Cable - Conducted Cable Assembly	Northwest EMC	OCP, HFP, AWC	OCPA	2023-03-07	2024-03-07
LISN	Solar Electronics	9252-50-24-BNC	LIA	2022-09-15	2023-09-15
LISN	Solar Electronics	9252-50-24-BNC	LIB	2022-12-19	2023-12-19

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.2 dB	-3.2 dB

CONFIGURATIONS INVESTIGATED

COVI0201-1
COVI0201-2

MODES INVESTIGATED

Transmitting 13.56 MHz RFID, Modulated mode

POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400007	Date:	2023-07-26
Customer:	Covidien LLC.	Temperature:	24.7°C
Attendees:	None	Relative Humidity:	47.2%
Customer Project:	None	Bar. Pressure (PMSL):	1013 mb
Tested By:	Mark Baytan	Job Site:	OC06
Power:	5VDC via 120VAC/60Hz	Configuration:	COVI0201-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	1	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

None

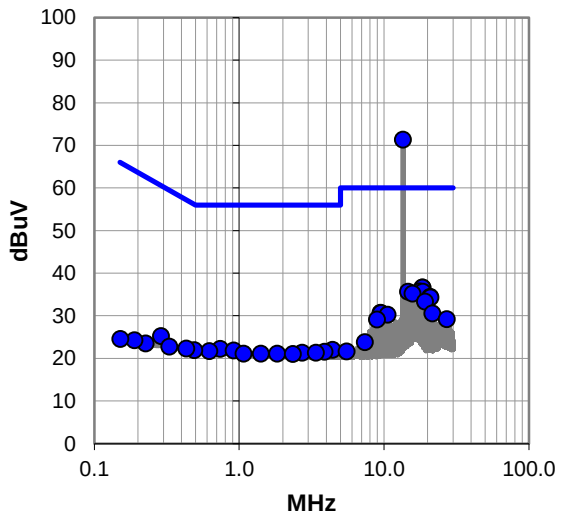
EUT OPERATING MODES

Transmitting 13.56 MHz RFID, Modulated mode

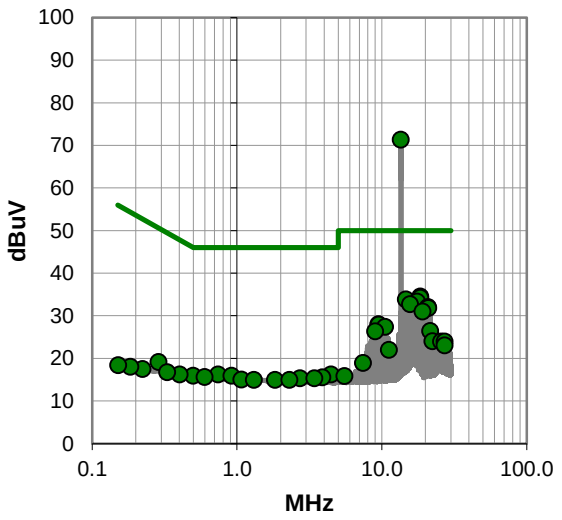
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

RESULTS - Run #1

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	50.4	20.9	71.3	60.0	11.3
18.463	15.2	21.4	36.6	60.0	-23.4
18.501	15.2	21.4	36.6	60.0	-23.4
17.578	14.4	21.3	35.7	60.0	-24.3
14.654	14.5	21.1	35.6	60.0	-24.4
18.539	14.2	21.4	35.6	60.0	-24.4
15.732	14.1	21.1	35.2	60.0	-24.8
20.886	12.8	21.6	34.4	60.0	-25.6
20.924	12.7	21.6	34.3	60.0	-25.7
19.192	11.9	21.4	33.3	60.0	-26.7
9.500	10.0	20.7	30.7	60.0	-29.3
9.538	9.9	20.7	30.6	60.0	-29.4
21.577	8.9	21.6	30.5	60.0	-29.5
10.577	9.4	20.8	30.2	60.0	-29.8
27.117	6.9	22.3	29.2	60.0	-30.8
8.962	8.5	20.6	29.1	60.0	-30.9
0.740	2.2	20.0	22.2	56.0	-33.8
4.424	1.7	20.3	22.0	56.0	-34.0
0.917	1.8	20.0	21.8	56.0	-34.2
0.623	1.7	20.0	21.7	56.0	-34.3
0.490	2.0	19.9	21.9	56.2	-34.3
3.885	1.2	20.3	21.5	56.0	-34.5
2.719	1.1	20.2	21.3	56.0	-34.7
3.385	1.1	20.2	21.3	56.0	-34.7
1.076	1.1	20.0	21.1	56.0	-34.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	50.4	20.9	71.3	50.0	21.3
18.461	13.1	21.4	34.5	50.0	-15.5
18.499	12.8	21.4	34.2	50.0	-15.8
14.654	12.7	21.1	33.8	50.0	-16.2
17.576	12.0	21.3	33.3	50.0	-16.7
15.692	11.6	21.1	32.7	50.0	-17.3
20.884	10.4	21.6	32.0	50.0	-18.0
20.924	10.2	21.6	31.8	50.0	-18.2
19.154	9.6	21.4	31.0	50.0	-19.0
9.500	7.3	20.7	28.0	50.0	-22.0
9.538	7.2	20.7	27.9	50.0	-22.1
10.539	6.6	20.8	27.4	50.0	-22.6
21.577	4.8	21.6	26.4	50.0	-23.6
9.000	5.7	20.6	26.3	50.0	-23.7
22.384	2.3	21.7	24.0	50.0	-26.0
25.692	1.9	22.0	23.9	50.0	-26.1
27.119	1.6	22.3	23.9	50.0	-26.1
27.154	0.7	22.3	23.0	50.0	-27.0
11.192	1.2	20.8	22.0	50.0	-28.0
0.739	-3.8	20.0	16.2	46.0	-29.8
4.462	-4.1	20.3	16.2	46.0	-29.8
0.498	-4.0	19.9	15.9	46.0	-30.1
0.917	-4.1	20.0	15.9	46.0	-30.1
0.599	-4.3	19.9	15.6	46.0	-30.4
3.885	-4.8	20.3	15.5	46.0	-30.5

CONCLUSION

Evaluation

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400007	Date:	2023-07-26
Customer:	Covidien LLC.	Temperature:	24.7°C
Attendees:	None	Relative Humidity:	47.2%
Customer Project:	None	Bar. Pressure (PMSL):	1013 mb
Tested By:	Mark Baytan	Job Site:	OC06
Power:	5VDC via 120VAC/60Hz	Configuration:	COVI0201-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	2	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

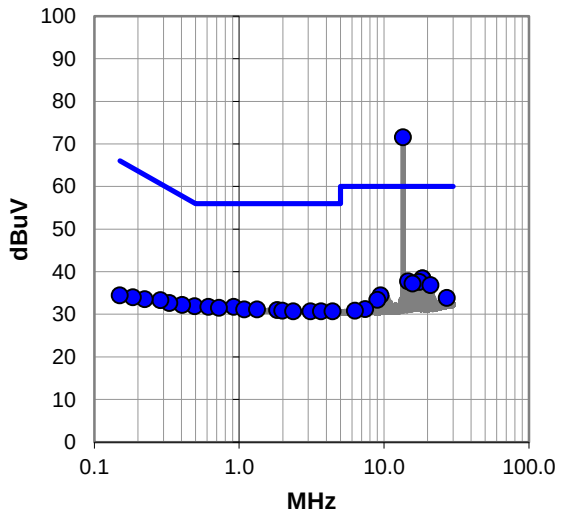
EUT OPERATING MODES

Transmitting 13.56 MHz RFID, Modulated mode

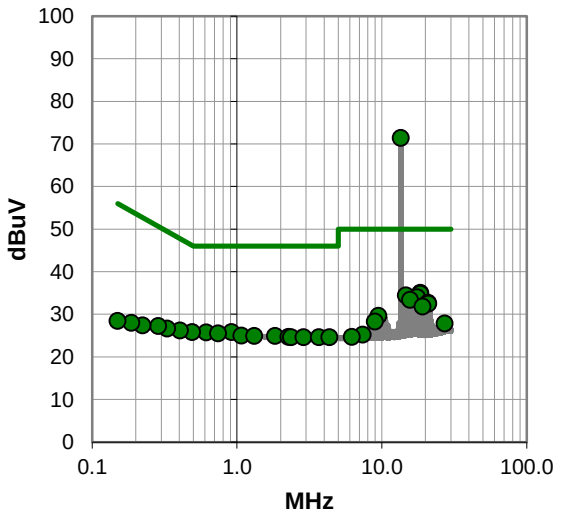
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

RESULTS - Run #2

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	50.6	20.9	71.5	60.0	11.5
18.463	17.0	21.4	38.4	60.0	-21.6
18.501	17.0	21.4	38.4	60.0	-21.6
14.692	16.6	21.1	37.7	60.0	-22.3
17.576	16.3	21.3	37.6	60.0	-22.4
15.732	16.1	21.1	37.2	60.0	-22.8
20.924	15.2	21.6	36.8	60.0	-23.2
0.493	12.0	19.9	31.9	56.1	-24.2
0.614	11.7	20.0	31.7	56.0	-24.3
0.917	11.7	20.0	31.7	56.0	-24.3
0.727	11.5	20.0	31.5	56.0	-24.5
1.085	11.1	20.0	31.1	56.0	-24.9
1.331	11.0	20.1	31.1	56.0	-24.9
1.836	10.9	20.1	31.0	56.0	-25.0
1.984	10.7	20.1	30.8	56.0	-25.2
2.369	10.5	20.2	30.7	56.0	-25.3
3.105	10.5	20.2	30.7	56.0	-25.3
3.679	10.4	20.3	30.7	56.0	-25.3
4.422	10.4	20.3	30.7	56.0	-25.3
0.403	12.3	19.9	32.2	57.8	-25.6
9.500	13.7	20.7	34.4	60.0	-25.6
27.119	11.5	22.3	33.8	60.0	-26.2
9.000	12.8	20.6	33.4	60.0	-26.6
0.330	12.6	20.0	32.6	59.5	-26.9
0.286	13.3	20.0	33.3	60.6	-27.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.560	50.5	20.9	71.4	50.0	21.4
18.461	13.6	21.4	35.0	50.0	-15.0
18.501	13.4	21.4	34.8	50.0	-15.2
14.654	13.3	21.1	34.4	50.0	-15.6
17.578	12.7	21.3	34.0	50.0	-16.0
15.692	12.3	21.1	33.4	50.0	-16.6
20.884	11.1	21.6	32.7	50.0	-17.3
20.924	10.9	21.6	32.5	50.0	-17.5
19.154	10.4	21.4	31.8	50.0	-18.2
0.917	5.8	20.0	25.8	46.0	-20.2
0.614	5.7	20.0	25.7	46.0	-20.3
9.500	8.9	20.7	29.6	50.0	-20.4
0.490	5.9	19.9	25.8	46.2	-20.4
0.740	5.5	20.0	25.5	46.0	-20.5
1.076	5.0	20.0	25.0	46.0	-21.0
1.319	4.8	20.1	24.9	46.0	-21.1
1.836	4.8	20.1	24.9	46.0	-21.1
2.268	4.5	20.2	24.7	46.0	-21.3
2.369	4.4	20.2	24.6	46.0	-21.4
2.884	4.4	20.2	24.6	46.0	-21.4
3.670	4.3	20.3	24.6	46.0	-21.4
4.347	4.3	20.3	24.6	46.0	-21.4
0.405	6.3	19.9	26.2	47.8	-21.6
8.962	7.7	20.6	28.3	50.0	-21.7
27.117	5.5	22.3	27.8	50.0	-22.2

CONCLUSION

Evaluation

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400022	Date:	2023-08-02
Customer:	Covidien LLC.	Temperature:	24.6°C
Attendees:	None	Relative Humidity:	50.2%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mb
Tested By:	Mark Baytan	Job Site:	OC06
Power:	5VDC via 120VAC/60Hz	Configuration:	COVI0201-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	3	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Antenna replaced with 50ohm terminator.

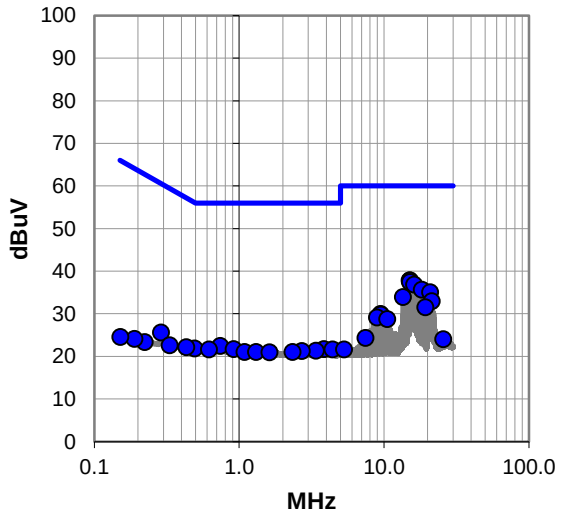
EUT OPERATING MODES

Transmitting 13.56 MHz RFID, Modulated mode

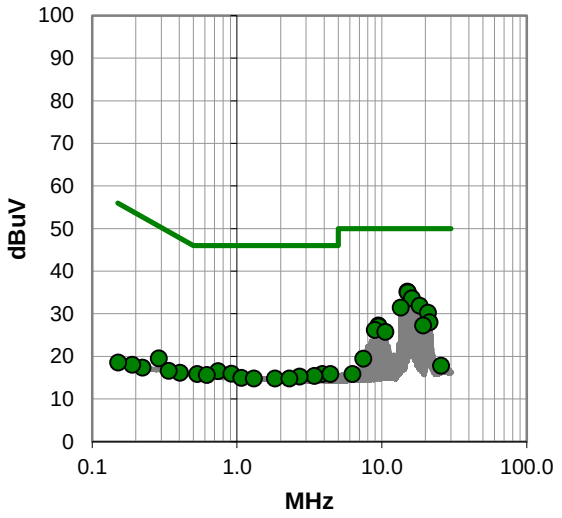
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
15.077	16.7	21.1	37.8	60.0	-22.2
15.115	16.7	21.1	37.8	60.0	-22.2
15.155	16.3	21.1	37.4	60.0	-22.6
16.154	15.7	21.1	36.8	60.0	-23.2
18.269	14.3	21.3	35.6	60.0	-24.4
20.886	13.4	21.6	35.0	60.0	-25.0
13.560	13.0	20.9	33.9	60.0	-26.1
21.423	11.3	21.6	32.9	60.0	-27.1
19.308	10.1	21.4	31.5	60.0	-28.5
9.500	9.2	20.7	29.9	60.0	-30.1
9.538	9.1	20.7	29.8	60.0	-30.2
8.962	8.5	20.6	29.1	60.0	-30.9
10.539	7.9	20.8	28.7	60.0	-31.3
0.740	2.4	20.0	22.4	56.0	-33.6
0.492	1.9	19.9	21.8	56.1	-34.3
0.917	1.7	20.0	21.7	56.0	-34.3
3.846	1.4	20.3	21.7	56.0	-34.3
0.618	1.6	20.0	21.6	56.0	-34.4
4.422	1.3	20.3	21.6	56.0	-34.4
3.385	1.1	20.2	21.3	56.0	-34.7
2.710	1.0	20.2	21.2	56.0	-34.8
0.289	5.6	20.0	25.6	60.6	-35.0
1.090	1.0	20.0	21.0	56.0	-35.0
1.313	0.9	20.1	21.0	56.0	-35.0
2.344	0.8	20.2	21.0	56.0	-35.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
15.077	14.1	21.1	35.2	50.0	-14.8
15.115	13.9	21.1	35.0	50.0	-15.0
16.154	12.5	21.1	33.6	50.0	-16.4
18.269	10.6	21.3	31.9	50.0	-18.1
13.560	10.5	20.9	31.4	50.0	-18.6
20.884	8.6	21.6	30.2	50.0	-19.8
21.423	6.4	21.6	28.0	50.0	-22.0
9.500	6.5	20.7	27.2	50.0	-22.8
19.308	5.8	21.4	27.2	50.0	-22.8
9.538	6.3	20.7	27.0	50.0	-23.0
8.962	5.6	20.6	26.2	50.0	-23.8
10.577	4.9	20.8	25.7	50.0	-24.3
0.739	-3.5	20.0	16.5	46.0	-29.5
0.917	-4.1	20.0	15.9	46.0	-30.1
0.531	-4.1	19.9	15.8	46.0	-30.2
3.884	-4.5	20.3	15.8	46.0	-30.2
4.422	-4.5	20.3	15.8	46.0	-30.2
0.618	-4.4	20.0	15.6	46.0	-30.4
3.423	-4.8	20.2	15.4	46.0	-30.6
7.462	-1.2	20.6	19.4	50.0	-30.6
2.710	-5.0	20.2	15.2	46.0	-30.8
0.289	-0.5	20.0	19.5	50.6	-31.1
1.076	-5.1	20.0	14.9	46.0	-31.1
1.313	-5.3	20.1	14.8	46.0	-31.2
1.836	-5.3	20.1	14.8	46.0	-31.2

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400022	Date:	2023-08-02
Customer:	Covidien LLC.	Temperature:	24.6°C
Attendees:	None	Relative Humidity:	50.2%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mb
Tested By:	Mark Baytan	Job Site:	OC06
Power:	5VDC via 120VAC/60Hz	Configuration:	COVI0201-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2023	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

Antenna replaced with 50ohm terminator.

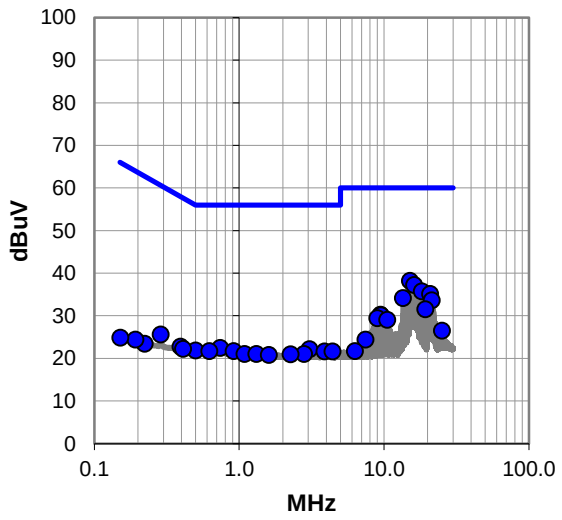
EUT OPERATING MODES

Transmitting 13.56 MHz RFID, Modulated mode

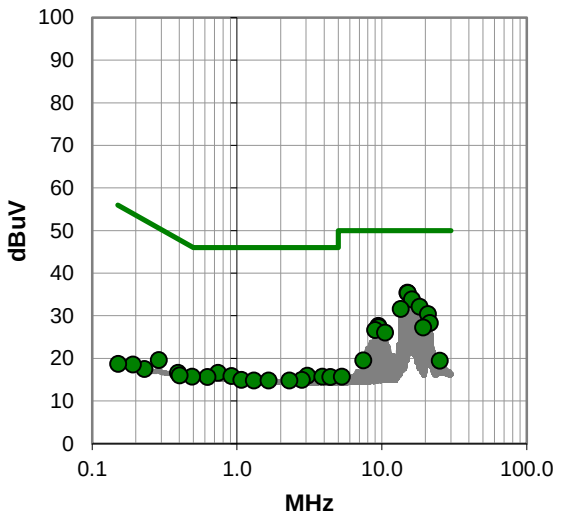
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

RESULTS - Run #4

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
15.115	17.1	21.1	38.2	60.0	-21.8
16.154	16.1	21.1	37.2	60.0	-22.8
18.269	14.4	21.3	35.7	60.0	-24.3
20.884	13.5	21.6	35.1	60.0	-24.9
13.560	13.2	20.9	34.1	60.0	-25.9
21.424	12.0	21.6	33.6	60.0	-26.4
19.308	10.1	21.4	31.5	60.0	-28.5
9.500	9.5	20.7	30.2	60.0	-29.8
9.538	9.4	20.7	30.1	60.0	-29.9
9.000	8.8	20.6	29.4	60.0	-30.6
10.539	8.2	20.8	29.0	60.0	-31.0
25.164	4.6	21.9	26.5	60.0	-33.5
0.740	2.4	20.0	22.4	56.0	-33.6
3.069	1.9	20.2	22.1	56.0	-33.9
0.501	1.9	19.9	21.8	56.0	-34.2
0.623	1.7	20.0	21.7	56.0	-34.3
0.917	1.7	20.0	21.7	56.0	-34.3
3.885	1.3	20.3	21.6	56.0	-34.4
4.424	1.3	20.3	21.6	56.0	-34.4
0.287	5.6	20.0	25.6	60.6	-35.0
1.093	1.0	20.0	21.0	56.0	-35.0
1.314	0.9	20.1	21.0	56.0	-35.0
2.809	0.8	20.2	21.0	56.0	-35.0
2.268	0.7	20.2	20.9	56.0	-35.1
1.603	0.7	20.1	20.8	56.0	-35.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
15.077	14.3	21.1	35.4	50.0	-14.6
15.115	14.2	21.1	35.3	50.0	-14.7
16.154	12.7	21.1	33.8	50.0	-16.2
18.269	10.8	21.3	32.1	50.0	-17.9
13.560	10.7	20.9	31.6	50.0	-18.4
20.884	8.8	21.6	30.4	50.0	-19.6
21.461	6.7	21.6	28.3	50.0	-21.7
9.500	6.9	20.7	27.6	50.0	-22.4
9.538	6.6	20.7	27.3	50.0	-22.7
19.308	5.8	21.4	27.2	50.0	-22.8
9.000	6.0	20.6	26.6	50.0	-23.4
10.539	5.2	20.8	26.0	50.0	-24.0
0.740	-3.4	20.0	16.6	46.0	-29.4
3.069	-4.3	20.2	15.9	46.0	-30.1
0.917	-4.2	20.0	15.8	46.0	-30.2
3.885	-4.6	20.3	15.7	46.0	-30.3
0.626	-4.4	20.0	15.6	46.0	-30.4
4.422	-4.7	20.3	15.6	46.0	-30.4
7.462	-1.1	20.6	19.5	50.0	-30.5
0.490	-4.2	19.9	15.7	46.2	-30.5
25.169	-2.5	21.9	19.4	50.0	-30.6
0.289	-0.4	20.0	19.6	50.6	-31.0
1.076	-5.1	20.0	14.9	46.0	-31.1
2.805	-5.3	20.2	14.9	46.0	-31.1
1.313	-5.3	20.1	14.8	46.0	-31.2

CONCLUSION

Pass

Tested By

EMISSIONS BANDWIDTH (20 DB)

element
WTD.2023.05.05.0

TEST DESCRIPTION

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.

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.

As defined in FCC 15.215 Part (c), intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise by specified in the specific rule section under which the equipment operates, is contained within the frequency band designed in the rule section under which the equipment is operated.

The 20 dB bandwidth must be contained within the band 13.110-14.010 MHz. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) of the spectrum analyzer was set to the range of 1% to 5% of the emissions bandwidth (EBW) and video bandwidth (VBW) bandwidth was set to at least 3 times the resolution bandwidth. The analyzer sweep time was set to auto and a peak detector was used.

Due to the amplitude of the carrier with respect to the modulated signal, the EUT was unable to meet the 1-5% RBW requirements when based off of the 20dB bandwidth. Therefore, the RBW was adjusted such that the effective bandwidth is roughly twice the data rate of the ISO 15693 protocol (2 x 26.48 kbps). The spectrum analyzer bandwidth measurement function was used to measure the 20 dB bandwidth.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAY	2023-03-22	2024-03-22
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21
Probe - Near Field Set	EMCO	7405	IPI	NCR	NCR

EMISSIONS BANDWIDTH (20 DB)

element
WTD.2023.05.05.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400007	Date:	2023-07-11
Customer:	Covidien LLC.	Temperature:	24.2°C
Attendees:	None	Relative Humidity:	47.7%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Nolan De Ramos	Job Site:	OC13
Power:	5VDC	Configuration:	COVI0201-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2023	ANSI C63.10:2013

COMMENTS

Transmitting 13.56 MHz RFID, Modulated mode: RFID Tag placed on top of module. Loop/modulation script running via rfid_test.exe on laptop PC.

At normal environmental conditions, analyzer offset was set so that the fundamental measures the same on the analyzer as the measured H-field strength at 10m.

DEVIATIONS FROM TEST STANDARD

None

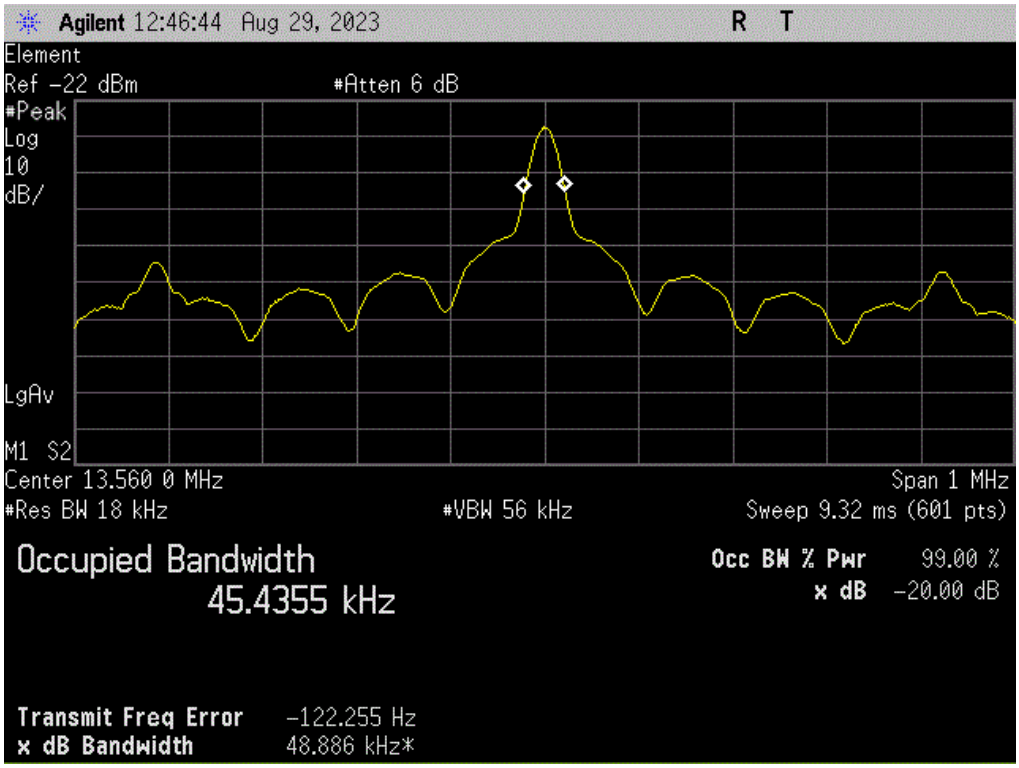
TESTED BY

Nolan De Ramos

TEST RESULTS

	Value	Limit (13.110 < f < 14.010 MHz)	Result
13.56 MHz RFID			
Normal Conditions	48.886 kHz	Within	Pass

EMISSIONS BANDWIDTH (20 DB)



13.56 MHz RFID; Normal Conditions

FIELD STRENGTH OF FUNDAMENTAL

element
WTD.2023.05.05.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

TEST DESCRIPTION

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

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The reference point of the loop antenna was maintained at 1m above the ground plane during the testing.

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

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

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.5, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2023-05-26	2024-05-26
Receiver	Rohde & Schwarz	ESCI	ARG	2022-08-19	2023-08-19

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

12.06 MHz TO 15.06 MHz

POWER INVESTIGATED

5VDC

CONFIGURATIONS INVESTIGATED

COVI0201-1

MODES INVESTIGATED

Transmitting RFID 13.56 MHz, modulated

FIELD STRENGTH OF FUNDAMENTAL

element
WTD.2023.05.05.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400007	Date:	2023-07-13
Customer:	Covidien LLC.	Temperature:	24.4°C
Attendees:	None	Relative Humidity:	40.9%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mb
Tested By:	Nolan De Ramos	Job Site:	OC08
Power:	5VDC	Configuration:	COVI0201-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	3	Test Distance (m):	10	Ant. Height(s) (m):	1(m)

COMMENTS

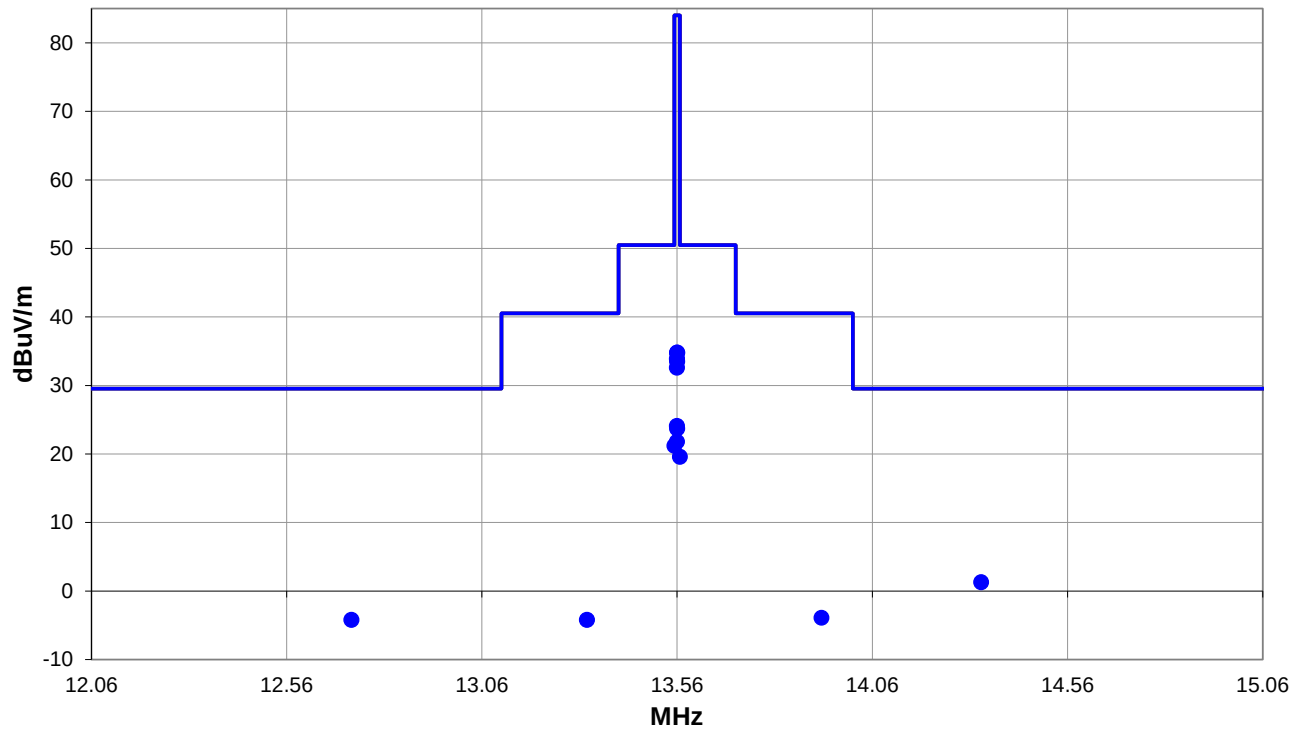
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz, modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 3 ■ PK ◆ AV ● QP

FIELD STRENGTH OF FUNDAMENTAL

element
WTD.2023.05.05.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

RESULTS - Run #3

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
14.339	8.8	11.6	1.0	98.0	10.0	0.0	Para to GND	QP	-19.1	1.3	29.5	-28.2	EUT Vert
13.553	28.7	11.6	1.0	290.0	10.0	0.0	Para to GND	QP	-19.1	21.2	50.5	-29.3	EUT Vert
13.567	27.1	11.6	1.0	274.0	10.0	0.0	Para to GND	QP	-19.1	19.6	50.5	-30.9	EUT Vert
12.726	3.2	11.7	1.0	129.0	10.0	0.0	Para to GND	QP	-19.1	-4.2	29.5	-33.7	EUT Vert
13.930	3.6	11.6	1.0	9.0	10.0	0.0	Para to GND	QP	-19.1	-3.9	40.5	-44.4	EUT Vert
13.329	3.2	11.7	1.0	331.0	10.0	0.0	Para to GND	QP	-19.1	-4.2	40.5	-44.7	EUT Vert
13.560	42.3	11.6	1.0	274.0	10.0	0.0	Para to GND	QP	-19.1	34.8	84.0	-49.2	EUT Vert
13.560	42.3	11.6	1.0	159.0	10.0	0.0	Perp to EUT	QP	-19.1	34.8	84.0	-49.2	EUT Horz
13.560	41.4	11.6	1.0	279.0	10.0	0.0	Perp to EUT	QP	-19.1	33.9	84.0	-50.1	EUT on Side
13.560	41.3	11.6	1.0	118.0	10.0	0.0	Para to GND	QP	-19.1	33.8	84.0	-50.2	EUT Horz
13.560	41.0	11.6	1.0	273.0	10.0	0.0	Perp to EUT	QP	-19.1	33.5	84.0	-50.5	EUT Vert
13.560	40.1	11.6	1.0	253.0	10.0	0.0	Para to GND	QP	-19.1	32.6	84.0	-51.4	EUT on Side
13.560	31.6	11.6	1.0	347.0	10.0	0.0	Para to EUT	QP	-19.1	24.1	84.0	-59.9	EUT Vert
13.560	31.2	11.6	1.0	361.0	10.0	0.0	Para to EUT	QP	-19.1	23.7	84.0	-60.3	EUT on Side
13.559	29.3	11.6	1.0	263.0	10.0	0.0	Para to EUT	QP	-19.1	21.8	84.0	-62.2	EUT Horz

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

TEST DESCRIPTION

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

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

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

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

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

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

As outlined in 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.

The limits in CFR 47, Part 15C 15.209(a) are identical to those is RSS-Gen section 8.9 Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, an E-Field measurement in dBuV/m can be converted to dBuA/m via the following formula: dBuV/m - 51.5 dB = dBuA/m. E-Field measurements have the same margin in dB to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limits.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Loop	EMCO	6502	AZB	2021-09-03	2023-09-03
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2023-05-26	2024-05-26
Receiver	Rohde & Schwarz	ESCI	ARG	2022-08-19	2023-08-19

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

9 kHz TO 30 MHz

POWER INVESTIGATED

5VDC

CONFIGURATIONS INVESTIGATED

COVI0201-1

MODES INVESTIGATED

Transmitting RFID 13.56 MHz, modulated

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400007	Date:	2023-07-13
Customer:	Covidien LLC.	Temperature:	24.6°C
Attendees:	None	Relative Humidity:	40.8%
Customer Project:	None	Bar. Pressure (PMSL):	1013 mb
Tested By:	Nolan De Ramos	Job Site:	OC08
Power:	5VDC	Configuration:	COVI0201-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	4	Test Distance (m):	10	Ant. Height(s) (m):	1(m)

COMMENTS

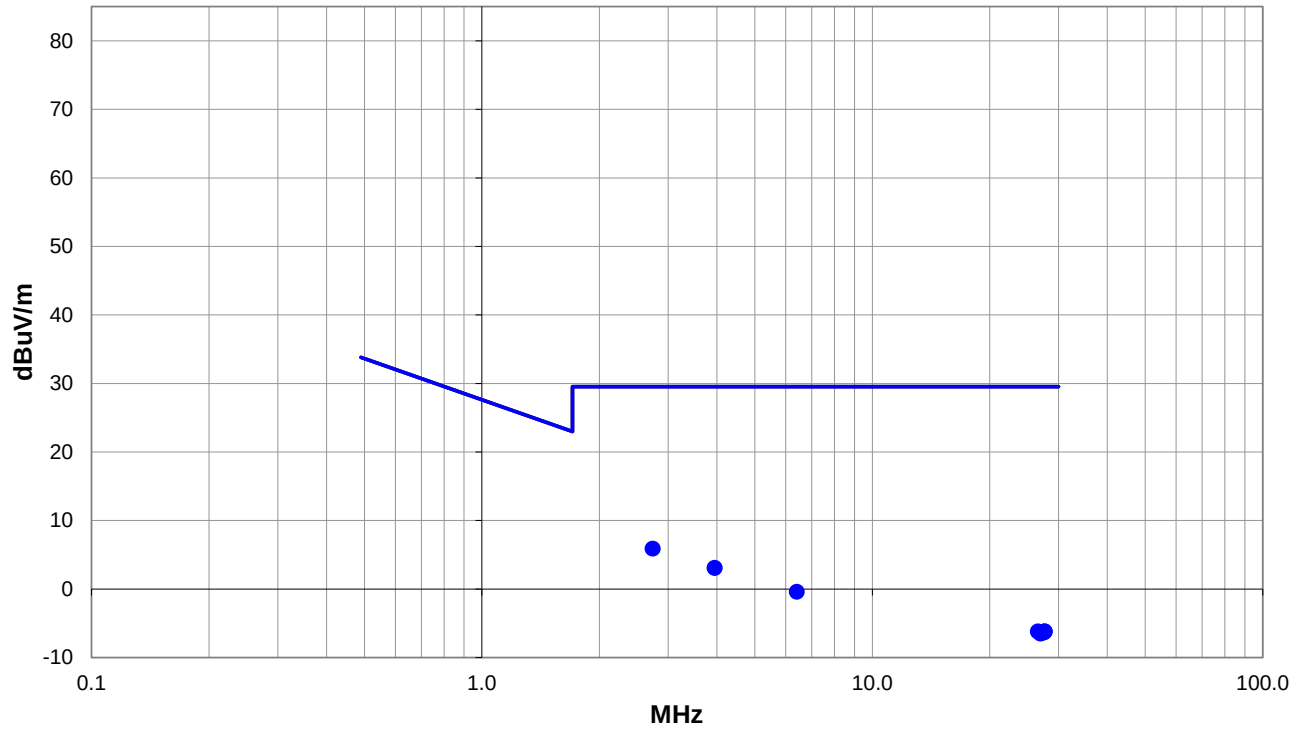
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz, modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 4 ■ PK ◆ AV ● QP

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

RESULTS - Run #4

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
2.738	14.4	10.6	1.0	6.0	10.0	0.0	Para to GND	QP	-19.1	5.9	29.5	-23.6	EUT on Side
3.945	11.3	10.9	1.0	200.0	10.0	0.0	Para to GND	QP	-19.1	3.1	29.5	-26.4	EUT on Side
6.404	7.5	11.2	1.0	329.0	10.0	0.0	Para to GND	QP	-19.1	-0.4	29.5	-29.9	EUT on Side
26.559	2.9	10.0	1.0	68.0	10.0	0.0	Para to GND	QP	-19.1	-6.2	29.5	-35.7	EUT on Side
27.648	3.1	9.8	1.0	240.0	10.0	0.0	Perp to EUT	QP	-19.1	-6.2	29.5	-35.7	EUT Horz
27.578	3.1	9.8	1.0	336.0	10.0	0.0	Para to EUT	QP	-19.1	-6.2	29.5	-35.7	EUT Horz
27.143	2.9	9.9	1.0	93.0	10.0	0.0	Perp to EUT	QP	-19.1	-6.3	29.5	-35.8	EUT Vert
27.524	3.0	9.8	1.0	260.0	10.0	0.0	Para to EUT	QP	-19.1	-6.3	29.5	-35.8	EUT on Side
27.533	3.0	9.8	1.0	351.0	10.0	0.0	Para to GND	QP	-19.1	-6.3	29.5	-35.8	EUT Horz
27.110	2.8	9.9	1.0	271.0	10.0	0.0	Para to GND	QP	-19.1	-6.4	29.5	-35.9	EUT Vert
26.990	2.8	9.9	1.0	241.0	10.0	0.0	Perp to EUT	QP	-19.1	-6.4	29.5	-35.9	EUT on Side
26.961	2.7	9.9	1.0	242.0	10.0	0.0	Para to EUT	QP	-19.1	-6.5	29.5	-36.0	EUT Vert

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30 MHz)

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Biconilog	EMCO	3142	AXA	2021-10-21	2023-10-21
Cable	Northwest EMC	3kHz - 1GHz RE Cables	OCB	2023-05-26	2024-05-26
Amplifier - Pre-Amplifier	Miteq	AM-1551	AOX	2023-05-26	2024-05-26
Receiver	Rohde & Schwarz	ESCI	ARG	2022-08-19	2023-08-19

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.4 dB	-3.4 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 1000 MHz

POWER INVESTIGATED

5VDC

CONFIGURATIONS INVESTIGATED

COVI0201-1

MODES INVESTIGATED

Transmitting RFID 13.56 MHz, modulated

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30 MHz)

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400007	Date:	2023-07-20
Customer:	Covidien LLC.	Temperature:	24.6°C
Attendees:	None	Relative Humidity:	0.00461%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mb
Tested By:	Mark Baytan	Job Site:	OC08
Power:	5VDC	Configuration:	COVI0201-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	12	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

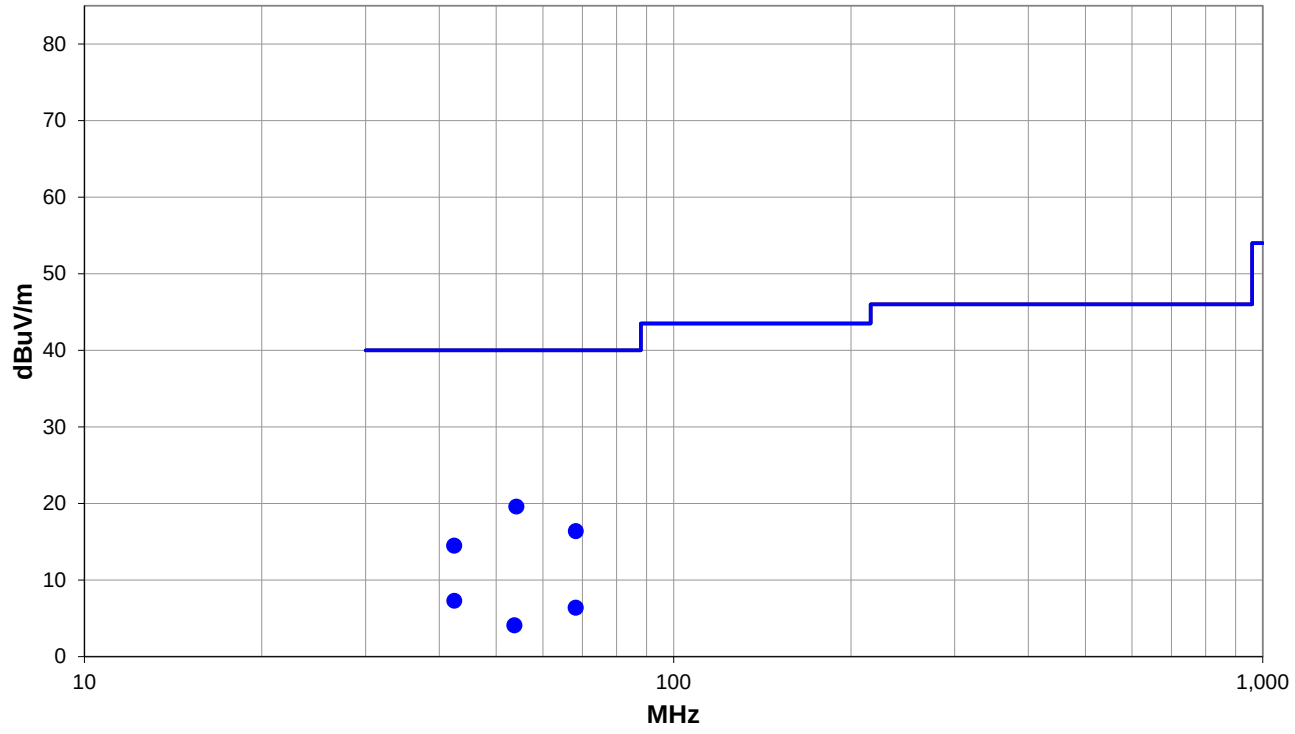
None

EUT OPERATING MODES

Transmitting RFID 13.56 MHz, modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 12 ■ PK ◆ AV ● QP

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30 MHz)

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

RESULTS - Run #12

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
54.094	48.4	-28.8	1.0	224.0	3.0	0.0	Vert	QP	0.0	19.6	40.0	-20.4	EUT on Side
68.231	46.5	-30.1	1.03	156.0	3.0	0.0	Vert	QP	0.0	16.4	40.0	-23.6	EUT on Side
42.405	40.1	-25.6	1.11	96.0	3.0	0.0	Vert	QP	0.0	14.5	40.0	-25.5	EUT on Side
42.436	32.9	-25.6	2.32	151.0	3.0	0.0	Horz	QP	0.0	7.3	40.0	-32.7	EUT on Side
68.214	36.5	-30.1	3.38	89.0	3.0	0.0	Horz	QP	0.0	6.4	40.0	-33.6	EUT on Side
53.675	32.9	-28.8	1.2	234.0	3.0	0.0	Horz	QP	0.0	4.1	40.0	-35.9	EUT on Side

CONCLUSION

Pass

Tested By

FREQUENCY STABILITY

element
TbtTx 2023.06.07.0 BETA
WTD.2023.05.05.0

TEST DESCRIPTION

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 spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

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

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

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

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAY	2023-03-22	2024-03-22
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPHS-32-3.5-SCT/AC	TBE	NCR	NCR
Meter - Temperature/Humidity	Omega Engineering, Inc.	HH414	DVB	2023-03-16	2024-03-16
Probe - Near Field Set	EMCO	7405	IPI	NCR	NCR

FREQUENCY STABILITY

element
TbtTx 2023.06.07.0 BETA
WTD.2023.05.05.0

EUT:	Secure RFID Reader (PT00170793)	Work Order:	COVI0201
Serial Number:	E231400007	Date:	2023-07-10
Customer:	Covidien LLC.	Temperature:	24°C
Attendees:	None	Relative Humidity:	47.4%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Nolan De Ramos	Job Site:	OC13
Power:	5VDC	Configuration:	COVI0201-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.225:2023	ANSI C63.10:2013

COMMENTS

Transmitting 13.56 MHz RFID, Continuous Wave (CW) mode: continuous 13.56 MHz transmit enabled via PuTTY Terminal on laptop PC.

At normal environmental conditions, analyzer offset was set so that the fundamental measures the same on the analyzer as the measured H-field strength at 10m.

DEVIATIONS FROM TEST STANDARD

None

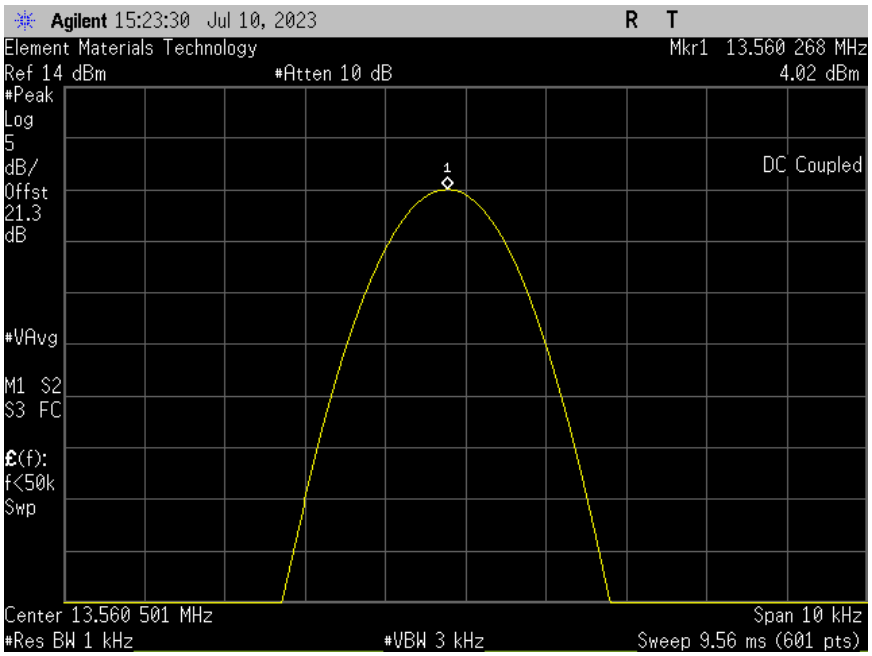
TESTED BY

Nolan De Ramos

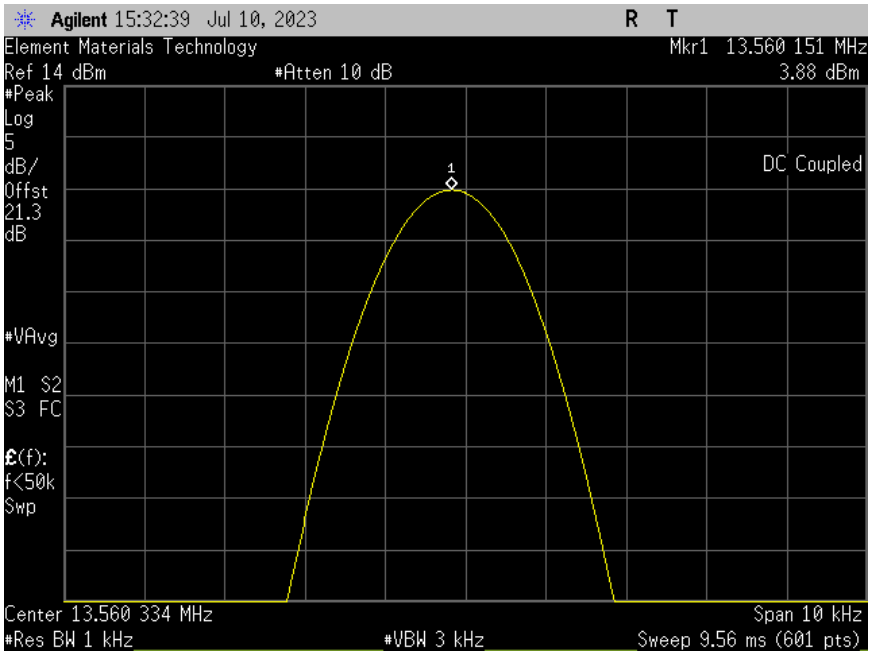
TEST RESULTS

		Measured Value (MHz)	Nominal Value (MHz)	Error (ppm)	Limit (ppm)	Results
13.56 MHz RFID						
	Normal Conditions	13.560268	13.560268	0	100	Pass
	Extreme Voltage 115%	13.560151	13.560268	9	100	Pass
	Extreme Voltage 85%	13.560168	13.560268	7	100	Pass
	Extreme Temperature +50°C	13.559683	13.560268	43	100	Pass
	Extreme Temperature +40°C	13.559767	13.560268	37	100	Pass
	Extreme Temperature +30°C	13.55985	13.560268	31	100	Pass
	Extreme Temperature +20°C	13.55995	13.560268	23	100	Pass
	Extreme Temperature +10°C	13.560167	13.560268	7	100	Pass
	Extreme Temperature +0°C	13.560117	13.560268	11	100	Pass
	Extreme Temperature -10°C	13.560203	13.560268	5	100	Pass
	Extreme Temperature -20°C	13.56027	13.560268	0	100	Pass

FREQUENCY STABILITY

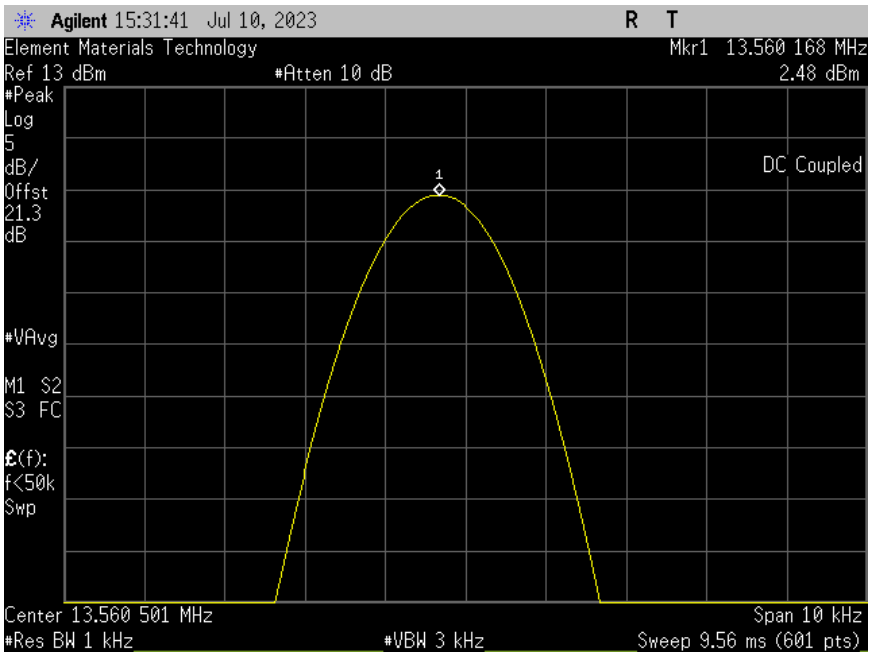


13.56 MHz RFID; Normal Conditions

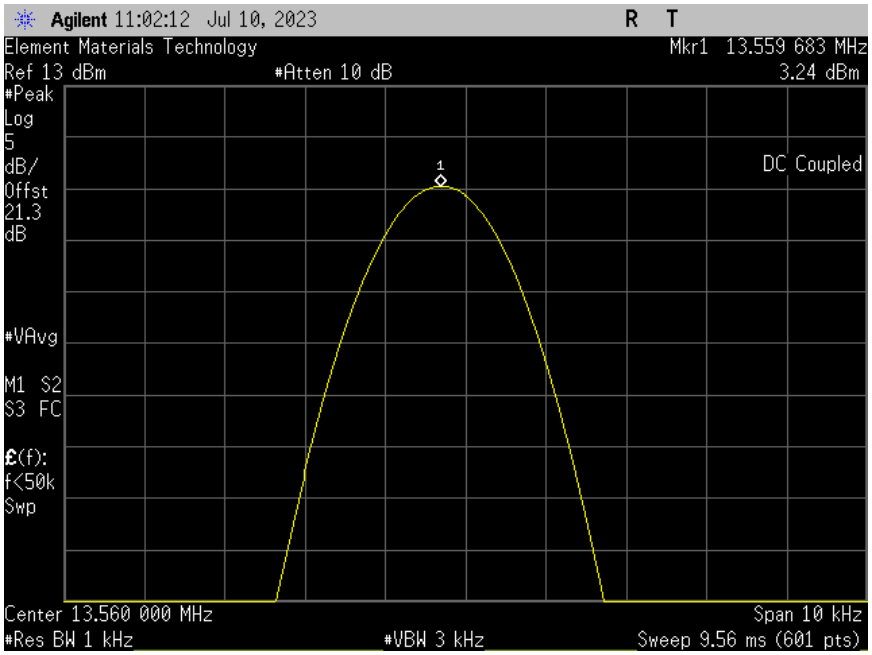


13.56 MHz RFID; Extreme Voltage 115%

FREQUENCY STABILITY

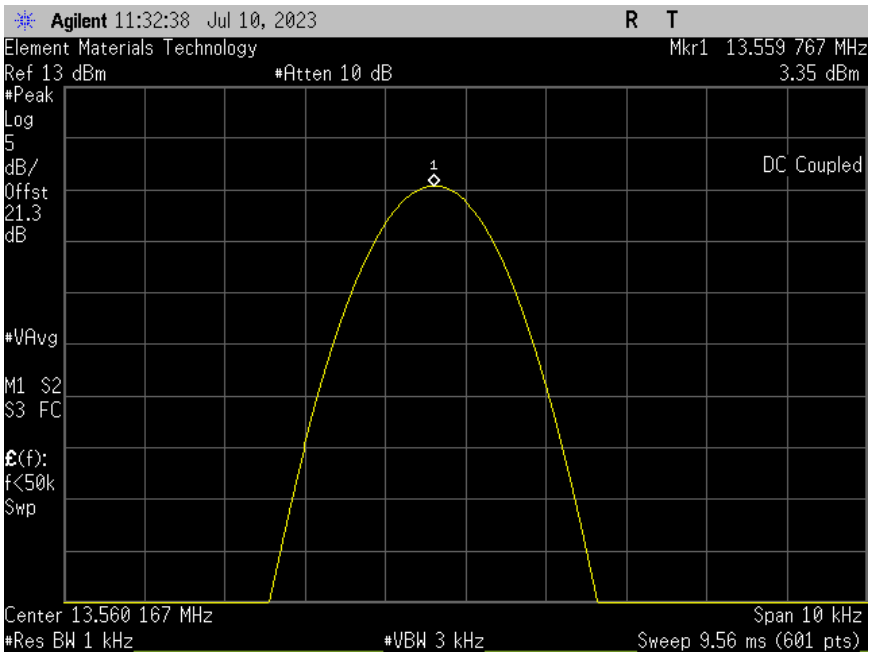


13.56 MHz RFID; Extreme Voltage 85%

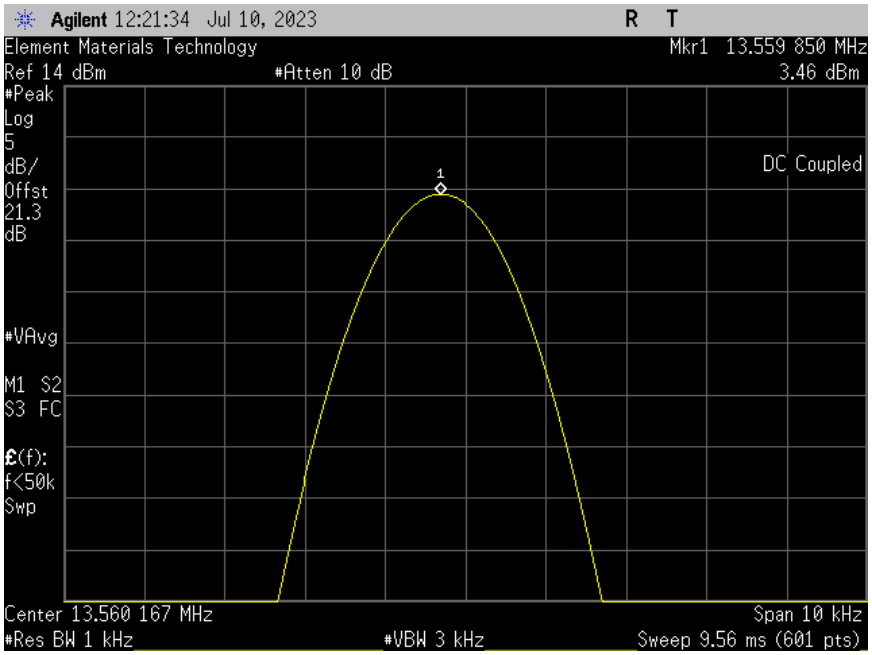


13.56 MHz RFID; Extreme Temperature +50°C

FREQUENCY STABILITY

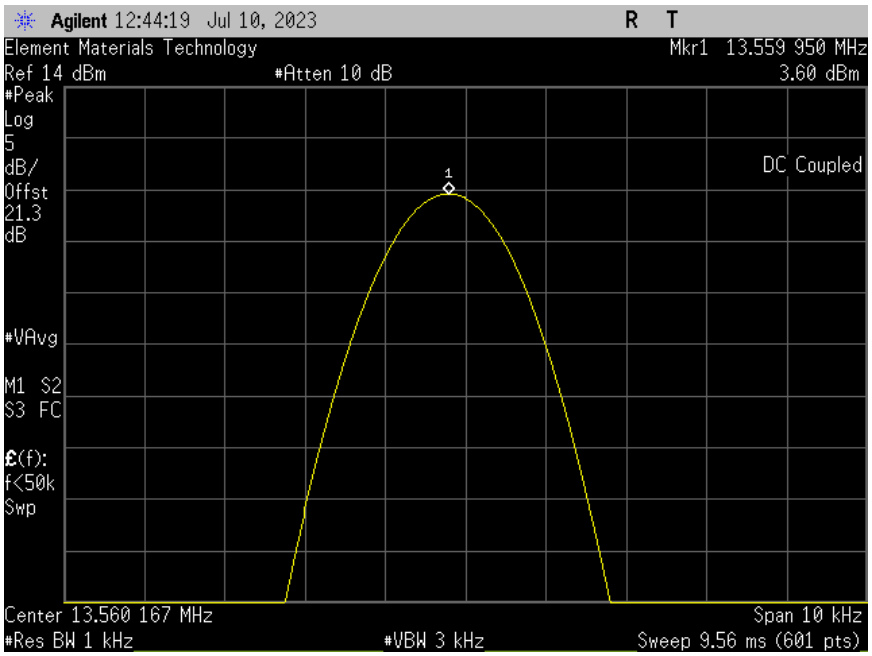


13.56 MHz RFID; Extreme Temperature +40°C

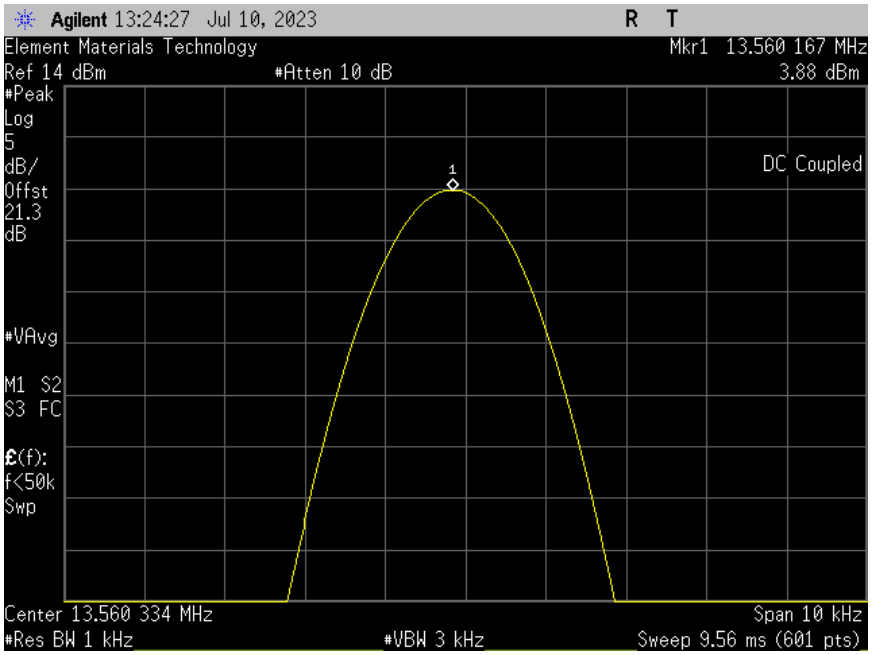


13.56 MHz RFID; Extreme Temperature +30°C

FREQUENCY STABILITY

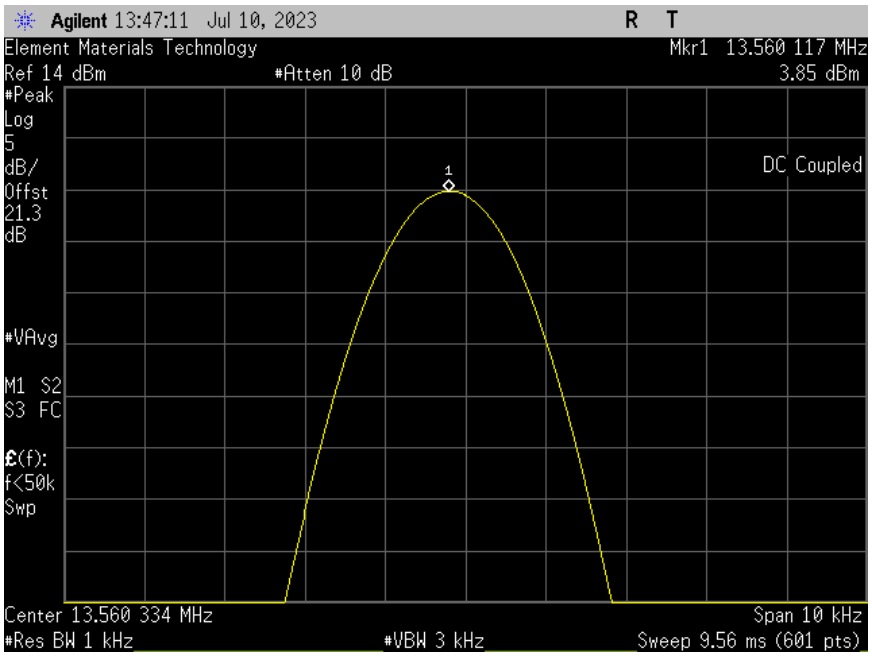


13.56 MHz RFID; Extreme Temperature +20°C

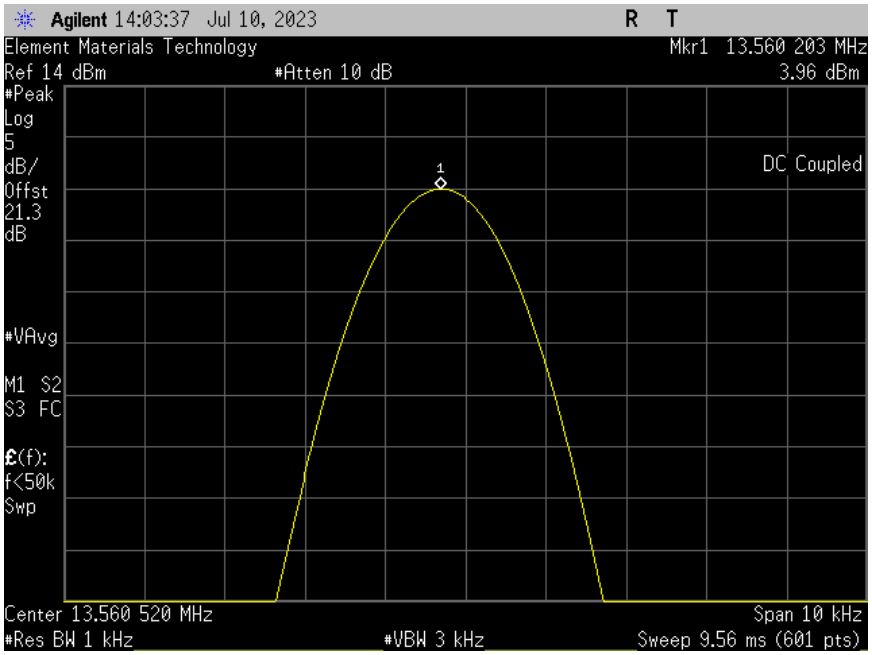


13.56 MHz RFID; Extreme Temperature +10°C

FREQUENCY STABILITY

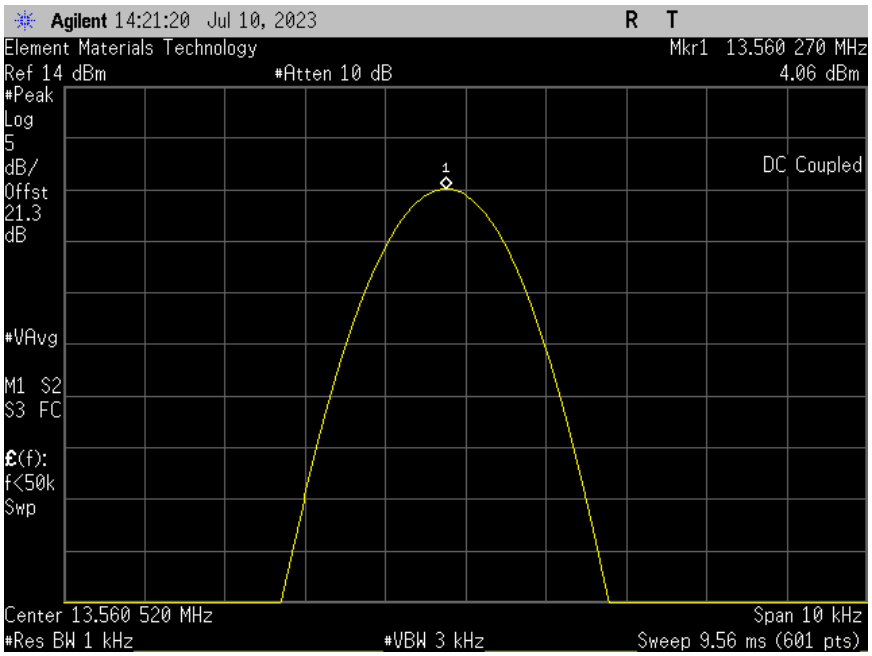


13.56 MHz RFID; Extreme Temperature +0°C



13.56 MHz RFID; Extreme Temperature -10°C

FREQUENCY STABILITY



13.56 MHz RFID; Extreme Temperature -20°C

End of Test Report