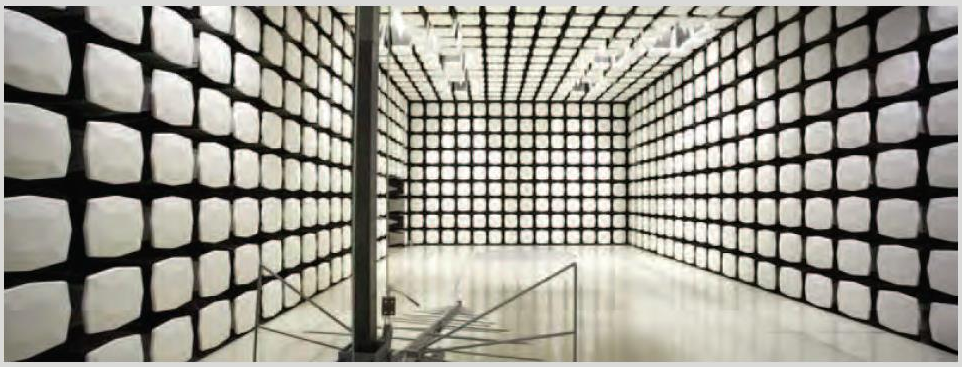
Entrust Corporation

Phase 3.1 LC Conversion

FCC 15.225:2022
13.56 MHz Radio

Report: DTCD0099.1 Rev. 1, Issue Date: March 24, 2023



CERT #3310.05

CERTIFICATE OF TEST

Last Date of Test: June 28, 2022
Entrust Corporation
EUT: Phase 3.1 LC Conversion

Radio Equipment Testing

Standards

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

Results

Test Description	Result	Specification Section(s)	Method Section(s)	Comments
Emissions Bandwidth (20 dB)	N/A	15.215(c)	6.9.2	Not included for a C2PC related to testing a limited module in a new host.
Field Strength of Fundamental	Pass	15.225(a)-(c)	6.4	
Field Strength of Spurious Emissions (Greater Than 30 MHz)	Pass	15.225(d), 15.209	6.5	
Field Strength of Spurious Emissions (Less Than 30 MHz)	Pass	15.225(d), 15.209	6.4	
Frequency Stability	N/A	15.225(e), 15.31(e), 15.215(c), 2.1055	6.8	Not required to add a host to a limited modular approval. Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart.
Powerline Conducted Emissions	Pass	15.207	6.2	

Deviations From Test Standards

None

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.

CERTIFICATE OF TEST

Approved By:

Eric Brandon, Department Manager

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REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Added note about continuously transmitting.	2023-03-24	20, 23, 26
	Updated functional description.	2023-03-24	10
	Photos removed from report.	2023-03-24	N/A

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

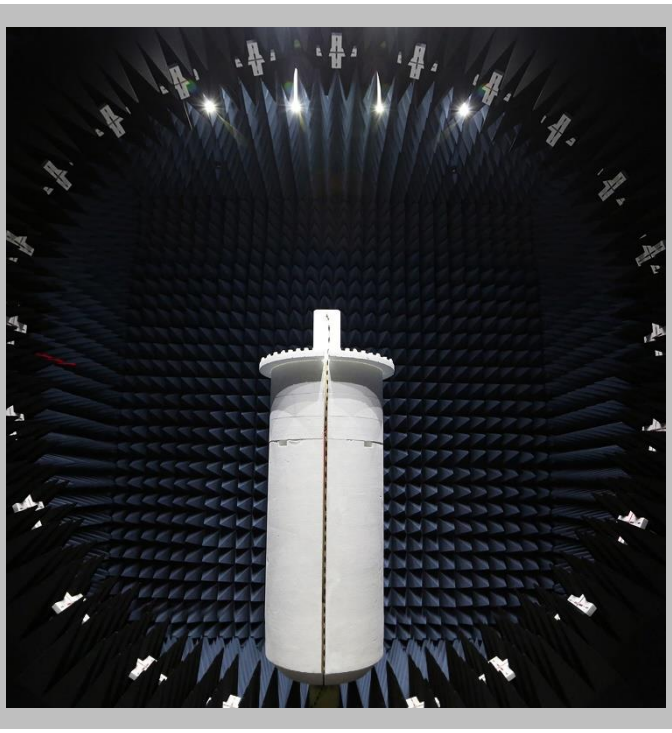
For details on the Scopes of our Accreditations, please visit:

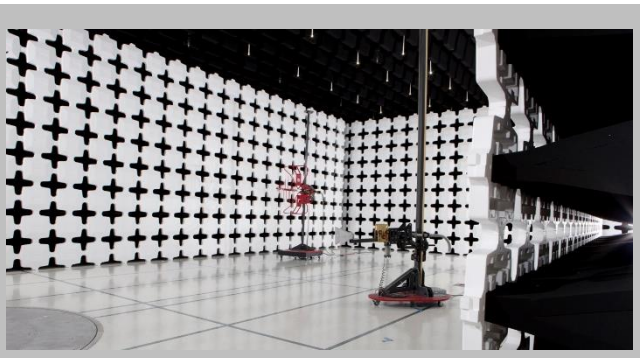
California Minnesota Oregon Texas Washington

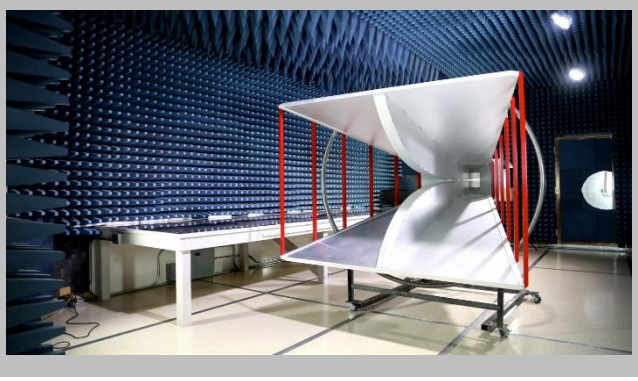
FACILITIES

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
TMU.2015.07.10

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

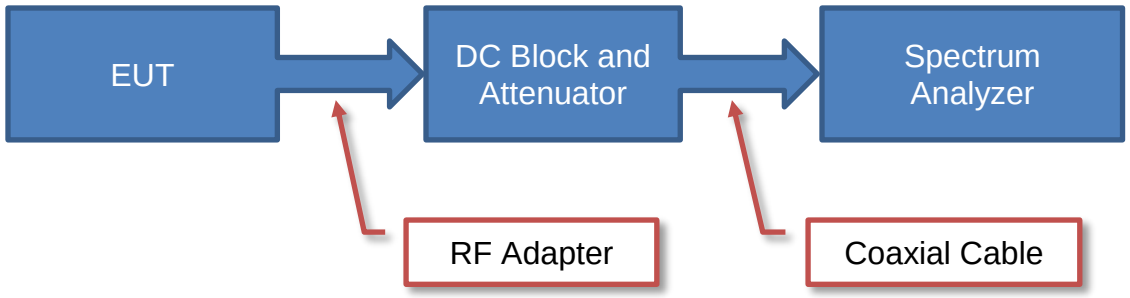
TEST SETUP BLOCK DIAGRAMS

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.

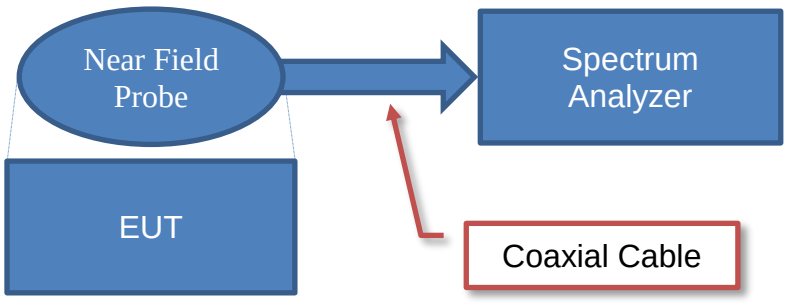
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

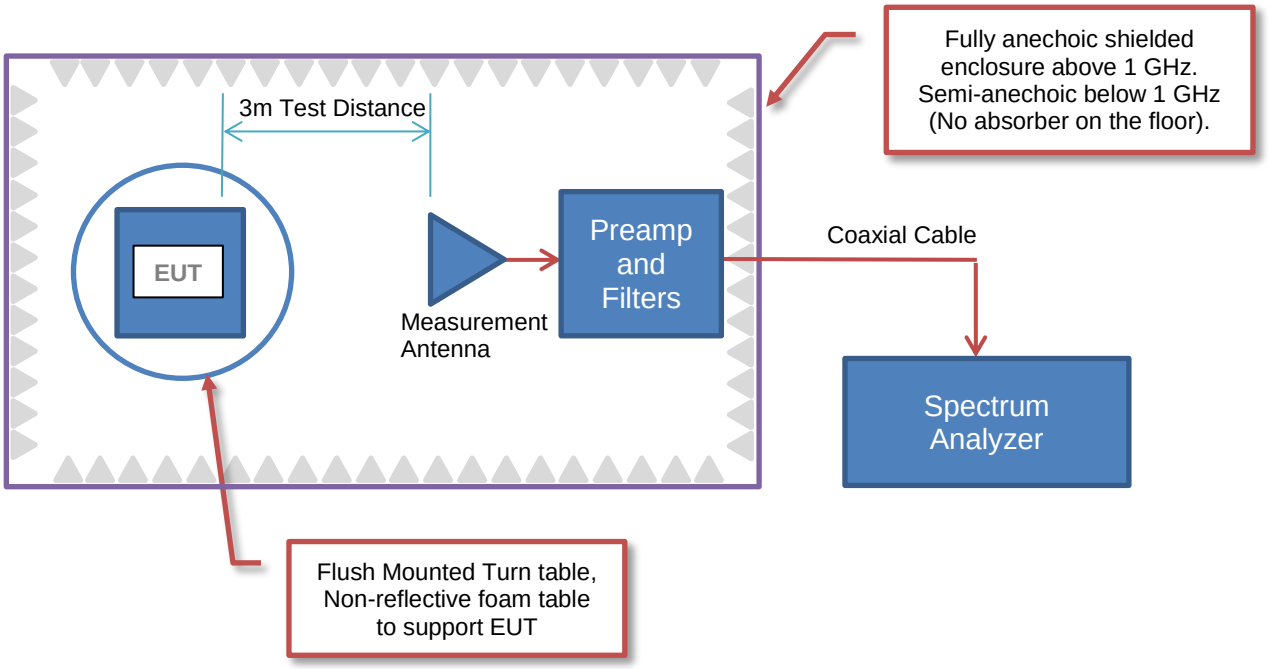


Sample Calculation (logarithmic units)

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**

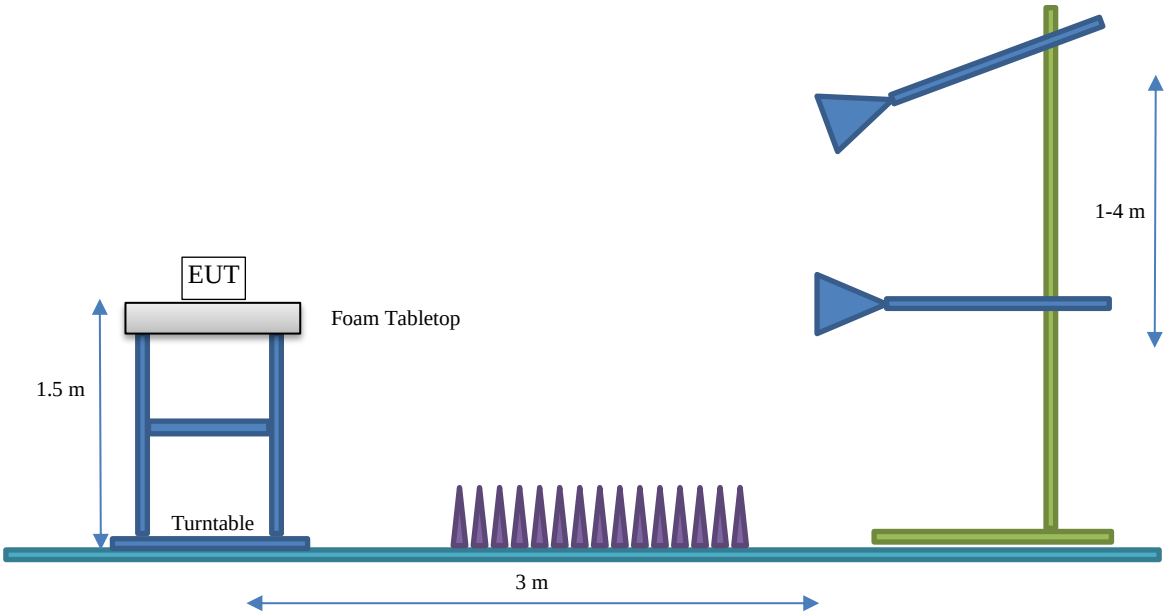
Radiated Power (ERP/EIRP) – Substitution Method:

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:	Entrust Corporation
Address:	1187 Park Place
City, State, Zip:	Shakopee, MN 55379
Test Requested By:	Mike Greschner
EUT:	Phase 3.1 LC Conversion
First Date of Test:	June 27, 2022
Last Date of Test:	June 28, 2022
Receipt Date of Samples:	June 27, 2022
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Card personalization system with RFID radio that monitors status of consumable supplies with FCC ID GCI-50543001

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)	Antenna Description
PCB Trace	Entrust Corporation	13.56	Circular, 4 turns, 46mm diameter

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

Radio	Modulation	Protocol	Data Rate	Frequency
Passive RFID	ASK	ISO 15693	26.48 kbps	13.56 MHz

CONFIGURATIONS

Configuration DTCD0099- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Card Issuance System	Entrust Corporation	Phase 3.1 LC Conversion	1

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	2 m	No	AC Mains	Phase 3.1 LC Conversion

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-06-27	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.
2	2022-06-27	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.
3	2022-06-27	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	2022-06-28	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

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

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	ARS	2022-04-20	2023-04-20
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	2022-04-04	2023-04-04
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	2022-03-07	2023-03-07

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.2 dB	-3.2 dB

CONFIGURATIONS INVESTIGATED

DTCD0099-1

MODES INVESTIGATED

RFID in continuous transmit at 13.56 MHz, all modules parallel exerciser.

POWERLINE CONDUCTED EMISSIONS

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

EUT:	Phase 3.1 LC Conversion	Work Order:	DTCD0099
Serial Number:	1	Date:	2022-06-27
Customer:	Entrust Corporation	Temperature:	24.8°C
Attendees:	Craig Jacobsen	Relative Humidity:	39.9%
Customer Project:	None	Bar. Pressure (PMSL):	1027 mb
Tested By:	Kyle McMullan	Job Site:	MN03
Power:	208VAC/60Hz	Configuration:	DTCD0099-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	3	Line:	Phase 1	Add. Ext. Attenuation (dB):	0

COMMENTS

None

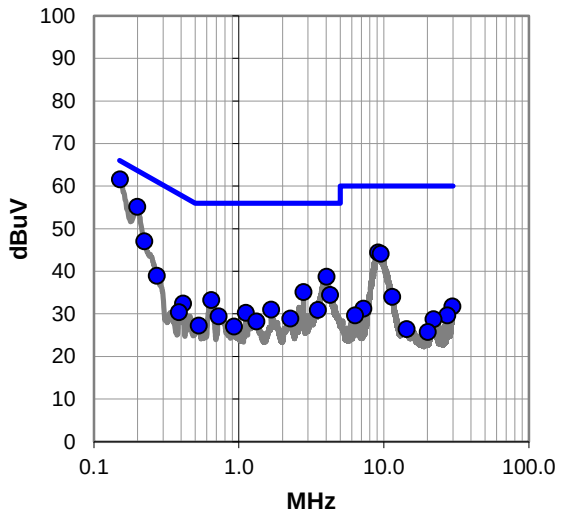
EUT OPERATING MODES

RFID in continuous transmit at 13.56 MHz, all modules parallel exerciser.

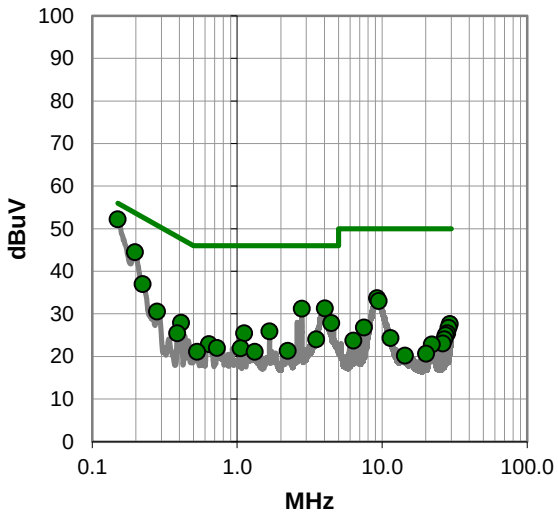
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.152	40.9	20.7	61.6	65.9	-4.3
0.199	34.6	20.5	55.1	63.7	-8.6
9.149	23.4	21.0	44.4	60.0	-15.6
0.223	26.6	20.4	47.0	62.7	-15.7
9.521	23.1	21.0	44.1	60.0	-15.9
4.035	18.2	20.5	38.7	56.0	-17.3
2.791	14.7	20.4	35.1	56.0	-20.9
4.273	13.9	20.5	34.4	56.0	-21.6
0.272	18.6	20.3	38.9	61.1	-22.2
0.646	12.9	20.3	33.2	56.0	-22.8
1.676	10.7	20.3	31.0	56.0	-25.0
3.507	10.4	20.5	30.9	56.0	-25.1
0.412	12.1	20.3	32.4	57.6	-25.2
1.117	10.0	20.2	30.2	56.0	-25.8
11.441	12.6	21.4	34.0	60.0	-26.0
0.727	9.1	20.3	29.4	56.0	-26.6
2.265	8.6	20.3	28.9	56.0	-27.1
0.386	10.1	20.3	30.4	58.1	-27.7
1.320	8.0	20.2	28.2	56.0	-27.8
29.720	9.2	22.5	31.7	60.0	-28.3
0.528	6.9	20.3	27.2	56.0	-28.8
7.228	10.4	20.8	31.2	60.0	-28.8
0.925	6.8	20.2	27.0	56.0	-29.0
27.482	7.2	22.4	29.6	60.0	-30.4
6.326	8.9	20.7	29.6	60.0	-30.4

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	31.5	20.7	52.2	56.0	-3.8
0.197	24.0	20.5	44.5	53.7	-9.2
4.038	10.8	20.5	31.3	46.0	-14.7
2.790	10.8	20.4	31.2	46.0	-14.8
0.223	16.6	20.4	37.0	52.7	-15.7
9.256	12.7	21.0	33.7	50.0	-16.3
9.471	12.0	21.0	33.0	50.0	-17.0
4.468	7.3	20.5	27.8	46.0	-18.2
0.411	7.6	20.3	27.9	47.6	-19.7
1.676	5.6	20.3	25.9	46.0	-20.1
0.280	10.2	20.3	30.5	50.8	-20.3
1.117	5.2	20.2	25.4	46.0	-20.6
3.507	3.5	20.5	24.0	46.0	-22.0
29.400	5.1	22.5	27.6	50.0	-22.4
0.386	5.1	20.3	25.4	48.1	-22.7
0.640	2.6	20.3	22.9	46.0	-23.1
7.497	6.0	20.8	26.8	50.0	-23.2
28.759	4.3	22.4	26.7	50.0	-23.3
0.727	1.7	20.3	22.0	46.0	-24.0
1.058	1.7	20.2	21.9	46.0	-24.1
28.118	3.0	22.4	25.4	50.0	-24.6
2.234	1.0	20.3	21.3	46.0	-24.7
0.528	0.8	20.3	21.1	46.0	-24.9
1.320	0.9	20.2	21.1	46.0	-24.9
27.482	2.6	22.4	25.0	50.0	-25.0

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

EUT:	Phase 3.1 LC Conversion	Work Order:	DTCD0099
Serial Number:	1	Date:	2022-06-27
Customer:	Entrust Corporation	Temperature:	24.8°C
Attendees:	Craig Jacobsen	Relative Humidity:	39.9%
Customer Project:	None	Bar. Pressure (PMSL):	1027 mb
Tested By:	Kyle McMullan	Job Site:	MN03
Power:	208VAC/60Hz	Configuration:	DTCD0099-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	4	Line:	Phase 2	Add. Ext. Attenuation (dB):	0

COMMENTS

None

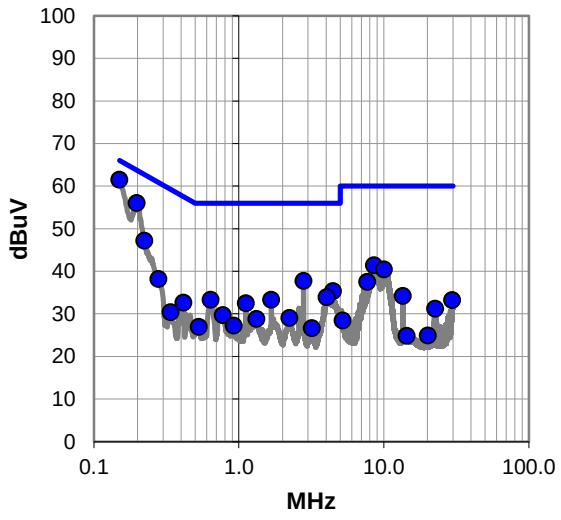
EUT OPERATING MODES

RFID in continuous transmit at 13.56 MHz, all modules parallel exerciser.

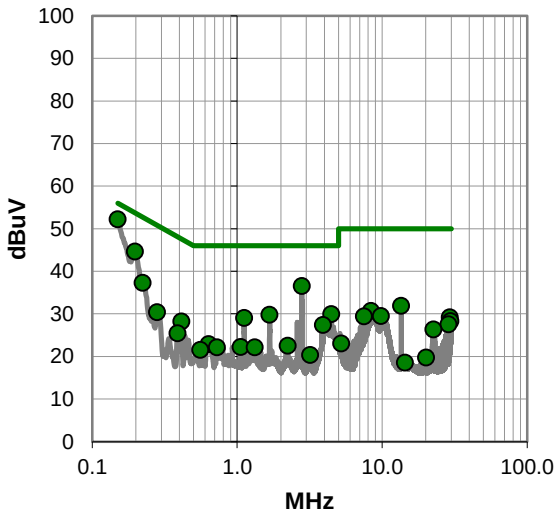
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

RESULTS - Run #4

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	40.8	20.7	61.5	66.0	-4.5
0.197	35.5	20.5	56.0	63.7	-7.7
0.223	26.8	20.4	47.2	62.7	-15.5
2.791	17.3	20.4	37.7	56.0	-18.3
8.568	20.5	20.9	41.4	60.0	-18.6
10.023	19.3	21.1	40.4	60.0	-19.6
4.470	14.8	20.5	35.3	56.0	-20.7
4.039	13.4	20.5	33.9	56.0	-22.1
7.698	16.7	20.8	37.5	60.0	-22.5
0.278	17.9	20.3	38.2	60.9	-22.7
0.638	13.0	20.3	33.3	56.0	-22.7
1.674	13.0	20.3	33.3	56.0	-22.7
1.116	12.3	20.2	32.5	56.0	-23.5
0.414	12.3	20.3	32.6	57.6	-25.0
13.559	12.8	21.4	34.2	60.0	-25.8
0.776	9.5	20.2	29.7	56.0	-26.3
29.705	10.7	22.5	33.2	60.0	-26.8
2.233	8.7	20.3	29.0	56.0	-27.0
1.322	8.6	20.2	28.8	56.0	-27.2
22.602	9.3	21.9	31.2	60.0	-28.8
0.924	7.0	20.2	27.2	56.0	-28.8
0.338	10.1	20.3	30.4	59.3	-28.9
0.528	6.6	20.3	26.9	56.0	-29.1
3.196	6.1	20.5	26.6	56.0	-29.4
5.202	7.8	20.6	28.4	60.0	-31.6

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	31.5	20.7	52.2	56.0	-3.8
0.197	24.1	20.5	44.6	53.7	-9.1
2.791	16.1	20.4	36.5	46.0	-9.5
0.223	16.9	20.4	37.3	52.7	-15.4
4.471	9.4	20.5	29.9	46.0	-16.1
1.674	9.5	20.3	29.8	46.0	-16.2
1.116	8.8	20.2	29.0	46.0	-17.0
13.559	10.5	21.4	31.9	50.0	-18.1
3.908	6.9	20.5	27.4	46.0	-18.6
8.394	9.8	20.9	30.7	50.0	-19.3
0.412	7.9	20.3	28.2	47.6	-19.4
0.280	10.1	20.3	30.4	50.8	-20.4
9.845	8.4	21.1	29.5	50.0	-20.5
7.497	8.6	20.8	29.4	50.0	-20.6
29.386	6.7	22.5	29.2	50.0	-20.8
29.702	5.8	22.5	28.3	50.0	-21.7
28.751	5.1	22.4	27.5	50.0	-22.5
0.388	5.1	20.3	25.4	48.1	-22.7
0.635	2.6	20.3	22.9	46.0	-23.1
2.233	2.2	20.3	22.5	46.0	-23.5
22.602	4.4	21.9	26.3	50.0	-23.7
1.058	2.0	20.2	22.2	46.0	-23.8
0.727	1.8	20.3	22.1	46.0	-23.9
1.322	1.9	20.2	22.1	46.0	-23.9
0.557	1.2	20.3	21.5	46.0	-24.5

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF FUNDAMENTAL

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

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
Receiver	Rohde & Schwarz	ESR26	ARP	2022-04-20	2023-04-20
Antenna - Loop	ETS Lindgren	6502	AOB	2021-06-01	2023-06-01
Cable	ESM Cable Corp.	Antenna Loop Cable	MNE	2022-01-30	2023-01-30

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

13.16 MHz TO 14.16 MHz

POWER INVESTIGATED

208VAC/60Hz

CONFIGURATIONS INVESTIGATED

DTCD0099-1

MODES INVESTIGATED

RFID continuously transmitting to read a tag at 13.56 MHz.

FIELD STRENGTH OF FUNDAMENTAL

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

EUT:	Phase 3.1 LC Conversion	Work Order:	DTCD0099
Serial Number:	1	Date:	2022-06-27
Customer:	Entrust Corporation	Temperature:	24.4°C
Attendees:	Craig Jacobsen	Relative Humidity:	41.1%
Customer Project:	None	Bar. Pressure (PMSL):	1026 mb
Tested By:	Kyle McMullan	Job Site:	MN07
Power:	208VAC/60Hz	Configuration:	DTCD0099-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	2	Test Distance (m):	3	Ant. Height(s) (m):	1(m)

COMMENTS

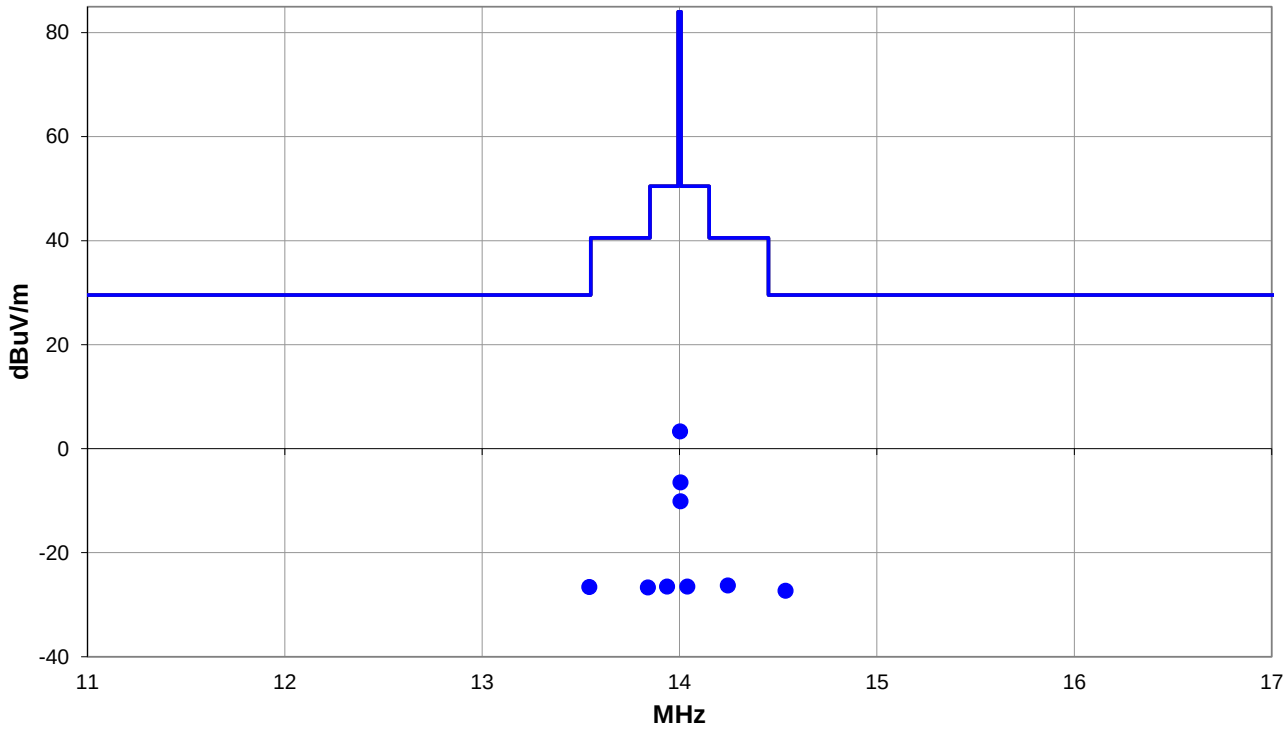
EUT is floor-standing device.

EUT OPERATING MODES

RFID continuously transmitting to read a tag at 13.56 MHz.

DEVIATIONS FROM TEST STANDARD

None



Run #: 2 ■ PK ◆ AV ● QP

FIELD STRENGTH OF FUNDAMENTAL

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

RESULTS - Run #2

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)
13.103	2.4	11.0	1.0	309.0	3.0	0.0	Par to EUT	QP	-40.0	-26.6	29.5	-56.1
14.097	1.8	10.9	1.0	345.0	3.0	0.0	Par to EUT	QP	-40.0	-27.3	29.5	-56.8
13.804	2.8	10.9	1.0	3.0	3.0	0.0	Par to EUT	QP	-40.0	-26.3	40.5	-66.8
13.399	2.3	11.0	1.0	302.0	3.0	0.0	Par to EUT	QP	-40.0	-26.7	40.5	-67.2
13.497	2.5	11.0	1.0	300.0	3.0	0.0	Par to EUT	QP	-40.0	-26.5	50.5	-77.0
13.600	2.6	10.9	1.0	304.0	3.0	0.0	Par to EUT	QP	-40.0	-26.5	50.5	-77.0
13.562	32.4	10.9	1.0	85.0	3.0	0.0	Par to EUT	QP	-40.0	3.3	84.0	-80.7
13.565	22.6	10.9	1.0	174.0	3.0	0.0	Perp to EUT	QP	-40.0	-6.5	84.0	-90.5
13.564	19.0	10.9	1.0	0.0	3.0	0.0	Par to GND	QP	-40.0	-10.1	84.0	-94.1

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHZ)

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

TEST DESCRIPTION

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

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

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

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

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

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

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

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	2022-01-30	2023-01-30
Receiver	Rohde & Schwarz	ESR26	ARP	2022-04-20	2023-04-20

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	1.8 dB	-1.8 dB

FREQUENCY RANGE INVESTIGATED

150 kHz TO 30 MHz

POWER INVESTIGATED

208VAC/60Hz

CONFIGURATIONS INVESTIGATED

DTCD0099-1

MODES INVESTIGATED

RFID continuously transmitting to read a tag at 13.56 MHz.

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHZ)

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

EUT:	Phase 3.1 LC Conversion	Work Order:	DTCD0099
Serial Number:	1	Date:	2022-06-27
Customer:	Entrust Corporation	Temperature:	24.4°C
Attendees:	Craig Jacobsen	Relative Humidity:	41.1%
Customer Project:	None	Bar. Pressure (PMSL):	1026 mb
Tested By:	Kyle McMullan	Job Site:	MN07
Power:	208VAC/60Hz	Configuration:	DTCD0099-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

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

COMMENTS

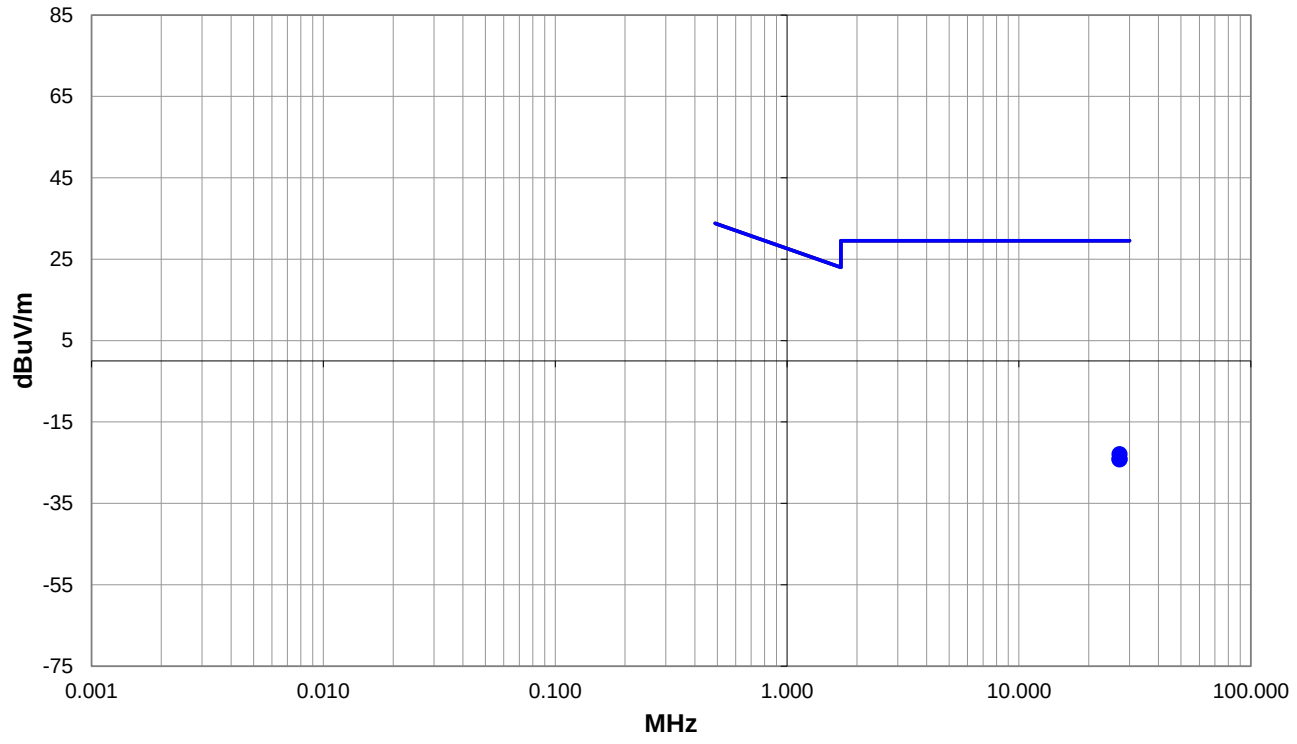
EUT is floor-standing device.

EUT OPERATING MODES

RFID continuously transmitting to read a tag at 13.56 MHz.

DEVIATIONS FROM TEST STANDARD

None



Run #: 4 ■ PK ◆ AV ● QP

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHZ)

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

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)
27.118	7.4	9.7	1.0	220.0	3.0	0.0	Perp to EUT	QP	-40.0	-22.9	29.5	-52.4
27.120	6.2	9.7	1.0	290.0	3.0	0.0	Par to EUT	QP	-40.0	-24.1	29.5	-53.6
27.121	6.1	9.7	1.0	217.0	3.0	0.0	Par to GND	QP	-40.0	-24.2	29.5	-53.7

CONCLUSION

Pass

Tested By

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30 MHZ)

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

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 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
Amplifier - Pre-Amplifier	Miteq	AM-1551	PAC	2022-06-13	2023-06-13
Antenna - Biconilog	ETS Lindgren	3142D	AXN	2021-12-08	2023-12-08
Cable	ESM Cable Corp.	MN04 Bilog Cables	MND	2022-01-30	2023-01-30
Receiver	Rohde & Schwarz	ESR26	ARP	2022-04-20	2023-04-20

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.6 dB	-3.6 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 1000 MHz

POWER INVESTIGATED

208VAC/50Hz

CONFIGURATIONS INVESTIGATED

DTCD0099-1

MODES INVESTIGATED

RFID continuously transmitting to read a tag at 13.56 MHz.

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30 MHZ)

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

EUT:	Phase 3.1 LC Conversion	Work Order:	DTCD0099
Serial Number:	1	Date:	2022-06-28
Customer:	Entrust Corporation	Temperature:	24.7°C
Attendees:	Craig Jacobsen	Relative Humidity:	45%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mb
Tested By:	Chris Patterson	Job Site:	MN04
Power:	208VAC/60Hz	Configuration:	DTCD0099-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	15	Test Distance (m):	10	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

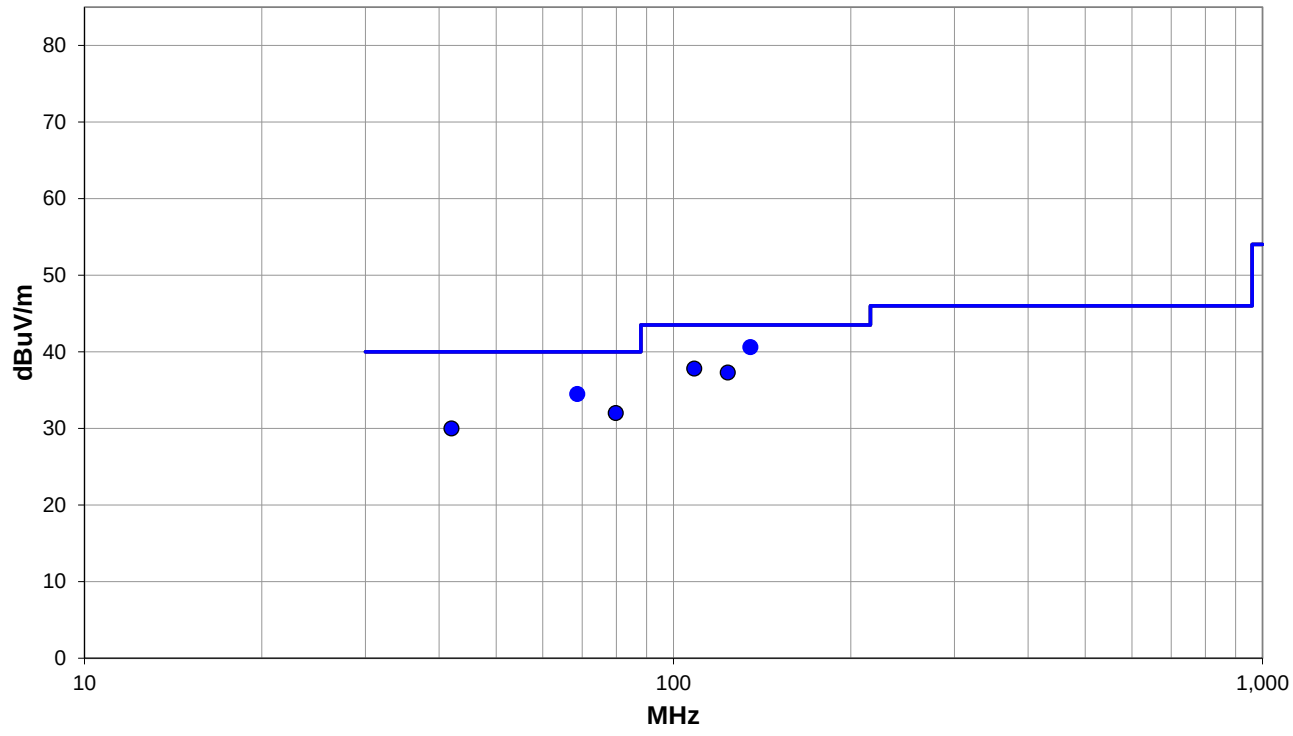
None

EUT OPERATING MODES

RFID in continuous transmit at 13.56 MHz.

DEVIATIONS FROM TEST STANDARD

None



Run #: 15 ■ PK ◆ AV ● QP

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30 MHZ)

element
WTD.2022.02.22.0
EmiR5 2022.03.10.0
PSA-ESCI 2022.1.12.0

RESULTS - Run #15

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
135.046	61.7	-31.6	1.0	66.0	10.0	0.0	Vert	QP	10.5	40.6	43.5	-2.9	EUT Horz
68.655	56.0	-32.0	1.95	300.0	10.0	0.0	Vert	QP	10.5	34.5	40.0	-5.5	EUT Horz
108.472	57.8	-30.5	1.2	108.0	10.0	0.0	Vert	QP	10.5	37.8	43.5	-5.7	EUT Horz
123.633	58.3	-31.5	1.0	257.0	10.0	0.0	Vert	QP	10.5	37.3	43.5	-6.2	EUT Horz
79.756	54.3	-32.8	1.0	56.0	10.0	0.0	Vert	QP	10.5	32.0	40.0	-8.0	EUT Horz
41.984	48.0	-28.5	1.0	344.0	10.0	0.0	Vert	QP	10.5	30.0	40.0	-10.0	EUT Horz

CONCLUSION

Pass

Tested By

End of Test Report