



Entrust Corporation
PB8500 DOD Module (Slingshot)

FCC 15.225:2021
13.56 MHz Radio

Report: DTCD0085.1, Issue Date: December 1, 2021



CERTIFICATE OF TEST

Last Date of Test: July 19, 2021
Entrust Corporation
EUT: PB8500 DOD Module (Slingshot)

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2021	ANSI C63.10:2013
FCC 15.209:2021	
FCC 15.225:2021	

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.4	Field Strength of Fundamental	Yes	Pass	
6.4	Field Strength of Spurious Emissions (Less Than 30 MHz)	Yes	Pass	
6.5	Field Strength of Spurious Emissions (Greater Than 30 MHz)	Yes	Pass	
6.8	Frequency Stability	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Eric Brandon, Department 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](#)

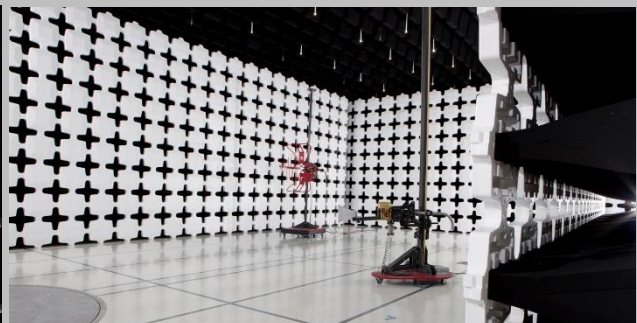
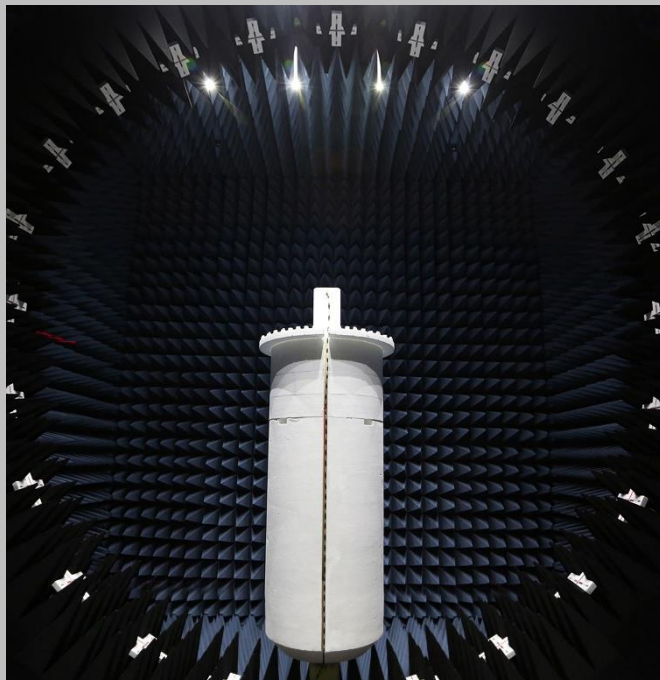
[Texas](#)

[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.

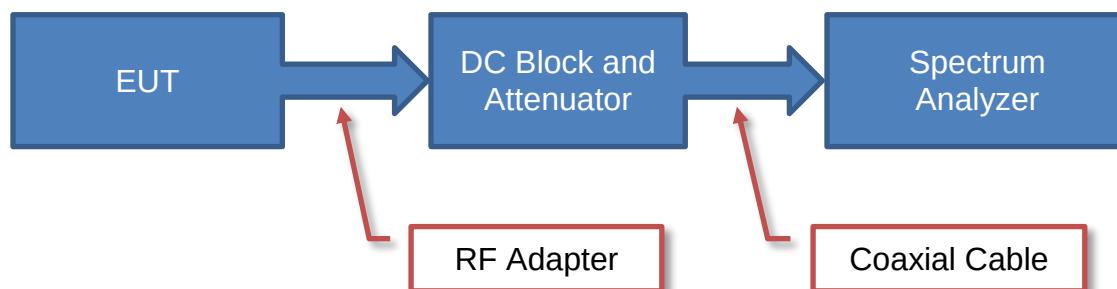
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific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

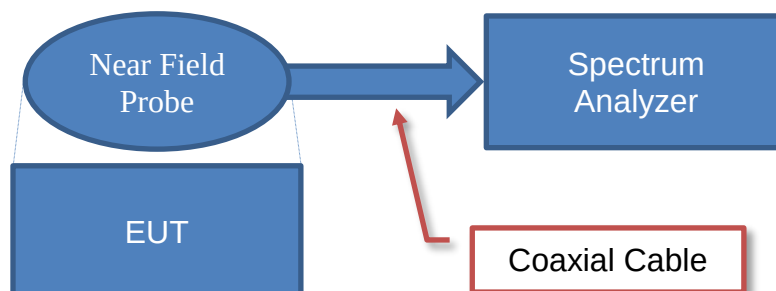
Antenna Port Conducted Measurements



Sample Calculation

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

Near Field Test Fixture Measurements

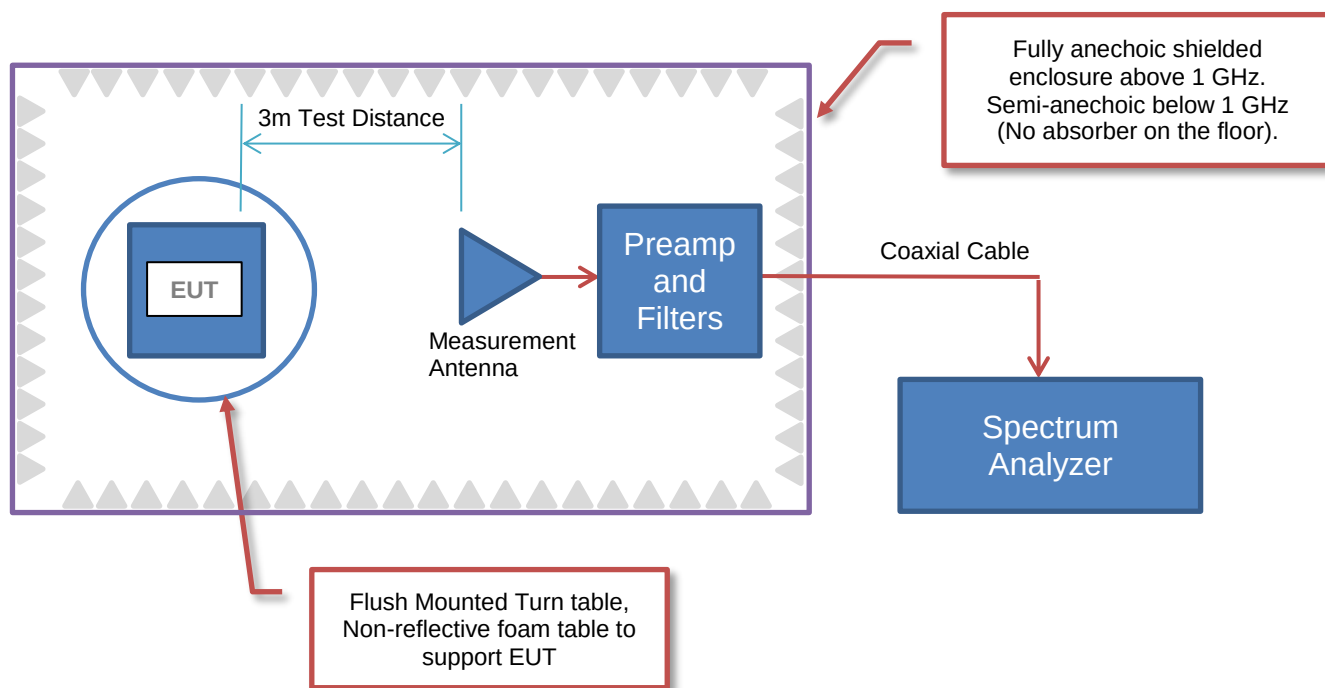


Sample Calculation

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

TEST SETUP BLOCK DIAGRAMS

Spurious Radiated Emissions



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:	PB8500 DOD Module (Slingshot)
First Date of Test:	July 13, 2021
Last Date of Test:	July 19, 2021
Receipt Date of Samples:	July 12, 2021
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Card Printer incorporating RFID module
Testing Objective:
To demonstrate compliance to FCC Part 15.225 specifications.

CONFIGURATIONS

Configuration DTCD0085- 6

Software/Firmware Running during test	
Description	Version
Transmitter Update	v1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Card Printer, (incorporating RFID module)	Entrust Corporation	PB8500 DOD Module (Slingshot)	112

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
iFume, Fume extraction System	Purex	1704132	016032

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Main AC Power	No	3.3m	No	AC Mains	Card Printer, (incorporating RFID module)
AC Power	No	2.4m	No	AC Mains	Card Printer, (incorporating RFID module)
AC Power	No	2.4m	No	AC Mains	Card Printer, (incorporating RFID module)
AC Power	No	1.0m	No	Card Printer, (incorporating RFID module)	iFume, Fume extraction System

CONFIGURATIONS

Configuration DTCD0085- 7

Software/Firmware Running during test	
Description	Version
Transmitter Update	v1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Card Printer, (incorporating RFID module)	Entrust Corporation	PB8500 DOD Module (Slingshot)	112

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Main AC Power	No	3.3m	No	AC Mains	Card Printer, (incorporating RFID module)
AC Power	No	2.4m	No	AC Mains	Card Printer, (incorporating RFID module)
AC Power	No	2.4m	No	AC Mains	Card Printer, (incorporating RFID module)

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-07-13	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	2021-07-15	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.
3	2021-07-16	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.
4	2021-07-19	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2021-07-19	Field Strength of Spurious Emissions (Less Than 30 MHz)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWER SETTINGS



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)
Circular PCB loop antenna with 4 turns, and a diameter of 35mm	Manufacturer	~13.54 MHz	Unknown

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

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Gauss Instruments	TDEMI 30M	ARK	2020-10-27	2021-10-27
LISN	Solar Electronics	9252-50-R-24-BNC	LIQ	2020-09-28	2021-09-28
LISN	Solar Electronics	9252-50-R-24-BNC	LIO	2020-09-28	2021-09-28
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	2021-03-10	2022-03-10

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.2 dB	-3.2 dB

CONFIGURATIONS INVESTIGATED

DTCD0085-1

MODES INVESTIGATED

All purpose exerciser with air purifier.

POWERLINE CONDUCTED EMISSIONS

EUT:	PB8500 DOD Module (Slingshot)	Work Order:	DTCD0085
Serial Number:	112	Date:	2021-07-13
Customer:	Entrust Corporation	Temperature:	22.6°C
Attendees:	Craig Jacobsen	Relative Humidity:	54.5%
Customer Project:	None	Bar. Pressure (PMSL):	1017 mb
Tested By:	Dan Haas	Job Site:	MN03
Power:	208VAC/60Hz	Configuration:	DTCD0085-1

TEST SPECIFICATIONS

Specification: Equipment Class B FCC 15.207:2021	Method: ANSI C63.4:2014
---	----------------------------

TEST PARAMETERS

Run #:	22	Line:	Neutral	Add. Ext. Attenuation (dB):	0
--------	----	-------	---------	-----------------------------	---

COMMENTS

DoD Main AC cable tested.

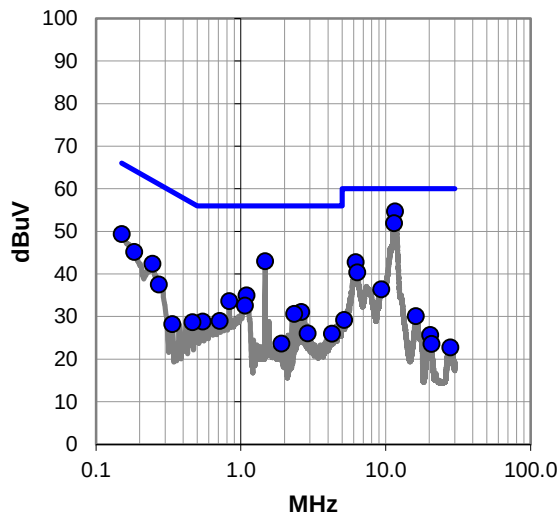
EUT OPERATING MODES

All purpose exerciser with air purifier.

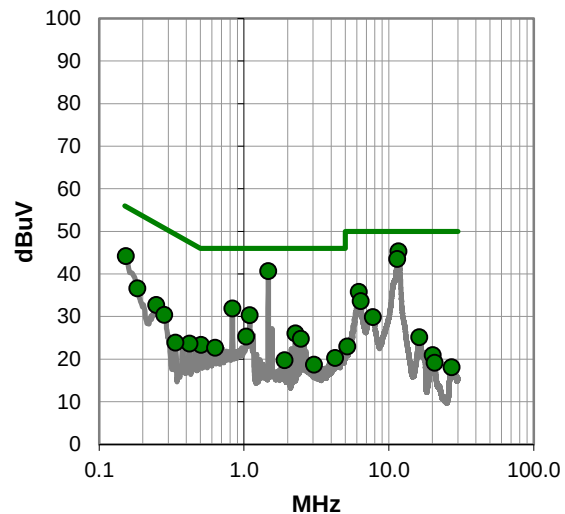
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #22

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.584	33.6	21.1	54.7	60.0	-5.3
11.431	30.8	21.1	51.9	60.0	-8.1
1.470	22.5	20.5	43.0	56.0	-13.0
0.150	28.7	20.7	49.4	66.0	-16.6
6.188	22.1	20.7	42.8	60.0	-17.2
0.183	24.6	20.6	45.2	64.3	-19.1
0.245	21.9	20.5	42.4	61.9	-19.5
6.344	19.7	20.7	40.4	60.0	-19.6
1.096	14.6	20.4	35.0	56.0	-21.0
0.830	13.2	20.4	33.6	56.0	-22.4
1.065	12.2	20.4	32.6	56.0	-23.4
0.271	17.2	20.3	37.5	61.1	-23.6
9.324	15.5	20.9	36.4	60.0	-23.6
2.614	10.5	20.6	31.1	56.0	-24.9
2.331	10.0	20.6	30.6	56.0	-25.4
0.713	8.6	20.4	29.0	56.0	-27.0
0.545	8.5	20.3	28.8	56.0	-27.2
0.462	8.4	20.3	28.7	56.7	-28.0
16.171	8.7	21.4	30.1	60.0	-29.9
2.895	5.5	20.6	26.1	56.0	-29.9
4.254	5.4	20.6	26.0	56.0	-30.0
5.165	8.6	20.6	29.2	60.0	-30.8
0.335	7.9	20.3	28.2	59.3	-31.1
1.906	3.2	20.5	23.7	56.0	-32.3
20.239	4.0	21.7	25.7	60.0	-34.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.625	24.2	21.1	45.3	50.0	-4.7
1.470	20.2	20.5	40.7	46.0	-5.3
11.434	22.4	21.1	43.5	50.0	-6.5
0.153	23.6	20.6	44.2	55.8	-11.6
0.830	11.5	20.4	31.9	46.0	-14.1
6.183	15.1	20.7	35.8	50.0	-14.2
1.096	9.9	20.4	30.3	46.0	-15.7
6.381	12.9	20.7	33.6	50.0	-16.4
0.183	16.0	20.6	36.6	54.3	-17.7
0.247	12.2	20.5	32.7	51.8	-19.1
2.260	5.5	20.6	26.1	46.0	-19.9
7.762	9.1	20.8	29.9	50.0	-20.1
0.281	10.1	20.3	30.4	50.8	-20.4
1.032	4.9	20.4	25.3	46.0	-20.7
2.472	4.2	20.6	24.8	46.0	-21.2
0.503	3.1	20.3	23.4	46.0	-22.6
0.630	2.4	20.3	22.7	46.0	-23.3
0.420	3.4	20.3	23.7	47.5	-23.8
16.217	3.8	21.4	25.2	50.0	-24.8
0.336	3.6	20.3	23.9	49.3	-25.4
4.254	-0.3	20.6	20.3	46.0	-25.7
1.906	-0.7	20.5	19.8	46.0	-26.2
5.166	2.4	20.6	23.0	50.0	-27.0
3.038	-1.9	20.6	18.7	46.0	-27.3
20.117	-0.7	21.7	21.0	50.0	-29.0

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	PB8500 DOD Module (Slingshot)	Work Order:	DTCD0085
Serial Number:	112	Date:	2021-07-13
Customer:	Entrust Corporation	Temperature:	22.6°C
Attendees:	Craig Jacobsen	Relative Humidity:	54.5%
Customer Project:	None	Bar. Pressure (PMSL):	1017 mb
Tested By:	Dan Haas	Job Site:	MN03
Power:	208VAC/60Hz	Configuration:	DTCD0085-1

TEST SPECIFICATIONS

Specification: Equipment Class B FCC 15.207:2021	Method: ANSI C63.4:2014
---	----------------------------

TEST PARAMETERS

Run #:	23	Line:	High Line	Add. Ext. Attenuation (dB):	0
--------	----	-------	-----------	-----------------------------	---

COMMENTS

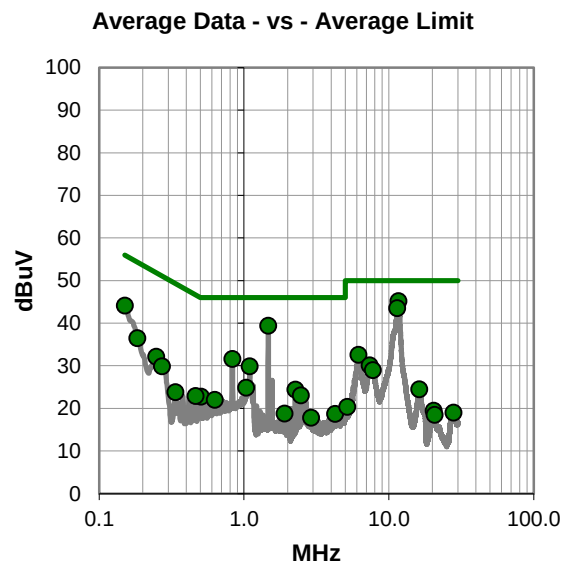
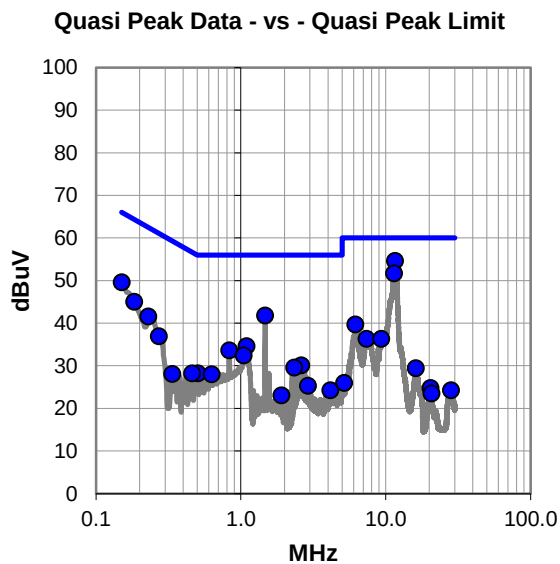
DoD Main AC cable tested.

EUT OPERATING MODES

All purpose exerciser with air purifier.

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #23

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.588	33.5	21.1	54.6	60.0	-5.4
11.413	30.6	21.1	51.7	60.0	-8.3
1.470	21.3	20.5	41.8	56.0	-14.2
0.150	28.9	20.7	49.6	66.0	-16.4
0.183	24.4	20.6	45.0	64.3	-19.3
6.180	19.0	20.7	39.7	60.0	-20.3
0.229	21.1	20.5	41.6	62.5	-20.9
1.096	14.2	20.4	34.6	56.0	-21.4
0.830	13.2	20.4	33.6	56.0	-22.4
1.046	12.0	20.4	32.4	56.0	-23.6
7.362	15.5	20.8	36.3	60.0	-23.7
9.318	15.4	20.9	36.3	60.0	-23.7
0.271	16.6	20.3	36.9	61.1	-24.2
2.614	9.5	20.6	30.1	56.0	-25.9
2.331	9.0	20.6	29.6	56.0	-26.4
0.503	7.9	20.3	28.2	56.0	-27.8
0.628	7.7	20.3	28.0	56.0	-28.0
0.460	7.9	20.3	28.2	56.7	-28.5
16.159	8.0	21.4	29.4	60.0	-30.6
2.896	4.7	20.6	25.3	56.0	-30.7
0.335	7.8	20.3	28.1	59.3	-31.2
4.149	3.7	20.6	24.3	56.0	-31.7
1.908	2.6	20.5	23.1	56.0	-32.9
5.167	5.4	20.6	26.0	60.0	-34.0
20.371	3.1	21.7	24.8	60.0	-35.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.624	24.1	21.1	45.2	50.0	-4.8
11.436	22.4	21.1	43.5	50.0	-6.5
1.470	18.9	20.5	39.4	46.0	-6.6
0.150	23.4	20.7	44.1	56.0	-11.9
0.830	11.2	20.4	31.6	46.0	-14.4
1.096	9.5	20.4	29.9	46.0	-16.1
6.181	11.9	20.7	32.6	50.0	-17.4
0.183	15.9	20.6	36.5	54.3	-17.8
0.247	11.6	20.5	32.1	51.8	-19.7
7.362	9.3	20.8	30.1	50.0	-19.9
7.764	8.2	20.8	29.0	50.0	-21.0
1.032	4.5	20.4	24.9	46.0	-21.1
0.271	9.6	20.3	29.9	51.1	-21.2
2.260	3.8	20.6	24.4	46.0	-21.6
2.472	2.5	20.6	23.1	46.0	-22.9
0.503	2.5	20.3	22.8	46.0	-23.2
0.462	2.6	20.3	22.9	46.7	-23.8
0.628	1.7	20.3	22.0	46.0	-24.0
0.335	3.5	20.3	23.8	49.3	-25.5
16.181	3.1	21.4	24.5	50.0	-25.5
1.906	-1.7	20.5	18.8	46.0	-27.2
4.254	-1.9	20.6	18.7	46.0	-27.3
2.896	-2.8	20.6	17.8	46.0	-28.2
5.169	-0.2	20.6	20.4	50.0	-29.6
20.372	-2.2	21.7	19.5	50.0	-30.5

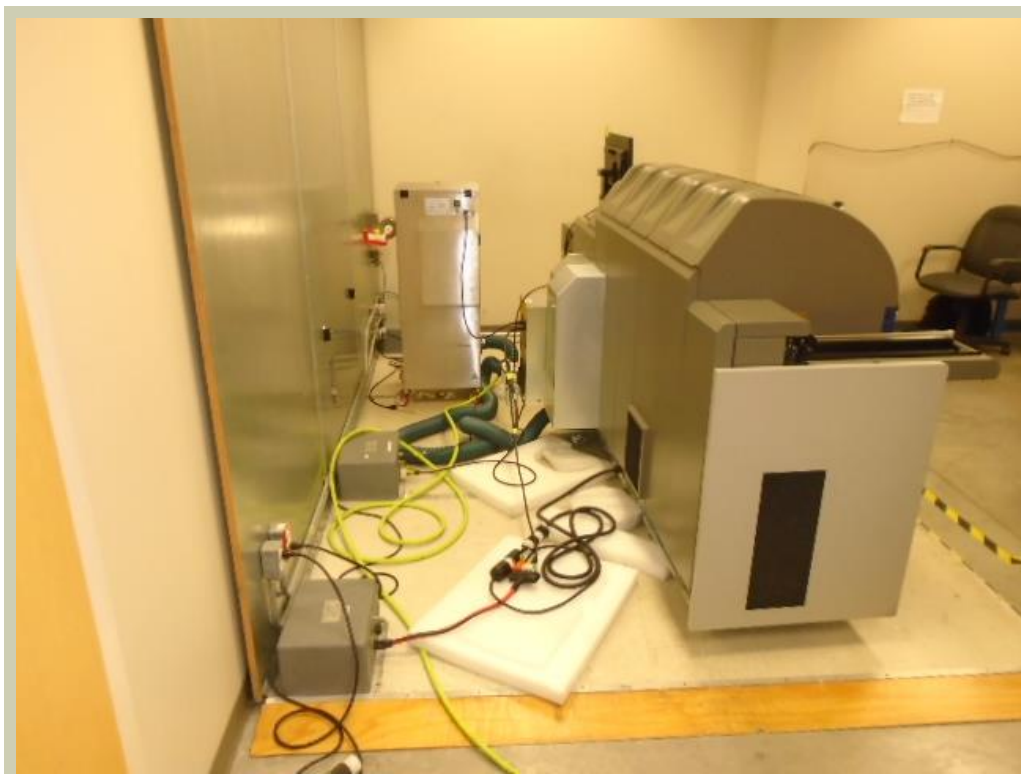
CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS



FIELD STRENGTH OF FUNDAMENTAL



PSA-ESCI 2021.03.17.0

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

MODES OF OPERATION

All 5 RFID radios transmitting at 13.56 MHz sequentially, one at a time.

POWER SETTINGS INVESTIGATED

230VAC/50Hz

CONFIGURATIONS INVESTIGATED

DTCD0085 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency | 9 kHz | Stop Frequency | 30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Loop	ETS Lindgren	6502	AOB	2021-06-01	2023-06-01
Cable	ESM Cable Corp.	MN04 Bilog Cables	MND	2021-02-02	2022-02-02
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

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

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

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

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

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

FIELD STRENGTH OF FUNDAMENTAL

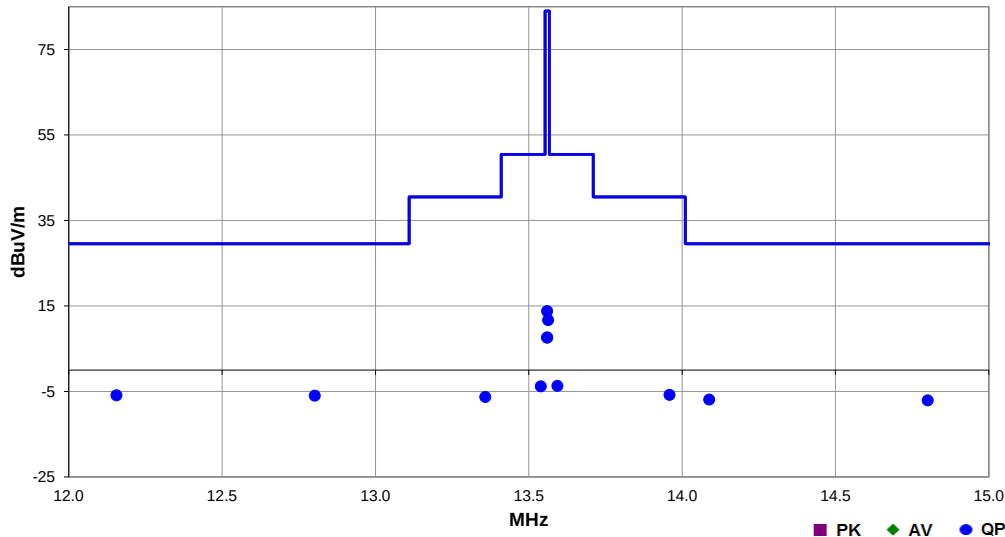


EmiRS 2021.06.24.0 PSA-ESCI 2021.03.17.0

Work Order:	DTCD0085	Date:	2021-07-19	 Tested by: Dan Haas, Christopher Heintzelman
Project:	None	Temperature:	22.1 °C	
Job Site:	MN04	Humidity:	54.7% RH	
Serial Number:	112	Barometric Pres.:	1025 mbar	
EUT:	PB8500 DOD Module (Slingshot)			
Configuration:	6			
Customer:	Entrust Corporation			
Attendees:	Jeff Aymond			
EUT Power:	230VAC/50Hz			
Operating Mode:	All 5 RFID radios transmitting at 13.56 MHz sequentially, one at a time.			
Deviations:	None			
Comments:	See comments for antenna orientation. Due to hardware/firmware limitations it is not possible for the EUT to have more than 1 RFID radio transmitting at a time.			

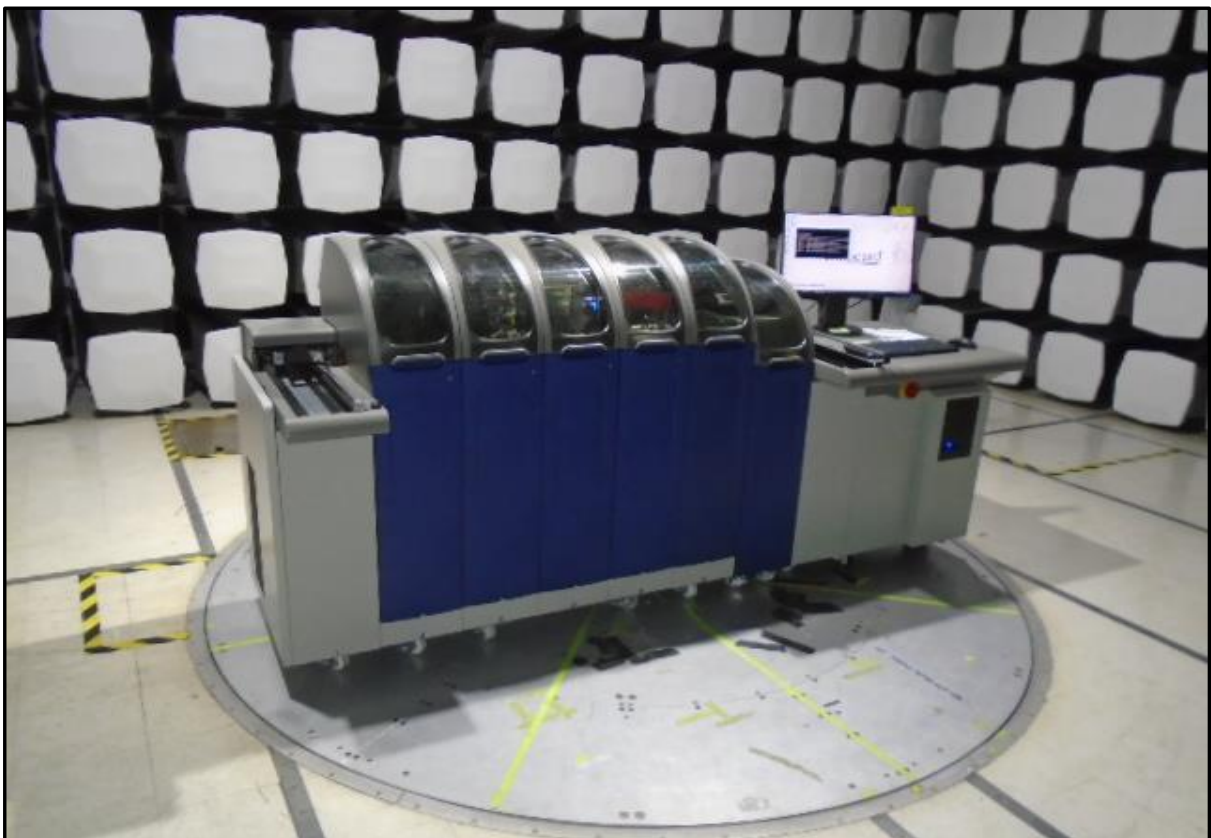
Test Specifications	Test Method
FCC 15.225:2021	ANSI C63.10:2013

Run #	38	Test Distance (m)	10	Antenna Height(s)	1(m)	Results	Pass
-------	----	-------------------	----	-------------------	------	---------	------

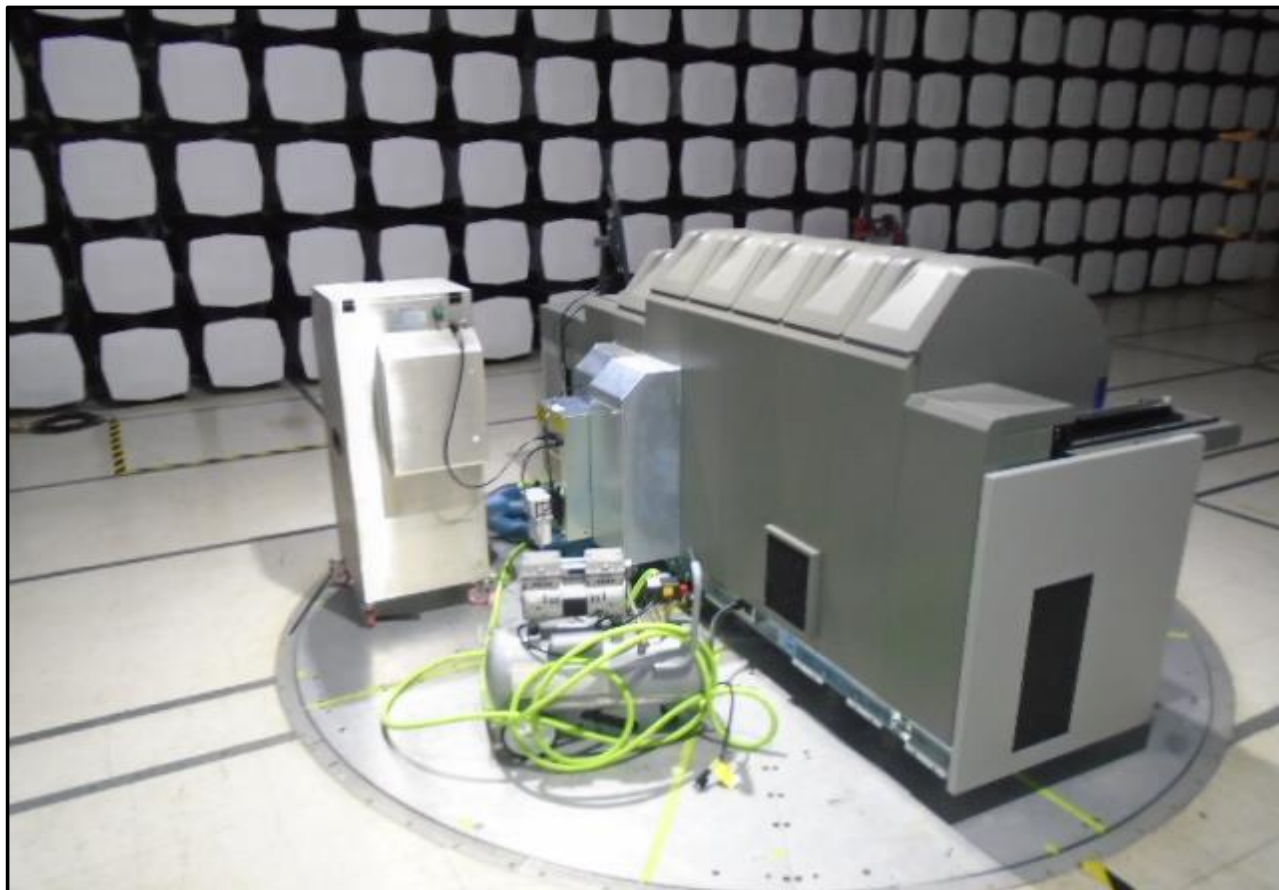


Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
12.155	2.1	11.1	1.0	198.0	10.0	0.0	Horz	QP	-19.1	-5.9	29.5	-35.4	Antenna perpendicular to EUT, perpendicular to GND plane.
12.802	2.0	11.1	1.0	201.0	10.0	0.0	Horz	QP	-19.1	-6.0	29.5	-35.5	Antenna perpendicular to EUT, perpendicular to GND plane.
14.088	1.2	11.0	1.0	275.0	10.0	0.0	Horz	QP	-19.1	-6.9	29.5	-36.4	Antenna perpendicular to EUT, perpendicular to GND plane.
14.801	1.0	11.0	1.0	167.0	10.0	0.0	Horz	QP	-19.1	-7.1	29.5	-36.6	Antenna perpendicular to EUT, perpendicular to GND plane.
13.959	2.3	11.0	1.0	284.0	10.0	0.0	Horz	QP	-19.1	-5.8	40.5	-46.3	Antenna perpendicular to EUT, perpendicular to GND plane.
13.358	1.7	11.1	1.0	220.0	10.0	0.0	Horz	QP	-19.1	-6.3	40.5	-46.8	Antenna perpendicular to EUT, perpendicular to GND plane.
13.594	4.4	11.0	1.0	279.0	10.0	0.0	Horz	QP	-19.1	-3.7	50.5	-54.2	Antenna perpendicular to EUT, perpendicular to GND plane.
13.539	4.3	11.0	1.0	293.0	10.0	0.0	Horz	QP	-19.1	-3.8	50.5	-54.3	Antenna perpendicular to EUT, perpendicular to GND plane.
13.560	21.9	11.0	1.0	270.0	10.0	0.0	Vert	QP	-19.1	13.8	84.0	-70.2	Antenna perpendicular to EUT, perpendicular to GND plane.
13.563	19.8	11.0	1.0	292.0	10.0	0.0	Horz	QP	-19.1	11.7	84.0	-72.3	Antenna perpendicular to EUT, perpendicular to GND plane.
13.560	15.7	11.0	1.0	270.0	10.0	0.0	Horz	QP	-19.1	7.6	84.0	-76.4	Antenna perpendicular to EUT, parallel to GND plane.
13.560	15.7	11.0	1.0	315.0	10.0	0.0	Vert	QP	-19.1	7.6	84.0	-76.4	Antenna parallel to EUT, perpendicular to GND plane.

FIELD STRENGTH OF FUNDAMENTAL



FIELD STRENGTH OF FUNDAMENTAL



FREQUENCY STABILITY



XMIT 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Thermometer	Omega Engineering, Inc.	HH311	DUB	2020-10-05	2023-10-05
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPH-32-3.5-SCT/AC	TBF	NCR	NCR
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Meter - Multimeter	Fluke	115	MBE	2020-02-26	2023-02-26
Block - DC	Fairview Microwave	SD3379	AMZ	2020-11-04	2021-11-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2020-09-14	2021-09-14
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	2020-12-27	2021-12-27

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



TSTx 2021.03.19.1 XMR 2020.12.30.0

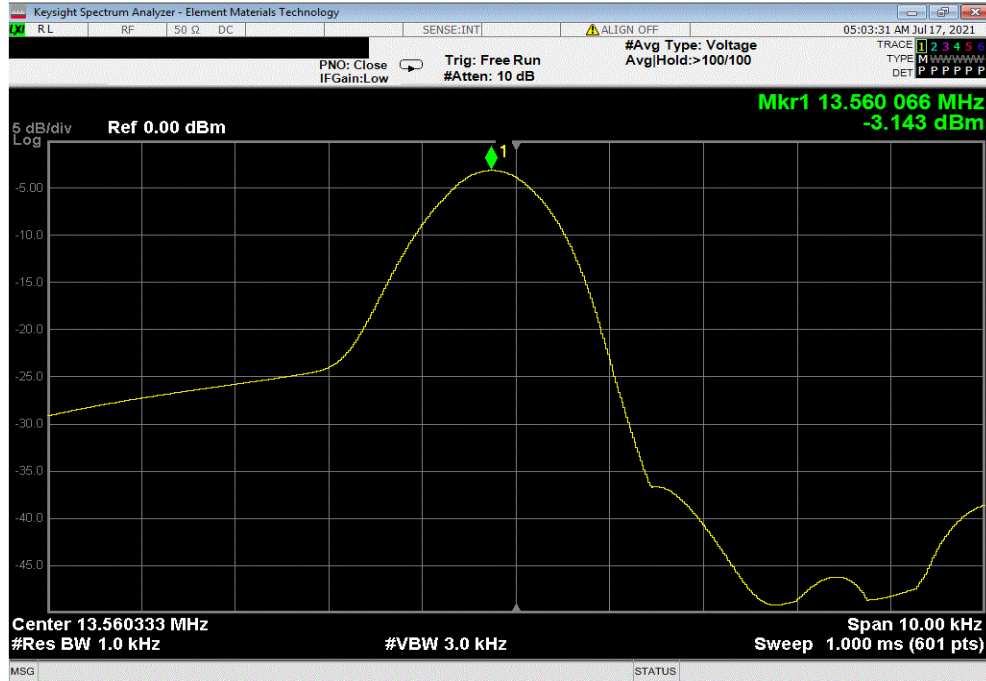
EUT: PB8500 DOD Module (Slingshot)		Work Order: DTCD0085	
Serial Number: 112		Date: 16-Jul-21	
Customer: Entrust Corporation		Temperature: 22.3 °C	
Attendees: Craig Jacobsen		Humidity: 50.9% RH	
Project: None		Barometric Pres.: 1019 mbar	
Tested by: Andrew Rogstad	Power: 208VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.225:2021		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	7	Signature <i>Andrew Rogstad</i>	
		Measured Value (MHz)	Assigned Value (MHz)
+50C		13.56006633	13.56
+40C		13.56008333	13.56
+30C		13.5601	13.56
+20C; Nominal Voltage		13.56011667	13.56
+20C; +15% Voltage		13.56011667	13.56
+20C; -15% Voltage		13.56011633	13.56
+10C		13.56013333	13.56
0C		13.56011667	13.56
-10C		13.560083	13.56
-20C		13.560033	13.56
		Error (ppm)	Limit (ppm)
		4.9	100
		6.2	100
		7.4	100
		8.6	100
		8.6	100
		8.6	100
		9.8	100
		8.6	100
		6.1	100
		2.4	100
			Results
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass

FREQUENCY STABILITY

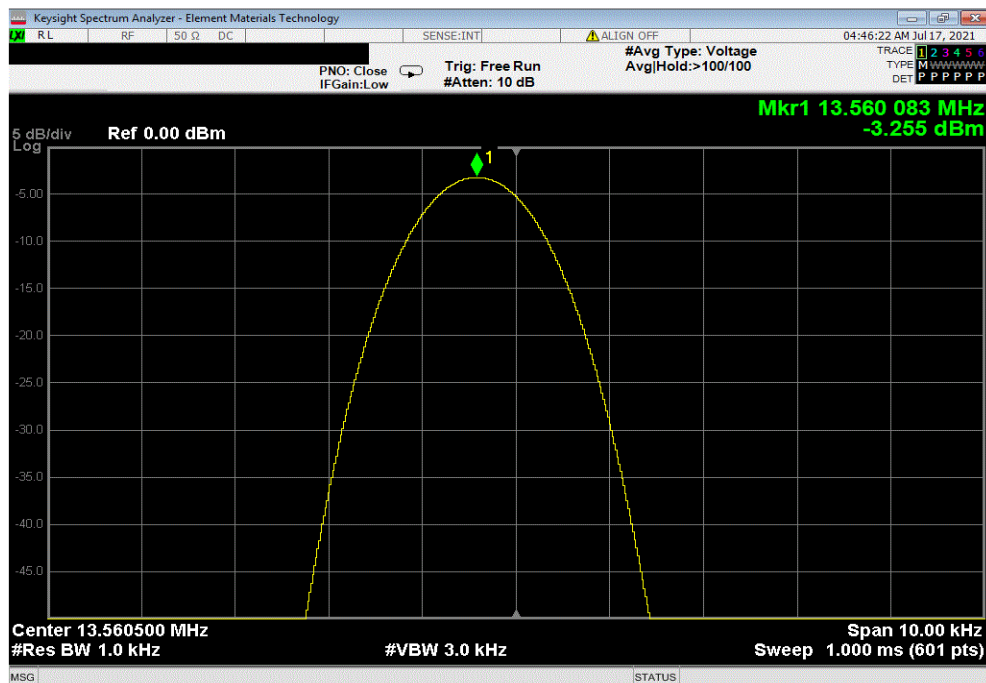


TbTx 2021.03.19.1 XMt 2020.12.30.0

+50C						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.56006633	13.56	4.9	100	Pass	



+40C						
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
	13.56008333	13.56	6.2	100	Pass	



ThyTx 2021.02.19.1 YMit 2020.12.30.4

Keysight Spectrum Analyzer - Element Materials Technology

RL RF 50 Ω DC SENSE:INT ALIGN OFF 05:32:24 AM Jul 17, 2021

PNO: Close IFGain:Low Trig: Free Run #Atten: 10 dB #Avg Type: Voltage Avg|Hold:>100/100

TRACE 1 2 3 4 5 6 TYPE: M-ANALOG DET: P P P P P P

5 dB/div Log Ref 0.00 dBm

Mkr1 13.560 100 MHz -3.359 dBm

Center 13.560500 MHz #Res BW 1.0 kHz #VBW 3.0 kHz Span 10.00 kHz Sweep 1.000 ms (601 pts)

Keysight Spectrum Analyzer - Element Materials Technology

RL RF 50 Ω DC SENSE:INT ALIGN OFF 05:52:16 AM Jul 17, 2021

PNO: Close IFGain:Low Trig: Free Run #Atten: 10 dB #Avg Type: Voltage Avg|Hold:>100/100

TRACE 1 2 3 4 5 6 TYPE M MAX/MIN DET P P P P P P

5 dB/div Log Ref 0.00 dBm

Mkr1 13.560 117 MHz -3.433 dBm

Center 13.560500 MHz #Res BW 3.0 kHz Span 10.00 kHz Sweep 1.000 ms (601 pts)

MSG STATUS

Keysight Spectrum Analyzer - Element Materials Technology

RL RF 50 Ω DC SENSE:INT

ALIGN OFF

05:56:19 AM Jul 17, 2021

TRACE 1 2 3 4 5 6
TYPE M W W W W W W W W W
DET P P P P P P P

PNO: Close IF Gain: Low Trig: Free Run #Atten: 10 dB

#Avg Type: Voltage Avg|Hold:>100/100

5 dB/div Log Ref 0.00 dBm

Mkr1 13.560 117 MHz -3.441 dBm

Center 13.560500 MHz
#Res BW 1.0 kHz #VBW 3.0 kHz

Span 10.00 kHz
Sweep 1.000 ms (601 pts)

MSG STATUS

Keysight Spectrum Analyzer - Element Materials Technology

RL RF 50 Ω DC SENSE:INT ALIGN OFF 05:57:24 AM Jul 17, 2021

PNO: Close IFGain: Low Trig: Free Run #Atten: 10 dB #Avg Type: Voltage Avg|Hold:>100/100

TRACE 1 2 3 4 5 6 TYPE M W W W W W W W DET P P P P P P P

5 dB/div Log Ref 0.00 dBm

Mkr1 13.560 116 MHz -3.441 dBm

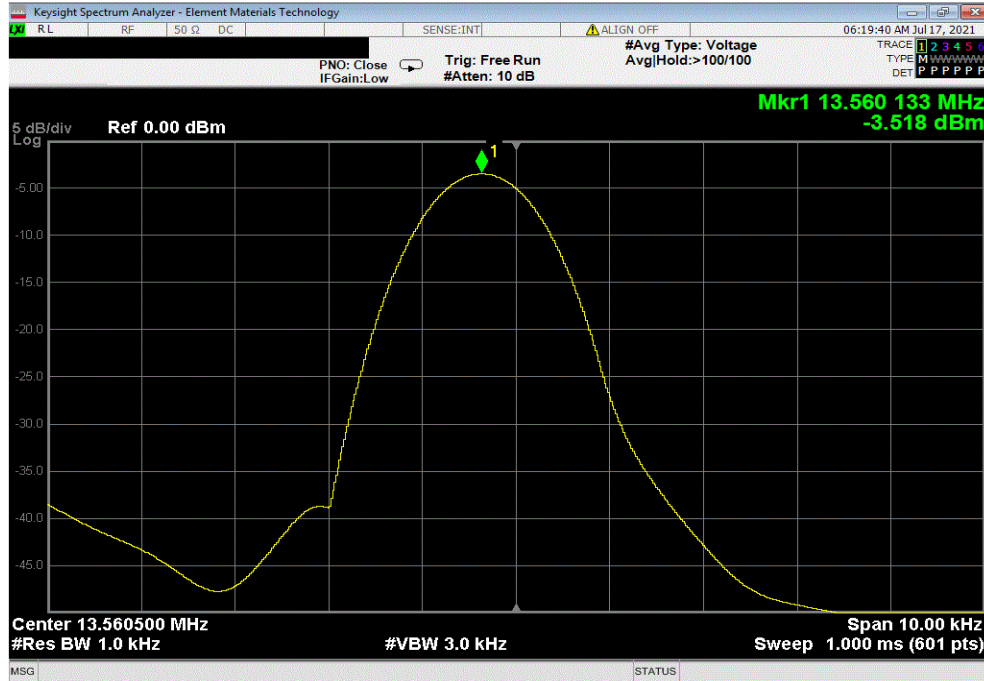
Center 13.560333 MHz #Res BW 1.0 kHz #VBW 3.0 kHz Span 10.00 kHz Sweep 1.000 ms (601 pts)

FREQUENCY STABILITY

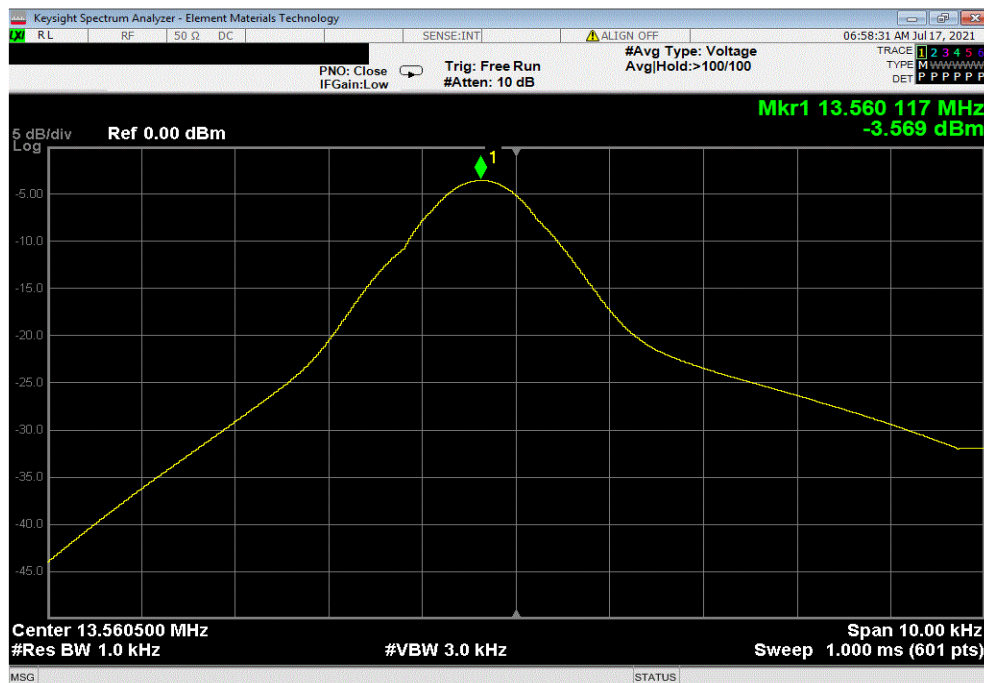


TMTx 2021.03.19.1 XMR 2020.12.30.0

+10C					
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
	13.56013333	13.56	9.8	100	Pass



0C					
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
	13.56011667	13.56	8.6	100	Pass



Keysight Spectrum Analyzer - Element Materials Technology

RL RF 50 Ω DC SENSE:INT

ALIGN OFF 07:20:43 AM Jul 17, 2021

#Avg Type: Voltage Avg|Hold:>100/100

Trig: Free Run #Atten: 10 dB

PNO: Close IF Gain: Low

TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P P P P P P P

5 dB/div Log Ref 0.00 dBm

Mkr1 13.560 083 MHz -3.627 dBm

Center 13.560333 MHz #Res BW 1.0 kHz #VBW 3.0 kHz Span 10.00 kHz Sweep 1.000 ms (601 pts)

MSG STATUS

Keysight Spectrum Analyzer - Element Materials Technology

RL RF 50 Ω DC SENSE:INT ALIGN OFF 08:04:59 AM Jul 17, 2021

PNO: Close IFGain:Low Trig: Free Run #Atten: 10 dB #Avg Type: Voltage Avg|Hold:>100/100

TRACE 1 2 3 4 5 6 TYPE M W A W M W M W DET P P P P P P

5 dB/div Log Ref 0.00 dBm

Mkr1 13.560 033 MHz -3.798 dBm

Center 13.560333 MHz #Res BW 1.0 kHz #VBW 3.0 kHz Span 10.00 kHz Sweep 1.000 ms (601 pts)

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)



PSA-ESCI 2021.03.17.0

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

MODES OF OPERATION

All 5 RFID radios transmitting at 13.56 MHz sequentially, one at a time.

POWER SETTINGS INVESTIGATED

208VAC/60Hz

CONFIGURATIONS INVESTIGATED

DTCD0085 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	30 MHz
-----------------	-------	----------------	--------

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	ESM Cable Corp.	MN04 Bilog Cables	MND	2021-02-02	2022-02-02
Antenna - Loop	ETS Lindgren	6502	AOB	2021-06-01	2023-06-01
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

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

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

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

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

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

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

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

FIELD STRENGTH OF SPURIOUS EMISSIONS (LESS THAN 30 MHz)

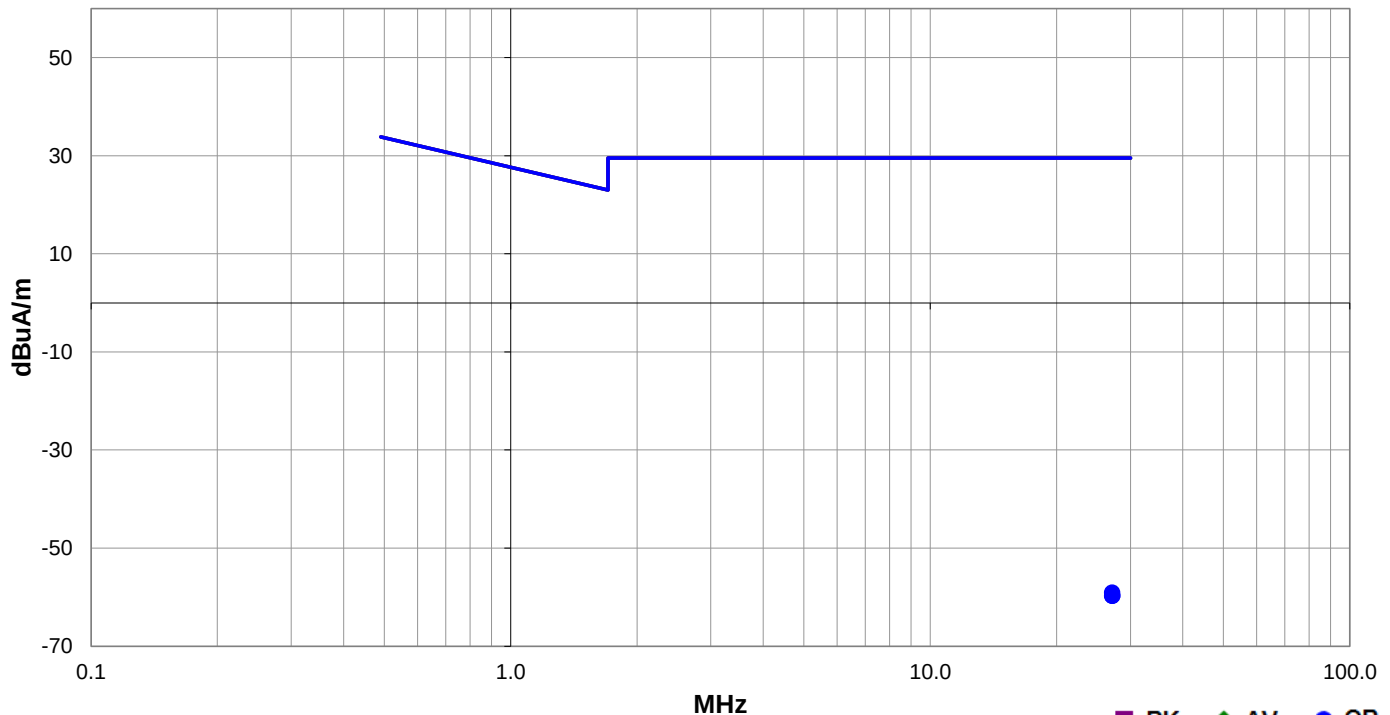


EmiR5 2021.06.24.0

PSA-ESCI 2021.03.17.0

Work Order:	DTCD0085	Date:	2021-07-19	
Project:	None	Temperature:	22 °C	
Job Site:	MN04	Humidity:	55.3% RH	
Serial Number:	112	Barometric Pres.:	1025 mbar	
EUT:	PB8500 DOD Module (Slingshot)			Tested by: Dan Haas
Configuration:	6			
Customer:	Entrust Corporation			
Attendees:	Jeff Aymond			
EUT Power:	208VAC/60Hz			
Operating Mode:	All 5 RFID radios transmitting at 13.56 MHz sequentially, one at a time.			
Deviations:	None			
Comments:	Due to hardware/firmware limitations it is not possible for the EUT to have more than 1 RFID radio transmitting at a time.			

Test Specifications				Test Method		
FCC 15.209:2021				ANSI C63.10:2013		
Run #	43	Test Distance (m)	10	Antenna Height(s)	1(m)	Results Pass



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 (dBuA/m)	Spec. Limit (dBuA/m)	Compared to Spec. (dB)
27.123	2.0	-42.0	1.0	360.0	10.0	0.0	Perp to EUT	QP	-19.1	-59.1	29.5	-88.6
27.143	1.4	-42.0	1.0	360.0	10.0	0.0	Par to GND	QP	-19.1	-59.7	29.5	-89.2
27.156	1.4	-42.0	1.0	159.0	10.0	0.0	Par to EUT	QP	-19.1	-59.7	29.5	-89.2

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30 MHZ)



PSA-ESCI 2021.03.17.0

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

MODES OF OPERATION

All 5 RFID radios transmitting at 13.56 MHz sequentially, one at a time.

POWER SETTINGS INVESTIGATED

208VAC/60Hz

CONFIGURATIONS INVESTIGATED

DTCD0085 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	1000 MHz
-----------------	--------	----------------	----------

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Amplifier - Pre-Amplifier	Miteq	AM-1551	PAC	2021-06-17	2022-06-17
Antenna - Biconilog	ETS Lindgren	3142D	AXN	2019-11-22	2021-11-22
Cable	ESM Cable Corp.	MN04 Bilog Cables	MND	2021-02-02	2022-02-02

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

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

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

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

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

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

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

FIELD STRENGTH OF SPURIOUS EMISSIONS (GREATER THAN 30 MHz)



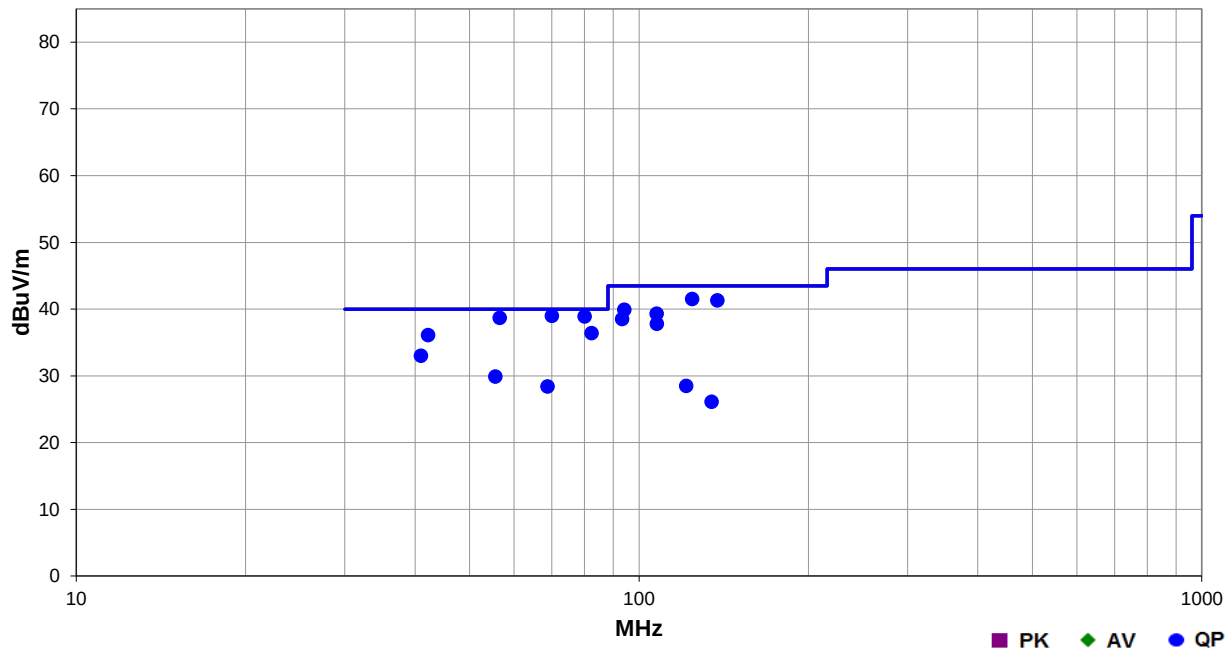
EmiR5 2021.06.24.0

PSA-ESCI 2021.03.17.0

Work Order:	DTCD0085	Date:	2021-07-15	
Project:	None	Temperature:	22.3 °C	
Job Site:	MN04	Humidity:	51.4% RH	
Serial Number:	112	Barometric Pres.:	1018 mbar	
EUT:		PB8500 DOD Module (Slingshot)		
Configuration:	6			
Customer:	Entrust Corporation			
Attendees:	Craig Jacobsen			
EUT Power:	208VAC/60Hz			
Operating Mode:	All 5 RFID radios transmitting at 13.56 MHz sequentially, one at a time.			
Deviations:	None			
Comments:	Due to hardware/firmware limitations it is not possible for the EUT to have more than 1 RFID radio transmitting at a time.			

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

Run #	21	Test Distance (m)	10	Antenna Height(s)	1 to 4(m)	Results	Pass
--------------	----	--------------------------	----	--------------------------	-----------	----------------	------



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)
70.003	60.6	-32.1	3.6	94.0	10.0	0.0	Horz	QP	10.5	39.0	40.0	-1.0
80.035	61.1	-32.7	4.0	114.0	10.0	0.0	Horz	QP	10.5	38.9	40.0	-1.1
56.565	60.3	-32.1	1.0	345.0	10.0	0.0	Vert	QP	10.5	38.7	40.0	-1.3
124.253	62.9	-31.9	3.7	45.0	10.0	0.0	Horz	QP	10.5	41.5	43.5	-2.0
137.782	62.5	-31.7	4.0	193.0	10.0	0.0	Horz	QP	10.5	41.3	43.5	-2.2
82.360	58.3	-32.4	1.8	139.0	10.0	0.0	Vert	QP	10.5	36.4	40.0	-3.6
94.157	60.6	-31.2	1.1	284.0	10.0	0.0	Vert	QP	10.5	39.9	43.5	-3.6
42.165	54.4	-28.8	3.5	229.0	10.0	0.0	Horz	QP	10.5	36.1	40.0	-3.9
107.490	59.5	-30.7	1.0	104.0	10.0	0.0	Vert	QP	10.5	39.3	43.5	-4.2
93.286	59.3	-31.3	4.0	311.0	10.0	0.0	Horz	QP	10.5	38.5	43.5	-5.0
107.512	58.0	-30.7	4.0	80.0	10.0	0.0	Horz	QP	10.5	37.8	43.5	-5.7
40.973	50.8	-28.3	1.0	249.0	10.0	0.0	Vert	QP	10.5	33.0	40.0	-7.0
55.538	51.4	-32.0	3.6	267.0	10.0	0.0	Horz	QP	10.5	29.9	40.0	-10.1
68.737	50.0	-32.1	2.4	129.0	10.0	0.0	Vert	QP	10.5	28.4	40.0	-11.6
121.281	49.7	-31.7	1.0	164.0	10.0	0.0	Vert	QP	10.5	28.5	43.5	-15.0
134.576	47.5	-31.9	1.0	253.0	10.0	0.0	Vert	QP	10.5	26.1	43.5	-17.4

End of Test Report