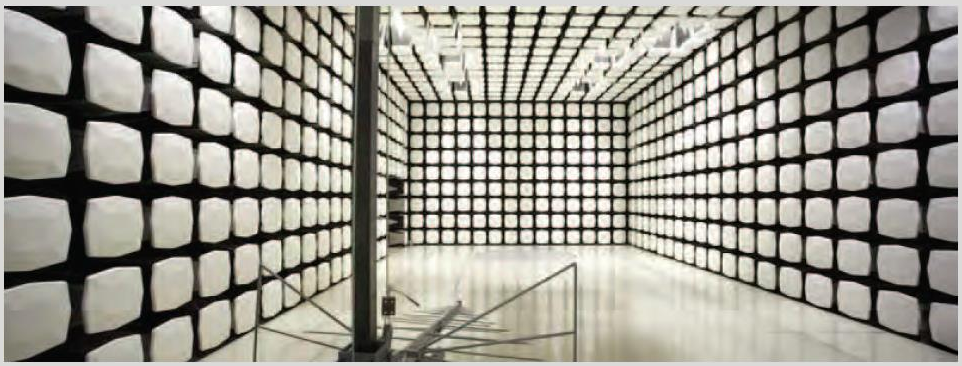
Descartes Systems (USA) LLC

PLT003

EN 301 489-17 V3.2.4:2020-09

Bluetooth Radio

Report: DESC0001.5 Rev. 1, Issue Date: July 27, 2022



ACCREDITED
CERT #3310.02

CERTIFICATE OF TEST

Last Date of Test: June 10, 2022
Descartes Systems (USA) LLC
EUT: PLT003

Emissions

Standards

Specification	Method
EN 301 489-17 V3.2.4:2020-09	EN 301 489-1 V2.2.3:2019-11

Results

Test Description	Specification Section(s)	Method Section(s)	Result	Comments
Radiated Emissions	7.1	8.2	Pass	
Radiated Emissions High Frequency	7.1	8.2	Pass	
Conducted Emissions DC Power	7.1	8.3	N/A	Not required unless the EUT is powered directly by DC (vehicle, DC power network, etc) or by an AC adapter with a DC input cable greater than 3m.
Conducted Emissions	7.1	8.4	N/A	Not required for a battery powered EUT.
Telecom Conducted Emissions	7.1	8.7	N/A	Not required for an EUT without a telecom port.
Harmonic Current Emissions	7.1	8.5	N/A	Not required for a battery powered EUT.
Voltage Fluctuations and Flicker	7.1	8.6	N/A	Not required for a battery powered EUT.

Details on the application of the performance criteria, as well as any manufacturer provided performance criteria or acceptable degradation of performance, are all contained within the report.

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.

CERTIFICATE OF TEST

Last Date of Test: June 10, 2022
Descartes Systems (USA) LLC
EUT: PLT003

Immunity

Standards

Specification	Method
EN 301 489-17 V3.2.4:2020-09	EN 301 489-1 V2.2.3:2019-11

Results

Test Description	Specification Section(s)	Method Section(s)	Standard Specified	Observed Criteria	Comments
Radiated Immunity	7.2	9.2	B	A	
Electrostatic Discharge (ESD)	7.2	9.3	B	A	
Electrical Fast Transients and Bursts (EFT)	7.2	9.4	B	N/A	Not required for a battery powered EUT.
Conducted Immunity	7.2	9.5	B	N/A	Not required for a battery powered EUT.
Transients And Surges In The Vehicular Environment	7.2	9.6	N/A	N/A	Not required unless the EUT is powered by a vehicle.
Voltage Interruptions	7.2	9.7	C	N/A	Not required for a battery powered EUT.
Voltage Dips	7.2	9.7	B/C	N/A	Not required for a battery powered EUT.
Surge	7.2	9.8	B	N/A	Not required for a battery powered EUT.

Details on the application of the performance criteria, as well as any manufacturer provided performance criteria or acceptable degradation of performance, are all contained within the report.

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
01	Updated testing objective	2022-07-27	10

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

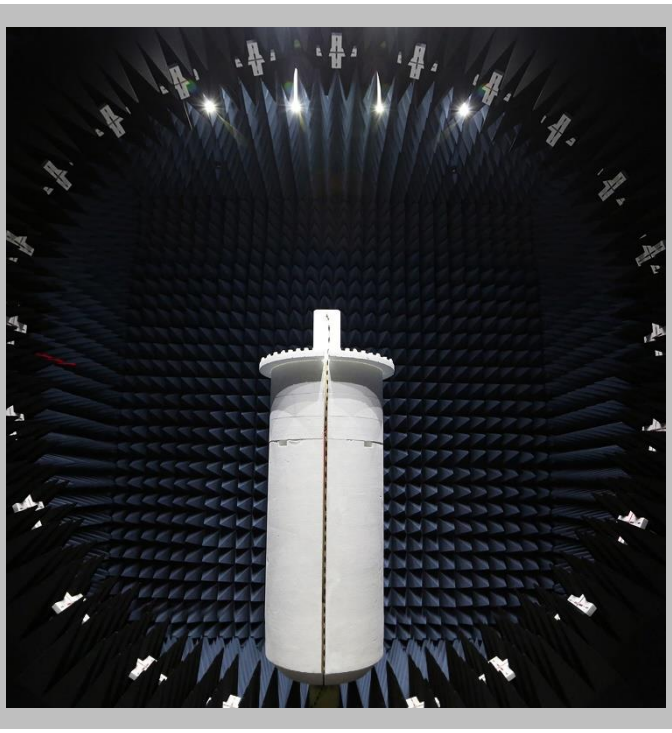
For details on the Scopes of our Accreditations, please visit:

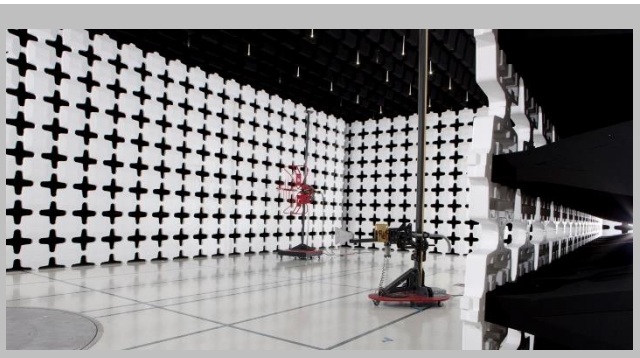
California Minnesota Oregon Texas Washington

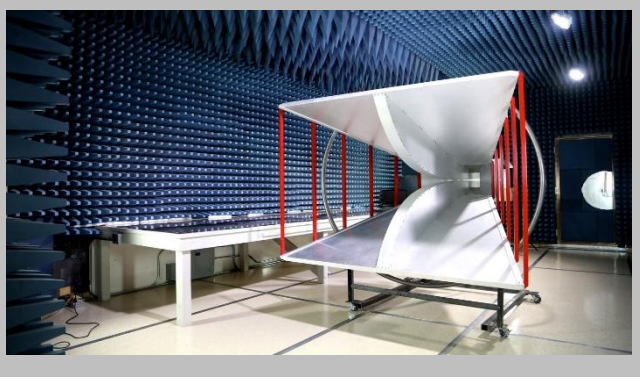
FACILITIES

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







EMISSIONS MEASUREMENTS

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

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

Measurements were made using the bandwidths and detectors specified. No video filter was used.

Sample Calculations

Radiated Emissions:

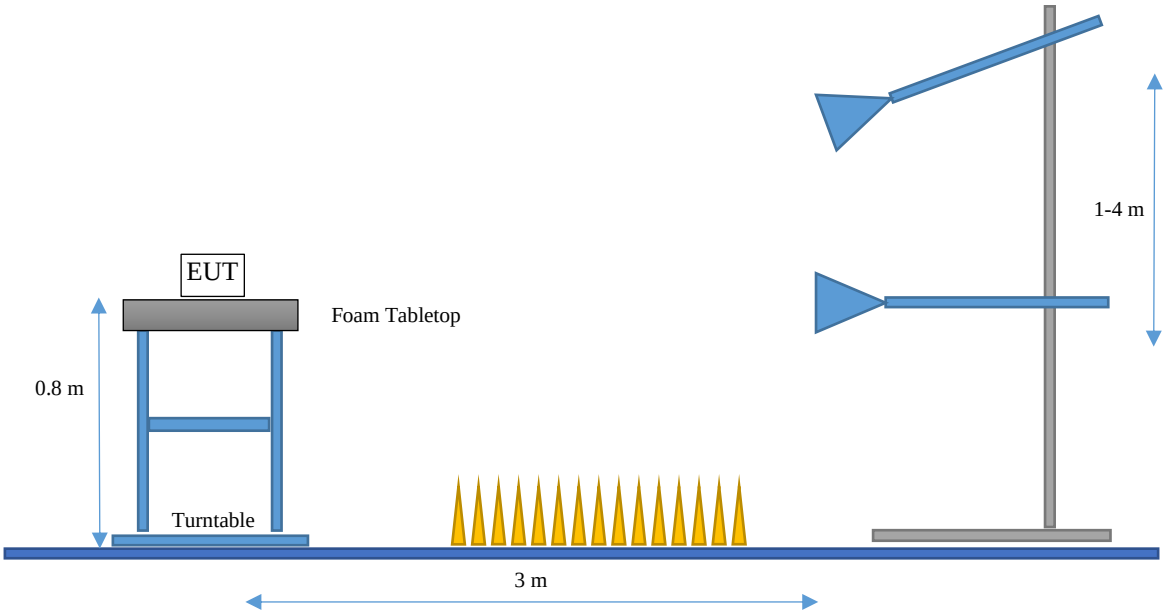
Measured Level (Amplitude)		Factor: Antenna Factor		Factor: Cable Factor		Factor: Amplifier Gain		Distance Adjustment Factor		External Attenuation		Field Strength
42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0	=	**33.5**

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**

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.



EXPLANATION OF ELEMENT PERFORMANCE CRITERIA

How Important Is It To Understand Performance Criteria?

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this quote were agreed upon by the client, prior to testing. It is the responsibility of the test laboratory to observe the performance of the equipment under test (EUT) and to accurately report those results. The test specification may define the acceptable performance criteria, but in the absence of this the manufacturer has the obligation to express the performance criteria in terms which relate to the performance of its specific product when used as intended, typically based on what the product data sheet or product specification defines.

Examples of functions defined by the manufacturer to be evaluated during testing include, but are not limited to, the following:

- Essential operational modes and states;
- Tests of all peripheral access (hard disks, LAN, printers, keyboard, mouse, etc.);
- Quality of software execution;
- Quality of data display and transmission;
- Quality of speech transmission;
- Any separate “Error” condition mode; ie, it can be a bigger risk that a function happens when it is not supposed to. Both intended operation and error conditions should be considered and tested.
- Ensuring that a radio transmitter continues to transmit and data/speech is not corrupted (additional details provided in the appropriate ETSI EN standard).
- Radio equipment with standby mode(s) of operation. ie, if a radio is supposed to be “idle/standing by” and an EMC test causes the device to transmit when it is not supposed to which triggers an event. See applicable EN 301 489 standard for details;

There is additional guidance related to this concept located in EUANB TGN 34 (section 4). The variety and the diversity of the apparatus within the scope of the EMC Directive make it difficult to define precise criteria for the evaluation of the immunity test results for every product. The manufacturer should consider the risks of not testing a mode or configuration and having potential problems when the device reaches the end-user. Additional testing does add cost, but it can be far cheaper than having to issue a product recall or selling a device that does not work in the real world due to EMC issues.

If a product specific specification is provided that defines a precise performance criterion, this will be used as the basis of the performance assessment. If we are not provided a test plan or a generic performance is defined in the test standard, we will use the following:

- Performance Criteria A
  - The EUT exhibited no change in performance when operating as intended. In this case no changes were observed during the test.
- Performance Criteria B
  - The EUT exhibited a change in performance when operating as intended. In this case the equipment returned to previous operation without any operator intervention, once the test stimulus was removed.
- Performance Criteria C
  - The EUT exhibited a change in performance when operating as intended. In this case the equipment required some operator intervention in order to return to previous operation.
- Performance Criteria D (if applicable)
  - The EUT exhibited a change in performance when operating as intended. In this case the equipment appears to have been damaged and would not recover.

If we are provided a test plan or information detailing the precise criteria for evaluating the test results, we will use that information and reference it as part of the test data.

PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Descartes Systems (USA) LLC
Address:	37 N Orange Ave #500
City, State, Zip:	Orlando, FL 32801
Test Requested By:	Maria Vivas
EUT:	PLT003
First Date of Test:	March 9, 2022
Last Date of Test:	June 10, 2022
Receipt Date of Samples:	March 9, 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:
Bluetooth Low Energy (BLE) tag used to monitor movement of goods and equipment. Each tag is made up of an Nordic nRF52810-QCAA module encased in a housing. Also included is three lithium cell batteries. It is adverting each 10 seconds

Testing Objective:
To demonstrate compliance of the Bluetooth radio to Article 3.1(b) of the RED

CONFIGURATIONS

Configuration DESC0001- 4

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
BLE Beacon Tag	COREInsight	PLT003	4

Configuration DESC0001- 10

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
BLE Beacon Tag	COREInsight	PLT003	E4:83:DF:05:8B:CA

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Reader	COREInsight	Reader	9A54BAD98DE8CD1AEA7-62B3

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-03-09	Radiated 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	2022-03-09	Radiated Emissions High Frequency	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	2022-06-10	Electrostatic Discharge (ESD)	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	2022-06-10	Radiated Immunity	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level was detected. This required the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search was utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT. Tests were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance was 3 meters or 10 meters (from antenna to boundary of EUT). At any measurement distance, the antenna height was varied from 1 meter to 4 meters. These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna was increased so that the lowest point of the bottom of the antenna cleared the ground surface by at least 25 cm.

The EUT arrangement is configured as equivalent to that occurring in normal use. Tabletop equipment is placed on a 0.8 meter high non-conductive table & for Floor-standing equipment, it is placed on, but insulated from a ground reference plane by the use of its own rollers or stand-off supports. If measurements above 1 GHz were required, the test setup was modified to meet the regulatory requirements for higher frequency measurements. If required, RF absorber was placed on the floor between the measurement antenna and EUT. If required, per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables.

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.

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
Spectrum Analyzer	Agilent	E4443A	AFB	2021-08-01	2022-08-01
Cable	None	10m Test Distance Cable	EVL	2021-11-30	2022-11-30
Pre-Amplifier	Fairview Microwave	FMAM63001	PAY	2022-02-02	2023-02-02
Antenna - Biconilog	EMCO	3141	AXG	2021-08-13	2023-08-13

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.8 dB	-3.8 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 1000 MHz

POWER INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

DESC0001-4

MODES INVESTIGATED

Continuous TX BLE 2402MHz

RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

EUT:	PLT003	Work Order:	DESC0001
Serial Number:	4	Date:	2022-03-09
Customer:	Descartes Systems (USA) LLC	Temperature:	20.5°C
Attendees:	None	Relative Humidity:	37.7%
Customer Project:	None	Bar. Pressure (PMSL):	1025 mb
Tested By:	Kam Robertson	Job Site:	EV11
Power:	Battery	Configuration:	DESC0001-4

TEST SPECIFICATIONS

Specification: Equipment Class B	Method:
EN 301 489-17 V3.2.4:2020-09	EN 301 489-1 V2.2.3:2019-11

TEST PARAMETERS

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

COMMENTS

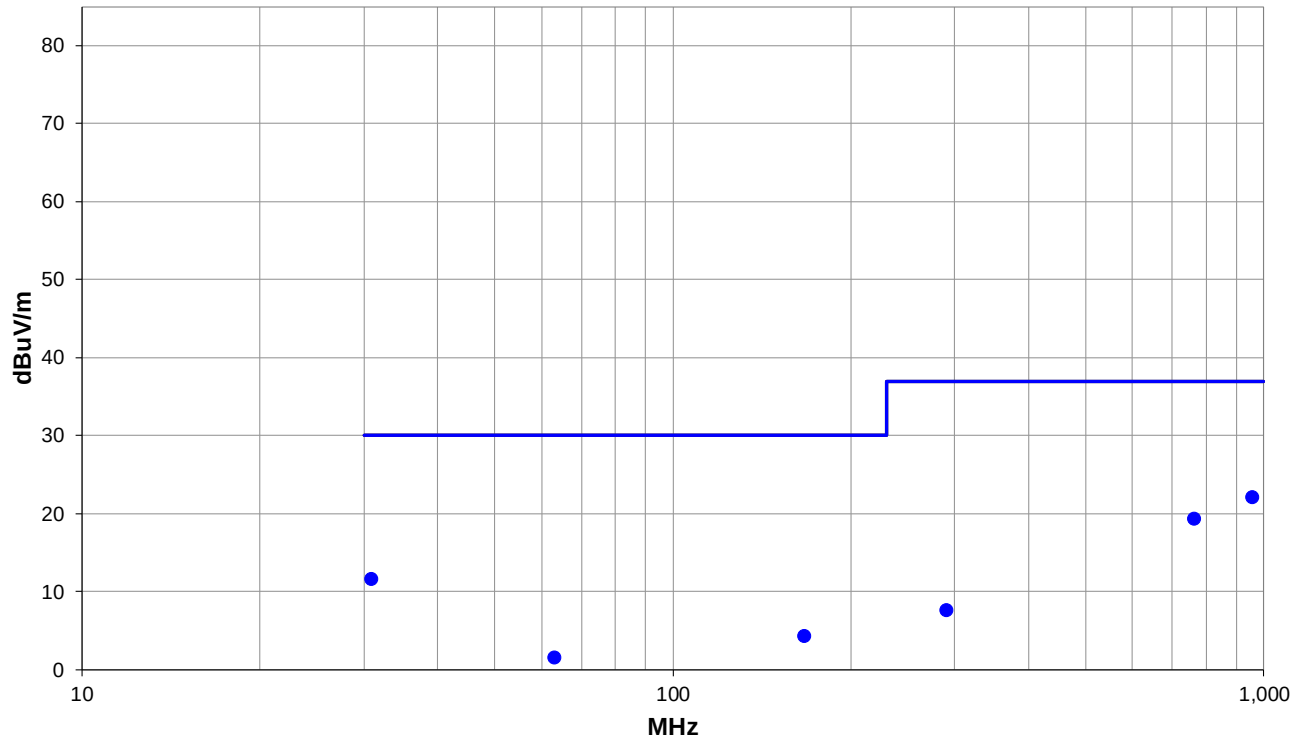
None

EUT OPERATING MODES

Continuous TX BLE 2402MHz

DEVIATIONS FROM TEST STANDARD

None



Run #: 1 ■ PK ◆ AV ● QP

RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

RESULTS - Run #1

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)
959.454	28.5	-6.5	1.5	63.0	10.0	0.0	Vert	QP	0.0	22.0	37.0	-15.0
764.732	29.2	-9.9	2.13	26.0	10.0	0.0	Horz	QP	0.0	19.3	37.0	-17.7
30.929	30.3	-18.8	1.5	57.0	10.0	0.0	Horz	QP	0.0	11.5	30.0	-18.5
166.932	29.9	-25.7	2.8	127.0	10.0	0.0	Vert	QP	0.0	4.2	30.0	-25.8
63.171	30.2	-28.7	1.0	30.0	10.0	0.0	Horz	QP	0.0	1.5	30.0	-28.5
290.970	29.9	-22.3	3.58	238.0	10.0	0.0	Horz	QP	0.0	7.6	37.0	-29.4

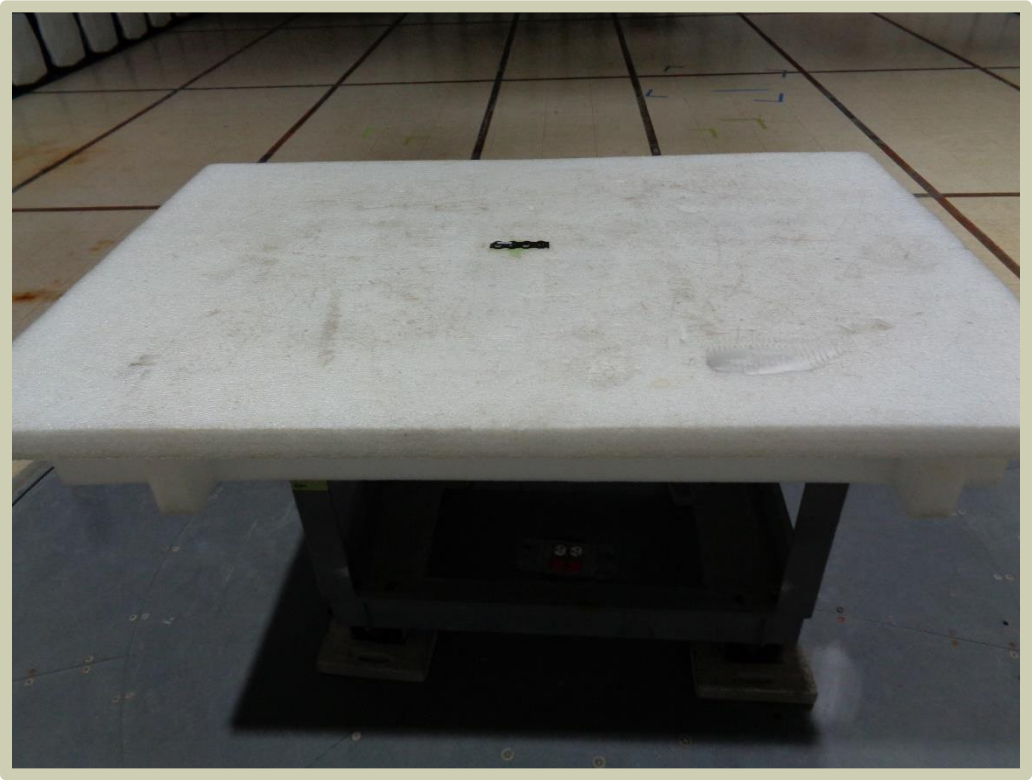
CONCLUSION

Pass

Tested By

RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0



RADIATED EMISSIONS HIGH FREQUENCY

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level was detected. This required the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search was utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT. Tests were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance was 3 meters or 10 meters (from antenna to boundary of EUT). At any measurement distance, the antenna height was varied from 1 meter to 4 meters. These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna was increased so that the lowest point of the bottom of the antenna cleared the ground surface by at least 25 cm.

The EUT arrangement is configured as equivalent to that occurring in normal use. Tabletop equipment is placed on a 0.8 meter high non-conductive table & for Floor-standing equipment, it is placed on, but insulated from a ground reference plane by the use of its own rollers or stand-off supports. If measurements above 1 GHz were required, the test setup was modified to meet the regulatory requirements for higher frequency measurements. If required, RF absorber was placed on the floor between the measurement antenna and EUT. If required, per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables.

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.

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
Spectrum Analyzer	Agilent	N9010A	AFI	2021-12-09	2022-12-09
Antenna - Double Ridge	EMCO	3115	AHC	2020-07-01	2022-07-01
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	2021-11-17	2022-11-17
Cable	N/A	Dble Ridge Horn Cables	EVB	2022-02-15	2023-02-15

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

FREQUENCY RANGE INVESTIGATED

1 GHz TO 6 GHz

POWER INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

DESC0001-4

MODES INVESTIGATED

Continuous TX BLE 2402MHz

RADIATED EMISSIONS HIGH FREQUENCY

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

EUT:	PLT003	Work Order:	DESC0001
Serial Number:	4	Date:	2022-03-09
Customer:	Descartes Systems (USA) LLC	Temperature:	20.6°C
Attendees:	None	Relative Humidity:	37.7%
Customer Project:	None	Bar. Pressure (PMSL):	1025 mb
Tested By:	Kam Robertson	Job Site:	EV01
Power:	Battery	Configuration:	DESC0001-4

TEST SPECIFICATIONS

Specification: Equipment Class B	Method:
EN 301 489-17 V3.2.4:2020-09	EN 301 489-1 V2.2.3:2019-11

TEST PARAMETERS

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

COMMENTS

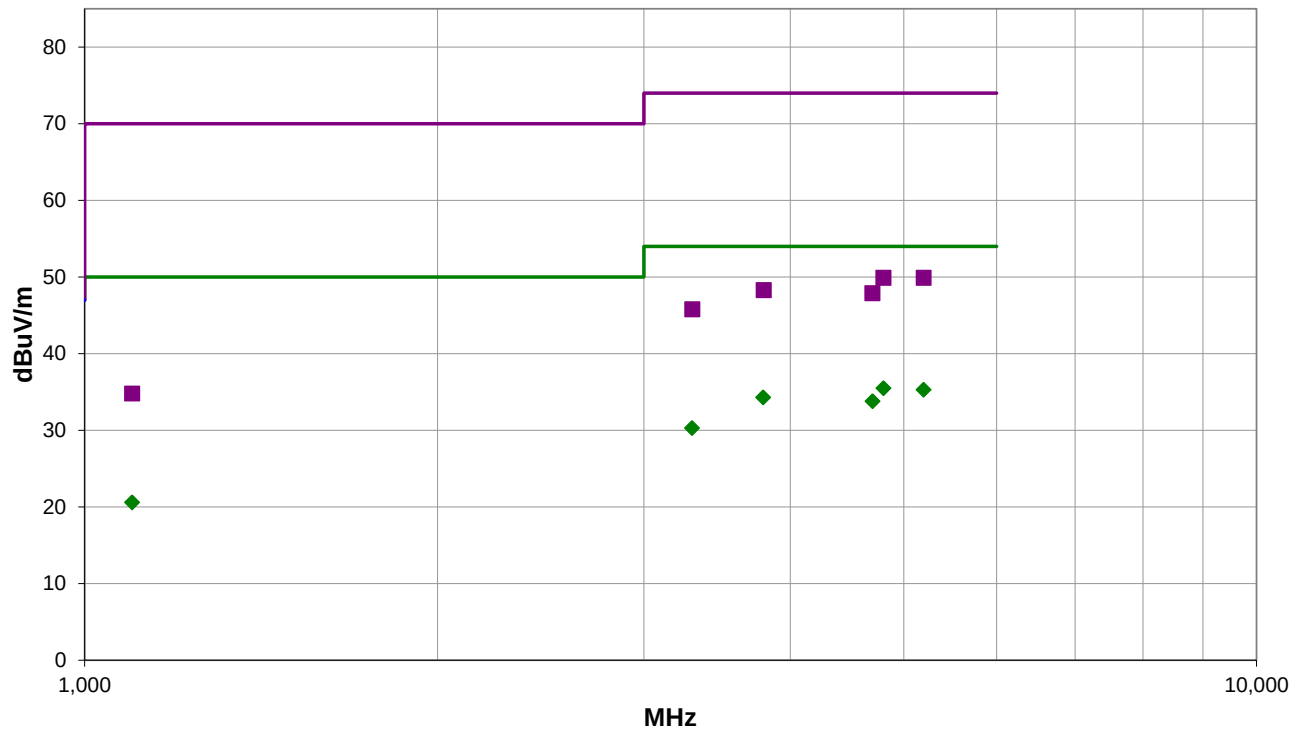
None

EUT OPERATING MODES

Continuous TX BLE 2402MHz

DEVIATIONS FROM TEST STANDARD

None



Run #: 4 ■ PK ◆ AV ● QP

RADIATED EMISSIONS HIGH FREQUENCY

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
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)
4804.300	27.3	8.2	1.2	289.0	3.0	0.0	Vert	AV	0.0	35.5	54.0	-18.5
5198.192	25.9	9.4	1.0	143.0	3.0	0.0	Horz	AV	0.0	35.3	54.0	-18.7
3792.667	27.1	7.2	1.2	306.0	3.0	0.0	Vert	AV	0.0	34.3	54.0	-19.7
4702.308	25.9	7.9	1.0	200.0	3.0	0.0	Horz	AV	0.0	33.8	54.0	-20.2
3297.958	26.1	4.2	2.26	233.0	3.0	0.0	Horz	AV	0.0	30.3	54.0	-23.7
4804.267	41.7	8.2	1.2	289.0	3.0	0.0	Vert	PK	0.0	49.9	74.0	-24.1
5199.242	40.5	9.4	1.0	143.0	3.0	0.0	Horz	PK	0.0	49.9	74.0	-24.1
3796.875	41.1	7.2	1.2	306.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7
4700.983	40.0	7.9	1.0	200.0	3.0	0.0	Horz	PK	0.0	47.9	74.0	-26.1
3299.750	41.6	4.2	2.26	233.0	3.0	0.0	Horz	PK	0.0	45.8	74.0	-28.2
1097.542	27.7	-7.1	1.0	16.0	3.0	0.0	Horz	AV	0.0	20.6	50.0	-29.4
1097.725	41.9	-7.1	1.0	16.0	3.0	0.0	Horz	PK	0.0	34.8	70.0	-35.2

CONCLUSION

Pass

Tested By

RADIATED EMISSIONS HIGH FREQUENCY

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

RADIATED IMMUNITY

element
WTD.2021.09.21.0

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a Radiated RF Immunity test was performed according to IEC 61000-4-3. The field was first established with no EUT present then maintained at the specified level. If an error is detected, the field strength may have been reduced to a level in which the error disappeared. This would be determined as the threshold of susceptibility. The test was conducted using horizontal and vertical antenna orientations.

Where additional spot frequency test is required for equipment, the separation distance is not the test distance as defined in IEC 61000-4-3, but the expected operating distance between the EUT and the interfering wireless communication device. The 3 meters distance noted in the datasheets is the calibrated test distance used to generate the test levels noted by the standard.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFU	2020-11-20	2022-11-20
Power Sensor	Amplifier Research	PH2000	SQQ	2021-10-01	2022-10-01
Power Sensor	Amplifier Research	PH2000	SQX	2022-05-31	2023-05-31
Meter - Power	Amplifier Research	PM2002	SQJ	2022-05-31	2023-05-31
Cable	Northwest EMC	20MHz-6GHz, Radiated Immunity	EVD	2022-01-05	2023-01-05
Amplifier - RF	Amplifier Research	150W1000	TAL	NCR	NCR
Amplifier - RF	Amplifier Research	200S1G6	TTU	NCR	NCR
Antenna - Double Ridge	EMCO	3115	AJI	NCR	NCR
Antenna - Log Periodic	EMCO	3144	ALJ	NCR	NCR
Monitor - Field	Amplifier Research	FL7040/Kit	IEP	2022-03-07	2023-03-07
Directional Coupler	Amplifier Research	DC6180A	IRO	NCR	NCR
Directional Coupler	Amplifier Research	DC7200	RHN	NCR	NCR

CONFIGURATIONS INVESTIGATED

DESC0001-10

MODES INVESTIGATED

BLE Beacons on 2402 MHz, 2426 MHz and 2480 MHz every 100 ms

RADIATED IMMUNITY

element
WTD.2021.09.21.0

EUT:	PLT003	Work Order:	DESC0001
Serial Number:	E4:83:DF:05:8B:CA	Date:	2022-06-10
Customer:	Descartes Systems (USA) LLC	Temperature:	22.2°C
Attendees:	None	Relative Humidity:	53.2%
Customer Project:	None	Bar. Pressure (PMSL):	1015 mbar
Tested By:	Jeff Alcoke	Job Site:	EV12
Power:	Battery	Configuration:	DESC0001-10

TEST SPECIFICATIONS

Specification:	Method:
EN 301 489-17 V3.2.4:2020-09	EN 301 489-1 V2.2.3:2019-11

TEST PARAMETERS

Test Level:	>= 10 V/m	Spec. Level:	3 V/m	Mod. Type:	AM
Start Frequency:	80MHz	Stop Frequency:	1000MHz	Mod. Frequency:	1kHz
Mod. Depth:	80%	Step Size:	1%	Dwell Time:	1 Sec.

Test Level:	>= 3 V/m	Spec. Level:	3 V/m	Mod. Type:	AM
Start Frequency:	1.0GHz	Stop Frequency:	6.0GHz	Mod. Frequency:	1kHz
Mod. Depth:	80%	Step Size:	1%	Dwell Time:	1 Sec.

SIDES TESTED

Front, Left, Top

POLARITIES TESTED

Horizontal, Vertical

TEST DISTANCE

3m

COMMENTS

None

EUT OPERATING MODES

BLE Beacons on 2402 MHz, 2426 MHz and 2480 MHz every 100 ms

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

Monitored remote BLE beacon reader for successful read of BLE beacons

CLOCKS AND OSCILLATORS

No clock nor oscillator frequencies were provided by the customer prior to testing. No specific frequencies were tested.

OBSERVATIONS

No Phenomena Observed.

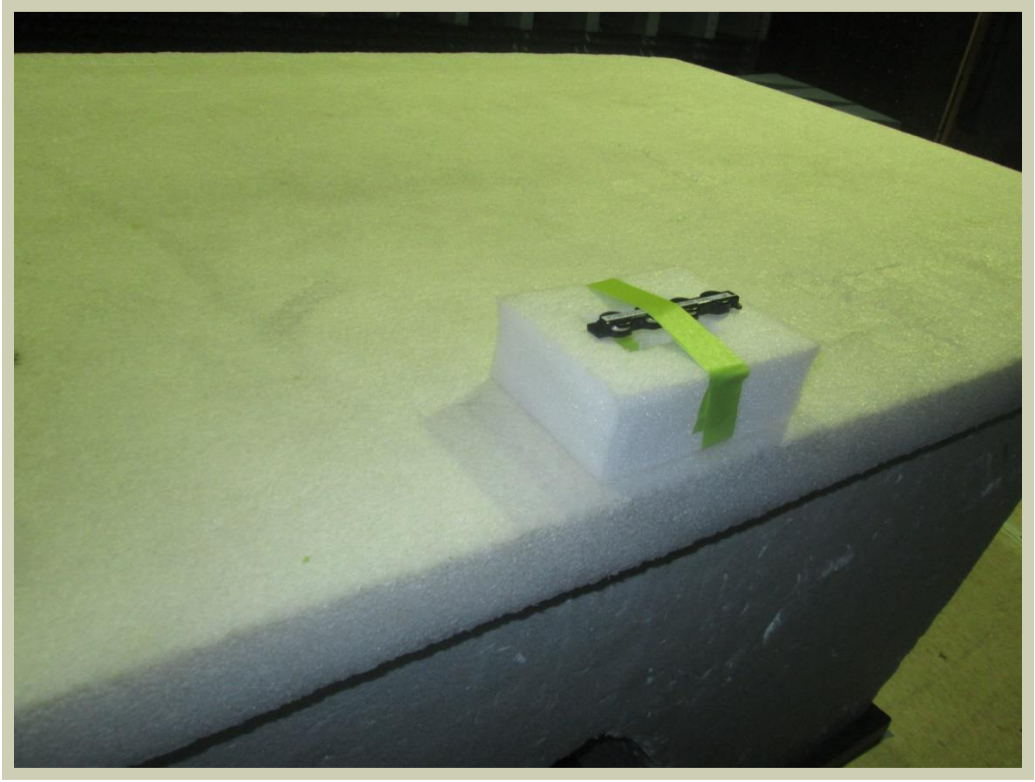
CONCLUSION

Meets Element Performance Criteria	A

The EUT exhibited no change in performance when operating as intended.

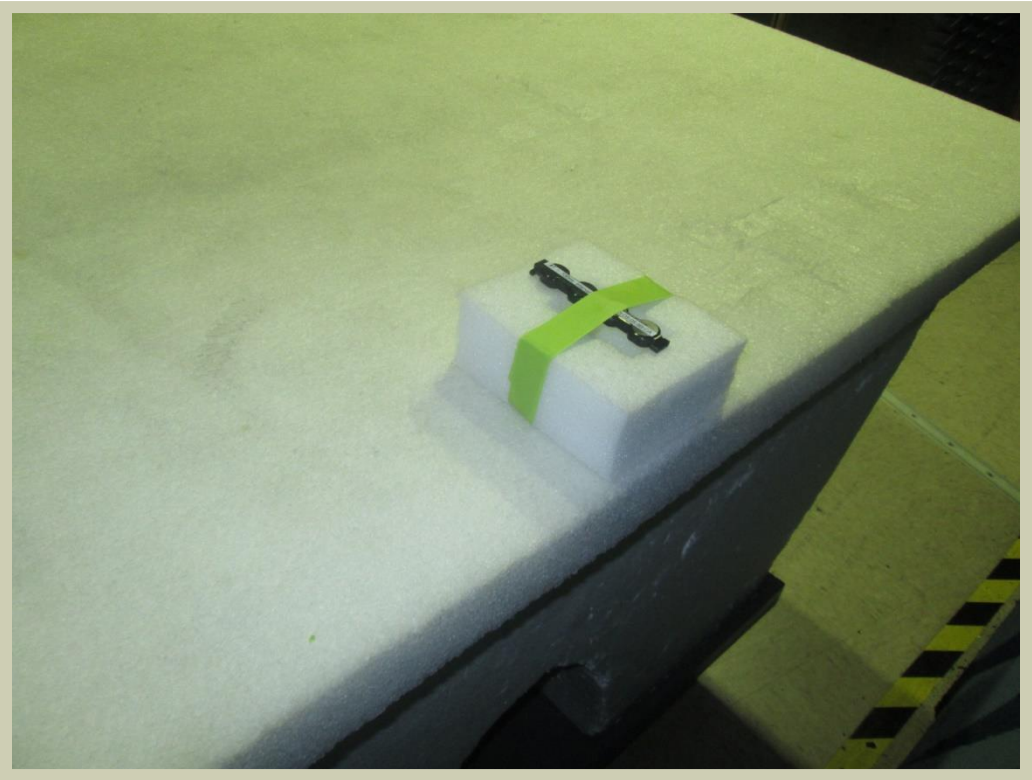
Tested By

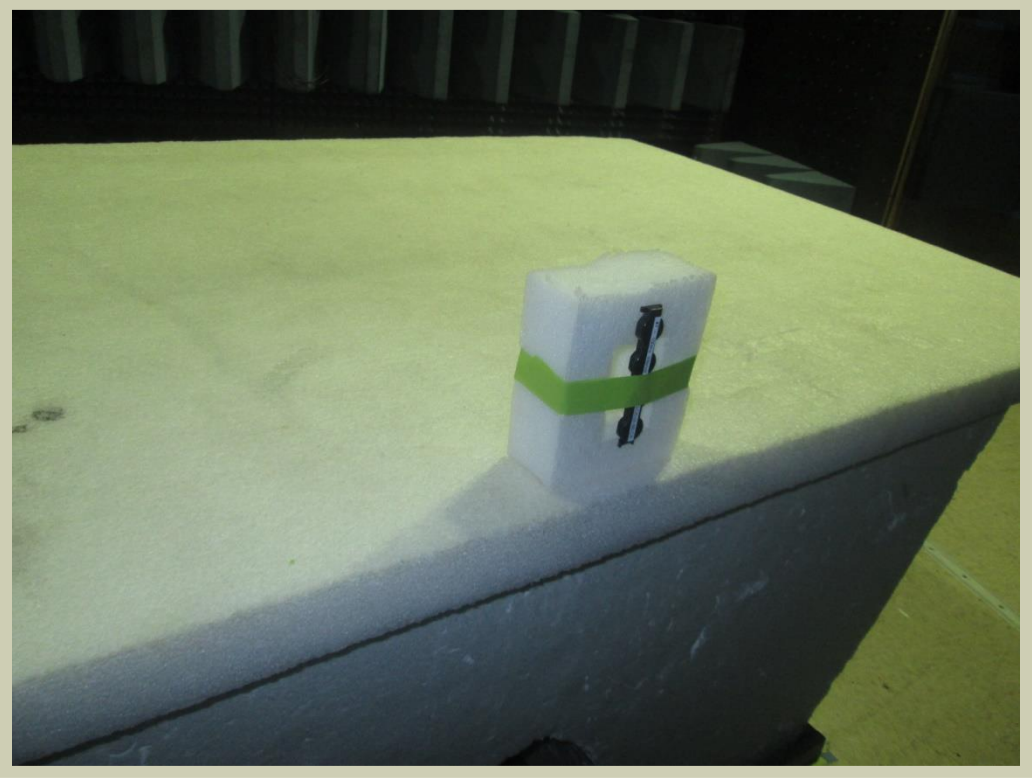
RADIATED IMMUNITY



RADIATED IMMUNITY

element
WTD.2021.09.21.0





ELECTROSTATIC DISCHARGE (ESD)

element
WTD.2021.09.21.0

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, the ESD Immunity test was performed according to the test method and the product related standard(s) listed on the data sheets. If called out, contact discharges were applied to the conductive accessible surfaces of the EUT and the coupling plane(s). If called out, air discharges were applied to accessible insulating surfaces and conductive non-accessible portions of accessible parts of the EUT as required by the product related standard. The number of discharges specified on the data sheets applies to each test voltage, preselected point, and each polarity (ie 25 at +4 kV and 25 at -4 kV). If the EUT was tested with a vertical coupling plane, testing on all four sides (front, back, left, right) was performed unless otherwise noted. The pictures depict one of those orientations. For devices isolated from protective earth, a resistor network was used to drain residual charges between ESD pulses, and where allowable by the standard, additional time greater than one second may have been used between discharges. If a response was detected after discharge, the type of response, discharge level, and location were noted.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
ESD Gun	Teseq	NSG 438	IGX	2022-06-01	2022-12-01
Probe - Temperature/Humidity	Omega Engineering, Inc.	iTHP-W-6	DUQ	2021-03-14	2024-03-14

CONFIGURATIONS INVESTIGATED

DESC0001-10

MODES INVESTIGATED

BLE Beacons on 2402 MHz, 2426 MHz and 2480 MHz every 100 ms

ELECTROSTATIC DISCHARGE (ESD)

element
WTD.2021.09.21.0

EUT:	PLT003	Work Order:	DESC0001
Serial Number:	E4:83:DF:05:8B:CA	Date:	2022-06-10
Customer:	Descartes Systems (USA) LLC	Temperature:	21.9°C
Attendees:	None	Relative Humidity:	53.5%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Jeff Alcoke	Job Site:	EV03
Power:	Battery	Configuration:	DESC0001-10

TEST SPECIFICATIONS

Specification:	Method:
EN 301 489-17 V3.2.4:2020-09	EN 301 489-1 V2.2.3:2019-11

TEST PARAMETERS

Energy Storage Capacitor:	150pf	Discharge Resistance:	330 ohms
Polarity of Output Voltage:	Positive and Negative	Time Between Successive Discharges:	>= 1 sec

COMMENTS

EUT is contained in a fully plastic molded enclosure. There are no locations for direct discharge.

EUT OPERATING MODES

BLE Beacons on 2402 MHz, 2426 MHz and 2480 MHz every 100 ms

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

Monitored remote BLE beacon reader for successful read of BLE beacons

TEST RESULT

See the following data sheets.

CONCLUSION

Meets Element Performance Criteria	A

The EUT exhibited no change in performance when operating as intended.

Tested By

ELECTROSTATIC DISCHARGE (ESD)

element
WTD.2021.09.21.0

TEST LEVELS

Discharge Type	Discharge Level (kV)		Number Of Discharges Per Location (Each Polarity)
	Positive	Negative	
Air – Direct	2,4,8	2,4,8	10
Contact – Direct	N/A	N/A	N/A
Contact – Indirect	4	4	10

OBSERVATIONS (Direct Discharges: Air)

Test Point	Voltage (kV)	Polarity	Result
1	2,4,8	+/-	1
2	2,4,8	+/-	1

OBSERVATIONS (Indirect Discharges)

Test Point	Voltage (kV)	Polarity	Result
VCP - Front	4	+/-	2
VCP - Rear	4	+/-	2
VCP - Left	4	+/-	2
VCP - Right	4	+/-	2
HCP - Front	4	+/-	2

RESULT DESCRIPTIONS

Result Number	Description
X	Not performed nor required.
1	Criteria A – No perceived discharge, no observed response from EUT.
2	Criteria A – Discharge observed, no observed response from EUT.

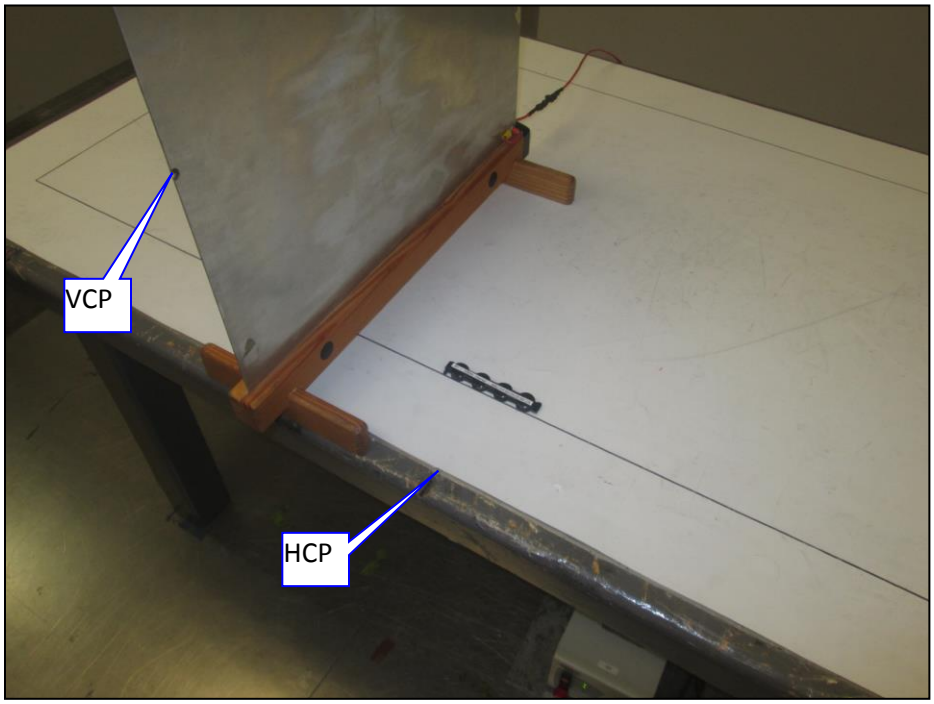


Image 1

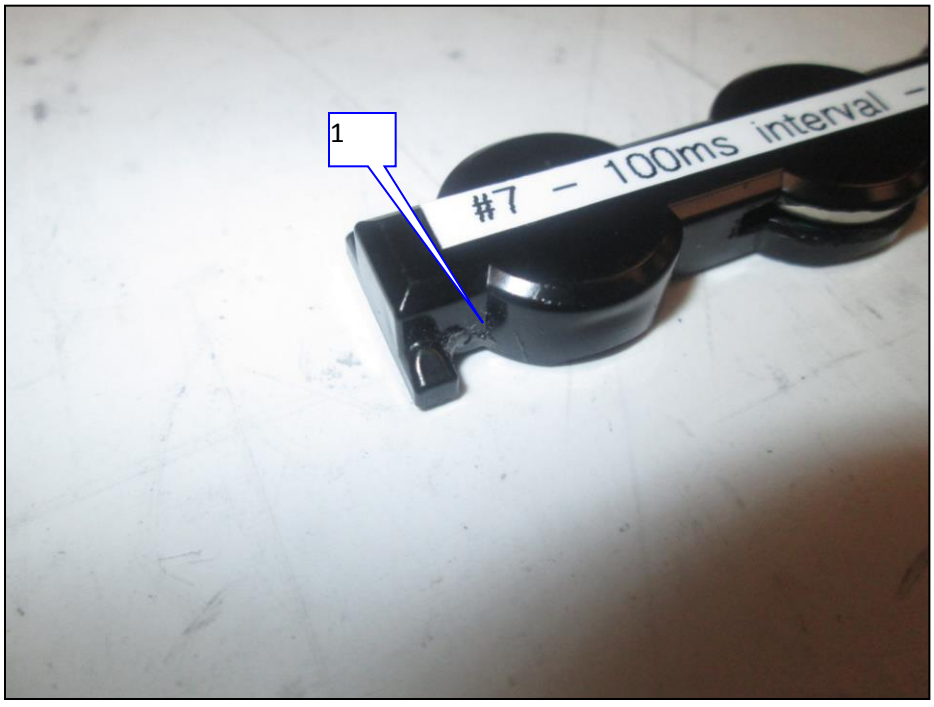


Image 2

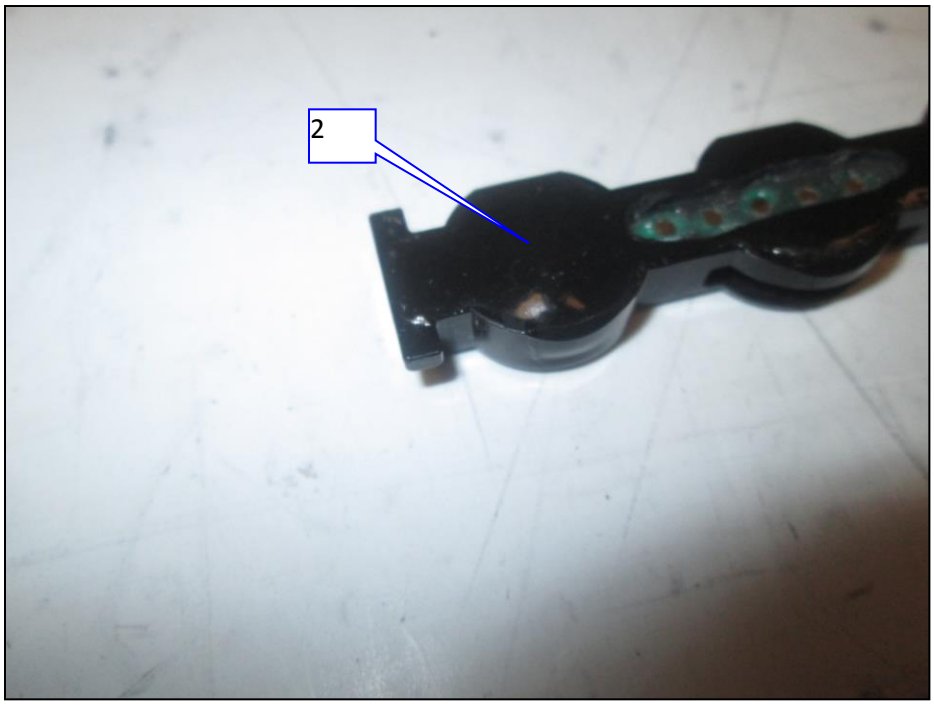


Image 3

End of Test Report