Element Materials Technology

UltraTEV Plus2

FCC 15.225:2018

13.56 MHz Radio

Report # ELEM0052.3

NVLAP LAB CODE: 201049-0

CERTIFICATE OF TEST

2017-1-25

Last Date of Test: March 19, 2018
Element Materials Technology
Model: UltraTEV Plus2

Radio Equipment Testing

Standards

Specification	Method
FCC 15.225:2018	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not requested for Class 1 Permissive Change
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	No	N/A	Not requested for Class 1 Permissive Change
6.8	Frequency Stability	No	N/A	Not requested for Class 1 Permissive Change

Deviations From Test Standards

None

Approved By:

Jeremiah Darden, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

2018.2.20

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 - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

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:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

MEASUREMENT UNCERTAINTY

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 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.

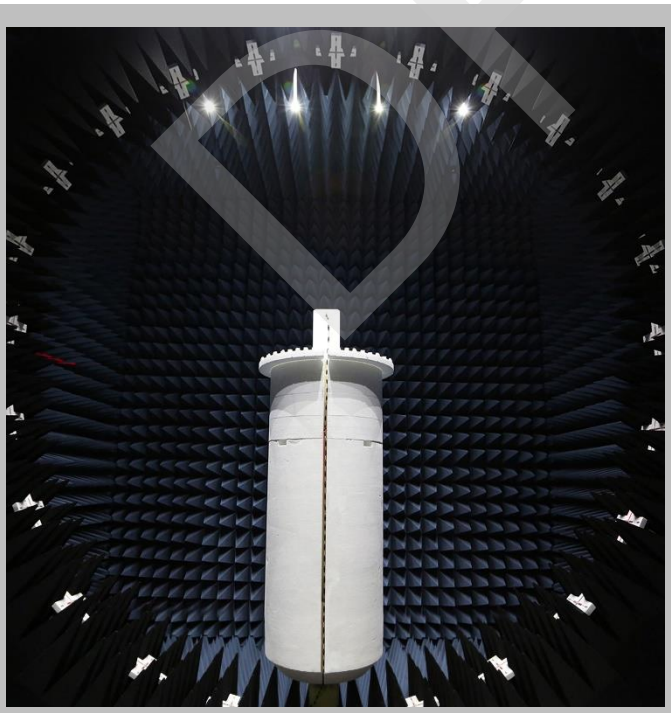
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

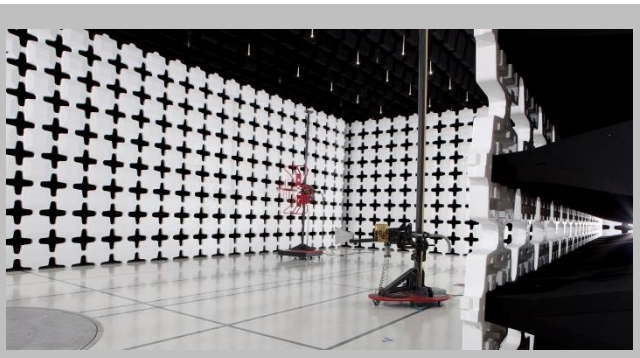
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.9 dB	-4.9 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

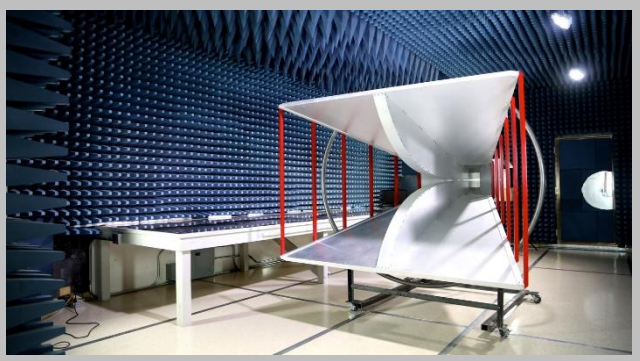
FACILITIES

2017.9.15

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	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
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157

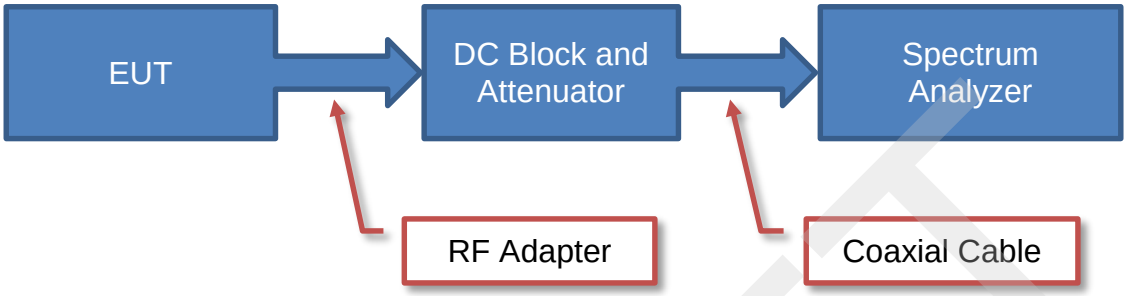




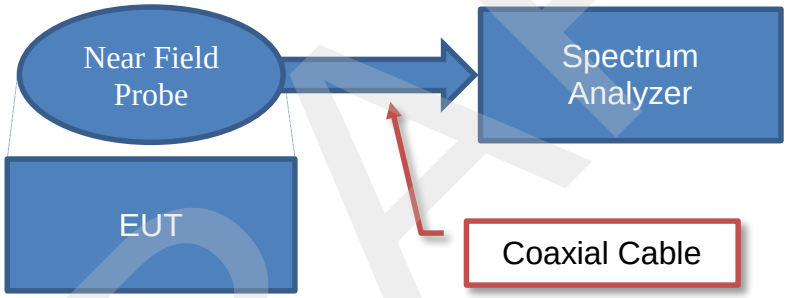


Test Setup Block Diagrams

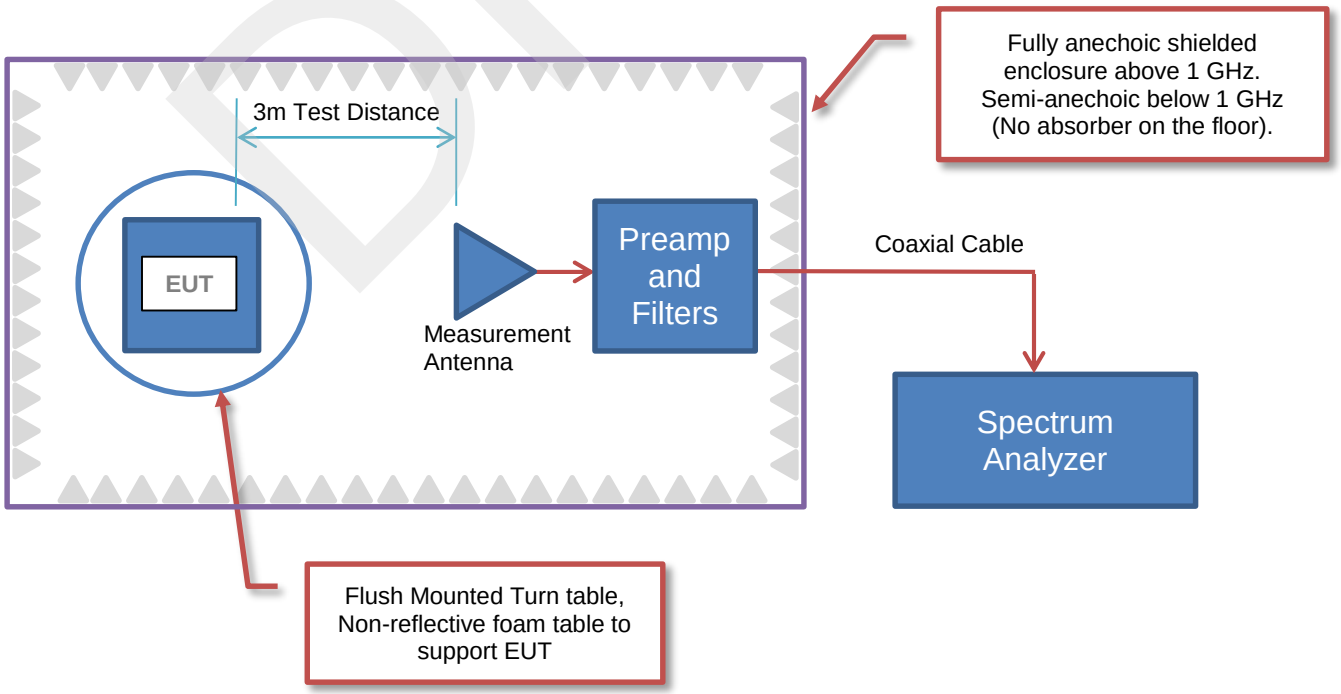
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

2017-1-25

Client and Equipment Under Test (EUT) Information

Company Name:	Element Materials Technology
Address:	Unit E South Orbital Trading Park Hedon Road
City, State, Zip:	Hull, HU9 1NJ
Test Requested By:	Alex Toohie
Model:	UltraTEV Plus2
First Date of Test:	March 19, 2018
Last Date of Test:	March 19, 2018
Receipt Date of Samples:	March 16, 2018
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
The UTP2 is a handheld instrument for detecting and measuring Partial Discharge (PD) in electrical assets, through measurement of Transient Earth Voltages, Ultrasonic emissions and Current pulses. The UTP2 is a handheld instrument and conveys the captured information to the user both visually via the colour LCD touch screen, and audibly via optional headphones connected via the headphone jack.

Testing Objective:
To demonstrate C1PC compliance to FCC Part 15.225 specifications.

CONFIGURATIONS

2017-1-25

Configuration ELEM0052- 1

Software/Firmware Running during test	
Description	**Version**
Blackbird	v3.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Partial Discharge Detector	EA Technology	UltraTEV Plus2	1201

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Host Laptop	Lenovo	SL300	L3-C2189
Mouse	Lenovo	MOEUUO	44K4698
AC/DC Brick	Lenovo	42T5276	11S42T5276Z1ZD8V8BC1BS

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.5m	No	AC Mains	AC/DC Brick
DC Cable	No	1.5m	Yes	AC/DC Brick	Host Laptop
USB Cable	Yes	1.0m	No	Partial Discharge Detector	Host Laptop
USB Cable	Yes	1.4m	No	Mouse	Host Laptop

MODIFICATIONS

2017-1-25

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/19/2018	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	3/19/2018	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.

FIELD STRENGTH OF FUNDEMENTAL

PSA-ESCI 2017.12.19

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

Continuously transmitting at 13.56 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

ELEM0052 - 1

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.	Interval
Antenna - Loop	ETS Lindgren	6502	AZM	24-Jun-2016	24 mo
Cable	Element	RE 9kHz - 1GHz	TXB	10-Oct-2017	12 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-2018	12 mo

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 center 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

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.4, 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.

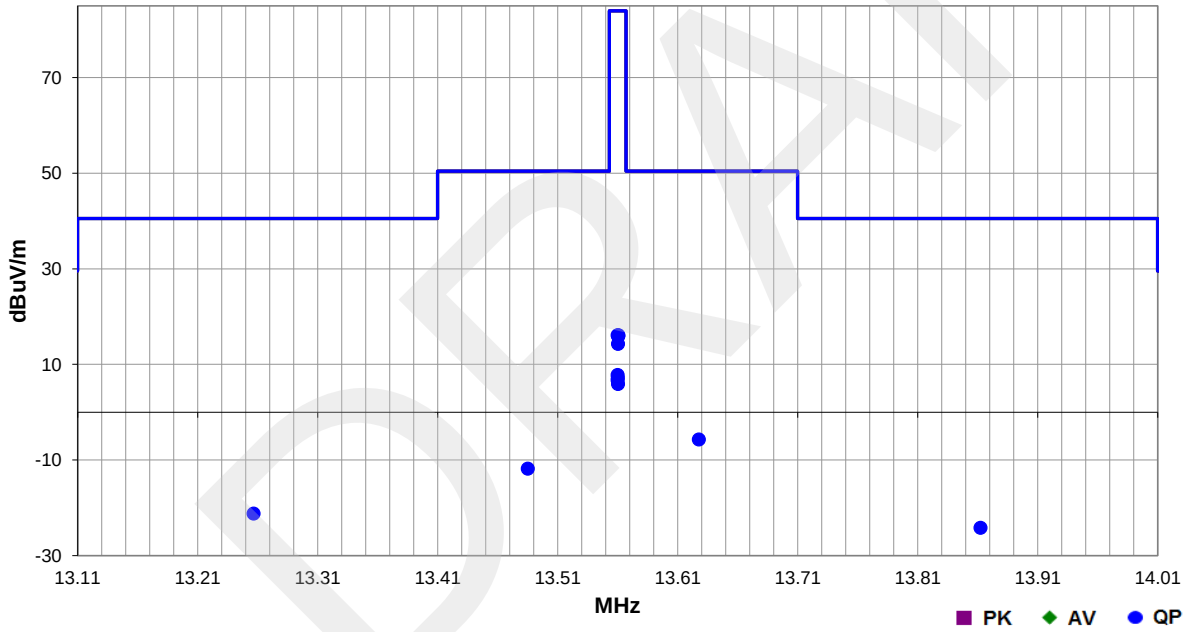
FIELD STRENGTH OF FUNDEMENTAL

EmiR5 2018.02.06 PSA-ESCI 2017.12.19

Work Order:	ELEM0052	**Date:**	19-Mar-2018		
Project:	None	**Temperature:**	23.6 °C		
Job Site:	TX02	**Humidity:**	43.8% RH		
Serial Number:	1201	**Barometric Pres.:**	1017 mbar	**Tested by:**	Marty Martin
EUT:	UltraTEV Plus2				
Configuration:	1				
Customer:	Element Materials Technology				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Continuously transmitting at 13.56 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.225:2018	ANSI C63.10:2013

Run #	50	**Test Distance (m)**	3	**Antenna Height(s)**	1(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
13.628	24.1	10.2	1.0	141.0	3.0	0.0	Horz	QP	-40.0	-5.7	50.5	-56.2	EUT Z, ANT Perp to EUT
13.257	8.6	10.2	1.0	105.9	3.0	0.0	Horz	QP	-40.0	-21.2	40.5	-61.7	EUT Z, ANT Perp to EUT
13.485	18.0	10.2	1.0	139.0	3.0	0.0	Horz	QP	-40.0	-11.8	50.5	-62.3	EUT Z, ANT Perp to EUT
13.862	5.7	10.1	1.0	112.9	3.0	0.0	Horz	QP	-40.0	-24.2	40.5	-64.7	EUT Z, ANT Perp to EUT
13.561	45.9	10.2	1.0	358.9	3.0	0.0	Horz	QP	-40.0	16.1	84.0	-67.9	EUT Z, ANT Perp to EUT
13.560	45.9	10.2	1.0	45.0	3.0	0.0	Horz	QP	-40.0	16.1	84.0	-67.9	EUT Y, ANT Perp to EUT
13.560	45.8	10.2	1.0	103.0	3.0	0.0	Horz	QP	-40.0	16.0	84.0	-68.0	EUT Z, ANT Par to EUT
13.561	45.7	10.2	1.0	80.0	3.0	0.0	Horz	QP	-40.0	15.9	84.0	-68.1	EUT Y, ANT Par to EUT
13.560	44.1	10.2	1.0	127.0	3.0	0.0	Horz	QP	-40.0	14.3	84.0	-69.7	EUT X, ANT Perp to EUT
13.560	37.6	10.2	1.0	231.9	3.0	0.0	Vert	QP	-40.0	7.8	84.0	-76.2	EUT Y, ANT Par to GND
13.560	37.0	10.2	1.0	226.9	3.0	0.0	Vert	QP	-40.0	7.2	84.0	-76.8	EUT Z, ANT Par to GND
13.560	36.5	10.2	1.0	300.0	3.0	0.0	Vert	QP	-40.0	6.7	84.0	-77.3	EUT X, ANT Par to GND
13.560	35.7	10.2	1.0	325.0	3.0	0.0	Horz	QP	-40.0	5.9	84.0	-78.1	EUT X, ANT Par to EUT

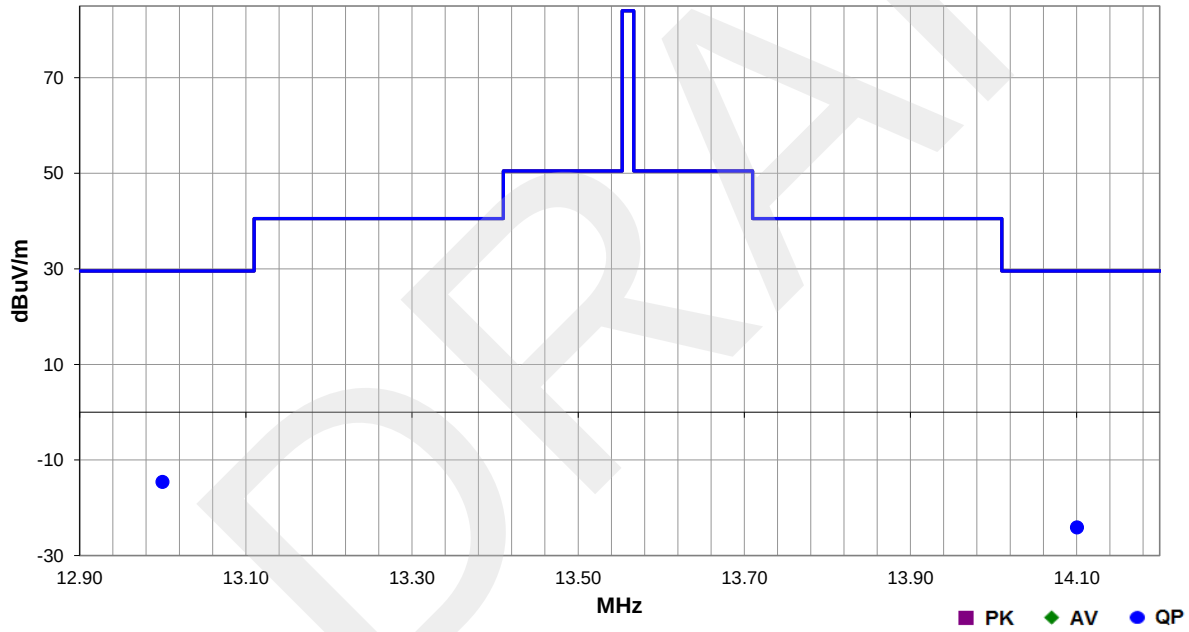
FIELD STRENGTH OF FUNDEMENTAL

EmiR5 2018.02.06 PSA-ESCI 2017.12.19

Work Order:	ELEM0052	**Date:**	19-Mar-2018		
Project:	None	**Temperature:**	23.1 °C		
Job Site:	TX02	**Humidity:**	44.4% RH		
Serial Number:	1201	**Barometric Pres.:**	1017 mbar	**Tested by:**	Marty Martin
EUT:	UltraTEV Plus2				
Configuration:	1				
Customer:	Element Materials Technology				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Continuously transmitting at 13.56 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.225:2018	ANSI C63.10:2013

Run #	53	**Test Distance (m)**	3	**Antenna Height(s)**	1(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
13.000	15.2	10.2	1.0	73.0	3.0	0.0	Horz	QP	-40.0	-14.6	29.5	-44.1	EUT Z, ANT Perp to EUT
14.100	5.8	10.1	1.0	81.9	3.0	0.0	Horz	QP	-40.0	-24.1	29.5	-53.6	EUT Z, ANT Perp to EUT

FIELD STRENGTH OF SPURIOUS EMISSIONS LESS THAN 30 MHZ

PSA-ESCI 2017.12.19

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

Continuously transmitting at 13.56 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

ELEM0052 - 1

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.	Interval
Antenna - Loop	ETS Lindgren	6502	AZM	24-Jun-2016	24 mo
Cable	Element	RE 9kHz - 1GHz	TXB	10-Oct-2017	12 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-2018	12 mo

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

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.4, 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.

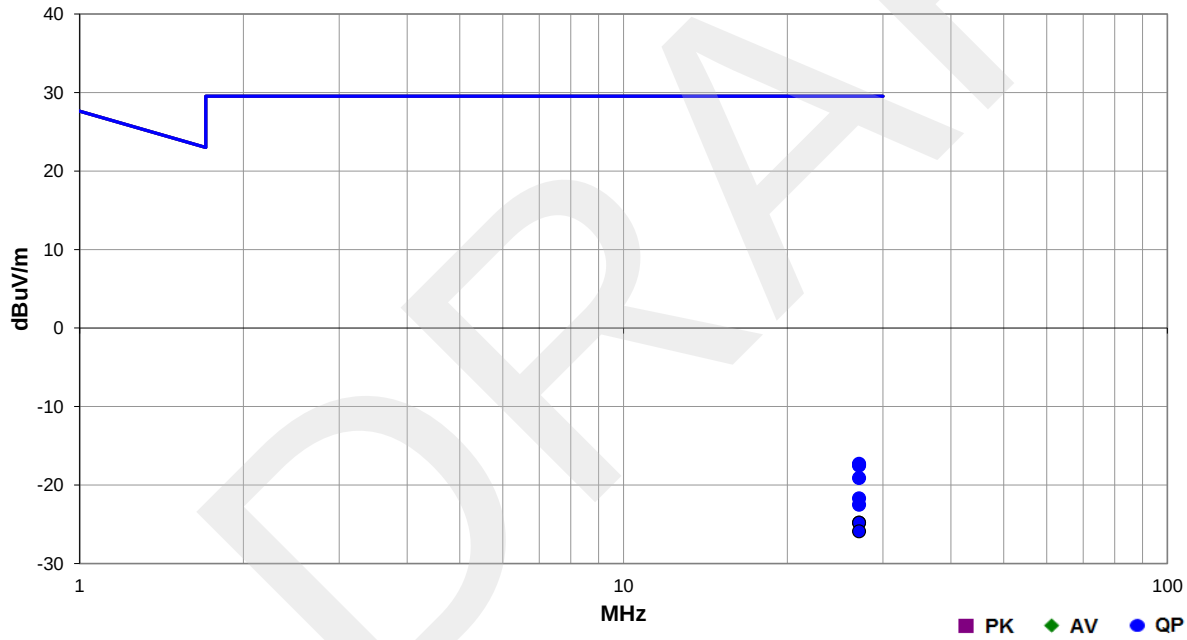
FIELD STRENGTH OF SPURIOUS EMISSIONS LESS THAN 30 MHZ

EmiR5 2018.02.06 PSA-ESCI 2017.12.19

Work Order:	ELEM0052	**Date:**	19-Mar-2018		
Project:	None	**Temperature:**	23.4 °C		
Job Site:	TX02	**Humidity:**	44.9% RH		
Serial Number:	1201	**Barometric Pres.:**	1016 mbar	**Tested by:**	Marty Martin
EUT:	UltraTEV Plus2				
Configuration:	1				
Customer:	Element Materials Technology				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Continuously transmitting at 13.56 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.225:2018	ANSI C63.10:2013

Run #	54	**Test Distance (m)**	3	**Antenna Height(s)**	1(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
27.105	14.0	8.7	1.0	183.9	3.0	0.0	Vert	QP	-40.0	-17.3	29.5	-46.8	EUT X, ANT Par to GND
27.103	13.9	8.7	1.0	108.0	3.0	0.0	Vert	QP	-40.0	-17.4	29.5	-46.9	EUT Z, ANT Par to GND
27.102	13.8	8.7	1.0	87.9	3.0	0.0	Vert	QP	-40.0	-17.5	29.5	-47.0	EUT Y, ANT Par to GND
27.105	12.2	8.7	1.0	96.0	3.0	0.0	Horz	QP	-40.0	-19.1	29.5	-48.6	EUT Y, ANT Perp to EUT
27.100	9.6	8.7	1.0	256.9	3.0	0.0	Horz	QP	-40.0	-21.7	29.5	-51.2	EUT X, ANT Perp to EUT
27.096	8.8	8.7	1.0	214.9	3.0	0.0	Horz	QP	-40.0	-22.5	29.5	-52.0	EUT Z, ANT Perp to EUT
27.104	6.5	8.7	1.0	81.0	3.0	0.0	Horz	QP	-40.0	-24.8	29.5	-54.3	EUT Y, ANT Par to EUT
27.101	6.5	8.7	1.0	75.0	3.0	0.0	Horz	QP	-40.0	-24.8	29.5	-54.3	EUT X, ANT Par to EUT
27.102	5.4	8.7	1.0	1.0	3.0	0.0	Horz	QP	-40.0	-25.9	29.5	-55.4	EUT Z, ANT Par to EUT