



## Element Materials Technology

UltraTEV Plus2

FCC 15.225:2018

13.56 MHz Radio

Report # ELEM0052.3



NVLAP LAB CODE: 201049-0



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# CERTIFICATE OF TEST

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	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID 2AGGBUTP2.
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	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID 2AGGBUTP2.
6.8	Frequency Stability	No	N/A	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID 2AGGBUTP2.

### 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



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## 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

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## 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.

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## European Union

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

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## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

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## Korea

**MSIT / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

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## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

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## 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.

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## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

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## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

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## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

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## Vietnam

**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

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## 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

## 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.

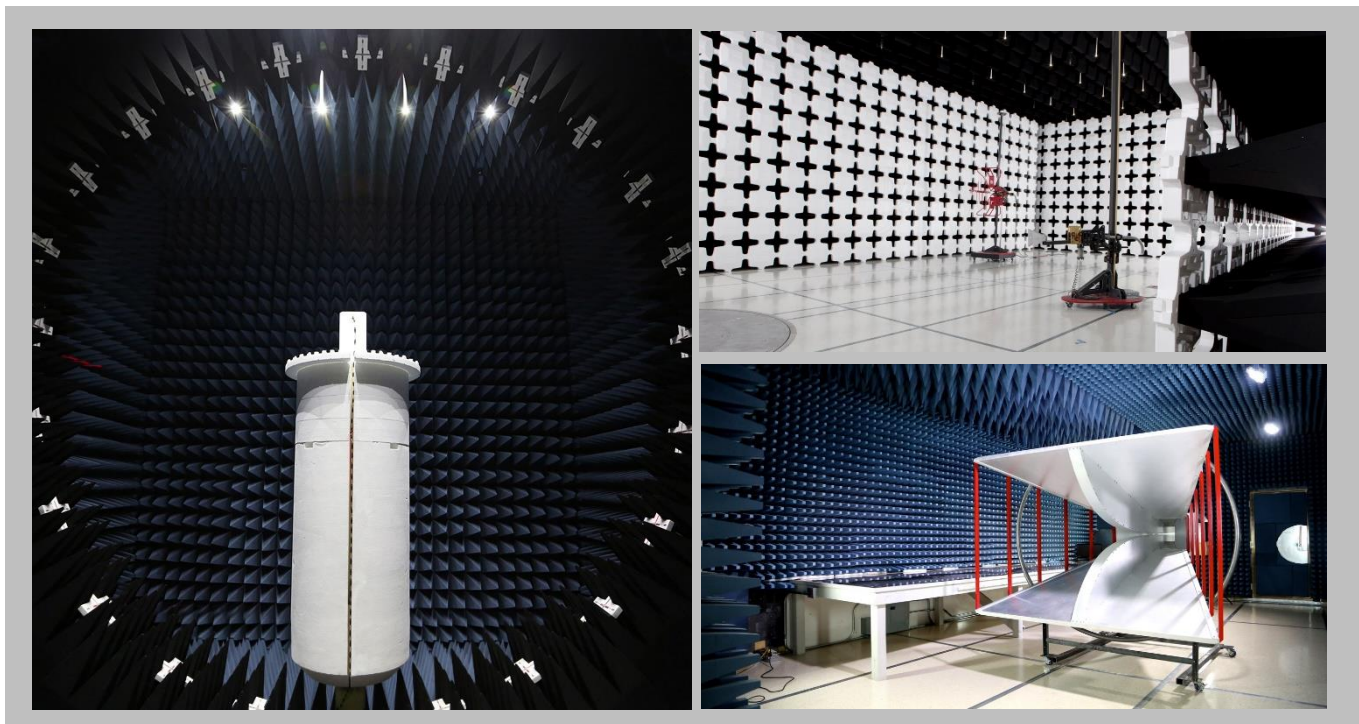
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

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

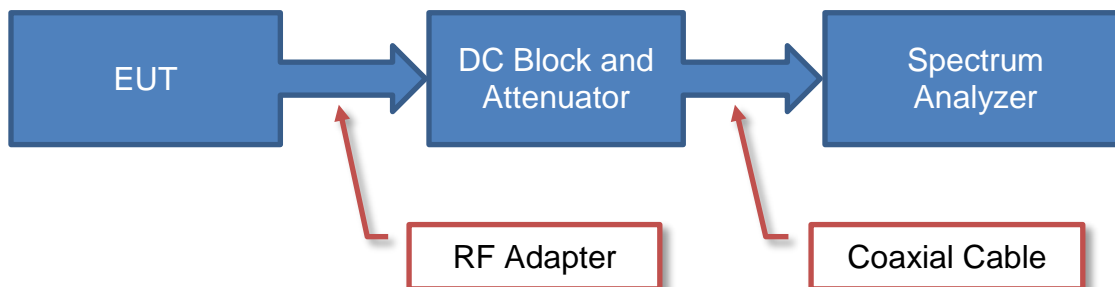


<b>California</b> Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	<b>Minnesota</b> Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	<b>New York</b> Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	<b>Oregon</b> Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	<b>Texas</b> Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	<b>Washington</b> Labs NC01-05 19201 120 <sup>th</sup> Ave NE Bothell, WA 98011 (425)984-6600
<b>NVLAP</b>					
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
<b>Innovation, Science and Economic Development Canada</b>					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
<b>BSMI</b>					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
<b>VCCI</b>					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
<b>Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA</b>					
US0158	US0175	N/A	US0017	US0191	US0157

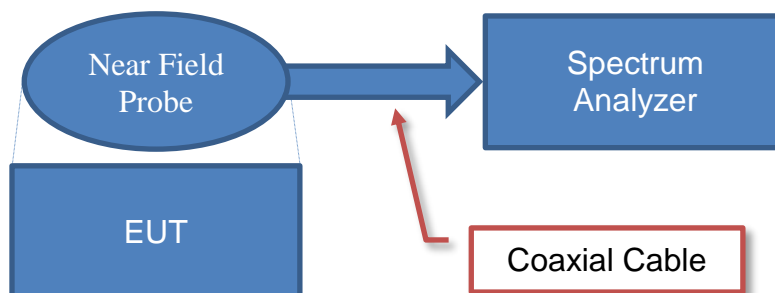


# Test Setup Block Diagrams

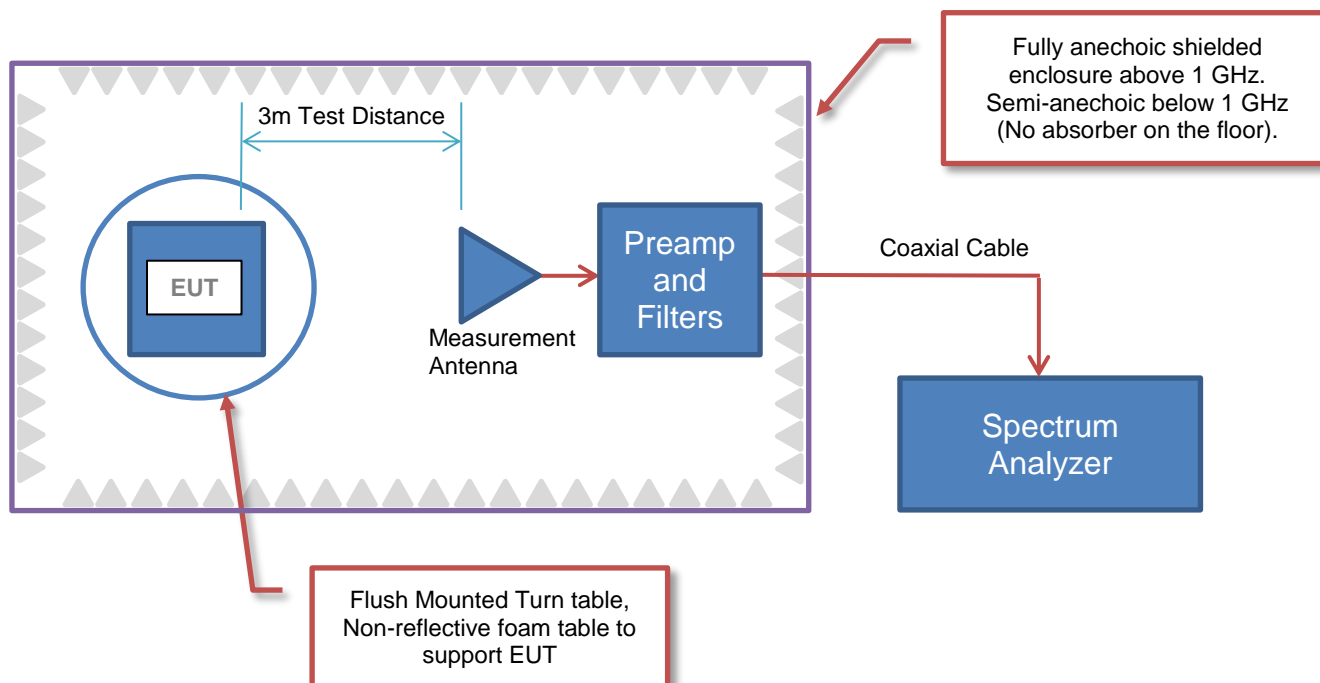
## Antenna Port Conducted Measurements



## Near Field Test Fixture Measurements



## Spurious Radiated Emissions







# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

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



## 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



## 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
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## 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 FUNDAMENTAL



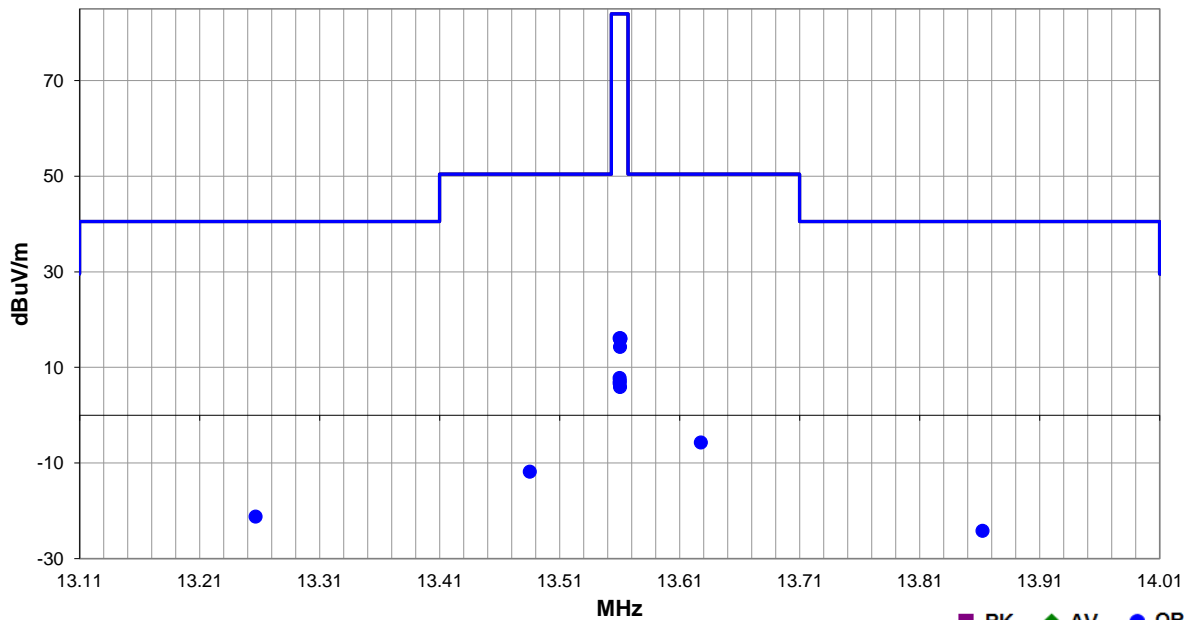
EmiRS 2018.02.06

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	
EUT:	UltraTEV Plus2			Tested by: Marty Martin
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
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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 FUNDAMENTAL



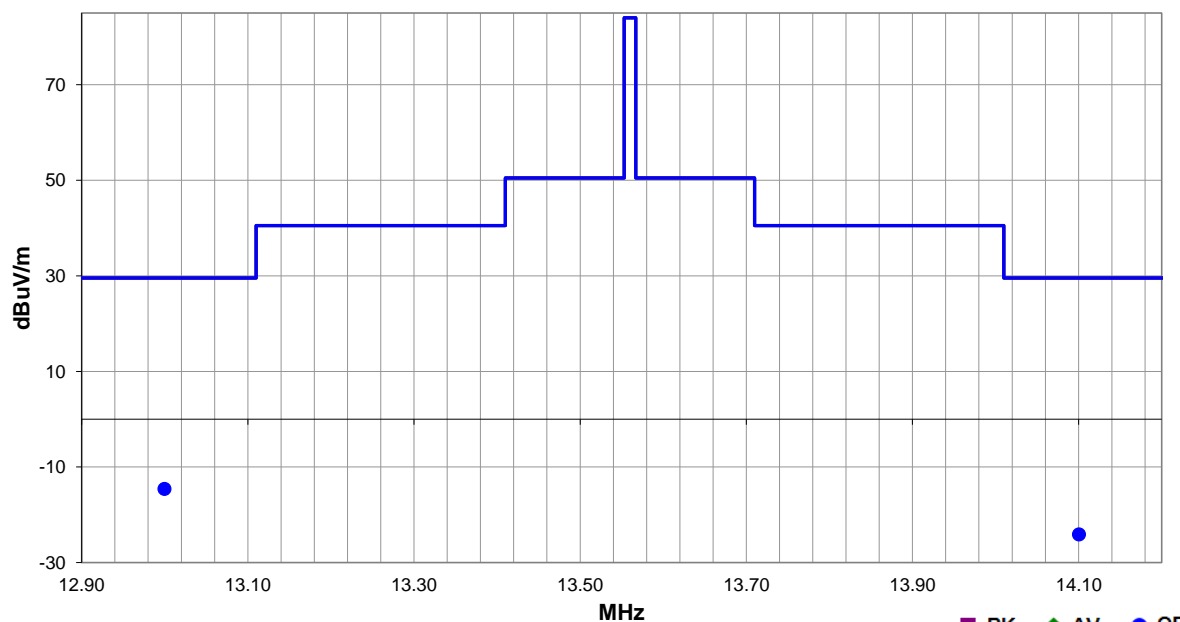
EmiRS 2018.02.06

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
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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
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## 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



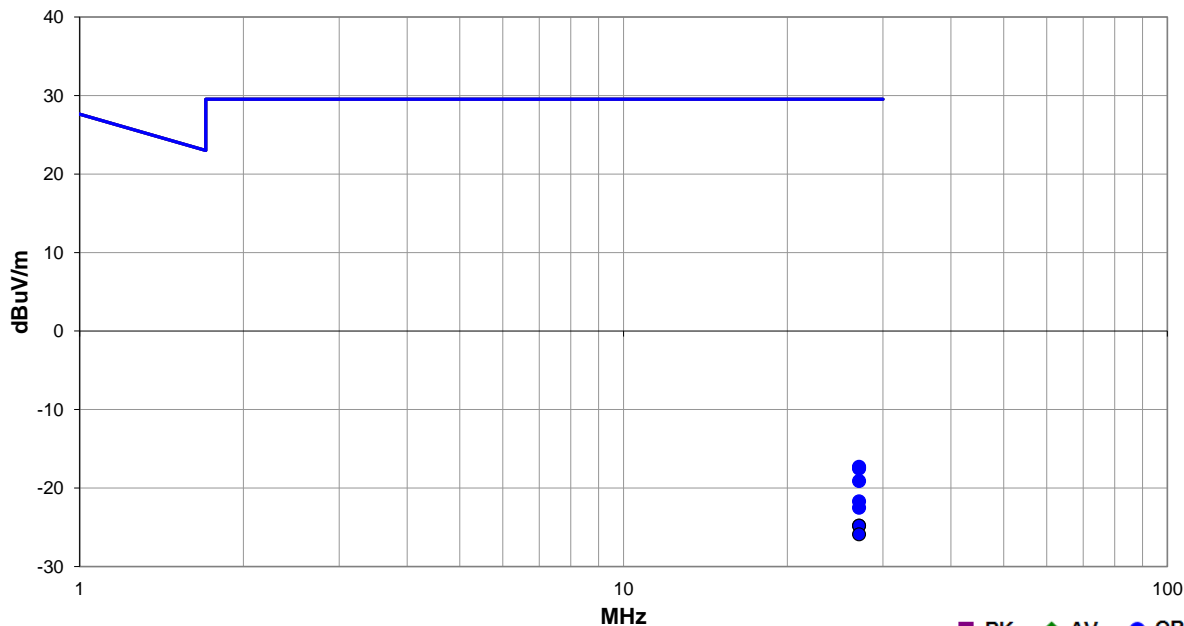
EmiRS 2018.02.06

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	
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
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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