

EA Technology Ltd

UltraTEV Plus2 (UTP2) FCC 15.207:2016 FCC 15.225:2016 13.56 MHz Radio

Report # ELEM0010.1



TESTING NVLAP Lab Code: 201049-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST



Last Date of Test: September 15, 2016 EA Technology Ltd Model: UltraTEV Plus2 (UTP2)

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2016 FCC 15.225:2016	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.2 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:

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



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 Northwest EMC 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 – Validated by the European Commission as a Notified Body under the R&TTE Directive.

Australia/New Zealand

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

Korea

MSIP / 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: <u>http://www.nwemc.com/accreditations/</u> 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.

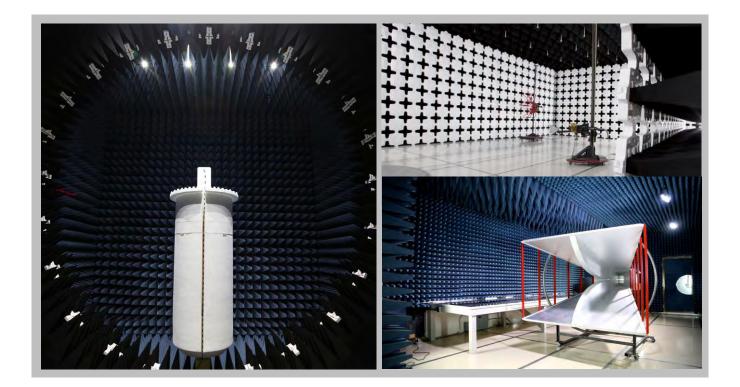
Test	+ MU	<u>- MU</u>
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%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

FACILITIES





California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy 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			
	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	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			



PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	EA Technology Ltd
Address:	Capenhurst Technology Park, Capenhurst
City, State, Zip:	Chester CH1 6ES United Kingdom
Test Requested By:	Richard Squires-Thornton
Model:	UltraTEV Plus2 (UTP2)
First Date of Test:	September 8, 2016
Last Date of Test:	September 15, 2016
Receipt Date of Samples:	September 6, 2016
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage

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 compliance to FCC Part 15.225 specifications.





Configuration ELEM0010- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Handheld Partial Discharge Instrument	EA Technology	UltraTEV Plus2 (UTP2)	0148

Peripherals in test setup boundar	у		
Description	Manufacturer	Model/Part Number	Serial Number
AC/DC Adapter (Instrument)	Stontronics	DSA-10PFP-05	TRA-028382-95

Cables							
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2		
USB to micro-USB	No	0.9m	Yes	Handheld Partial Discharge Instrument	AC/DC Adapter		

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	9/8/2016	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	9/8/2016	Field Strength of Spurious Emissions less than 30 MHz	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	9/8/2016	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 Northwest EMC following the test.
4	9/9/2016	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	9/15/2016	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.



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 500hm measuring port is terminated by a 500hm EMI meter or a 500hm resistive load. All 500hm measuring ports of the LISN are terminated by 500hm. 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	Rohde & Schwarz	ESCI	ARF	6/22/2016	6/22/2017
Cable - Conducted Cable Assembly	Northwest EMC	TXA, HHZ, TQR	TXAA	5/17/2016	5/17/2017
LISN	Solar Electronics	9252-50-R-24-BNC	LJK	9/21/2016	9/21/2017

MEASUREMENT UNCERTAINTY

	Decemption		
Expanded K=2 2.4 dB -2.4 dB	Expanded k=2	2.4 dB	-24 dB

CONFIGURATIONS INVESTIGATED

ELEM0010-2

MODES INVESTIGATED

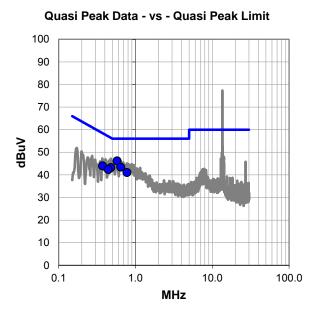
Charging Mode



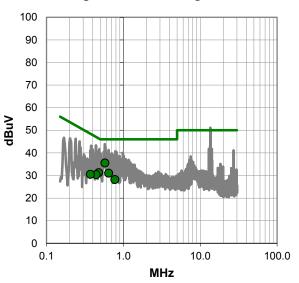
EUT:	UltraTEV Plu	is2 (UTP2))		Work Order:	ELEM0010					
Serial Number:	0148				Date:	09/23/2016					
Customer:	EA Technolo	gy Ltd		Temperature:	23.6°C						
Attendees:	None				Relative Humidity:	44.5%					
Customer Project:	None				Bar. Pressure:	1016 mb					
Tested By:	Jonathan Kie	efer			Job Site:	TX01					
Power:	110VAC/60H	lz			Configuration:	ELEM0010-2					
TEST SPECIFICATIONS											
Specification:				Method:							
FCC 15.207:2016				ANSI C63	.10:2013	2013					
TEST PARAME	TERS										
Run #: 20		Line:	High Line		Add. Ext. Attenuation (dB): 0						
COMMENTS	COMMENTS										
EUT transmitting at	EUT transmitting at 13.56 MHz. Antenna connected.										
EUT OPERATING MODES											
Charging Mode											

DEVIATIONS FROM TEST STANDARD

None



Average Data - vs - Average Limit





RESULTS - Run #20

Quasi Peak Data - vs - Quasi Peak Limit											
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)						
0.578	26.3	19.9	46.2	56.0	-9.8						
0.644	23.5	19.9	43.4	56.0	-12.6						
0.478	23.4	19.8	43.2	56.4	-13.2						
0.372	24.2	19.8	44.0	58.5	-14.5						
0.442	22.6	19.8	42.4	57.0	-14.6						
0.777	21.1	19.9	41.0	56.0	-15.0						

Average Data - vs - Average Limit										
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)					
0.578	15.6	19.9	35.5	46.0	-10.5					
0.644	11.1	19.9	31.0	46.0	-15.0					
0.478	11.4	19.8	31.2	46.4	-15.2					
0.442	10.6	19.8	30.4	47.0	-16.6					
0.777	8.3	19.9	28.2	46.0	-17.8					
0.372	10.7	19.8	30.5	48.5	-18.0					

CONCLUSION

Pass

Jonathan Kiefer

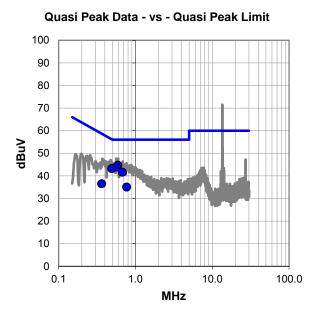
Tested By



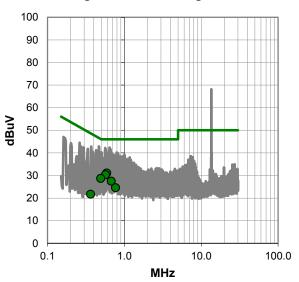
EUT:	UltraTEV Plu	is2 (UTP2)			Work Order:	ELEM0010				
Serial Number:	0148				Date:	09/23/2016				
Customer:	EA Technolo	ogy Ltd			Temperature:	23.6°C				
Attendees:	None				Relative Humidity:	44.5%				
Customer Project:	None				Bar. Pressure:	1016 mb				
Tested By:	Jonathan Kie	efer			Job Site:	TX01				
Power:	110VAC/60F	lz		Configuration:	ELEM0010-2					
TEST SPECIFICATIONS										
Specification:				Method:						
FCC 15.207:2016				ANSI C63.10	:2013					
TEST PARAME	TERS									
Run #: 21		Line:	Neutral	A	dd. Ext. Attenuation (dB	6): 0				
COMMENTS EUT transmitting at 13.56 MHz. Antenna connected.										
EUT OPERATING MODES Charging Mode										

DEVIATIONS FROM TEST STANDARD

None



Average Data - vs - Average Limit





RESULTS - Run #21

Quasi Peak Data - vs - Quasi Peak Limit										
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)					
0.589	24.8	19.9	44.7	56.0	-11.3					
0.569	24.0	19.9	43.9	56.0	-12.1					
0.492	23.4	19.8	43.2	56.1	-12.9					
0.676	21.7	19.9	41.6	56.0	-14.4					
0.768	15.1	19.9	35.0	56.0	-21.0					
0.363	16.7	19.8	36.5	58.7	-22.2					

Average Data - vs - Average Limit										
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)					
0.589	11.2	19.9	31.1	46.0	-14.9					
0.569	10.4	19.9	30.3	46.0	-15.7					
0.492	8.9	19.8	28.7	46.1	-17.4					
0.676	7.6	19.9	27.5	46.0	-18.5					
0.768	4.7	19.9	24.6	46.0	-21.4					
0.363	1.9	19.8	21.7	48.7	-27.0					

CONCLUSION

Pass

Jonathan Kiefer

Tested By



EUT:	UltraTEV Plu	IS2 (UTP2)			Work Order:	ELEM0010				
Serial Number:	0148				Date:	09/23/2016				
Customer:	EA Technolo	gy Ltd		Temperature:	23.6°C					
Attendees:	None				Relative Humidity:	44.5%				
Customer Project:	None			Bar. Pressure:	1016 mb					
Tested By:	Jonathan Kie	efer			Job Site:	TX01				
Power:	110VAC/60H	lz			Configuration:	ELEM0010-2				
TEST SPECIFICATIONS										
Specification:				Method:						
FCC 15.207:2016				ANSI C63.1	0:2013					
TEST PARAMETERS										
Run #: 22		Line:	High Line	Add. Ext. Attenuation (dB	d. Ext. Attenuation (dB): 0					
COMMENTS										

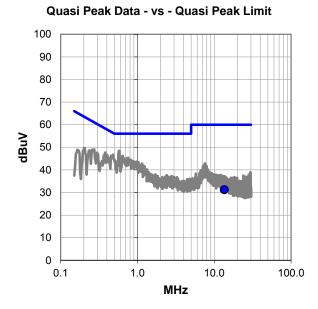
EUT transmitting at 13.56 MHz. Antenna disconnected.

EUT OPERATING MODES

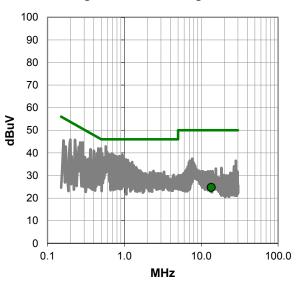
Charging Mode

DEVIATIONS FROM TEST STANDARD

None



Average Data - vs - Average Limit





RESULTS - Run #22

Q		Average Data - vs - Average Limit									
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)	Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.553	11.0	20.2	31.2	60.0	-28.8	13.553	4.5	20.2	24.7	50.0	-25.3

CONCLUSION

Pass

0	4	A	1
1	fonal	han Kie	her
6)		0

Tested By

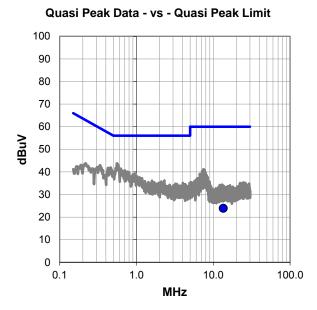


EUT:	UltraTEV Plu	IS2 (UTP2)			Work Order:	ELEM0010				
Serial Number:	0148				Date:	09/23/2016				
Customer:	EA Technolo	ogy Ltd			Temperature:	23.6°C				
Attendees:	None			Relative Humidity:	44.5%					
Customer Project:	None			Bar. Pressure:	1016 mb					
Tested By:	Jonathan Kie	efer		Job Site:	TX01					
Power:	110VAC/60H	lz		Configuration:	ELEM0010-2					
TEST SPECIFICATIONS										
Specification:				Method:						
FCC 15.207:2016				ANSI C63.1	.10:2013					
TEST PARAME	TERS									
Run #: 23		Line:	Neutral		Add. Ext. Attenuation (dB): 0				
COMMENTS										
EUT transmitting at	13.56 MHz. A	ntenna diso	connected.							
EUT OPERATING MODES										

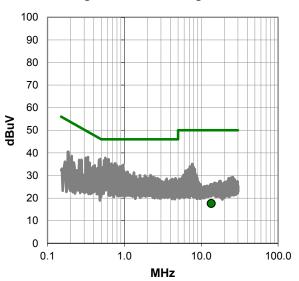
Charging Mode

DEVIATIONS FROM TEST STANDARD

None



Average Data - vs - Average Limit





RESULTS - Run #23

Q	uasi Peak	Data - vs	- Quasi P	eak Limit		Average Data - vs - Average Limit					
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)	Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
13.552	3.7	20.2	23.9	60.0	-36.1	13.552	-2.6	20.2	17.6	50.0	-32.4

CONCLUSION

Pass

0 4	1 1.1	
Jona	than Kiefe	2
0	. 0	

Tested By

FIELD STRENGTH OF FUNDAMENTAL



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

NFC Charging Mode

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

ELEM0010 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency 10 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
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	10/29/2015	12 mo
Antenna	ETS Lindgren	6502	AZM	6/24/2016	24 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	5/31/2016	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.

While scanning, fundamental carrier from the EUT was maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes, the EUT and/or associated antenna is positioned in 3 orthogonal planes (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

As outlined in 15.209(e) and 15.31(f)(2), 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



				-			EmiR5 2016.07.22.
Wo	rk Order:	ELEM0010			08/16	o _1.	
	Project:	None	Tempe		.5 °C	Jonathan?	Kiefer
	Job Site:	TX02	Hu		% RH		
Serial	Number:	0148	Barometric	Pres.: 101	9 mbar	Tested by: Jonathan	Kiefer
	EUI:	UltraTEV Plus2 (U	IP2)				
	guration:						
		EA Technology Ltd					
	ttendees:						
EU	I Power:	110VAC/60Hz					
Operatir	ng Mode:	NFC Charging Mod	le				
De	eviations:	None					
Co	omments:	QP data at 13.56M	Hz and band edge	es. 3m test distanc	e. 40dB/decade adjust	ment factor.	
Test Specif	fications				Test Method		
FCC 15.225	5:2016	•			ANSI C63.10:2013		
Run #	26	Test Distance (I	n) 3 A	ntenna Height(s)	1 to 4(m)	Results	Pass
90 —			., .			,	
70 -							
50							
dBuV/m 30							
10							
-10							
-10 -30 13.7	1	13.2 13.3	13.4	13.5 MH:	13.6 13.7	13.8	13.9 14.0

External Attenuation Polarity/ Transducer Type Distance Adjustment Compared to Spec. Amplitude Test Distance Spec. Limit Freq Factor ntenna Heigh Azimuth Detector Adjusted (MHz) (dBuV) (dB) (meters) (degrees) (meters) (dB) (dB) (dBuV/m) (dBuV/m) (dB) Comments Perp/GND, 13.567 31.3 10.2 1.0 159.0 3.0 0.0 Para/EUT QP -40.0 1.5 50.5 -49.0 EUT On Side Perp/GND, 13.553 29.6 10.2 1.0 156.0 3.0 0.0 Para/EUT QP -40.0 -0.2 50.5 -50.7 EUT On Side Perp/GND, 13.410 9.2 10.2 1.0 152.0 3.0 0.0 Para/EUT QP -40.0 -20.6 40.5 -61.1 EUT On Side Perp/GND, 1.0 QP -40.0 EUT On Side 13.710 7.9 10.2 153.9 3.0 0.0 Para/EUT -21.9 40.5 -62.4 Perp/GND, 13.110 6.8 10.2 1.0 82.9 3.0 0.0 . Para/EUT QP -40.0 -23.0 40.5 -63.5 EUT On Side Perp/GND, QP 14.010 56 10.1 1.0 27.0 3.0 0.0 Para/EUT -40.0 -24.3 40.5 -64 8 EUT On Side Perp/GND, 13.560 45.6 10.2 1.0 147.0 3.0 0.0 . Para/EUT QP -40.0 15.8 84.0 -68.2 EUT On Side Perp/GND, Perp/EUT Par/GND, OP EUT On Side 13.561 10.2 1.0 207.9 3.0 0.0 -40.0 15.8 84.0 -68.2 45.6 1.0 7.0 0.0 Perp/EUT QP -40.0 15.5 -68.5 EUT On Side 13.560 45.3 10.2 3.0 84.0 Perp/GND, 13.560 45.1 10.2 1.0 196.9 3.0 0.0 Perp/EUT QP -40.0 15.3 84.0 -68.7 EUT Horizontal

FIELD STRENGTH OF SPURIOUS EMISSIONS LESS THAN 30 MHZ



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

NFC Charging Mode

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

ELEM0010 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency 10 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
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	10/29/2015	12 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	5/31/2016	12 mo
Antenna	ETS Lindgren	6502	AZM	6/24/2016	24 mo

TEST DESCRIPTION

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

While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes, the EUT and/or associated antenna is positioned in 3 orthogonal planes (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

As outlined in 15.209(e) and 15.31(f)(2), 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



					00/00/46			
Wo	ork Order:	ELEM0010		Date:	09/08/16			
	Project:	None	Tem	perature:	23.5 °C	Jonat	than Kie	hen
	Job Site:	TX02		Humidity:	51% RH	0		0
Serial	I Number:	0148	Barome	tric Pres.:	1019 mbar	Tested	by: Jonathan Kief	er
		UltraTEV Plus2 (UTP2						
Confi	iguration:		/					
		EA Technology Ltd						
	Attendees:	None						
		110VAC/60Hz						
Operati	ing Mode:	NFC Charging Mode						
D	eviations:	None						
Co	omments:	QP data for 2nd harmo	onic 27.12N	1Hz. 3m test dis	tance. 40dB/de	ecade adjustment factor.		
	ifications				Test M			
CC 15.228	5:2016				ANSI C	63.10:2013		
Run #	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
Run #	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ight(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ight(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ight(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40 - 30 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40 30	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40 - 30 - 20 - W/NB	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results	Pass
40 - 30 - 20 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results Image: state	Pass
40 - 30 - 20 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results Image: state	Pass
40 - 30 - 20 - 10 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results Image: state	Pass
40 - 30 - 20 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results Image: Constraint of the second s	Pass
40 - 30 - 20 - 10 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results Image: state	Pass
40 - 30 - 20 - 10 - -10 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results Image: state	Pass
40 - 30 - 20 - 10 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results Image: state	Pass
40 - 30 - 20 - 10 - -10 -	29	Test Distance (m)	3	Antenna Hei	ght(s)	1 to 4(m)	Results Image: Image	Pass
40 - 30 - 20 - 10 - -10 -	29	Test Distance (m)		Antenna Hei	ght(s)	1 to 4(m)	Results Image: state	Pass
40	29	Test Distance (m)		Antenna Hei	ght(s)	1 to 4(m)	Results Image: state	Pass
40		Test Distance (m)		Antenna Hei		1 to 4(m)	Results Image: state	
40 - 30 - 20 - 10 - -10 - -20 -		Test Distance (m)	3	Antenna Hei	10	1 to 4(m)	Results Image: state	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
							Para/GND,						
27.121	12.5	8.7	1.0	242.0	3.0	0.0	Perp/EUT	QP	-40.0	-18.8	29.5	-48.3	EUT Horizontal
							Perp/GND,						
27.120	12.2	8.7	1.0	255.0	3.0	0.0	Para/EUT	QP	-40.0	-19.1	29.5	-48.6	EUT On Side
							Perp/GND,						
27.121	7.7	8.7	1.0	298.9	3.0	0.0	Perp/EUT	QP	-40.0	-23.6	29.5	-53.1	EUT Horizontal
							Perp/GND,						
27.116	7.4	8.7	1.0	109.0	3.0	0.0	Perp/EUT	QP	-40.0	-23.9	29.5	-53.4	EUT On Side
							Perp/GND,						
27.117	7.4	8.7	1.0	141.9	3.0	0.0	Perp/EUT	QP	-40.0	-23.9	29.5	-53.4	EUT Vertical
							Para/GND,						
27.115	5.5	8.7	1.0	237.9	3.0	0.0	Perp/EUT	QP	-40.0	-25.8	29.5	-55.3	EUT On Side
							Para/GND,						
27.124	5.4	8.7	1.0	303.0	3.0	0.0	Perp/EUT	QP	-40.0	-25.9	29.5	-55.4	EUT Vertical
							Perp/GND,						
27.122	5.3	8.7	1.0	157.0	3.0	0.0	Para/EUT	QP	-40.0	-26.0	29.5	-55.5	EUT Horizontal
							Perp/GND,						
27.119	5.2	8.7	1.0	32.0	3.0	0.0	Para/EUT	QP	-40.0	-26.1	29.5	-55.6	EUT Vertical

FIELD STRENGTH OF SPURIOUS EMISSIONS GREATER THAN 30 MHZ



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

NFC Charging Mode

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

ELEM0010 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz

Stop Frequency 140 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
Amplifier - Pre-Amplifier	Miteq	AM-1551	PAH	9/12/2016	12 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	5/31/2016	12 mo
Antenna - Biconilog	ETS Lindgren	3143B	AYF	4/13/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	10/29/2015	12 mo

TEST DESCRIPTION

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

While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.10:2013).

FIELD STRENGTH OF SPURIOUS EMISSIONS GREATER THAN 30 MHZ



	rk Order:	ELEM0010			Date		09/08/16	-			
	Project:	None		Ter	nperature	e:	23.4 °C	Jon	rathan Ki	refer	-
	Job Site:	TX02			Humidity		51.4% RH	-			
Serial	Number:	0148		Barome	etric Pres	.: 1	019 mbar	Testec	d by: Jonathan Kiel	ter	
		UltraTEV Plus2 (I	JTP2)								
Config	guration:	2									
		EA Technology L	td								
At	tendees:	None									
EUT	T Power:	110VAC/60Hz									
Operatin	ng Mode:	NFC Charging Mo	ode								
De	viations:	None									
Cor	mments:	QP data for harm	onics g	reater th	an 30 MH	lz. 13.56	MHz fundam	nental frequency.			
st Specifi C 15.225	ications						Test Me	ethod 63.10:2013			
Run #	25	Test Distance	(m)	3	Anteni	na Heigh	nt(s)	1 to 4(m)	Results	Pa	ISS
80											
80											
70											
70											
70											
70											
70 60 50 40 30					•						
70 60 50 40 30 20					•						100

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
40.678	51.2	-29.4	1.0	87.9	3.0	0.0	Vert	QP	0.0	21.8	40.0	-18.2	EUT Horizontal
40.678	50.1	-29.4	1.0	325.0	3.0	0.0	Vert	QP	0.0	20.7	40.0	-19.3	EUT On Side
40.684	48.4	-29.4	1.0	127.0	3.0	0.0	Vert	QP	0.0	19.0	40.0	-21.0	EUT Vertical
81.365	50.9	-32.3	1.0	27.9	3.0	0.0	Vert	QP	0.0	18.6	40.0	-21.4	EUT Horizontal
135.604	50.4	-30.4	1.0	55.0	3.0	0.0	Vert	QP	0.0	20.0	43.5	-23.5	EUT Horizontal
67.802	48.2	-32.2	1.0	224.0	3.0	0.0	Vert	QP	0.0	16.0	40.0	-24.0	EUT Horizontal
94.915	50.6	-31.4	1.0	28.9	3.0	0.0	Vert	QP	0.0	19.2	43.5	-24.3	EUT Horizontal
108.482	47.8	-30.2	1.0	106.9	3.0	0.0	Vert	QP	0.0	17.6	43.5	-25.9	EUT Horizontal
54.236	46.4	-33.1	1.0	111.0	3.0	0.0	Vert	QP	0.0	13.3	40.0	-26.7	EUT Horizontal
122.044	46.3	-31.3	1.0	138.0	3.0	0.0	Vert	QP	0.0	15.0	43.5	-28.5	EUT Horizontal
40.681	37.7	-29.4	3.3	342.0	3.0	0.0	Horz	QP	0.0	8.3	40.0	-31.7	EUT Horizontal
40.683	37.7	-29.4	3.7	255.0	3.0	0.0	Horz	QP	0.0	8.3	40.0	-31.7	EUT On Side
40.683	37.5	-29.4	2.9	296.0	3.0	0.0	Horz	QP	0.0	8.1	40.0	-31.9	EUT Vertical



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
Transformer	Mastech	5KVA-110V/250V	XPU	NCR	NCR
Probe - Near Field Set	ETS Lindgren	7405	IPS	NCR	NCR
Thermometer	Omegaette	HH311	DTX	4/3/2015	4/3/2018
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPH-8-2-SCT/AC	TBH	NCR	NCR
Block - DC	Fairview Microwave	SD3379	AMM	2/25/2016	2/25/2017
Attenuator	Fairview Microwave	SA4018-20	TQY	2/25/2016	2/25/2017
Cable	Fairview Microwave	SCK0963-60	TXF	11/3/2015	11/3/2016
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	3/15/2016	3/15/2017
Meter - Multimeter	Fluke	77-IV	MLT	9/25/2014	9/25/2017

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer. 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 transmitting at an unmodulated carrier frequency.

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.

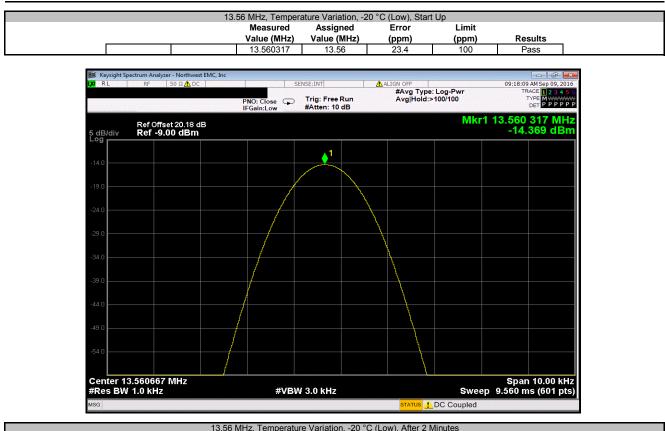
The requirement of a frequency tolerance of $\pm 0.01\%$ is equivalent to 100 ppm The formula to check for compliance is:

ppm = (Measured Frequency / Measured Nominal Frequency - 1) * 1,000,000

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С		Г
		L
	XMit	2016.05.06

	traTEV Plus2 (UTP2	1				Work Order:		
Serial Number: 01							09/09/16	
	Technology Ltd					Temperature:		
Attendees: No						Humidity:		
Project: No						Barometric Pres.:		
Tested by: Jo			Power: 110VAC/60Hz			Job Site:	TX09	
EST SPECIFICATION	S		Test Method					
CC 15.225:2016			ANSI C63.10:2013					
OMMENTS								
one								
EVIATIONS FROM T	EST STANDARD							
one								
nfiguration #	2		Jonethan Kiefer					
onfiguration #	2	O'rear trans	Jonathan niefer					
		Signature		Measured	Assigned	Error	Limit	
				Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results
.56 MHz				value (IVITIZ)	value (WHZ)	(ppiii)	(ppin)	Results
	mperature Variation							
Te	-20 °C (Lo	(wo						
	-20 C (LC	Start Up		13.560317	13.56	23.4	100	Pass
		After 2 Minutes		13.560317	13.56	23.4	100	Pass
		After 5 Minutes		13.560317	13.56	23.4	100	Pass
		After 10 Minutes		13.560317	13.56	23.4	100	Pass
	-10 °C	Alter to Minutes		10.000011	10.00	20.4	100	1 455
	10 0	Start Up		13.560317	13.56	23.4	100	Pass
		After 2 Minutes		13.560317	13.56	23.4	100	Pass
		After 5 Minutes		13.560317	13.56	23.4	100	Pass
		After 10 Minutes		13.560317	13.56	23.4	100	Pass
	0 °C			10.000017	10.00	20.7	100	1 435
	0.0	Start Up		13.560317	13.56	23.4	100	Pass
		After 2 Minutes		13.560317	13.56	23.4	100	Pass
		After 5 Minutes		13.560317	13.56	23.4	100	Pass
		After 10 Minutes		13.560317	13.56	23.4	100	Pass
	10 °C	Aller To Mindles		10.000011	10.00	20.4	100	1 455
	10 0	Start Up		13.56030033	13.56	22.2	100	Pass
		After 2 Minutes		13.560317	13.56	23.4	100	Pass
		After 5 Minutes		13.560317	13.56	23.4	100	Pass
		After 10 Minutes		13.56031633	13.56	23.3	100	Pass
	20 °C (No			13.30031033	15.50	20.0	100	1 833
	20 0 (140	Start Up		13.560267	13.56	19.7	100	Pass
		After 2 Minutes		13.56026667	13.56	19.7	100	Pass
		After 5 Minutes		13.560267	13.56	19.7	100	Pass
		After 10 Minutes		13.560267	13.56	19.7	100	Pass
	30 °C			10.000207	10.00	10.7	100	1 055
	30 0	Start Up		13.560267	13.56	19.7	100	Pass
		After 2 Minutes		13.560267	13.56	19.7	100	Pass
		After 5 Minutes		13.56025033	13.56	18.5	100	Pass
		After 10 Minutes		13.56025033	13.56	18.5	100	Pass
	40 °C			10.00020000	10.00	10.0	100	1 855
	40 0	Start Up		13.560217	13.56	16	100	Pass
		After 2 Minutes		13.560217	13.56	16	100	Pass
		After 5 Minutes		13.560217	13.56	16	100	Pass
		After 10 Minutes		13.560217	13.56	16	100	Pass
	50 °C (Hig			10.000217	10.00	10	100	1 033
	50 C (Hiệ	Start Up		13.560217	13.56	16	100	Pass
		After 2 Minutes		13.5602	13.56	14.8	100	Pass
		After 5 Minutes		13.56020033	13.56	14.8	100	Pass
		After 10 Minutes		13.5602	13.56	14.8	100	Pass
Ve	Itage Variation			10.0002	10.00	14.0	100	1 055
VC	Voltage: 1	15%						
	vondye. I	Start Up		13.56021667	13.56	16	100	Pass
	Voltage: 1	100%		13.30021007	10.00	10	100	r a55
	vondye. I	Start Up		13.56020033	13.56	14.8	100	Pass
	Voltage: 8			13.30020033	13.00	14.0	100	r dSS
	voltage: 8	Start Up		13.560217	13.56	16	100	Pass

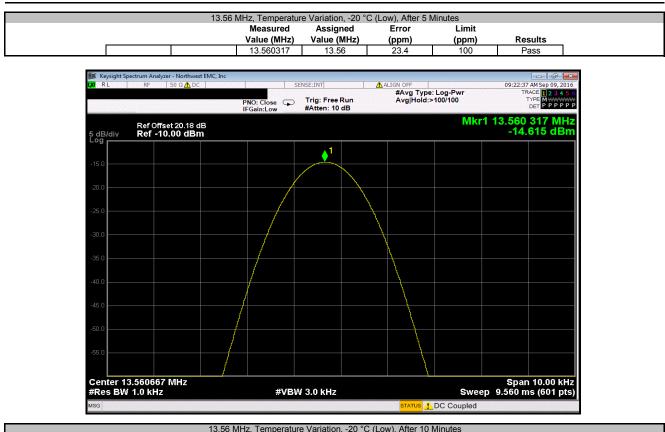




	13.56 MHz, Temper	ature Variation, -20	°C (Low), After 2	Minutes						
Measured Assigned Error Limit										
Value (MHz) Value (MHz) (ppm) (ppm) Results										
	13.56031	7 13.56	23.4	100	Pass					

Keysight Spectrum Analyzer - Northwe				
🛛 RL RF 50 Ω 🧥 DI		SENSE:INT	ALIGN OFF	09:20:16 AM Sep 09, 201
	PNO: Close C IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: Log-F Avg Hold:>100/10	0 TYPE MWWW DET P P P P
Ref Offset 20.18 dB/div Ref -10.00 dB	dB m			Mkr1 13.560 317 MH -14.491 dBn
15.0		↓ ¹		
20.0				
25.0				
30.0				
10.0				
15.0				
50.0				
55.0				
Center 13.560667 MHz Res BW 1.0 kHz	#V	BW 3.0 kHz		Span 10.00 kH Sweep 9.560 ms (601 pts
SG			STATUS DC C	





13.56 MHz, Temperature Variation, -20 °C (Low), After 10 Minutes										
Measured Assigned Error Limit										
		Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results				
		13.560317	13.56	23.4	100	Pass				

KI RL	rum Analyzer - Northwest EMC, RF 50 Ω Δ DC	and the second se	SENSE:INT		IGN OFF		09:27:24 AM Sep 09, 201
		PNO: Close IFGain:Low		un	#Avg Type: Log Avg Hold:>100/	100	TRACE 1 2 3 4 5 TYPE M WWWW DET P P P P P
dB/div	Ref -30.00 dBm					Mkr1 1	3.560 317 MH -35.044 dBn
-			1				
35.0							
10.0							
45.0							
50.0							
5.0							
0.0							
5.0							
0.0							
5.0							
enter 13.5 Res BW 1	560667 MHz .0 kHz	#	VBW 3.0 kHz			Sweep 9	Span 10.00 kH .560 ms (601 pt
ig					STATUS ! DC		the left pre-

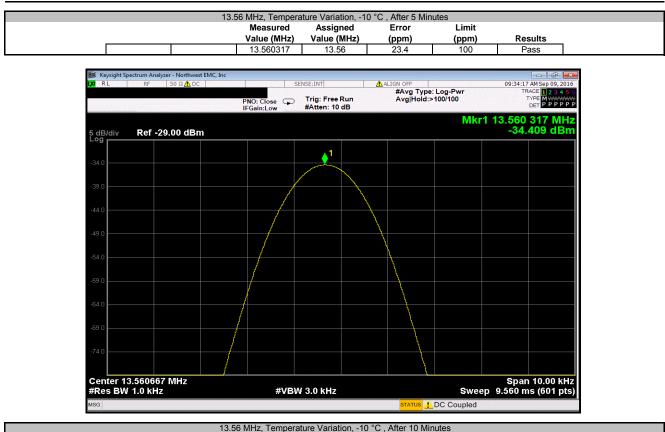




13.56 MHz, Temperature Variation, -10 °C , After 2 Minutes										
		Measured	Assigned	Error	Limit					
		Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results	_			
		13.560317	13.56	23.4	100	Pass				

α RL RF 50 Ω \Lambda DO	ist EMC, Inc	SENSE:INT	ALIGN OFF	09:31:39 AM Sep 09, 201
	PNO: Close IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 TYPE M WWWW DET PPPPP
dB/div Ref -29.00 dB	m		M	kr1 13.560 317 MH -34.433 dBn
-		1		
34.0				
39.0			<u> </u>	
44.0				
19.0				
4.0				
9.0				
4.0				
9.0				
4.0				
enter 13.560667 MHz Res BW 1.0 kHz		VBW 3.0 kHz		Span 10.00 kH eep 9.560 ms (601 pt
Kes BW 1.0 KHz	#		SW	eep 9.500 ms (00 m

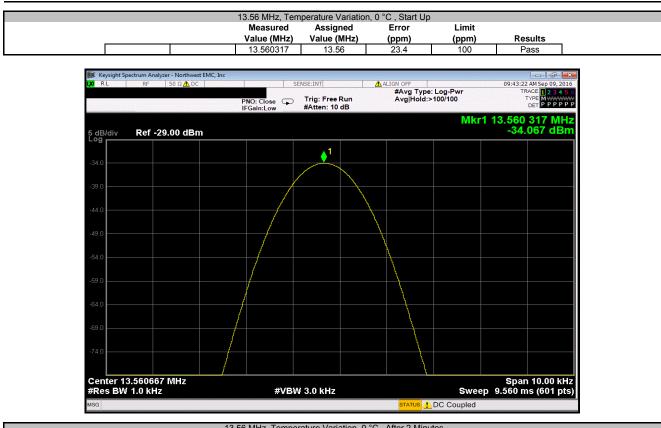




13.56 MHz, Temperature Variation, -10 °C , After 10 Minutes										
Measured Assigned Error Limit										
		Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results				
		13.560317	13.56	23.4	100	Pass				

VO: Close G	Trig: Free Rt #Atten: 10 d	un B	#Avg Type: L Avg Hold:>10	0/100	T 13,560	CE 2 3 4 5 (PE MWWWW DET P P P P P 317 MH: 108 dBn
	1			Mkr1	13.560 -34.4	317 MH: 108 dBn
/		1				
#VBW	/ 3.0 kHz			Sweep	Span 9.560 m	10.00 kH s (601 pts
	#VBM	#VBW 3.0 kHz	#VBW 3.0 kHz		#VBW 3.0 kHz Sweep	





13.56 MHz, Temperature Variation, 0 °C , After 2 Minutes										
			Measured	Assigned	Error	Limit				
			Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results	_		
			13.560317	13.56	23.4	100	Pass			

RL RF 5	- Northwest EMC, Inc 50 Ω 🛕 DC		SENSE:INT		IGN OFF		09:44:49 /	M Sep 09, 201
	-	PNO: Close 🕞 IFGain:Low		un	#Avg Type: Avg Hold:>	Log-Pwr 100/100	TRA TY	CE 1 2 3 4 5 PE M WWW ET P P P P P
dB/div Ref -29.	00 dBm					Mkr	1 13.560 (-34.0	317 MH 35 dBr
- , 34.0								
9.0								
4.0								
9.0					\			
4.0								
3.0								
4.0								
3.0	- /							
4.0								
enter 13.560667 M Res BW 1.0 kHz	//////////////////////////////////////	#VB	W 3.0 kHz		۱. ۱	Swee	Span p 9.560 ms	10.00 kH s (601 pt
G						***************************************		





13.56 MHz, Temperature Variation, 0 °C , After 10 Minutes										
		Measured	Assigned	Error	Limit					
		Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results				
		13.560317	13.56	23.4	100	Pass				

📕 Keysight Spectrum Analyzer - Northwest 🗶 RL 🛛 RF 🛛 50 Ω 🧥 DC	civic, inc	SENSE:INT	A 01	LIGN OFF	00:52	47 AM Sep 09, 201
	PNO: Cl IFGain:L	ose 👝 Trig: Fr	ee Run	#Avg Type: Log-Pv Avg Hold:>100/100	vr	TRACE 1 2 3 4 5 TYPE MWWWW DET P P P P P
dB/div Ref -29.00 dBm					Mkr1 13.56 -34	0 317 MH .012 dBn
34.0		•	1			
9.0						
4.0						
9.0				1		
4.0						
3.0						
4.0						
3.0						
4.0						
enter 13.560667 MHz Res BW 1.0 kHz		#VBW 3.0 kH	lz		Spa Sweep 9.560	ın 10.00 kH ms (601 pt
G				STATUS ! DC CO		





13.56 MHz, Temperature Variation, 10 °C , After 2 Minutes										
Measured Assigned Error Limit										
		Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results	_			
		13.560317	13.56	23.4	100	Pass				

RL RF 50 Ω 🚹 DC		SENSE:INT	ALIGN OFF	09:59:27 AM Sep 09, 201
	PNO: Close IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 TYPE M WWWW DET P P P P P
dB/div Ref -29.00 dBm			N	1kr1 13.560 317 MH -33.923 dBr
-		↓ 1		
34.0				
39.0				
4.0				
9.0				
4.0				
3.0				
4.0				
9.0				
4.0				
enter 13.560667 MHz				Span 10.00 kF weep 9.560 ms (601 pt
Res BW 1.0 kHz	#	VBW 3.0 kHz	S	weep 9.560 ms (601 pt

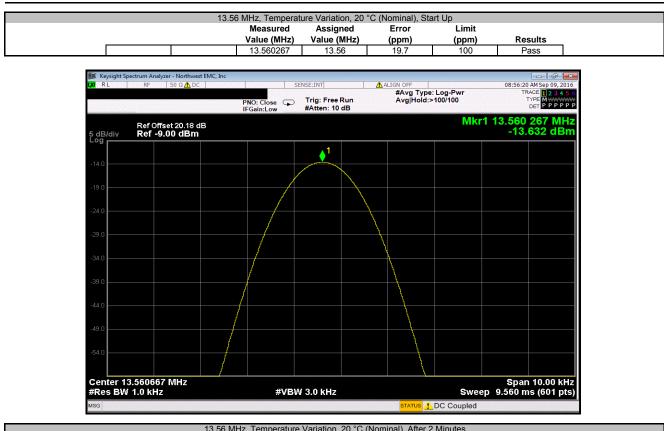




	13.56 MHz, Tempera	ture Variation, 10	°C , After 10 Mir	nutes		
	Measured	Assigned	Error	Limit		
	Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results	
	13.56031633	13.56	23.3	100	Pass	

U RL	RF 50 Ω Λ DC	Inc		SENSE:INT		ALIGN OFF		10:00:27	AM Sep 09, 201
		PN IF(IO: Close 😱 Gain:Low	Trig: Free F #Atten: 10	Run	#Avg Type: Avg Hold:>		TR	ACE 1 2 3 4 5 TYPE M DET P P P P P
dB/div	Ref -29.00 dBm						Mkr1	13.560 -33.	316 MH 928 dBr
-				≜ 1					
34.0					\				
9.0									
4.0									
9.0			/						
4.0			/						
9.0		/				¥ 4			
4.0						1			
ə.o									
		/							
4.0									
enter 13 Res BW	.560833 MHz		#VB	W 3.0 kHz		\	Swee	Span p 9.560 m	10.00 kH
G				A = 0000001/4			DC Coupled	5-01000 III	o too - br

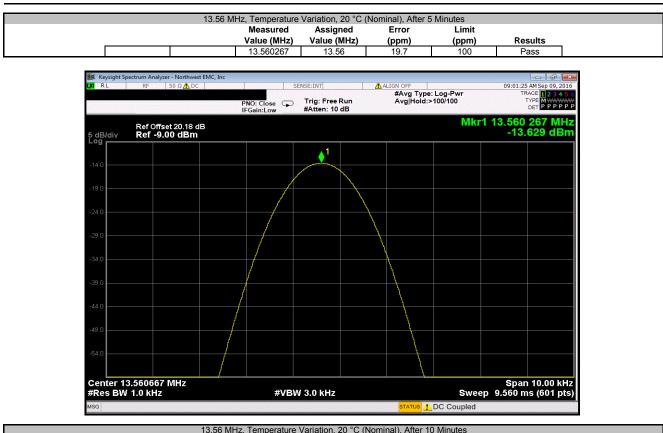




13.56 MHz, Temperature Variation, 20 °C (Nominal), After 2 Minutes									
Measured Assigned Error Limit									
	Va	lue (MHz)	Value (MHz)	(ppm)	(ppm)	Results			
	13.	56026667	13.56	19.7	100	Pass			

RL	RF 50 Ω 🗘 DC	st EMC, Inc	9	SENSE:INT	A AI	IGN OFF		08:58:29	AM Sep 09, 201
	-	PN	IO: Close 😱 Gain:Low	Trig: Free Ru #Atten: 10 di	ın	#Avg Type: L Avg Hold:>10	00/100	TR. T	ACE 1 2 3 4 5 YPE MWWWA DET PPPPP
dB/div og	Ref Offset 20.18 c Ref -9.00 dBm	iB					Mkr	13.560 -13.	267 MH 627 dBr
4.0				↓ ¹					
9.0									
4.0									
9.0									
4.0									
9.0									
4.0									
3.0									
4.0									
enter 13. Res BW	.560500 MHz 1.0 kHz		#VBI	AV 3.0 kHz		ų	Swee	Span 9.560 m	10.00 kH s (601 pt
G						STATUS / D			





13.56 MHz, Temperature Variation, 20 °C (Nominal), After 10 Minutes									
Measured Assigned Error Limit									
		Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results			
		13.560267	13.56	19.7	100	Pass			

RL RF	lyzer - Northwest EMC, Inc 50 Ω ⚠ DC		SENSE:INT	AL.	IGN OFF		09:07:07 A	M Sep 09, 201
	-	PNO: Close 🖵 IFGain:Low		un	#Avg Type: L Avg Hold:>1	00/100	יד ס	DE 1 2 3 4 5 PE MWWWW ET P P P P P
Ref Off dB/div Ref - 9	fset 20.18 dB 9.00 dBm					Mkr1	13.560 2 -13.6	267 MH 27 dBr
4.0			↓ ¹					
		/	$\langle \rangle$					
9.0								
4.0								
9.0								
4.0								
3.0								
4.0		/						
9.0								
4.0								
enter 13.56066 Res BW 1.0 kHz		#VB	W 3.0 kHz			Sweep	Span 9.560 ms	10.00 kH 601 pt
G						************************************		A STREET STREET

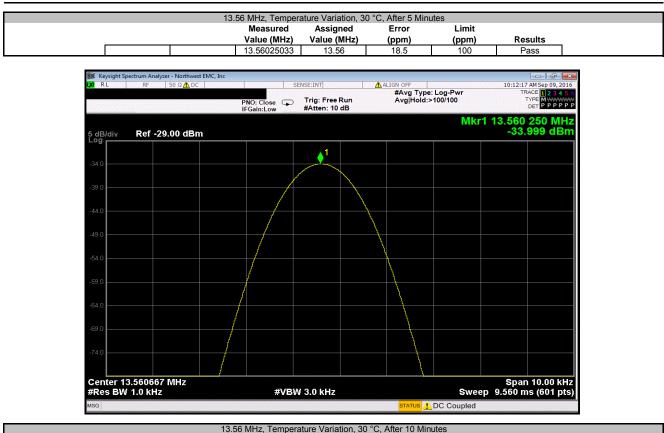




	13.56 MHz, Temperature Variation, 30 °C, After 2 Minutes									
Measured Assigned Error Limit										
			Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results			
			13.560267	13.56	19.7	100	Pass			

Keysight Spectrum Analyzer - I RL RF 50				
<mark>0</mark> RL RF 50	Ω 🚹 DC	SENSE:INT	ALIGN OFF	10:09:47 AM Sep 09, 2010
	PNO: Clos IFGain:Lo	e 🕞 Trig: Free Run w #Atten: 10 dB		TRACE 1 2 3 4 5 TYPE MWWWW DET P P P P P
dB/div Ref -29.0	0 dBm		MI	r1 13.560 267 MH -33.965 dBn
34.0		1		
39.0				
44.0				
49.0				
54.0	/			
9.0				
34.0				
39.0	/			
74.0				
enter 13.560667 M Res BW 1.0 kHz	Hz	#VBW 3.0 kHz	Sw	Span 10.00 kH eep 9.560 ms (601 pt
SG			STATUS / DC Coupled	





13.56 MHz, Temperature Variation, 30 °C, After 10 Minutes									
	Measured	Assigned	Error	Limit					
	Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results				
	13.56025033	13.56	18.5	100	Pass				

RL	ctrum Analyzer - Northwest EM RF 50 Ω 🚹 DC		SENSE:INT		IGN OFF		10:16:44	AM Sep 09, 201
		PNO: Close ⊂ IFGain:Low		un	#Avg Type: Avg Hold:>1	00/100	TR/ T	ACE 1 2 3 4 5 YPE M WWW DET P P P P P
dB/div og	Ref -29.00 dBm					Mkr	1 13.560 -34.0	250 MH 024 dBn
34.0								
19.0 								
4.0								
4.U 3.0								
				× × ×				
1.0								
0.0		/						
1.0								
9.0								
4.0								
enter 13. Res BW	.560667 MHz 1.0 kHz	#V	BW 3.0 kHz			Swee	Span p 9.560 m	10.00 kH s (601 pt
G					CTATUS .	C Coupled	NOT STREET	





13.56 MHz, Temperature Variation, 40 °C, After 2 Minutes									
Measured Assigned Error Limit									
		Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results	_		
		13.560217	13.56	16	100	Pass			

RL RF 50 Ω Δ DC		SENSE:INT	ALIGN OFF	10:45:40 AM Sep 09, 201
	PNO: Close G IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 TYPE M WWWW DET PPPP
dB/div Ref -29.00 dBm			MI	r1 13.560 217 MH -34.193 dBr
4.0		♦ ¹		
9.0				
4.0				
9.0				
4.0				
3.0	/			
4.0				
3.0				
4.0				
enter 13.560667 MHz Res BW 1.0 kHz	#V	BW 3.0 kHz	Sw	Span 10.00 kF eep 9.560 ms (601 pt





13.56 MHz, Temperature Variation, 40 °C, After 10 Minutes								
	Measured	Assigned	Error	Limit				
	Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results			
	13.560217	13.56	16	100	Pass			

	#Avg Type: Log-Pwr Avg Hold:>100/100	10:51:29 AM Sep 09. 201 TRACE 12 3 45 TYPE MY DET P P P P r1 13.560 217 MH -34.195 dBr
og 1 34.0 1 39.0 44.0 44.0 1 54.0 1 59.0 1		r1 13.560 217 MH -34.195 dBr
9.0		
4.0		
4.0		
enter 13.560667 MHz Res BW 1.0 kHz #VBW 3.0 kHz	euro.	Span 10.00 kH ep 9.560 ms (601 pt

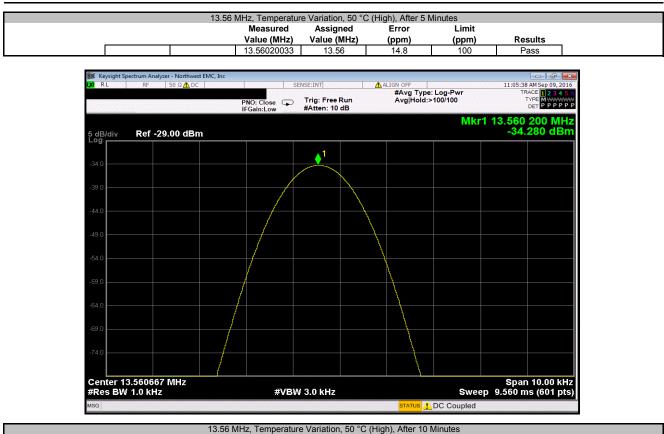




13.56 MHz, Temperature Variation, 50 °C (High), After 2 Minutes								
			Measured	Assigned	Error	Limit		
			Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results	
			13.5602	13.56	14.8	100	Pass	

α RL RF 50 Ω 🕰 DC	t EMC, Inc	SENSE:INT		IGN OFF		11:01:32 AM Sep 09, 201
	PNO: Close IFGain:Low	Trig: Free F	Run	#Avg Type: Log Avg Hold:>100/	j-Pwr 100	TRACE 1 2 3 4 5 TYPE M WWW DET P P P P P
dB/div Ref -29.00 dBr	n				Mkr1 13	.560 200 MH -34.255 dBn
34.0		∮ ¹				
9.0						
4.0	/					
9.0			No.			
4.0						
3.0						
4.0						
3.0						
4.0				\		
enter 13.560500 MHz Res BW 1.0 kHz		#VBW 3.0 kHz			Sweep 9.	Span 10.00 kH 560 ms (601 pt
SG .				STATUS ! DC	***************************************	

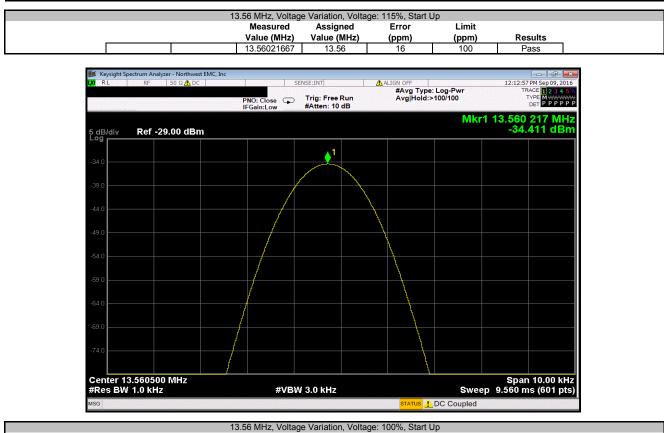




		Measured	Assigned	Error	Limit		
		Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results	
		13.5602	13.56	14.8	100	Pass	

RL RF 50 Ω Δ DC		ENSE:INT	ALIGN OFF	11	11:19 AM Sep 09, 201
	PNO: Close 🖵 IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: Log- Avg Hold:>100/1	00	TRACE 1 2 3 4 5 TYPE M WWW DET P P P P P
B/div Ref -29.00 dBm				Mkr1 13.5	60 200 MH 34.310 dBr
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.0			×		
.0					
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.0					
.0					
.0					
.0					
.0					
enter 13.560500 MHz tes BW 1.0 kHz	#VBV	/ 3.0 kHz		Sweep <u>9.56</u>	pan 10.00 kH 0 ms (601 pt





	13.56 MHz, Voltag	je Variation, Volta	ige: 100%, Start U	Jp	
	Measured	Assigned	Error	Limit	
	Value (MHz)	Value (MHz)	(ppm)	(ppm)	Results
	13.56020033	13.56	14.8	100	Pass

RL	rum Analyzer - Northwest EMC, In RF 50 Ω Δ DC		SENSE:INT	ALIGN OFF	12:11:07 PM Sep 09, 201
		PNO: Close 🖵 IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: Log-Pw Avg Hold:>100/100	TYPE M WWWW DET P P P P
dB/div	Ref -29.00 dBm				Mkr1 13.560 200 MH -34.272 dBr
-			1		
34.0					
9.0					
4.0				X	
9.0		/			
4.0					
9.0					
4.0					
3.0					
4.0		F			
enter 13.: Res BW 1	560667 MHz	#\/P	W 3.0 kHz		Span 10.00 kF Sweep 9.560 ms (601 pt
	.0 KH2	<i>₩</i> ♥⊑	44 5.0 KHZ	STATUS LDC COU	



