

**Electromagnetic Compatibility
Test Report
FCC CFR47 Part 15 Subpart B
FCC CFR47 Part 15 Subpart C 15.207, 15.209, 15.215 & 15.225
ICES-003 Issue 6
RSS Gen: Issue 4 & RSS-210: Issue 8**

Report Number: EJ0092_EXTRATECH-ESD_STATION-FCC-IC
Issue: Release version 2.0
Date of Issue: September 13, 2016
Number of Pages: 17

Testing laboratory: QAI LABORATORIES LTD.
Address: 834 80TH Street SW, Suite 200, Everett, WA 98203-7008
Phone: +1-425-512-8419

Laboratory Accreditations (per ISO/IEC 17025:2005):



American Association for Laboratory Accreditation Certificate Number: 3657.02

This report has been completed in accordance with the requirements of ISO/IEC 17025. Test results contained in this report are within QAI Laboratories ISO/IEC 17025 accreditation. QAI Laboratories authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for the use by the company's employees only.

Applicant's name: ExtraTech Systems, LLC
Address: 760 N. Thornton St., Post Falls, ID 83854
Phone Direct: 208-262-0852

Equipment under Test (EUT): ESD Check Point
Model Number: ESD/CP-HW01
Trade Mark:



Manufacturer: ExtraTech Systems, LLC
Marketing Numbers/Models: ESD Check Point, Agent
ESD Check Point, Deputy Agent
FCC Registration (FRN): 0025347485
FCC ID: 2AHJ2-ET16ESDCP1
IC: 21388-ET16ESDCP1

Table of Contents

Summary of Test Results	3
Revision History	4
General Information	5
Part 1: Fundamental Radiated Emission	8
Part 3: 99% bandwidth	10
Part 4: Frequency tolerance	11
Part 5: AC conducted emission	12
Appendix A Test Setup Photographs	15
End of Test Report	17

Summary of Test Results

The following tests demonstrate the testimony to "FCC & IC" Mark Electromagnetic compatibility testing for "ESD Check Point" manufactured by ExtraTech Systems, LLC

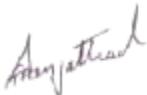
	Test	Standards	Description	Result
Part 1	Fundamental Radiated Emission	47 CFR (FCC) Part 15 15.225	within the band 13.553–13.567 MHz shall not exceed 15,848 uv/m at 30 meters.	Complies
Part 2	Spurious Radiated Emission	47 CFR (FCC) Part 15 15.209 15.225	Field strength of emissions outside of specified bands	Complies
Part 3	99% bandwidth	RSS Gen: Issue 4 - 6.6	99% bandwidth is contained within the frequency band	Complies
Part 4	Frequency tolerance	47 CFR (FCC) Part 15 15.225(e), RSS Gen: Issue 4 - 6.11	within $\pm 0.01\%$ of the operating frequency	Complies
Part 5	AC conducted emission	47 CFR (FCC) Part 15 Subpart B, ICES-003 Issue 6	Class A Limits	Complies

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC CFR47 Part 15 Subpart B & Subpart C 15.207, 15.209, 15.215 & 15.225; RSS Gen: Issue 4 & RSS-210: Issue 8. The manufacturer is responsible for the tested product configuration, continued product compliance with these standards listed, and for the appropriate auditing of subsequent products as required.

This is to certify that the following report is true and correct to the best of our knowledge.



Written by Jack Qin
 RF/EMC Test Engineer/Technical Writer



Reviewed by Arman Jathaul,
 EMC Project Manager

Revision History

Date	Report Number	Rev #	Details	Authors Initials
June 20, 2016	EJ0092_EXTRATECH-ESD_STATION-FCC-IC	0.0	Draft Test Report	JQ
July 11, 2016	EJ0092_EXTRATECH-ESD_STATION-FCC-IC	1.0	Final report	JQ
August 3, 2016	EJ0092_EXTRATECH-ESD_STATION-FCC-IC	1.1	Updated as per TCB comments	JQ
September 13, 2016	EJ0092_EXTRATECH-ESD_STATION-FCC-IC	2.0	Updated 99% OBW	JQ

All previous versions of this report have been superseded by the latest dated revision as listed in the above table. Please dispose of all previous electronic and paper printed revisions accordingly.

General Information

Equipment Under Test Information:

Manufacturer	ExtraTech Systems, LLC
Product Name	ESD Check Point, Deputy Agent ESD Check Point, Agent
Model Number	ESD/CP-HW01
Photograph	
Modifications	There were no modifications made to the EUT.

Environmental Conditions:

INDOORS, Temperature: 22-28°C, R.H.: 39.7 - 54.4%

Relevant Site Registrations and Accreditations:

USA EMC Test Laboratory:	QAI Laboratories Inc.
Location/Address	834 80 TH Street SW, Suite 200, Everett, WA 98203-7008
Tel:	+1-425-512-8419
Fax:	+1-425-322-3011
3 m Semi-Anechoic Chamber Test Site and AC Line Conduction Site FCC Test Site Address:	Same as above.
3 m Semi-Anechoic Chamber Test Site Industry Canada Test Site # 11876A-1 Address:	Same as above.
3 m Semi-Anechoic Chamber Test Site and AC Line Conduction Site FCC Test Site Registration Number:	307482
3 m Semi-Anechoic Chamber Test Site Industry Canada Test Site Registration File Number:	46405-11876

Measurement Uncertainties:

Test	Frequency Range / Polarization	Measurement Uncertainty
Conducted Emissions	0.150 – 30 MHz	2.5540
Radiated Emissions	30 – 200 MHz (H-pol)	2.7171
Radiated Emissions	30 – 200 MHz (V-pol)	3.8957
Radiated Emissions	200 – 1000 MHz (H-pol)	5.2340
Radiated Emissions	200 – 1000 MHz (V-pol)	4.6578

Sample Calculations – Radiated Emissions and Conducted Emissions:

Radiated Emissions:

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading.

$$\text{Field Strength (dB}\mu\text{V)} = \text{RAW} - \text{AMP} + \text{CL} + \text{ACF}$$

Where:

RAW = Measured level (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

Sample Radiated Emissions Calculation:

$$\text{Measurement} + \text{Antenna Correction Factor} - \text{Amplifier Gain} + \text{Cable Loss} = \text{Adjusted Radiated Emissions Value (dB}\mu\text{V/m)}$$

$$25.3 \text{ dB}\mu\text{V} + 19.7 \text{ dB} - 23.0 \text{ dB} + 3.7 \text{ dB} = 25.7 \text{ dB}\mu\text{V/m}$$

Conducted Emissions:

The measured RF Voltage that is applied to the conducted limits is calculated by subtracting the Amplifier Gain (if any) and adding the Cable Loss, LISN Correction Factor, High Pass Filter Loss, and the RF Fuse Loss to the measured reading.

$$\text{Adjusted RF Voltage (dB}\mu\text{V)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{LCF} + \text{HPF} + \text{RFF}$$

Where:

RAW = Measured level (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

LCF = LISN Correction Factor (dB/m)

HPF = High Pass Filter (dB)

RFF = RF Fuse (dB)

Sample Conducted Emissions Calculation:

$$\text{Measurement} + \text{LISN Factor} - \text{Amplifier Gain} + \text{Cable Loss} + \text{HPF Loss} + \text{RFF Loss} = \text{Adjusted Conducted RF Voltage Emissions Value (dB}\mu\text{V/m)}$$

$$47.3 \text{ dB}\mu\text{V} + 0.7 \text{ dB} - 21.0 \text{ dB} + 0.9 \text{ dB} + 0.5 \text{ dB} + 0.1 \text{ dB} = 28.5 \text{ dB}\mu\text{V/m}$$

Part 1: Fundamental Radiated Emission

DATE: March 30,2016

TEST STANDARDS: 47 CFR (FCC) Part 15 Subpart C 15.225

MINIMUM STANDARD: (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 uV/m or 84 dBuV/m at 30 meters

DATA & PLOT:

Frequency		MEAS	AMP	DIST	CORR	cMEAS	LIM	MARG
MHz		dBuV/m	dB	M	dB	dBuV/m	dBuV/m	dB
13.56M	PARA	42.8	0	3	11.9	54.7	124	65.3
13.56M	PERP	49.6	0	3	11.9	61.5	124	58.5

Note: The limit at 3m = limit at 30 m + 40Log (30/3)

$$=84\text{dBuV/m} + 40 \text{ dB}$$

$$=124\text{dBuV/m}$$

PERFORMANCE: Complies with the test standards above

Part 2: Spurious Radiated Emission

DATE: March 30,2016

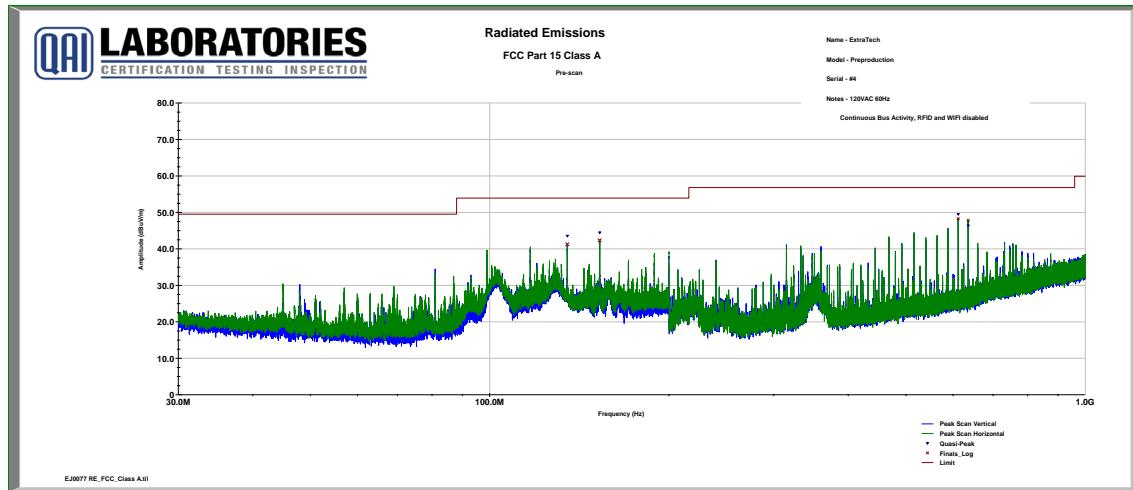
TEST STANDARDS: 47 CFR (FCC) Part 15 Subpart C 15.209

MINIMUM STANDARD: 15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency	Limit of Field strength		distance
MHz	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	m
0.009-0.49	2400/F(kHz)	67.6-20LogF(kHz)	300
0.49-1.705	24000/F(kHz)	87.6-20LogF(kHz)	30
1.705-30	30	29.5	30
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
above 960	500	54.0	3

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

DATA & PLOT:



Note: The test was performed on the frequency range between 9KHz and 1GHz. There were no emissions detected from the EUT's transmitter, which is over the limit required by the above standard.

PERFORMANCE: Complies with the test standards above

Part 3: 99% bandwidth

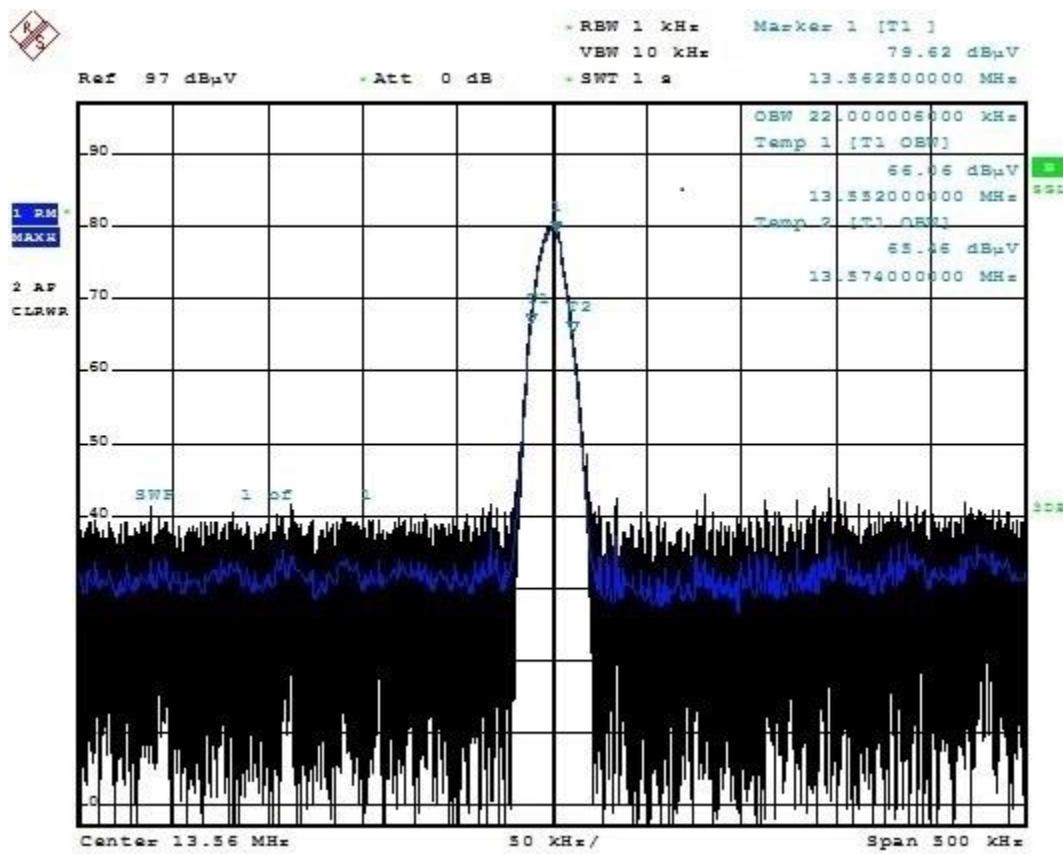
DATE: March 30, 2016

TEST STANDARDS: RSS Gen: Issue 4 - 6.6

MINIMUM STANDARD: 99% bandwidth is contained within the frequency band

Data & Plot:

Centre Frequency	Low side	High side	99% bandwidth
13.56MHz	13.332 MHz	13.374 MHz	22 kHz



PERFORMANCE: Complies with the test standards above

Part 4: Frequency tolerance

DATE: April 6, 2016

TEST STANDARDS: 47 CFR (FCC) Part 15 Subpart C 15.225(e)

MINIMUM STANDARD: The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of 20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Equipment:

Asset #	Equipment	Manufacturer	Model #	Serial #	Cal date	Cal Due
1575	Temperature Chamber	Ransco	925D-1-4	4341	Conditional	Conditional
1579	Thermometer	Fluke	52	28270224WS	8/25/2013	8/25/2016
1583	Thermocouple	Fluke	J-Type	None	8/25/2013	8/25/2016
1146	Spectrum Analyzer	Rohde & Schwarz	1164.4391.K40	100184	11/3/2013	11/3/2016
1061	Multimeter	Fluke	73-II	6831444	8/29/2014	8/29/2017
1253	Near Field Probe	Electrometrics	EM-6993	6CM H Field	Conditional	Conditional
None	Variable Autotransformer	Staco	3PN1010B	120V/10A	Conditional	Conditional

Data & Plot:

Frequency Vs. Voltage at 20° C

Voltage	Frequency (MHz)	Frequency Shift (MHz)	Maximum Allowed Frequency Shift (MHz)	Results
120 VAC	13.560045900	Reference	NA	NA
102 VAC	13.560045900	0	0.00135600	PASS
138 VAC	13.560045900	0	0.00135600	PASS

Frequency Vs Temperature

Temperature(°C)	Frequency (MHz)	Frequency Shift (MHz)	Maximum Allowed Frequency Shift (MHz)	Results
-30	13.5601189	+0.00014390	0.00135600	PASS
-20	13.5601798	+0.00013390	0.00135600	PASS
-10	13.5601578	+0.00011190	0.00135600	PASS
0	13.5601238	+0.00007790	0.00135600	PASS
10	13.5600818	+0.00003590	0.00135600	PASS
20	13.5600459	Reference	NA	PASS
30	13.5599998	-0.00004609	0.00135600	PASS
40	13.5599718	-0.00007409	0.00135600	PASS
50	13.5599498	-0.00009609	0.00135600	PASS

PERFORMANCE: Complies with the test standards above

Part 5: AC conducted emission

DATE: May 26, 2016

TEST STANDARDS: 47 CFR (FCC) Part 15 Subpart B, ICES-003 Issue 6

MINIMUM STANDARD: Class A Limits

Frequency (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15 - 0.50	79	66
0.5 - 30	73	60

Note 1 The lower limit shall apply at the transition frequencies

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The measurements were performed when the transmitter of the EUT was activated.

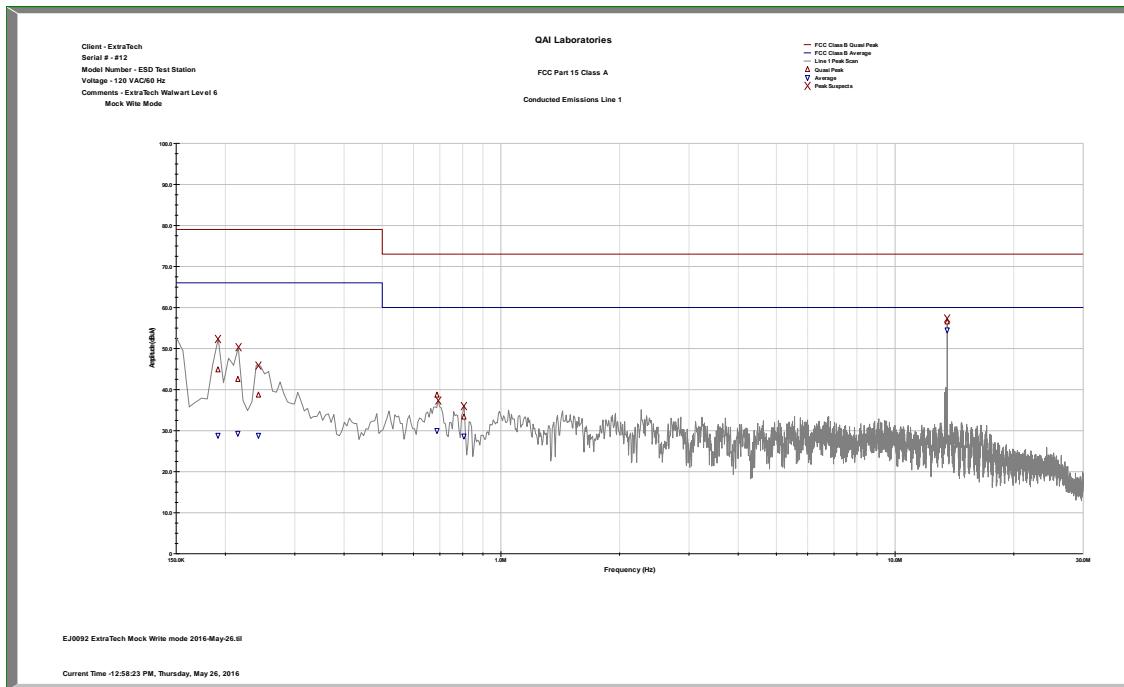
METHOD OF MEASUREMENT: Measurements were made using a test receiver with 9 kHz bandwidth, CISPR Quasi-Peak and Average detector.

Test Equipment:

Asset #	Description	Model	Manufacturer	Cal date	Cal Due date
00001008	QP Adapter	85650A	HP	2/5/2016	2/5/2017
00001181	SA Display Unit	85662A	HP	2/5/2016	2/5/2017
00001182	Spectrum Analyzer	85660B	HP	2/5/2016	2/5/2017
00001011	RF Preselector	85650A	HP	2/5/2016	2/5/2017
00001288	RF Fuse	7930-8.0	Solar	10/16/2014	10/16/2016
00001286	HP Filter	FCC-450B-2.4N	Fischer	10/16/2014	10/16/2016
00001057	LISN	FCC-LISN-50-25-2-08	Fischer	11/19/2015	11/19/2017

PERFORMANCE: Complies with the test standards above

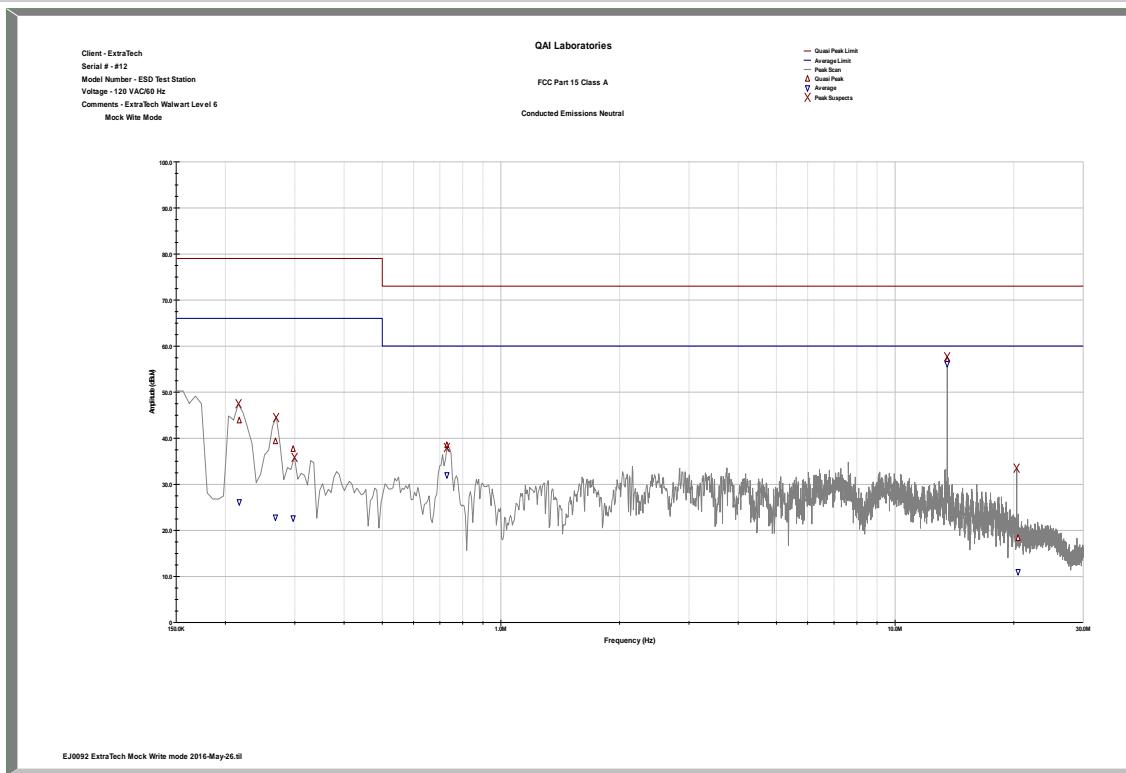
DATA & PLOT:



Plot: Conducted Emissions- Line

Data: Conducted Emissions- Line

Freq (MHz)	QP Meas (dBuV)	AVG Meas (dBuV)	Total Corr (dB)	QP Actual (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AVG Actual (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
0.192	44.99	28.92	0.03	44.85	79	-34.15	28.78	66	-37.22
0.215	42.65	29.55	-0.06	42.44	79	-36.56	29.34	66	-36.66
0.243	38.65	28.73	0.16	38.69	79	-40.31	28.77	66	-37.23
0.689	38.95	30.3	-0.3	38.61	73	-34.39	29.96	60	-30.04
0.806	33.32	28.65	0	33.28	73	-39.72	28.61	60	-31.39
13.558	56.51	54.41	0.06	56.52	73	-16.48	54.42	60	-5.58



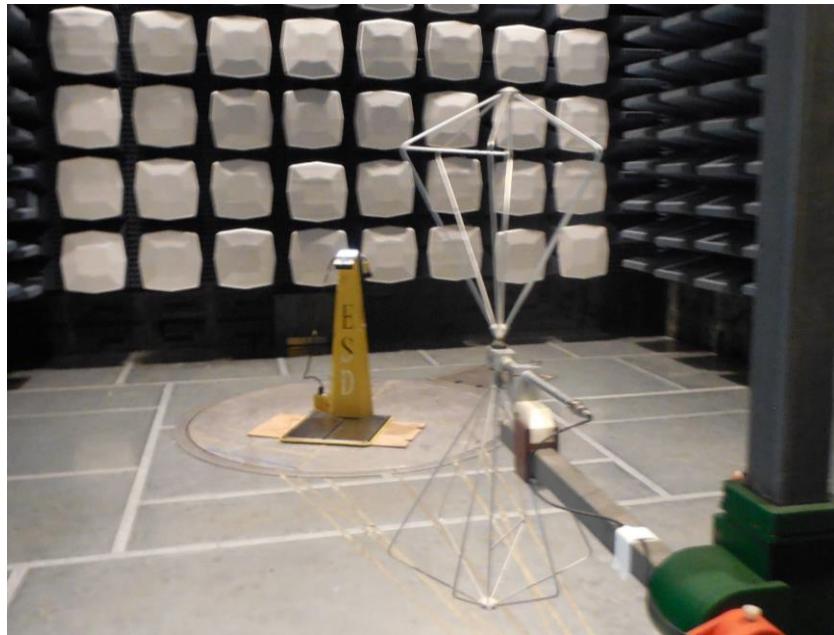
Plot: Conducted Emissions- Neutral

Data: Conducted Emissions- Neutral

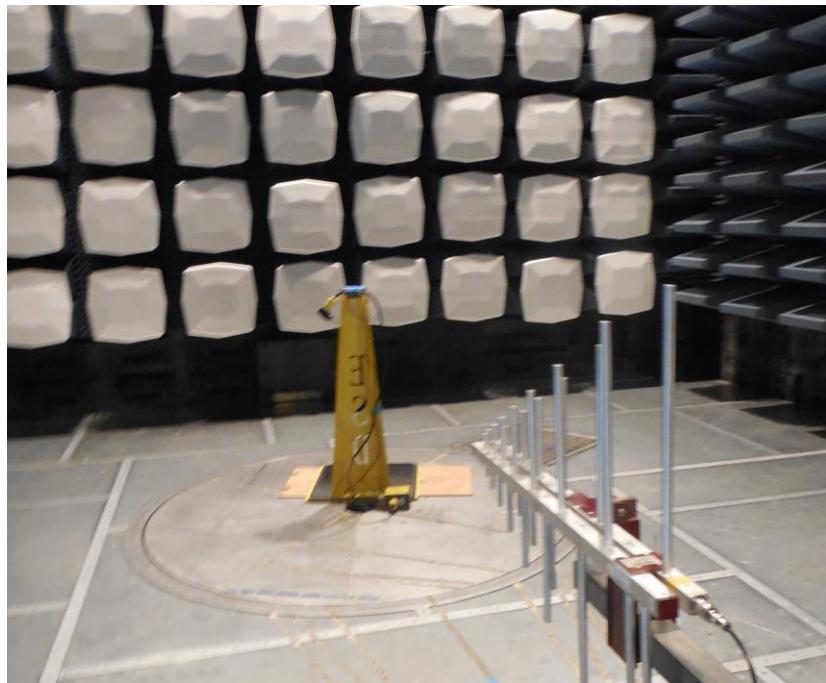
Freq (MHz)	QP Meas (dBuV)	AVG Meas (dBuV)	Total Corr (dB)	QP Actual (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AVG Actual (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
0.217	44.04	26.38	-0.15	43.74	79.00	-35.26	26.09	66.00	-39.91
0.268	39.43	22.98	-0.03	39.29	79.00	-39.71	22.84	66.00	-43.16
0.297	37.97	22.87	-0.17	37.71	79.00	-41.29	22.62	66.00	-43.38
0.728	38.61	32.20	-0.16	38.41	73.00	-34.59	32.00	60.00	-28.00
13.562	57.02	56.08	0.06	57.03	73.00	-15.97	56.09	60.00	-3.91
20.471	18.69	11.27	-0.29	18.31	73.00	-54.69	10.90	60.00	-49.10

THIS REPORT IS THE CONFIDENTIAL PROPERTY OF THE CLIENT ADDRESSED. THE REPORT MAY ONLY BE REPRODUCED IN FULL. PUBLICATION OF EXTRACTS FROM THIS REPORT IS NOT PERMITTED WITHOUT WRITTEN APPROVAL FROM QAI. ANY LIABILITY ATTACHED THERETO IS LIMITED TO THE FEE CHARGED FOR THE INDIVIDUAL PROJECT FILE REFERENCED. THE RESULTS OF THIS REPORT PERTAIN ONLY TO THE SPECIFIC SAMPLE(S) EVALUATED.

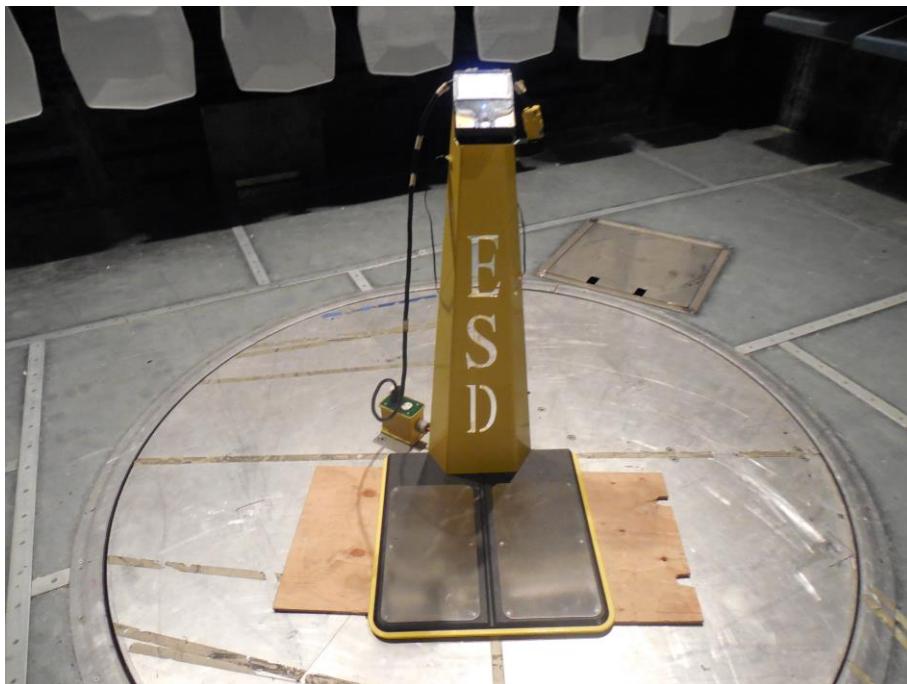
Appendix A Test Setup Photographs



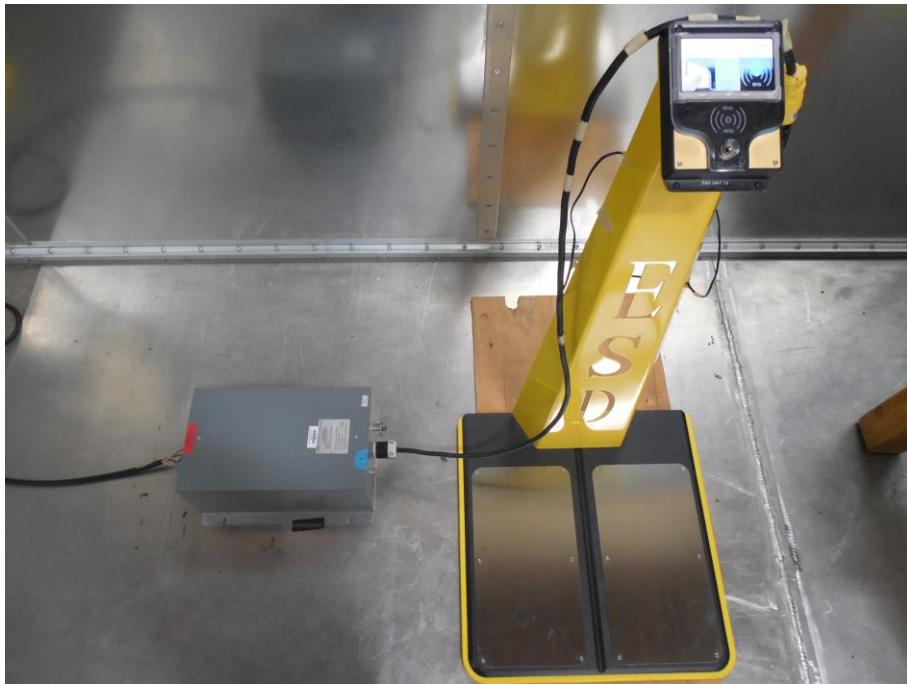
Radiated Emission Test Setup, 30MHz -200MHz



Radiated Emission Test Setup, above 200MHz



Radiated Emission Test Setup



Conducted Emission Test Setup

THIS REPORT IS THE CONFIDENTIAL PROPERTY OF THE CLIENT ADDRESSED. THE REPORT MAY ONLY BE REPRODUCED IN FULL. PUBLICATION OF EXTRACTS FROM THIS REPORT IS NOT PERMITTED WITHOUT WRITTEN APPROVAL FROM QAI. ANY LIABILITY ATTACHED THERETO IS LIMITED TO THE FEE CHARGED FOR THE INDIVIDUAL PROJECT FILE REFERENCED. THE RESULTS OF THIS REPORT PERTAIN ONLY TO THE SPECIFIC SAMPLE(S) EVALUATED.

End of Test Report

THIS REPORT IS THE CONFIDENTIAL PROPERTY OF THE CLIENT ADDRESSED. THE REPORT MAY ONLY BE REPRODUCED IN FULL. PUBLICATION OF EXTRACTS FROM THIS REPORT IS NOT PERMITTED WITHOUT WRITTEN APPROVAL FROM QAI. ANY LIABILITY ATTACHED THERETO IS LIMITED TO THE FEE CHARGED FOR THE INDIVIDUAL PROJECT FILE REFERENCED. THE RESULTS OF THIS REPORT PERTAIN ONLY TO THE SPECIFIC SAMPLE(S) EVALUATED.