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ELECTROMAGNETIC COMPATIBILITY TEST REPORT

PREPARED FOR AVIGILON CORPORATION
BY QAI LABORATORIES

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American Association for Laboratory Accreditation Certificate Number: 3657.02

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Applicable Test Standards:	FCC Title 47 CFR Part 15: Subpart B ICES-003 Issue 6 EN 55032:2012/AC:2013 EN 61000-6-3:2007/A1:2011/AC:2012 EN 61000-3-2:2014 | EN 61000-3-3:2013 EN 61000-6-1:2007 EN 55024:2010 CISPR 35:2016 EN 50130-4:2011/A1:2014
Equipment Tested:	Avigilon Presence Detector (APD)
Model Number(s):	APD-S1-D
Manufacturer:	Avigilon Corporation

REVISION HISTORY

Date	Report Number	Rev #	Details	Author's Initials
July 28, 2017	E10426-1712_Avigilon-Ping	0.0	Initial Release	HZ
Aug 4, 2017	E10426-1712_Avigilon-APD	0.1	Report update as per Avigilon's feedback	HZ
Aug 9, 2017	E10426-1712_Avigilon-APD	1.0	Signed Release	HZ

All previous versions of this report have been superseded by the latest dated revision as listed in the above table.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.

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REPORT AUTHORIZATION

The data documented in this report is for the test equipment provided by Avigilon Corporation Tests were conducted on the sample equipment as requested by Avigilon Corporation for the purpose of demonstrating compliance with FCC Title 47 CFR Part 15: Subpart B, ICES-003 Issue 6, EN 55032:2012/AC:2013, EN 61000-6-3:2007/A1:2011/AC:2012, EN 61000-3-2:2014, EN 61000-3-3:2013, EN 61000-6-1:2007, EN 55024:2010, CISPR 35:2016, and EN 50130-4:2011/A1:2014 as agreed upon by Avigilon Corporation as per Quote 17AN06301R1.

Avigilon Corporation is responsible for the tested product configuration, continued product compliance, and for the appropriate auditing of subsequent products as required. This report may comprise partial list of tests that are required for FCC, IC, or CE Declaration of Conformity and can only be produced by the manufacturer.

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

Approved by Parminder Singh	Tested by Jack Qin	Report Prepared by HP Enriquez
Director for the EMC Department	Sr EMC/RF Engineer	EMC Technical Writer

QAI FACILITIES

Founded in 1994 by a group of experienced certification and testing experts, QAI is an independent third-party testing, inspection and certification organization which serves the building industry, government and individuals with cost effective solutions through our in-house capabilities / services, and an established world-wide network of qualified affiliates. To help get your product to market, trust the provider that many leading global manufacturers do: QAI.

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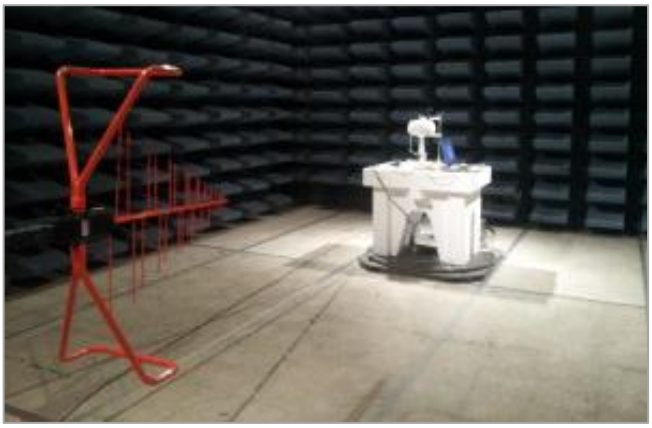
QAI EMC ACCREDITATION

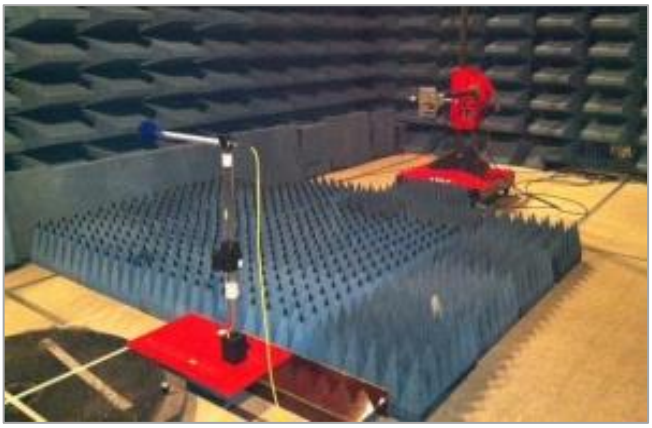
QAI EMC is your one-stop regulatory compliance partner for electromagnetic compatibility (EMC) and electromagnetic interference (EMI). Products are tested to the latest and applicable EMC/EMI requirements for domestic and international markets. QAI EMC goes above and beyond being a testing facility—we are your regulatory compliance partner. QAI EMC has the capability to perform RF Emissions and Immunity for all types of electronics manufacturing including Industrial, Scientific, Medical, Information Technology, Telecom, Wireless, Automotive, Marine and Avionics.

EMC Laboratory Location	FCC Designation (3m SAC)	IC Registration (3m SAC)	A2LA Certificate
Burnaby, BC, Canada	CA9543	21146-1	3657.02

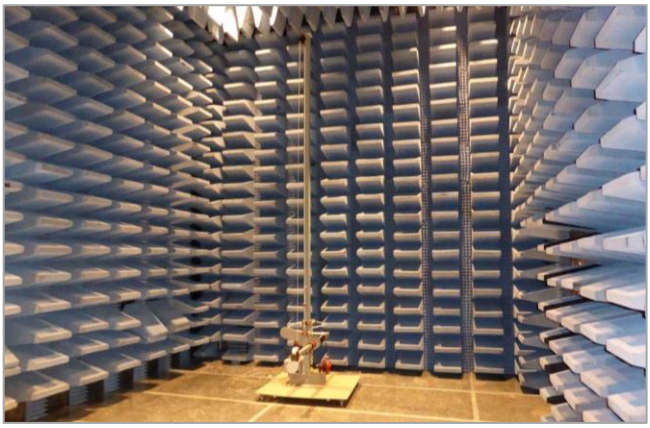
Headquarters & EMC Laboratory in Burnaby, BC



Chamber 1- 3m Semi-Anechoic Chamber (SAC) in Burnaby, BC



Chamber 1- 3m Semi-Anechoic Chamber (SAC) in Burnaby, BC



Chamber 2- 3m Semi-Anechoic Chamber (SAC) in Burnaby, BC

Chamber 2- 3m Semi-Anechoic Chamber (SAC) in Burnaby, BC

10m Open Area Test Site (OATS) in British Columbia, Canada

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Section I: EXECUTIVE SUMMARY

1.1 Purpose

The purpose of this report is to demonstrate and document the compliance of "Avigilon Presence Detector (APD)" as per Sections 1.2 & 1.3.

1.2 Scope

The information documented in this report is based on the test methods and levels as per Quote 17AN06301R1:

- **FCC Title 47 CFR Part 15** – Radio Frequency Devices, Subpart B - Unintentional Radiators.
- **ICES-003 Issue 6** – Information Technology Equipment (Including Digital Apparatus) - Limits and Methods of Measurement
- **EN 55032:2012/AC:2013** – Electromagnetic compatibility of multimedia equipment - Emissions requirements
- **EN 61000-3-2:2014 –** Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)
- **EN 61000-3-3:2013 –** Electromagnetic compatibility (EMC) -- Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection.
- **EN 61000-6-3:2007A1:2011/AC:2012 –** Electromagnetic compatibility (EMC) - Part 6-3: Generic standards Emission standard for residential, commercial and light-industrial environments.
- **EN 55024:2010** – Information technology equipment - Immunity characteristics - Limits and methods of measurement.
- **EN 61000-6-1:2007** – Electromagnetic compatibility (EMC) Part 6-1: Generic standards Immunity for residential, commercial and light-industrial environments.
- **CISPR 35:2016 –** Electromagnetic compatibility of multimedia equipment - Immunity requirements
- **EN 50130-4:2011/A1:2014 –** Alarm system - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and social alarm systems.

1.3 Summary of Results

The following tests demonstrate the testimony to "FCC, IC, and CE" Mark Electromagnetic compatibility testing for "Avigilon Presence Detector (APD)" manufactured by Avigilon Corporation

The following testing was performed pursuant to FCC Title 47 CFR Part 15 - Emissions

Test or Measurement	Applicable Test Method	Description	Result
Conducted Emissions for AC Mains	ANSI C63.4-2014 Class B Limits	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Radiated Emissions	ANSI C63.4-2014 Class B Limits	The radiated emissions are measured in the 30-1000MHz range	Complies

The following testing was performed pursuant to ICES-003 Issue 6 - Emissions

Test or Measurement	Applicable Test Method	Description	Result
Conducted Emissions for AC Mains	EN 55032:2012/AC:2013 Class B Limits	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Radiated Emissions	EN 55032:2012/AC:2013 Class B Limits	The radiated emissions are measured in the 30-1000MHz range	Complies

The following testing was performed pursuant to EN 55032:2012/AC:2013 and EN 61000-6-3:2007/A1:2011/AC:2012 - Emissions

Test or Measurement	Applicable Test Method	Description	Result
Conducted Emissions for AC Mains	EN 55032:2012/AC:2013 Class B Limits	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Radiated Emissions	EN 55032:2012/AC:2013 Class B Limits	The radiated emissions are measured in the 30-1000MHz range	Complies
Power Line Harmonics	EN 61000-3-2:2014	Maximum 1.08, 2.3, 0.43, 1.14, 0.3, 0.77, 0.23 A.... for 2nd to nth Harmonic Class A Limits	Complies
Power line Fluctuations (Flicker)	EN 61000-3-3:2013	Maximum 3% total Harmonic Distortion P_{st} <1, P_{lt} < 0.65	Complies

The following testing was performed pursuant to EN 55024:2010, EN 61000-6-1:2007, CISPR 35:2016, and EN 50130-4:2011/A1:2014 - Immunity

Test or Measurement	Applicable Standard	Description	Result
Electrostatic Discharge	IEC 61000-4-2:2008 ; EN 50130-4:2011/A1:2014 (Section 9)	± 8 kV Air ± 6 kV Contact	Complies
Radiated RF Immunity	IEC 61000-4-3:2006 +AMD1:2007+AMD2:2010 ; EN 50130-4:2011/A1:2014 (Section 10)a	80 to 2700 MHz, 10 V/m	Complies
Electrical Fast Transient/Burst	IEC 61000-4-4:2012 ; EN 50130-4:2011/A1:2014 (Section 12)	2 kV at AC Power Ports 1 kV at Signal Ports	Complies
Surge Transient	IEC 61000-4-5:2014 ; EN 50130-4:2011/A1:2014 (Section 13)	2 kV line-to-earth at AC Power Ports 1 kV line-to-line at AC Power Ports 0.5 kV signal ports to earth	Complies
Conducted Immunity	IEC 61000-4-6:2013 ; EN 50130-4:2011/A1:2014 (Section 11)a	3Vrms ; 10 Vrms	Complies
Power Frequency Magnetic Field	IEC 61000-4-8:2009	3 A/m ; 50 Hz and 60 Hz	Complies
Voltage Dips and Interruptions	IEC 61000-4-11:2004 ; EN 50130-4:2011/A1:2014 (Section 8)	0%, 0.5 Cycle 0%, 1 Cycle 40%, 10 Cycles 70%, 25 Cycles 80%, 250 Cycles 0%, 250 Cycles (Interruption)	Complies
Mains Supply Voltage Variations	EN 50130-4:2011/A1:2014 (Section 7)	$Umax^b = Unom^d + 10\ \%$ $Umin^c = Unom^d - 15\ \%$	Complies

Notes:

a *Pulsed Modulation Testing Not to Be Included*
b *Supply Voltage Max*
c *Supply Voltage Min*
d *Nominal Mains Voltage*

Section II: GENERAL INFORMATION

2.1 Product Description

The information provided in this section is for the Equipment Under Test (EUT) and the corresponding Auxiliary Equipment needed to perform the tests as a complete system.

EUT – Avigilon Presence Detector (APD)

Equipment Under Test (EUT) Information

No.	Item/Description	Manufacturer	Model No.	Serial No.
1	Avigilon Presence Detector (APD) MAC 00:18:85:03:BB:EA	Avigilon Corporation	APD-S1-D	PD2-33
2	Main Board		n/a	BA-15
3	Xethru Module		n/a	7911

EUT Input Power Source Information

No.	Item/Description	Manufacturer	Model No.	Serial No.
1	Power over Ethernet DC Power Input: 100-240VAC, 50/60Hz, 0.43A Output: 48VDC, 0.35A	PowerDsine	PD-3501G/AC	C15046555000001872

Ancillary/Auxiliary Equipment Information

No.	Item/Description	Manufacturer	Model No.	Serial No.
1	Laptop	Dell Inc.	LATITUDE E5440	H3DY012
2	Ethernet Cable (unshielded)	PC Cable World	PG330	n/a
3	Dummy digital IO cable 20AWG, 1m length w/ 50R termination	n/a	n/a	n/a

2.2 Environmental Conditions

The equipment under test was operated and tested under the following environmental conditions:

Parameter	Conditions
Location	Indoors
Temperature	22-28ºC
Relative Humidity	39.7 - 54.4%

2.3 Measurement Uncertainty

Parameter	Uncertainty
Radiated Emissions, 30MHz-1GHz	± 2.40 dB
Radiated Emissions, 1GHz-40GHz	± 2.48 dB
Radio Frequency	±1.5 x 10-5 MHz
Total RF Power Conducted	±1.36 dB
Spurious Emissions, Conducted	±1.36 dB
RF Power Density, Conducted	±1.36 dB
Temperature	±1ºC
Humidity	±5 %
DC and low frequency voltages	±3 %

2.4 Worst Test Case

Worst-case orientation was determined during the preliminary testing. The final radiated emissions were performed in the worst-case orientation.

2.5 Sample Calculations of Emissions Data

Radiated and conducted emissions were performed using EMC32 software developed by Rohdes & Schwarz. Transducer factors like Antenna factors, Cable Losses and Amplifier gains were stored in the test templates which are used to perform the emissions measurements. After test is finished, data is generated from the EMC32 consisting of product details, emission plots and final data tables as shown below.

Frequency (MHz)	QPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Ant. Ht. (cm)	Pol	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
42.663900	33.0	1000.000	120.000	100.0	H	70.0	13.2	7.5	40.5

Quasi Peak reading shown in the table above is already corrected by the software using correction factor shown in column “Corr.” The correction factor listed under “Corr.” table calculated as:

Corr.(dB) = Antenna factor + Cable loss

Or

Corr.(dB) = Antenna factor + Cable Loss - Amp gain (if pre-amplifier was used)

The final Quasi peak reading shown in the data is calculated by the software using following equation:

Corrected Quasi Peak(dBµV/m) = Raw Quasi Peak Reading + Antenna factor + Cable loss

To obtain the final Quasi-Peak or Average reading during power line conducted emissions, transducer factors are included in the final measurement as shown below.

Frequency (MHz)	QPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	44.3	1000.000	9.000	GND	0.6	21.7	66.0

Frequency (MHz)	QPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	27.2	1000.000	9.000	GND	0.6	28.8	56.0

Quasi Peak or Average reading shown in above table is already corrected by the software using the correction factor shown in column "Corr." The correction factor listed under "Corr." table calculated as:

Corr.(dB) = Antenna factor + Cable loss

The final Quasi peak or Average reading shown in the data is calculated by the software using following equation:

Corr. Quasi Peak/Average Reading (dBµV) = Raw Quasi Peak/Average Reading + Antenna factor + Cable loss

The allowable margin from the limits, as per the standards, were calculated for both radiated and conducted emissions:

Margin(dB) = Limit – Quasi-Peak or Average reading

2.6 Test Equipment List

The tables below contain all the equipment used by QAI Laboratories in conducting all tests on the Equipment Under Test (EUT) as per Section 1.3.

Emissions Test Equipment

Manufacturer	Model	Description	Serial No.	Calibration Due Date
Sunol Sciences	SM46C	Turntable	051204-2	N/A
Sunol Sciences	TWR95	Mast	TREML0001	N/A
Sunol Sciences	JB3	Biconilog Antenna 30MHz – 3GHz	A120106	2017-Sep-24
Sunol Sciences	DRH-118	Horn Antenna 1GHz-18GHz	A050905	2019-Mar-10
ETS Lindgren	3160-09	Horn Antenna 18GHz-26.5GHz	9701-1071	2017-Aug-30
ETS Lindgren	3160-10	Horn Antenna 26.5GHz-40.0GHz	9708-1075	2017-Aug-30
ETS Lindgren	6502	Active Loop Antenna 10kHz – 30MHz	2178	2017-Aug-21
ETS Lindgren	2165	Turntable	00043677	N/A
ETS Lindgren	2125	Mast	00077487	N/A
Rohde & Schwarz	ESU40	EMI Receiver	100011	2017-Nov-20
Fischer	FCC-LISN-50-25-2-08	LISN (150kHz-30MHz)	2041	2018-Nov-19
ETS Lindgren	S201	5-meter Semi-Anechoic Chamber	1030	N/A
AH Systems	PAM118	Amplifier 10KHz-18GHz	189	Conditional Use
California Instruments	PACS-1	Harmonics and flicker analyzer	72569	2018-Jul-18
California Instruments	OMNI 1-18 I	Programmable Impedance Flicker test	-	2018-Jul-18
California Instruments	3001ix	Power supply	HK52117	2018-Jul-18

Note: *Equipment listed above have 3 years calibration interval.*

Immunity Testing Equipment

Manufacturer	Model	Description	Serial No.	Calibration Due Date
Ophir	5048FE	RF Amplifier 0.15-230 MHz	1035	N/A
Ophir	5125FE	RF Amplifier 20-1000 MHz	1030	N/A
Ophir	5163FE	RF Amplifier 0.8-4.2 GHz	1044	N/A
Amplifier Research	FP2080	Isotropic Field Probe, 80 MHz to 40 GHz	17905/12002493-1/2	2018-Oct-11
Chase	emCELL	RF Immunity Chamber	1016	N/A
ETS Lindgren	S201	5-meter Semi-Anechoic Chamber	1030	N/A
HP	8648C	Signal Generator	3623A03622	2019-Feb-17
ThermoScientific	MiniZap	ESD Simulator:	0402265	2017-Oct-07
EMC Partner	CN-EFT1000	Capacitive Clamp	#408	2018-Jan-29
FCC	F-120-9A	Bulk Injection Clamp	399	N/A
Teseq	NSG 3060	EMC multifunction Generator - 6kV with CDN and INA	184	2018-May-14

Teseq	CDN 3061	Surge CDN	184	2018-May-14
Teseq	INA 6502-CIB	Step up Transformer	124	2018-May-14

Measurement Software List

Manufacturer	Model	Version	Description
Rhode & Schwarz	EMC 32	6.20.0	Emissions Test Software
VI Automation	Via EMC Immunity Executive	1.0.308	Radiated and Conducted Immunity Test Program
TESEQ	WIN 3000	1.2.0	Surge, EFT & Voltage Dips Immunity Test Program
Thurlby Thandar Instruments	HA-PC Link Version	2.02	Harmonics and Flicker Test Program

Section III: EMISSIONS TEST RESULTS

3.1 Radiated Emissions

Date Performed:

June 29, 2017

Test Standard:

- FCC Title 47 CFR Part 15: Subpart B
- ICES-003 Issue 6
- EN 55032:2012/AC:2013
- EN 61000-6-3:2007/A1:2011/AC:2012

Test Method:

- ANSI C63.4-2014
- EN 55032:2012/AC:2013

Required Limit:

FCC Class B Limit:

Frequency (MHz)	Field Strength Quasi Peak dBµV/m @ 3m SAC
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
Above 960	54.0

IC and CE Class B Limit:

Frequency (MHz)	Field Strength Quasi Peak dBµV/m @ 3m SAC
30 – 230	40.5
230 – 1000	47.5
***Note 1**: The lower limit shall apply at the transition frequency* ***Note 2**: Additional provisions may be required for cases where interference occurs*	

Frequency (MHz)	Maximum Field Strength	
	Average dBµV/m @ 3m	Peak dBµV/m @ 3m
1 – 3	50.0	70.0
3 – 6	54.0	74.0
***Note 1**: The lower limit shall apply at the transition frequency* ***Note 2**: Additional provisions may be required for cases where interference occurs*		

Method of Measurement:

The EUT was positioned in the center of the turntable in the SAC. The EUT was then measured for all the radiated emissions in the frequency range of 30MHz – 18GHz. Measurements were made using the spectrum analyzer and receiver using the appropriate antennas, amplifiers, attenuators, and filters.

The required Quasi-Peak CISPR bandwidth shall be 120 kHz for the range 30 – 1000 MHz. A 1 MHz Resolution Bandwidth (RBW, CISPR Band E) shall be used and a 10 Hz Video Bandwidth (VBW). The ANSI C63.4:2014 requirement for the placement of RF Absorber on the turntable Ground Plane shall be satisfied.

Emissions in both horizontal and vertical polarizations were measured while rotating the Equipment Under Test (EUT) on the turntable to maximize signal strength. In the case of high ambient noises, the measurements are performed at a closer distance and the limit is adjusted per the equation below. The result is added or subtracted to the required emission level to ensure compliance at the new distance.

$$20 \log\left(\frac{D1}{D2}\right);$$ Where D1 = Current Distance
D2 = Required Distance

Modifications:

No modification was required to comply for this test.

Result:

The EUT complies with the applicable standard.

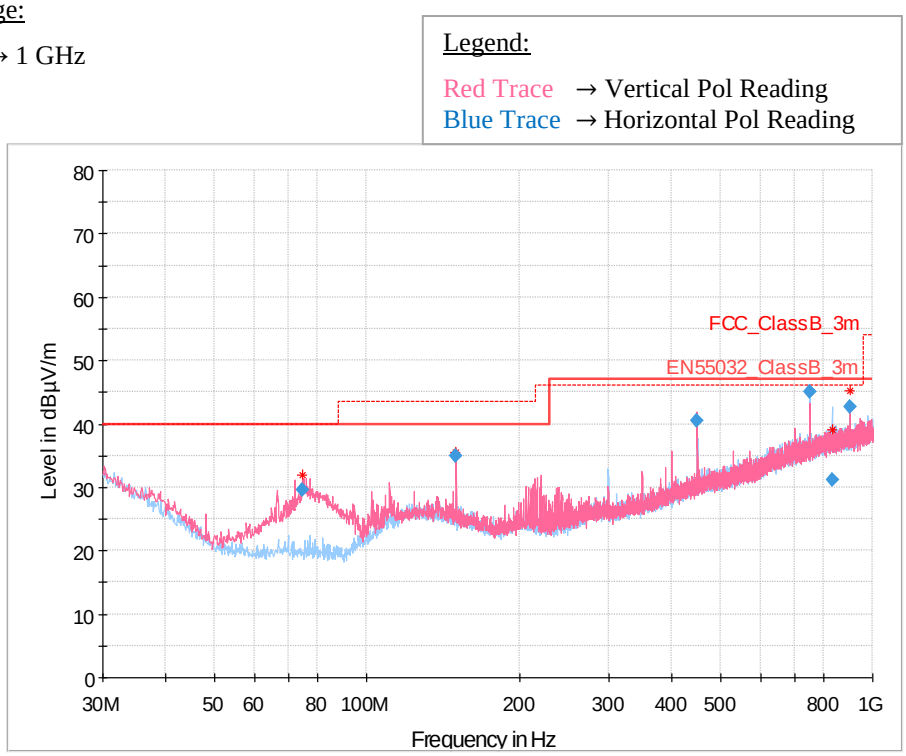
Measurement Data and Plot:

Test Voltage Used:

- 120Vac/60Hz

Frequency Range:

- 30 MHz ↔ 1 GHz



Plot 1: Radiated Emissions scanned at 3m SAC

Table 1: QPeak Data of Radiated Emissions measured at 3m – FCC Class B Limit

Freq. (MHz)	QPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Ant. Ht. (cm)	Pol	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
74.562650	29.52	1000.0	120.000	115.0	V	114.0	16.3	10.48	40.0
149.996400	34.91	1000.0	120.000	126.0	V	223.0	21.8	8.59	43.5
450.019300	40.54	1000.0	120.000	154.0	V	351.0	27.4	5.46	46.0
750.001750	45.05	1000.0	120.000	98.0	H	320.0	32.4	2.1	46.0
831.140200	31.24	1000.0	120.000	275.0	H	60.0	33.7	14.76	46.0
900.023150	42.71	1000.0	120.000	97.0	H	23.0	34.1	3.29	46.0

Table 2: QPeak Data of Radiated Emissions measured at 3m – IC/CE Class B Limit

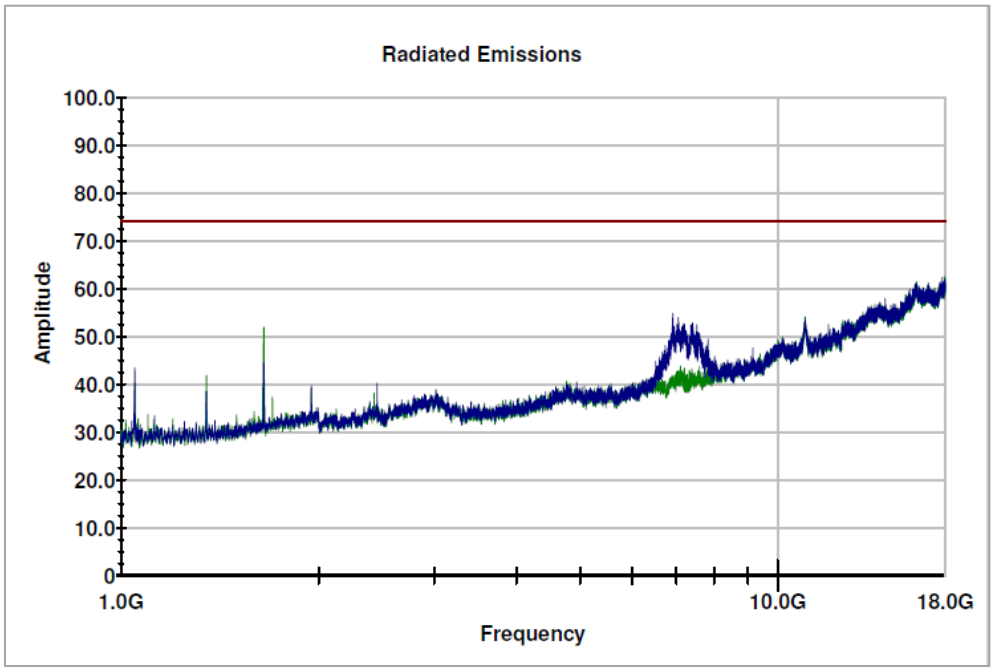
Freq. (MHz)	QPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Ant. Ht. (cm)	Pol	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
74.562650	29.52	1000.0	120.000	115.0	V	114.0	16.3	10.98	40.5
149.996400	34.91	1000.0	120.000	126.0	V	223.0	21.8	5.59	40.5
450.019300	40.54	1000.0	120.000	154.0	V	351.0	27.4	6.96	47.5
750.001750	45.05	1000.0	120.000	98.0	H	320.0	32.4	3.6	47.5
831.140200	31.24	1000.0	120.000	275.0	H	60.0	33.7	16.26	47.5
900.023150	42.71	1000.0	120.000	97.0	H	23.0	34.1	4.79	47.5

Test Voltage Used:

- 120Vac/60Hz

Frequency Range:

- 1 GHz ↔ 18 GHz



Plot 2: Radiated Emissions scanned at 3m SAC

Table 3: Average Data of Radiated Emissions at high frequency measured 3m SAC – FCC Class B Limit

Freq.	Average	Peak	Ant. Ht.	Ant. Pol.	Turn Table Position	H Corr.	V Corr.	Average Limit	Average Margin	Peak Limit	Peak Margin
MHz	dBµV/m	dBµV/m	cm		deg	dB	dB	dBµV/m	dB	dBµV/m	dB
1049.992	43.966	44.956	126.000	V	152.000	-7.644	-7.644	54.0	10.03	74.0	29.04
1349.873	40.195	42.995	235.000	V	181.000	-6.105	-6.105	54.0	13.81	74.0	31.01
1648.699	34.150	35.645	151.000	V	36.000	-3.955	-3.955	54.0	19.85	74.0	38.36
6915.798	46.880	46.200	239.000	V	224.000	9.200	9.200	54.0	7.12	74.0	27.80
7052.257	47.208	44.368	217.000	V	210.000	9.268	9.268	54.0	6.79	74.0	29.63

Table 4: Average Data of Radiated Emissions at high frequency measured 3m SAC – IC/CE Class B Limit

Freq.	Average	Peak	Ant. Ht.	Ant. Pol.	Turn Table Position	H Corr.	V Corr.	Average Limit	Average Margin	Peak Limit	Peak Margin
MHz	dBµV/m	dBµV/m	cm		deg	dB	dB	dBµV/m	dB	dBµV/m	dB
1049.992	43.966	44.956	126.000	V	152.000	-7.644	-7.644	50.0	6.03	70.0	25.04
1349.873	40.195	42.995	235.000	V	181.000	-6.105	-6.105	50.0	9.81	70.0	27.01
1648.699	34.150	35.645	151.000	V	36.000	-3.955	-3.955	50.0	15.85	70.0	34.36
6915.798	46.880	46.200	239.000	V	224.000	9.200	9.200	54.0	7.12	74.0	27.80
7052.257	47.208	44.368	217.000	V	210.000	9.268	9.268	54.0	6.79	74.0	29.63

3.2 AC Mains Conducted Emissions

Date Performed:

June 29, 2017

Test Standard:

- FCC Title 47 CFR Part 15: Subpart B
- ICES-003 Issue 6
- EN 55032:2012/AC:2013
- EN 61000-6-3:2007/A1:2011/AC:2012

Test Method:

- ANSI C63.4-2014
- EN 55032:2012/AC:2013

Required Limit:

FCC/IC/CE Class B Limit:

Frequency (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.50	66 to 56	56 to 46
0.50 – 5	56	46
5 – 30	60	50

Note 1: *The lower limit shall apply at the transition frequencies.*
Note 2: *The limit decreases linearly with the logarithm of the frequency in the 0.15 to 0.50 MHz*

Method of Measurement:

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

Modifications:

No modification was required to comply for this test.

Result:

The EUT complies with the applicable standard.

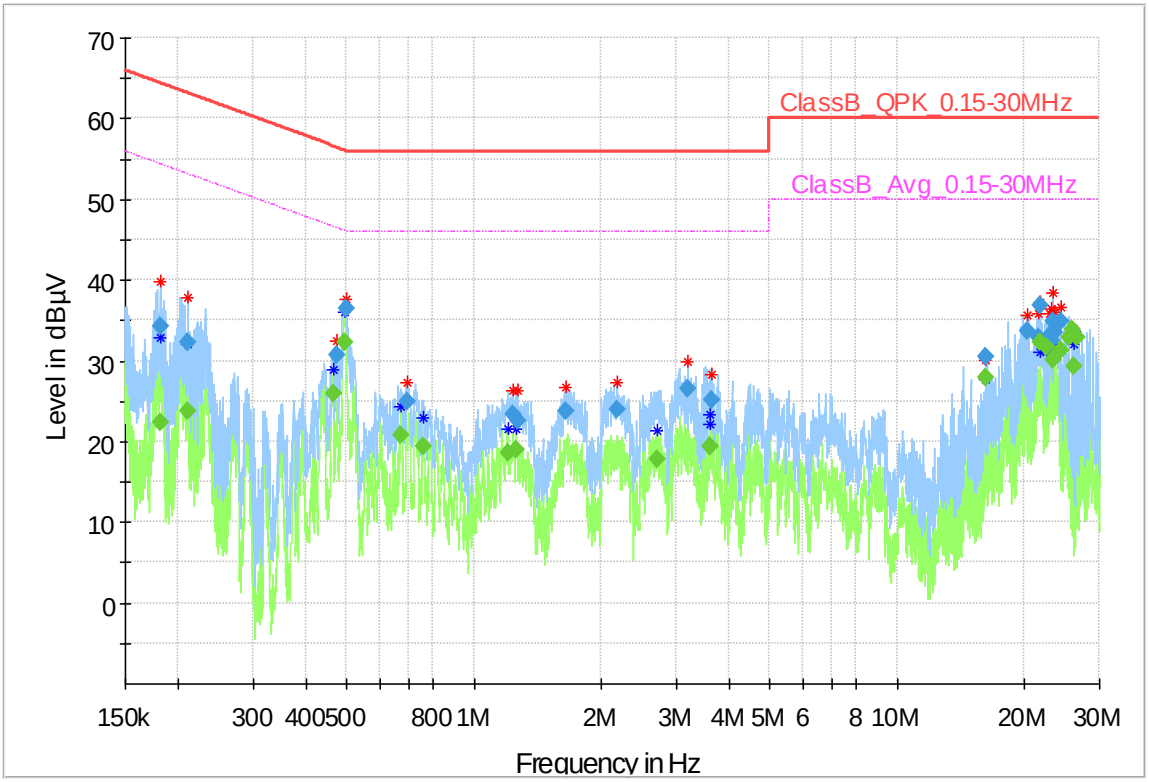
Measurement Data and Plot:

Test Voltage Used:

- Line 1, 120Vac/60Hz

Frequency Range:

- 0.150 MHz ↔ 30 MHz



Plot 3: Conducted Emissions – Line 1, 120Vac/60Hz

Table 5: QPeak Data of Conducted Emissions – Line 1, 120Vac/60Hz

Frequency (MHz)	QPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.181008	34.34	1000.0	9.000	GND	10.8	30.10	64.44
0.210496	32.36	1000.0	9.000	GND	10.8	30.82	63.19
0.473457	30.77	1000.0	9.000	GND	10.7	25.69	56.45
0.497222	36.36	1000.0	9.000	GND	10.7	19.69	56.05
0.692889	24.86	1000.0	9.000	GND	10.7	31.14	56.00
1.231001	23.44	1000.0	9.000	GND	10.7	32.56	56.00
1.264674	22.63	1000.0	9.000	GND	10.7	33.37	56.00
1.648197	23.74	1000.0	9.000	GND	10.7	32.26	56.00
2.179519	24.02	1000.0	9.000	GND	10.7	31.98	56.00
3.196041	26.61	1000.0	9.000	GND	10.8	29.39	56.00
3.635870	25.05	1000.0	9.000	GND	10.8	30.95	56.00
16.167656	30.58	1000.0	9.000	GND	11.4	29.42	60.00
20.261566	33.63	1000.0	9.000	GND	11.6	26.37	60.00
21.578432	32.95	1000.0	9.000	GND	11.7	27.05	60.00
21.664875	36.93	1000.0	9.000	GND	11.7	23.07	60.00
22.820661	33.17	1000.0	9.000	GND	11.7	26.83	60.00
23.072947	32.40	1000.0	9.000	GND	11.8	27.60	60.00
23.374702	34.96	1000.0	9.000	GND	11.8	25.04	60.00
23.515301	33.46	1000.0	9.000	GND	11.8	26.54	60.00
24.352484	34.83	1000.0	9.000	GND	11.8	25.17	60.00

Table 6: Average Data of Conducted Emissions – Line 1, 120Vac/60Hz

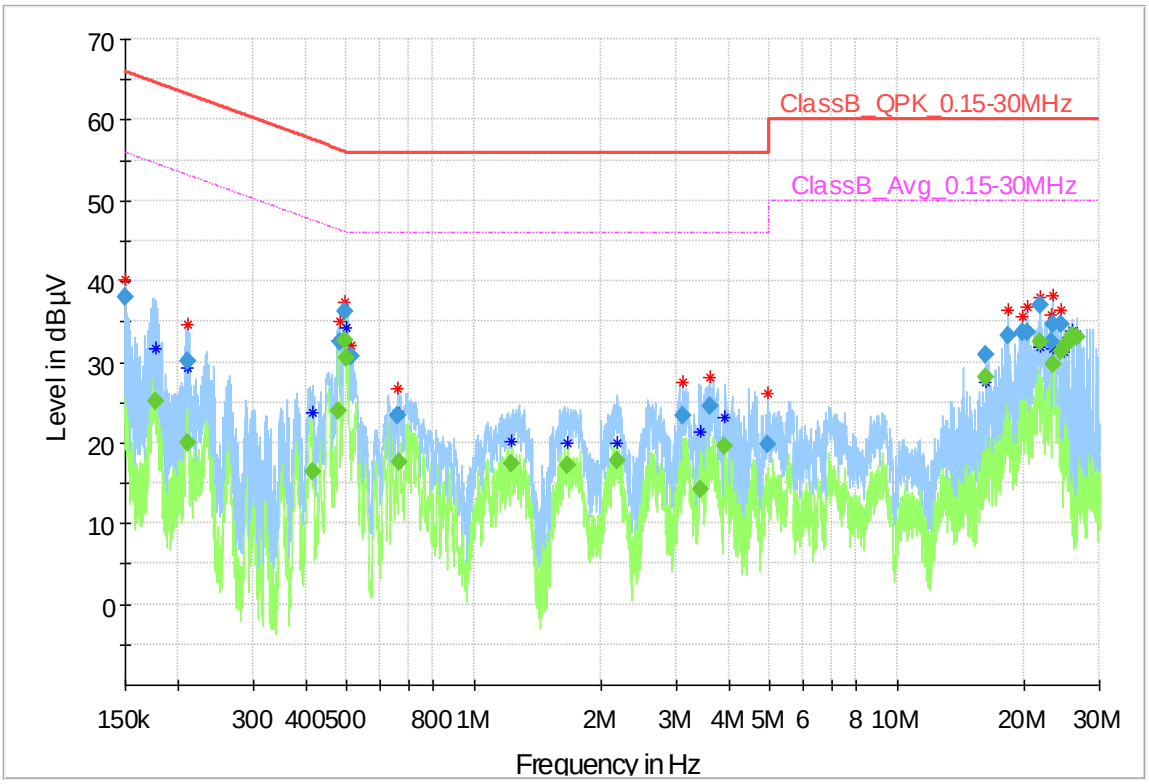
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182279	22.34	1000.0	9.000	GND	10.8	32.04	54.38
0.210496	23.83	1000.0	9.000	GND	10.8	29.35	53.19
0.465015	25.85	1000.0	9.000	GND	10.7	20.75	46.60
0.496229	32.26	1000.0	9.000	GND	10.7	13.80	46.06
0.672421	20.79	1000.0	9.000	GND	10.7	25.21	46.00
0.757350	19.33	1000.0	9.000	GND	10.7	26.67	46.00
1.201823	18.53	1000.0	9.000	GND	10.7	27.47	46.00
1.257112	18.96	1000.0	9.000	GND	10.7	27.04	46.00
2.702012	17.85	1000.0	9.000	GND	10.8	28.15	46.00
3.599711	19.47	1000.0	9.000	GND	10.8	26.53	46.00
3.624984	19.44	1000.0	9.000	GND	10.8	26.56	46.00
16.167656	27.84	1000.0	9.000	GND	11.4	22.16	50.00
21.664875	32.33	1000.0	9.000	GND	11.7	17.67	50.00
22.458616	31.78	1000.0	9.000	GND	11.7	18.22	50.00
23.374702	30.13	1000.0	9.000	GND	11.8	19.87	50.00
24.352484	31.23	1000.0	9.000	GND	11.8	18.77	50.00
25.403014	32.85	1000.0	9.000	GND	11.9	17.15	50.00
25.838338	33.88	1000.0	9.000	GND	11.9	16.12	50.00
26.123985	29.35	1000.0	9.000	GND	12.0	20.65	50.00
26.545118	32.91	1000.0	9.000	GND	12.0	17.09	50.00

Test Voltage Used:

- Line 2, 120Vac/60Hz

Frequency Range:

- 0.150 MHz ↔ 30 MHz



Plot 4: Conducted Emissions – Line 2, 120Vac/60Hz

Table 7: QPeak Data of Conducted Emissions – Line 2, 120Vac/60Hz

Frequency (MHz)	QPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	38.03	1000.0	9.000	GND	10.9	27.97	66.00
0.211128	30.13	1000.0	9.000	GND	10.8	33.03	63.16
0.480128	32.47	1000.0	9.000	GND	10.7	23.87	56.34
0.496229	36.27	1000.0	9.000	GND	10.7	19.79	56.06
0.513382	30.71	1000.0	9.000	GND	10.7	25.29	56.00
0.661093	23.44	1000.0	9.000	GND	10.7	32.56	56.00
3.107837	23.34	1000.0	9.000	GND	10.8	32.66	56.00
3.617745	24.53	1000.0	9.000	GND	10.8	31.47	56.00
4.931761	19.82	1000.0	9.000	GND	10.9	36.18	56.00
16.167656	30.90	1000.0	9.000	GND	11.4	29.10	60.00
18.246117	33.21	1000.0	9.000	GND	11.5	26.79	60.00
19.705816	33.68	1000.0	9.000	GND	11.6	26.32	60.00
20.261566	33.73	1000.0	9.000	GND	11.6	26.27	60.00
21.664875	37.07	1000.0	9.000	GND	11.7	22.93	60.00
23.072947	32.47	1000.0	9.000	GND	11.8	27.53	60.00
23.374702	34.57	1000.0	9.000	GND	11.8	25.43	60.00
24.352484	34.76	1000.0	9.000	GND	11.8	25.24	60.00

Table 8: Average Data of Conducted Emissions – Line 2, 120Vac/60Hz

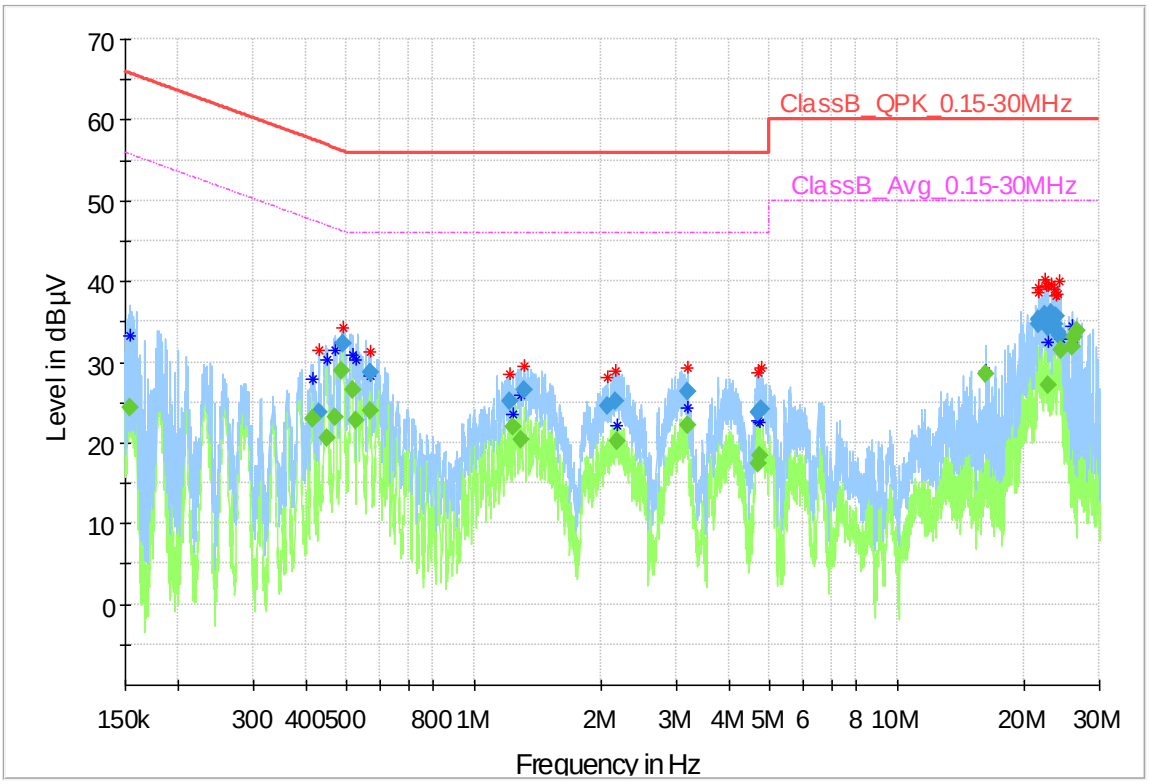
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.176718	25.18	1000.0	9.000	GND	10.8	29.45	54.64
0.211128	19.98	1000.0	9.000	GND	10.8	33.18	53.16
0.416599	16.39	1000.0	9.000	GND	10.7	31.13	47.52
0.476781	24.03	1000.0	9.000	GND	10.7	22.37	46.40
0.496229	32.58	1000.0	9.000	GND	10.7	13.48	46.06
0.499713	30.42	1000.0	9.000	GND	10.7	15.59	46.01
0.663741	17.66	1000.0	9.000	GND	10.7	28.34	46.00
1.228543	17.41	1000.0	9.000	GND	10.7	28.59	46.00
1.666418	17.11	1000.0	9.000	GND	10.7	28.89	46.00
2.181699	17.86	1000.0	9.000	GND	10.7	28.14	46.00
3.431088	14.28	1000.0	9.000	GND	10.8	31.72	46.00
3.918900	19.51	1000.0	9.000	GND	10.8	26.49	46.00
16.167656	28.07	1000.0	9.000	GND	11.4	21.93	50.00
21.664875	32.41	1000.0	9.000	GND	11.7	17.59	50.00
23.374702	29.80	1000.0	9.000	GND	11.8	20.20	50.00
24.352484	31.23	1000.0	9.000	GND	11.8	18.77	50.00
24.819369	31.94	1000.0	9.000	GND	11.9	18.06	50.00
25.403014	32.57	1000.0	9.000	GND	11.9	17.43	50.00
25.838338	33.28	1000.0	9.000	GND	11.9	16.72	50.00
26.545118	32.99	1000.0	9.000	GND	12.0	17.01	50.00

Test Voltage Used:

- Line 1, 230Vac/50Hz

Frequency Range:

- 0.150 MHz ↔ 30 MHz



Plot 5: Conducted Emissions – Line 1, 230Vac/50Hz

Table 9: QPeak Data of Conducted Emissions – Line 1, 230Vac/50Hz

Frequency (MHz)	QPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.429709	23.84	1000.0	9.000	GND	10.7	33.42	57.26
0.489333	32.20	1000.0	9.000	GND	10.7	23.98	56.18
0.566780	28.79	1000.0	9.000	GND	10.7	27.21	56.00
1.215110	25.23	1000.0	9.000	GND	10.7	30.77	56.00
1.308390	26.55	1000.0	9.000	GND	10.7	29.45	56.00
2.058819	24.47	1000.0	9.000	GND	10.7	31.53	56.00
2.155688	25.20	1000.0	9.000	GND	10.7	30.80	56.00
3.196041	26.26	1000.0	9.000	GND	10.8	29.74	56.00
4.691353	23.83	1000.0	9.000	GND	10.8	32.17	56.00
4.757461	24.07	1000.0	9.000	GND	10.8	31.93	56.00
21.492334	34.69	1000.0	9.000	GND	11.7	25.31	60.00
21.578432	35.18	1000.0	9.000	GND	11.7	24.82	60.00
22.324334	35.93	1000.0	9.000	GND	11.7	24.07	60.00
22.503555	35.30	1000.0	9.000	GND	11.7	24.70	60.00
22.661554	34.27	1000.0	9.000	GND	11.7	25.73	60.00
23.188543	36.12	1000.0	9.000	GND	11.8	23.88	60.00
23.444896	34.71	1000.0	9.000	GND	11.8	25.29	60.00
23.656746	35.63	1000.0	9.000	GND	11.8	24.37	60.00
23.846664	33.68	1000.0	9.000	GND	11.8	26.32	60.00
24.038106	33.37	1000.0	9.000	GND	11.8	26.63	60.00

Table 10: Average Data of Conducted Emissions – Line 1, 230Vac/50Hz

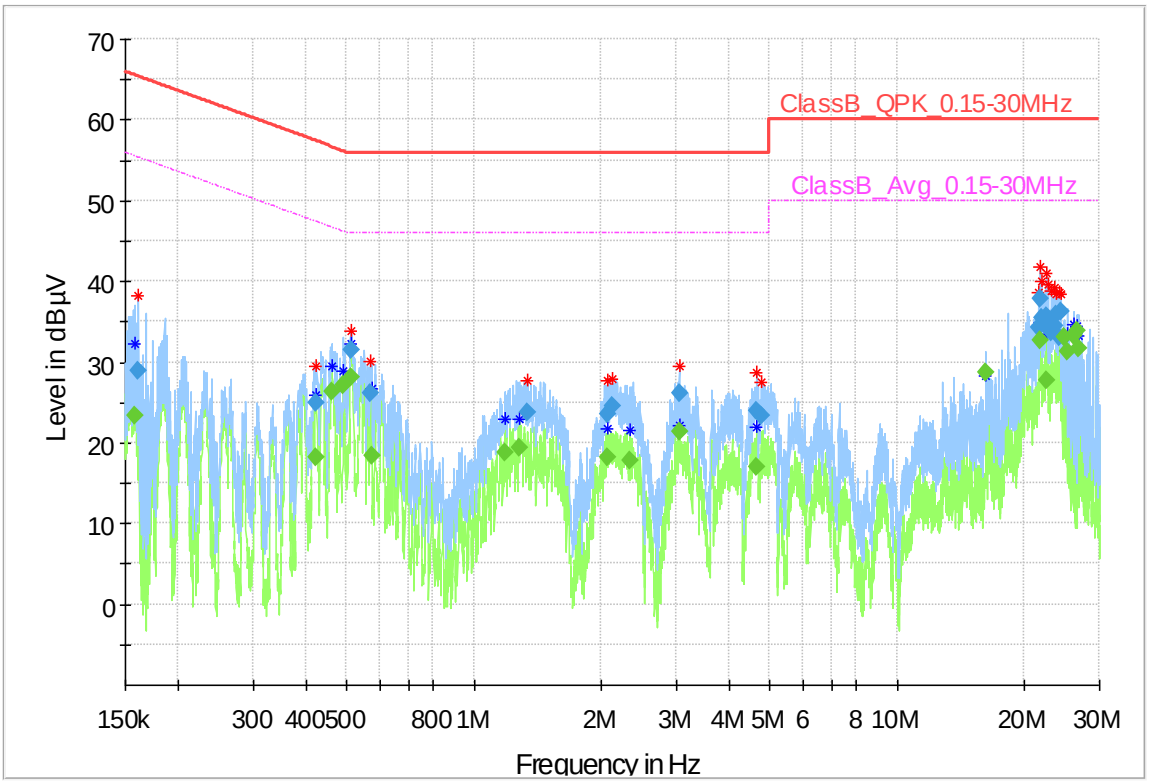
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154257	24.35	1000.0	9.000	GND	10.9	31.42	55.77
0.414522	23.05	1000.0	9.000	GND	10.7	24.51	47.56
0.449029	20.66	1000.0	9.000	GND	10.7	26.23	46.89
0.468280	23.24	1000.0	9.000	GND	10.7	23.31	46.54
0.487381	28.95	1000.0	9.000	GND	10.7	17.27	46.21
0.515954	26.50	1000.0	9.000	GND	10.7	19.50	46.00
0.527952	22.82	1000.0	9.000	GND	10.7	23.18	46.00
0.566780	23.95	1000.0	9.000	GND	10.7	22.05	46.00
1.233464	21.95	1000.0	9.000	GND	10.7	24.05	46.00
1.288920	20.39	1000.0	9.000	GND	10.7	25.61	46.00
2.181699	20.21	1000.0	9.000	GND	10.7	25.79	46.00
3.192848	22.17	1000.0	9.000	GND	10.8	23.83	46.00
4.672634	17.49	1000.0	9.000	GND	10.8	28.51	46.00
4.724291	18.45	1000.0	9.000	GND	10.8	27.55	46.00
16.167656	28.60	1000.0	9.000	GND	11.4	21.40	50.00
22.661554	27.08	1000.0	9.000	GND	11.7	22.92	50.00
24.352484	31.51	1000.0	9.000	GND	11.8	18.49	50.00
25.838338	31.87	1000.0	9.000	GND	11.9	18.13	50.00
26.123985	33.04	1000.0	9.000	GND	12.0	16.96	50.00
26.545118	33.95	1000.0	9.000	GND	12.0	16.05	50.00

Test Voltage Used:

- Line 2, 230Vac/50Hz

Frequency Range:

- 0.150 MHz ↔ 30 MHz



Plot 6: Conducted Emissions – Line 2, 230Vac/50Hz

Table 11: QPeak Data of Conducted Emissions – Line 2, 230Vac/50Hz

Frequency (MHz)	QPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.161515	28.95	1000.0	9.000	GND	10.8	36.44	65.39
0.424586	24.97	1000.0	9.000	GND	10.7	32.39	57.36
0.510312	31.42	1000.0	9.000	GND	10.7	24.58	56.00
0.569619	26.03	1000.0	9.000	GND	10.7	29.97	56.00
1.341495	23.71	1000.0	9.000	GND	10.7	32.29	56.00
2.067067	23.60	1000.0	9.000	GND	10.7	32.40	56.00
2.125733	24.56	1000.0	9.000	GND	10.7	31.44	56.00
3.046328	26.04	1000.0	9.000	GND	10.8	29.96	56.00
4.644696	23.96	1000.0	9.000	GND	10.8	32.04	56.00
4.776519	23.29	1000.0	9.000	GND	10.8	32.71	56.00
21.492334	34.36	1000.0	9.000	GND	11.7	25.64	60.00
21.664875	37.77	1000.0	9.000	GND	11.7	22.23	60.00
21.904384	35.38	1000.0	9.000	GND	11.7	24.62	60.00
22.413766	35.74	1000.0	9.000	GND	11.7	24.26	60.00
22.661554	34.19	1000.0	9.000	GND	11.7	25.81	60.00
23.096020	33.77	1000.0	9.000	GND	11.8	26.23	60.00
23.538817	34.42	1000.0	9.000	GND	11.8	25.58	60.00
23.656746	35.79	1000.0	9.000	GND	11.8	24.21	60.00
24.134403	33.02	1000.0	9.000	GND	11.8	26.98	60.00
24.352484	36.35	1000.0	9.000	GND	11.8	23.65	60.00

Table 12: Average Data of Conducted Emissions – Line 2, 230Vac/50Hz

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.157529	23.38	1000.0	9.000	GND	10.9	32.21	55.59
0.422892	18.21	1000.0	9.000	GND	10.7	29.18	47.39
0.463160	26.39	1000.0	9.000	GND	10.7	20.25	46.64
0.489823	27.13	1000.0	9.000	GND	10.7	19.04	46.17
0.512357	28.08	1000.0	9.000	GND	10.7	17.92	46.00
0.572473	18.31	1000.0	9.000	GND	10.7	27.69	46.00
1.183939	18.71	1000.0	9.000	GND	10.7	27.29	46.00
1.278655	19.47	1000.0	9.000	GND	10.7	26.53	46.00
2.067067	18.16	1000.0	9.000	GND	10.7	27.84	46.00
2.330472	17.86	1000.0	9.000	GND	10.7	28.14	46.00
3.049374	21.37	1000.0	9.000	GND	10.8	24.63	46.00
4.644696	17.06	1000.0	9.000	GND	10.8	28.94	46.00
16.167656	28.76	1000.0	9.000	GND	11.4	21.24	50.00
21.664875	32.66	1000.0	9.000	GND	11.7	17.34	50.00
22.413766	27.65	1000.0	9.000	GND	11.7	22.35	50.00
24.819369	33.02	1000.0	9.000	GND	11.9	16.98	50.00
25.251128	31.27	1000.0	9.000	GND	11.9	18.73	50.00
26.123985	33.28	1000.0	9.000	GND	12.0	16.72	50.00
26.545118	33.94	1000.0	9.000	GND	12.0	16.06	50.00
26.704787	31.76	1000.0	9.000	GND	12.0	18.24	50.00

3.2 Telecom Port Conducted Emissions

Date Performed:

July 10, 2017

Test Standard:

- EN 55032:2012/AC:2013
- EN 61000-6-3:2007/A1:2011/AC:2012

Test Method:

- EN 55032:2012/AC:2013

Required Limit:

FCC/IC/CE Class B Limit:

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 – 0.50	84 to 74	74 to 64
0.50 – 30.0	74	64

Note 1: *The limits decrease linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz*
Note 2: *The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150Ω to the telecommunication port under test (conversion factor is* $20\log_{10}\frac{150}{1} = 44\ dB$*)*

Method of Measurement:

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

Modifications:

No modification was required to comply for this test.

Result:

The EUT complies with the applicable standard.

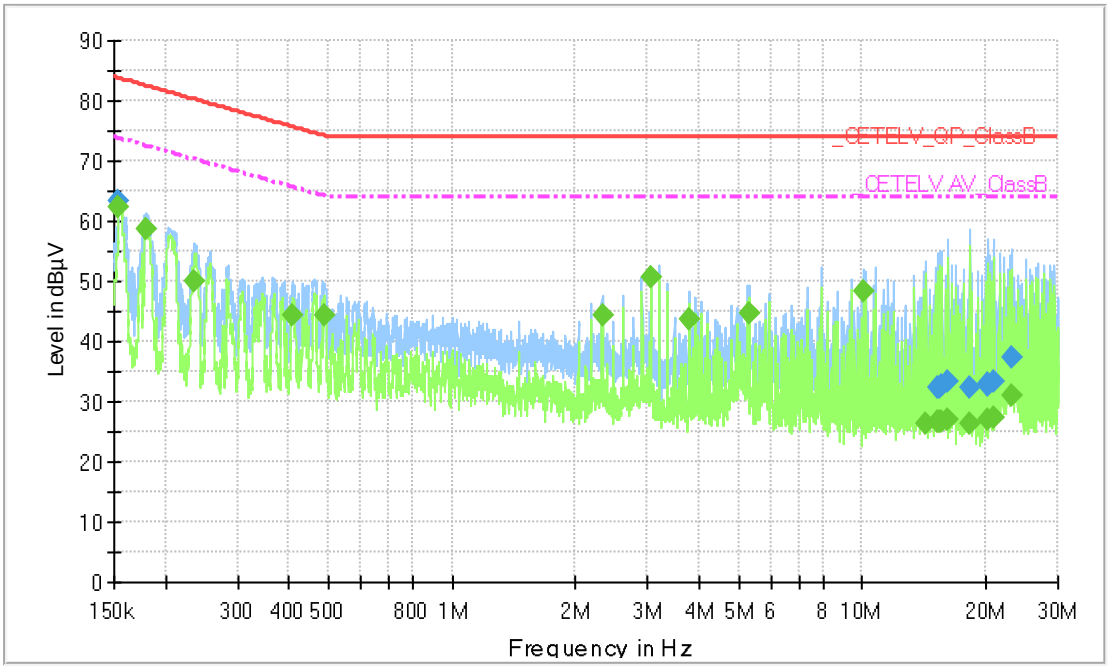
Measurement Data and Plot:

Test Voltage Used:

- 230Vac/50Hz

Frequency Range:

- 0.150 MHz ↔ 30 MHz



Plot 7: Telecom Port Conducted Emissions – 230Vac/50Hz

Table 13: QPeak Data of Telecom Port Conducted Emissions – 230Vac/50Hz

Frequency (MHz)	QPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.153795	63.5	1000.000	9.000	GND	20.4	20.3	83.8
15.265098	32.4	1000.000	9.000	GND	19.8	41.6	74.0
15.449290	32.5	1000.000	9.000	GND	19.9	41.5	74.0
15.635705	32.7	1000.000	9.000	GND	19.9	41.3	74.0
16.240986	33.5	1000.000	9.000	GND	19.9	40.5	74.0
18.383915	32.4	1000.000	9.000	GND	20.0	41.6	74.0
20.275782	33.0	1000.000	9.000	GND	20.0	41.0	74.0
20.336670	32.8	1000.000	9.000	GND	20.0	41.2	74.0
20.830404	33.4	1000.000	9.000	GND	20.0	40.6	74.0
23.089136	37.2	1000.000	9.000	GND	20.1	36.8	74.0

Table 14: Average Data of Telecom Port Conducted Emissions – 230Vac/50Hz

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.153795	62.2	1000.000	9.000	GND	20.4	11.6	73.8
0.179029	58.6	1000.000	9.000	GND	20.2	13.9	72.5
0.236372	50.0	1000.000	9.000	GND	20.2	20.2	70.2
0.410400	44.3	1000.000	9.000	GND	19.9	21.3	65.6
0.487868	44.4	1000.000	9.000	GND	19.9	19.8	64.2
2.322189	44.3	1000.000	9.000	GND	19.7	19.7	64.0
3.047661	50.6	1000.000	9.000	GND	19.8	13.4	64.0
3.774499	43.8	1000.000	9.000	GND	19.8	20.2	64.0
5.296775	44.8	1000.000	9.000	GND	19.8	19.2	64.0
10.062115	48.5	1000.000	9.000	GND	19.8	15.5	64.0
14.290601	26.5	1000.000	9.000	GND	19.8	37.5	64.0
15.265098	26.5	1000.000	9.000	GND	19.8	37.5	64.0
15.449290	26.6	1000.000	9.000	GND	19.9	37.4	64.0
15.635705	26.7	1000.000	9.000	GND	19.9	37.3	64.0
16.240986	27.1	1000.000	9.000	GND	19.9	36.9	64.0
18.383915	26.4	1000.000	9.000	GND	20.0	37.6	64.0
20.275782	26.9	1000.000	9.000	GND	20.0	37.1	64.0
20.830404	27.5	1000.000	9.000	GND	20.0	36.5	64.0
23.089136	30.9	1000.000	9.000	GND	20.1	33.1	64.0

3.3 Power Line Harmonics

Date Performed:

July 10, 2017

Test Standard:

- EN 55032:2012/AC:2013
- EN 61000-6-3:2007/A1:2011/AC:2012

Test Method:

EN 61000-3-2:2014

Required Limit:

Class A Limit for CE Standard:

Harmonic order n	Maximum permissible harmonic current A
Odd Harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n < 39$	$0.15 \frac{15}{n}$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n < 40$	$0.23 \frac{8}{n}$

Method of Measurement:

The equipment was operated and tested at 230Vac 50Hz while in "Continuous Mode" of operation. The equipment setup is comprised of a power analyzer with a filtered power source.

Modifications:

No modification was required to comply for this test.

Result:

The EUT complies with the applicable standard.

Measurement Data and Plot:

Table 15: Harmonics Data

Harmonic Number	Limit Current (mA)	Average (mA) (Filtered)	% Limit	Max. Value (mA) (Filtered)	% Limit	Assessment
2	2070	0.24	0	0.24	0	Pass
3	4408.2	12.65	0.3	12.75	0.3	Pass
4	824.1	0.26	0	0.29	0	Pass
5	2185	12.49	0.6	12.62	0.6	Pass
6	575	0.26	0	0.26	0	Pass
7	1475.8	12.17	0.8	12.28	0.8	Pass
8	440.8	0.24	0.1	0.25	0.1	Pass
9	766.7	11.75	1.5	11.86	1.5	Pass
10	352.6	0.23	0.1	0.24	0.1	Pass
11	632.5	11.23	1.8	11.35	1.8	Pass
12	293.9	0.21	0.1	0.21	0.1	Pass
13	402.5	10.65	2.6	10.75	2.7	Pass
14	251.9	0.2	0.1	0.2	0.1	Pass
15	287.5	9.99	3.5	10.07	3.5	Pass
16	220.4	0.17	0.1	0.17	0.1	Pass
17	253.7	9.28	3.7	9.36	3.7	Pass
18	195.9	0.15	0.1	0.15	0.1	Pass
19	227	8.51	3.7	8.58	3.8	Pass
20	176.3	0.13	0.1	0.14	0.1	Pass
21	205.4	7.72	3.8	7.77	3.8	Pass
22	160.3	0.11	0.1	0.12	0.1	Pass
23	187.5	6.92	3.7	6.95	3.7	Pass
24	146.9	0.08	0.1	0.1	0.1	Pass
25	172.5	6.1	3.5	6.12	3.5	Pass
26	135.6	0.07	0.1	0.08	0.1	Pass
27	159.7	5.29	3.3	5.3	3.3	Pass
28	125.9	0.06	0	0.06	0	Pass
29	148.7	4.51	3	4.52	3	Pass
30	117.5	0.05	0	0.05	0	Pass
31	139.1	3.76	2.7	3.76	2.7	Pass
32	110.2	0.04	0	0.04	0	Pass
33	130.7	3.05	2.3	3.06	2.3	Pass
34	103.7	0.03	0	0.03	0	Pass
35	123.2	2.39	1.9	2.4	1.9	Pass
36	98	0.04	0	0.04	0	Pass
37	116.6	1.79	1.5	1.82	1.6	Pass
38	92.8	0.04	0	0.04	0	Pass
39	110.6	1.28	1.2	1.29	1.2	Pass
40	88.2	0.04	0	0.04	0	Pass

3.4 Power Line Voltage Fluctuations and Flickers

Date Performed:

July 10, 2017

Test Standard:

- EN 55032:2012/AC:2013
- EN 61000-6-3:2007/A1:2011/AC:2012

Test Method:

EN 61000-3-3:2013

Required Limit:

The voltage characteristic was obtained from a histogram of U(t). The limits were applicable to voltage fluctuations and flicker at the supply terminals of the Equipment Under Test (EUT). The measured and calculated test limits are applicable according to clause 4 under test conditions described in clause 6 and Annex A of the standard as mentioned above. The following limits apply:

- The value of P_{st} shall not be greater than 1.0, P_{st} <1.0
- The value of P_{lt} shall not be greater than 0.65, P_{lt} < 0.65

Method of Measurement:

The equipment was operated and tested at 230Vac 50Hz while in "Continuous Mode" of operation. The equipment setup is comprised of power analyzer with filtered power source. The short-term (P_{st}) and the long-term (P_{lt}) flicker were measurement using the following analyzer.

Modifications:

No modification was required to comply for this test.

Result:

The EUT complies with the applicable standard.

Measurement Data and Plot:

Table 16: Power Line Voltage Fluctuations and Flickers data

Load Power:	0.024 kW 0.052 kVA		
Power Factor:	0.462		
Load Current:	0.2 Arms 0.8 Apk		
Crest Factor:	3.723		
Voltage Variations			
Nominal Voltage:	230 Vrms		
Highest Half-cycle level:	-0.14%		
Lowest Half-cycle level:	-0.09%		
Steady State definition:	>1000ms within +/- 0.2%		
Largest d(c) change down:	0.00%		
Largest d(c) change up:	0.00%		
Largest d(c) change:	0.00%	Limit: 3.3%	PASS
d(max):	0.00%	Limit: 4%	PASS
t(max):	0.00seconds	Limit: 500ms	PASS
Flicker			
Short Term Flicker Pst:	0	Limit: 1.00	PASS
Long Term Flicker Plt:	0	Limit: 0.65	PASS

P_{st} **Classifier Duration**	**Flicker**	P_{lt} **Calculation Interval**	P_{st}
0.10%	0	1:00	0
0.70%	0	2:00	0
1.00%	0	3:00	0
1.50%	0	4:00	0
2.20%	0	5:00	0
3%	0	6:00	0
4%	0	7:00	0
6%	0	8:00	0
8%	0	9:00	0
10%	0	10:00	0
13%	0	11:00	0
17%	0	12:00	0
30%	0	Plt =	0
50%	0		
80%	0		

Section IV: IMMUNITY TEST RESULTS

Performance Criteria as per standards EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016

Criterion A

The equipment shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

Criterion B

The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

EXAMPLE 1: A data transfer is controlled/checked by parity check or by other means. In the case of malfunctioning such as caused by a lightning strike, the data transfer will be repeated automatically. The reduced data transfer rate at this time is acceptable.

EXAMPLE 2: During testing, an analogue function value may deviate. After the test, the deviation vanishes.

EXAMPLE 3: In the case of a monitor used only for man-machine monitoring, it is acceptable that some degradation takes place for a short time, such as flashes during the burst application.

EXAMPLE 4: An intended change of the operating state is allowed if self-recoverable.

Criterion C

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

EXAMPLE 1: In the case of an interruption in the mains longer than the specified buffer time, the power supply unit of the equipment is switched off. The switch-on may be automatic or carried out by the operator.

EXAMPLE 2: After a programme interruption caused by a disturbance, the processor functions of the equipment stops at a defined position and is not left in a “crashed state”. The operator’s decision prompts may be necessary.

EXAMPLE 3: The test results in an opening of an over-current protection device that is replaced or reset by the operator.

4.1 Electrostatic Discharge Immunity Testing

Date Performed:

July 13, 2017

Test Standard:

- EN 55024:2010
- EN 61000-6-1:2007
- CISPR 35:2016
- EN 50130-4:2011/A1:2014

Test Method:

IEC 61000-4-2:2008

Required Minimum Criteria:

- As per the EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016 standards performance criteria:

  Criteria B

- As per the EN 50130-4:2011/A1:2014 standard performance criteria:

  There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the application of the discharges is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Method of Measurement:

When the equipment is subjected to air discharge or contact discharge of the selected severity level, the equipment must meet the minimum performance criteria described above. Each operator accessible connector and control is discharged 10 times without a system failure. Longer time between discharges may be required in order to be able to distinguish between a response caused by a single discharge and a response caused by a number of discharges.

IEC 61000-4-2: 8.3.2 - Indirect application of the discharge. Discharges to objects placed or installed near the EUT are simulated by applying the discharges of the ESD generator to a coupling plane, in the contact discharge mode.

Horizontal coupling plane - at least 10 single discharges (in the most sensitive polarity) is applied to the horizontal coupling plane, at points on each side of the EUT. The ESD generator is positioned vertically at a distance of 0.1 m from the EUT, with the discharge electrode touching the coupling plane.

Vertical coupling plane - at least 10 single discharges (in the most sensitive polarity) is applied to the centre of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5 m x 0.5m, is placed parallel to, and positioned at a distance of 0.1 m from, the EUT. Discharges shall be applied to the coupling plane, with sufficient different positions such that the four faces of the EUT are completely illuminated.

Data and Observations:

ESD Test Points Illustration

Note: 1) Air Discharge Test Point → Blue Arrow
2) Contact Discharge Test Point → Red Arrow

Table 17: Electrostatic Discharge Immunity Data

	Indirect Contact Discharge (kV)	
	Vertical Coupling Plane	Horizontal Coupling Plane
	± 6	± 6
Front of EUT	Pass	Pass
Left Side of EUT	Pass	Pass
Back of EUT	Pass	Pass
Right of EUT	Pass	Pass

Discharge	Level (kV)	Minimum Required Criteria (A/B/C)	Result Criteria (A/B/C)	Result (Pass/Fail)
Air	± 2	B	A	Pass
	± 4	B	A	Pass
	± 8	B	A	Pass
Direct Contact	± 2	-	-	-
	± 4	-	-	-
	± 6	-	-	-

MODIFICATIONS: Equipment Under Test (EUT) did not require any modifications.

OBSERVATIONS/COMMENTS: No issues were found during and after the test.

PERFORMANCE: Equipment Under Test (EUT) complies with the required criteria for compliance of standards EN 55024:2010, EN 61000-6-1:2007, CISPR 35:2016, and EN 50130-4:2011/A1:2014.

4.2 Radio-frequency Electromagnetic Field Amplitude Modulation Immunity Testing

Date Performed:

July 17, 2017

Test Standard:

- EN 55024:2010
- EN 61000-6-1:2007
- CISPR 35:2016
- EN 50130-4:2011/A1:2014

Test Method:

IEC 61000-4-3:2006+AMD1:2007+AMD2:2010

Required Minimum Criteria:

- As per the EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016 standards performance criteria:

  Criteria A

- As per the EN 50130-4:2011/A1:2014 standard performance criteria:

  There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change, and no such flickering of indicators occurs at a field strength of 3 V/m.

Method of Measurement:

The EUT is configured within a semi-anechoic chamber and subjected to an electromagnetic field of 10V/m.

Modulation: 80% AM (1kHz tone)
Sweep Rate: Less than 1.5×10^{-3} decades/s
Step Size:1% of previous Frequency (i.e. Previous Frequency X 1.01)
Dwell Time: 3000msec

Testing Frequency	Field Strength	Result
80MHz – 2.7GHz	10V/m	Pass, Criteria A

Data and Observations:

MODIFICATIONS: Equipment Under Test (EUT) did not require any modifications.

OBSERVATIONS/COMMENTS: No issues were found during and after the test.

PERFORMANCE: Equipment Under Test (EUT) complies with the required criteria for compliance of standards EN 55024:2010, EN 61000-6-1:2007, CISPR 35:2016, and EN 50130-4:2011/A1:2014.

4.3 Electrical Fast Transient/Burst Immunity Testing

Date Performed:

July 10, 2017

Test Standard:

- EN 55024:2010
- EN 61000-6-1:2007
- CISPR 35:2016
- EN 50130-4:2011/A1:2014

Test Method:

IEC 61000-4-4:2012

Required Minimum Criteria:

- As per the EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016 standards performance criteria:

  Criteria B

- As per the EN 50130-4:2011/A1:2014 standard performance criteria:

  There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the application of the bursts is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Method of Measurement:

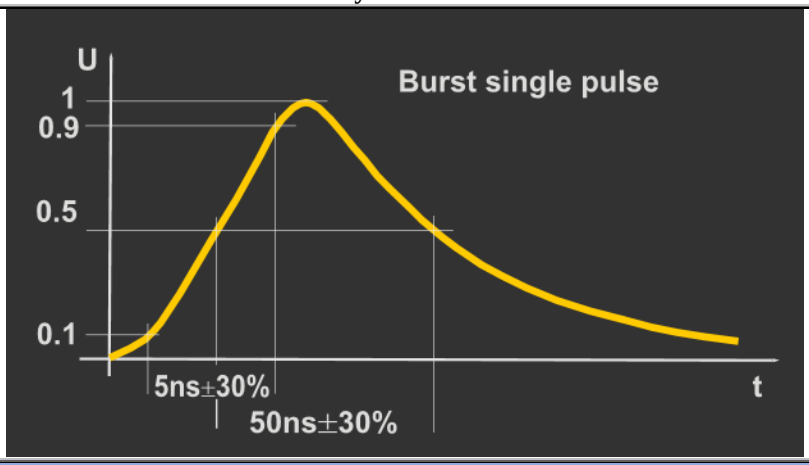
The EUT is configured as shown and subjected to Fast Transient Bursts at the severity level defined below. The equipment is monitored to establish compliance with the requirements of Criteria B.

Direct Injection – AC Power Ports, +/- 2 kV @ 5 & 100 kHz
Capacitive Clamp – Signal Ports, +/- 1 kV @ 5 & 100 kHz

Cable	Test Levels		Test Method	Result
	Voltage Peak	Repetition Rate		
AC Power Ports	+/- 2 kV	5 & 100 kHz	Direct	Pass, Criteria A
Signal Ports	+/- 1 kV	5 & 100 kHz	Clamp Injection	Pass, Criteria A

Data and Observations:

Table 18: Electrical Fast Transient/Burst Immunity Data



EFT at AC Power Ports							
Volt	**Polarity**	**Frequency**	**Burst Time**	**Repetition Time**	**Step Duration**	**Coupling**	**Status**
1000 V	Alt	5 kHz	15 ms	300 ms	120 s	IEC L1, N, PE	Passed
1000 V	Alt	100 kHz	75 Spikes	300 ms	120 s	IEC L1, N, PE	Passed
2000 V	Alt	5 kHz	15 ms	300 ms	120 s	IEC L1, N, PE	Passed
2000 V	Alt	100 kHz	75 Spikes	300 ms	120 s	IEC L1, N, PE	Passed
EFT at Signal Ports							
Volt	**Polarity**	**Frequency**	**Burst Time**	**Repetition Time**	**Step Duration**	**Coupling**	**Status**
1000 V	Alt	5 kHz	15 ms	300 ms	120 s	Capacitive Clamp	Passed
1000 V	Alt	100 kHz	75 Spikes	300 ms	120 s	Capacitive Clamp	Passed

MODIFICATIONS: Equipment Under Test (EUT) did not require any modifications.

OBSERVATIONS/COMMENTS: No issues were found during and after the test.

PERFORMANCE: Equipment Under Test (EUT) complies with the required criteria for compliance of standards EN 55024:2010, EN 61000-6-1:2007, CISPR 35:2016, and EN 50130-4:2011/A1:2014.

4.4 Surge Transient Immunity Testing

Date Performed:

July 10, 2017

Test Standard:

- EN 55024:2010
- EN 61000-6-1:2007
- CISPR 35:2016
- EN 50130-4:2011/A1:2014

Test Method:

IEC 61000-4-5:2014

Required Minimum Criteria:

- As per the EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016 standards performance criteria:

  Criteria B

- As per the EN 50130-4:2011/A1:2014 standard performance criteria:

  There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the application of the surges is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Method of Measurement:

Only power lines and AC inputs to AC to DC converters and battery charges are tested; however, all EQUIPMENT and SYSTEM cables are attached during the test.

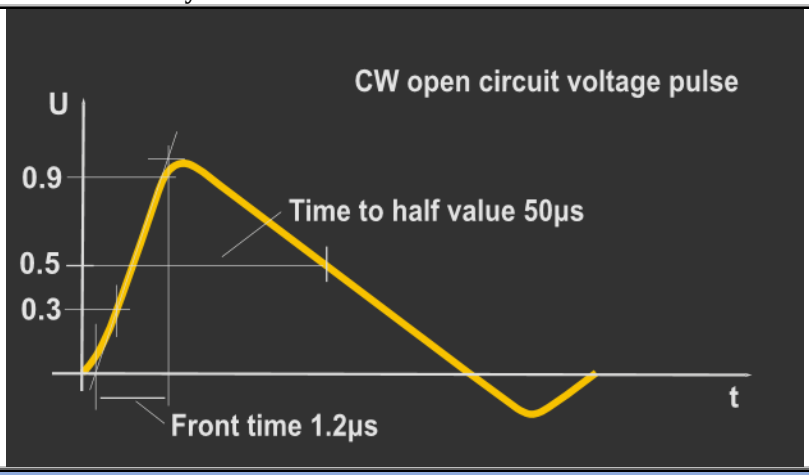
Extra low voltage and signal lines shall be subjected to transients injected by line-to-ground coupling mode only, via a 40 Ω series resistor.

Five surges at each voltage level and polarity are applied to each power line at each of the following AC voltage waveform angles: 0º 90º, 180º and 270º.

Surge Location	Surge Location	Surge Voltage	Result
AC Power Ports	L/L	+/- 1kV	Pass, Criteria A
AC Power Ports	L/G	+/- 2kV	Pass, Criteria A
Signal Ports	L/G	+/- 0.5kV	Pass, Criteria A

Data and Observations:

Table 19: Surge Transient Immunity Data



Surge on AC Power Ports							
Volt	**Polarity**	**Impedance**	**Phase**	**Repetition Time**	**Step Duration**	**Coupling**	**Status**
500 V	Alt	2 Ω	0/270 ° 90 ° Lin	20 s	10 Pulses	IEC L1 -> N	Passed
500 V	Alt	12 Ω	0/270 ° 90 ° Lin	20 s	10 Pulses	IEC L1 -> PE	Passed
500 V	Alt	12 Ω	0/270 ° 90 ° Lin	20 s	10 Pulses	IEC N -> PE	Passed
1000 V	Alt	2 Ω	0/270 ° 90 ° Lin	30 s	10 Pulses	IEC L1 -> N	Passed
1000 V	Alt	12 Ω	0/270 ° 90 ° Lin	30 s	10 Pulses	IEC L1 -> PE	Passed
1000 V	Alt	12 Ω	0/270 ° 90 ° Lin	30 s	10 Pulses	IEC N -> PE	Passed
2000 V	Alt	2 Ω	0/270 ° 90 ° Lin	20 s	10 Pulses	IEC L1 -> PE	Passed
2000 V	Alt	2 Ω	0/270 ° 90 ° Lin	20 s	10 Pulses	IEC N -> PE	Passed
Surge on Signal Ports							
Volt	**Polarity**	**Impedance**	**Phase**	**Repetition Time**	**Step Duration**	**Coupling**	**Status**
500 V	Alt	12 Ω	0/270 ° 90 ° Lin	20 s	10 Pulses	IEC L1 -> PE	Passed

MODIFICATIONS: Equipment Under Test (EUT) did not require any modifications.

OBSERVATIONS/COMMENTS: No issues were found during and after the test.

PERFORMANCE: Equipment Under Test (EUT) complies with the required criteria for compliance of standards EN 55024:2010, EN 61000-6-1:2007, CISPR 35:2016, and EN 50130-4:2011/A1:2014.

4.5 Radio-frequency Continuous Conducted Immunity Testing

Date Performed:

July 12, 2017

Test Standard:

- EN 55024:2010
- EN 61000-6-1:2007
- CISPR 35:2016
- EN 50130-4:2011/A1:2014

Test Method:

IEC 61000-4-6:2013

Required Minimum Criteria:

- As per the EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016 standards performance criteria:

  Criteria A

- As per the EN 50130-4:2011/A1:2014 standard performance criteria:

  There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change, and no such flickering of indicators occurs at U 0 = 130 dBµV or 3 Vrms.

Method of Measurement:

An RF signal was injected into the power and control lines using Bulk Current Injection Clamps, using the frequency range and parameters noted below.

Frequency Range:	150 kHz - 100 MHz
Modulation:	80% AM (1kHz tone)
Sweep Rate:	Less than 1.5 x 10-3 decades/s
Step Size:	1 % of previous Frequency (i.e. Previous Frequency X 1.01)
Dwell Time:	3000 msec

Cable	Test Type	Test Levels	Result
Signal Ports	Bulk Injection Clamp	3 Vrms	Pass
		10 Vrms	Conditional Pass (See Data and Observations below)
AC Power Ports	CDN	3 Vrms	Pass
		10 Vrms	Pass

Data and Observations:

MODIFICATIONS: Equipment Under Test (EUT) did not require any modifications.

OBSERVATIONS/COMMENTS: The EUT lost communication from the monitoring equipment when the bulk injection clamp method and a test level of 10Vrms was used on the EUT's signal line. The EUT and monitoring equipment communication recovered after the test.

No degradation or loss of communication occurred when a test level of 3Vrms was used during and after the test.

These observations are acceptable for compliance since there were no residual change in the EUT or any change in its output in which could be interpreted by associated equipment as a change.

PERFORMANCE: Equipment Under Test (EUT) complies with the required criteria for compliance of standards EN 55024:2010, EN 61000-6-1:2007, CISPR 35:2016, and EN 50130-4:2011/A1:2014.

4.6 Power Frequency Magnetic Field Immunity Testing

Date Performed:

July 17, 2017

Test Standard:

- EN 55024:2010
- EN 61000-6-1:2007
- CISPR 35:2016

Test Method:

IEC 61000-4-8:2009

Required Minimum Criteria:

- As per the EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016 standards performance criteria:

  Criteria A

Method of Measurement:

The equipment was operated and tested at 230Vac 50Hz, 60Hz while in "Continuous Mode" of operation.

The test was performed as per the procedure described in the IEC 61000-4-8:2009. Compliance is checked and determined during and after the tests in accordance with the said standard while the EUT is subjected to the following test levels:

Test level for continuous field: 3 A/m
Test levels for short duration 1 s to 3 s: 3 A/m

Data and Observations:

MODIFICATIONS:	Equipment Under Test (EUT) did not require any modifications.
OBSERVATIONS/COMMENTS:	No issues were found during and after the test.
PERFORMANCE:	Equipment Under Test (EUT) complies with the required criteria for compliance of standards EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016.

4.7 Voltage Dips and Interruptions Testing

Date Performed:

July 10, 2017

Test Standard:

- EN 55024:2010
- EN 61000-6-1:2007
- CISPR 35:2016
- EN 50130-4:2011/A1:2014

Test Method:

IEC 61000-4-11:2004

Required Minimum Criteria:

- As per the EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016 standards performance criteria:

  Criteria B & C

- As per the EN 50130-4:2011/A1:2014 standard performance criteria:

  There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Method of Measurement:

The EUT was connected to the test voltage using the provided AC power adapter. The required voltage Dips and Interruptions were applied as per the table below.

Test Level as per the standard(s) EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016:

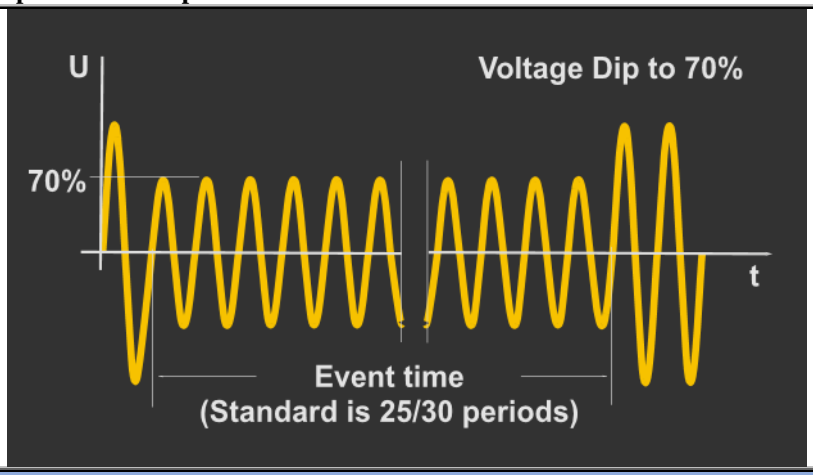
Test Performed	Test Specifications	Required Criteria	Result
Voltage Dips	0% during 0.5 Cycle	B	Pass, Criteria A
	0% during 1 Cycle	B	Pass, Criteria A
	70% during 25 Cycles	C	Pass, Criteria A
Voltage Interruptions	0% during 250 Cycles	C	Pass, Criteria B

Test Level as per the standard(s) EN 50130-4:2011/A1:2014:

Test Performed	Test Specifications	Result
Voltage Dips	40% during 10 Cycles	Pass
	70% during 25 Cycles	Pass
	80% during 250 Cycles	Pass
Voltage Interruptions	0% during 250 Cycles	Pass

Data and Observations:

Table 20: Voltage Dips and Interruptions Data



Result for EN 55024:2010, EN 61000-6-1:2007, and CISPR 35:2016					
Volt	**Phase**	**Repetition Time**	**Event Time**	**Step Duration**	**Status**
0 %	0 °	10 s	0.5 Cycle	3 Pulses	Passed
0 %	0 °	10 s	1 Cycle	3 Pulses	Passed
70 %	0 °	10 s	25 Cycles	3 Pulses	Passed
0 %	0 °	10 s	250 Cycles	3 Pulses	Passed
Result for EN 50130-4:2011/A1:2014					
Volt	**Phase**	**Repetition Time**	**Event Time**	**Step Duration**	**Status**
40 %	0 °	10 s	10 Cycles	3 Pulses	Passed
70 %	0 °	10 s	25 Cycles	3 Pulses	Passed
80 %	0 °	10 s	250 Cycles	3 Pulses	Passed
0 %	0 °	10 s	250 Cycles	3 Pulses	Passed

MODIFICATIONS: Equipment Under Test (EUT) did not require any modifications.

OBSERVATIONS/COMMENTS: No issues were found during and after the test.

PERFORMANCE: Equipment Under Test (EUT) complies with the required criteria for compliance of standards EN 55024:2010, EN 61000-6-1:2007, CISPR 35:2016, and EN 50130-4:2011/A1:2014.

4.8 Mains Supply Voltage Variations Testing

Date Performed:

July 10, 2017

Test Standard:

- EN 50130-4:2011/A1:2014

Required Minimum Criteria:

- As per the EN 50130-4:2011/A1:2014 standard performance criteria:

  There shall be no damage, malfunction or change of status due to the different supply voltage conditions.

Method of Measurement:

The EUT was first conditioned by applying the required test voltage as per the table below until temperature stability was reached. After reaching temperature stability at the specified supply voltage condition, the EUT was inspected visually for mechanical damage to ensure compliance with standards.

Supply voltage max (Umax)	Unom [a] + 10 %
Supply voltage min (Umin)	Unom [a] - 15 %
a Unom = Nominal mains voltage. Where provision is made to adapt the equipment to suit a number of nominal supply voltages (e.g. by transformer tap changing), the above conditioning severity shall be applied for each nominal voltage, with the equipment suitably adapted. For equipment which is claimed to be suitable for a range of nominal mains voltages (e.g. 220/240 V) without adaptation, Umax = (Maximum Unom) + 10 %, and Umin = (Minimum Unom) – 15 %. In any case the range of Unom shall include the European nominal mains voltage of 230 V.	

Data and Observations:

MODIFICATIONS:	Equipment Under Test (EUT) did not require any modifications.
OBSERVATIONS/COMMENTS:	No issues were found during and after the test.
PERFORMANCE:	Equipment Under Test (EUT) complies with the required criteria for compliance of standard EN 50130-4:2011/A1:2014.

Appendix A: TEST SETUP PHOTOS

Figure 1: Radiated Emissions performed at the SAC Test Setup

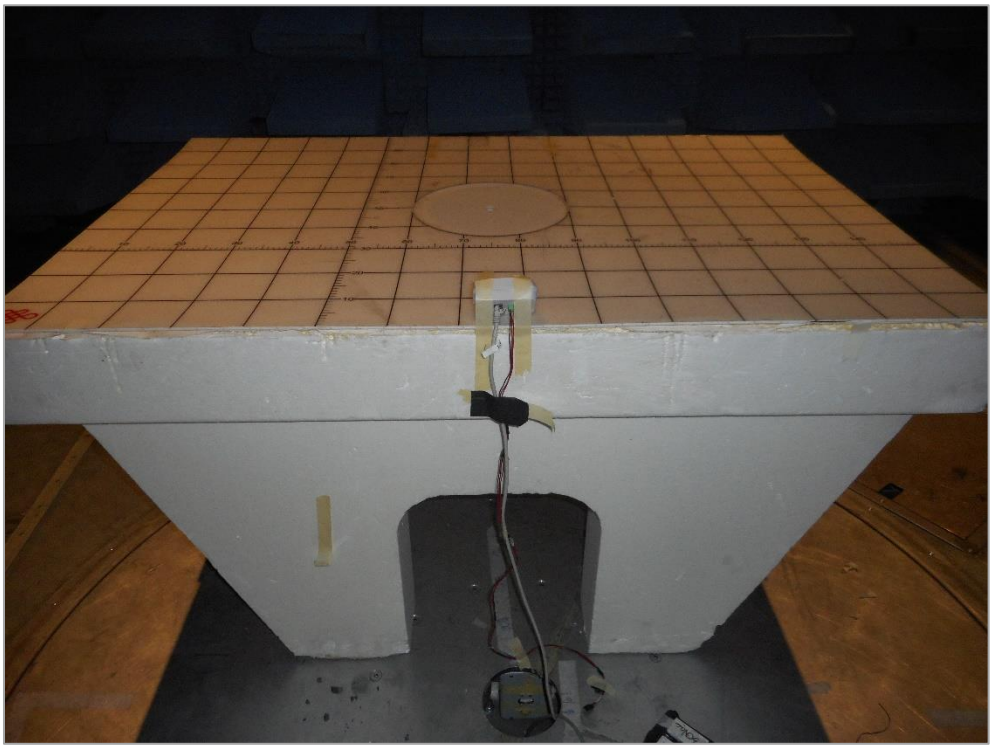


Figure 2: Radiated Emissions (close-up view) Test Setup

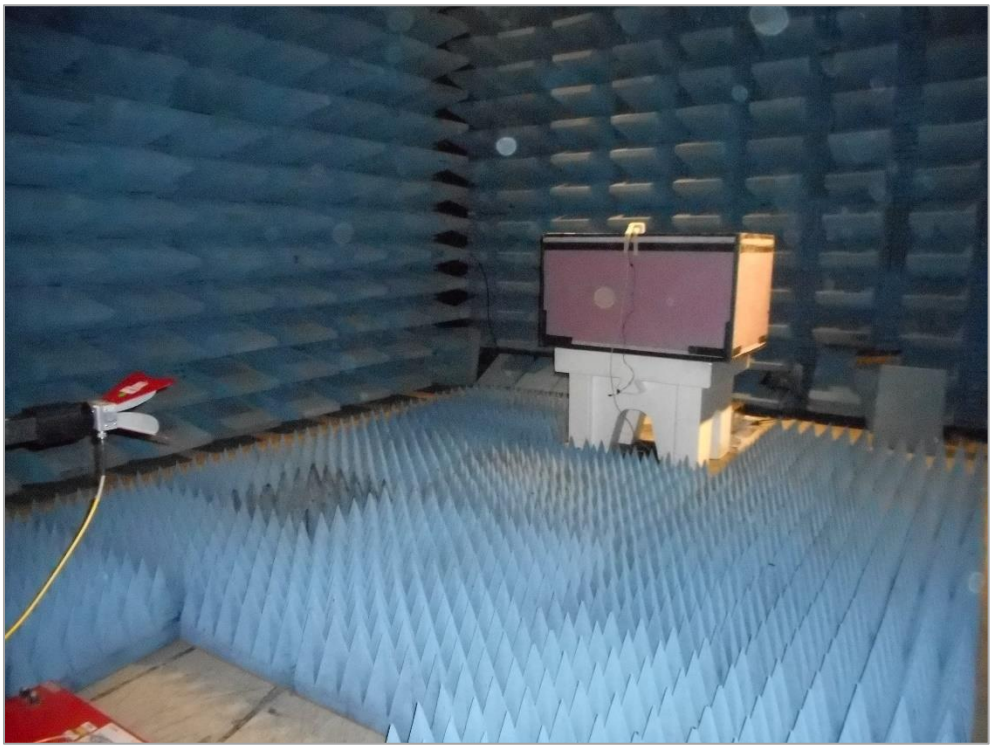


Figure 3: Radiated Emissions performed above 1GHz Test Setup

Figure 4: Radiated Emissions performed above 1GHz (close-up view) Test Setup

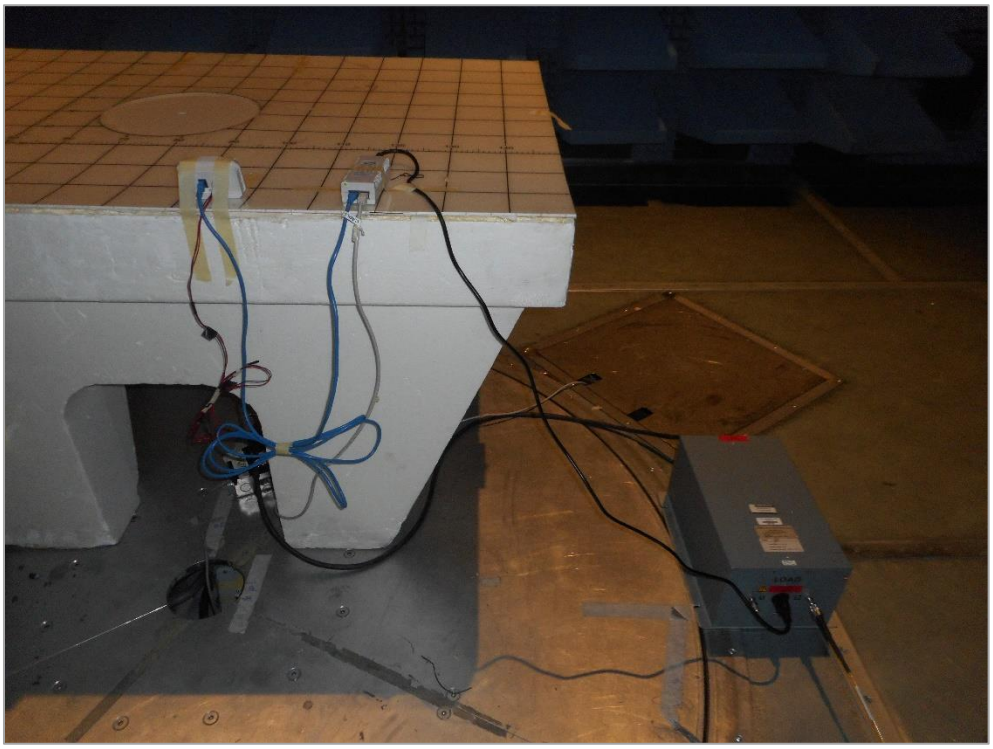


Figure 5: AC Mains Conducted Emissions Test Setup

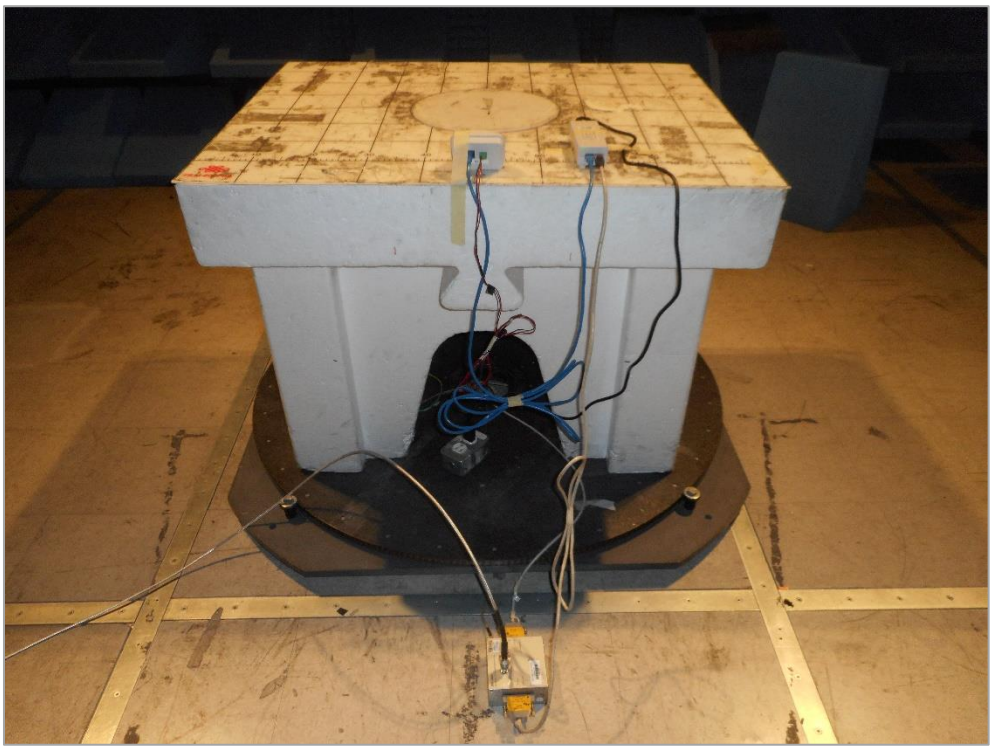


Figure 6: Telecom Port Conducted Emissions Test Setup

Figure 7: Immunity to Electrostatic Discharge Test Setup

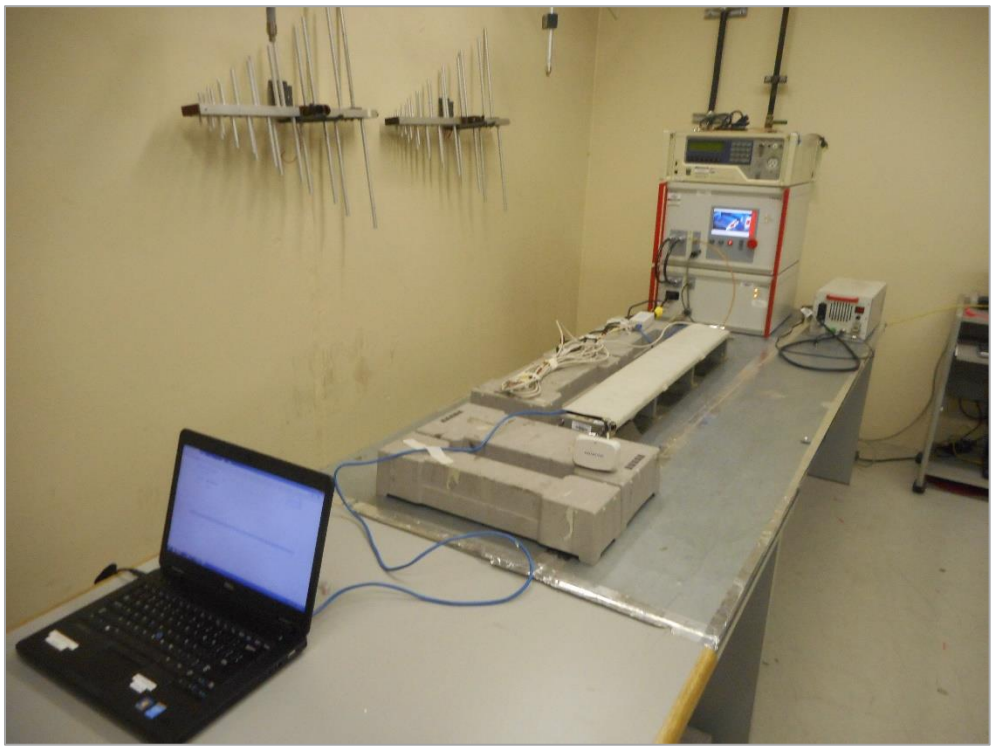
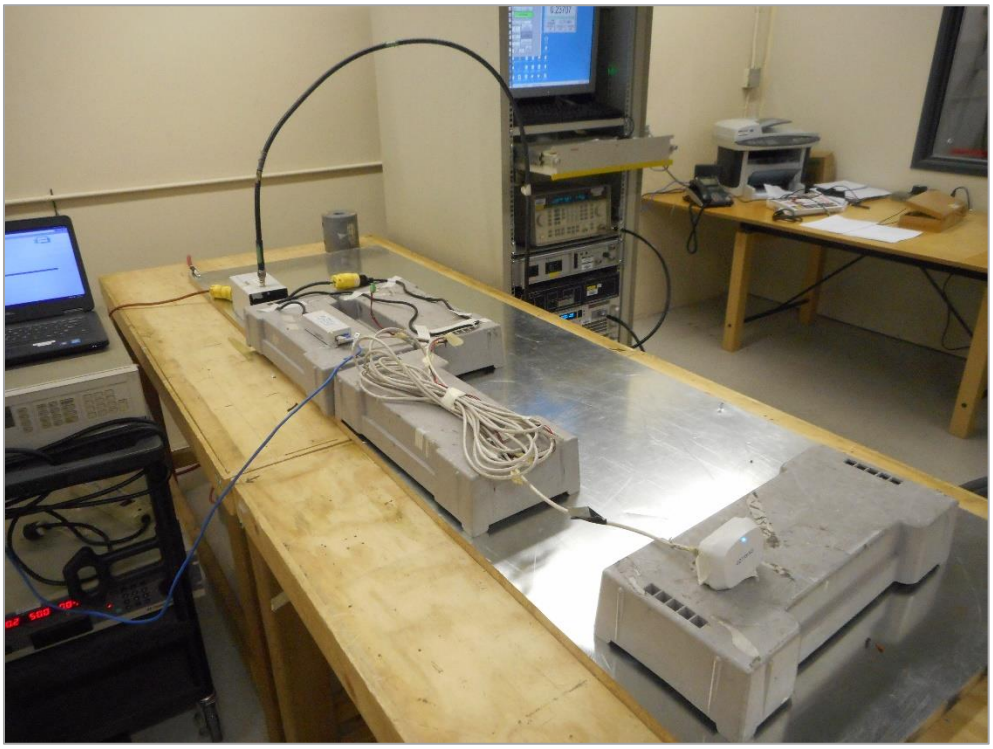


Figure 8: Immunity to EFT, Surge, and Voltage Dips & Interruptions Test Setup



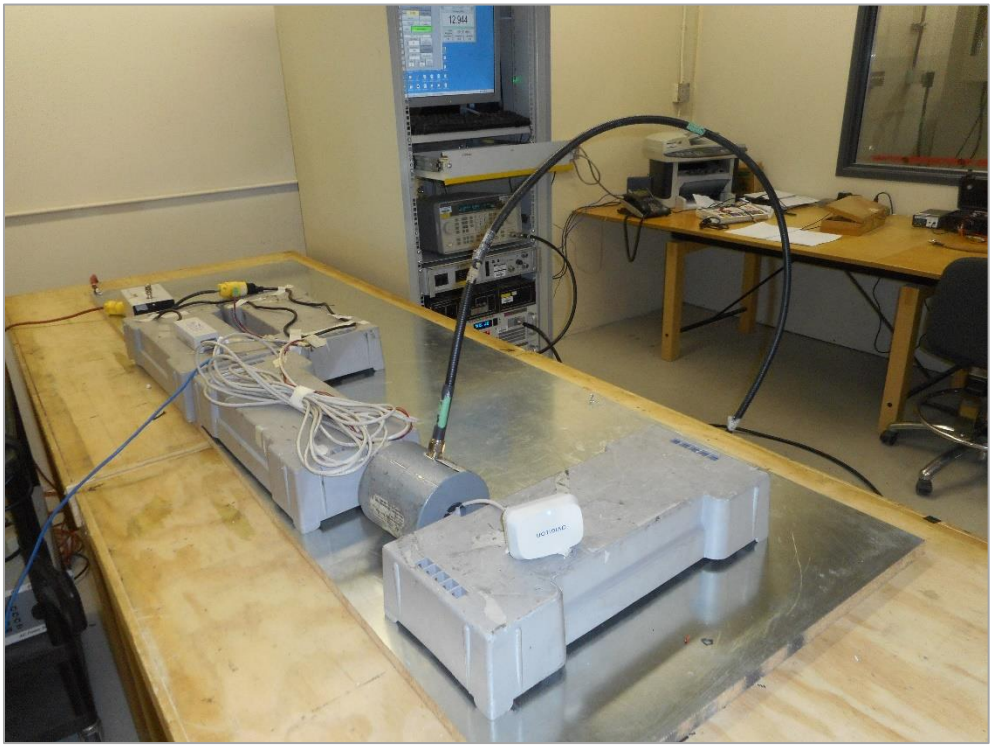


Figure 9: Immunity to Conducted RF Disturbances Test Setup

Appendix B: ABBREVIATIONS

Abbreviation	Definition
AC	Alternating Current
AM	Amplitude Modulation
CE	European Conformity
CISPR	Comité International Spécial des Perturbations Radioélectriques
DC	Direct Current
EFT	Electrical Fast Transient
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
ESD	ElectroStatic Discharge
EUT	Equipment Under Test
FCC	Federal Communications Commission
IC	Industry Canada
ICES	Interference Causing Equipment Standard
IEC	International Electrotechnical Commission
LISN	Line Impedance Stabilizing Network
OATS	Open Area Test Site
RF	Radio Frequency
RMS	Root-Mean-Square
SAC	Semi-Anechoic Chamber

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END OF REPORT