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1 Summary of Test Results

Basic Standards	Test Result
Emissions Testing as referenced in EN61326-1	
EN 55011, Radiated Emissions	Compliant
EN 55011, Conducted Emissions	Compliant
EN61000-3-2, Harmonic Current	Compliant
EN61000-3-3, Voltage Fluctuations	Compliant
Immunity testing as referenced in EN 61326-1	
EN 61000-4-2, Electro-Static Discharge	Compliant
EN 61000-4-3, Radiated Immunity	Compliant
EN 61000-4-4, Electric Fast Transients Immunity	Compliant
EN 61000-4-5, Surges Immunity	Compliant
EN 61000-4-6, Conducted Immunity	Compliant
EN 61000-4-8, Power Frequency Magnetic Field Immunity	Compliant
EN 61000-4-11, Voltage Dips & Interruptions	Compliant

1.1 *Modifications Required to Compliance*

1. Attached one ferrite (Fair-Rite 0431164281) on each sensor cable to be compliant for Radiated Emissions.

1.2 *Performance Criteria for Immunity*

- Criteria A – No loss of performance or data during or after the test
- Criteria B – No loss of data, some loss of performance that is self-recoverable without operator intervention
- Criteria C – No loss of data, some loss of performance that can be recovered with operator intervention

2 General Information

2.1 Client Information

Name: Johnson Controls
Address: 4366 Shackleford Rd, Suite B
City, State, Zip, Country: Norcross, GA 30093, USA

2.2 Test Laboratory

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

Accrediting Body: A2LA
Type of lab: Testing Laboratory
Certificate Number: 3212.01

2.3 General Information of EUT

Product Name: Air Pressure Monitoring System
Model Number Tested: FMS1655-S-0-0

Equivalent Model Numbers: FMS-1650 Series, HMS-1650 Series, CMS-1650 Series, FMS-1655 Series, HMS-1655 Series, CMS-1655 Series, LB-FMS1655 Series, LB-HMS1655 Series, LB-CMS1655 Series, FMS1655-M Series, HMS1655-M Series, LB-FMS1655-M Series, LB-HMS1655-M Series, VMS-1655 Series, LB-VMS-1655 Series, UVM1000

Rated Voltage: 120 VAC 50/60Hz or 240 VAC 50/60Hz or 24 VAC 50/60Hz
Test Voltage: 230 VAC 50Hz

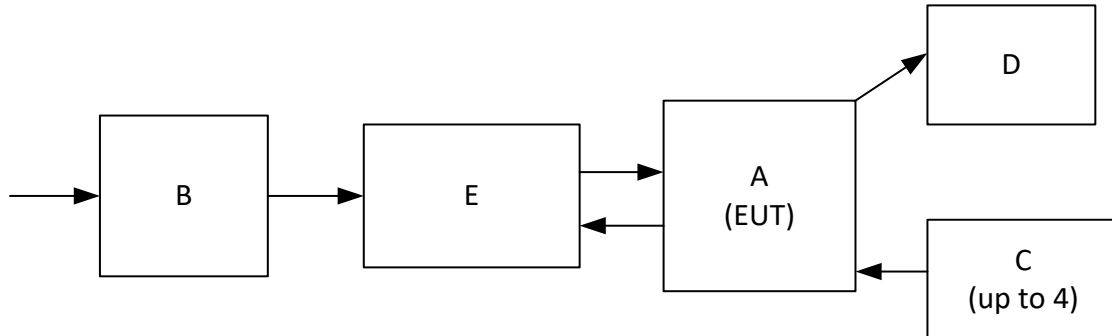
Sample Received Date: 14-Nov-2019
Dates of testing: 6-13-Dec-2019

2.4 Operating Modes and Conditions

The EUT was programmed by the manufacturer to run continuously exercising all modes of operation.

During immunity testing any loss of function was monitored either with video or visually.

2.1 EUT Connection Block Diagram



2.2 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Johnson Controls	Air Pressure Monitor System	FMS1655-S-X-X	F-11193856-003
B	Johnson Controls	Stepdown Transformer	S-300045	NSN
C	Johnson Controls	Differential Pressure Sensors	FMS165X-Remote Sensor	Several to list
D	Johnson Controls	User Interface Display Module	FMS1655-S-X-X	F-11193856-003
E	Johnson Controls	Universal Valve Module	UVM1000	VV10193856-002

2.3 Cable List

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	AC Mains	AC Mains	Stepdown Transformer	1.0	No	No
2	24 VAC Input	Stepdown Transformer	EUT	0.5	No	No
3	Sensor	EUT	Sensor	1.0	Yes	No
4	LCD Display	EUT	LCD Display	3.0	No	No
5	Universal Valve Module	UVM	EUT	0.5	No	No

Note: Cables 2, 3 and 4 can vary in length.

3 Radiated Emissions

3.1 Test Result

Test Description	Basic Standards	Test Result
Radiated Emissions, Class A	EN 55011	Compliant

3.2 Test Method

The initial preliminary exploratory scans were performed over the frequency range as indicated in the tables below using the max hold function and incorporating a Peak detector and using TILE! software. The final test data was measured using a Quasi-Peak detector below 1GHz and a Peak and Average detector above 1GHz. The receiver's resolution bandwidth was set to 120 kHz for measurements taken in the 30MHz to 1GHz frequency range and 1MHz for measurements for 1GHz and higher. Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency. The radiated measurements were recorded and compared to the limits indicated in the table below.

Radiated emissions limit below 1 GHz

Frequency Range	Limits (dBuV/m) Quasi-Peak		Equipment Classification
	3 m	10 m	
30 to 230 MHz	40.5	30	Class B
230 to 1000 MHz	47.5	37	

Frequency Range	Limits (dBuV/m) Quasi-Peak		Equipment Classification
	3 m	10 m	
30 to 230 MHz	50.5	40	Class A
230 to 1000 MHz	57.5	47	

Radiated emissions limit above 1 GHz

Frequency Range	Class A Limits (dBuV/m)		Class B Limits (dBuV/m)	
	FCC	CISPR	FCC	CISPR
1 to 3 GHz	Avg 60 Pk 80	Avg 56 Pk 76	Avg 54 Pk 74	Avg 50 Pk 70
3 to 6 GHz	Avg 60 Pk 80	Avg 60 Pk 80	Avg 54 Pk 74	Avg 54 Pk 74
6 to 40 GHz	Avg 60 Pk 80	No requirement	Avg 54 Pk 74	No requirement

3.3 Test Site

10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions

Temperature: 22.0°C
 Relative Humidity: 35.7%
 Atmospheric Pressure: 97.77kPa

3.4 Test Equipment

Test End Date: 9-Dec-2019

Tester: PL

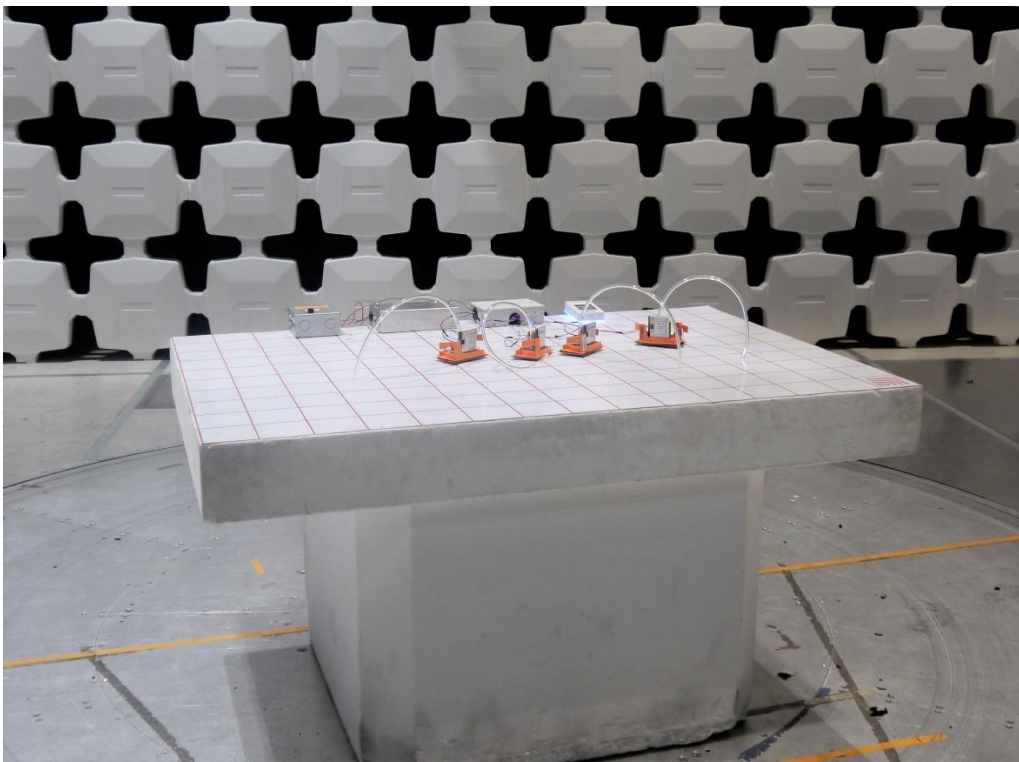
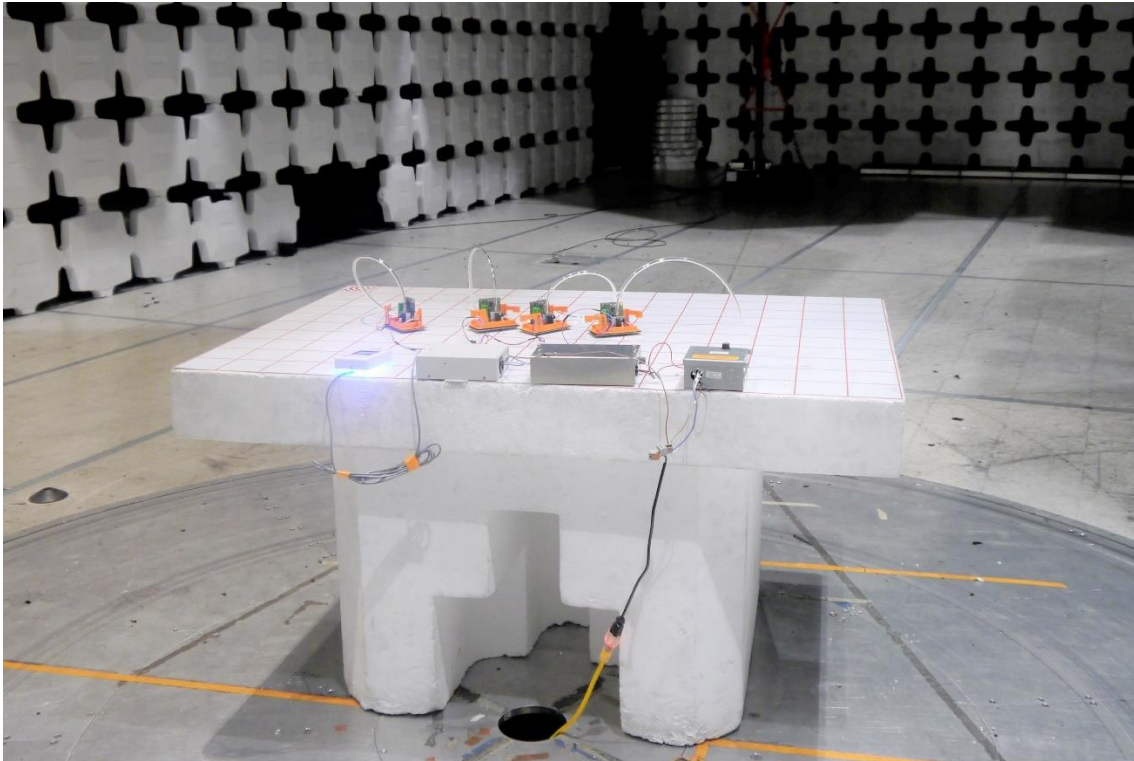
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079690	11-Dec-2020
RF CABLE	SF106	HUBER & SUHNER	B079712	5-Sep-2020
RF CABLE	SF106	HUBER & SUHNER	B079717	7-Sep-2020
RF CABLE	UC-N-MM-78	MAURY MICROWAVE	17017	5-Sep-2020
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	5-Sep-2020
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	1-Aug-2020
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020

Note: The calibration period equipment is 1 year.

Software:

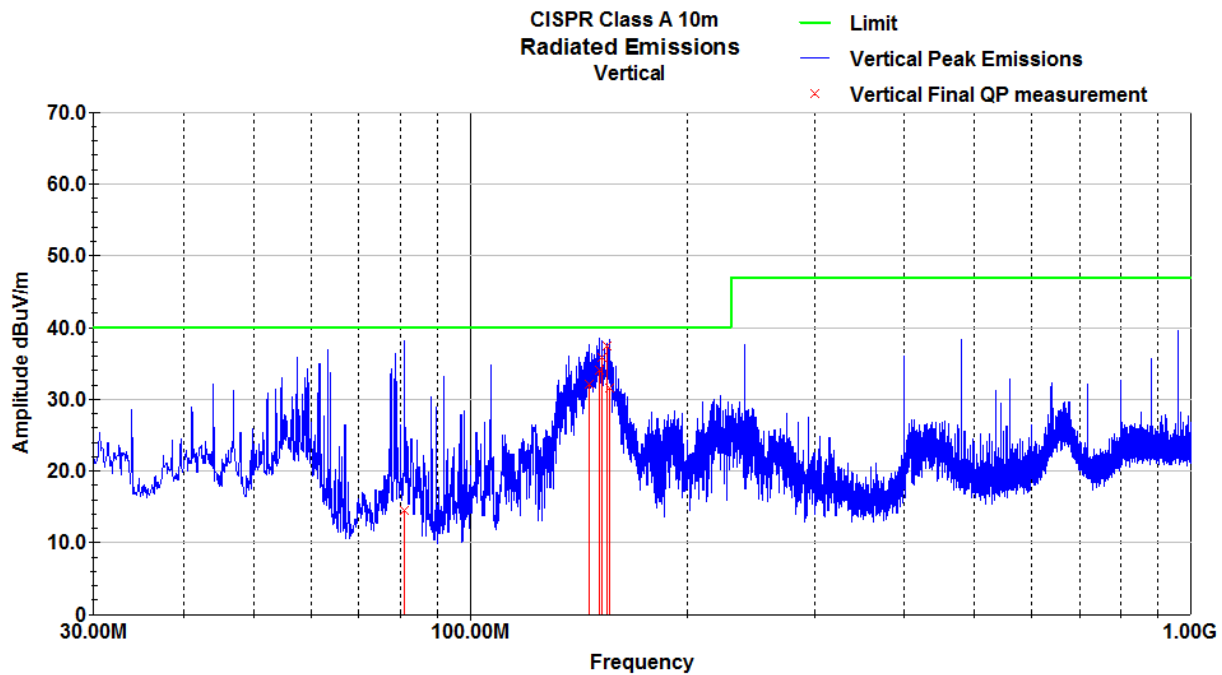
“RE 30-1000 MHz TILE7 190722” TILE! profile dated 02 August 2019

3.5 Test Setup Photographs



3.6 Test Data

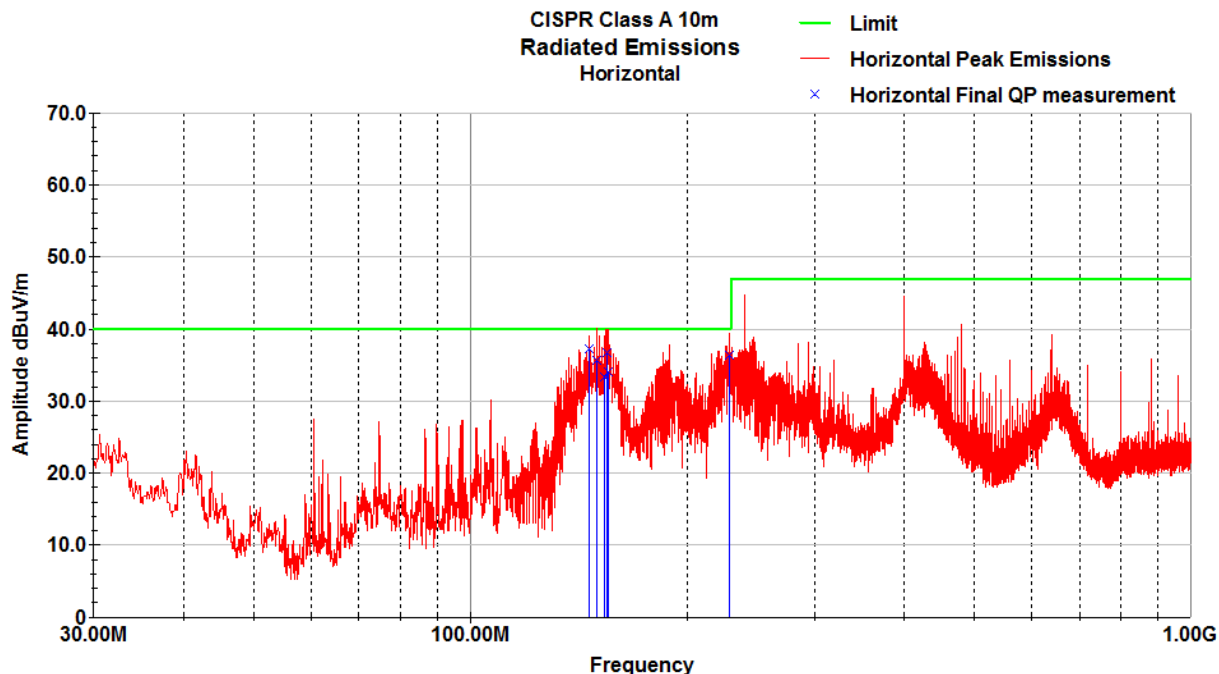
Vertical Radiated Emissions Plot



Vertical Radiated Emissions Data

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
81.03	39.9	V	28.0	310.0	7.5	1.2	34.2	14.5	40.0	-25.5
146.09	52.6	V	45.0	250.0	12.5	1.7	34.7	32.1	40.0	-7.9
150.87	54.5	V	57.0	323.0	12.6	1.7	34.7	34.1	40.0	-5.9
152.12	56.2	V	66.0	134.0	12.6	1.7	34.7	35.8	40.0	-4.2
154.56	57.9	V	87.0	153.0	12.6	1.7	34.7	37.4	40.0	-2.6
155.83	52.0	V	143.0	199.0	12.6	1.7	34.7	31.6	40.0	-8.4
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Horizontal Radiated Emissions Plot



Horizontal Radiated Emissions Data

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
146.33	57.7	H	12.0	400.0	12.5	1.7	34.7	37.2	40.0	-2.8
149.97	56.1	H	0.0	385.0	12.6	1.7	34.7	35.6	40.0	-4.4
153.24	53.8	H	1.0	400.0	12.6	1.7	34.7	33.4	40.0	-6.6
154.46	57.1	H	20.0	395.0	12.6	1.7	34.7	36.7	40.0	-3.3
155.62	54.5	H	12.0	386.0	12.6	1.7	34.7	34.1	40.0	-5.9
228.77	57.8	H	203.0	321.0	11.3	2.1	34.8	36.4	40.0	-3.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

4 Conducted Emissions

4.1 Test Result

Test Description	Basic Standards	Test Result
Conducted Emissions Class A	EN 55011	Compliant

4.2 Test Method

With the receivers resolution bandwidth was set to 9 kHz the initial preliminary exploratory scans were performed over the measuring frequency range (0.15MHz to 30MHz) using a max hold mode incorporating a Peak detector and Average detector and using the TILE! software. The final test data was measured using a Quasi-Peak detector and Average detector and compared against the limits indicated in the table below.

Frequency Range	Class A Limits (dBuV)		Class B Limits (dBuV)	
	FCC	CISPR	FCC	CISPR
0.15 to 0.5 MHz	Avg 66 QP 79		Avg 56 to 46 QP 66 to 56	
0.5 to 5 MHz	Avg 60 QP 73		Avg 46 Pk 56	
5 to 30 MHz	Avg 60 QP 73		Avg 50 Pk 60	

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.2°C

Relative Humidity: 36.4%

Atmospheric Pressure: 97.73kPa

4.4 Test Equipment

Test End Date: 9-Dec-2019

Tester: PL

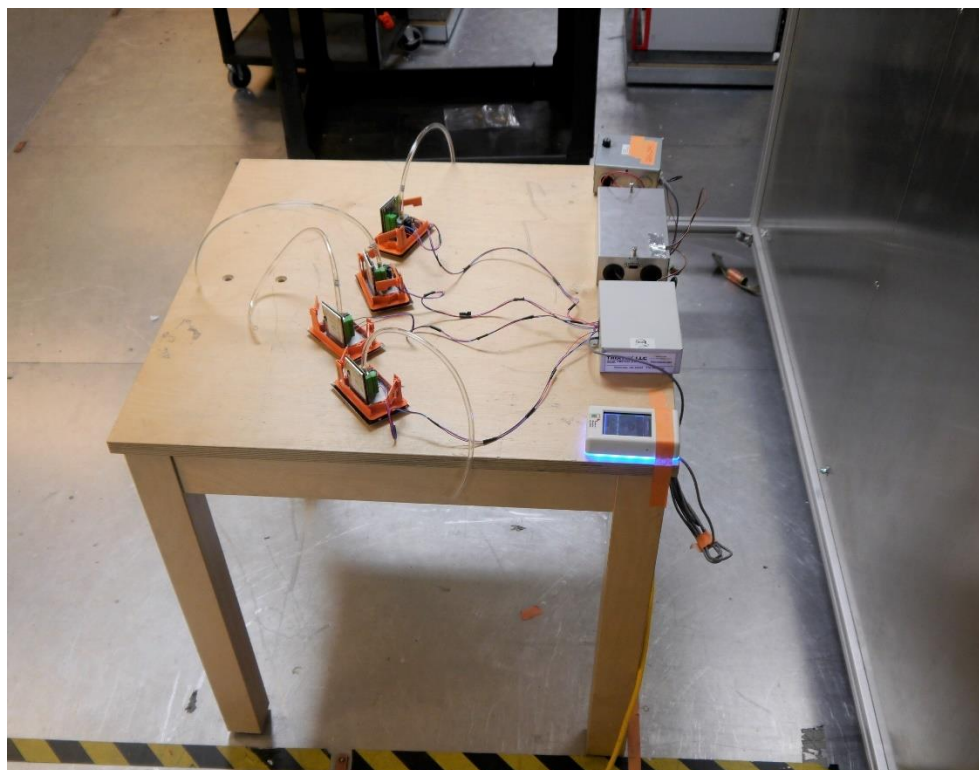
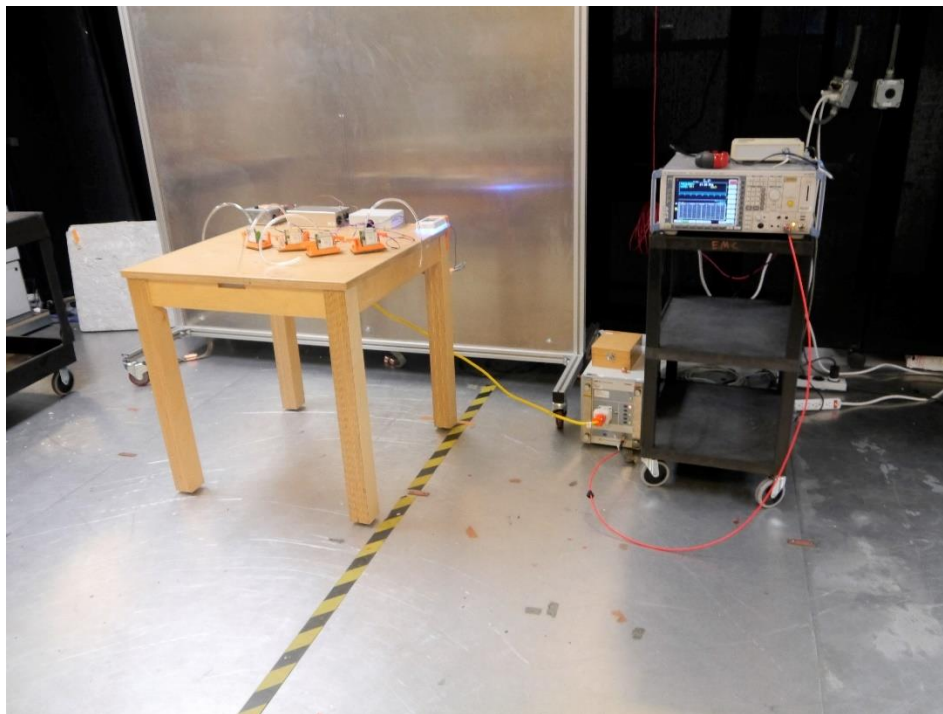
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
LINE IMPEDANCE STABILIZATION NETWORK	NNB 51	TESEQ	B085882	5-Apr-2020
RF CABLE	SF104	Huber & Suhner	B085905	11-Sep-2020
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	21-Aug-2020

Note: The calibration period equipment is 1 year.

Software:

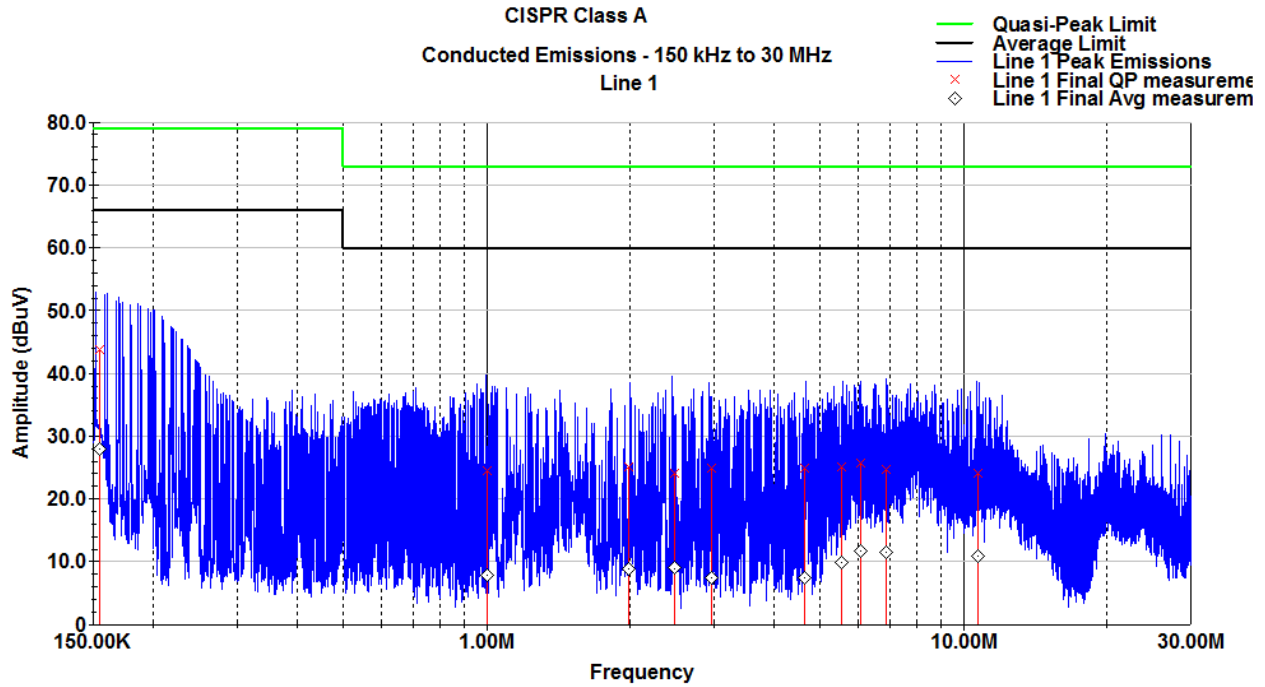
“181112 Conducted Emissions Tile7” TILE! profile dated 12 November 2019

4.5 Test Setup Photographs



4.6 Test Data

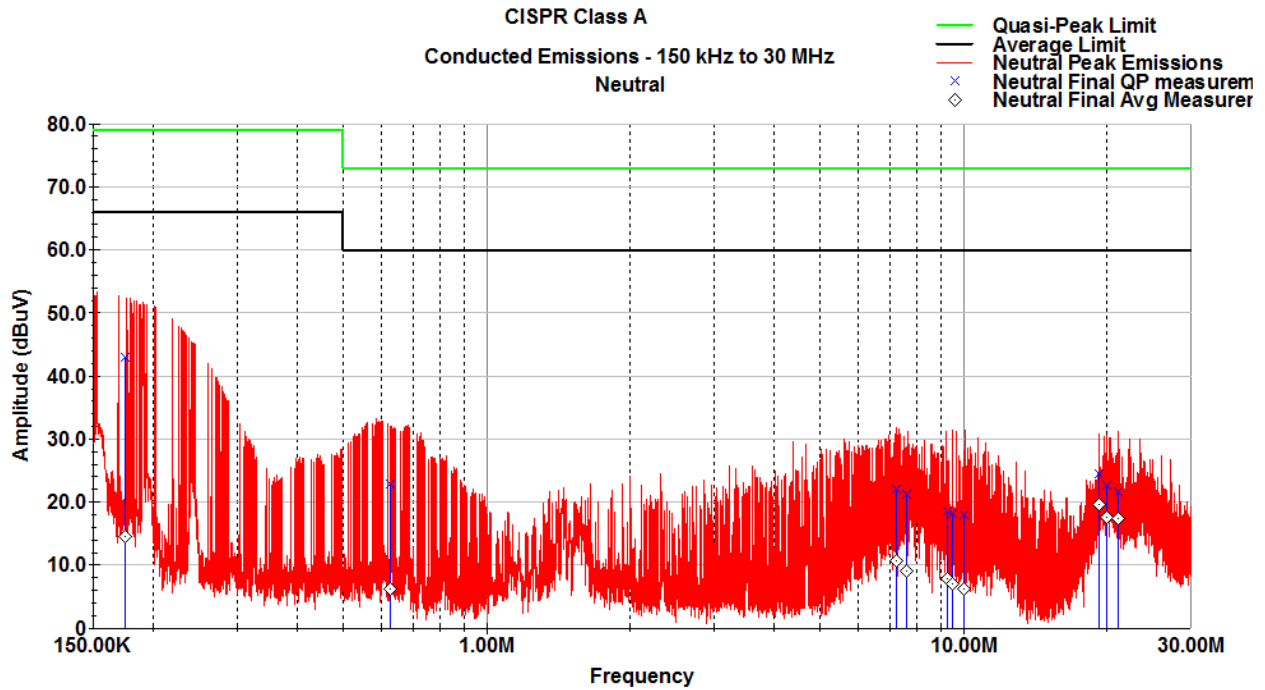
Line 1 Conducted Emissions Plot



Line 1 Conducted Emissions Data

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.154	43.8	79.0	-35.2	28.0	66.0	-38.0
1.003	24.6	73.0	-48.4	7.8	60.0	-52.2
1.987	25.0	73.0	-48.0	8.8	60.0	-51.2
2.473	24.0	73.0	-49.0	9.0	60.0	-51.0
2.968	24.8	73.0	-48.2	7.4	60.0	-52.6
4.643	24.9	73.0	-48.1	7.5	60.0	-52.5
5.563	25.1	73.0	-47.9	9.8	60.0	-50.2
6.096	25.7	73.0	-47.3	11.7	60.0	-48.3
6.889	24.8	73.0	-48.2	11.4	60.0	-48.6
10.714	24.1	73.0	-48.9	10.9	60.0	-49.1

Neutral Conducted Emissions Plot



Neutral Conducted Emissions Data

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.175	42.9	79.0	-36.1	14.6	66.0	-51.4
0.628	22.8	73.0	-50.2	6.2	60.0	-53.8
7.220	22.1	73.0	-50.9	10.7	60.0	-49.3
7.619	21.3	73.0	-51.7	9.0	60.0	-51.0
9.243	18.6	73.0	-54.4	7.8	60.0	-52.2
9.477	18.3	73.0	-54.7	7.1	60.0	-52.9
10.045	18.0	73.0	-55.0	6.3	60.0	-53.7
19.280	24.5	73.0	-48.5	19.7	60.0	-40.3
19.942	22.6	73.0	-50.4	17.5	60.0	-42.5
21.114	21.6	73.0	-51.4	17.4	60.0	-42.6

5 Electrostatic Discharge Immunity

5.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Electrostatic discharge immunity	EN 61326-1	IEC 61000-4-2	Compliant

5.2 Test Method

The EUT was placed on the ESD test table and was made to function as indicated in the “Operating Modes and Conditions” section of this report. Electrostatic discharges were applied as follows:

- 1) indirectly to the horizontal and vertical coupling planes using contact discharge method
- 2) directly to the EUT conductive surfaces using contact discharge method
- 3) directly to the EUT non-conductive surfaces using air discharge method

The EUT was monitored for performance.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.2 °C
 Relative Humidity: 42.6 %
 Atmospheric Pressure: 97.65 kPa

5.4 Test Equipment

Test End Date: 10-Dec-2019

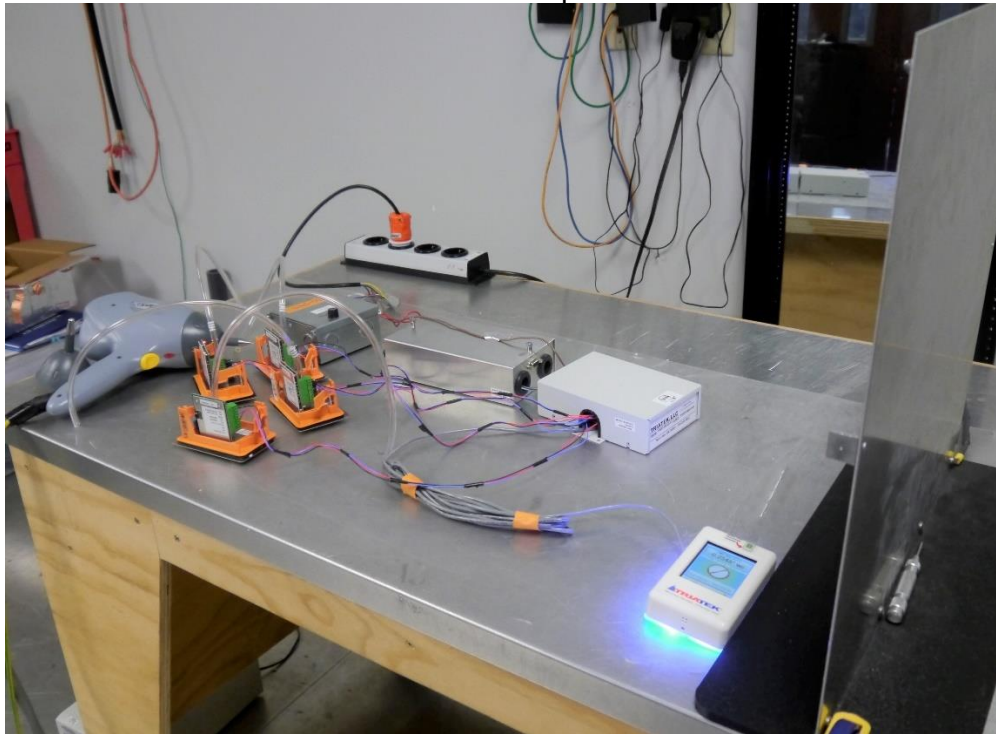
Tester: PB

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ESD GENERATOR	NSG 438	TESEQ	B085726	21-May-2020
OSCILLOSCOPE	RTO1014	ROHDE & SCHWARZ	B079487	18-Jan-2020
MULTIMETER	87V	Fluke	B079676	21-Aug-2020

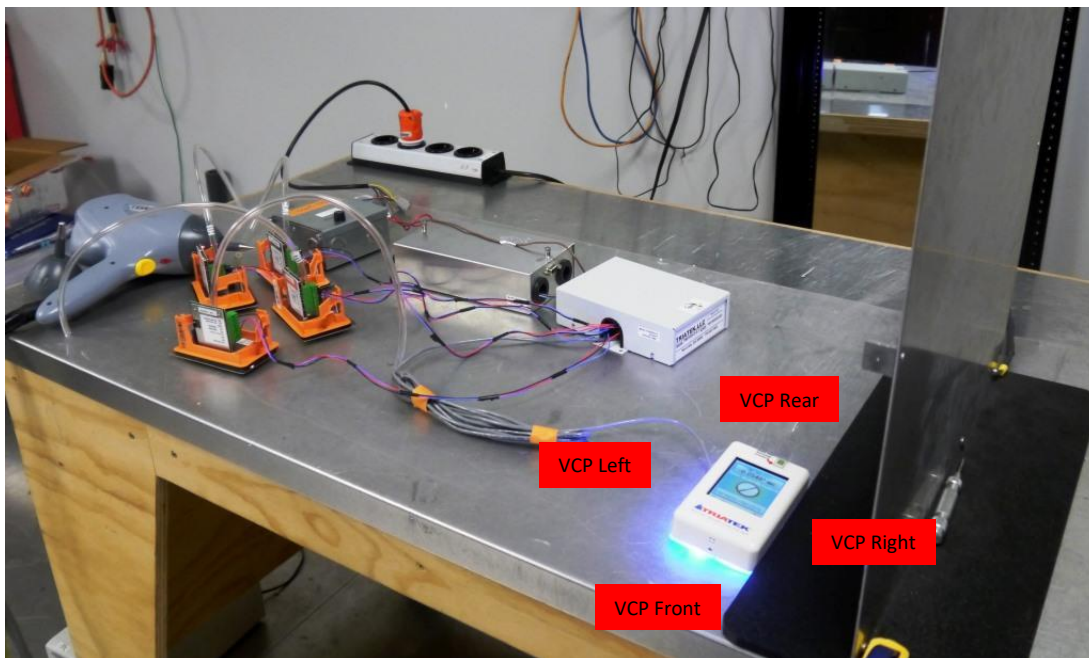
Note: The calibration period equipment is 1 year.

5.5 Test Setup Photographs

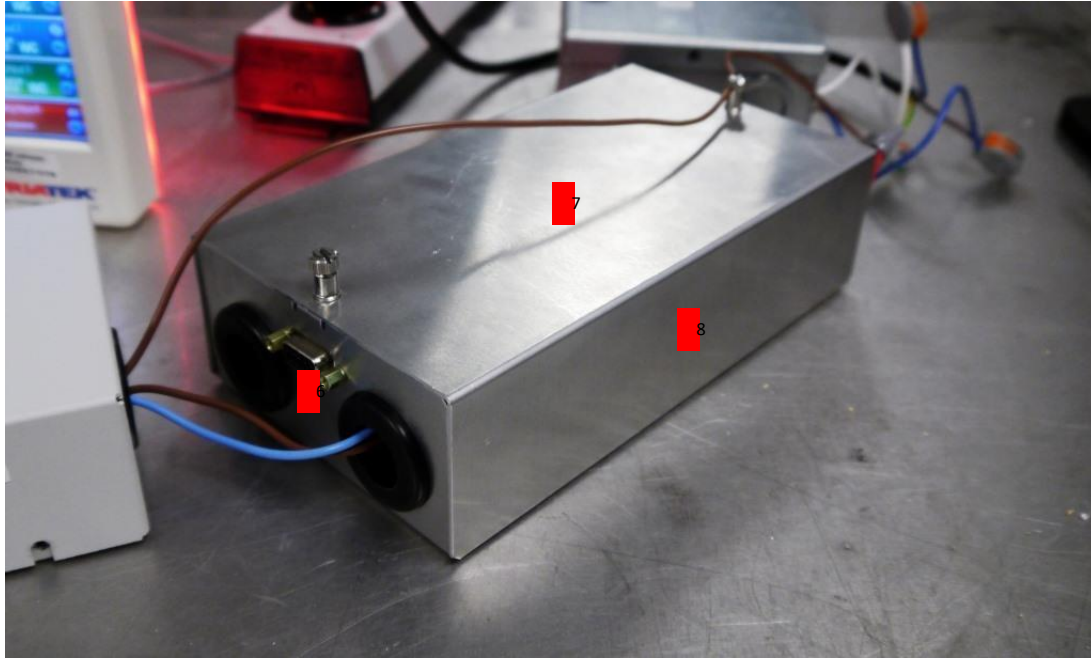
ESD Setup



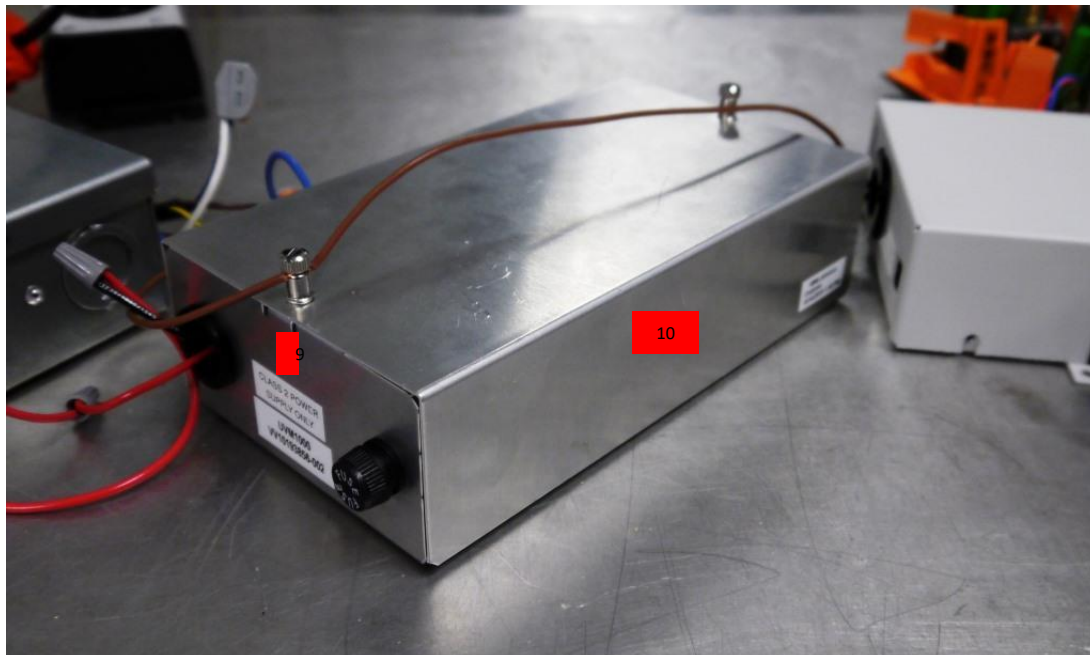
Discharge Locations



Discharge Locations



Discharge Locations



5.6 Test Data

Indirect Applications										
No.	Discharge Method	Discharges per location	Test Level (kV) Observed Performance							
			+2	-2	+4	-4	+6	-6	+8	-8
VCP Front	Contact	25	-	-	A	A	-	-	-	-
VCP Right	Contact	25	-	-	A	A	-	-	-	-
VCP Left	Contact	25	-	-	A	A	-	-	-	-
VCP Rear	Contact	25	-	-	A	A	-	-	-	-

Note: EUT normally mounted to a wall, therefore HCP was not tested.

Direct Applications										
No.	Discharge Method	Discharges per location	Test Level (kV) Observed Performance							
			+2	-2	+4	-4	+6	-6	+8	-8
1	Contact	10	A	A	A	A	-	-	-	-
2	Contact	10	A	A	A	A	-	-	-	-
3	Contact	10	A	A	A	A	-	-	-	-
4	Contact	10	A	A	A	A	-	-	-	-
5	Contact	10	A	A	A	A	-	-	-	-
6	Contact	10	A	A	A	A	-	-	-	-

Criteria A – Observed no degradation of performance.

6 Radiated RF Electromagnetic Field Immunity

6.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Radiated RF Immunity	EN 61326-1	IEC 61000-4-3	Compliant

6.2 Test Method

The EUT was placed in the ALSE uniform field and was made to function as indicated in the “Operating Modes and Conditions” section of this report. The test system was set to generate the required field strength. The EUT was monitored for performance.

6.3 Test Site

3m Absorber Lined Shielded Enclosure, SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.6 °C
Relative Humidity: 51.1 %
Atmospheric Pressure: 97.8 kPa

6.4 Test Equipment

Test End Date: 10-Dec-2019

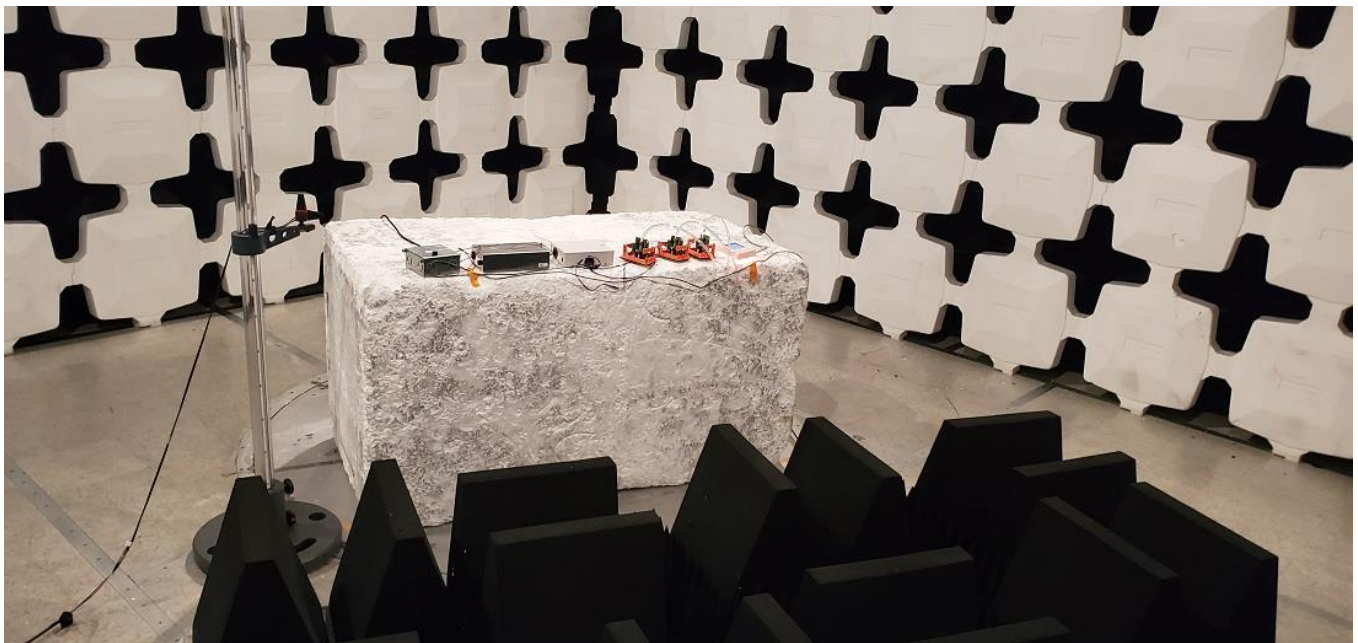
Tester: PB

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	30-Oct-2020
RF CABLE	SF106	HUBER & SUHNER	B079661	6-Sep-2020
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	6-Sep-2020
RF CABLE	SF106	HUBER & SUHNER	15008	20-Sep-2020
RF CABLE	SF106	HUBER & SUHNER	B085900	CNR
RF CABLE	SF106	HUBER & SUHNER	B085893	CNR
RF CABLE	SF106	HUBER & SUHNER	B085894	CNR
RF CABLE	SF106	HUBER & SUHNER	B085898	20-Sep-2020
POWER METER	PM 6006	TESEQ	B085729	13-Aug-2020
POWER METER	PM 6006	TESEQ	B085728	13-Aug-2020
DIRECTIONAL COUPLER	C5892-10	WERLATONE	B092083	VBU
1-6GHz DIRECTIONAL COUPLER	DC7205	RF MICROWAVE INSTRUMENTATION	17008	VBU
RI Filter	5L110-1020/TQ3000-N/NP	K&L MICROWAVE	17018	CNR
RF IMMUNITY TEST SYSTEM	ITS 6006	TESEQ	B085725	13-Aug-2020
POWER AMPLIFIER 80-1000MHz	80-1000-250	MILMEGA	B079821	CNR
POWER AMPLIFIER 1-6GHZ	8100-007	ETS LINDGREN	16002	CNR
FIELD MONITOR	HI-6100	ETS LINDGREN	B079819	CNR
ISOTROPIC FIELD PROBE (150KHZ-6GHZ)	HI-6105	ETS LINDGREN	B085740	8-Feb-2020
MULTI-DEVICE CONTROLLER	2090	ETS LINDGREN	B079818	CNR

Note: The calibration period equipment is 1 year.

Software: “Radiated Immunity 80-2700MHz” TILE! profile dated July 2018

6.5 Test Setup Photographs



6.6 Test Criteria

Frequency (MHz)	Polarity	Field Strength	Modulation	Frequency step	Test Distance (m)	Dwell time (s)	Minimum Criterion
80 to 1000	Vertical Horizontal	3 V/m	80%AM (1kHz)	1%	3	0.5	A
1400 to 2000	Vertical Horizontal	3 V/m	80%AM (1kHz)	1%	3	0.5	A
2000 to 2700	Vertical Horizontal	1 V/m	80%AM (1kHz)	1%	3	0.5	A

6.7 Test Data

Frequency (MHz)	Polarity	Observed performance			
		Front	Left	Rear	Right
80 to 1000	Vertical Horizontal	A	A	A	A
1400 to 2000	Vertical Horizontal	A	A	A	A
2000 to 2700	Vertical Horizontal	A	A	A	A

7 Electrical Fast Transients/Burst Immunity

7.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Electrical Fast Transient / Burst Immunity	EN 61326-1	IEC 61000-4-4	Compliant

7.2 Test Method

The EUT was connected to the transient test system and was made to function as indicated in the “Operating Modes and Conditions” section of this report. The test system was set to generate the required test voltage. The EUT was monitored for performance.

7.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.3°C

Relative Humidity: 35.9%

Atmospheric Pressure: 97.79kPa

7.4 Test Equipment

Test End Date: 9-Dec-2019

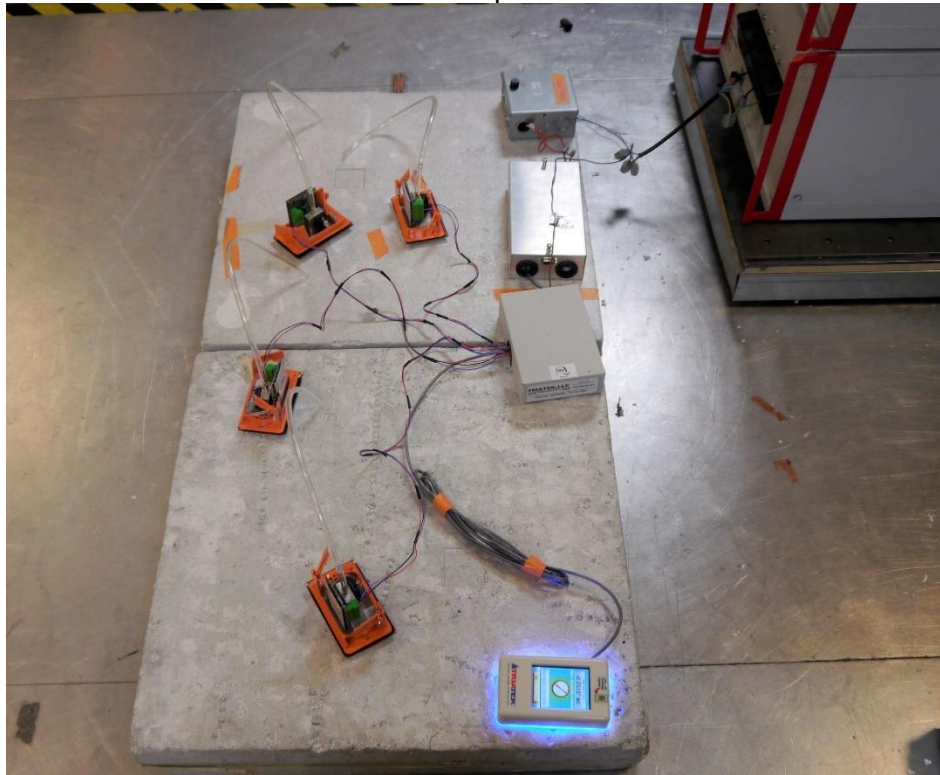
Tester: PL

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
COUPLING DECOUPLING NETWORK	CDN 3063	TESEQ	B079811	26-Apr-2020
EFT AND SURGE GENERATOR	NSG 3060	TESEQ	B079812	26-Apr-2020
COUPLING TRAY	CDN 3425	TESEQ	B079742	CNR

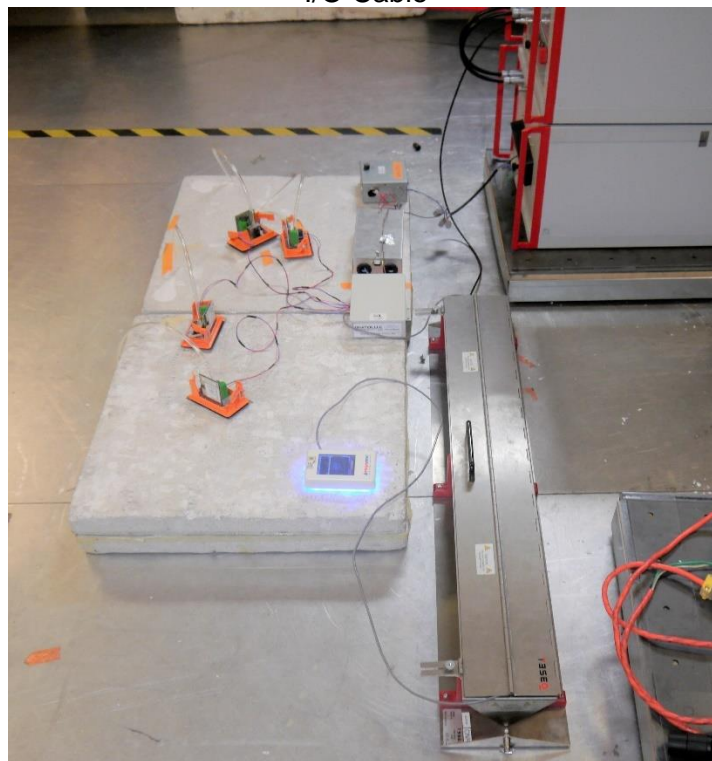
Note: The calibration period equipment is 1 year.

7.5 Test Setup Photographs

AC Input



I/O Cable



7.6 Test Data

Port Type	Coupling Device	Test Application	Test Level	Pulse (ns)	Repetition rate	Duration	Minimum performance criterion
AC Power	CDN	All lines to PE	2 kV	5/50	5 kHz	≥ 60 s	B
DC Power	CDN	All lines to PE	2 kV	5/50	5 kHz	≥ 60 s	B
Signal, I/O	Coupling tray	Per cable	1 kV	5/50	5 kHz	≥ 60 s	B

Port / Cable Tested	Port type	Observed Criterion
AC mains	AC mains	A
Controller Side	I/O Cable	B ¹
Display Side	I/O Cable	B ¹

Notes:

1. Display showed error “Comm Error! Display Module has lost communications with LON Controller.” System recovered when interference was removed. User intervention not necessary.

8 Surge Immunity

8.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Surge Immunity	EN 61326-1	IEC 61000-4-5	Compliant

8.2 Test Method

The EUT was connected to the transient test system and was made to function as indicated in the "Operating Modes and Conditions" section of this report. The test system was set to generate the required test voltage. The EUT was monitored for performance.

8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.3°C

Relative Humidity: 35.9%

Atmospheric Pressure: 97.79kPa

8.4 Test Equipment

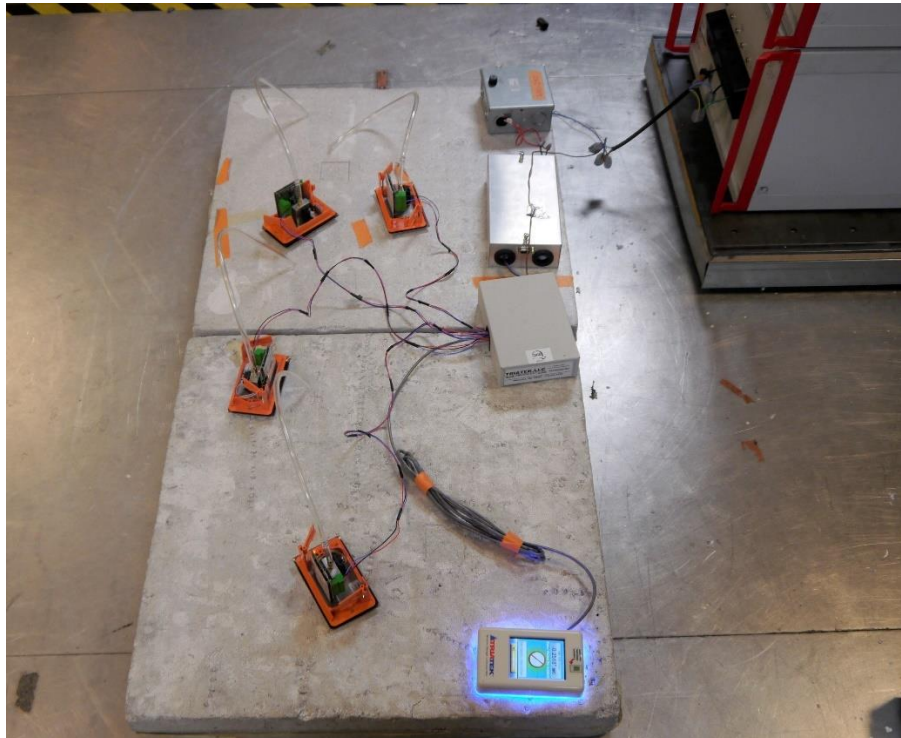
Test End Date: 9-Dec-2019

Tester: PL

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
COUPLING DECOUPLING NETWORK	CDN 3063	TESEQ	B079811	26-Apr-2020
EFT AND SURGE GENERATOR	NSG 3060	TESEQ	B079812	26-Apr-2020

Note: The calibration period equipment is 1 year.

8.5 Test Setup Photographs



8.6 Test Data

Test Application	Impedance	Coupling method	Pulse (us)	Number of surges ¹	Repetition rate (s)	Phase angle (°) ²	Test Level (kV)	Minimum criterion
L1 to N	2 ohm	CDN	1.2/50 (8/20)	5	≤ 60	0, 90, 180,270	± 0.5, ± 1	B
L1 to PE	12 ohm	CDN	1.2/50 (8/20)	5	≤ 60	0, 90, 180,270	± 0.5, ± 1, ± 2	B
N to PE	12 ohm	CDNt	1.2/50 (8/20)	5	≤ 60	0, 90, 180,270	± 0.5, ± 1, ± 2	B

(1) This is the number of surges applied at each polarity, phase angle and test level

(2) For DC power, phase angle is not applicable.

Port Tested	Test Application	Test Level (kV)	Observed Criterion
AC power	L1 to N	± 0.5	A
AC power	L1 to N	± 1	A
AC power	L1 to PE	± 0.5	A
AC power	L1 to PE	± 1	A
AC power	N to PE	± 0.5	A
AC power	N to PE	± 1	A

9 Conducted RF Immunity

9.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Conducted RF Immunity	EN 61326-1	IEC 61000-4-6	Compliant

9.2 Test Method

The EUT was placed in the ALSE uniform field and was made to function as indicated in the “Operating Modes and Conditions” section of this report. The test system was set to generate the required test voltage. The EUT was monitored for performance.

9.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.3°C

Relative Humidity: 35.6%

Atmospheric Pressure: 97.79kPa

9.4 Test Equipment

Test End Date: 9-Dec-2019

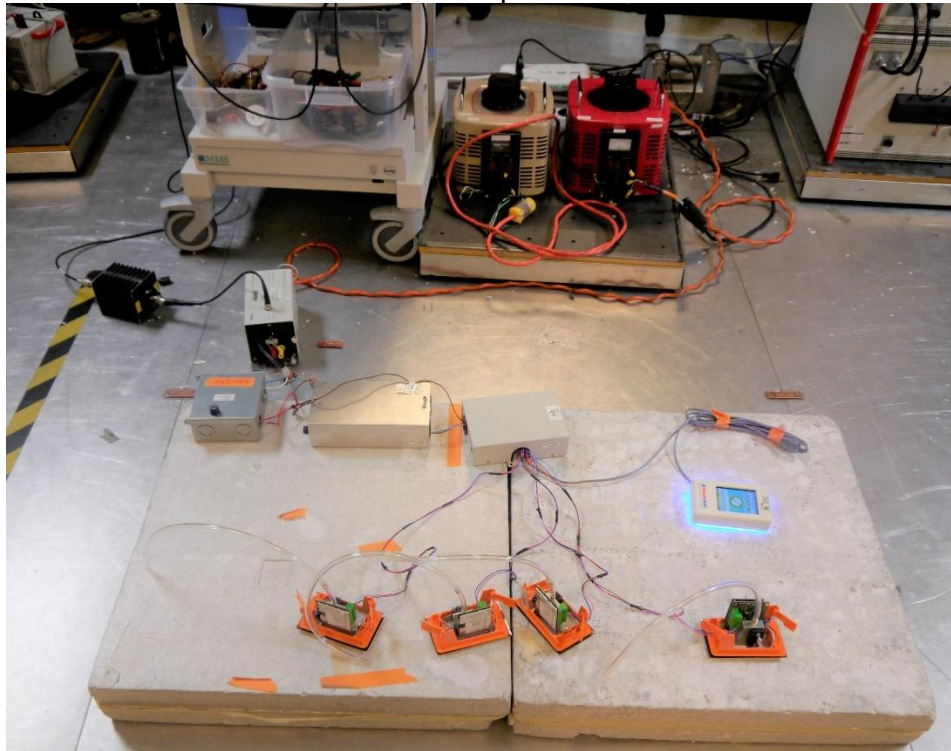
Tester: PB

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
CONDUCTED IMMUNITY TEST SYSTEM	NSG 4070A-75	TESEQ	B085727	15-Jan-2020
RF IMMUNITY TEST SYSTEM	ITS 6006	TESEQ	B085725	13-Aug-2020
ATTENUATOR, 6DB	PE7021-6	Pasternack	B079745	VBU
EM CLAMP	KMZ 801	TESEQ	B079738	15-Jan-2020

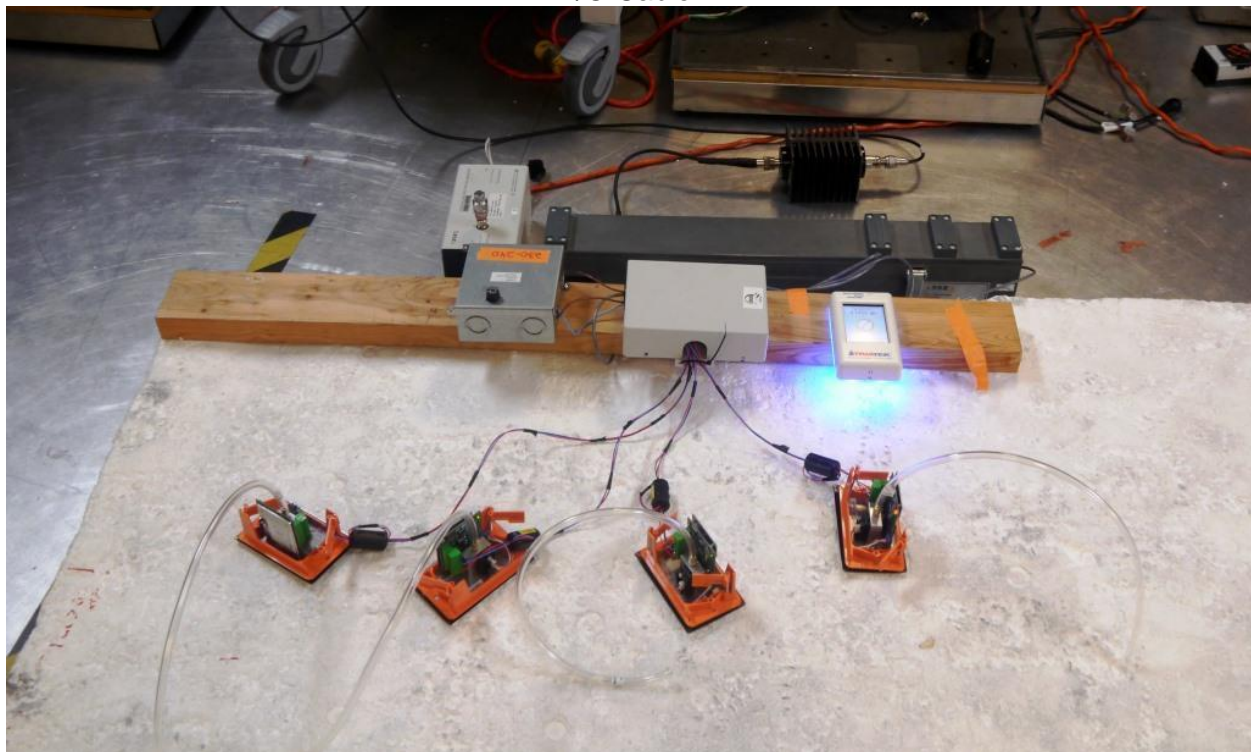
Note: The calibration period equipment is 1 year.

9.5 Test Setup Photographs

AC Input



I/O Cable



9.6 Test Data

Frequency (MHz)	Port Type	Coupling Device	Test Level	Modulation	Frequency step	Dwell time (s)	Minimum performance criterion
150 kHz to 80 MHz	AC power	CDN	3 V _{rms}	80%AM (1kHz)	1%	0.5	A
150 kHz to 80 MHz	DC power	CDN	3 V _{rms}	80%AM (1kHz)	1%	0.5	A
150 kHz to 80 MHz	Signal, I/O	EM Clamp	3 V _{rms}	80%AM (1kHz)	1%	0.5	A

Frequency (MHz)	Test Port	Observed Criterion
150 kHz to 80 MHz	AC Mains	A
150 kHz to 80 MHz	I/O (to Display side)	A
150 kHz to 80 MHz	I/O (Controller side)	A

10 Power Frequency Magnetic Field Immunity

10.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Power Frequency Magnetic Field Immunity	EN 61326-1	IEC 61000-4-8	Compliant

10.2 Test Method

The test system was set to generate the required test level. The EUT was monitored for performance.

10.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.4°C

Relative Humidity: 35.6%

Atmospheric Pressure: 97.82kPa

10.4 Test Equipment

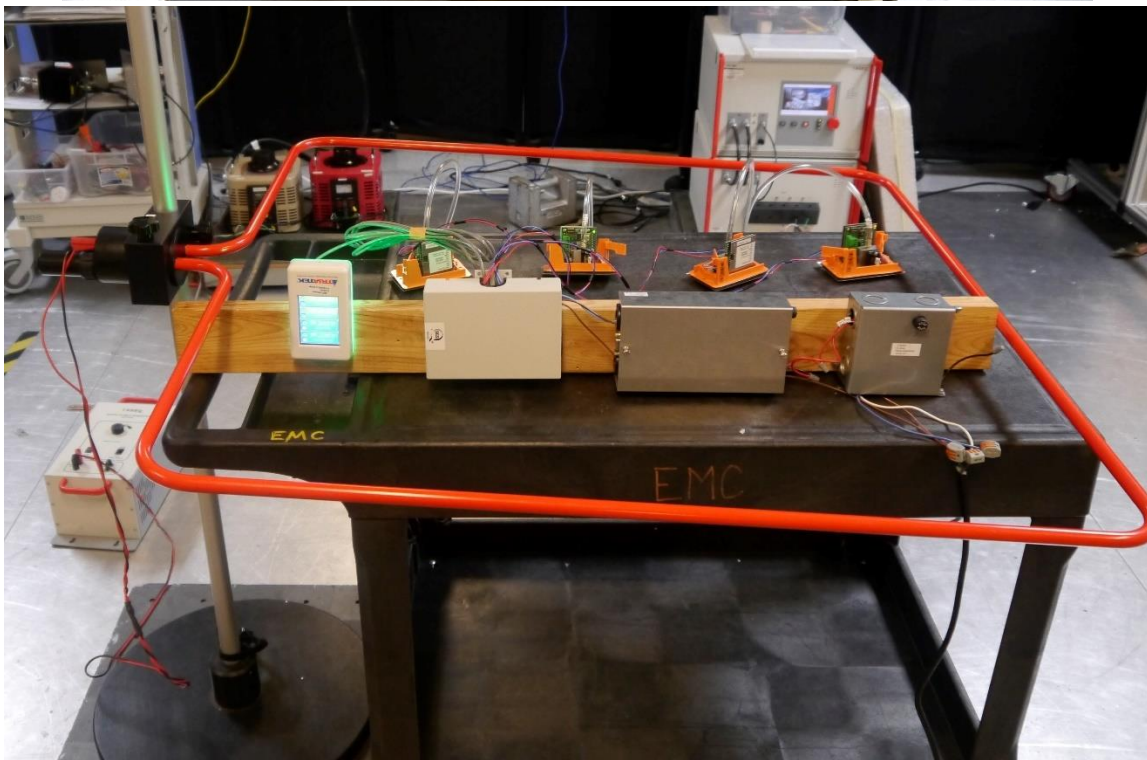
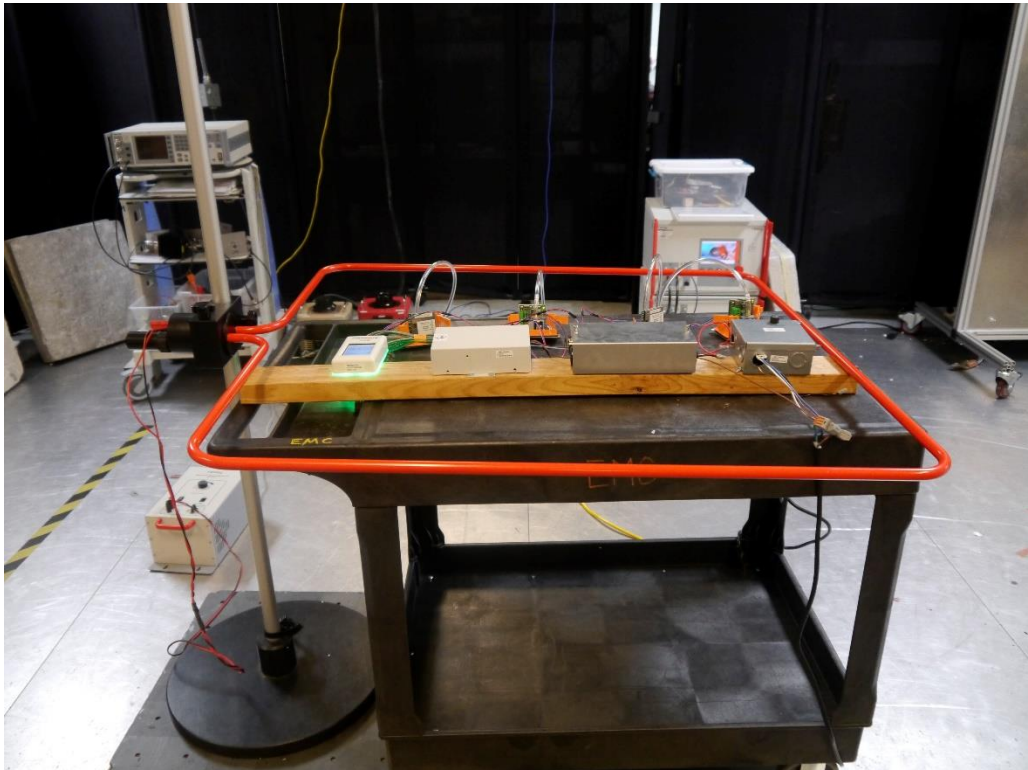
Test End Date: 9-Dec-2019

Tester: PL

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
MAGNETIC FIELD METER	1394	OMEGA	B079698	1-Oct-2020
FIELD COIL, MULTI-TURN	INA 702	TESEQ	B092084	VBU
MAGNETIC FIELD GENERATOR	MFO 6501	TESEQ	B085873	CNR

Note: The calibration period equipment is 1 year.

10.5 Test Setup Photographs



10.6 Test Data

Ambient field: 0.1382 A/m

Frequency	Axis	Test Level	Observed Criterion
50 Hz	X, Y, Z	3 A/m	A
60 Hz	X, Y, Z	3 A/m	A

11 Voltage Dips and Interruptions

11.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Voltage dips, short interruptions and voltage variations immunity	EN 61326-1	IEC 61000-4-11	Compliant

11.2 Test Method

The test system was set to generate the required test voltage. The EUT was monitored for performance.

11.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.2°C

Relative Humidity: 35.7%

Atmospheric Pressure: 97.76kPa

11.4 Test Equipment

Test End Date: 9-Dec-2019

Tester: PL

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
POWER SOURCE / ANALYZER	PROFLINE 2115	TESEQ	B087574	4-Oct-2021

Note: The calibration period equipment is 1 year.

11.5 Test Setup Photographs



11.6 Test Data

Mains frequency Hz	Test Level %U _T	Voltage dip / Interruption % reduction from U _T	Duration ms / Cycle	Minimum Criterion	Observed Criterion
50 Hz	0%	100%	1 cycle	B	A
50 Hz	40%	60%	10 cycles	C	B ¹
50 Hz	70%	30%	25 cycles	C	A
50 Hz	0%	100%	250 cycles	C	B ¹

Notes:

1. EUT shut off during voltage dip or interruption but it rebooted without user intervention.

12 Measurement Uncertainty

The measurement uncertainty figures are be calculated in accordance with TR 100 028-1 [2] and correspond to an expansion factor (coverage factor) $k = 2$ (which provide confidence levels of 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Parameter	Expanded Uncertainty for Normal k factor equal to 2	
	Required	Laboratory Actual
Radio Frequency	$\pm 1 \times 10^{-5}$	$\pm 9.8 \times 10^{-8}$
total RF power, conducted	± 1.5 dB	± 1.2 dB
RF power density, conducted	± 3 dB	± 0.7 dB
spurious emissions, conducted	± 3 dB	± 2.1 dB
all emissions, radiated	± 6 dB	± 4.8 dB
temperature	$\pm 1^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
humidity	± 5 %	$\pm 3.5\%$
DC and low frequency voltages	± 3 %	$\pm 0.4\%$

13 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	13-March 2020