CE

EMC Test Report

of

Equipment Under Test	:	Evoluent VerticalMouse D Small
Model Number	:	VMDS
Series Model Number	:	N/A

Issue to

Applicant	:	Evoluent
Address	:	925 Linden Ave., Unit C, South San Francisco, CA 94080 USA
Trade Name	:	Evoluent

Test Performed by

WEISHANG Certification Co., Ltd.
12F-3, No. 27-1, Ln. 169, Kangning St., Xizhi Dist., New Taipei City 221, Taiwan
Tel:(02)7708-0159 Fax:(02)7708-0282

EDITION HISTORY

Rev.	Issue Date	Revisions
1.0	Oct. 18, 2019	First Issue

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1. GENERAL INFORMATION

1.1 EUT Description

Equipment Under Test	Evoluent VerticalMouse D Small
Model Number	VMDS
Series Model Number	N/A
Applicant	Evoluent
Manufacture	Evoluent

I/O Port Types	Q'TY	Test Description
USB Port	1	Connected to PC

EUT Power Rating	DC 5V

Receipt Date	JAN. 23, 2019
Completion Date:	FEB. 11, 2019

※ *Detailed information, please refer to the EUT's specification or user's manual provided by Manufacturer.*

1.2 Summary of test result

Emission			
Item	Standard	Limit	Result
Conducted Emission	EN 55032:2015	Meet Class B limit	■Pass ☐ N/A
Radiated Emission	EN 55032:2015	Meet Class B limit	■Pass ☐ N/A
Harmonic current emissions	EN 61000-3-2:2014	EUT power <75W so do not test.	☐Pass ■ N/A
Voltage fluctuations & flicker	EN 61000-3-3:2013	Meets requirements	☐Pass ■ N/A

Immunity			
Item	Standard	Limit	Result
EN 55035: 2017			
ESD	IEC 61000-4-2:2008	Meet Criterion B	■Pass ☐ N/A
RS	IEC 61000-4-3:2006 +A1:2007 +A2:2010	Meet Criterion A	■Pass ☐ N/A
EFT	IEC 61000-4-4:2012	Meet Criterion B	☐Pass ■ N/A
Surge	IEC 61000-4-5:2014	Meet Criterion B	☐Pass ■ N/A
CS	IEC 61000-4-6:2013	Meet Criterion A	☐Pass ■ N/A
PFMF	IEC 61000-4-8:2010	Meet Criterion A	■Pass ☐ N/A
Voltage Dips & Voltage Variations	IEC 61000-4-11:2004	Meets Criterion Below Voltage Dips: 1) >95% reduction Criterion B 2) 30% reduction Criterion C Voltage Interruptions: 1) >95% reduction Criterion C	☐Pass ■ N/A

※The test results of this report relate only to the tested sample(s) identified in this report.
Manufacturer or whom it may concern should recognize the pass or fail of the test result.

Approved by: Reviewed by:

Oct. 18, 2019 Ben Lu Oct. 18, 2019 Jeff

Date **Engineering Supervisor** Date Test Engineer

1.3 Decision of Test Mode

- The following test mode(s) were scanned maximum emission level during the preliminary test:

Pre-Test Mode	
Mode 1	Working High DPI
Mode 2	Working Medium DPI
Mode 3	Working Low DPI

- Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.

Final Test Mode			
Emission	Conducted Emission		Mode 1
	Radiated Emission	Below 1GHz	Mode 1
		Above 1GHz	---
	Harmonic current emissions		---
	Voltage fluctuations & flicker		---
Immunity	ESD		Mode 1
	RS		Mode 1
	EFT		---
	Surge		---
	CS		---
	PFMF		Mode 1
	Voltage dips & voltage variations		---

1.4 Configuration and Peripheral

- Configuration

By the test photographs at each test station for the actual connections between EUT and support equipment.

- Peripheral

Peripheral	Manufacture	Model	Serial No.	Data Cable	Power Cord
PC	Dell	DCSM	7LDZX1S	N/A	Unshielded 1.8m
MONITOR	SONY	SDM-HS74	1356906	Shielded 1.6m	Unshielded 1.8m
PRINTER	HP	C4562B	H946151BZ	Shielded 1.8m	Unshielded 1.8m
Keyboard	Dell(U)	SK-8115	MY-0DJ325-71619-885-0166	Shielded 1.8m / USB	N/A
MODEM	D-Link	DFM-560EL	ES0O25A000007	N/A	N/A

1.5 Test Instruments

- Instrument meet of CISPR 16-1, ANSI C63.2 and Other required standards.
- Calibration period 1 year and the calibrations are traceable to NML/ROC and NIST/USA.
- N.C.R mean Not Calibration request.

Table List Of Test And Measurement Instrument

Conducted Emission Instrument					
Item	**Manufacture**	**Model No.**	**Serial No.**	**Cal. Due Day**	**Remark**
EMC Test Receiver	Agilent	N9038A	MY53290065	Jul. 05, 2019	
LISN #1	PMM	PMM L2-16B	000WT50628	Jul. 05, 2019	For EUT
LISN #2	PMM	PMM L2-16B	000WT50627	N.C.R	For Support Unit
RF Cable	Raison	CFD300NL(3m)	Cable-001	Jul. 05, 2019	
Impedance Stabilization	Schwarzbeck Mess	NTFM 8158	103	Jul. 08, 2019	
ABSORBING CLAMP	COM-POWER	AB-050	421915	Apr. 19, 2019	
RF CABLE	Huber+Suhner	5D-FB	CABLE-007	Apr. 21, 2019	
EMC Test Software	AUDIX	E3 (Ver. 9)	RK-001077	N.C.R	

Radiated Emission Instrument					
Item	**Manufacture**	**Model No.**	**Serial No.**	**Cal. Due Day**	**Remark**
Bilog Antenna	SUNOL	JB1	A052104	Sep. 13, 2019	
EMC Test Receiver	LIG	ISA-80	L0809K001	Sep. 29, 2019	
RF Cable	JYE BAO	RG214/U	Cable-002	Nov. 20, 2019	
Pre-Amplifier	WIRELESS	FPA-6592G	60021	Nov. 12, 2019	
EMC Test Software	AUDIX	E3 (Ver. 9)	RK-001077	N.C.R	

Current Harmonic and Voltage Fluctuations Instrument					
Item	**Manufacture**	**Model No.**	**Serial No.**	**Cal. Due Day**	**Remark**
5KV AC Power Source	SCHAFFNER	NSG1007	55869	Sep. 01, 2019	
Signal Conditioning	SCHAFFNER	CCN1000-1	72281	Sep. 01, 2019	

EMS – ESD Instrument					
Item	**Manufacture**	**Model No.**	**Serial No.**	**Cal. Due Day**	**Remark**
ESD Generator	Noise Ken	ESS-2002	ESS07Z7718	Jul. 05, 2019	

EMS – RS Instrument					
Item	**Manufacture**	**Model No.**	**Serial No.**	**Cal. Due Day**	**Remark**
RF Power Meter	BOONTON	4231A	110602	Nov. 21, 2019	
Signal Generator	R&S	SM300	101722	Jun. 15, 2019	
Electric Field probe	ETS-LINDGREN	HI-6005	29837	N.C.R	
Power Amplifier	SCHAFFNER	CBA9413B	4039	N.C.R	
Power Amplifier	TESEQ	CBA3G-050	T43752	N.C.R	
SWITCH NETWORK	TESEQ	RFB2000	26336	N.C.R	
RF Power sensor	BOONTON	51011-EMC	33109	Nov. 21, 2019	

EMS – CS Instrument					
Item	**Manufacture**	**Model No.**	**Serial No.**	**Cal. Due Day**	**Remark**
CDN	SCHAFFNER	CDN M316	20653	Aug. 30, 2019	
CDN	SCHAFFNER	CDN M216	19286	Aug. 30, 2019	
CDN	FRANKONIA	RJ45	60050134	Aug. 30, 2019	
6dB Attenuator	FRANKONIA	75-A-FFN-06	102D3233	N.C.R	
EM Injection Clamp	FCC	F-203I-23MM	471	Sep. 02, 2019	
Conducted disturbances generator	FRANKONIA	CIT10/75	102D3233	Jun. 25, 2019	

EMS – EFT、Surge、Dips Instrument					
Item	**Manufacture**	**Model No.**	**Serial No.**	**Cal. Due Day**	**Remark**
EMC Immunity Test system	EMC-PARTNER	TRA3000 FS-D-V	104041	Jul. 09, 2019	
Conducted disturbances generator	FRANKONIA	CIT10/75	102D3233	Sep. 01, 2019	
CDN	SCHAFFNER	CDN M316	20653	Oct. 07, 2019	
CDN	SCHAFFNER	CDN M216	19286	Aug. 30, 2019	
CDN	FRANKONIA	RJ45	60050134	Aug. 30, 2019	
6dB Attenuator	FRANKONIA	75-A-FFN-06	102D3233	N.C.R	
Induction Coil Interface	SCHAFFNER	2141	6019	N.C.R	
EM Injection Clamp	FCC	F-203I-23MM	471	Sep. 02, 2019	
TTIAXIAL ELF Magnetic Field Meter	HAEFELY DANA	MAG100.1 DAS-G60	96DA6-101	Oct. 19, 2019	

1.6 Measurement Uncertainty

Conducted Emission

The measurement uncertainty is evaluated as 3.61 dB.

Conducted Emissions (Telecommunication Ports)

The measurement uncertainty is evaluated as 3.91 dB.

Radiated Emission

The Horizontal measurement uncertainty of 30MHz - 1GHz is evaluated as 3.96 dB.
The Vertical measurement uncertainty of 30MHz - 1GHz is evaluated as 3.96 dB.
The Vertical and Horizontal measurement uncertainty of 1GHz to 6GHz is evaluated and choose which polarity is worst value as 3.74 dB.
Test location: Max Light Technology Co., Ltd.
No. 74-4, Shibachong Xi, Shihding Township, Taipei County 223, Taiwan (R.O.C.)

Harmonic Current Emission

The measurement uncertainty is evaluated as 3.1E-8.
Test location: Cal-Tech Technology Co., Ltd.
3F., No. 331, Tan Mei Street, Neihu District, Taipei City, Taiwan (R.O.C.)
Test location: Max Light Technology Co., Ltd.
No. 74-4, Shibachong Xi, Shihding Township, Taipei County 223, Taiwan (R.O.C.)

Voltage Fluctuations and Flicker

The measurement uncertainty is evaluated as 3.1E-8.
Test location: Max Light Technology Co., Ltd.
No. 74-4, Shibachong Xi, Shihding Township, Taipei County 223, Taiwan (R.O.C.)

Electrostatic Discharge

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 2005[E], the requirements for measurement uncertainty in ESD testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant ESD standards. The immunity test signal from the ESD system meet the required specifications in IEC 61000-4-2 through the calibration report with the calibrated uncertainty for the waveform of voltage / Current / timing as being 0.03 % / 2.2 % / 5.6 %.

Radiated susceptibility

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 2005[E], the requirements for measurement uncertainty in RS testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant RS standards. The immunity test signal from the RS system meet the required specifications in IEC 61000-4-3 through the calibration for the uniform field strength and monitoring for the test level with the uncertainty evaluation report for the electrical filed strength as being 3.2 dB.

Test location: Interocean EMC Technology Corp.

No. 5-2, Lin 1 Tin-Fu Tsun, Lin-Kou Dist New Taipei City, Taiwan 244, R.O.C.

Electrical fast transient/burst

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 2005[E], the requirements for measurement uncertainty in EFT/Burst testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant FT/Burst standards. The immunity test signal from the EFT/Burst system meet the required specifications in IEC 61000-4-4 through the calibration report with the calibrated uncertainty as 8.2 %.

Surge

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 2005[E], the requirements for measurement uncertainty in Surge testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant Surge standards. The immunity test signal from the Surge system meet the required specifications in IEC 61000-4-5 through the calibration report with the calibrated uncertainty for the waveform of voltage / current / timing as being 3.9 %.

Conducted disturbances

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 2005[E], the requirements for measurement uncertainty in CS standards testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant CS standards. The immunity test signal from the CS system meet the required specifications in IEC 61000-4-6 through the calibration report with the calibrated uncertainty for the vertical gain / Sweep timebase as being 0.66 % / 2.6 %

Test location: Max Light Technology Co., Ltd.

No. 74-4, Shibachong Xi, Shihding Township, Taipei County 223, Taiwan (R.O.C.)

Power frequency magnetic field

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 2005[E], the requirements for measurement uncertainty in PFMF testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant PFMF. The immunity test signal from the PFMF system meet the required specifications in IEC 61000-4-8 through the calibration report with the calibrated uncertainty as being 5 %

Voltage dips/short interruptions/voltage variations

As what is concluded in the document from Note2 of clause 5.4.6.2 of ISO/IEC 17025: 2005[E], the requirements for measurement uncertainty in Voltage dips testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant Voltage dips standards. The immunity test signal from the Voltage dips system meet the required specifications in IEC 61000-4-11 through the calibration report with the calibrated uncertainty for the Voltage / time as being 17 mV/V / 2.8 %

1.7 Temperature、Humidity and Pressure at Test Environment

Monitor Item	Test Site	Require（IEC60068-1）	Actual Reading
Temperature (°C)	CE	15-35	18
Humidity (%RH)		25-75	65
Barometric pressure (mbar)		860-1060	1018
Temperature (°C)	RE	15-35	18
Humidity (%RH)		25-75	70
Barometric pressure (mbar)		860-1060	1005
Temperature (°C)	Harmonic current Voltage fluctuations & flicker	N.A	N.A
Humidity (%RH)		N.A	N.A
Barometric pressure (mbar)		N.A	N.A
Temperature (°C)	ESD	15-35	21
Humidity (%RH)		30-60	54
Barometric pressure (mbar)		860-1060	1014
Temperature (°C)	RS	N.A	21
Humidity (%RH)		N.A	54
Barometric pressure (mbar)		N.A	1014
Temperature (°C)	EFT	15-35	N.A
Humidity (%RH)		30-60	N.A
Barometric pressure (mbar)		860-1060	N.A
Temperature (°C)	Surge	15-35	N.A
Humidity (%RH)		10-75	N.A
Barometric pressure (mbar)		860-1060	N.A
Temperature (°C)	CS	N.A	N.A
Humidity (%RH)		N.A	N.A
Barometric pressure (mbar)		N.A	N.A
Temperature (°C)	PFMF	15-35	21
Humidity (%RH)		25-75	54
Barometric pressure (mbar)		860-1060	1014
Temperature (°C)	Dips	15-35	N.A
Humidity (%RH)		25-75	N.A
Barometric pressure (mbar)		860-1060	N.A

2. Emission Test

2.1 Conducted Emission Measurement

2.1.1 Conducted Emission Limit

Frequency(MHz)	Class A (dBμV)		Class B (dBμV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.5 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

※ The lower limit shall apply at the transition frequencies.

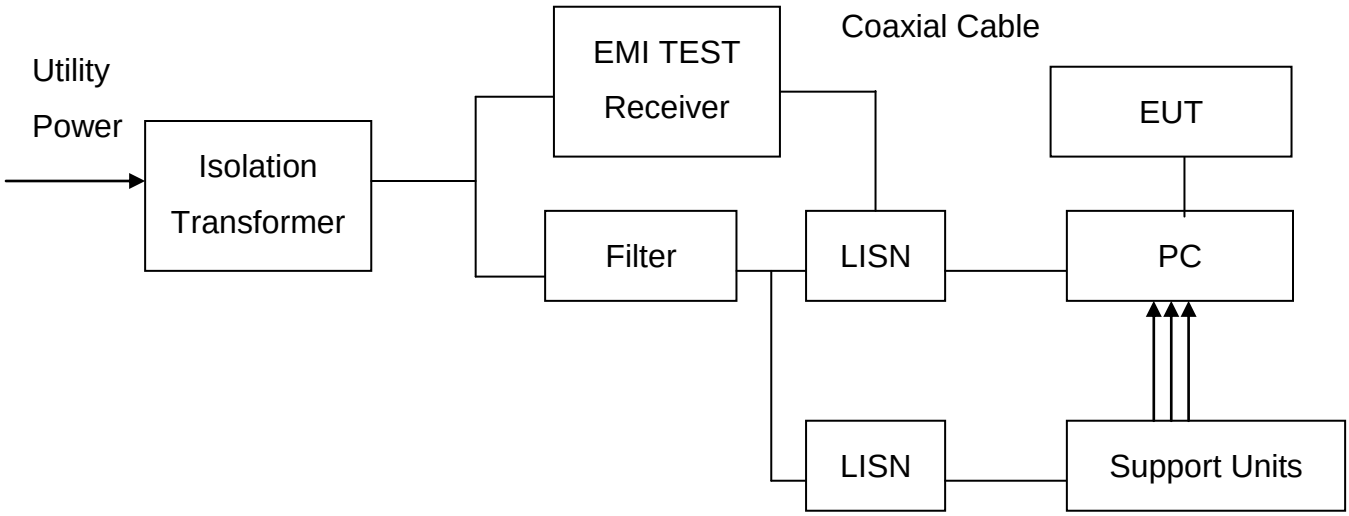
※ The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

2.1.2 Telecommunication Port Conducted Interference Limits:

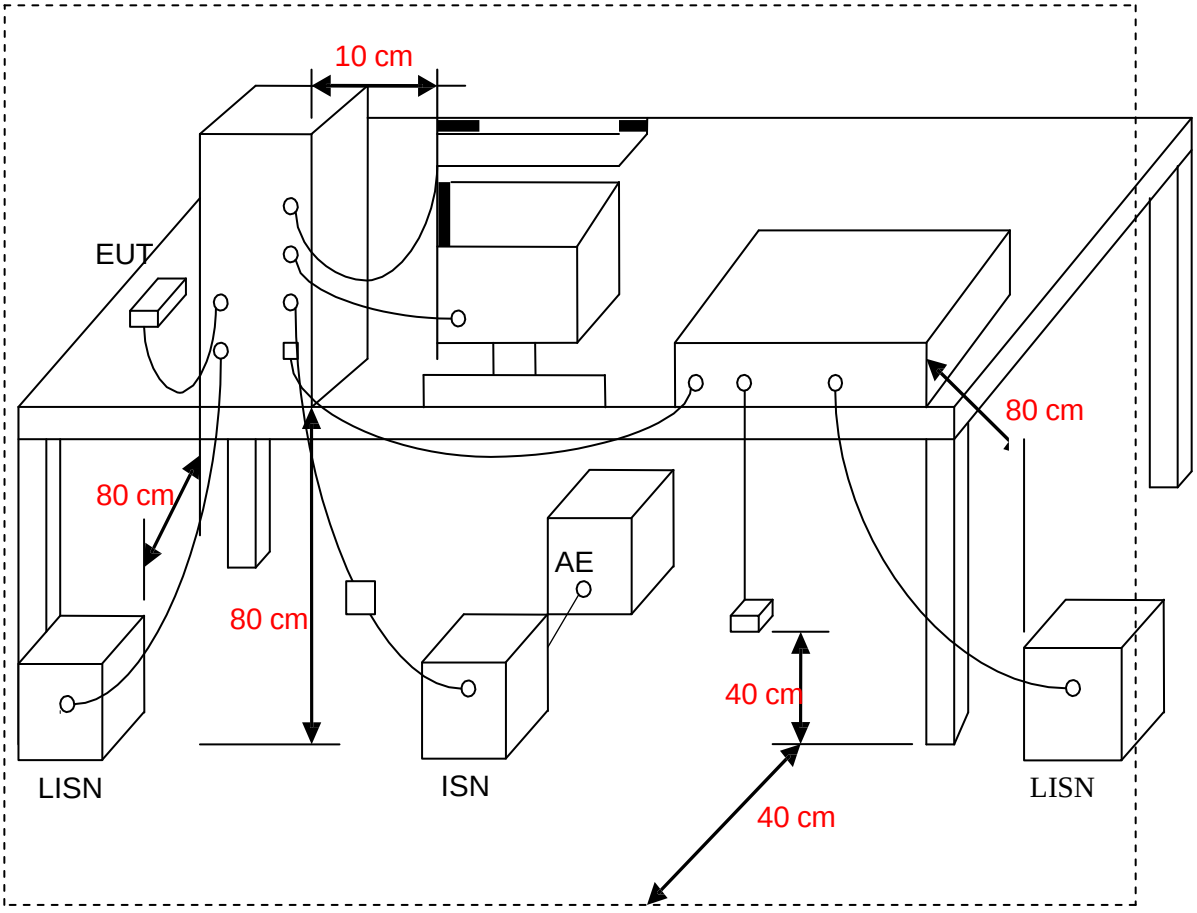
Frequency (MHz)	Class A (dBμV)			
	Voltage Limit (dBμV)		Current Limit (dBμA)	
0.15 - 0.5	97-87	84-74	53-43	40-30
0.5 – 30	87	74	43	30

Frequency (MHz)	Class B (dBμV)			
	Voltage Limit (dBμV)		Current Limit (dBμA)	
0.15 - 0.5	84-74	74-64	40-30	30-20
0.5 – 30	74	64	30	20

2.1.3 Test Setup



2.1.4 Block Diagram of Test Setup



2.1.5 Test Procedure

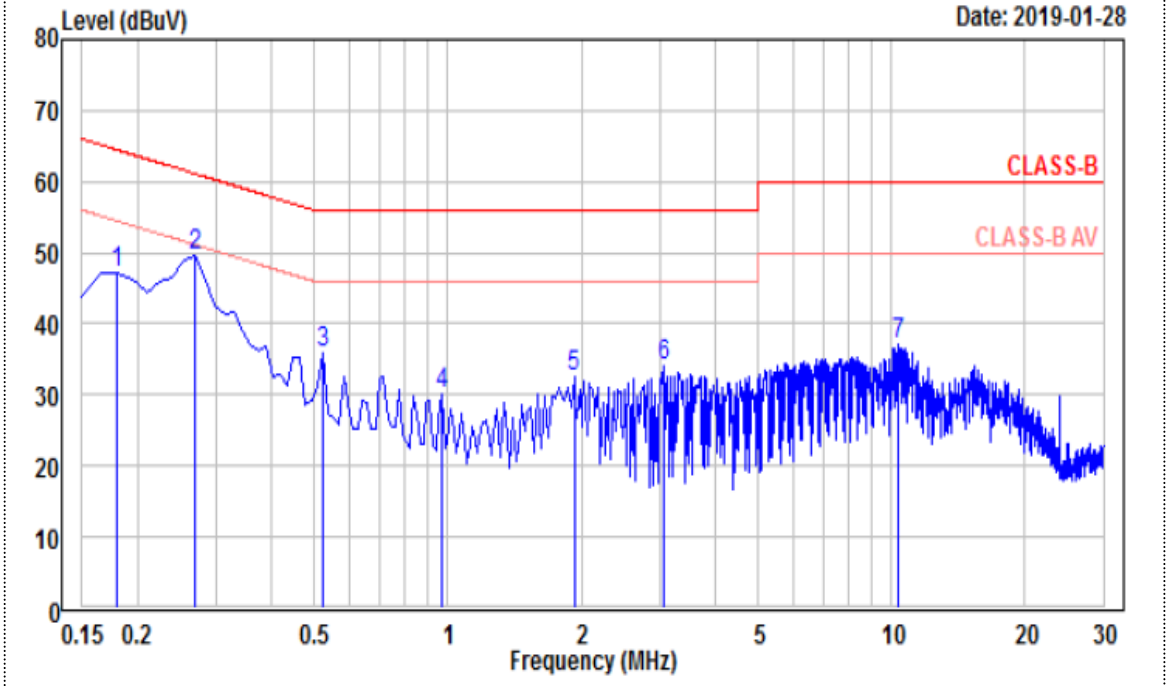
The EUT was tested according to the requirement of EN55032 (CISPR 32). The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The line impedance stabilization network (L.I.S.N) used was 50 ohm/50μH as specified. All readings were quasi-peak and average values of maximum conducted interference with 10 kHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. Both lines of the power mains of EUT were measured and the cables connected to EUT and support units were moved to find the maximum emission levels for each frequency. Telecommunication port interference measurement, using ISNs

First, Find the margin or higher points at least 6 points by software, then use manual to find the maximum data.

- The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The CISPR states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- The mains voltage shall be supplied to the EUT via the LISN when the measurement of telecommunication port is performed. The common mode disturbances at the telecommunication port shall be connected to the ISN.
- For telecommunication port interference measurement, using ISNs with suitable longitudinal conversion losses (LCL) as defined in the port of specification from manufacture, and the LCL shall be meet the related standard equirement. Measured the line and carried out using quasi-peak and average detector receivers of maximum conducted interference.
- If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

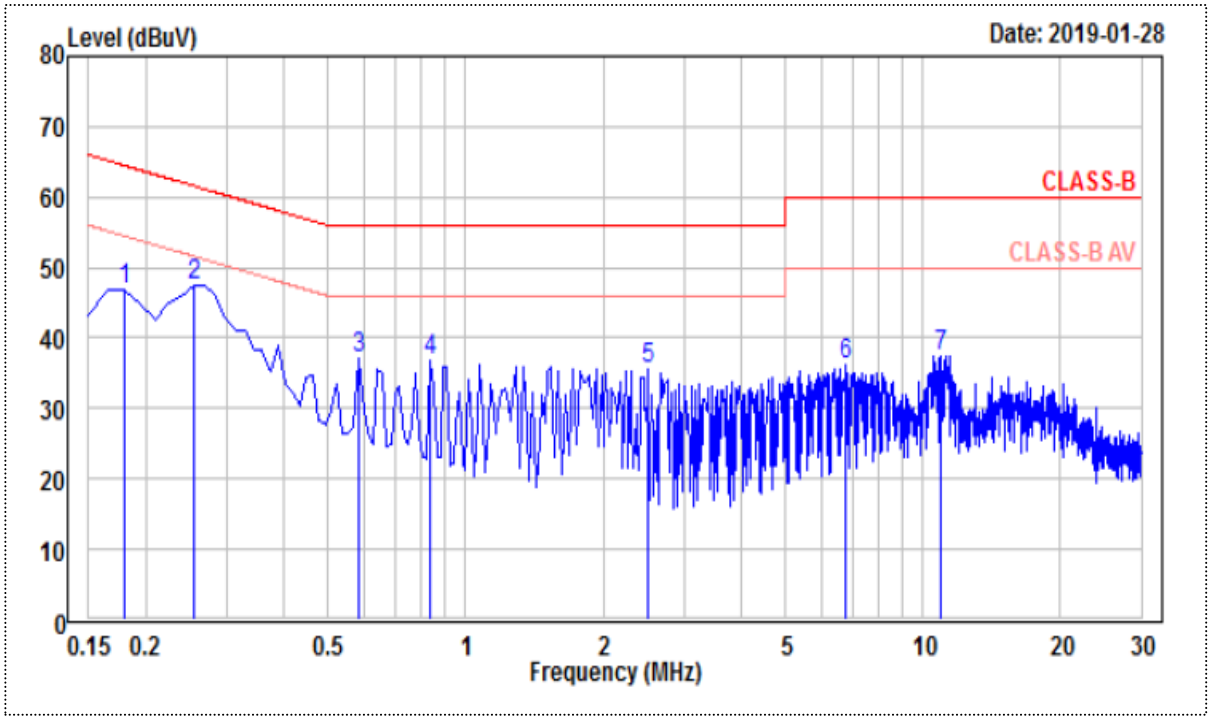
2.1.6 Test Result

(LISN-Line)



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.180	47.02	0.07	47.09	64.49	-17.40	Peak
2	0.269	49.57	0.07	49.64	61.14	-11.50	Peak
3	0.523	35.84	0.08	35.92	56.00	-20.08	Peak
4	0.971	30.10	0.10	30.20	56.00	-25.80	Peak
5	1.926	32.26	0.14	32.40	56.00	-23.60	Peak
6	3.075	34.00	0.16	34.16	56.00	-21.84	Peak
7	10.389	36.90	0.27	37.17	60.00	-22.83	Peak

(LISN-Neutral)



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.180	46.74	0.08	46.82	64.49	-17.67	Peak
2	0.254	47.46	0.08	47.54	61.61	-14.07	Peak
3	0.583	36.95	0.09	37.04	56.00	-18.96	Peak
4	0.837	36.68	0.11	36.79	56.00	-19.21	Peak
5	2.508	35.33	0.17	35.50	56.00	-20.50	Peak
6	6.792	35.92	0.23	36.15	60.00	-23.85	Peak
7	10.971	37.27	0.27	37.54	60.00	-22.46	Peak

2.1.7 Test Photograph

< CE Front View -- LISN >

< CE Rear View -- LISN >

2.2 Radiated Interference Measurement

2.2.1 Radiated Emission Limit

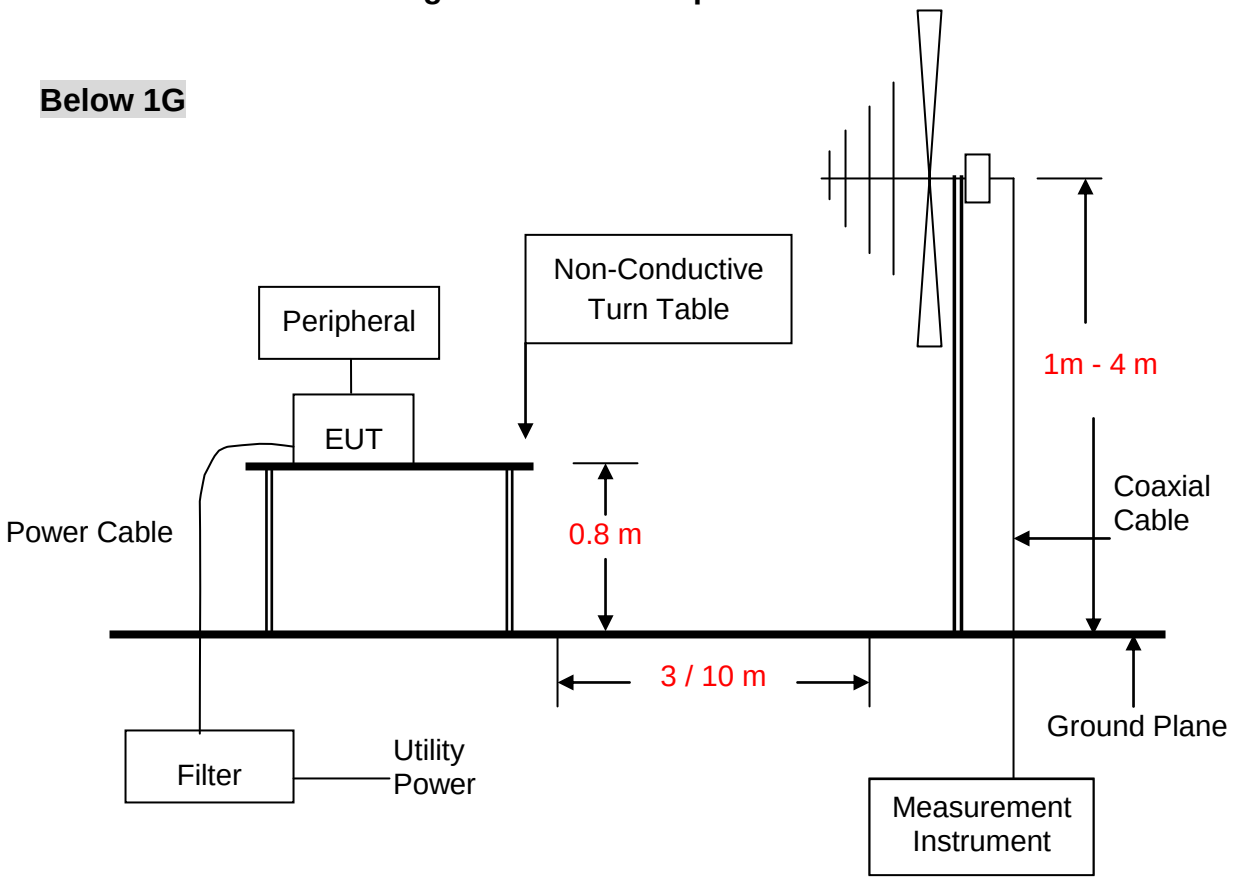
Frequency (MHz)	Class A (at 10m)	Class B (at 10m)
	dBμV/m	dBμV/m
30 - 230	40	30
230 - 1000	47	37

Frequency (MHz)	Class A (at 3m)		Class B (at 3m)	
	dBμV/m		dBμV/m	
	Average	Peak	Average	Peak
1000 - 3000	56	76	50	70
3000 - 6000	60	80	54	74

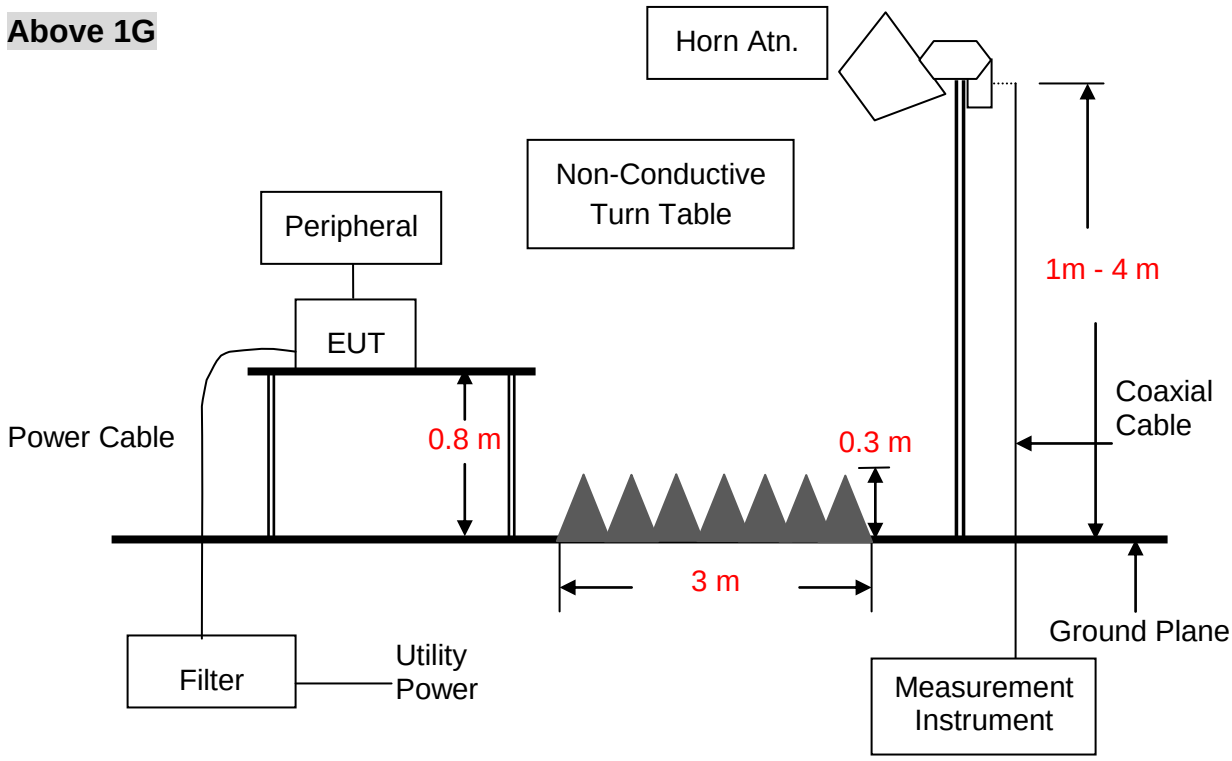
※ The lower limit shall apply at the transition frequencies.
※ Emission level (dBμV/m) = 20 log Emission level (μV/m).

2.2.2 Block Diagram of Test Setup in Chamber

Below 1G



Above 1G



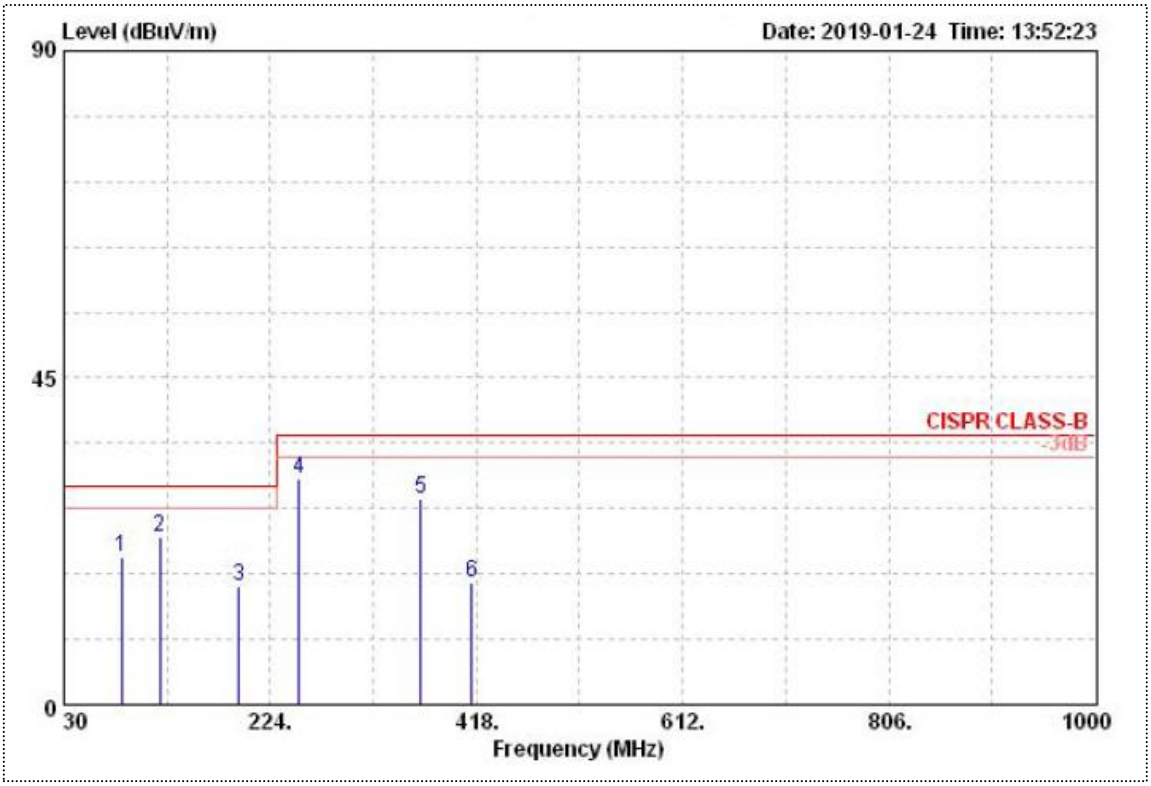
2.2.3 Test Procedure

The EUT was placed on a turntable just above ground. The turntable rotates 360 degrees to determine the position of the maximum emission level. EUT was set 10 meters away from the receiving antenna, which were mounted on an antenna tower. The antenna can move up and down between 1 meter and 4 meter to find out the maximum emission level. Broadband antenna was used as receiving antenna. Both horizontal and vertical polarization of the antenna was set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to EN 55032 (CISPR 32) on radiated measurement.
The bandwidth setting on the test receiver was 120 KHz.
The frequency range from 30MHz to 1000MHz was checked.

- The EUT was placed on a relatable table top 0.8 meter above ground.
- The EUT was set 10 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The EUT was positioned such that the distance from antenna to the EUT was 10 meters for under 1GHz, and 3 meter for above 1GHz.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.

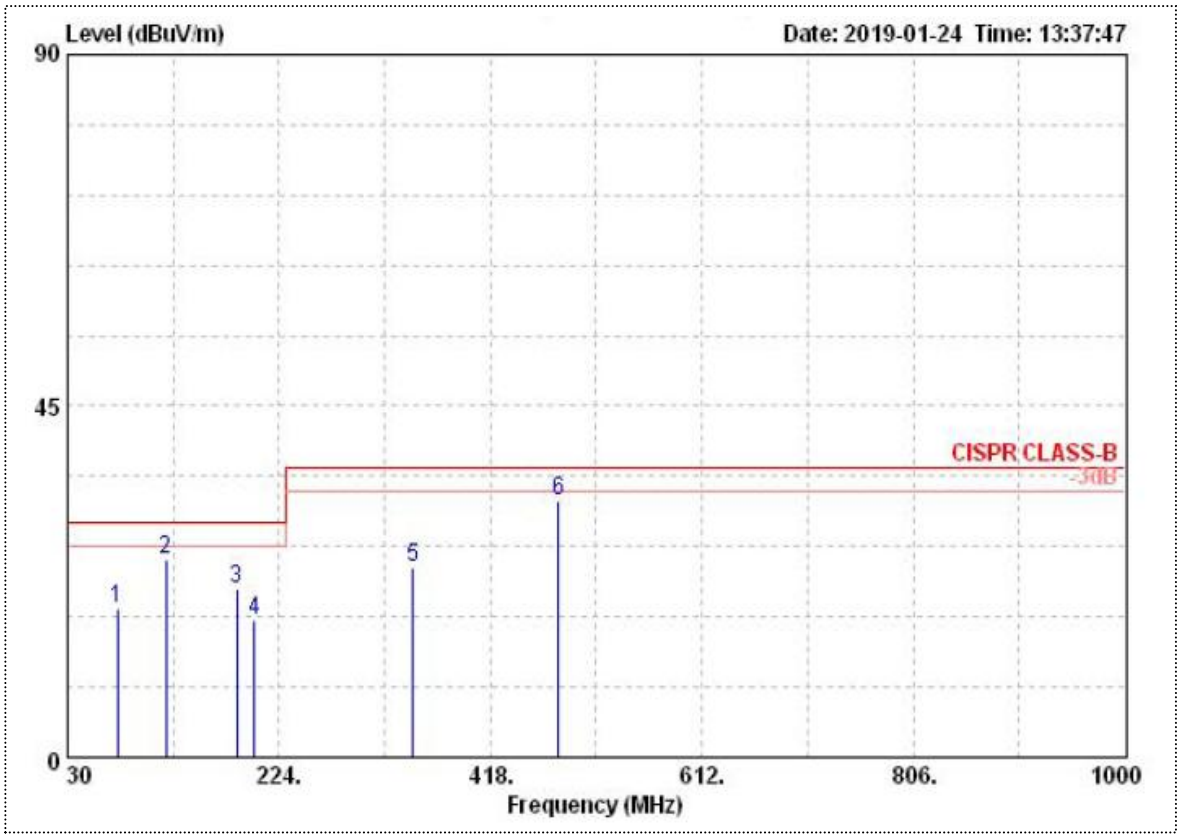
2.2.4 Test Result

(Below 1G - Horizontal)



	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	cm	deg	
1	84.01	20.21	-9.79	30.00	51.80	-31.59	100	360	QP
2	120.00	23.16	-6.84	30.00	54.32	-31.16	100	274	QP
3	194.89	16.34	-13.66	30.00	43.84	-27.50	100	95	QP
4	251.32	30.96	-6.04	37.00	55.74	-24.78	100	360	QP
5	365.74	28.45	-8.55	37.00	49.65	-21.20	100	108	QP
6	413.50	16.88	-20.12	37.00	37.21	-20.33	100	252	QP

(Below 1G – Vertical)



	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	cm	deg	
1	75.99	19.14	-10.86	30.00	50.97	-31.83	100	204	QP
2	120.00	25.26	-4.74	30.00	56.42	-31.16	100	360	QP
3	185.00	21.50	-8.50	30.00	48.50	-27.00	100	119	QP
4	201.77	17.59	-12.41	30.00	45.31	-27.72	100	223	QP
5	347.21	24.39	-12.61	37.00	46.45	-22.06	100	172	QP
6	480.00	32.88	-4.12	37.00	50.64	-17.76	100	208	QP

2.2.5 Test Photograph

< RE Front View >

< RE Rear View >

2.3 Current HARMONICS Test

2.3.1 Limit

For Class A Equipment

EVEN HARMONICS		ODD HARMONICS	
HARMONICS ORDER	LIMIT (Amp.)	HARMONICS ORDER	LIMIT (Amp.)
2	1.08	3	2.30
4	0.43	5	1.14
6	0.30	7	0.77
8 < n < 40	0.23 x 8 / n	9	0.40
		11	0.33
		13	0.21
		15 < n < 39	0.15 x 8 / n

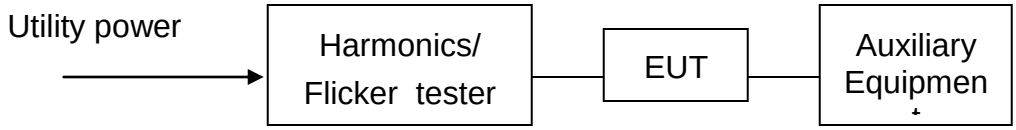
For Class B Equipment

Harmonics Order n	Max. permissible harmonics current per watt (mA/W)	Max. permissible harmonics current (A)
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15 ≤ n ≤ 39	3.85 / n	0.15 x 15 / n

※ *Class A and Class D are judged by test equipment automatically as per Section 5 of EN 61000-3-2:2014*

※ *The above limits for Class D equipment are for all applications having an active input power > 75 W. No limits apply for equipment with an active input power up to and including 75 W.*

2.3.2 Block Diagram of Test Setup



※ *The EUT system was put on a wooden table with 0.8m high.*

※ *For the actual test configuration, please refer to the photos of testing.*

2.3.3 Test Procedure

According to EN 61000-3-2:2014. The EUT is supplied in series with power analyzer from a power source has the same normal voltage and frequency as the rated supply voltage and the equipment under test. The rated voltage at the supply voltage of EUT of 0.94 time and 1.06 times shall be performed.

2.3.4 Test Result: N/A

2.4 Voltage Fluctuations

2.4.1 Limit

Short-team flicker (P_{st}) : 1.0

Long-term flicker (P_{lt}) : 0.65

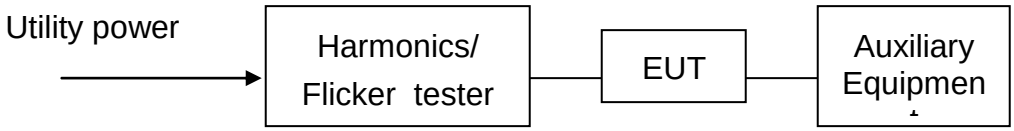
Relative steady-state voltage change (D_c) : ≤ 3%

Relative voltage change characteristic (D (t)) > 3% ; ($T_{D(t)}$) : ≤ 200 ms

Maximum relative voltage change (D_{max}) : ≤ 4%

TEST ITEM	LIMIT	NOTE
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
$T_{D(t)}$ (ms)	200	$T_{D(t)}$ means maximum time that D (t) exceeds 3 %.
D_{max} (%)	4%	D_{max} means maximum relative voltage change.
D_c (%)	3%	D_c means relative steady-state voltage change

2.4.2 Block Diagram of Test Setup



※ *The EUT system was put on a wooden table with 0.8m high.*

※ *For the actual test configuration, please refer to the photos of testing.*

2.4.3 Test Procedure

According to EN 61000-3-3:2013 The EUT is supplied in series with reference impedance from a power source with the voltage and frequency as the nominal supply voltage and frequency of the EUT.

2.4.4 Test Result: N/A

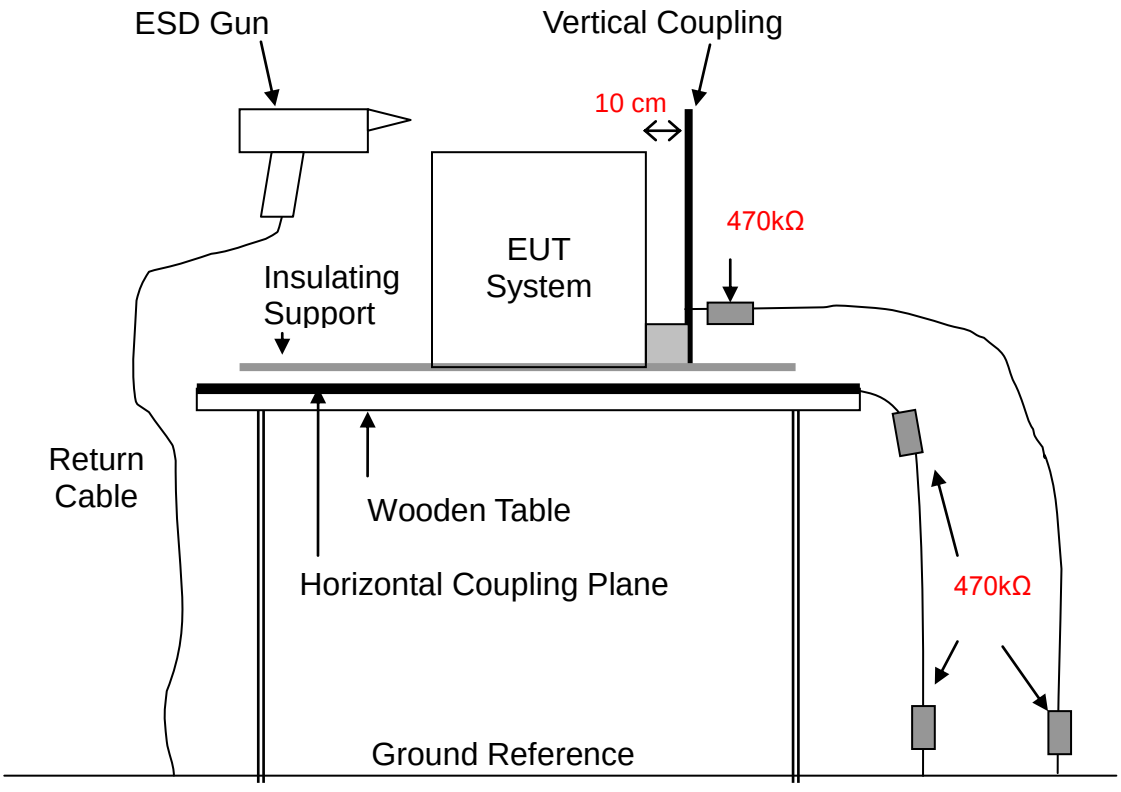
3. Immunity Test

3.1 Electrostatic Discharge (ESD)

3.1.1 Test Specification

IEC 61000-4-2	
Discharge Impedance	330Ω / 150pF
Discharge Mode	Single discharge
Polarity	Positive （+）& Negative （—）
Discharge Period	1 second Minimum
Discharge Voltage	Air Discharge Function : 8kV (Direct)
	Contact Discharge Function : 4kV (Direct / Indirect)
Count of Discharge	Air Discharge Function : Min. 20 times at each point
	Contact Discharge Function : Min.250 times in total single discharge
Standard Requirement	Criterion B

3.1.2 Block Diagram of Test Setup



※ The wooden table should be 0.8m high for table top EUT and 0.1m for floor-standing EUT.
※. For the actual test configuration, please refer to the photos of testing.
※ A distance of 1m minimum was provided between EUT and walls / other metallic structure.

3.1.3 Test Procedure

According to IEC 61000-4-2:2008

- Air discharge testing the climatic conditions shall be within the following ranges:
  - ambient temperature: 15℃ to 35℃;
  - relative humidity : 30% to 60%;
  - atmospheric pressure : 86 KPa (860 hPa) to 106 KPa (1060 hPa).

- The discharges shall be applied in two ways:

A) Contact discharges to the conductive surfaces and coupling planes:
The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the Horizontal Coupling Plane (HCP). The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test point be available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

B) Air discharges at slots and apertures and insulating surfaces:
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

- The EUT was located 0.1 m minimum from all side of the HCP (dimensions 1.6m x 0.8m).
- The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
- Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each HCP opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the HCP and perpendicular to its front edge during the discharge.
- At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane (VCP) in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

3.1.4 Test Result

Final Test Result	Pass
Performance criteria Judgment	A
Test Voltage	±2 / ±4 / ±8 KV for Air discharge
	±2 / ±4 KV for Contact discharge
	±2 / ±4 KV for Contact discharge
Temperature (°C)	21
Humidity (%RH)	54
Barometric pressure (mbar)	1014
Test Date	2019 / 1 / 31

Contact Discharge							
Test Condition	Test Voltage(KV)						Result
	±2	Performance Criteria	±4	Performance Criteria	±8	Performance Criteria	Pass
HCP	☒	☒A ☐B	☒	☒A ☐B	☐	☐A ☐B	☒
VCP	☒	☒A ☐B	☒	☒A ☐B	☐	☐A ☐B	☒
Screw	☒	☒A ☐B	☒	☒A ☐B	☐	☐A ☐B	☒

Air Discharge							
Test Condition	Test Voltage(KV)						Result
	±2	Performance Criteria	±4	Performance Criteria	±8	Performance Criteria	Pass
Case	☒	☒A ☐B	☒	☒A ☐B	☒	☒A ☐B	☒
Button	☒	☒A ☐B	☒	☒A ☐B	☒	☒A ☐B	☒

※ *Criterion A: Normal performance during test*

※ *Criterion B: Temporary degradation or loss of function or performance which is self-recoverable*

※ *Criterion C: Degradation or loss of function which requires intervention system reset.*

※ *For the tested points to EUT, please refer to attached page.*

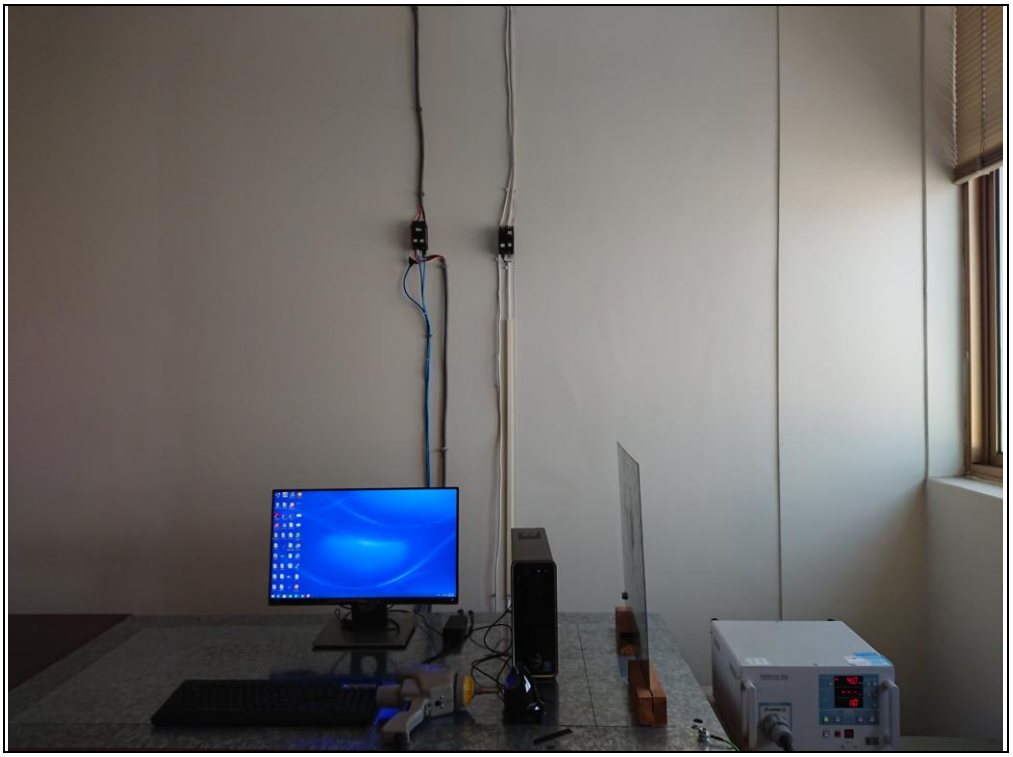
3.1.5 Test Photographs

Test Points Front View

Test Points Front View

Bule: Air / Red: Contact

< ESD View >

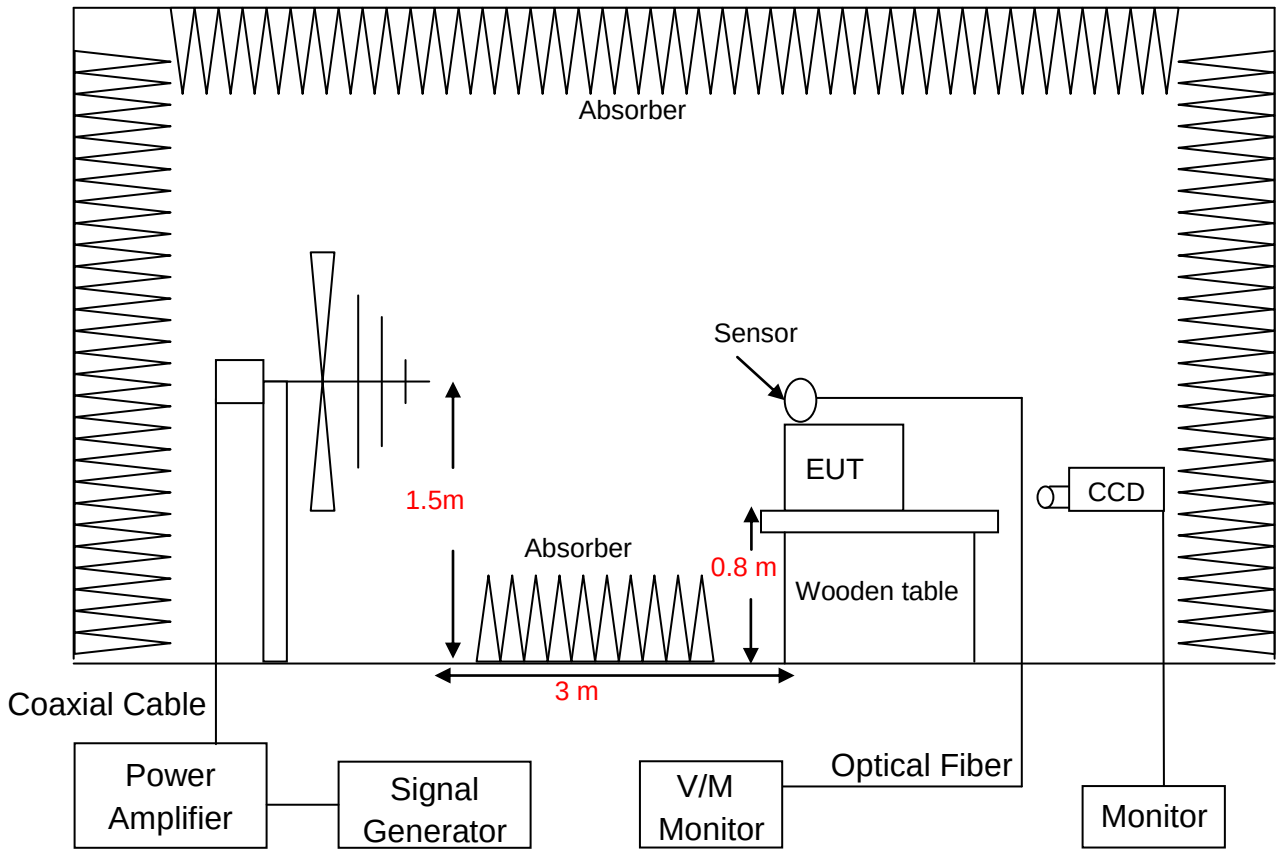


3.2 Radiated Electromagnetic Field (RS)

3.2.1 Test Specification

IEC 61000-4-3	
Source voltage and frequency	230V/50Hz, single phase
Frequency Range	80MHz – 5000MHz
Modulation	80%AM, 1kHz
Dwell time	≧3 sec
The rate of swept of frequency	1.5 x 10^{-3} decades/s
Field Strength	3V/m,
Frequency Step	1% of Fundamental
Antenna Polarization	Horizontal and Vertical
Antenna Height	1.5 m
Standard Requirement	Criterion A

3.2.2 Block Diagram of Test Setup



※ *The wooden table should be 0.8m high for table top EUT and 0.1m for floor-standing EUT.*
※. *For the actual test configuration, please refer to the photos of testing*

3.2.3 Test Procedure

According to IEC 61000-4-3: 2006+A1:2007+A2:2010

- The equipment to be tested is placed in the center of the enclosure on a wooden table. The equipment is then connected to power and signal leads according to pertinent installation instructions.
- The antenna which is enabling the complete frequency range of 80-5000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the applicable antennae.

- The test is normally performed with the antenna facing the most sensitive side of the EUT. The polarization of the field generated by the bucolical antenna necessitates testing each position twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. The circular polarization of the field from the log-spiral antenna makes a change of position of the antenna unnecessary.

- At each of the above conditions, the frequency range is swept 80-5000 MHz, pausing to adjust the R.F. signal level or to switch oscillators and antenna. The rate of sweep is in the order of $1.5*10^{-3}$ decades/s. The sensitive frequencies or frequencies of dominant interest may be discretely analyzed.

3.2.4 Test Result

Final Test Result	Pass
Performance criteria Judgment	A
Frequency Range	80~5000 MHz
Field Strength	3V/m,
Modulation	80%AM, 1kHz
Dwell time	3 sec
The rate of swept of frequency	1.5 x 10^{-3} decades/s
Antenna Polarization	Horizontal and Vertical
Temperature (°C)	21
Humidity (%RH)	54
Barometric pressure (mbar)	1014
Test Date	2019 / 1 / 31

Frequency (MHz)	Polarity	Azimuth (°)	Field strength (V/m)	Performance Criteria	Result
					Pass
80 ~ 1000	Vertical	0	3	☒A ☐B	☒
80 ~ 1000	Vertical	90	3	☒A ☐B	☒
80 ~ 1000	Vertical	180	3	☒A ☐B	☒
80 ~ 1000	Vertical	270	3	☒A ☐B	☒
80 ~ 1000	Horizontal	0	3	☒A ☐B	☒
80 ~ 1000	Horizontal	90	3	☒A ☐B	☒
80 ~ 1000	Horizontal	180	3	☒A ☐B	☒
80 ~ 1000	Horizontal	270	3	☒A ☐B	☒
1800	Vertical	0	3	☒A ☐B	☒
1800	Vertical	90	3	☒A ☐B	☒
1800	Vertical	180	3	☒A ☐B	☒
1800	Vertical	270	3	☒A ☐B	☒
1800	Horizontal	0	3	☒A ☐B	☒

1800	Horizontal	90	3	☒A ☐B	☒
1800	Horizontal	180	3	☒A ☐B	☒
1800	Horizontal	270	3	☒A ☐B	☒
2600	Vertical	0	3	☒A ☐B	☒
2600	Vertical	90	3	☒A ☐B	☒
2600	Vertical	180	3	☒A ☐B	☒
2600	Vertical	270	3	☒A ☐B	☒
2600	Horizontal	0	3	☒A ☐B	☒
2600	Horizontal	90	3	☒A ☐B	☒
2600	Horizontal	180	3	☒A ☐B	☒
2600	Horizontal	270	3	☒A ☐B	☒
3500	Vertical	0	3	☒A ☐B	☒
3500	Vertical	90	3	☒A ☐B	☒
3500	Vertical	180	3	☒A ☐B	☒
3500	Vertical	270	3	☒A ☐B	☒
3500	Horizontal	0	3	☒A ☐B	☒
3500	Horizontal	90	3	☒A ☐B	☒
3500	Horizontal	180	3	☒A ☐B	☒
3500	Horizontal	270	3	☒A ☐B	☒
5000	Vertical	0	3	☒A ☐B	☒
5000	Vertical	90	3	☒A ☐B	☒
5000	Vertical	180	3	☒A ☐B	☒
5000	Vertical	270	3	☒A ☐B	☒
5000	Horizontal	0	3	☒A ☐B	☒
5000	Horizontal	90	3	☒A ☐B	☒
5000	Horizontal	180	3	☒A ☐B	☒
5000	Horizontal	270	3	☒A ☐B	☒

※Criterion A: Normal performance during test

※Criterion B: Temporary degradation or loss of function or performance which is self-recoverable

※Criterion C: Degradation or loss of function which requires intervention system reset.

3.2.5 Test Photographs

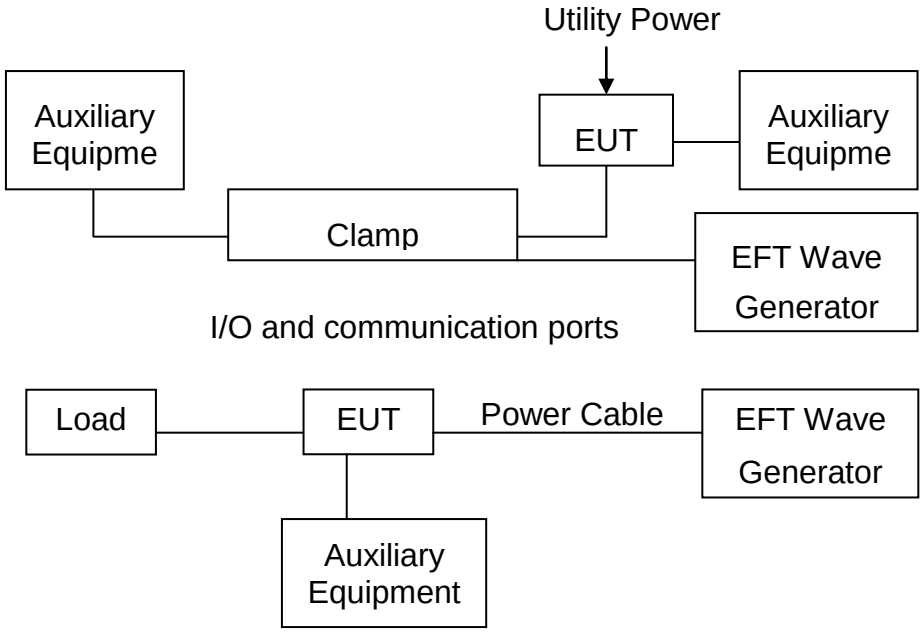
< RS View >

3.3 Electrical Fast Transient / Burst (EFT)

3.3.1 Test Specification

IEC 61000-4-4	
Source voltage and frequency	230V/50Hz, single phase
Pulse risetime and duration	5ns / 50ns
Pulse repetition	5kHz
Polarity	Positive and Negative Polarization
Burst duration and period	15ms / 300ms
Test duration	Greater than 1 minute
Time between test	10Sec
Severity levels	Power Line ±1kV
	Signal/Control Line ±0.5kV
Standard Requirement	Criterion B

3.3.2 Block Diagram of Test Setup



※ *The EUT system was put on a wooden table with 0.8m height for table top EUT and 0.1m for floor-standing EUT above ground reference plane.*

※ *For the actual test configuration, please refer to the photos of testing.*

※ *The minimum distance between the EUT and all other conductive structure was more than 0.5m.*

※*The minimum distance between the coupling plates of the coupling clamps (if used) and all over conductive structures, except the ground plane beneath the coupling clamp and beneath the EUT was more than 0.5m.*

※*The power cable connecting EUT was controlled under 1m.*

3.3.3 Test Procedure

According to IEC 61000-4-4:2012

- In order to minimize the effect of environmental parameters on test results, the climatic conditions when test is carrying out shall comply with the following requirements:
  - ambient temperature: 15℃ to 35℃
  - relative humidity : 45% to 75%
  - Atmospheric pressure: 86 Kpa (860 hPa) to 106 Kpa (1060 hPa)

- Test on Power Line:
  - The EFT/B-generator was located on the GRP. The length from the EFT/B-generator to the EUT is not exceeding 1 m.
  - The EFT/B-generator provides the ability to apply the test voltage in a non-symmetrical condition to the power supply input terminals of the EUT.

- Test on Signal/Control Lines:
  - The coupling clamp is composed of a clamp unit for housing the cable (length more than 3 m), and was placed on the GRP.
  - The coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test.

3.3.4 Test Result

Final Test Result	N/A
Performance criteria Judgment	N/A
Severity levels	Power Line ±1kV
	Signal/Control Line ±0.5kV
Polarity	Positive and Negative Polarization
Temperature (°C)	N/A
Humidity (%RH)	N/A
Barometric pressure (mbar)	N/A
Test Date	N/A

Test Line	Test Voltage(KV)						Result	
	±0.5	Performance Criteria	±1	Performance Criteria	±2	Performance Criteria	Pass	N/A
L	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
N	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
GND	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
Signal/Control Line	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒

※Criterion A: Normal performance during test

※Criterion B: Temporary degradation or loss of function or performance which is self-recoverable

※Criterion C: Degradation or loss of function which requires intervention system reset.

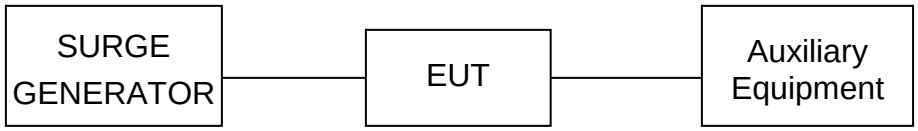
3.3.5 Test Photographs: N/A

3.4 Surge

3.4.1 Test Specification

IEC 61000-4-5	
Test Common mode level	0.5kV, 1kV, 2kV
Test Differential mode level	0.25kV, 0.5kV, 1kV
Polarity	Positive and Negative polarization
Test Phase	0°, 90°, 180°, 270°
Waveform	1.2/50 μs (open circuit)
	8/20μs (Short circuit :)
Generator Source Impedance	2Ω between networks
	12Ω between network and ground
Number of Pulse	5
Test Repetition	60 s
Standard Requirement	Criterion B

3.4.2 Block Diagram of Test Setup



※ *The EUT system was put on a wooden table with 0.8m height above ground reference plane.*

※ *For the actual test configuration, please refer to the photos of testing.*

3.4.3 Test Procedure

According to IEC 61000-4-5:2014

- The climatic conditions shall comply with the following requirements :
  - ambient temperature : 15 ℃ to 35 ℃
  - relative humidity : 10 % to 75 %
  - atmospheric pressure : 86 kPa to 106 kPa (860 hPa to 1060 hPa)
- The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
- For test applied to unshielded un-symmetrically operated interconnection lines of EUT：

  The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
- For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

  The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.
- The test shall be performed according the test plan that shall specify the test set-up with
  - generator and other equipment utilized
  - test level (voltage/current)
  - generator source impedance
  - internal or external generator trigger
  - number of tests : at least five positive and five negative at the selected points
  - repetition rate : maximum 1/min
  - inputs and outputs to be tested
  - representative operating conditions of the EUT
  - sequence of application of the surge to the circuit
  - phase angle in the case of AC. power supply

3.4.4 Test Result

Final Test Result	N/A
Performance criteria Judgment	N/A
Test Common mode level	±0.5kV, ±1kV, ±2kV
Test Differential mode level	±0.25kV, ±0.5kV, ±1kV
Test Phase	0°, 90°, 180°, 270°
Temperature (°C)	N/A
Humidity (%RH)	N/A
Barometric pressure (mbar)	N/A
Test Date	N/A

Common mode								
Coupling	Test Voltage(KV)						Result	
L+PE N+PE	±0.5	Performance Criteria	±1	Performance Criteria	±2	Performance Criteria	Pass	N/A
0°	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
90°	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
180°	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
270°	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒

Differential mode								
Coupling	Test Voltage(KV)						Result	
L+N	±0.25	Performance Criteria	±0.5	Performance Criteria	±1	Performance Criteria	Pass	N/A
0°	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
90°	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
180°	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒
270°	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☒

※Criterion A: Normal performance during test

※Criterion B: Temporary degradation or loss of function or performance which is self-recoverable

※Criterion C: Degradation or loss of function which requires intervention system reset.

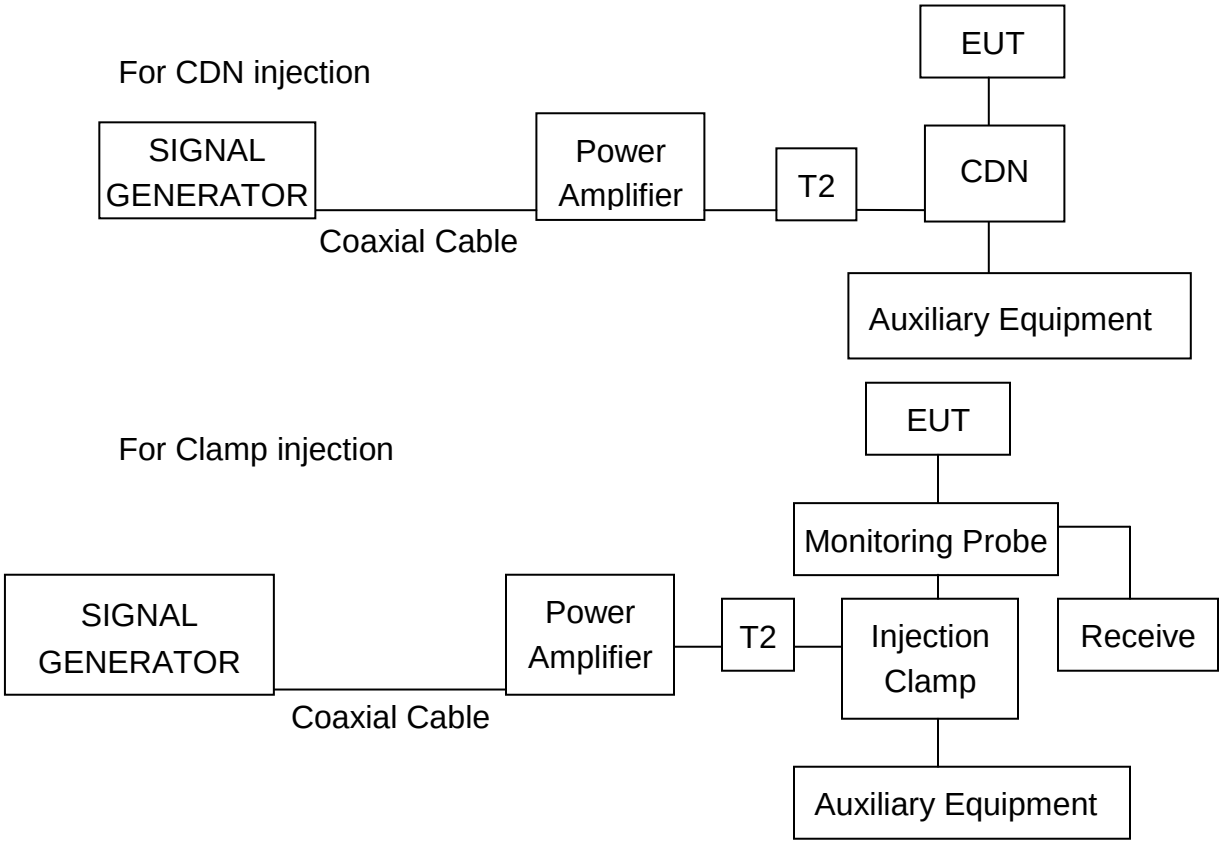
3.4.5 Test Photographs : N/A

3.5 Conducted Susceptibility (CS)

3.5.1 Test Specification

IEC 61000-4-6	
Source voltage and frequency	230 V/ 50 Hz, single phase
Sweeping frequency	0.15MHz - 80 MHz
Test level	Positive and Negative polarization
Modulation	AM 80%, 1 kHz Sine Wave
Frequency step	1%
Field Strength	3V r.m.s.
Dwell time	3 sec
Couple Cable	Power Mains
Coupling Device	CDN-M3(3 wires)
Standard Requirement	Criterion A

3.5.2 Block Diagram of Test Setup



※ *The EUT system was put on a wooden table with 0.1m height above ground.*

※ *For the actual test configuration, please refer to the photos of testing.*

※ *The distance between CDN(Clamp) and EUT was controlled between 0.1m and 0.3m.*

3.5.3 Test Procedure

According to IEC 61000-4-6:2013

- The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
- This test method test can be performed without using a sell shielded enclosure. This is because the disturbance levels applied and the geometry of the setups are not likely to radiated a high amount of energy, especially at the lower frequencies. If under certain circumstances the radiated energy is too high, a shielded enclosure has to be used.
- The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
- The frequency range is swept from 150 KHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1KHz sign wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
- The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
- An alternative test procedure may be adopted, wherein the frequency range is swept incrementally, with a step size not exceeding 4% of the start ad thereafter 4% of the preceding frequency value. The test level should be at least twice the value of the specified test level.
- In cases of dispute, the test procedure using a step size not exceeding 1% of the start and thereafter 1% of preceding frequency value shall take precedence.

.

3.5.4 Test Result

Final Test Result	N/A
Performance criteria Judgment	N/A
Sweeping frequency	0.15MHz – 80 MHz
Test Level	Positive and Negative polarization
Temperature (°C)	N/A
Humidity (%RH)	N/A
Barometric pressure (mbar)	N/A
Test Date	N/A

Frequency (MHz)	Field Strength (Vrms)	Injection Port	Injection Method	Performance Criterion	Result
0.15 - 80	3V	A.C Power	CDN-M3	☐A ☐B	N/A
0.15 - 80	3V	A.C Power	Clamp	☐A ☐B	N/A

※ Criterion A: Normal performance during test

※ Criterion B: Temporary degradation or loss of function or performance which is self-recoverable

※ Criterion C: Degradation or loss of function which requires intervention system reset.

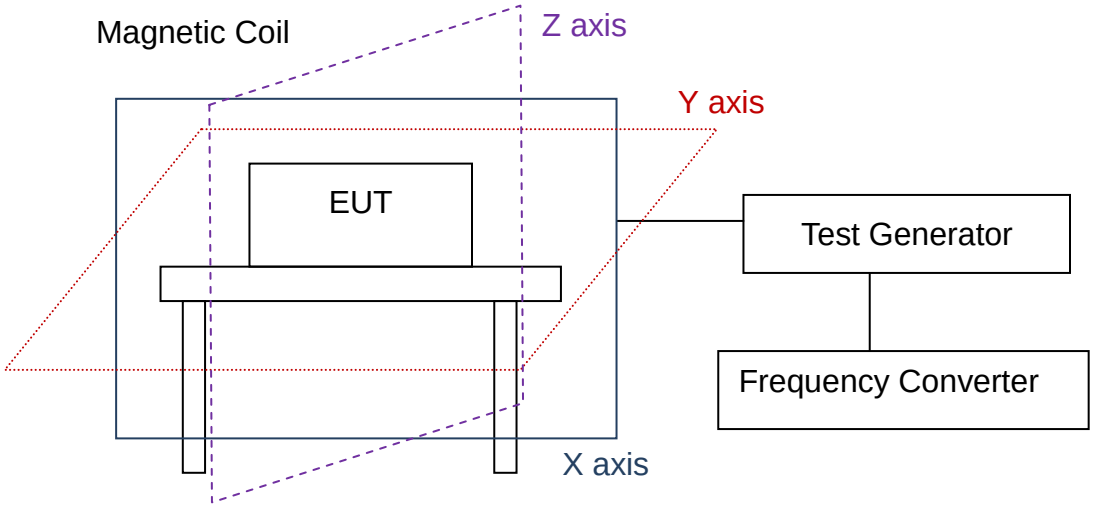
3.5.5 Test Photographs: N/A

3.6 Power Frequency Magnetic Field (PFMF)

3.6.1 Test Specification

IEC 61000-4-8	
Test axis	X, Y and Z axes
Test time	5 min / each axis
Field strength	■1 A/m, □3 A/m
Power-Frequency	■50Hz, □60Hz
Standard Requirement	Criterion A

3.6.2 Block Diagram of Test Setup



※ The EUT system was put on a wooden table with 0.8m height above ground.

※ For the actual test configuration, please refer to the photos of testing.

3.6.3 Test Procedure

According to IEC 61000-4-8:2010

- The equipment was configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.
- The EUT and its load are placed on a wooden table that is 0.8 meter above the GRP dimension is at least 1 meter x 1 meter.
- The test magnetic field shall be placed at least than 3 meter distance from the induction coil.
- The induction coil shall be rotated by 90° in order to expose the EUT to the test field with different orientation (X, Y, Z orientation).
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

3.6.4 Test Result

Final Test Result	Pass
Performance criteria Judgment	A
Magnetic strength	1 A/m
Power-Frequency	50Hz
Temperature (°C)	21
Humidity (%RH)	54
Barometric pressure (mbar)	1014
Test Date	2019 / 1 / 31

Test axis	Frequency（MHz）	Magnetic strength (A/m)	Performance Criteria	Pass
X	50	1	☒A ☐B	☒
Y	50	1	☒A ☐B	☒
Z	50	1	☒A ☐B	☒

※ *Criterion A: Normal performance during test*

※ *Criterion B: Temporary degradation or loss of function or performance which is self-recoverable*

※ *Criterion C: Degradation or loss of function which requires intervention system reset.*

3.6.5 Test Photographs

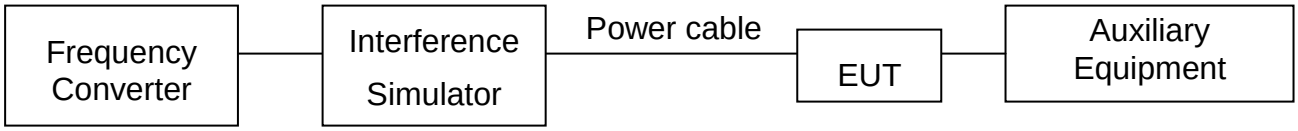
< PFMF View >

3.7 Voltage Dips and Interruption

3.7.1 Test Specification

IEC 61000-4-11	
Source voltage and frequency	230V/50Hz, single phase
Test Angle	0º, 45 º, 90 º, 135 º, 180 º, 225 º, 270 º, 315 º
Time between test	10 sec
Test duration	2min each phase
Voltage rise (and fall) time	1～5μs
Level and duration :	Sequence of 3 dips/interrupts
Test Level	
Dip depth	95%, 0.5 period
	30%, 25 period
Interrupt	95%, 250 period
Standard Requirement	
Dip 95%	Criterion B
Dip 30%	Criterion C
Interrupt > 95%	Criterion C

3.7.2 Block Diagram of Test Setup



※ The EUT system was put on a wooden table with 0.8m height above ground.

※ For the actual test configuration, please refer to the photos of testing.

3.7.3 Test Procedure

According to IEC 61000-4-11:2004

- The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1m*1m min. And 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The power cord shall be used the shortest power cord as specified by the manufacturer.

- The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips / interruptions with intervals of 10s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossing of the voltage waveform.

- The EUT is connected to the power mains through a coupling device that directly couples to the Voltage Dips and Interruption Generator.

- The EUT shall be tested for 30% voltage dip of supplied voltage and duration 25 Periods, for 95% voltage dip of supplied voltage and duration 0.5 Periods with a sequence of three voltage dips with intervals of 10 seconds, and for 95% voltage interruption of supplied voltage and duration 250 Periods with a sequence of three voltage interruptions with intervals of 10 seconds.

- Voltage phase shifting are shall occur at0º, 45º, 90º, 135º, 180º, 225º, 270º, 315º of the voltage.

3.7.4 Test Result

Final Test Result	N/A
Source voltage and frequency	230V/50Hz, single phase
Test Angle	0º, 45 º, 90 º, 135 º, 180 º, 225 º, 270 º, 315 º
Time between test	10 sec
Test duration	2min each phase
Voltage rise (and fall) time	1～5μs
Level and duration :	Sequence of 3 dips/interrupts
Temperature (°C)	N/A
Humidity (%RH)	N/A
Barometric pressure (mbar)	N/A
Test Date	N/A

AC POWER	DIP DEPTH (%)	DIP TIME (Period)	Performance Criterion	Result
230V/50Hz	95%	0.5	☐A ☐B ☐C	☐Pass ☒N/A
	30%	25	☐A ☐B ☐C	☐Pass ☒N/A
	95% (interrupt)	250	☐A ☐B ☐C	☐Pass ☒N/A

※ *Criterion A: Normal performance during test*

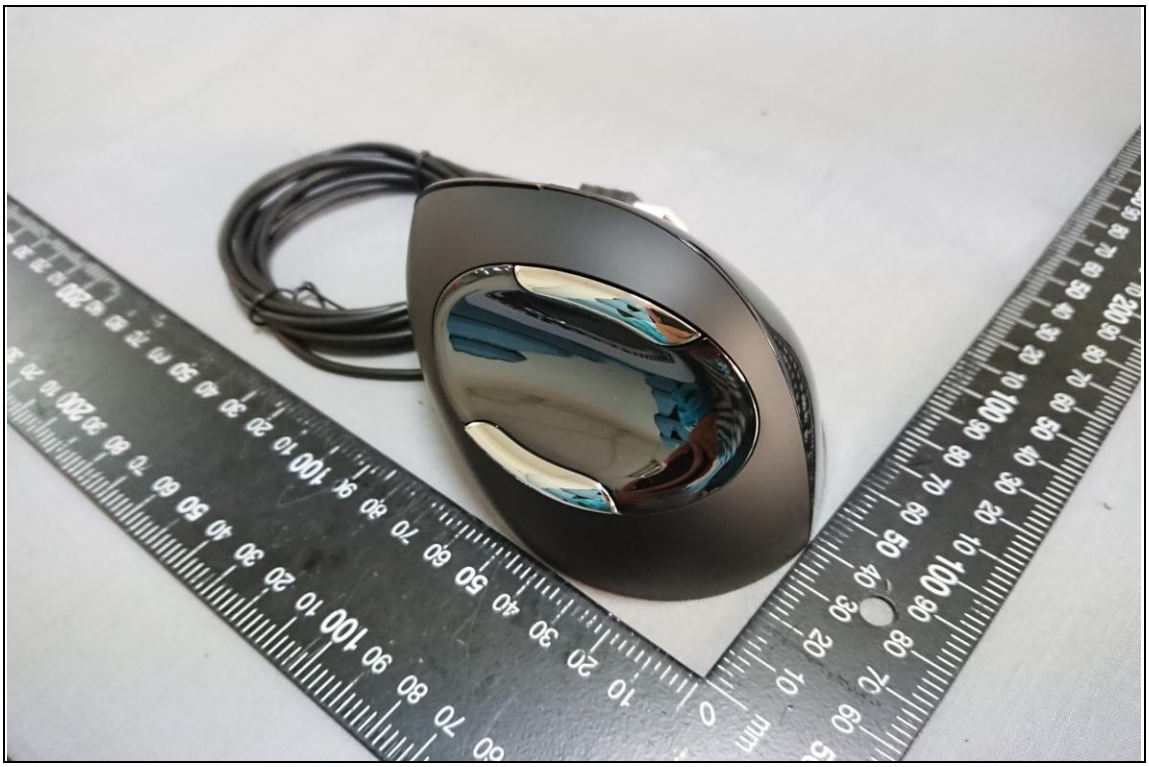
※ *Criterion B: Temporary degradation or loss of function or performance which is self-recoverable*

※ *Criterion C: Degradation or loss of function which requires intervention system reset.*

3.7.5 Test Photographs: N/A

4. EUT PHOTOGRAPHS

< Front view of EUT >



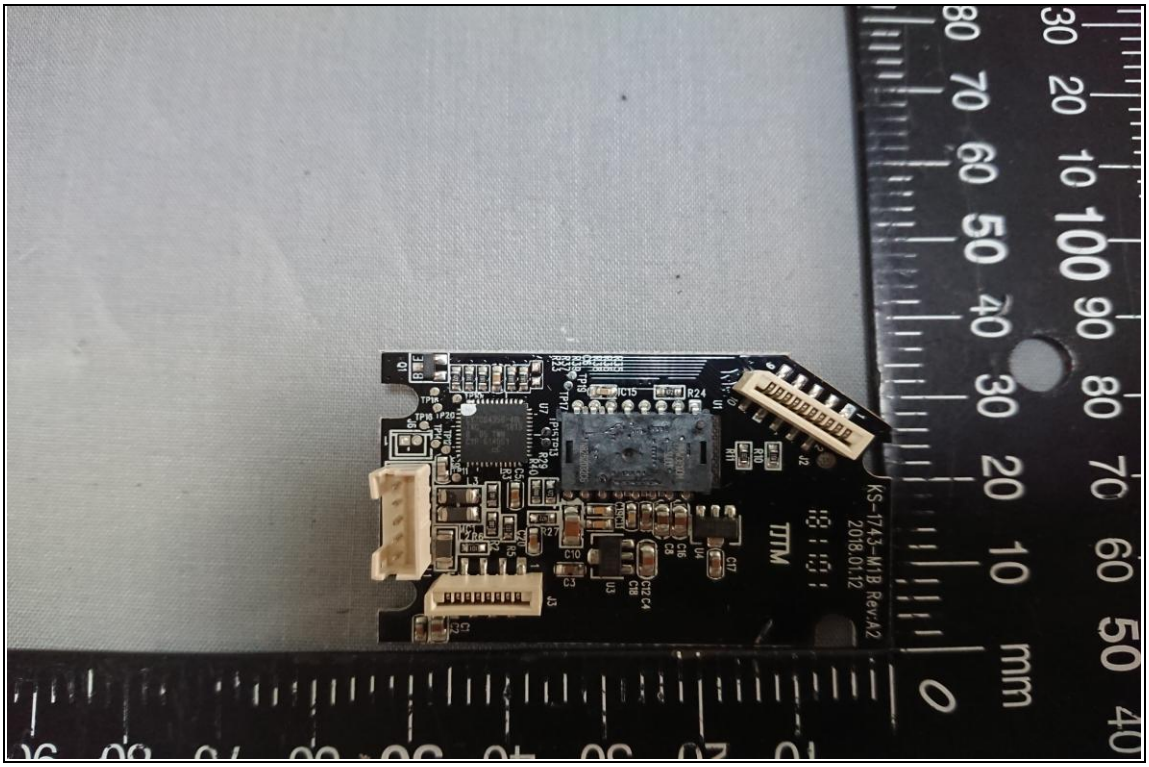
< Rear view of EUT >

< Inside View of EUT >

< Inside View of EUT >

< Inside View of EUT >

< PCB1-F >



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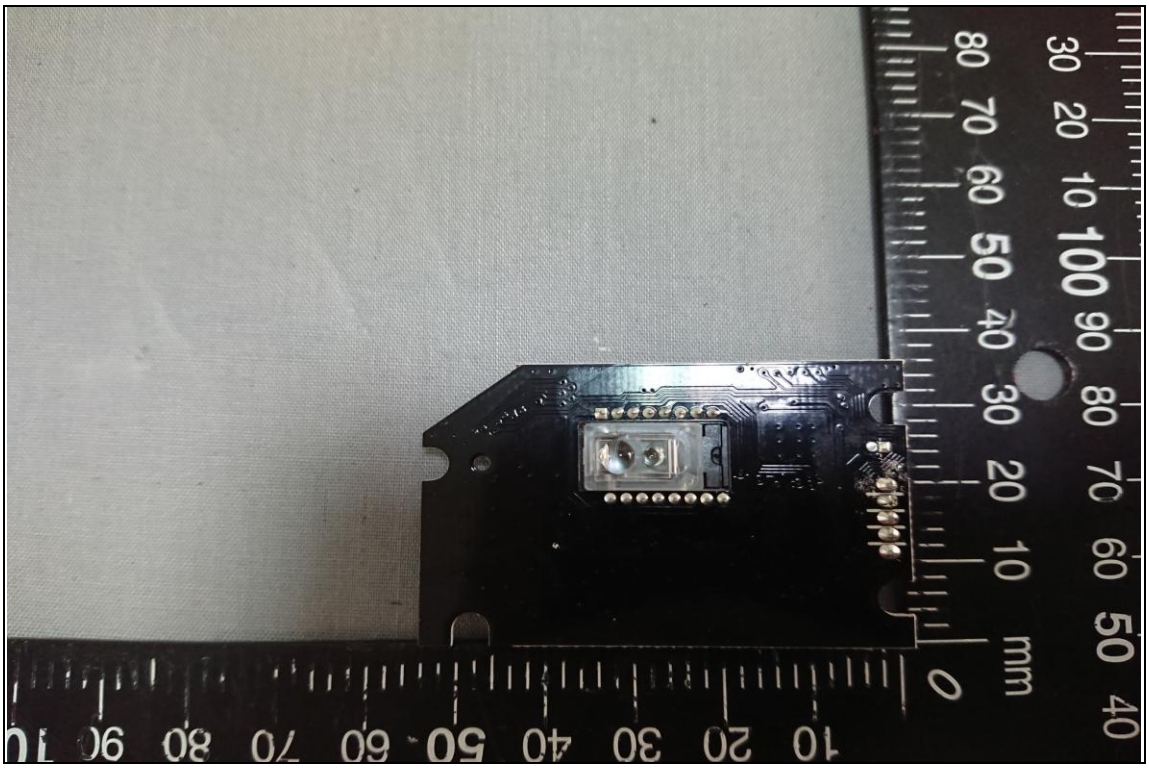

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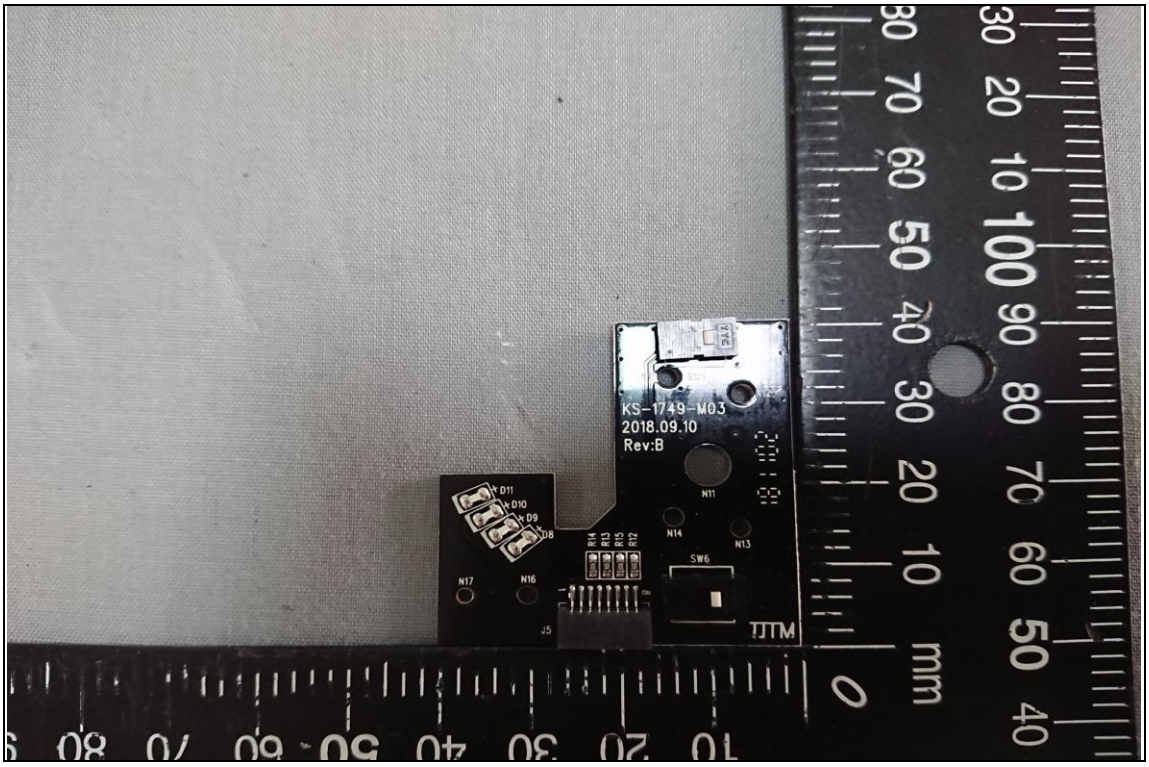

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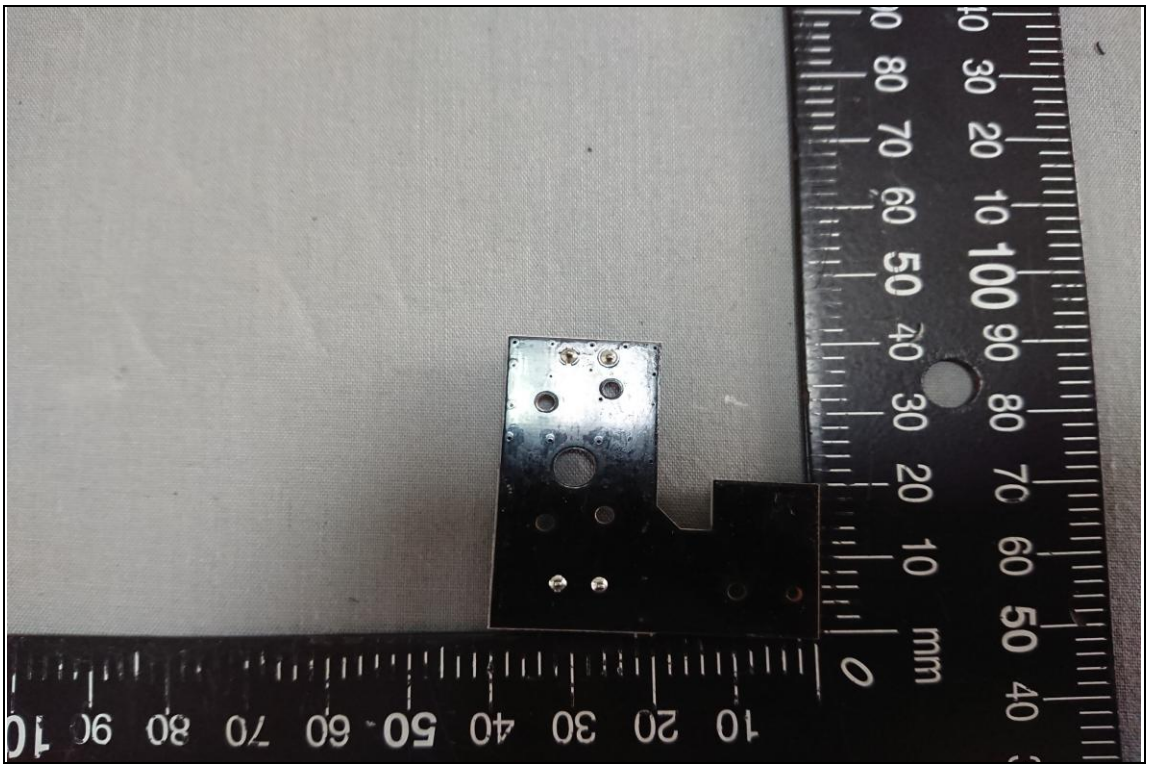

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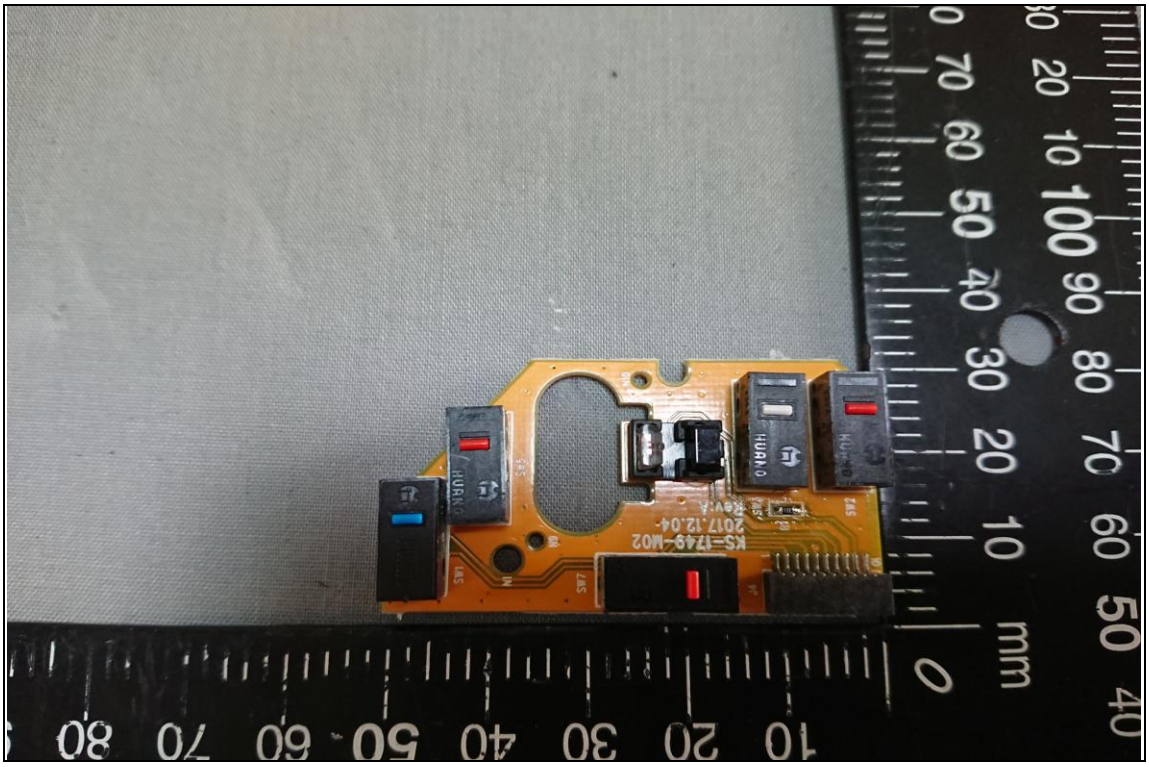

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