TEST REPORT

CERTIFICATE OF CONFORMITY

Standard:	**EN 55032: 2015+A11:2020, Class B** **EN 55035: 2017+A11:2020**
Report No.:	CEAAGC-WTW-P23110065
Product:	Notecard
Brand:	Blues Inc.
Model No.:	NOTE-LWEU
Received Date:	2023/11/2
Test Date:	2023/11/7 ~ 2023/11/9
Issued Date:	2024/8/13
Applicant:	Blues Inc.
Address:	50 Harbor St Manchester, MA, 01944-1425 United States.
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kewi Shan Dist., Taoyuan City 33383, Taiwan

Approved by: Leo Hsu , **Date:** 2024/8/13

Leo Hsu / Project Engineer

This test report consists of 35 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The test results in the report only apply to the tested sample. The test results in this report are traceable to the national or international standards.

Prepared by : Lena Wang / Specialist

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
CEAAGC-WTW-P23110065	Original release.	2024/8/13

1 Certificate

Product:	Notecard
Brand:	Blues Inc.
Test Model:	NOTE-LWEU
Sample Status:	Engineering sample
Applicant:	Blues Inc.
Test Date:	2023/11/7 ~ 2023/11/9
Standard:	EN 55032: 2015+A11:2020, Class B
	EN 55035: 2017+A11:2020
Measurement procedure:	EN 61000-4-2: 2009 / IEC 61000-4-2: 2008 ED. 2.0
	EN IEC 61000-4-3: 2020 / IEC 61000-4-3: 2020 ED. 4.0
	EN 61000-4-8: 2010 / IEC 61000-4-8: 2009 ED. 2.0

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

2 Summary of Test Results

The test items that the EUT need to perform in accordance with its interfaces, evaluated functions are as follows:

Standard	Test Item	Result	Remark
EN 55032	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class B margin is -4.01 dB at 993.89 MHz
EN 55032	Radiated Emissions above 1 GHz	Pass	Minimum passing Class B margin is -7.67 dB at 2608.58 MHz
IEC 61000-4-2	Electrostatic Discharges (ESD)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-3	Radio Frequency Electromagnetic Field (RS)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-8	Power Frequency Magnetic Field (PFMF)	Pass	For EN 55035 Performance Criteria A

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Performance Criteria

For EN 55035

General Performance Criteria

These criterions shall be used during the testing of primary functions where no specified in the normative annexes of EN 55035 is applicable.

Performance criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state 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, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion B

During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.

After the test, the equipment shall continue to operate as intended without operator intervention; 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), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.

Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

Product Specific Performance criteria for Audio output functions
Performance criterion A

Table – Performance criterion A – Limits for devices supporting telephony

Type of immunity test	Frequency range MHz	Acoustic or electrical interference ratio	Equivalent direct measurement		
			dB(SPL)	Digital dBm0	Analogue dBm
Conducted	0.15 to 30	–20 dB	55	–50	–50
	30 to 80	–10 dB	65	–40	–40
Radiated	80 to 1 000	0 dB	75	–30	–30

The acoustic level of the demodulated audio shall be less than the limits in column 4.

For all other Audio output devices:
The measured acoustic interference ratio and/or the measured electrical interference ratio during the test shall be –20 dB or better.

Performance criterion B

Use the general performance criterion B.

Performance criterion C

Use the general performance criterion C.

Product Specific Performance criteria for network functions
Equipment that provides these functions transmits and receives data through ports such as an analogue/digital data port. The networking functions are just like network switching and routing ; data transmission ; supervisory...etc.

The particular performance criteria which are specified in the normative annexes of CISPR 35/ EN 55035 take precedence over the corresponding parts of the general performance criteria.

Performance criterion A

Where relevant, during the application of the test the network function shall, as a minimum, operate ensuring that:

- established connections shall be maintained throughout the application of the test;
- no change of operational state or corruption of stored data occurs;
- no increase in error rate above the figure defined by the manufacturer occurs. The manufacturer should select the most appropriate performance measurement criteria for the product or system, for example bit error rate, block error rate;
- no request for retry above the figure defined by the manufacturer;
- the data transmission rate does not reduce below the figure defined by the manufacturer;
- no protocol failure occurs;
- other verifications are described in F.3.3.1 of CISPR 35/ EN 55035.

Performance criterion B

Established connections shall be maintained throughout the test, or shall self-recover in a way and timescale that is imperceptible to the user.

The error rate, request for retry and data transmission rates may be degraded during the application of the test. Degradation of the performance as described in criterion A is permitted, provided that the normal operation of the EUT is self-recoverable to the condition established prior to the application of the test.

Where required, as defined in Clause 5 of CISPR 35/ EN 55035, the acceptable operation of the function shall be verified at the completion of the test as described in Table H.1 of CISPR 35/ EN 55035, by confirming the following:

- the EUT's ability to establish a connection,
- the EUT's ability to clear a connection.

During surge testing disconnection is allowed on the analogue/digital data port being tested.

If the EUT is a supervisory equipment, it shall not impact the normal operation of the network being monitored. In addition, any supervisory functions impacted during the period of the test shall return to the state prior to the test. Elements to consider include: alarms, signalling lamps, printer output, network traffic rates, network monitoring.

Performance criterion C

Degradation of performance as described in criteria A and B is permitted provided that the normal operation of the EUT is self-recoverable to the condition immediately before the application of the test, or can be restored after the test by the operator.

Product Specific Performance Criteria for xDSL

The particular performance criteria which are specified in the normative annexes of CISPR 35/ EN 55035 take precedence over the corresponding parts of the general performance criteria.

Performance criterion A

Applicable for the test requirement defined in table clause 2.1 of EN 55035

During the swept frequency test the established connection shall be maintained throughout the testing and the information transferred without any additional reproducible errors or loss of synchronisation. If a degradation in performance is observed and the system is adaptive, for example has the capability to automatically retrain in the presence of an interfering signal, then for conducted immunity tests only, the following procedure shall be followed:

a) For each range of interfering frequencies in which degradation in performance is observed, three frequencies (beginning, middle and end) shall be identified.
b) At each of the frequencies identified in step a), the interfering signal shall be turned on and the system is allowed to retrain.
c) If the system is able to retrain and then functions correctly for a dwell time of at least 60 seconds without any additional reproducible errors or loss of synchronisation, then the performance level of the system is considered acceptable.
d) The frequencies identified in step a) and the data rates achieved in step b) shall be recorded in the test report.

Applicable for the test requirement defined in table clause 2.2 of EN 55035

It is important that the modems are able to train in the presence of repetitive impulsive noise and minimize disruption to the end-user where a repetitive impulsive noise source starts after the link has synchronized. Therefore the following procedure and performance criteria shall apply.

The manufacturer shall select the class of impulsive noise protection (INP) to be used for the immunity test and should state this information in the technical documentation and in the test report. The maximum delay shall be set to 8 ms.

In the absence of impulsive noise: The modem shall operate without retraining at its target noise margin with a bit rate value depending on the line attenuation and the stationary noise being present on the line. (The actual value will be between the minimum and maximum bit rate values programmed in the port).

The impulsive noise source shall then be applied at the required test level.

With the impulsive noise applied: The modem shall operate without retraining and without SES at the bit rate established prior to the application of the impulsive noise. No extra CRC errors shall occur due to the impulsive noise. After the test, the noise margin value shall return to the target noise margin.

Performance criterion B

Applicable for the test requirement defined in table clause 2.3 of EN 55035

Modems shall withstand the occurrence of isolated impulsive noise events. The performance criteria defined in below Table shall be applied.

Impulse duration (ms)	**Performance criteria**
0.24	The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.
10	The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.
300	The application of the impulse shall not cause the xDSL link to lose synchronisation.

Applicable for the test requirements defined in table clauses 2.5 and 4.5 of EN 55035

For application of this test to the xDSL port, a repetition rate of 100 kHz (burst length 0.75 ms) shall be used.

Degradation of the performance as described in criterion A is permitted in that errors are acceptable during the application of the test. However the application of the test shall not cause the system to lose the established connection or re-train. At the cessation of the test the system shall operate in the condition established prior to the application of the test without user intervention.

After the application of the EFT/B tests to the xDSL or AC mains port, the CRC error count shall not have increased by more than 600 when compared to the count prior to the application of the test.

Performance criterion C

Degradation of the performance as described in criteria A and B is permitted provided that the normal operation of the EUT is self-recoverable to the condition established prior to application of the test or can be restored after the test by the operator.

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Specification	Expanded Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	4.69 dB	6.3 dB (U_{cispr})
Radiated Emissions above 1 GHz	1 GHz ~ 6 GHz	5.15 dB	5.2 dB (U_{cispr})

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.3 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	Notecard
Brand	Blues Inc.
Test Model	NOTE-LWEU
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	3.3 Vdc
Accessory Device	Refer to Note as below
Data Cable Supplied	N/A

Note: The EUT uses following accessories.

CPU	
Brand	Model
STMicrosystems	STM32WL55CCU7

3.2 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 928 MHz, provided by Blues Inc., for detailed internal source, please refer to the manufacturer's specifications.

3.3 Features of EUT

The tests reported herein were performed according to the method specified by Blues Inc., for detailed feature description, please refer to the manufacturer's specifications or user's manual.
Please refer to appendix of the report if the applicant has provided additional descriptions of the EUT.

3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT has been pre-tested under following test modes.

Test Condition	
Mode	Radiated Emissions up to 1 GHz
1	869.525MHz link + 5 Vdc
Note: There are both standby mode and normal mode to be pre-tested then normal mode has the highest emission value.	

Test modes are presented in the report as below.

Test Condition	
Mode	Radiated Emissions up to 1 GHz
-	869.525MHz link + 5 Vdc
Mode	Radiated Emissions above 1 GHz
-	869.525MHz link + 5 Vdc
Mode	Electrostatic Discharges (ESD)
-	869.525MHz link + 5 Vdc
Mode	Radio Frequency Electromagnetic Field (RS)
-	869.525MHz link + 5 Vdc
Mode	Power Frequency Magnetic Field (PFMF)
-	869.525MHz link + 5 Vdc

3.5 Test Program Used and Operation Descriptions

For Emission test

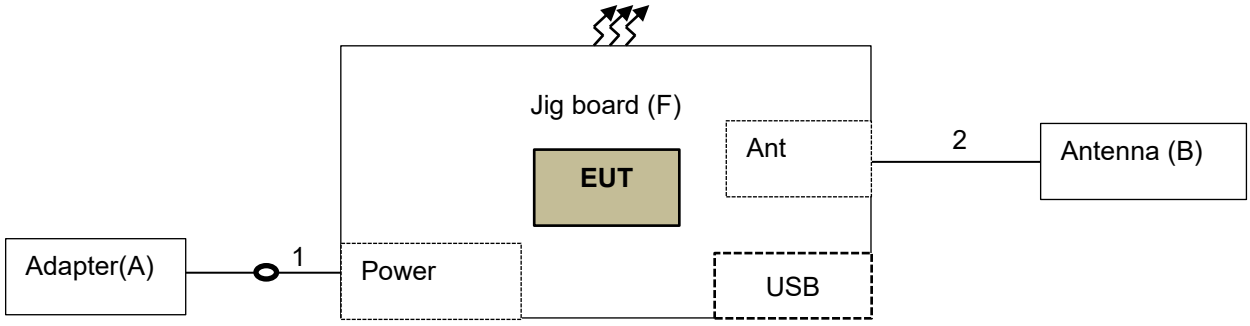
a. The EUT is powered by Adapter.
b. Make the EUT generate a Tx signal through instructions.
c. Use commands to make the peripheral Notedcard receiver EUT signals.

For Immunity test

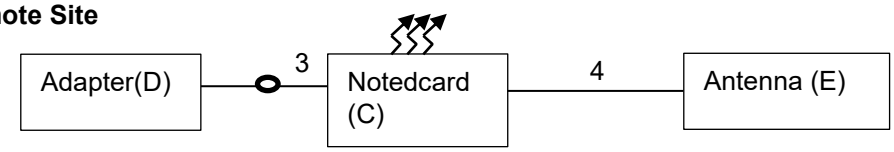
a. The EUT is connected to a Laptop, which acts as a communication partner via USB Cable.
b. Make the EUT generate a Tx signal through instructions.
c. Use commands to make the peripheral Notedcard receiver EUT signals.

3.6 Connection Diagram of EUT and Peripheral Devices

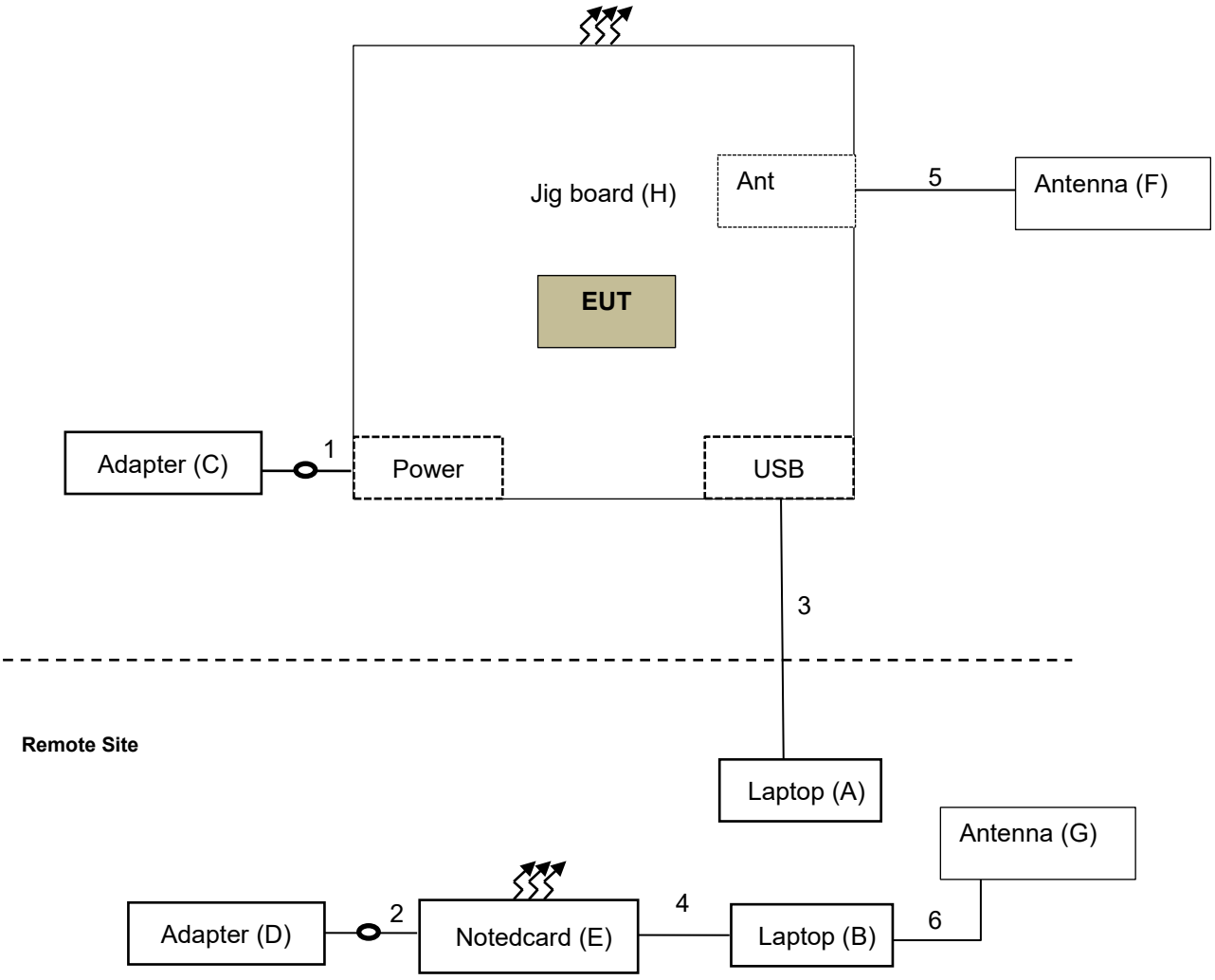
For Emission test



Remote Site



For Immunity test



3.7 Configuration of Peripheral Devices and Cable Connections

For Emission test

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Adapter	PHIHONG	PSAA05K-050	N/A	N/A	Supplied by applicant
B	Antenna	Molex	211140-0100	N/A	N/A	Supplied by applicant
C	Notedcard	Blues Inc.	NOTE-LWEU	N/A	N/A	Supplied by applicant
D	Adapter	PHIHONG	PSAA05K-050	N/A	N/A	Supplied by applicant
E	Antenna	Molex	211140-0100	N/A	N/A	Supplied by applicant
F	Jig board	N/A	N/A	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Power Cable	1	0.2	No	0	Supplied by applicant
2	Antenna Cable	1	0.1	Yes	0	Supplied by applicant
3	Power Cable	1	0.2	No	0	Supplied by applicant
4	Antenna Cable	1	0.1	Yes	0	Supplied by applicant

For Immunity test

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Laptop	Lenove	X240	PC03VG1H	N/A	Provided by Lab
B	Laptop	Dell	Latitude E6440	25X1M12	N/A	Provided by Lab
C	Adapter	HP	PSC11C	N/A	N/A	Provided by Lab
D	Adapter	HP	PSC11C	N/A	N/A	Provided by Lab
E	Notedcard	Blues Inc.	NOTE-LWEU	N/A	N/A	Supplied by applicant
F	Antenna	Molex	211140-0100	N/A	N/A	Supplied by applicant
G	Antenna	Molex	211140-0100	N/A	N/A	Supplied by applicant
H	Jig board	N/A	N/A	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Power Cable	1	0.2	No	0	Supplied by applicant
2	Power Cable	1	0.2	No	0	Supplied by applicant
3	USB Cable	1	1	Yes	0	Provided by Lab
4	USB Cable	1	1	Yes	0	Provided by Lab
5	Antenna Cable	1	0.1	Yes	0	Supplied by applicant
6	Antenna Cable	1	0.1	Yes	0	Supplied by applicant

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 Radiated Emissions up to 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower (H)	MFA-440	970705	N/A	N/A
Antenna Tower (V)	MFA-440	9707	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-148	2022/12/20	2023/12/19
		9168-156	2022/12/20	2023/12/19
Controller (H)	MF7802	08093	N/A	N/A
Controller (V)	MF7802	074	N/A	N/A
EMI Test Receiver R&S	ESR7	101264	2023/4/10	2024/4/9
		101471	2023/3/15	2024/3/14
Fixed Attenuator Mini-Circuits	UNAT-5+	PAD-CH(H)-01	2023/9/2	2024/9/1
		PAD-CH(V)-01	2023/9/2	2024/9/1
Preamplifier Sonoma	310N	352923	2023/5/7	2024/5/6
		352924	2023/5/7	2024/5/6
RF Coaxial Cable TIMES	LMR-600(11.8M)+LMR-400 (7M)	CABLE-CH1(HOR)-01	2023/9/2	2024/9/1
	LMR-600(18M)+LMR-400 (7M)	CABLE-CH1(VER)-01	2023/9/2	2024/9/1
Software	ADT_Radiated_V8.7.08	N/A	N/A	N/A
Turn Table	DS430	50303	N/A	N/A

Notes:

1. The test was performed in HY - 10M Chamber. The test site validated date: 2023/7/29 (NSA)
2. The VCCI Site Registration No. is R-11893.
3. Tested Date: 2023/11/8

4.2 Radiated Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower BVADT	AT100	AT93021702	N/A	N/A
Band Pass Filter Micro-Tronics	BRM17690-01	002	2023/9/2	2024/9/1
	BRM50716-01	G010	2023/9/2	2024/9/1
Boresight antenna tower fixture BV	BAF-02	3	N/A	N/A
Controller BVADT	SC100	SC93021702	N/A	N/A
Fixed Attenuator Mini-Circuits	BW-N4W5+	PAD-CH3-03	2023/7/8	2024/7/7
Horn Antenna ETS-Lindgren	3117	00034126	2023/10/18	2024/10/17
Horn Antenna Schwarzbeck	BBHA 9120D	209	2022/11/13	2023/11/12
Preamplifier Agilent	8449B	3008A02465	2023/2/15	2024/2/14
Preamplifier EMCI	EMC012645SE	980338	2023/5/7	2024/5/6
PXA Signal Analyzer Keysight	N9030B	MY60070562	2023/2/22	2024/2/21
RF Coaxial Cable HUBER+SUHNER&EMCI	SUCOFLEX 104&EMC104-SM-SM-8000	Cable-CH3-03(309224+170907)	2023/7/8	2024/7/7
Software BVADT	ADT_Radiated_V8.7.08	N/A	N/A	N/A
Turn Table BVADT	TT100	TT93021702	N/A	N/A

Notes:

1. The test was performed in HY - 966 Chamber 2. The test site validated date: 2023/4/29 (VSWR)
2. The VCCI Site Registration No. is G-20126.
3. Tested Date: 2023/11/9

4.3 Electrostatic Discharges (ESD)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Electrostatic Analog Tester Noiseken	ESS-2002	ESS0442784	2022/12/16	2023/12/15
Electrostatic Analog Tester Schaffner	NSG-438	1326	2023/7/6	2024/7/5
Electrostatic Analog Tester TESEQ	NSG 438	1614	2023/7/27	2024/7/26
ESD Generator EM TEST	Dito	V0701102114	2022/11/11	2023/11/10
ESD Gun EM TEST	Dito	P2209261291 / P2206259188	2023/4/28	2024/4/27
ESD Simulator Noiseken	ESS-B3011A	ESS1694113	2023/7/29	2024/7/28

Notes:

1. The test was performed in HY - ESD 1.
2. Tested Date: 2023/11/7

4.4 Radio Frequency Electromagnetic Field (RS)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Audio analyzer R&S	UPV	101009	2022/12/30	2023/12/29
Conditioning Amplifier B&K	Type 2690--0S2	2482371	2023/6/27	2024/6/26
Electric Field Probe ETS-Lindgren	HI-6105	00212757	2023/1/6	2024/1/5
Log Periodic Antenna R&S	HL046E	100114	N/A	N/A
Mouth Simulator B&K	4227	2411656	N/A	N/A
power amplifier BONN Elektronik	BLMA 1060-100/50D	118694	N/A	N/A
power amplifier R&S	BBA100	101011	N/A	N/A
Power Sensor Boonton	51011-EMC	33105	2023/7/14	2024/7/13
		33107	2023/7/14	2024/7/13
Power Sensor R&S	NRP-Z91	101572	2023/5/10	2024/5/9
		101573	2023/5/10	2024/5/9
Pressure-field Microphone B&K	4192-L-001	2764583	2022/11/23	2023/11/22
Signal Generator R&S	SMB100A	105801	2022/11/27	2023/11/26
Software R&S	EMC32 Version 8.52.0	N/A	N/A	N/A
Stacked Log Periodic Antenna Schwarzbeck	STLP 9149	9149-141	N/A	N/A

Notes:

1. The test was performed in HY - RS Chamber 2.
2. Tested Date: 2023/11/7

4.5 Power Frequency Magnetic Field (PFMF)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
AC Power Source Schaffner	Profline2105-208NSG1007	55616	2023/7/6	2024/7/5
Gaussmeter F.W. Bell	4190	0743043	2023/4/19	2024/4/18
Multi turn Magnetic TESEQ	INA 702/INA 2141/INA 752	268/1427/178	2023/3/6	2024/3/5

Notes:

1. The test was performed in HY - EMS 1.
2. Tested Date: 2023/11/7

5 Limits of Test Items

5.1 Radiated Emissions up to 1 GHz

Frequency (MHz)	Class A Quasi-peak (dBuV/m)		Class B Quasi-peak (dBuV/m)	
	at 3m	at 10m	at 3m	at 10m
30 - 230	50	40	40	30
230 - 1000	57	47	47	37

For radiated emissions from FM receivers only (Measurement Facility: OATS/SAC)

Frequency (MHz)	Fundamental (dBuV/m)		Harmonics (dBuV/m)	
	at 3m	at 10m	at 3m	at 10m
30 - 230	60	50	52	42
230 - 300	60	50	52	42
300 - 1000	60	50	56	46

Notes: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

5.2 Radiated Emissions above 1 GHz

Frequency (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	Average	Peak	Average	Peak
1 to 3	56	76	50	70
3 to 6	60	80	54	74

Notes: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Frequency Range of Radiated Measurement (For unintentional radiators)

Highest internal frequency (*Fx*)	**Highest measurement frequency (*FM*)** (GHz)
Fx ≤ *108 MHz*	1
108 MHz < ***Fx*** ≤ 500 MHz	2
500 MHz < ***Fx*** ≤ 1 GHz	5
Fx > *1 GHz*	5 x ***Fx*** up to a maximum of 6 GHz
Fx is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.	

5.3 General immunity requirements

For EN 55035

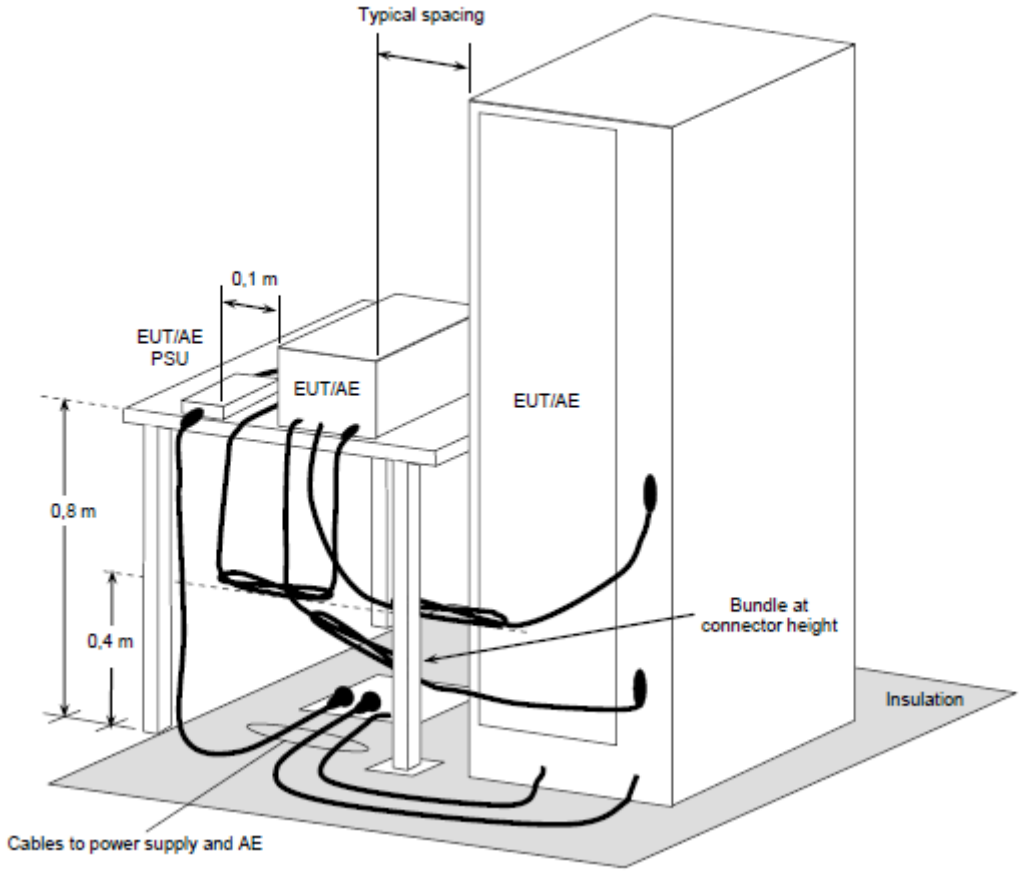
Port	Basic Standard	Test item	Test specification	Performance criteria
Enclosure	IEC 61000-4-2	Electrostatic Discharge (ESD)	±4 kV (contact) ±8 kV (Air)	B
	IEC 61000-4-3	Radio Frequency Electromagnetic Field (RS)	Swept Frequency Test: 80 to 1000(MHz), 3 V/m, 80% AM (1 kHz) Spot Frequency Test: 1800, 2600, 3500, 5000 MHz (±1%), 3 V/m, 80% AM (1 kHz)	A
	IEC 61000-4-8	Power Frequency Magnetic Field (PFMF)	1 A/m, 50 Hz	A

6 Test Arrangements

6.1 Radiated Emissions up to 1 GHz

a. For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of maximum thickness of 150 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
b. The EUT is set 10 meters away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1 m to 4 m and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system is set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.

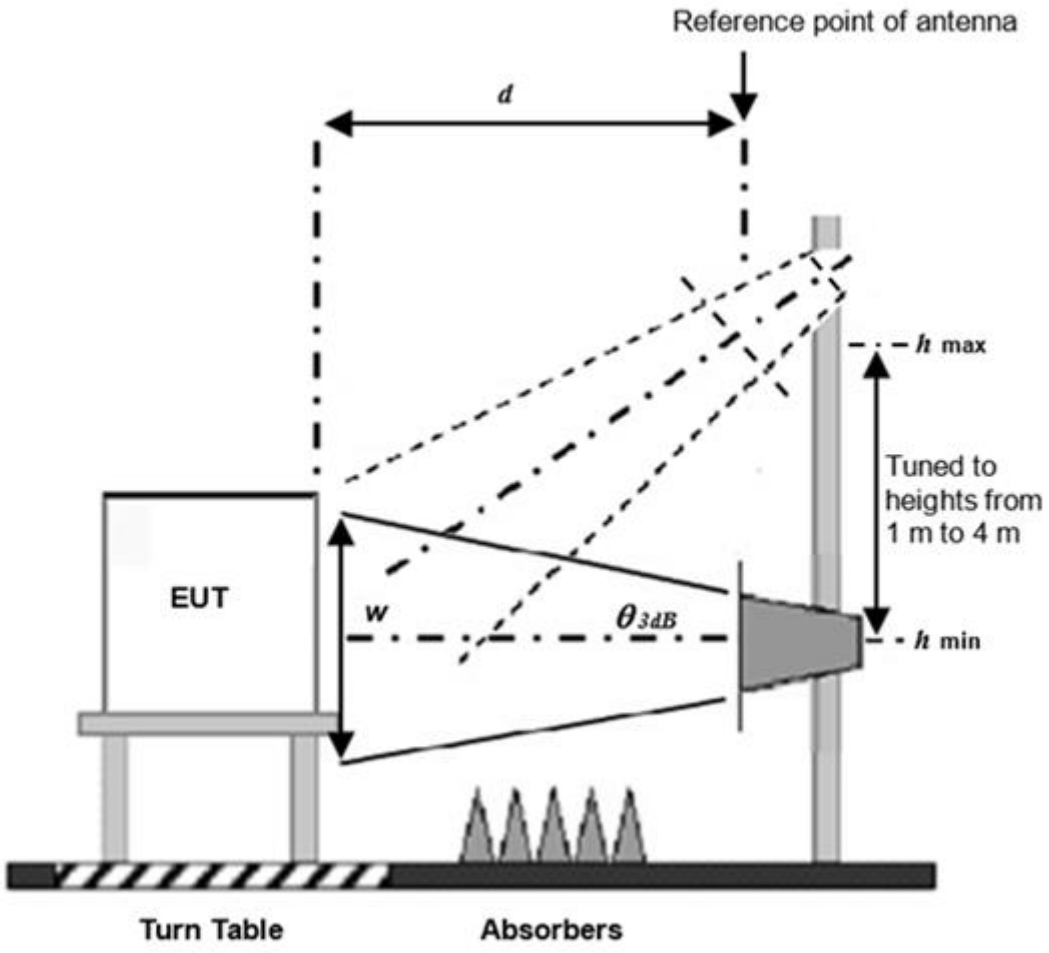


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.2 Radiated Emissions above 1 GHz

a. For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
b. The EUT was set *d* = 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The spectrum analyzer system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



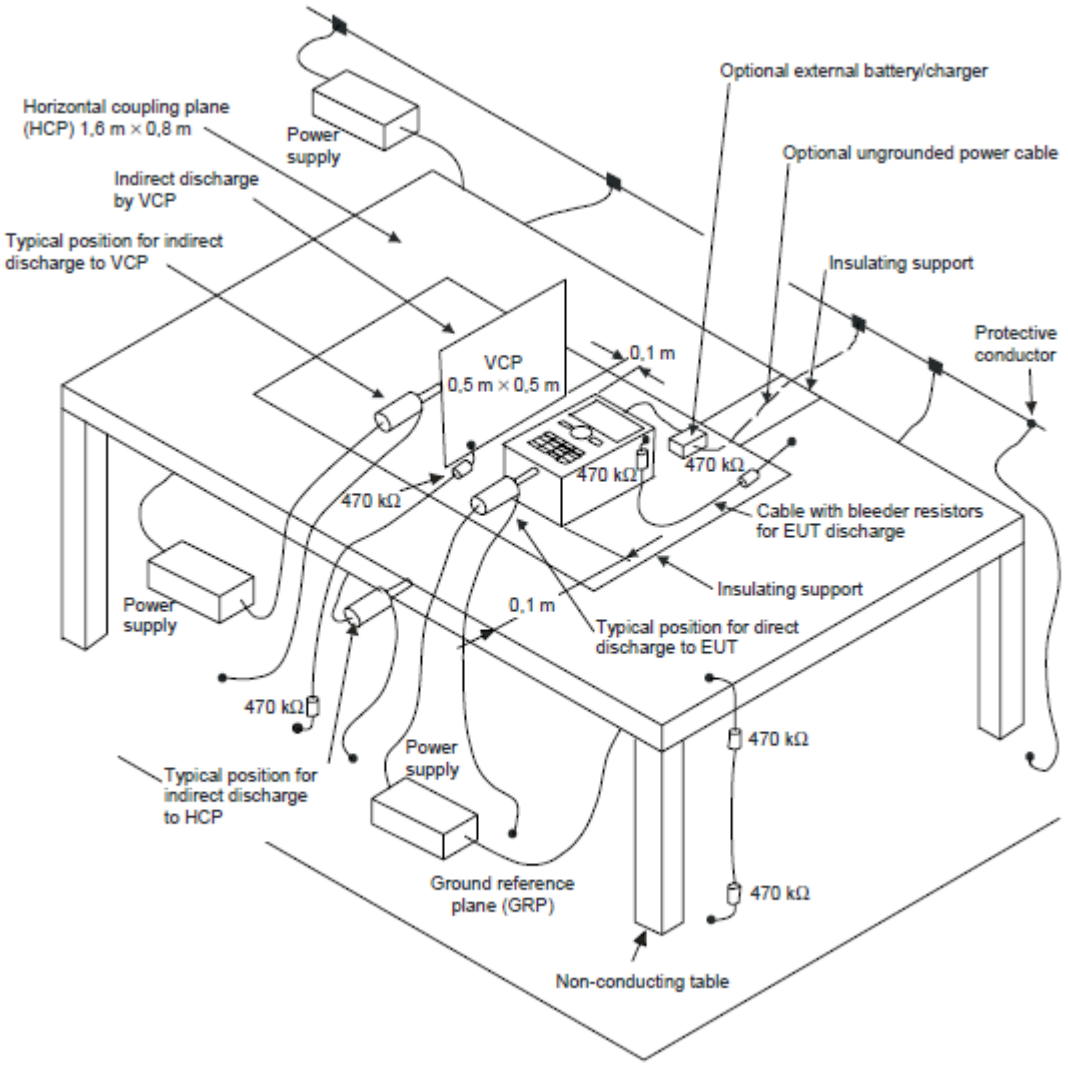
For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.3 Electrostatic Discharges (ESD)

Discharge Impedance:	330 ohm / 150 pF
Number of Discharge:	Air – Direct: 10 discharges per location (each polarity) Contact – Direct & Indirect: 10 discharges per location (each polarity)
Discharge Period:	1-second minimum

The basic test procedure was in accordance with EN/IEC 61000-4-2:

a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
c. The time interval between two successive single discharges was at least 1 second.
d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
f. 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.
g. At least ten single discharges (in the most sensitive polarity) were applied to the **H**orizontal **C**oupling **P**lane at points on each side of the EUT. The ESD generator was positioned at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP.**
h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **V**ertical **C**oupling **P**lane 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.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **G**round **R**eference **P**lane. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **H**orizontal **C**oupling **P**lane (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN/IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 m.

6.4 Radio Frequency Electromagnetic Field (RS)

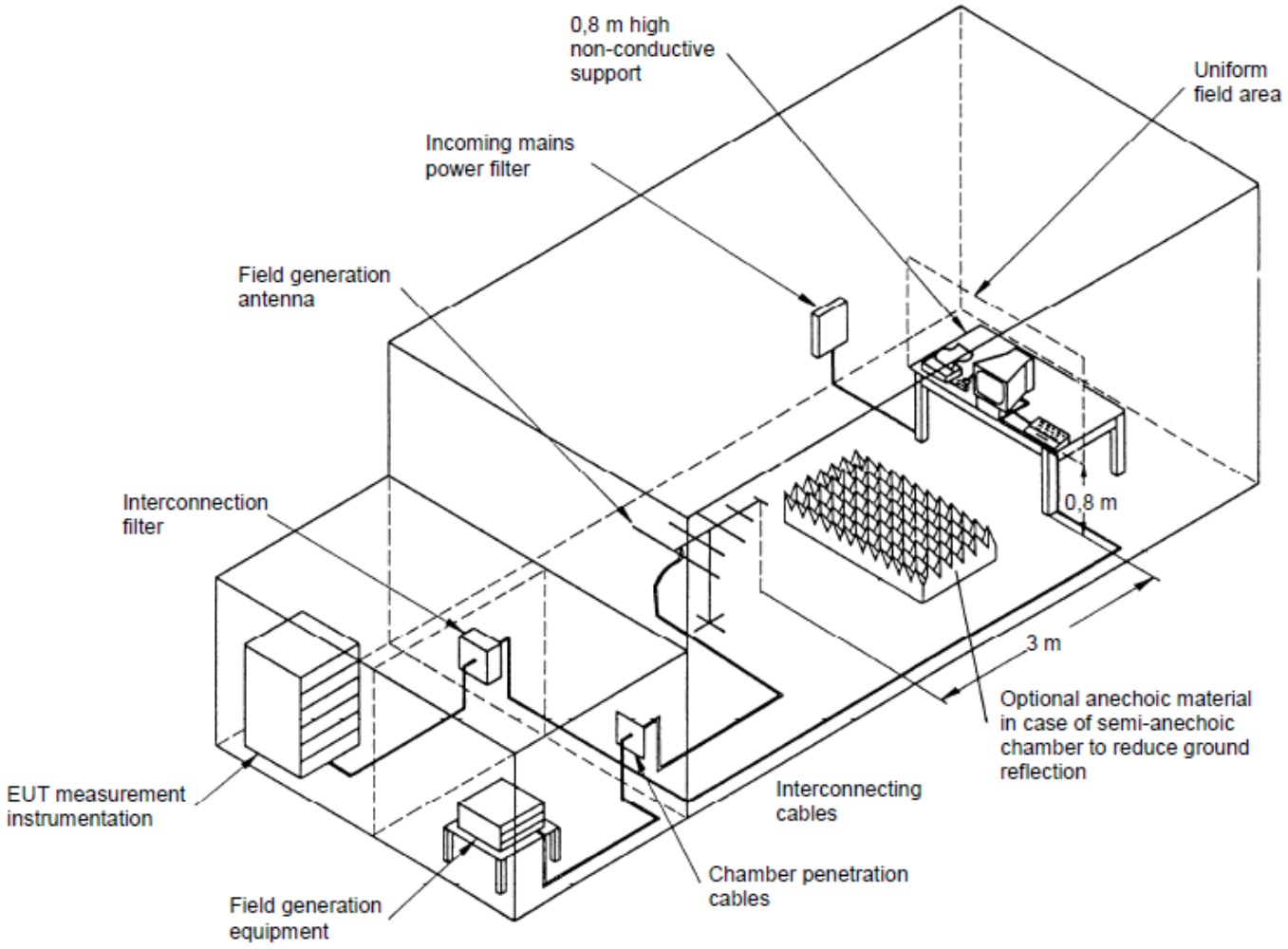
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time:	3 seconds

The test procedure was in accordance with EN/IEC 61000-4-3.

a. The testing was performed in a modified semi-anechoic chamber.

b. The frequency range shall be swept, with the signal 80% amplitude modulated with a 1kHz sine wave.

c. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN/IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN/IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

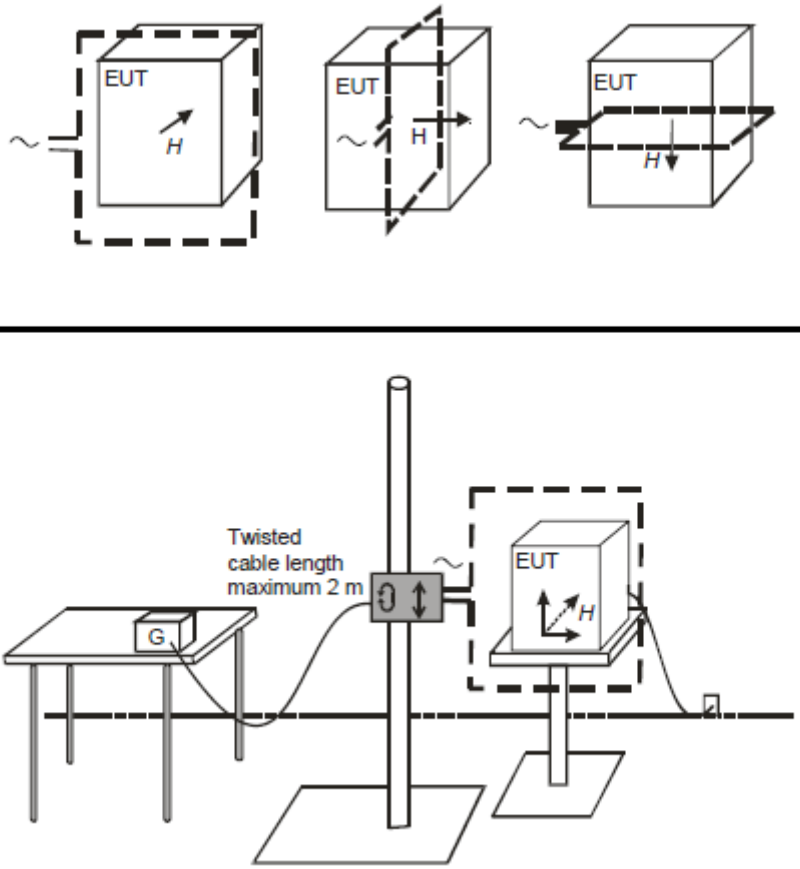
6.5 Power Frequency Magnetic Field (PFMF)

Observation Time:	1 minute
Inductance Coil:	Rectangular coil, 1 m x 1 m (L x W) or 2.6 m x 1 m (L x W)

a. The equipment is configured and connected to satisfy its functional requirements.

b. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

c. 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.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7 Test Results of Test Item

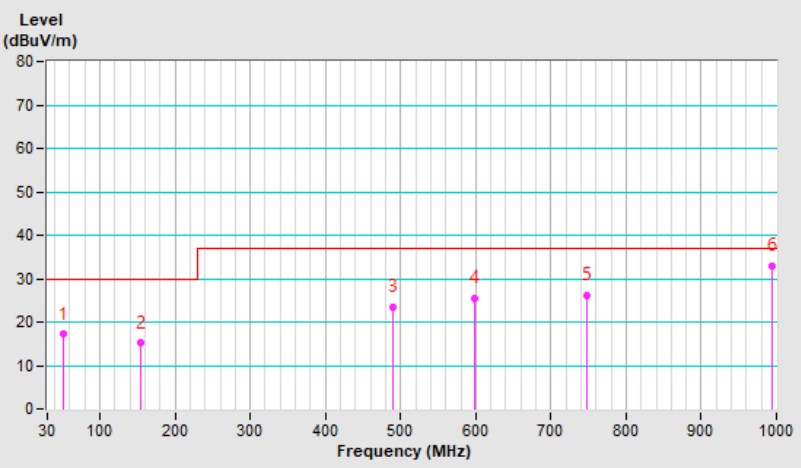
7.1 Radiated Emissions up to 1 GHz

Frequency Range	30 MHz ~ 1 GHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP), 120 kHz
Tested By	Brian Kuo	**Environmental Conditions**	22°C, 71% RH

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	50.40	17.20 QP	30.00	-12.80	2.40 H	161	29.30	-12.10
2	154.84	15.13 QP	30.00	-14.87	2.40 H	1	28.06	-12.93
3	489.07	23.40 QP	37.00	-13.60	2.00 H	306	31.10	-7.70
4	597.77	25.45 QP	37.00	-11.55	1.40 H	169	30.76	-5.31
5	747.90	26.26 QP	37.00	-10.74	4.00 H	157	28.84	-2.58
6	**993.89**	**32.99 QP**	**37.00**	**-4.01**	**3.00 H**	**146**	**31.09**	**1.90**

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. Margin value = Emission level – Limit value
4. The other emission levels were very low against the limit.

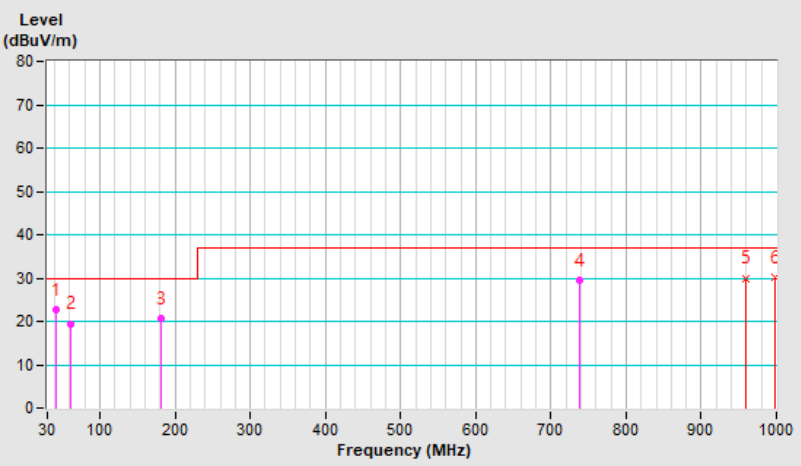


Frequency Range	30 MHz ~ 1 GHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP), 120 kHz
Tested By	Brian Kuo	**Environmental Conditions**	22°C, 71% RH

Antenna Polarity & Test Distance : Vertical at 10 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	41.58	22.61 QP	30.00	-7.39	3.00 V	112	35.87	-13.26
2	60.26	19.30 QP	30.00	-10.70	1.50 V	342	32.32	-13.02
3	181.58	20.53 QP	30.00	-9.47	1.00 V	150	35.50	-14.97
4	738.88	29.38 QP	37.00	-7.62	1.00 V	359	32.03	-2.65
5	959.39	29.75 QP	37.00	-7.25	1.00 V	168	28.07	1.68
6	997.64	30.05 QP	37.00	-6.95	1.00 V	110	27.90	2.15

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. Margin value = Emission level – Limit value
4. The other emission levels were very low against the limit.



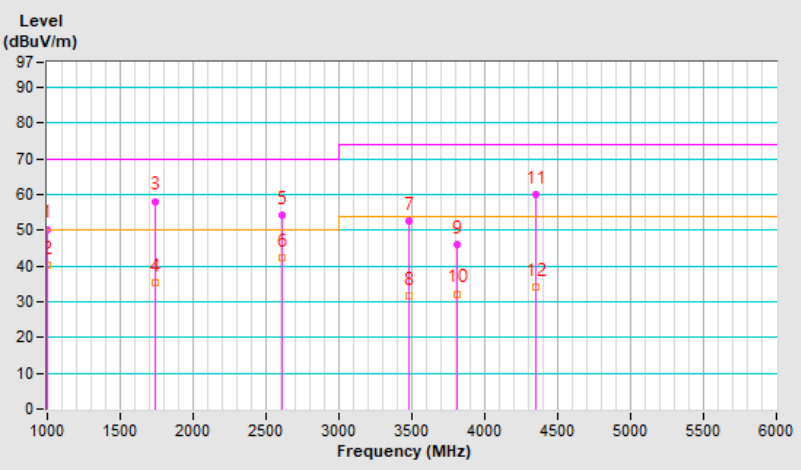
7.2 Radiated Emissions above 1 GHz

Frequency Range	1 GHz ~ 6 GHz	**Detector Function & Resolution Bandwidth**	Peak (PK) / Average (AV), 1MHz
Tested By	Nick Wu	**Environmental Conditions**	23°C, 73% RH

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	1000.44	50.33 PK	70.00	-19.67	1.00 H	1	53.08	-2.75
2	1000.44	40.23 AV	50.00	-9.77	1.00 H	1	42.98	-2.75
3	1739.00	58.10 PK	70.00	-11.90	1.63 H	156	60.45	-2.35
4	1739.00	35.43 AV	50.00	-14.57	1.63 H	156	37.78	-2.35
5	2608.58	54.33 PK	70.00	-15.67	1.24 H	178	53.59	0.74
6	**2608.58**	**42.33 AV**	**50.00**	**-7.67**	**1.24 H**	**178**	**41.59**	**0.74**
7	3478.09	52.56 PK	74.00	-21.44	1.56 H	259	49.84	2.72
8	3478.09	31.57 AV	54.00	-22.43	1.56 H	259	28.85	2.72
9	3807.95	45.86 PK	74.00	-28.14	1.65 H	204	41.80	4.06
10	3807.95	32.23 AV	54.00	-21.77	1.65 H	204	28.17	4.06
11	4347.42	59.88 PK	74.00	-14.12	1.00 H	192	54.28	5.60
12	4347.42	33.98 AV	54.00	-20.02	1.00 H	192	28.38	5.60

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. Margin value = Emission level – Limit value
4. The other emission levels were very low against the limit.

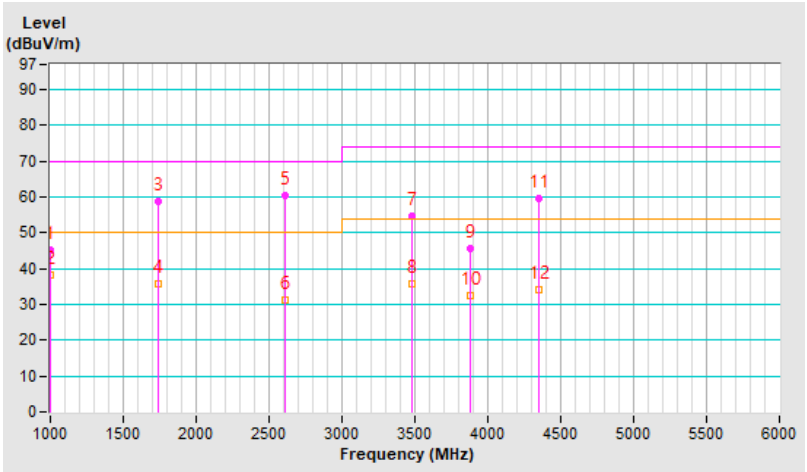


Frequency Range	1 GHz ~ 6 GHz	**Detector Function & Resolution Bandwidth**	Peak (PK) / Average (AV), 1MHz
Tested By	Nick Wu	**Environmental Conditions**	23°C, 73% RH

Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	1001.39	45.09 PK	70.00	-24.91	1.25 V	99	47.84	-2.75
2	1001.39	38.09 AV	50.00	-11.91	1.25 V	99	40.84	-2.75
3	1739.01	58.77 PK	70.00	-11.23	1.47 V	51	61.12	-2.35
4	1739.01	35.65 AV	50.00	-14.35	1.47 V	51	38.00	-2.35
5	2608.50	60.46 PK	70.00	-9.54	1.66 V	99	59.72	0.74
6	2608.50	31.25 AV	50.00	-18.75	1.66 V	99	30.51	0.74
7	3478.04	54.56 PK	74.00	-19.44	1.82 V	166	51.84	2.72
8	3478.04	35.87 AV	54.00	-18.13	1.82 V	166	33.15	2.72
9	3876.14	45.74 PK	74.00	-28.26	1.00 V	339	41.30	4.44
10	3876.14	32.60 AV	54.00	-21.40	1.00 V	339	28.16	4.44
11	4347.50	59.45 PK	74.00	-14.55	1.46 V	120	53.85	5.60
12	4347.50	34.05 AV	54.00	-19.95	1.46 V	120	28.45	5.60

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
   – Pre-Amplifier Factor (dB)
3. Margin value = Emission level – Limit value
4. The other emission levels were very low against the limit.



7.3 Electrostatic Discharges (ESD)

For EN 55035

Input Power	DC 5V	Environmental conditions	23 °C, 45 % RH 986 mbar
Tested by	Matt Lan		

Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criteria
2,4	+/-	Four Side	Note	Note	A

Description of test points of indirect application:

1. Front side 2. Rear side 3. Right side 4. Left side

Note: The EUT is operated normal during the test.

7.4 Radio Frequency Electromagnetic Field (RS)

For EN 55035

Input Power	DC 5V	Environmental conditions	22 °C, 58 % RH 986 mbar
Tested by	Matt Lan		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criteria
			(V/m)	Modulation		
80 - 1000	V&H	0 , 90 , 180 , 270	3	80% AM (1kHz)	Note	A
1800	V&H	0 , 90 , 180 , 270	3	80% AM (1kHz)	Note	A
2600	V&H	0 , 90 , 180 , 270	3	80% AM (1kHz)	Note	A
3500	V&H	0 , 90 , 180 , 270	3	80% AM (1kHz)	Note	A
5000	V&H	0 , 90 , 180 , 270	3	80% AM (1kHz)	Note	A

Note: The EUT is operated normal during the test.

7.5 Power Frequency Magnetic Field (PFMF)

For EN 55035

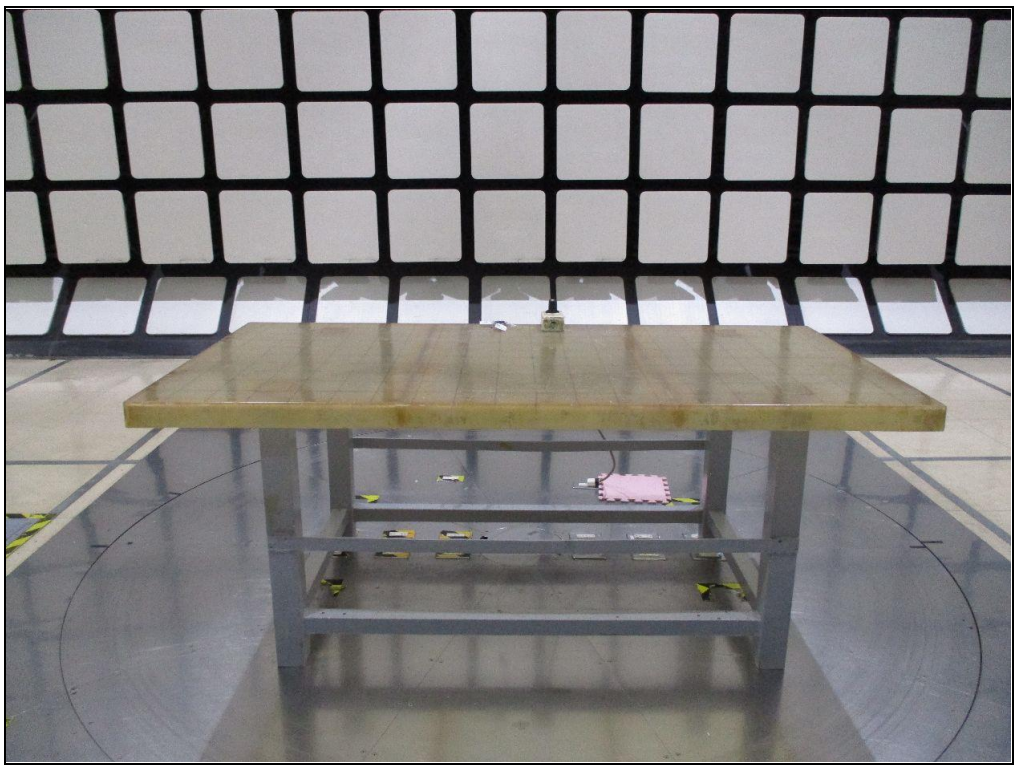
Input Power	DC 5V	Environmental conditions	23 °C, 54 % RH 986 mbar
Tested by	Matt Lan		

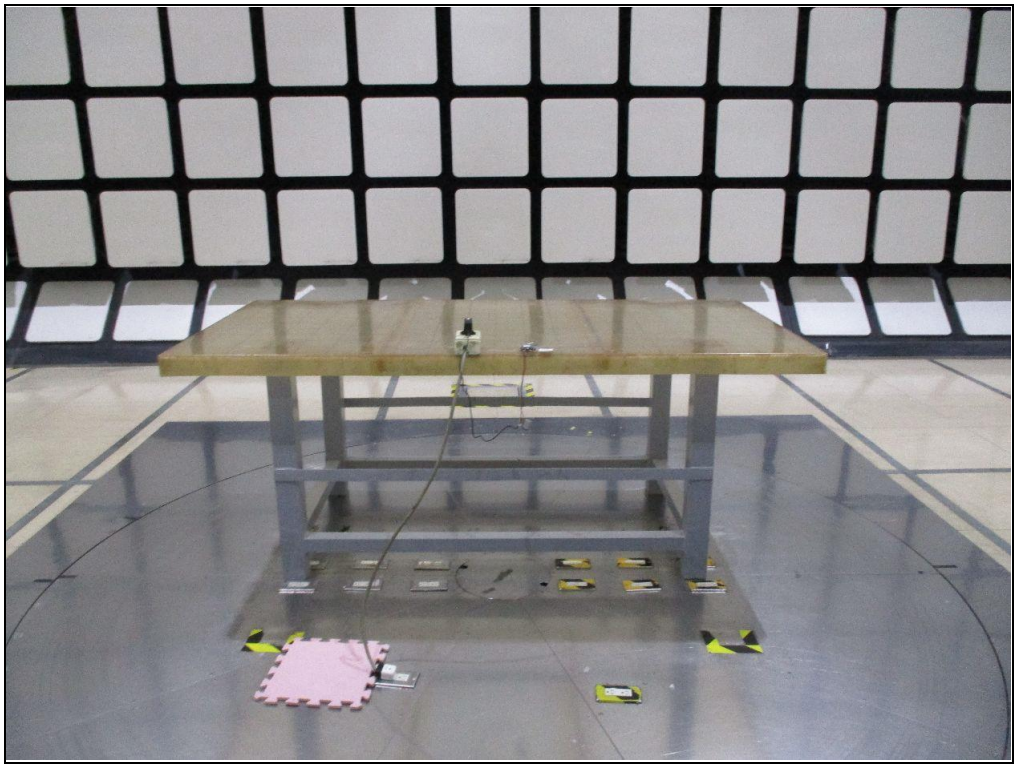
Application	Frequency (Hz)	Field Strength (A/m)	Observation	Performance Criteria
X - Axis	50	1	Note	A
Y - Axis	50	1	Note	A
Z - Axis	50	1	Note	A

Note: The EUT is operated normal during the test.

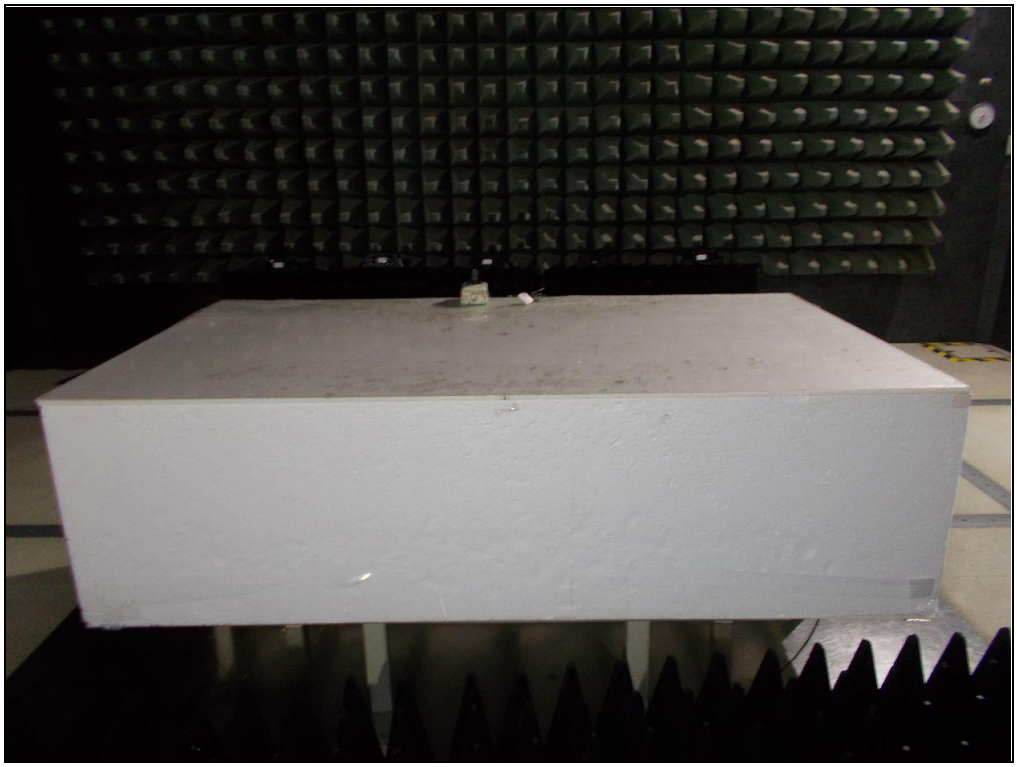
8 Pictures of Test Arrangements

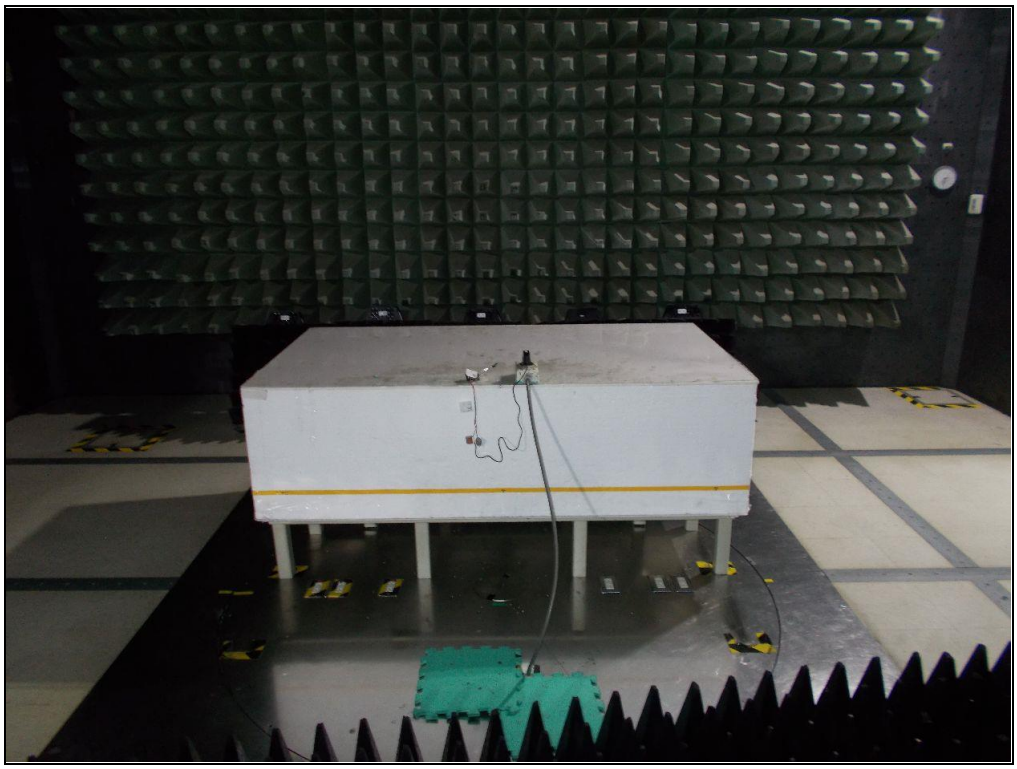
8.1 Radiated Emissions up to 1 GHz



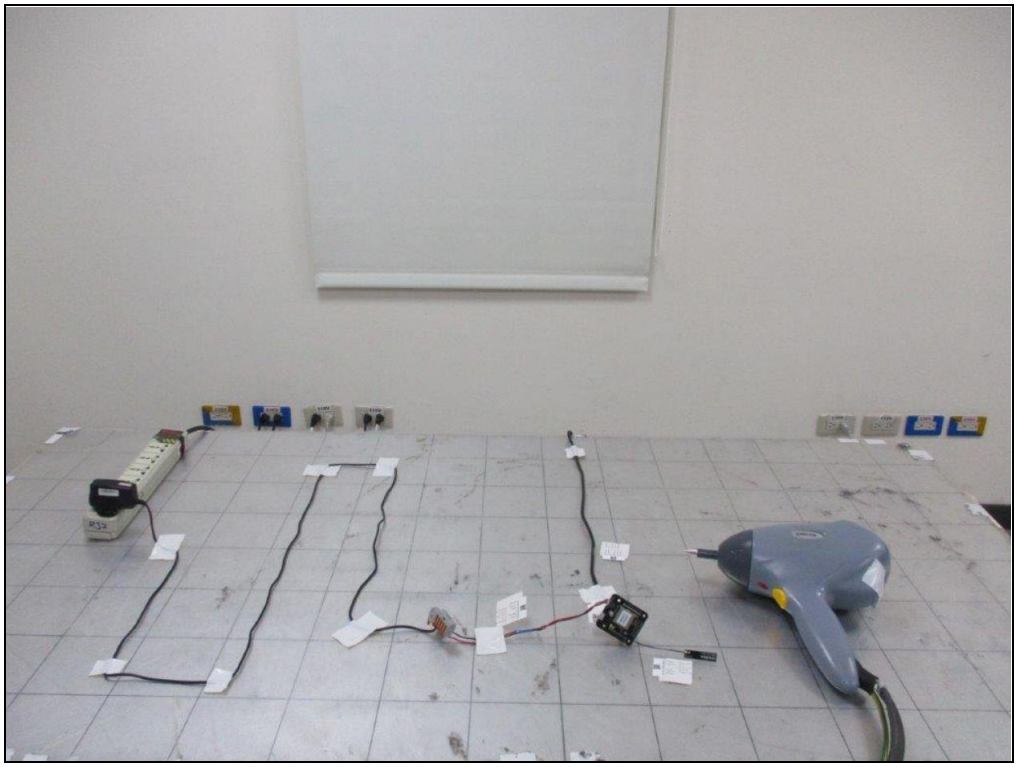


8.2 Radiated Emissions above 1 GHz

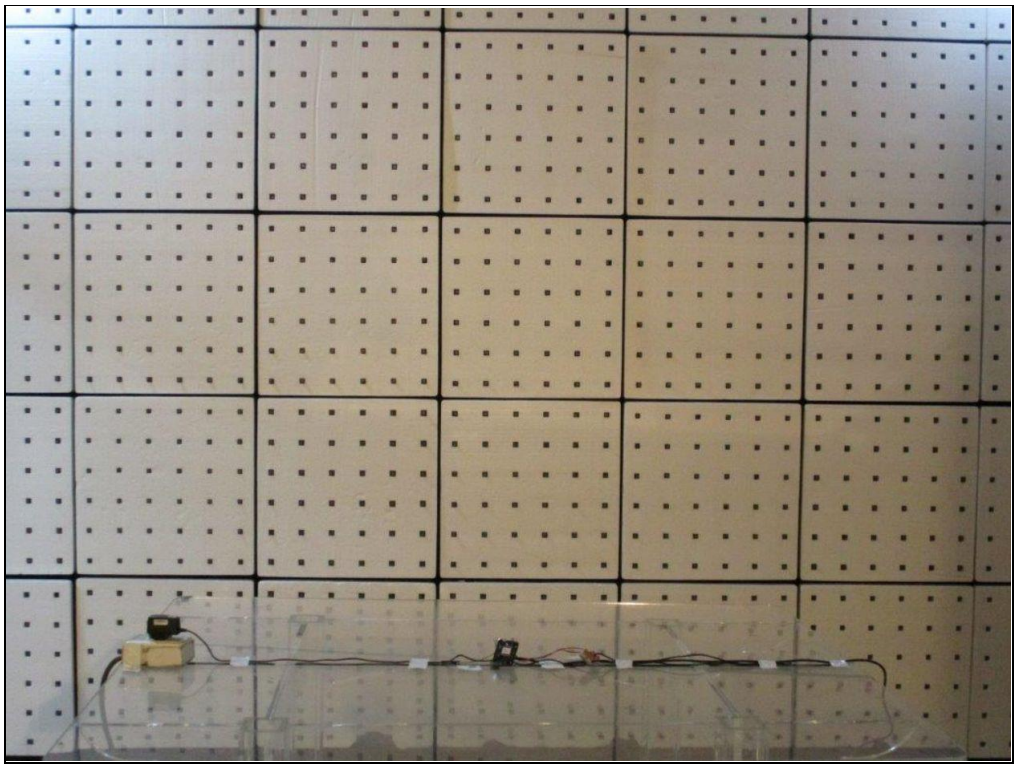




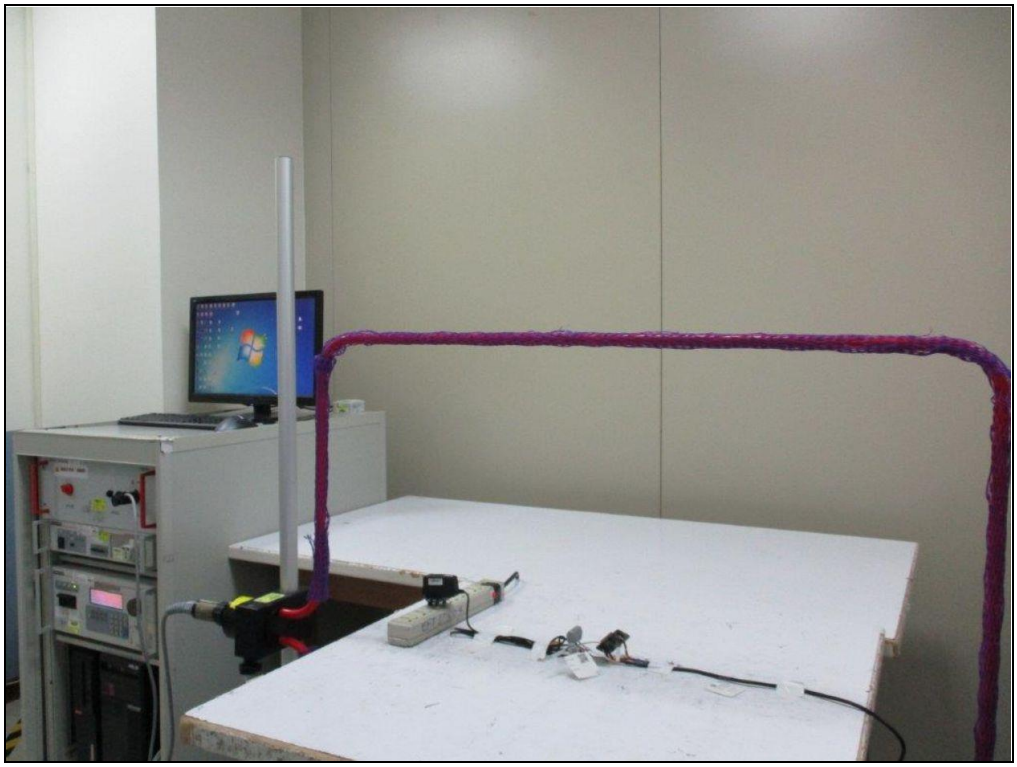
8.3 Electrostatic Discharges (ESD)



8.4 Radio Frequency Electromagnetic Field (RS)



8.5 Power Frequency Magnetic Field (PFMF)



9 Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@bureauveritas.com
Web Site: http://ee.bureauveritas.com.tw

The address and road map of all our labs can be found in our web site also.

--- END ---