

TEST REPORT

Report Number	240200052SEL-EMC1(R1)
Applicant Name/Address	Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-Gu, Suwon-si, Gyeonggi-Do, 16677, Korea
Test Sample Description	
- Product	Micro SD
- Model and/or Brand name	Testing Model: MB-MB512T*, MBMBFGVJQB**-E****, MBMCFGVJQB**-E**** Basic Model: MB-MD1T0S*, MBMDGGVKOB**-7****
- Manufacturer Name / Address . :	Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-Gu, Suwon-si, Gyeonggi-Do, 16677, Korea
- Rating(s)	DC (2.7-3.6) V
- Variant model name	MB-MD512S*, MBMDFGVJQB**-7****, MB-MD256S*, MBMDEGVHDB**-7****, MB-MB1T0T*, MBMBGGVKOB**-7****, MB-MB512T*, MBMBFGVJQB**-E****, MBMCFGVJQB**-E****, MB-MB256T*, MBMBEGVHDB**-E****, MBMCEGVHDB**-E****, MB-MB128T*, MBMBDGVGGB**-E****, MBMCDGVGGB**-E****
Receipt of sample(s)	16 Jun. 2025
Date of Test	17 Jun. 2025 ~ 19 Jun. 2025
Test Method(s)	EN 55032:2015/A11:2020+A1:2020(Class B) EN 55035:2017+A11:2020
Test Results & Uncertainty	See EMC Results Conclusion
Issue date	23 Jun. 2025

Note 1. The results shown in this test report refer only to the sample(s) tested.

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Note 3: Intertek is applied the Simple Acceptance without considering the measurement uncertainty according to ILAC G8-09/2019.

Note 4: This test report is not related to "KOLAS accreditation".

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Report No.: 240200052SEL-EMC1(R1)

Tested by

Name : Hwangsik Jung
Engineer

Approved by

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SECTION 2 EMC RESULTS CONCLUSION (WITH JUSTIFICATION)

We tested the Micro SD, Model: MB-MB512T*, MBMBFGVJQB**-E****, MBMCFGVJQB**-E****, to determine if it was in compliance with the relevant EN standards as marked on the test report.

We found that the unit met the requirement of EN 55032, EN 55035 standards when tested as received.

Test Items	Test Method	Results			See Note
		Comply	Not Comply	N/A	
I. Emission					
Conducted Emission	EN 55032	☒	☐	☐	☐
Radiated Emission (Below 1 GHz)	EN 55032	☒	☐	☐	☐
Radiated Emission (Above 1 GHz)	EN 55032	☒	☐	☐	☐
Conducted Differential Voltage	EN 55032	☐	☐	☒	☐
Harmonics	EN IEC 61000-3-2	☐	☐	☒	☐
Voltage Fluctuations and Flicker	EN 61000-3-3	☐	☐	☒	☐
II. Immunity					
Electrostatic Discharge	EN 55035 EN 61000-4-2	☒	☐	☐	☐
Radiated Immunity	EN 55035 EN 61000-4-3	☒	☐	☐	☐
Fast Transient	EN 55035 EN 61000-4-4	☒	☐	☐	☐
Surge Immunity	EN 55035 EN 61000-4-5	☒	☐	☐	☐
Conducted Immunity	EN 55035 EN 61000-4-6	☒	☐	☐	☐
Voltage Dips and Interruptions	EN 55035 EN 61000-4-11	☒	☐	☐	☐
-					





SECTION 3 EUT INFORMATION

Equipment Under Test (EUT):	Micro SD
Model:	MB-MB512T*, MBMBFGVJQB**-E****, MBMCFGVJQB**-E**** (Basic Model: MB-MD1T0S*, MBMDGGVKOB**-7****)
Variant Model:	MB-MD512S*, MBMDFGVJQB**-7****, MB-MD256S*, MBMDEGVHDB**-7****, MB-MB1T0T*, MBMBGGVKOB**-7****, MB-MB512T*, MBMBFGVJQB**-E****, MBMCFGVJQB**-E****, MB-MB256T*, MBMBEGVHDB**-E****, MBMCEGVHDB**-E****, MB-MB128T*, MBMBDGVGGB**-E****, MBMCDGVGGB**-E****
Variant model information:	The model is dualization model depending on storage capacity. MB-MD1T0S*, MBMDGGVKOB**-7****: 1 TB MB-MB1T0T*, MBMBGGVKOB**-7****: 1 TB MB-MD512S*, MBMDFGVJQB**-7****: 512 GB MB-MD256S*, MBMDEGVHDB**-7****: 256 GB MB-MB512T*, MBMBFGVJQB**-E****, MBMCFGVJQB**-E****: 512 GB, PCB dualization MB-MB256T*, MBMBEGVHDB**-E****, MBMCEGVHDB**-E****: 256 GB, PCB dualization MB-MB128T*, MBMBDGVGGB**-E****, MBMCDGVGGB**-E****: 128 GB, PCB dualization
Capacity:	1 TB, 512 GB, 256 GB, 128 GB
Serial No.:	-
Rated Voltage:	DC (2.7-3.6) V
Maximum clock frequency:	208 MHz
Etc:	Test the enclosure and AC power ports using the Notebook PC's power source.





SECTION 4 TEST Configuration, Operation mode and SET-UP

Ancillary Equipment List

Equipment	Model No.	Serial No.	Manufacturer	ETC.
Micro SD	MB-MB512T*, MBMBFGVJQB**- E****, MBMCFGVJQB**- E****	-	Samsung Electronics Co., Ltd.	EUT
Notebook PC	P73G	-	DELL INC.	AE
AC Adapter	LA65NM130	-	Liteon Technology Corporation ,Lite-On Technology (Changzhou) Co.,Ltd.	AE

Interface Cable

Start		END		CABLE		
Name	I/O Port	Name	I/O Port	Length (m)	Shield	With Ferrite
EUT	TF Slot type	Notebook PC	TF Card slot	-	-	-
Notebook PC	DC IN	AC Adapter	DC OUT	1.8	Unshielded	-
AC Adapter	AC IN	AC Power	AC OUT	1.0	Unshielded	-

Test Operation Mode

- Operating mode: After configuring the EUT as in the layout diagram, it is tested in the read, written and erased repeat state using the "EMC Exerciser" application program on the Notebook PC.

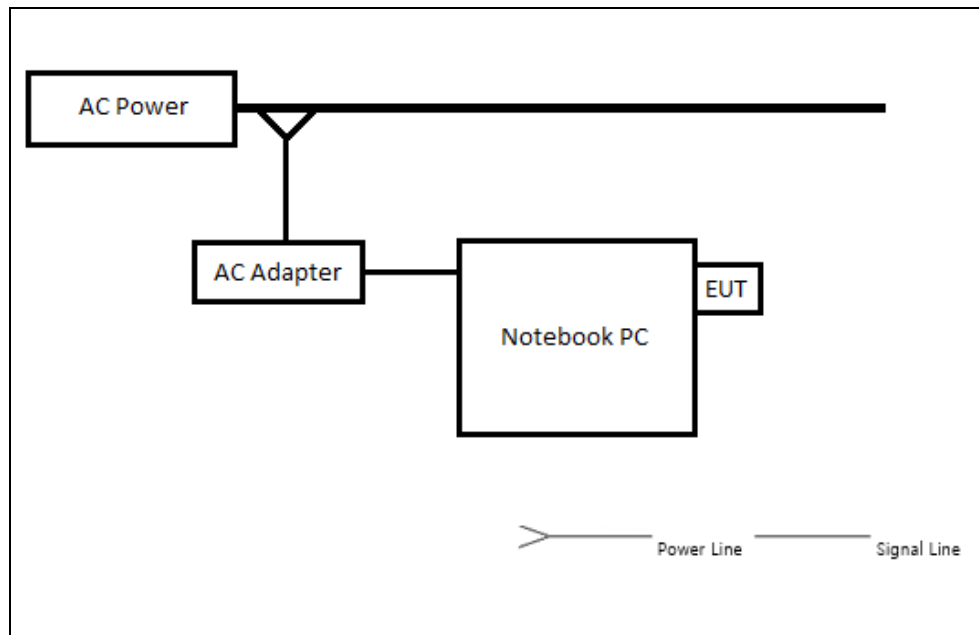
Reference of monitoring

- Check the data reading, writing, and erasing status with Display of Notebook PC.





Test Setup





SECTION 5 EMISSION

Conducted Emission

Test Method

Test standard : EN 55032

Used Test Equipment

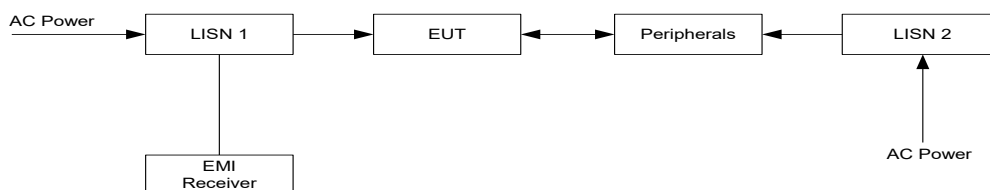
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC004	EMI Test Receiver	R & S	ESR7	101560	2026.01.02	1Y
EMC169	Two-Line V-Network	R & S	ENV216	101982	2026.04.03	1Y
Software	EMC32 (10.28.00)	ROHDE & SCHWARZ	-	-	-	-

Operating Environment

Test Voltage: AC 230 V, 50 Hz

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
Shielded Room 2	06-17	23.2 ± 1.0	41.1 ± 1.0	-

Test Setup and Procedure



The EUT along with its peripherals were placed on a 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 m space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 characteristic coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.



**Limits**

Conducted disturbance at mains ports

Frequency range (MHz)	Quasi-peak (dBμV) Class A	Average (dBμV) Class A
0.15 to 0.50	79	66
0.50 to 30	73	60

Note 1) The lower limit shall apply at the transition frequencies.

Note 2) The limit decreases linearly with the logarithm of the frequency in the range (0.15 ~ 0.5) MHz.

Note 3) Result (dBμV) = Reading (dBμV) + Corr. (Insertion Loss (dB) + Cable Loss (dB))

where. Result: Final value (QuasiPeak, Average),

Reading: Receiver reading value,

Corr.: Correction Factor (Margin = Limit – Result)

Frequency range (MHz)	Quasi-peak (dBμV) Class B	Average (dBμV) Class B
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note 1) The lower limit shall apply at the transition frequencies.

Note 2) The limit decreases linearly with the logarithm of the frequency in the range (0.15 ~ 0.5) MHz.

Note 3) Result (dBμV) = Reading (dBμV) + Corr. (Insertion Loss (dB) + Cable Loss (dB))

where. Result: Final value (QuasiPeak, Average),

Reading: Receiver reading value,

Corr.: Correction Factor (Margin = Limit – Result)

Conducted disturbance at telecommunication ports

Frequency range (MHz)	Quasi-peak (dBμV) Class A	Average (dBμV) Class A
0.15 to 0.50	97 to 87	84 to 74
0.5 to 30	87	74

Note 1) The lower limit shall apply at the transition frequencies.

Note 2) The limit decreases linearly with the logarithm of the frequency in the range (0.15 ~ 0.5) MHz.

Note 3) Result (dBμV) = Reading (dBμV) + Corr. (Insertion Loss (dB) + Cable Loss (dB))

where. Result: Final value (QuasiPeak, Average),

Reading: Receiver reading value,

Corr.: Correction Factor (Margin = Limit – Result)

Frequency range (MHz)	Quasi-peak (dBμV) Class B	Average (dBμV) Class B
0.15 to 0.50	84 to 74	74 to 64
0.5 to 30	74	64

Note 1) The lower limit shall apply at the transition frequencies.

Note 2) The limit decreases linearly with the logarithm of the frequency in the range (0.15 ~ 0.5) MHz.

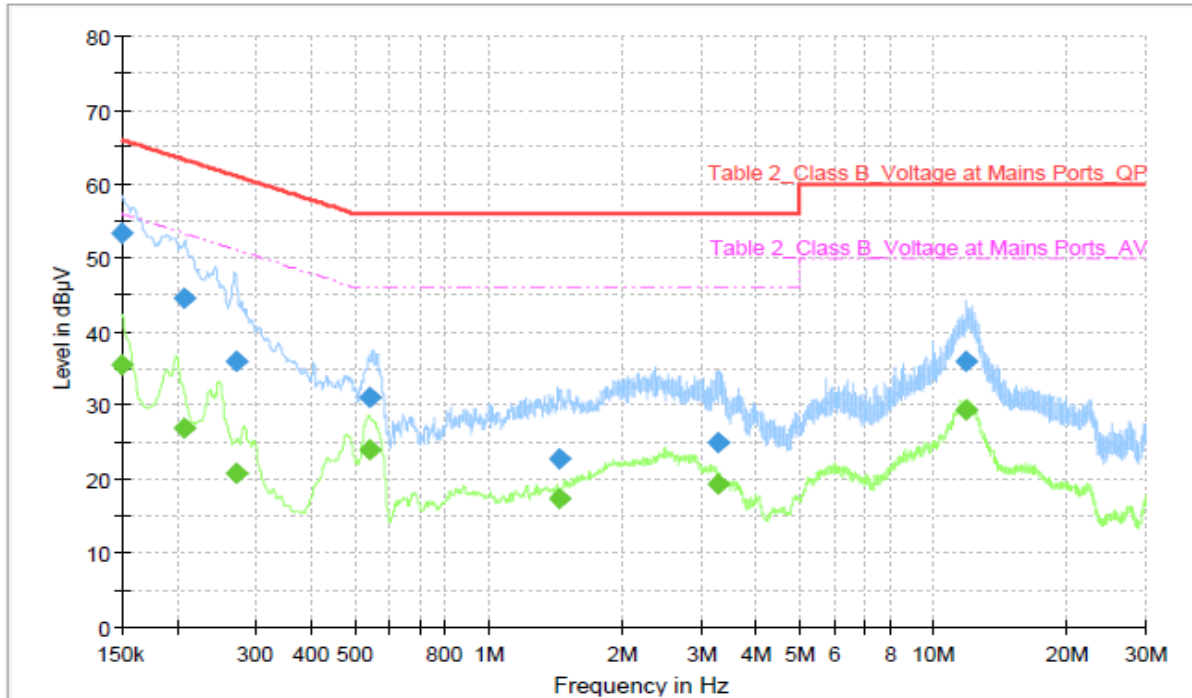
Note 3) Result (dBμV) = Reading (dBμV) + Corr. (Insertion Loss (dB) + Cable Loss (dB))

where. Result: Final value (QuasiPeak, Average),

Reading: Receiver reading value,

Corr.: Correction Factor (Margin = Limit – Result)



**Test Data****Final Result**

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150322	53.41	---	65.98	12.57	N	ON	9.8
0.150322	---	35.52	55.98	20.46	N	ON	9.8
0.208054	---	26.93	53.28	26.35	N	ON	9.9
0.208054	44.45	---	63.28	18.83	N	ON	9.9
0.270577	35.92	---	61.10	25.18	N	ON	9.8
0.270577	---	20.91	51.10	30.19	N	ON	9.8
0.544213	---	23.98	46.00	22.02	N	ON	9.9
0.544213	31.09	---	56.00	24.91	N	ON	9.9
1.449844	---	17.33	46.00	28.67	L1	ON	9.8
1.449844	22.84	---	56.00	33.16	L1	ON	9.8
3.277584	---	19.29	46.00	26.71	L1	ON	9.8
3.277584	24.92	---	56.00	31.08	L1	ON	9.8
11.856226	---	29.38	50.00	20.62	L1	ON	9.9
11.856226	36.00	---	60.00	24.00	L1	ON	9.9





Radiated Emission

Test Method and Summary

Test standard : EN 55032

Used Test Equipment

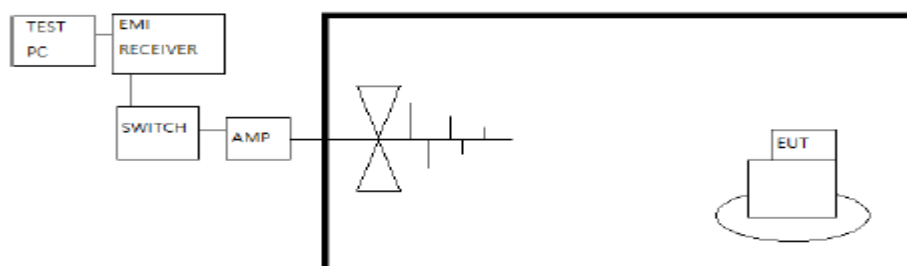
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC001	EMI Test Receiver	R & S	ESU40	100478	2026.01.02	1Y
EMC002	EMI Test Receiver	R & S	ESU26	100590	2026.01.02	1Y
EMC027	Biconilog (Type7)	ETS-Lindgren	3142E	00201450	2025.12.19	2Y
EMC028	DRG Horn (Medium)	ETS-Lindgren	3117	00201915	2025.10.04	1Y
EMC074	AMP	R & S	SCU-01D	1904843	2025.06.27	1Y
EMC215	Preamplifier	Agilent	HP 8449B	3008A01832	2026.02.04	1Y
-	CONTROLLER	Innco systems GmbH	CO3000	CO3000/887 /36540815/L	-	-
-	TURN TABLE	Innco systems GmbH	DT3000-2T	-	-	-
-	ANTENNA MASTER	Innco systems GmbH	MA4000-XP-ET	-	-	-
SOFTWARE	EMC32 (10.30.00)	ROHDE & SCHWARZ	-	-	-	-

Operating Environment

Test Voltage: AC 230 V, 50 Hz

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
10 m Chamber (Below 1 GHz)	06-18	23.2 ± 1.0	43.9 ± 1.0	-
10 m Chamber (Above 1 GHz)	06-18	23.5 ± 1.0	44.2 ± 1.0	-

Test Setup and Procedure



The EUT along with its peripherals were placed on a non-conducted table with a height of 0.8 m in height table above the reference ground plane.

Rotate the EUT from 0° to 360° and position the receiving antenna at heights from 1 m to 4 m above the reference ground plane continuously to determine associated with higher emission levels and record them.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

For measurements above 1 GHz,





Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal.
The final measurement antenna elevation shall be that which maximizes the emissions.

Limits

- The test frequency range of Radiated Disturbance measurements are listed below.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 6 GHz, whichever is lower

(1) Radiated Disturbance below 1 000 MHz at a measuring distance of 10 m

Frequency range (MHz)	Quasi-peak limits (dBμV/m)	
	Class A	Class B
30 to 230	40.0	30.0
230 to 1 000	47.0	37.0

Note 1) The lower limit shall apply at the transition frequency.

Note 2) Additional provisions may be required for cases where interference occurs.

Note 3) Result (dBμV/m) = Reading (dBμV) + c.f. (Ant. Factor (dB/m) + Cable Loss (dB) – Amp Gain (dB))

When, Result: Final value, Reading: Receiver reading value, c.f.: Correction Factor

Margin = Limit – Result

(2) Limits for Radiated Emission above 1 000 MHz at a measuring distance of 3 m

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

Note 1) Result (dBμV/m) = Reading (dBμV) + c.f. (Ant. Factor (dB/m) + Cable Loss (dB) - Amp Gain (dB))
when, Result: Final value, Reading: Receiver reading value, c.f. : Correction Factor

Margin = Limit - Result

Note 2) If measured at a distance other than 3 m, apply the following formula to compensate the measured value.

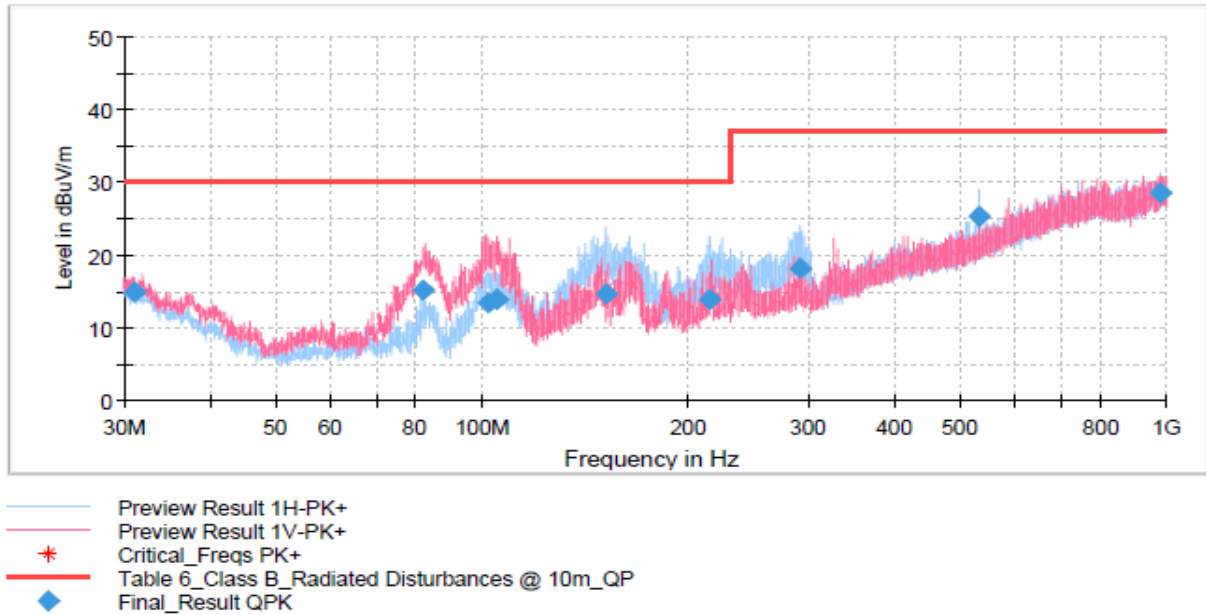
$E_m = E_{dm} + 20\log(d/3)$ (d: Measured distance)

E_m : Result of measured distance correction, E_{dm} : Measured value



**Test Data**

[30 MHz ~ 1 GHz]

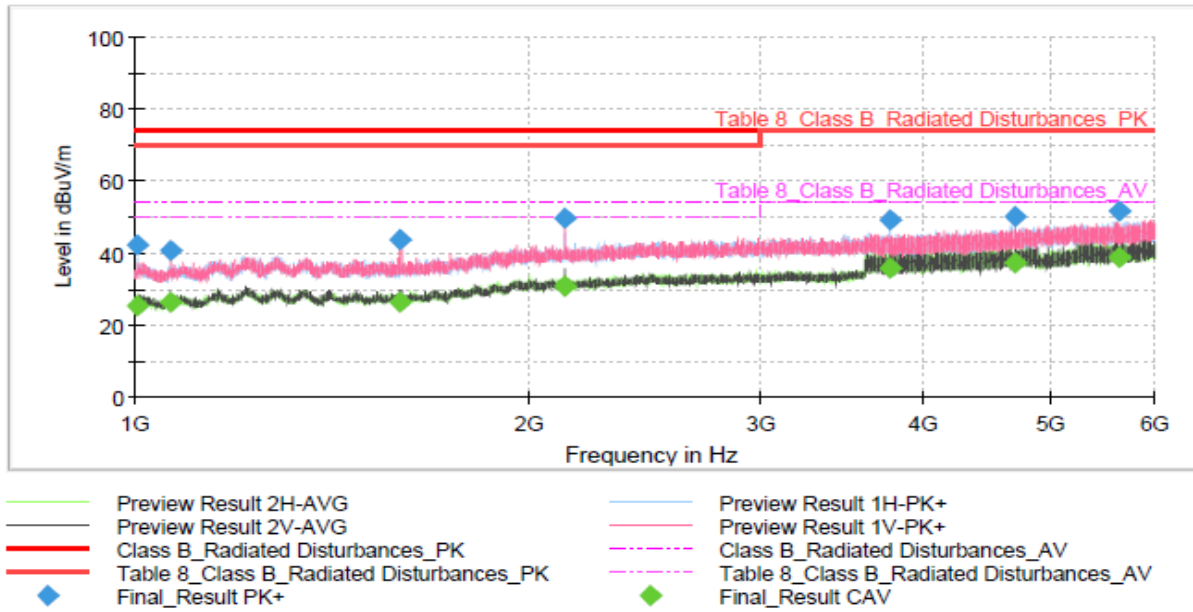
**Final Result**

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.99	15.03	30.00	14.97	164.0	V	51.00	-8.35
82.10	15.18	30.00	14.82	392.0	V	242.00	-16.16
101.93	13.44	30.00	16.56	144.0	V	21.00	-14.60
105.32	13.83	30.00	16.17	145.0	V	241.00	-14.63
152.25	14.70	30.00	15.30	385.0	H	160.00	-12.47
215.35	13.86	30.00	16.14	397.0	H	141.00	-10.34
291.34	18.20	37.00	18.80	366.0	H	241.00	-7.72
533.12	25.33	37.00	11.67	204.0	H	119.00	0.23
978.04	28.53	37.00	8.47	143.0	H	194.00	7.85





[1 GHz ~ 6 GHz]



Final Result

Frequency (MHz)	MaxPeak (dBuV/m)	CAverage (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1002.33	---	25.25	50.00	24.75	151.0	H	192.00	-4.92
1002.33	42.20	---	70.00	27.80	151.0	H	192.00	-4.92
1062.67	---	26.44	50.00	23.56	118.0	V	46.00	-4.60
1062.67	40.82	---	70.00	29.18	118.0	V	46.00	-4.60
1593.50	43.77	---	70.00	26.23	271.0	V	46.00	-1.93
1593.50	---	26.13	50.00	23.87	271.0	V	46.00	-1.93
2130.00	---	30.60	50.00	19.40	209.0	V	46.00	3.41
2130.00	49.54	---	70.00	20.46	209.0	V	46.00	3.41
3760.83	---	35.65	54.00	18.35	310.0	H	30.00	7.88
3760.83	49.14	---	74.00	24.86	310.0	H	30.00	7.88
4689.67	50.24	---	74.00	23.76	376.0	H	168.00	9.89
4689.67	---	37.33	54.00	16.67	376.0	H	168.00	9.89
5635.00	---	38.62	54.00	15.38	297.0	V	302.00	11.63
5635.00	51.92	---	74.00	22.08	297.0	V	302.00	11.63

* The margin of the limit in the 1 GHz to 3 GHz band was applied with EN 55032:A11, which is a worst condition.



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Conducted Differential Voltage

Test Method and Summary

Test standard : EN 55032

Used Test Equipment

Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
-	-	-	-	-	-	-

Operating Environment

Test Voltage: -

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
-	-	-	-	-

Test Setup and Procedure

The antenna terminals of the EUT and the auxiliary signal generator are connected to the Measuring set by means of coaxial cables and a resistive combining network having a minimum Attenuation of 6 dB. The EUT tuned to the wanted signal.

The measuring set is tuned to the relevant radiated frequency and the disturbance level is Measured taking into account the attenuation between the receiver antenna terminal and the Measuring set input.

Limits

Equipment type	Source	Frequency MHz	Limit values dB(μV) 75 Ohm Quasi-peak	
Television receivers, video recorders and PC tuner cards working in channels between 30 MHz and 1 GHz	Local oscillator	30 to 950	Fundamental	46
		950 to 2 150	Fundamental	54
		30 to 950	Harmonics	46
	Other	950 to 2 150	Harmonics	54
		30 to 2 150		46
Frequency modulation sound receivers and PC tuner cards	Local oscillator	≤1000	Fundamental	54
		30 to 300	Harmonics	50
	Other	300 to 1 000	Harmonics	52
		30 to 1 000		46

Note 1) At frequencies above 1 GHz the peak detector is used.





Report No.: 240200052SEL-EMC1(R1)

Test Data

N/A



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Harmonics

Test Method

Test standard : EN IEC 61000-3-2

Used Test Equipment

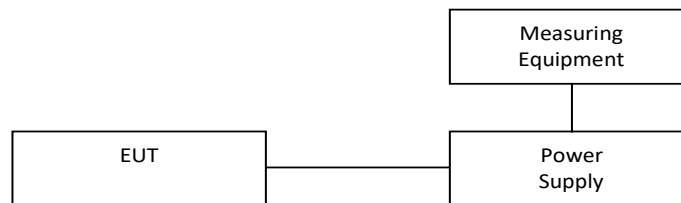
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
-	-	-	-	-	-	-

Operating Environment

Test Voltage: -

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
-	-	-	-	-

Test Setup and Procedure



The limits of harmonic components of the input current which may be produced by equipment having an input current up to and including 16 A per phase, and which is intended to be connected to public low-voltage distribution system had been checked.

Class A:

- balanced three-phase equipment;
- household appliances, excluding those specified as belonging to Class B, C or D;
- vacuum cleaners;
- high pressure cleaners;
- tools, excluding portable tools;
- independent phase control dimmers;
- audio equipment;
- professional luminaires for stage lighting and studios

Class B:

- portable tools
- arc welding equipment which is not professional equipment





Class C:

- lighting equipment

Class D:

Equipment having a specified power less than or equal to 600 W according to 6.3.2 of the following types

- personal computers and personal computer monitors;
- television receivers;
- refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

Note 1) According to EN 61000-3-2 the manufacturer shall specify the power of the apparatus. This value shall be used for establishing limits; the specified power shall be within $\pm 10\%$ of the measured power.

Note 2) Limit are not specified for

- Equipment with a rated power of 75 W or less (other than lighting equipment)
- Professional equipment with a total rated power greater than 1 kW
- Symmetrically controlled heating elements with a rated power less than or equal to 200 W
- Independent dimmers for incandescent lamps with a rated power less than or equal to 1



**Limit**

Class A equipment

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

Class B equipment

It shall not exceed the value give in Class A multiplied by a factor of 1.5.

Class C equipment

Harmonic order (n)	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	27
5	10
7	7
9	5
$11 \leq n \leq 39$ (odd harmonics only)	3

Class D equipment

Harmonic order (n)	Maximum permissible Harmonic current per watt (mA/W)	Maximum permissible Harmonic current (A)
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
$13 \leq n \leq 39$ (odd harmonics only)	$3.85/n$	See Class A





Test Data

N/A





Voltage fluctuations and flicker

Test Method

Test standard : EN 61000-3-3

Used Test Equipment

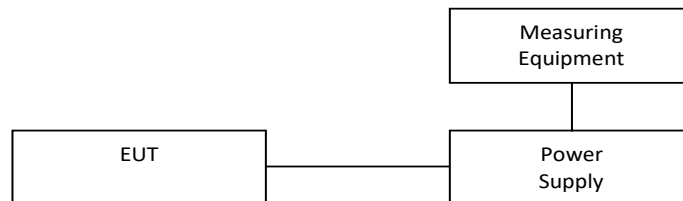
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
-	-	-	-	-	-	-

Operating Environment

Test Voltage: -

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
-	-	-	-	-

Test Setup and Procedure



The limits of voltage changes which may be produced by an equipment tested under specified conditions and which is intended to be connected to public low-voltage distribution system had been checked.

Limits

- the short-term flicker indicator, Pst, shall not be greater than 1.0
- the long-term flicker indicator, Plt, shall not be greater than 0.65
- the relative steady-state voltage change, dc shall not exceed 3.3 %
- the voltage change with time, d(t), during a voltage change shall not exceed 3.3 % for more than 500 ms
- the maximum relative voltage change, dmax, shall not exceed
 - a) 4 % without additional conditions
 - b) 6 % for equipment which is switched manually, if any
 - c) 7 % for equipment which is attended whilst in use, if any





Test Data

N/A





SECTION 6 IMMUNITY

Performance Criteria for Immunity test

The performance criteria was based on the following guidelines:

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.





Electrostatic Discharge

Test Method and Summary

Test standard : EN 61000-4-2

Used Test Equipment

Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC065	FLAGSHIP ESD SIMULATOR	TESEQ	NSG 438	197	2026.01.09	1Y

Operating Environment

Test Voltage: AC 230 V, 50 Hz

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
Shielded Room 1	06-19	23.6 ± 1.0	43.4 ± 1.0	100.3

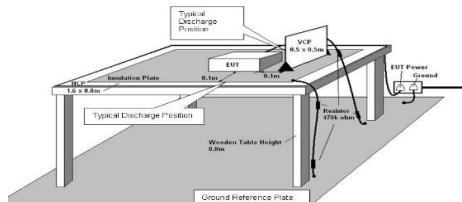
The EUT shall be operated within its intended climatic conditions

In the case of air discharge testing, the climatic conditions shall be within the following ranges

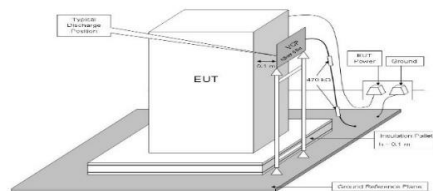
Ambient temperature	15 °C to 35 °C
Relative humidity	30 % R.H. to 60 % R.H.
Atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1 060 mbar)

Test Setup and Procedure

The typical table-top test setup is as follow:



The typical Floor-standing test setup is as follow:



A ground reference plane was located on the floor, and connected to earth via a low impedance connection. The return cable of the ESD generator was connected to the reference plane



**Test Summary**

Basic Standard		EN 61000-4-2
Level:		$\pm 2.0 / 4.0 / 8.0$ kV (Air Discharge)
		± 4.0 kV (Contact Discharge)
		± 4.0 kV (Indirect Contact Discharge)
Required Performance Criterion:		B
No. of Discharge		≥ 10
Time Between Each Discharge:		1 s
Test Mode:		Operating Mode
Test Point:	All accessible insulated enclosure and seams	
	Air Discharge:	All accessible points where contact discharge cannot be applied
	Contact:	All conductive surfaces of the EUT
	HCP:	All sides of the EUT (Floor-stand product excluded)
	VCP:	Four faces of the EUT

Test Result

Location of Position	Kind of Discharge	Applied Voltage	Polarity	Result
HCP	Contact	4.0 kV	Positive	A
			Negative	A
VCP			Positive	A
			Negative	A
Enclosure and TF slot	Air	(2.0 / 4.0 / 8.0) kV	Positive	A
			Negative	A

- A: The equipment shall continue to operate as intended without operator intervention and degradation of performance, loss of function or change of operating state is not allowed.





ESD Photo of selected test points

Contact discharge
Air discharge

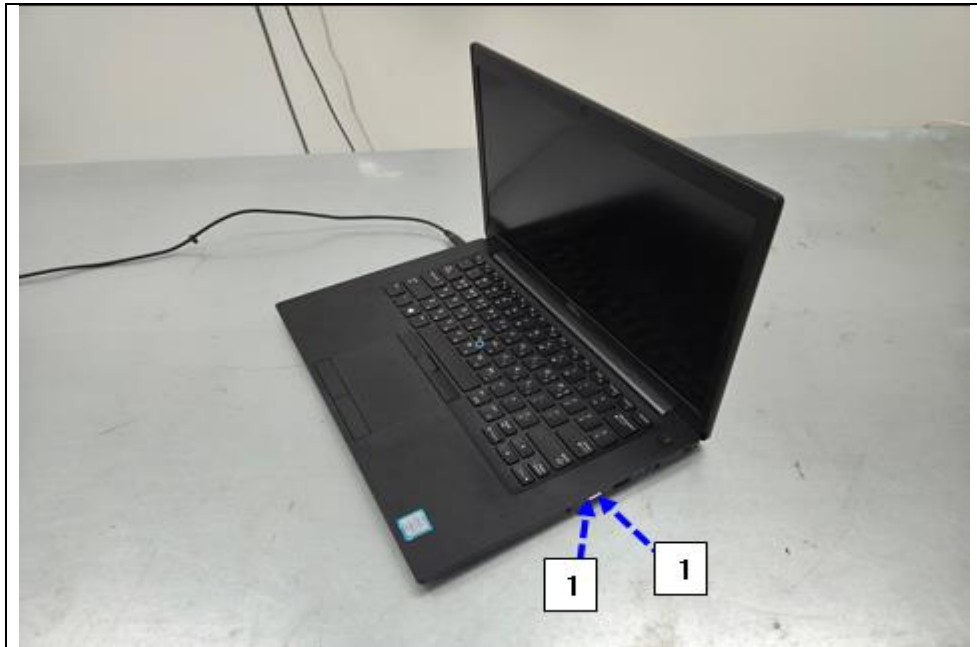


Photo 1





Radiated Susceptibility

Test Method

Test standard : EN 61000-4-3

Used Test Equipment

Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC016	RF and Microwave Signal Generator	R & S	SMB100A	110626	2026.01.02	1Y
EMC017	Power Meter	R & S	NRP2	104732	2026.01.03	1Y
EMC018	Average Power Sensor	R & S	NRP-Z91	103199	2026.01.03	1Y
EMC019	Average Power Sensor	R & S	NRP-Z91	103202	2025.09.04	1Y
EMC033	RF Amplifier	AR	1000W1000EM1	0344864	2026.01.03	1Y
EMC034	RF Amplifier	Amplifier Research	100S1G6M1	0344927	2026.01.03	1Y
EMC022	High Gain Log-Periodic	R & S	HL046Z1	100278	-	-
EMC036	Stacked Log Periodic Antenna	Schwarzbeck	STLP 9149	#345	-	-
-	CONTROLLER	Innco systems GmbH	CO3000	CO3000/88/36540815/L	-	-
-	TURN TABLE	Innco systems GmbH	DS1500-S	-	-	-
-	ANTENNA MASTER	R & S	STATIV VERFAHRBAR TRIPOD MOBLE	-	-	-
-	ANTENNA MASTER	Innco systems GmbH	MA2500-EP-HS	-	-	-
Soft ware	EMC32 (10.50.00)	Rohde & Schwarz	-	-	-	-

Operating Environment

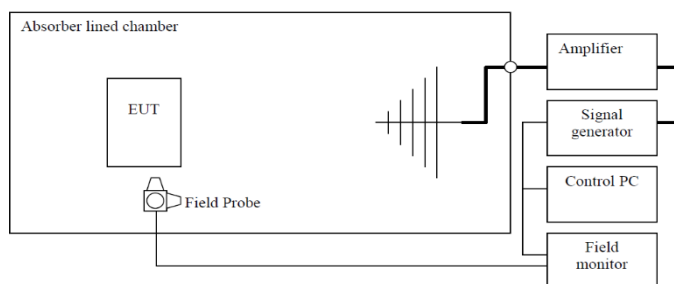
Test Voltage: AC 230 V, 50 Hz

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
RI Test Chamber	06-17	23.8 ± 1.0	43.7 ± 1.0	100.3





Test Setup and Procedure



The antenna has been orientated for both horizontal and vertical polarization.
The distance between antennas the equipment under testing was at least 3 m.
The tests have been performed with the antenna facing each of the four side of the EUT.

Test Summary

Basic Standard	EN 61000-4-3
Required Performance Criterion:	A
Test frequency:	80 MHz ~ 1 GHz
Spot frequency	1.8 GHz, 2.6 GHz, 3.5 GHz, 5 GHz
Level:	3 V/m
Modulation:	1 kHz, 80 % Amplitude Modulation
Frequency Step:	1 %
Dwell time:	1 s
Test Mode:	Operating Mode



**Test Result**

Test Side	Polarization	Result
Front	Horizontal	A
	Vertical	A
Rear	Horizontal	A
	Vertical	A
Left	Horizontal	A
	Vertical	A
Right	Horizontal	A
	Vertical	A

Audio output function (☐ Acoustic / ☐ Electrical)

Test Side	Audio Reference Level	Polarization	Result
Front		Horizontal	-
		Vertical	-
Rear		Horizontal	-
		Vertical	-
Left		Horizontal	-
		Vertical	-
Right		Horizontal	-
		Vertical	-

- A: The equipment shall continue to operate as intended without operator intervention and degradation of performance, loss of function or change of operating state is not allowed.



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Electrical Fast Transient/Burst

Test Method

Test standard : EN 61000-4-4

Used Test Equipment

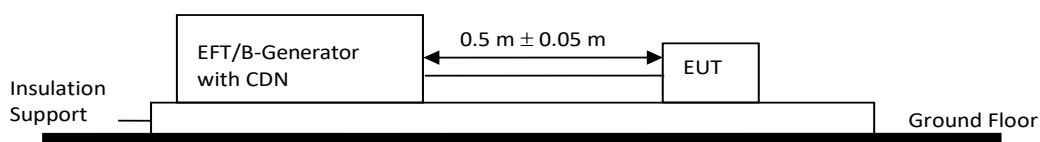
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC056	IMMUNITY TEST SYSTEM	HAEFELY HIPORONICS	AXOS8	182496	2026.02.13	1Y

Operating Environment

Test Voltage: AC 230 V, 50 Hz

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
Shielded Room 3	06-19	24.2 ± 1.0	43.3 ± 1.0	100.3

Test Setup and Procedure



The EUT has been placed on a wooden table 10 cm above the reference ground plane.

The reference ground plane exceeded the projected geometry of the EUT and the capacitive clamp by more than 20 cm. The clamp has placed directly on the reference ground plane.

The distance between the EUT and all other conductive structures except the ground plane beneath the EUT was more than 50 cm.

The distance between any coupling devices and the EUT shall be $(0.5 - 0/+0.1)$ m or table-top equipment testing, and (1.0 ± 0.1) m for floor standing equipment, unless otherwise specified in product standards.



**Test Summary**

Basic Standard		EN 61000-4-4
Port:	AC Power Ports	DC Power Ports, Signal Ports and Control Ports
Required Performance Criterion:		B
Repetition frequency		5 kHz, Tr/Th = 5 / 50 ns
Level:	± 1.0 kV	± 0.5 kV
Test Duration:		1 min
Test Mode:		Operating Mode

Test Result

Test Port	Test Point	Test Level	Polarity	Result
AC	L - N - PE	1.0 kV	Positive	A
			Negative	A
DC	-	0.5 kV	Positive	-
			Negative	-
Signal	-	0.5 kV	Positive	-
			Negative	-

- A: The equipment shall continue to operate as intended without operator intervention and degradation of performance, loss of function or change of operating state is not allowed.

- The EUT shall not include (analog/digital/signal/control/communication) ports greater than 3 m and shall therefore be excluded from the signal port test.





Surge Transient

Test Method

Test standard : EN 61000-4-5

Used Test Equipment

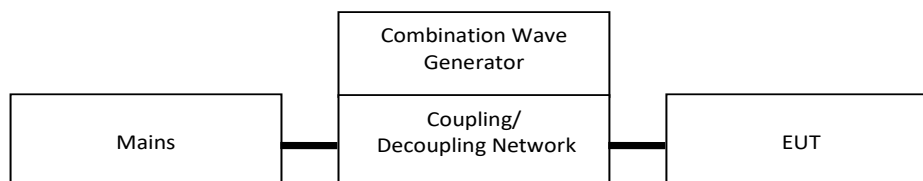
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC056	IMMUNITY TEST SYSTEM	HAEFELY HIPORONICS	AXOS8	182496	2026.02.13	1Y

Operating Environment

Test Voltage: AC 230 V, 50 Hz

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
Shielded Room 3	06-19	24.2 ± 1.0	43.3 ± 1.0	100.2

Test Setup and Procedure



The surge is to be applied to the EUT power supply terminal and the lines via the capacitive coupling network with decoupling networks. If not otherwise specified the power cord and interconnection line between the EUT and the coupling / decoupling networks should be 2 m in length (or shorter).

Five positive and five negative pulses shall be applied as far as applicable between phase and phase, phase and neutral, phase and protective earth, and between neutral and protective earth.

The surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the AC voltage wave (positive and negative).



**Test Summary**

Basic Standard		EN 61000-4-5	
Port		AC Power Ports	
Required Performance Criterion		B	
Surge pulse shape		Tr/Th = 1.2 / 50 μs	
Coupling Impedance	Line to Line	Line to ground	
	2 Ω (18 μF)	12 Ω (9 μF + 10 Ω)	
Angle		90°, 270°	
Number of Surge		5	
Level (kV)	L - N	N - PE	L - PE
	0.5 / 1	0.5 / 1 / 2	0.5 / 1 / 2
Interval time		1 min	
Test Mode		Operating Mode	

Test Result

Test Port	Test Point	Test Level (kV)	Polarity	Result
AC	L - N	0.5 / 1	Positive	A
			Negative	A
	L - PE	0.5 / 1 / 2	Positive	A
			Negative	A
	N - PE	0.5 / 1 / 2	Positive	A
			Negative	A

- A: The equipment shall continue to operate as intended without operator intervention and degradation of performance, loss of function or change of operating state is not allowed.





Conducted Susceptibility

Test Method and Summary

Test standard : EN 61000-4-6

Used Test Equipment

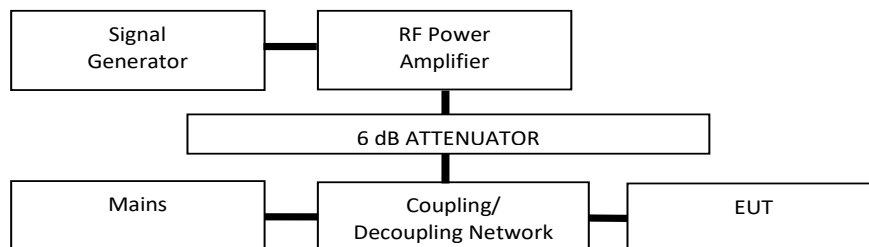
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC021	RF and Microwave Signal Generator	R & S	SMB100A	110627	2026.01.02	1Y
EMC023	Average Power Sensor	R & S	NRP-Z91	103200	2026.01.03	1Y
EMC038	RF Power Amplifier	AR	100A250AM1	0345211	2026.01.03	1Y
EMC039	Coupling Decoupling Networks	FCC	FCC-801-M2/M3-16A	161094	2025.06.27	1Y
EMC086	ATTENUATOR	Bird Technologies	150-A-FFN-06	1390416	2026.01.02	1Y
Soft ware	EMC32 (10.28.00)	Rohde & Schwarz	-	-	-	-

Operating Environment

Test Voltage: AC 230 V, 50 Hz

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
Shielded Room 1	06-19	23.7 ± 1.0	43.4 ± 1.0	100.3

Test Setup and Procedure



Test voltage should be applied on the signal line and control line, DC power ports or AC power ports alternately if applicable



**Test Summary**

Basic Standard:	EN 61000-4-6
Port:	AC/DC Power Ports, Digital/Analog/Data Ports
Required Performance Criterion:	A
Test frequency:	150 kHz ~ 80 MHz
Level:	150 kHz ~ 10 MHz (3 V) 10 MHz ~ 30 MHz (3 V ~ 1 V) 30 MHz ~ 80 MHz (1 V)
Modulation:	1 kHz, 80 % Amplitude Modulation
Frequency Step:	1 %
Dwell time:	1 s
Test Mode:	Operating Mode

Result

Test Port	Coupling method	Result
AC	CDN (M3)	A

Audio output function (☐ Acoustic / ☐ Electrical)

Test Port	Audio Reference Level	Result
-	-	-

- A: The equipment shall continue to operate as intended without operator intervention and degradation of performance, loss of function or change of operating state is not allowed.
- The EUT shall not include (analog/digital/signal/control/communication) ports greater than 3 m and shall therefore be excluded from the signal port test.



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Voltage Dips and Interruption

Test Method

Test standard : EN 61000-4-11

Used Test Equipment

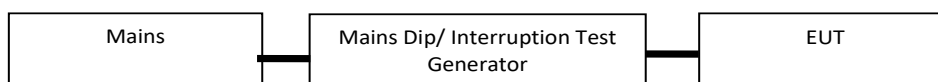
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC056	IMMUNITY TEST SYSTEM	HAEFELY HIPORONICS	AXOS8	182496	2026.02.13	1Y
	Voltage Dips Transformer	HAEFELY HIPORONICS	DIP 116	182620	N/A	N/A

Operating Environment

Test Voltage: AC 230 V, 50 Hz

Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
Shielded Room 3	06-19	24.2 ± 1.0	43.3 ± 1.0	100.3

Test Setup and Procedure



The EUT shall be tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event for each mode). Tests were conducted at zero crossings of the voltage.

Test Summary

Basic Standard		EN 61000-4-11
Port:	AC INPUT	
Required Performance Criterion:	B / C / C	
Number of dips:	3	
Phase:	0°	
Test Levels:	Test level in % U _T	Period
	0	0.5
	70	25 / 30
	0	250 / 300
Test Mode:	Operating Mode	



**Result**

Voltage dips % U _T	Test level % U _T	Periods (50 Hz) Cycle(s)	Result
100	0	0.5	A
30	70	25	A
100	0	250	A

- A: The equipment shall continue to operate as intended without operator intervention and degradation of performance, loss of function or change of operating state is not allowed.



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SECTION 7 APPENDIX I

Emission
Photographs of Test Configurations

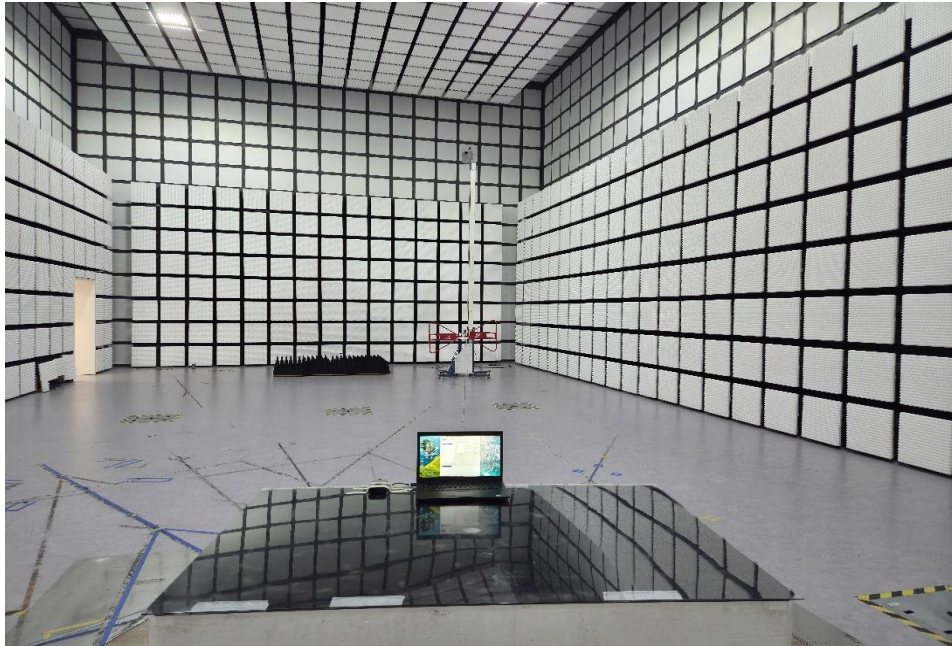


Conducted Emission



Conducted Emission



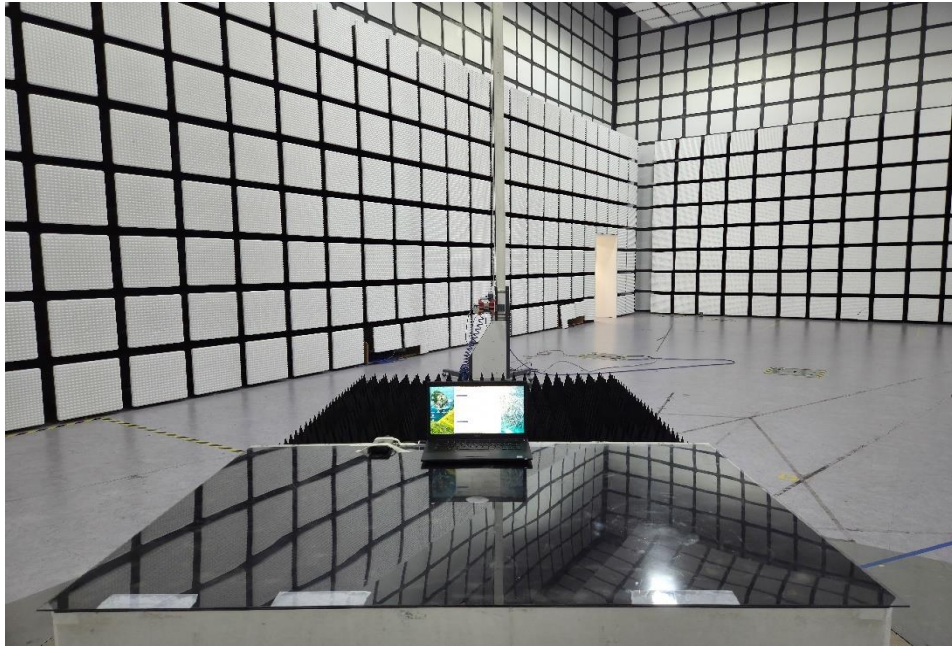


Radiated Emission below 1 GHz

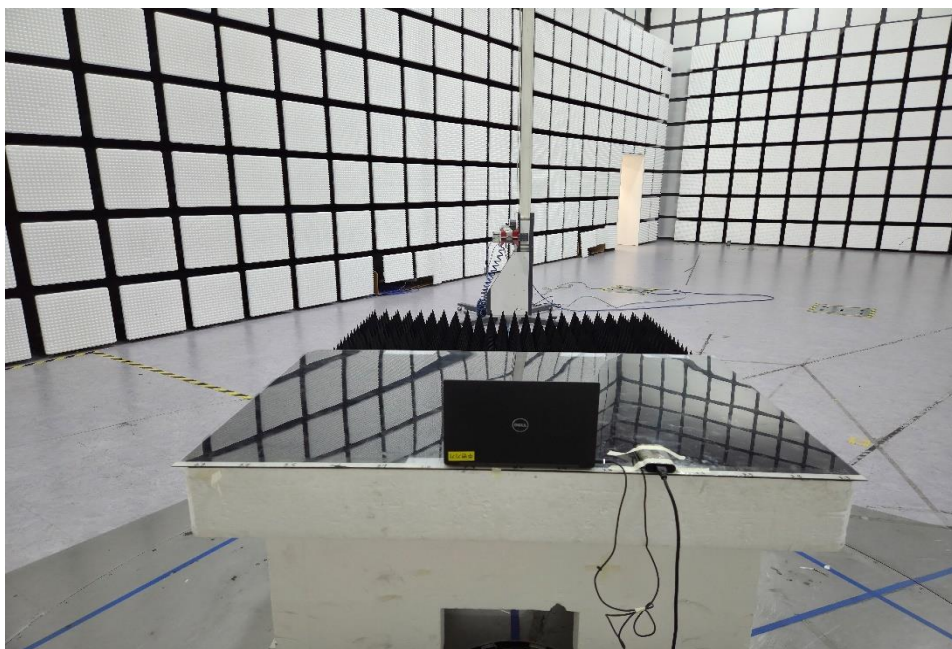


Radiated Emission below 1 GHz





Radiated Emission above 1 GHz



Radiated Emission above 1 GHz





N/A

Conducted Differential Voltage

N/A

Conducted Differential Voltage





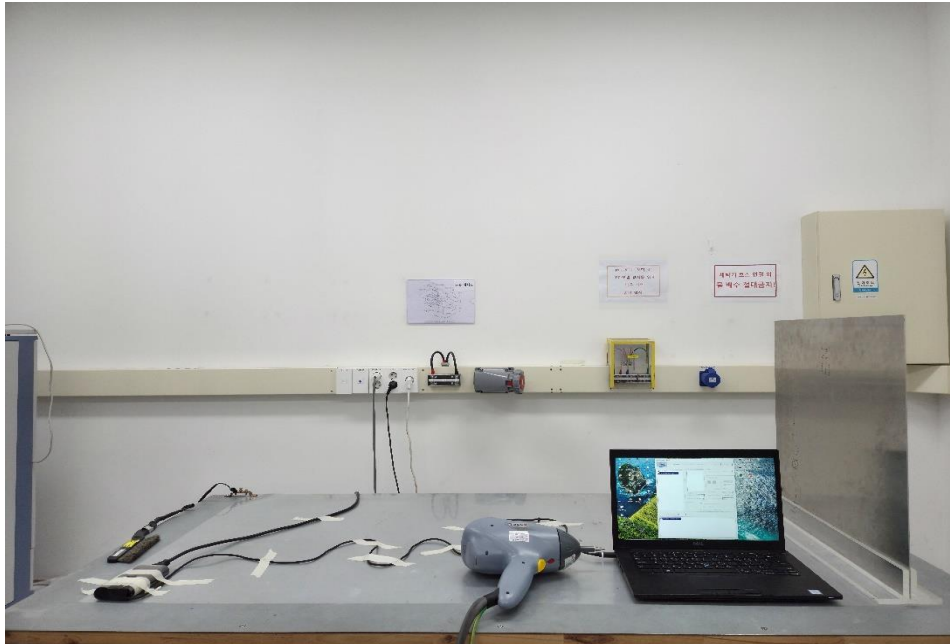
N/A

Harmonics

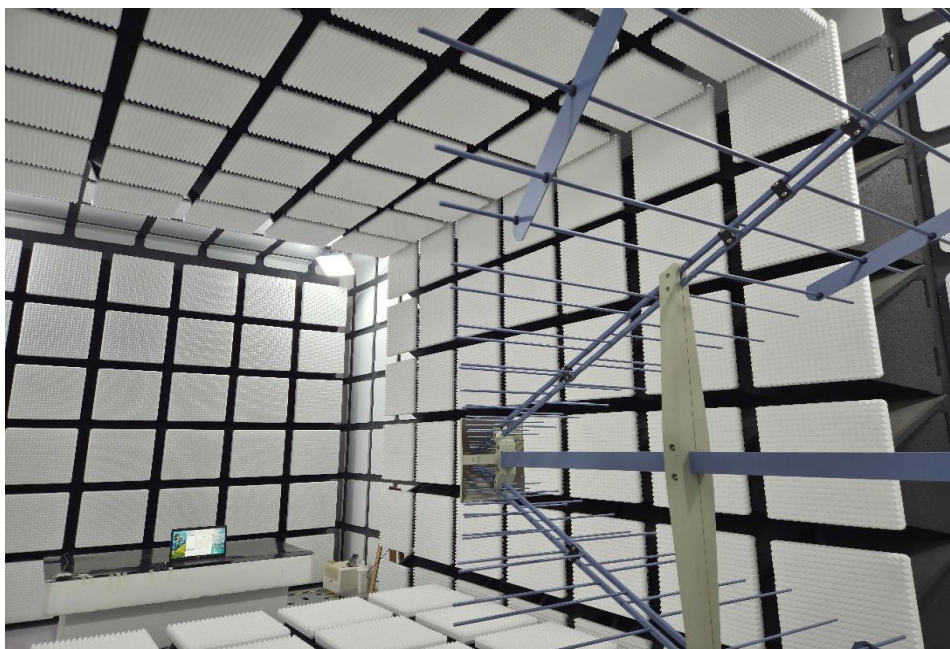
N/A

Voltage Fluctuations and Flicker



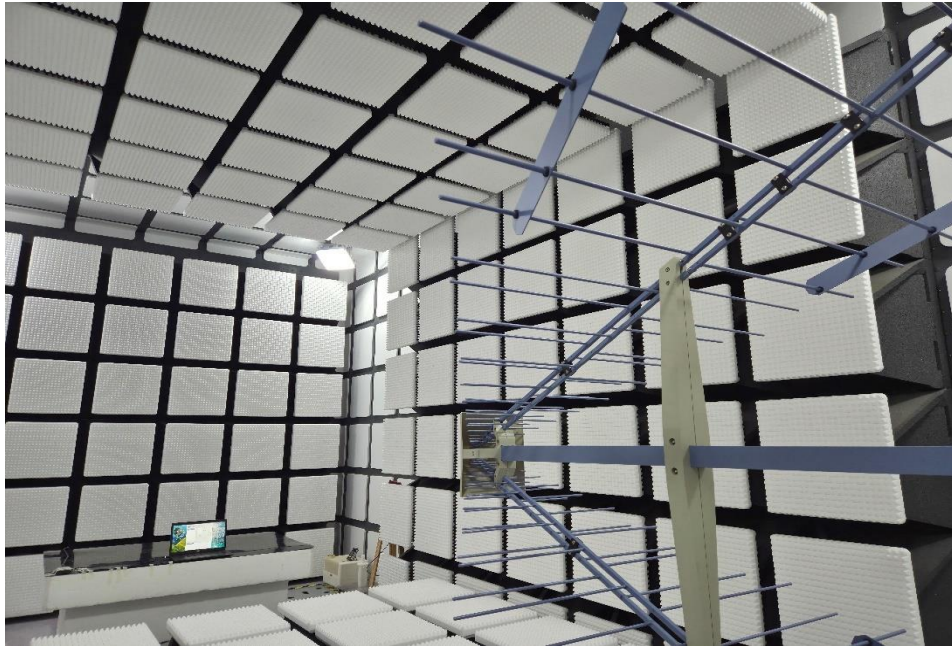


ESD

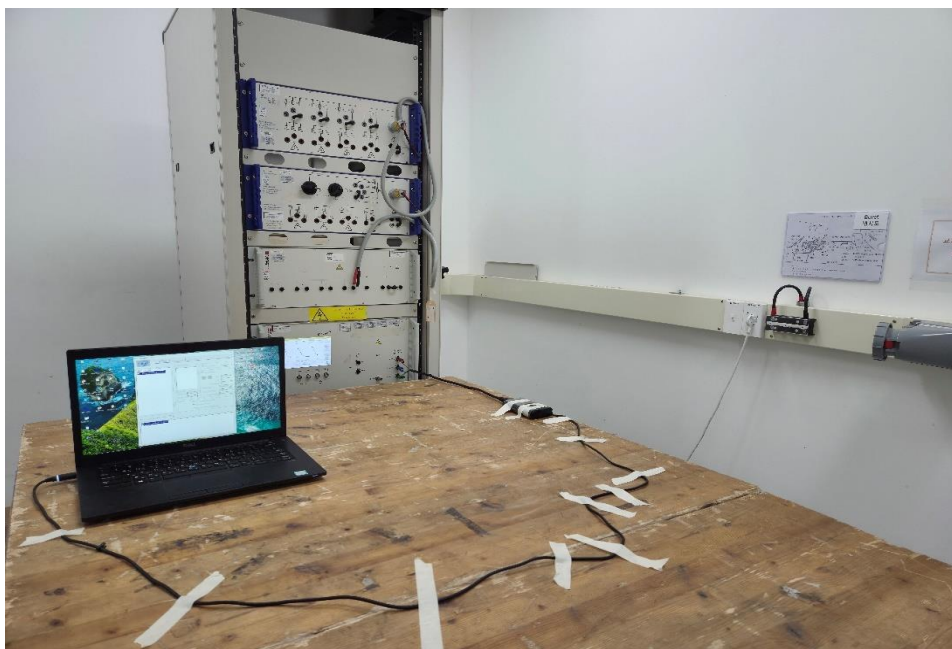


Radiated Susceptibility



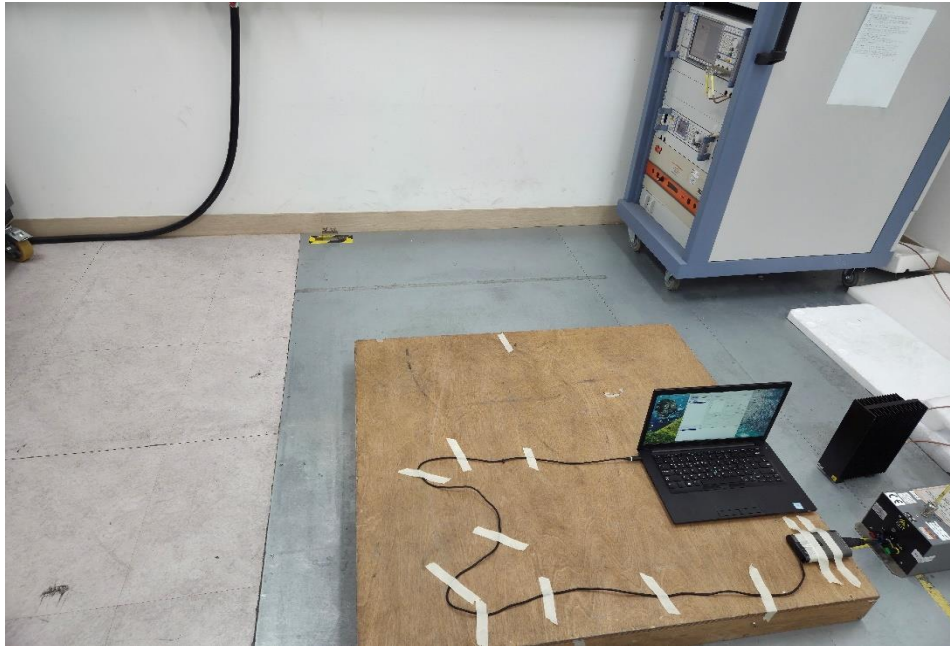


Electric Fast Transient/Burst

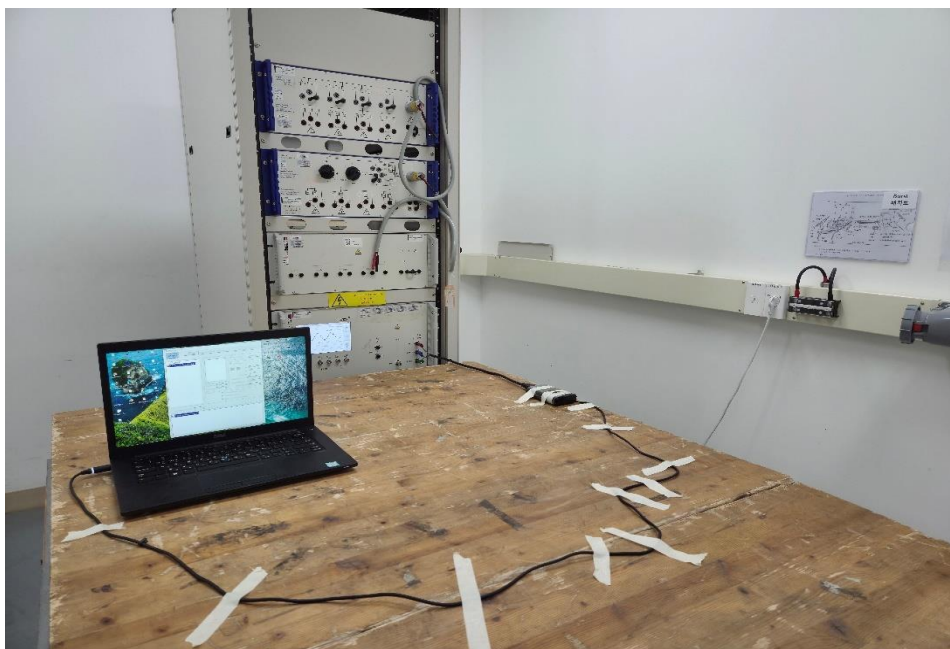


Surge Transient





Conducted Susceptibility



Voltage Dips and Interruptions





SECTION 8 APPENDIX II

Photographs of EUT



Front



Rear





SECTION 9 APPENDIX III

REVISION HISTORY

No.	Date	Description of Revision	Revised by
1	23 Jun. 2025	It has been revised from the report number 240200052SEL-EMC1 as below. 1. Add variant model: MB-MB512T*, MBMBFGVJQB**-E****, MBMCFGVJQB**-E****, MB-MB1T0T*, MBMBGGVKOB**-7****, MB-MB256T*, MBMBEGVHDB**-E****, MBMCEGVHDB**-E****, MB-MB128T*, MBMBDGVGGB**-E****, MBMCDGVGGB**-E**** MB-MB512T*, MBMBFGVJQB**-E****, MBMCFGVJQB**-E**** models test due to PCB dualization.	Shinyeong Lee

--- E N D ---



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