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TEST REPORT

Report Number	191000065SEL-EMC1(R1)
Applicant Name/Address	KD Navien Co.,Ltd. 95, Suworam-gil, Seotan-myeon, Pyeongtaek-si, Gyeonggi-do, Republic of Korea
Test Sample Description	
- Product ..... :	Bed warmer
- Model and/or Brand name ..... :	EQM580-KSUS
- Variant model name..... :	EQM580-QSUS, EQM580-SSUS
- Manufacturer Name / Address .. :	KD Navien Co.,Ltd. 95, Suworam-gil, Seotan-myeon, Pyeongtaek-si, Gyeonggi-do, Republic of Korea
- Rating(s) ..... :	AC 120 V, 60 Hz
Receipt of sample(s)	06 May 2020
Date of Test	10 Jun. 2020
Test Method(s)	FCC Part 15 Subpart B (Class B)
Test Results & Uncertainty	See EMC Results Conclusion
Issue date	11 Jun. 2020

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

Note 2: This report shall not be reproduced except in full, without the written approval of Intertek.

Note 3: This laboratory is not accredited for the test results marked as *.

Tested by;

Name: Harry Jeon
EMC Engineer

Approved by;

Name: Rina Bae
EMC Technical Manager

Intertek ETL SEMKO Korea Ltd.

SECTION 1 CONTENTS

SECTION 2 EMC RESULTS CONCLUSION (WITH JUSTIFICATION)

We tested the Bed Warmer, Model: EQM580-KSUS, to determine if it was in compliance with the relevant US standards as marked on the test report.
We found that the unit met the requirement of FCC Part 15 Subpart B standard when tested as received.

Test Items	Applied Standards	Results			
		Comply	Not Comply	N/A	See Note
Disturbance Voltage	FCC Part 15 Subpart B	☒	☐	☐	☒
Radiated disturbance (Below 1 GHz)	FCC Part 15 Subpart B	☒	☐	☐	☒
Radiated disturbance (Above 1 GHz)	FCC Part 15 Subpart B	☒	☐	☐	☒
Note 1) When determining the test conclusion, the Measurement Uncertainty of test has been considered.					

Measurement Uncertainty

Conducted Emission	150 kHz – 30 MHz	U = 3.3 [dB]
	(Confidence level approximately 95 %, k = 2)	
Radiated Emissions	9 kHz – 30 MHz	U = 4.5 [dB]
	30 MHz – 1 000 MHz	Horizontal: U = 4.3 [dB] Vertical: U = 4.5 [dB]
	1 GHz – 6 GHz	Horizontal: U = 5.6 [dB] Vertical: U = 5.4 [dB]
	6 GHz – 18 GHz	Horizontal: U = 5.8 [dB] Vertical: U = 5.8 [dB]
	(Confidence level approximately 95 %, k = 2)	

SECTION 3 TEST ENVIRONMENT AND CONDITIONS

Test Environment

Test Item	Test Site	Test date (MM-DD)	Temp (℃)	Humidity (% R.H.)	Pressure (kPa)
Disturbance Voltage	Shielded Room #2	06-10	23.4 ± 0.5	38.5 ± 0.5	-
Radiated disturbance (Below 1 GHz)	10 m chamber	06-10	23.6 ± 0.5	38.7 ± 0.5	
Radiated disturbance (Above 1 GHz)	10 m chamber	06-10	23.6 ± 0.5	38.7 ± 0.5	

SECTION 4 EUT INFORMATION

Equipment Under Test (EUT):	Bed warmer
Model:	EQM580-KSUS
Variant Model:	EQM580-QSUS, EQM580-SSUS
Serial No.:	-
Rated Voltage:	AC 120 V, 60 Hz
Tested Voltage:	AC 120 V, 60 Hz
Maximum clock frequency:	2 462 MHz
Variant model information:	Mat Size Difference EQM580-KSUS : King size EQM580-QSUS : Queen size EQM580-SSUS : Single size

SECTION 5 TEST CONFIGURATION, OPERATION MODE AND SET-UP

Test Ancillary Equipment

Equipment		Model No.	Serial No.	Manufacturer	Note
Bed warmer	Heating unit(Boiler) Remote Controller	EQM580-KSUS	-	KD Navien Co.,Ltd.	**EUT**

*Note: Heating unit(Boiler) and Remote Controller are included in Bed warmer, the EUT.

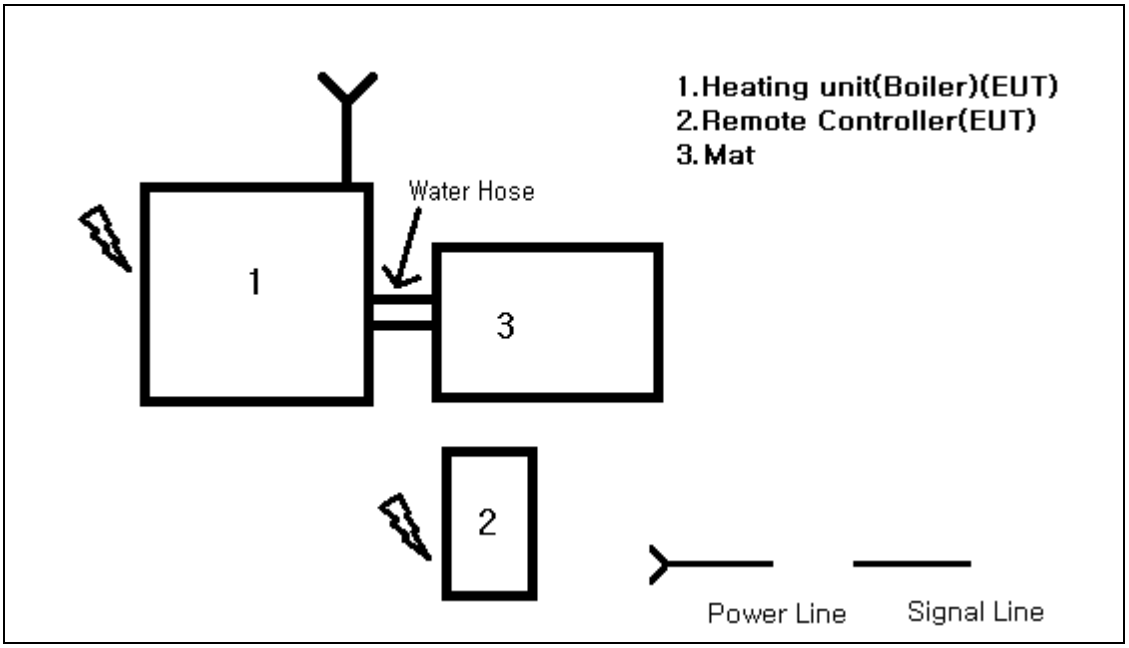
Used cable description

Start		End		cable Information		
Name	I/O Port	Name	I/O Port	Length (m)	Shield	With Ferrite
EUT ((Heating unit(Boiler))	AC IN	AC Power Source	-	1.7	Unshielded	-
EUT (Remote Controller)	-	-	-	-	-	-

Test Operation Mode

- Maximum temperature operating mode: It was tested after setting the maximum temperature.

Test Setup



SECTION 6 EMISSION

Radiated disturbance test

Test Method and Summary

Test standard: FCC Part 15 Subpart B

Used Test Equipment

Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC002	EMI Test Receiver	R & S	ESU26	100590	2021.01.02	1Y
EMC025	Biconilog (Type7)	ETS-Lindgren	3142E	00203547	2021.02.25	2Y
EMC029	DRG Horn (Medium)	ETS-Lindgren	3117	00203763	2021.02.25	2Y
EMC074	AMP	R & S	SCU-01D	1904843	2020.06.28	1Y
EMC077	AMP	R & S	SCU-18D	1952128	2020.06.28	1Y

Operating Environment

Test Voltage: AC 120 V, 60 Hz

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 – 500	2 000
500 – 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

(1) Limit for Radiated Emission below 1 000 MHz

Frequency range (MHz)	Class A Equipment (10 m distance) Quasi-peak (dBµV/m)	Class B Equipment (3 m distance) Quasi-peak (dBµV/m)
30 to 88	39.0	40
88 to 216	43.5	43.5
216 to 960	46.4	46
960 to 1 000	49.5	54

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) According to 15.109(g), as an alternative to the radiated emission limit shown above, digital devices may be shown to comply with the standards (CISPR), Pub. 22 shown as below.
Note 4) Result (dBµV/m) = Reading (dBµV) + Corr. (Ant. Factor (dB/m) + Cable Loss (dB) – Amp. Gain (dB))
Result: QuasiPeak, Reading: Receiver reading value, Corr.: Correction Factor
Margin = Limit – Result

Frequency range (MHz)	Class A Equipment (10 m distance) Quasi-peak (dBµV/m)	Class B Equipment (10 m distance) Quasi-peak (dBµV/m)
30 to 230	40	30
230 to 1 000	47	37

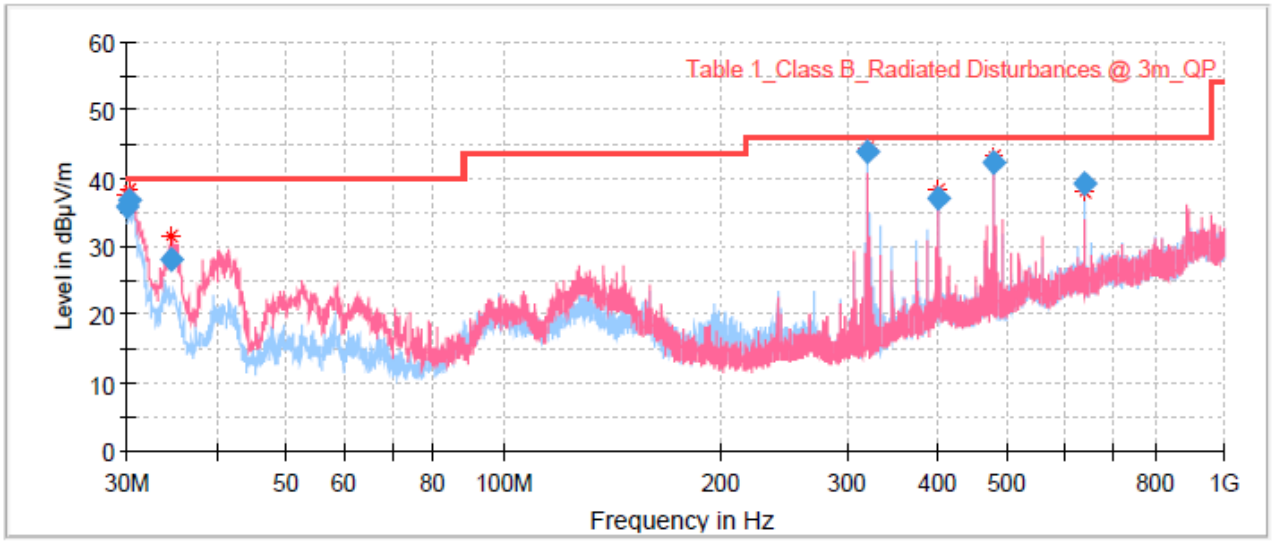
(2) Limits for Radiated Emission above 1 000 MHz at a measuring distance of 3 m

Frequency (GHz)	Class A Equipment		Class B Equipment	
	Peak (dBµV/m)	Average (dBµV/m)	Peak (dBµV/m)	Average (dBµV/m)
1 to 40	80	60	74	54

Note 1) Result (dBµV/m) = Reading (dBµV) + Corr. (Ant. Factor (dB/m) + Cable Loss (dB) – Amp. Gain (dB))
Result: Final value, Reading: Receiver reading value, Corr.: 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.
Em = Edm + 20*log(d/3) (d: Measured distance)
Em: Result of measured distance correction, Edm: Measured value

Test Data

[30 MHz ~ 1 GHz]



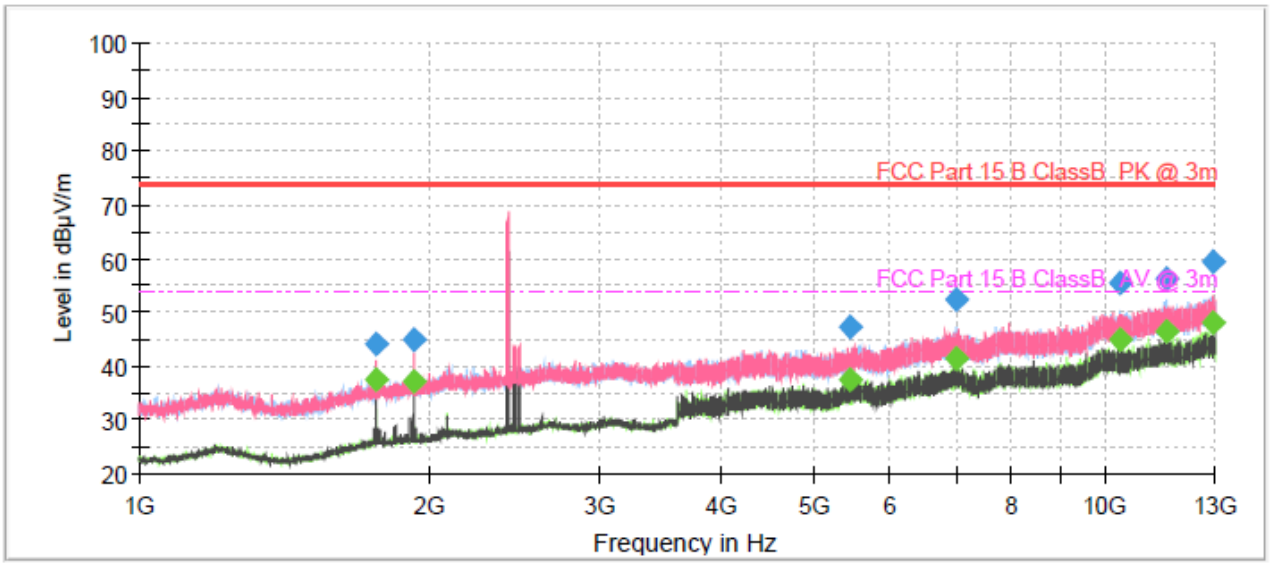
Preview Result 1H-PK+
Preview Result 1V-PK+
Critical_Freqs PK+
Table 1_Class B_Radiated Disturbances @ 3m_QP
Final_Result QPK

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.00	35.78	40.00	4.22	104.0	V	0.00	-6.88
30.12	36.76	40.00	3.24	100.0	V	0.00	-6.95
34.45	28.21	40.00	11.79	102.0	V	208.00	-9.44
320.00	43.83	46.00	2.17	220.0	H	108.00	-7.33
400.01	37.14	46.00	8.86	104.0	V	166.00	-2.56
480.02	42.44	46.00	3.56	100.0	V	170.00	-1.76
640.01	39.17	46.00	6.83	120.0	H	45.00	1.59

[1 GHz ~ 13 GHz]

Test distance : 3.0 m



Preview Result 2H-AVG
Preview Result 2V-AVG
FCC Part 15 B ClassB_PK @ 3m
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
FCC Part 15 B ClassB_AV @ 3m
Final_Result AVG

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1759.94	---	37.56	54.00	16.44	100.0	V	294.00	1.11
1759.94	44.28	---	74.00	29.72	100.0	V	294.00	1.11
1919.86	---	37.16	54.00	16.84	100.0	V	292.00	2.77
1919.86	45.08	---	74.00	28.92	100.0	V	292.00	2.77
5428.89	47.51	---	74.00	26.49	125.0	V	236.00	10.99
5428.89	---	37.63	54.00	16.37	125.0	V	236.00	10.99
7024.77	52.37	---	74.00	21.63	184.0	H	342.00	14.61
7024.77	---	41.33	54.00	12.67	184.0	H	342.00	14.61
10345.56	55.68	---	74.00	18.32	111.0	V	126.00	18.36
10345.56	---	44.79	54.00	9.21	111.0	V	126.00	18.36
11561.20	56.23	---	74.00	17.77	125.0	H	346.00	20.00
11561.20	---	46.67	54.00	7.33	125.0	H	346.00	20.00
12898.61	59.24	---	74.00	14.76	225.0	H	104.00	21.52
12898.61	---	48.04	54.00	5.96	225.0	H	104.00	21.52

*** 2.4 GHz EUT Frequency**

Disturbance Voltage test

Test Method and Summary

Test standard : FCC Part 15 Subpart B

Used Test Equipment

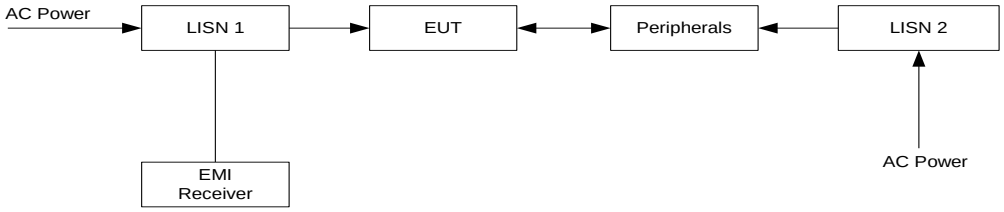
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC004	EMI Test Receiver	R & S	ESR7	101560	2021.01.02	1Y
EMC007	Two-Line V-Network	R & S	ENV216	101982	2020.10.15	1Y

Operating Environment

Test Voltage: AC 120 V, 60 Hz

Test Setup and Procedure

Disturbance Voltage Test at Mains Terminal:



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.

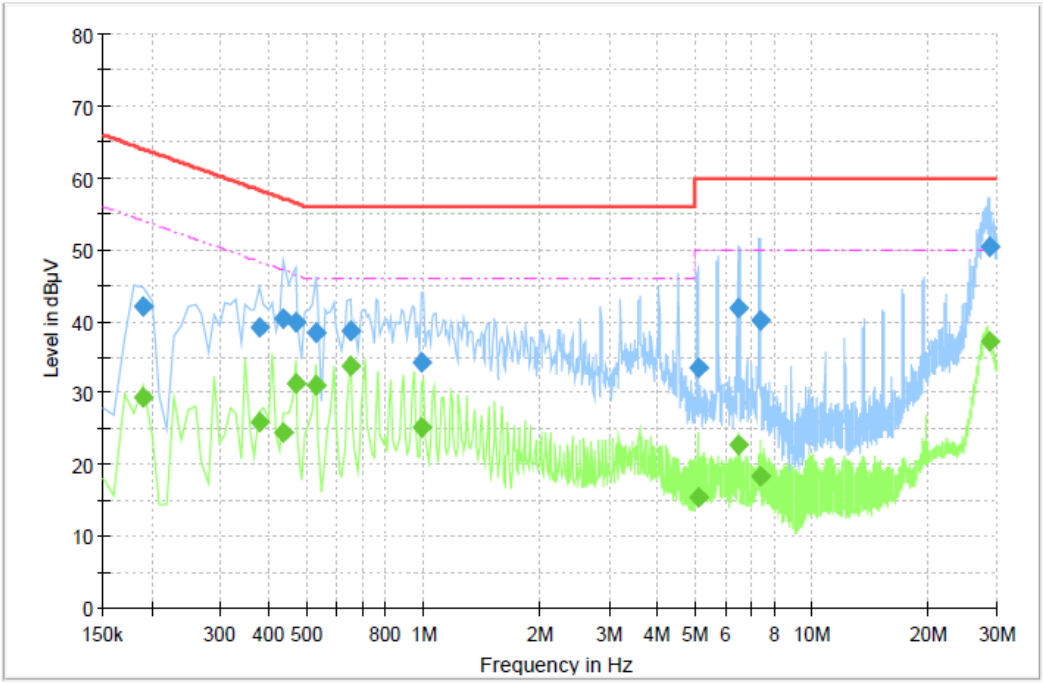
Limits

Frequency range (MHz)	Limits dB(µV)			
	Quasi-peak		Average	
	Class A	Class B	Class A	Class B
0.15 to 0.50	79	66 to 56	66	56 to 46
0.50 to 5	73	56	60	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))
Result: QuasiPeak/CAverage, Reading: Receiver reading value, Corr.: Correction Factor
Margin = Limit – Result

Test Data

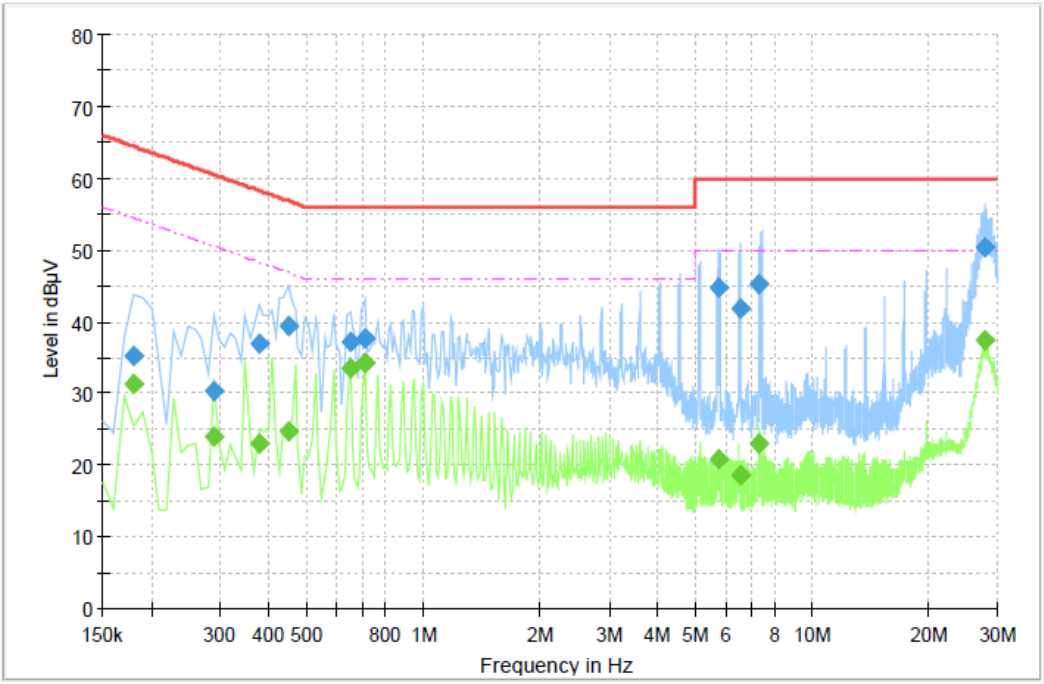
[Live]



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.189800	---	29.32	54.05	24.73	L1	ON	10.0
0.189800	42.14	---	64.05	21.91	L1	ON	10.0
0.378850	---	26.01	48.31	22.30	L1	ON	10.0
0.378850	39.14	---	58.31	19.17	L1	ON	10.0
0.438550	---	24.51	47.09	22.57	L1	ON	10.0
0.438550	40.30	---	57.09	16.79	L1	ON	10.0
0.468400	---	31.37	46.54	15.17	L1	ON	10.0
0.468400	39.79	---	56.54	16.75	L1	ON	10.0
0.528100	---	31.08	46.00	14.92	L1	ON	10.0
0.528100	38.51	---	56.00	17.49	L1	ON	10.0
0.647500	---	33.86	46.00	12.14	L1	ON	9.9
0.647500	38.72	---	56.00	17.28	L1	ON	9.9
0.995750	---	25.18	46.00	20.82	L1	ON	9.9
0.995750	34.17	---	56.00	21.83	L1	ON	9.9
5.115050	---	15.35	50.00	34.65	L1	ON	9.8
5.115050	33.45	---	60.00	26.55	L1	ON	9.8
6.448350	---	22.80	50.00	27.20	L1	ON	9.9
6.448350	41.86	---	60.00	18.14	L1	ON	9.9
7.383650	---	18.28	50.00	31.72	L1	ON	9.9
7.383650	40.05	---	60.00	19.95	L1	ON	9.9
28.746300	---	37.21	50.00	12.79	L1	ON	10.1
28.746300	50.36	---	60.00	9.64	L1	ON	10.1

[Neutral]

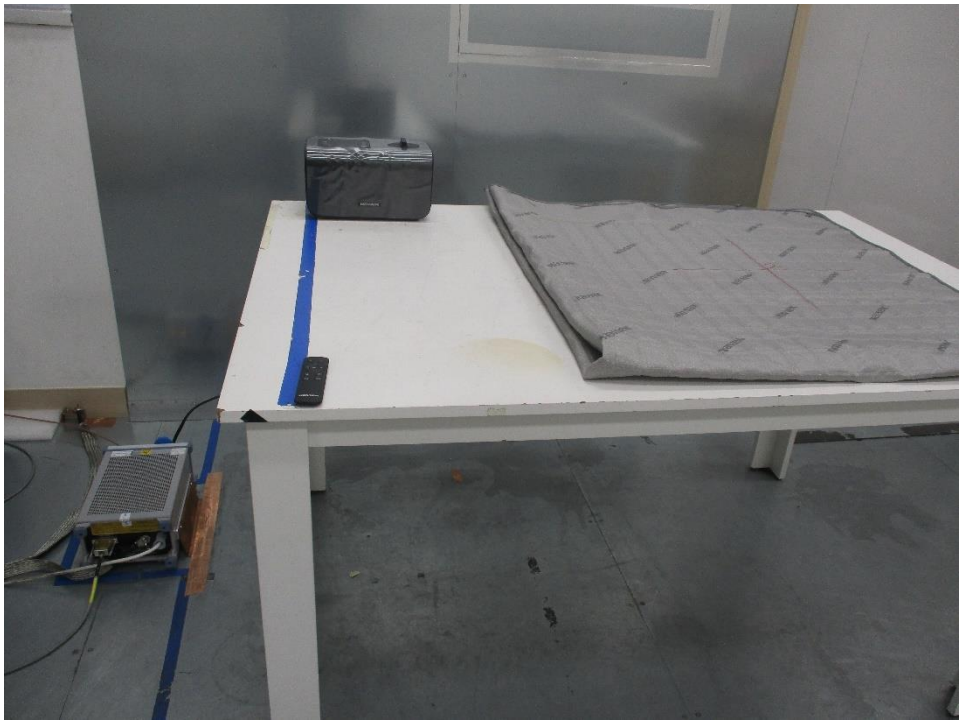


Final_Result

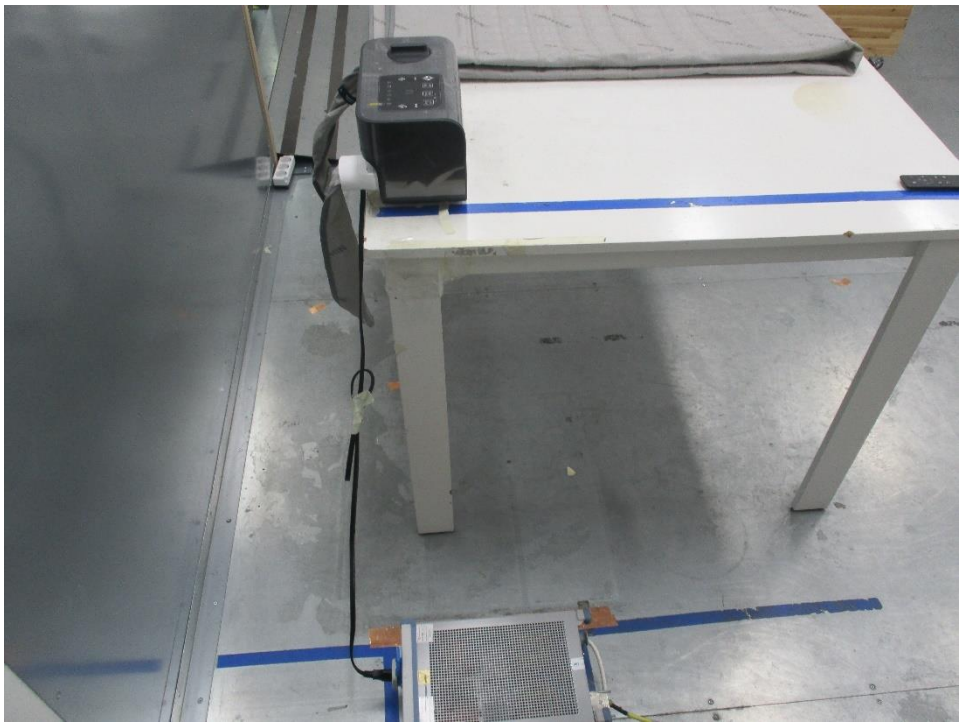
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.179850	---	31.36	54.49	23.14	N	ON	10.0
0.179850	35.22	---	64.49	29.28	N	ON	10.0
0.289300	---	24.06	50.54	26.48	N	ON	9.8
0.289300	30.40	---	60.54	30.15	N	ON	9.8
0.378850	---	23.05	48.31	25.25	N	ON	10.0
0.378850	37.04	---	58.31	21.27	N	ON	10.0
0.448500	---	24.81	46.90	22.09	N	ON	10.0
0.448500	39.43	---	56.90	17.47	N	ON	10.0
0.647500	---	33.56	46.00	12.44	N	ON	9.9
0.647500	37.22	---	56.00	18.78	N	ON	9.9
0.707200	---	34.22	46.00	11.78	N	ON	9.9
0.707200	37.75	---	56.00	18.25	N	ON	9.9
5.781700	---	20.72	50.00	29.28	N	ON	9.9
5.781700	44.83	---	60.00	15.17	N	ON	9.9
6.537900	---	18.69	50.00	31.31	N	ON	9.8
6.537900	41.86	---	60.00	18.14	N	ON	9.8
7.333900	---	22.96	50.00	27.04	N	ON	9.9
7.333900	45.33	---	60.00	14.67	N	ON	9.9
27.940350	---	37.47	50.00	12.53	N	ON	10.0
27.940350	50.40	---	60.00	9.60	N	ON	10.0

SECTION 7 APPENDIX I

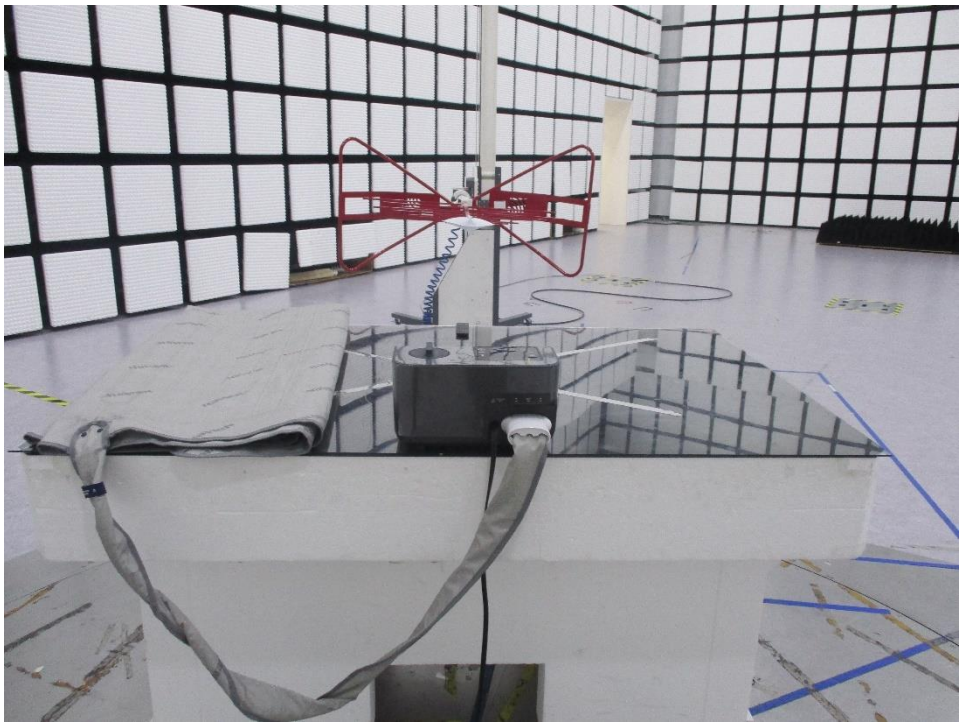
Photographs of Test Configurations



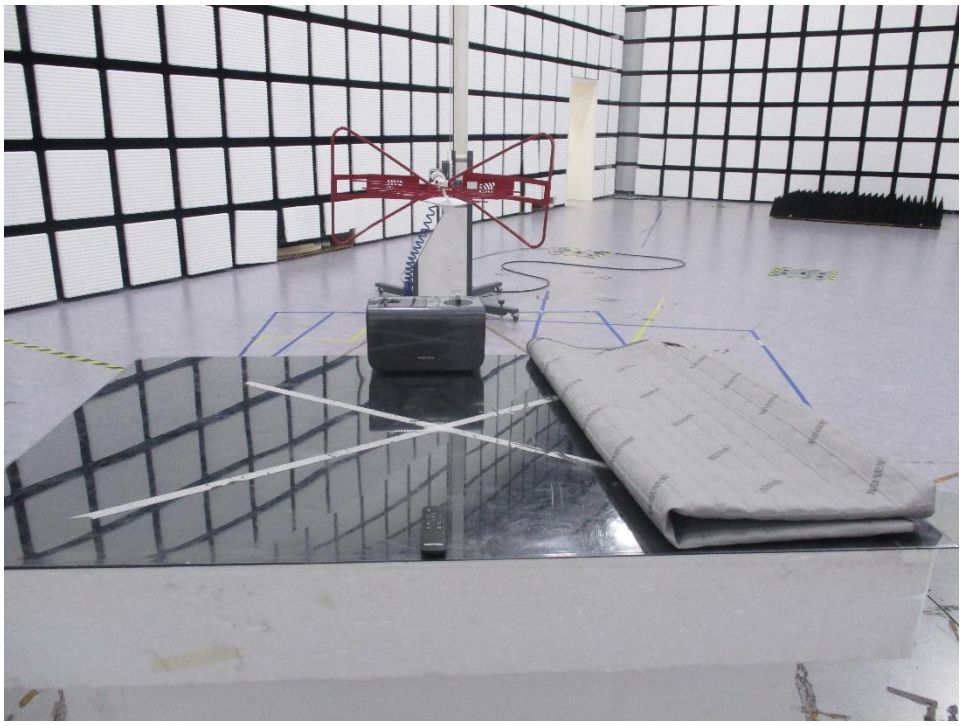
Disturbance Voltage Test



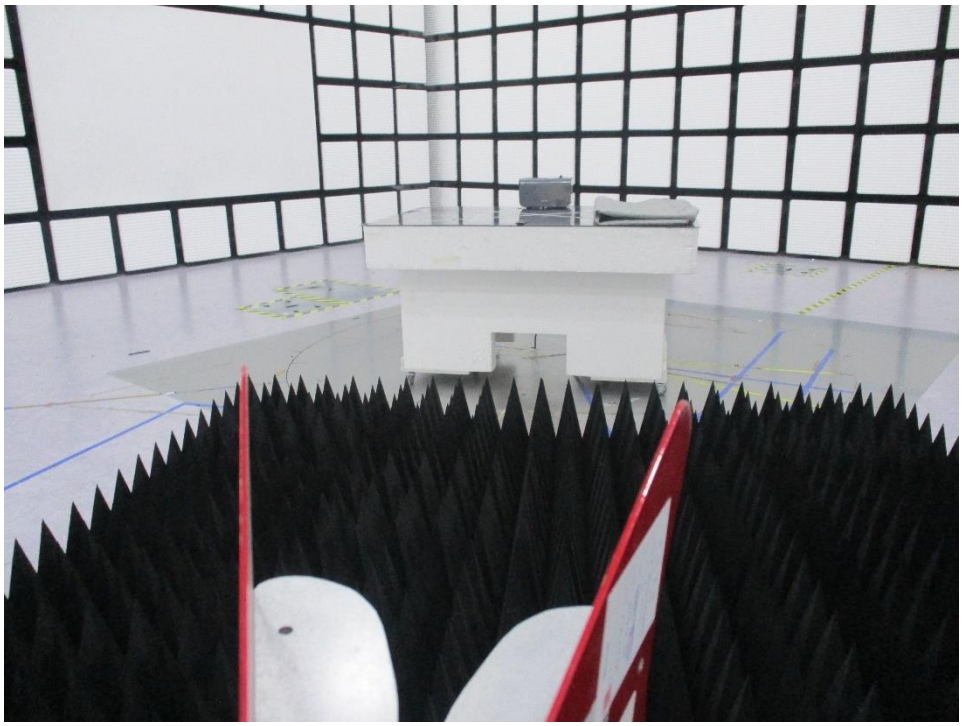
Disturbance Voltage Test



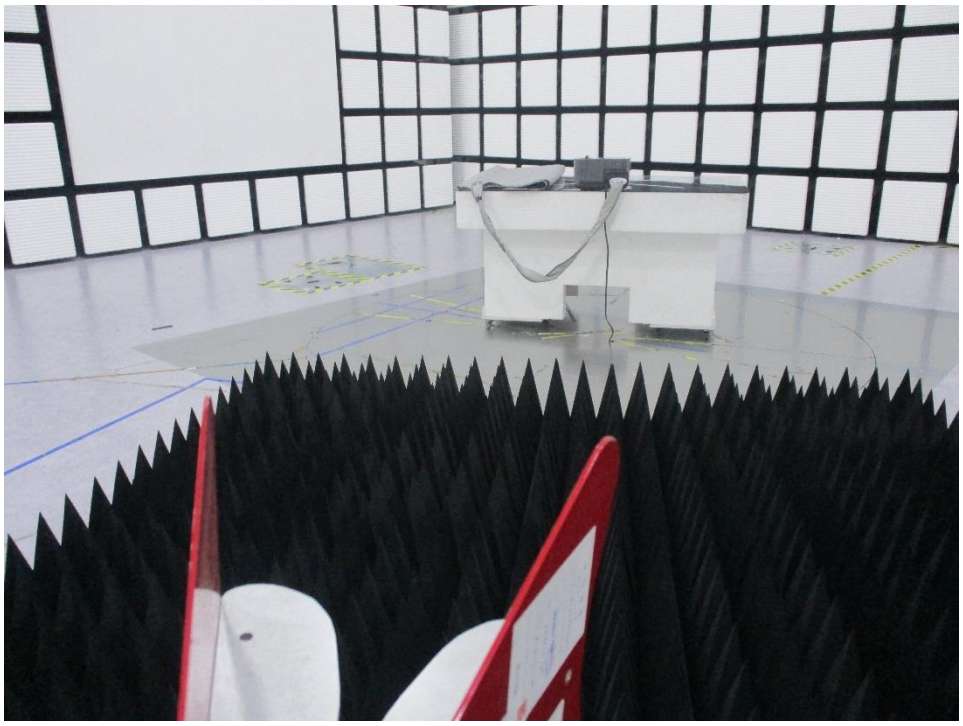
Radiated disturbance (30 MHz ~ 1 GHz)



Radiated disturbance (30 MHz ~ 1 GHz)



Radiated disturbance (1 GHz ~ 13 GHz)



Radiated disturbance (1 GHz ~ 13 GHz)

SECTION 8 APPENDIX II

Photographs of EUT

[Heating unit(Boiler)]

Front

Rear

[Remote Controller]

Front

Rear

SECTION 9 APPENDIX III

REVISION HISTORY

No.	Date	Description of Revision	Revised by
1	11 Jun. 2020	It has been revised from the report number 191000065SEL-EMC1 as below. 1. Main PCB, Power PCB, Panel PCB, and Waterbank have been changed.	Rina Bae

- E N D -