



Certificate Number: 5055.02

TEST REPORT

Report No.: SRTC2020-9003(F)-0012
Product Name: Automatic Cleaning Machine
Model Name: A00041301
Applicant: SoftBank Robotics Corp.
Manufacturer: SoftBank Robotics Corp.
Specification: FCC Part15B (Certification)
(2020 edition)
FCC ID: 2ATI9-A00041301

The State Radio_monitoring_center Testing Center (SRTC)
15th Building, No.30 Shixing Street, Shijingshan District,
Beijing, China

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1. General information

1.1 Notes of the test report

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The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

Company: The State Radio_monitoring_center Testing Center (SRTC)
Address: 15th Building, No.30 Shixing Street, Shijingshan District
Testing location: No.80, Zhaojiachang, BeizangCun, Daxing District, Beijing, China.
City: Beijing
Country or Region: China
Contacted person: Liu Jia
Tel: +86 10 57996183
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Email: liujiaf@srtc.org.cn

1.3 Applicant's details

Company: SoftBank Robotics Corp.
Address: 1-9-2 Higashi-shimbashi, Minato-ku, Tokyo,Japan
City: Tokyo
Country or Region: Japan
Contacted person: Huijun Wang
Tel: + 81-3-6889-2450
Email: huijun.wang@g.softbank.co.jp

1.4 Manufacturer's details

Company: SoftBank Robotics Corp.
Address: 1-9-2 Higashi-shimbashi, Minato-ku, Tokyo,Japan
City: Tokyo
Country or Region: Japan
Contacted person: Huijun Wang
Tel: + 81-3-6889-2450
Email: huijun.wang@g.softbank.co.jp

1.5 Application details

Date of reception of test sample: 25th May 2020

Date of test: 26th May 2020 to 18th June 2020

1.6 Reference specification

FCC Part 15B, 2020 (Certification)

1.7 Information of EUT

1.7.1 General information

Name of EUT	Automatic Cleaning Machine
Model Name	A00041301
FCC ID	2ATI9-A00041301
Frequency Range	WCDMA: FDD II / FDD IV / FDD V LTE:FDD 2/ FDD 4/ FDD 5/ FDD 7/ FDD 8/ FDD 12/ FDD 13/ FDD 26/ FDD 30/ FDD 41/ FDD 66 CA: CA_7C/ CA_41C
Equipment Class	Class B
Power Supply	Battery or Charger
Rated Power Supply Voltage	25.2V
Extreme Temperature	Lowest: 0°C Highest: +45°C
Extreme Voltage	Minimum: 21V Maximum: 29.4V
HW Version	1.0-01
SW Version	1.0-01

1.7.2 EUT details

Product Name	Model Name	Sample No.
Automatic Cleaning Machine	A00041301	#1

1.7.3 Auxiliary equipment details

AE (Auxiliary Equipment)1#: Battery

Type	Li-Lon
Manufacturer	TOCAD ENERGY Co., Ltd.
Model Number	P00041901A01
Capacity	28.44Ah
Normal Voltage	25.2V

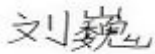
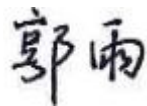

AE (Auxiliary Equipment) 2#: Charger

Manufacturer	MinebeaMitsumi Inc.
Model Number	P00041601A01
S/N	/

2. Test information

2.1 Summary of the test results

No.	Test case	FCC reference	Verdict
1	Conducted emissions	15.107	Pass
2	Radiated emissions	15.109	Pass

Approved By: Mr. Liu Wei Director of the test department 	Checked By: Mr. Guo Yu Vice director of the test department 
Tested by: Mr. Liu Jian Test engineer 	Issued date: 2020.06.23

2.2 Test result

2.2.1 Conducted Emissions-FCC Part15.107

Ambient condition:

Temperature	Relative humidity	Pressure
24.3°C	43.2%	100.9kPa

Test Setup:

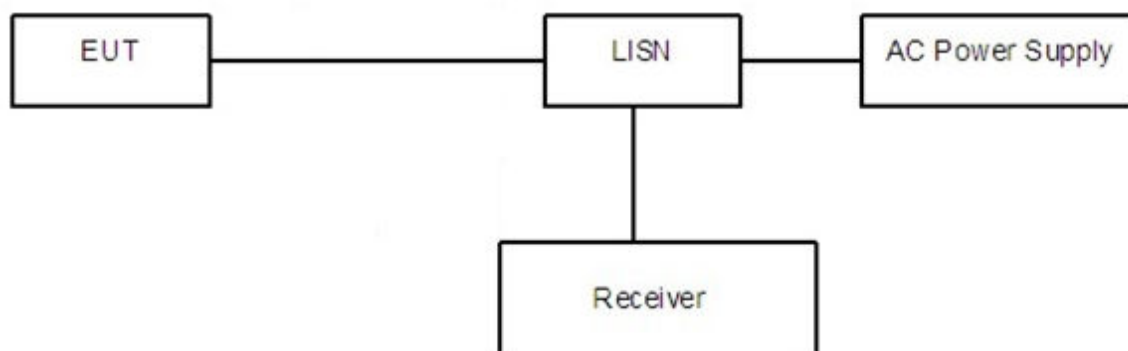


Figure 1

Test Procedure:

The EUT is placed on a non-metallic support 0.1m above the horizontal metal reference ground plane.

The AC main power supply of the EUT is connected to LISN and LISN is connected to the reference ground. The test set-up and the test methods are performed according to ANSI C63.4:2014.

Then start the test software EMC32. Sweep the whole frequency band through the range from 150 KHz to 30 MHz with RBW 9kHz, VBW 30kHz. The measurement should be done for both L line and N line. During pre-test, the receiver uses both peak detector and average detector. And the final test, the receiver uses both average detector and Quasi-peak detector.

The data of cable loss has been calibrated in full testing frequency range before the testing.

A “reference path loss” Corr.(dB) is established and the $L_{cable} + ATT + VDF$ is the attenuation of “reference path loss”, and including the cable loss, the attenuation of the attenuator, the voltage division factor of AMN.

The measurement results are obtained as described below:

$$P_{result} = P_{mea} + Corr.(dB)$$

Sample calculation: $(45.03dB\mu V) = (15.33dB\mu V) + (29.7dB)$, the corresponding frequency is 0.644657MHz.

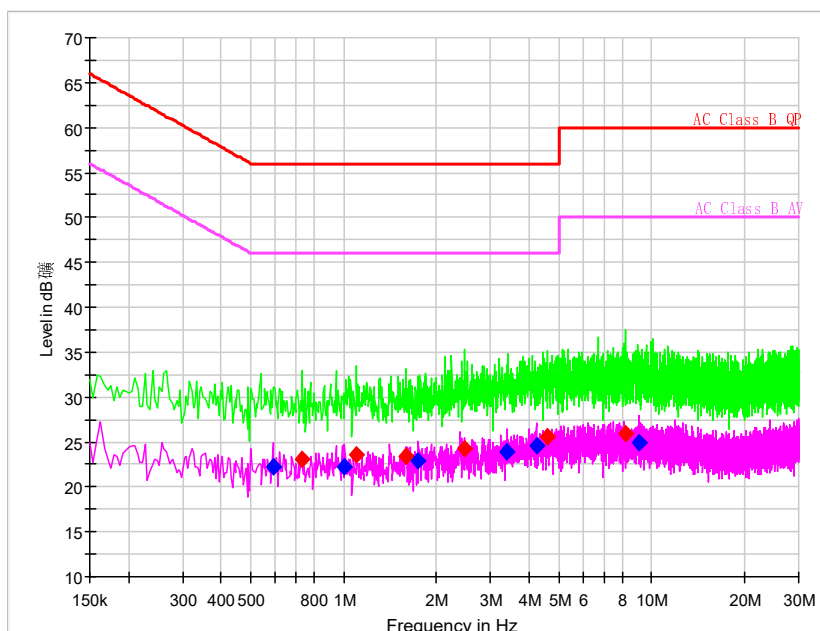
Limit:

Frequency of Emission(MHz)	Limits(dB μ V)	
	Quasi-peak	Average
0.15~0.5	66 to 56*	56 to 46*
0.5~5	56	46
5~30	60	50

Note: * Decreases with the logarithm of the frequency

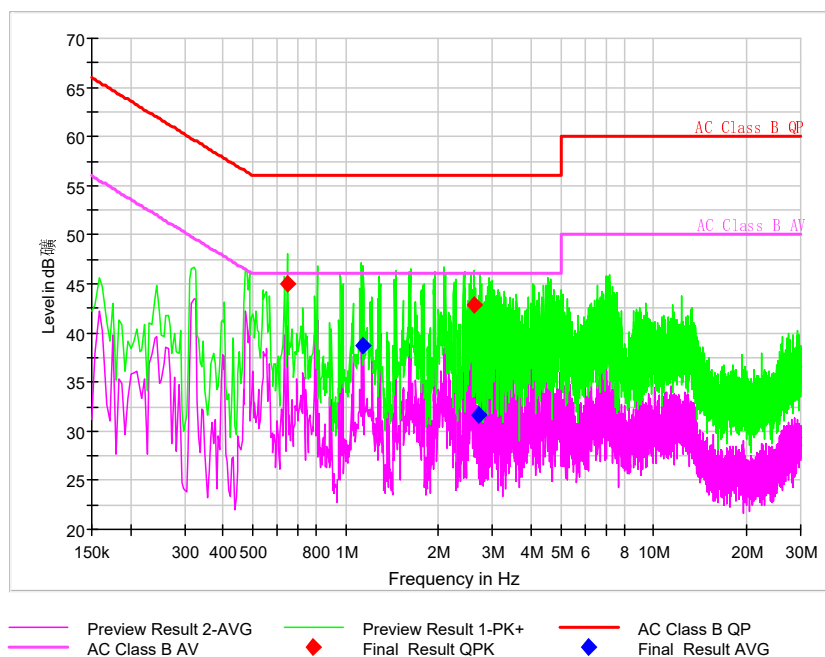
Test result:

Noise Level of the Measuring Instrument



Pic1. Conducted emission L and N Line

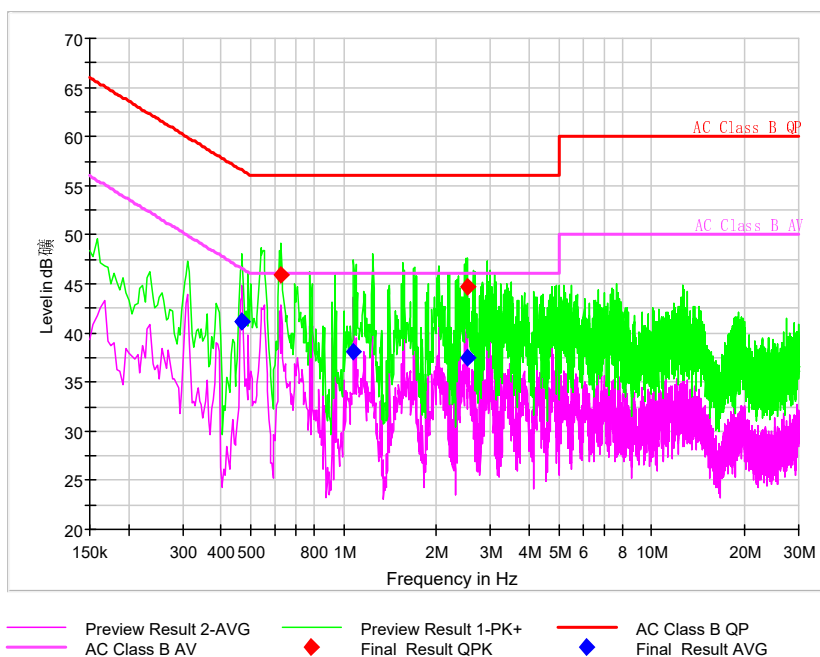
EUT + top AC mains input port:



Pic2. Conducted emission L&N Line

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr (dB)	Pmea QuasiPeak (dBµV)	Pmea Average (dBµV)
0.644657	45.03	---	56.00	10.97	L1	29.7	15.33	---
1.139314	---	38.72	46.00	7.28	L1	29.7	---	9.02
2.597700	42.84	---	56.00	13.16	L1	29.8	13.04	---
2.691514	---	31.66	46.00	14.34	L1	29.8	---	1.86

EUT + bottom AC mains input port:



Pic3. Conducted emission L&N Line

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr (dB)	Pmea QuasiPeak (dBµV)	Pmea Average (dBµV)
0.465557	---	41.19	46.59	5.40	L1	29.7	---	11.49
0.469821	---	41.21	46.52	5.31	L1	29.7	---	11.51
0.627600	45.96	---	56.00	10.04	L1	29.7	16.26	---
1.079614	---	38.16	46.00	7.84	L1	29.7	---	8.46
2.520943	---	37.55	46.00	8.45	N	29.8	---	7.75
2.520943	44.64	---	56.00	11.36	L1	29.8	14.84	---

2.2.2 Radiated Emissions-FCC Part15.109

Ambient condition:

Temperature	Relative humidity	Pressure
24.6°C	42.7%	100.8kPa

Test Setup:

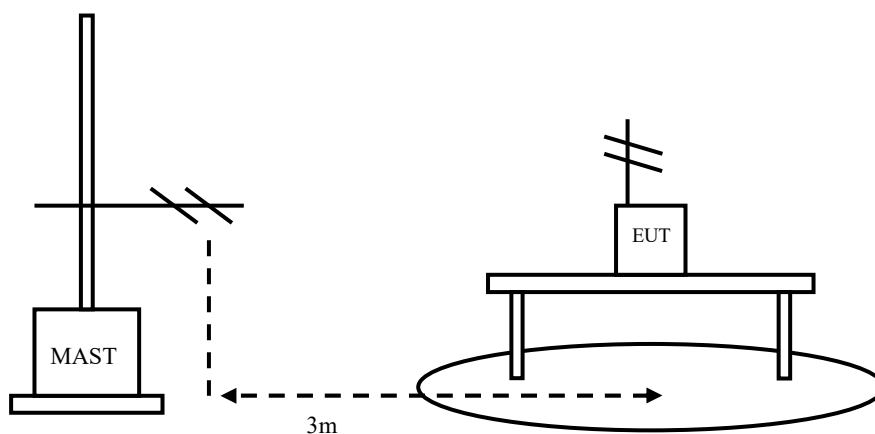


Figure 2

Test Procedure:

EUT + operation mode:

The EUT should be placed on a non-metallic support 10cm above the ground plane. The receive antennas shall be moved from 1 to 4 meters. The distance between EUT and receive antenna should be 3 meters.

The EUT was in the operation mode, all motors of the EUT were working.

The test set-up and the test methods are performed according to ANSI C63.4:2014. Then start the test software EMC32. Sweep the whole frequency band through the range from 30MHz to 1GHz, using receive log period antenna VULB 9163.

During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna.

The data of cable loss and antenna factor have been calibrated in full testing frequency range before the testing.

EUT + Charger:

The EUT should be placed on a non-metallic support 10cm above the ground plane. The receive antennas shall be moved from 1 to 4 meters. The distance between EUT and receive antenna should be 3 meters.

The EUT should work in charging mode. The test set-up and the test methods are performed according to ANSI C63.4:2014.

Then start the test software EMC32. Sweep the whole frequency band through the range from 30MHz to 1GHz, using receive log period antenna VULB 9163.

During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna.

The data of cable loss and antenna factor have been calibrated in full testing frequency range before the testing. All test results are performed with max hold at the horizontal and vertical polarity.

RBW=120kHz, VBW=300kHz, when the test frequency: 30MHz<f<1GHz

RBW=1MHz, VBW=3MHz, when the test frequency: f>1GHz

A “reference path loss” is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

The measurement results are obtained as described below:

$$\text{Result} = P_{\text{mea}} + A_{Rpl}$$

Limit:

Frequency of Emission(MHz)	Limits	
	Detector	Unit (dB μ V/m)
30~88	Quasi-peak	40
88~216	Quasi-peak	43.5
216~960	Quasi-peak	46
960~1000	Quasi-peak	54
1000~5th harmonic of the highest frequency or 40GHz, whichever is lower	Average Peak	54 74

Test result:

Sample calculation: (31.10dB μ V/m) = (49.2dB μ V/m) + (-18.1dB), the corresponding frequency is 40.784500MHz.

EUT + operation mode:

Frequency(MHz)	Result(dB μ V/m)	Limit (dB μ V/m)	ARpl (dB)	Pmea (dB μ V/m)	Polarity
40.784500	31.10	40.00	-18.1	49.2	V
78.169500	29.36	40.00	-23.5	52.86	V
648.064000	39.84	46.00	-6.0	45.84	V
719.989500	38.53	46.00	-4.9	43.43	V
744.045500	41.78	46.00	-4.5	46.28	V
779.644500	38.49	46.00	-3.8	42.29	V

EUT + top AC mains input port:

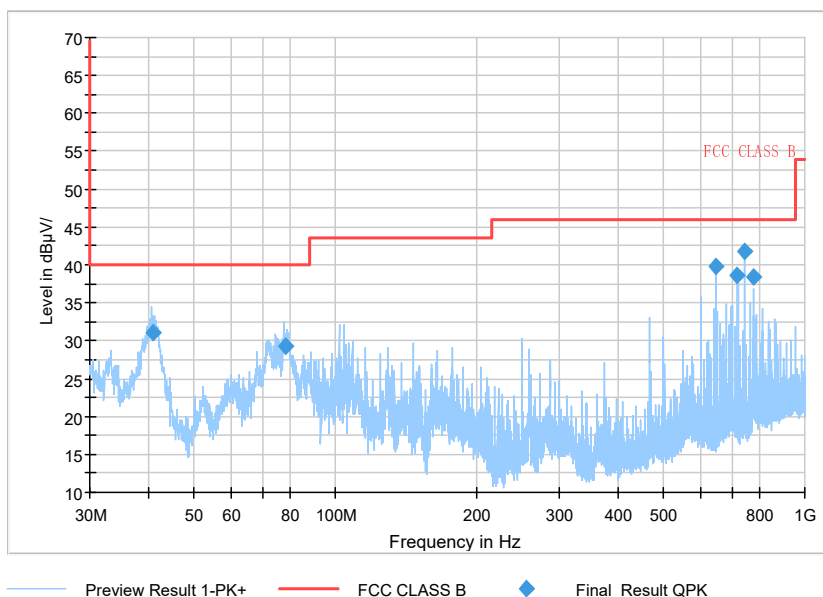
Frequency(MHz)	Result(dB μ V/m)	Limit (dB μ V/m)	ARpl (dB)	Pmea (dB μ V/m)	Polarity
52.789500	30.23	40.00	-17.5	47.73	V
70.859500	24.52	40.00	-21.8	46.32	V
190.641000	41.66	43.50	-19.1	60.76	V
648.064000	38.91	46.00	-6.0	44.91	V
719.989500	38.02	46.00	-4.9	42.92	V
744.045500	43.03	46.00	-4.5	47.53	V

EUT + bottom AC mains input port:

Frequency(MHz)	Result(dB μ V/m)	Limit (dB μ V/m)	ARpl (dB)	Pmea (dB μ V/m)	Polarity
53.160500	35.46	40.00	-17.5	52.96	V
53.699000	36.13	40.00	-17.6	53.73	V
191.185500	39.95	43.50	-19.1	59.05	V
648.055500	40.39	46.00	-6.0	46.39	V
719.989500	36.88	46.00	-4.9	41.78	V
744.045500	42.41	46.00	-4.5	46.91	V

EUT + operation mode: refer to Pic4, Pic5, Pic6, Pic7

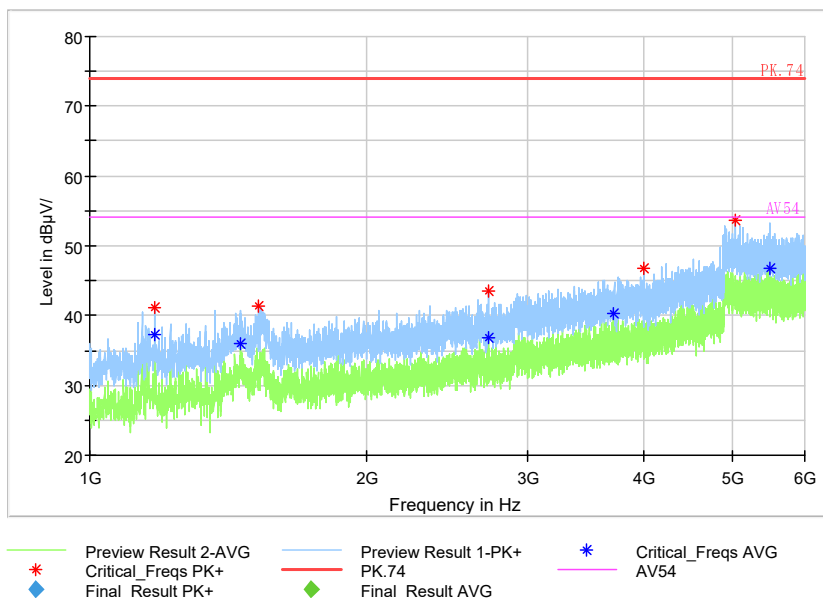
Full Spectrum



Pic4. Radiated emission(30MHz – 1GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical

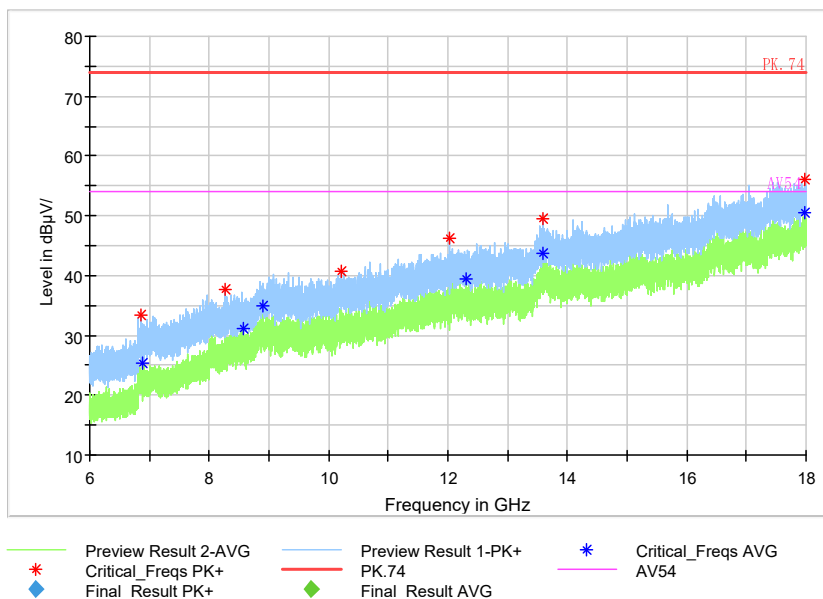
Full Spectrum



Pic5. Radiated emission (1GHz –6GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

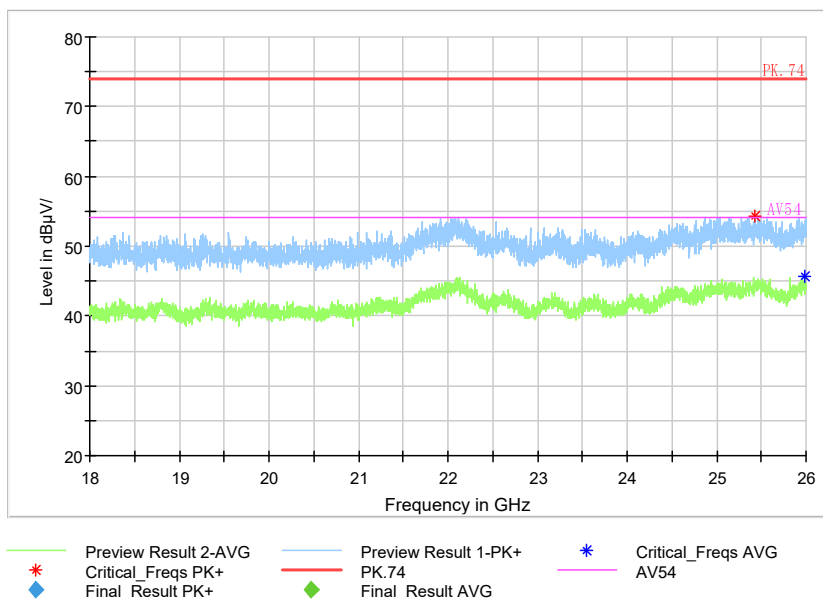
Full Spectrum



Pic6. Radiated emission (6GHz –18GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

Full Spectrum

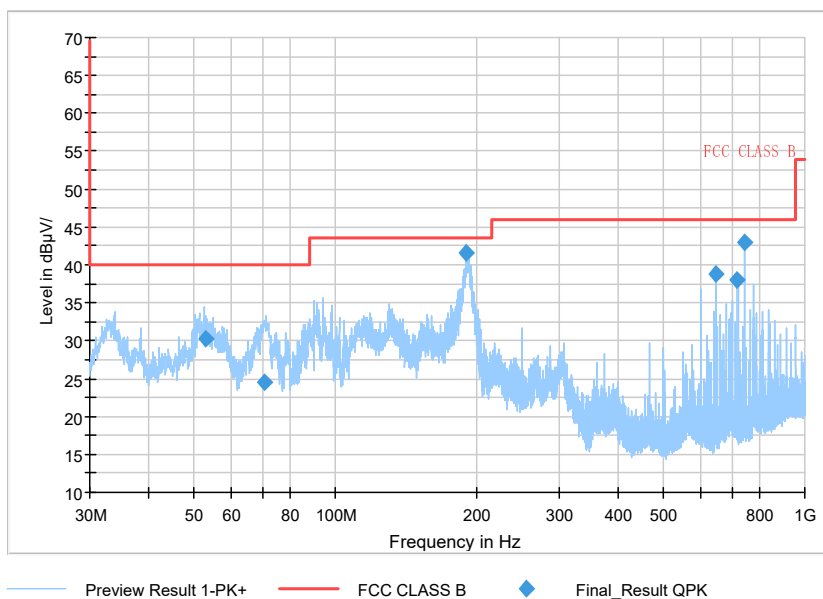


Pic7. Radiated emission (18GHz – 26GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

EUT + top AC mains input port: refer to Pic8, Pic9, Pic10, Pic11

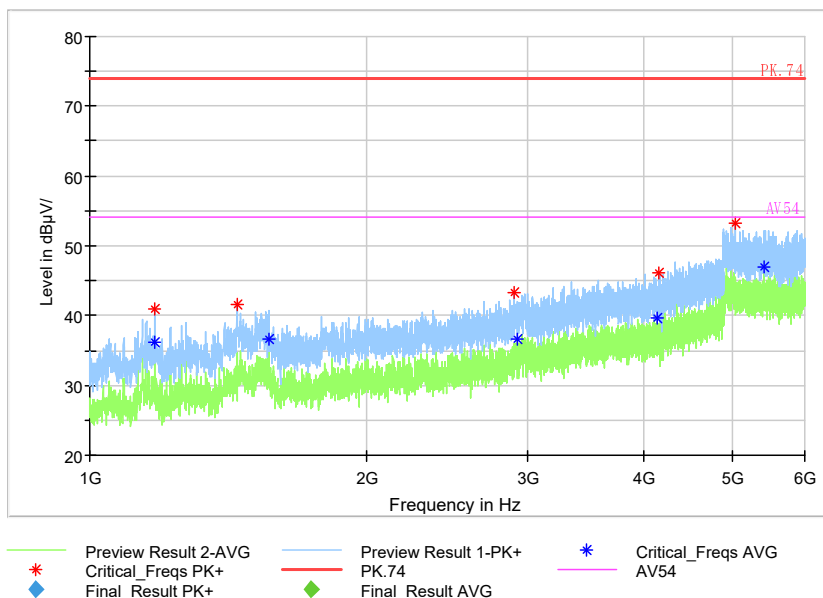
Full Spectrum



Pic8. Radiated emission(30MHz – 1GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical

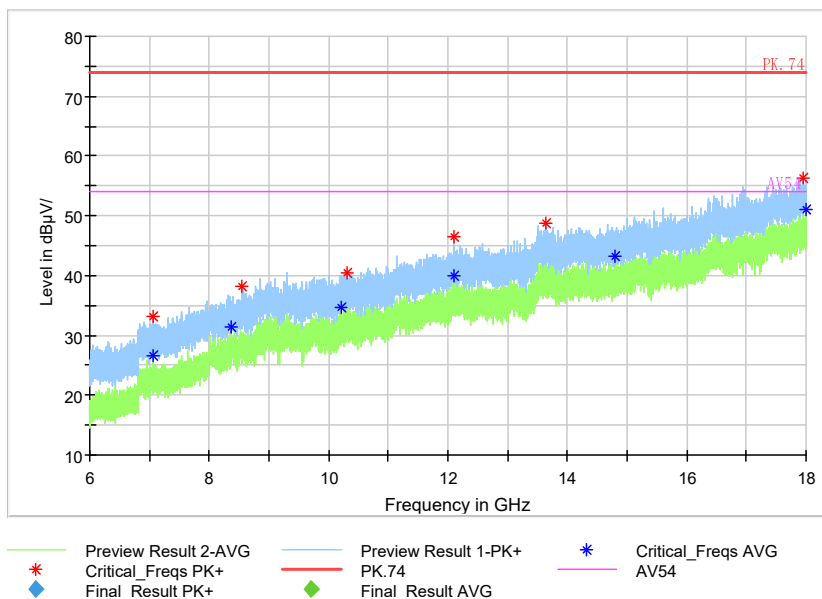
Full Spectrum



Pic9. Radiated emission (1GHz –6GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

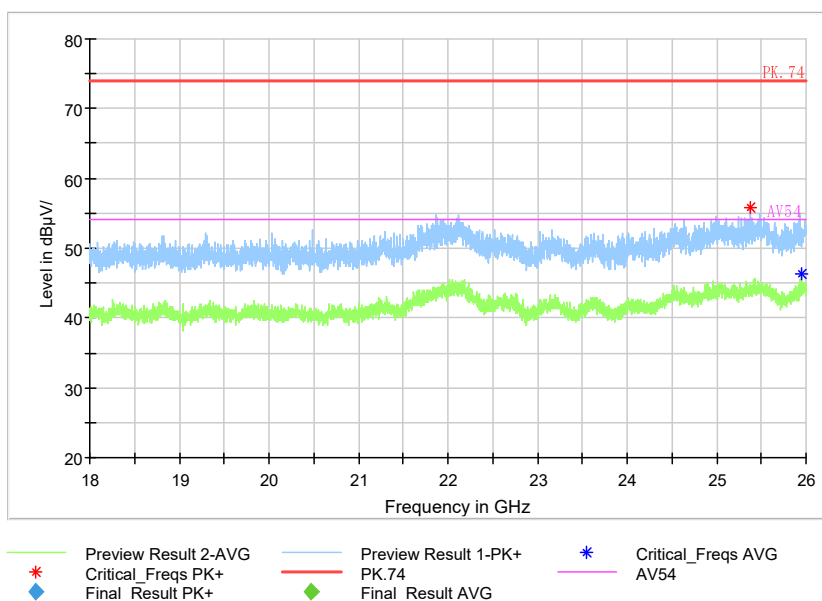
Full Spectrum



Pic10. Radiated emission (6GHz –18GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

Full Spectrum

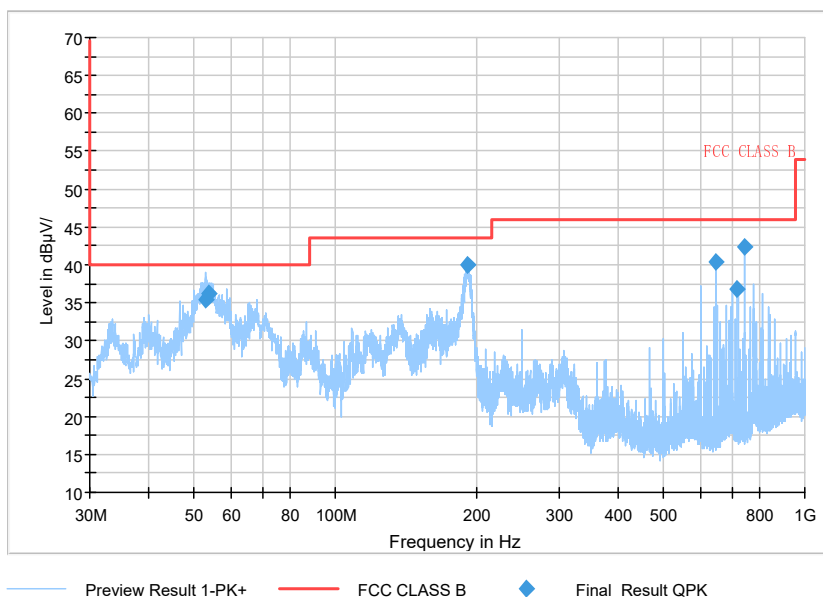


Pic11. Radiated emission (18GHz – 26GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

EUT + bottom AC mains input port: refer to Pic12, Pic13, Pic14, Pic15

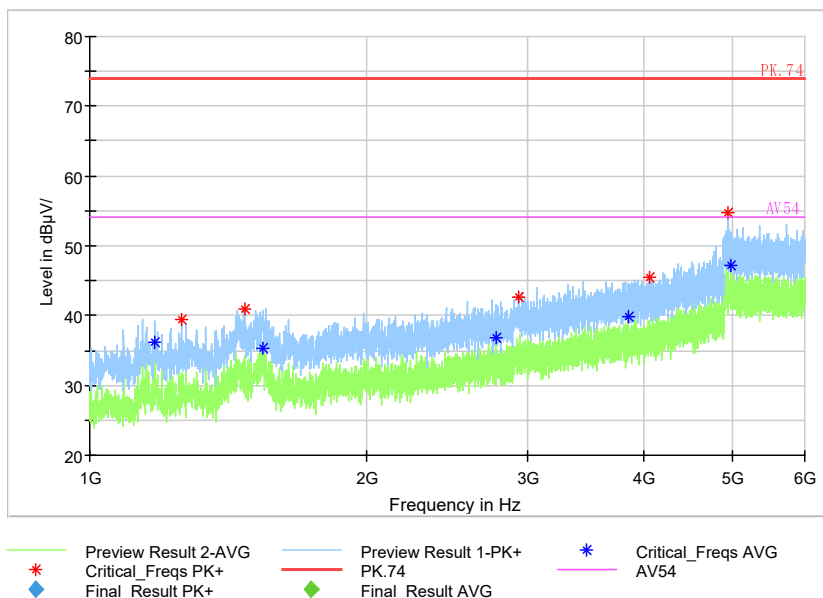
Full Spectrum



Pic12. Radiated emission(30MHz – 1GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical

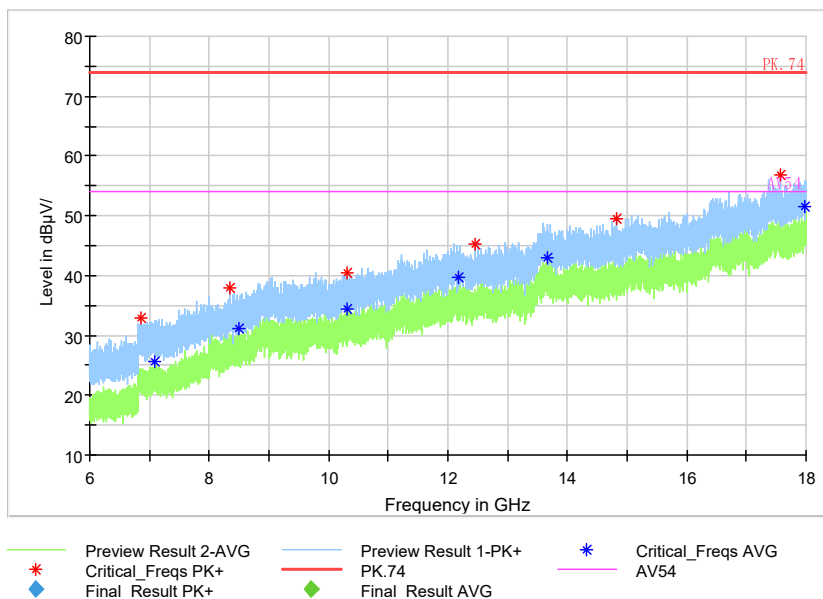
Full Spectrum



Pic13. Radiated emission (1GHz –6GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

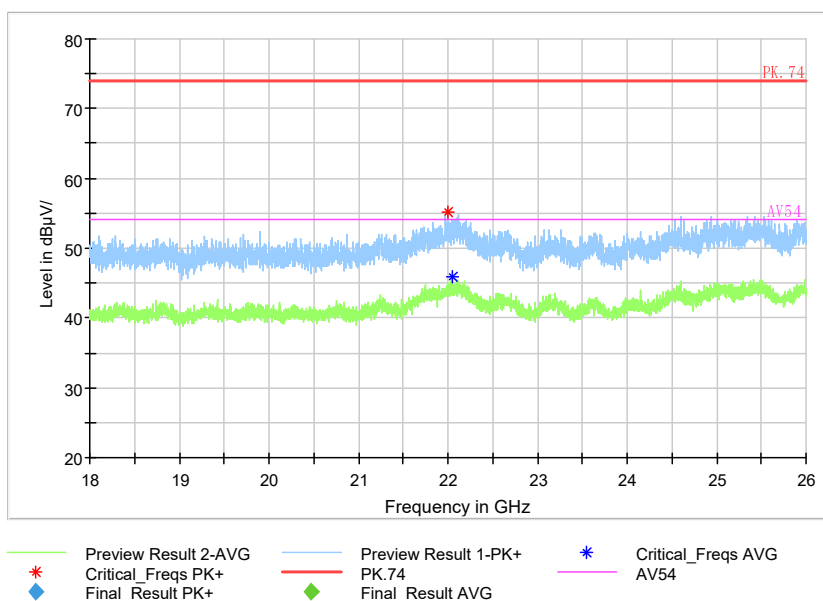
Full Spectrum



Pic14. Radiated emission (6GHz –18GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

Full Spectrum



Pic15. Radiated emission (18GHz – 26GHz)

Note: The test data in the graph includes two polarizations: horizontal and vertical.

2.3. List of test equipments

No.	Name/Model	Manufacturer	S/N	Calibration Due Date	Calibration Date
1	23.18m×16.88m×9.60mS emi-AnechoicChamber	FRANKONIA	-----	5th Sep. 2021	6th Sep. 2016
2	ESW EMI test receiver	R&S	101574	20th Aug. 2020	20th Aug. 2019
3	ESR3EMI test receiver	R&S	102361	20th Aug. 2020	20th Aug. 2019
4	9.080m×5.255m×3.525m Shielding room	FRANKONIA	-----	5th Sep. 2021	6th Sep. 2016
5	VULB 9163 Ultra log test antenna	schwarzbeck	867	25th Mar. 2021	25th Mar. 2020
6	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100512	25th Mar. 2021	25th Mar. 2020
7	ENV216 AMN	R&S	3560.6550. 12	20th Aug. 2020	20th Aug. 2019
8	EMC32EMI test software	R&S	-----	-----	-----

-----The end-----