EMC TEST REPORT

Project No.	LBE20140694	**Issue No.**	0
Applicant	**Name of organization**	Samsung Electronics Co., Ltd.	
	Address	(Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	Date of application	February 3, 2014	
EUT	**Type of device**	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMR381	
	Kind of product	Smart Wearable	
	Model No.	SM-R381	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	SAMSUNG ELECTRONICS CO., LTD. 94-1, Imsu-dong, Gumi-si, Gyengsangbuk-do, 730-722, Republic of Korea SAMSUNG ELECTRONICS HUIZHOU CO.,LTD. 516229, Chenjiang Town, HuiZhou City, Guangdong Province, China	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		February 3, 2014 ~ February 14, 2014	
Issue date		February 21 , 2014	

Test result : **Complied**

The equipment under test has found to be compliant with the applied standards.
(Refer to the attached test result for more detail.)

Tested by : Sung-Wook Choi S.W. Choi	**Reviewed by** : Jong-Sup Jeong Jong Jeong

The test results in this report only apply to the tested sample. This report must not be reproduced, except in full, without written permission from CS & Environment center.

SAMSUNG

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Table of contents

1. Report Information

1.1 Revision history 3

2. Summary of test results

2.1 Emission 3

3. General Information

3.1 Test facility 3

4. Test Configuration

4.1 Test Peripherals 4

4.2 EUT operating mode 4

4.3 Details of Sampling 4

4.4 Used cable description 5

4.5 Test arrangement 5

4.6 EUT Description 6

4.7 Clock Frequencies 6

4.8 Test configuration and condition 7

4.9 Measurement uncertainty 7

5. Result of individual tests

5.1 Conducted disturbance 8

5.2 Radiated disturbance 10

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Form No.: SRA-TRF-46/1

1. Report Information

1.1 Revision history

No	Revised detailed information
Issue 0	- LBE20140694 (SAMSUNG)

2. Summary of test results

1.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result
☒	Conducted Disturbance (Mains port)	FCC Part 15 Subpart B / ANSI C63.4-2009 (Class B)	Complied
☒	Radiated Disturbance		Complied

3. General Information

3.1 Test facility

The CS & Environment center is located on Samsung Electronics Co., Ltd. at (Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742 Republic of Korea.
All testing are performed in Semi-anechoic chambers conforming to the site attenuation characteristics defined by ANSI C63.4, CISPR 22, 16-1 and 16-2. and Shielded rooms.

The CS & Environment center is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:2005.

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4. Test Setup configuration

4.1 Test Peripherals

The cables used for these peripherals are either permanently attached by the peripheral manufacturer or coupled with an assigned cable as defined below.
The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Mark	Description	Model No.	Serial No.	Manufacturer / Trademark	FCC ID / DoC
A	Smart Wearable	SM-R381	-	SAMSUNG	A3LSMR381
B	Charging Dock	EP-BR381BB	-	SAMSUNG	-
C	Data Cable	ECB-DU4EWE	RT1D602ASE	SAMSUNG	-
D	Desk-Top Computer	DM300S3A	EBDEDC6FFD	SAMSUNG	DoC
			-	SAMSUNG	DoC
E	LCD TV Monitor	CF19MS	CF19H1LS700048Y	SAMSUNG	DoC
		EF23TS	EM23H1LS300070L	SAMSUNG	DoC
F	Mouse	SML-210PB	TAKD125021R	SAMSUNG	DoC
G	Keyboard	SDM8500P	8M001183	SAMSUNG	DoC
H	Gigabit Switch 8	J9794A	CN33FQ703Q	HP	DoC
			CN33FQ71XK	HP	DoC
I	Power Supply	EADP-15DC A	DIKD1245096741	Delta	DoC
			DIKD1245096576	Delta	DoC

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4.2 EUT operating mode

To achieve compliance applied standard specification, the following mode(s) were made during compliance testing:

Operating Mode 1	USB Mode (Data Communication)

4.3 Details of Sampling

Customer selected, single unit.

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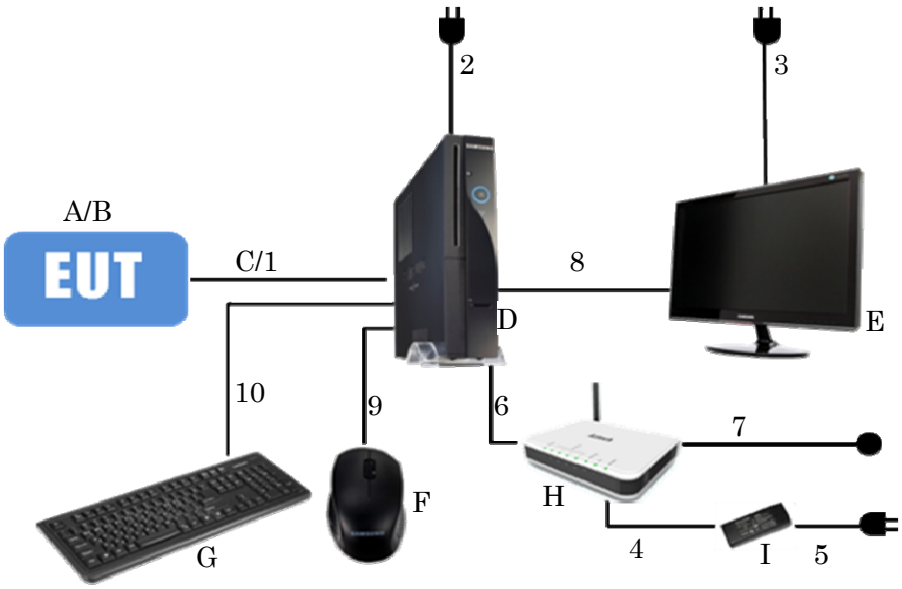
4.4 Used cable description

The EUT is configured, installed, arranged and operated in a manner consistent with typical applications. Interface cables/loads/devices are connected to at least one of each type of interface port of the EUT, and where practical, each cable shall be terminated in a device typical of actual usage. The type(s) of interconnecting cables to be used and the interface port (of the EUT) to which these were connected:

No.	Connected cable	Length [m]	Shielded [Y/N]	Note
1	Data Cable	1.0	Yes	From EUT to Desktop PC
2	Power	1.8	No	For Desk-Top Computer
3	Power	1.8	No	For LCD TV Monitor
4	Power	1.8	No	From Gigabit Switch 8 to Power Supply
5	Power	1.8	No	For Power Supply
6	LAN	1.5	No	From Desk-Top Computer to Gigabit Switch 8
7	LAN	1.5	No	From Gigabit Switch 8 to Local Area Network
8	RGB	1.8	Yes	From Desk-Top Computer to LCD TV Monitor
9	PS/2	1.5	Yes	From Desk-Top Computer to Mouse
10	PS/2	1.5	Yes	From Desk-Top Computer to Keyboard

4.5 Test arrangement



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4.6 EUT Description

4.6.1 The following features describe EUT represented by this report:

Item	Specification
Operating Temperature (℃)	-20 ~ +60
Operating Humidity (%)	0 ~ 95

4.6.2 The variant models

None

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]
CPU	1 000

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4.8 Test configuration and condition

☐The EUT exercise program which is the samsung standardized emission test program for windows was used during all EMC measurements were tested. This program was contained on the PC hard disk drive. Once loaded, the program sequentially exercises each system component in turn.

☒The EUT was exercised during the testing by data read and write cycles repeated with internal storage devices. At the end of the test, the copied back data was compared with original.

☐ The EUT was connected to the PC by using USB data cable to charge.

☐ The system was configured for testing in a typical fashion that a customer would normally use, and was tested while in an automated non-attendant mode.

Power source for the EUT operating was supplied by CVCF made by the Pacific Power Source Corp.

- Test Voltage : AC 120 V, 60 Hz

4.9 Measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus: (According to CISPR 16-4 and UKAS Lab 34.)

4.9.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	AC Mains	3.12 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.03 dB
	Vertical	4.13 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	4.53 dB
	Vertical	4.51 dB

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5. Results of individual test

5.1 Conducted disturbance

The EUT was connected to the Desk-Top Computer which was powered from one LISN for the measurements. The support equipment power cables were connected to a second LISN.
Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration. The EUT measured in accordance with the methods described in standards.

Limits for conducted disturbance at the mains ports

Frequency range Limits MHz	Resolution Bandwidth	Limits dB(μV)	
		Quasi-peak	Average
0,15 to 0,50	9 kHz	66 to 56	56 to 46
0,50 to 5	9 kHz	56	46
5 to 30	9 kHz	60	50
NOTE 1 The lower limit shall apply at the transition frequency. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz			

5.1.1 Test instrumentation

EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E5I-010	LISN	ESH3-Z5	R&S	100263	2013-10-17	12
E5I-018	EMI Test Receiver	ESU8	R&S	100484	2013-06-12	12
E5I-043	LISN	ENV216	R&S	101630	2013-06-07	12

5.1.2 Temperature and humidity condition

Test date	2014-02-14	Test engineer	Sung-Wook Choi
Climate condition	Ambient temperature	23.4 ℃	Limit (15.0 to 35.0) ℃
	Relative humidity	33.2 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	102.2 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR14)		

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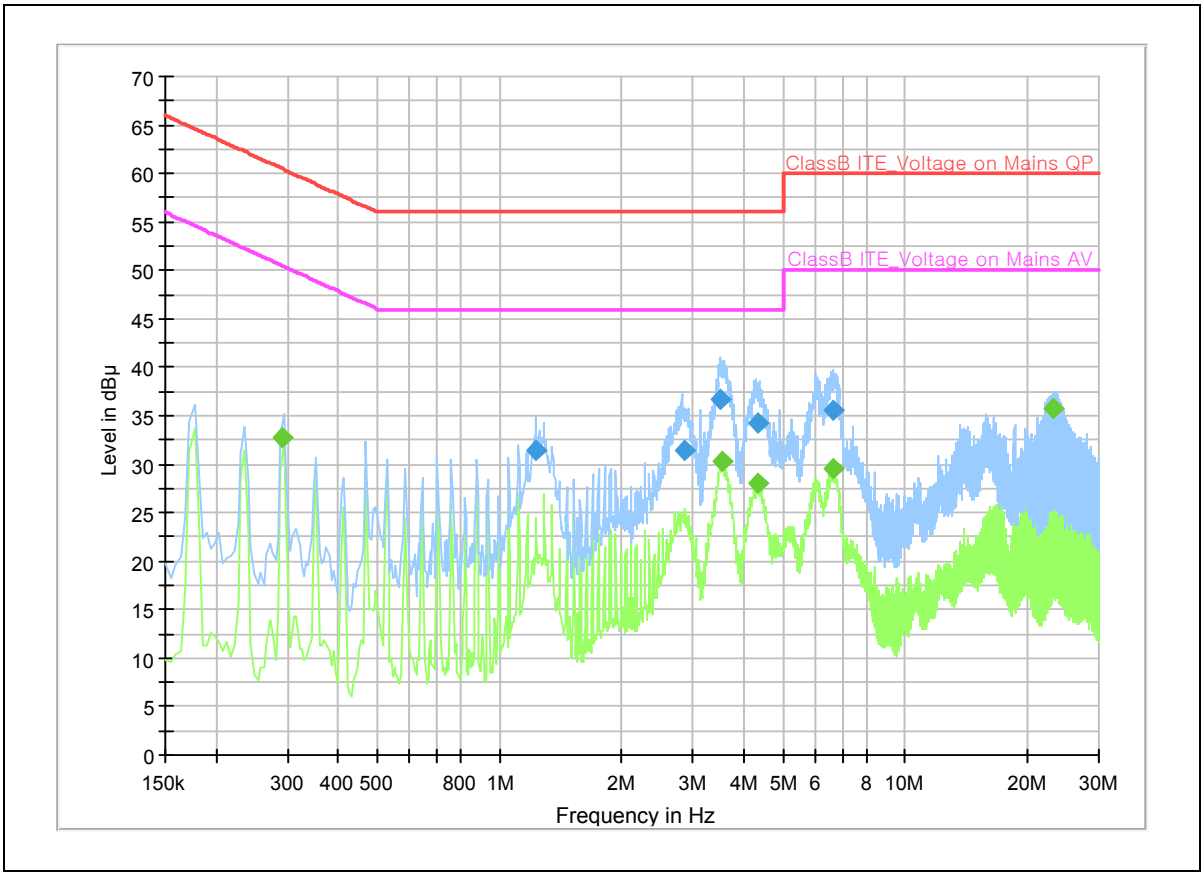
5.1.3 Test results

- Operating Mode 1: AC Mains



Note 1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Quasi-peak(QP) /CISPR-Average(CAV) final measurement results table:

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.292	---	32.7	50.5	17.8	L1	9.9
1.232	31.4	---	56.0	24.6	L1	9.8
2.866	31.5	---	56.0	24.5	L1	9.7
3.510	36.7	---	56.0	19.3	N	9.7
3.541	---	30.4	46.0	15.6	L1	9.7
4.336	---	28.0	46.0	18.0	L1	9.7
4.342	34.2	---	56.0	21.8	N	9.7
6.636	35.6	---	60.0	24.4	N	9.8
6.656	---	29.6	50.0	20.4	N	9.8
23.073	---	35.7	50.0	14.3	L1	9.9

Note 2) Level (QP and/or CAV) = Meter Reading (QP and/or CAV) + Corr. (LISN Insertion Loss + Cable Loss)
Margin (QP and/or CAV) = Limit – Level (QP and/or CAV)
QP = Quasi-Peak, CAV = CISPR-Average, Corr. = Correction Factor

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5.2 Radiated disturbance

The following data lists the significant emission frequencies, measured levels, correction factors (for antenna and cables), orientation of table, polarization and height of antenna, the corrected reading, the limit, and the amount of margin.

Peak measurements were made over the changeable frequency range 30 MHz to 1 GHz at a measurement distance of 10 m for the following antenna and turntable arrangements:

Antenna Height [cm]	Antenna Polarisation	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	120	300	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position.
Final measurements were made using quasi-peak detector.

Peak/CISPR-average measurements were made over the changeable frequency range 1 GHz to 40 GHz or 5th harmonics of the highest frequency in accordance with internal maximum operating frequency at a measurement distance of 3 m for the following antenna and turntable arrangements:

Antenna Height [cm]	Antenna Polarisation	Resolution Bandwidth [MHz]	Video Bandwidth [MHz]	Turntable position [degrees]
100 ~ 200	Horizontal, Vertical	1	3	0 ~ 345 (Step size: 15 degrees)

Measurements within 6 dB of the limit were then maximized by adjusting turntable position.
Final measurements were made using peak and CISPR-average detectors.

Limits for radiated disturbance of Class B ITE at a measuring distance of 3 m and 10 m

Frequency range Limits [MHz]	Field Strength		
	3 m [μV/m]	3 m [dB(μV/m)]	10 m [dB(μV/m)]
30 to 88	100	40.0	29.5
88 to 216	150	43.5	33.0
216 to 960	200	46.0	35.5
Above 960	500	54.0	43.5

Results checked manually; and points close to the limit line were re-measured.

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5.2.1 Test instrumentation

EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E5I-017	EMI Test Receiver	ESU8	R&S	100483	2013-06-11	12
E5I-021	EMI Test Receiver	ESU40	R&S	100376	2013-06-11	12
E5I-035	Horn Antenna	HF907	R&S	100506	2013-04-02	24
E5I-072	BiLog Antenna	CBL6112D	Teseq	36009	2013-06-03	24
E5I-071	BiLog Antenna	CBL6112D	Teseq	35384	2013-05-23	24
E5I-073	Preamplifier	310N	Sonoma	332016	2013-06-10	12
E5I-074	Preamplifier	310N	Sonoma	332017	2013-06-10	12

5.2.2 Temperature and humidity condition

Test date	2014-02-03	**Test engineer**	Sung-Wook Choi
Climate condition	Ambient temperature	22.8 ℃	Limit (15.0 to 35.0) ℃
	Relative humidity	32.7 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	102.0 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC8)		

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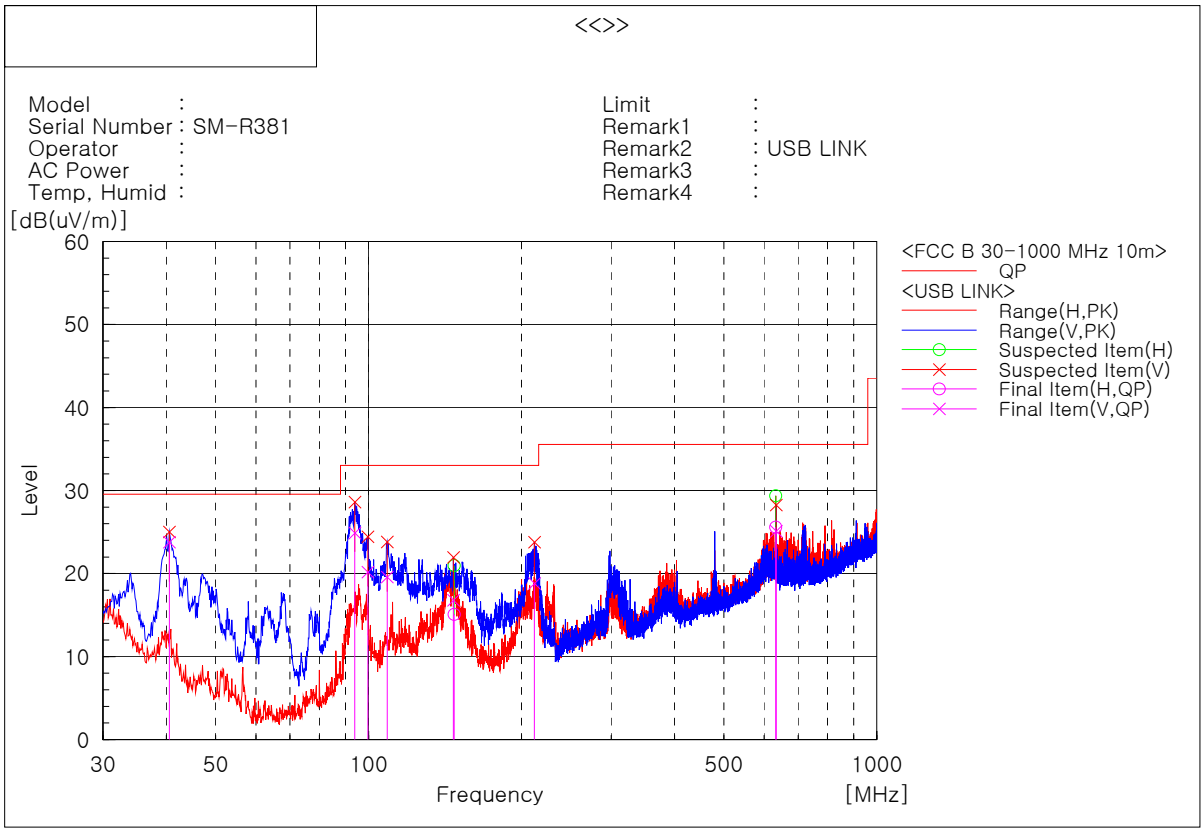
5.2.3 Test results

☐ Operating Mode 1

- Frequencies below 1 GHz



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	System
1	40.549	V	42.4	-18.6	23.8	29.5	5.7	100	245	2
2	93.899	V	45.9	-21.0	24.9	33.0	8.1	176	246	2
3	99.598	V	40.4	-20.2	20.2	33.0	12.8	200	242	2
4	108.813	V	38.7	-19.1	19.6	33.0	13.4	100	54	2
5	146.885	V	36.4	-19.6	16.8	33.0	16.2	100	244	2
6	147.370	H	35.1	-20.0	15.1	33.0	17.9	400	76	1
7	211.996	V	39.2	-20.4	18.8	33.0	14.2	100	352	2
8	632.128	H	34.6	-9.0	25.6	35.5	9.9	110	61	1
9	633.583	V	33.6	-8.5	25.1	35.5	10.4	300	18	2

Note) Receiving antenna polarization : Horizontal, Vertical
Test Distance : 10 m, Antenna Height : 1 to 4 meters
Level (QP) = Reading (QP) + c.f (Antenna Factor + Cable Loss - Amp. Gain)
Margin (QP) = Limit – Level (QP)
QP = Quasi-Peak, c.f = Correction Factor

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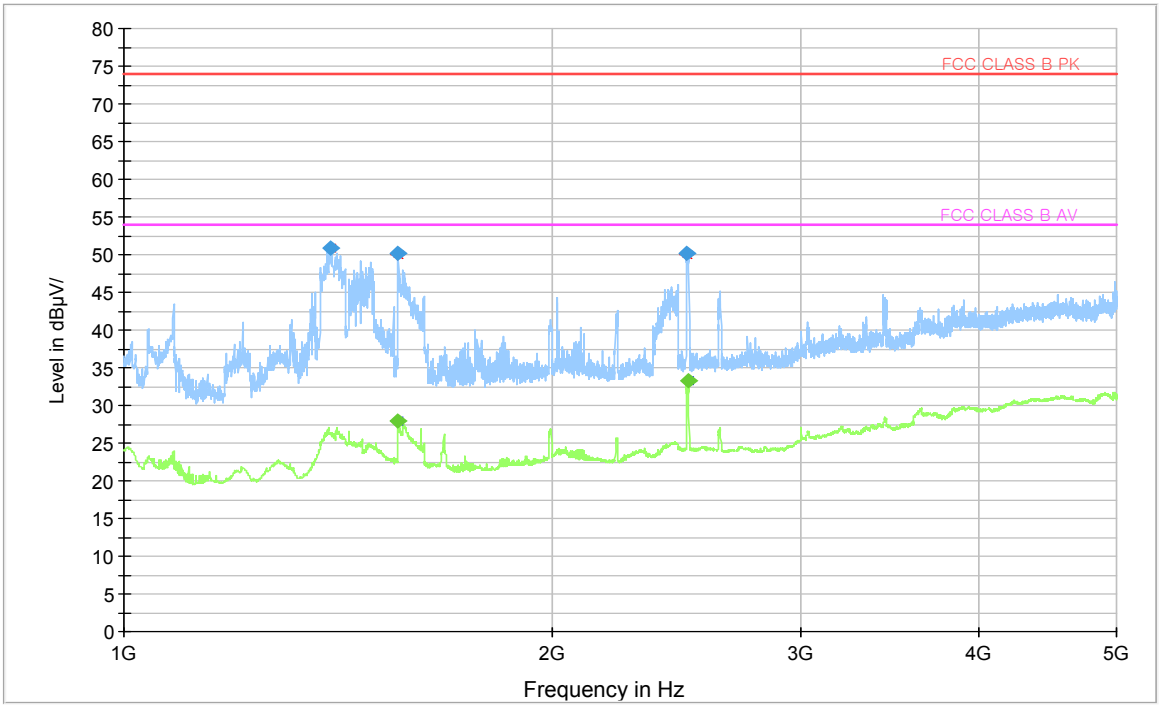
5.2.3 Test results

☐ Operating Mode 1

- Frequencies above 1 GHz



Final measurement results table(PK):

Frequency (MHz)	Level (dBuV/m)	Height (cm)	Polarisation	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
1 396.000	50.9	100	V	180.0	-7.5	23.1	74.0
1 560.500	50.1	100	V	90.0	-6.2	23.9	74.0
2491.000	50.1	100	H	270.0	-0.9	23.9	74.0

Final measurement results table(CAV):

Frequency (MHz)	Level (dBuV/m)	Height (cm)	Polarisation	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
1 560.500	28.0	100	H	45.0	-6.2	26.0	54.0
4 491.500	33.3	100	H	60.0	-0.8	20.7	54.0

Note) Receiving antenna polarization : Horizontal, Vertical
Test Distance : 3 m, Antenna Height : 1 to 2 meters
Level (PK and/or CAV) = Reading (PK and/or CAV) + Corr. (Antenna Factor + Cable Loss - Amp. Gain)
Margin (PK and/or CAV) = Limit – Level (PK and/or CAV)
PK = Peak, CAV = CISPR-Average, Corr. = Correction Factor

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