

EMC TEST REPORT

Project No.	LBE20136077	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	December 09, 2013	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LGTS7898I	
	Kind of product	Mobile Phone	
	Model No.	GT-S7898I	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	SAMSUNG ELECTRONICS TIANJIN CO.,LTD. 300-385 No.9 WeiWu Rd. Micro- Electronic Industrial Park Xiqing Dist, Tianjin, China	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		December 23, 2013	
Issue date		December 26, 2013	

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 : In-Gue Park

I. G. Park

Reviewed by : Tae-Young Jang



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1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	- LBE20136077 (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, 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.

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	Mobile Phone	GT-S7898I	-	SAMSUNG	A3LGTS7898I
B	Battery	B100AE	THaD912AS/2-B	SAMSUNG	-
C	Headset:	EHS61ASFWE	-	SAMSUNG	-
D	Data Cable	ECB-DU28BC	-	SAMSUNG	-
E	microSD Card	16GB	-	SANDISK	-
F	Travel Adapter:	EHS61ASFWE	DW1DB19DS/5- E	SAMSUNG	-
G	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
H	LCD TV Monitor	UE22C4000PWXZT	B20B3HUB200001A	SAMSUNG	DoC
I	Mouse	M-S48a	LZA00153189	SAMSUNG	DoC
J	Keyboard	SKG-2000PB	CNBA5902830AGP53Z5A3485	SAMSUNG	DoC
K	Gigabit Switch Hub	H3008	10070100009	EFM Networks	DoC
L	Power Supply	HB12B-050200SPA	HBK520201025	Shen Zhen City Hong Ben	-

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)
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4.3 Details of Sampling

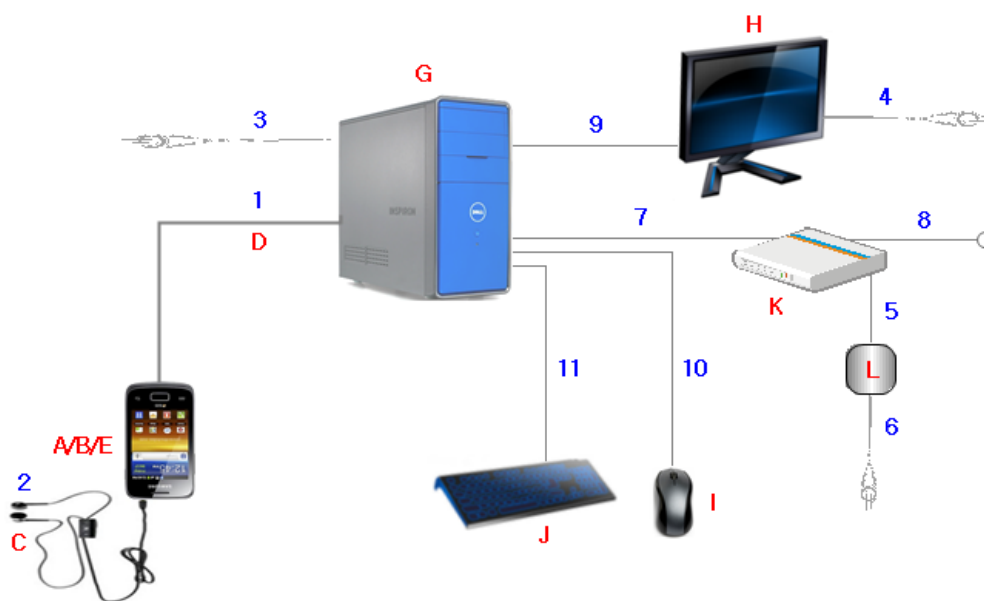
Customer selected, single unit.

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 / Travel Adapter	0.8	Yes	From EUT to Desk-Top Computer / From EUT to Travel Adapter
2	Headset	1.2	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LCD Monitor
5	Power	1.8	No	From Gigabit Switch 8 to Power Supply
6	Power	1.8	No	For Power Supply
7	LAN	1.5	No	From Desk-Top Computer to Gigabit Switch 8
8	LAN	1.5	No	From Gigabit Switch 8 to Local Area Network
9	RGB	1.8	Yes	From Desk-Top Computer to LCD Monitor
10	PS/2	1.8	Yes	From Desk-Top Computer to Mouse
11	PS/2	1.8	Yes	From Desk-Top Computer to Keyboard

4.5 Test arrangement



4.6 EUT Description

4.6.1 The following features describe EUT represented by this report:

Item	Specification	
Frequency Range	GSM1900	TX : 1 850.2 ~ 1 909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
Operating Temperature (°C)	-20 ~ +60	
Operating Humidity (%)	0 ~ 95	

4.6.2 The variant models

- None

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]	Kind of Clocks	Frequency [MHz]
CPU	1 200	-	-

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	2.95 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.69 dB
	Vertical	4.83 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	5.47 dB
	Vertical	5.45 dB

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 of Class B ITE

Frequency range Limits [MHz]	Resolution Bandwidth [kHz]	Limits [dB(μV)]	
		Quasi-peak	Average
0,15 to 0,50	9	66 to 56	56 to 46
0,50 to 5	9	56	46
5 to 30	9	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

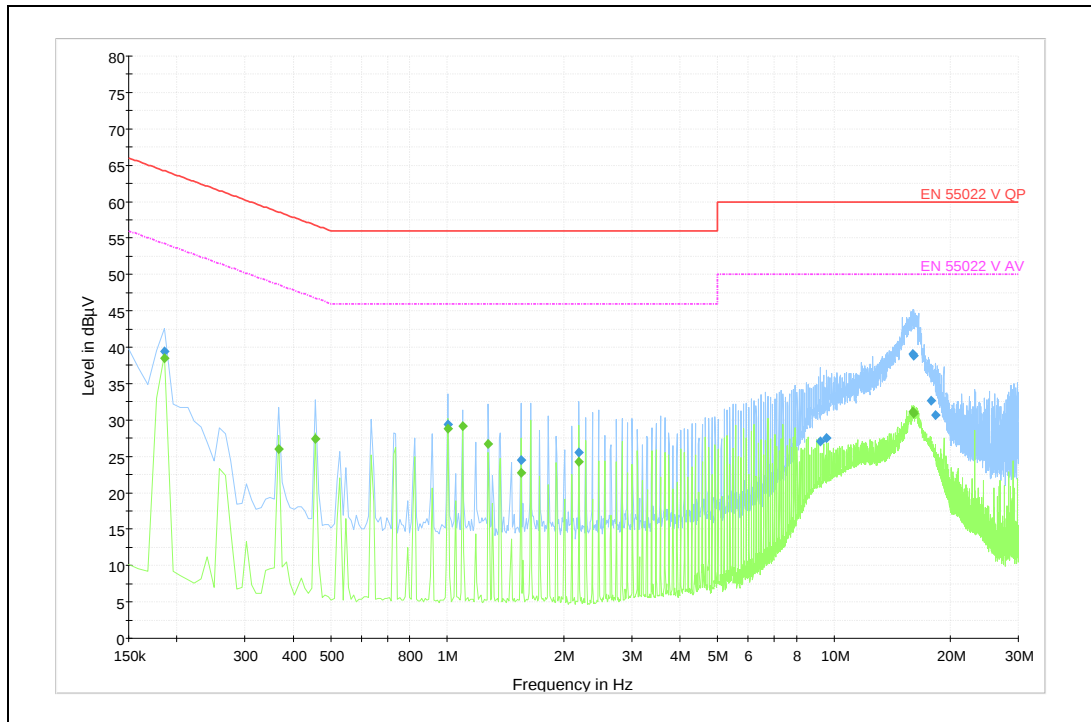
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E5I-016	EMI RECEIVER	ESU	R&S	100482	2013-08-29	12
E3I-259	Two-Line V-Network	ENV216	R&S	101369	2013-11-17	12
E3I-049	Two-Line V-Network	ESH3-Z5	R&S	100260	2013-01-08	12
-	Test Software	EMC32	R&S	Ver 8.53.0	-	-

5.1.2 Temperature and humidity condition

Test date	2013-12-23	Test engineer	In-Gue Park
Climate condition	Ambient temperature	23.4 °C	Limit (15.0 to 35.0) °C
	Relative humidity	38.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.7 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

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 final measurement results table:

Frequency [MHz]	Quasi-Peak [dBuV]	Line	Factor [dB]	Margin [dB]	Limit [dBuV]
0.186	39.4	N	10.1	24.8	64.2
1.005	29.4	N	9.8	26.6	56.0
1.554	24.5	L1	9.8	31.5	56.0
2.193	25.5	L1	9.7	30.5	56.0
9.222	27.0	L1	9.8	33.0	60.0
9.591	27.5	N	9.8	32.5	60.0
15.972	39.0	N	9.9	21.0	60.0
16.107	38.9	L1	9.8	21.1	60.0
17.808	32.6	L1	9.9	27.4	60.0
18.348	30.6	N	10.0	29.4	60.0

C/Average final measurement results table:

Frequency [MHz]	C/Average [dBuV]	Line	Factor [dB]	Margin [dB]	Limit [dBuV]
0.186	38.5	L1	10.1	15.7	54.2
0.366	26.0	N	10.0	22.6	48.6
0.456	27.4	L1	10.0	19.3	46.8
1.005	28.9	N	9.8	17.1	46.0
1.095	29.1	L1	9.8	16.9	46.0
1.275	26.7	N	9.8	19.3	46.0
1.554	22.8	N	9.8	23.2	46.0
2.193	24.3	L1	9.7	21.7	46.0
16.017	31.1	L1	9.8	18.9	50.0
16.053	30.9	N	9.9	19.1	50.0

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

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/RMS-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 ~ 400	Horizontal, Vertical	1	3	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using peak and rms-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 [$\mu\text{V/m}$]	3 m [dB($\mu\text{V/m}$)]	10 m [dB($\mu\text{V/m}$)]
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.

5.2.1 Test instrumentation

EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-005	EMI TEST RECEIVER	ESIB-26	R&S	100355	2013-02-06	12
E3I-263	BILOG Antenna	CBL 6143A	TESEQ	30262	2013-05-16	24
E3I-217	Preamplifier	310N	SONOMA	282363	2013-02-04	12
E3I-170	Double-Ridged Waveguide Horn Antenna	HF906	R&S	100028	2012-08-13	24
-	Test Software	EP5/RE	TOYO	Ver 3.10.20	-	-

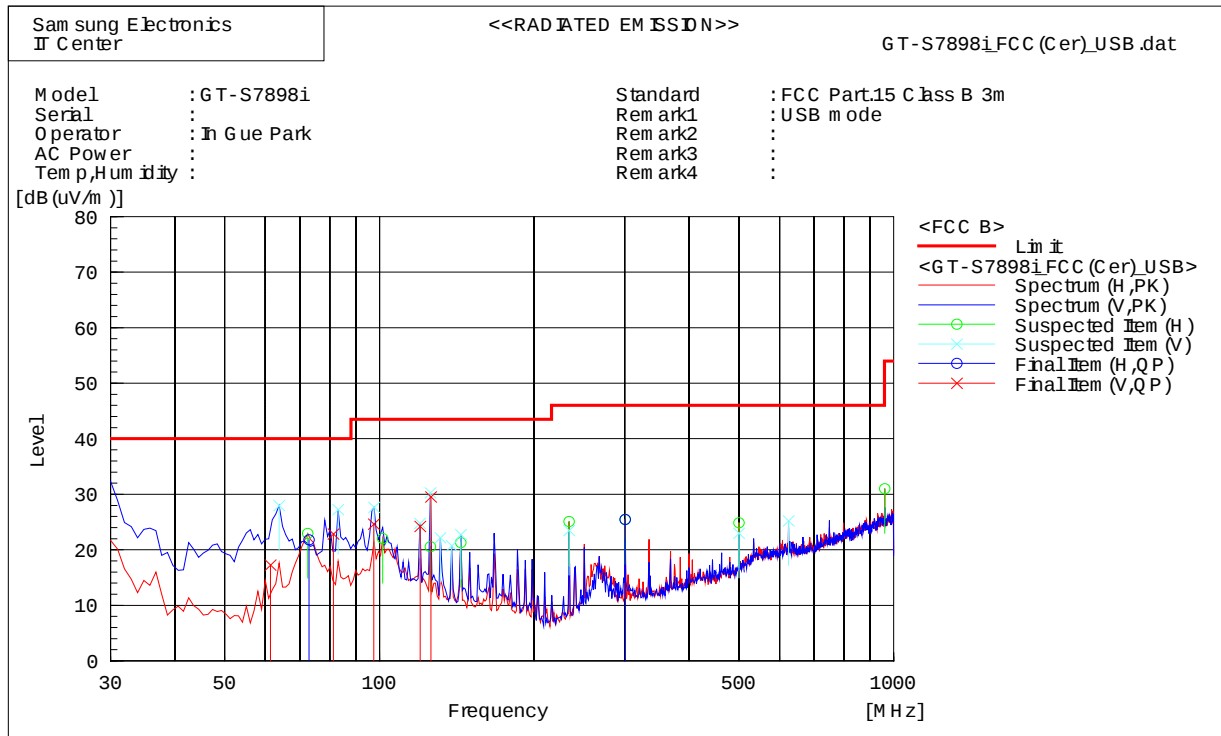
5.2.2 Temperature and humidity condition

Test date	2013-12-23	Test engineer	In-Gue Park
Climate condition	Ambient temperature	23.5 °C	Limit (15.0 to 35.0) °C
	Relative humidity	39.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.2 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC7)		

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz



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]
1	61.417	V	41.2	-23.9	17.3	40.0	22.7	101.0	311.0
2	72.940	H	44.7	-22.9	21.8	40.0	18.2	197.0	251.0
3	81.334	V	44.4	-21.6	22.8	40.0	17.2	101.0	11.0
4	97.504	V	43.5	-18.9	24.6	43.5	18.9	101.0	238.0
5	119.972	V	41.5	-17.3	24.2	43.5	19.3	102.0	292.0
6	125.990	V	47.0	-17.5	29.5	43.5	14.0	101.0	329.0
7	300.669	H	41.7	-16.3	25.4	46.0	20.6	196.0	226.0

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)

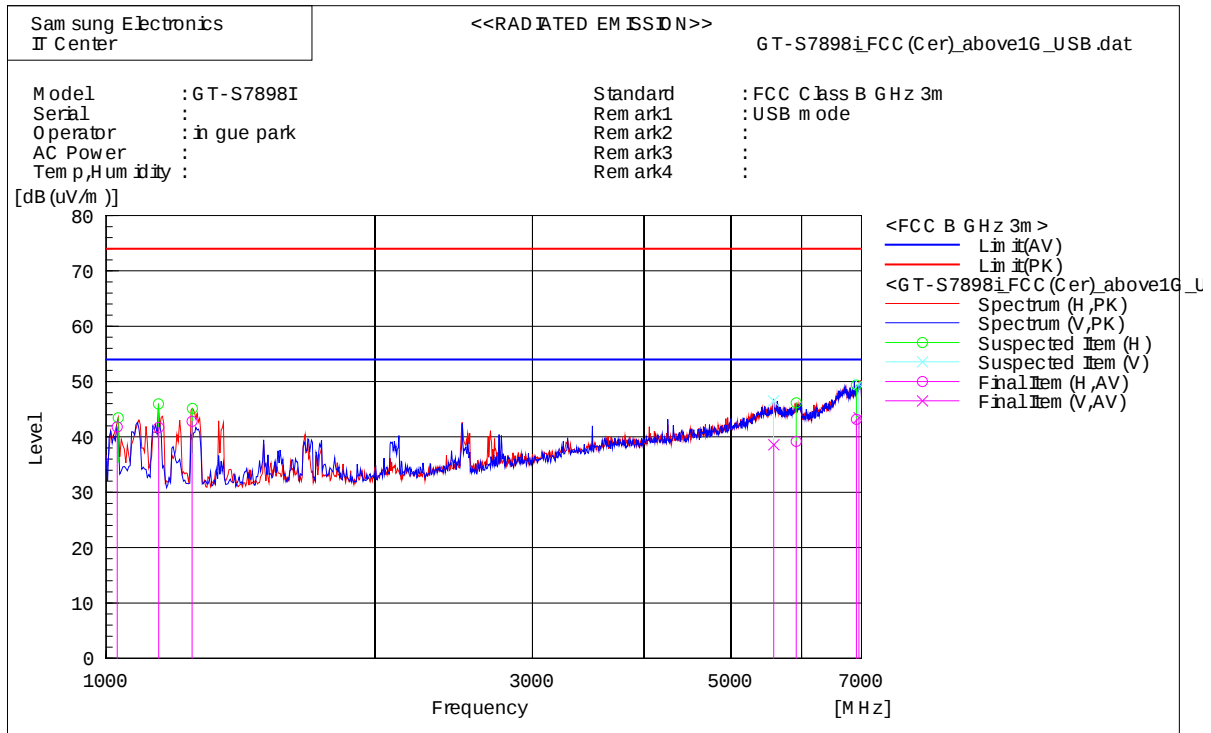
Margin (QP) = Limit - Level (QP)

QP = Quasi-Peak

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 1 000 ~ 7 000 MHz



Peak Measurement

Frequency [MHz]	POL	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin PK [dB]	Height [cm]	Angle [deg]
1 032.064	H	52.0	-8.5	43.5	74.0	30.5	103.0	286.0
1 144.289	H	54.4	-8.4	46.0	74.0	28.0	104.0	231.0
1 248.497	H	53.3	-8.2	45.1	74.0	28.9	107.0	242.0
5 579.158	V	42.2	4.3	46.5	74.0	27.5	100.0	2.0
5 915.832	H	41.0	5.2	46.2	74.0	27.8	111.0	318.0
6 907.816	H	40.8	8.5	49.3	74.0	24.7	100.0	337.0
6 955.912	V	41.0	8.6	49.6	74.0	24.4	106.0	90.0

C/Average Measurement

Frequency [MHz]	POL	Reading AV [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Limit [dB(uV/m)]	Margin AV [dB]	Height [cm]	Angle [deg]
1 029.118	H	50.3	-8.5	41.8	54.0	12.2	102.0	285.0
1 145.471	H	50.1	-8.4	41.7	54.0	12.3	101.0	230.0
1 247.796	H	51.0	-8.2	42.8	54.0	11.2	105.0	242.0
5 582.855	V	34.3	4.3	38.6	54.0	15.4	100.0	3.0
5 918.929	H	34.0	5.2	39.2	54.0	14.8	111.0	318.0
6 907.816	H	34.7	8.5	43.2	54.0	10.8	100.0	336.0
6 955.912	V	34.9	8.6	43.5	54.0	10.5	104.0	90.0

Note 1) Radiated emissions that do not exceed average limit were not tested with average detector mode.

Note2) Receiving antenna polarization : Horizontal and Vertical

Level PK(Peak) = Reading PK(Peak) + Factor(Antenna Factor + Cable Loss - Amp. Gain)

Level AV (C/Average) = Reading AV (C/Average) + Factor(Antenna Factor + Cable Loss - Amp. Gain)

Margin PK (Peak) = Limit – Level PK (Peak)

Margin AV (C/Average) = Limit – Level AV (C/Average)