

EMC TEST REPORT

Project No.	LBE20153743	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	June 10, 2015	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMN920X	
	Kind of product	Mobile Phone	
	Model No.	SM-N920X	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	SAMSUNG ELECTRONICS CO., LTD. (Imsoo-dong) 302, 3gongdan 3-ro, gumi-si, gyeongsangbuk-do, 730350 korea	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		June 22, 2015 ~ June 24, 2015	
Issue date		June 25, 2015	
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 		Reviewed by : Tae-Young Jang 	
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.			
 CS & Environment Center of Samsung Electronics Co., Ltd. (Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-so, 443-742, Republic of Korea			

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

1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	There are no revisions and this version is basic test report.

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	SM-N920X	-	SAMSUNG	A3LSMN920X
B	Battery	EB-BN920ABE	-	SAMSUNG	-
C	Headset	EG920BW	-	SAMSUNG	-
D	Data Cable	EP-DG925UWE	-	SAMSUNG	-
E	Router	T3004	T300475G00563	EFM Networks	DoC
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD Monitor	U2713HMT	CN-0GK0KD-74445-332-106L	Dell	DoC
H	Mouse	M-SBF96	LZ949BG0D9Y	Logitech	DoC
I	Keyboard	SKG-2000PB	CNBA5902830AGP53Z5A3485	SAMSUNG	DoC
J	Power Supply	FS0D0900800K	FW121030770D13041902138	FAIRONE	DoC

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

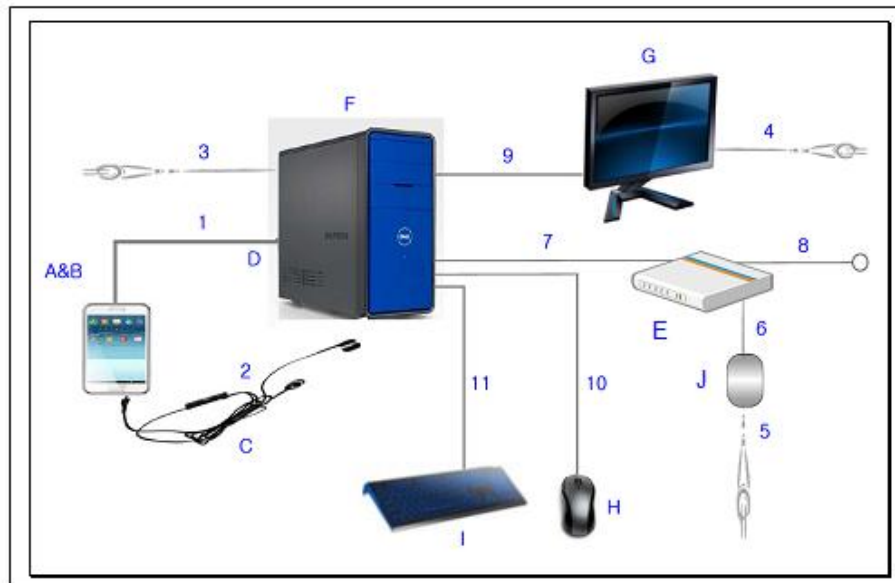
Customer selected, single unit.

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	USB	0.8	Yes	From EUT to Desk-Top Computer
2	Headset	1.6	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LCD TV Monitor
5	Power	1.8	No	For Power Supply
6	Power	1.8	No	From Router to Power Supply
7	LAN	1.5	No	From Desk-Top Computer to Router
8	LAN	1.5	No	From Router to Local Area Network
9	RGB	1.8	Yes	From Desk-Top Computer to LCD TV 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

Note: The EUT is a bar type mobile phone which can incorporate a camera, Bluetooth, Wi-Fi, GPS, ANT+, NFC, MP3 player and MP4 player

4.6.1 The variant models

- None

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]
CPU	2 100

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	3.16 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.90 dB
	Vertical	4.66 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	5.45 dB
	Vertical	5.43 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

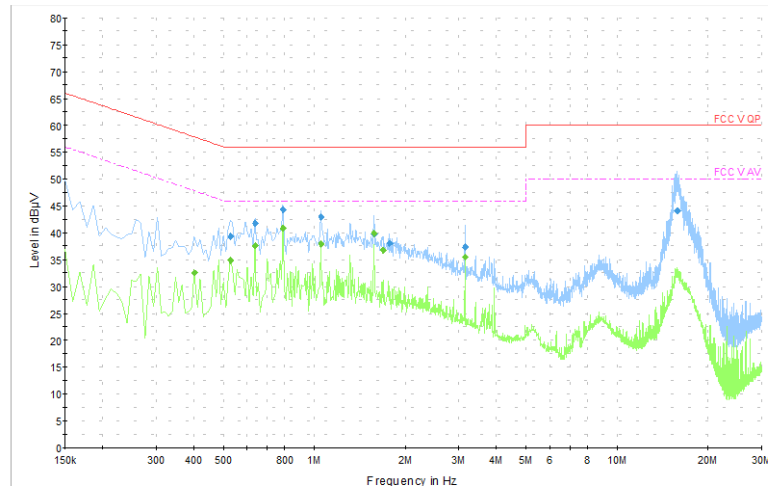
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-132	EMI Test Receiver	ESIB-26	R&S	100291	2014-12-08	12
E3I-259	Two-Line V-Network	ENV216	R&S	101369	2014-11-17	12
E3I-049	Two-Line V-Network	ESH3-Z5	R&S	100260	2015-01-12	12

5.1.2 Temperature and humidity condition

Test date	2015-06-24	Test engineer	In-Gue Park
Climate condition	Ambient temperature	(23.0 ~ 23.2) °C	Limit (15.0 to 35.0) °C
	Relative humidity	(40.5 ~ 40.7) % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	(100.6 ~ 100.8) 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.

Test Results (Quasi-Peak and CAV)

Quasi-peak final measurement results table

Frequency [MHz]	Quasi-Peak [dBμV]	Line	Factor [dB]	Margin [dB]	Limit [dBμV]
0.528	39.3	L1	9.9	16.7	56.0
0.636	41.8	N	9.9	14.2	56.0
0.789	44.3	N	9.9	11.7	56.0
1.050	42.9	N	9.8	13.1	56.0
1.572	39.7	L1	9.8	16.3	56.0
1.770	38.0	L1	9.7	18.0	56.0
3.147	37.3	L1	9.7	18.7	56.0
15.846	44.1	L1	9.8	15.9	60.0

CAV final measurement results table

Frequency [MHz]	CAV [dBμV]	Line	Factor [dB]	Margin [dB]	Limit [dBμV]
0.402	32.5	N	9.9	15.3	47.8
0.528	34.8	L1	9.9	11.2	46.0
0.636	37.6	N	9.9	8.4	46.0
0.789	40.9	L1	9.9	5.1	46.0
1.050	37.9	N	9.8	8.1	46.0
1.572	39.9	L1	9.8	6.1	46.0
1.689	36.8	N	9.7	9.2	46.0
3.147	35.5	L1	9.7	10.5	46.0

Note 2) Level (QP and/or CAV) = Meter Reading (QP and/or CAV) + Factor (LISN Insertion Loss + Cable Loss)

Margin (QP and/or CAV) = Limit – Level (QP and/or CAV)

QP = Quasi-Peak, CAV = CISPR-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 detectors.

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 ~ 400	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 [$\mu\text{V/m}$]	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-211	Antenna Mast	AM 4.0	Maturo	AM4.0/061/2410908	-	-
E3I-210	Antenna Mast	AM 4.0	Maturo	AM4.0/060/2410908	-	-
E3I-209	Controller	MCU	Maturo	MCU/100/2410908	-	-
E3I-010	Controller	HD100	HD	100/723	-	-
E3I-213	Preamplifier	317	SONOMA	282424	2014-11-10	12
E3I-214	Preamplifier	317	SONOMA	282425	2014-11-10	12
E3I-284	Preamplifier	ESV-Z3	R&S	815111	2015-04-16	12
E3I-130	BILOG Antenna	CBL6112D	TESEQ	25513	2014-10-21	24
E3I-190	BILOG Antenna	CBL6112B	Schaffner	2804	2014-05-14	24
E3I-170	Horn Antenna	HF906	R&S	100028	2014-10-20	24
E5I-015	EMI Test Receiver	ESU-08	R&S	100481	2015-05-13	12
E3I-233	EMI Test Receiver	ESU-26	R&S	100364	2015-03-31	12
E3I-165	EMI Test Receiver	ESI-26	R&S	100010	2014-09-29	12

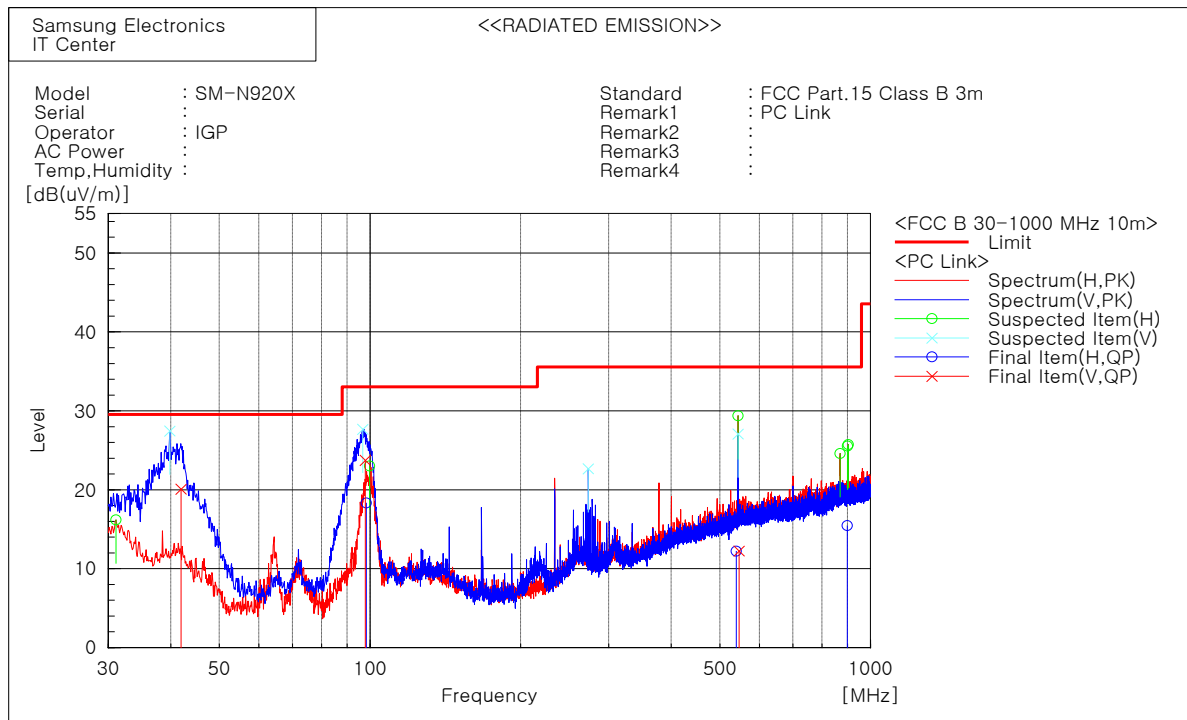
5.2.2 Temperature and humidity condition

Test date	2015-06-22	Test engineer	In-Gue Park
Climate condition	Ambient temperature	(22.1 ~ 22.3) °C	Limit (15.0 to 35.0) °C
	Relative humidity	(41.8 ~ 42.0) % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	(100.3 ~ 100.5) kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

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	41.931	V	44.7	-24.6	20.1	29.5	9.4	110.0	40.0	2
2	97.877	V	49.1	-25.4	23.7	33.0	9.3	277.0	254.0	2
3	98.248	H	43.3	-25.0	18.3	33.0	14.7	321.0	121.0	1
4	539.016	H	26.1	-13.9	12.2	35.5	23.3	133.0	319.0	1
5	546.112	V	27.2	-15.0	12.2	35.5	23.3	368.0	153.0	2
6	898.804	H	25.2	-9.7	15.5	35.5	20.0	168.0	339.0	1

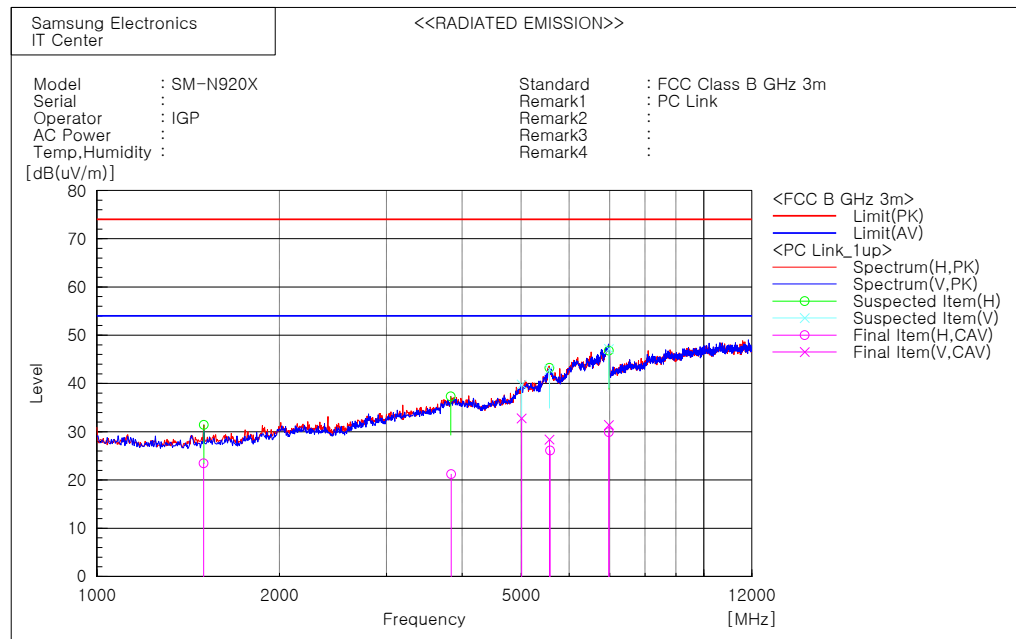
Note) Receiving antenna polarization : Horizontal, Vertical

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

- Frequencies above 1 GHz**Peak Measurement**

Frequency [MHz]	(P) ₁	Reading PK ²⁾ [dB(uV)]	Factor ³⁾ [dB(1/m)]	Level PK ⁴⁾ [dB(uV/m)]	Limit [dB(uV/m)]	Margin PK ⁵⁾ [dB]	Height [cm]	Angle [deg]
1 501.002	H	42.9	-11.5	31.4	74.0	42.6	100.0	64.0
3 829.659	H	40.8	-3.5	37.3	74.0	36.7	100.0	80.0
5 008.016	V	41.7	-1.9	39.8	74.0	34.2	100.0	135.0
5 567.135	H	43.8	-0.6	43.2	74.0	30.8	100.0	279.0
5 567.135	V	43.5	-0.6	42.9	74.0	31.1	100.0	354.0
6 973.948	V	43.6	3.6	47.2	74.0	26.8	100.0	154.0
6 973.948	H	43.2	3.6	46.8	74.0	27.2	100.0	13.0

Note 1) (P) : Abbreviation of Antenna Polarity

Note 2) Reading PK : Received raw Peak signal

Note 3) Factor = Antenna factor + Cable loss – Amplifier gain

Note 4) Level PK = Reading PK + Factor, Real signal Peak level

Note 5) Margin PK = Limit – Level PK

Note 6) PK : Abbreviation of Peak

C/Average Measurement

Frequency [MHz]	(P) ¹⁾	Reading C/AV ²⁾ [dB(uV)]	Factor ³⁾ [dB(1/m)]	Level C/AV ⁴⁾ [dB(uV/m)]	Limit [dB(uV/m)]	Margin C/AV ⁵⁾ [dB]	Height [cm]	Angle [deg]
1 500.020	H	35.0	-11.5	23.5	54.0	30.5	100.0	65.0
3 835.340	H	24.8	-3.6	21.2	54.0	32.8	102.0	81.0
5 008.016	V	34.7	-1.9	32.8	54.0	21.2	100.0	135.0
5 567.135	V	29.0	-0.6	28.4	54.0	25.6	103.0	354.0
5 581.834	H	26.6	-0.5	26.1	54.0	27.9	161.0	278.0
6 973.948	V	27.8	3.6	31.4	54.0	22.6	120.0	154.0
6 973.948	H	26.3	3.6	29.9	54.0	24.1	100.0	13.0

Note 1) (P) : Abbreviation of Antenna Polarity

Note 2) Reading C/AV : Received raw C/Average signal

Note 3) Factor = Antenna factor + Cable loss – Amplifier gain

Note 4) Level C/AV = Reading C/AV + Factor, Real signal C/Average level

Note 5) Margin C/AV = Limit – Level C/AV

Note 6) C/Average : CISPR Abbreviation of Average