

# EMC TEST REPORT

|                          |                                |                                                                                                                                                                                                                   |   |
|--------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| <b>Project No.</b>       | LBE20133977                    | <b>Issue No.</b>                                                                                                                                                                                                  | 0 |
| <b>Applicant</b>         | <b>Name of organization</b>    | Samsung Electronics Co., Ltd.                                                                                                                                                                                     |   |
|                          | <b>Address</b>                 | ( Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea                                                                                                                   |   |
|                          | <b>Date of application</b>     | July 24, 2013                                                                                                                                                                                                     |   |
| <b>EUT</b>               | <b>Type of device</b>          | <input checked="" type="checkbox"/> Class B personal computers and peripherals<br><input type="checkbox"/> All other devices                                                                                      |   |
|                          | <b>Equipment authorization</b> | <input type="checkbox"/> Declaration of Conformity <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Verification                                                                        |   |
|                          | <b>FCC ID</b>                  | A3LSMN9005                                                                                                                                                                                                        |   |
|                          | <b>Kind of product</b>         | Mobile Phone                                                                                                                                                                                                      |   |
|                          | <b>Model No.</b>               | SM-N9005                                                                                                                                                                                                          |   |
|                          | <b>Variant Model No.</b>       | Refer to clause 4.6                                                                                                                                                                                               |   |
|                          | <b>Manufacturer</b>            | SAMSUNG ELECTRONICS CO., LTD.<br>94-1, Imsu-dong, Gumi-si, Gyengsangbuk-do, 730-722, Republic of Korea<br>SAMSUNG ELECTRONICS HUIZHOU CO.,LTD.<br>516229, Chenjiang Town, HuiZhou City, Guangdong Province, China |   |
| <b>Applied Standards</b> |                                | FCC Part 15, Subpart B, Class B / ANSI C63.4-2009                                                                                                                                                                 |   |
| <b>Test Period</b>       |                                | July 29, 2013 ~ August 5, 2013                                                                                                                                                                                    |   |
| <b>Issue date</b>        |                                | August 10, 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** : Jeong-Soo Kim



**Reviewed by** : Tae-Young Jang



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# 1. Report Information

## 1.1 Revision history

| No      | Revised detailed information |
|---------|------------------------------|
| Issue 0 | - LBE20133977 (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   |
|-------------------------------------|---------------------------------------|------------------------------------------------------|----------|
| <input checked="" type="checkbox"/> | Conducted Disturbance<br>(Mains port) | FCC Part 15 Subpart B / ANSI C63.4-2009<br>(Class B) | Complied |
| <input checked="" type="checkbox"/> | 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.

## 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-N9005    | -                | SAMSUNG                  | A3LSMN9005   |
| B    | Battery           | B800BE      |                  | SAMSUNG                  | -            |
| C    | Headset           | EO-HS3303WE | -                | SAMSUNG                  | -            |
| D    | Data Cable        | ET-DQ10Y0BE | -                | SAMSUNG                  | -            |
| E    | microSD Card      | 16GB        | -                | SANDISK                  | -            |
| F    | Desk-Top Computer | DM300S3A    | EBDEDC6FFD       | SAMSUNG                  | DoC          |
|      |                   |             | -                | SAMSUNG                  | DoC          |
| G    | LCD TV Monitor    | CF19MS      | CF19H1LS700048Y  | SAMSUNG                  | DoC          |
|      |                   | EF23TS      | EM23H1LS300070L  | SAMSUNG                  | DoC          |
| H    | Mouse             | SML-210PB   | TAKD125021R      | SAMSUNG                  | DoC          |
| I    | Keyboard          | SDM8500P    | 8M001183         | SAMSUNG                  | DoC          |
| J    | Gigabit Switch 8  | 3CGSU08     | AB/9XRQAC0024825 | 3COM                     | DoC          |
|      | Gigabit Switch 8  | J9794A      | CN33FQ71XK       | HP                       | DoC          |
| K    | Power Supply      | PW150       | KA1203N03        | AULT                     | DoC          |
|      | Power Supply      | EADP-15DC A | DIKD1245096576   | HP                       | DoC          |

### 4.2 EUT operating mode

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

|                         |                               |
|-------------------------|-------------------------------|
| <b>Operating Mode 1</b> | USB Mode (Data Communication) |
|-------------------------|-------------------------------|

### 4.3 Details of Sampling

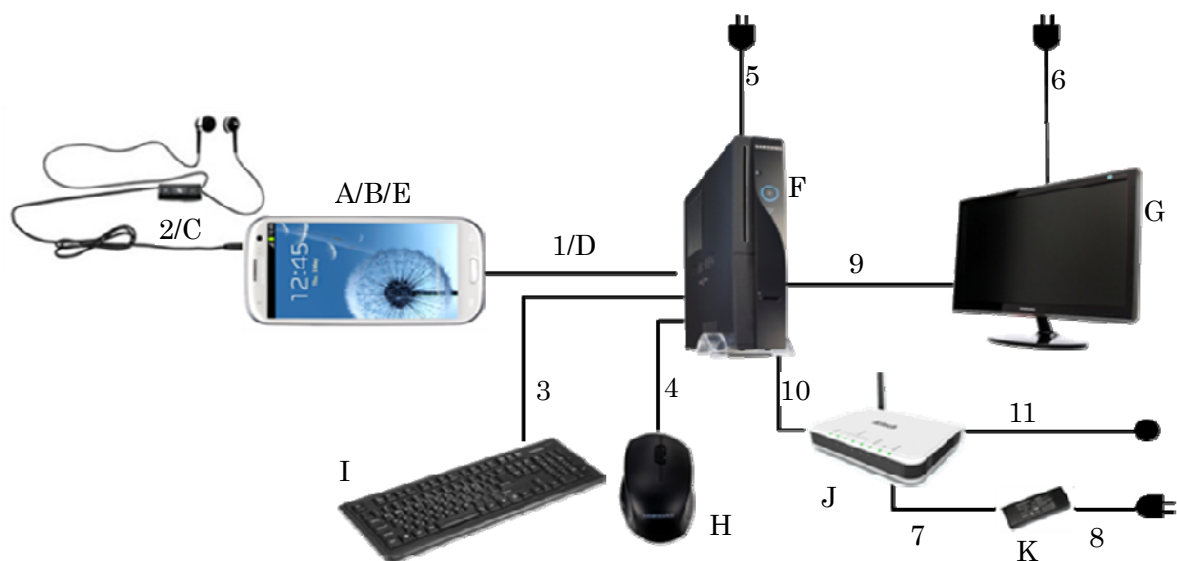
Customer selected, single unit.

## 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   | Data Cable      | 1.5        | Yes            | From EUT to Desktop PC                |
| 2   | Headset         | 1.2        | No             | For EUT                               |
| 3   | PS/2            | 1.8        | Yes            | For Keyboard                          |
| 4   | PS/2            | 1.8        | Yes            | For Mouse                             |
| 5   | Power           | 1.8        | No             | For Desktop PC                        |
| 6   | Power           | 1.8        | No             | For LCD Monitor                       |
| 7   | Power           | 1.8        | No             | From Gigabit Switch 8 to Power Supply |
| 8   | Power           | 1.8        | No             | For Power Supply                      |
| 9   | RGB Cable       | 1.8        | Yes            | From Monitor to Desktop PC            |
| 10  | LAN cable       | 1.5        | Yes            | From Desktop PC to Router             |
| 11  | LAN cable       | 1.5        | Yes            | From Router to Local Area Network     |

## 4.5 Test arrangement



## 4.6 EUT Description

4.6.1 The following features describe EUT represented by this report:

| Item                       | Specification |                                                          |
|----------------------------|---------------|----------------------------------------------------------|
| Frequency Range            | GSM850        | TX : 824.2 ~ 848.8 MHz<br>RX : 869.2 ~ 893.8 MHz         |
|                            | GSM1900       | TX : 1 850.2 ~ 1 909.8 MHz<br>RX : 1 930.2 ~ 1 989.8 MHz |
|                            | WCDMA B2      | TX : 1 852.4 ~ 1 907.6 MHz<br>RX : 1 932.4 ~ 1 987.6 MHz |
|                            | WCDMA B5      | TX : 826.4 ~ 846.6 MHz<br>RX : 871.4 ~ 891.6 MHz         |
|                            | LTE B5        | TX : 824 ~ 848.9 MHz<br>RX : 869 ~ 893.9 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 ] |
|----------------|-------------------|
| CPU            | 2 300             |

## 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<br>(C.L. 95 %, k = 2) |
|------------------------------------------|------------|-----------------------------------------------|
| Conducted disturbance                    | AC Mains   | $\pm 3.12$ dB                                 |
| Radiated Disturbance<br>(30 MHz ~ 1 GHz) | Horizontal | $\pm 4.03$ dB                                 |
|                                          | Vertical   | $\pm 4.13$ dB                                 |
| Radiated Disturbance<br>(1 GHz ~ 6 GHz)  | Horizontal | $\pm 4.53$ dB                                 |
|                                          | Vertical   | $\pm 4.51$ 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

| Frequency range Limits<br>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

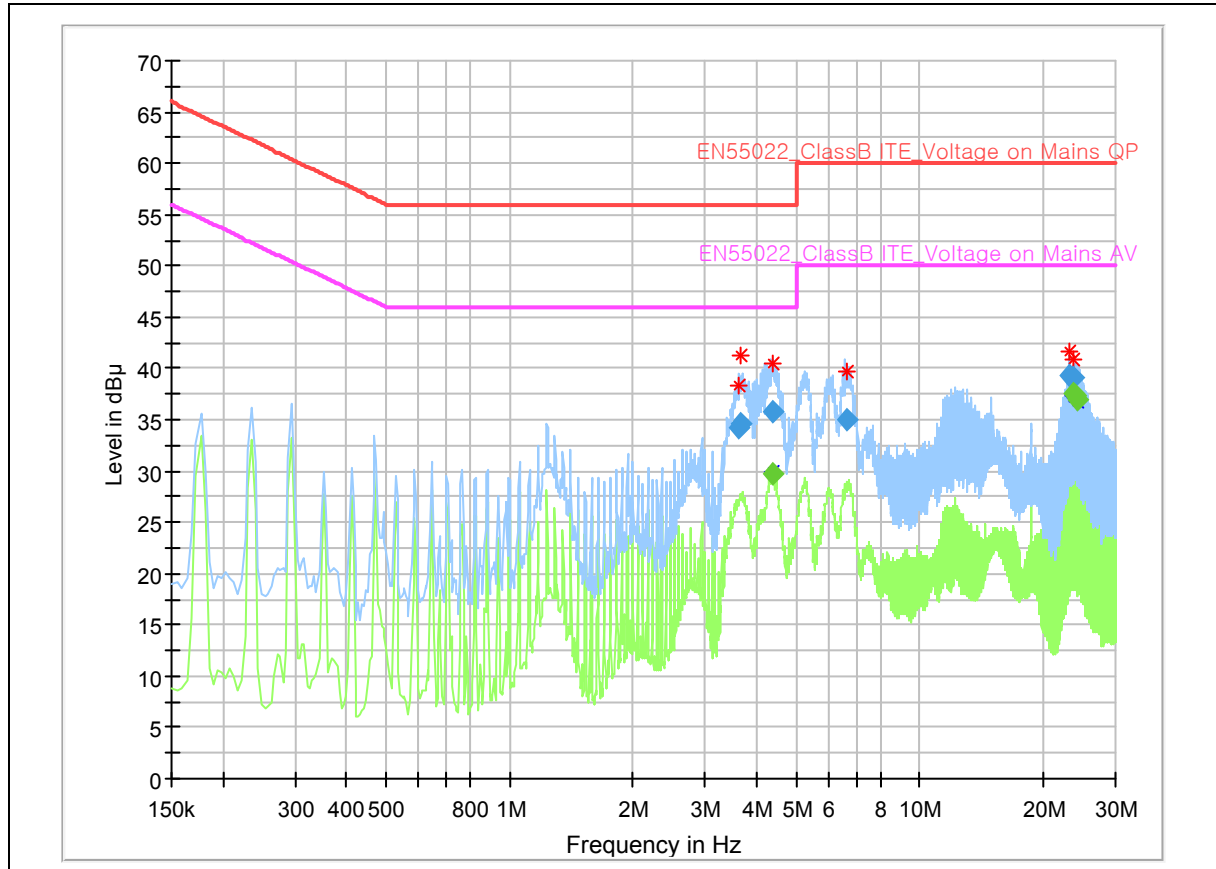
| EMC No. | Test Instrument   | Model name | Manufacturer | Serial No. | Calibration |                  |
|---------|-------------------|------------|--------------|------------|-------------|------------------|
|         |                   |            |              |            | Date        | Interval (Month) |
| E5I-010 | LISN              | ESH3-Z5    | R&S          | 100263     | 2012-10-16  | 12               |
| E5I-016 | EMI Test Receiver | ESU8       | R&S          | 100482     | 2013-06-11  | 12               |
| E5I-043 | LISN              | ENV216     | R&S          | 101630     | 2013-06-07  | 12               |

#### 5.1.2 Temperature and humidity condition

|                   |                      |               |                             |
|-------------------|----------------------|---------------|-----------------------------|
| Test date         | 2013-08-05           | Test engineer | Jeong-Soo Kim               |
| Climate condition | Ambient temperature  | 22.3 °C       | Limit (15.0 to 35.0) °C     |
|                   | Relative humidity    | 56.5 % R.H.   | Limit (25.0 to 75.0) % R.H. |
|                   | Atmospheric pressure | 99.7 kPa      | Limit (86.0 to 106.0) kPa   |
| Test place        | Shield Room (SR14)   |               |                             |

### 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 /Average final measurement results table:

| Frequency (MHz) | QuasiPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|------|------------|
| 3.634           | 34.28            | ---            | 56.00        | 21.72       | L1   | 9.7        |
| 3.677           | 34.52            | ---            | 56.00        | 21.48       | N    | 9.7        |
| 4.363           | ---              | 29.81          | 46.00        | 16.19       | N    | 9.7        |
| 4.380           | 35.77            | ---            | 56.00        | 20.23       | L1   | 9.7        |
| 6.610           | 34.99            | ---            | 60.00        | 25.01       | N    | 9.8        |
| 23.273          | 39.34            | ---            | 60.00        | 20.66       | L1   | 9.9        |
| 23.683          | ---              | 37.52          | 50.00        | 12.48       | L1   | 10.0       |
| 23.741          | 39.20            | ---            | 60.00        | 20.80       | N    | 10.0       |
| 23.917          | ---              | 37.30          | 50.00        | 12.70       | L1   | 10.0       |
| 24.092          | ---              | 37.04          | 50.00        | 12.96       | N    | 10.0       |

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 = 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 | Video bandwidth | Turntable position [ degrees ] |
|-----------------------|----------------------|----------------------|-----------------|--------------------------------|
| 100 ~ 400             | Horizontal, Vertical | 120 kHz              | 300 kHz         | Continuous                     |

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

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

| 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                           |

Peak/RMS-Average measurements were made over the changeable frequency range 1GHz to 40GHz or 5<sup>th</sup> in accordance with internal maximum operating frequency at a measurement distance of 3m 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<br>(Step size: 15 degrees) |

### Limits for radiated disturbance of ITE at a measurement distance of 3 m

| Class                                                     | Limits [dB( $\mu\text{V/m}$ )] |         |
|-----------------------------------------------------------|--------------------------------|---------|
|                                                           | Peak                           | Average |
| A                                                         | 80                             | 60      |
| B                                                         | 74                             | 54      |
| Average limit 500, 20 log 500 = 53.979 dB $\approx$ 54 dB |                                |         |

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using peak and rms-average detectors. 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) |
| E5I-015 | EMI Test Receiver                    | ESU8       | R&S          | 100481     | 2013-06-11  | 12               |
| E5I-020 | EMI Test Receiver                    | ESU40      | R&S          | 100375     | 2013-06-13  | 12               |
| E5I-036 | Double-Ridged Waveguide Horn Antenna | HF907      | R&S          | 100507     | 2013-04-02  | 24               |
| E5I-069 | BiLOG Antenna                        | CBL6112D   | Teseq        | 35382      | 2013-05-21  | 24               |
| E5I-070 | BiLOG Antenna                        | CBL6112D   | Teseq        | 35383      | 2013-05-22  | 24               |
| E5I-073 | Preamplifier                         | 310N       | Sonoma       | 332016     | 2013-06-10  | 12               |
| E5I-074 | Preamplifier                         | 310N       | Sonoma       | 332017     | 2013-06-10  | 12               |

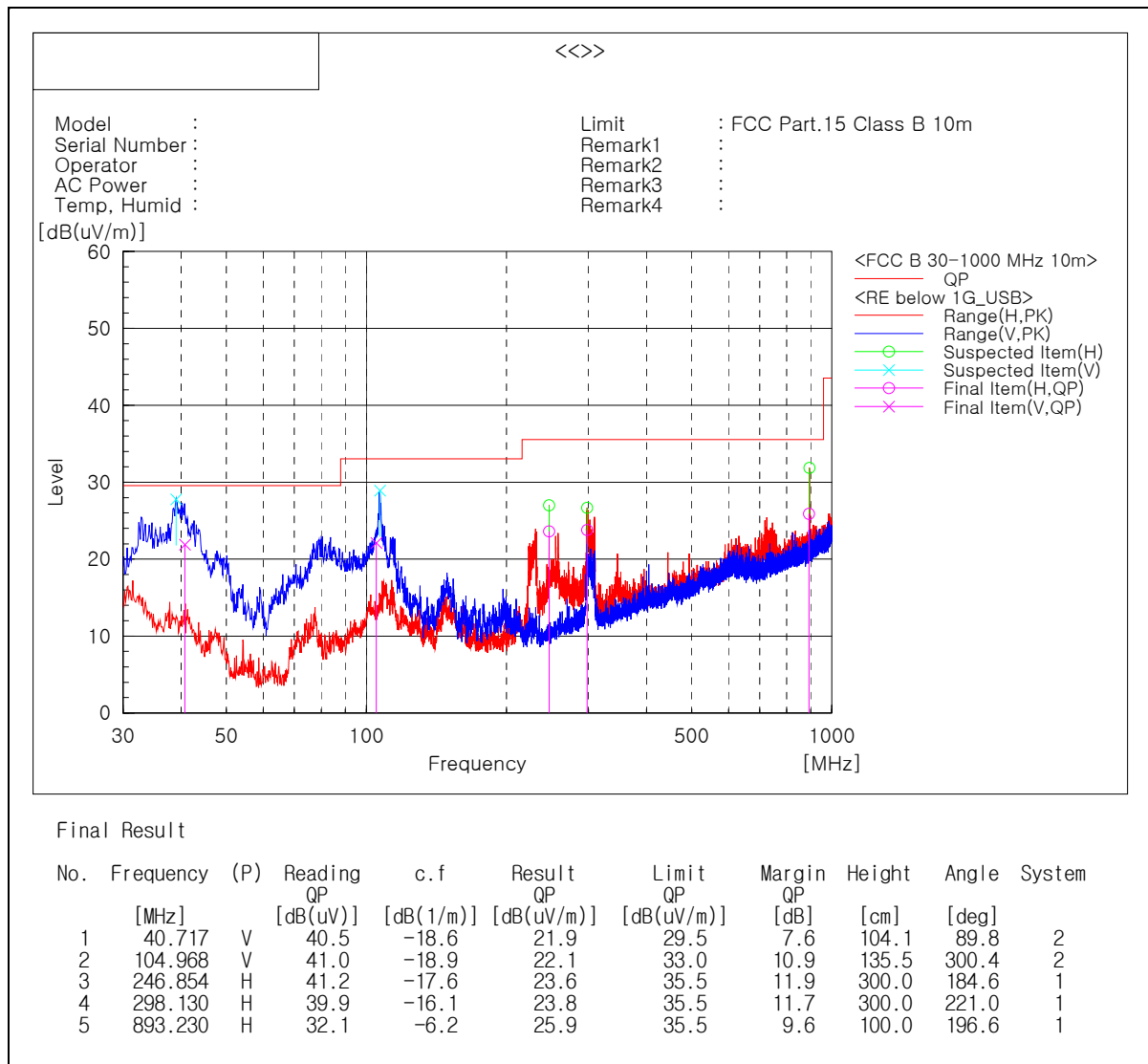
## 5.2.2 Temperature and humidity condition

|                   |                              |               |                             |
|-------------------|------------------------------|---------------|-----------------------------|
| Test date         | 2013-07-29                   | Test engineer | Jeong-Soo Kim               |
| Climate condition | Ambient temperature          | 21.5 °C       | Limit (15.0 to 35.0) °C     |
|                   | Relative humidity            | 59.5 % R.H.   | Limit (25.0 to 75.0) % R.H. |
|                   | Atmospheric pressure         | 99.7 kPa      | Limit (86.0 to 106.0) kPa   |
| Test place        | Semi-Anechoic Chamber (SAC8) |               |                             |

## 5.2.3 Test results

### ☐ Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz



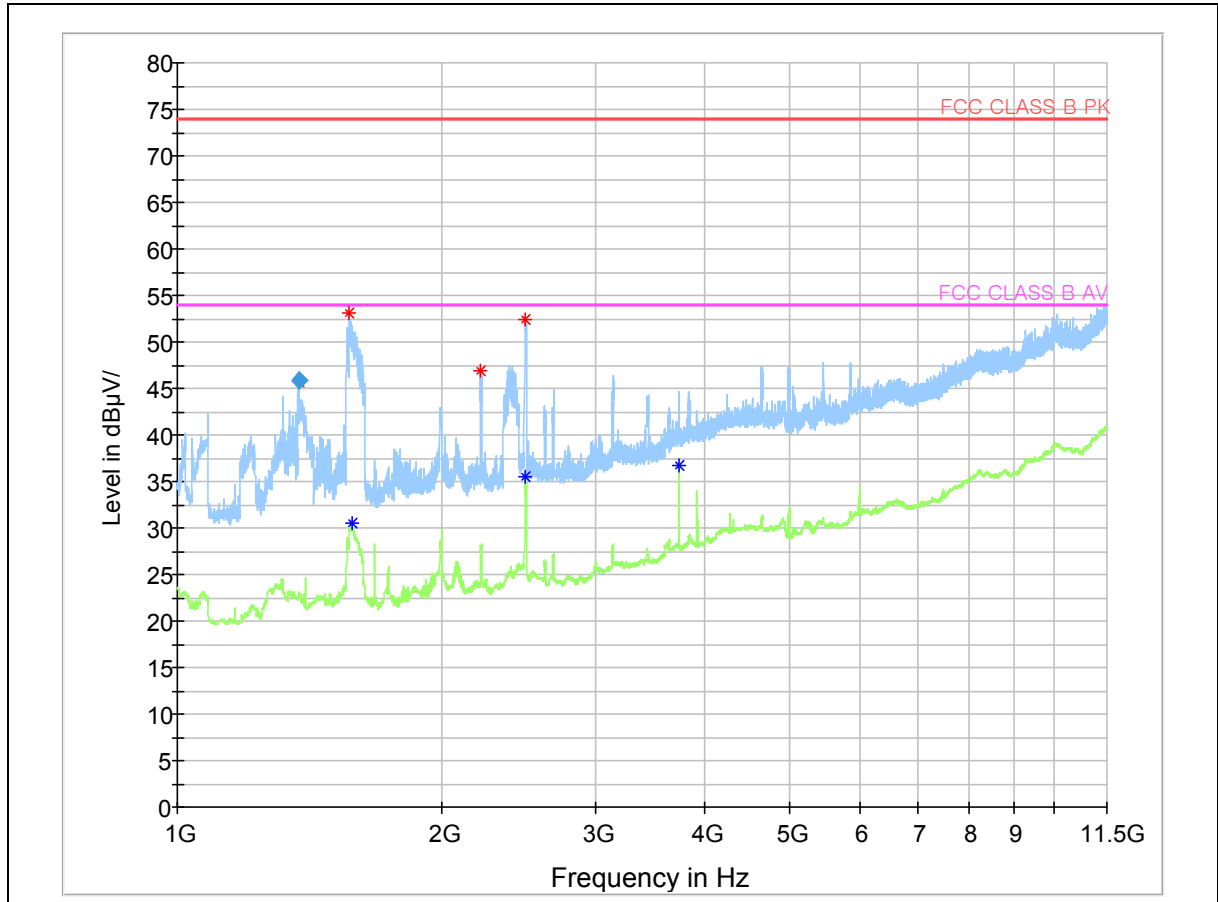
Note) Receiving antenna polarization : Horizontal, Vertical

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

**- Frequency range: 1 000 ~ 11 500 MHz**

| Frequency (MHz) | MaxPeak (dB $\mu$ V/m) | Average (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------------|------------------------|----------------------|-------------|-------------|-----|---------------|------------|
| 1 375.000       | 45.67                  | ---                    | 74.00                | 28.33       | 100.0       | H   | 179.0         | -9.2       |
| 1 572.500       | 53.18                  | ---                    | 74.00                | 20.82       | 100.0       | V   | 180.0         | -7.4       |
| 1 580.000       | ---                    | 30.50                  | 54.00                | 23.50       | 100.0       | V   | 180.0         | -7.4       |
| 2 220.000       | 46.93                  | ---                    | 74.00                | 27.07       | 100.0       | H   | 0.0           | -3.8       |
| 2 497.500       | ---                    | 35.49                  | 54.00                | 18.51       | 100.0       | H   | 180.0         | -2.0       |
| 2 497.500       | 52.45                  | ---                    | 74.00                | 21.55       | 100.0       | H   | 180.0         | -2.0       |
| 3 742.000       | ---                    | 36.79                  | 54.00                | 17.21       | 100.0       | V   | 270.0         | 3.8        |

Note) Receiving antenna polarization : Horizontal, Vertical

Test Distance : 3 m, Antenna Height : 1 to 4 meters

Level (PK and/or AV) = Reading (PK and/or AV) + Corr. (Antenna Factor + Cable Loss - Amp. Gain)

Margin (PK and/or AV) = Limit – Level (PK and/or AV)

PK = Peak, AV = Average