

# TEST REPORT

For

**Mobile phone incorporated with Felica (RFID)**

In conformity with

**FCC CFR 47 Part15 (October 1, 2007) / RSS-210 Issue 7, RSS-Gen Issue 2**

**Model: F-03A**

**FCC ID/ IC Certification No.: VQK-F-03A / 337E-F03A**

**Test Item: Mobile phone incorporated with Felica (RFID)**

**Report No: RY0811P06R1**

**Issue Date: 6 November 2008**

**Prepared for**

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## History

| Report No   | Date            | Revisions     | Revised by |
|-------------|-----------------|---------------|------------|
| RY0811P06R1 | 6 November 2008 | Initial Issue | M.Asano    |
|             |                 |               |            |
|             |                 |               |            |

## 1 General information

### 1.1 Product description

Test item : Mobile phone incorporated with Felica (RFID)  
Manufacturer : Fujitsu Limited  
Address : 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki, 211-8588, Japan  
Model : F-03A  
FCC ID : VQK-F-03A  
IC Certification No : 337E-F03A  
Serial numbers : 353716020008797, 353716020000562  
Transmitting Frequency : 13.56 MHz (RFID)  
Type of Modulation : ASK  
Operating temperature range : -10 to +55 degree C (Manufacturer declared)  
Receipt date of EUT : 30 October 2008  
Nominal power source voltages : DC 3.7V (Battery)

### 1.2 Test(s) performed/ Summary of test result

Test specification(s) : FCC CFR 47. Part 15 (October 1, 2007) / RSS-210 Issue 7, RSS-Gen Issue 2  
Test method(s) : ANSI C63.4: 2003  
Test(s) started : 30 October 2008  
Test(s) completed : 4 November 2008  
Purpose of test(s) : Grant for Certification of FCC / IC  
  
Summary of test result : Complied

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.

The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.

Compliance of the EUT is more probable than non-compliance is case that the margin is less than the measurement uncertainty in the Laboratory.

Test engineer :   
M.Asano  
EMC testing department

Reviewer :   
T. Ikegami  
Manager  
EMC testing department

### 1.3 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at **RF Technologies Ltd.**, located in 472, Nippa-cho, Kohoku-ku, Yokohama, 223-0057, Japan, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, per October 1, 2007. The description of the test facilities has been filed under registration number 879401 at the Office of the Federal Communications Commission. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at <http://www.fcc.gov>.

Registered by Voluntary Control Council for Interference by Information Technology Equipment (VCCI);

Each registered facility number is as follows;

Test site (Semi-Anechoic chamber 3m) R-2393

Test site (Shielded room) C-2617

Registered by Industry Canada (IC): The registered facility number is as follows

Test site No.1 (Anechoic chamber 3m): 6974A

Accredited by **National Voluntary Laboratory Accreditation Program** (NVLAP) for the emission tests stated in the scope of the certificate under Certificate Number 200780-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



NVLAP LAB CODE 200780-0

### 1.4 Measurement uncertainty

The treatment of uncertainty is based on the general matters on the definition of uncertainty in “Guide to the expression of uncertainty in measurement (GUM)” published by ISO. The Lab’s uncertainty is determined by referring UKAS Publication LAB34: 2002 “The Expression of Uncertainty in EMC Testing” and CISPR16-4-2: 2003 “Uncertainty in EMC Measurements”.

The uncertainty of the measurement result in the level of confidence of approximately 95% (k=2) is as follows;

Conducted emission:  $\pm 1.9$  dB (10 kHz – 30 MHz)

Radiated emission (9 kHz - 30MHz):  $\pm 2.8$  dB

Radiated emission (30MHz - 1000MHz):  $\pm 5.7$  dB

## 1.5 Summary of test results

| Requirement of;  | Section in FCC15           | Section in RSS210/ RSS-Gen | Serial No       | Result   | Section in this report |
|--|----------------------------|----------------------------|-----------------|----------|------------------------|
| 1.5.1 Occupied bandwidth (99%)                                 | -                          | RSS-Gen 4.6.1              | 353716020008797 | -        | 2.1                    |
| 1.5.2 Transmitter AC power line conducted emissions            | 15.207                     | RSS-Gen 7.2.2              | 353716020008797 | Complied | 2.2                    |
| 1.5.3 Transmitter radiated emissions between 9kHz to 30 MHz    | 15.225(a), (b),(c) and (d) | A2.6(a),(b),(c) And(d)     | 353716020008797 | Complied | 2.3                    |
| 1.5.4 Transmitter radiated emissions between 30MHz to 1000 MHz | 15.225 (d)                 | A2.6 (d)                   | 353716020008797 | Complied | 2.4                    |
| 1.5.5 Carrier frequency stability                              | 15.225 (e)                 | A2.6 (d)                   | 353716020000562 | Complied | 2.5                    |
| 1.5.6 Receiver AC power line conducted emissions               | 15.107                     | RSS-Gen 7.2.2              | 353716020008797 | Complied | 2.6                    |
| 1.5.7 Receiver radiated emissions above 30 MHz                 | 15.109                     | RSS-Gen 6                  | 353716020008797 | Complied | 2.7                    |

The field strength of spurious emission was measured in three orthogonal EUT positions (X-Plane, Y- Plane and Z- Plane). The axis defined in the photographs in clause 3.1 in this report.

## 1.6 Setup of equipment under test (EUT)

### 1.6.1 Test configuration of EUT

#### Equipment(s) under test:

|     | Item   | Manufacturer    | Model No. | Serial No.      |
|-----|--|-----------------|-----------|-----------------|
| A-1 | Mobile phone incorporated with Felica (RFID) | Fujitsu Limited | F-03A     | 353716020008797 |
| A-2 | Mobile phone incorporated with Felica (RFID) | Fujitsu Limited | F-03A     | 353716020000562 |
| B   | Li-ion Battery Pack                          | Fujitsu Limited | F10       | AAF29105        |

#### Support Equipment(s):

|   | Item       | Manufacturer    | Model No.        | Serial No. |
|---|------------|-----------------|------------------|------------|
| C | AC Adapter | NEC Corporation | MAS-BH0008-A 002 | QKA        |

#### Connected cable(s):

| No.  | Item                   | Identification (Manu.e.t.c) | Shielded YES / NO | Ferrite Core YES / NO | Connector Type Shielded YES / NO | Length (m) |
|------|------------------------|-----------------------------|-------------------|-----------------------|----------------------------------|------------|
| 1(*) | DC power cable         | NEC Corporation             | No                | No                    | No                               | 0.6        |
| 2    | AC power cable         | NEC Corporation             | No                | No                    | No                               | 1.3        |
| 3(*) | Conector convert cable | -                           | No                | No                    | No                               | 0.1        |
| 4    | Earphone cable         | NTT DOCOMO, INC.            | No                | No                    | No                               | 1.3        |

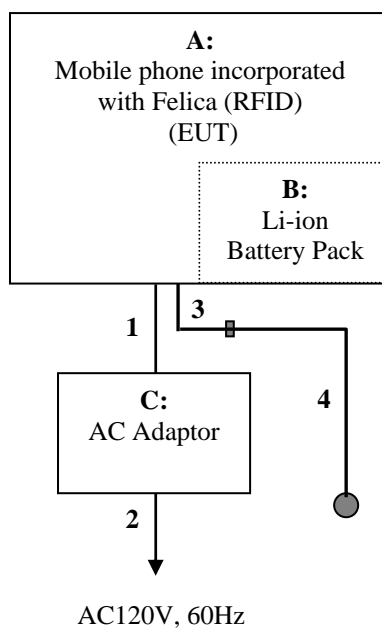
\* No.1 and No.3 are selectable.

## 1.6.2 Operating condition

Operating mode:

- Continuous transmission under the test mode
- Standby mode under the test mode

## 1.6.3 Setup diagram of tested system



Note: EUT has one connector which is connected either AC adapter (No.1 and No.2 above) or Earphone (No. 3 and No.4 above). On each tests, the result of the worse condition is reported as worst case in this report.

## 1.7 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the applicable standards described in clause 1.2.

## 1.8 Deviation from the standard

No deviations from the standards described in clause 1.2.

## 2 Test procedure and test data

### 2.1 Occupied bandwidth (99%)

#### Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 13.1.7 “Occupied bandwidth measurements” and Annex H.6 “Occupied bandwidth measurements”.

#### Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 13.1.7 “Occupied bandwidth measurements” and Annex H.6 “Occupied bandwidth measurements”.

The spectrum analyzer RBW was set as follows and VBW the video bandwidth shall be set to a value at least three times greater than the RBW.

| Fundamental frequency being measured | Minimum instrument bandwidth |
|--------------------------------------|------------------------------|
| 9 kHz to 30 MHz                      | 1 kHz                        |
| 30 MHz to 1000 MHz                   | 10 kHz                       |
| 1000 MHz to 40 GHz                   | 100 kHz                      |

#### Limitation

There are no limitations. The measurement value is used to calculate the emission designator.

#### Test equipment used (refer to List of utilized test equipment)

|      |      |      |  |  |  |
|------|------|------|--|--|--|
| TR04 | LP01 | CL11 |  |  |  |
|------|------|------|--|--|--|

#### Test results – Reporting purpose.

| Frequency (MHz) | 99% Bandwidth (kHz) |
|-----------------|---------------------|
| 13.56           | 2.26                |

#### Test Data

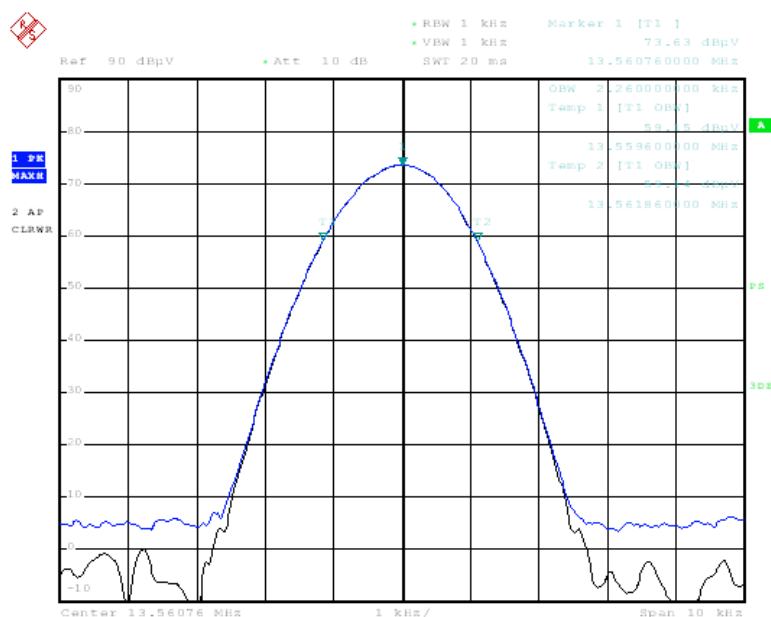
Tested Date: 4 November 2008

Temperature: 20 °C

Humidity: 53 %

Atmos. Press: 1016 hPa

Operating mode: Continuous transmission with modulation



## 2.2 Transmitter AC power line conducted emissions

### Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 clause 6 “General requirements for EUT equipment arrangements and operation” and Annex H.1 “AC power line conducted emission measurements setup”.

### Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 7, clause 13.1.3 and Annex H.2 “AC power line conducted emission measurements”.

Exploratory measurements were used the spectrum analyzer to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement.

Final ac power line conducted emission measurements were performed based on the exploratory tests.

The EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit are selected for the final measurement.

When the measurement value is greater than average limitation the average detection measurements were performed.

### Applicable rule and limitation

§15.207 (a) AC power line conducted limits

| Frequency of Emission (MHz) | Conducted Limit (dBuV) |            |
|-----------------------------|------------------------|------------|
|                             | Quasi-peak             | Average    |
| 0.15-0.5                    | 66 to 56 *             | 56 to 46 * |
| 0.5-5                       | 56                     | 46         |
| 5-30                        | 60                     | 50         |

\* Decreases with the logarithm of the frequency.

The lower limit applies at the band edges.

### Test equipment used (refer to List of utilized test equipment)

|      |      |      |      |
|------|------|------|------|
| TR04 | PL06 | LN05 | CL11 |
|------|------|------|------|

**Test results - Complied with requirement.**



**Test Data**

Tested Date: 4 November 2008

Temperature: 20 °C  
Humidity: 53 %  
Atmos. Press: 1016 hPa

Operating Mode: Continuous Transmission (Worst case configuration)

| No. | Frequency<br>[MHz] | Reading      |              | C.F.<br>[dB] | Result       |              | Limit        |              | Margin     |            | PHASE |
|-----|--------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|-------|
|     |                    | QP<br>[dBuV] | AV<br>[dBuV] |              | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dB] | AV<br>[dB] |       |
| 1   | 0.170              | 43.6         | 33.4         | 0.3          | 43.9         | 33.7         | 65.0         | 55.0         | 21.1       | 21.3       | L     |
| 2   | 1.820              | 39.0         | 28.4         | 0.3          | 39.3         | 28.7         | 56.0         | 46.0         | 16.7       | 17.3       | N     |
| 3   | 1.918              | 35.2         | 22.6         | 0.3          | 35.5         | 22.9         | 56.0         | 46.0         | 20.5       | 23.1       | L     |
| 4   | 3.671              | 27.5         | 19.3         | 0.5          | 28.0         | 19.8         | 56.0         | 46.0         | 28.0       | 26.2       | N     |
| 5   | 13.561             | 29.2         | 28.6         | 1.1          | 30.3         | 29.7         | 60.0         | 50.0         | 29.7       | 20.3       | N     |
| 6   | 13.561             | 32.1         | 31.7         | 1.1          | 33.2         | 32.8         | 60.0         | 50.0         | 26.8       | 17.2       | L     |

The power line conducted emission voltage is calculated by adding the LISN factor and Cable loss attenuation from the measured reading. The calculation is as follows:

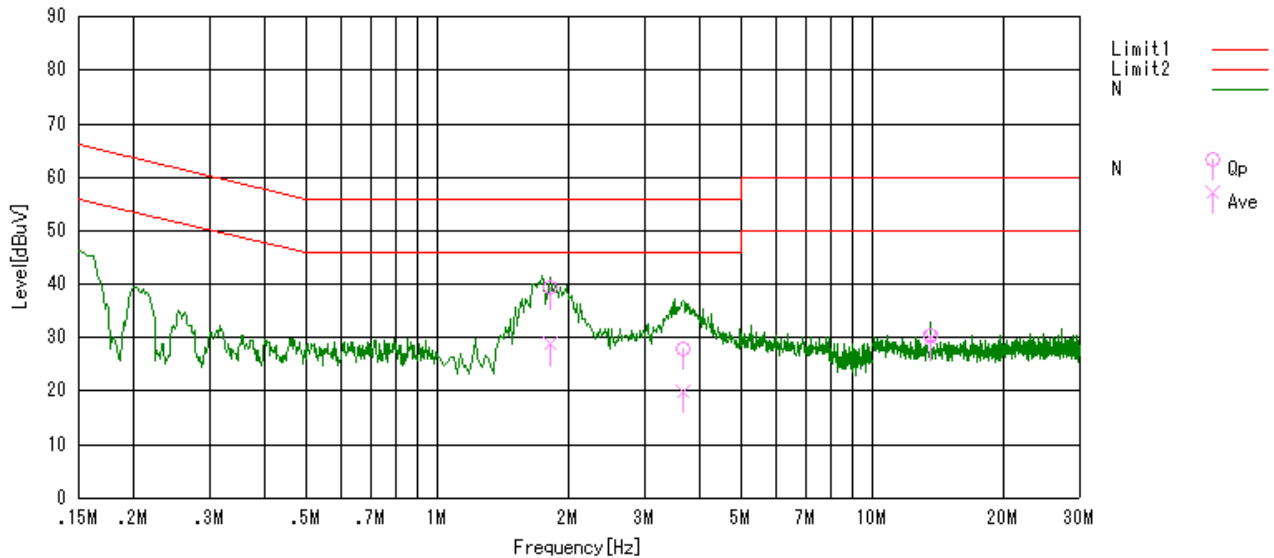
Result = Reading + C. F.  
where C.F. = LISN Factor + Cable Loss [dB]

Sample calculation at 1.820 MHz QP. result as follow:

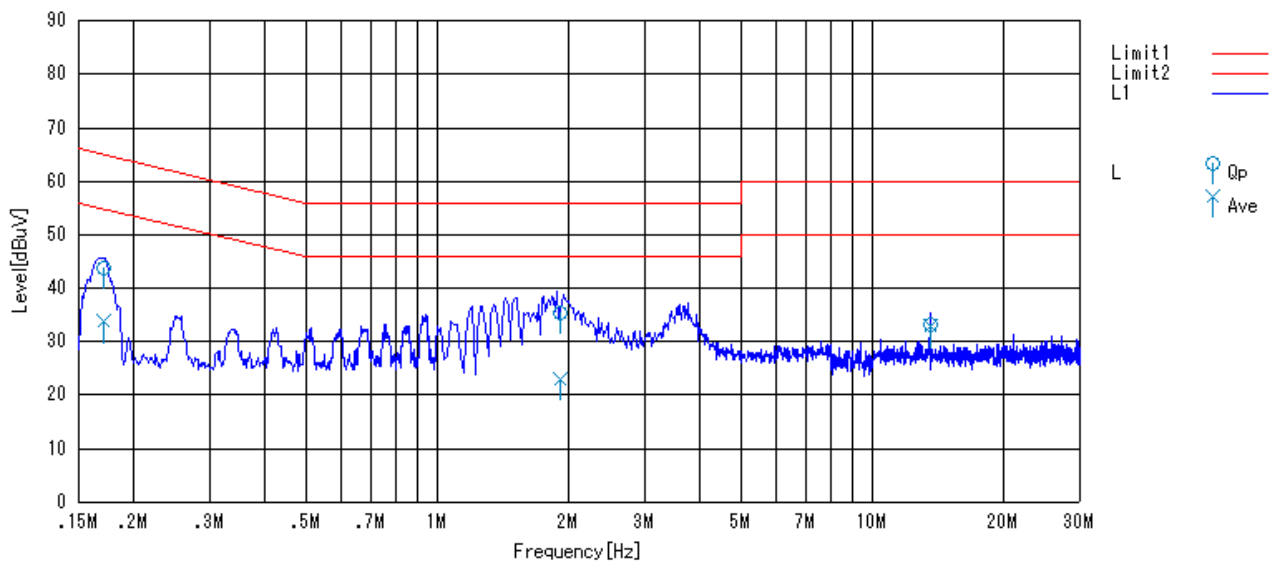
Result = Reading + C.F. = 39.0 + 0.3 = 39.3 [dBuV]  
Margin = Limit – Result = 56.0 – 39.3 = 16.7 [dB]

## Graphical express of test result (0.15 MHz-30MHz)

### AC Power line conducted emission. (Phase N)



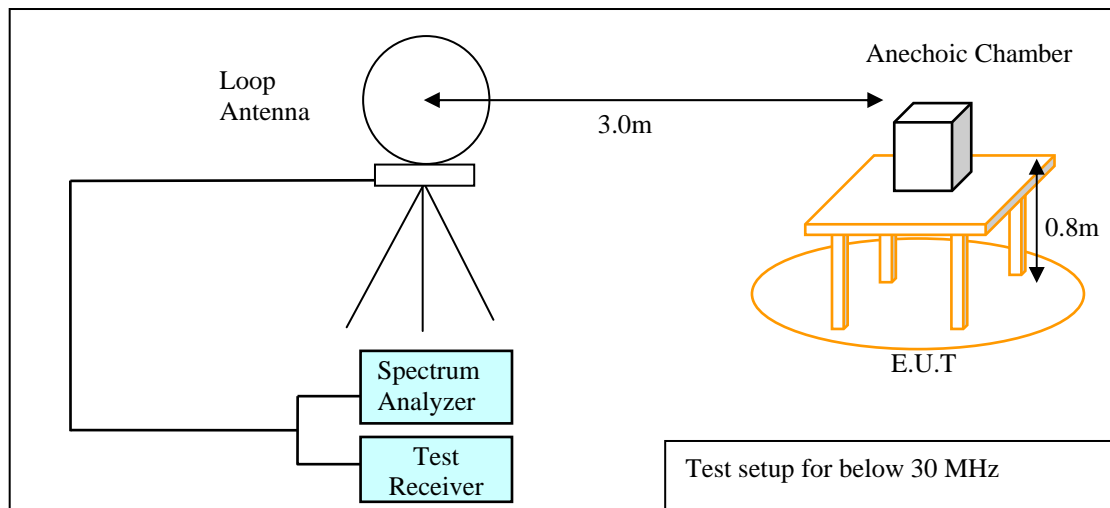
### AC Power line conducted emission. (Phase L)



## 2.3 Transmitter radiated spurious emissions between 9 KHz to 30 MHz

### Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 clause 6 “General requirements for EUT equipment arrangements and operation”, clause 8.2 and Annex H.3 “Radiated emission measurements setup”.



### Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 8.2. The EUT is placed on a non-conducted table which is 0.8m height from a ground plane and the measurement antenna to EUT distance is 3 meters. The turn table is rotated for 360 degrees to determine the maximum emission level.

In the frequency range of 9 kHz to 30 MHz, a calibrated loop antenna was positioned with its plane vertical at the distance 3m from the EUT with an extrapolation of corrected distance factor and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna also needs to be positioned horizontally. The center of the loop shall be 1 m above the ground.

EUT is placed at three different orientations (X, Y and Z axis) in order to find the worst orientation.

The spectrum analyzer and receiver is set to the followings;

Below 30 MHz:

RBW=10 kHz, VBW= 30 kHz, final measurement is carried out with a receiver RBW of 9 kHz (QP)

## Applicable rule and limitation

### §15.205 restricted bands of operation

Except as shown in paragraph 15.205 (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz           |
|---------------------|-----------------------|-----------------|---------------|
| 0.090 - 0.110       | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15    |
| 0.490 - 0.510       | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46   |
| 2.1735 - 2.1905     | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75   |
| 4.125 - 4.128       | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5   |
| 4.17725 - 4.17775   | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2     |
| 4.20725 - 4.20775   | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5     |
| 6.215 - 6.218       | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7   |
| 6.26775 - 6.26825   | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4  |
| 6.31175 - 6.31225   | 123 - 138             | 2200 - 2300     | 14.47 - 14.5  |
| 8.291 - 8.294       | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2  |
| 8.362 - 8.366       | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4   |
| 8.37625 - 8.38675   | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12 |
| 8.41425 - 8.41475   | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0   |
| 12.29 - 12.293      | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8   |
| 12.51975 - 12.52025 | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5  |
| 12.57675 - 12.57725 | 322 - 335.4           | 3600 - 4400     | (1)           |

15.205(b) except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

### §15.209 general requirements

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|-----------------|-----------------------|--------------------------|
| 0.009 - 0.490   | 2400/F (kHz)          | 300                      |
| 0.490 - 1.705   | 24000/F (kHz)         | 30                       |
| 1.705 - 30.0    | 30                    | 30                       |

In the emission table above, the tighter limit applies at the band edges.

The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz.

Radiated emission limits in the above bands are based on measurements employing an average detector.

### §15.225 Operation within the band 13.110 – 14.010 MHz

| Frequency (MHz) | Field strength @30m (uV/m) | Field strength @30m (dBuV/m) | Field strength @3m (dBuV/m) |
|-----------------|----------------------------|------------------------------|-----------------------------|
| 13.110 - 13.410 | 106                        | 40.5                         | 80.5                        |
| 13.410 - 13.553 | 334                        | 50.5                         | 90.5                        |
| 13.553 - 13.567 | 15,848                     | 84.0                         | 124.0                       |
| 13.567 - 13.710 | 334                        | 50.5                         | 90.5                        |
| 13.710 - 14.010 | 106                        | 40.5                         | 80.5                        |

$\text{dBuV/m} = 20 \times \log(\text{uV/m})$ , Corrected distance factor = 40dB / decade (15.31(f))

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the above radiated emission limits in § 15.209.

**Test equipment used (refer to List of utilized test equipment)**

|      |      |      |      |
|------|------|------|------|
| AC01 | LP01 | CL11 | TR04 |
|------|------|------|------|

**Test results** - Complied with requirement.**Test Data**

Tested Date: 4 November 2008

Temperature: 20 °C

Humidity: 53 %

Atmos. Press: 1016 hPa

Operating mode: Continuous Communication

EUT position: Z-plane (Worst case)

Connected cable: Earphone

Measurement distance: 3 m

## §15.225(a)/ (b)/ (c) Fundamental emission

| Freq.<br>(MHz) | Reading at 3m<br>(dBuV) | Detector<br>(QP/Ave) | Corr. Factor<br>(dB) | Result<br>(dBuV/m) | Limit at 3m<br>(dBuV/m) | Margin<br>(dB) |
|----------------|-------------------------|----------------------|----------------------|--------------------|-------------------------|----------------|
| 13.560         | 34.9                    | QP                   | 11.0                 | 45.9               | 124.0                   | 78.1           |

Correction Factor [dB] = Antenna Factor [dB/m] + Cable Loss [dB]

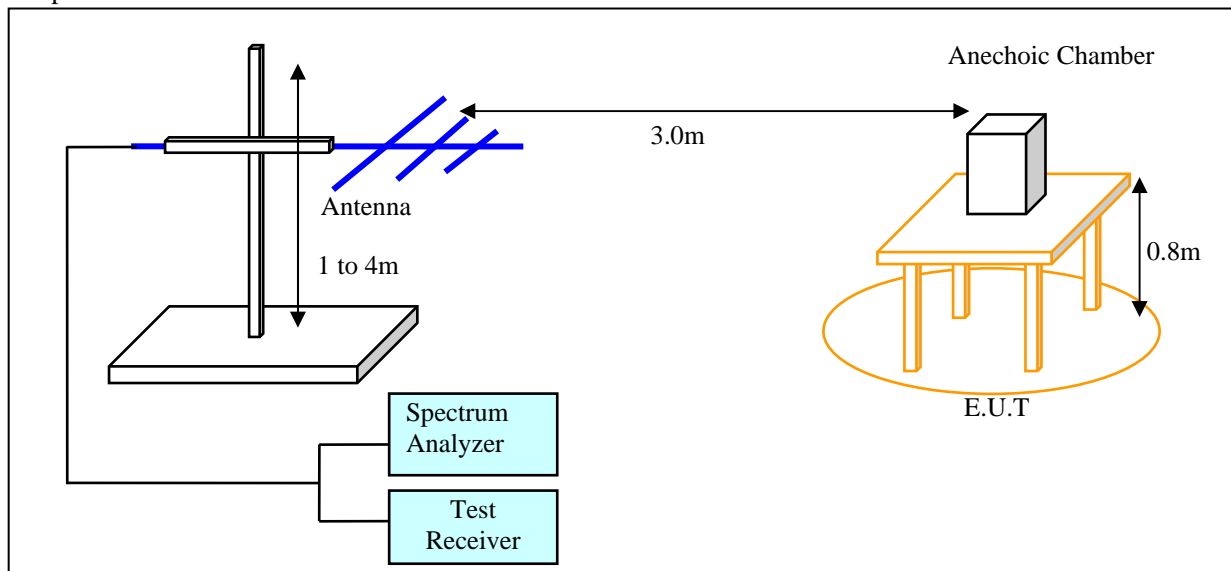
§15.225(d) Harmonics and spurious emission between 9 kHz to 30MHz (refer 15.209 and 15.205)

**There were no spurious emissions graters than noise floor or 20dB below the limit.**

## 2.4 Transmitter radiated spurious emissions between 30MHz to 1000MHz

### Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 clause 6 “General requirements for EUT equipment arrangements and operation”, clause 8.2.3 and Annex H.4 “Radiated emission measurements setup”.



### Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 8.2.3.

Exploratory radiated measurements were performed at the measurement distance of 3 meters using broadband antennas and a spectrum analyzer. The EUT was set up in its typical configuration and arrangement, and operated in its various modes.

For each mode of operation required to be tested, the frequency spectrum were monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) were explored to produce the emission that has the highest amplitude relative to the limit.

Based on the exploratory measurement results, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. This investigation was performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. EUT was placed at three different orientations (X, Y and Z axis) in order to find the worst orientation.

### Applicable rule and limitation

#### §15.209 general requirements

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Measurement Distance (m) | Field Strength (uV/m) | Field Strength (dBuV/m) |
|-----------------|--------------------------|-----------------------|-------------------------|
| 30 – 88         | 3                        | 100                   | 40.0                    |
| 88 – 216        | 3                        | 150                   | 43.5                    |
| 216 – 960       | 3                        | 200                   | 46.0                    |
| Above 960       | 3                        | 500                   | 54.0                    |

In the emission table above, the tighter limit applies at the band edges.

The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector.

**Test equipment used (refer to List of utilized test equipment)**

|      |      |      |      |      |
|------|------|------|------|------|
| AC01 | BA03 | CL11 | PR03 | TR04 |
|------|------|------|------|------|

**Test results - Complied with requirement.****Test Data**

Tested Date: 4 November 2008

Temperature: 20 °C

Humidity: 53 %

Atmos. Press: 1016 hPa

Operating mode: Continuous Communication

EUT position: Z-plane (Worst case)

Connected cable: Earphone

Measurement distance: 3 m

**§15.225(d) Harmonics and spurious emission between 30MHz to 1000MHz (refer 15.209)**

| No. | Frequency [MHz] | Reading [dBuV] | Antenna Factor [dB/m] | Cable Loss [dB] | Preamplifier Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Antenna Polarization |
|-----|-----------------|----------------|-----------------------|-----------------|------------------------|-----------------|----------------|-------------|----------------------|
| 1   | 40.682          | 35.9           | 13.0                  | 7.4             | 29.8                   | 26.5            | 40.0           | 13.5        | Vert.                |
| 2   | 67.804          | 41.8           | 6.0                   | 7.9             | 29.7                   | 26.0            | 40.0           | 14.0        | Hori.                |
| 3   | 67.804          | 45.2           | 6.0                   | 7.9             | 29.7                   | 29.4            | 40.0           | 10.6        | Vert.                |
| 4   | 77.641          | 44.2           | 6.8                   | 8.0             | 29.7                   | 29.3            | 40.0           | 10.7        | Vert.                |
| 5   | 77.779          | 42.9           | 6.8                   | 8.0             | 29.7                   | 28.0            | 40.0           | 12.0        | Hori.                |
| 6   | 81.364          | 48.3           | 7.2                   | 8.0             | 29.7                   | 33.8            | 40.0           | 6.2         | Hori.                |
| 7   | 81.364          | 49.8           | 7.2                   | 8.0             | 29.7                   | 35.3            | 40.0           | 4.7         | Vert.                |

**Calculation method**

The Correction Factors and Result are calculated as followings.

$$\text{Correction Factor [dB]} = \text{Antenna Factor [dB/m]} + \text{Cable Loss [dB]} - \text{Preamplifier Gain [dB]}$$

$$\text{Result [dBuV/m]} = \text{Reading [dBuV]} + \text{Correction Factor [dB]}$$

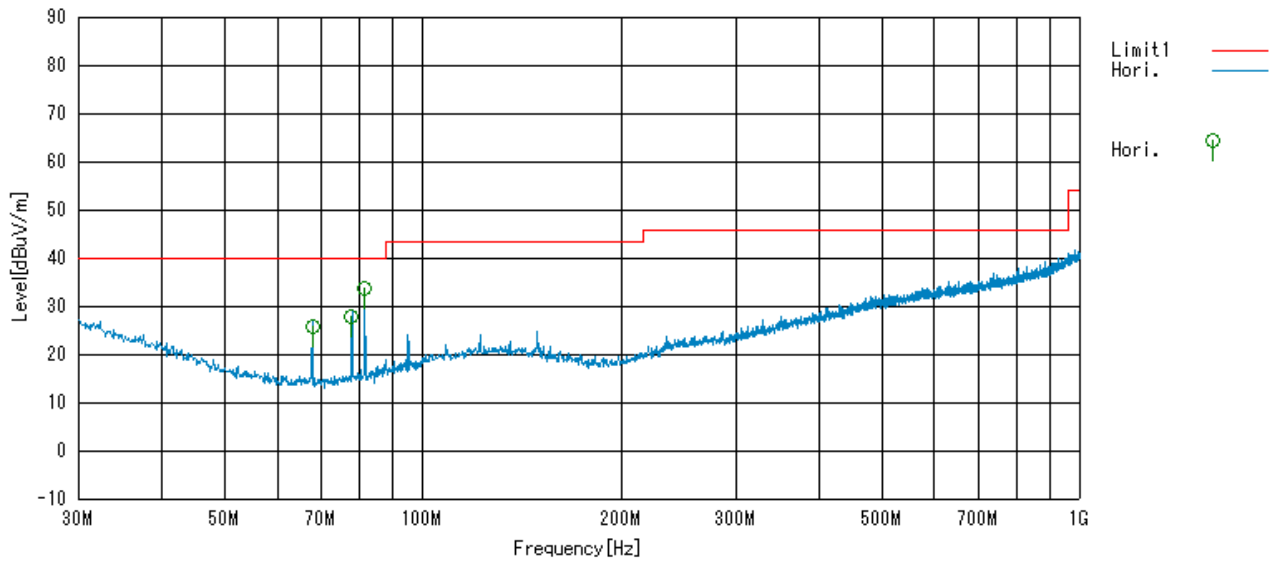
Sample calculation at 81.364 MHz vertical result as follow:

$$\text{Result} = \text{Reading} + \text{C.F.} = 49.8 - 14.5 = 35.3 \text{ [dBuV/m]}$$

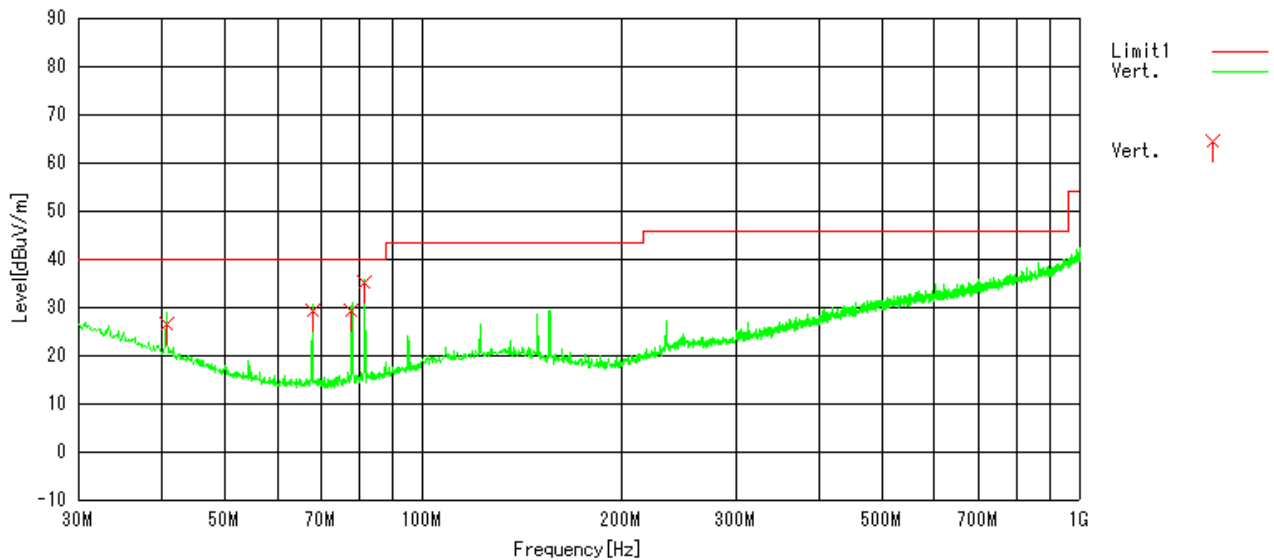
$$\text{Margin} = \text{Limit} - \text{Result} = 40.0 - 35.3 = 4.7 \text{ [dB]}$$

## Graphical express of test result (30MHz-1000MHz)

Antenna polarization: Horizontal



Antenna polarization: Vertical





## 2.5 Frequency stability

### Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 clauses 13.1.6.1 "Frequency stability measurements", and Annex H.5 "Frequency measurements".

### Test procedure

Measurement procedures were implemented according to the test method of ANSI C63.4: 2003 Annex H5.

Place the de-energized EUT in the temperature test chamber. Supply the EUT with nominal ac voltage, or install a new or fully charged battery in the EUT. An antenna was connected to the antenna output connector of the EUT if possible.

The frequency counter was connected to the measurement antenna with a suitable length of coaxial cable.

The environmental chamber set to the highest temperature specified in applicable regulation.

Allow sufficient time (approximately 30 minutes) for the temperature of the chamber to stabilize.

Turn the EUT on and measure the EUT operating frequency at startup, and two, five, and ten minutes after startup.

The measurements were performed that the temperature chamber set to reduce the lowest temperature specified in applicable regulation.

### Applicable rule and limitation

§15.225(e) Frequency tolerance

| Test items             | Variation ranges     | Limit    |
|------------------------|----------------------|----------|
| Temperature variations | -10 to +55 degrees * | +/-0.01% |

Note1: The above operating range is declared by manufacturer.

### Test equipment used (refer to List of utilized test equipment)

|      |      |      |  |
|------|------|------|--|
| LP51 | TC01 | TR06 |  |
|------|------|------|--|

**Test results -** Complied with requirement.

### Test Data

Tested Date: 30 October 2008

Temperature: 20 °C

Humidity: 47 %

Atmos. Press: 1014 hPa

### Operating Mode: Continuous Transmission

Power supply: Full charged Li-ion battery

| Temp.<br>(Degrees)             | Voltages<br>(V) | Measured Frequency (MHz) |           |           |           | Worst<br>Deviation<br>(%) | Limit<br>(%) |
|--------------------------------|-----------------|--------------------------|-----------|-----------|-----------|---------------------------|--------------|
|                                |                 | Start-up                 | 2 min.    | 5 min.    | 10 min.   |                           |              |
| Ambient Temperatures Variation |                 |                          |           |           |           |                           |              |
| 55                             | DC3.7V          | 13.560729                | 13.560728 | 13.560727 | 13.560727 | +0.00538                  | +/-0.01      |
| 20                             | DC3.7V          | 13.560825                | 13.560824 | 13.560823 | 13.560822 | +0.00608                  | +/-0.01      |
| 0                              | DC3.7V          | 13.560857                | 13.560859 | 13.560859 | 13.560860 | +0.00634                  | +/-0.01      |
| -10                            | DC3.7V          | 13.560861                | 13.560858 | 13.560859 | 13.560860 | +0.00635                  | +/-0.01      |

## 2.6 Receiver AC power line conducted emissions

**Test setup** - Same as clause 2.2

**Test procedure** - Same as clause 2.2

**Applicable rule and limitation**

§15.107 (a) AC power line conducted limits

| Frequency of Emission (MHz) | Conducted Limit (dBuV) |            |
|-----------------------------|------------------------|------------|
|                             | Quasi-peak             | Average    |
| 0.15-0.5                    | 66 to 56 *             | 56 to 46 * |
| 0.5-5                       | 56                     | 46         |
| 5-30                        | 60                     | 50         |

\* Decreases with the logarithm of the frequency. The lower limit applies at the band edges.

**Test equipment used (refer to List of utilized test equipment)**

|      |      |      |      |
|------|------|------|------|
| TR04 | PL06 | LN05 | CL11 |
|------|------|------|------|

**Test results** - Complied with requirement.

This transceiver could not achieved receiving mode only therefore the measurement was carried out under receiving ready condition of the EUT. This condition is same as standby.

**Test Data**

Tested Date: 4 November 2008

Temperature: 20 °C  
Humidity: 53 %  
Atmos. Press: 1016 hPa

Operating Mode: Ready to reception (same as standby)

| No. | Frequency<br>[MHz] | Reading      |              | C.F.<br>[dB] | Result       |              | Limit        |              | Margin     |            | PHASE |
|-----|--------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|-------|
|     |                    | QP<br>[dBuV] | AV<br>[dBuV] |              | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dB] | AV<br>[dB] |       |
| 1   | 0.151              | 46.5         | 30.0         | 0.3          | 46.8         | 30.3         | 65.9         | 55.9         | 19.1       | 25.6       | N     |
| 2   | 0.152              | 44.7         | 30.0         | 0.3          | 45.0         | 30.3         | 65.9         | 55.9         | 20.9       | 25.6       | L     |
| 3   | 1.862              | 38.2         | 28.6         | 0.3          | 38.5         | 28.9         | 56.0         | 46.0         | 17.5       | 17.1       | N     |
| 4   | 1.913              | 38.9         | 28.7         | 0.3          | 39.2         | 29.0         | 56.0         | 46.0         | 16.8       | 17.0       | L     |
| 5   | 3.678              | 32.5         | 24.2         | 0.5          | 33.0         | 24.7         | 56.0         | 46.0         | 23.0       | 21.3       | N     |
| 6   | 3.682              | 33.7         | 25.8         | 0.5          | 34.2         | 26.3         | 56.0         | 46.0         | 21.8       | 19.7       | L     |

The power line conducted emission voltage is calculated by adding the LISN factor and Cable loss attenuation from the measured reading. The calculation is as follows:

$$\text{Result} = \text{Reading} + \text{C. F.}$$

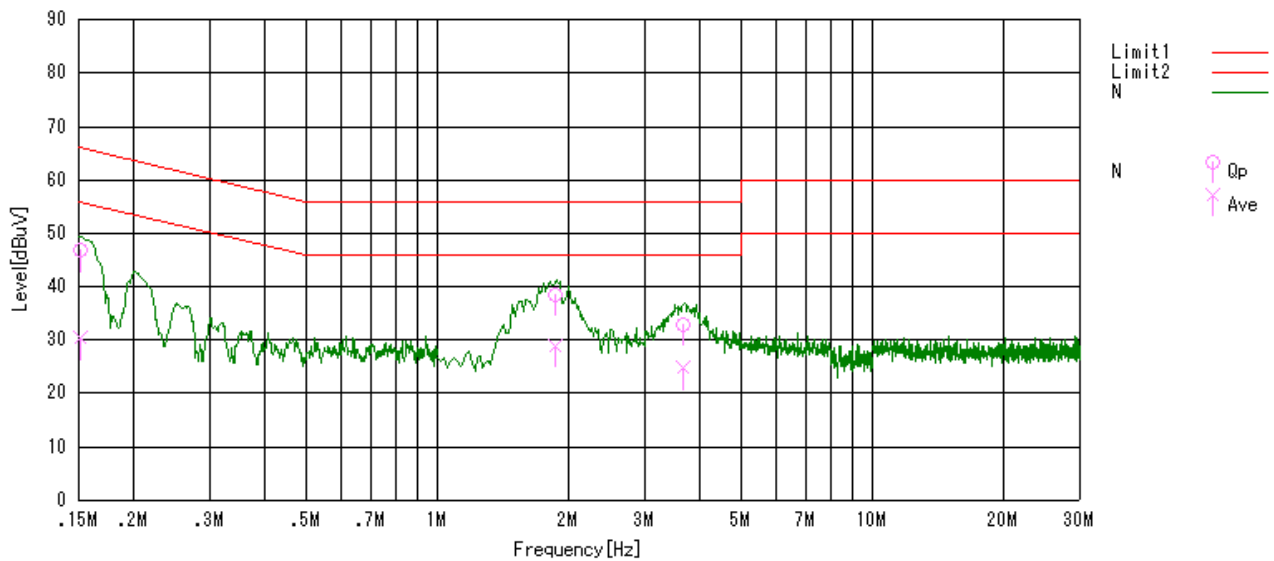
where C.F. = LISN Factor + Cable Loss [dB]

Sample calculation at 1.913 MHz QP. result as follow:

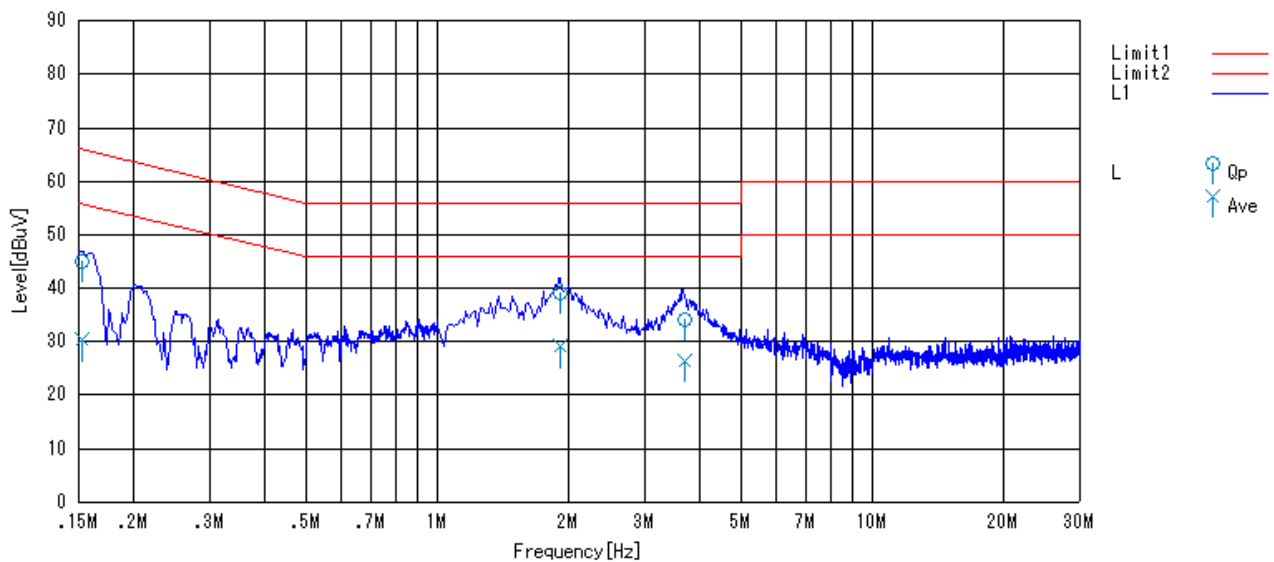
$$\text{Result} = \text{Reading} + \text{C.F.} = 38.9 + 0.3 = 39.2 \text{ [dBuV]}$$
$$\text{Margin} = \text{Limit} - \text{Result} = 56.0 - 39.2 = 16.8 \text{ [dB]}$$

## Graphical express of test result (0.15 MHz-30MHz)

### AC Power line conducted emission. (Phase N)



### AC Power line conducted emission. (Phase L)



## 2.7 Receiver Radiated spurious emissions between 30MHz to 1000MHz

Test setup - Same as clause 2.4

Test procedure - Same as clause 2.4

### Applicable rule and limitation at 3m

§15.109 radiated emission limitation

| Frequency (MHz) | Measurement Distance (m) | Field Strength (uV/m) | Field Strength (dBuV/m) |
|-----------------|--------------------------|-----------------------|-------------------------|
| 30 – 88         | 3                        | 100                   | 40.0                    |
| 88 – 216        | 3                        | 150                   | 43.5                    |
| 216 – 960       | 3                        | 200                   | 46.0                    |
| Above 960       | 3                        | 500                   | 54.0                    |

In the emission table above, the tighter limit applies at the band edges.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector.

Test results - Complied with requirement.

This transceiver could not achieved receiving mode only therefore the measurement was carried out under receiving ready condition of the EUT. This condition is same as standby.

### Test equipment used (refer to List of utilized test equipment)

|      |      |      |      |      |
|------|------|------|------|------|
| AC01 | BA03 | CL11 | PR03 | TR04 |
|------|------|------|------|------|

### Test Data

Tested Date: 4 November 2008

Temperature: 20 °C  
Humidity: 53 %  
Atmos. Press: 1016 hPa

Operating Mode: Ready to reception (same as standby)

EUT position: Z-plane (Worst case)

Connected cable: Earphone

Measurement distance: 3 m

| No. | Frequency [MHz] | Reading [dBuV] | Antenna Factor [dB/m] | Cable Loss [dB] | Preamplifier Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Antenna Polarization |
|-----|-----------------|----------------|-----------------------|-----------------|------------------------|-----------------|----------------|-------------|----------------------|
| 1   | 77.882          | 44.4           | 6.8                   | 8.0             | 29.7                   | 29.5            | 40.0           | 10.5        | Vert.                |
| 2   | 77.956          | 42.9           | 6.8                   | 8.0             | 29.7                   | 28.0            | 40.0           | 12.0        | Hori.                |
| 3   | 155.852         | 36.8           | 10.4                  | 8.9             | 29.6                   | 26.5            | 43.5           | 17.0        | Vert.                |
| 4   | 155.912         | 33.9           | 10.4                  | 8.9             | 29.6                   | 23.6            | 43.5           | 19.9        | Hori.                |
| 5   | 233.789         | 37.3           | 11.3                  | 9.7             | 29.6                   | 28.7            | 46.0           | 17.3        | Vert.                |
| 6   | 247.867         | 29.8           | 12.2                  | 9.9             | 29.6                   | 22.3            | 46.0           | 23.7        | Vert.                |

**Calculation method**

The Correction Factors and Result are calculated as followings.

$$\text{Correction Factor [dB/m]} = \text{Antenna Factor [dB/m]} + \text{Cable Loss [dB]} - \text{Preamplifier Gain [dB]}$$

$$\text{Result [dBuV/m]} = \text{Reading [dBuV]} + \text{Correction Factor [dB/m]}$$

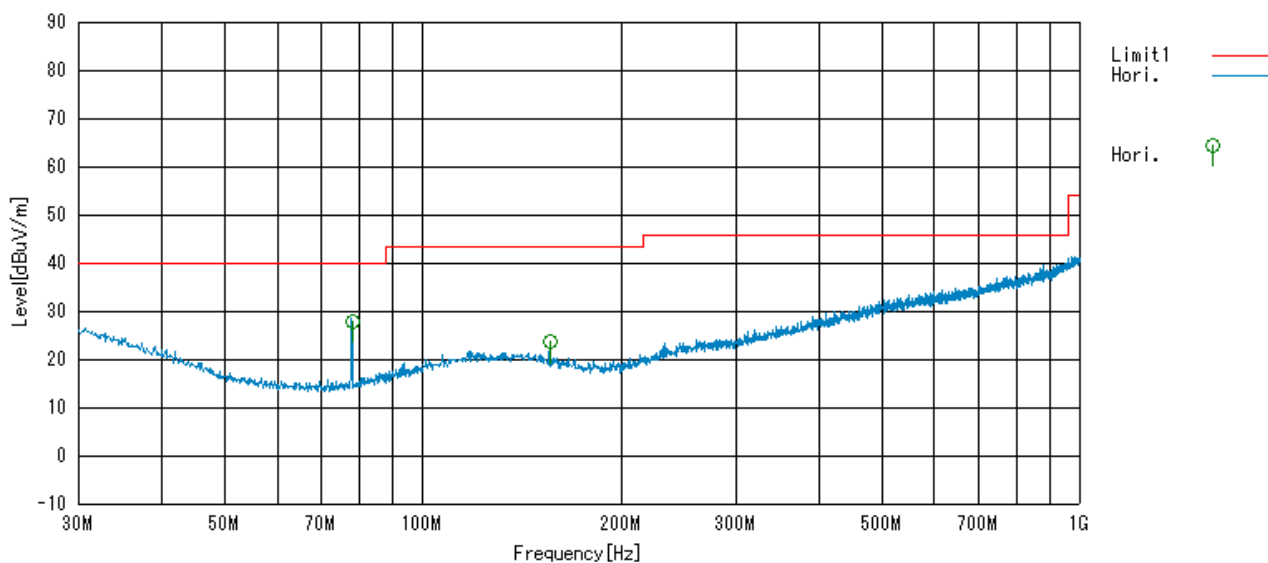
Sample calculation at 77.882 MHz Vertical result as follow:

$$\text{Result} = \text{Reading} + \text{C.F.} = 44.4 - 14.9 = 29.5 \text{ [dBuV/m]}$$

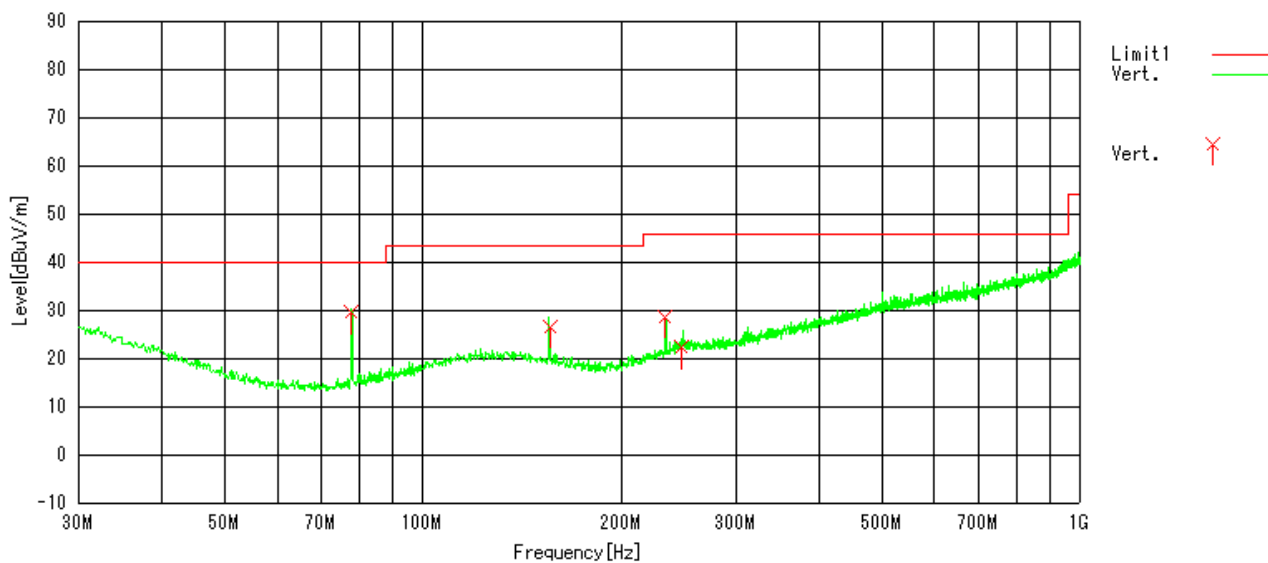
$$\text{Margin} = \text{Limit} - \text{Result} = 46.0 - 29.5 = 18.0 \text{ [dB]}$$

## Graphical express of test result (30MHz-1000MHz)

Antenna polarization: Horizontal



Antenna polarization: Vertical



#### 4 List of utilized test equipment/ calibration

| RFT ID No. | Kind of Equipment and Precision   | Manufacturer    | Model No. | Serial Number | Calibration Date | Calibrated until |
|------------|-----------------------------------|-----------------|-----------|---------------|------------------|------------------|
| AC01       | Anechoic Chamber (1st test room)  | JSE             | 203397C   | -             | 2008/07/04       | 2009/07/03       |
| BA03       | Biological Antenna                | CHASE           | CBL6111   | 1309          | 2008/05/07       | 2009/05/06       |
| CL11       | Antenna Cable                     | RFT             | -         | -             | 2008/06/11       | 2009/06/10       |
| LN05       | LISN                              | Kyoritsu        | KNW-407   | 8-1773-3      | 2008/05/12       | 2009/05/11       |
| LP01       | Loop Antenna                      | EMCO            | 6502      | 3436          | 2008/06/10       | 2009/06/09       |
| PL06       | Pulse Limiter                     | PMM             | PL-01     | 0000J10109    | 2008/01/17       | 2009/01/15       |
| PR03       | Pre. Amplifier                    | Anritsu         | MH648A    | M41984        | 2008/05/12       | 2009/05/11       |
| TR06       | Test Receiver<br>(F/W : 3.93 SP2) | Rohde & Schwarz | ESU26     | 100002        | 2008/09/02       | 2009/09/01       |
| TR04       | Test Receiver<br>(F/W : 3.82 SP1) | Rohde & Schwarz | ESCI      | 100447        | 2008/09/16       | 2009/09/15       |
| TC01       | Temperature Chamber               | ESPEC           | SH-641    | 92000964      | 2008/05/07       | 2009/05/06       |
| LP51       | Test Loop Antenna                 | Panasonic       | VQ-085C   | 002861A122    | not applicable   | not applicable   |

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.