

TEST REPORT

For

Mobile Base Station

In conformity with

FCC Part15 subpart B

Model: RTR-500GSM

FCC ID: Not Applicable

Test Item: Mobile Base Station

Report No: RY0907Z20R1

Issue Date: 20 July, 2009

Prepared for

T&D CORPORATION
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Prepared by

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History

Report No.	Date	Revisions	Issued By
RY0907Z20R1	20 July, 2009	Initial Issue	K. Ohnishi

1 General information

1.1 Product description


Test item : Mobile Base Station
Manufacturer : T&D CORPORATION
Address : 817-1 Shimadachi, Matsumoto, Nagano, Japan 390-0852
Model : RTR-500GSM
FCC ID/ IC Certification No. : Not Applicable
Serial numbers : 3E9E0001
Operating Frequency band : Tx/Rx Freq. (902 - 928 MHz)
Operating Frequency range : Tx/Rx Freq. (902.9376 MHz (0ch) – 927.1296 MHz (21ch))
Oscillator frequencies : 32.768 kHz, 9.83 MHz, 13.1072 MHz, 48 MHz
Receipt date of EUT : 19 June, 2009
Nominal power source voltages : AC 120V, 60Hz (Battery: DC 6.0V)

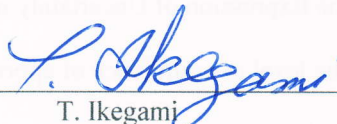
1.2 Test(s) performed/ Summary of test result

Test specification(s) : FCC CFR 47. Part 15 subpart B (October 1, 2008)
Test method(s) : ANSI C63.4: 2003
Test(s) started : 8 July, 2009
Test(s) completed : 20 July, 2009

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 : 
K. Ohnishi
Engineer
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 319924 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) Each registered facility number is as follows;

Test site No.1 (Semi 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: ± 1.9 dB (10 kHz – 30 MHz)

Radiated emission (30MHz - 1000MHz): ± 5.7 dB

RF conducted (below 3GHz): ± 0.7 dB

RF conducted (above 3GHz): ± 0.9 dB

1.5 Test results

Requirement of;	Section in FCC15	Result	Section in this report
1.5.1 Radiated emission	15.109	Complied	2.1
1.5.2 Conducted emission	15.107	Complied	2.2
1.5.3 Antenna power conduction	15.111	Complied	2.3

1.5.1 Radiated emission:

Min. Limit Margin 3.0 dB at 47.999 MHz

Remarks : The measurement results is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

1.5.2 Conducted emission:

Min. Limit Margin 2.1 dB at 0.412 MHz

Remarks : The measurement results is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

1.5.3 Antenna power conduction:

Min. Limit Margin 8.6 dB at 1.605 GHz

Remarks : The measurement results is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

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.	Remarks
A	Mobile Base Station	T&D CORPORATION	RTR-500GSM	3E9E0001	
B	Alkaline Battery	TOSHIBA	-	-	SIZE: AA (4pcs)

Support Equipment(s):

	Item	Manufacturer	Model No.	Serial No.
C	AC Adapter	T&D CORPORATION	AD-0605	-
D	PC	DELL	PP07L	2U915A02
E	AC Adapter	DELL	ADP-90FB	CN-06G356-48661-3B7-3XN7

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	T&D CORPORATION	No	No	No	1.85
2	USB cable	T&D CORPORATION	Yes	Yes	Yes	1.46
3	DC power cable	DELL	No	No	No	1.80
4	AC power cable	DELL	No	No	No	1.82

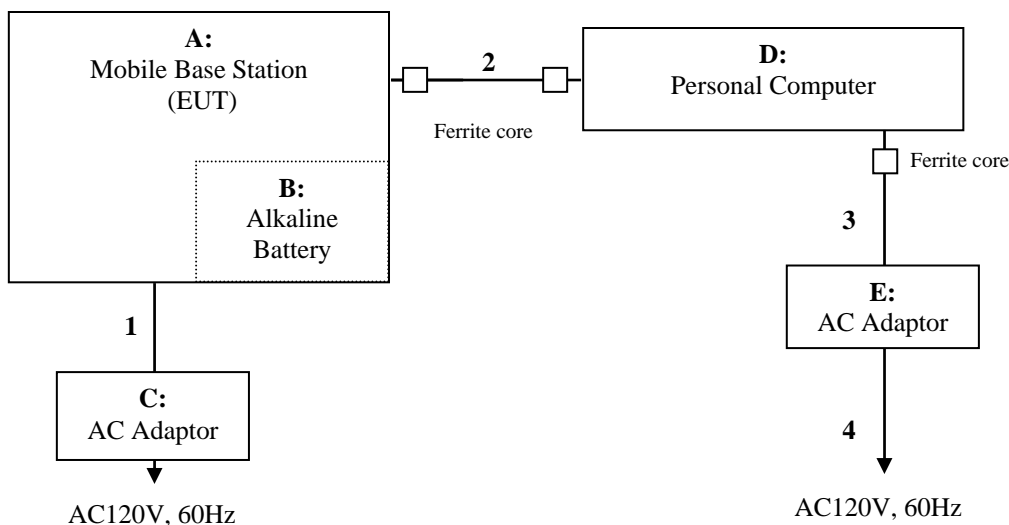
1.6.2 Operating condition:

Operating mode:

The EUT was tested under the following test mode prepared by the applicant:

- (1-1) Communication to PC
- (2-1) Continuous receiving (902.9376MHz)
- (2-2) Continuous receiving (914.4576MHz)
- (2-3) Continuous receiving (927.1296MHz)

1.6.3 Setup diagram of tested system:



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

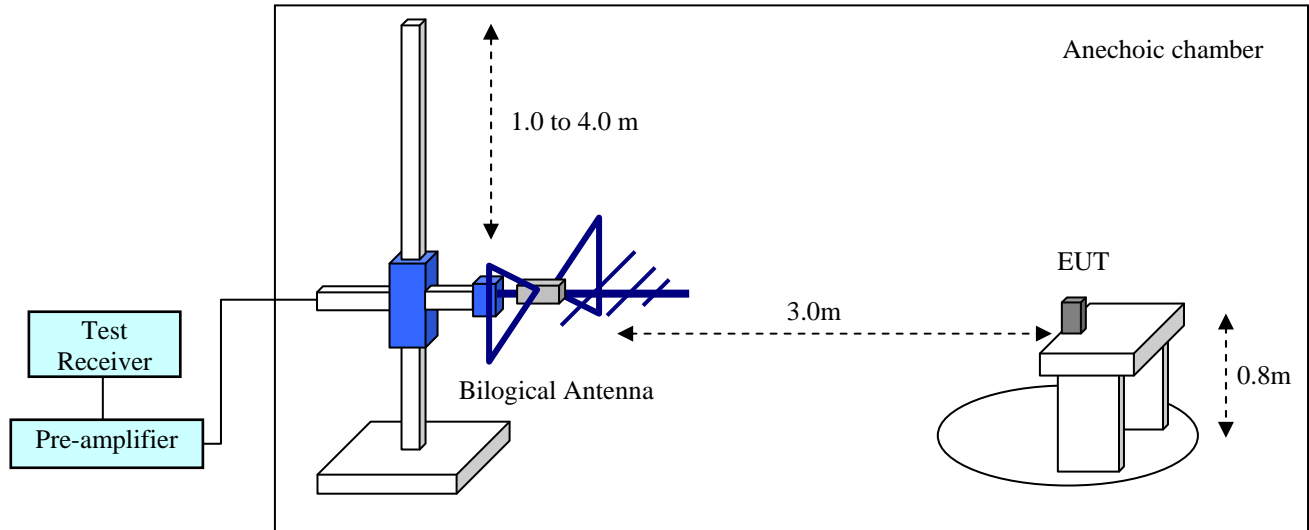
No deviations from the standards described in clause 1.2.

2 Test procedure and test data

2.1 Radiated spurious 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”, clause 8 “Radiated emission measurements” and clause 11 “Measurement of ITE”.



Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 8.2.3 and clause 11.6 “Radiated emission measurements”.

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.

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	53.9

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 equipment used (refer to List of utilized test equipment)

BA04	CL11	PR03	TR06
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Test results - Complied with requirement.

2.1.1 Between 30 - 1000 MHz

Test Data

Tested Date: 20 July, 2009

Temperature: 21 °C
 Humidity: 58 %
 Atmos. Press: 1011 hPa

Operating Mode: Communication to PC

Measurement distance: 3 m

No.	Frequency [MHz]	Reading [dBuV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna Polarization
1	39.808	40.7	13.2	7.5	29.7	31.7	40.0	8.3	Vert.
2	47.999	50.0	9.1	7.6	29.7	37.0	40.0	3.0	Vert.
3	96.061	44.1	9.9	8.3	29.6	32.7	43.5	10.8	Vert.
4	110.504	45.0	11.5	8.5	29.6	35.4	43.5	8.1	Vert.
5	195.040	50.8	9.2	9.4	29.5	39.9	43.5	3.6	Hori.
6	195.056	44.7	9.2	9.4	29.5	33.8	43.5	9.7	Vert.
7	585.059	28.9	18.6	13.4	29.7	31.2	46.0	14.8	Vert.
8	601.420	31.0	18.8	13.2	29.7	33.3	46.0	12.7	Vert.
9	662.706	35.5	19.1	13.3	29.6	38.3	46.0	7.7	Vert.

Calculation method

The Correction Factors and RESULT are calculated as followings.

$$\text{Correction Factor [dB/m]} = \text{FACTOR [dB/m]} + \text{LOSS [dB]} - \text{GAIN [dB]}$$

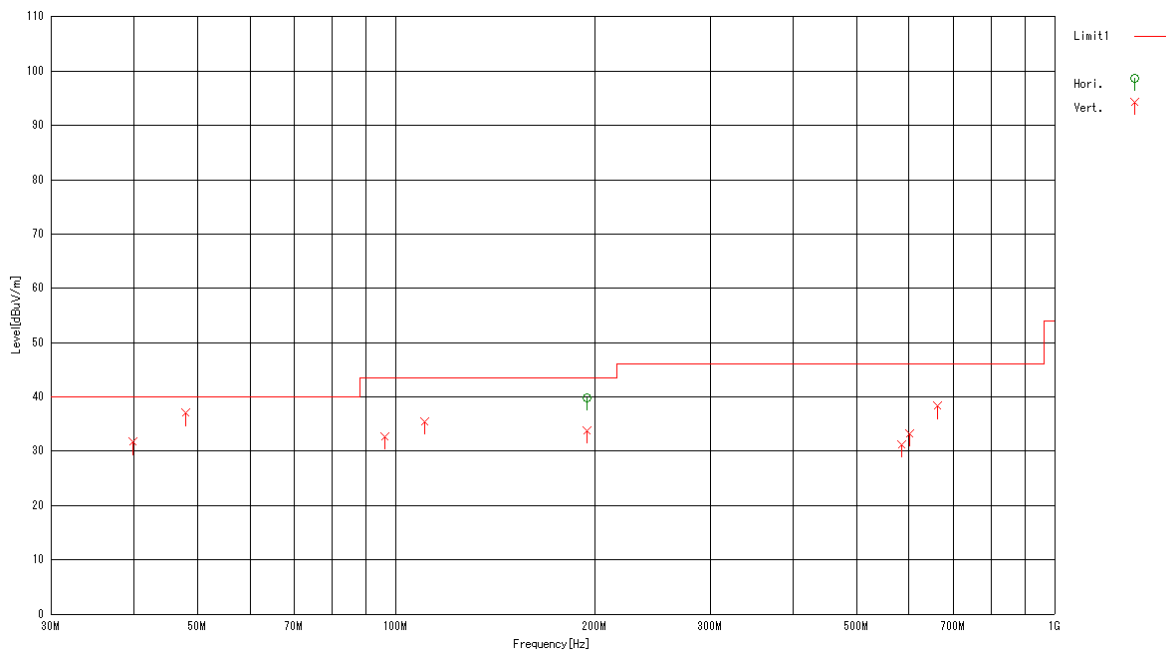
$$\text{RESULT [dBuV/m]} = \text{READING [dBuV]} + \text{Correction Factor [dB/m]}$$

Sample calculation at 47.999 MHz vertical result as follow:

$$\text{Result [dBuV/m]} = \text{Reading} + \text{C.F} = 50.0 + 9.1 + 7.6 - 29.7 = 37.0$$

$$\text{Margin [dB]} = \text{Limit} - \text{Result} = 40.0 - 37.0 = 3.0$$

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



2.2 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” clause 7 and clause 11 “Measurement of ITE”.

Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2003 clauses 7.2 and clause 11.5 “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 grater than average limitation the average detection measurements were performed.

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)

TR06	PL06	LN05	LN06	CL11
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Test results - Complied with requirement.

Test Data

Tested Date: 20 July, 2009

Temperature: 21 °C
 Humidity: 58 %
 Atmos. Press: 1011 hPa

Operating Mode: Communication to PC

No.	Frequency [MHz]	Reading		C.F. [dB]	Result		Limit		Margin		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.412	48.4	45.3	0.2	48.6	45.5	57.6	47.6	9.0	2.1	Va
2	0.413	43.4	38.6	0.2	43.6	38.8	57.6	47.6	14.0	8.8	Vb
3	0.822	45.9	41.1	0.3	46.2	41.4	56.0	46.0	9.8	4.6	Va
4	0.822	46.5	38.2	0.3	46.8	38.5	56.0	46.0	9.2	7.5	Vb
5	1.231	42.1	29.1	0.4	42.5	29.5	56.0	46.0	13.5	16.5	Vb
6	1.235	43.3	37.7	0.4	43.7	38.1	56.0	46.0	12.3	7.9	Va
7	1.644	40.7	32.0	0.4	41.1	32.4	56.0	46.0	14.9	13.6	Vb
8	2.060	41.6	32.2	0.5	42.1	32.7	56.0	46.0	13.9	13.3	Va
9	2.468	43.1	33.3	0.5	43.6	33.8	56.0	46.0	12.4	12.2	Vb
10	2.473	39.9	25.1	0.5	40.4	25.6	56.0	46.0	15.6	20.4	Va

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:

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

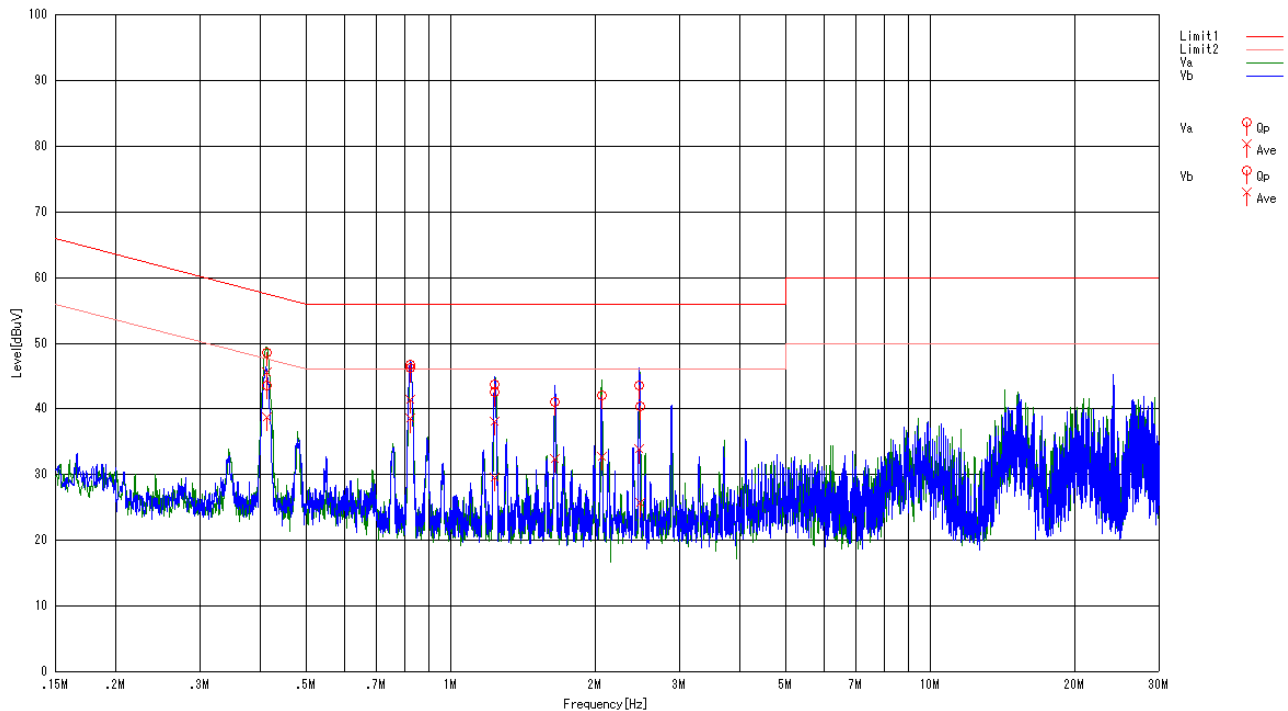
where C.F = LISN Factor + Cable Loss [dB]

Sample calculation at 0.412 MHz AV result as follow:

$$\text{Result [dBuV]} = \text{Reading} + \text{C.F} = 45.3 + 0.2 = 45.5 \text{ [dBuV]}$$

$$\text{Margin} = \text{Limit} - \text{Result} = 47.6 - 45.5 = 2.1 \text{ [dBuV]}$$

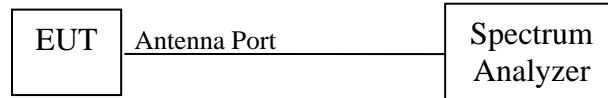
Graphical express of test result (0.15 MHz-30MHz)



2.3 Antenna power conduction

Test setup

Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure

The EUT antenna port connected to the spectrum analyzer. The RBW is set to 100 kHz (below 1GHz) or 1 MHz (above 1GHz). The VBW is set to three times of RBW. The sweep time is coupled appropriate.

Limitation

The power at the antenna terminal at any frequency within the range of measurements specified in § 15.33 shall not exceed 2.0 nW.

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

SA06					
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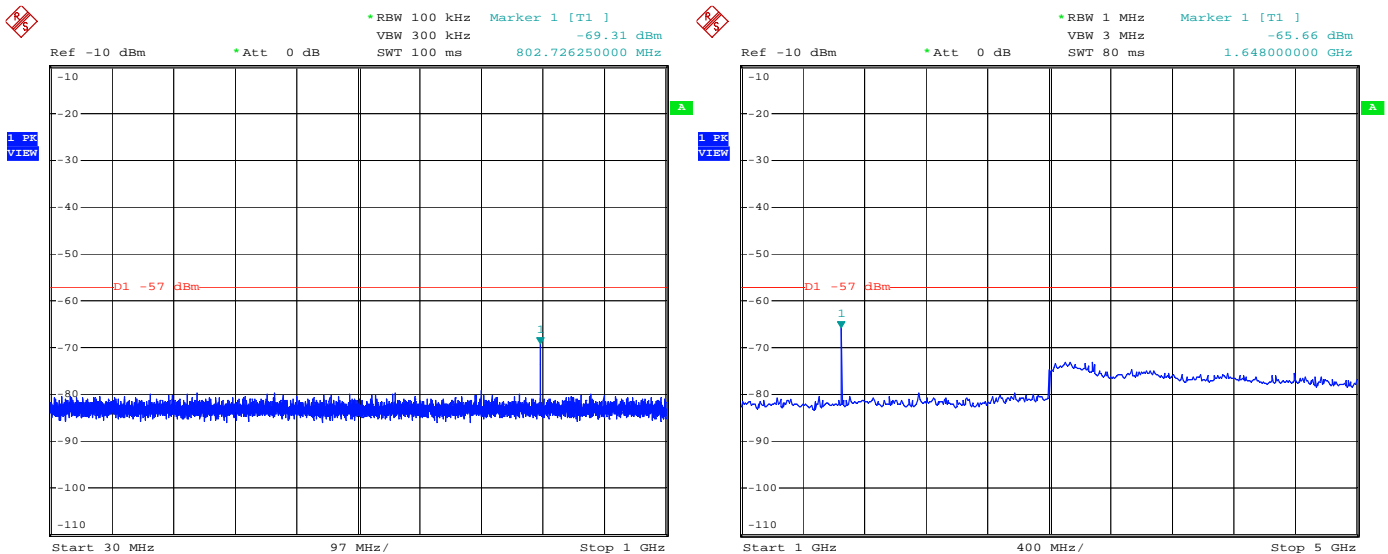
Test results – comply with the limitation.

Test Data

Tested Date: 8 July, 2009

Temperature: 24 °C
 Humidity: 35 %
 Atmos. Press: 1005 hPa

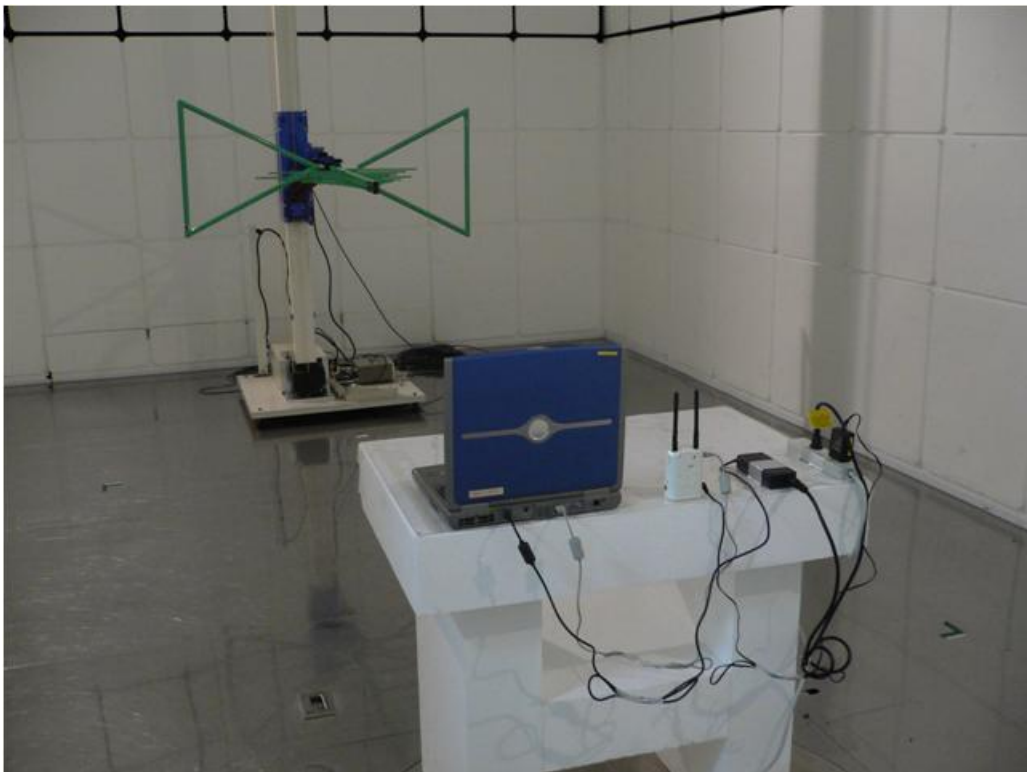
Worst Configuration (Hch: 927.1296MHz)



3 Test setup photographs

3.1 Radiated spurious emissions

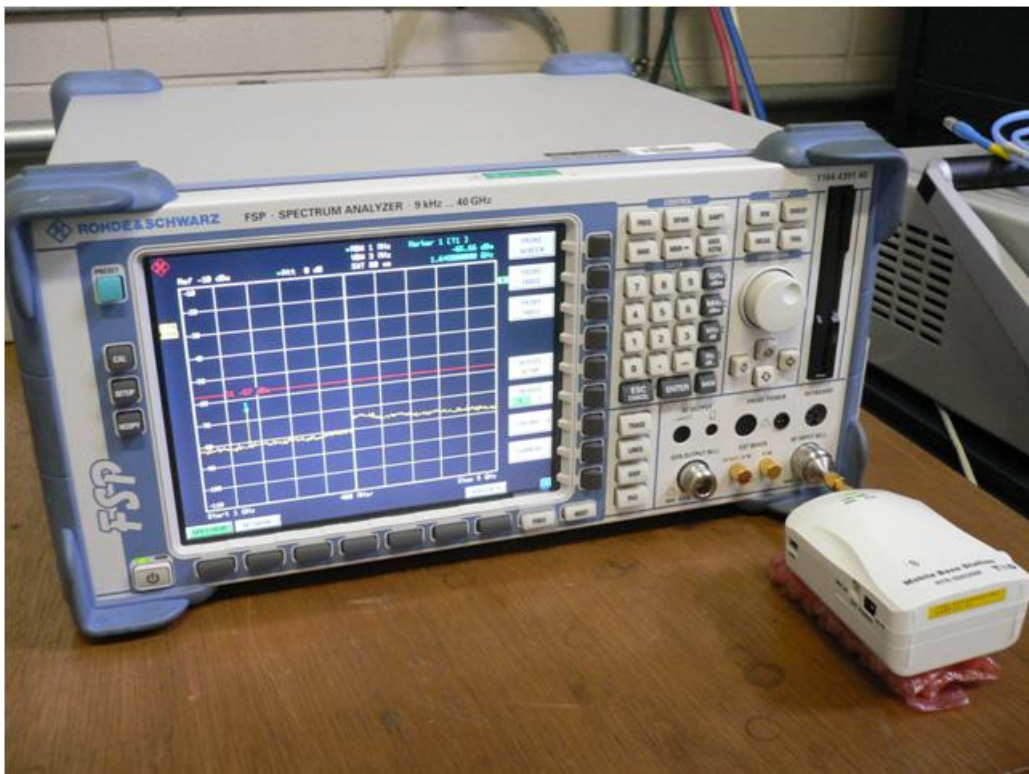
Between 30 -1000 MHz



3.2 AC power line conducted emissions



3.3 Antenna Port Measurements



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	2009/07/31
BA04	Biological Antenna	SCHAFFNER	CA2855	2903	2009/01/06	2010/01/31
CL11	Antenna Cable for RE	RFT	-	-	2009/04/13	2010/04/30
PR03	Pre. Amplifier	Anritsu	MH648A	M41984	2009/05/26	2010/05/31
PL06	Pulse Limiter	PMM	PL-01	0000J10109	2009/01/05	2010/01/31
LN05	LISN	Kyoritsu	KNW-407	8-1773-2	2009/05/26	2010/05/31
LN06	LISN	Kyoritsu	KNW-407	8-1773-3	2009/05/26	2010/05/31
TR06	Test Receiver (F/W : 3.93 SP2)	Rohde & Schwarz	ESU26	100002	2008/09/02	2009/09/30
SA06	Spectrum Analyzer (F/W: 3.60 SP1)	Rohde & Schwarz	FSP40	100071	2008/10/31	2009/10/31

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.