

Test Report

for

Electromagnetic Interference

of

E.U.T.: Wireless Handset (Base Unit)

Trade Name: LOGITECH

Model Number: 8701

Prepared for

LOGITECH INC.

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Prepared by

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3. This test data is traceable to National or International Standards.

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Appendix 1 – Power Line Conducted Test Data

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Certification of Compliance

Applicant : LOGITECH INC.
Manufacturer : HONOR TONE LTD
EUT Description : Wireless Handset (Base Unit)
Model No. : 8701
Serial No. : N/A
Tested Power Supply : 120Vac
Date of Final Test : June. 27, 2001
Measurement Procedures and Standards Used :

- ☒ CFR 47, Part 15
☒ ANSI C63.4: 1992

The device described above was tested by Interocean EMC Technology Corporation to determine the maximum emission levels emanated from the device and severity levels of the device endure and its performance criterion. The measurement results are contained in this test report and Interocean EMC Technology Corp assumes full responsibility for the accuracy and completeness of these measurements. This report shows the EUT is technically compliant with the Part 15 subpart C and ANSI C63.4 official requirements. This report applies to the above sample only and shall not be reproduced in part without written approval of Interocean EMC Technology Corporation.

Report Issued: 2001.06.27

Test Engineer: Jacky Yeh.
Jacky Yeh

Checked: Tomy
Tomy Hu

Approved: Kent
Kent J.K. Hsu

1 General Information

1.1 Description of Equipment Under Test

Equipment Under Test : Wireless Handset (Base Unit)
Model Number : 8701
Serial Number : N/A
Type of Sample Tested : ☒ Proto-type, ☐ Pre-production, ☐ Mass Production
Applicant : LOGITECH INC.
 6505 KAISER DR FREMONT, CA 94555, USA
Manufacturer : HONOR TONE LTD
 Tung Mun Industrial Zone, Dan Shuizhen, Dongguan, Hui Yang Hsien,
 Guangdong 516211, China
Power Supply : AC/DC Adapter, M/N: U090035D
 Input: 120Vac, 60Hz, 8W
 Output: 9Vdc, 350mA, Cable: Non-Shielded, Un-detachable, 1.8m
Data Cable : Signal Line & Audio Output, Non-Shielded, Un-detachable, 2m
Date of Receipt of Sample : May. 10, 2001
Date of Test : May. 10 ~ June. 27, 2000
Description of E.U.T. : The EUT is wireless Handset for audio signal. It's transferred audio signal to Handset remote. And the Handset remote also can transfer audio signal to base unit via microphone.

There are 10 free channels store in the EEPROM of the base and Handset remote unit. The channel frequency description as following:

Channel	Base Unit (MHz)	Handset Remote Unit (MHz)
1	902.20	924.80
2	902.50	925.10
3	902.80	925.40
4	903.10	925.70
5	903.40	926.00
6	903.70	926.30
7	904.00	926.60
8	904.30	926.90
9	904.60	927.20
10	904.90	927.50

1.2 Tested Supporting System Detail

1.2.1 Portable CD Player

Model Number : SL-S170
Serial Number : N/A
EMC Approved : N/A
Manufacturer : Panasonic

1.2.2 Speaker

Model Number : J-9915
Serial Number : N/A
EMC Approved : FCC DoC, BSMI, CE EMC
Manufacturer : J-S

1.3 Test Facility

Site Description : ☒ OATS 1 ☐ OATS 2

Name of Firm : Interocean EMC Technology Corp.

Site Location : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang,
Taipei County, Taiwan, R.O.C.

Site Filing : ~~EE~~ Federal Communication Commissions – USA
Registration No.: 96399
~~EE~~ Voluntary Control Council for Interference by Information Technology
Equipment (VCCI) – Japan
Registration No. (Conducted Room): C-1094
Registration No. (OATS 1): R-1040
Registration No. (OATS 2): R-1041

Site Accreditation : ~~EE~~ Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.
Accreditation No.:
SL2-IN-E-0026 for CNS13438 / CISPR22
SL2-A1-E-0026 for CNS13783-1 / CISPR14
~~EE~~ National Voluntary Laboratory Accreditation Program (NVLAP) - USA
Lab Code: 200458-0
~~EE~~ NEMKO
ELA 181

1.3.1 Test Methodology

Both conducted and Radiated Emission Measurement was performed according to the procedures in ANSI C63.4-1992 and Part 15 subpart C. Radiated Emission Measurement was performed at 3 meters distance from antenna to EUT.

1.3.2 Measurement Uncertainty

The uncertainty is calculated in accordance with NAMAS document NIS 81.

Conducted Uncertainty $U_c = \pm 2.96\text{dB}$.

Radiated Uncertainty $U_c = \pm 3.67\text{dB}$.

2 Power Line Conducted Emission Measurement

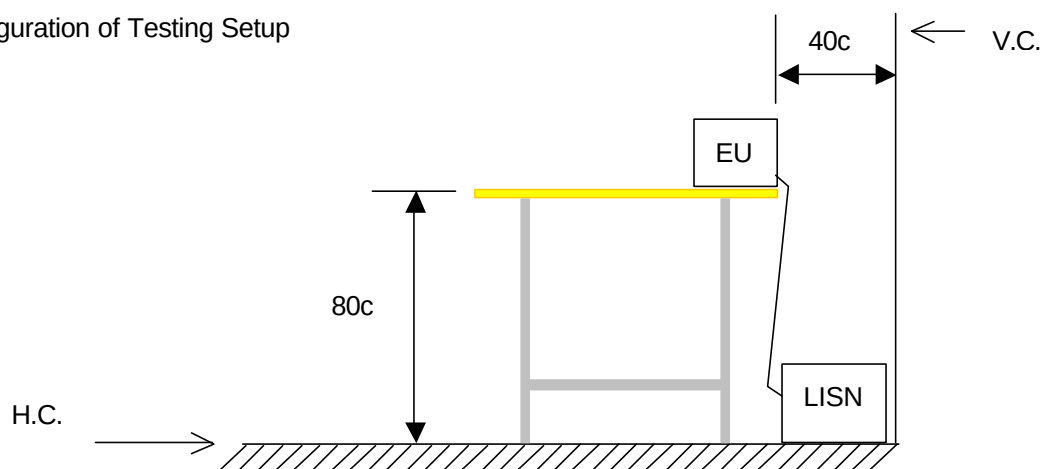
2.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Last Calibration
EMI Test Receiver	Rohde & Schwarz	ESCS 30	830245/027	2000/07/26
L.I.S.N.	Schwarzbeck	NNLK8121	8121417	2000/09/08
L.I.S.N.	Rohde & Schwarz	ESH3-Z5	829996/016	2000/06/16
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	830836/026	2000/07/29
RF Cable	IETC	CBL04	N/A	2000/10/11

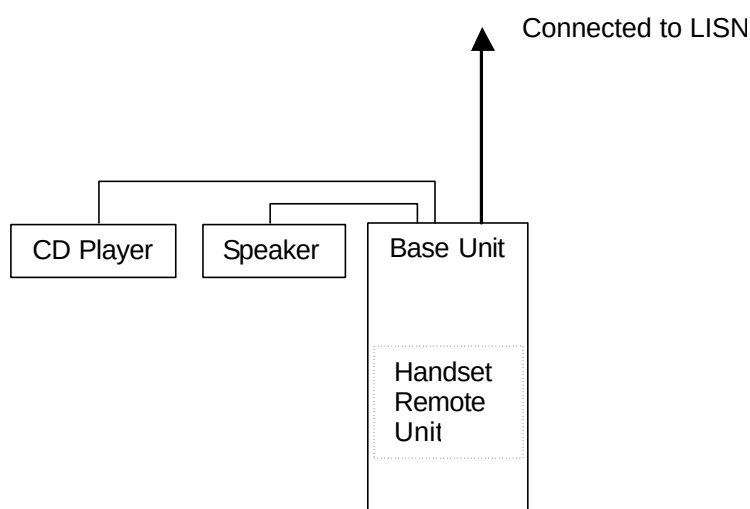
Note: All instrument upon which need to calibrated are with calibration period of 1 year.

2.2 Block Diagram of Test Configuration

Configuration of Testing Setup



Configuration of EUT Setup



Note:

1. Transmit mode without Handset Remote Unit.
2. Charge mode with Handset Remote Unit.

2.3 Conducted Limit

☒ FCC Part 15

Frequency (MHz)	☒ Class B	
	uV	dBuV
0.45 ~ 1.705	250	48
1.705 ~ 30	250	48

2.4 Instrument configuration

- 2.4.1 The EMI test receiver frequency range set from 450 KHz to 30 MHz.
- 2.4.2 The EMI test receiver bandwidth set at 9kHz.
- 2.4.3 The EMI test receiver detector set as Quasi-Peak (Q.P.).

2.5 Measured Mode

- 2.5.1 The test mode for final as following:

Mode 1: Charge mode

Mode 2: CD Play (Transmit)

2.6 Configuration of Measurement

- 2.6.1 The EUT was place on a non-conductive table whose total height equaled 80cm and vertical conducting plane located 40cm to the rear of the EUT.
- 2.6.2 The EUT was connected to the main power through Line Impedance Stabilization Networks (LISN). This setup provided a 50ohm/50?H coupling impedance for the measuring equipment. The auxiliary equipment was also connected to the main power through a LISN that provided a 50ohm/50?H coupling impedance with 50ohm termination. (Refer to the block diagram of the test setup and photographs.)
- 2.6.3 The conducted disturbance was measured between the phase lead and the reference ground, and between the neutral lead and reference ground. The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 2.6.4 The identification of the frequency of highest disturbance with respect to the limit was found by investigating disturbances at a number of significant frequencies. The probable frequency of maximum disturbance had been found and that the associated cable and EUT configuration and mode of operation had been identified.

2.7 Configuration of EUT

- 2.7.1 Setup the EUT and simulators as shown section 2.2.
- 2.7.2 Turn on the power of all equipment.
- 2.7.3 Transmit Mode
 - 2.7.3.1 Press the "Test Mode" button first, the offer 9Vdc to the base unit, the base unit will go into test mode.
 - 2.7.3.2 As the base unit goes into test mode, the default channel is channel one. And used "CH

UP” and “CH DOWN” button to sequence selects all of the channels.

2.7.3.3 There is a cable connects with the base unit and two plugs. The CD Player connected with green one (Signal In), and connected the speaker with blue one (Audio Output).

2.7.4 Charge Mode

Insert the battery into the battery slot to offer power to Handset remote unit, and put it to base unit to charge.

2.8 Test Result

PASS

The final tests data as shown on following page.

Date of Tested	: Jun. 21, 2001	Power Line	: Line
Temperature	: 27°C	Humidity	: 81%
Tested Mode	: Charge Mode		

[illegible]

1. All readings are Quasi-Peak values.
2. Factor = Insertion Loss + Cable Loss
3. “*” Means emission level un-detectable.
4. “--” Means do not need detect.

Date of Tested	: Jun. 21, 2001	Power Line	: Neutral
Temperature	: 27°C	Humidity	: 81%
Tested Mode	: Charge Mode		

[illegible]

1. All readings are Quasi-Peak values.
2. Factor = Insertion Loss + Cable Loss
3. “*” Means emission level un-detectable.
4. “--” Means do not need detect.

Date of Tested	: Jun. 21, 2001	Power Line	: Line
Temperature	: 27°C	Humidity	: 81%
Tested Mode	: CD Play (Transmit)		

[illegible]

- 1 All readings are Quasi-Peak values.
- 2 Factor = Insertion Loss + Cable Loss
- 3 “*” Means emission level un-detectable.
- 4 “--” Means do not need detect.

Date of Tested	: Jun. 21, 2001	Power Line	: Neutral
Temperature	: 27°C	Humidity	: 81%
Tested Mode	: CD Play (Transmit)		

[illegible]

- 1 All readings are Quasi-Peak values.
- 2 Factor = Insertion Loss + Cable Loss
- 3 “*” Means emission level un-detectable.
- 4 “-” Means do not need detect.

3 Radiated Emission Measurement

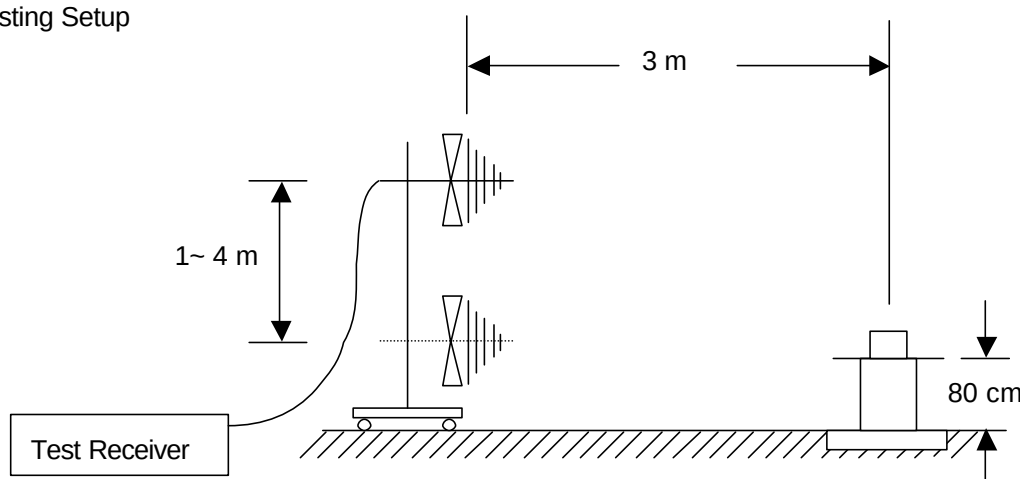
3.1 Instrument (OATS 1)

Instrument	Manufacturer	Model	Serial No.	Last Calibration
EMI Test Receiver	Rohde & Schwarz	ESI 07	830154/002	2000/07/28
Bi-Log Antenna	Schaffner	CBL6112B	2610	2000/06/28
Pre-Amplifier	Schaffner	CPA9231A	3351	2000/11/13
RF Cable	IETC	CBL01	N/A	2000/10/11
Horn Antenna	Com-Power	AH-118	10081	2000/09/15
Pre-Amplifier	Agilent Technologies	8449B	3008A01434	2000/09/19
RF Cable	Insulated Wire	NPS-2251-7880-NPR	CBL06	2000/10/19

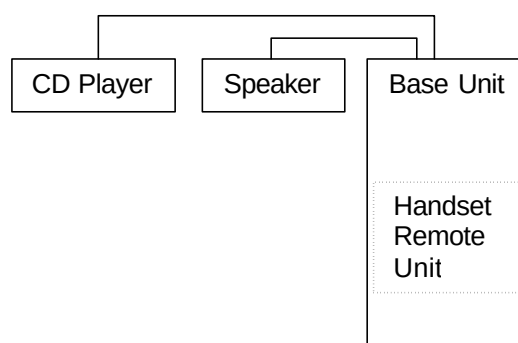
Note: All instrument upon which need to calibrated are with calibration period of 1 year.

3.2 Block Diagram of Test Configuration

Configuration of Testing Setup



Configuration of EUT Setup



Note:

1. Transmit mode without Handset Remote Unit when test Base Unit.
2. Charge mode with Handset Remote Unit when test Base Unit.

3.3 Radiated Limit

☒ FCC Part 15 (30~1000 MHz)

Frequency (MHz)	☐ Class A (10m)		☒ Class B (3m)	
	Field Strength (uV/m)	Quasi-Peak (dBuV/m)	Field Strength (uV/m)	Quasi-Peak (dBuV/m)
30 ~ 88	90	39.08	100	40.00
88 ~ 216	150	43.52	150	43.52
216 ~ 960	210	46.44	200	46.02
960 above	300	49.54	500	53.98

☒ FCC Part 15 (Section 15.249)

Frequency (MHz)	Fundamental		Harmonics	
	mv/m	dBuV/m	uV/m	dBuV/m
902~928	50	93.98	500	53.98

3.4 Instrument configuration

- 3.4.1 The EMI test receiver frequency range set from 30 MHz to 1000 MHz.
- 3.4.2 The EMI test receiver bandwidth set at 120 kHz.
- 3.4.3 The EMI test receiver detector set as Quasi-Peak (Q.P.).
- 3.4.4 The Spectrum frequency range set to fundamental and harmonics.

3.5 Measured Mode

- 3.5.1 The test mode for final as following:
 Mode 1: Charge mode
 Mode 2: CD Play (Transmit)

3.6 Configuration of Measurement

- 3.6.1 The EUT was place on a non-conductive table whose total height equaled 80cm. The turntable can rotate 360 degree to determine the position of the maximum emission level.
- 3.6.2 The EUT was set 10 meters away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.
- 3.6.3 The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 3.6.4 The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

3.7 Configuration of EUT

- 3.7.1 Setup the EUT and simulators as shown section 3.2.
- 3.7.2 Turn on the power of all equipment.

3.7.3 Transmit Mode

3.7.3.1 Press the “Test Mode” button first, then offer 9Vdc to the base unit, the base unit will go into test mode.

3.7.3.2 As the base unit goes into test mode, the default channel is channel one. And use “CH UP” and “CH DOWN” button to sequentially select all of the channels.

3.7.3.3 There is a cable that connects with the base unit and two plugs. The CD Player is connected with green one (Signal In), and connect the speaker with blue one (Audio Output).

3.7.4 Charge Mode

Insert the battery into the battery slot to offer power to Handset remote unit, and put it to base unit to charge.

3.8 Test Result

PASS.

The final test data as shown on the following page.

Radiated Emission Measurement Data

Date of Tested	: May 18, 2001	Polarization	: Horizontal
Temperature	: 26°C	Humidity	: 80%
Tested Mode	: Charge Mode		

Frequency (MHz)	Factor (dB)	Meter Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV/m)	Margin (dB)
30.000	-25.34	47.88	22.54	40.00	-17.46
119.725	-19.02	43.08	24.06	43.52	-19.46
127.000	-16.69	39.14	22.45	43.52	-21.07
146.400	-11.90	35.04	23.14	43.52	-20.38
170.650	-10.95	33.26	22.31	43.52	-21.21
359.800	-5.43	34.53	29.10	46.02	-16.92
500.450	-8.92	36.04	27.12	46.02	-18.90
645.950	-1.93	33.68	31.75	46.02	-14.27
725.975	-2.31	33.65	31.34	46.02	-14.68
927.250	-4.15	33.48	29.33	46.02	-16.69

Remark:

1. All readings are Quasi-Peak values.
2. Factor = Antenna Factor + Cable Loss – Pre-amplifier

Radiated Emission Measurement Data

Date of Tested	: May 18, 2001	Polarization	: Vertical
Temperature	: 26°C	Humidity	: 80%
Tested Mode	: Charge Mode		

Frequency (MHz)	Factor (dB)	Meter Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV/m)	Margin (dB)
30.000	-20.12	48.80	28.68	40.00	-11.32
59.100	-15.48	42.14	26.66	40.00	-13.34
80.925	-20.52	40.42	19.90	40.00	-20.10
100.325	-18.20	37.78	19.58	43.52	-23.94
110.025	-16.65	39.13	22.48	43.52	-21.04
131.850	-13.38	38.96	25.58	43.52	-17.94
146.400	-12.42	37.00	24.58	43.52	-18.94
308.875	-8.45	36.07	27.62	46.02	-18.40
468.925	-0.07	34.51	34.44	46.02	-11.58
927.250	-3.86	35.69	31.83	46.02	-14.19

Remark:

1. All readings are Quasi-Peak values.
2. “*” Means Average values.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier

Radiated Emission Measurement Data

Date of Tested	: May 18, 2001	Polarization	: Horizontal
Temperature	: 26°C	Humidity	: 80%
Tested Mode	: CD Play (Transmit)		

Frequency (MHz)	Factor (dB)	Meter Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV/m)	Margin (dB)
30.000	-25.34	49.49	24.15	40.00	-15.85
59.100	-15.24	35.68	20.44	40.00	-19.56
88.200	-16.33	35.95	19.62	43.52	-23.90
127.000	-16.69	39.86	23.17	43.52	-20.35
158.525	-9.58	31.59	22.01	43.52	-21.51
362.225	-5.31	33.42	28.11	46.02	-17.91
650.800	-2.14	32.59	30.45	46.02	-15.57
721.125	-1.81	31.91	30.10	46.02	-15.92
890.875	-5.86	40.90	35.04	46.02	-10.98
902.207 +	-6.65	90.70	84.05	93.98	-9.93
1804.400 *	-0.35	46.84	46.49	53.98	-7.49
2706.600 *	2.98	21.59	24.57	53.98	-29.41
3608.800 *	4.02	11.10	15.12	53.98	-38.86
4511.000 *	4.98	10.40	15.38	53.98	-38.60

Remark:

- 1 All readings are Quasi-Peak values.
- 2 "+" Means Fundamental Frequency.
- 3 "*" Means Peak values. Peak = Average + 20 dB.
- 4 Factor = Antenna Factor + Cable Loss – Pre-amplifier

Radiated Emission Measurement Data

Date of Tested	: May 18, 2001	Polarization	: Vertical
Temperature	: 26°C	Humidity	: 80%
Tested Mode	: CD Play (Transmit)		

Frequency (MHz)	Factor (dB)	Meter Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV/m)	Margin (dB)
30.000	-20.12	48.47	28.35	40.00	-11.65
59.100	-15.48	42.54	27.06	40.00	-12.94
80.925	-20.52	43.31	22.79	40.00	-17.21
110.025	-16.65	40.14	23.49	43.52	-20.03
127.000	-14.11	39.86	25.75	43.52	-17.77
131.850	-13.38	38.94	25.56	43.52	-17.96
471.350	-0.01	31.84	31.83	46.02	-14.19
890.875	-5.43	43.90	38.47	46.02	-7.55
902.207 +	-5.18	93.13	87.95	93.98	-6.03
1804.400 *	-0.35	47.13	46.78	53.98	-7.20
2706.600 *	2.98	22.18	25.16	53.98	-28.82
3608.800 *	4.02	11.61	15.63	53.98	-38.35
4511.000 *	4.98	10.41	15.39	53.98	-38.59

Remark:

- 1 All readings are Quasi-Peak values.
- 2 "+" Means Fundamental Frequency.
- 3 "*" Means Peak values. Peak = Average + 20 dB.
- 4 Factor = Antenna Factor + Cable Loss – Pre-amplifier

4 Frequency Measurements

4.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Last Calibration
EMI Test Receiver	Rohde & Schwarz	ESI 07	830154/002	2000/07/28
Temperature Chamber	KATO	SSE47BLA	N/A	2000/08/23

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

4.2 Measurement Operating Frequency

4.2.1 Test Condition: Temperature: 24°C.

4.2.2 Supplied the EUT with 120Vac.

4.2.3 The EUT frequency ranges over 1MHz, so operate on top frequency (902.20MHz) and bottom frequency (904.90MHz) in during test.

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

4.2.5 Result:

Timing	902.20 MHz	904.90 MHz
Start-Up	902.20539	904.90051
2 min.	902.20538	904.90048
5 min.	902.20527	904.90047
10 min.	902.20517	904.90047

4.3 Measurement Frequency Stability vs. Temperature

4.3.1 Set the environmental temperature test chamber to temperature of 20°C.

4.3.2 Supplied the EUT with 120Vac.

4.3.3 The EUT frequency ranges over 1MHz, so operate on top frequency (902.20MHz) and bottom frequency (904.90MHz) in during test.

4.3.4 Turn the environmental temperature test chamber on and wait the temperature of the chamber to stabilize.

4.3.5 While maintaining a constant temperature inside the environmental chamber, turn the EUT on and measure the EUT operating frequency at the start-up, and two, five, and ten minutes after startup.

4.3.6 Result:

Timing	902.20 MHz	904.90 MHz
Start-Up	902.20589	904.90049
2 min.	902.20587	904.90048
5 min.	902.20580	904.90046
10 min.	902.20577	904.90039

4.4 Measurement Frequency Stability vs. Voltage

4.4.1 Set the environmental temperature test chamber to temperature of 20°C.

4.4.2 Supplied the EUT with 102 & 138Vac.

- 4.4.3 The EUT frequency ranges over 1MHz, so operate on top frequency (902.20MHz) and bottom frequency (904.90MHz) in during test.
- 4.4.4 Turn the environmental temperature test chamber on and wait the temperature of the chamber to stabilize.
- 4.4.5 While maintaining a constant temperature inside the environmental chamber, turn the EUT on and measure the EUT operating frequency at the start-up, and two, five, and ten minutes after startup.
- 4.4.6 Result:

Timing	902.20 MHz		904.90 MHz	
	102Vac	138Vac	102Vac	138Vac
Start-Up	902.20497	902.20576	904.90017	904.90031
2 min.	902.20476	902.20534	904.90007	904.90023
5 min.	902.20412	902.20526	904.90002	904.90021
10 min.	902.20410	902.20531	904.89999	904.90024

5 Occupied Bandwidth Measurements

5.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Last Calibration
EMI Test Receiver	Rohde & Schwarz	ESI 07	830154/002	2000/07/28

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

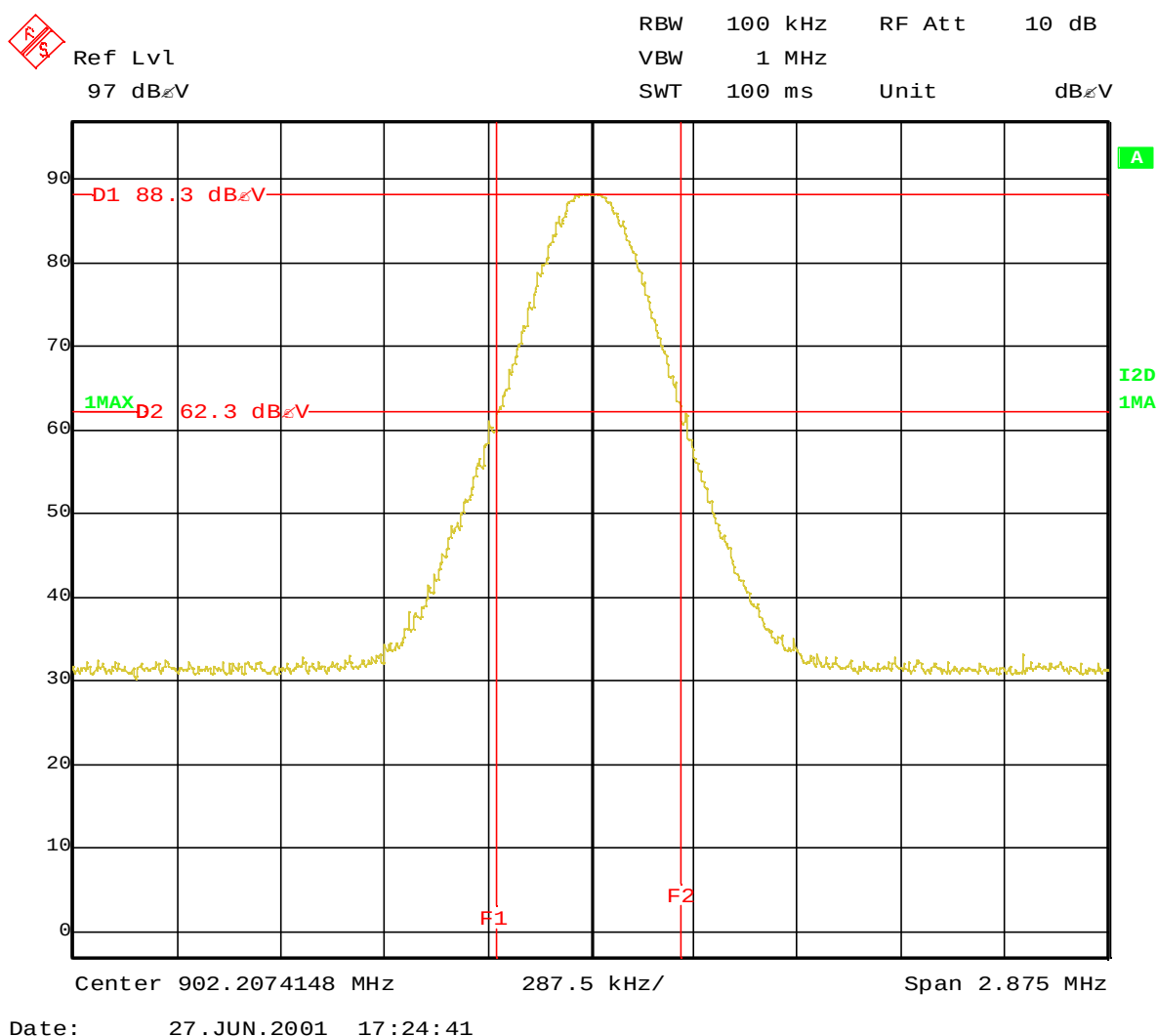
5.2 Instrument configuration

5.2.1 The EMI test receiver resolution bandwidth set at 100 kHz.

5.3 Result

5.3.1 Channel 1

Frequency: 902.20 MHz, Occupied Bandwidth: 517.51 kHz

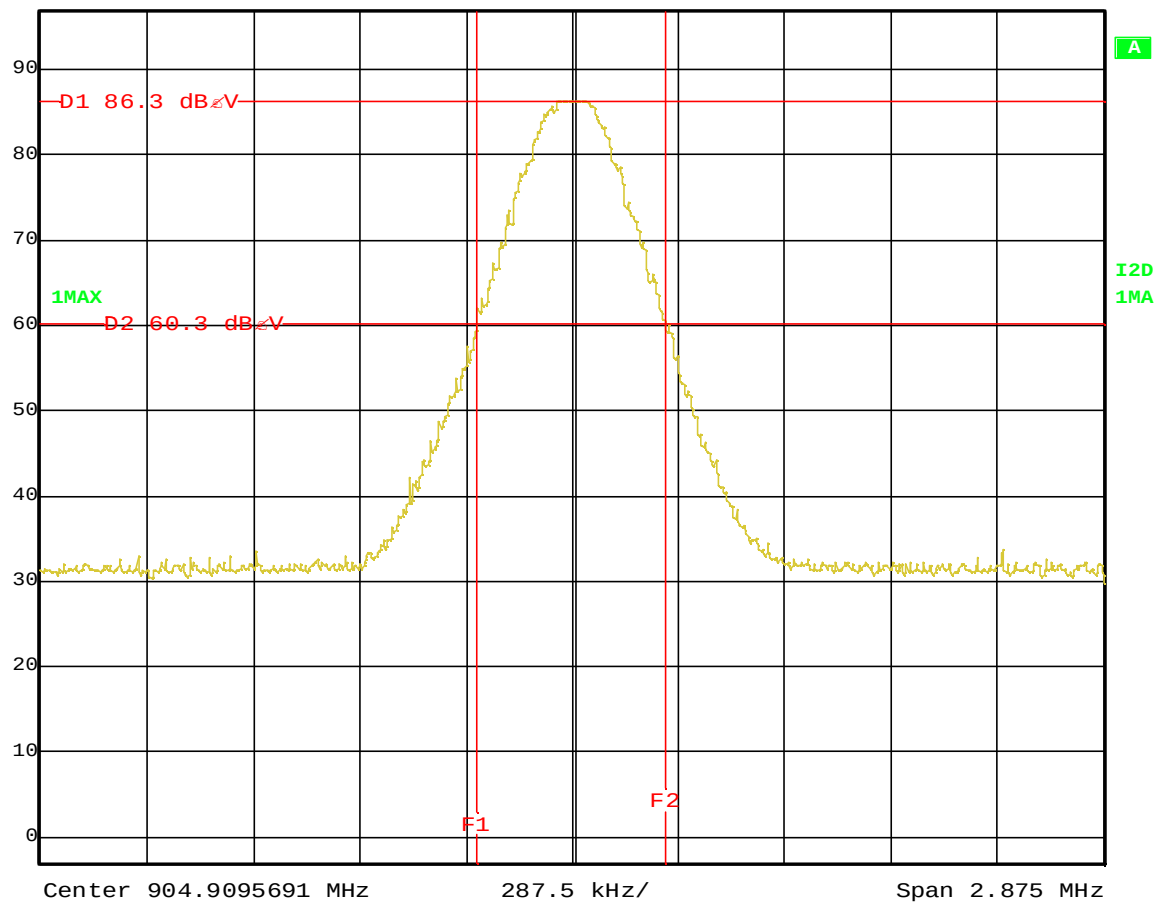


5.3.2 Channel 10

Frequency: 904.90 MHz, Occupied Bandwidth: 498.33 kHz

Ref Lvl
97 dB μ V

RBW	100 kHz	RF Att	10 dB
VBW	1 MHz		
SWT	100 ms	Unit	dB μ V



Date: 27. JUN. 2001 17:27:11

6 Photographs of Measurement

6.1 Power Line Conducted Emission Measurement



Conducted (Charge Mode)



Conducted (Transmit)

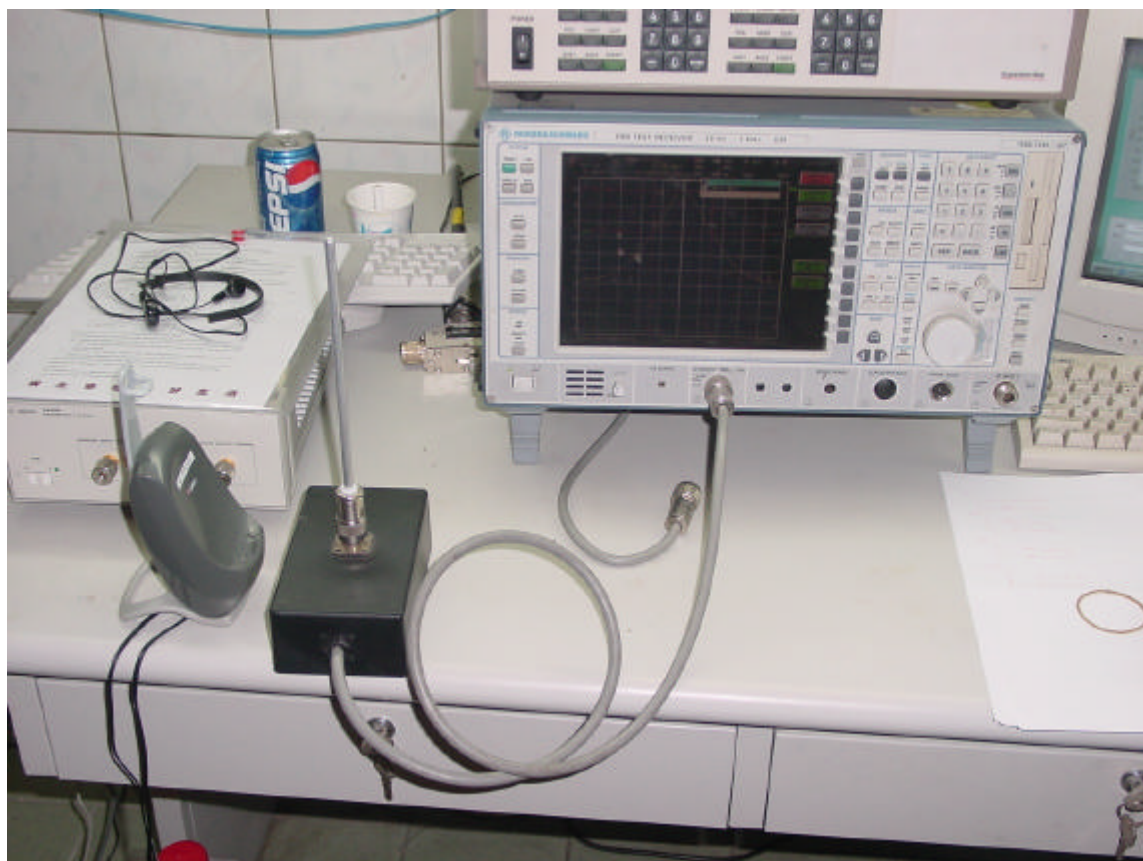
6.2 Radiated Emission Measurement



Radiated (30~1000MHz)



Radiated (1000MHz above)



Occupied Bandwidth



Temperature test chamber

7 Photographs of EUT



Front View of Appearance



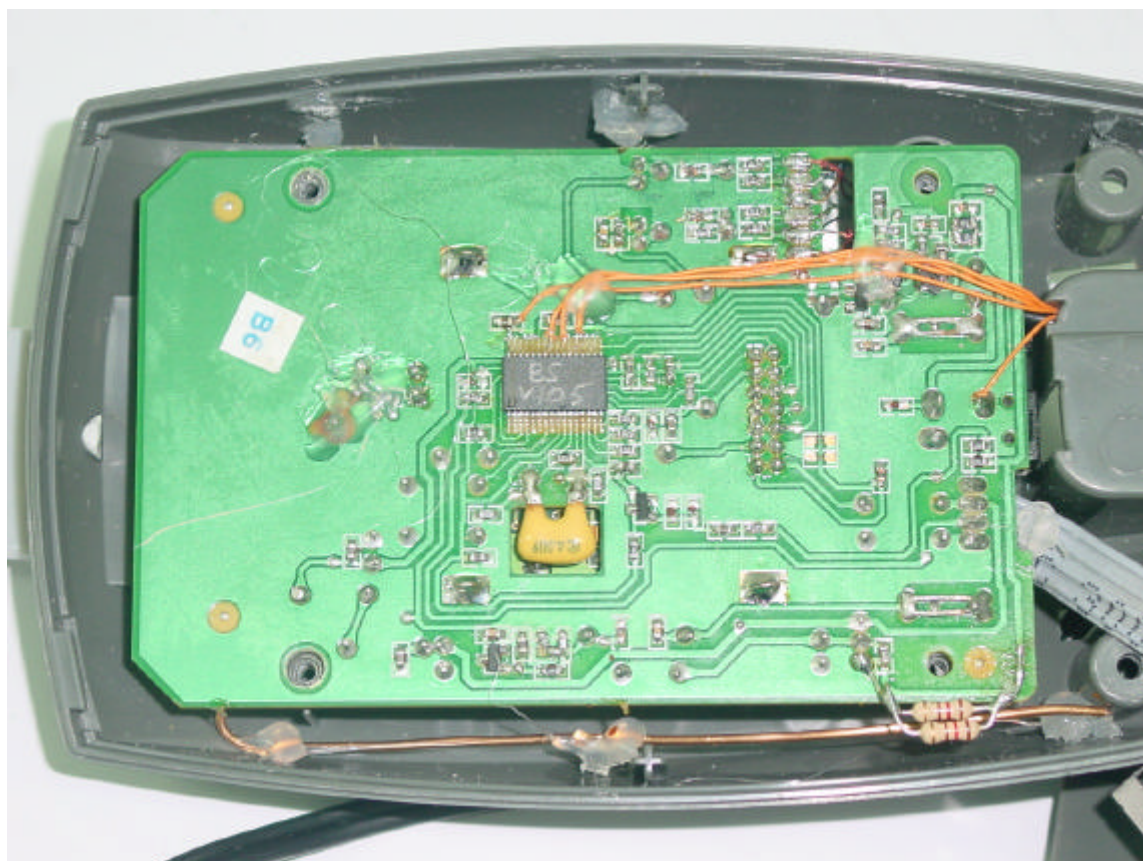
Rear View of Appearance



Power Adaptor



Adaptor Jack (The outside PCB only for switching channel in during test)



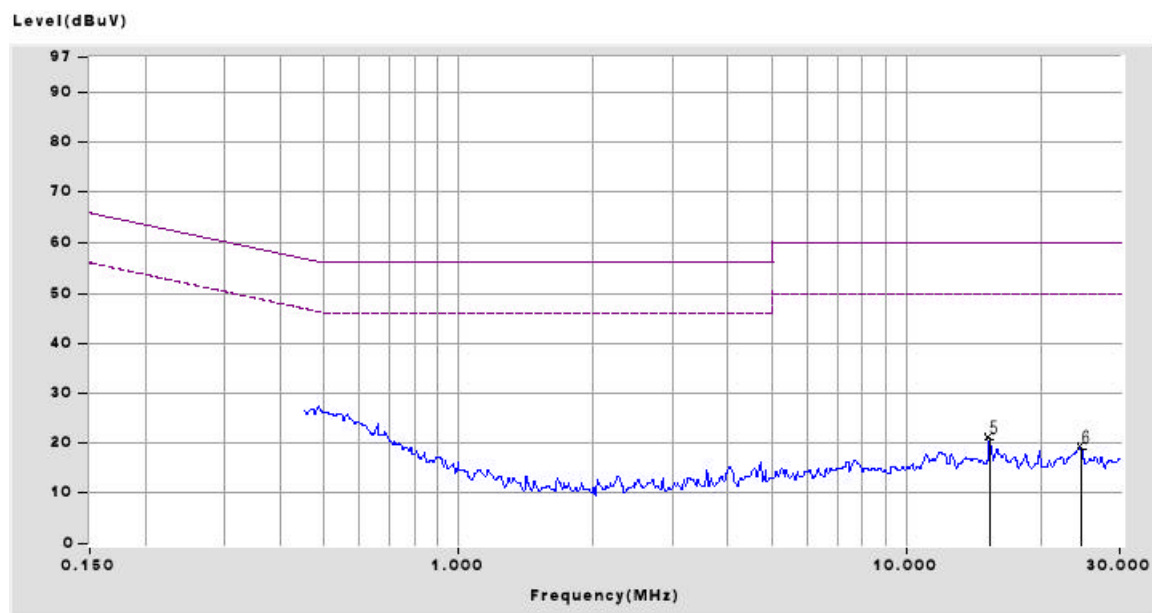
PCB (Solder Side)



PCB (RF Module, Component Side)

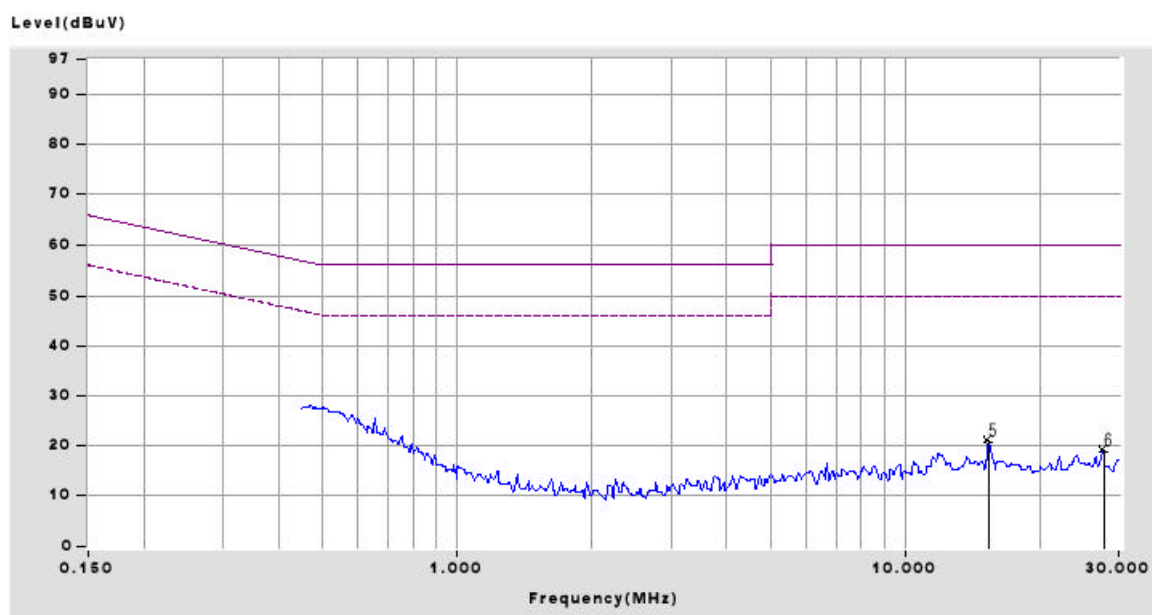
Appendix 1 – Power Line Conducted Test Data

A1.1 Mode 1: Charge



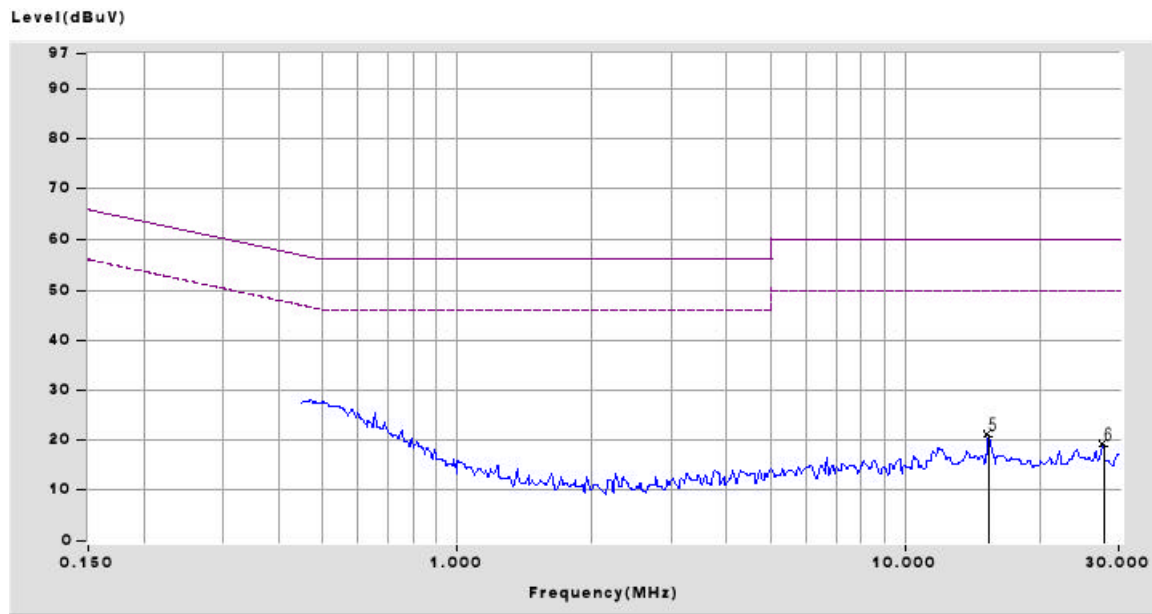
COMMENT: CHARGE MODE

Line



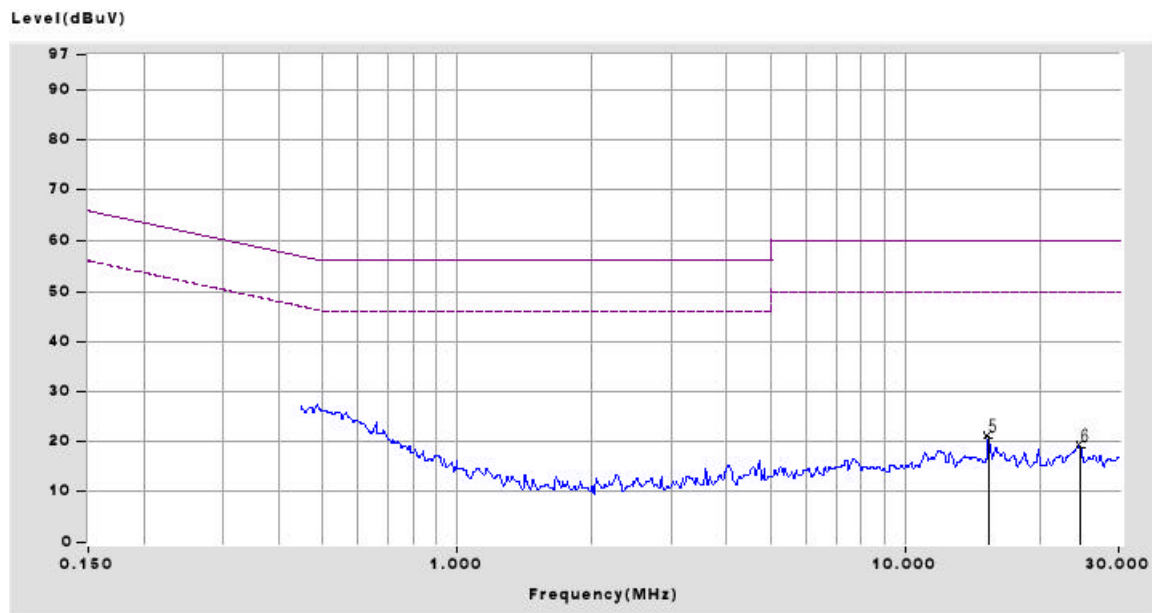
COMMENT: CHARGE MODE

Neutral

A1.2 Mode 2: CD play (Transmit)

COMMENT: CD PLAY MODE

Line



COMMENT: CD PLAY MODE

Neutral