



EMI TEST REPORT

Test Report No.: 25LE0249-HO-1b

Applicant : **CASIO COMPUTER (HONG KONG) LTD.**
Type of Equipment : **Wireless Calculator**
Model No. : **JZ-12W**
Test standard : **FCC Part 15 Subpart C : 2005**
Section 15.207 Conducted limits
Section 15.227 Operation within the band 26.96-27.28MHz
FCC ID : **BBQGY284B**
Test Result : **Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.

Date of test:

August 25 to September 9, 2005

Tested by:

Hiroka Umeyama
EMC Services

Approved by :

Naoki Sakamoto
Group Leader of
EMC Services

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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MF060b(01.06.05)

CONTENTS	PAGE
SECTION 1: Client information.....	3
SECTION 2: Equipment under test (E.U.T.)	3
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	7
SECTION 5: Radiated emission (Fundamental and Spurious Emission)	9
SECTION 6: -20dB Bandwidth	10
APPENDIX 1: Photographs of test setup.....	11
Radiated emission	11
Worst Case Position.....	12
APPENDIX 2: Test instruments	13
APPENDIX 3: Data of EMI test	14
Radiated emission(Fundamental emission and Spurious emission: below30MHz).....	14
Radiated emission (Spurious emission : above 30MHz).....	16
-20dB Bandwidth.....	17

SECTION 1: Client information

Company Name : CASIO COMPUTER (HONG KONG) LTD.
Brand or Trade name : CASIO
Address : 9/F., Tower I, Millennium City 1, 388 Kwun Tong Road, Kwun Tong,
Kowloon, Hong Kong
Telephone Number : +852-2318-7248
Facsimile Number : +852-2318-7448
Contact Person : Simon Wong

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Wireless Calculator
Model No. : JZ-12W
Serial No. : 13
Rating : DC3.0V
Country of Manufacture : China
Receipt Date of Sample : August 10, 2005
Condition of EUT : Engineering Prototype
(Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

Model No: JZ-12W is the Wireless Calculator, which transmits data to Personal computer with the Wireless Calculator Receiver.

The clock frequency of EUT is 200KHz (CPU).

Equipment Type : Transmitter
Frequency band : 27.140-27.150 MHz
Mode of operation : Simplex
Antenna Type : Wire Type
Method of Frequency Generation : Crystal
Operating voltage : DC 2.2 – 3.5V
Operating Temperature : 0 deg. C. to +40 deg. C.

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MF060b(01.06.05)

Test report No. : 25LE0249-HO-1b
Page : 4 of 17
Issued date : August 25, 2005
Revised date : August 30, 2005
Revised date : September 9, 2005
FCC ID : BBQGY284B

FCC 15.31 (e)

This EUT is a battery-operated equipment, and tests were performed using a new battery. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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MF060b(01.06.05)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart C: 2005
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.227 Operation within the band 26.96-27.28MHz

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	ANSI C63.4: 2003 7. AC powerline conducted emission measurements	Section 15.207	-	N/A	N/A	N/A*1)
2	Electric Field Strength of Fundamental Emission	ANSI C63.4: 2003 13. Measurement of intentional radiators	Section 15.227(a)	Radiated	N/A	28.5dB	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4: 2003 13. Measurement of intentional radiators	Section15.227(b) Section 15.209	Radiated	N/A	6.0dB (892.38MHz, Hor)	Complied
4	-20dB Bandwidth	ANSI C63.4: 2003 13. Measurement of intentional radiators	Section15.215(c)	Radiated	N/A	See data	Complied

Note: UL Apex's EMI Work Procedures No.QPM05.
*1) This test does not apply to the EUT, because it is a battery-operated device and is not connected to AC powerline.
Uncertainty:
*In case of the margin below the EMC Head Office's uncertainty.
The data listed in this report meets the limits unless the uncertainty is taken into consideration.
Spurious Emission (Radiated)
The measurement uncertainty (with a 95% confidence level) for this test using Loop antenna is $\pm 1.9\text{dB}(3\text{m}) / \pm 1.8\text{dB}(10\text{m})$.
The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.5\text{dB}(3\text{m}) / \pm 4.7\text{dB}(10\text{m})$.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 5.2\text{dB}(3\text{m}) / \pm 3.8\text{dB}(10\text{m})$.
The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is $\pm 6.6\text{dB}$.
The data listed in this test report has enough margin, more than the site margin.
Other test except Conducted Emission and Spurious Emission (Radiated)
The measurement uncertainty (with a 95% confidence level) for this test is $\pm 3.0\text{dB}$.
The data listed in this test report has enough margin, more than the site margin.

*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C: 2005 Section 15.227.

3.4 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	846015	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.4 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1 and No.2 semi-anechoic and No.3 shielded room.

3.5 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

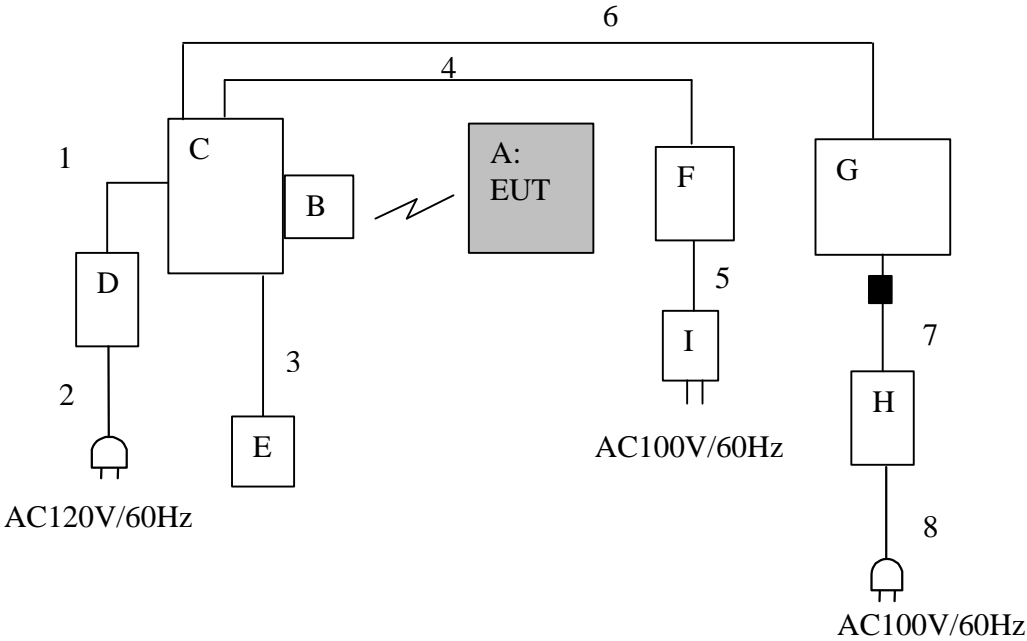
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The EUT was operated in a manner similar to typical use during the tests.

The mode used for testing : Transmitting mode

4.2 Configuration and peripherals



* Cabling was taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Calculator	JZ-12W	13	CASIO	EUT FCC ID: BBQGY284B
B	Wireless Calculator Receiver	JZ-12W	182	CASIO	-
C	Note PC	CF-L1EA	ODKSB09673	Panasonic	-
D	AC Adapter	CF-AA1639	000451726A	Panasonic	-
E	Mouse	M-S35	LZB05101615	Logitech	-
F	Modem	LFM-288BS	56110220366	Logitech	-
G	Printer	C6414A	CN0B11C1H2	Hewlett Packard	-
H	AC Adapter	C6409-66014	0049 R0D	Hewlett Packard	-
I	AC Adapter	AM-128100AT	-	AMIGO	-

List of cables used

No.	Name	Length (m)	Shield	Backshell Material
1	DC Power Cable	1.8	N	Polyvinyl chloride
2	AC Power Cable	1.8	N	Polyvinyl chloride
3	Mouse Cable	1.5	N	Polyvinyl chloride
4	RS232C Cable	1.5	Y	Polyvinyl chloride
5	DC Cable	1.8	N	Polyvinyl chloride
6	Printer Cable	1.5	Y	Polyvinyl chloride
7	DC Power Cable	2.0	N	Polyvinyl chloride
8	AC Power Cable	1.0	N	Polyvinyl chloride

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MF060b(01.06.05)

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

5.1 Operating environment

The test was carried out in a No.1 semi Anechoic Chamber

Temperature : 25deg. C.
Humidity : 60%

Test Procedure

The Radiated Electric Field Strength intensity has been measured on No.1 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for each antenna angle 0deg. , 45deg. and 90deg.

Frequency : From 30MHz to 1GHz at distance 3m

The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver.

[Fundamental emission]

	From 26.96kHz to 27.28kHz
Detector Type	PK/AV
IF Bandwidth	9kHz

[Spurious Emission]

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

- The carrier level and noise levels were confirmed at each position of X, Y and Z axis of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

9kHz – 490kHz [Limit at 3m]=[Limit at 300m]-40log (3[m]/300[m])

490kHz – 30MHz[Limit at 3m]=[Limit at 30m]-40log (3[m]/30[m])

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MF060b(01.06.05)

Test report No. : 25LE0249-HO-1b
Page : 10 of 17
Issued date : August 25, 2005
Revised date : August 30, 2005
Revised date : September 9, 2005
FCC ID : BBQGY284B

SECTION 6: -20dB Bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test data : APPENDIX 3
Test result : Pass

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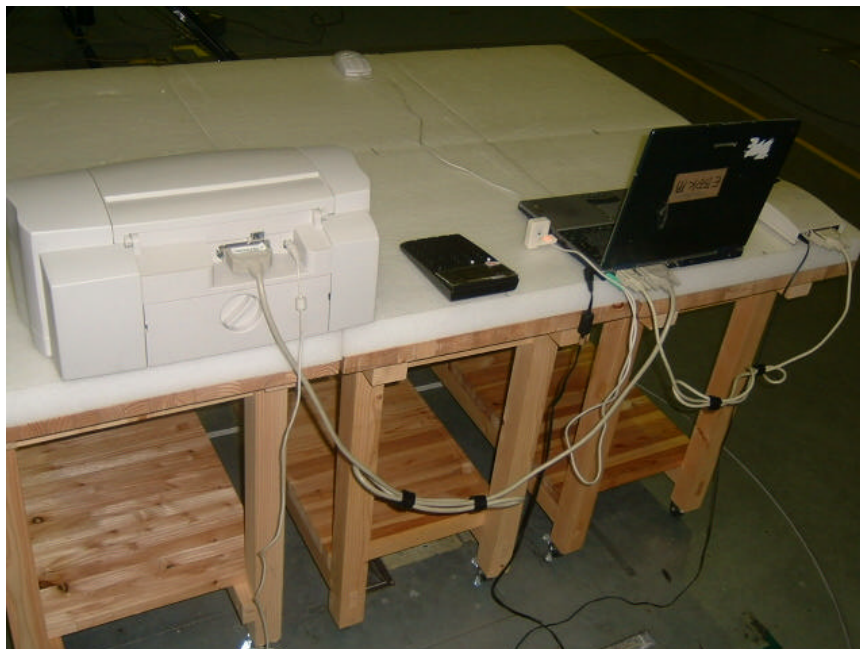
MF060b(01.06.05)

APPENDIX 1: Photographs of test setup

Radiated emission
Front



Rear



Worst Case Position

X-axis: above 30MHz



Y-axis: below 30MHz



Z-axis



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-01	Anechoic Chamber	TDK	Semi Anechoic Chamber 10m	RE	2004/11/13 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	RE	2004/11/12 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	RE	2004/10/14 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2004/10/14 * 12
MLPA-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	RE	2004/12/10 * 12
MAT-06	Attenuator(6dB)	Weinschel Corp	2	RE	2004/12/16 * 12
MCC-01	Coaxial Cable 0.1-3000MHz	Suhner/storm/Agilent/TSJ	-	RE	2004/12/19 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/Agilent/TSJ	-	RE	2004/12/24 * 12
MCC-31	coaxial cable	ULApex	-	RE	2005/06/02 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2005/05/24 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item :

RE: Radiated emission

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MF060b(01.06.05)

Test report No. : 25LE0249-HO-1b
 Page : 14 of 17
 Issued date : August 25, 2005
 Revised date : August 30, 2005
 Revised date : September 9, 2005
 FCC ID : BBQGY284B

APPENDIX 3: Data of EMI test

Radiated emission(Fundamental emission and Spurious emission: below30MHz)

DATA OF MAGNETIC RADIATED EMISSION TEST

UL Apex Co.,LTD. Head Office EMC Lab. No.1 Semi Anechoic Chamber

Applicant : CASIO COMPUTER (HONG KONG) LTD. Report No. : 25LE0249-HO
 Kind of EUT : Wireless Calculator Power : DC3.0V
 Model No. : JZ-12W Temp./ Humi. : 25deg.C / 60%
 Serial No. : 13 Operator : Hiroka Umeyama

Mode / Remarks: Transmitting 27.145MHz MAX Axis Search

LIMIT :

Freq.	Reading	DET	Ant.Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]		
27.14150	26.1	QP	19.9	7.7	28.0	25.7	----	----	0deg	359	X-Axis
27.14150	39.6	QP	19.9	7.7	28.0	39.2	----	----	45deg	200	X-Axis
27.14150	42.9	QP	19.9	7.7	28.0	42.5	----	----	90deg	170	X-Axis
27.14150	42.9	QP	19.9	7.7	28.0	42.5	----	----	0deg	325	Y-Axis
27.14150	57.4	QP	19.9	7.7	28.0	57.0	----	----	45deg	312	Y-Axis
27.14150	61.4	QP	19.9	7.7	28.0	61.0	----	----	90deg	202	Y-
27.14150	50.2	QP	19.9	7.7	28.0	49.8	----	----	0deg	332	Z-Axis
27.14150	56.0	QP	19.9	7.7	28.0	55.6	----	----	45deg	359	Z-Axis
27.14150	61.2	QP	19.9	7.7	28.0	60.8	----	----	90deg	120	Z-Axis

CHART : WITH FACTOR ANT TYPE : LOOP
 CALCULATION : READING + ANT FACTOR + LOSS(CABLE + ATTEN.-AMP.)

Page :

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MF060b(01.06.05)

Test report No. : 25LE0249-HO-1b
 Page : 15 of 17
 Issued date : August 25, 2005
 Revised date : August 30, 2005
 Revised date : September 9, 2005
 FCC ID : BBQGY284B

Radiated emission (Fundamental emission and Spurious emission: below 30MHz)

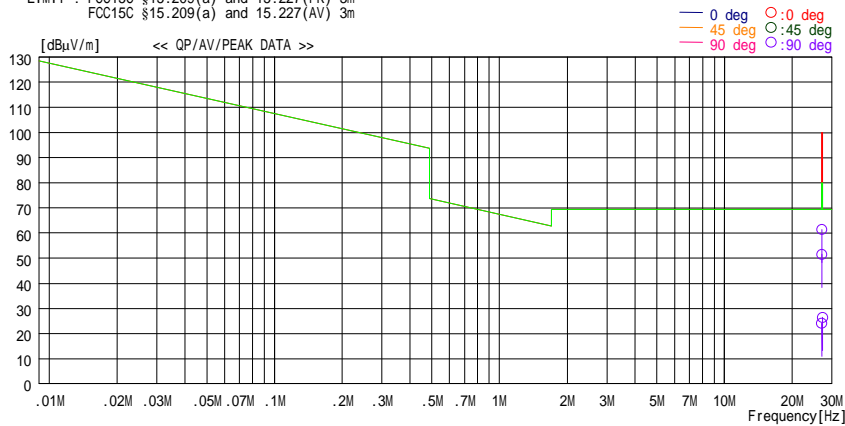
DATA OF MAGNETIC RADIATED EMISSION TEST

UL Apex Co.,LTD. Head Office EMC Lab. No.1 Semi Anechoic Chamber

Applicant : CASIO COMPUTER (HONG KONG) LTD. Report No. : 25LE0249-HO
 Kind of EUT : Wireless Calculator Power : DC3.0V
 Model No. : JZ-12W Temp./ Humi. : 25deg.C / 60%
 Serial No. : 13 Operator : Hiroka Umeyama

Mode / Remarks : Transmitting 27.145MHz MAX-Axis

LIMIT : FCC15C §15.209(a) and 15.227(PK) 3m
 FCC15C §15.209(a) and 15.227(AV) 3m



Freq.	Reading	DET	Ant.Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]		[deg]	
27.14150	61.8	PEAK	19.9	7.7	28.0	61.4	100.0	38.6	90deg	202	Y-Axis
27.14150	51.9	AV	19.9	7.7	28.0	51.5	80.0	28.5	90deg	202	Y-Axis
26.96000	24.5	QP	19.9	7.7	28.0	24.1	69.4	45.3	90deg	202	Y-Axis
27.28000	26.8	QP	19.9	7.7	28.0	26.4	69.4	43.0	90deg	202	Y-Axis

CHART : WITH FACTOR ANT TYPE : LOOP. All other spurious emissions were less than 20dB for the limit.
 CALCULATION : READING + ANT FACTOR + LOSS(CABLE + ATTEN.-AMP.) Page:

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MF060b(01.06.05)

Test report No. : 25LE0249-HO-1b
 Page : 16 of 17
 Issued date : August 25, 2005
 Revised date : August 30, 2005
 Revised date : September 9, 2005
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Radiated emission (Spurious emission : above 30MHz)

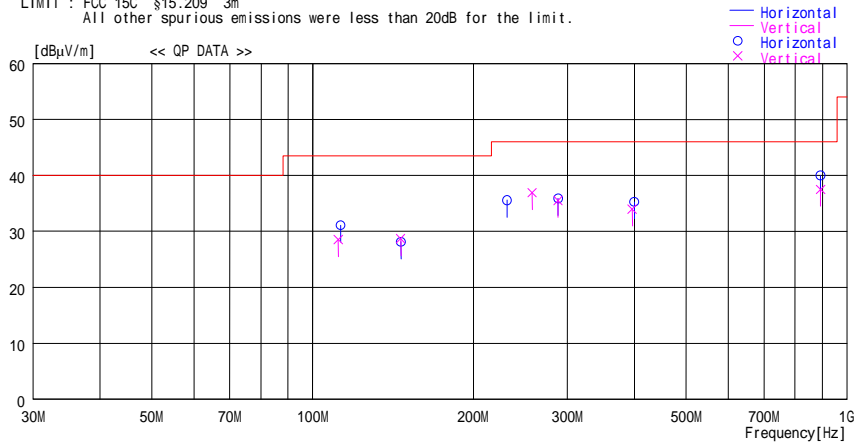
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2005/08/12 11:21:33

Applicant : CASIO COMPUTER(HONG KONG) LTD. Report No. : 25LE0249-HO
 Kind of EUT : Wireless Calculator Power : DC3.0V
 Model No. : JZ-12W Temp /Humi% : 25deg.C / 60%
 Serial No. : 13 Operator : Hiroka Umeyama

Mode / Remarks : Transmitting 27.145MHz MAX-Axis

LIMIT : FCC 15C §15.209 3m
 All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna		Level	Angle	Height	Polar.	Limit	Margin
			Factor	Loss& Gain						
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]
111.670	36.1	QP	11.9	-19.5	28.5	359	100	Vert.	43.5	15.0
112.750	38.5	QP	12.0	-19.4	31.1	6	300	Hori.	43.5	12.4
146.220	32.3	QP	14.8	-19.0	28.1	140	240	Hori.	43.5	15.4
146.220	32.9	QP	14.8	-19.0	28.7	359	100	Vert.	43.5	14.8
231.060	36.0	QP	17.3	-17.7	35.6	8	230	Hori.	46.0	10.4
257.725	36.4	QP	17.9	-17.4	36.9	359	100	Vert.	46.0	9.1
288.000	33.3	QP	19.8	-17.2	35.9	7	285	Hori.	46.0	10.1
288.000	32.9	QP	19.8	-17.2	35.5	359	100	Vert.	46.0	10.5
396.500	33.2	QP	17.9	-17.1	34.0	179	100	Vert.	46.0	12.0
400.210	34.4	QP	18.0	-17.1	35.3	0	100	Hori.	46.0	10.7
892.380	33.9	QP	21.4	-15.3	40.0	172	156	Hori.	46.0	6.0
892.380	31.4	QP	21.4	-15.3	37.5	250	100	Vert.	46.0	8.5

CHART: WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
 CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

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-20dB Bandwidth

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COMPANY : CASIO COMPUTER (HONG KONG) LTD.	REPORT NO. : 25LE0249-HO
EQUIPMENT : Wireless Calculator	REGULATION : FCC 15C
MODEL : JZ-12W	TEST DISTANCE : 3m
S/N : 13	DATE : 09/09/2005
POWER : DC3.0V	TEMPERATURE : 25 deg.C.
MODE : Transmitting	HUMIDITY : 60 %
	ENGINEER : Hiroka Umeyama

FREQ [MHz]	-20dB Bandwidth [kHz]
27.145	12.31

