TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Casio Computer Co. Ltd.
IT-3000M54E Handheld Printer Terminal

To: FCC Part 15.247

Test Report Serial No:
RFI/MPTB1/RP45177JD07A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By: Tony Henriques** 
Tested By: Adam Miller 	**Release Version No: PDF01**
Issue Date: 21 April 2004	**Test Dates: 18 March 2004 to 23 March 2004**

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Test Of: Casio Computer Co. Ltd.
IT-3000M54E Handheld Printer Terminal
To: FCC Part 15.247

Table of Contents

1. Customer Information

Company Name:	Casio Computer Co. Ltd
Address:	229 Sakuragaoka 2-chome Higashiyamato-shi Tokyo 207-8501 JAPAN
Contact Name:	Mr Shuji Yamashita

2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the customer:

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Casio
Model Name or Number:	IT-3000M54E
Serial Number:	None Stated
FCC ID Number:	BBQIT3000
Country of Manufacture:	Japan
Date of Receipt:	17 March 2004

2.2. Description Of EUT

The equipment under test is a Bluetooth enabled handheld printer terminal.

2.3. Modifications Incorporated In EUT

During the course of testing the EUT was not modified.

2.4. Additional Information Related To Testing

Power Supply Requirement:	Internal 7.4 V (nominal) DT-9723LI lithium ion battery		
Intended Operating Environment:	Residential, commercial & light industrial		
Equipment Category:	Portable		
Type of Unit:	Transceiver		
Interface Ports:	RS-232C; SD Memory Card Slot; Charging Jack		
Transmit Frequency Range	2402 MHz to 2480 MHz		
Transmit Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Receive Frequency Range	2402 MHz to 2480 MHz		
Receive Channels Tested	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Occupied Bandwidth	1 MHz		
Highest Unintentionally Generated Frequency	2480 MHz		
Maximum Power Output (EIRP)	0.3 dBm		

2.5. Accessories

Description:	Barcode Reader
Brand Name:	Casio
Model Name or Number:	DT-9656CR
Serial Number:	None Stated
Country of Manufacture:	Japan

Description:	Magnetic Card Reader
Brand Name:	Casio
Model Name or Number:	None Stated
Serial Number:	None Stated
Country of Manufacture:	Japan

2.6. Support Equipment

No support equipment was used to exercise the EUT during testing.

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 15 Subpart C: 2003 (Section 15.247)
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

3.2. Methods And Procedures

The methods and procedures used were as detailed in:

ANSI C63.2 (1987)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2001)
Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)
Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)
Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)
Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

DA00-705 (2000)
Title: Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

3.3. Definition Of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations From The Test Specification

None.

5. Operation Of The EUT During Testing

5.1. Operating Conditions

The EUT was tested in a normal laboratory environment.

During testing, the EUT was powered by an internal 7.4 V (nominal) DT-9723LI Lithium ion battery.

5.2. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated.

Preliminary radiated spurious pre-scan tests were performed in both transmit (Bluetooth active) and idle modes on the highest operating frequency of the EUT (top channel) with the accessories stated in section 2.5 of this report connected and disconnected. The combinations that exhibited the worst case mode of operation were then used to perform final measurements. Final measurements were then performed on the top, middle and bottom channels and hopping on all channels if an emission was identified.

For all other transmit mode measurements the Bluetooth mode was active and set to transmit on the top, middle and bottom channels and hopping on all channels as necessary.

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

Configured with barcode reader and magnetic card reader attached.

6. Summary Of Test Results

Range Of Measurements	Specification Reference	Port Type	Compliancy Status
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2003 Section 15.109	Antenna	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 15: 2003 Section 15.247(a)(1)(iii)	Antenna	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: 2003 Section 15.247(a)(1)	Antenna	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: 2003 Section 15.247(a)(1)(iii)	Antenna	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2003 Section 15.247(b)(1)	Antenna	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2003 Sections 15.247(c) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2003 Sections 15.247(c) & 15.209(a)	Antenna	Complied

6.1. Location Of Tests

All the measurements described in this report were performed at the premises of Radio Frequency Investigation Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

7. Measurements, Examinations And Derived Results

7.1. General Comments

7.1.1. This section contains test results only.

7.1.2. Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 9 for details of measurement uncertainties.

7.2. Idle Mode Radiated Emissions: Section 15.109

7.2.1. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

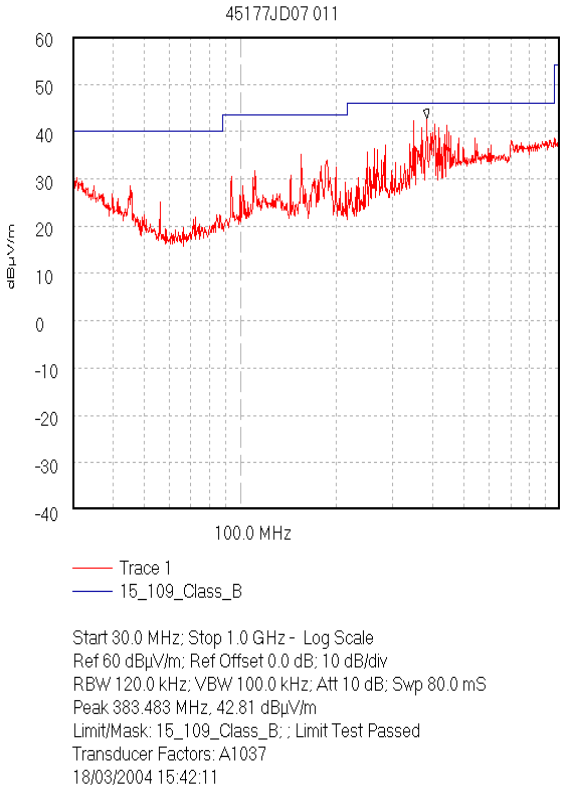
7.2.1.1. The EUT was configured as for radiated emissions testing as described in Section 8 of this report.

7.2.1.2. Tests were performed to identify the maximum idle mode radiated emissions levels.

Frequency (MHz)	Antenna. Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
145.182	Vert.	23.2	43.5	20.3	Complied
155.748	Vert.	30.0	43.5	13.5	Complied
187.464	Horiz.	23.4	43.5	20.1	Complied
199.386	Vert.	25.6	43.5	17.9	Complied
249.215	Vert.	29.8	46.0	16.2	Complied
283.944	Vert.	24.2	46.0	21.8	Complied
348.911	Vert.	39.4	46.0	6.6	Complied
382.757	Vert.	40.0	46.0	6.0	Complied
404.971	Vert.	37.1	46.0	8.9	Complied
442.368	Vert.	37.6	46.0	8.4	Complied

Test Of: Casio Computer Co. Ltd.
IT-3000M54E Handheld Printer Terminal
To: FCC Part 15.247

Idle Mode Radiated Emissions: Section 15.109 (Continued)



Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Idle Mode Radiated Emissions: Section 15.109 (Continued)

7.2.2. Electric Field Strength Measurements (Frequency Range 1.0 to 12.5 GHz)

7.2.2.1. The EUT was configured as for radiated emissions testing as described in Section 8 of this report.

7.2.2.2. Tests were performed to identify the maximum idle mode radiated emissions levels.

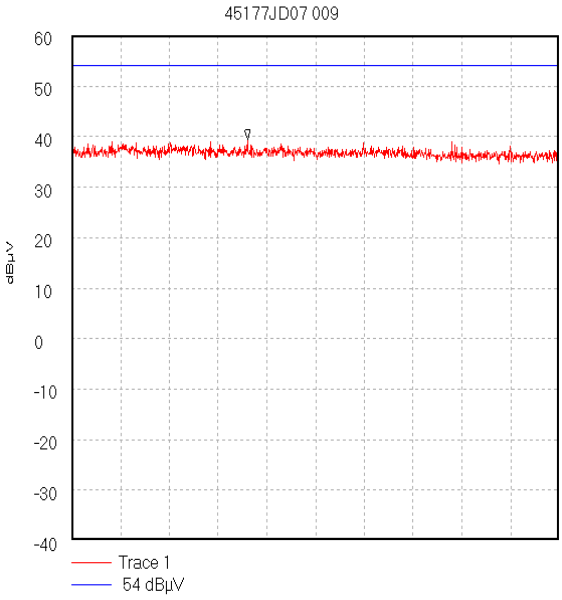
Results: Highest Peak Level:

Frequency (GHz)	Antenna. Polarity	Peak Detector Level (dBµV)	Antenna Factor	Cable Loss	Actual Peak Level (dBµV/m)	**Average Limit (dBµV/m)	Margin (dB)	Result
4.633*	Vert	17.6	24.2	1.7	43.5	54.0	10.5	Complied
5.677*	Vert	15.6	24.4	1.9	41.9	54.0	12.1	Complied

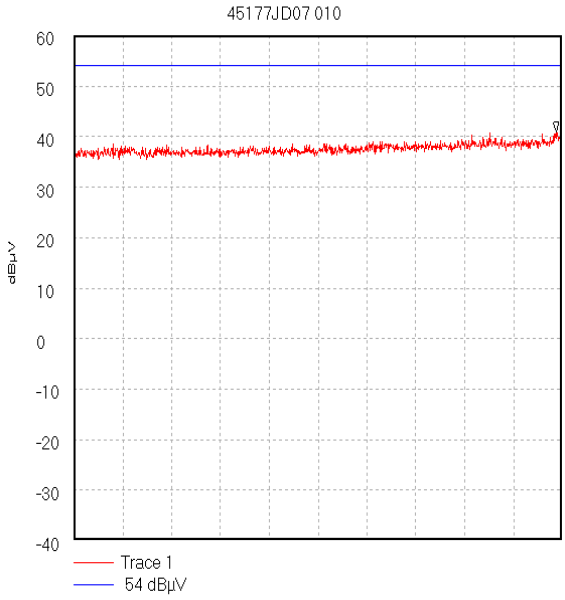
**Note: No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor readings of the measuring receiver were recorded as shown in the table above.*
***Note: The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.*

Test Of: **Casio Computer Co. Ltd.**
IT-3000M54E Handheld Printer Terminal
To: **FCC Part 15.247**

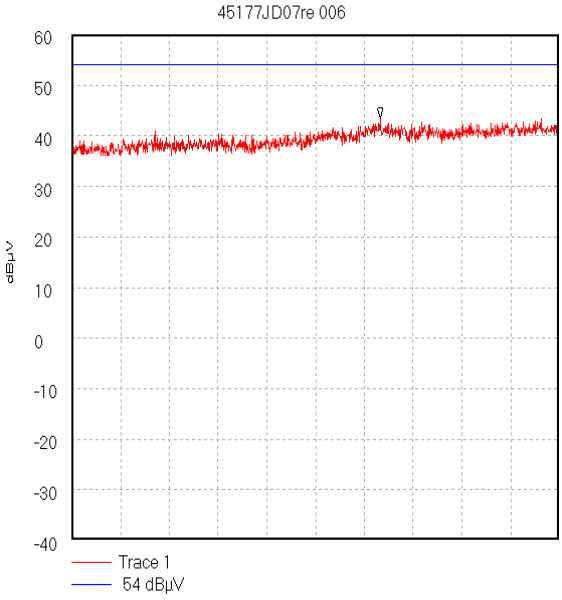
Idle Mode Radiated Emissions: Section 15.109 (Continued)



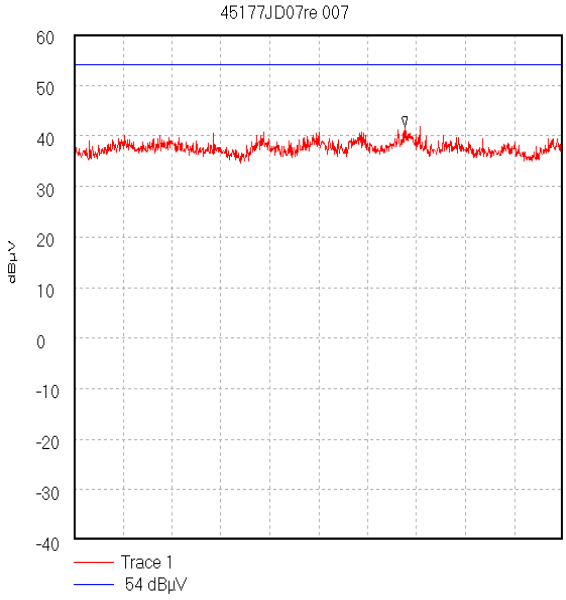
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.361 GHz, 39.39 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
18/03/2004 15:30:57



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.976 GHz, 41.01 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
18/03/2004 15:32:37



Start 4.0 GHz; Stop 5.0 GHz
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.633 GHz, 43.5 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
19/03/2004 15:08:09

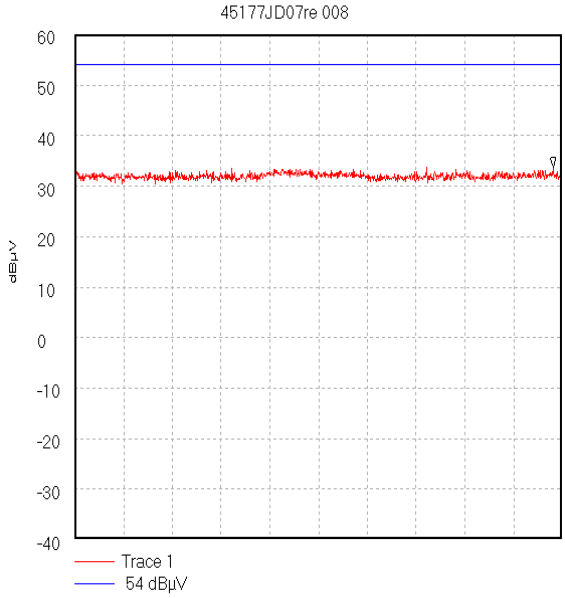


Start 5.0 GHz; Stop 6.0 GHz
Ref 60 dBµV; Ref Offset 2.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.677 GHz, 41.87 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
19/03/2004 15:08:48

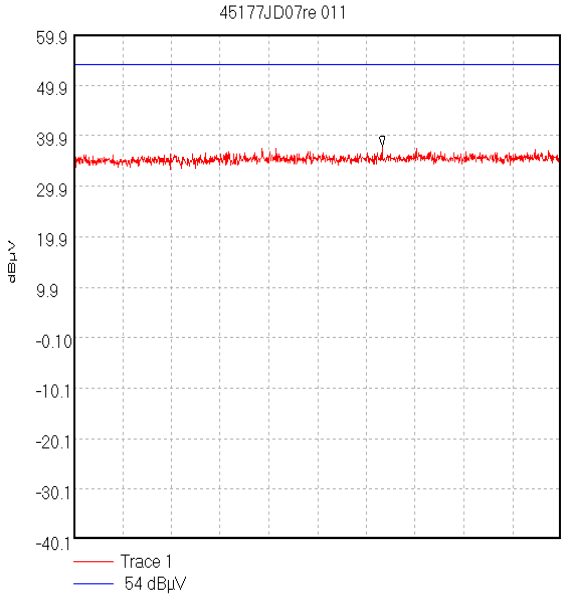
Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Of: **Casio Computer Co. Ltd.**
IT-3000M54E Handheld Printer Terminal
To: **FCC Part 15.247**

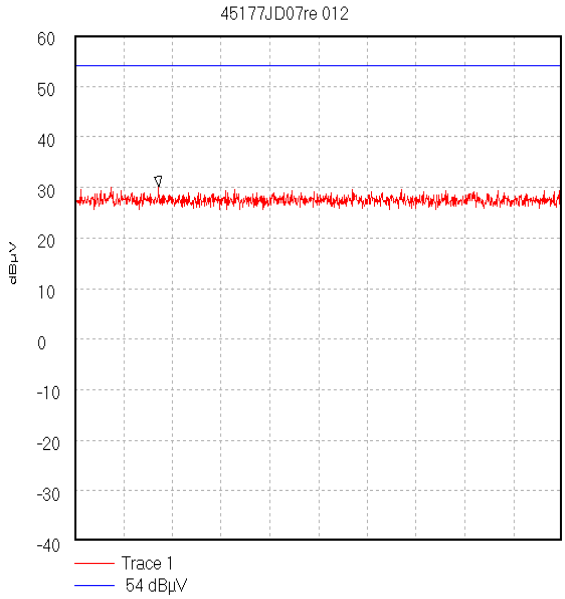
Idle Mode Radiated Emissions: Section 15.109 (Continued)



Start 6.0 GHz; Stop 8.0 GHz
Ref 60 dBµV; Ref Offset 2.3 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 7.964 GHz, 33.8 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
19/03/2004 15:44:08



Start 8.0 GHz; Stop 12.0 GHz
Ref 59.9 dBµV; Ref Offset 2.2 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 10.533 GHz, 37.76 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
19/03/2004 16:07:42



Start 12.0 GHz; Stop 12.5 GHz
Ref 60 dBµV; Ref Offset 2.2 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 12.086 GHz, 30.12 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
19/03/2004 16:14:33

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

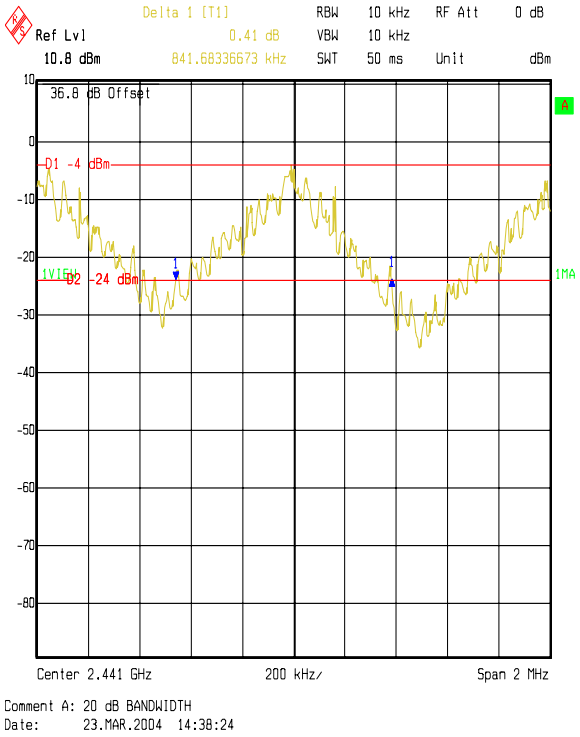
7.3.Transmitter 20 dB Bandwidth: Section 15.247(a)(1)(iii)

7.3.1. The EUT was configured as for carrier frequency separation/20 dB bandwidth measurements as described in Section 8 of this report.

7.3.2. Tests were performed to identify the 20 dB bandwidth.

Results:

Transmitter 20dB Bandwidth (kHz)	Limit (kHz)
841.683	None Specified



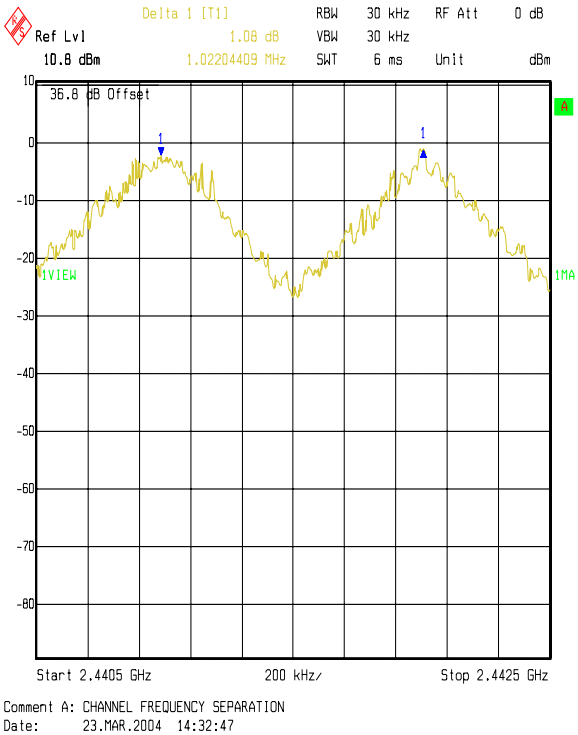
7.4. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

7.4.1. The EUT was configured as for carrier frequency separation measurements as described in Section 8 of this report.

7.4.2. Tests were performed to identify the carrier frequency separation.

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit (> 20 dB BW) (kHz)	Margin (kHz)	Result
1022.044	841.683	180.361	Complied



7.5. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii)

7.5.1. The EUT was configured as for average time of occupancy measurements as described in Section 8 of this report.

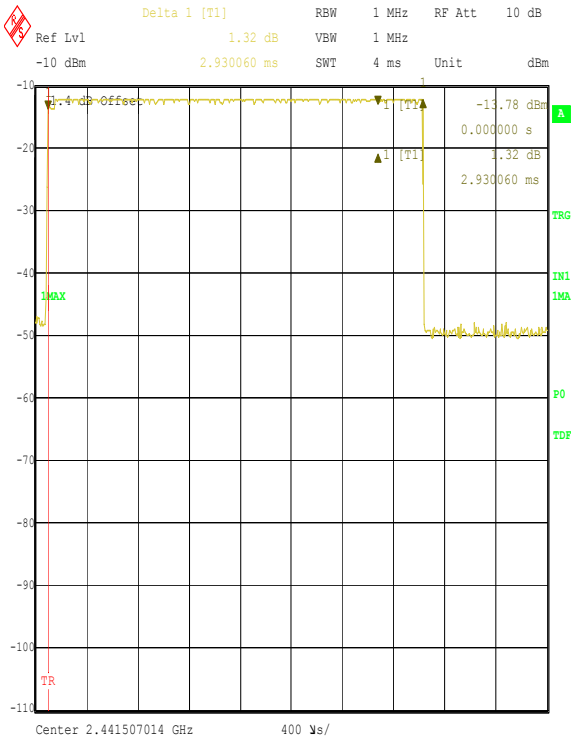
7.5.2. Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

Results:

Emission Width (ms)	Number of Hops in 31.6 seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2.93006	108	0.31644	0.4	0.08356	Complied

Test Of: **Casio Computer Co. Ltd.**
IT-3000M54E Handheld Printer Terminal
To: **FCC Part 15.247**

Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii) (Continued)



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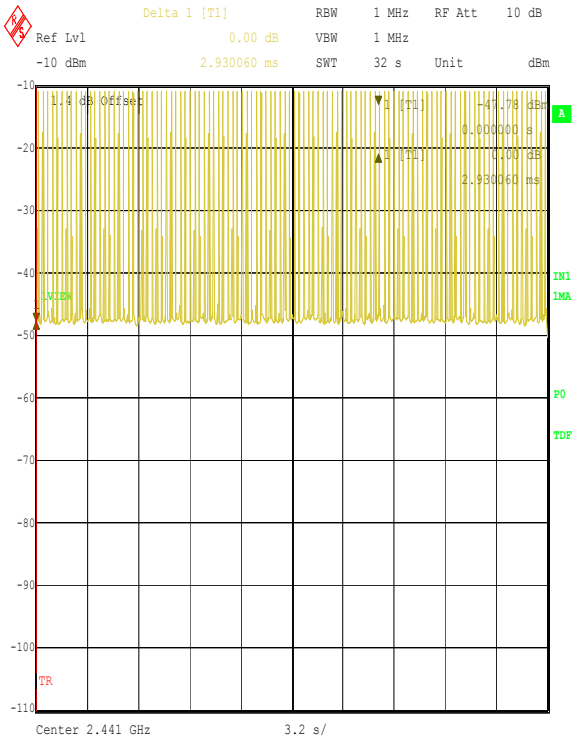

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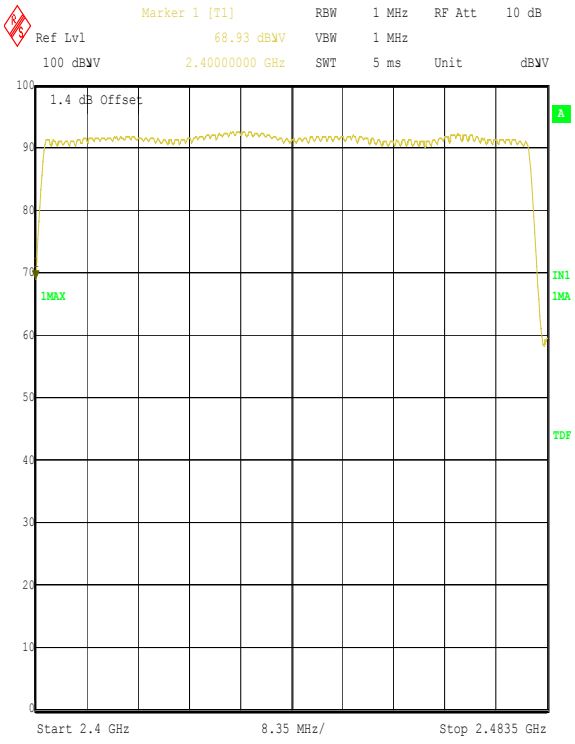


Date: 24.MAR.2004 13:05:57

7.6. Transmitter Maximum Peak Output Power: Section 15.247(b)(1)

7.6.1. The EUT was configured as for Transmitter Effective Isotropic Radiated Power measurements as described in Section 8 of this report.

7.6.1. Tests were performed to identify the transmitter maximum EIRP of the EUT.

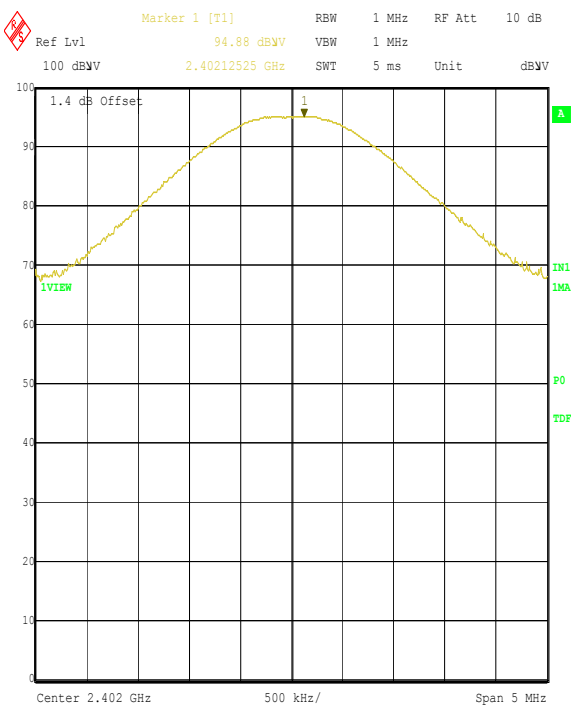
Results:

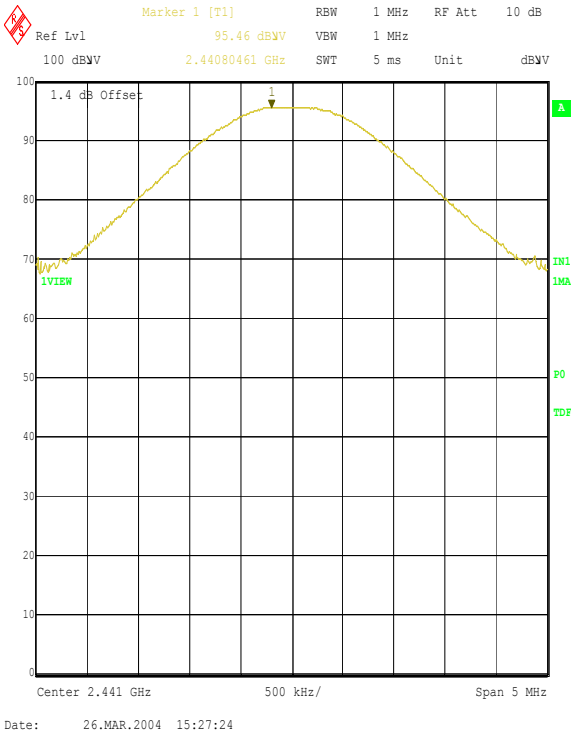
Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-0.3	30.0	30.3	Complied
Middle	0.3	30.0	29.7	Complied
Top	-0.8	30.0	30.8	Complied

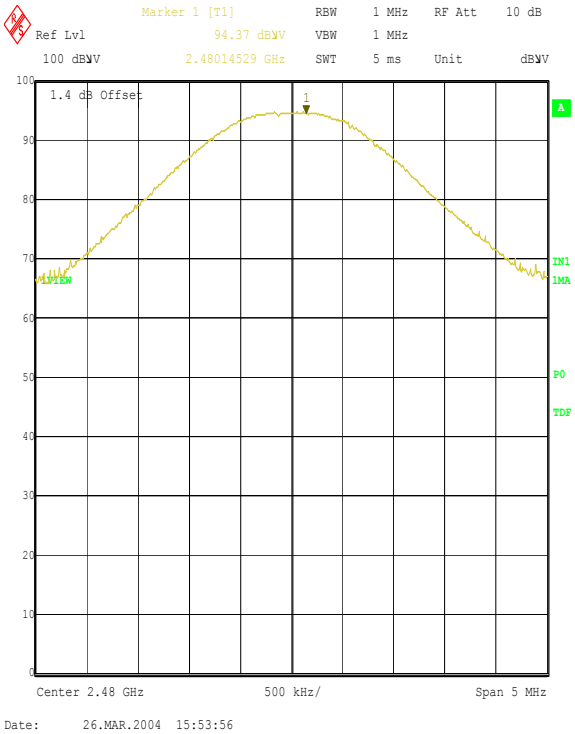
Note: These tests were performed radiated therefore the EUT antenna gain is encompassed in the final result and not measurable.

Test Of: **Casio Computer Co. Ltd.**
IT-3000M54E Handheld Printer Terminal
To: **FCC Part 15.247**

Transmitter Maximum Peak Output Power: Section 15.247(b)(1) (Continued)







Note: To convert from fieldstrength to an equivalent peak EIRP in dBm, subtract 95.2 dB.
e.g. 94.9 –95.2 = -0.3 dBm. The figure of 95.2 dB is arrived at using the formula P = (V/m x d)^2 /30.

7.7. Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a)

7.7.1. Electric Field Strength Measurements: 30 to 1000 MHz.

7.7.1.1. The EUT was configured as for radiated field strength measurements as described in Section 8 of this report.

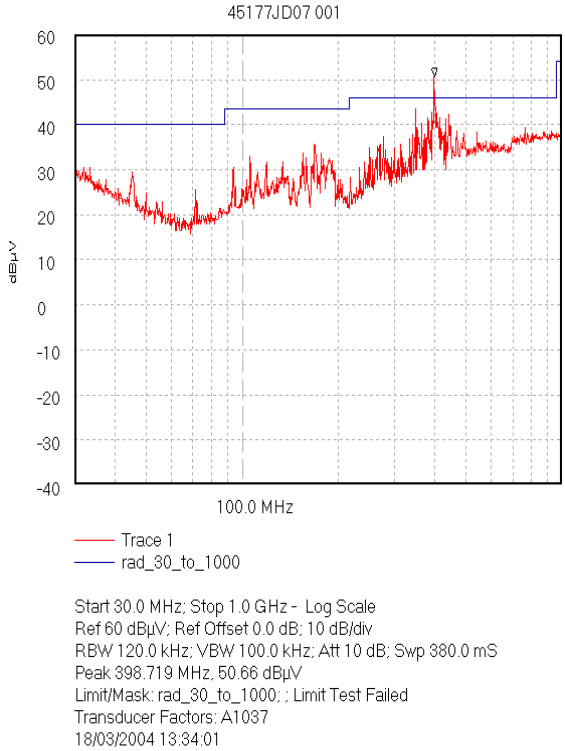
7.7.1.2. Tests were performed to identify the maximum out of band transmitter radiated spurious emission level present in the band 30 MHz to 10 x the highest fundamental frequency.

Results: Top Channel

Frequency (MHz)	Antenna. Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
187.464	Horiz.	23.4	43.5	20.1	Complied
348.916	Vert.	37.2	46.0	8.8	Complied
380.075	Vert.	36.0	46.0	10.0	Complied
398.751	Vert.	38.8	46.0	7.2	Complied
448.609	Vert.	38.1	46.0	7.9	Complied

Note: The preliminary scans showed similar emission levels for each mode below 1 GHz, therefore final radiated emissions measurements were performed with the EUT set to the top channel only.

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)



Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)

7.7.2. Electric Field Strength Measurements: 1.0 to 25.0 GHz) (Emissions Occurring In The Restricted Bands)

Results: Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
4.803709	Vert.	28.6	24.2	1.8	54.6	74.0	19.4	Complied

Results: Highest Average Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
4.803709	Vert.	25.0	24.2	1.8	51.0	54.0	3.0	Complied

Results: Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
4.881653	Vert.	29.5	24.2	1.8	55.5	74.0	18.5	Complied

Results: Highest Average Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
4.881653	Vert.	25.9	24.2	1.8	51.9	54.0	2.1	Complied

Test Of: Casio Computer Co. Ltd.
IT-3000M54E Handheld Printer Terminal
To: FCC Part 15.247

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)

Results: Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
4.960070	Vert.	25.0	24.2	1.8	51.0	74.0	23.0	Complied

Results: Highest Average Level: Top Channel

Frequency (GHz)	Antenna Polarity	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
4.960070	Vert.	20.7	24.2	1.8	46.7	54.0	7.3	Complied

Results: Highest Peak Level: Hopping Channel

Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
4.880200	Vert.	29.4	24.2	1.8	55.4	74.0	18.6	Complied

Results: Highest Average Level: Hopping Channel

Frequency (GHz)	Antenna Polarity	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
4.880200	Vert.	12.8	24.2	1.8	38.8	54.0	15.2	Complied

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)

7.7.3. Electric Field Strength Measurements: 1.0 to 25.0 GHz (Emissions Outside The Restricted Bands)

Results: Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
9.607368	Vert.	3.9	30.4	2.5	36.8	74.9	38.1	Complied

Results: Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
9.764036	Vert.	7.1	30.5	2.6	40.2	75.5	35.3	Complied

Results: Highest Peak Level: Top Channel

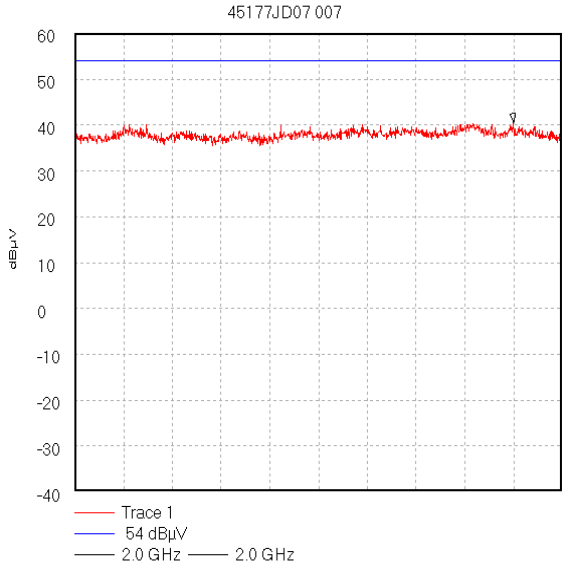
Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
9.920591	Vert.	7.4	30.5	2.6	40.5	74.4	33.9	Complied

Results: Highest Peak Level: Hopping Mode

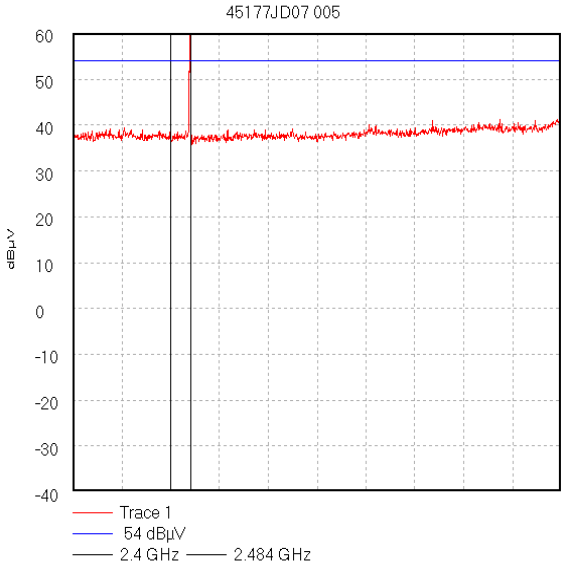
Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
9.908522	Vert.	6.3	30.5	2.6	39.4	75.5	36.1	Complied

Test Of: **Casio Computer Co. Ltd.**
IT-3000M54E Handheld Printer Terminal
To: **FCC Part 15.247**

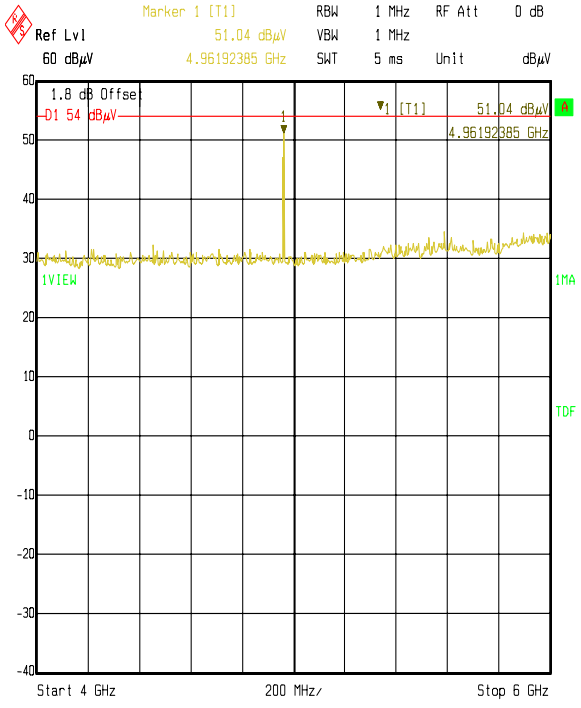
Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)



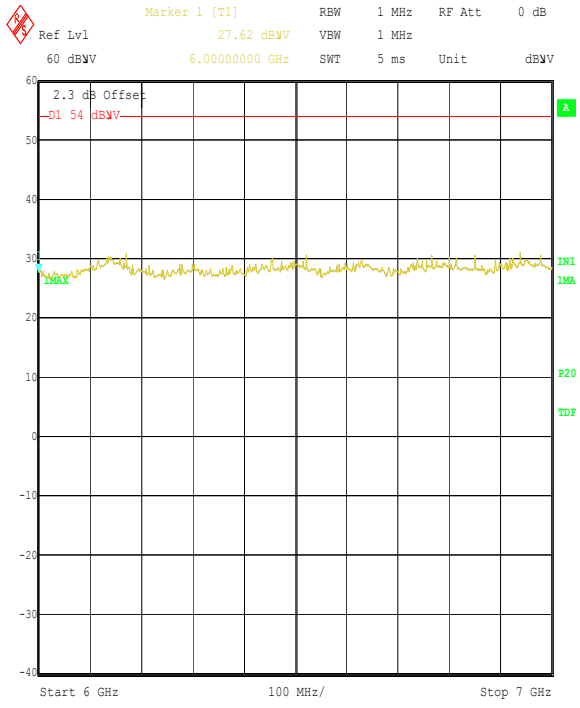
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.9 GHz, 40.58 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
18/03/2004 14:06:01



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 2.478 GHz, 63.98 dBµV
Display Line: 54 dBµV; ; Limit Test Failed
18/03/2004 14:02:23



Date: 24.MAR.2004 11:10:21



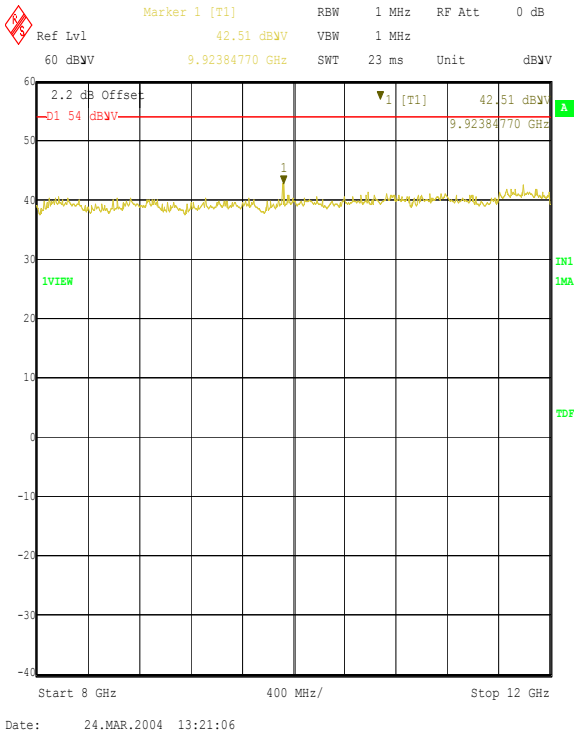
Date: 23.MAR.2004 11:27:31

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

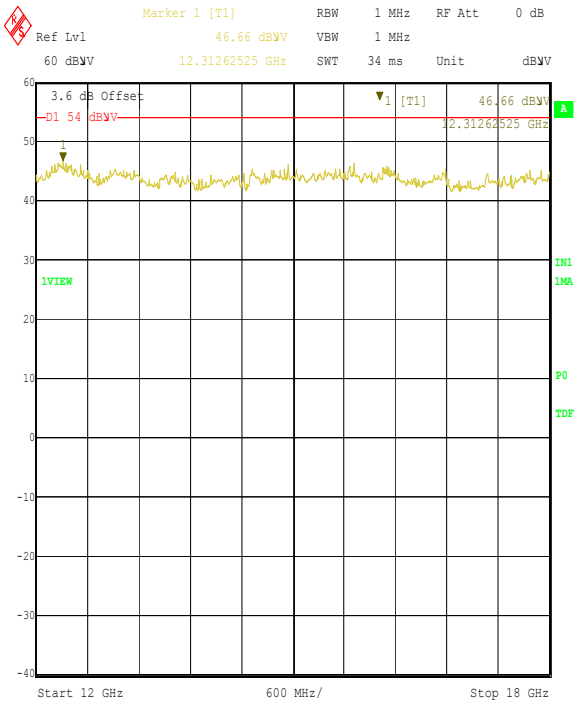
Test Of: **Casio Computer Co. Ltd.**
IT-3000M54E Handheld Printer Terminal
To: **FCC Part 15.247**

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)

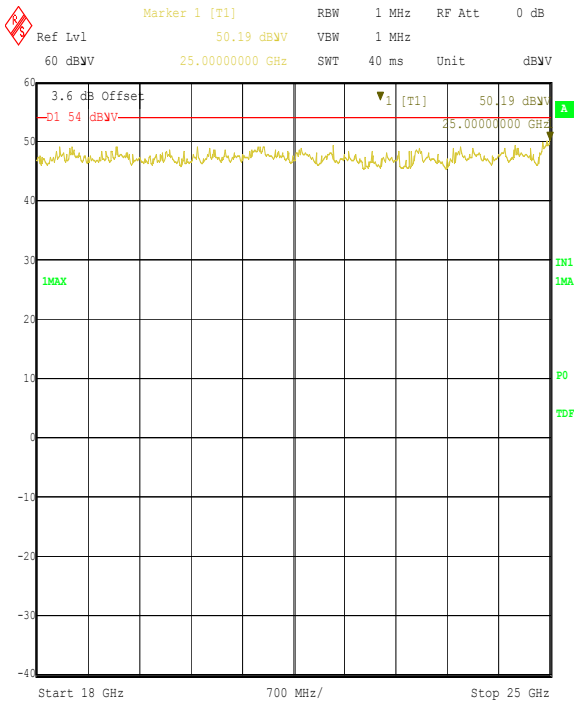
Date: 23.MAR.2004 11:31:09



Date: 24.MAR.2004 13:21:06



Date: 23.MAR.2004 13:18:13



Date: 23.MAR.2004 13:40:49

Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

7.8. Transmitter Band Edge Radiated Emissions: Section 15.247(c) & 15.209(a)

7.8.1. Electric Field Strength Measurements

7.8.1.1. The EUT was configured as for band edge compliance of radiated emissions measurements as described in Section 8 of this report.

7.8.1.2. Tests were performed to identify the maximum radiated band edge emissions.

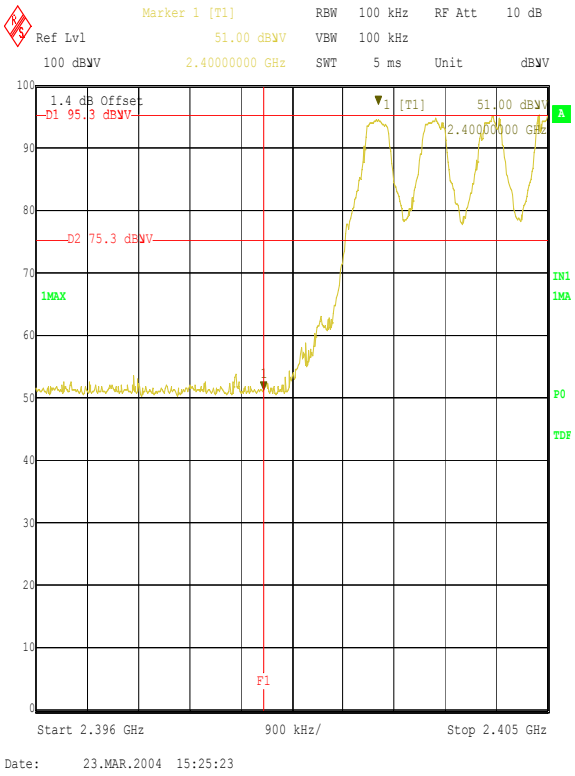
Results: Peak Power Level Hopping Mode:

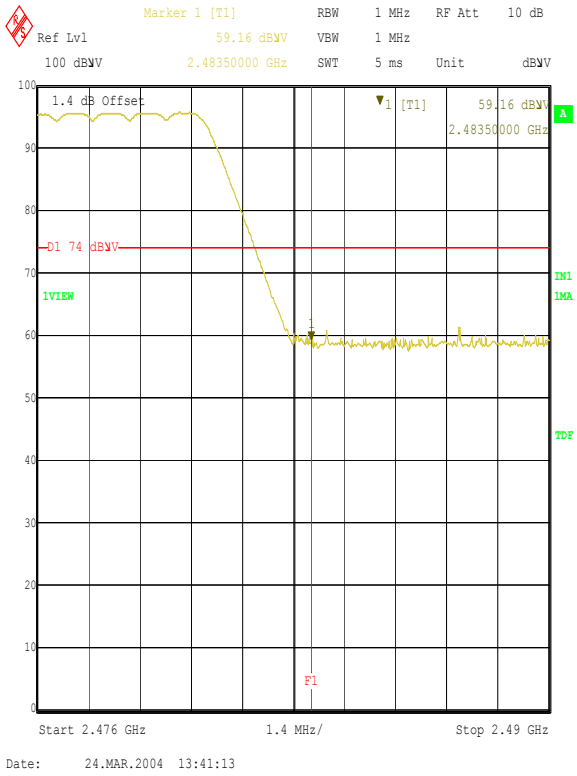
Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.4000	Vert	28.4	21.2	1.4	51.0	74.9	23.9	Complied
2.4835	Vert	36.4	21.4	1.4	59.2	74.0	14.8	Complied

Results: Average Power Level Hopping Mode:

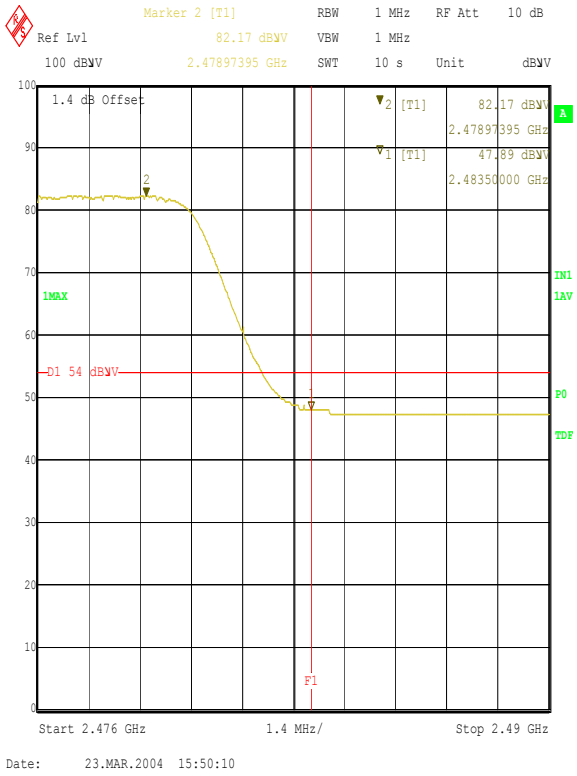
Frequency (GHz)	Antenna Polarity	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.4835	Vert	25.3	21.2	1.4	47.9	54.0	6.1	Complied

Transmitter Band Edge Radiated Emissions: Section 15.247(c) & 15.209(a) (Continued)





Note: The above plot incorrectly shows the –20 dBc limit line as 75.3 dBµV, it should have been 74.9 dBµV. It is confirmed that the positioning of the limit line has no bearing on the measurement and the level recorded at the band edge is correct.



Transmitter Band Edge Radiated Emissions: Section 15.247(c) & 15.209(a) (Continued)

Results: Peak Power Level Static Mode:

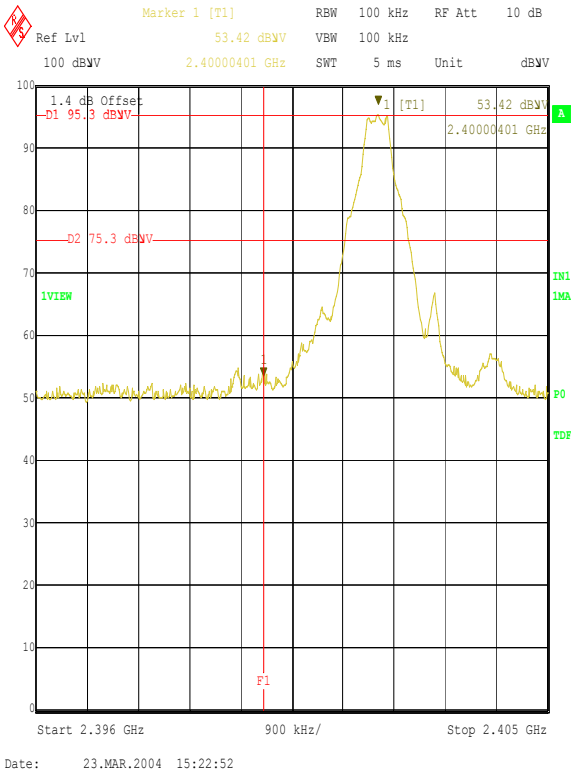
Frequency (GHz)	Antenna Polarity	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.4000	Vert	30.8	21.2	1.4	53.4	74.9	21.5	Complied
2.4835	Vert	36.2	21.4	1.4	59.0	74.0	15.0	Complied

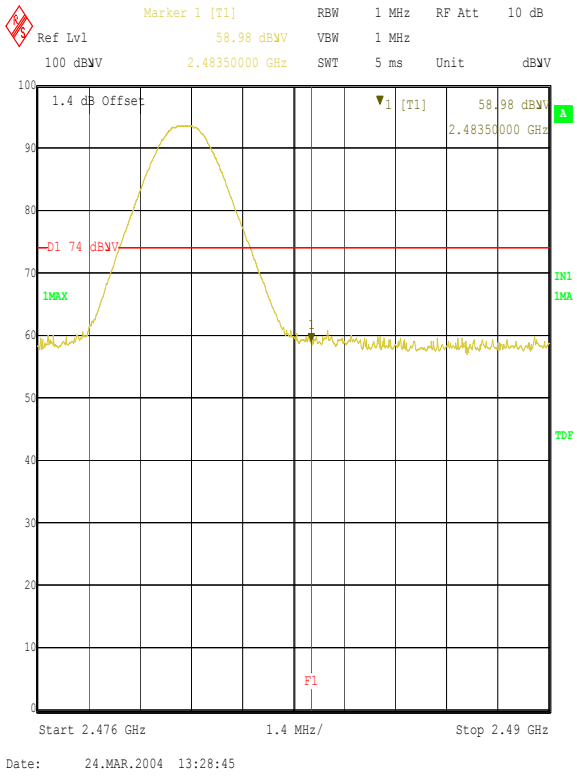
Results: Average Power Level Static Mode:

Frequency (GHz)	Antenna Polarity	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.4835	Vert	25.7	21.4	1.4	48.5	54.0	5.5	Complied

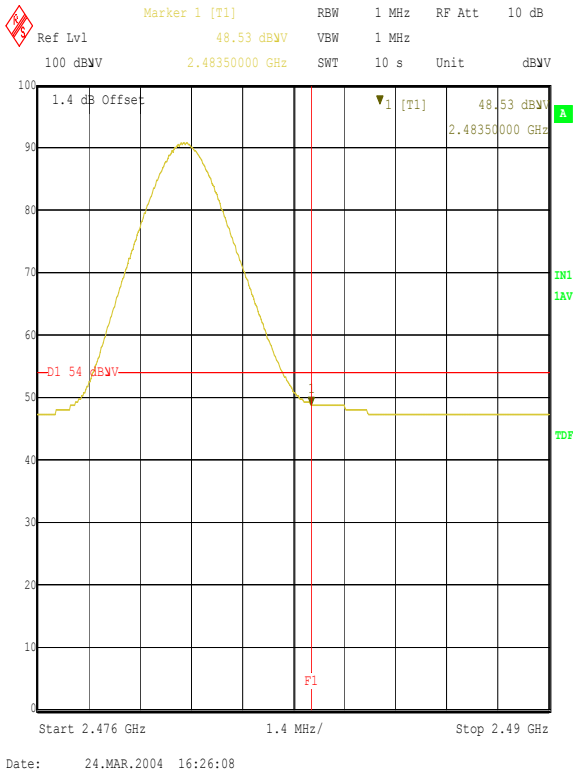
Test Of: **Casio Computer Co. Ltd.**
IT-3000M54E Handheld Printer Terminal
To: **FCC Part 15.247**

Transmitter Band Edge Radiated Emissions: Section 15.247(c) & 15.209(a) (Continued)





Note: The above plot incorrectly shows the –20 dBc limit line as 75.3 dBµV, it should have been 74.9 dBµV. It is confirmed that the positioning of the limit line has no bearing on the measurement and the level recorded at the band edge is correct.



8. Measurement Methods

8.1. Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. Any emission within 20 dB of the limit were then measured on the open area test site, except in cases where the noise floor was within 20 dB of the limit, in these cases the highest point of the noise floor was measured.

Where an emission fell inside a restricted band, measurements were made at the appropriate test distance using a measuring receiver with a Quasi-Peak detector for measurements below 1000 MHz and an Average and Peak detector for measurements above 1000 MHz. A peak detector was used for all other measurements.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

All measurements on the open area test site were performed using broadband antennas in both vertical and horizontal polarisations.

On the open area test site, at each frequency where a signal was to be measured, the trace was maximised by rotating a turntable through 360°. The angle at which the maximum signal was observed was locked out. For frequencies below 1000 MHz the test antenna was varied in height between 1 m and 4 m in order to further maximise the target emission.

For frequencies above 1000 MHz where a horn antenna was used, height searching was performed to locate the optimal height of the horn with respect to the EUT. At this point the horn was locked off and the turntable was again rotated through 360° to maximise the target signal. It should be noted that the received signal from the EUT would diminish very quickly after it exits the beam width of the horn antenna, for this reason it may not be necessary to fully height search with the horns.

At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

Scans were performed to the upper frequency limits as stated in Section 15.33

Radiated Field Strength Emissions (Continued)

The final field strength was determined as the indicated level in dBμV plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1 GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak / Average
Mode:	Max Hold	Not applicable	Max Hold
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz
Amplitude Range:	100 dB	100 dB	100 dB
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

8.2. Carrier Frequency Separation/20 dB Bandwidth

The EUT and spectrum analyser was configured as for radiated measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine the bandwidth and separation of each transmission channel the measurement analyser was configured to measure two adjacent channels whilst the EUT was in hopping mode.

To determine the occupied bandwidth, a resolution bandwidth of 10 kHz was used, which is greater than 1% of the 20 dB bandwidth. A video bandwidth of, at least, the same value was used.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20 dB below the peak level.

The bandwidth was determined at the points where the 20 dB reference line intercepted the power envelope of the emission.

8.3. Average Time of Occupancy

The EUT and spectrum analyser was configured as for radiated measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

First the maximum packet length was determined on the centre channel.

The measurement analyser was configured to the time domain mode by setting the span to zero with a sweep time sufficiently wide enough to measure one pulse.

The EUT was configured to operate in normal mode of operation. The pulse width of one transmission was then recorded. The measurement analyser was then configured in zero span i.e. in the time domain and the sweep time was set to 32 seconds (the closest allowable setting to 31.6 seconds). This 31.6 second period was determined by multiplying the number of channels the device operates over (79) by 0.4 seconds.

The number of transmissions within this period was noted and multiplied by the pulse width recorded earlier. This gives the maximum occupancy over 31.6 seconds.

8.4. Effective Isotropic Radiated Power (EIRP)

EIRP measurements were performed in accordance with the standard, against appropriate limits.

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4. The transmitter was fitted with an integral antenna; therefore all radiated tests were performed with the unit operating into the integral antenna.

The level of the EIRP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the Vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a horn antenna. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

Effective Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The EIRP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated EIRP to obtain the substituted EUT EIRP.

Delta (dB) = EUT – SG

where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

EIRP SG= Signal Generator Level - Cable Loss + Antenna Gain

The EUT EIRP is calculated as:

EIRP EUT = EIRP SG + Delta.

The test equipment settings for EIRP measurements were as follows:

Receiver Function	**Setting**
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

8.5. Band Edge Compliance of RF Radiated Emissions

The EUT and spectrum analyser were configured as for Radiated measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine band-edge compliance, the analyser resolution bandwidth was set to ≥ 1% of the analyser span. The video bandwidth was set to be no less than the resolution bandwidth. The sweep was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

A plot of the lower band edge of the allocated frequency band was produced. A marker was set to the level of the highest in band emission with a limit line set to 20 dB below this. The marker was then placed on the highest out of band emission (the specification states that either the band edge level must be measured or the highest out of band emission, whichever is the greater). The plots show that the highest out of band emission complies with the -20 dBc limit.

The above procedure was then repeated for the upper band edge except that, as the upper band edge fell on a restricted band edge (as defined in Section 15.205(a)), the limit for the restricted band was applied instead of the -20 dBc limit i.e. the general limits defined in Section 15.209(a). Two plots were taken, one with the spectrum analyser detector set to peak and one with the detector set to average.

Final measurements were performed on the worst-case configuration as described in Part 15.31(i).

9. Measurement Uncertainty

9.1. No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

9.2. The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

9.3. The uncertainty of the result may need to be taken into account when interpreting the measurement results.

9.4. The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Transmitter Maximum Peak Output Power	Not applicable	95%	+/- 1.78 dB
Transmitter Carrier Frequency Separation	Not applicable	95%	+/- 0.01 ppm
20 dB Bandwidth	Not applicable	95%	+/- 0.12 %
Transmitter Average Time of Occupancy	Not applicable	95%	+/- 10 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	+/- 1.78 dB

9.5. The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A027	Horn Antenna	Eaton	9188-2	301
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139
A259	Bilog Antenna	Chase	CBL6111	1513
A428	WG 12 horn	Flann	12240-20	134
A429	WG 16 horn	Flann	16240-20	561
A430	WG 18 horn	Flann	18240-20	425
A436	WG 20 horn	Flann	20240-20	330
C178	Cable	Rosenberger	UFA210A-1-1181-70x70	None
C461	Cable	Rosenberger	UFA210A-1-1182-704704	98H0305
C468	N-Type Coaxial Cable	Rosenberger	UFA210A-1-3937-504504	98L0440
M023	ESVP Receiver	Rohde & Schwarz	ESVP	872 991/027
M028	FSB Spectrum Analyser	Rohde & Schwarz	FSB	860 001/009 (RF), 860 161/007 (Display)
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M1124	ESIB Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K
S201	Site 1	RFI	1	None
S202	Site 2	RFI	2	S202-15011990

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

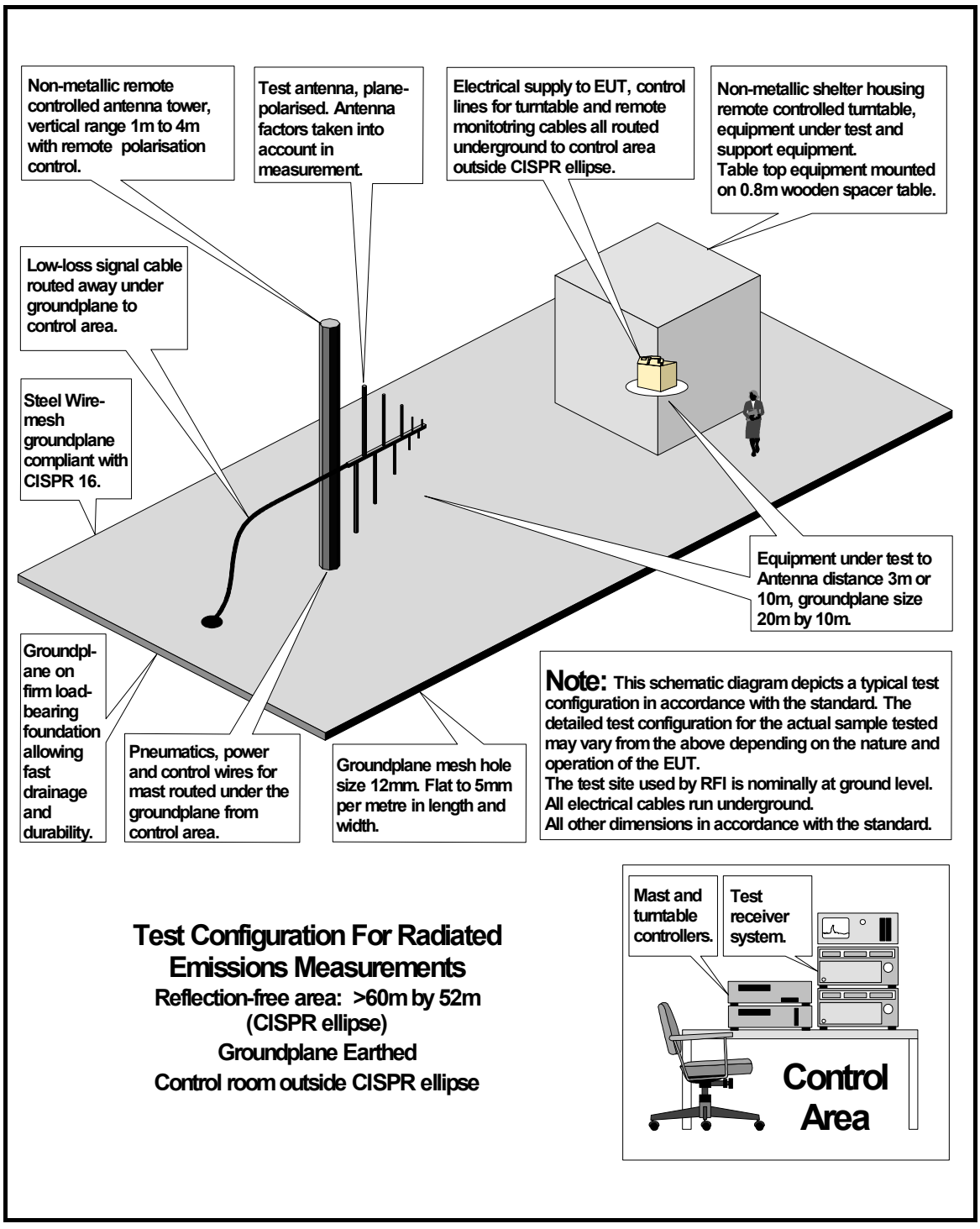
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\RP45177JD07\EMIRAD	Test configuration for measurement of radiated emissions

Test Of: Casio Computer Co. Ltd.
IT-3000M54E Handheld Printer Terminal
To: FCC Part 15.247

DRG\RP45177JD07\EMIRAD



Test Configuration For Radiated Emissions Measurements
Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse