

**TEST REPORT
FROM
RFI GLOBAL SERVICES LTD**

Test of: Roke Manor.
RF660R Portal Reader.

To: FCC Part 15.247: 2004 (Subpart C)

Test Report Serial No:
RF\MPTE4\RP71376JD01A
Supersedes Test Report Serial No:
RF\MPTE3\RP71376JD01A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager:  pp	
Tested By: Steven Wong 	Checked By: Nigel Davison 
Report Copy No: PDF01	
Issue Date: 27 October 2005	Test Dates: 13 September 2005 to 16 September 2005

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields.
This report may be copied in full. The results in this report apply only to the sample(s) tested.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

This page has been left intentionally blank.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Table of Contents

1. Client Information4

2. Equipment Under Test (EUT)5

3. Test Results.....10

4. Deviations from the Test Specification11

5. Operation of the EUT during Testing12

6. Summary of Test Results13

7. Measurements, Examinations and Derived Results14

8. Measurement Uncertainty54

9. Measurement Methods55

Appendix 2. Test Equipment Used63

Appendix 3. Test Configuration Drawings.....65

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

1. Client Information

Company Name:	Roke Manor Research Limited.
Address:	Accounts Payable Roke Manor Romsey Hany SO51 0ZN
Contact Name:	Mr D. Sherry

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

2. Equipment Under Test (EUT)

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

2.1. Identification of Equipment Under Test (EUT)

Brand Name:	Siemens
Model Name or Number:	RF660R Portal Reader
Unique Type Identification:	6GT2811-0AA00
Serial Number:	101425080.001
Hardware Version:	RF660R
Software Version:	DROP3-ESWB-0-4
FCC ID Number:	NXW-RF660
Country of Manufacture:	None Stated
Date of Receipt:	13 September 2005

Brand Name:	Siemens
Model Name or Number:	RF660A
Unique Type Identification:	6GT2812-0AA01
Serial Number:	101408505.006
Hardware Version:	Not Applicable
Software Version:	Not Applicable
Country of Manufacture:	None Stated
Date of Receipt:	13 September 2005

Brand Name:	Siemens
Model Name or Number:	RF660A
Unique Type Identification:	6GT2812-0AA01
Serial Number:	101408505.015
Hardware Version:	Not Applicable
Software Version:	Not Applicable
Country of Manufacture:	None Stated
Date of Receipt:	13 September 2005

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Identification of Equipment Under Test (EUT) (Continued)

Brand Name:	Siemens
Model Name or Number:	RF660A
Unique Type Identification:	6GT2812-0AA01
Serial Number:	101408505.045
Hardware Version:	Not Applicable
Software Version:	Not Applicable
Country of Manufacture:	None Stated
Date of Receipt:	13 September 2005

Brand Name:	Siemens
Model Name or Number:	RF660A
Unique Type Identification:	6GT2812-0AA01
Serial Number:	101408505.017
Hardware Version:	Not Applicable
Software Version:	Not Applicable
Country of Manufacture:	None Stated
Date of Receipt:	13 September 2005

Brand Name:	Siemens
Model Name or Number:	RF600 Antenna Cable L10
Unique Type Identification:	6GT2815-OAN10 (Times 4)
Serial Number:	None Stated
Hardware Version:	Not Applicable
Software Version:	Not Applicable
Country of Manufacture:	None Stated
Date of Receipt:	13 September 2005

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

2.2. Description of EUT

The equipment under test is a UHF RFID Reader for communication with passive UHF tags. The RF660R reader uses for RF660A antennas.

2.3. Modifications Incorporated in EUT

During the course of testing the EUT was not modified.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

2.4. Additional Information Related to Testing

Power Supply Requirement:	24 V DC Supply		
Intended Operating Environment:	Commercial, Light Industry and RFID		
Equipment Category:	Spread Spectrum Device (902-928 MHz)		
Type of Unit:	Base Station (Fixed Use)		
Type of Modulation:	DSB-ASK and SSB-ASK		
Emission Designator:	500KK7D		
Temperature Range:	-25°C to + 55°C		
Transmit Frequency Range:	902 to 928 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	902.75
	Middle	24	914.75
	Top	49	927.25
Receive Frequency Range:	902 to 928 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	902.75
	Middle	24	914.75
	Top	49	927.25
Maximum Peak Power Output	29.5 dBm (measured)		

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

2.5. Port Identification

Port	Description	Type/Length	Applicable
1	DC Input, 24 V Power	-	Y
2	Digital I/O	-	Y
3	RS232	-	Y
4	RS422	-	Y
5	Ethernet	20m Shielded Twisted Pair	Y
6	Antenna 1	10m LMR195 Coax	Y
7	Antenna 2	10m LMR195 Coax	Y
8	Antenna 3	10m LMR195 Coax	Y
9	Antenna 4	10m LMR195 Coax	Y
10	Earth Point	10m LMR195 Coax	Y

2.6. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	PPX
Serial Number:	66110 (Roke Manor Asset No.)
Cable Length and Type:	Not Applicable
Connected to Port:	Serial RS232 (Only for setup purposes, disconnected during testing)

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

3. Test Results

Reference:	FCC Part 15.247: 2004 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR22) (Intentional Radiators operating within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz)

3.1. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2003)

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.

3.2. 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.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

4. Deviations from the Test Specification

None.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

5. Operation of the EUT during Testing

5.1. Operating Modes

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

For all transmitter tests, the EUT was set to transmit at full power with 4Db connection cable loss and highest rate.

For standby mode tests, the EUT was set to inactive mode with the PA powered off.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

For the radiated measurement and AC conducted measurements the EUT was connected with 4 antennas via 10m cables, RS232 serial cable, digital interface cable, RS422 cable, Ethernet cable and powered by an external 24 V power supply. For all conducted antenna port measurement, the EUT is powered by an external 24 V DC supply, configured with RS232 cable, 3 antenna port terminated with 50 ohm load and connected with a 10 m coaxial cable for testing.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliance Status
Idle Mode AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.109	Antenna	Complied
Transmitter AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.207	AC Mains	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)(i)	Antenna Terminals	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)	Antenna Terminals	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)(i)	Antenna Terminals	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2004 Section 15.247(b)(2)	Antenna Terminals	Complied
Transmitter Conducted Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.247 (d)	Antenna Terminals	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Sections 15.247(d) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Conducted Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.247(d)	Antenna Terminals	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.247(d) & 15.209(a)	Antenna Terminals	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of:

RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England
and RFI Global Services Ltd, Pavilion A, Ashwood Park, Ahswood Way, Basingstoke, Hampshire
RG23 8BG.

RFI Industry Canada Number: IC# 3485A.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

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 8 for details of measurement uncertainties.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2. Test Results

7.2.1. Idle Mode AC Conducted Spurious Emissions: Section 15.107

The EUT was configured as for ac conducted emission measurements as described in section 9 of this report.

Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

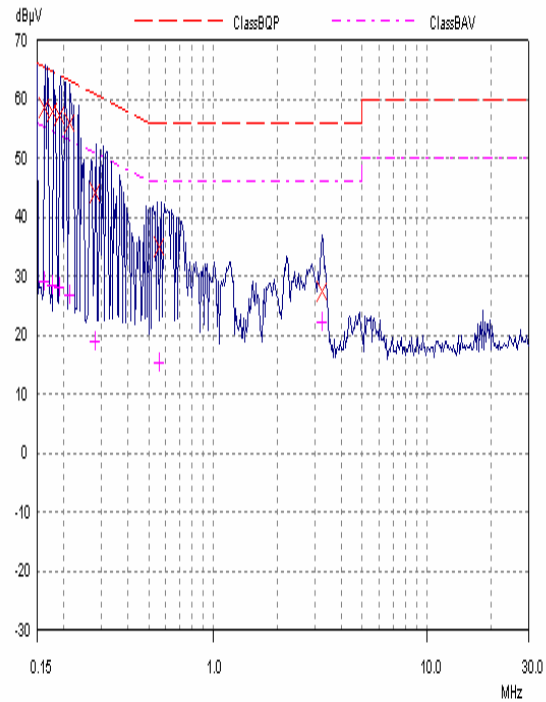
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.16289	Neutral	58.45	65.32	6.87	Complied
0.17774	Neutral	57.76	64.59	6.83	Complied
0.1907	Neutral	57.26	64.01	6.75	Complied
0.21238	Neutral	55.99	63.11	7.12	Complied
0.28197	Neutral	44.11	60.76	16.65	Complied
0.55836	Neutral	34.82	56.00	21.18	Complied
3.26579	Neutral	27.25	56.00	28.75	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.16289	Neutral	29.18	55.32	26.14	Complied
0.17774	Neutral	28.43	54.59	26.16	Complied
0.1907	Neutral	27.93	54.01	26.08	Complied
0.21238	Neutral	26.79	53.11	26.32	Complied
0.28197	Neutral	18.99	50.76	31.77	Complied
0.55836	Neutral	15.14	46.00	30.86	Complied
3.26579	Neutral	22.22	46.00	23.78	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.2. Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

The EUT was configured as for radiated emission testing as described in section 9 of this report. Tests were performed to identify the maximum receiver or standby radiated emission levels.

Results:

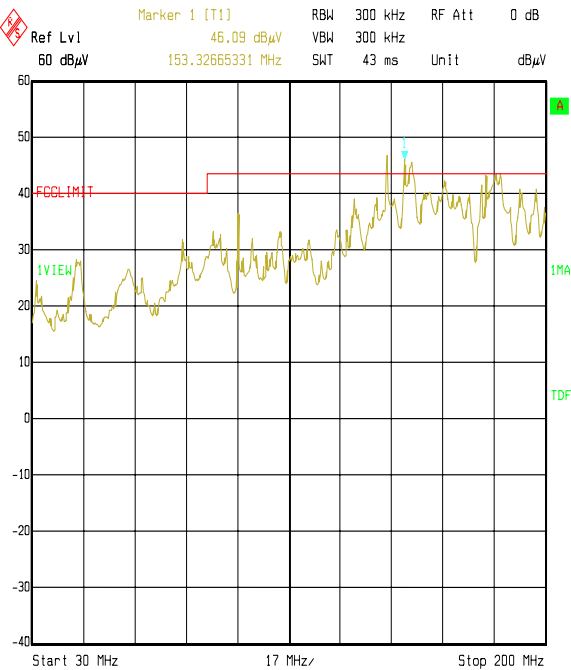
Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
147.456	Vert.	22.0	43.5	21.5	Complied
184.195	Vert.	19.0	43.5	24.5	Complied
206.151	Vert.	21.9	43.5	21.6	Complied
294.911	Horiz.	34.1	46.0	11.9	Complied
491.519	Horiz.	38.7	46.0	7.3	Complied
713.131	Horiz.	26.8	46.0	19.2	Complied
814.955	Horiz.	31.3	46.0	14.7	Complied
882.800	Horiz.	36.7	46.0	9.3	Complied
911.588	Horiz.	33.8	46.0	12.2	Complied
927.253	Horiz.	33.3	46.0	12.7	Complied

Note(s):

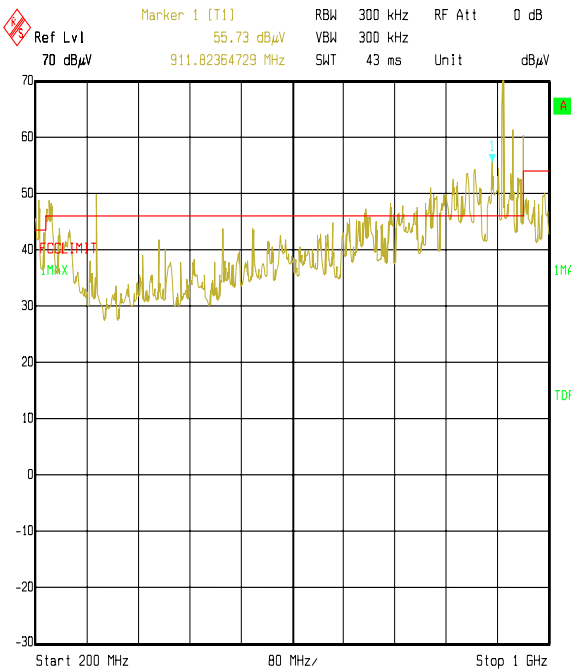
1. Plots within this section incorrectly show the test date. This is in fact an error and it has been confirmed that the test date was 13 September 2005 instead of 29 June 2005.
 2. Plots showing emissions occurring at 153.327 MHz, 217.635 MHz, 929.459 MHz, 943.888 MHz, 955.110 MHz and 959.920 MHz. These emissions were confirmed as background emissions. Therefore, no measurement is performed on these frequencies.
-

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength
Measurements (Frequency Range: 30 to 1000 MHz) (Continued)



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Standby mode
Date: 29.JUN.2005 12:48:09



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Standby mode
Date: 29.JUN.2005 13:11:07

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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.3. Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 5 GHz)

Results:

Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1016.232	Vert.	28.0	21.5	0.5	50.0	74.0	24.0	Complied
1081.309	Vert.	28.7	21.5	0.5	50.7	74.0	23.3	Complied
1839.498	Vert.	27.1	21.6	0.8	49.5	74.0	24.5	Complied

Highest Average Level:

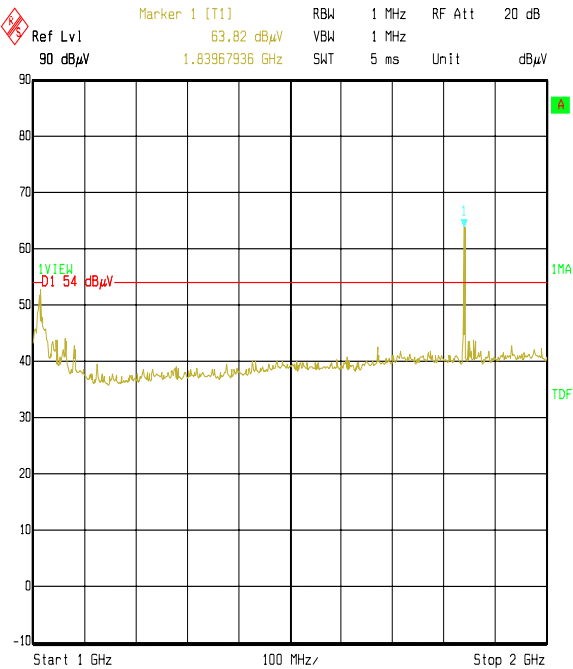
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1016.232	Vert.	14.1	21.5	0.5	36.1	54.0	17.9	Complied
1081.309	Vert.	24.8	21.5	0.5	46.8	54.0	7.2	Complied
1839.498	Vert.	19.6	21.6	0.5	42.0	54.0	12.0	Complied

Note(s):

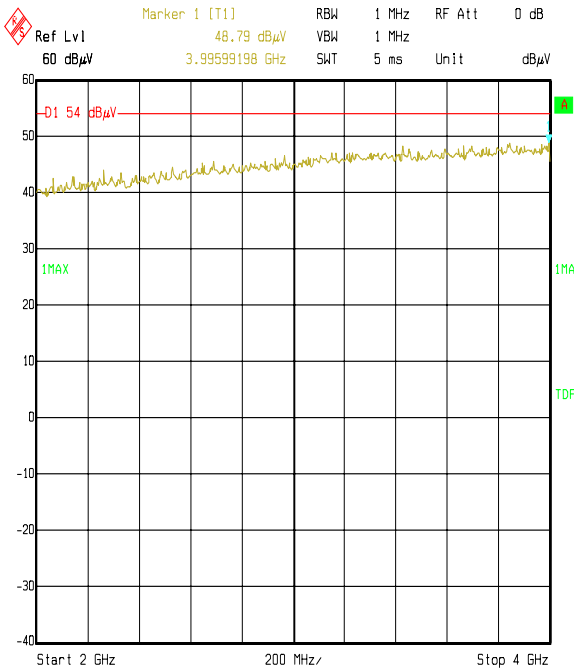
1. Plots of 1 to 21 GHz and 2 to 4 GHz incorrectly show the test date. This is in fact an error and it has been confirmed that the date should be 13 September 2005 instead of 29 June 2005.
-

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

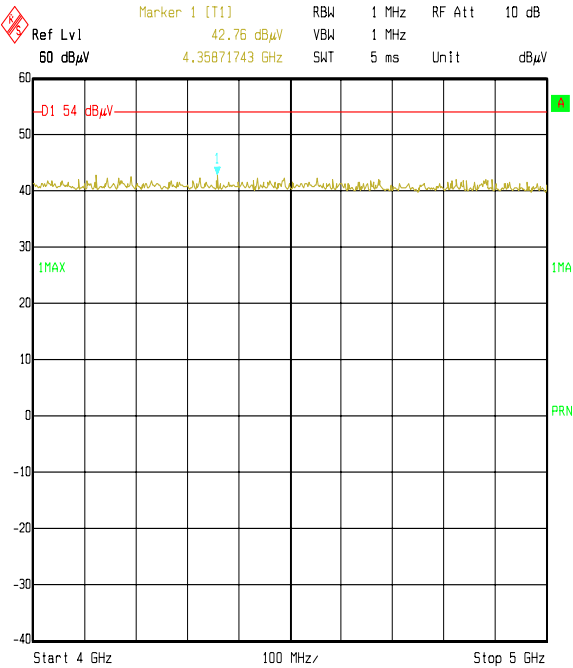
Idle Mode Radiated Spurious Emissions: Section 15.109 - Electric Field Strength Measurements (Frequency Range: 1 to 5 GHz) (Continued)



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Standby mode
Date: 29.JUN.2005 15:18:32



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Standby mode
Date: 29.JUN.2005 14:53:05



Title: 71376JD01 RF660 Rad. emissions
Comment A: Standby mode
Date: 15.SEP.2005 10:37:23

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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.4. Transmitter AC Conducted Spurious Emissions: Section 15.207

The EUT was configured for ac conducted emission measurements as described in section 9 of this report.

Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

Results: Top Channel

Quasi-Peak Detector Measurements on Live and Neutral Lines

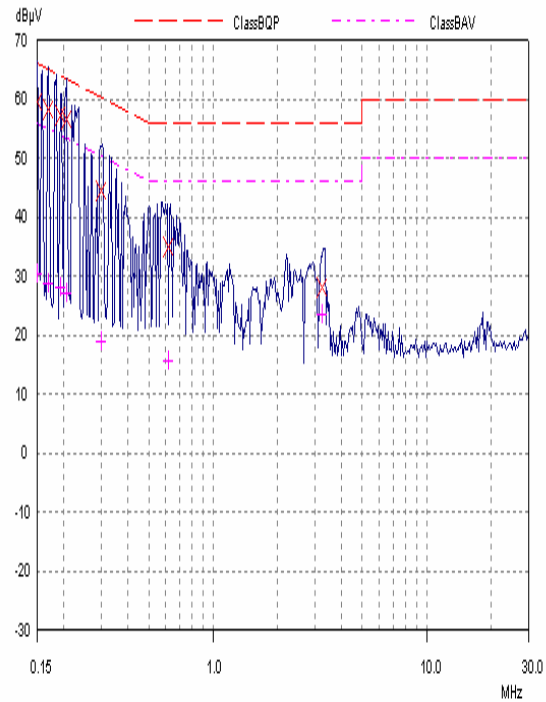
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1502	Neutral	59.42	65.99	6.57	Complied
0.16955	Neutral	58.16	64.98	6.82	Complied
0.19214	Neutral	57.21	63.94	6.73	Complied
0.20717	Neutral	56.46	63.32	6.86	Complied
0.29874	Neutral	44.49	60.28	15.79	Complied
0.61869	Live	35.04	56.00	20.96	Complied
3.2634	Neutral	28.16	56.00	27.84	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.1502	Neutral	30.27	55.99	25.72	Complied
0.16955	Neutral	28.86	54.98	26.12	Complied
0.19214	Neutral	27.93	53.94	26.01	Complied
0.20717	Neutral	27.16	53.32	26.16	Complied
0.29874	Neutral	18.84	50.28	31.44	Complied
0.61869	Live	15.49	46.00	30.51	Complied
3.2634	Neutral	23.59	46.00	22.41	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter AC Conducted Spurious Emissions: Section 15.207 (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

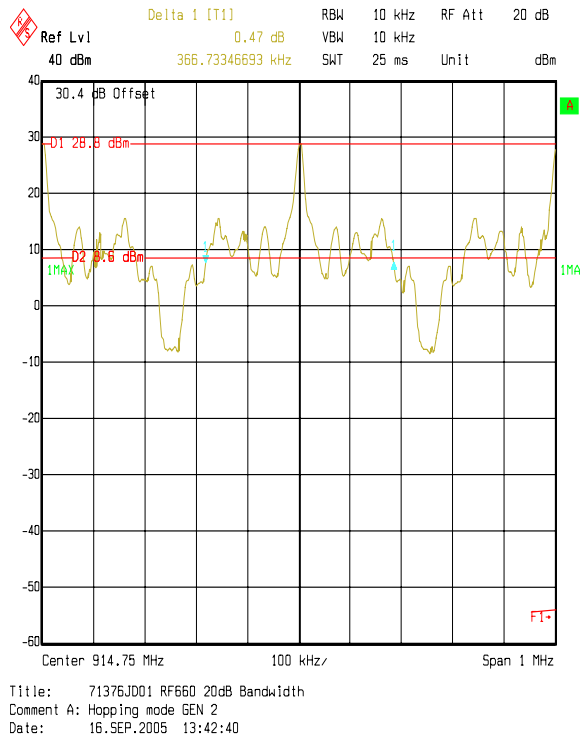
Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.5. Transmitter 20 dB Bandwidth: Section 12.247(a)(1)(i)

The EUT was configured for 20 dB bandwidth measurements as described in section 9 of this report. Tests were performed to identify the 20 dB bandwidth.

Results:

Transmitter 20 dB Bandwidth (kHz)	Limit (kHz)
366.733	≤500



Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

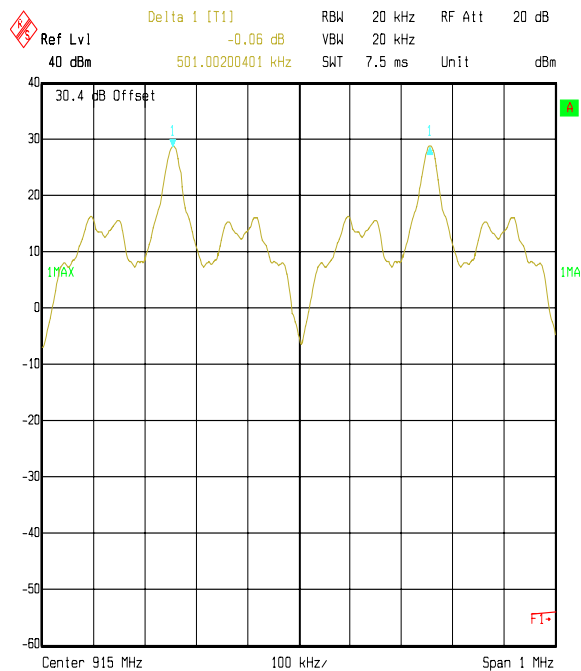
7.2.6. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

The EUT was configured for carrier frequency separation measurements as described in section 9 of this report.

Tests were performed to identify the carrier frequency separation.

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit ≥ 20 dB	Margin (kHz)	Result
501.002	366.733	134.269	Complied



Title: 71376JD01 RF660 Carrier frequency separation
Comment A: Hopping mode
Date: 16.SEP.2005 13:58:09

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.7. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(i)

The EUT was configured for average time of occupancy measurements as described in section 9 of this report.

Results: GEN 1.

Emission Width (μ s)	Number of Hops in 10 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
288176.150	0.667	0.192	0.4	0.208	Complied

Measurement at 914.75 MHz.

Results: GEN 2.

Emission Width (μ s)	Number of Hops in 10 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
287174.146	0.667	0.192	0.4	0.208	Complied

Measurement at 914.75 MHz

Results: GEN 2 (Tari = 25 μ S).

Emission Width (μ s)	Number of Hops in 20 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
286172.142	1.333	0.381	0.4	0.019	Complied

Measurement at 914.75 MHz.

Results: GEN 2 (Tari = 12.5 μ S).

Emission Width (μ s)	Number of Hops in 20 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
284168.134	1.333	0.379	0.4	0.021	Complied

Measurement at 914.75 MHz.

Results: ISO B

Emission Width (ms)	Number of Hops in 20 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
288.577154	1.333	0.385	0.4	0.015	Complied

Measurement at 914.75 MHz.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.8. Transmitter Maximum Peak Output Power: Section 15.247(b)(2)

The EUT was configured for transmitter peak output power measurements as described in section 9 of this report.

Tests were performed to identify the transmitter maximum peak output power (ERP) of the EUT.

Results:**AC Powered Devices**

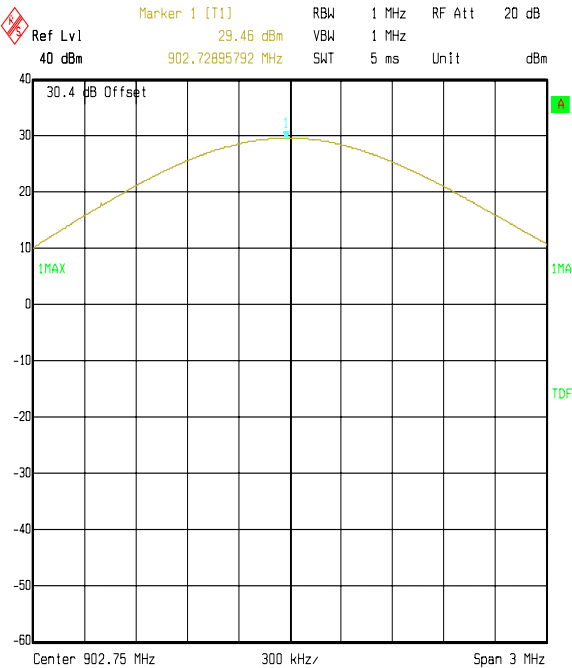
Channel	Input Voltage (AC)	Conducted RF O/P Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	93.50	29.5	30.0	0.5	Complied
Bottom	110.00	29.5	30.0	0.5	Complied
Bottom	126.50	29.5	30.0	0.5	Complied
Middle	93.50	29.3	30.0	0.7	Complied
Middle	110.00	29.3	30.0	0.7	Complied
Middle	126.50	29.3	30.0	0.7	Complied
Top	93.50	29.0	30.0	1.0	Complied
Top	110.00	29.0	30.0	1.0	Complied
Top	126.50	29.0	30.0	1.0	Complied

Note(s):

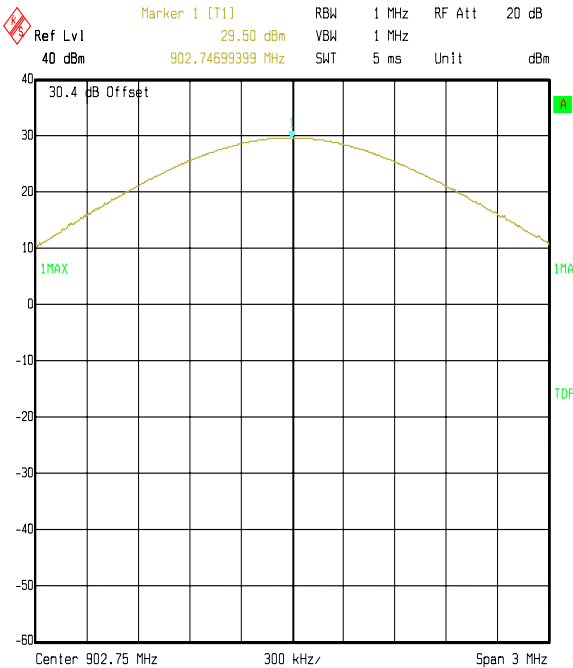
1. As per the requirements of FCC part 15.247 (b)(4) and 15.247(b)(2), the limits of 1 watt (30 dBm) refer to the conducted output power limit, based on the use of antennas with directional gains that do not exceed 6 dBi.
 2. The declared antenna gain of the antennas by the manufacturer is 6 dBi.
 3. The output power level was taken from the antenna port, which is reference to the point at the end of the 10m cable, connected between the EUT and the antenna. As worst case configuration.
-

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

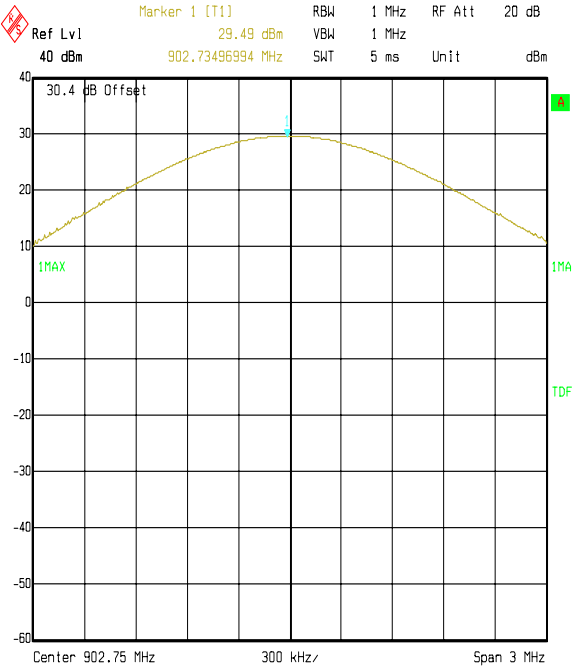
Transmitter Maximum Peak Output Power: Section 15.247(b)(3) (Continued)



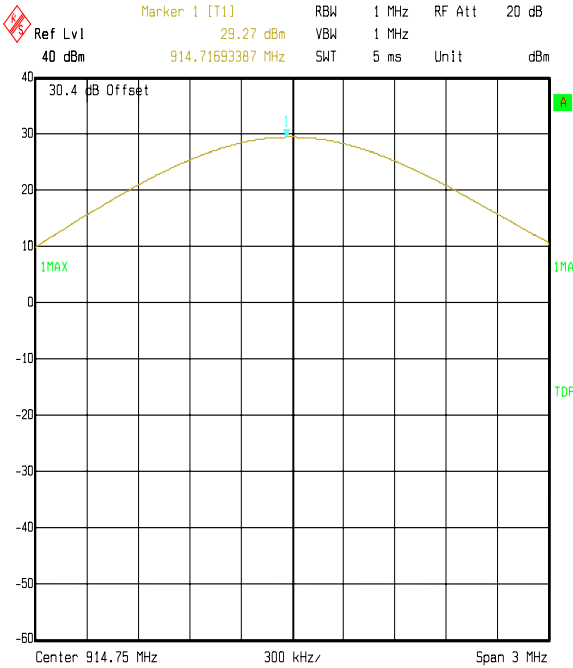
Title: 71376JD01 RF660 Conducted Output Power
Comment A: Bottom channel, Low voltage
Date: 16.SEP.2005 11:54:39



Title: 71376JD01 RF660 Conducted Output Power
Comment A: Bottom channel, Nominal voltage
Date: 16.SEP.2005 11:57:20



Title: 71376JD01 RF660 Conducted Output Power
Comment A: Bottom channel, High voltage
Date: 16.SEP.2005 11:59:25

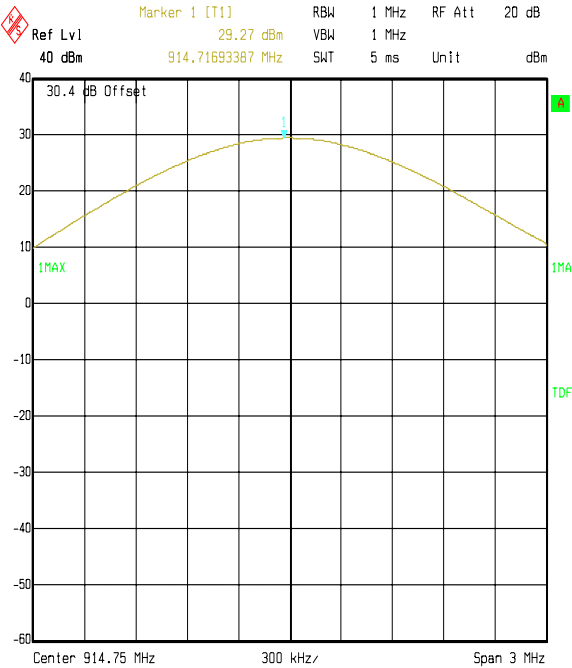


Title: 71376JD01 RF660 Conducted Output Power
Comment A: Middle channel, Low voltage
Date: 16.SEP.2005 11:52:05

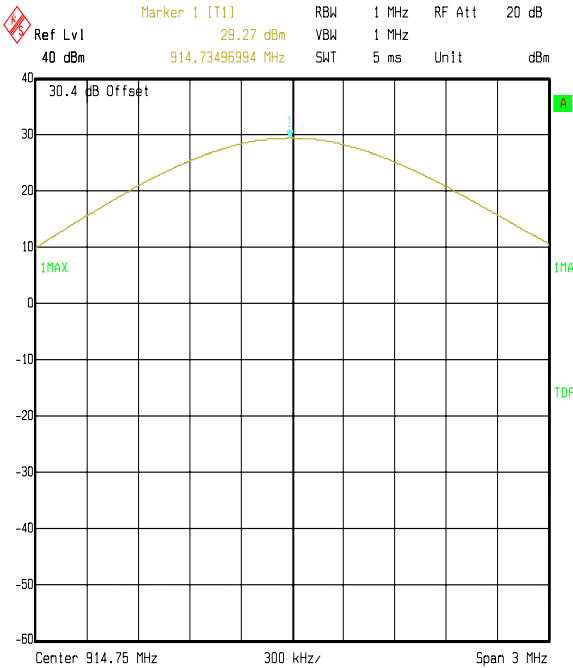
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

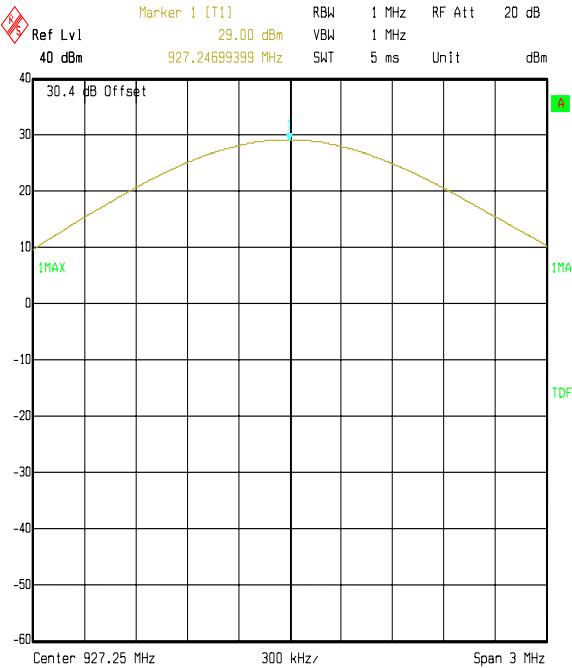
Transmitter Maximum Peak Output Power: Section 15.247(b)(3) (Continued)



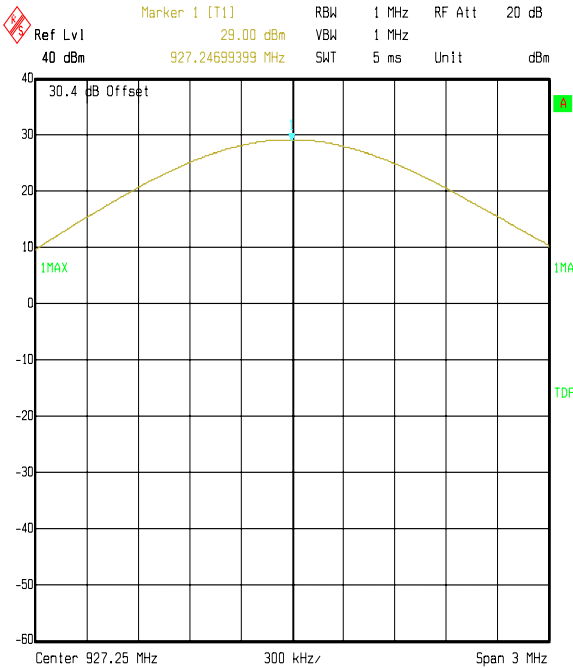
Title: 71376JD01 RF660 Conducted Output Power
Comment A: Middle channel, Nominal voltage
Date: 16.SEP.2005 11:47:48



Title: 71376JD01 RF660 Conducted Output Power
Comment A: Middle channel, High voltage
Date: 16.SEP.2005 11:46:02



Title: 71376JD01 RF660 Conducted Output Power
Comment A: Top channel, Low voltage
Date: 16.SEP.2005 11:42:19

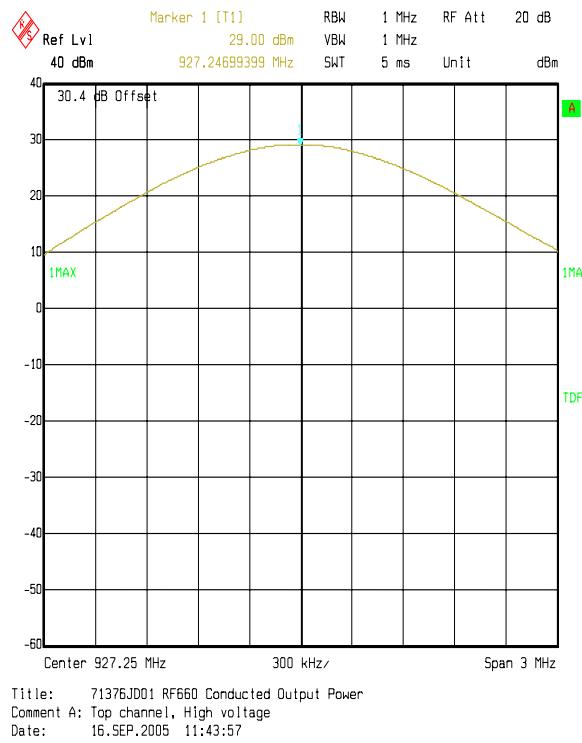


Title: 71376JD01 RF660 Conducted Output Power
Comment A: Top channel, Nominal voltage
Date: 16.SEP.2005 11:39:46

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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Maximum Peak Output Power: Section 15.247(b)(3) (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.9. Transmitter Conducted Emissions: Section 15.247(d)

The EUT was configured for transmitter conducted emissions measurements as described in section 9 of this report.

Tests were performed to identify the maximum transmitter conducted emission levels.

The limit lines shown in the plots below are set to a level 20 dB below the measured highest fundamental peak power.

Results:**Bottom Channel**

Frequency (MHz)	Peak or RMS Averaging Emission Level (dBm)	Peak or RMS Averaging Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
6945.892	-33.1	-62.4	-20	42.4	Complied

Middle Channel

Frequency (MHz)	Peak or RMS Averaging Emission Level (dBm)	Peak or RMS Averaging Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
6957.916	-33.4	-62.4	-20.0	42.4	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Conducted Emissions: Section 15.247(d) (Continued)**Top Channel**

Frequency (MHz)	Peak or RMS Averaging Emission Level (dBm)	Peak or RMS Averaging Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
928.144	-7.5	-36.3	-20.0	16.3	Complied

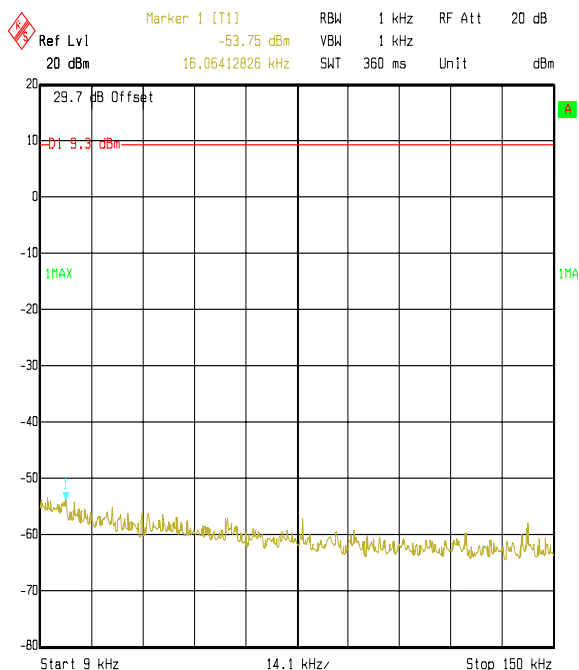
Hopping Channel

Frequency (MHz)	Peak or RMS Averaging Emission Level (dBm)	Peak or RMS Averaging Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
928.289	1.0	-28.3	-20.0	8.3	Complied

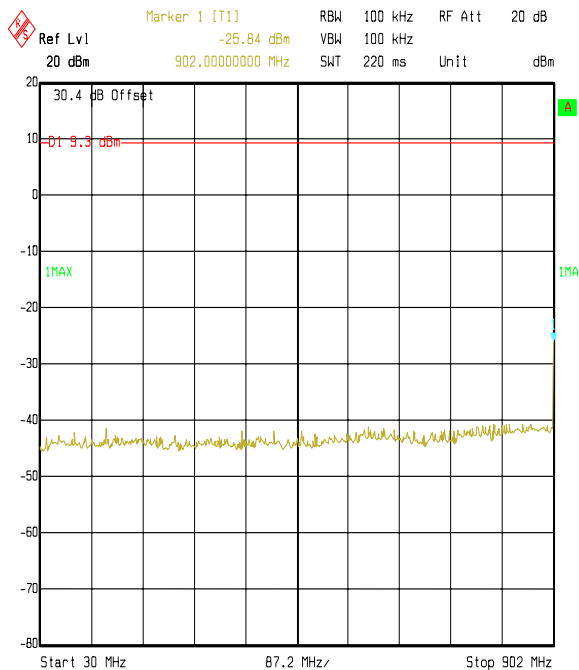
Note(s):

1. No spurious emissions were detected above the noise floor of the measuring receiver; the highest peak noise floor reading of the measuring receiver was recorded.
-

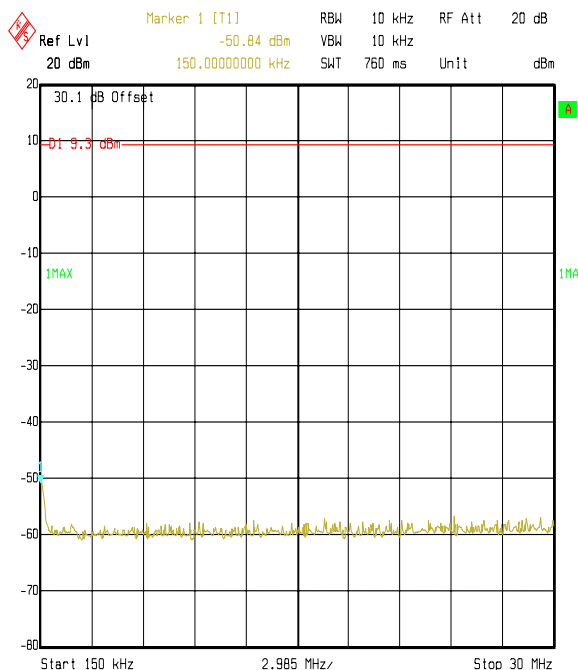
Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Conducted Emissions: Section 15.247(d) (Continued)

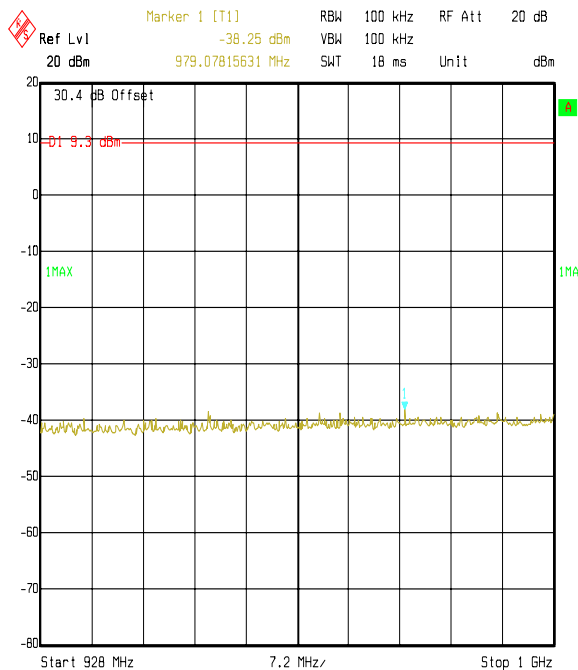
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Bottom channel
Date: 16.SEP.2005 10:48:05



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Bottom channel
Date: 16.SEP.2005 10:44:28



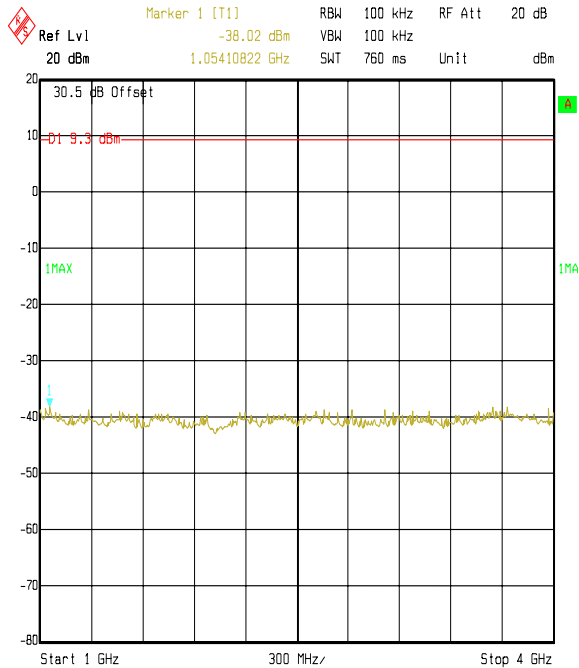
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Bottom channel
Date: 16.SEP.2005 10:46:40



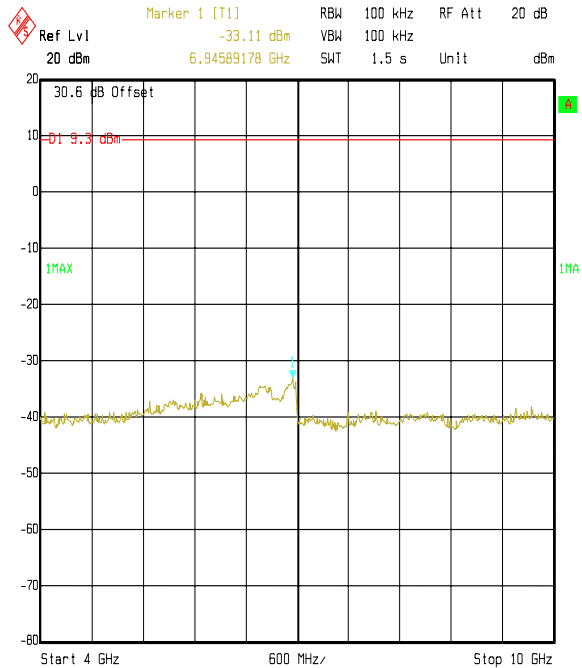
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Bottom channel
Date: 16.SEP.2005 10:41:37

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

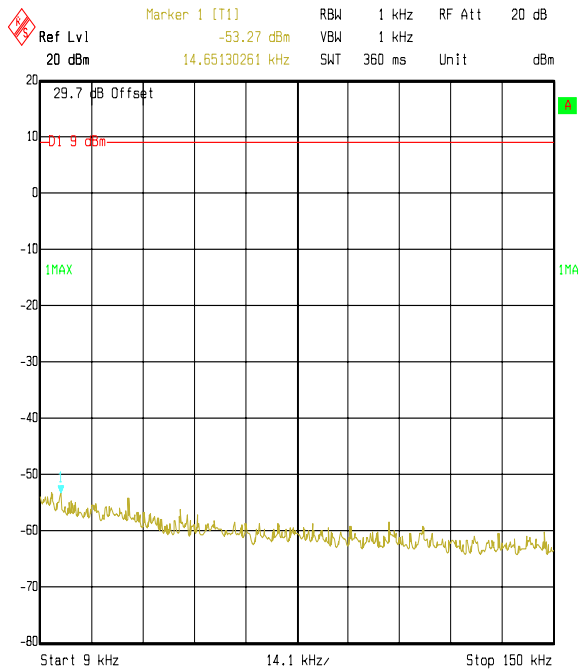
Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Conducted Emissions: Section 15.247(d) (Continued)

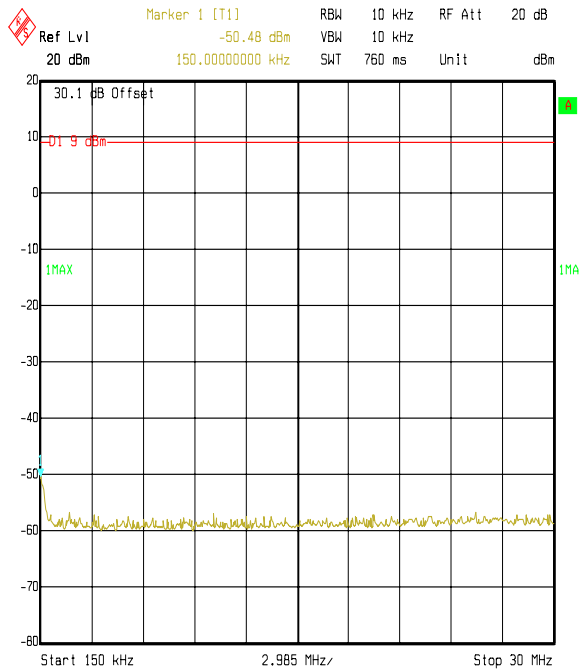
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Bottom channel
Date: 16.SEP.2005 10:39:51



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Bottom channel
Date: 16.SEP.2005 10:38:57



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Middle channel
Date: 16.SEP.2005 10:50:28

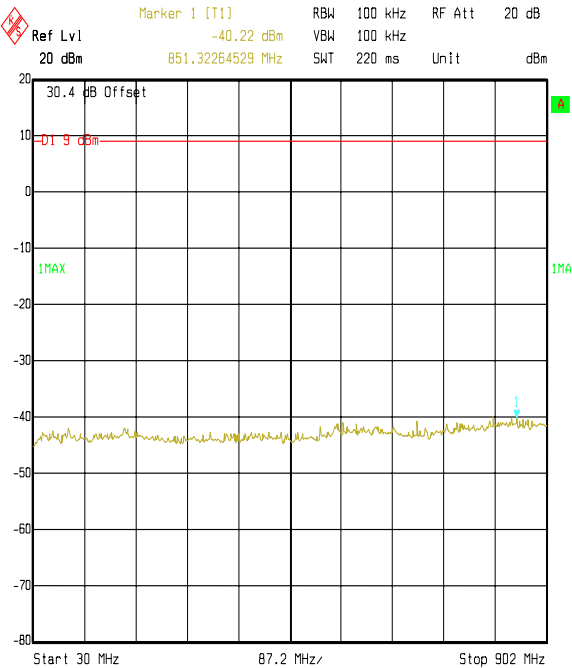


Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Middle channel
Date: 16.SEP.2005 10:54:19

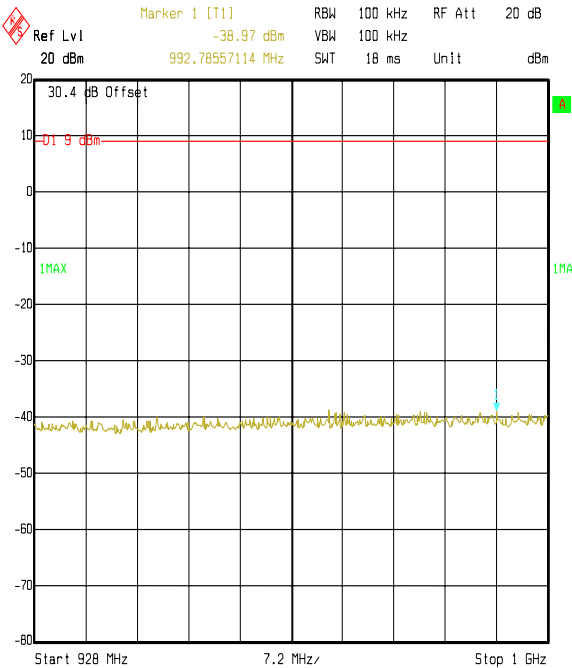
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

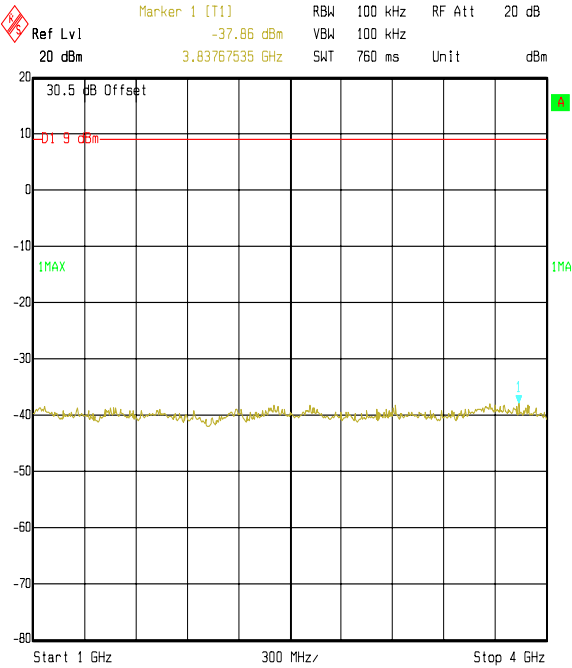
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



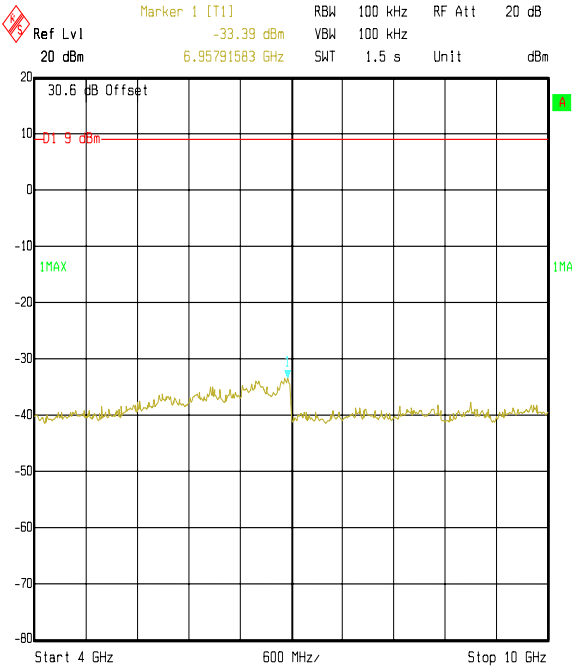
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Middle channel
Date: 16.SEP.2005 10:56:19



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Middle channel
Date: 16.SEP.2005 10:57:21



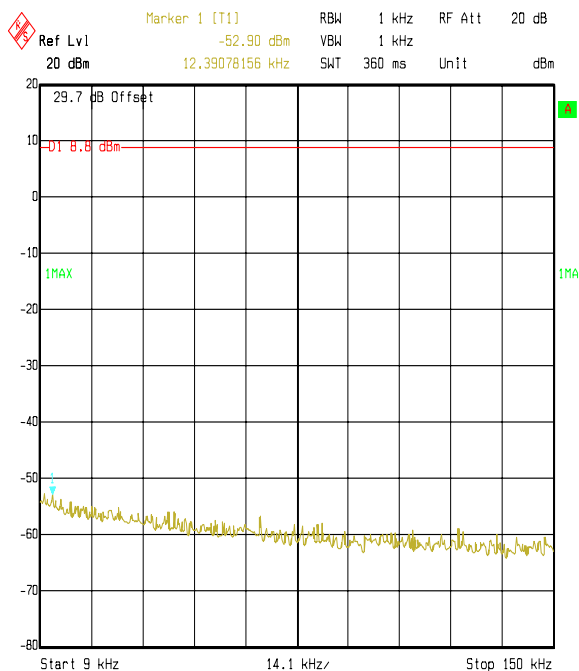
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Middle channel
Date: 16.SEP.2005 10:59:56



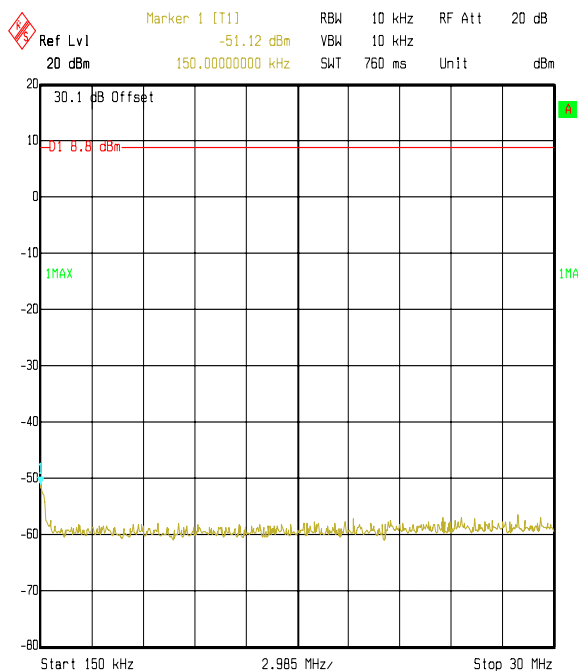
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Middle channel
Date: 16.SEP.2005 11:04:01

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

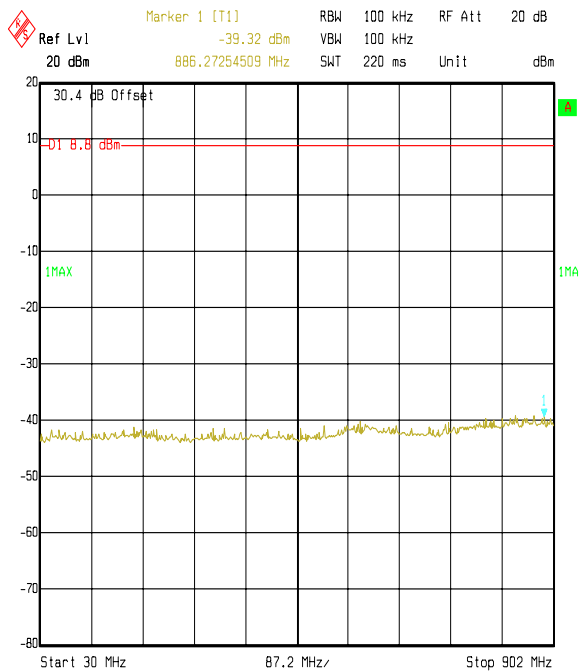
Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Conducted Emissions: Section 15.247(d) (Continued)

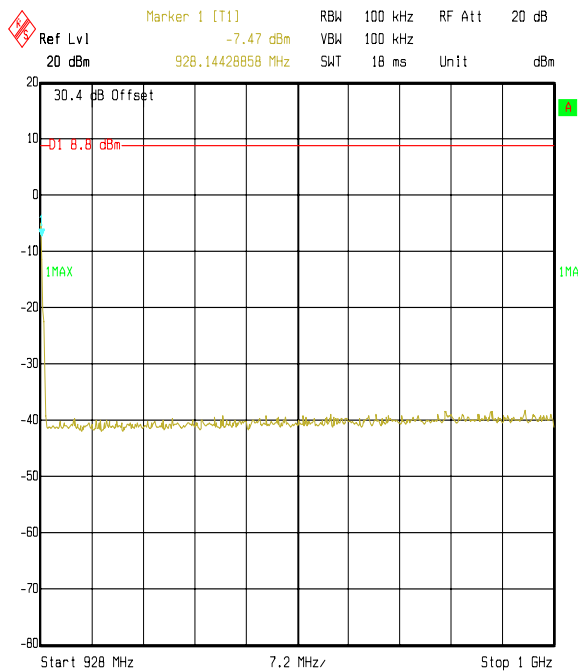
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Top channel
Date: 16.SEP.2005 11:21:20



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Top channel
Date: 16.SEP.2005 11:19:40



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Top channel
Date: 16.SEP.2005 11:18:01

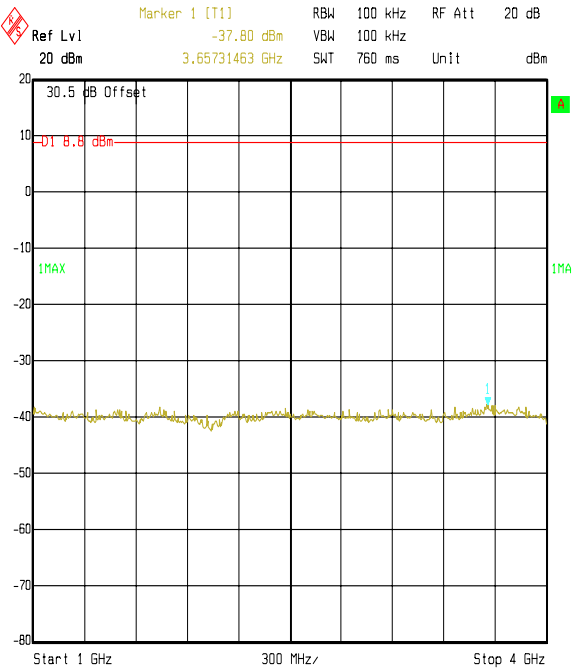


Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Top channel
Date: 16.SEP.2005 11:14:22

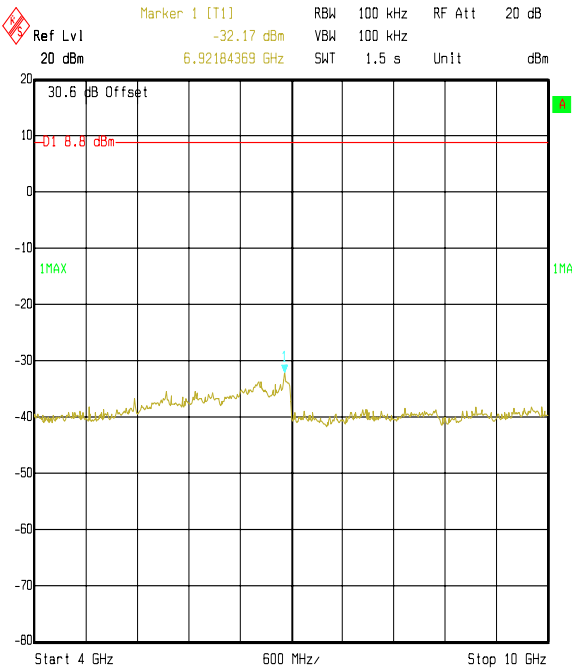
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

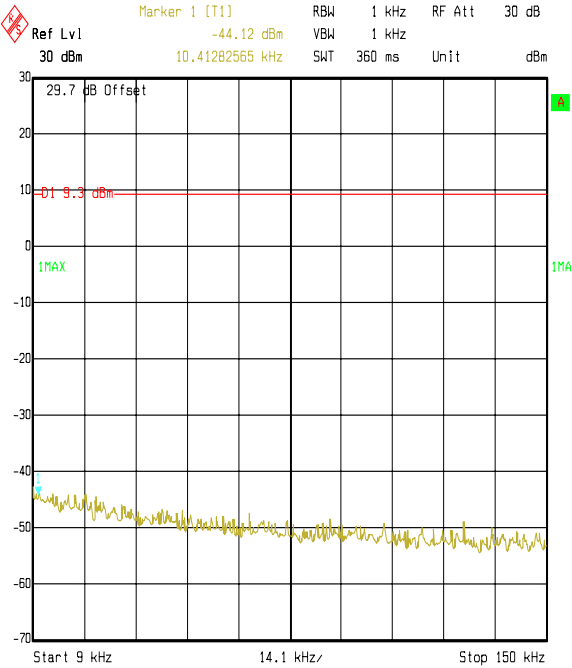
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



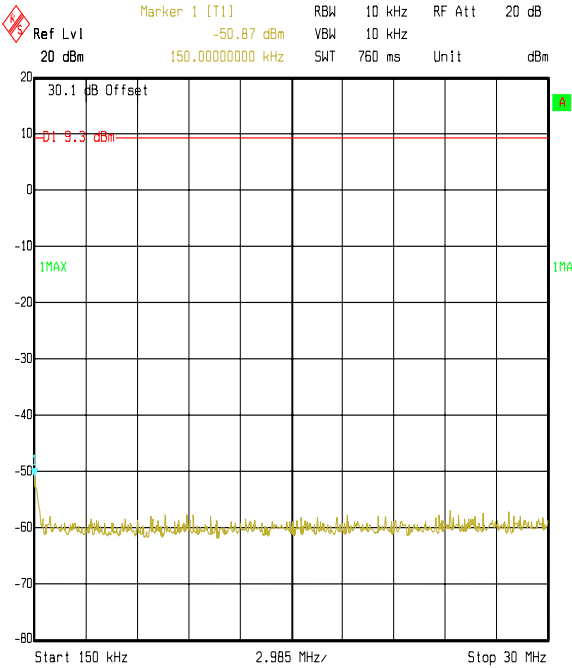
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Top channel
Date: 16.SEP.2005 11:09:38



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Top channel
Date: 16.SEP.2005 11:06:57



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Hopping mode
Date: 16.SEP.2005 10:20:27

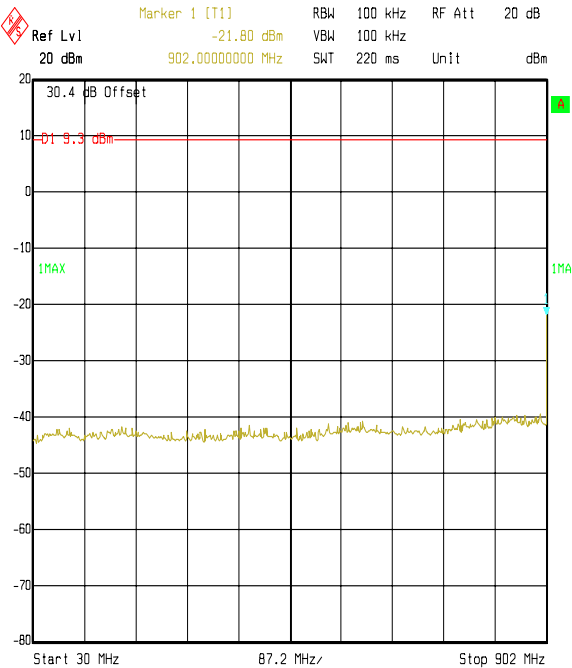


Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Hopping mode
Date: 16.SEP.2005 10:23:54

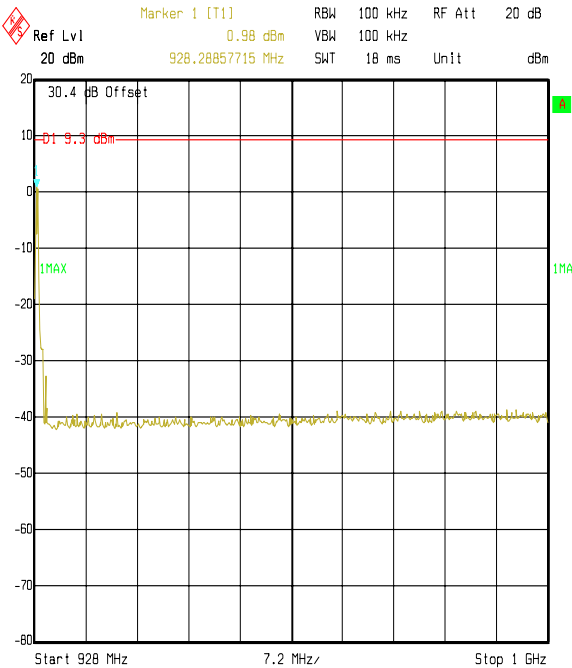
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

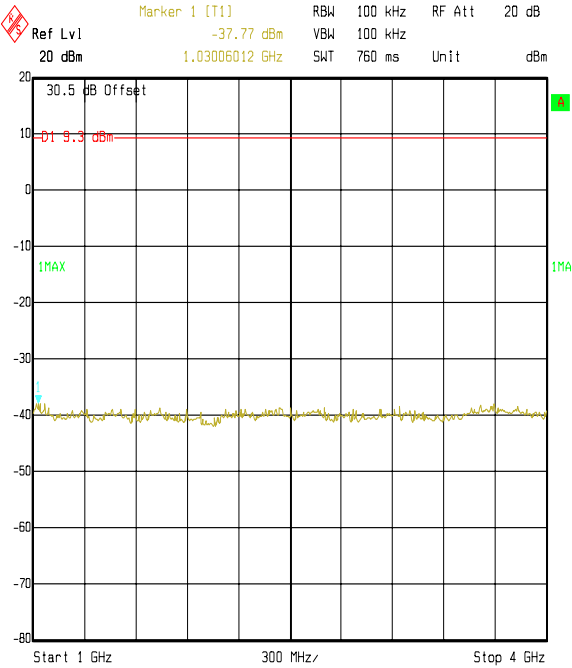
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



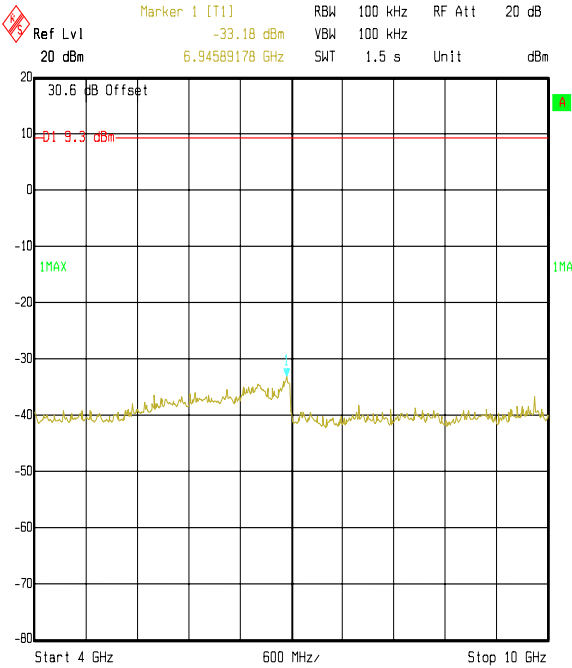
Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Hopping mode
Date: 16.SEP.2005 10:29:58



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Hopping mode
Date: 16.SEP.2005 10:27:32



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Hopping mode
Date: 16.SEP.2005 10:33:59



Title: 71376JD01 RF660 Conducted Spurious Emissions
Comment A: Hopping mode
Date: 16.SEP.2005 10:35:09

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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.10. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements: 30 to 1000 MHz (emissions occurring in the restricted bands)

The EUT was configured for radiated emission testing as described in section 9 of this report. Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Hopping Channel

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
163.941	Horiz.	33.8	43.5	9.7	Complied
167.126	Vert.	23.9	43.5	19.6	Complied
255.601	Horiz.	24.3	46.0	21.7	Complied
979.168	Horiz.	34.4	54.0	19.6	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.11. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements: 30 to 1000 MHz (emissions outside the restricted bands)

The EUT was configured for radiated emission testing as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Hopping Channel

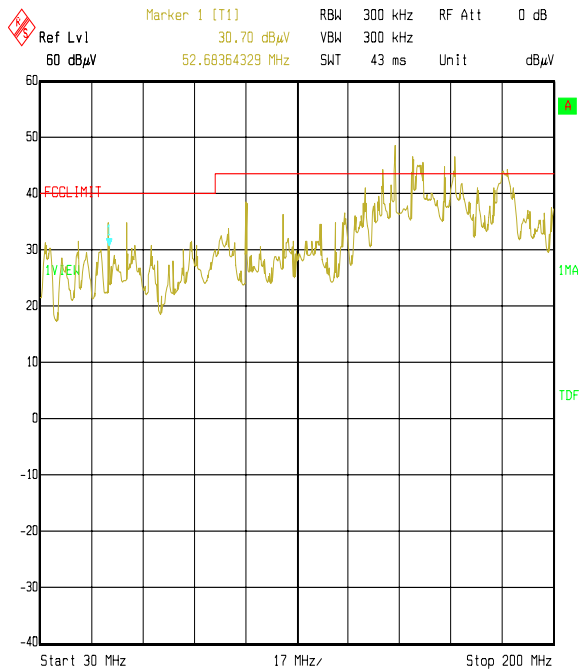
Frequency (MHz)	Antenna Polarity	Peak or RMS Averaging Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
206.101	Vert.	29.2	111.0	81.8	Complied
876.017	Horiz.	36.1	111.0	74.9	Complied
895.516	Horiz.	37.0	111.0	74.0	Complied

Note(s):

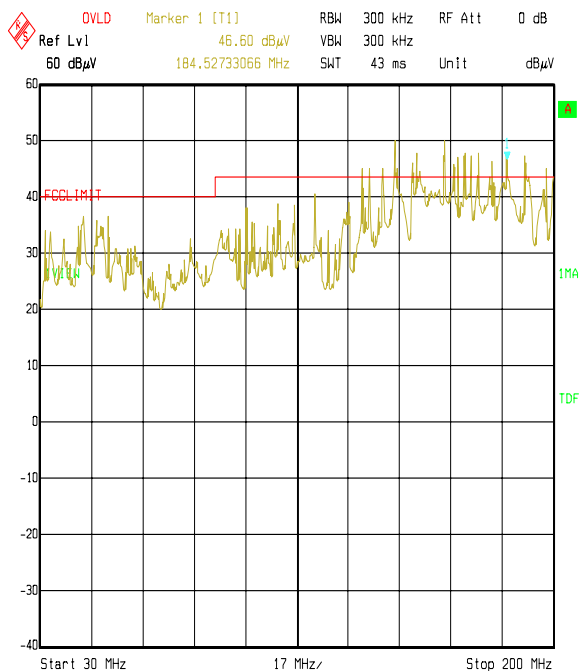
1. Plots within this section incorrectly show the test date. This is in fact an error and it has been confirmed that the date should be 13 September 2005 instead of 29 June 2005.
 2. Plots showing emissions occurring at 153.327 MHz, 217.635 MHz, 929.459 MHz, 943.888 MHz, 955.110 MHz and 959.920 MHz. These emissions were confirmed as background emissions. Therefore, no measurements were performed at these frequencies.
 3. 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.
-

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

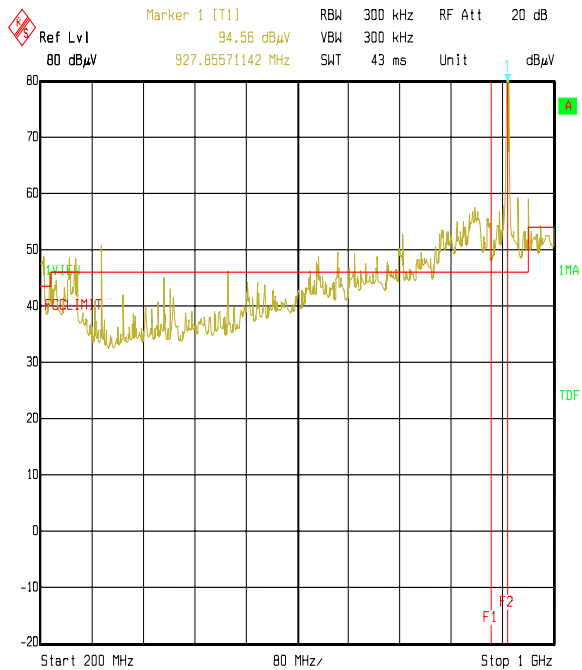
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements: 30 to 1000 MHz (emissions outside the restricted bands) (Continued)



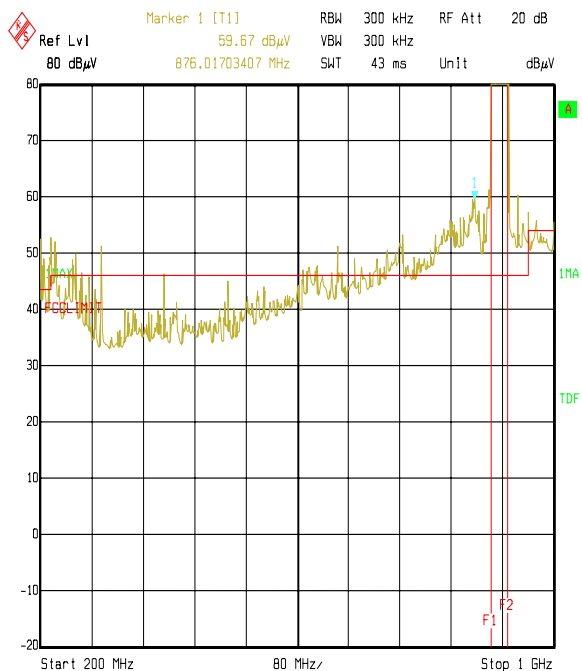
Title: 71376JD01 RF660 RAD. Emissions
Comment A: Top channel GEN 2
Date: 29.JUN.2005 12:34:18



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Hopping mode GEN 2
Date: 29.JUN.2005 12:41:29



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Top channel Gen 2
Date: 29.JUN.2005 13:36:02



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Hopping mode Gen 2
Date: 29.JUN.2005 13:41:18

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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.12. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions occurring in the restricted bands)

The EUT was configured for radiated emission testing as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1.003391	Vert.	28.0	21.5	0.5	50.0	74.0	24.0	Complied
1.081309	Vert.	29.8	21.5	0.5	51.8	74.0	22.2	Complied
2.708145	Vert.	35.7	21.7	0.9	58.3	74.0	15.7	Complied
3.611042	Horiz.	22.1	22.9	1.0	46.0	74.0	28.0	Complied
4.513855	Horiz.	29.6	24.2	1.2	55.0	74.0	19.0	Complied
5.416217	Horiz.	29.3	24.3	1.4	52.6	74.0	21.4	Complied
7.492189	Horiz.	16.3	26.9	1.6	44.8	74.0	29.2	Complied

Highest Average Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1.003391	Vert.	14.1	21.5	0.5	36.1	54.0	17.9	Complied
1.081309	Vert.	25.0	21.5	0.5	47.0	54.0	7.0	Complied
2.708145	Vert.	11.6	21.5	0.9	34.2	54.0	19.8	Complied
3.611042	Horiz.	7.6	22.9	1.0	31.5	54.0	22.5	Complied
4.513855	Horiz.	8.4	24.2	1.2	33.8	54.0	20.2	Complied
5.416217	Horiz.	-0.4	24.3	1.4	25.1	54.0	28.9	Complied
7.492189	Horiz.	7.4	26.9	1.6	35.9	54.0	18.1	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions occurring in the restricted bands) (Continued)

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1.003391	Vert.	28.0	21.5	0.5	50.0	74.0	24.0	Complied
1.081309	Vert.	29.8	21.5	0.5	51.8	74.0	22.2	Complied
2.744281	Vert.	39.1	21.7	0.9	61.7	74.0	12.3	Complied
3.659058	Horiz.	20.9	22.9	1.0	44.8	74.0	29.2	Complied
4.573753	Horiz.	30.6	24.2	1.2	56.0	74.0	18.0	Complied
7.504053	Horiz.	16.9	26.9	1.7	45.5	74.0	28.5	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions occurring in the restricted bands) (Continued)

Highest Average Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1.003391	Vert.	14.1	21.5	0.5	36.1	54.0	17.9	Complied
1.081309	Ver.	25.0	21.5	0.5	47.0	54.0	7.0	Complied
2.744281	Vert.	11.7	21.7	0.9	34.3	54.0	19.7	Complied
3.659058	Horiz.	6.9	22.9	1.0	30.8	54.0	23.2	Complied
4.573753	Horiz.	8.6	24.2	1.2	34.0	54.0	20.2	Complied
7.504053	Horiz.	7.7	26.9	1.7	36.3	54.0	17.7	Complied

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1.003391	Vert.	28.0	21.5	0.5	50.0	74.0	24.0	Complied
1.081309	Vert.	29.8	21.5	0.5	51.8	74.0	22.2	Complied
2.781805	Vert.	42.5	21.8	0.9	65.2	74.0	8.8	Complied
3.709107	Horiz.	22.5	23.0	1.1	46.5	74.0	27.5	Complied
4.636273	Horiz.	31.7	24.2	1.2	57.1	74.0	16.9	Complied
7.516984	Horiz.	17.6	26.9	1.7	46.2	74.0	27.8	Complied

Highest Average Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
1.003391	Vert.	14.1	21.5	0.5	36.1	54.0	17.9	Complied
1.081309	Vert.	25.0	21.5	0.5	47.0	54.0	7.0	Complied
2.781805	Vert.	12.3	21.8	0.9	35.0	54.0	19.0	Complied
3.709107	Horiz.	7.7	23.0	1.1	31.8	54.0	22.2	Complied
4.636273	Horiz.	8.4	24.2	1.2	33.8	54.0	20.2	Complied
7.516984	Horiz.	10.7	26.9	1.7	39.3	54.0	14.7	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions occurring in the restricted bands) (Continued)

Highest Peak Level: Hopping Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1.003391	Vert.	28.0	21.5	0.5	50.0	74.0	24.0	Complied
1.081309	Vert.	29.8	21.5	0.5	51.8	74.0	22.2	Complied
2.768125	Vert.	43.4	21.7	0.9	66.0	74.0	8.0	Complied
3.639080	Horiz.	22.9	22.9	1.0	46.8	74.0	27.2	Complied
4.633753	Horiz.	31.7	24.2	1.2	5.1	74.0	16.9	Complied
7.501240	Horiz.	15.7	26.9	1.7	44.3	74.0	29.7	Complied

Highest Average Level: Hopping Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1.003391	Vert.	14.1	21.5	0.5	36.1	54.0	17.9	Complied
1.081309	Vert.	25.0	21.5	0.5	47.0	54.0	7.0	Complied
2.768125	Vert.	12.7	21.7	0.9	35.3	54.0	18.7	Complied
3.639080	Horiz.	7.6	22.9	1.0	31.5	54.0	22.5	Complied
4.633753	Horiz.	8.6	24.2	1.2	34.0	54.0	20.0	Complied
7.501240	Horiz.	7.6	26.9	1.7	36.2	54.0	17.8	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.13. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions outside the restricted bands)

The EUT was configured for radiated emission testing as described in section 9 of this report.

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
1.805510	Vert.	47.2	21.6	0.5	69.3	111.0	41.7	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
1.829527	Vert.	47.4	21.6	0.5	69.5	111.0	41.5	Complied
5.488899	Horiz.	25.7	24.3	1.4	51.4	111.0	59.6	Complied

Highest Peak or Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
1.854592	Vert.	46.8	21.6	0.6	69.0	111.0	42.0	Complied
5.563508	Horiz.	25.6	24.3	1.4	51.3	111.0	59.7	Complied

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions outside the restricted bands) (Continued)

Highest Peak Level: Hopping Channel

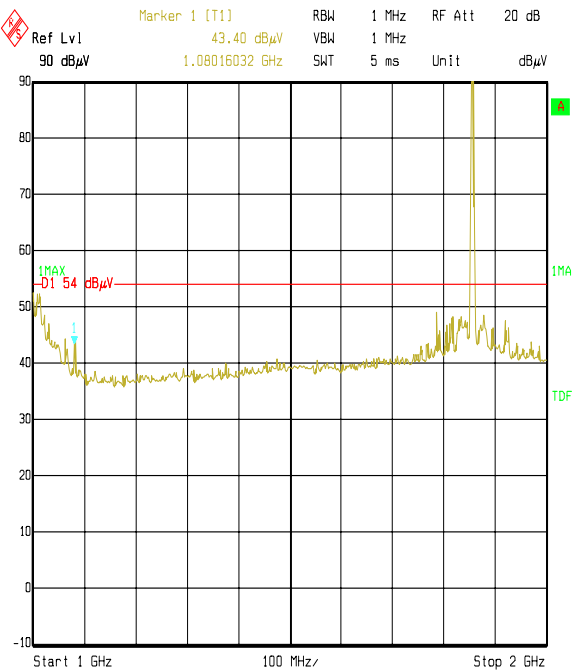
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
1.809568	Vert.	47.4	21.6	0.5	69.5	111.0	41.5	Complied
5.506234	Horiz.	27.7	24.3	1.4	53.4	111.0	57.6	Complied

Note(s):

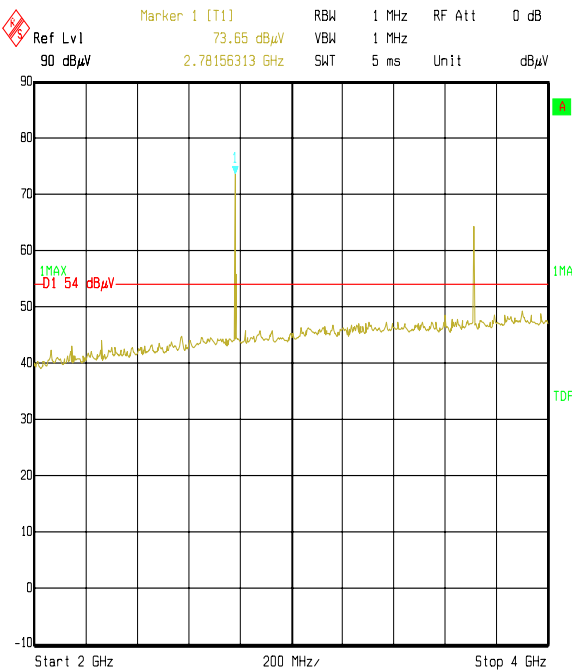
1. Plots of 1 to 21 GHz and 2 to 4 GHz have incorrectly show the test date. This is in fact an error and it has been confirmed that the date should have been 13 September 2005 instead of 29 June 2005.
-

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

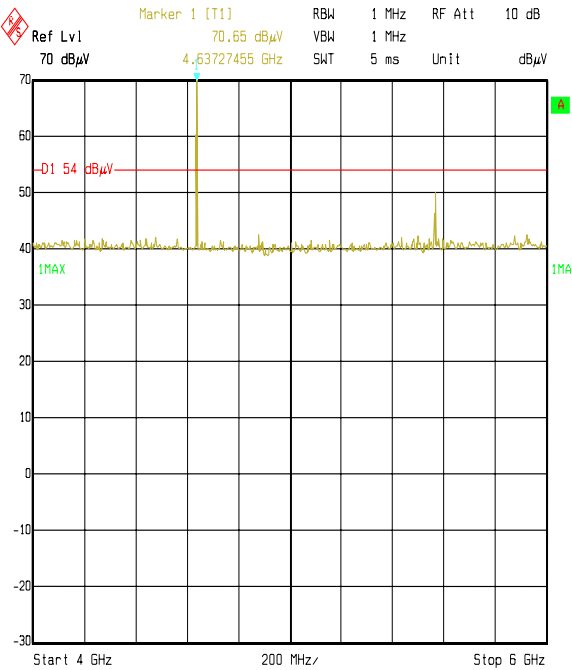
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions outside the restricted bands) (Continued)



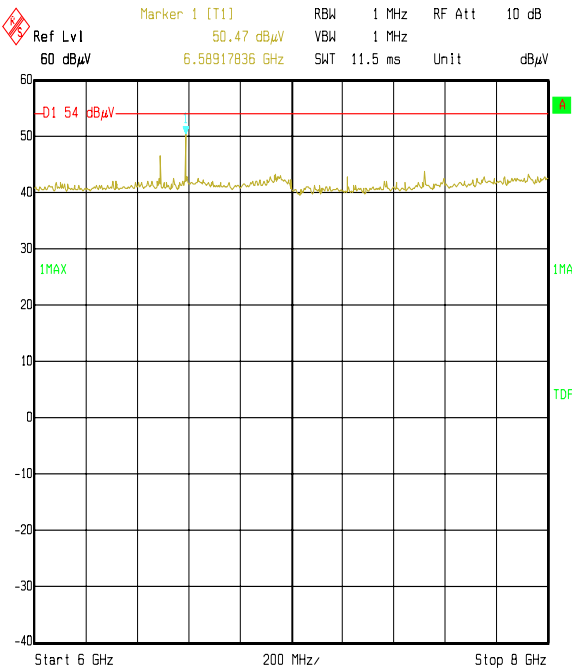
Title: 71376JD01 RF660 RAD. Emissions
Comment A: Top channel Gen 2
Date: 29.JUN.2005 15:12:06



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Top channel Gen 2
Date: 29.JUN.2005 15:07:18



Title: 71376JD01 RF660 Rad. emissions
Comment A: Top channel GEN 2
Date: 15.SEP.2005 10:27:26

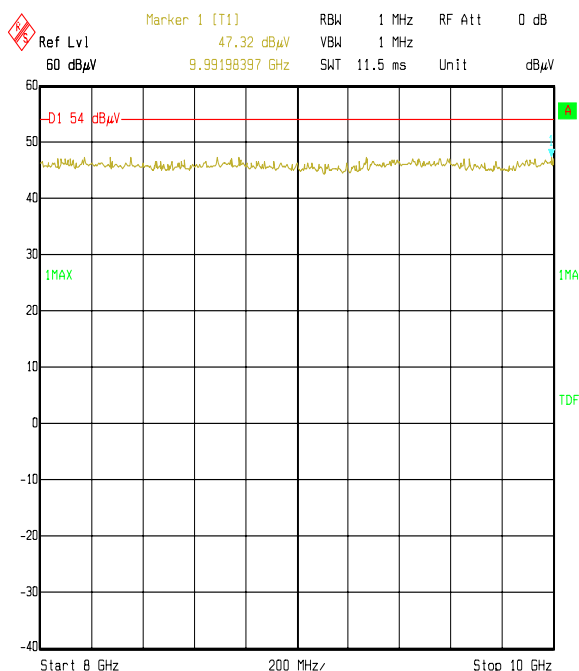


Title: 71376JD01 RF660 Rad. emissions
Comment A: Top channel GEN 2
Date: 15.SEP.2005 11:00:19

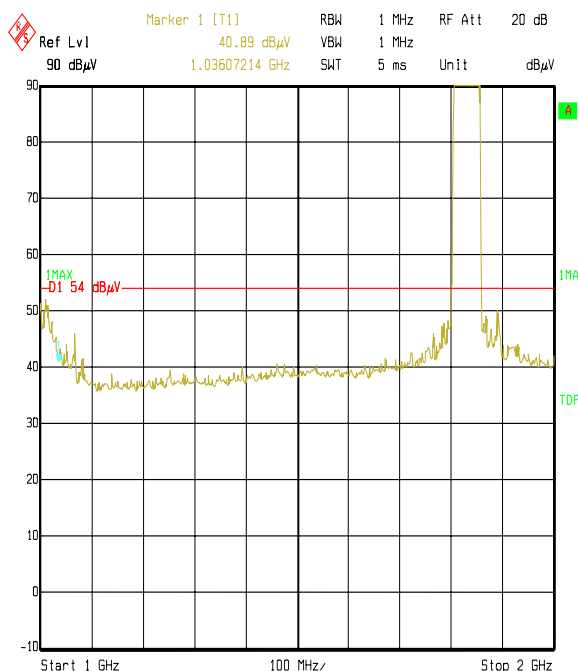
Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

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

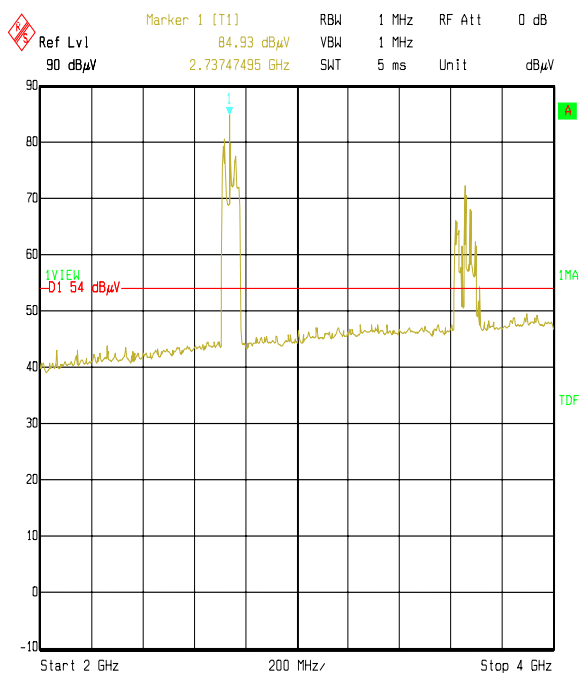
Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions outside the restricted bands) (Continued)



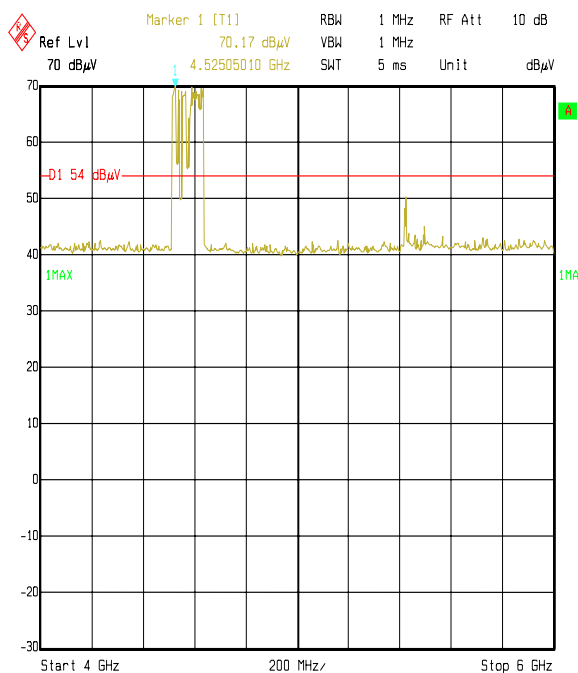
Title: 71376JD01 RF660 Rad. emissions
Comment A: Top channel GEN 2
Date: 15.SEP.2005 11:30:18



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Hopping mode Gen 2
Date: 29.JUN.2005 15:14:21



Title: 71376JD01 RF660 RAD. Emissions
Comment A: Hopping mode GEN 2
Date: 29.JUN.2005 15:00:34

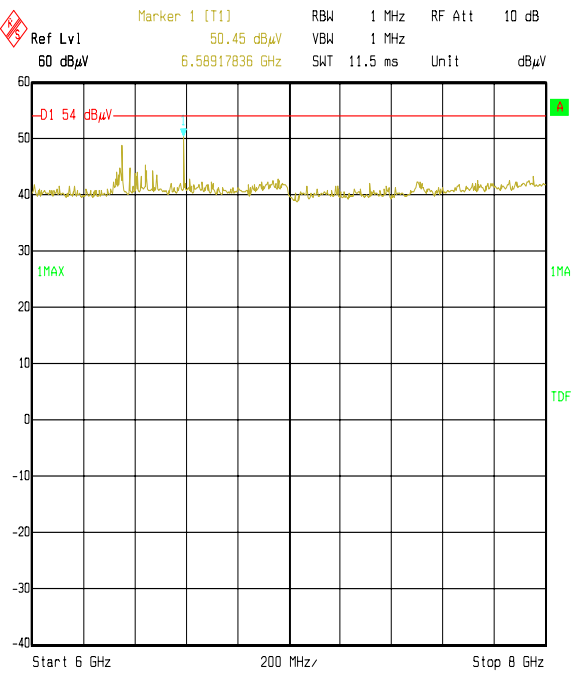


Title: 71376JD01 RF660 Rad. emissions
Comment A: Hopping mode GEN 2
Date: 15.SEP.2005 10:33:02

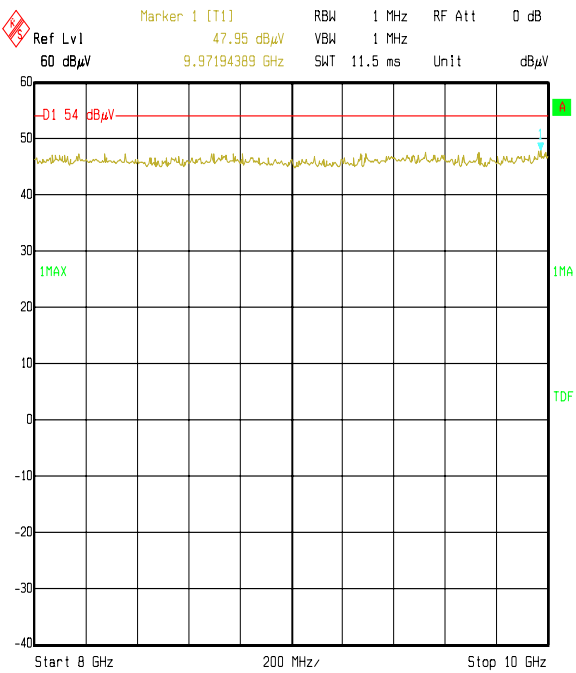
Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

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

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) - Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz) (emissions outside the restricted bands) (Continued)



Title: 71376JD01 RF660 Rad. emissions
Comment A: Hopping mode GEN 2
Date: 15.SEP.2005 10:45:43



Title: 71376JD01 RF660 Rad. emissions
Comment A: Hopping mode GEN 2
Date: 15.SEP.2005 11:31:24

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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.14. Transmitter Band Edge Conducted Emissions: Section 15.247(d)

The EUT was configured for transmitter conducted emission measurements as described in section 9 of this report.

Tests were performed to identify the maximum conducted band edge emission levels.

The limit lines shown in the hopping mode plots below are set to a level 20 dB below the measured fundamental peak power of the highest power level contained within a 100 kHz bandwidth.

The limit lines shown in the static mode plots below are set to a level 20 dB below the measured fundamental peak power of the channels closest to the lower and upper band edge in a 100 kHz bandwidth.

Results:

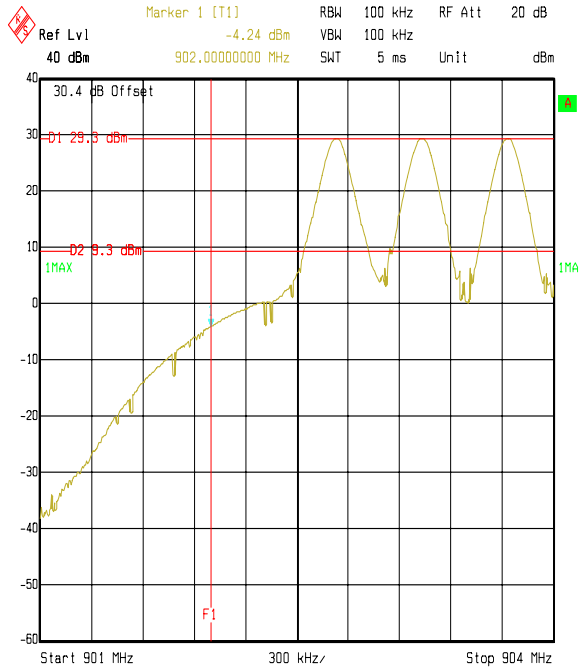
Peak Power Level Hopping Mode:

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
902	-4.2	-33.5	-20.0	13.5	Complied
928	-6.1	-35.4	-20.0	15.4	Complied

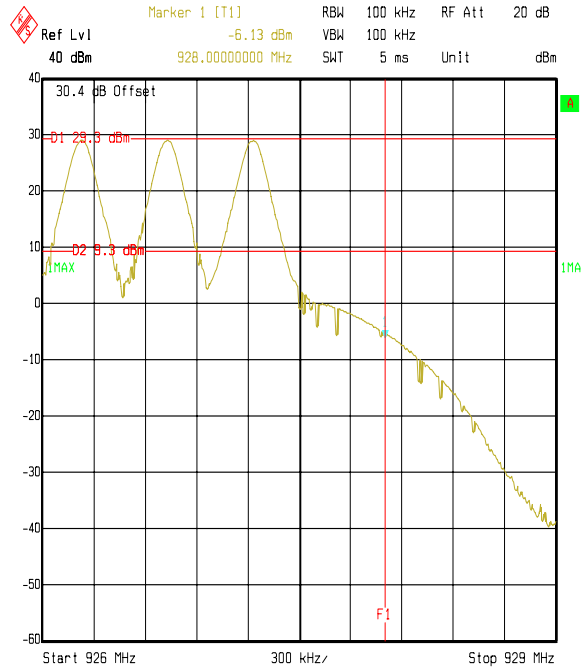
Peak Power Level Static Mode:

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
902	-4.2	-33.5	-20.0	13.5	Complied
928	-5.4	-34.2	-20.0	14.2	Complied

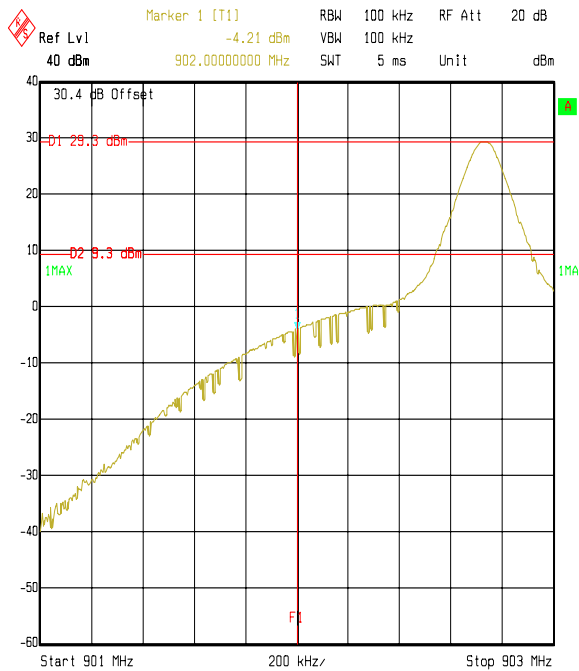
Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Transmitter Band Edge Conducted Emissions: Section 15.247(d) (Continued)

Title: 71376JD01 RF660 Conducted Bandedge
Comment A: Hopping mode
Date: 16.SEP.2005 12:17:31



Title: 71376JD01 RF660 Conducted Bandedge
Comment A: Hopping mode
Date: 16.SEP.2005 12:25:45



Title: 71376JD01 RF660 Conducted Bandedge
Comment A: Bottom channel
Date: 16.SEP.2005 12:13:28



Title: 71376JD01 RF660 Conducted Bandedge
Comment A: Top channel
Date: 16.SEP.2005 12:28:47

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

7.2.15. Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) - Electric Field Strength Measurements

The EUT was configured for band edge compliance of radiated emission measurements as described in section 9 of this report.

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

Results:

Peak Power Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
902	Vert.	70.5	23.0	4.4	97.9	111.0	13.1	Complied
928	Vert.	70.1	23.0	4.4	97.5	111.0	13.5	Complied

Average Power Level Hopping Mode:

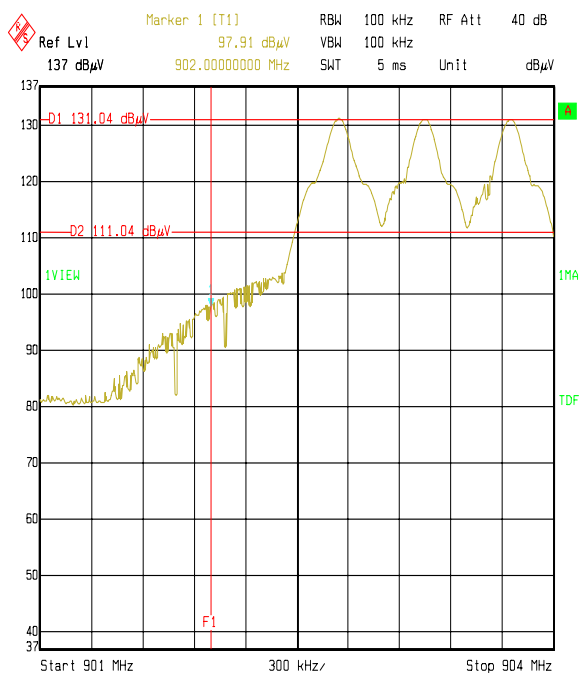
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
902	Vert.	70.5	23.0	4.4	97.9	111.0	13.1	Complied
928	Vert.	70.1	23.0	4.4	97.8	111.0	13.2	Complied

Note(s):

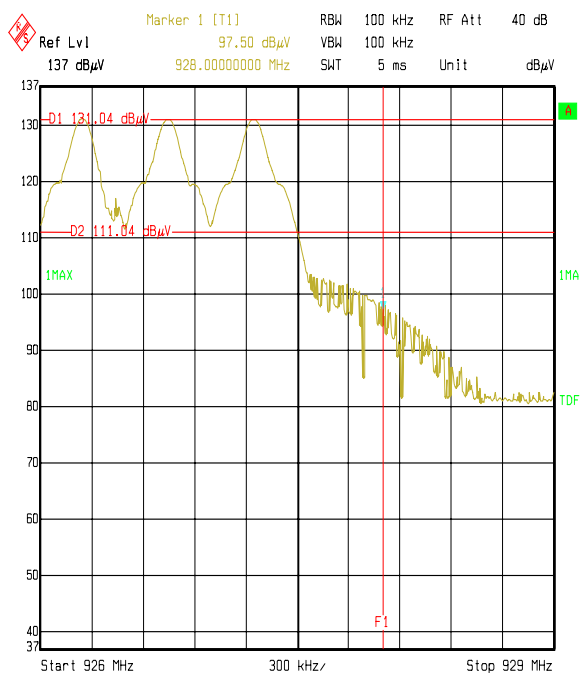
1. -20 dBc limit
 2. Peak measurements were performed on the band edge frequency 2.4835 GHz, as it lies within the restricted bands.
-

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

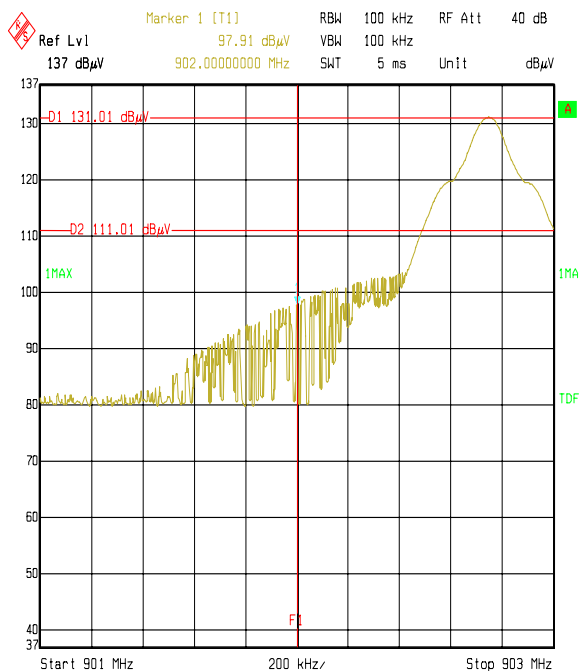
Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) - Electric Field Strength Measurements (Continued)



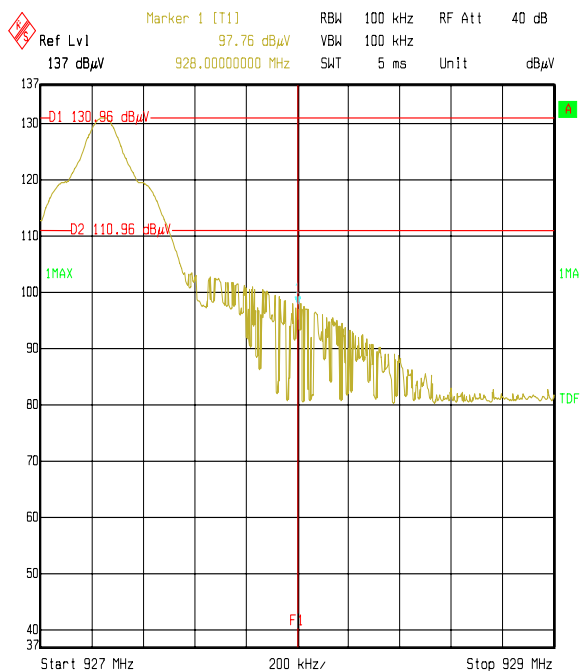
Title: 71376JD01 RF660 Rad. Bandedge
Comment A: Hopping mode GEN 2
Date: 15.SEP.2005 13:05:45



Title: 71376JD01 RF660 Rad. Bandedge
Comment A: Hopping mode GEN 2
Date: 15.SEP.2005 12:46:47



Title: 71376JD01 RF660 Rad. Bandedge
Comment A: Bottom channel GEN 2
Date: 15.SEP.2005 12:54:49



Title: 71376JD01 RF660 Rad. Bandedge
Comment A: Top channel GEN 2
Date: 15.SEP.2005 12:49:52

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

8. Measurement Uncertainty

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.

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

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

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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.25 dB
Transmitter Maximum Peak Output Power	Not applicable	95%	± 0.46 dB
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	±1.2 dB
Transmitter Carrier Frequency Separation	Not applicable	95%	±0.01 ppm
Transmitter Average Time of Occupancy	Not applicable	95%	±10%
20 dB Bandwidth	Not applicable	95%	±0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±1.78 dB

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.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

9. Measurement Methods

9.1. AC Mains Conducted Emissions

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

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with a Weinschel WA46-10, 24 V dc power supply, which in turn was powered by a 110V 60 Hz ac mains, supplied via a line impedance stabilisation network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

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

Receiver Function	Initial Scan	Final Measurements
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz	9 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	>1 s
Observation Time:	Not applicable	>15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

9.2. 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 – 2003 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.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Radiated Emissions (Continued)

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

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

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

Receiver Function	Initial Scan	Final Measurements <1 GHz	Final Measurements ≥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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

9.3. Conducted Antenna Port Emissions

Conducted antenna port emissions measurements were performed using a 100 kHz bandwidth in accordance with the standard against the appropriate limits.

Prior to testing being performed a suitable RF attenuator and cable, were calibrated for the required frequency range. For each measurement range the calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the losses in the measurement set up.

Initial measurements covering the entire measurement band in the form of swept scans were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which final measurements were necessary. To make the final measurements a peak detector was used in conjunction with the appropriate detector IF measuring bandwidth.

Repetitive scans were performed to allow for emissions with low repetition rates.

Scans were performed to the upper frequency limits as stated in 15.33(a)(1)

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

9.4. Carrier Frequency Separation / 20 dB Bandwidth

The EUT and spectrum analyser was configured as for conducted antenna port 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. The spectrum analyser was configured with a resolution bandwidth and video bandwidth greater than 1% of the frequency span.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak points on the two adjacent channels were noted and the separation between them recorded.

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.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

9.5. Average Time of Occupancy

The EUT and spectrum analyser was configured as for conducted antenna port 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.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

9.6. Peak Output Power

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

Prior to testing being performed a suitable RF attenuator and cable, were calibrated for the required frequencies. For each frequency to be measured, the calibrated level of the attenuator and cable were entered as an offset into a spectrum analyser to compensate for the measurement set up.

To determine the transmitter output power, the EUT was operated at maximum power and a result was obtained from the spectrum analyser using peak detector and trace max hold

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

9.7. 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 $\geq 1\%$ of the analyser span. The video bandwidth was set to be $\geq$ to 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

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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Calibration Date
A023	Conical Log-Spiral Antenna	EMCO	3101	3118	10/09/06
A027	Horn Antenna	Eaton	9188-2	301	06/10/06
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557	06/10/06
A073	Biconical Antenna	EMCO	3104C	9004-4249	15/12/05
A1069	ESH3-Z5	Rohde & Schwarz	ESH3-Z5	837469/012	17/01/06
A1393	HUBER + SUHNER AG	HUBER + SUHNER AG	757456	6820.17.B	Calibrated before use.
A1399	Weinschel Associates	Weinschel Associates	WA46-10	A126	Calibrated before use.
A1534	Preamplifier 1-26.5 GHz	Hewlett Packard	8449B OPT H02	3008A00405	29/07/06
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128	02/07/07
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139	06/10/06
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519	06/10/06
A259	Bilog Antenna	Chase	CBL6111	1513	21/02/06
A364	WG 24 isolator	MRI	FRU-600	131	Calibrated before use.
A392	3 dB attenuator (9)	Suhner	6803.17.B	None	01/01/10
C1082	Rosenberger Cable 2m	Rosenberger	FA210A1020M5 050	28463-1	Calibrated before use.
C1117	Cable	None	None	None	Calibrated before use.
C387	Cable	Rosenberger	UFB 293B-1-0720-50x51 FSCM 64639	97B1011	Calibrated before use.
C453	Cable	Rosenberger	RG142XX-001-RFIB	C453-10081998	Calibrated before use.
C461	Cable	Rosenberger	UFA210A-1-1182-704704	98H0305	Calibrated before use.

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Calibration Date
C468	N-Type Coaxial Cable	Rosenberger	UFA210A-1-3937-504504	98L0440	29/01/06
G023	OPT.H64 Amplifier	Hewlett Packard	8447F	3113A05059	Calibrated before use.
L0794	Power Meter	Anritsu	ML243A	00500068	06/09/06
L0796	Swept Signal Generator	Agilent	83630B	3844A00937	06/09/06
L0799	AC Power Supply	Kikusui	PCR 1000LA	JA002944	07/09/06
L0800	Power Sensor	Anritsu	MA2474A	001688	07/09/06
L0803	2-4 GHz Horn Antenna	Electro-Metrics	EM-7021	106	07/09/06
L0804	1 - 2.5 GHz Horn Antenna	Electro-Metrics	EM-7020	106	07/09/06
M003	Spectrum Monitor (VDU)	Rohde & Schwarz	EZM	883 580/008	Not Applicable.
M044	ESVP Receiver	Rohde & Schwarz	ESVP	891 845/026	11/03/06
M090	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:838494/005 RU:836833/001	05/11/05
M1242	FSEM30 Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986_022	25/08/06
M128	Fluke 76 DVM	Fluke	76	65340273	29/11/05
M142	Audio Analyser	Neutrik	A2	945	18/08/05
M517	Fluke 77 DMM	Fluke	JF77 Series	63150434R	07/04/06
S0520	DC Power Supply	GW instek	GPC-3030	E835141	25/02/06
S201	Site 1	RFI	1	None	08/11/05
S202	Site 2	RFI	2	S202-15011990	Calibrated before use.
S212	Site 12	RFI	12	None	Calibrated before use.

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

Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

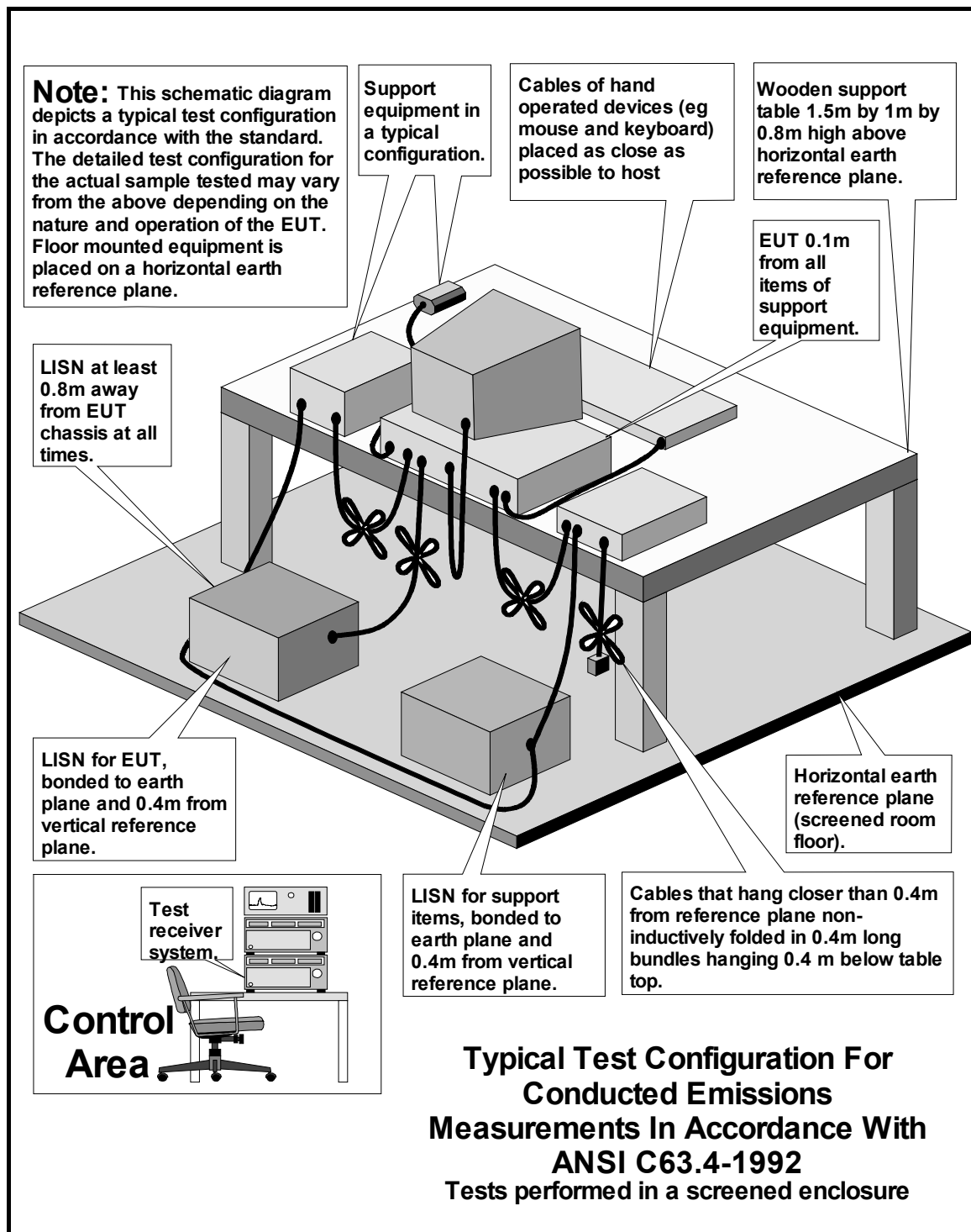
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\71376\EMICON	Test configuration for measurement of conducted emissions.
DRG\71376\EMIRAD	Test configuration for measurement of radiated emissions.

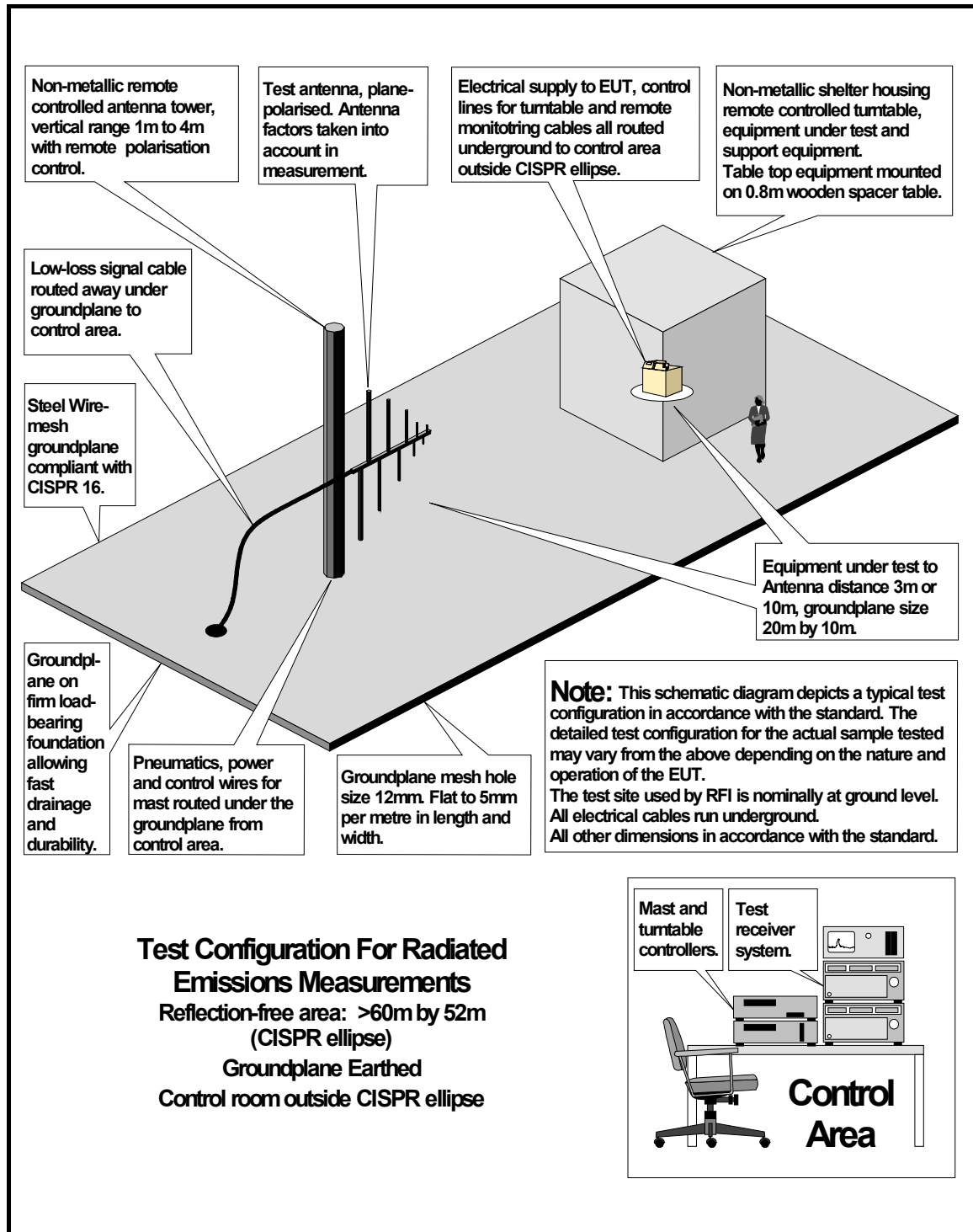
Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

DRG\71376\EMICON



Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

DRG\71376\EMIRAD



Test of: Roke Manor.
RF660R Portal Reader.
To: FCC Part 15.247: 2004 (Subpart C)

This page has been left intentionally blank.
