TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Plextek Ltd.
Blighter 202

To: FCC Part 90 in accordance to RFI Test Plan RFI/REGA1/TP47865JD01

Test Report Serial No:
RFI/MPTE3/RP48350JD08A

Supersedes Test Report Serial No:
RFI/MPTE2/RP48350JD08A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager: 	
Tested By: Nigel Davison 	**Checked By: Steven Wong**  **pp**
Report Copy No: PDF01	
Issue Date: 23 January 2007	**Test Dates: 24 July 2006 to 28 July 2006**

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Test of: Plextek Ltd.
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Table of Contents

1. Client Information

Company Name:	Plextek Ltd
Address:	London Road Great Chesterford Essex CB10 1NY
Contact Name:	Mr T Allen

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)

Description:	Radar
Brand Name:	Blighter
Model Name or Number:	202
Serial Number:	8B1010
Hardware Revision:	Build Standard Note: 8BYB0501
Software Revision:	8BS25022
Software Version Number:	Version 8 of FPGA Code
FCC ID:	UFQ-Blighter-202
Country of Manufacture:	United Kingdom
Date of Receipt:	24 July 2006

Description:	Power Cable
Brand Name:	Blighter
Model Name or Number:	Not Applicable
Serial Number:	8B342
Country of Manufacture:	United Kingdom
Date of Receipt:	24 July 2006

Description:	LAN Cable
Brand Name:	Blighter
Model Name or Number:	Not Applicable
Serial Number:	8B335
Country of Manufacture:	United Kingdom
Date of Receipt:	24 July 2006

2.2. Description of EUT

The equipment under test is a radar designed for the detection of moving objects, including people and vehicle, utilising a low cost, e-scan antenna technology. It is intended for local area surveillance.

2.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

2.4. Additional Information Related to Testing

Power Supply Requirement:	DC Supply of 12-24 V, 6A		
Equipment Category:	Radar		
Type of Unit:	Portable DC Supplied		
Interface Ports:	LAN 1. LAN 2, Power, Debug, Utility, WLAN Antenna and Earth Strap		
Transmit Frequency Range:	15.713 to 17.123		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (GHz)
	Bottom	0	15.713
	Middle	3	16.223
	Top	7	17.123
Highest Unintentionally Generated Frequency:	None Stated		
Highest Fundamental Frequency:	17.123 GHz		
Occupied Bandwidth:	17-18 MHz		

2.5. Support Equipment

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

Description:	Laptop
Brand Name:	ACER
Model Name or Number:	Travel Mate 290LCi
Serial Number:	LXT350602133511623EB00

Description:	Utility Cable
Brand Name:	Blighter
Model Name or Number:	Not Applicable
Serial Number:	8B224

Description:	Tripod
Brand Name:	Not Applicable
Model Name or Number:	00-1135-9005
Serial Number:	Not Applicable

3. Test Specification, Methods and Procedures

3.1. Test Specifications

Reference:	FCC Part 90: 01 October 2005
Title:	Code of Federal Regulations, Part 90 (47CFR90) Private Land Mobile Radio Services.

3.2. 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

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

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

There were no deviations from the test specification.

5. Operation of the EUT During Testing

5.1. Operating Modes

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

Transmitting on top, middle and bottom channels.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

Standalone.

6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliancy Status
Transmitter Carrier Output Power	C.F.R. 47 FCC Part 2.1046	Antenna Terminals	* Not Applicable
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 2.1049	Antenna Terminals	* Not Applicable
Transmitter Radiated Emissions (Out of Band) (30 MHz to 85 GHz)	C.F.R. 47 FCC Part 2.1053	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 2.1053	Antenna	Complied
Transmitter Frequency Stability (Temperature)	C.F.R. 47 FCC Part 2.1055	Antenna Terminals	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 2.1055	Antenna Terminals	Complied

Note(s):

** As no limits are stated in the standard compliancy cannot be stated at this stage.*

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.

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 8 for details of measurement uncertainties.

7.2. Transmitter Carrier Output Power: Sections 2.1046

The EUT was configured as for conducted RF output power as described in section 9 of this report.

Tests were performed to identify the EUT's maximum conducted transmit power.

Results:

Channel	Frequency (GHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)
Bottom	15.713	32.0	20.0	52.0
Middle	16.223	31.6	20.0	51.6
Top	17.123	32.2	20.0	52.2

7.3. Transmitter Occupied Bandwidth (Bandwidth Limitations): Sections 2.1049

7.3.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 9 of this report.

7.3.2. Tests were performed to identify the maximum bandwidth occupied by the fundamental frequency of the EUT.

Results:

Channel	Frequency (GHz)	RBW (kHz)	VBW (kHz)	Occupied Bandwidth (MHz)
Bottom	15.713	300	1000	15.596
Middle	16.223	300	1000	15.763
Top	17.123	300	1000	15.663

Note(s):

1. The occupied bandwidth was measured using the occupied bandwidth function of the R&S measurement analyser (ESIB).

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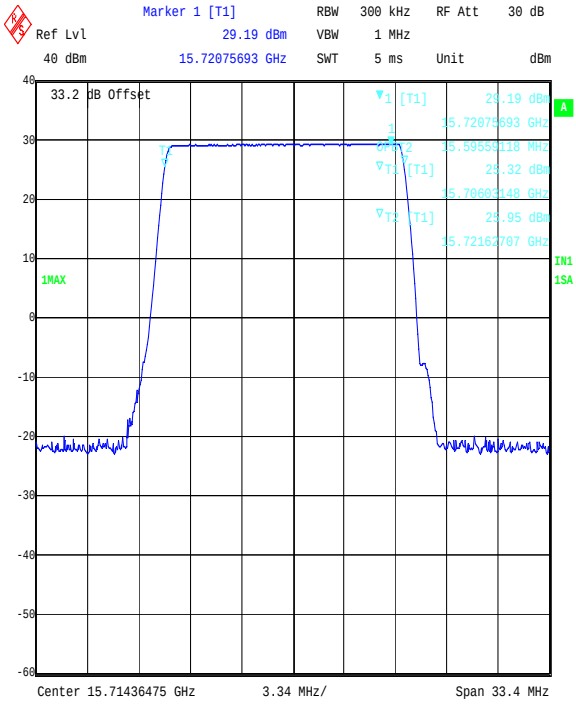
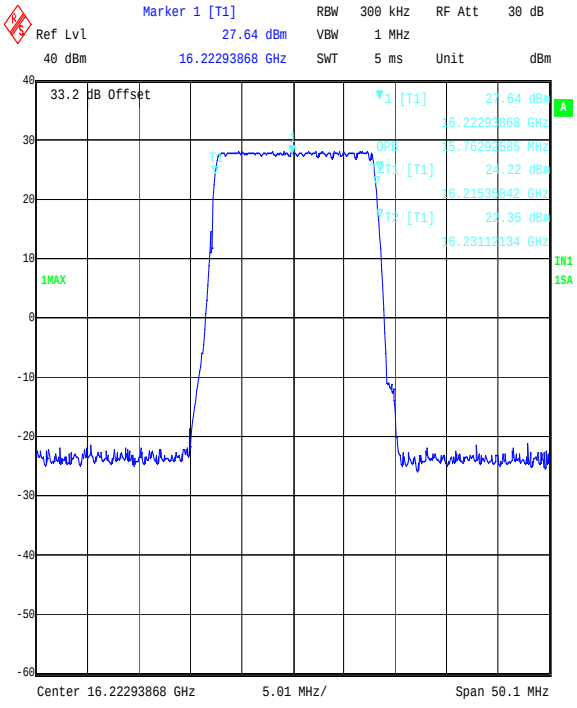
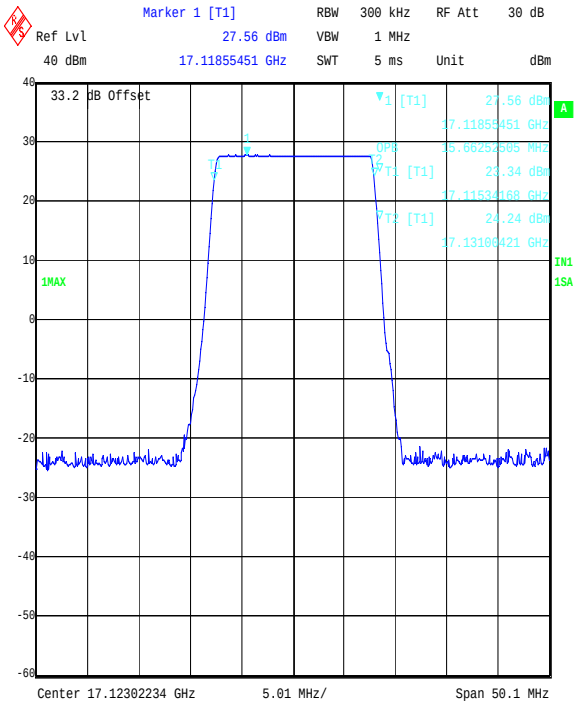
Transmitter Occupied Bandwidth (Bandwidth Limitations): Sections 2.1049 (Continued)







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

7.4. Transmitter Radiated Emissions: Section 2.1053

7.4.1. The EUT was configured as for transmitter radiated emissions testing as described in Section 9 of this report.

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

Results:

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
6989.979	-27.2	-79.4	-65.2	14.2	Complied

Note(s):

1. As no spurious emissions were noted the highest noise floor reading was taken.

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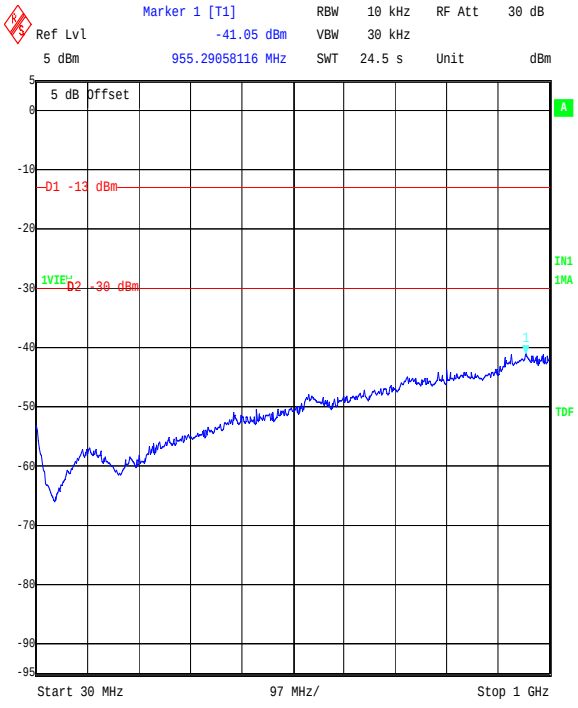
Transmitter Radiated Emissions: Section 2.1053 (Continued)



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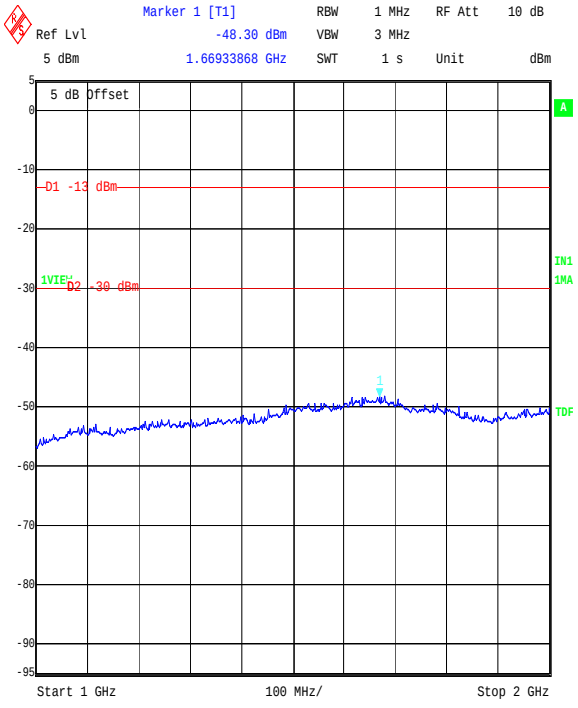

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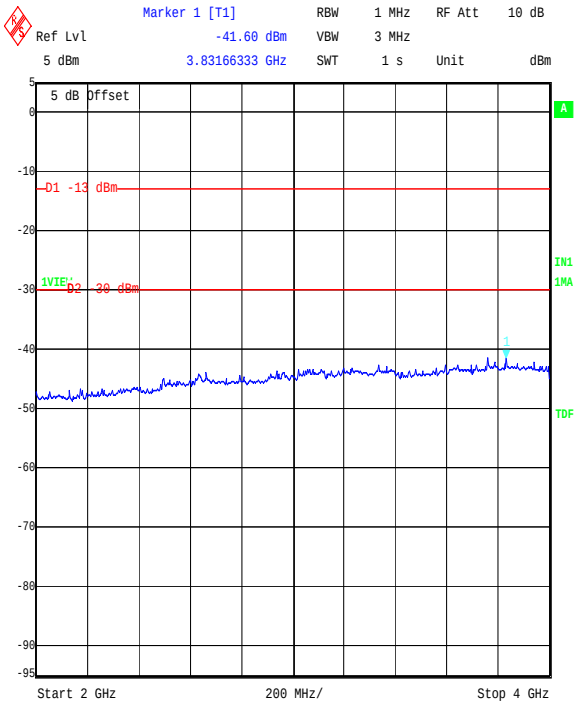

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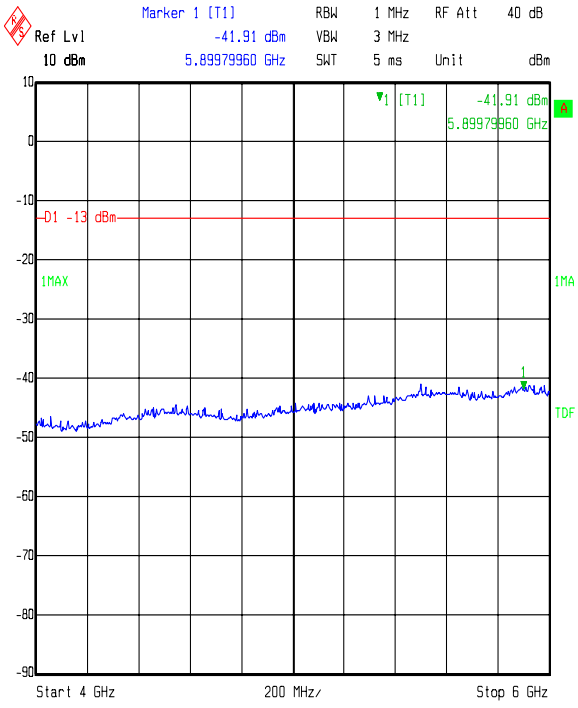

Date: 25.JUL.2006 17:03:18

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

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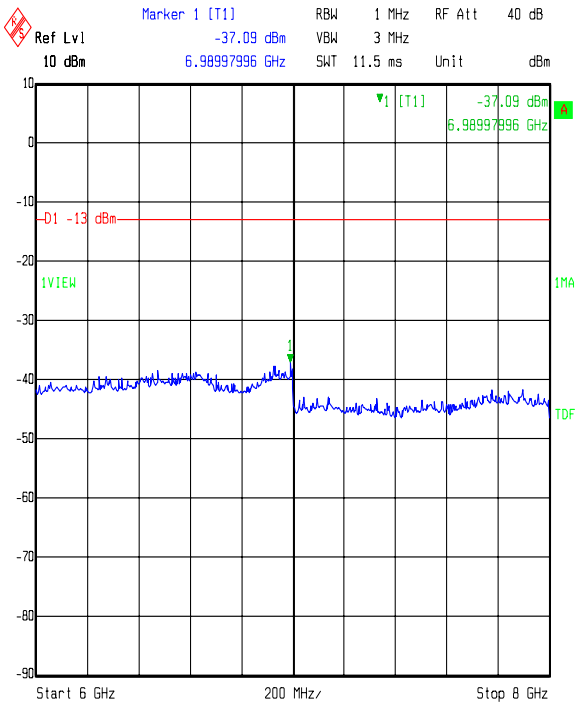
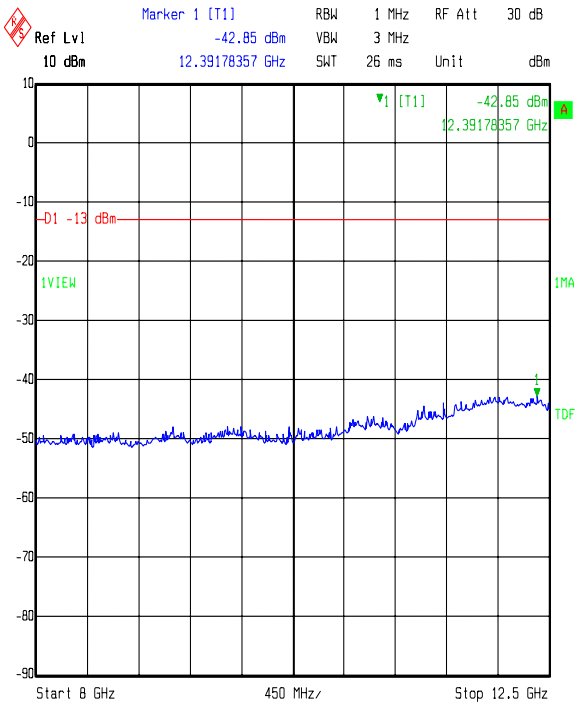
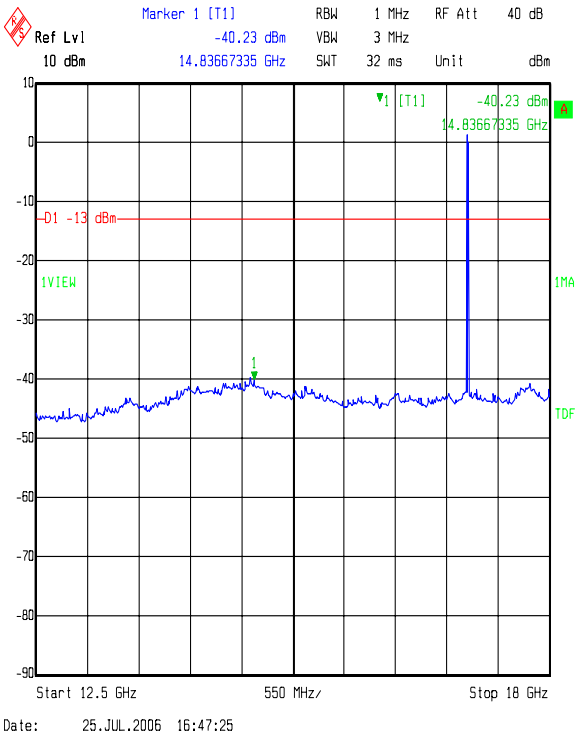
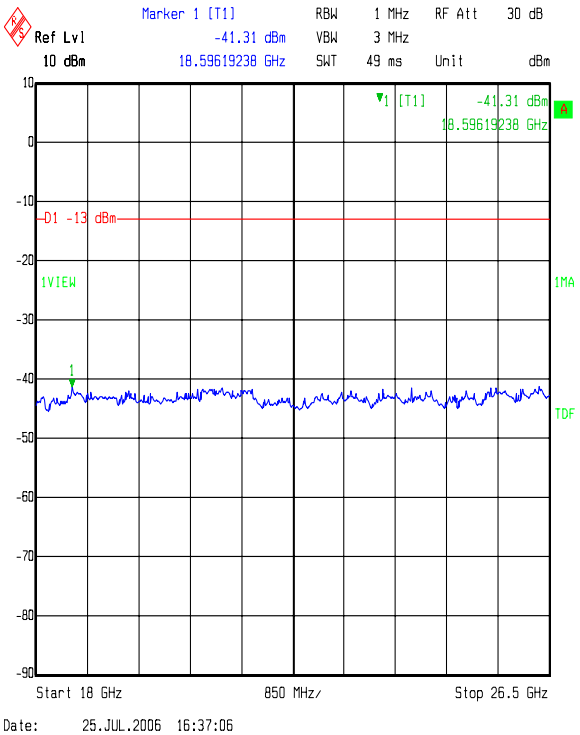
Transmitter Radiated Emissions: Section 2.1053 (Continued)



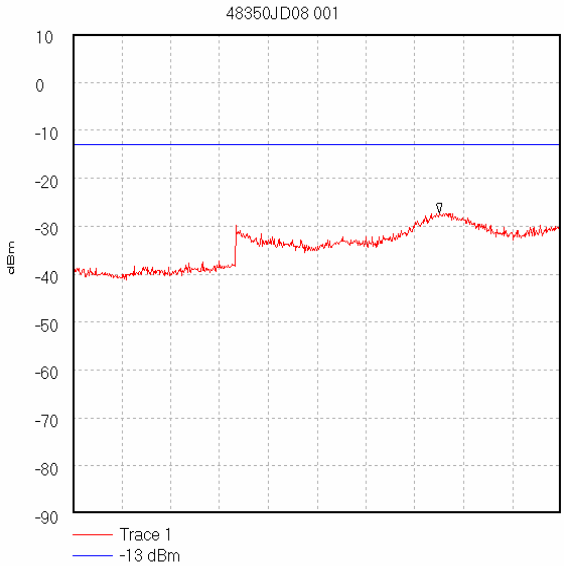




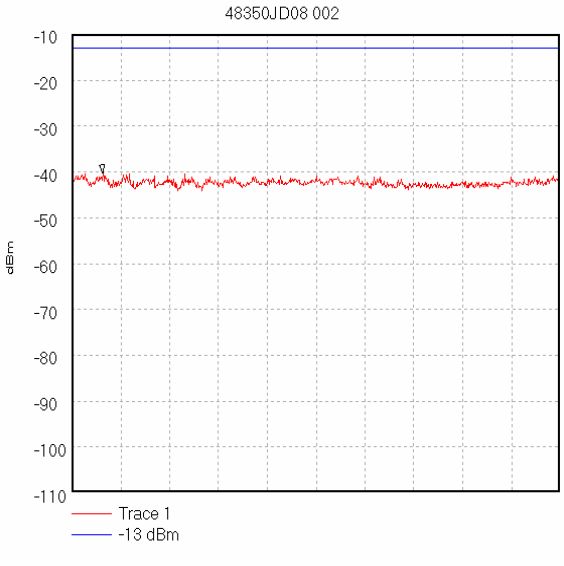


Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables. Note that the emission indicated on the 12.5GHz to 18GHz plot is the transmitter carrier.

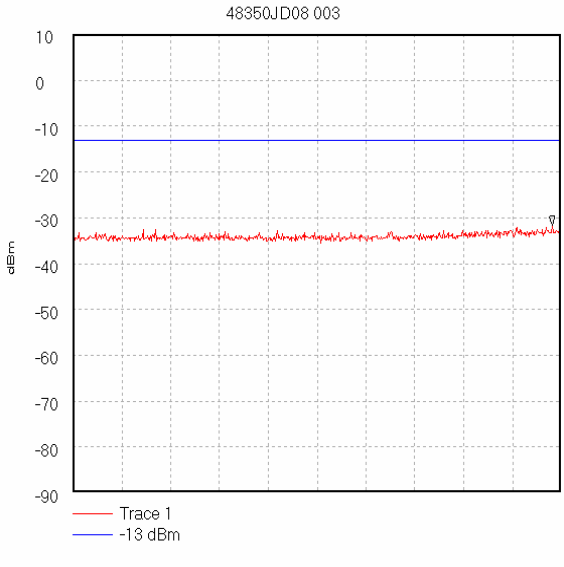
Transmitter Radiated Emissions: Section 2.1053 (Continued)



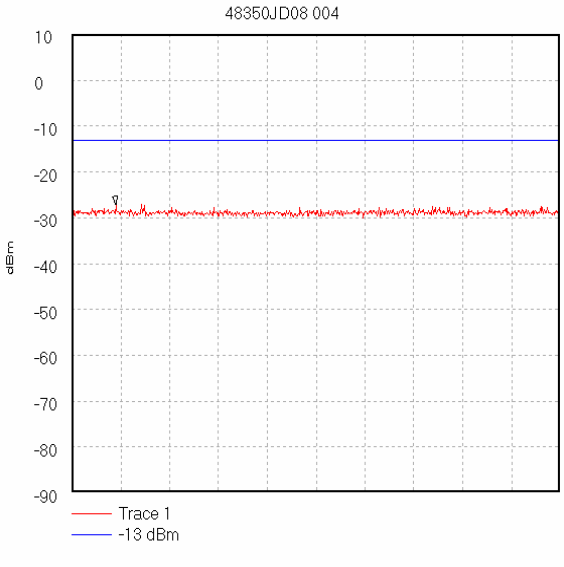
Start 26.5 GHz; Stop 40.0 GHz
Ref 10 dBm; Ref Offset 25.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 10 dB; Swp 270.0 mS
Peak 36.625 GHz, -27.33 dBm
Display Line: -13 dBm;
25/07/2006 11:43:01



Start 40.0 GHz; Stop 60.0 GHz
Ref -10 dBm; Ref Offset 28.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Cnv Loss 23.5 dB; Swp 130.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 41.266667 GHz, -40.33 dBm
Display Line: -13 dBm;
25/07/2006 12:16:13



Start 60.0 GHz; Stop 75.0 GHz
Ref 10 dBm; Ref Offset 25.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Cnv Loss 34.55 dB; Swp 97.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 74.725 GHz, -31.67 dBm
Display Line: -13 dBm;
25/07/2006 12:35:30



Start 75.0 GHz; Stop 86.0 GHz
Ref 10 dBm; Ref Offset 25.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Cnv Loss 41.5 dB; Swp 71.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 75.99 GHz, -27.17 dBm
Display Line: -13 dBm;
25/07/2006 12:43:17

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

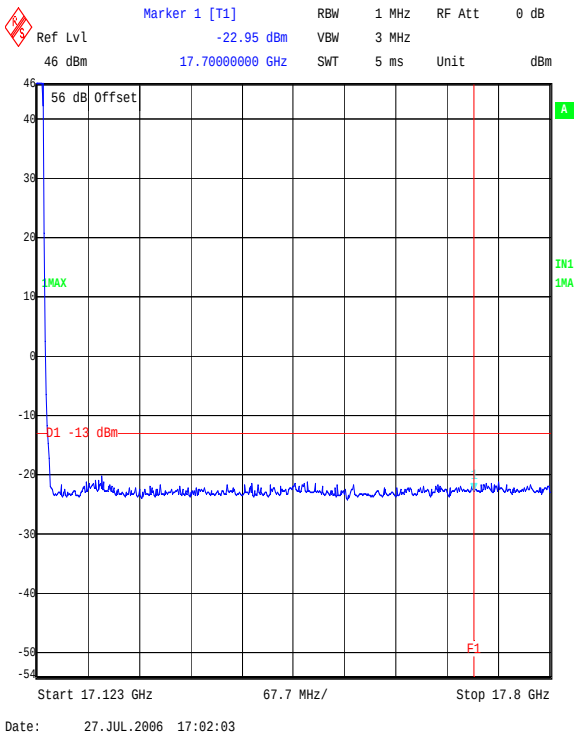
7.5. Transmitter Radiated Emission Band Edges: 2.1053

7.5.1. The EUT was configured as for transmitter radiated emissions testing as described in Section 9 of this report.

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

Results: Upper

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
17700	-23.0	75.2	65.2	10	Complied



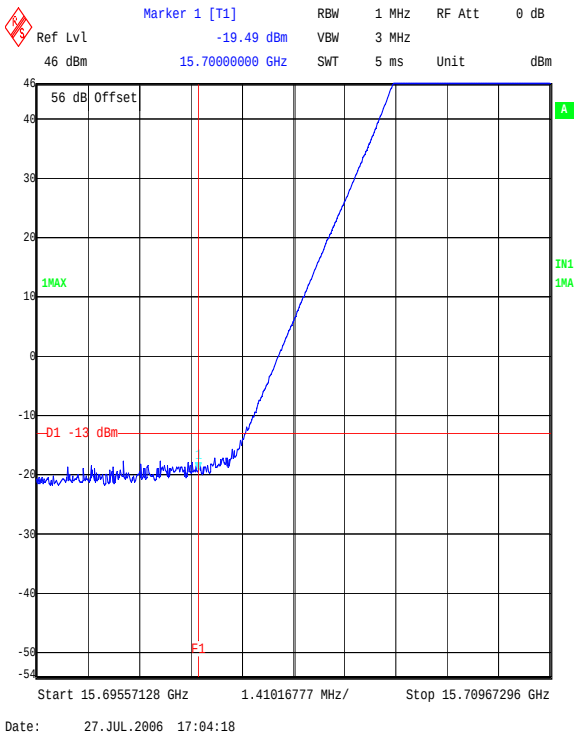
7.6. Transmitter Radiated Emission Band Edges: 2.1053

7.6.1. The EUT was configured as for transmitter radiated emissions testing as described in Section 9 of this report.

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

Results: Lower

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
15700	-19.5	71.5	65.2	6.3	Complied



7.7. Transmitter Frequency Stability (Temperature Variation): Sections 2.1055

7.7.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

7.7.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

Results:

Bottom Channel

Temperature (°C)	Measured Frequency (GHz)	Lower Band Edge Limit (GHz)	Margin (GHz)	Result
-30	15.702461	15.7	0.002461	Complied
-20	15.702929	15.7	0.002929	Complied
-10	15.702471	15.7	0.002471	Complied
0	15.702599	15.7	0.002599	Complied
10	15.702694	15.7	0.002698	Complied
20	15.702752	15.7	0.002752	Complied
30	15.702747	15.7	0.002747	Complied
40	15.702778	15.7	0.002778	Complied
50	15.703030	15.7	0.003030	Complied

7.8. Transmitter Frequency Stability (Temperature Variation): Sections 2.1055

7.8.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

7.8.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

Results:

Top Channel

Temperature (°C)	Measured Frequency (GHz)	Upper Band Edge Limit (GHz)	Margin (GHz)	Result
-30	17.137721	17.7	0.562279	Complied
-20	17.134491	17.7	0.565509	Complied
-10	17.134722	17.7	0.565277	Complied
0	17.134592	17.7	0.565408	Complied
10	17.134122	17.7	0.565878	Complied
20	17.134813	17.7	0.565187	Complied
30	17.135108	17.7	0.564892	Complied
40	17.134779	17.7	0.565221	Complied
50	17.135101	17.7	0.564899	Complied

7.9. Transmitter Frequency Stability (Voltage Variation): Sections 2.1055

7.9.1. The EUT was configured as for frequency stability measurements as described in Section 9 of this report.

7.9.2. Tests were performed to identify the maximum frequency error of the EUT with variations in ambient temperature.

Results:

Bottom Channel

Temperature (°C)	Measured Frequency (GHz)	Band Edge Limit (GHz)	Margin (GHz)	Result
10.2	15.702966	15.7	0.002966	Complied
24.0	15.702863	15.7	0.002863	Complied
27.6	15.702931	15.7	0.002931	Complied

Top Channel

Temperature (°C)	Measured Frequency (GHz)	Band Edge Limit (GHz)	Margin (GHz)	Result
10.2	17.134464	17.7	0.565536	Complied
24.0	17.134516	17.7	0.565484	Complied
27.6	17.133967	17.7	0.566033	Complied

8. Measurement Uncertainty

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 86 GHz	95%	+/- 2.94 dB
Carrier Output Power (EIRP)	30 MHz to 26.5 GHz	95%	+/- 2.94 dB
Occupied Bandwidth	N/A	95%	+/- 0.12%
Frequency Stability	Not applicable	95%	+/- 11.37 ppm

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.

9. Measurement Methods

9.1. Transmitter Carrier Output Power (Conducted)

The EUT and communications analyser were configured as per ANSI TIA-603-B, Land Mobile FM or PM Communications Equipment; Measurement and Performance Standards.

A communications analyser was connected to a temporary antenna port of the EUT via a suitable cable. Prior to testing being performed the cable was calibrated for loss at the required frequency. For each frequency under test, the calibrated level of cable loss was noted and then added to the level indicated on the communications analyser. In order to obtain EIRP, the stated antenna gain was added to the conducted power.

9.2. Occupied (20 dB) Bandwidth

The EUTwas connected to a spectrum analyser enabled with an occupied bandwidth function via an temporary antenna connection via suitable attenuation.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured from the fundamental emission at the bottom, middle and top channels. The Occupied Bandwidth was measured in line with the requirements of 2.1049 i.e. EUT modulated with a signal representing the maximum rated conditions under which it will operate (worst case)

The occupied bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB or ESIB spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained. The analyser automatically configures the measurement bandwidths to make an accurate measurement based on the channel bandwidth and channel spacing of the EUT.

9.3. Transmitter Radiated Emissions

The EUT and spectrum analyser were configured as per ANSI TIA-603-B, Land Mobile FM or PM Communications Equipment; Measurement and Performance Standards.

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

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency were performed in order to identify frequencies on which the EUT was generating spurious emissions. This determined the frequencies from the EUT that required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m, below 4 GHz; above 4 GHz a 1m and 10cm measurement distances was used. All levels were corrected for the reduced distances. A limit line was set to the specification limit; levels within 20 dB of this limit were measured where possible, where the receiver noise floor came to within the 20dB of the limit, the system noise floor may have been recorded.

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.

An open area test site using the appropriate test distance and spectrum analyser with an peak detector was used for final measurements. All measurements on the open area test site were performed using broadband antennas.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. 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. The procedure was repeated for the vertical polarisation.

Once the final amplitude (maximised) had been obtained and noted, the EUT was replaced by a substitution antenna, and a substitution method applied. The substitution antennas used were a horn antenna for measurements greater then or equal to 1 GHz and a dipole for measurements below 1 GHz. 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:-

ERP = Signal Generator Level - Cable Loss + Antenna Gain

Once the ERP was obtained, the difference between it and the level of the fundamental emission for the ERP of the channel under test was noted at the spurious attenuation level in dBc. The following formula was used as described in TIA-603-B.

$$dB = 10 \log_{10} \left(\frac{TX\ power\ in\ watts}{0.001} \right) - \text{spurious level (dBm)}$$

For frequencies further than 250% of the authorized bandwidth from the centre of the assigned frequency (fc) the emissions shall be attenuated by at least 50 dBs or 55 + iolog P (dB) which ever is the lesser attenuation relative to the transmitter unmodulated carrier output power level measured for the channel under test. The tabulated results in the results section of this report show the spurious emission in dBm and as attenuation relative to the carrier in dBc.

9.4. Transmitter Frequency Stability

The EUT and communications analyser were configured as per ANSI TIA-603-B, Land Mobile FM or PM Communications Equipment; Measurement and Performance Standards.

The EUT was situated within an environmental test chamber and monitored with a spectrum analyser via an temporary antenna port.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range -30°C to 50°C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for hand carried battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

The frequency was measured at the spurious emissions limit(-13dBm) for both upper and lower channels, this level was then compared with authorised upper and lower band edges. The margins were reported.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval Months
A028	Horn Antenna	Eaton	91888-2	304	08 June 2006	36
A1362	Eaton	Stoddart Aircraft Radio Co., Inc.	91889-1	N/A	08 June 2006	12
A1534	Preamplifier 1-26.5 GHz	Hewlett Packard	8449B OPT H02	3008A00405	Cal before use	-
A248	60 dB Variable Attenuator	Narda	743-60	01411	12 Jan 2006	12
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128	02 Jul 2004	36
A427	WG 14 horn	Flann	14240-20	150	12 Jan 2006	12
C1164	1.5m N-type Cable	Rosenberger Micro-Coax	FA210A101 5007070	43188-1	Cal before use	-
C1166	2m N-Type Cable	Rosenberger Micro-Coax	FA210A102 0007070	43189-02	Cal before use	-
C1193	Microwave Coax	Utiflex	FA147A101 5M2020A	BUA02C 0154	05 May 2006	12
M1012	HP 11970A	Hewlett Packard	11970A	3003A07397	Cal before use	-
M1122	40 GHz Peak Power Sensor	Boonton Electronics	57340	3297	17 May 2006	12
M1123	RF Power Meter	Boonton	4531	138201	17 May 2006	12
M1124	ESIB Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	23 Nov 2005	12

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval Months
M1223	VT4002	Votsch	VT4002	58566072720010	03 Dec 2005	12
M1266	Thermo Hygro	RS	212-124	0	18 Feb 2006	12
M1269	True RMS Multimeter	Fluke	179	90250210	16 Feb 2006	12
M197	Mixer	Hewlett Packard	11970U	2332A00782	Cal before use	-
M297	HP 11970U Harmonic Mixer	Hewlett Packard	11970U	3003A01516	Cal before use	-
S011	D.C. PSU	INSTEK	PR-3010H	9401270	N/A	12
S202	Site 2	RFI	2	S202-15011990	Cal before use	-
S207	Site 7	RFI	7	-	Cal before use	-

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

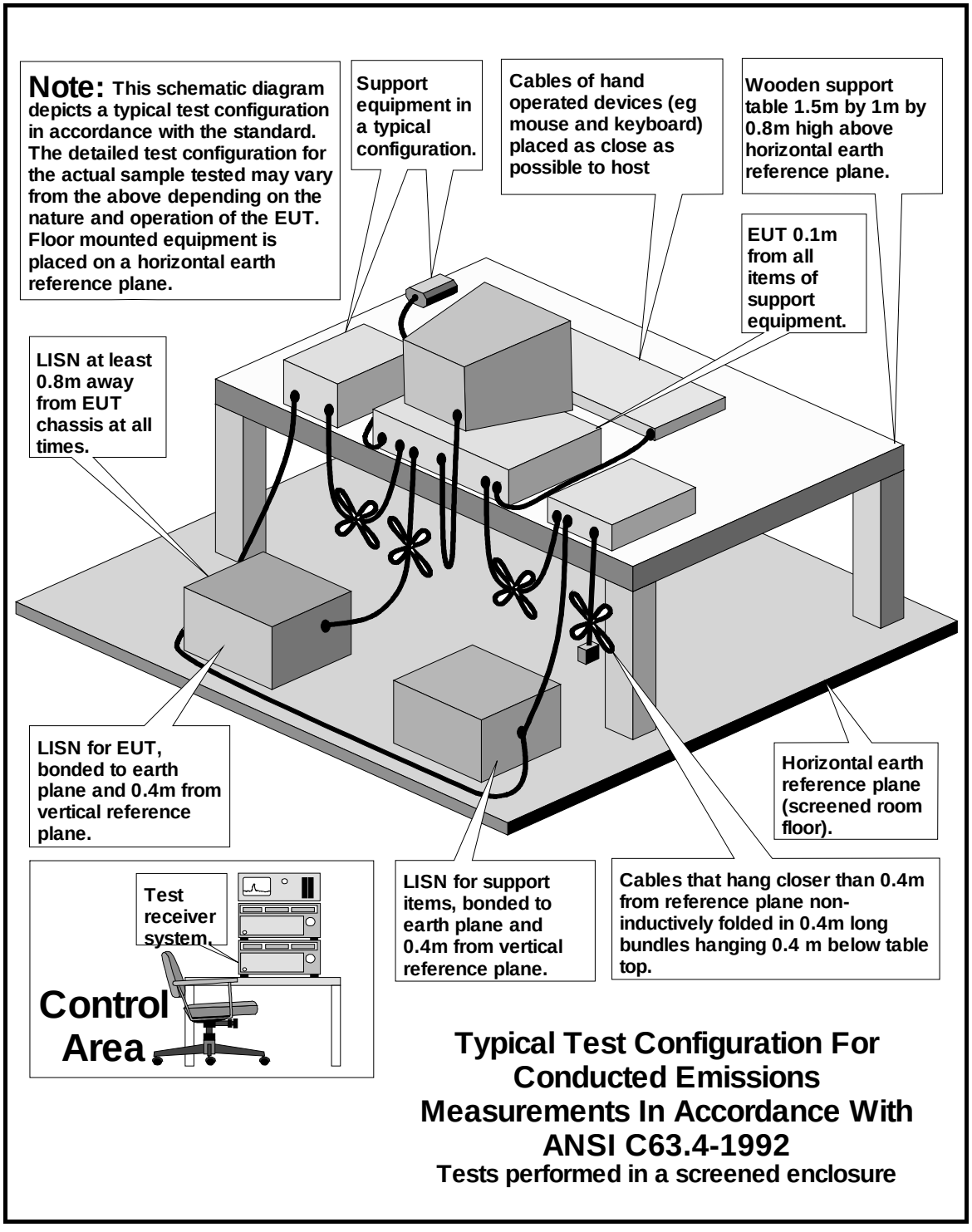
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\48350JD08\EMICON	Test configuration for measurement of conducted emissions.
DRG\48350JD08\EMIRAD	Test configuration for measurement of radiated emissions.

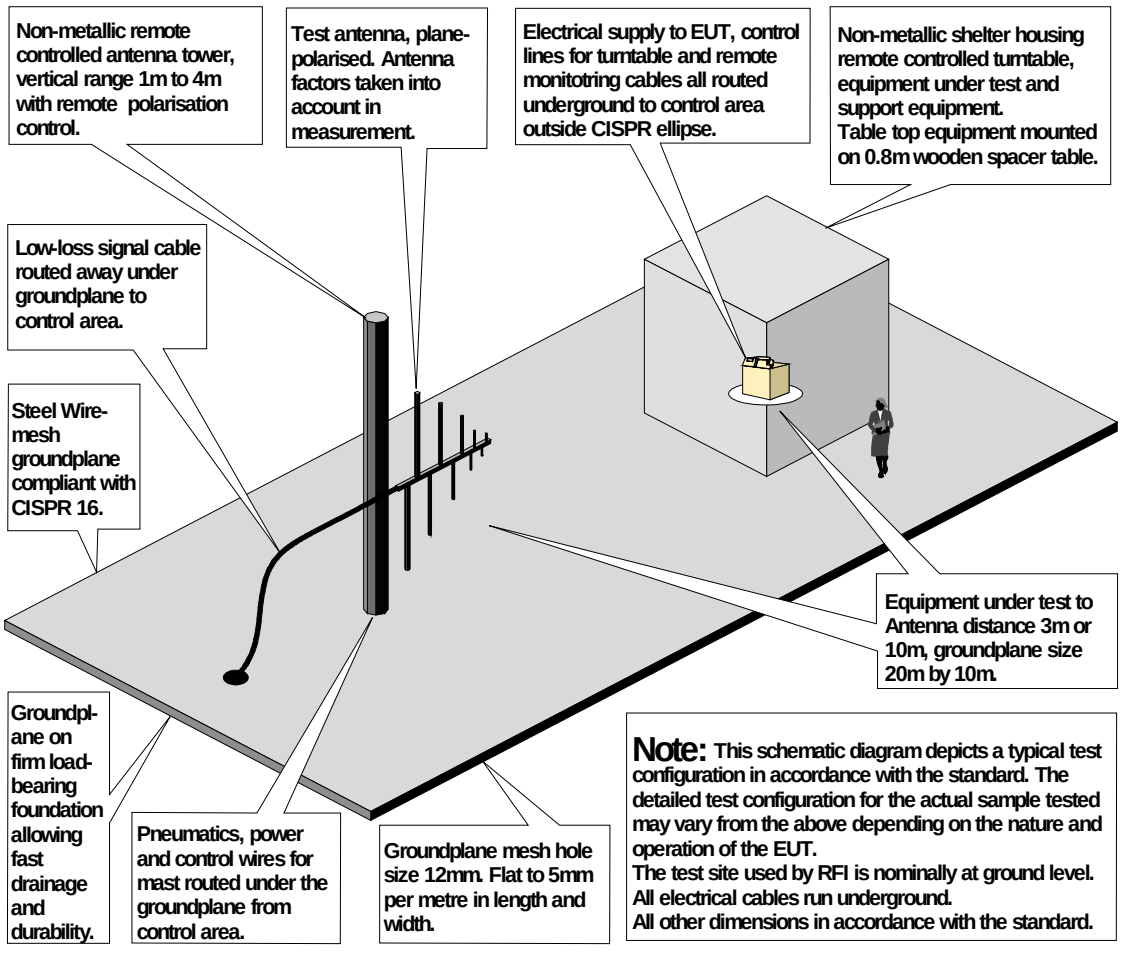
Test of: **Plextek Ltd.**
Blighter 202
To: **FCC Part 90 in accordance to RFI Test Plan RFI/REGA1/TP47865JD01**

DRG\48350JD08\EMICON



Test of: **Plextek Ltd.**
Blighter 202
To: **FCC Part 90 in accordance to RFI Test Plan RFI/REGA1/TP47865JD01**

DRG\48350JD08\EMIRAD



Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical cables run underground.
All other dimensions in accordance with the standard.

Test Configuration For Radiated Emissions Measurements

Reflection-free area: >60m by 52m
(CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse