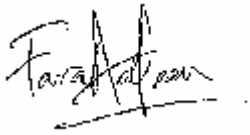
TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Satellite Tracking of People LLC (STOP)
BluTag

To: FCC Part 24 Subpart E: 2004

Test Report Serial No:
RFI\MPTE2\RP46121JD016A

Supersedes Test Report Serial No:
RFI\MPTE1\RP46121JD16A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager:  pp	
Tested By: Steven Wong  **pp**	**Checked By: Tony Henriques**  **pp**
Report Copy No: **PDF01**	
Issue Date: 06 April 2005	**Test Dates: 24 February 2005 to 02 March 2005 and 30 March 2005 to 01 April 2005**

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The results in this report apply only to the sample(s) tested.

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Table of Contents

1. Client Information

Company Name:	Satellite Tracking of People LLC (STOP)
Address:	102 Woodmont Blvd. Suite 800 Nashville TN 37205 USA
Contact Name:	Mr Stephen Freathy

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:	STOP
Model Name or Number:	BluTag
Serial Number:	62
FCC ID Number:	S5EAA70008
Country of Manufacture:	UK
Date of Receipt:	24 February 2005

Brand Name:	STOP
Model Name or Number:	BluTag
Serial Number:	18-9770
FCC ID Number:	S5EAA70008
Country of Manufacture:	UK
Date of Receipt:	29 March 2005

Note: The Blutag 18-9770 unit was used for the following tests: Transmitter Effective Isotropic Radiated Power (EIRP), Transmitter Occupied Bandwidth, Transmitter Out of Band Radiated Emissions and Transmitter Band Edge Radiated Emissions.

2.2. Accessories

The following accessories were supplied with the EUT:

Description:	AC Charger
Brand Name:	MPW
Model Name or Number:	SA070810
Serial Number:	None stated
Cable Length and Type:	2 Core, 1.6m
Connected to Port:	AC Charger Port

2.3. Description of EUT

The equipment under test is a personal tracking device incorporating GSM 1900 technology

2.4. Modifications Incorporated in EUT

During the course of testing the EUT was not modified.

2.5. Additional Information Related to Testing

Power Supply Requirement:	Nominal 110V 60 Hz AC Mains supply via the AC Charger (charges integral 4.2 VDC Li-ion battery)		
Intended Operating Environment:	Within GSM Network Coverage		
Equipment Category:	GSM 1900		
Type of Unit:	Portable (Standalone battery powered device)		
Interface Ports:	AC Charger Connector		
Transmit Frequency Range:	1850.2 MHz to 1909.8 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	512	1850.2
	Middle	660	1879.8
	Top	810	1909.8
Receive Frequency Range:	1930.2 MHz to 1989.8 MHz		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	512	1930.2
	Middle	660	1960.0
	Top	810	1989.8
Maximum Power Output (EIRP)	30.0 dBm		

2.6. Support Equipment

No support equipment was used to exercise the EUT during testing, only a GPRS/GSM signal simulator as test equipment.

3. Test Specification, Methods and Procedures

3.1. Test Specifications

Reference:	FCC Part 24 Subpart E: 2004 (Broadband PCS)
Title:	Code of Federal Regulations, Part 24 (47CFR24) Personal Communication Services.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003
Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1996)
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.

3.3. Definition of Measurement Equipment

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

4. Deviations from the Test Specification

None.

5. Operation of the EUT During Testing

5.1. Operating Modes

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

Transmit Mode:

For carrier output power, occupied bandwidth and final transmitter radiated measurements, testing was performed at full power on top, middle and bottom channels of the assigned frequency block.

For frequency stability testing, measurements were performed at full power on the top and bottom channels of the assigned frequency block at -30ºC through to +50ºC in 10º increments.

All transmitter radiated spurious pre-scan tests were performed at full power on the top, middle and bottom channels if an emission was identified.

Receiver/Idle Mode:

Testing was performed with the call terminated from the GSM test simulator and the EUT left in its idle mode.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

The EUT was configured with AC charger connected.

6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliancy Status
Idle Mode AC Conducted Spurious 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	Enclosure	Complied
Transmitter Effective Isotropic Radiated Power (EIRP)	C.F.R. 47 FCC Part 24: 2004 Section 24.232	Antenna	Complied
Transmitter Frequency Stability (Temperature Variation)	C.F.R. 47 FCC Part 24: 2004 Section 24.235	Antenna	Complied
Transmitter Frequency Stability (Voltage Variation)	C.F.R. 47 FCC Part 24: 2004 Section 24.235	Antenna	Complied
Transmitter Occupied Bandwidth	C.F.R. 47 FCC Part 24: 2004 Section 24.238	Antenna	Complied
Transmitter Out of Band Radiated Emissions	C.F.R. 47 FCC Part 24: 2004 Section 2.1053/24.238	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 2: 2004 Section 2.1053/24.238	Antenna	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.

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. Idle Mode AC Conducted Spurious Emissions: Section 15.107

7.2.1. The EUT was configured as for AC conducted emissions measurements as described in Section 9 of this report.

7.2.2. Tests were performed to identify the maximum emissions levels on the AC Mains line of the EUT.

Results:

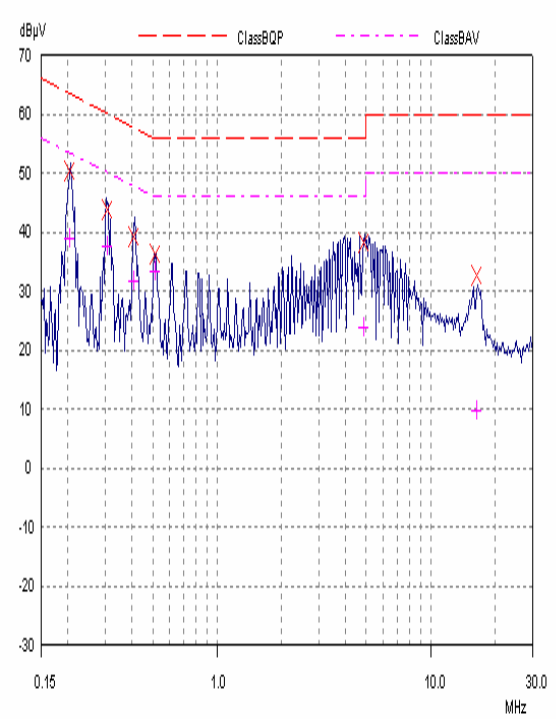
Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.20457	Neutral	50.41	63.42	13.01	Complied
0.30553	Live	43.95	60.09	16.14	Complied
0.40933	Neutral	39.31	57.66	18.35	Complied
0.51176	Live	36.16	56.00	19.84	Complied
4.89478	Neutral	38.09	56.00	17.91	Complied
16.45294	Neutral	32.73	60.00	27.27	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.20457	Live	38.97	53.42	14.45	Complied
0.30553	Live	37.55	50.09	12.54	Complied
0.40933	Live	31.72	47.66	16.94	Complied
0.51176	Live	33.42	46.00	12.58	Complied
4.89478	Neutral	23.85	46.00	22.15	Complied
16.45294	Live	9.78	50.00	40.22	Complied

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.

7.3. Idle Mode Radiated Spurious Emissions: Section 15.109

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

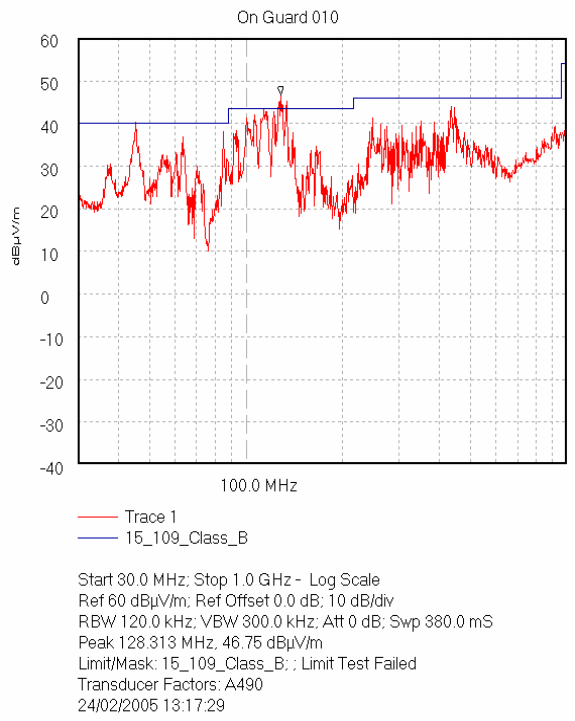
7.3.1.1. The EUT was configured as for receiver radiated emissions testing as described in Section 9 of this report.

7.3.1.2. Tests were performed to identify the maximum receiver or standby radiated emissions levels.

Results:

Frequency (MHz)	Antenna Polarity	Quasi-Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
45.074	Vert	23.0	40.0	17.0	Complied
62.983	Vert	15.9	40.0	24.1	Complied
112.716	Vert	27.0	43.5	16.5	Complied
129.816	Vert	23.0	43.5	20.5	Complied
149.570	Vert	13.3	43.5	30.2	Complied
283.770	Vert	11.9	46.0	34.1	Complied

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



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

Note: Emissions shown in the plot in the range 250 MHz to 600 MHz (with the exception of the emission at 283.770 MHz) were background ambient emissions which did not emanate from the EUT. Because these emissions were confirmed not to emanate from the EUT, no levels have been recorded in the preceding results table.

Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)

7.3.2. Electric Field Strength Measurements (Frequency Range: 1 to 10 GHz)

Results:

Bottom Channel - Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.951323	Horiz	32.9	26.9	2.3	62.1	74.0	11.9	Complied

Bottom Channel – Highest Average Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.951323	Horiz	20.6	26.9	2.3	49.8	54.0	4.2	Complied

Middle Channel – Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.951323	Horiz	32.9	26.9	2.3	62.1	74.0	11.9	Complied

Middle Channel – Highest Average Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.951323	Horiz	20.6	26.9	2.3	49.8	54.0	4.2	Complied

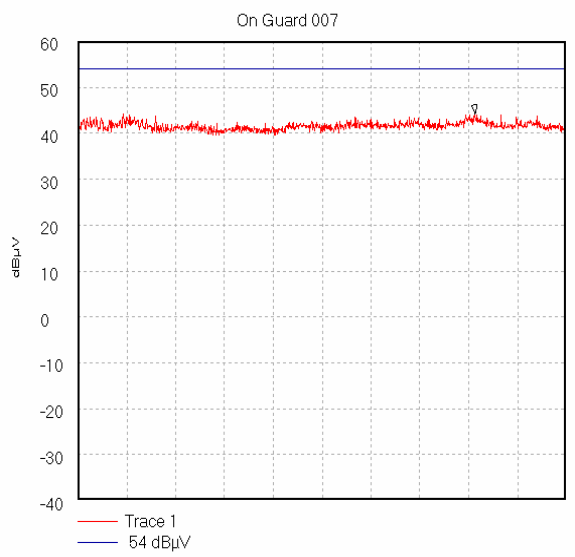
Top Channel – Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.951323	Horiz	32.9	26.9	2.3	62.1	74.0	11.9	Complied

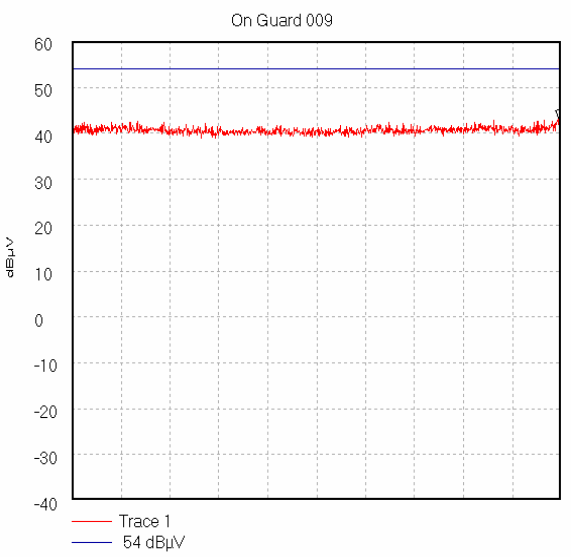
Top Channel – Highest Average Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
7.951323	Horiz	20.6	26.9	2.3	49.8	54.0	4.2	Complied

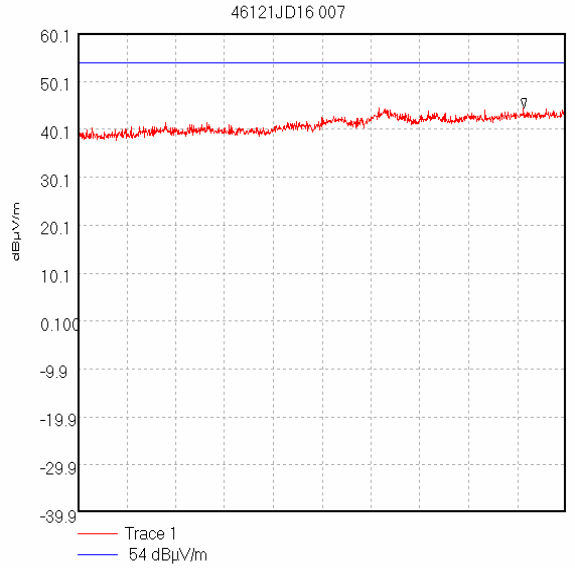
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



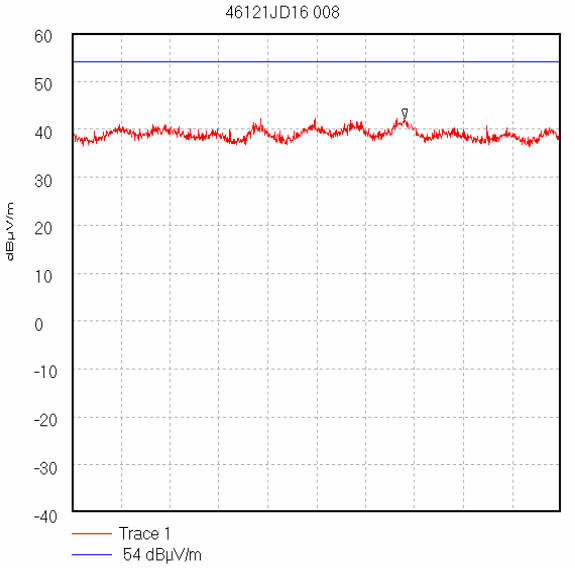
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.813 GHz, 44.18 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
Transducer Factors: A490
24/02/2005 13:08:29



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.989 GHz, 43.14 dBµV
Display Line: 54 dBµV; ; Limit Test Passed
Transducer Factors: A490
24/02/2005 13:12:50



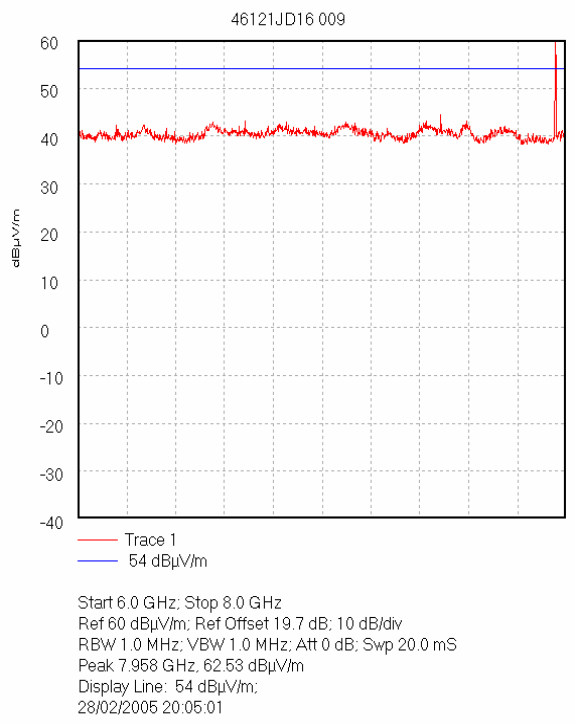
Start 4.0 GHz; Stop 5.0 GHz
Ref 60.1 dBµV/m; Ref Offset 16.5 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.913 GHz, 44.54 dBµV/m
Display Line: 54 dBµV/m;
28/02/2005 19:33:55

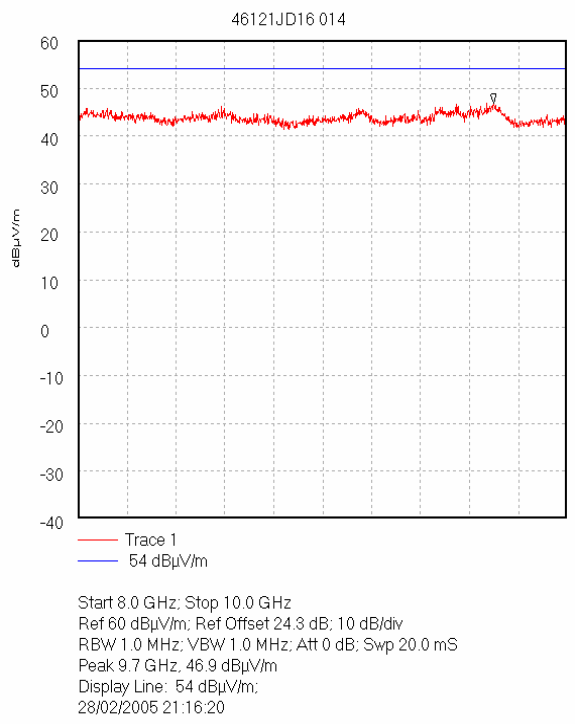


Start 5.0 GHz; Stop 6.0 GHz
Ref 60 dBµV/m; Ref Offset 16.9 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.68 GHz, 42.31 dBµV/m
Display Line: 54 dBµV/m;
28/02/2005 19:36:12

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

Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)





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

7.4. Transmitter Effective Isotropic Radiated Power (EIRP): Section 24.232

7.4.1. The EUT was configured as for Effective Isotropic Radiated Power as described in Section 9 of this report.

7.4.2. Tests were performed to identify the maximum Effective Isotropic Radiated Power (EIRP).

Results:

Channel	Measured Frequency (MHz)	Antenna Polarity	Maximum Transmitter EIRP (dBm)	Limit EIRP (dBm)	Margin (dB)	Result
Bottom	1850.2	Horiz	30.0	33.0	2.9	Complied
Middle	1879.8	Horiz	28.9	33.0	4.0	Complied
Top	1909.8	Horiz	28.6	33.0	4.4	Complied

7.5. Transmitter Frequency Stability (Temperature Variation): Section 24.235

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

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

Results:

Bottom Channel (1850.2 MHz)

Temperature (ºC)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
-30	1850.189480	1850	0.189480	Complied
-20	1850.183470	1850	0.183470	Complied
-10	1850.216553	1850	0.216553	Complied
0	1850.220541	1850	0.220541	Complied
10	1850.214529	1850	0.214529	Complied
20	1850.185471	1850	0.185471	Complied
30	1850.179459	1850	0.179459	Complied
40	1850.184469	1850	0.184469	Complied
50	1850.183470	1850	0.183470	Complied

Top Channel (1909.8 MHz)

Temperature (ºC)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
-30	1909.787475	1910	0.212525	Complied
-20	1909.779459	1910	0.220541	Complied
-10	1909.786473	1910	0.213527	Complied
0	1909.843587	1910	0.156413	Complied
10	1909.815531	1910	0.184469	Complied
20	1909.786470	1910	0.213530	Complied
30	1909.779459	1910	0.220541	Complied
40	1909.820540	1910	0.179460	Complied
50	1909.783470	1910	0.216530	Complied

7.6. Transmitter Frequency Stability (Voltage Variation): Section 24.235

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

7.6.2. Tests were performed to identify the maximum frequency error of the EUT with variations in nominal operating voltage.

Results:

Bottom Channel (1850.2 MHz)

Supply Voltage (V)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
93.5	1850.18547	1850	0.18547	Complied
126.5	1850.21553	1850	0.21553	Complied

Top Channel (1909.8 MHz)

Supply Voltage (V)	Measured Frequency (MHz)	Upper Band Edge Limit (MHz)	Margin (MHz)	Result
93.5	1909.78246	1910	0.21754	Complied
126.5	1909.78747	1910	0.21253	Complied

7.7. Transmitter Occupied Bandwidth: Section 24.238

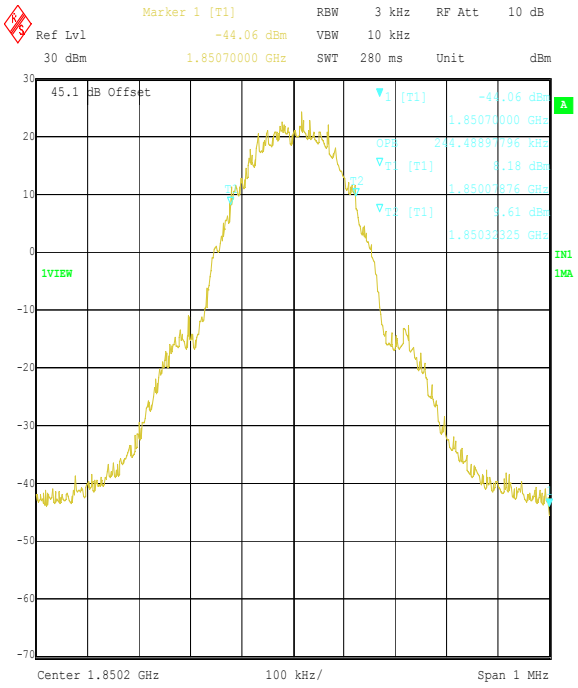
7.7.1. The EUT was configured as for Occupied Bandwidth measurements as described in Section 9 of this report.

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

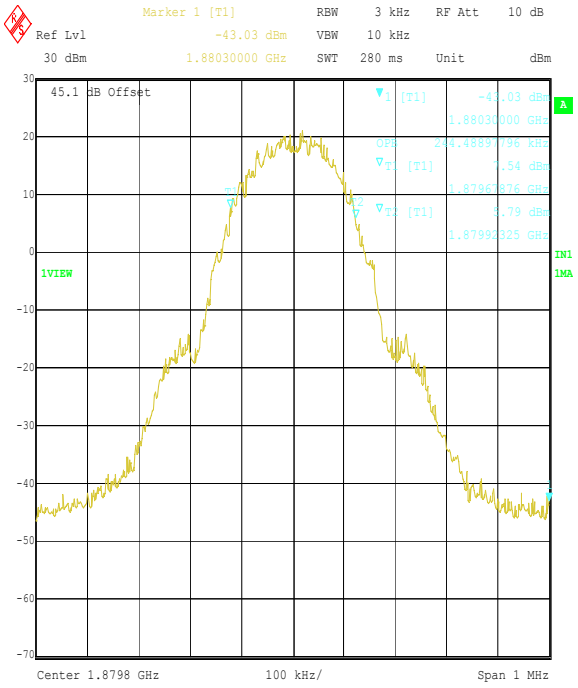
Results:

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (kHz)
Bottom	1850.2	3.0	10.0	244.489
Middle	1879.8	3.0	10.0	244.489
Top	1909.8	3.0	10.0	244.489

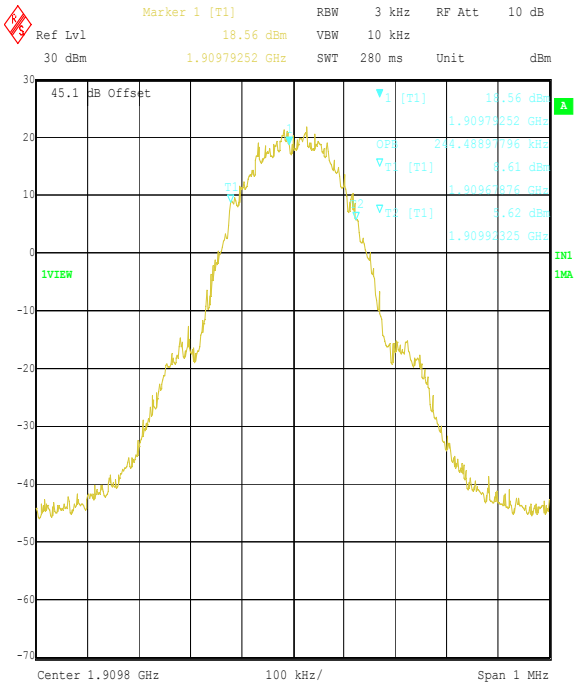
Transmitter Occupied Bandwidth: Section 24.238 (Continued)



Comment A: 46121/26 O.BW. Bottom Channel
Date: 1.APR.2005 19:44:53



Comment A: 46121/26 O.BW. Middle Channel
Date: 1.APR.2005 19:42:15



Comment A: 46121/26 O.BW. Top Channel
Date: 1.APR.2005 19:40:15

Note: The occupied bandwidth is measured using the internal OBW function of the measurement analyser. The analyser automatically configures the measurement bandwidths to make an accurate measurement. The results can be observed in the right hand corner of the graphs.

7.8. Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238.

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

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

Results:

Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3700.565	-33.9	-13.0	20.9	Complied
5550.443	-36.7	-13.0	23.7	Complied
7400.659	-48.8	-13.0	35.8	Complied
7951.328	-43.2	-13.0	30.2	Complied
9250.744	-39.7	-13.0	26.7	Complied
11101.297	-37.5	-13.0	24.5	Complied

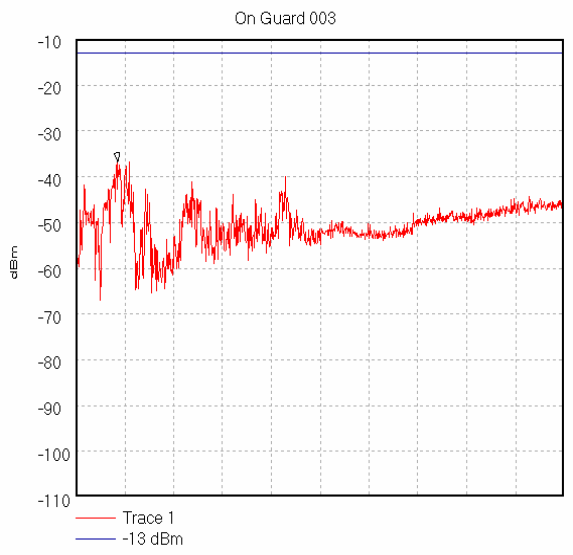
Middle Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3759.519	-24.6	-13.0	11.6	Complied
5639.218	-40.7	-13.0	27.7	Complied
7519.331	-40.3	-13.0	27.3	Complied
7951.328	-43.2	-13.0	30.2	Complied
9399.351	-32.5	-13.0	19.5	Complied
11278.888	-31.7	-13.0	18.7	Complied

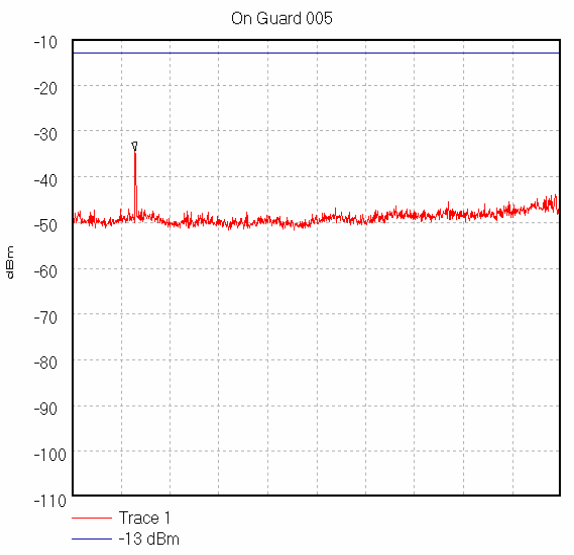
Top Channel

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3819.718	-25.4	-13.0	12.4	Complied
5729.444	-38.9	-13.0	25.9	Complied
7639.487	-39.5	-13.0	26.5	Complied
7951.328	-42.3	-13.0	29.3	Complied
9549.150	-32.8	-13.0	19.8	Complied
11459.090	-32.1	-13.0	19.1	Complied

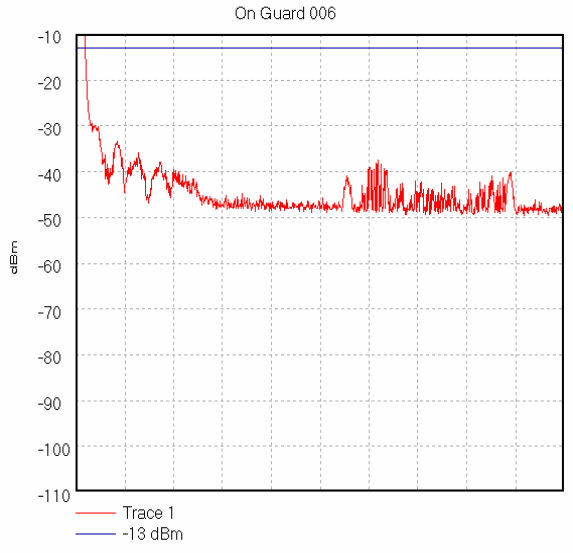
Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)



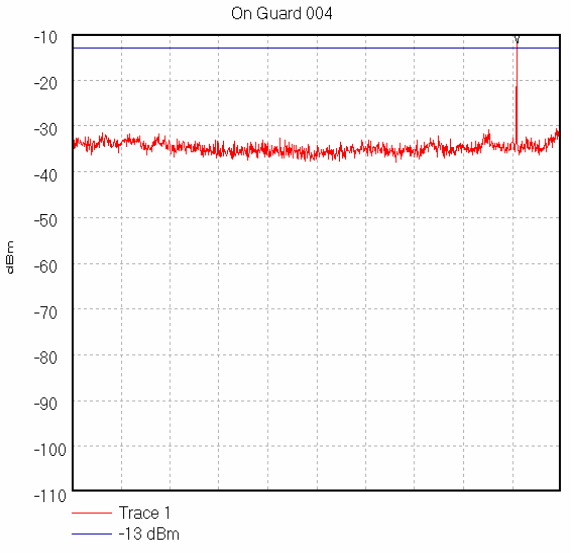
Start 30.0 MHz; Stop 1.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 112.989 MHz, -36.79 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
24/02/2005 12:33:15



Start 1.0 GHz; Stop 1.85 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.11 GHz, -34.4 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
24/02/2005 12:46:01



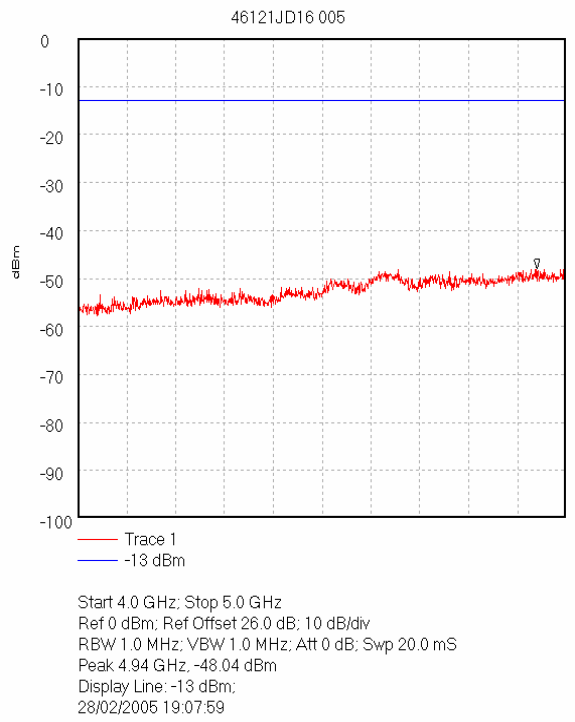
Start 1.91 GHz; Stop 2.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.911 GHz, -6.02 dBm
Display Line: -13 dBm; ; Limit Test Failed
Transducer Factors: A490
24/02/2005 12:47:39



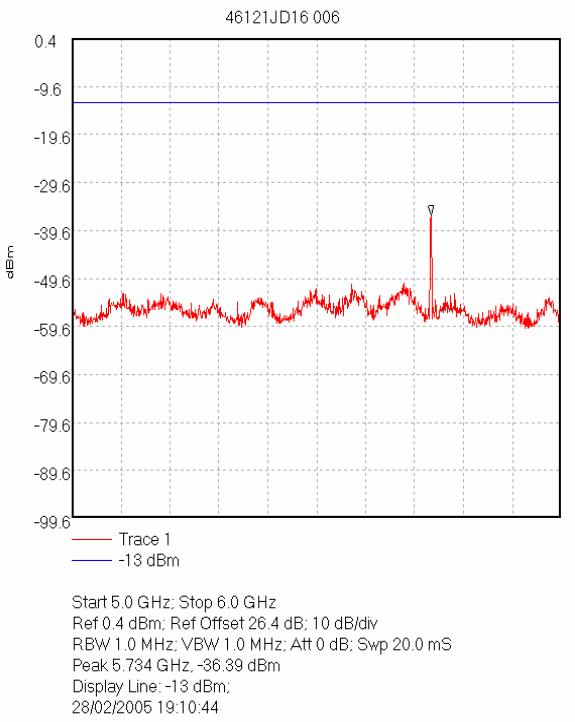
Start 2.0 GHz; Stop 4.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 3.82 GHz, -12.0 dBm
Display Line: -13 dBm; ; Limit Test Failed
Transducer Factors: A490
24/02/2005 12:43:26

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

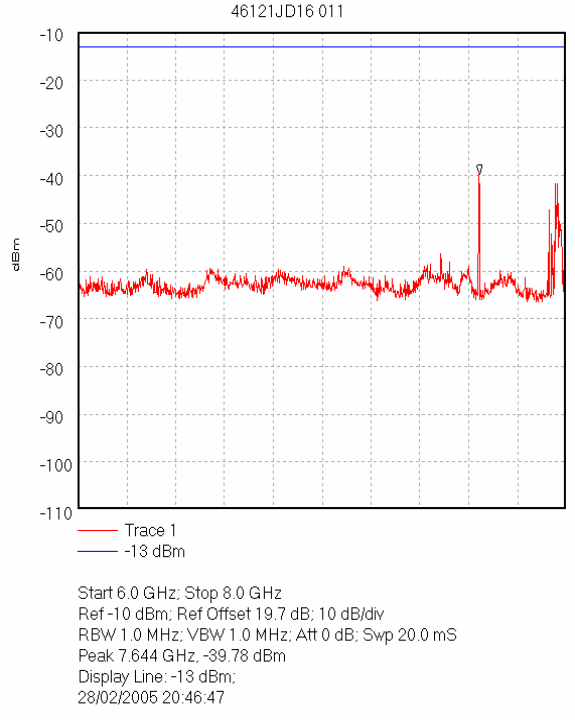
Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)



Start 4.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 26.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.94 GHz, -48.04 dBm
Display Line: -13 dBm;
28/02/2005 19:07:59



Start 5.0 GHz; Stop 6.0 GHz
Ref 0.4 dBm; Ref Offset 26.4 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 5.734 GHz, -36.39 dBm
Display Line: -13 dBm;
28/02/2005 19:10:44

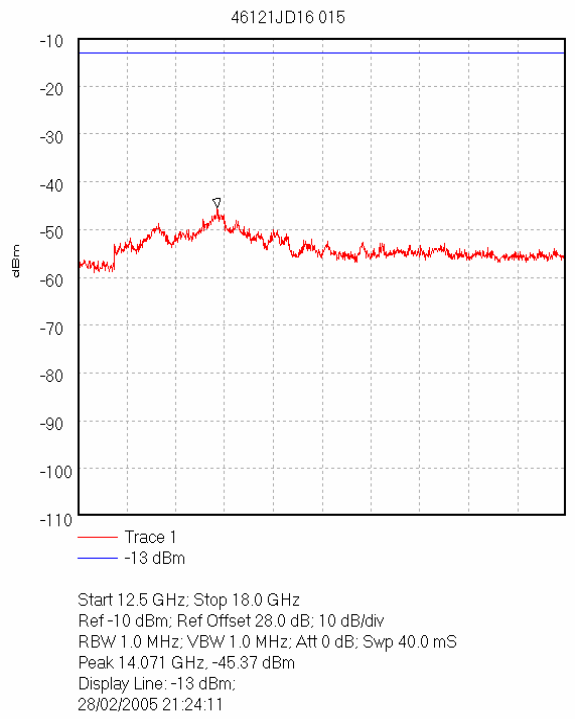


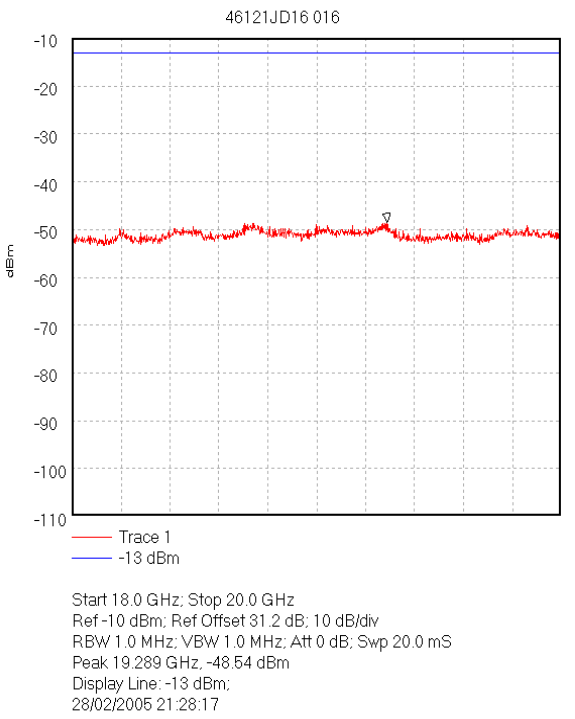
Start 6.0 GHz; Stop 8.0 GHz
Ref -10 dBm; Ref Offset 19.7 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 7.644 GHz, -39.78 dBm
Display Line: -13 dBm;
28/02/2005 20:46:47

Start 8.0 GHz; Stop 12.5 GHz
Ref -10 dBm; Ref Offset 24.3 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 9.55 GHz, -37.75 dBm
Display Line: -13 dBm;
28/02/2005 21:01:19

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

Transmitter Out of Band Radiated Emissions: Section 2.1053 & 24.238 (Continued)





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

Transmitter Out of Band Radiated Emissions: Section 2.1053/24.238 (Continued)

Integrated Power Over 1 MHz Strip Band: 1911 to 1912 MHz

1st 1 MHz block immediately outside adjacent frequency block

100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	579.549	6	559.548
2	531.952	7	591.060
3	526.254	8	548.136
4	495.172	9	512.632
5	555.371	10	514.074
Total Peak Power:		5413.748 nW/MHz	

Integrated Power Over 1 MHz Strip Band: 1912 to 1913 MHz

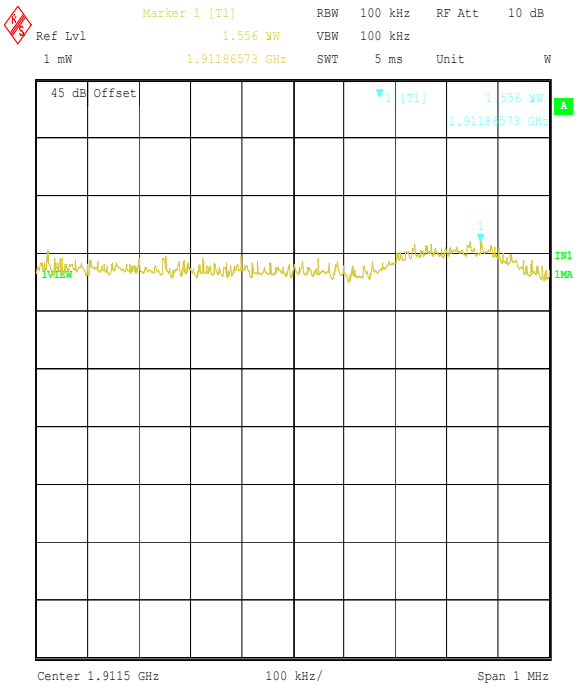
2nd 1 MHz block immediately outside adjacent frequency block

100 kHz Strip Number	Peak Power (nW/100 kHz)	100 kHz Strip Number	Peak Power (nW/100 kHz)
1	534.199	6	512.153
2	549.678	7	569.594
3	545.065	8	473.848
4	531.455	9	493.552
5	502.413	10	508.567
Total Peak Power:		5220.524 nW/MHz	

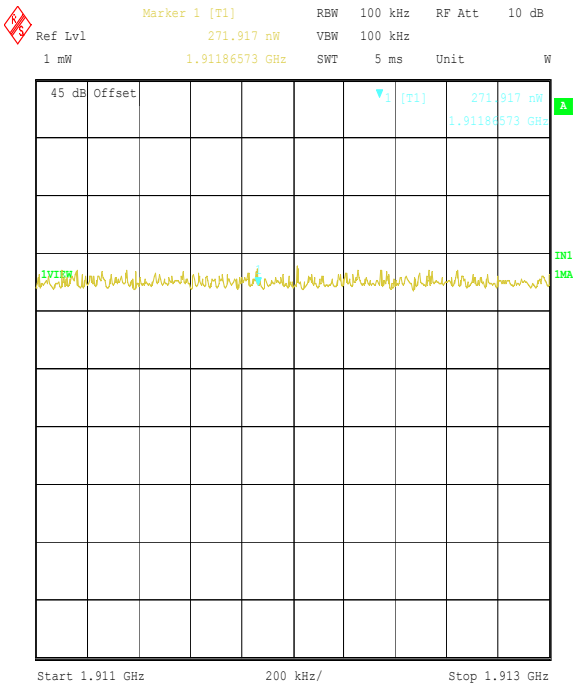
Results:

Band (MHz)	Peak Power (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Status
1911 to 1912	-22.7	-13.0	9.7	Complied
1912 to 1913	-22.8	-13.0	9.8	Complied

Transmitter Out of Band Radiated Emissions: Section 2.1053/24.238 (Continued)



Comment A: 46121/26 Band Edge 1. Top Channel.
Date: 1.APR.2005 20:04:46



Comment A: 46121/26 Band Edge 2. Top Channel.
Date: 1.APR.2005 20:05:58

7.9. Transmitter Radiated Emissions at Band Edges: Section 2.1053 & 24.238

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

7.9.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency block that the EUT will operate over.

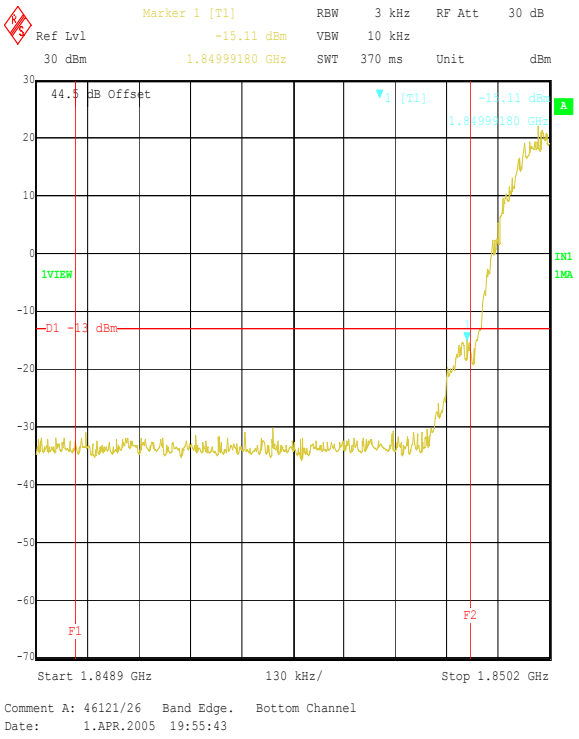
Results:

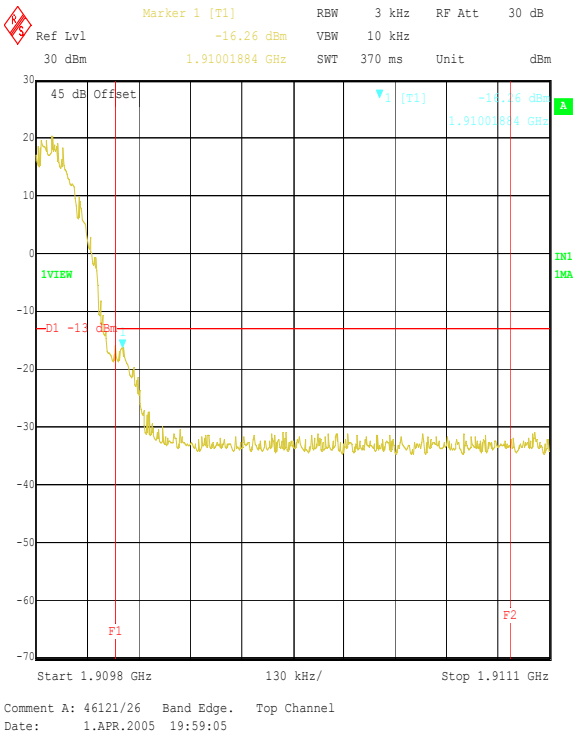
Bottom Band Edge

Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
1850	-15.1	-13.0	2.1	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1910	-16.3	-13.0	3.3	Complied





8. Measurement Uncertainty

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

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

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

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

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Effective Isotropic Radiated Power (EIRP)	Not applicable	95%	+/- 1.78 dB
Frequency Stability	Not applicable	95%	+/- 20 Hz
Minimum Bandwidth	Not Applicable	95%	+/- 0.12 %
Occupied Bandwidth	1850 to 1910 MHz	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 26 GHz	95%	+/- 1.78 dB

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

9. Measurement Methods

9.1. Effective Isotropic Radiated Power (EIRP)

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

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 - 2003 Clause 5.4. The transmitter was fitted with an integral antenna; therefore all radiated tests were performed with the unit operating into the integral antenna.

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

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

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

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

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

All measurements were performed using broadband Horn antennas.

Effective Isotropic Radiated Power (EIRP) (Continued)

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

Delta (dB) = EUT – SG

where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

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

The EUT EIRP is calculated as:

EIRP EUT = EIRP SG + Delta.

The test equipment settings for EIRP measurements were as follows:

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

9.2. Frequency Stability

The EUT was situated within an environmental test chamber and connected directly to the GSM test set via an air link.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range -30 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 and ensure they remained within specified operating parameters.

Measurements were made on the top and bottom channels.

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.

Once the environmental chamber had reached thermal equilibrium, the nominal frequency of the EUT was measured and recorded. The recorded frequency was compared to the applicants declared operating frequency band edges.

In order to show compliance, the measured frequency must remain within the declared frequency band.

The reported data shows the nominal frequency drift and its margin from the band edge. If this margin is positive, the result is compliant. If it goes negative, the result is a non-compliance. There is also a frequency graph presented offering the frequency variation around nominal frequency.

9.3. Occupied Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function and a GSM test set via an air link.

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.

As the EUT is a PCS device, no modulation input port was available. A call was therefore set up using the PCS/GSM simulator and using normal modulation. The Occupied Bandwidth was measured in this configuration.

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 settings were set as per those outlined in the spectrum analyser user manual for this measurement, i.e., RBW $\geq$ 1% of occupied bandwidth. A value of 3 kHz was used.

9.4. 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 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

9.5. Transmitter Radiated Emissions

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. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT, which 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. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

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 vertical 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 horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

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

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

The limit in the standard states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P), where (P) is the maximum measured fundamental power for the channel under test. This limit always reduces to -13 dBm therefore, the limit line presented on the accompanying plots is set to -13 dBm.

Any spurious measured were then compared to the –13 dBm limit. The requirement is for the emission to be less than -13 dBm. The margin between emission and limit is recorded and should always be positive to indicate compliance.

All measurements were performed using broadband Horn antennas.

Transmitter Radiated Emissions (Continued)

It should be noted that FCC Part 24.238 states that the 1st MHz band immediately adjacent to the applicants declared frequency block may be measured using a resolution bandwidth of at least 1% of the emission bandwidth. This bandwidth was found by calculating 1% of the bandwidth measured in the transmitter occupied bandwidth section of this report. The next largest available bandwidth above this calculated figure was, therefore, used i.e. 3 kHz.

The measurements in the 2nd and 3rd 1 MHz blocks away from the adjacent 1 MHz block from 1911 MHz to 1912 MHz and 1912 MHz to 1913 MHz were carried out using an analyser span of 1 MHz and a 100 kHz receiver resolution bandwidth (RBW). 10 linear readings were taken for each 100 kHz strip across the 1 MHz band. These readings were integrated to give the emission level in an equivalent 1 MHz bandwidth.

9.6. Receiver Radiated Emissions

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 the upper frequency detailed in Section 15.33(b) were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT, which required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector measuring bandwidth (see table below). 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. A limit line was set to the specification limit. Levels within 20 dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

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.

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.

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

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

Receiver Function	**Initial Scan**	**Final Measurements Below 1 GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A003	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	357 881/052
A027	Horn Antenna	Eaton	9188-2	301
A028	Horn Antenna	Eaton	91888-2	304
A031	Horn Antenna	Eaton	91889-2	557
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002
A254	Horn Antenna	Flann	14240-20	139
A259	Bilog Antenna	Chase	CBL6111	1513
A288	Bilog Antenna	Chase	CBL6111A	1589
A428	Horn Antenna	Flann	12240-20	134
A429	WG 16 horn	Flann	16240-20	561
A430	Horn Antenna	Flann	18240-20	425
A436	Horn Antenna	Flann	20240-20	330
C1065	Rosenberger	Rosenberger	UFA210-1-7872	0985
C459	Cable	Rosenberger	UFA210A-1-1182-704704	98H0303
C565	C565-N-3	Rosenberger	UFA 210A-1-1181-70x70	96 L 0703
E013	Environmental Chamber	Sanyo	ATMOS chamber	None
L0733	GSM Test Set	Anritsu	MT8820A	6K0001055
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M028	Spectrum Analyser	Rohde & Schwarz	FSB	860 001/009 (RU); 860 161/007 (DU)
M044	Test Receiver	Rohde & Schwarz	ESVP	891 845/026
M069	Spectrum Analyser/ Test Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M1124	Rohde & Schwarz	Rohde & Schwarz	ESIB26	100046K
M1140	GSM Test Set	Anritsu	MT8820A	6K0000647
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016
M505/ M506	Spectrum Analyser/ Test Receiver	Rohde & Schwarz	ESBI	827 060/004 (RU); 825 316/010 (DU)
S003	Variac	Zen	E08	736699
S201	Site 1	RFI	1	
S202	Site 2	RFI	2	S202-15011990

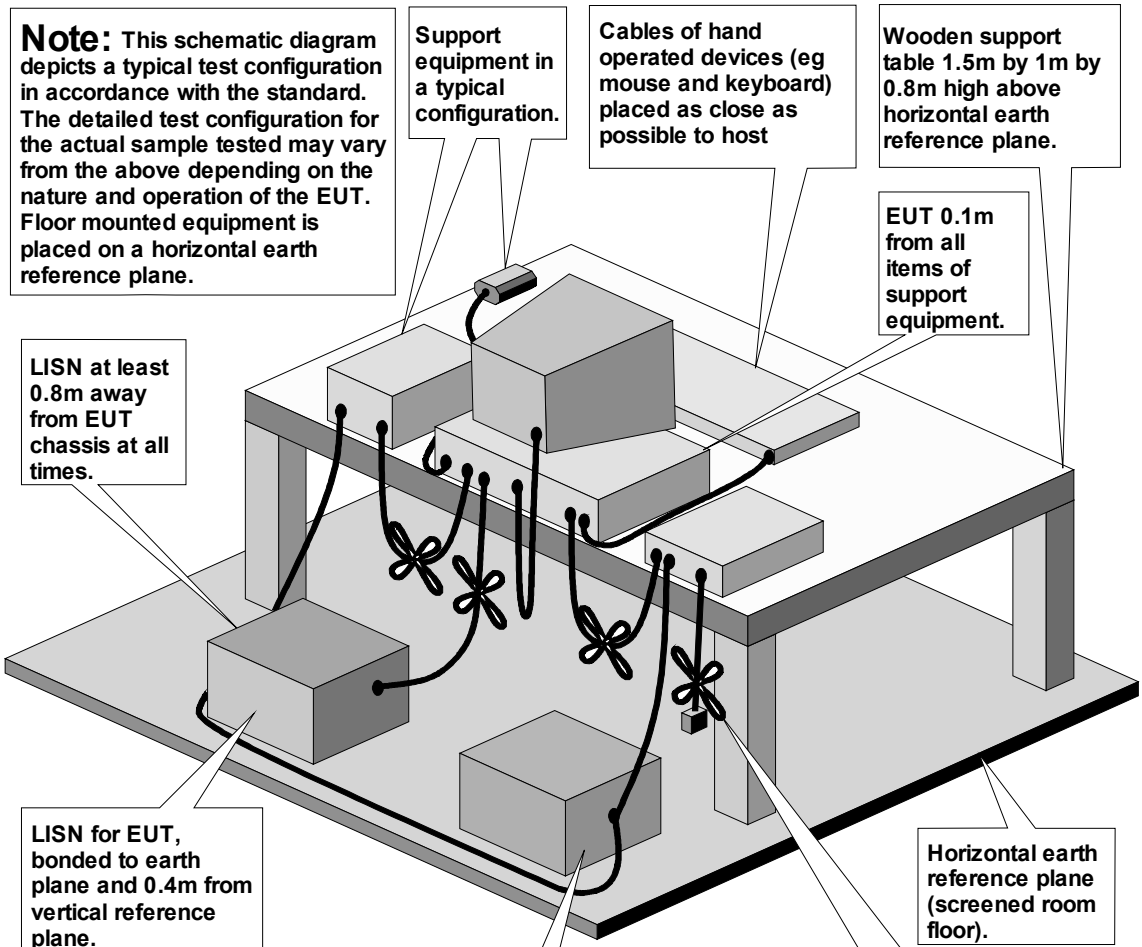
NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\46121JD16\EMICON	Test configuration for measurement of conducted emissions.
DRG\46121JD16\EMIRAD	Test configuration for measurement of radiated emissions.

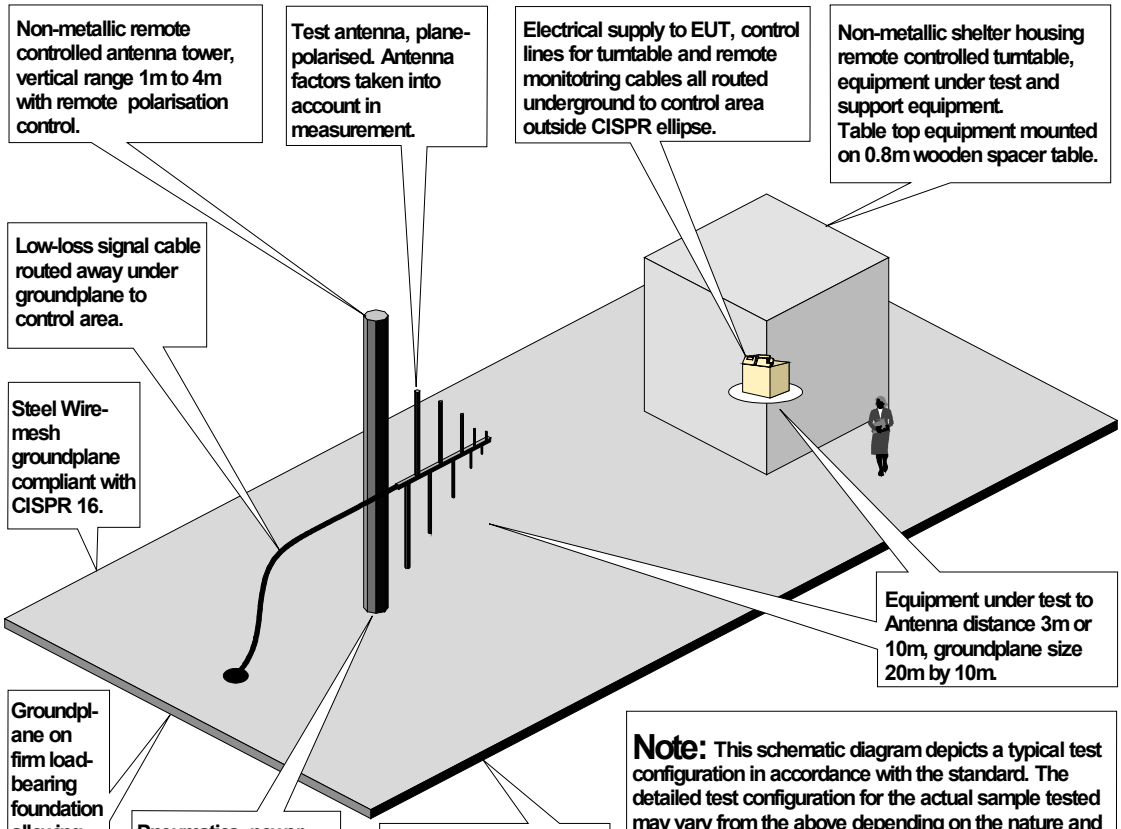
DRG\46121JD16\EMICON



Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992

Tests performed in a screened enclosure

DRG\46121JD16\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