TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Danger Inc.
Hiptop GSM 1900 Mobile Phone

To: FCC Part 24: 2001 and FCC Part 15: 2001

Test Report Serial No:
RFI/MPTB1/RP43528JD01A

This Test Summary Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By:**  **pp**
Tested By: 	**Release Version No: PDF01**
Issue Date: 12 August 2002	**Test Dates: 05 June 2002 to 19 June 2002**

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Table of Contents

1. Client Information

Company Name:	Danger, Inc
Address:	124 University Avenue. Palo Alto, CA 94301 USA
Contact Name:	Marcus Wallgren

2. Equipment Under Test (EUT)

The following information has been supplied by the client:

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Danger
Model Name or Number:	Hiptop
Unique Type Identification:	Not Stated by Client
Serial Number:	00102800002450
Country of Manufacture:	Thailand
FCC ID Number:	P5J-FYMASMBD-01
Date of Receipt:	5 June 2002

2.2. Description Of EUT

The equipment under test is a GSM-1900, GPRS, class 8, class B-enabled PDA, powered by a non-removable lithium ion battery; the battery is supplied with the EUT. The EUT is also capable of being used with a recharger and digital camera accessories.

2.3. Modifications Incorporated In EUT

The EUT has not been modified from what is described by the Model Name stated above.

2.4. Additional Information Related To Testing

Power Supply Requirement: (non-removable lithium ion battery)	+ 4.2 V
Power Supply Requirement: (AC Battery Charger)	110 V, 60 Hz AC Mains Battery Charger
Intended Operating Environment:	Within GSM Network Coverage
Equipment Category:	Mobile Telephony/PDA
Type of Unit:	Mobile Station
Weight:	184 g
Dimensions:	120 mm x 67 mm x 30 mm
Interface Ports:	2.5 mm Jack headset/camera port 2.5 mm Jack Power port USB Downlink Port Infra-Red Port
Transmit Frequency	B, M and T (1850.2, 1880.0 and 1909.8 MHz)
Receive Frequency	B, M and T (1930.2, 1960.0 and 1989.8 MHz)
Maximum Power Output	1 Watt Max

2.5. Support Equipment

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

Description:	Digital Camera
Brand Name:	Kyocera
Model Name or Number:	Hi-Res HC-D01
Serial Number:	Not Stated by Client
FCC ID Number:	Not Applicable
Cable Length And Type:	Not Stated by Client
Connected to Port:	2.5 mm Jack Plug socket

Description:	USB Cable
Brand Name:	Copartner
Model Name or Number:	E193793
Serial Number:	Not Stated by Client
FCC ID Number:	Not Applicable
Cable Length And Type:	180 cm
Connected to Port:	USB Downlink Port

Description:	Battery Charger
Brand Name:	CUI INC
Model Name or Number:	EPAS-101W-05
Serial Number:	Not Stated by Client
FCC ID Number:	Not Applicable
Cable Length And Type:	XINYA-D 20AWG 185 cm
Connected to Port:	Charger Port

Support Equipment (continued)

Description:	Hands Free Kit
Brand Name:	Sun Let
Model Name or Number:	YH3688
Serial Number:	Not Stated by Client
FCC ID Number:	Not Applicable
Cable Length And Type:	114 cm
Connected to Port:	2.5 mm Jack Plug socket

Description:	Car Kit/Cigarette Lighter Adapter
Brand Name:	Power Lab
Model Name or Number:	Not Stated by Client
Serial Number:	Not Stated by Client
FCC ID Number:	Not Applicable
Cable Length And Type:	Not Stated by Client
Connected to Port:	Charger Port

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 24: 2001 Sections 24.232, 24.235, 24.238
Title:	Code of Federal Regulations, Part 24 (47CFR) Personal Communication Services.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

Reference:	FCC Part 15: 2001 Class B, Sections: 15.107 and 15.109
Title:	Code of Federal Regulations, Part 15 (47CFR) Radio Frequency Devices: Digital Devices.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

3.2. Methods And Procedures

The methods and procedures used were as detailed in:

47CFR: Part 24 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47: Personal Communication Services.

47CFR: Part 15 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47: Telecommunication

47CFR: Part 2 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47: Telecommunication

ANSI C63.2 (1996)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

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

ANSI C63.5 (1998)
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 Conditions

The EUT was tested in a normal laboratory environment.

During testing, the EUT was powered by a 4.2 V battery supply and connected to 110 V AC battery charger.

5.2. Operating Modes

The EUT was tested in the following operating modes:

Call Mode:
For carrier output power, occupied bandwidth, 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 –30 through +50 deg.C in 10 degree increments.

All transmitter radiated and conducted spurious pre-scan tests were performed at full power on the middle channel of the assigned frequency block. Final measurements were then performed on the Top, Middle and Bottom channels if an emission was identified.

Receive/PDA Mode:
Testing was performed with the call terminated and the phone was left in its receive mode. All PDA accessories were connected during this phase of testing and the PDA was open and active.

5.3. Configuration and Peripherals

The EUT was tested in the following configuration:

The EUT was connected to a GSM test set either by direct connection or via an air link.
The EUT was configured with a USB cable, Hands Free Kit and Battery Charger for transmitter testing.
The EUT was configured with a USB cable, Camera and Battery Charger/Car Kit for receiver/PDS mode testing.

NB Section 2 of this report contains a full list of support equipment used and Appendix 3 contains a schematic diagram of the test configuration.

6. Summary Of Test Results

6.1. Call Mode

Range Of Measurements	Specification Reference	Mode of Operation	Port Type	Compliancy Status
Carrier Output Power (Radiated)	Part 24 of CFR 47: 2001, Section 24.232	Transmit	Antenna	Complied
Carrier Output Power (Conducted)	Part 24 of CFR 47: 2001, Section 24.232	Transmit	Antenna Terminals	Complied
Frequency Stability (Temperature Variation)	Part 24 of CFR 47: 2001, Section 24.235	Transmit	Antenna Terminals	Complied
Frequency Stability (Voltage Variation)	Part 24 of CFR 47: 2001, Section 24.235	Transmit	Antenna Terminals	Complied
Occupied Bandwidth	Part 24 of CFR 47: 2001, Section 24.238	Transmit	Antenna Terminals	Complied
Emissions at Band Edges	Part 24 of CFR 47: 2001, Section 24.238	Transmit	Antenna Terminals	Complied
Conducted Emissions (Antenna Terminals)	Part 24 of CFR 47: 2001, Section 24.238	Transmit	Antenna Terminals	Complied
Electric Field Strength, Spurious Emissions (1 MHz to 20000 MHz)	Part 24 of CFR 47: 2001, Section 24.238	Transmit	Antenna	Complied

6.2. Receive/PDA Mode

Range Of Measurements	Specification Reference	Mode of Operation	Port Type	Compliancy Status
Electric Field Strength, Spurious Emissions (1 MHz to 10000 MHz)	Part 15 of CFR 47: 2001, Section 15.109	Receive/ PDA	Enclosure	Complied
Conducted Spurious Emissions (450 kHz to 30 MHz)	Part 15 of CFR 47: 2001, Section 15.107	Receive/ PDA	AC Mains Input	Complied

6.3. Location Of Tests

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

7. Measurements, Examinations And Derived Results

7.1. General Comments

7.1.1. This section contains test results only. Details of the test methods and procedures can be found in Appendix 3 of this report.

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.

7.1.3. The term “Call Mode” is used to signify Transmitter active and in normal mode of operation.

7.1.4. The term “PDA Mode” is used to signify that the phone is in a Standby condition being used as a PDA.

7.2. Carrier Output Power: Call Mode: (Antenna Terminals): Section 24.232

7.2.1.The EUT, spectrum analyser and GSM test set were configured as for conducted antenna port measurements.

7.2.2. Tests were performed to identify the maximum transmit power in accordance with FCC Part 24.232 for conducted power.

7.2.3. The applicant provided a temporary antenna port to allow a direct connection to be made for conducted power measurements.

7.2.4. Results are shown for the EUT set to Bottom, Middle and Top channels using a fully charged battery. The battery nominally charged voltage is declared at 4.2 Volts:

Results:

Channel	Maximum Transmitter Output Level (Watts)	Limit (Watts)	Margin	Result
Bottom (512)	0.555	2.0	1.445	Complied
Middle (660)	0.503	2.0	1.497	Complied
Top (810)	0.489	2.0	1.511	Complied

7.3. Carrier Output Power: Call Mode: (EIRP): Section 24.232

7.3.1. Tests were performed to identify the maximum transmit power in accordance with FCC Part 24.232 for EIRP.

7.3.2. Results are shown for the EUT set to Bottom, Middle and Top channels using a fully charged battery. The battery nominally charged voltage is declared at 4.2 Volts:

Results

Channel	Antenna Polarity (H/V)	Maximum Transmitter EIRP (dBm)	Limit EIRP (dBm)	Margin	Result
Bottom (512)	Vert	29.1	33	3.900	Complied
Middle (660)	Vert	28.5	33	4.500	Complied
Top (810)	Vert	29.2	33	3.800	Complied

7.4. Frequency Stability Measurements: Call Mode: (Temperature and Voltage Variation): Section 24.235

7.4.1.The EUT and HP GSM analyser were configured for conducted antenna port measurements.

7.4.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.4.3. Measurements were performed to determine the frequency stability of the fundamental emission from the EUT, when subjected to variation of ambient temperature and variation of supply voltage.

7.4.4. The device is battery operated. The applicant has stated that the nominal voltage of the battery is 4.2 volts with an end point voltage of 3.6 volts. Extreme measurements were performed at these two voltages as requested in FCC Part 2.1055 (d) (2)

7.4.5. The ambient temperature was varied from -30°C to +50°C in 10°C steps. During the test the fundamental frequency of the EUT shall stay within the authorised frequency block.

7.4.6. The client has stated that the authorised frequency block is:-

Lower Block Edge	1850 MHz
Upper Block Edge	1910 MHz

The limit is stated as the frequency stability that is sufficient to ensure that the fundamental emission stays within the authorised frequency block.

Frequency Stability Measurements: Call Mode: (continued)

Results: Bottom Channel (1850.2 MHz)

Temperature (°C)	DC Input Voltage (Volts)	Absolute Peak Frequency Error (Hz)	Frequency Error (ppm)	Limit to band Edge (ppm)	Margin (ppm)	Result
-30	4.2	4.6	0.002	108.921	108.106	Complied
	3.6	5.9	0.003	108.921	108.105	Complied
-20	4.2	-5.2	0.003	108.921	108.105	Complied
	3.6	-1.7	0.001	108.921	108.107	Complied
-10	4.2	3.8	0.002	108.921	108.106	Complied
	3.6	1.0	0.001	108.921	108.108	Complied
+0	4.2	45.0	0.024	108.921	108.084	Complied
	3.6	37.0	0.020	108.921	108.088	Complied
+10	4.2	18.0	0.010	108.921	108.098	Complied
	3.6	22.0	0.012	108.921	108.096	Complied
+20	4.2	17.0	0.009	108.921	108.099	Complied
	3.6	18.0	0.010	108.921	108.098	Complied
+30	4.2	-11.3	0.006	108.921	108.102	Complied
	3.6	-3.0	0.002	108.921	108.106	Complied
+40	4.2	-3.6	0.002	108.921	108.106	Complied
	3.6	-1.0	0.001	108.921	108.108	Complied
+50	4.2	-14.9	0.008	108.921	108.100	Complied
	3.6	-13.6	0.007	108.921	108.101	Complied

Frequency Stability Measurements: Call Mode: (continued)

Results: Top Channel (1909.8 MHz)

Temperature (°C)	DC Input Voltage (Volts)	Absolute Peak Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	4.2	0.4	0.001	104.723	104.712	Complied
	3.6	11.7	0.006	104.723	104.706	Complied
-20	4.2	27.0	0.014	104.723	104.698	Complied
	3.6	13.0	0.007	104.723	104.705	Complied
-10	4.2	14.4	0.008	104.723	104.705	Complied
	3.6	15.6	0.008	104.723	104.704	Complied
+0	4.2	26.0	0.014	104.723	104.698	Complied
	3.6	30.0	0.016	104.723	104.696	Complied
+10	4.2	38.0	0.020	104.723	104.692	Complied
	3.6	29.0	0.015	104.723	104.697	Complied
+20	4.2	27.0	0.014	104.723	104.698	Complied
	3.6	36.0	0.019	104.723	104.693	Complied
+30	4.2	25.0	0.013	104.723	104.699	Complied
	3.6	20.0	0.010	104.723	104.702	Complied
+40	4.2	11.0	0.006	104.723	104.706	Complied
	3.6	9.8	0.005	104.723	104.707	Complied
+50	4.2	50.0	0.026	104.723	104.686	Complied
	3.6	48.0	0.025	104.723	104.687	Complied

7.5. Transmitter Conducted Measurements: Call Mode: (Occupied Bandwidth): Section 24.238

7.5.1. The EUT, HP GSM test and spectrum analyser were configured for conducted antenna port measurements.

7.5.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.5.3.The device was operating in its normal mode of operation.

7.5.4. Measurements were performed to determine the Occupied Bandwidth of the fundamental emission from the EUT at the bottom middle and top channels.

7.5.5. The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB 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 FSEB user manual for this measurement. i.e., RBW <= 1/20 of occupied bandwidth.

Results:

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (kHz)
Bottom (512)	1850.2	3	3	242.986
Middle (660)	1879.8	3	3	245.491
Top (810)	1909.8	3	3	250.501

7.6. Transmitter Conducted Measurements: Call Mode: (Emissions at Band Edges): Section 24.238

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

7.6.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.6.3.FCC Part 24.238 states that emissions shall be attenuated by at least 43+10 log(P) dB below the transmitter power (P). It also 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 to be 3 kHz.

7.6.4. The highest level within these 1 MHz bands was thus measured and recorded.

Results:

Bottom Band Edge

Frequency (MHz)	Peak Emission Level (Watts)	Spurious Attenuation Level (dB)	Limit (dB)	Margin (dB)	Result
1850.000	0.043	43.8	43.0	0.80	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (Watts)	Spurious Attenuation Level (dB)	Limit (dB)	Margin (dB)	Result
1910.000	0.031	43.4	43.0	0.40	Complied

7.7. Transmitter Conducted Measurements: Call Mode: (Emissions Outside of Authorised Frequency Block): Section 24.238

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

7.7.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.7.3.FCC Part 24.238 states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P).

7.7.4.The spurious attenuation level is defined as: -

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

Results: Bottom, Middle and Top Channels.

Frequency (MHz)	Peak Emission Level (mW)	Spurious Attenuation Level (dB)	Limit (dB)	Margin (dB)	Result
14033.000	0.000002	56.2	43.0	13.2	Complied

7.8. Test Results For Radiated Emissions: Call Mode: Section 2.1053

7.8.1. Electric Field Strength Measurements: 30 to 1000 MHz

7.8.1.1. Preliminary Radiated spurious scans were performed with the EUT set to the Middle channel. Any visible spurious was then measured with the device set to top, bottom and middle channels.

7.8.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector at a test distance of 3m (results incorporate antenna factors and cable losses):

7.8.1.3. FCC Part 24.238 states that emissions shall be attenuated by at least 43+10 log (P) dB below the transmitter power (P_t). However, this is defined for conducted measurements. For radiated field strength measurements the limit is re-defined.

7.8.1.4. A substitution method was performed in order to determine the equivalent field strength limit for 43+10 log (P) at 3 meters.

Results:

Frequency (MHz)	Ant. Pol.	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
84.0	Vert	30.4	82.0	51.6	Complied
103.779	Vert	34.0	82.0	48.0	Complied
114.019	Vert	29.5	82.0	52.5	Complied
117.007	Vert	28.2	82.0	53.8	Complied
120.007	Vert	32.1	82.0	49.9	Complied
129.995	Vert	26.9	82.0	55.1	Complied
149.417	Vert	26.4	82.0	55.6	Complied
181.993	Vert	18.7	82.0	63.3	Complied
227.959	Vert	19.8	82.0	62.2	Complied
346.670	Hori	15.7	82.0	66.3	Complied

*Note: All three channels exhibited the same emission frequency and level.

7.9. Test Results For Radiated Emissions: Call Mode

7.9.1. Electric Field Strength Measurements: 1.0 to 26.0 GHz

7.9.1.1. The client has stated that the highest clock frequency for the EUT was 2.480 GHz. Therefore tests were performed up to 26 GHz.

7.9.1.2. Preliminary radiated spurious scans were performed with the EUT set to Bottom, Middle and Top channels as stated in section 5.2.

7.9.1.3. The following table lists frequencies at which emissions were measured using an Peak detector, a measurement test distance of 3 meters was used for the indicated results (results incorporate antenna factors and cable losses):

Highest Peak Level:- Bottom Channel

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Result
3.7003	Vert	53.4	22.9	1.2	77.50	82.0	4.50	Complied

Highest Peak Level: - Middle Channel

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Result
3.7595	Vert.	50.4	22.9	1.2	74.50	82.0	7.50	Complied

Highest Peak Level: - Top Channel

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Result
3.8196	Vert.	50.2	22.9	1.2	74.30	82.0	7.70	Complied

7.10. Test Results For Radiated Emissions: Receive/PDA Mode: Section 15.109

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

7.10.1.1. The following table indicates measured results with the EUT operated in receive mode to the limits specified in Part 15.109.

7.10.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector at a test distance of 3m (results incorporate antenna factors and cable losses):

Results:

Frequency (MHz)	Ant. Pol.	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
84.0	Vert	30.4	40.0	9.6	Complied
103.779	Vert	34.0	43.5	9.5	Complied
114.019	Vert	29.5	43.5	14.0	Complied
117.007	Vert	28.2	43.5	15.3	Complied
120.007	Vert	32.1	43.5	11.4	Complied
129.995	Vert	26.9	43.5	16.6	Complied
149.417	Vert	26.4	43.5	17.1	Complied
181.993	Vert	18.7	43.5	24.8	Complied
227.959	Vert	19.8	46.0	26.2	Complied
346.670	Hori	15.7	46.0	30.3	Complied

Test Results For Radiated Emissions: Receive/PDA Mode (continued)

Electric Field Strength Measurements (Frequency Range: 1.0 to 26.0 GHz)

7.10.1.3. The following table indicates measured results with the EUT operated in receive mode to the limits specified in Part 15.109.

7.10.1.4. There were no indicated radiated emissions above 1 GHz, thus no final results were obtained.

7.11. Test Results For AC Mains Conducted Emissions: Call Mode: Section 15.207

7.11.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.11.1.1. The following table indicates measured results to the limits specified in Part 15.207 (a) and (b)

7.11.1.2. Preliminary conducted spurious scans were performed with the EUT set to Bottom, Middle and Top channel.

7.11.1.3. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector:

Results:

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
0.488	Live/Neutral	39.1	48.0	8.9	Complied
0.650	Live/Neutral	33.8	48.0	14.2	Complied
0.809	Live/Neutral	35.1	48.0	12.9	Complied
0.969	Live/Neutral	36.0	48.0	12.0	Complied
1.132	Live/Neutral	38.5	48.0	9.5	Complied
1.308	Live/Neutral	35.7	48.0	12.3	Complied
1.782	Live/Neutral	33.3	48.0	14.7	Complied
2.108	Live/Neutral	33.5	48.0	14.5	Complied
2.426	Live/Neutral	37.6	48.0	10.4	Complied
2.585	Live/Neutral	39.6	48.0	8.4	Complied
2.749	Live/Neutral	37.2	48.0	10.8	Complied
3.233	Live/Neutral	36.6	48.0	11.4	Complied
3.589	Live/Neutral	33.4	48.0	14.6	Complied
4.220	Live/Neutral	31.9	48.0	16.1	Complied
4.845	Live/Neutral	33.1	48.0	14.9	Complied
5.020	Live/Neutral	35.4	48.0	12.6	Complied
5.360	Live/Neutral	35.3	48.0	12.7	Complied
6.371	Live/Neutral	31.5	48.0	16.5	Complied

7.12. Test Results For AC Mains Conducted Emissions: Receive/PDA Mode: Section 15.107

7.12.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.12.1.1. The following table indicates measured results to the limits specified in Part 15.107

7.12.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector:

Results:

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
0.488	Live/Neutral	39.1	48.0	8.9	Complied
0.650	Live/Neutral	33.8	48.0	14.2	Complied
0.809	Live/Neutral	35.1	48.0	12.9	Complied
0.969	Live/Neutral	36.0	48.0	12.0	Complied
1.132	Live/Neutral	38.5	48.0	9.5	Complied
1.308	Live/Neutral	35.7	48.0	12.3	Complied
1.782	Live/Neutral	33.3	48.0	14.7	Complied
2.108	Live/Neutral	33.5	48.0	14.5	Complied
2.426	Live/Neutral	37.6	48.0	10.4	Complied
2.585	Live/Neutral	39.6	48.0	8.4	Complied
2.749	Live/Neutral	37.2	48.0	10.8	Complied
3.233	Live/Neutral	36.6	48.0	11.4	Complied
3.589	Live/Neutral	33.4	48.0	14.6	Complied
4.220	Live/Neutral	31.9	48.0	16.1	Complied
4.845	Live/Neutral	33.1	48.0	14.9	Complied
5.020	Live/Neutral	35.4	48.0	12.6	Complied
5.360	Live/Neutral	35.3	48.0	12.7	Complied
6.371	Live/Neutral	31.5	48.0	16.5	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
Carrier Output Power (EIRP)	Not applicable	95%	+/- 4.0 dB
Conducted Emissions (AC)	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Conducted Emissions Antenna Port	0.009 kHz to 26 GHz	95%	+/- 2.9 dB
Radiated Emissions at 3.0 metres	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Emissions at 3.0 metres	1 GHz to 26 GHz	95%	+/- 4.18 dB
Frequency Stability	Not applicable	95%	+/- 4.2 dB
Occupied Bandwidth	1850 to 1910 MHz	95%	+/- 0.12 %
Emissions at Band Edges	1850 to 1910 MHz	95%	+/- 2.9 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.

Appendix 1. Test Equipment Used

Instrument	Manufacturer	Model	RFI No.
HFH2-Z2 Loop Antenna	Rohde & Schwarz	HFH2-Z2	A007
HFH2-Z2 Metal Tripod	Rohde & Schwarz	HFU-Z	A008
Horn Antenna	Eaton	9188-2	A027
Horn Antenna	Eaton	91888-2	A028
2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	A031
LISN	Rohde & Schwarz	ESH3-Z5	A067
Chase Bilog Antenna	Chase EMC Ltd	CBL6112B	A1037
Site 2 Controller SC144	-	SC144	A197
WG 16 Microwave Horn	Flann Microwave	16240-20	A255
OATS Positioning Controller	Rohde & Schwarz	HCC	A276
3 dB attenuator (9)	Suhner	6803.17.B	A392
WG 14 horn	Flann	14240-20	A427
WG 12 horn	Flann	12240-20	A428
WG 18 horn	Flann	18240-20	A430
WG 20 horn	Flann	20240-20	A436
Bilog Antenna	Chase	CBL6111A	A490
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A559
Cable	RFI	None	C161
Cable	Rosenberger	UFA210A-1-1181-70x70	C230
Coaxial Cable	Rosenberger	UFA210A-1-1181-70x70	C346
Cable	Rosenberger	UFA210A-1-1181-70x70	C360
Cable	Rosenberger	UFA210A-1-1181-70x70	C362
BNC Cable	Rosenberger	RG142	C364

Test Equipment Used (continued)

Instrument	Manufacturer	Model	RFI No.
N-Type Coaxial Cable	Rosenberger	UFA210A-1-3937-504504	C468
C564-N-2	Rosenberger	UFA 210A-1-0787-70x70	C564
C574-N-N-2	Rosenberger	UFA210A-1-788-50x50	C574
PCN Environmental Chamber	Sanyo	ATMOS chamber	E013
Spectrum Monitor	Rohde & Schwarz	EZM	M003
ESVP Receiver	Rohde & Schwarz	ESVP	M023
ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	M069
GSM Test set	Hewlett Packard	8922M	M1013
DCS Test set	Hewlett Packard	83220E	M1014
Spectrum Analyser	Rohde & Schwarz	FSEB 30	M127
Fluke 76 DVM	Fluke	76	M128
Turntable Controller	R.H.Electrical Services	RH351	M173
GSM MS Test Set	Hewlett Packard	8922M	M175
DCS 1800 MS Test Set	Hewlett Packard	83220E	M176
Thermo/hygrometer	Oregon Scientific	M245	M245
Analyser Display Unit	Rohde & Schwarz	ESAI-D	M505
RF unit	Rohde & Schwarz	ESBI-RF	M506
D.C. PSU	INSTEK	PC-3060	S010

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

Appendix 2. Measurement Methods

A2.1 FCC Part 24.232: Effective Isotropic Radiated Power (EIRP)

A2.1.1 EIRP measurements were performed in accordance with the standard, against appropriate limits.

A2.1.2 The EIRP was measured with the EUT arranged on a non-conducting table on an open area test site using an antenna height of 1.5 m and a measurement distance of 3 m

A2.1.3 The level of the EIRP was maximised by rotating the table.

A2.1.4 Once the final amplitude (maximised) had been made, the EIRP was ascertained using a substitution method using a isotropic antenna and a supplied test signal via a signal generator.

A2.1.5 All measurements were performed using broadband Horn antennas.

A2.1.6 The test equipment settings for EIRP measurements were as follows:

Receiver Function	**Final Measurements**
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	20 dB
Measurement Time:	> 1 s
Observation Time:	> 15 s
Sweep Time:	Coupled

A2.2 FCC Part 24.235: Frequency Stability

A2.2.1 Measurements were performed inside an environmental chamber under extremes of temperature and voltage to determine the frequency stability of the device under test against specified limits.

2.2.2 Measurements were made on the top and bottom channels within the temperature range –30 to 50 Deg C, and at the declared nominal supply voltage and at the declared endpoint voltage.

2.2.3 The EUT was then switched off for a minimum of 30 minutes while the environmental chamber stabilised at the next temperature within the temperature range. .

A2.2.4 FCC Part 24.235 states that the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorised frequency block. As such, the frequency difference from declared was measured in parts per million (ppm) with the difference between this and the authorised band edge being reported., also in (ppm)

A2.3 Conducted Antenna Port Measurements: FCC Part 24.238:

A2.3.1 Spurious measurements at the Antenna port were performed from 1 MHz to the lower frequency of the allocated frequency block and from the top frequency of the allocated frequency block to 10 times the highest EUT generated frequency (26 GHz).

A2.3.2 A measuring receiver was connected to the antenna port of the EUT via a suitable cable and RF Attenuator. The total loss of both the cable and the attenuator were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

A2.3.3 The specified frequency band was investigated with the transmitter operating at full power on the middle channel. Any spurious noted was then measured with the transmitter set to top, bottom and middle channels.

A2.3.4 Measurements were also made in the 1 MHz bands, immediately adjacent to the band edges of the frequency block, using a resolution bandwidth of at least 1% of the occupied bandwidth (300kHz), as per FCC Part 24.238 (b). The resolution bandwidth was thus set to 3kHz.

A2.3.5 The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	100 kHz	120 kHz	1 MHz
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s	> 1 s
Observation Time:	Not applicable	> 15 s	> 15 s
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

* The resolution bandwidth used for measurements in the 1 MHz blocks either side of the declared operating frequency block was set to 3 kHz.

A2.4 FCC Part 24.238: Occupied Bandwidth

A2.4.1 The EUT was connected to the spectrum analyser via its temporary antenna port.

A2.4.2 The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Rohde and Schwarz FSEB 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 FSEB user manual for this measurement. Ie, RBW <= 1/20 of occupied bandwidth. A value of 3kHz was used.

A2.5 FCC Part 15: AC Mains Conducted Emissions

A2.5.1 AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.5.2 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.

A2.5.3 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.

A2.5.4 During the swept measurements (and also during subsequent final measurements on single frequencies) 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.

A2.5.5 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.

A2.5.6 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

* Where measurements were made below 150 kHz a 200 Hz bandwidth was used.

A2.6 Radiated Emissions: FCC Part 15/24

A2.6.1 Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.6.2 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, and for the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

A2.6.3 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. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested on the open area test site, at the appropriate distance, using a measuring receivers with a Quasi-Peak detector (below 1000 MHz), where applicable, for measurements above 1000 MHz average and peak detectors were used.

A2.6.4 For the main (final) measurements the EUT was arranged on a non-conducting table on an open area test site, as detailed in the specification.

A2.6.5 All measurements on the open area test site were performed using broadband antennas.

A2.6.6 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. 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.

A2.6.7 For final measurements on the open area test site, for frequencies between 9 kHz and 30 MHz where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna angle through 360°. With the antenna set to a fixed height of 1.5 m. 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.

A2.6.8 The test equipment settings for radiated emissions measurements were as follows:

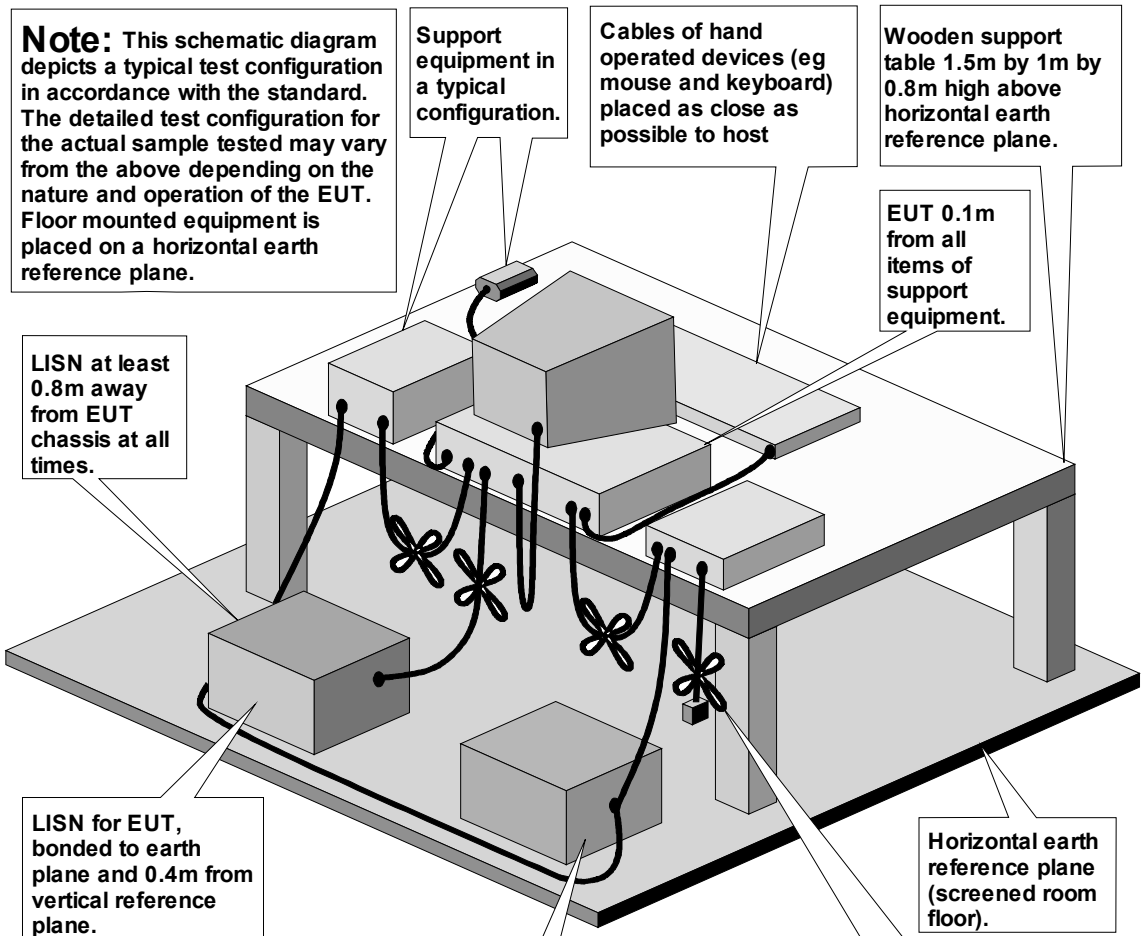
Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1GHz) (1MHz > 1GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s	> 1 s
Observation Time:	Not applicable	> 15 s	> 15 s
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\43528JD01\EMICON	Test configuration for measurement of conducted emissions
DRG\43528JD01\EMIRAD	Test configuration for measurement of radiated emissions
DRG\43528JD01\001	Schematic diagram of the EUT, support equipment and interconnecting cables used for the test (Receive/PDA mode)
DRG\43528JD01\002	Schematic diagram of the EUT, support equipment and interconnecting cables used for the test (call mode)

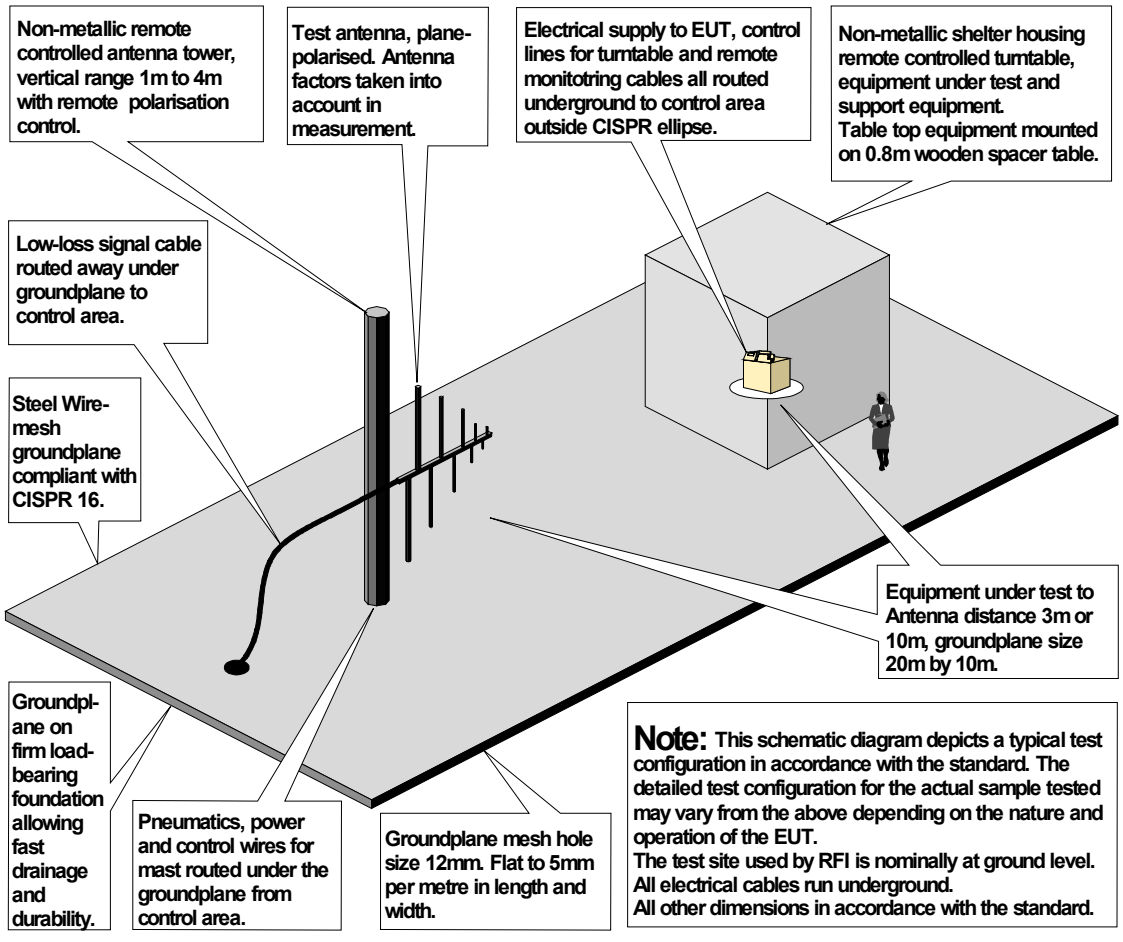
DRG\43528JD01\EMICON



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

Tests performed in a screened enclosure

DRG\43528JD01\EMIRAD



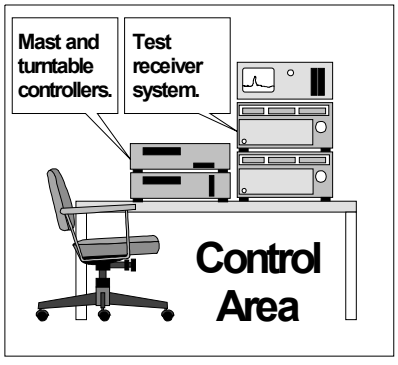
Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical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

Test Configuration For Radiated Emissions Measurements

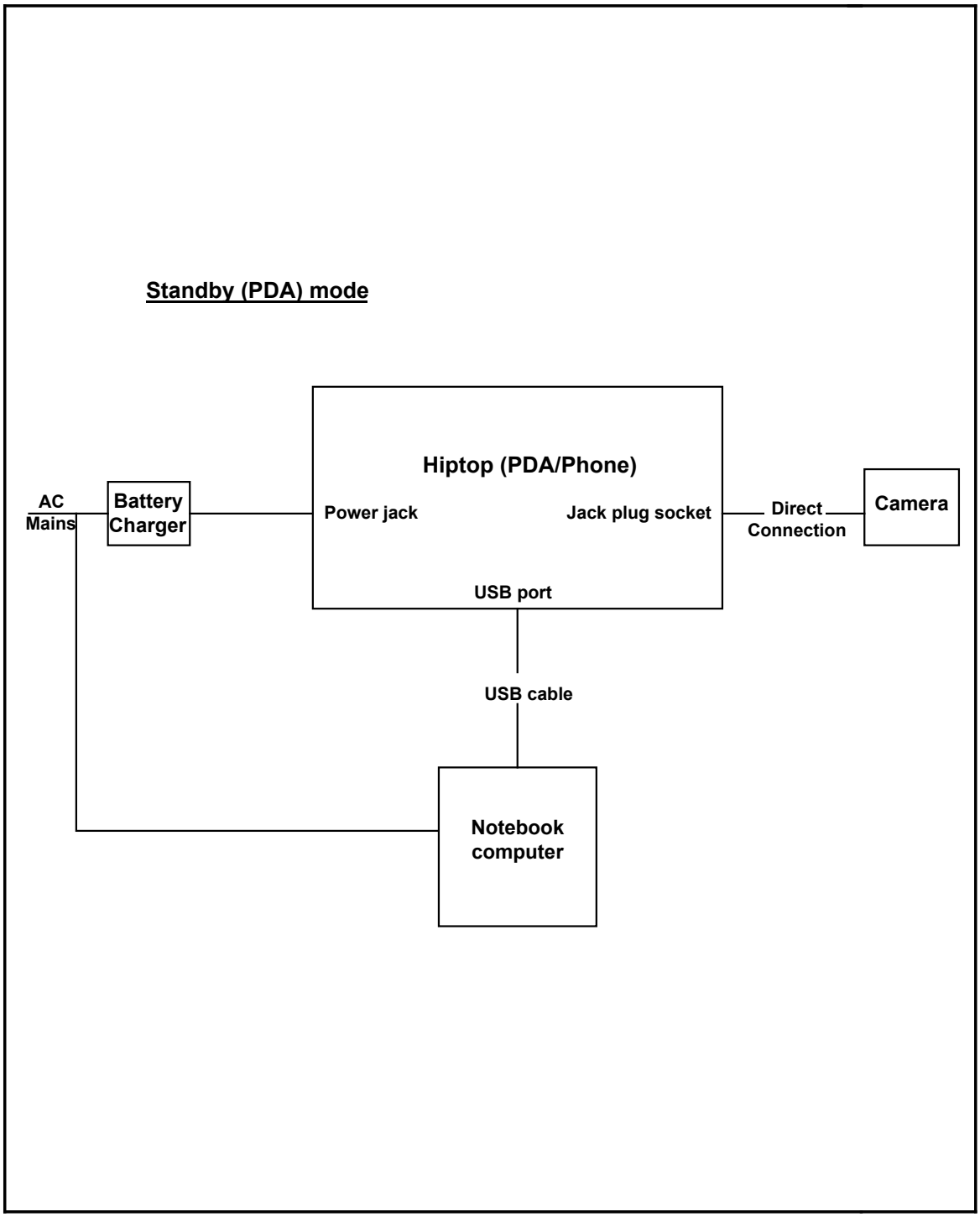
Reflection-free area: >60m by 52m (CISPR ellipse)

Groundplane Earthed

Control room outside CISPR ellipse



DRG\43528JD01\001



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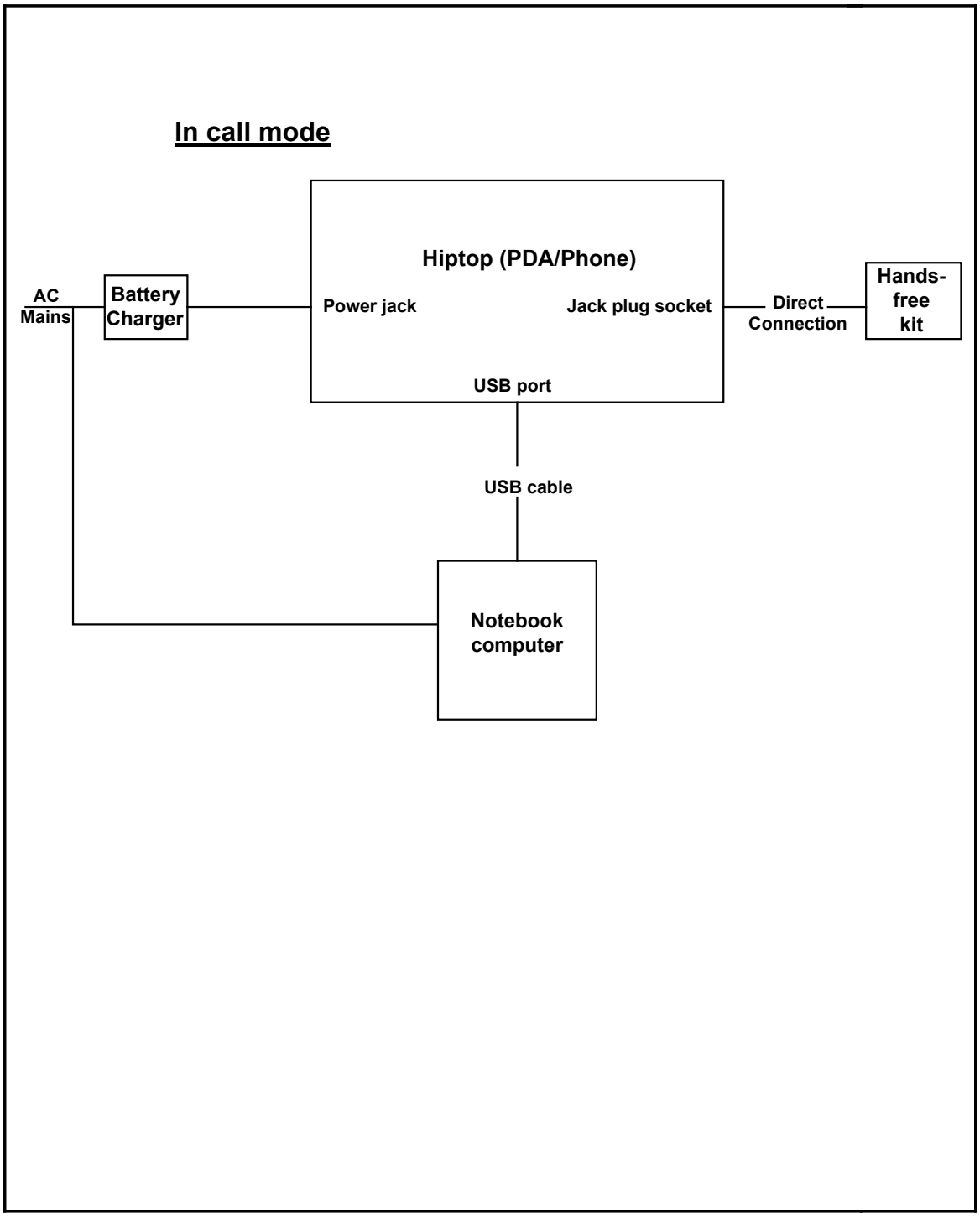

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