TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Ericsson Microwave Systems AB.
Ericsson RBS 2000, RBS 2401 GSM
1900 Duplex Configuration

To: FCC Part 24:1998
(Clause: 24.236)
and
FCC Part 15 Subpart B:1998

Test Report Serial No:
RFI/EMCB2/RP40144A
Supersedes Test Report Serial No:
RFI/EMCB1/RP40144A

This Test Report Is Issued Under The Authority Of Brian Watson Technical Director: 	**Checked By:** 
Tested By: 	**Release Version No: PDF01**
Issue Date: 1st December 1999	**Test Date: 18th November 1999 to 19th November 1999**

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1. Client Information

Company Name:	Ericsson Microwave Systems AB
Address:	S-431 84 Molndal Sweden
Contact Name:	Krister Boman

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:	Ericsson
Model Name or Number:	RBS 2401 GSM 1900
Unique Type Identification:	KRC 161 45/090
Serial Number:	A531925530
Country of Manufacture:	Sweden
FCC ID Number:	B5KKRC16145
Date of Receipt:	18th November 1999

2.2. Description Of EUT

The equipment under test is a pico GSM base station configured with 2 transceiver units. The pico shall provide mobile telephone users with a connection to a mobile network or PSTN.

2.3. Hardware Revision List

Description	Product Number	Serial No.	Revision
Cabinet	**KRC 161 45/090**	**A531925530**	**R2E**
CPI	ROA 219 3067/1	S951104608	R3A
TCB 6TRX A5/1-2	ROA 117 3677/1	A531657454	R4D
DXB-TX	ROA 117 3678/3	A531874869	R3A
Distribution Plane	ROA 219 2057/1	S951099457	R2B
Duplex Filter	KRF 901 09/1	A531888531	R1A
Power Supply	ROA 219 3066/1	TA31002131	R3B
TXU 1900	ROA 117 4664/1	A531925507	R1D
TXU 1900	ROA 117 4664/1	A531925511	R1D
RXDP 1900	ROA 117 4665/1	A531441217	R1B
RXU 1900	ROA 117 3581/1	A531914473	R1B
RXU 1900	ROA 117 3581/1	A531914505	R1B

2.4. Modifications Incorporated In EUT

None stated by client.

2.5. Additional Information Related To Testing

Power Supply Requirement: DC Supply (volts/Amps):	N/A
Power Supply Requirement: Internal Backup Battery:	N/A
Power Supply Requirement: AC Supply (Volts/Amps):	230 V, 50 Hz AC Mains Supply 16 Amp (Max) OR 115 V, 60 Hz
Intended Operating Environment:	Commercial, Light industrial and Heavy industrial
Equipment Category:	Mobile Telephony
Type of Unit:	Based Station (Fixed Use)
Weight:	19 Kg
Dimensions:	509mm x 122mm x 406mm
Interface Ports:	AC mains port – Multi Pin Connector G 703 PCM Interface Port - Multi Pin Connector 2 RF Connectors – TNC-Type Coax
Transmit Frequency	B, M and T (1930.2, 1960.0 and 1989.8 MHz)
Receive Frequency	B, M and T (1850.2, 1880.0 and 1909.8 MHz)
Maximum power output	0.16 Watts Max

2.6. Support Equipment

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

Description:	GSM RBS tester
Brand Name:	Rohde & Schwarz
Model Name or Number:	CMD 57
Serial Number:	YG 0694
FCC ID Number:	N/A
Cable Length And Type:	10 m RF coaxial, Suhner S04 262 and 20 m 100 ohm Abis cable
Connected to Port:	Abis Data In / Out, RFIn / Out

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 15: 1998 Class B
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.

Reference:	FCC Part 24:1998. Clause 24.236
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.

3.2. Methods And Procedures

The methods and procedures used were as detailed in:

47CFR: Part 24 (1997)
Title: Federal Communications Commission: Code of Federal Regulations 47: Personal Communication Services.

47CFR: Part 15 (1997)
Title: Federal Communications Commission: Code of Federal Regulations 47: Telecommunication

47CFR: Part 2 (1997)
Title: Federal Communications Commission: Code of Federal Regulations 47: Telecommunication

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

ANSI C63.4 (1992)
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 (1987)
Title: Specification for Radio Interference measuring apparatus and measurement methods.

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

As an additional test, AC conducted emissions were performed in accordance with FCC Pt 15 Subpart C, Subclause 15.207, as there were no test requirements in FCC Part 24.

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 115 V 60 Hz, AC mains supply.

5.2. Operating Modes

The EUT was tested in the following operating modes:

Transmit Mode: (Part 24)

The EUT was set to operate with all transmitters transmitting on full power with all timeslots active. Measurements were performed with the EUT set to operate on bottom and middle channels and middle and top channels only. Slow Frequency Hopping (SFH) was disabled.

Receive Mode: (Part 15)

All transmitters were disabled, and the EUT was set to receive data only.

The reason for choosing this mode was that it was defined by the client as being likely to be the worst case with regards EMC.

5.3. Configuration And Peripherals

The EUT was tested in the following configuration: The EUT was connected to a GSM test set and each port was fitted with a typical type and length of cable as shown in the diagram given in Appendix 3 of this report.

The reason for choosing this configuration was that it was defined by the client as being likely to be the worst case with regards EMC.

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. Radiated Emissions

Range Of Measurements	Specification Reference	Mode of Operation	Port Type	Compliancy Status
Conducted Spurious Emissions 450 kHz to 30 MHz	Section 15 of C.F.R. 47: 1997, Clause 15.107	Receive Mode	AC Mains Input	Complied
Conducted Spurious Emissions 450 kHz to 30 MHz	Section 15 and 24 of C.F.R. 47: 1997, Clause 15.207	Transmit Mode	AC Mains Input	Complied
Electric Field Strength, Spurious Emissions 30 MHz to 10000 MHz	Section 15 of C.F.R. 47: 1997, Clause 15.109	Receive Mode	Enclosure	Complied
Electric Field Strength, Spurious Emissions 30 MHz to 20000 MHz	Section 24 Clause 24.236 of C.F.R 47: 1997	Transmit Mode	Enclosure	Complied
Effective Radiated Power Spurious Emissions 30 MHz to 20000 MHz	Section 24 Clause 24.236 of C.F.R 47: 1997	Transmit Mode	Enclosure	Complied

6.2. 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. The measurement uncertainties stated were calculated in accordance with the requirements of NAMAS Document NIS 81 with a confidence level of 95%. Please refer to Section 8 for details of measurement uncertainties.

7.2. Test Results For AC Mains Conducted Emissions.

7.2.1. Quasi-Peak Detector Measurements: Live and Neutral Lines: Receive Mode.

7.2.1.1. Plots of the initial scans can be found in Appendix 4.

7.2.1.2. Measurements were performed in accordance with the limits specified in Part 15.107 Class B.

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

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.485	Live	29.6	48.0	18.4	Complied
0.485	Neutral	30.9	48.0	17.1	Complied
1.059	Neutral	29.1	48.0	18.9	Complied
1.062	Live	29.3	48.0	18.7	Complied
1.253	Live	28.5	48.0	19.5	Complied
1.253	Neutral	27.9	48.0	20.1	Complied
3.884	Neutral	19.3	48.0	28.7	Complied
3.956	Live	29.0	48.0	19.0	Complied
9.816	Live	35.2	48.0	12.8	Complied
9.816	Neutral	35.5	48.0	12.5	Complied
18.011	Neutral	31.5	48.0	16.5	Complied
18.013	Live	28.9	48.0	19.1	Complied

7.2.2. Quasi-Peak Detector Measurements: Live and Neutral Lines: Transmit Mode.

7.2.2.1. Plots of the initial scans can be found in Appendix 4.

7.2.2.2. Measurements were performed in accordance with the limits specified in Part 15.207 (15.107 Class B) and are for the EUT operating on bottom and middle channels.

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

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.486	Live	29.5	48.0	18.5	Complied
0.488	Neutral	30.1	48.0	17.9	Complied
1.062	Live	29.6	48.0	18.4	Complied
1.064	Neutral	27.8	48.0	20.2	Complied
1.253	Live	28.5	48.0	19.5	Complied
1.256	Neutral	27.0	48.0	21.0	Complied
3.958	Live	28.2	48.0	19.8	Complied
9.812	Neutral	32.8	48.0	15.2	Complied
9.903	Live	33.6	48.0	14.4	Complied
17.889	Live	28.8	48.0	19.2	Complied
17.897	Neutral	31.3	48.0	16.7	Complied
21.022	Neutral	29.9	48.0	18.1	Complied

7.2.3. Quasi-Peak Detector Measurements: Live and Neutral Lines: Transmit Mode.

7.2.3.1. Plots of the initial scans can be found in Appendix 4.

7.2.3.2. Measurements were performed in accordance with the limits specified in Part 15.207 (15.107 Class B) and are for the EUT operating on middle and top channels.

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

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.486	Live	29.8	48.0	18.2	Complied
0.486	Neutral	30.7	48.0	17.3	Complied
1.060	Neutral	29.7	48.0	18.3	Complied
1.063	Live	28.8	48.0	19.2	Complied
1.251	Neutral	27.9	48.0	20.1	Complied
1.253	Live	28.6	48.0	19.4	Complied
3.957	Live	28.8	48.0	19.2	Complied
9.895	Neutral	33.8	48.0	14.2	Complied
9.899	Live	33.8	48.0	14.2	Complied
17.888	Live	28.9	48.0	19.1	Complied
17.889	Neutral	31.0	48.0	17.0	Complied
21.119	Neutral	30.3	48.0	17.7	Complied

7.3. Test Results For Radiated Emissions.

7.3.1. Electric Field Strength Measurements: Receive Mode: 30 MHz to 10000 MHz.

7.3.1.1. The client has stated that the highest clock frequency for the EUT was 1989.8 MHz. Therefore tests were performed up to 10000.0 MHz.

7.3.1.2. Plots of the initial scans can be found in Appendix 4 of this test report.

7.3.1.3. 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):

Frequency (MHz)	Ant. Pol.	Q-P Level (dBmV/m)	Q-P Limit (dBmV/m)	Margin (dB)	Result
50.000	Vert.	21.6	47.0	25.4	Complied
51.820	Vert.	24.7	47.0	22.3	Complied
83.748	Vert.	13.1	47.0	33.9	Complied
119.813	Vert.	13.6	47.0	33.4	Complied
121.899	Vert.	20.7	47.0	26.3	Complied
786.026	Vert.	35.2	47.0	11.8	Complied
786.747	Vert.	35.3	47.0	11.7	Complied

7.3.2. Electric Field Strength Measurements – Receive Mode – 1.0GHz to 10.0GHz.

7.3.2.1. The client has stated that the highest clock frequency for the EUT was 1989.8 MHz. Therefore tests were performed up to 10000 MHz.

7.3.2.2. The radiated spurious emissions preliminary scans performed in the screened chamber within the frequency range 1.0 GHz to 10.0 GHz. These scans revealed two frequencies at 1.8211 GHz and 1.8511 GHz to be of a significant level. Further investigation showed that the levels highlighted by the preliminary scans were of a transient nature, and therefore no level above the noise floor of the test receiver was noted. Therefore, as scans revelled that there were no spurious emissions present within this frequency band, no measurements were taken on the Open Area Test Site within this frequency range. Plots of these initial scans can be found in Appendix 4 of this test report.

7.3.3. Electric Field Strength Measurements: Transmit Mode: 30 MHz to 1000 MHz.

7.3.3.1. The client has stated that the highest clock frequency for the EUT was 1989.8 MHz. Therefore tests were performed up to 20000.0 MHz.

7.3.3.2. Measurements were performed in accordance with the limits specified in Part 24.236, and are for the EUT operating on bottom and middle channels. The specified limit of 47dBuV/m is specified at the border of the PCS service area. Therefore, for the purpose of this test, the limit was specified at a test distance of 3m.

7.3.3.3. Plots of the initial scans can be found in Appendix 4 of this test report.

7.3.3.4. 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):

Frequency (MHz)	Ant. Pol.	Q-P Level (dBmV/m)	Q-P Limit (dBmV/m)	Margin (dB)	Result
31.163	Vert.	26.1	47.0	20.9	Complied
65.000	Vert.	19.9	47.0	27.1	Complied
113.835	Vert.	17.3	47.0	29.7	Complied
119.821	Vert.	16.3	47.0	30.7	Complied
786.029	Vert.	34.9	47.0	12.1	Complied
786.751	Vert.	35.3	47.0	11.7	Complied

7.3.4. Electric Field Strength Measurements: Transmit Mode: 30 MHz to 1000 MHz.

7.3.4.1. The client has stated that the highest clock frequency for the EUT was 1989.8 MHz. Therefore tests were performed up to 20000.0 MHz.

7.3.4.2. Measurements were performed in accordance with the limits specified in Part 24.236, and are for the EUT operating on middle and top channels. The specified limit of 47dBuV/m is specified at the border of the PCS service area. Therefore, for the purpose of this test, the limit was specified at a test distance of 3m.

7.3.4.3. Plots of the initial scans can be found in Appendix 4 of this test report.

7.3.4.4. 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):

Frequency (MHz)	Ant. Pol.	Q-P Level (dBmV/m)	Q-P Limit (dBmV/m)	Margin (dB)	Result
31.605	Vert.	30.1	47.0	16.9	Complied
48.560	Vert.	20.3	47.0	26.7	Complied
109.800	Vert.	14.5	47.0	32.5	Complied
113.792	Vert.	15.2	47.0	31.8	Complied
121.813	Vert.	14.8	47.0	32.2	Complied
786.024	Vert.	38.1	47.0	8.9	Complied
786.749	Vert.	38.0	47.0	9.0	Complied

7.3.5. Electric Field Strength Measurements: Transmit Mode: 1000 MHz to 20000 MHz.

7.3.5.1. The client has stated that the highest transmit frequency for the EUT was 1989.8 MHz. Therefore tests were performed up to 20000 MHz.

7.3.5.2. Preliminary scans and final measurements were performed with the EUT transmitting on both bottom and middle channels and middle and top channels.

7.3.5.3. The radiated spurious emissions preliminary scans within the frequency range 1000 MHz to 20000 MHz were found to be greater than 10dB below the reference limit line. Therefore no measurements were taken within this frequency range. Plots of the initial scans can be found in Appendix 4 of this test report.

7.3.6. Test Results For Radiated Emissions: Transmit Mode.

7.3.7. Effective Radiated Power (ERP) Measurements: 30MHz to 1000MHz.

7.3.7.1. The client has stated that the highest transmit frequency for the EUT was 1989.8 MHz. Therefore tests were performed up to 20000 MHz.

7.3.7.2. Measurements were performed in accordance with the limits specified in Part 24.236, and are for the EUT operating on bottom and middle channels. In addition to the electric field strength levels specified within this report, ERP measurements were also performed.

7.3.7.3. The following table lists frequencies at which emissions were measured using a Peak detector at a test distance of 3m.

Frequency (MHz)	Pol (H/V)	Bandwidth (kHz)	Level (dBuV)	Site Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
31.163	Vert.	120	4.1	40.4	-62.9	-33.0	29.9	Complied
65.000	Vert.	120	10.1	27.4	-79.6	-33.0	46.6	Complied
113.835	Vert.	120	0.4	22.2	-84.8	-33.0	51.8	Complied
119.821	Vert.	120	-0.9	25.5	-81.5	-33.0	48.5	Complied
786.029	Vert.	120	9.0	40.9	-57.1	-33.0	24.1	Complied
786.751	Vert.	120	9.4	40.9	-56.7	-33.0	23.7	Complied

7.3.8. Effective Radiated Power (ERP) Measurements: 30MHz to 1000MHz.

7.3.8.1. The client has stated that the highest transmit frequency for the EUT was 1989.8 MHz. Therefore tests were performed up to 20000 MHz.

7.3.8.2. Measurements were performed in accordance with the limits specified in Part 24.236, and are for the EUT operating on middle and top channels. In addition to the electric field strength levels specified within this report, ERP measurements were also performed.

7.3.8.3. The following table lists frequencies at which emissions were measured using a Peak detector at a test distance of 3m.

Frequency (MHz)	Pol (H/V)	Bandwidth (kHz)	Level (dBuV)	Site Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
31.605	Vert.	120	8.3	44.6	-54.1	-33.0	21.1	Complied
48.560	Vert.	120	7.2	20.1	-79.7	-33.0	46.7	Complied
109.800	Vert.	120	-2.2	23.8	-85.4	-33.0	52.4	Complied
113.792	Vert.	120	-1.8	23.8	-85.0	-33.0	52.0	Complied
121.813	Vert.	120	-2.4	27.2	-82.2	-33.0	49.2	Complied
786.024	Vert.	120	12.2	40.9	-53.9	-33.0	20.9	Complied
786.749	Vert.	120	12.1	40.9	-54.0	-33.0	21.0	Complied

7.4. Investigative Additional Testing: Measurements, Examinations and Results of Radiation Hazard Survey (not UKAS accredited)

Note: Tests marked "Not UKAS accredited" in this report are not included in the UKAS accreditation schedule for the laboratory

7.4.1. At the request of the client, a Radiation Hazard investigation was performed. The results of this investigation are shown for information purposes only and do not form part of this compliance report. It should be noted that this type of work is not listed on RFIs UKAS schedule and is there "not UKAS accredited".

7.4.2. An investigation was carried out around the EUT with the EUT access door both open and closed.

7.4.3. Measurements of power density were taken, using a calibrated Radiation Hazard Survey Meter, around the EUT at heights above the floor of between 0.5m and 2.5m. Also, the test bench area around, in front of, by the side of and under the bench.

7.4.4. The following table shows measurement results at specific locations with the access doors both open and closed.

Key points in area:

Position	Level	Measurement Distance
Clear area around EUT:	<0.01 mW/cm^2	>25cm from any surface, standing area
Around and under bench and EUT:	<0.01 mW/cm^2	>25cm above and below unit
Around EUT:	0.01 mW/cm^2	<1cm from unit

8. Measurement Uncertainty

8.1. Company Policy, as based on the NAMAS Accreditation Standard, M10, paragraph 12.11 (o), states that Test Reports shall include estimated uncertainty of the calibration or test result (this information need only appear in test reports and test certificates where it is relevant to the validity or application of the test result, where a client's instructions so require or where uncertainty affects compliance to a specification or limit).

8.2. The global uncertainties have been calculated in accordance with NAMAS NIS 81 (Edition 1, May 1994) as follows:

Measurement Type	Range	Confidence Level	Calculated Uncertainty
Conducted Emissions	0.45 MHz to 30 MHz	95%	+/- 2.2 dB
Radiated Field Strength Emissions	30 MHz to 1.0 GHz	95%	+/- 4.9 dB
Radiated Field Strength Emissions	1.0 GHz to 10.0 GHz	95%	+/- 4.4 dB
Radiated Emissions (Effective Radiated Power)	1 GHz to 20 GHz	95%	+/- 4.2 dB

8.3. Measurement uncertainties have been applied in accordance with NAMAS document NIS 81 (edition 1, May 1994), and in the absence of any specification criteria, guidance, or code of practice, compliance has been judged on the basis of shared risk.

8.4. In the case of emissions tests, the measured value of the disturbance from the product sample shall be compared directly with the limits. If the measured value is equal to or less than the limit the product is deemed to pass the test.

8.5. In the case of immunity tests, the equipment is deemed to pass the test if it fulfils the stated performance criteria at the required or a higher severity level. The measurement uncertainty has been taken into account in the calibration procedures stated in the relevant basic standard.

8.6. The methods used to calculate the above uncertainties are in line with those used for calibration laboratories contained in NAMAS document NIS 3003 Edition 8 “The Expression of Uncertainty and Confidence in Measurement” May 1995, which align with international recommendations “Guide to the Expression of Uncertainty in Measurement” ISO/IEC/OIML/BIPM (Prepared by ISO/TAG 4: January 1993).

Appendix 1. Test Equipment Used

Instrument	Manufacturer	Model	RFI No.
Screened Enclosure: Emissions			
Receiver / Spectrum Analyser System	R & S	ESMI	M069
Plotter	H.P.	7440A	P001
Bilog Antenna	Chase	CBL6111	A490
Co-Axial Cable	R.F.I.	None	C049
Co-Axial Cable	Rosenberger	LU7_150_2000	C499
Single Phase LISN	R & S	ESH3-Z5	A1069
Pulse Limitter	R & S	ESH3-Z2	A287
Isotropic Field Probe	Narda	8621B	M163
Horn Antenna (1 to 2 GHz)	Eaton	9188-2	A028
Horn Antenna (2 to 4 GHz)	Eaton	91889-2	A031
Horn Antenna (4 to 6 GHz)	Flann	12240-20	A428
Horn Antenna (5 to 8.2 GHz)	Flann	12420-20	A439
Horn Antenna (8 2 to 12.5 GHz)	Flann	16240-20	A429
Horn Antenna (12 5 to 18 GHz)	Flann	18240-20	A438
Horn Antenna (18 to 26 GHz)	Flann	20240-20	A436
Open Area Test Site			
Receiver	R & S	ESVP	M023
Spectrum Monitor	R & S	EZM	M004
Bilog Antenna	Chase	CBL6112B	A1037
3dB Attenuator	Suhner	6803.17.B	A392
Signal Generator	R & S	SMG	G009
Half Wave tuned dipole kit	EMCO	C121C	A072
Cable	Rosenberger	UFA210A-1-1181-70x70	C152
Insertion unit	R & S	URY-Z2	M034
Power Meter	R & S	URY	M095

Test Equipment Used (continued)

Instrument	Manufacturer	Model	RFI No.
Open Area Test Site			
Cable	Rosenberger	UFA210A-1-1181-70x70	C222
Turntable Controller	R.H.Electrical Services	RH351	M173

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

Appendix 2. Measurement Methods

A2.1. AC Mains Conducted Emissions

A2.1.1. AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.1.2. 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.

A2.1.3. 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.

A2.1.4. 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.

A2.1.5. 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.

A2.1.6. 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.

A2.2. Radiated Electric Field Strength Emissions:

A2.2.1. Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.2.2. 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.

A2.2.3. 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.

A2.2.4. 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.

A2.2.5. All measurements on the open area test site were performed using broadband antennas.

A2.2.6. 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.

A2.2.7. The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan Below 1000 MHz**	**Final Measurements Below 1000 MHz**
Detector Type:	Peak	Quasi-Peak (CISPR)
Mode:	Max Hold	Not applicable
Resolution Bandwidth:	120 kHz	120 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

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

A2.3. Radiated Emissions: Effective Radiated Power

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

A2.3.2. 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.

A2.3.3. 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.

A2.3.4. 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.

A2.3.5. All measurements on the open area test site were performed using broadband antennas.

A2.3.6. 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.

A2.3.7. Once the final amplitude (maximised) had been made, the effective radiated power was ascertained using a substitution method at each emission test frequency using a tuned half-wave dipole antenna and a supplied test signal via a signal generator.

A2.3.8. The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan Below 1000 MHz**	**Final Measurements Below 1000 MHz**
Detector Type:	Peak	Quasi-Peak (CISPR)
Mode:	Max Hold	Not applicable
Resolution Bandwidth:	120 kHz	120 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

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

A2.6. Test Methods and Procedures for Radiation Hazard Survey. (Not UKAS Accredited)

A2.6.1. A Narda 8616 meter with 8621 probe was used to make the measurements. The measurement equipment was placed at the point to be measured and the field strength present was displayed in milliWatts per squared centimetre ($mW/cm^{2)}$.

A2.6.2. The standard referenced for the testing was the National Radiological Protection Board (NRPB) Volume 4 No.5: 1993 guidance document. The IEEE standard ANSI C95.2 is very similar to this document and therefore comparisons may easily be made.

A2.6.3. This document and therefore the measurement equipment deal with the thermal effects of the radiation only. Thermal effects are not considered.

A2.6.4. A summary of the recommended power density levels given by the NRPB are as follows:

Frequency Range	**Power Density Investigation Limit (mW/cm^{-1})**
300 to 400 MHz	$1650f^2$ (Where f is in GHz)
400 to 800 MHz	260
800 to 1550 MHz	$410f^2$ (Where f is in GHz)
1.55 to 300 GHz	1000

These limits are for full body exposure. The equipment used is calibrated for a test distance of >25cm to assure a far field measurement. Clearly, full body exposure would be virtually impossible at less than 25cm from the source.

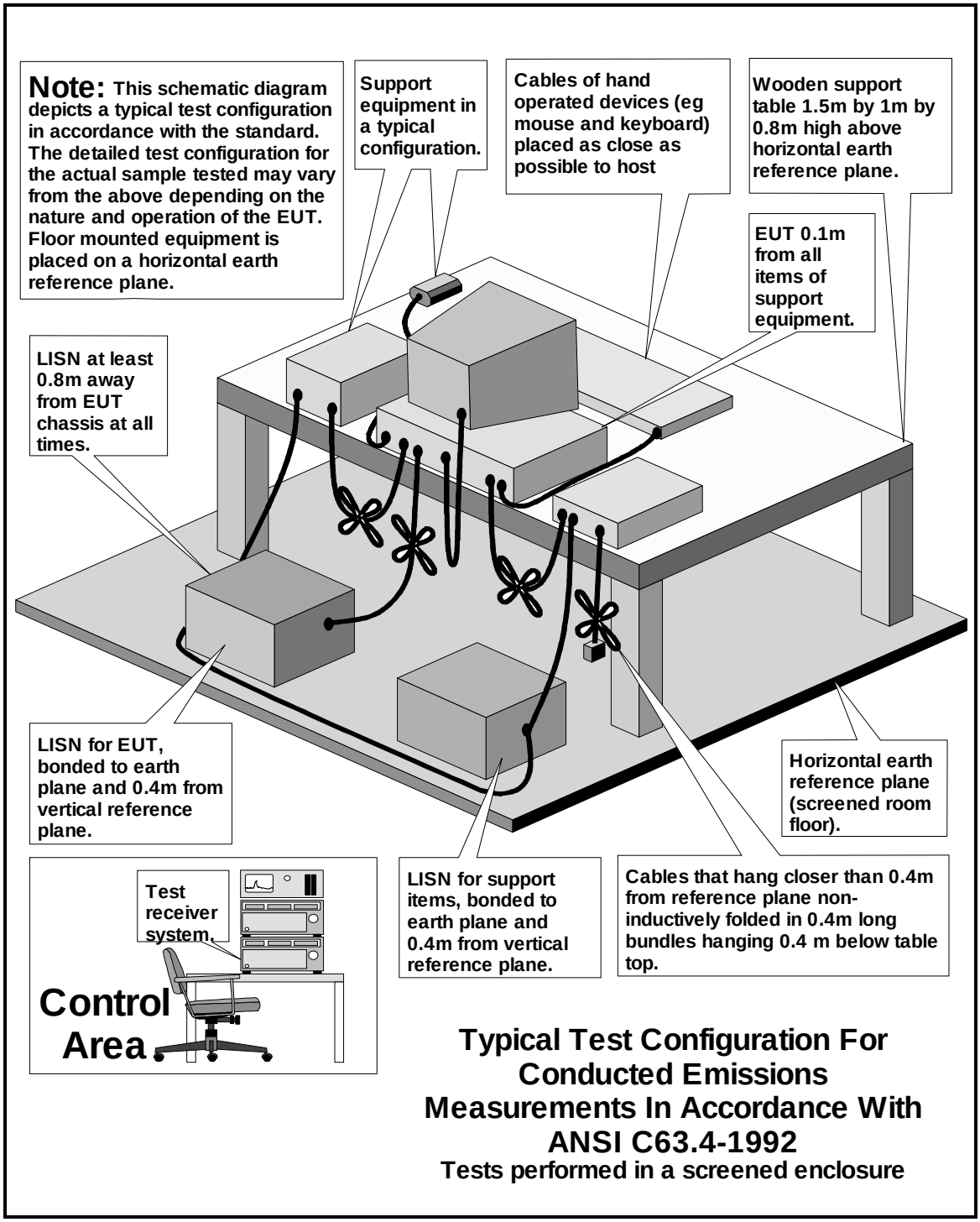
Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\40144JD01\EMICON	Test configuration for measurement of conducted emissions
DRG\40144JD01\EMIRAD	Test configuration for measurement of radiated emissions
DRG\40144JD01\001	Schematic diagram of the EUT, support equipment and interconnecting cables used for the test

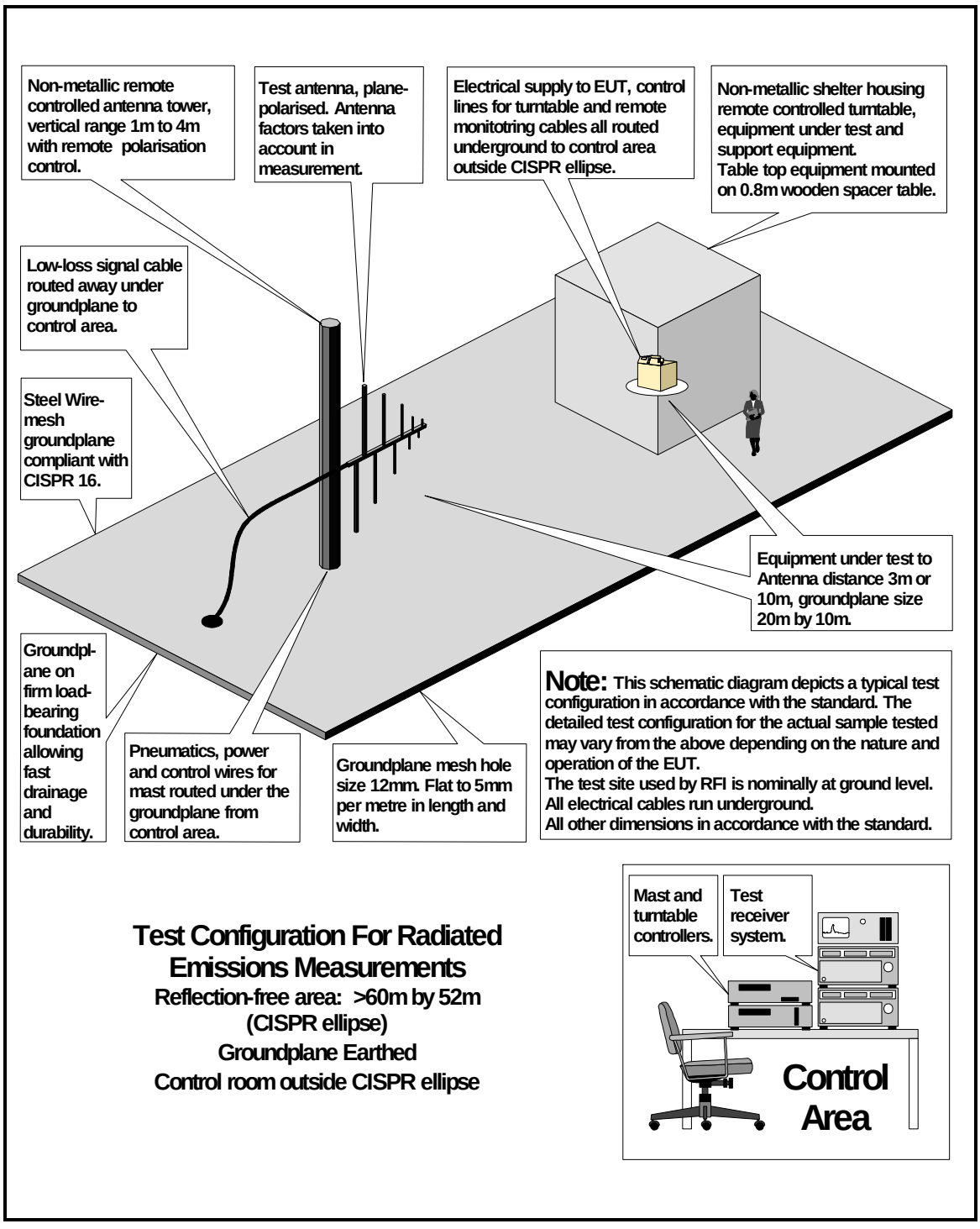
Test Of: **Ericsson Microwave Systems AB.**
Ericsson RBS 2000, RBS 2401 GSM 1900 Duplex Configuration
To: **FCC Part 24:1998 (Clause: 24.236) and FCC Part 15 Subpart B:1998**

DRG\40144JD01\EMICON



Test Of: **Ericsson Microwave Systems AB.**
Ericsson RBS 2000, RBS 2401 GSM 1900 Duplex Configuration
To: **FCC Part 24:1998 (Clause: 24.236) and FCC Part 15 Subpart B:1998**

DRG\40144JD01\EMIRAD

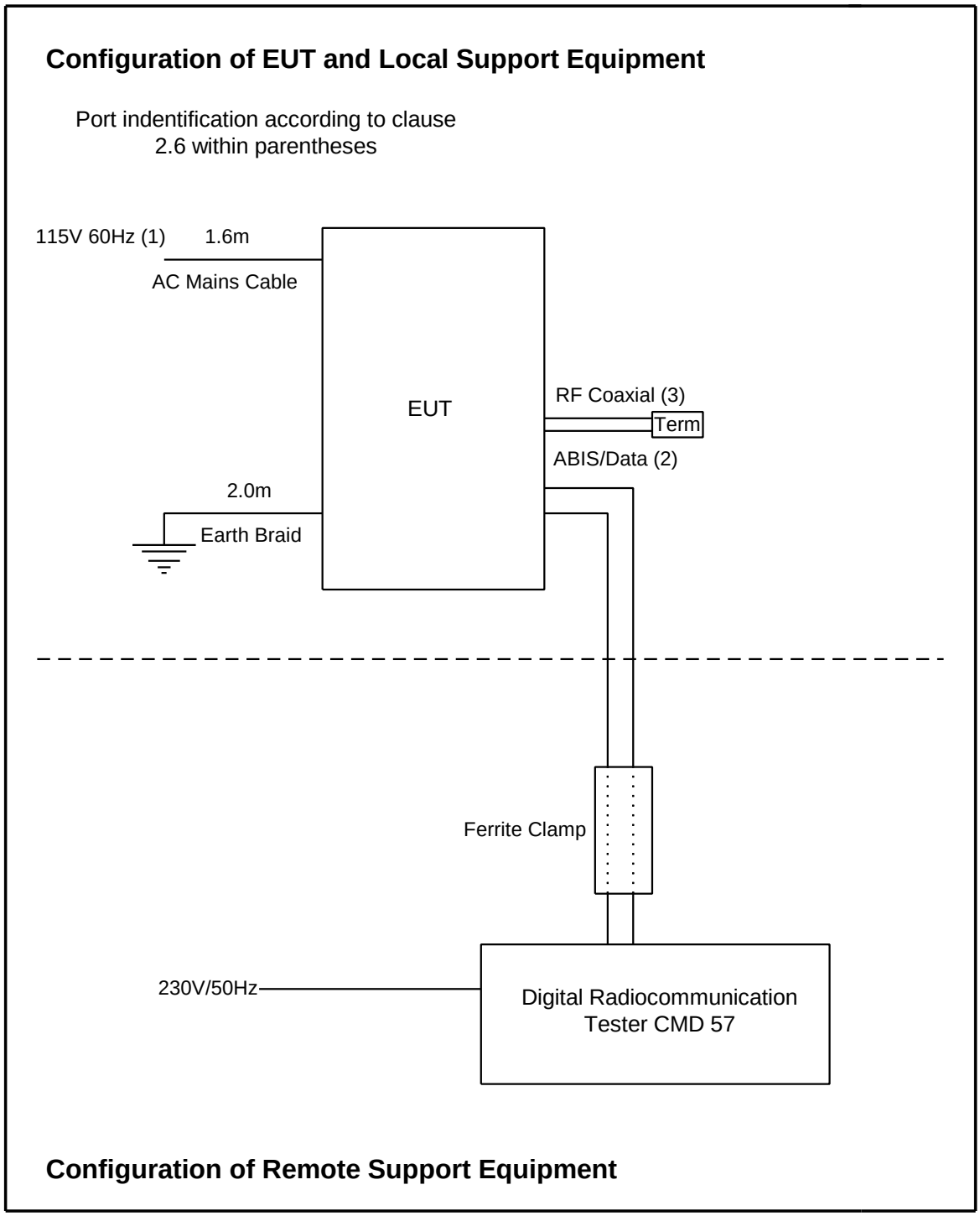


Test Configuration For Radiated Emissions Measurements
Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse

Test Of: **Ericsson Microwave Systems AB.**
Ericsson RBS 2000, RBS 2401 GSM 1900 Duplex Configuration
To: **FCC Part 24:1998 (Clause: 24.236) and FCC Part 15 Subpart B:1998**

DRG\40144JD01\001

Configuration of EUT and Local Support Equipment



Configuration of Remote Support Equipment