TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Ericsson AB.
RBS 2308

To: FCC Part 22: 2001

Test Report Serial No:
RFI/MPTB1/RP44227JD01A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By:**  **pp**
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1. Client Information

Company Name:	Ericsson AB
Address:	Torshamnsgatan 21-23 S-164 80 Kista Sweden
Contact Name:	Mr Larry Lindstrom

2. Equipment Under Test (EUT)

The following information has been supplied by the client:

2.1. Identification Of Equipment Under Test (EUT)

Unit	Model Number	Serial Number	Revision Number
RBS 2308 Cabinet	KRC 161 84/7	AE5000PZT6	R2B

Note The above unit was tested for all conducted measurements at Mölndal.

Unit	Model Number	Serial Number	Revision Number
RBS 2308 Cabinet	KRC 161 84/7	AE5000PT4P	R2B

Note The above unit was tested for radiated spurious emissions at Basingstoke.

2.2. Description Of EUT

The EUT is an RBS 2308 GMSK/8PSK base transceiver station operating in the GSM 850 MHz Band.

2.3. Modifications Incorporated In EUT

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

2.4. Additional Information Related To Testing

Type of Unit:	GSM 850 Base Transceiver Station
Interface Ports:	Telecommunication line – E1 or T1 PCM x2 (G703) TIB – synchronisation interface Mains 115 V AC Input DVT – RBS Master Control RF x2 RXBP x2
Transmit Frequency	869 MHz to 894 MHz
Receive Frequency	824 MHz to 849 MHz
Maximum Power Output	34 dBm

2.5. Support Equipment – Mölndal

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

Description:	BSC Simulator
Brand Name:	RBS Master 2
Model Name or Number:	LPY 107 1007/1 R1F
Serial Number:	00163
FCC ID Number:	Not applicable
Cable Length And Type:	3 m, 9 pin, D Type
Connected to Port:	G703-1 ABIS
Cable Length And Type:	3 m, 9 pin, D Type, Shielded
Connected to Port:	G.703-2 ABIS
Cable Length And Type:	3 m, 9 pin, D type
Connected to Port:	RBS DVT
Cable Length And Type:	2 m, BNC
Connected to Port:	Ext Ref In
Cable Length And Type:	2 m, BNC
Connected to Port:	TRIG Out
Cable Length And Type:	2 m, BNC
Connected to Port:	10 MHz Out
Cable Length And Type:	1.5m, 9 Way, D Type
Connected to Port:	PC DVT
Cable Length And Type:	1.5m, 9 Way, D Type
Connected to Port:	PC Ctrl
Cable Length And Type:	2m, Mains Cable
Connected to Port:	AC Mains In
Cable Length And Type:	3 m, 34 Way Ribbon Cable
Connected to Port:	TIB In/Out

Support Equipment – Mölndal (continued)

Description:	Computer
Brand Name:	Propac
Model Name or Number:	18-0100 Type 18
Serial Number:	38
FCC ID Number:	Not applicable
Cable Length And Type:	1.5 m, 9 Pin D Type
Connected to Port:	PC DVT
Cable Length And Type:	1.5 m, 9 Pin D Type
Connected to Port:	PC Ctrl
Cable Length And Type:	2 m, Mains Cable
Connected to Port:	AC Input
Cable Length And Type:	0.3 m, GPIB
Connected to Port:	IEEE Bus
Cable Length And Type:	4 m, 8 Core
Connected to Port:	Network
Cable Length And Type:	10 m, 7 Way
Connected to Port:	Mouse
Cable Length And Type:	10 m, 7 Way
Connected to Port:	Keyboard

2.6.Support Equipment - Basingstoke

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

Description:	RBS Master 2
Brand Name:	Ericsson
Model Name or Number:	LPY1071007/1
Serial Number:	00155
FCC ID Number:	Not applicable
Cable Length And Type:	2 x 6 Core Shielded (15 WD – 9 WD)
Connected to Port:	EUT G.703 A+B

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Latitude LS
Serial Number:	0001498T-12800-081-2594
FCC ID Number:	Not applicable
Cable Length And Type:	2 m, RS232 Shielded
Connected to Port:	RBC Master – PC Ctrl

RBS 2308 (115 V, 60 Hz AC) Hardware List (Conducted Measurements at Mölndal)

Unit	Model Number	Serial Number	Revision Number
Filter Unit RRU MBU-01	ROA 117 4776/1	S951926013	R2A
IXU21	BOE 602 15/2	AE5000PKGE	R1A
Mounting Base	None stated	None stated	None stated
Heater	BPC 111 25/1	X031000222	R3A
PSU	BML 151 23/1	X701000096	R2A
Digital Radio Board DRB1 PCB	ROA 117 4767/2	AE5000PBVP	R1B/C
Radio Access Board 1 PCB	ROA 117 4853/1	AE5000P2V9	R1B/B
Digital Radio Board DRB2 PCB	ROA 117 4767/2	AE5000PBVR	R1B/C
Radio Access Board 2 PCB	ROA 117 4853/1	AE5000P2VJ	R1B/B
Y Interface Board	ROA 117 4799/3	S951971924	R1B/B
Radio Interface Board	ROA 117 4831/1	S951952684	R1B
Duplex Filter Unit 1	KRF 102 249/1	TF30000076	R1A
Duplex Filter Unit 2	KRF 102 249/1	TF30000037	R1A
Power Interface Board	ROA 117 4775/1	S951951659	R1B

RBS 2308 (115 V, 60 Hz AC) Hardware List (Radiated Measurements at Basingstoke)

Unit	Model Number	Serial Number	Revision Number
IXU21	BOE 602 15/2	AE5000PSVB	R1B
Mounting Base	SEB 112 1133/2	S951966437	R1A

3. Test Specification, Methods And Procedures

3.1. Test Specifications

Reference:	FCC Part 22: 2001 Sections 22.355, 22.913, 22.917
Title:	Code of Federal Regulations, Part 22 (47CFR) Public Mobile Services.
Comments:	None.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

Reference:	FCC Part 2: 2001 Sections 2.1046 2.1047 2.1049 2.1051 2.1053 2.1055
Title:	Code of Federal Regulations, Part 2 (47CFR) Frequency allocations and radio treaty matters; General Rules and Regulations
Comments:	None.
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 22 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47: Public Mobile Services.

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.

5.2. Operating Modes

The EUT was tested in the following operating modes:

5.2.1. Radiated Emissions – GMSK Mode

Channel No.	Frequency	Transmitter	ARP
128	869.2 MHz	0	A
150	873.6 MHz	1	A
190	881.6 MHz	2	B
251	893.8 MHz	3	B

5.2.2. Radiated Emissions – EDGE Mode

Channel No.	Frequency	Transmitter	ARP
128	869.2 MHz	0	A
150	873.6 MHz	1	A
190	881.6 MHz	2	B
251	893.8 MHz	3	B

5.2.3. Conducted Measurements

GMSK Mode		EDGE Mode	
Channel No.	Frequency	Channel No.	Frequency
128	869.2 MHz	128	869.2 MHz
129	869.4 MHz	129	869.4 MHz
189	881.4 MHz	189	881.4 MHz
250	893.6 MHz	250	893.6 MHz
251	893.8 MHz	251	893.8 MHz

5.3. Configuration and Peripherals

The EUT was tested in the following configuration:

As a standalone RBS 2308 base transceiver station.

6. Summary Of Test Results

6.1. Transmit Mode

Range Of Measurements	Specification Reference	Mode of Operation	Port Type	Compliancy Status
Conducted RF Output Power (GSM 850 Mode)	Part 2 of CFR 47: 2001, Section 2.1046(a)	Transmit	Antenna Terminals	Complied
Modulation Characteristics	Part 22 of CFR 47: 2001, Section 2.1047(a)	Transmit	Antenna Terminals	Complied
Frequency Stability (Temperature & Voltage Variation)	Part 22 of CFR 47: 2001, Section 2.1055/22.355	Transmit	Antenna Terminals	Complied
Occupied Bandwidth	Part 22 of CFR 47: 2001, Section 2.1049	Transmit	Antenna Terminals	Complied
Conducted Out of Band Emissions, including Inband Intermodulation Test (9 kHz to 10.0 GHz)	Part 22 of CFR 47: 2001, Section 2.1051/22.917	Transmit	Antenna Terminals	Complied
Electric Field Strength, Spurious Emissions (30 MHz to 10.0 GHz)	Part 2 of CFR 47: 2001, Section 2.1053/22.917	Transmit	Antenna	Complied

6.2. Location Of Tests

All the measurements described in this report were performed at the premises of Ericsson AB, Bergfotsgatan 2, Mölndal, SE-431 84, Sweden and Radio Frequency Investigation Ltd., Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ

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. Conducted RF Output Power: GSM 850 Mode: Section 2.1046 (a)

7.2.1. The EUT and spectrum analyser 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 2.1046(a) for conducted power, with reference to TIA_EIA_603B.

7.2.3. Measurements were made at the ARP (Antenna Reference Point) output connectors.

7.2.4. The output was connected to a spectrum analyser via cables, a 50 Ohm attenuator and an RF box containing further attenuators.

7.2.5. The path loss of 31.5 dB was entered into the spectrum analyser as a reference level offset.

7.2.6. Results are shown for the EUT set to Bottom, Middle and Top channels using a 115 V AC 60 Hz supply.

Results

Mode: GMSK – Tx0

Channel	Frequency (MHz)	Level (dBm)
Bottom	869.250100	33.96
Middle	881.430060	34.03
Top	893.830060	33.94

Mode: GMSK – Tx1

Channel	Frequency (MHz)	Level (dBm)
Bottom	869.250100	33.84
Middle	881.470140	33.93
Top	893.870140	33.87

Mode: GMSK – Tx2

Channel	Frequency (MHz)	Level (dBm)
Bottom	869.250100	33.79
Middle	881.410020	33.88
Top	893.830060	33.84

Conducted RF Output Power: GSM 850 Mode: Section 2.1046 (a) (continued)

Mode GMSK – Tx3

Channel	Frequency (MHz)	Level (dBm)
Bottom	869.310220	33.82
Middle	881.410020	33.97
Top	893.810020	33.85

Mode 8PSK (EDGE) – Tx0

Channel	Frequency (MHz)	Level (dBm)
Bottom	869.230060	33.88
Middle	881.430060	34.04
Top	893.830060	33.85

Mode 8PSK (EDGE) – Tx1

Channel	Frequency (MHz)	Level (dBm)
Bottom	869.230060	33.86
Middle	881.450100	33.92
Top	893.830060	33.95

Mode 8PSK (EDGE) – Tx2

Channel	Frequency (MHz)	Level (dBm)
Bottom	869.270140	33.74
Middle	881.450100	33.84
Top	893.830060	33.81

Carrier Output Power: GSM 850 Mode: Section 2.1046 (a) (continued)

Mode 8PSK (EDGE) – Tx3

Channel	Frequency (MHz)	Level (dBm)
Bottom	869.290180	33.79
Middle	881.410020	34.05
Top	893.749899	34.33

7.3. Modulation Characteristics: Section 2.1047

7.3.1. The EUT and spectrum analyser were configured as for conducted antenna port measurements.

7.3.2. Tests were performed to identify the modulation characteristics in accordance with FCC Part 2.1047, with reference to TIA_EIA_603B and TR45 SP-4027-280C for Limits.

7.3.3. Measurements were made at the ARP output connectors.

7.3.4. The output was connected to a spectrum analyser, which was used in GSM BTS analyser mode, via cables and with 30 dB of attenuation in the path.

7.3.5. Testing was performed on the middle channel only.

7.3.6. **GMSK** mode– The tolerance of the maximum output phase error, shall not be greater than 5 degrees.

7.3.7. **EDGE** mode– The error vector magnitude, (EVM) shall be less that 12.5% RMS. The origin offset in any burst shall be less than –30 dBc.

Mode GMSK

GMSK	**Phase Error (º)**	
	Tx1	Tx3
Phase Error	2.85	2.89
Max	2.89	

EDGE	**EVM (% RMS)**	
	Tx1	Tx3
EVM	1.63	1.67
Max EVM	1.67	

	Origin Offset (dB)	
	Tx1	Tx3
Origin Offset	-50.17	-40.17
Max 00	-40.17	

7.4. Frequency Stability Measurements: GSM 850 Mode: (Temperature and Voltage Variation): Sections 22.355

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

7.4.2. 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.

7.4.3. Measurements were made at the ARP output connectors.

7.4.4. The output was connected to a spectrum analyser which was used in GSM BTS analyser mode, via cables and with 30 dB of attenuation in the path.

7.4.5. The path loss was entered into the spectrum analyser as a reference level offset.

7.4.6. Testing was performed on the middle channel only.

7.4.7. 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 1.5 ppm of the fundamental frequency.

7.4.8.The ppm frequency error is calculated using the following formula taken from the TIA_EIA_603B document.

$$\text{ppm error} = \left(\frac{MCF_{MHz}}{ACF_{MHz}} - 1\right) * 10^6$$

where MCF_{MHz} is the measured carrier frequency in MHz
ACF_{MHz} is the assigned carrier frequency in MHz

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

Lower Block Edge	869 MHz
Upper Block Edge	894 MHz

Frequency Stability Measurements (continued)

Results: Mode GMSK - Tx0
Channel 189 (881.4 MHz)

Temperature (°C)	AC Input Voltage (Volts)	Peak Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	97.75	-5.9	0.00669	1.500	1.493	Complied
	132.25	-6.0	0.00681	1.500	1.493	Complied
-20	97.75	-7.9	0.00896	1.500	1.491	Complied
	132.25	-6.9	0.00783	1.500	1.492	Complied
-10	97.75	-5.4	0.00613	1.500	1.494	Complied
	132.25	-5.0	0.00567	1.500	1.494	Complied
+0	97.75	-6.8	0.00771	1.500	1.492	Complied
	132.25	-6.6	0.00749	1.500	1.493	Complied
+10	97.75	-6.2	0.00703	1.500	1.493	Complied
	132.25	-6.7	0.00760	1.500	1.492	Complied
+20	97.75	-8.2	0.00930	1.500	1.491	Complied
	132.25	-6.0	0.00681	1.500	1.493	Complied
+30	97.75	-6.1	0.00692	1.500	1.493	Complied
	132.25	-5.8	0.00658	1.500	1.493	Complied
+40	97.75	-4.5	0.00511	1.500	1.495	Complied
	132.25	-8.9	0.01010	1.500	1.490	Complied
+50	97.75	-9.8	0.01112	1.500	1.489	Complied
	132.25	-6.7	0.00760	1.500	1.492	Complied

Frequency Stability Measurements (continued)

Results: Mode GMSK – Tx2
Channel 189 (881.4 MHz)

Temperature (°C)	AC Input Voltage (Volts)	Peak Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	97.75	-6.5	0.00737	1.500	1.493	Complied
	132.25	-6.9	0.00783	1.500	1.492	Complied
-20	97.75	-8.2	0.00930	1.500	1.491	Complied
	132.25	-6.3	0.00715	1.500	1.493	Complied
-10	97.75	-7.4	0.00840	1.500	1.492	Complied
	132.25	-6.7	0.00760	1.500	1.492	Complied
+0	97.75	-6.8	0.00771	1.500	1.492	Complied
	132.25	-5.9	0.00669	1.500	1.493	Complied
+10	97.75	-6.3	0.00715	1.500	1.493	Complied
	132.25	-7.2	0.00817	1.500	1.492	Complied
+20	97.75	-6.6	0.00749	1.500	1.493	Complied
	132.25	-5.8	0.00658	1.500	1.493	Complied
+30	97.75	-3.2	0.00363	1.500	1.496	Complied
	132.25	-4.5	0.00511	1.500	1.495	Complied
+40	97.75	-5.4	0.00613	1.500	1.494	Complied
	132.25	-5.8	0.00658	1.500	1.493	Complied
+50	97.75	-8.0	0.00908	1.500	1.491	Complied
	132.25	-9.3	0.01055	1.500	1.489	Complied

Frequency Stability Measurements (continued)

Results: Mode EDGE – Tx0
Channel 189 (881.4 MHz)

Temperature (°C)	AC Input Voltage (Volts)	Absolute Peak Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	97.75	-5.8	0.00658	1.500	1.493	Complied
	132.25	-6.7	0.00760	1.500	1.492	Complied
-20	97.75	2.5	0.00284	1.500	1.4197	Complied
	132.25	-4.1	0.00465	1.500	1.495	Complied
-10	97.75	-8.0	0.00908	1.500	1.491	Complied
	132.25	-4.4	0.00499	1.500	1.495	Complied
+0	97.75	-4.9	0.00556	1.500	1.494	Complied
	132.25	-6.5	0.00737	1.500	1.493	Complied
+10	97.75	-7.0	0.00794	1.500	1.492	Complied
	132.25	-5.2	0.00590	1.500	1.494	Complied
+20	97.75	-6.7	0.00760	1.500	1.492	Complied
	132.25	-8.4	0.00953	1.500	1.490	Complied
+30	97.75	-6.8	0.00771	1.500	1.492	Complied
	132.25	-7.9	0.00896	1.500	1.491	Complied
+40	97.75	-7.2	0.00817	1.500	1.492	Complied
	132.25	-8.0	0.00908	1.500	1.491	Complied
+50	97.75	-5.8	0.00658	1.500	1.493	Complied
	132.25	-6.1	0.00692	1.500	1.493	Complied

Frequency Stability Measurements (continued)

Results: Mode EDGE – Tx2
Channel 189 (881.4 MHz)

Temperature (°C)	AC Input Voltage (Volts)	Peak Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	97.75	-4.2	0.00477	1.500	1.495	Complied
	132.25	-4.3	0.00488	1.500	1.495	Complied
-20	97.75	-8.9	0.01010	1.500	1.490	Complied
	132.25	-4.5	0.00511	1.500	1.495	Complied
-10	97.75	-4.6	0.00522	1.500	1.495	Complied
	132.25	-4.7	0.00533	1.500	1.495	Complied
+0	97.75	-7.3	0.00828	1.500	1.492	Complied
	132.25	-9.0	0.01021	1.500	1.490	Complied
+10	97.75	-5.3	0.00601	1.500	1.494	Complied
	132.25	-8.2	0.00930	1.500	1.491	Complied
+20	97.75	-4.0	0.00454	1.500	1.495	Complied
	132.25	-6.5	0.00737	1.500	1.493	Complied
+30	97.75	-6.3	0.00715	1.500	1.493	Complied
	132.25	-6.3	0.00715	1.500	1.493	Complied
+40	97.75	-6.0	0.00681	1.500	1.493	Complied
	132.25	-7.0	0.00794	1.500	1.492	Complied
+50	97.75	-8.4	0.00953	1.500	1.490	Complied
	132.25	-6.5	0.00737	1.500	1.493	Complied

7.5. Transmitter Conducted Measurements: GSM 850 Mode (Occupied Bandwidth): Sections 2.1049

7.5.1. The EUT and spectrum analyser were configured for conducted antenna port measurements.

7.5.2.Tests were performed to identify the Occupied Bandwidth in accordance with FCC Part 2.1049 with reference to TIA_EIA_603B.

7.5.3.Measurements were made at the ARP output connectors.

7.5.4. The output was connected to a spectrum analyser via cables and with 30 dB of attenuation in the path,

7.5.5. The path loss was entered into the spectrum analyser as a reference level offset.

7.5.6. In GMSK mode this unit must use a reduced transmit power by 4 dB to 30 dBm for the channels adjacent to each frequency block edge in order to show compliance.

7.5.7. In Edge mode it was not possible to reduce the transmit power enough for the channels adjacent to each frequency block edge to fulfil the requirements, thus these channels must be excluded in order to comply.

7.5.8. The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43+ 10 Log (P) dB.

7.5.9. Please refer to the accompanying graph document for graphical results.

7.6. Transmitter Conducted Measurements: (Out of Band Emissions - Spurious and Intermodulation Responses): Section 2.1051/22.917(e)

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

7.6.2.Tests were performed to identify out of band emissions in accordance with FCC Part 2.1051 and 22.917(e) with reference to TIA_EIA_603B.

7.6.3. Tests were also performed to identify the level of any Intermodulation responses present.

7.6.4. Measurements were made at the ARP output connectors

7.6.5. The output was connected to a spectrum analyser via cables, attenuation and an RF box containing various filters.

7.6.6. The path loss was entered into the spectrum analyser as a reference level offset.

7.6.7.FCC Part 22.917(e) states that emissions shall be attenuated by at least 43+10 Log (P) dB below the transmitter power, where (P) is the power measured at the EUT antenna terminals.

7.6.8. There were no emissions within 20 dB of the limit. Please refer to the accompanying graph document for graphical results.

7.7. Transmitter Radiated Emissions: Section 2.1053/22.917 (e)

Electric Field Strength Measurements of Spurious Emissions and Intermodulation Products: 30 MHz to 10 GHz

7.7.1. Tests were performed to identify the field strength of spurious emissions as per ANSI/TIA_EIA_603B.

7.7.2. Tests were also performed to identify the field strength of any Intermodulation responses present.

7.7.3. Measurements were performed at 3 m test distance with 1.5 m antenna height in a screened room in the frequency range of 30 MHz to 10 GHz.

7.7.4. The power of any emission outside the frequency band shall be attenuated below the transmitter power (p) by at least 43 + 10 Log (P) dB.

7.7.5. The limit line was determined by radiating -13dBm from a dipole located in place of the EUT and measuring the equivalent field strength at the 3 meters.

7.7.6. Please refer to the accompanying graph document for all graphical results.

7.7.7. Excluding the fundamental emissions, all other indicated spurious and intermodulation responses were at least 20 dB below the relevant limit.

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	Not applicable	95%	+/- 1.3 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%	+/- 1.3 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%	+/- 1.78 dB
Frequency Stability	Not applicable	95%	+/- 11.7 Hz
Occupied Bandwidth	869 to 894 MHz	95%	+/- 11.7 Hz
Emissions at Band Edges	869 to 894 MHz	95%	+/- 1.3 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

Test equipment used for testing at Ericsson AB

Description	Manufacturer	Model Number	Serial Number
Signal Analyser	Rohde & Schwarz	FSIQ26	838600/010
RF Box	Ericsson	LYP 108 15/2	1
Attenuator	Weinschel Corp.	48-10-34	BC0458
Cable 1	Harbour Industries	2.5 M N-Type to N-Type 27478 LL142	N/A
Cable 2	Harbour Industries	2.5 M N-Type to N-Type 27478 LL142	N/A
Cable 3	Suhner Sucoflex	0.5 M N-Type to N-Type 104E	SN 1979/4E
Cable 4	Suhner Sucoflex	0.25 M N-Type to N-Type 104E	SN 7739/4E
Cable 5	Suhner Sucoflex	0.25 M N-Type to N-Type 104E	SN 7740/4E
Network Analyser	Hewlett Packard	HP8720D	US36140166
Multimeter	Fluke	76 True RMS	68720337
Temperature Chamber	Vötsch	VCS 7250/S	58566031900010
Cable 6	Suhner Sucoflex	0.25 M N-Type to N-Type 104E	SN 7865/4E
Power Supply	Hewlett Packard	6813A	US37290103
Signal Generator	R&S	SME03	843441/003
Power Meter	R&S	NRVS	827023/075
Power Sensor	R&S	NRV-Z52	827191/003
Terminator	Weinschel Corp.	M1426	BL3577
Notch Filter	K&L	LPY 108 16/1	-

Test equipment used for testing at Radio Frequency Investigation Ltd.

Instrument	Manufacturer	Model	RFI No.
Horn Antenna	Eaton	9188-2	A027
2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	A031
ESH3-Z5	Rohde & Schwarz	ESH3-Z5	A1069
Bilog Antenna	Chase	CBL6111	A259
OATS Positioning Controller	Rohde & Schwarz	HCC	A276
OATS Antenna Mast	Rohde & Schwarz	HCM	A277
3 dB attenuator (9)	Suhner	6803.17.B	A392
WG 14 horn	Flann	14240-20	A427
WG 12 horn	Flann	12240-20	A428
WG 16 horn	Flann	16240-20	A429
Bi-log Antenna	Chase	CBL6111A	A553
Cables	Rosenberger	UFA210A-1-1181-70x70	C160
Cable	Rosenberger	UFA210A-1-1181-70x70	C178
Rosenberger cable	Rosenberger	UFA 210A-1-1180-70X70	C202
Cable	Rosenberger	RG142XX-001-RFIB	C453
Cable	Rosenberger	RG142XX-002-RFIB	C457
ESIB26 EMI Test Receiver	Rohde & Schwartz	ESIB	L0665
Spectrum Monitor	Rohde & Schwarz	EZM	M003
ESVP Receiver	Rohde & Schwarz	ESVP	M044
Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	M088
Turntable Controller	R.H.Electrical Services	RH351	M173
OATS Turntable	British Turntable Ltd	S36069	M174
Thermometer/Barometer/Hygrometer	Oregan Scientific	BA 116	M244
Site 1	RFI	1	S201
Site 12	RFI	12	S212

Appendix 2. Measurement Methods

A2.1 Conducted Antenna Port Measurements: FCC Part 2

A2.1.1 Spurious measurements at the Antenna port were performed from 9 kHz 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.

A2.1.2 A spectrum analyser was connected to the antenna port of the EUT via a suitable cable, RF Attenuator and filters. The total loss of the cable, attenuator and filters were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

A2.1.3 The specified frequency bands were investigated with the transmitter operating at full power on the appropriate channels as described in section 5.2.

A2.2 FCC Part 2.1055: Frequency Stability

A2.2.1 The EUT was situated within an environmental test chamber and connected to test equipment via an access port.

A2.2.1 Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range –30 to 50 deg C.

A2.2.1 Measurements were also performed at voltage extremes.

A2.2.1 The requirement was to determine the frequency stability of the device under specified environmental operating conditions.

A2.2.2 Measurements were made on the middle channel.

A2.2.3 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.

A2.2.4 The frequency error measured was converted to an error in ppm using the following formula as defined by TIA_EIA_603B:-

$$\text{ppm error} = \left(\frac{MCF_{MHz}}{ACF_{MHz}} - 1\right) * 10^6$$

where MCF_{MHz} is the measured carrier frequency in MHz
ACF_{MHz} is the assigned carrier frequency in MHz

A2.2.5 The measured ppm had to be less then the relevant limits in order to comply.

A2.3 FCC Part 2.1049 (i): Occupied Bandwidth

A2.3.1 The EUT was connected to a spectrum analyser via its antenna port.

A2.3.1 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 and top channels for GMSK mode and on the bottom channel plus one and the top channel minus one for 8PSK.

A2.3.2 The Occupied Bandwidth was measured with the EUT output connected to a spectrum analyser via cables and with 30 dB of attenuation in the path, the path loss was entered into the spectrum analyser as a reference level offset. Tests were performed to identify the Occupied Bandwidth in accordance with FCC Part 2.1049 with reference to TIA_EIA_603B.

A2.4 Radiated Emissions: FCC Part 22

A2.4.1 Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.4.2 Initial pre-scans covering the entire measurement band from 30 MHz up to the highest specified frequency 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 with required further attention. 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.

A2.4.3 The radiated scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m with the EUT arranged and rotated on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

A2.4.4 The test equipment settings for radiated emissions measurements were as follows:

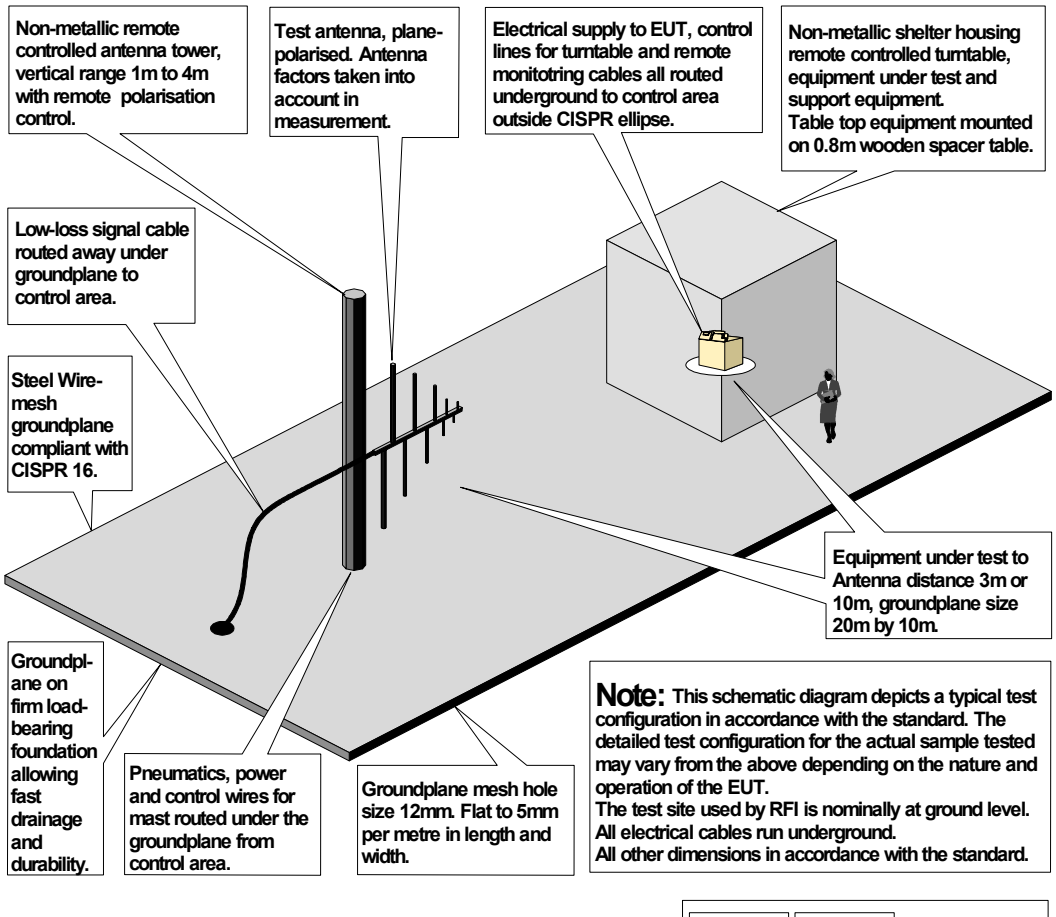
Receiver Function	**Radiated Scan**
Detector Type:	Peak
Mode:	Max Hold
Bandwidth:	(100 kHz < 1GHz) (1MHz > 1GHz)
Amplitude Range:	60 dB
Measurement Time:	Not applicable
Observation Time:	Not applicable
Step Size:	Continuous sweep
Sweep Time:	Coupled

Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\44227JD01\EMIRAD	Test configuration for measurement of radiated emissions
DRG\44227JD01\001	Schematic diagram of the EUT, support equipment and interconnecting cables used for the radiated spurious emissions
DRG\44227JD01\002	Schematic diagram of the EUT, support equipment and interconnecting cables used for the conducted measurements

DRG\44227JD01\EMIRAD



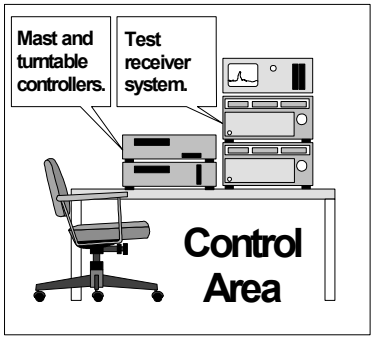
Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical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

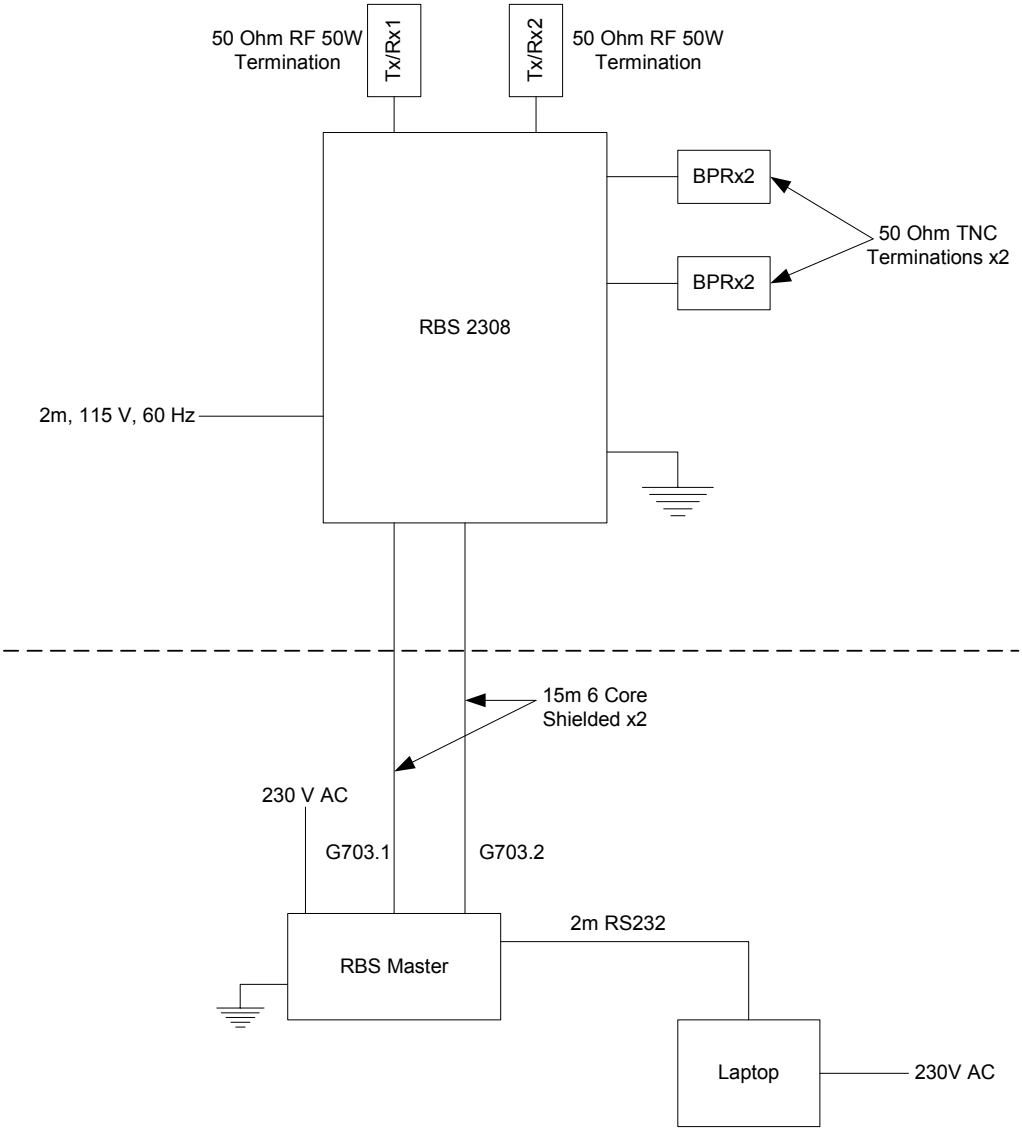
Groundplane Earthed

Control room outside CISPR ellipse



DRG\44227JD01\001

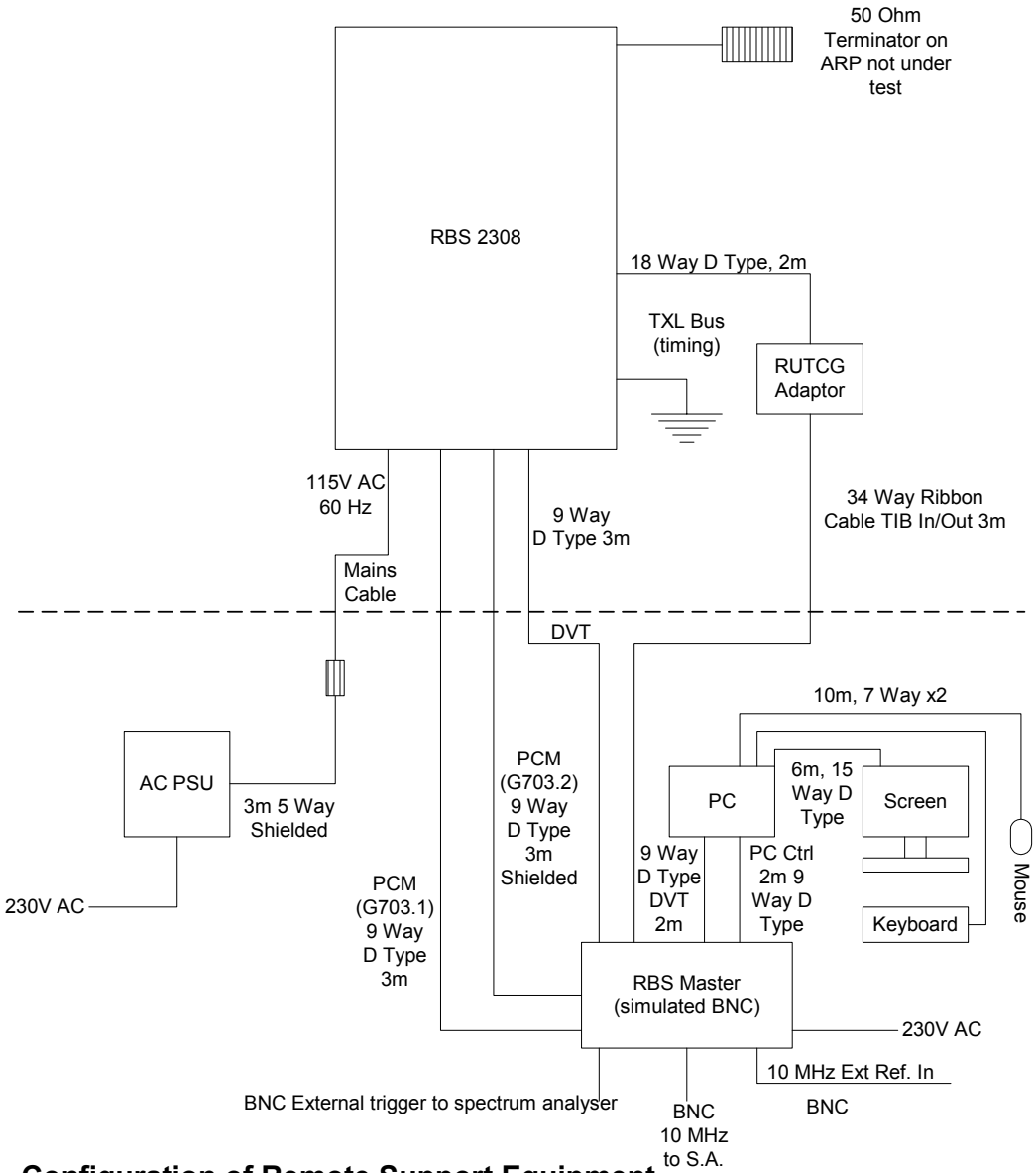
Configuration of EUT and Local Support Equipment
Radiated Spurious Emissions



Configuration of Remote Support Equipment

DRG\44227JD01\002

Configuration of EUT and Local Support Equipment
Conducted Measurements



Configuration of Remote Support Equipment

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