InterLab

FCC Measurement/Technical Report on

GSM/UMTS module
Siemens Cellular Engine HC25

Report Reference: MDE_Siem_0605_hc25_FCC_h.doc

Test Laboratory:

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Germany
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Deutscher Akkreditierungs Rat
DAT-P-192/99-01

CTIA Authorized Test Lab
LAB CODE 20011121-00

Note:
The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the testing laboratory.

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0 Summary

0.1 Technical Report Summary

Type of Authorization
Certification for a GSM cellular radiotelephone device

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 0 to 19 and Parts 20 to 69 (10-1-06 Edition). The following subparts are applicable to the results in this test report.

Part 2
Subpart J - Equipment Authorization Procedures, Certification

§ 2.1046 Measurement required: RF power output

§ 2.1049 Measurement required: Occupied bandwidth

§ 2.1051 Measurement required: Spurious emissions at antenna terminals

§ 2.1053 Measurement required: Field strength of spurious radiation

§ 2.1055 Measurement required: Frequency stability

§ 2.1057 Frequency spectrum to be investigated

Part 24
Subpart E - Broadband PCS

§ 24.232 Power and antenna height limits

§ 24.235 Frequency stability

§ 24.236 Field strength limits

§ 24.238 Emission limitations for Broadband PCS equipment

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 0.2 Measurement Summary.

In order to demonstrate that the maximum output power of the new variant is within ±0.5 dB of the original module, a delta measurement between the two modules was performed. The results are listed in the annex of this report.

0.2 Measurement Summary

Field strength of spurious radiation

The measurement was performed according to FCC §2.1053 10-1-06

OP-Mode	Setup	Port	Final Result
op-mode 1	Setup_a02	enclosure	N/P
op-mode 2	Setup_a02	enclosure	passed
op-mode 3	Setup_a02	enclosure	N/P
op-mode 4	Setup_a02	enclosure	N/P
op-mode 5	Setup_a02	enclosure	N/P
op-mode 6	Setup_a02	enclosure	N/P
op-mode 7	Setup_a02	enclosure	N/P
op-mode 8	Setup_a02	enclosure	N/P
op-mode 9	Setup_a02	enclosure	N/P

N/P: Not Performed.
- The test was performed in the operating mode with the highest output power based on the output power comparison measurement.

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40880 Ratingen, Germany
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Responsible for Accreditation Scope: Machulec

Responsible for Test Report:

1 Administrative Data

1.1 Testing Laboratory

Company Name:	7 Layers AG
Address	Borsigstr. 11 40880 Ratingen Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716 .

The test facility is also accredited by the following accreditation organisation:

- Deutscher Akkreditierungs Rat	DAR-Registration no. DAT-P-192/99-01
Responsible for Accreditation Scope:	Dipl.-Ing. Bernhard Retka Dipl.-Ing. Robert Machulec Dipl.-Ing. Thomas Hoell
Report Template Version:	2007-08-29

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Arndt Stoecker
Receipt of EUT:	2007-11-27
Date of Test(s):	2007-12-04 to 2007-12-05
Date of Report:	2007-12-13

1.3 Applicant Data

Company Name:	Siemens AG
Address:	Siemensdamm 50 13629 Berlin Germany
Contact Person:	Mr. Halawi

1.4 Manufacturer Data

Company Name:	please see applicant data
Address:	
Contact Person:	

2 Testobject Data

2.1 General EUT Description

Equipment under Test:	GSM/UMTS module
Type Designation:	Siemens Cellular Engine HC25
Kind of Device:	GSM 850/900/1800/1900/FDDII/FDDV
(optional)	
Voltage Type:	DC
Nominal Voltage:	4.2 V
Maximum Voltage:	4.2 V
Minimum Voltage:	3.5 V

General product description:

The Equipment Under Test (EUT) is a GSM 850/900/1800/1900 module and supports EDGE, and FDD II with HSDPA.
The manufacturer declared that nominal voltage is equal to high voltage.

In PCS1900 mode the EUT operates in blocks A through F from 1850.2 MHz (lowest channel = 512) to 1909.8 MHz (highest channel = 810).

In FDD II mode the EUT operates in channel blocks A through F from 1852.4 MHz (lowest channel = 9262) to 1907.6 MHz (highest channel = 9538).

The EUT provides the following ports:

Ports
antenna connector
enclosure
System connector

The main components of the EUT are listed and described in Chapter 2.2

2.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status	Date of Receipt
EUT A (Code: 10900EF27)	GSM/UMTS module	Siemens Cellular Engine	010009	rev. 01.760 (SV 07)	B2.11	2007-11-27
Remark: EUT A is equipped with a permanent antenna connector.						
EUT B (Code: 10900ED27)	GSM/UMTS module	Siemens Cellular Engine	015077	rev. 01.760 (SV 07)	B2.11	-
Remark: EUT B is equipped with a permanent antenna connector.						

NOTE: The short description is used to simplify the identification of the EUT in this test report.

2.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	HW Status	SW Status	Serial no.	FCC ID
AE_1	External antenna Algon MiniMag	Dualband antenna Ordering number 1140.26	-	-	-	–
Remark: the antenna gain is declared by the applicant as: 1.65 dBi = -0.49dBD						
AE_2	Develop-ment board DSB3	DSB75	DSB75_B1.1	-	DBI_ ICM-100012-03	-
AE_3	Adapter board	Quinn DSB75 Adapter A1			Q_DSB75_A1_334	-
AE_4	Housing for DSB75	-	-	-	DSB75_B10009	-
AE_5	Flexcable 1	-	-	-	-	--

2.4 EUT Setups

This chapter describes the combination of EUT's and ancillary equipment used for testing.

Setup No.	Combination of EUTs	Description
setup_a01	EUT A + AE_1 + AE_2 + AE_3 + AE_5	setup for conducted tests
setup_a02	EUT B + AE_1 + AE_2 + AE_3 + AE_4 + AE_5	setup for radiated spurious emissions tests

2.5 Operating Modes

This chapter describes the operating modes of the EUT's.

Op. Mode	Description of Operating Modes	Remarks
	PCS voice call	
op-mode 1	Call established on Traffic Channel (TCH) 512, Carrier Frequency 1850.2 MHz	512 is the lowest channel PCS data call
op-mode 2	Call established on Traffic Channel (TCH) 661, Carrier Frequency 1880 MHz Additionally the GPS receiver is active.	661 is a mid channel PCS data call
op-mode 3	Call established on Traffic Channel (TCH) 810, Carrier Frequency 1909.8 MHz	810 is the highest channel PCS data call
	EDGE data call	
op-mode 4	Call established on Traffic Channel (TCH) 512, Carrier Frequency 1850.2 MHz	512 is the lowest channel EDGE data call
op-mode 5	Call established on Traffic Channel (TCH) 661, Carrier Frequency 1880 MHz	661 is a mid channel EDGE data call
op-mode 6	Call established on Traffic Channel (TCH) 810, Carrier Frequency 1909.8 MHz	810 is the highest channel EDGE data call
	FDD II data call	
op-mode 7	Call established on Traffic Channel (TCH) 9262, Carrier Frequency 1852.4 MHz	9262 is the lowest channel FDD II data call
op-mode 8	Call established on Traffic Channel (TCH) 9400, Carrier Frequency 1880 MHz	9400 is a mid channel FDD II data call
op-mode 9	Call established on Traffic Channel (TCH) 9538, Carrier Frequency 1907.6 MHz	9538 is the highest channel FDD II data call

3 Test Results

3.1 Field strength of spurious radiation

Standard FCC Part 24, 10-1-06
Subpart E

The test was performed according to: FCC §2.1053, 10-1-06

3.1.1 Test Description

1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to the R&S CMD55 / CMU200 Digital Communication Tester which was located outside the chamber via coaxial cable.

2) A call was established on a Traffic Channel (TCH) between the EUT and the base station simulator (R&S CMD55 / CMU200 Digital Communication Tester).
Important Settings:
- Discontinuous Transmission: OFF
- Modulation Signal: PSR16-1 (Pseudo Random Sequence)
- Output Power: Maximum
- Channel : Varied during measurements

3) A pre-calibration procedure is used so that the readings from the spectrum analyser are corrected and represent directly the equivalent radiated power (related to a lamda/2 dipole).

4) All spurious radiation measurements were made with spectrum analyser and the appropriate calibrated antennas for the frequency range of 30 MHz to 20 GHz (up to the 10th harmonic of the transmit frequency).

5) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the GSM-Band,
b) [10 kHz / 30 kHz] in case the curve of the analyser IF-Filter leads to an exceeding of the limit, in this case a worst case correction factor of 20 dB (1 MHz -> 10 kHz) was used
c) [1 MHz / 3 MHz] otherwise
- Sweep Time: Calculated by using a formula given in the Product Standard "GSM 11.10-1 edition 4" for spurious emissions measurements (depending on the transmitting signal, the span and the resolution bandwidth)

6) The spurious emissions (peak) were measured in both vertical and horizontal antenna polarisation during the call is established on the lowest channel, mid channel and on the highest channel.

3.1.2 Test Requirements / Limits

§ 2.1053 Measurements required: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this

test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of Sec. 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.
(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:
(2) All equipment operating on frequencies higher than 25 MHz.

§ 2.1057 Frequency spectrum to be investigated.

(a) In all of the measurements set forth in Secs. 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:
(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(b) Particular attention should be paid to harmonics and subharmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.
(c) The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.
(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

§ 24.238 Emission limitations for Broadband PCS equipment

(a) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
This is calculated to be -13 dBm (effective radiated power) which corresponds to 84.6 dBµV/m (field strength) in a distance of 3 m.

(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

3.1.3 Test Protocol

Temperature: 24 °C
Air Pressure: 1022 hPa
Humidity: 38 %

Op. Mode	Setup	Port
op-mode 2	setup_a02	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
-	-	-	-	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.

3.1.4 Test result: Field strength of spurious radiation

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 2	Passed

4 Test Equipment

EUT Digital Signalling System

Equipment	Type	Serial No.	Manufacturer
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz
Signalling Unit for Bluetooth Spurious Emissions	PTW60	100004	Rohde & Schwarz
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz

EMI Test System

Equipment	Type	Serial No.	Manufacturer
Comparison Noise Emitter	CNE III	99/016	York
EMI Analyzer	ESIB 26	845986/006	Rohde & Schwarz
Signal Generator	SMR 20	846834/008	Rohde & Schwarz

EMI Radiated Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer
Antenna mast 4m	MA 240	240/492	HD GmbH H. Deisel
Biconical dipole	VUBA 9117	9117108	Schwarzbeck
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32	849785	Miteq
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35	896037	Miteq
Broadband Amplifier 45MHz-27GHz	JS4-00102600-42	619368	Miteq
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2 + W38.01-2	Kabel Kusch
Cable "ESI to Horn Antenna"	UFB311A + UFB293C	W18.02-2 + W38.02-2	Rosenberger-Microcoax
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic
KUEP pre amplifier	Kuep 00304000	001	7layers
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz
Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO

EMI Conducted Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber+Suhner
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz

Auxiliary Test Equipment

Equipment	Type	Serial No.	Manufacturer
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel
Digital Multimeter 01	Voltcraft M-3860M	IJ096055	Conrad
Digital Multimeter 02	Voltcraft M-3860M	IJ095955	Conrad
Digital Oscilloscope	TDS 784C	B021311	Tektronix
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz
Notch Filter ultra stable	WRCA800/960-6E	24	Wainwright
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz
Temperature Chamber	VT 4002	58566002150010	Vötsch
Temperature Chamber	KWP 120/70	59226012190010	Weiss
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH

Anechoic Chamber

Equipment	Type	Serial No.	Manufacturer
Air Compressor (pneumatic)			Atlas Copco
Controller	CO 2000	CO2000/328/12470406 /L	Innco innovative constructions GmbH
EMC Camera	CE-CAM/1		CE-SYS
EMC Camera for observation of EUT	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1		Siemens&Matsushita
Filter telephone systems / modem	B84312-C40-B1		Siemens&Matsushita
Filter Universal 1A	B84312-C30-H3		Siemens&Matsushita
Fully/Semi AE Chamber	10.58x6.38x6		Frankonia
Turntable	DS 420S	420/573/99	HD GmbH, H. Deisel
Valve Control Unit (pneum.)	VE 615P	615/348/99	HD GmbH, H. Deisel

Equipment	Type	Serial No.	Manufacturer
10 MHz Reference	MFS	5489/001	Efratom
Power Meter 832025/059	NRVD	832025/059	Rohde & Schwarz
Power Sensor A 832279/013	NRV-Z1	832279/013	Rohde & Schwarz
Power Sensor B 832279/015	NRV-Z1	832279/015	Rohde & Schwarz
Power Supply	E3632A	MY40003776	Agilent
Power Supply	PS-2403D	-	Conrad
RF Step Attenuator 833695/001	RSP	833695/001	Rohde & Schwarz
Rubidium Frequency Normal	MFS	002	Efratom
Signal Analyzer FSIQ26 832695/007	FSIQ26	832695/007	Rohde & Schwarz
Signal Generator 833680/003	SMP 03	833680/003	Rohde & Schwarz
Signal Generator A 834344/002	SMIQ03B	834344/002	Rohde & Schwarz
Signal Generator B 832870/017	SMIQ03B	832870/017	Rohde & Schwarz
Signal Switching and Conditioning Unit	SSCU	338826/005	Rohde & Schwarz
Signalling Unit PTW60 838312/014	PTW60 for TS8960	838312/014	Rohde & Schwarz
System Controller 829323/008	PSM12	829323/008	Rohde & Schwarz

5 Photo Report

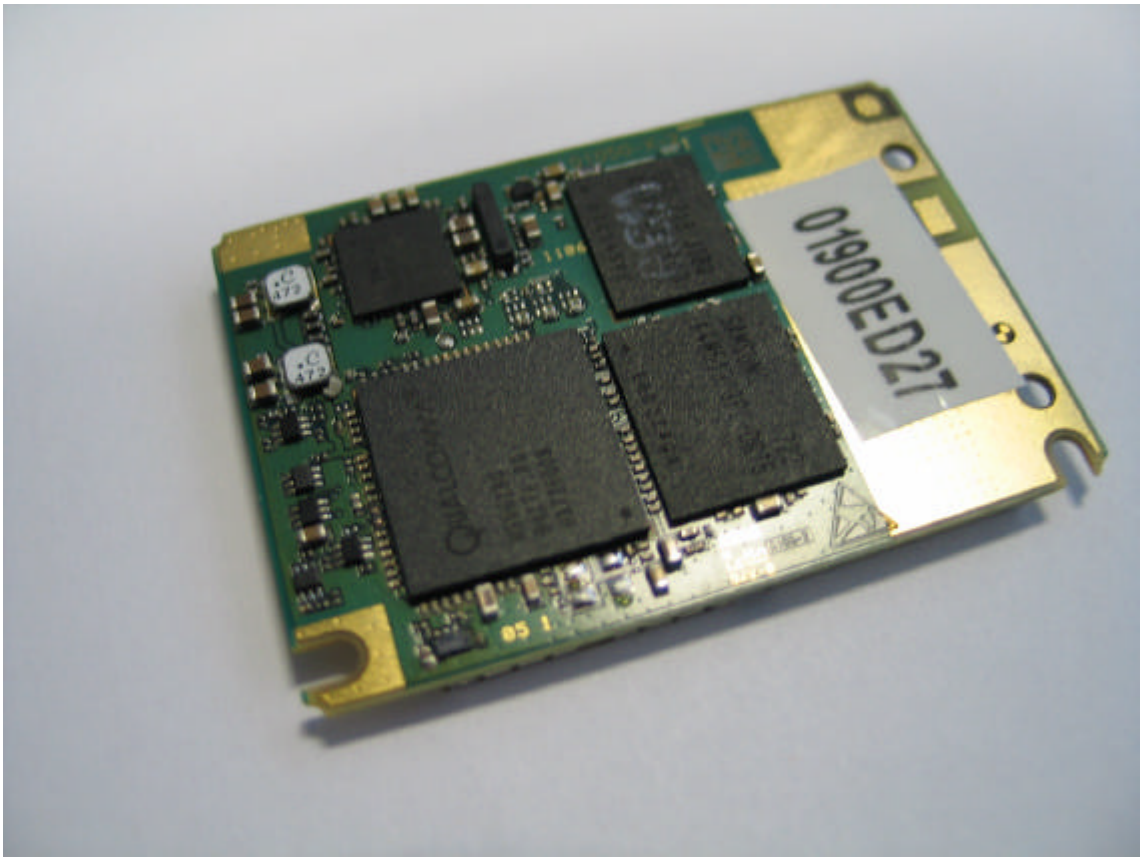


Photo 1: EUT (front side)

Photo 2: EUT (rear side)

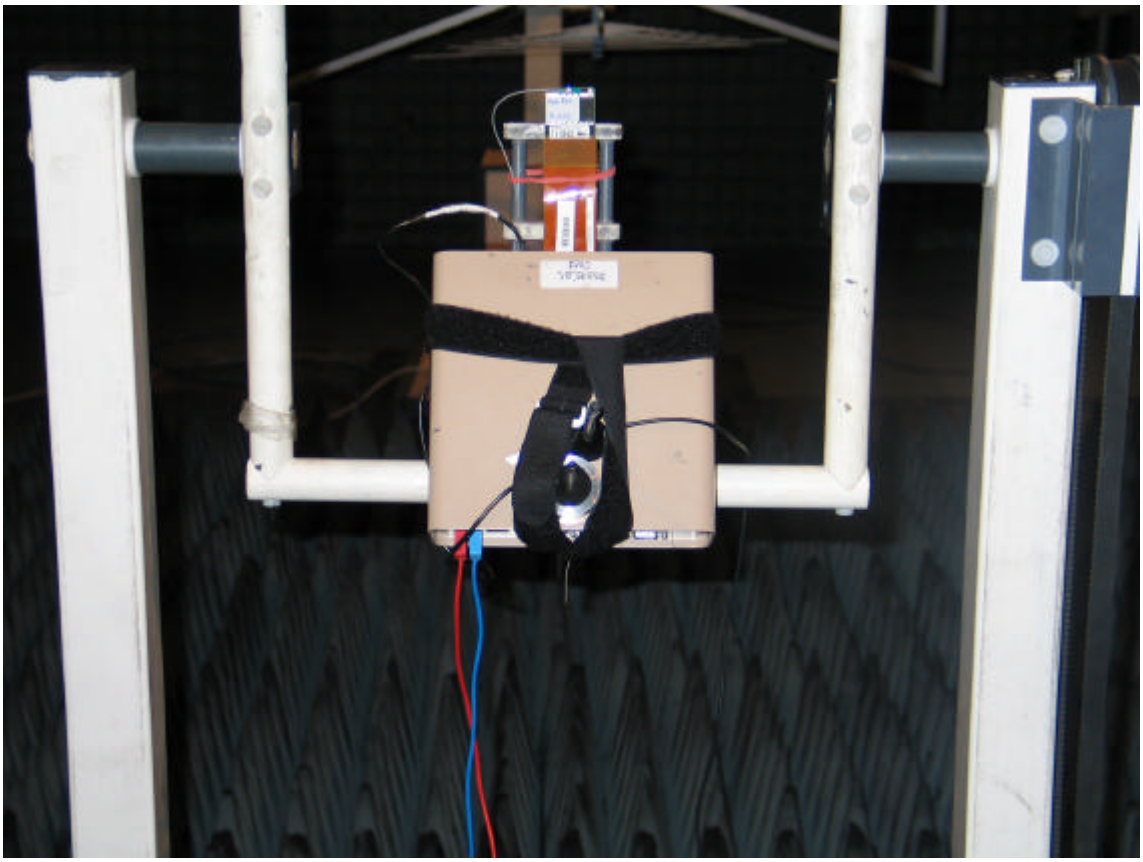
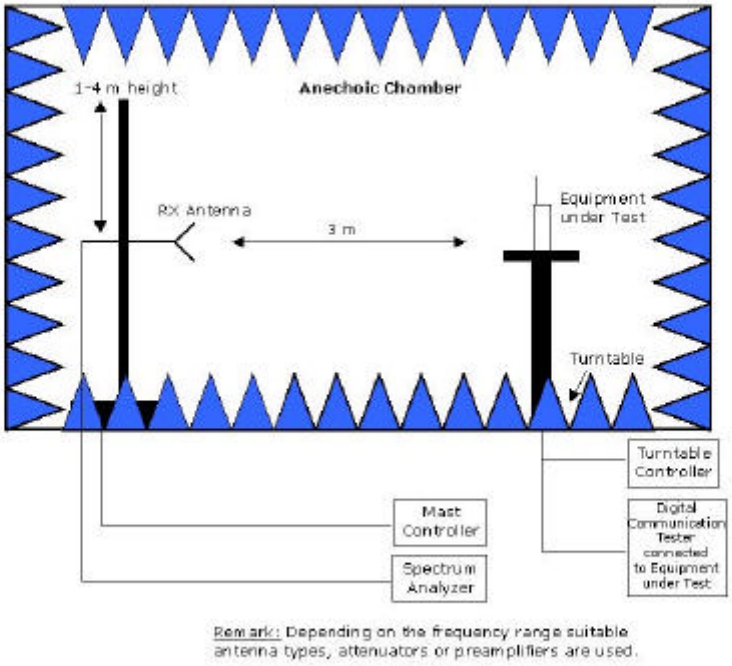
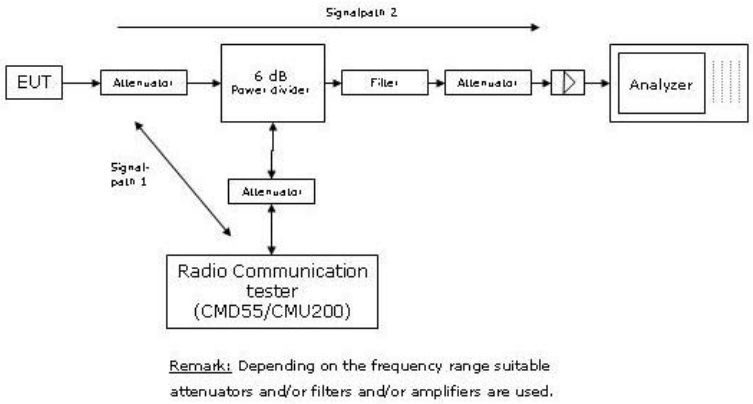


Photo 3: Setup for radiated tests

6 Setup Drawings



Drawing 1: Principle setup for radiated measurements.



Drawing 2: Principle setup for conducted measurements under nominal conditions

7 Annex

Output power comparison HC25 rel1 and HC25rel2

AO12: HC25 rel1 Modul, S/N 008933 => **Reference**
EF27: HC25 rel2 Modul, S/N 013310

Band	TCH	Freq/MHz	delta power/dB AO12 - EF27
GSM 850	128	824.2	0.1
	190	836.6	0.1
	251	848.8	0.0
EDGE 850	128	824.2	0.1
	190	836.6	0.0
	251	848.8	0.1
UTRA FDD V	4132	826.4	0.5
	4183	836.6	0.2
	4233	846.6	0.3
GSM 1900	512	1850.2	0.2
	661	1880.0	0.2
	810	1909.8	0.1
EDGE 1900	512	1850.2	0.2
	661	1880.0	0.1
	810	1909.8	0.1
UTRA FDD II	9262	1852.4	-0.2
	9400	1880.0	0.0
	9538	1907.6	0.3