InterLab®

FCC Measurement/Technical Report on

GSM/UMTS module
Siemens Cellular Engine HC28

Report Reference: MDE_Siem_0605_FCCf

Test Laboratory:

7 layers AG
Borsigstrasse 11
40880 Ratingen
Germany
email: info@7Layers.de

Deutscher Akkreditierungs Rat
DAR
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

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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.

0.2 Measurement Summary

RF Power Output

The measurement was performed according to FCC §2.1046 10-1-06

OP-Mode	Setup	Port	Final Result
op-mode 1	setup_04	antenna connector	passed
op-mode 2	setup_04	antenna connector	passed
op-mode 3	setup_04	antenna connector	passed
op-mode 4	setup_04	antenna connector	passed
op-mode 5	setup_04	antenna connector	passed
op-mode 6	setup_04	antenna connector	passed
op-mode 7	setup_04	antenna connector	passed
op-mode 8	setup_04	antenna connector	passed
op-mode 9	setup_04	antenna connector	passed
op-mode 10	setup_02	antenna connector	passed
op-mode 11	setup_02	antenna connector	passed
op-mode 12	setup_02	antenna connector	passed

Frequency stability

The measurement was performed according to FCC §2.1055 10-1-06

OP-Mode	Setup	Port	Final Result
–	–	–	N/P

Spurious emissions at antenna terminals

The measurement was performed according to FCC §2.1051 10-1-06

OP-Mode	Setup	Port	Final Result
op-mode 2	setup_01	antenna connector	passed
op-mode 5	setup_01	antenna connector	passed
op-mode 8	setup_03	antenna connector	passed

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 2	setup_05	enclosure	passed
op-mode 5	setup_05	enclosure	passed
op-mode 8	setup_05	enclosure	passed

Emission and Occupied Bandwidth

The measurement was performed according to FCC §2.1049 10-1-06

OP-Mode	Setup	Port	Final Result
op-mode 2	setup_01	antenna connector	passed
op-mode 5	setup_01	antenna connector	passed
op-mode 8	setup_03	antenna connector	passed

Band edge compliance

The measurement was performed according to FCC §24.238 10-1-06

OP-Mode	Setup	Port	Final Result
op-mode 1	setup_04	antenna connector	passed
op-mode 6	setup_04	antenna connector	passed
op-mode 7	setup_04	antenna connector	passed

N/P not performed

The tests were chosen in agreement with the applicant.
This module HC28 is a modification of the module HC25 (FCC ID: QIPHC25).

7 layers AG, Borsigstr. 11
40880 Ratingen, Germany
Phone +49 (0)2102 749 0

Responsible for Accreditation Scope: _____ 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:	2007-08-13

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Receipt of EUT:	2007-08-14
Date of Test(s):	2007-08-21 to 2007-09-17
Date of Report:	2007-09-17

1.3 Applicant Data

Company Name:	Siemens AG
Address:	Siemensdamm 50 13629 Berlin Germany
Contact Person:	Mr. Hussein 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 HC28
Kind of Device:	GSM 850/900/1800/1900 + UMTS FDD I/II/V
(optional)	module
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 I/II/V 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
data port

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: 01901DD02)	GSM/UMTS module	Siemens Cellular Engine HC28	011694	B2.10	revision 00.070	2007-08-14
EUT B (Code: 01901DE02)	GSM/UMTS module	Siemens Cellular Engine HC28	011777	B2.10	revision 00.070	2007-08-14
EUT C (Code: 01901DH02)	GSM/UMTS module	Siemens Cellular Engine HC28	013430	B2.10	revision 00.070	2007-08-28
EUT D (Code: 01901DO03)	GSM/UMTS module	Siemens Cellular Engine HC28	013310	B2.11	revision 00.080	2007-09-11

Remark: The EUTs are 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
AE1	Develop-ment Board DSB3	DSB75	DSB75_B1.1	–	GBI: ICM-100012-03	–
AE2	Adapter Board	Quinn DSB75 Adapter A1	–	–	Q_DSB75_A 1_309	–
AE3	Housing for DSB75	–	–	–	DSB75_B1 0009	–
AE4	External antenna Allgon-MiniMAG	Dualband Antenna Ordering number: 1140.26	–	–	–	–

Remark: The antenna gain is declared by the applicant as: 1.65 dBi = –0.49 dBD.

2.4 EUT Setups

This chapter describes the combination of EUTs and ancillary equipment used for testing.

Setup No.	Combination of EUTs	Description
setup_01	EUT A + AE1 + AE2	setup for conducted tests
setup_02	EUT B + AE1 + AE2	setup for conducted tests
setup_03	EUT C + AE1 + AE2	setup for conducted tests
setup_04	EUT D + AE1 + AE2	setup for conducted tests
setup_05	EUT A + AE1 + AE2 + AE3 + AE4	setup for radiated tests

2.5 Operating Modes

This chapter describes the operating modes of the EUTs used for testing.

Op. Mode	Description of Operating Modes	Remarks
	PCS data 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	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
	FDD II data call (HSDPA)	
op-mode 10	Call established on Traffic Channel (TCH) 9263, Carrier Frequency 1852.6 MHz	9262 is a low channel FDD II HSDPA data call
op-mode 11	Call established on Traffic Channel (TCH) 9400, Carrier Frequency 1880 MHz	9400 is a mid channel FDD II HSDPA data call
op-mode 12	Call established on Traffic Channel (TCH) 9537, Carrier Frequency 1907.4 MHz	9538 is a high channel FDD II HSDPA data call

HSDPA Subtests: (see Annex C of 3GPP TS 34.121, Table C.10.1.4)

Sub-test	**βc**	**βd**	**βd (SF)**	**βc/βd**	**βHS** (Note1, Note 2)	**CM (dB)** (Note 3)	**MPR (dB)** (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: $?_{ACK}$, $?_{NACK}$ and $?_{CQI}$ = 30/15 with b_{hs} = 30/15 * b_c .

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, $?_{ACK}$ and $?_{NACK}$ = 30/15 with b_{hs} = 30/15 * b_c , and $?_{CQI}$ = 24/15 with b_{hs} = 24/15 * b_c .

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

3 Test Results

3.1 RF Power Output

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

The test was performed according to: FCC §2.1046, 10-1-06

3.1.1 Test Description

1) The EUT was coupled to the R&S Spectrum Analyser and the R&S CMD55 / CMU200 Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
2) The total insertion losses for RF Path 1 and RF Path 2 were measured. The values were used to correct the readings from the R&S Spectrum Analyser and the R&S CMD55 / CMU200 Digital Communication Tester.
3) 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: Varied during measurements
- Channel (Frequency): Varied during measurements
4) The transmitted power of the EUT was recorded for all possible power control level by using an internal measurement function of the CMD55 / CMU200.
5) During this test the Spectrum Analyser was only used to check if the results are comprehensible.

The test system TS8950 GW by Rohde & Schwarz was used to perform the output power measurement in the mode HSDPA , which is a validated platform according to the PTCRB certification requirements.
The measured output power is an RMS value according to 3GPP requirements for 3G devices and was measured at the antenna connector of the EUT.

3.1.2 Test Requirements / Limits

§2.1046 Measurements Required: RF Power Output
(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the output terminals when this test is made shall be stated.
§24.232 Power and antenna height limits
(c) Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.
(d) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

3.1.3 Test Protocol

Temperature: 24 °C
Air Pressure: 1007 .. 1020 hPa
Humidity: 39 .. 42 %

Op. Mode	Setup	Port
see below	see below	antenna connector

Op. Mode	Setup	HSDPA Subtest	Output power Measured (dBm)	Remark
1	setup_04	–	30.1	–
2	setup_04	–	30.2	–
3	setup_04	–	30.1	–
4	setup_04	–	28.0	–
5	setup_04	–	28.1	–
6	setup_04	–	28.0	–
7	setup_04	–	26.5	–
8	setup_04	–	26.8	–
9	setup_04	–	26.3	–
10	setup_02	1	20.3	*
10	setup_02	2	21.1	*
10	setup_02	3	20.2	*
10	setup_02	4	20.3	*
11	setup_02	1	21.5	*
11	setup_02	2	21.1	*
11	setup_02	3	20.9	*
11	setup_02	4	20.9	*
12	setup_02	1	21.2	*
12	setup_02	2	21.0	*
12	setup_02	3	21.1	*
12	setup_02	4	20.9	*

Remarks:
The highest EIRP including antenna gain (1.65 dBi) is 31.9 dBm.
* tested at TS8950 GW (RMS value)

3.1.4 Test result: RF Power Output

FCC Part 22, Subpart H	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed
	op-mode 4	passed
	op-mode 5	passed
	op-mode 6	passed
	op-mode 7	passed
	op-mode 8	passed
	op-mode 9	passed
	op-mode 10	passed
	op-mode 11	passed
	op-mode 12	passed

3.2 Spurious emissions at antenna terminals

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

The test was performed according to FCC §2.1051, 10-1-06

3.2.1 Test Description

1) The EUT was coupled to the R&S Spectrum Analyser and the R&S CMD55 / CMU200 Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".

2) The total insertion losses for RF Path 1 and RF Path 2 were measured. The values were used to correct the readings from the R&S Spectrum Analyser and the R&S CMD55 / CMU200 Digital Communication Tester.

3) 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

4) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the PCS-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 "PCS 11.10-1 edition 4" for spurious emissions measurements (depending on the transmitting signal, the span and the resolution bandwidth)

5) The spurious emissions (peak) were measured in the frequency range from 9 kHz to 20 GHz (up to the 10th harmonic) during the call is established on the lowest channel

3.2.2 Test Requirements / Limits

§ 2.1051 Spurious emissions at antenna terminals

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in Sec. 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 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.
Remark of the test laboratory: This is calculated to be -13 dBm.
(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.

3.2.3 Test Protocol

Temperature: 26 .. 27 °C
Air Pressure: 1020 .. 1022 hPa
Humidity: 34 .. 46 %

Op. Mode	Setup	Port
op-mode 2	setup_01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
–	–	–	-13.0

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

Op. Mode	Setup	Port
op-mode 5	setup_01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
–	–	–	-13.0

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

Op. Mode	Setup	Port
op-mode 8	setup_03	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
–	–	–	-13.0

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

3.2.4 Test result: Spurious emissions at antenna terminals

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 2	passed
	op-mode 5	passed
	op-mode 8	passed

3.3 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

3.3.1 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.

3.3.2 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.

3.3.3 Test Protocol

Temperature: 24 .. 25 °C
Air Pressure: 1000 .. 1025 hPa
Humidity: 43 .. 50 %

Op. Mode	Setup	Port
op-mode 2	setup_05	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.

Op. Mode	Setup	Port
op-mode 5	setup_05	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.

Op. Mode	Setup	Port
op-mode 8	setup_05	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.

3.3.4 Test result: Field strength of spurious radiation

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 2	passed
	op-mode 5	passed
	op-mode 8	passed

3.4 Emission and Occupied Bandwidth

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

The test was performed according to: FCC §2.1049, 10-1-06

3.4.1 Test Description

1) The EUT was coupled to the R&S Spectrum Analyser and the R&S CMD55 / CMU200 Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".

2) The total insertion losses for RF Path 1 and RF Path 2 were measured. The values were used to correct the readings from the R&S Spectrum Analyser and the R&S CMD55 / CMU200 Digital Communication Tester.

3) 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

4) Important Analyser Settings:
- Resolution Bandwidth: 3 kHz (1% of the manufacturers stated occupied bandwidth)
- Video Bandwidth: 10 kHz (three times the Resolution Bandwidth)
- Sweep Span: 1 MHz (at least 250% of the emission bandwidth)

5) The maximum spectral level of the modulated signal was recorded as the reference.

6) The emission bandwidth is measured as follows:
the two furthest frequencies above and below the frequency of the maximum reference level where the spectrum is –26 dB down have to be found.

7) The occupied bandwidth (99% Bandwidth) is measured as follows:
the occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power.

3.4.2 Test Requirements / Limits

§ 2.1049 Measurements required: Occupied bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions (as applicable):

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

3.4.3 Test Protocol

Temperature: 26 .. 27 °C
Air Pressure: 1020 .. 1022 hPa
Humidity: 34 .. 46 %

Op. Mode	Setup	Port
op-mode 2	setup_01	antenna connector

Bandwidth kHz	Remarks
320.6	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 244.5 kHz.

Op. Mode	Setup	Port
op-mode 5	setup_01	antenna connector

Bandwidth kHz	Remarks
296.6	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 232.5 kHz.

Op. Mode	Setup	Port
op-mode 8	setup_03	antenna connector

Bandwidth kHz	Remarks
4669.3	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4208.4 kHz.

3.4.4 Test result: Emission and Occupied Bandwidth

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 2	passed
	op-mode 5	passed
	op-mode 8	passed

3.5 Band edge compliance

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

The test was performed according to: FCC §24.238, 10-1-06

3.5.1 Test Description

1) The EUT was coupled to the R&S CMU200 Digital Communications Tester via a 10 dB attenuator and a 6 dB coupler.
2) For the measurement the EUT is connected to the Spectrum Analyser via 30 dB attenuator and 6 dB coupler.
3) The spectrum analyser is set to a RBW/VBW of
   - 3 kHz / 3 kHz for GSM and EDGE mode
   - 100 kHz / 300 kHz for FDD mode.

3.5.2 Test Requirements / Limits

§ 24.238 Effective radiated power limits

3.5.3 Test Protocol

Temperature: 24 .. 25 °C
Air Pressure: 1010 .. 1020 hPa
Humidity: 42 .. 47 %

Op. Mode	Setup	Port
op-mode 1	setup_04	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1850	-13.3	-13.0

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 6	setup_04	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1910	-19.4	-13.0

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 7	setup_04	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1850	-16.3	-13.0

Remark: Please see annex for the measurement plot.

3.5.4 Test result: Band edge compliance

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 1	passed
	op-mode 6	passed
	op-mode 7	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	ESI 26	830482/004	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

TS8950 GW

Name of Device	Type	Serial Number	Manufacturer
Spectrum Analyser	FSU26	100136	Rohde & Schwarz GmbH & Co.KG: ...
Dual Channel Power meter	NRVD	100668	Rohde & Schwarz GmbH & Co.KG: ...
Diode Power Sensor	NRV-Z1	100149	Rohde & Schwarz GmbH & Co.KG: ...
Diode Power Sensor	NRV-Z1	100052	Rohde & Schwarz GmbH & Co.KG: ...
Signal Generator	SMP02	100129	Rohde & Schwarz GmbH & Co.KG: ...
Vector Signal Generator	SMIQ B3	101698	Rohde & Schwarz GmbH & Co.KG: ...
Vector Signal Generator	SMIQ B3	101699	Rohde & Schwarz GmbH & Co.KG: ...
Vector Signal Generator	SMIQ B3	100580	Rohde & Schwarz GmbH & Co.KG: ...
Vector Signal Generator	SMIQ B3	100582	Rohde & Schwarz GmbH & Co.KG: ...
Vector Signal Generator	SMIQ B3	100583	Rohde & Schwarz GmbH & Co.KG: ...
Vector Signal Generator	SMIQ B3	832492/061	Rohde & Schwarz GmbH & Co.KG: ...
GSM Signaling Unit	CRTU-G	100025	Rohde & Schwarz GmbH & Co.KG: ...
W-CDMA Signaling Unit	CRTU-W	100033	Rohde & Schwarz GmbH & Co.KG: ...
Power Supply	NGSM 32/10 DC	100043	Rohde & Schwarz GmbH & Co.KG: ...
System Controler	TS-PC 36	100016	Rohde & Schwarz GmbH & Co.KG: ...
Advanced Signal Conditioning Unit	ASCU850	100009	Rohde & Schwarz GmbH & Co.KG: ...
Advanced Signal Conditioning Unit	ASCU900	100015	Rohde & Schwarz GmbH & Co.KG: ...
Advanced Signal Conditioning Unit	ASCU1800	100023	Rohde & Schwarz GmbH & Co.KG: ...
Advanced Signal Conditioning Unit	ASCU1900	100018	Rohde & Schwarz GmbH & Co.KG: ...
Fading Simulator	ABFS	100041	Rohde & Schwarz GmbH & Co.KG: ...
Fading Simulator	ABFS	100047	Rohde & Schwarz GmbH & Co.KG: ...
Protocol Unit W-CDMA	CRTU-PU	100046	Rohde & Schwarz GmbH & Co.KG: ...
Industrial System Controler (spare)	PSL3		Rohde & Schwarz GmbH & Co.KG: ...
Industrial System Controler	PSL3	100035	Rohde & Schwarz GmbH & Co.KG: ...
Advanced Signal Conditioning Unit	ASCU FDD I+II	100002	Rohde & Schwarz GmbH & Co.KG: ...
Radio Unit W-CDMA	CRTU-RU	100035	Rohde & Schwarz GmbH & Co.KG: ...
Signal Switching and Conditioning Unit	SSCU-GW	100020	Rohde & Schwarz GmbH & Co.KG: ...
Fading Simulator	ABFS	100040	Rohde & Schwarz GmbH & Co.KG: ...
Distribution Unit		100025	Rohde & Schwarz GmbH & Co.KG: ...
Spectrum Analyser	FSU26	100090	Rohde & Schwarz GmbH & Co.KG: ...
Vector Signal Generator	SMU200A	101498	Rohde & Schwarz GmbH & Co.KG: ...
Vector Signal Generator	SMU200A	101499	Rohde & Schwarz GmbH & Co.KG: ...
Advanced Signal Conditioning Unit	ASCU FDD V	100014	Rohde & Schwarz GmbH & Co.KG: ...
SSCU Signal switching and conditioning...	SSCU-EXT	100010	Rohde & Schwarz GmbH & Co.KG: ...
TS-COMB Combiner Box	TS-COMB	100004	Rohde & Schwarz GmbH & Co.KG: ...
CS-HUB Ethernet Hub / Optical Output	CS-HUB	100028	Rohde & Schwarz GmbH & Co.KG: ...
CS- TRIGA Trigger amplifier	CS- TRIGA	100041	Rohde & Schwarz GmbH & Co.KG: ...
ADU 200 Relay Box 5	Relay Box	A04388	Ontrak Control Systems Inc.: Mr. Fortin
Radio Unit W-CDMA	CRTU-RU	100212	Rohde & Schwarz GmbH & Co.KG: ...
Advanced Signal Conditioning Unit	ASCU IV-IX	100009	Rohde & Schwarz GmbH & Co.KG: ...

5 Photo Report

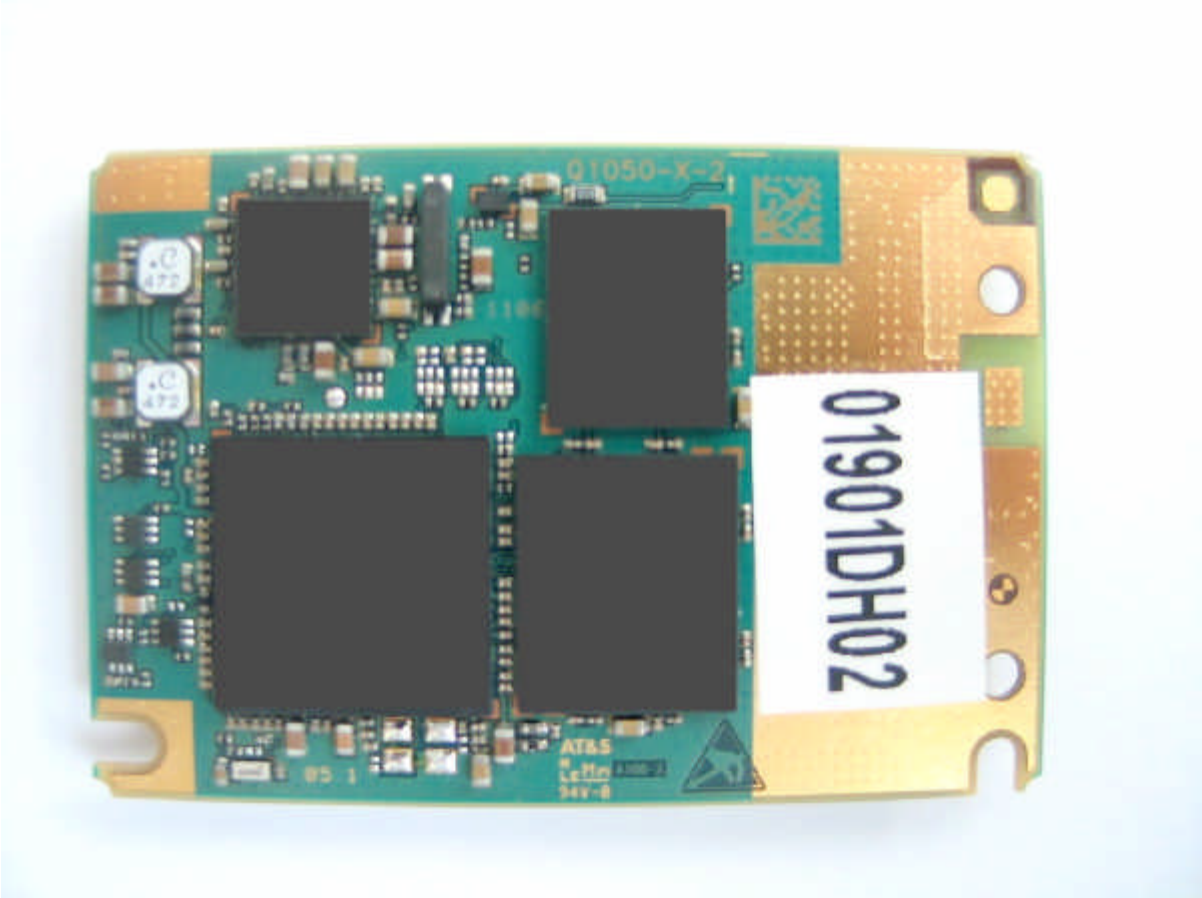


Photo 1: EUT (front side)

Photo 2: EUT (rear side)

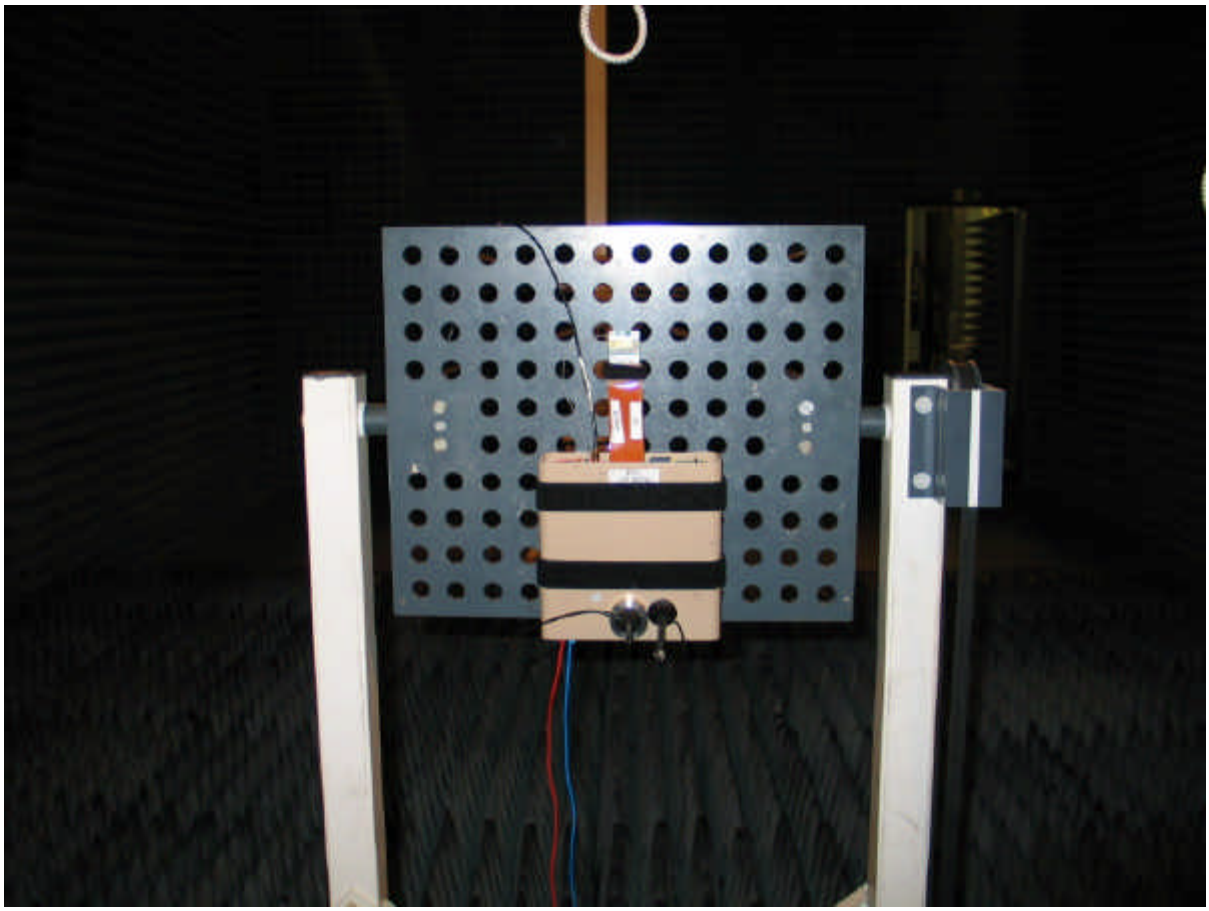
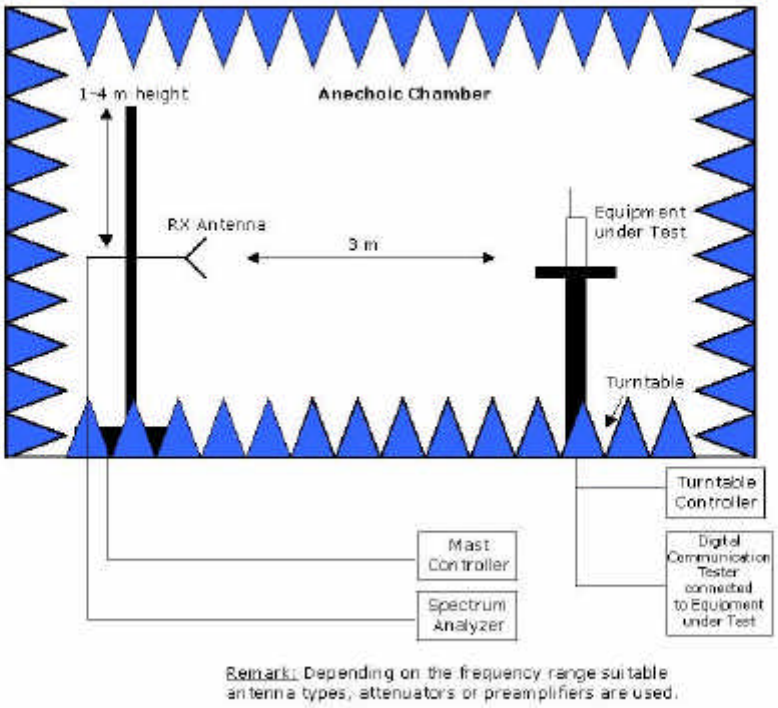
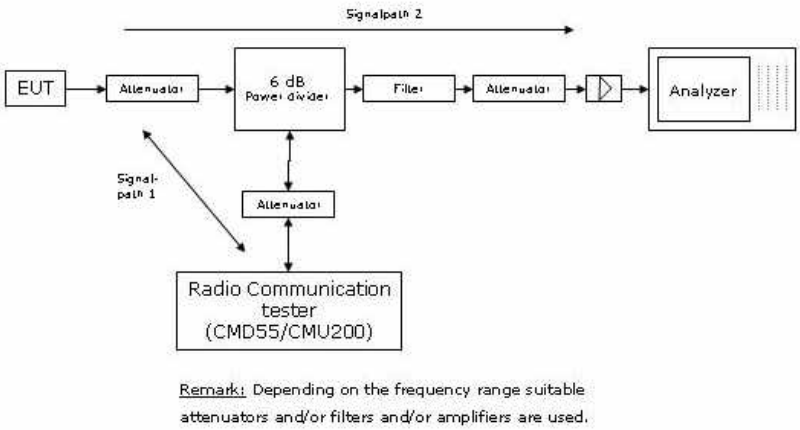


Photo 3: Setup for radiated tests

6 Setup Drawings



Drawing 1: Principle setup for radiated measurements.



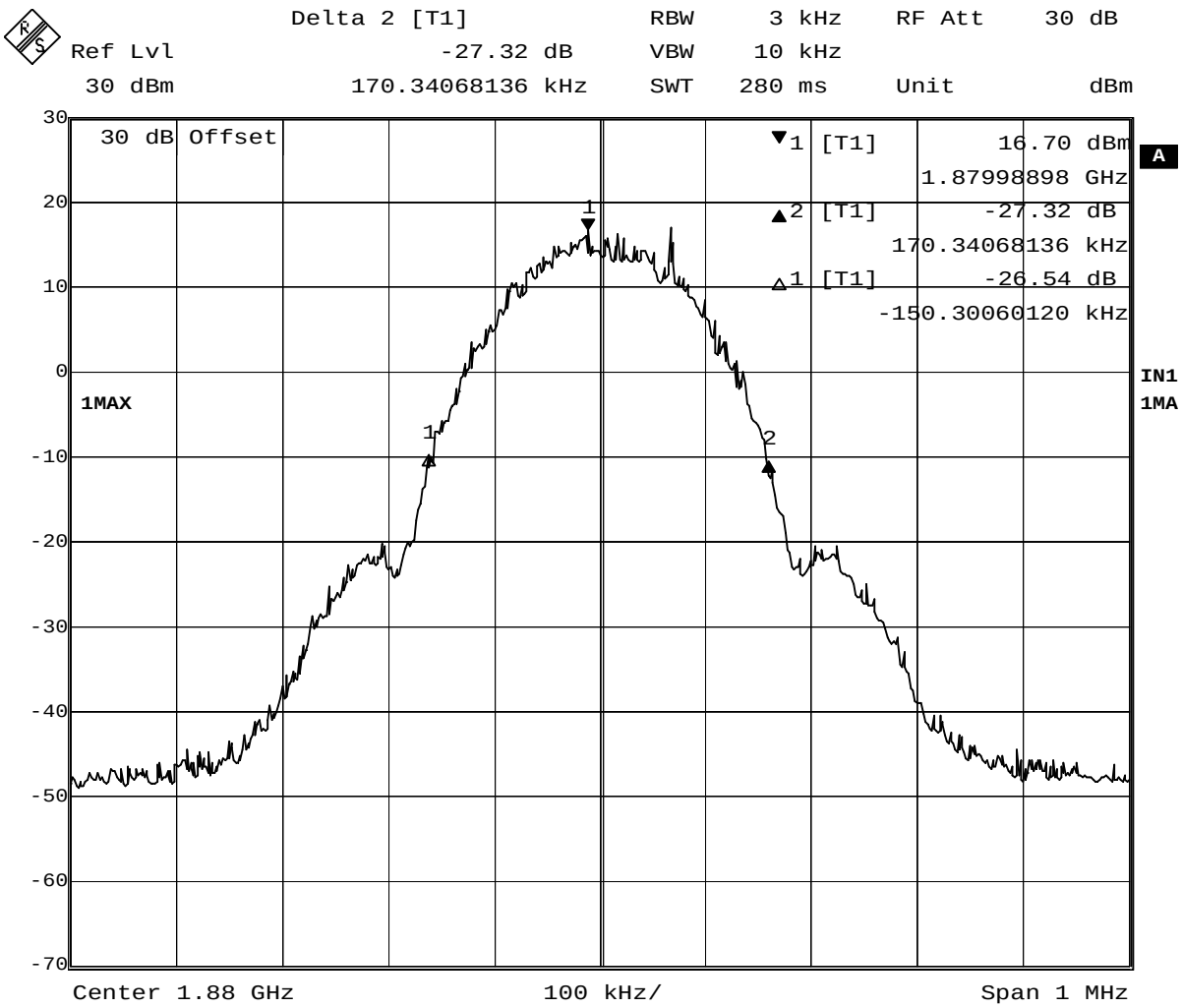
Drawing 2: Principle setup for conducted measurements under nominal conditions

7 Annex

Measurement plots Emission and Occupied Bandwidth

Op. Mode

op-mode 2

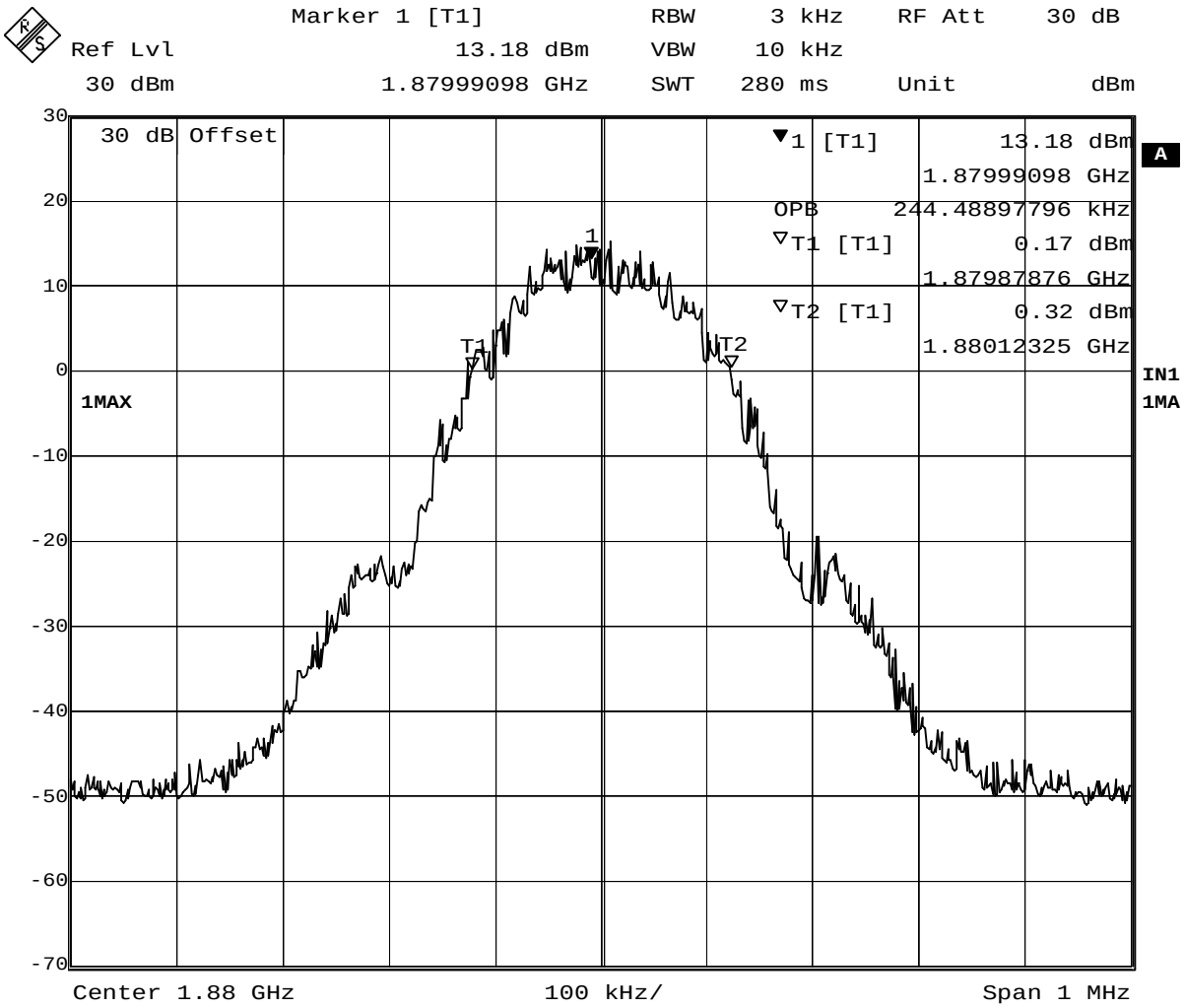


Date: 24.AUG.2007 19:09:10

Test: Emissions bandwidth (26 dB bandwidth), Channel 661 (1880.0 MHz)

Op. Mode

op-mode 2

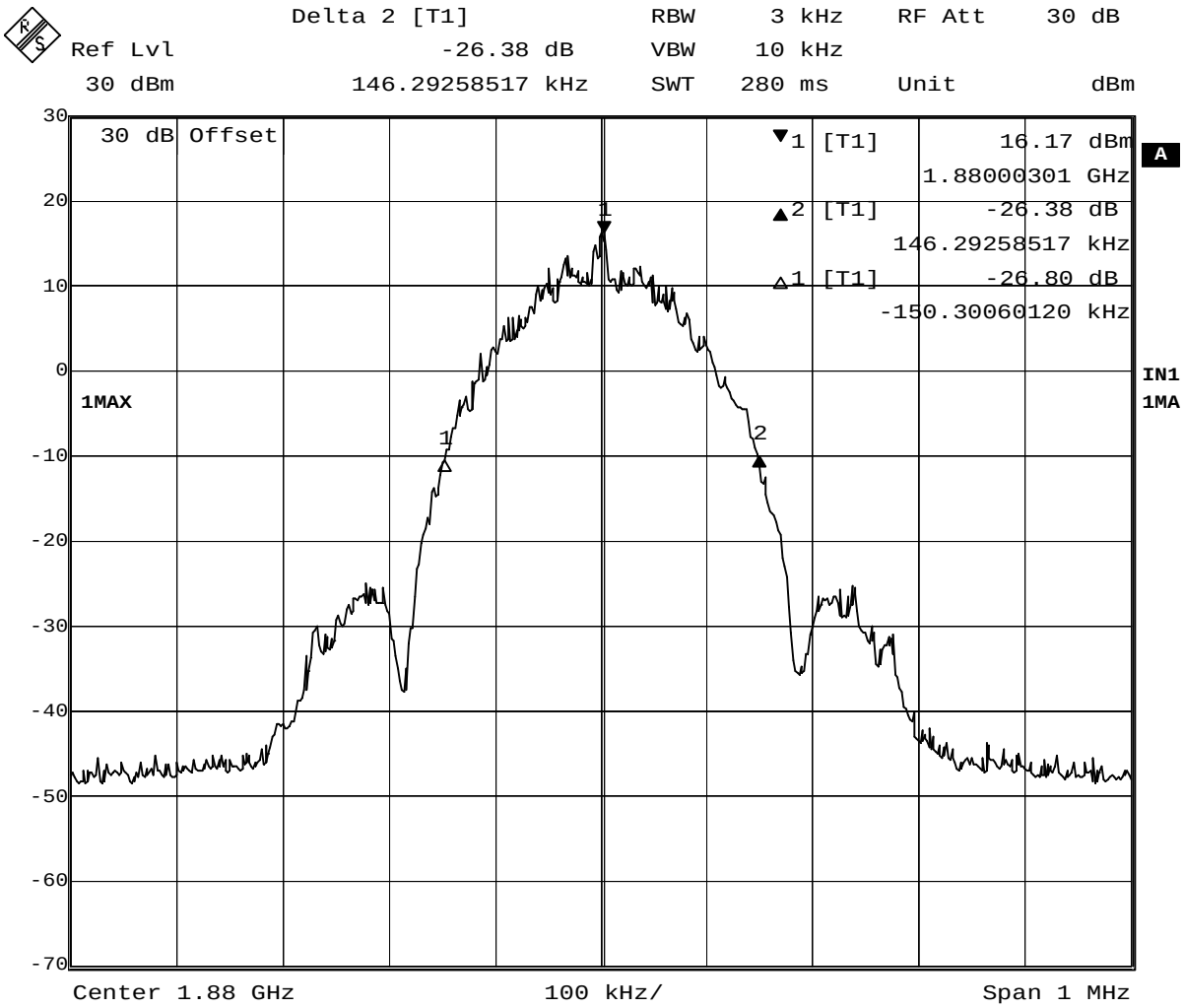


Date: 24.AUG.2007 18:53:10

Test: Occupied bandwidth, Channel 661 (1880.0 MHz)

Op. Mode

op-mode 5

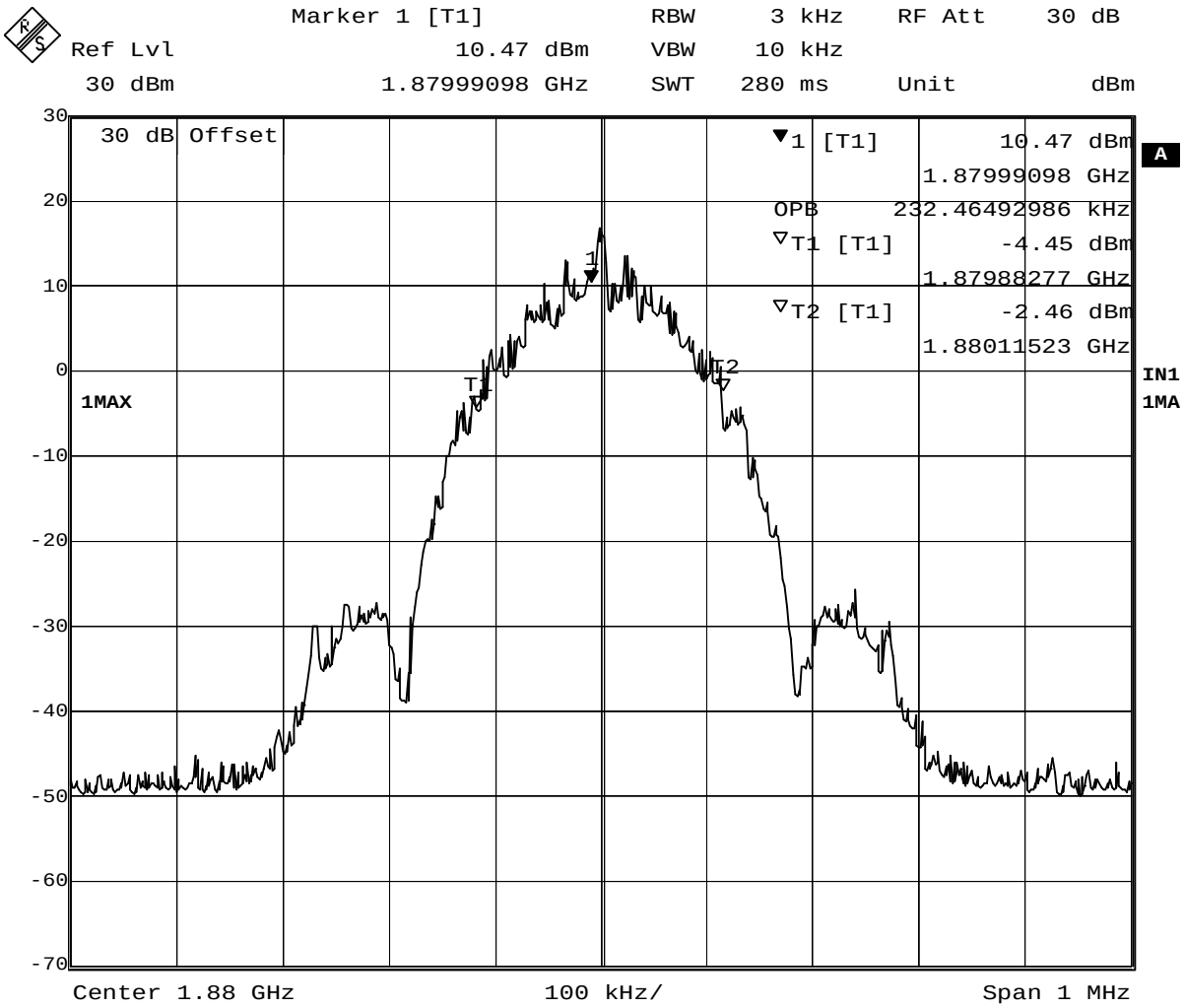


Date: 24.AUG.2007 19:03:28

Test: Emissions bandwidth (26 dB bandwidth), Channel 661 (1880.0 MHz)

Op. Mode

op-mode 5

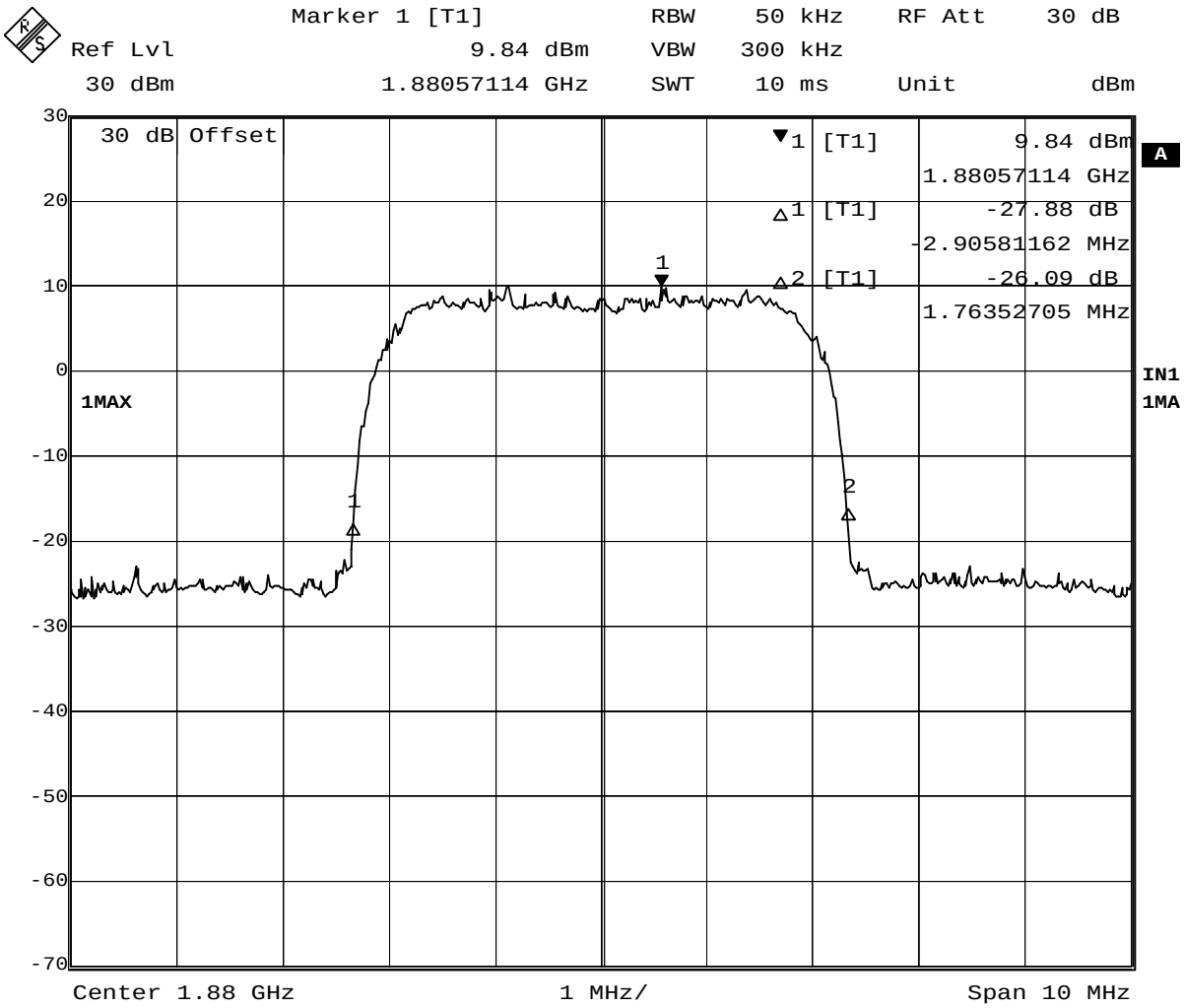


Date: 24.AUG.2007 18:55:28

Test: Occupied bandwidth, Channel 661 (1880.0 MHz)

Op. Mode

op-mode 8

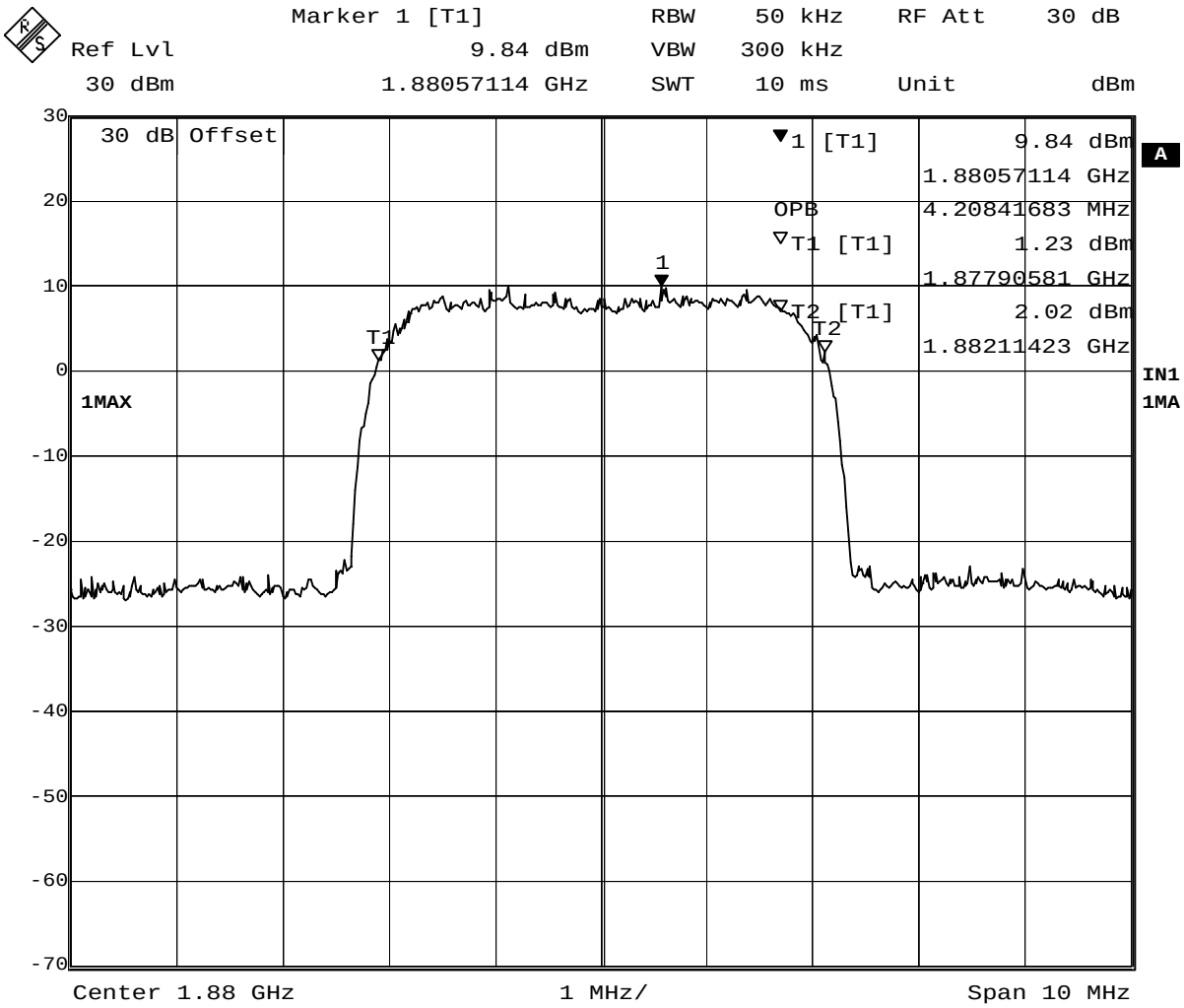


Date: 28.AUG.2007 16:15:29

Test: Emissions bandwidth (26 dB bandwidth), Channel 9400 (1880.0 MHz)

Op. Mode

op-mode 8



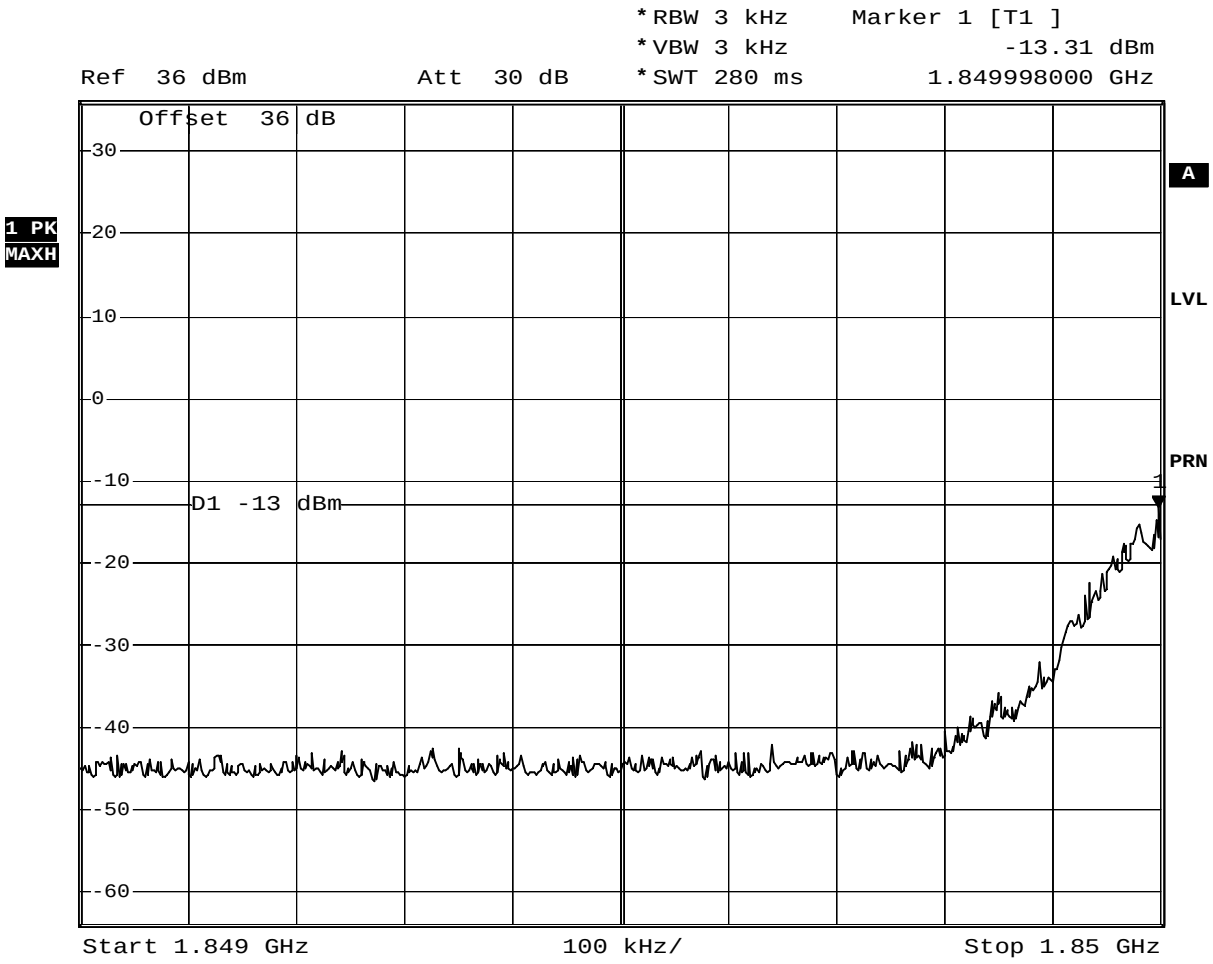
Date: 28.AUG.2007 16:14:24

Test: Occupied bandwidth, Channel 9400 (1880.0 MHz)

Measurement plots Band edge compliance

Op. Mode

op-mode 1

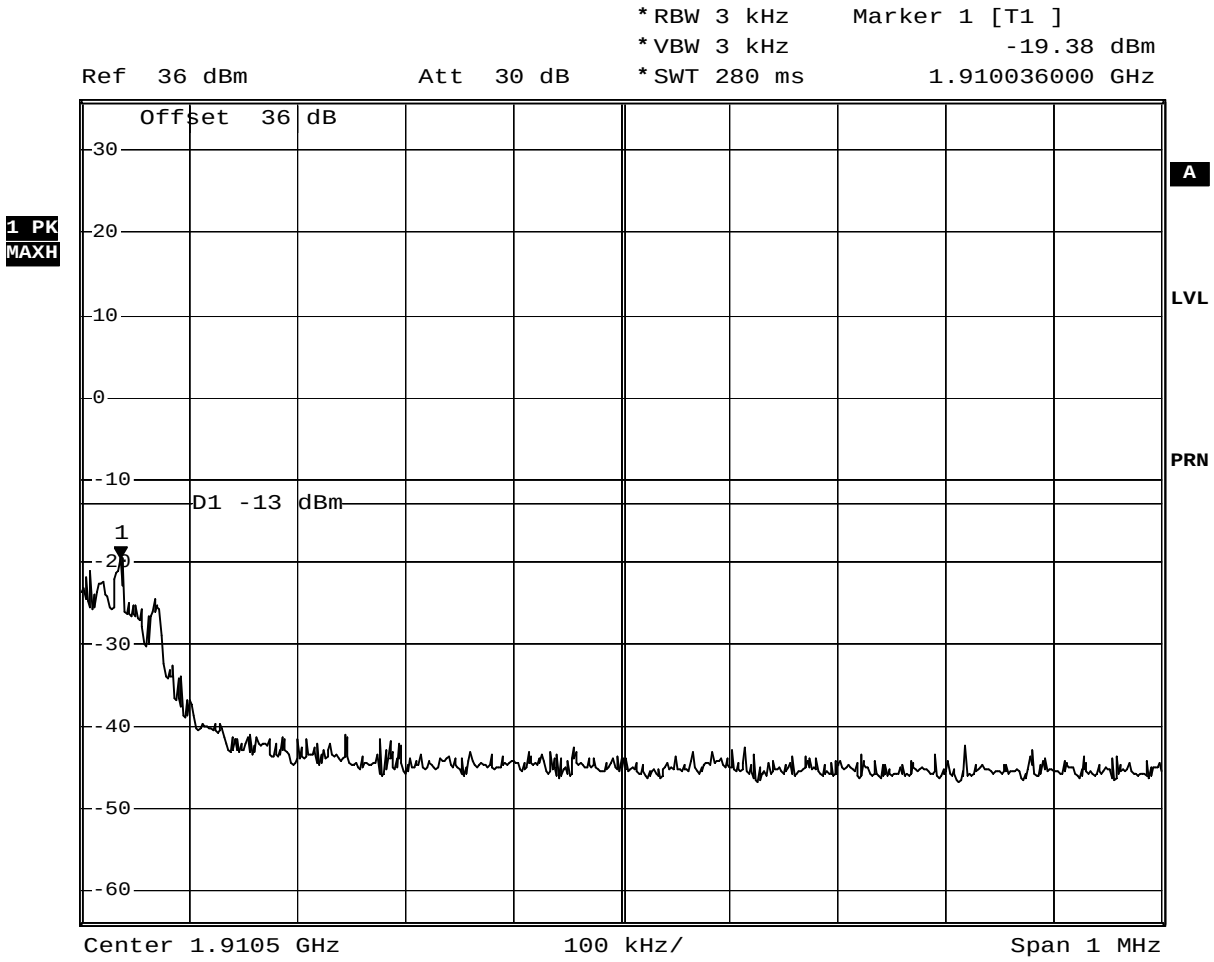


Comment:
Date: 11.SEP.2007 14:14:15

Test: band edge compliance , Channel 512,PCS

Op. Mode

op-mode 6

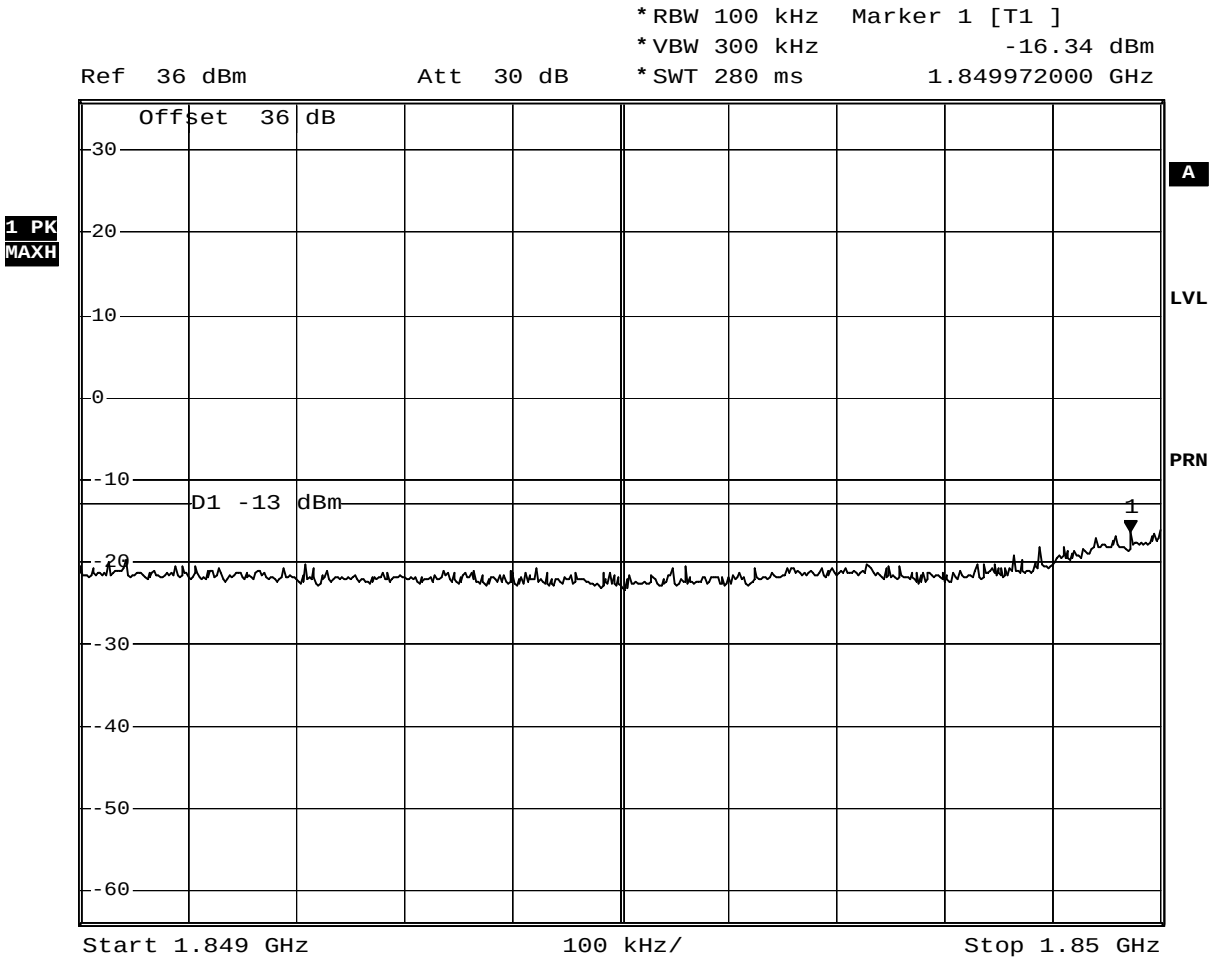


Comment:
Date: 11.SEP.2007 14:16:05

Test: band edge compliance , Channel 512, EDGE

Op. Mode

op-mode 7



Comment:
Date: 17.SEP.2007 14:07:30

Test: band edge compliance , Channel 9262, FDD II