Partial FCC Test Report

According to

47 CFR Part 22H, 24E

Equipment	:	**Notebook Computer**
Trade Name	:	**acer**
Model Name	:	**ZG5, Aspire one**
FCC ID	:	**HLZZG53GO**
Tx Frequency Range	:	**GSM850 : 824.2 ~ 848.8MHz** **GSM1900 : 1850.2 ~ 1909.8 MHz**
Max. ERP/EIRP Power	:	**GSM850 : 0.86 W** **GSM1900 : 0.90 W**
Emission Designator	:	**300KGXW**
Applicant	:	**Acer Inc.** 8F, 88, Sec.1, Hsin Tai Wu Rd. Hsichih Taipei Hsien 221 Taiwan, R.O.C.

- The test result refers exclusively to the test presented test model / sample.
- Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
- The data shown in this test report were carried out on Aug. 06, 2008 at **Sporton International Inc. LAB.**
- Report No.: FG870804, Report Version: Rev. 01.

Roy Wu
Manager

SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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History of This Test Report

Report Issue Date: Sep. 03, 2008

Report No.	Description

1. General Information

1.1 Applicant

Acer Inc.

8F, 88, Sec.1, Hsin Tai Wu Rd. Hsichih Taipei Hsien 221 Taiwan, R.O.C.

1.2 Manufacturer

Quanta Computer Inc.

1. No.2, Lane 58, Sanzhuang Road, Songjiang Export Processing Zone, Shanghai, P.R. China
2. No.4, Wen Ming 1st Street, Kuei Shan Hsiang, Taoyuan Shien, Taiwan, R.O.C.333
3. No.8, Dongjing Rd., Songjiang Industrial Zone, Shanghai, P.R. China
4. No.4, Lane 58 Sanzhuang Road, Songjiang Export Processing Zone, Shanghai, P.R. China
5. North to Songsheng. Road, Songjiang Industrial Zone, Shanghai, P.R. China
6. B#, No.1 South Rongteng Road, Songjiang Export Processing Zone, Shanghai, P.R. China
7. Standard Factory, South to Valqua, Rongxin Road, Songjiang Export Processing Zone, Shanghai, P.R. China
8. C#, No.1 South Rongteng Road, Songhjang Export Processing Zone, Shanghai, P.R. China
9. No.6, Lane 66 Sanzhuang Road, Songjiang Export Processing Zone, Shanghai, P.R. China
10. No.6, Lane 58 Sanzhuang Road, Songjiang Export Processing Zone, Shanghai, P.R. China
11. Huade Building , No.18 ChuangYe Rd., ShandDi Zone, HaiDian District, Beijing, P.R.C.
12. No.68 Sanzhuang Road, Songjiang Export Processing Zone, Shanghai, P.R. China
13. 2F, C Building, XinYe Rd, Export Processing District In Torch, Zhongshan, Guangdong, P.R.C.

1.3 Basic Description of Equipment under Test

AC Adapter	**Brand Name**	LITE-ON
	Model Name	PA-1300-04
	Power Rating	I/P:100-240Vac, 50-60Hz, 1.0A; O/P: 19Vdc, 1.58A,
	AC Power Cord Type	3.20 meter shielded cable with ferrite core
Battery	**Brand Name**	Simplo
	Model Name	UM08B74
	Power Rating	11.1Vdc, 5200mAh/60Wh
	Type	Li-ion

Remark: Above EUT's information was declared by manufacturer. Please refer to the specifications of manufacturer or User's Manual for more detailed features description.

Notebook Specification			
Housing Type	Plastic		
AC Power Adapter	Lite-on	**Model**	PA-1300-04AC
AC Power Adapter Rating	I/P: 100-240Vac O/P:19Vdc, 1.58A		
AC Power Core Type	Non-shielded AC 3-pin (1.8m)		
DC Power Cable Type	Non-shielded DC (1.5m) with one ferrite core		
CPU	Intel	**Model**	N270 (1.6GHz)
Memory Capacity	512MB / 1GB		
8.9" LCD Panel	AUO	**Model**	A089SW01 V0
			A089SW01 V1
	CHI MEI	**Model**	N089L6-L02
HDD	Intel	**Model**	Z-U130 SLC (4GB)
			ZT4 MLC (4GB)
			ZT4 MLC (8GB)
	Sandisk	**Model**	uSSD MLC (8GB)
	Seagate	**Model**	ST980310AS (80GB)
	WD	**Model**	WD800BEVT-22ZCT0 (80GB)
	HGST	**Model**	HTS543280L9A300 (80GB)
Battery	SIMPLO	**Model**	UM08A71
			UM08A72
			UM08A73
			UM08B74
	Panasonic	**Model**	UM08A52
Wireless LAN	Atheros	**Model**	AR5BXB63
Camera	Lite-On	**Model**	08PC01 SP0814V1.2
	Suyin		CN0316-M608-0V01
3G Card	OPTION	**Model**	M00301

1.4 Feature of Equipment under Test

Product Feature & Specification	
DUT Type :	Notebook Computer
Trade Name :	acer
Model Name :	ZG5, Aspire one
FCC ID :	HLZZG53GO
Tx Frequency :	GSM850 : 824 MHz ~ 849 MHz GSM1900 : 1850 MHz ~ 1910 MHz
Rx Frequency :	GSM850 : 869 MHz ~ 894 MHz GSM1900 : 1930 MHz ~ 1990 MHz
Maximum ERP/EIRP :	GSM850 : 0.86 W (29.34 dBm) GSM1900 : 0.90 W (29.52 dBm)
Antenna Type :	Fixed Internal
HW Version :	D
SW Version :	3109
Type of Modulation :	QPSK
Type of Emission :	300KGXW
DUT Stage :	Production Unit

2. Test Configuration of Equipment under Test

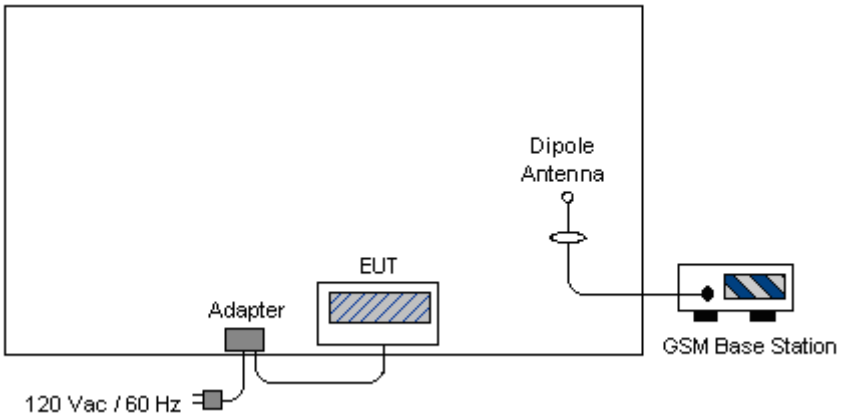
2.1 Test Manner

1. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range.
2. During all testings, EUT is in link mode with base station emulator at maximum power level.
3. The EUT integrates OPTION M00301 WWAN module (FCC ID: NCM0M00301), the conducted test cases can be referred to the WWAN module report.
4. Frequency range investigated: radiated emission from 30 MHz to 9000 MHz for GSM850; from 30MHz to 19000 MHz for GSM1900.

2.2 Test Mode

Item \ Band	GPRS850	GPRS1900
Radiated Emission	☒ Mode 1: GPRS Link	☒ Mode 2: GPRS Link

2.3 Connection Diagram of Test System



2.4 Ancillary Equipment List

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Code
1.	GSM Base Station	R&S	CMU200	N/A	N/A	Unshielded, 1.8m

3. General Information of Test Site

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,
Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-327-3456
FAX : 886-3-328-4978
Test Site No : 03CH07-HY
FCC Designation No : TW1022

The chamber meets the characteristics of ANSI C63.4-2003. This site is on file with the FCC.

3.1 Test Voltage

AC 120V / 60Hz

3.2 Test Compliance

47 CFR Part 22H, 24E, Part 2

3.3 Frequency Range

a. Radiation: from 30MHz to 9000MHz for GSM850.
b. Radiation: from 30 MHz to 19000 MHz for GSM1900.

3.4 Test Distance

The test distance of radiated emission from antenna to EUT is 3 m.

4. Test Data and Test Result

4.1 List of Measurements and Examinations

FCC Rule	Description Of Test	Result	Section
§22.913 §24.232	ERP / EIRP	Passed	4.3
§2.1053	Field Strength of Spurious Radiation	Passed	4.2

4.2 ERP / EIRP Measurement

Equivalent isotropic radiated power measurements by substitution method according to ANSI/TIA/EIA-603-C.

4.2.1 Measurement Instruments

As described in chapter 5 of this test report.

4.2.2 Test Procedure

a. The EUT was placed on a tutntable with 1.0 meter height in an fully anechoic chamber.

b. The EUT was set 1.2 meters from the receiving antenna which was mounted on the antenna tower.

c. The table was rotated 360 degrees to determine the position of the highest radiated power.

d. The height of the receiving antenna is also kept at 1.0M height.

e. Taking the record of maximum ERP/EIRP.

f. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.

g. The conducted power at the terminal of the dipole antenna is measured.

h. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.

i. ERP/EIRP = Ps + Et – Es + Gs = Ps + Rt – Rs + Gs

Ps (dBm)：Input power to substitution antenna.

Gs (dBi or dBd)：Substitution antenna Gain.

Et = Rt + AF

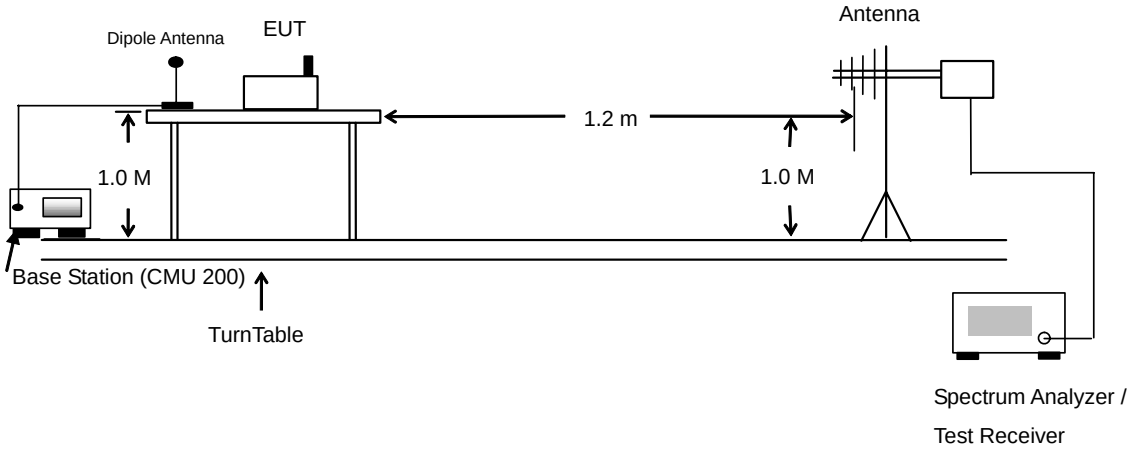
Es = Rs + AF

AF (dB/m)：Receive antenna factor

Rt：The highest received signal in Spectrum Analyzer for EUT.

Rs：The highest received signal in spectrum analyzer for substitution antenna.

4.2.3 Test Setup Layout of ERP/EIRP



4.2.4 Test Result

GSM850 Radiated Power ERP						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
824.20	-20.04	-48.12	0.00	-1.08	27.00	0.50
836.40	-19.93	-48.28	0.00	-0.93	27.42	0.55
848.80	-20.34	-48.35	0.00	-0.76	27.25	0.53
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
824.20	-19.73	-47.97	0.00	-1.08	27.16	0.52
836.40	-18.87	-48.01	0.00	-0.93	28.21	0.66
848.80	-17.95	-48.05	0.00	-0.76	29.34	0.86

GSM1900 Radiated Power EIRP						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	EIRP (W)
1850.20	-24.89	-51.88	0.00	1.96	28.95	0.79
1880.00	-27.79	-52.99	0.00	2.00	27.20	0.52
1909.80	-28.92	-54.28	0.00	1.98	27.34	0.54
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	EIRP (W)
1850.20	-24.57	-52.13	0.00	1.96	29.52	0.90
1880.00	-26.77	-53.17	0.00	2.00	28.40	0.69
1909.80	-27.07	-54.13	0.00	1.98	29.04	0.80

4.3 Field Strength of Spurious Radiation

Equivalent isotropic radiated Power Measurements by substitution method according to ANSI/TIA/EIA-603-C.

4.3.1 Measurement Instruments

As described in chapter 5 of this test report.

4.3.2 Test Procedure

a. The EUT was placed on a rotatable wooden table with 0.8 meter about ground.

b. The EUT was set 3 meters from the receiving antenna which was mounted on the antenna tower.

c. The table was rotated 360 degrees to determine the position of the highest spurious emission.

d. The height of the receiving antenna is varied between one meter and four meters to reach the maximum spurious emission for both horizontal and vertical polarizations.

e. Taking the record of maximum spurious emission.

f. A Horn antenna was substituted in place of the EUT and was driven by a signal generator.

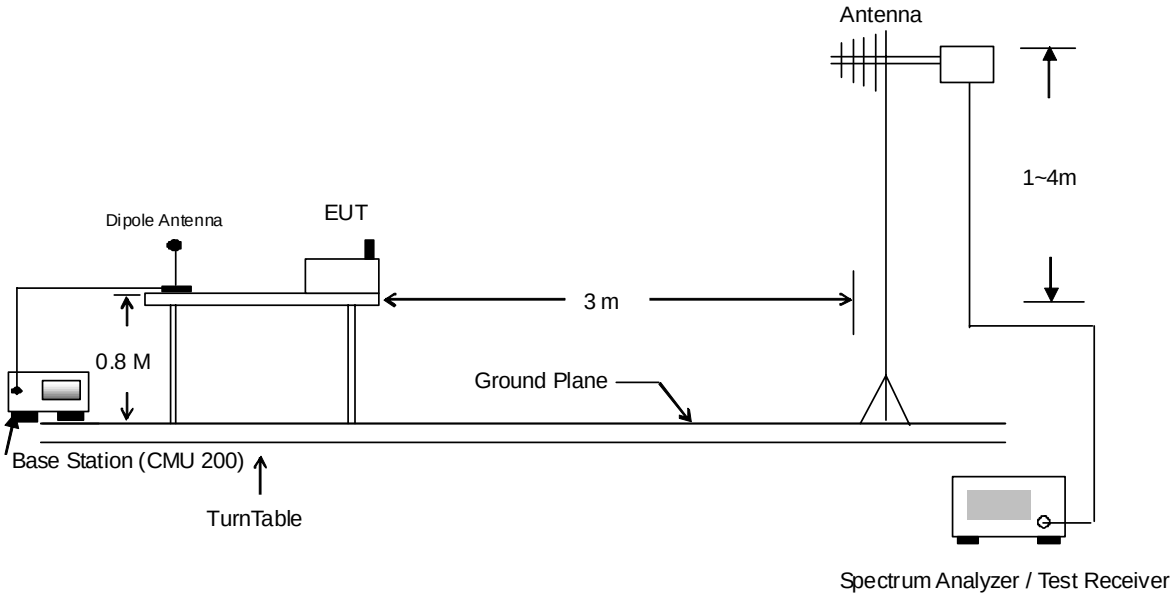
g. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.

h. Taking the recored of output power at antenna port.

i. Repeat step 7 to step 8 for another polarization.

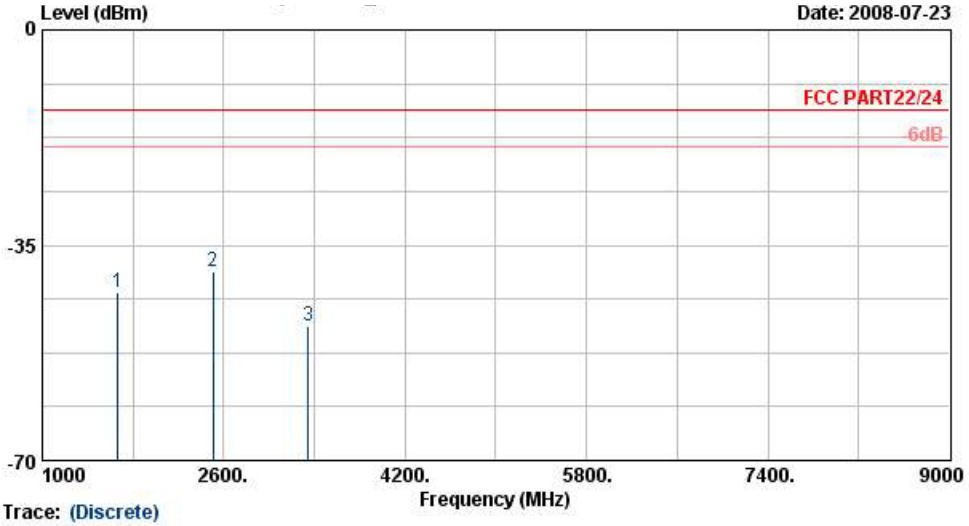
j. Emission level (dBm) = output power + substitution Gain.

4.3.3 Test Setup Layout



4.3.4 Test Data

- Mode 1
- Horizontal Polarization



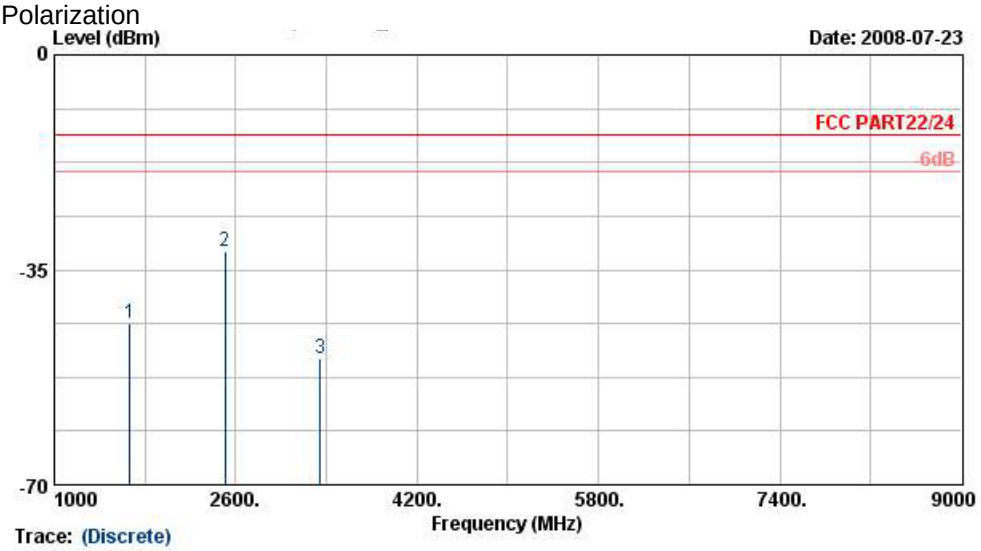
Trace: (Discrete)

Site : 03CH07-HY
Condition : HF-EIRP(080306) HORIZONTAL
EUT : 8.9吋Notebook
Power : 120Vac/60Hz
Model : FG870804
Mode : GPRS 850 Link Mode Ch189 + Adaptor
IMEI : 357564010220188

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1669	-42.69	-13	-29.69	-50.86	-41.7	3.39	4.55	H	Pass
2509	-39.35	-13	-26.35	-47.39	-39.41	3.71	5.92	H	Pass
3346	-48.21	-13	-33.06	-59.16	-50.14	3.13	7.21	H	Pass

Remark : Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

- Vertical Polarization

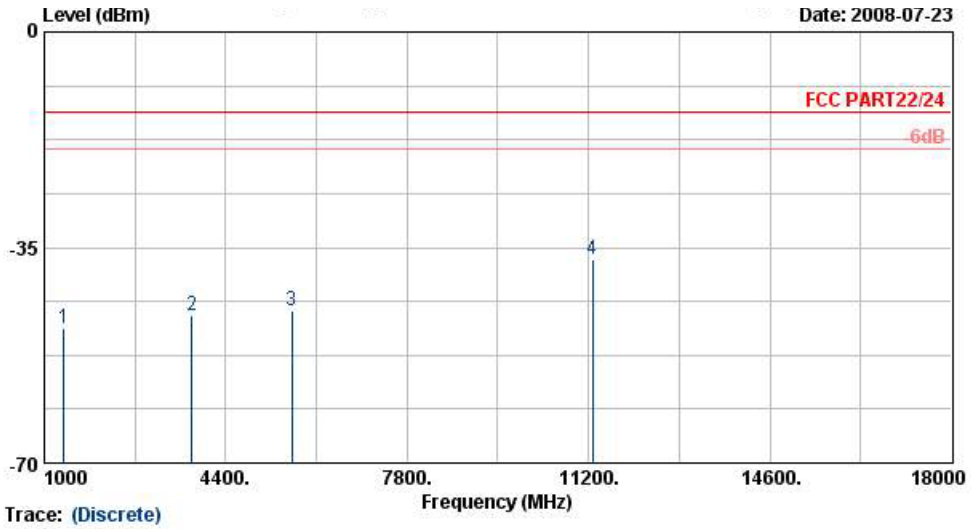


Site : 03CH07-HY
Condition : HF-EIRP(080306) VERTICAL
EUT : 8.9吋Notebook
Power : 120Vac/60Hz
Model : FG870804
Mode : GPRS 850 Link Mode Ch189 + Adaptor
IMEI : 357564010220188

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1669	-43.67	-13	-30.67	-48.26	-42.29	3.39	4.16	V	Pass
2509	-32.13	-13	-19.13	-43.85	-31.99	3.71	5.72	V	Pass
3346	-49.34	-13	-36.34	-58.82	-51.54	3.13	7.48	V	Pass

Remark : Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

- Mode 2
- Horizontal Polarization

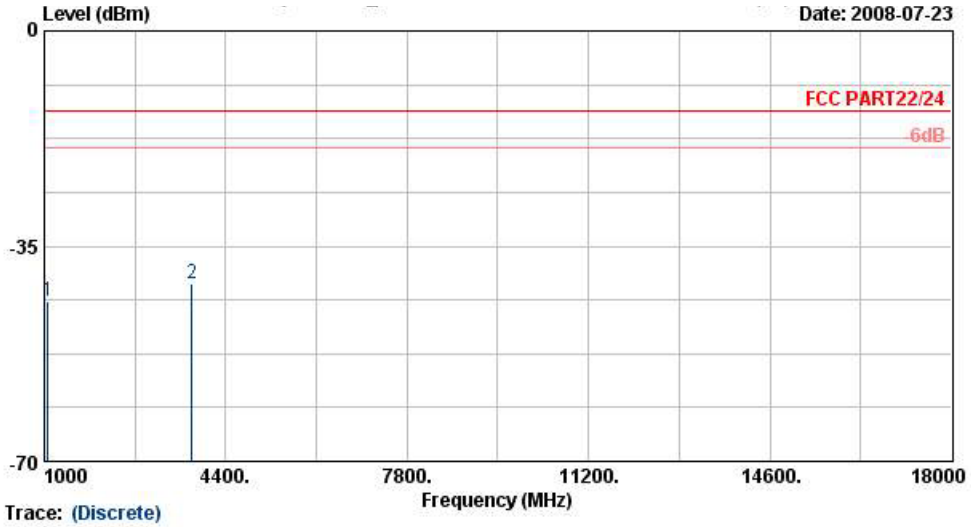


Site : 03CH07-HY
Condition : HF-EIRP(080306) HORIZONTAL
EUT : 8.9吋Notebook
Power : 120Vac/60Hz
Model : FG870804
Mode : GPRS 1900 Link Mode Ch661 + Adaptor
IMEI : 357564010220188

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1366	-48.02	-13	-35.02	-55.24	-49.9	4.21	6.09	H	Pass
3760	-45.97	-13	-32.97	-59.91	-49.34	4.03	7.40	H	Pass
5636	-45.38	-13	-32.38	-64.65	-50.32	3.87	8.81	H	Pass
11280	-36.88	-13	-23.88	-67.51	-39.16	8.48	10.76	H	Pass

Remark : Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

- Vertical Polarization



Site : 03CH07-HY
Condition : HF-EIRP(080306) VERTICAL
EUT : 8.9吋Notebook
Power : 120Vac/60Hz
Model : FG870804
Mode : GPRS 1900 Link Mode Ch661 + Adaptor
IMEI : 357564010220188

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1062	-44.03	-13	-31.03	-54.32	-47.17	3.61	6.75	V	Pass
3760	-41.13	-13	-28.13	-58.25	-45.01	4.03	7.91	V	Pass

Remark : Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

5. List of Measurement Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz-1GHz	Dec. 01, 2007	Nov. 30, 2008	Radiation (03CH07-HY)
Spectrum Analyzer	R & S	FSP	101067	9KHz~30GHz	Dec. 05, 2007	Dec. 04, 2008	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1G~18GHz	Aug. 13, 2008	Aug. 12. 2009	Radiation (03CH07-HY)
PreAmplifier	Agilent	8449B	3008A02362	1~26.5GHz	Dec. 22, 2007	Dec. 21, 2008	Radiation (03CH07-HY)
PreAmplifier	COM-POWER	PA-103A	161241	10-1000MHz.32dB .GAIN	Mar. 31, 2008	Mar. 30, 2009	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	66584	1G~18GHz	Aug. 06, 2008	Aug. 05. 2009	Radiation (03CH07-HY)

6. Uncertainty Evaluation

Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.41	Normal(k=2)	0.21
Antenna factor calibration	0.83	Normal(k=2)	0.42
Cable loss calibration	0.25	Normal(k=2)	0.13
Pre Amplifier Gain calibration	0.27	Normal(k=2)	0.14
RCV/SPA specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site imperfection	1.43	Rectangular	0.83
Mismatch	+0.39/-0.41	U-shaped	0.28
Combined standard uncertainty Uc(y)	**1.27**		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	**2.54**		

Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Contribution	Uncertainty of x_i		$u(x_i)$	Ci	$Ci*u(x_i)$
	dB	Probability Distribution			
Receiver reading	±0.10	Normal(k=1)	0.10	1	0.10
Antenna factor calibration	±1.70	Normal(k=2)	0.85	1	0.85
Cable loss calibration	±0.50	Normal(k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR Γ1= 0.197 Antenna VSWR Γ2= 0.194 Uncertainty=20log(1-Γ1*Γ2)	+0.34/-0.35	U-shaped	0.244	1	0.244
Combined standard uncertainty Uc(y)	**2.36**				
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	**4.72**				

END OF TEST REPORT

Appendix A. Photographs of EUT

Please refer to Sporton report number EP870804 as below.

InterLab®

FCC Measurement/Technical Report on

GSM/UMTS Module
MO0301

Report Reference: MDE_Opti_0709_FCCc

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.

InterLab® is a registered trademark of 7 layers AG

Table of Contents

0 Summary

0.1 Technical Report Summary

Type of Authorization
Certification for an Unintentional Radiator (Class B digital device)

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-06 Edition) and 15 (10-1-06 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart A – General

§ 15.31 Measurement standards

§ 15.33 Frequency range of radiated measurements

Part 15, Subpart B – Unintentional Radiators

§ 15.101 Equipment authorization of unintentional radiators

§ 15.107 Conducted limits

§ 15.109 Radiated emission limits

Note:
None.

Summary Test Results:

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

0.2 Measurement Summary

FCC Part 15, Subpart B	§ 15.107		
Conducted Emissions (AC power line)			
The measurement was performed according to ANSI C63.4			2003
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_01	AC Port (power line)	passed

FCC Part 15, Subpart B	§ 15.109		
Spurious Radiated Emissions			
The measurement was performed according to ANSI C63.4			2003
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 2	Setup_02	Enclosure	passed

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:	2007-07-16

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Date of Test(s):	2007-07-10 to 2007-07-26
Date of Report:	2007-08-03

1.3 Applicant Data

Company Name:	Option NV
Address:	Gaston Geenslaan 14 3001 Leuven Belgium
Contact Person:	Mr. Lodeweyckx

1.4 Manufacturer Data

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

2 Product labelling

2.1 FCC ID label

At the time of the report there was no FCC label available.

2.2 Location of the label on the EUT

see above

3 Test object Data

3.1 General EUT Description

Equipment under Test	GSM/UMTS Module
Type Designation:	MO0301
Kind of Device:	GSM 850/900/1800/1900 + UTRA FDD I/II/V
(optional)	including HSDPA
Voltage Type:	DC
Nominal Voltage:	3.6 V
Maximum Voltage:	3.6 V
Minimum Voltage:	3.0 V

General product description:

The Equipment under Test (EUT) is a USB modem that supports GSM/EDGE 850/900/1800/1900 and FDD I, II and V with HSDPA.

The EUT provides the following ports:

Ports
Enclosure

The main components of the EUT are listed and described in Chapter 3.2

3.2 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: 37250c01) Remark: none	GSM/UMTS Module	MO0301	004401440497333	2.0	2.5.0	2007-06-28
EUT B (Code: 37250d01) Remark: none	GSM/UMTS Module	MO0301	004401440497333	2.0	2.5.0	2007-07-09

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

3.3 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	Printer	Epson Stylus C84	–	–	FBPT048906	–
AE2	Keyboard	Cherry RS6000	–	–	G0000273	–
AE3	Mouse	Logitech M-BB48	–	–	LZC90505478	–
AE4	Monitor	LG Flatron L1740BQ	–	–	509WANF1W607	BEJL17NU
AE5	Laptop	Fujitsu Siemens AMILO Pro V3205	–	–	YK2H014267	–
AE6	AC Adapter	0335C2065	–	–	A30638114250	–
AE7	Monitor	DELL 1907FPc	–	–	CN-VTC300-64180-692-UVCSREV-A00	–
AE8	Test cradle	Cobra SPQ	V1.0	–	–	–
AE9	Test cradle	PEPIJN	V2.0	–	–	–

3.4 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+AE3+AE4 +AE5+AE6+AE8	Setup for conducted test
Setup_02	EUT B +AE1+AE2+AE3+AE5 +AE6+AE7+AE9	Setup for radiated test

3.5 Operating Modes

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

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	Call established on Traffic Channel (TCH) 661, Carrier Frequency 1880 MHz	661 is a mid channel PCS data call
op-mode 2	GSM 1900 idle mode	A mode of operation of a receiver or a transceiver, where the Equipment Under Test (EUT) is powered, available for service and available to respond to a request to set up a call.

4 Test Results

4.1 Conducted emissions (AC power line)

Standard FCC Part 15, 10-1-06
Subpart B

The test was performed according to: ANSI C 63.4, 2003

4.1.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003. The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50µH || 50 Ohm Line Impedance Stabilization Network (LISN). The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan
Intention of this step is, to determine the conducted EMI-profile of the EUT.
EMI receiver settings:
- Detector: Peak - Maxhold
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 5 kHz
- IF–Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement
Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.
EMI receiver settings:
- Detector: Quasi-Peak
- IF - Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:
1) Neutral lead - reference ground (PE grounded)
2) Phase lead - reference ground (PE grounded)
3) Neutral lead - reference ground (PE floating)
4) Phase lead - reference ground (PE floating)

The highest value is reported.

4.1.2 Test Requirements / Limits

FCC Part 15, Subpart B, §15.107

Frequency Range (MHz)	QP Limit (dBµV)	AV Limit (dBµV)
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50

Used conversion factor: Limit (dBµV) = 20 log (Limit (µV)/1µV).

4.1.3 Test Protocol

Temperature: 25 °C
Air Pressure: 1013 hPa
Humidity: 40 %

Op. Mode	Setup	Port
op-mode 1	Setup_01	AC Port (power line)

Power line	Frequency MHz	Measured value dBµV	Delta to limit dBµV	Remarks
-	-	-	-	-

Remark: Please see annex for the measurement plot.
An empty table means that no final measurement was performed because no relevant frequencies (peaks) were found during the preliminary scan.

4.1.4 Test result: Conducted emissions (AC power line)

FCC Part 15, Subpart B	Op. Mode	Result
	op-mode 1	passed

4.2 Spurious radiated emissions

Standard FCC Part 15, 10-1-06
Subpart B

The test was performed according to: ANSI C 63.4, 2003

4.2.1 Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.
The radiated emissions measurements were made in a typical installation configuration.
The measurement procedure is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)

Intention of this step is, to determine the radiated EMI-profile of the EUT.
Settings for step 1:
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180° to 180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2:

A further measurement will be performed on the frequencies determined in step 1.
Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.
Settings for step 2:
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –180° to 180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:
- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3:

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum amplitude for each frequency found in step 2. The turntable azimuth and antenna height, which was determined in step 2, will be adjusted for each frequency. The turntable azimuth will be slowly varied by +/– 22.5° around this value. The value of emission is continuously measured during this process. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by +/- 25 cm around the antenna height determined in step 2. The value of emission is also continuously measured during this process. The antenna height of the highest emission will also be recorded and adjusted.
Settings for step 3:
- Detector: Peak – Maxhold
- Frequencies to be investigated: Frequencies determined in step 2
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –22.5° to +22.5° around the value determined in step 2
- Height variation range: –0.25 m to +0.25 m around the value determined in step 2

Step 4: Final measurement (with QP detector)

With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

Measurement above 1 GHz:

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse-linear-distance-squared for the power density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.
Detector: Peak, Average (simultaneously)
RBW = VBW = 1 MHz; above 7 GHz 100 kHz

4.2.2 Test Requirements / Limits

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits
Frequency Range (MHz): Class B Limit (dBµV/m)

Frequency Range (MHz)	Class B Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

§15.35(b)
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....
Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

4.2.3 Test Protocol

Temperature: 27 °C
Air Pressure: 1012 hPa
Humidity: 40 %

Op. Mode	Setup	Port
op-mode 2	Setup_02	Enclosure

Polari-sation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Horizontal	509.94	43.50			46.0			2.5	
Horizontal	513.90	41.40			46.0			4.6	
Vertical	581.70	32.00			46.0			14.0	
Vertical	585.54	39.10			46.0			6.9	
Vertical	589.50	36.40			46.0			9.6	
Vertical	589.56	38.80			46.0			7.2	
Horizontal	597.66	43.10			46.0			2.9	
Horizontal	605.34	44.20			46.0			1.8	
Horizontal	613.38	43.50			46.0			2.5	
Horizontal	621.54	29.50			46.0			16.5	

Remark: Please see annex for the measurement plot. The measurement was performed up to 1GHz.
For tests below 1 GHz an empty table means that no final measurement was performed because no relevant frequencies (peaks) were found during the preliminary scan.
For tests above 1 GHz spurious emissions in the range 20 dB below the limit are reported.

4.2.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart B	Op. Mode	Result
	op-mode 1	passed

5 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
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz
Bluetooth Signalling Unit	CBT (1153.9000.35)	100302	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

6 Photo Report

Photo 1: Test setup for conducted measurements

Photo 2: Test setup for radiated measurements

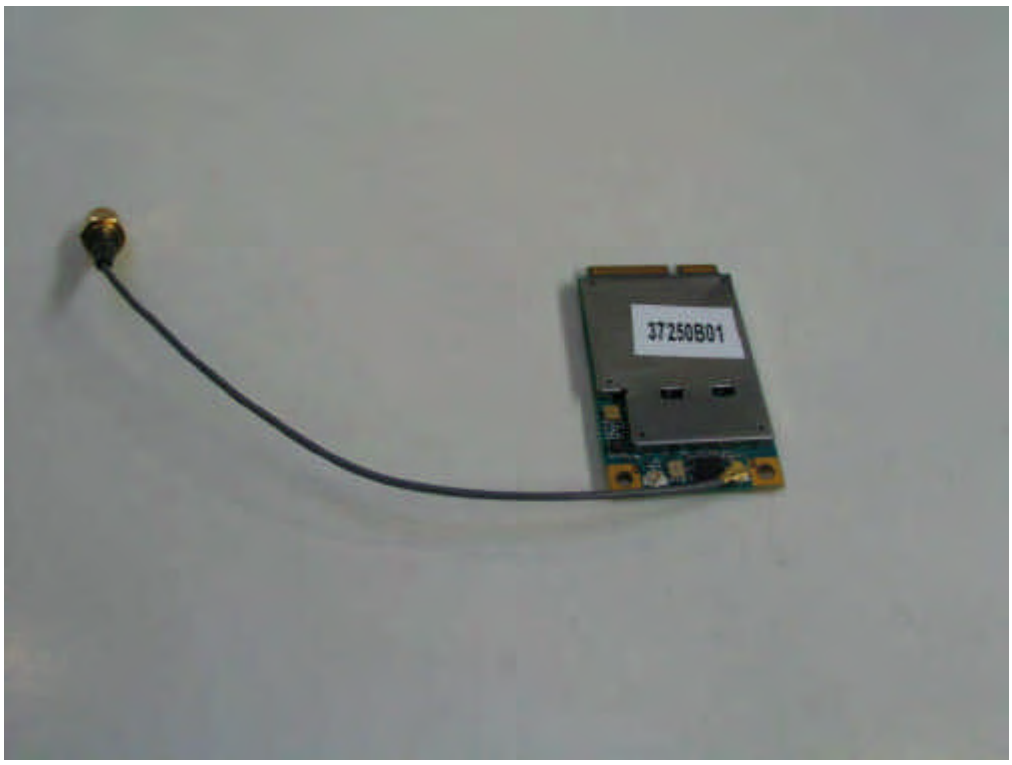


Photo 3: EUT (front side)

Photo 4: EUT (rear side)

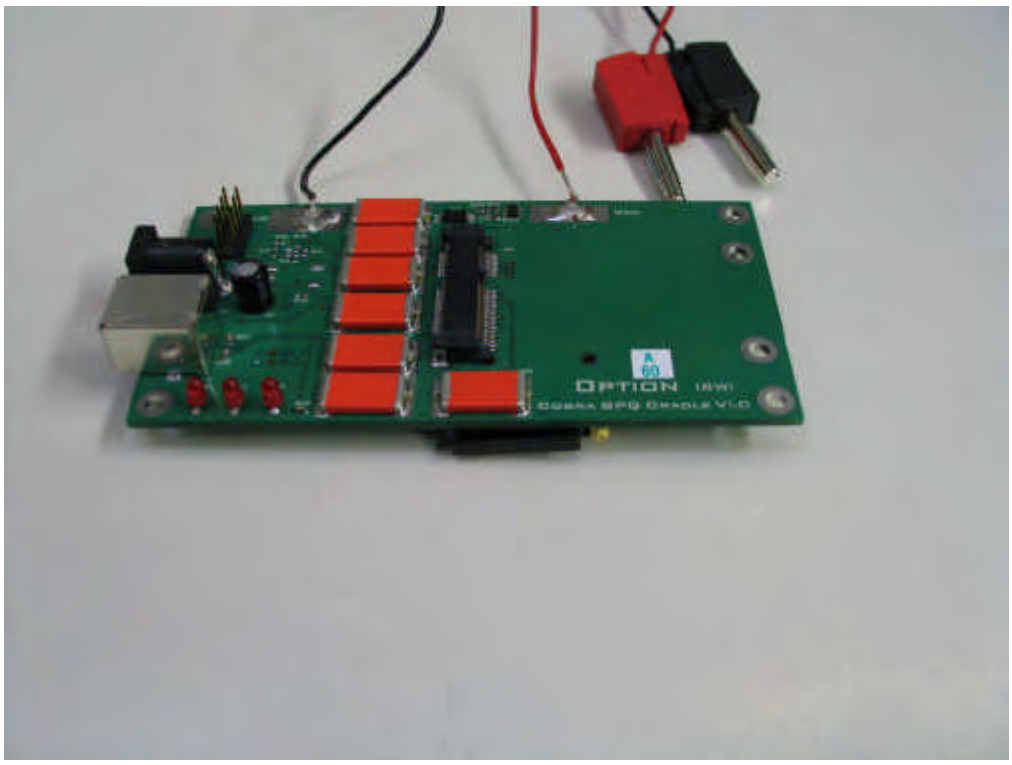
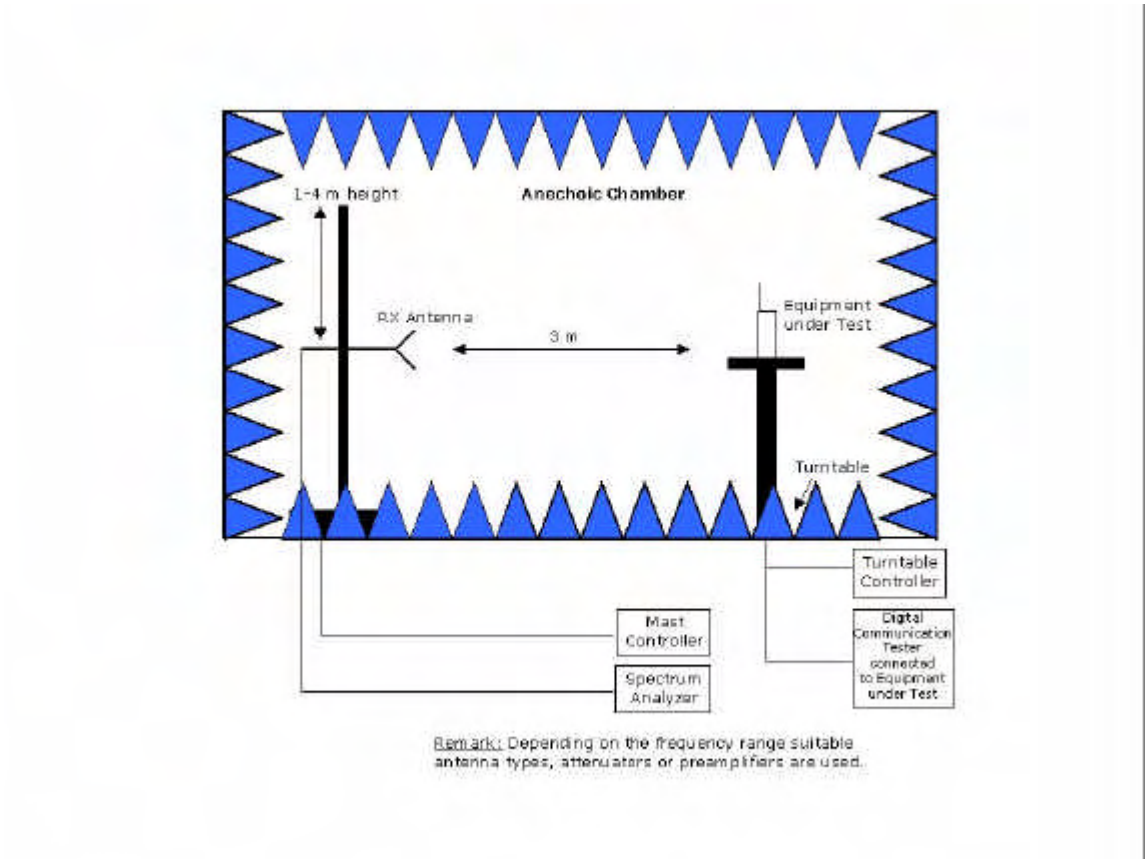


Photo 5: Test cradle Cobra SPQ

Photo 6: Test cradle Pepijn

7 Setup Drawings



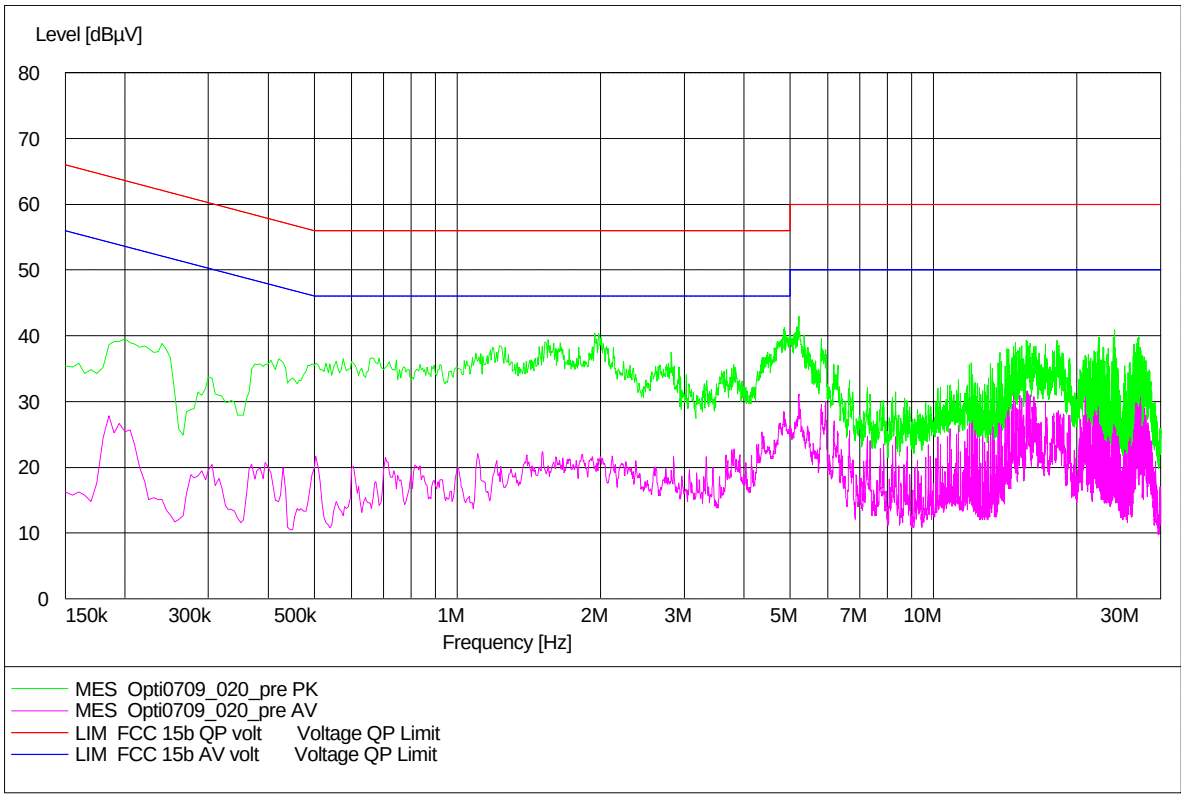
Drawing 1: Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

8 Annex measurement plots

8.1 AC Mains conducted

Op. Mode

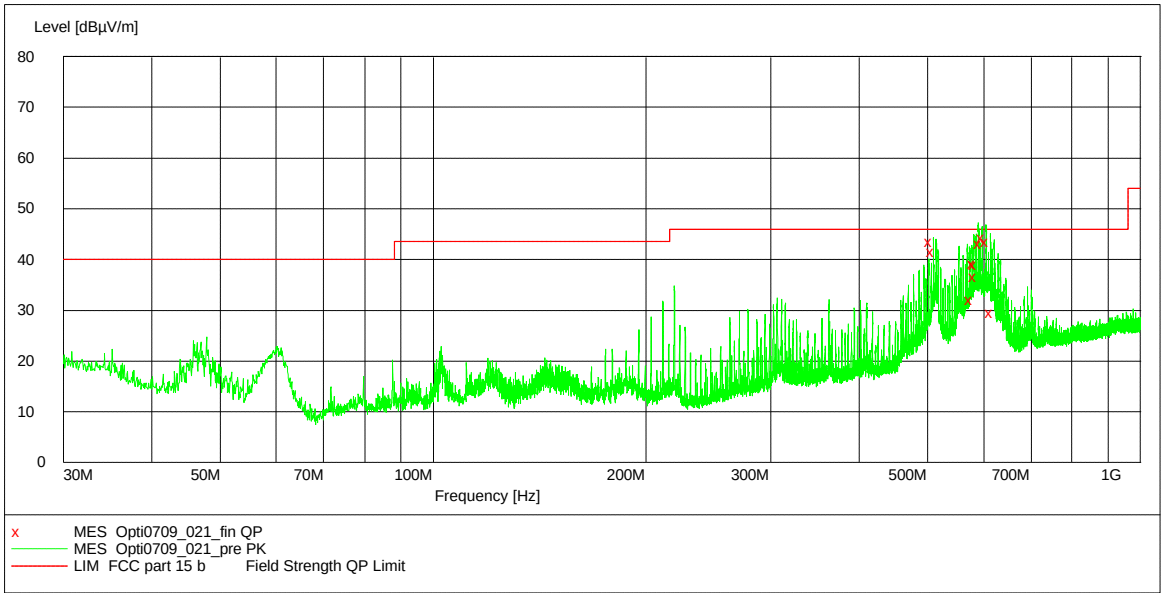
op-mode 1



8.2 Radiated Emissions

Op. Mode

op-mode 2



InterLab®

FCC Measurement/Technical Report on

GSM/UMTS Module
MO0301

Report Reference: MDE_Opti_0709_FCCd

Test Laboratory:

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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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Table of Contents

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 22
Subpart C – Operational and Technical Requirements

§ 22.355 Frequency tolerance

Subpart H – Cellular Radiotelephone Service

§ 22.913 Effective radiated power limits

§ 22.917 Emission limitations for cellular equipment

Summary Test

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_a02	antenna connector	passed
op-mode 2	Setup_a02	antenna connector	passed
op-mode 3	Setup_a02	antenna connector	passed
op-mode 4	Setup_a02	antenna connector	passed
op-mode 5	Setup_a02	antenna connector	passed
op-mode 6	Setup_a02	antenna connector	passed
op-mode 7	Setup_a02	antenna connector	passed
op-mode 8	Setup_a02	antenna connector	passed
op-mode 9	Setup_a02	antenna connector	passed

Frequency stability

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

OP-Mode	Setup	Port	Final Result
op-mode 2	Setup_a02	antenna connector	passed
op-mode 5	Setup_a02	antenna connector	passed
op-mode 8	Setup_a02	antenna connector	passed

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 1	Setup_a02	antenna connector	passed
op-mode 2	Setup_a02	antenna connector	passed
op-mode 3	Setup_a01	antenna connector	passed
op-mode 4	Setup_a02	antenna connector	passed
op-mode 5	Setup_a02	antenna connector	passed
op-mode 6	Setup_a02	antenna connector	passed
op-mode 7	Setup_a02	antenna connector	passed
op-mode 8	Setup_a02	antenna connector	passed
op-mode 9	Setup_a02	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 1	Setup_a03	Enclosure	passed
op-mode 2	Setup_a03	Enclosure	passed
op-mode 3	Setup_a03	Enclosure	passed
op-mode 4	Setup_a03	Enclosure	passed
op-mode 5	Setup_a03	Enclosure	passed
op-mode 6	Setup_a03	Enclosure	passed
op-mode 7	Setup_a03	Enclosure	passed
op-mode 8	Setup_a03	Enclosure	passed
op-mode 9	Setup_a03	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 1	Setup_a02	antenna connector	passed
op-mode 2	Setup_a02	antenna connector	passed
op-mode 3	Setup_a02	antenna connector	passed
op-mode 4	Setup_a02	antenna connector	passed
op-mode 5	Setup_a02	antenna connector	passed
op-mode 6	Setup_a02	antenna connector	passed
op-mode 7	Setup_a02	antenna connector	passed
op-mode 8	Setup_a02	antenna connector	passed
op-mode 9	Setup_a02	antenna connector	passed

Band edge compliance

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

OP-Mode	Setup	Port	Final Result
op-mode 1	Setup_a02	antenna connector	passed
op-mode 3	Setup_a02	antenna connector	passed
op-mode 4	Setup_a02	antenna connector	passed
op-mode 6	Setup_a02	antenna connector	passed
op-mode 7	Setup_a02	antenna connector	passed
op-mode 9	Setup_a02	antenna connector	passed

This test report replaces the 7 layers test report reference MDE_Opti_0709a, dated 2007-08-03.

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:	2006-12-18

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Receipt of EUT:	2007-05-16
Date of Test(s):	2007-06-22 to 2007-07-12
Date of Report:	2007-08-10

1.3 Applicant Data

Company Name:	Option NV
Address:	Gaston Geenslaan 14 3001 Leuven Belgium
Contact Person:	Mr. Lodeweyckx

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:	MO0301
Kind of Device:	GSM 850/900/1800/1900 + UTRA FDD I/II/V
(optional)	including HSDPA
Voltage Type:	DC
Nominal Voltage:	3.6 V
Maximum Voltage:	3.6 V
Minimum Voltage:	3.0 V

General product description:

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

In GSM 850 mode the EUT operates in channel blocks A and B from 824.2 MHz (lowest channel = 128) to 848.8 MHz (highest channel = 251).

The EUT provides the following ports:

Ports
antenna connector
enclosure

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: 37250a01)	GSM/UMTS Module	MO0301	004401440494298	2.0	2.5.0	2007-06-18
Remark: EUT A is equipped with a permanent antenna connector.						
EUT B (Code: 37250b01)	GSM/UMTS Module	MO0301	004401440494199	2.0	2.5.0	2007-06-18
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
AE1	Test Cradle	Cobra SPQ Cradle	V 1.0	-	-	-
AE2	Test Cradle	Pepijn	V 2.0	-	00023	-
AE3	External antenna “omni-directiona quadriband”	Telsa T01111916 antenna gain: -0.14 dBD = 2.0 dBi - 2.14 dB	-	-	-	-

2.4 EUT Setups

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

Setup No.	Combination of EUTs	Description
Setup_a01	EUT A + AE2	setup for conducted tests
Setup_a02	EUT B + AE1	setup for conducted tests
Setup_a03	EUT B + AE1 + AE3	setup for radiated tests

2.5 Operating Modes

This chapter describes the operating modes of the EUT's used for testing.

Op. Mode	Description of Operating Modes	Remarks
	PCS data call	
op-mode 1	Call established on Traffic Channel (TCH) 128, Carrier Frequency 824.2 MHz	128 is the lowest channel PCS data call
op-mode 2	Call established on Traffic Channel (TCH) 190, Carrier Frequency 836.6 MHz	190 is a mid channel PCS data call
op-mode 3	Call established on Traffic Channel (TCH) 251, Carrier Frequency 848.8 MHz	251 is the highest channel PCS data call
	EDGE data call	
op-mode 4	Call established on Traffic Channel (TCH) 128, Carrier Frequency 824.2 MHz	128 is the lowest channel EDGE data call
op-mode 5	Call established on Traffic Channel (TCH) 190, Carrier Frequency 836.6 MHz	190 is a mid channel EDGE data call
op-mode 6	Call established on Traffic Channel (TCH) 251, Carrier Frequency 848.8 MHz	251 is the highest channel EDGE data call
	FDD V data call CS mode	
op-mode 7	Call established on Traffic Channel (TCH) 4132, Carrier Frequency 826.4 MHz	4132 is the lowest channel FDD V data call
op-mode 8	Call established on Traffic Channel (TCH) 4183, Carrier Frequency 836.6 MHz	4183 is a mid channel FDD V data call
op-mode 9	Call established on Traffic Channel (TCH) 4233, Carrier Frequency 846.6 MHz	4233 is the highest channel FDD V data call

3 Test Results

3.1 RF Power Output

Standard FCC Part 22, 10-1-06
Subpart H

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 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 CMU200 Digital Communication Tester.

3) A call was established between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

4) The transmitted power of the EUT was recorded by using an internal measurement function of the CMU200.

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.

§22.913 Effective radiated power limits

(a) Maximum ERP. … The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

3.1.3 Test Protocol

Temperature: 25 °C
Air Pressure: 1008 hPa
Humidity: 36 %

Op. Mode	Setup	Port
op-mode 1	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
5	33	31.70	-1.30

Remark: none

Op. Mode	Setup	Port
op-mode 2	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
5	33	31.90	-1.10

Remark: none

Op. Mode	Setup	Port
op-mode 3	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
5	33	31.90	-1.10

Remark: none

Op. Mode	Setup	Port
op-mode 4	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
5	33	27.00	-6.00

Remark: none

Op. Mode	Setup	Port
op-mode 5	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
5	33	27.10	-5.90

Remark: none

Op. Mode	Setup	Port
op-mode 6	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
5	33	27.20	-5.80

Remark: none

Op. Mode	Setup	Port
op-mode 7	setup_a02	antenna connector

Power class	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
3	24	24.69	0.69

Remark: none

Op. Mode	Setup	Port
op-mode 8	setup_a02	antenna connector

Power class	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
3	24	25.03	1.03

Remark: none

Op. Mode	Setup	Port
op-mode 9	setup_a02	antenna connector

Power class	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
3	24	24.89	0.89

Remark: none

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

3.2 Frequency stability

Standard FCC Part 22, 10-1-06
Subpart H

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

3.2.1 Test Description

1) The EUT was placed inside the climatic chamber.

2) The EUT was coupled to the R&S CMU200 Digital Communication Tester. Refer to chapter "Setup Drawings".

3) The climatic chamber was cycled down/up to a certain temperature.

4) After the temperature was stabilized (at least one hour) the EUT was switched on and a call was established between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

5) The frequency error of the EUT were recorded by using an internal measurement function of the CMU200 immediately after the call was established, five minutes after the call was established and ten minutes after the call was established.

6) This measurement procedure was performed for all combinations of voltage (low, nominal, high) and temperature (from –30°C to +50°C in increments of 10°C).

3.2.2 Test Requirements / Limits

§2.1055 Measurements required: Frequency stability

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

§22.355 Frequency tolerance

…the carrier frequency of each transmitter in the Public Mobile Service must be maintained within the tolerances given in table C-1 of this section.

Table C-1.- Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (ppm)	Base, fixed (ppm)	Mobile up to 3 watts (ppm)	Mobile above 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	**2.5**	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

For the mid channel (836.6 MHz) the frequency tolerance is 2.5 ppm (2091.5 Hz).

3.2.3 Test Protocol

Temperature: 25 - 27 °C
Air Pressure: 995 - 1008 hPa
Humidity: 36 - 42 %

Op. Mode	Setup	Port
op-mode 2	setup_a02	antenna connector

		Normal Voltage / V	
		3.6	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)
+50	0	-37	-67
+50	5	-22	-42
+50	10	-13	-35
+40	0	-20	-91
+40	5	4	78
+40	10	-22	-139
+30	0	-19	-218
+30	5	-4	-202
+30	10	-23	-190
+10	0	-45	-271
+10	5	-15	-224
+10	10	-21	-355
0	0	-14	-20
0	5	-25	-28
0	10	-22	-26
–10	0	21	30
–10	5	-9	-14
–10	10	-1	-5
–20	0	11	22
–20	5	12	16
–20	10	-20	-25
–30	0	-3	-9
–30	5	3	8
–30	10	-5	-11

		Minimum Voltage / V		Normal Voltage / V		Maximum Voltage / V	
		85%=3.06		100%=3.6		3.8 V	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)
+20	0	-30	-46	-10	69	-4	79
+20	5	-19	-32	-37	-63	16	27
+20	10	-33	-45	-24	-39	-26	-43

Remark: The EUT did not operate at 115% of normal voltage. Instead the call was established at normal voltage and then increased to 3.8 V.

Op. Mode	Setup	Port
op-mode 5	setup_a02	antenna connector

		Normal Voltage / V	
		3.6	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)
+50	0	-34	-69
+50	5	-38	-65
+50	10	-37	-67
+40	0	-23	-81
+40	5	-37	-108
+40	10	-5	-78
+30	0	-11	161
+30	5	24	397
+30	10	6	163
+10	0	-15	360
+10	5	-42	-307
+10	10	-2	242
0	0	-9	-20
0	5	-5	-11
0	10	-21	-28
–10	0	17	-56
–10	5	0	-9
–10	10	-8	-15
–20	0	26	53
–20	5	-19	-64
–20	10	-27	-36
–30	0	27	56
–30	5	21	33
–30	10	-43	-53

		Minimum Voltage / V		Normal Voltage / V		Maximum Voltage / V	
		85% = 3.06		100% = 3.6		3.85	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)
+20	0	-39	-67	-37	-63	-3	-41
+20	5	-38	-54	-6	-47	-11	-27
+20	10	-18	-44	-34	-49	-4	-25

Remark: The EUT did not operate at 115% of normal voltage. Instead the call was established at normal voltage and then increased to 3.85 V.

Op. Mode	Setup	Port
op-mode 8	setup_a02	antenna connector

		Normal Voltage / V	
		3.6	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)
+50	0	-1	-104
+50	5	15	79
+50	10	0	89
+40	0	4	221
+40	5	11	-275
+40	10	21	432
+30	0	6	-261
+30	5	23	394
+30	10	3	-391
+10	0	-19	-547
+10	5	11	580
+10	10	50	708
0	0	-1	-22
0	5	1	21
0	10	1	15
–10	0	0	21
–10	5	-1	-21
–10	10	-1	-28
–20	0	-1	22
–20	5	-1	16
–20	10	-1	16
–30	0	0	19
–30	5	-1	19
–30	10	0	20

		Minimum Voltage / V		Normal Voltage / V		Maximum Voltage / V	
		85% = 3.06		100% = 3.6		3.95	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)
+20	0	-1	-33	2	29	-4	-37
+20	5	-1	32	-2	-41	-1	-24
+20	10	-1	26	-1	25	-1	29

Remark: The EUT did not operate at 115% of normal voltage. Instead the call was established at normal voltage and then increased to 3.95 V.

3.2.4 Test result: Frequency stability

FCC Part 22, Subpart H	Op. Mode	Result
	op-mode 2	passed
	op-mode 5	passed
	op-mode 8	passed

3.3 Spurious emissions at antenna terminals

Standard FCC Part 22, 10-1-06
Subpart H

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

3.3.1 Test Description

1) The EUT was coupled to the R&S Spectrum Analyser and the R&S 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 CMU200 Digital Communication Tester.

3) A call was established between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

4) 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 depending on the transmitting signal (technology), the span and the resolution bandwidth

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

3.3.2 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.

§ 22.917 Emission limitations for cellular 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 100 kHz or greater. 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.* 100 kHz 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 – 28 °C
Air Pressure: 1005 - 1006 hPa
Humidity: 37 - 42 %

Op. Mode	Setup	Port
op-mode 1	setup_a02	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
824	3.0	–15.37	-13.0

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

Op. Mode	Setup	Port
op-mode 2	setup_a02	antenna connector

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

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

Op. Mode	Setup	Port
op-mode 3	setup_a01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
849	3.0	–13.72	-13.0

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

Op. Mode	Setup	Port
op-mode 4	setup_a02	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
824	3.0	–21.80	-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_a02	antenna connector

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

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

Op. Mode	Setup	Port
op-mode 6	setup_a02	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
849	3.0	–20.99	-13.0

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

Op. Mode	Setup	Port
op-mode 7	setup_a02	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
820	3.0	-28.61	-13.0
1102	1000	-22.84	-13.0

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

Op. Mode	Setup	Port
op-mode 8	setup_a02	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
850	3.0	–32.65	-13.0

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

Op. Mode	Setup	Port
op-mode 9	setup_a02	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
850	3.0	-29.55	-13.0
1125	1000	-24.64	-13.0

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

3.3.4 Test result: Spurious emissions at antenna terminals

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

3.4 Field strength of spurious radiation

Standard FCC Part 22, 10-1-06
Subpart H

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

3.4.1 Test Description

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

2) A call was established between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

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 10 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 depending on the transmitting signal (technology), 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.

3.4.2 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.

§ 22.917 Emission limitations for cellular 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 100 kHz or greater. 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.* 100 kHz 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.

3.4.3 Test Protocol

Temperature: 25 - 27 °C
Air Pressure: 1004 - 10013 hPa
Humidity: 34 - 48 %

Op. Mode	Setup	Port
op-mode 1	setup_a03	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
823	Horizontal	3.0	–17.88	-13.0

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

Op. Mode	Setup	Port
op-mode 2	setup_a03	Enclosure

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

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

Op. Mode	Setup	Port
op-mode 3	setup_a03	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
849	Horizontal	3.0	–22.80	-13.0

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

Op. Mode	Setup	Port
op-mode 4	setup_a03	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
824	Horizontal	3.0	–20.65	-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_a03	Enclosure

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

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

Op. Mode	Setup	Port
op-mode 6	setup_a03	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
849	Horizontal	3.0	-28.98	-13.0

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

Op. Mode	Setup	Port
op-mode 7	setup_a03	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
1103	Vertical	3.0	-23.06	-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_a03	Enclosure

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

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

Op. Mode	Setup	Port
op-mode 9	setup_a03	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
1127	Vertical	30	-23.84	-13.0

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

3.4.4 Test result: Field strength of spurious radiation

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

3.5 Emission and Occupied Bandwidth

Standard FCC Part 22, 10-1-06
Subpart H

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

3.5.1 Test Description

1) The EUT was coupled to the R&S Spectrum Analyser and the R&S 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 CMU200 Digital Communication Tester.

3) A call was established between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

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.

3.5.2 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.

3.5.3 Test Protocol

Temperature: 25 °C
Air Pressure: 1004 hPa
Humidity: 48 %

Op. Mode	Setup	Port
op-mode 1	setup_a02	antenna connector

Bandwidth kHz	Remarks
318	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 246 kHz.

Op. Mode	Setup	Port
op-mode 2	setup_a02	antenna connector

Bandwidth kHz	Remarks
314	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 248 kHz.

Op. Mode	Setup	Port
op-mode 3	setup_a02	antenna connector

Bandwidth kHz	Remarks
316	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 244 kHz.

Op. Mode	Setup	Port
op-mode 4	setup_a02	antenna connector

Bandwidth kHz	Remarks
316	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 242 kHz.

Op. Mode	Setup	Port
op-mode 5	setup_a02	antenna connector

Bandwidth kHz	Remarks
308	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 242 kHz.

Op. Mode	Setup	Port
op-mode 6	setup_a02	antenna connector

Bandwidth kHz	Remarks
310	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 248 kHz.

Op. Mode	Setup	Port
op-mode 7	setup_a02	antenna connector

Bandwidth kHz	Remarks
4740	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4180 kHz.

Op. Mode	Setup	Port
op-mode 8	setup_a02	antenna connector

Bandwidth kHz	Remarks
4720	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4160 kHz.

Op. Mode	Setup	Port
op-mode 9	setup_a02	antenna connector

Bandwidth kHz	Remarks
4720	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4200 kHz.

3.5.4 Test result: Emission and Occupied Bandwidth

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

3.6 Band edge compliance

Standard FCC Part 22, 10-1-06
Subpart H

The test was performed according to: FCC §22.913, 10-1-06

3.6.1 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 (GSM).
   The spectrum analyser is set to a RBW/VBW of 100 kHz/300 kHz (UMTS).

3.6.2 Test Requirements / Limits

§ 22.913 Effective radiated power limits

3.6.3 Test Protocol

Temperature: 25 °C
Air Pressure: 1004 hPa
Humidity: 48 %

Op. Mode	Setup	Port
op-mode 1	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
824	-13.63	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 3	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
849	-13.20	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 4	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
824	-18.14	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 6	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
849	-19.65	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 7	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
824	-16.41	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 9	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
849	-16.16	-13

Remark: Please see annex for the measurement plot.

3.6.4 Test result: Band edge compliance

FCC Part 22, Subpart H	Op. Mode	Result
	op-mode 1	passed
	op-mode 3	passed
	op-mode 4	passed
	op-mode 6	passed
	op-mode 7	passed
	op-mode 9	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

5 Photo Report

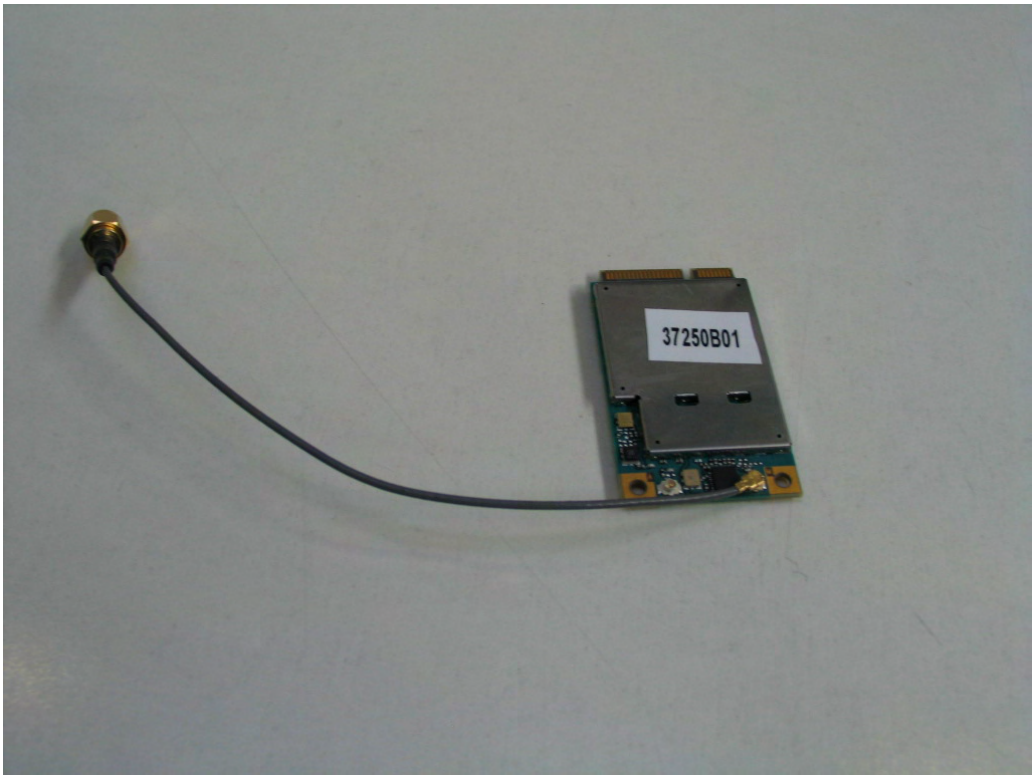


Photo 1: EUT (front side)

Photo 2: EUT (front side)

Photo 3: EUT (rear side)

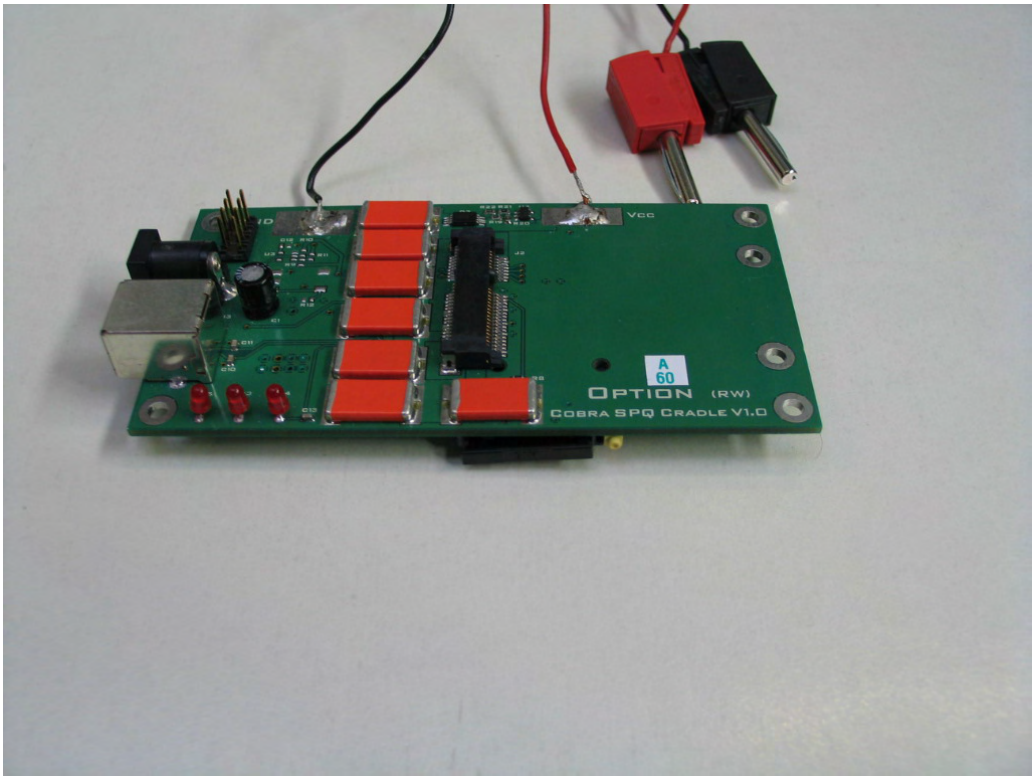


Photo 4: Test cradle Cobra SPQ

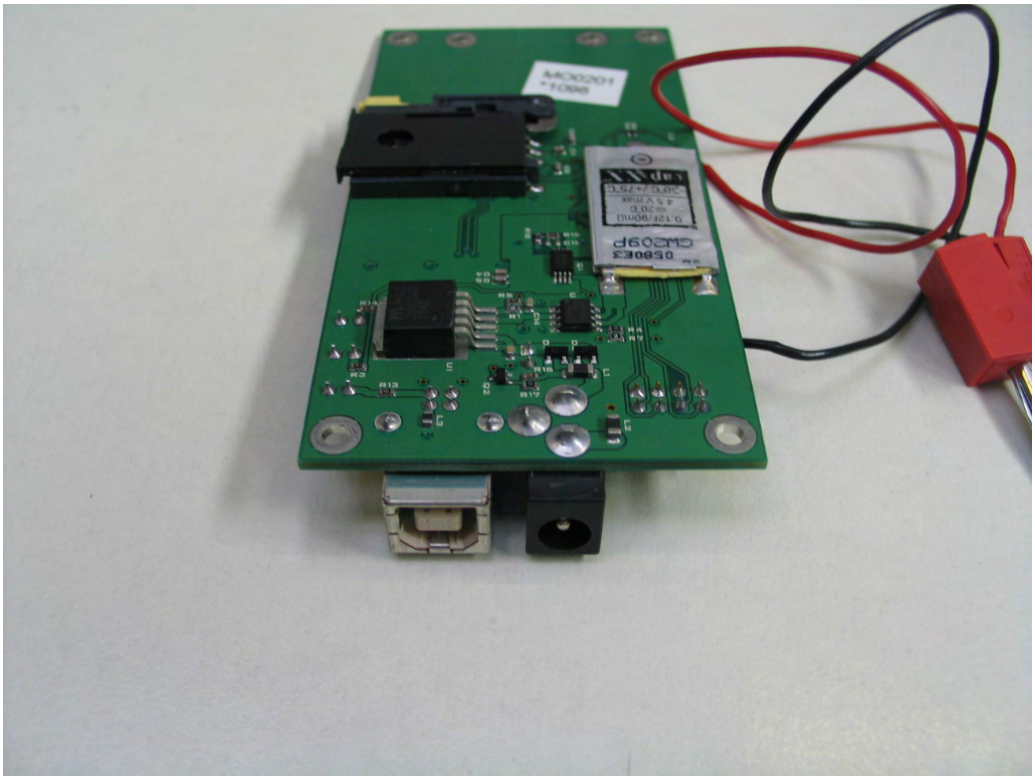


Photo 5: Test cradle Pepijn

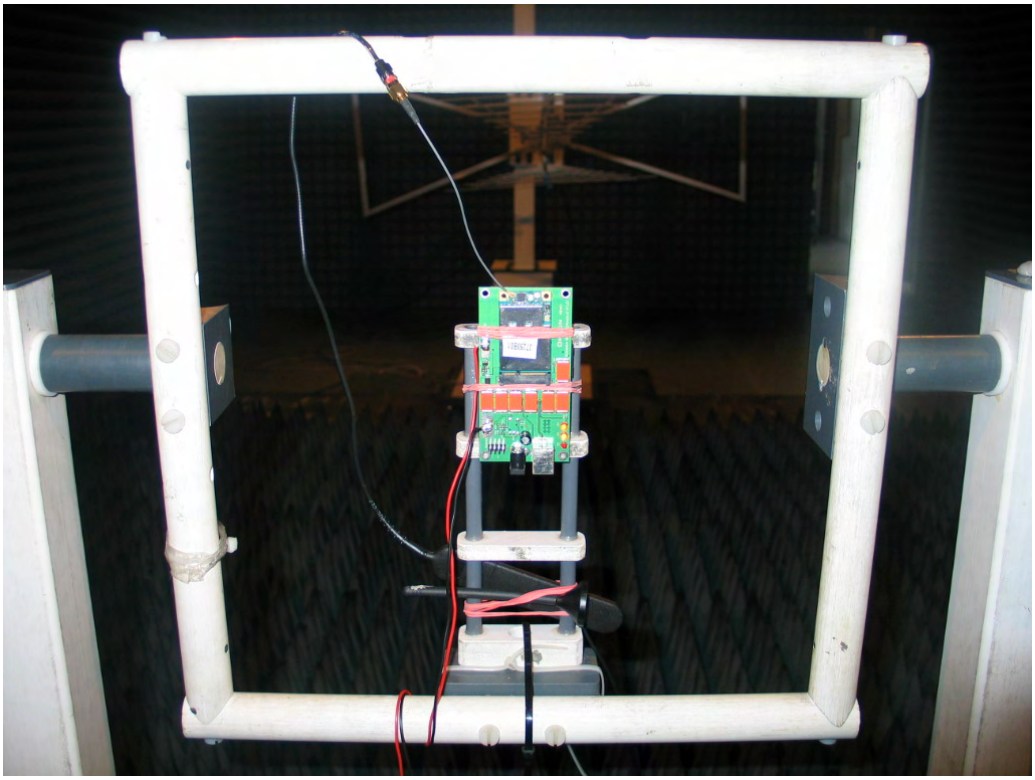
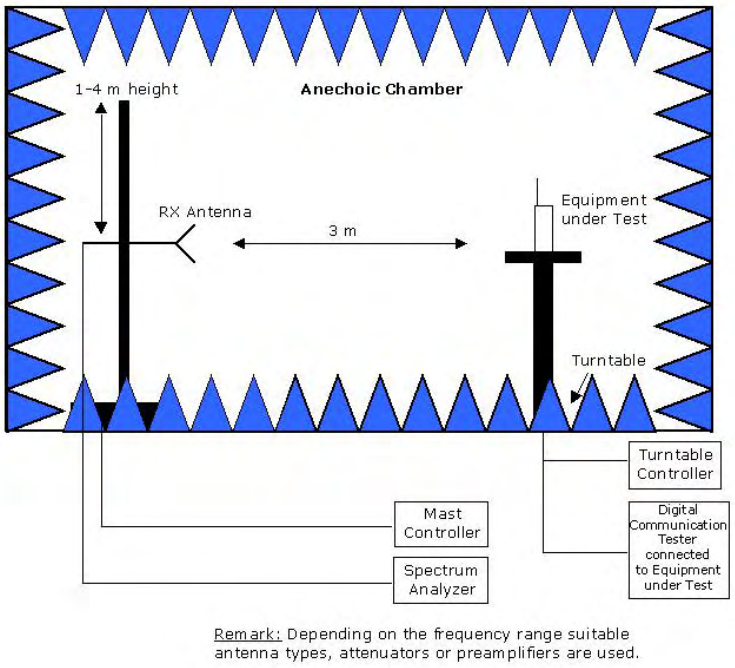
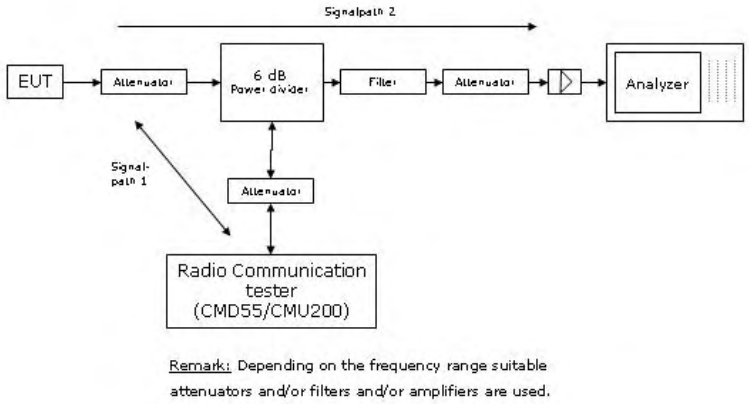


Photo 6: Setup for radiated tests

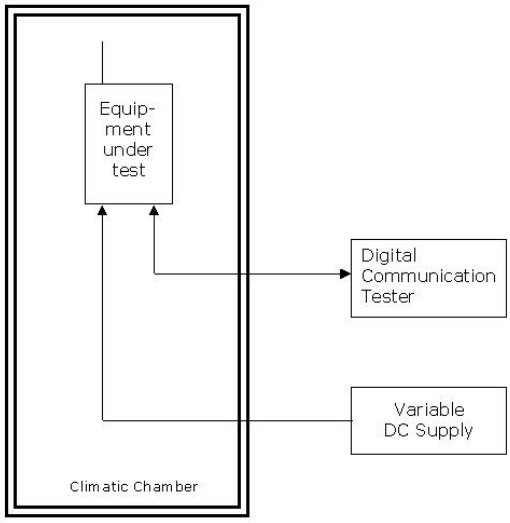
6 Setup Drawings



Drawing 1: Principle setup for radiated measurements.



Drawing 2: Principle setup for conducted measurements under nominal conditions



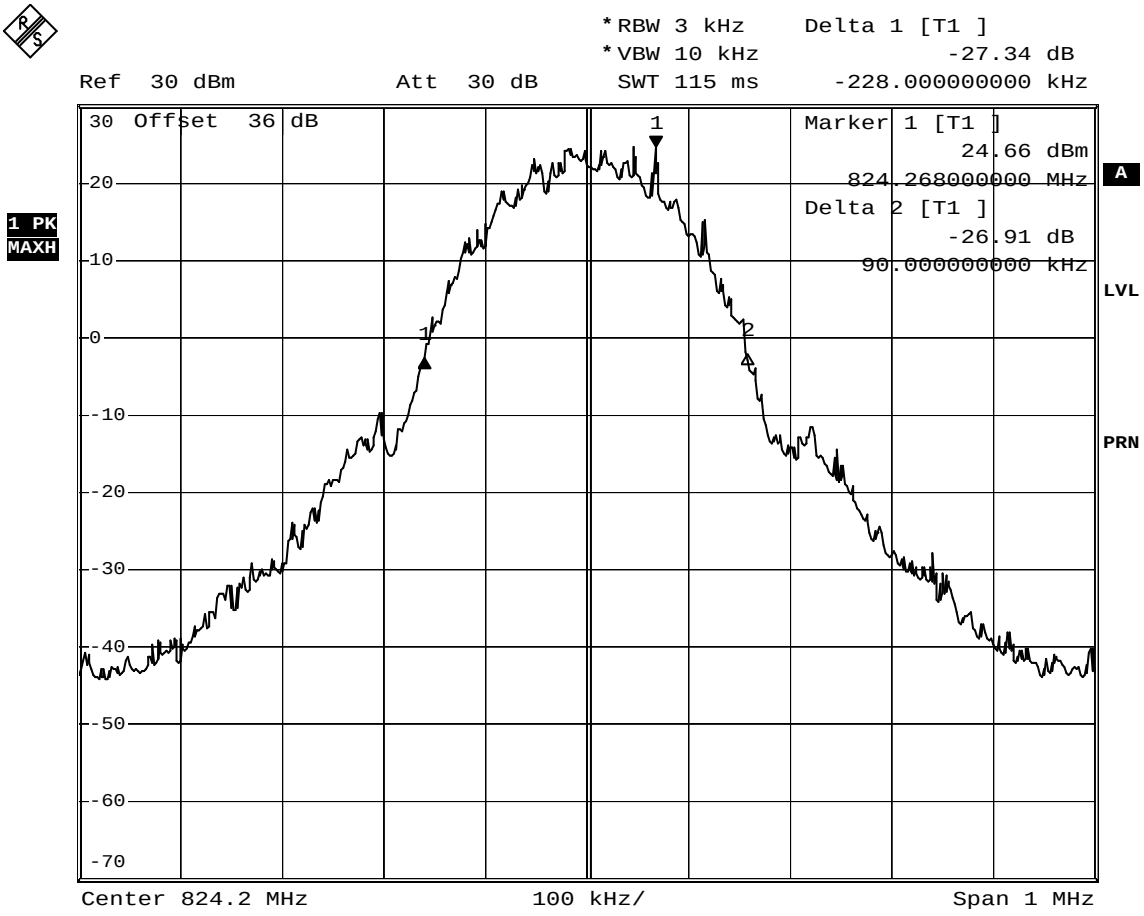
Drawing 3: Principle setup for tests under extreme test conditions

7 Annex

Measurement plots Emission and Occupied Bandwidth

Op. Mode

op-mode 1

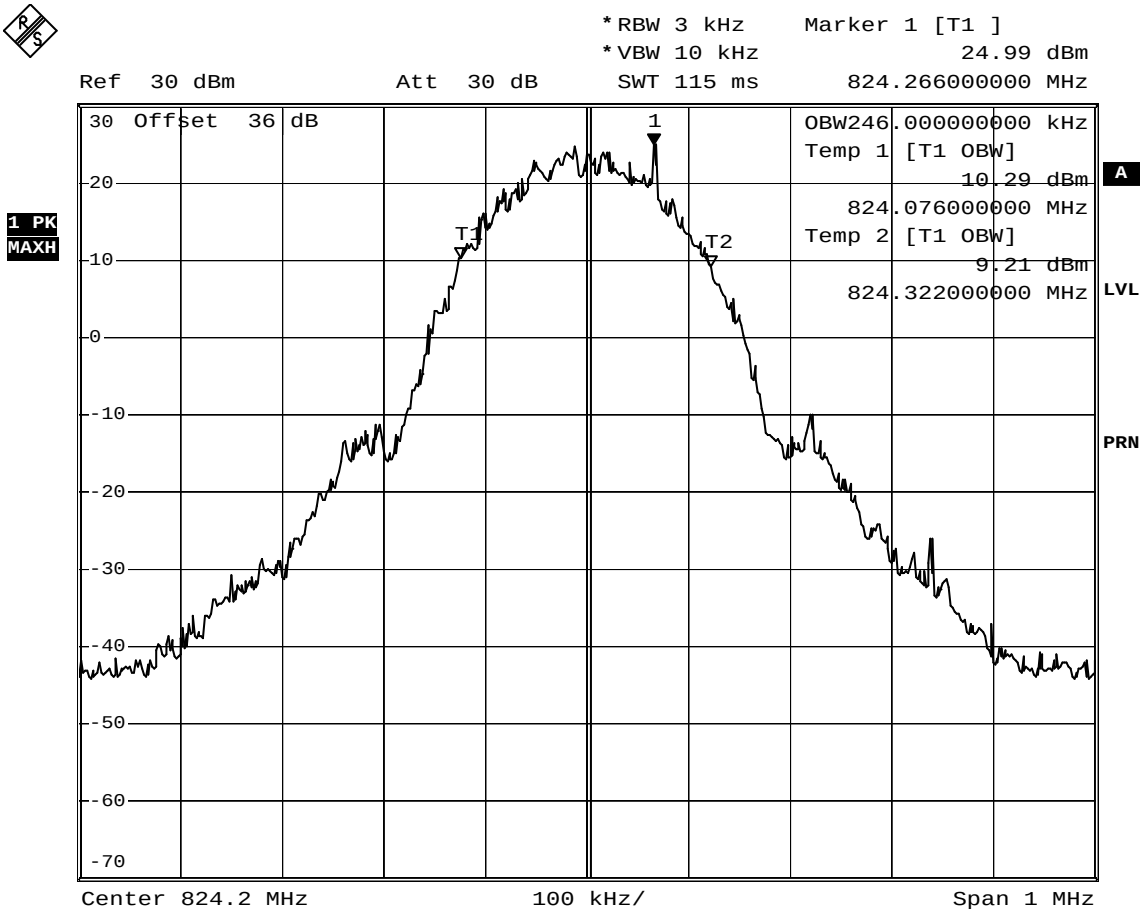


Date: 25.JUN.2007 14:37:56

Test: Emissions bandwidth (26 dB bandwidth), Channel 128 (824.2 MHz)

Op. Mode

op-mode 1

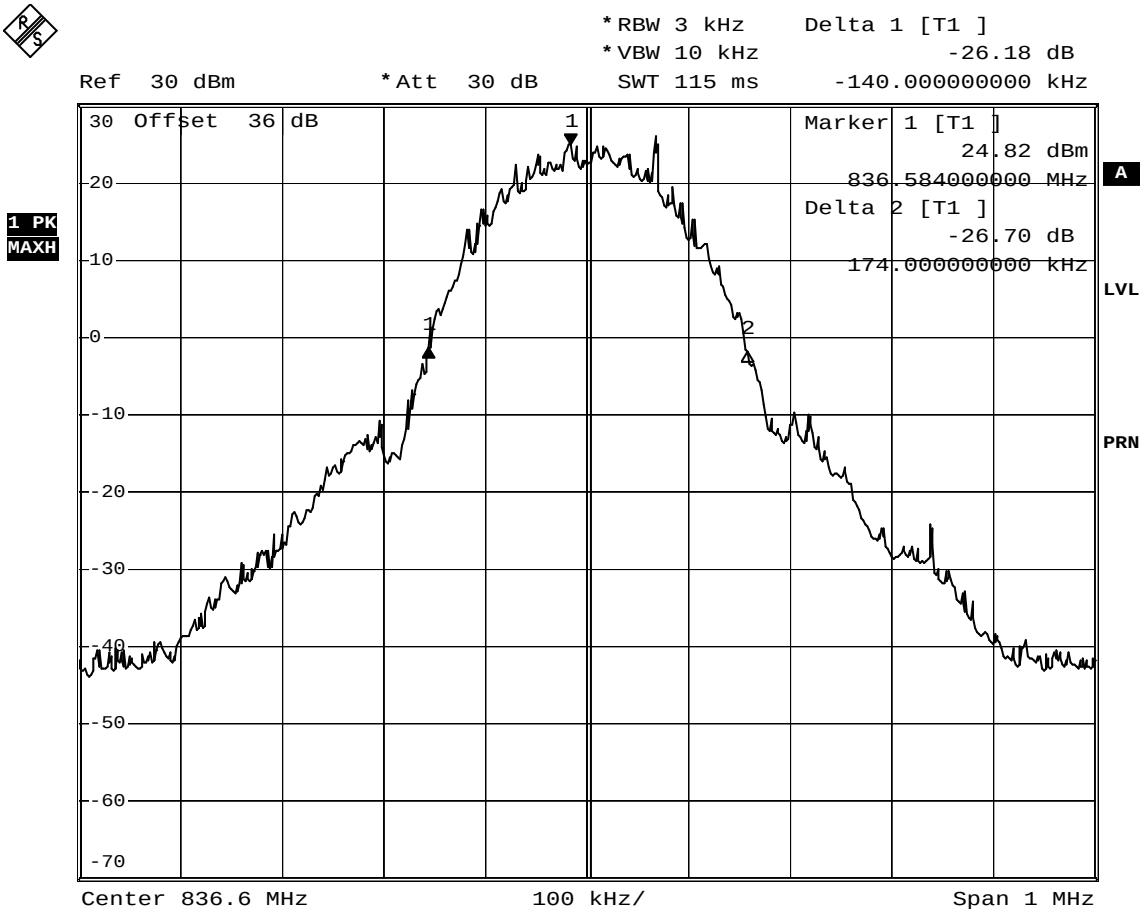


Date: 25.JUN.2007 14:39:06

Test: Occupied bandwidth, Channel 128 (824.2 MHz)

Op. Mode

op-mode 2

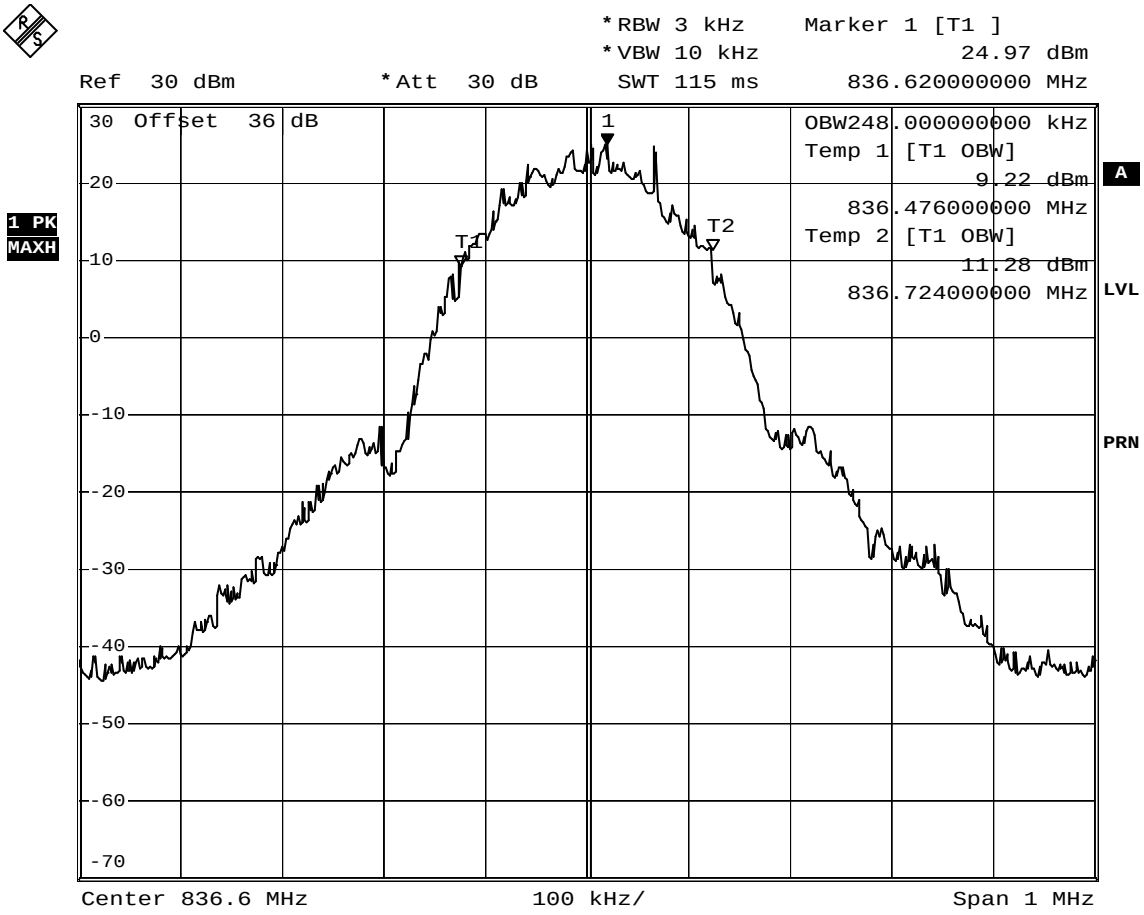


Date: 25.JUN.2007 14:42:04

Test: Emissions bandwidth (26 dB bandwidth), Channel 190 (836.6 MHz)

Op. Mode

op-mode 2

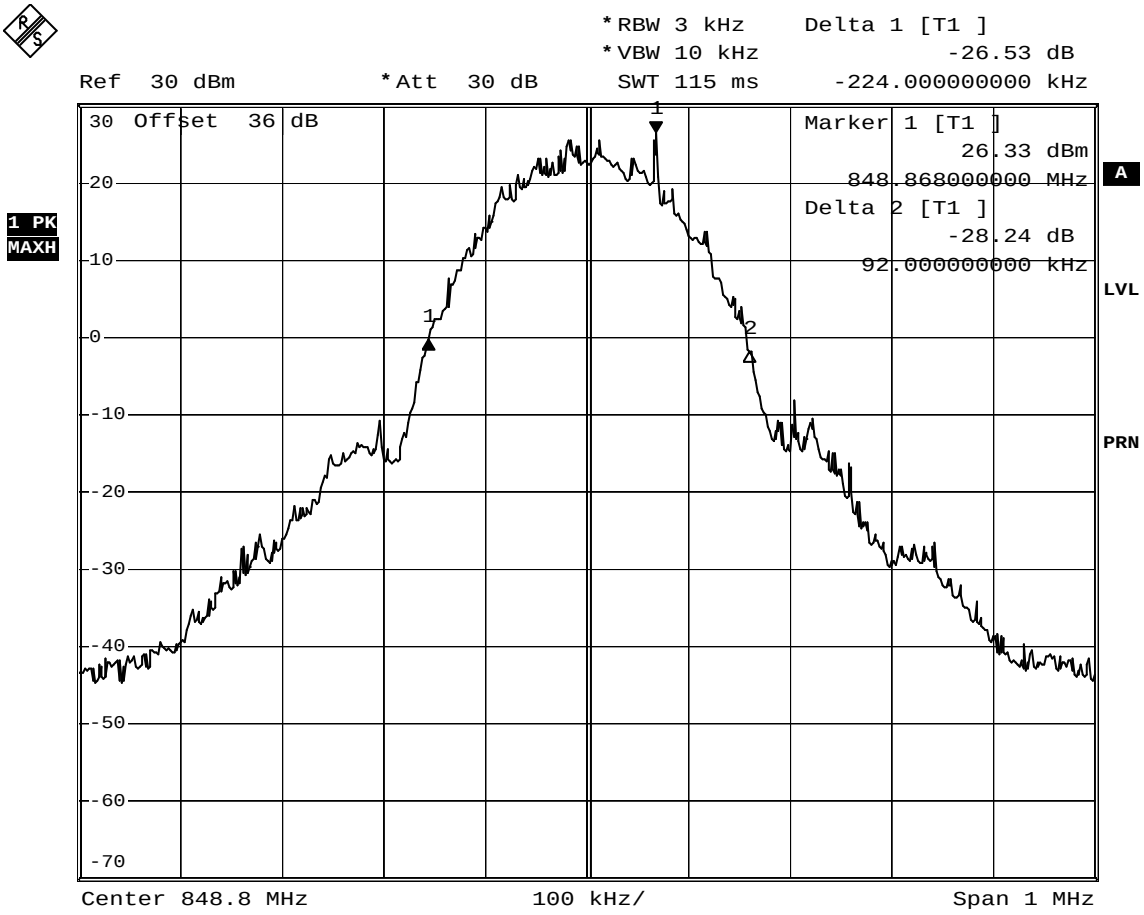


Date: 25.JUN.2007 14:43:14

Test: Occupied bandwidth, Channel 190 (836.6 MHz)

Op. Mode

op-mode 3

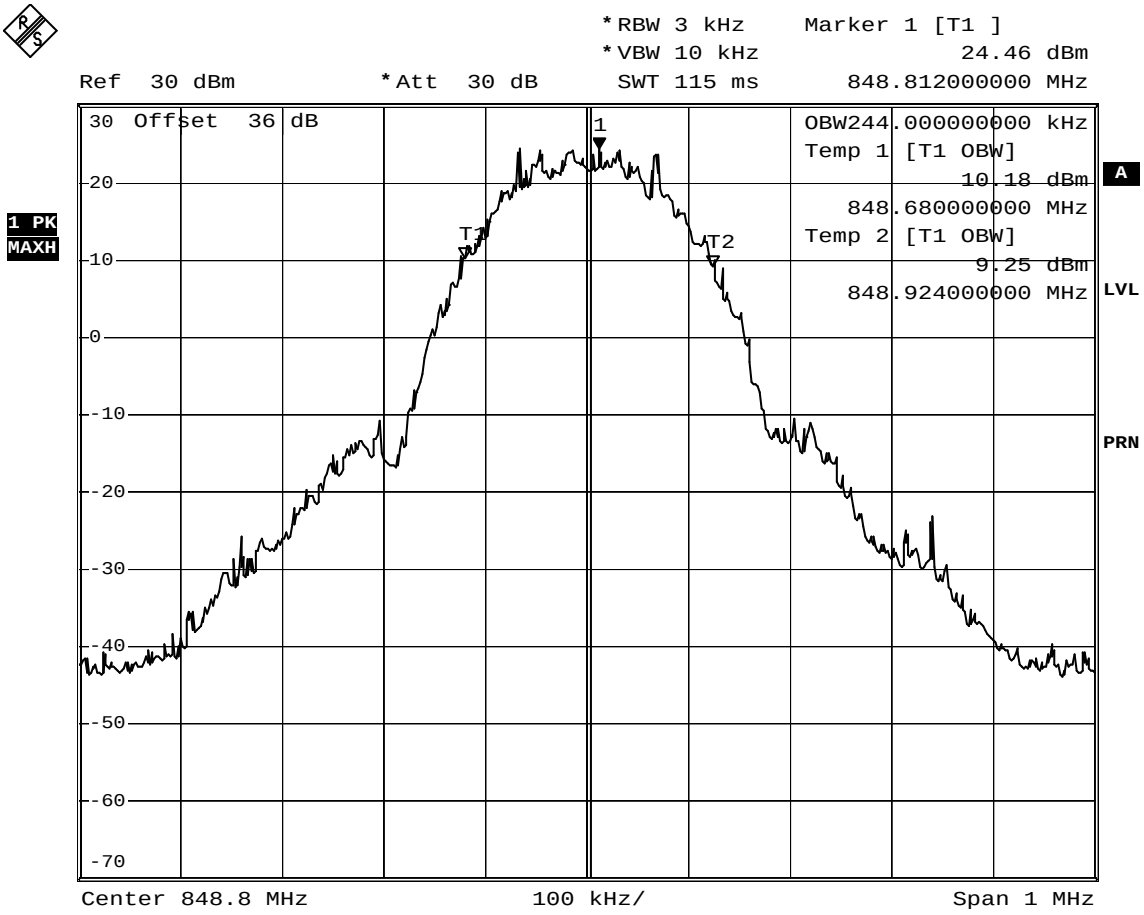


Date: 25.JUN.2007 14:45:32

Test: Emissions bandwidth (26 dB bandwidth), Channel 251 (848.8 MHz)

Op. Mode

op-mode 3

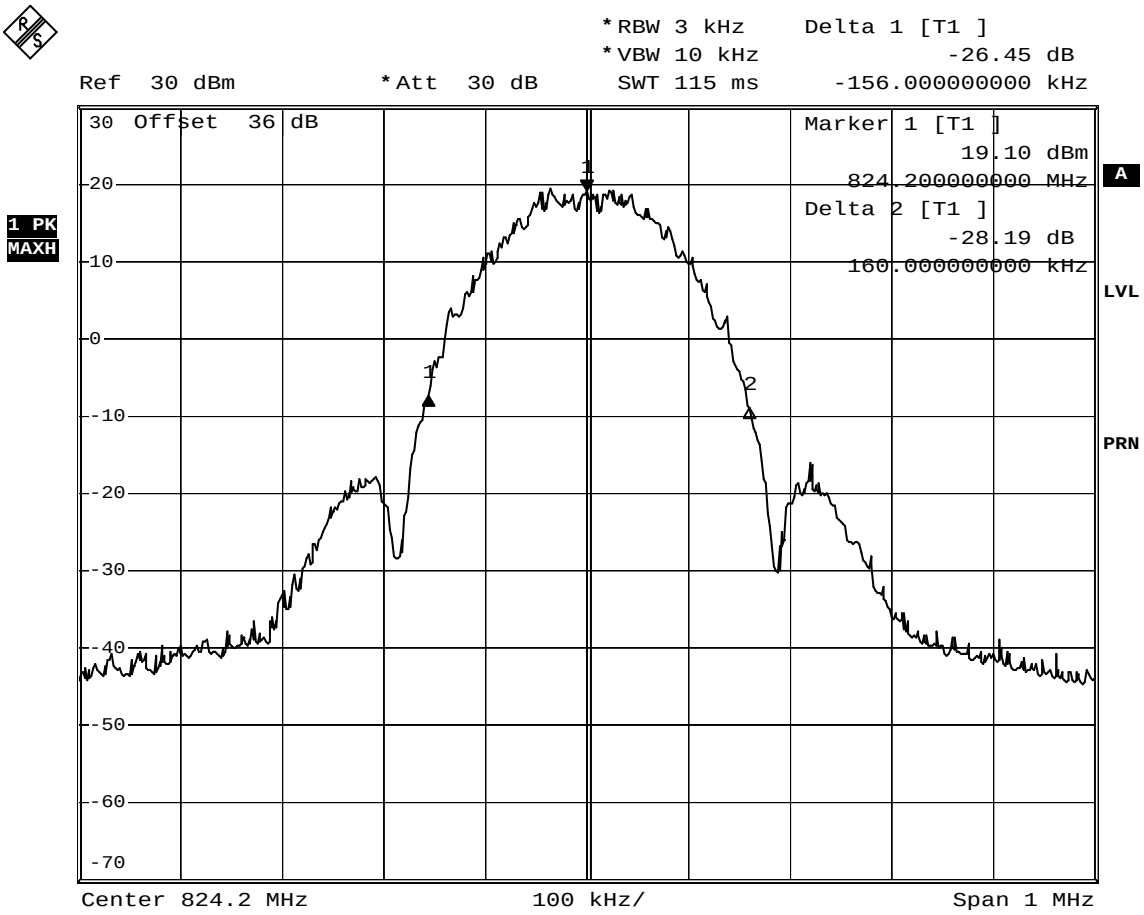


Date: 25.JUN.2007 14:47:35

Test: Occupied bandwidth, Channel 251 (848.8 MHz)

Op. Mode

op-mode 4

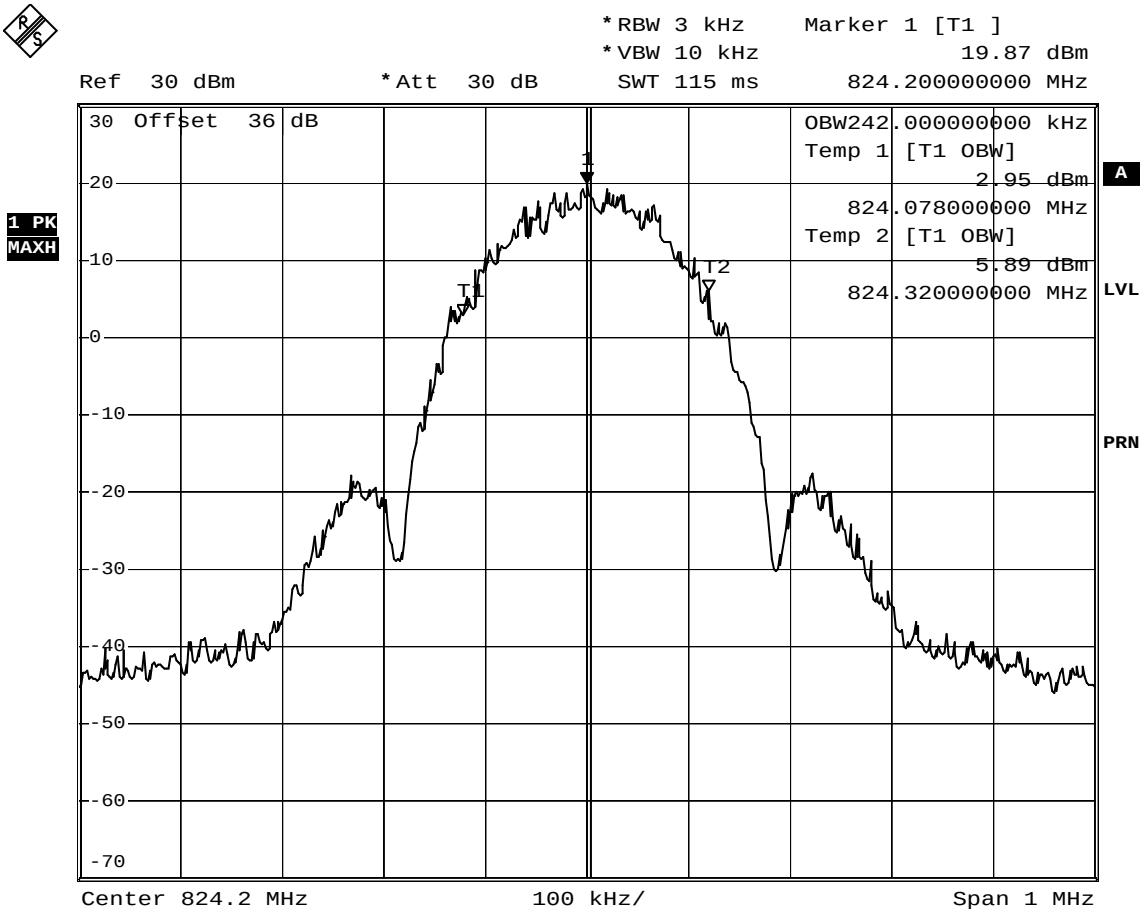


Date: 25.JUN.2007 15:03:23

Test: Emissions bandwidth (26 dB bandwidth), Channel 128 (824.2 MHz)

Op. Mode

op-mode 4

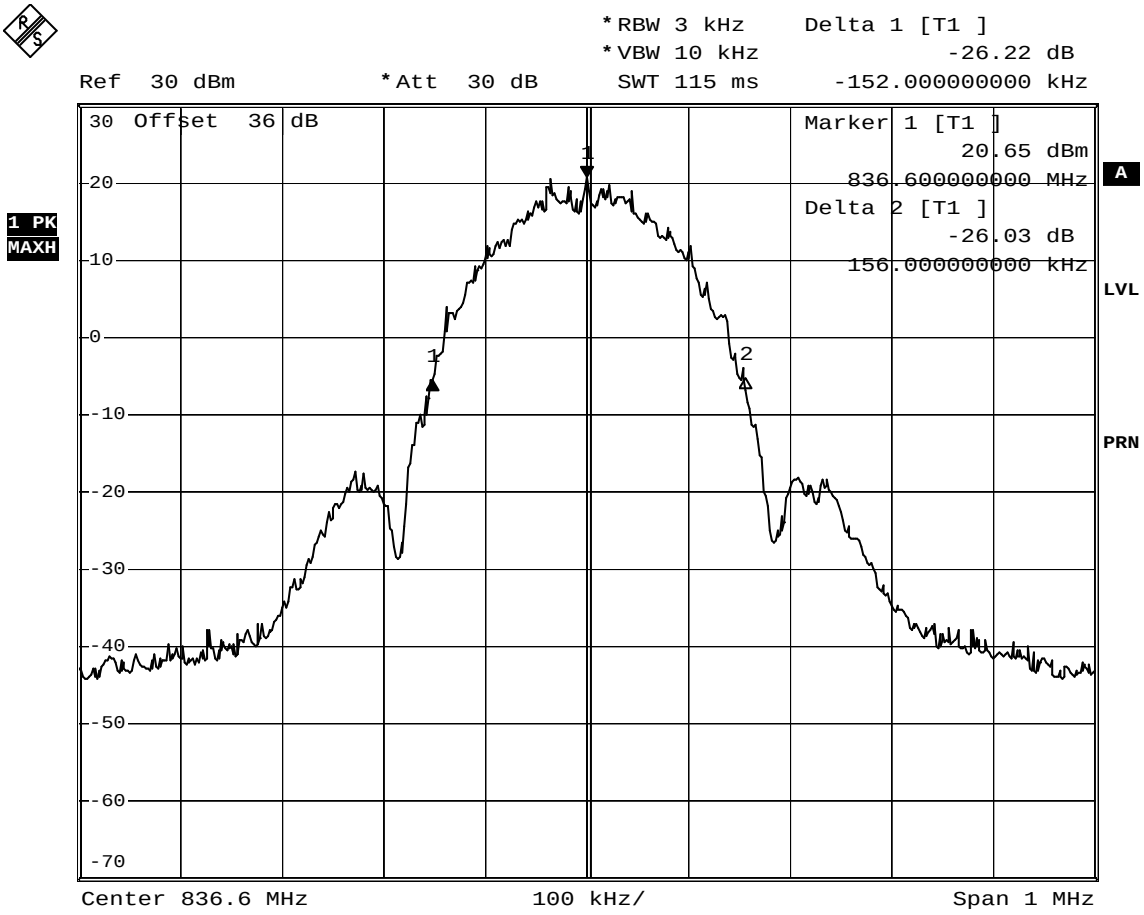


Date: 25.JUN.2007 15:04:34

Test: Occupied bandwidth, Channel 128 (824.2 MHz)

Op. Mode

op-mode 5

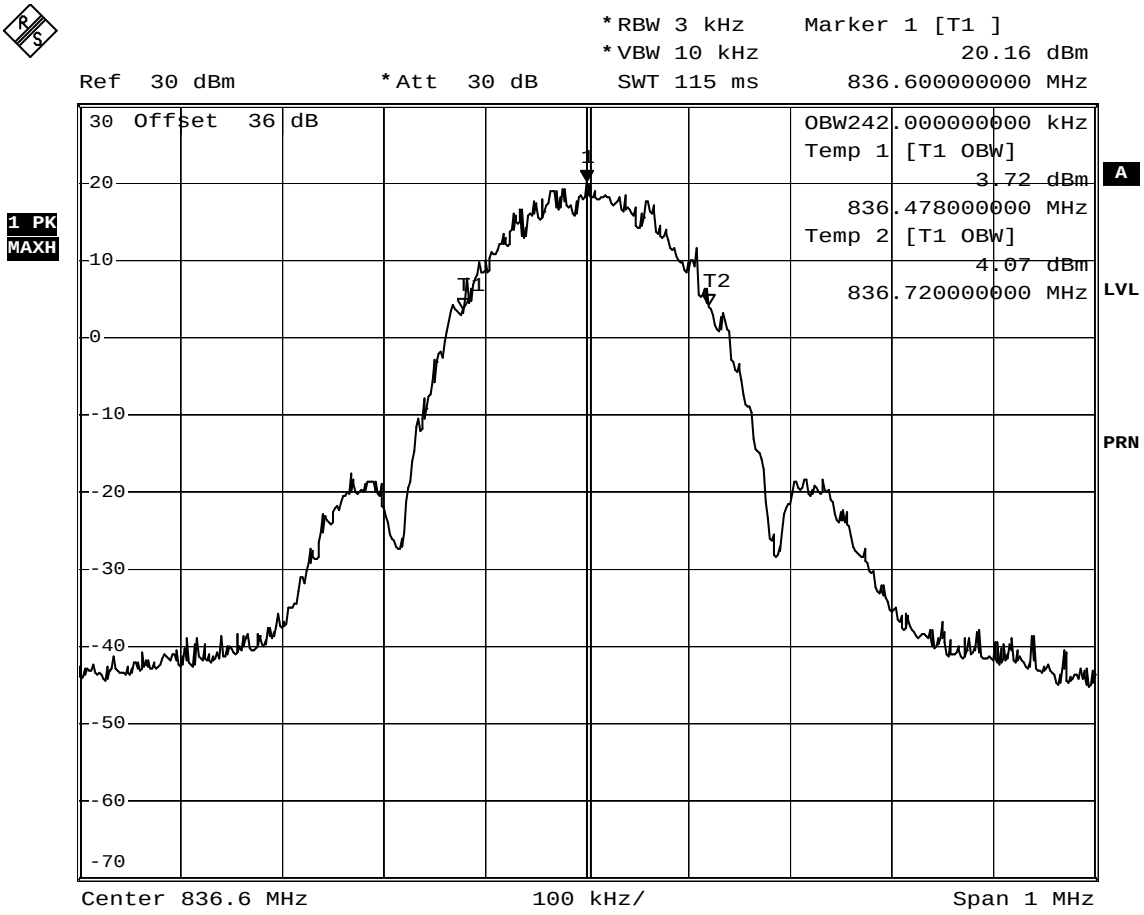


Date: 25.JUN.2007 14:58:09

Test: Emissions bandwidth (26 dB bandwidth), Channel 190 (836.6 MHz)

Op. Mode

op-mode 5

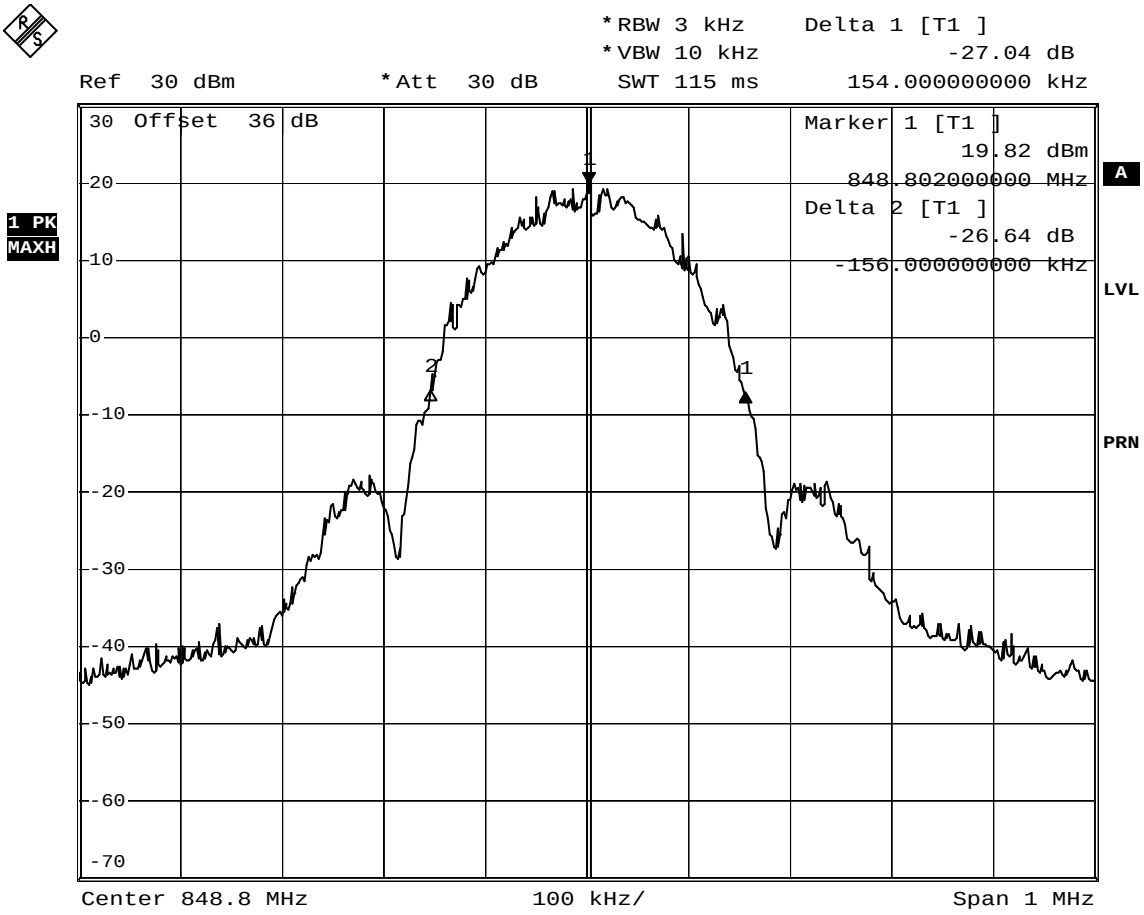


Date: 25.JUN.2007 15:00:02

Test: Occupied bandwidth, Channel 190 (836.6 MHz)

Op. Mode

op-mode 6

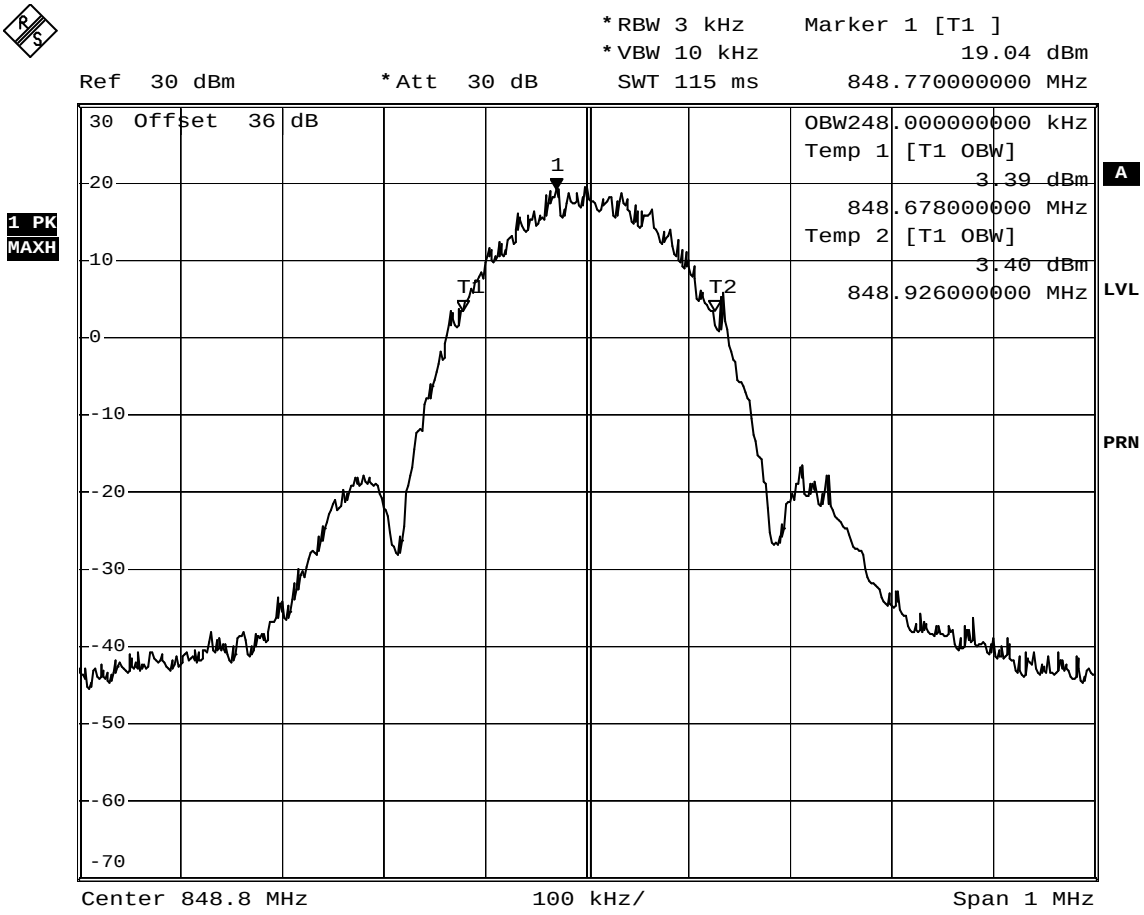


Date: 25.JUN.2007 14:52:02

Test: Emissions bandwidth (26 dB bandwidth), Channel 251 (848.8 MHz)

Op. Mode

op-mode 6

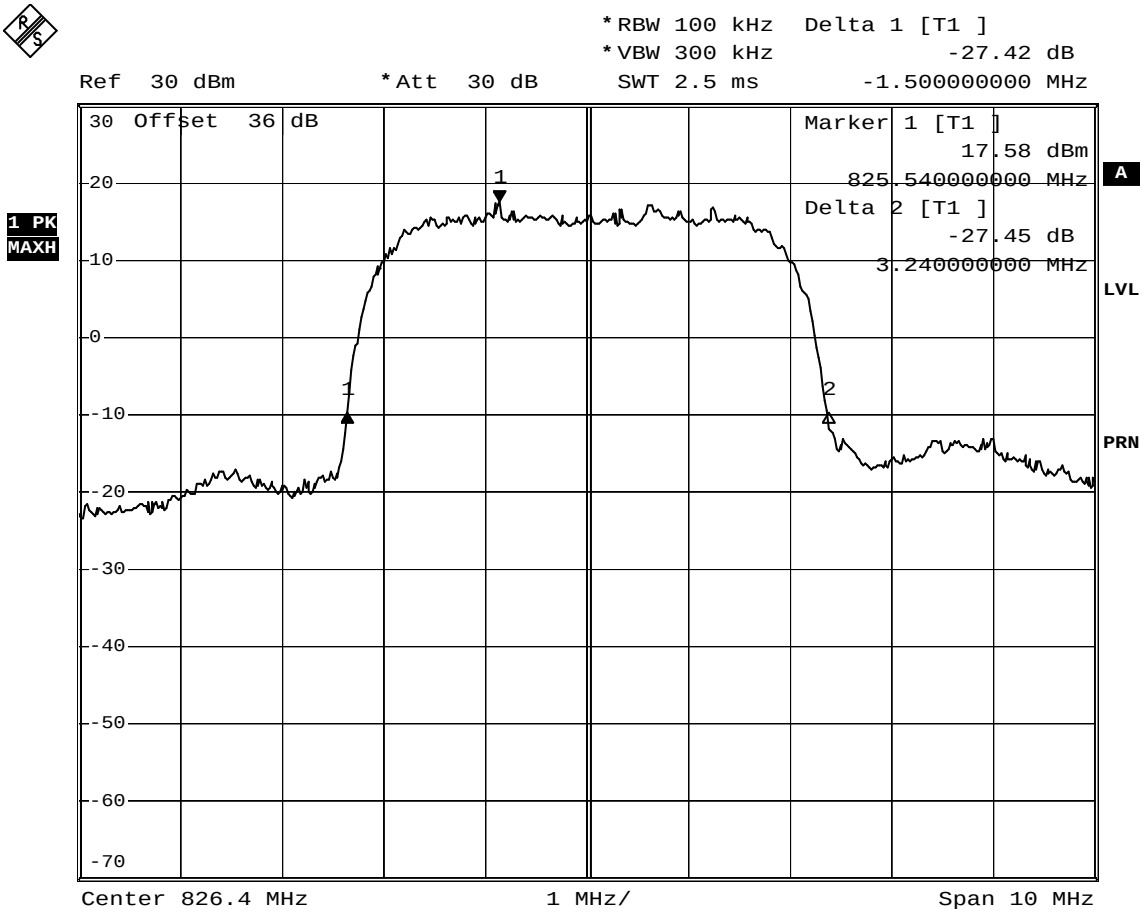


Date: 25.JUN.2007 14:53:51

Test: Occupied bandwidth, Channel 251 (848.8 MHz)

Op. Mode

op-mode 7

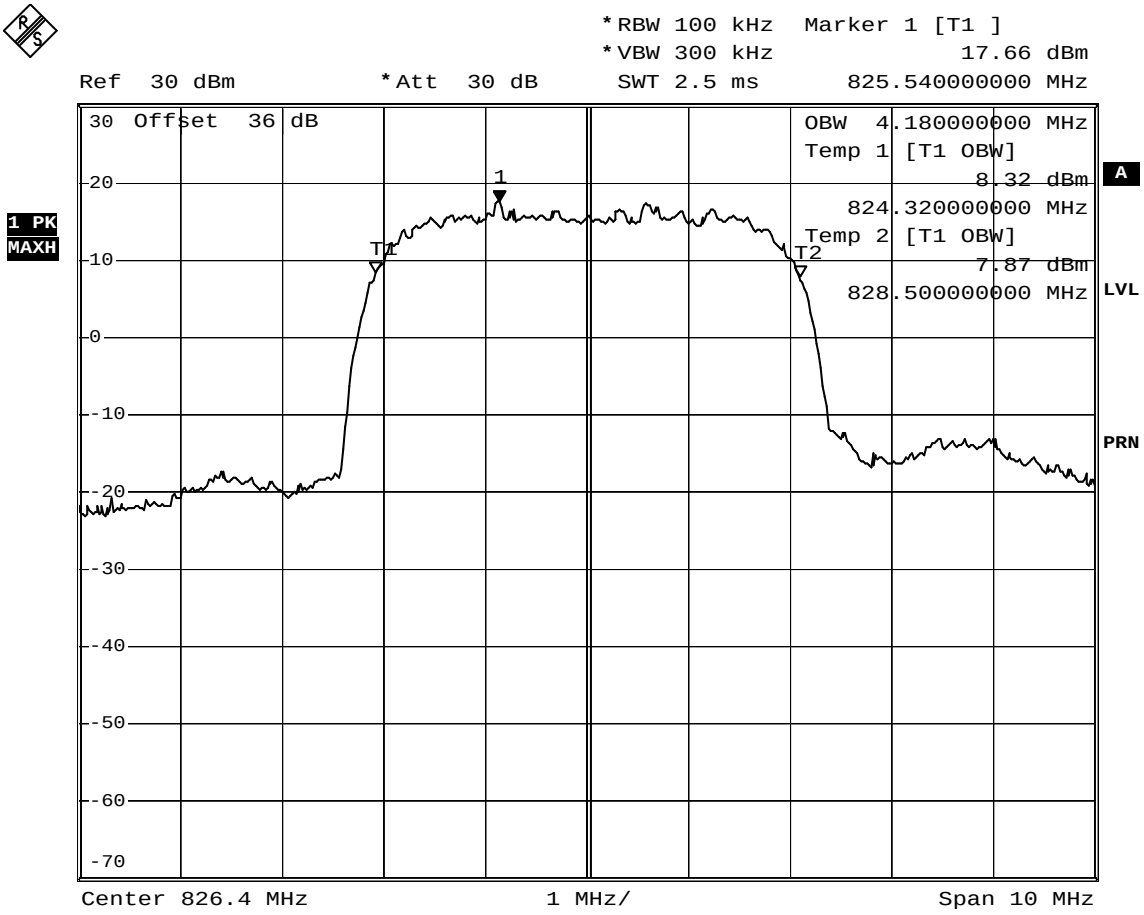


Date: 25.JUN.2007 15:45:28

Test: Emissions bandwidth (26 dB bandwidth), Channel 4132 (826.4 MHz)

Op. Mode

op-mode 7

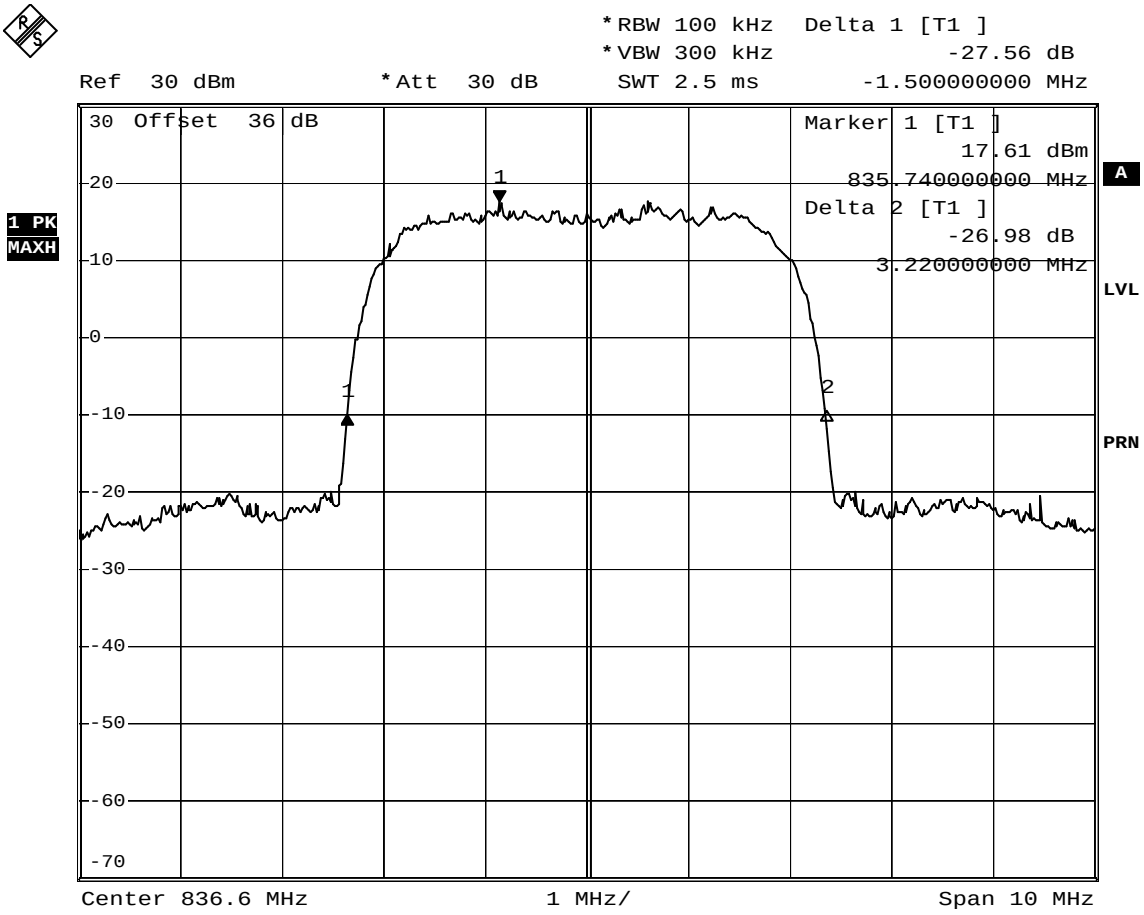


Date: 25.JUN.2007 15:49:56

Test: Occupied bandwidth, Channel 4132 (826.4 MHz)

Op. Mode

op-mode 8

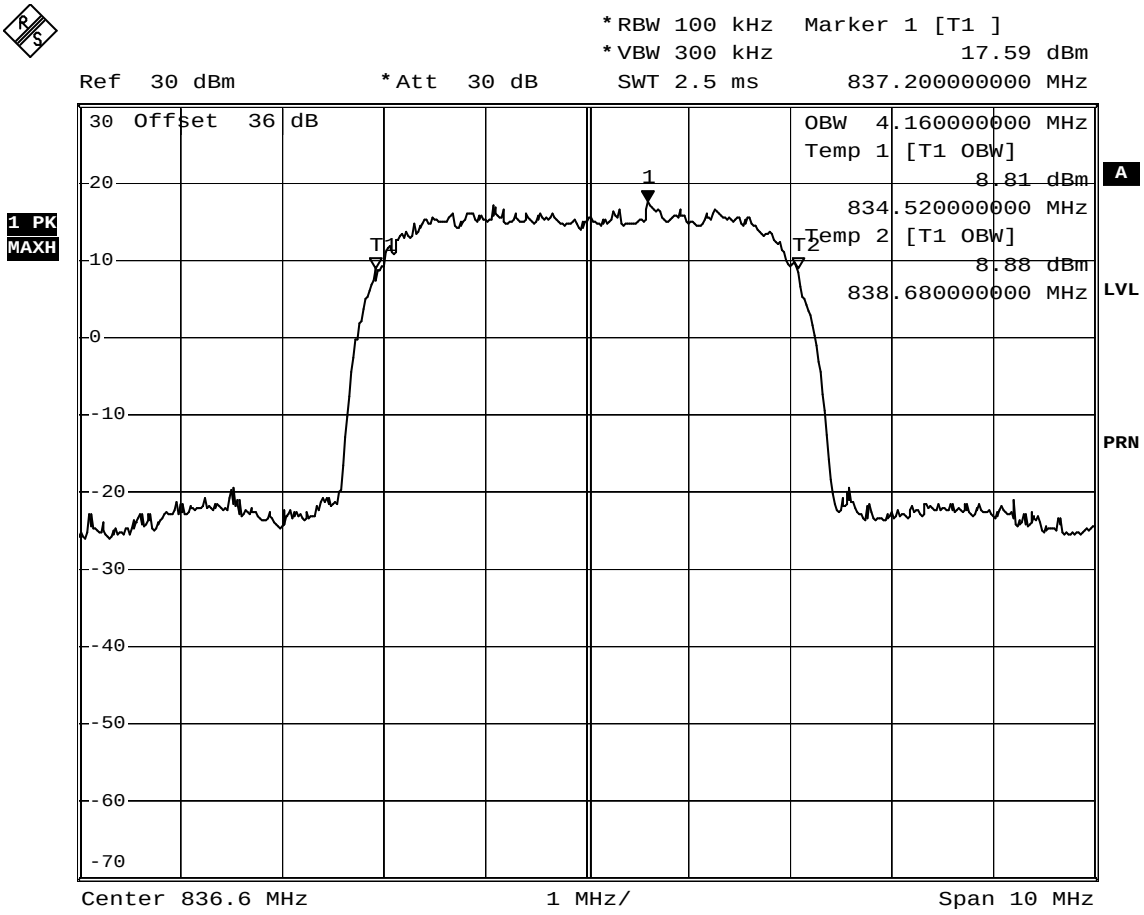


Date: 25.JUN.2007 15:40:51

Test: Emissions bandwidth (26 dB bandwidth), Channel 4183 (836.6 MHz)

Op. Mode

op-mode 8

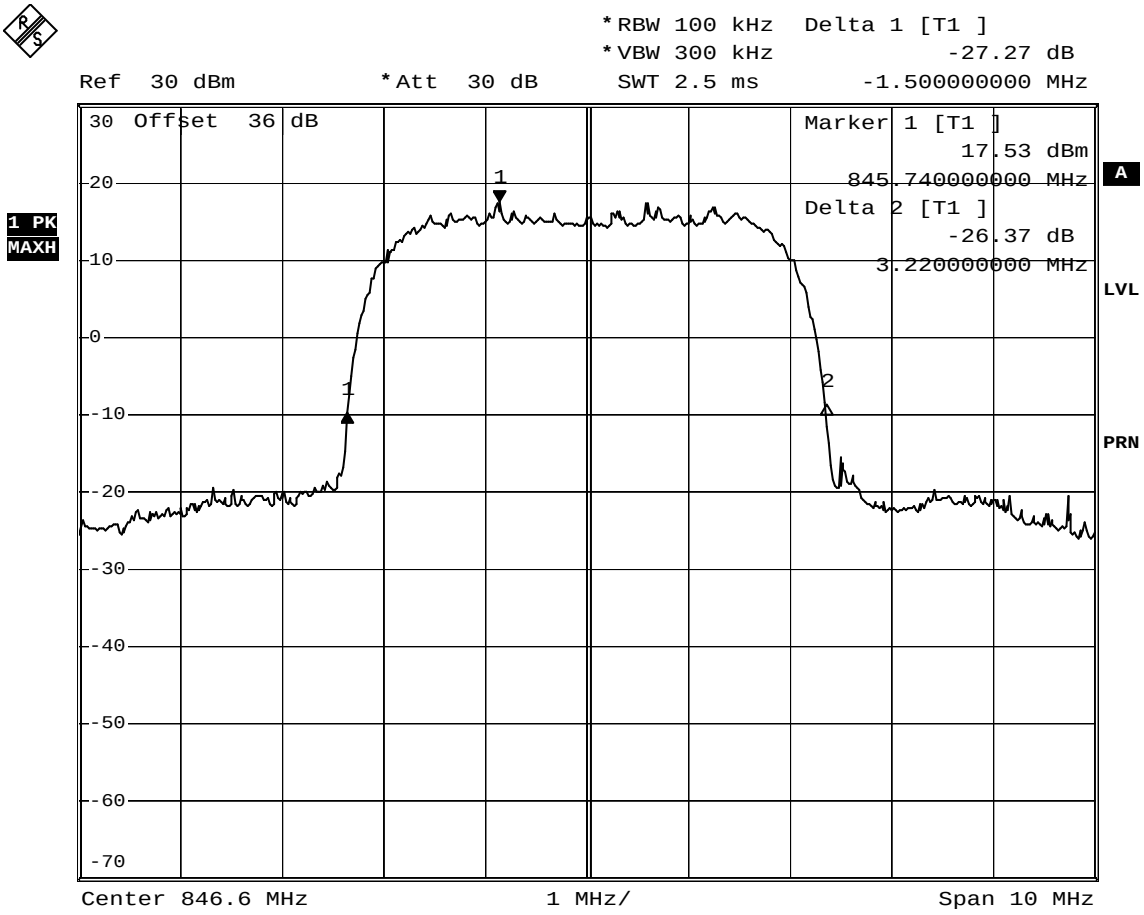


Date: 25.JUN.2007 15:42:25

Test: Occupied bandwidth, Channel 4183 (836.6 MHz)

Op. Mode

op-mode 9

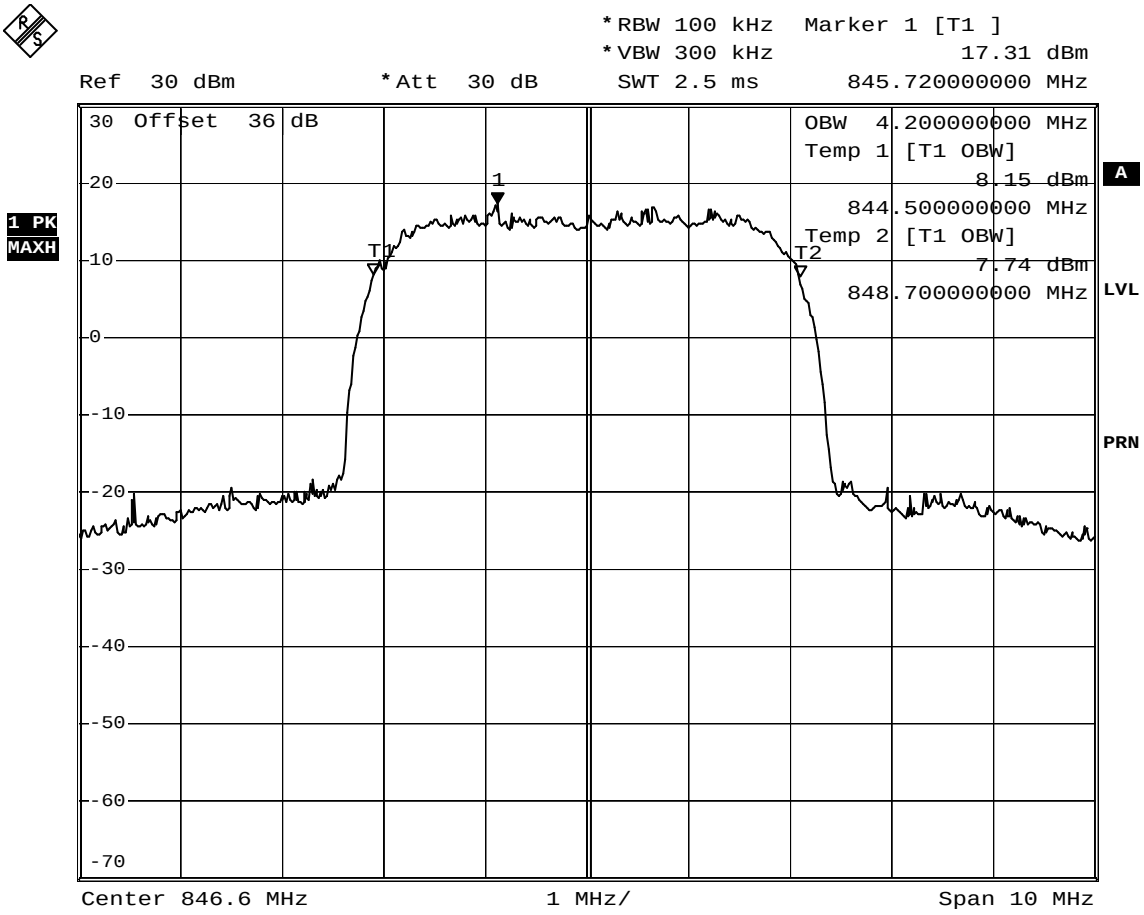


Date: 25.JUN.2007 15:36:44

Test: Emissions bandwidth (26 dB bandwidth), Channel 4233 (846.6 MHz)

Op. Mode

op-mode 9



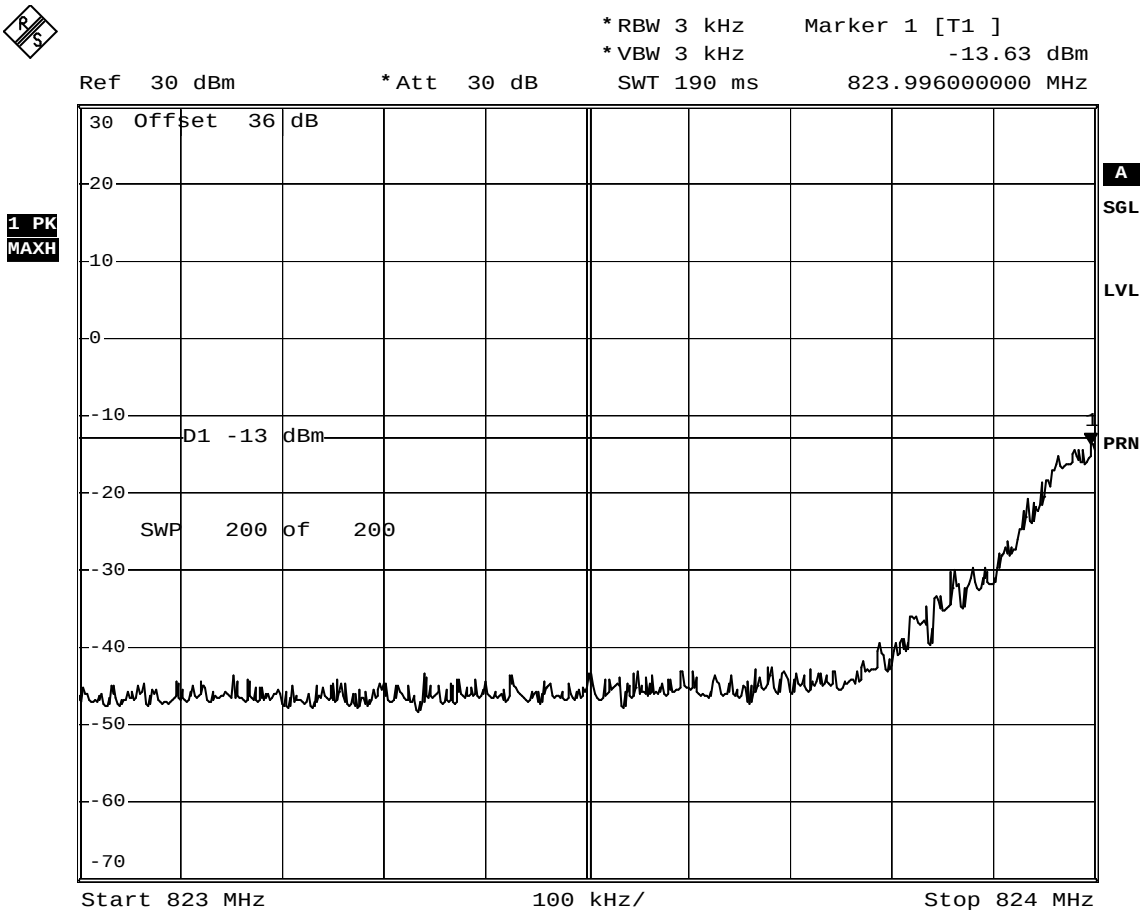
Date: 25.JUN.2007 15:38:05

Test: Occupied bandwidth, Channel 4233 (846.6 MHz)

Measurement plots Band edge compliance

Op. Mode

op-mode 1

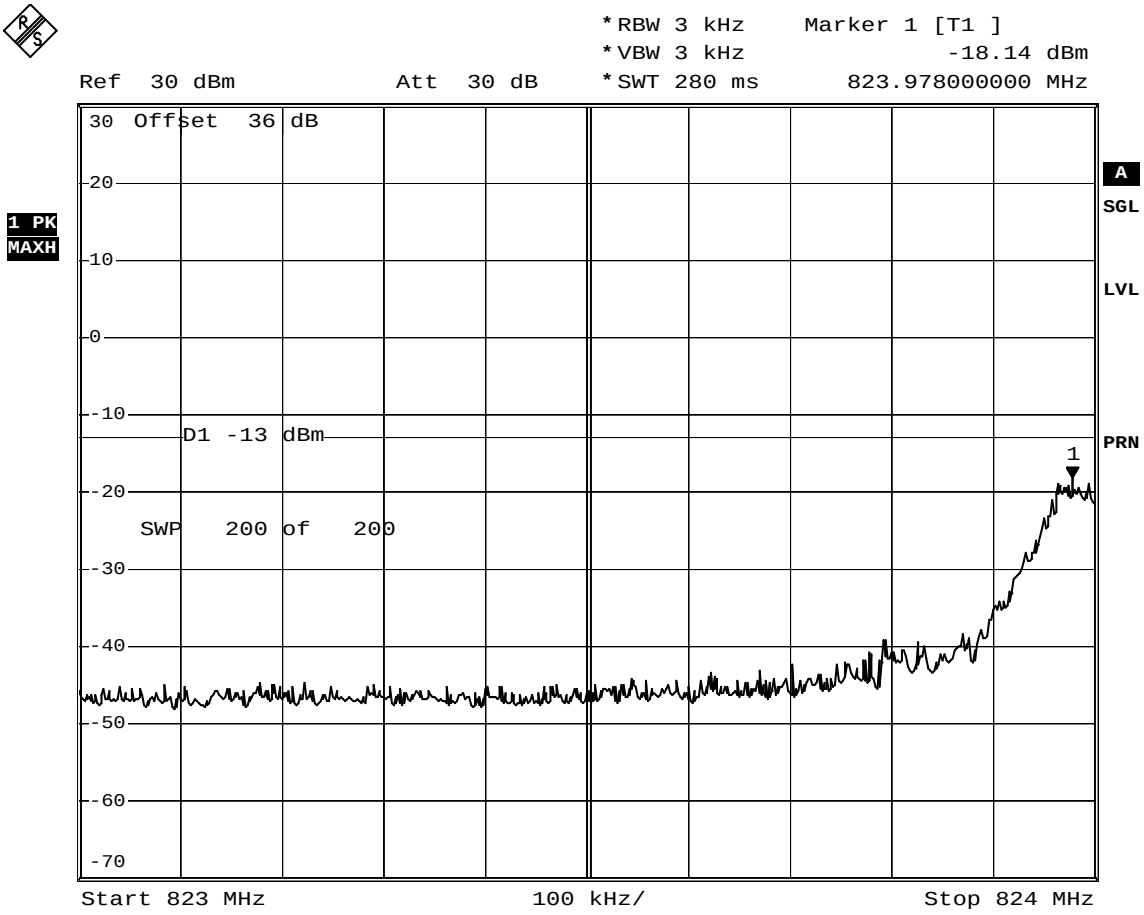


Date: 25.JUN.2007 15:12:23

Test: band edge compliance , Channel 128, GSM

Op. Mode

op-mode 4

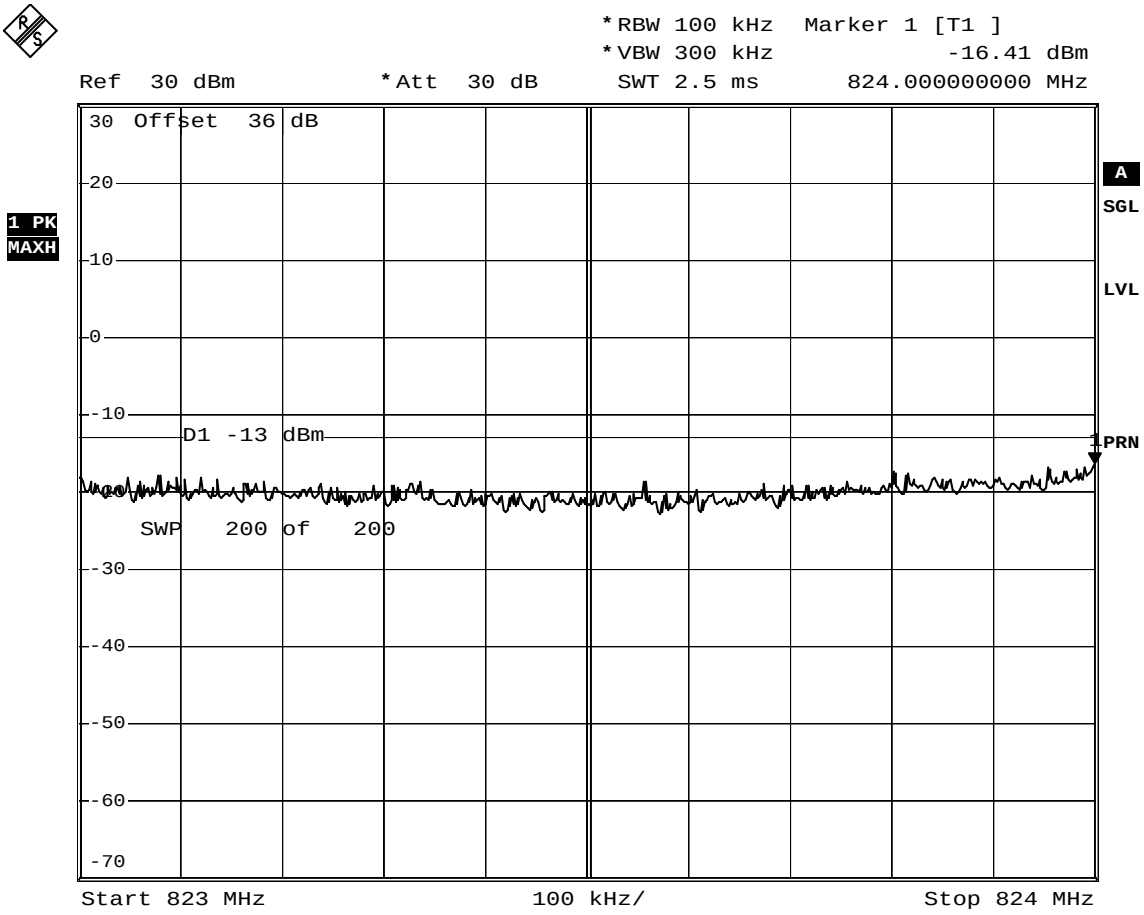


Date: 25.JUN.2007 13:31:32

Test: band edge compliance , Channel 128, EDGE

Op. Mode

op-mode 7

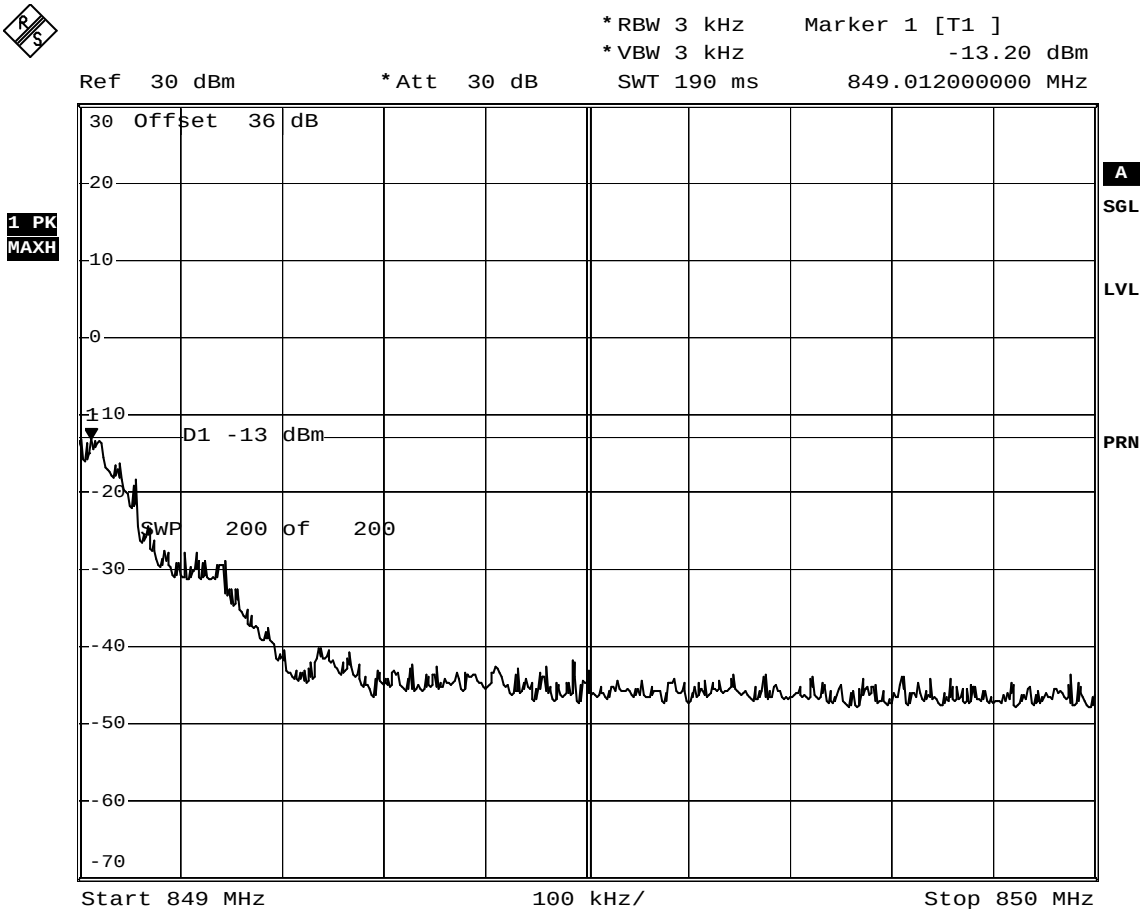


Date: 25.JUN.2007 15:30:15

Test: band edge compliance , Channel 4132, FDD V

Op. Mode

op-mode 3

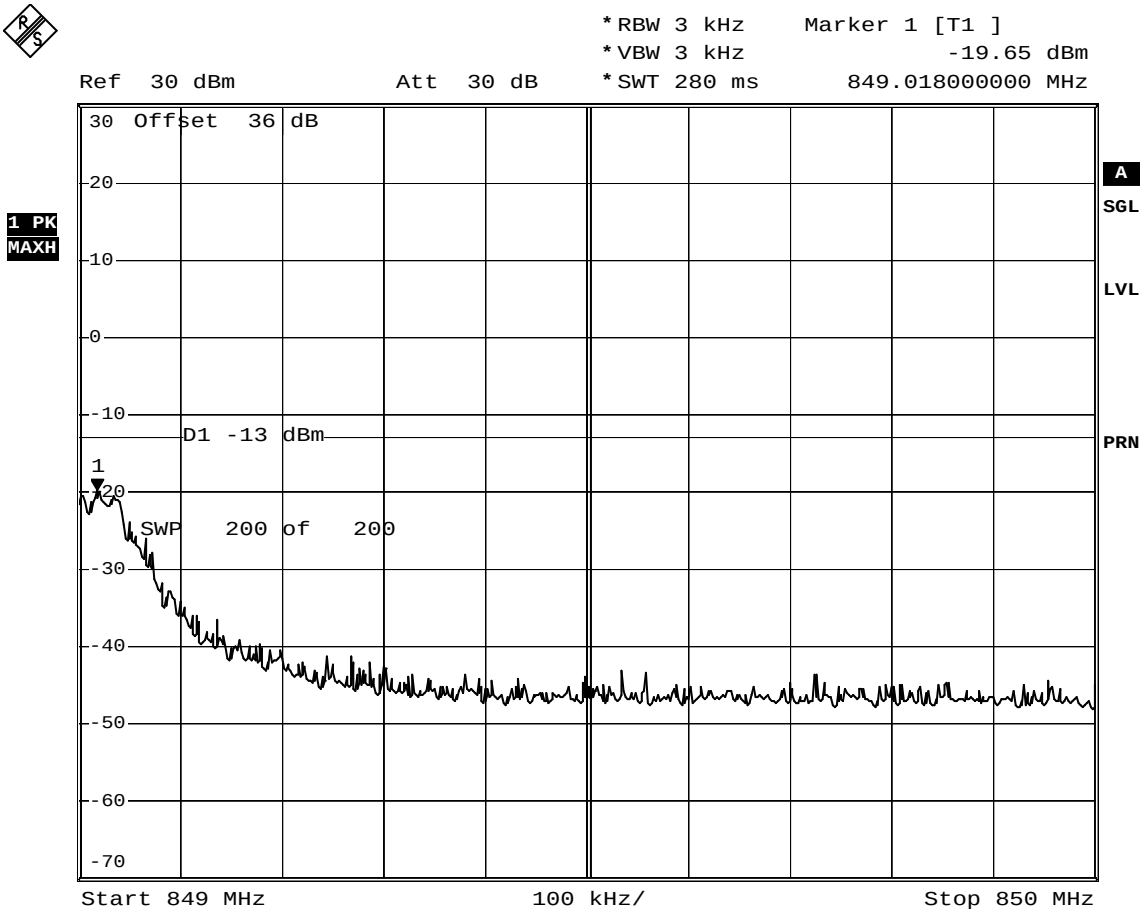


Date: 25.JUN.2007 15:16:35

Test: band edge compliance , Channel 251, GSM

Op. Mode

op-mode 6

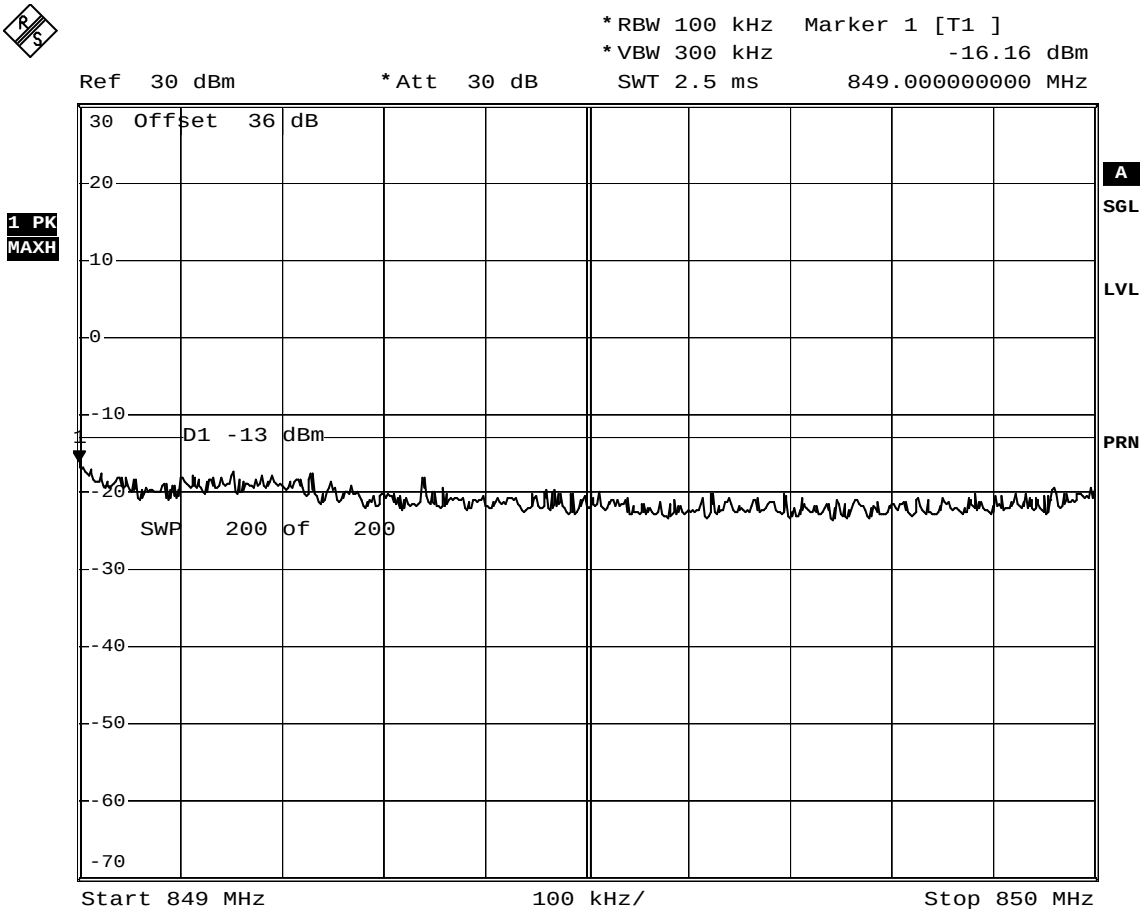


Date: 25.JUN.2007 13:34:44

Test: band edge compliance, Channel 251, EDGE

Op. Mode

op-mode 9



Date: 25.JUN.2007 15:31:22

Test: band edge compliance, Channel 4233, FDD V

InterLab®

FCC Measurement/Technical Report on

GSM/UMTS Module
MO0301

Report Reference: MDE_Opti_0709_FCCe

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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Table of Contents

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.

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_a02	antenna connector	passed
op-mode 2	Setup_a02	antenna connector	passed
op-mode 3	Setup_a02	antenna connector	passed
op-mode 4	Setup_a02	antenna connector	passed
op-mode 5	Setup_a02	antenna connector	passed
op-mode 6	Setup_a02	antenna connector	passed
op-mode 7	Setup_a02	antenna connector	passed
op-mode 8	Setup_a02	antenna connector	passed
op-mode 9	Setup_a02	antenna connector	passed

Frequency stability

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

OP-Mode	Setup	Port	Final Result
op-mode 2	Setup_a02	antenna connector	passed
op-mode 4	Setup_a02	antenna connector	passed
op-mode 8	Setup_a02	antenna connector	passed

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 1	Setup_a01	antenna connector	passed
op-mode 2	Setup_a01	antenna connector	passed
op-mode 3	Setup_a01	antenna connector	passed
op-mode 4	Setup_a01	antenna connector	passed
op-mode 5	Setup_a01	antenna connector	passed
op-mode 6	Setup_a01	antenna connector	passed
op-mode 7	Setup_a01	antenna connector	passed
op-mode 8	Setup_a01	antenna connector	passed
op-mode 9	Setup_a01	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 1	Setup_a03	Enclosure	passed
op-mode 2	Setup_a03	Enclosure	passed
op-mode 3	Setup_a03	Enclosure	passed
op-mode 4	Setup_a03	Enclosure	passed
op-mode 5	Setup_a03	Enclosure	passed
op-mode 6	Setup_a03	Enclosure	passed
op-mode 7	Setup_a03	Enclosure	passed
op-mode 8	Setup_a03	Enclosure	passed
op-mode 9	Setup_a03	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 1	Setup_a01	antenna connector	passed
op-mode 2	Setup_a01	antenna connector	passed
op-mode 3	Setup_a01	antenna connector	passed
op-mode 4	Setup_a01	antenna connector	passed
op-mode 5	Setup_a01	antenna connector	passed
op-mode 6	Setup_a01	antenna connector	passed
op-mode 7	Setup_a01	antenna connector	passed
op-mode 8	Setup_a01	antenna connector	passed
op-mode 9	Setup_a01	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_a01	antenna connector	passed
op-mode 3	Setup_a01	antenna connector	passed
op-mode 4	Setup_a01	antenna connector	passed
op-mode 6	Setup_a01	antenna connector	passed
op-mode 7	Setup_a01	antenna connector	passed
op-mode 9	Setup_a01	antenna connector	passed

This test report replaces the 7 layers test report reference MDE_Opti_0709b, dated 2007-08-03.

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:	2006-12-18

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Receipt of EUT:	2007-05-16
Date of Test(s):	2007-06-22 to 2007-07-12
Date of Report:	2007-08-10

1.3 Applicant Data

Company Name:	Option NV
Address:	Gaston Geenslaan 14 3001 Leuven Belgium
Contact Person:	Mr. Lodeweyckx

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:	MO0301
Kind of Device:	GSM 850/900/1800/1900 + UTRA FDD I/II/V
(optional)	including HSDPA
Voltage Type:	DC
Nominal Voltage:	3.6 V
Maximum Voltage:	3.6 V
Minimum Voltage:	3.0V

General product description:

The Equipment under Test (EUT) is a data card that supports GSM/EDGE 850/900/1800/1900 and FDD I, II and 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

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: 37250a01)	GSM/UMTS Module	MO0301	004401440494298	2.0	2.5.0	2007-06-18
Remark: EUT A is equipped with a permanent antenna connector.						
EUT B (Code: 37250b01)	GSM/UMTS Module	MO0301	004401440494199	2.0	2.5.0	2007-06-18
Remark: EUT B is equipped with a permanent antenna connector (gain= 2.0 dBi).						

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	Test Cradle	Cobra SPQ Cradle	V 1.0	-	-	-
AE2	Test Cradle	Pepijn	V 2.0	-	-	-
AE3	External antenna "omni-directiona quadriband"	Telsa T01111916 antenna gain: 2.0 dBi				

2.4 EUT Setups

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

Setup No.	Combination of EUTs	Description
Setup_a01	EUT A + AE2	setup for conducted tests
Setup_a02	EUT B + AE1	setup for conducted tests
Setup_a03	EUT B + AE1 + AE3	setup for radiated tests

2.5 Operating Modes

This chapter describes the operating modes of the EUT's 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 CS mode	
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 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 between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

4) The transmitted power of the EUT was recorded by using an internal measurement function of the CMU200.

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: 25 °C
Air Pressure: 1008 hPa
Humidity: 36 %

Op. Mode	Setup	Port
op-mode 1	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
0	30	28.40	-1.60

Remark: none

Op. Mode	Setup	Port
op-mode 2	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
0	30	28.60	-1.40

Remark: none

Op. Mode	Setup	Port
op-mode 3	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
0	30	28.40	-1.60

Remark: none

Op. Mode	Setup	Port
op-mode 4	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
0	30	26.40	-3.60

Remark: none

Op. Mode	Setup	Port
op-mode 5	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
0	30	26.70	-3.30

Remark: none

Op. Mode	Setup	Port
op-mode 6	setup_a02	antenna connector

Power Control Level	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
0	30	26.60	-3.40

Remark: none

Op. Mode	Setup	Port
op-mode 7	setup_a02	antenna connector

Power class	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
3	24	24.56	0.56

Remark: none

Op. Mode	Setup	Port
op-mode 8	setup_a02	antenna connector

Power class	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
3	24	25.06	1.06

Remark: none

Op. Mode	Setup	Port
op-mode 9	setup_a02	antenna connector

Power class	Output power Nominal (dBm)	Output power Measured (dBm)	Difference dB
3	24	24.85	0.85

Remark: none

3.1.4 Test result: RF Power Output

FCC Part 24, Subpart E	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

3.2 Frequency stability

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

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

3.2.1 Test Description

1) The EUT was placed inside the climatic chamber.

2) The EUT was coupled to the R&S CMD55 / CMU200 Digital Communication Tester. Refer to chapter "Setup Drawings".

3) The climatic chamber was cycled down/up to a certain temperature.

4) After the temperature was stabilized (at least one hour) the EUT was switched on and a call was established between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

5) The frequency error of the EUT were recorded by using an internal measurement function of the CMD55 / CMU200 immediately after the call was established, five minutes after the call was established and ten minutes after the call was established.

6) This measurement procedure was performed for all combinations of voltage (low, nominal, high) and temperature (from –30°C to +50°C in increments of 10°C).

3.2.2 Test Requirements / Limits

§2.1055 Measurements required: Frequency stability

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

§24.235 Frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

7Layers interpretation of limit:

To ensure that the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block following limit was used:

+/- 2.5 ppm = 4700 Hz

3.2.3 Test Protocol

Temperature: 25 – 27 °C
Air Pressure: 995 - 1008 hPa
Humidity: 36 - 42 %

Op. Mode	Setup	Port
op-mode 2	setup_a02	antenna connector

		Normal Voltage / V	
		3.6	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)
+50	0	-11	170
+50	5	-16	-44
+50	10	-19	-60
+40	0	-71	-112
+40	5	-11	175
+40	10	-7	-50
+30	0	-34	-169
+30	5	-31	-141
+30	10	-41	-171
+10	0	-63	-291
+10	5	-58	-303
+10	10	-50	-224
0	0	-33	-45
0	5	-48	-57
0	10	-37	220
–10	0	9	20
–10	5	-47	-59
–10	10	-62	-72
–20	0	21	40
–20	5	-5	-14
–20	10	-20	-30
–30	0	19	84
–30	5	-9	-22
–30	10	-12	-22

		Minimum Voltage / V		Normal Voltage / V		Maximum Voltage / V	
		85% = 3.06		100% = 3.6		3.9	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)
+20	0	-34	575	-42	-528	-26	-684
+20	5	-6	422	-76	-723	-21	-1161
+20	10	-44	-632	-12	860	-48	-1320

Remark: The EUT did not operate at 115% of normal voltage. Instead the call was established at normal voltage and then increased to 3.9 V.

Op. Mode	Setup	Port
op-mode 5	setup_a02	antenna connector

		Normal Voltage / V	
		3.6	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)
+50	0	-34	-80
+50	5	-53	-78
+50	10	-46	-82
+40	0	-70	-123
+40	5	-68	-102
+40	10	-55	-100
+30	0	-60	-215
+30	5	-32	-150
+30	10	-49	-159
+10	0	-33	483
+10	5	2	-678
+10	10	13	-419
0	0	-7	-33
0	5	-32	-44
0	10	-62	-74
–10	0	-2	-26
–10	5	-50	-60
–10	10	-60	-71
–20	0	-4	-66
–20	5	-41	-52
–20	10	-14	65
–30	0	18	69
–30	5	-3	-20
–30	10	-32	-45

		Minimum Voltage / V		Normal Voltage / V		Maximum Voltage / V	
		85%=3.06		100%=3.6		3.9	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)
+20	0	-25	-53	-48	-84	-46	-89
+20	5	-63	-77	-50	-89	-33	-80
+20	10	-59	-70	-61	-75	-25	-83

Remark: The EUT did not operate at 115% of normal voltage. Instead the call was established at normal voltage and then increased to 3.9 V.

Op. Mode	Setup	Port
op-mode 8	setup_a02	antenna connector

		Normal Voltage / V	
		3.6	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)
+50	0	-2	-98
+50	5	-6	-72
+50	10	0	68
+40	0	5	307
+40	5	0	-240
+40	10	9	404
+30	0	2	477
+30	5	4	500
+30	10	7	-407
+10	0	34	615
+10	5	14	636
+10	10	12	-517
0	0	-2	-29
0	5	1	-46
0	10	-1	-47
–10	0	-1	36
–10	5	0	33
–10	10	-1	-36
–20	0	-1	-24
–20	5	-2	-27
–20	10	-2	-32
–30	0	-2	-83
–30	5	1	-30
–30	10	2	43

		Minimum Voltage / V		Normal Voltage / V		Maximum Voltage / V	
		85%=3.06		100%=3.6		3.95	
Temp. °C	Duration min	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)	Freq. error Average (Hz)	Freq. error Max. (Hz)
+20	0	-1	66	-2	-39	1	-40
+20	5	-5	-55	-2	-56	0	-57
+20	10	1	56	1	65	-1	-46

Remark: The EUT did not operate at 115% of normal voltage. Instead the call was established at normal voltage and then increased to 3.95 V.

3.2.4 Test result: Frequency stability

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

3.3 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

3.3.1 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 between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

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 depending on the transmitting signal (technology), 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

3.3.2 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.

3.3.3 Test Protocol

Temperature: 26 °C
Air Pressure: 1005 hPa
Humidity: 42 %

Op. Mode	Setup	Port
op-mode 1	setup_a01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
1849	3.0	–14.08	-13.0

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

Op. Mode	Setup	Port
op-mode 2	setup_a01	antenna connector

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

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

Op. Mode	Setup	Port
op-mode 3	setup_a01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
1910	3.0	–13.70	-13.0

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

Op. Mode	Setup	Port
op-mode 4	setup_a01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
1850	3.0	–21.35	-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_a01	antenna connector

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

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

Op. Mode	Setup	Port
op-mode 6	setup_a01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
1910	3.0	–21.73	-13.0

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

Op. Mode	Setup	Port
op-mode 7	setup_a01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
1849	3.0	–17.95	-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_a01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
3740	1000	–22.57	-13.0

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

Op. Mode	Setup	Port
op-mode 9	setup_a01	antenna connector

Frequency MHz	Bandwidth kHz	Measured Level dBm	Limit dBm
1911	3.0	-25.37	-13.0
3809	1000	-19.64	-13.0

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

3.3.4 Test result: Spurious emissions at antenna terminals

FCC Part 24, Subpart E	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

3.4 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

3.4.1 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 between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

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 depending on the transmitting signal (technology), 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.

3.4.2 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.

3.4.3 Test Protocol

Temperature: 25 - 27 °C
Air Pressure: 1004 - 1013 hPa
Humidity: 34 - 48 %

Op. Mode	Setup	Port
op-mode 1	setup_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
1849	Horizontal	3.0	-15.76	-13.0
11101	Vertical	1000.0	-31.49	-13.0

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

Op. Mode	Setup	Port
op-mode 2	setup_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
11285	Vertical	1000.0	–25.53	-13.0

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

Op. Mode	Setup	Port
op-mode 3	setup_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
1910	Horizontal	3.0	-18.44	-13.0
11469	Vertical	1000.0	-23.63	-13.0

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

Op. Mode	Setup	Port
op-mode 4	setup_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
1849	Horizontal	3.0	-23.99	-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_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
11285	Vertical	1000.0	-25.15	-13.0

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

Op. Mode	Setup	Port
op-mode 6	setup_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
1910	Horizontal	3.0	-24.78	-13.0
11469	Vertical	1000.0	-23.63	-13.0

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

Op. Mode	Setup	Port
op-mode 7	setup_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
1845	Horizontal	3.0	-28.82	-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_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
3742	Horizontal	1000.0	-30.78	-13.0

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

Op. Mode	Setup	Port
op-mode 9	setup_a03	enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
1911	Horizontal	3.0	-28.76	-13.0
3803	Vertical	1000.0	-24.66	-13.0

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

3.4.4 Test result: Field strength of spurious radiation

FCC Part 24, Subpart E	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

3.5 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

3.5.1 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 between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester). The EUT was set to maximum output power. Other important settings are mentioned in the chapter “operating modes”.

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.

3.5.2 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.

3.5.3 Test Protocol

Temperature: 25 °C
Air Pressure: 1004 hPa
Humidity: 48 %

Op. Mode	Setup	Port
op-mode 1	setup_a02	antenna connector

Bandwidth kHz	Remarks
318	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 248 kHz.

Op. Mode	Setup	Port
op-mode 2	setup_a02	antenna connector

Bandwidth kHz	Remarks
316	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 244 kHz.

Op. Mode	Setup	Port
op-mode 3	setup_a02	antenna connector

Bandwidth kHz	Remarks
302	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 248 kHz.

Op. Mode	Setup	Port
op-mode 4	setup_a02	antenna connector

Bandwidth kHz	Remarks
298	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 240 kHz.

Op. Mode	Setup	Port
op-mode 5	setup_a02	antenna connector

Bandwidth kHz	Remarks
290	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 240 kHz.

Op. Mode	Setup	Port
op-mode 6	setup_a02	antenna connector

Bandwidth kHz	Remarks
290	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 232 kHz.

Op. Mode	Setup	Port
op-mode 7	setup_a02	antenna connector

Bandwidth kHz	Remarks
4720	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4180 kHz.

Op. Mode	Setup	Port
op-mode 8	setup_a02	antenna connector

Bandwidth kHz	Remarks
4700	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4180 kHz.

Op. Mode	Setup	Port
op-mode 9	setup_a02	antenna connector

Bandwidth kHz	Remarks
4720	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4200 kHz.

3.5.4 Test result: Emission and Occupied Bandwidth

FCC Part 24, Subpart E	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

3.6 Band edge compliance

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

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

3.6.1 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 (GSM).
   The spectrum analyser is set to a RBW/VBW of 100 kHz/300 kHz (UMTS).

3.6.2 Test Requirements / Limits

§ 24.238 Effective radiated power limits

3.6.3 Test Protocol

Temperature: 25 °C
Air Pressure: 1004 hPa
Humidity: 48 %

Op. Mode	Setup	Port
op-mode 1	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1850	-16.35	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 3	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1910	-14.61	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 4	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1850	-20.51	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 6	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1910	-21.65	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 7	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1850	-18.71	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 9	Setup_a02	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1910	-17.12	-13

Remark: Please see annex for the measurement plot.

3.6.4 Test result: Band edge compliance

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 1	passed
	op-mode 3	passed
	op-mode 4	passed
	op-mode 6	passed
	op-mode 7	passed
	op-mode 9	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

7 layers Bluetooth™ Full RF Test Solution

Bluetooth RF Conformance Test System TS8960

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

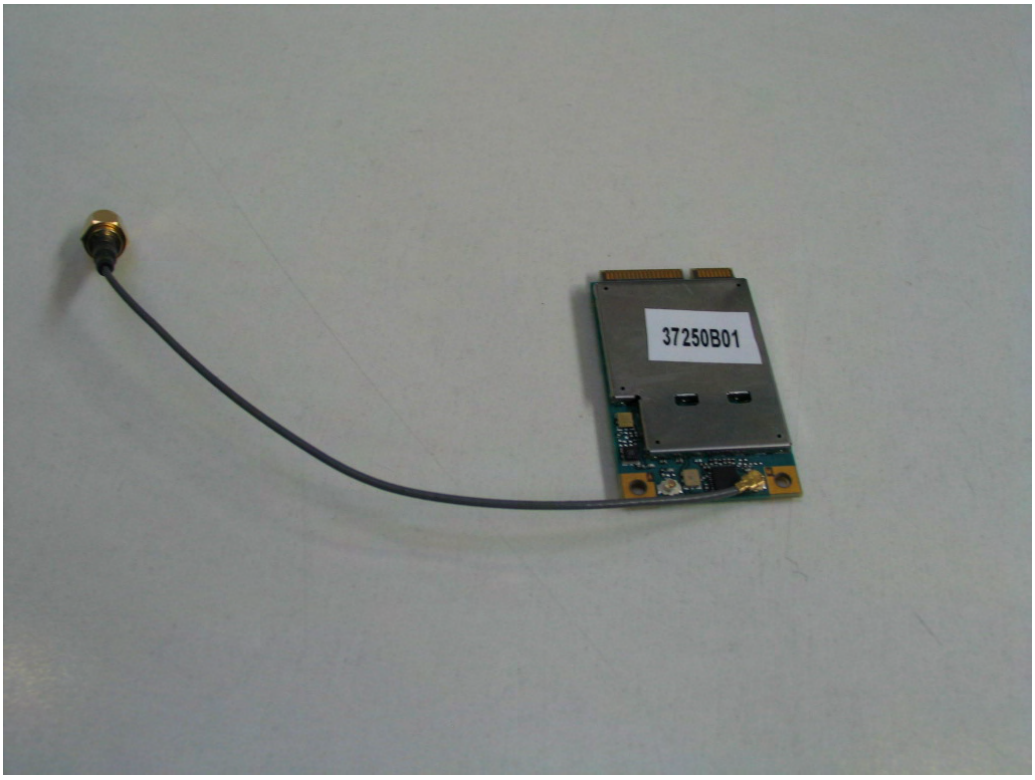


Photo 1: EUT (front side)

Photo 2: EUT (front side)

Photo 3: EUT (rear side)

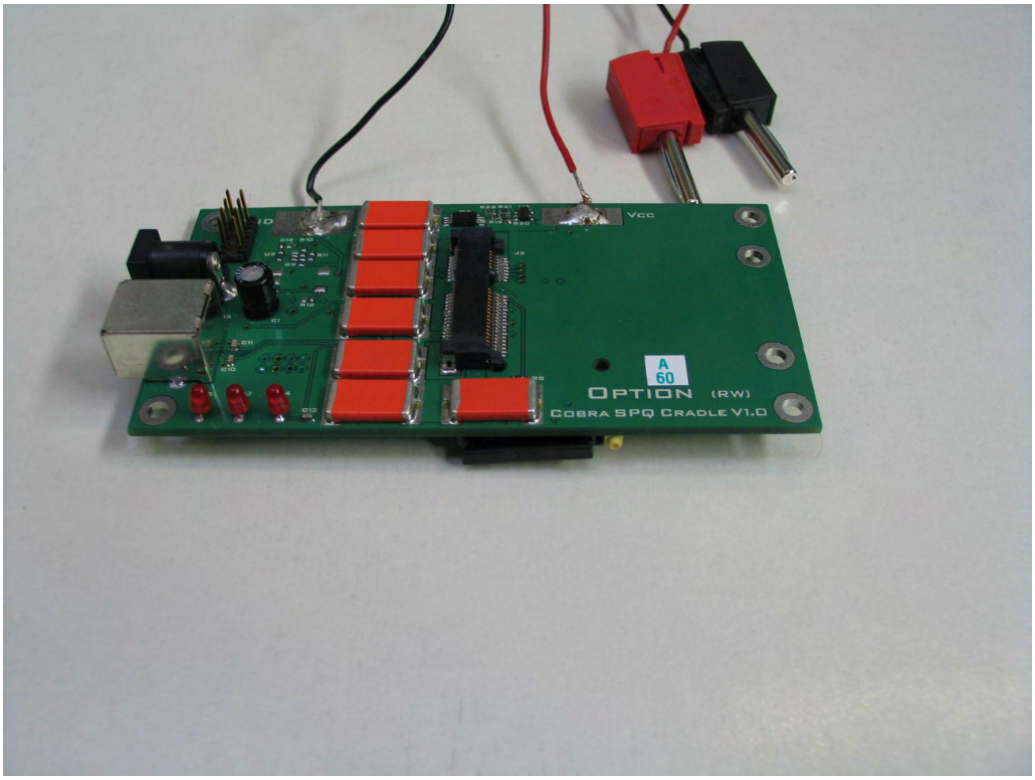


Photo 4: Test cradle Cobra SPQ

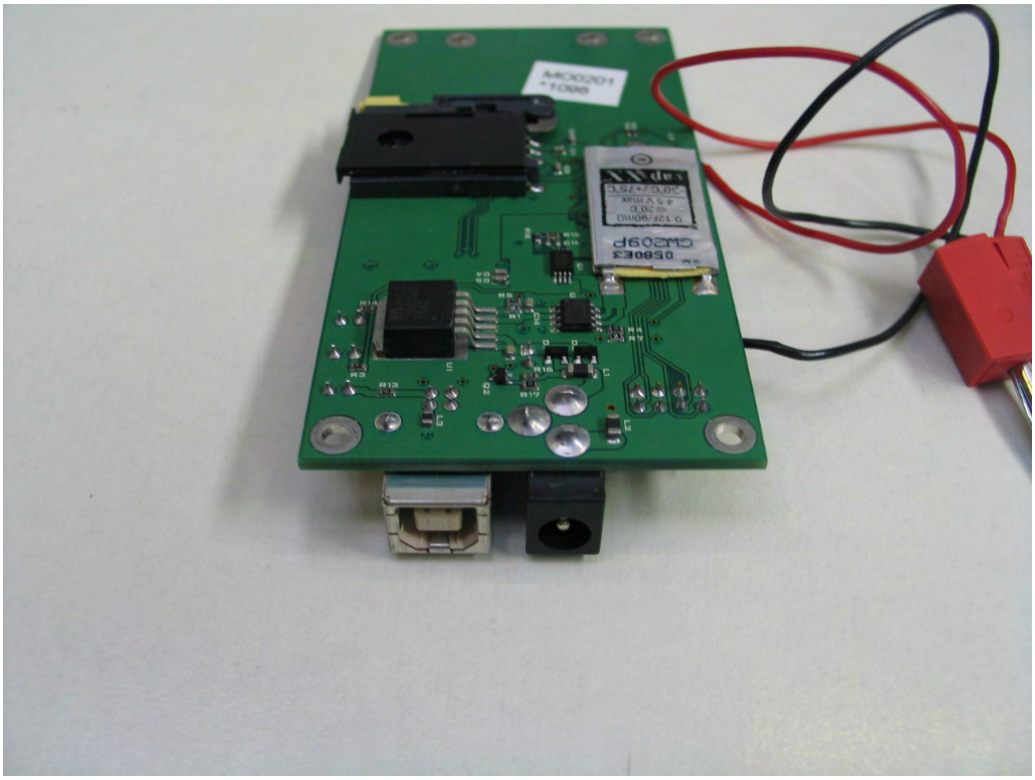


Photo 5: Test cradle Pepijn

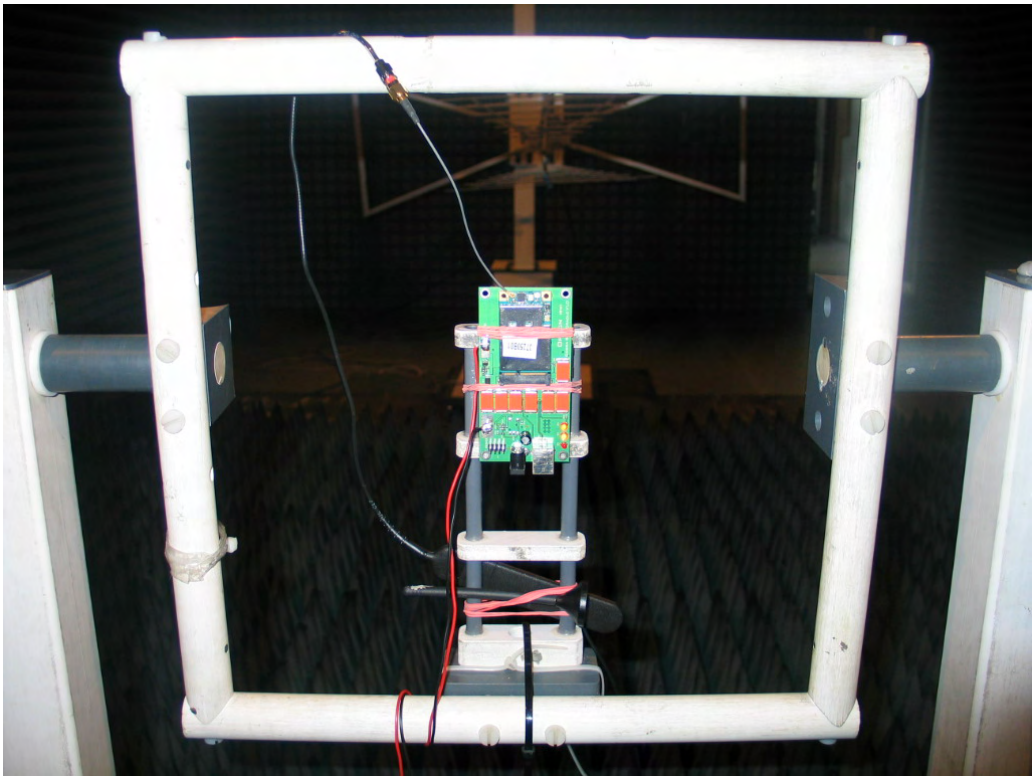
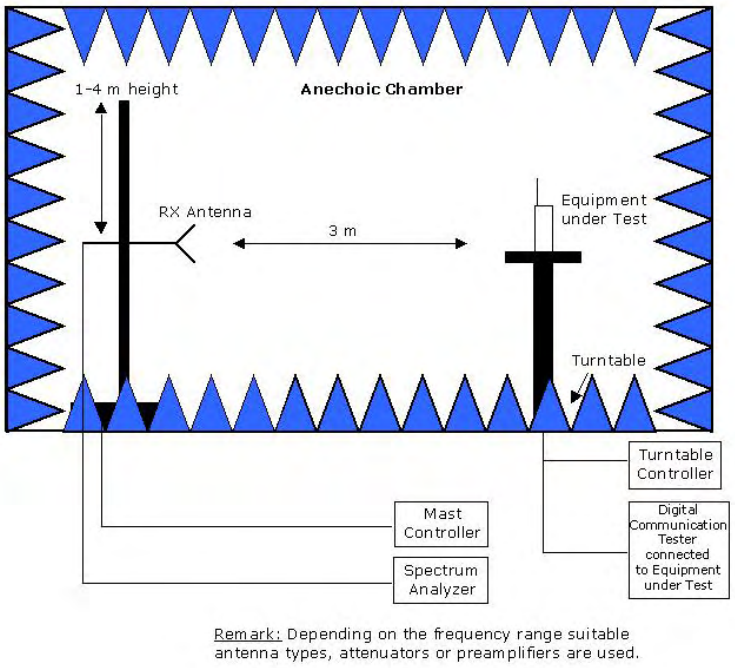
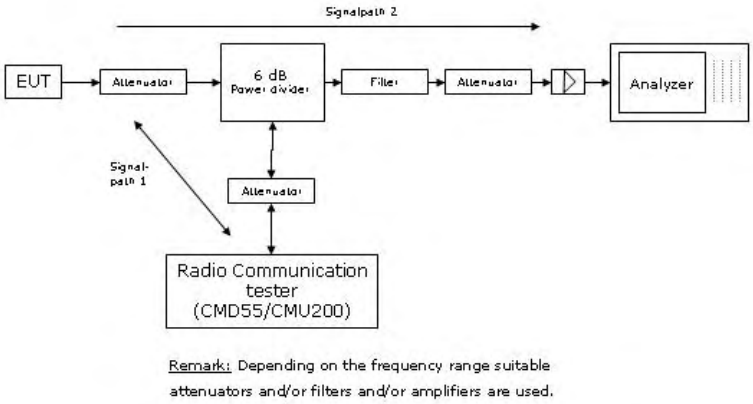


Photo 6: Setup for radiated tests

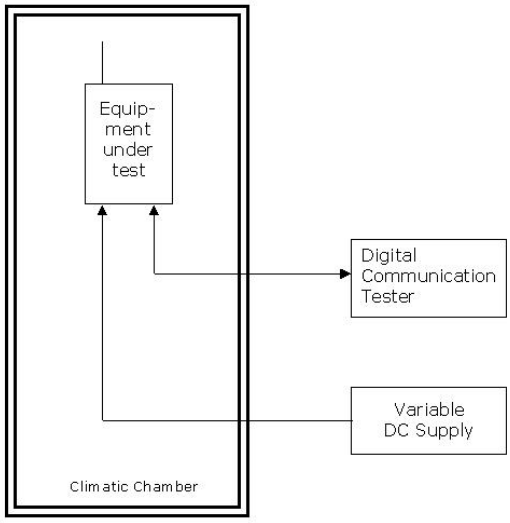
6 Setup Drawings



Drawing 1: Principle setup for radiated measurements.



Drawing 2: Principle setup for conducted measurements under nominal conditions



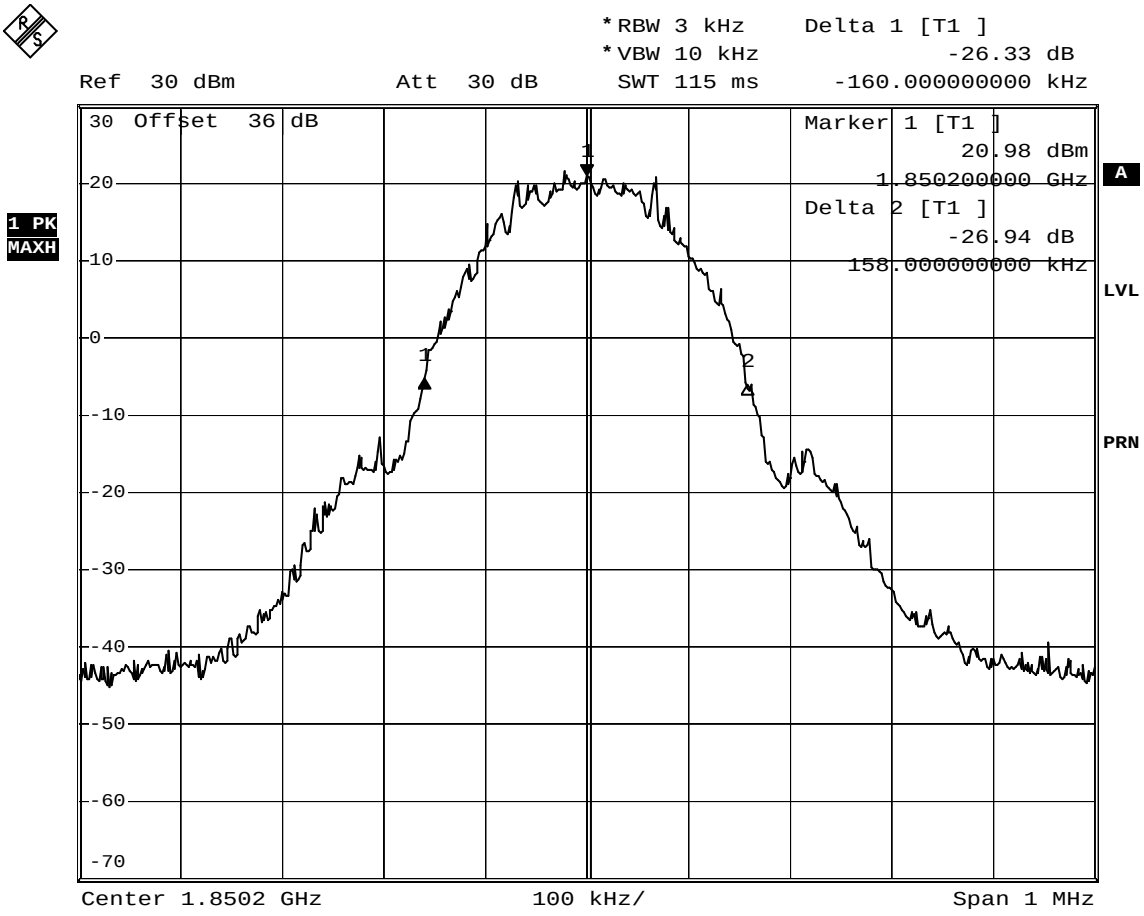
Drawing 3: Principle setup for tests under extreme test conditions

7 Annex

Measurement plots Emission and Occupied Bandwidth

Op. Mode

op-mode 1

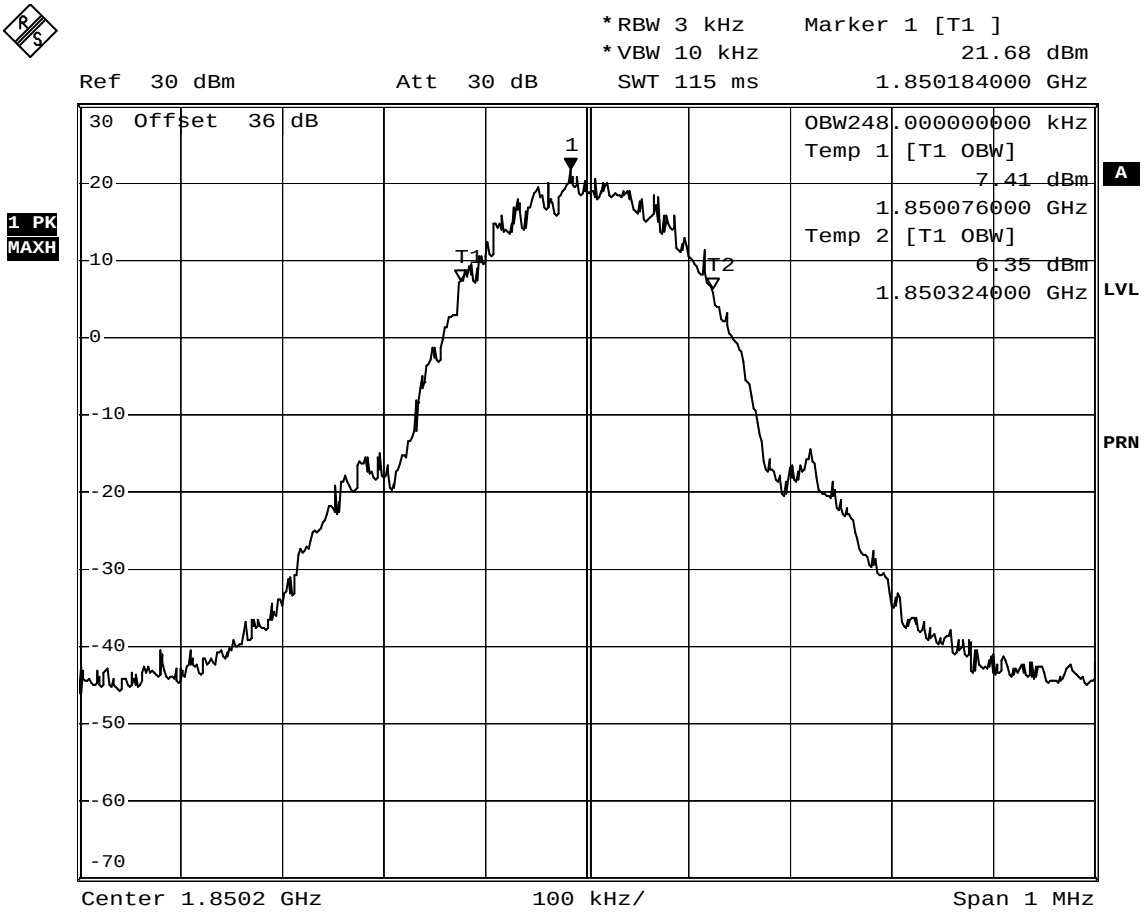


Date: 25.JUN.2007 14:17:55

Test: Emissions bandwidth (26 dB bandwidth), Channel 512 (1850.2 MHz)

Op. Mode

op-mode 1

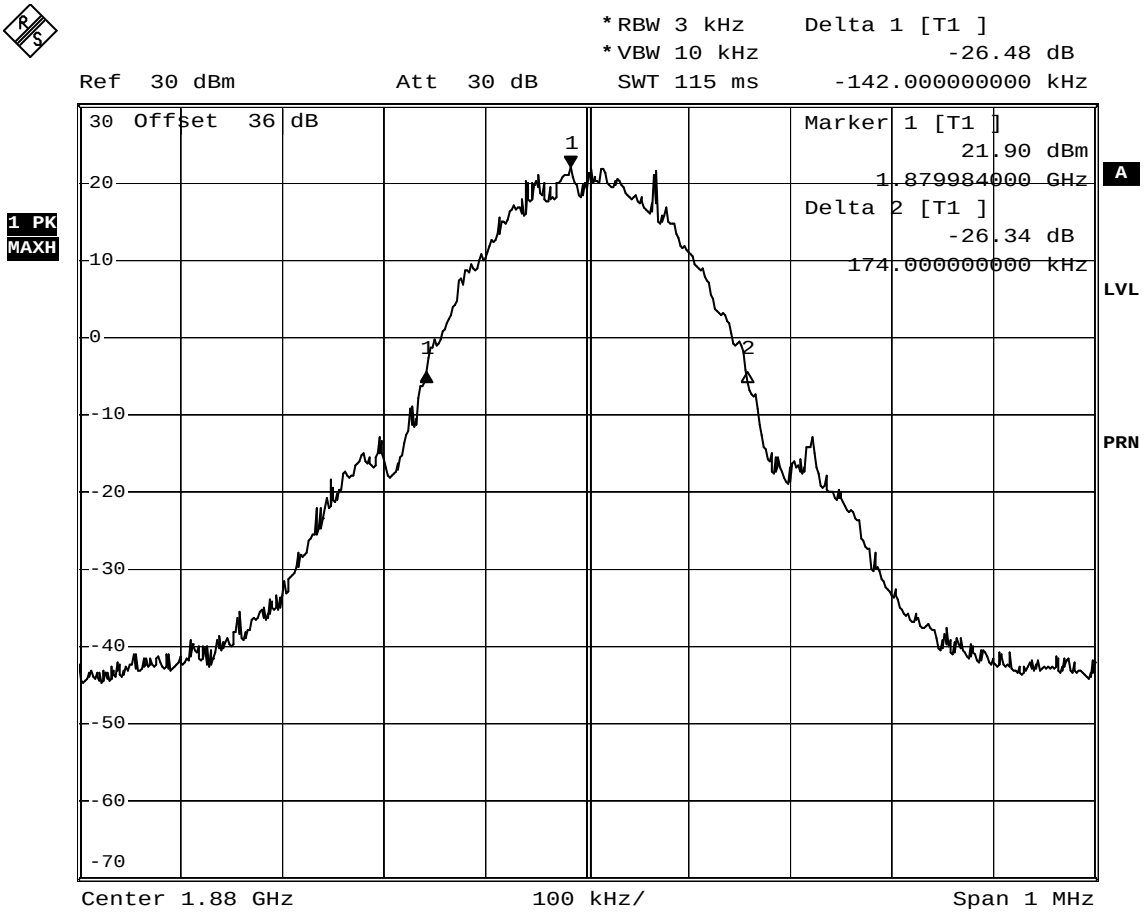


Date: 25.JUN.2007 14:19:23

Test: Occupied bandwidth, Channel 512 (1850.2 MHz)

Op. Mode

op-mode 2

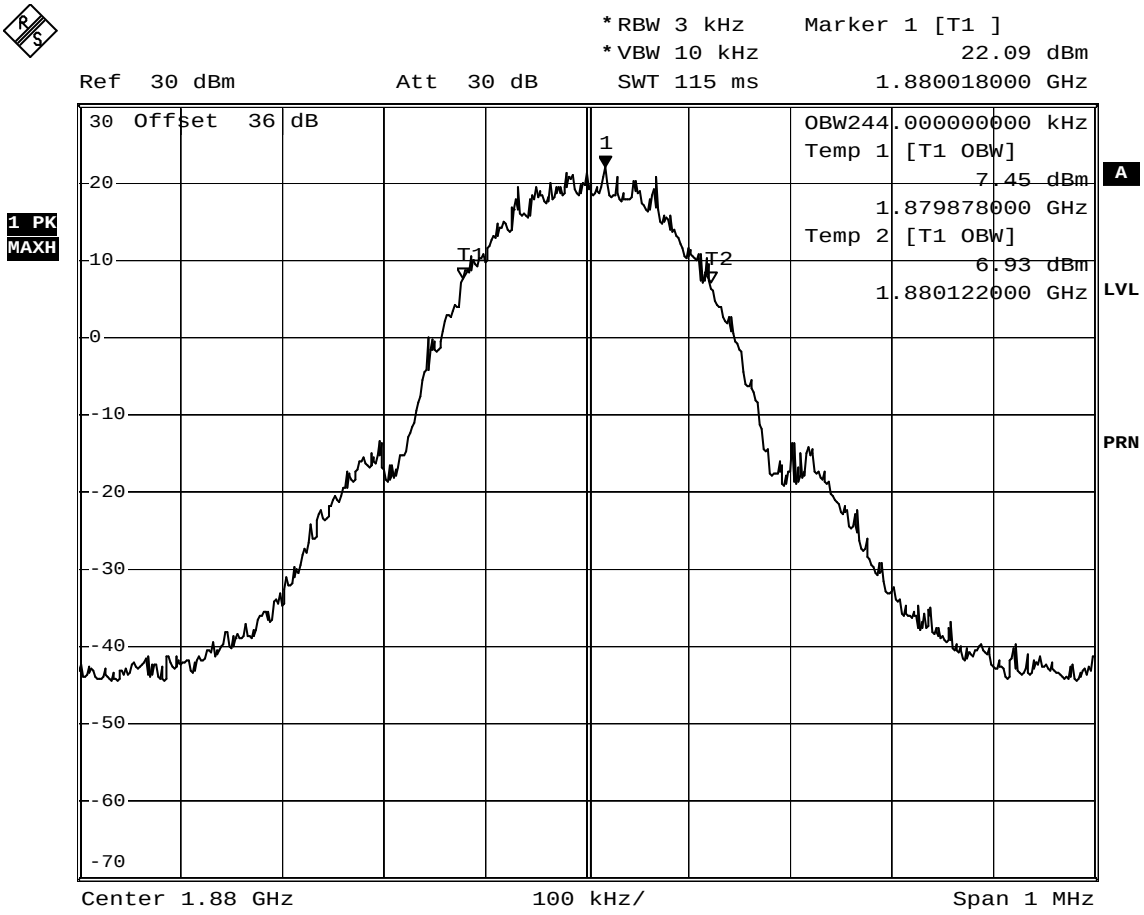


Date: 25.JUN.2007 14:22:08

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

Op. Mode

op-mode 2

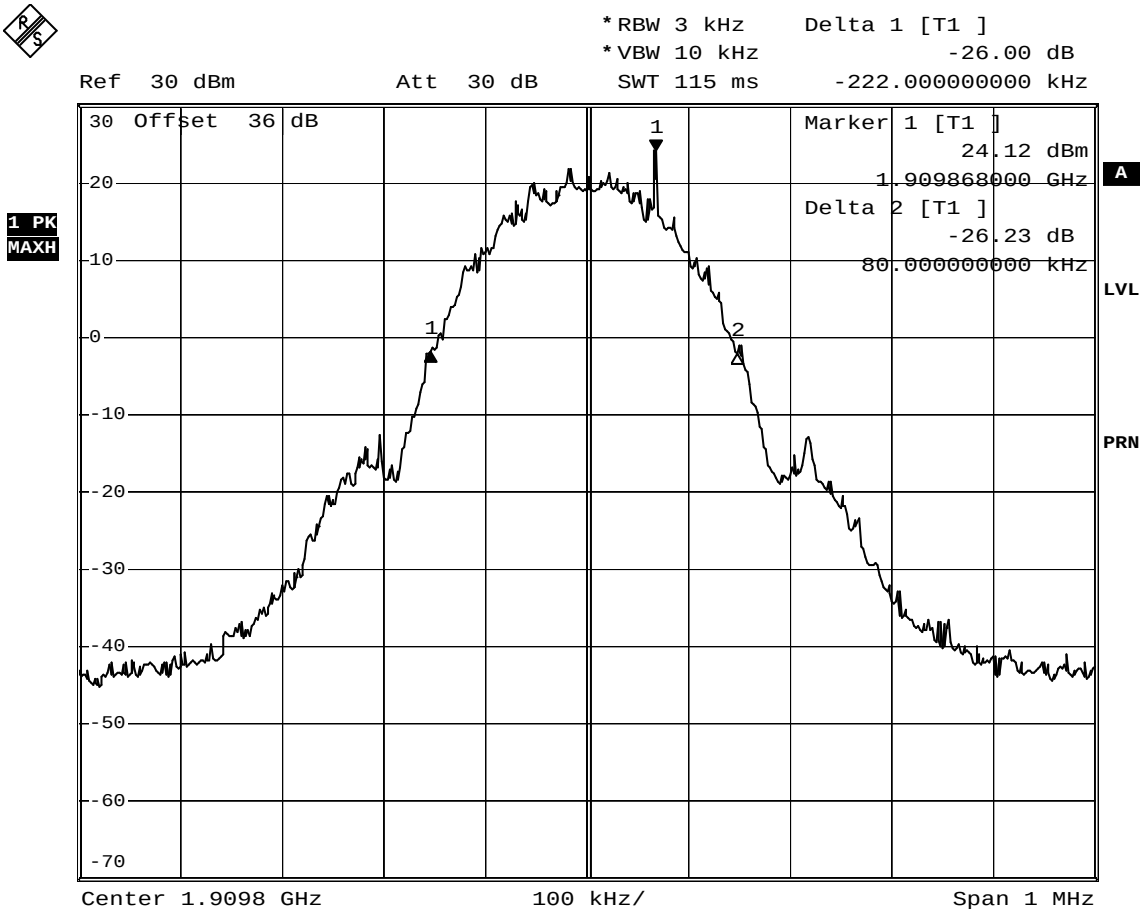


Date: 25.JUN.2007 14:23:56

Test: Occupied bandwidth, Channel 661 (1880.0 MHz)

Op. Mode

op-mode 3

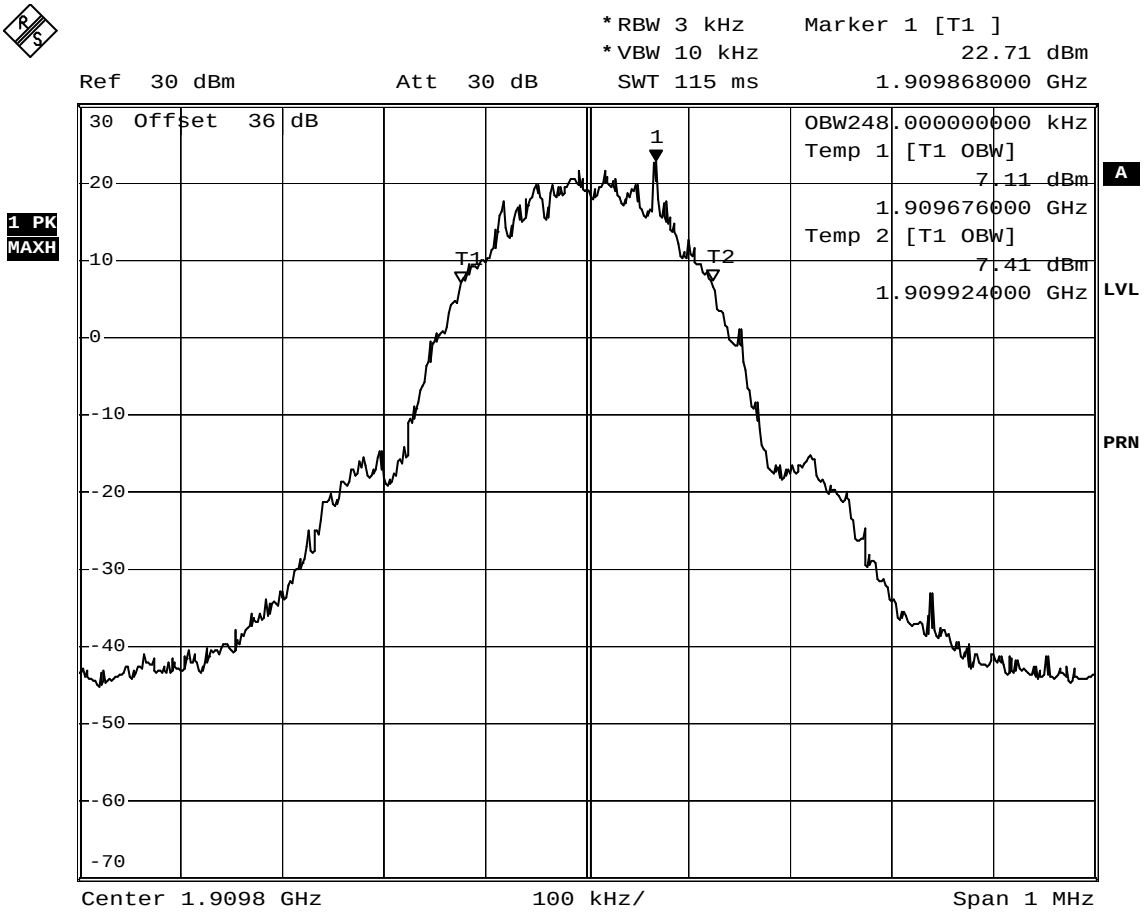


Date: 25.JUN.2007 14:26:25

Test: Emissions bandwidth (26 dB bandwidth), Channel 810 (1909.8 MHz)

Op. Mode

op-mode 3

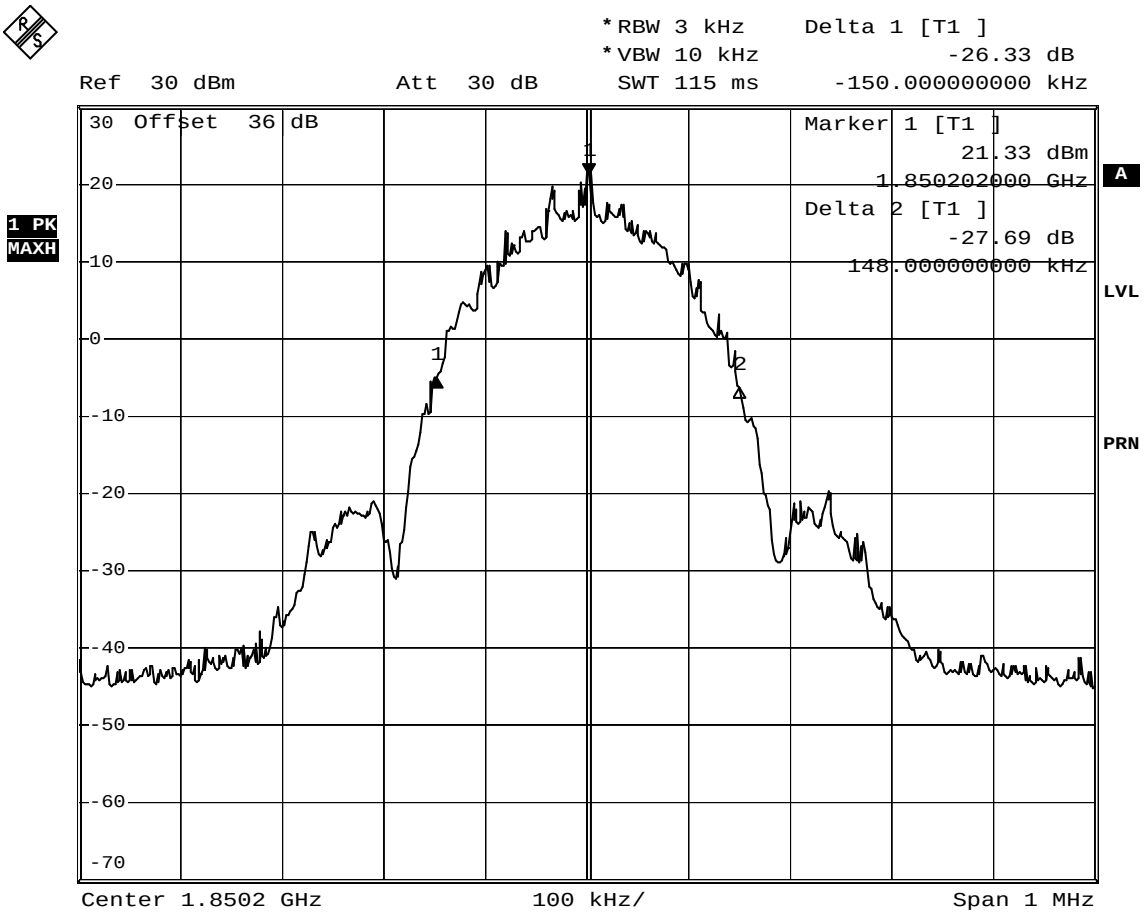


Date: 25.JUN.2007 14:28:18

Test: Occupied bandwidth, Channel 810 (1909.8 MHz)

Op. Mode

op-mode 4

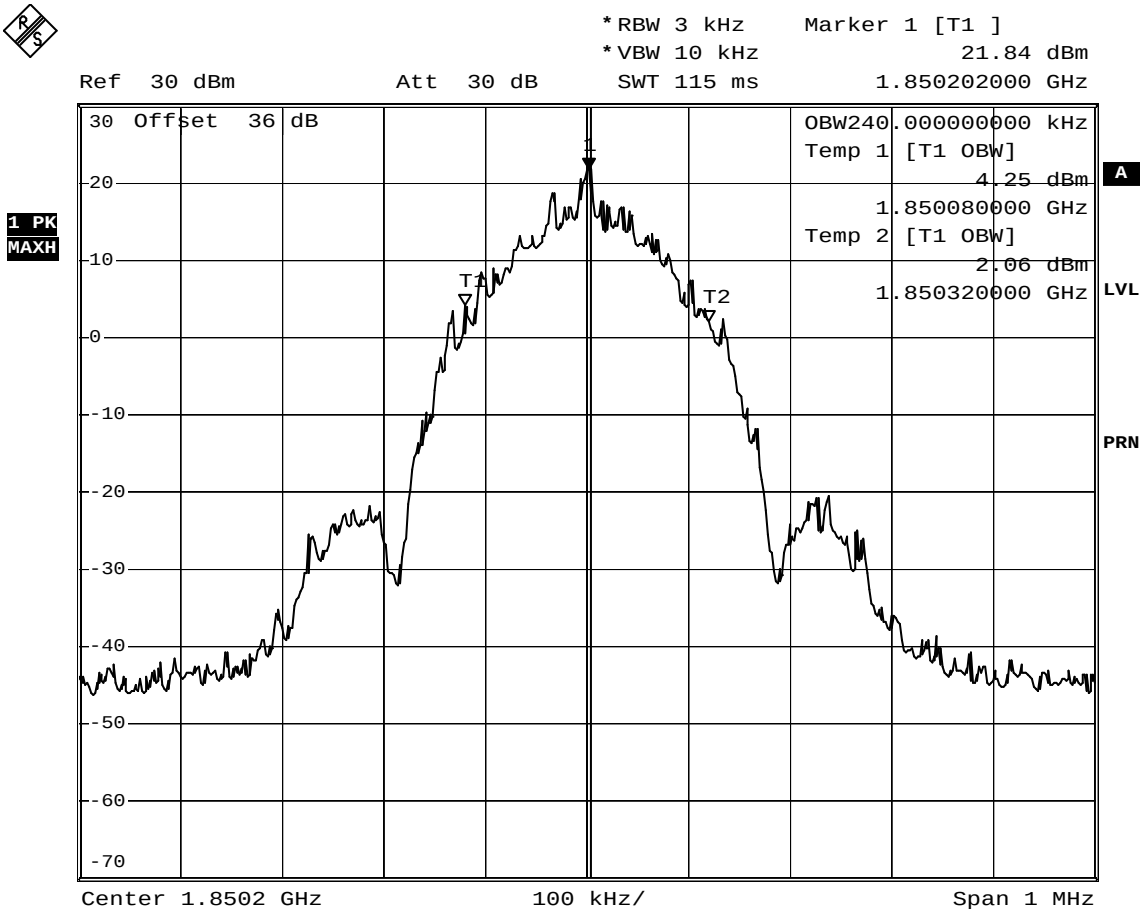


Date: 25.JUN.2007 13:59:55

Test: Emissions bandwidth (26 dB bandwidth), Channel 512 (1850.2 MHz)

Op. Mode

op-mode 4

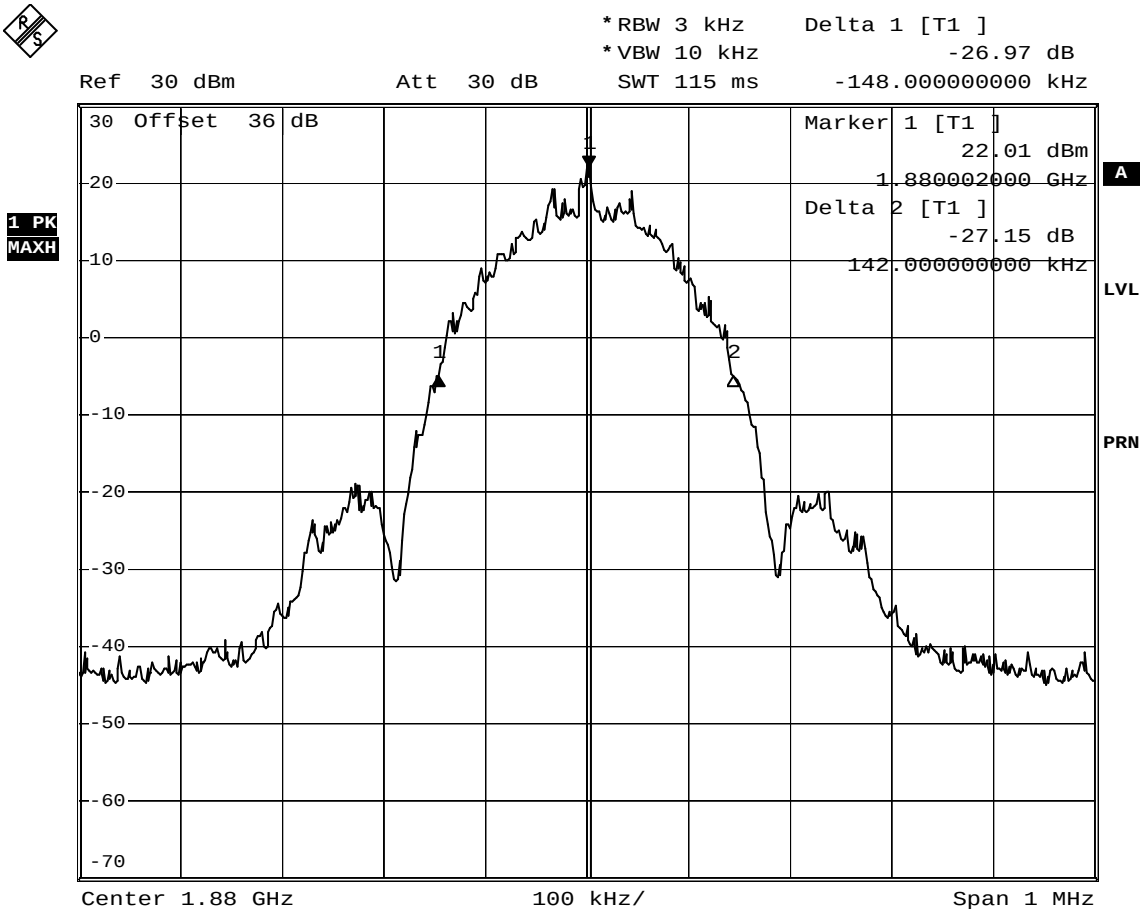


Date: 25.JUN.2007 14:01:07

Test: Occupied bandwidth, Channel 512 (1850.2 MHz)

Op. Mode

op-mode 5

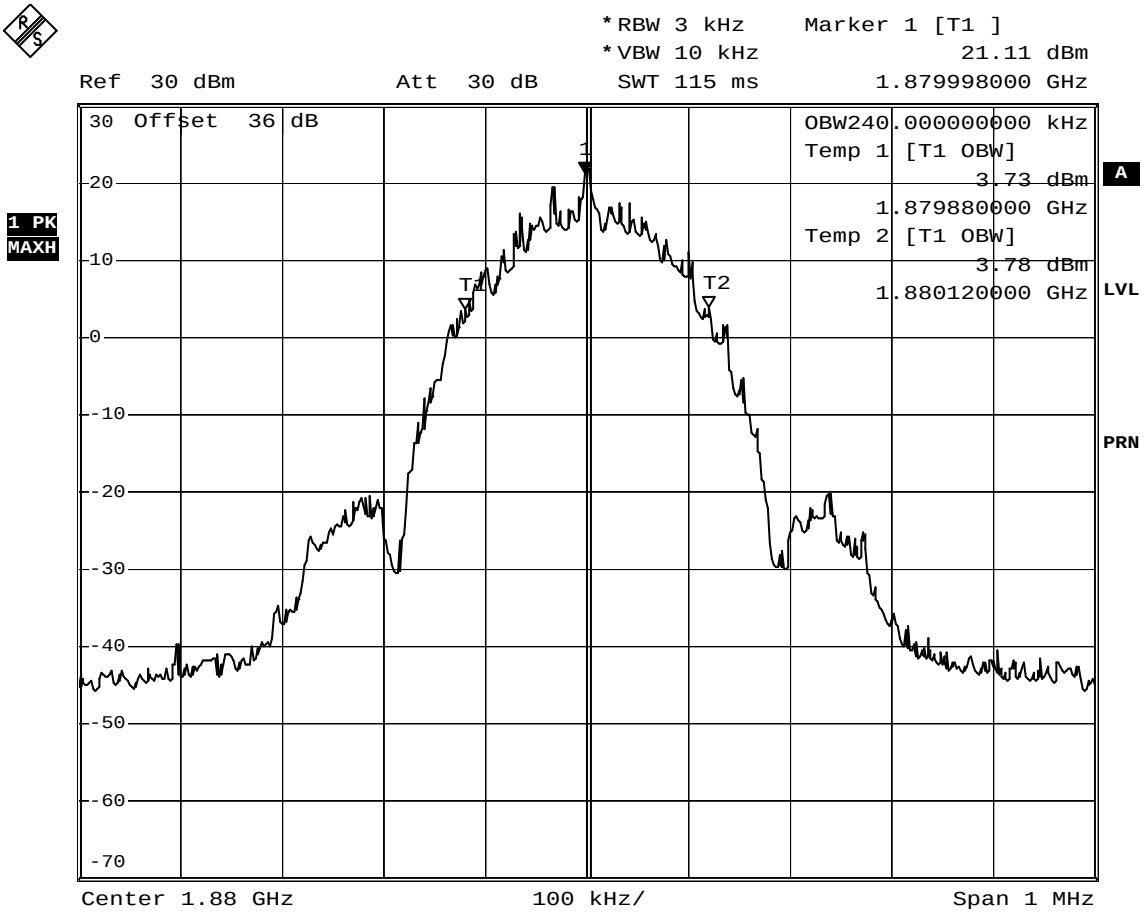


Date: 25.JUN.2007 14:05:09

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

Op. Mode

op-mode 5

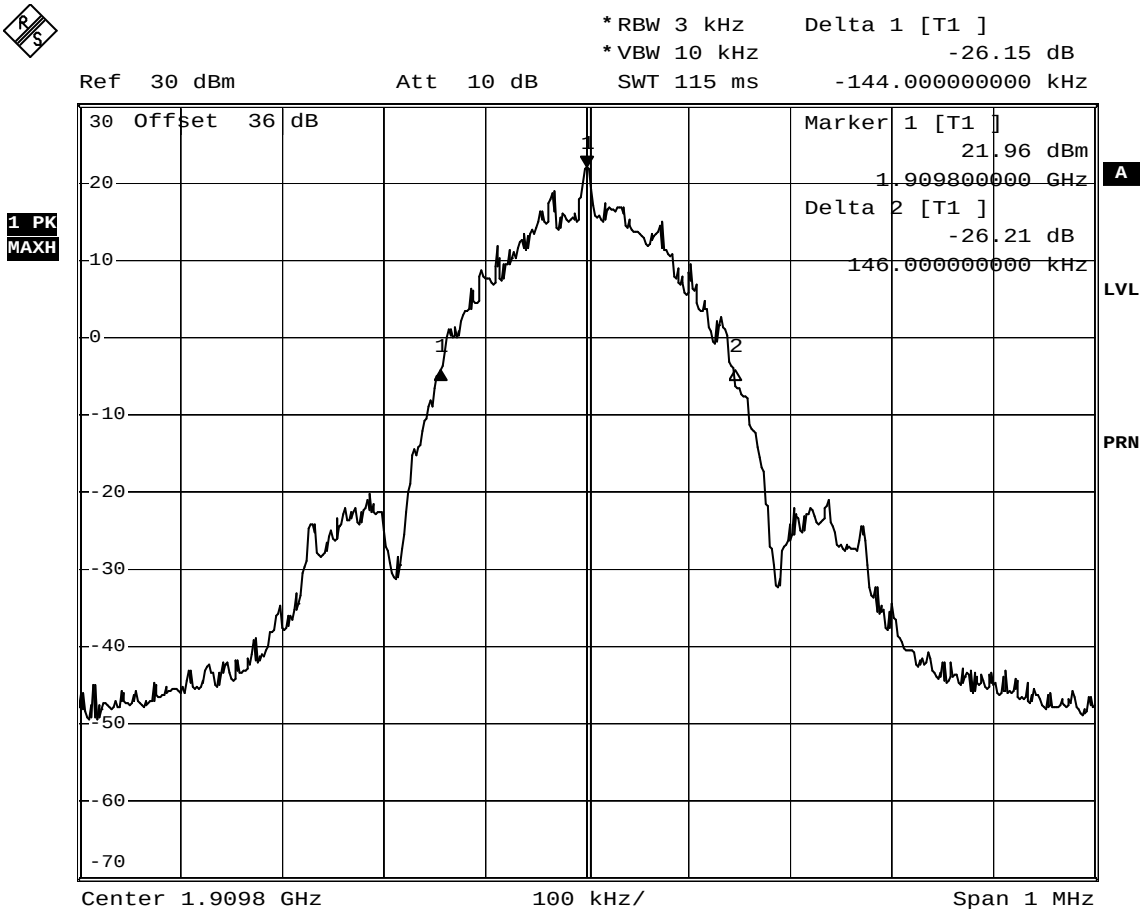


Date: 25.JUN.2007 14:06:51

Test: Occupied bandwidth, Channel 661 (1880.0 MHz)

Op. Mode

op-mode 6

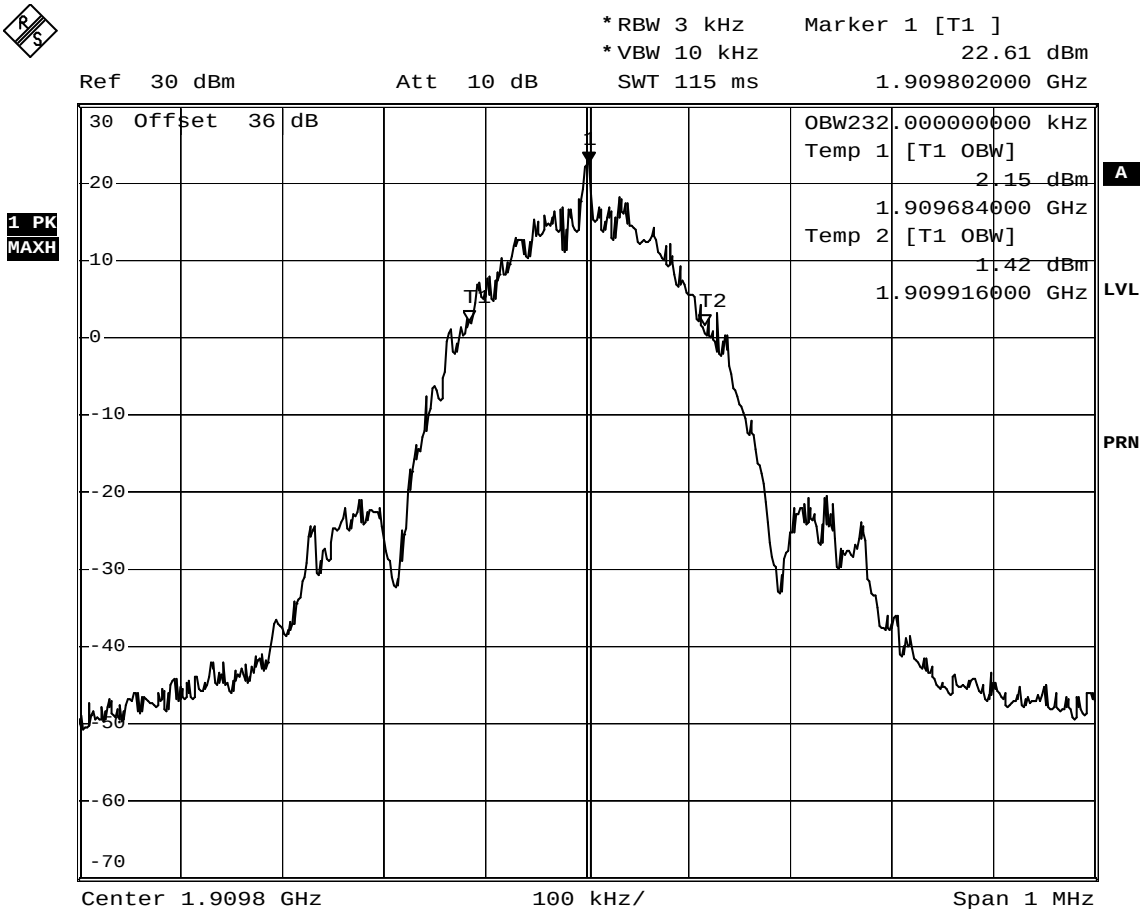


Date: 25.JUN.2007 14:09:56

Test: Emissions bandwidth (26 dB bandwidth), Channel 810 (1909.8 MHz)

Op. Mode

op-mode 6

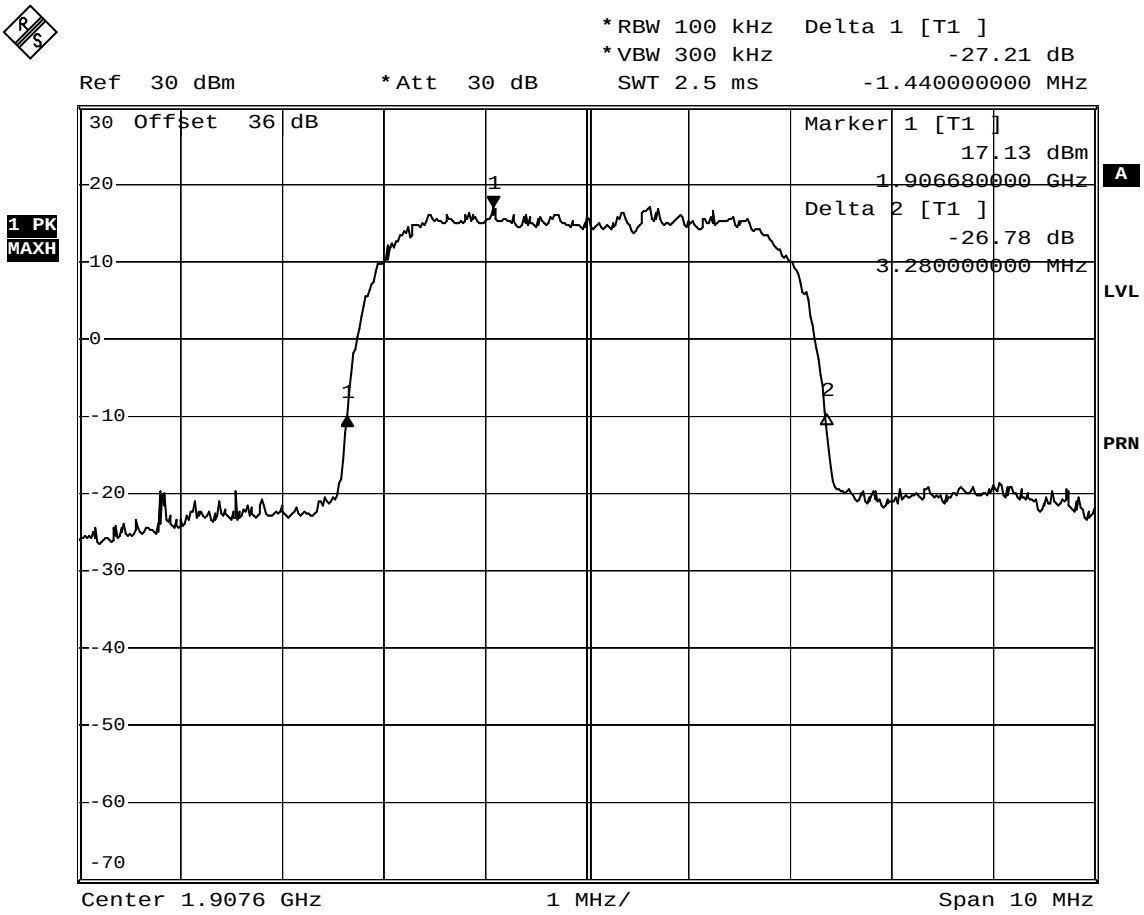


Date: 25.JUN.2007 14:11:03

Test: Occupied bandwidth, Channel 810 (1909.8 MHz)

Op. Mode

op-mode 7

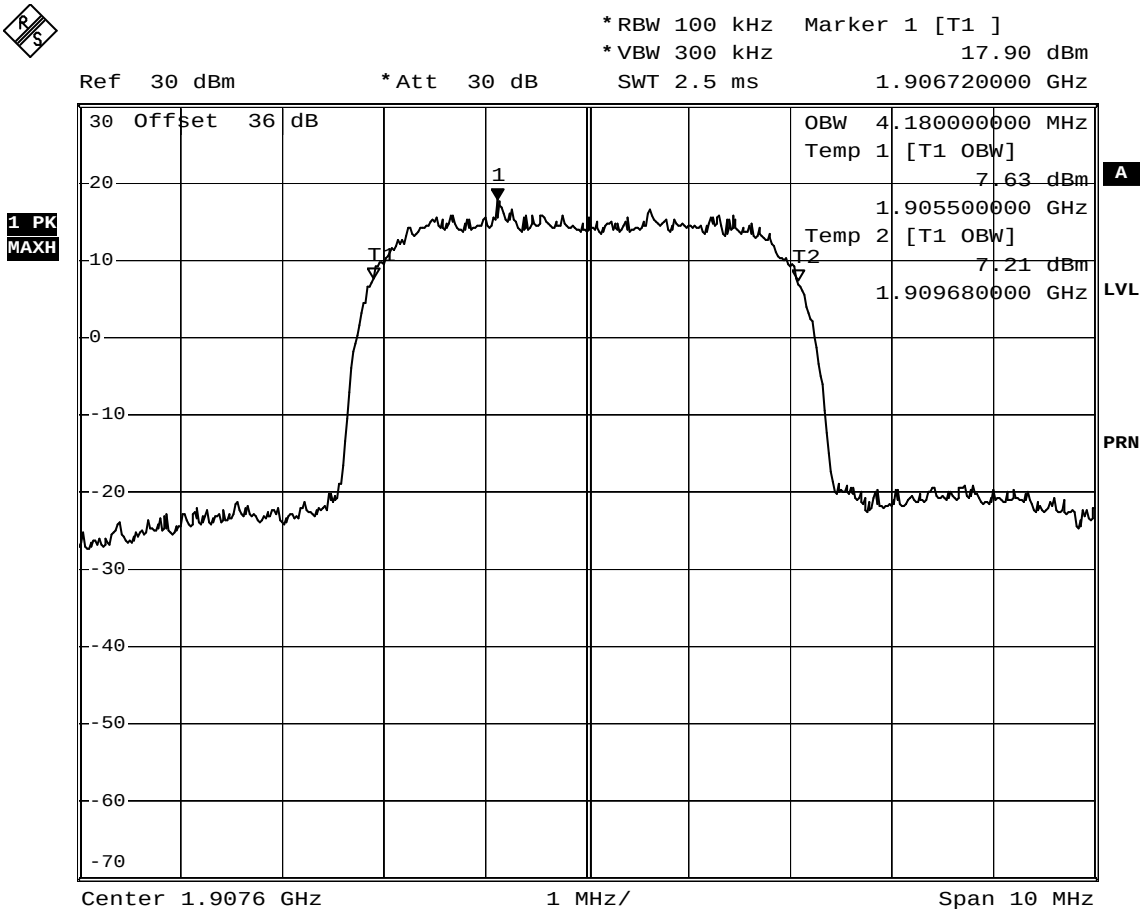


Date: 27.JUN.2007 08:24:20

Test: Emissions bandwidth (26 dB bandwidth), Channel 9262 (1852.4 MHz)

Op. Mode

op-mode 7

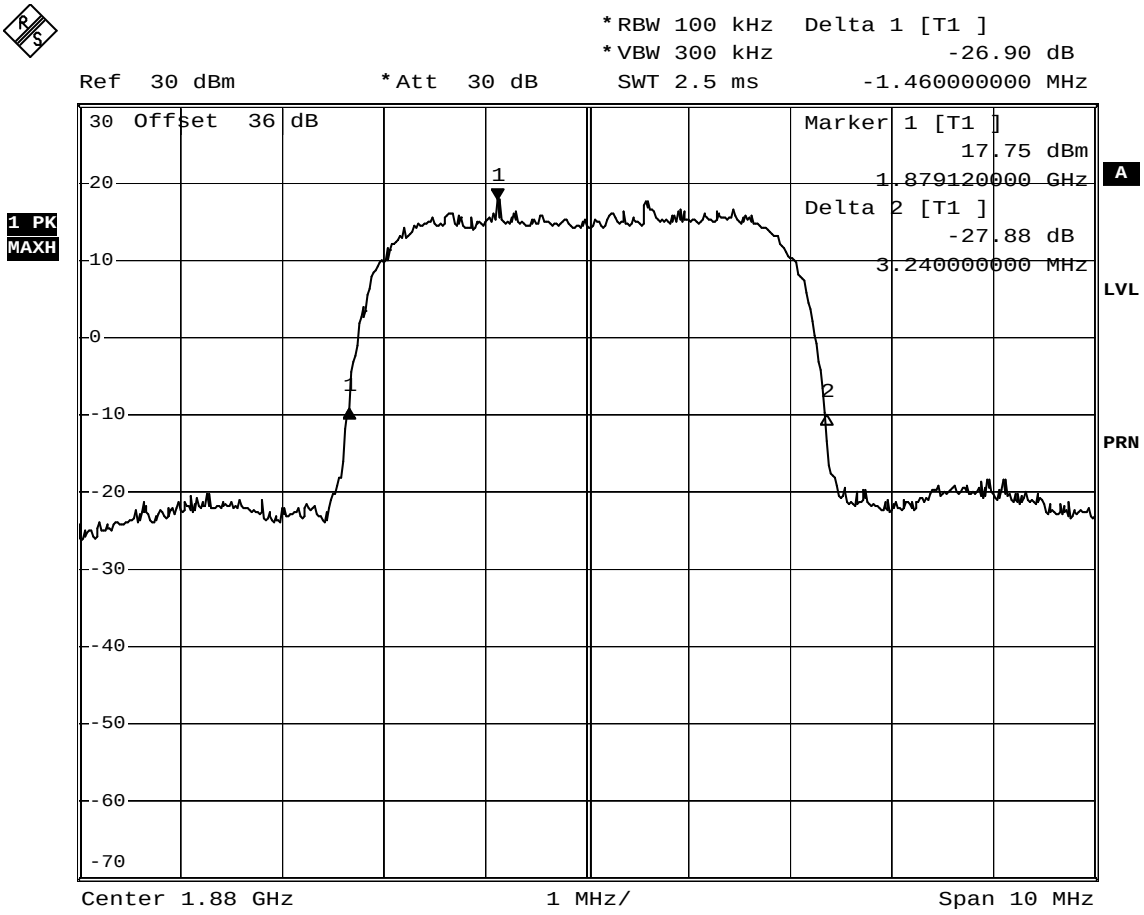


Date: 27.JUN.2007 08:24:59

Test: Occupied bandwidth, Channel 9262 (1852.4 MHz)

Op. Mode

op-mode 8

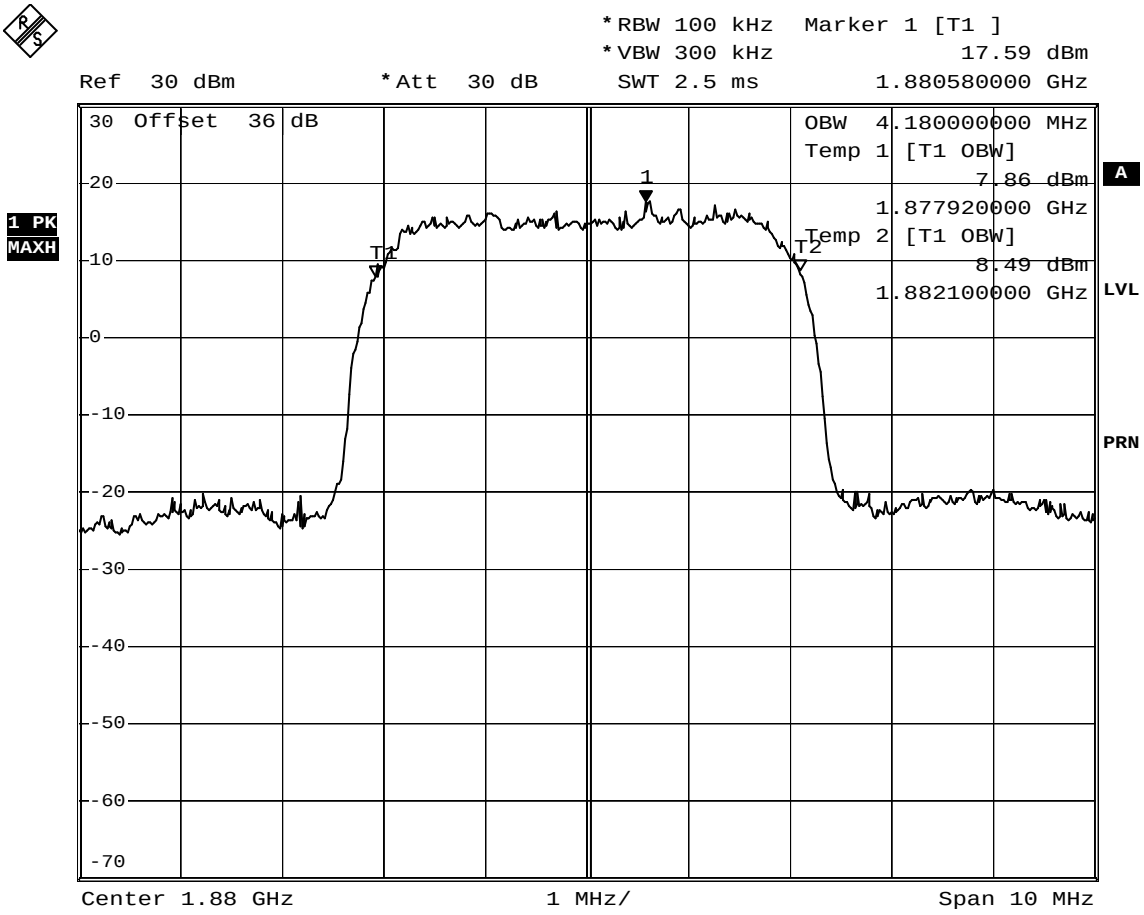


Date: 27.JUN.2007 08:26:06

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

Op. Mode

op-mode 8

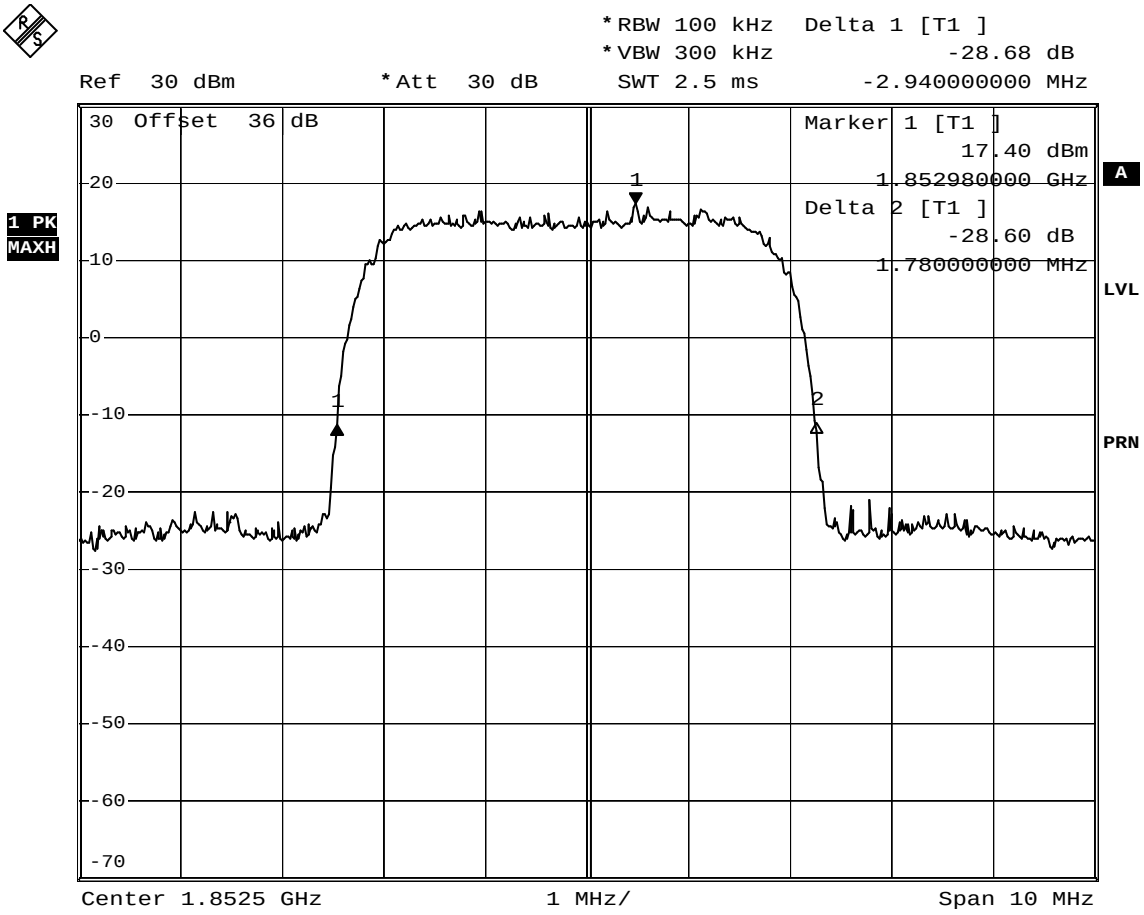


Date: 27.JUN.2007 08:27:09

Test: Occupied bandwidth, Channel 9400 (1880.0 MHz)

Op. Mode

op-mode 9

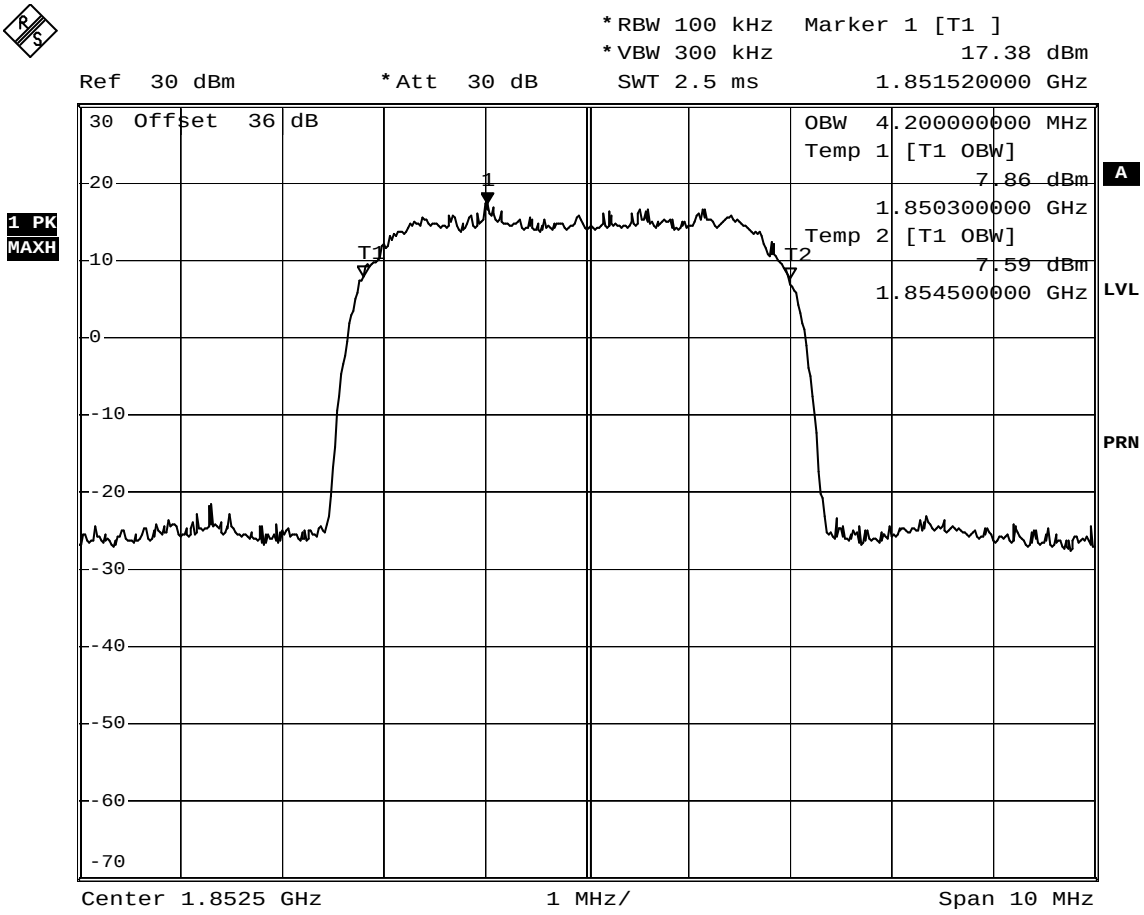


Date: 27.JUN.2007 08:28:27

Test: Emissions bandwidth (26 dB bandwidth), Channel 9538 (1907.6 MHz)

Op. Mode

op-mode 9



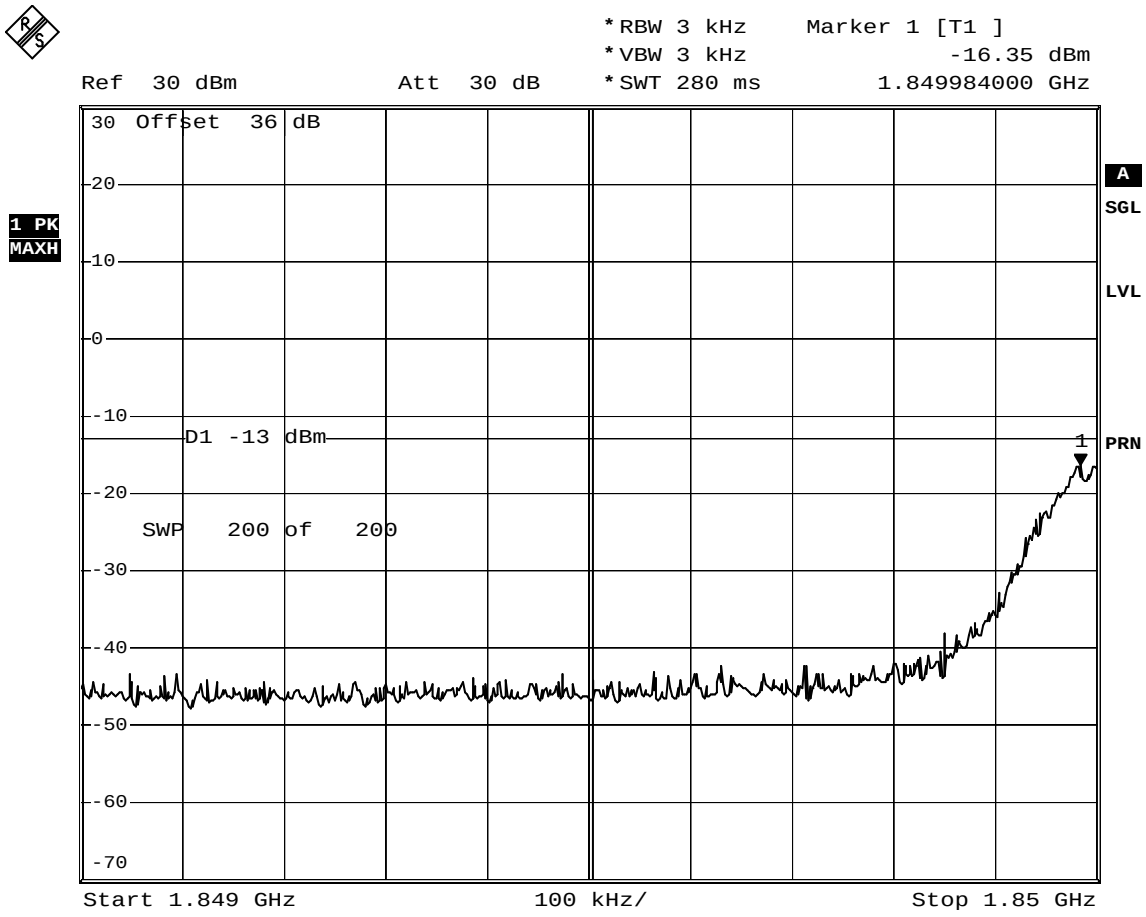
Date: 27.JUN.2007 08:29:38

Test: Occupied bandwidth, Channel 9538 (1907.6 MHz)

Measurement plots Band edge compliance

Op. Mode

op-mode 1

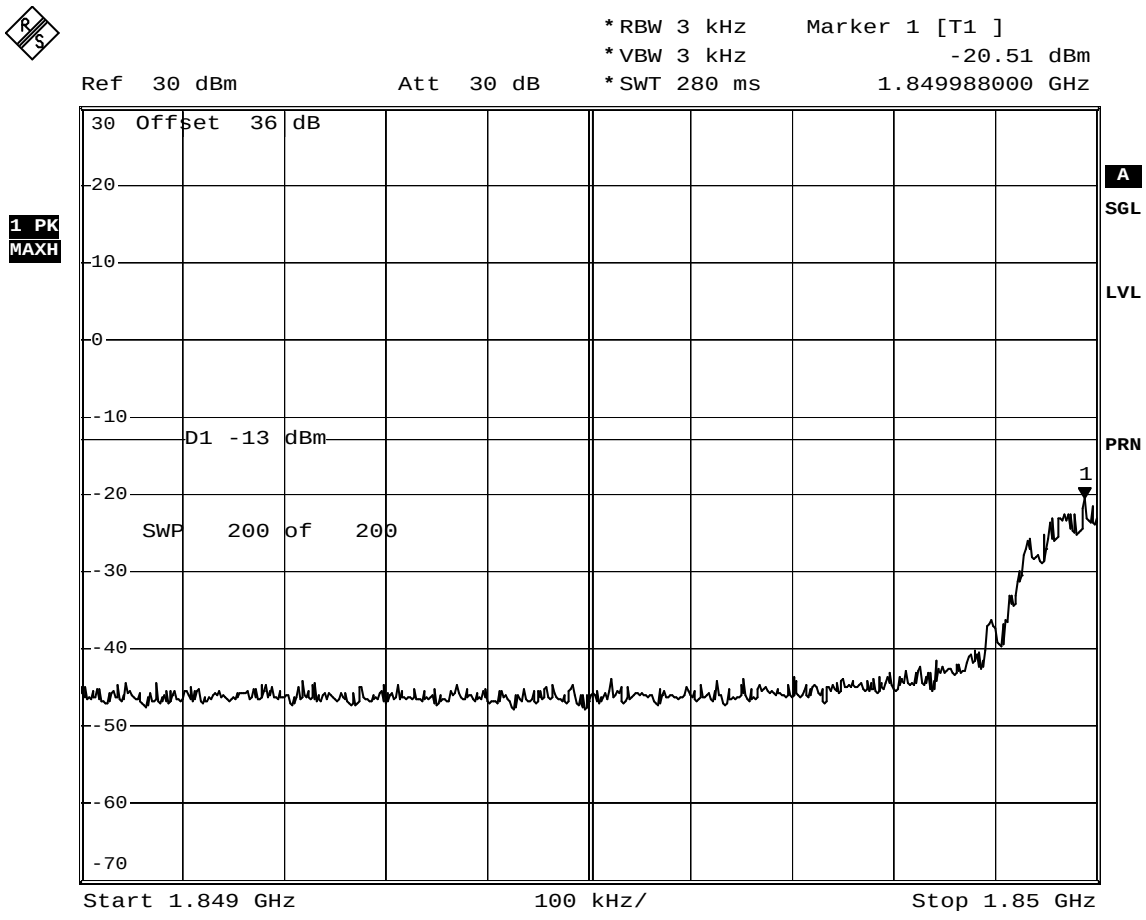


Date: 25.JUN.2007 13:44:53

Test: band edge compliance , Channel 512, PCS

Op. Mode

op-mode 4

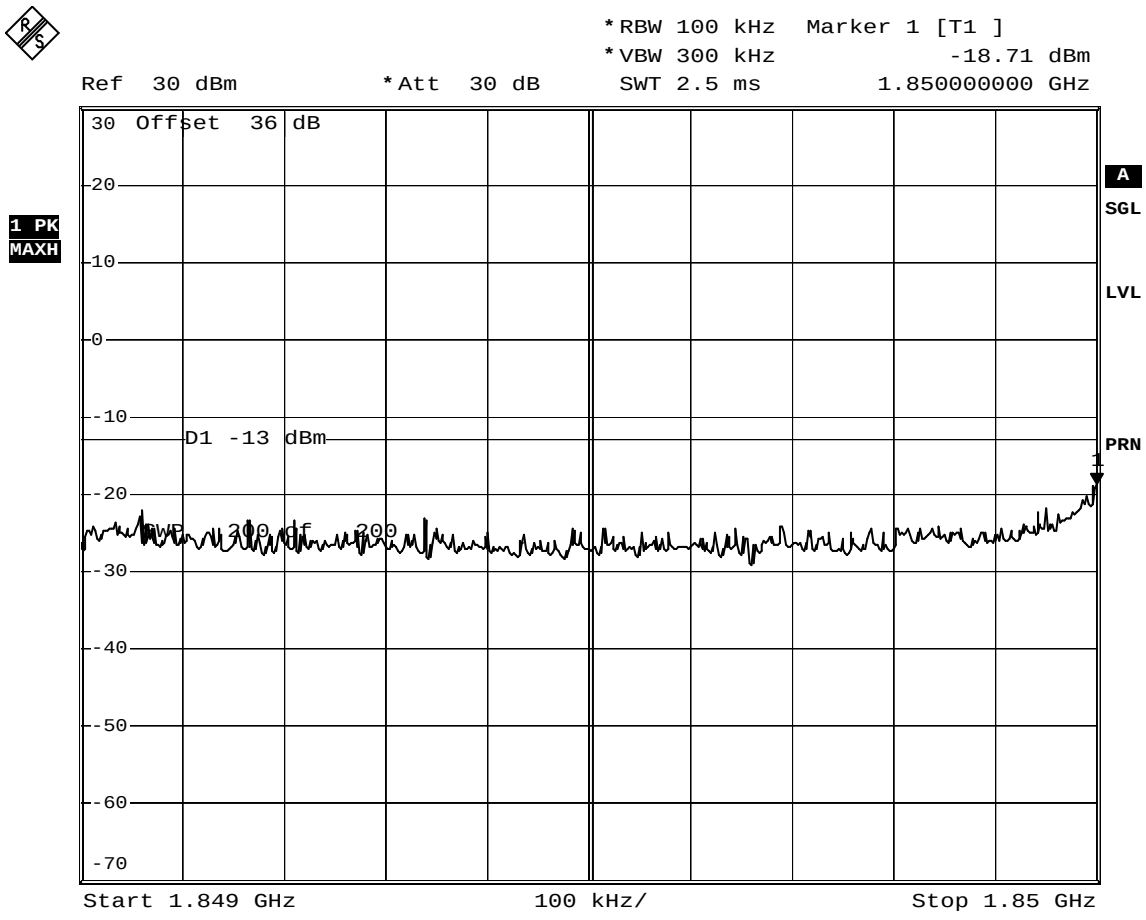


Date: 25.JUN.2007 13:53:37

Test: band edge compliance , Channel 512, EDGE

Op. Mode

op-mode 7

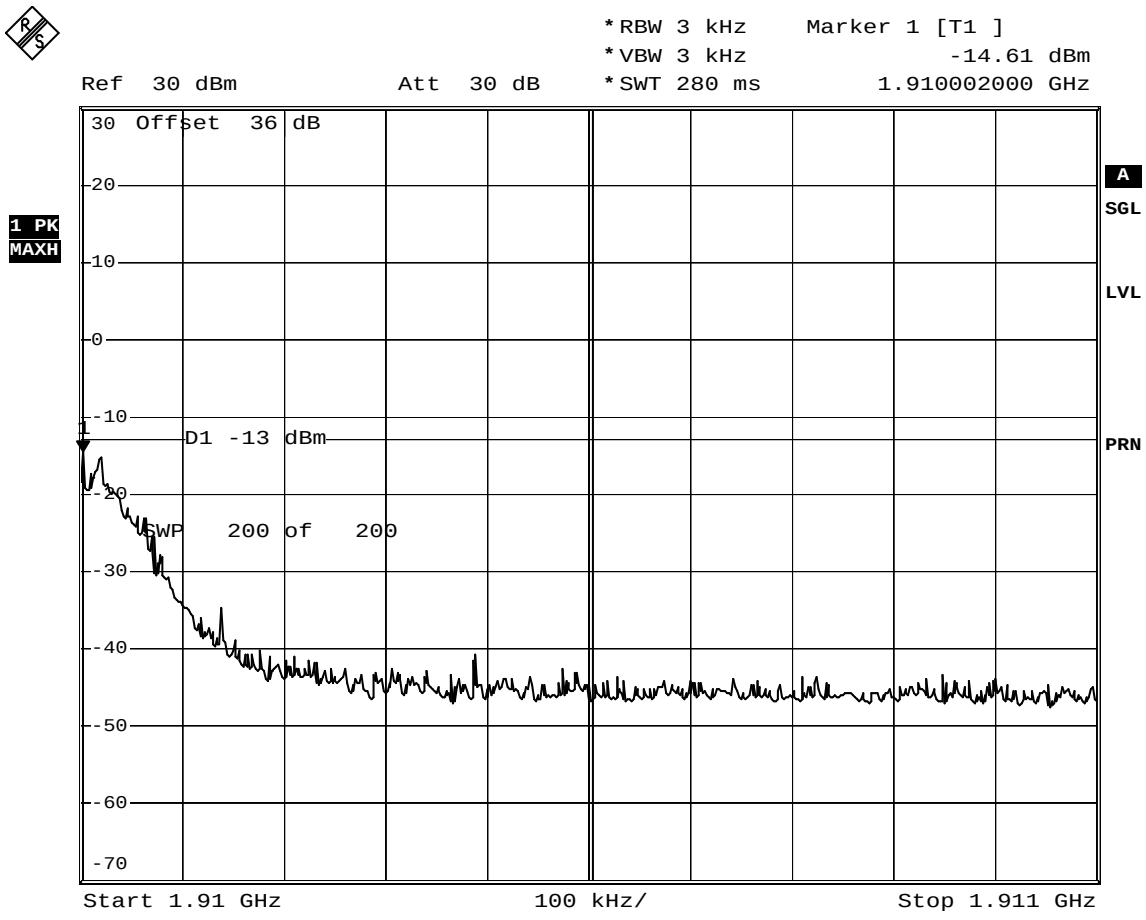


Date: 27.JUN.2007 08:17:53

Test: band edge compliance , Channel 9262, FDD II

Op. Mode

op-mode 3

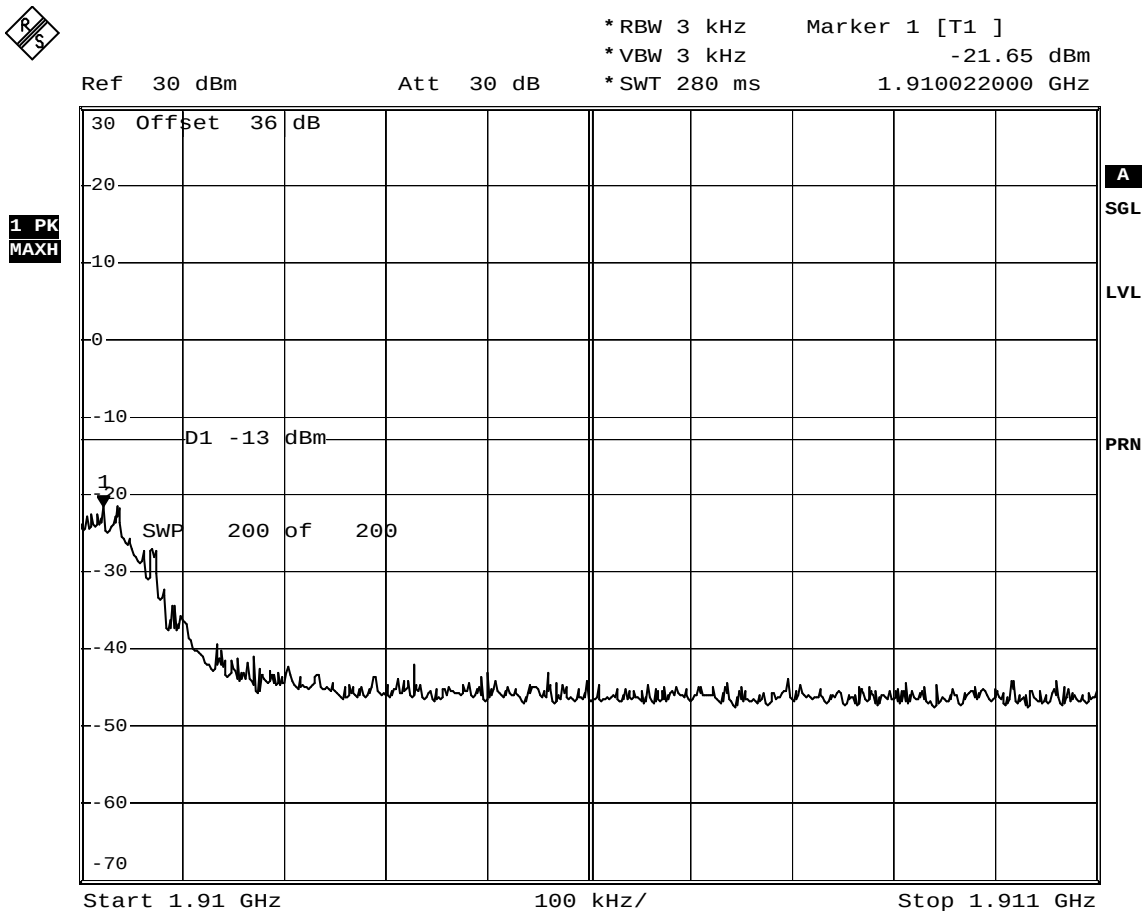


Date: 25.JUN.2007 13:47:00

Test: band edge compliance, Channel 810, PCS

Op. Mode

op-mode 6

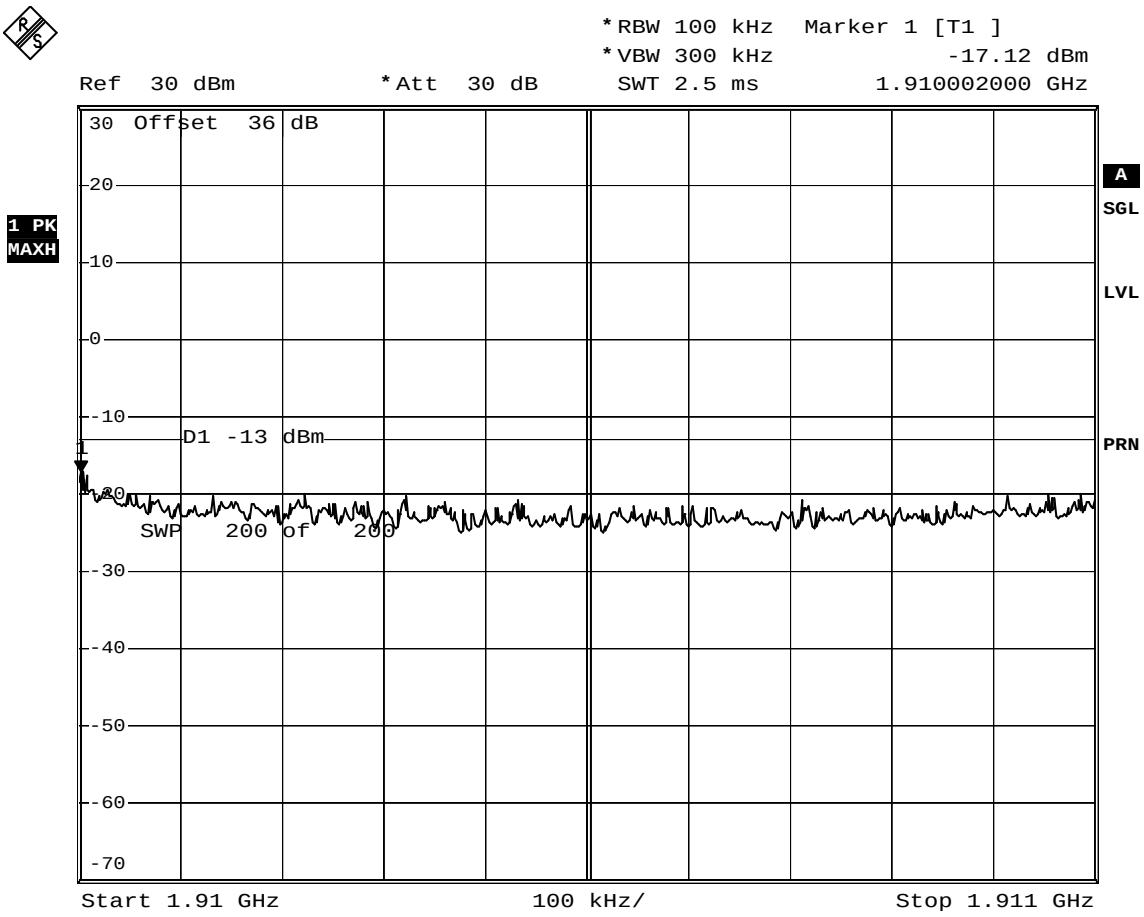


Date: 25.JUN.2007 13:51:07

Test: band edge compliance, Channel 810, EDGE

Op. Mode

op-mode 9



Date: 27.JUN.2007 08:19:30

Test: band edge compliance, Channel 9538, FDD II

InterLab®

FCC Measurement/Technical Report on

GSM/UMTS Module
MO0301

Report Reference: MDE_Opti_0709_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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Table of Contents

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

Part 22
Subpart H – Cellular Radiotelephone Service

Part 24
Subpart E - Broadband PCS

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 1-6	Setup_a01	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**
			N/P
Field strength of spurious radiation			
The measurement was performed according to FCC §2.1053			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
			N/P
Emission and Occupied Bandwidth			
The measurement was performed according to FCC §2.1049			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
			N/P
Band edge compliance			
The measurement was performed according to FCC §24.238			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
			N/P

N/P: not performed

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:	2007-07-20

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Receipt of EUT:	See chapter 2.2
Date of Test(s):	2007-08-10
Date of Report:	2007-08-13

1.3 Applicant Data

Company Name:	Option NV
Address:	Gaston Geenslaan 14 3001 Leuven Belgium
Contact Person:	Mr. Lodeweyckx

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:	MO0301
Kind of Device:	GSM 850/900/1800/1900 + UTRA FDD I/II/V
(optional)	including HSDPA
Voltage Type:	DC
Nominal Voltage:	3.6 V
Maximum Voltage:	3.6 V
Minimum Voltage:	3.0 V

General product description:

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

The EUT provides the following ports:

Ports
antenna connector
enclosure

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: 37250f01) Remark: none	GSM/UMTS Module	MO0301	PE2476C0BG	2.0	2.5	2007-06-18

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	Test Cradle	Cobra SPQ Cradle	V 1.0	-	-	-

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 + AE1	

2.5 Operating Modes

This chapter describes the operating modes of the EUT's used for testing.

Op. Mode	Description of Operating Modes	Remarks
	UTRA FDD II HSDPA	
op-mode 1	Call established on Traffic Channel (TCH) 9262, Carrier Frequency 1852.4 MHz	9262 is the lowest channel FDD II data call
op-mode 2	Call established on Traffic Channel (TCH) 9400, Carrier Frequency 1880 MHz	9400 is a mid channel FDD II data call
op-mode 3	Call established on Traffic Channel (TCH) 9538, Carrier Frequency 1907.6 MHz	9538 is the highest channel FDD II data call
	UTRA FDD V HSDPA	
op-mode 4	Call established on Traffic Channel (TCH) 4132, Carrier Frequency 826.4 MHz	4132 is the lowest channel FDD V data call HSUPA
op-mode 5	Call established on Traffic Channel (TCH) 4183, Carrier Frequency 836.6 MHz	4183 is a mid channel FDD V data call HSUPA
op-mode 6	Call established on Traffic Channel (TCH) 4233, Carrier Frequency 846.6 MHz	4233 is the highest channel FDD V data call HSUPA

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: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_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, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c , and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_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 22, 10-1-06 Subpart H	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

For performing the output power measurement the test system TS8950 GW by Rohde & Schwarz was used, 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.

§22.913 Effective radiated power limits

(a) Maximum ERP. … The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

§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: 21 °C
Air Pressure: 1010 hPa
Humidity: 35 %

Op. Mode	Setup	Port
see table below	a01	antenna connector

subtest	op-mode	max. output power/dBm (RMS)
1	4	21.5
1	5	21.3
1	6	21.9
2	4	21.6
2	5	21.3
2	6	22.2
3	4	21.4
3	5	21.4
3	6	22.2
4	4	21.5
4	5	21.4
4	6	22.1

Remark: none

Temperature: 21 °C
Air Pressure: 1010 hPa
Humidity: 35 %

Op. Mode	Setup	Port
see table below	a01	antenna connector

subtest	op-mode	max. output power/dBm (RMS)
1	1	21.1
1	2	20.9
1	3	21.4
2	1	21.2
2	2	20.9
2	3	21.7
3	1	21.2
3	2	21.0
3	3	21.8
4	1	21.2
4	2	22.2
4	3	20.2

Remark: none

3.1.4 Test result: RF Power Output

Test Setup	Result
a01	passed

4 Test Equipment

TS8950GW

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

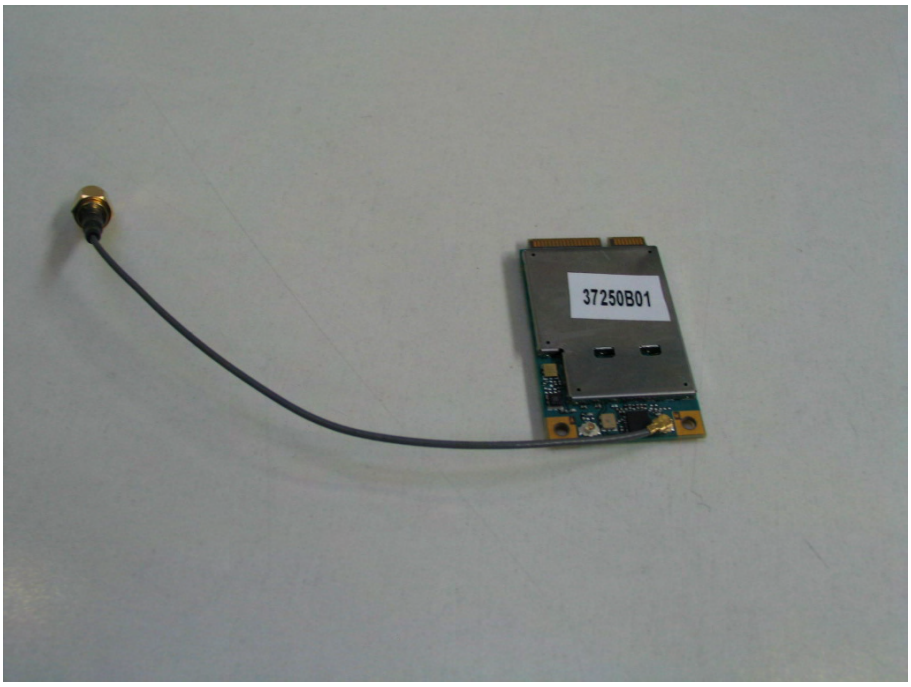

Photo 1: EUT (front side)

Photo 2: EUT (front side)

Photo 3: EUT (rear side)

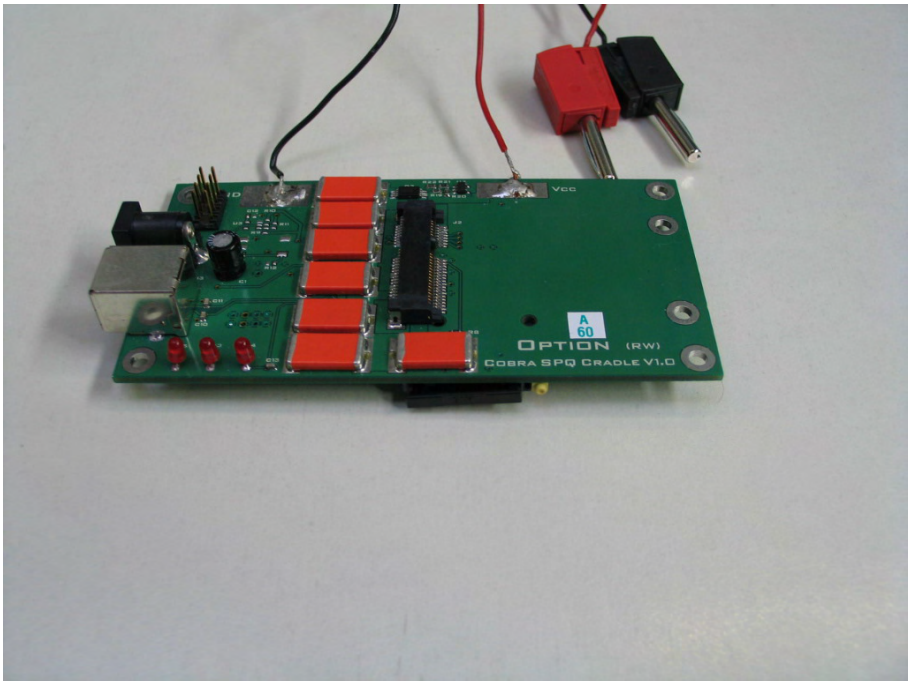

Photo 4: Test cradle Cobra SPQ

InterLab®

FCC Measurement/Technical Report on

GSM / UMTS module MO0301

Report Reference: MDE_Opti_0709_FCCg

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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Table of Contents

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 22
Subpart C – Operational and Technical Requirements

§ 22.355 Frequency tolerance

Subpart H – Cellular Radiotelephone Service

§ 22.913 Effective radiated power limits

§ 22.917 Emission limitations for cellular equipment

Summary Test

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_a01	antenna connector	passed
op-mode 2	Setup_a01	antenna connector	passed
op-mode 3	Setup_a01	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**
			N/P
Field strength of spurious radiation			
The measurement was performed according to FCC §2.1053			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
			N/P
Emission and Occupied Bandwidth			
The measurement was performed according to FCC §2.1049			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_a01	antenna connector	passed
op-mode 2	Setup_a01	antenna connector	passed
op-mode 3	Setup_a01	antenna connector	passed
Band edge compliance			
The measurement was performed according to FCC §2.1053			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_a01	antenna connector	passed
op-mode 3	Setup_a01	antenna connector	passed

N/P – not performed

The tests were selected by the customer. As a signalling unit a CMU200 by R&S was provided by the customer and used for carrying out the tests. The settings of the CMU200 were provided by the customer, too. The HSUPA software on the CMU200 is a beta version by R&S, version 4x50. The test "RF power output" was performed with all five subtests. For all other tests subtest 5 were chosen.

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:	2007-08-29

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Robert Machulec
Receipt of EUT:	2007-10-01
Date of Test(s):	2007-10-01
Date of Report:	2007-10-04

1.3 Applicant Data

Company Name:	Option NV
Address:	Gaston Geenslaan 14 3001 Leuven Belgium
Contact Person:	Mr. Lodeweyckx

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:	MO0301
Kind of Device:	GSM 850/900/1800/1900 + UTRA FDD I/II/V
(optional)	including HSDPA + HSUPA
Voltage Type:	DC
Nominal Voltage:	3.6 V
Maximum Voltage:	3.6 V
Minimum Voltage:	3.0 V

General product description:

The Equipment under Test (EUT) is a data card that supports GSM/EDGE 850/900/1800/1900 and FDD I, II and V with HSDPA and HSUPA.
The manufacturer declared that nominal voltage is equal to high voltage.

In GSM 850 mode the EUT operates in channel blocks A and B from 824.2 MHz (lowest channel = 128) to 848.8 MHz (highest channel = 251).

In FDD V mode the EUT operates in channel blocks A and B from 826.4 MHz (lowest channel = 4132) to 846.6 MHz (highest channel = 4233).

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: 37250B03)	GSM/UMTS Module	MO0301	049419	2.0	2.7.2	2007-08-14
Remark: EUT A is equipped with a temporary 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	Test Cradle	Cobra SPQ Cradle	V 1.0	-	-	-

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 + AE1	setup for conducted tests

2.5 Operating Modes

This chapter describes the operating modes of the EUT's used for testing.

Op. Mode	Description of Operating Modes	Remarks
	FDD V HSUPA call	
op-mode 1	Call established on Traffic Channel (TCH) 4132, Carrier Frequency 826.4 MHz	4132 is the lowest channel FDD V data call
op-mode 2	Call established on Traffic Channel (TCH) 4183, Carrier Frequency 836.6 MHz	4183 is a mid channel FDD V data call
op-mode 3	Call established on Traffic Channel (TCH) 4233, Carrier Frequency 846.6 MHz	4233 is the highest channel FDD V data call

The following parameter sets were provided by the customer:

3GPP TS 34.121-1 V7.5.0 (2007-06)

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1)*	β_{ec}	β_{ed} *(Note 5)* *(Note 6)*	β_{ed} *(SF)*	β_{ed} *(Codes)*	CM *(dB)* *(Note 2)*	MPR *(dB)* *(Note 2)*	*AG Index* *(Note 6)*	*E-TFCI*
1	11/15 *(Note 3)*	15/15 *(Note 3)*	64	11/15 *(Note 3)*	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 *(Note 4)*	15/15 *(Note 4)*	64	15/15 *(Note 4)*	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 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 = 10/15 and β_d = 15/15.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 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 = 14/15 and β_d = 15/15.

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

3 Test Results

3.1 RF Power Output

Standard FCC Part 22, 10-1-06
Subpart H

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 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 CMU200 Digital Communication Tester.
3) A call was established on a Traffic Channel (TCH) between the EUT and the base station simulator (R&S 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 measured by using a spectrum analyser.

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.
§22.913 Effective radiated power limits
(a) Maximum ERP. … The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

3.1.3 Test Protocol

Temperature: 24 °C
Air Pressure: 1023 hPa
Humidity: 43 %

Op. Mode	Setup	Port
op-mode 1	setup_a01	antenna connector

Output power Nominal (dBm)	Output power Measured (dBm) Subtest 1	Output power Measured (dBm) Subtest 2	Output power Measured (dBm) Subtest 3	Output power Measured (dBm) Subtest 4	Output power Measured (dBm) Subtest 5
24	25.26	24.77	24.65	24.52	25.26

Remark: none

Op. Mode	Setup	Port
op-mode 2	setup_a01	antenna connector

Output power Nominal (dBm)	Output power Measured (dBm) Subtest 1	Output power Measured (dBm) Subtest 2	Output power Measured (dBm) Subtest 3	Output power Measured (dBm) Subtest 4	Output power Measured (dBm) Subtest 5
24	25.67	24.65	24.77	24.90	26.08

Remark: none

Op. Mode	Setup	Port
op-mode 3	setup_a01	antenna connector

Output power Nominal (dBm)	Output power Measured (dBm) Subtest 1	Output power Measured (dBm) Subtest 2	Output power Measured (dBm) Subtest 3	Output power Measured (dBm) Subtest 4	Output power Measured (dBm) Subtest 5
24	25.03	25.67	24.77	24.77	25.15

Remark: none

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

3.2 Emission and Occupied Bandwidth

Standard FCC Part 22, 10-1-06
Subpart H

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

3.2.1 Test Description

1) The EUT was coupled to the R&S Spectrum Analyser and the R&S 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 CMU200 Digital Communication Tester.

3) A call was established on a Traffic Channel (TCH) between the EUT and the base station simulator (R&S 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.

3.2.2 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.

3.2.3 Test Protocol

Temperature: 24 °C
Air Pressure: 1023 hPa
Humidity: 43 %

Op. Mode	Setup	Port
op-mode 1	setup_a01	antenna connector

Bandwidth kHz	Remarks
4770	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4208 kHz.

Op. Mode	Setup	Port
op-mode 2	setup_a01	antenna connector

Bandwidth kHz	Remarks
4749	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4188 kHz.

Op. Mode	Setup	Port
op-mode 3	setup_a01	antenna connector

Bandwidth kHz	Remarks
4749	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4208 kHz.

3.2.4 Test result: Emission and Occupied Bandwidth

FCC Part 22, Subpart H	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed

3.3 Band edge compliance

Standard FCC Part 22, 10-1-06
Subpart H

The test was performed according to: FCC §22.913, 10-1-06

3.3.1 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 / 100 kHz for FDD mode.

3.3.2 Test Requirements / Limits

§ 22.917 Emission limitations for cellular equipment

3.3.3 Test Protocol

Temperature: 24 °C
Air Pressure: 1023 hPa
Humidity: 43 %

Op. Mode	Setup	Port
op-mode 1	Setup_a01	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
824	-13.48	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 3	Setup_a01	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
849	-17.36	-13

Remark: Please see annex for the measurement plot.

3.3.4 Test result: Band edge compliance

FCC Part 22, Subpart H	Op. Mode	Result
	op-mode 1	passed
	op-mode 3	passed

4 Test Equipment

EUT Digital Signalling System provided by manufacturer

Equipment	Type	Serial No.	Manufacturer
Universal Radio Communication Tester	CMU 200	106914	Rohde & Schwarz

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

7 layers Bluetooth™ Full RF Test Solution

Bluetooth RF Conformance Test System TS8960

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

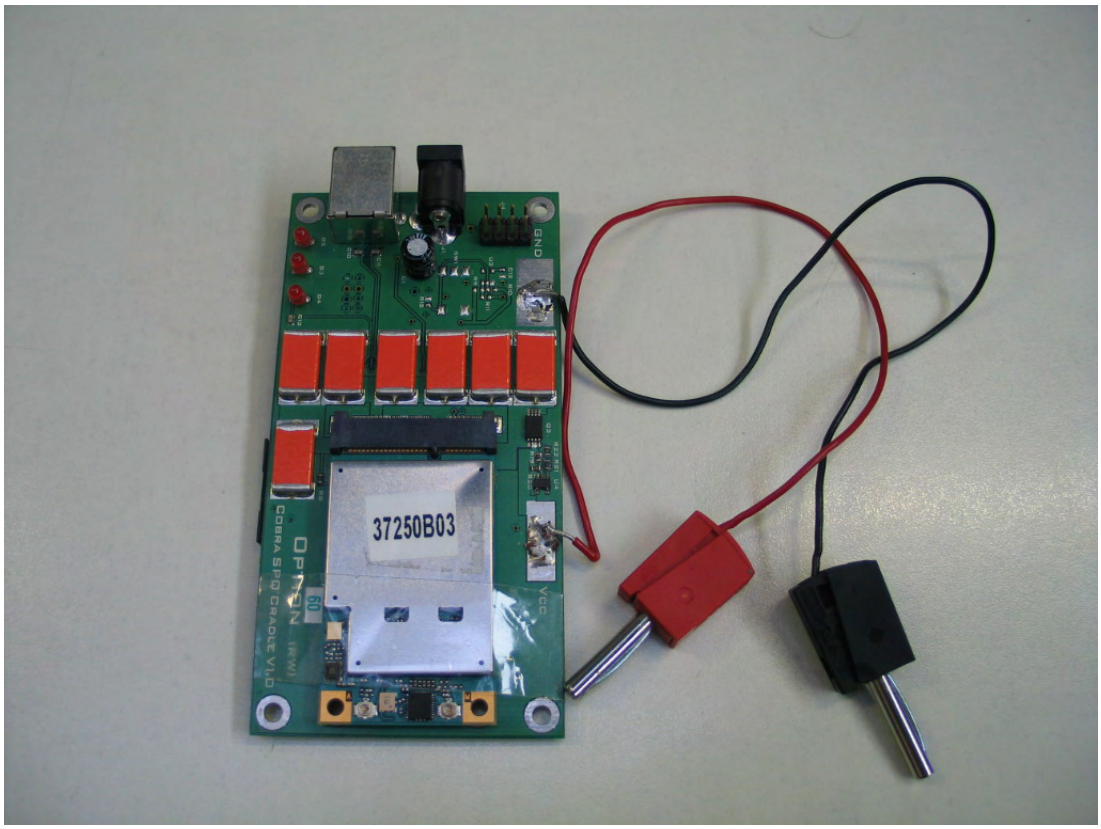


Photo 1: EUT inside cradle (front side)

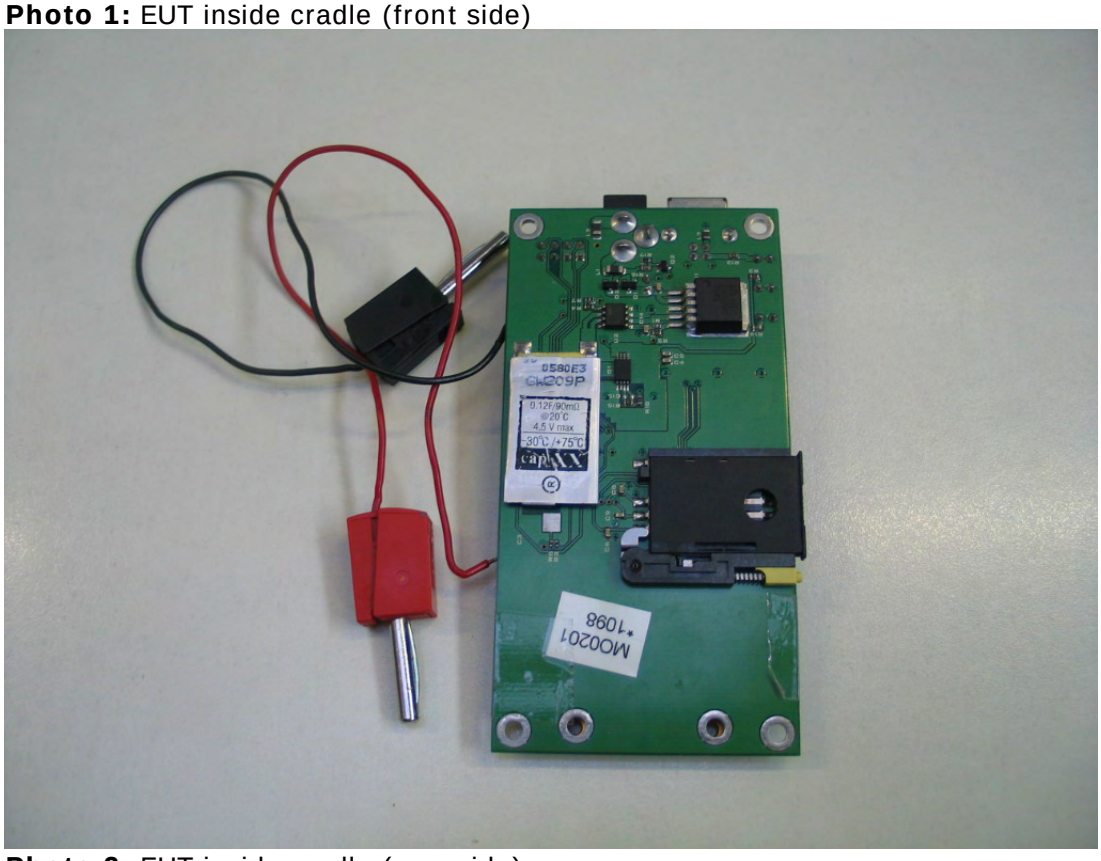
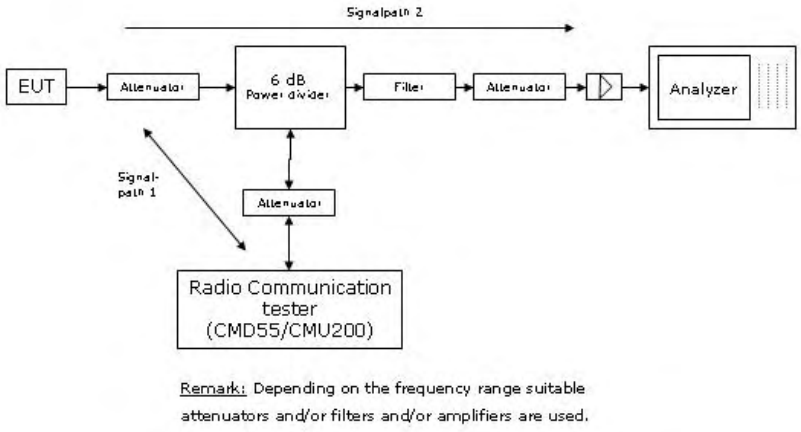


Photo 2: EUT inside cradle (rear side)

6 Setup Drawings



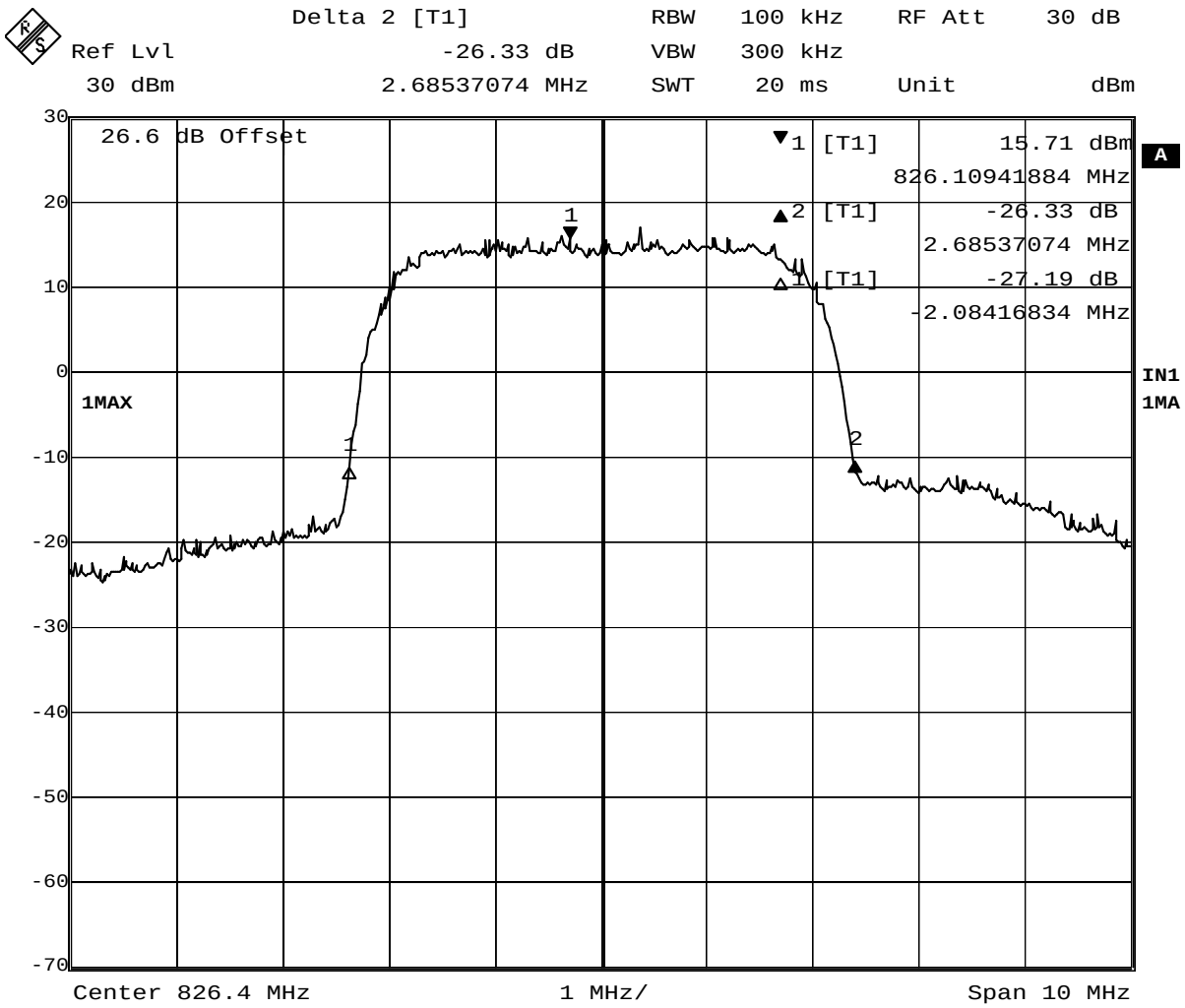
Drawing 1: Principle setup for conducted measurements under nominal conditions

7 Annex

Measurement plots Emission and Occupied Bandwidth

Op. Mode

op-mode 1

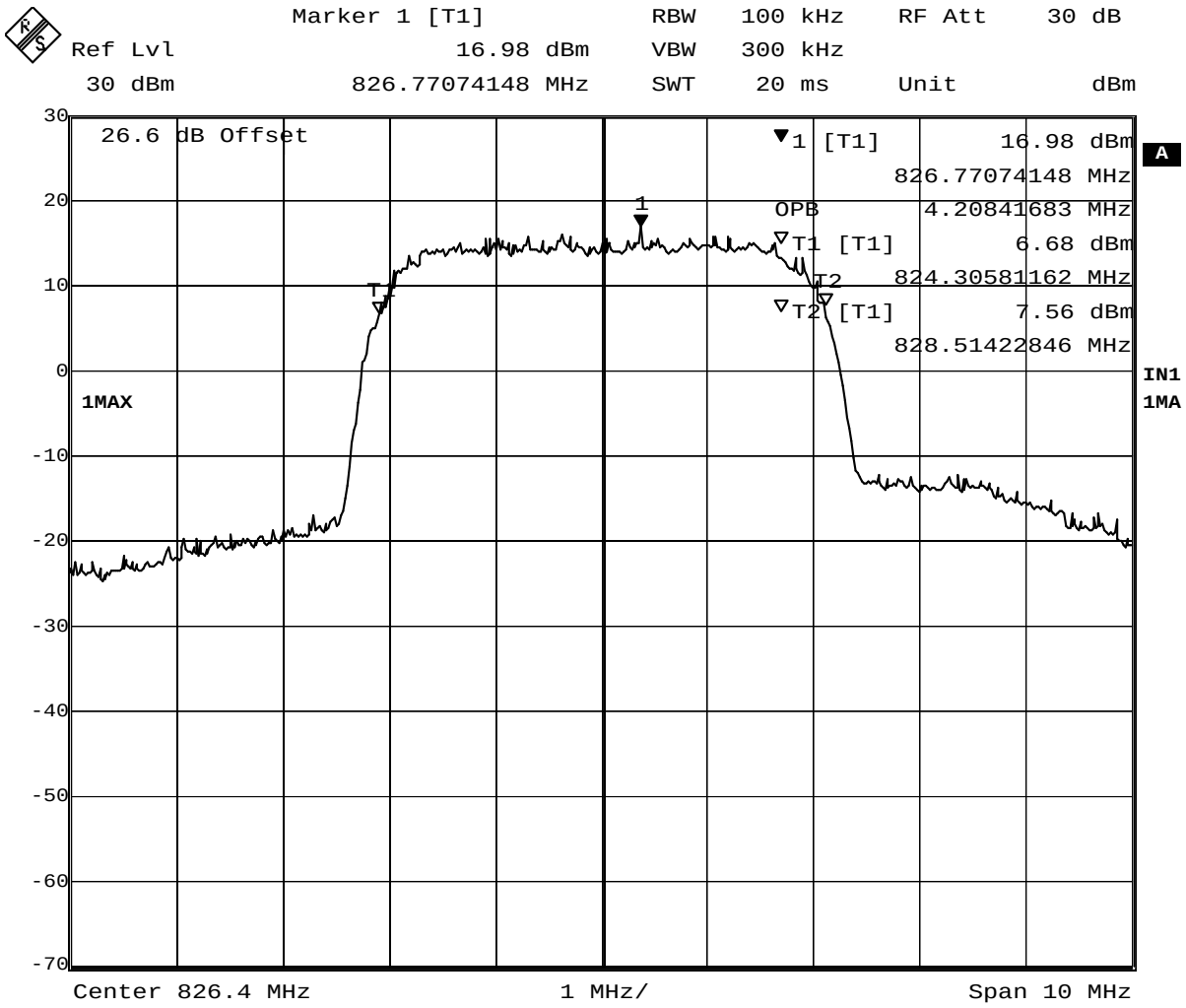


Date: 1.OCT.2007 12:02:56

Test: Emissions bandwidth (26 dB bandwidth), Channel 4132 (826.4 MHz)

Op. Mode

op-mode 1

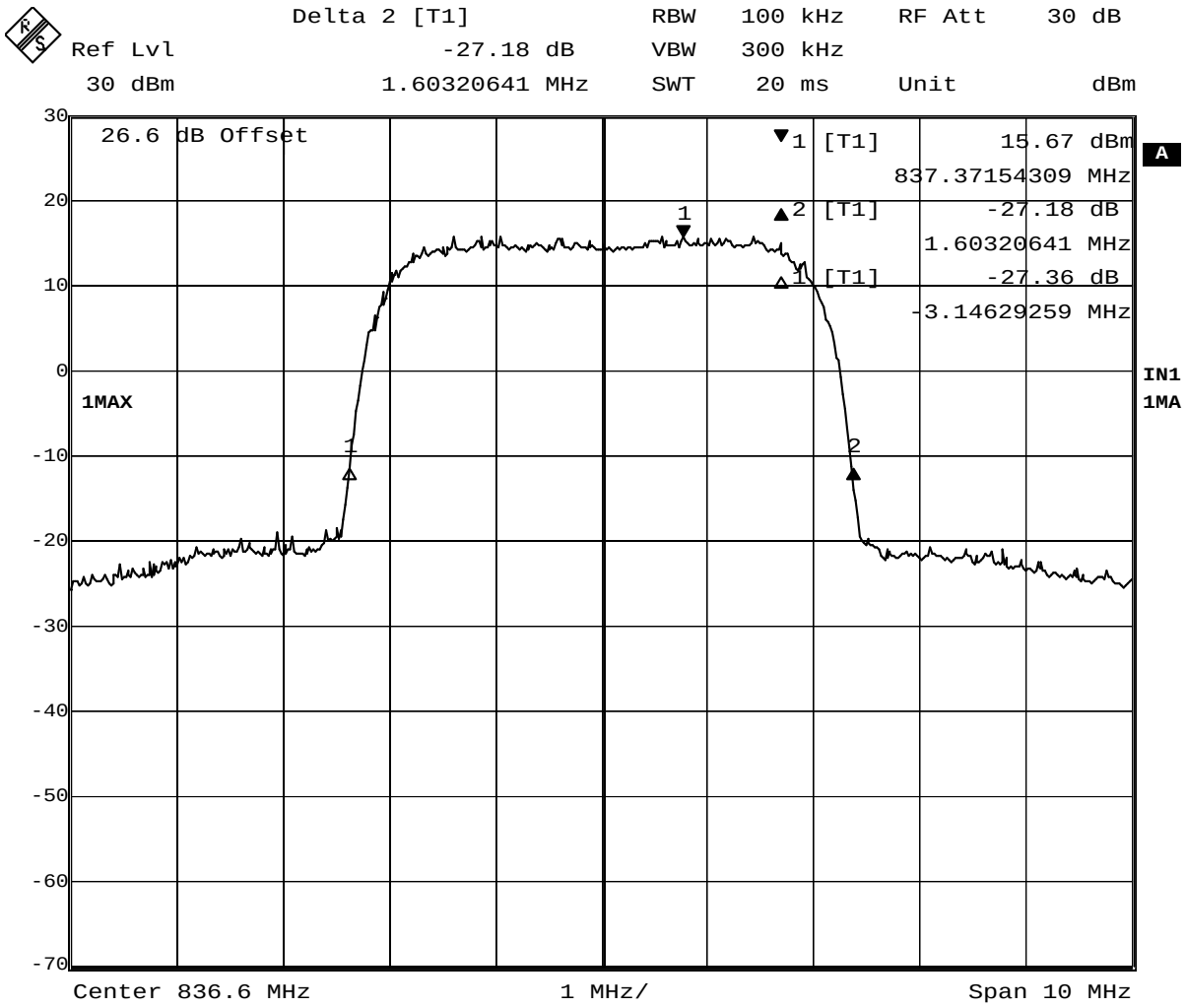


Date: 1.OCT.2007 12:03:22

Test: Occupied bandwidth, Channel 4132 (826.4 MHz)

Op. Mode

op-mode 2

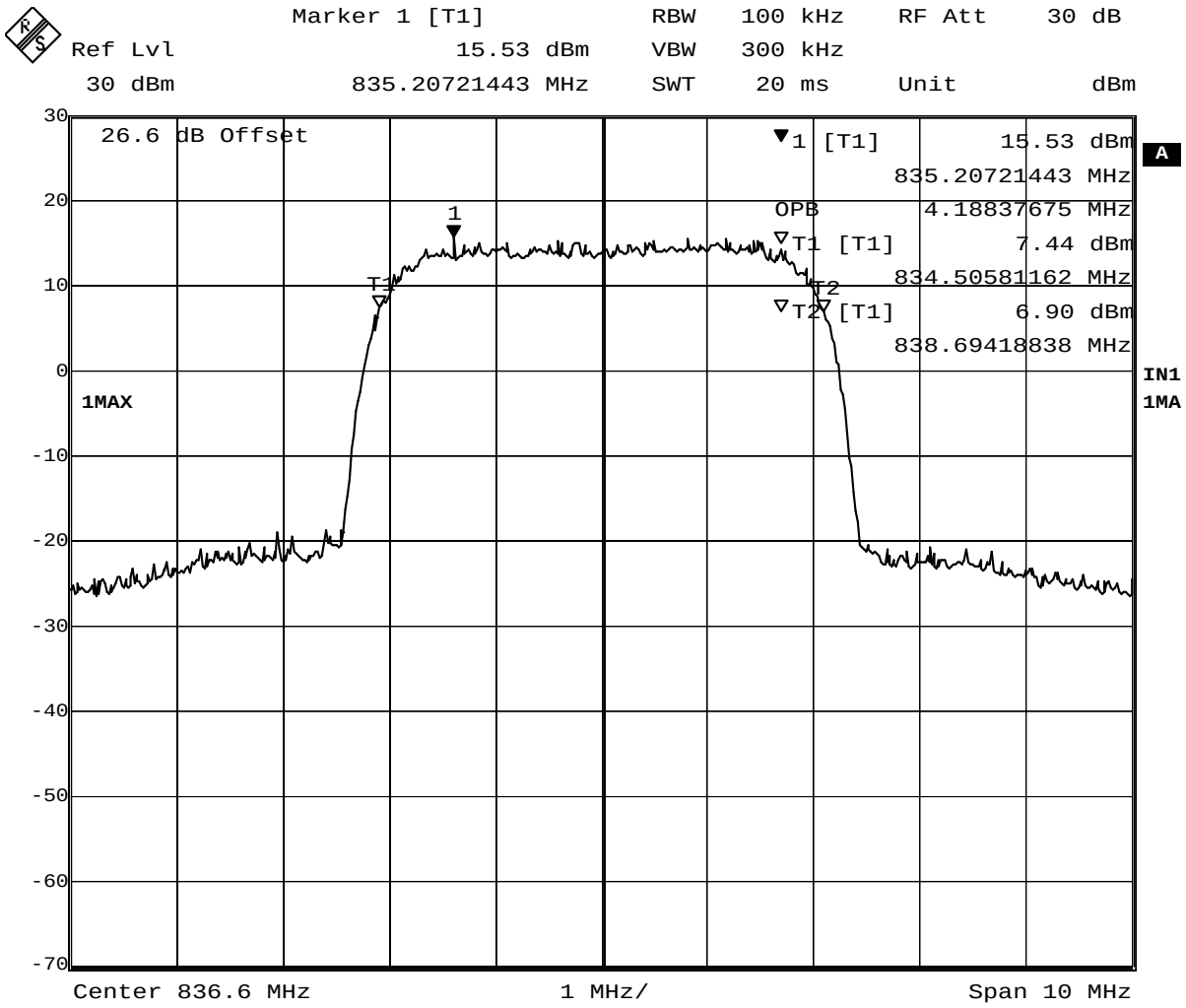


Date: 1.OCT.2007 11:58:25

Test: Emissions bandwidth (26 dB bandwidth), Channel 4183 (836.6 MHz)

Op. Mode

op-mode 2

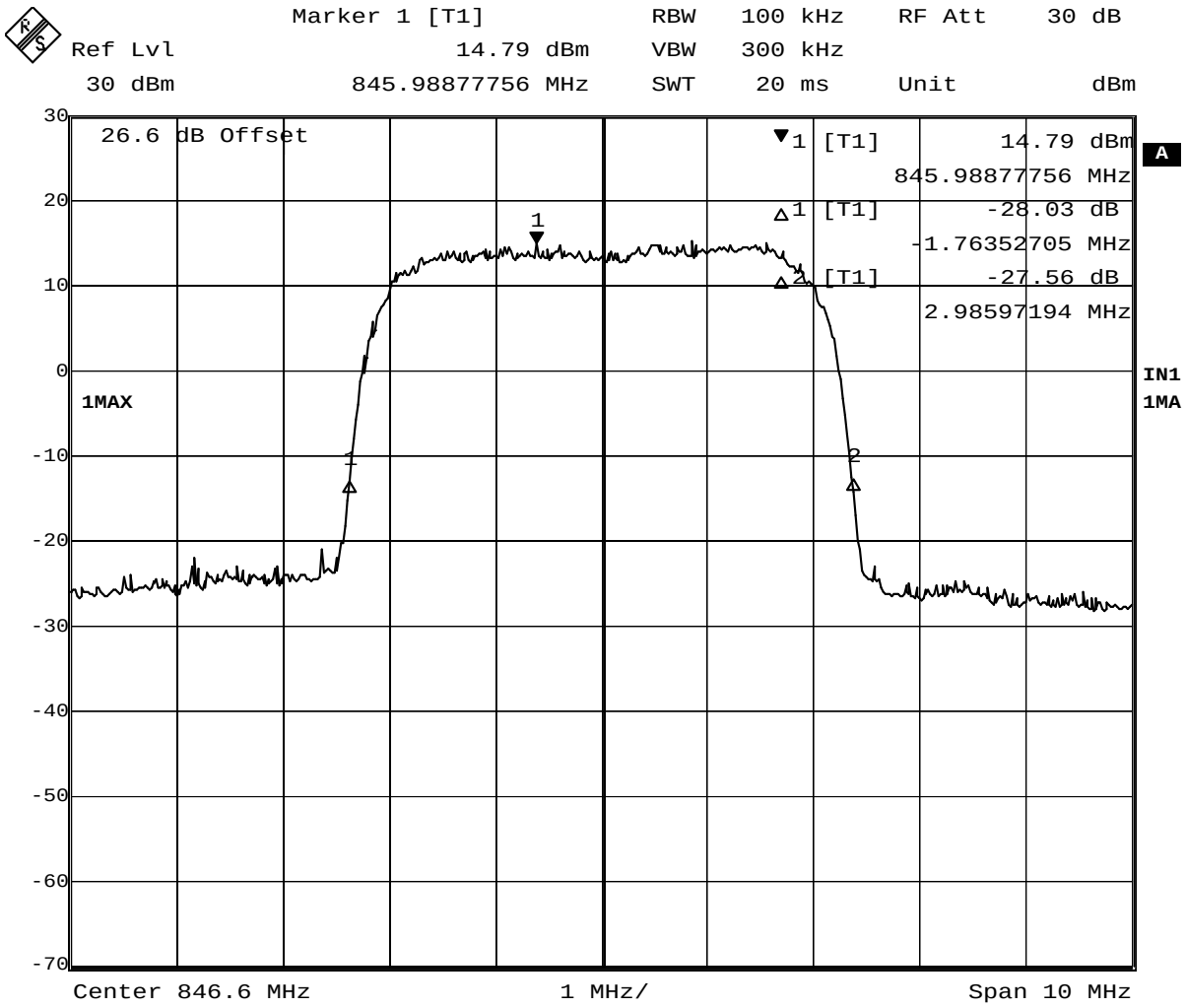


Date: 1.OCT.2007 11:56:01

Test: Occupied bandwidth, Channel 4183 (836.6 MHz)

Op. Mode

op-mode 3

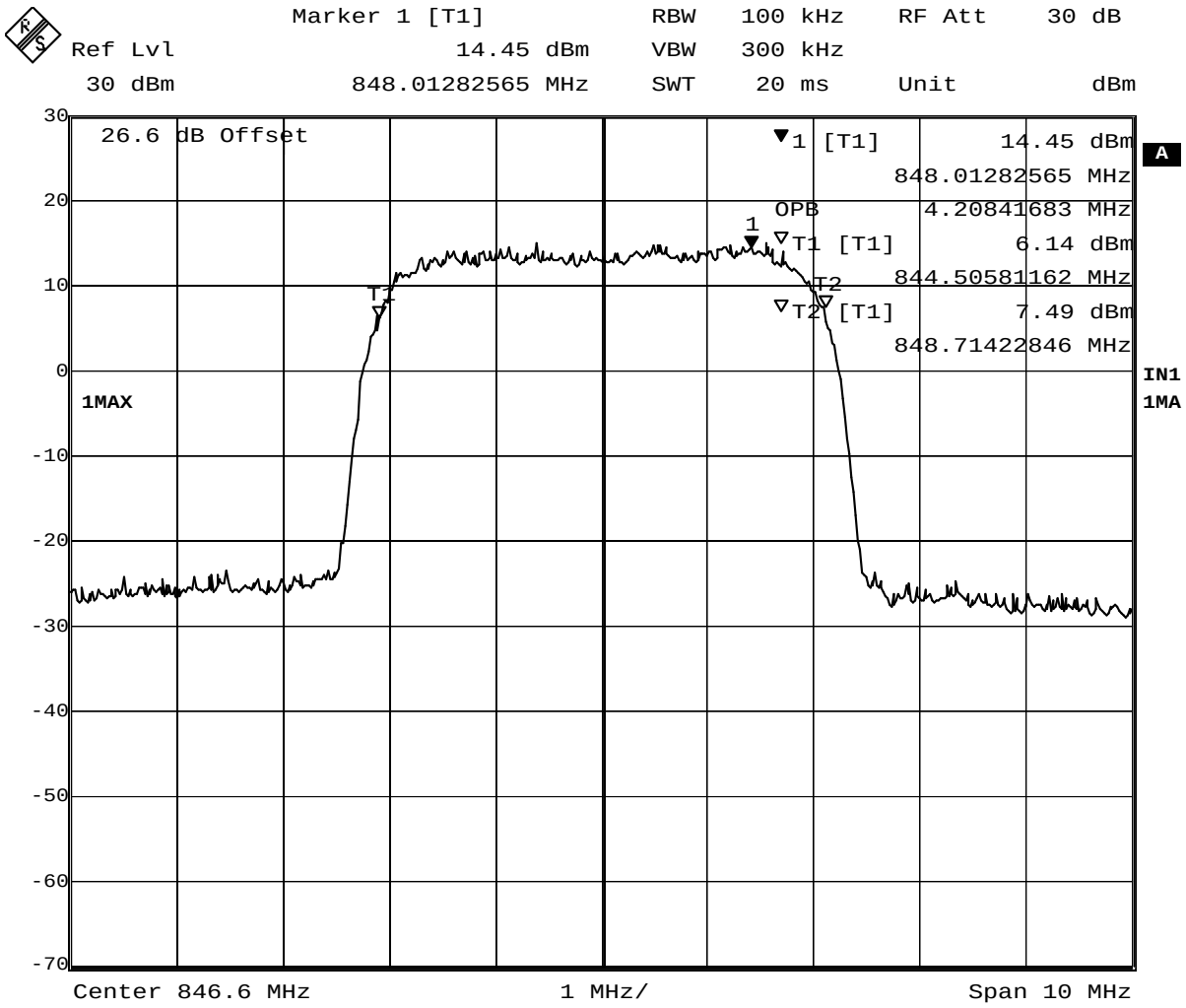


Date: 1.OCT.2007 12:06:27

Test: Emissions bandwidth (26 dB bandwidth), Channel 4233 (846.6 MHz)

Op. Mode

op-mode 3

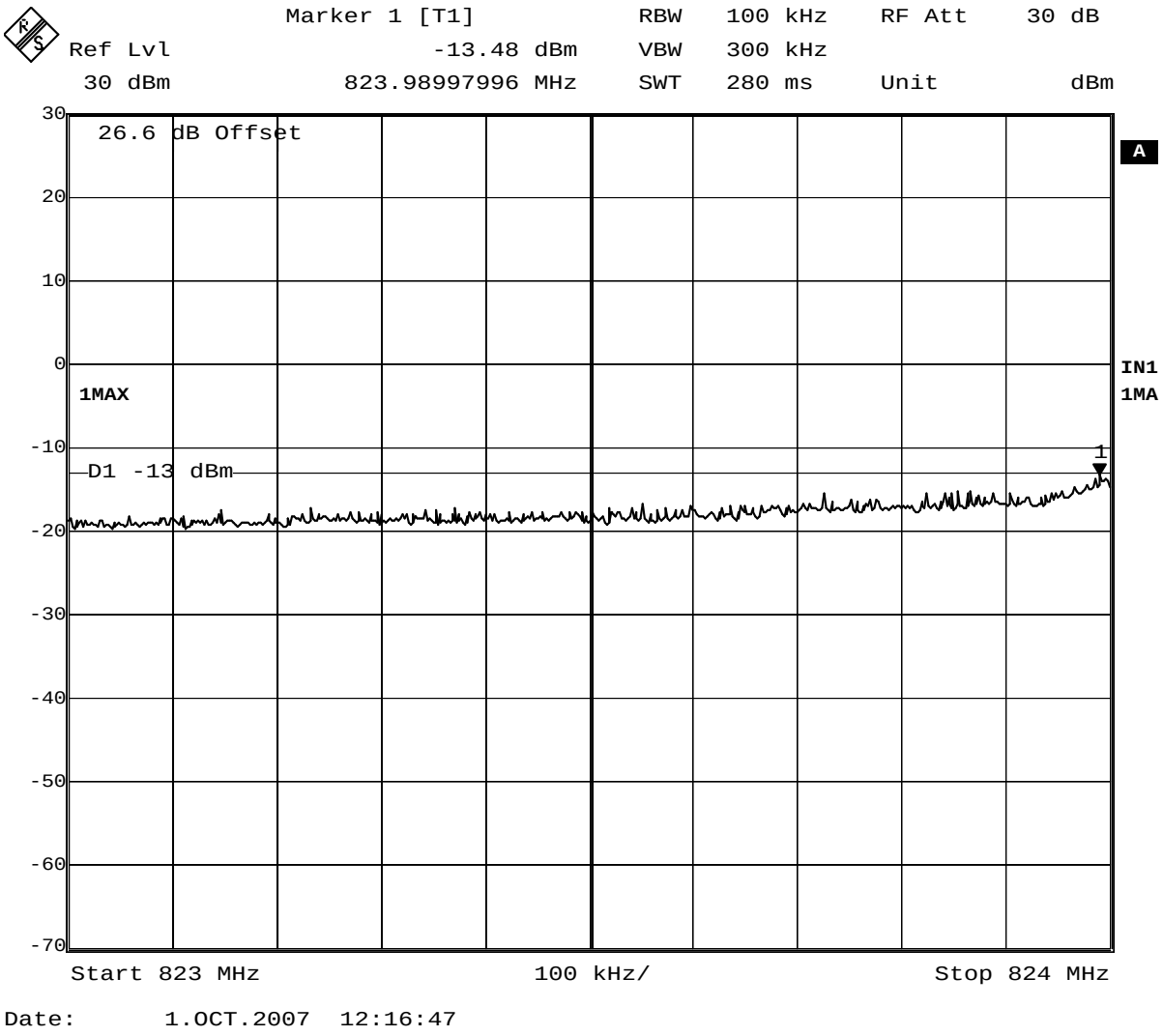


Date: 1.OCT.2007 12:05:32

Test: Occupied bandwidth, Channel 4233 (846.6 MHz)

Op. Mode

op-mode 1

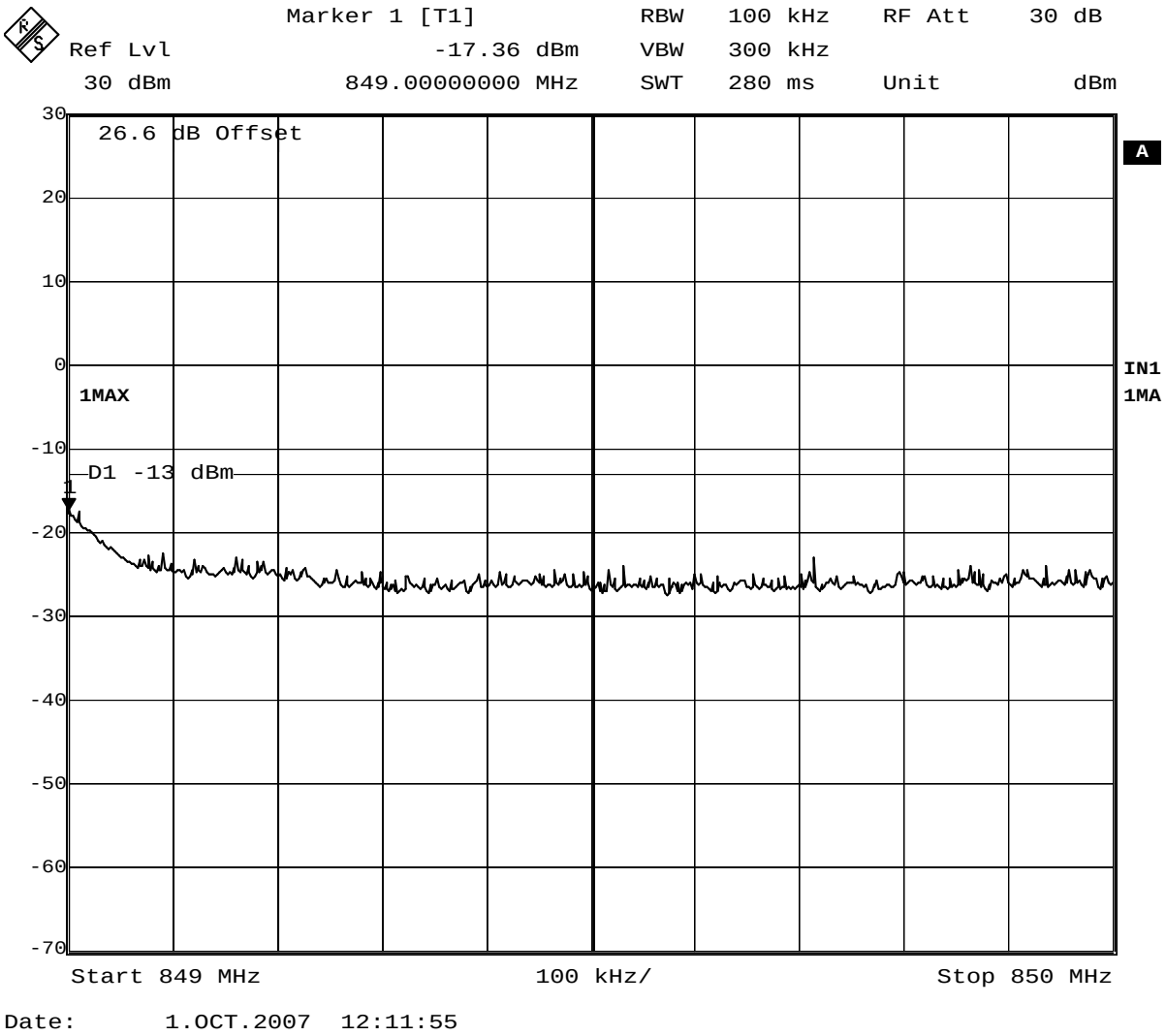


Date: 1.OCT.2007 12:16:47

Test: band edge compliance , Channel 4132, FDD V

Op. Mode

op-mode 3



Test: band edge compliance, Channel 4233, FDD V

InterLab®

FCC Measurement/Technical Report on

GSM / UMTS module
MO0301

Report Reference: MDE_Opti_0709_FCCh

Test Laboratory:

DAT-P-192/99-01

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

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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Table of Contents

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.

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_a01	antenna connector	passed
op-mode 2	Setup_a01	antenna connector	passed
op-mode 3	Setup_a01	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**
			N/P

Field strength of spurious radiation			
The measurement was performed according to FCC §2.1053			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
			N/P

Emission and Occupied Bandwidth			
The measurement was performed according to FCC §2.1049			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_a01	antenna connector	passed
op-mode 2	Setup_a01	antenna connector	passed
op-mode 3	Setup_a01	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_a01	antenna connector	passed
op-mode 3	Setup_a01	antenna connector	passed

N/P – not performed

The tests were selected by the customer. As a signalling unit a CMU200 by R&S was provided by the customer and used for carrying out the tests. The settings of the CMU200 were provided by the customer, too. The HSUPA software on the CMU200 is a beta version by R&S, version 4x50. The test "RF power output" was performed with all five subtests. For all other tests subtest 5 were chosen.

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. Robert Machulec
Receipt of EUT:	2007-10-01
Date of Test(s):	2007-10-01
Date of Report:	2007-10-04

1.3 Applicant Data

Company Name:	Option NV
Address:	Gaston Geenslaan 14 3001 Leuven Belgium
Contact Person:	Mr. Lodeweyckx

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:	MO0301
Kind of Device:	GSM 850/900/1800/1900 + UTRA FDD I/II/V
(optional)	including HSDPA + HSUPA
Voltage Type:	DC
Nominal Voltage:	3.6 V
Maximum Voltage:	3.6 V
Minimum Voltage:	3.0 V

General product description:

The Equipment under Test (EUT) is a data card that supports GSM/EDGE 850/900/1800/1900 and FDD I, II and V with HSDPA and HSUPA.
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: 37250B03)	GSM/UMTS Module	MO0301	049419	2.0	2.7.2	2007-08-14
Remark: EUT A is equipped with a temporary 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	Test Cradle	Cobra SPQ Cradle	V 1.0	-	-	-

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 + AE1	setup for conducted tests

2.5 Operating Modes

This chapter describes the operating modes of the EUT's used for testing.

Op. Mode	Description of Operating Modes	Remarks
	FDD II HSUPA call	
op-mode 1	Call established on Traffic Channel (TCH) 9262, Carrier Frequency 1852.4 MHz	9262 is the lowest channel FDD II data call
op-mode 2	Call established on Traffic Channel (TCH) 9400, Carrier Frequency 1880 MHz	9400 is a mid channel FDD II data call
op-mode 3	Call established on Traffic Channel (TCH) 9538, Carrier Frequency 1907.6 MHz	9538 is the highest channel FDD II data call

The following parameter sets were provided by the customer:

3GPP TS 34.121-1 V7.5.0 (2007-06)

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1)*	β_{ec}	β_{ed} *(Note 5)* *(Note 6)*	β_{ed} *(SF)*	β_{ed} *(Codes)*	CM *(dB)* *(Note 2)*	MPR *(dB)* *(Note 2)*	*AG Index* *(Note 6)*	*E-TFCI*
1	11/15 *(Note 3)*	15/15 *(Note 3)*	64	11/15 *(Note 3)*	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 *(Note 4)*	15/15 *(Note 4)*	64	15/15 *(Note 4)*	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 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 = 10/15 and β_d = 15/15.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 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 = 14/15 and β_d = 15/15.

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

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 measured by using a spectrum analyser.

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: 1023 hPa
Humidity: 43 %

Op. Mode	Setup	Port
op-mode 1	setup_a01	antenna connector

Output power Nominal (dBm)	Output power Measured (dBm) Subtest 1	Output power Measured (dBm) Subtest 2	Output power Measured (dBm) Subtest 3	Output power Measured (dBm) Subtest 4	Output power Measured (dBm) Subtest 5
24	24.95	24.36	24.36	24.59	24.36

Remark: none

Op. Mode	Setup	Port
op-mode 2	setup_a01	antenna connector

Output power Nominal (dBm)	Output power Measured (dBm) Subtest 1	Output power Measured (dBm) Subtest 2	Output power Measured (dBm) Subtest 3	Output power Measured (dBm) Subtest 4	Output power Measured (dBm) Subtest 5
24	25.33	24.95	24.95	25.20	25.33

Remark: none

Op. Mode	Setup	Port
op-mode 3	setup_a01	antenna connector

Output power Nominal (dBm)	Output power Measured (dBm) Subtest 1	Output power Measured (dBm) Subtest 2	Output power Measured (dBm) Subtest 3	Output power Measured (dBm) Subtest 4	Output power Measured (dBm) Subtest 5
24	24.59	24.14	24.36	24.82	24.48

Remark: none

3.1.4 Test result: RF Power Output

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed

3.2 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

3.2.1 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: 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.

3.2.2 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.

3.2.3 Test Protocol

Temperature: 24 °C
Air Pressure: 1023 hPa
Humidity: 43 %

Op. Mode	Setup	Port
op-mode 1	setup_a01	antenna connector

Bandwidth kHz	Remarks
5802	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4228 kHz.

Op. Mode	Setup	Port
op-mode 2	setup_a01	antenna connector

Bandwidth kHz	Remarks
4729	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4208 kHz.

Op. Mode	Setup	Port
op-mode 3	setup_a01	antenna connector

Bandwidth kHz	Remarks
4749	please see annex

Remark: The given value is the result of the 26dB bandwidth measurement.
The 99% Bandwidth is 4208 kHz.

3.2.4 Test result: Emission and Occupied Bandwidth

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed

3.3 Band edge compliance

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

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

3.3.1 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 / 100 kHz for FDD mode.

3.3.2 Test Requirements / Limits

§ 24.238 Effective radiated power limits

3.3.3 Test Protocol

Temperature: 24 °C
Air Pressure: 1023 hPa
Humidity: 43 %

Op. Mode	Setup	Port
op-mode 1	Setup_a01	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1850	-13.27	-13

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 3	Setup_a01	antenna connector

Frequency MHz	Measured value dBm	Limit dBm
1910	-15.42	-13

Remark: Please see annex for the measurement plot.

3.3.4 Test result: Band edge compliance

FCC Part 24, Subpart E	Op. Mode	Result
	op-mode 1	passed
	op-mode 3	passed

4 Test Equipment

EUT Digital Signalling System provided by manufacturer

Equipment	Type	Serial No.	Manufacturer
Universal Radio Communication Tester	CMU 200	106914	Rohde & Schwarz

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

5 Photo Report

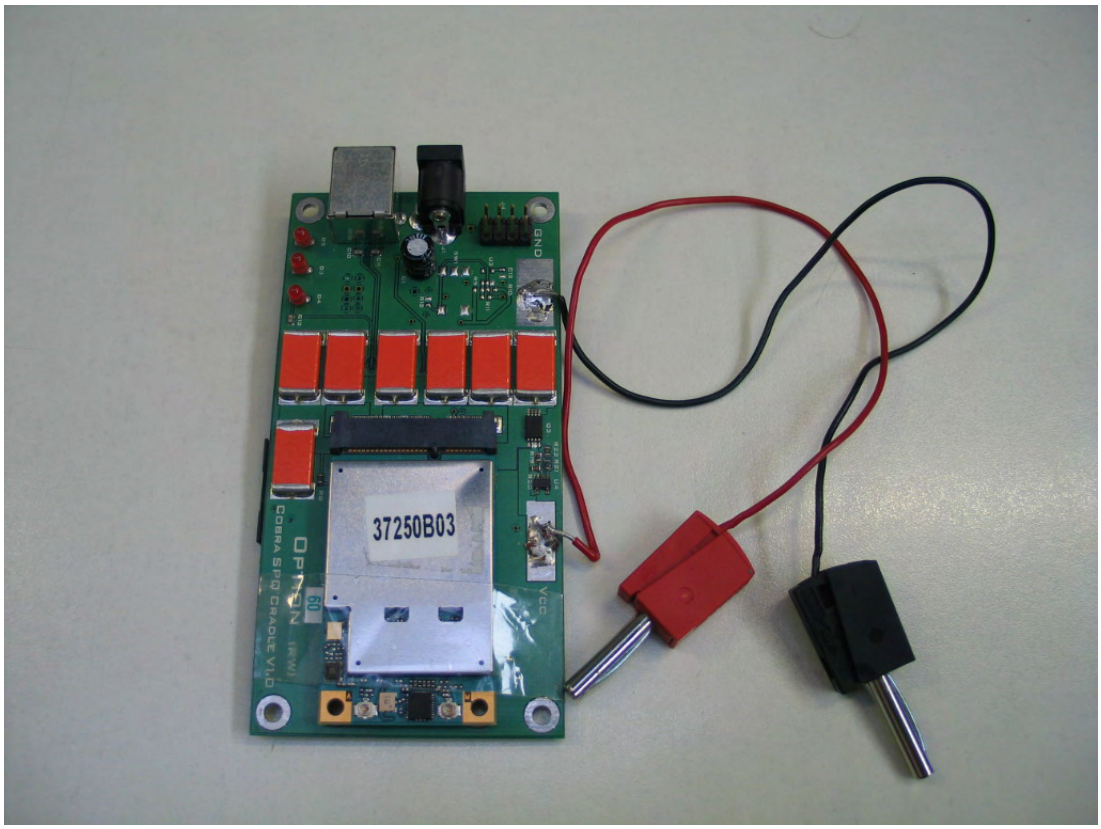


Photo 1: EUT inside cradle (front side)

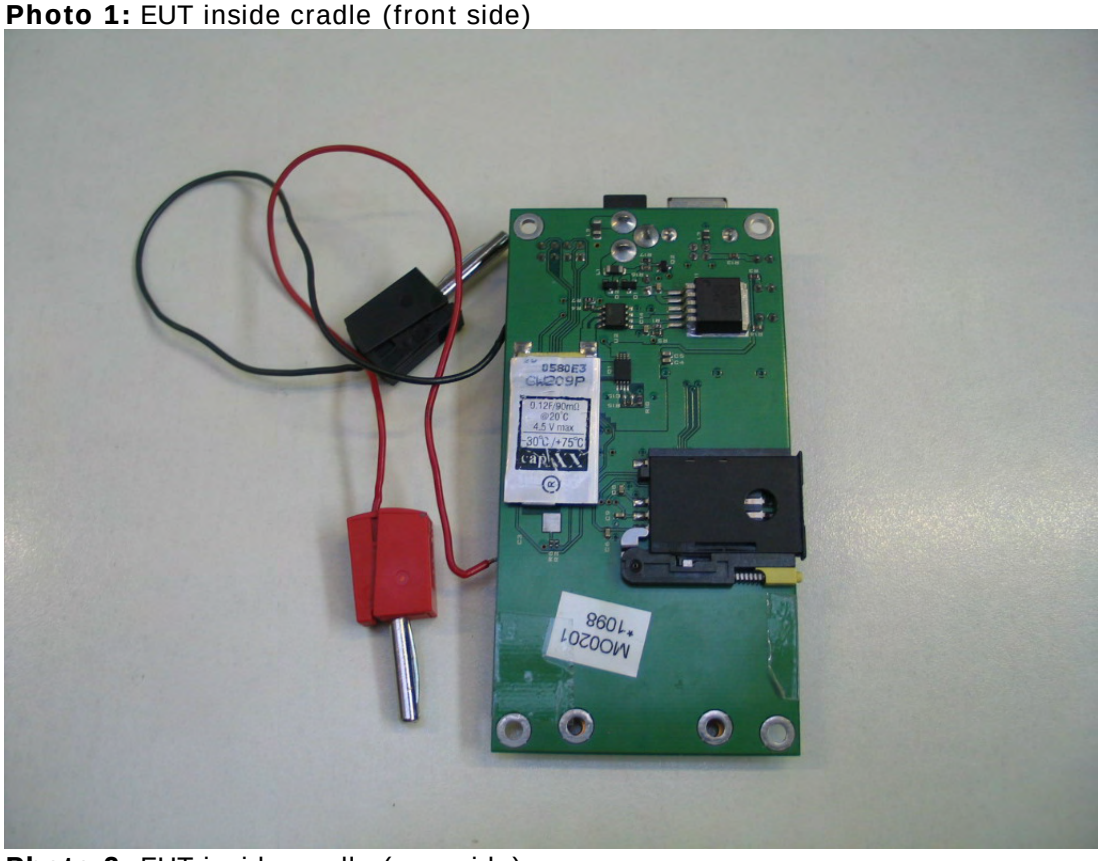
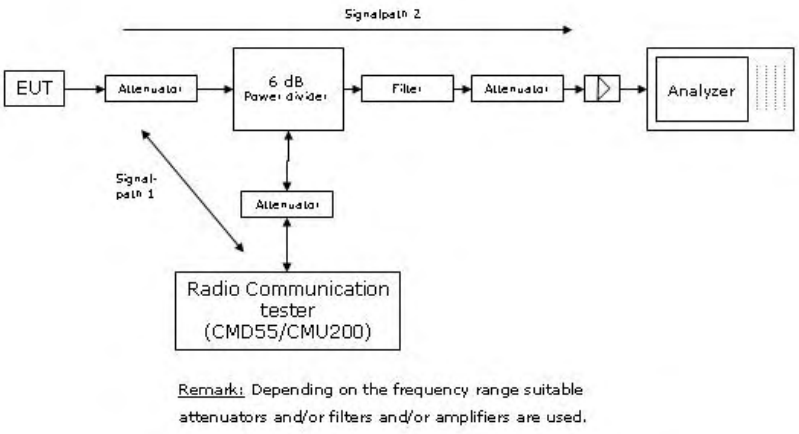


Photo 2: EUT inside cradle (rear side)

6 Setup Drawings



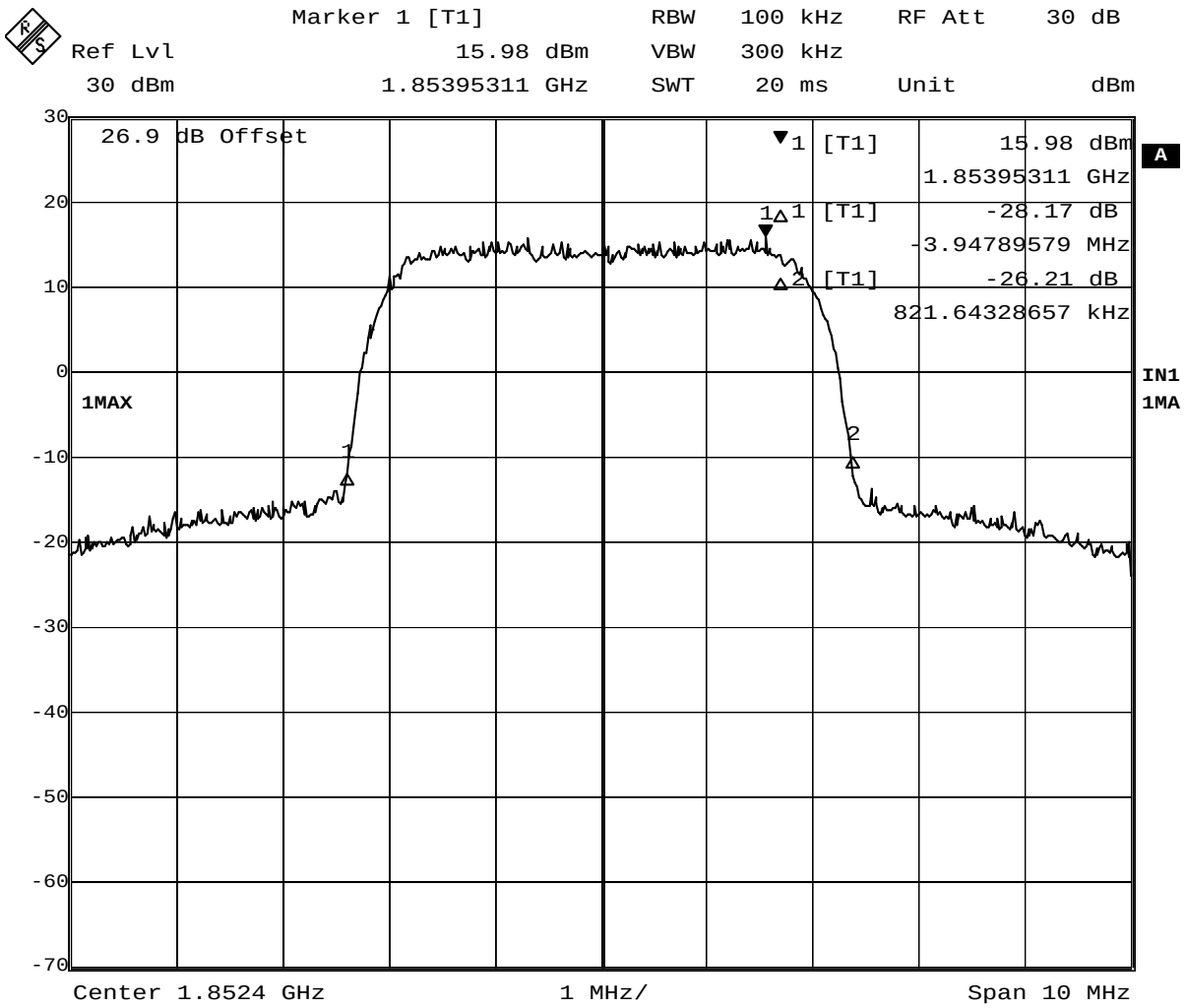
Drawing 1: Principle setup for conducted measurements under nominal conditions

7 Annex

Measurement plots Emission and Occupied Bandwidth

Op. Mode

op-mode 1

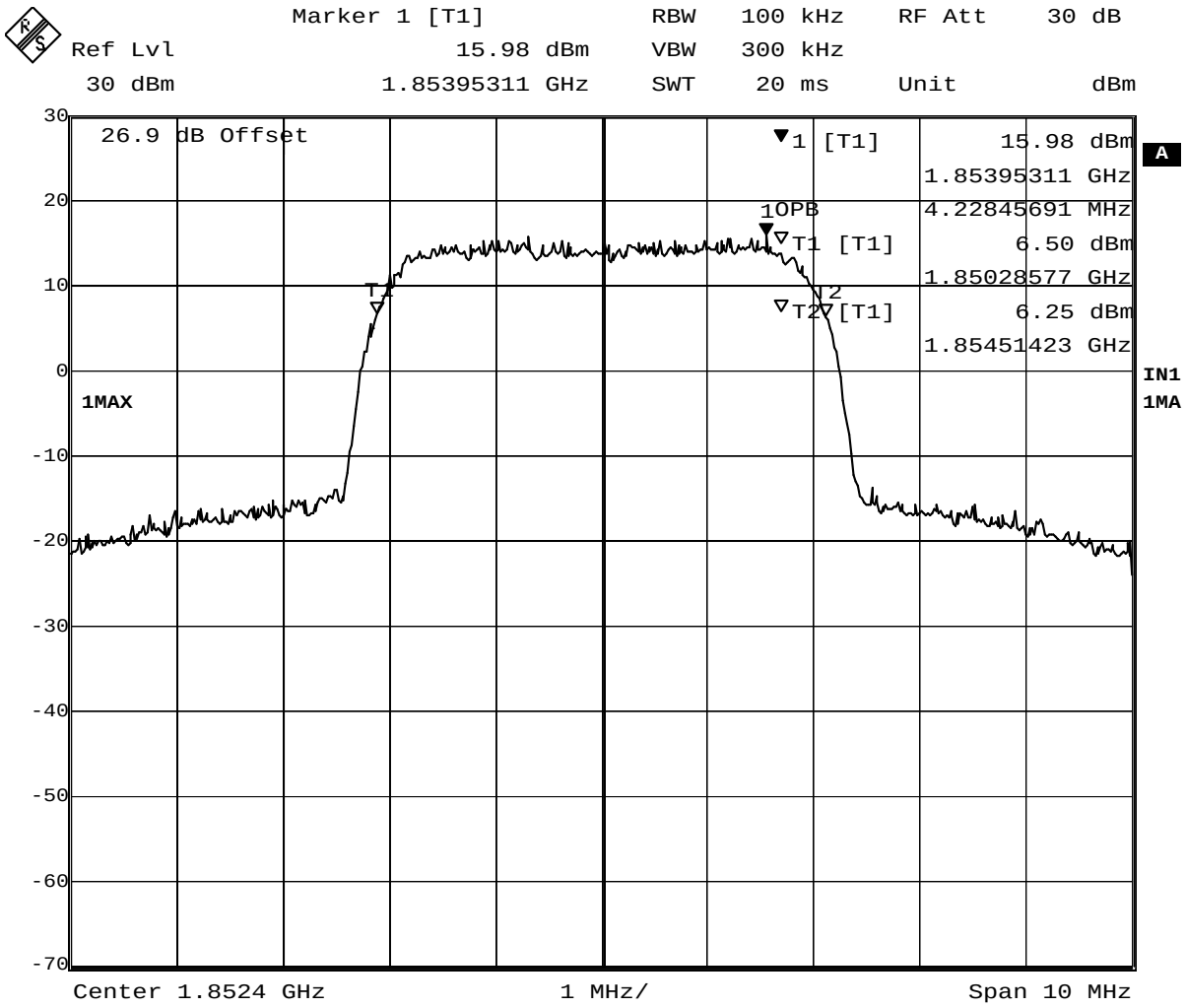


Date: 1.OCT.2007 12:38:01

Test: Emissions bandwidth (26 dB bandwidth), Channel 9262

Op. Mode

op-mode 1

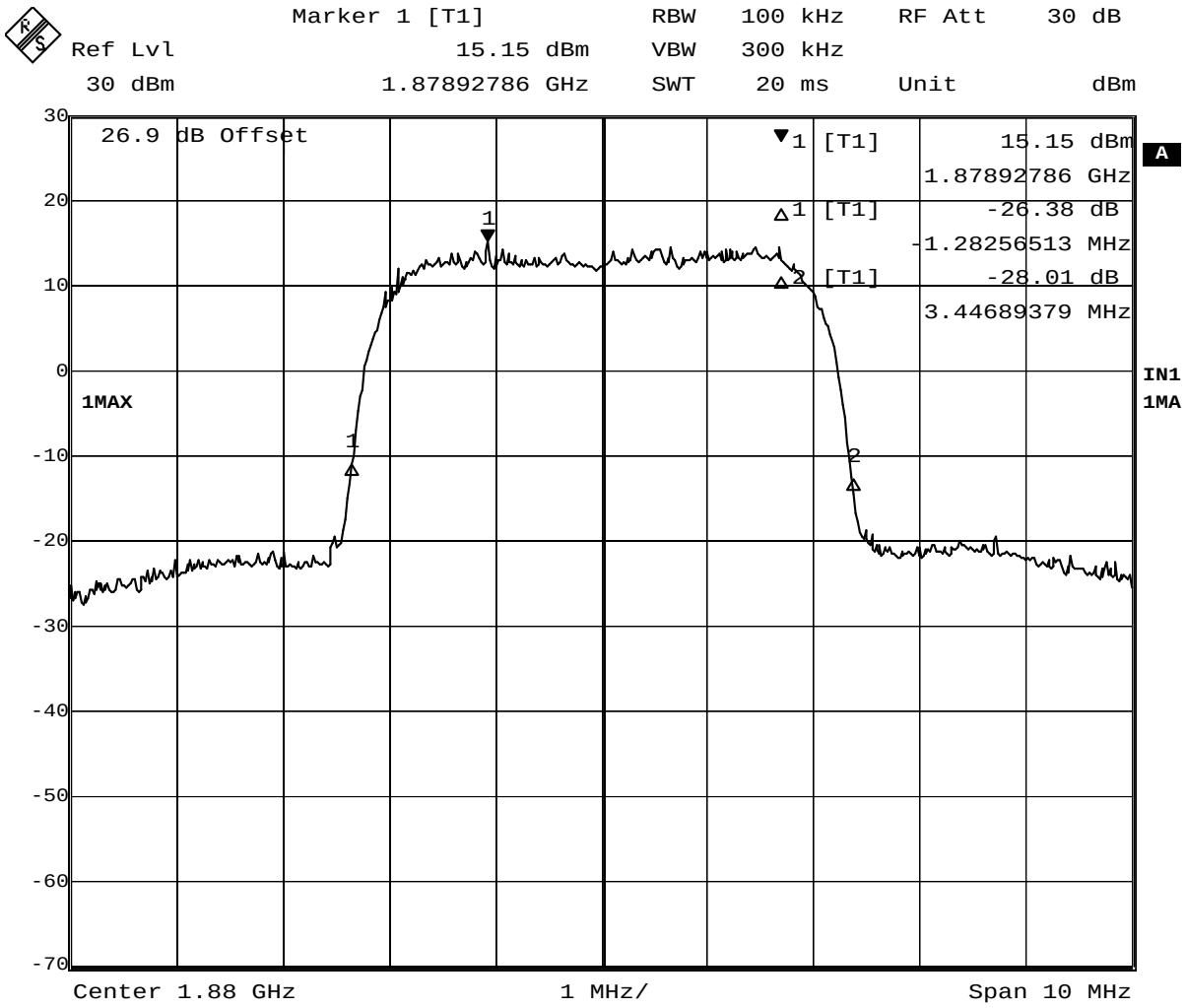


Date: 1.OCT.2007 12:36:27

Test: Occupied bandwidth, Channel 9262

Op. Mode

op-mode 2

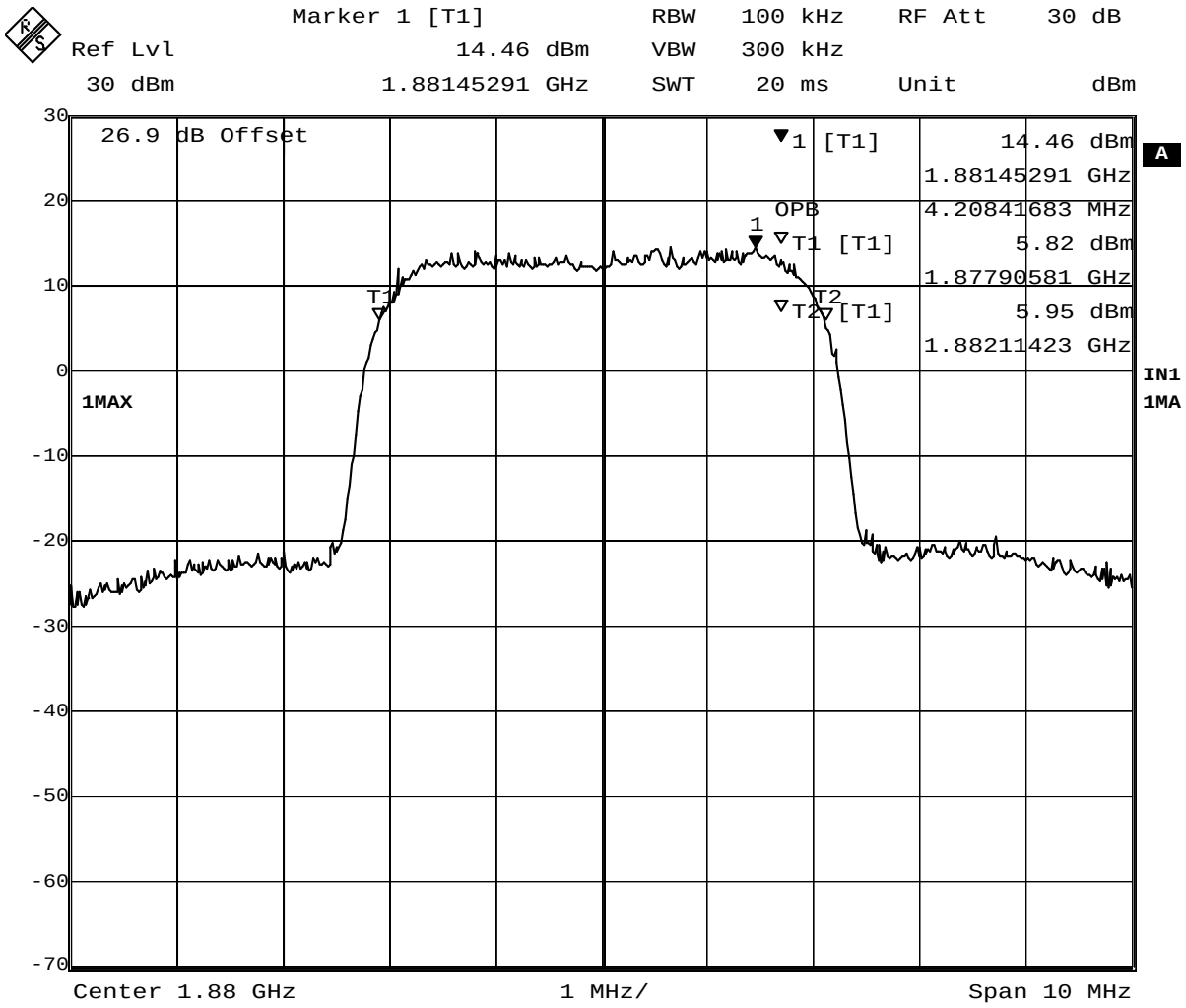


Date: 1.OCT.2007 12:32:17

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

Op. Mode

op-mode 2

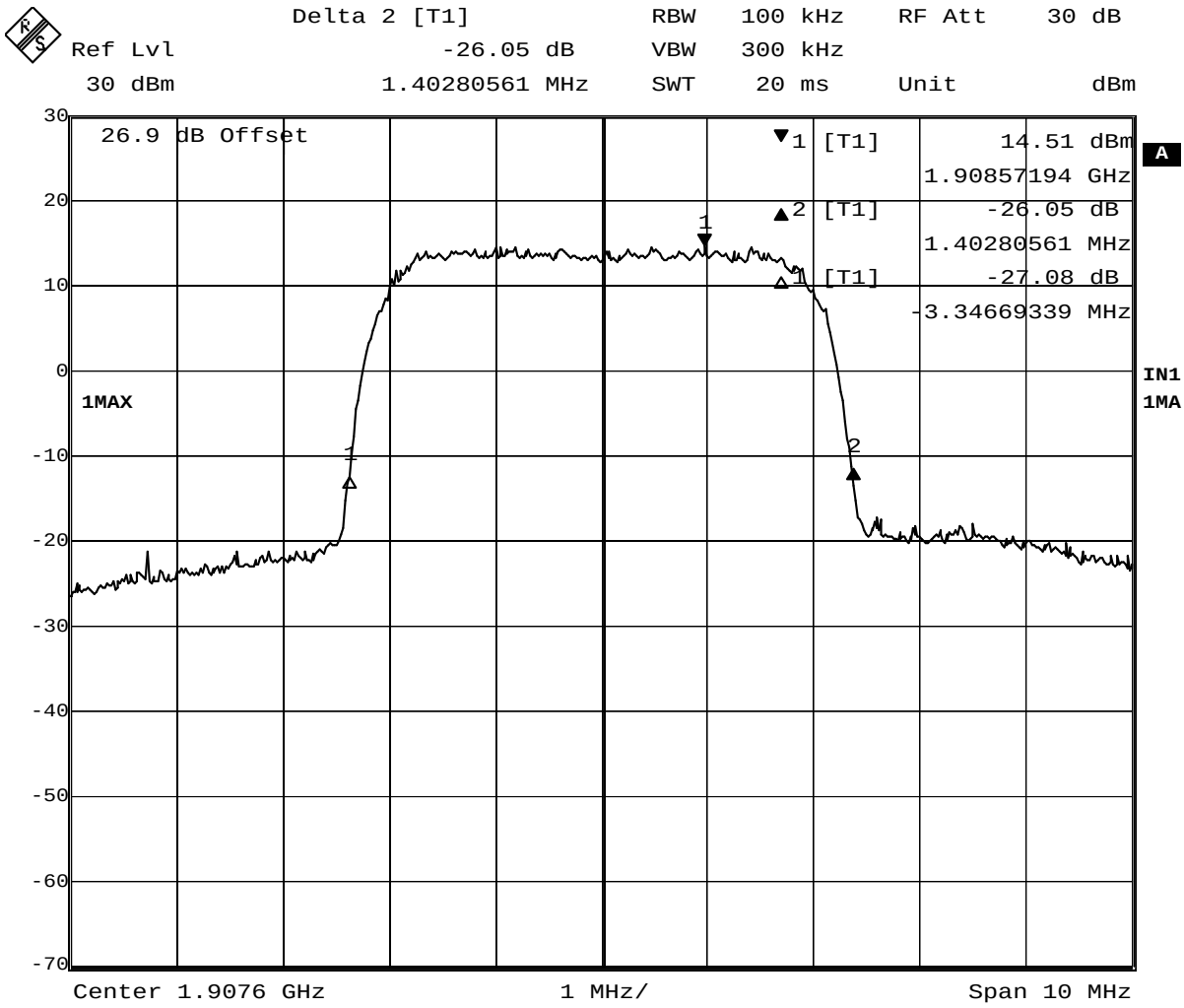


Date: 1.OCT.2007 12:31:17

Test: Occupied bandwidth, Channel 9400

Op. Mode

op-mode 3

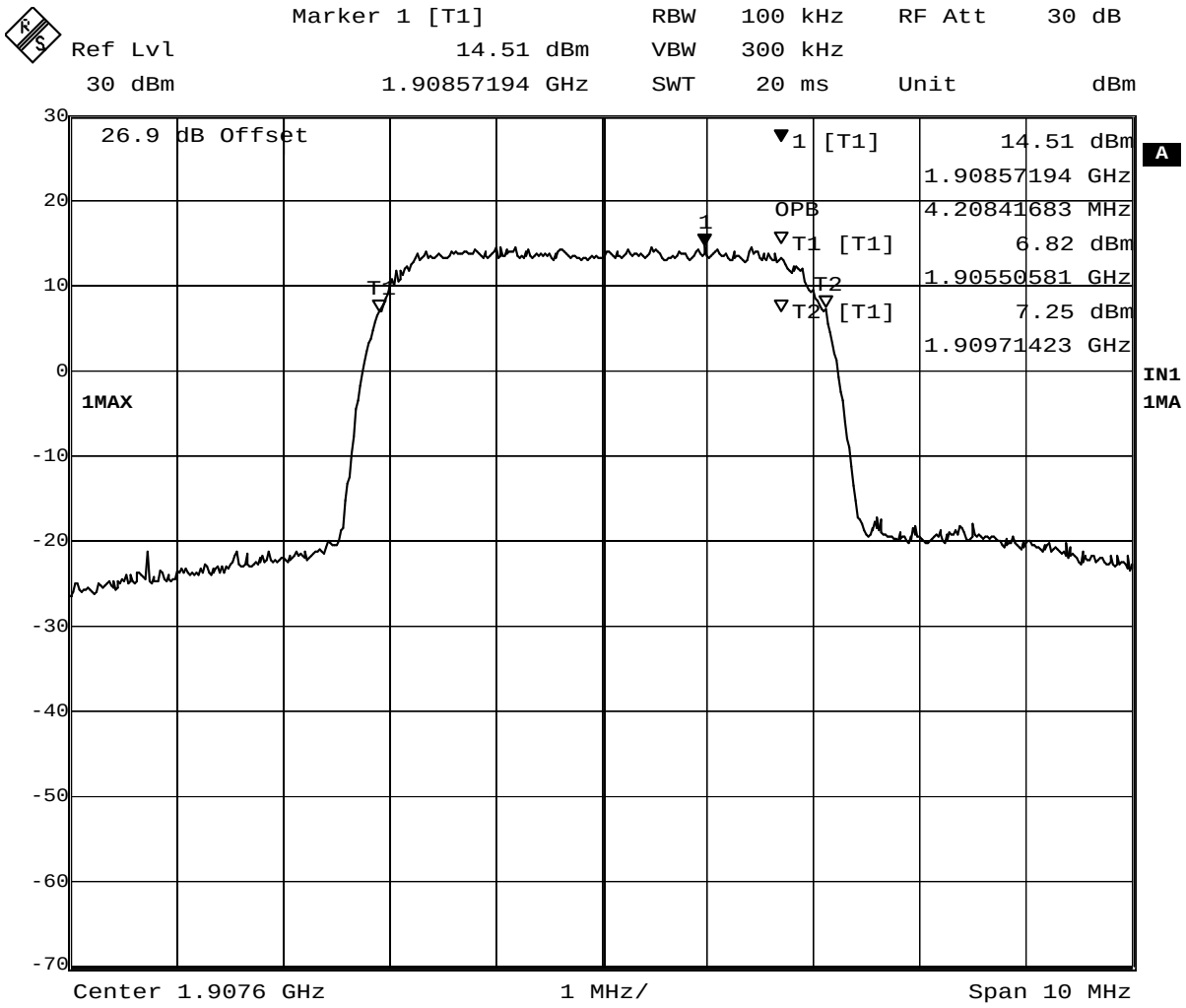


Date: 1.OCT.2007 12:28:27

Test: Emissions bandwidth (26 dB bandwidth), Channel 9538

Op. Mode

op-mode 3



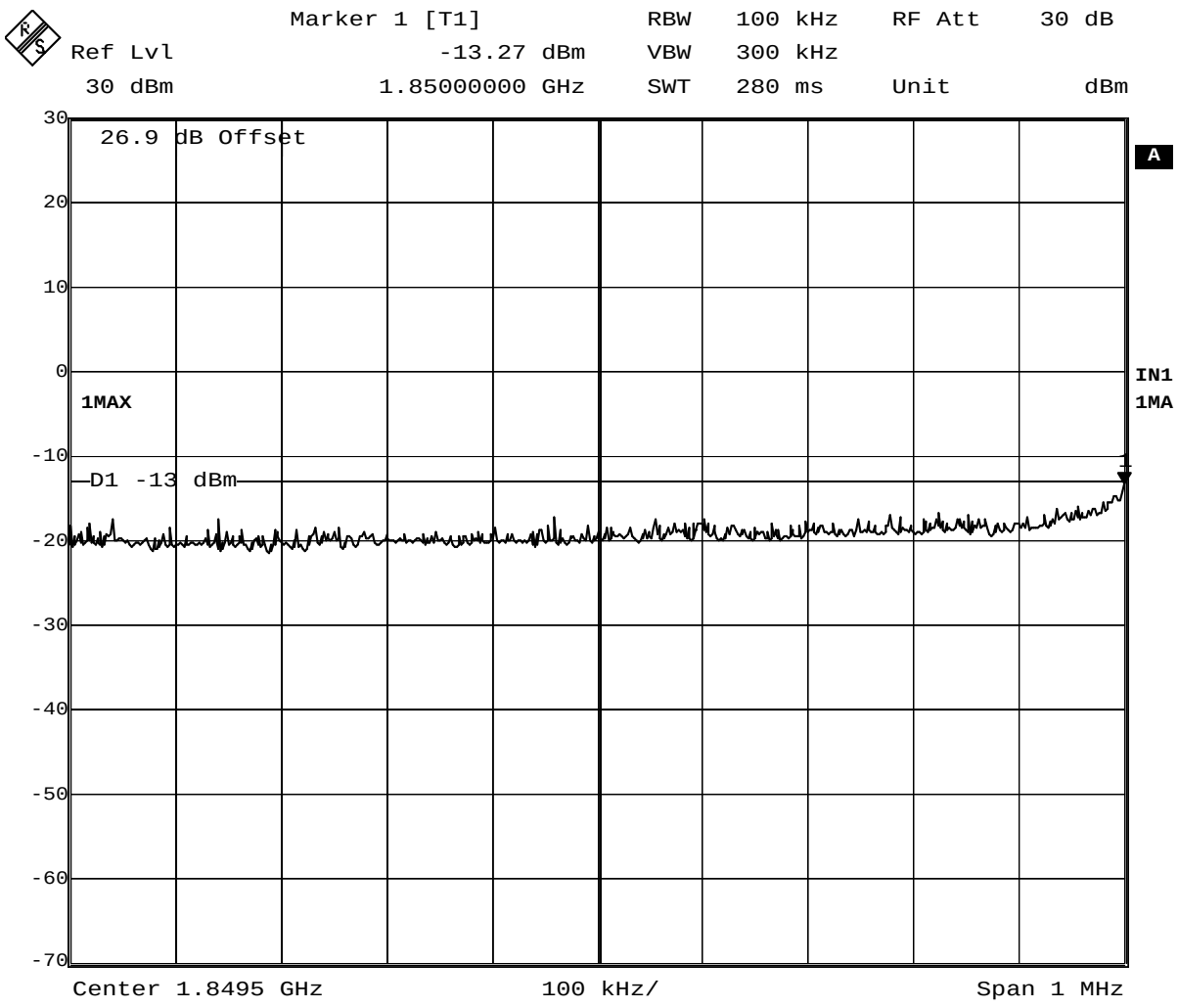
Date: 1.OCT.2007 12:28:59

Test: Occupied bandwidth, Channel 9538

Measurement plots Band edge compliance

Op. Mode

op-mode 1

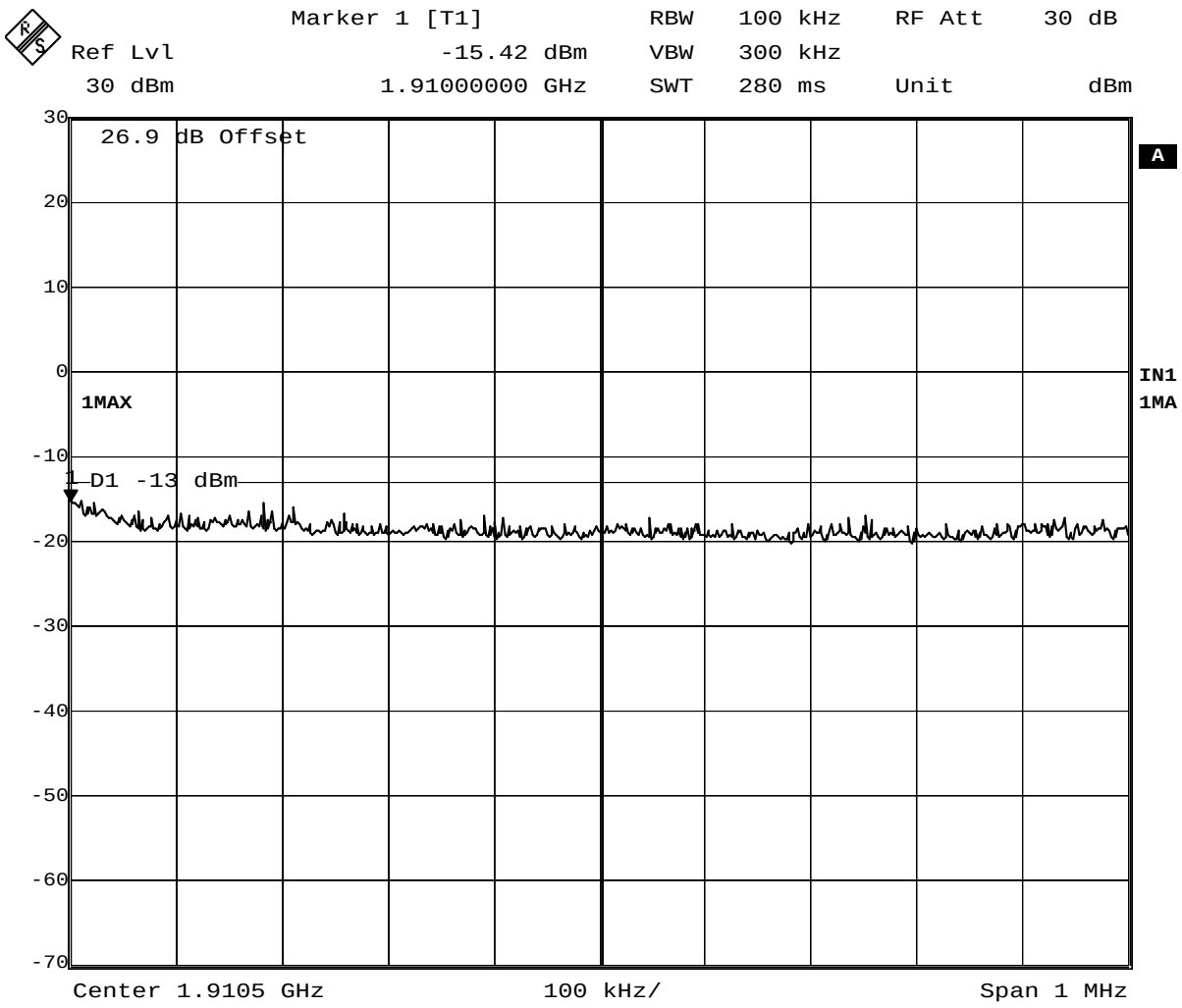


Date: 1.OCT.2007 12:43:28

Test: band edge compliance , Channel 9262

Op. Mode

op-mode 3



Test: band edge compliance, Channel 9538