

FCC TEST REPORT

FCC 47 CFR Part 22H ISED RSS-132, Issue 2

Cellular Telephones Operating in the Bands 824-849MHz and 869-894MHz

FCC 47 CFR Part 24E ISED RSS-133, Issue 5

2GHz Personal Communication Services

Testing Laboratory: Eurofins Product Service GmbH

Address: Storkower Str. 38c

15526 Reichenwalde

Germany

Accreditation:





FCC Test Firm Designation Number: DE0008

IC Testing Laboratory site: 3470A-2

Applicant's name eResearchTechnology GmbH

Address: Sieboldstrasse 3

97230 Estenfeld GERMANY

Test specification:

Standard.....: 47 CFR Part 22H, 47 CFR Part 24E

RSS-132, Issue 3: 2013-01, RSS-133, Issue 6: 2013-01

Test scope.....: partial Radio compliance test

Equipment under test (EUT):

Product description Spirometer

Model No. SpiroSphere - Main Unit

Additional Model(s) None

Brand Name(s) SpiroSphere

Hardware version 04.04.03

Firmware / Software version Jet Lib + Test APP 0.14.0 ERT

App: sd_SpiroSpherePackage-v1.1.19tgz

FCC-ID: 2AAUFSPS001 IC: 11335A-SPS001

Test result Passed



Possible test case verdicts:

- neither assessed nor tested: N/N

- required by standard but not appl. to test object: N/A

- required by standard but not tested: N/T

- not required by standard for the test object: N/R

- test object does meet the requirement P (Pass)

- test object does not meet the requirement F (Fail)

Testing:

Test Lab Temperature: 20 – 23 °C

Test Lab Humidity 32 – 38 %

Date of receipt of test item.....: 2017-03-23

Compiled by Christian Weber

(Responsible for Test)

Approved by (+ signature).....:
(Head of Lab)

Christian Weber

Date of issue 2017-05-12

Total number of pages: 32

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:

Test case reduction on radiated measurements only is based on the requirements for host integration for full modular approved transmitter modules (KDB 996369 D02) used by the EUT. The EUT uses a module with full modular approval according to FCC and IC rules. For details about the radio module see EUT description in section 1.

C. Weber



Version History

Version	Issue Date	Remarks	Revised by
01	2017-05-12	Initial Release	



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1 Equipment (Test item) Description

Description	Spiron	neter		
Model	SpiroSphere - Main Unit			
Additional Model(s)	None			
Brand Name(s)	SpiroS	phere		
Serial number	None			
Hardware version	04.04.0	03		
Software / Firmware version	Jet_Lik	+ Test_A	APP 0.14.0 ERT	
Continue / Fillinguic Version	App: s	d_SpiroSp	here Main UnitPacka	age-v1.1.19tgz
PMN	SpiroS	phere		
HVIN	SpiroS	phere		
FVIN	N/A			
HMN	N/A			
FCC-ID	2AAUF	SPS001		
IC	11335	A-SPS001		
Equipment type	End product			
Equipment classification	Mobile Device (Human Body distance > 20 cm)			
Radio type	Transceiver			
Radio technology	W-CDMA / LTE			
Operating frequency range	UMTS FDD V : TX = 824 - 849 MHz, RX = 869 - 894 MHz UMTS FDD II : TX = 1850 - 1910 MHz, RX = 1930 - 1990 MHz			
Assigned frequency band	Cell. Service Block A & B : 824 - 849 MHz & 869 - 894 MHz Broadband PCS : 1850 - 1910 MHz & 1930 - 1990 MHz			
	F _{LOW}	CH: 41	33 UL: 826.6 MHz	CH: 4358 DL: 871.6 MHz
Main test frequencies UMTS FDD V	F _{MID}	CH: 41	75 UL: 835.0 MHz	CH: 4400 DL: 880.0 MHz
OWIS FDD V	F _{HIGH} CH: 4232 UL: 846.4 MHz CH: 4457 DL: 891.4 MH		CH: 4457 DL: 891.4 MHz	
	F _{LOW}	CH: 92	63 UL: 1852.6 MHz	CH: 9663 DL: 1932.6 MHz
Main test frequencies UMTS FDD II	F _{MID}	CH: 94	00 UL: 1880.0 MHz	CH: 9800 DL: 1960.0 MHz
	F _{HIGH}	CH: 95	37 UL: 1907.4 MHz	CH: 9937 DL: 1987.4 MHz
Supported transmission modes	Circuit	switched,	Packet switched	
Modulations			16-QAM; HSUPA : E -QAM, 64-QAM	BPSK
Number of antennas	1x TX/	RX		
	Туре		2G/3G radio module)
	Model		HL8548	
	Manufa	acturer	Sierra Wireless	
Radio module	HW Ve	ersion	none	
	SW Ve	ersion	5.5.14.0 or higher	
	FCC-II)	N7NHL8548	
	IC		2417C-HL8548	



Product Service

	Туре	integrated	
Antenna	Model	FXP14.07.0 100A	
Antenna	Manufacturer	taoglas	
	Gain	3 to 1.5 dBi (Declaration)	
	eResearchTechi	nology GmbH	
Manufacturer	Sieboldstrasse 3		
Wallaracture	97230 Estenfeld		
	GERMANY		
	V _{NOM}	N/A	
Power supply	V _{MIN}	N/A	
	V _{MIN}	N/A	
	Model	GTM91099-3099-4.0-T2	
AC/DC-Adaptor	Vendor	GlobTec Inc.	
ACIDO-Adaptoi	Input	110-240 V AC 50-60 Hz	
	Output	5.0 V DC 6A	



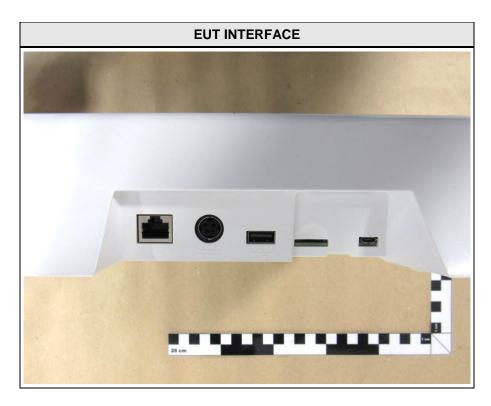
1.1 Photos – Equipment External







Product Service



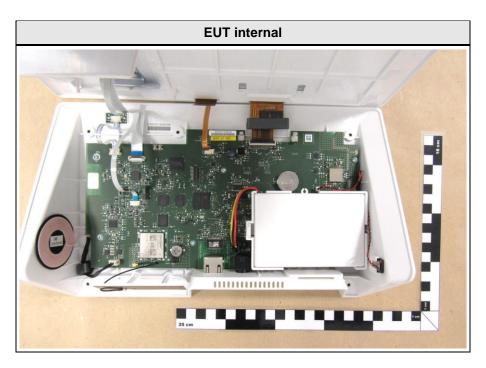


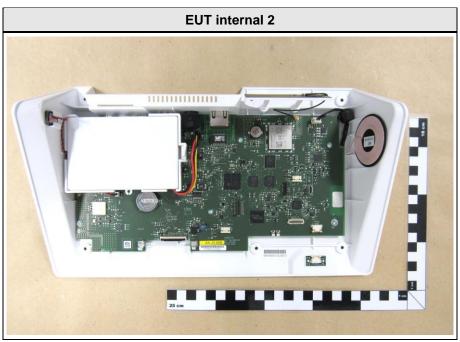


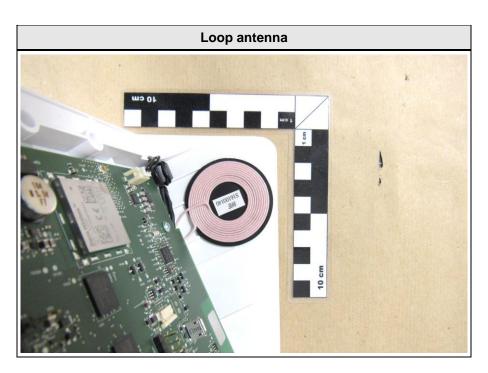


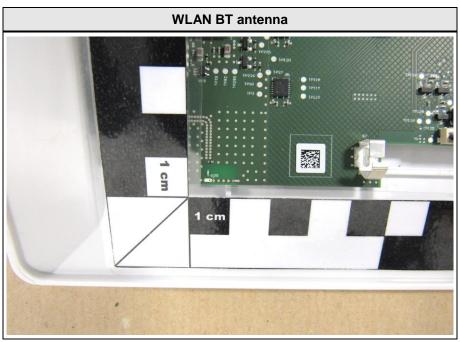


1.2 Photos – Equipment internal

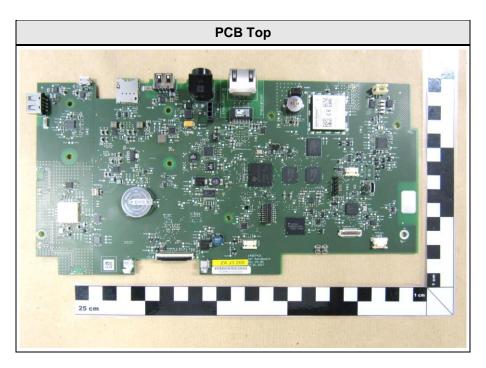


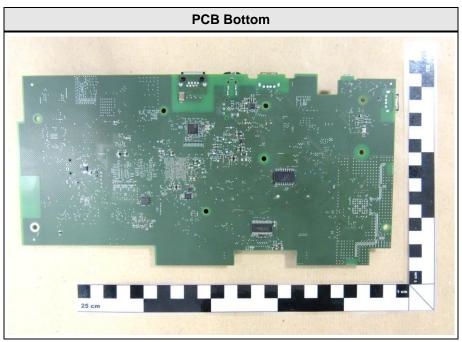






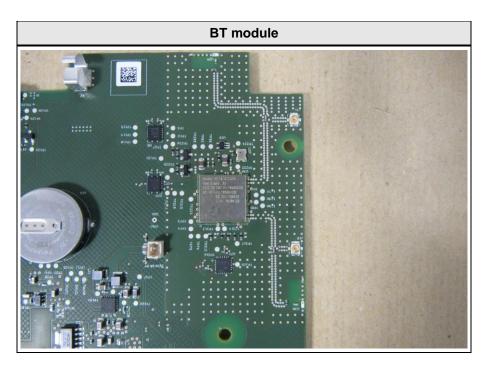


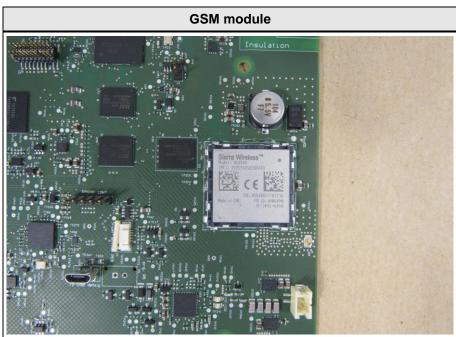






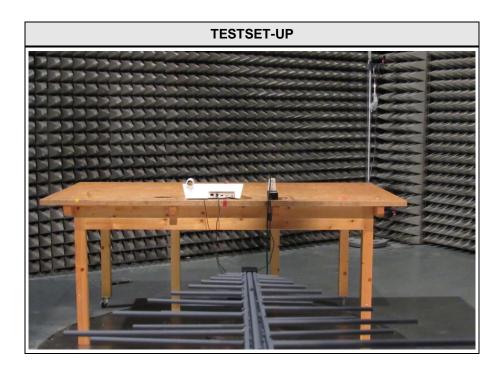
Product Service







1.3 Photos - Test setup





1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
SIM	Network	R&S	CMW500	UMTS -Tester

*Note: Use the following abbreviations:

AE : Auxiliary/Associated Equipment, or SIM : Simulator (Not Subjected to Test)

CABL: Connecting cables



1.5 Test Modes

Mode #	Description				
	General conditions:	EUT powered by power supply. Active call to communication tester.			
W-CDMA - PS	Radio conditions:	Mode = transmit Connection = Packet Switched Modulation = QPSK Configuration = RMC 12.2kbps + HSPA Power level = Maximum			
W CDMA DV	General conditions:	EUT powered by power supply. No active call to communication tester.			
W-CDMA - RX	Radio conditions:	Mode = receive Connection = Sign. RAB Cell FACH			



1.6 Test Equipment Used During Testing

Measurement Software						
Description	Description Manufacturer Name Version					
EMC Test Software Dare Instruments Radimation 15.2.4						

Occupied Bandwidth						
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due	
Spectrum Analyzer	R&S	FSIQ 26	EF00242	2016-04	2017-04	

Radiated power						
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due	
Fully-anechoic chamber	Frankonia	AC 3	EF00199	-	-	
Spectrum Analyzer	R&S	FSIQ 26	EF00242	2016-04	2017-04	
LPD Antenna	R&S	HL 223	EF00187	2016-05	2019-05	
Horn Antenna	R&S	BBHA 9120D	EF01153	2016-07	2017-07	

Radiated spurious emissions							
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due		
Semi-anechoic chamber	Frankonia	AC 1	EF00062	-	-		
Spectrum Analyzer	R&S	FSEK 30	EF00168	2016-12	2017-12		
Biconical Antenna	R&S	HK 116	EF00012	2016-05	2019-05		
LPD Antenna	R&S	HL 223	EF00212	2016-04	2019-04		
LPD Antenna	R&S	HL 025	EF00327	2015-10	2018-10		



1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in $dB\mu V$. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer ($dB\mu V$) + A.F. (dB) = Net field strength ($dB\mu V/m$)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of $dB\mu V/m$). The FCC limits are given in units of $\mu V/m$. The following formula is used to convert the units of $\mu V/m$ to $dB\mu V/m$:

Limit (dB μ V/m) = 20*log (μ V/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF = Net Reading : Net reading - FCC limit = Margin $21.5 \text{ dB}\mu\text{V} + 26 \text{ dB} = 47.5 \text{ dB}\mu\text{V/m} : 47.5 \text{ dB}\mu\text{V/m} - 57.0 \text{ dB}\mu\text{V/m} = -9.5 \text{ dB}$



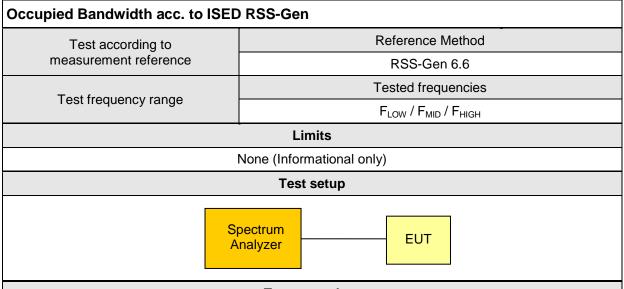
2 Result Summary

FCC 47 CFR Part 22H, 24E, ISED RSS-132, 133							
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks			
RSS-Gen 6.6	Occupied Bandwidth	RSS-Gen 6.6 KDB 971168		Informational only			
FCC § 24.235 FCC § 22.355 ISED RSS-132 § 4.3 ISED RSS-133 § 6.3	Frequency stability	FCC § 24.235 FCC § 22.355 ISED RSS-132 § 4.3 ISED RSS-133 § 6.3 KDB 971168	N/R				
FCC § 22.913(a)	Effective radiated power	ANSI/TIA-603-D KDB 971168	PASS				
FCC § 24.232(c) ISED RSS-132 § 4.4 ISED RSS-133 § 6.4	Equivalent isotropic radiated power	ANSI/TIA-603-D KDB 971168	PASS				
FCC § 24.232(d) ISED RSS-133 § 6.4	Peak to average ratio	KDB 971168	N/R				
FCC § 22.917(b) FCC § 24.238(b) ISED RSS-132 § 4.5 ISED RSS-133 § 6.5	Band-edge compliance	KDB 971168	N/R				
FCC § 22.917(a) FCC § 24.238(a) ISED RSS-132 § 4.5 ISED RSS-133 § 6.5	Conducted out-of-band emissions	KDB 971168	N/R				
FCC § 22.917(a) FCC § 24.238(a) ISED RSS-132 § 4.5 ISED RSS-133 § 6.5	Radiated out-of-band emissions	ANSI/TIA-603-D KDB 971168	PASS				
ISED RSS-132 § 4.6 ISED RSS-133 § 6.6 ISED RSS-Gen 7.1	Receiver radiated spurious emissions	ISED RSS-Gen 7.1	PASS				



3 Test Conditions and Results

3.1 Test Conditions and Results - Occupied Bandwidth



Test procedure

- 1. EUT set to test mode (Communication tester is used if needed)
- 2. Span set to at least twice the emission spectrum
- 3. Resolution bandwidth set to 1 % of span
- 4. Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function

Test results – W-CDMA V						
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]			
F _{LOW}	826.6	W-CDMA - PS	4949			
F _{MID}	835.0	W-CDMA - PS	4969			
F _{HIGH}	846.4	W-CDMA - PS	4288			
	Test results – W-CDMA II					
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]			
F _{LOW}	1852.6	W-CDMA - PS	4288			
F _{MID}	1880.0	W-CDMA - PS	4248			
F _{HIGH}	1907.4	W-CDMA - PS	4228			
Comments:						



Occupied Bandwidth - W-CDMA V FLOW

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1702-6295

Applicant: eResearchTechnology GmbH

EUT Name: Spirometer

Model: SpiroSphere – Main Unit
Test Site: Eurofins Product Service GmbH

Operator: Burkhard Pudell Test Conditions: Tnom / Vnom

Mode: UMTS FDD V / CH: 4133 / RMC+HSPA

Test Date: 2017-03-28

Verdict: NONE (INFORMATION ONLY)

Note 1: A spectrum analyzer with an integrated 99% power bandwidth function is used

Note 2: OBW = 4.949 MHz





Occupied Bandwidth - W-CDMA V F_{MID}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1702-6295

Applicant: eResearchTechnology GmbH

EUT Name: Spirometer

Model: SpiroSphere – Main Unit
Test Site: Eurofins Product Service GmbH

Operator: Burkhard Pudell Test Conditions: Tnom / Vnom

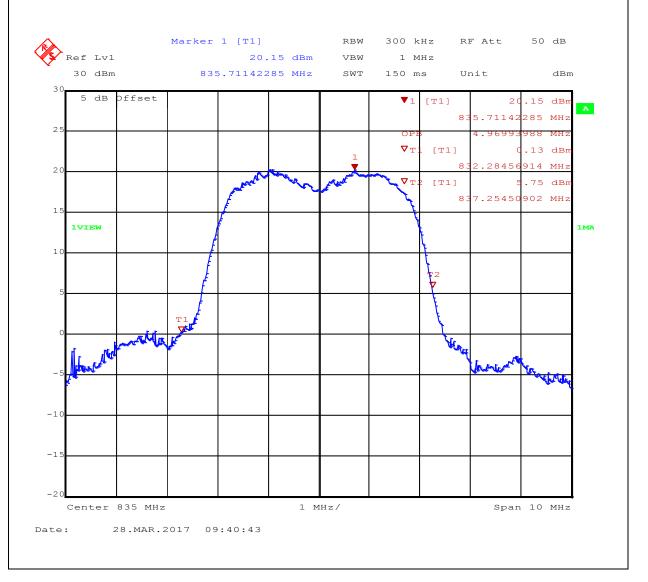
Mode: UMTS FDD V / CH: 4175 / RMC+HSPA

Test Date: 2017-03-28

Verdict: NONE (INFORMATION ONLY)

Note 1: A spectrum analyzer with an integrated 99% power bandwidth function is used

Note 2: OBW = 4.969 MHz





Occupied Bandwidth - W-CDMA V FHIGH

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1702-6295

Applicant: eResearchTechnology GmbH

EUT Name: Spirometer

Model: SpiroSphere – Main Unit
Test Site: Eurofins Product Service GmbH

Operator: Burkhard Pudell Test Conditions: Tnom / Vnom

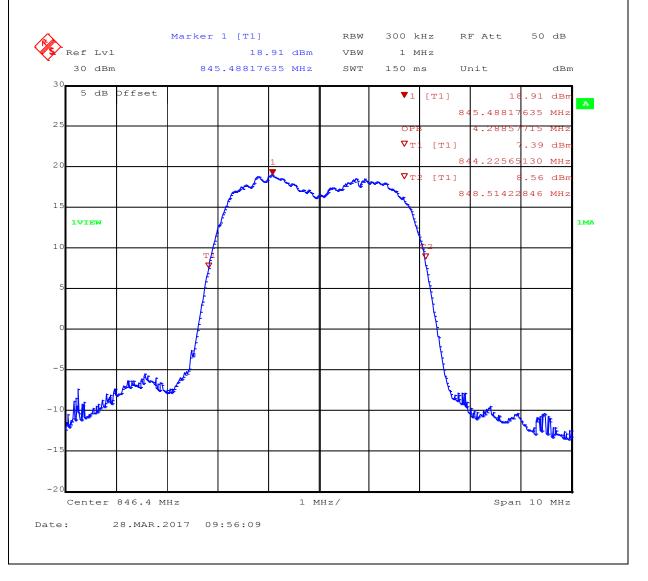
Mode: UMTS FDD V / CH: 4232 / RMC+HSPA

Test Date: 2017-03-28

Verdict: NONE (INFORMATION ONLY)

Note 1: A spectrum analyzer with an integrated 99% power bandwidth function is used

Note 2: OBW = 4.288 MHz





Occupied Bandwidth - W-CDMA II FLOW

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1702-6295

Applicant: eResearchTechnology GmbH

EUT Name: Spirometer

Model: SpiroSphere – Main Unit
Test Site: Eurofins Product Service GmbH

Operator: Burkhard Pudell Test Conditions: Tnom / Vnom

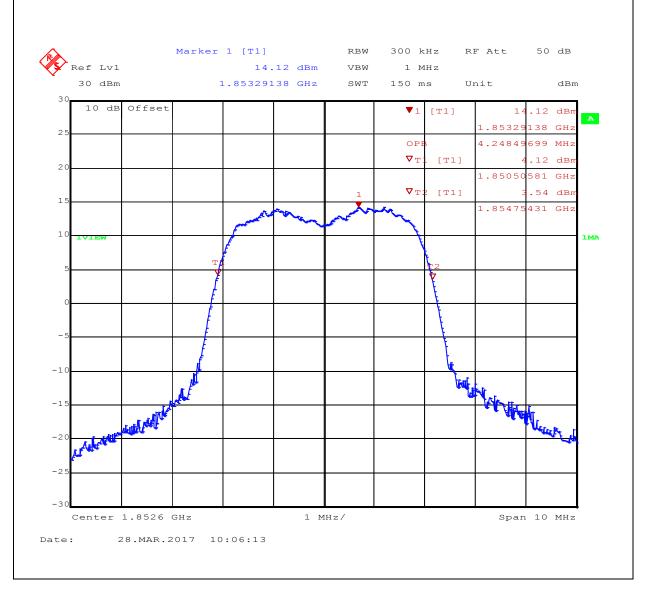
Mode: UMTS FDD II / CH: 9263 / RMC+HSPA

Test Date: 2017-03-28

Verdict: NONE (INFORMATION ONLY)

Note 1: A spectrum analyzer with an integrated 99% power bandwidth function is used

Note 2: OBW = 4.248 MHz





Occupied Bandwidth - W-CDMA II F_{MID}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1702-6295

Applicant: eResearchTechnology GmbH

EUT Name: Spirometer

Model: SpiroSphere – Main Unit
Test Site: Eurofins Product Service GmbH

Operator: Burkhard Pudell Test Conditions: Tnom / Vnom

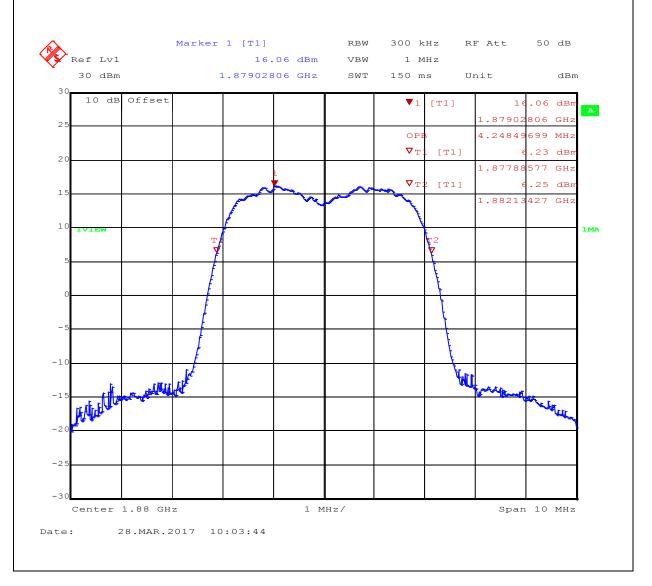
Mode: UMTS FDD II / CH: 9400 / RMC+HSPA

Test Date: 2017-03-28

Verdict: NONE (INFORMATION ONLY)

Note 1: A spectrum analyzer with an integrated 99% power bandwidth function is used

Note 2: OBW = 4.248 MHz





Occupied Bandwidth - W-CDMA II FHIGH

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1702-6295

Applicant: eResearchTechnology GmbH

EUT Name: Spirometer

Model: SpiroSphere – Main Unit
Test Site: Eurofins Product Service GmbH

Operator: Burkhard Pudell Test Conditions: Tnom / Vnom

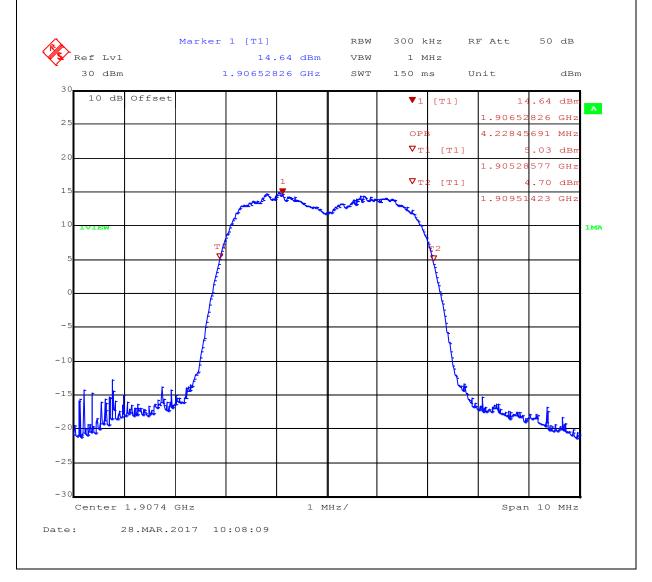
Mode: UMTS FDD II / CH: 9537 / RMC+HSPA

Test Date: 2017-03-28

Verdict: NONE (INFORMATION ONLY)

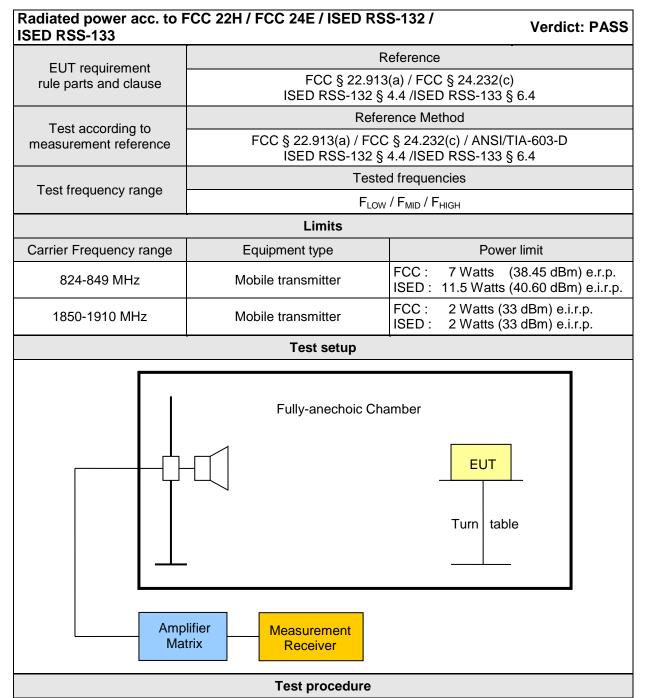
Note 1: A spectrum analyzer with an integrated 99% power bandwidth function is used

Note 2: OBW = 4.228 MHz





3.2 Test Conditions and Results – Effective radiated power / Equivalent isotropic radiated power



- 1. EUT set to test mode
- 2. The radiated power is measured with a measurement antenna in vertical polarization
- 3. To obtain maximum level the EUT is rotated
- 4. The EUT is replaced with a half-wave dipole and the power to the dipole is adjusted to obtain same radiated power measurement value



Product Service

Test results – W-CDMA V E.R.P.											
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.r.p]	Limit [dBm e.r.p]	Margin [dB]	Result				
F _{LOW}	826.6	W-CDMA - PS	hor	21.2	38.45	-17.25	PASS				
F _{MID}	835.0	W-CDMA - PS	hor	22.4	38.45	-16.05	PASS				
F _{HIGH}	846.4	W-CDMA - PS	hor	20.8	38.45	-17.65	PASS				
	Test results – W-CDMA V E.I.R.P.										
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result				
F _{LOW}	826.6	W-CDMA - PS	hor	23.35	40.6	-17.25	PASS				
F _{MID}	835.0	W-CDMA - PS	hor	24.55	40.6	-16.05	PASS				
F _{HIGH}	846.4	W-CDMA - PS	hor	22.95	40.6	-17.65	PASS				
		Test result	s – W-CD	MAII E.I.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result				
F _{LOW}	1852.6	W-CDMA - PS	ver	21.5	33	-11.5	PASS				
F _{MID}	1880	W-CDMA - PS	ver	21.3	33	-11.7	PASS				
F _{HIGH}	1907.4	W-CDMA - PS	ver	19.3	33	-13.7	PASS				
Comments:											



3.3 Test Conditions and Results - Transmitter radiated emissions

Transmitter radiated power acc. to FCC 22H / FCC 24E / Verdict: PASS ISED RSS-132 / ISED RSS-133							
Toot oppording refere	naad	Reference Method					
Test according refere standards	ncea	FCC § 22.917(a) / FCC § 24.238(a) ISED RSS-132 § 4.5 / ISED RSS-133 § 6.5					
Test according to)	Reference Method					
measurement refere	nce	ANS	I/TIA-603-D				
Test frequency ran	Toot froquer surrenge		d frequencies				
rest frequency fair	y c	30 MHz -	– 10 th Harmonic				
		Limits					
Carrier Frequency range		Limit					
824-849 MHz	Attenuation	below transmitter power ≥ 4	43 + 10 ⋅ log ₁₀ (F	P) [dB] = -13 dBm			
1850-1910 MHz	Attenuation	n below transmitter power ≥ 43 + 10 · log ₁₀ (P) [dB] = -13 dBm					
		Test setup					
		Semi-anechoic Chamber Ground Plane	EUT Turn table				
Ampl Mat		Measurement Receiver					

Test procedure

- 1. EUT set to test mode
- 2. Maximum emission level is measured by rotating the EUT and adjusting the antenna height for vertical polarization
- 3. The EUT is replaced by a substitution antenna and generator
- 4. The power level is set to obtain the same power reading
- 5. Measurement is repeated for horizontal polarization



Product Service

	Test results – W-CDMA FDD V										
Channel	Frequency [MHz]	Mode	Emission [MHz]	Margin [dB]							
F _{LOW}	826.6	W-CDMA - PS	823	-5.31							
F _{MID}	835.0	W-CDMA - PS	No significant spurious emissions								
F _{HIGH}	846.4	W-CDMA - PS	No significant spurious emissions								
Comments:	Comments:										

Test results – W-CDMA FDD II										
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dbm]	Pol.	Limit [dBm]	Margin [dB]			
F _{LOW}	1852.6	W-CDMA - PS	1850	-20.15	ver	-13	-7.15			
F _{LOW}	1852.6	W-CDMA - PS	1850	-17.93	hor	-13	-4.93			
F _{MID}	1880.0	W-CDMA - PS	No significant spurious emissions							
F _{HIGH}	1907.4	W-CDMA - PS	1910	-19.21	ver	-13	-6.21			
F _{HIGH}	1907.4	W-CDMA - PS	1910	-17.19	hor	-13	-4.19			
Comments:	Comments:									



3.4 Test Conditions and Results - Receiver radiated emissions

Receiver radiated emissions acc. to ISED RSS-210 Verdict: PASS								
Test according referenced			Reference Method					
standards			ISED RSS-132 5.6 / 133 6.6					
Test according to			Reference Method					
measurement reference			ANSI C63.4					
Test frequency range			Tested frequencies					
rest frequency fair	Test frequency range			0 MHz – 5 th Harr	nonic	;		
EUT test mode				Receive				
			Limits					
Frequency range [MHz]	Detecto	r	Limit [µV/m]	Limit [dBµV/	m]	Limit Distance [m]		
30 – 88	Quasi-Pe	ak	100	40		3		
88 – 216	88 – 216 Quasi-Pea		150	43.5		3		
216 – 960	216 – 960 Quasi-Pe		200	46		3		
960 – 1000 Quasi-Pea		ak	500	54		3		
> 1000 Average		9	500	54		3		
			Test setup					
			Semi-anechoic Ch	Turr	UT 1 tat	ole		
	plifier atrix	N	Measurement Receiver					



Test procedure

- 1. EUT set to receive mode (Communication tester is used if needed)
- 2. Span it set according to measurement range
- 3. Resolution bandwidth below 1GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1MHz with peak/average detector is used above 1GHz
- 4. Markers are set to peak emission levels

Test results										
Channel	Frequency [MHz]	Emission [MHz]	Emission Level [dbµV/m]	Emission Level [µV/m]	Det.	Limit [µV/m]	Margin [µV/m]			
F_{MID}	835	1510	45.66	191.9	pk	500	-309.1			
F _{MID}	835	1516	46.89	221.1	pk	500	-278.9			
F _{MID}	835	2122	46.91	221.6	pk	500	-278.4			
F _{MID}	835	2722	47.20	229.1	pk	500	-270.9			
F _{MID}	1880	1510	45.20	182.0	pk	500	-318.0			
F _{MID}	1880	1516	46.98	223.4	pk	500	-276.6			
F _{MID}	1880	2116	46.36	208.0	pk	500	-292.0			
F _{MID}	1880	2726	46.36	208.0	pk	500	-292.0			

Comments:

* Physical distance between EUT and measurement antenna.

** Emission level corresponds to ambient noise floor