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

Report Reference No. .... :	G0M-1612-6168-TFC224GS-V01
Testing Laboratory .... :	Eurofins Product Service GmbH
Address .... :	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation .... :	A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC OATS Filing assigned code: 3470A
Applicant's name .... :	eResearch Technology 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	Asthma Monitor AM3
Model No.	AM3 Option G+
Additional Model(s)	None
Brand Name(s)	None
Hardware version	1.0
Firmware / Software version	9.40
	FCC-ID: 2AAUFAM3G02 IC: 11335A-AM3G02
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...:	2016-12-23
Date (s) of performance of tests..................................:	2017-01-04 - 2017-01-09
Compiled by ....:	Matthias Handrik
Tested by (+ signature) ....: (Responsible for Test)	Matthias Handrik
Approved by (+ signature)................: (Head of Lab)	Christian Weber
Date of issue ....:	2017-01-31
Total number of pages ....:	26

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 ISED rules. For details about the radio module see EUT description in section 1.

Version History

Version	Issue Date	Remarks	Revised by
01	2017-01-31	Initial Release	

REPORT INDEX

1 Equipment (Test item) Description

Description	Asthma Monitor AM3
Model	AM3 Option G+
Additional Model(s)	None
Brand Name(s)	None
Serial number	None
Hardware version	1.0
Software / Firmware version	9.40
PMN	N/A
HVIN	AM3 Option G+
FVIN	N/A
HMN	N/A
FCC-ID	2AAUFAM3G02
IC	11335A-AM3G02
Equipment type	End product
Equipment classification	Portable Device (Human Body distance < 20 cm)
Radio type	Transceiver
Radio technology	GSM850 / GSM1900
Operating frequency range	GSM850 : TX = 824 - 849 MHz, RX = 869 - 894 MHz GSM1900 : 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

Main test frequencies GSM850	F_{LOW}	CH : 128 UL: 824.2 MHz	CH : 128 DL: 869.2 MHz
	F_{MID}	CH : 188 UL: 836.2 MHz	CH : 188 DL: 881.2 MHz
	F_{HIGH}	CH : 251 UL: 848.8 MHz	CH : 251 DL: 893.8 MHz
Main test frequencies GSM1900	F_{LOW}	CH : 512 UL: 1850.2 MHz	CH : 512 DL: 1930.2 MHz
	F_{MID}	CH : 661 UL: 1880.0 MHz	CH : 661 DL: 1960.0 MHz
	F_{HIGH}	CH : 810 UL: 1909.8 MHz	CH : 810 DL: 1989.8 MHz

Supported transmission modes	GSM, GPRS
Modulations	GSM, GPRS : GMSK
Multislot class	10
Number of antennas	1

Radio module	Type	GSM/UMTS module
	Model	HL8548
	Manufacturer	Sierra Wireless
	HW Version	N/A
	SW Version	N/A
	FCC-ID	N7NHL8548
	IC	2417C-HL8548

1.1 Photos – Equipment External

EUT TOP

EUT BOTTOM
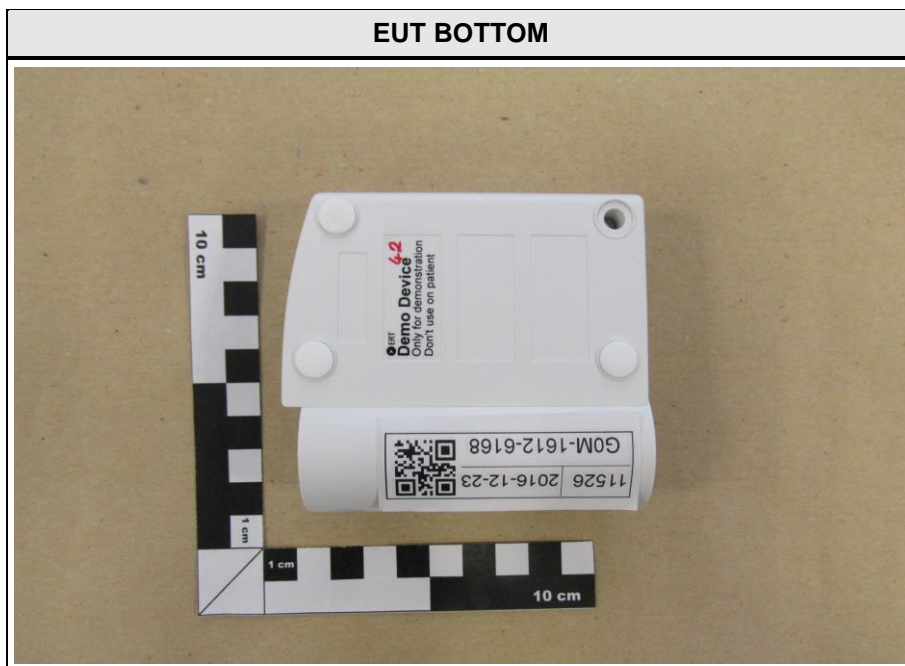
1.2 Photos – Equipment internal

EUT PCB BACK

EUT PCB FRONT

Test setup radiated spurious emission
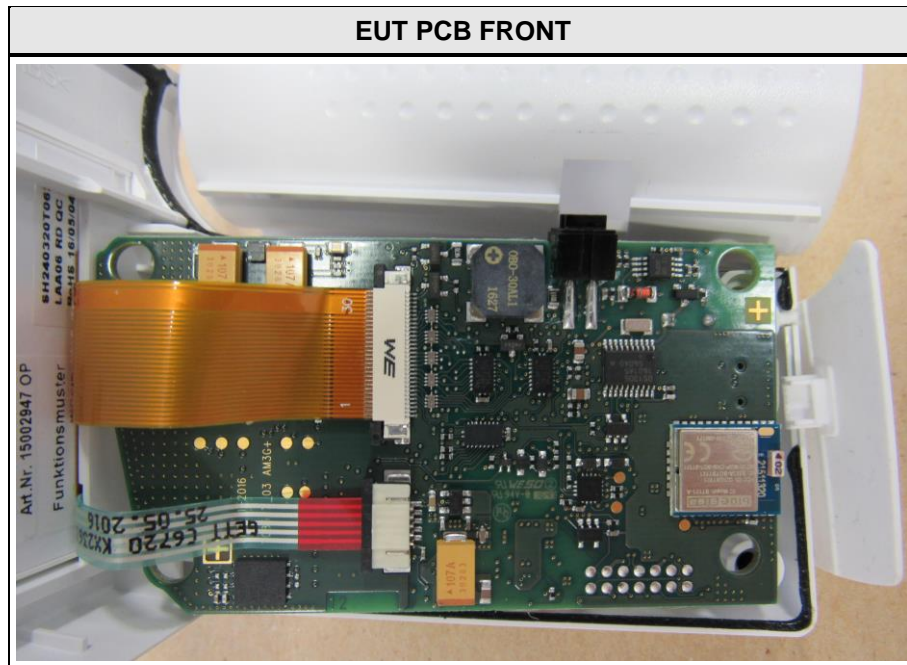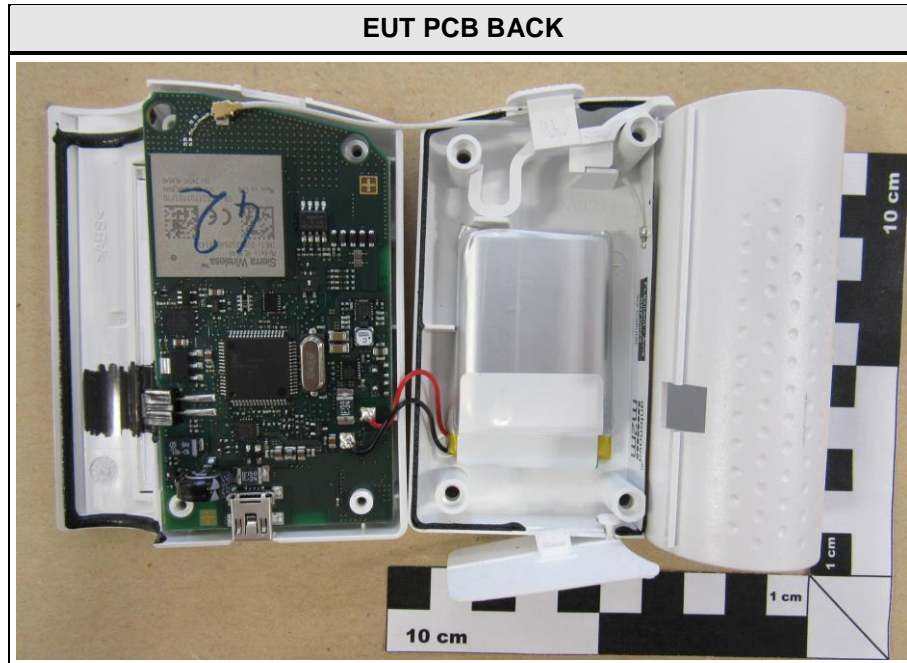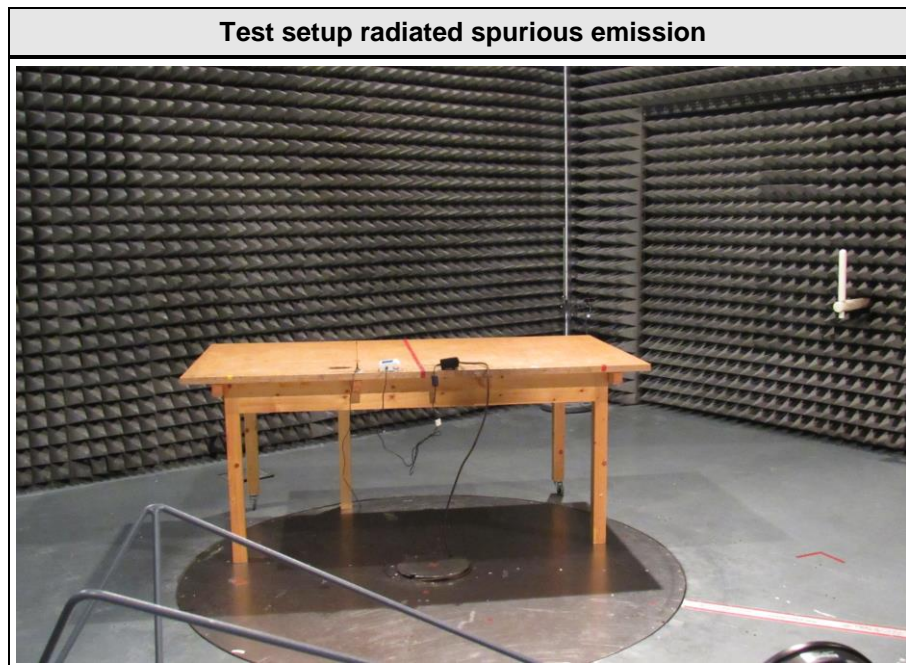
1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
SIM	Communication tester	Rohde & Schwarz	CMU 200	
*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	
GSM850	General conditions:	EUT powered up. AC/DC adaptor connected for charging. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = Circuit switched Modulation = GMSK Slot configuration = 1 up / 1 down Power level = Maximum (PCL5)
GSM1900	General conditions:	EUT powered up. AC/DC adaptor connected for charging. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = Circuit switched Modulation = GMSK Slot configuration = 1 up / 1 down Power level = Maximum (PCL0)

1.6   Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2015.2.4

Occupied Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2016-02	2017-02

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
Biconical Antenna	R&S	HK 116	EF00012	2016-05	2019-05
LPD Antenna	R&S	HL 223	EF00187	2016-05	2019-05
LPD Antenna	R&S	HL 025	EF00327	2015-10	2018-10

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 dBμV. 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 (dBμV) + A.F. (dB) = Net field strength (dBμV/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 dBμV/m). The FCC limits are given in units of μV/m. The following formula is used to convert the units of μV/m to dBμV/m:

Limit (dBμV/m) = 20*log (μV/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 dBμV +  26 dB =     47.5 dBμV/m     :    47.5 dBμV/m - 57.0 dBμV/m = -9.5 dB
```

2 Result Summary

<table>
<tr><td colspan="5">FCC 47 CFR Part 22H, 24E, ISED RSS-132, 133</td></tr>
<tr><th>Product Specific Standard Section</th><th>Requirement – Test</th><th>Reference Method</th><th>Result</th><th>Remarks</th></tr>
<tr><td>RSS-Gen 6.6</td><td>Occupied Bandwidth</td><td>RSS-Gen 6.6
KDB 971168</td><td></td><td>Informational only</td></tr>
<tr><td>FCC § 24.235
FCC § 22.355
ISED RSS-132 § 4.3
ISED RSS-133 § 6.3</td><td>Frequency stability</td><td>FCC § 24.235
FCC § 22.355
ISED RSS-132 § 4.3
ISED RSS-133 § 6.3
KDB 971168</td><td>N/T</td><td></td></tr>
<tr><td>FCC § 22.913(a)</td><td>Effective radiated power</td><td>ANSI/TIA-603-D
KDB 971168
ANSI C63.26</td><td>PASS</td><td></td></tr>
<tr><td>FCC § 24.232(c)
ISED RSS-132 § 4.4
ISED RSS-133 § 6.4</td><td>Equivalent isotropic radiated power</td><td>ANSI/TIA-603-D
KDB 971168
ANSI C63.26</td><td>PASS</td><td></td></tr>
<tr><td>FCC § 24.232(d)
ISED RSS-133 § 6.4</td><td>Peak to average ratio</td><td>FCC § 24.232(d)
ISED RSS-133 § 6.4
KDB 971168</td><td>N/T</td><td></td></tr>
<tr><td>FCC § 22.917(b)
FCC § 24.238(b)
ISED RSS-132 § 4.5
ISED RSS-133 § 6.5</td><td>Band-edge compliance</td><td>FCC § 22.917(b)
FCC § 24.238(b)
ISED RSS-132 § 4.5
ISED RSS-133 § 6.5
KDB 971168</td><td>N/T</td><td></td></tr>
<tr><td>FCC § 22.917(a)
FCC § 24.238(a)
ISED RSS-132 § 4.5
ISED RSS-133 § 6.5</td><td>Conducted out-of-band emissions</td><td>FCC § 22.917(a)
FCC § 24.238(a)
ISED RSS-132 § 4.5
ISED RSS-133 § 6.5
KDB 971168</td><td>N/T</td><td></td></tr>
<tr><td>FCC § 22.917(a)
FCC § 24.238(a)
ISED RSS-132 § 4.5
ISED RSS-133 § 6.5</td><td>Radiated out-of-band emissions</td><td>ANSI/TIA-603-D
KDB 971168
ANSI C63.26</td><td>PASS</td><td></td></tr>
<tr><td>ISED RSS-132 § 4.6
ISED RSS-133 § 6.6
ISED RSS-Gen 7.1</td><td>Receiver radiated spurious emissions</td><td>ISED RSS-132 § 4.6
ISED RSS-133 § 6.6
ISED RSS-Gen 7.1
ANSI C63.26</td><td>PASS</td><td></td></tr>
<tr><td colspan="5">Remarks:</td></tr>
</table>

3 Test Conditions and Results

3.1 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. to ISED RSS-Gen			
Test according to measurement reference	Reference Method		
	RSS-Gen 6.6		
Test frequency range	Tested frequencies		
	F_{LOW} / F_{MID} / F_{HIGH}		
Limits			
None (Informational only)			
Test setup			

Spectrum Analyzer — EUT

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 – GSM850			
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]
F_{LOW}	824.2	GSM850	237.18
F_{MID}	836.2	GSM850	237.18
F_{HIGH}	848.8	GSM850	237.18
Test results – GSM1900			
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]
F_{LOW}	1850.2	GSM1900	241.99
F_{MID}	1880	GSM1900	241.99
F_{HIGH}	1909.8	GSM1900	241.99
Comments:			

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1612-6168

Applicant:	eResearch Technology GmbH
EUT Name:	Asthma Monitor AM3
Model:	AM3 Option G+
Test Site:	Eurofins Product Service GmbH
Operator:	Matthias Handrik
Test Conditions:	Tnom / Vnom
Mode:	GSM 850 / CH: 128 / PCL: 5 (33 dBm) Circuited Switched
Test Date:	2017-01-09
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 237.18 kHz

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1612-6168

Applicant:	eResearch Technology GmbH
EUT Name:	Asthma Monitor AM3
Model:	AM3 Option G+
Test Site:	Eurofins Product Service GmbH
Operator:	Matthias Handrik
Test Conditions:	Tnom / Vnom
Mode:	GSM 850 / CH: 188 / PCL: 5 (33 dBm) Circuit Switched
Test Date:	2017-01-09
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 237.18 kHz

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1612-6168

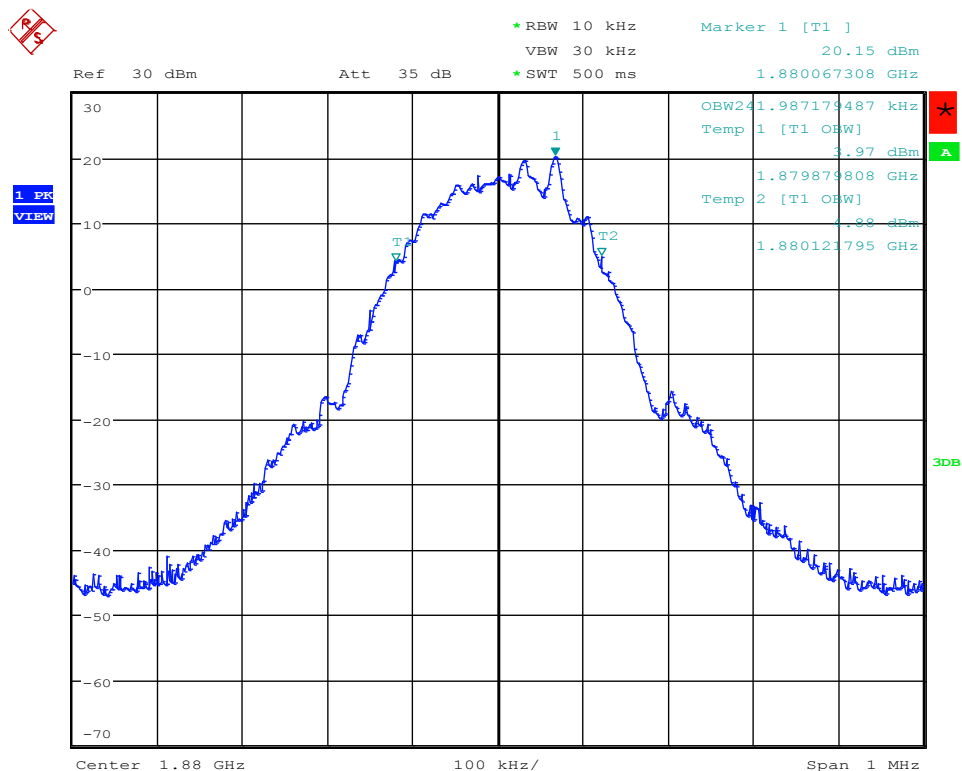|	
Applicant:	eResearch Technology GmbH
EUT Name:	Asthma Monitor AM3
Model:	AM3 Option G+
Test Site:	Eurofins Product Service GmbH
Operator:	Matthias Handrik
Test Conditions:	Tnom / Vnom
Mode:	GSM 850 / CH: 251 / PCL: 5 (33 dBm) Circuit Switched
Test Date:	2017-01-09
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 237.18 kHz

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1612-6168

Applicant:	eResearch Technology GmbH
EUT Name:	Asthma Monitor AM3
Model:	AM3 Option G+
Test Site:	Eurofins Product Service GmbH
Operator:	Matthias Handrik
Test Conditions:	Tnom / Vnom
Mode:	GSM 1900 / CH: 512 / PCL: 5 (33 dBm) Circuit Switched
Test Date:	2017-01-09
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 241.99 kHz
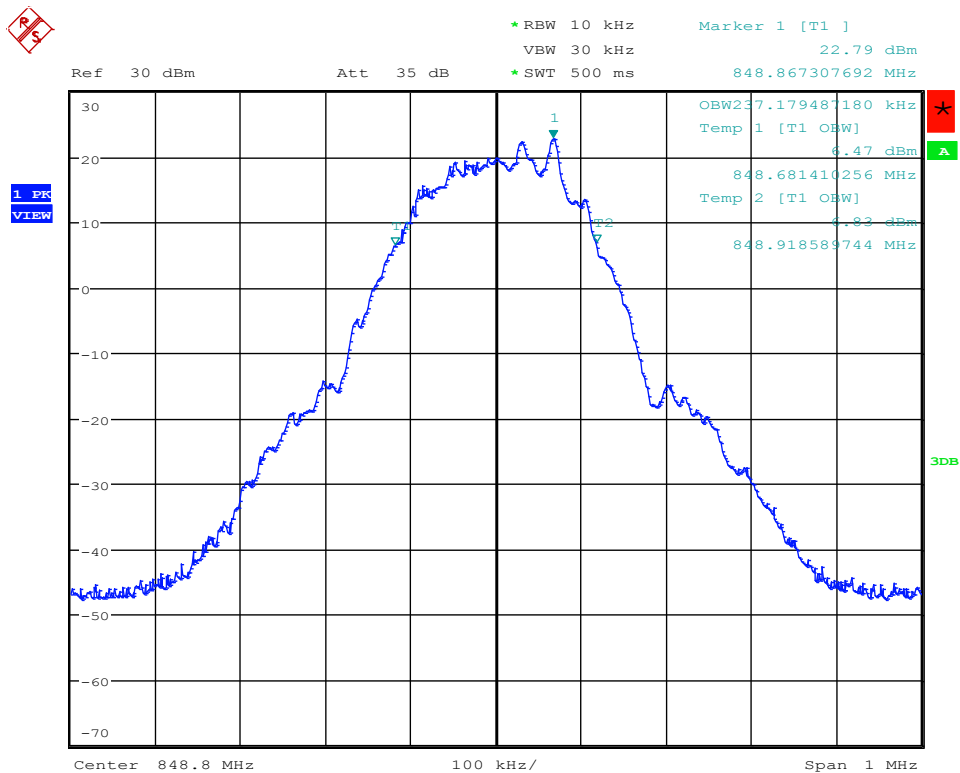
Occupied Bandwidth acc. to RSS-Gen
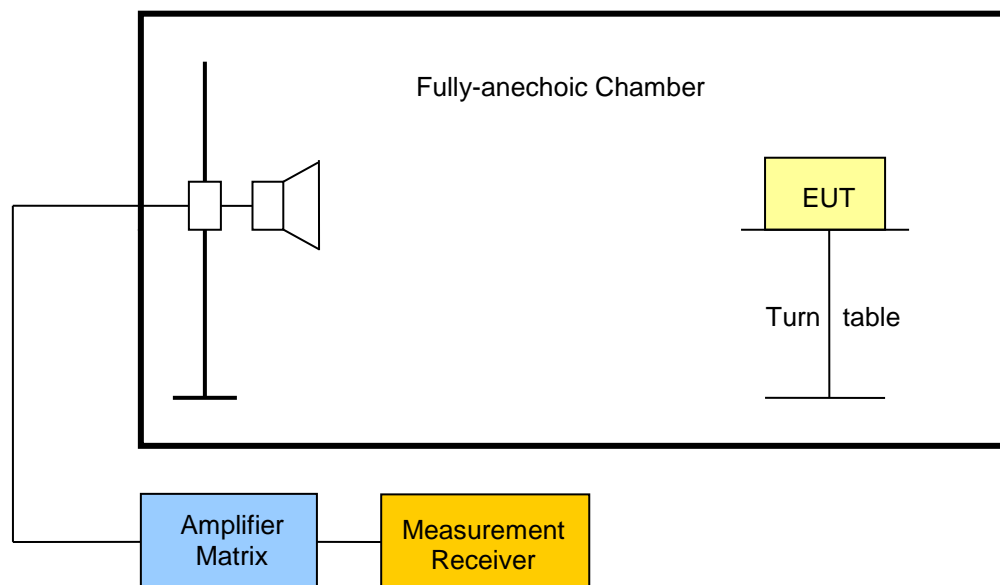
Project Number: G0M-1612-6168

Applicant:	eResearch Technology GmbH
EUT Name:	Asthma Monitor AM3
Model:	AM3 Option G+
Test Site:	Eurofins Product Service GmbH
Operator:	Matthias Handrik
Test Conditions:	Tnom / Vnom
Mode:	GSM 1900 / CH: 661 / PCL: 5 (33 dBm) Circuit Switched
Test Date:	2017-01-09
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 241.99 kHz

Test Report No.: G0M-1612-6168-TFC224GS-V01

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1612-6168

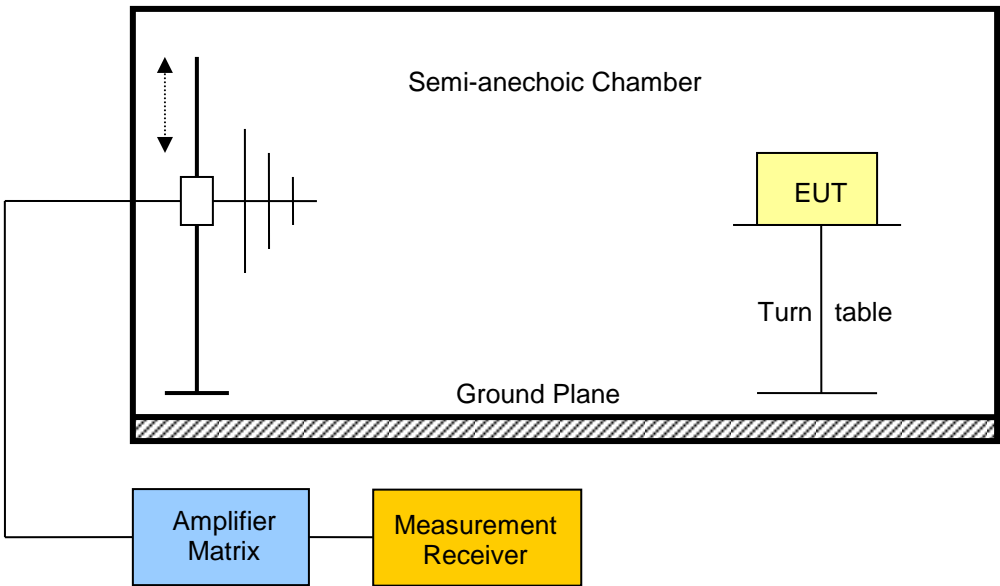|	
Applicant:	eResearch Technology GmbH
EUT Name:	Asthma Monitor AM3
Model:	AM3 Option G+
Test Site:	Eurofins Product Service GmbH
Operator:	Matthias Handrik
Test Conditions:	Tnom / Vnom
Mode:	GSM 1900 / CH: 810 / PCL: 5 (33 dBm) Circuit Switched
Test Date:	2017-01-09
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 241.99 kHz
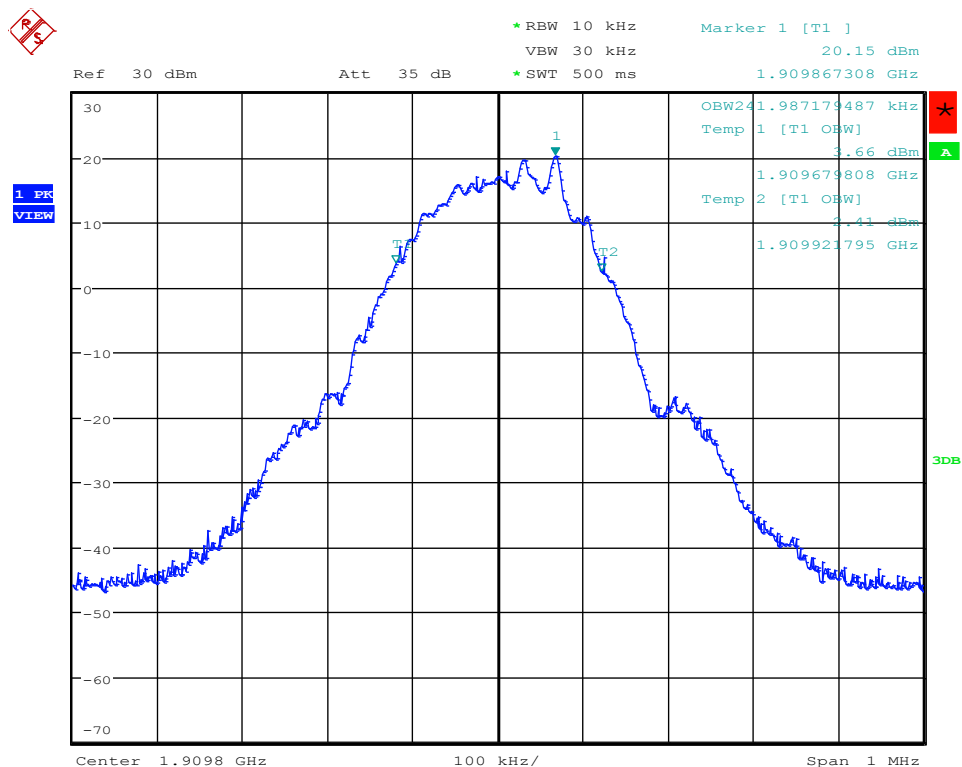
3.2 Test Conditions and Results – Effective radiated power / Equivalent isotropic radiated power

Radiated power acc. to FCC 22H / FCC 24E / ISED RSS-132 / ISED RSS-133			Verdict: PASS
EUT requirement rule parts and clause	Reference		
	FCC § 22.913(a) / FCC § 24.232(c) ISED RSS-132 § 4.4 /ISED RSS-133 § 6.4		
Test according to measurement reference	Reference Method		
	FCC § 22.913(a) / FCC § 24.232(c) / ANSI/TIA-603-D ISED RSS-132 § 4.4 /ISED RSS-133 § 6.4 / ANSI C63.26		
Test frequency range	Tested frequencies		
	F_{LOW} / F_{MID} / F_{HIGH}		

Limits		
Carrier Frequency range	Equipment type	Power limit
824-849 MHz	Mobile transmitter	FCC: 7 Watts (38.45 dBm) e.r.p. ISED: 11.5 Watts (40.60 dBm) e.i.r.p.
1850-1910 MHz	Mobile transmitter	FCC: 2 Watts (33 dBm) e.i.r.p. ISED: 2 Watts (33 dBm) e.i.r.p.

Test setup

Test procedure

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
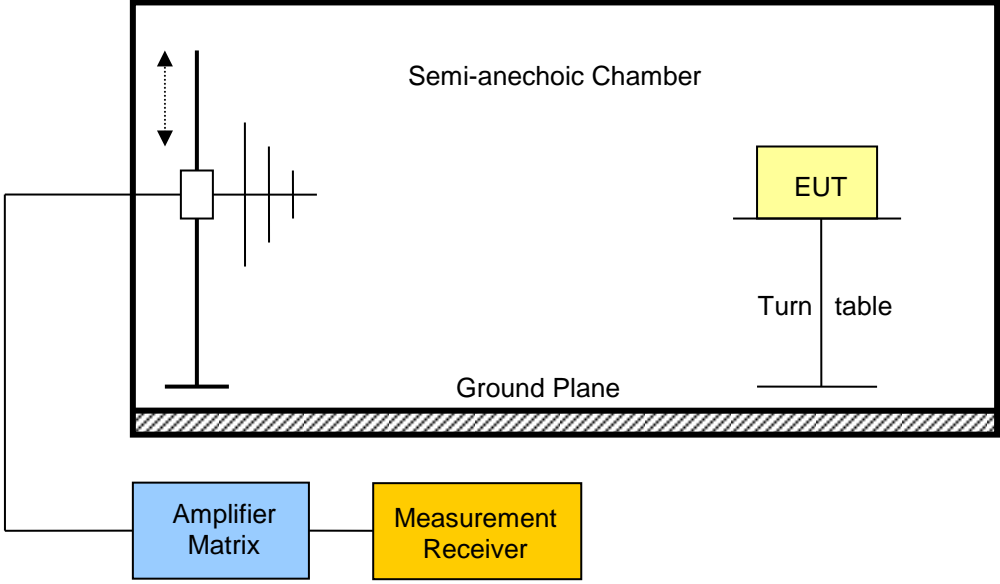
Test results – GSM850 E.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.r.p]	Limit [dBm e.r.p]	Margin [dB]	Result
F_{LOW}	824.2	GSM850	hor	18.6	38.45	-19.85	PASS
F_{MID}	836.2	GSM850	hor	20.6	38.45	-17.85	PASS
F_{HIGH}	848.8	GSM850	hor	22.7	38.45	-15.75	PASS
Test results – GSM850 E.I.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result
F_{LOW}	824.2	GSM850	hor	20.8	40.6	-19.80	PASS
F_{MID}	836.2	GSM850	hor	22.8	40.6	-17.80	PASS
F_{HIGH}	848.8	GSM850	hor	24.6	40.6	-16.00	PASS
Test results – GSM1900 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}	1850.2	GSM1900	hor	22.7	33	-10.30	PASS
F_{MID}	1880	GSM1900	hor	22.5	33	-10.50	PASS
F_{HIGH}	1909.8	GSM1900	hor	23.3	33	-09.70	PASS
Comments:							

3.3 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated power acc. to FCC 22H / FCC 24E / ISED RSS-132 / ISED RSS-133	Verdict: PASS

Test according referenced standards	Reference Method
	FCC § 22.917(a) / FCC § 24.238(a) ISED RSS-132 § 4.5 / ISED RSS-133 § 6.5
Test according to measurement reference	Reference Method
	ANSI/TIA-603-D / ANSI C63.26
Test frequency range	Tested frequencies
	30 MHz – 10th Harmonic

Limits	
Carrier Frequency range	Limit
824-849 MHz	Attenuation below transmitter power ≥ 43 + 10 · $\log_{10}$(P) [dB] = -13 dBm
1850-1910 MHz	Attenuation below transmitter power ≥ 43 + 10 · $\log_{10}$(P) [dB] = -13 dBm

Test setup

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

Test results – GSM850							
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dbm]	Pol.	Limit [dBm]	Margin [dB]
F$_{LOW}$	824.2	GSM850	823.998	-19.8	hor	-13	-06.80
F$_{HIGH}$	848.8	GSM850	849	-15.8	hor	-13	-02.80
Test results – GSM1900							
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dbm]	Pol.	Limit [dBm]	Margin [dB]
F$_{LOW}$	1850.2	GSM1900	1850	-22.8	hor	-13	-09.80
F$_{LOW}$	1850.2	GSM1900	3700	-23.8	hor	-13	-10.80
F$_{MID}$	1880	GSM1900	3756	-21.3	hor	-13	-08.30
F$_{HIGH}$	1909.8	GSM1900	1910	-22.1	ver	-13	-09.10
F$_{HIGH}$	1909.8	GSM1900	3816	-20.6	hor	-13	-07.60
Comments:							

3.4 Test Conditions and Results – Receiver radiated emissions

Receiver radiated emissions acc. to ISED RSS-132 / ISED RSS-133			Verdict: PASS	
Test according referenced standards	Reference Method			
	ISED RSS-132 5.6 / 133 6.6			
Test according to measurement reference	Reference Method			
	ANSI C63.26			
Test frequency range	Tested frequencies			
	30 MHz – 5th Harmonic			
EUT test mode	Receive			

Limits

Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3

Test setup

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 GSM 850

Channel	Frequency [MHz]	Emission [MHz]	Emission Level [dBµV/m]	Emission Level [µV/m]	Det.	Limit [µV/m]	Margin [µV/m]
F$_{MID}$	836.2	37.2	28.4	26.30	qp	40	-13.70
F$_{MID}$	836.2	3946	44.69	171.59	pk	500	-328.41
F$_{MID}$	836.2	7896	50.2	323.59	pk	500	-176.41

Test results GSM 1900

Channel	Frequency [MHz]	Emission [MHz]	Emission Level [dBµV/m]	Emission Level [µV/m]	Det.	Limit [µV/m]	Margin [µV/m]
F$_{MID}$	1880	37.2	28.4	26.30	qp	40	-13.70
F$_{MID}$	1880	3910	44.41	166.15	pk	500	-333.85
F$_{MID}$	1880	7952	49.79	308.67	pk	500	-191.33

Comments: