eurofins | Product Service

FCC TEST REPORT

FCC 47 CFR Part 22H
Industry Canada RSS-132, Issue 2
Cellular Telephones Operating in the Bands 824-849MHz and 869-894MHz
FCC 47 CFR Part 24E
Industry Canada RSS-133, Issue 5
2GHz Personal Communication Services

Report Reference No. ..... :	G0M-1607-5772-TFC224U-V02
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 ..... :	FALCOM GmbH
Address ..... :	Gewerbering 6 98704 Langewiesen 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	UMTS/GSM/GPS-Device
Model No.	FOX3-KMD
Additional Model(s)	None
Brand Name(s)	None
Hardware version	O_102_Rev02b
Firmware / Software version	3.0.4
	FCC-ID: QIXFOX3-KMD IC: 5383A-FOX3KMD
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 ..... :	2016-07-28	
Date (s) of performance of tests ..... :	2016-09-19 - 2016-09-26	
Compiled by ..... :	Matthias Handrik	
Tested by (+ signature) ..... : (Responsible for Test)	Burkhard Pudell	B. Pudell
Approved by (+ signature) ..... : (Head of Lab)	Christian Weber	C. Weber
Date of issue ..... :	2017-01-19	
Total number of pages ..... :	28	

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.

Version History

Version	Issue Date	Remarks	Revised by
01	2016-10-26	Initial Release	
02	2017-01-19	Test scope and test remarks corrected	C. Weber

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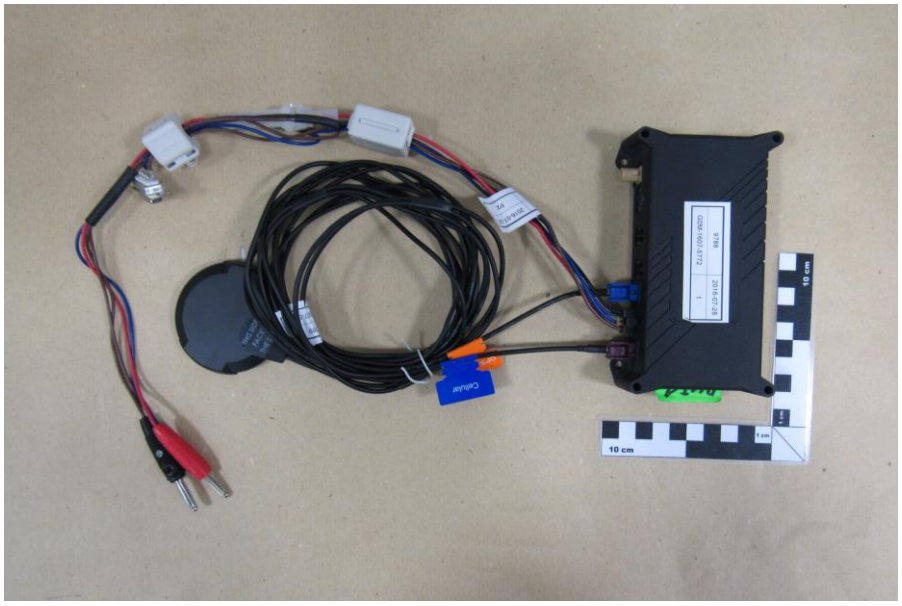
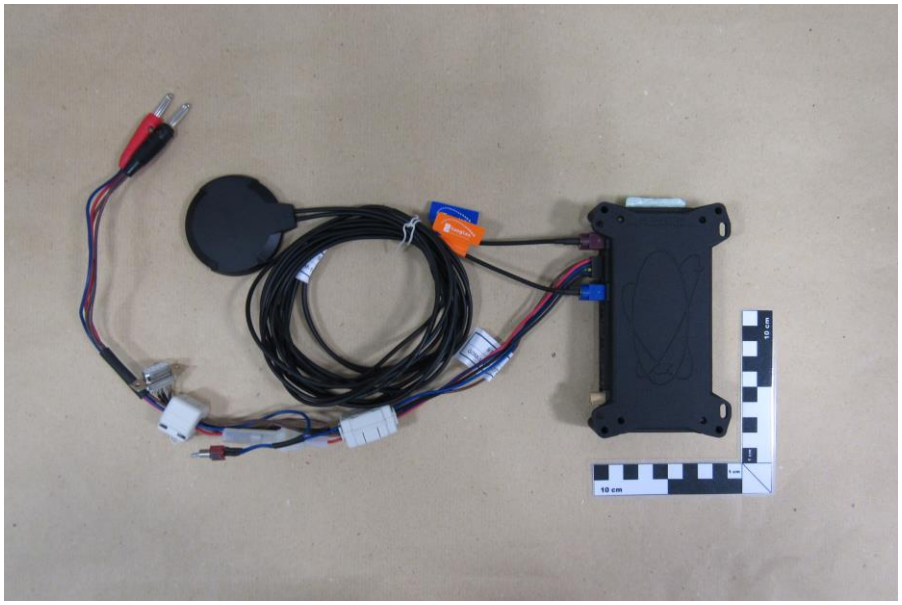
1 Equipment (Test item) Description

Description	UMTS/GSM/GPS-Device		
Model	FOX3-KMD		
Additional Model(s)	None		
Brand Name(s)	None		
Serial number	None		
Hardware version	O_102_Rev02b		
Software / Firmware version	3.0.4		
PMN	Keyless-Mobility Device		
HVIN	FOX3-KMD		
FVIN	none		
HMN	none		
FCC-ID	QIXFOX3-KMD		
IC	5383A-FOX3KMD		
Equipment type	End product		
Equipment classification	Mobile Device (Human Body distance > 20 cm)		
Radio type	Transceiver		
Radio technology	W-CDMA		
Operating frequency range	FDD V : TX = 824 - 849 MHz, RX = 869 - 894 MHz 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		
Main test frequencies FDD V	F_{LOW}	CH : 4133 UL: 826.6 MHz	CH : 4358 DL: 871.6 MHz
	F_{MID}	CH : 4175 UL: 835 MHz	CH : 4400 DL: 880 MHz
	F_{HIGH}	CH : 4232 UL: 846.4 MHz	CH : 4457 DL: 891.4 MHz
Main test frequencies FDDII	F_{LOW}	CH : 9263 UL: 1852.6 MHz	CH : 9663 DL: 1932.6 MHz
	F_{MID}	CH : 9400 UL: 1880.0 MHz	CH : 9800 DL: 1960.0 MHz
	F_{HIGH}	CH : 9537 UL: 1907.4 MHZ	CH : 9937 DL: 1987.4 MHZ
Supported transmission modes	Packet switched		
Modulations	HSDPA : QPSK, 16-QAM; HSUPA : BPSK		
Multislot class	10		
Number of antennas	1		
Radio module	Type	GSM/GPRS/UMTS module	
	Model	LISA-U201	
	Manufacturer	uBlox	
	HW Version	214001	
	SW Version	03S(23.41)	
	FCC-ID	YPYLISAU201	
	IC	8595A-LISAU201	

Antenna	Type	external dedicated
	Model	FAL-ANT14 MA220
	Manufacturer	Taoglas
	Gain	2dBi
Manufacturer	FALCOM GmbH Gewerbering 6 98704 Langewiesen GERMANY	
Power supply	V_{NOM}	12 or 24 VDC (Battery only)
	V_{MIN}	N/A
	V_{MIN}	N/A
AC/DC-Adaptor	Model	N/A
	Vendor	N/A
	Input	N/A
	Output	N/A

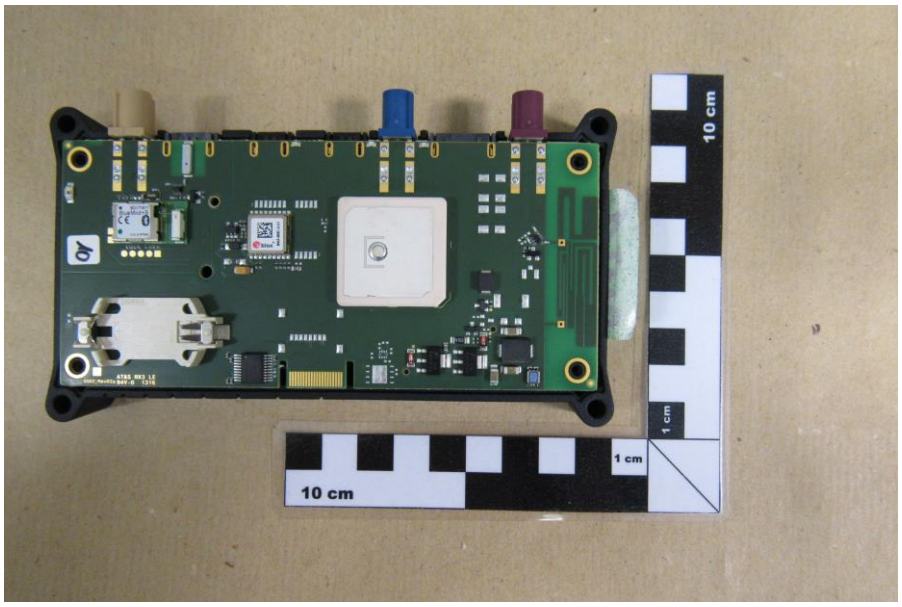
1.1 Photos – Equipment External

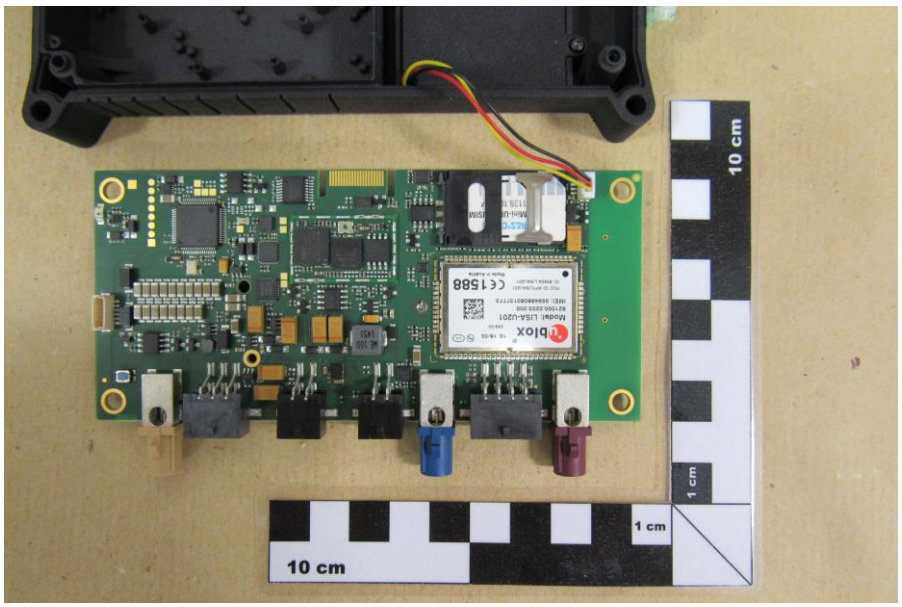
EUT TOP


EUT BOTTOM


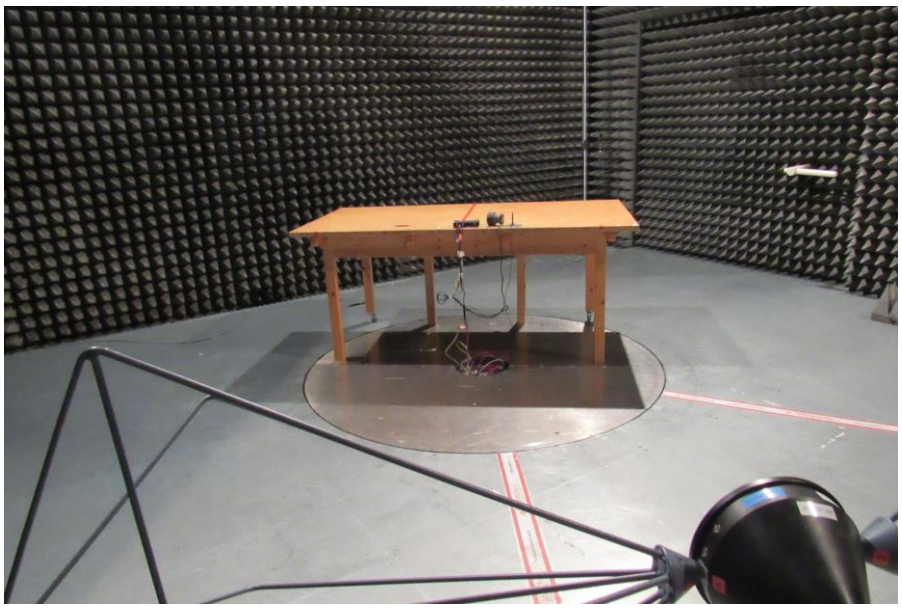
EUT FRONT

1.2 Photos – Equipment internal

EUT PCB TOP


EUT PCB BOTTOM


1.3 Photos – Test setup

RSE Setup


1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
SIM	Communication tester	Rohde & Schwarz	CMW500	

***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	
FDD V-Ext	General conditions:	EUT powered by battery. External GSM and GPS antenna connected. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = Packet Switch Modulation = QPSK Configuration = RMC 12.2kbps + HSPA Power level = Maximum
FDD II-Ext	General conditions:	EUT powered by battery. External GSM and GPS antenna connected. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = Packet Switch Modulation = QPSK Configuration = RMC 12.2kbps + HSPA Power level = Maximum
FDD - RX	General conditions:	EUT powered by battery. External GSM and external GPS antenna connected. EUT attached to communication tester
	Radio conditions:	Mode = receive

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	FSIQ26	EF00242	2016-04	2017-04

Radiated power					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Fully-anechoic chamber	Frankonia	AC 3	EF00199	functional test	functional test
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	2016-01	2019-01
MXE EMI Receiver	Keysight Technologies	N9038A-526/WXP	EF01070	2016-08	2017-08
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

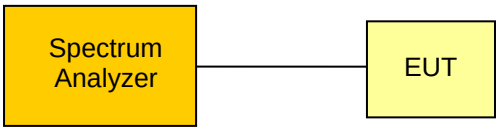
2 Result Summary

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

3 Test Conditions and Results

3.1 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. to IC 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	



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 – FDD V

Channel	Frequency [MHz]	Mode	Occupied Bandwidth [MHz]
F_{LOW}	826.6	FDD V	4.108
F_{MID}	835.0	FDD V	4.088
F_{HIGH}	846.4	FDD V	4.088

Test results – FDD II

Channel	Frequency [MHz]	Mode	Occupied Bandwidth [MHz]
F_{LOW}	1852.6	FDD II	4.088
F_{MID}	1880.0	FDD II	4.088
F_{HIGH}	1907.4	FDD II	4.068

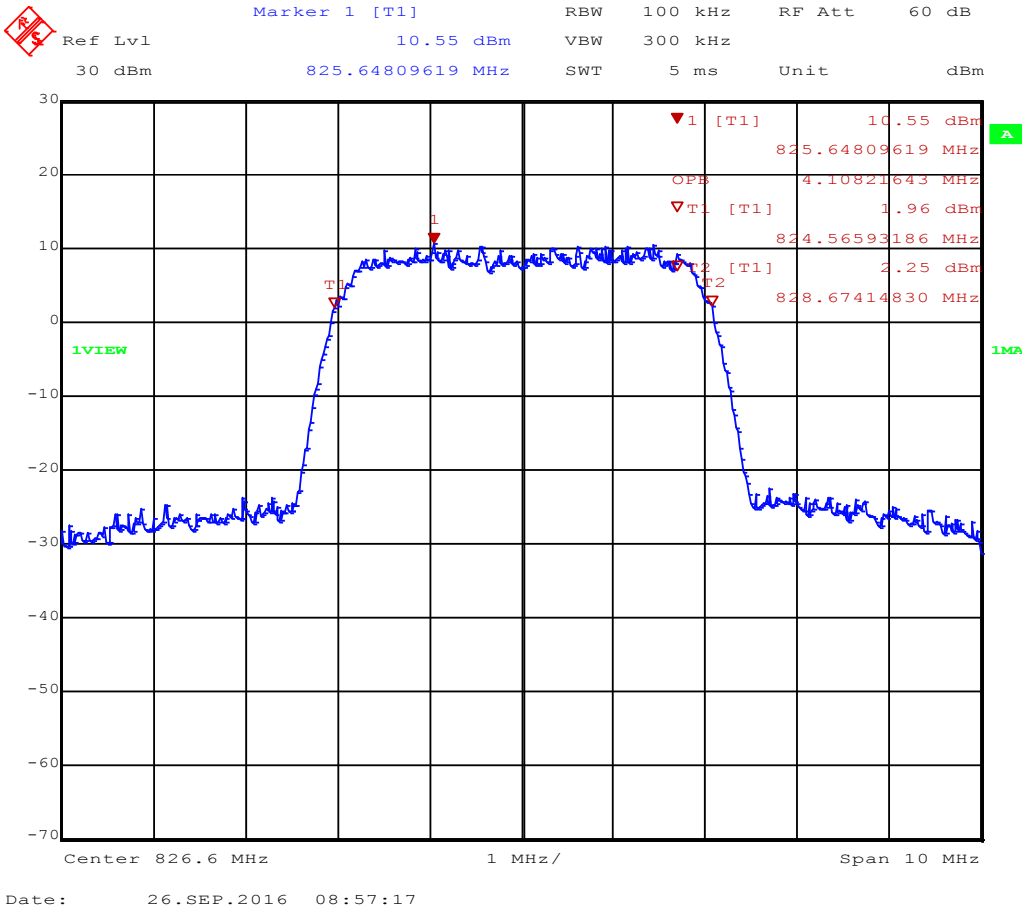
Comments:

Occupied Bandwidth – FDD V F_{LOW}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1607-5772

Applicant:	FALCOM GmbH
EUT Name:	UMTS/GSM/GPS-Device
Model:	FOX3-KMD
Test Site:	Eurofins Product Service GmbH
Operator:	Handrik
Test Conditions:	Tnom / Vnom
Mode:	UMTS FDD V; Ch.: 4133; RMC
Test Date:	2016-09-26
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 4.108MHz

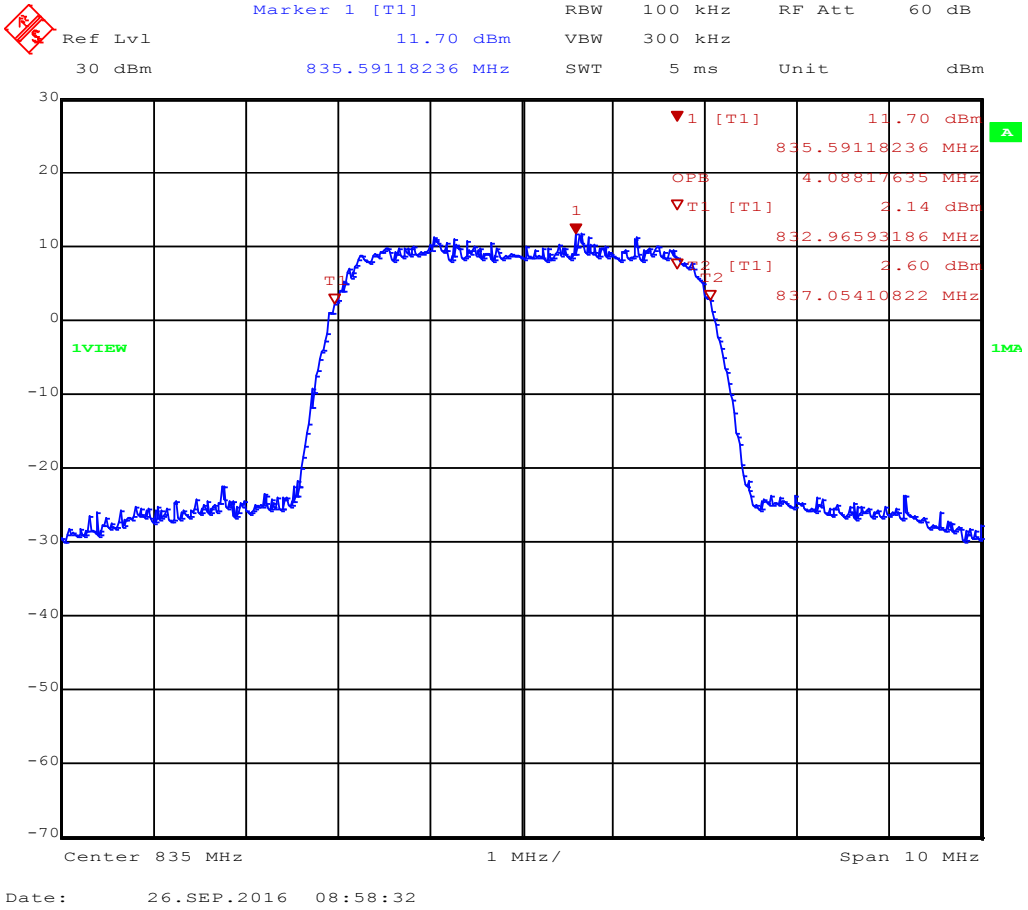


Occupied Bandwidth – FDD V F_{MID}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1607-5772

Applicant:	FALCOM GmbH
EUT Name:	UMTS/GSM/GPS-Device
Model:	FOX3-KMD
Test Site:	Eurofins Product Service GmbH
Operator:	Handrik
Test Conditions:	Tnom / Vnom
Mode:	UMTS FDD V; Ch.: 4175; RMC
Test Date:	2016-09-26
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 4.088MHz

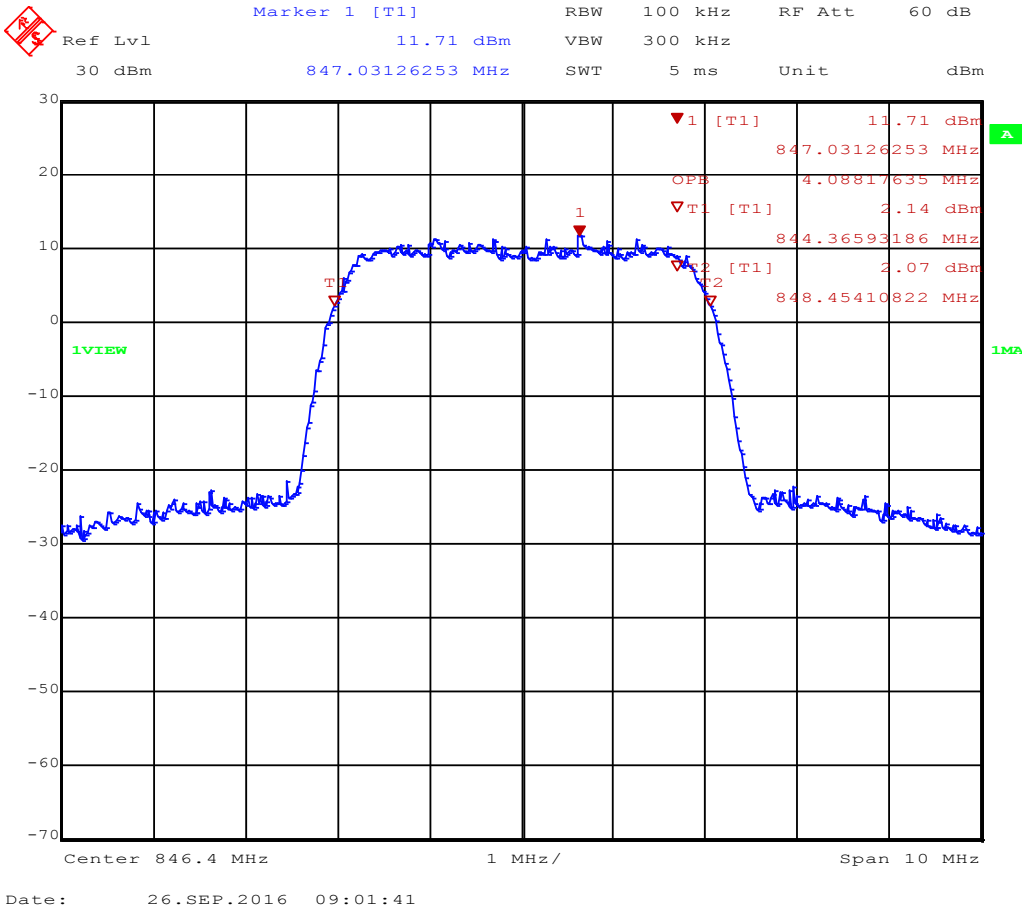


Occupied Bandwidth – FDD V F_{HIGH}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1607-5772

Applicant:	FALCOM GmbH
EUT Name:	UMTS/GSM/GPS-Device
Model:	FOX3-KMD
Test Site:	Eurofins Product Service GmbH
Operator:	Handrik
Test Conditions:	Tnom / Vnom
Mode:	UMTS FDD V; Ch.: 4232; RMC
Test Date:	2016-09-26
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 4.088MHz

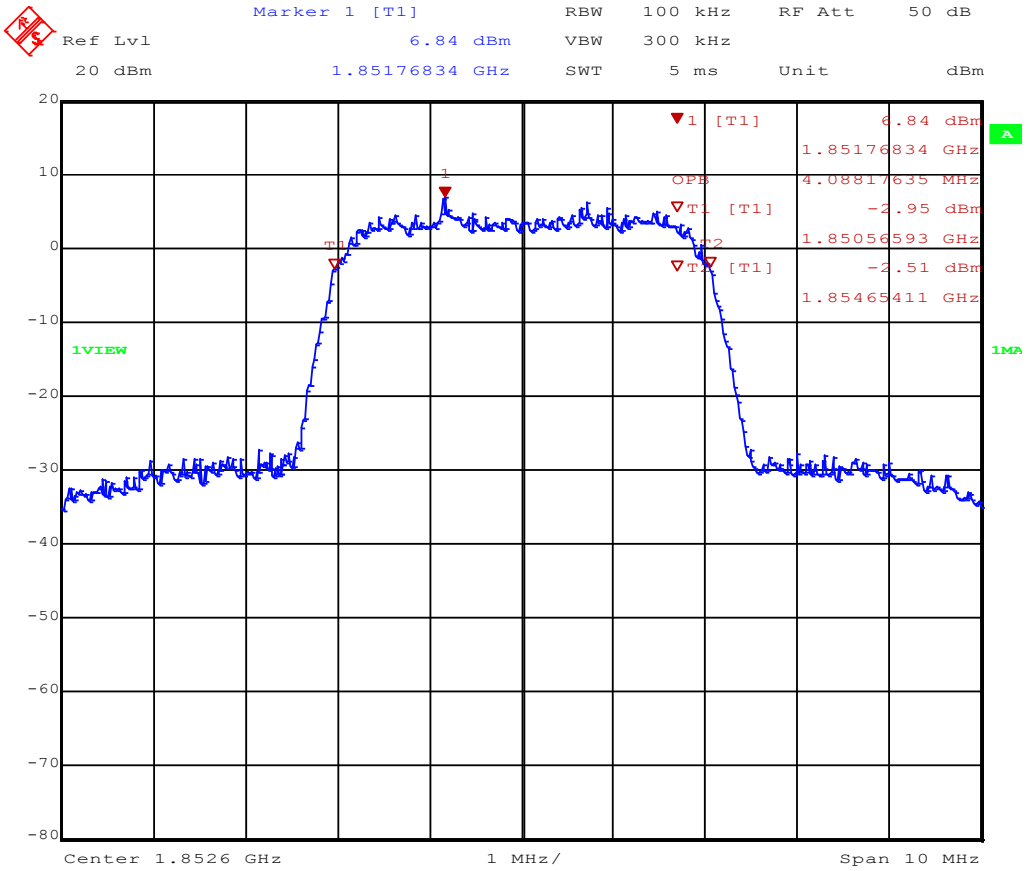


Occupied Bandwidth – EGPRS1900 F_{LOW}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1607-5772

Applicant:	FALCOM GmbH
EUT Name:	UMTS/GSM/GPS-Device
Model:	FOX3-KMD
Test Site:	Eurofins Product Service GmbH
Operator:	Handrik
Test Conditions:	Tnom / Vnom
Mode:	UMTS FDD II; Ch.: 9263; RMC
Test Date:	2016-09-26
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 4.088MHz

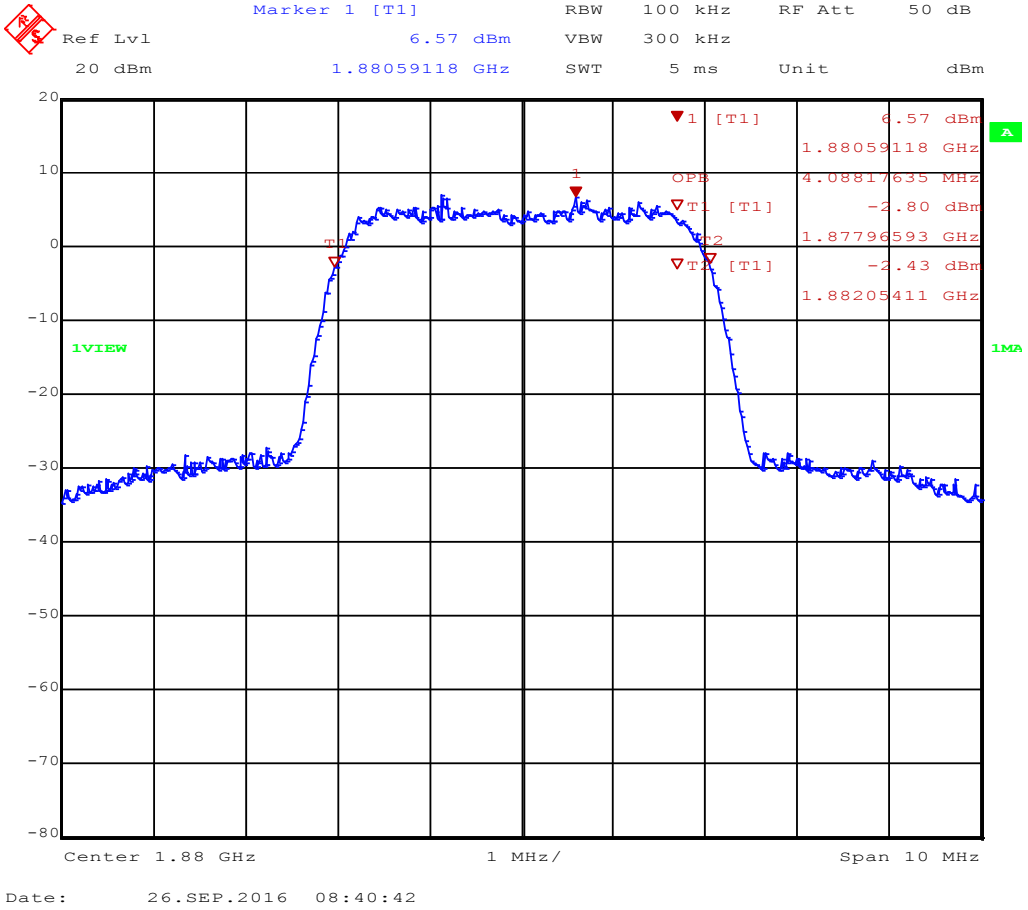


Occupied Bandwidth – EGPRS1900 F_{MID}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1607-5772

Applicant:	FALCOM GmbH
EUT Name:	UMTS/GSM/GPS-Device
Model:	FOX3-KMD
Test Site:	Eurofins Product Service GmbH
Operator:	Handrik
Test Conditions:	Tnom / Vnom
Mode:	UMTS FDD II; Ch.: 9400; RMC
Test Date:	2016-09-26
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 4.088MHz

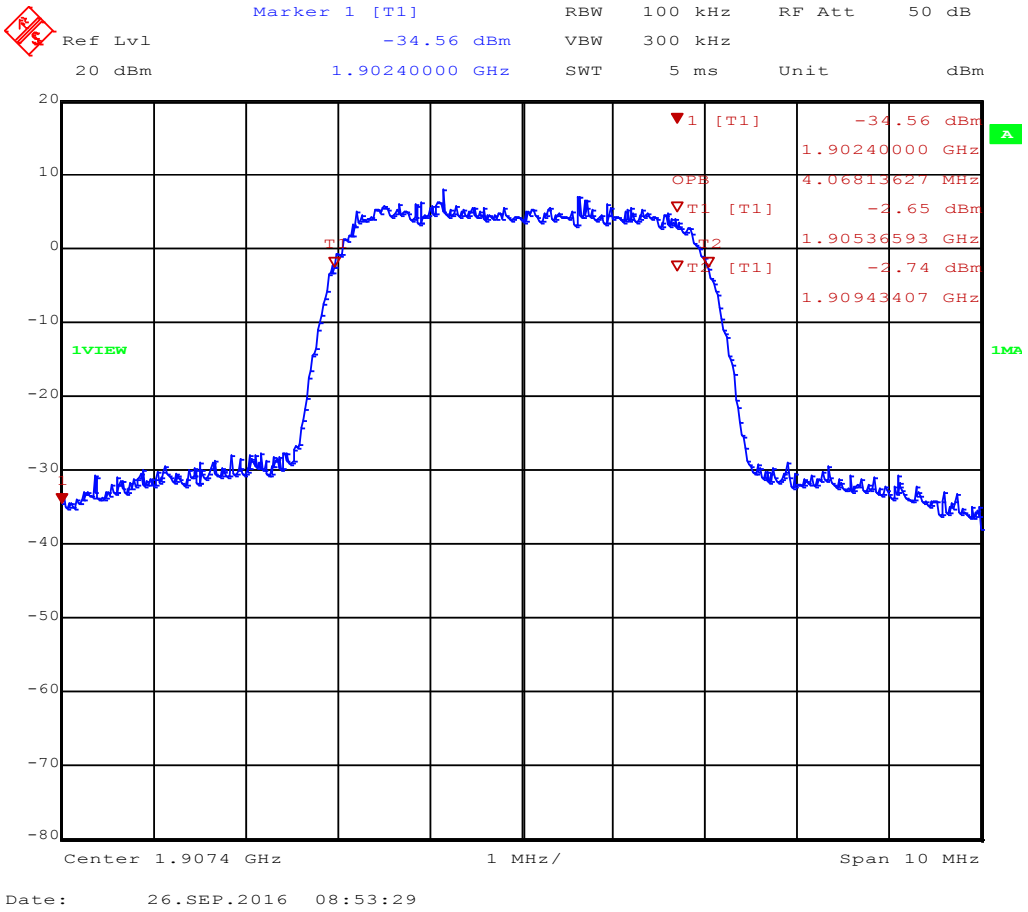


Occupied Bandwidth – EGPRS1900 F_{HIGH}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1607-5772

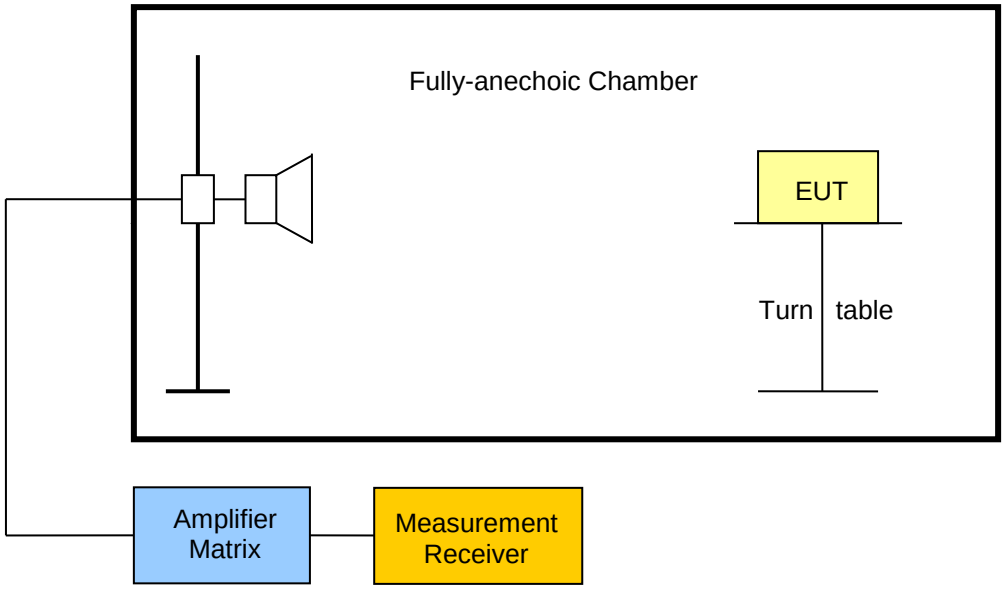
Applicant:	FALCOM GmbH
EUT Name:	UMTS/GSM/GPS-Device
Model:	FOX3-KMD
Test Site:	Eurofins Product Service GmbH
Operator:	Handrik
Test Conditions:	Tnom / Vnom
Mode:	UMTS FDD II; Ch.: 9537; RMC
Test Date:	2016-09-26
Verdict:	NONE (INFORMATION ONLY)
Note 1:	A spectrum analyzer with an integrated 99% power bandwidth function is used
Note 2:	OBW = 4.068MHz



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

Radiated power acc. to FCC 22H / FCC 24E / IC RSS-132 / IC RSS-133		Verdict: PASS
EUT requirement rule parts and clause	Reference	
	FCC § 22.913(a) / FCC § 24.232(c) IC RSS-132 § 4.4 /IC RSS-133 § 6.4	
Test according to measurement reference	Reference Method	
	FCC § 22.913(a) / FCC § 24.232(c) / ANSI/TIA-603-D IC RSS-132 § 4.4 /IC RSS-133 § 6.4	
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. IC : 11.5 Watts (40.60 dBm) e.i.r.p.
1850-1910 MHz	Mobile transmitter	FCC : 2 Watts (33 dBm) e.i.r.p. IC : 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 – FDD 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	FDD V	hor	21.8	38.45	-16.65	PASS
F_{MID}	835.0	FDD V	ver	20.0	38.45	-18.45	PASS
F_{HIGH}	846.4	FDD V	ver	18.8	38.45	-19.65	PASS
Test results – FDDV 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	FDD V	hor	23.95	40.6	-16.65	PASS
F_{MID}	835.0	FDD V	ver	22.15	40.6	-18.45	PASS
F_{HIGH}	846.4	FDD V	ver	20.95	40.6	-19.65	PASS
Test results – FDD II 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	FDD II	ver	11.5	33	-21.50	PASS
F_{MID}	1880.0	FDD II	hor	12.1	33	-20.90	PASS
F_{HIGH}	1907.4	FDD II	ver	13.1	33	-19.90	PASS
Comments:							

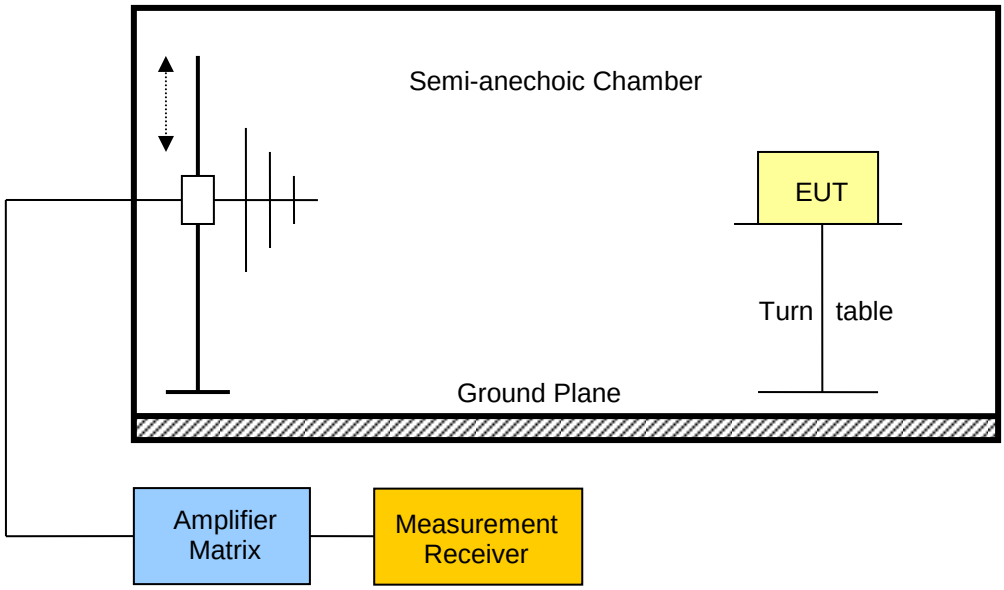
3.3 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated power acc. to FCC 22H / FCC 24E / IC RSS-132 / IC RSS-133	**Verdict: PASS**
Test according referenced standards	Reference Method
	FCC § 22.917(a) / FCC § 24.238(a) IC RSS-132 § 4.5 / IC 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



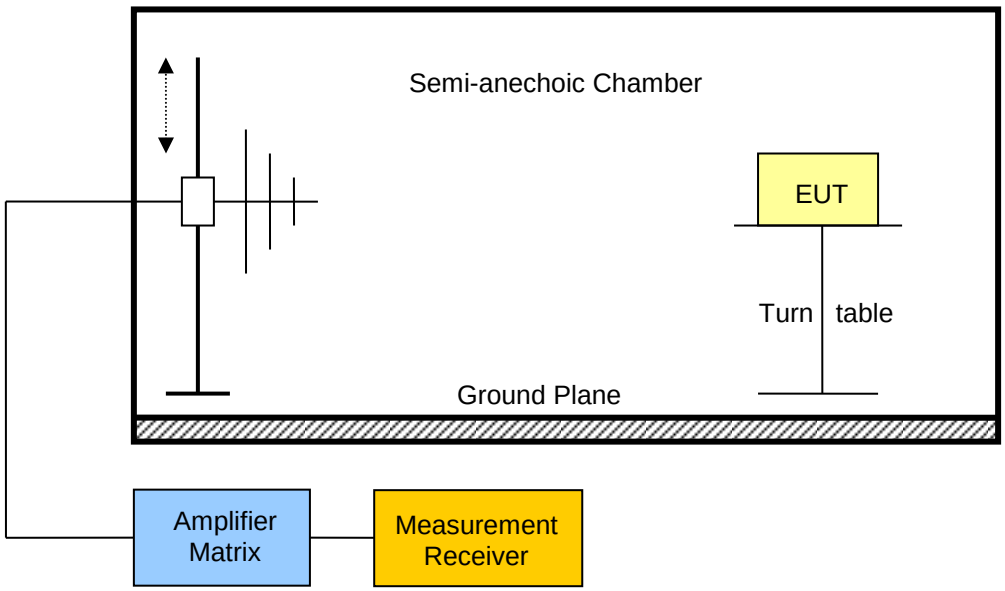
Test procedure

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 – FDD V							
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dBm]	Pol.	Limit [dBm]	Margin [dB]
F_{LOW}	826.6	FDD V	822.7	-23.8	hor	-13	-10.80
F_{MID}	835.0	FDD V	1060	-41.7	ver	-13	-28.70
F_{HIGH}	846.4	FDD V	850.1	-21.6	hor	-13	-08.60
Test results – FDD II							
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dBm]	Pol.	Limit [dBm]	Margin [dB]
F_{LOW}	1852.6	FDD II	1844	-30.2	ver	-13	-17.20
F_{MID}	1880.0	FDD II	398.4	-54.2	ver	-13	-41.20
F_{HIGH}	1907.4	FDD II	1915	-31.5	ver	-13	-18.50
Comments:							

3.4 Test Conditions and Results – Receiver radiated emissions

Receiver radiated emissions acc. to IC RSS-210				**Verdict: PASS**
Test according referenced standards	Reference Method			
	IC RSS-132 5.6 / 133 6.6			
Test according to measurement reference	Reference Method			
	ANSI C63.4			
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 FDD V

Channel	Frequency [MHz]	Emission [MHz]	Emission Level [dbµV/m]	Emission Level [µV/m]	Det.	Limit [µV/m]	Margin [µV/m]
F_{MID}	835.0	31.02	31.2	36.31	pk	100	-63.69
F_{MID}	835.0	1594	46.58	213.30	pk	500	-286.70

Test results FDD II

Channel	Frequency [MHz]	Emission [MHz]	Emission Level [dbµV/m]	Emission Level [µV/m]	Det.	Limit [µV/m]	Margin [µV/m]
F_{MID}	1880.0	30.18	33.5	47.32	pk	100	-52.68
F_{MID}	1880.0	1006	50.59	338.45	pk	500	-161.55

Comments:
* Physical distance between EUT and measurement antenna.
** Emission level corresponds to ambient noise floor