

# Inter Lab

Final Report on

TOBY-R200

FCC ID: XPY1EHM44NN

IC: 8595A-1EHM44NN

**Report Reference:** MDE\_UBLOX\_1626\_FCCb according to:

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C

**Date:** January 04, 2017

### **Test Laboratory:**

7layers GmbH Borsigstraße 11 40880 Ratingen Germany



Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in pars without the written approval of the test laboratory.

7layers GmbH

Borsigstraße 11 40880 Ratingen, Germany T +49 (0) 2102 749 0 F +49 (0) 2102 749 350 www.7layers.com Geschäftsführer / Managing Directors: Frank Spiller Bernhard Retka Alexandre Norré-Oudard Registergericht registered in: Düsseldorf, HRB 75554 USt-IdNr VAT No.: DE203159652 TAX No. 147/5869/0385 A Bureau Veritas Group Company



#### 1 Administrative Data

### 1.1 Project Data

Project Responsible:

Date Of Test Report:

Date of first test:

Date of last test:

Patrick Lomax

2017/01/04

2016/11/08

## 1.2 Applicant Data

Company Name: u-blox AG

Street: Zürcherstrasse 68,

CH-8800 Thalwil

Country: Switzerland

Contact Person: Mr. Giulio Comar

Function: Certification Manager

Department: Cellular Product Certification

Phone: +41 44 722 7462 Fax: +41 44 722 7447

E-Mail: giulio.comar@u-blox.com

#### 1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

#### 7 layers DE

Company Name: 7layers GmbH

Street: Borsigstrasse 11

City: 40880 Ratingen

Country: Germany

Contact Person: Mr. Michael Albert

Phone: +49 2102 749 201

Fax: +49 2102 749 444

E Mail: Michael.Albert@7Layers.com

### **Laboratory Details**

Lab ID	Identification	Responsible	Accreditation Info
Lab 1	Radiated Emissions	Mr. Marco Kullik	DAkkS-Registration no. D-PL-12140-01-00
		Mr. Jens Dörwald	ISEDC OATS registration number 3699A-1
			FCC accreditation registration number 929146
Lab 2	Radio Lab	Mr. Dobrin Dobrinov	DAkkS-Registration no. D-PL-12140-01-00
		Mr. Daniel Gall	ISEDC OATS registration number 3699A-1
			FCC accreditation registration number 929146



#### 1.4 Signature of the Testing Responsible

responsible for tests performed in: Lab 1, Lab 2

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

1.5 Signature of the Accreditation Responsible

Accreditation scope responsible person

responsible for Lab 1, Lab 2

#### 2 **Test Object Data**

#### 2.1 **General OUT Description**

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: TOBY-R200

Type / Model / Family:

TOBY-R200

FCC ID: XPY1EHM44NN IC: 8595A-1EHM44NN

[M. hyllih]

Product Category:

Module

Manufacturer:

Company Name:

See applicant data

Contact Person:

Parameter List: Parameter name

Value

Parameter for Scope FCC\_v2:

AC Power Supply

120v/60Hz AC

Antenna gain

The product does not include a predefined antenna.

DC Power Supply

highest channel

251 (848.8MHz) for GSM850, 810 (1909.8MHz) for GSM1900,

4233 (846.6MHz) for FDD5, 9538 (1907.6MHz) for FDD2

lowest channel

128 (824.2MHz) for GSM850, 512 (1850.2MHz) for GSM1900, 4132 (826.4MHz) for FDD5, 9262 (1852.4MHz)for FDD2

LTE\_Operating Frequencies

Please see Annex for channel list

mid channel

190 (836.6MHz) for GSM850, 661 (1880.0MHz) for GSM1900, 4183 (836.6MHz) for FDD5, 9400 (1880MHz) for FDD2



### 2.2 Detailed Description of OUT Samples

#### Sample: AE06

OUT Identifier TOBY-R200
Sample Description RF Sample

Serial No. 352848080016583

 HW Status
 283002

 SW Status
 30.19

 Date of Receipt
 2016/10/24

Low Voltage3.3 VLow Temp.-20 °CHigh Voltage4.4 VHigh Temp.55 °CNominal Voltage3.8 VNormal Temp.25 °C

#### Sample: AJ06

OUT IdentifierTOBY-R200Sample DescriptionStandard SampleSerial No.352848080016799

 HW Status
 283002

 SW Status
 30.19

 Date of Receipt
 2016/10/24

Low Voltage3.3 VLow Temp.-20 °CHigh Voltage4.4 VHigh Temp.55 °CNominal Voltage3.8 VNormal Temp.25 °C

## Sample: AT10

OUT IdentifierTOBY-R200Sample DescriptionStandard SampleSerial No.352848080028158

 HW Status
 283A01

 SW Status
 30.26

Low Voltage 3.3 V Low Temp. -20 °C High Voltage 4.4 V High Temp. 55 °C Nominal Voltage 3.8 V Normal Temp. 25 °C



# 2.3 OUT Features

Designation	Description	Allowed Values	Supported Value(s)
Features for s	cope: FCC_v2		
Eant	removable antenna supplied and type tested with the radio equipment, designed as an indispensable part of the equipment		
EDGE850	EUT supports EDGE in the band 824 MHz - 849 MHz		
EDGE1900	EUT supports EDGE in the band 1850 MHz - 1910 MHz		
eFDD2			
eFDD4			
eFDD5			
eFDD12			
FDD2	EUT supports UMTS FDD2 in the band 1850 MHz - 1910 MHz		
FDD5	EUT supports UMTS FDD5 in the band 824 MHz - 849 MHz		
GSM850	EUT supports GSM850 band 824MHz - 849MHz		
HSDPA- FDD2	EUT supports UMTS FDD2 HSDPA in the band 1850 MHz - 1910 MHz		
HSDPA- FDD5	EUT supports UMTS FDD5 HSDPA in the band 824 MHz - 849 MHz		
HSUPA- FDD2	EUT supports UMTS FDD2 HSUPA in the band 1850 MHz - 1910 MHz		
HSUPA- FDD5	EUT supports UMTS FDD5 HSUPA in the band 824 MHz - 849 MHz		
PCS1900	EUT supports PCS1900 band 1850MHz - 1910MHz		
TantC	temporary antenna connector, which may be only built-in for testing, designed as an example part of the equipment		

# 2.4 Auxiliary Equipment

AE No.	Type Designation	Serial No.	HW Status	SW Status	Description
AE 02	EVB-WL3		NO_EVK_CS_19	•	Evaluation test
AE 03	GSATT151000009		1A00		board 700-2800 MHz
AE 04	GSATT151000009				Antenna #1 700-2800 MHz
AL UT	G5A11151000009				Antenna #2
AE 01	UUX324-1215	E09-0291984			AC/DC converter



# 2.5 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

Setup No.	List of OUT samples		List of auxiliary e	equipment
Sample N	lo.	Sample Description	AE No.	AE Description
AE06 (AI	E06)			
Sample:	AE06	RF Sample	AE 02	Evaluation test board
			AE 01	AC/DC converter
AJ06 (AJ	106)			
Sample:	AJ06	Standard Sample	AE 02	Evaluation test board
			AE 03	700-2800 MHz Antenna #1
			AE 04	700-2800 MHz Antenna #2
			AE 01	AC/DC converter
AT10 (A	Г10)			
Sample:	AT10	Standard Sample	AE 02	Evaluation test board
			AE 01	AC/DC converter

# 3 Results

#### 3.1 General

**Documentation of tested**Available at the test laboratory.

devices:

Interpretation of the test results:

The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment  $\frac{1}{2} \int_{\mathbb{R}^{n}} \frac{1}{2} \left( \frac{1}{2} \int$ 

implementation.

# 3.2 List of the Applicable Body

(Bodies for Scope: FCC\_v2)

Designation	Description
FCC47CFRChIPART22PUBLIC MOBILE SERVICES	Part 22, Subpart H - Cellular Radiotelephone Service
FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES	Part 24, Subpart E - Broadband PCS
FCC47CFRChIPART27MISCELLANEOU S WIRELESS COMMUNICATIONS SERVICES	Part 27, Subpart C - Technical Standards



### 3.3 List of Test Specification

Test Specification: FCC part 2 and 22
Version 10-1-16 Edition

Title: PART 2 - GENERAL RULES AND REGULATIONS

PART 22 - PUBLIC MOBILE SERVICES

Applicable Errata Activate Date Comment

ANSI C63.4-2003 04/1/30

Test Specification: FCC part 2 and 24
Version 10-1-16 Edition

Title: PART 2 - GENERAL RULES AND REGULATIONS

PART 24 - PERSONAL COMMUNICATIONS SERVICES

Applicable Errata Activate Date Comment

ANSI C63.4-2003 04/1/30

Test Specification: FCC part 2 and 27
Version 10-1-16 Edition

Title: PART 2 - GENERAL RULES AND REGULATIONS

PART 27 - MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES



# 3.4 Summary

Test Ca	Test Case Identifier / Name Lab						
Test	condition)	Result	Date of Test	Ref.	Setup		
Test	Specification: FCC part 2 and 22						
22.1	RF Power Output §2.1046, §22.913						
22.1; §22.9	_RF Power Output Summary §2.1046, 113	Passed	2016/11/09	Lab 2	AT10		
22.2	Frequency stability §2.1055						
22.2;	_Frequency stability Summary §2.1055	Passed	2016/11/09	Lab 2	AE06		
22.3	Spurious emissions at antenna terminals §	52.1051.					
	Spurious emissions at antenna	Passed	2016/11/09	Lab 2	AE06		
•	nals summary §2.1051, §22.917		, , , , , ,				
22.4	Field strength of spurious radiation §2.10	53, §22.917					
22.4;	Field strength of spurious radiation	Passed	2016/11/10	Lab 1	AJ06		
	nary §2.1053, §22.917						
	Frequency Band = 850, Mode = EDGE, nel = 128, Frequency = 824.2MHz	Passed	2016/11/08	Lab 1	AJ06		
	Frequency Band = 850, Mode = EDGE,	Passed	2016/11/08	Lab 1	AJ06		
-	nel = 190, Frequency = 836.6MHz		, ,				
	Frequency Band = 850, Mode = EDGE,	Passed	2016/11/08	Lab 1	AJ06		
	nel = 251, Frequency = 848.8MHz Frequency Band = 850, Mode = GSM,	Passed	2016/11/08	Lab 1	AJ06		
•	nel = 128, Frequency = 824.2MHz	1 43364	2010/11/00	Lab I	A300		
22.4;	Frequency Band = 850, Mode = GSM,	Passed	2016/11/08	Lab 1	AJ06		
	nel = 190, Frequency = 836.6MHz	Dd	2016/11/00	1-6-4	A10.6		
-	Frequency Band = 850, Mode = GSM, nel = 251, Frequency = 848.8MHz	Passed	2016/11/08	Lab 1	AJ06		
	Frequency Band = eFDD5, Mode =	Passed	2016/11/08	Lab 1	AJ06		
	5MHz, Channel = 20425, Frequency =						
	MHz, Method = radiated	Passed	2016/11/09	Lab 1	AJ06		
	Frequency Band = eFDD5, Mode = 5MHz, Channel = 20525, Frequency =	Passeu	2016/11/08	Lab I	DUCA		
-	iMHz, Method = radiated						
	Frequency Band = eFDD5, Mode =	Passed	2016/11/08	Lab 1	AJ06		
	5MHz, Channel = 20625, Frequency = 5MHz, Method = radiated						
	Frequency Band = FDD5, Mode =	Passed	2016/11/08	Lab 1	AJ06		
-	A, Channel = 4132, Frequency =						
826.4			2015/11/20				
•	Frequency Band = FDD5, Mode = A, Channel = 4183, Frequency =	Passed	2016/11/08	Lab 1	AJ06		
836.6							
22.4;	Frequency Band = FDD5, Mode =	Passed	2016/11/08	Lab 1	AJ06		
	A, Channel = 4233, Frequency =						
846.6 22.4:	Frequency Band = FDD5, Mode =	Passed	2016/11/08	Lab 1	AJ06		
	A, Channel = 4132, Frequency =	. 45564	2010/11/00	200 1	,500		
826.4							
	Frequency Band = FDD5, Mode =	Passed	2016/11/08	Lab 1	AJ06		
836.6	A, Channel = 4183, Frequency =						
	Frequency Band = FDD5, Mode =	Passed	2016/11/08	Lab 1	AJ06		
	A, Channel = 4233, Frequency =						
846.6	MHz Frequency Band = FDD5, Mode = W-	Passad	2016/11/08	Lab 1	AJ06		
	A, Channel = 4132, Frequency =	Passed	2010/11/00	Lab 1	7300		
826.4							
	Frequency Band = FDD5, Mode = W-	Passed	2016/11/08	Lab 1	AJ06		
836.6	A, Channel = 4183, Frequency =						
	Frequency Band = FDD5, Mode = W-	Passed	2016/11/08	Lab 1	AJ06		
CDMA	A, Channel = 4233, Frequency =						
846.6	MHz						



		Reference: MDE U	DLOV 1636 EC	Ch according to
	FCC	Part 22, Subpart H, Part		
Test Case Identifier / Name	100	2 Tare 22, Subpare 11, Tare	Lab	rait 27 Subpart C
Test (condition)	Result	Date of Test	Ref.	Setup
· · · · · · · · · · · · · · · · · · ·				
22.5 Emission and Occupied Bandwidth §2.1049	), §22.917			
22.5; _Emission and Occupied Bandwidth Summary §2.1049, §22.917	Passed	2016/11/09	Lab 2	AT10
22.6 Band edge compliance §2.1053, §22.917				
22.6; _Band edge compliance Summary §2.1053, §22.917	Passed	2016/11/09	Lab 2	AE06
22.7 Peak-to-Average Ratio Summary §2.1046				
22.7; Peak-to-Average Ratio Summary §2.1046	Passed	2016/11/09	Lab 2	AE06
Test Specification: FCC part 2 and 24				
24.1 RF Power Output §2.1046, §24.232				
24.1; RF Power Output Summary §2.1046, §24.232	Passed	2016/11/09	Lab 2	AE06
24.2 Frequency stability §2.1055, §24.235				
24.2; Frequency stability Summary §2.1055, 24.235	Passed	2016/11/09	Lab 2	AE06
24.3 Spurious emissions at antenna terminals §	2.1051, §24.238			
24.3; Spurious emissions at antenna terminals Summary §2.1051, §24.238	Passed	2016/11/09	Lab 2	AE06



Tost Casa Identifier / Name	FCC	C Part 22, Subpart H, Part	: 24, subpart E, <i>Lab</i>	Part 27 Subpar
Test Case Identifier / Name Test (condition)	Result	Date of Test	Ref.	Setup
24.4 Field strength of spurious radiation §2.	.1053. 624.238			
24.4; Field strength of spurious radiation	Passed	2016/11/10	Lab 1	AJ06
Summary §2.1053, §24.238				
24.4; Frequency Band = 1900, Mode = EDGE,	Passed	2016/11/08	Lab 1	AJ06
Channel = 512, Frequency = 1850.2MHz	Dd	2016/11/00	1 - 1- 4	A10.6
24.4; Frequency Band = 1900, Mode = EDGE, Channel = 661, Frequency = 1880.0MHz	Passed	2016/11/08	Lab 1	AJ06
24.4; Frequency Band = 1900, Mode = EDGE,	Passed	2016/11/08	Lab 1	AJ06
Channel = 810, Frequency = 1909.8MHz				
24.4; Frequency Band = 1900, Mode = GSM,	Passed	2016/11/08	Lab 1	AJ06
Channel = 512, Frequency = 1850.2MHz	Passed	2016/11/09	Lab 1	AJ06
24.4; Frequency Band = 1900, Mode = GSM, Channel = 661, Frequency = 1880.0MHz	Passeu	2016/11/08	Lab I	DUCA
24.4; Frequency Band = 1900, Mode = GSM,	Passed	2016/11/08	Lab 1	AJ06
Channel = 810, Frequency = 1909.8MHz				
24.4; Frequency Band = eFDD2, Mode =	Passed	2016/11/08	Lab 1	AJ06
QPSK 5MHz, Channel = 18625, Frequency =				
1852.5MHz, Method = radiated 24.4; Frequency Band = eFDD2, Mode =	Passed	2016/11/08	Lab 1	AJ06
QPSK 5MHz, Channel = 18900, Frequency =	i asseu	2010/11/00	Lab 1	AJUU
1880MHz, Method = radiated				
24.4; Frequency Band = eFDD2, Mode =	Passed	2016/11/08	Lab 1	AJ06
QPSK 5MHz, Channel = 19175, Frequency =				
1907.5MHz, Method = radiated 24.4; Frequency Band = FDD2, Mode =	Passed	2016/11/08	Lab 1	AJ06
HSDPA, Channel = 9262, Frequency =	rasseu	2010/11/00	Lab 1	AJUU
1852.4MHz				
24.4; Frequency Band = FDD2, Mode =	Passed	2016/11/08	Lab 1	AJ06
HSDPA, Channel = 9400, Frequency =				
1880MHz	Dd	2016/11/00	1 - 1- 4	A10.6
24.4; Frequency Band = FDD2, Mode = HSDPA, Channel = 9538, Frequency =	Passed	2016/11/08	Lab 1	AJ06
1907.6MHz				
24.4; Frequency Band = FDD2, Mode =	Passed	2016/11/08	Lab 1	AJ06
HSUPA, Channel = 9262, Frequency =				
1852.4MHz		2015/11/20		
24.4; Frequency Band = FDD2, Mode = HSUPA, Channel = 9400, Frequency =	Passed	2016/11/08	Lab 1	AJ06
1880MHz				
24.4; Frequency Band = FDD2, Mode =	Passed	2016/11/08	Lab 1	AJ06
HSUPA, Channel = 9538, Frequency =				
1907.6MHz				
24.4; Frequency Band = FDD2, Mode = W-	Passed	2016/11/08	Lab 1	AJ06
CDMA, Channel = 9262, Frequency = 1852.4MHz				
24.4; Frequency Band = FDD2, Mode = W-	Passed	2016/11/08	Lab 1	AJ06
CDMA, Channel = 9400, Frequency =				
1880MHz				
24.4; Frequency Band = FDD2, Mode = W-	Passed	2016/11/08	Lab 1	AJ06
CDMA, Channel = 9538, Frequency = 1907.6MHz				
24.5 Emission and Occupied Bandwidth §2.1	, -			
24.5; Emission and Occupied Bandwidth Summary §2.1049, §24.238	Passed	2016/11/09	Lab 2	AE06
24.6 Band edge compliance §2.1053, §24.23	38			
24.6; Band edge compliance summary §2.1053, §24.238	Passed	2016/11/09	Lab 2	AE06
24.7 Peak-to-Average ratio §2.1046, §24.23	32			
24.7; Peak-to-Average Ratio Summary	Passed	2016/11/09	Lab 2	AE06
§2.1046, §24.232				

Test Specification: FCC part 2 and 27



Reference: MDE UBLOX 1626 FCCb according to: FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C Test Case Identifier / Name Lab Date of Test Test (condition) Result Ref. Setup RF Power Output §2.1046, §27.250 27.1 27.1; RF Power Output Summary §2.1046, AE06 Passed 2016/11/09 Lab 2 §27.250 27.2 Frequency stability §2.1055, §27.54 27.2; Frequency stability Summary §2.1055, 2016/11/09 Lab 2 AF06 Passed §27.54 27.3 Spurious emissions at antenna terminals §2.1051, §27.53 27.3; Spurious emissions at antenna 2016/11/09 AF06 Lab 2 terminals Summary §2.1051, §27.53 Field strength of spurious radiation §2.1053, §27.53 27.4 27.4; Field strength of spurious radiation 2016/11/10 Lab 1 AJ06 Passed Summary §2.1053, §27.53 27.4; Frequency Band = eFDD12, Mode = Passed 2016/11/08 Lab 1 AJ06 QPSK 5MHz, Channel = 23035, Frequency = 701.5MHz, Method = radiated 27.4; Frequency Band = eFDD12, Mode = 2016/11/08 Lab 1 AJ06 Passed QPSK 5MHz, Channel = 23095, Frequency = 707.5MHz, Method = radiated 27.4; Frequency Band = eFDD12, Mode = Passed 2016/11/08 Lab 1 AJ06 QPSK 5MHz, Channel = 23155, Frequency = 713.5MHz, Method = radiated 27.4; Frequency Band = eFDD4, Mode = Passed 2016/11/08 Lab 1 AJ06 QPSK 5MHz, Channel = 19975, Frequency = 1712.5MHz, Method = radiated AJ06 27.4; Frequency Band = eFDD4, Mode = 2016/11/08 Lab 1 Passed QPSK 5MHz, Channel = 20175, Frequency = 1732.5MHz, Method = radiated 2016/11/08 AJ06 27.4; Frequency Band = eFDD4, Mode = Passed Lab 1 QPSK 5MHz, Channel = 20375, Frequency = 1752.5MHz, Method = radiated Emission and Occupied Bandwidth §2.1049 2016/11/09 AE06 27.5; Emission and Occupied Bandwidth Passed Lab 2 Summary §2.1049 Band edge compliance §2.1053, §27.53 27.6; Band edge compliance summary Passed 2016/11/09 Lab 2 AE06 §2.1053, §27.53 27.7 Peak-to-Average ratio §2.1046, §27.50 27.7; Peak-to-Average Ratio Summary Passed 2016/11/09 Lab 2 AE06 §2.1046, §27.50



# 3.5 Detailed Results

# 3.5.1 22.1 RF Power Output §2.1046, §22.913

### Test: 22.1; \_RF Power Output Summary §2.1046, §22.913

Result: Passed

Setup No.: AT10

Date of Test: 2016/11/09 10:38

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

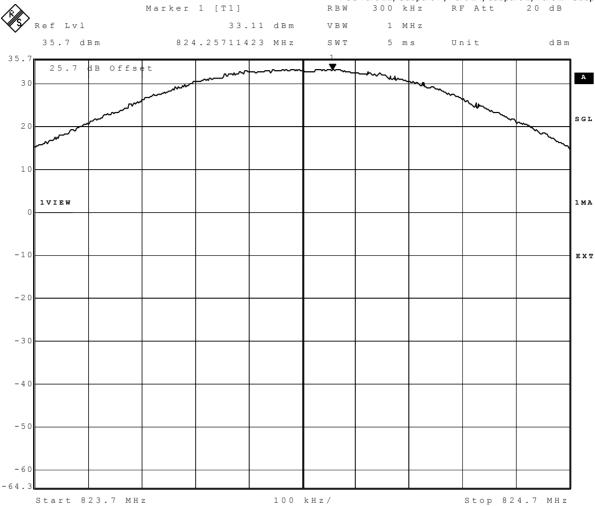


**Transmitter Output Powe** 

Reference: MDE\_UBLOX\_1626\_FCCb according to: FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C

ansmitter Output	Powe				FCC Pa	rt 22, Subpa	art H, F	Part 24	, subpart E
		Ressource	Bandwidth	Peak Conducted	Average Conducted	RMS Conducted	FCC EIRP	IC EIRP	Maximum Antenna
Radio Technology	Channel	Blocks	(MHz)	Power	Power	Power	Limit	Limit	Gain (dBi)
GSM 850	low	-	0.2	(dBm) 33.11	(dBm) 32.96	(dBm) 33.06	(W) 11.48	(W) 11.5	7.49
GSM 850	mid	-	0.2	32.95	32.9	32.84	11.48	11.5	7.65
GSM 850	high	-	0.2	32.92	32.81	32.85	11.48	11.5	7.68
GSM 850 EDGE	low	-	0.2	30.07	30.04	29.95	11.48		10.53
GSM 850 EDGE	mid	-	0.2	29.88	29.72	29.73	11.48	11.5	10.72
GSM 850 EDGE	high	-	0.2	30.04	29.98	30.02	11.48	11.5	10.56
FDD V FDD V	low mid	-	5 5	28.48 28.87	23.11	23.27 23.18	11.48	11.5	17.33 17.42
FDD V	high	-	5	28.48	22.93	23.12	11.48	11.5	17.48
DD V HSDPA Subtest 1	low	-	5	28.7	23.36	23.75	11.48	11.5	16.85
DD V HSDPA Subtest 1	mid	-	5	28.87	23.32	23.57	11.48	11.5	17.03
DD V HSDPA Subtest 1	high	-	5	28.74	23.22	23.51	11.48	11.5	17.09
DD V HSDPA Subtest 2	low	-	5	29.28	23.09	24.25	11.48		16.35
DD V HSDPA Subtest 2	mid	-	5	29.28	23.03	23.53	11.48	11.5	17.07
DD V HSDPA Subtest 2 DD V HSDPA Subtest 3	high low	-	5 5	30.3 29.82	23.04 22.94	23.54 23.66	11.48	11.5	17.06 16.94
DD V HSDPA Subtest 3	mid	-	5	29.82	22.89	23.68	11.48	11.5	16.92
DD V HSDPA Subtest 3	high	-	5	29.7	22.87	23.58	11.48	11.5	17.02
DD V HSDPA Subtest 4	low	-	5	29.28	23	23.64	11.48	11.5	16.96
DD V HSDPA Subtest 4	mid	-	5	29.82	22.83	23.64	11.48	11.5	16.96
DD V HSDPA Subtest 4	high	-	5	29.82	22.86	23.63	11.48	11.5	16.97
DD V HSUPA Subtest 1	low	-	5	29.7	23.4	23.66	11.48	11.5	16.94
DD V HSUPA Subtest 1	mid	-	5	29.98	23.25	23.56	11.48	11.5	17.04
DD V HSUPA Subtest 1	high	-	5	29.98	23.22	23.63	11.48	11.5	16.97
DD V HSUPA Subtest 2	low	-	5	28.74	21.57	22.61	11.48	11.5	17.99
DD V HSUPA Subtest 2	mid	-	5	30.54	22.65	23.38	11.48	11.5	17.22
DD V HSUPA Subtest 2	high	-	5 5	30.54	22.52	23.11	11.48	11.5	17.49
DD V HSUPA Subtest 3 DD V HSUPA Subtest 3	low mid	-	5	30.3 31.05	22.67 23.41	23.46 24.24	11.48	11.5	17.14 16.36
DD V HSUPA Subtest 3	high	-	5	30.62	23.56	24.24	11.48	11.5	16.28
DD V HSUPA Subtest 4	low	-	5	27.19	21.06	21.36	11.48		19.24
DD V HSUPA Subtest 4	mid	-	5	29.82	22.42	23.15	11.48	11.5	17.45
DD V HSUPA Subtest 4	high	-	5	30.3	22.69	23.76	11.48	11.5	16.84
DD V HSUPA Subtest 5	low	-	5	29.82	23.72	23.89	11.48	11.5	16.71
DD V HSUPA Subtest 5	mid	-	5	29.82	23.22	23.88	11.48	11.5	16.72
DD V HSUPA Subtest 5	high	-	5	29.28	23.46	23.47	11.48	11.5	17.13
eFDD 5 QPSK	low	1	1.4	-	-	21.56	11.48	11.5	19.04
eFDD 5 QPSK	low	3	1.4	-	-	21.22	11.48	11.5	19.38
eFDD 5 QPSK	low	6	1.4	-	-	20.21	11.48	11.5	20.39
eFDD 5 QPSK	mid	1	1.4	-	-	21.49	11.48	11.5	19.11
eFDD 5 QPSK	mid	3	1.4	-	-	21.07	11.48	11.5	19.53
eFDD 5 QPSK eFDD 5 QPSK	mid high	6 1	1.4	-	-	20.11	11.48 11.48		20.49 19.4
eFDD 5 QPSK	high	3	1.4	-	-	20.84	11.48		19.76
eFDD 5 QPSK	high	6	1.4	-	-	19.93	11.48	11.5	20.67
eFDD 5 16QAM	low	1	1.4	-	-	20.6	11.48	11.5	20
eFDD 5 16QAM	low	6	1.4	-	-	19.4	11.48	11.5	21.2
eFDD 5 16QAM	mid	1	1.4	-	-	20.39	11.48	11.5	20.21
eFDD 5 16QAM	mid	6	1.4	-	-	19.17	11.48	11.5	21.43
eFDD 5 16QAM	high	1	1.4	-	-	20.21	11.48	11.5	20.39
eFDD 5 16QAM	high	6	1.4	-	-	18.93	11.48	11.5	21.67
eFDD 5 QPSK	low	1	3	-	-	21.97	11.48		18.63
eFDD 5 QPSK eFDD 5 QPSK	low mid	15 1	3	-	-	20.73 21.64	11.48 11.48		19.87 18.96
eFDD 5 QPSK	mid	15	3	-	-	20.48	11.48		20.12
eFDD 5 QPSK	high	1	3	-	-	21.54	11.48		19.06
eFDD 5 QPSK	high	15	3	-	-	20.28	11.48		20.32
eFDD 5 16QAM	low	1	3	-	-	21	11.48		19.6
eFDD 5 16QAM	low	15	3	-	-	19.81		11.5	20.79
eFDD 5 16QAM	mid	1	3	-	-	20.86	11.48		19.74
eFDD 5 16QAM	mid	15	3	-	-	19.58		11.5	21.02
eFDD 5 16QAM	high	1	3	-	-	20.74	11.48		19.86
eFDD 5 16QAM	high	15	3	-	-	19.36		11.5	21.24
eFDD 5 QPSK	low	1 12	5 5	-	-	22.05	11.48		18.55 19.9
eFDD 5 QPSK eFDD 5 QPSK	low	25	5	-	-	20.7	11.48	11.5	19.91
eFDD 5 QPSK	mid	1	5	-	-	21.85		11.5	18.75
eFDD 5 QPSK	mid	12	5	-	-	20.46		11.5	20.14
eFDD 5 QPSK	mid	25	5	-	-	20.43	11.48		20.17
eFDD 5 QPSK	high	1	5	-	-	21.54		11.5	19.06
eFDD 5 QPSK	high	12	5	-	-	20.24	11.48	11.5	20.36
eFDD 5 QPSK	high	25	5	-	-	20.28	11.48	11.5	20.32
eFDD 5 16QAM	low	1	5	-	-	20.99	11.48		19.61
eFDD 5 16QAM	low	25	5	-	-	19.7		11.5	20.9
eFDD 5 16QAM	mid	1	5	-	-	20.81	11.48		19.79
eFDD 5 16QAM	mid	25	5	-	-	19.43		11.5	21.17
eFDD 5 16QAM	high bigh	1 25	5 5	-	-	21.03 19.35		11.5	19.57 21.25
eFDD 5 16QAM eFDD 5 QPSK	high low	1	10	-	-	22.06	11.48	11.5	18.54
eFDD 5 QPSK	low	50	10	-	-	20.86	11.48		19.74
	mid	1	10	-	-	22	11.48		18.6
	I IIIIG			-	-	20.67	11.48		19.93
eFDD 5 QPSK	mid	50	10						
		50 1	10	-	-	21.73	11.48	11.5	10.0/
eFDD 5 QPSK eFDD 5 QPSK	mid			-	-	21.73 20.6	11.48 11.48		18.87 20
eFDD 5 QPSK eFDD 5 QPSK eFDD 5 QPSK	mid high	1	10				11.48		20
eFDD 5 QPSK eFDD 5 QPSK eFDD 5 QPSK eFDD 5 QPSK eFDD 5 16QAM eFDD 5 16QAM	mid high high low low	1 50 1 50	10 10 10 10	-	- - -	20.6 21.07 19.91	11.48 11.48 11.48	11.5 11.5 11.5	20 19.53 20.69
eFDD 5 QPSK eFDD 5 QPSK eFDD 5 QPSK eFDD 5 QPSK eFDD 5 16QAM eFDD 5 16QAM eFDD 5 16QAM	mid high high low low mid	1 50 1 50 1	10 10 10 10 10		- - -	20.6 21.07 19.91 20.74	11.48 11.48 11.48 11.48	11.5 11.5 11.5 11.5	20 19.53 20.69 19.86
eFDD 5 QPSK eFDD 5 QPSK eFDD 5 QPSK eFDD 5 QPSK eFDD 5 16QAM eFDD 5 16QAM	mid high high low low	1 50 1 50	10 10 10 10		- - -	20.6 21.07 19.91	11.48 11.48 11.48	11.5 11.5 11.5 11.5 11.5	18.87 20 19.53 20.69 19.86 20.88 19.89





Date: 26.0CT.2016 08:25:25

GSM850, Channel: low



Reference: MDE\_UBLOX\_1626\_FCCb according to:

Stop 824.7 MHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 300 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl 30.07 dBm 1 MHz VBW 35.7 dBm 824.17695391 MHz 5 ms Unit dВm SWT 25.7 dB Offset A 3 0 SGL 2 0 10 1 VIEW 1 MA -10 EXT -20 - 3 0 - 4 ( - 5 0 -60

100 kHz/

2.NOV.2016 13:57:23 Date:

GSM850 EDGE, Channel: low

Start 823.7 MHz

-64.3



Reference: MDE\_UBLOX\_1626\_FCCb according to: FCC Part 22, Subpart H, Part 24, Subpart E, Part 27 Subpart C BW 10 MHz RF Att 20 dB

Marker 1 [T1] RBW 10 MHz RF Att Ref Lvl 23.27 dBm 10 MHz VBW 35.7 dBm 827.55230461 MHz SWT 5 ms Unit dВm 25.7 dB Offset A 3 0 SGL 2 0 10 1 V I E W 1 R M -10 EXT -20 - 3 0 - 4 0 - 5 0 -60 -64.3 Start 821.4 MHz 1 MHz/ Stop 831.4 MHz

Date: 25.0CT.2016 14:10:34

FDD V, Channel: low



Reference: MDE\_UBLOX\_1626\_FCCb according to: FCC Part 22, Subpart H, Part 24, Subpart E, Part 27 Subpart C BW 10 MHz RF Att 20 dB

Stop 831.4 MHz

10 MHz Marker 1 [T1] RBW RF Att Ref Lvl 24.25 dBm 10 MHz VBW 827.21162325 MHz 35.7 dBm SWT 5 ms Unit dВm 25.7 dB Offset A 3 0 SGL 2 0 10 1 V I E W 1 R M -10 EXT -20 - 3 0 - 4 0 - 5 0 -60 -64.3

1 MHz/

Date: 26.0CT.2016 09:23:22

FDD V HSDPA, Channel: low

Start 821.4 MHz



Reference: MDE\_UBLOX\_1626\_FCCb according to:

Stop 851.6 MHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C 10 MHz Marker 1 [T1] RBW RF Att Ref Lvl 24.32 dBm VBW 10 MHz 35.7 dBm 848.35350701 MHz 5 ms Unit dВm SWT 25.7 dB Offset A 3 0 SGL 10 1 VIEW 1 R M -10 EXT -20 - 3 0 - 4 0 - 5 0 -60 -64.3

1 MHz/

26.OCT.2016 10:10:36 Date:

FDD V HSUPA, Channel: high

Start 841.6 MHz



UNCAL

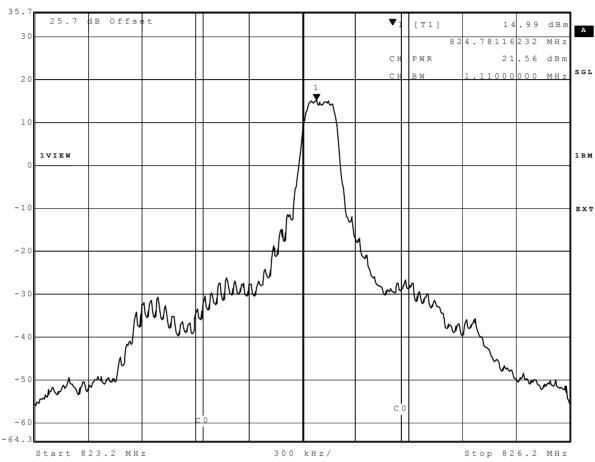
Reference: MDE\_UBLOX\_1626\_FCCb according to: FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C

RBW 30 kHz RF Att 20 dB

Ref Lvl 14.99 dBm VBW 100 kHz

Marker 1 [T1]

35.7 dBm 824.78116232 MHz SWT 5 ms Unit dBm



Date: 24.0CT.2016 14:33:53

eFDD5 QPSK, 1.4MHz, RB1, Channel: low



Stop 828.5 MHz

Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl 19.92 dBm VBW 300 kHz 35.7 dBm 825.68637275 MHz 5 ms Unit SWT dВm 25.7 dB Offset  $\blacktriangledown_1$ [T1] 19.92 dBm A 3 0 825.68637275 МНг 21.97 dBm СН PWR 78000000 2 0 10 1 VIEW 1 R M -10 EXT -20 Journal Manual March - 30 Mylwh - 4 ( - 5 ( C 0 -60 -64.3

600 kHz/

Date: 24.0CT.2016 14:42:50

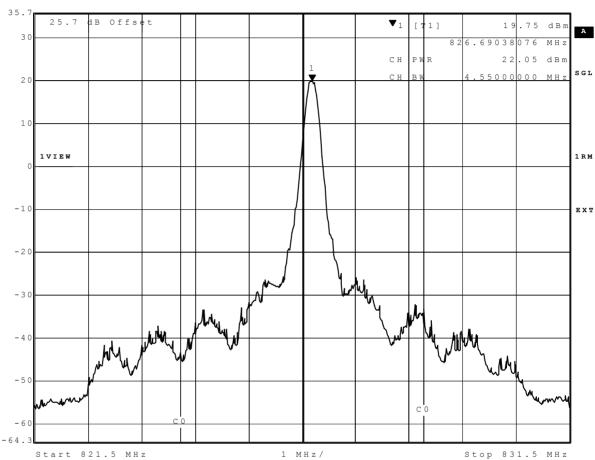
eFDDV QPSK, 3MHz, RB1, Channel: low

Start 822.5 MHz



Marker 1 [T1] RBW 100 kHz RF Att 20 dB

Ref Lvl 19.75 dBm VBW 300 kHz
35.7 dBm 826.69038076 MHz SWT 5 ms Unit dBm



Date: 24.0CT.2016 14:49:59

eFDDV QPSK, 5MHz, RB1, Channel: low



Marker 1 [T1] RBW RF Att 200 kHz Ref Lvl 21.42 dBm VBW 1 MHz 35.7 dBm 829.10020040 MHz 5 ms Unit dВm SWT 25.7 dB Offset  $\blacktriangledown_1$ [11] 21.42 dBm A 3 0 829.10020040 МНг 22.06 dBm СН 9.06000000 MHz 2 0 10 1 VIEW 1 R M -10 EXT -20 - 30 My M MINING - 4 ( - 5 0 - 60 -64.3

2 MHz/

Date: 24.0CT.2016 15:13:10

eFDDV QPSK, 10MHz, RB1, Channel. low

Start 819 MHz

Stop 839 MHz



Marker 1 [T1] RBW RF Att 200 kHz Ref Lvl 20.53 dBm VBW 1 MHz 35.7 dBm 829.10020040 MHz 5 ms Unit SWT dВm 25.7 dB Offset [ + 1 ]  $\blacktriangledown_1$ 20.53 dBm A 3 0 829.10020040 МНг 21.07 dBm СН R 9.02000000 MHz 2 0 10 1 VIEW 1 R M -10 EXT -20 - 30 - 4 ( - 5 0 - 60 -64.3

2 MHz/

Date: 24.0CT.2016 15:16:44

eFDDV 16QAM, 10MHz, RB1, Channel. low

Start 819 MHz

Stop 839 MHz



# 3.5.2 22.2 Frequency stability §2.1055

# Test: 22.2; \_Frequency stability Summary §2.1055

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 12:09

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22



#### **Detailed Results:**

Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
-30	0			-17	-28	passed
-30	5	normal	2095.5	-20	-37	passed
-30	10			-19	-37	passed
-20	0			-11	-22	passed
-20	5	normal	2095.5	-16	-32	passed
-20	10			-14	-27	passed
-10	0			-10	-20	passed
-10	5	normal	2095.5	-12	-21	passed
-10	10			-12	-26	passed
0	0			-5	-16	passed
0	5	normal	2095.5	-7	-15	passed
0	10			-8	-22	passed
10	0			-8	-17	passed
10	5	normal	2095.5	-6	-13	passed
10	10			-2	-11	passed
20	0			-6	-12	passed
20	5	low	2095.5	-4	-19	passed
20	10			-3	-17	passed
20	0	normal		-3	-11	passed
20	5	=	2095.5	-9	-19	passed
20	10	high <sup>1)</sup>		-2	-17	passed
20	0			-6	-13	passed
20	5	high	2095.5	-5	-22	passed
20	10			-4	-11	passed
30	0			-4	-17	passed
30	5	normal	2095.5	-4	-17	passed
30	10			-2	-19	passed
40	0			-3	-16	passed
40	5	normal	2095.5	-2	-15	passed
40	10			-2	-13	passed
50	0			-1	-11	passed
50	5	normal	2095.5	-3	-18	passed
50	10			-6	-19	passed

EDGE 850 Band, Mid channel



Taman	Duration	Valtage	Limit			Subpart H, Part 24,
Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
_			112			
-30	0			-11	-18	passed
-30	5	normal	2095.5	-14	-23	passed
-30	10			-12	-23	passed
-20	0			-8	-14	passed
-20	5	normal	2095.5	-6	-15	passed
-20	10			-7	-21	passed
-10	0			-6	-12	passed
-10	5	normal	2095.5	-4	-13	passed
-10	10			-1	-15	passed
0	0			1	9	passed
0	5	normal	2095.5	-3	-13	passed
0	10			-2	-12	passed
10	0			1	9	passed
10	5	normal	2095.5	4	12	passed
10	10			3	14	passed
20	0			3	11	passed
20	5	low	2095.5	2	14	passed
20	10			3	14	passed
20	0	normal		0	6	passed
20	5	=	2095.5	3	14	passed
20	10	high <sup>1)</sup>		2	11	passed
20	0			2	10	passed
20	5	high	2095.5	7	12	passed
20	10			3	13	passed
30	0			4	9	passed
30	5	normal	2095.5	6	12	passed
30	10			2	13	passed
40	0			3	8	passed
40	5	normal	2095.5	7	13	passed
40	10			4	11	passed
50	0			3	7	passed
50	5	normal	2095.5	5	11	passed
50	10			3	14	passed

GSM 850 Band, Mid channel



Temp.	Duration	Voltage	Subpart H, Part 24, Verdict				
°C	min	voitage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	verdict	
-30	0					nassad	
-30	5		2095.5	36	23	passed	
		normal		32	72 55	passed	
-30	10			28		passed	
-20	0		0005.5	19	25	passed	
-20	5	normal	2095.5	25	38 52	passed	
-20	10			21		passed	
-10	0		0005.5	37	103	passed	
-10	5	normal	2095.5	29	62	passed	
-10	10			34	83	passed	
0	0		2095.5	26	49	passed	
0	5	normal		36	65	passed	
0	10			29	39	passed	
10	0	normal			41	68	passed
10	5		2095.5	17	74	passed	
10	10			13	35	passed	
20	0		2095.5	14	28	passed	
20	5	low		13	31	passed	
20	10			18	29	passed	
20	0	normal		9	61	passed	
20	5	=	2095.5	25	37	passed	
20	10	high <sup>1)</sup>		31	42	passed	
20	0			36	39	passed	
20	5	high	2095.5	29	48	passed	
20	10			34	40	passed	
30	0			20	36	passed	
30	5	normal	2095.5	23	44	passed	
30	10			4	39	passed	
40	0			48	93	passed	
40	5	normal	2095.5	13	68	passed	
40	10			27	37	passed	
50	0			36	30	passed	
50	5	normal	2095.5	44	27	passed	
50	10			15	77	passed	

HSDPA FDD 5, Mid Channel



Temp.	Duration	Voltage	Limit	Freq. error	Freq. error	Verdict
°C	min		Hz	Average (Hz)	Max. (Hz)	
-30	0			-28	-322	passed
-30	5	normal	2095.5	104	350	passed
-30	10			99	-383	passed
-20	0			80	357	passed
-20	5	normal	2095.5	97	410	passed
-20	10			-70	-440	passed
-10	0			-94	-442	passed
-10	5	normal	2095.5	-21	-435	passed
-10	10			-20	-427	passed
0	0			89	436	passed
0	5	normal	2095.5	-57	-425	passed
0	10			-105	-458	passed
10	0		2095.5	-50	-437	passed
10	5	normal		-30	-328	passed
10	10			-64	-325	passed
20	0		2095.5	-51	-463	passed
20	5	low		-38	-454	passed
20	10			-55	-464	passed
20	0	normal		-45	-396	passed
20	5	=	2095.5	-36	-396	passed
20	10	high <sup>1)</sup>		87	354	passed
20	0			-44	-479	passed
20	5	high	2095.5	-42	-479	passed
20	10			90	-378	passed
30	0			-14	-400	passed
30	5	normal	2095.5	-11	452	passed
30	10			-16	-354	passed
40	0			-81	-399	passed
40	5	normal	2095.5	-50	-216	passed
40	10			-68	-268	passed
50	0			6	-82	passed
50	5	normal	2095.5	-26	-400	passed
50	10			41	-378	passed

HSUPA, FDD 5, Mid Channel



Temp.	Duration	Voltage	Limit	Freq. error	Freq. error	Subpart H, Part 24, Verdict
°C	min		Hz	Average (Hz)	Max. (Hz)	
-30	0			15	61	passed
-30	5	normal	2091.25	18	84	passed
-30	10			3	30	passed
-20	0			16	41	passed
-20	5	normal	2091.25	7	16	passed
-20	10			12	25	passed
-10	0			18	19	passed
-10	5	normal	2091.25	5	24	passed
-10	10			22	5	passed
0	0			17	17	passed
0	5	normal	2091.25	37	45	passed
0	10			35	18	passed
10	0	normal	2091.25	20	24	passed
10	5			6	39	passed
10	10			19	103	passed
20	0		2091.25	14	36	passed
20	5	low		12	28	passed
20	10			7	18	passed
20	0	normal		10	12	passed
20	5	= 43	2091.25	28	21	passed
20	10	high <sup>1)</sup>		31	38	passed
20	0			3	24	passed
20	5	high	2091.25	18	62	passed
20	10			9	54	passed
30	0			21	47	passed
30	5	normal	2091.25	23	26	passed
30	10			9	78	passed
40	0			27	10	passed
40	5	normal	2091.25	5	28	passed
40	10			18	14	passed
50	0			14	94	passed
50	5	normal	2091.25	28	51	passed
50	10			20	37	passed

LTE, eFDD5, QPSK 5MHz BW, Mid channel



Temp.	Duration	Voltage	Subpart H, Part 24, Verdict				
°C	min	voitage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	verdict	
-30	0					nassad	
-30	5		2095.5	34	87	passed	
-30		normal		16 72	45 80	passed	
	10					passed	
-20	0		0005.5	25	37	passed	
-20	5	normal	2095.5	39	66	passed	
-20	10			10	63	passed	
-10	0		0005.5	26	27	passed	
-10	5	normal	2095.5	46	38	passed	
-10	10			19	59	passed	
0	0			20	46	passed	
0	5	normal	2095.5	25	29	passed	
0	10			21	77	passed	
10	0	normal			17	24	passed
10	5		2095.5	18	49	passed	
10	10			36	69	passed	
20	0		2095.5	46	38	passed	
20	5	low		32	67	passed	
20	10			43	86	passed	
20	0	normal		17	37	passed	
20	5	=	2095.5	32	55	passed	
20	10	high <sup>1)</sup>		28	81	passed	
20	0			35	88	passed	
20	5	high	2095.5	36	89	passed	
20	10			27	77	passed	
30	0			37	27	passed	
30	5	normal	2095.5	9	34	passed	
30	10			14	79	passed	
40	0			18	106	passed	
40	5	normal	2095.5	22	69	passed	
40	10			36	48	passed	
50	0			34	67	passed	
50	5	normal	2095.5	27	47	passed	
50	10			11	43	passed	

UMTS, FDD5. Mid Channel



# 3.5.3 22.3 Spurious emissions at antenna terminals §2.1051, §22.917

# Test: 22.3; Spurious emissions at antenna terminals summary §2.1051, §22.917

Result: Passed
Setup No.: AE06

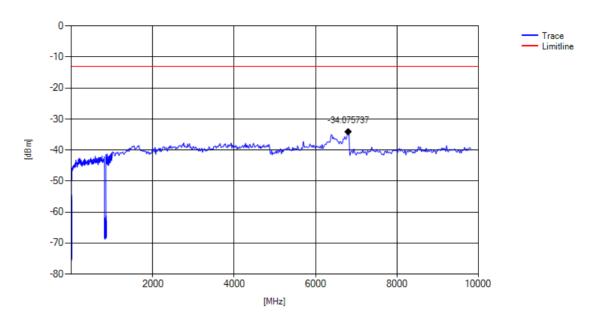
Date of Test: 2016/11/09 12:15

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

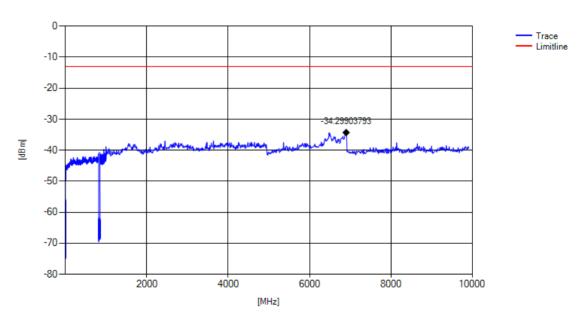
Test Specification: FCC part 2 and 22



#### **Detailed Results:**

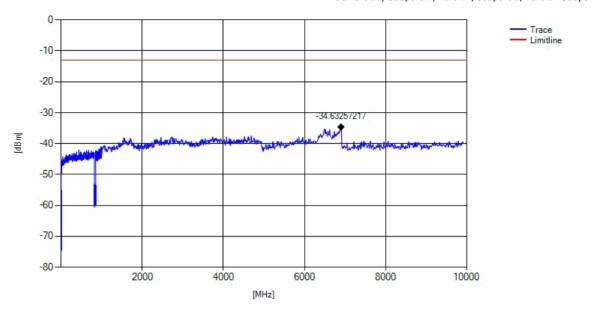


GSM850 EDGE, Channel: mid

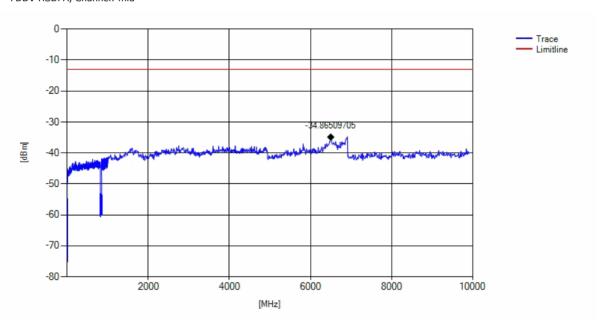


GSM850, Channel: mid



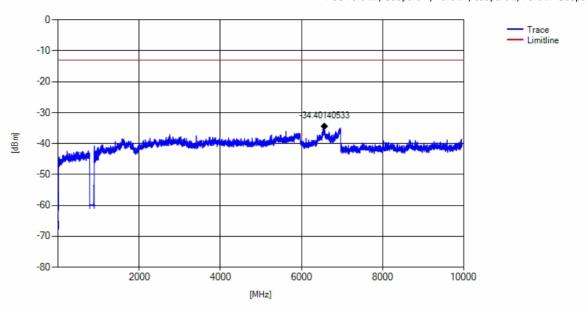


FDDV HSDPA, Channel: mid

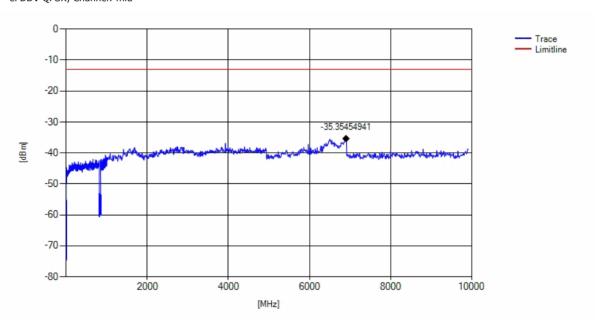


FDDV HSUPA, Channel: mid





eFDDV QPSK, Channel: mid



FDDV, Channel: mid



# 3.5.4 22.4 Field strength of spurious radiation §2.1053, §22.917

# Test: 22.4; Field strength of spurious radiation Summary §2.1053, §22.917

Result: Passed
Setup No.: AJ06

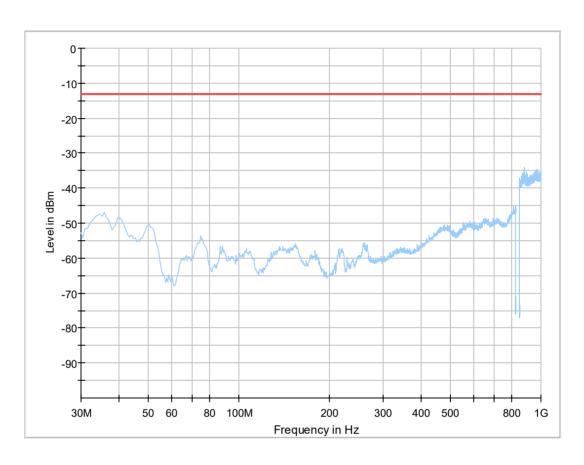
Date of Test: 2016/11/10 8:00

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22



#### **Detailed Results:**



**Critical Freqs** 

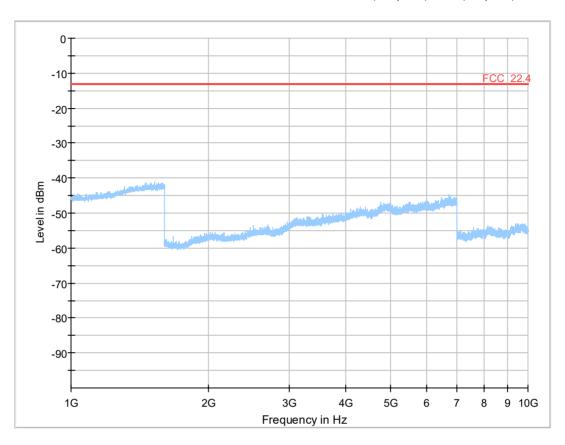
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: GSM850 EDGE, Channel: mid





Critical\_Freqs

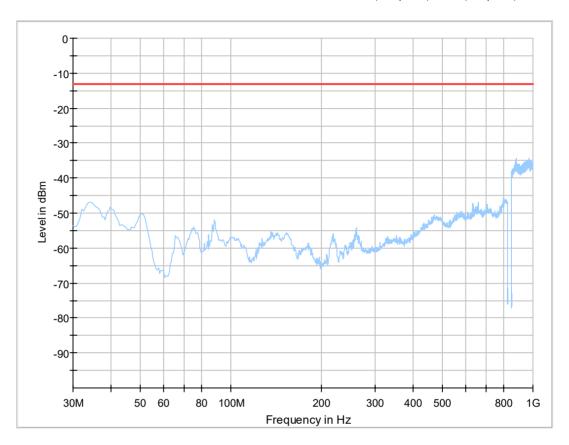
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 10GHz: GSM850 EDGE, Channel: mid





Critical\_Freqs

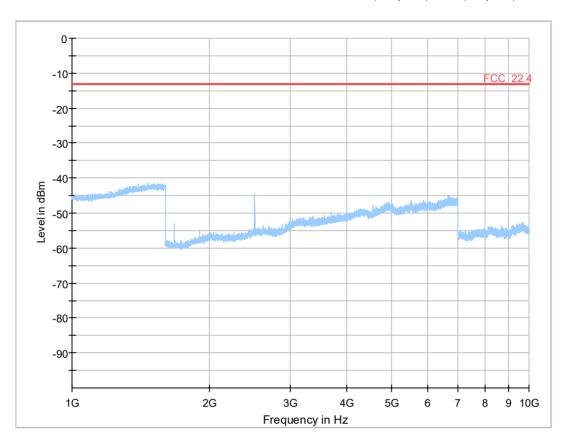
	Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
I											

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: GSM850, Channel: mid





Critical\_Freqs

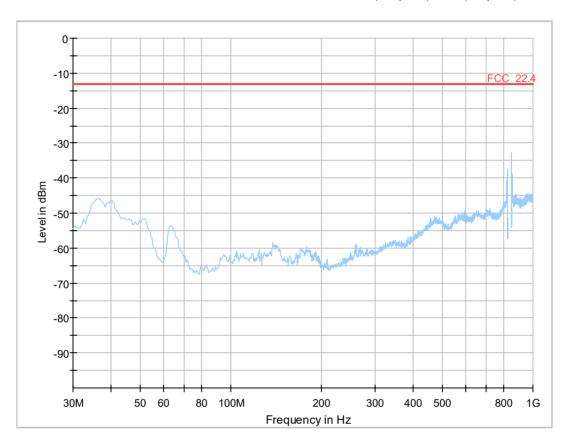
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 10GHz: GSM850, Channel: mid





Critical\_Freqs

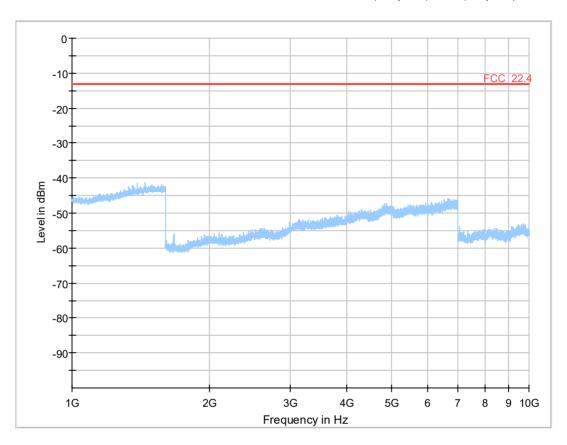
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: FDD V HSDPA, Channel: mid





Critical\_Freqs

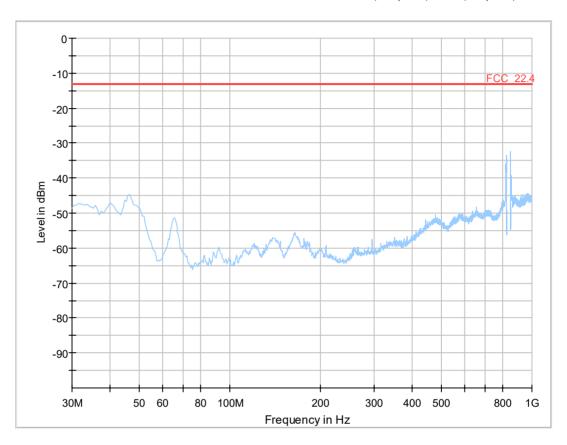
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 10GHz: FDD V HSDPA, Channel: mid





Critical\_Freqs

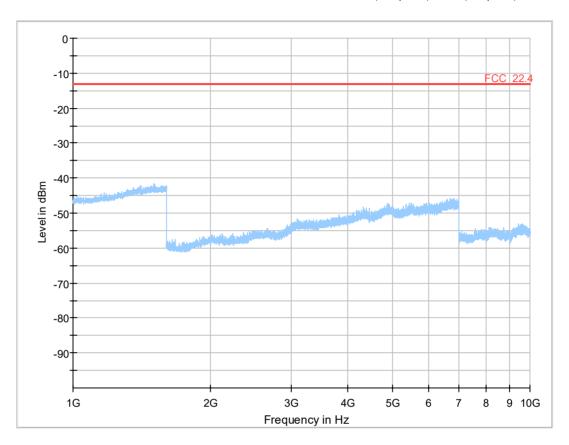
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: FDD V HSUPA, Channel: mid





Critical\_Freqs

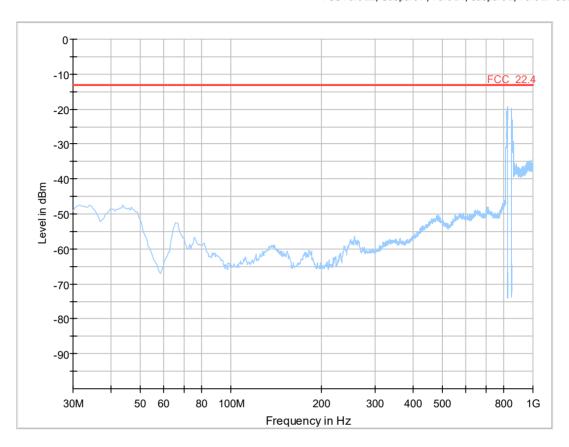
	Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
I											

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 10GHz: FDD V HSUPA, Channel: mid



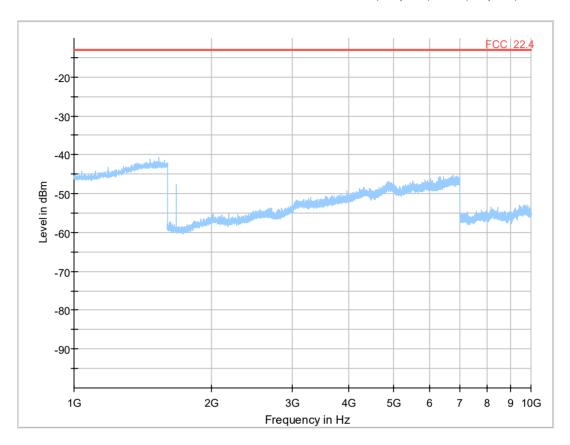


Critical\_Freqs

_	•									
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
823.000000	-19.30	-13.00	6.30	7000.0	1000.000	150.0	٧	-90.0	90.0	-71.9
850.000000	-19.78	-13.00	6.78	2000.0	1000.000	150.0	٧	-90.0	90.0	-73.5

30 MHz - 1GHz: eFDD V, Channel: mid





Critical\_Freqs

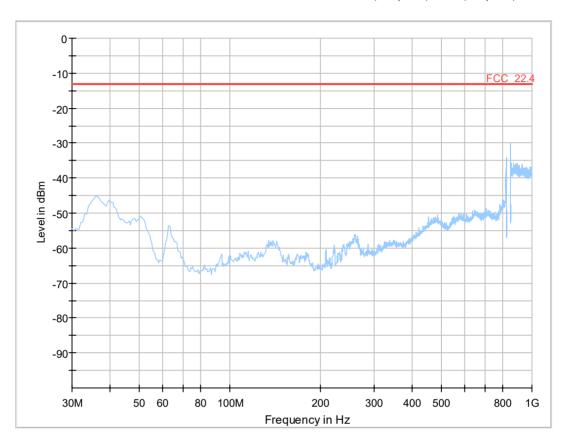
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 10GHz: eFDD V, Channel: mid





Critical\_Freqs

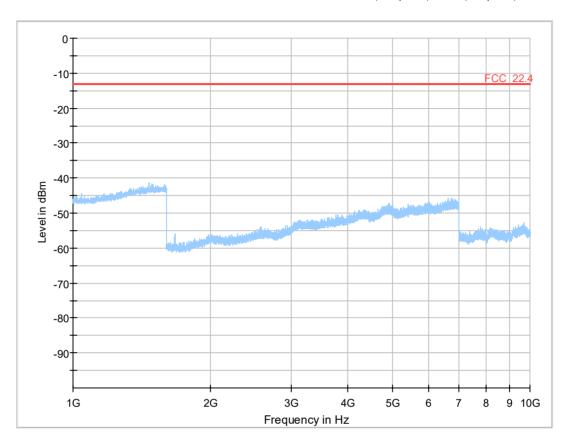
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: FDD V, Channel: mid





**Critical Freqs** 

	Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
I											

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 10GHz: FDD V, Channel: mid

Test: 22.4; Frequency Band = 850, Mode = EDGE, Channel = 128, Frequency = 824.2MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:26

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES



#### Test: 22.4; Frequency Band = 850, Mode = EDGE, Channel = 190, Frequency = 836.6MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:27

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

#### Test: 22.4; Frequency Band = 850, Mode = EDGE, Channel = 251, Frequency = 848.8MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:26

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

#### Test: 22.4; Frequency Band = 850, Mode = GSM, Channel = 128, Frequency = 824.2MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:23

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

#### Test: 22.4; Frequency Band = 850, Mode = GSM, Channel = 190, Frequency = 836.6MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:24

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

### Test: 22.4; Frequency Band = 850, Mode = GSM, Channel = 251, Frequency = 848.8MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:25

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

# Test: 22.4; Frequency Band = eFDD5, Mode = QPSK 5MHz, Channel = 20425, Frequency = 826.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:33

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES



# Test: 22.4; Frequency Band = eFDD5, Mode = QPSK 5MHz, Channel = 20525, Frequency = 836.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:33

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

# Test: 22.4; Frequency Band = eFDD5, Mode = QPSK 5MHz, Channel = 20625, Frequency = 846.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:35

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

#### Test: 22.4; Frequency Band = FDD5, Mode = HSDPA, Channel = 4132, Frequency = 826.4MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:31

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

#### Test: 22.4; Frequency Band = FDD5, Mode = HSDPA, Channel = 4183, Frequency = 836.6MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:31

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

## Test: 22.4; Frequency Band = FDD5, Mode = HSDPA, Channel = 4233, Frequency = 846.6MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:32

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

### Test: 22.4; Frequency Band = FDD5, Mode = HSUPA, Channel = 4132, Frequency = 826.4MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:29

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES



#### Test: 22.4; Frequency Band = FDD5, Mode = HSUPA, Channel = 4183, Frequency = 836.6MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:29

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

#### Test: 22.4; Frequency Band = FDD5, Mode = HSUPA, Channel = 4233, Frequency = 846.6MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:29

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

#### Test: 22.4; Frequency Band = FDD5, Mode = W-CDMA, Channel = 4132, Frequency = 826.4MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:28

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

### Test: 22.4; Frequency Band = FDD5, Mode = W-CDMA, Channel = 4183, Frequency = 836.6MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:27

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22

### Test: 22.4; Frequency Band = FDD5, Mode = W-CDMA, Channel = 4233, Frequency = 846.6MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:28

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES



## 3.5.5 22.5 Emission and Occupied Bandwidth §2.1049, §22.917

### Test: 22.5; \_Emission and Occupied Bandwidth Summary §2.1049, §22.917

Result: Passed
Setup No.: AT10

Date of Test: 2016/11/09 11:38

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES



#### **Detailed Results:**

<b>Emission and Occupied</b>	d Bandwid	th				
Ambient temperature:	26 °C					
Relative humidity:	35%					
		Ressource	Bandwidth	Nominal BW	26 dB BW	99 % BW
Radio Technology	Channel	Blocks	(MHz)	[MHz]	[kHz]	[kHz]
GSM 850	low	-	0.2	0.2	314.63	246.49
GSM 850	mid	-	0.2	0.2	310.62	244.49
GSM 850	high	-	0.2	0.2	310.62	246.49
GSM 850 EDGE	low	-	0.2	0.2	276.55	236.47
GSM 850 EDGE	mid	-	0.2	0.2	282.57	238.48
GSM 850 EDGE	high	-	0.2	0.2	286.57	238.48
FDD V	low	-	5	5	4669.34	4088.18
FDD V	mid	-	5	5	4669.34	4068.14
FDD V	high	-	5	5	4669.34	4068.14
FDD V HSDPA Subtest 1	low	-	5	5	4669.34	4068.14
FDD V HSDPA Subtest 1	mid	-	5	5	4689.39	4068.14
FDD V HSDPA Subtest 1	high	-	5	5	4669.34	4068.14
FDD V HSUPA Subtest 1	low	-	5	5	4689.39	4088.18
FDD V HSUPA Subtest 1	mid	-	5	5	4689.38	4088.18
FDD V HSUPA Subtest 1	high	-	5	5	4669.34	4088.18
FDD V HSUPA Subtest 5	low	-	5	5	4709.42	4088.18
FDD V HSUPA Subtest 5	mid	-	5	5	4689.38	4088.18
FDD V HSUPA Subtest 5	high	-	5	5	4709.42	4088.18
eFDD 5 QPSK	low	6	1.4	1.4	-	1112.22
eFDD 5 QPSK	mid	6	1.4	1.4	-	1112.22
eFDD 5 QPSK	high	6	1.4	1.4	-	1118.24
eFDD 5 16QAM	low	6	1.4	1.4	-	1118.24
eFDD 5 16QAM	mid	6	1.4	1.4	-	1106.21
eFDD 5 16QAM	high	6	1.4	1.4	-	1118.24
eFDD 5 QPSK	low	15	3	3	-	2777.56
eFDD 5 QPSK	mid	15	3	3	-	2765.53
eFDD 5 QPSK	high	15	3	3	-	2765.53
eFDD 5 16QAM	low	15	3	3	-	2777.56
eFDD 5 16QAM	mid	15	3	3	=	2765.53
eFDD 5 16QAM	high	15	3	3	-	2753.51
eFDD 5 QPSK	low	25	5	5	-	4549.1
eFDD 5 QPSK	mid	25	5	5	-	4509.02
eFDD 5 QPSK	high	25	5	5	-	4549.1
eFDD 5 16QAM	low	25	5	5	-	4569.14
eFDD 5 16QAM	mid	25	5	5	_	4549.1
eFDD 5 16QAM	high	25	5	5	_	4529.06
eFDD 5 QPSK	low	50	10	10	-	9058.12
eFDD 5 QPSK	mid	50	10	10	-	9018.04
eFDD 5 QPSK	high	50	10	10	-	9058.12
eFDD 5 16QAM	low	50	10	10	-	9018.04
eFDD 5 16QAM	mid	50	10	10	-	9018.04
eFDD 5 16QAM	high	50	10	10	<u> -</u>	9058.12



Stop 824.7 MHz

Delta 2 [T1] RBW RF Att 3 k H z Ref Lvl -27.21 dB VBW 10 kHz 35.7 dBm 134.26853708 kHz 5 s Unit SWT dBm dB Offset [T1] 24.52 dBm A 3 0 824.22304609 МНг [T1] -27.21 dB **▲**<sup>2</sup> 2 0 [T1] -26.47 dB  $\Delta^1$ -180.36072145 kHz 10 1 VIEW 1 MA -10 EXT -20 - 3 ( The transfer of the second of

100 kHz/

Date: 26.0CT.2016 08:21:43

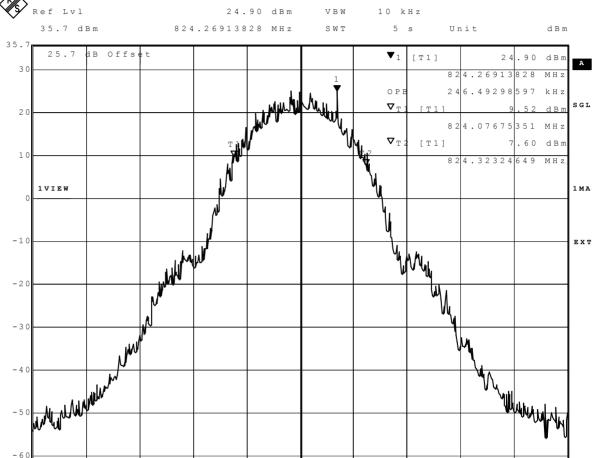
GSM850 26dB, Channel: low

Start 823.7 MHz



Stop 824.7 MHz

Marker 1 [T1] RBW RF Att 3 k H z



100 kHz/

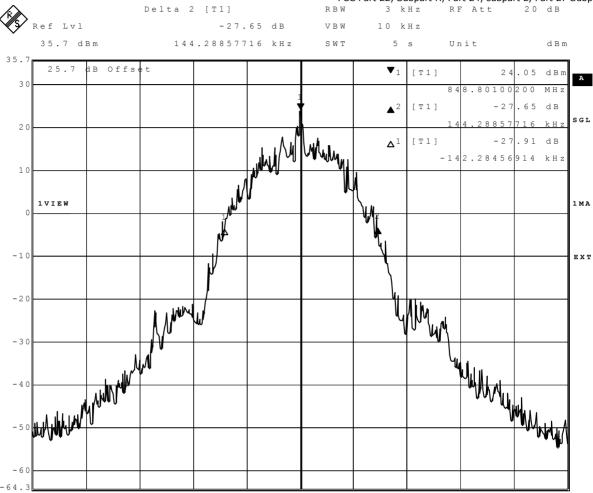
26.OCT.2016 08:21:09 Date:

GSM850 99%, Channel: low

Start 823.7 MHz



Stop 849.3 MHz



100 kHz/

Date: 2.NOV.2016 13:26:10

GSM850 EDGE 26dB, Channel: high

Start 848.3 MHz



Stop 849.3 MHz

Marker 1 [T1] RBW 3 k H z RF Att Ref Lvl 24.31 dBm VBW 10 kHz 35.7 dBm 848.80100200 MHz 5 s Unit SWT dBm dB Offset  $\blacktriangledown_1$ [T1] 24.31 dBm A 3 0 8 4 8 . 8 0 1 0 0 2 0 0 МНг 238.47695391 O.P. The second secon  $\nabla_{\underline{\mathbb{T}}}$ 2 0 848.68276553 MHz  $\nabla_{\mathrm{T}}$ [T1] 3.35 dBm 10 848.92124248 1 VIEW 1 MA -10 EXT -50 

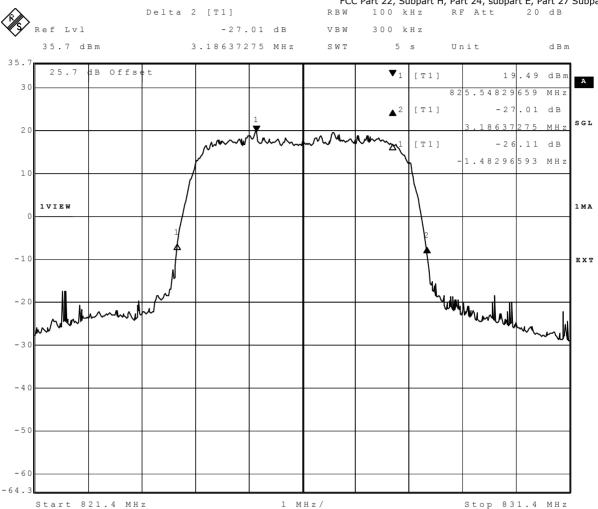
100 kHz/

2.NOV.2016 13:25:36 Date:

GSM850 EDGE 99%, Channel: high

Start 848.3 MHz





Date: 25.0CT.2016 13:48:35

FDD V 26dB, channel: low



Stop 831.4 MHz

Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl 19.53 dBm VBW 300 kHz 35.7 dBm 825.52825651 MHz 5 s Unit SWT dBm 25.7 dB Offset  $\blacktriangledown_1$ [T1] 19.53 dBm A 3 0 825.52825651 МНг 4.08817635 MHz 0 P I  $\nabla_{\underline{\mathbb{T}}}$ 2 0 824.36593186 MHz  $\nabla_{\mathrm{T}}$ 2 [T1] 10.73 dBm 10 828.45410822 MHz 1 VIEW 1 MA -10 EXT Mullim Mulli - 3 ( - 4 ( - 50 - 60

1 MHz/

Date: 25.0CT.2016 13:48:01

FDD V 99%, channel: low

Start 821.4 MHz



Stop 841.6 MHz

Delta 2 [T1] RBW 100 kHz RF Att Ref Lvl -27.63 dB VBW 300 kHz 35.7 dBm 1.66332665 MHz 5 s Unit SWT dВm 25.7 dB Offset [T1] 19.44 dBm A 3 0 837.29138277 МНг **▲**<sup>2</sup> [T1] -27.63 dB 2 0 -26.75 dB [T1] 3.02605210 MHz 10 1 VIEW 1 MA -10 EXT Market Ma -20 hum hum - 3 ( - 4 ( - 50 - 60

1 MHz/

Date: 26.0CT.2016 09:04:22

FDD V HSDPA 26dB, Channel: mid

Start 831.6 MHz



Stop 841.6 MHz

Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl 19.29 dBm VBW 300 kHz 35.7 dBm 835.64809619 MHz 5 s Unit SWT dВm 25.7 dB Offset  $\blacktriangledown_1$ [T1] 19.29 dBm A 3 0 835.64809619 МНг 4.06813627 MHz 0 P I  $\nabla_{\underline{\mathrm{T}}}$ 2 0 834.56593186 MHz  $\nabla_{\mathbb{T}} \nabla$ 2 [T1] 10.12 dBm 10 838.63406814 MHz 1 VIEW 1 MA -10 EXT -20 - 3 ( - 4 ( - 50 - 60

1 MHz/

Date: 26.0CT.2016 09:03:51

FDD V HSDPA 99%, Channel: mid

Start 831.6 MHz



Stop 831.4 MHz

Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl 18.95 dBm VBW 300 kHz 35.7 dBm 827.49218437 MHz 5 s Unit SWT dBm 25.7 dB Offset  $\blacktriangledown_1$ [T1] 18.95 dBm A 3 0 827.49218437 МНг 4.08817635 MHz 0 P I  $\nabla_{\underline{\mathbb{T}}}$ 2 0 824.36593186 MHz  $\nabla_{\mathrm{T}}$ 2 [T1] 10.06 dBm 10 828.45410822 MHz 1 VIEW 1 MA -10 EXT College Land Colle -20 - 4 ( - 50 - 60 -64.3

1 MHz/

Date: 26.0CT.2016 11:30:22

FDD V HSUPA 26dB, Channel: low

Start 821.4 MHz



Stop 831.4 MHz

Delta 2 [T1] RBW 100 kHz RF Att Ref Lvl -27.23 dB VBW 300 kHz 35.7 dBm 3.50701403 MHz 5 s Unit SWT dBm 25.7 dB Offset **▼**1 [T1] 18.56 dBm A 3 0 825.24769539 МНг [T1] -27.23 dB 2 0 -28.21 dB [T1] 1.20240481 MHz 10 1 VIEW 1 MA -10 EXT hara Malkery and -20 - 3 0 - 4 ( - 50 - 60

1 MHz/

Date: 26.0CT.2016 11:30:53

FDD V HSUPA 99%, Channel: low

Start 821.4 MHz



Stop 849.8 MHz

Marker 1 [T1] RBW RF Att 30 kHz Ref Lvl 16.21 dBm VBW 100 kHz 35.7 dBm 847.88817635 MHz 5 s Unit SWT dBm 25.7 dB Offset  $\blacktriangledown_1$ [T1] 16.21 dBm A 3 0 8 4 7 . 8 8 8 1 7 6 3 5 МНг 1.11823647 MHz O.P.  $\nabla_{\underline{\mathrm{T}}}$ 2 0 847.73787575 MHz ᄶᠯ 7.27 dBm [T1] 10 848.85611222 MHz 1 VIEW 1 MA -10 EXT Myllimbury - 4 ( - 50 - 60 -64.3

300 kHz/

Date: 24.0CT.2016 14:12:03

eFDD5 16QAM, 1.4MHz, Channel: high

Start 846.8 MHz



Stop 828.5 MHz

Marker 1 [T1] RBW RF Att 100 kHz Ref Lvl 17.45 dBm VBW 300 kHz 35.7 dBm 825.84268537 MHz 5 s Unit SWT dBm 25.7 dB Offset  $\blacktriangledown_1$ [T1] 17.45 dBm A 3 0 825.84268537 МНΖ 2.77755511 MHz O.P.  $\nabla_{\underline{\mathrm{T}}}$ 2 0 824.11122244 MHz  $\nabla_{\mathrm{T}}$ 全1] 10.44 dBm 10 826.88877756 MHz 1 VIEW 1 M A -10 EXT -20 who were prove - 3 0 - 4 C - 5 0 -60 -64.3

600 kHz/

Date: 24.0CT.2016 14:12:46

eFDD5 QPSK, 3MHz, Channel: low

Start 822.5 MHz



Stop 831.5 MHz

Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl 14.99 dBm VBW 300 kHz 35.7 dBm 824.58617234 MHz 5 s Unit SWT dBm 25.7 dB Offset  $\blacktriangledown_1$ [T1] 14.99 dBm A 3 0 824.58617234 4.56913828 MHz O.P.  $\nabla_{\underline{\mathrm{T}}}$ 2 0 824.22545090 MHz 8.24 dBm [T1] 10 828.79458918 MHz 1 VIEW 1 M A -10 EXT -20 - 4 C - 5 0 -60 -64.3

1 MHz/

Date: 24.0CT.2016 14:18:14

eFDD5 16QAM, 5MHz, Channel: low

Start 821.5 MHz



Marker 1 [T1] RBW 200 kHz RF Att Ref Lvl 16.42 dBm VBW 1 MHz 35.7 dBm 832.50701403 MHz 5 s Unit SWT dВm 25.7 dB Offset  $\blacktriangledown_1$ [T1] 16.42 dBm A 3 0 832.50701403 MHz 9.05811623 MHz 0 P I  $\nabla_{\mathrm{T}}$ 2 0 824.49098196 MHz **T**<sup>2</sup>T 1 ] 10.88 dBm 10 833.54909820 MHz 1 VIEW 1 MA -10 EXT -20 - 30 - 4 ( - 50 - 60 -64.3 Start 819 MHz 2 MHz/ Stop 839 MHz

Date: 24.0CT.2016 14:20:55

eFDD5 QPSK, 10MHz, Channel: low



## 3.5.6 22.6 Band edge compliance §2.1053, §22.917

### Test: 22.6; \_Band edge compliance Summary §2.1053, §22.917

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 12:22

Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES



#### **Detailed Results:**

Band Edge									
Ambient temperature:	20 ℃								
Relative humidity:	60 %								
Radio Technology	Channel	Nominal BW	Ressource	Peak	Average	RMS [dBm]		Margin to	Verdict
CCM OFO	la	0.2	Blocks	[dBm]	[dBm]	20.27	/dBm		
GSM 850	low	0.2	-	-16.48	-35.26	-28.27	-13		Passed
GSM 850	high	0.2	-	-18.74	-38.28	-28.74	-13		Passed
GSM 850 EDGE	low	0.2	-	-23.42	-45.89	-36.94	-13	10.42	Passed
GSM 850 EDGE	high	0.2	-	-26.79	-47.82	-36.34	-13	13.79	Passed
FDD V	low	5	-	-20.43	-32.63	-31.91	-13	18.91	Passed
FDD V	high	5	-	-22.94	-33.02	-32.26	-13		Passed
FDD V HSDPA Subtest 1	low	5	-	-20.75	-32.26	-31.24	-13	18.24	Passed
FDD V HSDPA Subtest 1	high	5	-	-20.42	-31.91	-31.24	-13	18.24	Passed
FDD V HSUPA Subtest 1	low	5	-	-22.03	-30.32	-29.76	-13	16.76	Passed
FDD V HSUPA Subtest 1	high	5	-	-19.97	-31.24	-30.04	-13		Passed
FDD V HSUPA Subtest 5	low	5	-	-22.2	-30.92	-30.04	-13	17.04	Passed
FDD V HSUPA Subtest 5	high	5	-	-19.7	-31.57	-30.62	-13	17.62	Passed
eFDD 5 QPSK	low	1.4	6	-16.18	-28	-26.4	-13	13.4	Passed
eFDD 5 QPSK	high	1.4	6	-16.9	-29.52	-27.72	-13	14.72	Passed
eFDD 5 16QAM	low	1.4	6	-16.2	-29.5	-27.4	-13	14.4	Passed
eFDD 5 16QAM	high	1.4	6	-18.5	-30.62	-28.98	-13	15.98	Passed
eFDD 5 QPSK	low	3	15	-15.58	-30.32	-27.61	-13	14.61	Passed
eFDD 5 QPSK	high	3	15	-16.3	-32.63	-29.5	-13	16.5	Passed
eFDD 5 16QAM	low	3	15	-15.55	-30.92	-28.04	-13	15.04	Passed
eFDD 5 16QAM	high	3	15	-17.25	-33.42	-30.32	-13	17.32	Passed
eFDD 5 QPSK	low	5	25	-13.77	-31.91	-28.74	-13	15.74	Passed
eFDD 5 QPSK	high	5	25	-14.32	-34.29	-30.32	-13	17.32	Passed
eFDD 5 16QAM	low	5	25	-16.78	-33.42	-30.62	-13	17.62	Passed
eFDD 5 16QAM	high	5	25	-16	-35.26	-30.92	-13	17.92	Passed
eFDD 5 QPSK	low	10	50	-14.53	-34.76	-30.92	-13	17.92	Passed
eFDD 5 QPSK	high	10	50	-15.01	-36.94	-32.26	-13	19.26	Passed
eFDD 5 16QAM	low	10	50	-16.2	-36.34	-32.26	-13	19.26	Passed
eFDD 5 16QAM	high	10	50	-14.9	-38.28	-33.42	-13	20.42	Passed

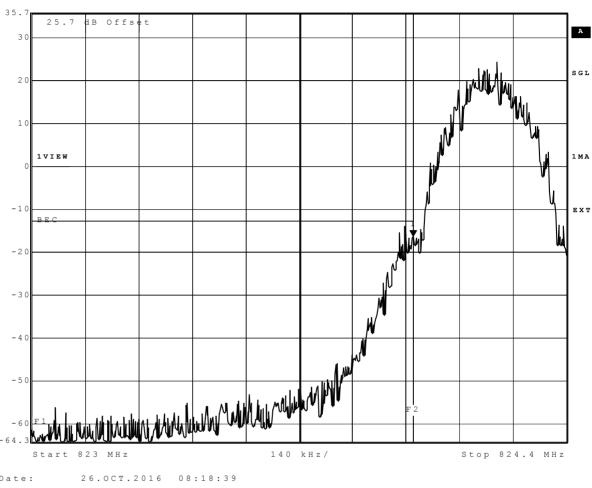


dВm

RBW RF Att 3 k H z

Ref Lvl -16.48 dBm VBW 3 k H z 35.7 dBm 824.00000000 MHz 5 s Unit SWT

Marker 1 [T1]

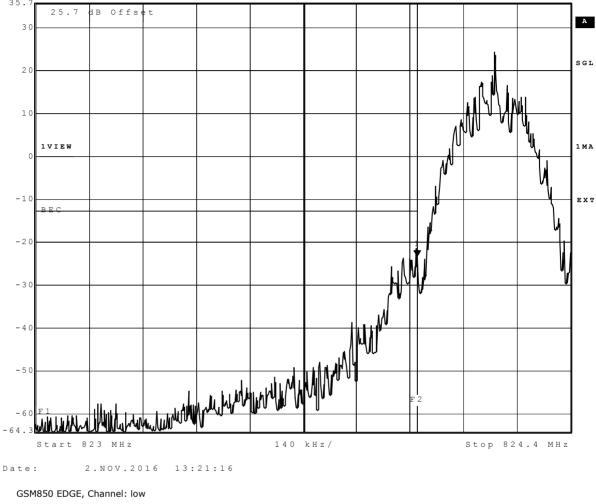


26.OCT.2016 08:18:39 Date:

GSM850, Channel: low



Marker 1 [T1] RBW RF Att 3 k H z Ref Lvl -23.42 dBm VBW 3 k H z 35.7 dBm 824.00000000 MHz 5 s Unit dВm SWT



2.NOV.2016 13:21:16 Date:

GSM850 EDGE, Channel: low



Reference: MDE\_UBLOX\_1626\_FCCb according to:

Stop 828.8 MHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -31.91 dBm 50 kHz VBW 35.7 dBm 824.00000000 MHz 5 s SWT Unit dВm 25.7 dB Offset A 3 0 SGL 2 0 10 1 V I E W 1 R M -10 EXT -20 - 3 0 - 4 ( - 5 0 -60

580 kHz/

25.OCT.2016 13:35:28 Date:

FDDV, Channel: low

Start 823 MHz



Reference: MDE\_UBLOX\_1626\_FCCb according to:

Stop 828.8 MHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -31.24 dBm 50 kHz VBW 35.7 dBm 824.00000000 MHz 5 s SWT Unit dВm 25.7 dB Offset A 3 0 SGL 2 0 10 1 V I E W 1 R M -10 EXT -20 - 3 0 - 4 ( - 5 0 -60 -64.3

580 kHz/

26.OCT.2016 08:52:31 Date:

FDDV HSDPA, Channel: low

Start 823 MHz



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -29.76 dBm 50 kHz VBW 35.7 dBm 824.00000000 MHz 5 s SWT Unit dВm 25.7 dB Offset A 3 0 SGL 2 0 10 1 V I E W 1 R M -10 EXT -20 - 3 0 - 4 ( - 5 0 -60 -64.3 Start 823 MHz 580 kHz/ Stop 828.8 MHz

26.OCT.2016 10:44:49 Date:

FDDV HSUPA, Channel: low



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 20 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -26.40 dBm 20 kHz VBW 25.7 dBm 824.00000000 MHz SWT 5 s Unit dВm 25.7 dB Offset A 2 0 SGL 10 1 VIEW 1 R M -20 EXT - 30 - 4 0 - 5 ( - 6 0 -70 -74.3 Start 823 MHz 250 kHz/ Stop 825.5 MHz

24.OCT.2016 15:23:01 Date:

eFDDV QPSK, 1.4MHz, Channel: low



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 30 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -27.61 dBm 30 kHz VBW 35.7 dBm 824.00000000 MHz SWT 5 s Unit dВm 25.7 dB Offset A 3 0 SGL 2 0 10 1 V I E W 1 R M -10 EXT -20 - 3 0 - 5 0 -60 -64.3

400 kHz/

24.OCT.2016 15:26:16 Date:

eFDDV QPSK, 3MHz, Channel: low

Start 823 MHz

Stop 827 MHz



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -28.74 dBm 50 kHz VBW 35.7 dBm 824.00000000 MHz SWT 5 s Unit dВm 25.7 dB Offset A 3 0 SGL 2 0 10 1 V I E W 1 R M -10 EXT -20 - 3 0 - 4 ( - 5 0 -60

600 kHz/

24.OCT.2016 15:29:32 Date:

eFDD5 QPSK, 5MHz, Channel: low

Start 823 MHz

-64.3

Stop 829 MHz



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 100 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -30.92 dBm 100 kHz VBW 35.7 dBm 824.00000000 MHz SWT 5 s Unit dВm 25.7 dB Offset A 3 0 SGL 2 0 10 1 V I E W 1 R M -10 EXT -20 - 3 0 - 4 0 - 5 0 -60 -64.3

1.1 MHz/

24.OCT.2016 15:32:37 Date:

eFDDV QPSK, 10MHz, Channel: low

Start 823 MHz

Stop 834 MHz



## 3.5.7 22.7 Peak-to-Average Ratio Summary §2.1046

### Test: 22.7; Peak-to-Average Ratio Summary §2.1046

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 12:02

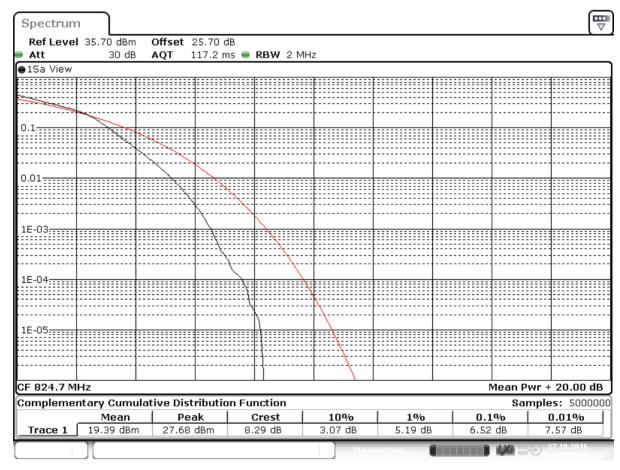
Body: FCC47CFRChIPART22PUBLIC MOBILE SERVICES

Test Specification: FCC part 2 and 22



#### **Detailed Results:**

Peak to Average Ratio							
Ambient temperature: Relative humidity:	26 °C 35%						
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak to Average Ratio	Limit (IC) (dB)	Verdict	
GSM 850	low	-	0.2	0.15	13	PASSED	
GSM 850	mid	-	0.2	0.05	13	PASSED	
GSM 850	high	-	0.2	0.11	13	PASSED	
GSM 850 EDGE	low	-	0.2	0.03	13	PASSED	
GSM 850 EDGE	mid	-	0.2	0.16	13	PASSED	
GSM 850 EDGE	high	-	0.2	0.11	13	PASSED	
FDD V	low	-	5	5.37	13	PASSED	
FDD V	mid	-	5	5.91	13	PASSED	
FDD V	high	-	5	5.55	13	PASSED	
FDD V HSDPA Subtest 1	low	-	5	5.34	13	PASSED	
FDD V HSDPA Subtest 1	mid	-	5	5.55	13	PASSED	
FDD V HSDPA Subtest 1	high	-	5	5.52	13	PASSED	
FDD V HSUPA Subtest 1	low	-	5	6.19	13	PASSED	
FDD V HSUPA Subtest 1	mid	-	5	6.25	13	PASSED	
FDD V HSUPA Subtest 1	high	-	5	7.26	13	PASSED	
FDD V HSUPA Subtest 5	low	-	5	6.88	13	PASSED	
FDD V HSUPA Subtest 5	mid	-	5	6.93	13	PASSED	
FDD V HSUPA Subtest 5	high	-	5	6.83	13	PASSED	
eFDD 5 QPSK	low	6	1.4	5.62	13	PASSED	
eFDD 5 QPSK	mid	6	1.4	5.65	13	PASSED	
eFDD 5 QPSK	high	6	1.4	5.48	13	PASSED	
eFDD 5 16QAM	low	6	1.4	6.52	13	PASSED	
eFDD 5 16QAM	mid	6	1.4	6.41	13	PASSED	
eFDD 5 16QAM	high	6	1.4	6.43	13	PASSED	



Date: 27.0 CT.2016 16:02:49

eFDDV 16QAM, Channel: low



## 3.5.8 24.1 RF Power Output §2.1046, §24.232

## Test: 24.1; RF Power Output Summary §2.1046, §24.232

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 8:26

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24



#### **Detailed Results:**

Transmitter Output Power								
Ambient temperature:	26 °C							
Relative humidity:	35%							
Radio Technology	Channel	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC / IC EIRP Limit (W)	Maximum Antenna Gain (dBi)	Verdict
GSM 1900	low	0.2	30.8	30.77	30.8	2	2.2	Passed
GSM 1900	mid	0.2	30.8	30.77	30.78	2	2.2	Passed
GSM 1900	high	0.2	30.75	30.72	30.75	2		Passed
GSM 1900 EDGE	low	0.2	29.27	29.25	29.12	2	3.73	Passed
GSM 1900 EDGE	mid	0.2	29.29	29.27	29.26	2		Passed
GSM 1900 EDGE	high	0.2	29.17	29.13	29.14	2	3.83	Passed
FDD II	low	5	28.86	23.18	23.32	2	9.68	Passed
FDD II	mid	5	28.59	23.01	23.17	2	9.83	Passed
FDD II	high	5	28.59	22.94	23.13	2	9.87	Passed
FDD II HSDPA Subtest 1	low	5	28.71	23.46	23.66	2	9.34	Passed
FDD II HSDPA Subtest 1	mid	5	28.71	23.45	23.59	2	9.41	Passed
FDD II HSDPA Subtest 1	high	5	28.86	23.26	23.47	2	9.53	Passed
FDD II HSDPA Subtest 2	low	5	29.6	23.71	24.2	2		Passed
FDD II HSDPA Subtest 2	mid	5	29.24	23.75	24.31	2	8.69	Passed
FDD II HSDPA Subtest 2	high	5	29.78	23.59	24.06	2	8.94	Passed
FDD II HSDPA Subtest 3	low	5	29.6	23.88	24.68	2	8.32	Passed
FDD II HSDPA Subtest 3	mid	5	30.05	23.84	24.37	2	8.63	Passed
FDD II HSDPA Subtest 3	high	5	30.2	23.71	24.11	2	8.89	Passed
FDD II HSDPA Subtest 4	low	5	30.2	23.71	24.47	2		Passed
FDD II HSDPA Subtest 4	mid	5	29.47	23.74	24.49	2		Passed
FDD II HSDPA Subtest 4	high	5	29.78	23.46	24.2	2	8.8	Passed
FDD II HSUPA Subtest 1	low	5	30.05	23.14	23.55	2	9.45	Passed
FDD II HSUPA Subtest 1	mid	5	29.47	23.27	23.57	2	9.43	Passed
FDD II HSUPA Subtest 1	high	5	30.05	22.91	23.54	2	9.46	Passed
FDD II HSUPA Subtest 2	low	5	30.05	22.46	23.36	2	9.64	Passed
FDD II HSUPA Subtest 2	mid	5	30.96	22.37	23.13	2	9.87	Passed
FDD II HSUPA Subtest 2	high	5	30.64	22.04	22.92	2	10.08	Passed
FDD II HSUPA Subtest 3	low	5	31.12	23.47	24.29	2	8.71	Passed
FDD II HSUPA Subtest 3	mid	5	30.96	23.43	24.24	2	8.76	Passed
FDD II HSUPA Subtest 3	high	5	31.04	22.96	24	2	9	Passed
FDD II HSUPA Subtest 4	low	5	30.8	22.51	23.51	2	9.49	Passed
FDD II HSUPA Subtest 4	mid	5	30.48	22.48	23.57	2	9.43	Passed
FDD II HSUPA Subtest 4	high	5	30.72	22.18	23.38	2		Passed
FDD II HSUPA Subtest 5	low	5	29.6	23.53	23.55	2	9.45	Passed
FDD II HSUPA Subtest 5	mid	5	30.48	23.54	23.79	2		Passed
FDD II HSUPA Subtest 5	high	5	30.32	23.11	23.43	2	9.57	Passed



Transmitter Output Power							
Ambient temperature:	26 °C						
Relative humidity:	35%						
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	RMS Conducted Power (dBm)	FCC / IC EIRP Limit (W)	Maximum Antenna Gain (dBi)	Verdic
eFDD 2 QPSK	low	1	1.4	21.19	2	11.81	Passed
eFDD 2 QPSK	low	3	1.4	20.74	2	12.26	Passed
eFDD 2 QPSK	low	6	1.4	19.61	2	13.39	Passed
eFDD 2 QPSK	mid	1	1.4	21.39	2	11.61	Passed
eFDD 2 QPSK	mid	3	1.4	20.99	2	12.01	Passed
eFDD 2 QPSK	mid	6	1.4	20.14	2	12.86	Passed
eFDD 2 QPSK	high	1	1.4	21.05	2		Passed
eFDD 2 QPSK	high	3	1.4	20.65	2		Passed
eFDD 2 QPSK	high	6	1.4	19.78	2		Passed
eFDD 2 16QAM	low	1	1.4	20.15	2		Passed
eFDD 2 16QAM	low	6	1.4	18.73	2		Passed
eFDD 2 16QAM	mid	1	1.4	20.35	2	12.65	Passed
eFDD 2 16QAM	mid	6	1.4	19.23	2		Passed
eFDD 2 16QAM	high	1	1.4	20.04	2		Passed
eFDD 2 16QAM	high	6	1.4	18.75	2		Passed
eFDD 2 QPSK	low	1	3	21.55	2	11.45	Passed
eFDD 2 QPSK	low	15	3	20.16	2		Passed
eFDD 2 QPSK	mid	1	3	21.84	2		Passed
eFDD 2 QPSK	mid	15	3	20.5	2		Passed
eFDD 2 QPSK	high	1	3	21.52	2		Passed
eFDD 2 QPSK	high	15	3	20.05	2		Passed
eFDD 2 16QAM	low	1	3	20.48	2		Passed
eFDD 2 16QAM	low	15	3	19.22	2		Passed
eFDD 2 16QAM	mid	1	3	20.75	2		Passed
eFDD 2 16QAM	mid	15	3	19.47	2		Passed
eFDD 2 16QAM	high	1	3	20.43	2		Passed
eFDD 2 16QAM	high	15	3	19.15	2		Passed
eFDD 2 QPSK	low	1	5	21.51	2		Passed
eFDD 2 QPSK	low	12	5	20.16	2		Passed
eFDD 2 QPSK	low	25	5	20.24	2		Passed
eFDD 2 QPSK	mid	1	5	21.81	2		Passed
eFDD 2 QPSK	mid	12	5	20.48	2		Passed
eFDD 2 QPSK	mid	25	5	20.43	2		Passed
eFDD 2 QPSK	high	1	5	21.34	2		Passed
eFDD 2 QPSK	high	12	5	20.14	2		Passed
eFDD 2 QPSK	high	25	5	20.06	2		Passed
eFDD 2 16QAM	low	1	5	20.68	2		Passed
eFDD 2 16QAM	low	25	5	19.22	2		Passed
eFDD 2 16QAM	mid	1	5	20.9	2		Passed
eFDD 2 16QAM	mid	25	5	19.4	2		Passed
eFDD 2 16QAM	high	1	5	20.74	2		Passed
eFDD 2 16QAM	high	25	5	19.07	2		Passed



<b>Transmitter Output Power</b>							
Ambient temperature:	26 °C						
Relative humidity:	35%						
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	RMS Conducted Power (dBm)	FCC / IC EIRP Limit (W)	Maximum Antenna Gain (dBi)	Verdict
eFDD 2 QPSK	low	1	10	21.8	2		Passed
eFDD 2 QPSK	low	50	10	20.43	2	12.57	Passed
eFDD 2 QPSK	mid	1	10	21.86	2	11.14	Passed
eFDD 2 QPSK	mid	50	10	20.66	2	12.34	Passed
eFDD 2 QPSK	high	1	10	21.59	2	11.41	Passed
eFDD 2 QPSK	high	50	10	20.39	2		Passed
eFDD 2 16QAM	low	1	10	20.68	2	12.32	Passed
eFDD 2 16QAM	low	50	10	19.6	2	13.4	Passed
eFDD 2 16QAM	mid	1	10	20.79	2	12.21	Passed
eFDD 2 16QAM	mid	50	10	19.82	2	13.18	Passed
eFDD 2 16QAM	high	1	10	20.62	2	12.38	Passed
eFDD 2 16QAM	high	50	10	19.43	2	13.57	Passed
eFDD 2 QPSK	low	1	15	21.8	2	11.2	Passed
eFDD 2 QPSK	low	36	15	20.83	2	12.17	Passed
eFDD 2 QPSK	low	75	15	20.65	2	12.35	Passed
eFDD 2 QPSK	mid	1	15	21.92	2	11.08	Passed
eFDD 2 QPSK	mid	36	15	20.91	2	12.09	Passed
eFDD 2 QPSK	mid	75	15	20.79	2	12.21	Passed
eFDD 2 QPSK	high	1	15	21.72	2	11.28	Passed
eFDD 2 QPSK	high	36	15	20.79	2	12.21	Passed
eFDD 2 QPSK	high	75	15	20.48	2	12.52	Passed
eFDD 2 16QAM	low	1	15	20.82	2		Passed
eFDD 2 16QAM	low	75	15	19.81	2	13.19	Passed
eFDD 2 16QAM	mid	1	15	20.87	2	12.13	Passed
eFDD 2 16QAM	mid	75	15	19.98	2	13.02	Passed
eFDD 2 16QAM	high	1	15	20.71	2	12.29	Passed
eFDD 2 16QAM	high	75	15	19.58	2		Passed
eFDD 2 QPSK	low	1	20	21.73	2	11.27	Passed
eFDD 2 QPSK	low	100	20	20.66	2		Passed
eFDD 2 QPSK	mid	1	20	21.89	2	11.11	Passed
eFDD 2 QPSK	mid	100	20	20.81	2	12.19	Passed
eFDD 2 QPSK	high	1	20	21.56	2	11.44	Passed
eFDD 2 QPSK	high	100	20	20.65	2		Passed
eFDD 2 16QAM	low	1	20	20.7	2		Passed
eFDD 2 16QAM	low	100	20	19.94	2	13.06	Passed
eFDD 2 16QAM	mid	1	20	20.78	2	12.22	Passed
eFDD 2 16QAM	mid	100	20	19.98	2	13.02	Passed
eFDD 2 16QAM	high	1	20	20.62	2		Passed
eFDD 2 16QAM	high	100	20	19.77	2		Passed



Stop 1.8507 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 300 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl 30.80 dBm 1 MHz VBW 36.2 dBm 1.85024910 GHz 5 ms Unit dВm SWT 26.2 dB Offset A SGL 2 0 1 V I E W 1 M A EXT -20 -30 - 40 - 50

100 kHz/

26.OCT.2016 08:45:36 Date:

Start 1.8497 GHz

GSM1900 Channel: low

-63.8



Stop 1.8805 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 300 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl 29.29 dBm 1 MHz VBW 36.2 dBm 1.87999699 GHz SWT 5 ms Unit dВm 26.2 dB Offset A SGL 2 0 1 V I E W 1 M A EXT -20 -30 - 40 - 50

100 kHz/

2.NOV.2016 11:55:32 Date:

GSM1900 EDGE Channel: mid

Start 1.8795 GHz

-63.8



Stop 1.8574 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 10 MHz RF Att 20 dB Marker 1 [T1] 10 MHz RBW RF Att Ref Lvl 23.32 dBm 10 MHz VBW 36.2 dBm 1.85395311 GHz SWT 5 ms Unit dВm 26.2 dB Offset A SGL 2 0 10 1 VIEW 1 R M EXT -20 -30 - 4 0 - 50 -63.8

1 MHz/

25.OCT.2016 14:13:37 Date:

Start 1.8474 GHz

FDDII Channel: low



Stop 1.8574 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 10 MHz RF Att 20 dB Marker 1 [T1] 10 MHz RBW RF Att Ref Lvl 24.68 dBm 10 MHz VBW 36.2 dBm 1.85383287 GHz SWT 5 ms Unit dВm 26.2 dB Offset A SGL 2 0 10 1 VIEW 1 R M EXT -20 -30 - 40 - 50 -63.8

1 MHz/

26.OCT.2016 09:33:34 Date:

FDDII HSDPA Channel: low

Start 1.8474 GHz



Stop 1.8574 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 10 MHz RF Att 20 dB Marker 1 [T1] RBW 10 MHz RF Att Ref Lvl 24.29 dBm 10 MHz VBW 36.2 dBm 1.85341202 GHz SWT 5 ms Unit dВm 26.2 dB Offset A SGL 2 0 10 1 VIEW 1 R M EXT -20 -30 - 4 0 - 50 -63.8

1 MHz/

26.OCT.2016 10:11:45 Date:

FDDII HSUPA Channel: low

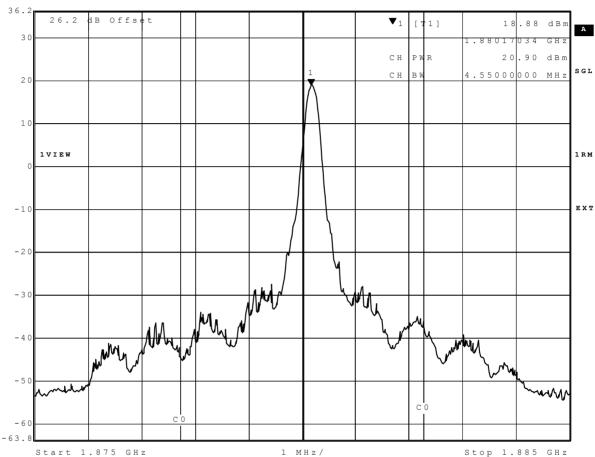
Start 1.8474 GHz



Marker 1 [T1] RBW 100 kHz RF Att 20 dB

Ref Lv1 18.88 dBm VBW 300 kHz

36.2 dBm 1.88017034 GHz SWT 5 ms Unit dBm



Date: 24.0CT.2016 17:56:56

eFDDII 16QAM, 5MHz, RB1, Channel: mid



Marker 1 [T1] RBW RF Att 200 kHz Ref Lvl 21.28 dBm VBW 1 MHz 36.2 dBm 1.88010020 GHz 5 ms Unit SWT dВm 26.2 dB Offset  $\blacktriangledown_1$ [ 1 1 ] 21.28 dBm A 1.88010020 21.86 dBm СН R СН В 9.02000000 MHz 2 0 10 1 V I E W 1 R M EXT -20 - 30 Why. - 4 ( - 60 -63.8 Start 1.87 GHz 2 MHz/ Stop 1.89 GHz

Date: 24.0CT.2016 18:00:33

eFDDII QPSK, 10MHz, RB1, Channel: mid



## 3.5.9 24.2 Frequency stability §2.1055, §24.235

## Test: 24.2; Frequency stability Summary §2.1055, 24.235

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 9:55

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24



#### **Detailed Results:**

Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict																							
-30	0			8	18	passed																							
-30	5	normal	4700	4	22	passed																							
-30	10			5	23	passed																							
-20	0			17	29	passed																							
-20	5	normal	4700	7	24	passed																							
-20	10			9	30	passed																							
-10	0			12	23	passed																							
-10	5	normal	4700	12	28	passed																							
-10	10			9	27	passed																							
0	0			15	25	passed																							
0	5	normal	4700	11	28	passed																							
0	10			8	24	passed																							
10	0			7	22	passed																							
10	5	normal	4700	3	25	passed																							
10	10			2	27	passed																							
20	0		4700 4700 4700		4700	7	26	passed																					
20	5	low				4	20	passed																					
20	10					3	28	passed																					
20	0	normal			6	19	passed																						
20	5	=			4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	4700	3	30	passed
20	10	high <sup>1)</sup>													1	30	passed												
20	0			-2	-18	passed																							
20	5	high		4700	2	21	passed																						
20	10			4	28	passed																							
30	0			8	30	passed																							
30	5	normal	4700	4	21	passed																							
30	10			2	33	passed																							
40	0			6	29	passed																							
40	5	normal	4700	5	22	passed																							
40	10			2	24	passed																							
50	0		3		26	passed																							
50	5	normal	4700	4	18	passed																							
50	10			6	25	passed																							

EDGE 1900, Mid Channel



Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
_			112			
-30	0			15	25	passed
-30	5	normal	4700 17		34	passed
-30	10			19	28	passed
-20	0			20	32	passed
-20	5	normal	4700	15	37	passed
-20	10			14	33	passed
-10	0			20	34	passed
-10	5	normal	4700	18	39	passed
-10	10			17	39	passed
0	0			17	32	passed
0	5	normal	4700	16	35	passed
0	10			15	36	passed
10	0			14	32	passed
10	5	normal	4700	12	34	passed
10	10			13	34	passed
20	0			13	28	passed
20	5	low	4700	12	36	passed
20	10			14	36	passed
20	0	normal		12	22	passed
20	5	=	4700	16	38	passed
20	10	high <sup>1)</sup>		17	36	passed
20	0			18	33	passed
20	5	high	4700	17	36	passed
20	10			22	34	passed
30	0			17	24	passed
30	5	normal	4700	15	38	passed
30	10			14	31	passed
40	0			15	23	passed
40	5	normal	4700	18	31	passed
40	10			14	28	passed
50	0			14	24	passed
50	5	normal	4700	21	33	passed
50	10			15	26	passed

GSM 1900, Mid Channel



Temp.	Duration	Voltage	Limit	Freq. error	Freq. error	Ubpart H, Part 24, Verdict
°C	min		Hz	Average (Hz)	Max. (Hz)	
-30	0			34	28	passed
-30	5	normal	4700	26	53	passed
-30	10			24	41	passed
-20	0			28	88	passed
-20	5	normal	4700	31	45	passed
-20	10			24	52	passed
-10	0			19	39	passed
-10	5	normal	4700	37	82	passed
-10	10			25	34	passed
0	0			33	29	passed
0	5	normal	4700	23	41	passed
0	10			26	49	passed
10	0			19	14	passed
10	5	normal	4700	15	62	passed
10	10			20	37	passed
20	0			14	32	passed
20	5	low	4700	20	49	passed
20	10			24	16	passed
20	0	normal		27	35	passed
20	5	=	4700	18	17	passed
20	10	high <sup>1)</sup>		20	42	passed
20	0			31	38	passed
20	5	high	4700	11	45	passed
20	10			18	36	passed
30	0			31	29	passed
30	5	normal	4700	9	31	passed
30	10			15	58	passed
40	0			28	47	passed
40	5	normal	4700	26	35	passed
40	10			23	40	passed
50	0			27	55	passed
50	5	normal	4700	30	28	passed
50	10			21	74	passed

HSDPA, FDD2, Mid Channel



Temp.	Duration	Voltage	Limit	Freq. error	Freq. error	Verdict						
°C	min		Hz	Average (Hz)	Max. (Hz)	Volume						
-30	0			-9	538	passed						
-30	5	normal	4700	64	506	passed						
-30	10			-63	556	passed						
-20	0			-92	-474	passed						
-20	5	normal	4700	-70	-371	passed						
-20	10			-50	-477	passed						
-10	0			-54	-411	passed						
-10	5	normal	4700	-38	-487	passed						
-10	10			27	-407	passed						
0	0			-48	-406	passed						
0	5	normal	4700	-37	437	passed						
0	10			87	353	passed						
10	0			-4	-432	passed						
10	5	normal	4700	4700	4700	4700	94	393	passed			
10	10			-122	-549	passed						
20	0			-44	-406	passed						
20	5	low	4700	-95	-489	passed						
20	10			-38	-454	passed						
20	0	normal								71	376	passed
20	5	=	4700	55	-303	passed						
20	10	high <sup>1)</sup>		-21	393	passed						
20	0			-56	-485	passed						
20	5	high	4700	-17	476	passed						
20	10			102	413	passed						
30	0			-43	-467	passed						
30	5	normal	4700	-25	-452	passed						
30	10			-99	-538	passed						
40	0			-1	-409	passed						
40	5	normal	4700	-45	-516	passed						
40	10			-62	-343	passed						
50	0		_	105	388	passed						
50	5	normal	4700	-57	-361	passed						
50	10			-21	-335	passed						

HSUPA, FDD2, Mid Channel



						FCC		
Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict		
			ПZ	3 \ ,	` ,			
-30	0			27	54	passed		
-30	5	normal	4700	14	23	passed		
-30	10			16	67	passed		
-20	0			21	48	passed		
-20	5	normal	4700	23	26	passed		
-20	10			9	33	passed		
-10	0			34	11	passed		
-10	5	normal	4700	21	27	passed		
-10	10			26	27	passed		
0	0			15	18	passed		
0	5	normal	4700	10	44	passed		
0	10			18	69	passed		
10	0			3	35	passed		
10	5	normal	4700	15	13	passed		
10	10			9	18	passed		
20	0			4	26	passed		
20	5	low	4700	21	34	passed		
20	10			12	42	passed		
20	0	normal	normal	normal		12	42	passed
20	5	=	4700	4	23	passed		
20	10	high <sup>1)</sup>		11	13	passed		
20	0			14	38	passed		
20	5	high	4700	8	24	passed		
20	10			26	44	passed		
30	0			18	37	passed		
30	5	normal	4700	24	31	passed		
30	10			8	55	passed		
40	0			23	85	passed		
40	5	normal	4700	11	62	passed		
40	10			19	70	passed		
50	0			3	43	passed		
50	5	normal	4700	16	17	passed		
50	10			11	38	passed		

LTE, eFDD2, 5 MHz BW, QPSK, Mid Channel



Temp.	Duration	Voltage	Limit	Freq. error	Freq. error	Subpart H, Part 24, Verdict
°C	min		Hz	Average (Hz)	Max. (Hz)	
-30	0			10	47	passed
-30	5	normal	4700	22	40	passed
-30	10			19	38	passed
-20	0			37	56	passed
-20	5	normal	4700	24	49	passed
-20	10			35	33	passed
-10	0			51	33	passed
-10	5	normal	4700	29	59	passed
-10	10			42	82	passed
0	0			35	38	passed
0	5	normal	4700	49	32	passed
0	10			46	71	passed
10	0			17	92	passed
10	5	normal	4700	23	65	passed
10	10			15	80	passed
20	0			26	44	passed
20	5	low	4700	18	82	passed
20	10			32	66	passed
20	0	normal		9	46	passed
20	5	=	4700	18	29	passed
20	10	high <sup>1)</sup>		24	38	passed
20	0			16	34	passed
20	5	high	4700	24	48	passed
20	10			32	64	passed
30	0			36	27	passed
30	5	normal	4700	39	35	passed
30	10			35	21	passed
40	0			16	89	passed
40	5	normal	4700	21	73	passed
40	10			36	47	passed
50	0			28	114	passed
50	5	normal	4700	42	84	passed
50	10			39	93	passed

UMTS, FDD2, Mid Channel



## 3.5.10 24.3 Spurious emissions at antenna terminals §2.1051, §24.238

## Test: 24.3; Spurious emissions at antenna terminals Summary §2.1051, §24.238

Result: Passed
Setup No.: AE06

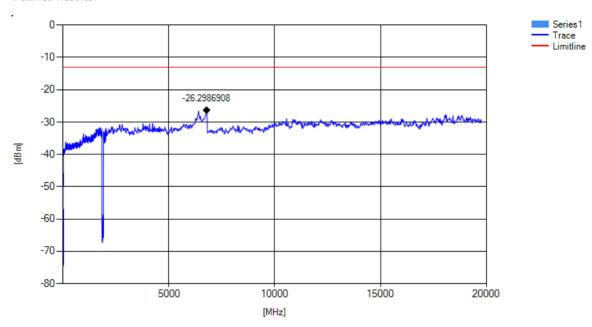
Date of Test: 2016/11/09 9:58

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

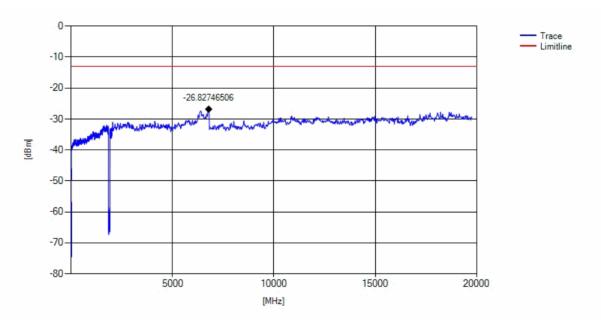
Test Specification: FCC part 2 and 24



#### **Detailed Results:**

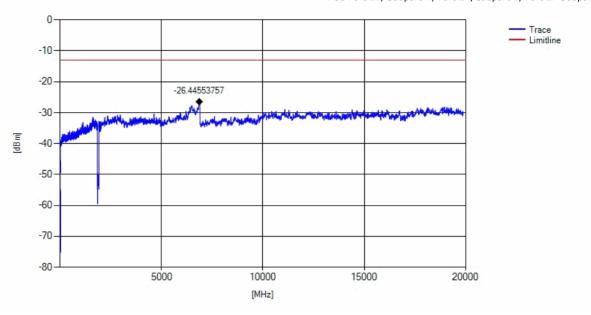


GSM1900 GSM, Channel: mid

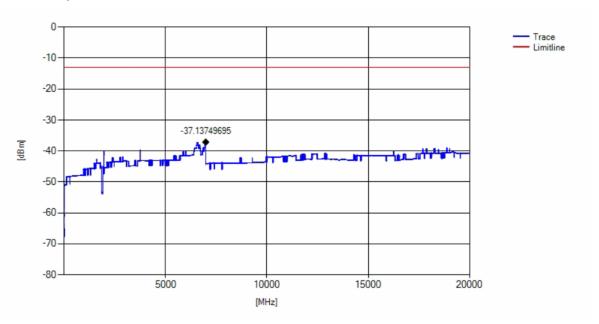


GSM1900 EDGE, Channel: mid



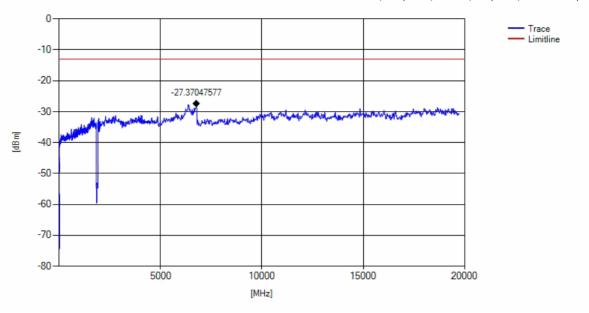


FDDII HSUPA, Channel: mid



eFDDII QPSK, 5MHz, Channel: mid





FDDII HSDPA, Channel: mid



## 3.5.11 24.4 Field strength of spurious radiation §2.1053, §24.238

## Test: 24.4; Field strength of spurious radiation Summary §2.1053, §24.238

Result: Passed
Setup No.: AJ06

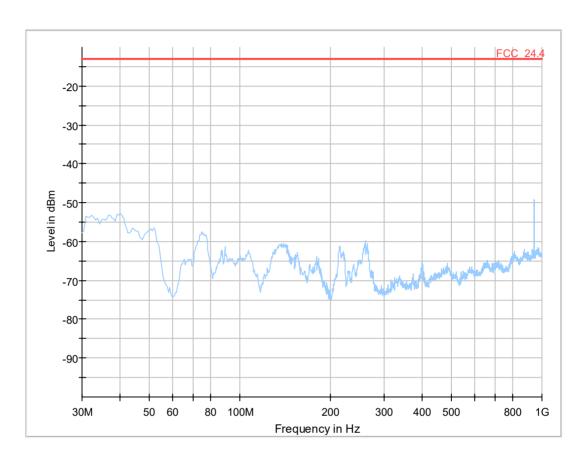
Date of Test: 2016/11/10 8:58

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24



#### **Detailed Results:**



Critical\_Freqs

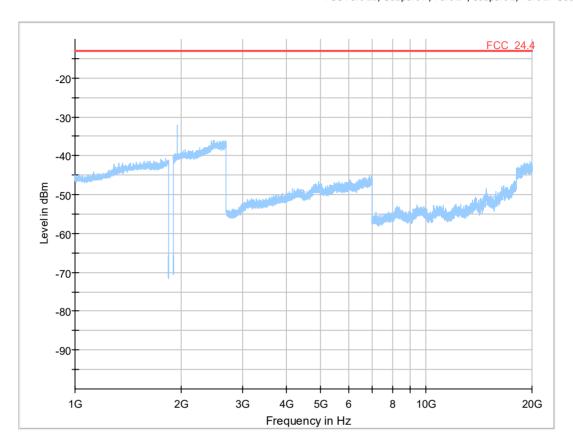
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: GSM1900 EDGE, Channel: mid





Critical\_Freqs

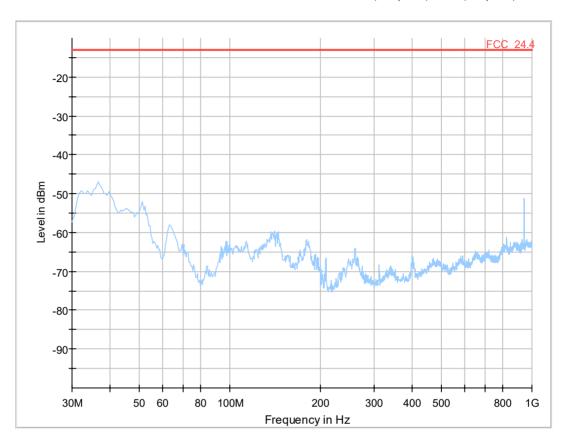
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 20GHz: GSM1900 EDGE, Channel: mid





Critical\_Freqs

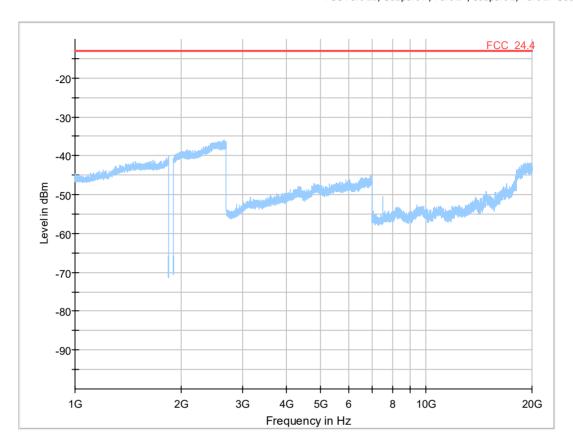
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: GSM1900, Channel: mid





Critical\_Freqs

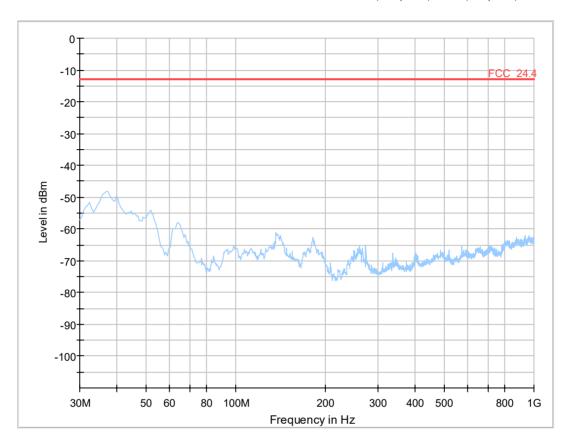
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 20GHz: GSM1900, Channel: mid





Critical\_Freqs

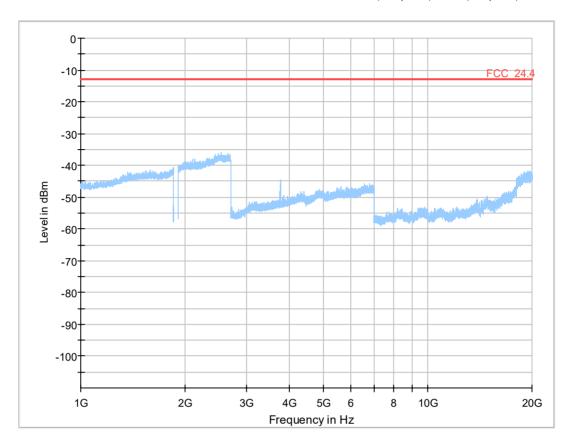
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: FDD II HSDPA, Channel: mid





Critical\_Freqs

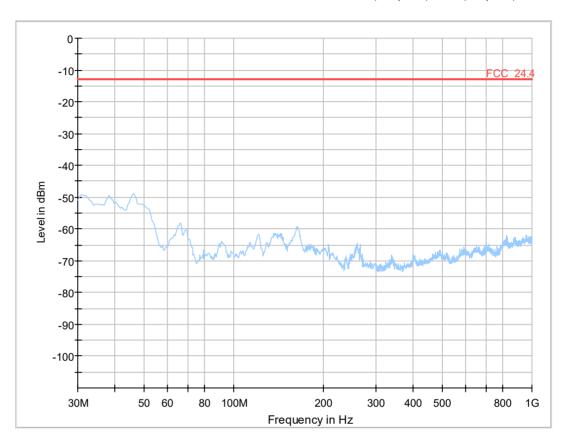
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 20GHz: FDD II HSDPA, Channel: mid





Critical\_Freqs

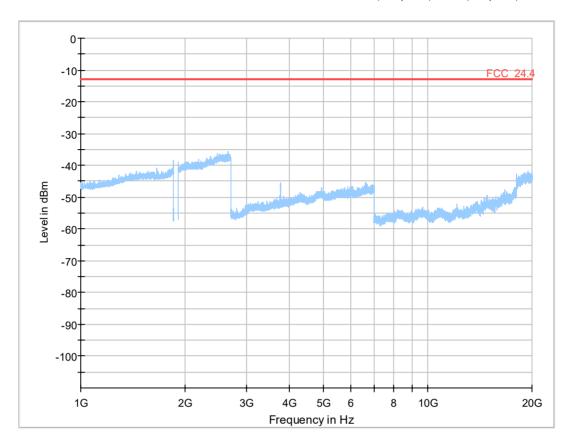
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: FDD V HSUPA, Channel: mid





Critical\_Freqs

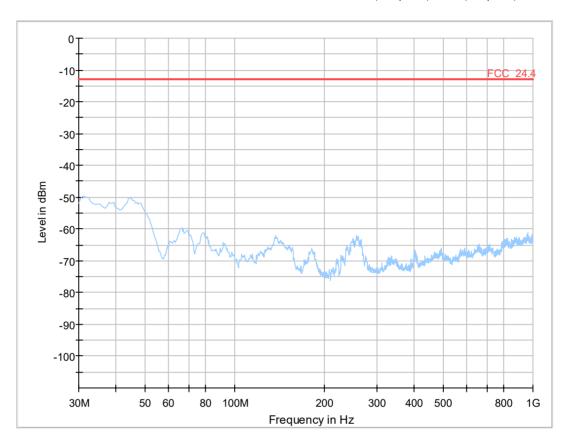
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 20GHz: FDD V HSUPA, Channel: mid





Critical\_Freqs

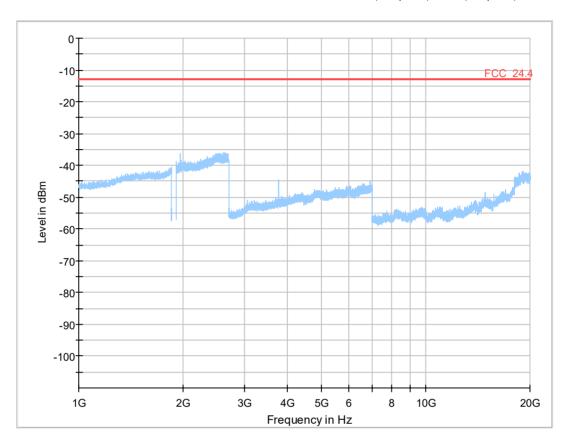
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: eFDD2, Channel: mid





Critical\_Freqs

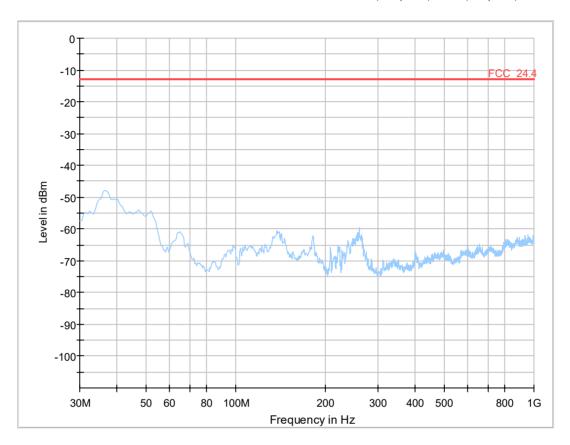
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 20GHz: eFDD2, Channel: mid





Critical\_Freqs

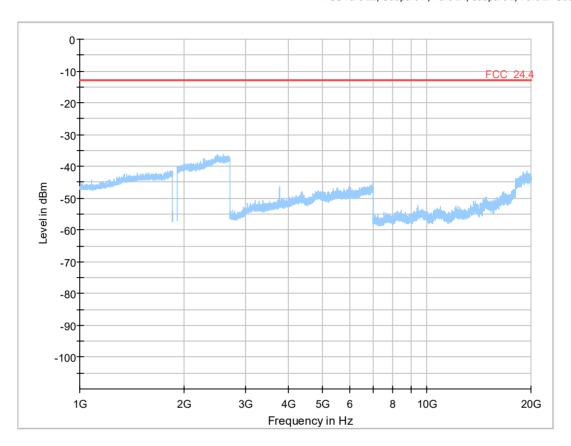
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: FDD II, Channel: mid





**Critical Freqs** 

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

# Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 20GHz: FDD II, Channel: mid

Test: 24.4; Frequency Band = 1900, Mode = EDGE, Channel = 512, Frequency = 1850.2MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:44

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES



#### Test: 24.4; Frequency Band = 1900, Mode = EDGE, Channel = 661, Frequency = 1880.0MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:44

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

#### Test: 24.4; Frequency Band = 1900, Mode = EDGE, Channel = 810, Frequency = 1909.8MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:43

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

#### Test: 24.4; Frequency Band = 1900, Mode = GSM, Channel = 512, Frequency = 1850.2MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:42

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

#### Test: 24.4; Frequency Band = 1900, Mode = GSM, Channel = 661, Frequency = 1880.0MHz

AJ06

Result: Passed

Setup No.:

Date of Test: 2016/11/08 8:42

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

### Test: 24.4; Frequency Band = 1900, Mode = GSM, Channel = 810, Frequency = 1909.8MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:43

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

# Test: 24.4; Frequency Band = eFDD2, Mode = QPSK 5MHz, Channel = 18625, Frequency = 1852.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:48

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES



# Test: 24.4; Frequency Band = eFDD2, Mode = QPSK 5MHz, Channel = 18900, Frequency = 1880MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:49

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

# Test: 24.4; Frequency Band = eFDD2, Mode = QPSK 5MHz, Channel = 19175, Frequency = 1907.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:49

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

#### Test: 24.4; Frequency Band = FDD2, Mode = HSDPA, Channel = 9262, Frequency = 1852.4MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:47

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

#### Test: 24.4; Frequency Band = FDD2, Mode = HSDPA, Channel = 9400, Frequency = 1880MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:48

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

## Test: 24.4; Frequency Band = FDD2, Mode = HSDPA, Channel = 9538, Frequency = 1907.6MHz

A106

Result: Passed

Setup No.:

Date of Test: 2016/11/08 8:47

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

### Test: 24.4; Frequency Band = FDD2, Mode = HSUPA, Channel = 9262, Frequency = 1852.4MHz

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:46

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES



#### Test: 24.4; Frequency Band = FDD2, Mode = HSUPA, Channel = 9400, Frequency = 1880MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:46

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

#### Test: 24.4; Frequency Band = FDD2, Mode = HSUPA, Channel = 9538, Frequency = 1907.6MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:46

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

#### Test: 24.4; Frequency Band = FDD2, Mode = W-CDMA, Channel = 9262, Frequency = 1852.4MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:45

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

## Test: 24.4; Frequency Band = FDD2, Mode = W-CDMA, Channel = 9400, Frequency = 1880MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:45

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

### Test: 24.4; Frequency Band = FDD2, Mode = W-CDMA, Channel = 9538, Frequency = 1907.6MHz

Result: Passed

Setup No.: AJ06

Date of Test: 2016/11/08 8:45

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES



## 3.5.12 24.5 Emission and Occupied Bandwidth §2.1049, §24.238

### Test: 24.5; Emission and Occupied Bandwidth Summary §2.1049, §24.238

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 8:47

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES



#### **Detailed Results:**

Detailed Results: Emission and Occupied Bandwidth						
Ambient temperature:	26 °C					
Relative humidity:	35%					
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Nominal BW [MHz]	[kHz]	99 % BW [kHz]
GSM 1900	low	-	0.2	0.2	318.64	244.49
GSM 1900	mid	-	0.2	0.2	312.63	246.49
GSM 1900	high	-	0.2	0.2	308.62	246.49
GSM 1900 EDGE	low	-	0.2	0.2	280.56	236.47
GSM 1900 EDGE	mid	-	0.2	0.2	282.57	232.40
GSM 1900 EDGE	high	-	0.2	0.2	276.55	230.4
FDD II	low	-	5	5	4689.38	4088.18
FDD II	mid	-	5	5	4669.34	4068.14
FDD II	high	-	5	5	4669.34	4088.18
FDD II HSDPA Subtest 1	low	-	5	5	4709.42	4068.14
FDD II HSDPA Subtest 1	mid	-	5	5	4689.39	4068.14
FDD II HSDPA Subtest 1	high	-	5	5	4669.34	4068.14
FDD II HSUPA Subtest 1	low	-	5	5	4689.39	4108.22
FDD II HSUPA Subtest 1	mid	-	5	5	4709.42	4088.18
FDD II HSUPA Subtest 1	high	-	5	5	4689.38	4088.18
FDD II HSUPA Subtest 5	low	-	5	5	4709.42	4108.22
FDD II HSUPA Subtest 5	mid	-	5	5	4689.38	4088.18
FDD II HSUPA Subtest 5	high	-	5	5	4709.42	4088.18
eFDD 2 QPSK	low	6	1.4	1.4	-	1112.22
eFDD 2 QPSK	mid	6	1.4	1.4	-	1106.2
eFDD 2 QPSK	high	6	1.4	1.4	-	1118.24
eFDD 2 16QAM	low	6	1.4	1.4	-	1106.2
eFDD 2 16QAM	mid	6	1.4	1.4	-	1124.25
eFDD 2 16QAM eFDD 2 QPSK	high low	6 15	1.4 3	1.4 3	-	1112.22 2765.53
eFDD 2 QPSK	mid	15	3	3	_	2765.53
eFDD 2 QPSK	high	15	3	3	-	2765.53
eFDD 2 16QAM	low	15	3	3	_	2765.53
eFDD 2 16QAM	mid	15	3	3	-	2765.53
eFDD 2 16QAM	high	15	3	3	-	2765.53
eFDD 2 QPSK	low	25	5	5	-	4549.:
eFDD 2 QPSK	mid	25	5	5	-	4529.00
eFDD 2 QPSK	high	25	5	5	-	4509.02
eFDD 2 16QAM	low	25	5	5	-	4529.00
eFDD 2 16QAM	mid	25	5	5	-	4549.:
eFDD 2 16QAM	high	25	5	5	-	4549.:
eFDD 2 QPSK	low	50	10	10	-	9058.12
eFDD 2 QPSK	mid	50	10	10	-	9018.04
eFDD 2 QPSK	high	50	10	10	-	9058.12
eFDD 2 16QAM	low	50	10	10	-	9058.12
eFDD 2 16QAM	mid	50	10	10	-	9058.12
eFDD 2 16QAM	high	50	10	10	-	9018.04
eFDD 2 QPSK	low	75	15	15	-	13707.4
eFDD 2 QPSK	mid	75	15	15	-	13527.0
eFDD 2 QPSK	high	75	15	15	-	13527.0
eFDD 2 16QAM	low	75 75	15	15	-	13647.29
eFDD 2 16QAM	mid	75 75	15 15	15 15	-	13587.1
eFDD 2 16QAM	high				-	13527.0
eFDD 2 QPSK eFDD 2 QPSK	low mid	100 100	20 20	20 20	-	18196.3 18196.3
eFDD 2 QPSK eFDD 2 QPSK	high	100	20	20	-  -	18196.3
eFDD 2 QPSK eFDD 2 16QAM	low	100	20	20	-	18196.3
eFDD 2 16QAM eFDD 2 16QAM	mid	100	20	20	-	18116.23
eFDD 2 16QAM eFDD 2 16QAM	high	100	20	20	<del>                                     </del>	18196.39



Stop 1.8507 GHz

Marker 1 [T1] RBW RF Att 3 k H z Ref Lvl 22.49 dBm VBW 10 kHz 36.2 dBm 1.85018297 GHz 5 s Unit SWT dBm 26.2 dB Offset [T1] 22.49 dBm A 244.48897796 0 P I **V**<sub>T\_</sub> [T1] dВm 2 0 1.85007876 GHz  $\nabla_{\mathrm{T}}$ [T1] .13 dBm 10 1 VIEW 1 MA -10 EXT -20 - 30 While we have been a fair to the fair of t

100 kHz/

Date: 26.0CT.2016 08:41:25

GSM1900 26dB, Channel: low

Start 1.8497 GHz

-63.8



Stop 1.8507 GHz

Delta 2 [T1] RBW RF Att 3 k H z Ref Lvl -27.49 dB VBW 10 kHz 36.2 dBm 94.18837608 kHz 5 s Unit SWT dBm 26.2 dB Offset [T1] 22.24 dBm A -27.49 dB [T1] 94.18837608 kHz 2 0 -28.47 dB [T1]  $\Delta^1$ -224.44889712 kHz 10 1 VIEW 1 MA -10 EXT -20 -30 hunder warming

100 kHz/

Date: 26.0CT.2016 08:41:58

GSM1900 99%, Channel: low

Start 1.8497 GHz

-63.8



Stop 1.8805 GHz

Marker 1 [T1] RBW RF Att 3 k H z Ref Lvl 23.58 dBm 10 kHz VBW 36.2 dBm 1.88000100 GHz 5 s Unit SWT dBm 26.2 dB Offset [T1] 23.58 dBm A .88000100 232.46492986 0 P I  $\nabla_{\mathrm{T}}$ 2.0 1.87988477 GHz  $\nabla_{\mathrm{T}}$  2 [T1] -0.96 dBm 10 1 VIEW 1 M A -10 EXT -50 mm -63.8

100 kHz/

Date: 2.NOV.2016 11:51:26

GSM1900 EDGE 26dB, Channel: mid

Start 1.8795 GHz



Stop 1.8805 GHz

Delta 2 [T1] RBW 3 k H z RF Att Ref Lvl -26.38 dB VBW 10 kHz 36.2 dBm 138.27655239 kHz 5 s Unit SWT dBm 26.2 dB Offset [T1] 23.83 dBm A -26.38 dB [T1] 138.27655239 kHz 20 -26.20 dB [T1] -144.28857645 kHz 10 1 VIEW 1 MA -10 EXT hour many

100 kHz/

2.NOV.2016 11:52:00 Date:

GSM1900 EDGE 99%, Channel: mid

Start 1.8795 GHz

-63.8

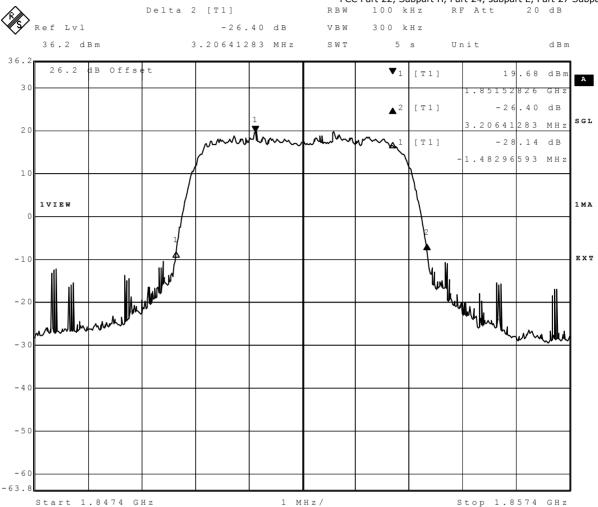


Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl 19.68 dBm VBW 300 kHz 36.2 dBm 1.85152826 GHz 5 s Unit SWT dBm 26.2 dB Offset 19.68 dBm [T1] A 4.08817635 MHz OPE  $\nabla_{\mathrm{T}}$ 2 0 1.85036593 GHz ▼<sub>T</sub>(2 [ T 1 ] 11.53 dBm 10 1 VIEW 1 M A -10 EXT - 20 - 30 - 4 0 - 5 0 -60 -63.8 Start 1.8474 GHz 1 MHz/ Stop 1.8574 GHz

Date: 25.0CT.2016 13:51:22

FDDII 26dB, Channel: low





Date: 25.0CT.2016 13:51:55

FDDII 99%, Channel: low



Stop 1.8574 GHz

Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl 19.65 dBm VBW 300 kHz 36.2 dBm 1.85309138 GHz 5 s Unit SWT dВm 26.2 dB Offset [T1] 19.65 dBm A 4.06813627 MHz 0 P I  $\nabla_{\mathbb{T}}$ [T1] 10.16 dBm 20 1.85036593 GHz  $\nabla_{\mathbb{T}}$ 2 [T1] 11.28 dBm 10 1 VIEW 1 MA EXT Yhay where there is a surprise to -20 Tappy de moundless - 4 ( - 50 - 60

1 MHz/

Date: 26.0CT.2016 09:06:14

FDDII HSDPA 26dB, Channel: low

Start 1.8474 GHz

-63.8



Stop 1.8574 GHz

Delta 2 [T1] RBW RF Att 100 kHz Ref Lvl -27.73 dB VBW 300 kHz 36.2 dBm 1.68336673 MHz 5 s Unit SWT dBm 26.2 dB Offset [T1] 19.66 dBm A 1.85307134 GHz [T1] -27.73 dB .68336673 MHz 20 [T1] -28.47 dB 3.02605210 MHz 10 1 VIEW 1 M A the hope when -10 EXT Lewman Hally Method -20 - 4 0 -50 -60

1 MHz/

Date: 26.0CT.2016 09:06:45

FDDII HSDPA 99%, Channel: low

Start 1.8474 GHz

-63.8



Stop 1.8574 GHz

Marker 1 [T1] RBW RF Att 100 kHz Ref Lvl 18.94 dBm VBW 300 kHz 36.2 dBm 1.85355230 GHz 5 s Unit SWT dBm 26.2 dB Offset  $\blacktriangledown_1$ [T1] 18.94 dBm A 4.10821643 MHz O.P.  $\nabla_{\mathbb{T}}$ [T1] 9.92 dBm 20 Turun 1.85034589 GHz  $\nabla_{T}$ 2 [T1] .65 dBm 10 1 VIEW 1 MA EXT They wanter warmen the land -20 - 4 ( - 50 -63.8

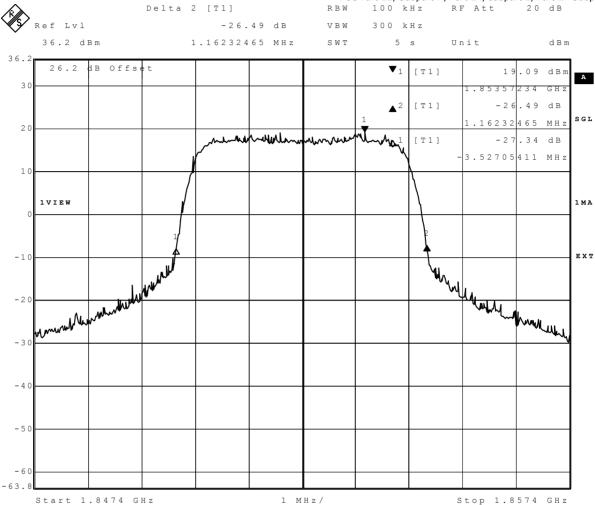
1 MHz/

Date: 26.0CT.2016 11:02:14

FDDII HSUPA 26dB, Channel: low

Start 1.8474 GHz





Date: 26.0CT.2016 11:02:45

FDDII HSUPA 99%, Channel: low



Marker 1 [T1] RBW RF Att 30 kHz Ref Lvl 16.51 dBm 100 kHz VBW 36.2 dBm 1.87958818 GHz 5 s SWT Unit dBm 26.2 dB Offset  $\blacktriangledown_1$ [T1] 16.51 dBm A 1.12424850 MHz O.P.  $\nabla_{\mathrm{T}}$ dВm 2.0 1.87943186 GHz [T1] .59 dBm 10 1 V I E W 1 M A EXT might white the stand of the st www. -20 - 4 0 -50 -60 -63.8 Start 1.8785 GHz 300 kHz/ Stop 1.8815 GHz

eFDDII 16QAM, 1.4MHz, RB6, Channel: mid

Date:

24.OCT.2016 16:51:15



Stop 1.8522 GHz

Marker 1 [T1] RBW RF Att 30 kHz Ref Lvl 16.26 dBm 100 kHz VBW 36.2 dBm 1.85106974 GHz 5 s Unit SWT dBm 26.2 dB Offset [T1] 16.26 dBm A 1.85106974 1.11222445 MHz 0 P I  $\nabla_{\mathrm{T}}$ [T1] 2 0 1.85014389 GHz [T1] .46 dBm 10 1 VIEW 1 M A EXT hall the second - 4 0 -50 -60 -63.8

300 kHz/

Date: 24.0CT.2016 16:49:21

eFDDII QPSK, 3MHz, RB6, Channel: low

Start 1.8492 GHz



Stop 1.9125 GHz

Marker 1 [T1] RBW RF Att 100 kHz Ref Lvl 16.04 dBm 300 kHz VBW 36.2 dBm 1.90566633 GHz 5 s Unit d B m SWT 26.2 dB Offset 16.04 dBm [T1] A 4.50901804 MHz 0 P I **V**<sub>T\_</sub> [T1] 11.12 dBm 2 0 1.90524549 GHz **~ √** [<sup>2</sup>T 1 ] 11.16 dBm 10 1 VIEW 1 MA EXT -20 - 30 - 4 ( - 50

1 MHz/

Date: 24.0CT.2016 16:56:00

eFDDII QPSK, 5MHz, RB25, Channel: high

Start 1.9025 GHz

-63.8

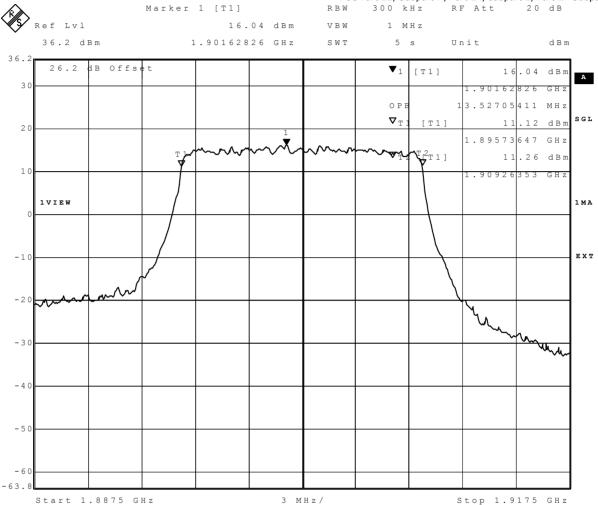


Marker 1 [T1] RBW 200 kHz RF Att Ref Lvl 15.96 dBm VBW 1 MHz 36.2 dBm 1.90618236 GHz 5 s Unit d B m SWT 26.2 dB Offset [T1] 15.96 dBm A 9.05811623 MHz 0 P I  $\nabla_{\mathbb{T}}$ [T1] 10.94 dBm 2 0 1.90045090 GHz **₩**--T[2T 1 ] 10.59 dBm 10 1 VIEW 1 MA EXT - 2 - 30 - 4 ( - 50 -63.8 Start 1.895 GHz 2 MHz/ Stop 1.915 GHz

Date: 24.0CT.2016 16:58:51

eFDDII QPSK, 10MHz, RB25, Channel: high

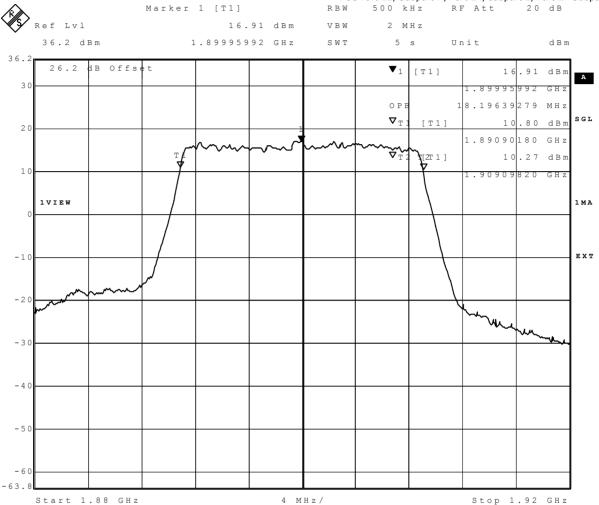




Date: 24.0CT.2016 17:01:42

eFDDII QPSK, 15MHz, RB75, Channel: low





eFDDII QPSK, 20MHz, RB100, Channel: high

Date:

24.OCT.2016 17:04:33



## 3.5.13 24.6 Band edge compliance §2.1053, §24.238

### Test: 24.6; Band edge compliance summary §2.1053, §24.238

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 9:14

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES



#### **Detailed Results:**

Band Edge									
Radio Technology	Channel	Nominal BW	Ressource Blocks	Peak [dBm]	Average [dBm]	RMS [dBm]	Limit /dBm	Margin to Limit /dB	Verdict
GSM 1900	low	0.2	-	-19.89	-39.37	-30.12	-13	6.89	Passed
GSM 1900	high	0.2	-	-21.64	-38.54	-30.74	-13	8.64	Passed
GSM 1900 EDGE	low	0.2	-	-23.08	-43.8	-34.76	-13	10.08	Passed
GSM 1900 EDGE	high	0.2	-	-24.34	-40.28	-34.26	-13	11.34	Passed
FDD II	low	5	-	-19.44	-29.82	-28.74	-13	15.74	Passed
FDD II	high	5	-	-20.89	-33.79	-32.92	-13	19.92	Passed
FDD II HSDPA Subtest 1	low	5	-	-19.6	-29	-28	-13	15	Passed
FDD II HSDPA Subtest 1	high	5	-	-18.77	-32.13	-30.74	-13	17.74	Passed
FDD II HSUPA Subtest 1	low	5	-	-19.78	-28.74	-27.54	-13	14.54	Passed
FDD II HSUPA Subtest 1	high	5	-	-19.98	-31.07	-30.12	-13	17.12	Passed
FDD II HSUPA Subtest 5	low	5	-	-16.74	- 29	-27.54	-13	14.54	Passed
FDD II HSUPA Subtest 5	high	5	-	-20.86	-31.41	-30.42	-13	17.42	Passed
eFDD 2 QPSK	low	1.4	6	-15.68	-26.9	-25.92	-13	12.92	Passed
eFDD 2 QPSK	high	1.4	6	-17.25	-28	-26.7	-13	13.7	Passed
eFDD 2 16QAM	low	1.4	6	-15.75	-28.48	-26.9	-13	13.9	Passed
eFDD 2 16QAM	high	1.4	6	-17.4	-29.26	-27.77	-13	14.77	Passed
eFDD 2 QPSK	low	3	15	-14.67	-28.48	-26.7	-13	13.7	Passed
eFDD 2 QPSK	high	3	15	-16.92	-30.74	-28.74	-13	15.74	Passed
eFDD 2 16QAM	low	3	15	-15.56	-29.54	-27.54	-13	14.54	Passed
eFDD 2 16QAM	high	3	15	-18.44	-31.41	-29.54	-13	16.54	Passed
eFDD 2 QPSK	low	5	25	-13.49	-30.12	-27.77	-13	14.77	Passed
eFDD 2 QPSK	high	5	25	-14.38	-32.13	-29.82	-13	16.82	Passed
eFDD 2 16QAM	low	5	25	-16.37	-31.41	-29.26	-13	16.26	Passed
eFDD 2 16QAM	high	5	25	-15.69	-32.92	-30.42	-13	17.42	Passed
eFDD 2 QPSK	low	10	50	-13.45	-31.41	-29.26	-13	16.26	Passed
eFDD 2 QPSK	high	10	50	-14.76	-33.79	-31.41	-13	18.41	Passed
eFDD 2 16QAM	low	10	50	-15.21	-32.52	-30.12	-13	17.12	Passed
eFDD 2 16QAM	high	10	50	-15.73	-34.76	-32.52	-13	19.52	Passed
eFDD 2 QPSK	low	15	75	-9.73	-29.26	-27.32	-13	14.32	Passed
eFDD 2 QPSK	high	15	75	-12.04	-32.92	-29.82	-13	16.82	Passed
eFDD 2 16QAM	low	15	75	-10.5	-30.12	-28	-13	15	Passed
eFDD 2 16QAM	high	15	75	-12.3	-33.79	-30.74	-13	17.74	Passed
eFDD 2 QPSK	low	20	100	-15.93	-31.76	-30.42	-13	17.42	Passed
eFDD 2 QPSK	high	20	100	-14.13	-34.76	-32.13	-13	19.13	Passed
eFDD 2 16QAM	low	20	100	-15.86	-32.52	-31.07	-13	18.07	Passed
eFDD 2 16QAM	high	20	100	-16.45	-35.84	-33.79	-13	20.79	Passed



Marker 1 [T1] RBW RF Att 3 k H z Ref Lvl -19.89 dBm VBW 3 k H z 36.2 dBm 1.85000000 GHz 5 s Unit dВm SWT 26.2 dB Offset A SGL 2 0 10 1 VIEW 1 M A -10 EXT BEC -20

GH Z Start 1.849 GHz Stop 1.8504 GHz

GSM1900, Channel: low

26.OCT.2016 08:29:35

-30

- 4 0

- 50

Date:



Stop 1.8504 GHz

Marker 1 [T1] RBW RF Att 3 k H z Ref Lvl -23.08 dBm VBW 3 k H z 36.2 dBm 1.85000000 GHz 5 s Unit dВm SWT 26.2 dB Offset A SGL 2 0 10 1 V I E W 1 M A EXT BEC 11:46:25 -20 - 30 - 4 ( - 5 (

2.NOV.2016 11:46:25 Date:

GSM1900 EDGE, Channel: low

Start 1.849 GHz



Reference: MDE\_UBLOX\_1626\_FCCb according to:

Stop 1.8548 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -28.74 dBm 50 kHz VBW 36.2 dBm 1.85000000 GHz 5 s SWT Unit dВm dB Offset 26.2 A SGL 2 0 10 1 VIEW 1 R M EXT BEC -20 -30 - 4 0 - 50 -60 -63.8

580 kHz/

25.OCT.2016 13:38:40 Date:

Start 1.849 GHz

FDDII, Channel: low



Reference: MDE\_UBLOX\_1626\_FCCb according to:

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -28.00 dBm 50 kHz VBW 36.2 dBm 1.85000000 GHz 5 s SWT Unit dВm dB Offset 26.2 A SGL 2 0 10 1 VIEW 1 R M EXT BEC -20 -30 - 50 -60 -63.8 Stop 1.8548 GHz

580 kHz/

26.OCT.2016 08:55:48 Date:

FDDII HSDPA, Channel: low

Start 1.849 GHz



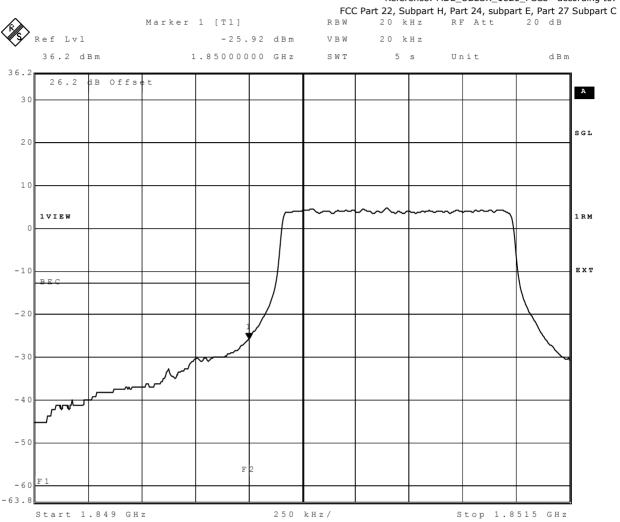
Marker 1 [T1] RBW Ref Lvl -27.54 dBm 50 kHz VBW 36.2 dBm 1.85000000 GHz 5 s SWT Unit dВm dB Offset 26.2 A SGL 2 0 10 1 VIEW 1 R M EXT BEC -20 -30 - 50 -60 -63.8 Stop 1.8548 GHz Start 1.849 GHz 580 kHz/

Date: 26.0CT.2016 10:49:41

FDDII HSUPA, Channel: low



Reference: MDE\_UBLOX\_1626\_FCCb according to:



eFDDII QPSK, 1.4MHz, Channel: low

24.OCT.2016 16:03:54

Date:



Reference: MDE\_UBLOX\_1626\_FCCb according to:

Stop 1.853 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 30 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -26.70 dBm 30 kHz VBW 36.2 dBm 1.85000000 GHz SWT 5 s Unit dВm 26.2 dB Offset A SGL 2 0 10 1 VIEW 1 R M EXT BEC -20 -30 - 4 ( - 50 -60 -63.8

400 kHz/

24.OCT.2016 16:07:11 Date:

eFDDII QPSK, 3MHz, Channel: low

Start 1.849 GHz



Stop 1.855 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW RF Att 50 kHz Ref Lvl -27.77 dBm 50 kHz VBW 36.2 dBm 5 s 1.85000000 GHz SWT Unit dВm 26.2 dB Offset A SGL 2 0 10 1 VIEW 1 R M EXT BEC -20 -30 - 4 0 - 50 -60 -63.8

600 kHz/

24.OCT.2016 16:10:29 Date:

eFDDII QPSK, 5MHz, Channel: low

Start 1.849 GHz



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl -29.26 dBm 100 kHz VBW 36.2 dBm 1.85000000 GHz SWT 5 s Unit dВm 26.2 dB Offset A SGL 2 0 10 1 VIEW 1 R M -10 EXT BEC -20 - 30 - 4 0 - 50 -60 -63.8 1.1 MHz/ Start 1.849 GHz Stop 1.86 GHz

24.OCT.2016 16:14:49 Date:

eFDDII QPSK, 10MHz, Channel: low



Stop 1.865 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 200 kHz RF Att 20 dB Marker 1 [T1] RBW Ref Lvl -27.32 dBm VBW 200 kHz 36.2 dBm 1.85000000 GHz 5 s Unit dВm SWT 26.2 dB Offset A SGL 2 0 10 1 VIE 1 R M -10 EXT BEC -20 - 3 0 - 4 0 -50 -63.8

1.6 MHz/

24.OCT.2016 16:19:10 Date:

eFDDII QPSK, 15MHz, Channel: low

Start 1.849 GHz



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 200 kHz RF Att 20 dB Marker 1 [T1] RBW 200 kHz RF Att Ref Lvl -30.42 dBm 200 kHz VBW 36.2 dBm 1.85000000 GHz SWT 5 s Unit dВm . 2 dB Offset A SGL 2 0 10 1 R M 1 VIEW -10 EXT BEC -20 -30 - 4 0 - 5 0 - 60

2.1 MHz/

24.OCT.2016 16:23:30 Date:

eFDDII QPSK, 20MHz, Channel: low

Start 1.849 GHz

-63.8

Stop 1.87 GHz



## 3.5.14 24.7 Peak-to-Average ratio §2.1046, §24.232

## Test: 24.7; Peak-to-Average Ratio Summary §2.1046, §24.232

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 9:43

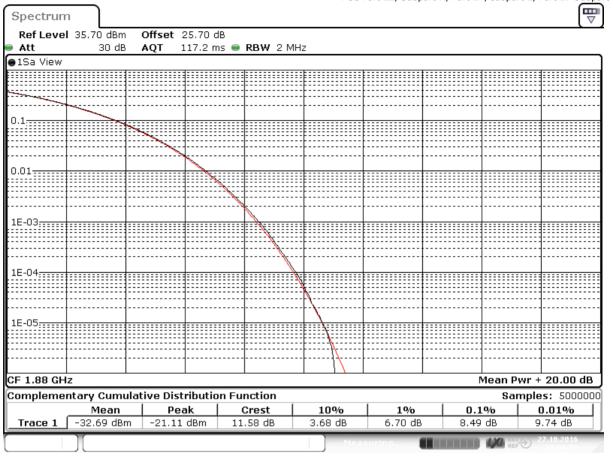
Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES



### **Detailed Results:**

Peak to Average Ratio						
Amphiant tamenauntuun.	26 °C					
Ambient temperature:						
Relative humidity:	35%					
Radio Technology	Chan nel	Ressour ce Blocks	Bandwidth (MHz)	Peak to Average Ratio	Limit (IC) (dB)	Verdict
GSM 1900	low	-	0.2	0.03	13	PASSED
GSM 1900	mid	-	0.2	0.03	13	PASSED
GSM 1900	high	-	0.2	0.03	13	PASSED
GSM 1900 EDGE	low	-	0.2	0.02	13	PASSED
GSM 1900 EDGE	mid	-	0.2	0.02	13	PASSED
GSM 1900 EDGE	high	-	0.2	0.04	13	PASSED
FDD II	low	-	5	5.68	13	PASSED
FDD II	mid	-	5	5.58	13	PASSED
FDD II	high	-	5	5.65	13	PASSED
FDD II HSDPA Subtest 1	low	-	5	5.25	13	PASSED
FDD II HSDPA Subtest 1	mid	-	5	5.26	13	PASSED
FDD II HSDPA Subtest 1	high	-	5	5.6	13	PASSED
FDD II HSUPA Subtest 1	low	-	5	5.89	13	PASSED
FDD II HSUPA Subtest 1	mid	-	5	5.49	13	PASSED
FDD II HSUPA Subtest 1	high	-	5	6.19	13	PASSED
FDD II HSUPA Subtest 5	low	-	5	5.72	13	PASSED
FDD II HSUPA Subtest 5	mid	-	5	6.21	13	PASSED
FDD II HSUPA Subtest 5	high	-	5	6.49	13	PASSED
eFDD 2 QPSK	low	6	1.4	5.51	13	PASSED
eFDD 2 QPSK	mid	6	1.4	5.48	13	PASSED
eFDD 2 QPSK	high	6	1.4	5.59	13	PASSED
eFDD 2 16QAM	low	6	1.4	6.26	13	PASSED
eFDD 2 16QAM	mid	6	1.4	8.49	13	PASSED
eFDD 2 16QAM	high	6	1.4	8.46	13	PASSED





Date: 27.0 CT.2016 16:06:52

eFDDII 16QAM, 1.4MHz, RB6, Channel: mid



## 3.5.15 27.1 RF Power Output §2.1046, §27.250

## Test: 27.1; RF Power Output Summary §2.1046, §27.250

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 15:05

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES



### **Detailed Results:**

Transmitter Output Power								
Ambient temperature:	26 °C							
Relative humidity:	35%							
,				RMS	FCC	IC	Maximum	Maximum
Radio Technology	Channel	Ressource	Bandwidth (MHz)	Conducted	EIRP	EIRP	Antenna	Antenna
▼	-	Blocks	▼	Power (dBm)	Limit (V ▼	Limit (V	Gain FCC (dBi)	Gain IC (dBi)
eFDD 4 QPSK	low	1	1.4	21.55	1	1	8.45	8.45
eFDD 4 QPSK	low	3	1.4	21.41	1	1	8.59	8.59
eFDD 4 QPSK	low	6	1.4	20.17	1	1	9.83	9.83
eFDD 4 QPSK eFDD 4 QPSK	mid mid	3	1.4 1.4	21.75 21.36	1	1	8.25 8.64	8.25 8.64
eFDD 4 QPSK	mid	6	1.4	20.11	1	1	9.89	9.89
eFDD 4 QPSK	high	1	1.4	21.65	1	1	8.35	8.35
eFDD 4 QPSK	high	3	1.4	21.44	1	1	8.56	8.56
eFDD 4 QPSK eFDD 4 16QAM	high low	6 1	1.4 1.4	20.35 20.82	1	1	9.65 9.18	9.65 9.18
eFDD 4 16QAM	low	6	1.4	19.34	1	1	10.66	10.66
eFDD 4 16QAM	mid	1	1.4	20.68	1	1	9.32	9.32
eFDD 4 16QAM	mid	6	1.4	19.32	1	1	10.68	10.68
eFDD 4 16QAM eFDD 4 16QAM	high high	6	1.4 1.4	20.73 19.35	1	1	9.27 10.65	9.27 10.65
eFDD 4 QPSK	low	1	3	21.97	1	1	8.03	8.03
eFDD 4 QPSK	low	15	3	20.6	1	1	9.4	9.4
eFDD 4 QPSK	mid	1	3	21.97	1	1	8.03	8.03
eFDD 4 QPSK eFDD 4 QPSK	mid high	15 1	3	20.65 22.13	1	1	9.35 7.87	9.35 7.87
eFDD 4 QPSK	high	15	3	20.79	1	1	9.21	9.21
eFDD 4 16QAM	low	1	3	21.02	1	1	8.98	8.98
eFDD 4 16QAM	low	15	3	19.71	1	1	10.29	10.29
eFDD 4 16QAM eFDD 4 16OAM	mid mid	1 15	3	21.03 19.68	1	1	8.97 10.32	8.97 10.32
eFDD 4 16QAM	high	1	3	21.01	1	1	8.99	8.99
eFDD 4 16QAM	high	15	3	19.86	1	1	10.14	10.14
eFDD 4 QPSK	low	1	5	22.04	1	1	7.96	7.96
eFDD 4 QPSK eFDD 4 QPSK	low	12 25	<u>5</u> 5	20.65 20.62	1	1	9.35 9.38	9.35 9.38
eFDD 4 QFSK	mid	1	5	22.05	1	1	7.95	7.95
eFDD 4 QPSK	mid	12	5	20.59	1	1	9.41	9.41
eFDD 4 QPSK	mid	25	5	20.67	1	1	9.33	9.33
eFDD 4 QPSK eFDD 4 QPSK	high high	1 12	<u>5</u>	22.08 20.7	1	1	7.92 9.3	7.92 9.3
eFDD 4 QPSK	high	25	5	20.66	1	1	9.34	9.34
eFDD 4 16QAM	low	1	5	20.95	1	1	9.05	9.05
eFDD 4 16QAM	low	25	5	19.56	1	1	10.44	10.44
eFDD 4 16QAM eFDD 4 16QAM	mid mid	1 25	<u>5</u> 5	21.06 19.65	1	1	8.94 10.35	8.94 10.35
eFDD 4 16QAM	high	1	5	21.2	1	1	8.8	8.8
eFDD 4 16QAM	high	25	5	19.77	1	1	10.23	10.23
eFDD 4 QPSK	low	1	10	21.6	1	1	8.4	8.4
eFDD 4 QPSK eFDD 4 QPSK	low mid	50 1	10 10	20.78 21.5	1	1	9.22 8.5	9.22 8.5
eFDD 4 QPSK	mid	50	10	20.86	1	1	9.14	9.14
eFDD 4 QPSK	high	1	10	22.17	1	1	7.83	7.83
eFDD 4 QPSK	high	50	10	20.92	1	1	9.08	9.08
eFDD 4 16QAM eFDD 4 16QAM	low	1 50	10 10	20.96 19.78	1	1	9.04 10.22	9.04 10.22
eFDD 4 16QAM	mid	1	10	20.99	1	1	9.01	9.01
eFDD 4 16QAM	mid	50	10	19.85	1	1	10.15	10.15
eFDD 4 16QAM	high	1 50	10	21.13	1	1	8.87	8.87
eFDD 4 16QAM eFDD 4 QPSK	high low	50 1	10 15	19.98 22.1	1	1	10.02 7.9	10.02 7.9
eFDD 4 QPSK	low	36	15	21.11	1	1	8.89	8.89
eFDD 4 QPSK	low	75	15	20.95	1	1	9.05	9.05
eFDD 4 QPSK	mid	1 20	15	22.21	1	1	7.79	7.79
eFDD 4 QPSK eFDD 4 QPSK	mid mid	36 75	15 15	21.07 20.97	1	1	8.93 9.03	8.93 9.03
eFDD 4 QPSK	high	1	15	22.24	1	1	7.76	7.76
eFDD 4 QPSK	high	36	15	21.23	1	1	8.77	8.77
eFDD 4 QPSK eFDD 4 16QAM	high low	75 1	15 15	21.02 21.07	1	1	8.98 8.93	8.98 8.93
eFDD 4 16QAM	low	75	15	20	1	1	10	10
eFDD 4 16QAM	mid	1	15	21.33	1	1	8.67	8.67
eFDD 4 16QAM	mid	75	15	19.96	1	1	10.04	10.04
eFDD 4 16QAM eFDD 4 16OAM	high	1 75	15 15	21.33 20.1	1	1	8.67 9.9	8.67 9.9
eFDD 4 16QAM eFDD 4 QPSK	high low	1	20	21.97	1	1	8.03	8.03
eFDD 4 QPSK	low	100	20	20.99	1	1	9.01	9.01
eFDD 4 QPSK	mid	1	20	21.97	1	1	8.03	8.03
eFDD 4 QPSK eFDD 4 QPSK	mid high	100 1	20 20	21.03 22.15	1	1	8.97 7.85	8.97 7.85
eFDD 4 QPSK eFDD 4 QPSK	high	100	20	22.15	1	1	8.88	8.88
eFDD 4 16QAM	low	1	20	20.9	1	1	9.1	9.1
eFDD 4 16QAM	low	100	20	19.91	1	1	10.09	10.09
eFDD 4 16QAM eFDD 4 16QAM	mid mid	100	20 20	20.81 19.99	1	1	9.19 10.01	9.19 10.01



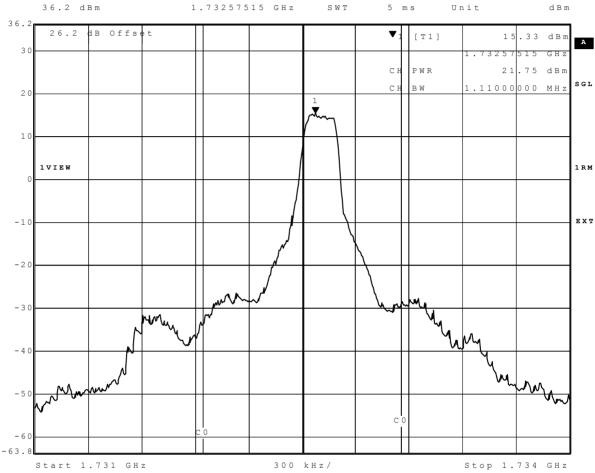
Transmitter Output Power								
Ambient temperature:	26 °C							
Relative humidity:	35%							
Relative Humbury:	33%			RMS	FCC	IC	Mavimum	Maximum
		Da		_	EIRP	EIRP	Antenna	
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Conducted				Antenna
		BIOCKS		Power		Limit		Gain IC
ED D 12 ODS!/		_		(dBm)	(W)	(W)	(dBi)	(dBi)
eFDD 12 QPSK	low	1	1.4	21.35	1	1	8.65	8.65
eFDD 12 QPSK	low	3	1.4	21.02	1	1	8.98	
eFDD 12 QPSK	low	6	1.4	20.07	1	1	9.93	
eFDD 12 QPSK	mid	1	1.4	21.29	1	1	8.71	8.71
eFDD 12 QPSK	mid	3	1.4	21.07	1	1	8.93	8.93
eFDD 12 QPSK	mid	6	1.4	20.06	1	1	9.94	9.94
eFDD 12 QPSK	high	1	1.4	21.16	1	1	8.84	8.84
eFDD 12 QPSK	high	3	1.4	20.94	1	1	9.06	9.06
eFDD 12 QPSK	high	6	1.4	19.86	1	1	10.14	10.14
eFDD 12 16QAM	low	1	1.4	20.4	1	1	9.6	9.6
eFDD 12 16QAM	low	6	1.4	19.02	1	1	10.98	10.98
eFDD 12 16QAM	mid	1	1.4	20.26	1	1	9.74	9.74
eFDD 12 16QAM	mid	6	1.4	19.08	1	1	10.92	10.92
eFDD 12 16QAM	high	1	1.4	20.15	1	1	9.85	9.85
eFDD 12 16QAM	high	6	1.4	18.87	1	1	11.13	
eFDD 12 QPSK	low	1	3	21.71	1	1	8.29	8.29
eFDD 12 QPSK	low	15	3	20.52	1	1	9.48	
eFDD 12 QPSK	mid	1	3	21.76	1	1	8.24	
eFDD 12 QPSK	mid	15	3	20.47	1	1	9.53	9.53
	high	1	3		1	1	8.34	
eFDD 12 QPSK				21.66				
eFDD 12 QPSK	high	15	3	20.24	1	1	9.76	
eFDD 12 16QAM	low	1	3	20.75	1	1	9.25	
eFDD 12 16QAM	low	15	3	19.52	1	1	10.48	
eFDD 12 16QAM	mid	1	3	20.83	1	1	9.17	9.17
eFDD 12 16QAM	mid	15	3	19.47	1	1	10.53	10.53
eFDD 12 16QAM	high	1	3	20.63	1	1	9.37	9.37
eFDD 12 16QAM	high	15	3	19.3	1	1	10.7	10.7
eFDD 12 QPSK	low	1	5	21.79	1	1	8.21	8.21
eFDD 12 QPSK	low	12	5	20.43	1	1	9.57	9.57
eFDD 12 QPSK	low	25	5	20.41	1	1	9.59	9.59
eFDD 12 QPSK	mid	1	5	21.88	1	1	8.12	8.12
eFDD 12 QPSK	mid	12	5	20.51	1	1	9.49	9.49
eFDD 12 QPSK	mid	25	5	20.39	1	1	9.61	9.61
eFDD 12 QPSK	high	1	5	21.71	1	1	8.29	8.29
eFDD 12 QPSK	high	12	5	20.33	1	1	9.67	9.67
eFDD 12 QPSK	high	25	5	20.33	1	1	9.67	9.67
eFDD 12 16QAM	low	1	5	20.86	1	1	9.14	9.14
eFDD 12 16QAM	low	25	5	19.42	1	1	10.58	10.58
eFDD 12 16QAM	mid	1	5	20.78	1	1	9.22	9.22
eFDD 12 16QAM	mid	25	5	19.39	1	1	10.61	10.61
eFDD 12 16QAM	high	1	5	20.95	1	1	9.05	
eFDD 12 16QAM	high	25	5	19.37	1	1	10.63	
eFDD 12 QPSK	low	1	10	21.99	1	1	8.01	
eFDD 12 QPSK	low	50	10	20.79	1	1	9.21	
eFDD 12 OPSK	mid	1	10	21.94	1	1	8.06	
eFDD 12 QPSK	mid	50	10	20.73	1	1	9.27	
eFDD 12 QPSK	high	1	10	21.93	1	1	8.07	8.07
eFDD 12 QPSK	high	50	10	20.7	1	1	9.3	
eFDD 12 QF3K	low	1	10	21.05	1	1	8.95	
· · · · · ·				19.71				
eFDD 12 16QAM	low	50	10	20.89	1	1	10.29	
eFDD 12 16QAM	mid	1	10		1	1	9.11	
eFDD 12 16QAM	mid	50	10	19.74	1	1	10.26	
eFDD 12 16QAM	high	1	10	20.92	1	1	9.08	
eFDD 12 16QAM	high	50	10	19.66	1	1	10.34	10.34



UNCAL Marker 1 [T1] RBW 30 kHz RF Att 20 dB

Ref Lvl 15.33 dBm VBW 100 kHz

Ref Lvl 15.33 dBm VBW 100 kHz
36.2 dBm 1.73257515 GHz SWT 5 ms Unit



Date: 24.0CT.2016 20:09:42

eFDD4 QPSK, 1.4MHz, RB1, Channel: mid



Marker 1 [T1] RBW 100 kHz RF Att Ref Lvl 20.03 dBm VBW 300 kHz 36.2 dBm 5 ms 1.75369840 GHz Unit SWT dВm 26.2 dB Offset 20.03 dBm  $\blacktriangledown_1$ [T1] A 22.13 dBm СН PWR СН ВЖ 2.77000000 MHz 20 10 1 V I E W 1 R M EXT -20 Many Many Many - 30 - 4 ( C 0 - 60 -63.8 Start 1.7505 GHz 600 kHz/ Stop 1.7565 GHz

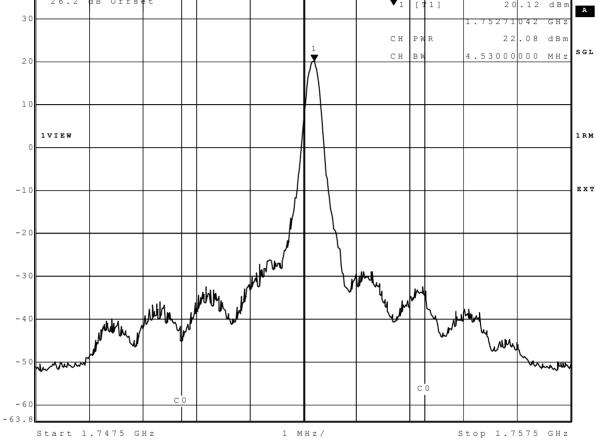
Date: 24.0CT.2016 20:19:10

eFDD4 QPSK, 3MHz, RB1, Channel: mid



Marker 1 [T1] RBW 100 kHz RF Att

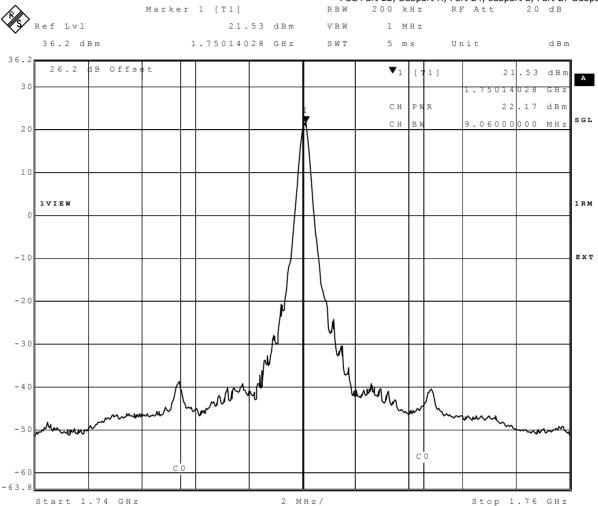
Ref Lvl 20.12 dBm 300 kHz VBW 36.2 dBm 1.75271042 GHz 5 ms Unit dВm SWT 26.2 dB Offset  $\blacktriangledown_1$ [11] 20.12 dBm 22.08 dBm СН



24.OCT.2016 20:26:21 Date:

eFDD4 QPSK, 5MHz, RB1, Channel: high





eFDD4 QPSK, 10MHz, RB1, Channel: high

Date:

24.OCT.2016 20:45:18



Marker 1 [T1] RBW RF Att 300 kHz Ref Lvl 21.91 dBm VBW 1 MHz 36.2 dBm 1.74771042 GHz 5 ms Unit dВm SWT 26.2 dB Offset [11] 21.91 dBm A GHz 22.24 dBm СН СН ВИ 13.59000000 MHz 2 0 10 1 VIEW 1 R M EXT -20 -30 - 4 ( - 50 С -63.8 Start 1.7325 GHz 3 MHz/ Stop 1.7625 GHz

eFDD4 QPSK, 15MHz, RB1, Channel: high

Date:

24.OCT.2016 20:53:44



Marker 1 [T1] RBW RF Att 500 kHz Ref Lvl 22.05 dBm VBW 2 MHz 36.2 dBm 1.74512024 GHz 5 ms Unit dВm SWT 26.2 dB Offset [T1] 22.05 dBm A GHz 22.15 dBm СН PWR сн в W 18.28000000 MHz 2 0 10 1 V I E W 1 R M EXT -20 -30 - 4 ( - 50 C 0 -63.8 Start 1.725 GHz 4 MHz/ Stop 1.765 GHz

eFDD4 QPSK, 20MHz, RB1, Channel: high

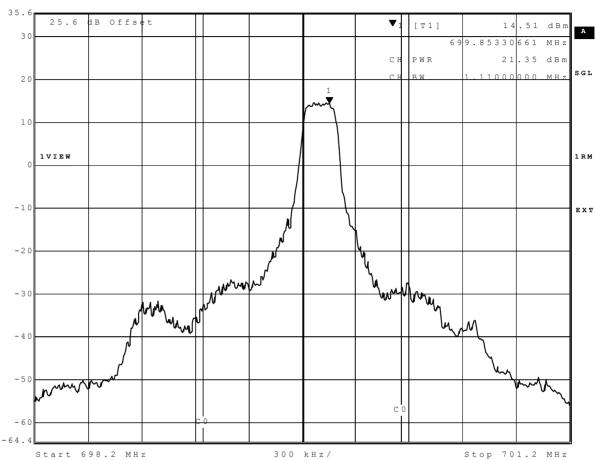
Date:

24.OCT.2016 21:03:58



UNCAL Marker 1 [T1] RBW 30 kHz RF Att 20 dB

Ref Lvl 14.51 dBm VBW 100 kHz
35.6 dBm 699.85330661 MHz SWT 5 ms Unit dBm



Date: 24.0CT.2016 22:40:21

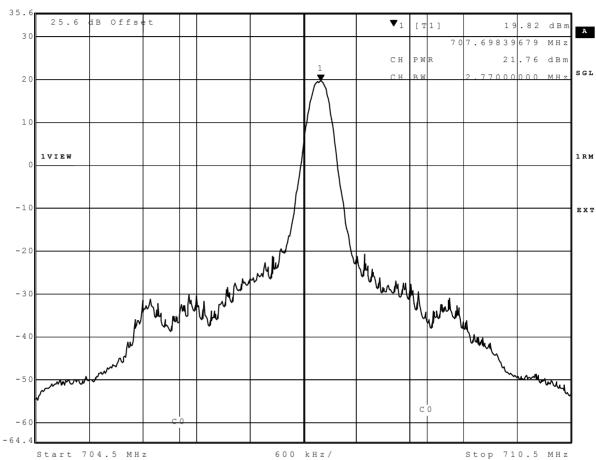
eFDD12 QPSK, 1.4MHz, 1RB, Channel: low



dBm

Marker 1 [T1] RBW 100 kHz RF Att 20 dB

Ref Lvl 19.82 dBm VBW 300 kHz
35.6 dBm 707.69839679 MHz SWT 5 ms Unit



Date: 24.0CT.2016 22:50:19

eFDD12 QPSK, 3MHz, RB1, Channel: mid

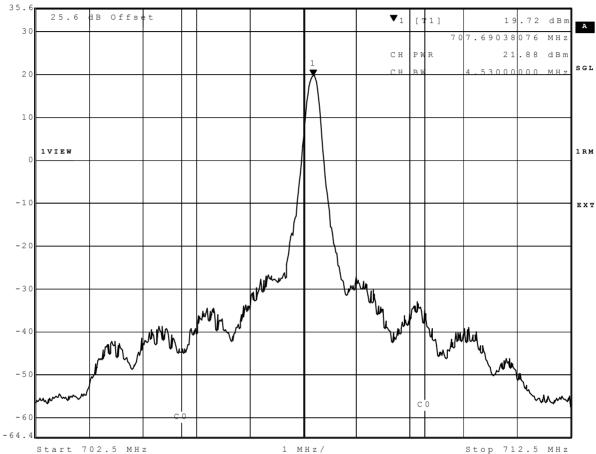


RBW 100 kHz RF Att 20 dB

Ref Lvl 19.72 dBm VBW 300 kHz

Marker 1 [T1]

35.6 dBm 707.69038076 MHz SWT 5 ms Unit dBm



Date: 24.0CT.2016 22:57:44

eFDD12 QPSK, 5MHz, RB1, Channel: mid



Marker 1 [T1] RBW RF Att 200 kHz Ref Lvl 21.44 dBm VBW 1 MHz 35.6 dBm 704.10020040 MHz 5 ms Unit SWT dВm 25.6 dB Offset [71]  $\blacktriangledown_1$ 21.44 dBm A 704.10020040 МНΖ 21.99 dBm СН 2 0 1 V I E W 1 R M EXT -20 My Maria - 4 ( - 5 0

2 MHz/

Date: 24.0CT.2016 23:06:04

eFDD12 QPSK, 10MHz, RB1, Channel: low

Start 694 MHz

-60 -64.4

Stop 714 MHz



## 3.5.16 27.2 Frequency stability §2.1055, §27.54

## Test: 27.2; Frequency stability Summary §2.1055, §27.54

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 15:41

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES



#### **Detailed Results:**

Temp.	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
-30	0			54	100	passed
-30	5	normal	4331.25	50	107	passed
-30	10			52	99	passed
-20	0			30	85	passed
-20	5	normal	4331.25	17	99	passed
-20	10			16	61	passed
-10	0			16	153	passed
-10	5	normal	4331.25	9	-119	passed
-10	10			26	94	passed
0	0			9	91	passed
0	5	normal	4331.25	5	123	passed
0	10			-9	96	passed
10	0			1	177	passed
10	5	normal	4331.25	-8	334	passed
10	10			-6	-297	passed
20	0			45	97	passed
20	5	low	4331.25	40	101	passed
20	10		-	53	113	passed
20	0	normal		-6	140	passed
20	5	=	4331.25	11	346	passed
20	10	high <sup>1)</sup>		-22	-228	passed
20	0	44		90	passed	
20	5	high	4331.25	51	110	passed
20	10			54	90	passed
30	0			-7	-160	passed
30	5	normal	4331.25	2	110	passed
30	10			-21	-125	passed
40	0			5	-193	passed
40	5	normal	4331.25	14	90	passed
40	10			5	310	passed
50	0			8	-131	passed
50	5	normal	4331.25	25	93	passed
50	10			2	153	passed

LTE, eFDD4, QPSK, 5 MHz BW, Mid Channel



Temp.	Duration	Voltage	Limit	Freq. error	Freq. error	rt 22, Subpart H, Verdict
°C	min	voitage	Hz	Average (Hz)	Max. (Hz)	Veruici
-30	0			45	97	passed
-30	5	normal	1769	40	101	passed
-30	10	Hollia	1709	53	113	passed
-20	0			-2	72	passed
-20	5	normal	1769	8	-124	passed
-20	10	Hollia	1709	7	-176	passed
-10	0			59	108	passed
-10	5	normal	1769	56	92	passed
-10	10	Hollia	1709	55	112	passed
0	0			53	99	passed
0	5	normal	1769	49	105	passed
0	10	Horman	1709	61	105	passed
10	0			17	108	passed
10	5	normal	1769	34	128	passed
10	10	Hollia	1709	16	-114	passed
20	0			24	-120	passed
20	5	low	1760	34	161	passed
20	10	IOVV	1769	24	80	passed
20	0			28	63	passed
20	5	normal =	1769	29	79	passed
20	10	high <sup>1)</sup>	1769	26	-136	passed
	20 0	,		26	163	passed
20	5	high	1769	20	-106	passed
20	10	iligii	1700	40	163	passed
30	0			47	110	passed
30	5	normal	1769	52	112	passed
30	10			53	98	passed
40	0			54	100	passed
40	5	normal	1769	50	107	passed
40	10			52	99	passed
50	0			-9	-151	passed
50	5	normal		-12	-195	passed
50	10			-15	-107	passed
	-			_		I::000

LTE, eFDD12, QPSK, 5 MHz BW, Mid Channel



### 3.5.17 27.3 Spurious emissions at antenna terminals §2.1051, §27.53

### Test: 27.3; Spurious emissions at antenna terminals Summary §2.1051, §27.53

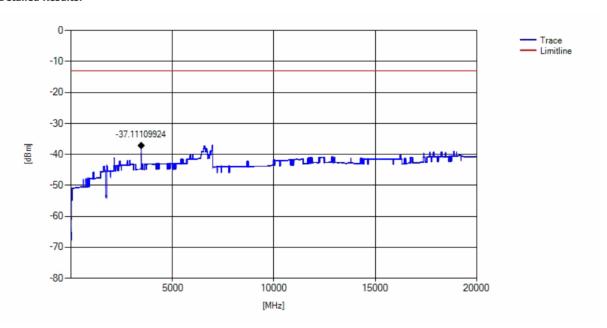
Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 15:43

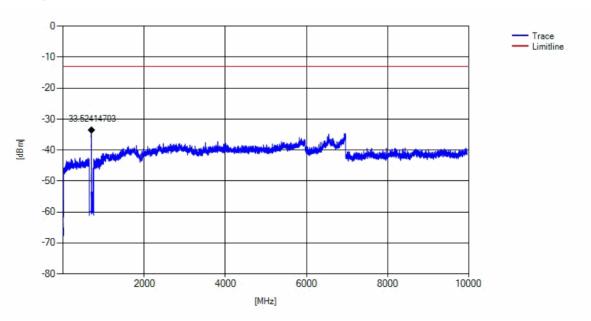
Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 27

#### **Detailed Results:**



eFDD4 QPSK, Channel: mid



eFDD12 QPSK, Channel: mid



## 3.5.18 27.4 Field strength of spurious radiation §2.1053, §27.53

## Test: 27.4; Field strength of spurious radiation Summary §2.1053, §27.53

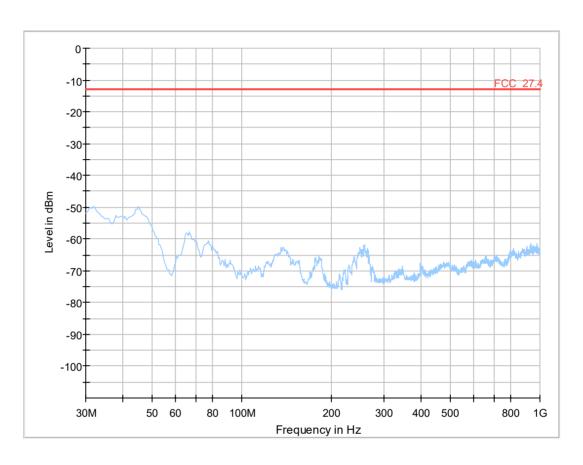
Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/10 8:52

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES



#### **Detailed Results:**



Critical\_Freqs

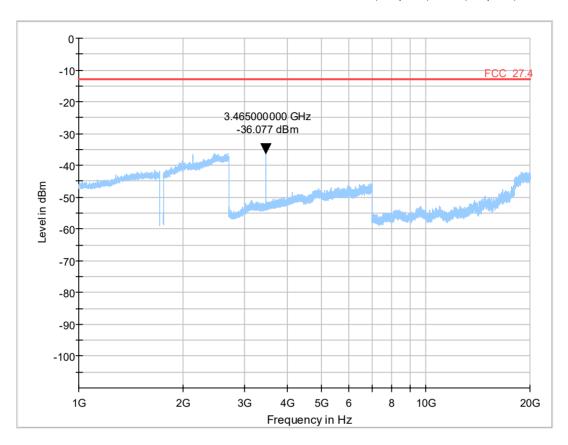
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: eFDD4, Channel: mid





Critical\_Freqs

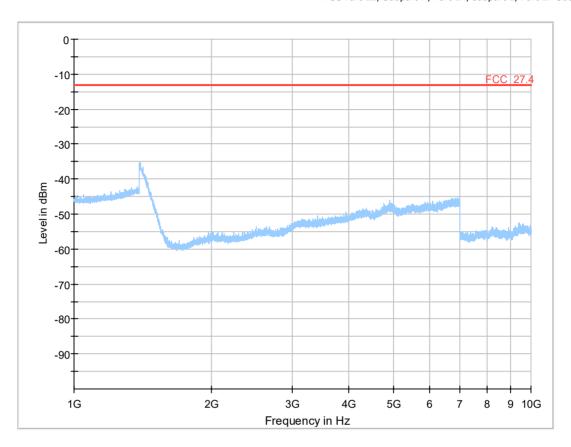
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 20GHz: eFDD4, Channel: mid





Critical\_Freqs

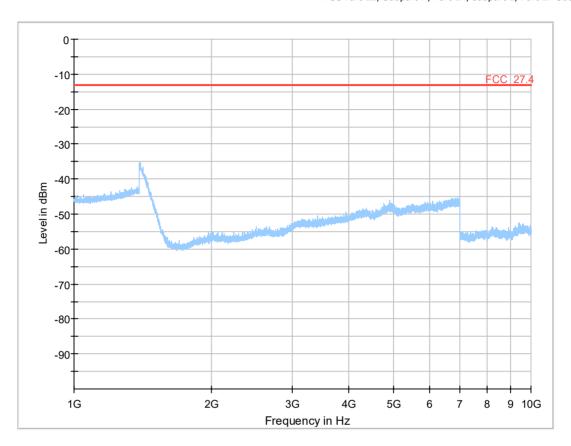
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

30 MHz - 1GHz: eFDD12, Channel: mid





**Critical Freqs** 

	Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
I											

## Final\_Result

Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)

1 GHz - 10GHz: eFDD12, Channel: mid

Test: 27.4; Frequency Band = eFDD12, Mode = QPSK 5MHz, Channel = 23035, Frequency = 701.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:51

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES



## Test: 27.4; Frequency Band = eFDD12, Mode = QPSK 5MHz, Channel = 23095, Frequency = 707.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:51

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 27

# Test: 27.4; Frequency Band = eFDD12, Mode = QPSK 5MHz, Channel = 23155, Frequency = 713.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:52

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 27

# Test: 27.4; Frequency Band = eFDD4, Mode = QPSK 5MHz, Channel = 19975, Frequency = 1712.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:52

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 27

# Test: 27.4; Frequency Band = eFDD4, Mode = QPSK 5MHz, Channel = 20175, Frequency = 1732.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:53

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 27

# Test: 27.4; Frequency Band = eFDD4, Mode = QPSK 5MHz, Channel = 20375, Frequency = 1752.5MHz, Method = radiated

Result: Passed
Setup No.: AJ06

Date of Test: 2016/11/08 8:54

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES



## 3.5.19 27.5 Emission and Occupied Bandwidth §2.1049

## Test: 27.5; Emission and Occupied Bandwidth Summary §2.1049

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 16:24

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES



#### **Detailed Results:**

Ambient temperature:	26 °C					
Relative humidity:	35%					
Radio Technology	Channel		Bandwidth		26 dB BW	
		Blocks	(MHz)	BW [MHz]	[kHz]	[kHz]
eFDD 4 QPSK eFDD 4 QPSK	low mid	6	1.4 1.4	1.4 1.4	-	1112.22 1112.22
eFDD 4 QFSK	high	6	1.4	1.4	-	1112.22
eFDD 4 16QAM	low	6	1.4	1.4	_	1118.24
eFDD 4 16QAM	mid	6	1.4	1.4	_	1112.22
eFDD 4 160AM	high	6	1.4	1.4	_	1106.21
eFDD 4 QPSK	low	15	3	3	_	2765.53
eFDD 4 QPSK	mid	15	3	3	_	2765.53
eFDD 4 QPSK	high	15	3	3	-	2765.53
eFDD 4 16QAM	low	15	3	3	-	2777.56
eFDD 4 16QAM	mid	15	3	3	-	2765.53
eFDD 4 16QAM	high	15	3	3	-	2765.53
eFDD 4 QPSK	low	25	5	5	-	4549.1
eFDD 4 QPSK	mid	25	5	5	-	4549.1
eFDD 4 QPSK	high	25	5	5	-	4529.06
eFDD 4 16QAM	low	25	5	5	-	4509.02
eFDD 4 16QAM	mid	25	5	5	-	4529.06
eFDD 4 16QAM	high	25	5	5	-	4549.1
eFDD 4 QPSK	low	50	10	10	-	9058.12
eFDD 4 QPSK	mid	50	10	10	-	9018.04
eFDD 4 QPSK	high	50	10	10	-	9058.12
eFDD 4 16QAM	low	50	10	10	-	9058.12
eFDD 4 16QAM	mid	50	10	10	-	9058.12
eFDD 4 16QAM	high	50	10	10	-	9058.12
eFDD 4 QPSK	low	75	15	15	-	13707.41
eFDD 4 QPSK	mid	75	15	15	-	13527.05
eFDD 4 QPSK	high	75	15	15	-	13587.17
eFDD 4 16QAM	low	75	15	15	-	13647.29
eFDD 4 16QAM	mid	75	15	15	-	13587.17
eFDD 4 16QAM	high	75	15	15	-	13647.29
eFDD 4 QPSK	low	100	20	20	-	18116.23
eFDD 4 QPSK eFDD 4 QPSK	mid	100	20	20	-	18196.39 18276.55
eFDD 4 QPSK eFDD 4 16QAM	high low	100 100	20 20	20 20	-	18196.39
eFDD 4 16QAM	mid	100	20	20	_	18196.39
eFDD 4 16QAM	high	100	20	20	_	18276.55
eFDD 12 QPSK	low	6	1.4	1.4	_	1112.22
eFDD 12 QPSK	mid	6	1.4	1.4	_	1112.22
eFDD 12 QPSK	high	6	1.4	1.4	-	1112.22
eFDD 12 16QAM	low	6	1.4	1.4	-	1112.22
eFDD 12 16QAM	mid	6	1.4	1.4	-	1106.2
eFDD 12 16QAM	high	6	1.4	1.4	-	1124.25
eFDD 12 QPSK	low	15	3	3	-	2765.53
eFDD 12 QPSK	mid	15	3	3	-	2765.53
eFDD 12 QPSK	high	15	3	3	-	2753.5
eFDD 12 16QAM	low	15	3	3	-	2777.56
eFDD 12 16QAM	mid	15	3	3	-	2753.5
eFDD 12 16QAM	high	15	3	3	-	2777.56
eFDD 12 QPSK	low	25	5	5	-	4549.:
eFDD 12 QPSK	mid	25	5	5	-	4529.0
eFDD 12 QPSK	high	25	5	5	-	4529.0
eFDD 12 16QAM	low	25	5	5	-	4529.00
eFDD 12 16QAM	mid	25	5	5	-	4529.00
eFDD 12 16QAM	high	25	5	5	-	4569.1
eFDD 12 QPSK	low	50	10	10	-	9058.12
eFDD 12 QPSK	mid	50	10	10	-	9018.04
eFDD 12 QPSK	high	50	10	10	-	9058.12
eFDD 12 16QAM	low	50	10	10	<b> -</b>	9058.12
eFDD 12 16QAM	mid	50	10	10		9058.12



Marker 1 [T1] RBW RF Att 30 kHz Ref Lvl 16.45 dBm VBW 100 kHz 36.2 dBm 1.75387615 GHz 5 s Unit SWT dBm 26.2 dB Offset [T1] 16.45 dBm A 1.75387615 1.10621242 MHz 0 P I  $\nabla_{\mathrm{T}}$ [T1] 2.0 1.75374990 GHz **√**₹\_T [T1] 7.14 dBm 10 1 VIEW 1 M A EXT Mandolo March March Manhart whole -20 - 4 0 -50 -63.8 Start 1.7528 GHz 300 kHz/ Stop 1.7558 GHz

eFDD4 16QAM, 1.4MHz, Channel: high

Date:

24.OCT.2016 19:42:10



Stop 1.7145 GHz

Marker 1 [T1] RBW RF Att 100 kHz Ref Lvl 17.23 dBm 300 kHz VBW 36.2 dBm 1.71243186 GHz 5 s Unit d B m SWT 26.2 dB Offset 17.23 dBm [T1] A 2.77755511 MHz O.P.  $\nabla_{\mathbb{T}}$ [T1] 9.88 dBm 2 0 1.71011122 GHz  $\nabla_{\mathrm{T}}$ Ţ1] 8.97 dBm 10 1 VIEW 1 MA -10 EXT -21 - 30 - 4 ( - 50

600 kHz/

Date: 24.0CT.2016 19:44:04

eFDD4 16QAM, 3MHz, Channel: low

Start 1.7085 GHz

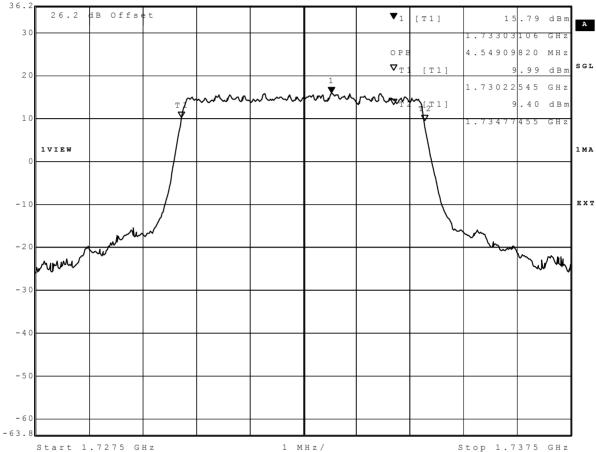
-63.8



Marker 1 [T1] RBW 100 kHz RF Att 20 dB

Ref Lv1 15.79 dBm VBW 300 kHz

36.2 dBm 1.73303106 GHz SWT 5 s Unit dBm



Date: 24.0CT.2016 19:45:58

eFDD4 QPSK, 5MHz, Channel: mid



Marker 1 [T1] RBW RF Att 200 kHz Ref Lvl 16.53 dBm 1 MHz VBW 36.2 dBm 1.73039579 GHz 5 s SWT Unit dBm 26.2 dB Offset  $\blacktriangledown_1$ [T1] 16.53 dBm A 1.73039579 9.01803607 MHz 0 P I  $\nabla_{\mathrm{T}}$ 10.70 dBm 2 0 1.72799098 GHz  $\sqrt[2]{T1}$ 11.83 dBm 10 1 VIEW 1 M A EXT WWW. Warmer - 4 0 -50 -60 -63.8 Start 1.7225 GHz 2 MHz/ Stop 1.7425 GHz

eFDD4 QPSK, 10MHz, Channel: mid

Date:

24.OCT.2016 19:48:48



Marker 1 [T1] RBW 300 kHz RF Att Ref Lvl 16.59 dBm VBW 1 MHz 36.2 dBm 1.72330160 GHz 5 s Unit SWT dВm 26.2 dB Offset [T1] 16.59 dBm A 1.72330160 13.70741483 MHz 0 P I  $\nabla_{\mathrm{T}}$ 2 0 1.71067635 GHz T1] 8.79 dBm 10 1 VIEW 1 M A -10 EXT -30 - 4 0 -50 -60 -63.8 Start 1.7025 GHz 3 MHz/ Stop 1.7325 GHz

Date: 24.0CT.2016 19:51:13

eFDD4 QPSK, 15MHz, Channel: low



Marker 1 [T1] RBW 500 kHz RF Att Ref Lvl 17.66 dBm VBW 2 MHz 36.2 dBm 1.73742485 GHz 5 s Unit dВm SWT 26.2 dB Offset [T1] 17.66 dBm A 1.73742485 18.27655311 MHz 0 P I  $\nabla_{\mathrm{T}}$ 10.78 dBm 2 0 1.73582164 GHz [2T 1 ] 10.52 dBm 10 1 VIEW 1 M A -10 EXT -30 - 4 0 -50 -60 -63.8 Start 1.725 GHz 4 MHz/ Stop 1.765 GHz

Date: 24.0CT.2016 19:55:00

eFDD4 QPSK, 20MHz, Channel: high



Stop 716.8 MHz

Marker 1 [T1] RBW RF Att 30 kHz Ref Lvl 16.03 dBm VBW 100 kHz 35.6 dBm 714.88817635 MHz 5 s Unit SWT dBm 25.6 dB Offset  $\blacktriangledown_1$ [T1] 16.03 dBm A 714.88817635 МНΖ 1.12424850 MHz 0 P I  $\nabla_{\mathrm{T}}$ 20 714.73787575 MHz 6.69 dBm [T1] 715.86212425 MHz 1 VIEW 1 MA EXT -20 undylallary - 4 ( - 5 0 - 60

300 kHz/

Date: 24.0CT.2016 22:02:00

eFDD12 16QAM, 1.4MHz, Channel: high

Start 713.8 MHz

-64.4



Stop 717.5 MHz

Marker 1 [T1] RBW RF Att 100 kHz Ref Lvl 16.52 dBm VBW 300 kHz 35.6 dBm 715.09519038 MHz 5 s Unit SWT dBm 25.6 dB Offset  $\blacktriangledown_1$ [T1] 16.52 dBm A 715.09519038 МНг 2.77755511 MHz O.P.  $\nabla_{\mathrm{T}}$ 2 0 713.09919840 MHz  $\nabla_{\mathrm{T}}$ 2r 1 ] 10.26 dBm 715.87675351 MHz 1 VIEW 1 M A EXT -20 hour - 4 C - 5 0 -60

600 kHz/

Date: 24.0CT.2016 22:04:50

eFDD12 16QAM, 3MHz, Channel: high

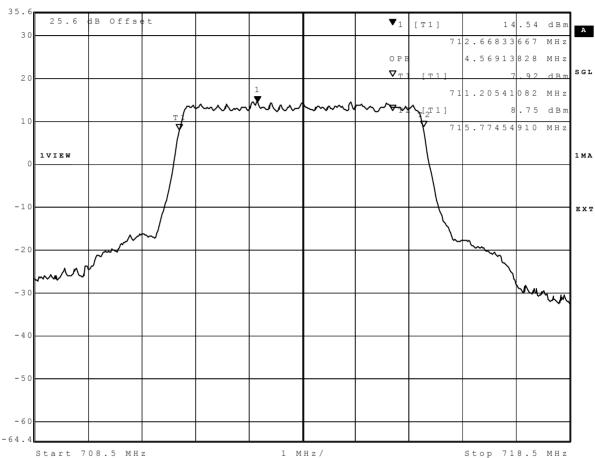
Start 711.5 MHz

-64.4



Marker 1 [T1] RBW 100 kHz RF Att 20 dB

Ref Lvl 14.54 dBm VBW 300 kHz
35.6 dBm 712.66833667 MHz SWT 5 s Unit dBm



Date: 24.0CT.2016 22:07:41

eFDD12 16QAM, 5MHz, Channel: high



Marker 1 [T1] RBW 200 kHz RF Att Ref Lvl 15.13 dBm VBW 1 MHz 35.6 dBm 707.21242485 MHz 5 s Unit SWT dВm 25.6 dB Offset  $\blacktriangledown_1$ [T1] 15.13 dBm A 707.21242485 MHz 9.05811623 MHz 0 P I  $\nabla_{\mathrm{T}}$ 2 0 706.45090180 MHz [2T 1 ] 9.86 dBm 715.50901804 MHz 1 VIEW 1 MA EXT -20 - 4 ( - 5 0 - 60 -64.4

2 MHz/

Date: 24.0CT.2016 22:36:49

eFDD12 16QAM, 10MHz, Channel: high

Start 701 MHz

Stop 721 MHz



# 3.5.20 27.6 Band edge compliance §2.1053, §27.53

# Test: 27.6; Band edge compliance summary §2.1053, §27.53

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 16:04

Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 27



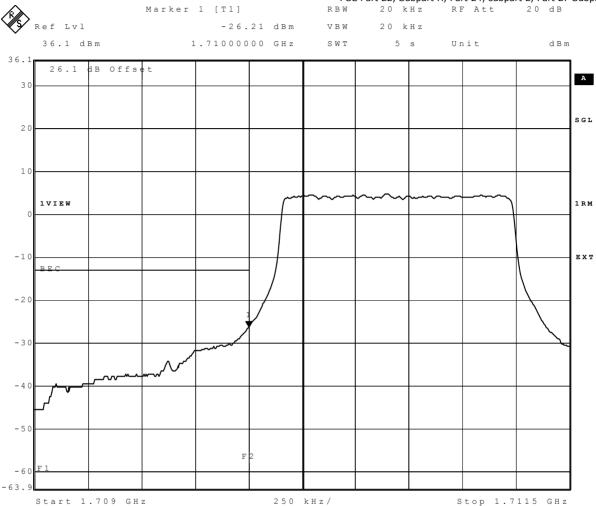
#### **Detailed Results:**

Ambient temperature:	20 °C	Relative humidity	<b>/</b> :	60 %					
Radio Technology	Channel	Nominal BW	Ressource Blocks	Peak [dBm]	Average [dBm]	RMS [dBm]	Limit /dBm	Margin to	Verdict
eFDD 4 QPSK	low	1.4	6	-16.1	-27.64	-26.21	-13	13.21	Passed
eFDD 4 QPSK	high	1.4	6	-16.6	-28.58	-27	-13	14	Passed
eFDD 4 16QAM	low	1.4	6	-16.5	-28.84	-27	-13	14	Passed
eFDD 4 16QAM	high	1.4	6	-16.8	-29.1	-27.64	-13	14.64	Passed
eFDD 4 QPSK	low	3	15	-15.1	-29.36	-27	-13	14	Passed
eFDD 4 QPSK	high	3	15	-15.4	-30.52	-28.1	-13	15.1	Passed
eFDD 4 16QAM	low	3	15	-16.2	-29.92	-27.64	-13	14.64	Passed
eFDD 4 16QAM	high	3	15	-16.4	-30.84	-28.84	-13	15.84	Passed
eFDD 4 QPSK	low	5	25	-13.7	-30.84	-27.87	-13	14.87	Passed
eFDD 4 QPSK	high	5	25	-13.7	-31.51	-28.58	-13	15.58	Passed
eFDD 4 16QAM	low	5	25	-17.8	-33.02	-30.22	-13	17.22	Passed
eFDD 4 16QAM	high	5	25	-17	-33.44	-30.52	-13	17.52	Passed
eFDD 4 QPSK	low	10	50	-13.6	-32.23	-29.36	-13	16.36	Passed
eFDD 4 QPSK	high	10	50	-14.2	-33.44	-30.52	-13	17.52	Passed
eFDD 4 16QAM	low	10	50	-16	-33.44	-30.84	-13	17.84	Passed
eFDD 4 16QAM	high	10	50	-13.8	-34.36	-31.51	-13	18.51	Passed
eFDD 4 QPSK	low	15	75	-9.53	-30.84	-28.34	-13	15.34	Passed
eFDD 4 QPSK	high	15	75	-10.3	-33.02	-29.1	-13	16.1	Passed
eFDD 4 16QAM	low	15	75	-10.7	-31.51	-28.84	-13	15.84	Passed
eFDD 4 16QAM	high	15	75	-10.9	-33.44	-29.92	-13	16.92	Passed
eFDD 4 QPSK	low	20	100	-15.9	-32.23	-30.52	-13	17.52	Passed
eFDD 4 QPSK	high	20	100	-12.5	-34.36	-31.86	-13	18.86	Passed
eFDD 4 16QAM	low	20	100	-16	-33.02	-31.17	-13	18.17	Passed
eFDD 4 16QAM	high	20	100	-14.9	-35.38	-33.02	-13	20.02	Passed
eFDD 12 QPSK	low	1.4	6	-12.8	-26.16	-23.71	-13	10.71	Passed
eFDD 12 QPSK	high	1.4	6	-12.3	-28.37	-25.48	-13	12.48	Passed
eFDD 12 16QAM	low	1.4	6	-12.2	-27.92	-25.16	-13	12.16	Passed
eFDD 12 16QAM	high	1.4	6	-14.1	-29.34	-26.52	-13	13.52	Passed
eFDD 12 QPSK	low	3	15	-15	-29.34	-27.1	-13	14.1	Passed
eFDD 12 QPSK	high	3	15	-16.3	-31.67	-28.6	-13	15.6	Passed
eFDD 12 16QAM	low	3	15	-15	-30.14	-27.5	-13	14.5	Passed
eFDD 12 16QAM	high	3	15	-17.6	-32.73	-29.86	-13	16.86	Passed
eFDD 12 QPSK	low	5	25	-13.1	-30.42	-27.71	-13	14.71	Passed
eFDD 12 QPSK	high	5	25	-13.8	-32.73	-29.34	-13	16.34	Passed
eFDD 12 16QAM	low	5	25	-15.9	-32.73	-29.6	-13	16.6	Passed
eFDD 12 16QAM	high	5	25	-15.2	-33.52	-30.14	-13	17.14	Passed
eFDD 12 QPSK	low	10	50	-7.15	-28.6	-25.65	-13	12.65	Passed
eFDD 12 QPSK	high	10	50	-7.75	-31.02	-27.71	-13	14.71	Passed
eFDD 12 16QAM	low	10	50	-9.2	-30.14	-27.1	-13	14.1	Passed
eFDD 12 16QAM	high	10	50	-8.33	-32.36	-28.84	-13	15.84	Passed



Reference: MDE\_UBLOX\_1626\_FCCb according to: FCC Part 22, Subpart H, Part 24, Subpart E, Part 27 Subpart C

BW 20 kHz RF Att 20 dB

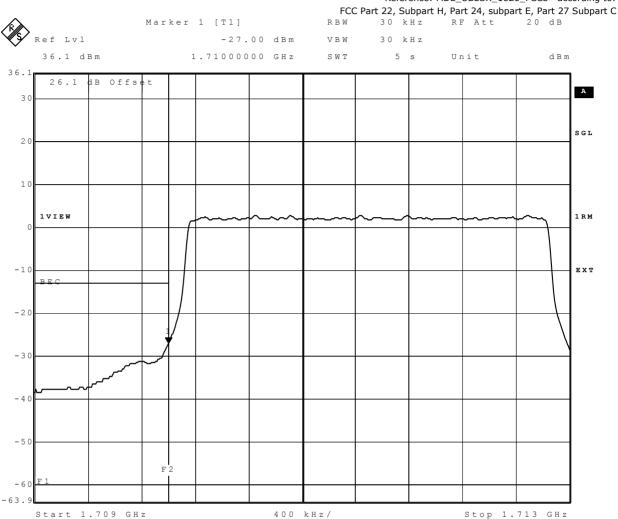


eFDD4 QPSK, 1.4MHz, Channel: low

Date:

24.OCT.2016 18:50:31





24.OCT.2016 18:53:47 Date:

eFDD4 QPSK, 3MHz, Channel: low



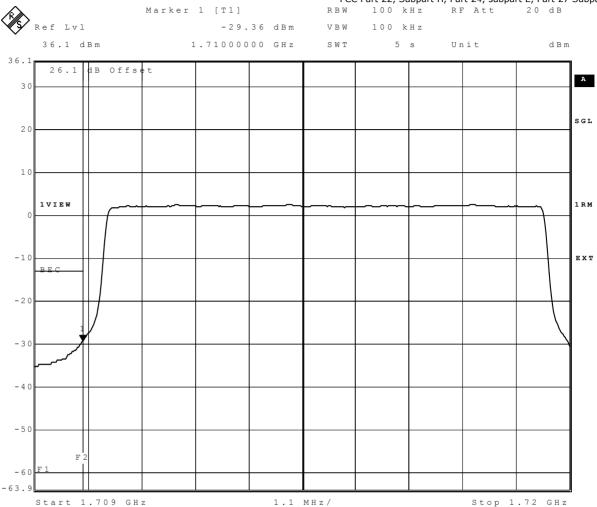
FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW RF Att 50 kHz Ref Lvl -27.87 dBm 50 kHz VBW 36.1 dBm 1.71000000 GHz 5 s Unit dВm SWT dB Offset 26.1 A 3 0 SGL 2 0 10 1 VIEW 1 R M -10 EXT BEC - 30 - 50 -60 -63.9 Start 1.709 GHz 600 kHz/ Stop 1.715 GHz

24.OCT.2016 18:57:04 Date:

eFDD4 QPSK, 5MHz, Channel: low



Reference: MDE\_UBLOX\_1626\_FCCb according to: FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C BW 100 kHz RF Att 20 dB



eFDD4 QPSK, 10MHz, Channel: low

Date:

24.OCT.2016 19:00:24



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 200 kHz RF Att 20 dB Marker 1 [T1] RBW 200 kHz RF Att Ref Lvl -28.34 dBm 200 kHz VBW 36.1 dBm 1.71000000 GHz 5 s Unit dВm SWT 26.1 dB Offset A 3 0 SGL 2 0 10 1 R M 1 VIEV -10 EXT BEC - 30 - 50 -60 -63.9 Start 1.709 GHz 1.6 MHz/ Stop 1.725 GHz

24.OCT.2016 19:04:47 Date:

eFDD4 QPSK, 15MHz, Channel: low



Stop 1.73 GHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 200 kHz RF Att 20 dB Marker 1 [T1] RBW 200 kHz RF Att Ref Lvl -30.52 dBm 200 kHz VBW 36.1 dBm 1.71000000 GHz SWT 5 s Unit dВm . 1 dB Offset A 3 0 SGL 2 0 10 1 VIEW 1 R M -10 EXT BE - 30 - 50 -60 -63.9

2.1 MHz/

24.OCT.2016 19:09:08 Date:

eFDD4 QPSK, 20MHz, Channel: low

Start 1.709 GHz



Stop 702.5 MHz

FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 30 kHz RF Att 20 dB Marker 1 [T1] RBW RF Att 30 kHz Ref Lvl -23.71 dBm 30 kHz VBW 35.6 dBm 699.0000000 MHz 5 s Unit dВm SWT 25.6 dB Offse A SGL 2 0 1 VIEW 1 R M EXT -20 - 4 ( - 5 0  $\overline{\mathbb{W}}$ - 60

450 kHz/

24.OCT.2016 21:29:57 Date:

eFDD12 QPSK, 1.4MHz, Channel: low

Start 698 MHz

-64.4



- 4 (

- 5 0

-60 -64.4

Reference: MDE\_UBLOX\_1626\_FCCb according to: FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 30 kHz RF Att 20 dB Marker 1 [T1] RBW RF Att 30 kHz Ref Lvl -27.10 dBm 30 kHz VBW 35.6 dBm 699.0000000 MHz SWT 5 s Unit dВm 25.6 dB Offset A SGL 2 0 1 VIEW 1 R M EXT -20

400 kHz/

24.OCT.2016 21:33:12 Date:

eFDD12 QPSK, 3MHz, Channel: low

Start 698 MHz

Stop 702 MHz



FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 50 kHz RF Att 20 dB Marker 1 [T1] RBW RF Att 50 kHz Ref Lvl -27.71 dBm 50 kHz VBW 35.6 dBm 699.00000000 MHz SWT 5 s Unit dВm 25.6 dB Offset A SGL 2 0 1 VIEW 1 R M EXT -20 - 3 0 - 40 - 5 0 -60

600 kHz/

24.OCT.2016 21:36:26 Date:

eFDD12 QPSK, 5MHz, Channel: low

Start 698 MHz

-64.4

Stop 704 MHz



- 40

- 5 0

- 60

Date:

Reference: MDE\_UBLOX\_1626\_FCCb according to: FCC Part 22, Subpart H, Part 24, subpart E, Part 27 Subpart C
BW 200 kHz RF Att 20 dB Marker 1 [T1] RBW 200 kHz RF Att Ref Lvl -25.65 dBm 200 kHz VBW 35.6 dBm 699.00000000 MHz 5 s Unit dВm SWT 25.6 dB Offset A SGL 2 0 1 V I E W 1 R M EXT -20

-64.4 1.1 MHz/ Start 698 MHz Stop 709 MHz

eFDD12 QPSK, 10MHz, Channel: low

24.OCT.2016 21:39:42



# 3.5.21 27.7 Peak-to-Average ratio §2.1046, §27.50

# Test: 27.7; Peak-to-Average Ratio Summary §2.1046, §27.50

Result: Passed
Setup No.: AE06

Date of Test: 2016/11/09 16:43

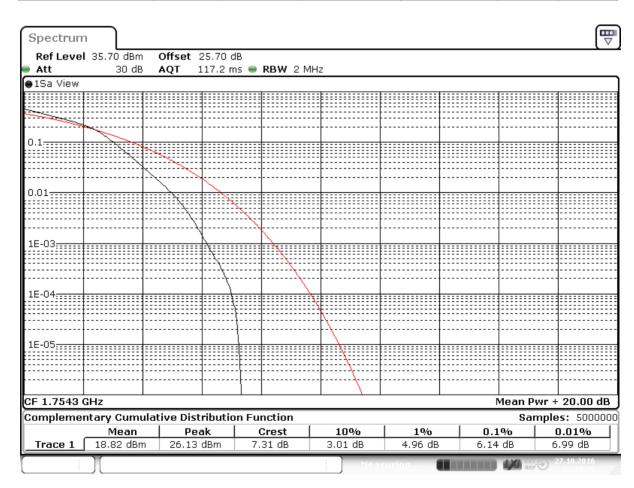
Body: FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 27



#### **Detailed Results:**

Peak to Average Rat	io					
Ambient temperature: Relative humidity:	26 °C 35%					
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak to Average Ratio	Limit (IC) (dB)	Verdict
eFDD 4 QPSK	low	6	1.4	5.25	13	PASSED
eFDD 4 QPSK	mid	6	1.4	5.3	13	PASSED
eFDD 4 QPSK	high	6	1.4	5.36	13	PASSED
eFDD 4 16QAM	low	6	1.4	6.14	13	PASSED
eFDD 4 16QAM	mid	6	1.4	6.12	13	PASSED
eFDD 4 16QAM	high	6	1.4	6.14	13	PASSED
eFDD 12 QPSK	low	6	1.4	5.86	13	PASSED
eFDD 12 QPSK	mid	6	1.4	5.83	13	PASSED
eFDD 12 QPSK	high	6	1.4	5.83	13	PASSED
eFDD 12 16QAM	low	6	1.4	6.61	13	PASSED
eFDD 12 16QAM	mid	6	1.4	6.58	13	PASSED
eFDD 12 16QAM	high	6	1.4	6.46	13	PASSED



Date:27.0CT.2016 16:10:25

eFDD4 16QAM, Channel: high





Date: 27.0 CT 2016 16:21:24

eFDD12 16QAM, Channel: high



# 4 Test Equipment Details

## 4.1 List of Used Test Equipment

The calibration, hardware and software states are shown for the testing period.

# **Test Equipment Anechoic Chamber**

Lab ID: Lab 1

Description: Anechoic Chamber for radiated testing

Calibration DetailsLast ExecutionNext Exec.NSA (FCC)2014/01/092017/01/09

# **Single Devices for Anechoic Chamber**

Single Device Name	Туре	Serial Number	Manufacturer
Air compressor	none	-	
Anechoic Chamber	10.58 x 6.38 x 6.00 m <sup>3</sup>	none	
	Calibration Details		Last Execution Next Exec.
	FCC listing 96716 3m Part15/18		2014/01/09 2017/01/08
Anechoic Chamber	8.8m x 4.6m x 4.05 m	B83117-S40- X191	Albatross Projects GmbH
Controller Maturo	MCU	961208	Maturo GmbH
EMC camera	CE-CAM/1	-	
EMC camera Nr.2	CCD-400E	0005033	
Filter ISDN	B84312-C110-E1		
Filter Universal 1A	ВВ4312-С30-Н3	-	



## Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID: Lab 1

Description: Equipment for emission measurements

Serial Number: see single devices

## Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	Туре	Serial Number	Manufacturer
Antenna mast	AM 4.0	AM4.0/180/11920 513	Maturo GmbH
Biconical Broadband Antenna	SBA 9119	9119-005	
Biconical dipole	VUBA 9117	9117-108	
Broadband Amplifier L GHz - 4 GHz	AFS4-01000400-1Q-10P-4	-	
Broadband Amplifier 18 GHz - 26 GHz	JS4-18002600-32-5P	849785	
Broadband Amplifier 30 MHz - 18 GHz	JS4-00101800-35-5P	896037	
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01- 2+W38.01-2	
Cable "ESI to Horn Antenna"	SucoFlex	W18.02- 2+W38.02-2	
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		Last Execution Next Exec.
	Standard Calibration		2015/06/23 2018/06/22
Double-ridged horn	HF 907	102444	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		Last Execution Next Exec.
	Standard Calibration		2015/05/11 2018/05/10
Double-ridged horn- luplicated 2015-07- .5 10:47:55	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG
ligh Pass Filter	4HC1600/12750-1.5-KK	9942011	
ligh Pass Filter	5HC2700/12750-1.5-KK	9942012	
ligh Pass Filter	5HC3500/18000-1.2-KK	200035008	
ligh Pass Filter	WHKX 7.0/18G-8SS	09	
Horn Antenna Schwarzbeck 15-26.5 GHz BBHA 9170	ВВНА 9170	BBHA9170262	
ogper. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG
Logper. Antenna (upgraded)	HL 562 Ultralog new biconicals	830547/003	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		Last Execution Next Exec.
	Standard Calibration		2015/06/30 2018/06/29
oop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		Last Execution Next Exec.
	DKD Calibration		2014/11/27 2017/11/27



## Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	Туре	Serial Number	Manufacturer
Standard Gain / Pyramidal Horn Antenna 40 GHz	3160-10	00086675	
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5- 10kg/024/379070 9	Maturo GmbH

# **Test Equipment Auxiliary Test Equipment**

Lab ID: Lab 1, Lab 2

Description: Single Devices for various Test Equipment

Type: various
Serial Number: none

## **Single Devices for Auxiliary Test Equipment**

Single Device Name	Туре	Serial Number	Manufacturer	
Broadband Power Divider N (Aux)	1506A / 93459	LM390		
Broadband Power Divider SMA	WA1515	A855		
Digital Multimeter 03 Multimeter)	Fluke 177	86670383		
	Calibration Details		Last Execution Next Exec.	
	DAkkS Calibration		2016/02/04 2018/02/28	
rigital Multimeter 13 Clamp Meter)	Fluke 325	31270091WS	FLUKE	
	Calibration Details		Last Execution Next Exec.	
	DAkkS-Calibration		2016/02/04 2019/02/28	
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018		
ibre optic link ransceiver (Aux)	FO RS232 Link	182-018		
solating Transformer	LTS 604	1888		
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24		
Signal Analyzer	FSV30 103005		Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		Last Execution Next Exec.	
	DKD calibration		2016/02/25 2018/02/24	
pectrum Analyser	FSU26	200418		
	Calibration Details		Last Execution Next Exec.	
	Standard calibration		2016/11/03 2017/11/02	
Spectrum Analyzer	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		Last Execution Next Exec.	
	DKD calibration		2015/06/23 2018/06/22	
/ector Signal Generator	SMIQ 03B	832492/061		



# **Test Equipment Digital Signalling Devices**

Lab ID: Lab 1, Lab 2

Description: Signalling equipment for various wireless technologies.

## **Single Devices for Digital Signalling Devices**

Single Device Name	Туре	Serial Number	Manufacturer	
CMW500	CMW500 Calibration Details	107500	Last Execution	Next Exec.
	Standard calibration		2015/07/13	2017/07/14
Digital Radio Communication Tester	CMD 55 831050/020		Rohde & Schwa	rz GmbH &
	Calibration Details		Last Execution	Next Exec.
	DKD calibration		2014/12/02	2017/12/01
Universal Radio Communication Tester	CMU 200 837983/052		Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		Last Execution	Next Exec.
	DKD calibration		2014/12/03	2017/12/02
	HW/SW Status		Date of Start	Date of End
	HW options: B11, B21V14, B21-2, B41, B52V14, B54V14, B56V14, B68 3v04, B95, P0 SW options: K21 4v11, K22 4v11, K23 4v11, K24 K28 4v10, K42 4v11, K43 4v11, K53 K66 4v10, K68 4v10, Firmware: μP1 8v40 01.12.05	2007/01/02		
	 SW: K62, K69		2008/11/03	
Vector Signal Generator	SMU200A	100912	Rohde & Schwa Co. KG	rz GmbH &



## **Test Equipment Emission measurement devices**

Lab ID: Lab 1

Description: Equipment for emission measurements

Serial Number: see single devices

## Single Devices for Emission measurement devices

Single Device Name	Туре	Serial Number	Manufacturer	
EMI Receiver / Spectrum Analyzer	ESR 7	101424		
	Calibration Details		Last Execution	Next Exec.
	Initial Factory Calibration		2014/11/13	2016/11/12
Personal Computer	Dell	30304832059		
Power Meter	NRVD	828110/016		
	Calibration Details		Last Execution	Next Exec.
	Standard calibration		2016/05/24	2017/05/23
Sensor Head A	NRV-Z1	827753/005		
	Calibration Details		Last Execution	Next Exec.
	Standard calibration		2016/05/27	2017/05/26
Signal Generator	SMR 20	846834/008	Rohde & Schwai	z GmbH &
			Co. KG	
	Calibration Details		Last Execution	Next Exec.
	Standard Calibration		2014/06/24	2017/06/23
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwai Co. KG	z GmbH &
	Calibration Details		Last Execution	Next Exec.
	DAkkS Calibration (DK)		2015/12/09	2017/12/08
	HW/SW Status		Date of Start	Date of End
	Firmware-Update 4.34.4 from 3.45	during calibration	2009/12/03	
Spectrum Analyzer	FSW 43	103779		
•	Calibration Details		Last Execution	Next Exec.
	Initial Factory Calibration		2014/11/17	2016/11/16

# **Test Equipment Multimeter 03**

Lab ID:Lab 1, Lab 2Description:Fluke 177Serial Number:86670383

## Single Devices for Multimeter 03

Single Device Name	Туре	Serial Number	Manufacturer	
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383		
	Calibration Details		Last Execution	Next Exec.
	DAkkS Calibration		2016/02/04	2018/02/28



# **Test Equipment Radio Lab Test Equipment**

Lab ID: Lab 2

Description: Radio Lab Test Equipment

## **Single Devices for Radio Lab Test Equipment**

Single Device Name	Туре	Serial Number	Manufacturer	
Broadband Power Divider SMA	WA1515	A856		
Coax Attenuator 10dB SMA 2W	4T-10	F9401		
Coax Attenuator 10dB SMA 2W	56-10	W3702		
Coax Attenuator 10dB SMA 2W	56-10	W3711		
Coax Cable Huber&Suhner	Sucotest 2,0m		Huber&Suhner	
Coax Cable Rosenberger Micro Coax FA210A0010003030 SMA/SMA 1,0m	FA210A0010003030	54491-2		
Power Meter	NRVD Calibration Details	828110/016	Last Execution	Next Exec.
	Standard calibration		2016/05/24	2017/05/23
RF Step Attenuator RSP	RSP	833695/001		
Rubidium Frequency Standard	Datum, Model: MFS	5489/001		
	Calibration Details		Last Execution	Next Exec.
	DAkks Calibration		2016/06/22	2017/06/23
Sensor Head A	NRV-Z1 Calibration Details	827753/005	Last Execution	Next Exec.
	Standard calibration		2016/05/27	2017/05/26
Signal Generator SME	SME03	827460/016		
	Calibration Details		Last Execution	Next Exec.
	Standard calibration		2014/12/02	2017/12/01
Signal Generator SMP	SMP02	833286/0014	Rohde & Schwar Co. KG	z GmbH &
	Calibration Details		Last Execution	Next Exec.
	Standard calibration		2016/05/24	2019/05/23



# Test Equipment T/A Logger 13

Lab ID:Lab 1, Lab 2Description:Lufft Opus10 TPRType:Opus10 TPRSerial Number:13936

## Single Devices for T/A Logger 13

Single Device Name	Туре	Serial Number	Manufacturer	
ThermoAirpressure Datalogger 13 (Environ)	Opus10 TPR (8253.00)	13936		
	Calibration Details		Last Execution	Next Exec.
	Customized calibration		2015/02/27	2017/02/26

#### Test Equipment T/H Logger 03

Lab ID:Lab 2Description:Lufft Opus10Serial Number:7482

## Single Devices for T/H Logger 03

Single Device Name	Туре	Serial Number	Manufacturer	
ThermoHygro Datalogger 03 (Environ)	Opus10 THI (8152.00)	7482		
	Calibration Details		Last Execution	Next Exec.
	Customized calibration		2015/02/27	2017/02/26

#### Test Equipment T/H Logger 12

Lab ID:Lab 1Description:Lufft Opus10Serial Number:12482

#### Single Devices for T/H Logger 12

Single Device Name	Туре	Serial Number	Manufacturer	
ThermoHygro Datalogger 12 (Environ)	Opus10 THI (8152.00)	12482		
	Calibration Details		Last Execution	Next Exec.
	Customized calibration		2015/03/10	2017/03/09

# **Test Equipment Temperature Chamber 05**

Lab ID: Lab 2

Description: Temperature Chamber VT4002

Type: Vötsch

Serial Number: see single devices

# **Single Devices for Temperature Chamber 05**

Single Device Name	Туре	Serial Number	Manufacturer	
Temperature Chamber Vötsch 05	VT 4002	58566080550010		
	Calibration Details		Last Execution	Next Exec.
	Customized calibration		2016/03/09	2018/03/08



- 5 Annex
- 5.1 Additional Information for Report



Summary of Test Results
The EUT complied with all performed tests as listed in the summary section of this report.
Technical Report Summary
Type of Authorization :
Certification for a GSM/WCDMA/LTE/CDMA2000 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 69. 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
Part 22, Subpart H – Cellular Radiotelephone Service
§ 22.913 Effective radiated power limits § 22.917 Emission limitations for cellular equipment
additional documents
ANSI TIA-603-D-2004 KDB 971168 D01
Description of Methods of Measurements
RF Power Output
Standard FCC Part 22, Subpart H

The test was performed according to: FCC §2.1046



Test Description (conducted measurement procedure)

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Channel (Frequency): please refer to the detailed results
- 4) The transmitted power of the EUT was recorded by using a spectrum analyser.

Test Description (radiated measurement procedure)

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 3) A substitution 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) The output power was measured in both vertical and horizontal antenna polarisation during the call is established on the lowest channel, mid channel and on the highest channel. To find the worst case power all orientations (X, Y, Z) of the EUT have been measured.
- 5) The test procedure according to TIA-603-D-2004 has been considered.

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)(2) Maximum ERP.  $\dots$  The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

Emission and Occupied Bandwidth

Standard FCC Part 22, Subpart H

The test was performed according to: FCC §2.1049

Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings:
- Resolution Bandwidth: >1% of the manufacturer's stated occupied 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 are each equal to 0.5 percent of the total mean power.



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.

Spurious emissions at antenna terminals

Standard FCC Part 22, Subpart H

The test was performed according to FCC §2.1051

#### Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings
- [Resolution Bandwidth]:
- a) [>=1% of wanted signal bandwidth] in the Span of 1 MHz directly below and above the PCS-Band,
- b) otherwise [100 kHz] (or [1 MHz] for accelerated sweep times)
- c) [reduced resolution bandwidth] in case the curve of the analyser IF-Filter or the wanted EUT signal leads to an exceeding of the limit, in this case a correction factor was used
- Sweep Time: depending on the transmitting signal, the span and the resolution bandwidth
- 5) The spurious emissions peaks were measured in the frequency range from 9 kHz to 10 GHz (up to the  $10 \, \text{Hz}$  to  $10 \, \text{GHz}$  (up to the  $10 \, \text{Hz}$  to  $10 \, \text{Hz}$  to

Test Requirements / Limits

 $\S~2.1051~Spurious~emissions~at~antenna~terminals$ 

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.

- $\S$  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.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Field strength of spurious radiation					
Standard	FCC Part 22, Subpart H				

The test was performed according to: FCC §2.1053

#### Test Description

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 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). The frequency range from 9 kHz to 30 MHz has been examined during the conducted spurious emission measurements.
- 5) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
- a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the Band,
- b)  $[10 \, \text{kHz} / 30 \, \text{kHz}]$  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: depending on the transmitting signal, the span and the resolution bandwidth
- 6) The spurious emissions peaks were measured in both vertical and horizontal antenna polarization during the call is established on the lowest channel, mid channel and on the highest channel. To find the worst case peaks all orientations (X, Y, Z) of the EUT have been measured.
- 7) After this initial test, a final test according to TIA-603-D 2.2.12 Unwanted Emissions is performed on signals which are identified as being close to the limit. For any emissions found to be within 10 dB of the limit, a specific signal substitution measurement is performed at the frequency of the emission to determine the exact e.i.r.p. value.

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 dBuV/m (field strength

This is calculated to be -13 dBm (effective radiated power) which corresponds to 84.6 dB $\mu$ V/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.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Frequency stability

Standard FCC Part 22, Subpart H

The test was performed according to FCC §2.1055

Test Description

- 1) The EUT was placed inside a temperature chamber.
- 2) The EUT was coupled to a Digital Communication Tester. Refer to chapter "Setup Drawings".



- 3) The climatic chamber was cycled down/up to a certain temperature, starting with the EUT minimum temperature.
- 4) After the temperature was stabilized the EUT was switched on and a call was established on a Traffic Channel between the EUT and the Digital Communication Tester.

Important Settings:

- Output Power: Maximum
- Mid Channel
- 5) The frequency error of the EUT was recorded by using an internal measurement function of the Digital Communication Tester 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 temperature variation from  $-30^{\circ}$ C to  $+50^{\circ}$ C in increments of  $10^{\circ}$ C, if not otherwise stated in the detailed results.

When the EUT did not operate at certain temperature levels, these measurements were left out.

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  $-30^{\circ}$  to  $+50^{\circ}$  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 (MHz)	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/aFor the mid

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

Band edge compliance

Standard FCC Part 22, Subpart H

The test was performed according to: FCC §22.913

Test Description

1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power



Divider. Refer to chapter "Setup Drawings".

- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester.

Important Settings:

- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings:
- Resolution Bandwidth = Video Bandwidth: >1% of the manufacturer's stated occupied bandwidth

Test Requirements / Limits

§ 22.917 Emission limitations for cellular equipment

Refer to chapter "Field strength of spurious radiation".

Summary of Test Results

The EUT complied with all performed tests as listed in the summary section of this report.

Technical Report Summary

Type of Authorization :

Certification for a GSM/WCDMA/LTE/CDMA2000 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 69. 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

 $\S~2.1053$  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

additional documents



ANSI TIA-603-D-2004
KDB 971168 D01
Description of Methods of Measurements
RF Power Output
——————————————————————————————————————
Standard: FCC Part 24, Subpart E
The test was performed according to: FCC §2.1046

Test Description (conducted measurement procedure)

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Channel (Frequency): please refer to the detailed results
- 4) The transmitted power of the EUT was recorded by using a spectrum analyser.

Test Description (radiated measurement procedure)

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 3) A substitution 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) The output power was measured in both vertical and horizontal antenna polarisation during the call is established on the lowest channel, mid channel and on the highest channel. To find the worst case power all orientations (X, Y, Z) of the EUT have been measured.
- 5) The test procedure according to TIA-603-D-2004 has been considered.

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.
- (e) 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.

Emission	and	Occupied	Bandwidth



Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §2.1049

#### Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings:
- Resolution Bandwidth: >1% of the manufacturer's stated occupied 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 are each equal to 0.5 percent of the total mean power.

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.

Spurious emissions at antenna terminals

Standard: FCC Part 24, Subpart E

The test was performed according to FCC §2.1051

#### Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings
- [Resolution Bandwidth]:
- a) [>=1% of wanted signal bandwidth] in the Span of 1 MHz directly below and above the Band,
- b) otherwise [1 MHz]
- c) [reduced resolution bandwidth] in case the curve of the analyser IF-Filter or the wanted EUT signal leads to an exceeding of the limit, in this case a correction factor was used
- Sweep Time: depending on the transmitting signal, the span and the resolution bandwidth
- 5) The spurious emissions peaks were measured in the frequency range from 9 kHz to 20 GHz (up to the 10th harmonic) during the call was established



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.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Field strength of spurious radiation
Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §2.1053

Test Description

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 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). The frequency range from 9 kHz to 30 MHz has been examined during the conducted spurious emission measurements.
- 5) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
- a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the 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: depending on the transmitting signal, the span and the resolution bandwidth
- 6) The spurious emissions peaks 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. To find the worst case peaks all orientations (X, Y, Z) of the EUT have been measured.
- 7) After this initial test, a final test according to TIA-603-D 2.2.12 Unwanted Emissions is performed on signals which are identified as being close to the limit. For any emissions found to be within 10 dB of the limit, a specific signal substitution measurement is performed at the frequency of the emission to determine the exact e.i.r.p. value.

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 dB $\mu$ V/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.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Frequency stability

Standard: FCC Part 24, Subpart E

The test was performed according to FCC §2.1055

#### Test Description

- 1) The EUT was placed inside a temperature chamber.
- 2) The EUT was coupled to a Digital Communication Tester. Refer to chapter "Setup Drawings".
- 3) The climatic chamber was cycled down/up to a certain temperature, starting with the EUT minimum temperature.
- 4) After the temperature was stabilized the EUT was switched on and a call was established on a Traffic Channel between the EUT and the Digital Communication Tester.

Important Settings:

- Output Power: Maximum
- Mid Channel
- 5) The frequency error of the EUT was recorded by using an internal measurement function of the Digital Communication Tester 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 temperature variation from  $-30^{\circ}$ C to  $+50^{\circ}$ C in increments of  $10^{\circ}$ C, if not otherwise stated in the detailed results.

When the EUT did not operate at certain temperature levels, these measurements were left out.

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 for a frequency of 1880.0 MHz

in accordance with FCC Part 22, Subpart H, §22.355, table C-1: Frequency tolerance for the carrier frequency of mobile transmitters in the Public Mobile Service in the frequency range 821 to 896 MHz.

Band edge compliance

Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §24.238

# Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings:
- Resolution Bandwidth = Video Bandwidth: >1% of the manufacturer's stated occupied bandwidth

Test Requirements / Limits

§ 24.238 Effective radiated power limits

Refer to chapter "Field strength of spurious radiation".



Summary of Test Results
The EUT complied with all performed tests as listed in the summary section of this report.
Technical Report Summary
Type of Authorization :
Certification for a GSM/WCDMA/LTE/CDMA2000 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 69. 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
Part 22, Subpart H – Cellular Radiotelephone Service
§ 22.913 Effective radiated power limits § 22.917 Emission limitations for cellular equipment
additional documents
ANSI TIA-603-D-2004
KDB 971168 D01
Description of Methods of Measurements
RF Power Output
Standard FCC Part 22, Subpart H

The test was performed according to: FCC §2.1046



Test Description (conducted measurement procedure)

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Channel (Frequency): please refer to the detailed results
- 4) The transmitted power of the EUT was recorded by using a spectrum analyser.

Test Description (radiated measurement procedure)

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 3) A substitution 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) The output power was measured in both vertical and horizontal antenna polarisation during the call is established on the lowest channel, mid channel and on the highest channel. To find the worst case power all orientations (X, Y, Z) of the EUT have been measured.
- 5) The test procedure according to TIA-603-D-2004 has been considered.

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

Emission and Occupied Bandwidth

Standard FCC Part 22, Subpart H

The test was performed according to: FCC §2.1049

Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings:
- Resolution Bandwidth: >1% of the manufacturer's stated occupied 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 are each equal to 0.5 percent of the total mean power.



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.

Spurious emissions at antenna terminals

Standard FCC Part 22, Subpart H

The test was performed according to FCC §2.1051

#### Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings
- [Resolution Bandwidth]:
- a) [>=1% of wanted signal bandwidth] in the Span of 1 MHz directly below and above the PCS-Band,
- b) otherwise [100 kHz] (or [1 MHz] for accelerated sweep times)
- c) [reduced resolution bandwidth] in case the curve of the analyser IF-Filter or the wanted EUT signal leads to an exceeding of the limit, in this case a correction factor was used
- Sweep Time: depending on the transmitting signal, the span and the resolution bandwidth
- 5) The spurious emissions peaks were measured in the frequency range from 9 kHz to 10 GHz (up to the  $10 \, \text{Hz}$  to  $10 \, \text{GHz}$  (up to the  $10 \, \text{Hz}$  to  $10 \, \text{Hz}$  to

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.

- $\S$  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.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Field strength o	f spurious radiation
Standard	FCC Part 22, Subpart H

The test was performed according to: FCC §2.1053

#### Test Description

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 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). The frequency range from 9 kHz to 30 MHz has been examined during the conducted spurious emission measurements.
- 5) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
- a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the Band,
- b)  $[10 \, \text{kHz} / 30 \, \text{kHz}]$  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: depending on the transmitting signal, the span and the resolution bandwidth
- 6) The spurious emissions peaks were measured in both vertical and horizontal antenna polarization during the call is established on the lowest channel, mid channel and on the highest channel. To find the worst case peaks all orientations (X, Y, Z) of the EUT have been measured.
- 7) After this initial test, a final test according to TIA-603-D 2.2.12 Unwanted Emissions is performed on signals which are identified as being close to the limit. For any emissions found to be within 10 dB of the limit, a specific signal substitution measurement is performed at the frequency of the emission to determine the exact e.i.r.p. value.

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 dBm//m (field streng

This is calculated to be -13 dBm (effective radiated power) which corresponds to 84.6 dB $\mu$ V/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.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Frequency stability

Standard FCC Part 22, Subpart H

The test was performed according to FCC §2.1055

Test Description

- 1) The EUT was placed inside a temperature chamber.
- 2) The EUT was coupled to a Digital Communication Tester. Refer to chapter "Setup Drawings".



- 3) The climatic chamber was cycled down/up to a certain temperature, starting with the EUT minimum temperature.
- 4) After the temperature was stabilized the EUT was switched on and a call was established on a Traffic Channel between the EUT and the Digital Communication Tester.

Important Settings:

- Output Power: Maximum
- Mid Channel
- 5) The frequency error of the EUT was recorded by using an internal measurement function of the Digital Communication Tester 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 temperature variation from  $-30^{\circ}$ C to  $+50^{\circ}$ C in increments of  $10^{\circ}$ C, if not otherwise stated in the detailed results.

When the EUT did not operate at certain temperature levels, these measurements were left out.

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 (MHz)	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/aFor the mid

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

Band edge compliance

Standard FCC Part 22, Subpart H

The test was performed according to: FCC §22.913

Test Description

1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power



Divider. Refer to chapter "Setup Drawings".

- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester.

Important Settings:

- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings:
- Resolution Bandwidth = Video Bandwidth: >1% of the manufacturer's stated occupied bandwidth

Test Requirements / Limits
§ 22.917 Emission limitations for cellular equipment
Refer to chapter "Field strength of spurious radiation".
Current of Task Passille
Summary of Test Results
The EUT complied with all performed tests as listed in the summary section of this report.
Technical Report Summary
<del></del>

Type of Authorization:

Certification for a GSM/WCDMA/CDMA2000 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 69. 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

 $\S$  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

additional documents



ANSI TIA-603-D-2004

Description of Methods of Measurements
RF Power Output
Standard: ECC Part 24 Subpart F

The test was performed according to: FCC §2.1046

Test Description (conducted measurement procedure)

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Channel (Frequency): please refer to the detailed results
- 4) The transmitted power of the EUT was recorded by using a spectrum analyser.

Test Description (radiated measurement procedure)

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 3) A substitution 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) The output power was measured in both vertical and horizontal antenna polarisation during the call is established on the lowest channel, mid channel and on the highest channel. To find the worst case power all orientations (X, Y, Z) of the EUT have been measured.
- 5) The test procedure according to TIA-603-D-2004 has been considered.

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.
- (e) 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.

Emission	and	Occupied	Bandwidth



Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §2.1049

#### Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings:
- Resolution Bandwidth: >1% of the manufacturer's stated occupied 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 are each equal to 0.5 percent of the total mean power.

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.

Spurious emissions at antenna terminals

Standard: FCC Part 24, Subpart E

The test was performed according to FCC §2.1051

#### Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings
- $\hbox{- [Resolution Bandwidth]:} \\$
- a) [>=1% of wanted signal bandwidth] in the Span of 1 MHz directly below and above the Band,
- b) otherwise [1 MHz]
- c) [reduced resolution bandwidth] in case the curve of the analyser IF-Filter or the wanted EUT signal leads to an exceeding of the limit, in this case a correction factor was used
- Sweep Time: depending on the transmitting signal, the span and the resolution bandwidth
- 5) The spurious emissions peaks were measured in the frequency range from 9 kHz to 20 GHz (up to the 10th harmonic) during the call was established



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.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Field strength of spurious radiation
Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §2.1053

Test Description

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 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). The frequency range from 9 kHz to 30 MHz has been examined during the conducted spurious emission measurements.
- 5) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
- a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the 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: depending on the transmitting signal, the span and the resolution bandwidth
- 6) The spurious emissions peaks 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. To find the worst case peaks all orientations (X, Y, Z) of the EUT have been measured.
- 7) After this initial test, a final test according to TIA-603-D 2.2.12 Unwanted Emissions is performed on signals which are identified as being close to the limit. For any emissions found to be within 10 dB of the limit, a specific signal substitution measurement is performed at the frequency of the emission to determine the exact e.i.r.p. value.

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 dB $\mu$ V/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.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Frequency stability

Standard: FCC Part 24, Subpart E

The test was performed according to FCC §2.1055

#### Test Description

- 1) The EUT was placed inside a temperature chamber.
- 2) The EUT was coupled to a Digital Communication Tester. Refer to chapter "Setup Drawings".
- 3) The climatic chamber was cycled down/up to a certain temperature, starting with the EUT minimum temperature.
- 4) After the temperature was stabilized the EUT was switched on and a call was established on a Traffic Channel between the EUT and the Digital Communication Tester.

Important Settings:

- Output Power: Maximum
- Mid Channel
- 5) The frequency error of the EUT was recorded by using an internal measurement function of the Digital Communication Tester 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 temperature variation from  $-30^{\circ}$ C to  $+50^{\circ}$ C in increments of  $10^{\circ}$ C, if not otherwise stated in the detailed results.

When the EUT did not operate at certain temperature levels, these measurements were left out.

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 for a frequency of 1880.0 MHz
in accordance with FCC Part 22, Subpart H, §22.355, table C-1: Frequency tolerance for the carrier frequency of mobile transmitters in the Public Mobile Service in the frequency range 821 to 896 MHz.
Band edge compliance
Standard: FCC Part 24, Subpart E
The test was performed according to: FCC §24.238
Test Description
1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".  2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.  3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:  - Output Power: Maximum  - Channel: please refer to the detailed results  4) Important Analyser Settings:  - Resolution Bandwidth = Video Bandwidth: >1% of the manufacturer's stated occupied bandwidth
Test Requirements / Limits
§ 24.238 Effective radiated power limits
Refer to chapter "Field strength of spurious radiation".  Summary of Test Results
The EUT complied with all performed tests as listed in the summary section of this report.
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

Part 2, Subpart J - Equipment Authorization Procedures, Certification

47 CFR Ch.1 Parts 0 to 69. The following subparts are applicable to the results in this test report.



§ 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 27, Subpart C—Technical Standards

§ 27.50 Power and antenna height limits

§ 27.53 Emissions limits

§ 27.54 Frequency stability

additional documents

ANSI TIA-603-D-2004

Standard

Description of Methods of Measurements

RF Power Output

The test was performed according to: FCC §2.1046

FCC Part 27, Subpart C

Test Description (conducted measurement procedure)

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Channel (Frequency): please refer to the detailed results
- 4) The transmitted power of the EUT was recorded by using a spectrum analyser.

Test Description (radiated measurement procedure)

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 3) A substitution 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) The output power was measured in both vertical and horizontal antenna polarisation during the call is established on the lowest channel, mid channel and on the highest channel. To find the worst case power all orientations (X, Y, Z) of the EUT have been measured.
- 5) The test procedure according to TIA-603-D-2004 has been considered.

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. §27.50 Power and antenna height limits.

(d) The following power and antenna height requirements apply to stations transmitting in the 1710-1755 MHz and 2110-2155 MHz bands:

(2) Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to a peak EIRP of 1 watt. Fixed stations operating in this band are limited to a maximum antenna height of 10 meters above ground, and mobile and portable stations must employ a means for limiting power to the minimum necessary for successful communications.

Emission and Occupied Bandwidth

Standard FCC Part 27, Subpart C

The test was performed according to: FCC §2.1049

### Test Description

- 1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings:
- Resolution Bandwidth: >1% of the manufacturer's stated occupied 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 are each equal to 0.5 percent of the total mean power.

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.

Spurious emissions at antenna terminals

Standard FCC Part 27, Subpart C

The test was performed according to FCC §2.1051

Test Description

1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".



- 2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
- 3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 4) Important Analyser Settings
- [Resolution Bandwidth]:
- a) [>=1% of wanted signal bandwidth] in the Span of 1 MHz directly below and above the Band,
- b) otherwise [1 MHz]
- c) [reduced resolution bandwidth] in case the curve of the analyser IF-Filter or the wanted EUT signal leads to an exceeding of the limit, in this case a correction factor was used
- Sweep Time: depending on the transmitting signal, the span and the resolution bandwidth
- 5) The spurious emissions peaks were measured in the frequency range from 9 kHz to 18 GHz (up to the 10 th harmonic) during the call is established

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.
- § 27.53 Emission limits
- (h) For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log 10$ (P) dB

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

- (1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.
- (2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
- (3) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

For reporting only spurious emission levels rea	aching to the 20dB margin to limit were noted.
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Field strength of spurious radiation							
Standard	FCC Part 27, Subpart C						



The test was performed according to: FCC §2.1053

#### Test Description

- 1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
- 2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester. Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
- 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 18 GHz (up to the 10th harmonic of the transmit frequency). The frequency range from 9 kHz to 30 MHz has been examined during the conducted spurious emission measurements.
- 5) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
- a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the 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: depending on the transmitting signal, the span and the resolution bandwidth
- 6) The spurious emissions peaks 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. To find the worst case peaks all orientations (X, Y, Z) of the EUT have been measured.
- 7) After this initial test, a final test according to TIA-603-D 2.2.12 Unwanted Emissions is performed on signals which are identified as being close to the limit. For any emissions found to be within 10 dB of the limit, a specific signal substitution measurement is performed at the frequency of the emission to determine the exact e.i.r.p. value.

# 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.
- § 27.53 Emission limits



(h) For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log 10$  (P) dB

Remark of the test laboratory: This is calculated to be -13 dBm (effective radiated power) which corresponds to 84.6 dB $\mu$ V/m (field strength) in a distance of 3 m.

- (1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.
- (2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
- (3) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Frequency stability

Standard FCC Part 27, Subpart C

The test was performed according to FCC §2.1055

# Test Description

- 1) The EUT was placed inside a temperature chamber.
- $\ \, \hbox{2) The EUT was coupled to a Digital Communication Tester. Refer to chapter "Setup Drawings"}. \\$
- 3) The climatic chamber was cycled down/up to a certain temperature, starting with the EUT minimum temperature.
- 4) After the temperature was stabilized the EUT was switched on and a call was established on a Traffic Channel between the EUT and the Digital Communication Tester.

  Important Settings:
- Output Power: Maximum
- Mid Channel
- 5) The frequency error of the EUT was recorded by using an internal measurement function of the Digital Communication Tester 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 temperature variation from  $-30^{\circ}$ C to  $+50^{\circ}$ C in increments of  $10^{\circ}$ C, if not otherwise stated in the detailed results.

When the EUT did not operate at certain temperature levels, these measurements were left out.

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.

§27.54 Frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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 = 4350 Hz for channel 1450, frequency 1740.0 MHz +/- 2.5 ppm = 4331 Hz for channel 1412, frequency 1732.4 MHz

in



Subtests HSDPA

Sub- test	βс	β <b>d</b>	βd (SF)	βc/βd	β <b>HS</b> (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1:	$?_{ACK}$ , $?_{NACK}$ and $?_{CQI} = 30/15$ with	$\beta_{hs}$ = 30/15 *	$eta_c$ .
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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, ?<sub>ACK</sub> and ?<sub>NACK</sub> = 30/15 with  $\beta_{hs}$  = 30/15 \*  $\beta_c$ , and ?<sub>CQI</sub> = 24/15

with  $\beta_{hs}$  = 24/15 \*  $\beta_c$  .

Note 3: CM = 1 for  $\beta_c/\beta_d$  =12/15,  $\beta_{hs}/\beta_c$ =24/15. For all other combinations of DPDCH, DPCCH and HSDPCH 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  $\beta_c/\beta_d$  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  $\beta_c$  = 11/15 and  $\beta_d$  = 15/15.

#### Subtests HSUPA

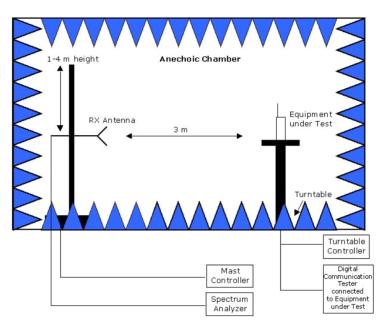
Subtests 1150171

Subtest	Mode	Loopback Mode	Rel99 RMC	HSDPA FRC	HSUPA Test	Number of E- DPDCH Channels
			12.2kbps			
1	Rel6 HSUPA	Test Mode 1	RMC	H-Set1	HSUPA Loopback	1
			12.2kbps			
2	Rel6 HSUPA	Test Mode 1	RMC	H-Set1	HSUPA Loopback	1
			12.2kbps			
3	Rel6 HSUPA	Test Mode 1	RMC	H-Set1	HSUPA Loopback	2
			12.2kbps			
4	Rel6 HSUPA	Test Mode 1	RMC	H-Set1	HSUPA Loopback	1
			12.2kbps			
5	Rel6 HSUPA	Test Mode 1	RMC	H-Set1	HSUPA Loopback	1

Subtest	Max UL Data Rate (kb/s)	βc/βd	βhs	βed	СМ
1	242.1	11/15	22/15	1309/225	1
2	161.3	6/15	12/15	94/75	3
3	524.7	15/9	30/15	47/15	2
4	197.6	2/15	4/15	56/75	3
5	299.6	15/15	30/15	134/15	1



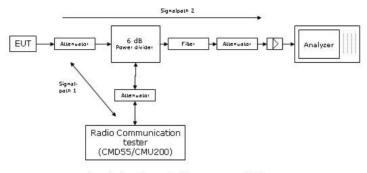
Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

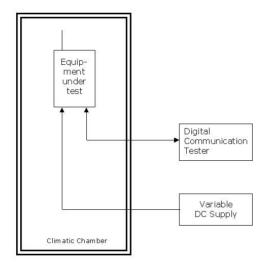
Principle set-up for radiated measurements





Remark: Depending on the frequency range suitable attenuators and/or filters and/or amplifiers are used.

Principle set-up for conducted measurements under nominal conditions



Principle set-up for tests under extreme test conditions



		RF Channel					RF Channel		
TEST MODE	TX / RX	Low	Mid	High	TEST MODE	TX / RX	Low	Mid	High
	TX (1.4M)	18607	18900	19193			19957	20175	20393
		1850.7 MHz	1880 MHz	1909.3 MHz		TX (1.4M)	1710.7MHz	1732.5MHz	1754.3MHz
		CH 18615	CH 18900	CH 19185			CH 19965	CH 20175	CH 20385
	TX (3M)	1851.5 MHz	1880 MHz	1908.5 MHz		TX (3M)	1711.50 MHz	1732.50 MHz	1753.50 MHz
		CH 18625	CH 18900	CH 19175			CH 19975	CH 20175	CH 20375
	TX (5M)	1852.5 MHz	1880 MHz	1907.5 MHz		TX (5M)	1712.50 MHz	1732.50 MHz	1752.50 MHz
		CH 18650	CH 18900	CH 19150			CH 20000	CH 20175	CH 20350
l L	TX (10)	1855 MHz	1880 MHz	1905 MHz		TX (10)	1715.00 MHz	1732.50 MHz	1750.00 MHz
		CH 18675	CH 18900	CH 19125			CH 20025	CH 20175	CH 20325
L	TX (15M)	1857.5 MHz	1880 MHz	1902.5 MHz		TX (15M)	1717.50 MHz	1732.50 MHz	1747.50 MHz
		CH 18700	CH 18900	CH 19100			CH 20050	CH 20175	CH 20300
LTE eFDD 2	TX (20M)	1860 MHz	1880 MHz	1900 MHz	LTE eFDD 4	TX (20M)	1720.00 MHz	1732.50 MHz	1745.00 MHz
LIE GFDD 2		CH 607	CH 900	CH 1193	LIE eFDD 4		CH 1957	CH 2175	CH 2393
L	RX (1.4M)	1930.7 MHz	1960 MHz	1989.3 MHz		RX (1.4M)	2110.70 MHz	2132.50 MHz	2154.30 MHz
		CH 615	CH 900	CH 1185			CH 1965	CH 2175	CH 2385
l L	RX (3M)	1931.5 MHz	1960 MHz	1988.5 MHz		RX (3M)	2111.50 MHz	2132.50 MHz	2153.50 MHz
		CH 625	CH 900	CH 1175			CH 1975	CH 2175	CH 2375
	RX (5M)	1932.50 MHz	1880.00 MHz	1987.5 MHz		RX (5M)	2112.50 MHz	2132.50 MHz	2152.50 MHz
		CH 650	CH 900	CH 1150			CH 2000	CH 2175	CH 2350
	RX (10M)	1935.00 MHz	1960.00 MHz	1985.00 MHz		RX (10M)	2115.00 MHz	2132.50 MHz	2150.00 MHz
		CH 675	CH 900	CH 1125			CH 2025	CH 2175	CH 2325
L	RX (15M)	1937.50 MHz	1960.00 MHz	1982.50 MHz		RX (15M)	2117.50 MHz	2132.50 MHz	2147.50 MHz
		CH 700	CH 900	CH 1100			CH 2050	CH 2175	CH 2300
	RX (20M)	1940.00 MHz	1960.00 MHz	1980.00 MHz		RX (20M)	2120.00 MHz	2132.50 MHz	2145.00 MHz
			RF Channel				RF Channel		
TEST MODE	TX / RX	Low	Mid	High	TEST MODE	TX / RX	Low	Mid	High
		20407	20525	20643			CH 23017	CH 23095	CH 23173
Ľ	TX (1.4M)	824.7	836.5	848.3		TX (1.4M)	699.70 MHz	707.50 MHz	715.30 MHz
		CH 20415	CH 20525	CH 20635			CH 23025	CH 23095	CH 23165
L	TX (3M)	825.50 MHz	836.50 MHz	847.50 MHz		TX (3M)	700.50 MHz	707.50 MHz	714.50 MHz
		CH 20425	CH 20525	CH 20625			CH 23035	CH 23095	CH 23155
	TX (5M)	826.50 MHz	836.50 MHz	846.50 MHz		TX (5M)	701.50 MHz	707.50 MHz	713.50 MHz
		CH 20450	CH 20525	CH 20600			CH 23060	CH 23095	CH 23130
LTE eFDD 5	TX (10)	829.00 MHz	836.50 MHz	844.00 MHz	LTE eFDD	TX (10)	704.00 MHz	707.50 MHz	711.00 MHz
LIL CIDD 3		CH 2407	CH 20525	CH 2643	12		CH 5017	CH 5095	CH 5173
l L	RX (1.4M)	869.70 MHz	881.50 MHz	893.70 MHz		RX (1.4M)	729.70 MHz	737.50 MHz	745.30 MHz
		CH 2415	CH 20525	CH 2635			CH 5025	CH 5095	CH 5165
l L	RX (3M)	870.50 MHz	881.50 MHz	892.50 MHz		RX (3M)	730.50 MHz	737.50 MHz	744.50 MHz
		CH 2425	CH 2525	CH 2625			CH 5035	CH 5095	CH 5155
	RX (5M)	871.50 MHz	881.50 MHz	891.50 MHz		RX (5M)	731.50 MHz	737.50 MHz	743.50 MHz
	1177 (3141)								
	101 (3141)	CH 2450	CH 2525	CH 2600			CH 5060	CH 5095	CH 5130

Channels used for LTE Testing



# Correlation of measurement requirements for Cellular Equipment from FCC and IC

FCC Rule / IC Standard	Part 22	RSS-132 Issue 3, 2016	Part 24	RSS-133 Issue 6, 2013	Part 27	RSS-139 Issue 3, 2015	RSS-130 Issue 1, 2013
Effective (isotropic) Radiated Power	§2.1046 §22.913	RSS-GEN, §6.12 RSS-132, §5.4	§2.1046 §24.232	RSS-GEN, §6.12 RSS-133, §6.4	§2.1046 §27.50	RSS-GEN, §6.12 RSS-139; §6.4	RSS-GEN, §6.12 RSS-130; §4.4
Emission and Occupied Bandwidth	§2.1049	RSS-GEN §6.6	§2.1049	RSS-GEN §6.6	§2.1049	RSS-GEN §6.6	RSS-GEN §6.6
"Spuri" at Antenna Terminal	§2.1051 §22.917	RSS-GEN, §6.13 RSS-132, §5.5	§2.1051 §24.238	RSS-GEN, §6.13 RSS-132, §6.5	§2.1051 §27.53	RSS-GEN, §6.13 RSS-139, §6.5	RSS-GEN, §6.13 RSS-130, §4.6
Band Edge compliance	§2.1051 §22.917	RSS-GEN, §6.13	§2.1051 §24.238	RSS-GEN, §6.13	§2.1051 §27.53	RSS-GEN, §6.13	RSS-GEN, §6.13
Frequency Stability	§2.1055 §22.355	RSS-GEN, §6.11	§2.1055 §24.235	RSS-GEN, §6.11 RSS-132, §6.3	§2.1055 §27.51	RSS-GEN, §6.11 RSS-139, §6.3	RSS-GEN, §6.11 RSS-130, §4.3
Peak to Average Ratio	N/A	RSS-132, §5.3	§2.1046 §24.232	RSS-133, §6.4	§2.1046 §27.50	RSS-139, §6.4	RSS-130; §4.4
Field Strength of Spurious Radiation	§2.1053 §22.917	RSS-GEN, §6.13 RSS-132, §5.2	§2.1053 §24.235	RSS-GEN, §6.13 RSS-133, §6.5	§2.1053 §27.51	RSS-GEN, §6.13 RSS-139, §6.5	RSS-GEN, §6.13 RSS-130, §4.6

<sup>\*)</sup> Receivers which are part of Transceivers are exempted with respect to Notice 2012-DRS0126.



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