InterLab®

Final Report on

Cellular Module
Cinterion® ALAS6A-US Data Module

FCC ID: QIPALAS6A-US
IC: 7830A-ALAS6AUS

according to FCC Part 22, Subpart H, Part 24, Subpart E and Part 27, Subpart C

Report Reference:	MDE_GEMALTO_1605_FCCb_rev1
Date:	October 04, 2016

Test Laboratory:
7layers GmbH
Borsigstraße 11
40880 Ratingen
Germany

DAkkS Deutsche Akkreditierungsstelle D-PL-12140-01-01

1 Administrative Data

1.1 Project Data

Project Responsible:	Andreas Tübel
Date Of Test Report:	2016/10/04
Date of first test:	2016/07/20
Date of last test:	2016/08/12

1.2 Applicant Data

Company Name: Gemalto M2M GmbH

Street:	Siemensdamm 50
City:	13629 Berlin
Country:	Germany

Contact Person: Mr. Thorsten Liebig

Function:	Manager Approval
Department:	Approval Department
Phone:	+49 3031102 8241
Fax:	+49 30311028305
Mobile:	+49 160 70 74 027
E-Mail:	Thorsten.Liebig@gemalto.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 Mr. Jens Dörwald	DAkkS-Registration no. D-PL-12140-01-01
Lab 2	Radio Lab	Mr. Dobrin Dobrinov Mr. Daniel Gall	DAkkS-Registration no. D-PL-12140-01-01

Revision·History¶

¶

Report·version·control¤			
Version¤	**Release·date¤**	**Change·Description¤**	**Version·validity¤**
initial¤	2016-08-23¤	--¤	invalid¤
rev1¤	2016-10-04¤	Corrected·one·value·FCC22·test·case·band·edge·compliance,·corrected·cropped·output·power·table·FCC24¤	valid¤

¶

1.4 Signature of the Testing Responsible

DANIEL GALL
2016.10.04
15:28:00 +02'00'

Daniel Gall
responsible for tests performed in: Lab 1, Lab 2

1.5 Signature of the Accreditation Responsible

MARCO KULLIK
2016.10.04
16:26:01 +02'00'

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: Cinterion ALAS6A-US Data Module

Type / Model / Family:	Cinterion ALAS6A-US Data Module HW: Rev. 3.2.0 SW: Rev. 00.136
Product Category:	Module
Manufacturer:	
Company Name:	See applicant data
Contact Person:	-

Parameter List:

Parameter name	*Value*
Parameter for Scope FCC_v2:	
DC Power Supply	12 (V)
highest channel	251 (848.8MHz) for GSM850, 810 (1909.8MHz) for GSM1900, 4233 (846.6MHz) for FDD5, 9538 (1907.6MHz) for FDD2, 1513 (1752.6MHz) for FDD4
lowest channel	128 (824.2MHz) for GSM850, 512 (1850.2MHz) for GSM1900, 4132 (826.4MHz) for FDD5, 9262 (1852.4MHz)for FDD2, 1312 (1712.4MHz) for FDD4
mid channel	190 (836.6MHz) for GSM850, 661 (1880.0MHz) for GSM1900, 4183 (836.6MHz) for FDD5, 9400 (1880MHz) for FDD2, 1412 (1732.4MHz)/1450 (1740.0MHz) for FDD4

2.2 Detailed Description of OUT Samples

Sample : ab01

OUT Identifier	Cinterion ALAS6A-US Data Module		
Sample Description	RF Sample #02		
HW Status	Rev. 3.1.1		
SW Status	Rev. 00.118		
Low Voltage	3.3 V	*Low Temp.*	-20 °C
High Voltage	4.2 V	*High Temp.*	55 °C
Nominal Voltage	4.2 V	*Normal Temp.*	25 °C

Sample : bb02

OUT Identifier	Cinterion ALAS6A-US Data Module		
Sample Description	RF Sample #04		
HW Status	Rev. 3.2.0		
SW Status	Rev. 00.118		
Low Voltage	3.3 V	*Low Temp.*	-20 °C
High Voltage	4.2 V	*High Temp.*	55 °C
Nominal Voltage	4.2 V	*Normal Temp.*	25 °C

2.3 OUT Features

Features for OUT: **Cinterion ALAS6A-US Data Module**

Designation	*Description*	*Allowed Values*	*Supported Value(s)*
Features for scope: 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		
FDD4	EUT supports UMTS FDD4 in the band 1710 MHz - 1755 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-FDD4	EUT supports UMTS FDD4 HSDPA in the band 1710 MHz - 1755 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-FDD4	EUT supports UMTS FDD4 HSUPA in the band 1710 MHz - 1755 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 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 equipment*	
	Sample No.	*Sample Description*	*AE No.*	*AE Description*
S01_AB01	**(Tx Testing only RF Sample #02)**			
	Sample: ab01	RF Sample #02	AE 01	DSB75 Development Board
			AE 03	Housing Box for Test Setup
			AE 02	Module Adapter Plate ALAS6-DSB75
			AE 04	Panorama Antennas LPB-7-27-05SP
S01_BB02	**(Rx Testing only RF Sample #04)**			
	Sample: bb02	RF Sample #04	AE 01	DSB75 Development Board
			AE 03	Housing Box for Test Setup
			AE 02	Module Adapter Plate ALAS6-DSB75
			AE 04	Panorama Antennas LPB-7-27-05SP

3 Results

3.1 General

Documentation of tested devices: Available at the test laboratory.

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 implementation.

Note:

1. All tests are performed under environmental conditions within the requirements of the specifications. Environmental conditions are available at the laboratory.

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
FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	Part 27, Subpart C - Technical Standards

3.3 List of Test Specification

Test Specification:	**FCC part 2 and 22**
Version	10-1-13 Edition
Title:	PART 2 - GENERAL RULES AND REGULATIONS PART 22 - PUBLIC MOBILE SERVICES
Test Specification:	**FCC part 2 and 24**
Version	10-1-13 Edition
Title:	PART 2 - GENERAL RULES AND REGULATIONS PART 24 - PERSONAL COMMUNICATIONS SERVICES
Test Specification:	**FCC part 2 and 27**
Version	10-1-13 Edition
Title:	PART 2 - GENERAL RULES AND REGULATIONS PART 27 - MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

3.4 Summary

Test Case Identifier / Name Test (condition)	Result	Date of Test	Lab Ref.	Setup
Test Specification: FCC part 2 and 22				
22.1 RF Power Output §2.1046, §22.913				
22.1; RF Power Output Summary §2.1046, §22.913	Passed	2016/07/20	Lab 2	S01_AB01
22.2 Frequency stability §2.1055				
22.2; Frequency stability Summary §2.1055	Passed	2016/07/29	Lab 2	S01_AB01
22.3 Spurious emissions at antenna terminals §2.1051, §22.917				
22.3; Spurious emissions at antenna terminals summary §2.1051, §22.917	Passed	2016/08/12	Lab 2	S01_BB02
22.4 Field strength of spurious radiation §2.1053, §22.917				
22.4; Field strength of spurious radiation Summary §2.1053, §22.917	Passed	2016/08/04	Lab 1	S01_AB01
22.5 Emission and Occupied Bandwidth §2.1049, §22.917				
22.5; Emission and Occupied Bandwidth Summary §2.1049, §22.917	Passed	2016/07/20	Lab 2	S01_AB01
22.6 Band edge compliance §2.1053, §22.917				
22.6; Band edge compliance Summary §2.1053, §22.917	Passed	2016/07/20	Lab 2	S01_AB01
22.7 Peak-to-Average Ratio Summary §2.1046				
22.7; Peak-to-Average Ratio Summary §2.1046	Passed	2016/08/03	Lab 2	S01_AB01
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	2016/07/30	Lab 2	S01_AB01
24.2 Frequency stability §2.1055, §24.235				
24.2; Frequency stability Summary §2.1055, 24.235	Passed	2016/07/29	Lab 2	S01_AB01
24.3 Spurious emissions at antenna terminals §2.1051, §24.238				
24.3; Spurious emissions at antenna terminals Summary §2.1051, §24.238	Passed	2016/08/12	Lab 2	S01_BB02
24.4 Field strength of spurious radiation §2.1053, §24.238				
24.4; Field strength of spurious radiation Summary §2.1053, §24.238	Passed	2016/07/26	Lab 1	S01_AB01
24.5 Emission and Occupied Bandwidth §2.1049, §24.238				
24.5; Emission and Occupied Bandwidth Summary §2.1049, §24.238	Passed	2016/07/29	Lab 2	S01_AB01
24.6 Band edge compliance §2.1053, §24.238				
24.6; Band edge compliance summary §2.1053, §24.238	Passed	2016/07/30	Lab 2	S01_AB01
24.7 Peak-to-Average ratio §2.1046, §24.232				
24.7; Peak-to-Average Ratio Summary §2.1046, §24.232	Passed	2016/08/03	Lab 2	S01_BB02
Test Specification: FCC part 2 and 27				
27.1 RF Power Output §2.1046, §27.250				
27.1; RF Power Output Summary §2.1046, §27.250	Passed	2016/07/30	Lab 2	S01_BB02

Test Case Identifier / Name *Test (condition)*	*Result*	*Date of Test*	*Lab Ref.*	*Setup*
27.2 Frequency stability §2.1055, §27.54				
27.2; Frequency stability Summary §2.1055, §27.54	Passed	2016/07/30	Lab 2	S01_AB01
27.3 Spurious emissions at antenna terminals §2.1051, §27.53				
27.3; Spurious emissions at antenna terminals Summary §2.1051, §27.53	Passed	2016/08/12	Lab 2	S01_BB02
27.4 Field strength of spurious radiation §2.1053, §27.53				
27.4; Field strength of spurious radiation Summary §2.1053, §27.53	Passed	2016/08/01	Lab 1	S01_AB01
27.5 Emission and Occupied Bandwidth §2.1049				
27.5; Emission and Occupied Bandwidth Summary §2.1049	Passed	2016/07/30	Lab 2	S01_AB01
27.6 Band edge compliance §2.1053, §27.53				
27.6; Band edge compliance summary §2.1053, §27.53	Passed	2016/07/30	Lab 2	S01_AB01
27.7 Peak-to-Average ratio §2.1046, §27.50				
27.7; Peak-to-Average Ratio Summary §2.1046, §27.50	Passed	2016/08/03	Lab 2	S01_BB02

3.5 Detailed Results

3.5.1 22.1 RF Power Output §2.1046, §22.913

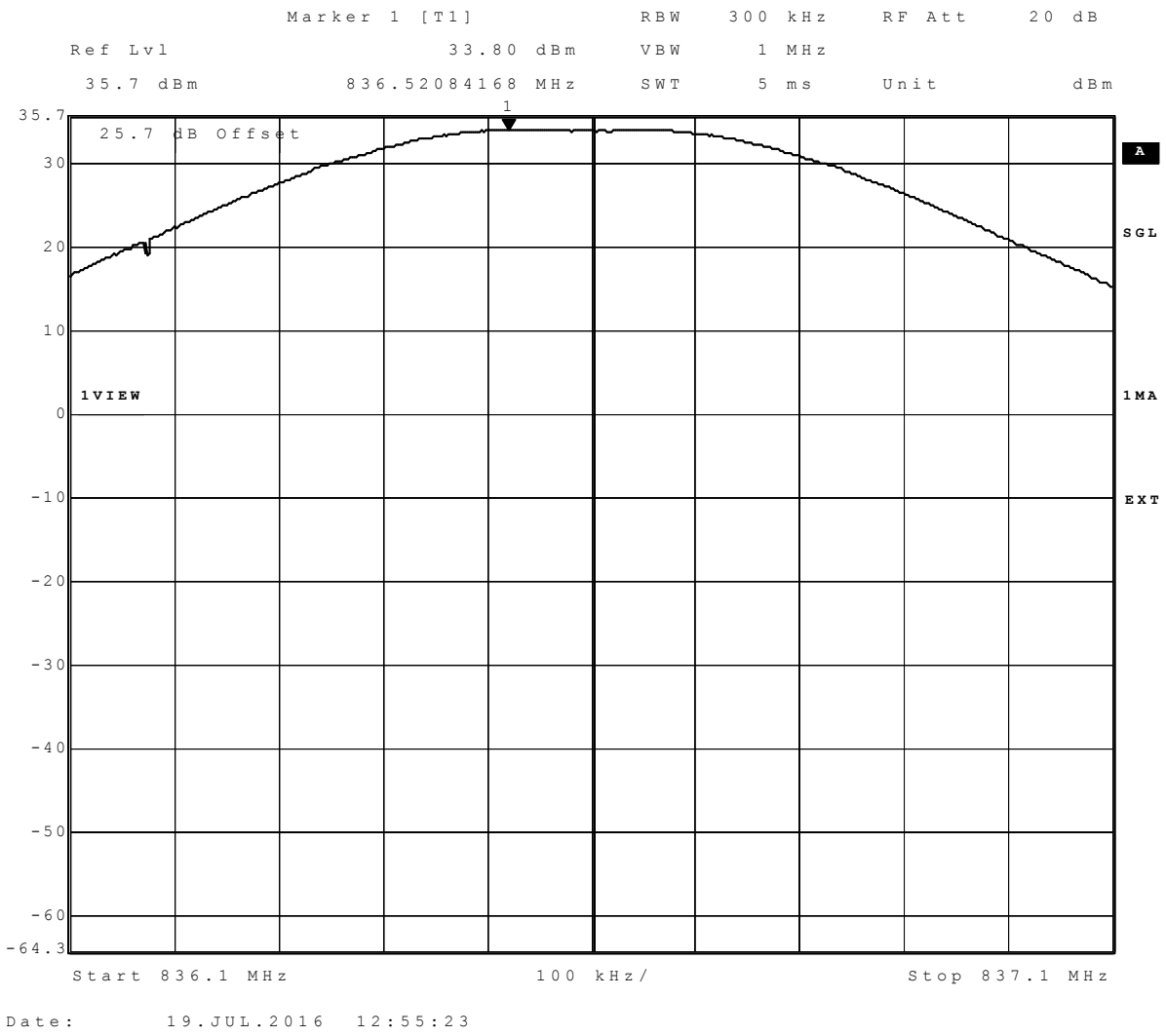
Test: 22.1; RF Power Output Summary §2.1046, §22.913

Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/20 15:40
Body:	FCC47CFRChIPART22PUBLIC MOBILE SERVICES
Test Specification:	FCC part 2 and 22

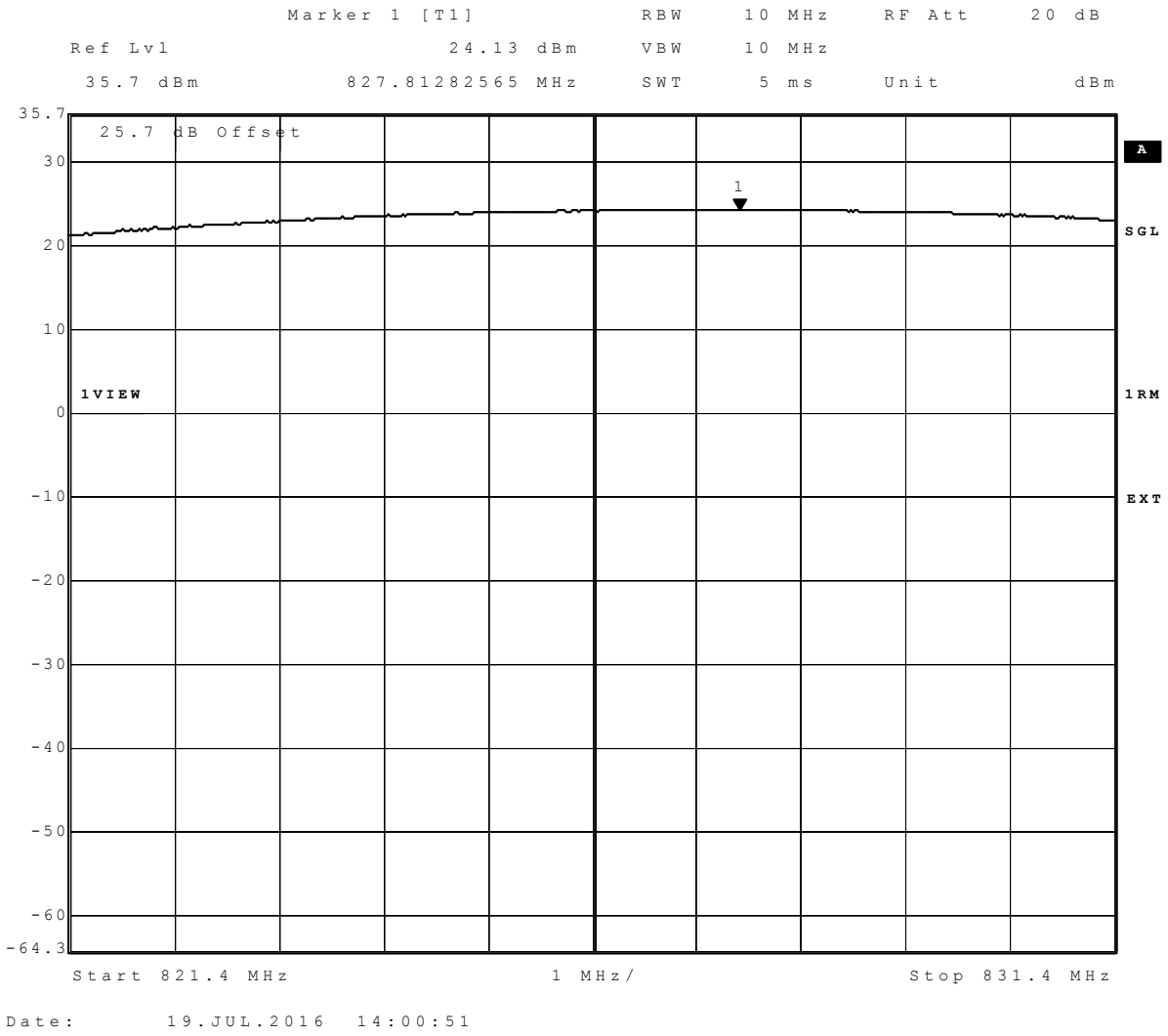
Detailed Results:

Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC EIRP Limit (W)	IC EIRP Limit (W)	Maximum Antenna Gain (dBi)
GSM 850 GPRS	low	-	0.2	33.72	33.69	33.67	11.48	11.5	6.88
GSM 850 GPRS	mid	-	0.2	33.8	33.74	33.74	11.48	11.5	6.8
GSM 850 GPRS	high	-	0.2	33.41	33.35	33.33	11.48	11.5	7.19
GSM 850 EDGE	low	-	0.2	30.69	30.68	30.68	11.48	11.5	9.91
GSM 850 EDGE	mid	-	0.2	30.6	30.58	30.57	11.48	11.5	10
GSM 850 EDGE	high	-	0.2	30.55	30.54	30.53	11.48	11.5	10.05
FDD V	low	-	5	29.7	23.99	24.13	11.48	11.5	16.47
FDD V	mid	-	5	29.83	23.92	24	11.48	11.5	16.6
FDD V	high	-	5	29.94	23.8	24	11.48	11.5	16.6
FDD V HSDPA Subtest 1	low	-	5	28.7	23.5	23.6	11.48	11.5	17
FDD V HSDPA Subtest 1	mid	-	5	28.5	23.1	23.2	11.48	11.5	17.4
FDD V HSDPA Subtest 1	high	-	5	28.3	22.8	23	11.48	11.5	17.6
FDD V HSDPA Subtest 2	low	-	5	29.8	22.8	23.3	11.48	11.5	17.3
FDD V HSDPA Subtest 2	mid	-	5	29.2	22.4	23	11.48	11.5	17.6
FDD V HSDPA Subtest 2	high	-	5	28.7	21.9	22.5	11.48	11.5	18.1
FDD V HSDPA Subtest 3	low	-	5	29.7	22.6	23.3	11.48	11.5	17.3
FDD V HSDPA Subtest 3	mid	-	5	29.4	22.3	22.9	11.48	11.5	17.7
FDD V HSDPA Subtest 3	high	-	5	28.7	21.8	22.4	11.48	11.5	18.2
FDD V HSDPA Subtest 4	low	-	5	30.4	22.5	23.3	11.48	11.5	17.3
FDD V HSDPA Subtest 4	mid	-	5	29.7	22.3	23	11.48	11.5	17.6
FDD V HSDPA Subtest 4	high	-	5	28.8	21.7	22.5	11.48	11.5	18.1
FDD V HSUPA Subtest 1	low	-	5	29.9	22.4	22.7	11.48	11.5	17.9
FDD V HSUPA Subtest 1	mid	-	5	29.7	22.1	22.6	11.48	11.5	18
FDD V HSUPA Subtest 1	high	-	5	29.7	22.4	22.7	11.48	11.5	17.9
FDD V HSUPA Subtest 2	low	-	5	30.14	21.28	22.04	11.48	11.5	18.56
FDD V HSUPA Subtest 2	mid	-	5	30.05	20.9	21.8	11.48	11.5	18.8
FDD V HSUPA Subtest 2	high	-	5	29.8	21.4	21.9	11.48	11.5	18.7
FDD V HSUPA Subtest 3	low	-	5	30.51	21.9	22.6	11.48	11.5	18
FDD V HSUPA Subtest 3	mid	-	5	30.5	21.6	22.4	11.48	11.5	18.2
FDD V HSUPA Subtest 3	high	-	5	30.24	21.3	22.1	11.48	11.5	18.5
FDD V HSUPA Subtest 4	low	-	5	30.09	21.4	22.03	11.48	11.5	18.57
FDD V HSUPA Subtest 4	mid	-	5	30.5	22.3	22.8	11.48	11.5	17.8
FDD V HSUPA Subtest 4	high	-	5	29.7	21.4	22	11.48	11.5	18.6
FDD V HSUPA Subtest 5	low	-	5	30	21.7	22.5	11.48	11.5	18.1
FDD V HSUPA Subtest 5	mid	-	5	29.8	21.3	22.2	11.48	11.5	18.4
FDD V HSUPA Subtest 5	high	-	5	30.1	22.5	22.9	11.48	11.5	17.7
eFDD 5 QPSK	low	1	1.4	-	-	22.4	11.48	11.5	18.2
eFDD 5 QPSK	low	3	1.4	-	-	22.27	11.48	11.5	18.33
eFDD 5 QPSK	low	6	1.4	-	-	21.24	11.48	11.5	19.36
eFDD 5 QPSK	mid	1	1.4	-	-	22.2	11.48	11.5	18.4
eFDD 5 QPSK	mid	3	1.4	-	-	22.02	11.48	11.5	18.58
eFDD 5 QPSK	mid	6	1.4	-	-	20.99	11.48	11.5	19.61
eFDD 5 QPSK	high	1	1.4	-	-	22.21	11.48	11.5	18.39
eFDD 5 QPSK	high	3	1.4	-	-	22.22	11.48	11.5	18.38
eFDD 5 QPSK	high	6	1.4	-	-	21.05	11.48	11.5	19.55
eFDD 5 16QAM	low	1	1.4	-	-	21.39	11.48	11.5	19.21
eFDD 5 16QAM	low	6	1.4	-	-	20.09	11.48	11.5	20.51
eFDD 5 16QAM	mid	1	1.4	-	-	21.21	11.48	11.5	19.39
eFDD 5 16QAM	mid	6	1.4	-	-	19.88	11.48	11.5	20.72
eFDD 5 16QAM	high	1	1.4	-	-	21.47	11.48	11.5	19.13
eFDD 5 16QAM	high	6	1.4	-	-	20.21	11.48	11.5	20.39

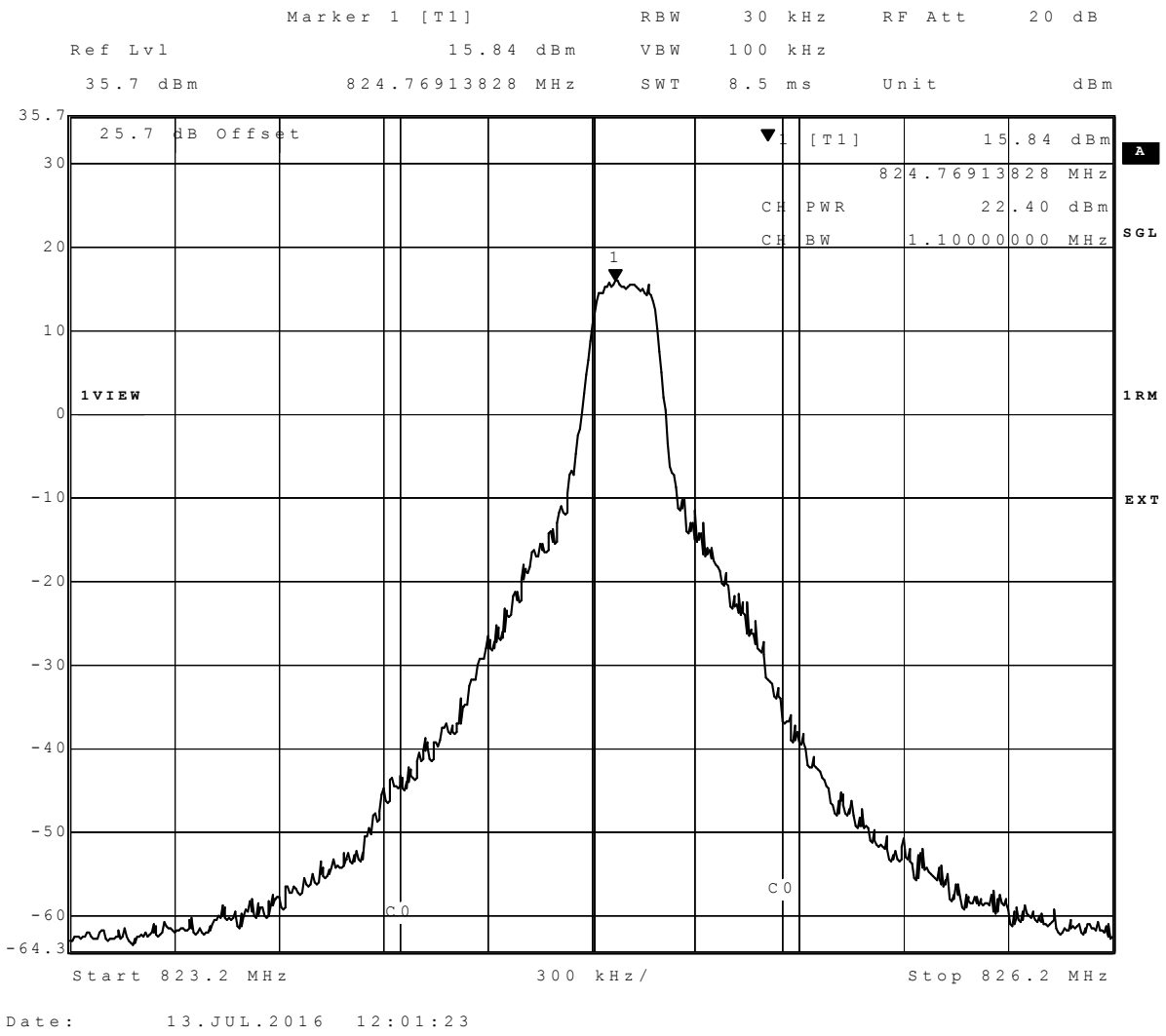
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC EIRP Limit (W)	IC EIRP Limit (W)	Maximum Antenna Gain (dBi)
eFDD 5 QPSK	low	1	3	-	-	22.79	11.48	11.5	17.81
eFDD 5 QPSK	low	15	3	-	-	21.47	11.48	11.5	19.13
eFDD 5 QPSK	mid	1	3	-	-	22.51	11.48	11.5	18.09
eFDD 5 QPSK	mid	15	3	-	-	21.34	11.48	11.5	19.26
eFDD 5 QPSK	high	1	3	-	-	22.75	11.48	11.5	17.85
eFDD 5 QPSK	high	15	3	-	-	21.39	11.48	11.5	19.21
eFDD 5 16QAM	low	1	3	-	-	21.72	11.48	11.5	18.88
eFDD 5 16QAM	low	15	3	-	-	20.51	11.48	11.5	20.09
eFDD 5 16QAM	mid	1	3	-	-	21.64	11.48	11.5	18.96
eFDD 5 16QAM	mid	15	3	-	-	20.3	11.48	11.5	20.3
eFDD 5 16QAM	high	1	3	-	-	21.71	11.48	11.5	18.89
eFDD 5 16QAM	high	15	3	-	-	20.45	11.48	11.5	20.15
eFDD 5 QPSK	low	1	5	-	-	22.79	11.48	11.5	17.81
eFDD 5 QPSK	low	12	5	-	-	21.59	11.48	11.5	19.01
eFDD 5 QPSK	low	25	5	-	-	21.48	11.48	11.5	19.12
eFDD 5 QPSK	mid	1	5	-	-	22.74	11.48	11.5	17.86
eFDD 5 QPSK	mid	12	5	-	-	21.3	11.48	11.5	19.3
eFDD 5 QPSK	mid	25	5	-	-	21.28	11.48	11.5	19.32
eFDD 5 QPSK	high	1	5	-	-	22.71	11.48	11.5	17.89
eFDD 5 QPSK	high	12	5	-	-	21.3	11.48	11.5	19.3
eFDD 5 QPSK	high	25	5	-	-	21.36	11.48	11.5	19.24
eFDD 5 16QAM	low	1	5	-	-	21.82	11.48	11.5	18.78
eFDD 5 16QAM	low	25	5	-	-	20.43	11.48	11.5	20.17
eFDD 5 16QAM	mid	1	5	-	-	21.6	11.48	11.5	19
eFDD 5 16QAM	mid	25	5	-	-	20.26	11.48	11.5	20.34
eFDD 5 16QAM	high	1	5	-	-	21.8	11.48	11.5	18.8
eFDD 5 16QAM	high	25	5	-	-	20.44	11.48	11.5	20.16
eFDD 5 QPSK	low	1	10	-	-	22.87	11.48	11.5	17.73
eFDD 5 QPSK	low	50	10	-	-	21.74	11.48	11.5	18.86
eFDD 5 QPSK	mid	1	10	-	-	22.66	11.48	11.5	17.94
eFDD 5 QPSK	mid	50	10	-	-	21.52	11.48	11.5	19.08
eFDD 5 QPSK	high	1	10	-	-	22.92	11.48	11.5	17.68
eFDD 5 QPSK	high	50	10	-	-	21.77	11.48	11.5	18.83
eFDD 5 16QAM	low	1	10	-	-	22.05	11.48	11.5	18.55
eFDD 5 16QAM	low	50	10	-	-	20.62	11.48	11.5	19.98
eFDD 5 16QAM	mid	1	10	-	-	21.69	11.48	11.5	18.91
eFDD 5 16QAM	mid	50	10	-	-	20.47	11.48	11.5	20.13
eFDD 5 16QAM	high	1	10	-	-	21.83	11.48	11.5	18.77
eFDD 5 16QAM	high	50	10	-	-	20.71	11.48	11.5	19.89



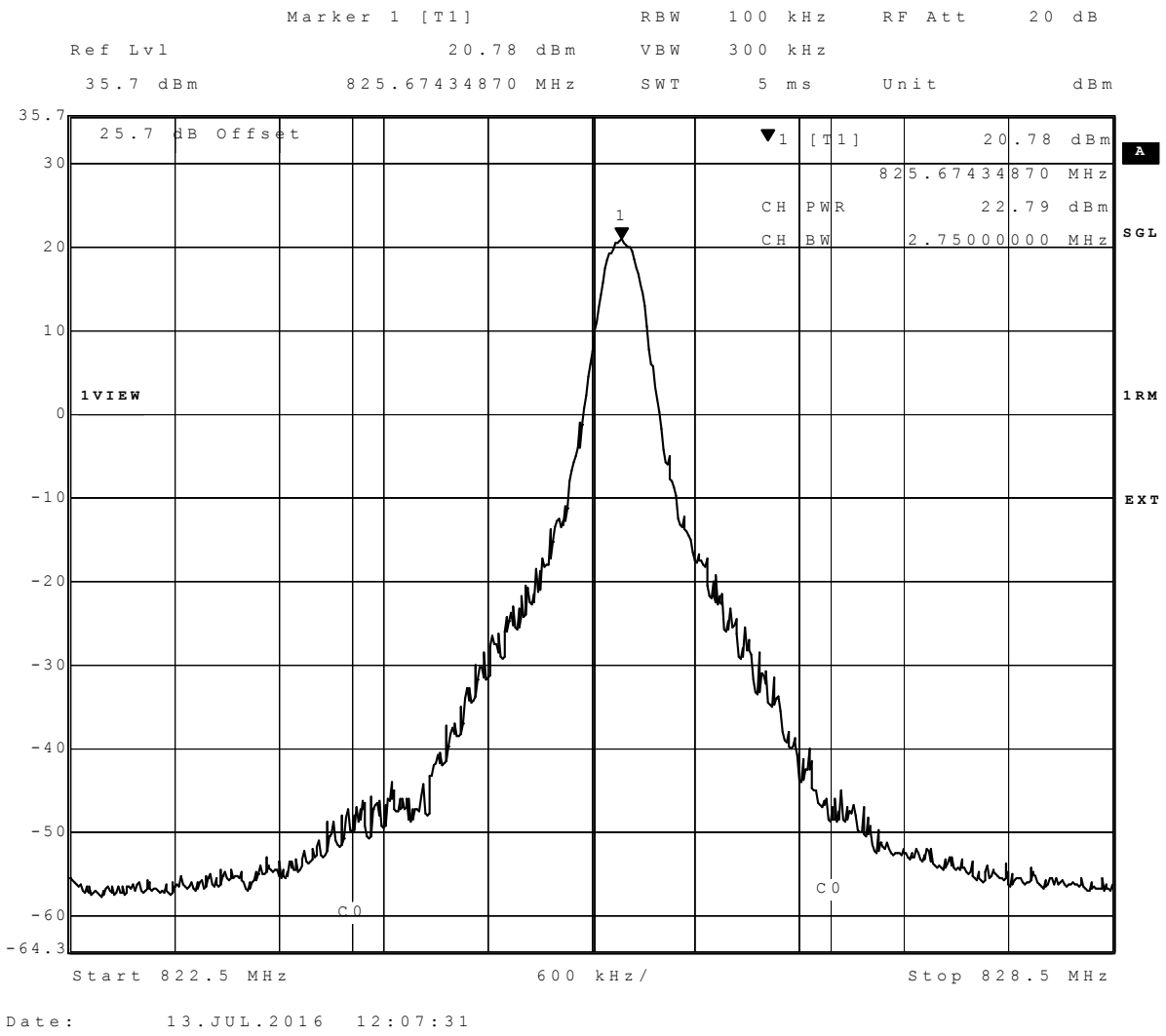
GSM 850 GPRS mid channel



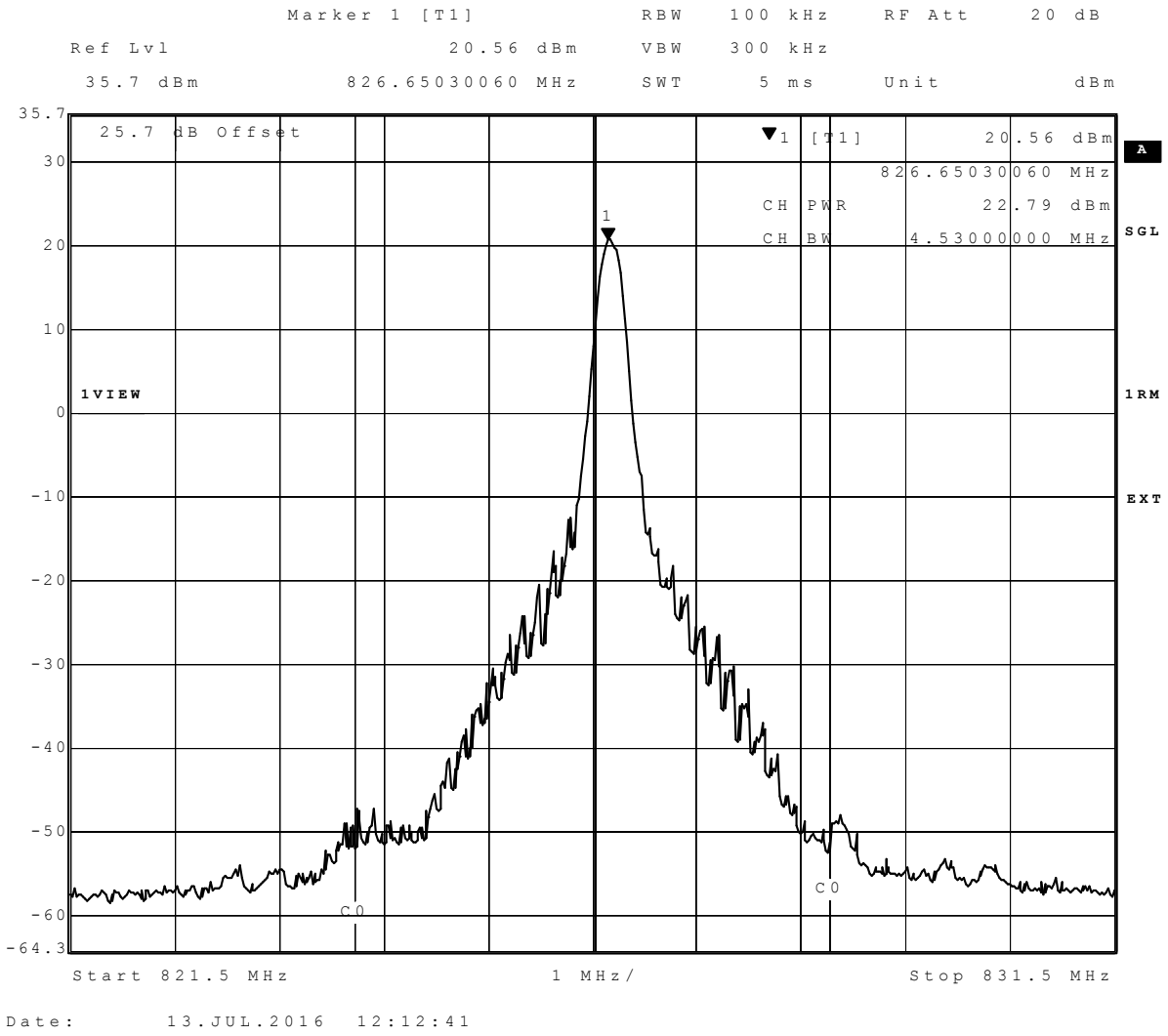
FDD V low channel



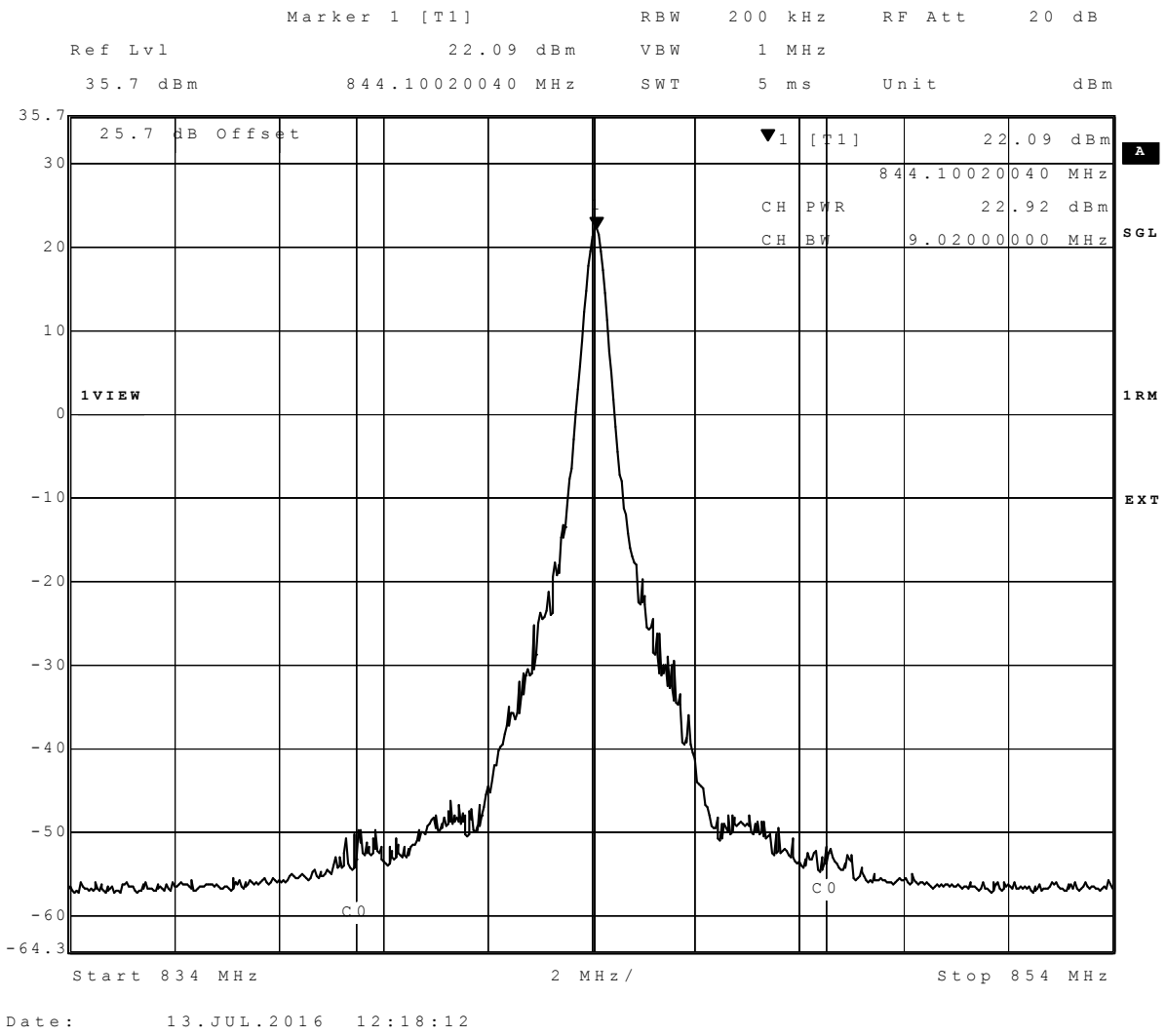
eFDD 5 1.4 MHz 1 RB QPSK low channel



eFDD 5 3 MHz 1 RB QPSK low channel



eFDD 5 5 MHz 1 RB QPSK low channel



eFDD 5 10 MHz 1 RB QPSK high channel

3.5.2 22.2 Frequency stability §2.1055

Test: 22.2; Frequency stability Summary §2.1055

Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/29 16:15
Body:	FCC47CFRChIPART22PUBLIC MOBILE SERVICES
Test Specification:	FCC part 2 and 22

Detailed Results:

Radio Technology	Voltage	Temp (°C)	Frequency (MHz)	Frequency Error (Hz)	Deviation (ppm)	Limit (Hz)
	normal	-30	836.5	14	0.02	2091.25
	normal	-20	836.5	20	0.02	2091.25
	normal	-10	836.5	22	0.03	2091.25
	normal	0	836.5	29	0.03	2091.25
	normal	10	836.5	24	0.03	2091.25
GSM 850 GPRS	normal = high	20	836.5	30	0.04	2091.25
	normal	30	836.5	28	0.03	2091.25
	normal	40	836.5	34	0.04	2091.25
	normal	50	836.5	34	0.04	2091.25
	low	20	836.5	26	0.03	2091.25
	normal	-30	836.5	20	0.02	2091.25
	normal	-20	836.5	-35	-0.04	2091.25
	normal	-10	836.5	23	0.03	2091.25
	normal	0	836.5	43	0.05	2091.25
	normal	10	836.5	48	0.06	2091.25
GSM 850 EDGE	normal = high	20	836.5	30	0.04	2091.25
	normal	30	836.5	28	0.03	2091.25
	normal	40	836.5	34	0.04	2091.25
	normal	50	836.5	31	0.04	2091.25
	low	20	836.5	32	0.04	2091.25
	normal	-30	836.5	-13	-0.02	2091.25
	normal	-20	836.5	-12	-0.01	2091.25
	normal	-10	836.5	-11	-0.01	2091.25
	normal	0	836.5	-13	-0.02	2091.25
	normal	10	836.5	-11	-0.01	2091.25
FDD V	normal = high	20	836.5	-11	-0.01	2091.25
	normal	30	836.5	-9	-0.01	2091.25
	normal	40	836.5	-9	-0.01	2091.25
	normal	50	836.5	-8	-0.01	2091.25
	low	20	836.5	-8	-0.01	2091.25
	normal	-30	836.5	11	0.01	2091.25
	normal	-20	836.5	7	0.01	2091.25
	normal	-10	836.5	8	0.01	2091.25
	normal	0	836.5	-9	-0.01	2091.25
	normal	10	836.5	-13	-0.02	2091.25
FDD V HSDPA	normal = high	20	836.5	-15	-0.02	2091.25
Subtest 1	normal	30	836.5	15	0.02	2091.25
	normal	40	836.5	10	0.01	2091.25
	normal	50	836.5	11	0.01	2091.25
	low	20	836.5	7	0.01	2091.25

Radio Technology	Voltage	Temp (°C)	Frequency (MHz)	Frequency Error (Hz)	Deviation (ppm)	Limit (Hz)
	normal	-30	836.5	12	0.01	2091.25
	normal	-20	836.5	8	0.01	2091.25
	normal	-10	836.5	-7	-0.01	2091.25
	normal	0	836.5	6	0.01	2091.25
	normal	10	836.5	-8	-0.01	2091.25
FDD V HSUPA	normal = high	20	836.5	-8	-0.01	2091.25
Subtest 1	normal	30	836.5	11	0.01	2091.25
	normal	40	836.5	-14	-0.02	2091.25
	normal	50	836.5	8	0.01	2091.25
	low	20	836.5	-7	-0.01	2091.25
	normal	-30	836.5	7	0.01	2091.25
	normal	-20	836.5	5	0.01	2091.25
	normal	-10	836.5	5	0.01	2091.25
	normal	0	836.5	6	0.01	2091.25
	normal	10	836.5	5	0.01	2091.25
eFDD 5 QPSK	normal = high	20	836.5	5	0.01	2091.25
5 MHz, 1 RB	normal	30	836.5	-6	-0.01	2091.25
	normal	40	836.5	-6	-0.01	2091.25
	normal	50	836.5	-16	-0.02	2091.25
	low	20	836.5	5	0.01	2091.25

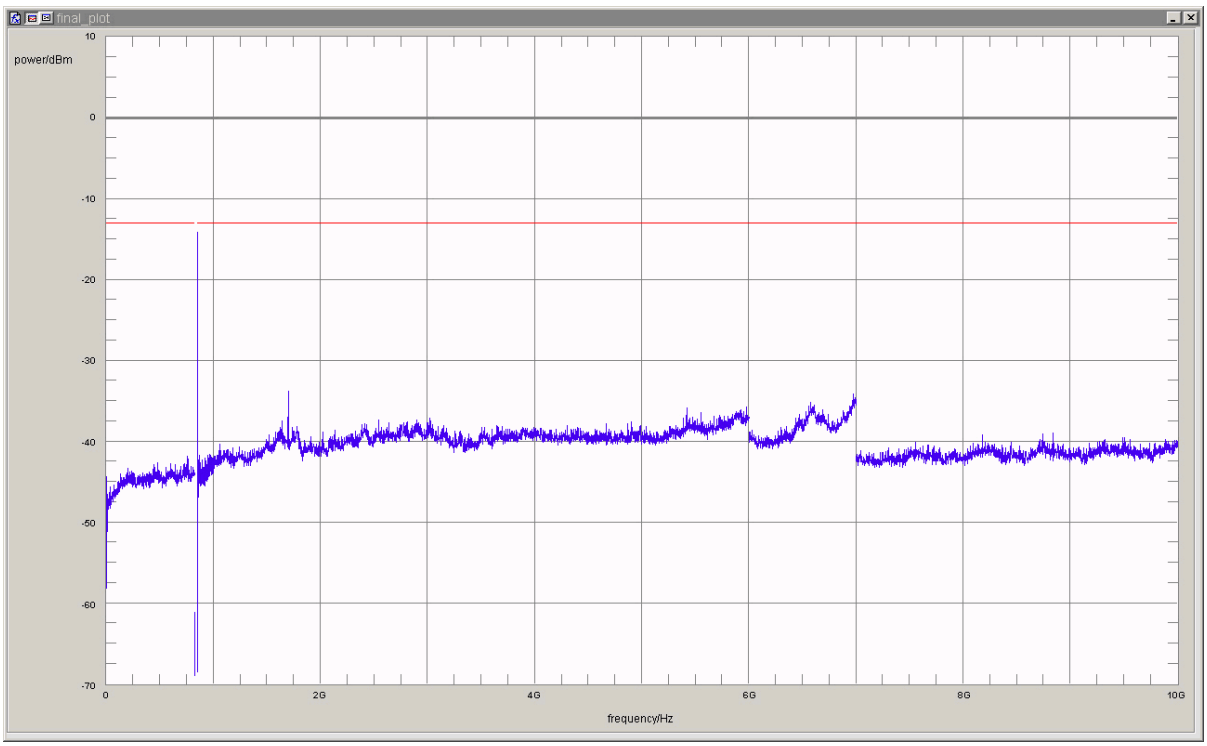
3.5.3 22.3 Spurious emissions at antenna terminals §2.1051, §22.917

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

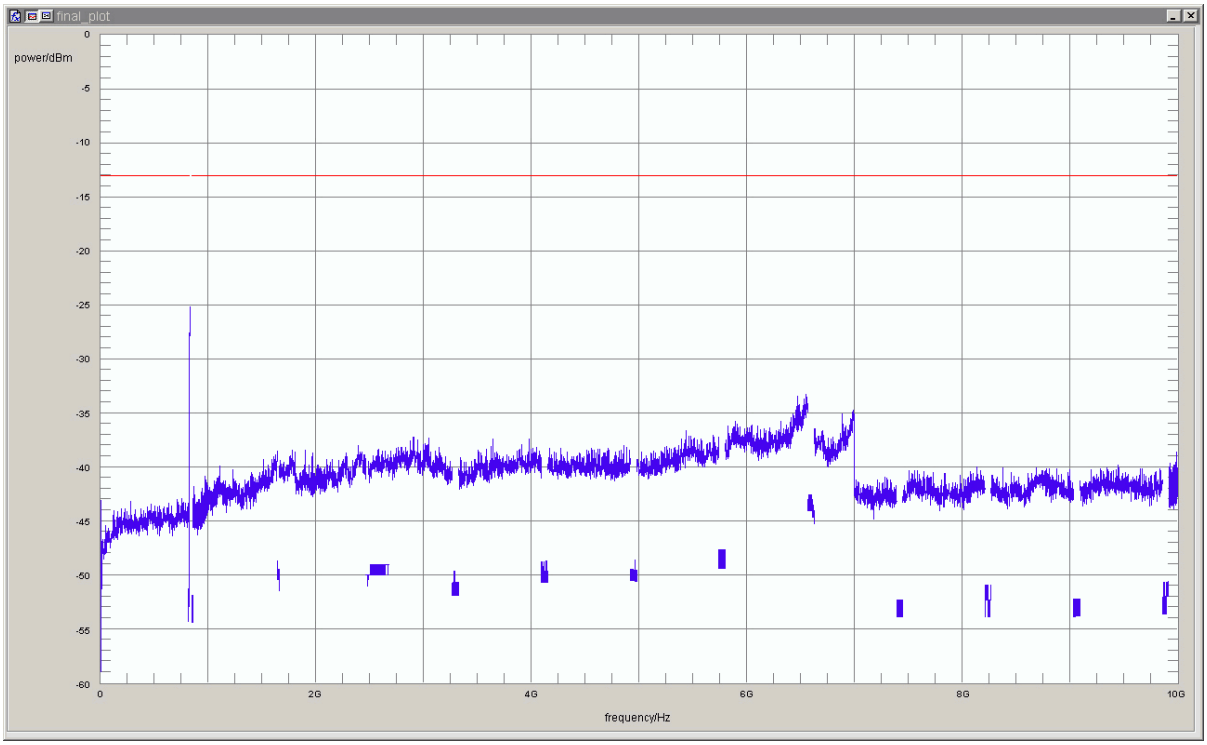
Result:	Passed
Setup No.:	S01_BB02
Date of Test:	2016/08/12 12:03
Body:	FCC47CFRChIPART22PUBLIC MOBILE SERVICES
Test Specification:	FCC part 2 and 22

Detailed Results:

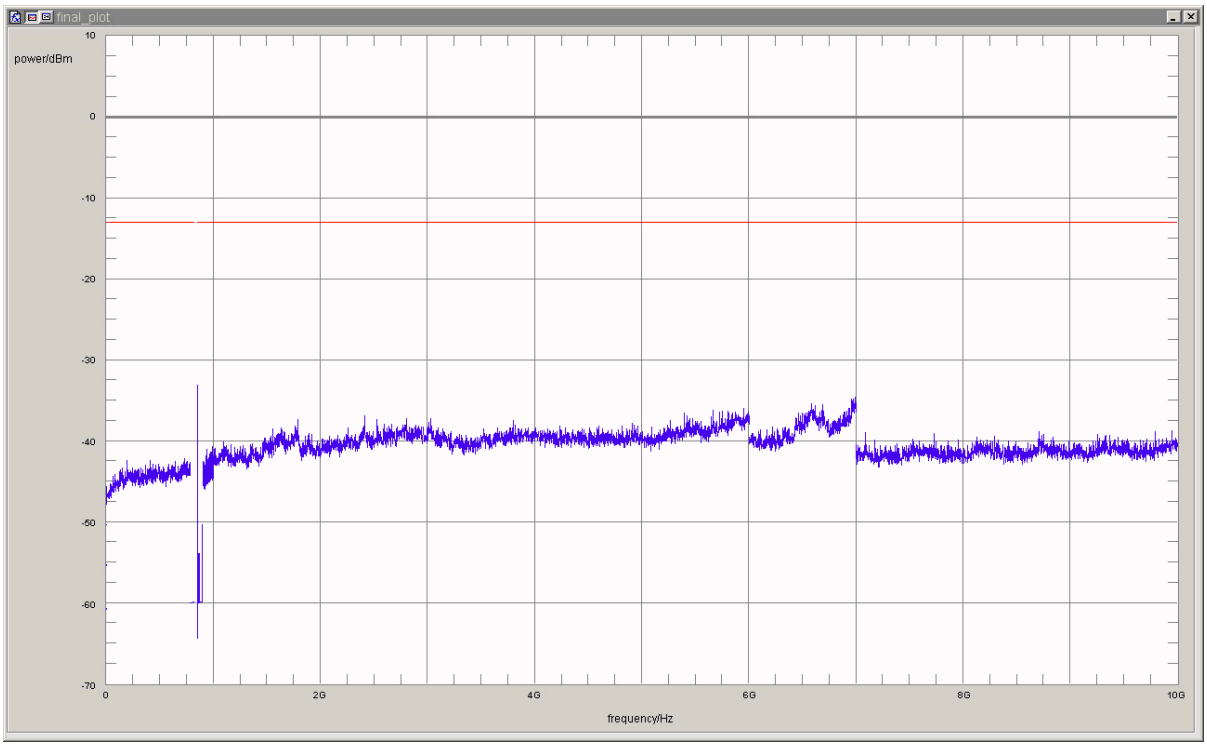
Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB
GSM 850 GPRS	low	peak	maxhold	3	823.98	-14.3	-13	1.3
GSM 850 GPRS	mid	peak	maxhold	-	-	-	-13	>20
GSM 850 GPRS	high	peak	maxhold	3	849.03	-14.2	-13	1.2
GSM 850 EDGE	low	peak	maxhold	3	823.97	-22.2	-13	9.2
GSM 850 EDGE	mid	peak	maxhold	-	-	-	-13	>20
GSM 850 EDGE	high	peak	maxhold	3	849.04	-22.5	-13	9.5
FDD V	low	rms	maxhold	50	824	-26.1	-13	13.1
FDD V	mid	rms	maxhold	-	-	-	-13	>20
FDD V	high	rms	maxhold	50	849	-28.2	-13	15.2
FDD V HSDPA Subtest 1	low	rms	maxhold	50	824	-27.4	-13	14.4
FDD V HSDPA Subtest 1	mid	rms	maxhold	-	-	-	-13	>20
FDD V HSDPA Subtest 1	high	rms	maxhold	50	849.16	-32	-13	19
FDD V HSUPA Subtest 5	low	rms	maxhold	50	824	-25.1	-13	12.1
FDD V HSUPA Subtest 5	mid	rms	maxhold	-	-	-	-13	>20
FDD V HSUPA Subtest 5	high	rms	maxhold	50	849	-27.9	-13	14.9
eFDD 5 QPSK	low	rms	maxhold	5	823.99	-33.42	-13	20.42
eFDD 5 QPSK	mid	rms	maxhold	-	-	-	-13	>20
eFDD 5 QPSK	high	rms	maxhold	5	849	-33.12	-13	20.12



GSM 850 GPRS high channel



FDD V HSUPA Subtest 5 low channel



eFDD 5 high channel 5 MHz QPSK 1 RB

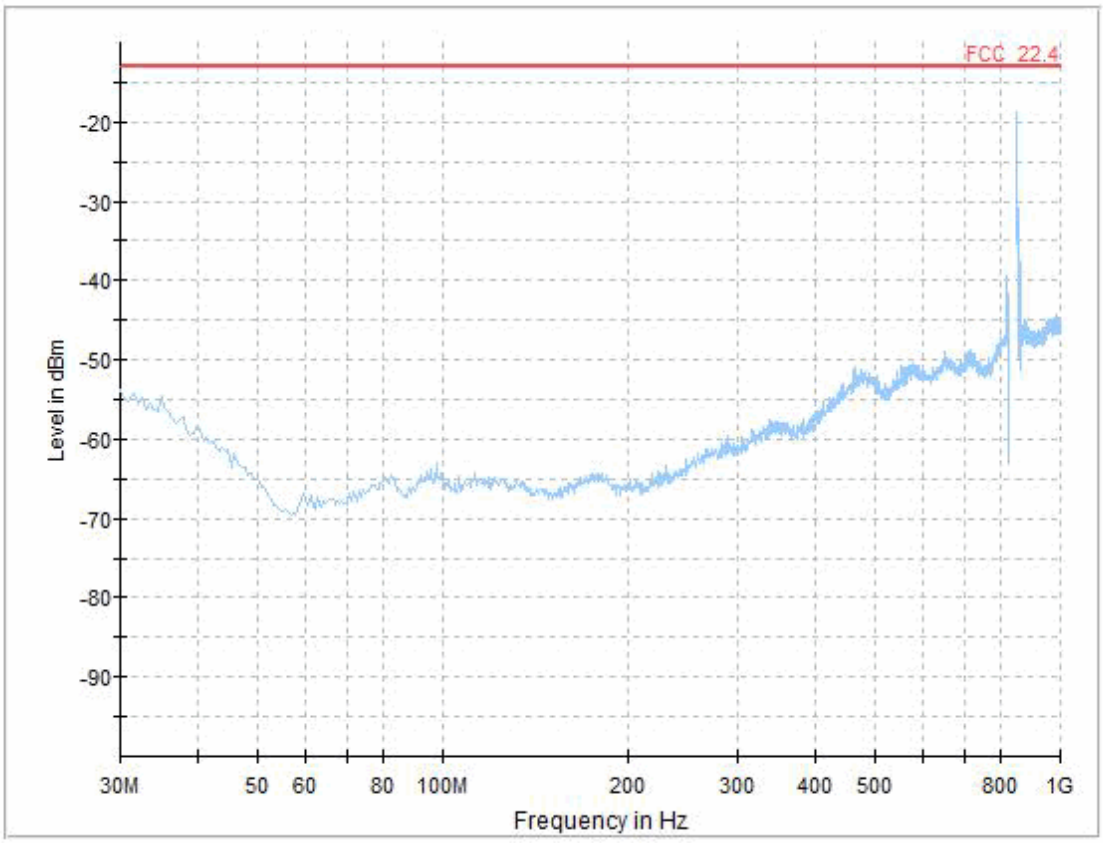
3.5.4 22.4 Field strength of spurious radiation §2.1053, §22.917

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

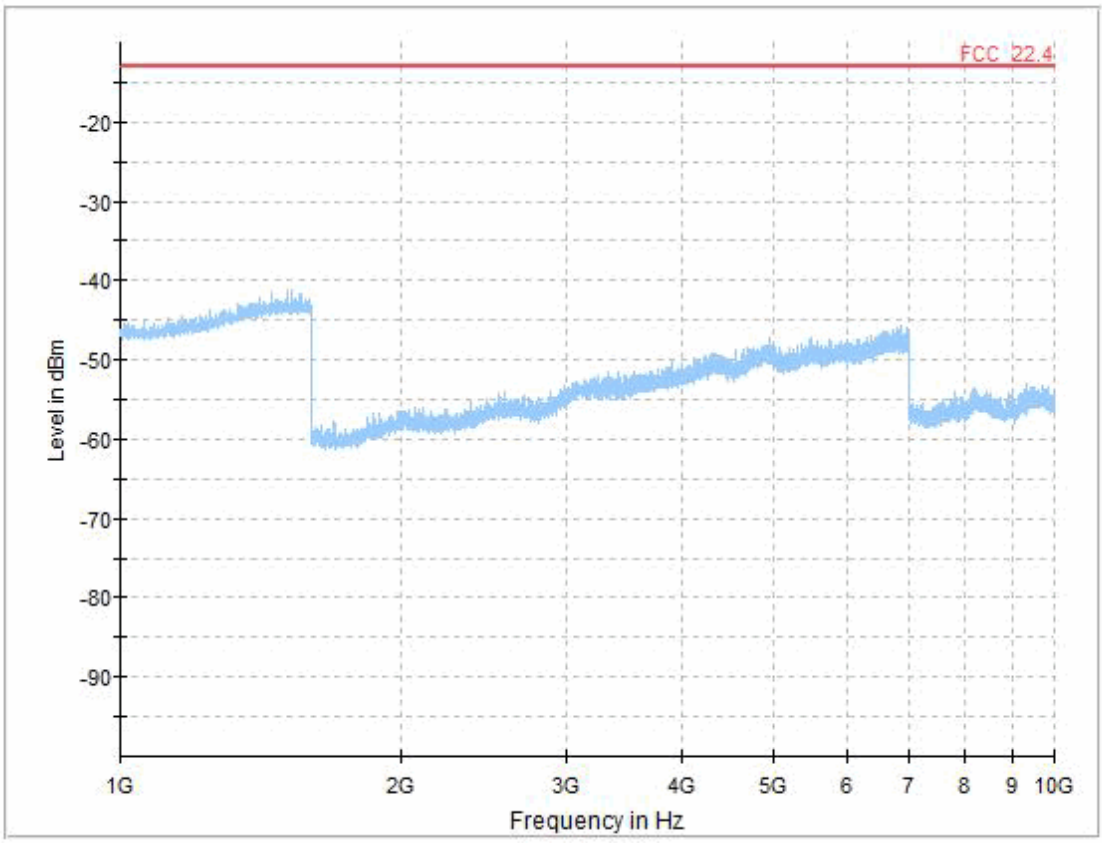
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/08/04 18:40
Body:	FCC47CFRChIPART22PUBLIC MOBILE SERVICES
Test Specification:	FCC part 2 and 22

Detailed Results:

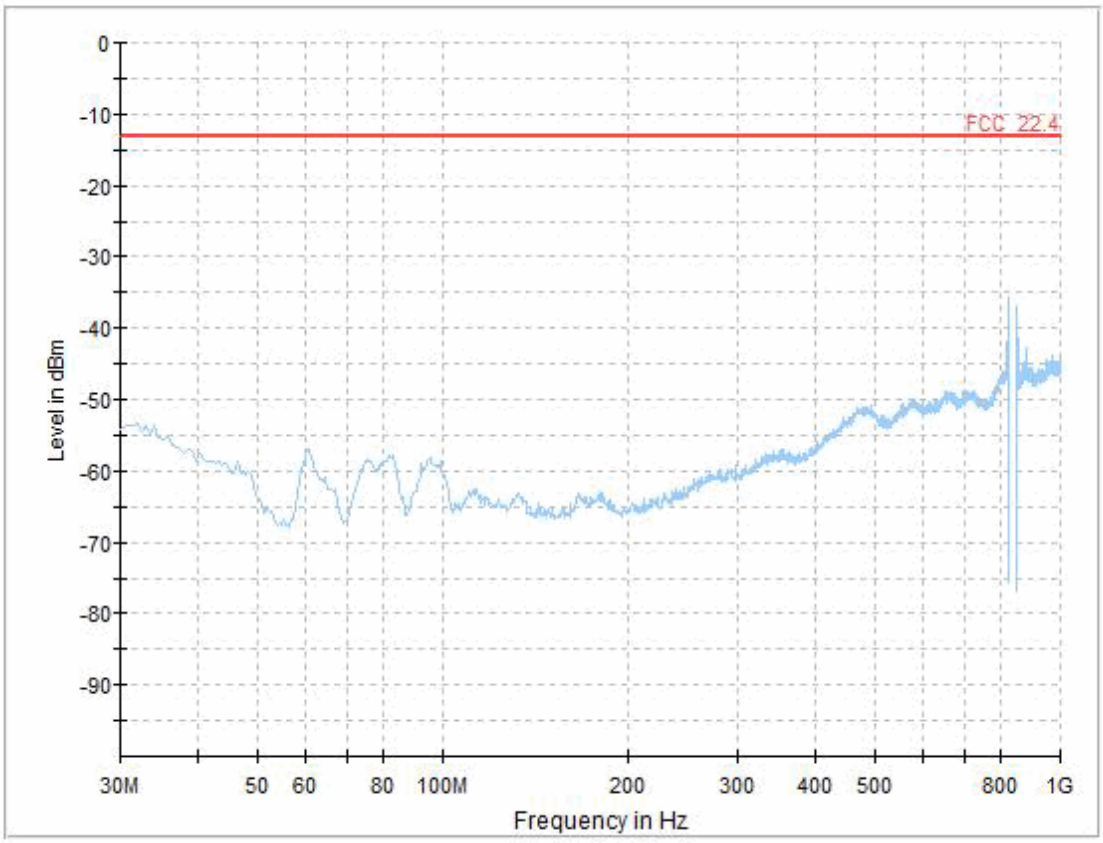
Radio Technology	Channel	Detector	Trace	Ressource Blocks	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB	Remark
GSM 850	low	peak	maxhold	-	3	824	-14.2	-13	1.2	1)
GSM 850	mid	peak	maxhold	-	1000	817.55	-42.8	-13	29.8	1)
GSM 850	high	peak	maxhold	-	3	849.02	-20.2	-13	7.2	1)
GSM 850 EDGE	low	peak	maxhold	-	3	824	-22.7	-13	9.7	1)
GSM 850 EDGE	mid	peak	maxhold	-	1000	818.4	-41.4	-13	28.4	1)
GSM 850 EDGE	high	peak	maxhold	-	3	849.04	-22.6	-13	9.6	1)
FDD V	low	peak	maxhold	-	100	822.87	-21.6	-13	8.6	1)
FDD V	low	peak	maxhold	-	50	823.87	-23.1	-13	10.1	1)
FDD V	mid	peak	maxhold	-	1000	816.56	-41.8	-13	28.8	1)
FDD V	high	peak	maxhold	-	50	849.17	-23.1	-13	10.1	1)
FDD V HSDPA Subtest 1	low	peak	maxhold	-	50	824	-21.2	-13	8.2	1)
FDD V HSDPA Subtest 1	mid	peak	maxhold	-	1000	850	-32.6	-13	19.6	1)
FDD V HSDPA Subtest 1	high	peak	maxhold	-	50	849	-17.7	-13	4.7	1)
FDD V HSUPA Subtest 1	low	peak	maxhold	-	100	822.78	-27.4	-13	14.4	1)
FDD V HSUPA Subtest 1	low	peak	maxhold	-	50	823.83	-22.2	-13	9.2	1)
FDD V HSUPA Subtest 1	mid	peak	maxhold	-	1000	850.6	-34.5	-13	21.5	1)
FDD V HSUPA Subtest 1	high	peak	maxhold	-	50	849	-18.9	-13	5.9	1)
FDD V HSUPA Subtest 1	high	peak	maxhold	-	100	850.18	-24.9	-13	11.9	1)
eFDD 5 QPSK	low	RMS	maxhold	1	3	824	-37	-13	24	2)
eFDD 5 QPSK	mid	peak	maxhold	1	1000	822.5	-35.9	-13	22.9	1)
eFDD 5 QPSK	high	RMS	maxhold	1	3	849	-36.6	-13	23.6	2)
1) Performed in the range 30 MHz - 10 GHz										
2) Performed around band and around harmonics only (since no peaks outside this range were seen in pre tests)										



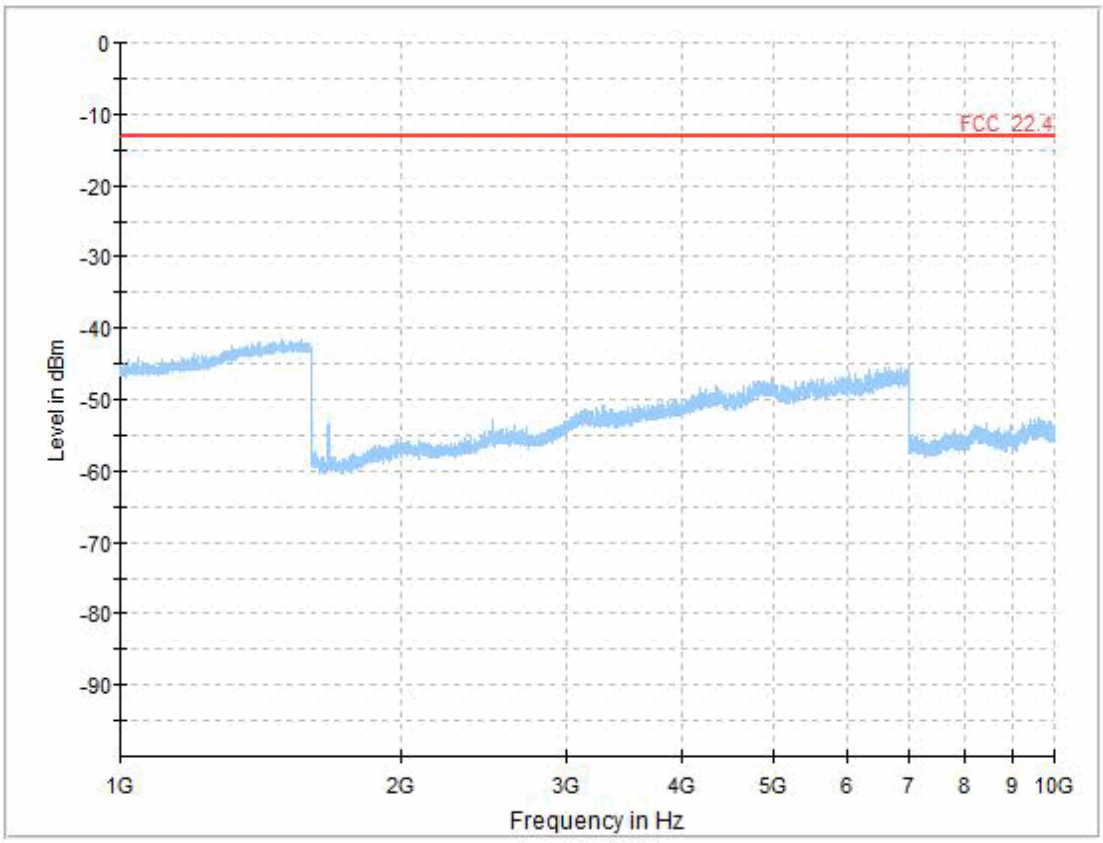
HSUPA FDD V high channel, 30 MHz - 1 GHz



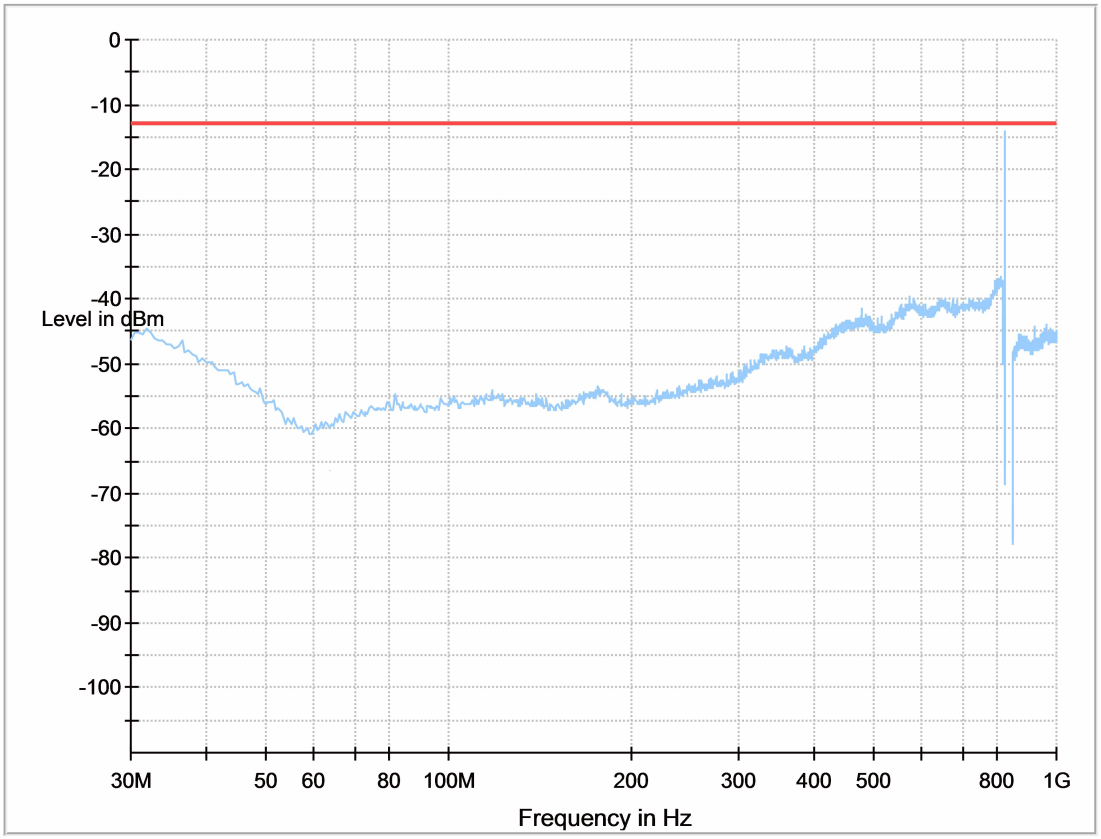
HSUPA FDD V high channel, 1 GHz - 10 GHz



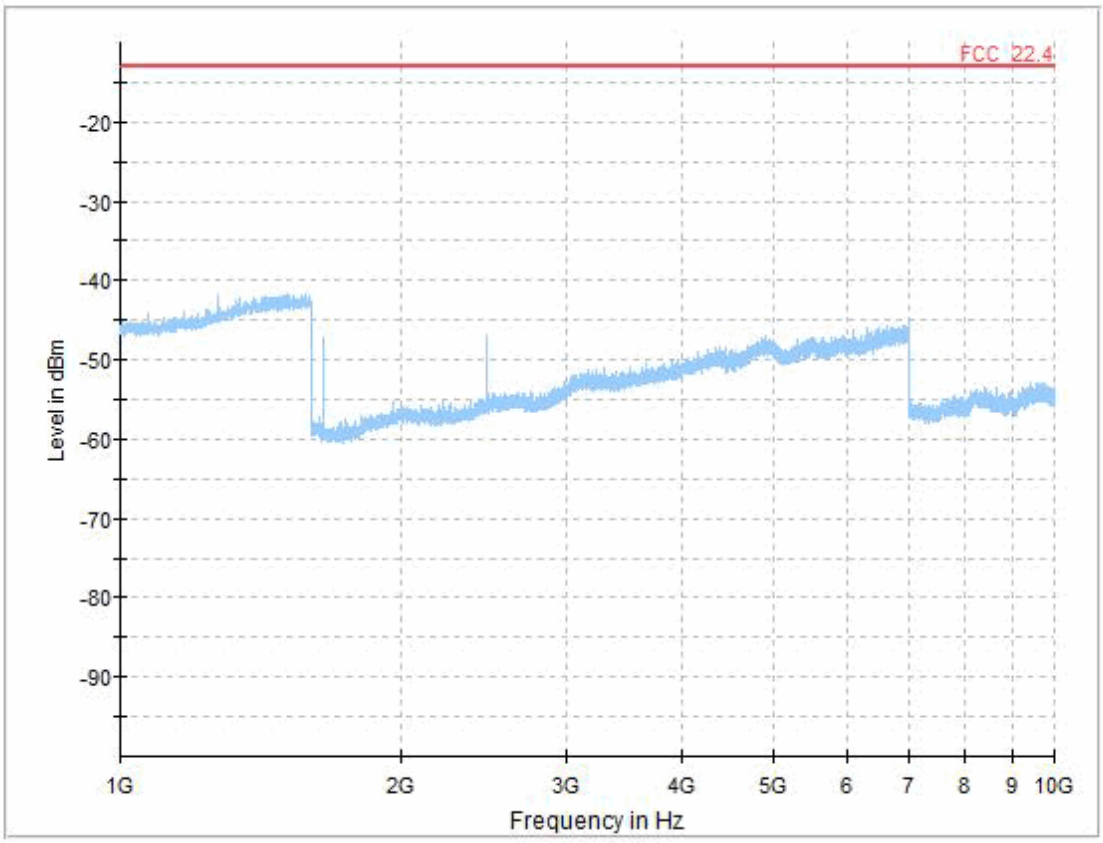
LTE eFDD 5 mid channel, 30 MHz - 1 GHz



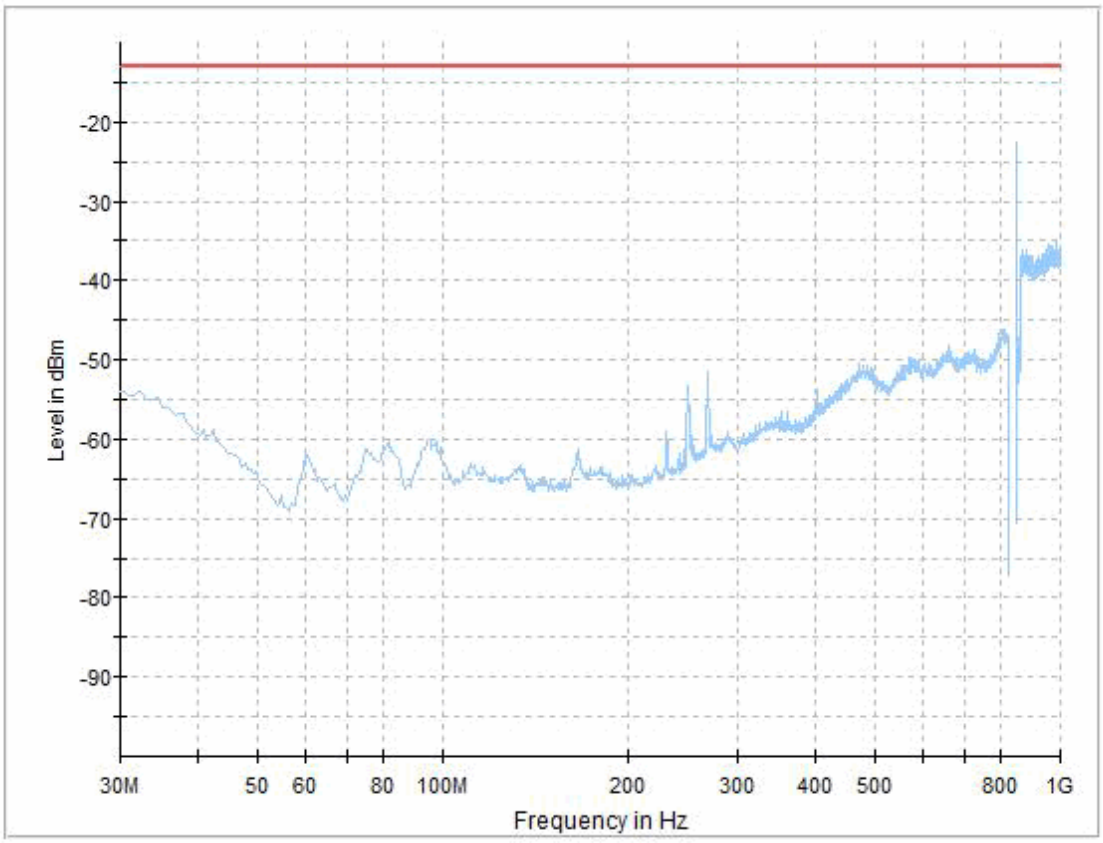
LTE eFDD 5 mid channel, 1 GHz - 10 GHz



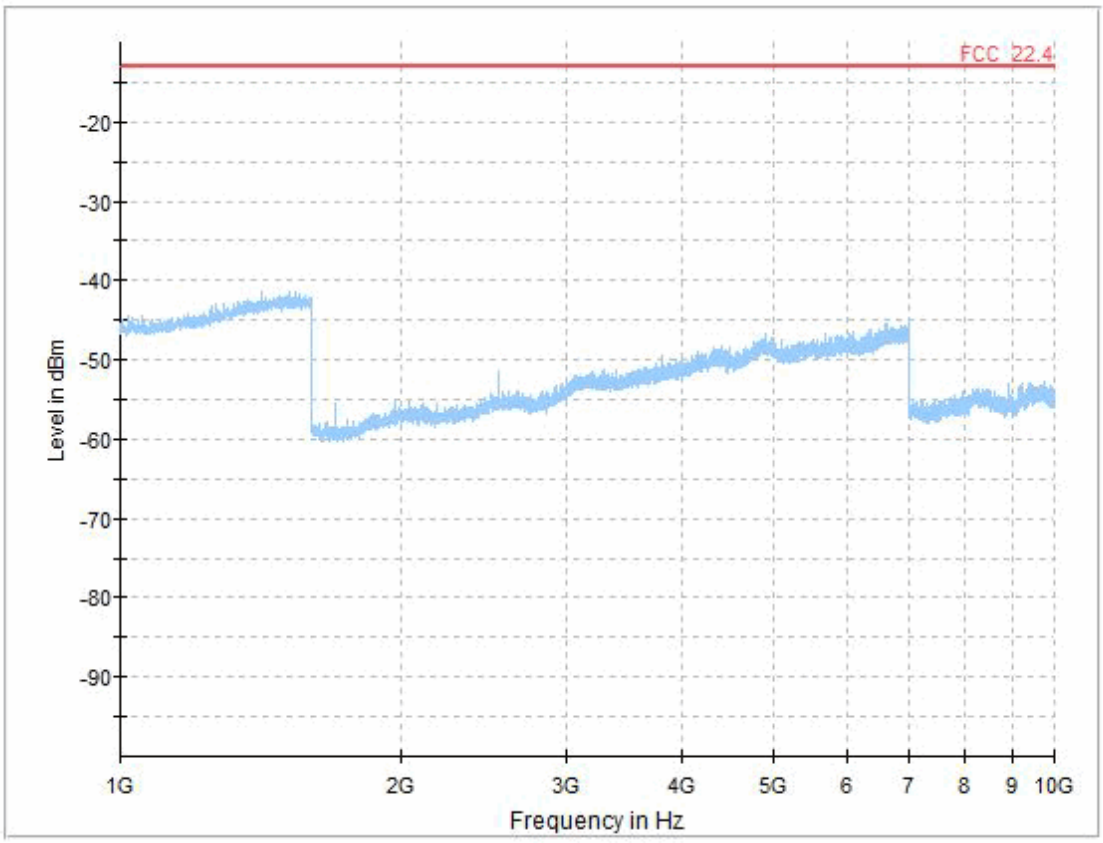
GSM 850 low channel, 30 MHz - 1 GHz



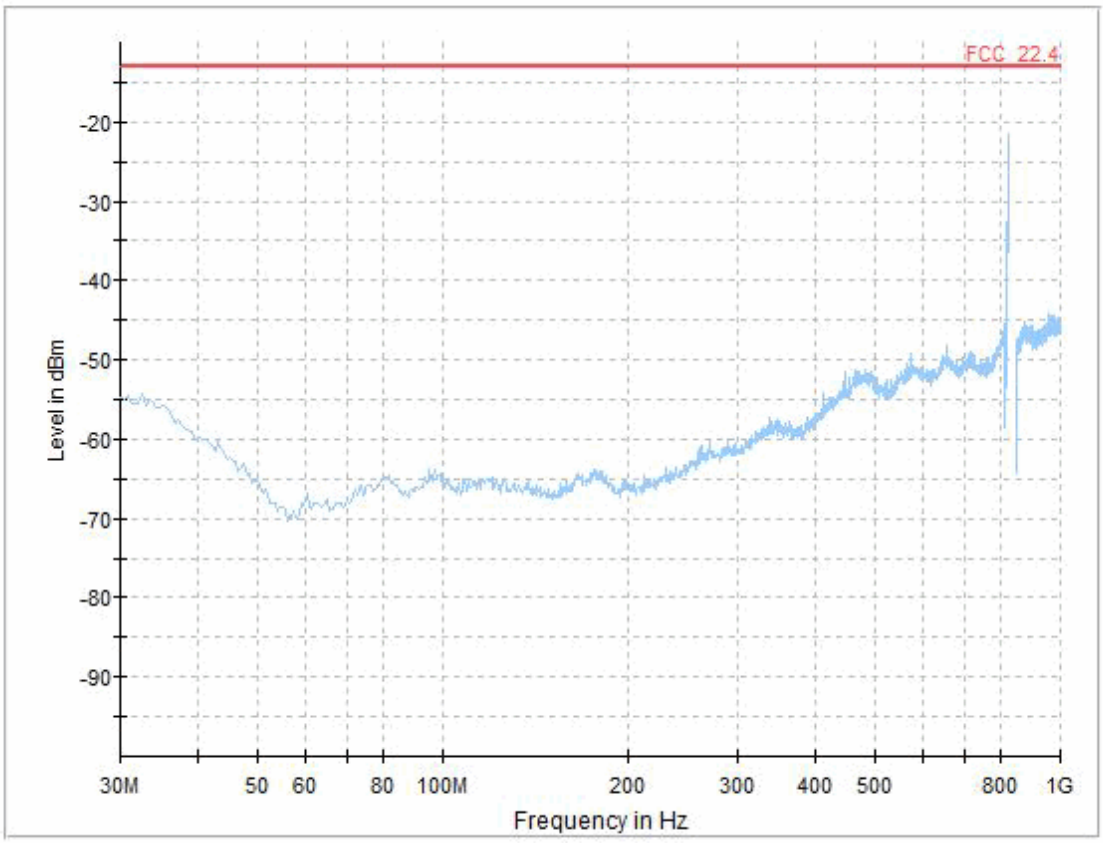
GSM 850 low channel, 1 GHz - 10 GHz



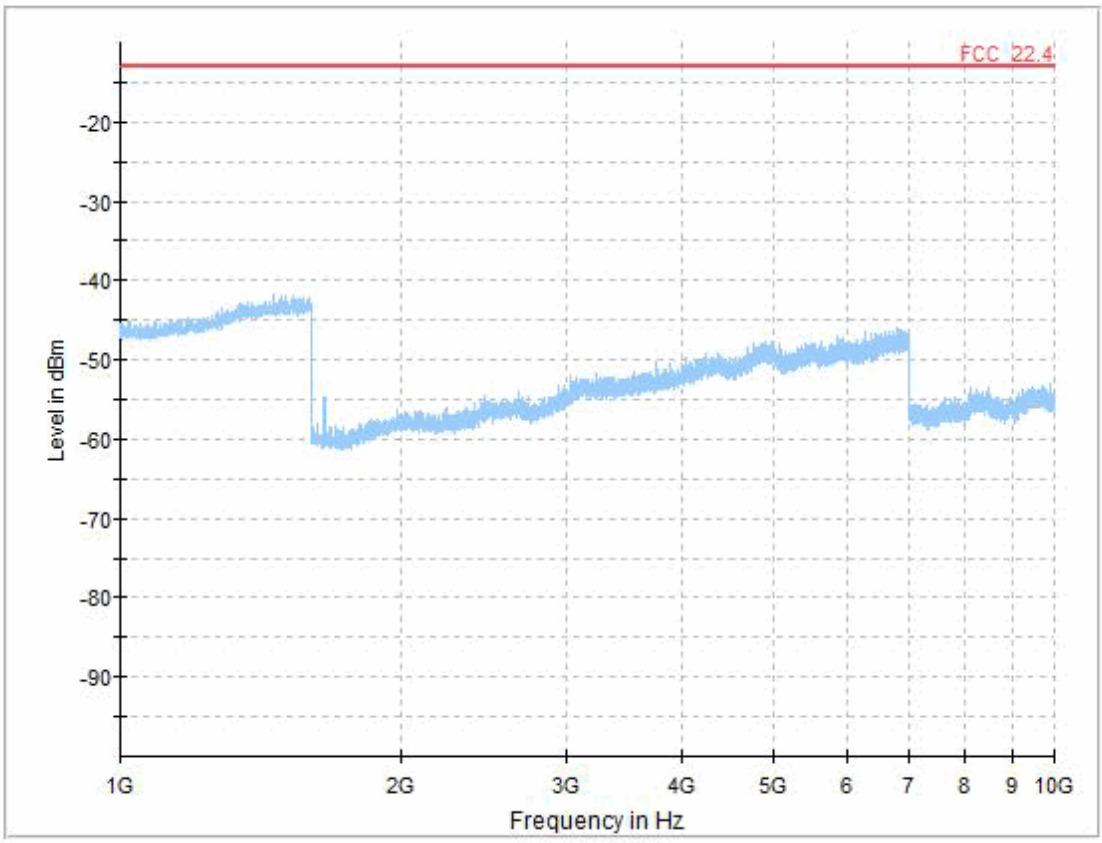
EDGE 850 high channel, 30 MHz - 1 GHz



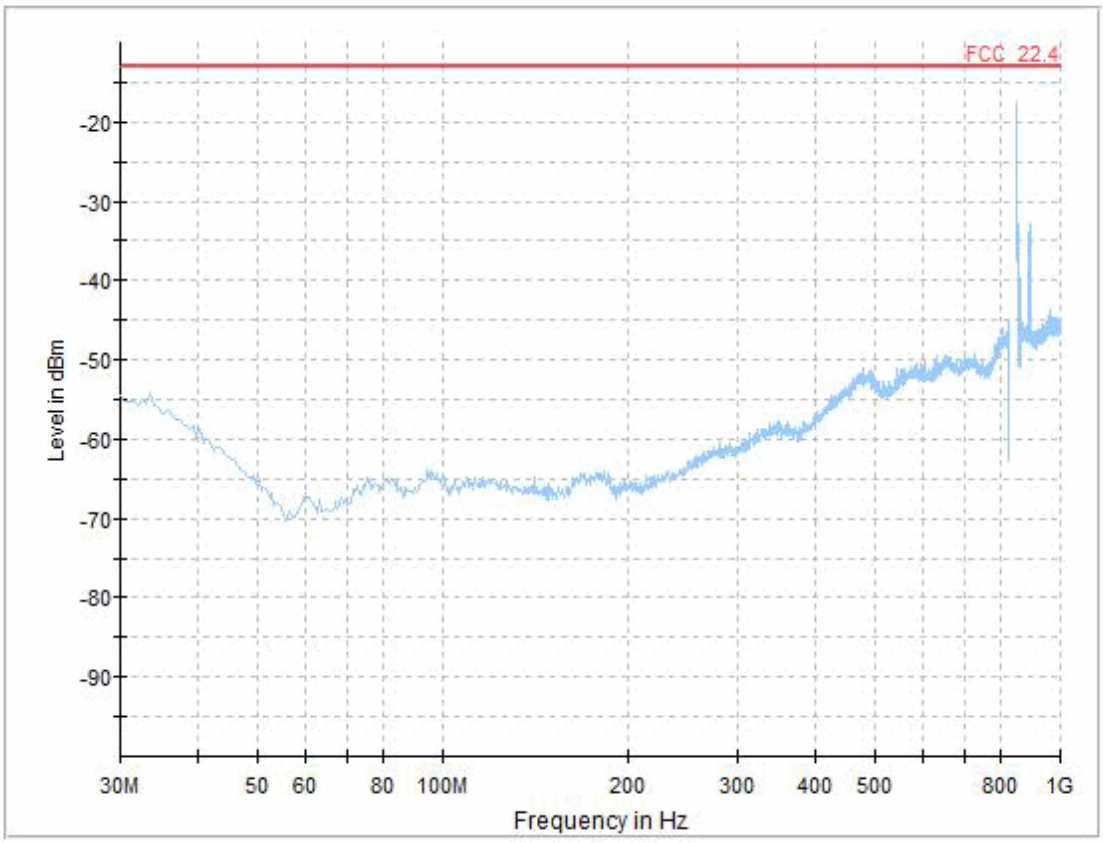
EDGE 850 high channel, 1 GHz - 10 GHz



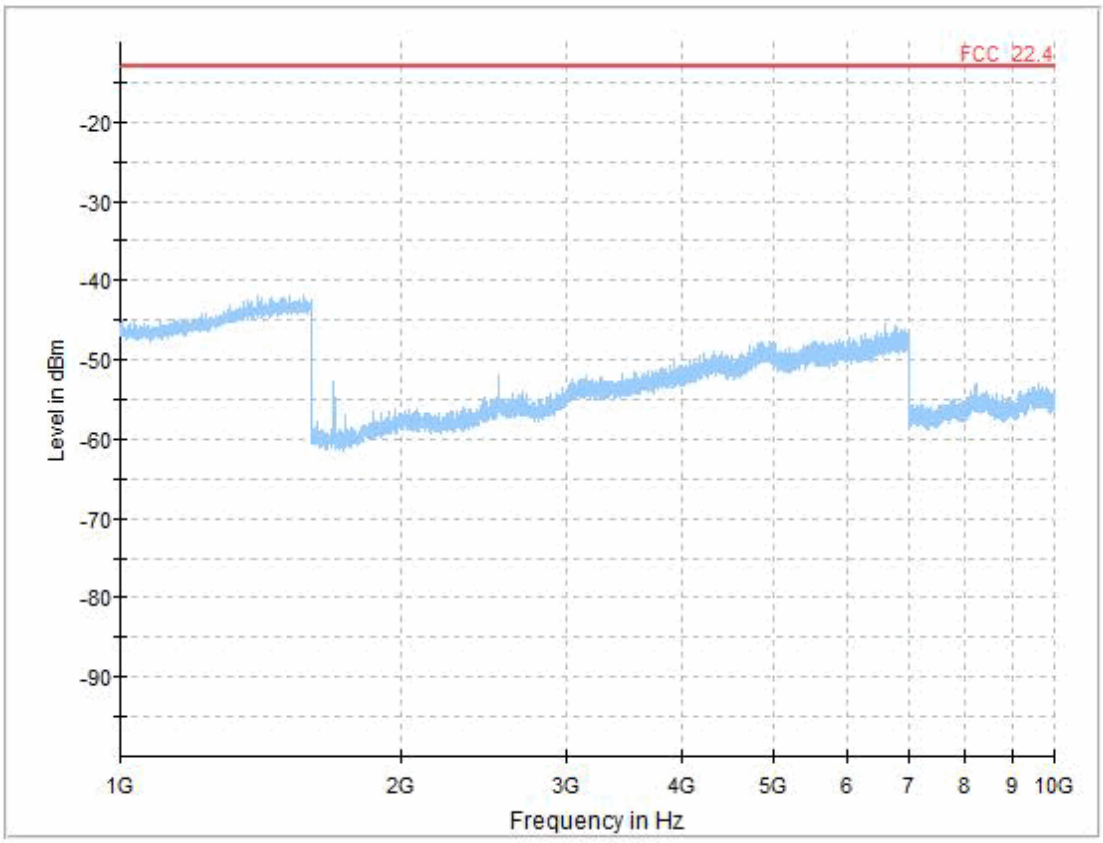
WCDMA FDD V low channel, 30 MHz - 1 GHz



WCDMA FDD V low channel, 1 GHz - 10 GHz



HSDPA FDD V high channel, 30 MHz - 1 GHz



HSDPA FDD V high channel, 1 GHz - 10 GHz

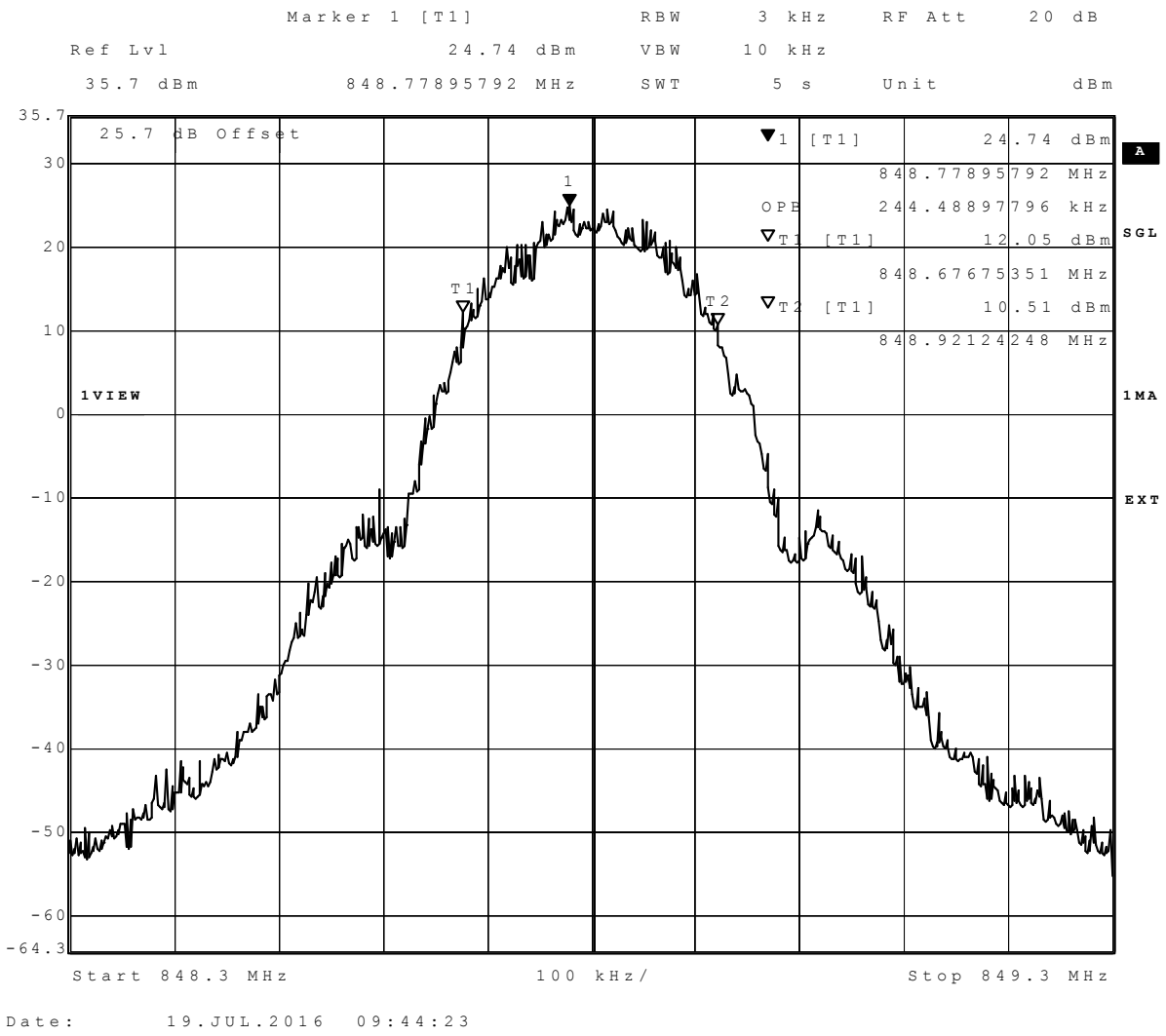
3.5.5 22.5 Emission and Occupied Bandwidth §2.1049, §22.917

Test: 22.5; Emission and Occupied Bandwidth Summary §2.1049, §22.917

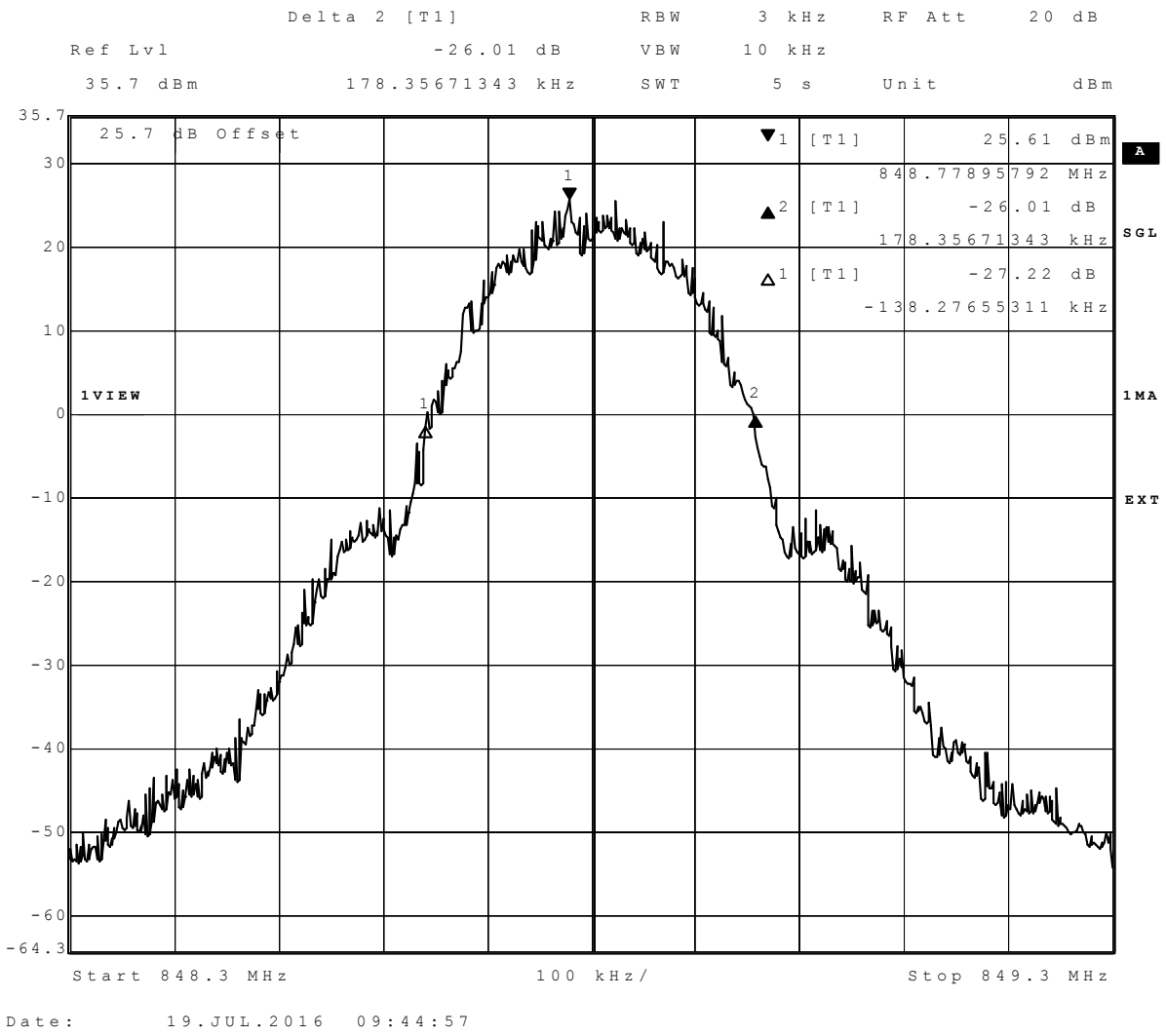
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/20 16:27
Body:	FCC47CFRChIPART22PUBLIC MOBILE SERVICES
Test Specification:	FCC part 2 and 22

Detailed Results:

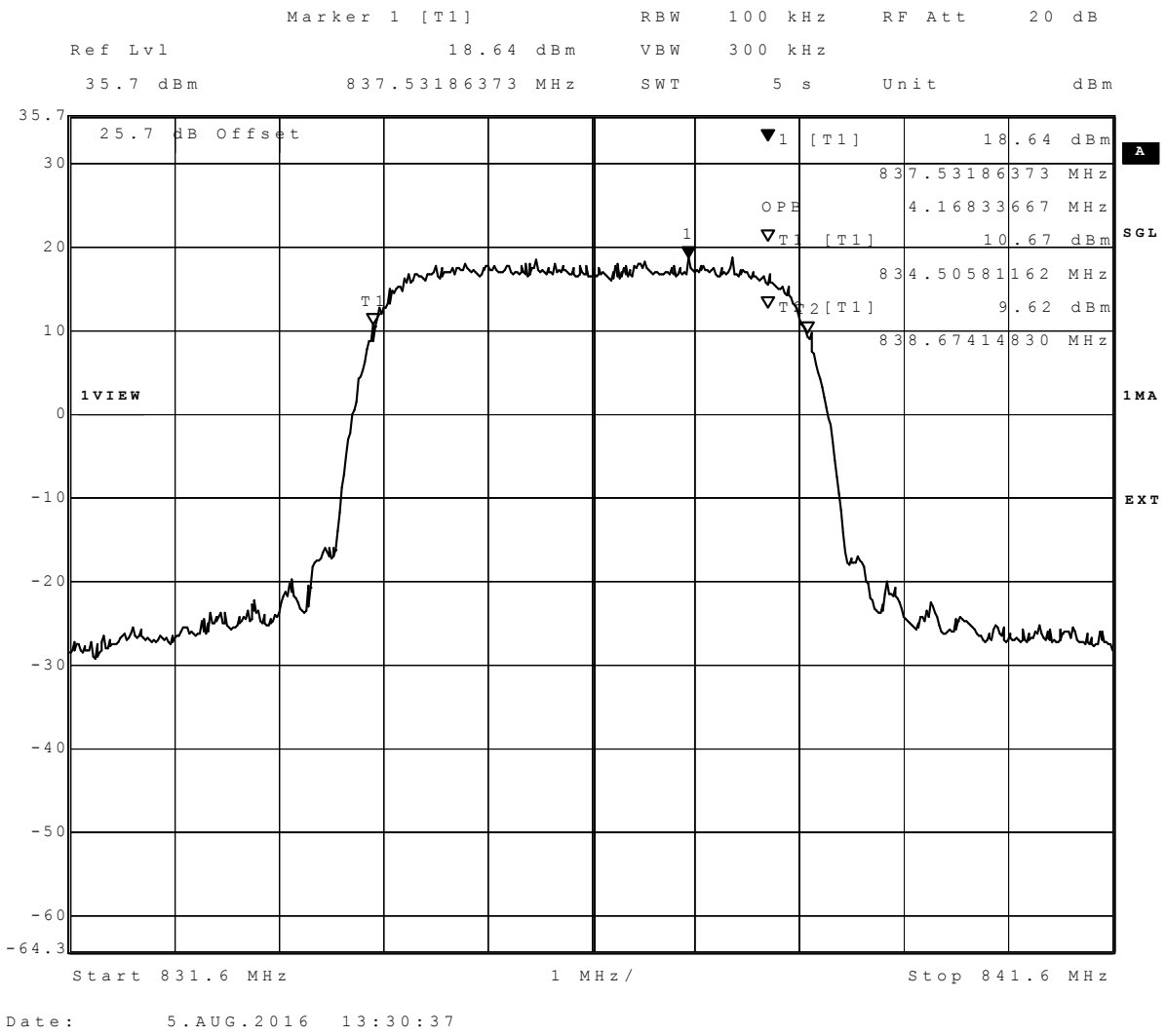
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	26 dB BW [kHz]	99 % BW [kHz]
GSM 850 GPRS	low	-	0.2	310.6	244.5
GSM 850 GPRS	mid	-	0.2	314.6	242.5
GSM 850 GPRS	high	-	0.2	**316.6**	**244.5**
GSM 850 EDGE	low	-	0.2	292.6	240.5
GSM 850 EDGE	mid	-	0.2	284.6	230.5
GSM 850 EDGE	high	-	0.2	284.6	236.5
FDD V	low	-	5	4749.5	4128.3
FDD V	mid	-	5	4769.5	4128.3
FDD V	high	-	5	4749.5	4128.3
FDD V HSDPA Subtest 1	low	-	5	4749.5	4128.3
FDD V HSDPA Subtest 1	mid	-	5	4749.5	4148.3
FDD V HSDPA Subtest 1	high	-	5	4769.5	4148.3
FDD V HSUPA Subtest 1	low	-	5	4769.5	4148.3
FDD V HSUPA Subtest 1	mid	-	5	4769.5	4148.3
FDD V HSUPA Subtest 1	high	-	5	4749.5	4168.3
FDD V HSUPA Subtest 5	low	-	5	4789.3	4168.3
FDD V HSUPA Subtest 5	mid	-	5	**4789.6**	**4168.3**
FDD V HSUPA Subtest 5	high	-	5	4789.6	4148.3
eFDD 5 QPSK	low	6	1.4	-	1100.2
eFDD 5 QPSK	mid	6	1.4	-	1100.2
eFDD 5 QPSK	high	6	1.4	-	**1106.2**
eFDD 5 16QAM	low	6	1.4	-	1100.2
eFDD 5 16QAM	mid	6	1.4	-	1094.2
eFDD 5 16QAM	high	6	1.4	-	1100.2
eFDD 5 QPSK	low	15	3	-	2753.5
eFDD 5 QPSK	mid	15	3	-	2765.5
eFDD 5 QPSK	high	15	3	-	2753.5
eFDD 5 16QAM	low	15	3	-	**2777.5**
eFDD 5 16QAM	mid	15	3	-	2753.5
eFDD 5 16QAM	high	15	3	-	2753.5
eFDD 5 QPSK	low	25	5	-	4529.1
eFDD 5 QPSK	mid	25	5	-	4529.1
eFDD 5 QPSK	high	25	5	-	4529.1
eFDD 5 16QAM	low	25	5	-	4529.1
eFDD 5 16QAM	mid	25	5	-	**4549.1**
eFDD 5 16QAM	high	25	5	-	4529.1
eFDD 5 QPSK	low	50	10	-	9018
eFDD 5 QPSK	mid	50	10	-	8978
eFDD 5 QPSK	high	50	10	-	9018
eFDD 5 16QAM	low	50	10	-	9018
eFDD 5 16QAM	mid	50	10	-	**9018**
eFDD 5 16QAM	high	50	10	-	8978



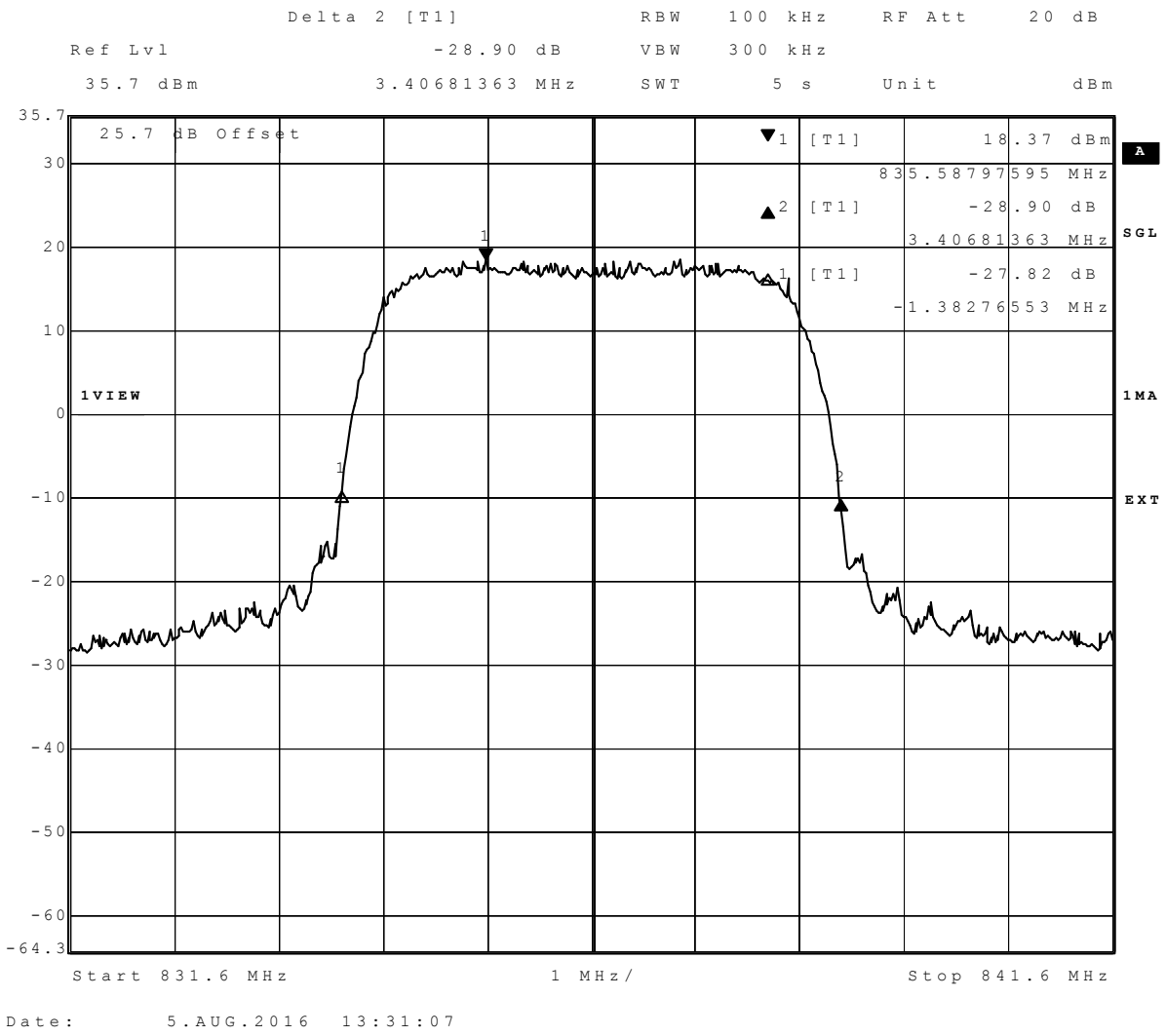
GSM 850 GPRS high channel 99% BW



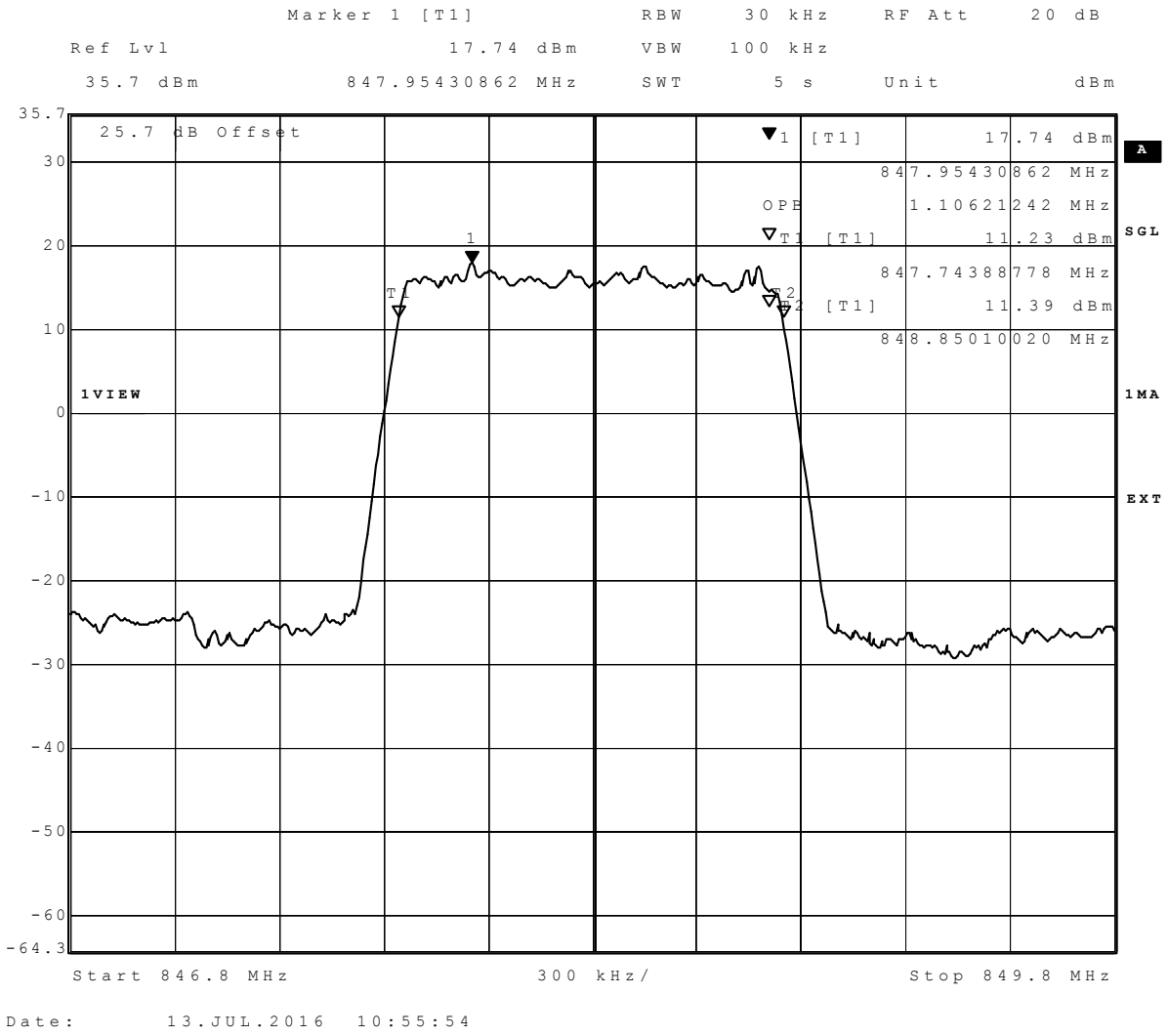
GSM 850 GPRS high channel 26 dB BW



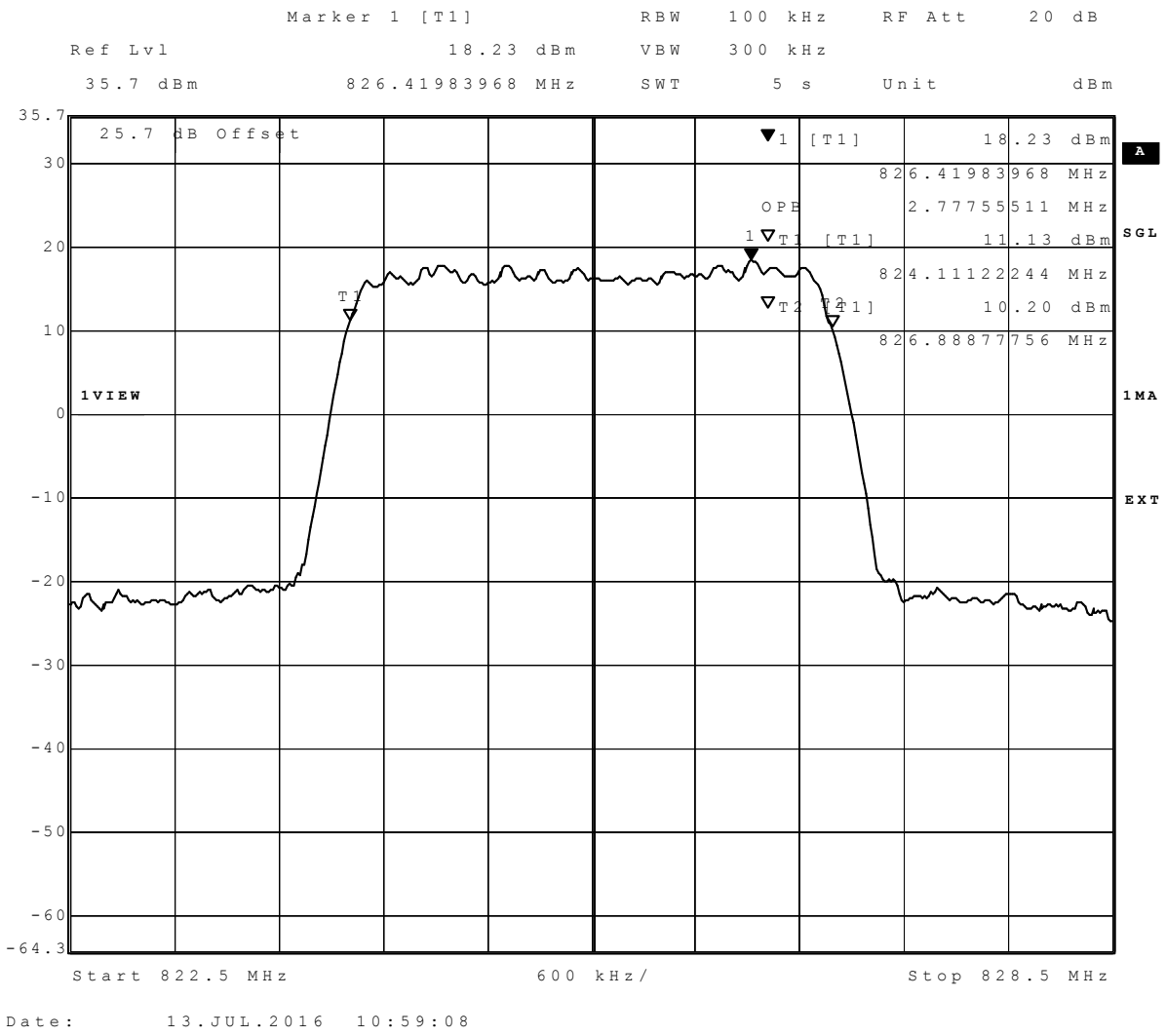
HSUPA Subtest 5 FDD V mid channel 99 % BW



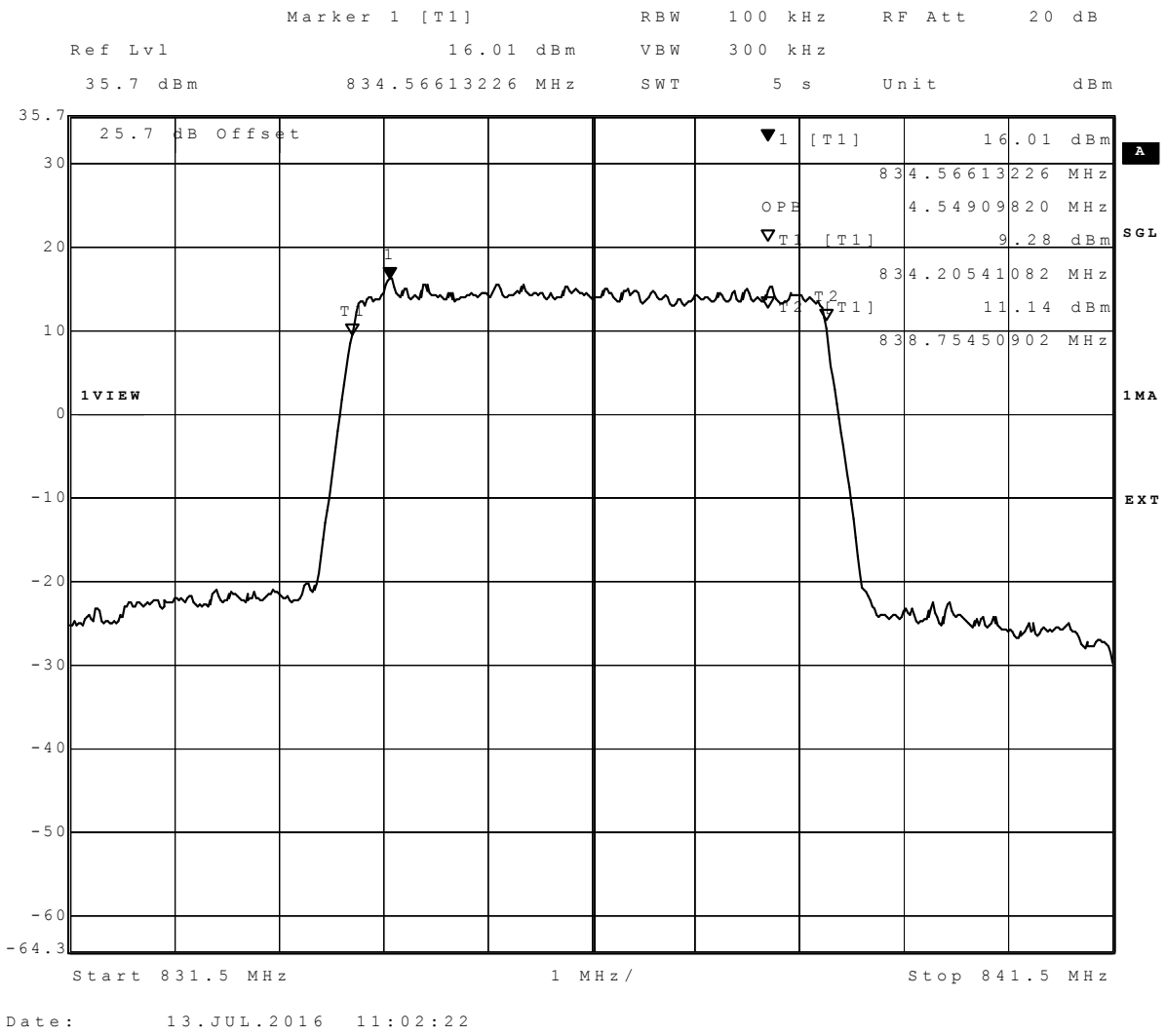
HSUPA Subtest 5 FDD V mid channel 26 dB BW



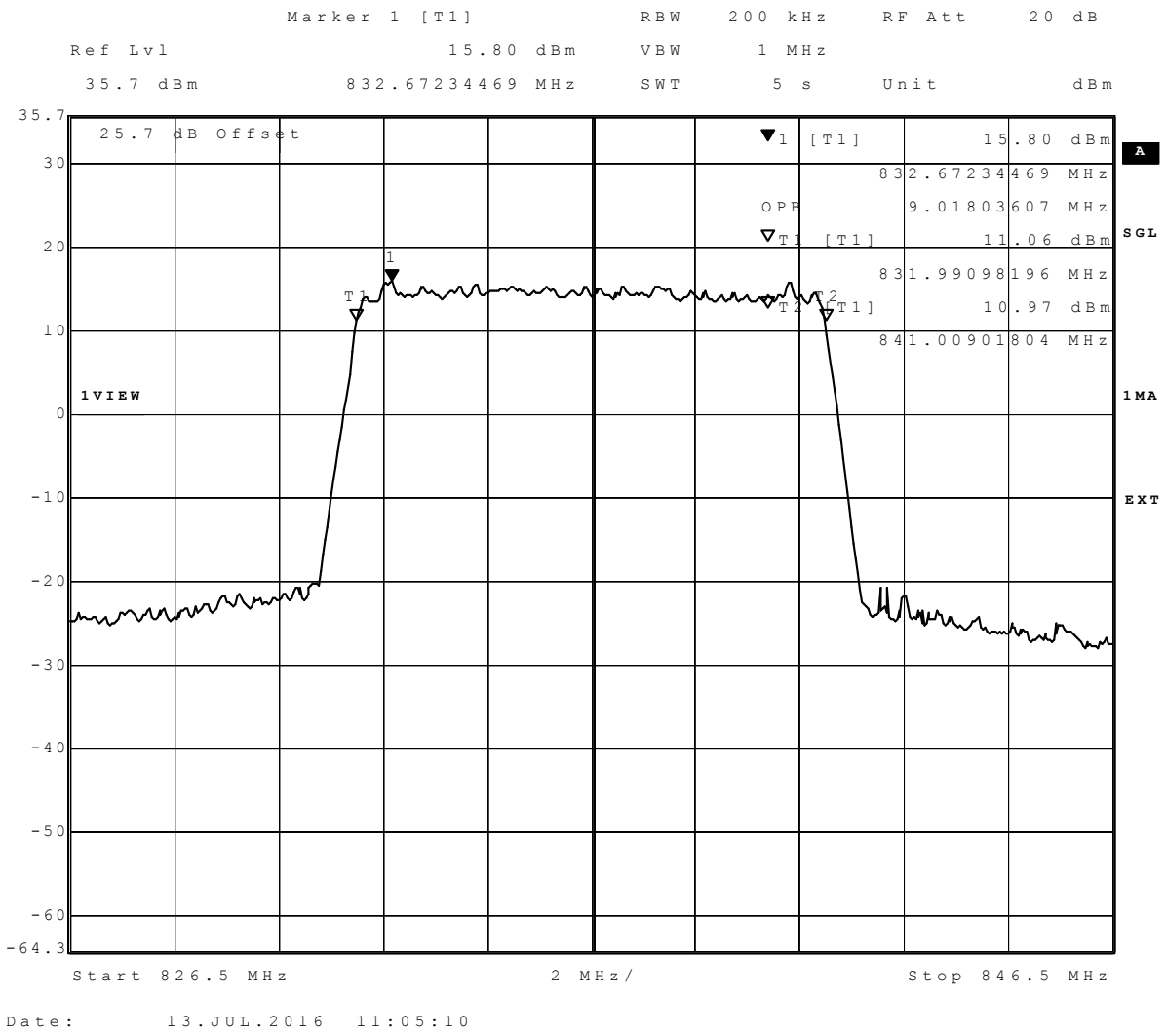
eFDD 5 high channel QPSK 1.4 MHz BW 6 RB



eFDD 5 low channel 16QAM 3 MHz BW 15 RB



eFDD 5 mid channel 16QAM 5 MHz BW 25 RB



eFDD 5 mid channel 16QAM 10 MHz BW 50 RB

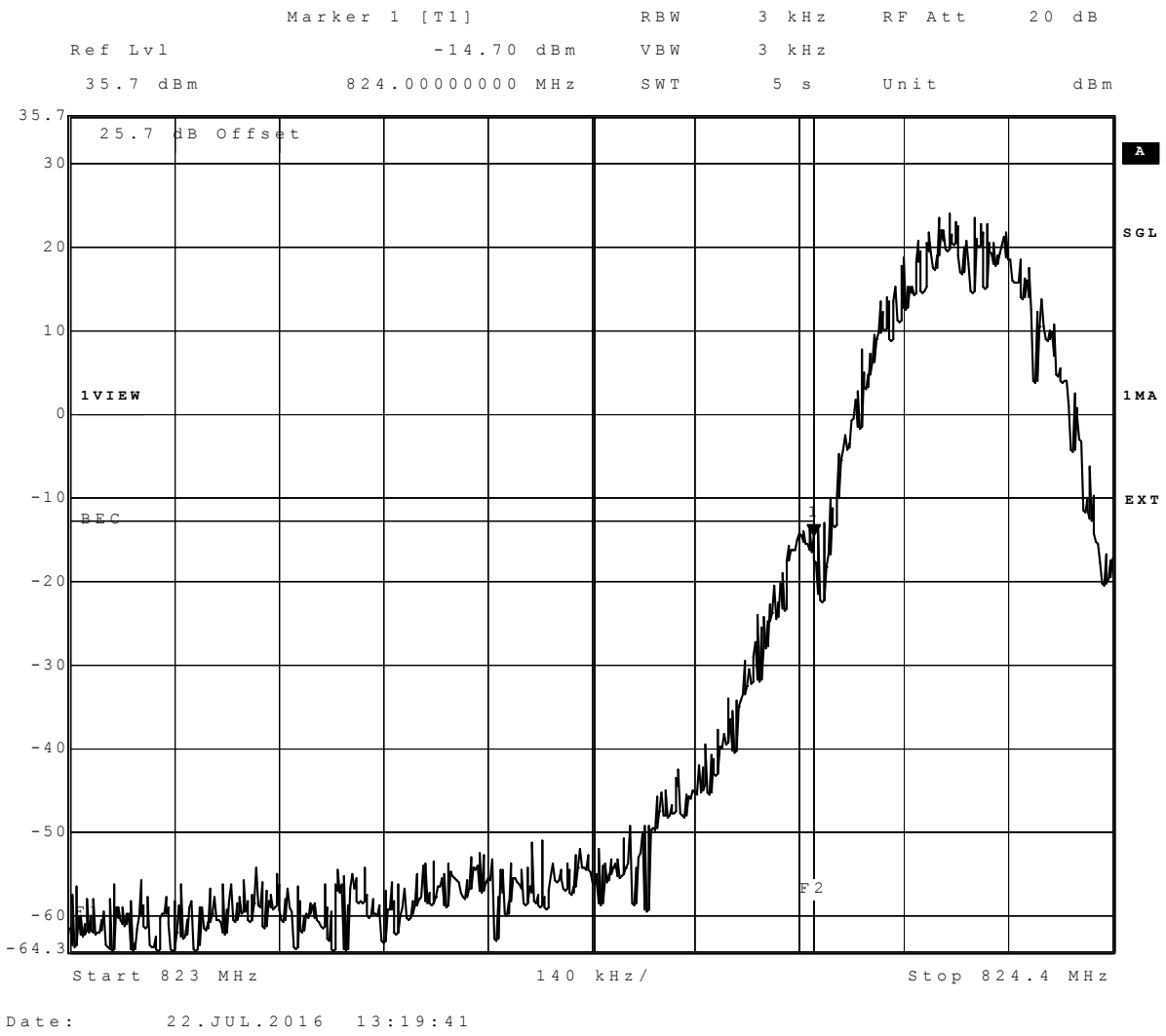
3.5.6 22.6 Band edge compliance §2.1053, §22.917

Test: 22.6; Band edge compliance Summary §2.1053, §22.917

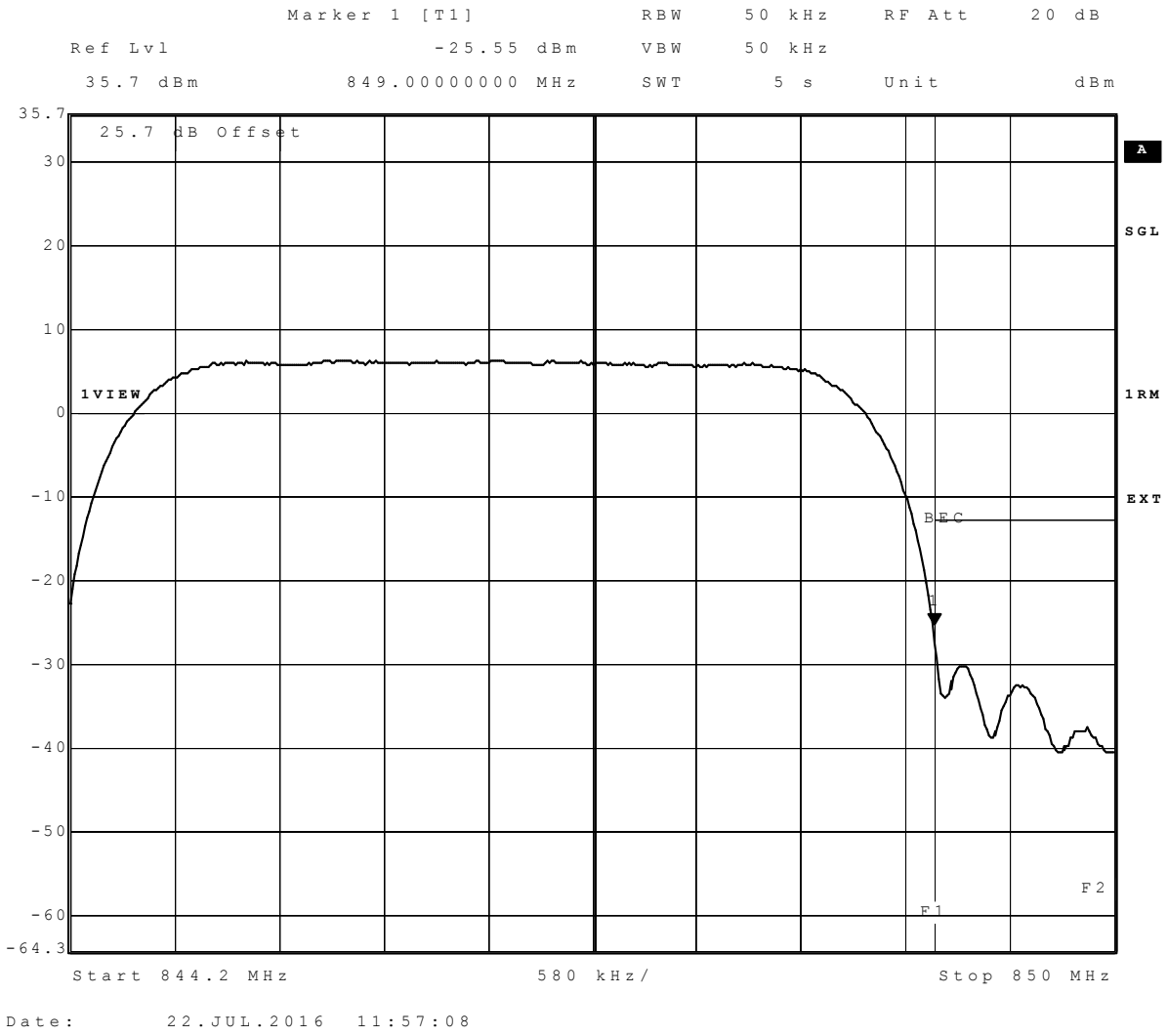
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/20 16:48
Body:	FCC47CFRChIPART22PUBLIC MOBILE SERVICES
Test Specification:	FCC part 2 and 22

Detailed Results:

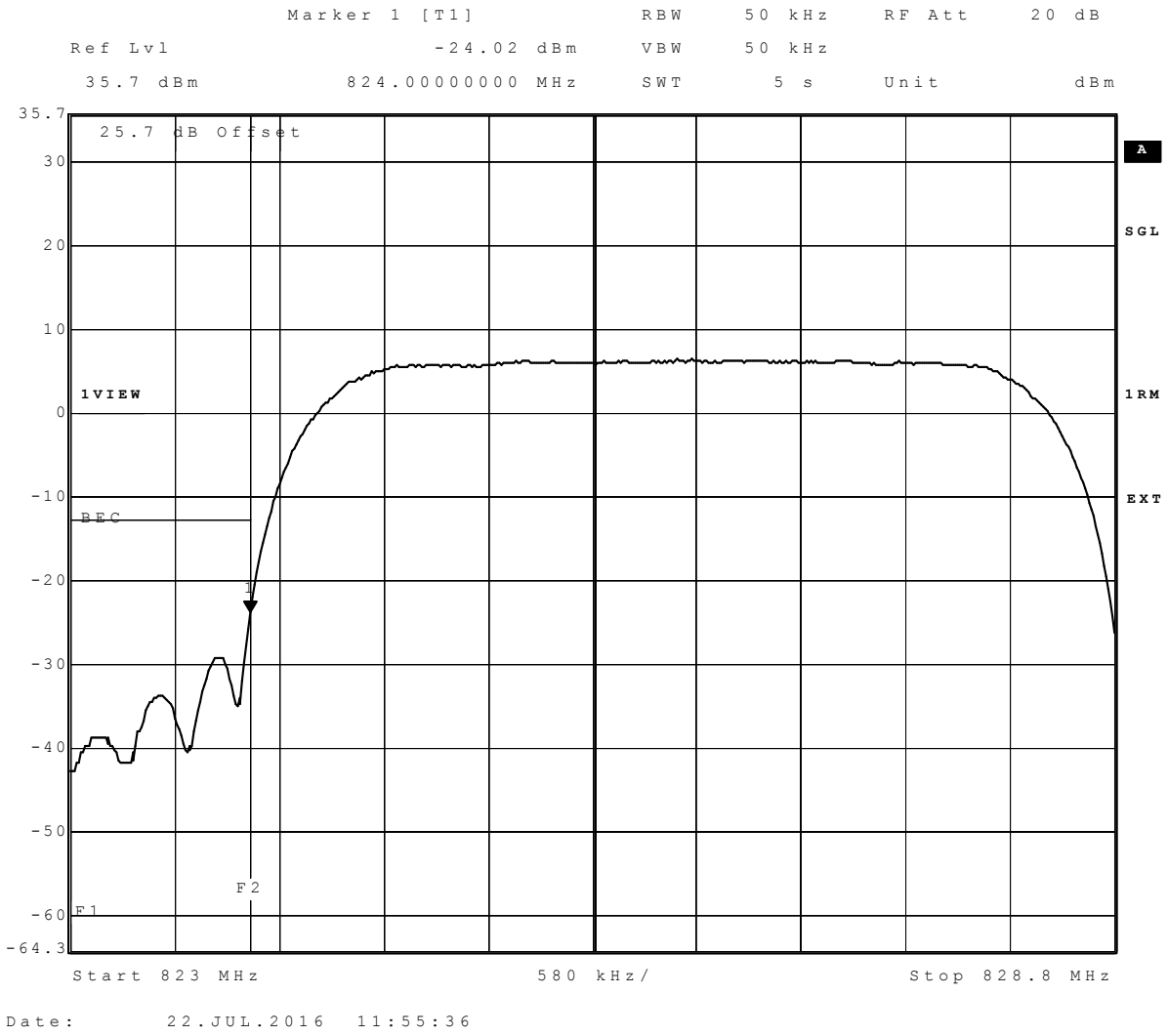
Radio Technology	Channel	Nominal BW	Ressource Blocks	Peak [dBm]	RMS [dBm]	Limit /dBm	Margin to Limit /dB
GSM 850 GPRS	low	0.2	-	**-14.7**	-24.9	-13	1.7
GSM 850 GPRS	high	0.2	-	**-18.48**	-30.04	-13	5.48
GSM 850 EDGE	low	0.2	-	-25.42	-38.28	-13	12.42
GSM 850 EDGE	high	0.2	-	-26.12	-38.28	-13	13.12
FDD V	low	5	-	-15.15	**-24.02**	-13	11.02
FDD V	high	5	-	-16.54	**-25.55**	-13	12.55
FDD V HSDPA Subtest 1	low	5	-	-19.17	-26.42	-13	13.42
FDD V HSDPA Subtest 1	high	5	-	-17.67	-27.4	-13	14.4
FDD V HSUPA Subtest 1	low	5	-	-17.17	-25.38	-13	12.38
FDD V HSUPA Subtest 1	high	5	-	-19.83	-28.04	-13	15.04
FDD V HSUPA Subtest 5	low	5	-	-18.13	-25.38	-13	12.38
FDD V HSUPA Subtest 5	high	5	-	-18.64	-27.4	-13	14.4
eFDD 5 QPSK	low	1.4	6	-28.24	-35.22	-13	22.22
eFDD 5 QPSK	high	1.4	6	-30.3	-37.61	-13	24.61
eFDD 5 16QAM	low	1.4	6	-24.05	-33.42	-13	20.42
eFDD 5 16QAM	high	1.4	6	-27.27	-36.34	-13	23.34
eFDD 5 QPSK	low	3	15	-15.27	**-27.61**	-13	14.61
eFDD 5 QPSK	high	3	15	-16.71	**-29.24**	-13	16.24
eFDD 5 16QAM	low	3	15	-17.03	-28.98	-13	15.98
eFDD 5 16QAM	high	3	15	-17.07	-29.76	-13	16.76
eFDD 5 QPSK	low	5	25	-17.32	-30.92	-13	17.92
eFDD 5 QPSK	high	5	25	-18.59	-31.57	-13	18.57
eFDD 5 16QAM	low	5	25	-15.91	-30.92	-13	17.92
eFDD 5 16QAM	high	5	25	-19.8	-33.02	-13	20.02
eFDD 5 QPSK	low	10	50	-19.52	-34.29	-13	21.29
eFDD 5 QPSK	high	10	50	-19.83	-34.76	-13	21.76
eFDD 5 16QAM	low	10	50	-22.45	-33.84	-13	20.84
eFDD 5 16QAM	high	10	50	-22.74	-35.26	-13	22.26



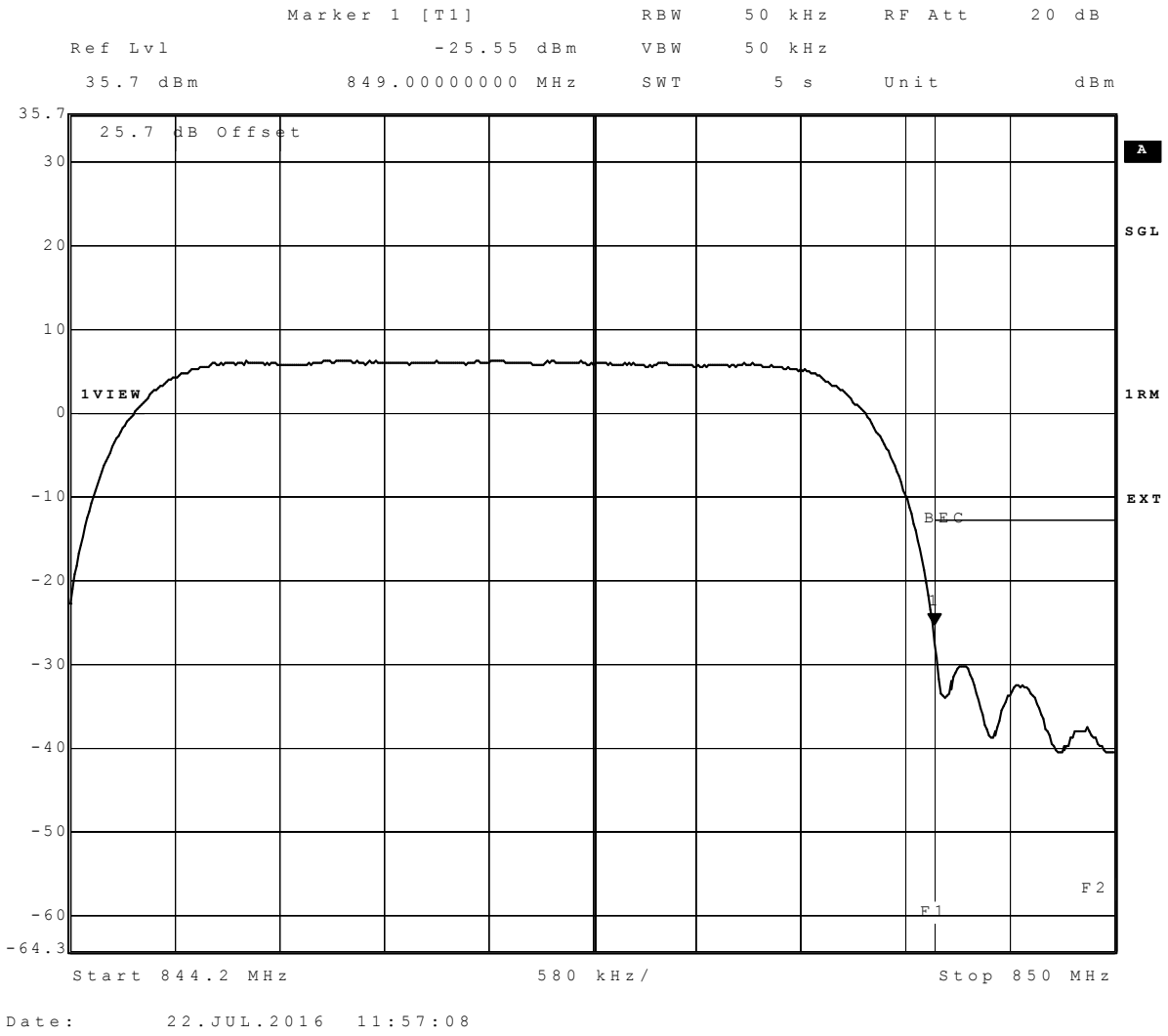
GSM 850 GPRS low channel



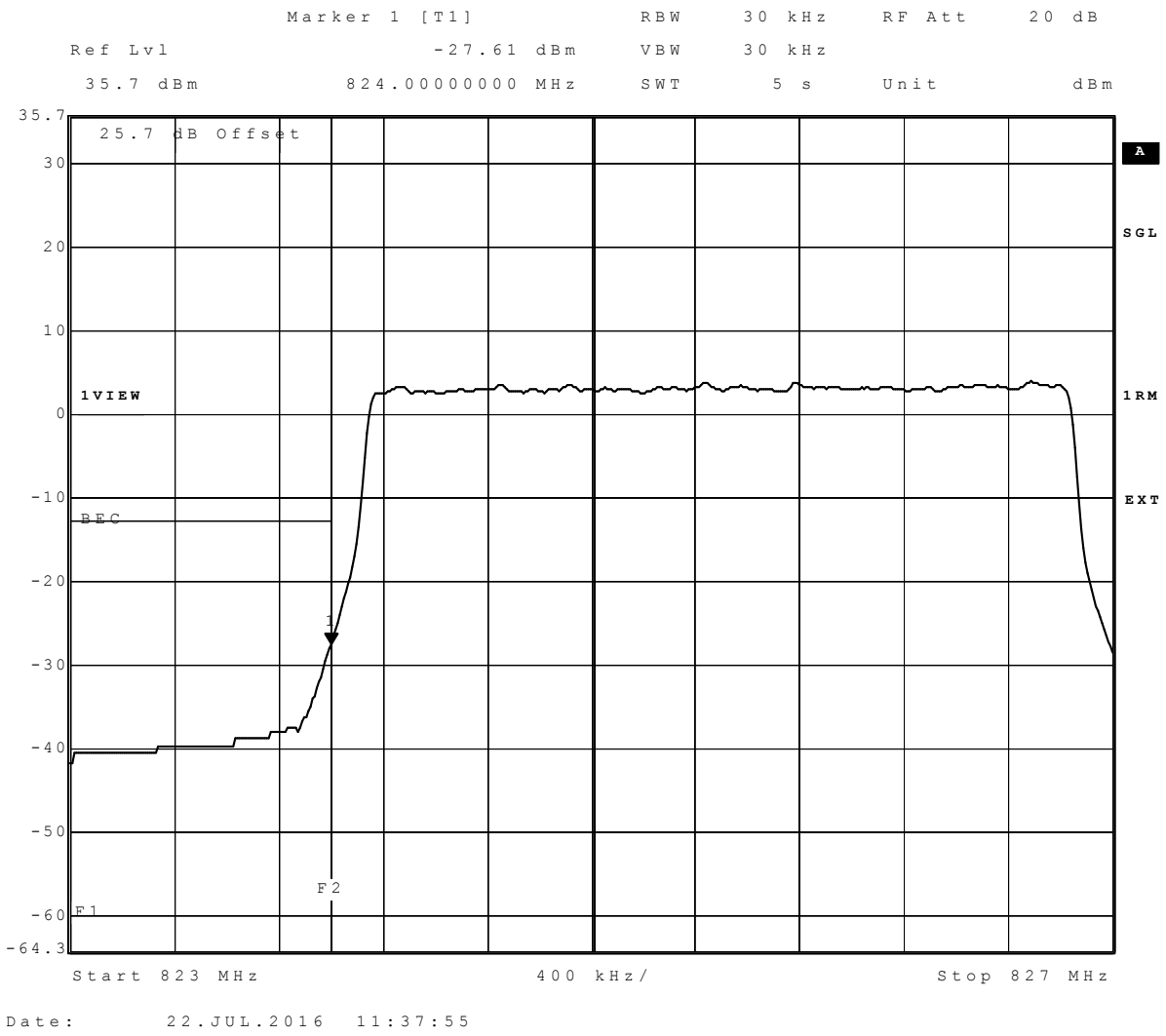
GSM 850 GPRS high channel



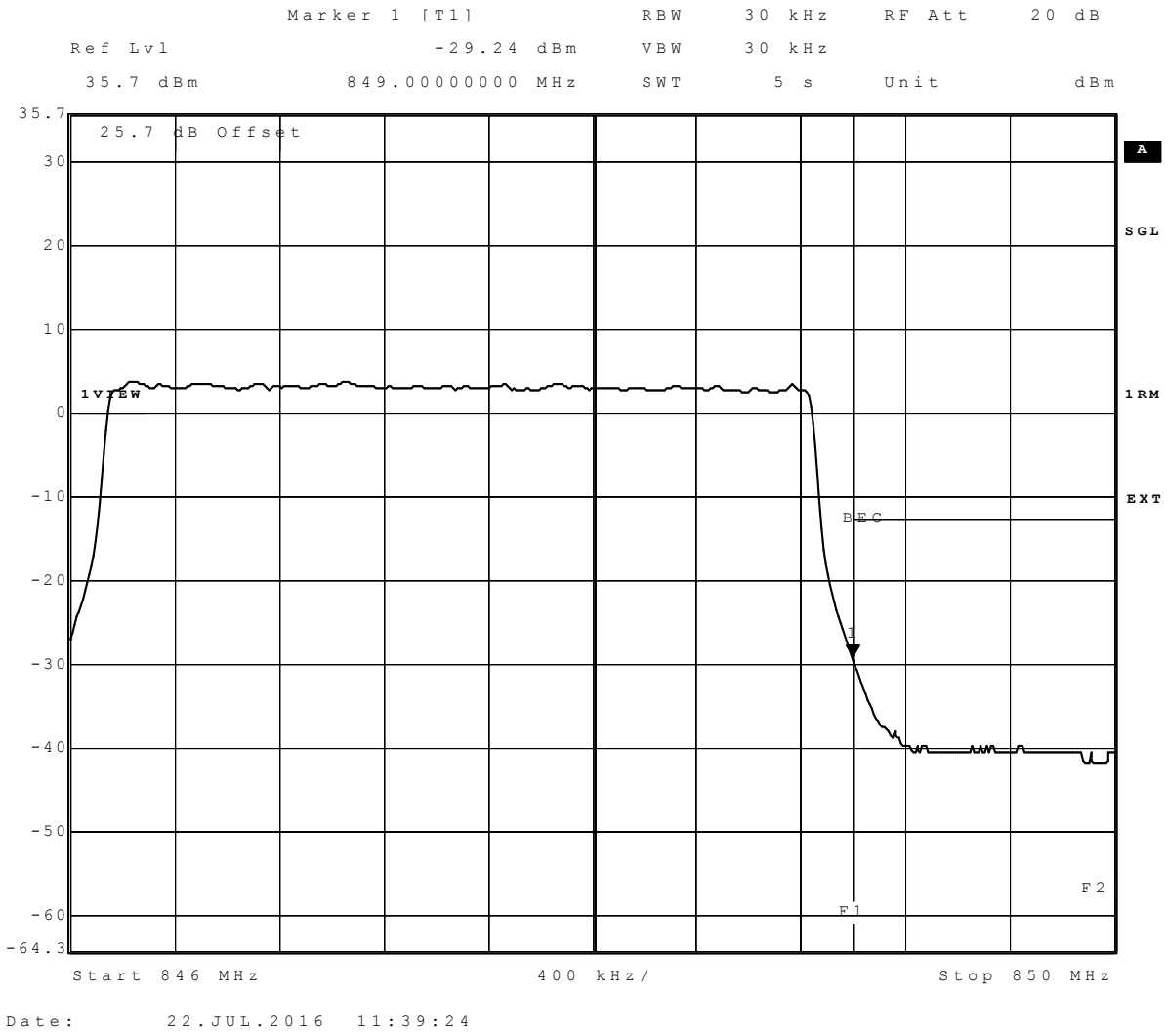
FDD V low channel



FDD V high channel



eFDD V low channel 3 MHz BW QPSK 15 RB



eFDD V high channel 3 MHz BW QPSK 15 RB

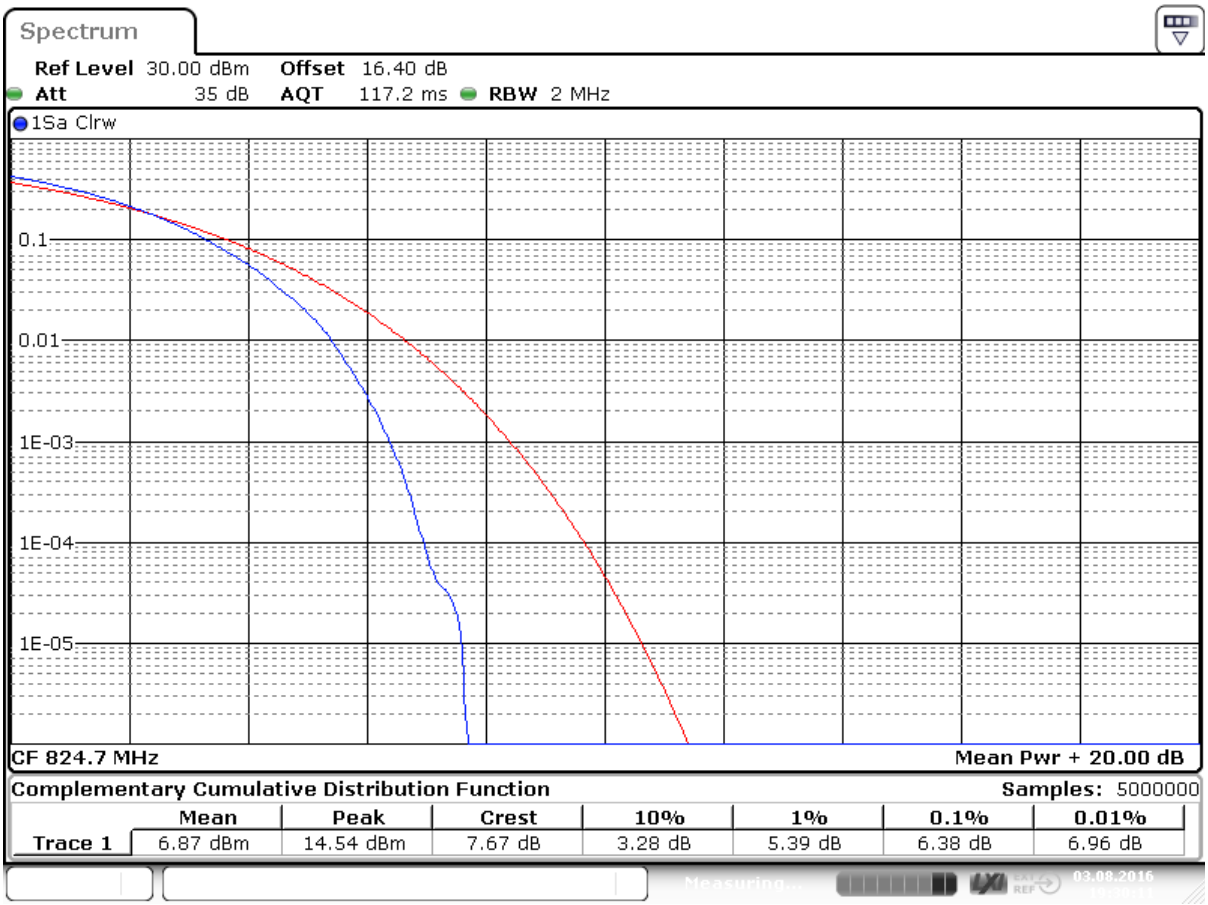
3.5.7 22.7 Peak-to-Average Ratio Summary §2.1046

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

Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/08/03 17:42
Body:	FCC47CFRChIPART22PUBLIC MOBILE SERVICES
Test Specification:	FCC part 2 and 22

Detailed Results:

Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak to Average Ratio	Limit (IC) (dB)	Remark
GSM 850 GPRS	low	-	0.2	0.03	13	1)
GSM 850 GPRS	mid	-	0.2	0.06	13	1)
GSM 850 GPRS	high	-	0.2	0.06	13	1)
GSM 850 EDGE	low	-	0.2	0.01	13	1)
GSM 850 EDGE	mid	-	0.2	0.02	13	1)
GSM 850 EDGE	high	-	0.2	0.01	13	1)
FDD V	low	-	5	5.71	13	1)
FDD V	mid	-	5	5.91	13	1)
FDD V	high	-	5	6.14	13	1)
FDD V HSDPA Subtest 1	low	-	5	5.2	13	1)
FDD V HSDPA Subtest 1	mid	-	5	5.4	13	1)
FDD V HSDPA Subtest 1	high	-	5	5.5	13	1)
FDD V HSUPA Subtest 1	low	-	5	7.5	13	1)
FDD V HSUPA Subtest 1	mid	-	5	7.6	13	1)
FDD V HSUPA Subtest 1	high	-	5	7.3	13	1)
FDD V HSUPA Subtest 5	low	-	5	8.3	13	1)
FDD V HSUPA Subtest 5	mid	-	5	8.5	13	1)
FDD V HSUPA Subtest 5	high	-	5	7.6	13	1)
eFDD 5 QPSK	low	6	1.4	5.42	13	
eFDD 5 QPSK	mid	6	1.4	5.3	13	
eFDD 5 QPSK	high	6	1.4	5.22	13	
eFDD 5 16QAM	low	6	1.4	6.38	13	
eFDD 5 16QAM	mid	6	1.4	6.14	13	
eFDD 5 16QAM	high	6	1.4	6.17	13	
1) Value calculated using the results of testcase Output Power						



Date: 3.AUG.2016 19:30:12

eFDD 5 16QAM low channel

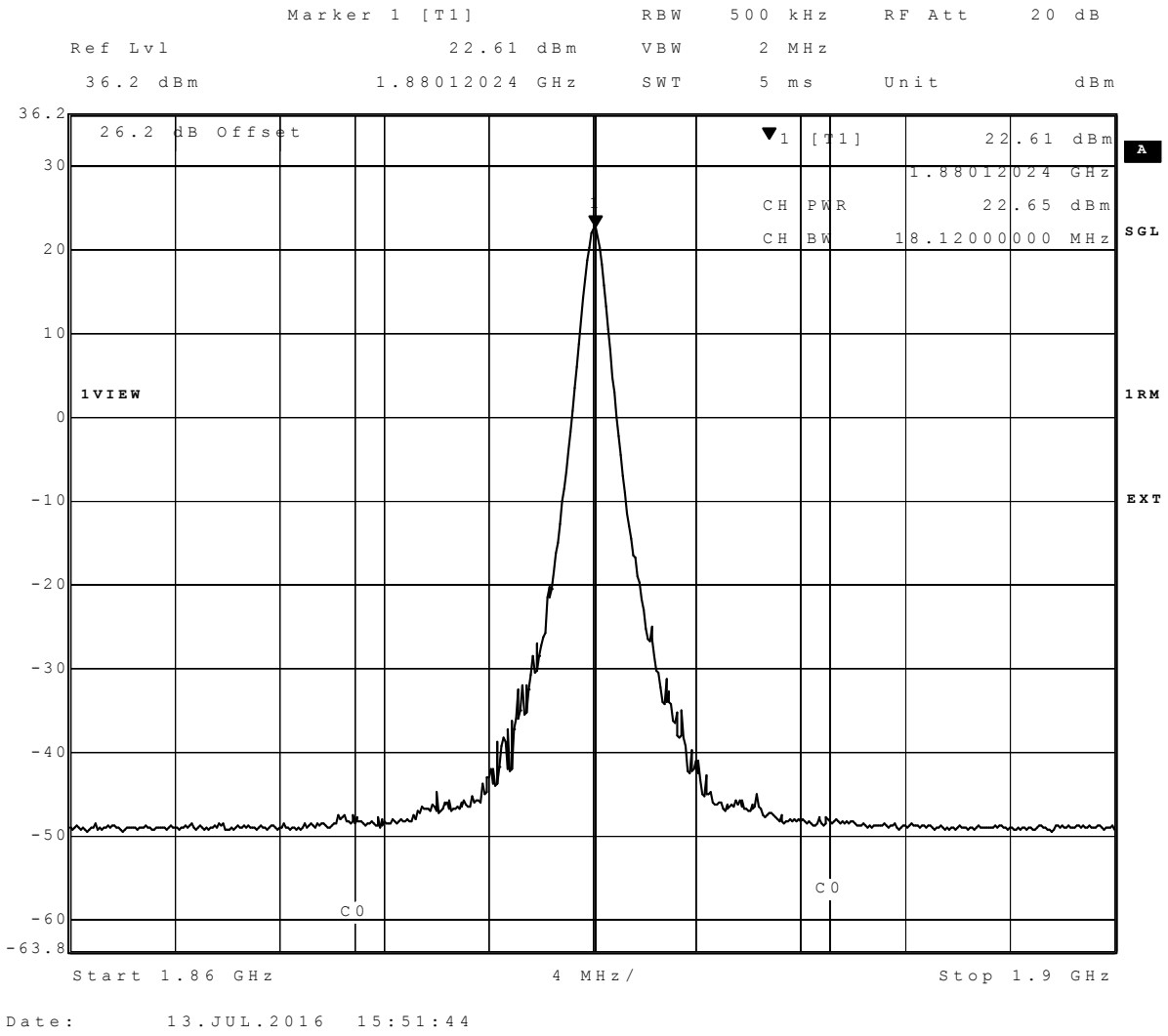
3.5.8 24.1 RF Power Output §2.1046, §24.232

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

Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/30 18:00
Body:	FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 24

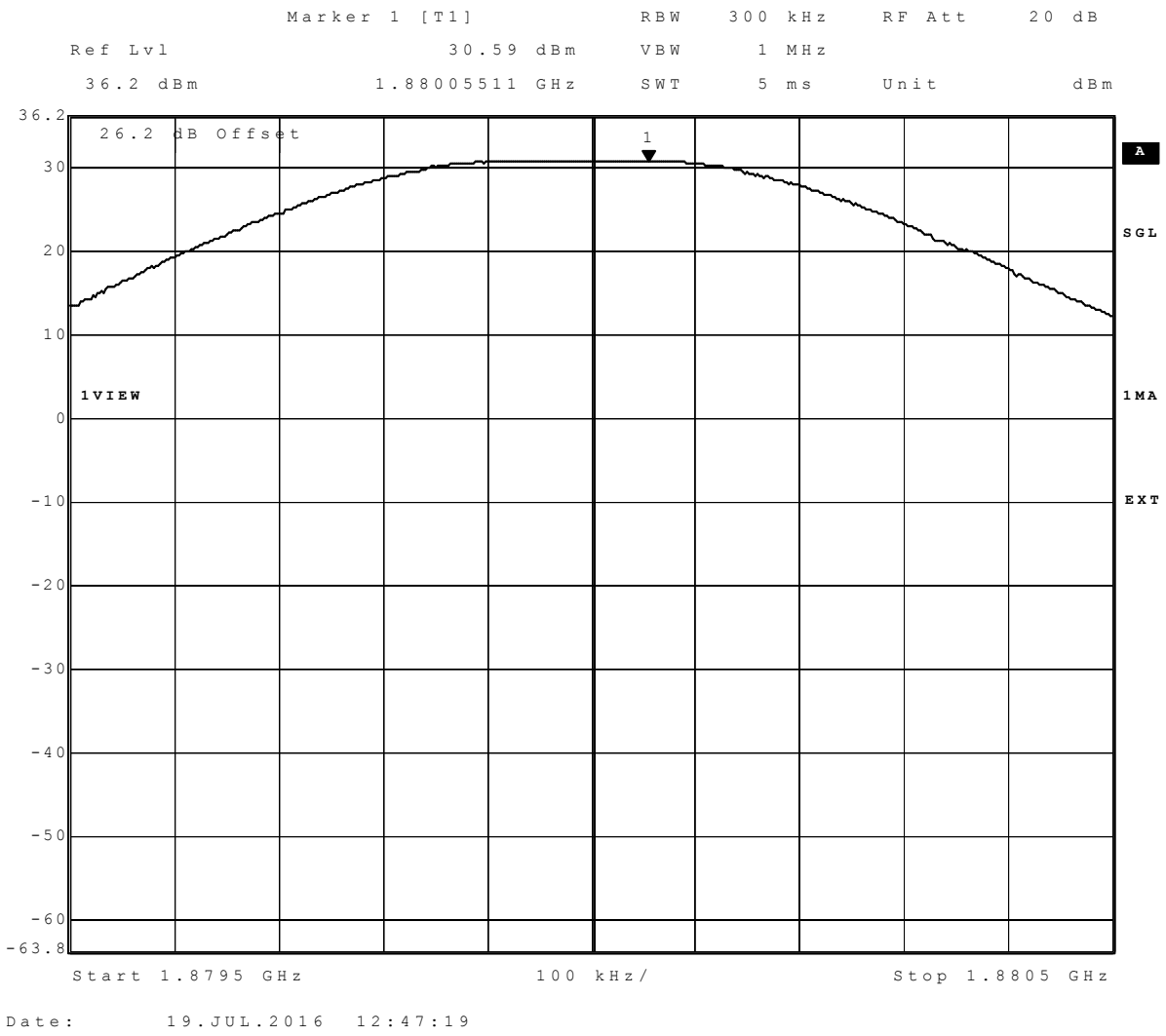
Detailed Results:

Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC / IC EIRP Limit (W)	Maximum Antenna Gain (dBi)
GSM 1900 GPRS	low	-	0.2	30.12	30.09	30.09	2	2.88
GSM 1900 GPRS	mid	-	0.2	30.59	30.57	30.58	2	2.41
GSM 1900 GPRS	high	-	0.2	30.49	30.47	30.48	2	2.51
GSM 1900 EDGE	low	-	0.2	30.09	29.96	30.02	2	2.91
GSM 1900 EDGE	mid	-	0.2	30.12	30.07	30.09	2	2.88
GSM 1900 EDGE	high	-	0.2	29.96	29.79	29.66	2	3.04
FDD II	low	-	5	29.49	24.04	24.18	2	8.82
FDD II	mid	-	5	30.06	24.09	24.1	2	8.9
FDD II	high	-	5	30.06	23.98	24.18	2	8.82
FDD II HSDPA Subtest 1	low	-	5	28.7	23.31	23.44	2	9.56
FDD II HSDPA Subtest 1	mid	-	5	29.07	23.45	23.58	2	9.42
FDD II HSDPA Subtest 1	high	-	5	28.96	23.32	23.51	2	9.49
FDD II HSDPA Subtest 2	low	-	5	29.32	22.76	23.28	2	9.72
FDD II HSDPA Subtest 2	mid	-	5	29.07	22.76	23.2	2	9.8
FDD II HSDPA Subtest 2	high	-	5	29.49	22.56	23.12	2	9.88
FDD II HSDPA Subtest 3	low	-	5	29.91	22.62	23.31	2	9.69
FDD II HSDPA Subtest 3	mid	-	5	29.32	22.63	23.27	2	9.73
FDD II HSDPA Subtest 3	high	-	5	29.19	22.52	23.19	2	9.81
FDD II HSDPA Subtest 4	low	-	5	29.91	22.69	23.33	2	9.67
FDD II HSDPA Subtest 4	mid	-	5	30.06	22.51	23.25	2	9.75
FDD II HSDPA Subtest 4	high	-	5	29.19	22.39	23.13	2	9.87
FDD II HSUPA Subtest 1	low	-	5	29.3	22.4	22.6	2	10.4
FDD II HSUPA Subtest 1	mid	-	5	29.8	22.4	22.7	2	10.3
FDD II HSUPA Subtest 1	high	-	5	29.2	22.3	22.6	2	10.4
FDD II HSUPA Subtest 2	low	-	5	28.9	21.3	21.7	2	11.3
FDD II HSUPA Subtest 2	mid	-	5	29.3	21.42	21.8	2	11.2
FDD II HSUPA Subtest 2	high	-	5	29.3	21.2	21.7	2	11.3
FDD II HSUPA Subtest 3	low	-	5	29.6	21.38	22.1	2	10.9
FDD II HSUPA Subtest 3	mid	-	5	30.2	21.5	22.1	2	10.9
FDD II HSUPA Subtest 3	high	-	5	30.2	21.5	22.1	2	10.9
FDD II HSUPA Subtest 4	low	-	5	29.6	21.3	22	2	11
FDD II HSUPA Subtest 4	mid	-	5	29.8	21.6	22.1	2	10.9
FDD II HSUPA Subtest 4	high	-	5	30	22	22.5	2	10.5
FDD II HSUPA Subtest 5	low	-	5	29.4	22.5	22.9	2	10.1
FDD II HSUPA Subtest 5	mid	-	5	29.8	22.6	23	2	10
FDD II HSUPA Subtest 5	high	-	5	29.6	22.6	22.9	2	10.1
eFDD 2 QPSK	low	1	1.4	-	-	21.91	2	11.09
eFDD 2 QPSK	low	3	1.4	-	-	21.46	2	11.54
eFDD 2 QPSK	low	6	1.4	-	-	20.37	2	12.63
eFDD 2 QPSK	mid	1	1.4	-	-	21.47	2	11.53
eFDD 2 QPSK	mid	3	1.4	-	-	21.2	2	11.8
eFDD 2 QPSK	mid	6	1.4	-	-	20.4	2	12.6
eFDD 2 QPSK	high	1	1.4	-	-	22	2	11
eFDD 2 QPSK	high	3	1.4	-	-	21.55	2	11.45
eFDD 2 QPSK	high	6	1.4	-	-	20.52	2	12.48
eFDD 2 16QAM	low	1	1.4	-	-	20.8	2	12.2
eFDD 2 16QAM	low	6	1.4	-	-	19.44	2	13.56
eFDD 2 16QAM	mid	1	1.4	-	-	20.7	2	12.3
eFDD 2 16QAM	mid	6	1.4	-	-	19.72	2	13.28
eFDD 2 16QAM	high	1	1.4	-	-	21.38	2	11.62
eFDD 2 16QAM	high	6	1.4	-	-	19.51	2	13.49



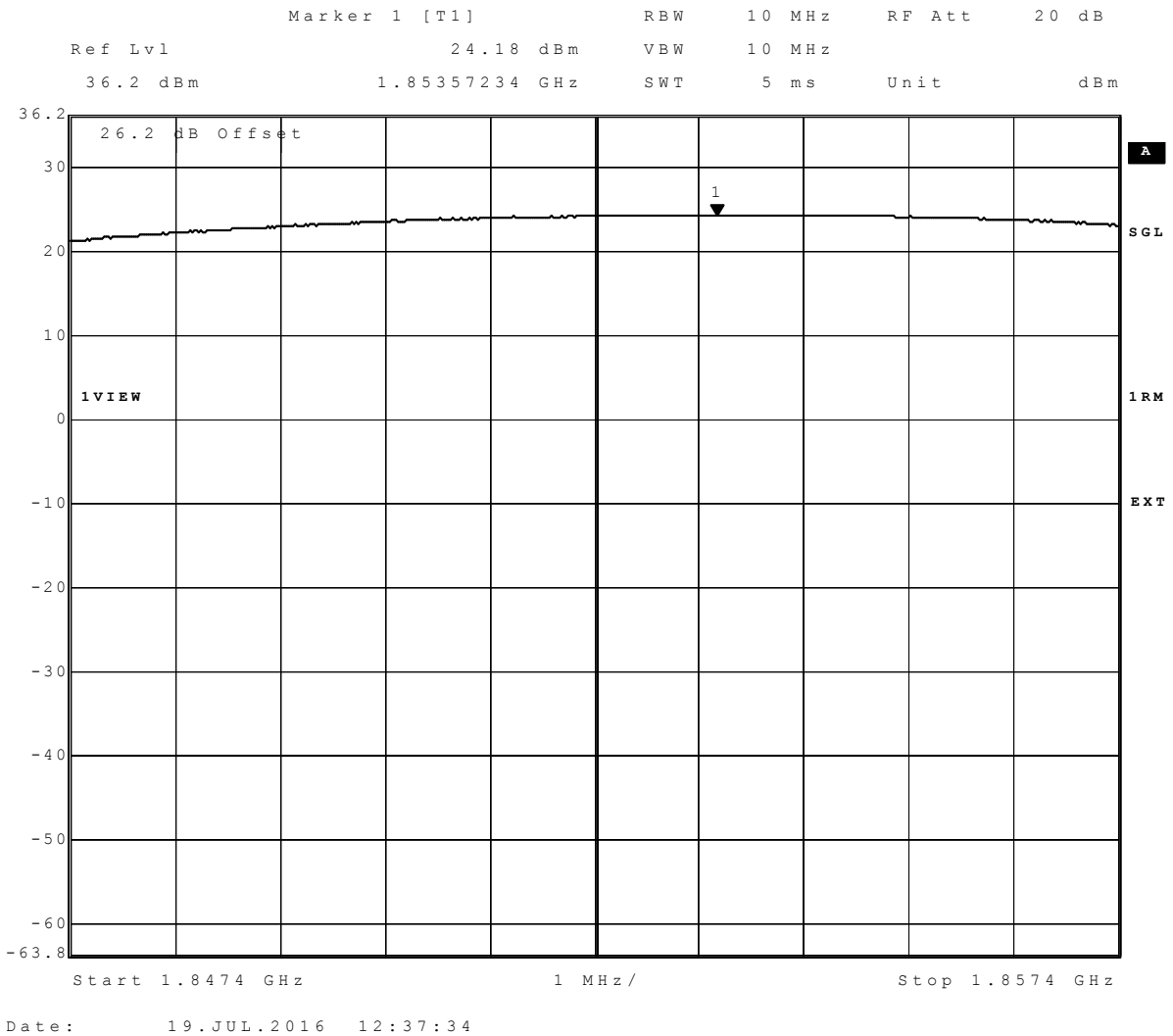
eFDD 2 mid channel 1 RB QPSK 20 MHz BW

Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC / IC EIRP Limit (W)	Maximum Antenna Gain (dBi)
eFDD 2 QPSK	low	1	3	-	-	22.14	2	10.86
eFDD 2 QPSK	low	15	3	-	-	20.84	2	12.16
eFDD 2 QPSK	mid	1	3	-	-	22.33	2	10.67
eFDD 2 QPSK	mid	15	3	-	-	20.99	2	12.01
eFDD 2 QPSK	high	1	3	-	-	22.48	2	10.52
eFDD 2 QPSK	high	15	3	-	-	20.99	2	12.01
eFDD 2 16QAM	low	1	3	-	-	21.4	2	11.6
eFDD 2 16QAM	low	15	3	-	-	19.9	2	13.1
eFDD 2 16QAM	mid	1	3	-	-	21.55	2	11.45
eFDD 2 16QAM	mid	15	3	-	-	19.99	2	13.01
eFDD 2 16QAM	high	1	3	-	-	21.41	2	11.59
eFDD 2 16QAM	high	15	3	-	-	20.04	2	12.96
eFDD 2 QPSK	low	1	5	-	-	22.47	2	10.53
eFDD 2 QPSK	low	12	5	-	-	20.95	2	12.05
eFDD 2 QPSK	low	25	5	-	-	20.83	2	12.17
eFDD 2 QPSK	mid	1	5	-	-	22.64	2	10.36
eFDD 2 QPSK	mid	12	5	-	-	21.13	2	11.87
eFDD 2 QPSK	mid	25	5	-	-	21.07	2	11.93
eFDD 2 QPSK	high	1	5	-	-	22.89	2	10.11
eFDD 2 QPSK	high	12	5	-	-	21.08	2	11.92
eFDD 2 QPSK	high	25	5	-	-	21	2	12
eFDD 2 16QAM	low	1	5	-	-	21.58	2	11.42
eFDD 2 16QAM	low	25	5	-	-	19.89	2	13.11
eFDD 2 16QAM	mid	1	5	-	-	21.77	2	11.23
eFDD 2 16QAM	mid	25	5	-	-	20.04	2	12.96
eFDD 2 16QAM	high	1	5	-	-	21.72	2	11.28
eFDD 2 16QAM	high	25	5	-	-	19.99	2	13.01
eFDD 2 QPSK	low	1	10	-	-	22.57	2	10.43
eFDD 2 QPSK	low	50	10	-	-	21.19	2	11.81
eFDD 2 QPSK	mid	1	10	-	-	22.56	2	10.44
eFDD 2 QPSK	mid	50	10	-	-	21.35	2	11.65
eFDD 2 QPSK	high	1	10	-	-	22.64	2	10.36
eFDD 2 QPSK	high	50	10	-	-	21.28	2	11.72
eFDD 2 16QAM	low	1	10	-	-	21.66	2	11.34
eFDD 2 16QAM	low	50	10	-	-	20.17	2	12.83
eFDD 2 16QAM	mid	1	10	-	-	21.55	2	11.45
eFDD 2 16QAM	mid	50	10	-	-	20.38	2	12.62
eFDD 2 16QAM	high	1	10	-	-	21.82	2	11.18
eFDD 2 16QAM	high	50	10	-	-	20.29	2	12.71
eFDD 2 QPSK	low	1	15	-	-	22.74	2	10.26
eFDD 2 QPSK	low	36	15	-	-	21.94	2	11.06
eFDD 2 QPSK	low	75	15	-	-	21.86	2	11.14
eFDD 2 QPSK	mid	1	15	-	-	22.71	2	10.29
eFDD 2 QPSK	mid	36	15	-	-	21.86	2	11.14
eFDD 2 QPSK	mid	75	15	-	-	21.68	2	11.32
eFDD 2 QPSK	high	1	15	-	-	22.59	2	10.41
eFDD 2 QPSK	high	36	15	-	-	21.83	2	11.17
eFDD 2 QPSK	high	75	15	-	-	21.76	2	11.24
eFDD 2 16QAM	low	1	15	-	-	22.07	2	10.93
eFDD 2 16QAM	low	75	15	-	-	20.82	2	12.18
eFDD 2 16QAM	mid	1	15	-	-	21.53	2	11.47
eFDD 2 16QAM	mid	75	15	-	-	20.66	2	12.34
eFDD 2 16QAM	high	1	15	-	-	21.92	2	11.08
eFDD 2 16QAM	high	75	15	-	-	20.72	2	12.28

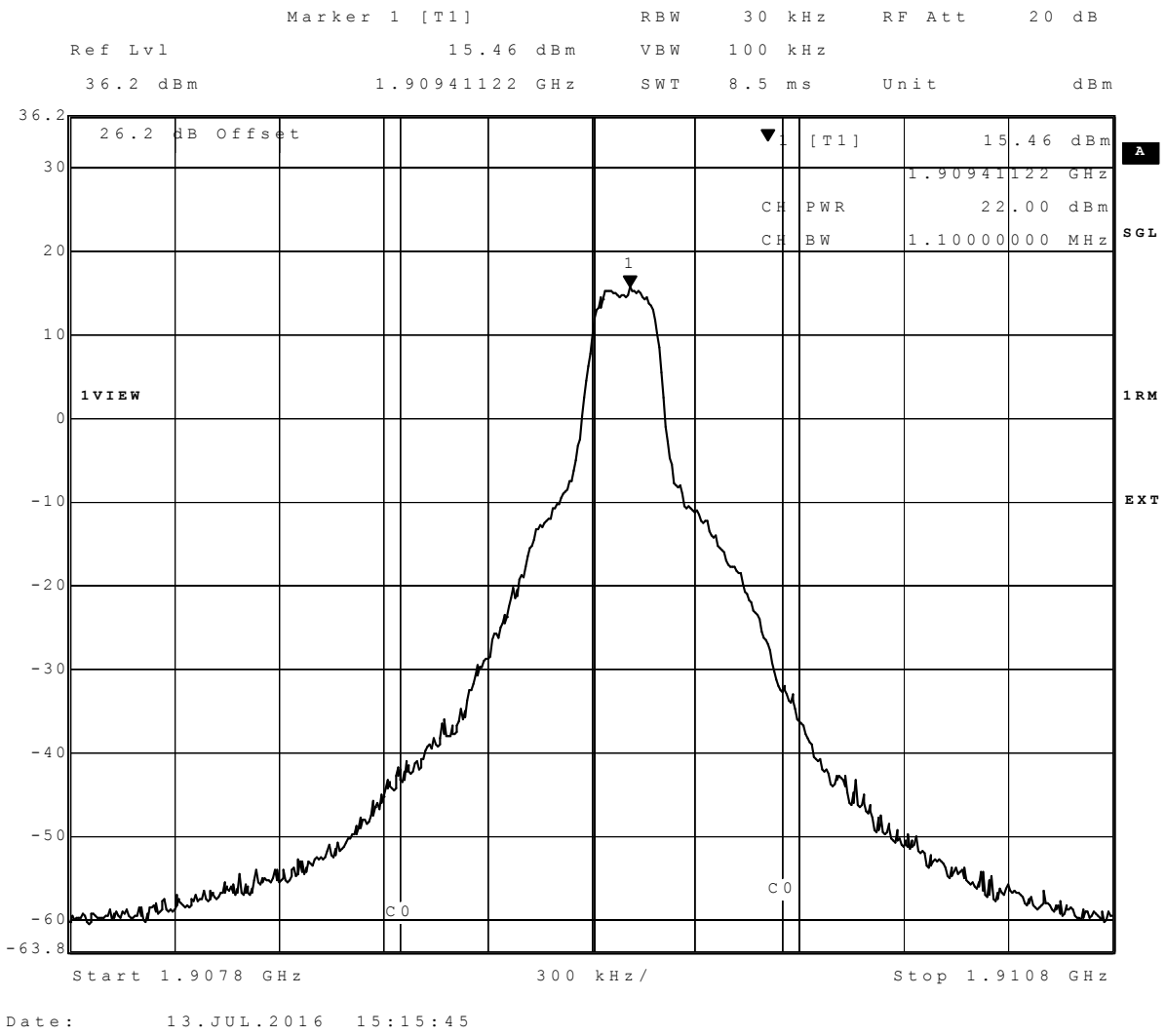


GSM 1900 GPRS mid channel

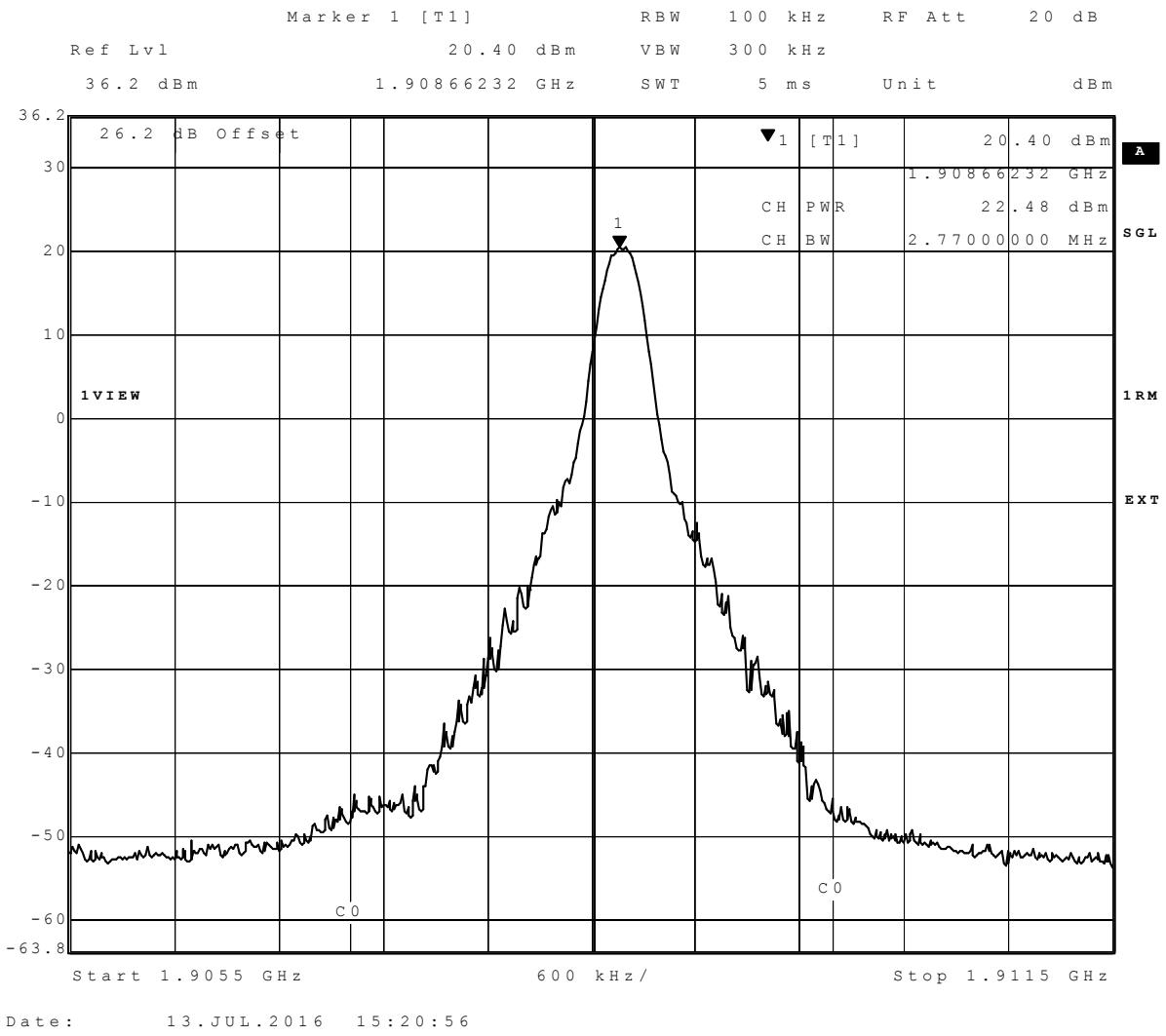
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC / IC EIRP Limit (W)	Maximum Antenna Gain (dBi)
eFDD 2 QPSK	low	1	20	-	-	22.63	2	10.37
eFDD 2 QPSK	low	100	20	-	-	21.94	2	11.06
eFDD 2 QPSK	mid	1	20	-	-	22.65	2	10.35
eFDD 2 QPSK	mid	100	20	-	-	21.76	2	11.24
eFDD 2 QPSK	high	1	20	-	-	22.59	2	10.41
eFDD 2 QPSK	high	100	20	-	-	21.9	2	11.1
eFDD 2 16QAM	low	1	20	-	-	21.73	2	11.27
eFDD 2 16QAM	low	100	20	-	-	20.97	2	12.03
eFDD 2 16QAM	mid	1	20	-	-	21.61	2	11.39
eFDD 2 16QAM	mid	100	20	-	-	20.76	2	12.24
eFDD 2 16QAM	high	1	20	-	-	21.59	2	11.41
eFDD 2 16QAM	high	100	20	-	-	20.94	2	12.06



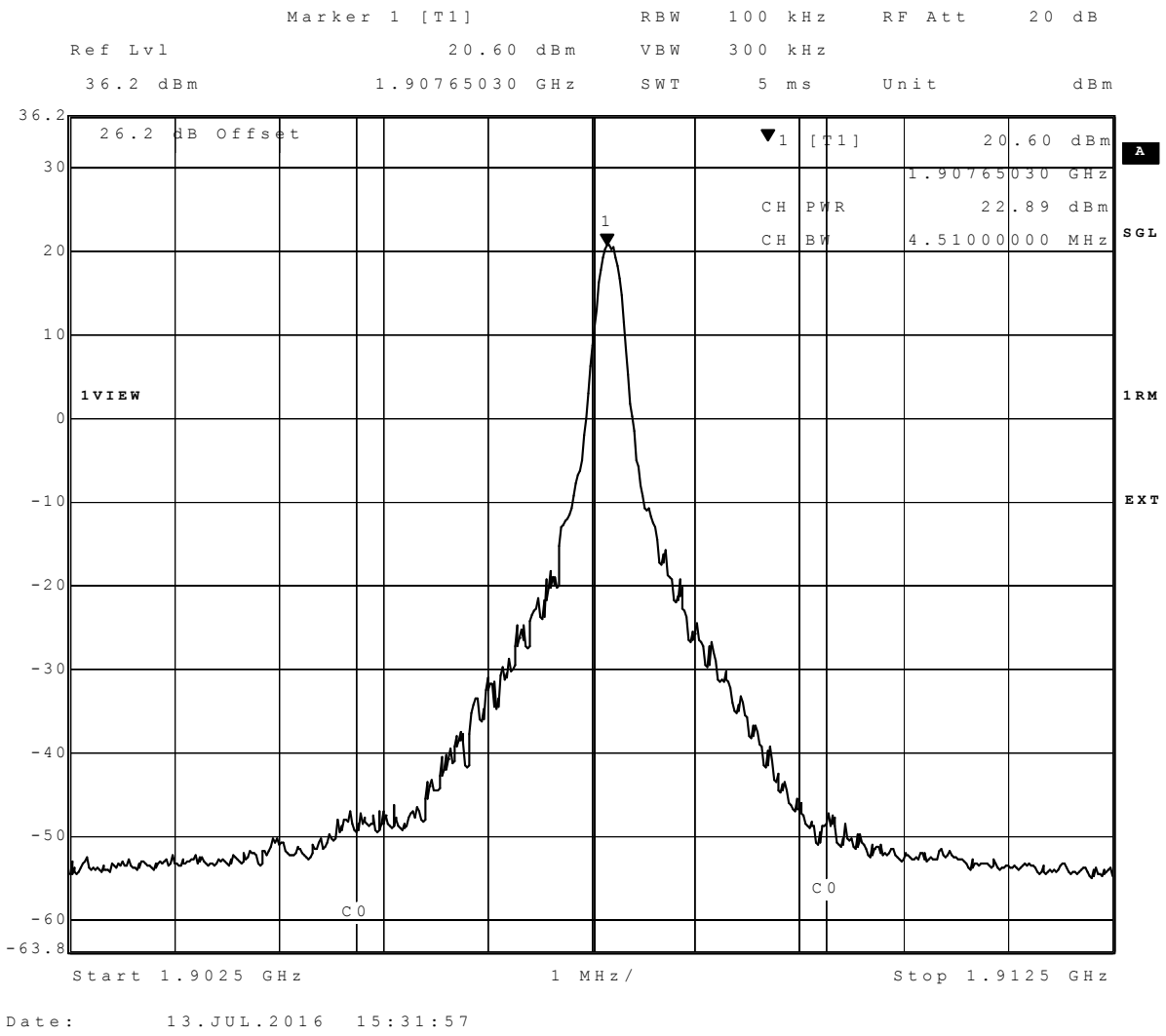
FDD II low channel



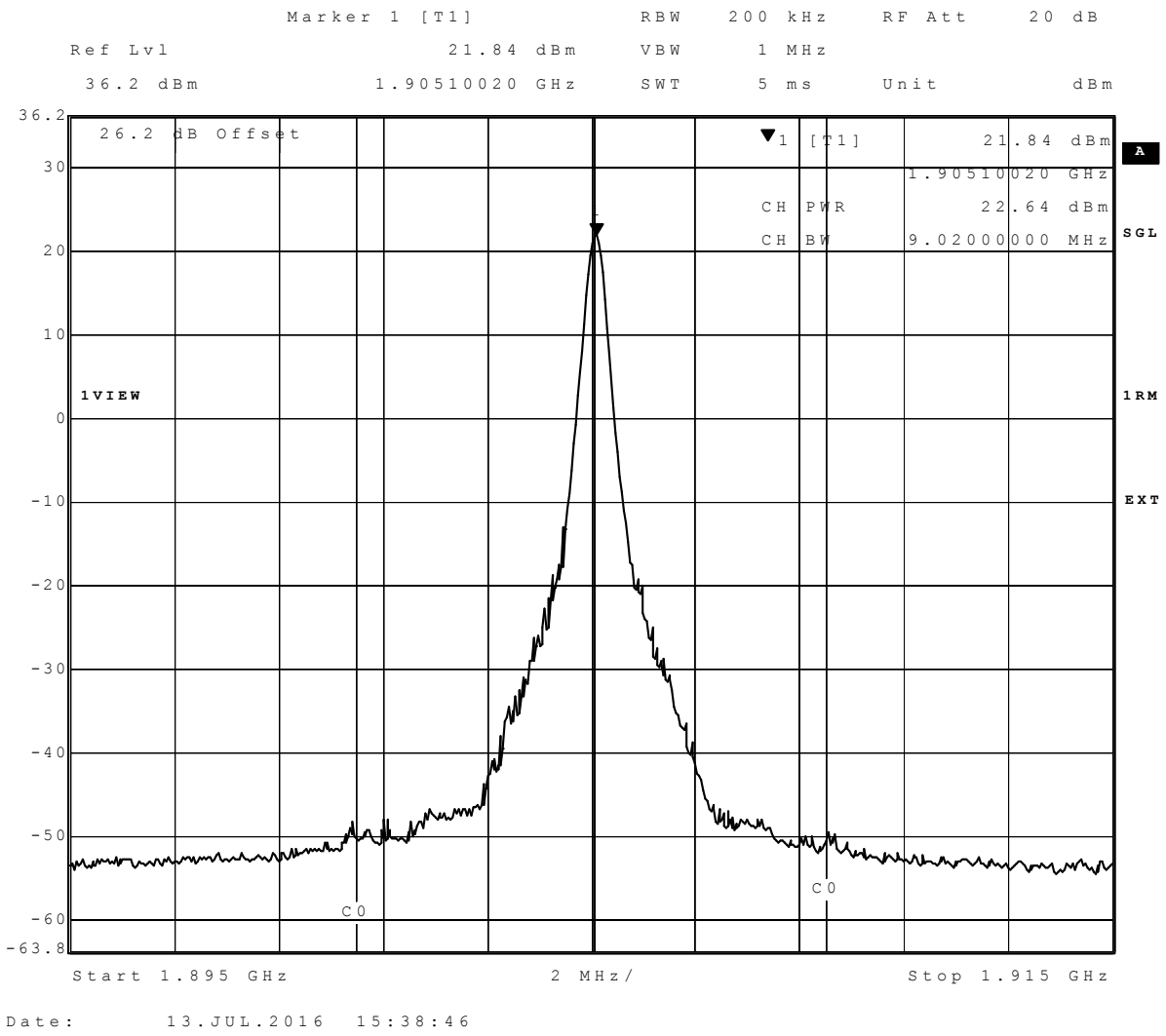
eFDD 2 high channel 1 RB QPSK 1.4 MHz BW



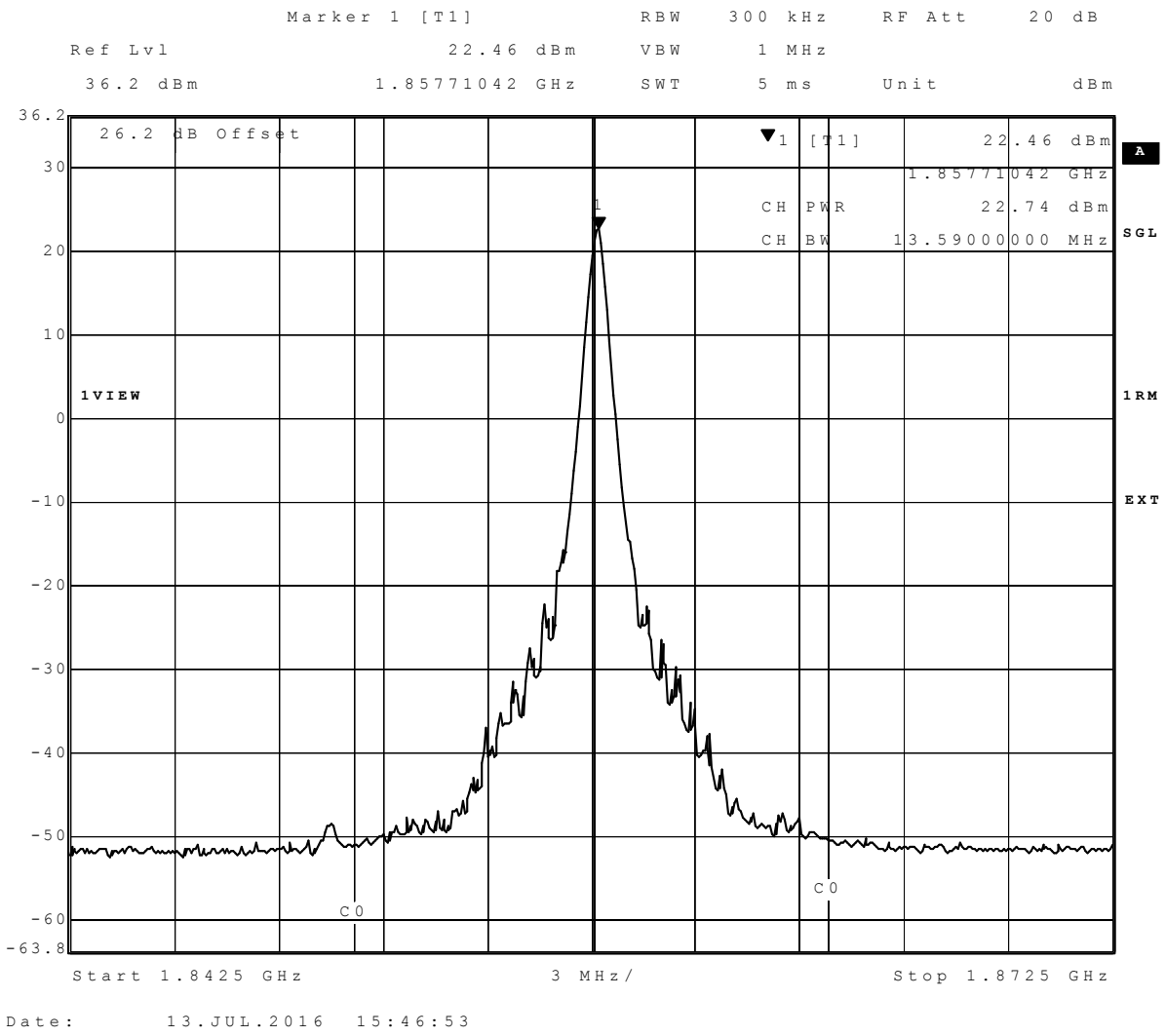
eFDD 2 high channel 1 RB QPSK 3 MHz BW



eFDD 2 high channel 1 RB QPSK 5 MHz BW



eFDD 2 high channel 1 RB QPSK 10 MHz BW



eFDD 2 low channel 1 RB QPSK 15 MHz BW

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.:	S01_AB01
Date of Test:	2016/07/29 15:03
Body:	FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 24

Detailed Results:

Radio Technology	Voltage	Temp (°C)	Frequency (MHz)	Frequency Error (Hz)	Deviation (ppm)	Limit (Hz)
	normal	-30	1880	14	0.01	4700
	normal	-20	1880	20	0.01	4700
	normal	-10	1880	22	0.01	4700
	normal	0	1880	29	0.02	4700
	normal	10	1880	24	0.01	4700
GSM 1900 GPRS	normal = high	20	1880	30	0.02	4700
	normal	30	1880	28	0.01	4700
	normal	40	1880	34	0.02	4700
	normal	50	1880	34	0.02	4700
	low	20	1880	26	0.01	4700
	normal	-30	1880	189	0.10	4700
	normal	-20	1880	183	0.10	4700
	normal	-10	1880	179	0.10	4700
	normal	0	1880	119	0.06	4700
	normal	10	1880	77	0.04	4700
GSM 1900 EDGE	normal = high	20	1880	185	0.10	4700
	normal	30	1880	153	0.08	4700
	normal	40	1880	170	0.09	4700
	normal	50	1880	46	0.02	4700
	low	20	1880	38	0.02	4700
	normal	-30	1880	-10	-0.01	4700
	normal	-20	1880	-10	-0.01	4700
	normal	-10	1880	-10	-0.01	4700
	normal	0	1880	-11	-0.01	4700
	normal	10	1880	-9	0.00	4700
FDD II	normal = high	20	1880	-5	0.00	4700
	normal	30	1880	6	0.00	4700
	normal	40	1880	10	0.01	4700
	normal	50	1880	-10	-0.01	4700
	low	20	1880	-7	0.00	4700
	normal	-30	1880	6	0.00	4700
	normal	-20	1880	9	0.00	4700
	normal	-10	1880	7	0.00	4700
	normal	0	1880	6	0.00	4700
	normal	10	1880	8	0.00	4700
FDD II HSDPA	normal = high	20	1880	9	0.00	4700
Subtest 1	normal	30	1880	6	0.00	4700
	normal	40	1880	9	0.00	4700
	normal	50	1880	7	0.00	4700
	low	20	1880	9	0.00	4700

Radio Technology	Voltage	Temp (°C)	Frequency (MHz)	Frequency Error (Hz)	Deviation (ppm)	Limit (Hz)
	normal	-30	1880	14	0.01	4700
	normal	-20	1880	10	0.01	4700
	normal	-10	1880	-11	-0.01	4700
	normal	0	1880	10	0.01	4700
	normal	10	1880	14	0.01	4700
FDD II HSUPA	normal = high	20	1880	12	0.01	4700
Subtest 1	normal	30	1880	7	0.00	4700
	normal	40	1880	17	0.01	4700
	normal	50	1880	11	0.01	4700
	low	20	1880	10	0.01	4700
	normal	-30	1880	15	0.01	4700
	normal	-20	1880	7	0.00	4700
	normal	-10	1880	11	0.01	4700
	normal	0	1880	-9	0.00	4700
	normal	10	1880	-10	-0.01	4700
eFDD 2 QPSK	normal = high	20	1880	-12	-0.01	4700
5 MHz, 1 RB	normal	30	1880	-27	-0.01	4700
	normal	40	1880	-10	-0.01	4700
	normal	50	1880	-12	-0.01	4700
	low	20	1880	-9	0.00	4700

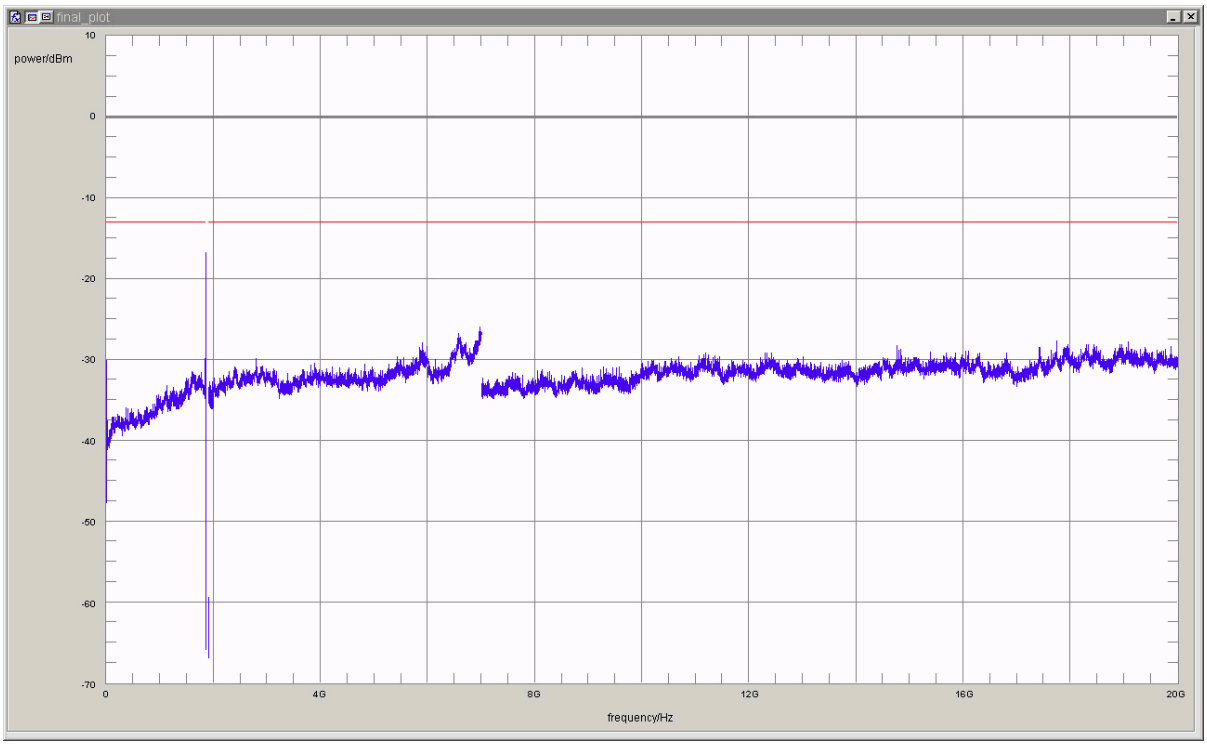
3.5.10 24.3 Spurious emissions at antenna terminals §2.1051, §24.238

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

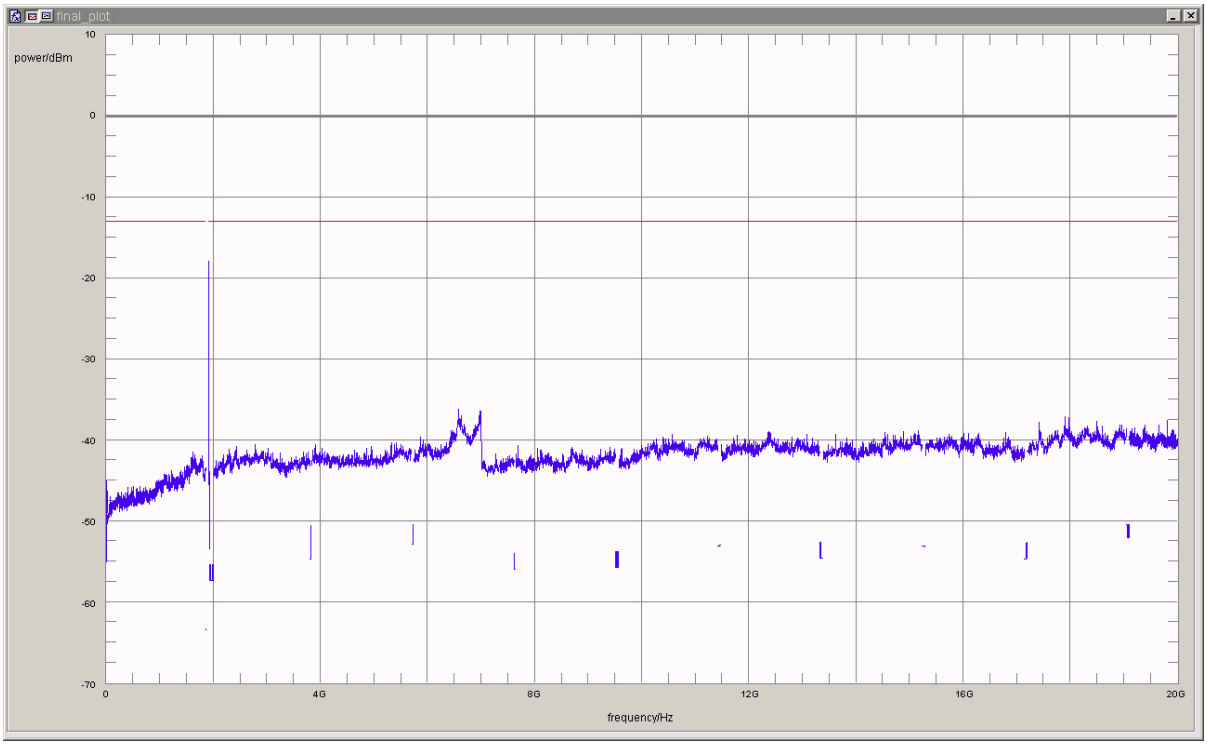
Result:	Passed
Setup No.:	S01_BB02
Date of Test:	2016/08/12 12:04
Body:	FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 24

Detailed Results:

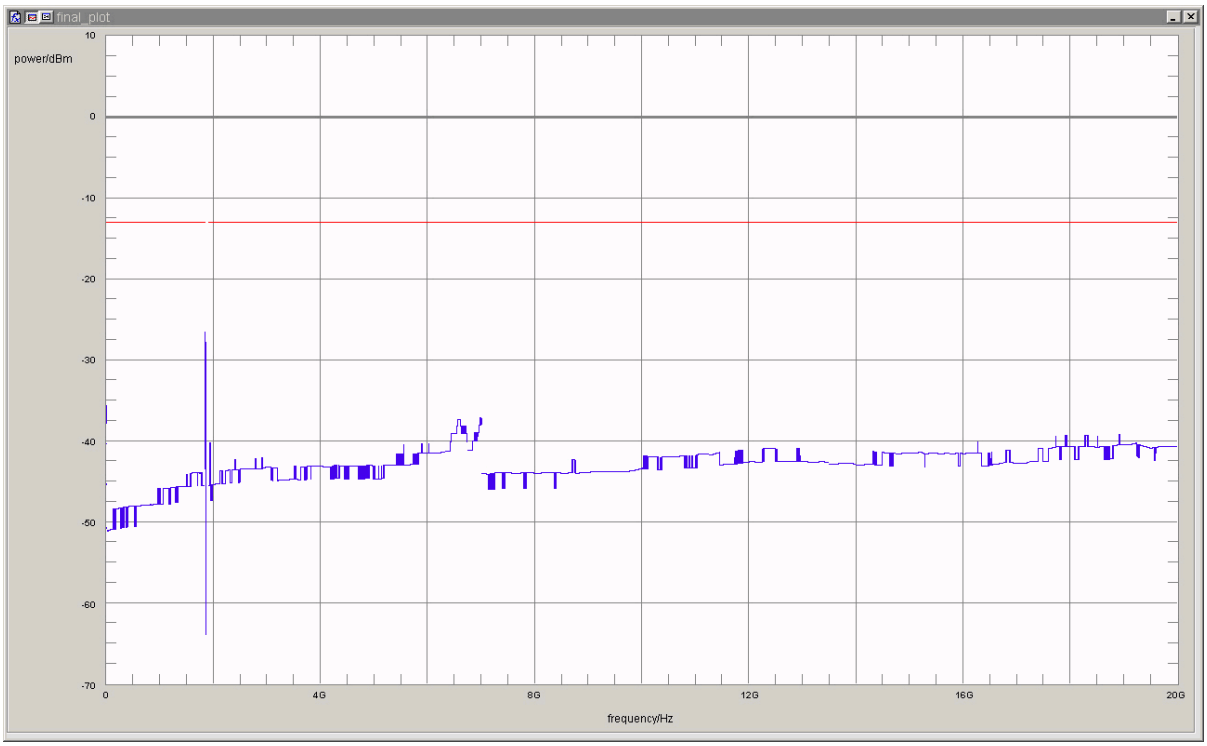
Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB	Remark
GSM 1900 GPRS	low	peak	maxhold	3	1849.98	-16.7	-13	3.7	
GSM 1900 GPRS	mid	peak	maxhold	-	-	-	-13	>15	
GSM 1900 GPRS	high	peak	maxhold	3	1910.02	-17.2	-13	4.2	
GSM 1900 EDGE	low	peak	maxhold	3	1849.99	-21.9	-13	8.9	
GSM 1900 EDGE	mid	peak	maxhold	-	-	-	-13	>15	
GSM 1900 EDGE	high	peak	maxhold	3	1910.02	-23.3	-13	10.3	
FDD II	low	rms	maxhold	100	1848.87	-19.4	-13	6.4	1)
FDD II	mid	rms	maxhold	-	-	-	-13	>15	
FDD II	high	rms	maxhold	100	1911.07	-17.9	-13	4.9	1)
FDD II HSDPA Subtest 1	low	rms	maxhold	100	1848.77	-21.8	-13	8.8	1)
FDD II HSDPA Subtest 1	mid	rms	maxhold	-	-	-	-13	>15	
FDD II HSDPA Subtest 1	high	rms	maxhold	100	1911.09	-22.4	-13	9.4	1)
FDD II HSUPA Subtest 5	low	rms	maxhold	100	1848.93	-19.5	-13	6.5	1)
FDD II HSUPA Subtest 5	mid	rms	maxhold	-	-	-	-13	>15	
FDD II HSUPA Subtest 5	high	rms	maxhold	100	1911.05	-18.7	-13	5.7	1)
eFDD 2 QPSK	low	rms	maxhold	100	1845.97	-26.5	-13	13.5	1)
eFDD 2 QPSK	mid	rms	maxhold	-	-	-	-13	>15	
eFDD 2 QPSK	high	rms	maxhold	100	1911.74	-31.4	-13	18.4	1)
1) Use of smaller RBW due to close proximity to transmitter signal, 10 dB were added to the value									



GSM 1900 GPRS low channel



FDD II high channel



eFDD 2 low channel 5 MHz QPSK 1RB

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.:	S01_AB01
Date of Test:	2016/07/26 10:24
Body:	FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 24

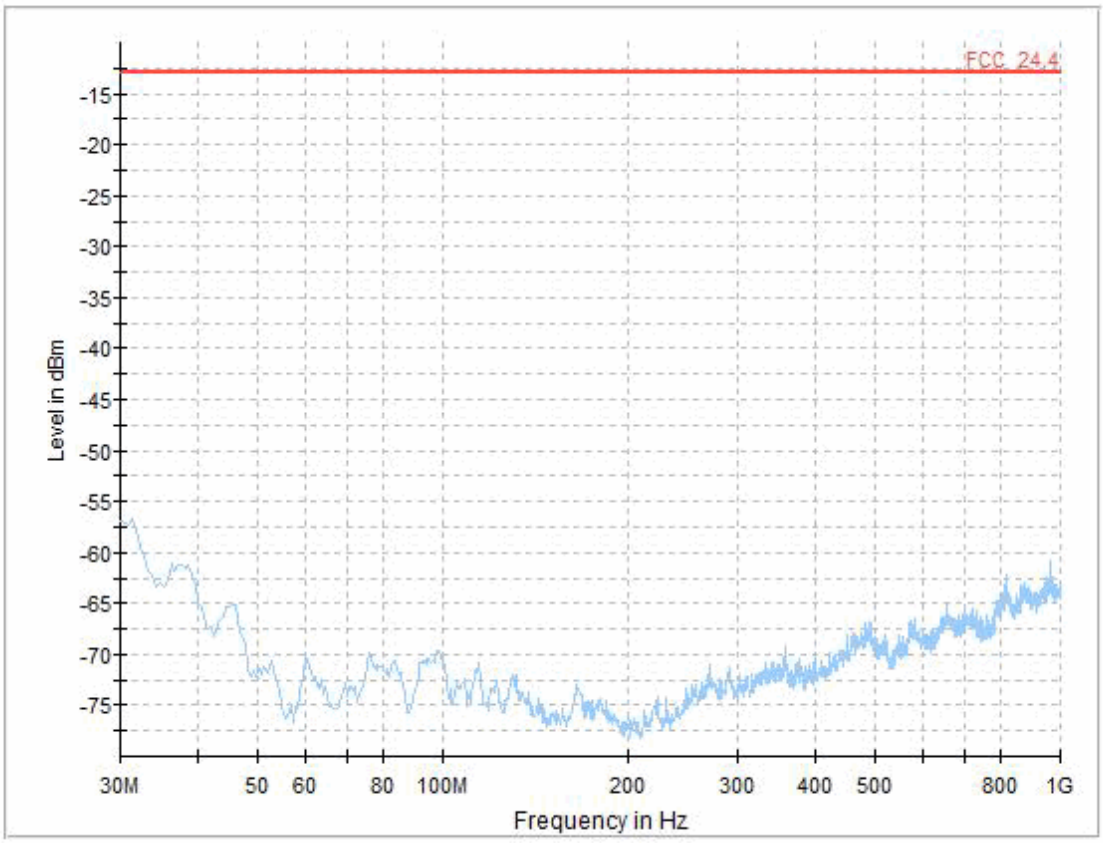
Detailed Results:

Radio Technology	Channel	Detector	Trace	Ressource Blocks	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB	Remark
GSM 1900	low	peak	maxhold	-	3	1849.98	-16.6	-13	3.6	1)
GSM 1900	mid	peak	maxhold	-	1000	5640	-41.8	-13	28.8	1)
GSM 1900	high	peak	maxhold	-	3	1910	-16.2	-13	3.2	1)
GSM 1900 EDGE	low	peak	maxhold	-	3	1850	-22.4	-13	9.4	1)
GSM 1900 EDGE	mid	peak	maxhold	-	1000	5640	-43.7	-13	30.7	1)
GSM 1900 EDGE	high	peak	maxhold	-	3	1910.04	-20.7	-13	7.7	1)
FDD II	low	RMS	maxhold	-	100	1848.83	-26.1	-23	3.1	1) 3)
FDD II	low	RMS	maxhold	-	50	1850	-22.3	-13	9.3	1)
FDD II	mid	peak	maxhold	-	1000	5643.5	-42.1	-13	29.1	1)
FDD II	high	RMS	maxhold	-	50	1910	-20	-13	7	1)
FDD II	high	RMS	maxhold	-	100	1911.23	-24.9	-23	1.9	1) 3)
FDD II HSDPA Subtest 1	low	RMS	maxhold	-	100	1848.58	-29.1	-23	6.1	1) 3)
FDD II HSDPA Subtest 1	low	RMS	maxhold	-	50	1850	-24.6	-13	11.6	1)
FDD II HSDPA Subtest 1	mid	peak	maxhold	-	1000	6866	-40.7	-13	27.7	1)
FDD II HSDPA Subtest 1	high	RMS	maxhold	-	50	1910	-25	-13	12	1)
FDD II HSDPA Subtest 1	high	RMS	maxhold	-	100	1911.29	-30.9	-23	7.9	1) 3)
FDD II HSUPA Subtest 1	low	RMS	maxhold	-	100	1848.96	-27.7	-23	4.7	1) 3)
FDD II HSUPA Subtest 1	low	RMS	maxhold	-	50	1850	-25.6	-13	12.6	1)
FDD II HSUPA Subtest 1	mid	peak	maxhold	-	-	-	-	-13	>20	1)
FDD II HSUPA Subtest 1	high	RMS	maxhold	-	50	1910	-26.3	-13	13.3	1)
FDD II HSUPA Subtest 1	high	RMS	maxhold	-	100	1911.05	-29.3	-23	6.3	1) 3)

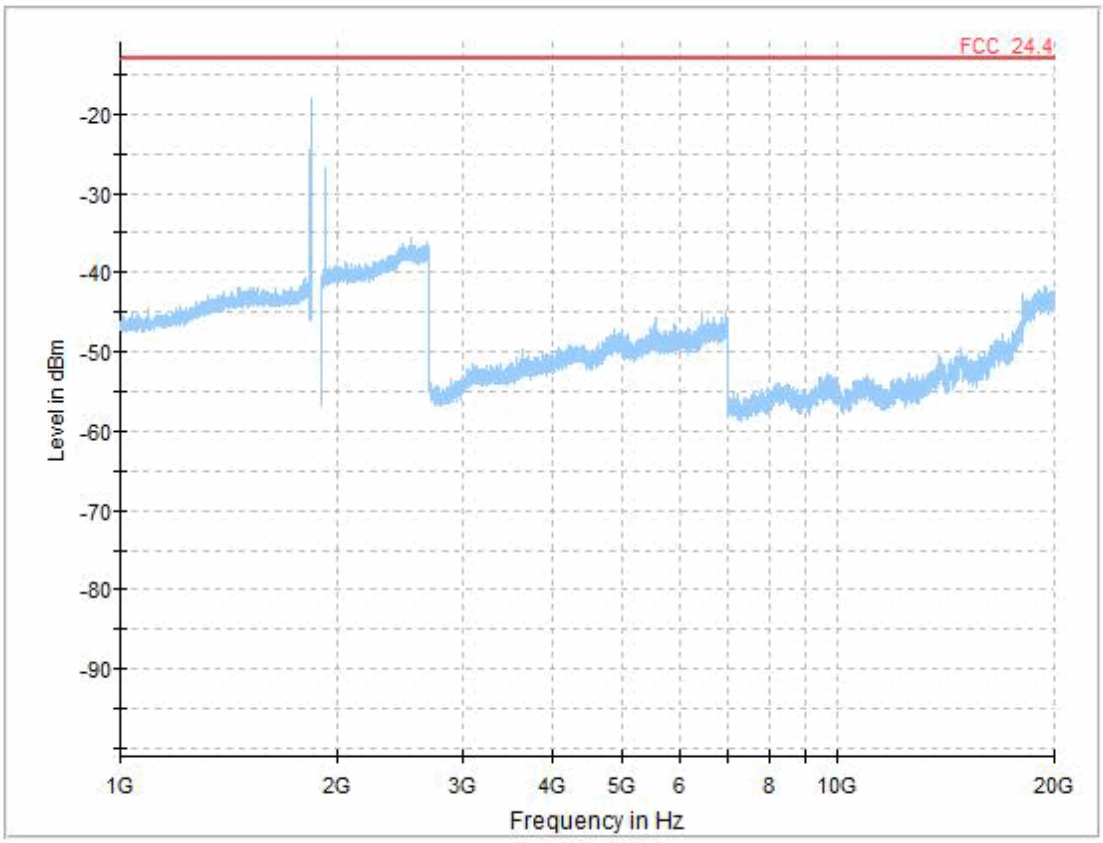
1) Performed in the range 30 MHz - 20 GHz

2) Performed in the range 1-20 GHz, around band and around harmonics only (since no peaks outside this range were seen in pre tests)

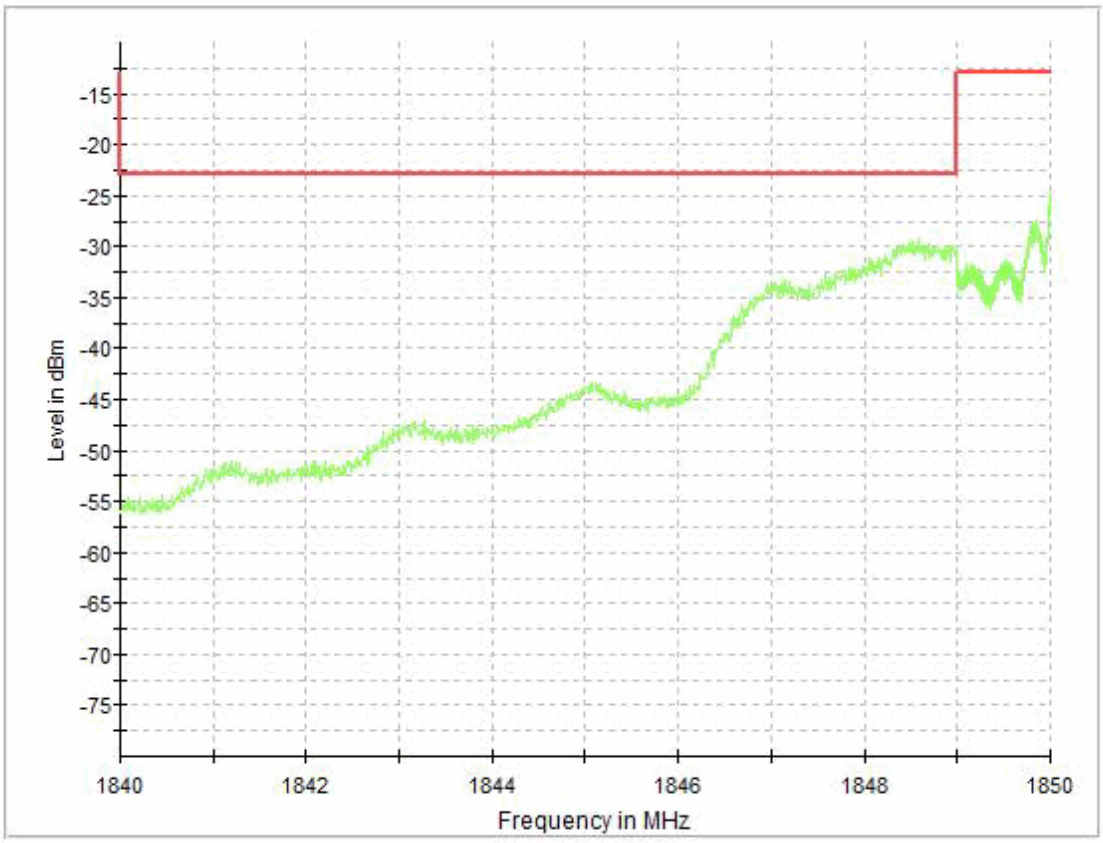
3) Due to close proximity to carrier value too high with standard bandwidth, measurement repeated in 100 kHz RBW resulting in reduced limit of -23 dBm



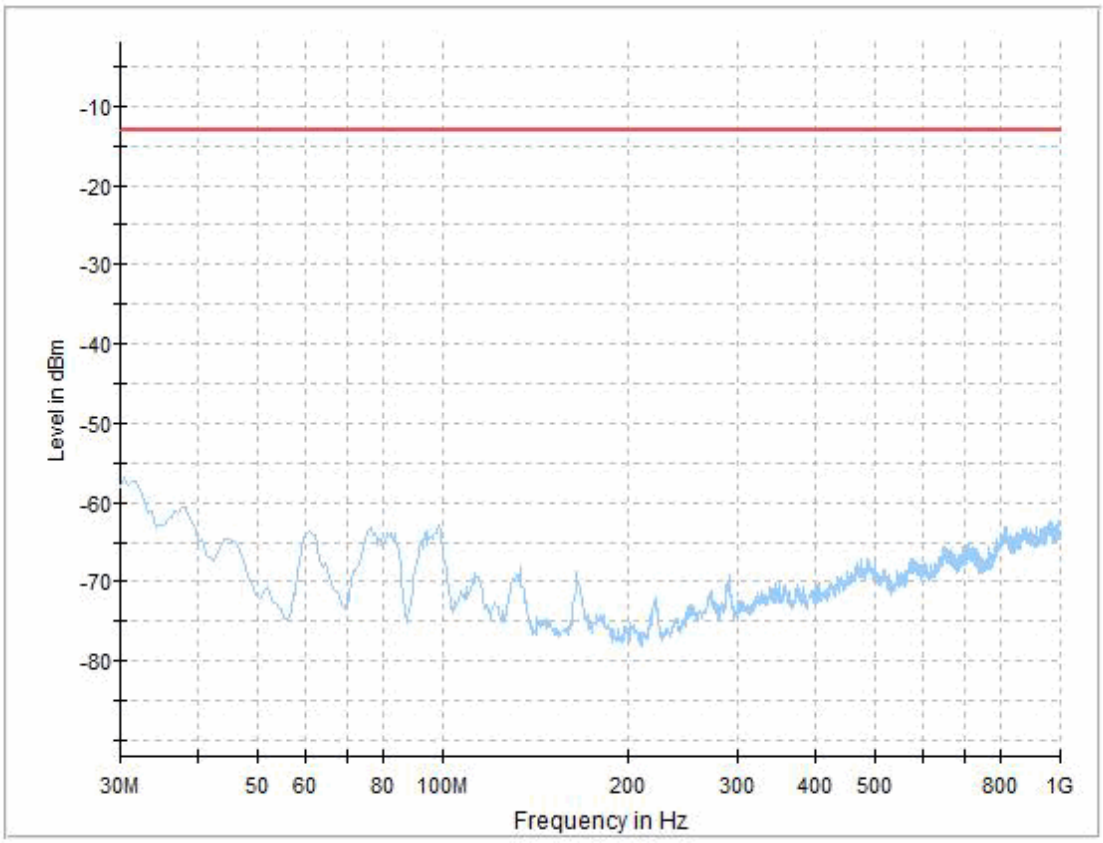
HSDPA FDD II low channel, 30 MHz - 1 GHz



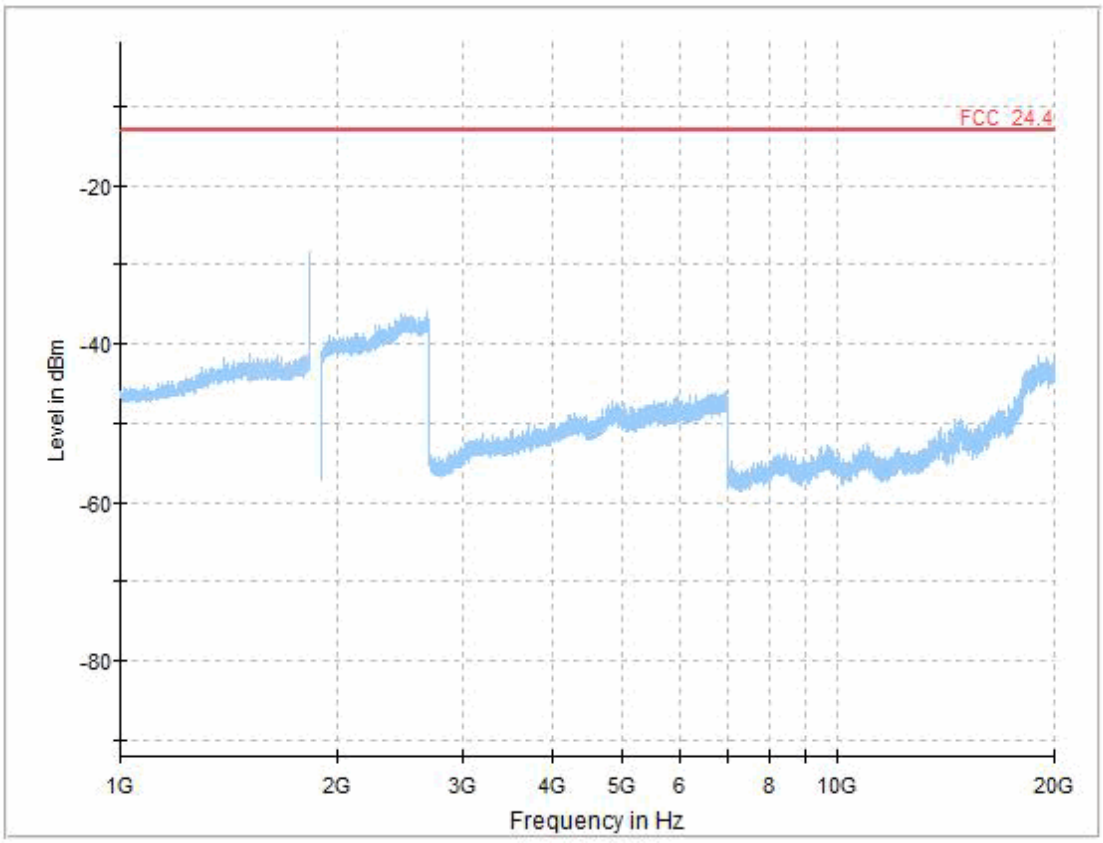
HSDPA FDD II low channel, 1 GHz - 20 GHz



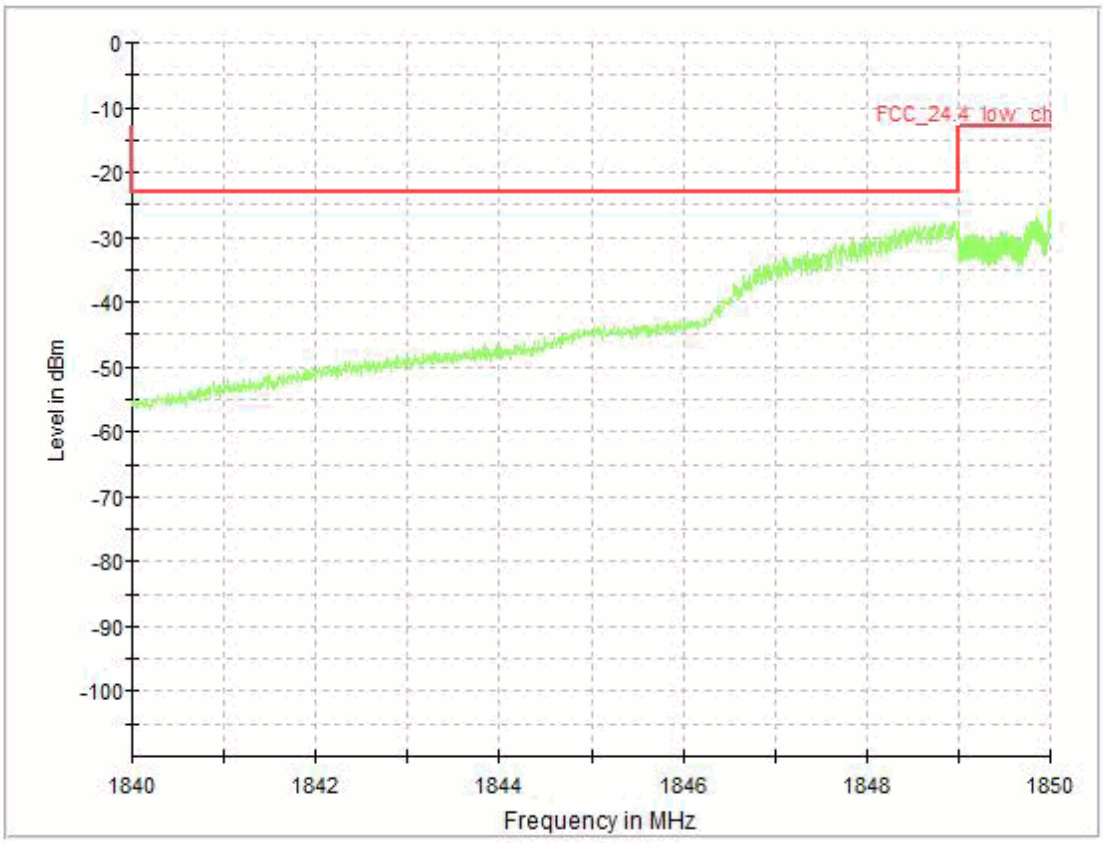
HSDPA FDD II low channel, measurement with RMS detector and reduced bandwidth



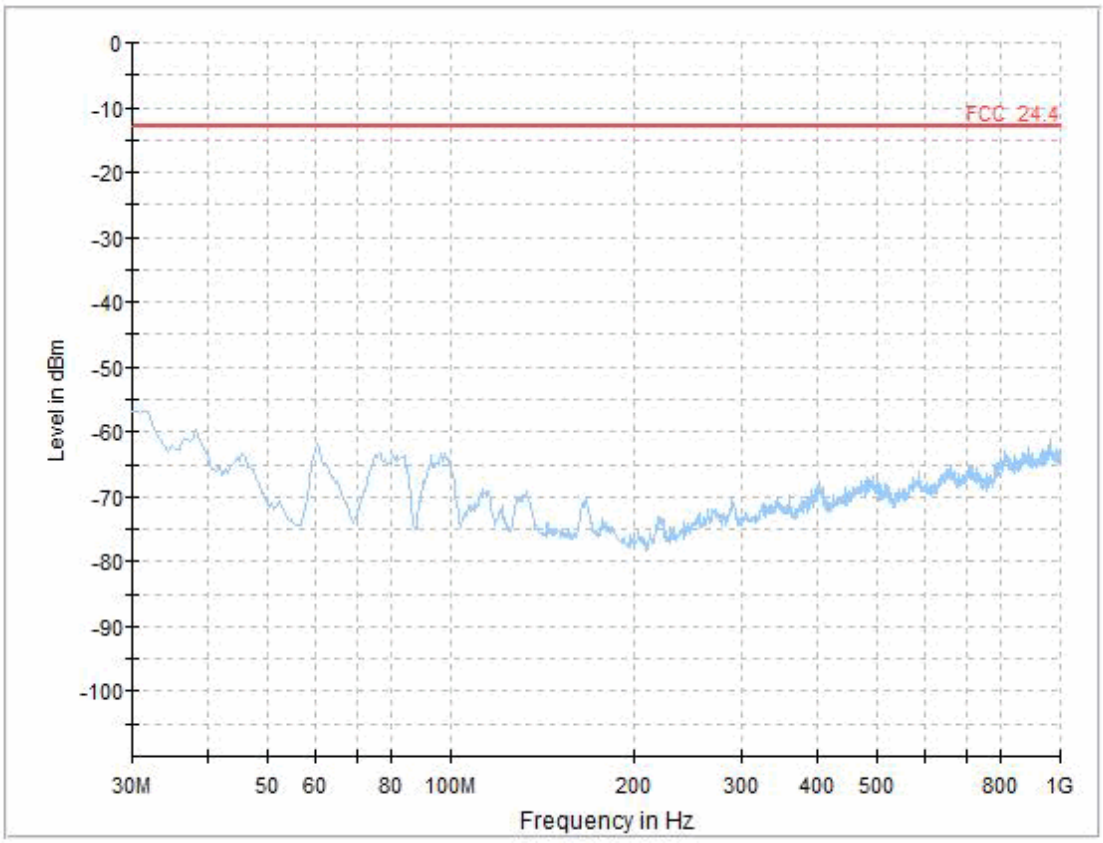
HSUPA FDD II low channel, 30 M - 1 GHz



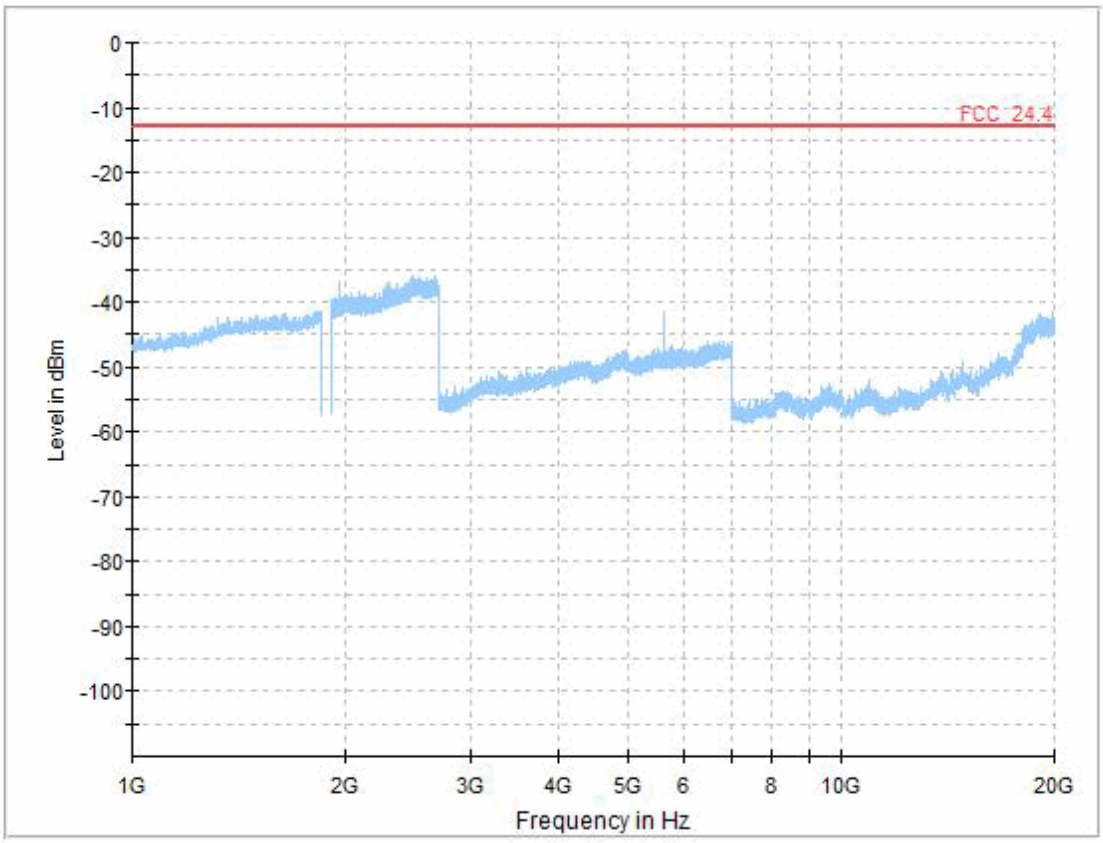
HSUPA FDD II low channel, 1 GHz - 20 GHz



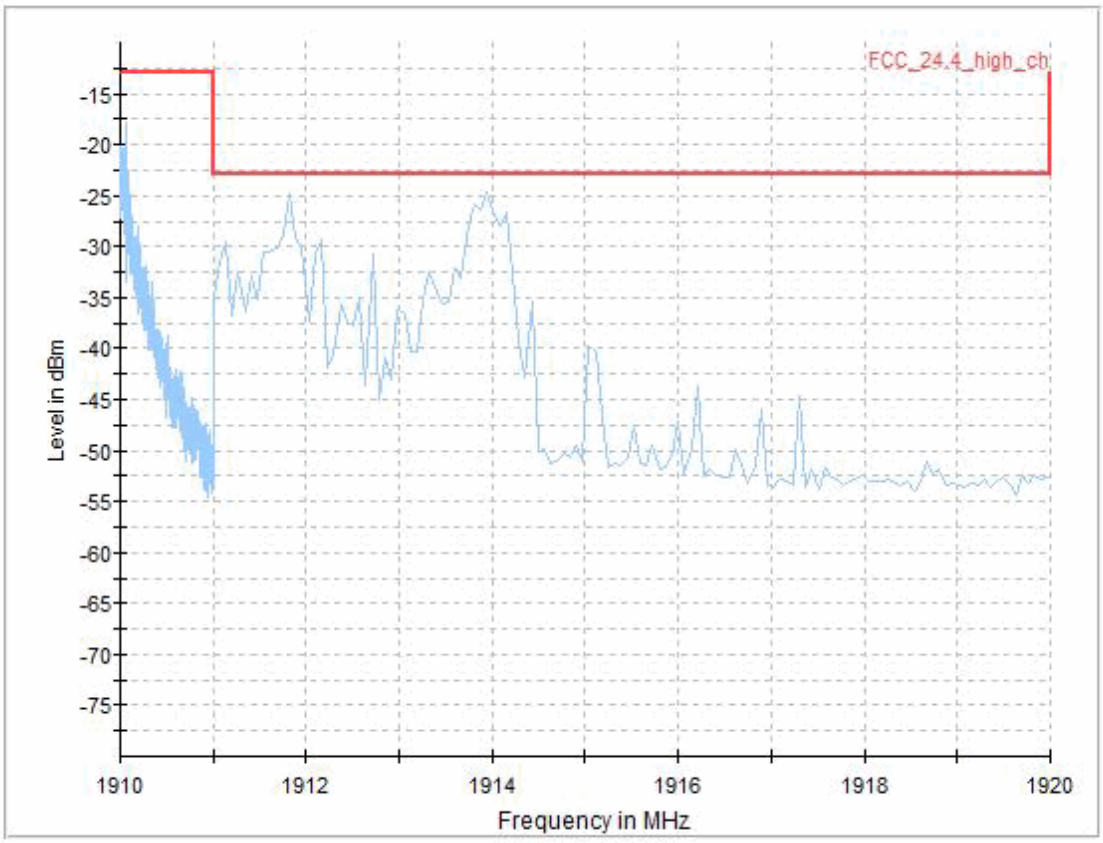
HSUPA FDD II low channel, 1840 - 1850 MHz, RMS detector and reduced RBW



eFDD 2 mid channel 30 MHz - 1 GHz



eFDD 2 mid channel, 1 GHz - 20 GHz



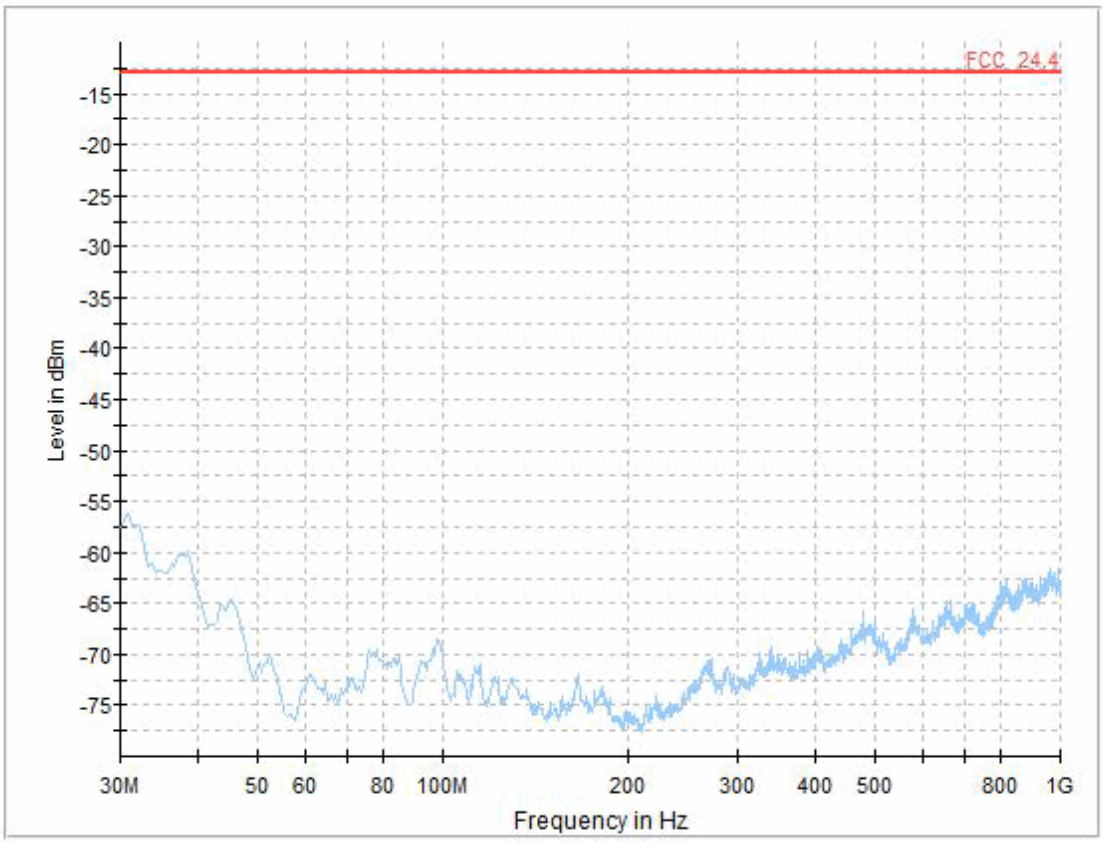
eFDD 2 high channel, 1910 - 1920 MHz, peak and reduced RBW

Radio Technology	Channel	Detector	Trace	Ressource Blocks	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB	Remark
GSM 1900	low	peak	maxhold	-	3	1849.98	-16.6	-13	3.6	1)
GSM 1900	mid	peak	maxhold	-	1000	5640	-41.8	-13	28.8	1)
GSM 1900	high	peak	maxhold	-	3	1910	-16.2	-13	3.2	1)
GSM 1900 EDGE	low	peak	maxhold	-	3	1850	-22.4	-13	9.4	1)
GSM 1900 EDGE	mid	peak	maxhold	-	1000	5640	-43.7	-13	30.7	1)
GSM 1900 EDGE	high	peak	maxhold	-	3	1910.04	-20.7	-13	7.7	1)
FDD II	low	RMS	maxhold	-	100	1848.83	-26.1	-23	3.1	1) 3)
FDD II	low	RMS	maxhold	-	50	1850	-22.3	-13	9.3	1)
FDD II	mid	peak	maxhold	-	1000	5643.5	-42.1	-13	29.1	1)
FDD II	high	RMS	maxhold	-	50	1910	-20	-13	7	1)
FDD II	high	RMS	maxhold	-	100	1911.23	-24.9	-23	1.9	1) 3)
FDD II HSDPA Subtest 1	low	RMS	maxhold	-	100	1848.58	-29.1	-23	6.1	1) 3)
FDD II HSDPA Subtest 1	low	RMS	maxhold	-	50	1850	-24.6	-13	11.6	1)
FDD II HSDPA Subtest 1	mid	peak	maxhold	-	1000	6866	-40.7	-13	27.7	1)
FDD II HSDPA Subtest 1	high	RMS	maxhold	-	50	1910	-25	-13	12	1)
FDD II HSDPA Subtest 1	high	RMS	maxhold	-	100	1911.29	-30.9	-23	7.9	1) 3)
FDD II HSUPA Subtest 1	low	RMS	maxhold	-	100	1848.96	-27.7	-23	4.7	1) 3)
FDD II HSUPA Subtest 1	low	RMS	maxhold	-	50	1850	-25.6	-13	12.6	1)
FDD II HSUPA Subtest 1	mid	peak	maxhold	-	-	-	-	-13	>20	1)
FDD II HSUPA Subtest 1	high	RMS	maxhold	-	50	1910	-26.3	-13	13.3	1)
FDD II HSUPA Subtest 1	high	RMS	maxhold	-	100	1911.05	-29.3	-23	6.3	1) 3)

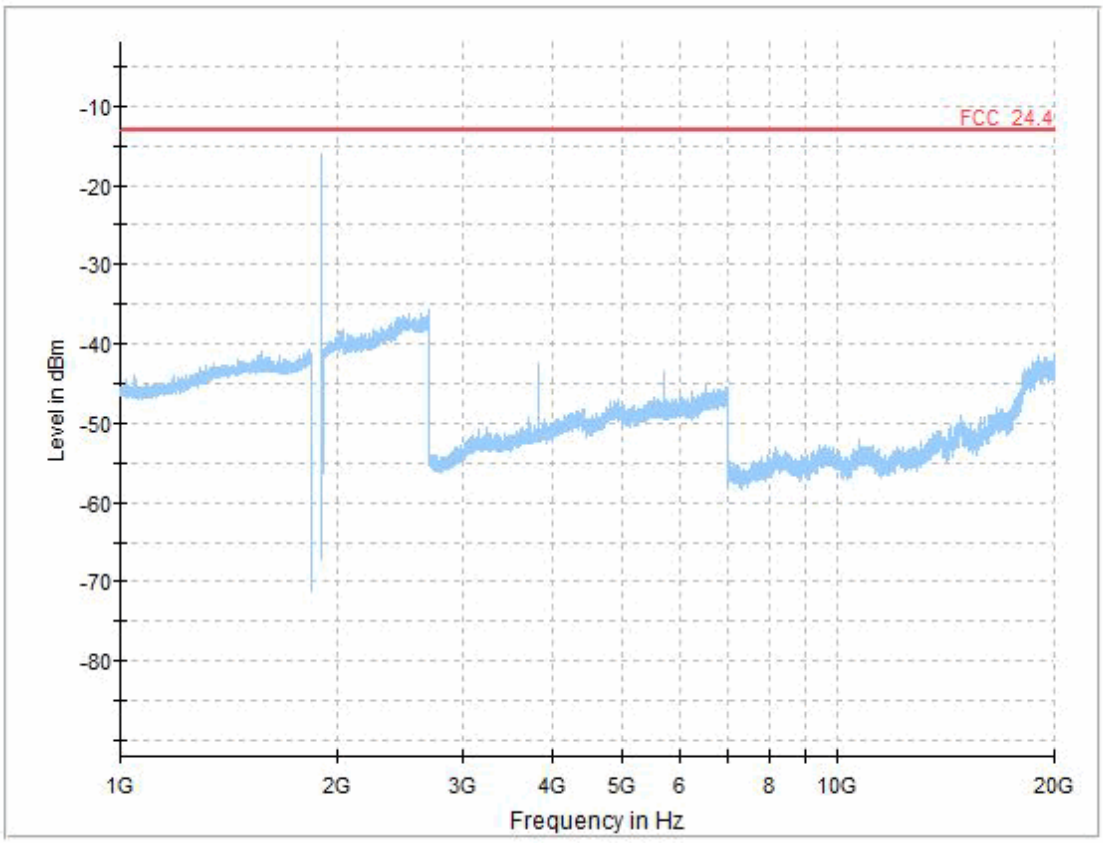
1) Performed in the range 30 MHz - 20 GHz

2) Performed in the range 1-20 GHz, around band and around harmonics only
(since no peaks outside this range were seen in pre tests)

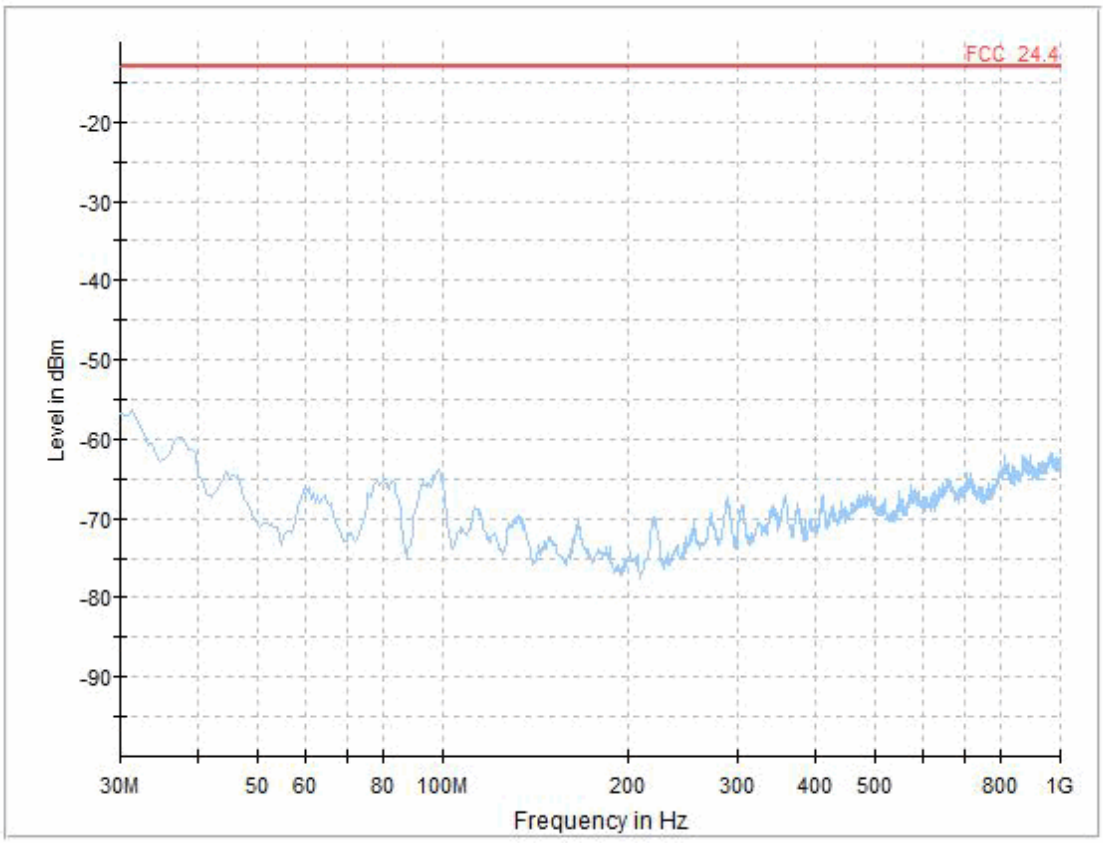
3) Due to close proximity to carrier value too high with standard bandwidth, measurement repeated in 100 kHz RBW resulting in reduced limit of -23 dBm



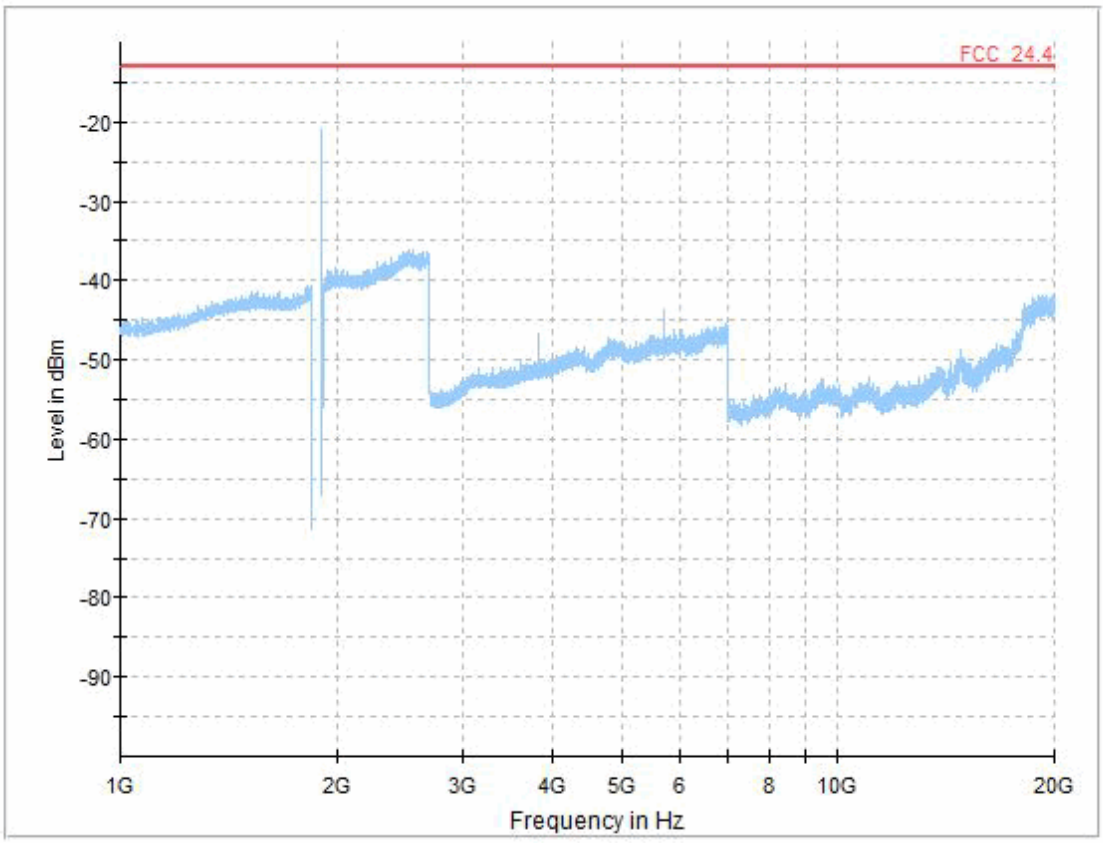
GSM 1900 high channel, 30 MHz - 1 GHz



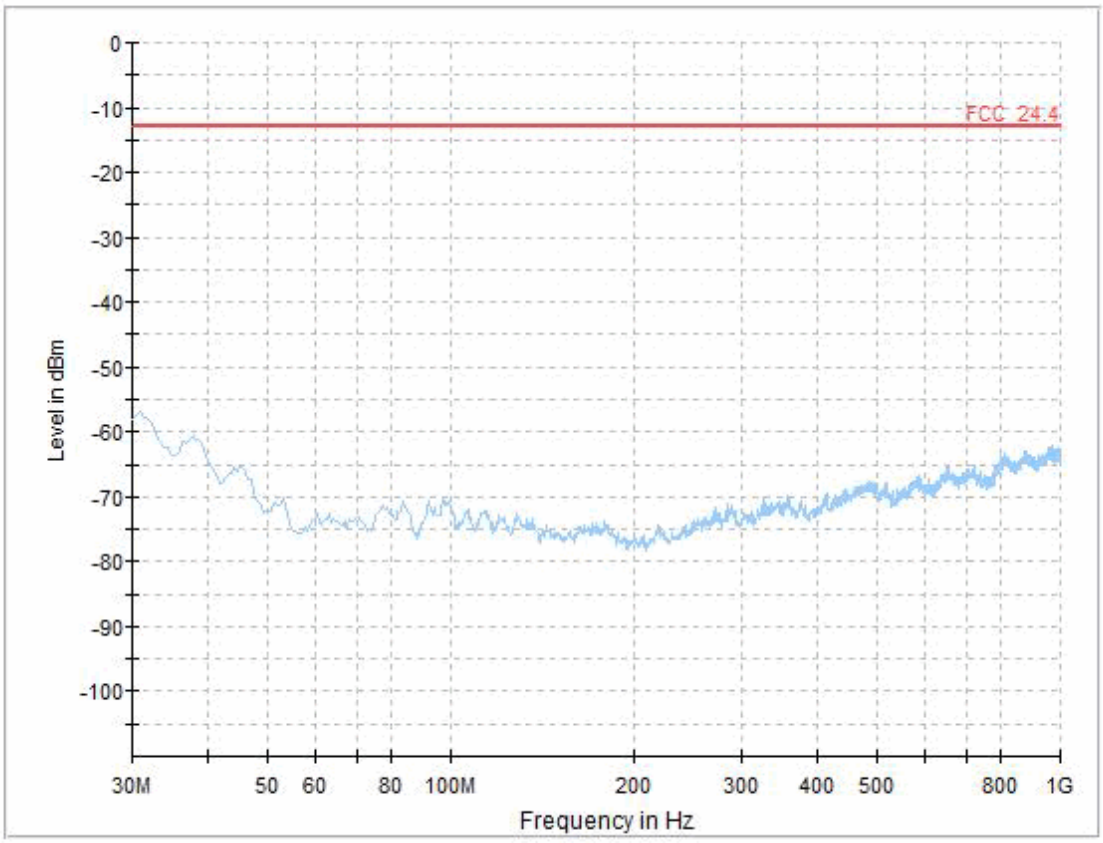
GSM 1900 high channel, 1 GHz - 20 GHz



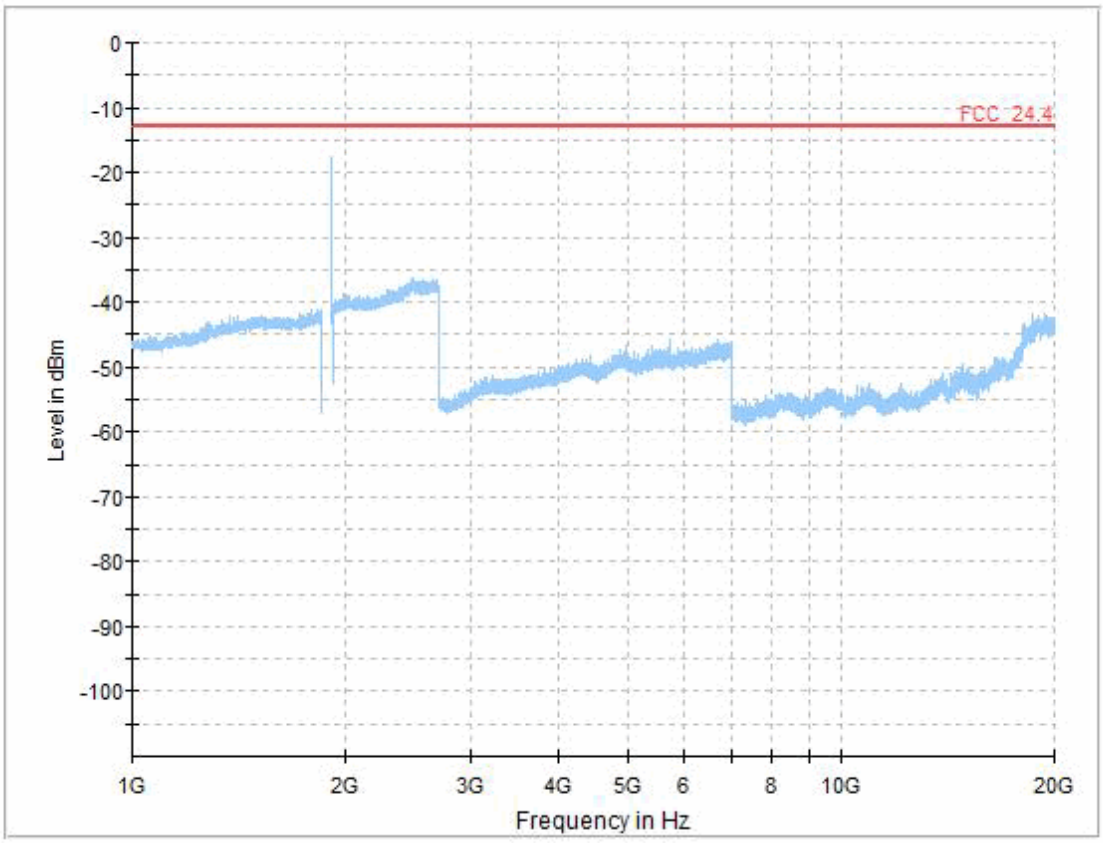
EDGE 1900 high channel, 30 MHz - 1 GHz



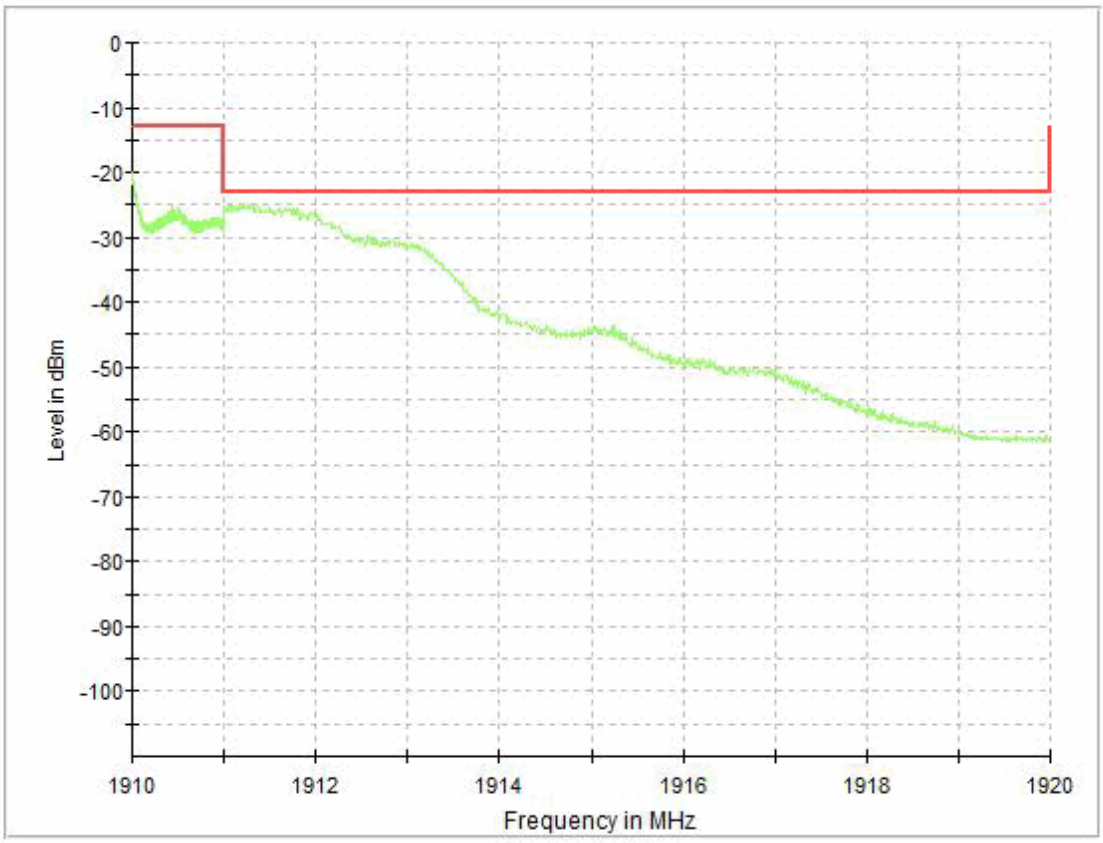
EDGE 1900 high channel, 1 GHz - 20 GHz



WCDMA FDD II high channel, 30 MHz - 1 GHz



WCDMA FDD II high channel, 1 GHz - 20 GHz



WCDMA FDD II high channel, measurement with RMS detector and reduced bandwidth

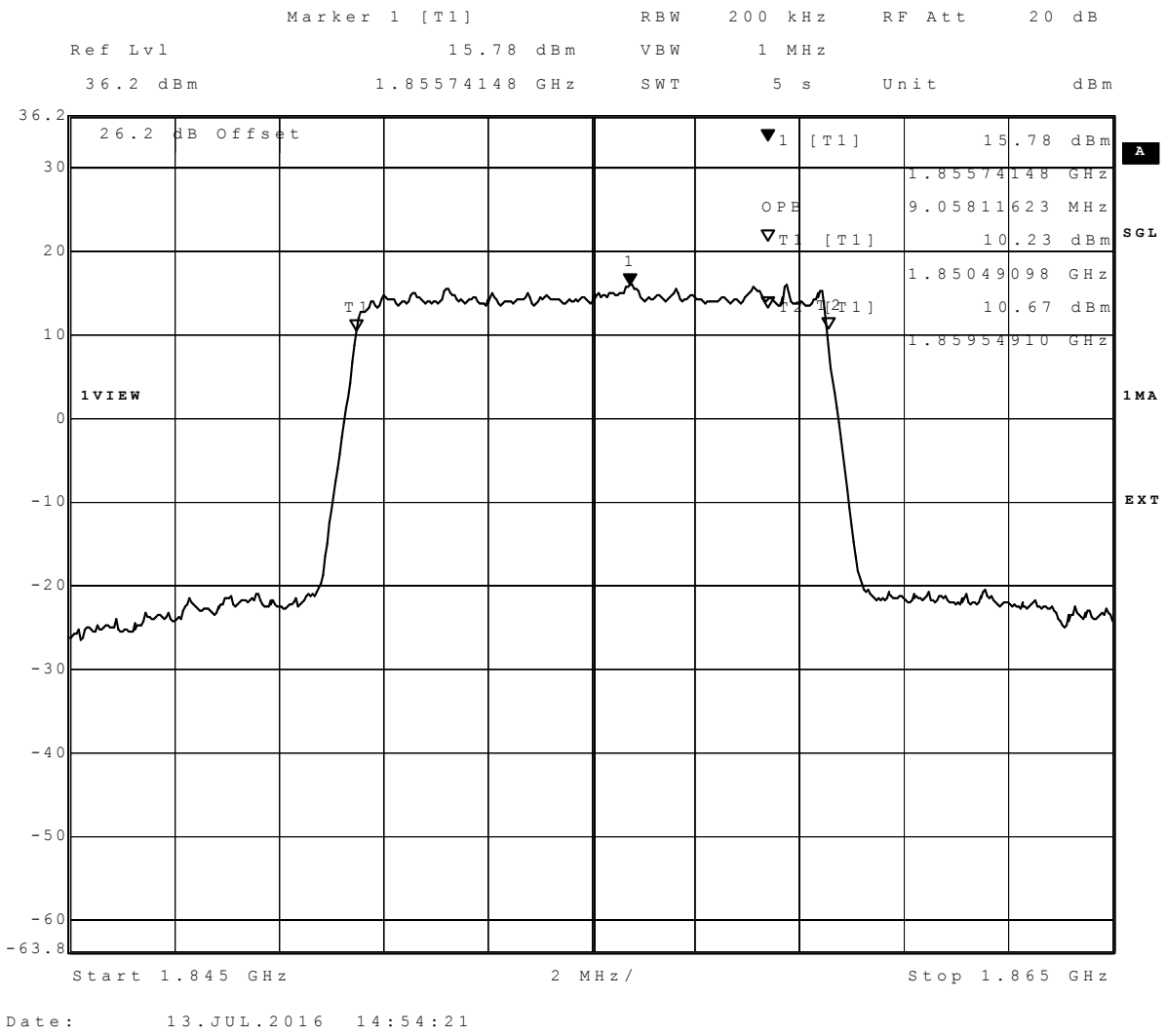
3.5.12 24.5 Emission and Occupied Bandwidth §2.1049, §24.238

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

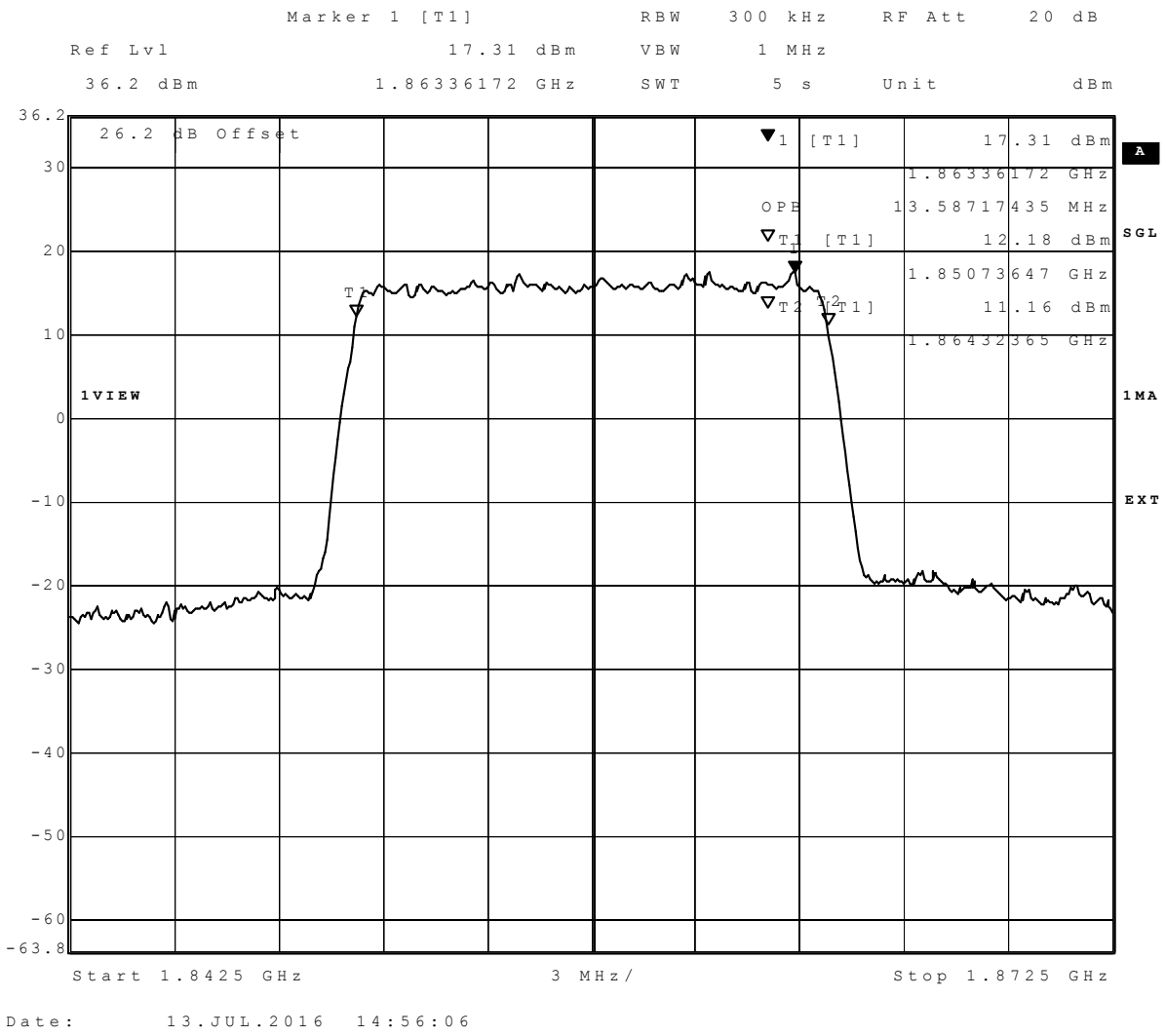
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/29 15:27
Body:	FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 24

Detailed Results:

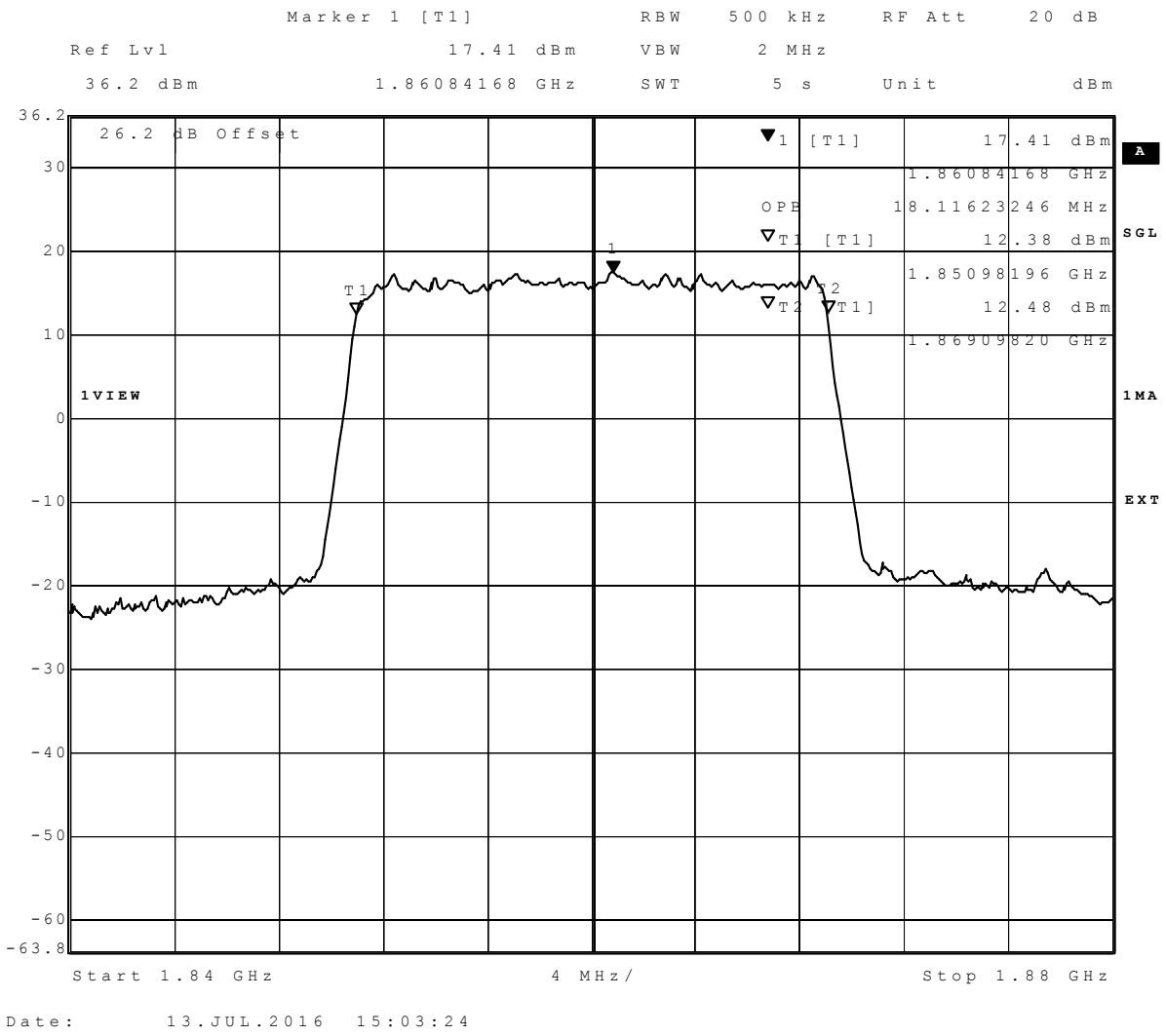
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	26 dB BW [kHz]	99 % BW [kHz]
GSM 1900 GPRS	low	-	0.2	318.6	242.5
GSM 1900 GPRS	mid	-	0.2	310.6	244.5
GSM 1900 GPRS	high	-	0.2	**318.6**	**242.5**
GSM 1900 EDGE	low	-	0.2	288.5	228.5
GSM 1900 EDGE	mid	-	0.2	296.6	230.5
GSM 1900 EDGE	high	-	0.2	284.6	232.5
FDD II	low	-	5	4769.5	4168.3
FDD II	mid	-	5	4769.5	4168.3
FDD II	high	-	5	4789.6	4168.3
FDD II HSDPA Subtest 1	low	-	5	4769.5	4168.3
FDD II HSDPA Subtest 1	mid	-	5	4769.5	4148.3
FDD II HSDPA Subtest 1	high	-	5	4789.6	4168.3
FDD II HSUPA Subtest 1	low	-	5	4769.5	4168.3
FDD II HSUPA Subtest 1	mid	-	5	**4789.6**	**4188.4**
FDD II HSUPA Subtest 1	high	-	5	4789.6	4168.3
FDD II HSUPA Subtest 5	low	-	5	4769.5	4188.4
FDD II HSUPA Subtest 5	mid	-	5	4789.6	4168.3
FDD II HSUPA Subtest 5	high	-	5	4769.5	4168.3
eFDD 2 QPSK	low	6	1.4	-	**1106.2**
eFDD 2 QPSK	mid	6	1.4	-	1100.2
eFDD 2 QPSK	high	6	1.4	-	1100.2
eFDD 2 16QAM	low	6	1.4	-	1094.2
eFDD 2 16QAM	mid	6	1.4	-	1106.2
eFDD 2 16QAM	high	6	1.4	-	1094.2



eFDD 2 low channel 10 MHz 16QAM 99% BW

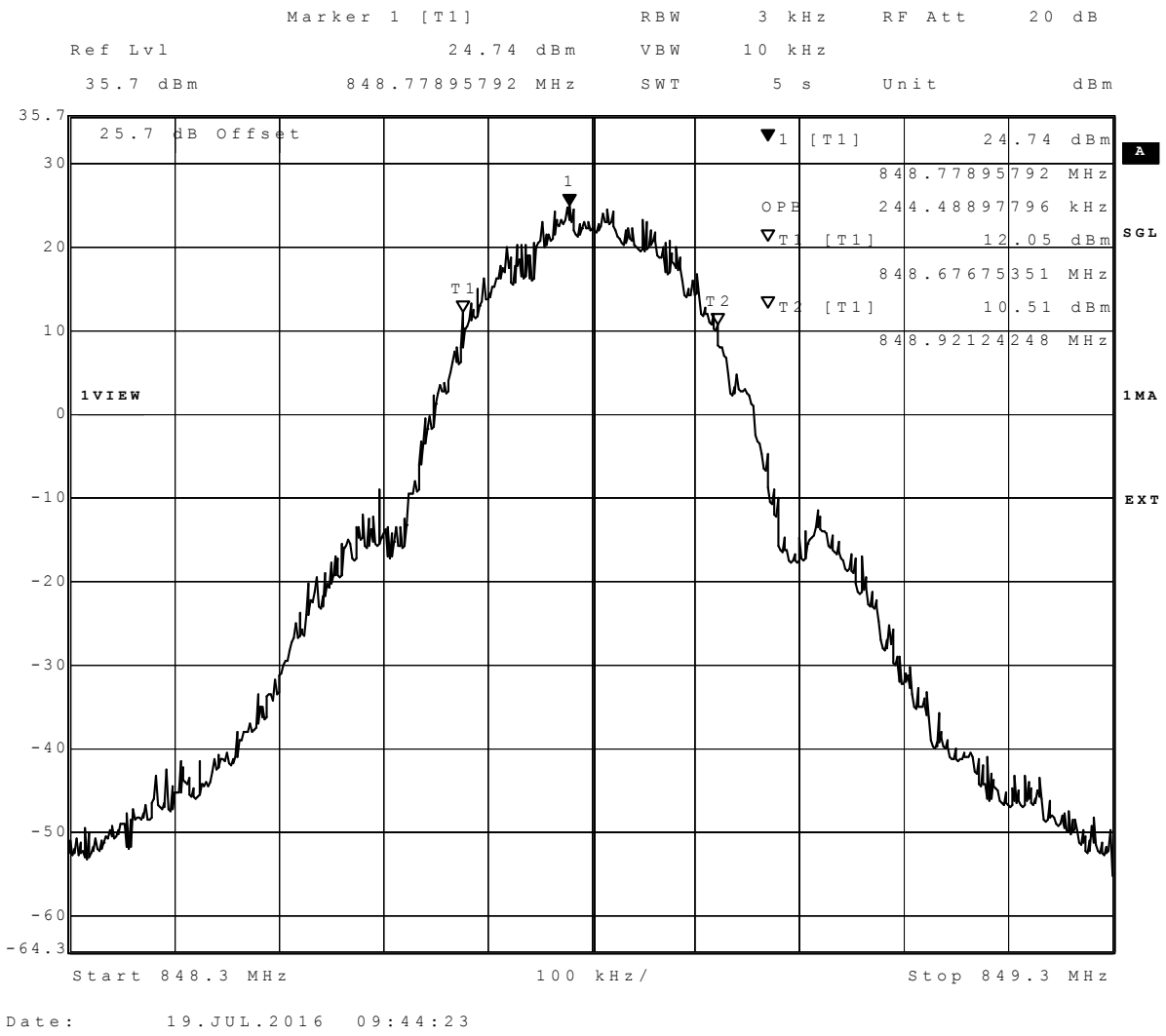


eFDD 2 low channel 15 MHz QPSK 99% BW

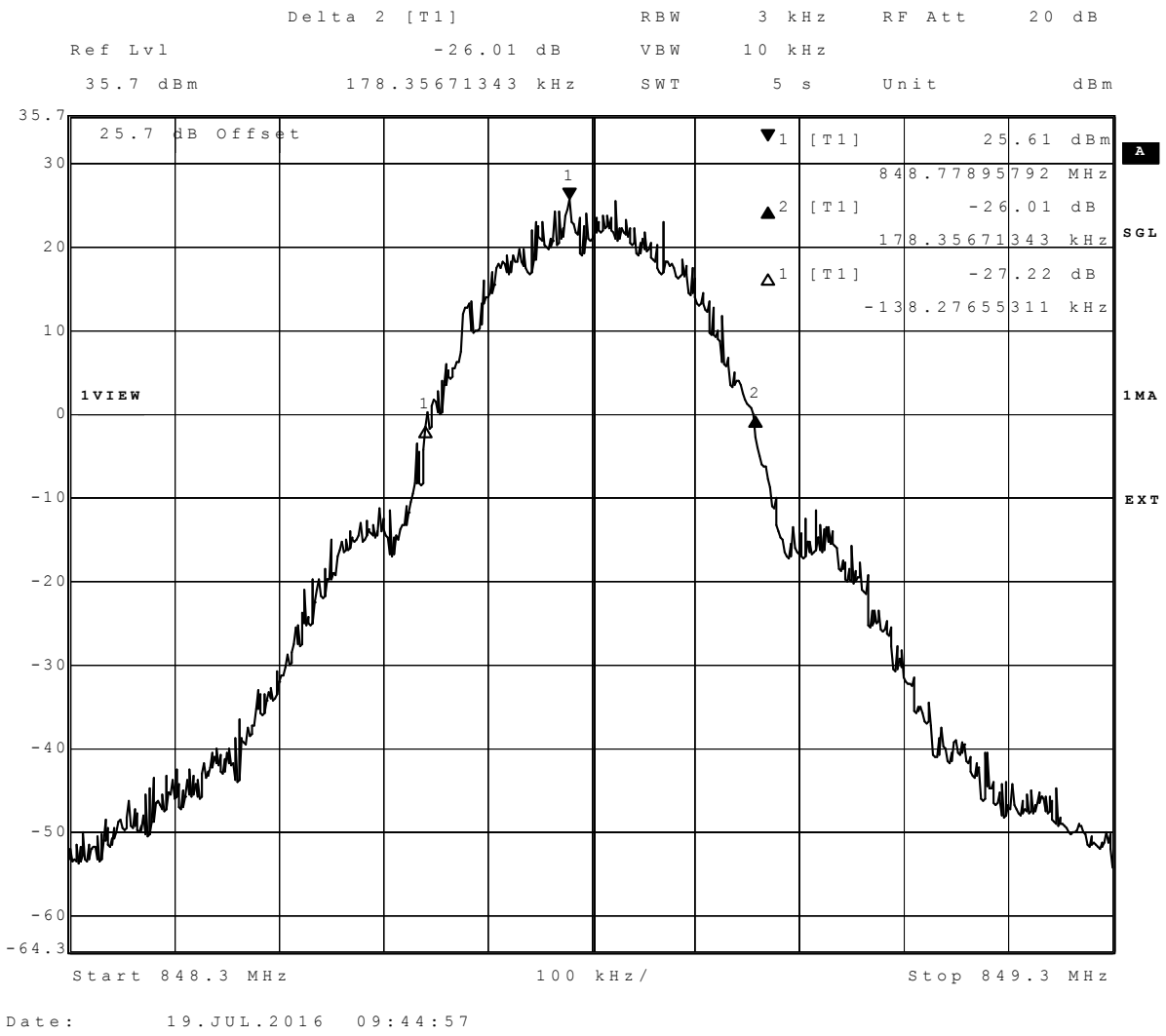


eFDD 2 low channel 20 MHz 16QAM 99% BW

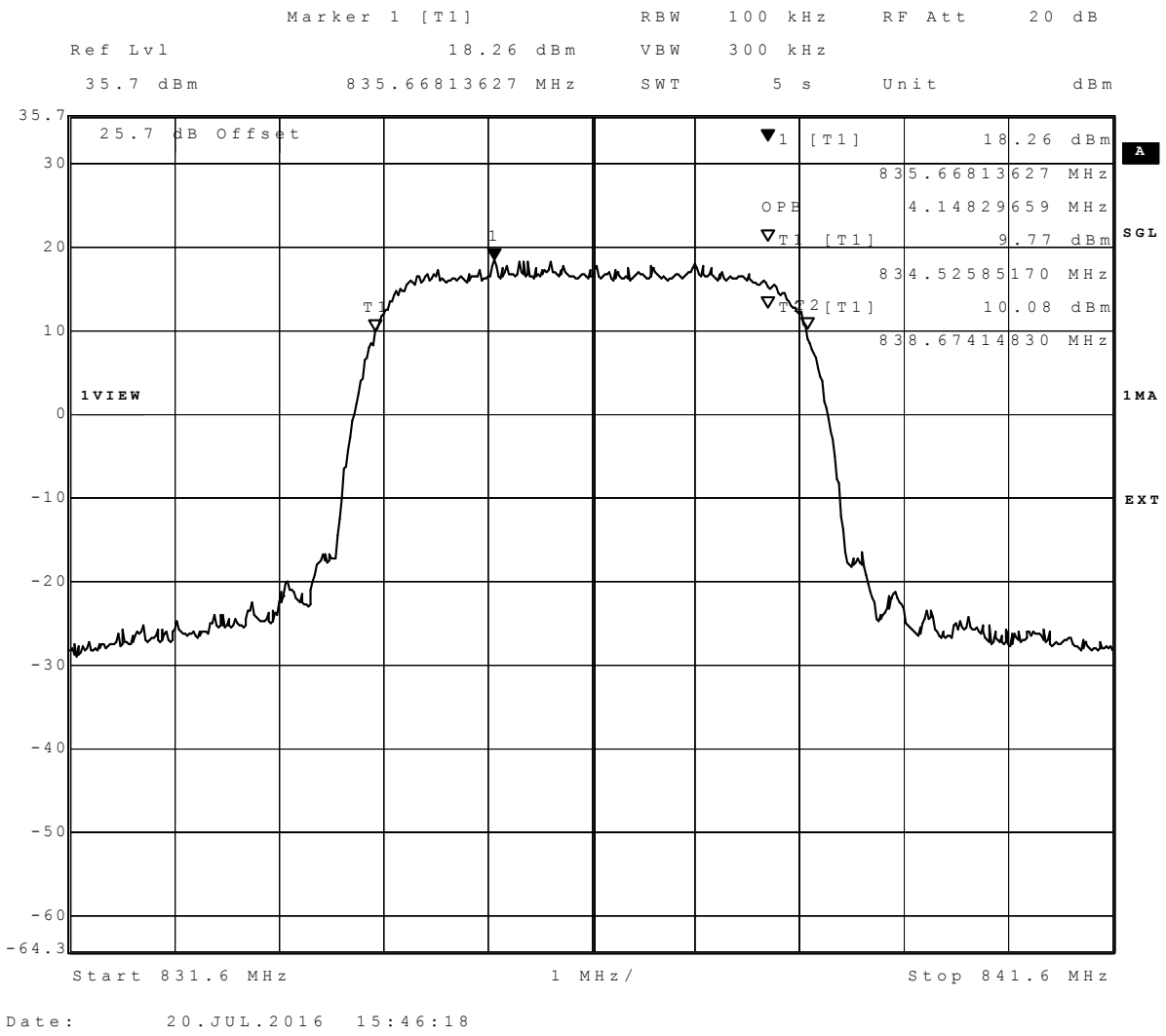
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	26 dB BW [kHz]	99 % BW [kHz]
eFDD 2 QPSK	low	15	3	-	2753.5
eFDD 2 QPSK	mid	15	3	-	2753.5
eFDD 2 QPSK	high	15	3	-	2765.5
eFDD 2 16QAM	low	15	3	-	**2789.6**
eFDD 2 16QAM	mid	15	3	-	2741.5
eFDD 2 16QAM	high	15	3	-	2753.5
eFDD 2 QPSK	low	25	5	-	4529.1
eFDD 2 QPSK	mid	25	5	-	4529.1
eFDD 2 QPSK	high	25	5	-	4509
eFDD 2 16QAM	low	25	5	-	**4529.1**
eFDD 2 16QAM	mid	25	5	-	4529.1
eFDD 2 16QAM	high	25	5	-	4529.1
eFDD 2 QPSK	low	50	10	-	9018
eFDD 2 QPSK	mid	50	10	-	8978
eFDD 2 QPSK	high	50	10	-	9018
eFDD 2 16QAM	low	50	10	-	**9058.1**
eFDD 2 16QAM	mid	50	10	-	9018
eFDD 2 16QAM	high	50	10	-	9018
eFDD 2 QPSK	low	75	15	-	**13587.2**
eFDD 2 QPSK	mid	75	15	-	13527.1
eFDD 2 QPSK	high	75	15	-	13527.1
eFDD 2 16QAM	low	75	15	-	13527.1
eFDD 2 16QAM	mid	75	15	-	13527.1
eFDD 2 16QAM	high	75	15	-	13527.1
eFDD 2 QPSK	low	100	20	-	18036.1
eFDD 2 QPSK	mid	100	20	-	18116.2
eFDD 2 QPSK	high	100	20	-	18036.1
eFDD 2 16QAM	low	100	20	-	**18116.2**
eFDD 2 16QAM	mid	100	20	-	18116.2
eFDD 2 16QAM	high	100	20	-	18036.1



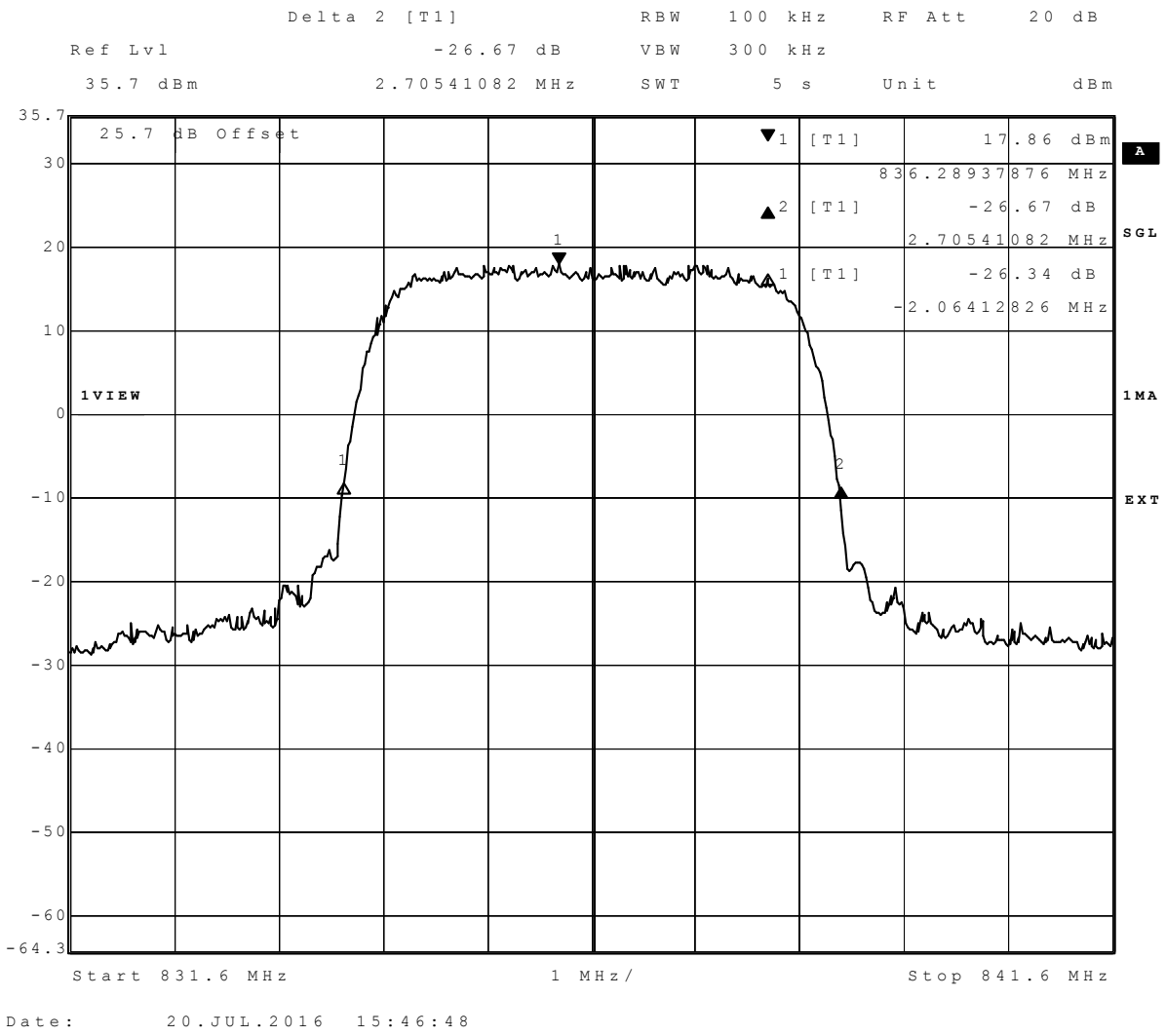
GSM 1900 GPRS high channel 99% BW



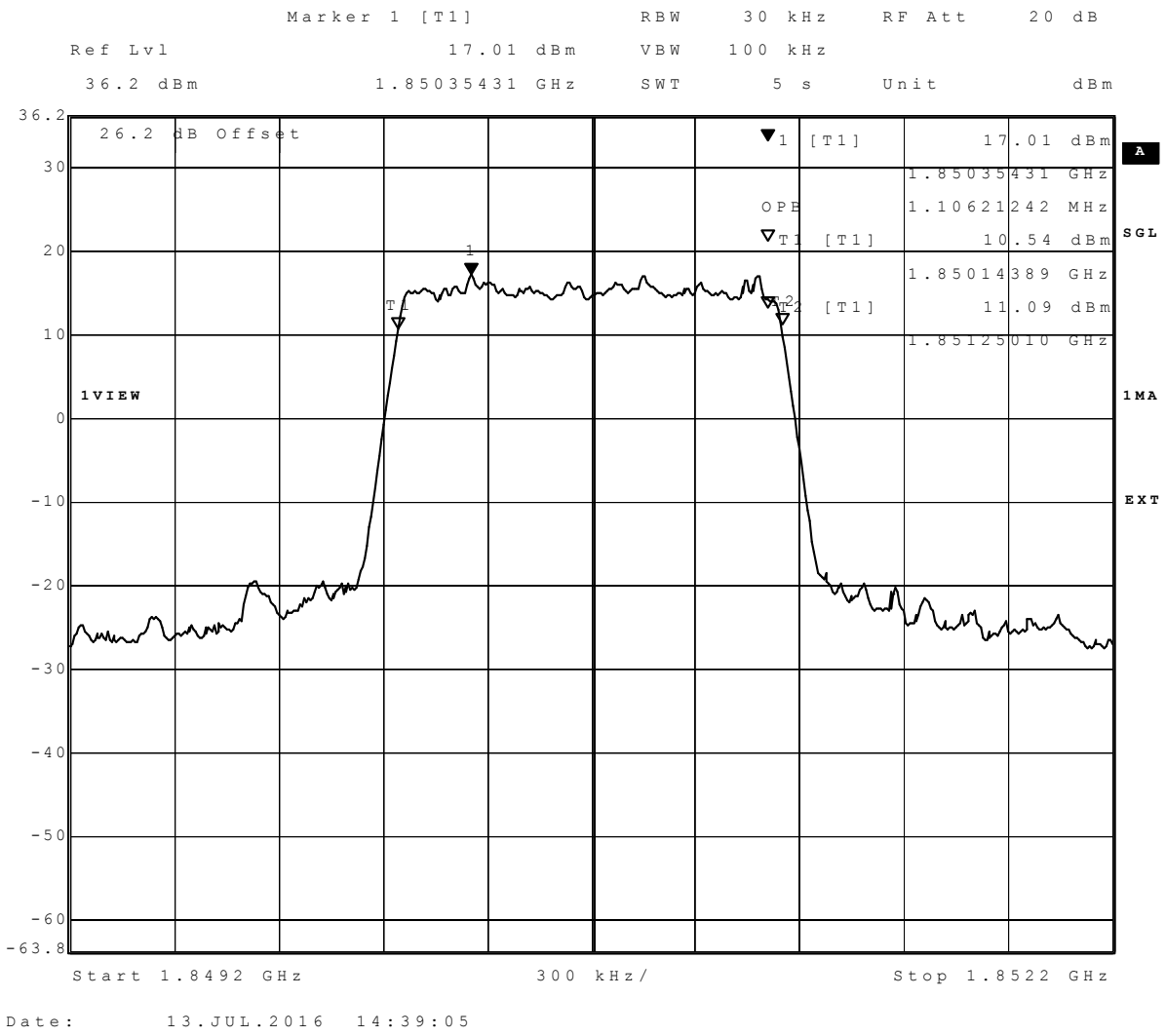
GSM 1900 GPRS high channel 26 dB BW



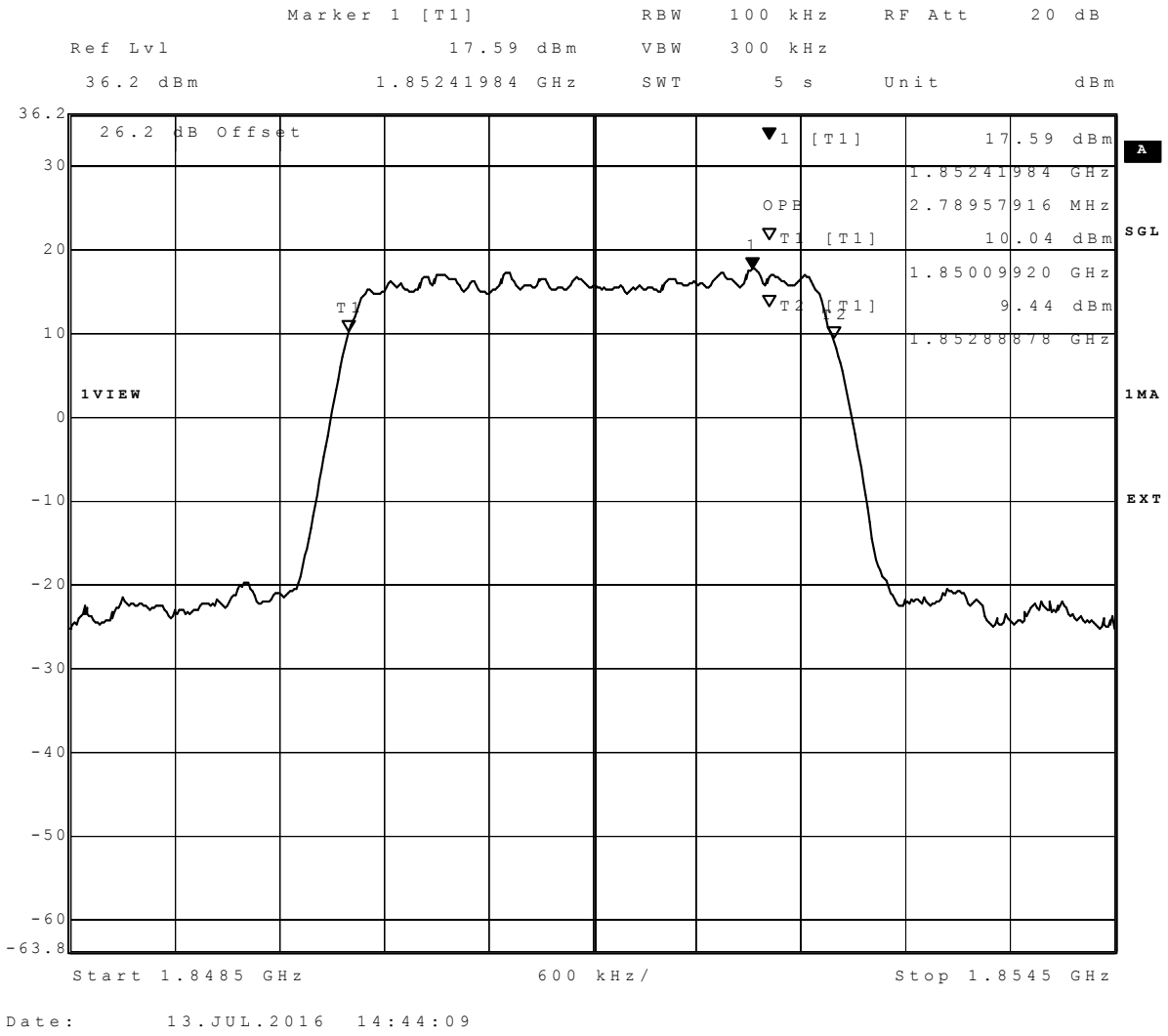
FDD II HSUPA Subtest 1 mid channel 99% BW



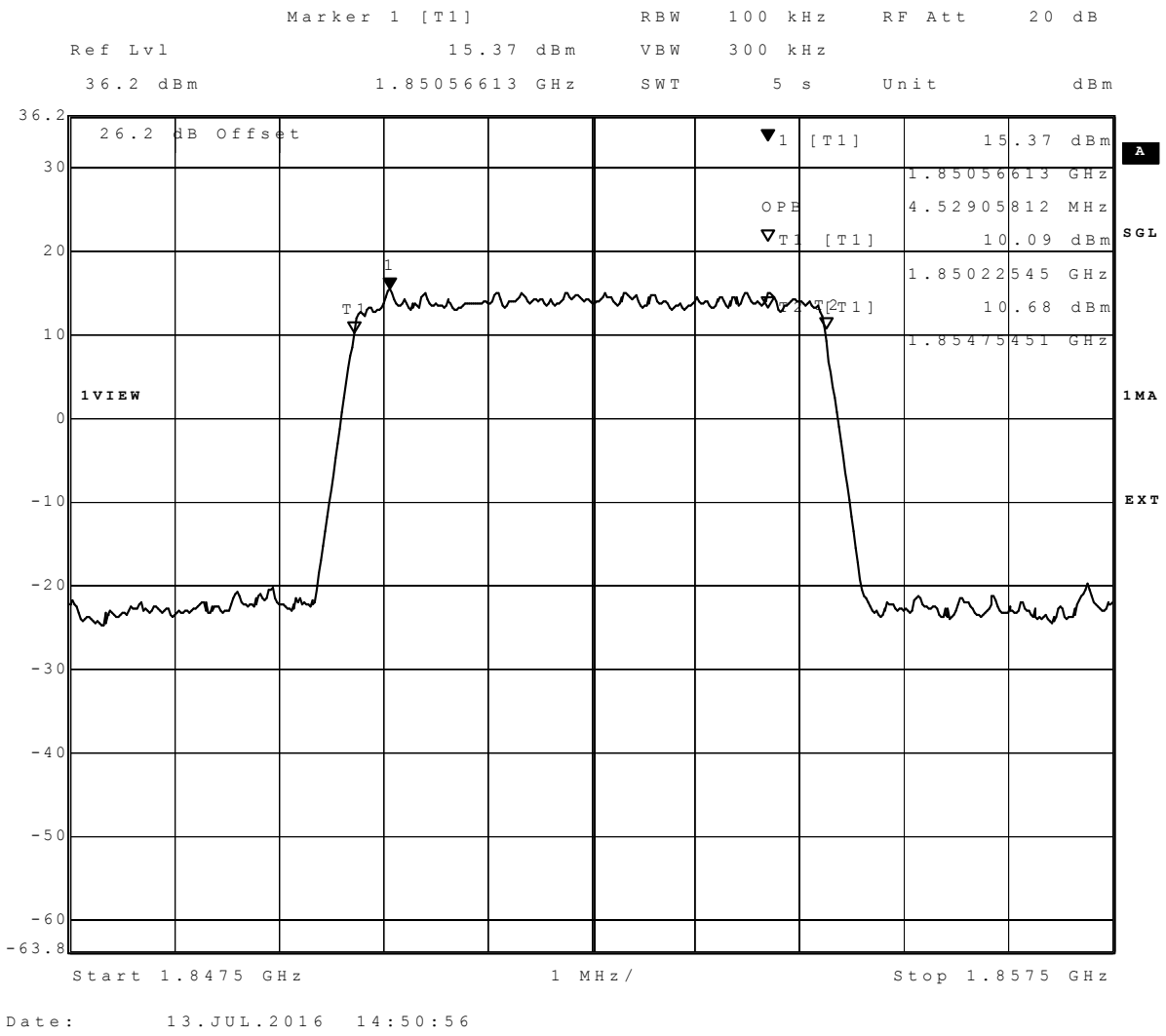
FDD II HSUPA Subtest 1 mid channel 26 dB BW



eFDD 2 low channel 1.4 MHz QPSK 99% BW



eFDD 2 low channel 3 MHz 16QAM 99% BW



eFDD 2 low channel 5 MHz 16QAM 99% BW

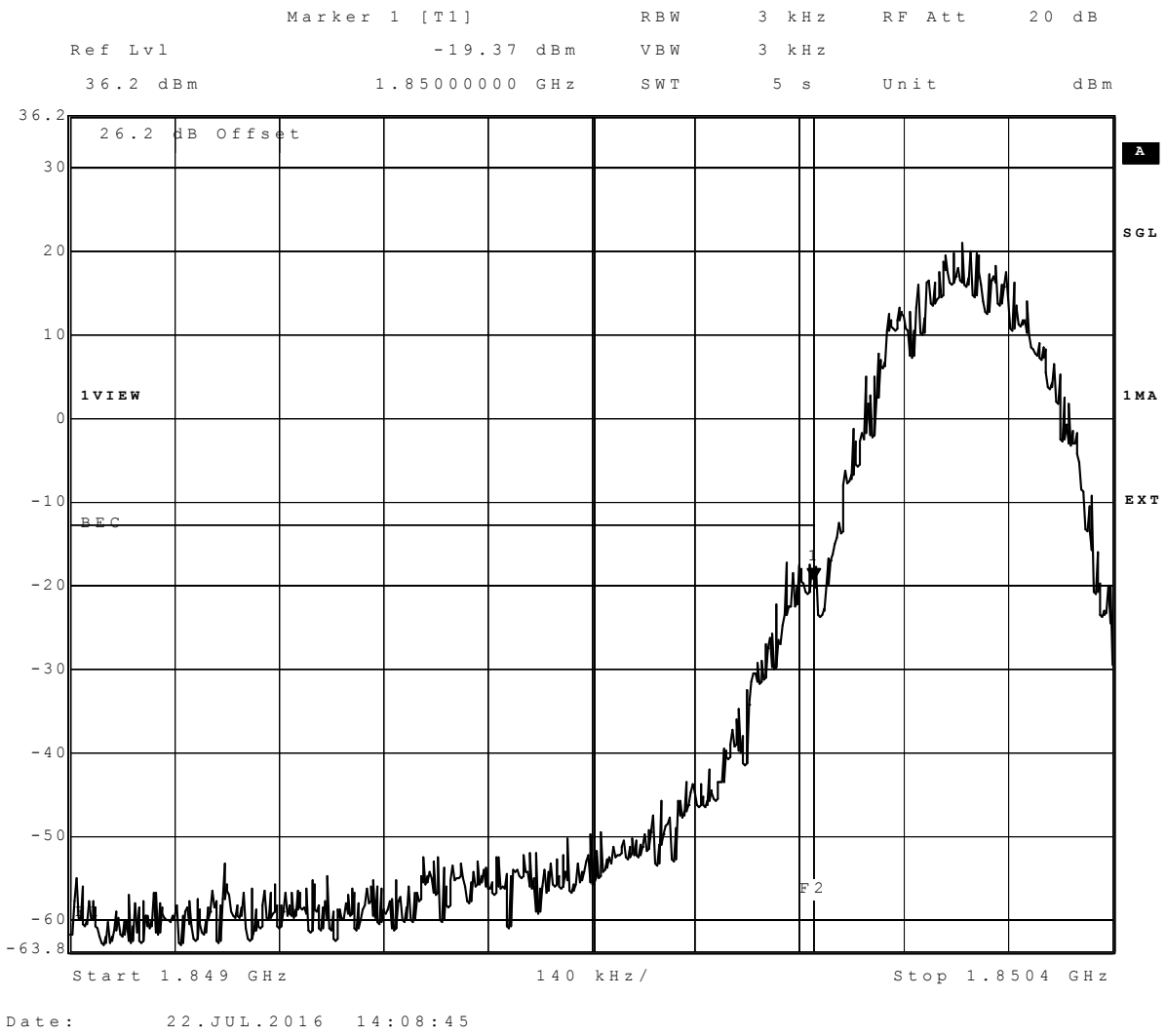
3.5.13 24.6 Band edge compliance §2.1053, §24.238

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

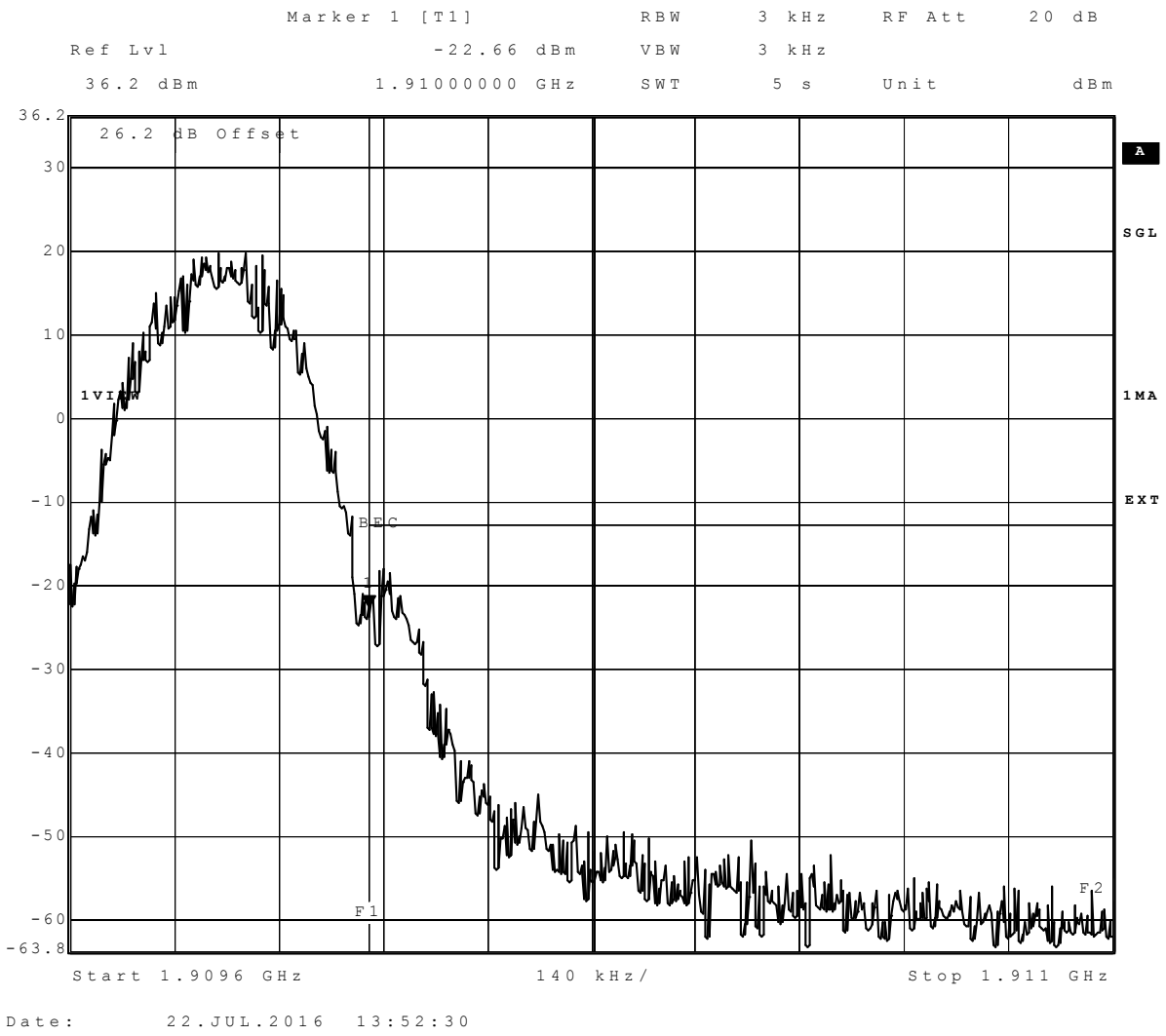
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/30 19:14
Body:	FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 24

Detailed Results:

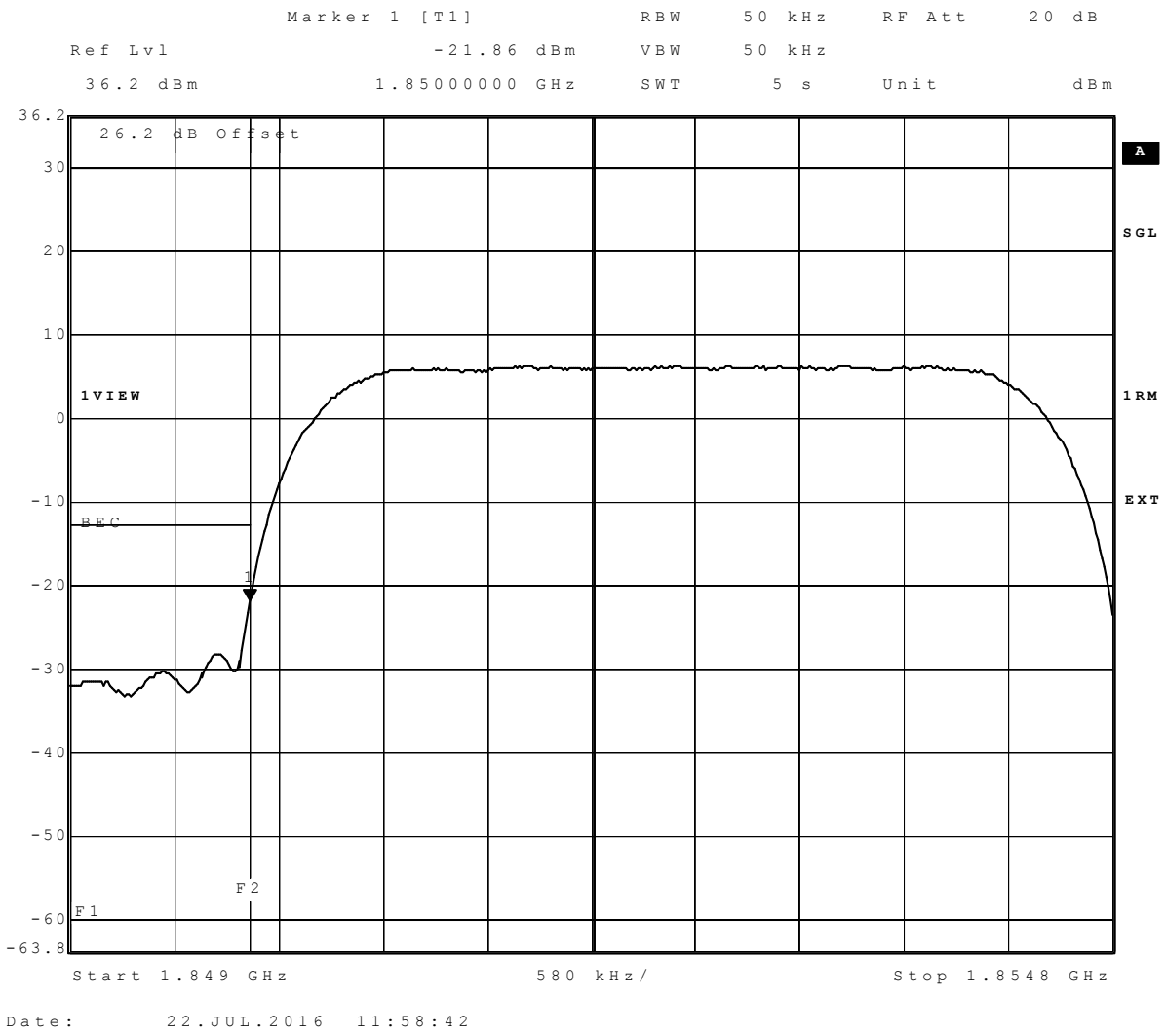
Radio Technology	Channel	Nominal BW	Ressource Blocks	Peak [dBm]	RMS [dBm]	Limit /dBm	Margin to Limit /dB
GSM 1900 GPRS	low	0.2	-	**-19.37**	-30.42	-13	6.37
GSM 1900 GPRS	high	0.2	-	**-22.66**	-31.13	-13	9.66
GSM 1900 EDGE	low	0.2	-	-30.8	-43.8	-13	17.8
GSM 1900 EDGE	high	0.2	-	-31.26	-42.46	-13	18.26
FDD II	low	5	-	-14.86	**-21.86**	-13	8.86
FDD II	high	5	-	-14.56	**-22.34**	-13	9.34
FDD II HSDPA Subtest 1	low	5	-	-16.55	-24.1	-13	11.1
FDD II HSDPA Subtest 1	high	5	-	-18.4	-26.3	-13	13.3
FDD II HSUPA Subtest 1	low	5	-	-14.78	-23.11	-13	10.11
FDD II HSUPA Subtest 1	high	5	-	-17.62	-26.7	-13	13.7
FDD II HSUPA Subtest 5	low	5	-	-15.33	-23.38	-13	10.38
FDD II HSUPA Subtest 5	high	5	-	-15.89	-25.39	-13	12.39
eFDD 2 QPSK	low	1.4	6	-22.5	-30.74	-13	17.74
eFDD 2 QPSK	high	1.4	6	-21.83	-29	-13	16
eFDD 2 16QAM	low	1.4	6	-23.37	-31.76	-13	18.76
eFDD 2 16QAM	high	1.4	6	-22.07	-30.74	-13	17.74
eFDD 2 QPSK	low	3	15	-16.68	**-26.9**	-13	13.9
eFDD 2 QPSK	high	3	15	-16.63	**-27.54**	-13	14.54
eFDD 2 16QAM	low	3	15	-17.69	-28.24	-13	15.24
eFDD 2 16QAM	high	3	15	-16.63	-27.77	-13	14.77
eFDD 2 QPSK	low	5	25	-18.39	-29.82	-13	16.82
eFDD 2 QPSK	high	5	25	-17.48	-29.54	-13	16.54
eFDD 2 16QAM	low	5	25	-16.76	-30.42	-13	17.42
eFDD 2 16QAM	high	5	25	-19.15	-30.12	-13	17.12
eFDD 2 QPSK	low	10	50	-17.96	-30.12	-13	17.12
eFDD 2 QPSK	high	10	50	-20.59	-31.41	-13	18.41
eFDD 2 16QAM	low	10	50	-21.38	-32.52	-13	19.52
eFDD 2 16QAM	high	10	50	-20.45	-32.52	-13	19.52
eFDD 2 QPSK	low	15	75	-17.47	-28.74	-13	15.74
eFDD 2 QPSK	high	15	75	-17.87	-29.54	-13	16.54
eFDD 2 16QAM	low	15	75	-18.27	-31.07	-13	18.07
eFDD 2 16QAM	high	15	75	-19.09	-31.07	-13	18.07
eFDD 2 QPSK	low	20	100	-20.12	-30.74	-13	17.74
eFDD 2 QPSK	high	20	100	-20.05	-30.74	-13	17.74
eFDD 2 16QAM	low	20	100	-20.22	-33.34	-13	20.34
eFDD 2 16QAM	high	20	100	-20.22	-32.13	-13	19.13



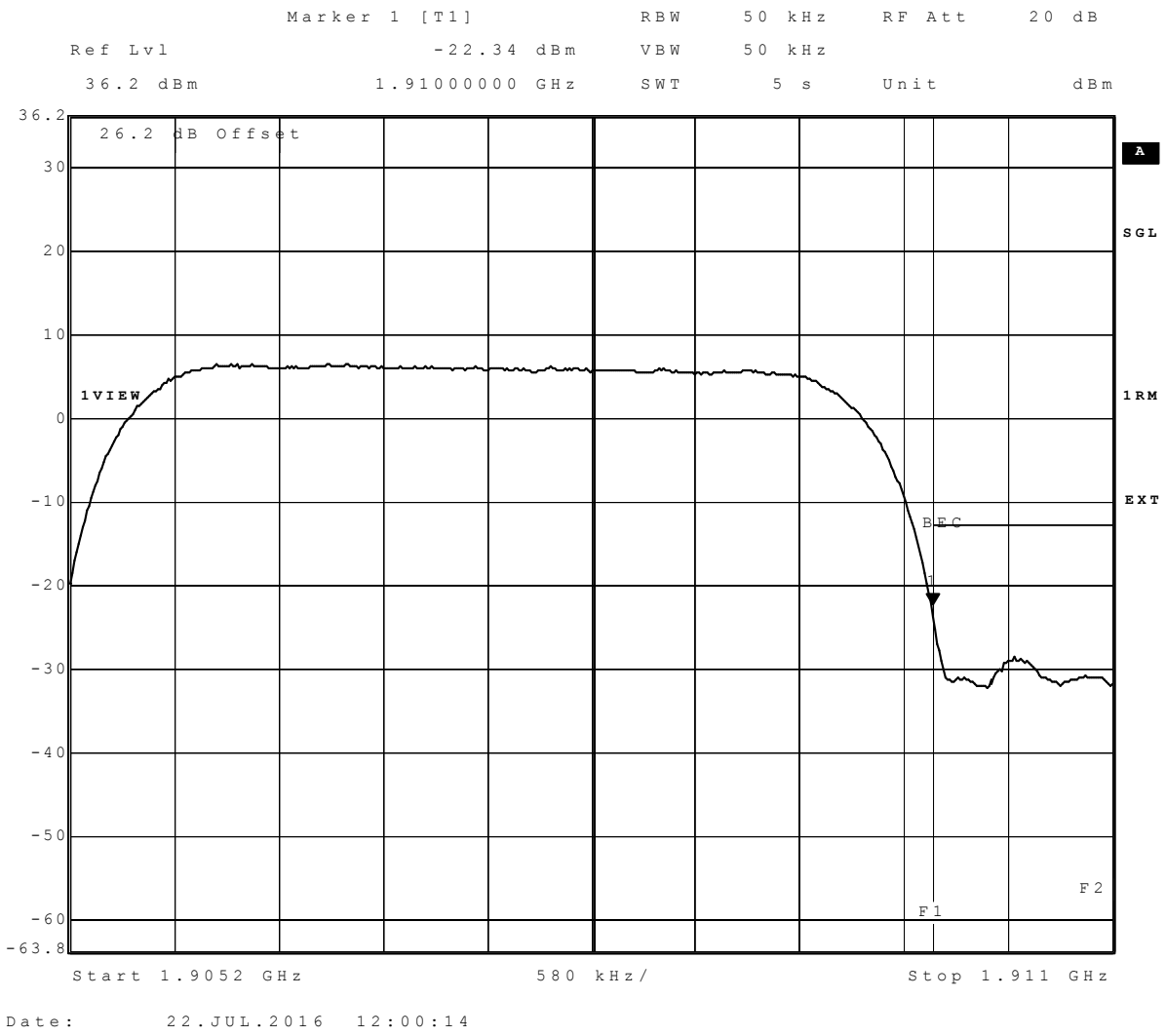
GSM 1900 GPRS low channel



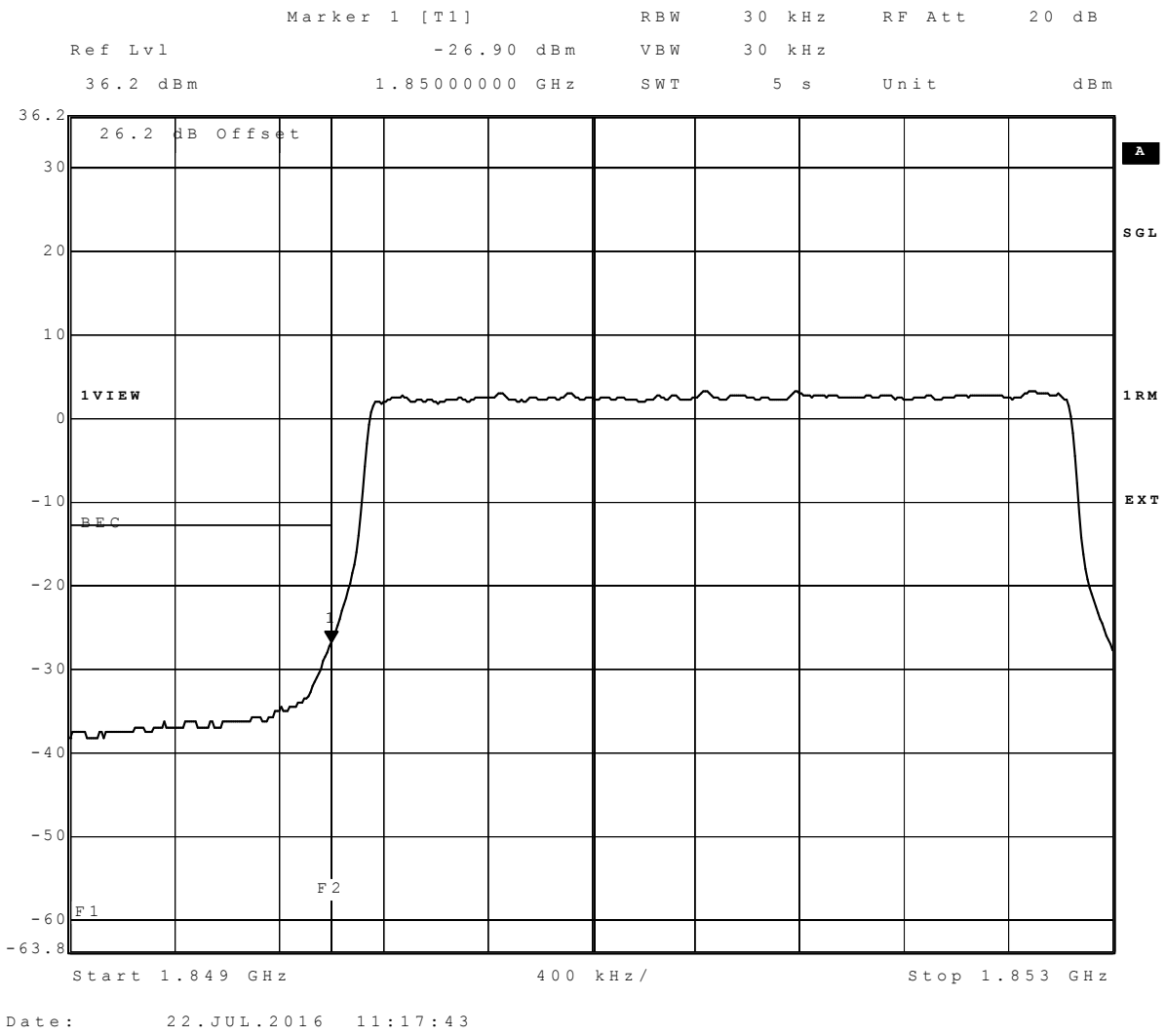
GSM 1900 GPRS high channel



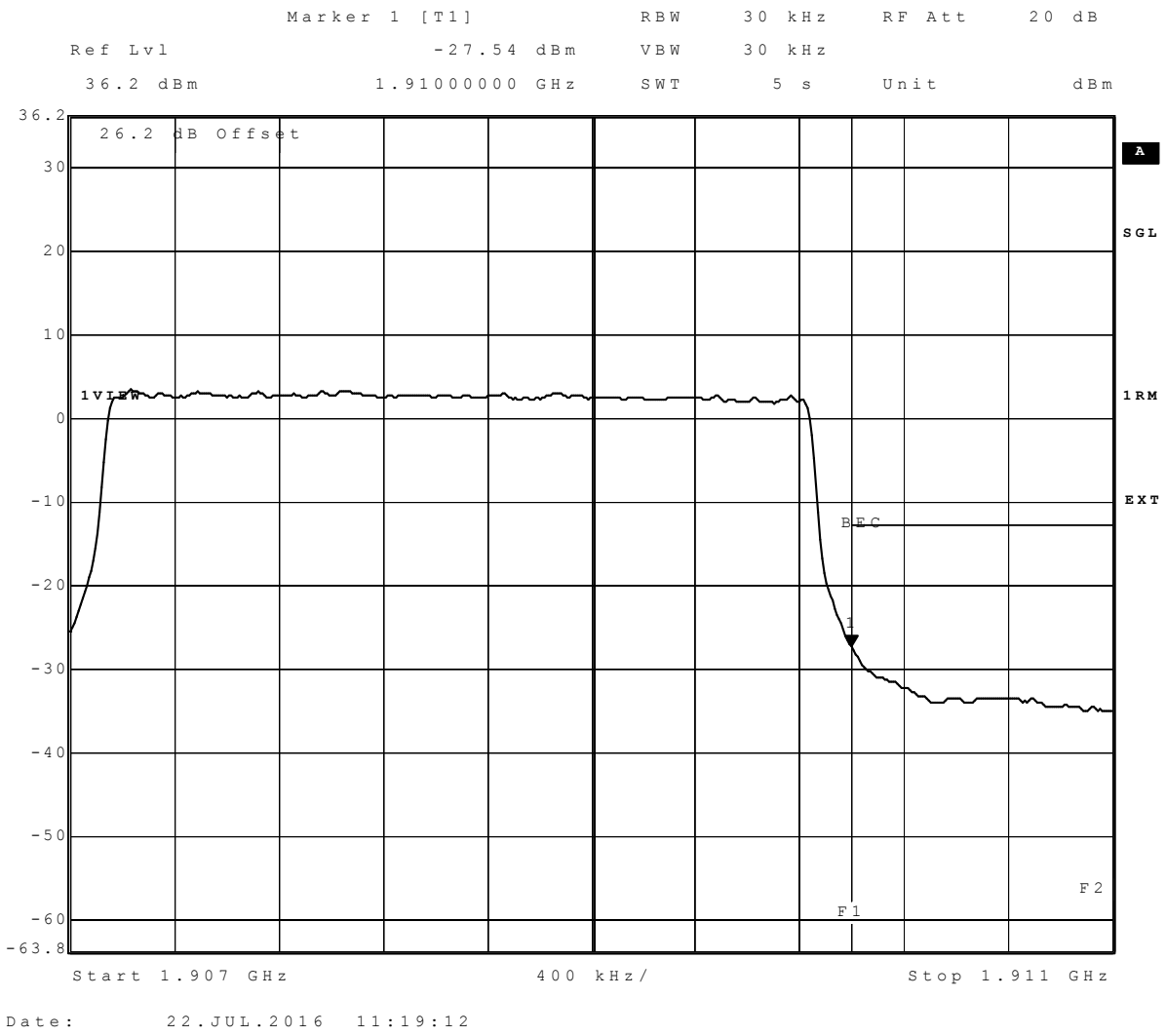
FDD II low channel



FDD II high channel



eFDD 2 QPSK low channel 3 MHz



eFDD 2 QPSK high channel 3 MHz

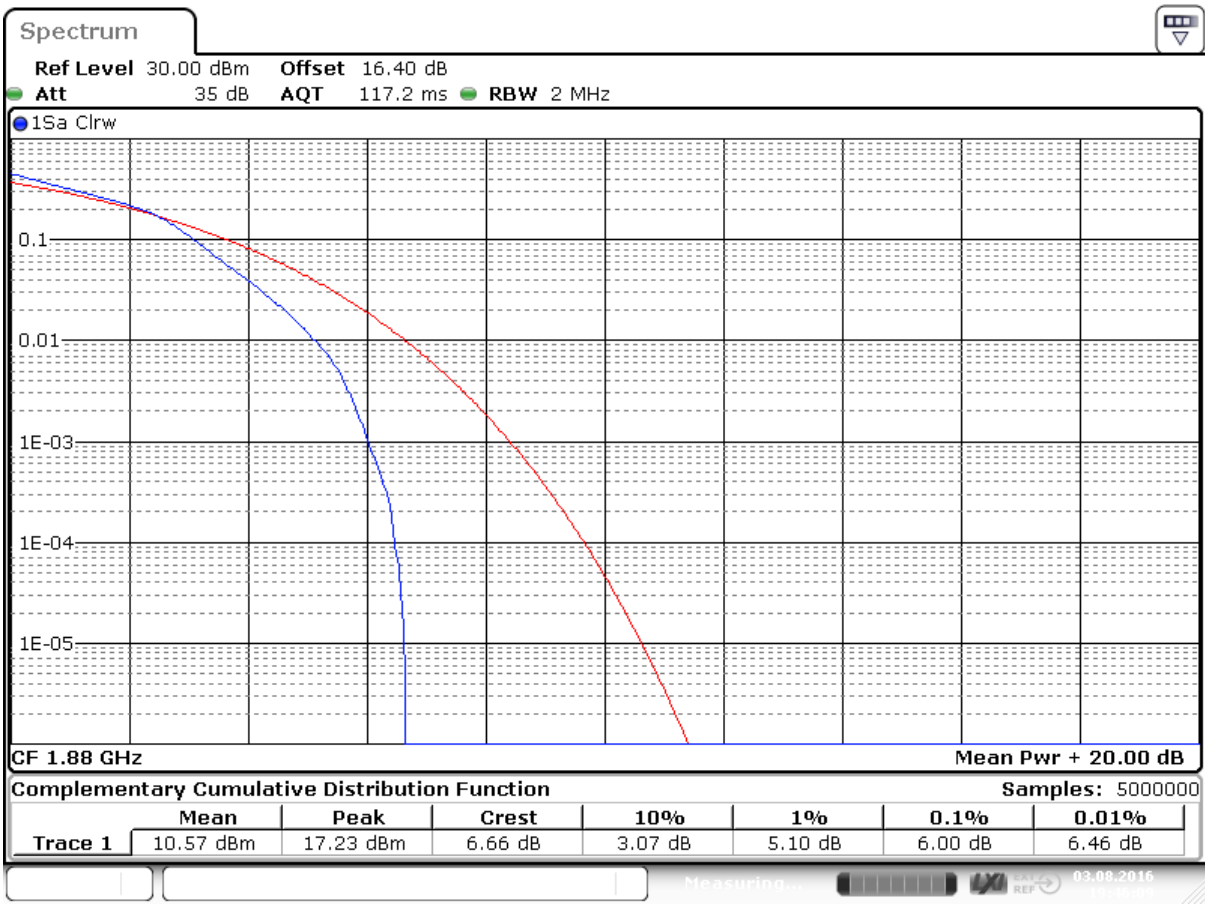
3.5.14 24.7 Peak-to-Average ratio §2.1046, §24.232

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

Result:	Passed
Setup No.:	S01_BB02
Date of Test:	2016/08/03 19:21
Body:	FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 24

Detailed Results:

Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak to Average Ratio	Limit (IC) (dB)	Remark
GSM 1900 GPRS	low	-	0.2	0.03	13	1)
GSM 1900 GPRS	mid	-	0.2	0.02	13	1)
GSM 1900 GPRS	high	-	0.2	0.02	13	1)
GSM 1900 EDGE	low	-	0.2	0.13	13	1)
GSM 1900 EDGE	mid	-	0.2	0.05	13	1)
GSM 1900 EDGE	high	-	0.2	0.17	13	1)
FDD II	low	-	5	5.45	13	1)
FDD II	mid	-	5	5.97	13	1)
FDD II	high	-	5	6.08	13	1)
FDD II HSDPA Subtest 1	low	-	5	5.39	13	1)
FDD II HSDPA Subtest 1	mid	-	5	5.62	13	1)
FDD II HSDPA Subtest 1	high	-	5	5.64	13	1)
FDD II HSUPA Subtest 1	low	-	5	6.56	13	1)
FDD II HSUPA Subtest 1	mid	-	5	6.31	13	1)
FDD II HSUPA Subtest 1	high	-	5	6.93	13	1)
FDD II HSUPA Subtest 5	low	-	5	7.29	13	1)
FDD II HSUPA Subtest 5	mid	-	5	6.69	13	1)
FDD II HSUPA Subtest 5	high	-	5	6.67	13	1)
eFDD 2 QPSK	low	6	1.4	4.93	13	
eFDD 2 QPSK	mid	6	1.4	5.13	13	
eFDD 2 QPSK	high	6	1.4	4.58	13	
eFDD 2 16QAM	low	6	1.4	5.88	13	
eFDD 2 16QAM	mid	6	1.4	6	13	
eFDD 2 16QAM	high	6	1.4	5.54	13	
1) Value calculated using the results of testcase Output Power						



Date: 3.AUG.2016 19:46:10

eFDD 2 mid channel 16 QAM

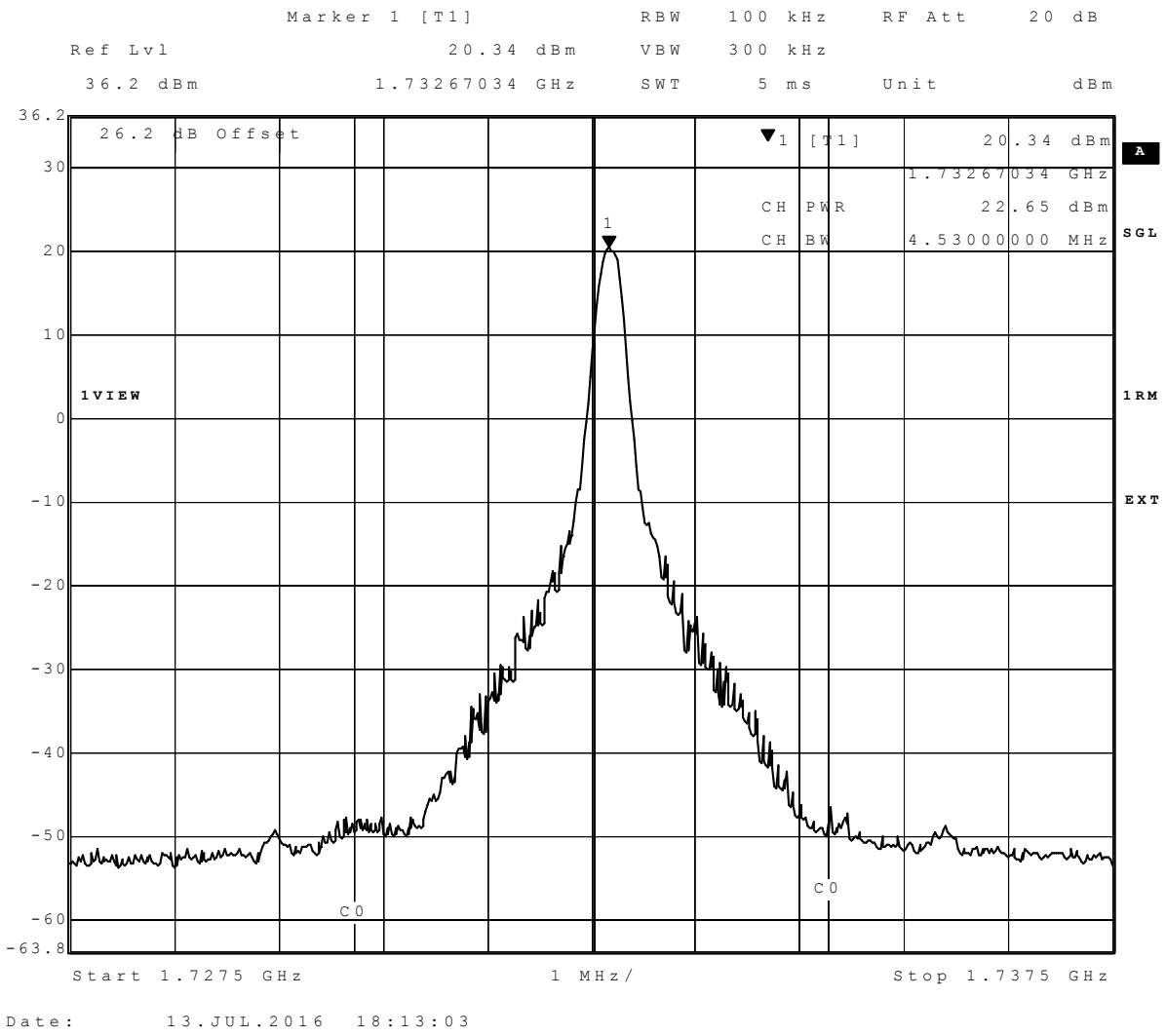
3.5.15 27.1 RF Power Output §2.1046, §27.250

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

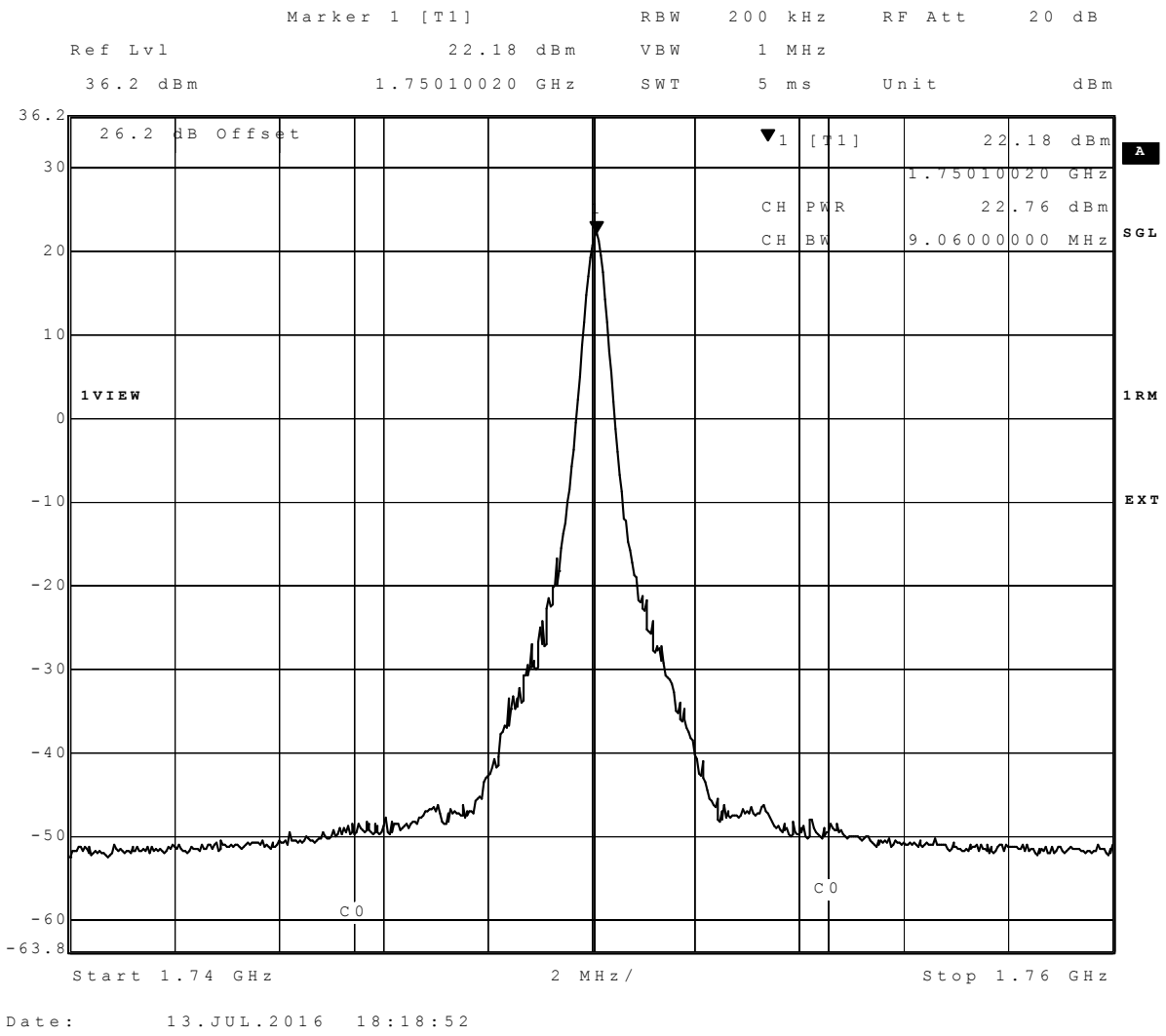
Result:	Passed
Setup No.:	S01_BB02
Date of Test:	2016/07/30 17:48
Body:	FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 27

Detailed Results:

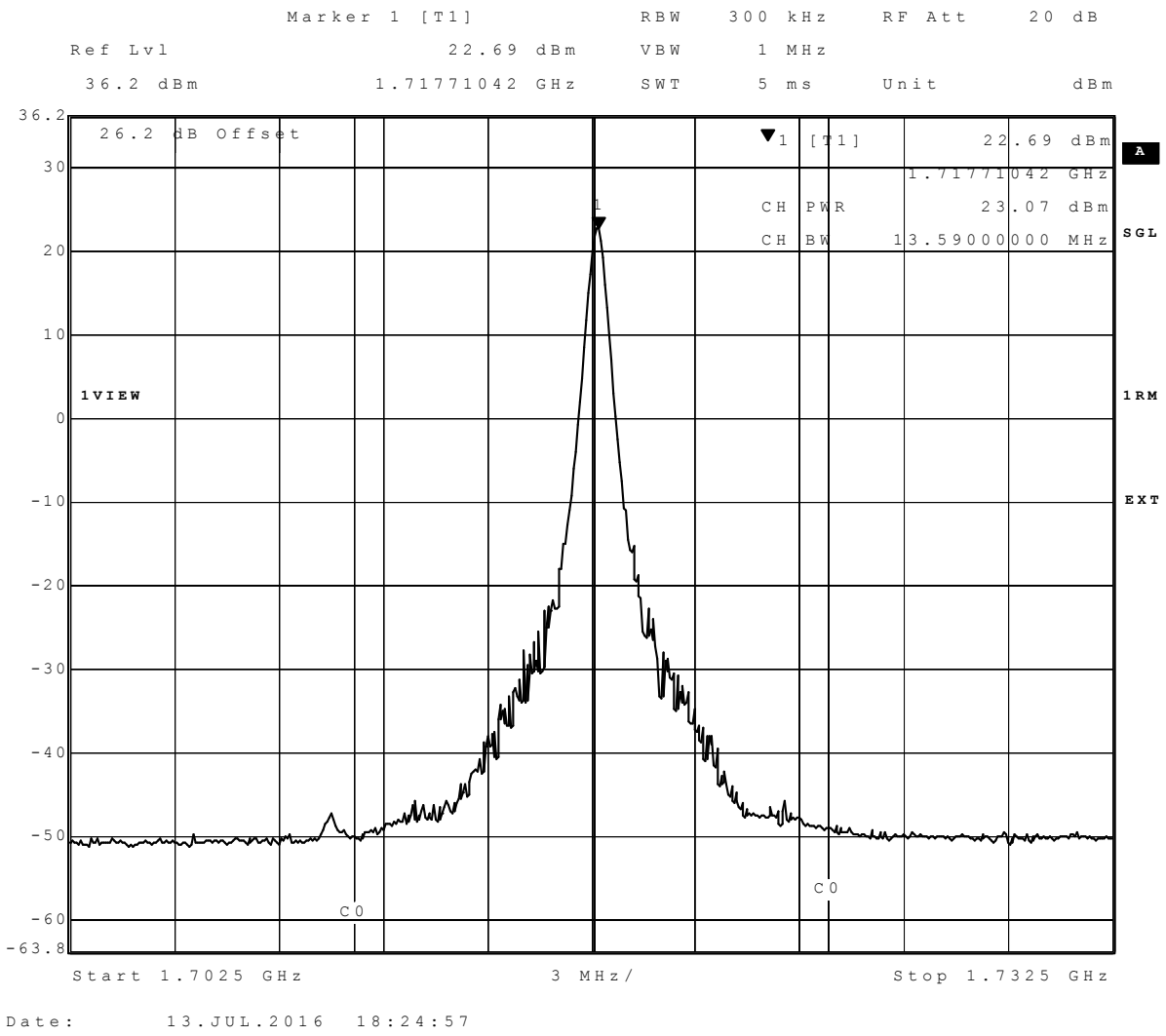
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC EIRP Limit (W)	IC EIRP Limit (W)	Maximum Antenna Gain FCC (dBi)	Maximum Antenna Gain IC (dBi)
FDD IV	low	-	5	29.4	23.9	24	1	1	6	6
FDD IV	mid 1	-	5	29.6	24	24.1	1	1	5.9	5.9
FDD IV	mid 2	-	5	29.2	23.9	24	1	1	6	6
FDD IV	high	-	5	29.93	23.82	23.96	1	1	6.04	6.04
FDD IV HSDPA Subtest 1	low	-	5	28.6	23.2	23.3	1	1	6.7	6.7
FDD IV HSDPA Subtest 1	mid 1	-	5	28.9	23.4	23.5	1	1	6.5	6.5
FDD IV HSDPA Subtest 1	mid 2	-	5	28.6	23.3	23.4	1	1	6.6	6.6
FDD IV HSDPA Subtest 1	high	-	5	28.2	22.8	22.95	1	1	7.05	7.05
FDD IV HSDPA Subtest 2	low	-	5	29.4	22.6	23.1	1	1	6.9	6.9
FDD IV HSDPA Subtest 2	mid 1	-	5	29.4	22.7	23.3	1	1	6.7	6.7
FDD IV HSDPA Subtest 2	mid 2	-	5	29.1	22.6	23.1	1	1	6.9	6.9
FDD IV HSDPA Subtest 2	high	-	5	28.84	22.1	22.61	1	1	7.39	7.39
FDD IV HSDPA Subtest 3	low	-	5	29.2	22.5	23.2	1	1	6.8	6.8
FDD IV HSDPA Subtest 3	mid 1	-	5	29.6	22.6	23.3	1	1	6.7	6.7
FDD IV HSDPA Subtest 3	mid 2	-	5	29.4	22.5	23.1	1	1	6.9	6.9
FDD IV HSDPA Subtest 3	high	-	5	29.71	22	22.72	1	1	7.28	7.28
FDD IV HSDPA Subtest 4	low	-	5	29.4	22.5	23.3	1	1	6.7	6.7
FDD IV HSDPA Subtest 4	mid 1	-	5	29.4	22.7	23.3	1	1	6.7	6.7
FDD IV HSDPA Subtest 4	mid 2	-	5	29.61	22.5	23.3	1	1	6.7	6.7
FDD IV HSDPA Subtest 4	high	-	5	28.72	21.93	22.73	1	1	7.27	7.27
FDD IV HSUPA Subtest 1	low	-	5	29.8	22.2	22.5	1	1	7.5	7.5
FDD IV HSUPA Subtest 1	mid 1	-	5	30	22.5	22.8	1	1	7.2	7.2
FDD IV HSUPA Subtest 1	mid 2	-	5	30.2	22.3	22.6	1	1	7.4	7.4
FDD IV HSUPA Subtest 1	high	-	5	29.49	22.38	22.7	1	1	7.3	7.3
FDD IV HSUPA Subtest 2	low	-	5	29.4	21.1	21.9	1	1	8.1	8.1
FDD IV HSUPA Subtest 2	mid 1	-	5	29.4	21.2	22	1	1	8	8
FDD IV HSUPA Subtest 2	mid 2	-	5	28.7	20.6	21.2	1	1	8.8	8.8
FDD IV HSUPA Subtest 2	high	-	5	29.34	21.37	21.91	1	1	8.09	8.09
FDD IV HSUPA Subtest 3	low	-	5	30.8	22	22.6	1	1	7.4	7.4
FDD IV HSUPA Subtest 3	mid 1	-	5	30.5	22	22.8	1	1	7.2	7.2
FDD IV HSUPA Subtest 3	mid 2	-	5	30.8	22	22.6	1	1	7.4	7.4
FDD IV HSUPA Subtest 3	high	-	5	30.49	21.52	22.19	1	1	7.81	7.81
FDD IV HSUPA Subtest 4	low	-	5	30	21.8	22.4	1	1	7.6	7.6
FDD IV HSUPA Subtest 4	mid 1	-	5	30.34	21.8	22.36	1	1	7.64	7.64
FDD IV HSUPA Subtest 4	mid 2	-	5	29.93	21.54	22.17	1	1	7.83	7.83
FDD IV HSUPA Subtest 4	high	-	5	29.93	21.49	22.13	1	1	7.87	7.87
FDD IV HSUPA Subtest 5	low	-	5	29.6	21.6	22.5	1	1	7.5	7.5
FDD IV HSUPA Subtest 5	mid 1	-	5	30.4	21.8	22.7	1	1	7.3	7.3
FDD IV HSUPA Subtest 5	mid 2	-	5	29.8	21.6	22.5	1	1	7.5	7.5
FDD IV HSUPA Subtest 5	high	-	5	29.93	22.62	23.01	1	1	6.99	6.99
eFDD 4 QPSK	low	1	1.4	-	-	22	1	1	8	8
eFDD 4 QPSK	low	3	1.4	-	-	21.7	1	1	8.3	8.3
eFDD 4 QPSK	low	6	1.4	-	-	20.6	1	1	9.4	9.4
eFDD 4 QPSK	mid	1	1.4	-	-	22.2	1	1	7.8	7.8
eFDD 4 QPSK	mid	3	1.4	-	-	21.8	1	1	8.2	8.2
eFDD 4 QPSK	mid	6	1.4	-	-	20.7	1	1	9.3	9.3
eFDD 4 QPSK	high	1	1.4	-	-	22	1	1	8	8
eFDD 4 QPSK	high	3	1.4	-	-	21.8	1	1	8.2	8.2
eFDD 4 QPSK	high	6	1.4	-	-	20.8	1	1	9.2	9.2
eFDD 4 16QAM	low	1	1.4	-	-	21.4	1	1	8.6	8.6
eFDD 4 16QAM	low	6	1.4	-	-	19.7	1	1	10.3	10.3
eFDD 4 16QAM	mid	1	1.4	-	-	21.3	1	1	8.7	8.7
eFDD 4 16QAM	mid	6	1.4	-	-	19.6	1	1	10.4	10.4
eFDD 4 16QAM	high	1	1.4	-	-	21.4	1	1	8.6	8.6
eFDD 4 16QAM	high	6	1.4	-	-	19.7	1	1	10.3	10.3



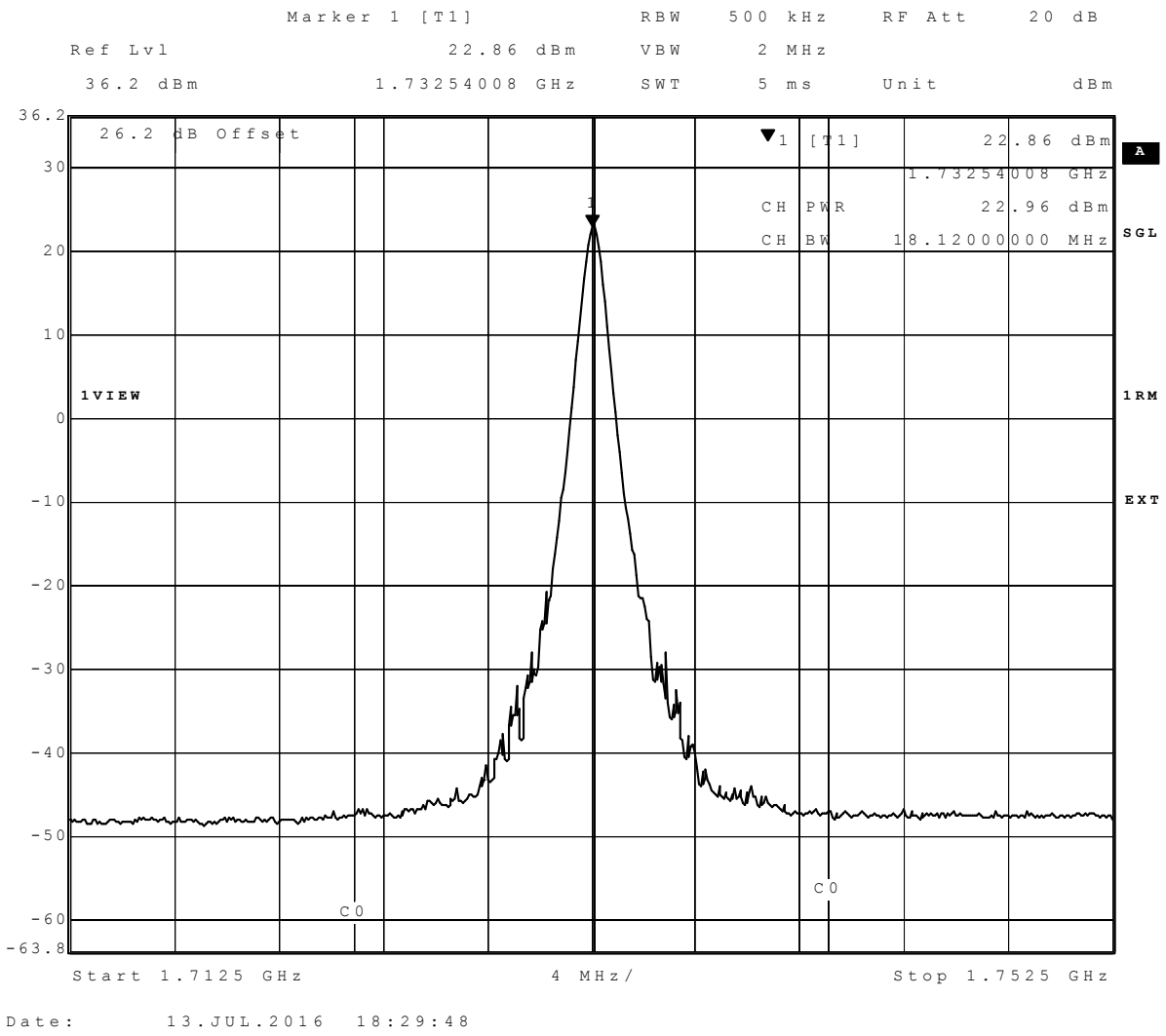
eFDD 4 QPSK mid channel 5 MHz 1 RB



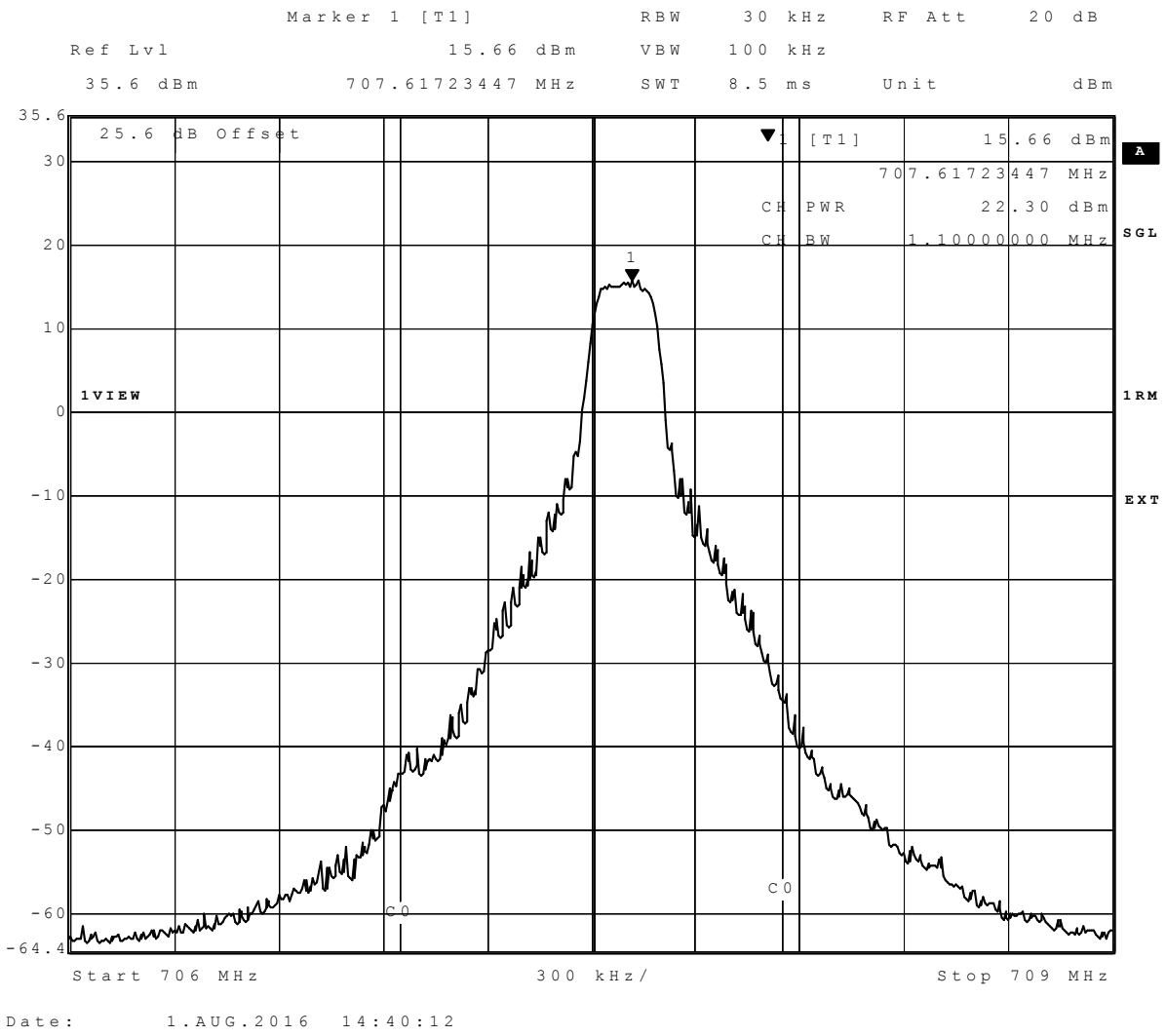
eFDD 4 QPSK high channel 10 MHz 1 RB



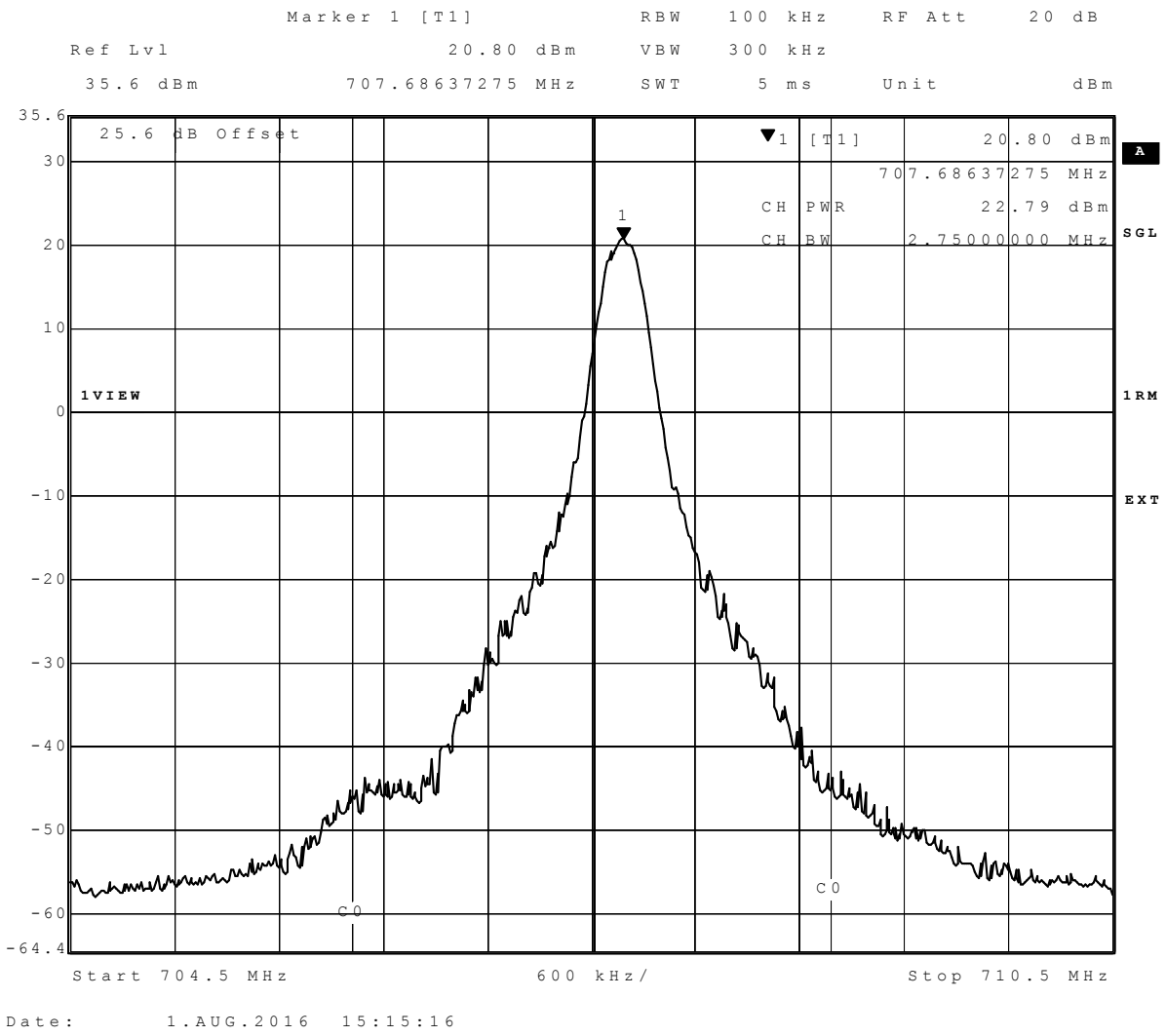
eFDD 4 QPSK low channel 15 MHz 1 RB



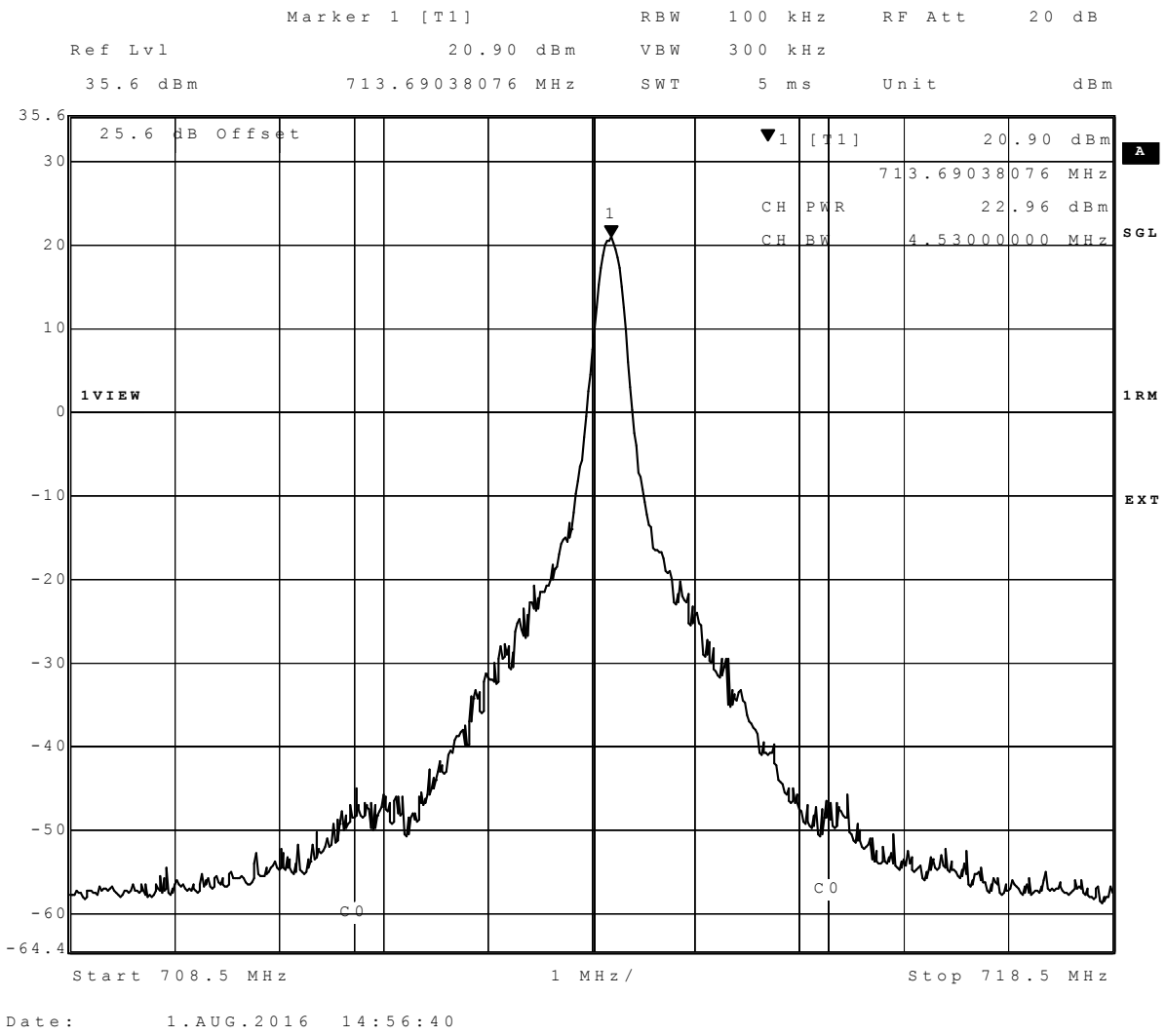
eFDD 4 QPSK mid channel 20 MHz 1 RB



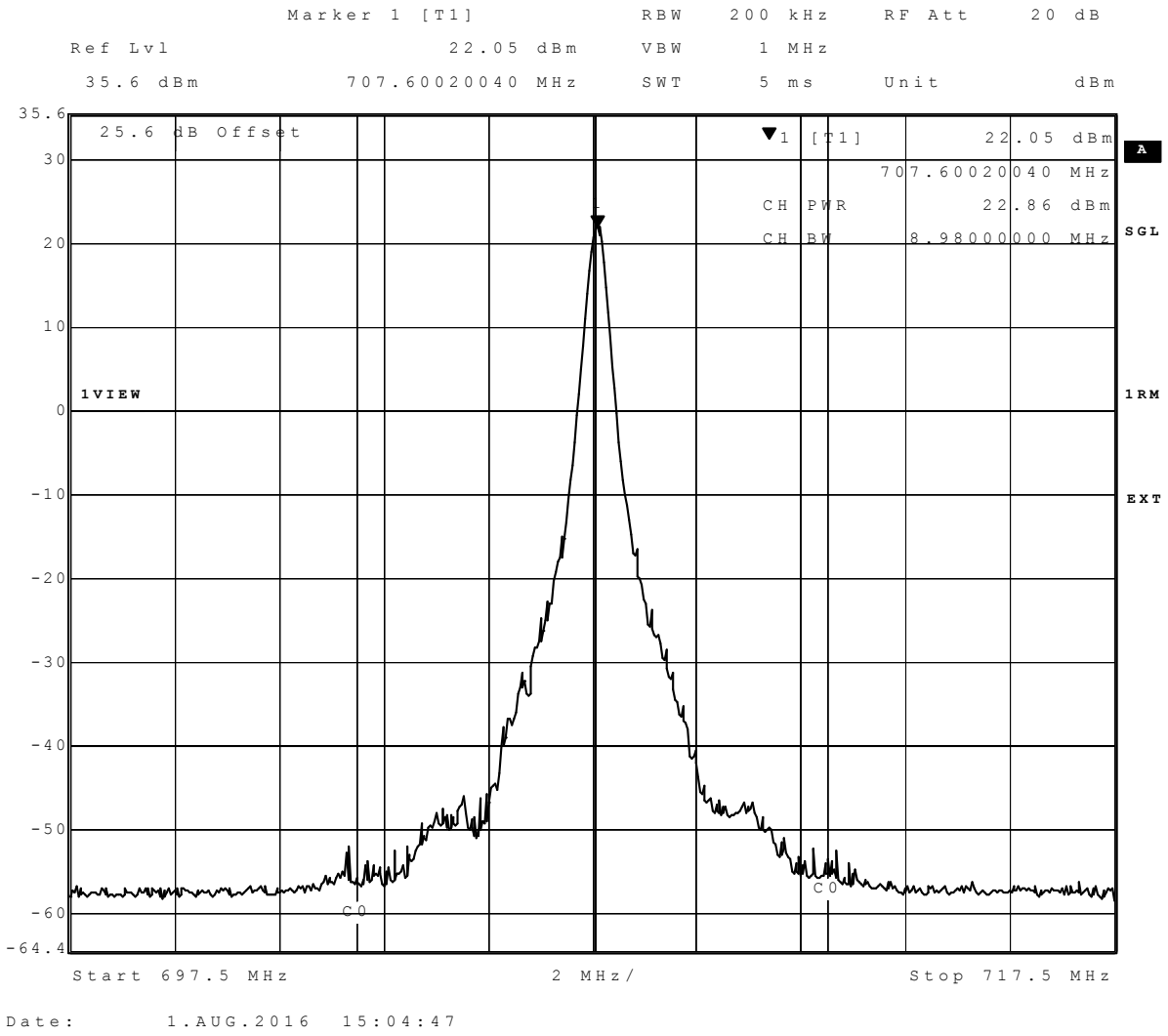
eFDD 12 QPSK mid channel 1.4 MHz 1 RB



eFDD 12 QPSK mid channel 3 MHz 1 RB



eFDD 12 QPSK high channel 5 MHz 1 RB

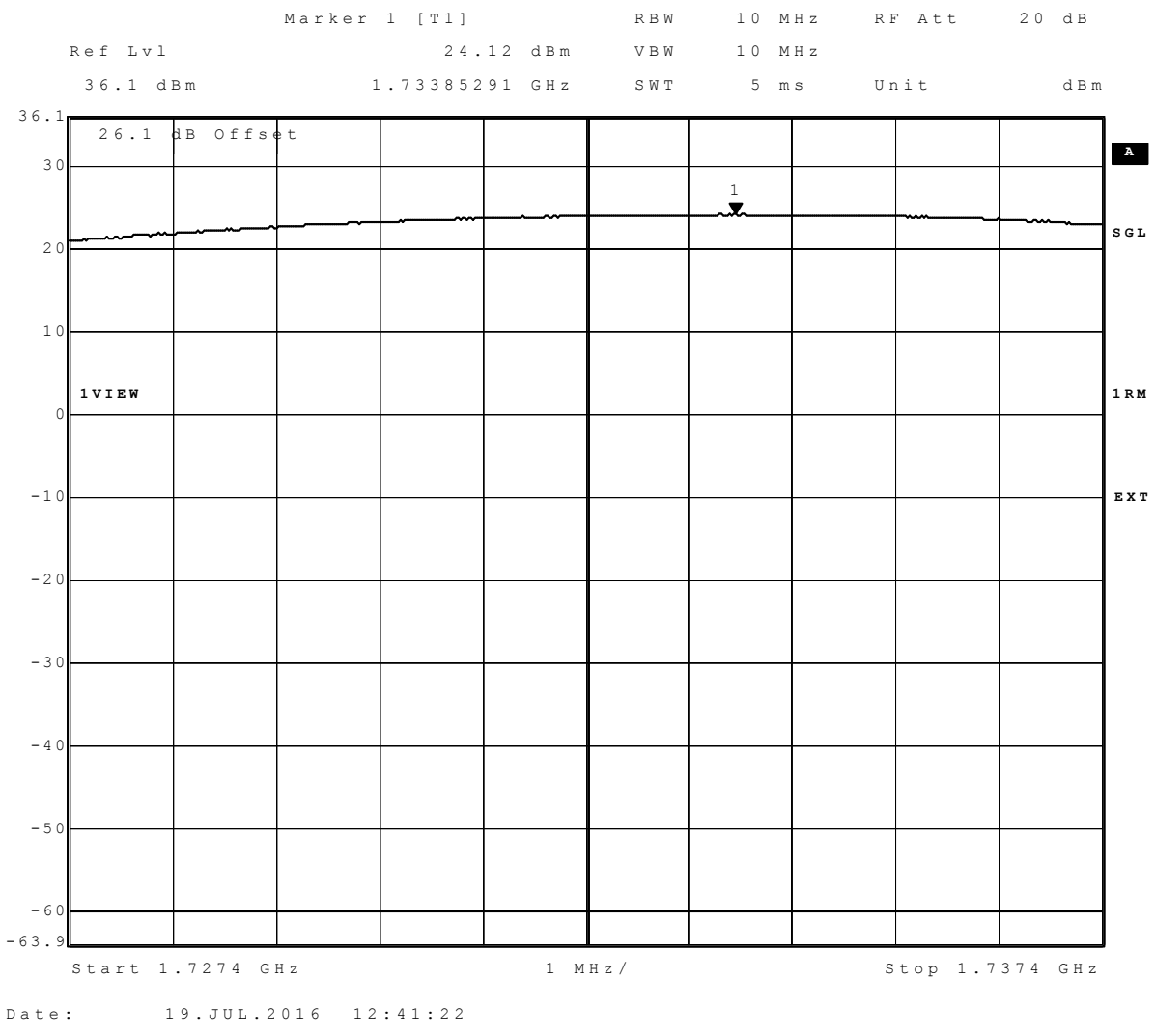


eFDD 12 QPSK mid channel 10 MHz 1 RB

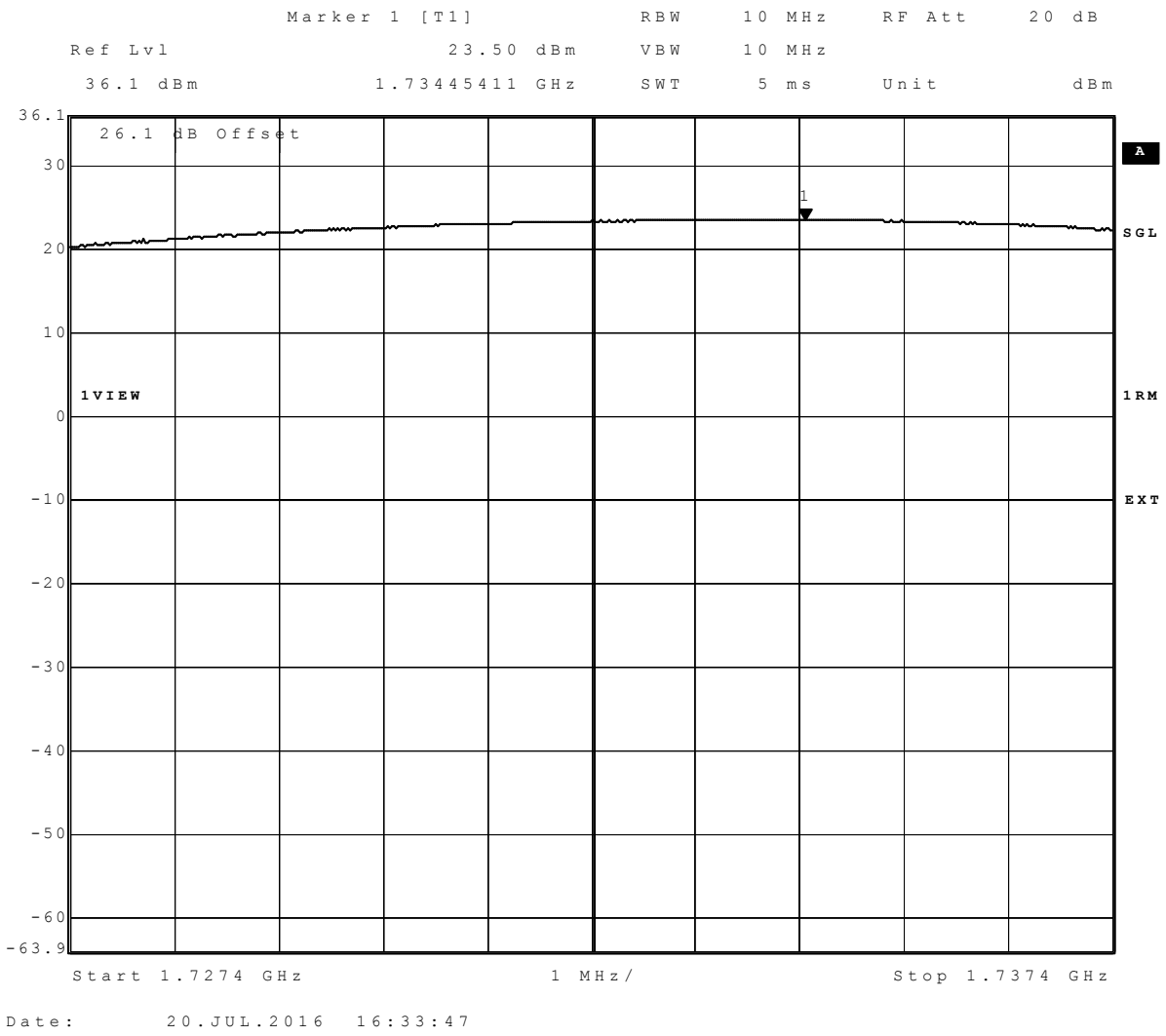
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC EIRP Limit (W)	IC EIRP Limit (W)	Maximum Antenna Gain FCC (dBi)	Maximum Antenna Gain IC (dBi)
eFDD 4 QPSK	low	1	3	-	-	22.8	1	1	7.2	7.2
eFDD 4 QPSK	low	15	3	-	-	21.1	1	1	8.9	8.9
eFDD 4 QPSK	mid	1	3	-	-	22.7	1	1	7.3	7.3
eFDD 4 QPSK	mid	15	3	-	-	21	1	1	9	9
eFDD 4 QPSK	high	1	3	-	-	22.7	1	1	7.3	7.3
eFDD 4 QPSK	high	15	3	-	-	21.1	1	1	8.9	8.9
eFDD 4 16QAM	low	1	3	-	-	21.5	1	1	8.5	8.5
eFDD 4 16QAM	low	15	3	-	-	20.1	1	1	9.9	9.9
eFDD 4 16QAM	mid	1	3	-	-	21.7	1	1	8.3	8.3
eFDD 4 16QAM	mid	15	3	-	-	20.3	1	1	9.7	9.7
eFDD 4 16QAM	high	1	3	-	-	21.9	1	1	8.1	8.1
eFDD 4 16QAM	high	15	3	-	-	20.1	1	1	9.9	9.9
eFDD 4 QPSK	low	1	5	-	-	22.8	1	1	7.2	7.2
eFDD 4 QPSK	low	12	5	-	-	21	1	1	9	9
eFDD 4 QPSK	low	25	5	-	-	21.1	1	1	8.9	8.9
eFDD 4 QPSK	mid	1	5	-	-	22.9	1	1	7.1	7.1
eFDD 4 QPSK	mid	12	5	-	-	21	1	1	9	9
eFDD 4 QPSK	mid	25	5	-	-	21	1	1	9	9
eFDD 4 QPSK	high	1	5	-	-	22.9	1	1	7.1	7.1
eFDD 4 QPSK	high	12	5	-	-	21	1	1	9	9
eFDD 4 QPSK	high	25	5	-	-	21	1	1	9	9
eFDD 4 16QAM	low	1	5	-	-	21.8	1	1	8.2	8.2
eFDD 4 16QAM	low	25	5	-	-	20.6	1	1	9.4	9.4
eFDD 4 16QAM	mid	1	5	-	-	21.8	1	1	8.2	8.2
eFDD 4 16QAM	mid	25	5	-	-	20	1	1	10	10
eFDD 4 16QAM	high	1	5	-	-	21.6	1	1	8.4	8.4
eFDD 4 16QAM	high	25	5	-	-	20	1	1	10	10
eFDD 4 QPSK	low	1	10	-	-	22.7	1	1	7.3	7.3
eFDD 4 QPSK	low	50	10	-	-	21.42	1	1	8.58	8.58
eFDD 4 QPSK	mid	1	10	-	-	22.6	1	1	7.4	7.4
eFDD 4 QPSK	mid	50	10	-	-	21.3	1	1	8.7	8.7
eFDD 4 QPSK	high	1	10	-	-	22.8	1	1	7.2	7.2
eFDD 4 QPSK	high	50	10	-	-	21.4	1	1	8.6	8.6
eFDD 4 16QAM	low	1	10	-	-	22	1	1	8	8
eFDD 4 16QAM	low	50	10	-	-	20.4	1	1	9.6	9.6
eFDD 4 16QAM	mid	1	10	-	-	21.4	1	1	8.6	8.6
eFDD 4 16QAM	mid	50	10	-	-	20.3	1	1	9.7	9.7
eFDD 4 16QAM	high	1	10	-	-	21.7	1	1	8.3	8.3
eFDD 4 16QAM	high	50	10	-	-	20.4	1	1	9.6	9.6
eFDD 4 QPSK	low	1	15	-	-	23.1	1	1	6.9	6.9
eFDD 4 QPSK	low	36	15	-	-	22	1	1	8	8
eFDD 4 QPSK	low	75	15	-	-	21.9	1	1	8.1	8.1
eFDD 4 QPSK	mid	1	15	-	-	23	1	1	7	7
eFDD 4 QPSK	mid	36	15	-	-	22.1	1	1	7.9	7.9
eFDD 4 QPSK	mid	75	15	-	-	22	1	1	8	8
eFDD 4 QPSK	high	1	15	-	-	22.9	1	1	7.1	7.1
eFDD 4 QPSK	high	36	15	-	-	22	1	1	8	8
eFDD 4 QPSK	high	75	15	-	-	21.9	1	1	8.1	8.1
eFDD 4 16QAM	low	1	15	-	-	22.2	1	1	7.8	7.8
eFDD 4 16QAM	low	75	15	-	-	20.8	1	1	9.2	9.2
eFDD 4 16QAM	mid	1	15	-	-	21.9	1	1	8.1	8.1
eFDD 4 16QAM	mid	75	15	-	-	21	1	1	9	9
eFDD 4 16QAM	high	1	15	-	-	21.9	1	1	8.1	8.1
eFDD 4 16QAM	high	75	15	-	-	20.9	1	1	9.1	9.1

Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC EIRP Limit (W)	IC EIRP Limit (W)	Maximum Antenna Gain FCC (dBi)	Maximum Antenna Gain IC (dBi)
eFDD 4 QPSK	low	100	20	-	-	22	1	1	8	8
eFDD 4 QPSK	mid	1	20	-	-	23	1	1	7	7
eFDD 4 QPSK	mid	100	20	-	-	22	1	1	8	8
eFDD 4 QPSK	high	1	20	-	-	22.8	1	1	7.2	7.2
eFDD 4 QPSK	high	100	20	-	-	22	1	1	8	8
eFDD 4 16QAM	low	1	20	-	-	21.9	1	1	8.1	8.1
eFDD 4 16QAM	low	100	20	-	-	20.9	1	1	9.1	9.1
eFDD 4 16QAM	mid	1	20	-	-	21.7	1	1	8.3	8.3
eFDD 4 16QAM	mid	100	20	-	-	21	1	1	9	9
eFDD 4 16QAM	high	1	20	-	-	21.9	1	1	8.1	8.1
eFDD 4 16QAM	high	100	20	-	-	21	1	1	9	9
eFDD 12 QPSK	low	1	1.4	-	-	22	1	1	8	8
eFDD 12 QPSK	low	3	1.4	-	-	21.7	1	1	8.3	8.3
eFDD 12 QPSK	low	6	1.4	-	-	20.6	1	1	9.4	9.4
eFDD 12 QPSK	mid	1	1.4	-	-	22.3	1	1	7.7	7.7
eFDD 12 QPSK	mid	3	1.4	-	-	21.8	1	1	8.2	8.2
eFDD 12 QPSK	mid	6	1.4	-	-	20.8	1	1	9.2	9.2
eFDD 12 QPSK	high	1	1.4	-	-	22.2	1	1	7.8	7.8
eFDD 12 QPSK	high	3	1.4	-	-	21.9	1	1	8.1	8.1
eFDD 12 QPSK	high	6	1.4	-	-	20.7	1	1	9.3	9.3
eFDD 12 16QAM	low	1	1.4	-	-	21.3	1	1	8.7	8.7
eFDD 12 16QAM	low	6	1.4	-	-	20.28	1	1	9.72	9.72
eFDD 12 16QAM	mid	1	1.4	-	-	21.1	1	1	8.9	8.9
eFDD 12 16QAM	mid	6	1.4	-	-	20.51	1	1	9.49	9.49
eFDD 12 16QAM	high	1	1.4	-	-	21.1	1	1	8.9	8.9
eFDD 12 16QAM	high	6	1.4	-	-	20.44	1	1	9.56	9.56
eFDD 12 QPSK	low	1	3	-	-	22.5	1	1	7.5	7.5
eFDD 12 QPSK	low	15	3	-	-	21.1	1	1	8.9	8.9
eFDD 12 QPSK	mid	1	3	-	-	22.8	1	1	7.2	7.2
eFDD 12 QPSK	mid	15	3	-	-	21.4	1	1	8.6	8.6
eFDD 12 QPSK	high	1	3	-	-	22.7	1	1	7.3	7.3
eFDD 12 QPSK	high	15	3	-	-	21.2	1	1	8.8	8.8
eFDD 12 16QAM	low	1	3	-	-	22.1	1	1	7.9	7.9
eFDD 12 16QAM	low	15	3	-	-	20.1	1	1	9.9	9.9
eFDD 12 16QAM	mid	1	3	-	-	22.4	1	1	7.6	7.6
eFDD 12 16QAM	mid	15	3	-	-	20.4	1	1	9.6	9.6
eFDD 12 16QAM	high	1	3	-	-	21.8	1	1	8.2	8.2
eFDD 12 16QAM	high	15	3	-	-	20.2	1	1	9.8	9.8
eFDD 12 QPSK	low	1	5	-	-	22.9	1	1	7.1	7.1
eFDD 12 QPSK	low	12	5	-	-	21.2	1	1	8.8	8.8
eFDD 12 QPSK	low	25	5	-	-	21.1	1	1	8.9	8.9
eFDD 12 QPSK	mid	1	5	-	-	22.9	1	1	7.1	7.1
eFDD 12 QPSK	mid	12	5	-	-	21.4	1	1	8.6	8.6
eFDD 12 QPSK	mid	25	5	-	-	21.3	1	1	8.7	8.7
eFDD 12 QPSK	high	1	5	-	-	23	1	1	7	7
eFDD 12 QPSK	high	12	5	-	-	21.2	1	1	8.8	8.8
eFDD 12 QPSK	high	25	5	-	-	21.3	1	1	8.7	8.7
eFDD 12 16QAM	low	1	5	-	-	22	1	1	8	8
eFDD 12 16QAM	low	25	5	-	-	20.85	1	1	9.15	9.15
eFDD 12 16QAM	mid	1	5	-	-	22.1	1	1	7.9	7.9
eFDD 12 16QAM	mid	25	5	-	-	20.82	1	1	9.18	9.18
eFDD 12 16QAM	high	1	5	-	-	22.1	1	1	7.9	7.9
eFDD 12 16QAM	high	25	5	-	-	20.91	1	1	9.09	9.09

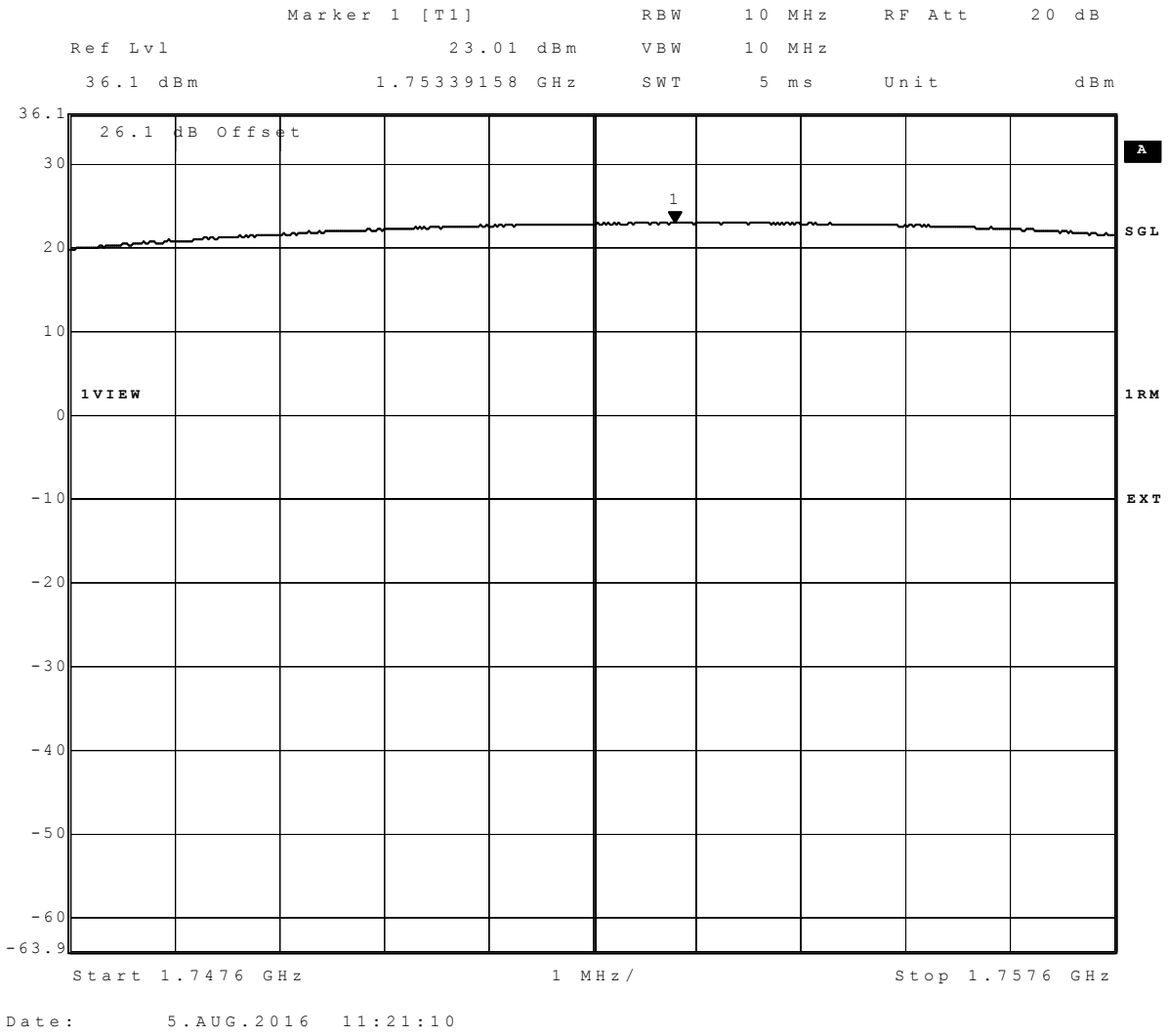
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak Conducted Power (dBm)	Average Conducted Power (dBm)	RMS Conducted Power (dBm)	FCC EIRP Limit (W)	IC EIRP Limit (W)	Maximum Antenna Gain FCC (dBi)	Maximum Antenna Gain IC (dBi)
eFDD 12 QPSK	low	1	10	-	-	22.9	1	1	7.1	7.1
eFDD 12 QPSK	low	50	10	-	-	21.6	1	1	8.4	8.4
eFDD 12 QPSK	mid	1	10	-	-	22.9	1	1	7.1	7.1
eFDD 12 QPSK	mid	50	10	-	-	21.7	1	1	8.3	8.3
eFDD 12 QPSK	high	1	10	-	-	22.9	1	1	7.1	7.1
eFDD 12 QPSK	high	50	10	-	-	21.6	1	1	8.4	8.4
eFDD 12 16QAM	low	1	10	-	-	22.5	1	1	7.5	7.5
eFDD 12 16QAM	low	50	10	-	-	20.7	1	1	9.3	9.3
eFDD 12 16QAM	mid	1	10	-	-	20.8	1	1	9.2	9.2
eFDD 12 16QAM	mid	50	10	-	-	22.1	1	1	7.9	7.9
eFDD 12 16QAM	high	1	10	-	-	22.1	1	1	7.9	7.9
eFDD 12 16QAM	high	50	10	-	-	20.6	1	1	9.4	9.4



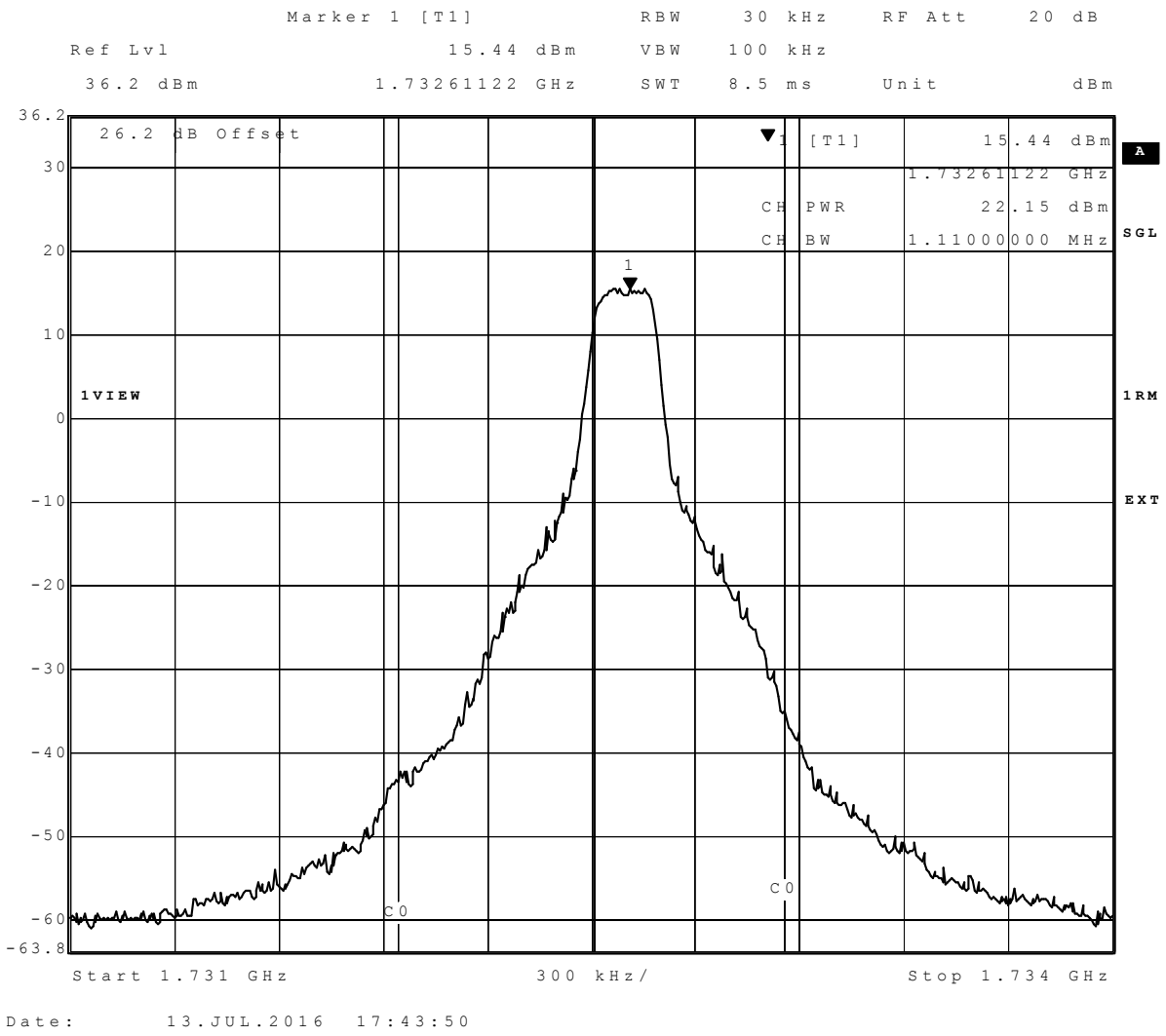
FDD IV mid channel 1412 (1732.4 MHz)



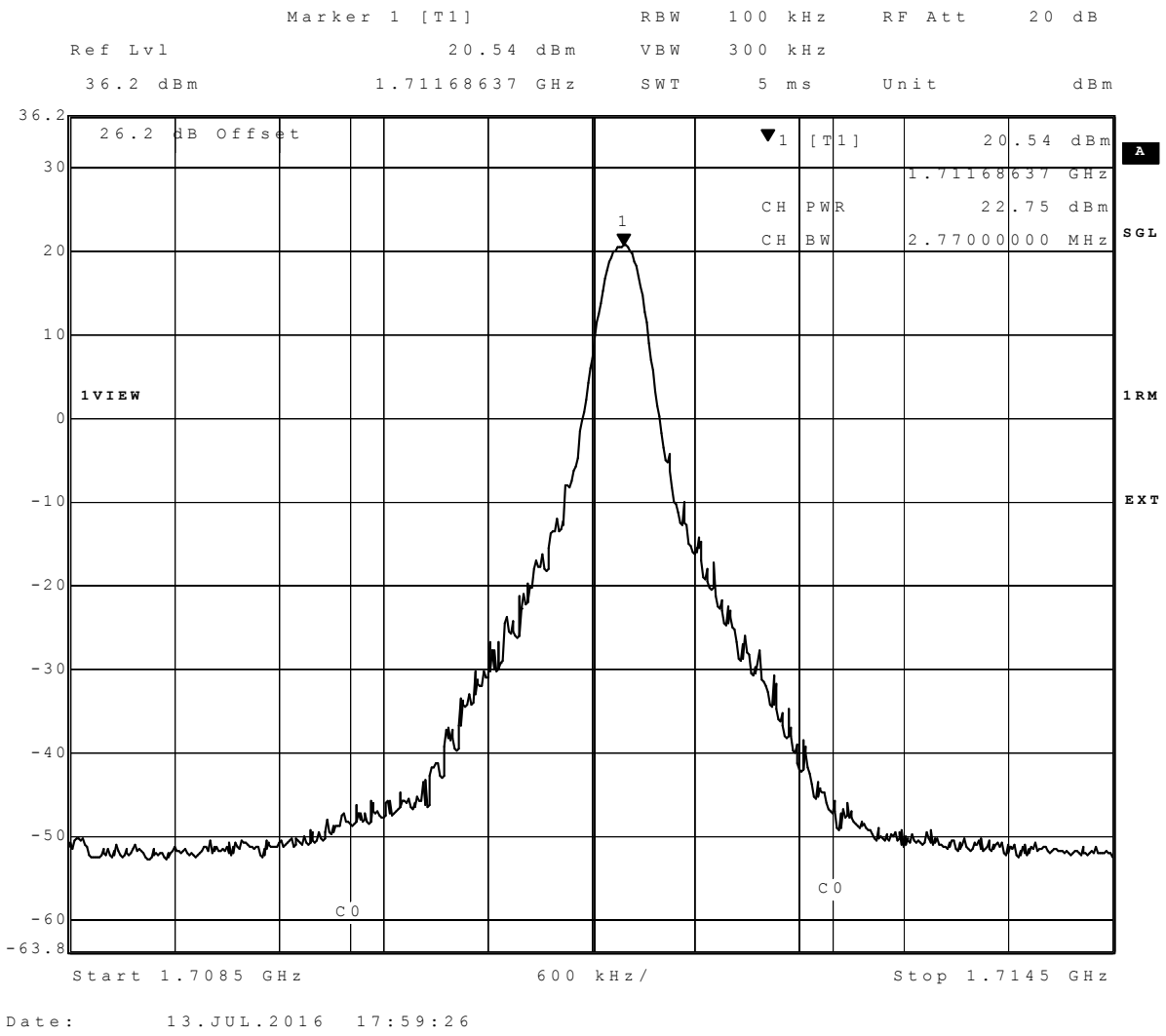
FDD IV HSDPA Subtest 1 mid channel 1412 (1732.4 MHz)



FDD IV HSUPA Subtest 5 high channel



eFDD 4 QPSK mid channel 1.4 MHz 1 RB



eFDD 4 QPSK low channel 3 MHz 1 RB

3.5.16 27.2 Frequency stability §2.1055, §27.54

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

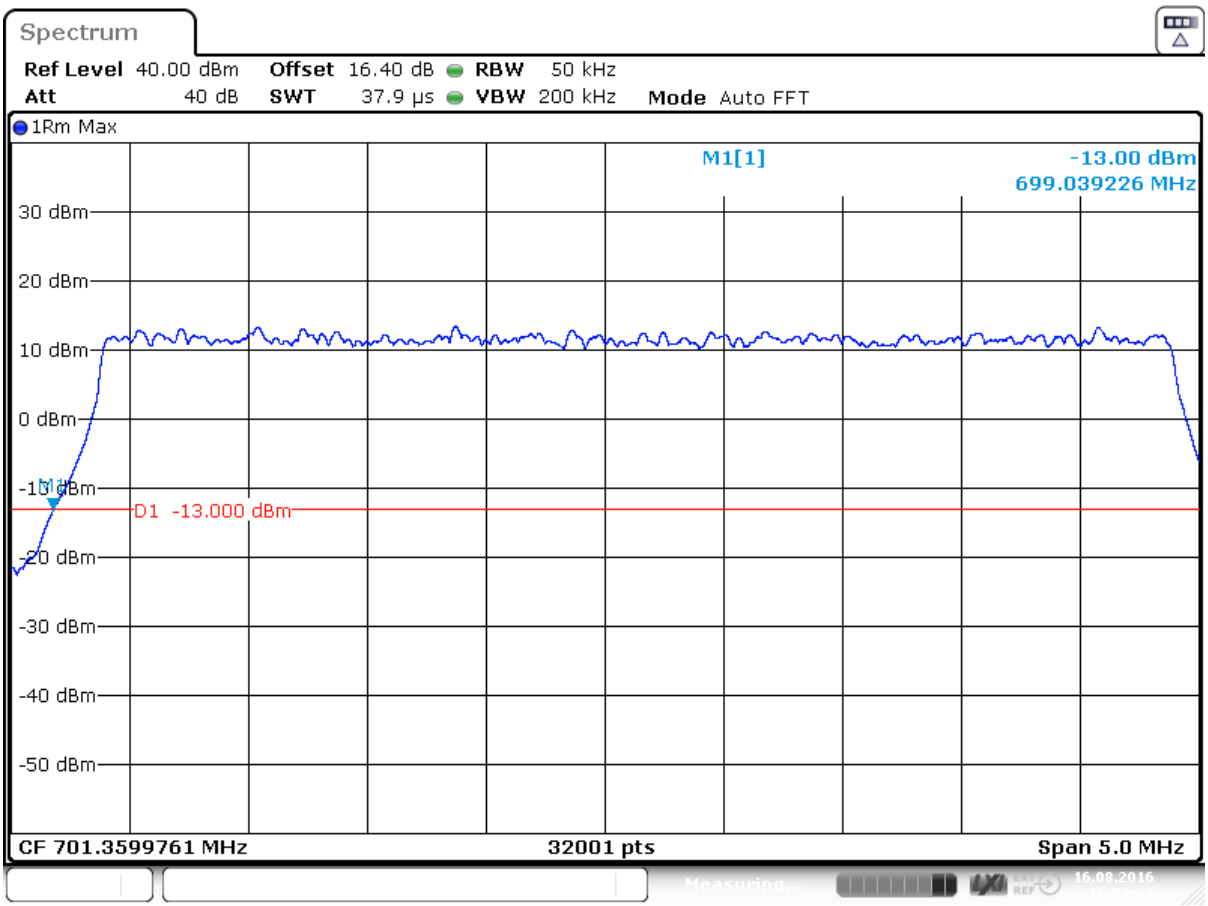
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/30 18:17
Body:	FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 27

Detailed Results:

Radio Technology	Voltage	Temp (°C)	Frequency (MHz)	Frequency Error (Hz)	Deviation (ppm)	Limit (Hz)
	normal	-30	1732.4	-10	-0.01	4331
	normal	-20	1732.4	10	0.01	4331
	normal	-10	1732.4	-6	0.00	4331
	normal	0	1732.4	7	0.00	4331
	normal	10	1732.4	-7	0.00	4331
FDD IV	normal = high	20	1732.4	-7	0.00	4331
	normal	30	1732.4	10	0.01	4331
	normal	40	1732.4	12	0.01	4331
	normal	50	1732.4	-10	-0.01	4331
	low	20	1732.4	-5	0.00	4331
	normal	-30	1732.4	-56	-0.03	4331
	normal	-20	1732.4	-25	-0.01	4331
	normal	-10	1732.4	-19	-0.01	4331
	normal	0	1732.4	-36	-0.02	4331
	normal	10	1732.4	-40	-0.02	4331
FDD IV HSDPA	normal = high	20	1732.4	-18	-0.01	4331
Subtest 1	normal	30	1732.4	14	0.01	4331
	normal	40	1732.4	20	0.01	4331
	normal	50	1732.4	25	0.01	4331
	low	20	1732.4	-19	-0.01	4331
	normal	-30	1732.4	33	0.02	4331
	normal	-20	1732.4	24	0.01	4331
	normal	-10	1732.4	15	0.01	4331
	normal	0	1732.4	31	0.02	4331
	normal	10	1732.4	-21	-0.01	4331
FDD IV HSUPA	normal = high	20	1732.4	-12	-0.01	4331
Subtest 1	normal	30	1732.4	-23	-0.01	4331
	normal	40	1732.4	20	0.01	4331
	normal	50	1732.4	-23	-0.01	4331
	low	20	1732.4	-21	-0.01	4331
	normal	-30	1732.4	8	0.00	4331
	normal	-20	1732.4	7	0.00	4331
	normal	-10	1732.4	6	0.00	4331
	normal	0	1732.4	8	0.00	4331
	normal	10	1732.4	-7	0.00	4331
eFDD 4 QPSK	normal = high	20	1732.4	-9	-0.01	4331
5 MHz, 1 RB	normal	30	1732.4	-9	-0.01	4331
	normal	40	1732.4	7	0.00	4331
	normal	50	1732.4	-7	0.00	4331
	low	20	1732.4	-6	0.00	4331

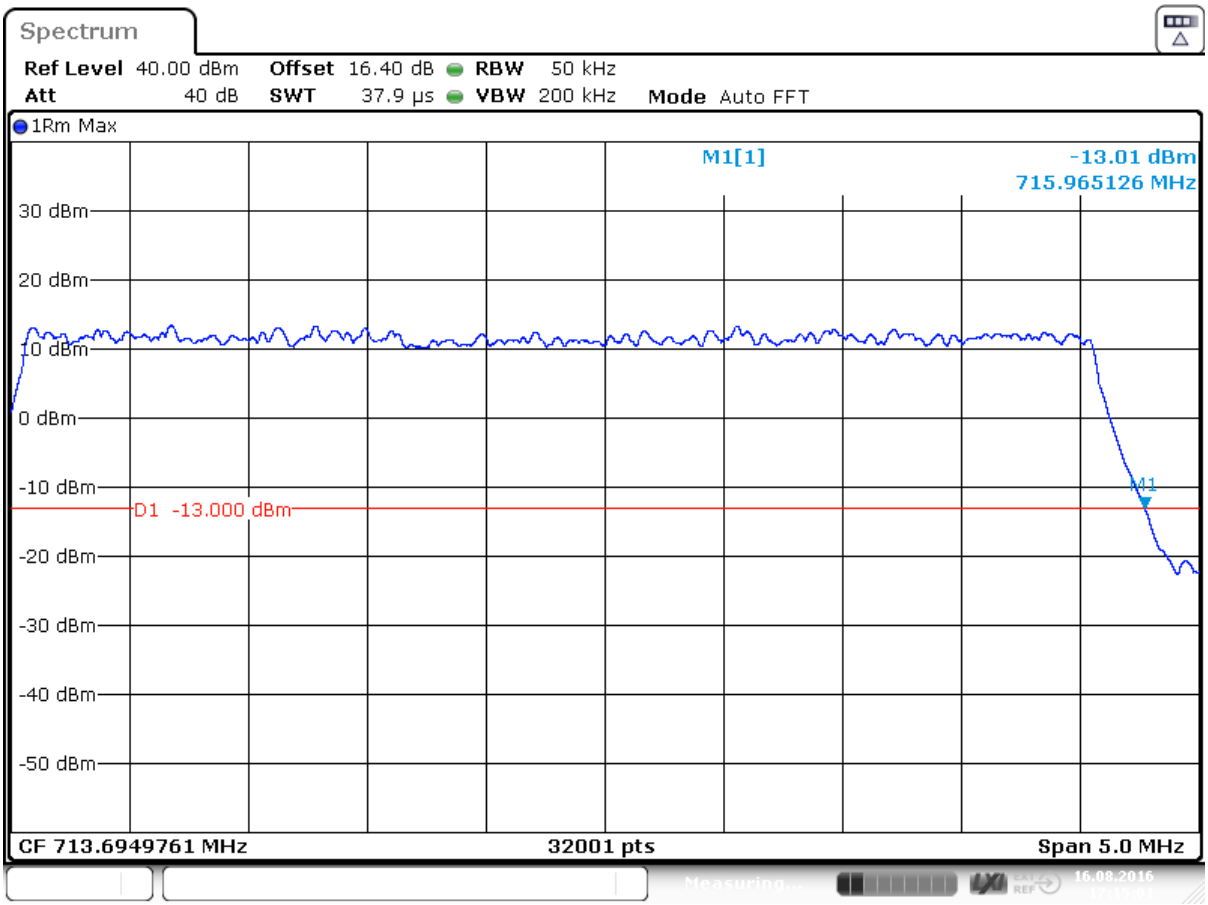
Radio Technology	Voltage	Temp (°C)	Frequency (MHz)	Frequency Error (Hz)	Deviation (ppm)	Limit (Hz)
	normal	-30	707.5	4	0.01	1768.75
	normal	-20	707.5	5	0.01	1768.75
	normal	-10	707.5	-3	0.00	1768.75
	normal	0	707.5	5	0.01	1768.75
	normal	10	707.5	5	0.01	1768.75
eFDD 12 QPSK	normal = high	20	707.5	-5	-0.01	1768.75
5 MHz, 1 RB	normal	30	707.5	-4	-0.01	1768.75
	normal	40	707.5	-5	-0.01	1768.75
	normal	50	707.5	-4	-0.01	1768.75
	low	20	707.5	4	0.01	1768.75
RSS-130 4.3 (b)						

LTE eFDD12						
(MHz) / Resource Blocks	f_L (MHz)	f_H (MHz)	Frequency Error (Hz)	Freq. (MHz)	Limit (MHz)	Result
5 / 25	699.0392	-	5	699.0392	698	Passed
	-	715.9651	5	715.9651	716	Passed



Date: 16.AUG.2016 16:58:02

eFDD 12 QPSK 5 MHz low channel



Date: 16.AUG.2016 17:15:02

eFDD 12 QPSK 5 MHz high channel

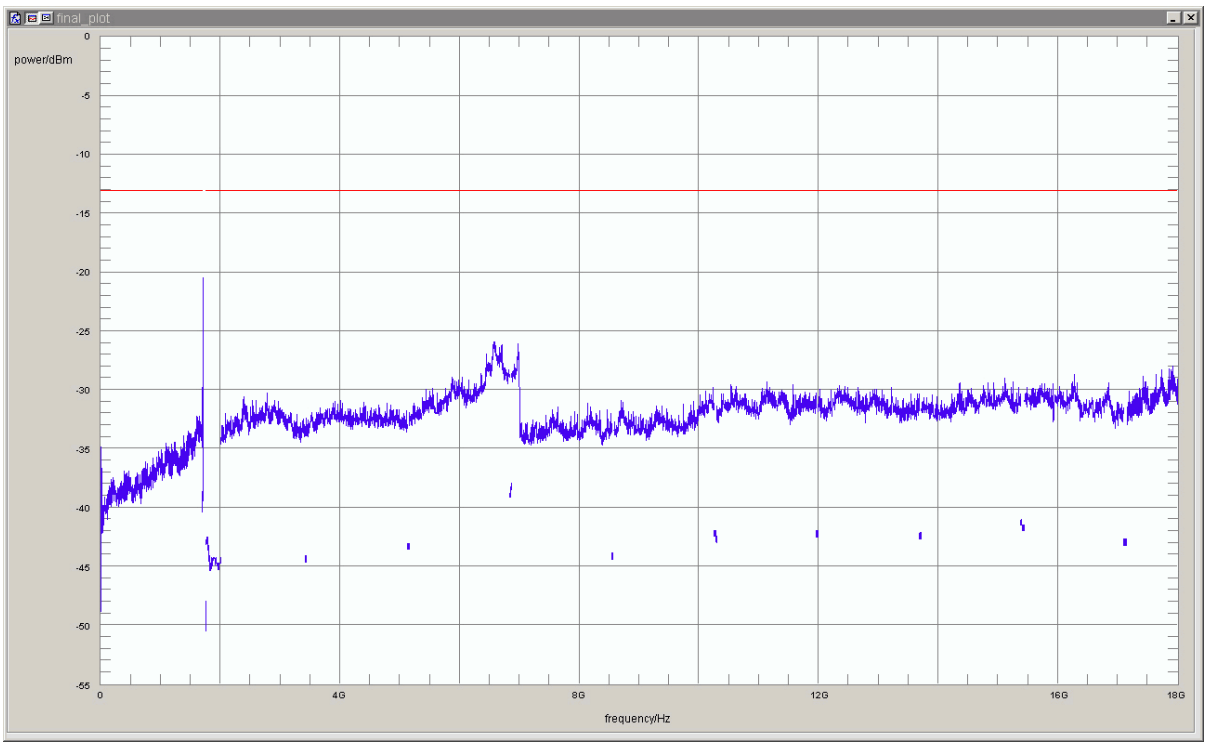
3.5.17 27.3 Spurious emissions at antenna terminals §2.1051, §27.53

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

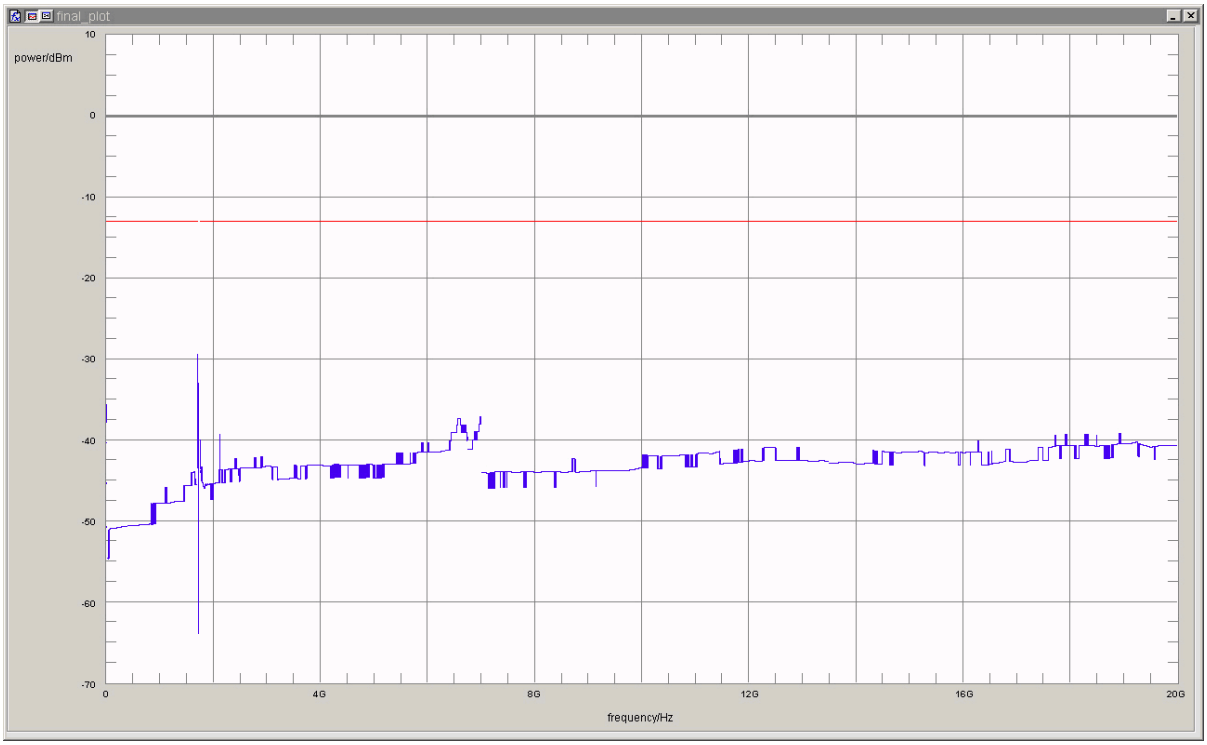
Result:	Passed
Setup No.:	S01_BB02
Date of Test:	2016/08/12 12:04
Body:	FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 27

Detailed Results:

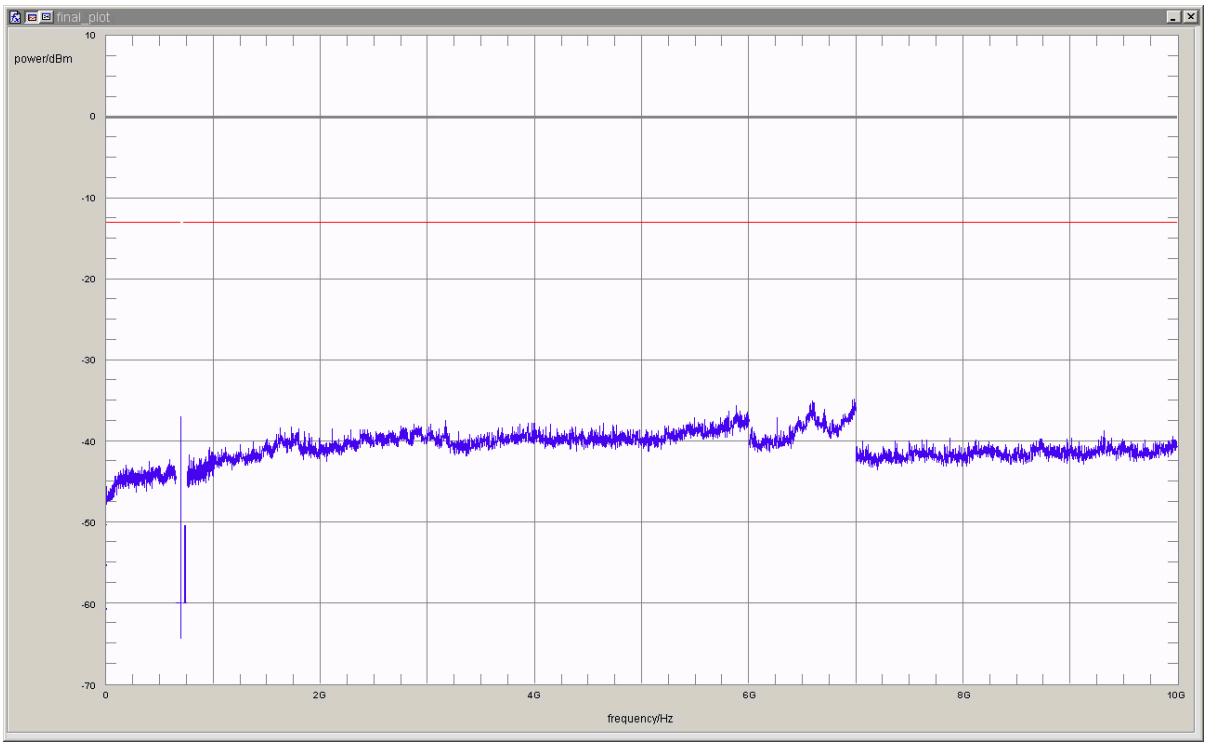
Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB	Remark
FDD IV	low	rms	maxhold	100	1708.8	-20.5	-13	7.5	1)
FDD IV	mid1	rms	maxhold	-	-	-	-13	>15	
FDD IV	mid2	rms	maxhold	-	-	-	-13	>15	
FDD IV	high	rms	maxhold	100	1756.45	-21.3	-13	8.3	1)
FDD IV HSDPA Subtest 1	low	rms	maxhold	100	1708.57	-22.4	-13	9.4	1)
FDD IV HSDPA Subtest 1	mid1	rms	maxhold	-	-	-	-13	>15	
FDD IV HSDPA Subtest 1	mid2	rms	maxhold	-	-	-	-13	>15	
FDD IV HSDPA Subtest 1	high	rms	maxhold	100	1756.52	-22.5	-13	9.5	1)
FDD IV HSUPA Subtest 1	low	rms	maxhold	100	1708.82	-20	-13	7	1)
FDD IV HSUPA Subtest 1	mid1	rms	maxhold	-	-	-	-13	>15	
FDD IV HSUPA Subtest 1	mid2	rms	maxhold	-	-	-	-13	>15	
FDD IV HSUPA Subtest 1	high	rms	maxhold	100	1756.02	-21	-13	8	1)
eFDD 4 QPSK	low	rms	maxhold	100	1708.15	-29.5	-13	16.5	1)
eFDD 4 QPSK	mid	rms	maxhold	-	-	-	-13	>20	
eFDD 4 QPSK	high	rms	maxhold	-	-	-	-13	>20	
eFDD 12 QPSK	low	rms	maxhold	-	-	-	-13	>20	
eFDD 12 QPSK	mid	rms	maxhold	-	-	-	-13	>20	
eFDD 12 QPSK	high	rms	maxhold	-	-	-	-13	>20	
1) Use of smaller RBW due to close proximity to transmitter signal, 10 dB were added to the value									



FDD IV low channel



eFDD 4 low channel QPSK 5 MHz 1RB



eFDD 12 low channel QPSK 5 MHz 1 RB

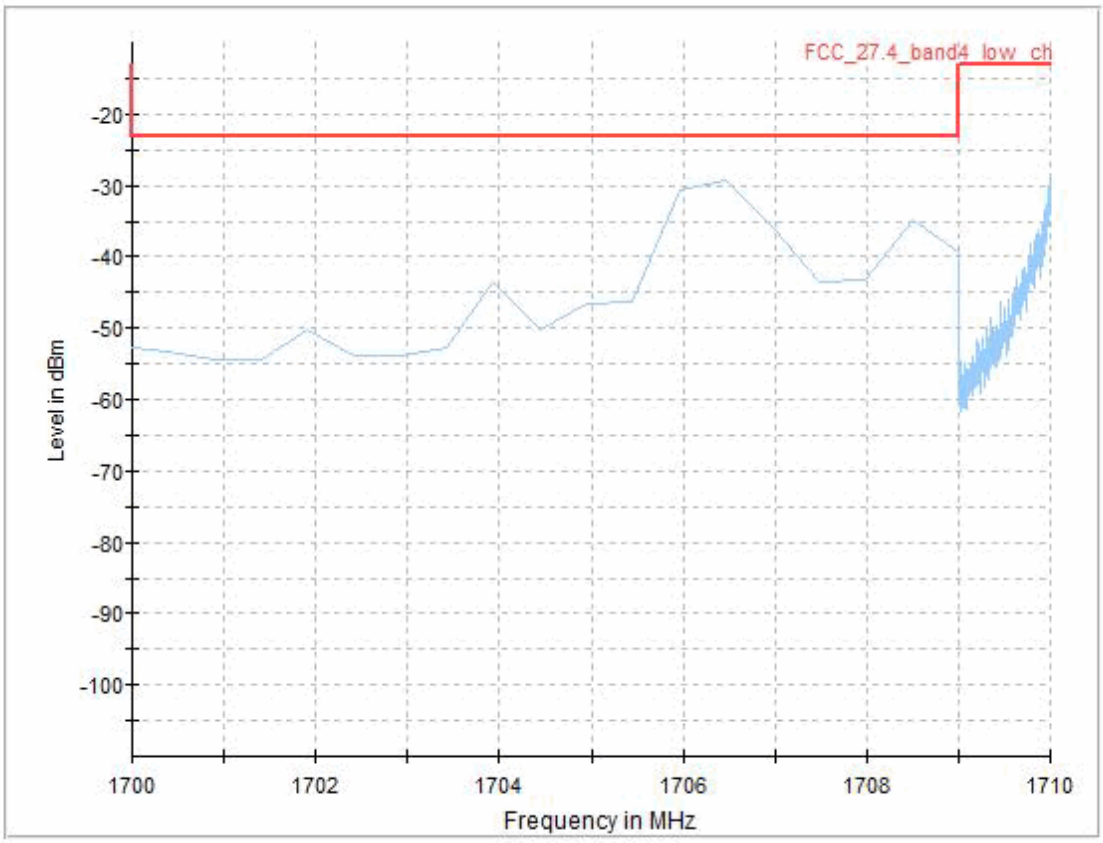
3.5.18 27.4 Field strength of spurious radiation §2.1053, §27.53

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

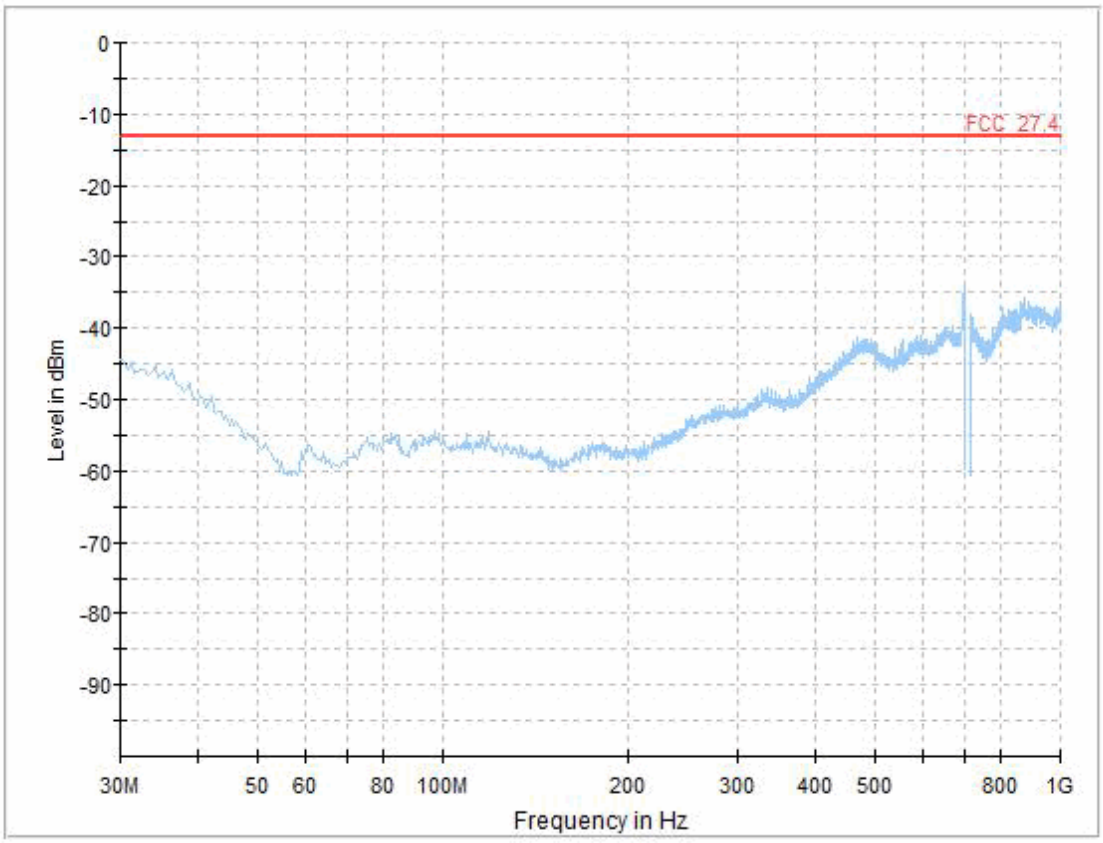
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/08/01 15:25
Body:	FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 27

Detailed Results:

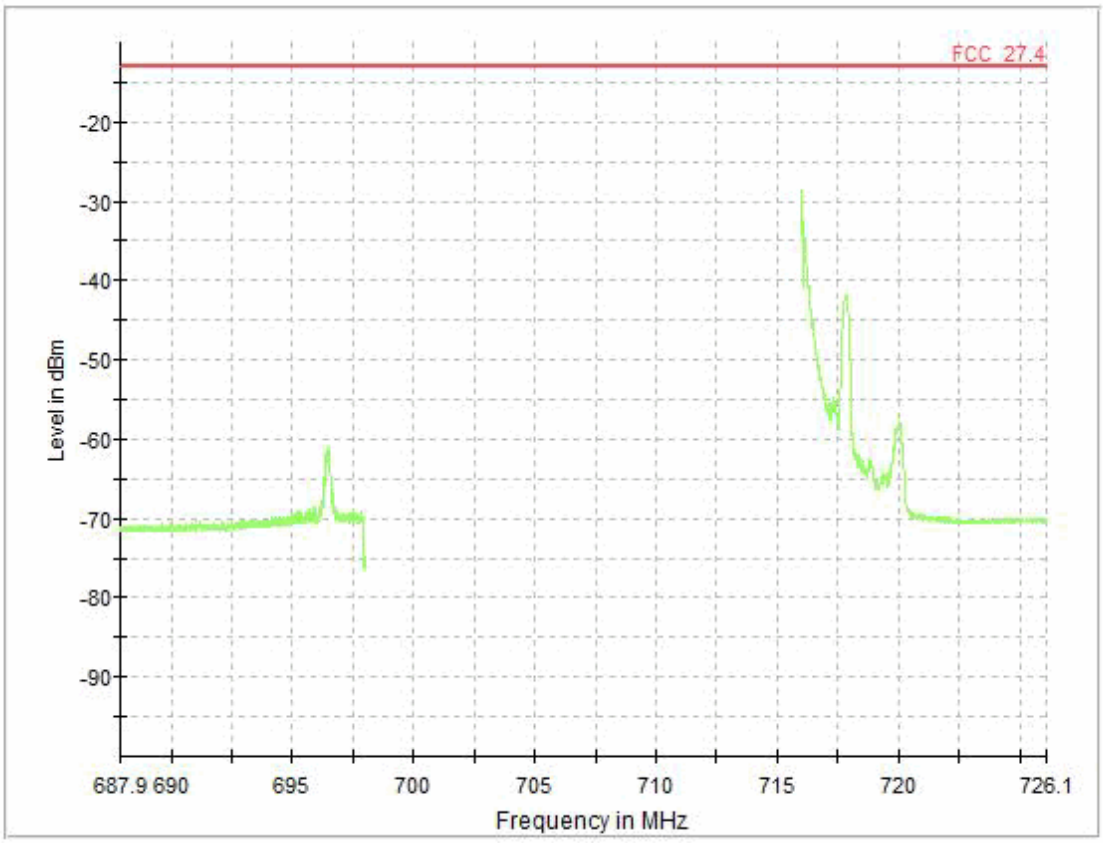
Radio Technology	Channel	Detector	Trace	Ressource Blocks	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB	Remark
FDD IV	low	RMS	maxhold	-	100	1708.87	-27	-23	4	3) 4)
FDD IV	low	RMS	maxhold	-	50	1710	-24.1	-13	11.1	3)
FDD IV	mid 1	peak	maxhold	-	-	-	-	-13	> 20	2)
FDD IV	mid 2	peak	maxhold	-	1000	1757.49	-37.1	-13	24.1	2)
FDD IV	high	RMS	maxhold	-	50	1755	-25.9	-13	12.9	3) 4)
FDD IV	high	RMS	maxhold	-	100	1756.5	-30.9	-23	7.9	3)
FDD IV HSDPA Subtest 1	low	RMS	maxhold	-	100	1708.88	-31	-23	8	3) 4)
FDD IV HSDPA Subtest 1	low	RMS	maxhold	-	50	1710	-26.1	-13	13.1	3)
FDD IV HSDPA Subtest 1	mid 1	peak	maxhold	-	-	-	-	-13	> 20	3)
FDD IV HSDPA Subtest 1	mid 2	peak	maxhold	-	1000	1704.98	-31.2	-13	18.2	3)
FDD IV HSDPA Subtest 1	high	RMS	maxhold	-	50	1755	-25.9	-13	12.9	3)
FDD IV HSDPA Subtest 1	high	RMS	maxhold	-	100	1756.39	-32.4	-23	9.4	3) 4)
FDD IV HSUPA Subtest 1	low	RMS	maxhold	-	100	1780.82	-29.7	-23	6.7	3) 4)
FDD IV HSUPA Subtest 1	low	RMS	maxhold	-	50	1710	-26.8	-13	13.8	3)
FDD IV HSUPA Subtest 1	mid 1	peak	maxhold	-	1000	1709	-36.9	-13	23.9	3)
FDD IV HSUPA Subtest 1	mid 2	RMS	maxhold	-	-	-	-	-13	> 20	3)
FDD IV HSUPA Subtest 1	high	RMS	maxhold	-	50	1755	-27.2	-13	14.2	3)
FDD IV HSUPA Subtest 1	high	RMS	maxhold	-	100	1756	-31.5	-23	8.5	3) 4)
1) Performed in the range 30 MHz - 10 GHz										
2) Performed in the range 30 MHz - 20 GHz										
3) Performed around band and around harmonics only (since no peaks outside this range were seen in pre tests)										
4) Due to close proximity to carrier value too high with standard bandwidth, measurement repeated in 100 kHz RBW,										



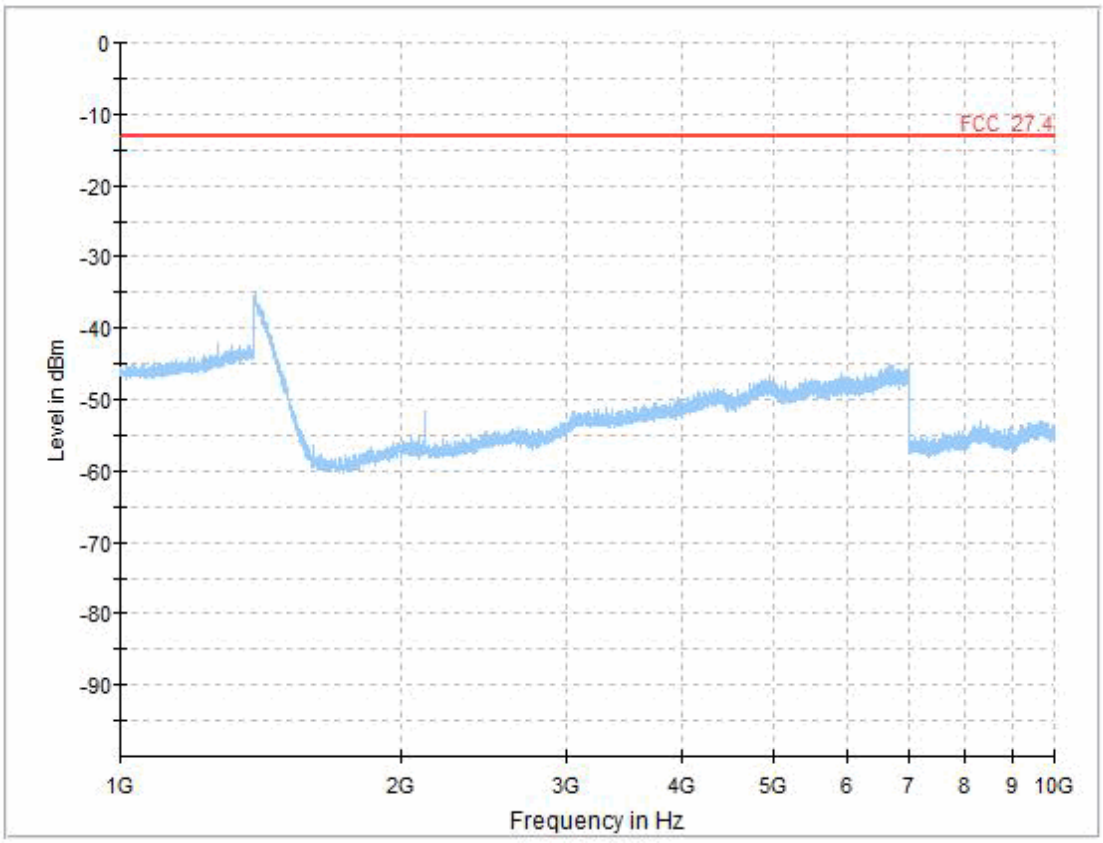
LTE eFDD 4 low channel, range 1700 - 1710 MHz



LTE eFDD 12 mid channel, 30 MHz - 1 GHz



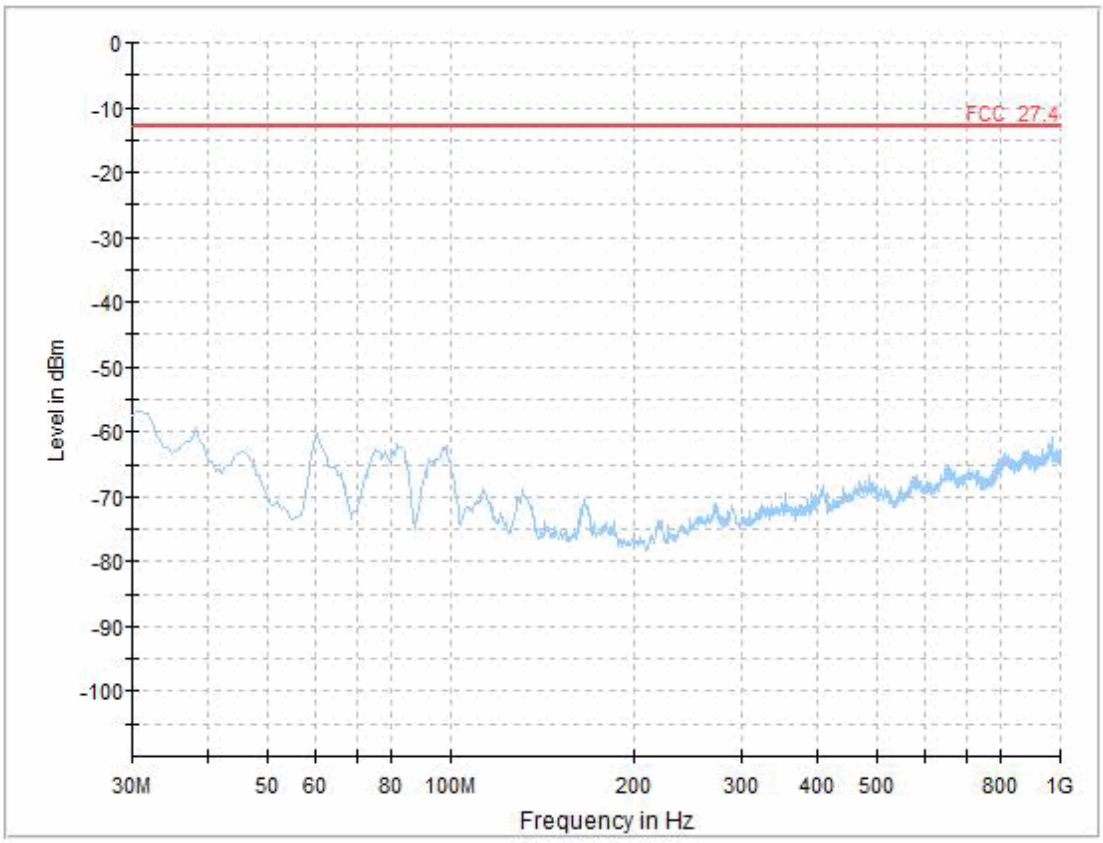
LTE eFDD 12 high channel, around band



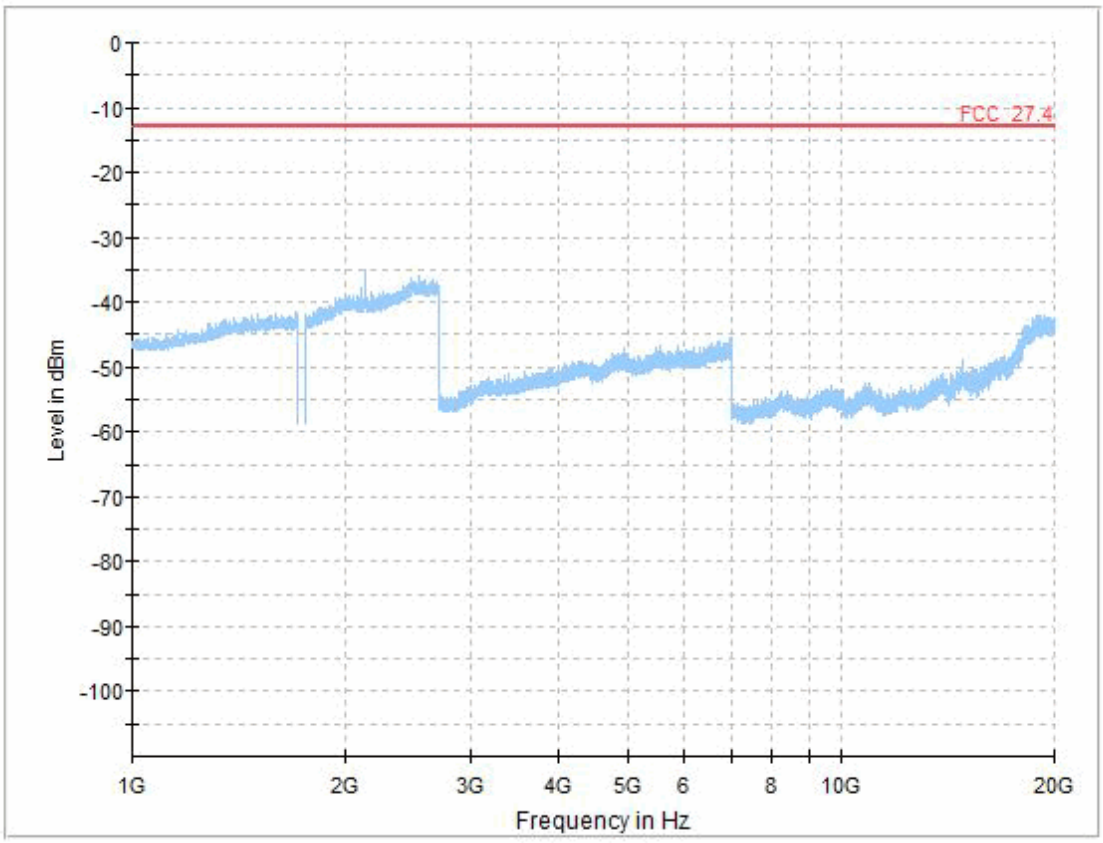
LTE eFDD 12 mid channel, 1 GHz - 10 GHz

Radio Technology	Channel	Detector	Trace	Ressource Blocks	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB	Remark
eFDD 4 QPSK	low	peak	maxhold	1	100	1706.47	-29.2	-23	6.2	2) 4)
eFDD 4 QPSK	low	peak	maxhold	1	3	1710	-28.7	-13	15.7	2)
eFDD 4 QPSK	mid	peak	maxhold	1	-	-	-	-13	> 20	2)
eFDD 4 QPSK	high	peak	maxhold	1	3	1755	-29.2	-13	16.2	2)
eFDD 4 QPSK	high	peak	maxhold	1	100	1756.47	-33.5	-23	10.5	2) 4)
eFDD 12 QPSK	low	RMS	maxhold	1	100	697.18	-40.9	-13	27.9	3)
eFDD 12 QPSK	mid	peak	maxhold	1	1000	698.06	-33.5	-13	20.5	1)
eFDD 12 QPSK	high	RMS	maxhold	1	3	716	-28.5	-13	15.5	3)
eFDD 12 QPSK	high	RMS	maxhold	1	100	716.1	-32.4	-13	19.4	3)

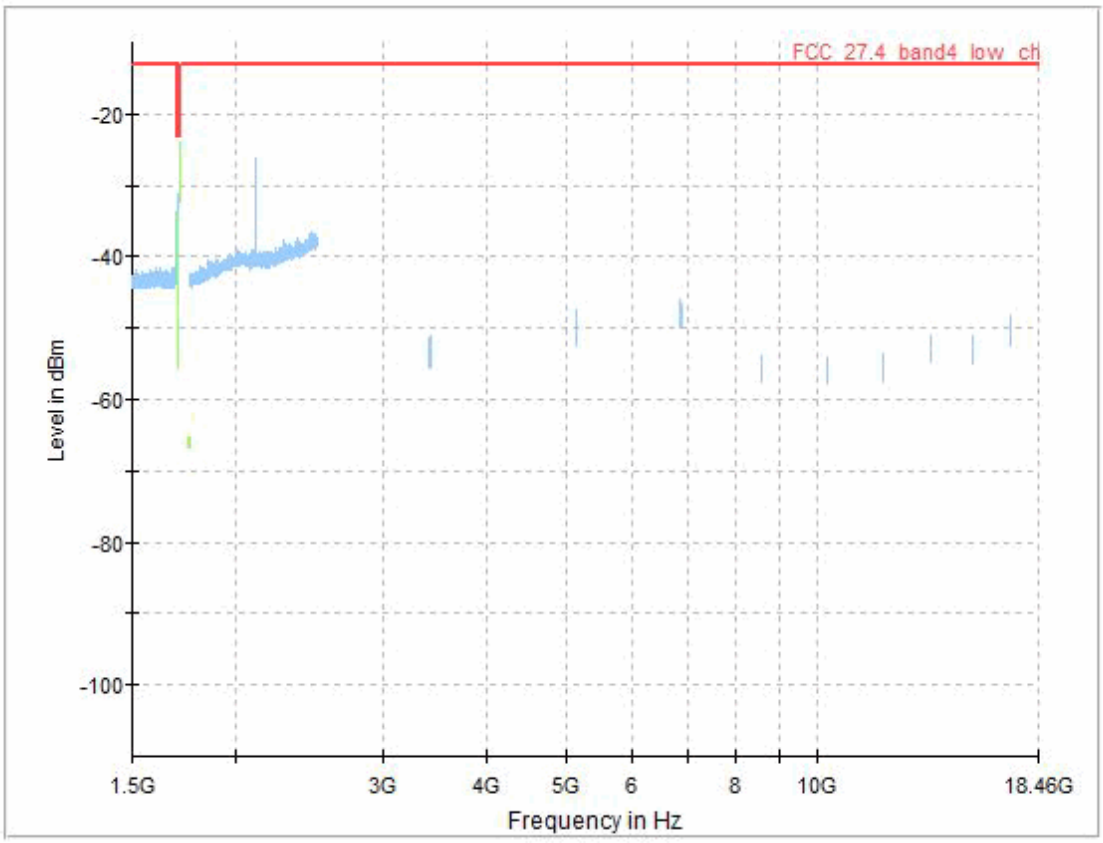
1) Performed in the range 30 MHz - 10 GHz
2) Performed in the range 30 MHz - 20 GHz
3) Performed around band and around harmonics only (since no peaks outside this range were seen in pre tests)
4) Due to close proximity to carrier value too high with standard bandwidth, measurement repeated in 100 kHz RBW,



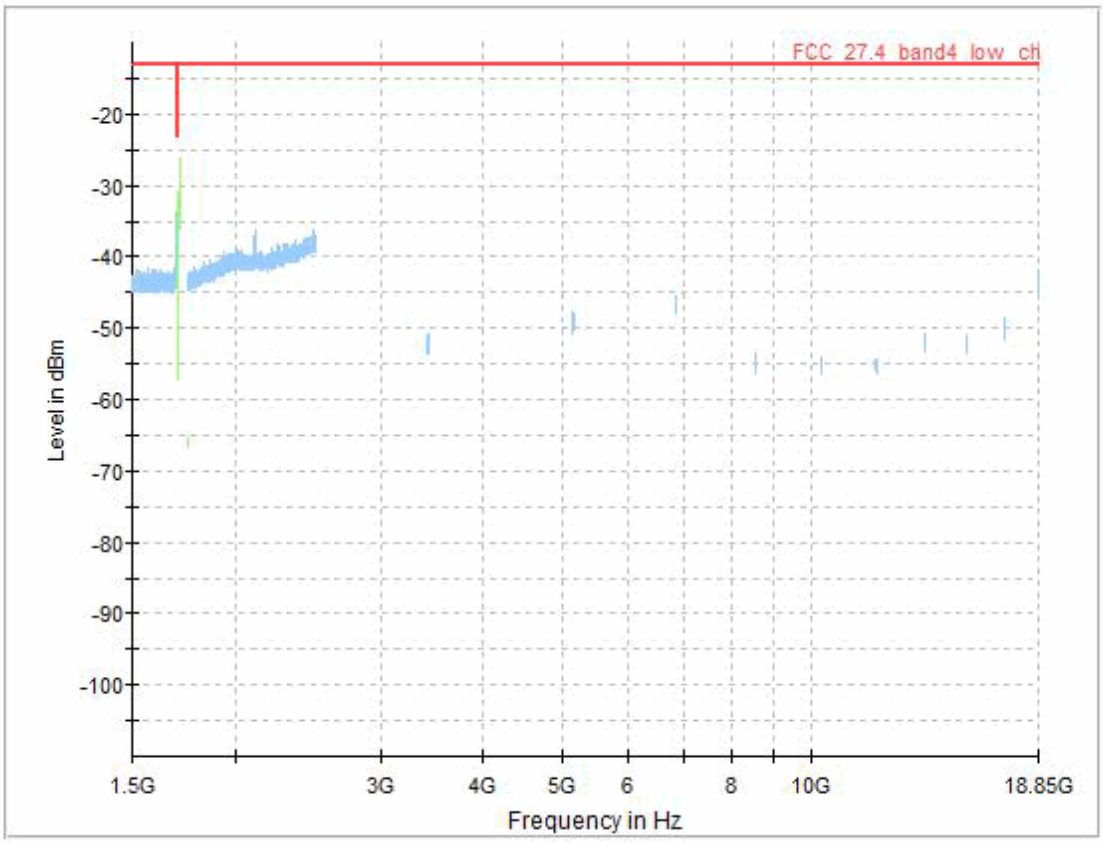
WCDMA FDD IV mid 1 (Ch. 1412, 1732.4 MHz), 30 MHz - 1 GHz



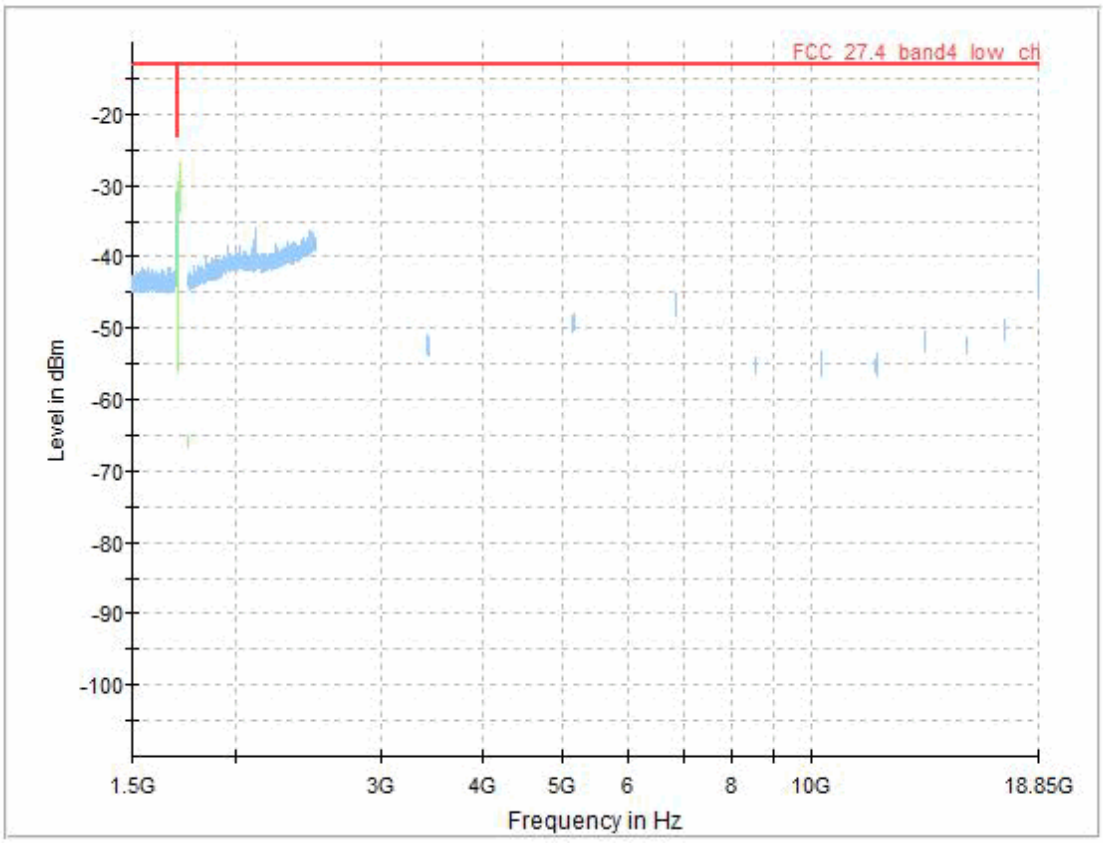
WCDMA FDD IV mid 1 (Ch. 1412, 1732.4 MHz), 1 GHz - 20 GHz



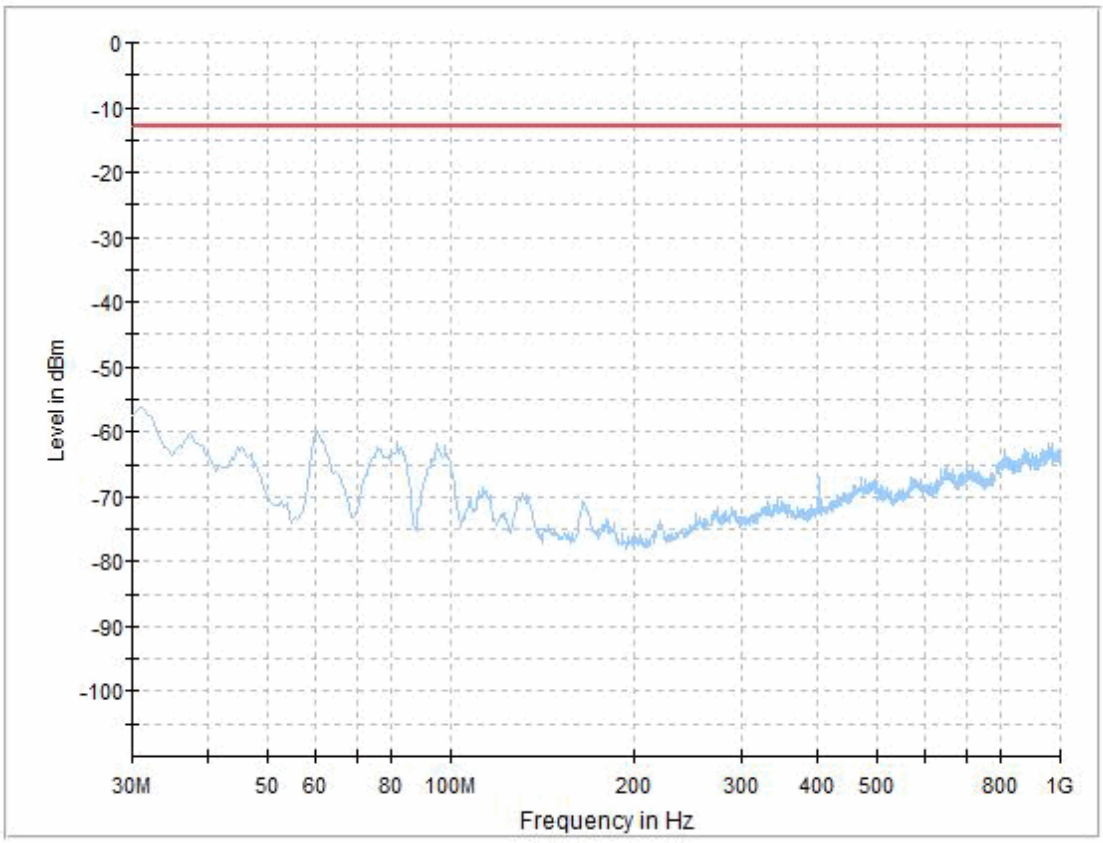
WCDMA FDD IV low channel, measurement around carrier and harmonics



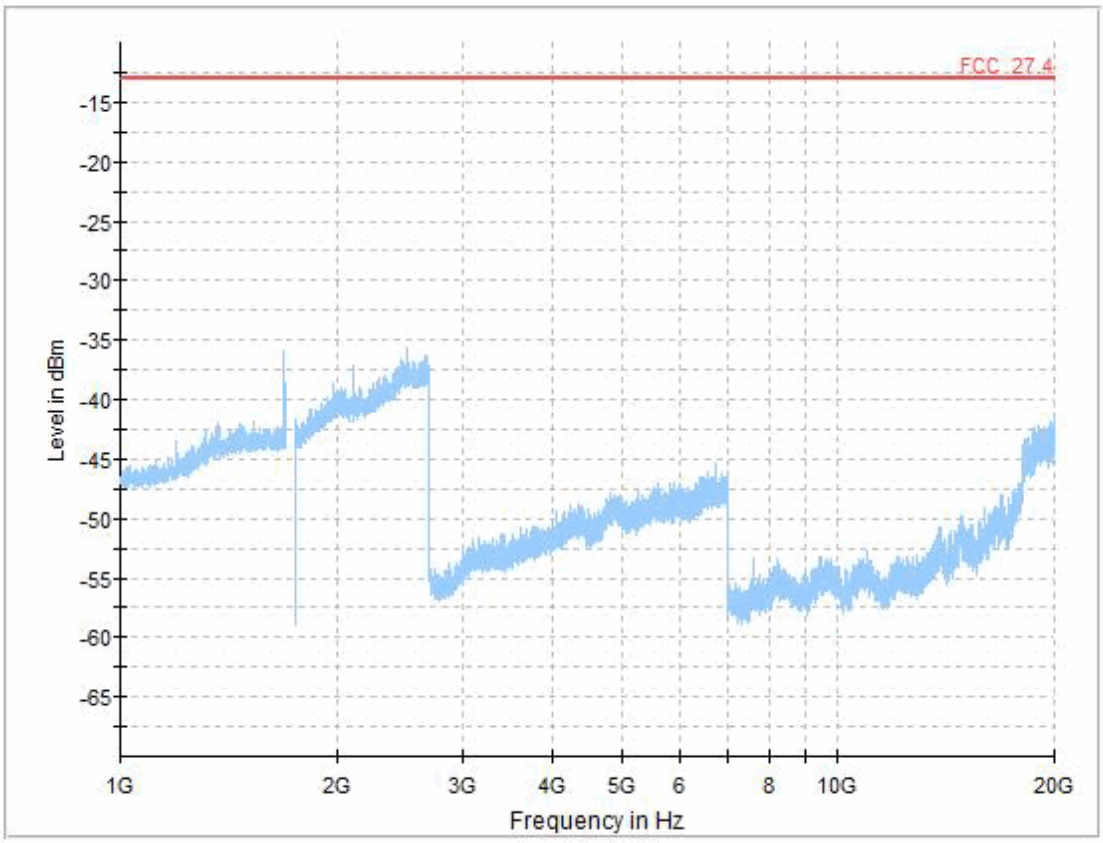
HSDPA FDD IV low channel, measurement around band and harmonics



HSUPA FDD IV low channel, measurement around band and harmonics



LTE eFDD 4 low channel, 30 MHz - 1 GHz



LTE eFDD 4 low channel, 1 GHz - 20 GHz

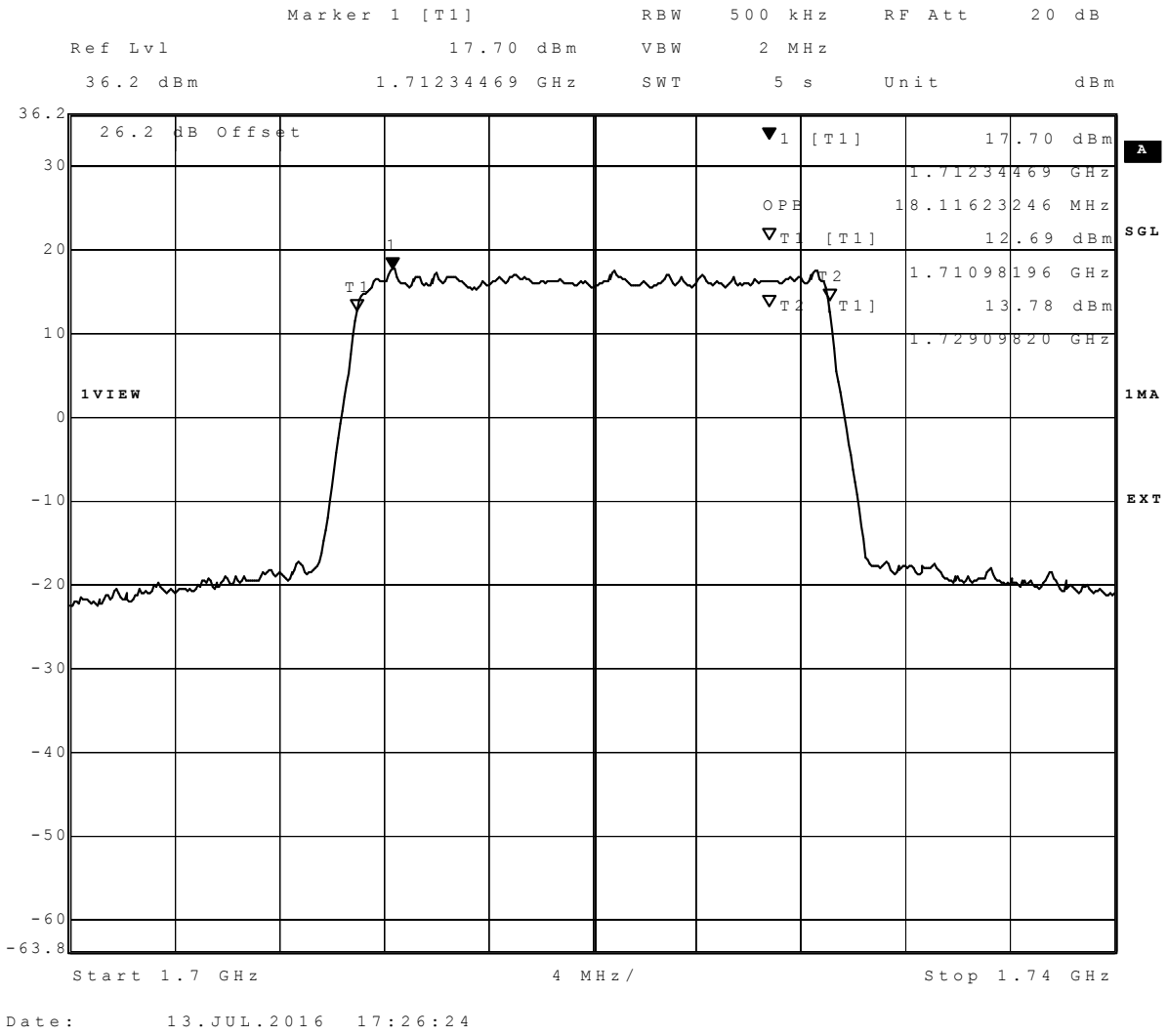
3.5.19 27.5 Emission and Occupied Bandwidth §2.1049

Test: 27.5; Emission and Occupied Bandwidth Summary §2.1049

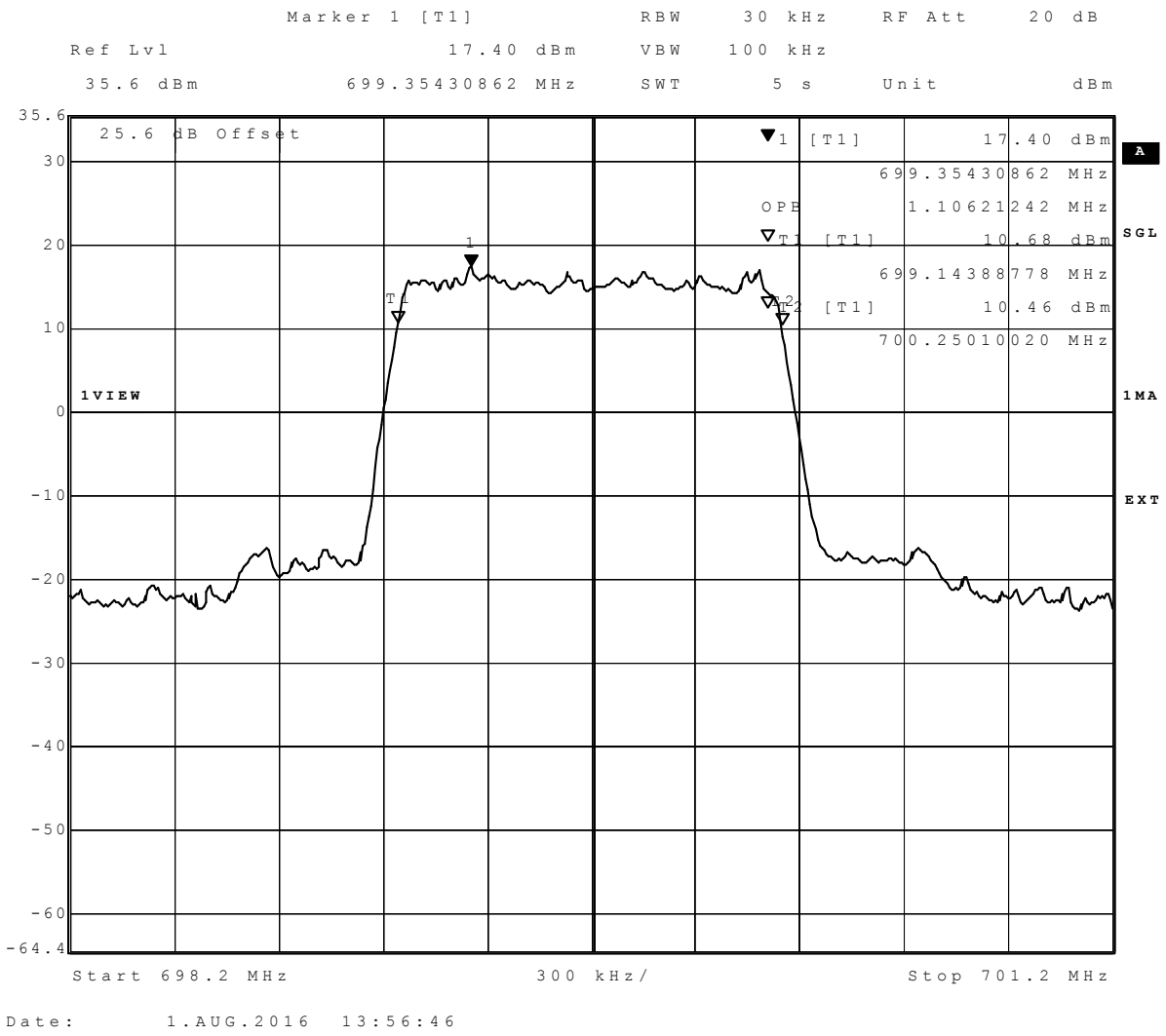
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/30 18:26
Body:	FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 27

Detailed Results:

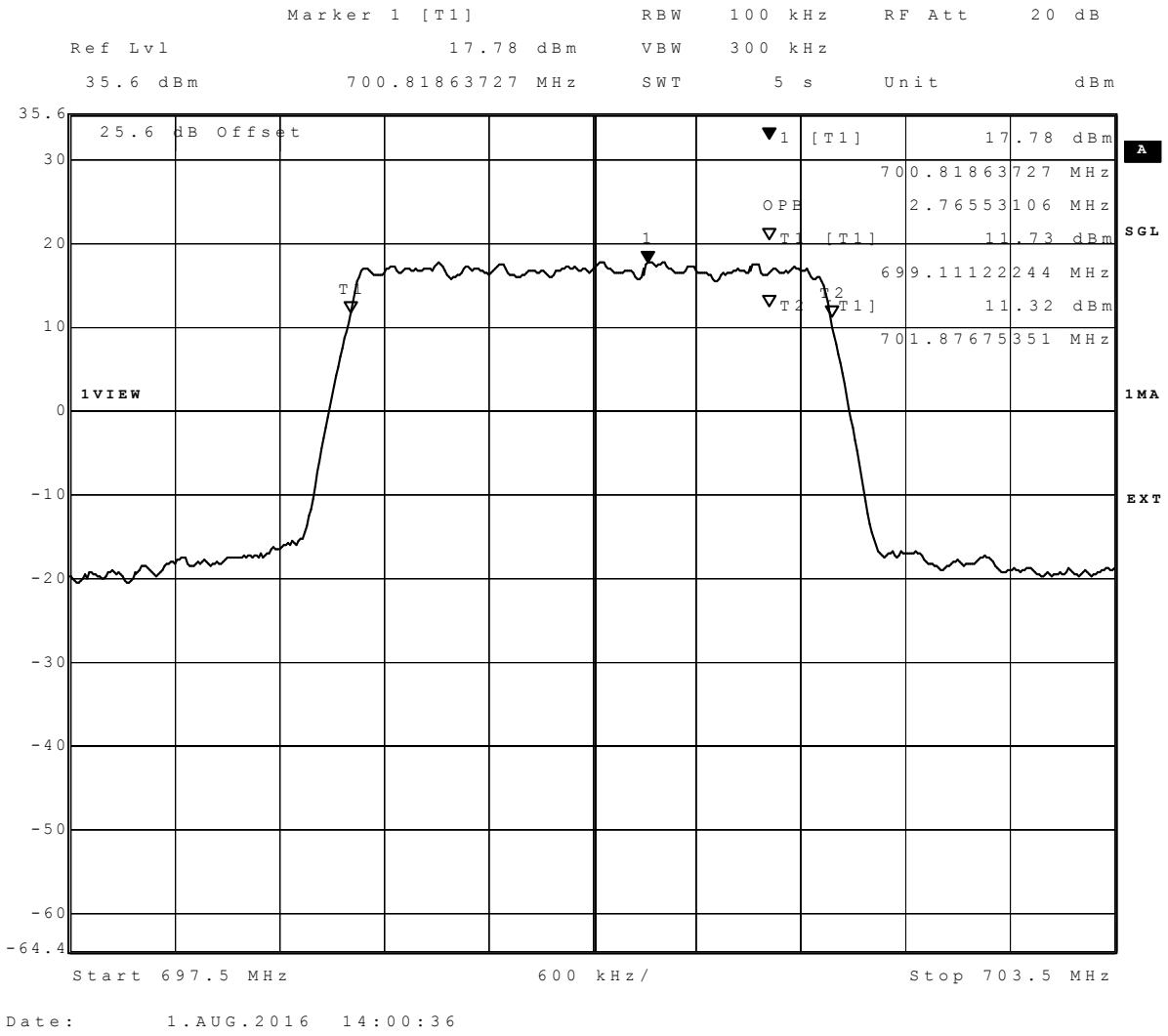
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	26 dB BW [kHz]	99 % BW [kHz]
FDD IV	low	-	5	4769.5	4128.3
FDD IV	mid1	-	5	4769.5	4128.3
FDD IV	mid2	-	5	4749.5	4148.3
FDD IV	high	-	5	4769.5	4148.3
FDD IV HSDPA Subtest 1	low	-	5	4769.5	4148.3
FDD IV HSDPA Subtest 1	mid1	-	5	4769.5	4128.3
FDD IV HSDPA Subtest 1	mid2	-	5	4769.5	4148.3
FDD IV HSDPA Subtest 1	high	-	5	4769.5	4128.3
FDD IV HSUPA Subtest 1	low	-	5	4769.5	4148.3
FDD IV HSUPA Subtest 1	mid1	-	5	4769.5	4168.3
FDD IV HSUPA Subtest 1	mid2	-	5	4769.5	4148.3
FDD IV HSUPA Subtest 1	high	-	5	4769.5	4168.3
FDD IV HSUPA Subtest 5	low	-	5	**4789.6**	**4168.3**
FDD IV HSUPA Subtest 5	mid1	-	5	4789.6	4148.3
FDD IV HSUPA Subtest 5	mid2	-	5	4769.5	4168.3
FDD IV HSUPA Subtest 5	high	-	5	4769.5	4168.3
eFDD 4 QPSK	low	6	1.4	-	1100.2
eFDD 4 QPSK	mid	6	1.4	-	1106.2
eFDD 4 QPSK	high	6	1.4	-	1106.2
eFDD 4 16QAM	low	6	1.4	-	1100.2
eFDD 4 16QAM	mid	6	1.4	-	**1106.2**
eFDD 4 16QAM	high	6	1.4	-	1100.2
eFDD 4 QPSK	low	15	3	-	2765.5
eFDD 4 QPSK	mid	15	3	-	2765.5
eFDD 4 QPSK	high	15	3	-	2753.5
eFDD 4 16QAM	low	15	3	-	**2777.5**
eFDD 4 16QAM	mid	15	3	-	2741.5
eFDD 4 16QAM	high	15	3	-	2753.5
eFDD 4 QPSK	low	25	5	-	4529.1
eFDD 4 QPSK	mid	25	5	-	4529.1
eFDD 4 QPSK	high	25	5	-	4509
eFDD 4 16QAM	low	25	5	-	4529.1
eFDD 4 16QAM	mid	25	5	-	**4549.1**
eFDD 4 16QAM	high	25	5	-	4549.1
eFDD 4 QPSK	low	50	10	-	9018
eFDD 4 QPSK	mid	50	10	-	8977.9
eFDD 4 QPSK	high	50	10	-	9058.1
eFDD 4 16QAM	low	50	10	-	9018
eFDD 4 16QAM	mid	50	10	-	9018
eFDD 4 16QAM	high	50	10	-	**9058.1**



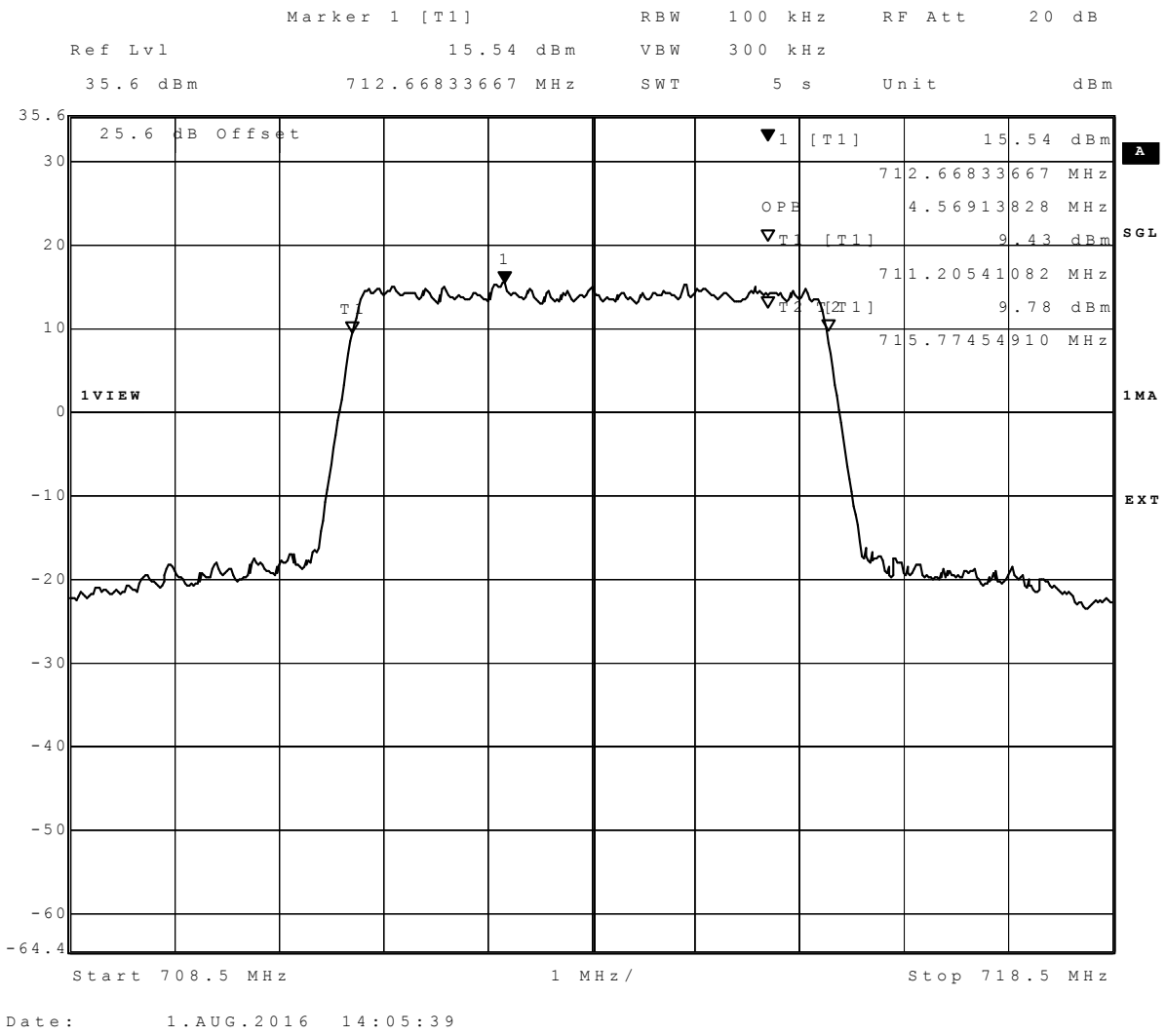
eFDD 4 low channel 20 MHz 16QAM 99 % BW



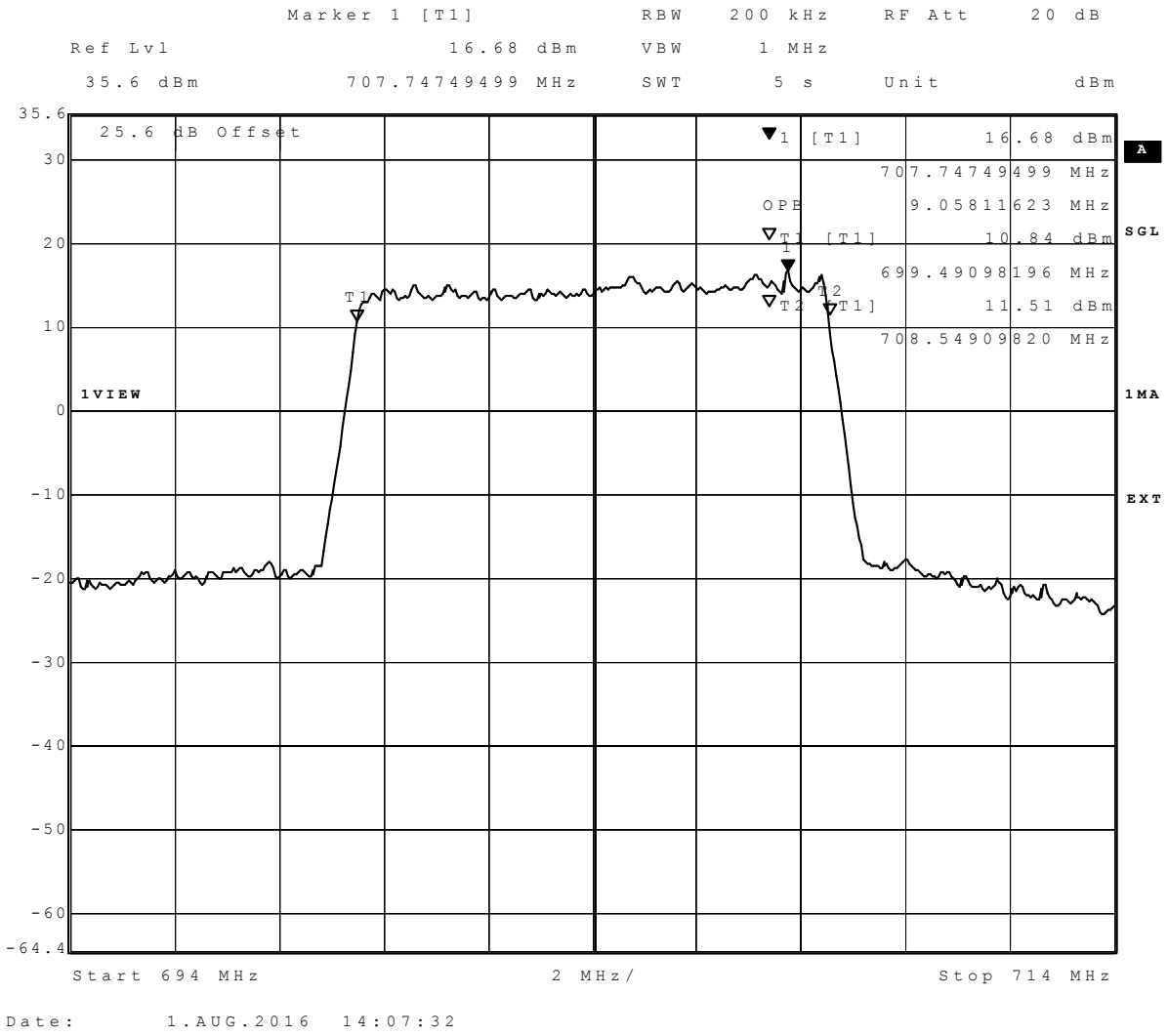
eFDD 12 low channel 1.4 MHz QPSK 99 % BW



eFDD 12 low channel 3 MHz 16QAM 99 % BW

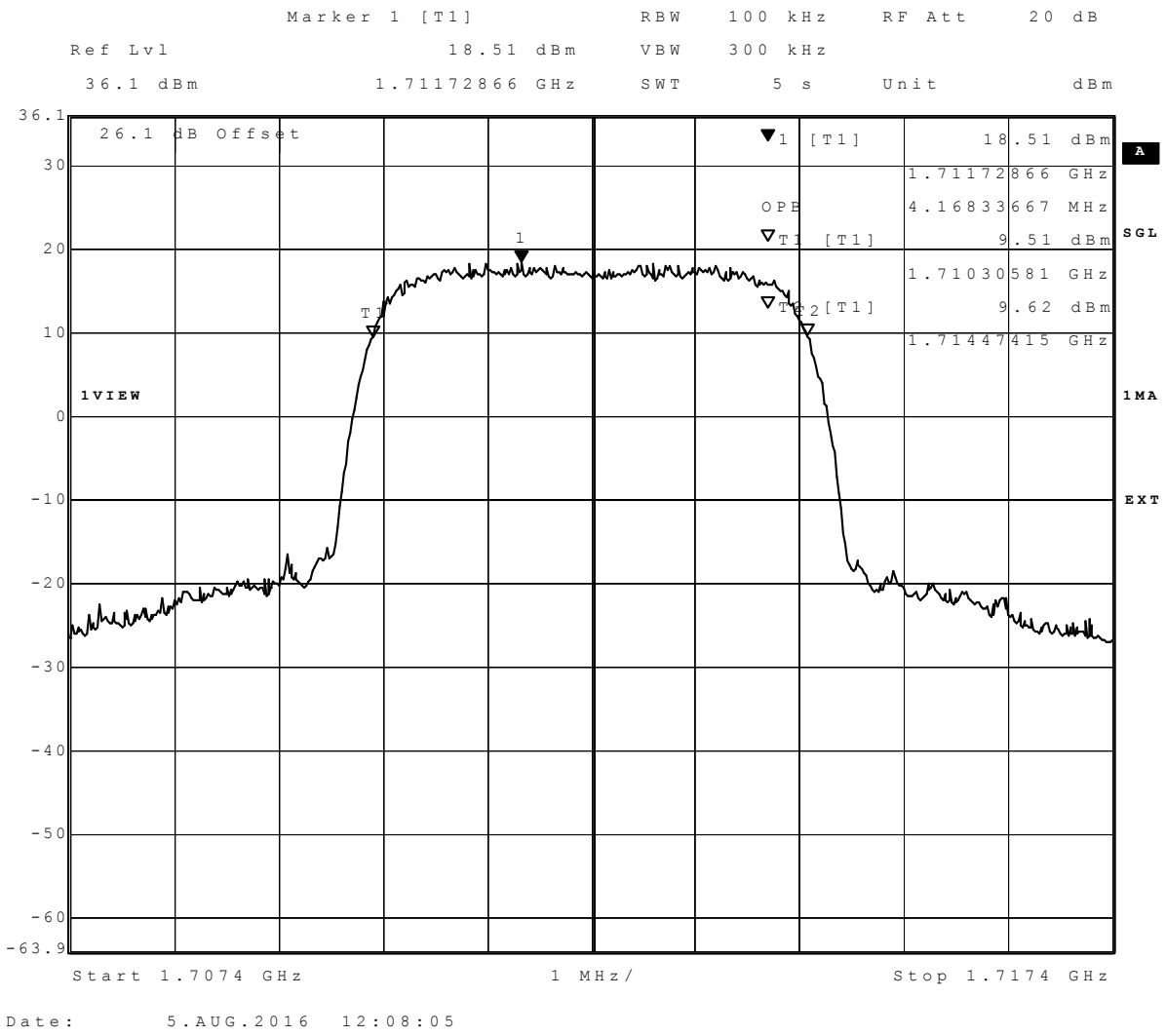


eFDD 12 high channel 5 MHz 16QAM 99 % BW

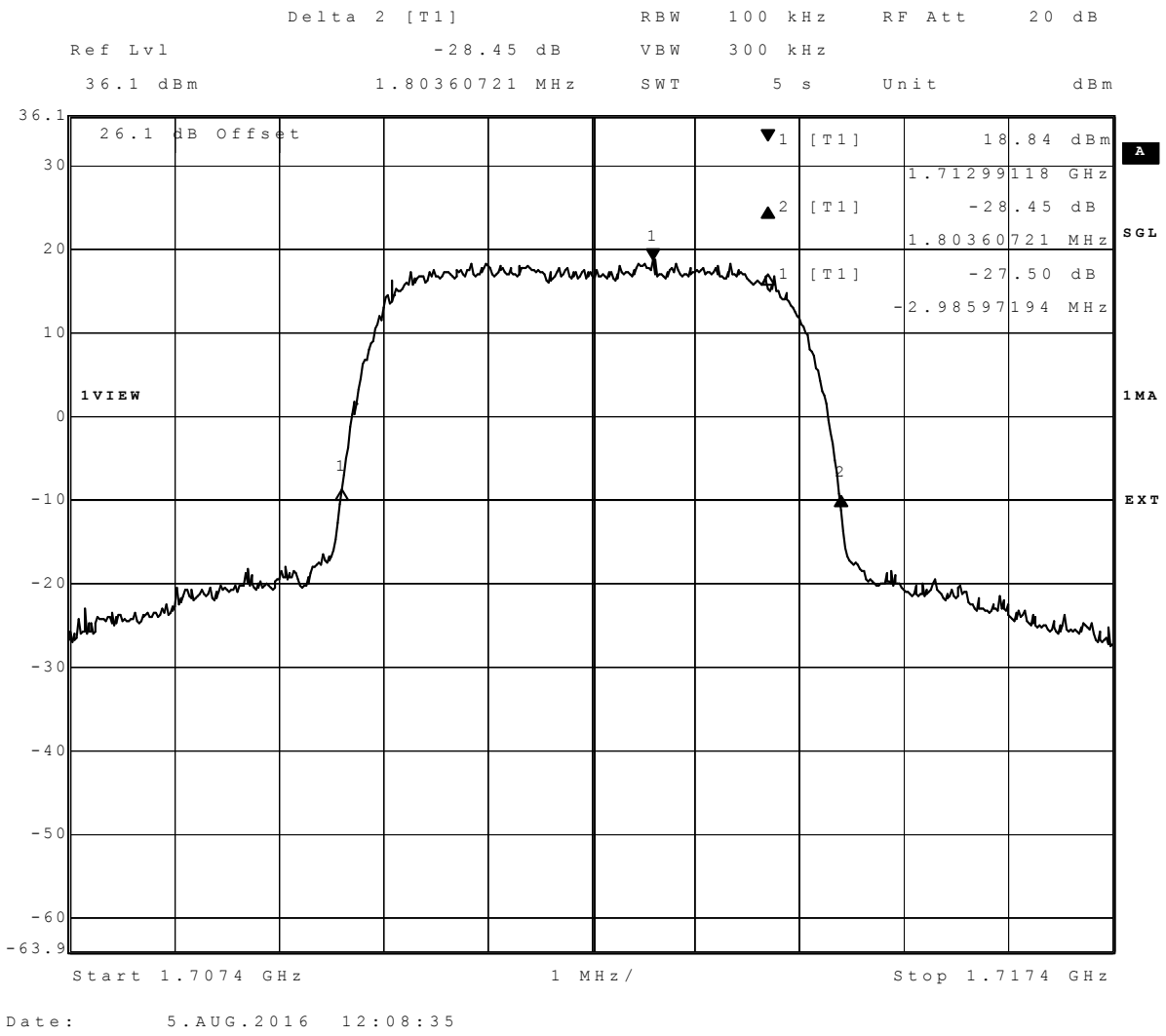


eFDD 12 low channel 10 MHz 16QAM 99 % BW

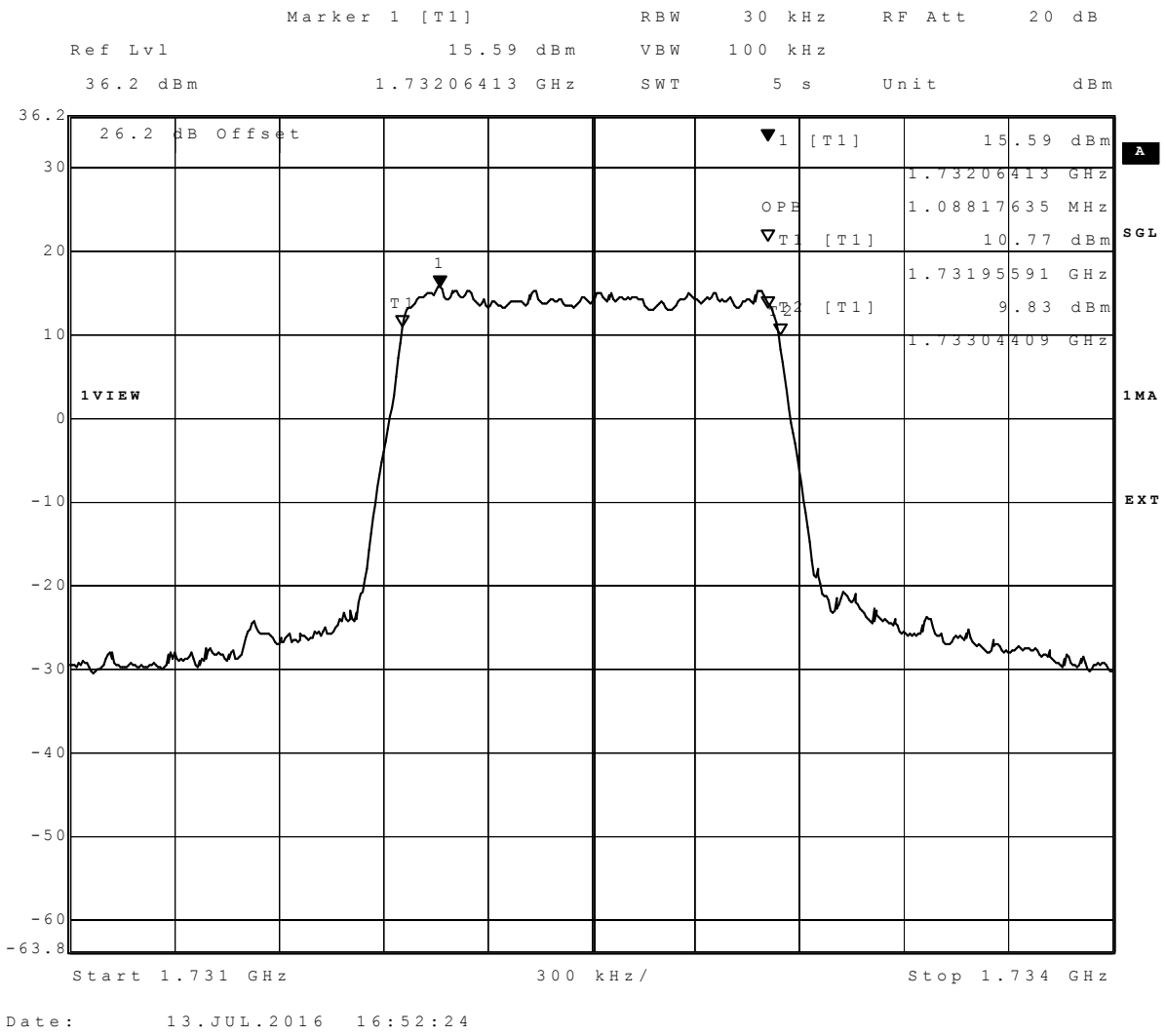
Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	26 dB BW [kHz]	99 % BW [kHz]
eFDD 4 QPSK	low	75	15	-	13587.2
eFDD 4 QPSK	mid	75	15	-	13466.9
eFDD 4 QPSK	high	75	15	-	13527.1
eFDD 4 16QAM	low	75	15	-	13527.1
eFDD 4 16QAM	mid	75	15	-	13587.2
eFDD 4 16QAM	high	75	15	-	**13587.2**
eFDD 4 QPSK	low	100	20	-	18116.2
eFDD 4 QPSK	mid	100	20	-	18116.2
eFDD 4 QPSK	high	100	20	-	18116.2
eFDD 4 16QAM	low	100	20	-	**18116.2**
eFDD 4 16QAM	mid	100	20	-	18036.1
eFDD 4 16QAM	high	100	20	-	18036.1
eFDD 12 QPSK	low	6	1.4	-	**1106.2**
eFDD 12 QPSK	mid	6	1.4	-	1100.2
eFDD 12 QPSK	high	6	1.4	-	1100.2
eFDD 12 16QAM	low	6	1.4	-	1100.2
eFDD 12 16QAM	mid	6	1.4	-	1100.2
eFDD 12 16QAM	high	6	1.4	-	1100.2
eFDD 12 QPSK	low	15	3	-	2765.5
eFDD 12 QPSK	mid	15	3	-	2753.5
eFDD 12 QPSK	high	15	3	-	2765.5
eFDD 12 16QAM	low	15	3	-	**2789.6**
eFDD 12 16QAM	mid	15	3	-	2753.5
eFDD 12 16QAM	high	15	3	-	2765.5
eFDD 12 QPSK	low	25	5	-	4549.1
eFDD 12 QPSK	mid	25	5	-	4529.1
eFDD 12 QPSK	high	25	5	-	4529.1
eFDD 12 16QAM	low	25	5	-	4529.1
eFDD 12 16QAM	mid	25	5	-	4529.1
eFDD 12 16QAM	high	25	5	-	**4569.1**
eFDD 12 QPSK	low	50	10	-	9058.1
eFDD 12 QPSK	mid	50	10	-	8977.9
eFDD 12 QPSK	high	50	10	-	9058.1
eFDD 12 16QAM	low	50	10	-	**9058.1**
eFDD 12 16QAM	mid	50	10	-	9018
eFDD 12 16QAM	high	50	10	-	9018



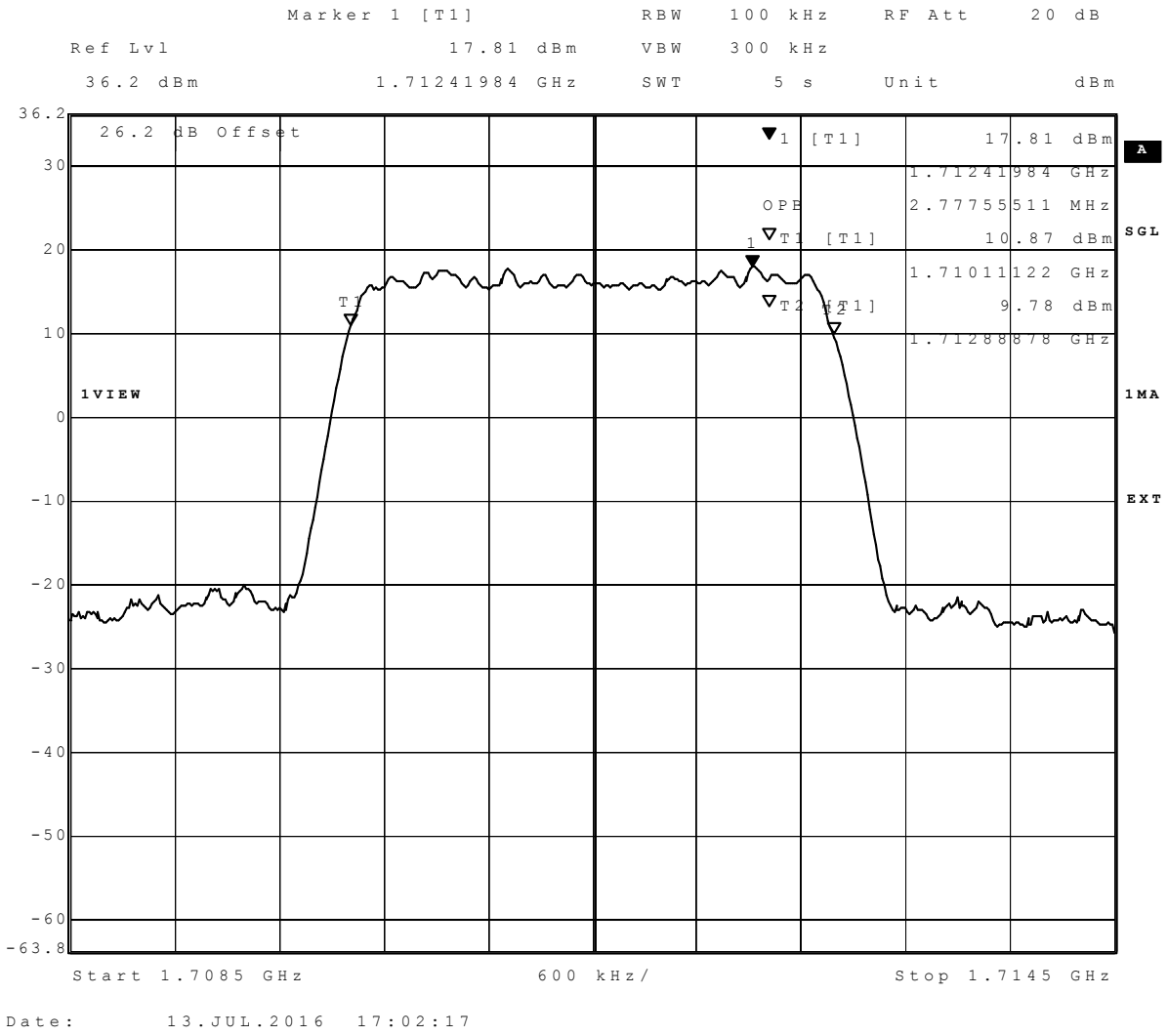
FDD IV HSUPA Subtest 5 low channel 99 % BW



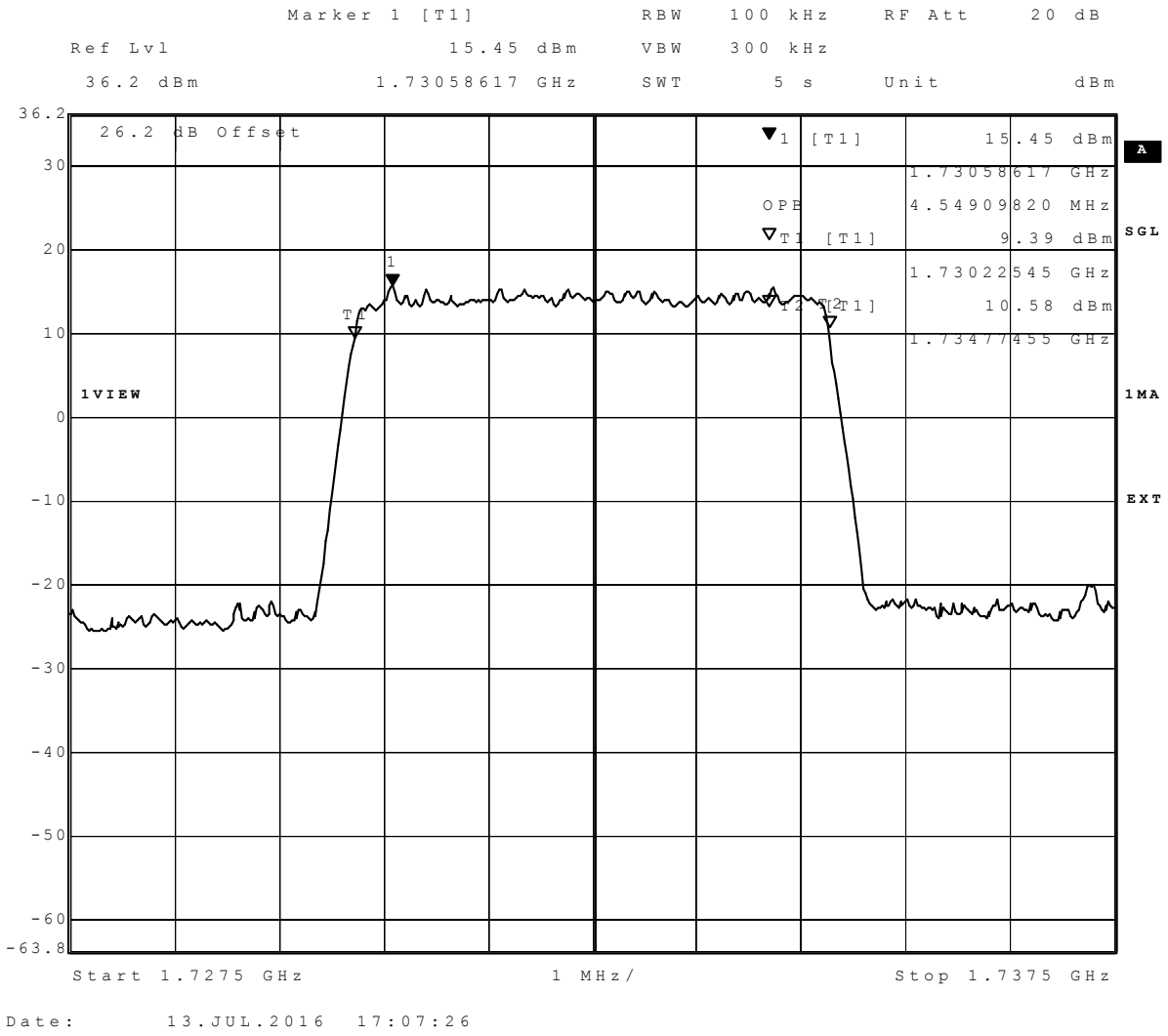
FDD IV HSUPA Subtest 5 low channel 26 dB BW



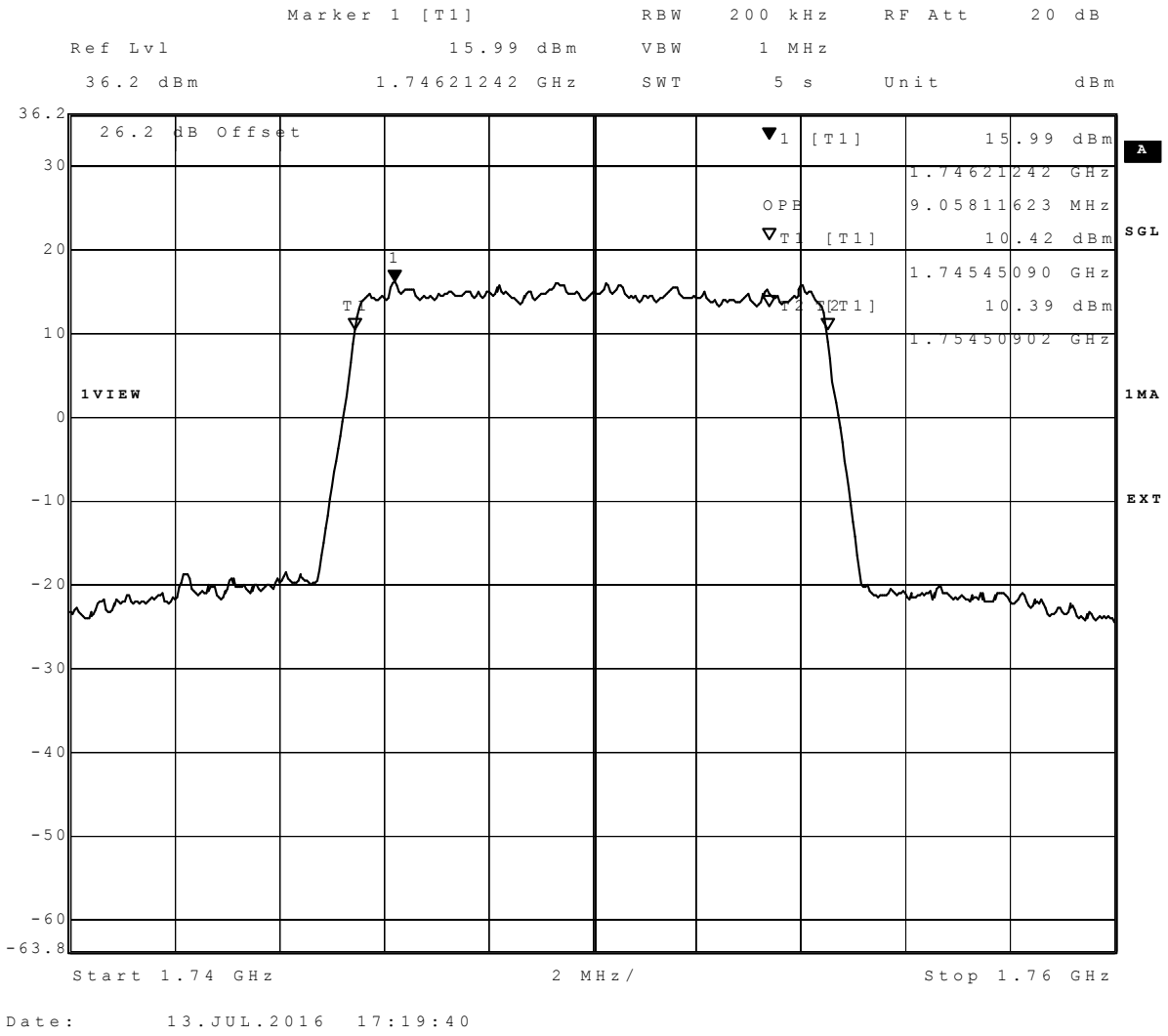
eFDD 4 mid channel 1.4 MHz 16QAM 99 % BW



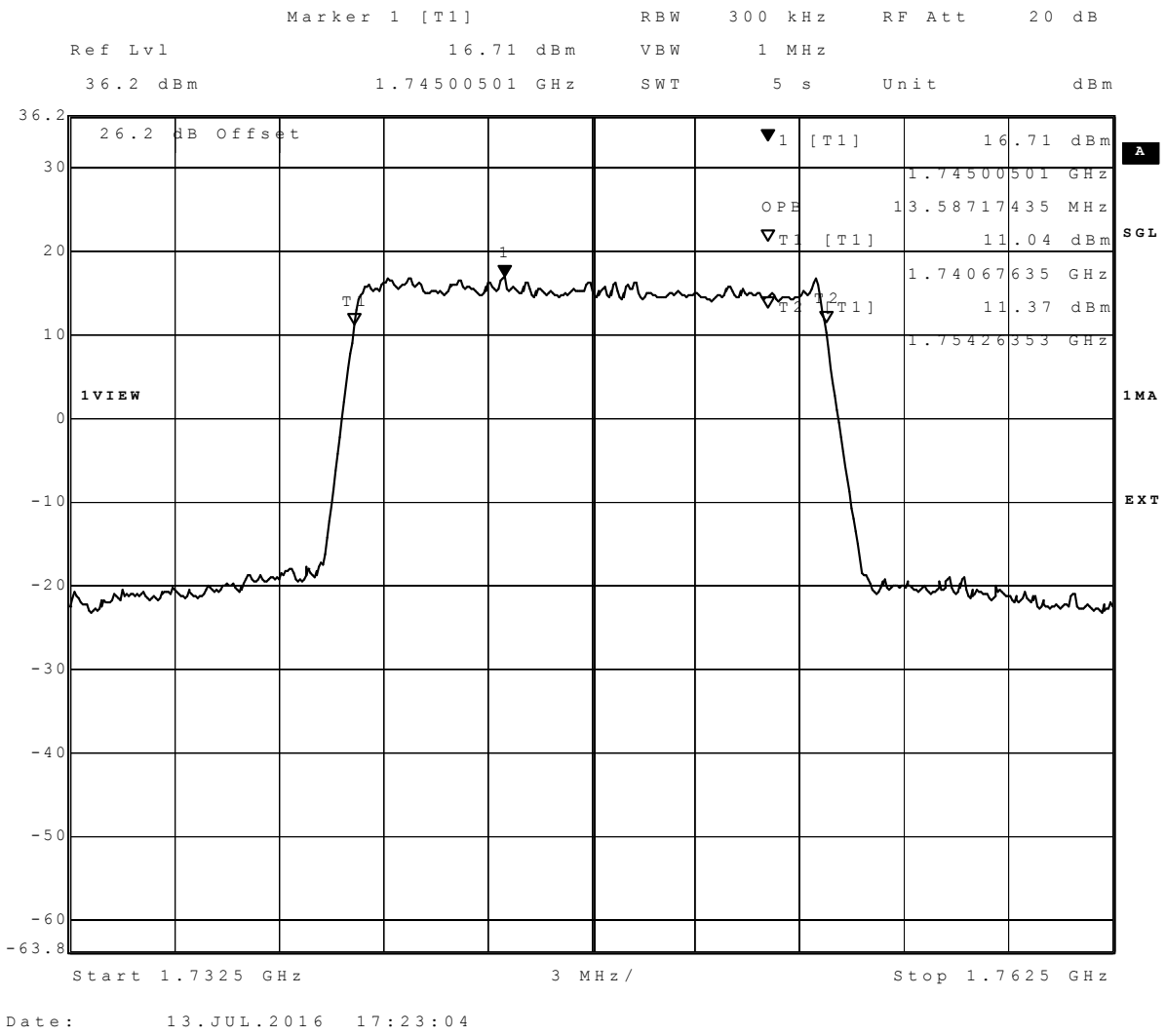
eFDD 4 low channel 3 MHz 16QAM 99 % BW



eFDD 4 mid channel 5 MHz 16QAM 99 % BW



eFDD 4 high channel 10 MHz 16QAM 99 % BW



eFDD 4 high channel 15 MHz 16QAM 99 % BW

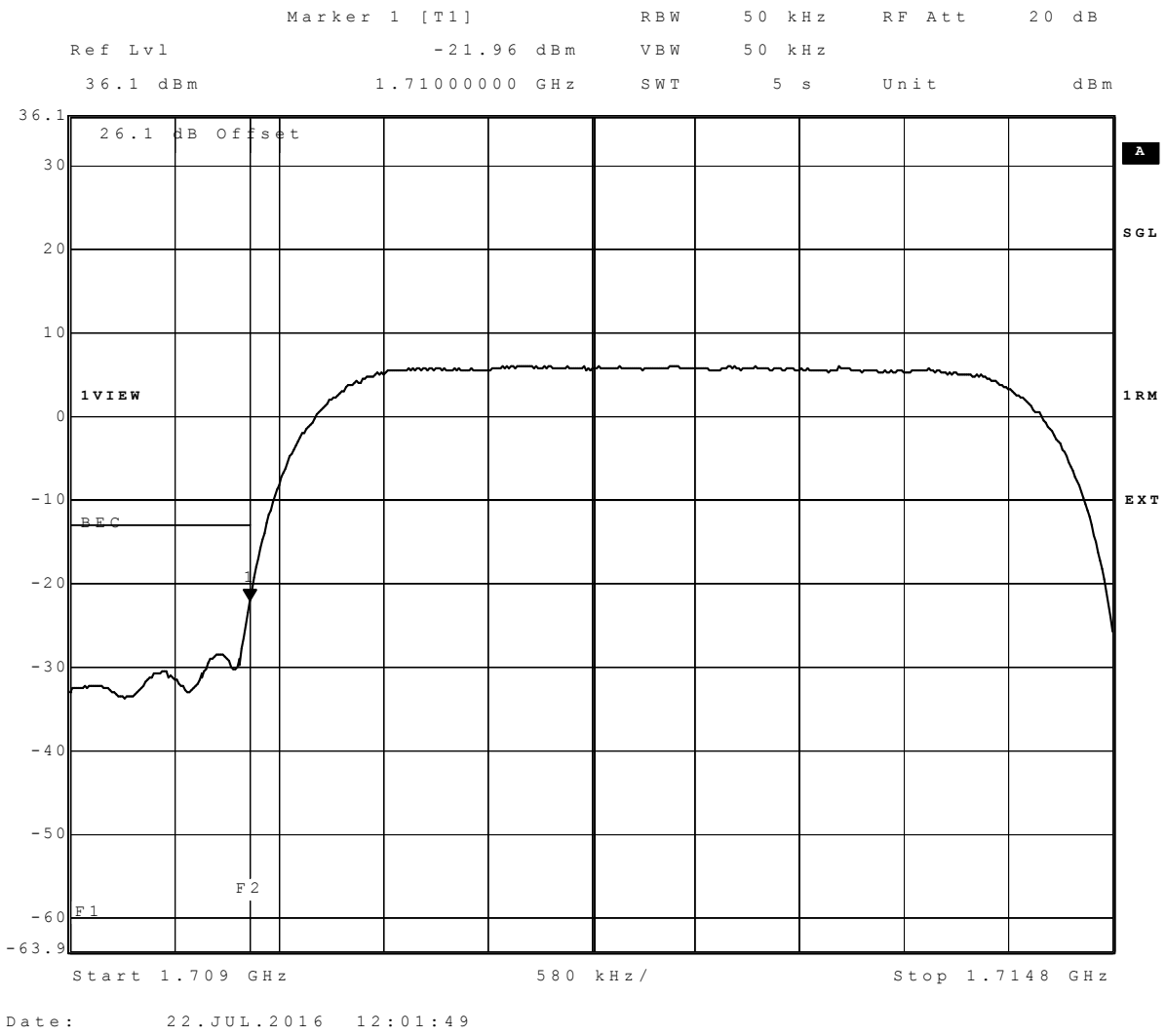
3.5.20 27.6 Band edge compliance §2.1053, §27.53

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

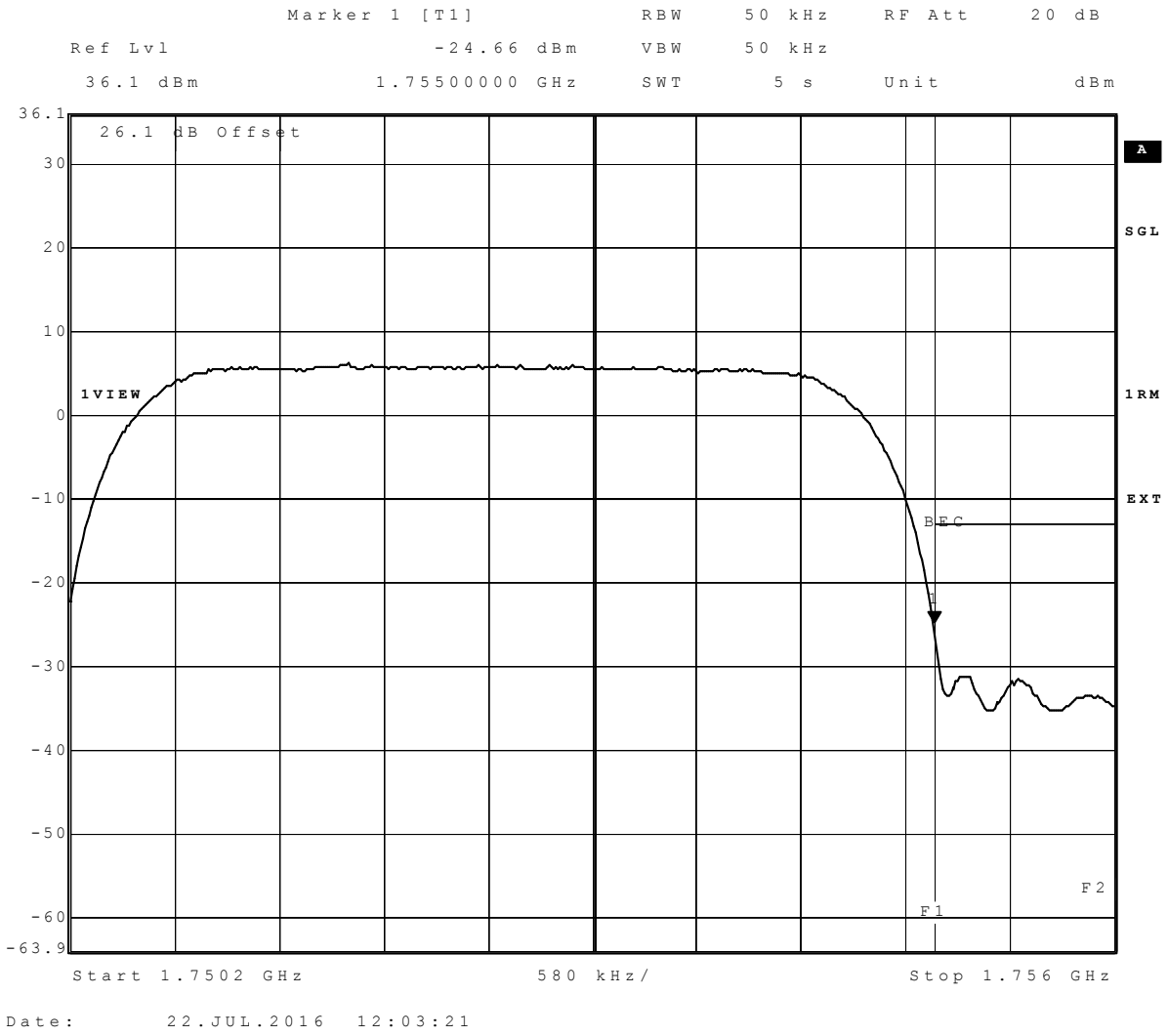
Result:	Passed
Setup No.:	S01_AB01
Date of Test:	2016/07/30 19:30
Body:	FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 27

Detailed Results:

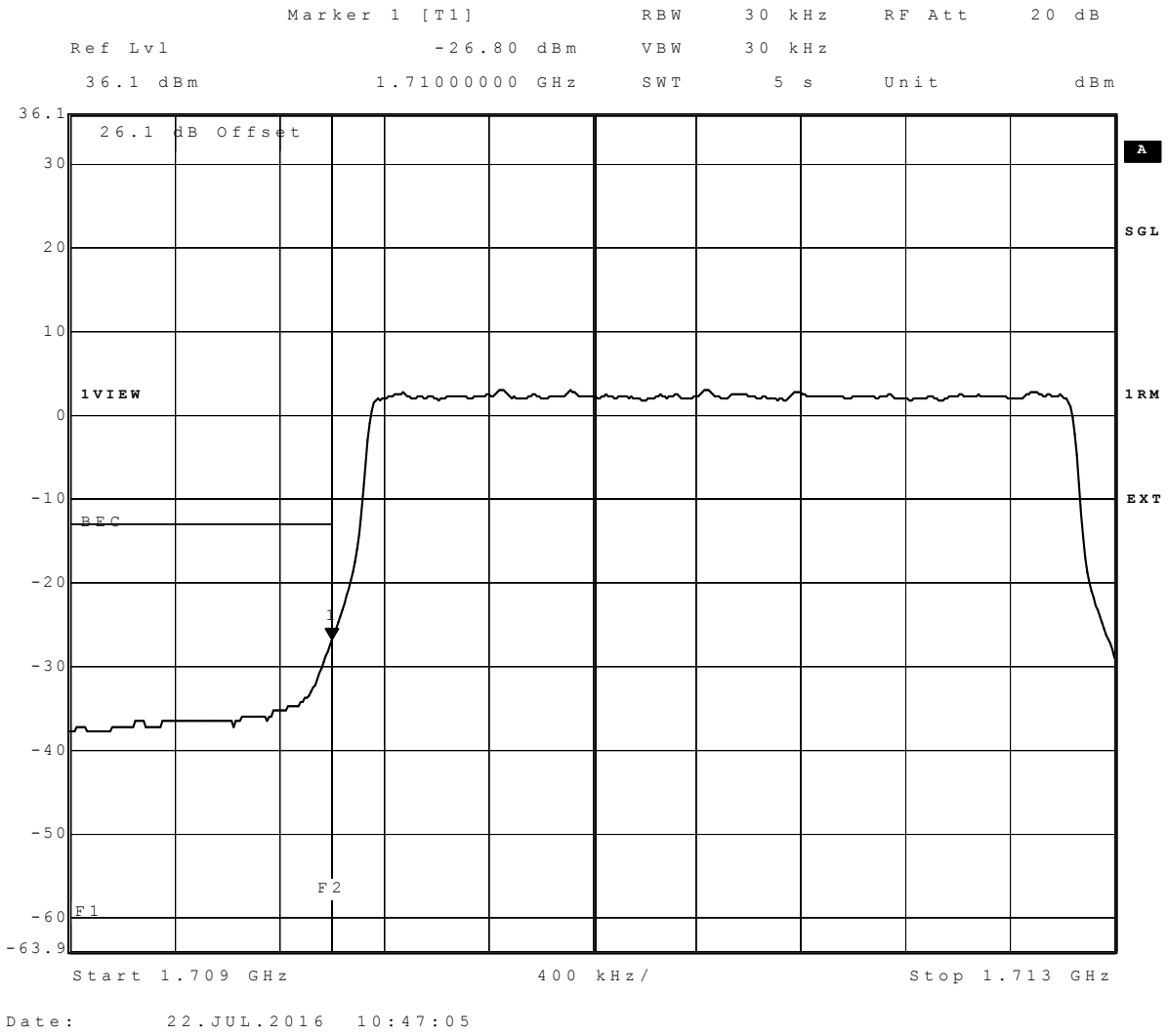
Radio Technology	Channel	Nominal BW	Ressource Blocks	Peak [dBm]	RMS [dBm]	Limit /dBm	Margin to Limit /dB
FDD IV	low	5	-	-14.67	**-21.96**	-13	8.96
FDD IV	high	5	-	-15.32	**-24.66**	-13	11.66
FDD IV HSDPA Subtest 1	low	5	-	-16.39	-23.21	-13	10.21
FDD IV HSDPA Subtest 1	high	5	-	-19.01	-27.64	-13	14.64
FDD IV HSUPA Subtest 1	low	5	-	-14.83	-22.94	-13	9.94
FDD IV HSUPA Subtest 1	high	5	-	-17.63	-26.6	-13	13.6
FDD IV HSUPA Subtest 5	low	5	-	-15.54	-23.48	-13	10.48
FDD IV HSUPA Subtest 5	high	5	-	-17.69	-26.02	-13	13.02
eFDD 4 QPSK	low	1.4	6	-26.5	-33.89	-13	20.89
eFDD 4 QPSK	high	1.4	6	-25.25	-33.44	-13	20.44
eFDD 4 16QAM	low	1.4	6	-25.32	-34.86	-13	21.86
eFDD 4 16QAM	high	1.4	6	-27.18	-34.86	-13	21.86
eFDD 4 QPSK	low	3	15	-16.13	**-26.8**	-13	13.8
eFDD 4 QPSK	high	3	15	-16.99	**-28.58**	-13	15.58
eFDD 4 16QAM	low	3	15	-17.89	-28.34	-13	15.34
eFDD 4 16QAM	high	3	15	-16.8	-28.58	-13	15.58
eFDD 4 QPSK	low	5	25	-17.98	-28.84	-13	15.84
eFDD 4 QPSK	high	5	25	-18.27	-31.17	-13	18.17
eFDD 4 16QAM	low	5	25	-13.35	-27.21	-13	14.21
eFDD 4 16QAM	high	5	25	-16.6	-29.36	-13	16.36
eFDD 4 QPSK	low	10	50	-17.35	-29.64	-13	16.64
eFDD 4 QPSK	high	10	50	-20.29	-31.51	-13	18.51
eFDD 4 16QAM	low	10	50	-19.94	-31.86	-13	18.86
eFDD 4 16QAM	high	10	50	-21.17	-32.62	-13	19.62
eFDD 4 QPSK	low	15	75	-16.32	-27.87	-13	14.87
eFDD 4 QPSK	high	15	75	-17.4	-28.84	-13	15.84
eFDD 4 16QAM	low	15	75	-18.62	-29.92	-13	16.92
eFDD 4 16QAM	high	15	75	-18.75	-30.52	-13	17.52
eFDD 4 QPSK	low	20	100	-19.42	-30.52	-13	17.52
eFDD 4 QPSK	high	20	100	-18	-30.22	-13	17.22
eFDD 4 16QAM	low	20	100	-20.67	-31.86	-13	18.86
eFDD 4 16QAM	high	20	100	-19.71	-31.51	-13	18.51
eFDD 12 QPSK	low	1.4	6	-19	-27.3	-13	14.3
eFDD 12 QPSK	high	1.4	6	-18.22	-27.5	-13	14.5
eFDD 12 16QAM	low	1.4	6	-18.27	-28.14	-13	15.14
eFDD 12 16QAM	high	1.4	6	-17.92	-27.3	-13	14.3
eFDD 12 QPSK	low	3	15	-14.39	**-25.48**	-13	12.48
eFDD 12 QPSK	high	3	15	-14.29	-26.9	-13	13.9
eFDD 12 16QAM	low	3	15	-14.81	-27.1	-13	14.1
eFDD 12 16QAM	high	3	15	-16.02	**-26.71**	-13	13.71
eFDD 12 QPSK	low	5	25	-16.46	-27.92	-13	14.92
eFDD 12 QPSK	high	5	25	-17.43	-29.34	-13	16.34
eFDD 12 16QAM	low	5	25	-17.63	-28.14	-13	15.14
eFDD 12 16QAM	high	5	25	-18.77	-29.6	-13	16.6
eFDD 12 QPSK	low	10	50	-10.94	-26.71	-13	13.71
eFDD 12 QPSK	high	10	50	-11.73	-28.14	-13	15.14
eFDD 12 16QAM	low	10	50	-13.5	-27.3	-13	14.3
eFDD 12 16QAM	high	10	50	-14.54	-27.92	-13	14.92



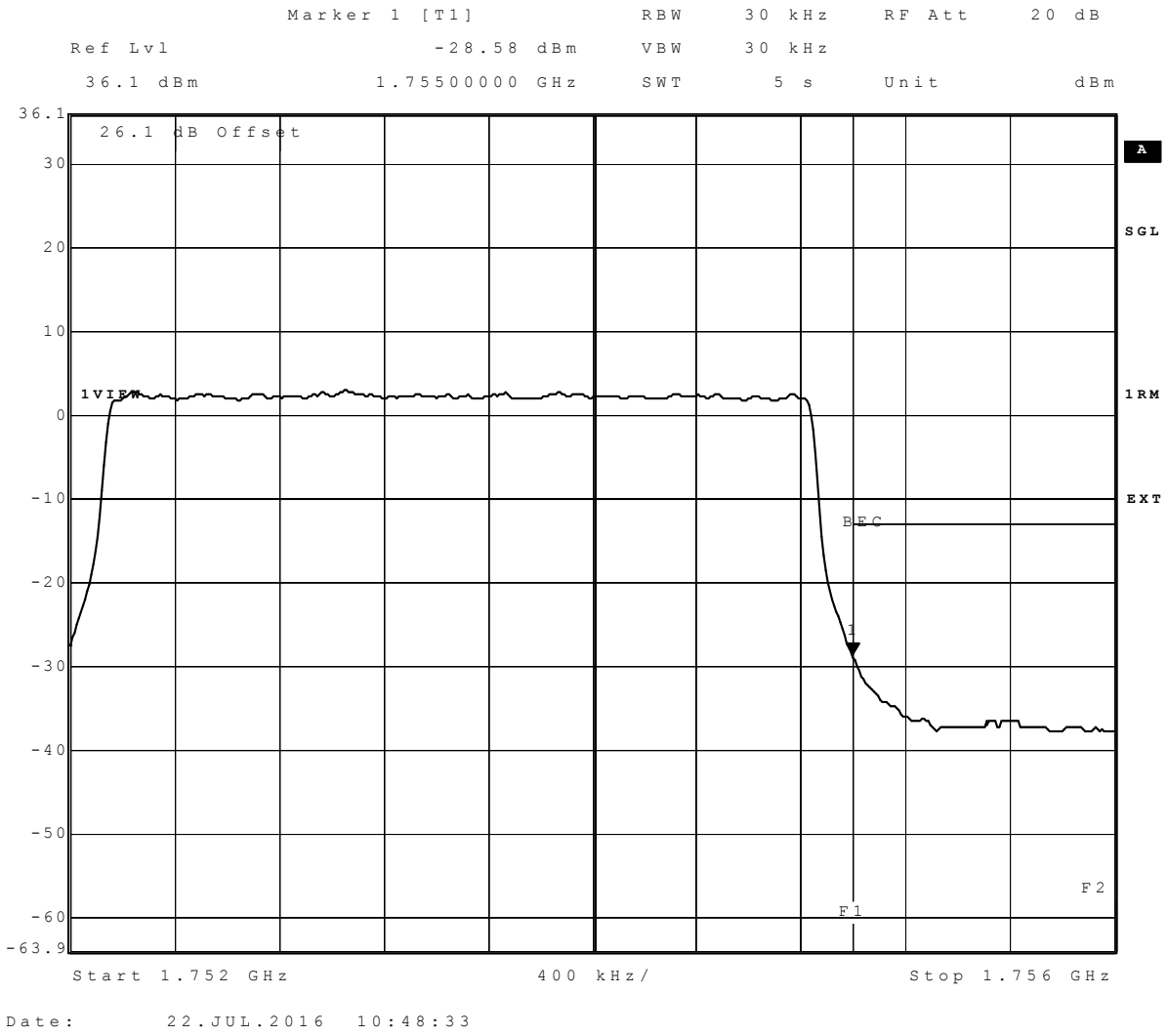
FDD IV low channel



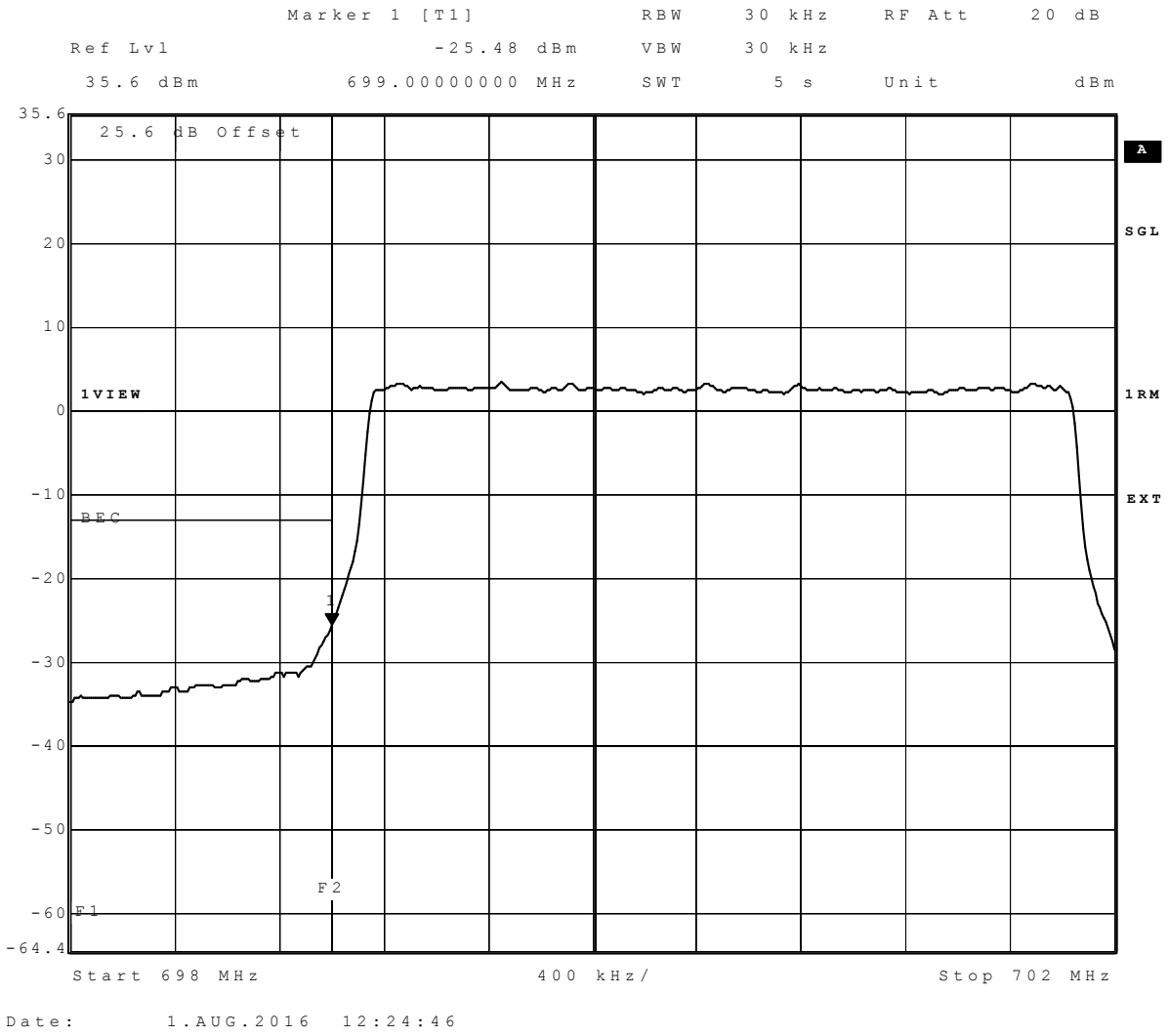
FDD IV high channel



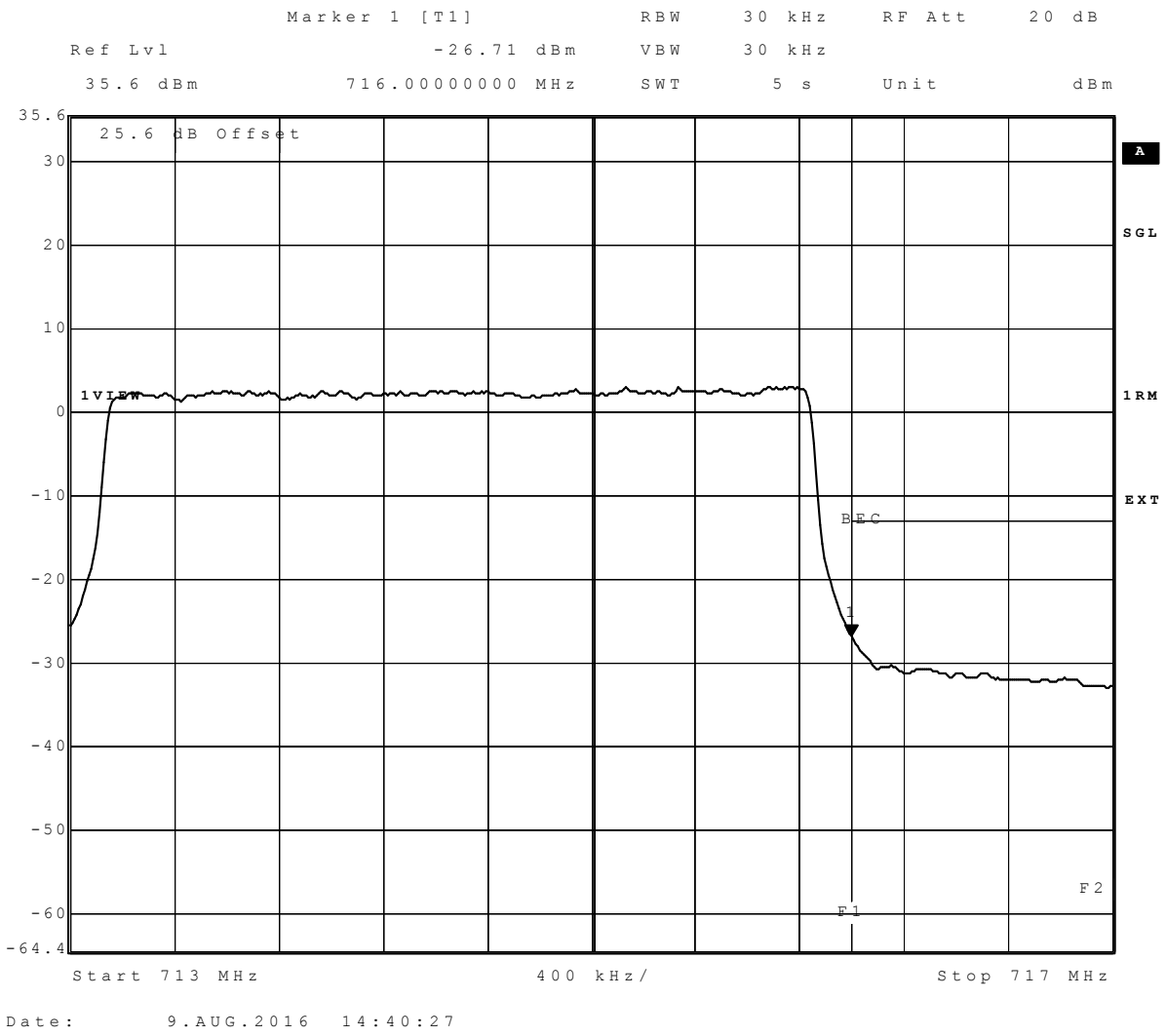
eFDD 4 low channel 3 MHz QPSK



eFDD 4 high channel 3 MHz QPSK



eFDD 12 low channel 3 MHz QPSK



eFDD 12 high channel 3 MHz 16QAM

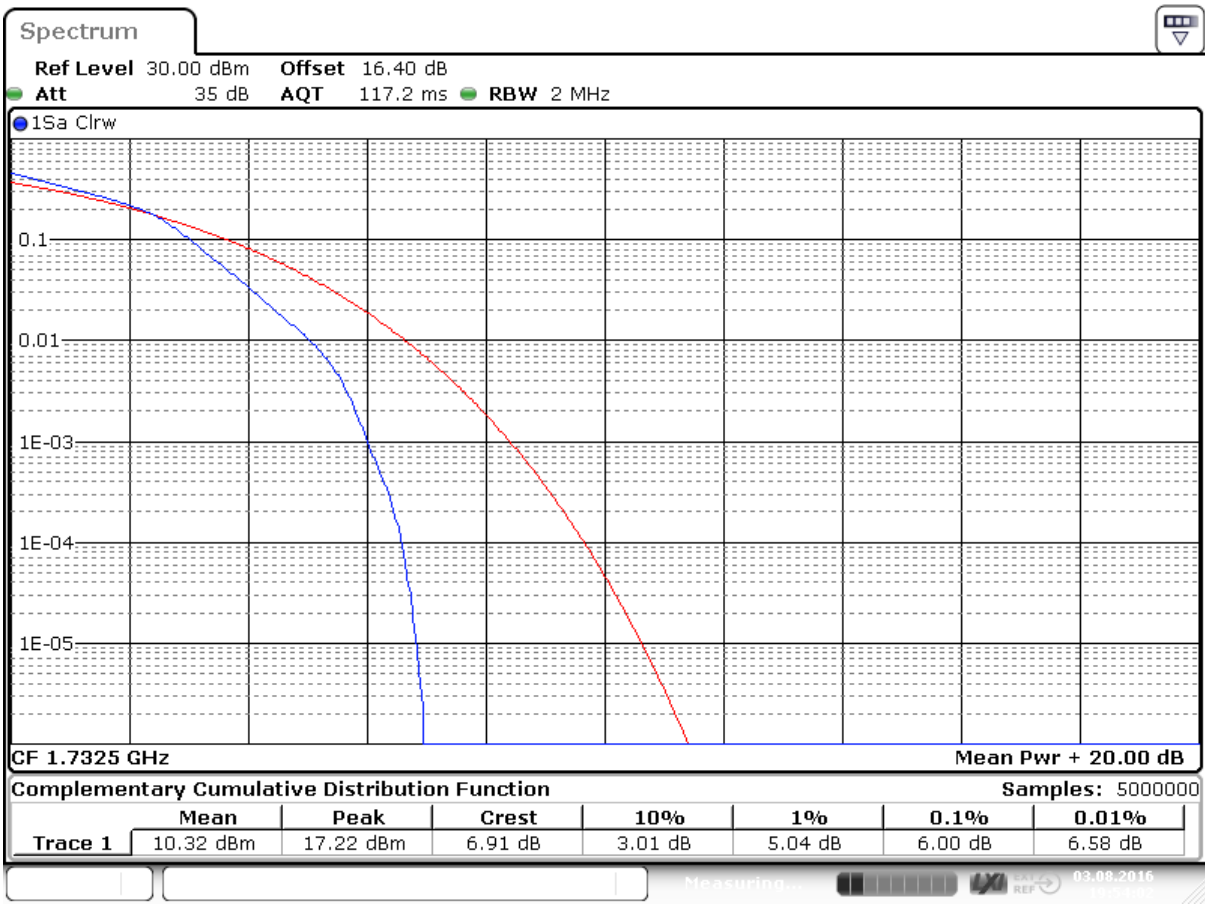
3.5.21 27.7 Peak-to-Average ratio §2.1046, §27.50

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

Result:	Passed
Setup No.:	S01_BB02
Date of Test:	2016/08/03 19:25
Body:	FCC47CFRChIPART27MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES
Test Specification:	FCC part 2 and 27

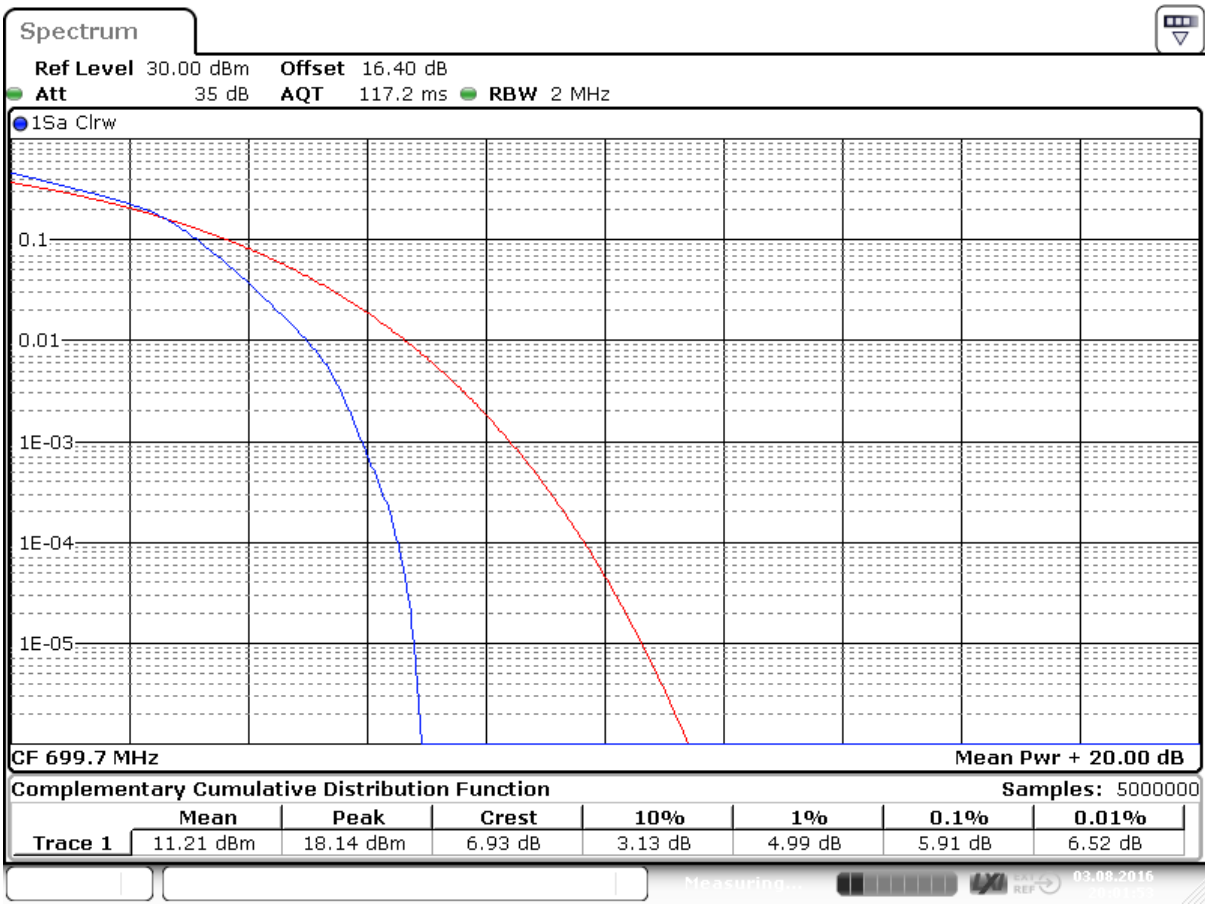
Detailed Results:

Radio Technology	Channel	Ressource Blocks	Bandwidth (MHz)	Peak to Average Ratio	Limit (IC) (dB)	
FDD IV	low	-	5	5.5	13	1)
FDD IV	mid	-	5	5.6	13	1)
FDD IV	high	-	5	5.3	13	1)
FDD IV HSDPA Subtest 1	low	-	5	6.11	13	1)
FDD IV HSDPA Subtest 1	mid	-	5	5.4	13	1)
FDD IV HSDPA Subtest 1	high	-	5	5.5	13	1)
FDD IV HSUPA Subtest 1	low	-	5	5.3	13	1)
FDD IV HSUPA Subtest 1	mid	-	5	5.4	13	1)
FDD IV HSUPA Subtest 1	high	-	5	6.8	13	1)
FDD IV HSUPA Subtest 5	low	-	5	6.7	13	1)
FDD IV HSUPA Subtest 5	mid	-	5	6.5	13	1)
FDD IV HSUPA Subtest 5	high	-	5	6.74	13	1)
eFDD 4 QPSK	low	6	1.4	5.07	13	
eFDD 4 QPSK	mid	6	1.4	5.16	13	
eFDD 4 QPSK	high	6	1.4	5.07	13	
eFDD 4 16QAM	low	6	1.4	5.97	13	
eFDD 4 16QAM	mid	6	1.4	6	13	
eFDD 4 16QAM	high	6	1.4	6	13	
eFDD 12 QPSK	low	6	1.4	5.16	13	
eFDD 12 QPSK	mid	6	1.4	4.99	13	
eFDD 12 QPSK	high	6	1.4	5.1	13	
eFDD 12 16QAM	low	6	1.4	5.91	13	
eFDD 12 16QAM	mid	6	1.4	5.88	13	
eFDD 12 16QAM	high	6	1.4	5.83	13	
1) Value calculated using the results of testcase Output Power						



Date: 3.AUG.2016 19:54:02

eFDD 4 16QAM mid channel



Date: 3.AUG.2016 20:01:53

eFDD 12 16QAM low channel

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 Details	*Last Execution*	*Next Exec.*
NSA (FCC)	2014/01/09	2017/01/09

Single Devices for Anechoic Chamber

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Air compressor	none	-	
Anechoic Chamber	10.58 x 6.38 x 6.00 m³	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	BB4312-C30-H3	-	

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	*Type*	*Serial Number*	*Manufacturer*
Antenna mast	AM 4.0	AM4.0/180/11920513	Maturo GmbH
Biconical Broadband Antenna	SBA 9119	9119-005	
Biconical dipole	VUBA 9117	9117-108	
Broadband Amplifier 1 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

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
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-duplicated 2015-07-15 10:47:55	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG	
High Pass Filter	4HC1600/12750-1.5-KK	9942011		
High Pass Filter	5HC2700/12750-1.5-KK	9942012		
High Pass Filter	5HC3500/18000-1.2-KK	200035008		
High Pass Filter	WHKX 7.0/18G-8SS	09		
Horn Antenna Schwarzbeck 15-26.5 GHz BBHA 9170	BBHA 9170	BBHA9170262		
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG	
Log.-per. 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
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD Calibration		2014/11/27	2017/11/27
Standard Gain / Pyramidal Horn Antenna 40 GHz	3160-10	00086675		
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5-10kg/024/3790709	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	*Type*	*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
Digital 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		
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018		
Isolating 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
Spectrum Analyser	FSU26	200418		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2015/10/20	2016/10/19
Spectrum Analyzer	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD calibration		2015/06/23	2018/06/22
Vector 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	*Type*	*Serial Number*	*Manufacturer*	
CMW500	CMW500	107500		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2015/07/13	2017/07/14
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG	
	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, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, Firmware: µP1 8v40 01.12.05 --- SW: K62, K69		2007/01/02 2008/11/03	
Vector Signal Generator	SMU200A	100912	Rohde & Schwarz GmbH & Co. KG	

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	*Type*	*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 & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2014/06/24	2017/06/23
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG	
	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 2**
Description:	Fluke 177
Serial Number:	86670383

Single Devices for Multimeter 03

Single Device Name	*Type*	*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	*Type*	*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	828110/016		
	Calibration Details		*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	827753/005		
	Calibration Details		*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 & Schwarz GmbH & Co. KG	
	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 2**
Description:	Lufft Opus10 TPR
Type:	Opus10 TPR
Serial Number:	13936

Single Devices for T/A Logger 13

Single Device Name	*Type*	*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 2**
Description:	Lufft Opus10
Serial Number:	7482

Single Devices for T/H Logger 03

Single Device Name	*Type*	*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 1**
Description:	Lufft Opus10
Serial Number:	12482

Single Devices for T/H Logger 12

Single Device Name	*Type*	*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	*Type*	*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/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-C-2004

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-C-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 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.

§ 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 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 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-C 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 dBµV/m (field strength) in a distance of 3 m.

(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

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°C to +50°C in increments of 10°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".

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/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 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-C-2004

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-C-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-C 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 dBµV/m (field strength) in a distance of 3 m.

(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB

below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

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°C to +50°C in increments of 10°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/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-C-2004

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-C-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 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.

§ 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 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 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-C 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 dBµV/m (field strength) in a distance of 3 m.

(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

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°C to +50°C in increments of 10°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".

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/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 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-C-2004

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-C-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-C 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 dBµV/m (field strength) in a distance of 3 m.

(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB

below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

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°C to +50°C in increments of 10°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 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 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-C-2004

Description of Methods of Measurements

RF Power Output

Standard FCC Part 27, Subpart C

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-C-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 10th 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 log10(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 reaching to the 20dB margin to limit were noted.

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-C 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 log10(P) dB.
Remark of the test laboratory: This is calculated to be -13 dBm (effective radiated power) which corresponds to 84.6 dBµV/m (field strength) in a distance of 3 m.
(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.
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°C to +50°C in increments of 10°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	βc	βd	βd (SF)	βc/βd	βHS (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

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

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, $?_{ACK}$ and $?_{NACK}$ = 30/15 with β_{hs} = 30/15 * β_c , and $?_{CQI}$ = 24/15 with β_{hs} = 24/15 * β_c .

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

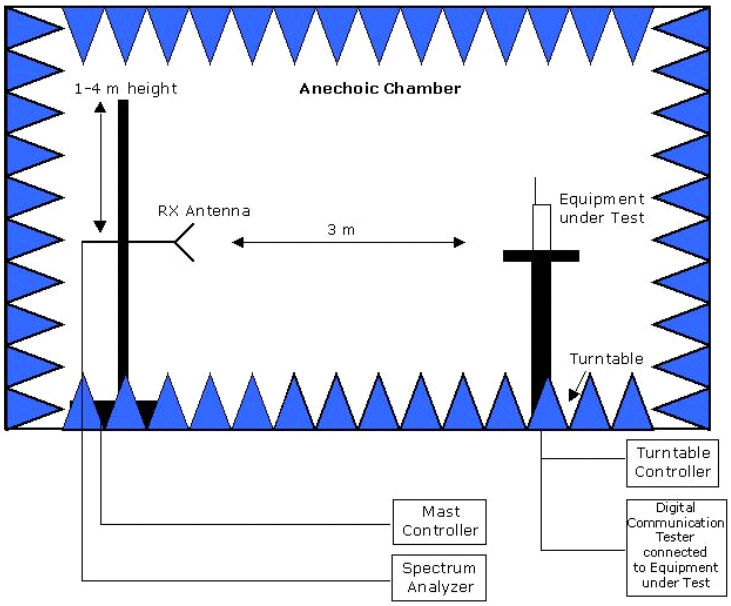
Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Subtests HSUPA

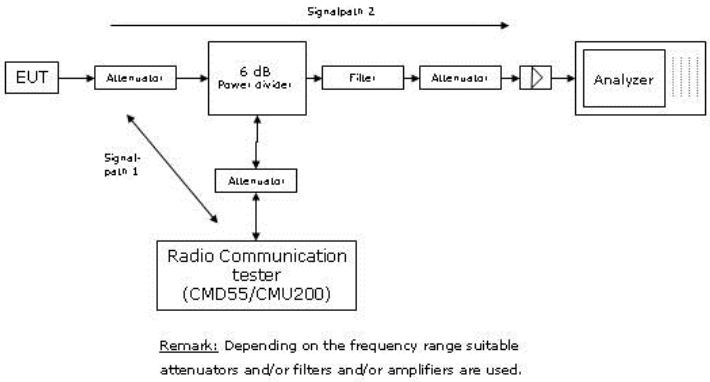
Subtest	Mode	Loopback Mode	Rel99 RMC	HSDPA FRC	HSUPA Test	Number of E-DPDCH Channels
1	Rel6 HSUPA	Test Mode 1	12.2kbps RMC	H-Set1	HSUPA Loopback	1
2	Rel6 HSUPA	Test Mode 1	12.2kbps RMC	H-Set1	HSUPA Loopback	1
3	Rel6 HSUPA	Test Mode 1	12.2kbps RMC	H-Set1	HSUPA Loopback	2
4	Rel6 HSUPA	Test Mode 1	12.2kbps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

Subtest	Max UL Data Rate (kb/s)	βc/βd	βhs	βed	CM
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

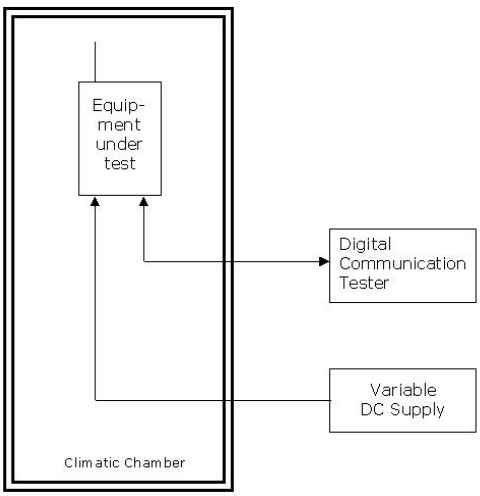
Setup Drawings



Principle set-up for radiated measurements



Principle set-up for conducted measurements under nominal conditions



Principle set-up for tests under extreme test conditions

Correlation Channels and Frequencies FCC 22

TEST MODE	TX / RX	RF Channel		
		Low	Mid	High
GSM 850 + GPRS + EDGE	TX	CH 128	CH 190	CH 251
		824.2 MHz	836.6 MHz	848.8 MHz
FDD V + HSDPA + HSUPA	TX	CH 4132	CH 4183	CH 4233
		826.4 MHz	836.6 MHz	846.6 MHz
LTE eFDD 5	TX (1.4M)	CH 20407	CH 20525	CH 20643
		824.7	836.5	848.3
	TX (3M)	CH 20415	CH 20525	CH 20635
		825.50 MHz	836.50 MHz	847.50 MHz
	TX (5M)	CH 20425	CH 20525	CH 20625
		826.50 MHz	836.50 MHz	846.50 MHz
	TX (10)	CH 20450	CH 20525	CH 20600
		829.00 MHz	836.50 MHz	844.00 MHz

Correlation Channels and Frequencies FCC 24

TEST MODE	TX	RF Channel		
		Low	Mid	High
GSM 1900 + GPRS + EDGE	TX	CH 512	CH 661	CH 810
		1850.2 MHz	1880 MHz	1909.8 MHz
FDD II + HSDPA + HSUPA	TX	CH 9262	CH 9400	CH 9538
		1852.4 MHz	1880 MHz	1907.6 MHz
LTE eFDD 2	TX (1.4M)	CH 18607	CH 18900	CH 19193
		1850.7 MHz	1880 MHz	1909.3 MHz
	TX (3M)	CH 18615	CH 18900	CH 19185
		1851.5 MHz	1880 MHz	1908.5 MHz
	TX (5M)	CH 18625	CH 18900	CH 19175
		1852.5 MHz	1880 MHz	1907.5 MHz
	TX (10)	CH 18650	CH 18900	CH 19150
		1855 MHz	1880 MHz	1905 MHz
	TX (15M)	CH 18675	CH 18900	CH 19125
		1857.5 MHz	1880 MHz	1902.5 MHz
	TX (20M)	CH 18700	CH 18900	CH 19100
		1860 MHz	1880 MHz	1900 MHz

Correlation Channels and Frequencies FCC 27

TEST MODE	TX / RX	RF Channel			
		Low	Mid1	Mid2	High
FDD IV + HSDPA + HSUPA	TX	CH 1312	CH 1412	CH 1450	CH 1513
		1712.4 MHz	1732.4 MHz	1740 MHz	1752.6 MHz
		Low	Mid		High
LTE eFDD 4	TX (1.4M)	CH 19957	CH 20175		CH 20393
		1710.7 MHz	1732.5 MHz		1754.3 MHz
	TX (3M)	CH 19965	CH 20175		CH 20385
		1711.50 MHz	1732.50 MHz		1753.50 MHz
	TX (5M)	CH 19975	CH 20175		CH 20375
		1712.50 MHz	1732.50 MHz		1752.50 MHz
	TX (10)	CH 20000	CH 20175		CH 20350
		1715.00 MHz	1732.50 MHz		1750.00 MHz
	TX (15M)	CH 20025	CH 20175		CH 20325
		1717.50 MHz	1732.50 MHz		1747.50 MHz
	TX (20M)	CH 20050	CH 20175		CH 20300
		1720.00 MHz	1732.50 MHz		1745.00 MHz
LTE eFDD 12	TX (1.4M)	CH 23017	CH 23095		CH 23173
		699.7 MHz	707.5 MHz		715.3 MHz
	TX (3M)	CH 23025	CH 23095		CH 23165
		700.50 MHz	707.5 MHz		714.50 MHz
	TX (5M)	CH 23035	CH 23095		CH 23155
		701.50 MHz	707.5 MHz		713.50 MHz
	TX (10)	CH 23060	CH 23095		CH 23130
		704.00 MHz	707.5 MHz		711.00 MHz

Correlation of measurement requirements for Cellular Equipment from FCC and IC

FCC Rule / IC Standard	Part 22 /	RSS-132	Part 24 /	RSS-133	Part 27 /	RSS-139 /	RSS-130
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

*) Receivers which are part of Transceivers are exempted with respect to Notice 2012-DRS0126.

6 Index

1 Administrative Data 2

1.1 Project Data 2

1.2 Applicant Data 2

1.3 Test Laboratory Data 2

1.4 Signature of the Testing Responsible 3

1.5 Signature of the Accreditation Responsible 3

2 Test Object Data 3

2.1 General OUT Description 3

2.2 Detailed Description of OUT Samples 4

2.3 OUT Features 5

2.4 Setups used for Testing 6

3 Results 6

3.1 General 6

3.2 List of the Applicable Body 7

3.3 List of Test Specification 7

3.4 Summary 8

3.5 Detailed Results 10

3.5.1 22.1 RF Power Output §2.1046, §22.913 10

3.5.2 22.2 Frequency stability §2.1055 19

3.5.3 22.3 Spurious emissions at antenna terminals §2.1051, §22.917 22

3.5.4 22.4 Field strength of spurious radiation §2.1053, §22.917 25

3.5.5 22.5 Emission and Occupied Bandwidth §2.1049, §22.917 39

3.5.6 22.6 Band edge compliance §2.1053, §22.917 49

3.5.7 22.7 Peak-to-Average Ratio Summary §2.1046 57

3.5.8 24.1 RF Power Output §2.1046, §24.232 60

3.5.9 24.2 Frequency stability §2.1055, §24.235 71

3.5.10 24.3 Spurious emissions at antenna terminals §2.1051, §24.238 74

3.5.11 24.4 Field strength of spurious radiation §2.1053, §24.238 77

3.5.12 24.5 Emission and Occupied Bandwidth §2.1049, §24.238 96

3.5.13 24.6 Band edge compliance §2.1053, §24.238 109

3.5.14 24.7 Peak-to-Average ratio §2.1046, §24.232 117

3.5.15 27.1 RF Power Output §2.1046, §27.250 120

3.5.16 27.2 Frequency stability §2.1055, §27.54 137

3.5.17 27.3 Spurious emissions at antenna terminals §2.1051, §27.53 141

3.5.18 27.4 Field strength of spurious radiation §2.1053, §27.53 144

3.5.19 27.5 Emission and Occupied Bandwidth §2.1049 157

3.5.20 27.6 Band edge compliance §2.1053, §27.53 172

3.5.21 27.7 Peak-to-Average ratio §2.1046, §27.50 180

4 Test Equipment Details 184

4.1 List of Used Test Equipment 184

5 Annex 191

5.1 Additional Information for Report 191

6 Index 230