FCC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E

WWAN

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n and NFC

MODEL NUMBER : SM-G390Y

FCC ID: A3LSMG390Y

REPORT NUMBER: 4787873630-E6V1

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Prepared for
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ACCREDITED
TL-637

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5
1.1. INTRODUCTION OF TEST DATA REUSE 6
1.2. DIFFERENCE 6
1.3. SPOT CHECK VERIFICATION DATA 6
1.4. REFERENCE DETAIL 7
2. TEST METHODOLOGY 8
3. FACILITIES AND ACCREDITATION 8
4. CALIBRATION AND UNCERTAINTY 8
4.1. MEASURING INSTRUMENT CALIBRATION 8
4.2. SAMPLE CALCULATION 8
4.3. MEASUREMENT UNCERTAINTY 8
5. EQUIPMENT UNDER TEST 9
5.1. DESCRIPTION OF EUT 9
5.2. MAXIMUM OUTPUT POWER (GSM) 9
5.3. MAXIMUM OUTPUT POWER (WCDMA) 10
5.4. MAXIMUM OUTPUT POWER (LTE) 10
5.5. DESCRIPTION OF AVAILABLE ANTENNAS 11
5.6. DESCRIPTION OF TEST SETUP 12
6. TEST AND MEASUREMENT EQUIPMENT 14
7. Summary Table 15
8. RF POWER OUTPUT VERIFICATION 16
8.1. GSM/GPRS/EDGE 16
8.1.1. GSM OUTPUT POWER RESULT 17
8.2. UMTS REL 99 19
8.2.1. WCDMA OUTPUT POWER RESULT 23
8.3. LTE OUTPUT VERIFICATION 25
8.3.1. LTE OUTPUT POWER RESULT 26
9. PEAK TO AVERAGE RATIO 27
9.1. CONDUCTED PEAK TO AVERAGE RESULT 27
9.2. CONDUCTED PEAK TO AVERAGE PLOTS 29
10. LIMITS AND CONDUCTED RESULTS 32

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10.1. OCCUPIED BANDWIDTH 32
10.1.1. OCCUPIED BANDWIDTH RESULTS 32
10.1.2. OCCUPIED BANDWIDTH PLOTS 35
10.2. BAND EDGE EMISSIONS 43
GSM 43
WCDMA/LTE 43
10.2.1. BAND EDGE PLOTS 46
10.3 OUT OF BAND EMISSIONS 52
10.3.1. OUT OF BAND EMISSIONS PLOTS 55
10.4. FREQUENCY STABILITY 63
10.4.1. FREQUENCY STABILITY RESULTS 64
11. RADIATED TEST RESULTS 69
11.1. RADIATED POWER (ERP & EIRP) 69
11.1.1. ERP/EIRP Results 70
11.1.2. ERP/EIRP DATA 72
11.2. FIELD STRENGTH OF SPURIOUS RADIATION 80
11.2.1. SPURIOUS RADIATION PLOTS 81
12. SETUP PHOTOS 89

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n and NFC

MODEL NUMBER: SM-G390Y

SERIAL NUMBER: R38HC02374V (RADIATED, Original model);
R38HC02391M (CONDUCTED, Original model)
R38J10TN4JF(RADIATED, A3LSMG390Y)

DATE TESTED: JAN 18, 2017 – JAN 25, 2017 (Original Test)
MAR 02, 2017 – MAR 03, 2017 (A3LSMG390Y)

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 22H and 24E	Pass

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

SungGil Park
Suwon Lab Engineer
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Tested By:

Junwhan Lee
Suwon Lab Engineer
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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMG390F, PCE WWAN(FCC CFR 47 Part 22H, 24E). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMG390Y shares the same enclosure and circuit board as FCC ID: A3LSMTG390F. The GSM/WCDMA/LTE circuitry and layout are identical between these two units. The GSM/WCDMA/LTE antennas and surrounding circuitry are the same between these two units. The only differences between the A3LSMG390F and the A3LSMF390Y are that LTE B28 added and LTE B20 is deleted. PED document described the differences in detail.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMG390F remains representative of FCC ID: A3LSMG390Y. The test data of FCC ID: A3LSMG390F being submitted for this application to cover GSM/WCDMA/LTE features.

1.3. SPOT CHECK VERIFICATION DATA

Band	Test Item	Worst Mode	Frequency	Test Limit	Original model	Spot check model	Deviation
					SM-G390F Results	SM-G390Y Results	
					FCC ID : A3LSMG390F	FCC ID : A3LSMG390Y	
GSM850	ERP	GPRS	848.8 MHz	38.45 dBm	28.58 dBm	28.58 dBm	0.00 dBc
	RSE	GPRS	2.4726 GHz	-13dBm	-30.6 dBm	-31.6 dBm	-1.00 dBc
GSM1900	EIRP	GPRS	1850.2 MHz	33 dBm	29.63 dBm	29.35 dBm	-0.28 dBc
	RSE	GPRS	5.55 GHz	-13dBm	-47.7 dBm	-47.6 dBm	0.10 dBc
WCDMA Band 5	ERP	HSDPA	826.4 MHz	38.45 dBm	20.29 dBm	20.04 dBm	-0.25 dBc
	RSE	Rel. 99	1.6732 GHz	-13dBm	-44.4 dBm	-50.4 dBm	-6.00 dBc
WCDMA Band 2	EIRP	HSDPA	1.88 GHz	33 dBm	23.38 dBm	22.46 dBm	-0.92 dBc
	RSE	Rel. 99	3.8152 GHz	-13dBm	-51.6 dBm	-51.8 dBm	-0.2 dBc
LTE Band 5	ERP	5M BW QPSK	826.5 MHz	38.45 dBm	18.04 dBm	17.49 dBm	-0.55 dBc
	RSE	10M BW QPSK	1.658 GHz	-13dBm	-36 dBm	-38.4 dBm	-2.4 dBc

Comparison of two models, higher deviation is within 3dB range and all test results are under FCC Technical Limits.

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1.4. REFERENCE DETAIL

Reference application that contains the reused reference data.

Equipment Class	Reference FCC ID	Type Grant/Permissive Change	Reference Application	Folder Test/RF Exposure	Report Tittle / Section
DTS	A3LSMG390F	Grant	4787833362-E2V1	Test	FCC Report BLE All sections (Except Section 10.3, 11)
DSS	A3LSMG390F	Grant	4787833362-E3V1	Test	FCC Report BT / All sections (Except Section 10.3, 11)
			4787833362-S1V2	RF Exposure	FCC Report SAR / Section 9.6, 10.8
DXX	A3LSMG390F	Grant	4787833362-E5V2	Test	FCC Report NFC / All sections (Except Section 8.1.2, 9)
PCE	A3LSMG390F	Grant	4787833362-E6V1	Test	FCC Report WWAN / All sections
			4787833362-S1V2	RF Exposure	FCC Report SAR / Section for GSM 850 (9.1, 10.1), GSM 1900 (9.1, 10.2), WCDMA B2 (9.2, 10.3), WCDMA B5 (9.2, 10.4), LTE B2 (9.3, 10.5),

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 22.
3. FCC CFR 47 Part 24.
4. ANSI TIA-603-D

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
☐ Chamber 1
☒ Chamber 2

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4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

EIRP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss(between the SG and substitution antenna) + Substitution Antenna Factor (dBi)

ERP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss(between the SG and substitution antenna)

(Path loss = Signal generator output – PSA reading with substitution antenna)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, Below 1GHz	4.14 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

Uncertainty figures are valid to a confidence level of 95%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n and NFC.

5.2. MAXIMUM OUTPUT POWER (GSM)

The transmitter has a maximum peak conducted and radiated ERP / EIRP output powers as follows:

FCC Part 22/24						
Band	Frequency Range	Modulation	Conducted		Radiated	
	[MHz]	Peak	Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
GSM850	824~849	GMSK	31.63	1455.46		
		GPRS	31.66	1465.55	28.58	721.11
		EGPRS	26.58	454.99	24.36	272.90
GSM1900	1850~1910	GMSK	28.55	716.14		
		GPRS	28.61	726.11	29.63	918.33
		EGPRS	25.00	316.23	26.78	476.43

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5.3. MAXIMUM OUTPUT POWER (WCDMA)

The transmitter has a maximum peak conducted and radiated ERP / EIRP output powers as follows:

FCC Part 22/24						
Band	Frequency Range	Modulation	Conducted		Radiated	
	[MHz]	Peak	Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824~849	REL99	23.22	209.89	19.75	94.41
		HSDPA	22.12	162.93	20.29	106.91
		HSUPA	23.18	207.97		
Band 2	1850~1910	REL99	22.04	159.96	23.38	217.77
		HSDPA	21.98	157.76	23.13	205.59
		HSUPA	22.00	158.49		

5.4. MAXIMUM OUTPUT POWER (LTE)

The transmitter has a maximum peak conducted and radiated ERP / EIRP output powers as follows:

LTE Band 5

FCC Part 22							
Band	Frequency Range	BandWidth	Modulation	Conducted		Radiated	
	[MHz]	[MHz]	Peak	Avg [dBm]	Avg [mW]	Avg [dBm]	Avg [mW]
Band 5	824 ~ 849	10	QPSK	23.08	203.24	17.14	51.76
			16QAM	21.68	147.23	16.18	41.50
		5	QPSK	23.13	205.59	18.04	63.68
			16QAM	21.39	137.72	17.04	50.58
		3	QPSK	23.10	204.17	17.77	59.84
			16QAM	21.57	143.55	16.79	47.75
		1.4	QPSK	23.16	207.01	16.34	43.05
			16QAM	21.71	148.25	15.35	34.28

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5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a internal antenna for the [List the bands supported] with a maximum peak gain as follow:

Frequency (MHz)	Peak Gain (dBi)
GSM850 / WCDMA Band 5 / LTE Band 5 824 ~ 849 MHz	-1.9
GSM1900 / WCDMA Band 2 1850 ~ 1910 MHz	0.3

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA50HWE	DK4H630HS/A -E	N/A
Data Cable	SAMSUNG	ECB-DU68WE	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Power	1	Mini-USB	Shielded	0.8m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.0m	N/A

TEST SETUP

The EUT is continuously communicated to the call box during the tests.

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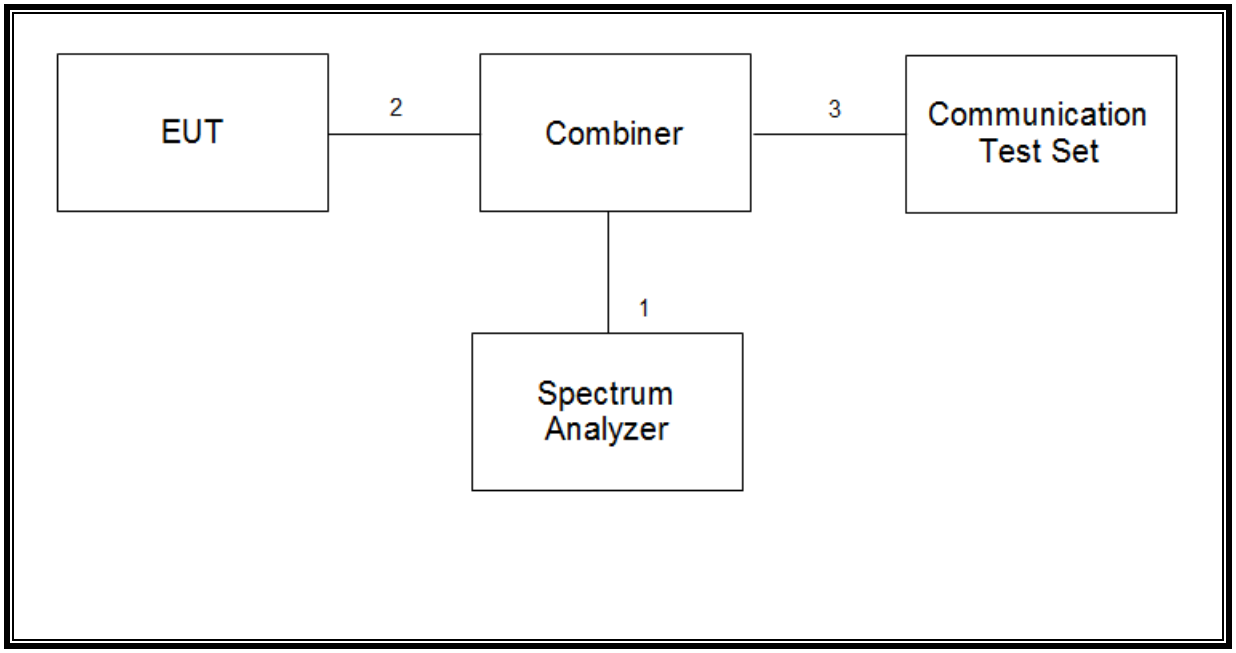
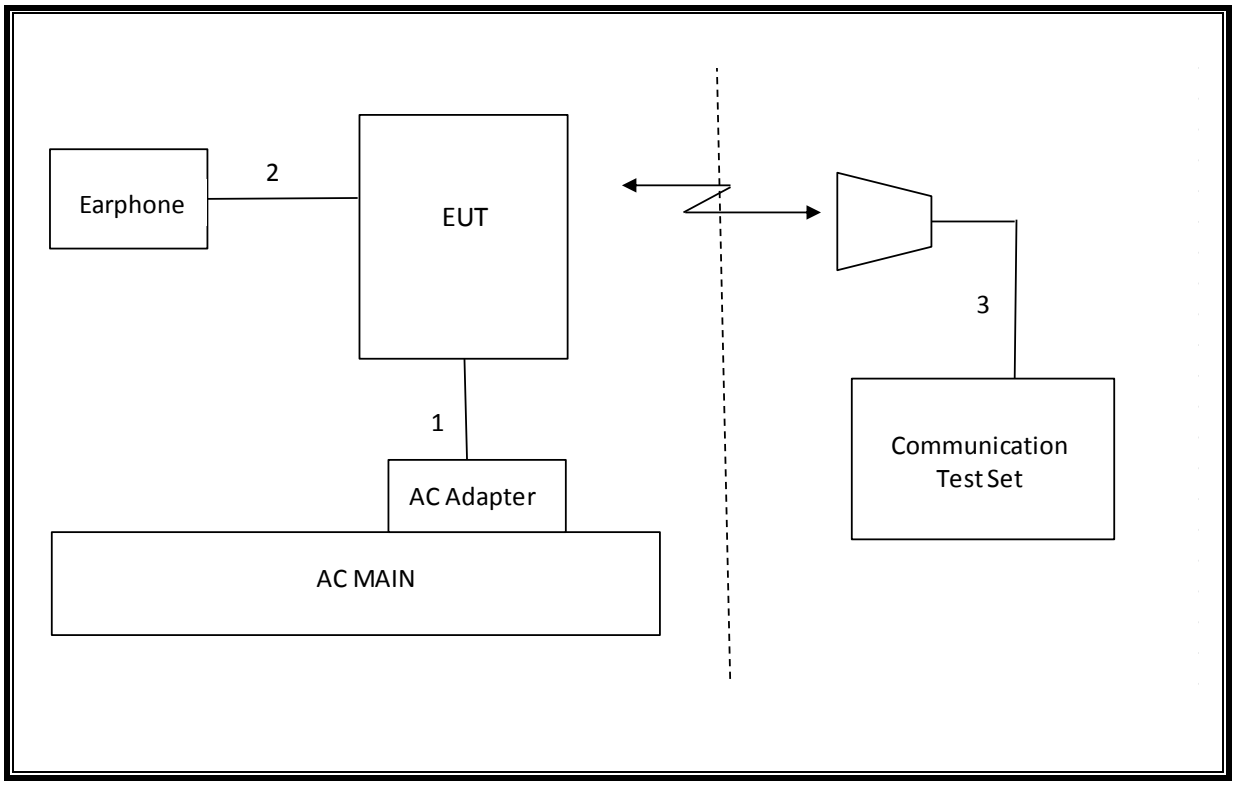
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121D DB4	00164753	07-28-17
Antenna, Horn, 40 GHz	ETS	3116C	00166155	11-30-17
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	12-15-17
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	10-14-18
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-25-17
Antenna, Horn, 18 GHz	ETS	3115	00167211	10-14-18
Antenna, Horn, 18 GHz	ETS	3117	00168724	06-17-17
Antenna, Horn, 18 GHz	ETS	3117	00168717	06-17-17
Combiner	WEINSCHEL	1575	2150	08-16-17
Communications Test Set	R&S	CMW500	150312	08-17-17
Communications Test Set	R&S	CMW500	115331	08-17-17
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-16-17
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-17-17
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-16-17
Preamplifier	ETS	3115-PA	00167475	08-17-17
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-16-17
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-17-17
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-17-17
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-16-17
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-17-17
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-17-17
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	08-17-17
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	08-17-17
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-17-17
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-17-17
Attenuator	PASTERNACK	PE7087-10	A009	08-16-17
Temperature Chamber	ESPEC	SH-642	93001109	08-17-17
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Antenna port test software	UL	CLT	Ver 1.6	

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7. Summary Table

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result	Note
2.1049	Occupied Band width (99%)	N/A	Conducted	Pass	8.9769 MHz
22.917(a) 24.238(a)	Band Edge / Conducted Spurious Emission	-13dBm		Pass	-15.789 dBm
2.1046	Conducted output power	N/A		Pass	31.66dBm
22.355 24.235	Frequency Stability	2.5PPM		Pass	-0.012 PPM
22.913(a)(2)	Effective Radiated Power	38.5 dBm	Radiated	Pass	28.58 dBm
24.232(c)	Equivalent Isotropic Radiated Power	33dBm		Pass	29.63 dBm
22.917(a) 24.238(a)	Radiated Spurious Emission	-13dBm		Pass	-30.6 dBm

FCC Rule Part	Frequency Range [MHz]	Output Power [W]	Frequency Tolerance	Emission Designator	Emission Bandwidth [MHz]	Communication Type
GSM						
22H	824.2 - 848.8	0.721	2.5 ppm	241KGXW		GSM850
22H	824.2 - 848.8	0.273	2.5 ppm	248KG7W		EDGE850
24E	1850.2 - 1909.8	0.918	2.5 ppm	242KGXW		GSM1900
24E	1850.2 - 1909.8	0.476	2.5 ppm	242KG7W		EDGE1900
WCDMA						
22H	826.4 - 846.6	0.107	2.5 ppm	4M14F9W		WCDMA B5
24E	1852.4 - 1907.6	0.218	2.5 ppm	4M14F9W		WCDMA B2
LTE Band 5						
22H	829.0 - 844.0	0.052	2.5 ppm	8M96G7W	10	QPSK
22H	829.0 - 844.0	0.042	2.5 ppm	8M98D7W	10	16QAM
22H	826.5 - 846.5	0.064	2.5 ppm	4M50G7W	5	QPSK
22H	826.5 - 846.5	0.051	2.5 ppm	4M50D7W	5	16QAM

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8. RF POWER OUTPUT VERIFICATION

8.1. GSM/GPRS/EDGE

Function: Menu select > GSM Mobile Station > GSM 850/900/1800/1900
Press Connection control to choose the different menus
Press RESET > choose all to reset all settings
Connection Press Signal Off to turn off the signal and change settings
Network Support > GSM+GPRS or GSM+EGPRS
Main Service > Packet Data
Service selection > Test Mode A – Auto Slot Config. off
MS Signal Press Slot Config bottom on the right twice to select and change the number of time slots and power setting
> Slot configuration > Uplink/Gamma
> 33 dBm for GPRS 850/900
> 30 dBm for GPRS1800/1900
BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel
Frequency Offset > + 0 Hz
Mode > BCCH and TCH
BCCH Level > -85 dBm (May need to adjust if link is not stable)
BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]
Channel Type > Off
P0> 4 dB
Slot Config > Unchanged (if already set under MS Signal)
TCH > choose desired test channel
Hopping > Off
Main Timeslot > 3 (Default)
Network Coding Scheme > CS4 (GPRS) and MCS5 ~ MCS9 (EGPRS)
Bit Stream > 2E9-1PSR Bit Pattern
AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input
Connection Press Signal On to turn on the signal and change settings

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8.1.1. GSM OUTPUT POWER RESULT

GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. [MHz]	Max. Power	
						Burst Pwr [dBm]	Frame Pwr [dBm]
850	GSM (Voice)	CS1	1	128	824.2	31.31	22.27
				190	836.6	31.51	22.48
				251	848.8	31.63	22.60
	GPRS (GMSK)	CS1	1	128	824.2	31.35	22.32
				190	836.6	31.53	22.50
				251	848.8	31.66	22.63
			2	128	824.2	30.70	24.68
				190	836.6	30.86	24.84
				251	848.8	30.98	24.96
			3	128	824.2	29.63	25.37
				190	836.6	29.76	25.50
				251	848.8	29.87	25.61
			4	128	824.2	28.56	25.55
				190	836.6	28.66	25.65
				251	848.8	28.75	25.74
	EGPRS (8PSK)	MCS5	1	128	824.2	26.57	17.54
				190	836.6	26.45	17.42
				251	848.8	26.58	17.55
			2	128	824.2	25.24	19.22
				190	836.6	25.33	19.31
				251	848.8	25.42	19.40
			3	128	824.2	24.00	19.74
				190	836.6	24.08	19.82
				251	848.8	24.15	19.89
			4	128	824.2	22.65	19.64
				190	836.6	22.73	19.72
				251	848.8	22.79	19.78

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GSM1900 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. [MHz]	Max. Power	
						Burst Pwr [dBm]	Frame Pwr [dBm]
1900	GSM (Voice)	CS1	1	512	1850.2	28.55	19.52
				661	1880.0	28.30	19.27
				810	1909.8	28.39	19.36
	GPRS (GMSK)	CS1	1	512	1850.2	28.61	19.58
				661	1880.0	28.27	19.24
				810	1909.8	28.44	19.40
			2	512	1850.2	26.70	20.68
				661	1880.0	26.71	20.69
				810	1909.8	27.17	21.14
			3	512	1850.2	25.20	20.94
				661	1880.0	25.10	20.84
				810	1909.8	25.50	21.24
			4	512	1850.2	23.82	20.81
				661	1880.0	23.80	20.79
				810	1909.8	24.20	21.19
	EGPRS (8PSK)	MCS5	1	512	1850.2	24.56	15.52
				661	1880.0	24.61	15.57
				810	1909.8	25.00	15.97
			2	512	1850.2	22.63	16.61
				661	1880.0	22.70	16.68
				810	1909.8	23.20	17.18
			3	512	1850.2	21.47	17.21
				661	1880.0	21.53	17.27
				810	1909.8	22.26	18.00
			4	512	1850.2	20.17	17.16
				661	1880.0	20.20	17.19
				810	1909.8	21.00	17.99

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8.2. UMTS REL 99

Release 99 Setup Procedures used to establish the test signals

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	11/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs=βhs/βc	30/15			

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HSPA (HSDPA & HSUPA) Setup Procedures used to establish the test signals

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	6/15	15/9	2/15	15/1
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	1309/225	94/75	47/15	56/75	47/15
	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	Ahs = βhs/βc	30/15				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
	Reference E-TFCI PO	27	27	27	27	27
	Maximum Channelisation Codes	2xSF2				SF4

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DC-HSDPA Setup Procedures used to establish the test signals

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH _Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.		
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

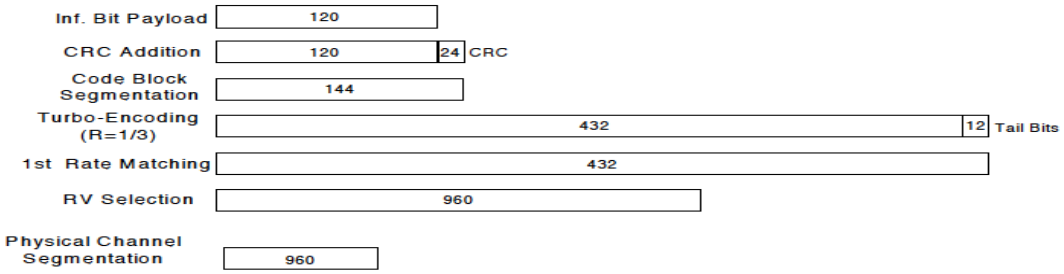

Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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The following 4 Sub-tests for HSDPA were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/βd	2/15	11/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs = βhs/ βc	30/15			

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

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8.2.1. WCDMA OUTPUT POWER RESULT

WCDMA Band 5 Measured Results

Band	Mode		UL Ch No.	Freq. [MHz]	MPR [dB]	Avg Pwr [dBm]
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	0	23.15
			4183	836.6	0	23.22
			4233	846.6	0	23.14
	HSDPA	Subtest 1	4132	826.4	0	21.90
			4183	836.6	0	22.10
			4233	846.6	0	22.00
		Subtest 2	4132	826.4	0	21.30
			4183	836.6	0	21.50
			4233	846.6	0	21.40
		Subtest 3	4132	826.4	0.5	21.80
			4183	836.6	0.5	22.00
			4233	846.6	0.5	21.90
		Subtest 4	4132	826.4	0.5	20.10
			4183	836.6	0.5	20.30
			4233	846.6	0.5	20.20
	HSUPA	Subtest 1	4132	826.4	0	21.19
			4183	836.6	0	21.29
			4233	846.6	0	21.23
		Subtest 2	4132	826.4	2	19.13
			4183	836.6	2	19.20
			4233	846.6	2	19.14
		Subtest 3	4132	826.4	1	19.66
			4183	836.6	1	19.77
			4233	846.6	1	19.70
		Subtest 4	4132	826.4	2	19.10
			4183	836.6	2	19.21
			4233	846.6	2	19.13
		Subtest 5	4132	826.4	0	21.60
			4183	836.6	0	21.68
			4233	846.6	0	21.62

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WCDMA Band 2 Measured Results

Band	Mode		UL Ch No.	Freq. [MHz]	MPR [dB]	Avg Pwr [dBm]
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	0	21.85
			9400	1880.0	0	21.66
			9538	1907.6	0	22.04
	HSDPA	Subtest 1	9262	1852.4	0	21.79
			9400	1880.0	0	21.60
			9538	1907.6	0	21.98
		Subtest 2	9262	1852.4	0	21.54
			9400	1880.0	0	21.42
			9538	1907.6	0	21.74
		Subtest 3	9262	1852.4	0.5	21.50
			9400	1880.0	0.5	21.06
			9538	1907.6	0.5	21.44
		Subtest 4	9262	1852.4	0.5	20.11
			9400	1880.0	0.5	19.70
			9538	1907.6	0.5	20.06
	HSUPA	Subtest 1	9262	1852.4	0	20.99
			9400	1880.0	0	20.69
			9538	1907.6	0	21.18
		Subtest 2	9262	1852.4	2	18.91
			9400	1880.0	2	18.66
			9538	1907.6	2	18.96
		Subtest 3	9262	1852.4	1	20.98
			9400	1880.0	1	20.66
			9538	1907.6	1	21.00
		Subtest 4	9262	1852.4	2	18.91
			9400	1880.0	2	18.64
			9538	1907.6	2	19.00
		Subtest 5	9262	1852.4	0	21.84
			9400	1880.0	0	21.57
			9538	1907.6	0	22.00

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8.3. LTE OUTPUT VERIFICATION

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.
UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signalling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-
Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.					

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8.3.1. LTE OUTPUT POWER RESULT

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	23.01	23.00	23.08
			1	25	0	22.97	22.91	22.99
			1	49	0	22.98	22.92	22.99
			25	0	1	21.11	21.07	21.08
			25	12	1	21.05	21.00	21.01
			25	25	1	21.04	21.03	21.02
			50	0	1	21.09	21.05	21.07
		16QAM	1	0	1	21.21	21.68	21.50
			1	25	1	21.10	21.58	21.43
			1	49	1	21.13	21.61	21.42
			25	0	2	20.05	20.12	20.10
			25	12	2	20.00	20.07	20.07
			25	25	2	19.99	20.07	20.03
			50	0	2	20.02	20.03	20.04

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	22.91	23.13	22.89
			1	12	0	22.87	23.04	22.80
			1	24	0	22.92	23.05	22.83
			12	0	1	22.11	22.09	22.05
			12	7	1	22.10	22.08	22.03
			12	13	1	22.11	22.05	22.03
			25	0	1	22.10	22.06	22.03
		16QAM	1	0	1	21.19	21.25	21.39
			1	12	1	21.11	21.18	21.31
			1	24	1	21.13	21.23	21.36
			12	0	2	20.96	21.05	20.90
			12	7	2	20.96	21.01	20.90
			12	13	2	20.94	21.01	20.89
			25	0	2	21.11	20.98	20.99

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	23.06	23.00	23.09
			1	8	0	23.04	22.91	23.03
			1	14	0	23.10	22.98	23.08
			8	0	1	22.12	22.09	22.03
			8	4	1	22.14	22.09	22.05
			8	7	1	22.13	22.07	22.03
			15	0	1	22.13	22.08	22.06
		16QAM	1	0	1	21.16	21.57	21.28
			1	8	1	21.03	21.49	21.17
			1	14	1	21.10	21.52	21.22
			8	0	2	21.00	20.78	20.90
			8	4	2	21.01	20.78	20.91
			8	7	2	21.00	20.77	20.89
			15	0	2	20.99	21.01	20.89

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr [dBm] Max. Power		
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	23.11	23.12	23.05
			1	3	0	23.10	23.10	23.02
			1	5	0	23.16	23.13	23.04
			3	0	1	23.04	22.97	22.96
			3	1	1	23.04	23.01	22.98
			3	3	1	23.05	22.96	22.97
			6	0	1	22.07	22.05	22.02
		16QAM	1	0	1	21.54	21.69	21.53
			1	3	1	21.52	21.66	21.49
			1	5	1	21.56	21.71	21.52
			3	0	2	21.41	21.46	21.56
			3	1	2	21.31	21.44	21.49
			3	3	2	21.30	21.44	21.49
			6	0	2	21.10	20.86	20.90

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9. PEAK TO AVERAGE RATIO

Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v02r02;

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The PAR were measured on the Spectrum Analyzer.

Test Spec

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

9.1. CONDUCTED PEAK TO AVERAGE RESULT

GSM

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
GSM850	190	836.6	GPRS	0.22	13.00
			EGPRS	2.77	
GSM1900	661	1880.0	GPRS	0.19	
			EGPRS	3.67	

WCDMA

Band	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	4183	836.6	REL99	2.95	13.00
			HSDPA	3.10	
Band 2	9400	1880.0	REL99	3.03	
			HSDPA	3.14	

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LTE

Band	BW [MHz]	Channel	f [MHz]	Mode	Ratio [dB]	Limit [dB]
Band 5	10	20525	836.5	QPSK	4.92	13.00
				16QAM	6.51	
	5			QPSK	5.03	
				16QAM	6.54	
	3			QPSK	5.05	
				16QAM	6.74	
	1.4			QPSK	5.07	
				16QAM	6.64	

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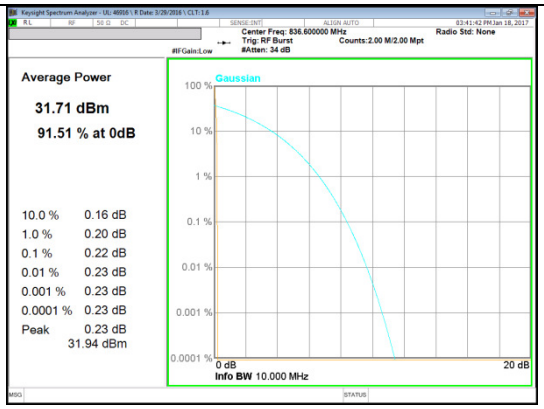
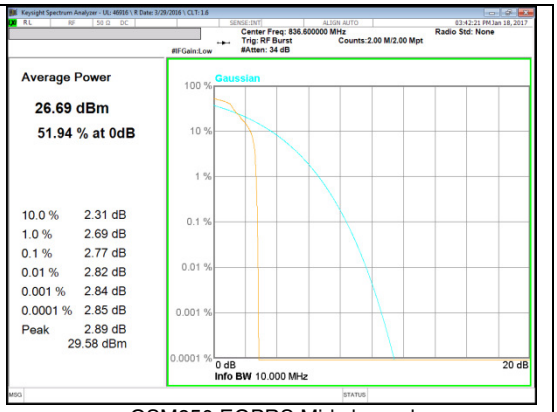
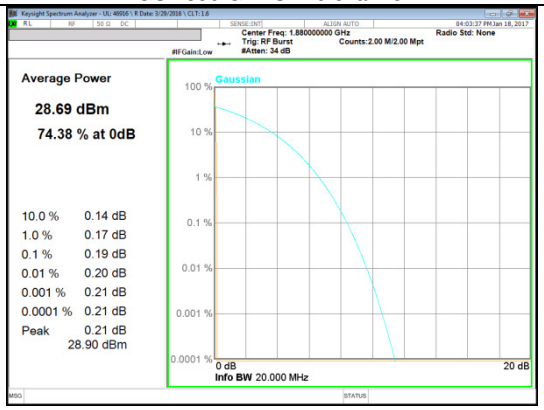
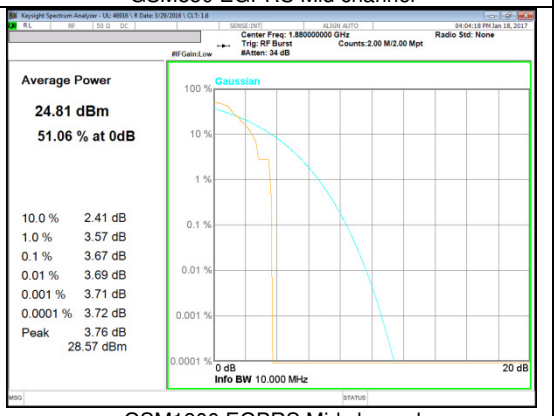
9.2. CONDUCTED PEAK TO AVERAGE PLOTS

GSM

GSM 850	 GSM850 GPRS Mid channel	 GSM850 EGPRS Mid channel
GSM 1900	 GSM1900 GPRS Mid channel	 GSM1900 EGPRS Mid channel

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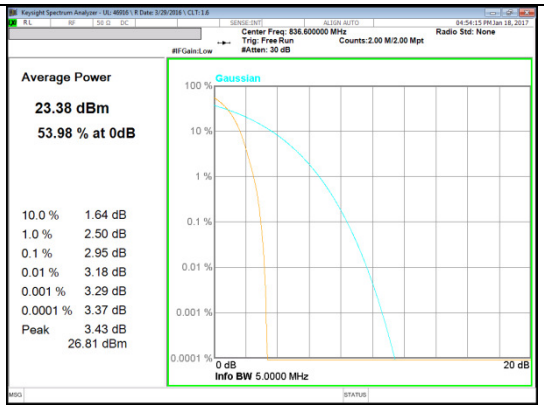
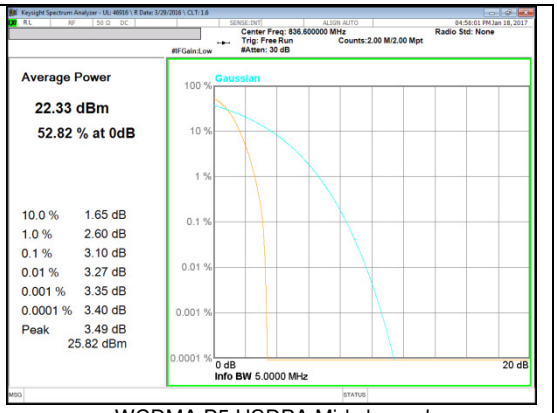
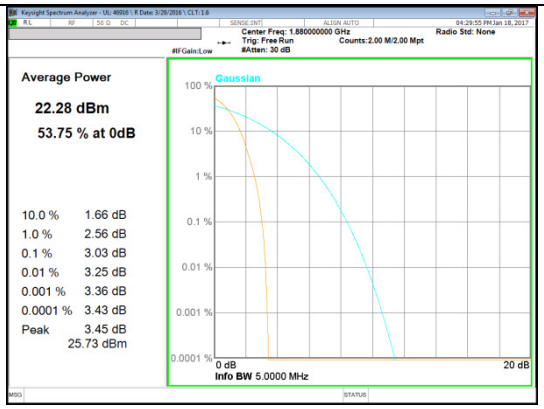
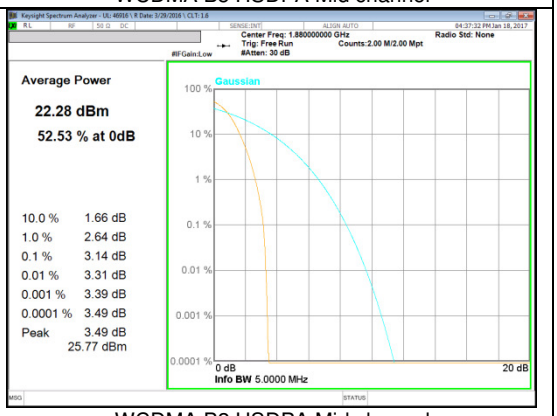
WCDMA

WCDMA Band 5	 WCDMA B5 REL99 Mid channel	 WCDMA B5 HSDPA Mid channel
WCDMA Band 2	 WCDMA B2 REL99 Mid channel	 WCDMA B2 HSDPA Mid channel

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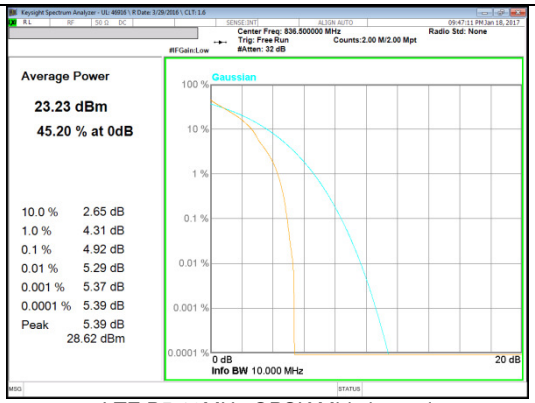
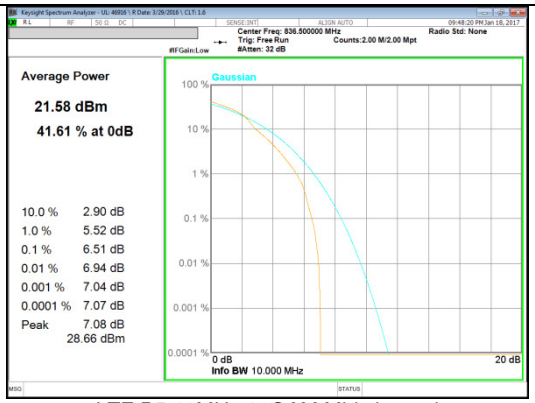
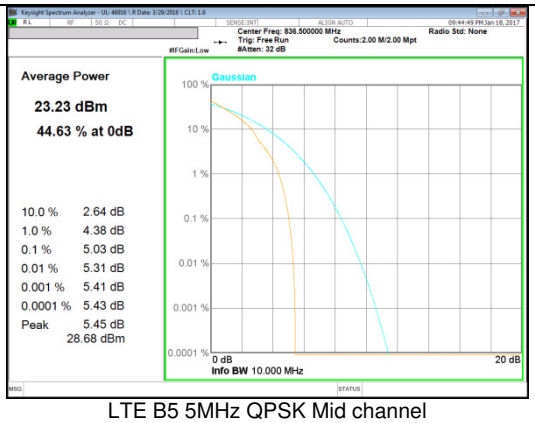
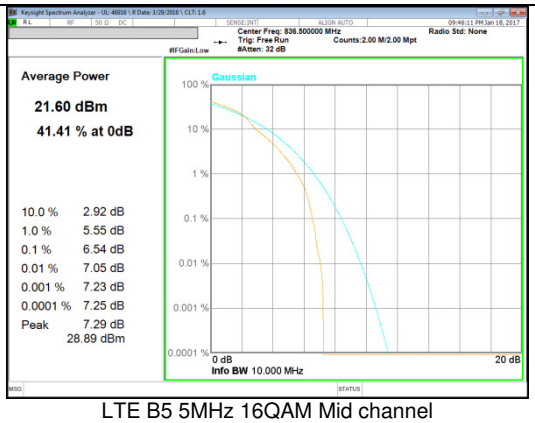
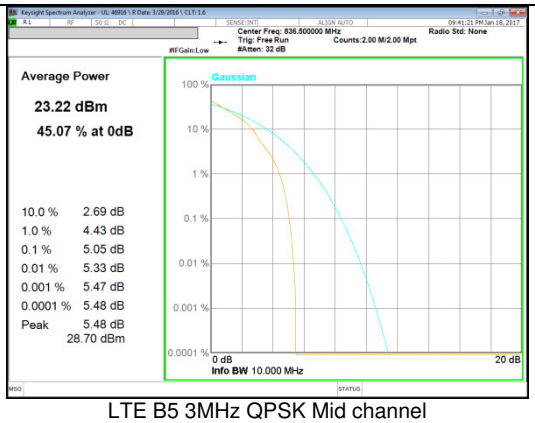
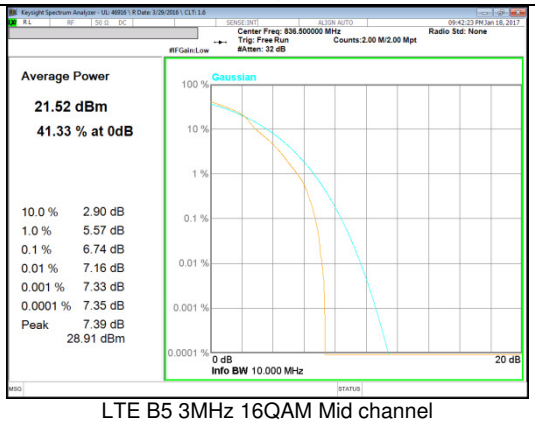
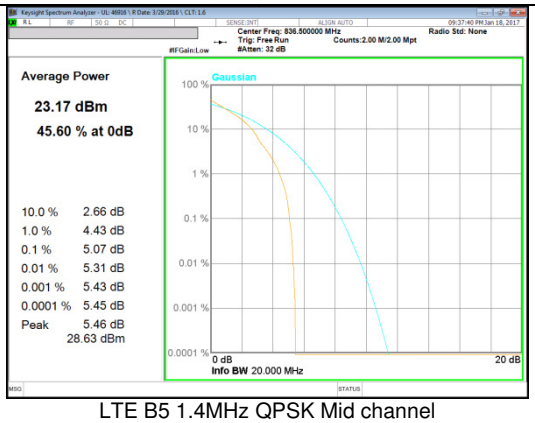
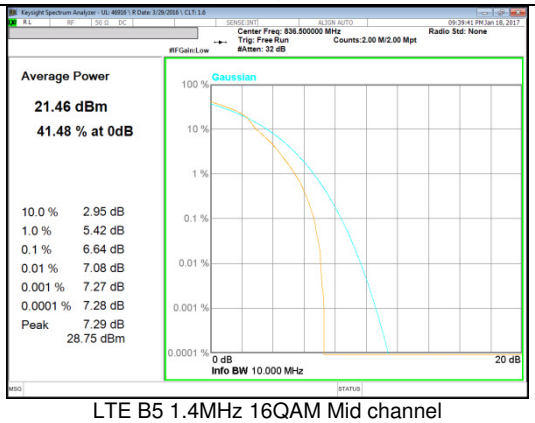
LTE Band 5

LTE Band 5 10 MHz	 LTE B5 10MHz QPSK Mid channel	 LTE B5 10MHz 16QAM Mid channel
LTE Band 5 5 MHz	 LTE B5 5MHz QPSK Mid channel	 LTE B5 5MHz 16QAM Mid channel
LTE Band 5 3 MHz	 LTE B5 3MHz QPSK Mid channel	 LTE B5 3MHz 16QAM Mid channel
LTE Band 5 1.4 MHz	 LTE B5 1.4MHz QPSK Mid channel	 LTE B5 1.4MHz 16QAM Mid channel

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10. LIMITS AND CONDUCTED RESULTS

10.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

(KDB 971168 D01 Power Meas License Digital Systems v02r02)

10.1.1. OCCUPIED BANDWIDTH RESULTS

GSM

Band	Mode	Channel	f [MHz]	99% BW [KHz]	26dB BW [KHz]
GSM850	GPRS	128	824.2	240.80	317.0
		190	836.6	238.88	310.8
		251	848.8	242.75	310.7
	EGPRS	128	824.2	243.56	315.1
		190	836.6	247.52	311.1
		251	848.8	247.09	315.4
GSM1900	GPRS	512	1850.2	236.32	301.6
		661	1880.0	239.71	306.8
		810	1909.8	241.95	307.2
	EGPRS	512	1850.2	242.06	304.6
		661	1880.0	242.12	301.8
		810	1909.8	237.12	308.4

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WCDMA

Band	Mode	Channel	f [MHz]	99% BW [MHz]	26dB BW [MHz]
Band 5	REL99	4132	826.4	4.1310	4.702
		4183	836.6	4.1397	4.706
		4233	846.6	4.1373	4.687
	HSDPA	4132	826.4	4.1413	4.703
		4183	836.6	4.1434	4.698
		4233	846.6	4.1429	4.684
Band 2	REL99	9262	1852.4	4.1290	4.675
		9400	1880.0	4.1449	4.695
		9538	1907.6	4.1325	4.698
	HSDPA	9262	1852.4	4.1319	4.685
		9400	1880.0	4.1415	4.678
		9538	1907.6	4.1307	4.678

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LTE Band 5

Band	BW [MHz]	Channel	f [MHz]	Mode	99% BW [MHz]	26dB BW [MHz]
Band 5	10	20450	829.0	QPSK	8.9255	10.02
				16QAM	8.9276	10.22
		20524	836.5	QPSK	8.9615	10.25
				16QAM	8.9769	10.09
		20599	844.0	QPSK	8.9183	10.12
				16QAM	8.9448	10.20
	5	20425	826.5	QPSK	4.4969	5.208
				16QAM	4.4849	5.197
		20524	836.5	QPSK	4.4927	5.240
				16QAM	4.5005	5.176
		20624	846.5	QPSK	4.5036	5.251
				16QAM	4.4945	5.273
	3	20415	825.5	QPSK	2.6941	3.074
				16QAM	2.7000	3.101
		20524	836.5	QPSK	2.7013	3.085
				16QAM	2.6970	3.056
		20634	847.5	QPSK	2.6922	3.049
				16QAM	2.6975	3.079
	1.4	20407	824.7	QPSK	1.0881	1.341
				16QAM	1.0871	1.335
		20524	836.5	QPSK	1.0915	1.373
				16QAM	1.0931	1.384
		20624	848.3	QPSK	1.0916	1.351
				16QAM	1.0944	1.385

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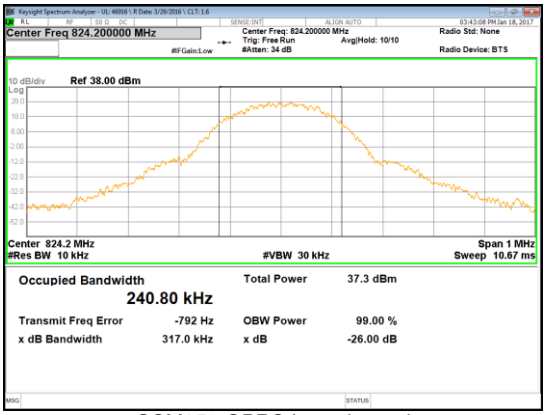
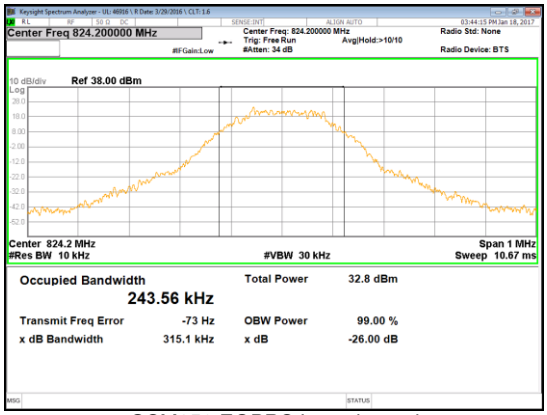
10.1.2. OCCUPIED BANDWIDTH PLOTS

GSM 850

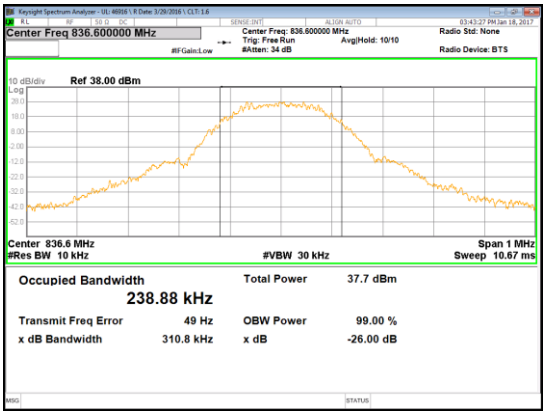
GSM 850



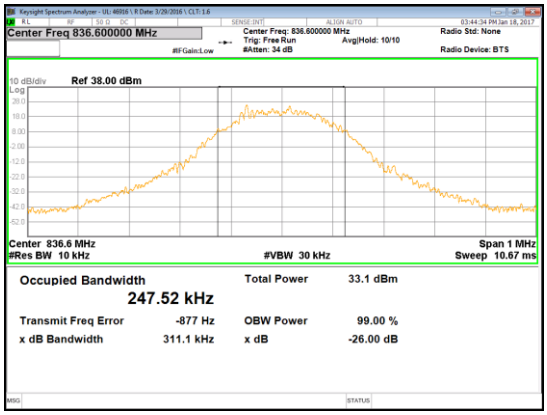
GSM850 GPRS Low channel



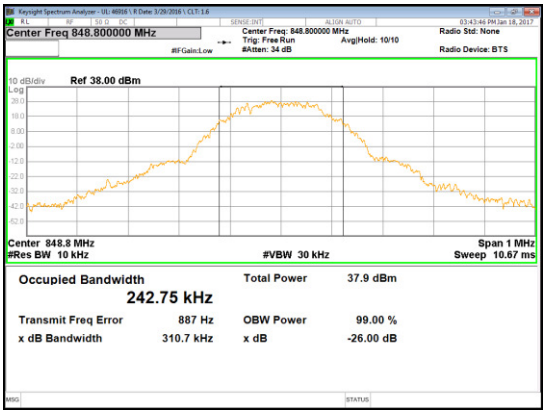
GSM850 EGPRS Low channel



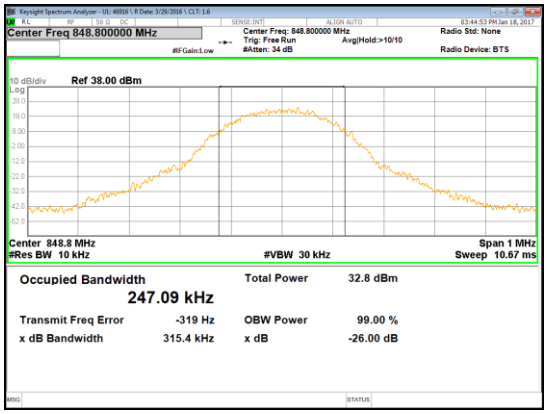
GSM850 GPRS Mid channel



GSM850 EGPRS Mid channel



GSM850 GPRS High channel



GSM850 EGPRS High channel

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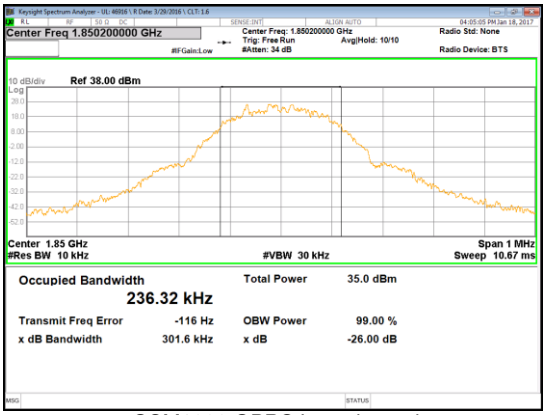
GSM 1900

GSM 1900



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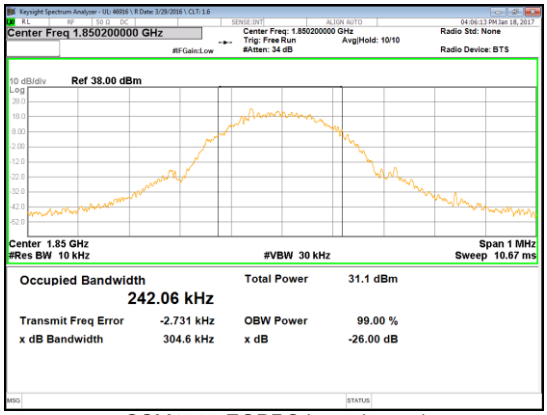

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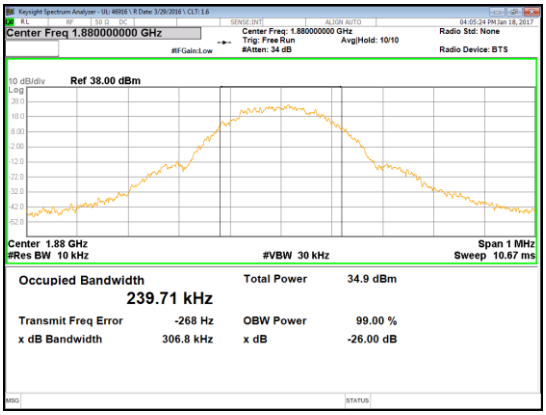
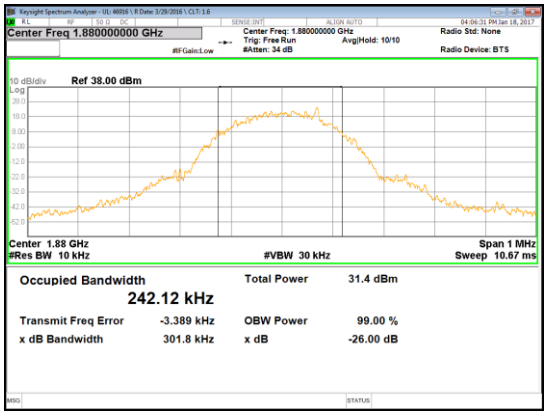
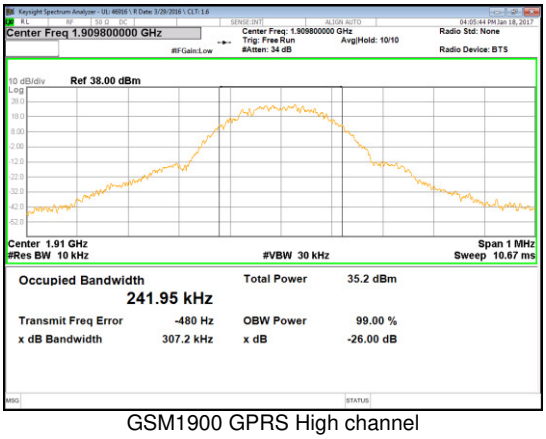


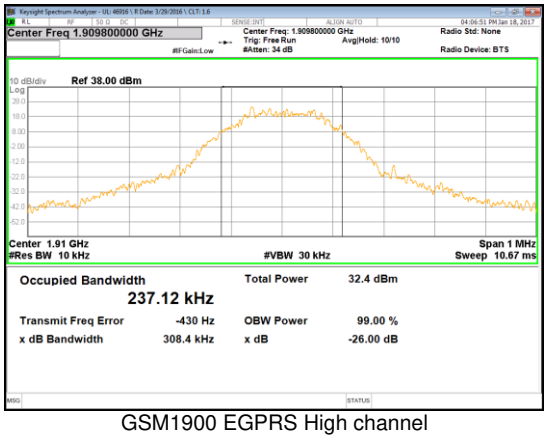
GSM1900 GPRS Mid channel



GSM1900 EGPRS Mid channel



GSM1900 GPRS High channel



GSM1900 EGPRS High channel

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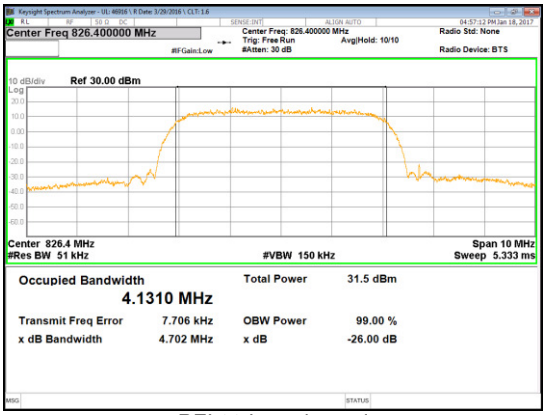
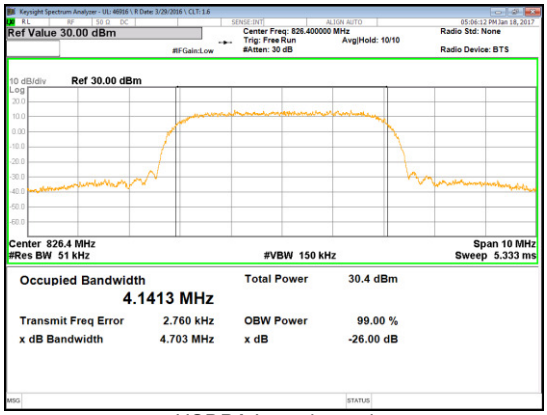
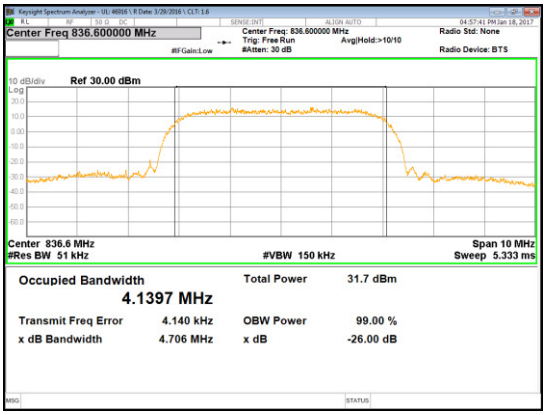
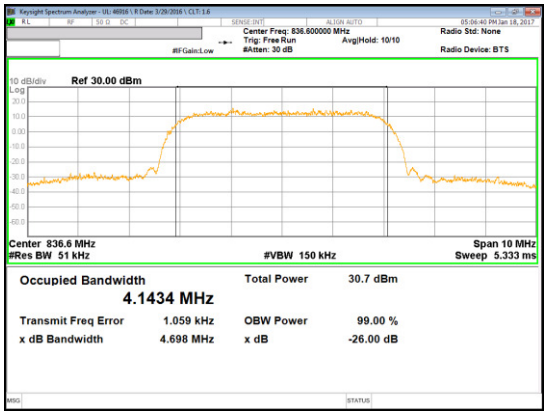
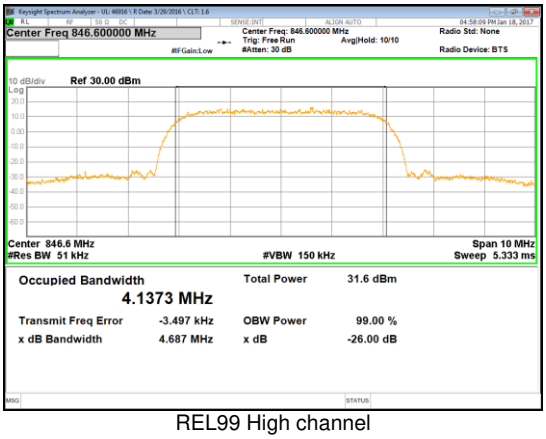
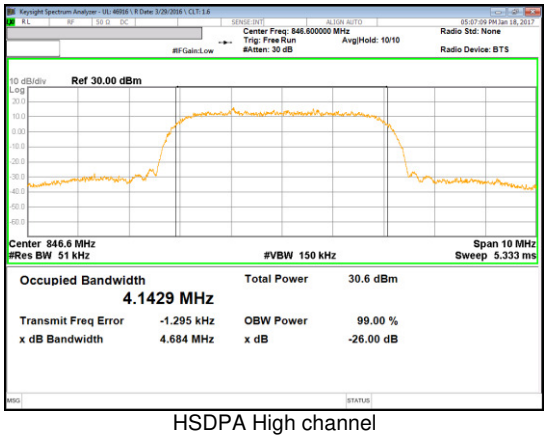
WCDMA Band 5

Band 5	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

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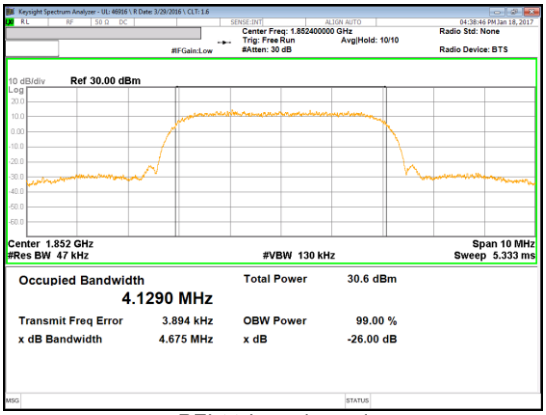
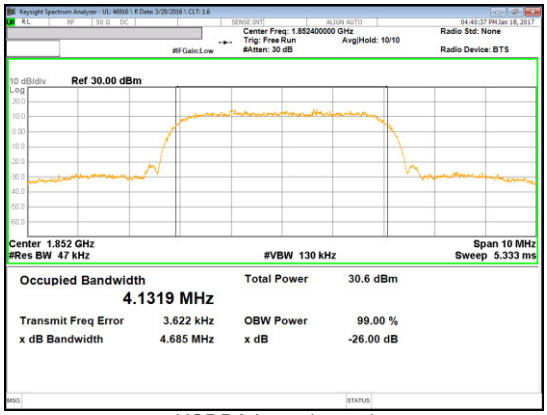
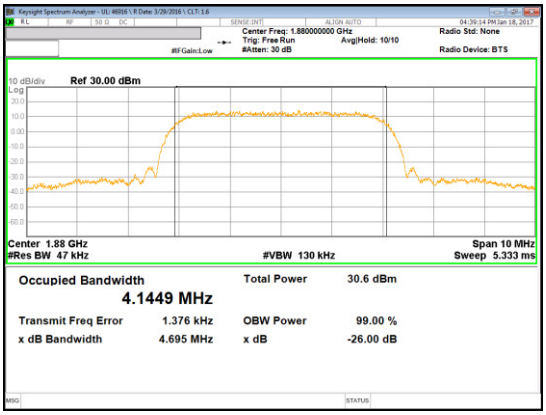
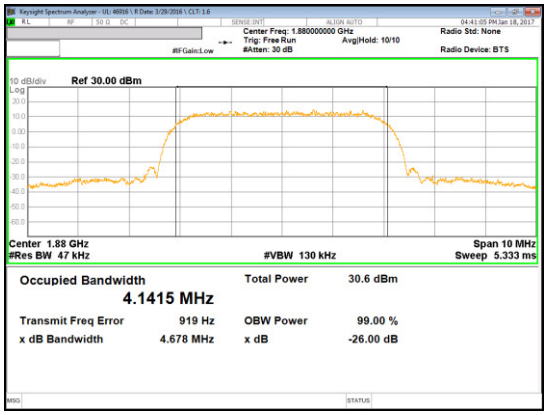
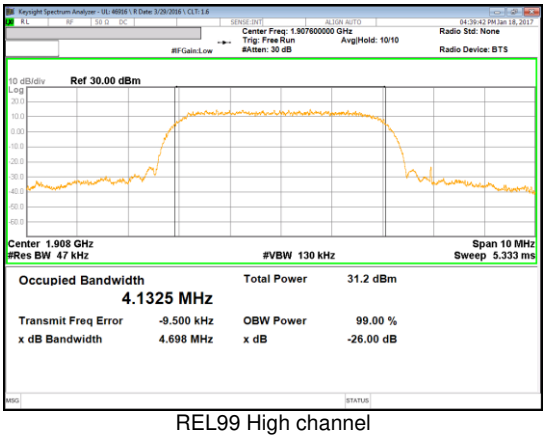
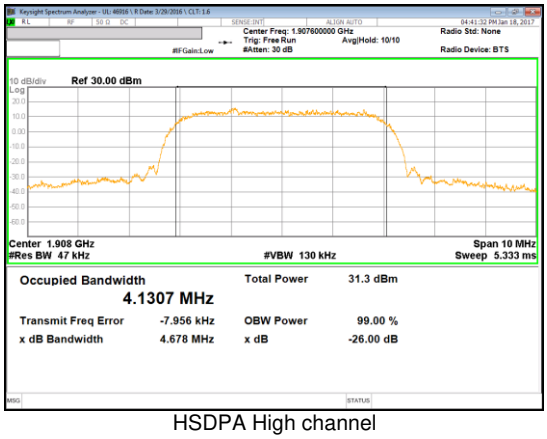
WCDMA Band 2

Band 2	 REL99 Low channel	 HSDPA Low channel
	 REL99 Mid channel	 HSDPA Mid channel
	 REL99 High channel	 HSDPA High channel

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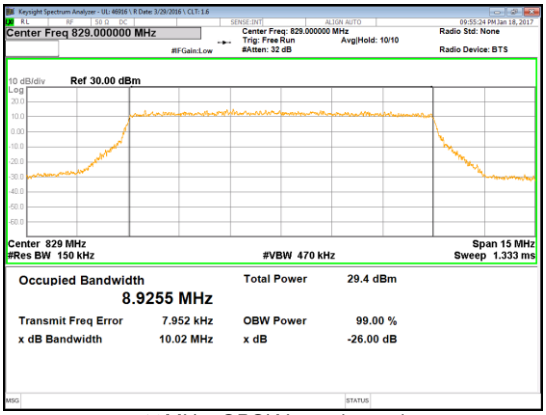
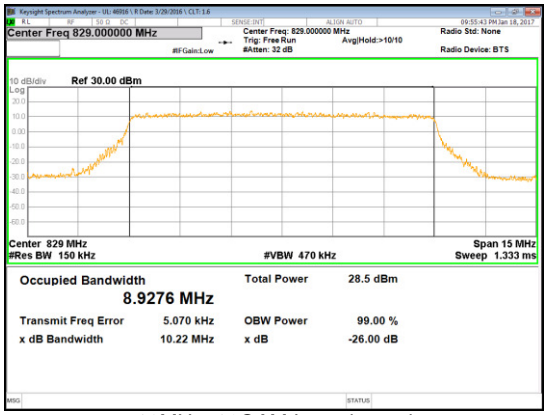
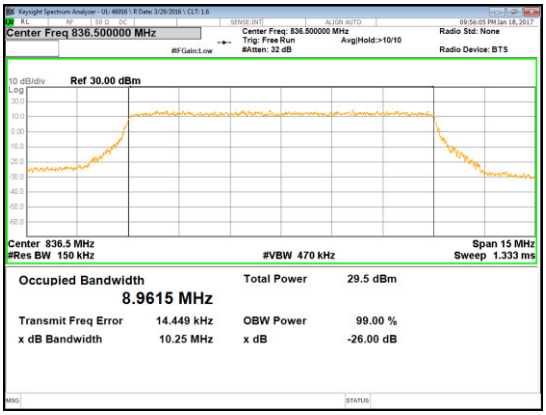
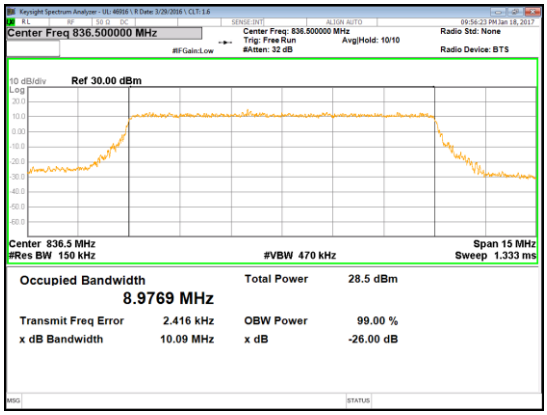
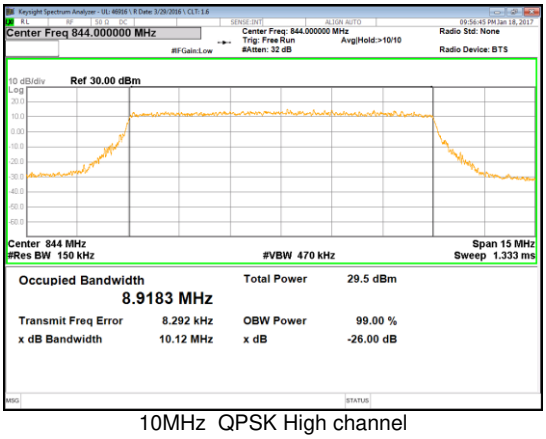
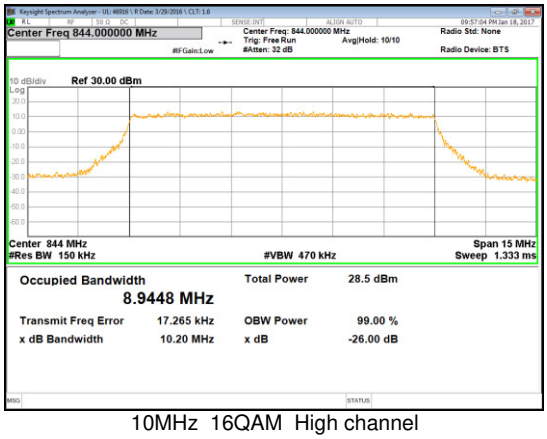
LTE Band 5

Band 5 10MHz	 10MHz QPSK Low channel	 10MHz 16QAM Low channel
	 10MHz QPSK Mid channel	 10MHz 16QAM Mid channel
	 10MHz QPSK High channel	 10MHz 16QAM High channel

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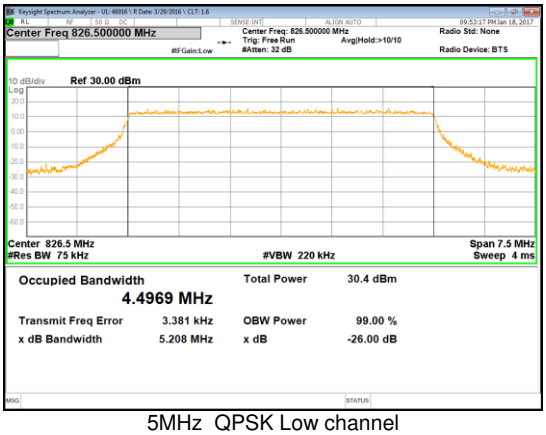
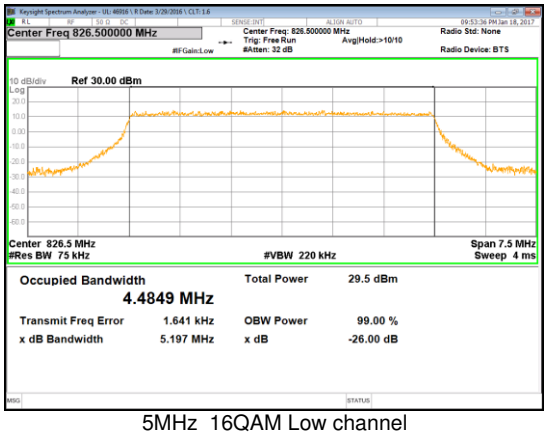
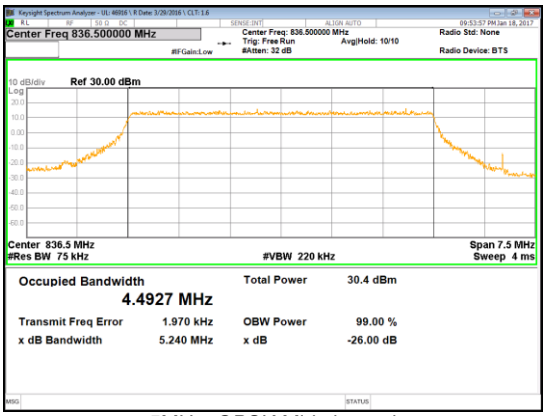
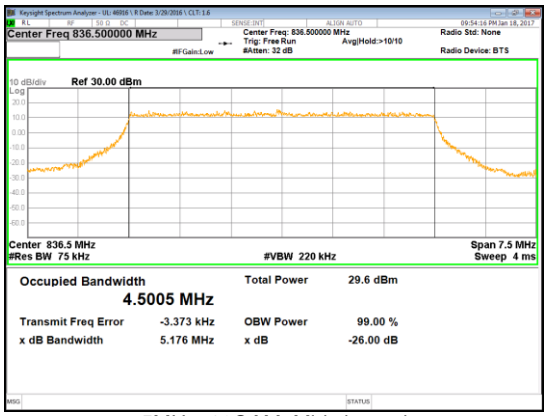
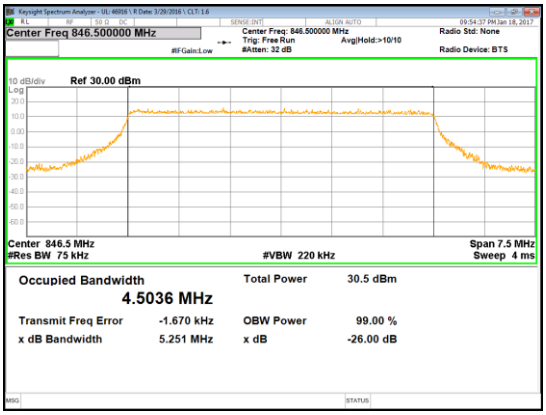
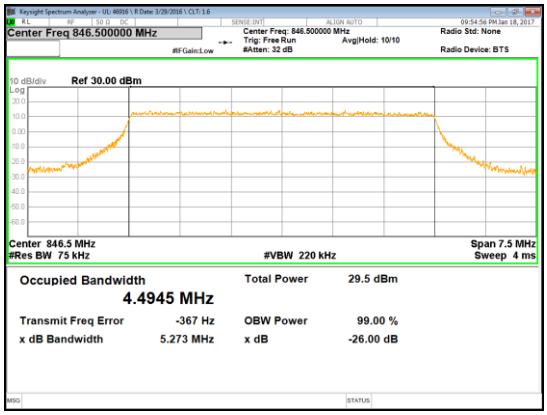
Band 5 5MHz	 5MHz QPSK Low channel	 5MHz 16QAM Low channel
	 5MHz QPSK Mid channel	 5MHz 16QAM Mid channel
	 5MHz QPSK High channel	 5MHz 16QAM High channel

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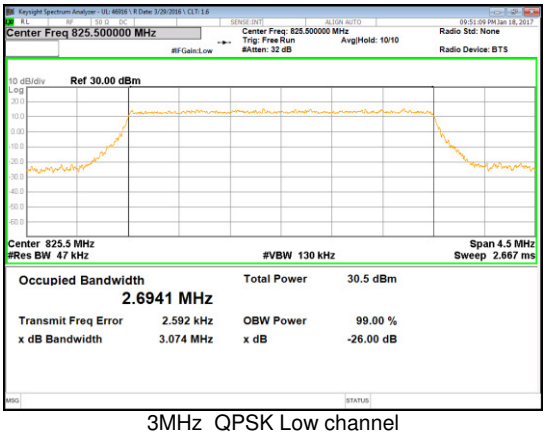
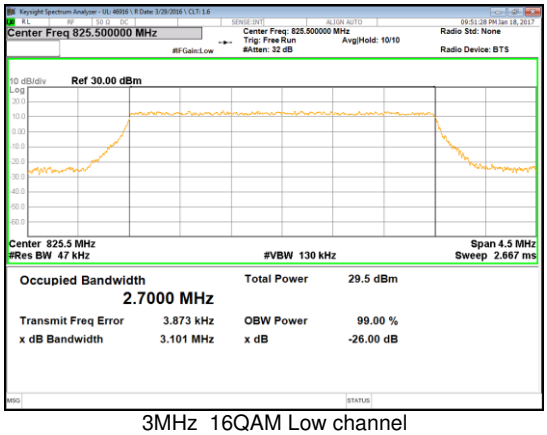
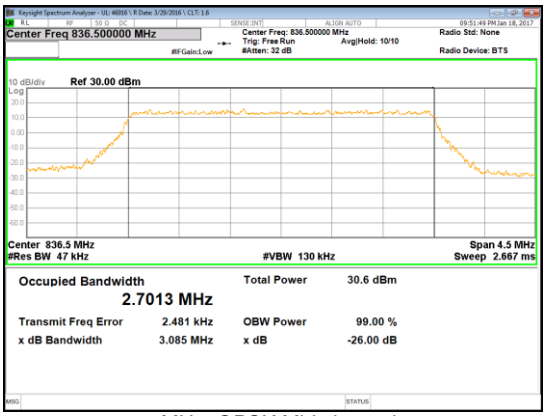
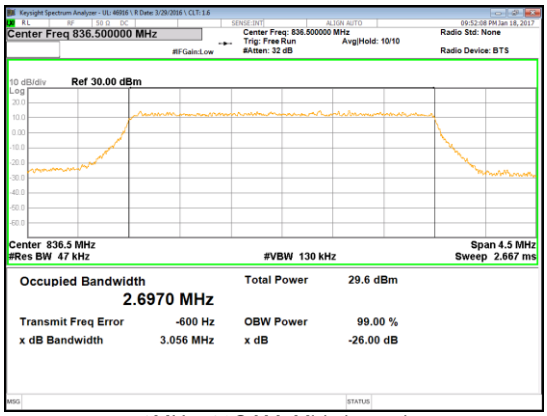
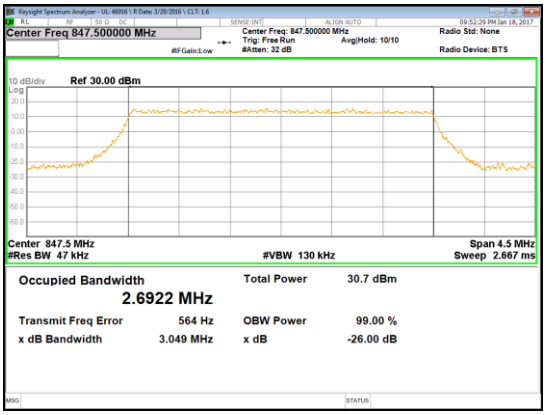
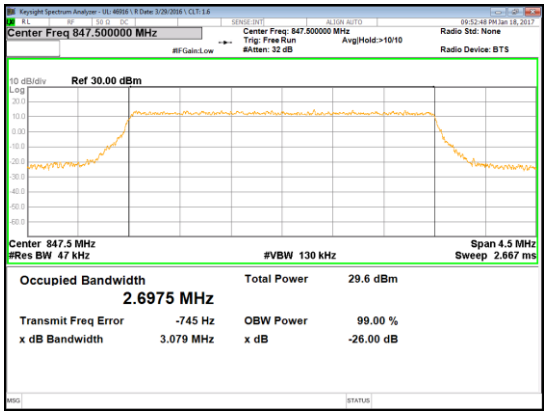
Band 5 3MHz	 3MHz QPSK Low channel	 3MHz 16QAM Low channel
	 3MHz QPSK Mid channel	 3MHz 16QAM Mid channel
	 3MHz QPSK High channel	 3MHz 16QAM High channel

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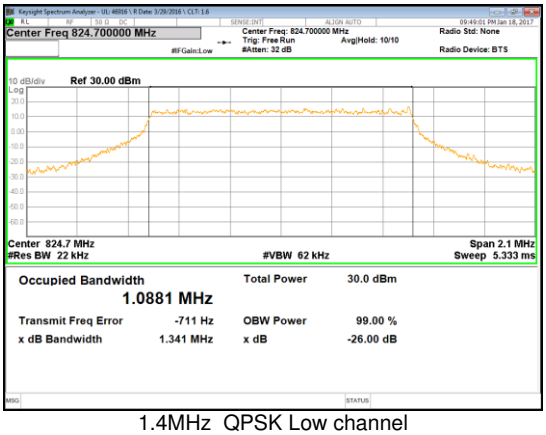
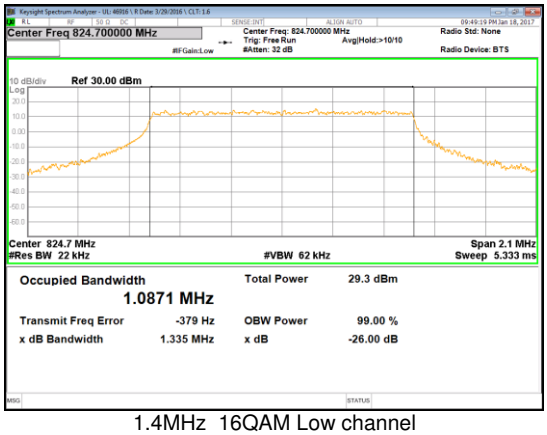
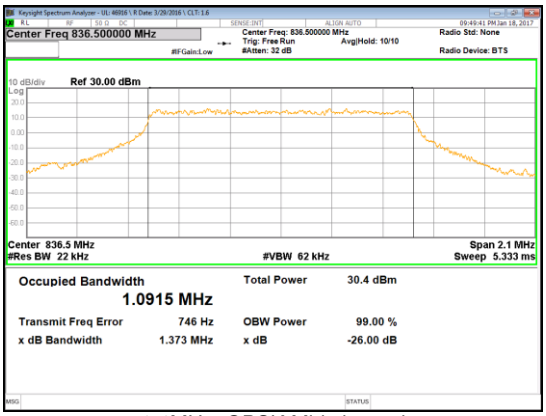
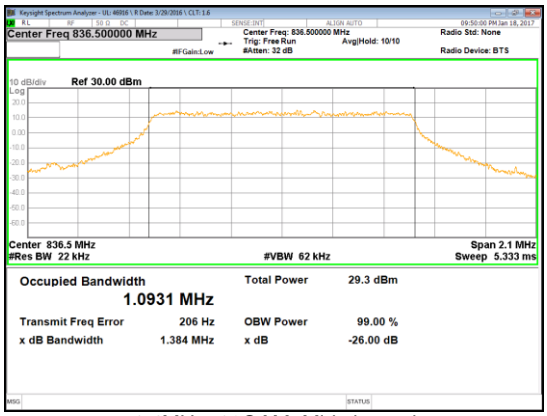
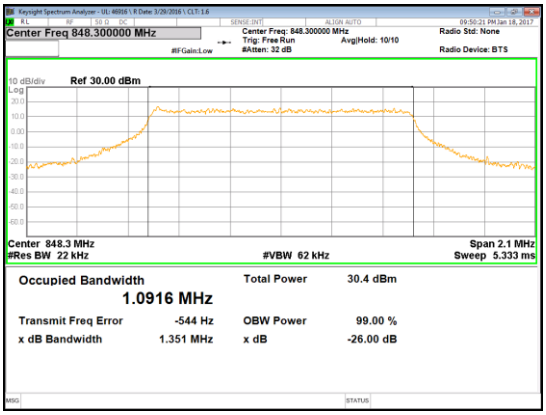
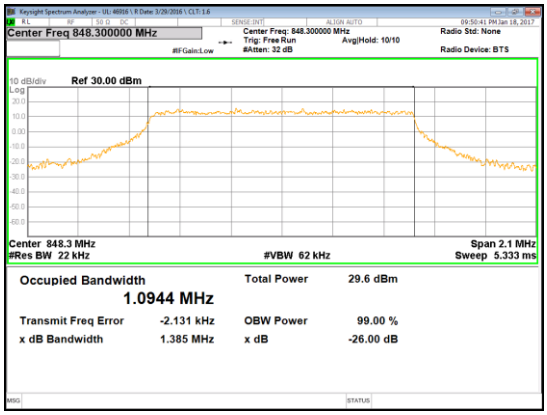
Band 5 1.4MHz	 1.4MHz QPSK Low channel	 1.4MHz 16QAM Low channel
	 1.4MHz QPSK Mid channel	 1.4MHz 16QAM Mid channel
	 1.4MHz QPSK High channel	 1.4MHz 16QAM High channel

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10.2. BAND EDGE EMISSIONS

RULE PART(S)

FCC: §22.359 and §24.238

LIMITS

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.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02
The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

GSM

a) Set the RBW = 1 ~ 5% of OBW(GSM850 – 8.2KHz, GSM1900 – 9.1KHz)

b) Set VBW ≥ 3 × RBW;

c) Set span ≥ 1.5 times the OBW;

d) Sweep time = 1S ;

e) Detector = RMS;

f) Ensure that the number of measurement points ≥ 2*Span/RBW;

g) Trace mode = Average(100);

h) Add duty cycle correction factor (9dB)

WCDMA/LTE

b) Set the RBW = 1 ~ 1.5 % of OBW(Typically limited to a minimum RBW of 1% of the OBW)

b) Set VBW ≥ 3 × RBW;

c) Set span ≥ 1.5 times the OBW;

d) Sweep time = Auto;

e) Detector = RMS;

f) Ensure that the number of measurement points ≥ 2*Span/RBW;

g) Trace mode = Average (100);

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RESULTS

GSM

Band	Mode	Side	f [MHz]	Level [dBm]	Limit [dBm]
GSM850	GPRS	Lower	823.997	-17.717	-13.00
		Upper	849.018	-17.066	
	EGPRS	Lower	824.000	-24.197	
		Upper	849.000	-25.507	
GSM1900	GPRS	Lower	1849.982	-20.242	
		Upper	1910.018	-19.560	
	EGPRS	Lower	1849.967	-28.268	
		Upper	1910.008	-27.432	

WCDMA

Band	Mode	Side	f [MHz]	Level [dBm]	Limit [dBm]
Band 5	REL99	Lower	824	-25.586	-13.00
		Upper	849	-24.761	
	HSDPA	Lower	824	-26.997	
		Upper	849	-27.049	
Band 2	REL99	Lower	1850	-27.337	
		Upper	1910	-28.182	
	HSDPA	Lower	1850	-29.070	
		Upper	1910	-27.639	

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LTE 5

Bandwidth	Mode	Side	RB Status	f [MHz]	Level [dBm]	Limit [dBm]
10 MHz	QPSK	Lower	1RB	824.000	-32.354	-13.00
			FRB	824.000	-31.806	
		Upper	1RB	849.000	-26.250	
			FRB	849.000	-29.880	
	16QAM	Lower	1RB	824.000	-33.871	
			FRB	824.000	-33.242	
		Upper	1RB	849.000	-28.385	
			FRB	849.000	-27.685	
5 MHz	QPSK	Lower	1RB	824.000	-17.843	
			FRB	824.000	-22.250	
		Upper	1RB	849.000	-18.922	
			FRB	849.000	-21.080	
	16QAM	Lower	1RB	824.000	-19.045	
			FRB	824.000	-24.593	
		Upper	1RB	849.000	-19.910	
			FRB	849.000	-25.517	
3 MHz	QPSK	Lower	1RB	824.000	-15.789	
			FRB	824.000	-23.294	
		Upper	1RB	849.000	-16.201	
			FRB	849.000	-23.058	
	16QAM	Lower	1RB	824.000	-19.020	
			FRB	824.000	-25.294	
		Upper	1RB	849.000	-16.807	
			FRB	849.000	-23.242	
1.4 MHz	QPSK	Lower	1RB	824.000	-21.841	
			FRB	824.000	-21.347	
		Upper	1RB	849.000	-20.461	
			FRB	849.000	-23.140	
	16QAM	Lower	1RB	824.000	-25.443	
			FRB	824.000	-25.948	
		Upper	1RB	849.000	-22.804	
			FRB	849.000	-23.584	

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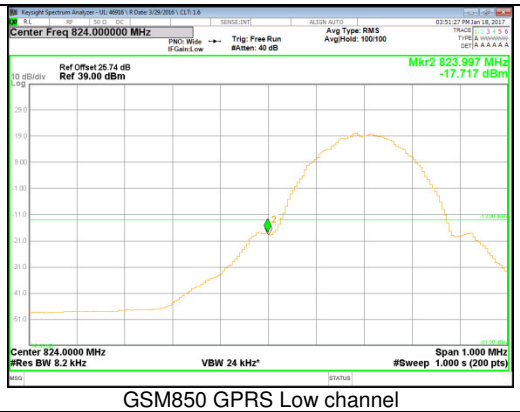
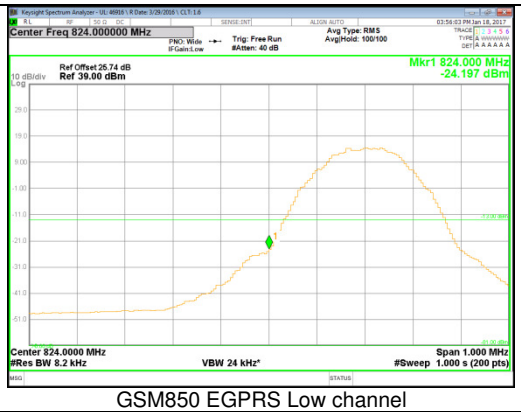
10.2.1. BAND EDGE PLOTS

GSM

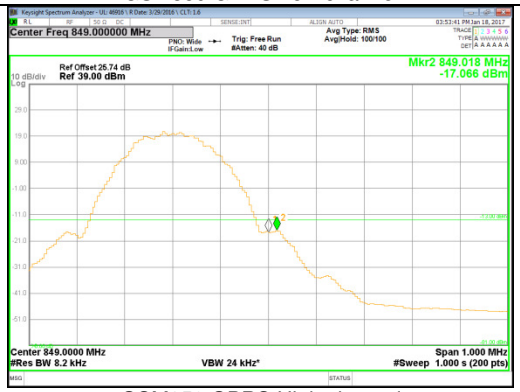
GSM 850



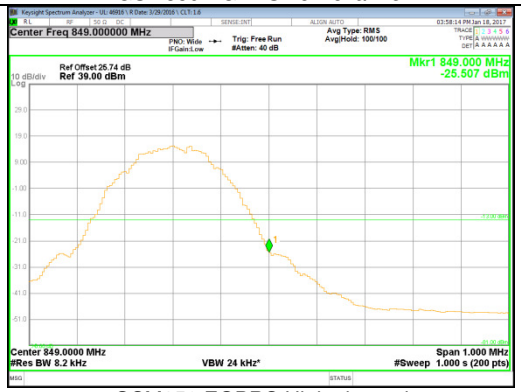
GSM850 GPRS Low channel



GSM850 EGPRS Low channel

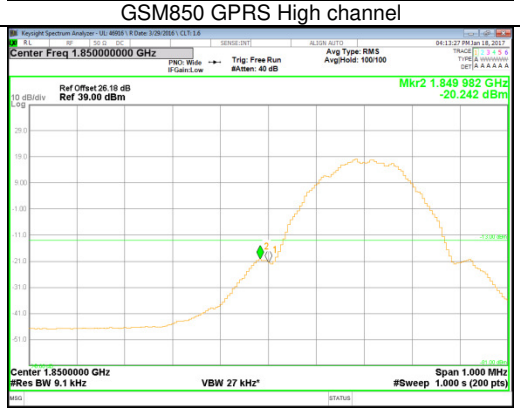


GSM850 GPRS High channel

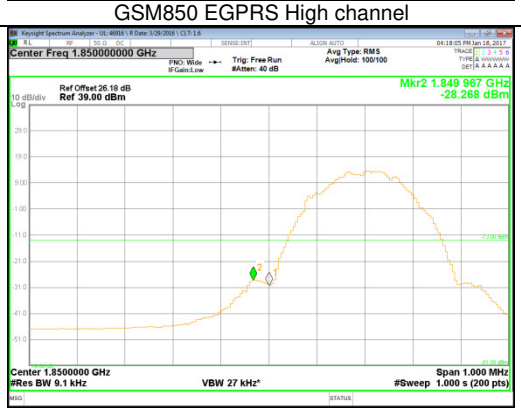


GSM850 EGPRS High channel

GSM 1900



GSM1900 GPRS Low channel



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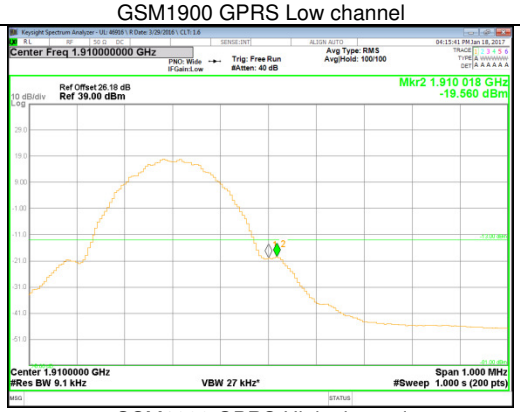
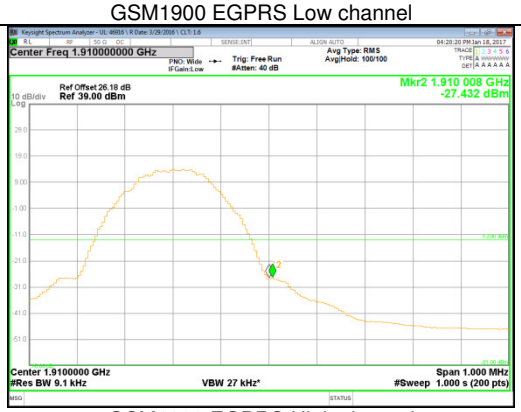


GSM1900 GPRS High channel



GSM1900 EGPRS High channel

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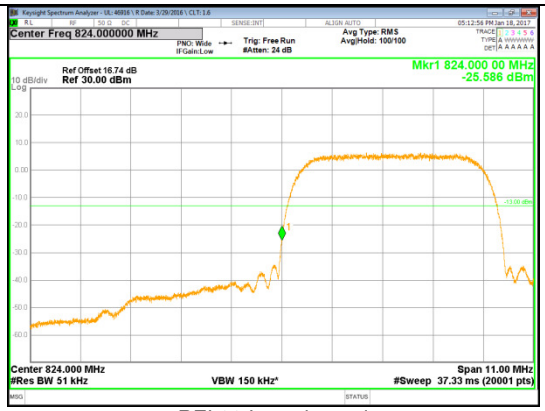
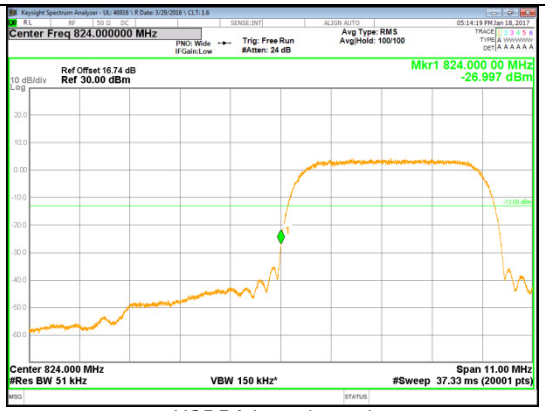
WCDMA

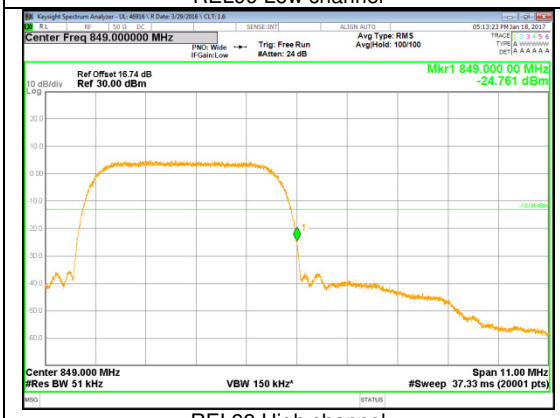
Band 5



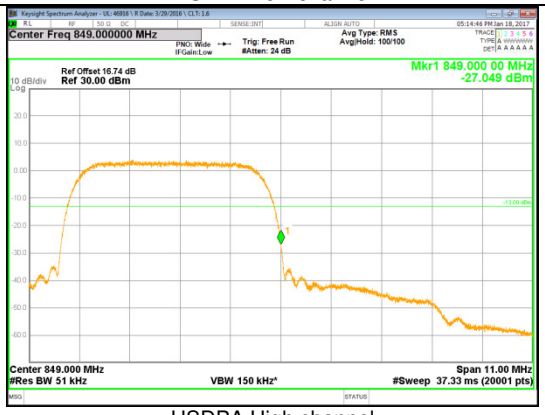
REL99 Low channel



HSDPA Low channel

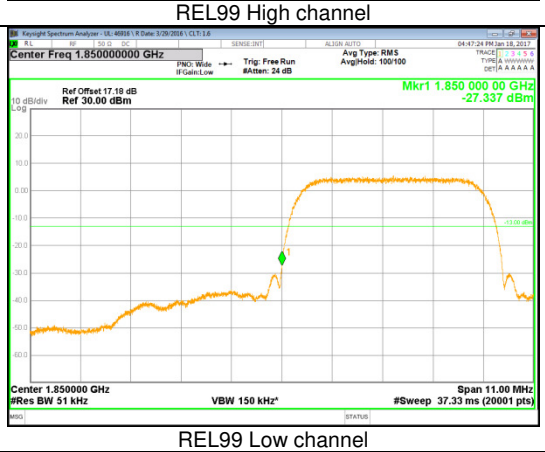


REL99 High channel

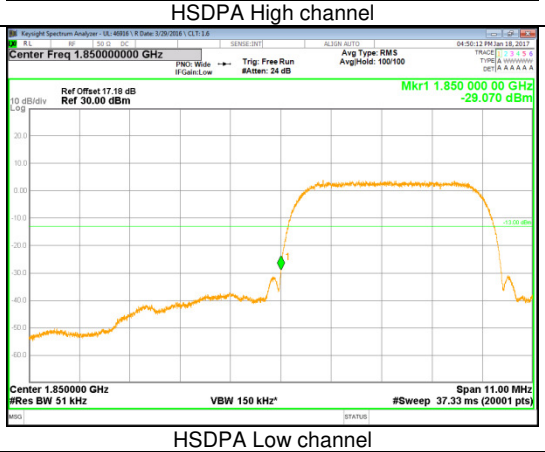


HSDPA High channel

Band 2



REL99 Low channel



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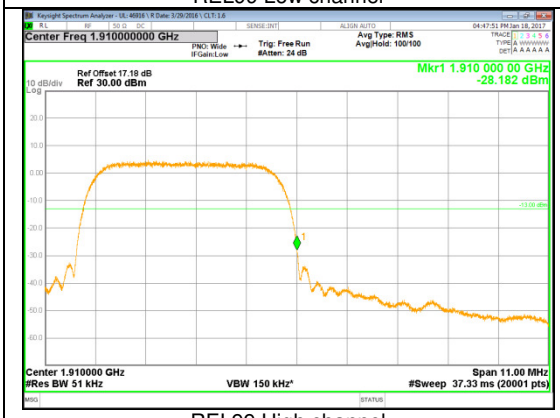
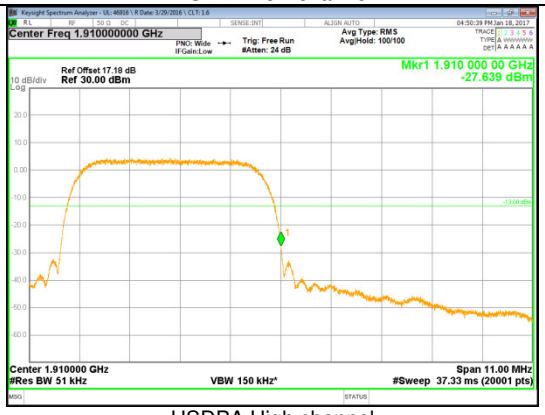


REL99 High channel



HSDPA High channel

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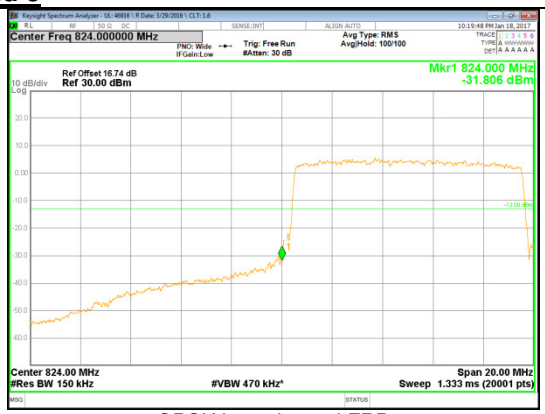
LTE Band 5

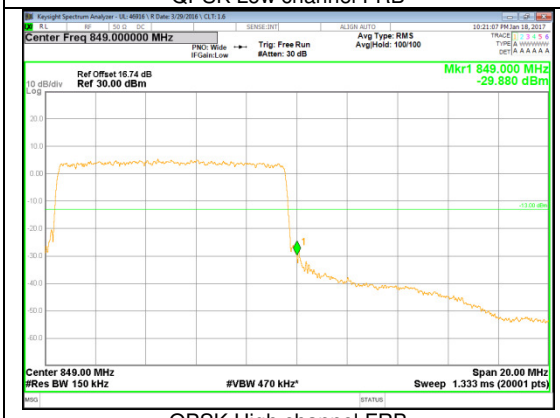
Band 5

10MHz

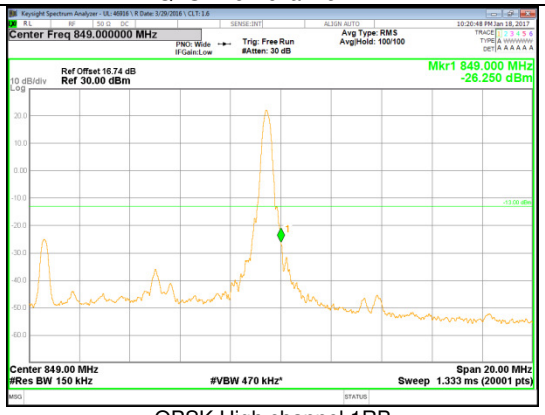


QPSK Low channel FRB

QPSK Low channel 1RB



QPSK High channel FRB



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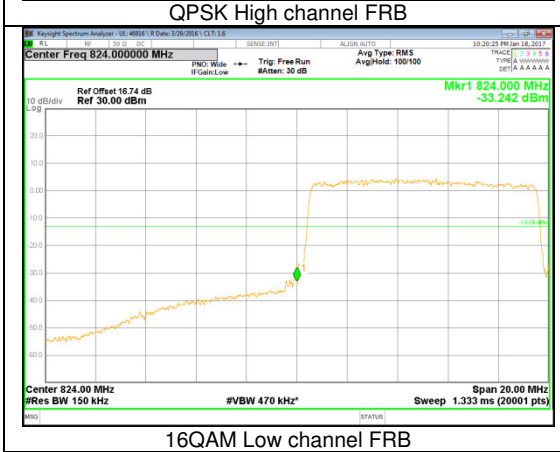
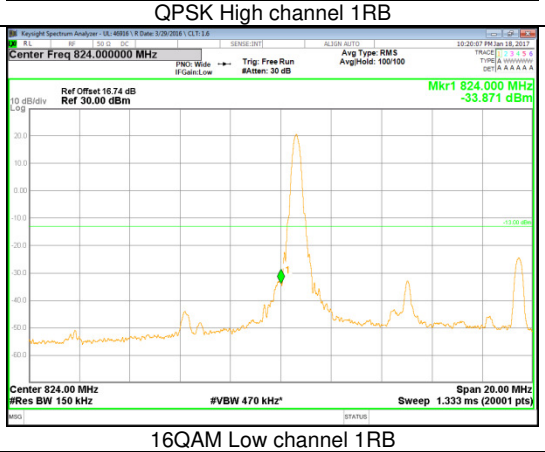
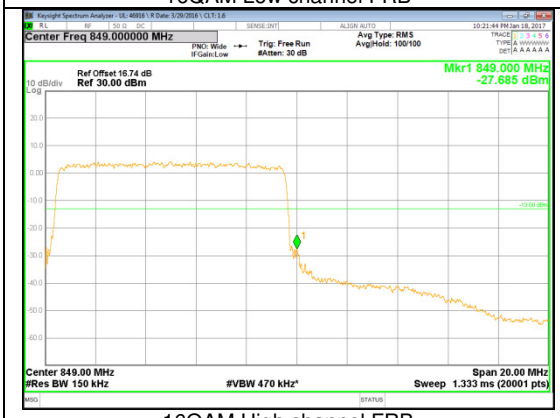


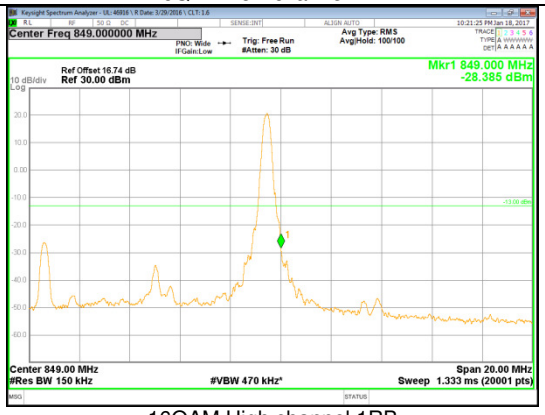
16QAM Low channel FRB



16QAM Low channel 1RB



16QAM High channel FRB



16QAM High channel 1RB

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