FCC Test Report

Report No.:AGC00767180503FE02

FCC ID	:	P46-VOLT5XL
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Smartphone
BRAND NAME	:	SURGE
MODEL NAME	:	VOLT_5XL
CLIENT	:	Unimax Communications
DATE OF ISSUE	:	Jun. 20, 2018
STANDARD(S)	:	FCC Part 22H & 24E Rules
REPORT VERSION	:	V1.0

Attestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd.

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun. 20, 2018	Valid	Initial Release

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1.VERIFICATION OF COMPLIANCE

Applicant	Unimax Communications
Address	18201 McDurmott St. West Suite E, Irvine, CA 92614
Manufacturer	Shenzhen TENSEN Industrial Co., Ltd.
Address	4th Floor, Yufeng Building, Jinhai Road No.6-9, Xixiang Street, Bao'an District, Shenzhen
Product Designation	Smartphone
Brand Name	SURGE
Test Model	VOLT_5XL
Date of test	May 17, 2018~Jun. 20, 2018
Deviation	None
Condition of Test Sample	Normal

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance(Shenzhen) Co., Ltd. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI/TIA-603-E-2016. The sample tested as described in this report is in compliance with the FCC Rules Part 22H and 24E.

The test results of this report relate only to the tested sample identified in this report.

Tested By	Donjon Huang(Huang Dongyang)	Jun. 20, 2018
Reviewed By	Bart Xie(Xie Xiaobin)	Jun. 20, 2018
Approved By	Forrest Lei(Lei Yonggang) Authorized Officer	Jun. 20, 2018

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2. GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	Smartphone
Hardware version:	A969-37-MB-V2.0
Software version:	VOLT_5XL_V1.0
Frequency Bands:	☒GSM 850 ☒PCS1900 (U.S. Bands) ☒GSM 900 ☒DCS 1800 (Non-U.S. Bands) ☒UMTS FDD Band II ☒UMTS FDD Band IV ☒UMTS FDD Band V (U.S. Bands) ☐UMTS FDD Band I ☐UMTS FDD Band VIII (Non-U.S. Bands)
Antenna Type	PIFA Antenna
Type of Modulation	GSM / GPRS : GMSK EGPRS: GMSK/8PSK WCDMA : QPSK
Antenna gain(GSM):	GSM850: -0.9dBi; PCS1900: -0.3dBi; Band II: -0.3dBi; Band IV: -0.7dBi; Band V: -0.9dBi
Power Supply:	DC 3.8V by battery
Battery parameter:	DC3.8V/2000mAh
Dual SIM Card	GSM/WCDMA/LTE Card Slot
GPRS Class	12
Extreme Vol. Limits:	DC3.4 V to 4.35V (Normal: DC3.8V)
Extreme Temp. Tolerance	-10℃ to +50℃
*** Note: 1. The High Voltage DC4.35V and Low Voltage DC3.4V were declared by manufacturer 2. The EUT couldn't be operating normally with higher or lower voltage.	

***** Note:**1.The maximum power levels are GSM for MCS-4: GMSK link, and RMC 12.2kbps mode for WCDMA band V, WCDMA band IV, WCDMA II only these modes were used for all tests.

2. We found out the test mode with the highest power level after we analyze all the data rates. So we chose worst case as a representative.

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GSM/WCDMA Card1 Slot:

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
GSM 850	30.28	32.33	31.60
PCS 1900	27.21	29.36	28.74
UMTS BAND V	21.67	23.73	21.70
UMTS BAND IV	21.32	23.64	21.92
UMTS BAND II	21.58	23.35	21.69

GSM/WCDMA Card2 Slot:

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
GSM 850	30.26	32.3	31.55
PCS 1900	27.17	29.45	28.63

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2.2RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID:P46-VOLT5XL**, filing to comply with the FCC Part 22H&24E requirements.

2.3 TEST METHODOLOGY

The radiated emission testing was performed according to the procedures of ANSI/TIA-603-E-2016 and KDB 971168 D01 Power Means License Digital Systems v03R01.

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2.4 TEST FACILITY

Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2F., Bldg.2, No.1-4, ChaxiSanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District B112-B113, Bldg.12, BaoanBldg Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen 518012
NVLAP LAB CODE	600153-0
Designation Number	CN5028
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by National Voluntary Laboratory Accreditation program, NVLAP Code 600153-0

ALL TEST EQUIPMENT LIST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Jun.20, 2017	Jun.19, 2018
TEST RECEIVER	R&S	ESPI	101206	Jun.12, 2018	Jun.11, 2019
LISN	R&S	ESH2-Z5	100086	Aug.21, 2017	Aug.20, 2018
TEST RECEIVER	R&S	ESCI	10096	Jun.20, 2017	Jun.19, 2018
TEST RECEIVER	R&S	ESCI	10096	Jun.12, 2018	Jun.11, 2019
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec.08, 2017	Dec.07, 2018
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep.20, 2017	Sep.19, 2018
preamplifier	ChengYi	EMC184045SE	980508	Sep.15, 2017	Sep.14, 2018
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May.18, 2017	May.17, 2019
Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-205	Jun.20, 2017	Jun.19, 2018
Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-205	Jun.12, 2018	Jun.11, 2019
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep.28, 2017	Sep.27, 2018
SIGNAL ANALYZER	Agilent	N9020A	MY52090123	Sep. 21, 2017	Sep. 20, 2018
USB Wideband Power Sensor	Agilent	U2021XA	MY54110007	Sep. 21, 2017	Sep. 20, 2018
Universal Radio Communication Tester	R&S	CMU200	120237	Mar.01,2018	Feb.28,2019
Universal Radio Communication Tester	Agilent	8960	GB46200384	July 16,2017	July 15,2018

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Power Splitter	Agilent	11636A	34	Sep.21,2017	Sep.20,2018
Attenuator	JFW	50FHC-006-50	N/A	June 20, 2017	June 19, 2018
Attenuator	JFW	50FHC-006-50	N/A	Jun.12, 2018	Jun.11, 2019
LOOP ANTENNA	A.H	SAS-562B	/	Mar.01,2018	Feb.28, 2019

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2.6 SPECIAL ACCESSORIES

The battery wassupplied by the applicant were used as accessories and being tested with EUT intended for FCC grant together.

2.7 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

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3. SYSTEM TEST CONFIGURATION

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The Transmitter was operated in the maximum output power mode through Communication Tester. The TX frequency was fixed which was for the purpose of the measurements.

3.3 CONFIGURATION OF EUT SYSTEM

Fig. 2-1 Configuration of EUT System

Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Remark
1	Smartphone	VOLT_5XL	P46-VOLT5XL	EUT
2	Adapter	VOLT_5XL	DC 5.0V 1500mA	Accessory
3	Battery	VOLT_5XL	DC3.8V/ 2000mAh	Accessory
4	USB Cable	N/A	N/A	Accessory
5	Earphone	N/A	N/A	Accessory

***Note: All the accessories have been used during the test. The following "EUT" in setup diagram means EUT system.

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4. SUMMARY OF TEST RESULTS

Item Number	Item Description		FCC Rules	Result
1	Conducted Output Power		2.1046	Pass
2	Radiated Output Power		22.913(a) (2)	Pass
			24.232 (c)	Pass
			27.50(d)(4)	Pass
3	Peak-to-Average Ratio	Peak-to-Average Ratio	24.232(d)	Pass
4	Spurious Emission	Conducted Band Edge/ Spurious Emission	2.1051/22.917(a)/24.238(a)/27.53(h)	Pass
		Radiated Spurious Emission	2.1053/22.917(a)/24.238(a)/27.53(h)	
5	Frequency Stability		2.1055/22.355/24.235/27.54	Pass
6	Occupied Bandwidth		2.1049	Pass

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5. DESCRIPTION OF TEST MODES

During the testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication Tester (CMU 200)to ensure max power transmission and proper modulation. Three channels (The top channel, the middle channel and the bottom channel) were chosen for testing on both GSM and PCS frequency band.

***Note:** GSM/GPRS/EGPRS 850, GSM/GPRS/EGPRS 1900, WCDMA/HSPA band II, WCDMA/HSPA band V, WCDMA/HSPA band IV mode have been tested during the test.

The worst condition was recorded in the test report if no other modes test data.

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6. OUTPUT POWER

6.1 CONDUCTED OUTPUT POWER

6.1.1 MEASUREMENT METHOD

The transmitter output port was connected to base station.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

Measure the maximum burst average power and average power for other modulation signal.

The EUT was setup for the max output power with pseudo random data modulation. Power was measured with Spectrum Analyzer. The measurements were performed on all modes(GSM/GPRS/EGPRS 850, GSM/GPRS/EGPRS 1900, WCDMA/HSPA band II,WCDMA/HSPA band V, WCDMA/HSPA band IV)at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

6.1.2 MEASUREMENT RESULT

Conducted Output Power Limits for GPRS/EDGE 850 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	33 dBm (2W)	- 2
EDGE	27 dBm(0.5W)	±2
Conducted Output Power Limits for GPRS/EDGE 1900band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	30 dBm (1W)	- 2
EDGE	26 dBm (0.4W)	±2
Conducted Output Power Limits for UMTS band II		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
WCDMA	24dBm (0.25W)	- 2
Conducted Output Power Limits for UMTS band V		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
WCDMA	24dBm (0.25W)	- 2
Conducted Output Power Limits for UMTS band IV		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
WCDMA	24dBm (0.25W)	- 2

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GSM 850:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg.Burst Power	Duty cycle Factor(dB)	Frame Power(dBm)
GSM850	824.2	33	**32.33**	-0.67	31.59	-9	22.59
	836.6	33	32.23	-0.77	31.53	-9	22.53
	848.8	33	32.3	-0.7	**31.6**	-9	22.6
GPRS850 (1 Slot)	824.2	33	32.12	-0.88	31.44	-9	22.44
	836.6	33	32.07	-0.93	31.37	-9	22.37
	848.8	33	31.98	-1.02	31.23	-9	22.23
GPRS850 (2 Slot)	824.2	30	29.35	-0.65	28.58	-6	22.58
	836.6	30	29.42	-0.58	28.74	-6	22.74
	848.8	30	29.33	-0.67	28.63	-6	22.63
GPRS850 (3 Slot)	824.2	28.23	28.01	-0.22	27.27	-4.26	23.01
	836.6	28.23	27.88	-0.35	27.19	-4.26	22.93
	848.8	28.23	27.94	-0.29	27.22	-4.26	22.96
GPRS850 (4 Slot)	824.2	27	26.11	-0.89	25.41	-3	22.41
	836.6	27	26.17	-0.83	25.47	-3	22.47
	848.8	27	26.4	-0.6	25.69	-3	22.69

Mode	Channel	Frequency (MHz)	Peak Power (dBm)	Avg.Burst Power (dBm)
EDGE (1 Slot)	128	824.2	27.08	25.07
	190	836.6	27.34	25.14
	251	848.8	27.08	25.35
EDGE (2 Slot)	128	824.2	24.32	22.09
	190	836.6	24.24	22.11
	251	848.8	24.17	22.25
EDGE (3 Slot)	128	824.2	23.51	21.29
	190	836.6	23.37	21.22
	251	848.8	23.39	21.39
EDGE (4 Slot)	128	824.2	22.22	19.34
	190	836.6	22.54	19.19
	251	848.8	22.33	19.41

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PCS 1900:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg.Burst Power	Duty cycle Factor(dB)	Frame Power(dBm)
GSM1900	1850.2	30	29.23	-0.77	28.53	-9	19.53
	1880	30	**29.36**	-0.64	28.65	-9	19.65
	1909.8	30	29.1	-0.9	28.37	-9	19.37
GPRS1900 (1 Slot)	1850.2	30	29.33	-0.67	28.59	-9	19.59
	1880	30	29.35	-0.65	**28.74**	-9	19.74
	1909.8	30	29.24	-0.76	28.5	-9	19.5
GPRS1900 (2 Slot)	1850.2	27	25.21	-1.79	24.53	-6	18.53
	1880	27	25.16	-1.84	24.42	-6	18.42
	1909.8	27	25.32	-1.68	24.58	-6	18.58
GPRS1900 (3 Slot)	1850.2	25.23	24.12	-1.11	23.39	-4.26	19.13
	1880	25.23	24.29	-0.94	23.55	-4.26	19.29
	1909.8	25.23	24.2	-1.03	23.52	-4.26	19.26
GPRS1900 (4 Slot)	1850.2	24	23.26	-0.74	22.58	-3	19.58
	1880	24	23.48	-0.52	22.83	-3	19.83
	1909.8	24	23.32	-0.68	22.65	-3	19.65

Mode	Channel	Frequency (MHz)	Peak Power (dBm)	Avg.Burst Power (dBm)
EDGE (1 Slot)	512	1850.2	26.54	24.17
	661	1880	26.62	24.32
	810	1909.8	26.22	24.54
EDGE (2 Slot)	512	1850.2	23.21	21.58
	661	1880	23.36	21.69
	810	1909.8	23.51	21.72
EDGE (3 Slot)	512	1850.2	23.16	21.55
	661	1880	23.27	21.36
	810	1909.8	23.32	21.28
EDGE (4 Slot)	512	1850.2	22.48	20.27
	661	1880	22.37	20.49
	810	1909.8	22.53	20.23

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UMTS BAND V

Mode	Frequency (MHz)	Reference power	Peak Power	Tolerance	Avg.Burst Power
WCDMA850 RMC	826.4	24	23.72	-0.28	**21.7**
	836.4	24	**23.73**	-0.27	21.47
	846.6	24	23.66	-0.34	21.5
WCDMA850 AMR	826.4	24	23.12	-0.88	20.32
	836.4	24	23.23	-0.77	20.73
	846.6	24	23.13	-0.87	20.53
HSDPA Subtest 1	826.4	24	22.91	-1.09	20.61
	836.4	24	22.25	-1.75	20.39
	846.6	24	22.22	-1.78	20.91
HSDPA Subtest 2	826.4	24	22.54	-1.46	20.67
	836.4	24	22.34	-1.66	20.89
	846.6	24	22.27	-1.73	20.62
HSDPA Subtest 3	826.4	24	22.1	-1.9	20.53
	836.4	24	22.48	-1.52	20.71
	846.6	24	22.43	-1.57	20.76
HSDPA Subtest 4	826.4	24	23.67	-0.33	21.07
	836.4	24	23.66	-0.34	21.13
	846.6	24	23.27	-0.73	21.21
HSUPA Subtest 1	826.4	24	22.47	-1.53	20.46
	836.4	24	22.41	-1.59	20.87
	846.6	24	23.7	-0.3	21.64
HSUPA Subtest 2	826.4	24	22.58	-1.42	20.55
	836.4	24	22.95	-1.05	20.91
	846.6	24	22.89	-1.11	21.06
HSUPA Subtest 3	826.4	24	23.21	-0.79	20.89
	836.4	24	22.94	-1.06	21.02
	846.6	24	22.8	-1.2	20.9
HSUPA Subtest 4	826.4	24	22.79	-1.21	20.74
	836.4	24	22.56	-1.44	20.62
	846.6	24	22.8	-1.2	20.77
HSUPA Subtest 5	826.4	24	22.98	-1.02	20.66
	836.4	24	22.84	-1.16	20.77
	846.6	24	22.89	-1.11	20.79

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UMTS BAND IV

Mode	Frequency (MHz)	Reference power	Peak Power	Tolerance	Avg.Burst Power
WCDMA 1700 RMC	1712.4	24	**23.64**	-0.36	21.82
	1732.6	24	23.61	-0.39	21.89
	1752.6	24	23.58	-0.42	**21.92**
WCDMA 1700 AMR	1712.4	24	23.04	-0.96	20.74
	1732.6	24	23.15	-0.85	21.15
	1752.6	24	23.05	-0.95	20.95
HSDPA Subtest 1	1712.4	24	22.83	-1.17	20.03
	1732.6	24	22.17	-1.83	20.81
	1752.6	24	22.14	-1.86	20.33
HSDPA Subtest 2	1712.4	24	22.46	-1.54	20.09
	1732.6	24	22.26	-1.74	20.31
	1752.6	24	22.19	-1.81	20.04
HSDPA Subtest 3	1712.4	24	22.02	-1.98	20.95
	1732.6	24	22.4	-1.6	20.13
	1752.6	24	22.35	-1.65	21.18
HSDPA Subtest 4	1712.4	24	23.59	-0.41	21.49
	1732.6	24	23.58	-0.42	21.55
	1752.6	24	23.19	-0.81	21.63
HSUPA Subtest 1	1712.4	24	22.39	-1.61	21.88
	1732.6	24	22.33	-1.67	20.29
	1752.6	24	23.62	-0.38	21.06
HSUPA Subtest 2	1712.4	24	22.5	-1.5	20.97
	1732.6	24	22.87	-1.13	20.33
	1752.6	24	22.81	-1.19	20.48
HSUPA Subtest 3	1712.4	24	23.13	-0.87	21.31
	1732.6	24	22.86	-1.14	20.44
	1752.6	24	22.72	-1.28	20.32
HSUPA Subtest 4	1712.4	24	22.71	-1.29	20.16
	1732.6	24	22.48	-1.52	20.04
	1752.6	24	22.72	-1.28	20.19
HSUPA Subtest 5	1712.4	24	22.9	-1.1	20.08
	1732.6	24	22.76	-1.24	20.19
	1752.6	24	22.81	-1.19	20.21

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UMTS BAND II

Mode	Frequency (MHz)	Reference power	Peak Power	Tolerance	Avg.Burst Power
WCDMA1900 RMC	1852.4	24	23.29	-0.71	20.89
	1880	24	23.31	-0.69	21.66
	1907.6	24	**23.35**	-0.65	**21.69**
WCDMA1900 AMR	1852.4	24	22.81	-1.19	20.51
	1880	24	22.92	-1.08	20.92
	1907.6	24	22.82	-1.18	20.72
HSDPA Subtest 1	1852.4	24	22.6	-1.4	19.8
	1880	24	21.94	-2.06	20.58
	1907.6	24	21.91	-2.09	20.1
HSDPA Subtest 2	1852.4	24	22.23	-1.77	19.86
	1880	24	22.03	-1.97	20.08
	1907.6	24	21.96	-2.04	19.81
HSDPA Subtest 3	1852.4	24	21.79	-2.21	20.72
	1880	24	22.17	-1.83	19.9
	1907.6	24	22.12	-1.88	20.95
HSDPA Subtest 4	1852.4	24	22.36	-1.64	21.26
	1880	24	22.35	-1.65	21.32
	1907.6	24	22.96	-1.04	21.4
HSUPA Subtest 1	1852.4	24	22.16	-1.84	21.65
	1880	24	22.1	-1.9	20.06
	1907.6	24	22.39	-1.61	20.83
HSUPA Subtest 2	1852.4	24	22.27	-1.73	20.74
	1880	24	22.64	-1.36	20.1
	1907.6	24	22.58	-1.42	20.25
HSUPA Subtest 3	1852.4	24	22.9	-1.1	21.08
	1880	24	22.63	-1.37	20.21
	1907.6	24	22.49	-1.51	20.09
HSUPA Subtest 4	1852.4	24	22.48	-1.52	19.93
	1880	24	22.25	-1.75	19.81
	1907.6	24	22.49	-1.51	19.96
HSUPA Subtest 5	1852.4	24	22.67	-1.33	19.85
	1880	24	22.53	-1.47	19.96
	1907.6	24	22.58	-1.42	19.98

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According to 3GPP 25.101 sub-clause 6.2.2 , the maximum output power is allowed to be reduced by following the table.

Table 6.1aA: UE maximum output power with HS-DPCCH and E-DCH

UE Transmit Channel Configuration	CM(db)	MPR(db)
For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH	0≤ CM≤3.5	MAX(CM-1,0)
Note: CM=1 for β_c/β_d=12/15,β_{hs}/β_c=24/15.For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present the beta gains on those channels are reduced firsts to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done .However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a compensate for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

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6.2 RADIATED OUTPUT POWER

6.2.1 MEASUREMENT METHOD

The measurements procedures specified in ANSI/TIA-603-E-2016wereapplied.

1. Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signal operating below 1GHz are performed using dipole antennas. Measurements on signals operating above 1GHz are performed using broadband horn antennas. All measurements are performed as RMS average measurements while the EUT operating at its maximum duty cycle, at maximum power, and at the approximate frequencies.
2. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
3. The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as ARpl=Pin + 2.15 - Pr. TheARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: Power=PMea+ARpl
4. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
5. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
6. The EUT is then put into continuously transmitting mode at its maximum power level.
7. Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.
8. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).
9. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi...

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6.2.2 PROVISIONS APPLICABLE

Mode	FCC Part Section(s)	Nominal Peak Power
GSM/EDGE 850	22.913(a)(2)	<=38.45dBm (7W). ERP
GSM/EDGE 1900	24.232(c)	<=33dBm (2W). EIRP
UMTS BAND II	24.232(c)	<=33dBm (2W),EIRP
UMTS BANDV	22.913(a)(2)	<=38.45dBm (7W).ERP
UMTS BAND IV	27.50(d)(4)	<=30dBm (1W). EIRP

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6.2.3 MEASUREMENT RESULT

Radiated Power (ERP) for GSM/ EDGE 850				
Mode	Frequency	Result		Conclusion
		Max. Peak ERP (dBm)	Polarization Of Max. ERP	
GSM	824.2	**30.28**	Horizontal	Pass
	836.6	30.11	Horizontal	Pass
	848.8	30.24	Horizontal	Pass
	824.2	29.25	Vertical	Pass
	836.6	29.09	Vertical	Pass
	848.8	29.22	Vertical	Pass
EDGE	824.2	29.99	Horizontal	Pass
	836.6	29.89	Horizontal	Pass
	848.8	29.9	Horizontal	Pass
	824.2	28.94	Vertical	Pass
	836.6	28.85	Vertical	Pass
	848.8	28.84	Vertical	Pass

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Radiated Power (E.I.R.P) for GSM/ EDGE 1900				
Mode	Frequency	Result		Conclusion
		Max. Peak E.I.R.P.(dBm)	Polarization Of Max. E.I.R.P.	
GSM	1850.2	27.2	Horizontal	Pass
	1880.0	27.11	Horizontal	Pass
	1909.8	27.03	Horizontal	Pass
	1850.2	26.15	Vertical	Pass
	1880.0	26.1	Vertical	Pass
	1909.8	26.03	Vertical	Pass
EDGE	1850.2	**27.21**	Horizontal	Pass
	1880.0	27.17	Horizontal	Pass
	1909.8	27.16	Horizontal	Pass
	1850.2	25.18	Vertical	Pass
	1880.0	25.15	Vertical	Pass
	1909.8	25.11	Vertical	Pass

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Radiated Power (ERP) for UMTS band V				
Mode	Frequency	Result		Conclusion
		Max. Peak ERP (dBm)	Polarization Of Max. ERP	
UMTS	826.4	**21.67**	Horizontal	Pass
	836.4	21.61	Horizontal	Pass
	846.6	21.6	Horizontal	Pass
	826.4	20.99	Vertical	Pass
	836.4	20.95	Vertical	Pass
	846.6	20.95	Vertical	Pass

Radiated Power (E.I.R.P) for UMTS band II				
Mode	Frequency	Result		Conclusion
		Max. Peak E.I.R.P (dBm)	Polarization Of Max. E.I.R.P	
UMTS	1852.4	**21.58**	Horizontal	Pass
	1880	21.52	Horizontal	Pass
	1907.6	21.55	Horizontal	Pass
	1852.4	20.81	Vertical	Pass
	1880	20.86	Vertical	Pass
	1907.6	20.84	Vertical	Pass

Radiated Power (E.I.R.P) for UMTS band IV				
Mode	Frequency	Result		Conclusion
		Max. Peak E.I.R.P (dBm)	Polarization Of Max. E.I.R.P.	
UMTS	1712.4	21.23	Horizontal	Pass
	1732.6	21.22	Horizontal	Pass
	1752.6	**21.32**	Horizontal	Pass
	1712.4	20.58	Vertical	Pass
	1732.6	20.63	Vertical	Pass
	1752.6	20.61	Vertical	Pass

Note: Above is the worst mode data.

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6.3. PEAK-TO-AVERAGE RATIO

6.3.1 MEASUREMENT METHOD

Use one of the procedures presented in 4.1 to measure the total peak power and record as PPk. Use one of the applicable procedures presented 4.2 to measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

PAPR (dB) = PPk (dBm) - PAvg (dBm).

6.3.2 PROVISIONS APPLICABLE

This is the test for the Peak-to-Average Ratio from the EUT.

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

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6.3.3 MEASUREMENT RESULT

Modes	GSM850(GSM)		
Channel	128	190	251
	(Low)	(Mid)	(High)
Frequency (MHz)	824.2	836.6	848.8
Peak-To-Average Ratio (dB)/GSM	1.02	1.11	1.14
Peak-To-Average Ratio (dB)/GRPS	0.63	0.51	0.56

Modes	PCS1900 (GSM)		
Channel	512	661	810
	(Low)	(Mid)	(High)
Frequency (MHz)	1850.2	1880	1909.8
Peak-To-Average Ratio (dB)/GSM	1.44	1.25	1.40
Peak-To-Average Ratio (dB)/GRPS	0.79	0.74	0.69

Modes	UMTS BAND V		
Channel	4132	4182	4233
	(Low)	(Mid)	(High)
Frequency (MHz)	826.4	836.4	846.6
Peak-To-Average Ratio (dB)	1.76	1.81	1.74

Modes	UMTS BAND IV		
Channel	8562	8663	8763
	(Low)	(Mid)	(High)
Frequency (MHz)	1712.4	1732.6	1752.6
Peak-To-Average Ratio (dB)	2.10	2.08	2.05

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Modes	UMTS BAND II		
Channel	9262	9400	9538
	(Low)	(Mid)	(High)
Frequency (MHz)	1852.4	1880	1907.6
Peak-To-Average Ratio (dB)	2.00	1.80	2.01

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7. OCCUPIED BANDWIDTH

7.1 MEASUREMENT METHOD

1. The Occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper Frequency limits, the mean power radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

2. RBW=1~5% of the expected OBW, VBW>=3 x RBW, Detector=Peak, Trace mode=max hold, Sweep=auto couple, and the trace was allowed to stabilize.

7.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

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7.3 MEASUREMENT RESULT

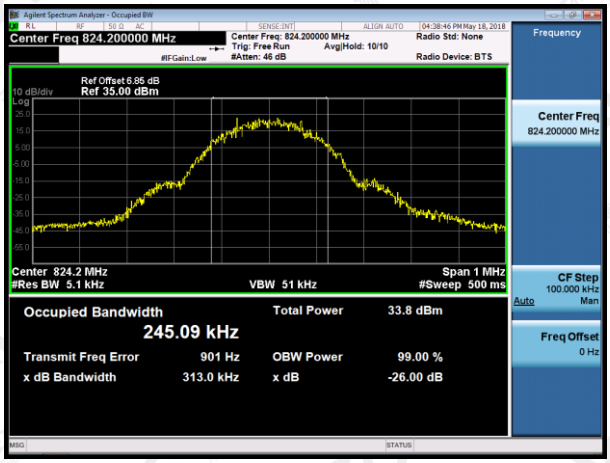
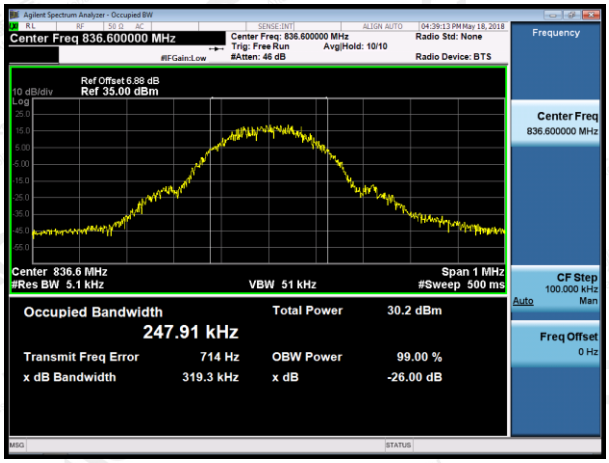
Test Results

Test Band	Test Mode	Test Channel	Occupied Bandwidth (KHZ)	Emission Bandwidth (KHZ)	Verdict
GSM850	GSM	LCH	245.1	313.0	PASS
		MCH	247.9	319.3	PASS
		HCH	246.4	312.0	PASS

Test Band	Test Mode	Test Channel	Occupied Bandwidth (KHZ)	Emission Bandwidth (KHZ)	Verdict
PCS1900	GSM	LCH	248.3	312.8	PASS
		MCH	249.1	314.6	PASS
		HCH	249.8	312.9	PASS

For GSM

Test Band=GSM850/PCS1900

GSM 850-LCH-GSM	GSM 850-MCH-GSM
	

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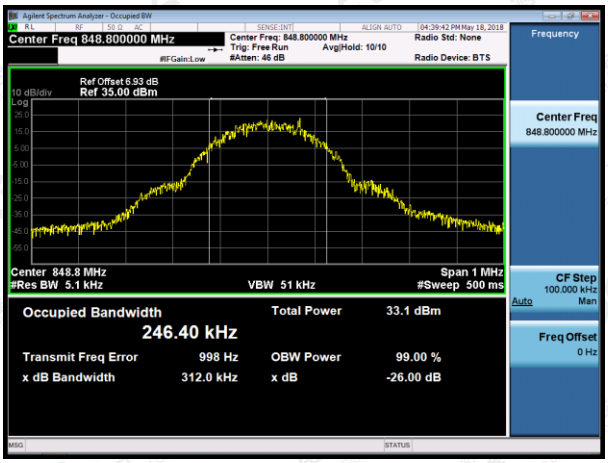
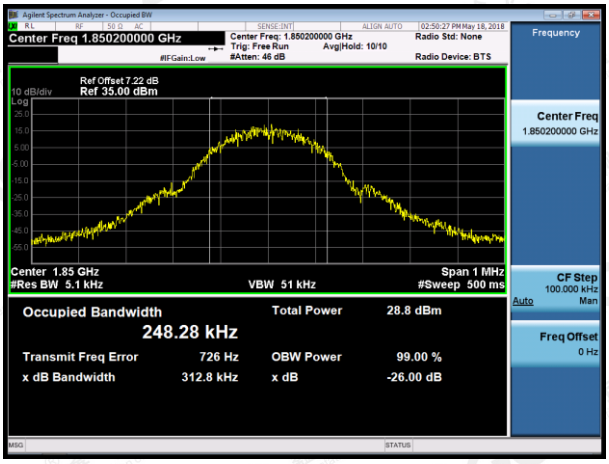
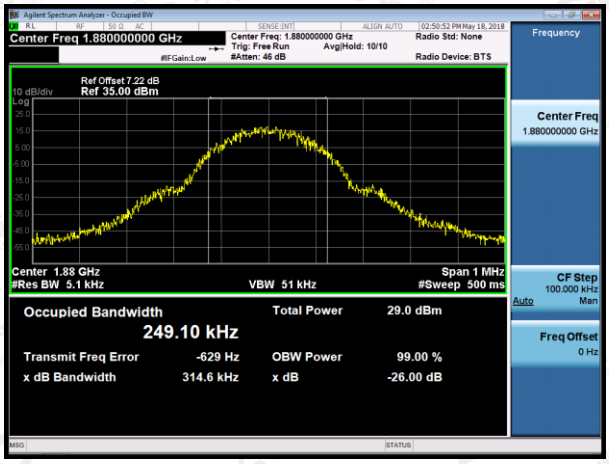
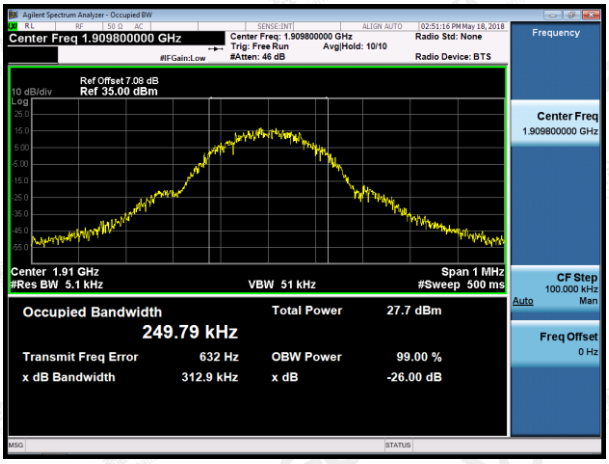
GSM 850-HCH-GSM	
	

GSM 1900-LCH-GSM	GSM 1900-MCH-GSM
	

GSM 1900-HCH-GSM	
	

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Test Band	Test Mode	Test Channel	Occupied Bandwidth (KHZ)	Emission Bandwidth (KHZ)	Verdict
WCDMA 850	UMTS	LCH	4195.0	4843	PASS
		MCH	4215.5	4875	PASS
		HCH	4186.1	4870	PASS

Test Band	Test Mode	Test Channel	Occupied Bandwidth (KHZ)	Emission Bandwidth (KHZ)	Verdict
WCDMA 1700	UMTS	LCH	4229.0	4933	PASS
		MCH	4210.6	4905	PASS
		HCH	4226.3	4935	PASS

Test Band	Test Mode	Test Channel	Occupied Bandwidth (KHZ)	Emission Bandwidth (KHZ)	Verdict
WCDMA 1900	UMTS	LCH	4231.7	4935	PASS
		MCH	4227.1	4931	PASS
		HCH	4220.2	4925	PASS

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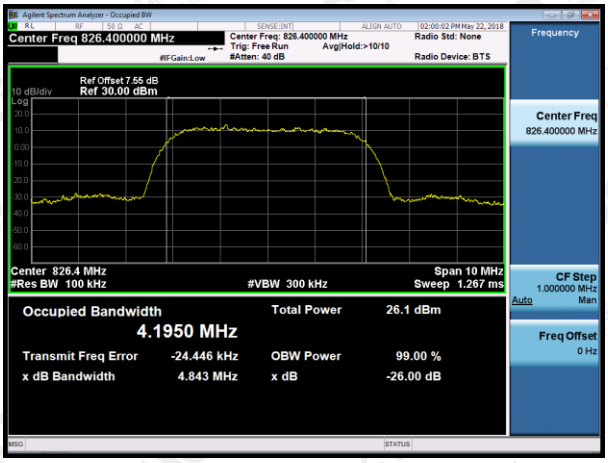
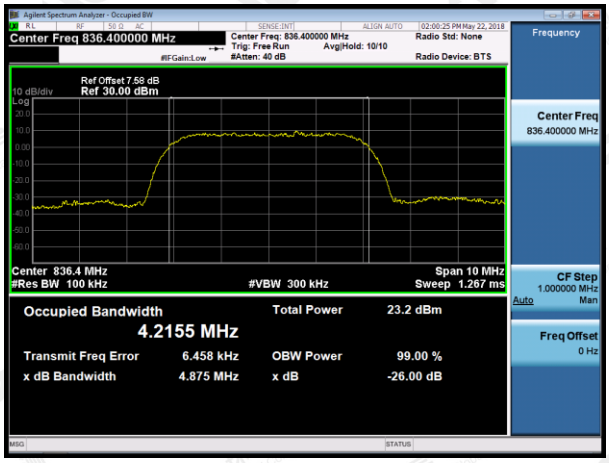
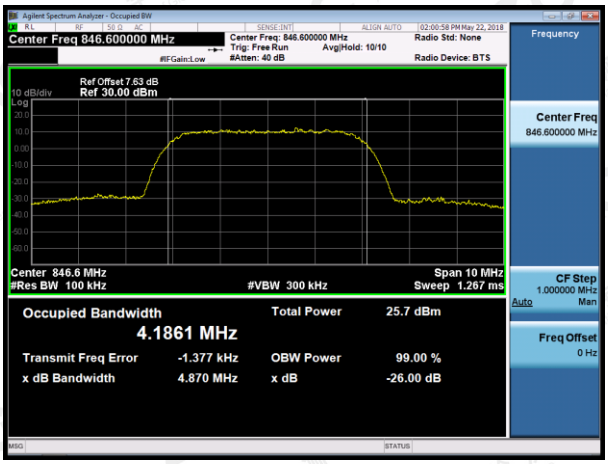
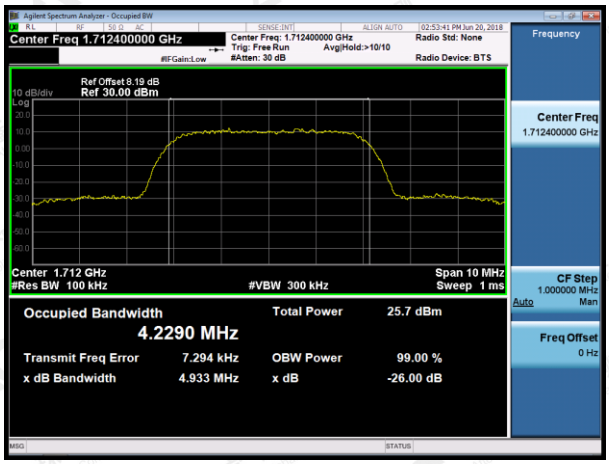
For WCDMA

Test Band=WCDMA850/WCDMA1700/WCDMA/1900

WCDMA 850-LCH	WCDMA 850-MCH
	

WCDMA 850-HCH	WCDMA 1700-LCH
	

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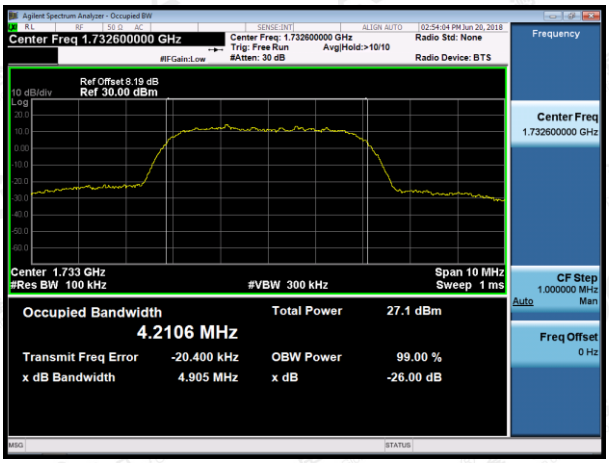
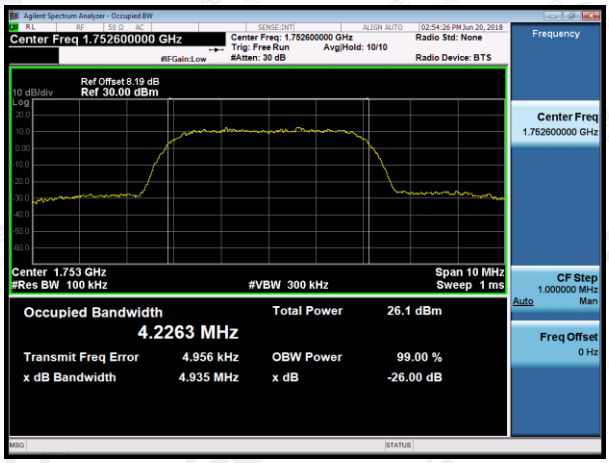
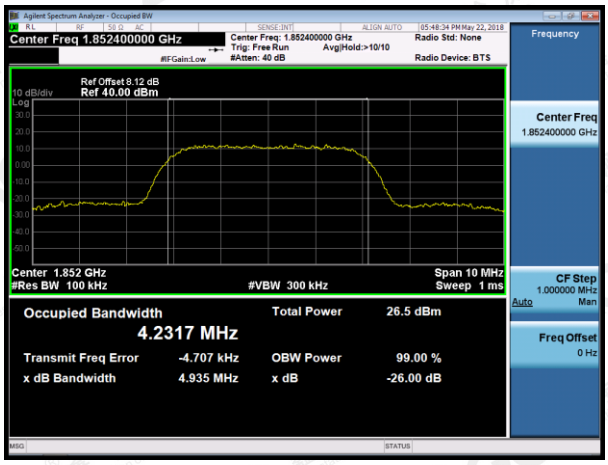
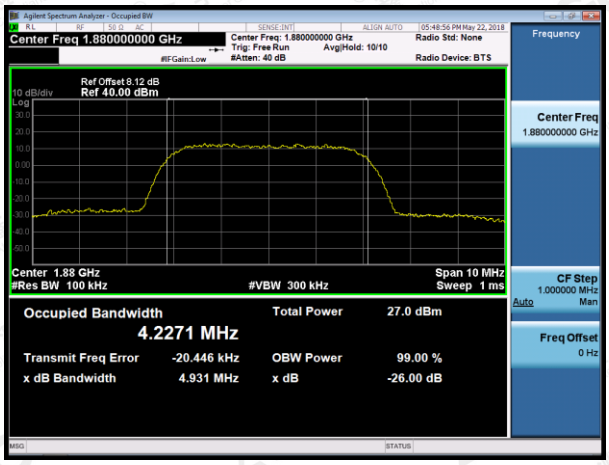
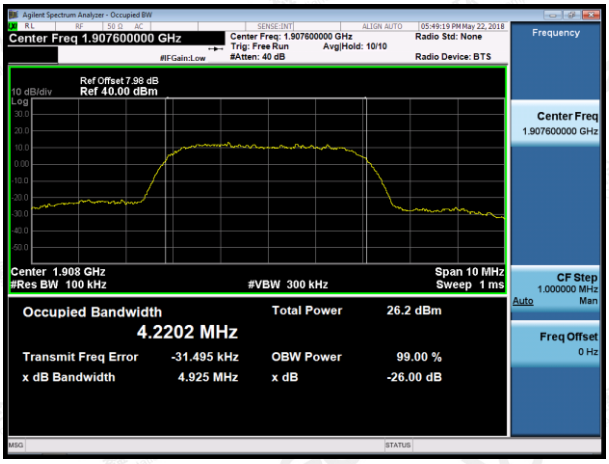
WCDMA 1700-MCH	WCDMA 1700-HCH
	

WCDMA 1900-LCH	WCDMA 1900-MCH
	

WCDMA 1900-HCH	
	

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8. BAND EDGE

8.1 MEASUREMENT METHOD

1. All out of band emissions are measured with an analyzer spectrum connected to the antenna terminal of the EUT while the EUT at its maximum duty cycle, at maximum power, and at the approximate frequencies. All data rates were investigated to determine the worst case configuration
2. The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.
3. Start and stop frequency were set such that the band edge would be placed in the center of the plot.
4. Span was set large enough so as to capture all out of band emissions near the band edge.
5. RBW>1% of the emission bandwidth, VBW >=3 x RBW, Detector=RMS, Number of points>=2 x Span/RBW, Trace mode=max hold, Sweep time=auto couple, and the trace was allowed to stabilize

8.2 PROVISIONS APPLICABLE

As Specified in FCC rules of 22.917(a) 、24.238(a)and KDB 971168 D01 V03R01.

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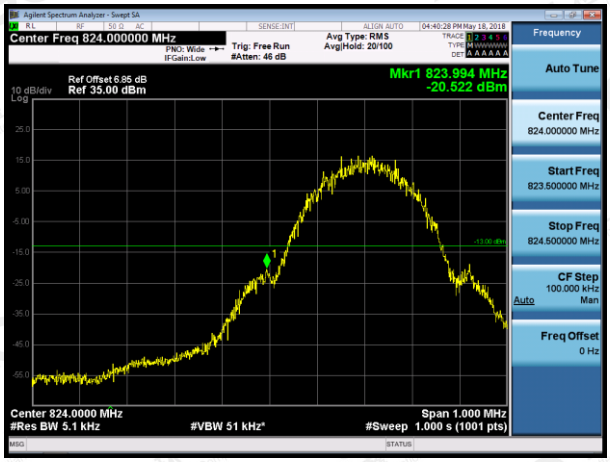
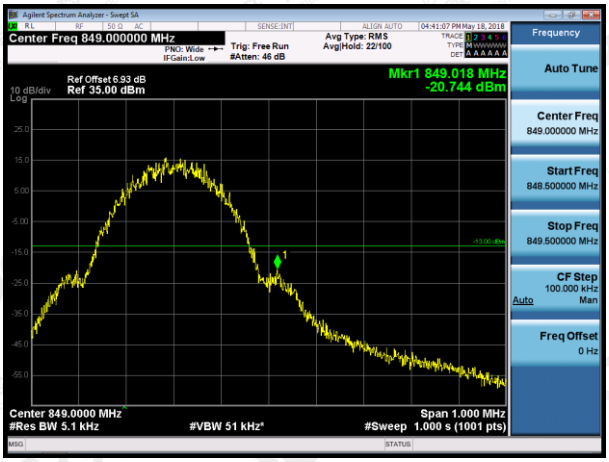
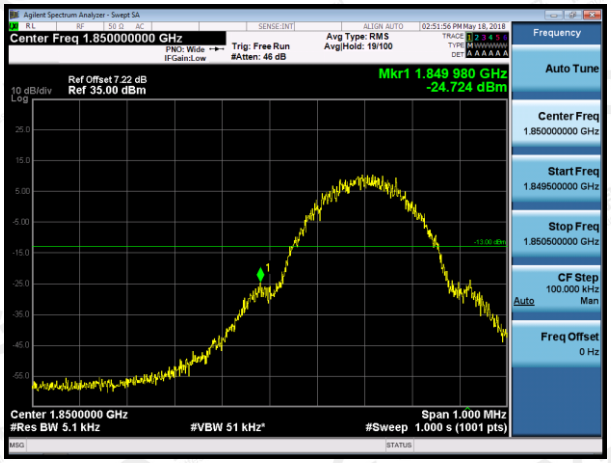
8.3 MEASUREMENT RESULT

Test Results

For GSM

Test Band=GSM850/GSM1900

GSM 850-LCH-GSM	GSM 850-HCH-GSM
	

GSM 1900-LCH-GSM	GSM 1900-HCH-GSM
	

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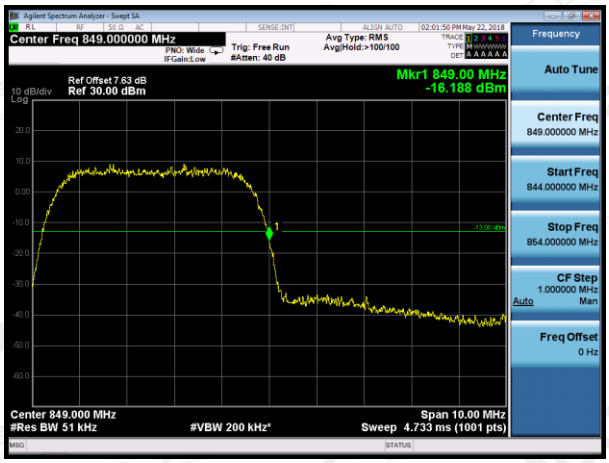
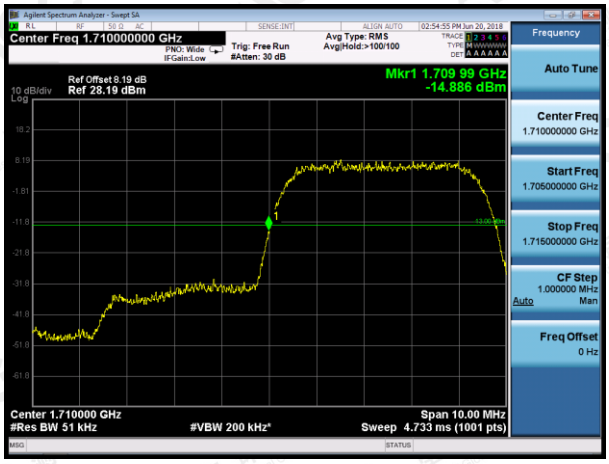
For WCDMA

Test Band=WCDMA850/WCDMA1700/WCDMA 1900

Test Mode=UMTS

WCDMA 850-LCH	WCDMA 850-HCH
	

WCDMA 1700-LCH	WCDMA 1700-HCH
	

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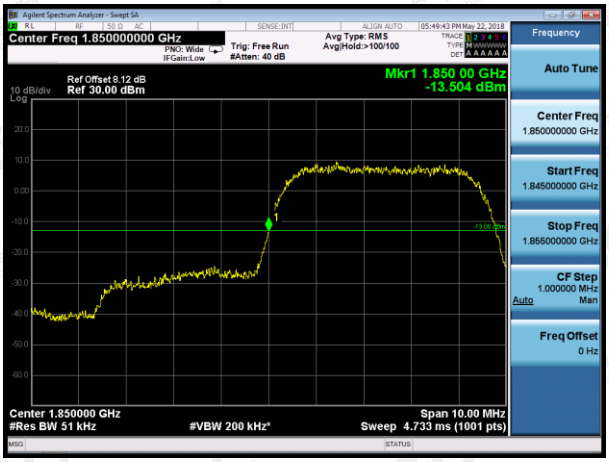
WCDMA 1900-LCH	WCDMA 1900-HCH
	

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9. SPURIOUS EMISSION

9.1 CONDUCTED SPURIOUS EMISSION

9.1.1MEASUREMENT METHOD

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. The level of the carrier and the various conducted spurious and harmonic frequency is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the approximate frequencies. All data rates were investigated to determine the worst case configuration.

2. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM850, data taken from 30 MHz to 9 GHz.

3. Determine EUT transmit frequencies: the following typical channels were chosen to conducted emissions testing.

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Typical Channels for testing of GSM 850	
Channel	Frequency (MHz)
128	824.2
190	836.6
251	848.8

Typical Channels for testing of PCS 1900	
Channel	Frequency (MHz)
512	1850.2
661	1880.0
810	1909.8

Typical Channels for testing of UMTS band V	
Channel	Frequency (MHz)
4132	826.4
4182	836.4
4233	846.6

Typical Channels for testing of UMTS band IV	
Channel	Frequency (MHz)
8562	1712.4
8663	1732.6
8763	1752.6

Typical Channels for testing of UMTS band II	
Channel	Frequency (MHz)
9262	1852.4
9400	1880
9538	1907.6

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9.1.2 PROVISIONS APPLICABLE

On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

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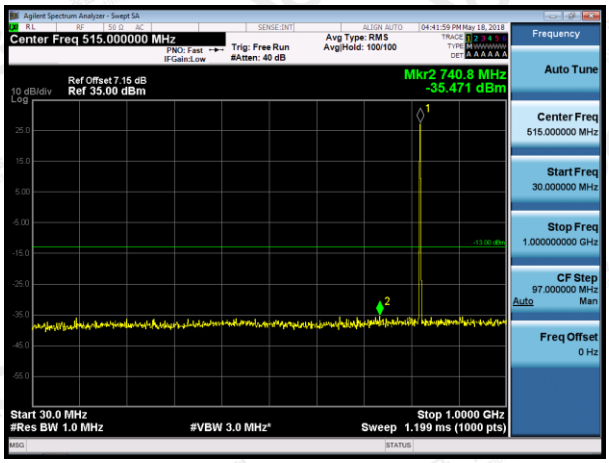
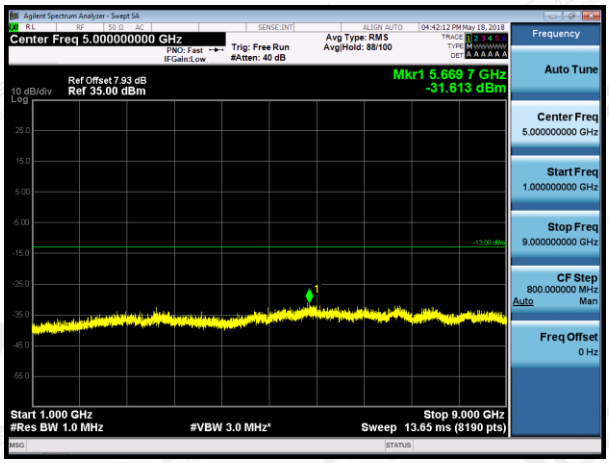
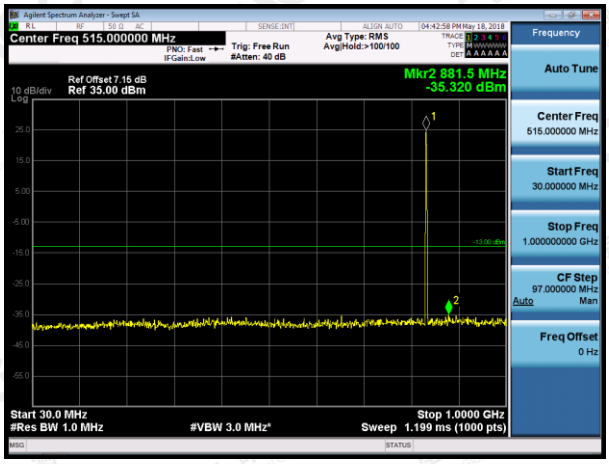
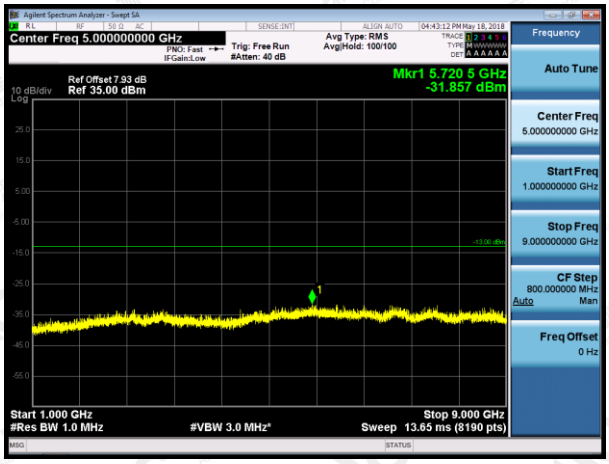
9.1.3MEASUREMENT RESULT

Test Results

Test Band=GSM850/GSM1900

GSM 850-LCH-GSM	GSM 850-LCH-GSM
	

GSM 850-MCH-GSM	GSM 850-MCH-GSM
	

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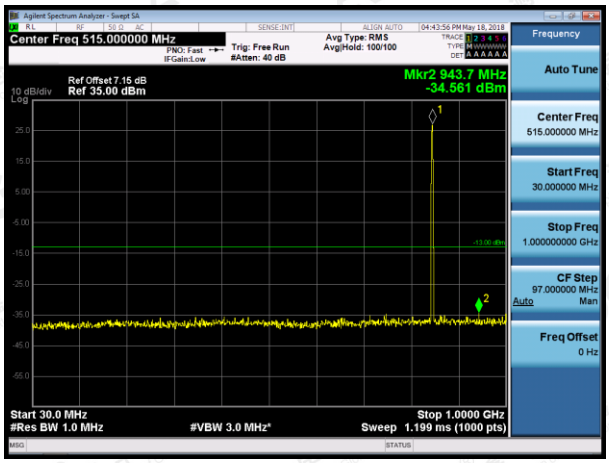
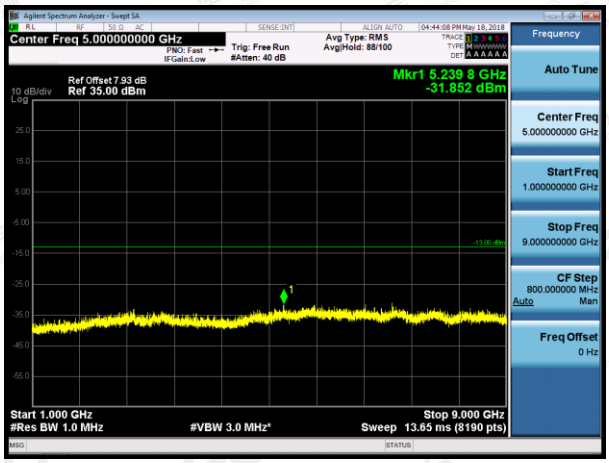
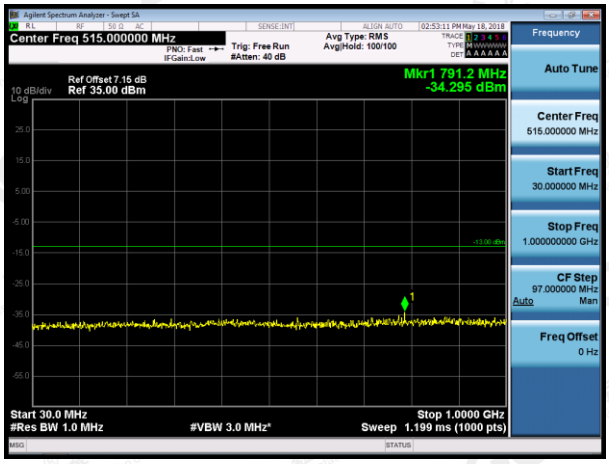
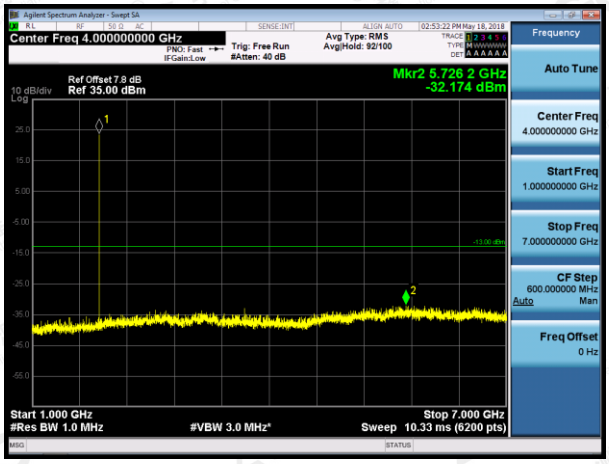
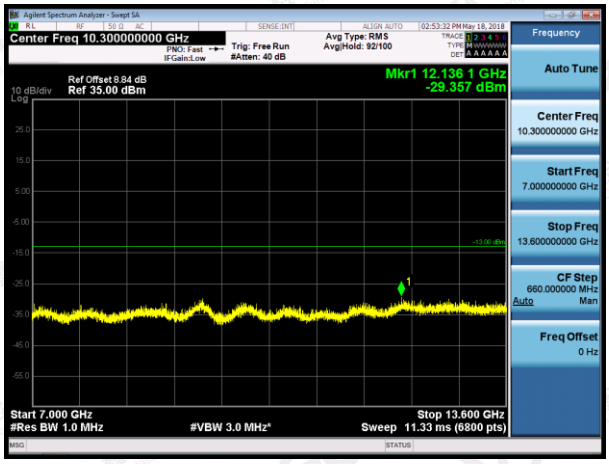
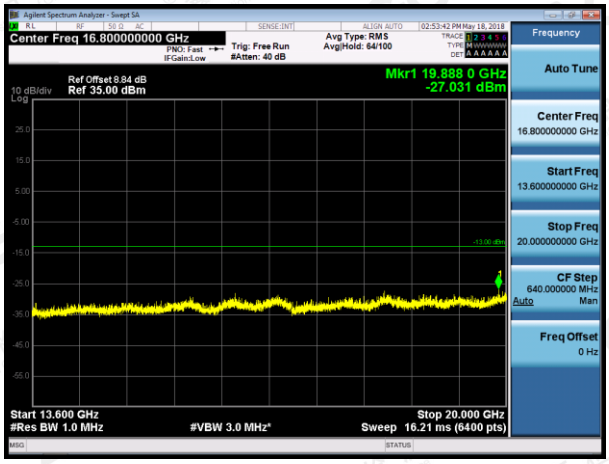
GSM 850-HCH-GSM	GSM 850-HCH-GSM
	

GSM 1900-LCH-GSM	GSM 1900-LCH-GSM
	

GSM 1900-LCH-GSM	GSM 1900-LCH-GSM
	

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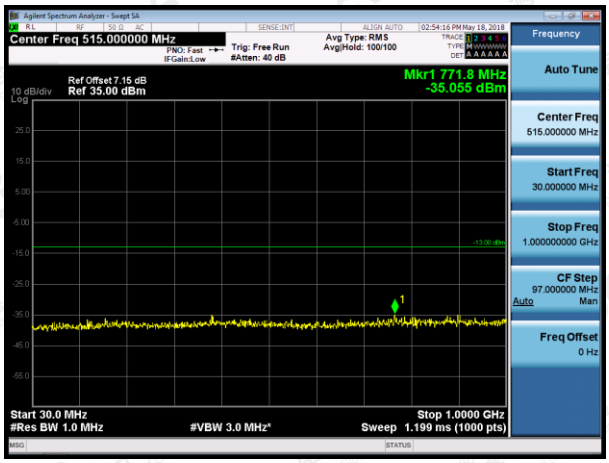
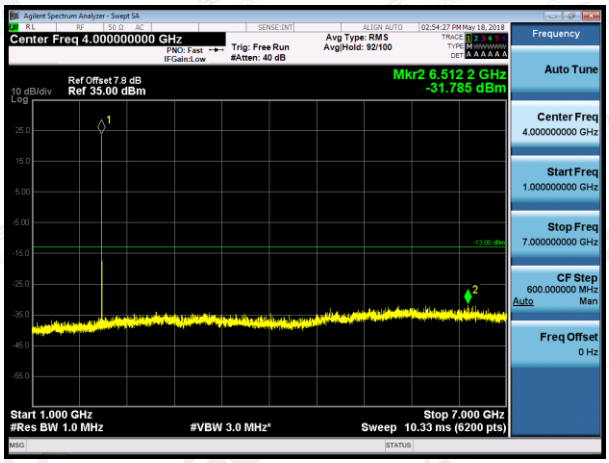
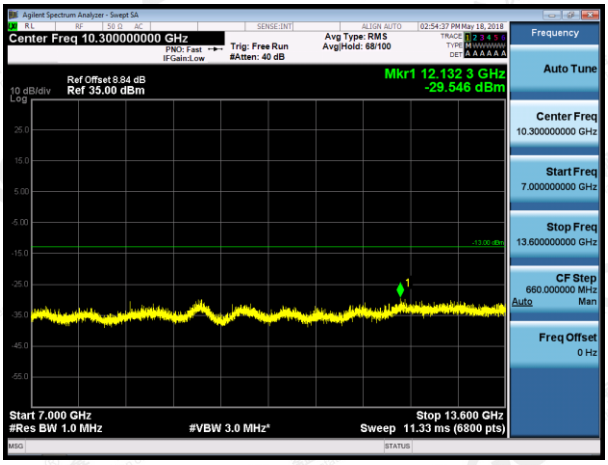
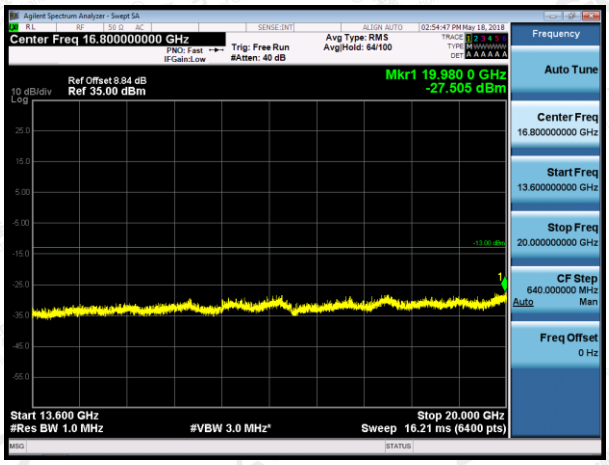
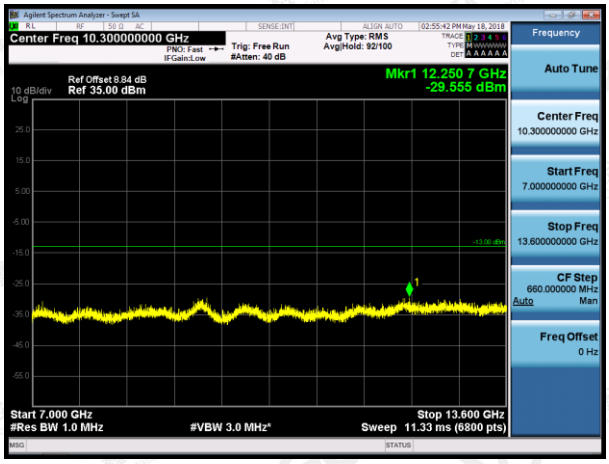
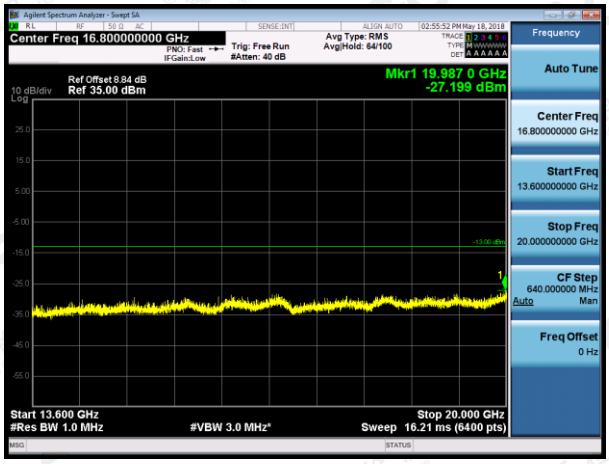
GSM 1900-MCH-GSM	GSM 1900-MCH-GSM
	

GSM 1900-MCH-GSM	GSM 1900-MCH-GSM
	

GSM 1900-HCH-GSM	GSM 1900-HCH-GSM
	

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