2.4 Frequency Stability

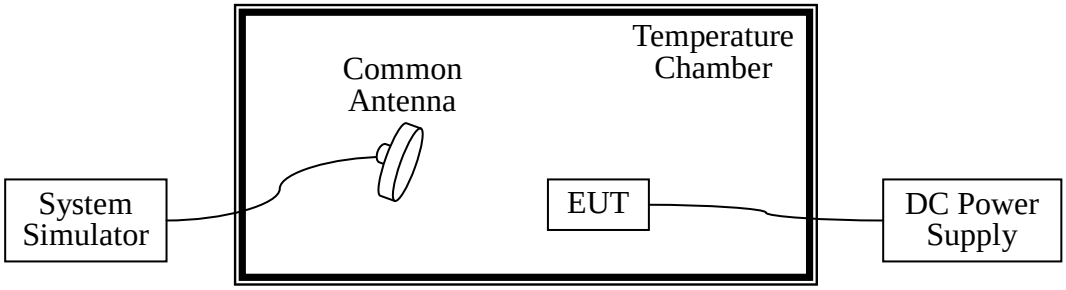
2.4.1 Requirement

According to FCC section 22.355 and FCC section 24.235 and IC RSS-GEN section 4.5 the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

(a) The temperature is varied from -30°C to +50°C at intervals of not more than 10°C.
(b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

2.4.2 Test Description

1. Test Setup:



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS via a Common Antenna.

2. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB43130131	2014.02.26	2015.02.25
DC Power Supply	Good Will	GPS-3030DD	EF920938	2014.02.26	2015.02.25
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)	2014.02.26	2015.02.25

2.4.3 Test Verdict

The nominal, highest and lowest extreme voltages are separately 3.7VDC, 4.2VDC and 3.4VDC, which are specified by the applicant; the normal temperature here used is 25°C. The frequency deviation limit of

850MHz band is ±2.5ppm, and 1900MHz is ±1ppm, 1700MHz ±1ppm.

1. GSM 850MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 128 (824.2MHz)		Channel = 190 (836.6MHz)		Channel = 251 (848.8MHz)		
		Hz	Limits	Hz	Limits	Hz	Limits	
3.7	-30	-24.45	±2060.5	22.12	±2091.5	16.87	±2122	PASS
	-20	27.31		12.43		-15.02		
	-10	-2.25		-17.46		15.16		
	0	30.26		32.14		5.05		
	+10	21.79		-24.93		3.02		
	+20	-19.56		-17.19		10.76		
	+30	34.36		19.36		-16.53		
	+40	42.63		19.64		-2.13		
	+55	35.28		23.27		-12.89		
4.2	+25	-15.73		29.05		-7.55		
3.4	+25	-17.75		37.73		7.78		

2. GSM 1900MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 512 (1850.2MHz)		Channel = 661 (1880.0MHz)		Channel = 810 (1909.8MHz)		
		Hz	Limits	Hz	Limits	Hz	Limits	
3.7	-30	18.21	±1850.2	21.78	±1880.0	32.75	±1909.8	PASS
	-20	37.08		-20.48		-18.88		
	-10	-2.05		-13.76		-16.88		
	0	40.06		-18.38		19.32		
	+10	1.98		-21.61		25.31		
	+20	-19.76		15.52		30.26		
	+30	39.76		-0.78		-29.21		
	+40	46.66		33.37		19.33		
	+55	39.88		24.02		-19.37		
4.2	+25	37.88		23.72		27.09		
3.4	+25	-7.69		15.92		19.99		

3. EDGE 850MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 128 (824.2MHz)		Channel = 190 (836.6MHz)		Channel = 251 (848.8MHz)		
		Hz	Limits	Hz	Limits	Hz	Limits	
3.7	-30	-32.12	±2060.5	26.12	±2091.5	6.22	±2122	PASS
	-20	36.98		13.73		-13.80		
	-10	-3.25		-18.35		12.06		
	0	41.06		38.10		5.05		
	+10	1.99		-22.06		3.02		
	+20	-19.86		-16.11		10.76		
	+30	39.56		17.76		-16.51		
	+40	46.62		15.54		-2.11		
	+55	39.98		3.57		-12.89		
4.2	+25	-15.71		14.05		-7.83		
3.4	+25	-17.02		6.93		6.98		

4. EDGE 1900MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 512 (1850.2MHz)		Channel = 661 (1880.0MHz)		Channel = 810 (1909.8MHz)		
		Hz	Limits	Hz	Limits	Hz	Limits	
3.7	-30	-12.87	±1850.2	25.22	±1880.0	2.57	±1909.8	PASS
	-20	1.72		7.63		-13.76		
	-10	1.75		-25.78		-13.21		
	0	2.57		-1.36		13.23		
	+10	-10.78		-17.98		5.23		
	+20	-2.11		-21.61		35.16		
	+30	14.03		14.58		-26.88		
	+40	5.43		-0.78		19.34		
	+55	-2.46		37.07		-16.77		
4.2	+25	18.02		4.08		26.59		
3.4	+25	-7.29		14.13		19.03		

5. WCDMA 850MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 4123 (826.4MHz)		Channel = 4175 (835MHz)		Channel = 4233 (846.6MHz)		
		Hz	Limit	Hz	Limit	Hz	Limit	
3.7	-30	19.22	±2066	12.27	±2087.5	-1.20	±2116.5	PASS
	-20	-7.52		-0.62		-18.48		
	-10	-3.43		22.45		7.67		
	0	16.47		13.25		4.32		
	+10	30.18		1.31		-17.33		
	+20	32.07		-12.22		11.90		
	+30	-7.98		30.62		6.63		
	+40	26.31		13.45		28.93		
	+55	12.10		-12.42		19.76		
4.2	+25	-6.87		30.82		23.89		
3.4	+25	18.66		-17.80		-18.60		

6. WCDMA 1900MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 9262 (1852.4MHz)		Channel = 9400 (1880.0MHz)		Channel = 9538 (1907.6MHz)		
		Hz	Limits	Hz	Limits	Hz	Limits	
3.7	-30	-4.22	±1852.4	-12.67	±1880.0	-7.29	±1907.6	PASS
	-20	19.35		13.28		25.60		
	-10	5.35		-14.36		15.11		
	0	18.92		18.59		-3.17		
	+10	31.40		21.39		18.12		
	+20	13.55		37.27		-10.39		
	+30	1.31		2.37		17.47		
	+40	-12.52		-13.47		27.84		
	+55	-13.65		-5.81		-2.53		
4.2	+25	23.23		14.68		21.05		
3.4	+25	23.12		26.37		-25.22		

7. HSDPA 850MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 4123 (826.4MHz)		Channel = 4175 (835MHz)		Channel = 4233 (846.6MHz)		
		Hz	Limit	Hz	Limit	Hz	Limit	
3.7	-30	27.46	±2066	-24.07	±2087.5	17.11	±2116.5	PASS
	-20	-8.66		-14.06		14.41		
	-10	20.85		36.23		21.57		
	0	12.78		-8.41		-24.37		
	+10	-14.75		-13.95		-13.96		
	+20	8.78		-24.37		35.23		
	+30	-1.49		12.88		-8.31		
	+40	17.14		-14.75		-13.95		
	+55	-23.61		23.37		25.37		
4.2	+25	32.03		7.93		7.98		
3.4	+25	17.11		-31.21		1.98		

8. HSDPA 1900MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 9262 (1852.4MHz)		Channel = 9400 (1880.0MHz)		Channel = 9538 (1907.6MHz)		
		Hz	Limits	Hz	Limits	Hz	Limits	
3.7	-30	12.57	±1852.4	-351	±1880	2.51	±1907.6	PASS
	-20	-16.05		22.71		-8.48		
	-10	20.42		15.37		-14.02		
	0	-3.11		-12.21		-9.01		
	+10	21.71		10.60		5.64		
	+20	20.12		-4.81		-3.85		
	+30	-15.01		34.31		9.57		
	+40	22.71		8.46		27.54		
	+55	16.42		-24.88		-12.42		
4.2	+25	-11.25		29.53		-2.83		
3.4	+25	10.53		-2.47		15.52		

9. HSUPA 850MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 4123 (826.4MHz)		Channel = 4175 (835MHz)		Channel = 4233 (846.6MHz)		
		Hz	Limit	Hz	Limit	Hz	Limit	
3.7	-30	27.52	±2066	15.51	±2087.5	15.75	±2116.5	PASS
	-20	-15.40		-19.43		27.52		
	-10	-12.71		-12.79		37.71		
	0	-14.09		-0.44		-7.32		
	+10	-0.37		0.01		-4.91		
	+20	-11.85		-6.64		21.35		
	+30	29.57		24.25		-5.94		
	+40	-11.89		9.73		13.78		
	+55	-0.45		24.76		28.55		
4.2	+25	1.78		-4.67		29.31		
3.4	+25	1.65		6.65		-7.60		

10. HSUPA 1900MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 9262 (1852.4MHz)		Channel = 9400 (1880.0MHz)		Channel = 9538 (1907.6MHz)		
		Hz	Limits	Hz	Limits	Hz	Limits	
3.7	-30	32.57	±1852.4	-12.79	±1880	7.29	±1907.6	PASS
	-20	28.13		-0.84		2.11		
	-10	7.82		0.11		-4.85		
	0	2.41		14.82		17.08		
	+10	-4.73		-15.25		-1.86		
	+20	16.22		-11.79		23.52		
	+30	-1.55		-0.44		-0.48		
	+40	24.16		1.25		-12.05		
	+55	14.79		-7.84		-5.81		
4.2	+25	-8.08		6.71		25.38		
3.4	+25	23.78		-1.73		-15.88		

11. HSPA+ 850MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 4123 (826.4MHz)		Channel = 4175 (835MHz)		Channel = 4233 (846.6MHz)		
		Hz	Limit	Hz	Limit	Hz	Limit	
3.7	-30	27.22	±2066	13.51	±2087.5	12.45	±2116.5	PASS
	-20	-14.40		-19.43		27.52		
	-10	-12.71		-12.79		37.71		
	0	-14.09		-0.44		-7.32		
	+10	-0.37		0.01		-4.91		
	+20	-11.85		-6.64		21.35		
	+30	29.57		24.25		-5.94		
	+40	-11.89		9.73		13.78		
	+55	-0.45		24.76		28.55		
4.2	+25	1.78		-4.67		29.31		
3.4	+25	1.45		6.75		-7.90		

12. HSPA+ 1900MHz Band

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 9262 (1852.4MHz)		Channel = 9400 (1880.0MHz)		Channel = 9538 (1907.6MHz)		
		Hz	Limits	Hz	Limits	Hz	Limits	
3.7	-30	31.67	±1852.4	-12.29	±1880	7.29	±1907.6	PASS
	-20	28.13		-0.84		2.11		
	-10	7.82		0.11		-4.85		
	0	2.41		14.82		17.08		
	+10	-4.73		-15.25		-1.86		
	+20	16.22		-11.79		23.52		
	+30	-1.55		-0.44		-0.48		
	+40	24.16		1.25		-12.05		
	+55	14.79		-7.84		-5.81		
4.2	+25	-8.08		6.71		25.38		
3.4	+25	23.38		-1.33		-15.38		

2.5 Conducted Out of Band Emissions

2.5.1 Requirement

According to FCC section 22.917(a) and FCC section 24.238(a) and IC RSS-GEN section 4.7 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43+10*log(P)dB. This calculated to be -13dBm.

2.5.2 Test Description

See section 2.1.2 of this report.

2.5.3 Test Result

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

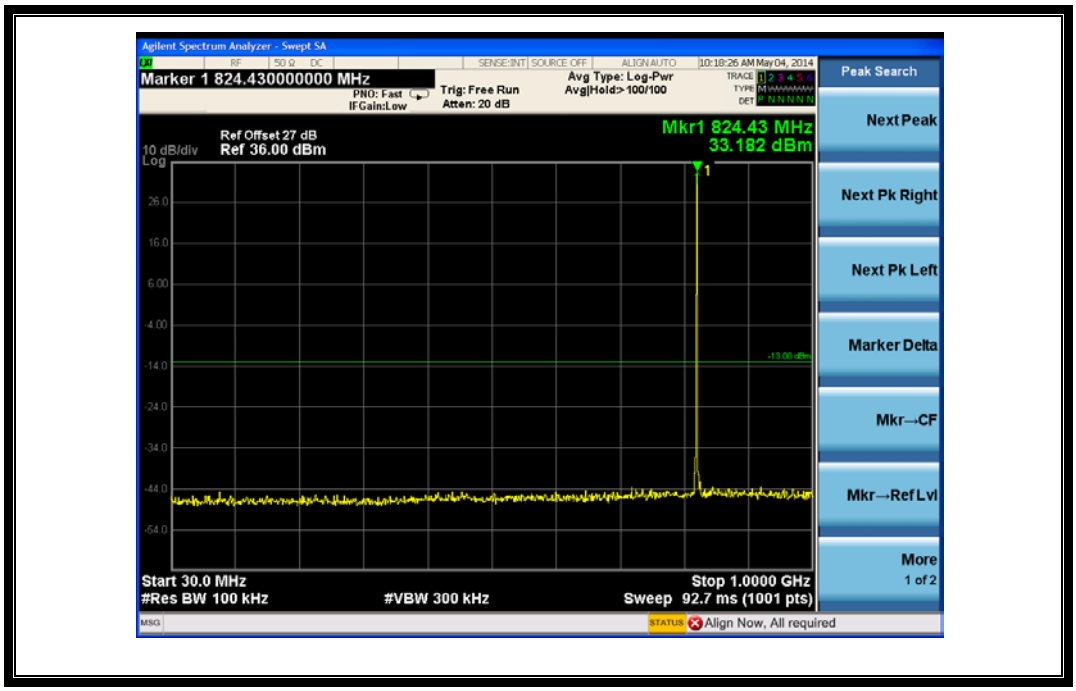
1. Test Verdict:

Band	Channel	Frequency (MHz)	Measured Max. Spurious Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
GSM 850MHz	128	824.2	<-25	Plot A1toA1.1	-13	PASS
	190	836.6	<-25	Plot A2toA2.1		PASS
	251	848.8	<-25	Plot A3toA3.1		PASS
GSM 1900MHz	512	1850.2	<-25	Plot B1toB1.1	-13	PASS
	661	1880.0	<-25	Plot B2toB2.1		PASS
	810	1909.8	-20.02	Plot B3toB3.1		PASS
EDGE 850MHz	128	824.2	<-25	Plot C1toC1.1	-13	PASS
	190	836.6	<-25	Plot C2toC2.1		PASS
	251	848.8	<-25	Plot C3toC3.1		PASS
EDGE 1900MHz	512	1850.2	<-25	Plot D1toD1.1	-13	PASS
	661	1880.0	<-25	Plot D2toD2.1		PASS
	810	1909.8	<-25	Plot D3toD3.1		PASS
WCDMA 850MHz	4132	826.4	<-25	Plot E1toE1.1	-13	PASS
	4175	835	<-25	Plot E2toE2.1		PASS
	4233	846.6	-24.853	Plot E3toE3.1		PASS
WCDMA 1900MHz	9262	1852.4	<-25	Plot F1toF1.1	-13	PASS
	9400	1880	<-25	Plot F2toF2.1		PASS
	9538	1907.6	<-25	Plot F3toF3.1		PASS
HSDPA	4132	826.4	<-25	Plot G1toG1.1	-13	PASS

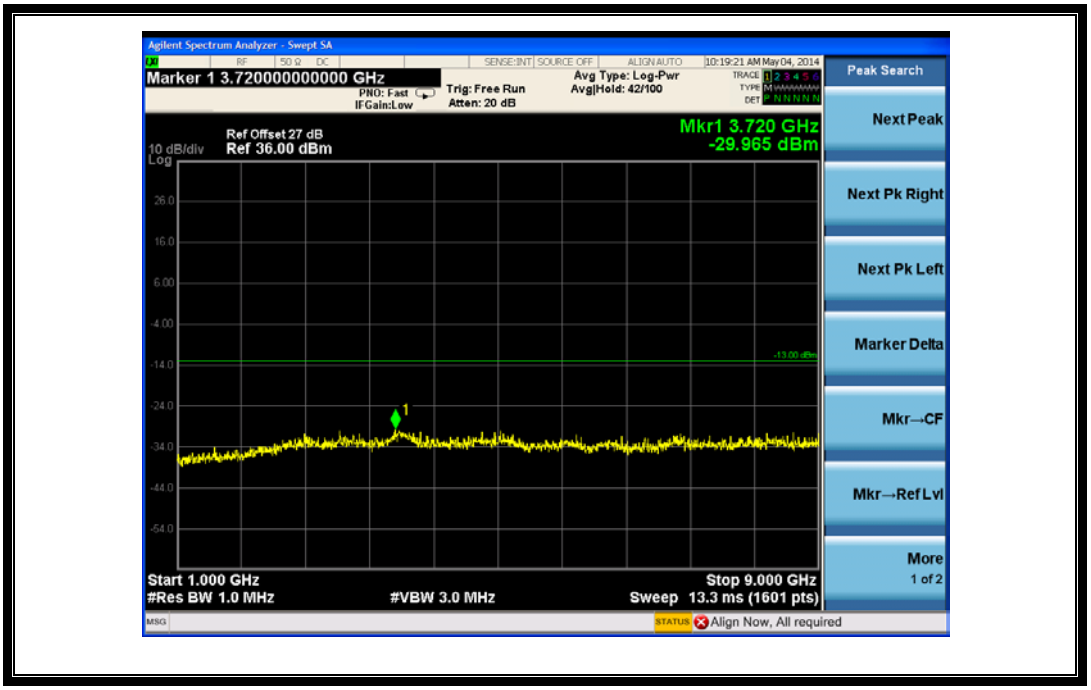
Band	Channel	Frequency (MHz)	Measured Max. Spurious Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
850MHz	4175	835	<-25	Plot G2toG2.1		PASS
	4233	846.6	-24.946	Plot G3toG3.1		PASS
HSDPA 1900MHz	9262	1852.4	<-25	Plot H1toH1.1	-13	PASS
	9400	1880	<-25	Plot H2toH2.1		PASS
	9538	1907.6	<-25	Plot H3toH3.1		PASS
HSUPA 850MHz	4132	826.4	<-25	Plot I1toI1.1	-13	PASS
	4175	835	<-25	Plot I2toI2.1		PASS
	4233	846.6	-24.108	Plot I3toI3.1		PASS
HSUPA 1900MHz	9262	1852.4	<-25	Plot J1toJ1.1	-13	PASS
	9400	1880	<-25	Plot J2toJ2.1		PASS
	9538	1907.6	<-25	Plot J3toJ3.1		PASS
HSPA+ 850MHz	4132	826.4	<-25	Plot K1toK1.1	-13	PASS
	4175	835	<-25	Plot K2toK2.1		PASS
	4233	846.6	-23.928	Plot K3toK3.1		PASS
HSPA+ 1900MHz	9262	1852.4	<-25	Plot L1toL1.1	-13	PASS
	9400	1880	<-25	Plot L2toL2.1		PASS
	9538	1907.6	<-25	Plot L3toL3.1		PASS

2. Test Plots for the Whole Measurement Frequency Range:

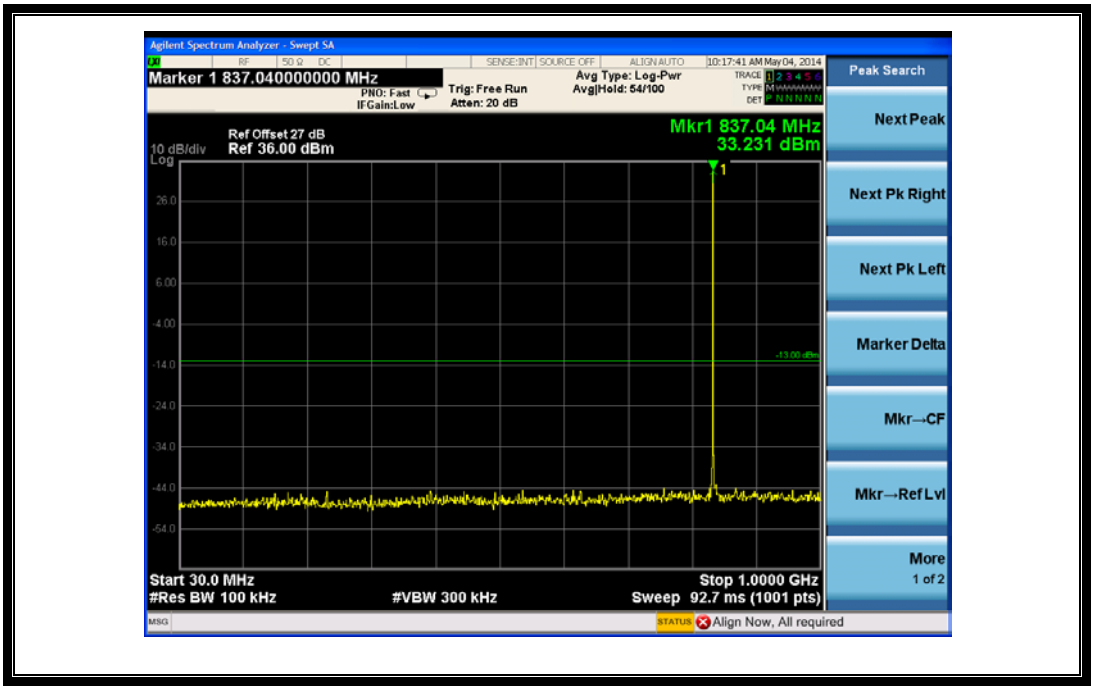
Note: the power of the EUT transmitting frequency should be ignored.



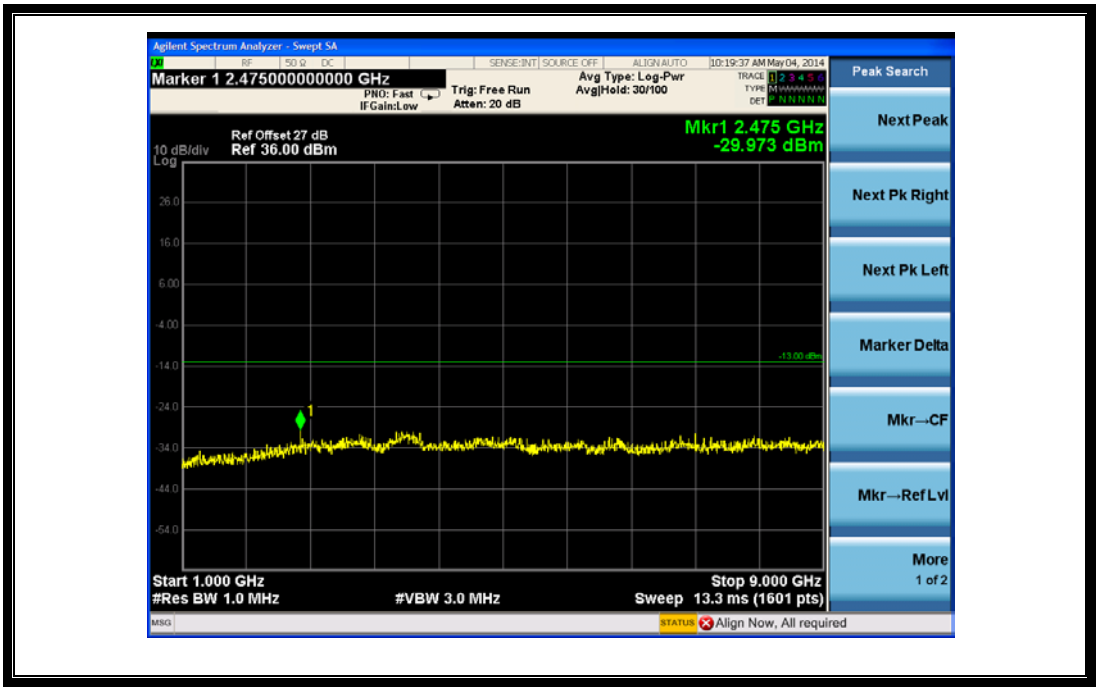
(Plot A1:GSM 850MHz Channel = 128, 30MHz to 1GHz)



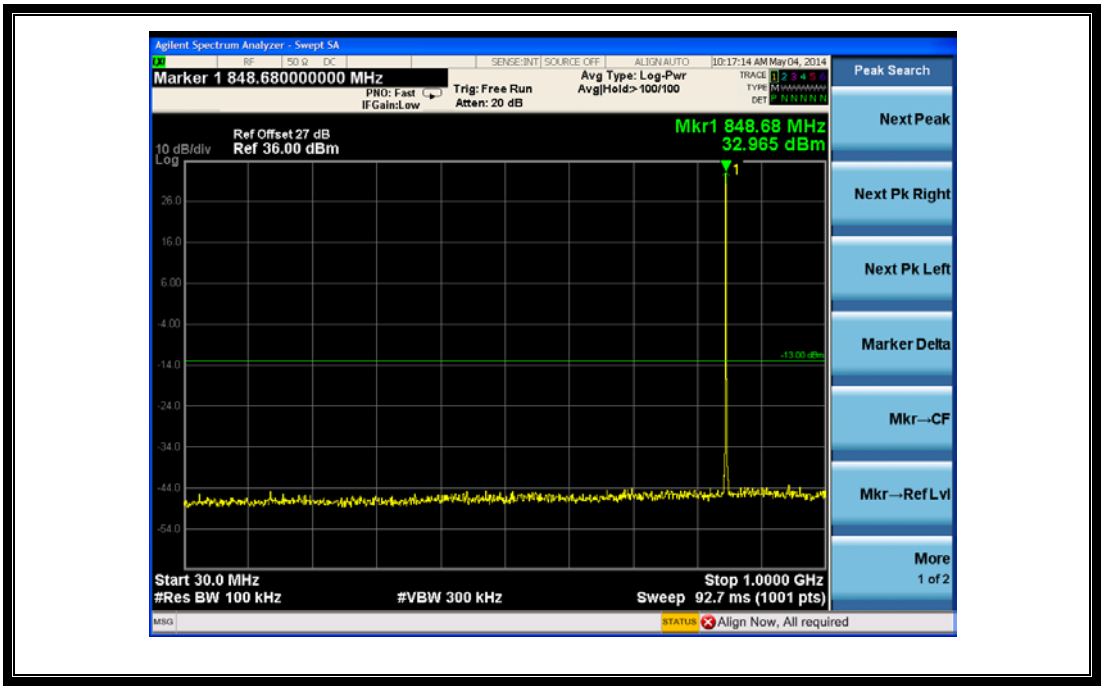
(Plot A1.1: GSM 850MHz Channel = 128, 1GHz to 9GHz)



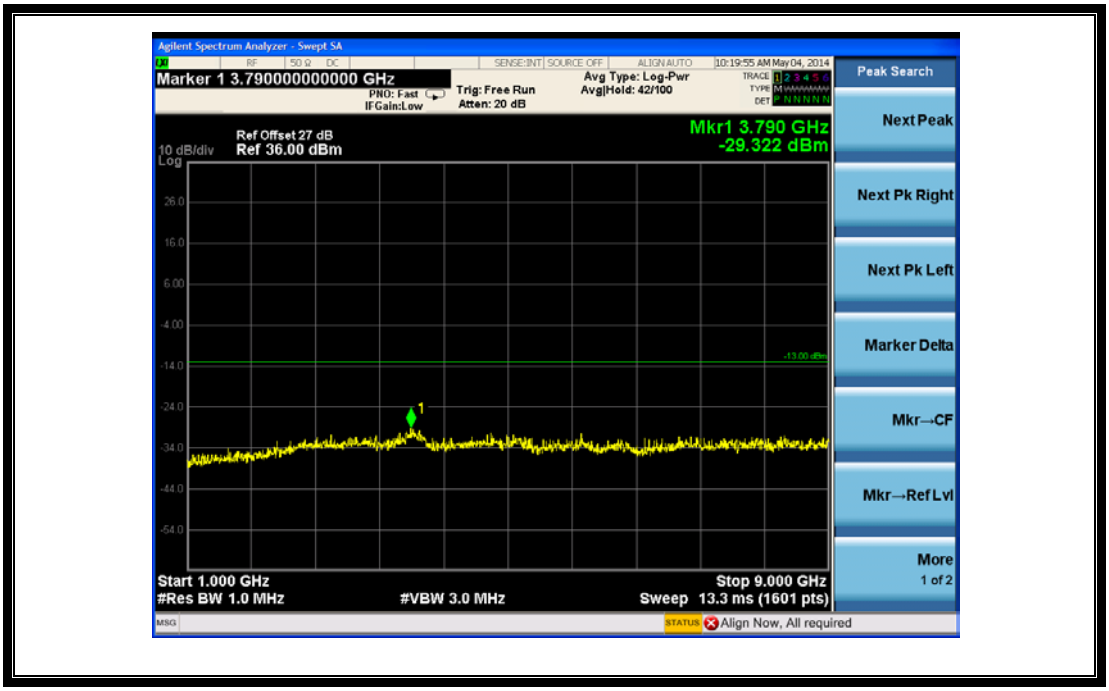
(Plot A2:GSM 850MHz Channel = 190, 30MHz to 1GHz)



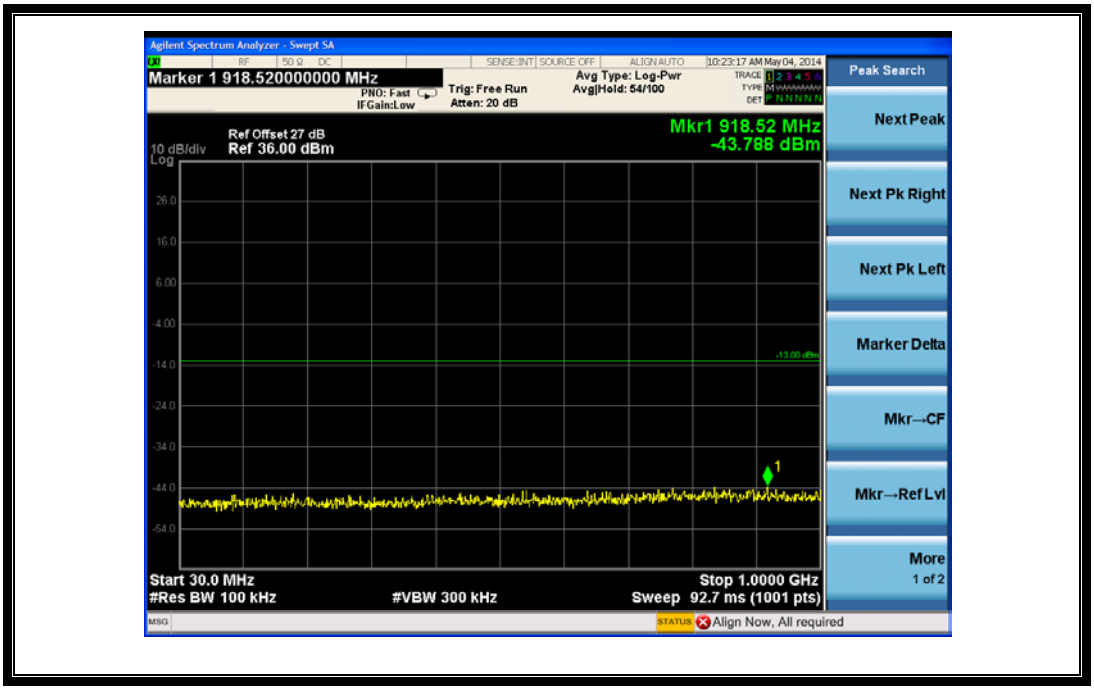
(Plot A2.1: GSM 850MHz Channel = 190, 1GHz to 9GHz)



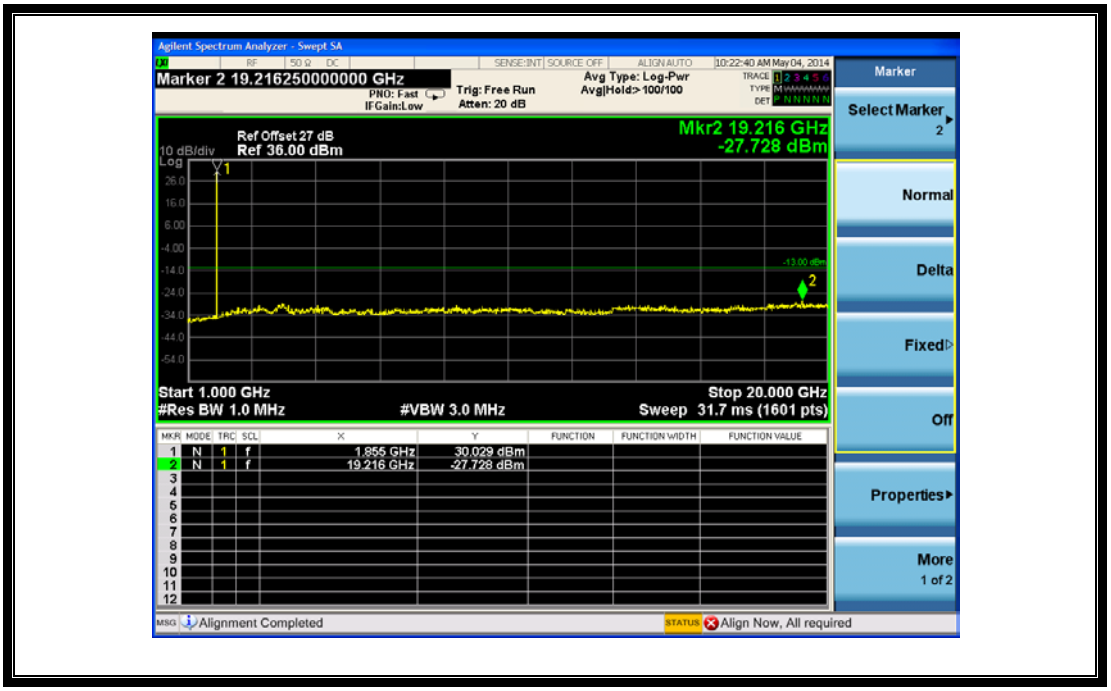
(Plot A3:GSM 850MHz Channel = 251, 30MHz to 1GHz)



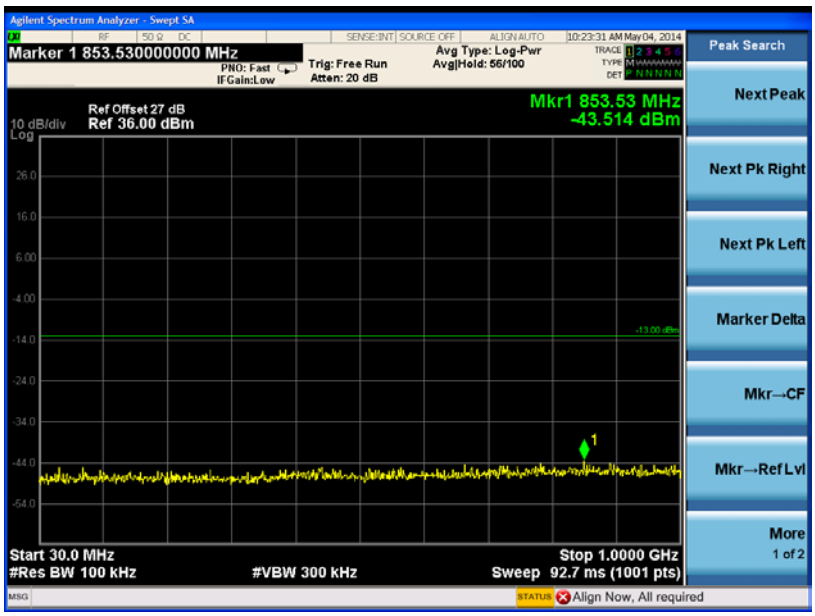
(Plot A3.1: GSM 850MHz Channel = 251, 1GHz to 9GHz)



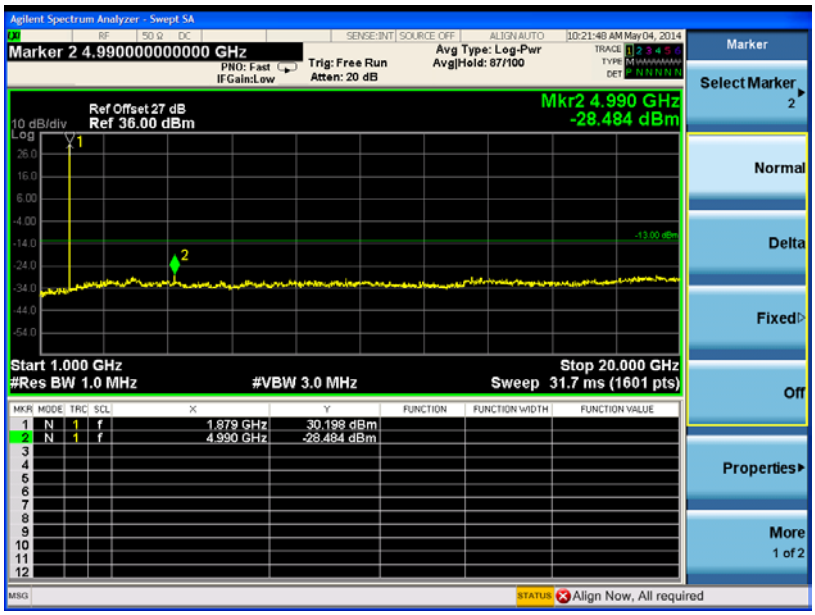
(Plot B1: GSM 1900MHz Channel = 512, 30MHz to 1GHz)



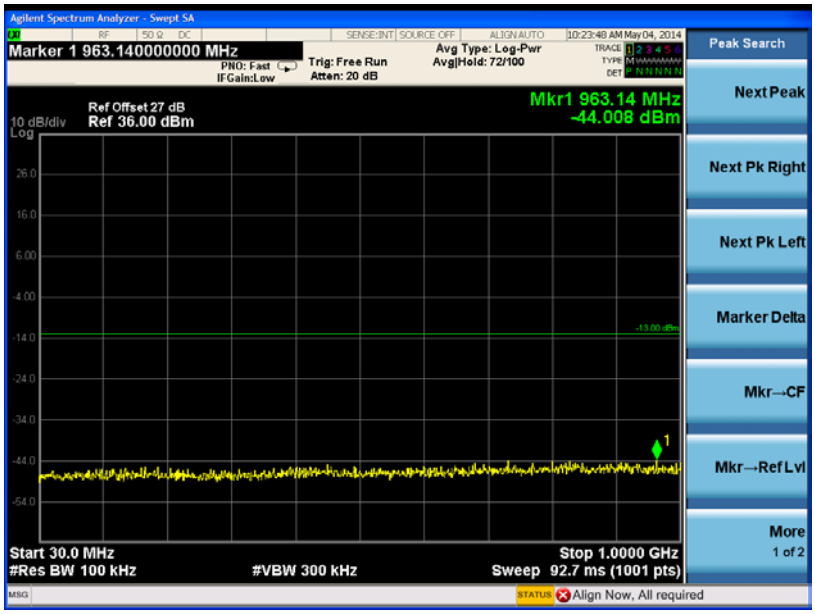
(Plot B1.1: GSM 1900MHz Channel = 512, 1GHz to 20GHz)



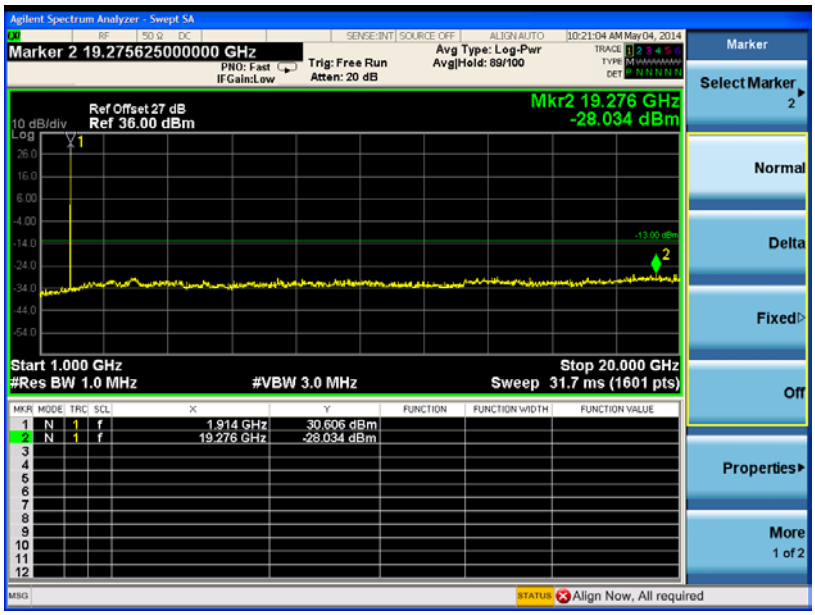
(Plot B2: GSM 1900MHz Channel = 661, 30MHz to 1GHz)



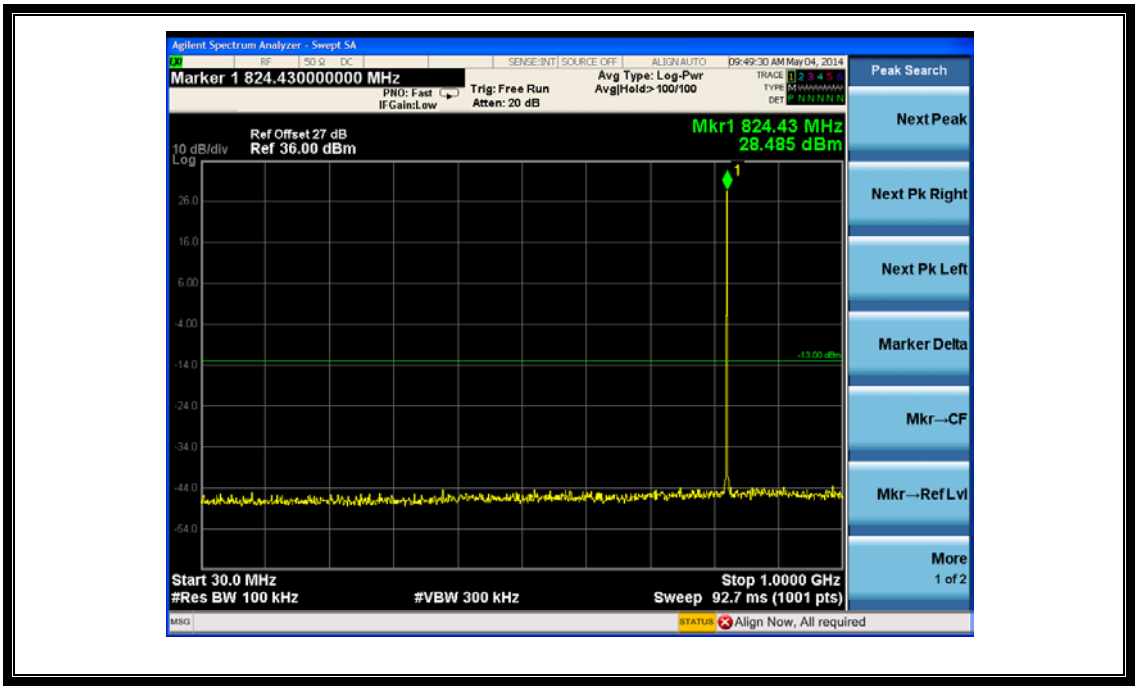
(Plot B2.1: GSM 1900MHz Channel = 661, 1GHz to 20GHz)



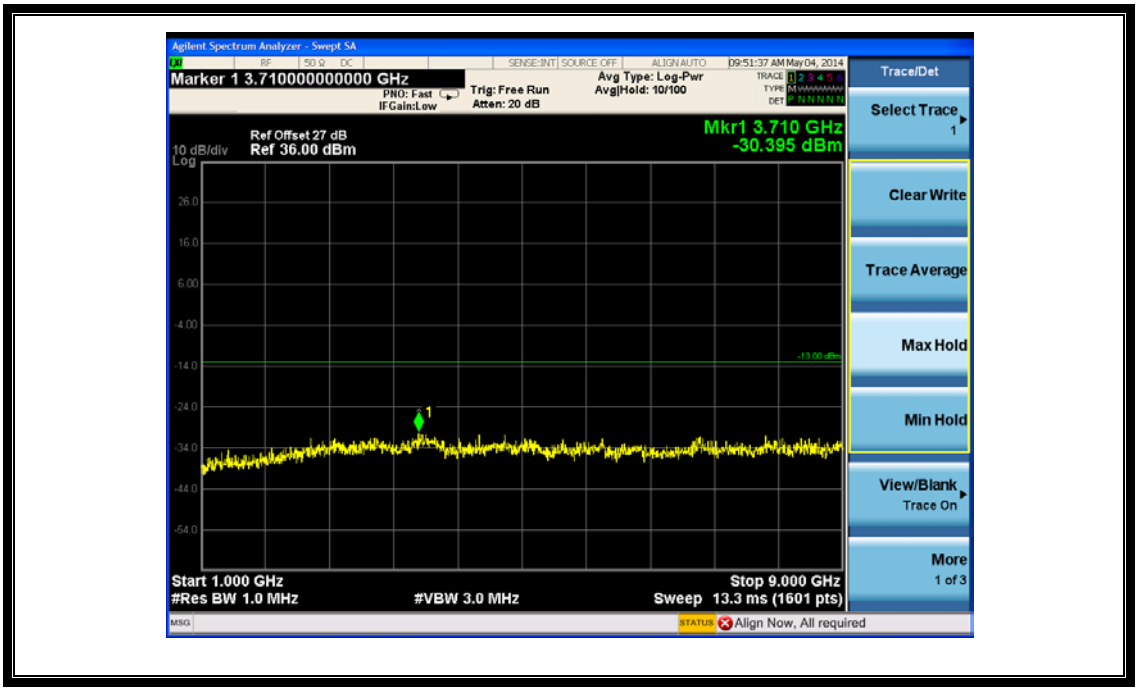
(Plot B3: GSM 1900MHz Channel = 810, 30MHz to 1GHz)



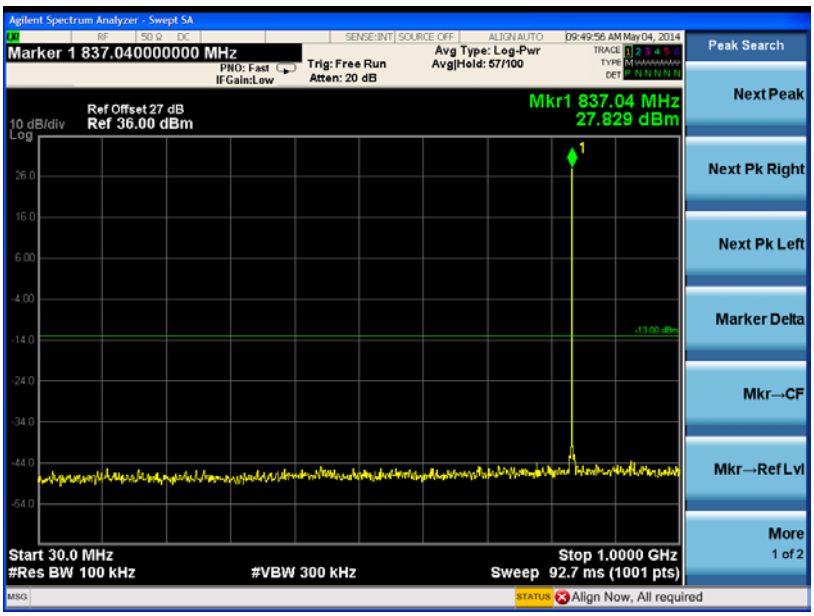
(Plot B3.1: GSM 1900MHz Channel = 810, 1GHz to 20GHz)



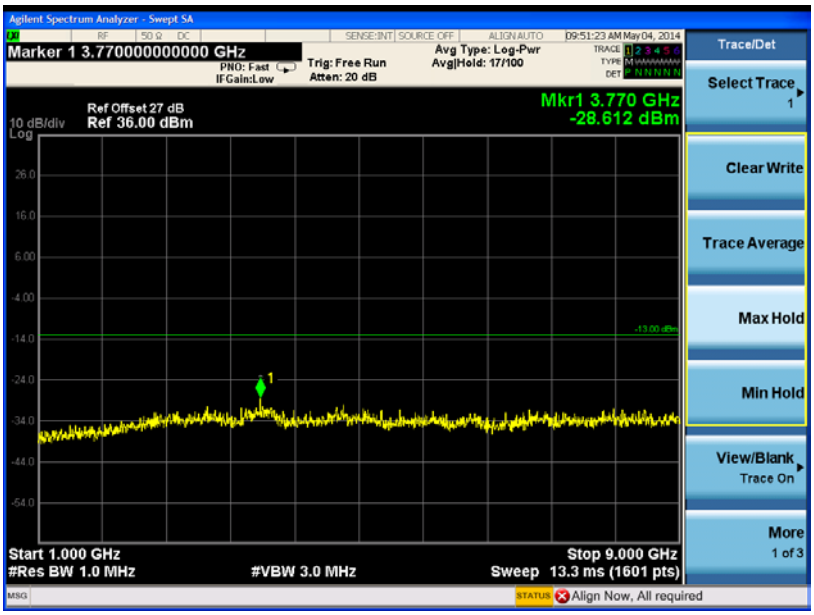
(Plot C1: EDGE 850MHz Channel = 128, 30MHz to 1GHz)



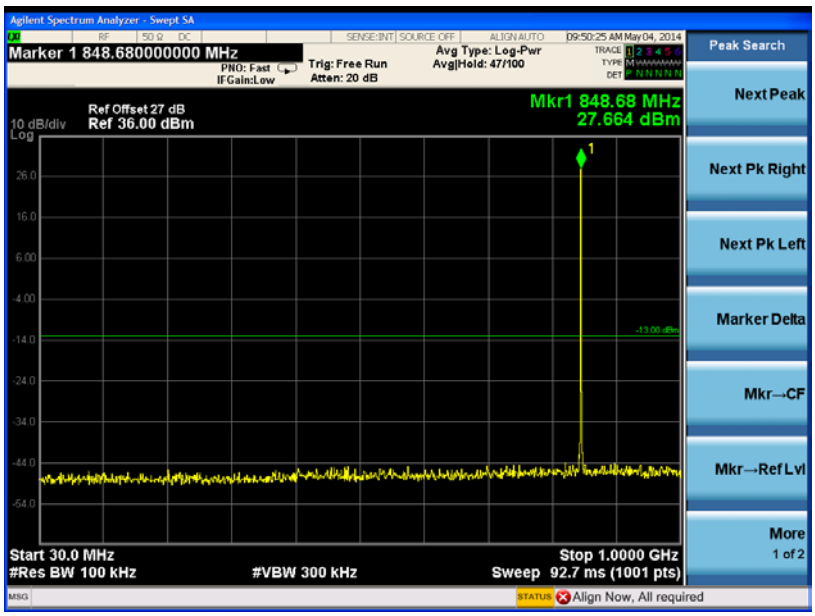
(Plot C1.1: EDGE 850MHz Channel = 128, 1GHz to 9GHz)



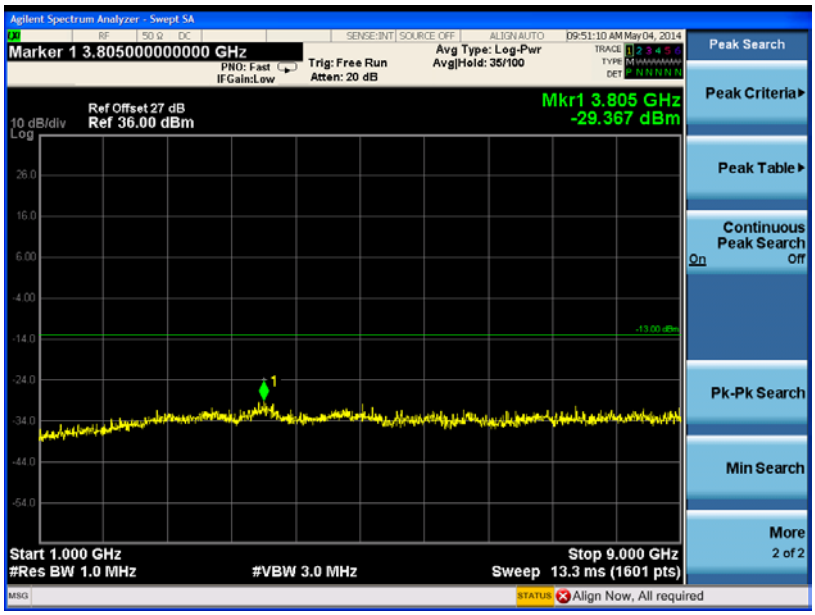
(Plot C2: EDGE 850MHz Channel = 190, 30MHz to 1GHz)



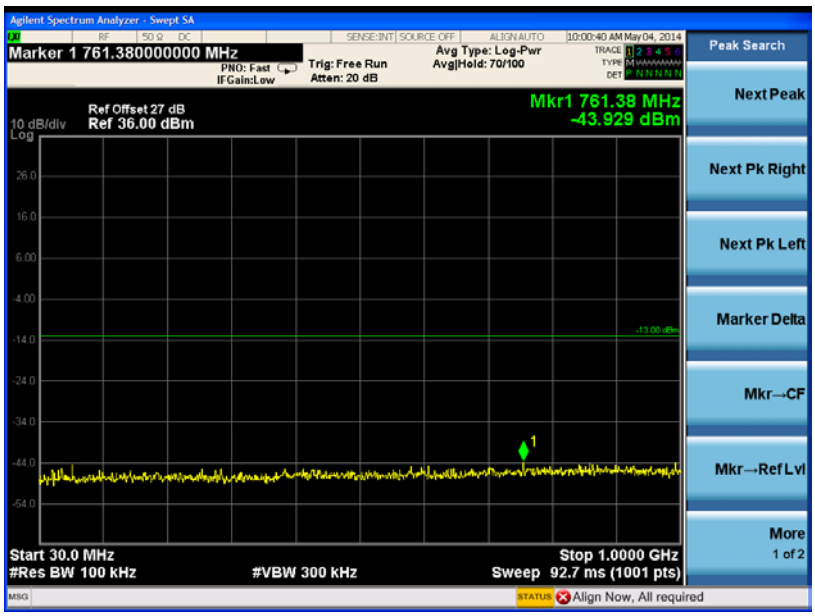
(Plot C2.1: EDGE 850MHz Channel = 190, 1GHz to 9GHz)



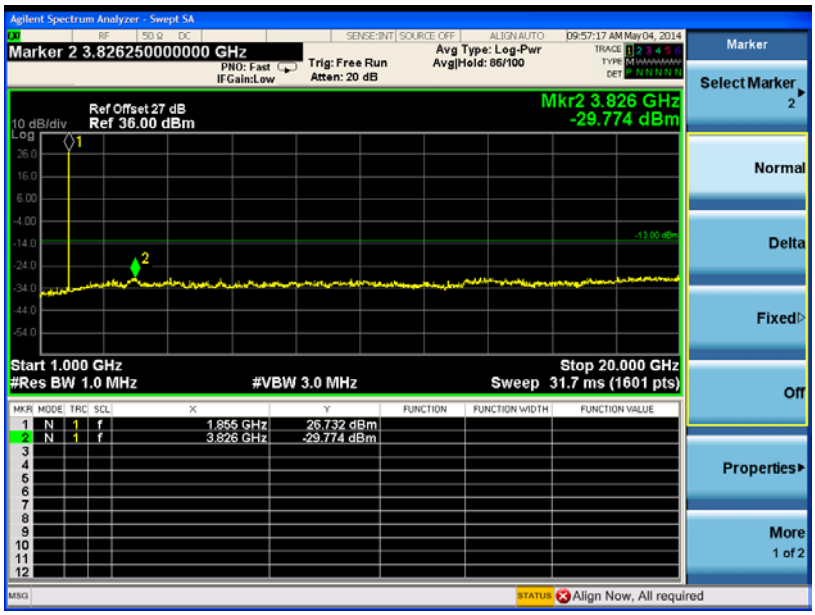
(Plot C3: EDGE 850MHz Channel = 251, 30MHz to 1GHz)



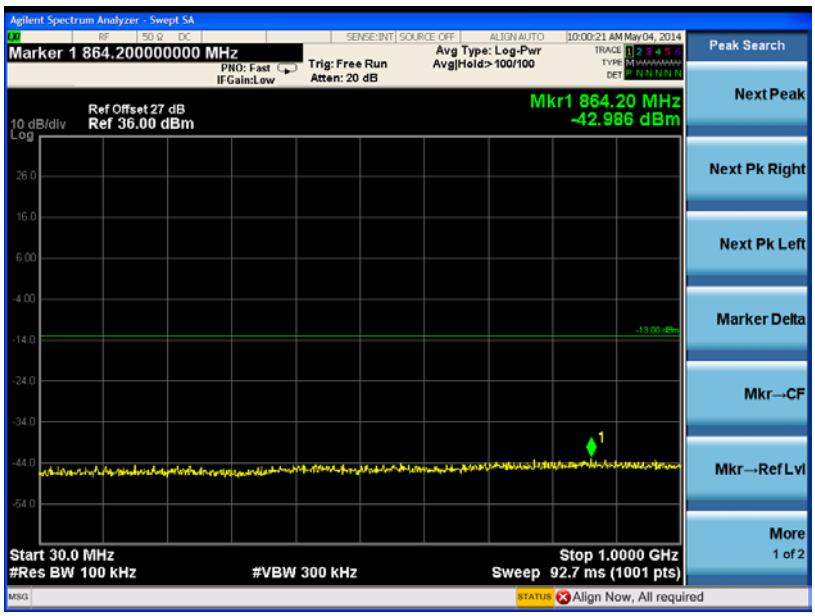
(Plot C3.1: EDGE 850MHz Channel = 251, 1GHz to 9GHz)



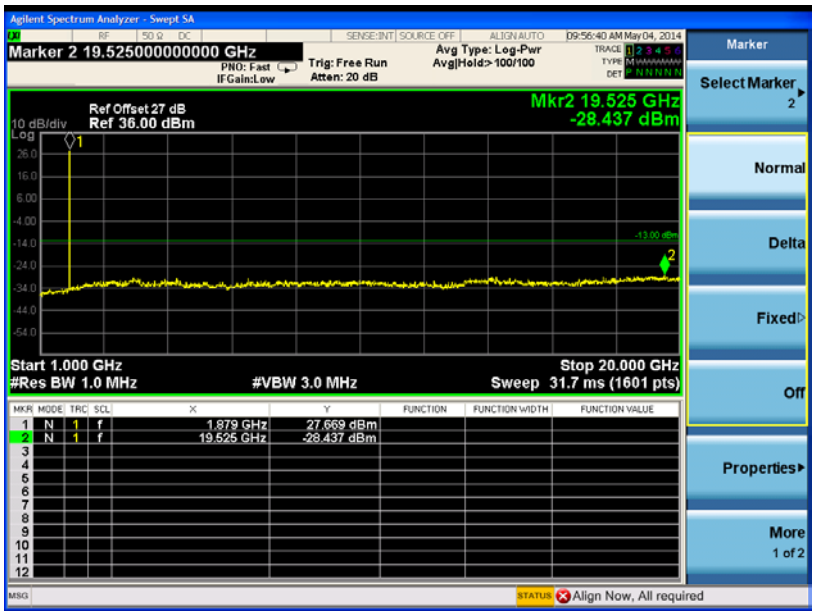
(Plot D1: EDGE 1900MHz Channel = 512, 30MHz to 1GHz)



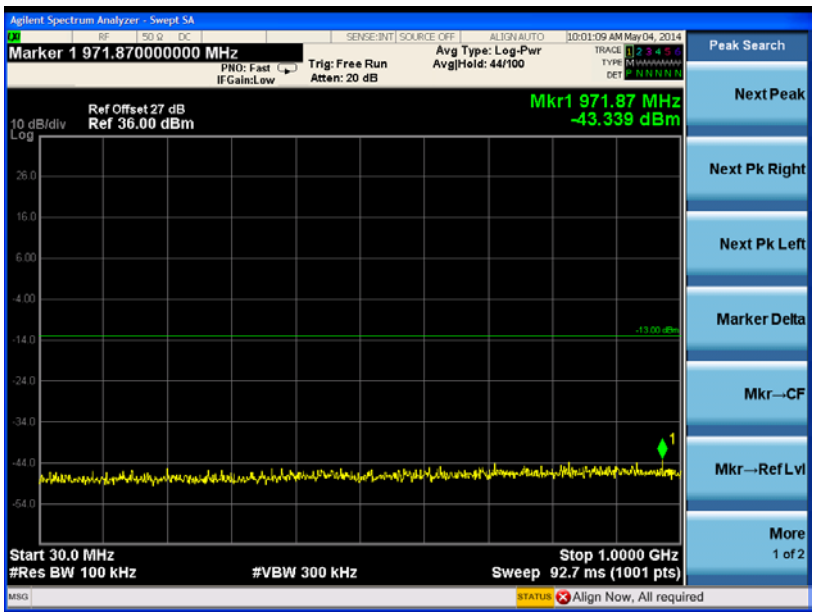
(Plot D1.1: EDGE 1900MHz Channel = 512, 1GHz to 20GHz)



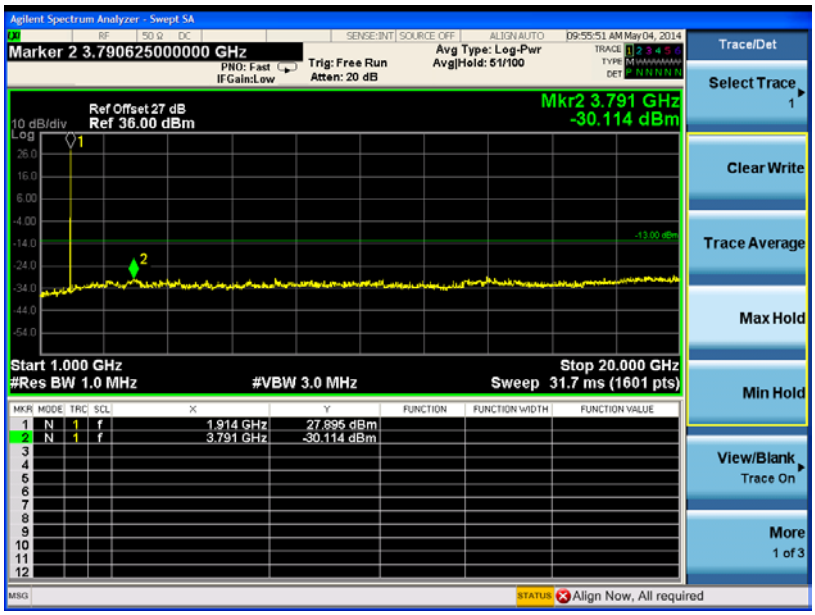
(Plot D2: EDGE 1900MHz Channel = 661, 30MHz to 1GHz)



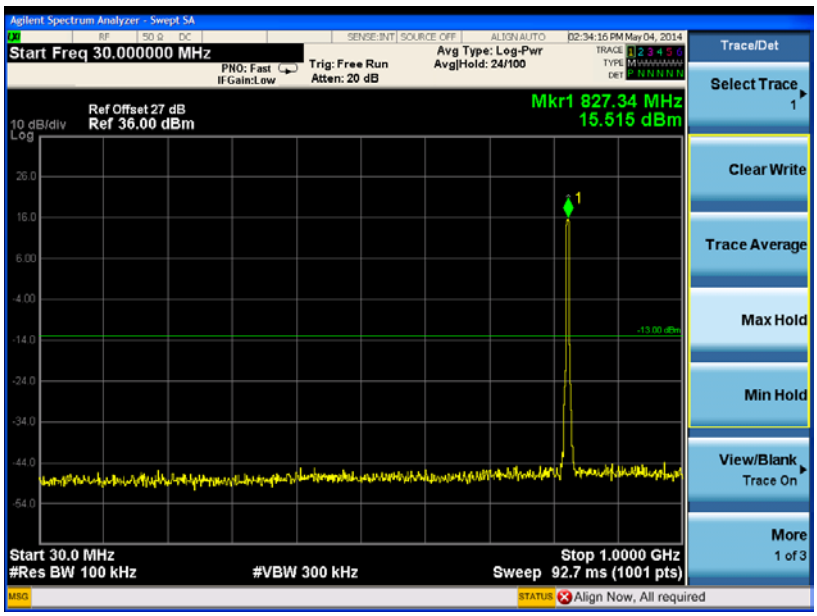
(Plot D2.1: EDGE 1900MHz Channel = 661,1GHz to 20GHz)



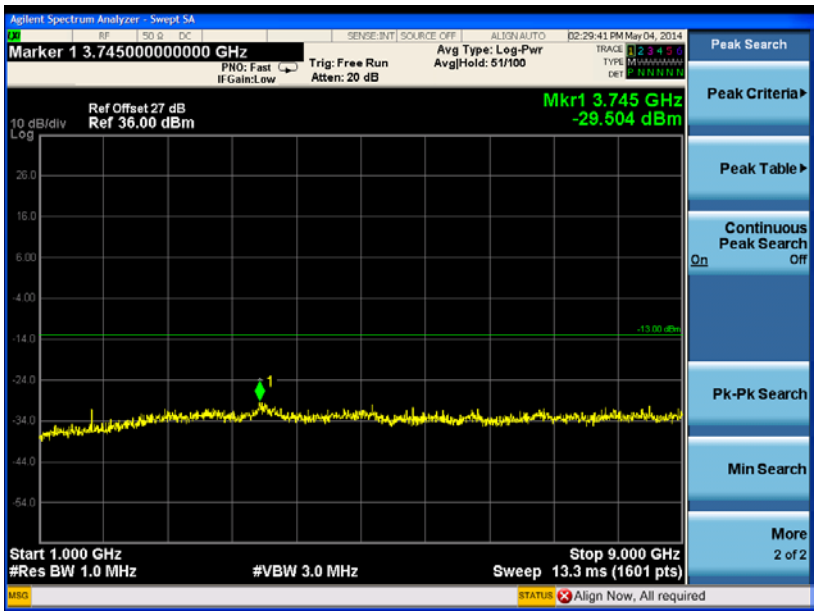
(Plot D3: EDGE 1900MHz Channel = 810, 30MHz to 1GHz)



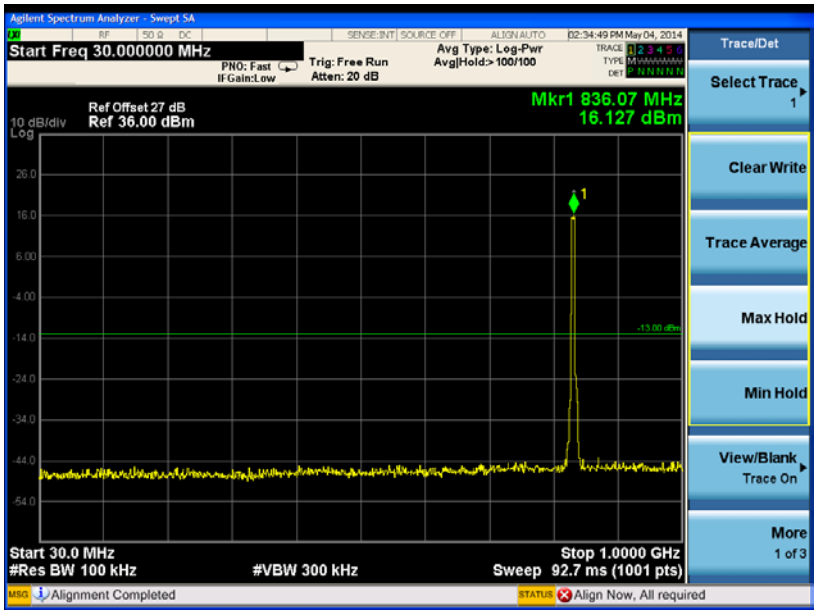
(Plot D3.1: EDGE 1900MHz Channel = 810, 1GHz to 20GHz)



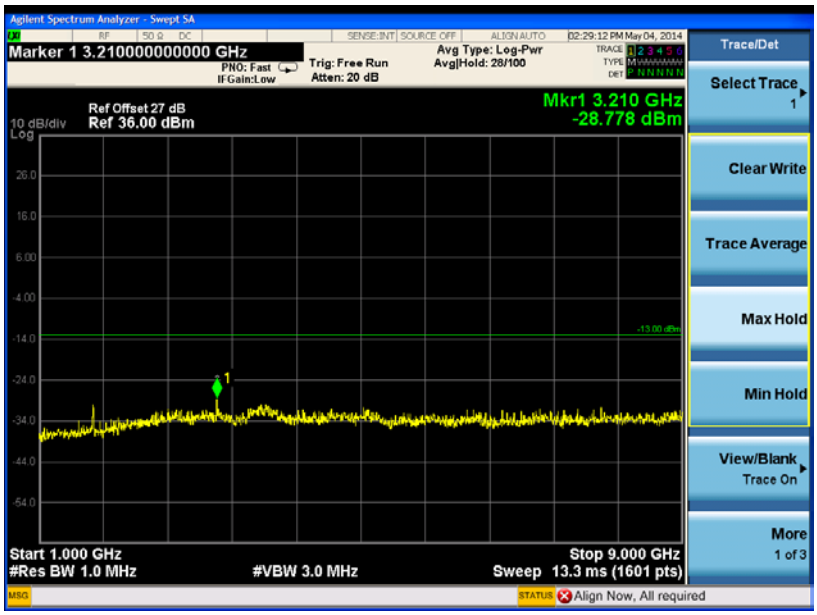
(Plot E1: WCDMA850MHz Channel = 4132, 30MHz to 1GHz)



(Plot E1.1: WCDMA850MHz Channel = 4132, 1GHz to 9GHz)



(Plot E2: WCDMA850MHz Channel = 4175, 30MHz to 1GHz)



(Plot E2.1: WCDMA850MHz Channel = 4175, 1GHz to 9GHz)