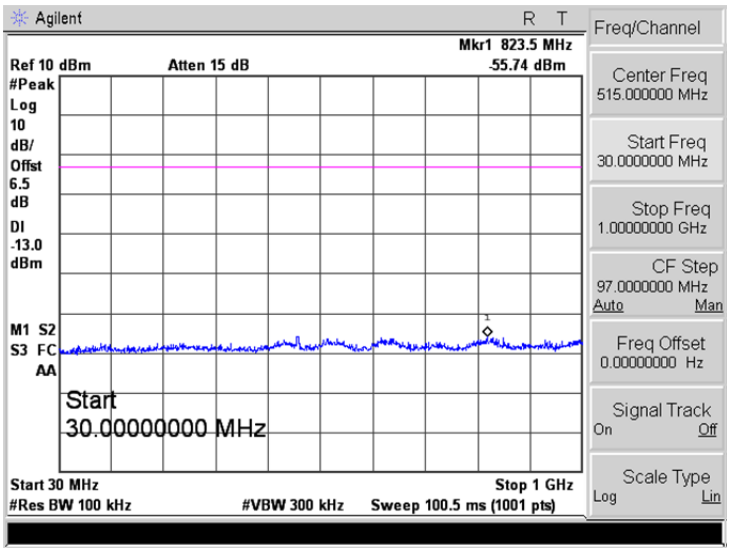
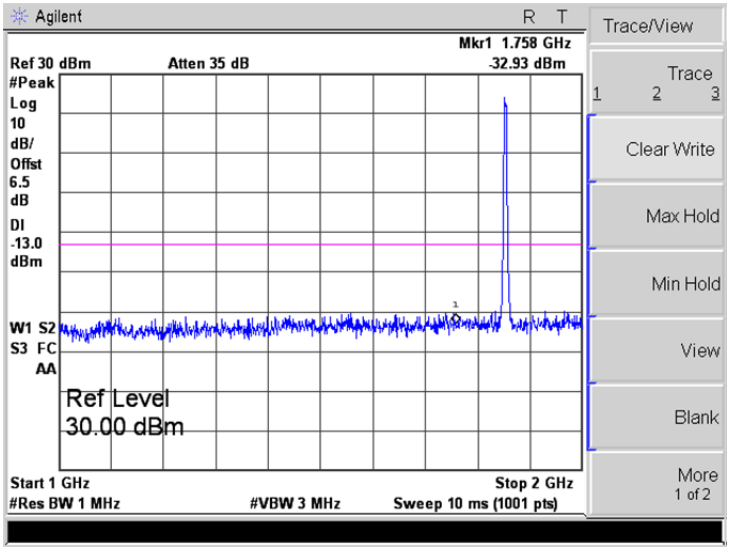
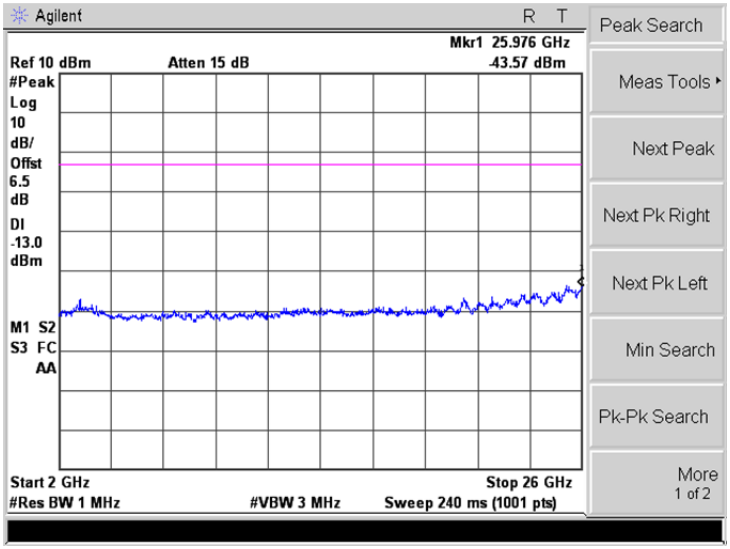
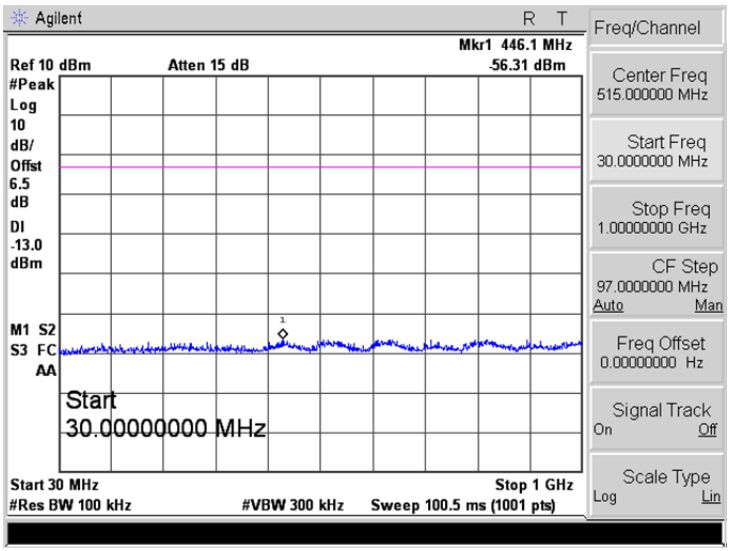
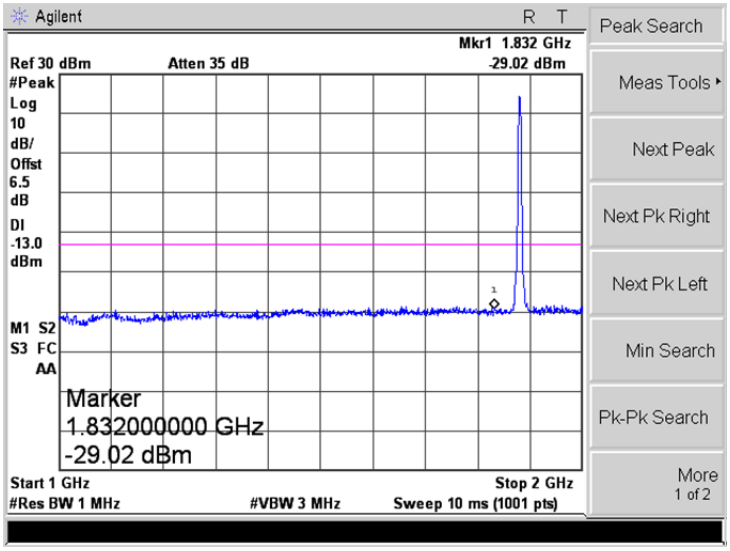
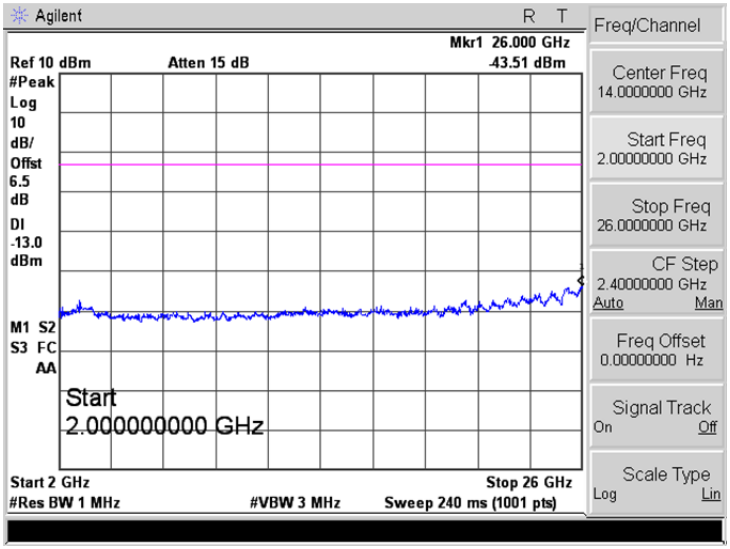
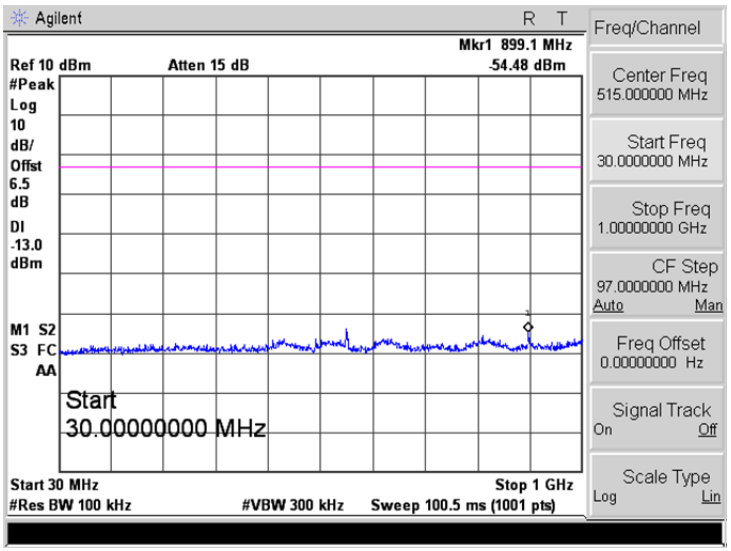
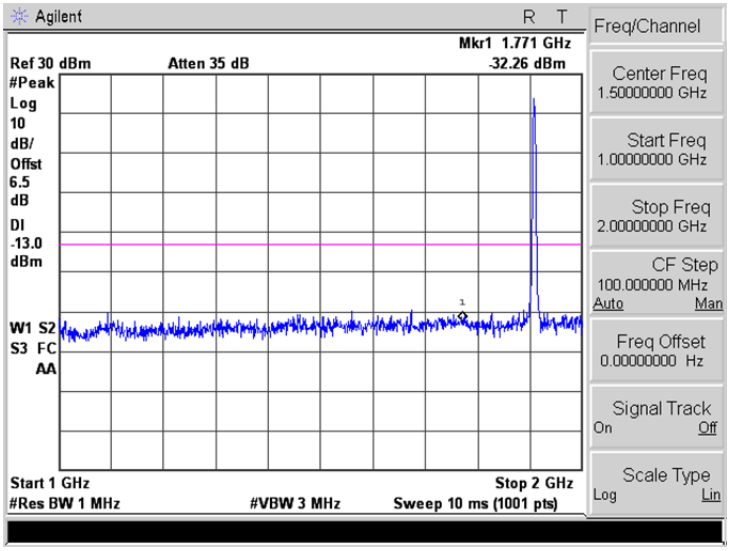
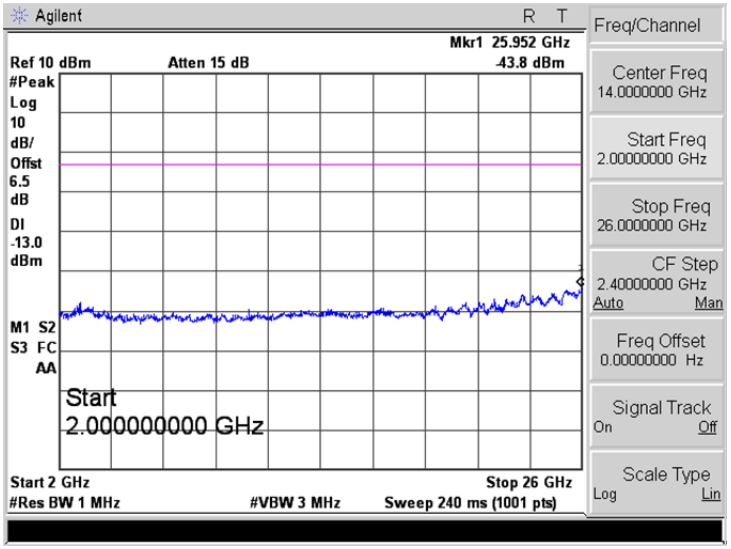
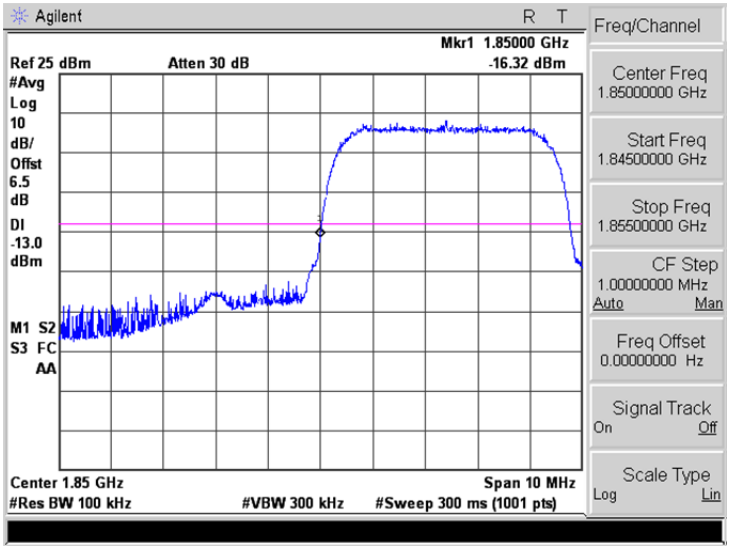
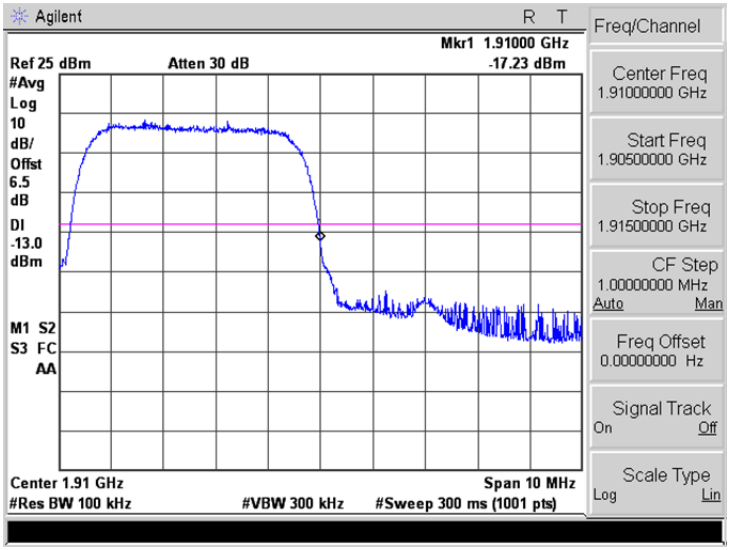
WCDMA Band II	
Low Channel	
	
	

WCDMA Band II	
Middle Channel	
	
	

WCDMA Band II	
High Channel	
	
	

WCDMA Band II	
Low Band Emission	
High Band Emission	

8. Spurious Radiated Emissions

8.1 Standard Applicable

According to §22.917(a), the power of any emissions 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.

According to §24.238(a), the power of any emissions 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.

According to §27.53 (h), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

8.2 Test Procedure

1. The setup of EUT is according with per ANSI/TIA Standard 603E and ANSI C63.26 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

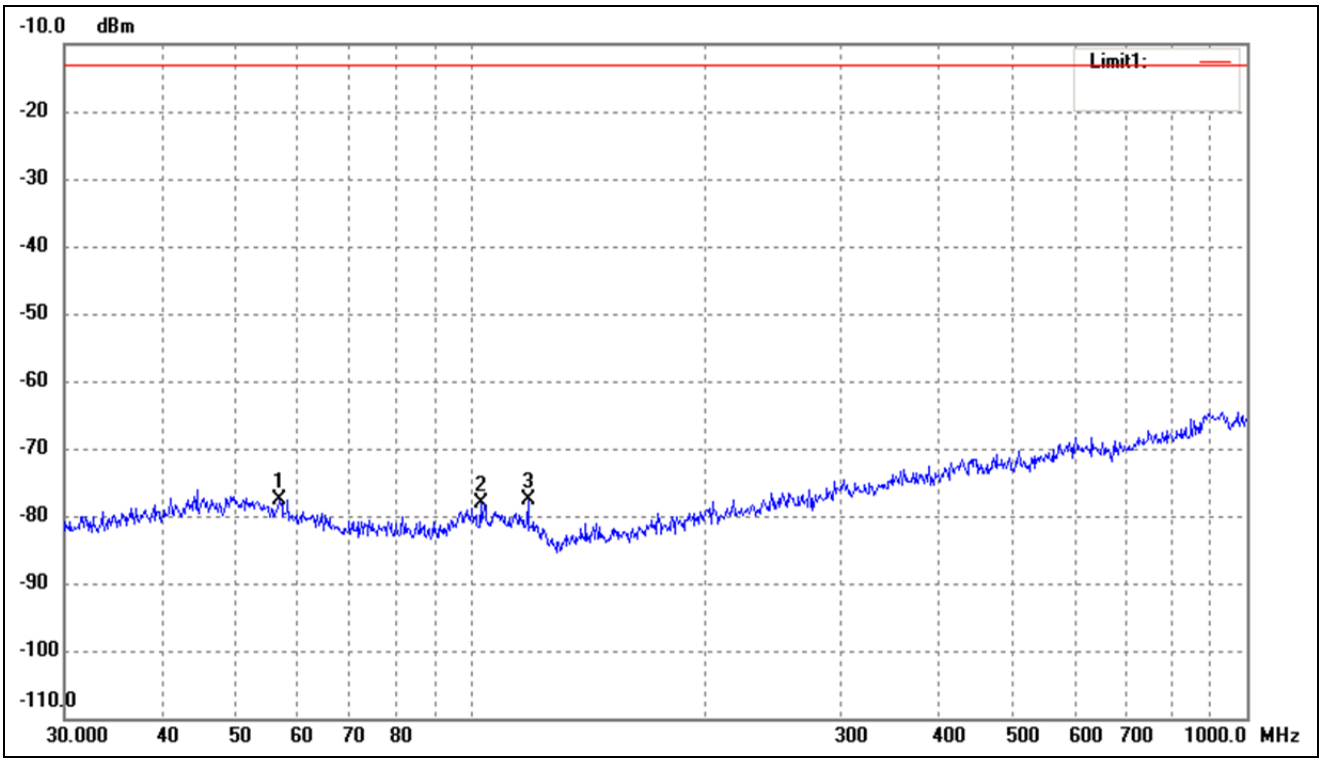
Spurious attenuation limit in dB =43+10 Log_{10} (power out in Watts)

8.3 Summary of Test Results/Plots

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

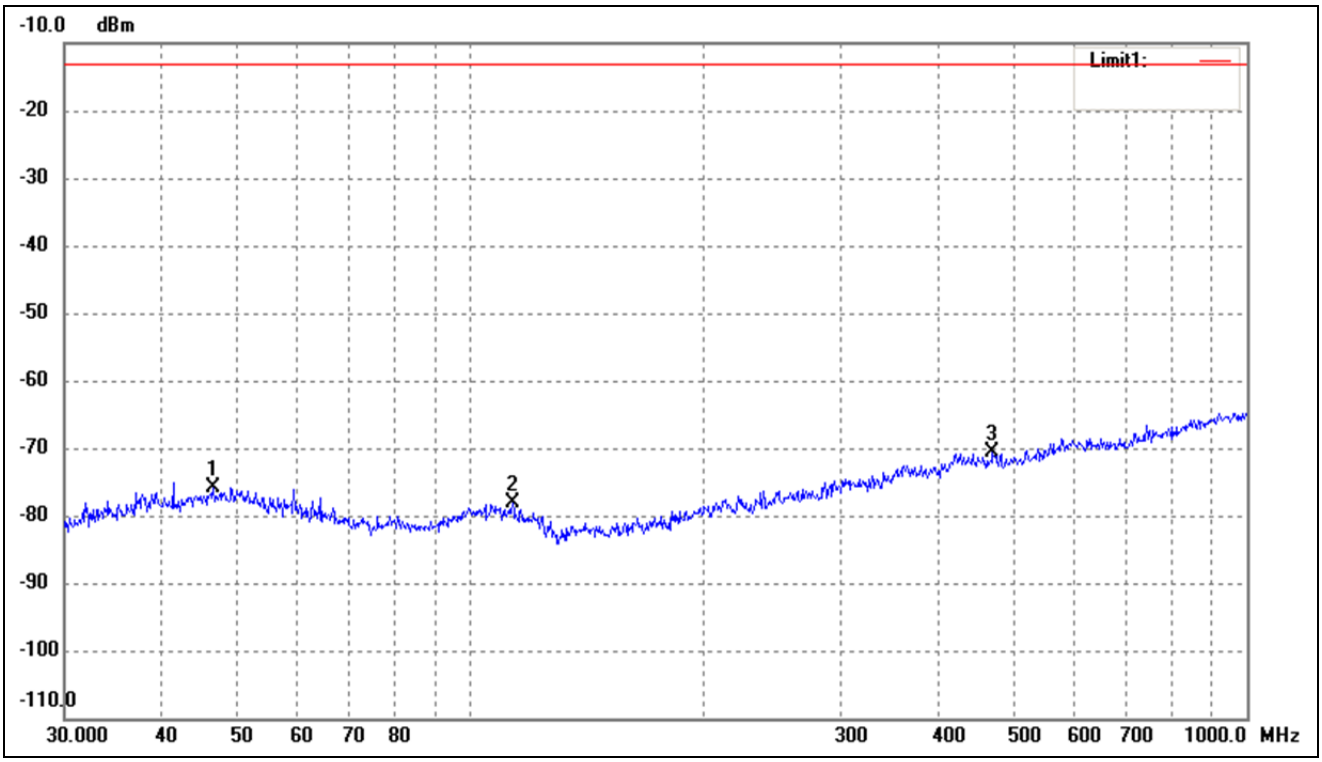
➢ Spurious Emissions Below 1GHz

For Cellular Band			
Test Channel	GSM850	Polarity:	Horizontal



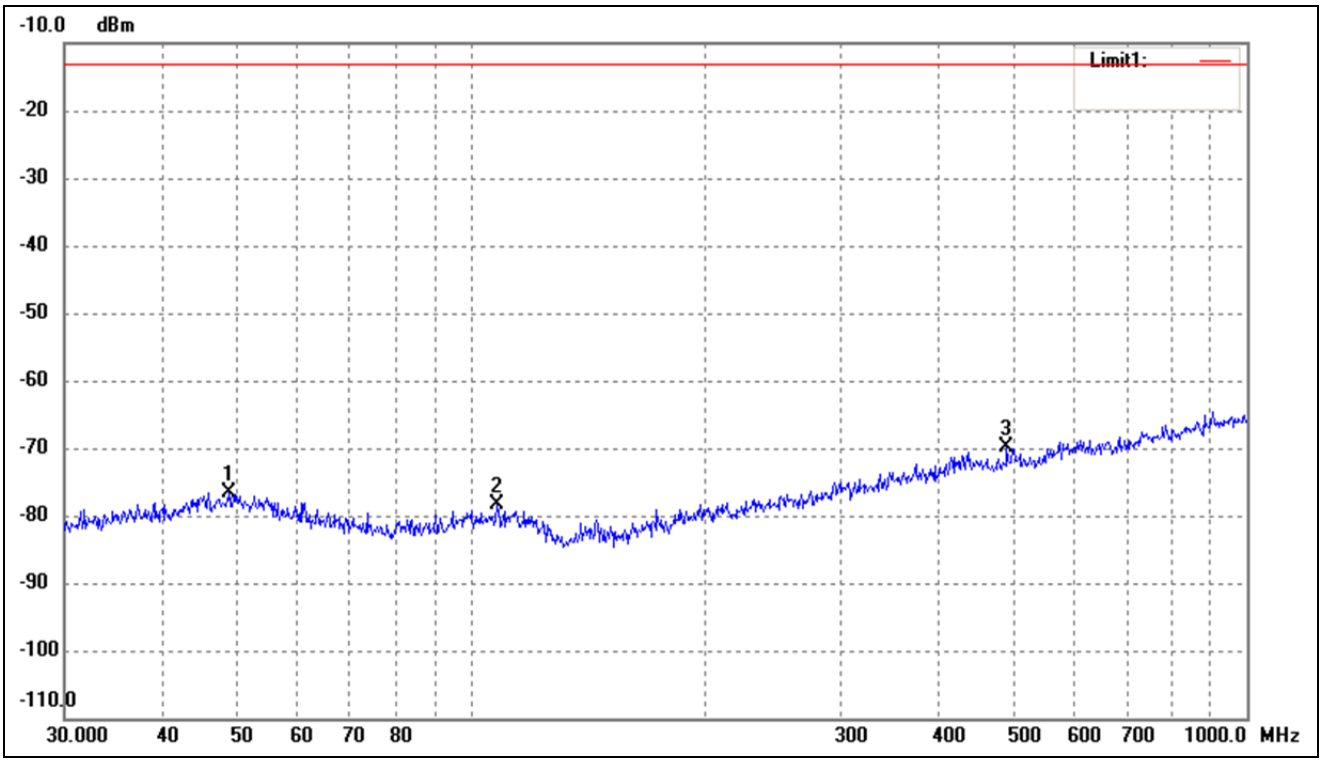
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	56.7917	-76.79	-0.77	-77.56	-13.00	-64.56	ERP
2	103.0800	-76.81	-1.33	-78.14	-13.00	-65.14	ERP
3	118.6014	-75.38	-2.18	-77.56	-13.00	-64.56	ERP

For Cellular Band			
Test Channel	GSM850	Polarity:	Vertical



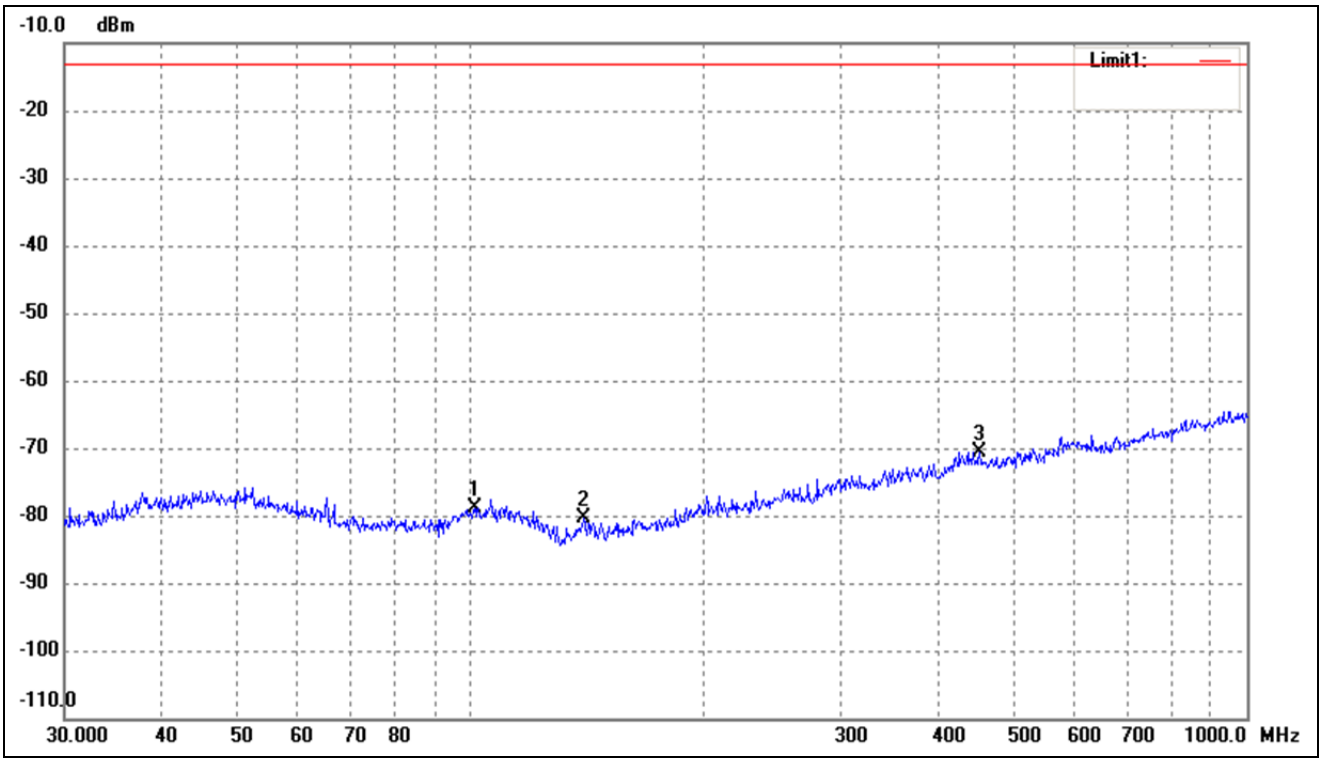
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	46.6664	-76.38	0.58	-75.80	-13.00	-62.80	ERP
2	113.3163	-76.60	-1.59	-78.19	-13.00	-65.19	ERP
3	470.5232	-75.77	5.20	-70.57	-13.00	-57.57	ERP

For Cellular Band			
Test Channel	GSM1900	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	48.8429	-77.37	0.73	-76.64	-13.00	-63.64	ERP
2	108.2667	-77.17	-1.25	-78.42	-13.00	-65.42	ERP
3	490.7447	-75.42	5.49	-69.93	-13.00	-56.93	ERP

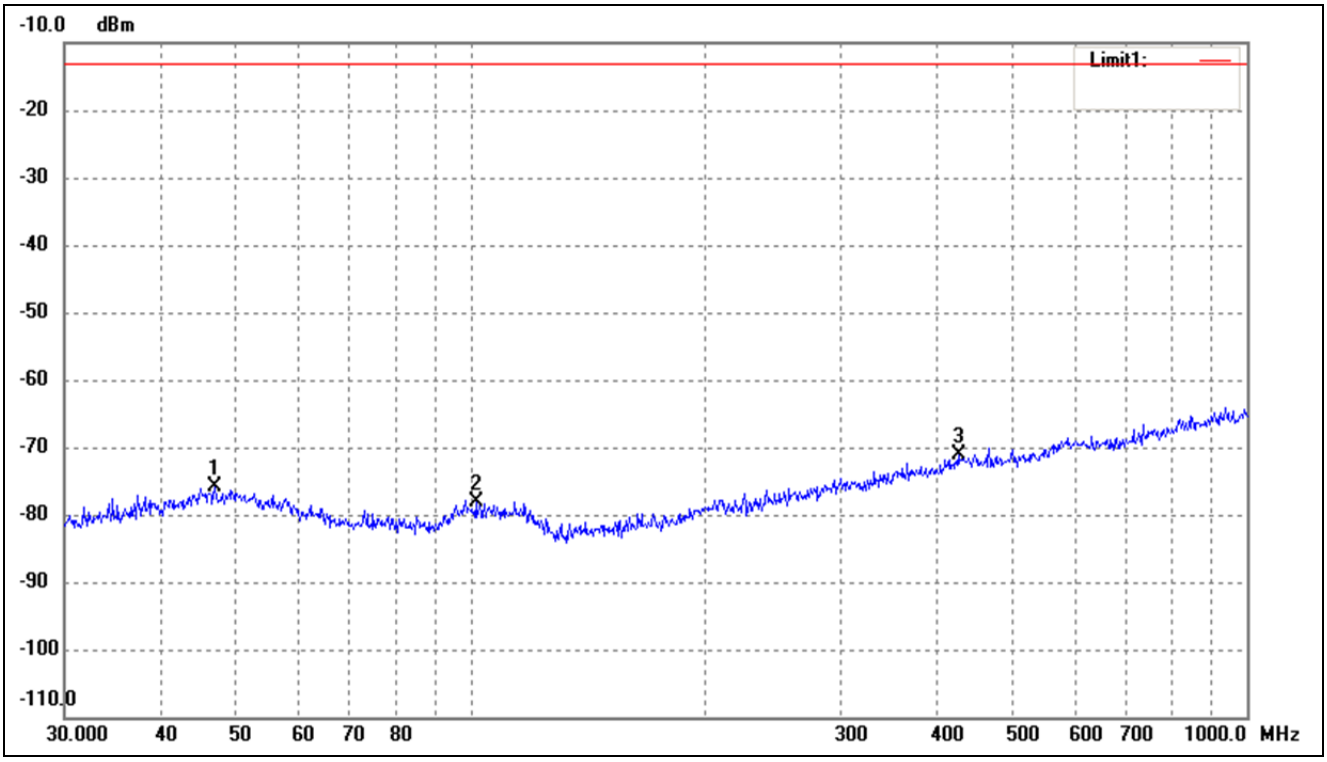
For Cellular Band			
Test Channel	GSM1900	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	101.2885	-77.50	-1.37	-78.87	-13.00	-65.87	ERP
2	139.8508	-76.71	-3.74	-80.45	-13.00	-67.45	ERP
3	452.7197	-75.91	5.37	-70.54	-13.00	-57.54	ERP

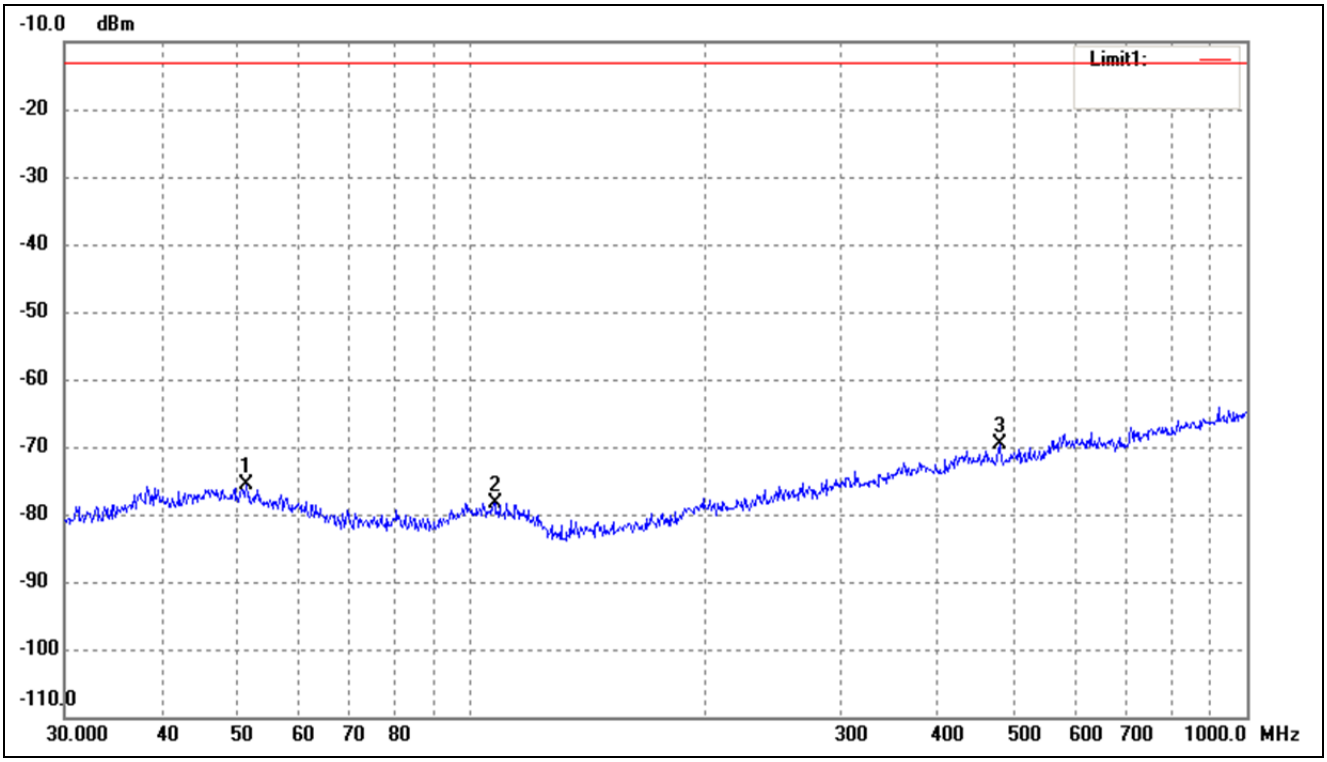
Note: Margin= (Reading+ Correct)- Limit

Test Channel	WCDMA Band V	Polarity:	Horizontal



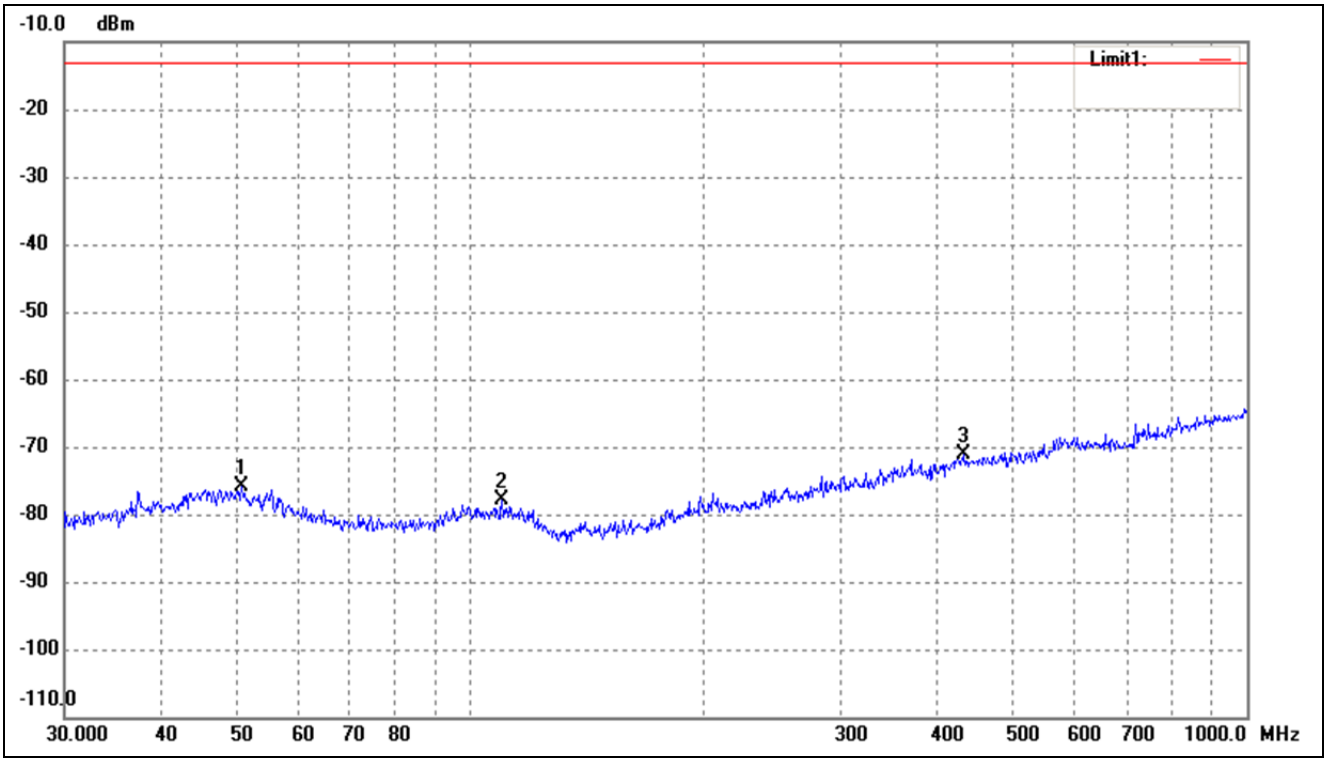
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	46.8303	-76.35	0.59	-75.76	-13.00	-62.76	ERP
2	101.6443	-76.68	-1.35	-78.03	-13.00	-65.03	ERP
3	425.0280	-76.81	5.61	-71.20	-13.00	-58.20	ERP

Test Channel	WCDMA Band V	Polarity:	Vertical



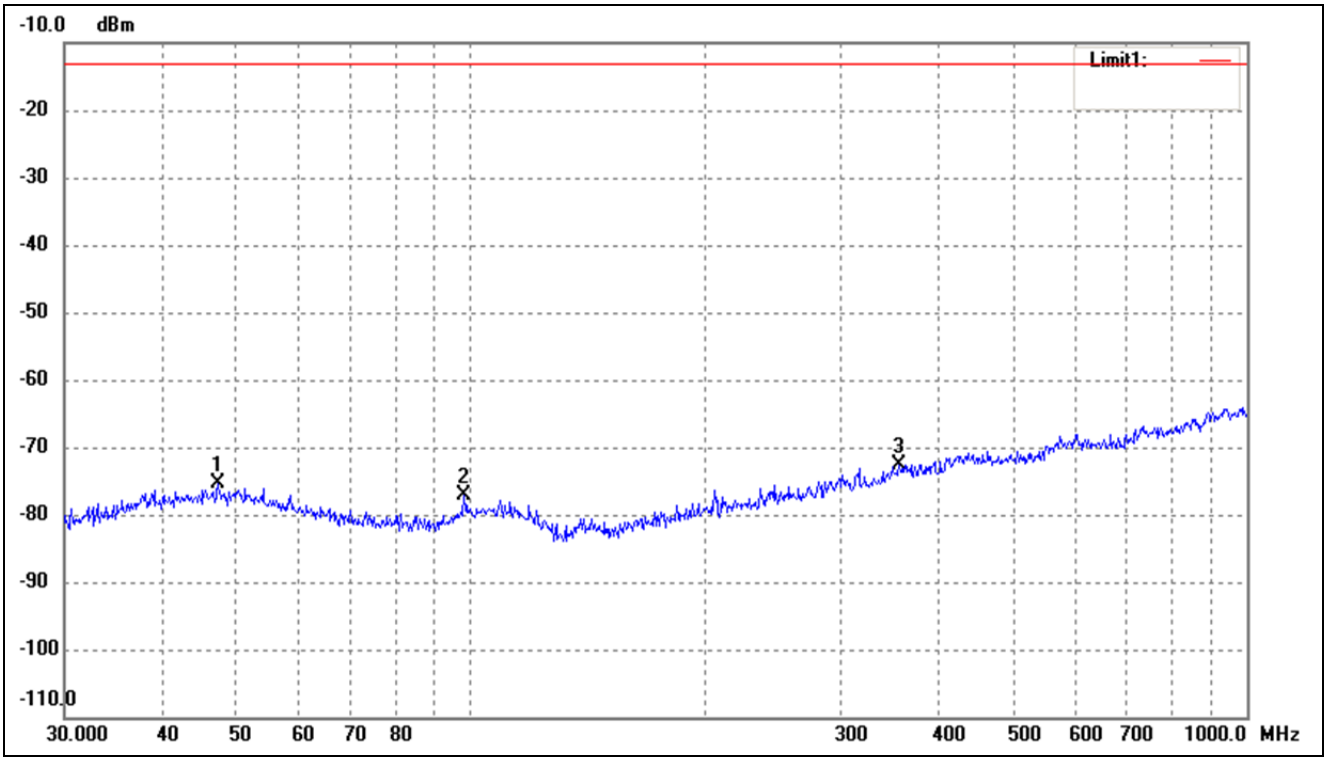
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	51.4807	-76.16	0.47	-75.69	-13.00	-62.69	ERP
2	107.5101	-77.03	-1.25	-78.28	-13.00	-65.28	ERP
3	480.5276	-75.01	5.35	-69.66	-13.00	-56.66	ERP

Test Channel	WCDMA Band IV	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	50.7637	-76.45	0.63	-75.82	-13.00	-62.82	ERP
2	109.7960	-76.62	-1.22	-77.84	-13.00	-64.84	ERP
3	432.5457	-76.81	5.61	-71.20	-13.00	-58.20	ERP

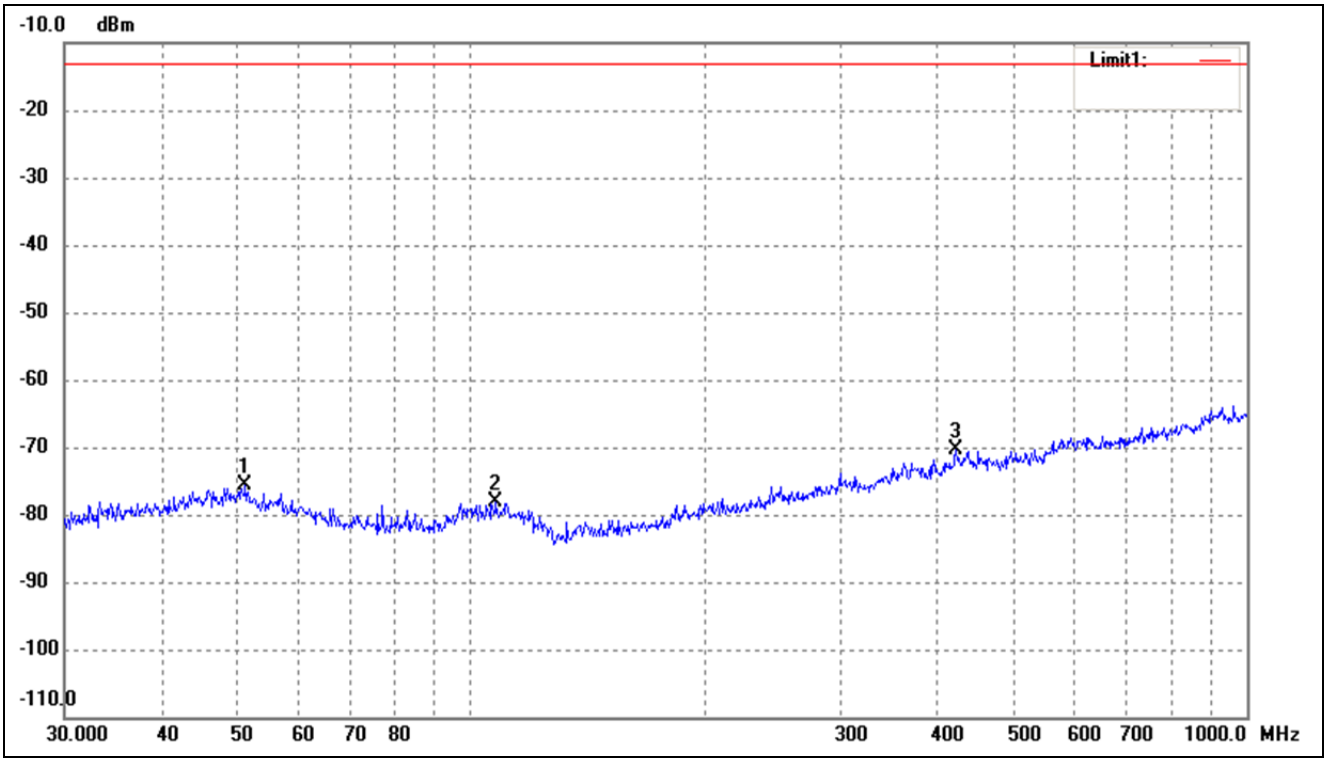
Test Channel	WCDMA Band IV	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	47.3255	-76.01	0.62	-75.39	-13.00	-62.39	ERP
2	98.1419	-75.28	-1.81	-77.09	-13.00	-64.09	ERP
3	356.6758	-76.39	3.88	-72.51	-13.00	-59.51	ERP

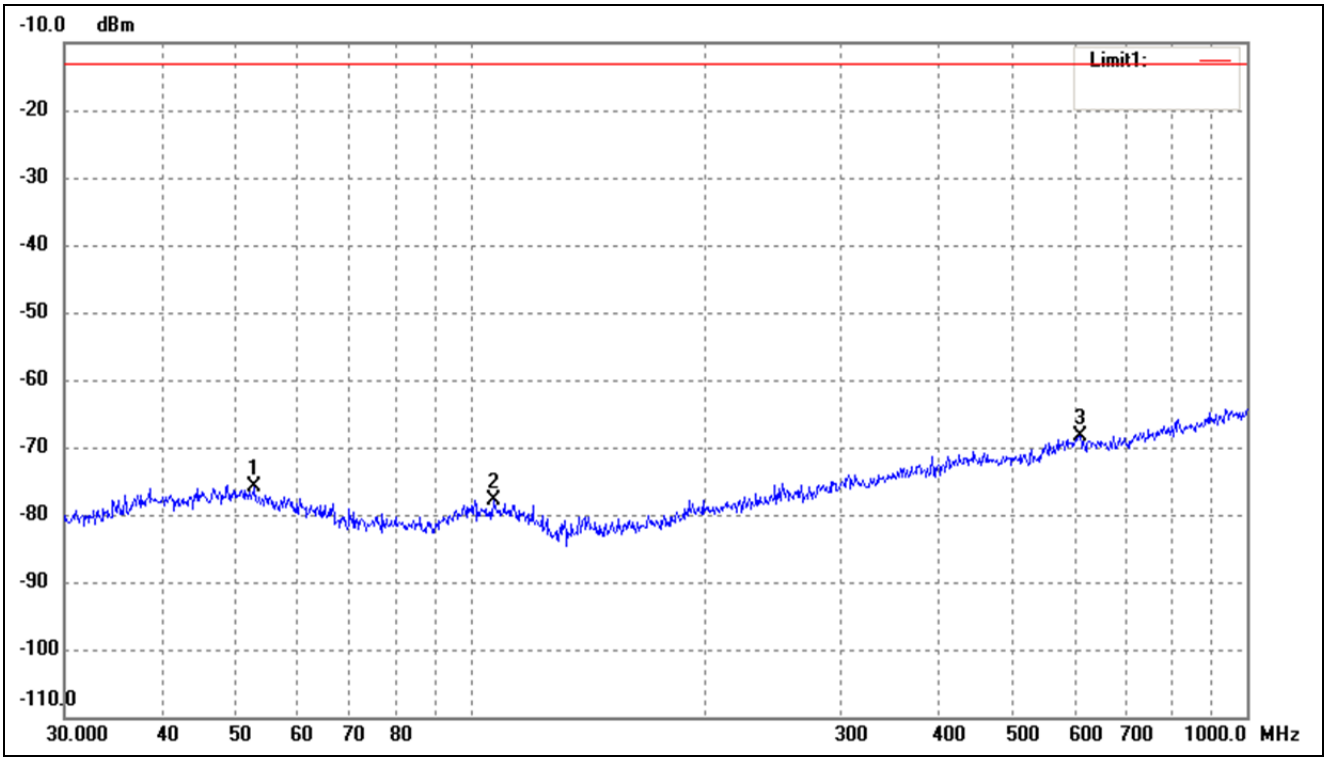
Note: Margin= (Reading+ Correct)- Limit

Test Channel	WCDMA Band II	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	51.3005	-76.02	0.51	-75.51	-13.00	-62.51	ERP
2	107.8877	-76.97	-1.25	-78.22	-13.00	-65.22	ERP
3	422.0577	-75.98	5.51	-70.47	-13.00	-57.47	ERP

Test Channel	WCDMA Band II	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	52.7600	-76.02	0.16	-75.86	-13.00	-62.86	ERP
2	107.1337	-76.63	-1.27	-77.90	-13.00	-64.90	ERP
3	609.9217	-76.04	7.74	-68.30	-13.00	-55.30	ERP

Note: Margin= (Reading+ Correct)- Limit

- Spurious Emissions Above 1GHz
- For Cellular Band_GSM850 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (824.2MHz)						
1648.4	-37.36	4.94	-32.42	-13	-19.42	H
2472.6	-42.54	8.46	-34.08	-13	-21.08	H
1648.4	-36.36	4.94	-31.42	-13	-18.42	V
2472.6	-41.45	8.46	-32.99	-13	-19.99	V
Middle Channel (836.6MHz)						
1673.2	-37.05	5.11	-31.94	-13	-18.94	H
2509.8	-44.47	8.54	-35.93	-13	-22.93	H
1673.2	-35.47	5.11	-30.36	-13	-17.36	V
2509.8	-44.04	8.54	-35.5	-13	-22.5	V
High Channel (848.8MHz)						
1697.6	-36.84	5.25	-31.59	-13	-18.59	H
2546.4	-44.05	8.57	-35.48	-13	-22.48	H
1697.6	-35.37	5.25	-30.12	-13	-17.12	V
2546.4	-44.49	8.57	-35.92	-13	-22.92	V

- For PCS Band_GSM1900 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1850.2MHz)						
3700.4	-42.65	10.54	-32.11	-13	-19.11	H
5550.6	-48.59	13.37	-35.22	-13	-22.22	H
3700.4	-42.07	10.54	-31.53	-13	-18.53	V
5550.6	-49.41	13.37	-36.04	-13	-23.04	V
Middle Channel (1880MHz)						
3760.0	-40.12	10.64	-29.48	-13	-16.48	H
5640.0	-48.41	13.54	-34.87	-13	-21.87	H
3760.0	-40.07	10.64	-29.43	-13	-16.43	V
5640.0	-48	13.54	-34.46	-13	-21.46	V
High Channel (1909.8MHz)						
3819.6	-42.13	10.74	-31.39	-13	-18.39	H
5729.4	-46.63	13.71	-32.92	-13	-19.92	H
3819.6	-41.38	10.74	-30.64	-13	-17.64	V
5729.4	-49.06	13.71	-35.35	-13	-22.35	V

➢ For WCDMA Band V Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (826.4MHz)						
1652.8	-34.15	4.94	-29.21	-13	-16.21	H
2479.2	-41.54	8.46	-33.08	-13	-20.08	H
1652.8	-36.72	4.94	-31.78	-13	-18.78	V
2479.2	-42.74	8.46	-34.28	-13	-21.28	V
Middle Channel (836.6MHz)						
1672.8	-35.69	5.11	-30.58	-13	-17.58	H
2509.2	-42.34	8.54	-33.8	-13	-20.8	H
1672.8	-35.57	5.11	-30.46	-13	-17.46	V
2509.2	-41.37	8.54	-32.83	-13	-19.83	V
High Channel (846.6MHz)						
1693.2	-34.65	5.25	-29.4	-13	-16.4	H
2539.8	-43.52	8.57	-34.95	-13	-21.95	H
1693.2	-36.97	5.25	-31.72	-13	-18.72	V
2539.8	-44.44	8.57	-35.87	-13	-22.87	V

➢ For WCDMA Band IV Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1712.4MHz)						
3424.8	-35.17	8.65	-26.52	-13	-13.52	H
5137.2	-40.09	12.03	-28.06	-13	-15.06	H
3424.8	-35.45	8.65	-26.8	-13	-13.8	V
5137.2	-41.88	12.03	-29.85	-13	-16.85	V
Middle Channel (1732.4MHz)						
3466.8	-36	8.91	-27.09	-13	-14.09	H
5200.2	-41.08	12.29	-28.79	-13	-15.79	H
3466.8	-35.73	8.91	-26.82	-13	-13.82	V
5200.2	-39.77	12.29	-27.48	-13	-14.48	V
High Channel (1752.6MHz)						
3505.2	-35.88	9.11	-26.77	-13	-13.77	H
5257.8	-41.67	12.56	-29.11	-13	-16.11	H
3505.2	-32.11	9.11	-23	-13	-10	V
5257.8	-39.11	12.56	-26.55	-13	-13.55	V

➢ For WCDMA Band II Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1852.4MHz)						
3704.8	-33.99	10.17	-23.82	-13	-10.82	H
5557.2	-41.21	14.69	-26.52	-13	-13.52	H
3704.8	-35.66	10.17	-25.49	-13	-12.49	V
5557.2	-40.06	14.69	-25.37	-13	-12.37	V
Middle Channel (1880MHz)						
3760.8	-35.63	10.26	-25.37	-13	-12.37	H
5640.0	-41.34	14.78	-26.56	-13	-13.56	H
3760.8	-35.22	10.26	-24.96	-13	-11.96	V
5640.0	-42.77	14.78	-27.99	-13	-14.99	V
High Channel (1907.6MHz)						
3815.2	-35.81	10.59	-25.22	-13	-12.22	H
5722.8	-40.8	15.03	-25.77	-13	-12.77	H
3815.2	-32.19	10.59	-21.6	-13	-8.6	V
5722.8	-39.94	15.03	-24.91	-13	-11.91	H

Note: Result=Reading+ Correct, Margin= Result- Limit

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

9. Frequency Stability

9.1 Standard Applicable

According to §22.355, §24.235, §27.54 the limit is 2.5ppm.

9.2 Test Procedure

According to §2.1055, the following test procedure was performed.
The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.
The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode.

9.3 Summary of Test Results/Plots

Note: 1. Worst case at GSM850/PCS1900/WCDMA B2/B5/B4 middle channel
2. Normal Voltage NV=DC3.85V; Low Voltage LV=DC3.5V;High Voltage HV=DC4.35V

➢ Frequency stability V.S. Temperature measurement

Reference Frequency: GSM850 Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
NV	-30	65	0.0782	2.50	Pass
	-20	54	0.0644		
	-10	48	0.0579		
	0	42	0.0497		
	10	37	0.0441		
	20	32	0.0377		
	30	36	0.0432		
	40	42	0.0506		
	50	48	0.0579		

Reference Frequency: PCS1900 Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
NV	-30	66	0.0352	2.50	Pass
	-20	58	0.0307		
	-10	46	0.0245		
	0	39	0.0209		
	10	34	0.0180		
	20	30	0.0160		
	30	35	0.0184		
	40	42	0.0221		
	50	48	0.0254		

Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
NV	-30	45	0.0542	2.50	Pass
	-20	40	0.0478		
	-10	35	0.0423		
	0	29	0.0349		
	10	24	0.0285		
	20	19	0.0230		
	30	27	0.0322		
	40	31	0.0368		
	50	35	0.0414		

Reference Frequency: WCDMA Band IV Middle channel=1412 channel=1733.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
NV	-30	55	0.0320	2.50	Pass
	-20	52	0.0297		
	-10	41	0.0235		
	0	36	0.0209		
	10	32	0.0182		
	20	27	0.0155		
	30	33	0.0191		
	40	40	0.0231		
	50	44	0.0253		

Reference Frequency: WCDMA Band II Middle channel=9400 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
NV	-30	56	0.0299	2.50	Pass
	-20	46	0.0245		
	-10	42	0.0221		
	0	35	0.0184		
	10	28	0.0147		
	20	24	0.0127		
	30	31	0.0164		
	40	37	0.0196		
	50	41	0.0217		

➢ Frequency stability V.S. Voltage measurement

Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	HV	73	0.0873	2.50	Pass
	NV	65	0.0772		
	LV	58	0.0699		
Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	HV	55	0.0291	2.50	Pass
	NV	48	0.0258		
	LV	44	0.0233		
Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm) Result	
		Hz	ppm		
25	HV	51	0.0607	2.50	Pass
	NV	46	0.0552		
	LV	38	0.0460		
Reference Frequency: WCDMA Band IV Middle channel=1412 channel=1733.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	HV	60	0.0346	2.50	Pass
	NV	52	0.0297		
	LV	45	0.0262		
Reference Frequency: WCDMA Band II Middle channel=9400 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	HV	37	0.0196	2.50	Pass
	NV	32	0.0168		
	LV	28	0.0147		

10. Modulation characteristics

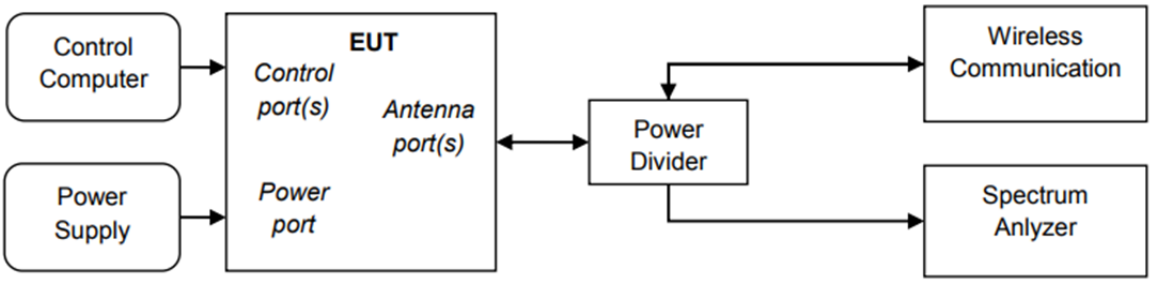
10.1 Standard Applicable

According to §2.1047, measurements required: Modulation characteristics is given below:

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.
(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.
(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.
(d) Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

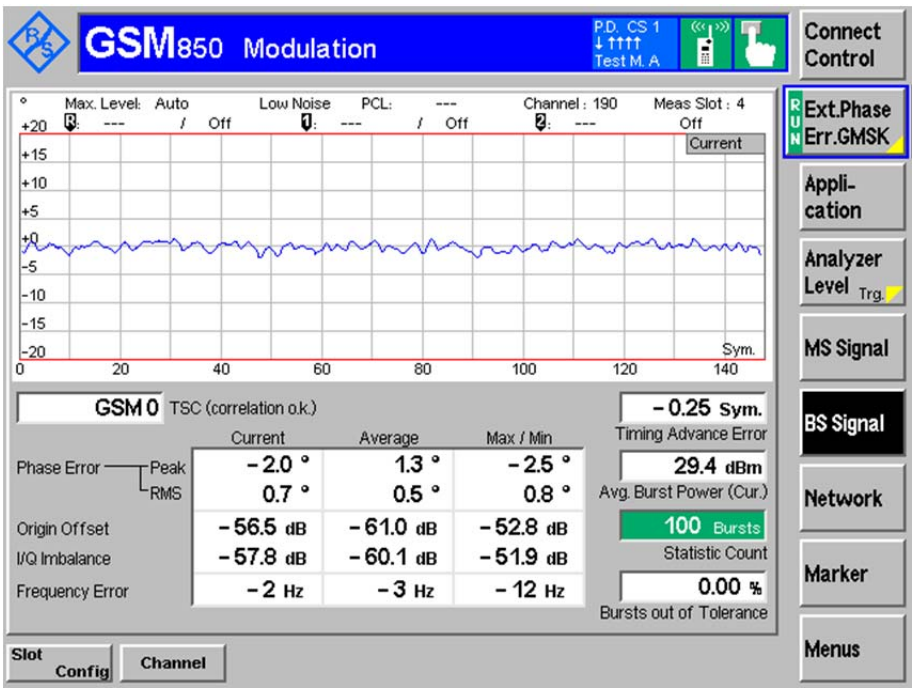
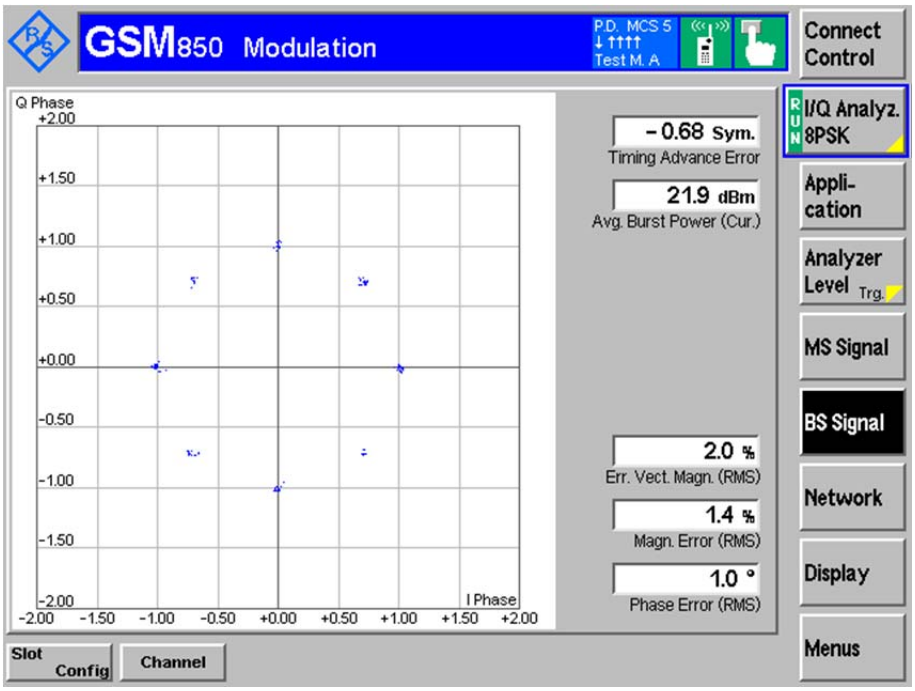
10.2 Test Procedure

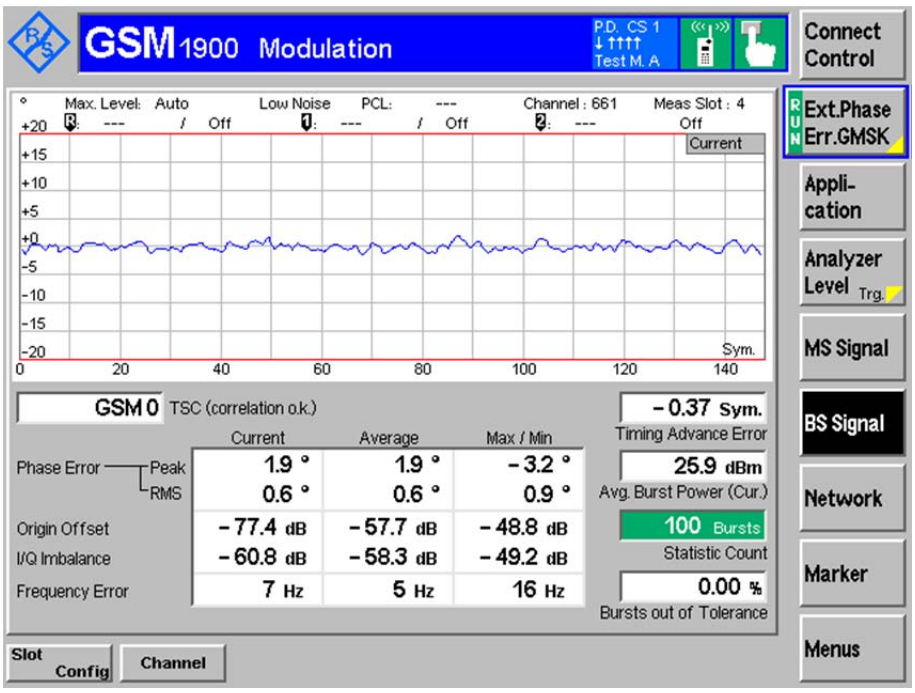
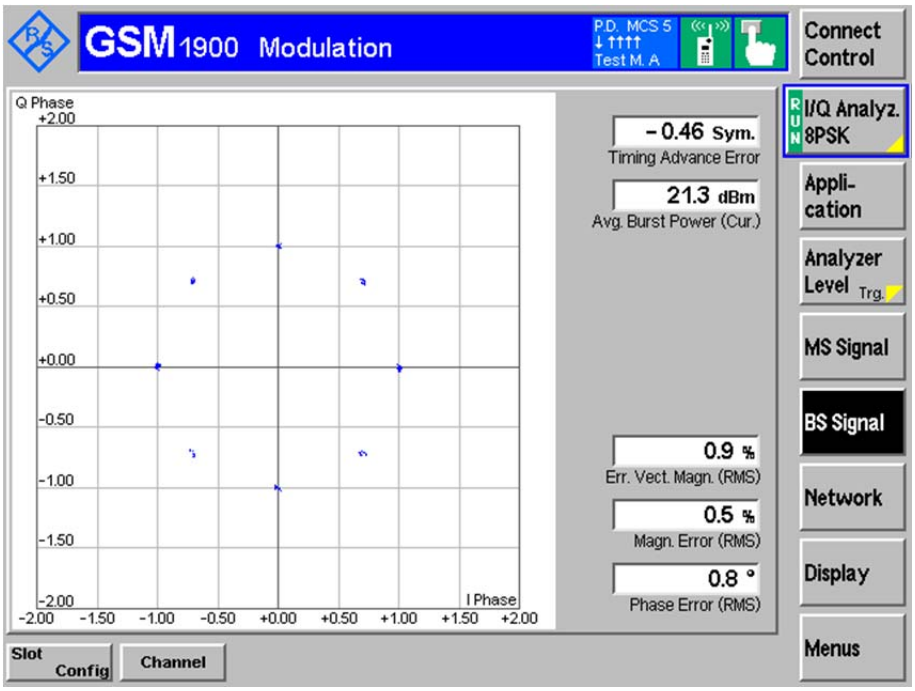
According to ANSI C63.26-2015 section 5.3.2, the following test setup was performed.

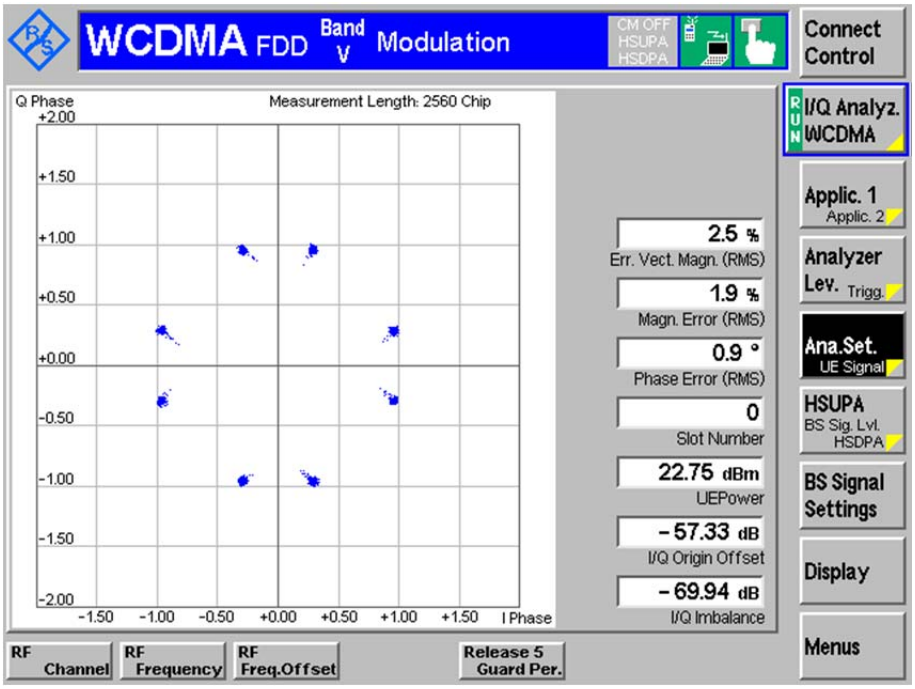
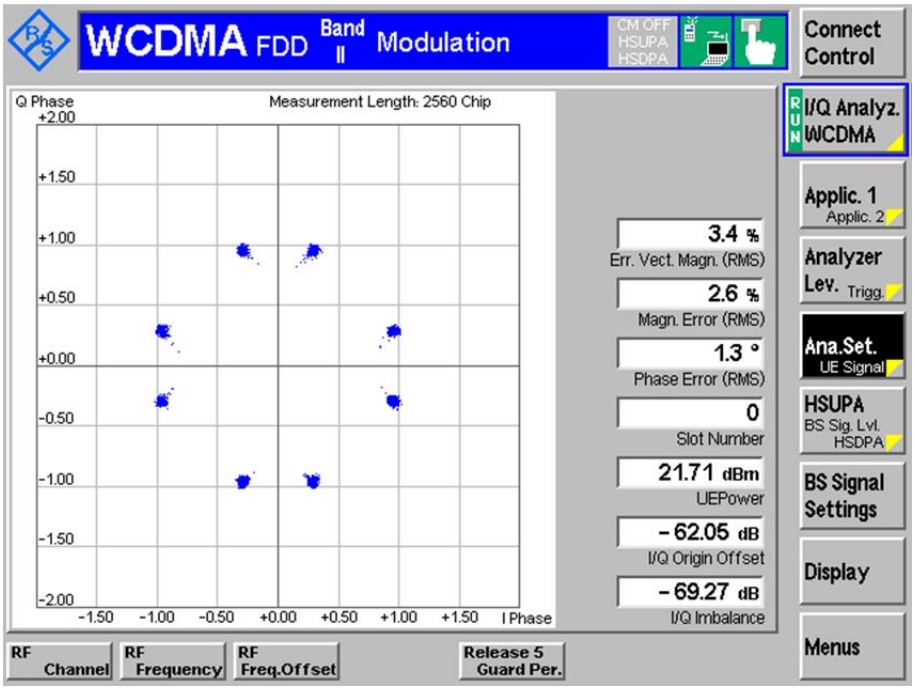


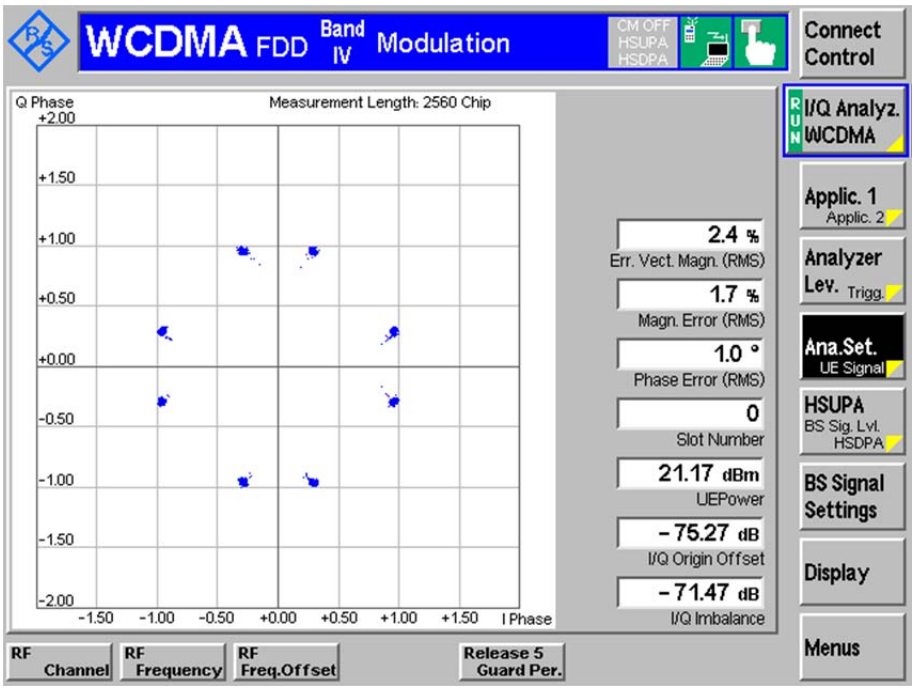
10.3 Summary of Test Results/Plots

Only the worst case was selected to record

GSM850	
Middle Channel-GMSK	
Middle Channel-8PSK	

GSM1900	
Middle Channel-GMSK	
Middle Channel-8PSK	

WCDMA B5	
WCDMA B2	

WCDMA B4	

******* END OF REPORT *******