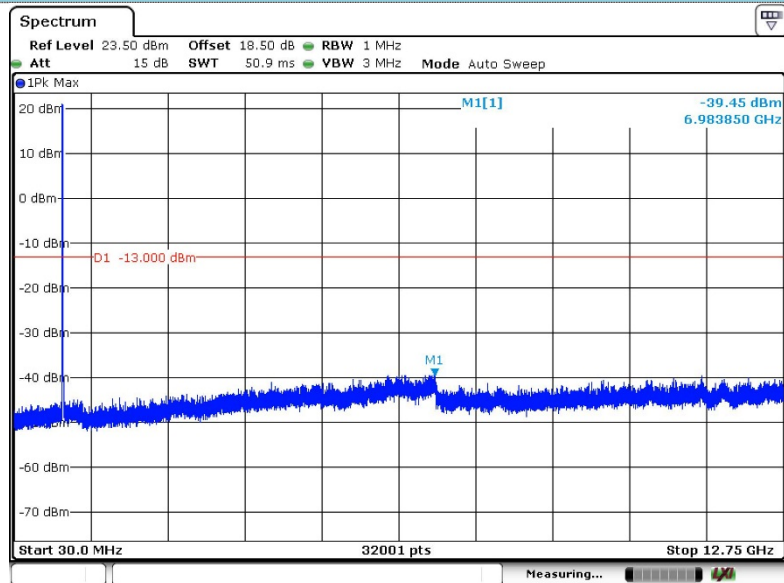
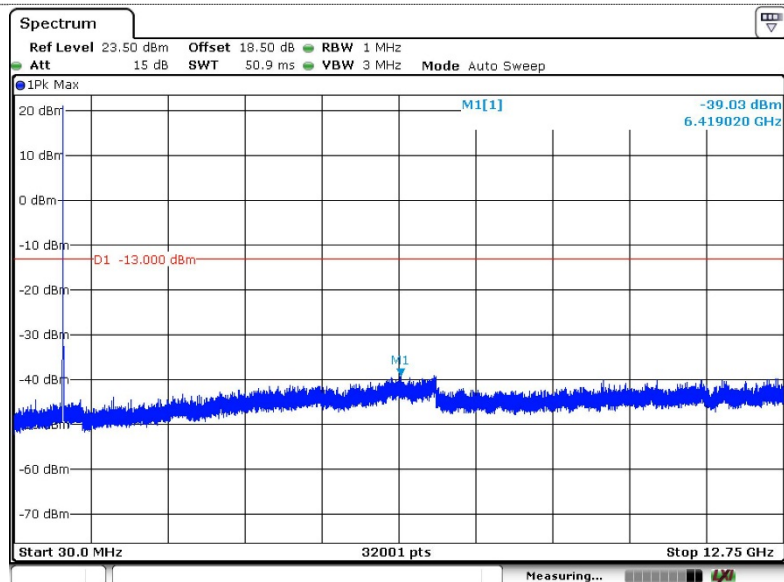


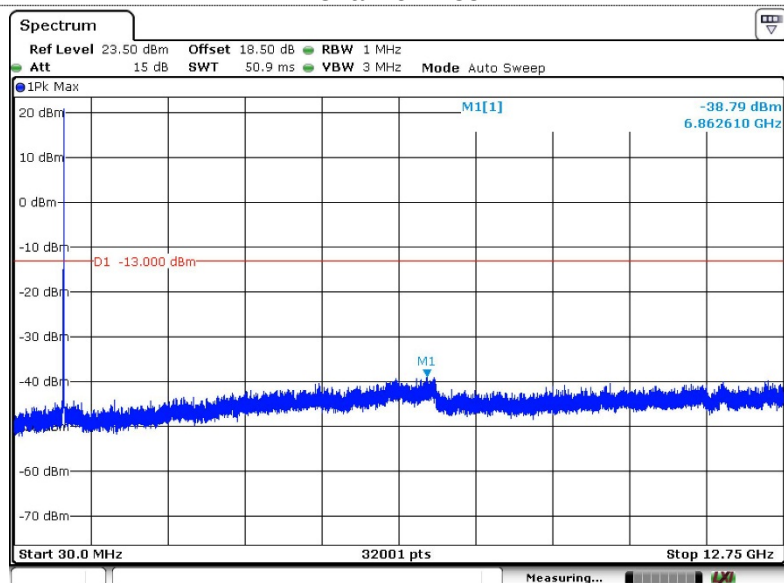
WCDMA Band V



Channel 4132



Channel 4183



Channel 4233

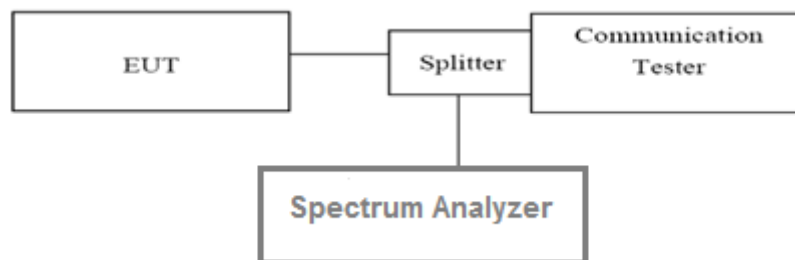
5.4. Band Edge

LIMIT

Part 24.238 and Part 22.917 specify that 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.

The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

TEST CONFIGURATION



TEST PROCEDURE

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. For the band edge: 2G: Set the RBW=3KHz, VBW = 10KHz, Sweep time= Auto
3G: Set the RBW=100KHz, VBW = 300KHz, Sweep time= Auto

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

GSM850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency(MHz)	Values(dBm)		
128	824.2	824	-26.48	-13.00	Pass
251	848.8	849	-24.99	-13.00	Pass

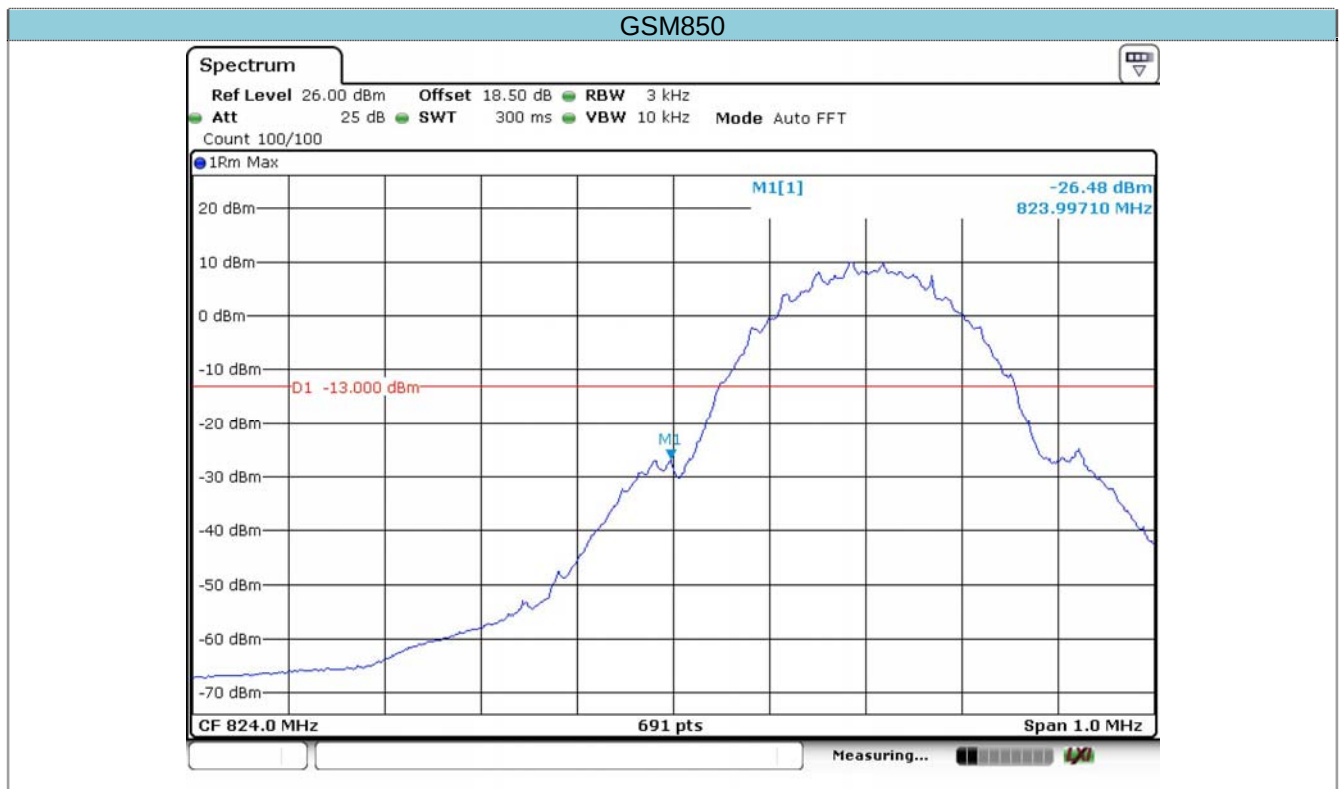
GPRS850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency(MHz)	Values(dBm)		
128	824.2	824	-26.91	-13.00	Pass
251	848.8	849	-25.37	-13.00	Pass

PCS1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency(MHz)	Values(dBm)		
512	1850.2	1850	-30.20	-13.00	Pass
810	1909.8	1910	-31.21	-13.00	Pass

GPRS1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency(MHz)	Values(dBm)		
512	1850.2	1850	-31.10	-13.00	Pass
810	1909.8	1910	-31.39	-13.00	Pass

WCDMA Band II					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency(MHz)	Values(dBm)		
9262	1852.4	1850	-25.24	-13.00	Pass
9538	1907.6	1910	-26.49	-13.00	Pass

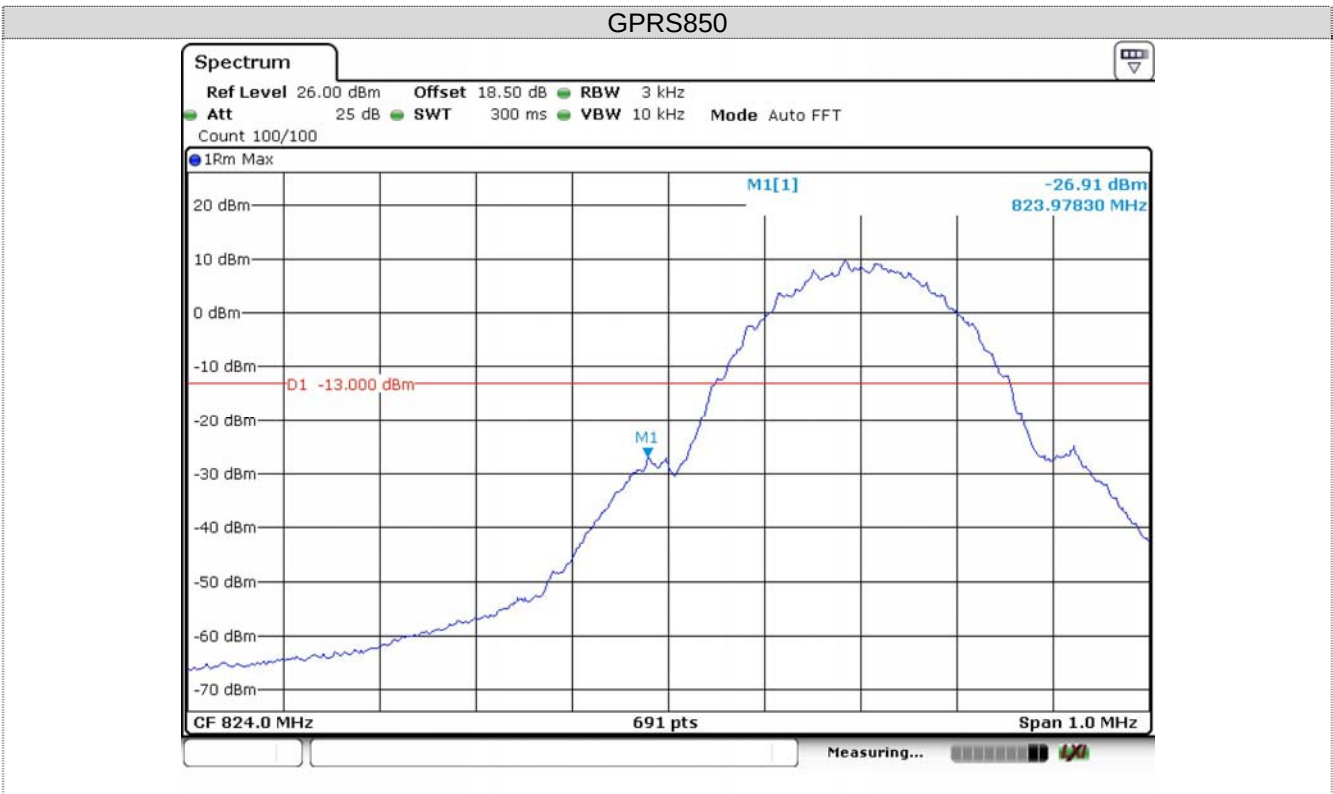
WCDMA Band V					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency(MHz)	Values(dBm)		
4132	826.4	824	-23.36	-13.00	Pass
4233	846.6	849	-24.76	-13.00	Pass



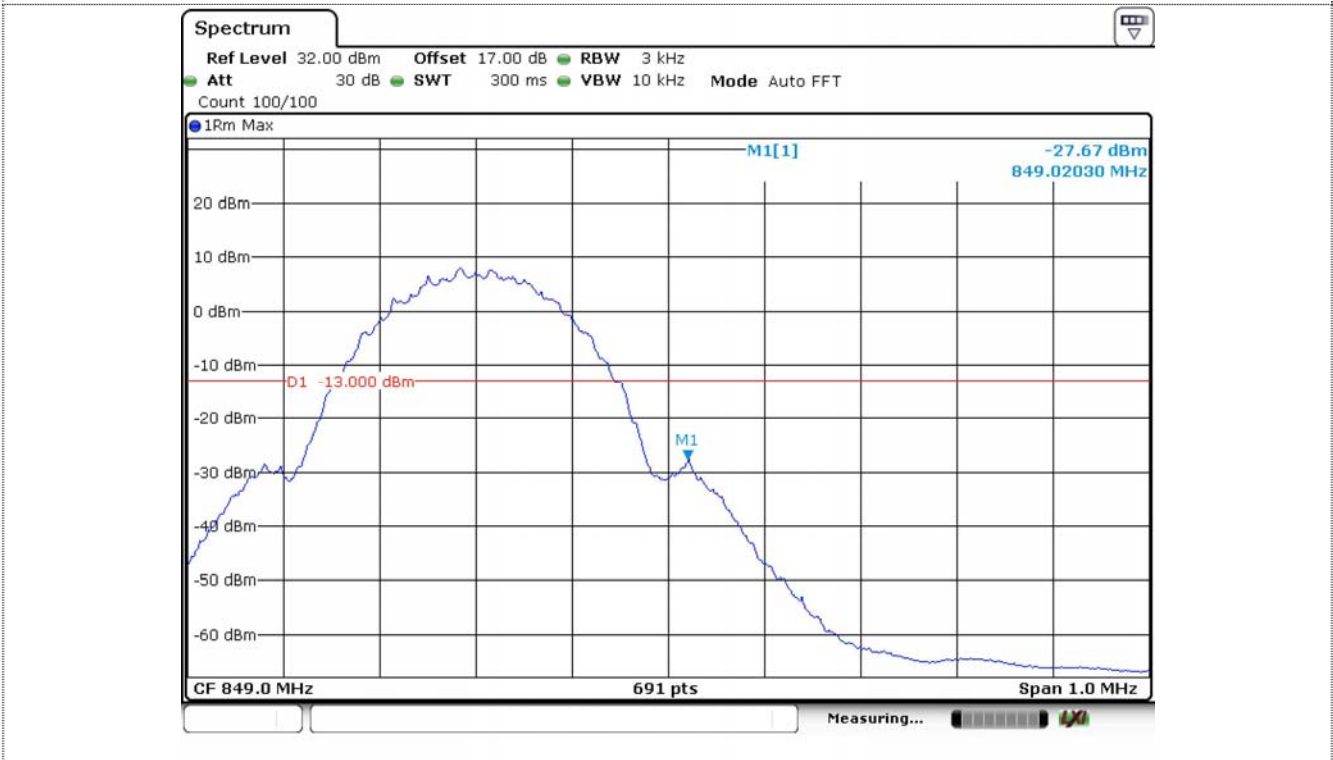
Channel 128



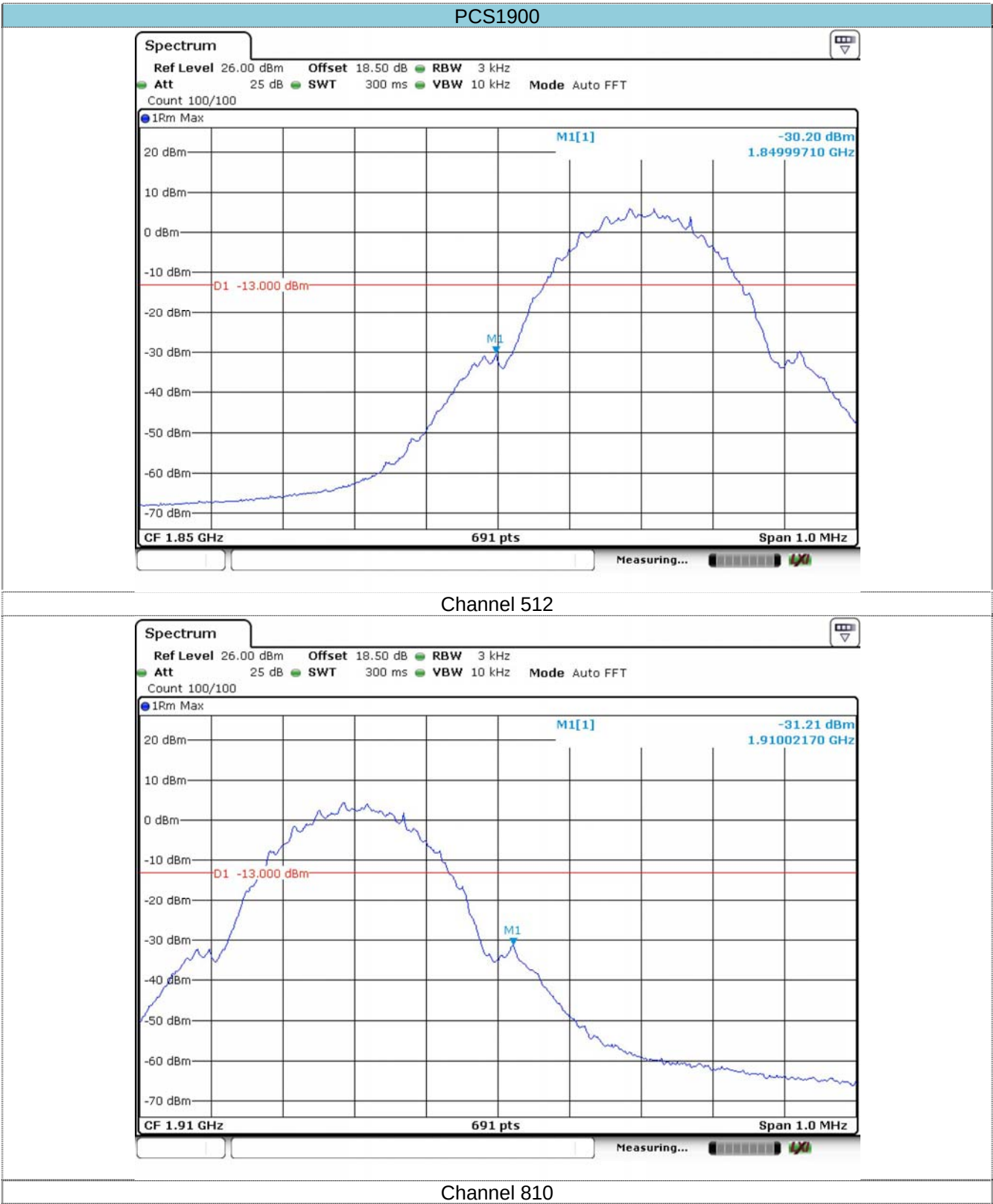
Channel 251

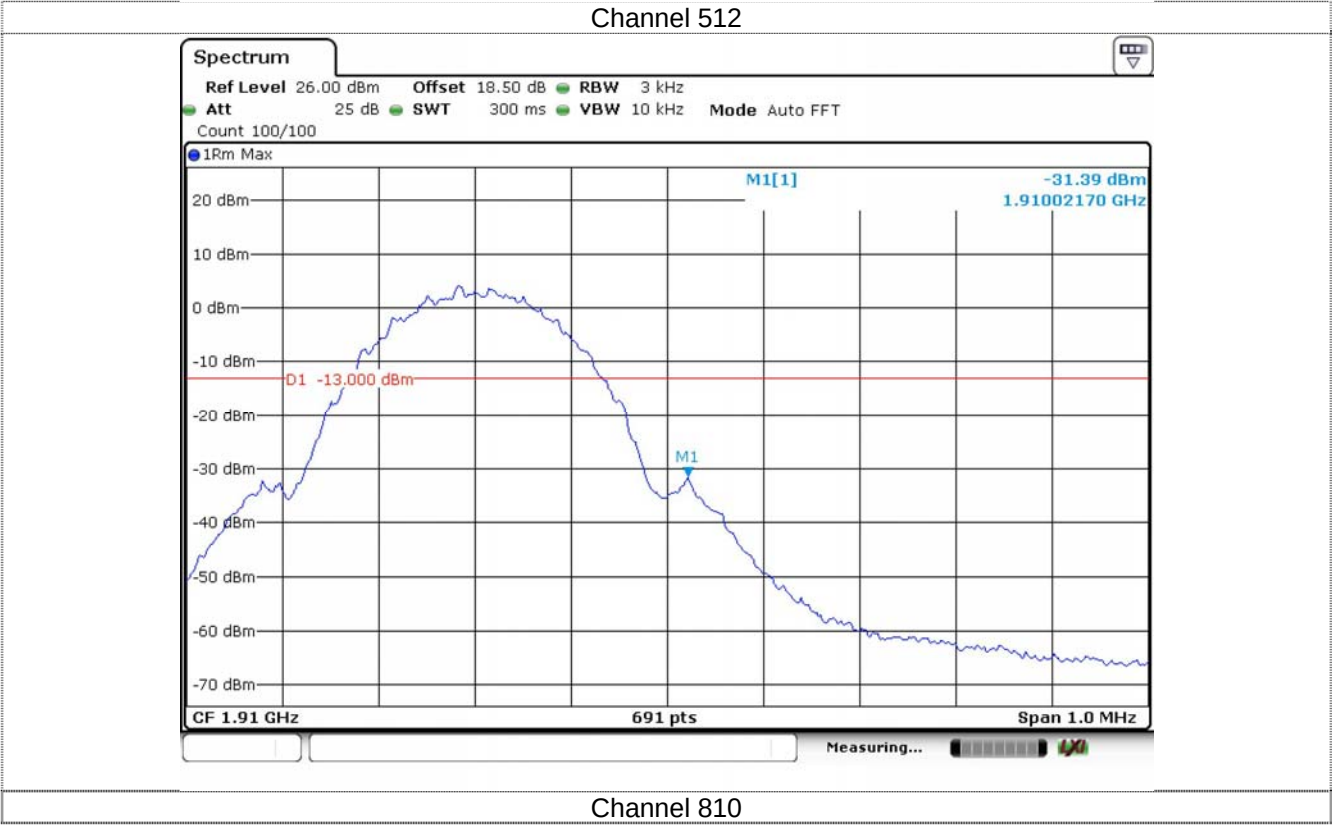
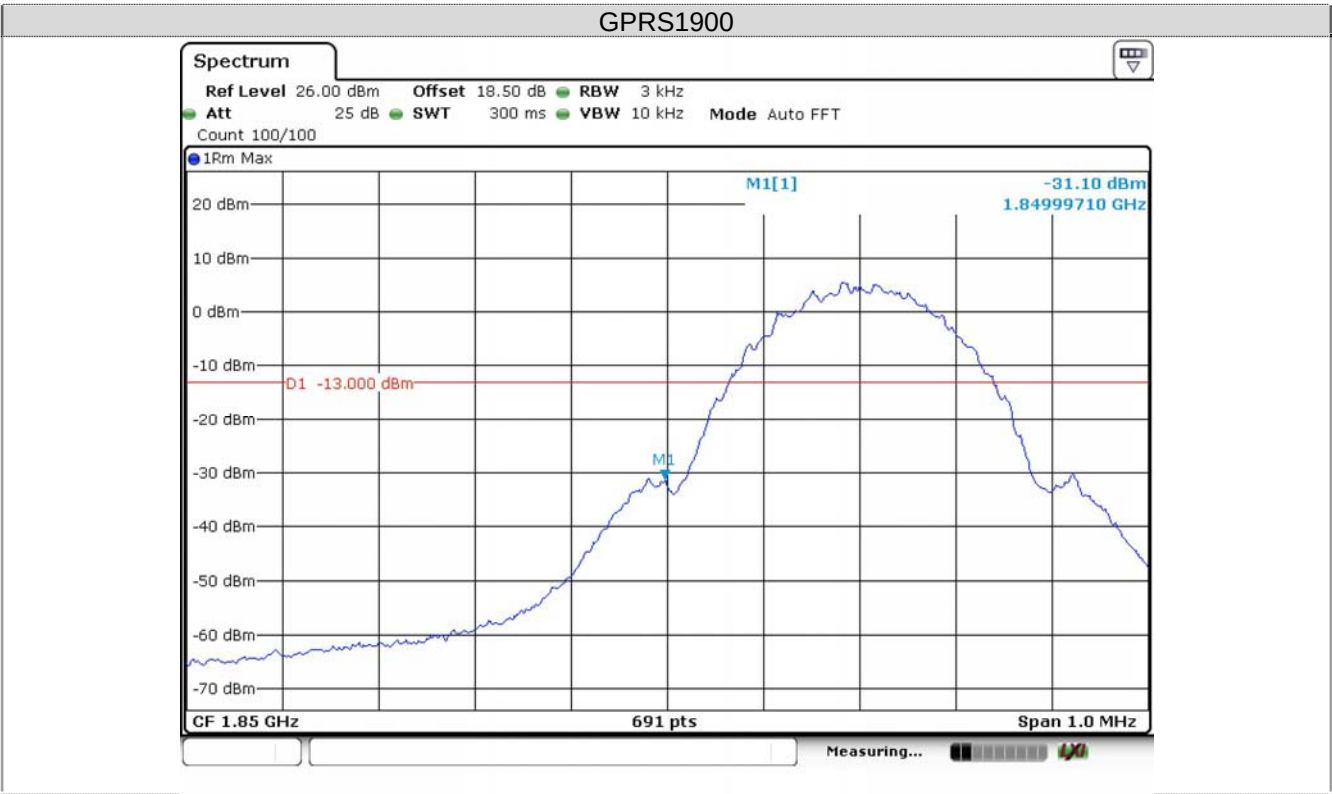


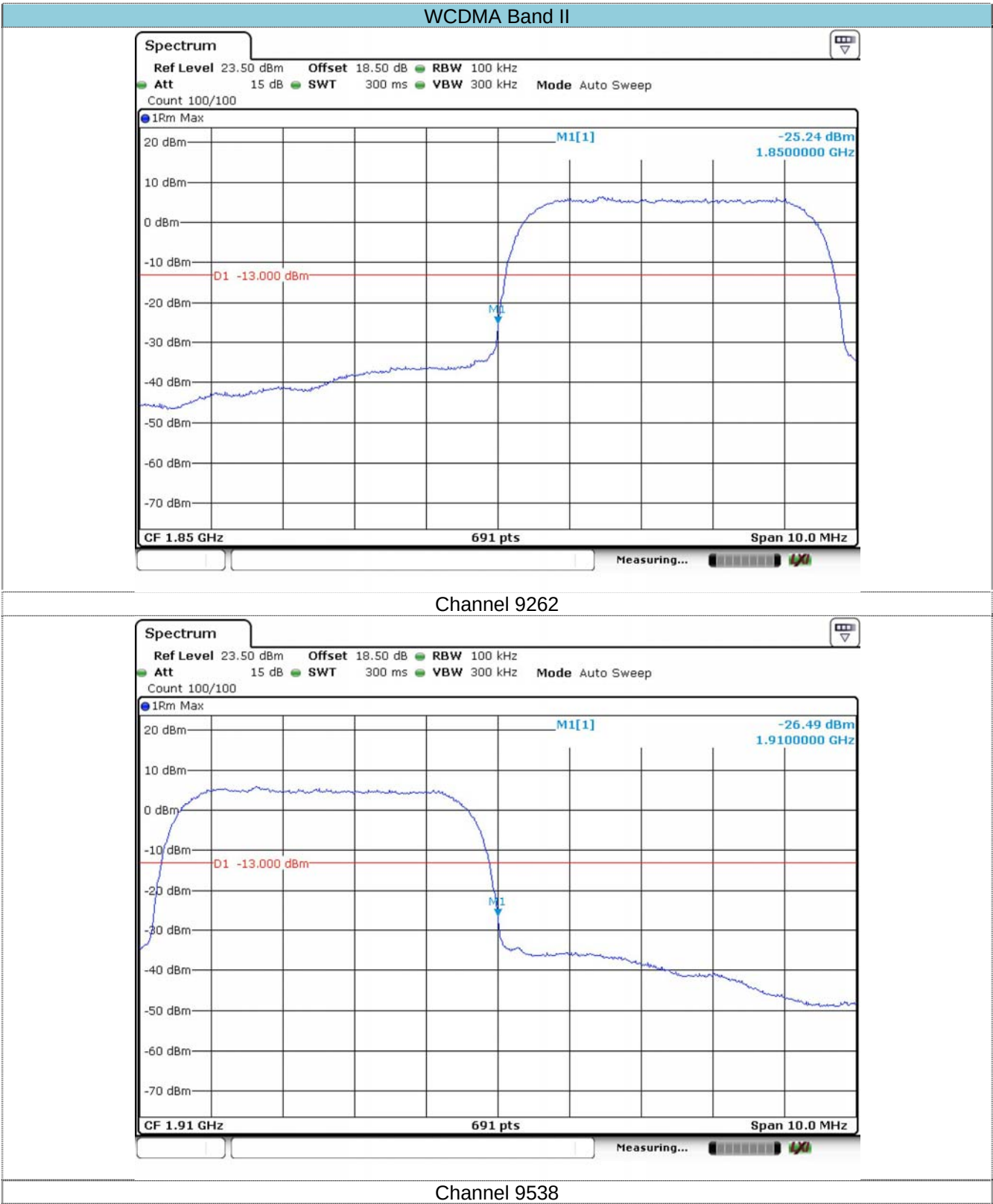
Channel 128

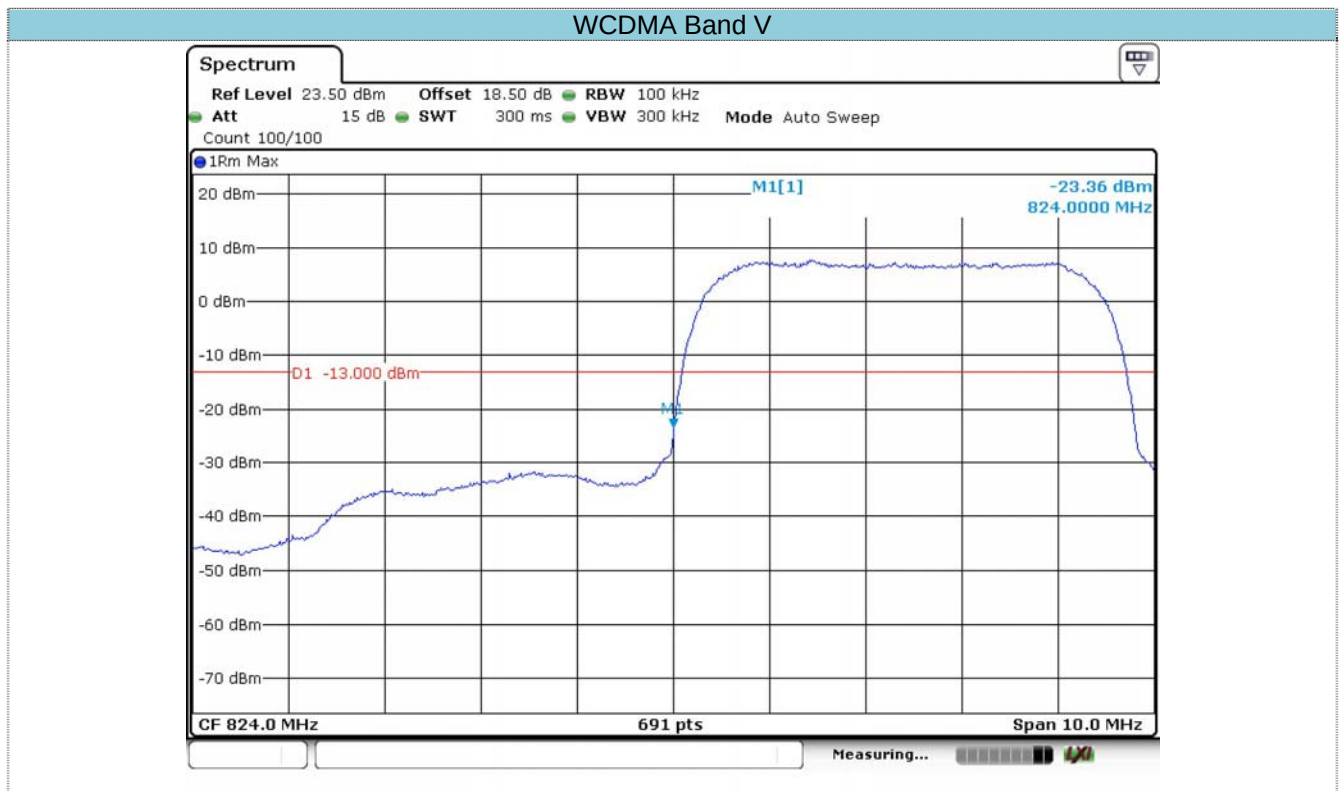


Channel 251

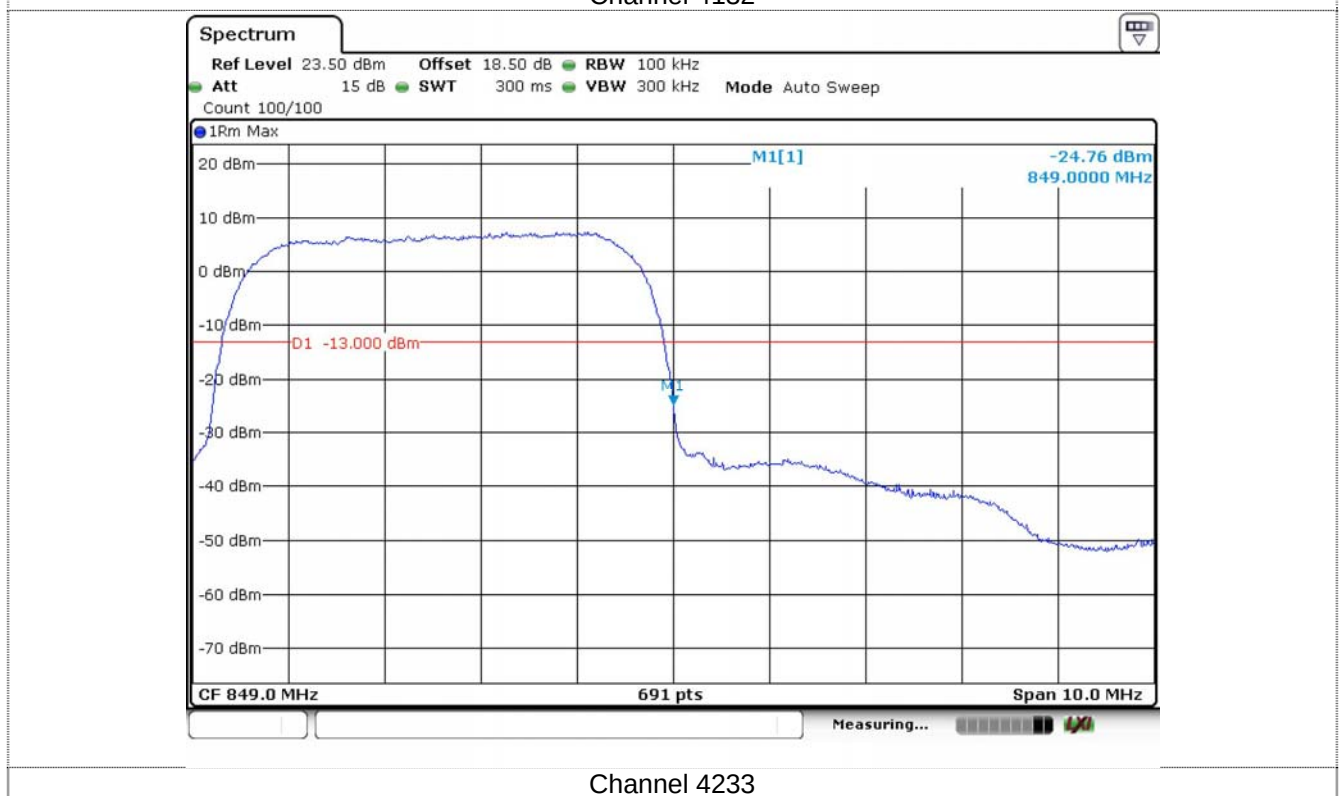








Channel 4132



Channel 4233

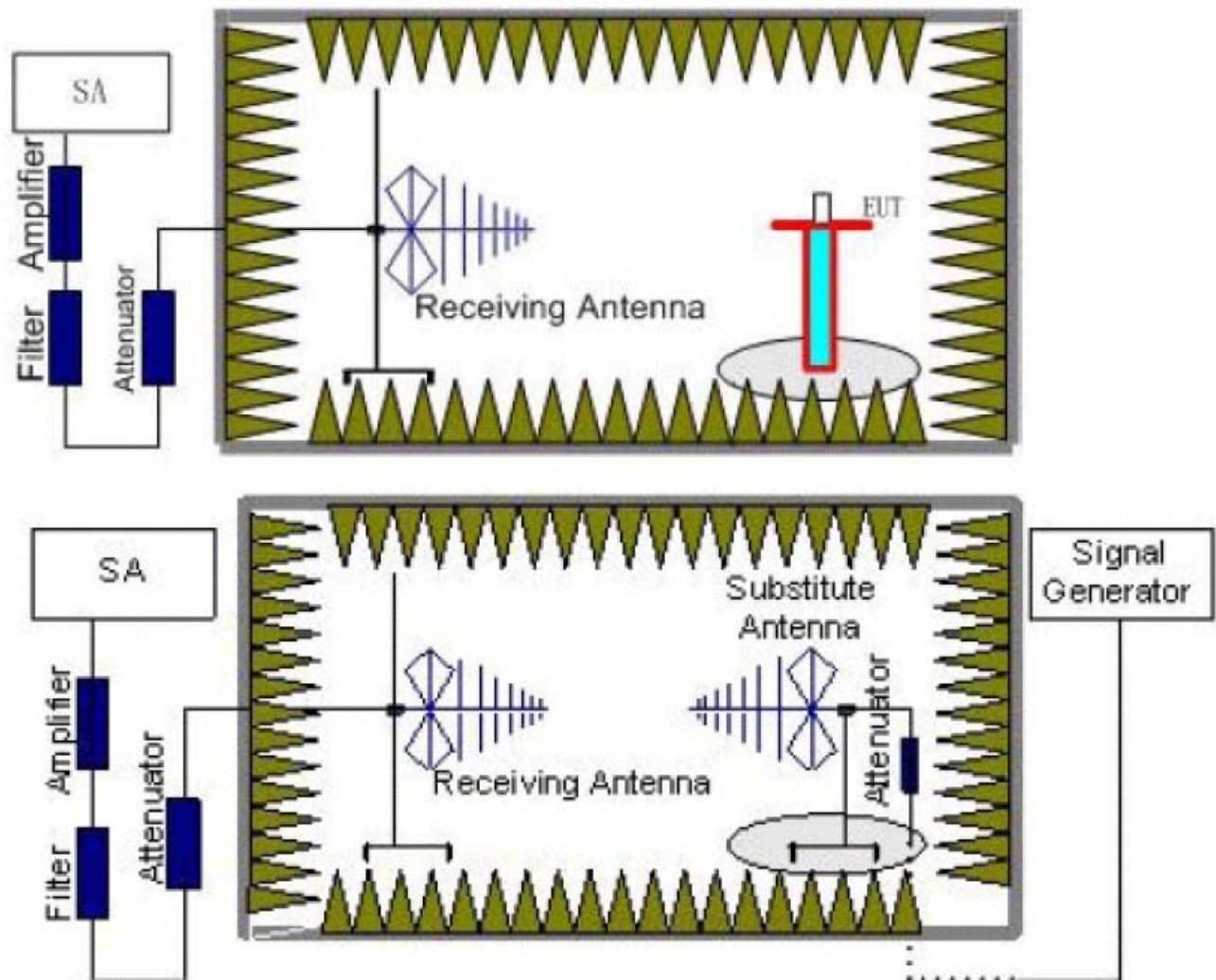
5.5. ERP and EIRP

LIMIT

GSM850/WCDMA Band V: 7W ERP

PCS1900/WCDMA Band II: 2W EIRP

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.0m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 1GHz,, And the maximum value of the receiver should be recorded as (Pr).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the

frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
6. The measurement results are obtained as described below:
 $\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$
 We used SMF100A microwave signal generator which signal level can up to 33dBm, so we not used power Amplifier for substitution test; The measurement results are amend as described below:
 $\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
 ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Mode	Channel	Antenna Pol.	ERP	Limit (dBm)	Result
GSM850	128	V	30.45	38.45	Pass
		H	26.52		
	190	V	29.74		
		H	25.85		
	251	V	29.68		
		H	25.77		
GPRS850	128	V	30.42	38.45	Pass
		H	26.32		
	190	V	29.87		
		H	25.43		
	251	V	29.37		
		H	25.88		

Mode	Channel	Antenna Pol.	EIRP	Limit (dBm)	Result
PCS1900	512	V	27.52	33.00	Pass
		H	23.65		
	661	V	27.47		
		H	23.88		
	810	V	27.84		
		H	23.22		
GPRS1900	512	V	27.48	33.00	Pass
		H	23.55		
	661	V	27.38		
		H	23.44		
	810	V	27.36		
		H	23.59		

Mode	Channel	Antenna Pol.	EIRP	Limit (dBm)	Result
WCDMA Band II	9262	V	21.45	33.00	Pass
		H	14.85		
	9400	V	20.36		
		H	14.44		
	9538	V	20.58		
		H	14.66		

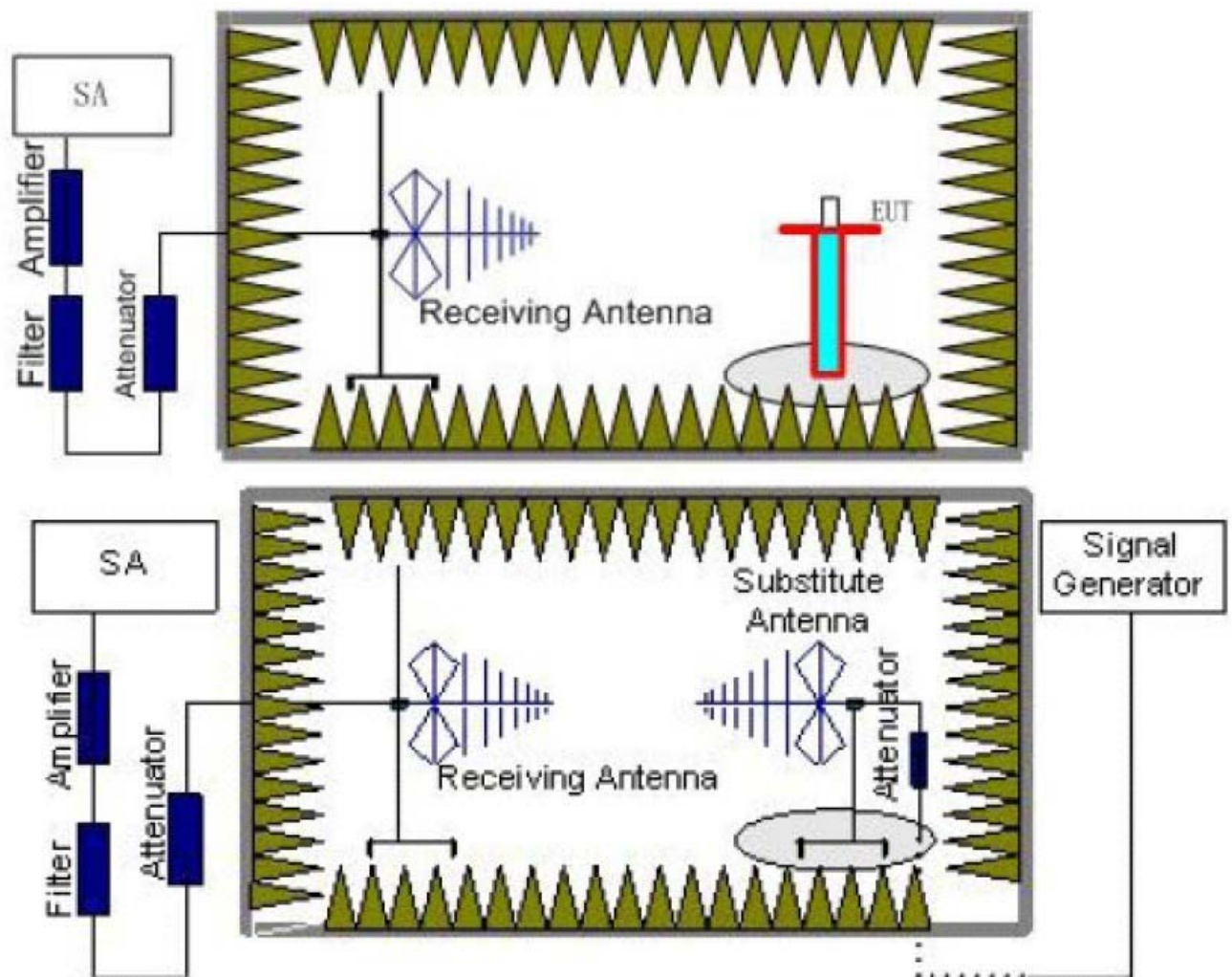
Mode	Channel	Antenna Pol.	ERP	Limit (dBm)	Result
WCDMA Band V	4132	V	20.37	38.45	Pass
		H	14.56		
	4183	V	20.36		
		H	14.22		
	4233	V	20.38		
		H	14.52		

5.6. Radiated Spurious Emission

LIMIT

-13dBm

TEST CONFIGURATION



TEST RESULTS

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.0m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the

substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:
Power(EIRP)=PMea- PAg - Pcl + Ga
We used SMF100A microwave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substitution test; The measurement results are amend as described below:
Power(EIRP)=PMea- Pcl + Ga
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note: Worst case at GSM850/PCS1900

GSM850					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
128	182.21	Vertical	-66.83	-13.00	Pass
	378.65	V	-63.42		
	1648.51	V	-45.93		
	2472.57	V	-40.46		
	3295.11	V	-45.92		
	9067.72	V	-38.06		
	156.09	Horizontal	-69.58	-13.00	Pass
	259.91	H	-60.20		
	1648.51	H	-49.28		
	2472.57	H	-36.88		
	3295.11	H	-52.74		
	4945.67	H	-45.62		
190	259.91	Vertical	-62.23	-13.00	Pass
	378.65	V	-60.80		
	1764.70	V	-47.81		
	2510.89	V	-38.48		
	4179.88	V	-50.31		
	9213.53	V	-39.67		
	156.09	Horizontal	-69.43	-13.00	Pass
	259.91	H	-60.40		
	1747.34	H	-49.36		
	2410.87	H	-44.33		
	5017.92	H	-50.45		
	9213.53	H	-37.67		
251	156.09	Vertical	-69.38	-13.00	Pass
	259.91	V	-57.80		
	1698.14	V	-48.64		
	2547.01	V	-37.45		
	4240.94	V	-39.61		
	8494.84	V	-41.41		
	156.09	Horizontal	-66.14	-13.00	Pass
	259.91	H	-63.75		
	1698.14	H	-47.75		
	2547.01	H	-39.25		
	4240.94	H	-50.06		
	7444.58	H	-47.88		

Remark:

1. The emission behaviour belongs to narrowband spurious emission.
2. The emission levels of not record in the report are very lower than the limit and not show in test report.

PCS1900					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
512	156.09	Vertical	-68.99	-13.00	Pass
	390.82	V	-62.29		
	1150.99	V	-69.40		
	2413.52	V	-59.18		
	3700.48	V	-42.27		
	5554.08	V	-37.52		
	233.89	Horizontal	-68.21	-13.00	Pass
	390.82	H	-71.30		
	1762.77	H	-53.88		
	2413.52	H	-57.08		
	3700.48	H	-45.79		
	5554.08	H	-44.79		
661	156.09	Vertical	-67.04	-13.00	Pass
	259.91	V	-69.29		
	1269.22	V	-55.03		
	2262.04	V	-50.79		
	3759.98	V	-47.30		
	8133.18	V	-46.23		
	156.09	Horizontal	-76.11	-13.00	Pass
	233.89	H	-69.90		
	1196.11	H	-53.78		
	2440.18	H	-37.64		
	3759.98	H	-49.64		
	5643.40	H	-47.31		
810	85.85	Vertical	-78.31	-13.00	Pass
	259.91	V	-68.57		
	1486.76	V	-53.35		
	2499.88	V	-50.87		
	3820.45	V	-48.81		
	5725.84	V	-39.35		
	156.09	Horizontal	-66.11	-13.00	Pass
	259.91	H	-62.93		
	1747.34	H	-45.38		
	2456.32	H	-46.82		
	3820.45	H	-51.02		
	9553.71	H	-39.15		

Remark:

1. The emission behaviour belongs to narrowband spurious emission.
2. The emission levels of not record in the report are very lower than the limit and not show in test report.

WCDMA Band II					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
9262	184.14	Vertical	-71.15	-13.00	Pass
	245.69	V	-67.82		
	1370.67	V	-53.68		
	2519.18	V	-45.03		
	3700.48	V	-43.93		
	5562.15	V	-41.98		
	245.69	Horizontal	-65.29	-13.00	Pass
	615.16	H	-64.92		
	1265.04	H	-55.11		
	2595.02	H	-45.86		
9400	3705.85	Vertical	-49.33	-13.00	Pass
	7412.26	V	-38.23		
	245.69	V	-67.47		
	615.16	V	-69.32		
	1753.11	V	-30.98		
	2413.52	V	-40.58		
	3754.53	Horizontal	-46.98	-13.00	Pass
	7520.54	H	-36.77		
	200.36	H	-71.74		
	245.69	H	-65.55		
	1747.34	H	-31.28		
	1960.99	H	-42.82		
9538	3754.53	Vertical	-43.34	-13.00	Pass
	7531.45	V	-38.40		
	184.14	V	-68.04		
	414.90	V	-66.80		
	1989.20	V	-43.21		
	2519.18	V	-46.40		
	3809.38	Horizontal	-47.01	-13.00	Pass
	7630.40	H	-36.88		
	200.36	H	-71.50		
	245.69	H	-68.21		
	1989.20	H	-47.86		
	2580.81	H	-47.89		

Remark:

1. The emission behaviour belongs to narrowband spurious emission.
2. The emission levels of not record in the report are very lower than the limit and not show in test report.

WCDMA Band V					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
4132	200.36	Vertical	-65.22	-13.00	Pass
	414.90	V	-67.26		
	1290.30	V	-54.00		
	1747.34	V	-39.73		
	4507.29	V	-54.96		
	7674.79	V	-48.23		
	200.36	Horizontal	-69.43	-13.00	Pass
	245.69	H	-65.35		
	1747.34	H	-43.64		
	2413.52	H	-46.73		
	4874.47	H	-54.17		
	7981.27	H	-47.09		
4183	200.36	Vertical	-71.20	-13.00	Pass
	300.22	V	-73.26		
	1747.34	V	-37.44		
	2424.15	V	-44.98		
	4811.26	V	-54.66		
	7843.58	V	-48.09		
	200.36	Horizontal	-68.07	-13.00	Pass
	414.90	H	-64.96		
	1747.34	H	-48.60		
	2519.18	H	-49.06		
	4860.35	H	-54.20		
	10651.48	H	-44.16		
4233	200.36	Vertical	-66.07	-13.00	Pass
	245.69	V	-68.02		
	1511.46	V	-52.86		
	2456.32	V	-35.78		
	5150.64	V	-53.86		
	8445.71	V	-47.31		
	200.36	Horizontal	-65.19	-13.00	Pass
	365.56	H	-67.53		
	1473.75	H	-54.15		
	2519.18	H	-50.32		
	5466.18	H	-53.59		
	7832.21	H	-47.79		

Remark:

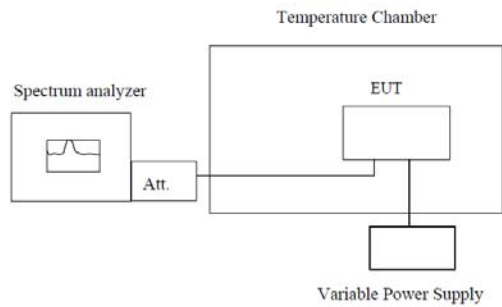
1. The emission behaviour belongs to narrowband spurious emission.
2. The emission levels of not record in the report are very lower than the limit and not show in test report.

5.7. Frequency stability V.S. Temperature measurement

LIMIT

2.5ppm

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -30°C . After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of $+50^{\circ}\text{C}$ reached.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note: Worst case at GSM850/PCS1900/WCDMA B2/B5 mid channel

Reference Frequency: GSM850 Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.80	-30	25	0.030	2.50	Pass
	-20	24	0.029		
	-10	23	0.027		
	0	23	0.027		
	10	28	0.033		
	20	26	0.031		
	30	24	0.029		
	40	24	0.029		
	50	25	0.030		
Reference Frequency: PCS1900 Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.80	-30	22	0.012	2.50	Pass
	-20	23	0.012		
	-10	25	0.013		
	0	24	0.013		
	10	21	0.011		
	20	23	0.012		
	30	26	0.014		
	40	25	0.013		
	50	24	0.013		

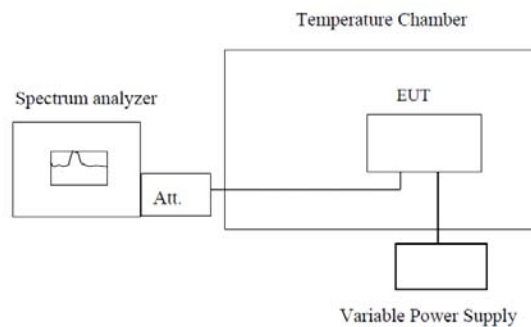
Reference Frequency: WCDMA Band II Middle channel=9400 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.80	-30	10	0.005	2.50	Pass
	-20	11	0.006		
	-10	13	0.007		
	0	12	0.006		
	10	15	0.008		
	20	13	0.007		
	30	14	0.007		
	40	12	0.006		
	50	11	0.006		
Reference Frequency: WCDMA Band V Middle channel=4182 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.80	-30	8	0.010	2.50	Pass
	-20	9	0.011		
	-10	10	0.012		
	0	11	0.013		
	10	8	0.010		
	20	9	0.011		
	30	13	0.016		
	40	12	0.014		
	50	9	0.011		

5.8. Frequency stability V.S. Voltage measurement

LIMIT

2.5ppm

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage.
2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and record the frequency.
3. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note: Worst case at GSM850/PCS1900/WCDMA B2 /B5 mid channel

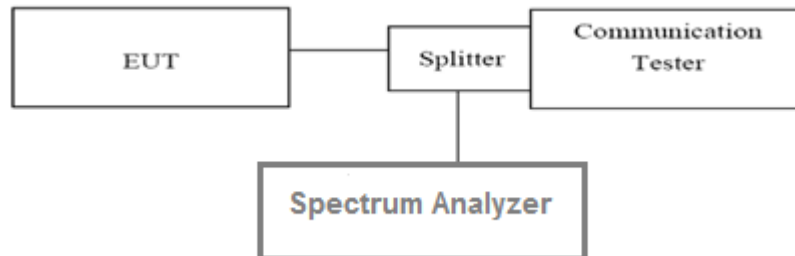
Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.35	25	0.030	2.50	Pass
	3.80	24	0.029		
	3.60	23	0.027		
Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.35	20	0.011	2.50	Pass
	3.80	21	0.011		
	3.60	23	0.012		
Reference Frequency: WCDMA Band II Middle channel=9400 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.35	10	0.005	2.50	Pass
	3.80	13	0.007		
	3.60	12	0.006		
Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.35	8	0.010	2.50	Pass
	3.80	9	0.011		
	3.60	10	0.012		

5.9. Peak-Average Ratio

LIMIT

13dB

TEST CONFIGURATION



TEST PROCEDURE

According with KDB 971168

1. The signal analyzer' s CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal " RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the " on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

TEST MODE:

Please refer to the clause 3.3

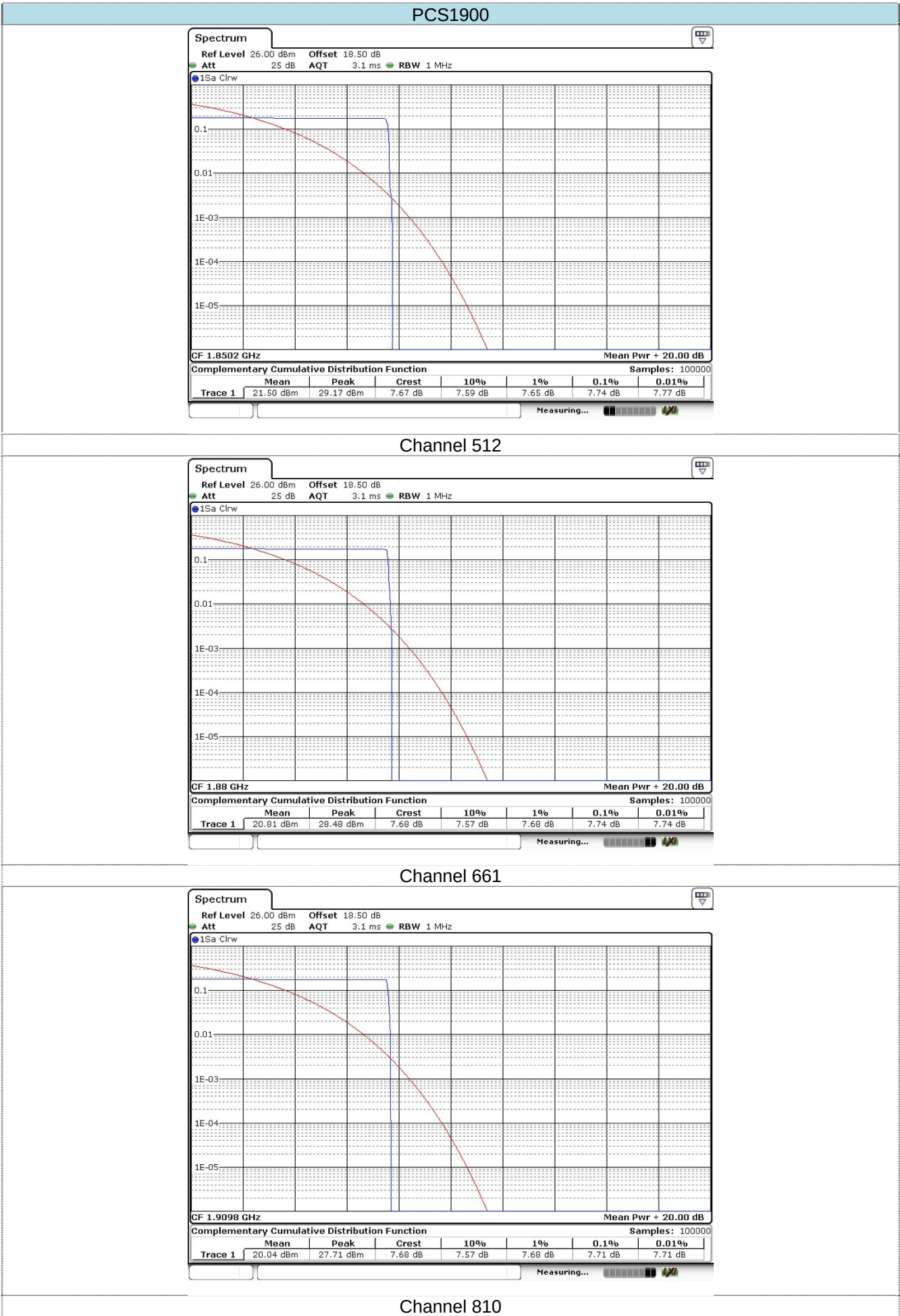
TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

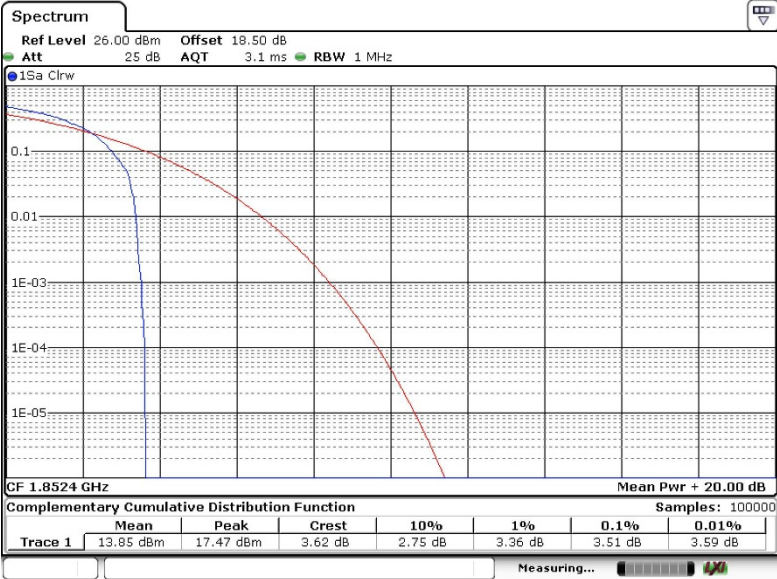
Note: Worst case PCS1900, WCDMA BAND1900, WCDMA BAND1700

Band	Channel	Frequency(MHz)	PAR	Limit(dB)	Result
PCS1900	512	1850.2	7.74	13.00	Pass
	661	1880.0	7.74	13.00	Pass
	810	1909.8	7.71	13.00	Pass

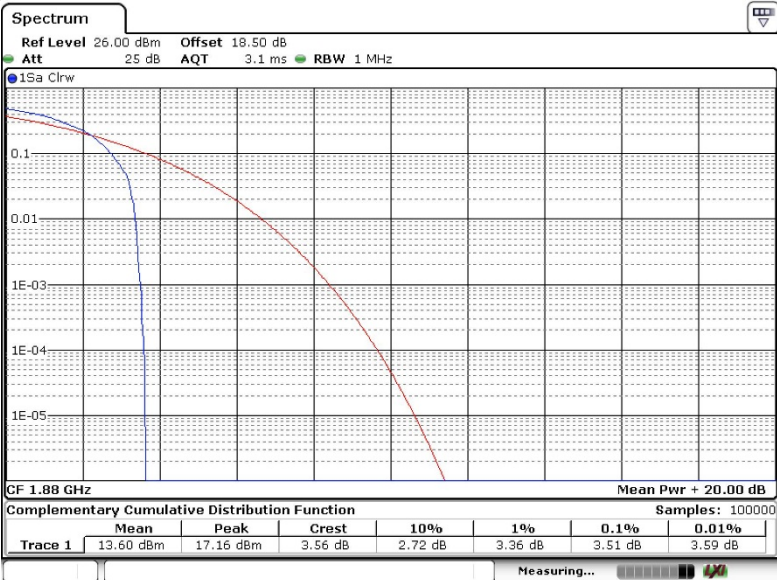
Band	Channel	Frequency(MHz)	PAR	Limit(dB)	Result
WCDMA BAND II	9262	1852.4	3.51	13.00	Pass
	9400	1880.0	3.51	13.00	Pass
	9538	1907.6	3.45	13.00	Pass



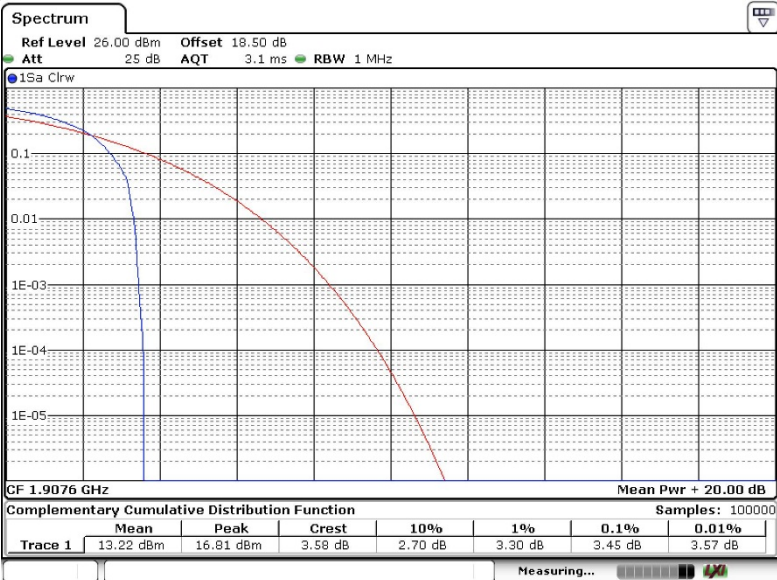
WCDMA BAND II



Channel 9262



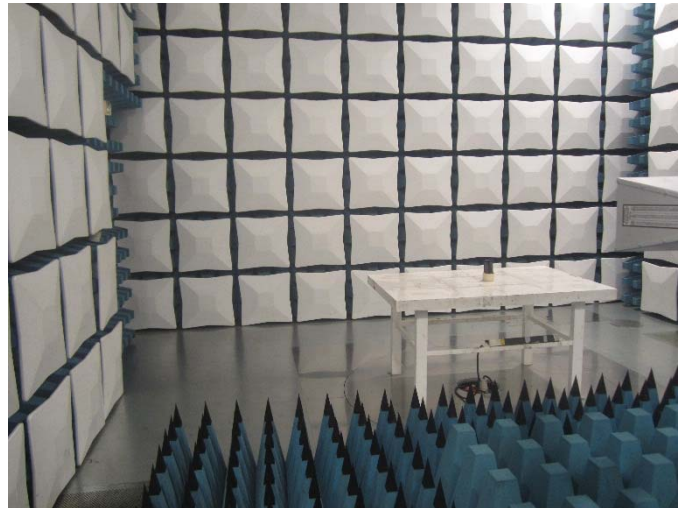
Channel 9400



Channel 9538

6. Test Setup Photos of the EUT

Radiated emission:

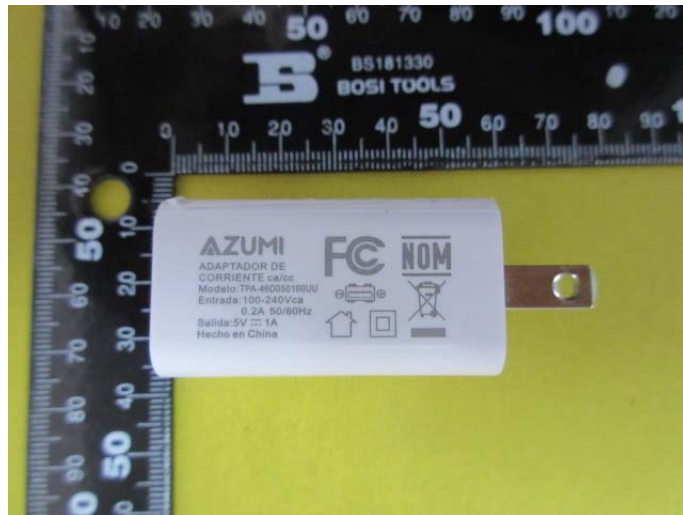


7. External and Internal Photos of the EUT

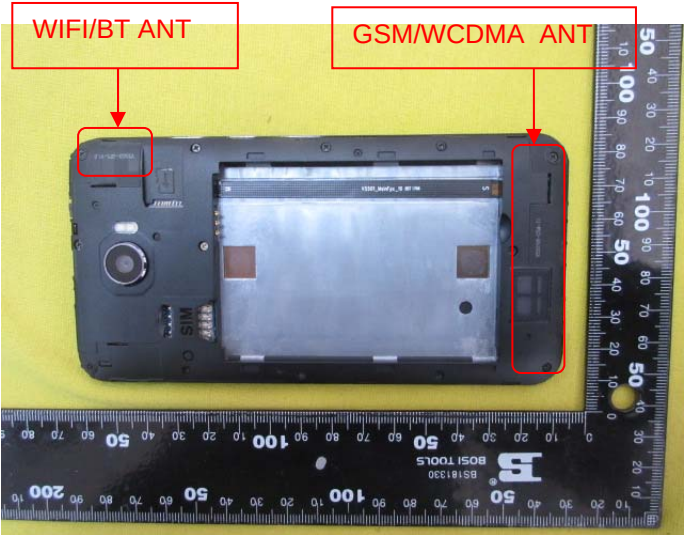
External photos of the EUT

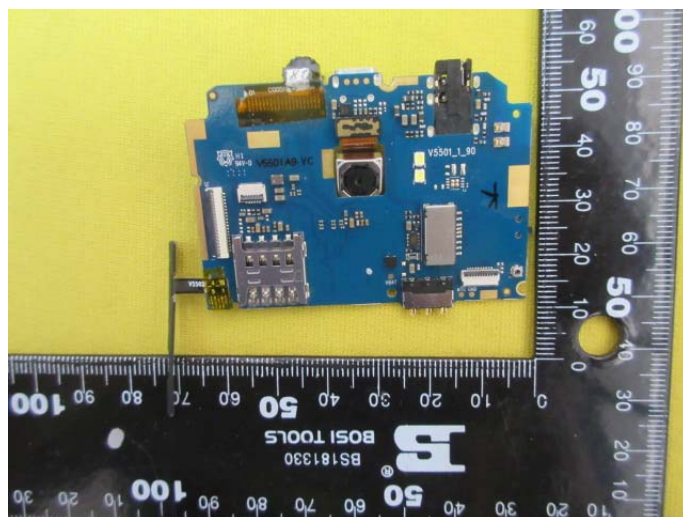
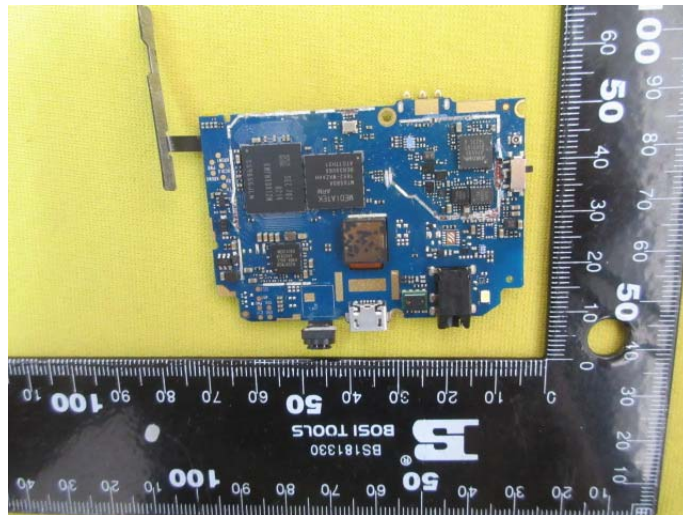


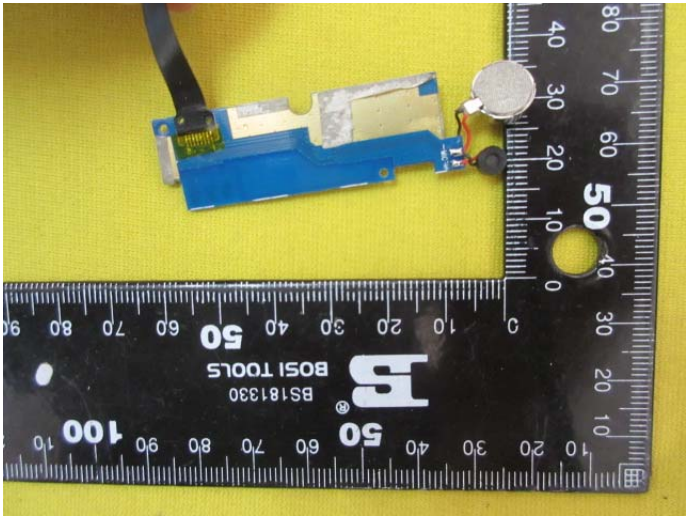
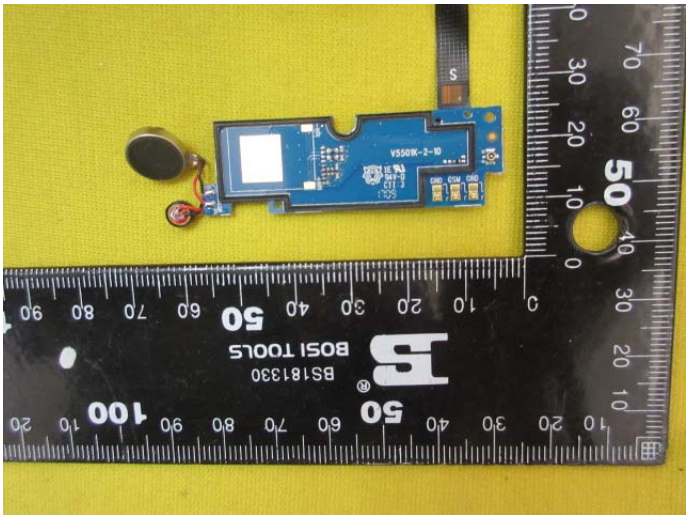




Internal photos of the EUT







.....End of Report.....