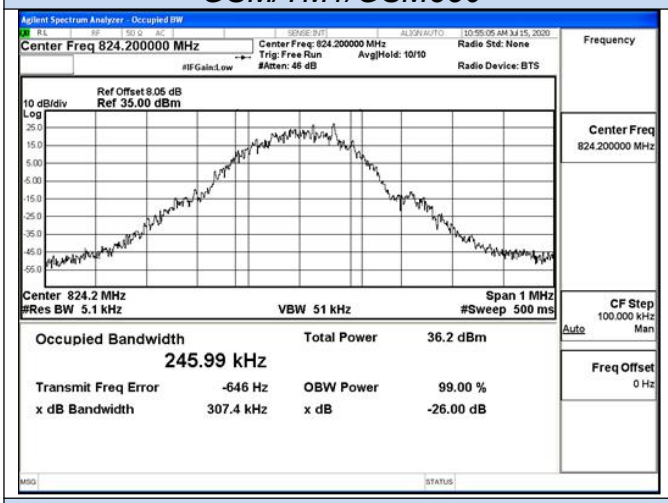
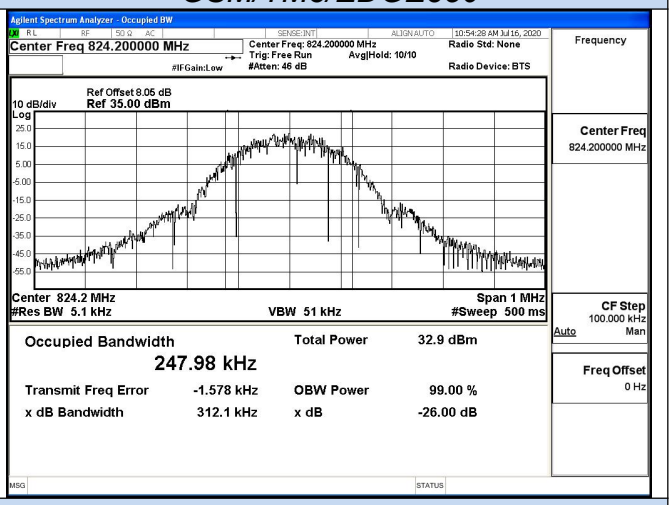
Occupied Bandwidth and Emission Bandwidth

GSM/TM1/GSM850



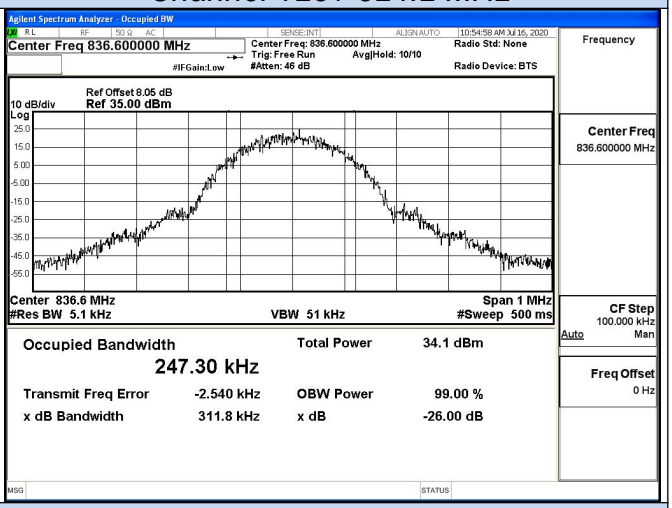
Channel 128 / 824.2 MHz

GSM/TM3/EDGE850

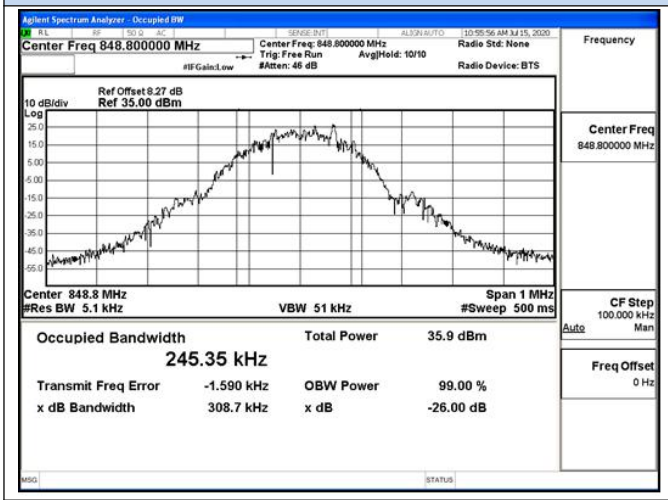


Channel 128 / 824.2 MHz

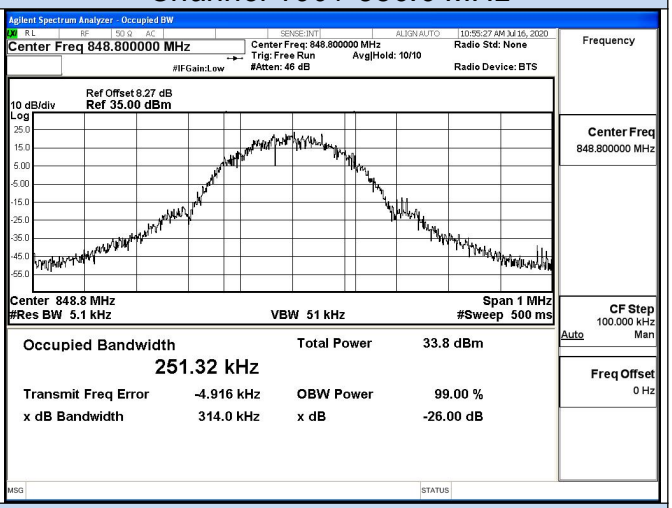
Channel 190 / 836.6 MHz



Channel 190 / 836.6 MHz



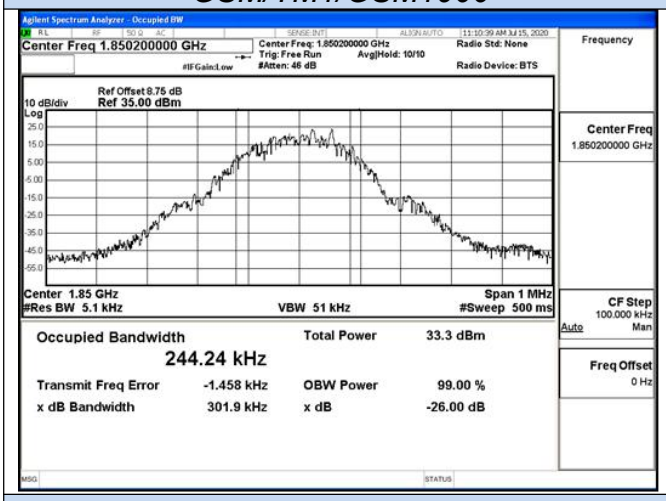
Channel 251 / 848.8 MHz



Channel 251 / 848.8 MHz

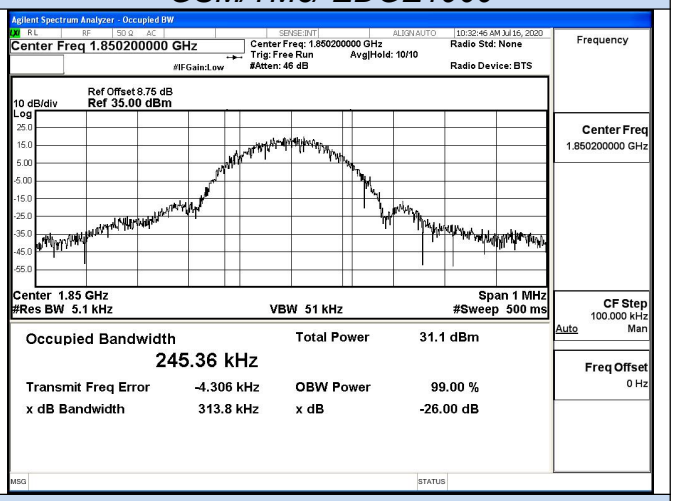
Occupied Bandwidth and Emission Bandwidth

GSM/TM1/GSM1900



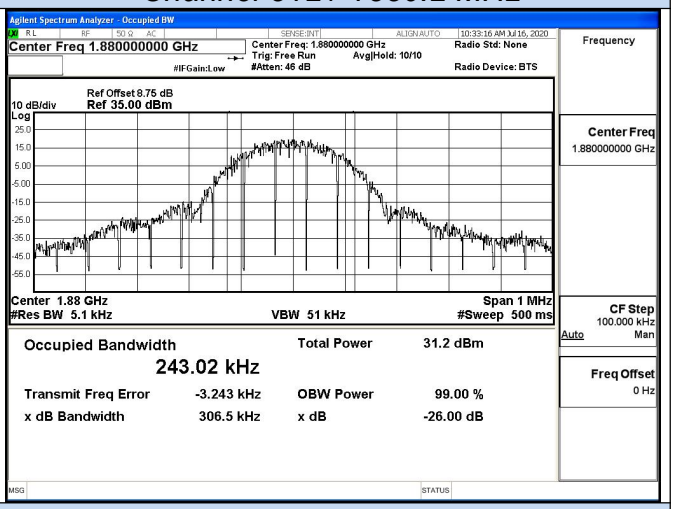
Channel 512 / 1850.2 MHz

GSM/TM3/ EDGE1900

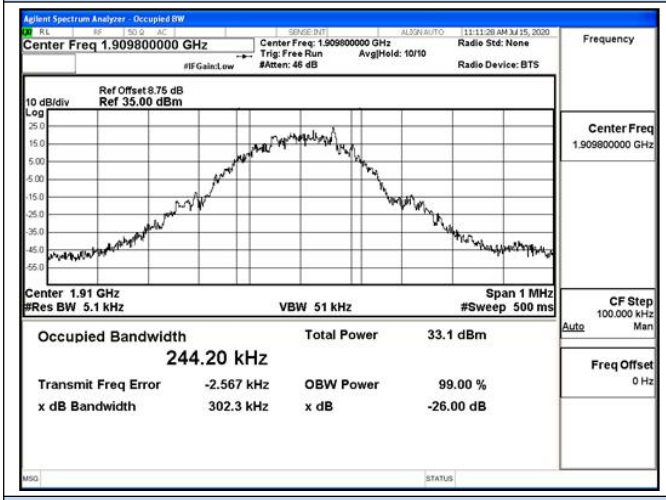


Channel 512 / 1850.2 MHz

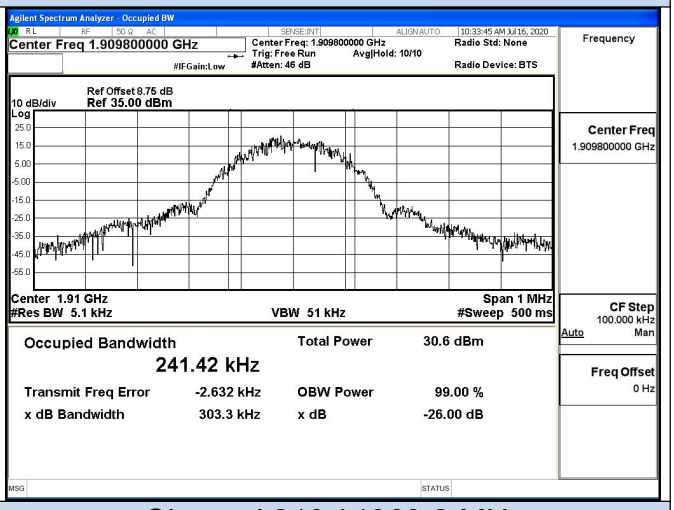
Channel 661 / 1880.0MHz



Channel 661 / 1880.0MHz



Channel 810 / 1909.8 MHz



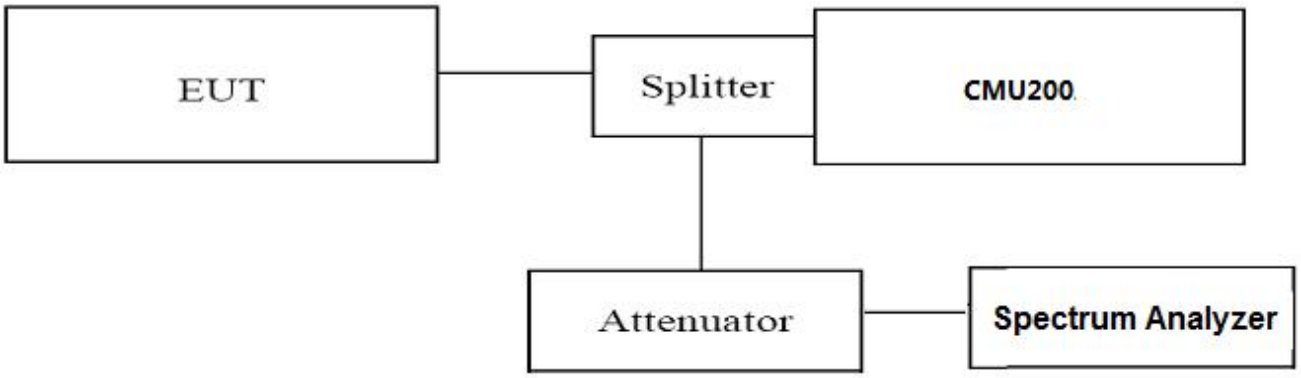
Channel 810 / 1909.8 MHz

4.4 Band Edge Complicance

TEST APPLICABLE

During the process of testing, the EUT was controlled via Digital Radio Communication tester (CMU200) to ensure max power transmission and proper modulation.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The power was measured with Spectrum Analyzer N9020A;
3. Set RBW=5.1KHz,VBW=51KHz,Span=1MHz,SWT=Auto, Dector: RMS;
1. These measurements were done at 2 frequencies, 1850.20 MHz and 1909.80 MHz for PCS1900 band; 824.20 MHz and 848.80 MHz for GSM850 band. (bottom and top of operational frequency range).

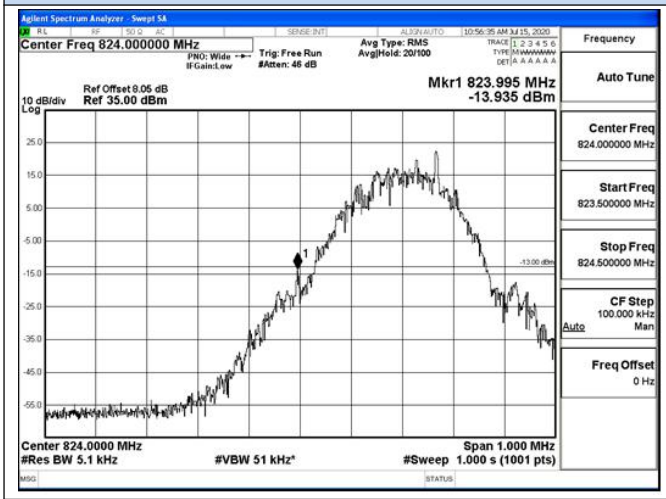
TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Band Edg Compliance (dBm)	Limits (dBm)	Verdict
GSM/TM1/GSM850	128	824.2	<-13dBm	-13dBm	PASS
	251	848.8	<-13dBm	-13dBm	
GSM/TM3/EDGE850	128	824.2	<-13dBm	-13dBm	PASS
	251	848.8	<-13dBm	-13dBm	
GSM/TM1/GSM1900	512	1850.2	<-13dBm	-13dBm	PASS
	810	1909.8	<-13dBm	-13dBm	
GSM/TM3/EDGE1900	512	1850.2	<-13dBm	-13dBm	PASS
	810	1909.8	<-13dBm	-13dBm	

Remark:
1. *Test results including cable loss;*
2. *Please refer to following plots;*

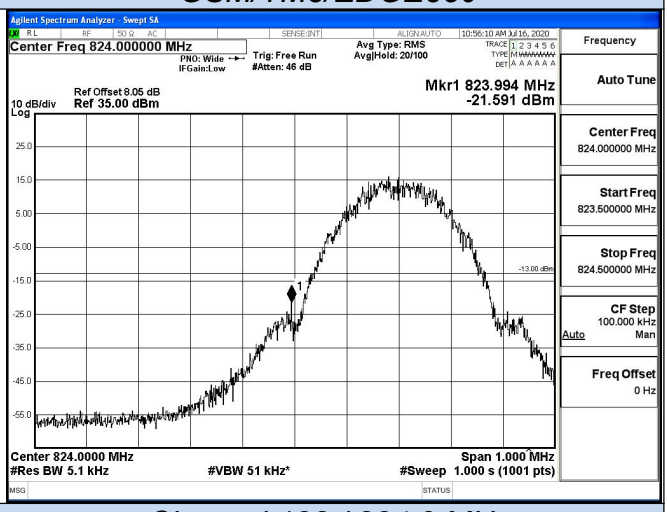
Band-edge Compliance

GSM/TM1/GSM850

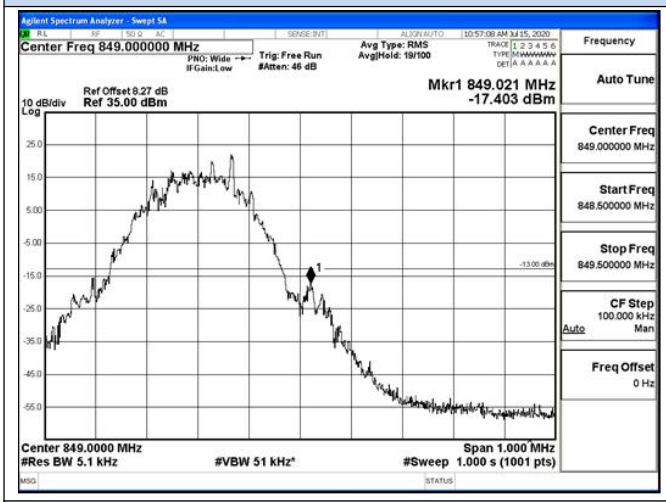


Channel 128 / 824.2 MHz

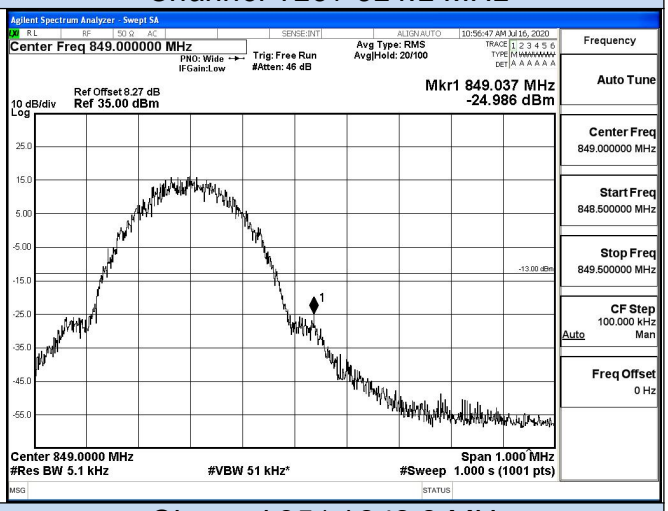
GSM/TM3/EDGE850



Channel 128 / 824.2 MHz



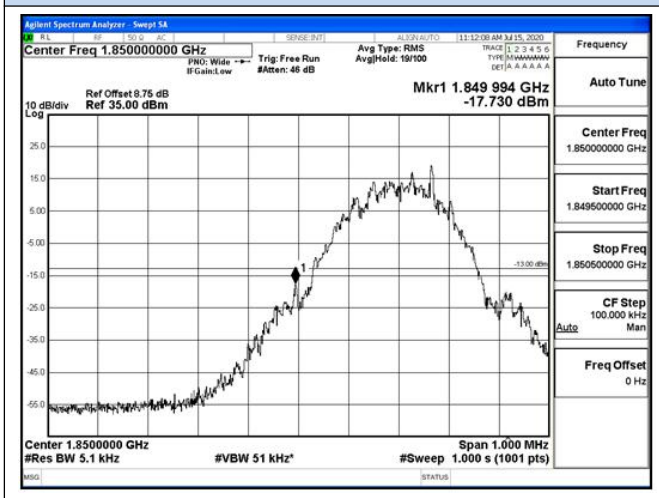
Channel 251 / 848.8 MHz



Channel 251 / 848.8 MHz

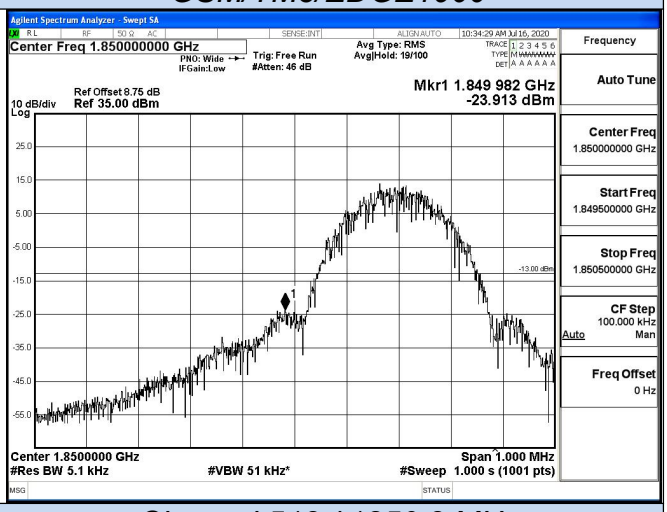
Band-edge Compliance

GSM/TM1/GSM1900

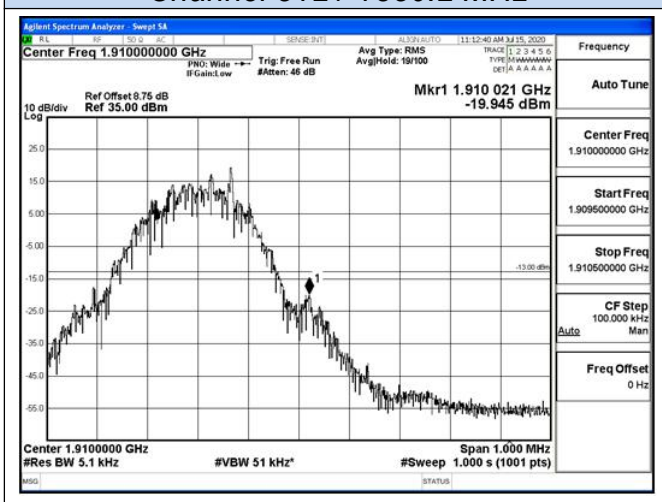


Channel 512 / 1850.2 MHz

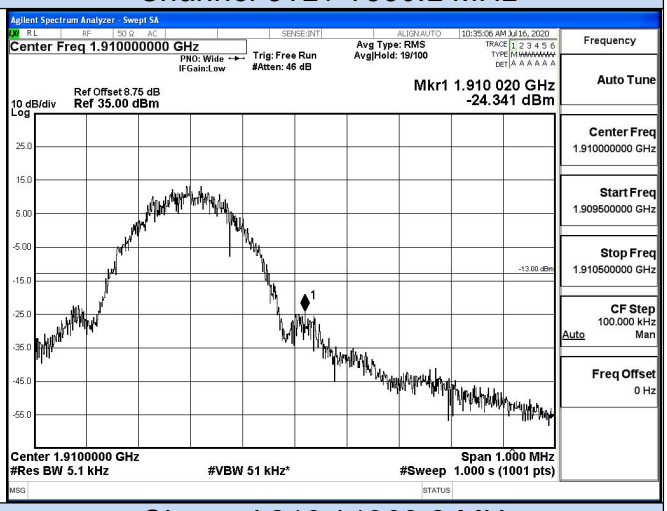
GSM/TM3/EDGE1900



Channel 512 / 1850.2 MHz



Channel 810 / 1909.8 MHz



Channel 810 / 1909.8 MHz

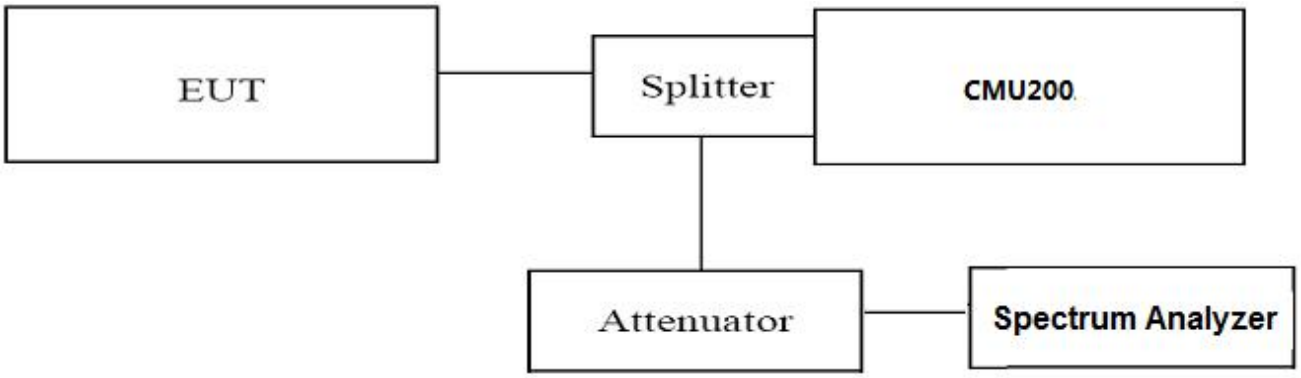
4.5 Spurious Emssion on Antenna Port

TEST APPLICABLE

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

1. Determine frequency range for measurements: From CFR 2.1057 and RSS-GEN 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 9 KHz to 20 GHz, data taken from 30 MHz to 20 GHz. For GSM850, this equates to a frequency range of 9 KHz to 9 GHz,data taken from 30 MHz to 9 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; if the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give an optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:
   The trace mode is set to MaxHold to get the highest signal at each frequency;
   Wait 25 seconds;
   Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The power was measured with Spectrum Analyzer N9020A;
3. These measurements were done at 3 frequencies, 1850.20 MHz, 1880.00 MHz and 1909.80 MHz for PCS1900 band; 824.20 MHz, 836.60 MHz and 848.80 MHz for GSM850 band. (Low, middle and high of operational frequency range).

TEST LIMIT

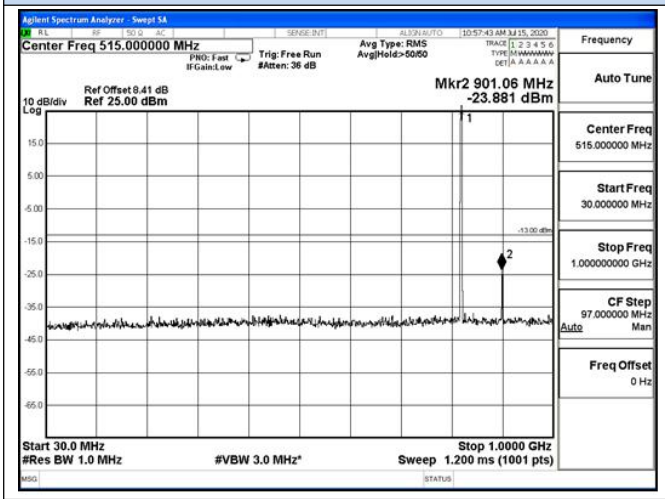
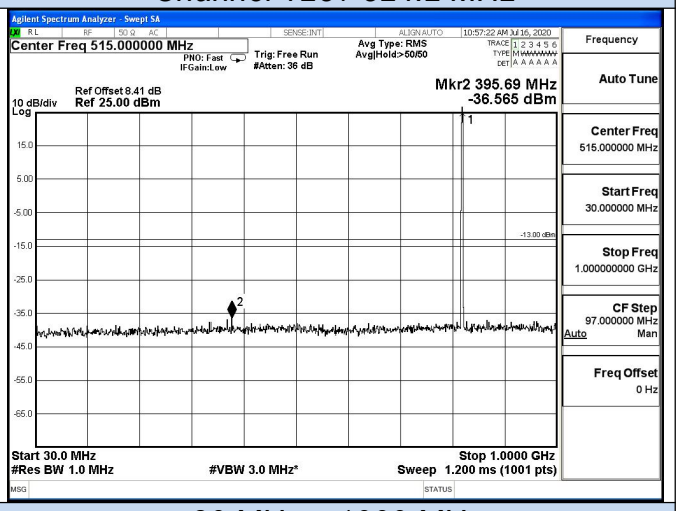
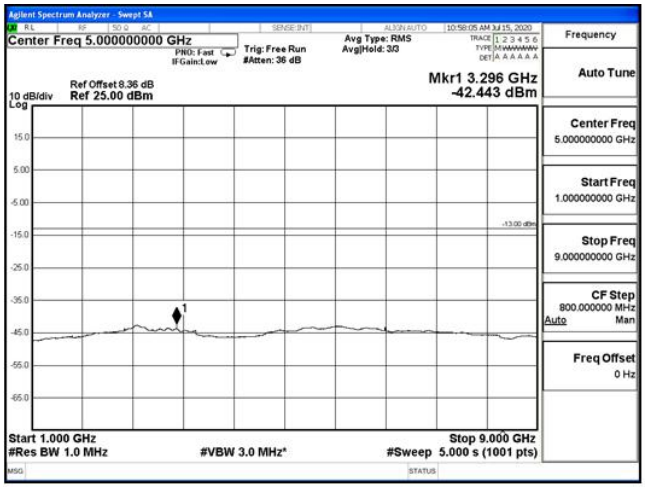
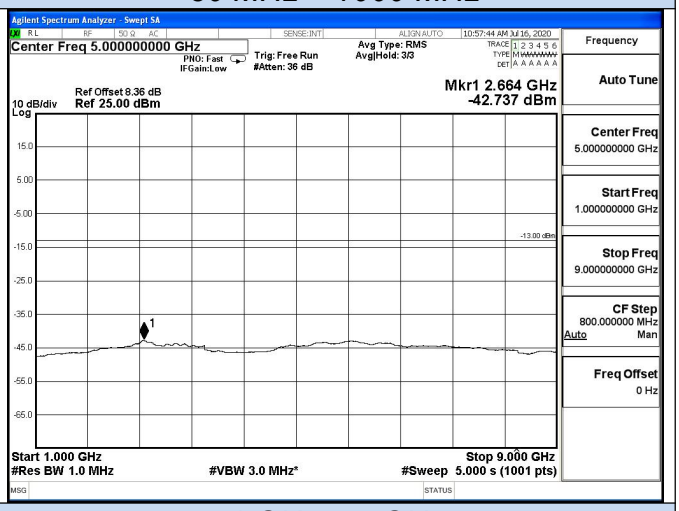
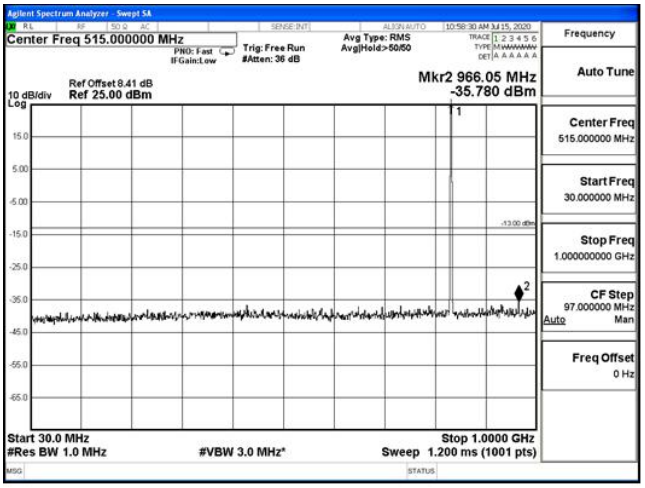
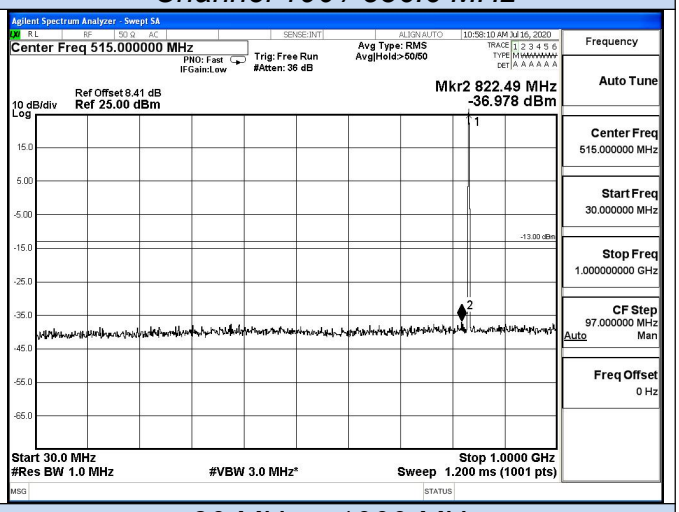
Part 24.238, Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at 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 RESULTS

Test Mode	Channel	Frequency (MHz)	Spurious RF Conducted Emission (dBm)	Limits (dBm)	Verdict
GSM/TM1/GSM850	128	824.2	<-13dBm	-13dBm	PASS
	190	836.6	<-13dBm	-13dBm	
	251	848.8	<-13dBm	-13dBm	
GSM/TM3/EDGE850	128	824.2	<-13dBm	-13dBm	PASS
	190	836.6	<-13dBm	-13dBm	
	251	848.8	<-13dBm	-13dBm	
GSM/TM1/GSM1900	512	1850.2	<-13dBm	-13dBm	PASS
	661	1880.0	<-13dBm	-13dBm	
	810	1909.8	<-13dBm	-13dBm	
GSM/TM3/EDGE1900	512	1850.2	<-13dBm	-13dBm	PASS
	661	1880.0	<-13dBm	-13dBm	
	810	1909.8	<-13dBm	-13dBm	

Remark:
1. *Test results including cable loss;*
2. *Please refer to following plots;*
3. *Not reorded test plots from 9 KHz to 30 MHz as emission levels 20dB lower than emission limit;*

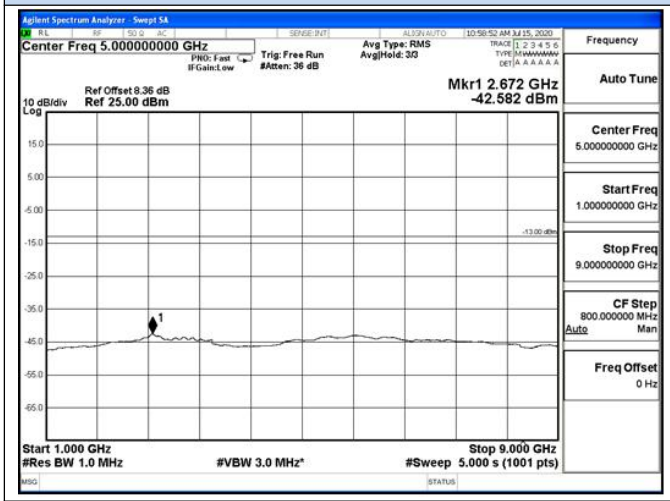
Spurious Emssion on Antenna Port

GSM/TM1/GSM850	GSM/TM3/EDGE850
Channel 128 / 824.2 MHz	Channel 128 / 824.2 MHz
	
30 MHz – 1000 MHz	30 MHz – 1000 MHz
	
1 GHz – 9 GHz	1 GHz – 9 GHz
Channel 190 / 836.6 MHz	Channel 190 / 836.6 MHz
	
30 MHz – 1000 MHz	30 MHz – 1000 MHz

Spurious Emssion on Antenna Port

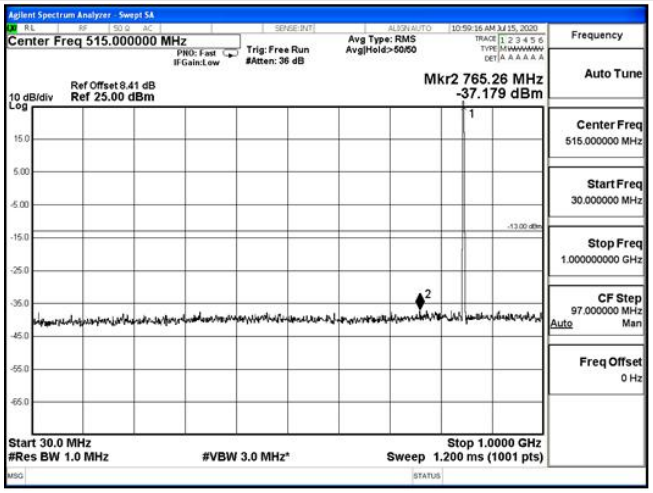
GSM/TM1/GSM850

Channel 190 / 836.6 MHz

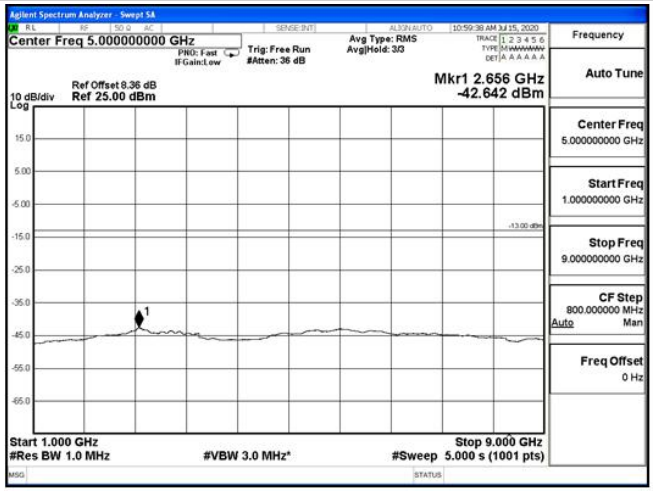


1 GHz – 9 GHz

Channel 251 / 848.8 MHz



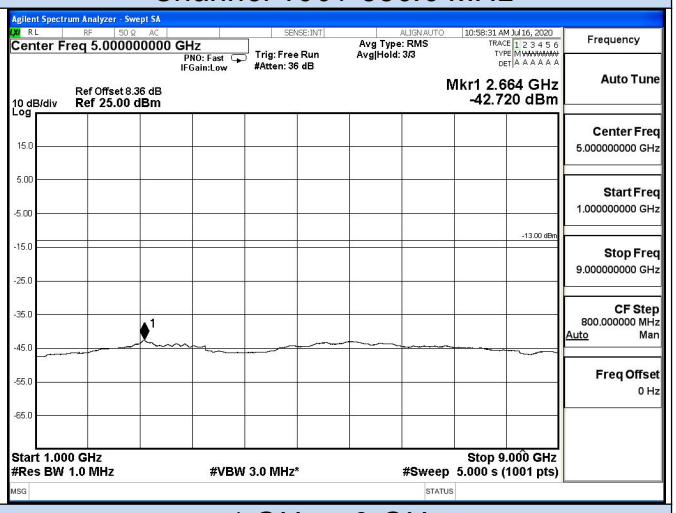
30 MHz – 1000 MHz



1 GHz – 9 GHz

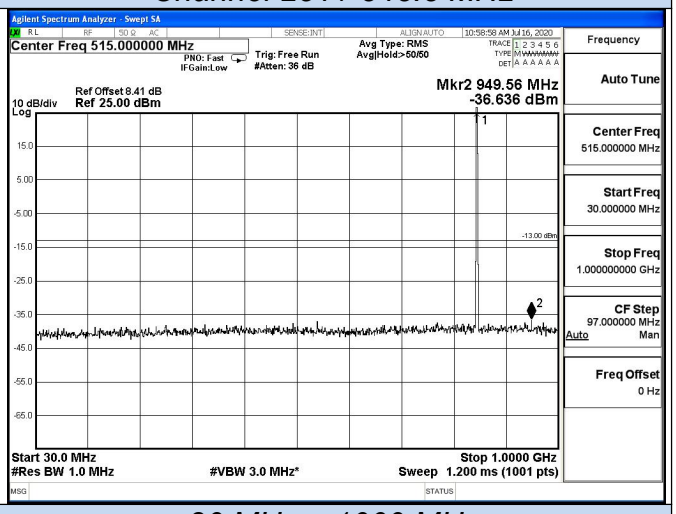
GSM/TM3/EDGE850

Channel 190 / 836.6 MHz

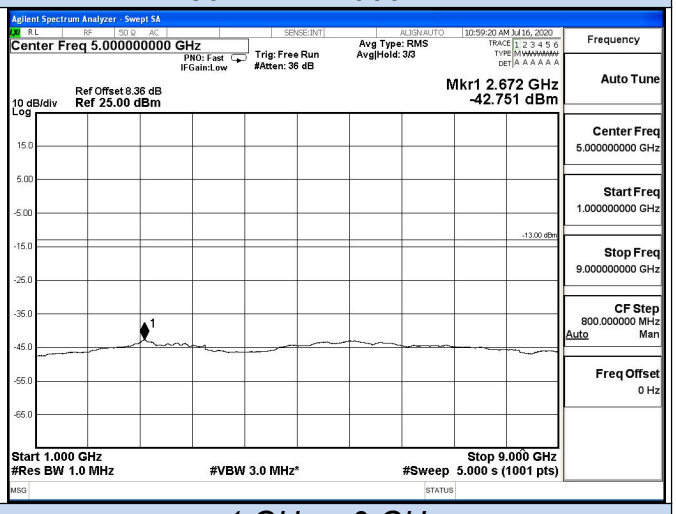


1 GHz – 9 GHz

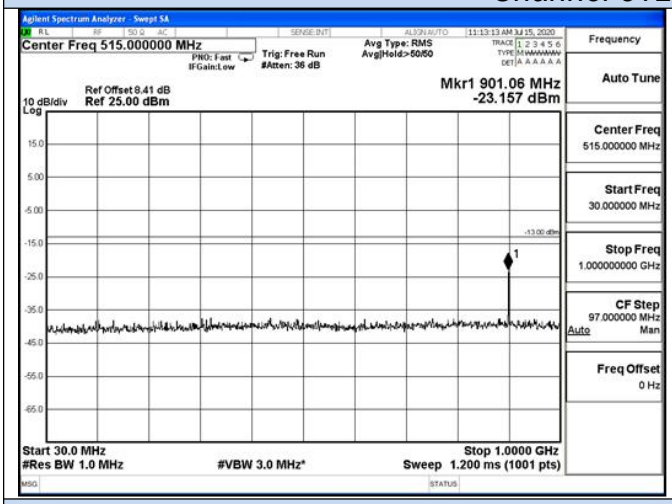
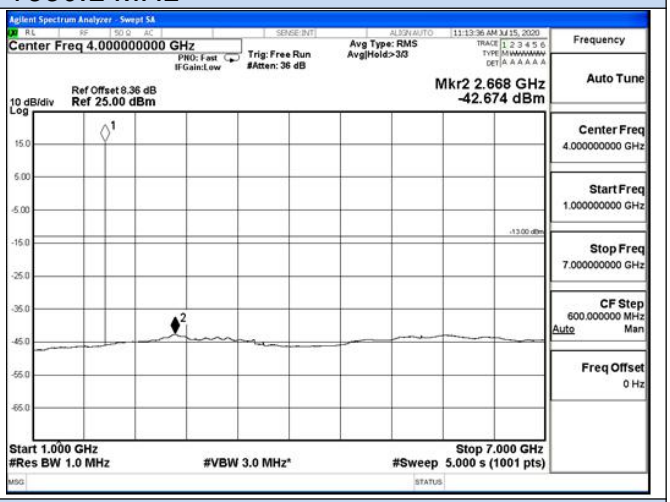
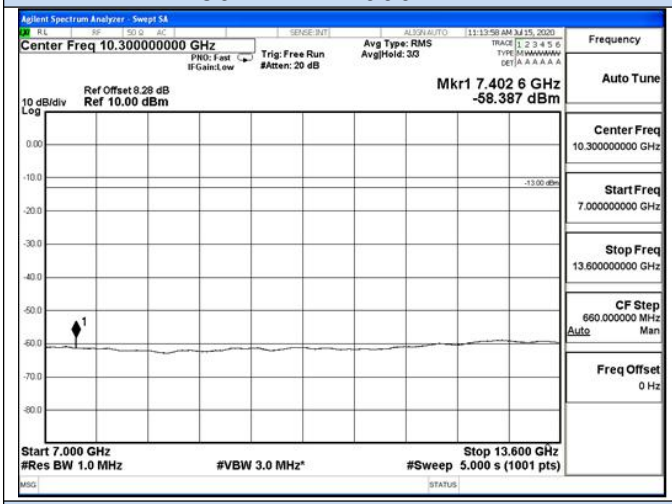
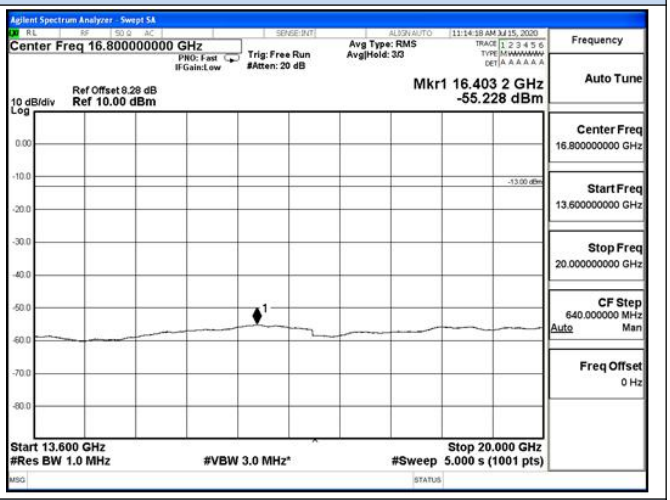
Channel 251 / 848.8 MHz

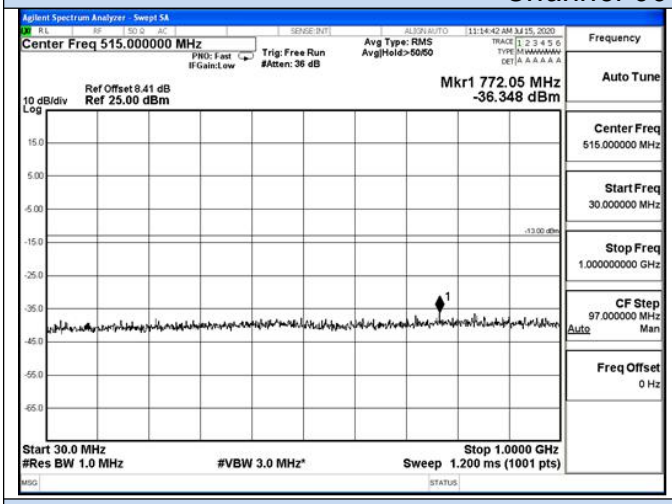
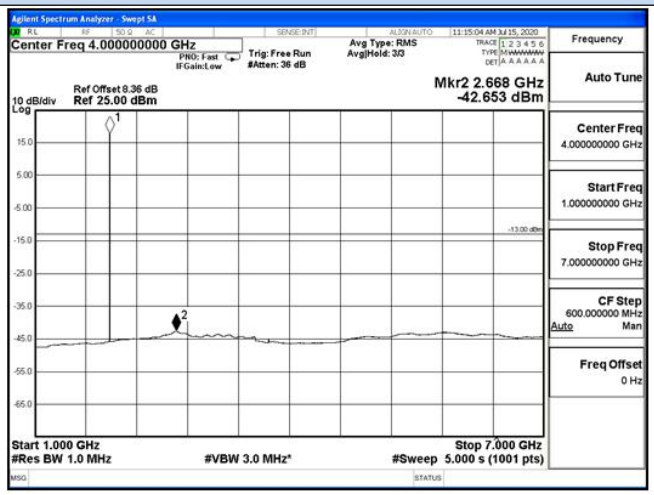
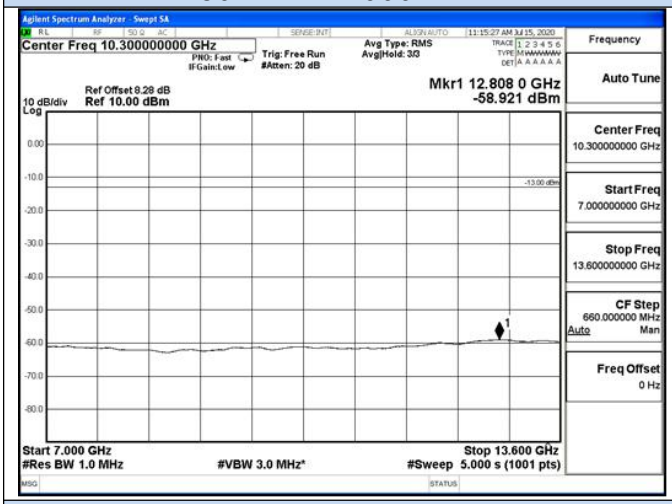
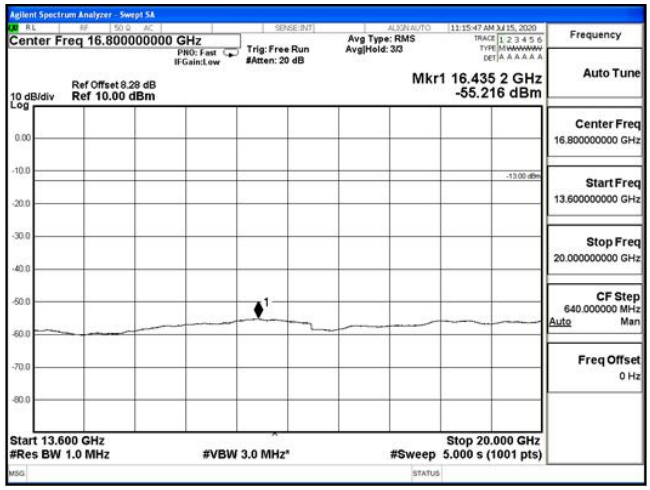


30 MHz – 1000 MHz



1 GHz – 9 GHz

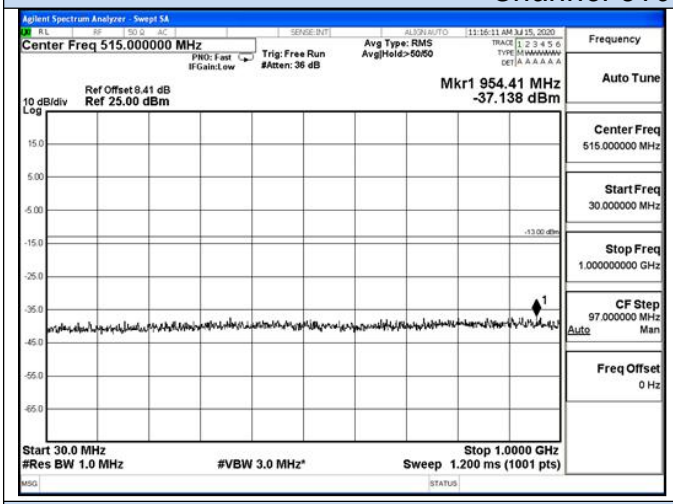
Spurious Emssion on Antenna Port	
GSM/TM1/GSM1900	
Channel 512 / 1850.2 MHz	
	
30 MHz – 1000 MHz	1 GHz – 7 GHz
	
7 GHz – 13.6 GHz	13.6 GHz – 20 GHz

Spurious Emssion on Antenna Port	
GSM/TM1/GSM1900	
Channel 661 / 1880 MHz	
	
30 MHz – 1000 MHz	1 GHz – 7 GHz
	
7 GHz – 13.6 GHz	13.6 GHz – 20 GHz

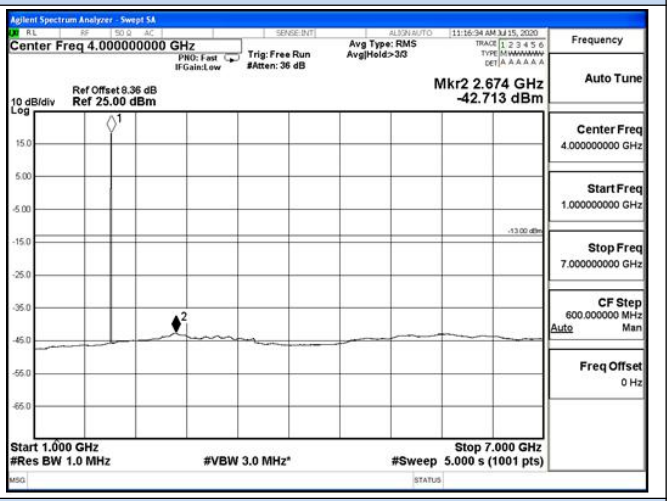
Spurious Emssion on Antenna Port

GSM/TM1/GSM1900

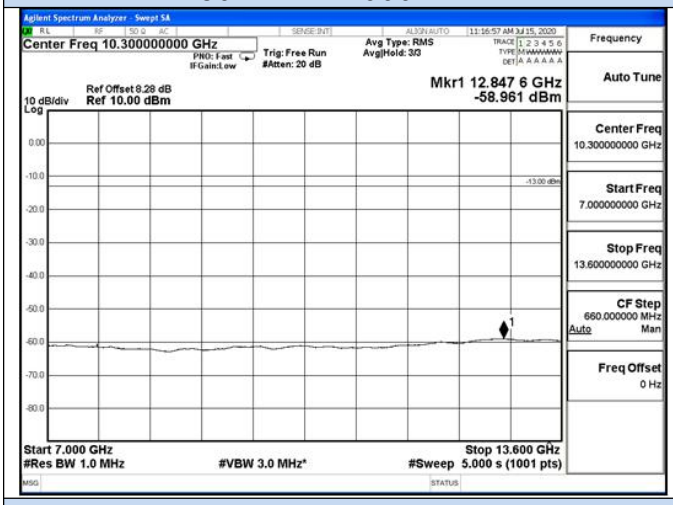
Channel 810 / 1909.8 MHz



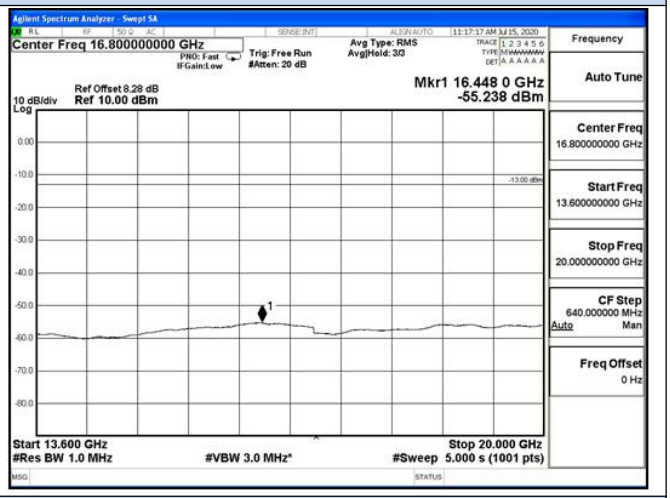
30 MHz – 1000 MHz



1 GHz – 7 GHz



7 GHz – 13.6 GHz

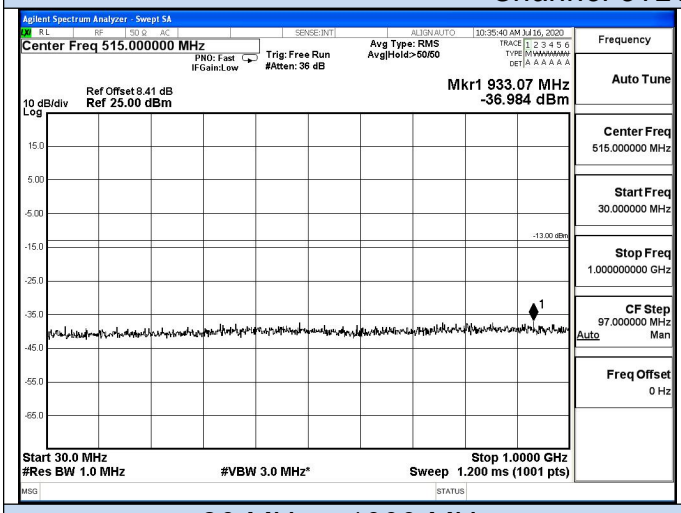


13.6 GHz – 20 GHz

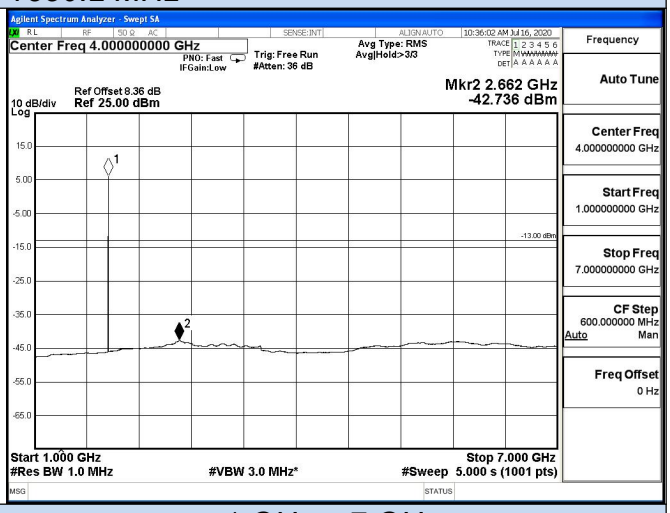
Spurious Emssion on Antenna Port

GSM/TM3/EDGE1900

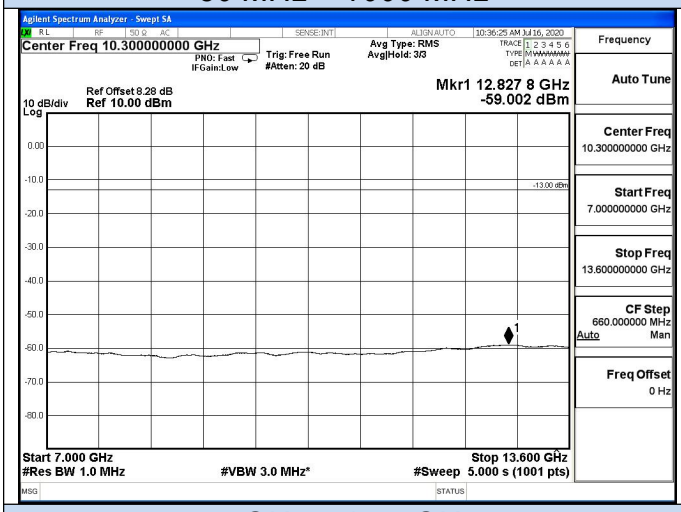
Channel 512 / 1850.2 MHz



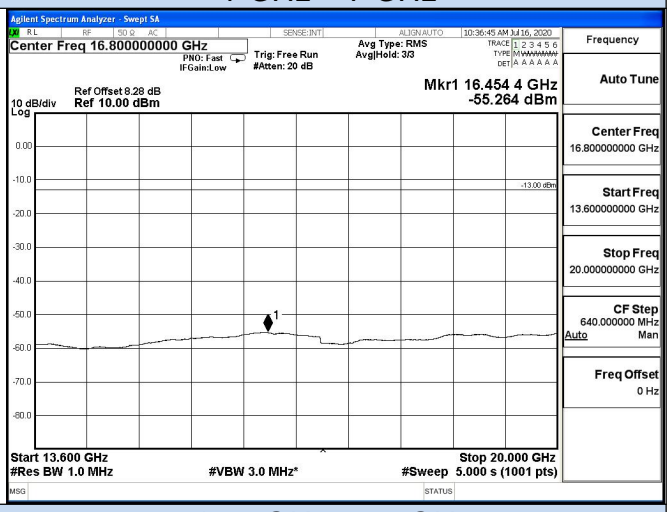
30 MHz – 1000 MHz



1 GHz – 7 GHz



7 GHz – 13.6 GHz

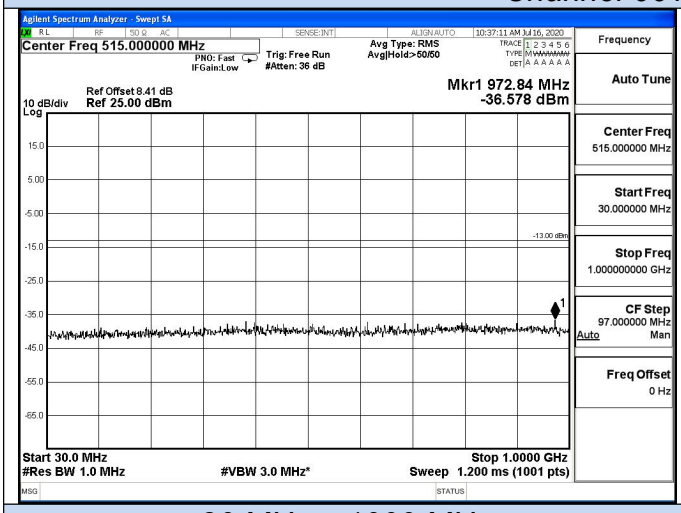


13.6 GHz – 20 GHz

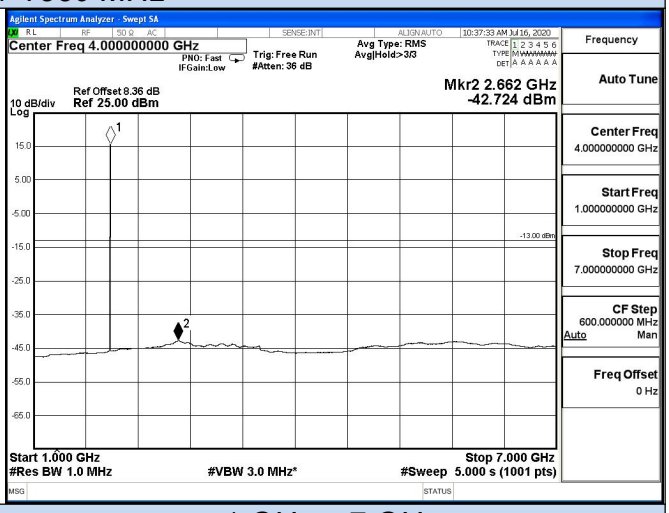
Spurious Emssion on Antenna Port

GSM/TM3/EDGE1900

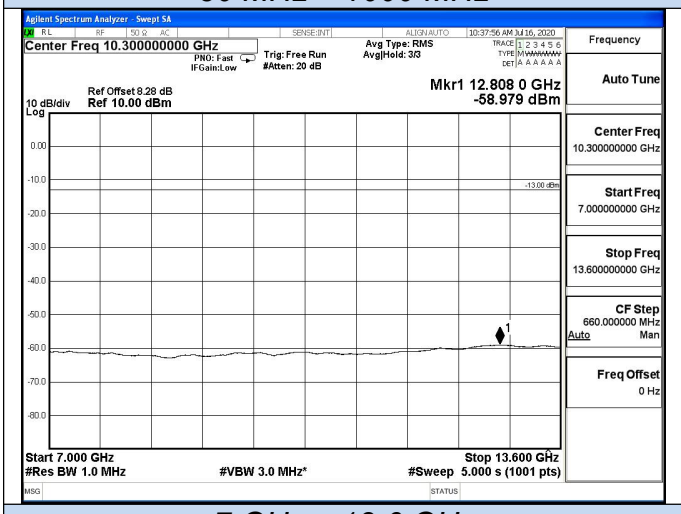
Channel 661 / 1880 MHz



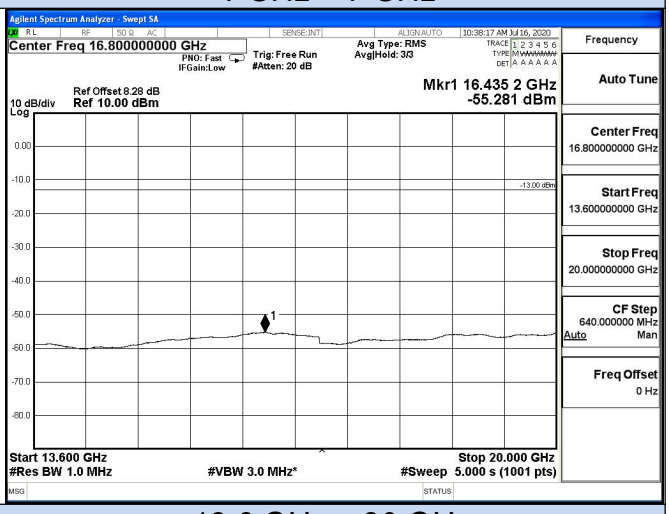
30 MHz – 1000 MHz



1 GHz – 7 GHz



7 GHz – 13.6 GHz

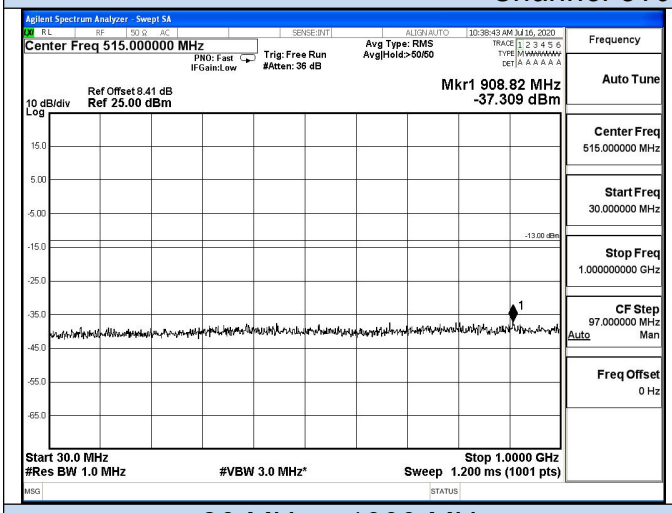


13.6 GHz – 20 GHz

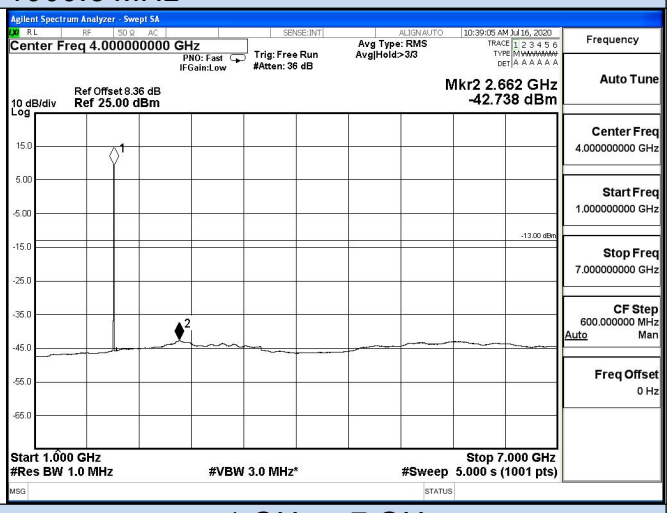
Spurious Emssion on Antenna Port

GSM/TM3/EDGE1900

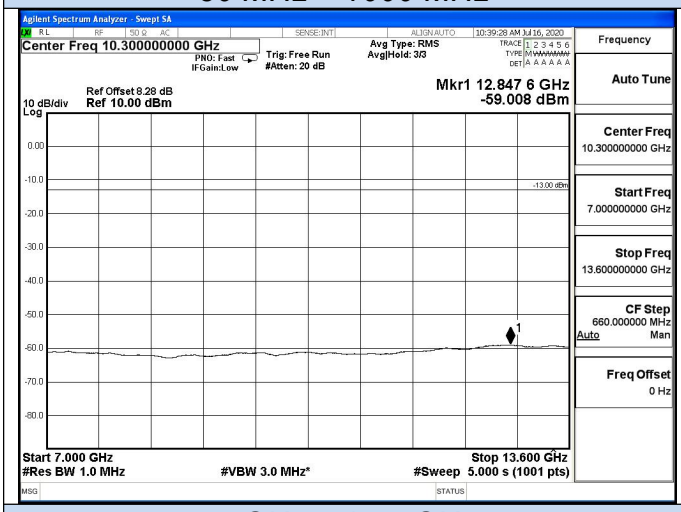
Channel 810 / 1909.8 MHz



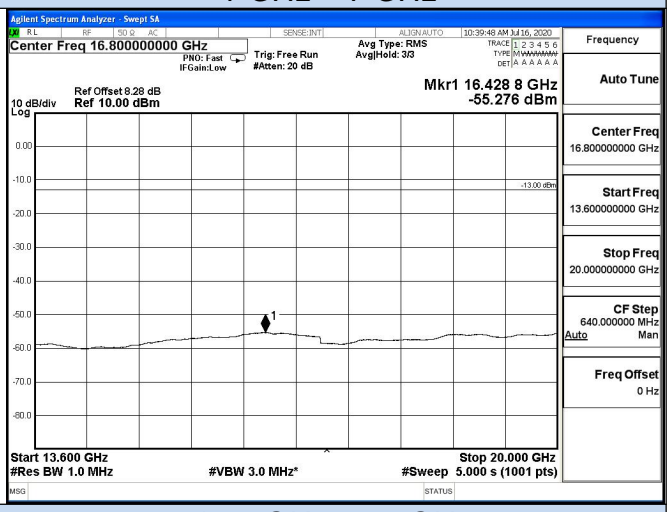
30 MHz – 1000 MHz



1 GHz – 7 GHz



7 GHz – 13.6 GHz



13.6 GHz – 20 GHz

4.6 Frequency Stability Test

TEST APPLICABLE

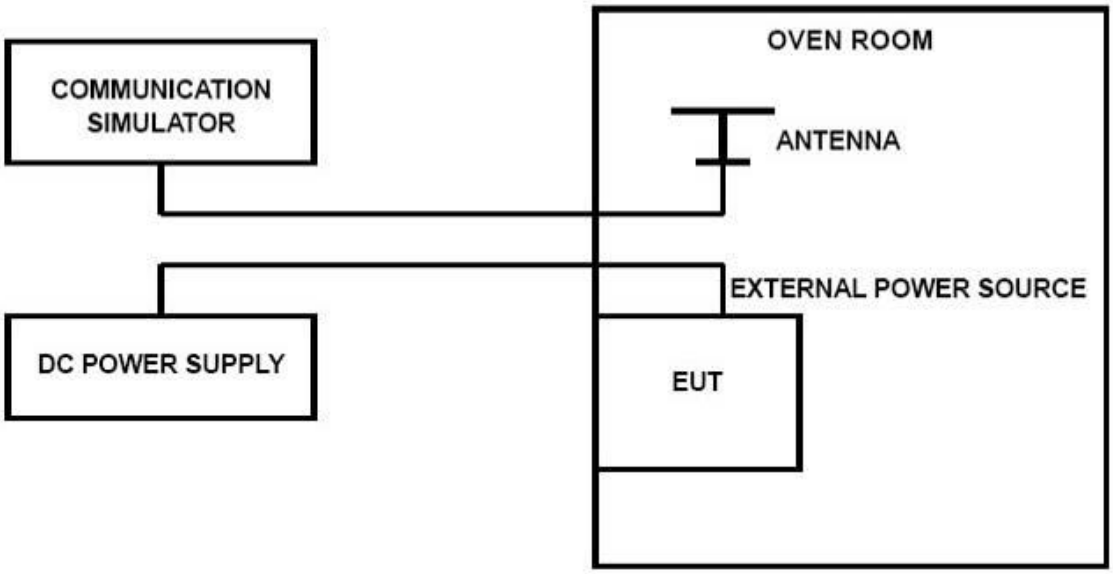
1. According to FCC Part 2 Section 2.1055 (a)(1) and RSS-GEN, the frequency stability shall be measured with variation of ambient temperature from -30℃ to +50℃ centigrade.
2. According to FCC Part 2 Section 2.1055 (E) (2) and RSS-GEN, for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried voltage equipment and the end voltage point was 3.40V.

TEST PROCEDURE

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature;
2. Subject the EUT to overnight soak at -30℃;
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on middle channel of PCS 1900 and GSM850, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 0.5 hours unpowered, to allow any self-heating to stabilize, before continuing;
6. Subject the EUT to overnight soak at +50℃;
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
8. Repeat the above measurements at 10℃ increments from +50℃ to -30℃. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure;

TEST CONFIGURATION



TEST LIMITS

For Hand carried battery powered equipment

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.40VDC and 4.20VDC, with a nominal voltage of 3.80DC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

For equipment powered by primary supply voltage

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

TEST RESULTS

GSM/TM1/GSM850					
DC Power	Temperature (℃)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
20.4	25	-32	-0.038	2.50	PASS
24.0	25	-31	-0.037	2.50	PASS
27.6	25	12	0.014	2.50	PASS
24.0	-30	12	0.014	2.50	PASS
24.0	-20	4	0.004	2.50	PASS
24.0	-10	43	0.051	2.50	PASS
24.0	0	10	0.011	2.50	PASS
24.0	10	-2	-0.003	2.50	PASS
24.0	20	8	0.010	2.50	PASS
24.0	30	5	0.006	2.50	PASS
24.0	40	-42	-0.050	2.50	PASS
24.0	50	8	0.010	2.50	PASS

GSM/TM3/EDGE850					
DC Power	Temperature (℃)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
20.4	25	41	0.048	2.50	PASS
24.0	25	-21	-0.025	2.50	PASS
27.6	25	41	0.049	2.50	PASS
24.0	-30	-27	-0.032	2.50	PASS
24.0	-20	-4	-0.005	2.50	PASS
24.0	-10	5	0.006	2.50	PASS
24.0	0	24	0.029	2.50	PASS
24.0	10	-17	-0.020	2.50	PASS
24.0	20	-47	-0.057	2.50	PASS
24.0	30	2	0.002	2.50	PASS
24.0	40	-9	-0.011	2.50	PASS
24.0	50	16	0.019	2.50	PASS

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GSM/TM1/GSM1900					
DC Power	Temperature (℃)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
20.4	25	-11	-0.006	2.50	PASS
24.0	25	-9	-0.005	2.50	PASS
27.6	25	-37	-0.020	2.50	PASS
24.0	-30	41	0.022	2.50	PASS
24.0	-20	-4	-0.002	2.50	PASS
24.0	-10	38	0.020	2.50	PASS
24.0	0	-47	-0.025	2.50	PASS
24.0	10	14	0.008	2.50	PASS
24.0	20	14	0.008	2.50	PASS
24.0	30	-45	-0.024	2.50	PASS
24.0	40	-35	-0.019	2.50	PASS
24.0	50	44	0.023	2.50	PASS

GSM/TM3/EDGE1900					
DC Power	Temperature (℃)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
20.4	25	35	0.019	2.50	PASS
24.0	25	1	0.001	2.50	PASS
27.6	25	-34	-0.018	2.50	PASS
24.0	-30	22	0.012	2.50	PASS
24.0	-20	-36	-0.019	2.50	PASS
24.0	-10	29	0.015	2.50	PASS
24.0	0	-27	-0.015	2.50	PASS
24.0	10	-38	-0.020	2.50	PASS
24.0	20	-10	-0.005	2.50	PASS
24.0	30	-13	-0.007	2.50	PASS
24.0	40	-26	-0.014	2.50	PASS
24.0	50	-22	-0.012	2.50	PASS

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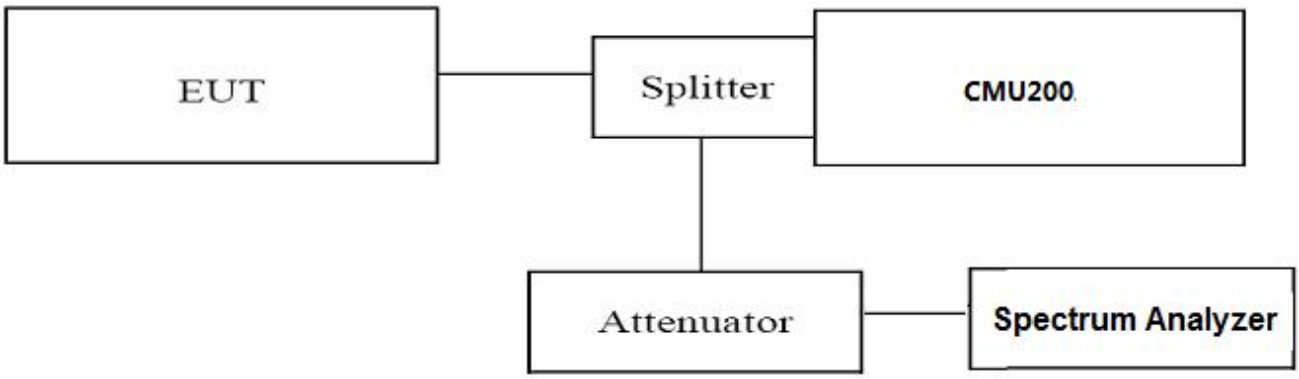
4.7 Peak-to-Average Ratio (PAR)

LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION



TEST PROCEDURE

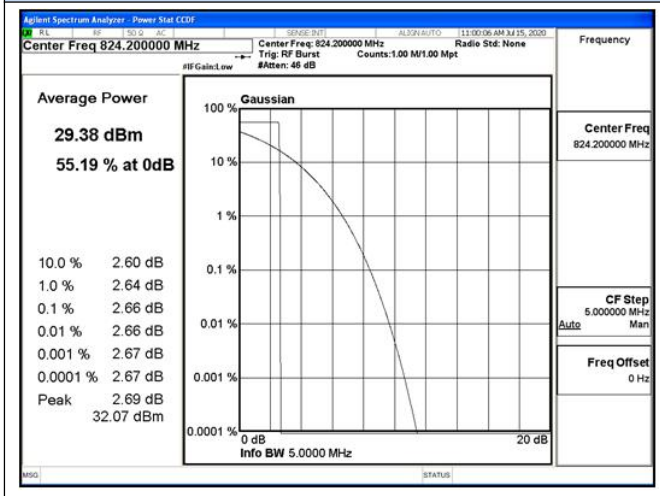
Use spectrum to measure the total peak power and record as P_{Pk}. Use spectrum to measure the total average power and record as P_{Avg}. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm).
Determine the PAPR from:
PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	PAPR Value (dB)	Limits (dB)	Verdict
GSM/TM1/GSM850	128	824.2	2.66	13.0	PASS
	190	836.6	2.63	13.0	
	251	848.8	2.63	13.0	
GSM/TM3/EDGE850	128	824.2	2.74	13.0	PASS
	190	836.6	2.74	13.0	
	251	848.8	2.75	13.0	
GSM/TM1/GSM1900	512	1850.2	2.62	13.0	PASS
	661	1880.0	2.61	13.0	
	810	1909.8	2.62	13.0	
GSM/TM3/EDGE1900	512	1850.2	2.84	13.0	PASS
	661	1880.0	2.79	13.0	
	810	1909.8	2.78	13.0	

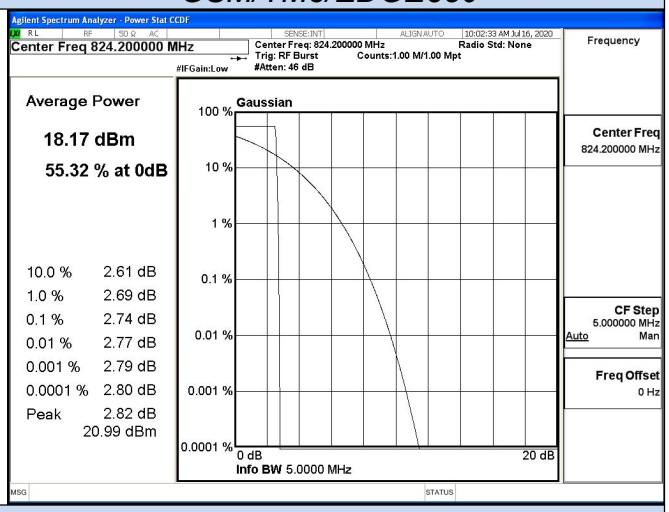
Peak-to-Average Ratio (PAR)

GSM/TM1/GSM850

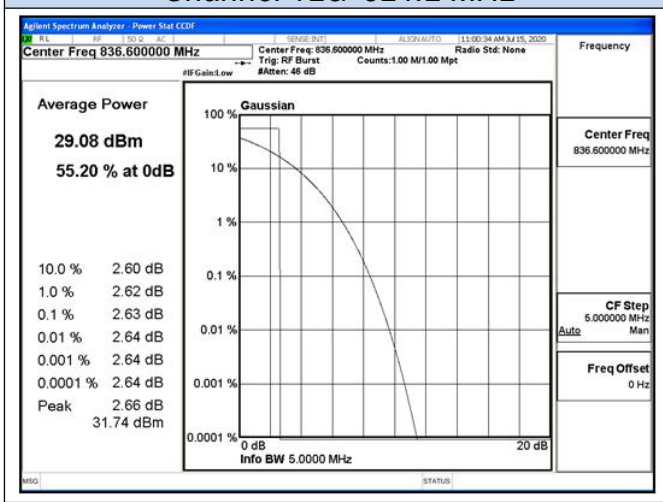


Channel 128/ 824.2 MHz

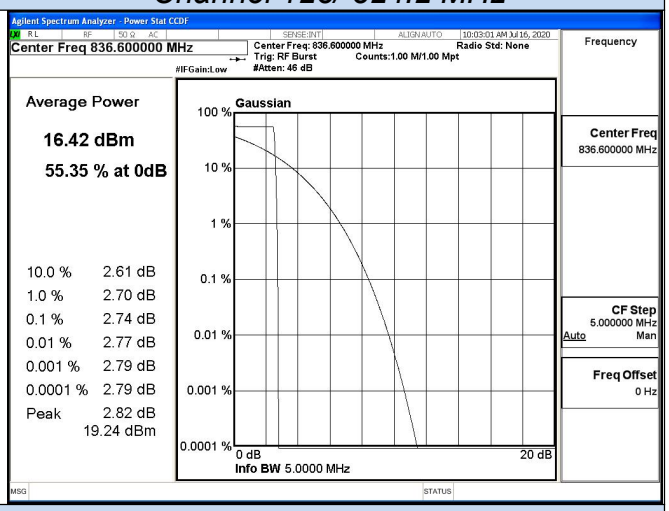
GSM/TM3/EDGE850



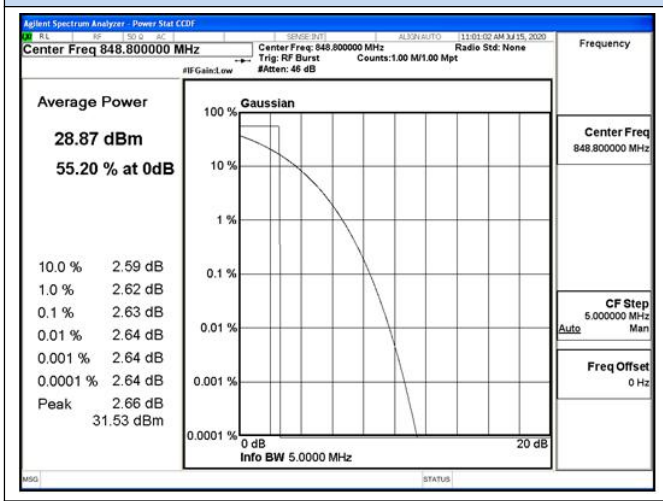
Channel 128/ 824.2 MHz



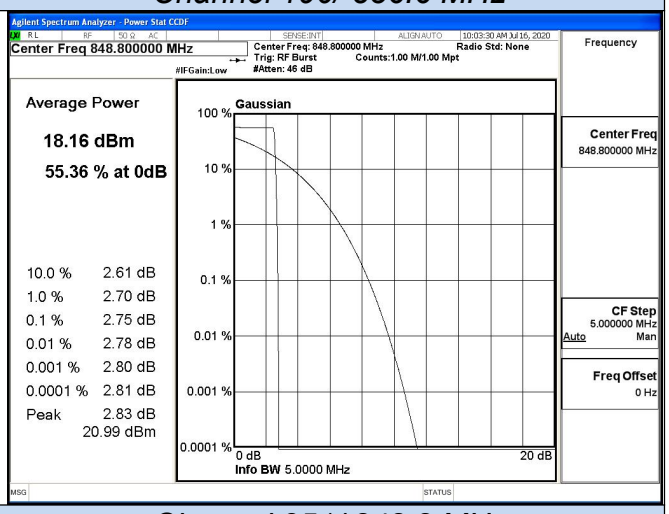
Channel 190/ 836.6 MHz



Channel 190/ 836.6 MHz



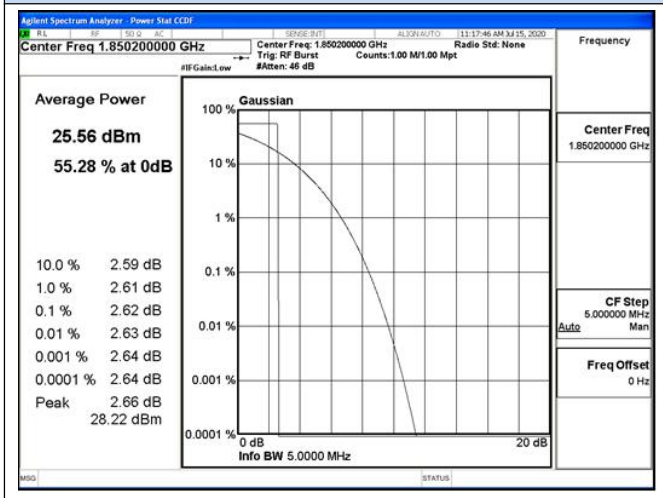
Channel 251/ 848.8 MHz



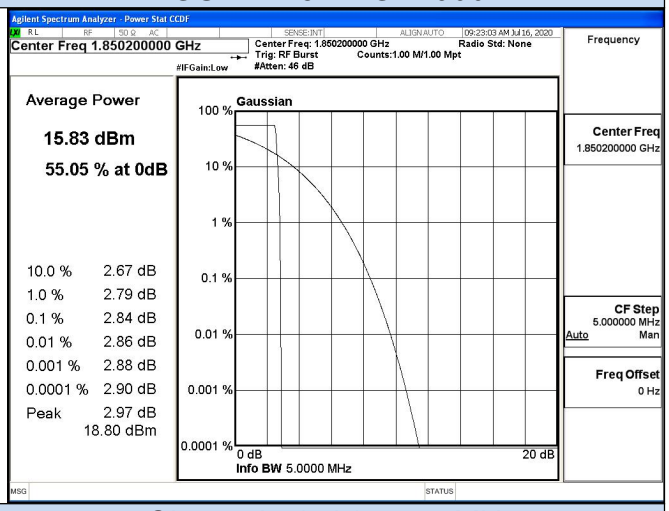
Channel 251/ 848.8 MHz

Peak-to-Average Ratio (PAR)

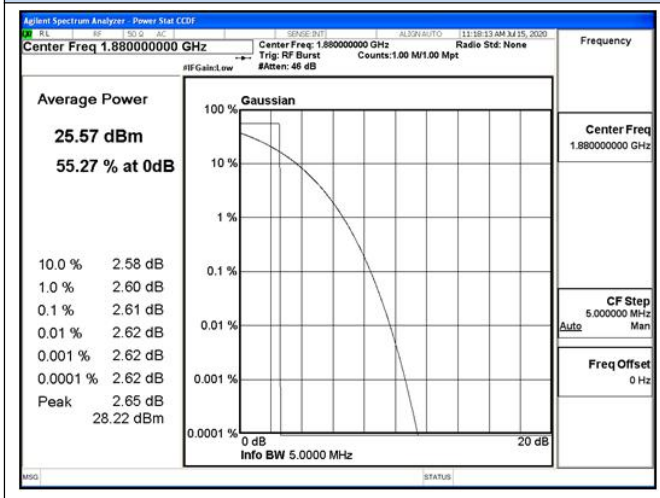
GSM/TM1/GSM1900



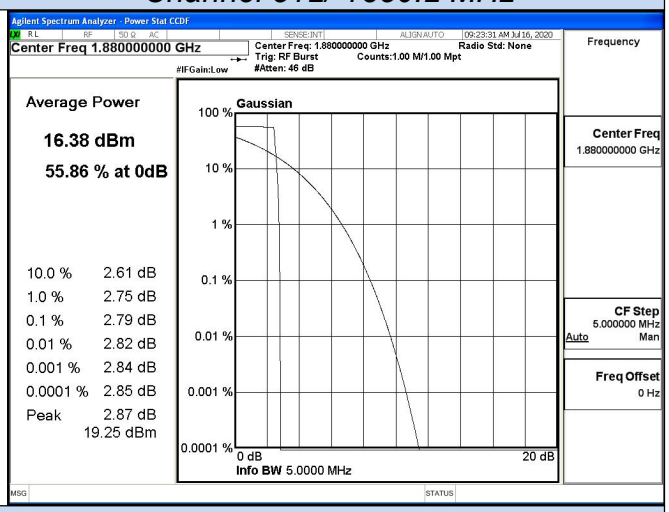
GSM/TM3/EDGE1900



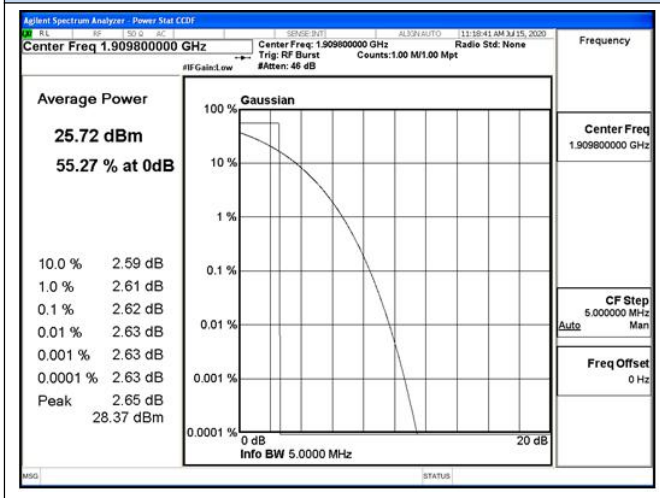
Channel 512/ 1850.2 MHz



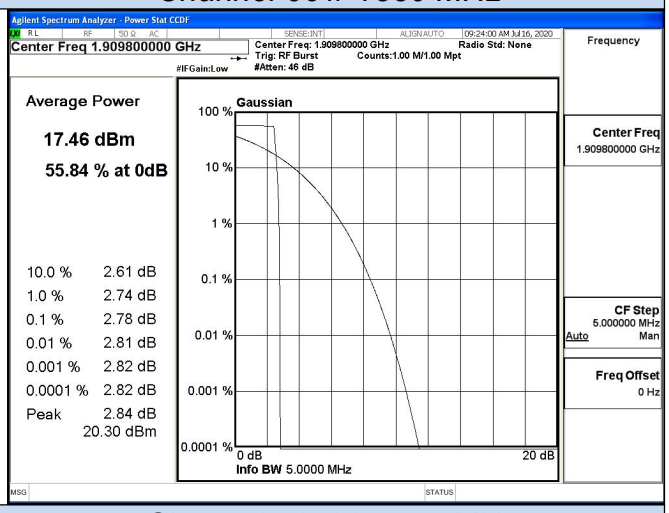
Channel 512/ 1850.2 MHz



Channel 661/ 1880 MHz



Channel 661/ 1880 MHz



Channel 810/ 1909.8 MHz

Channel 810/ 1909.8 MHz

5 TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

6 EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

7 INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

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