

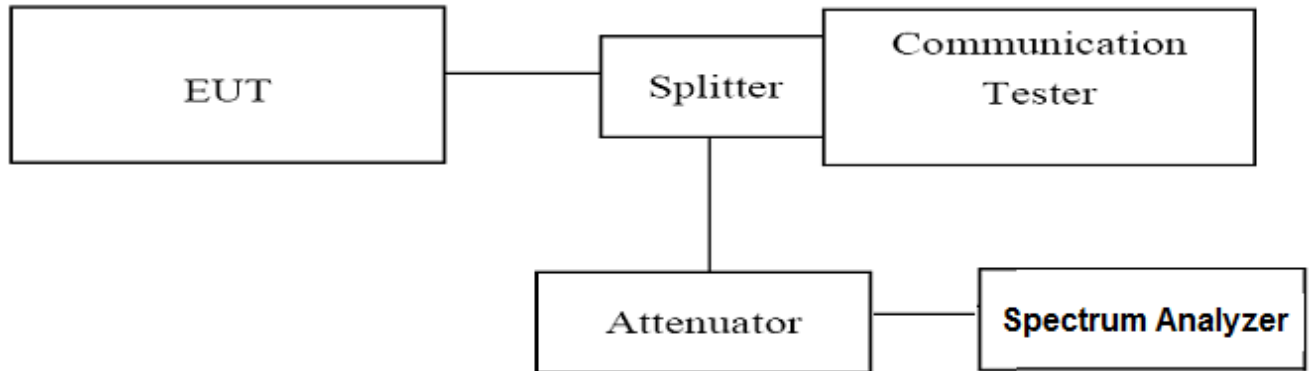


4.4 Band Edge Compliance

TEST APPLICABLE

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (CMW500) 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 Agilent Spectrum Analyzer N9020A;
3. Set RBW=5.1KHz, VBW=51KHz, Span=3MHz, SWT=300ms, Dector: RMS;
4. 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. (bottom, middle and top of operational frequency range).

TEST RESULTS

GSM 850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.998	-13.80	-13.00	PASS
251	848.80	849.020	-16.81	-13.00	PASS

GSM 1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1849.981	-21.16	-13.00	PASS
810	1909.80	1910.022	-20.62	-13.00	PASS

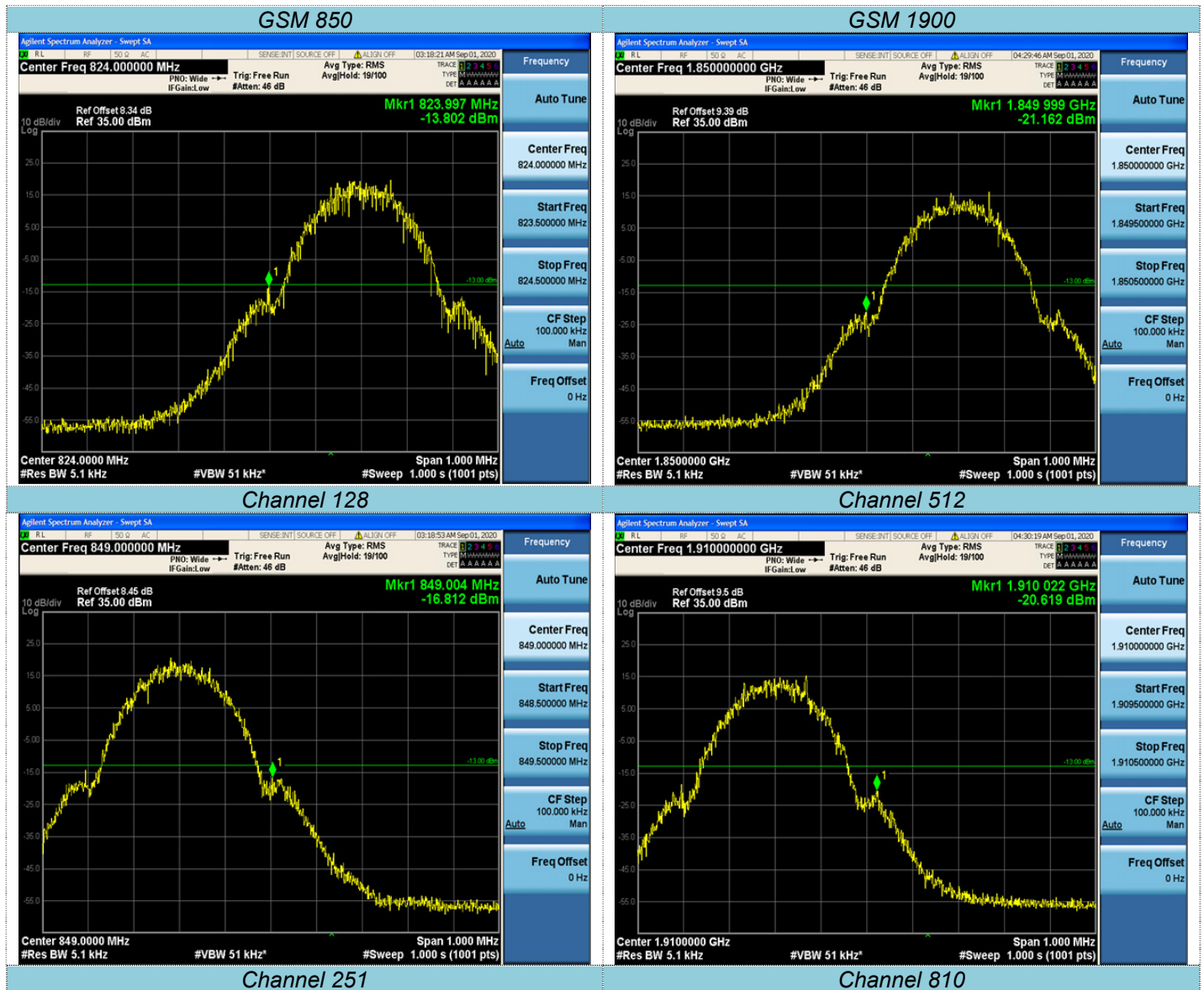
GPRS 850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.990	-16.64	-13.00	PASS
251	848.80	849.020	-17.16	-13.00	PASS

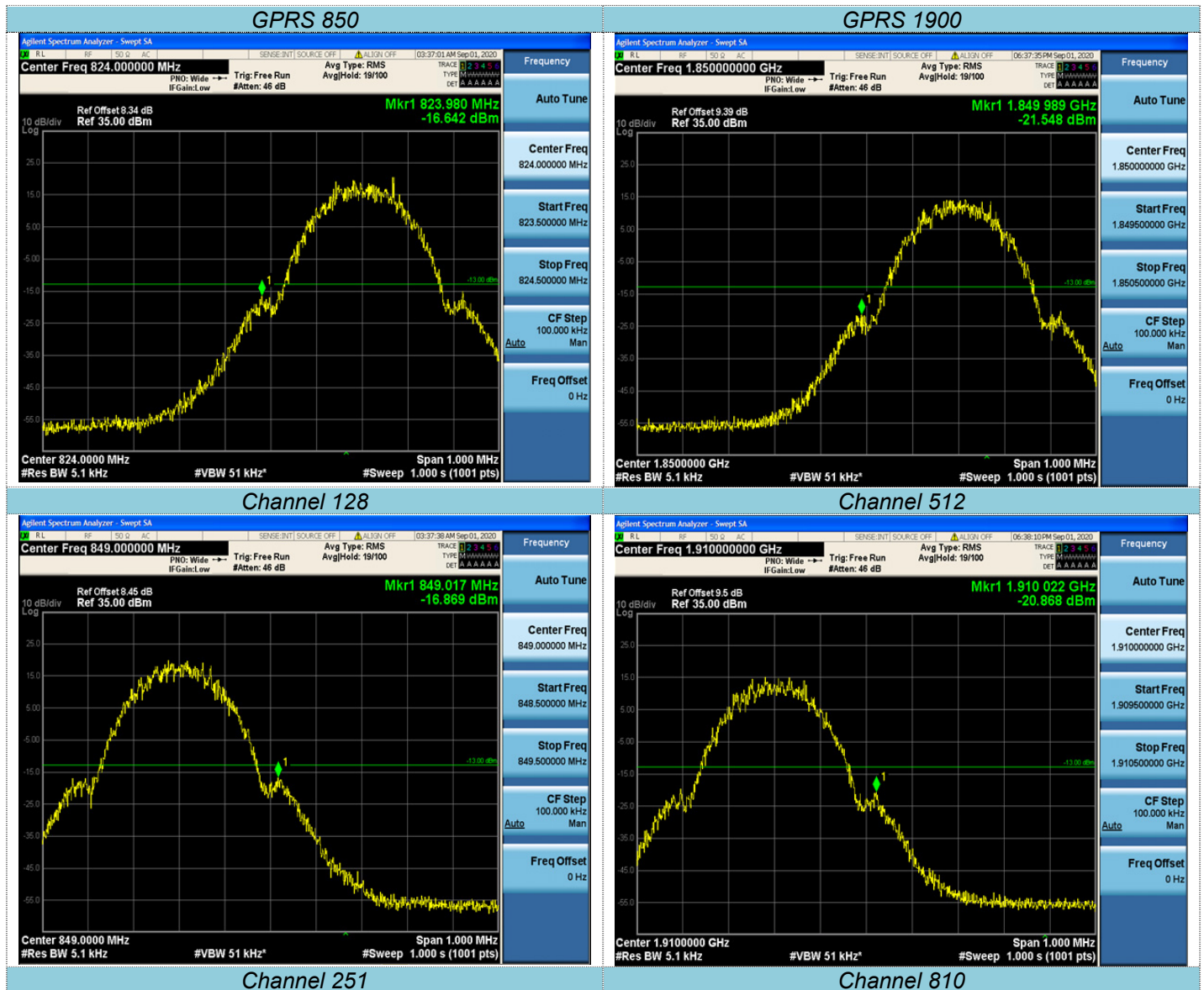
GPRS 1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1849.978	-21.55	-13.00	PASS
810	1909.80	1910.022	-20.87	-13.00	PASS



EGPRS 850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.980	-28.52	-13.00	PASS
251	848.80	849.020	-27.97	-13.00	PASS

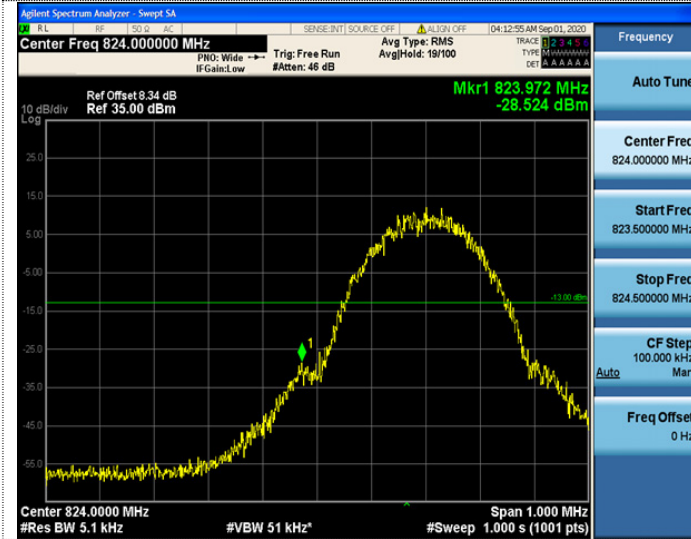
EGPRS 1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1849.984	-25.36	-13.00	PASS
810	1909.80	1910.022	-28.16	-13.00	PASS



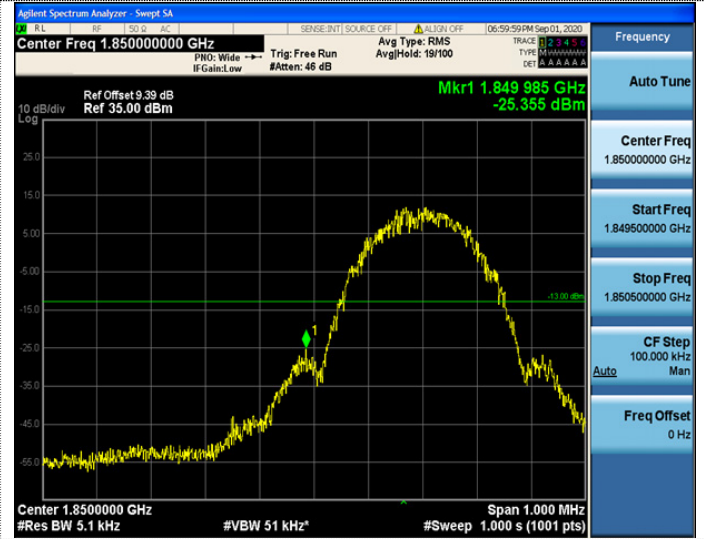




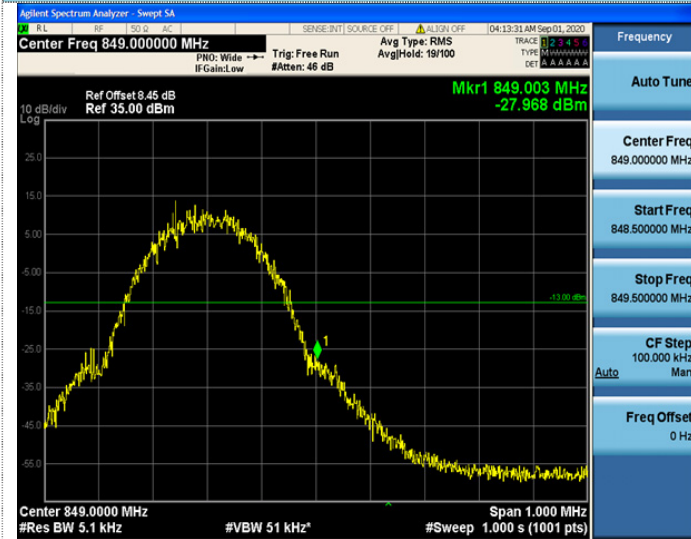
EGPRS 850



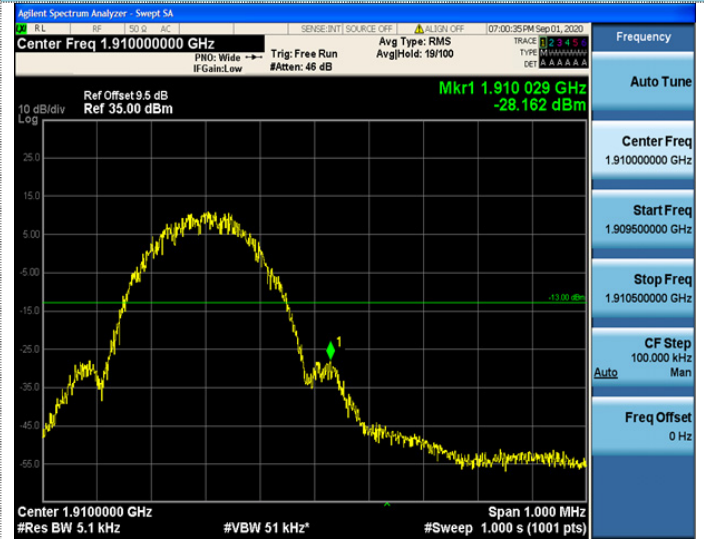
EGPRS 1900



Channel 128



Channel 512



Channel 251

Channel 810



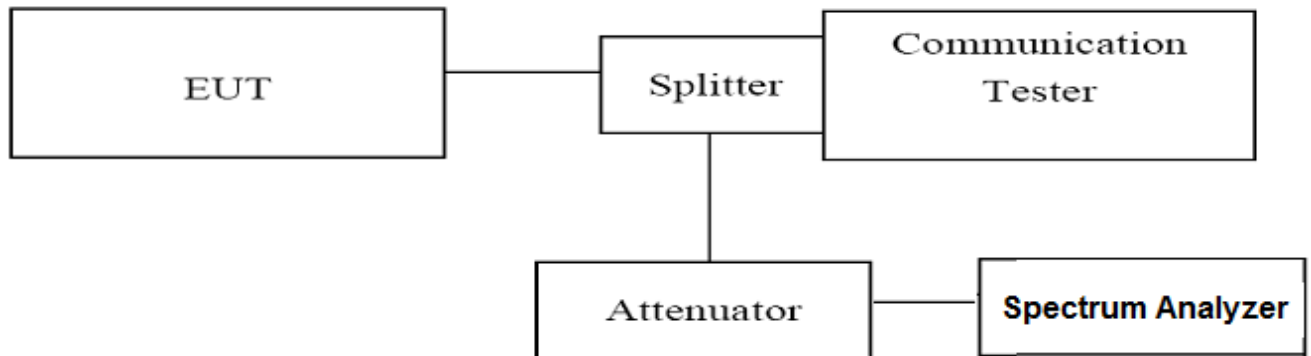
4.5 Spurious Emission on Antenna Port

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 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 19.1 GHz, data taken from 9 KHz to 25 GHz. For GSM850, data taken from 9 KHz 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 Agilent Spectrum Analyzer N9020A (peak);
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 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 RESULTS

Note:We tested GSM/GPRS/EGPRS mode and recorded the worst case at the GPRS mode.



4.5.1 For GPRS 850 Test Results

A. Test Verdict

Test Mode/ Channel	Frequency (MHz)	Frequency Range	Limit (dBm)	Verdict
GPRS 850 /128	824.20	150KHz-30MHz	-13.00	PASS
		30MHz-5GHz	-13.00	PASS
		5GHz-18GHz	-13.00	PASS
GPRS 850 /190	836.60	150KHz-30MHz	-13.00	PASS
		30MHz-5GHz	-13.00	PASS
		5GHz-18GHz	-13.00	PASS
GPRS 850 /251	848.80	150KHz-30MHz	-13.00	PASS
		30MHz-5GHz	-13.00	PASS
		5GHz-18GHz	-13.00	PASS

Note:

1. In general, the worse case attenuation requirement shown above was applied.
2. "----" means that the emission level is too low to be measured or at least 20 dB down than the limit.

B. Test Plots

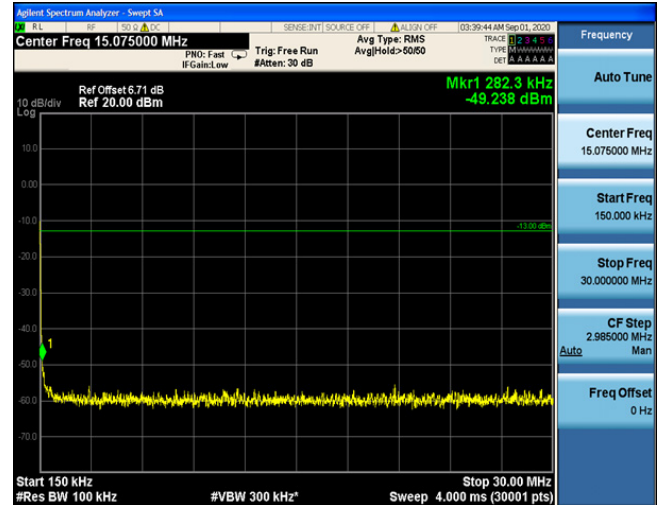
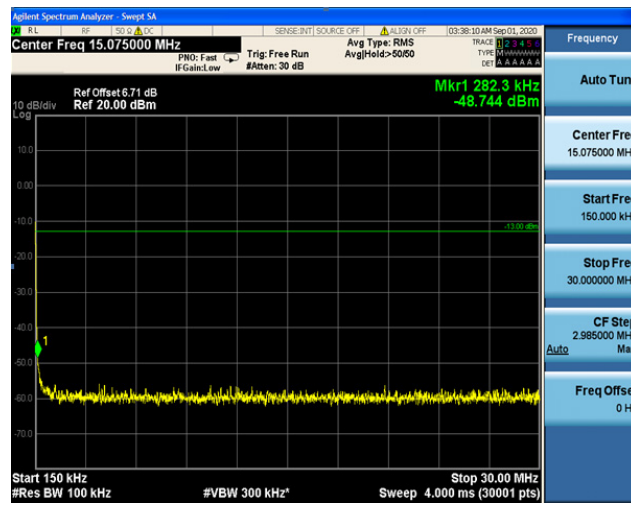


Test Mode: GPRS

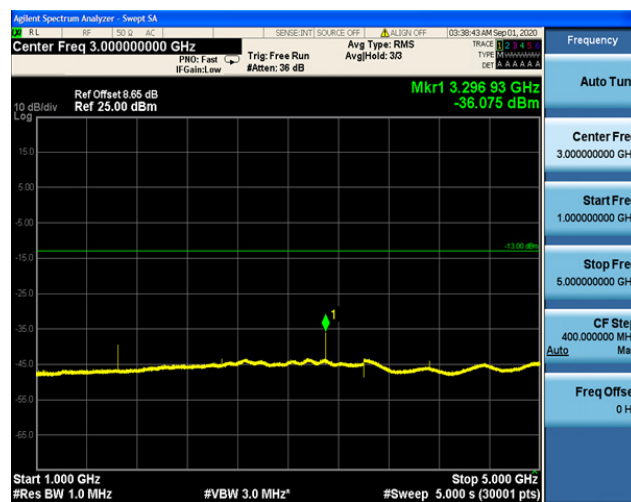
Test channel : 128

Test Mode: GPRS

Test channel : 190



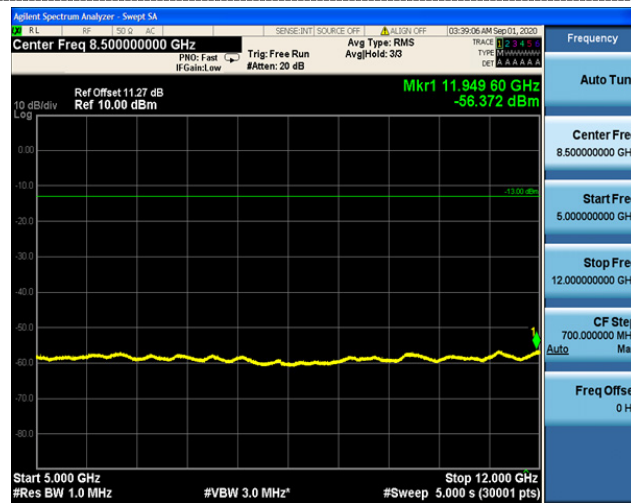
0.15~30MHz



0.15~30MHz



1GHz ~5GHz



1GHz ~5GHz



5GHz ~12GHz

5GHz ~12GHz



12GHz ~18GHz

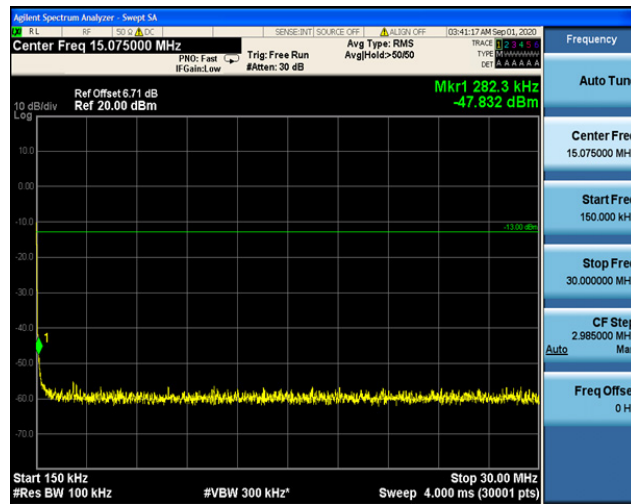


12GHz ~18GHz

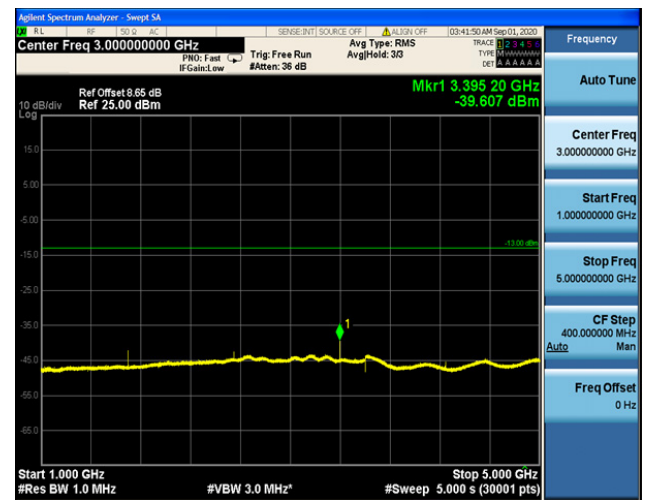


Test Mode: GPRS

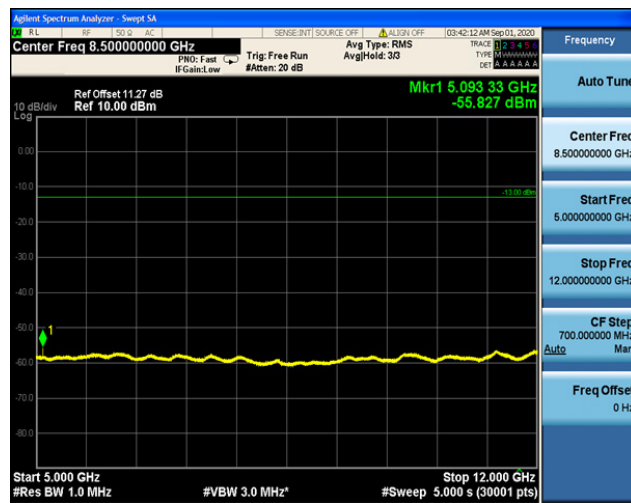
Test channel : 251



0.15~30MHz



1GHz ~5GHz



5GHz ~12GHz



12GHz ~18GHz



4.5.2 For GPRS 1900 Test Results

A. Test Verdict

Test Mode/ Channel	Frequency (MHz)	Frequency Range	Limit (dBm)	Verdict
GPRS 1900 /512	1850.20	9KHz-150KHz	-13.00	PASS
		150KHz-30MHz	-13.00	PASS
		30MHz -8GHz	-13.00	PASS
		8GHz-26.5GHz	-13.00	PASS
GPRS 1900 /661	1880.00	9KHz-150KHz	-13.00	PASS
		150KHz-30MHz	-13.00	PASS
		30MHz -8GHz	-13.00	PASS
		8GHz-26.5GHz	-13.00	PASS
GPRS 1900 /810	1909.80	9KHz-150KHz	-13.00	PASS
		150KHz-30MHz	-13.00	PASS
		30MHz -8GHz	-13.00	PASS
		8GHz-26.5GHz	-13.00	PASS

Note:

1. In general, the worse case attenuation requirement shown above was applied.
2. "----" means that the emission level is too low to be measured or at least 20 dB down than the limit.

B. Test Plots

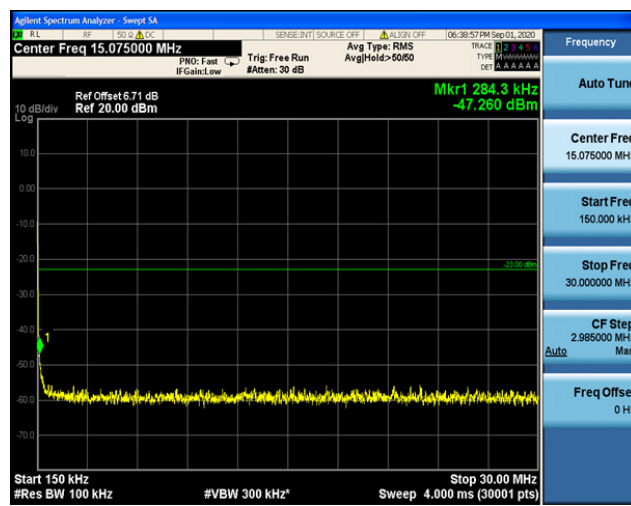


Test Mode: GPRS

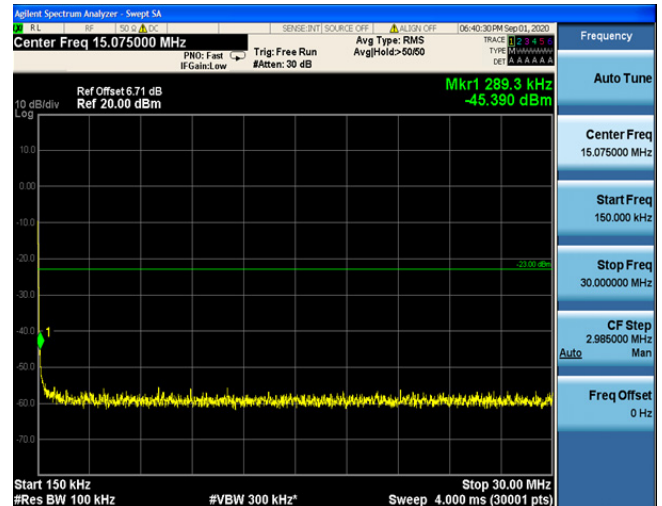
Test channel : 512

Test Mode: GPRS

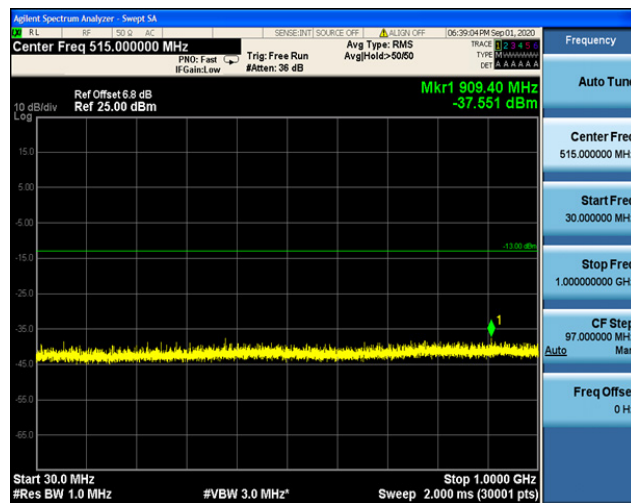
Test channel : 661



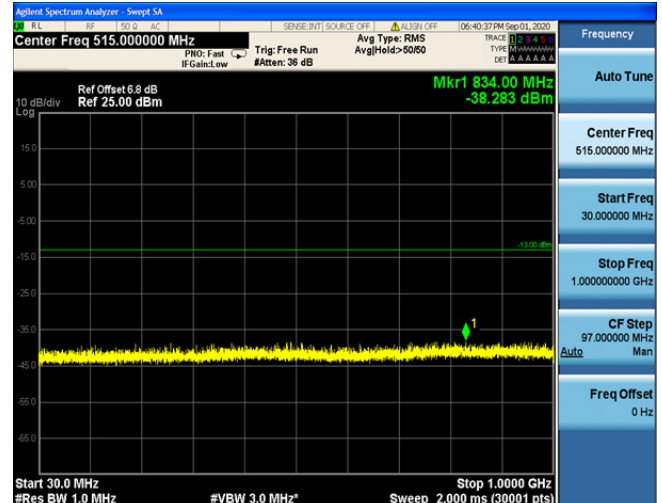
0.15~30MHz



0.15~30MHz



30MHz~1GHz



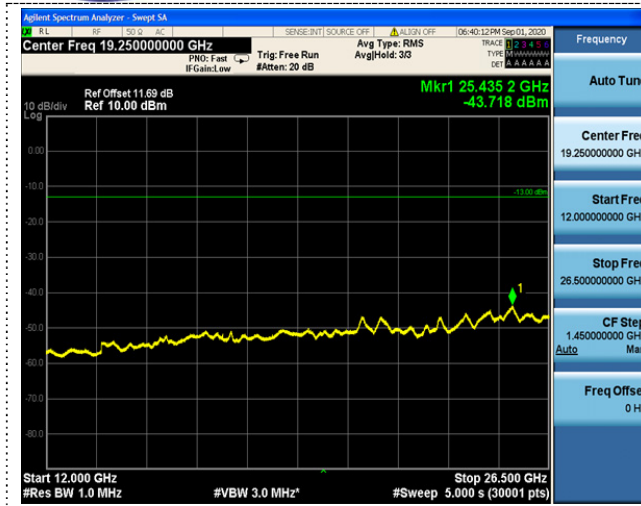
30MHz~1GHz



5GHz ~12GHz



5GHz ~12GHz



12GHz ~26.5GHz

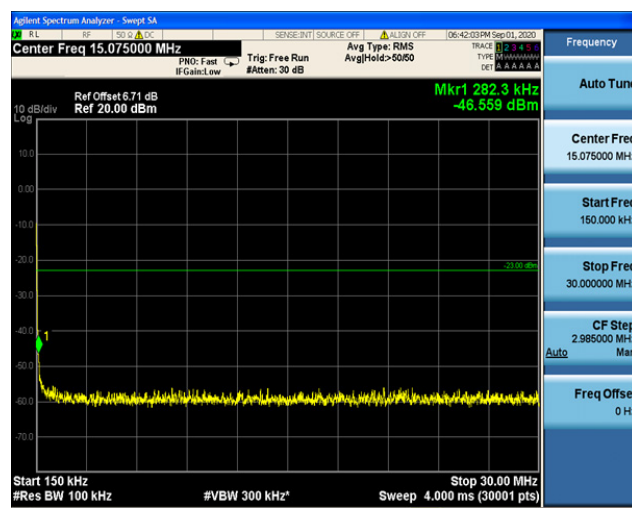


12GHz ~26.5GHz

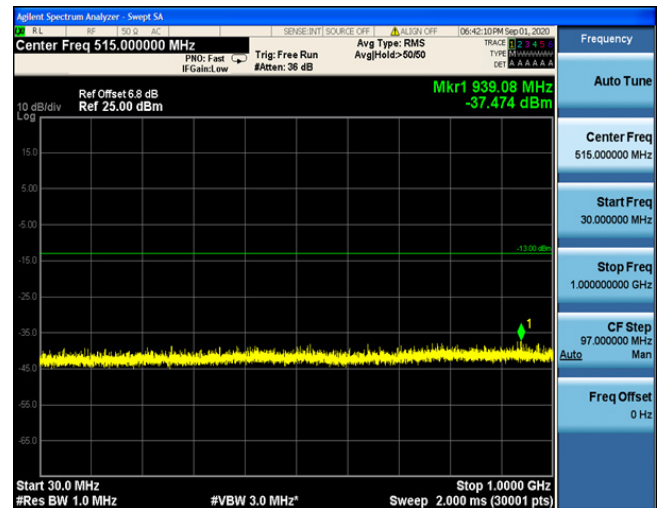


Test Mode: GPRS

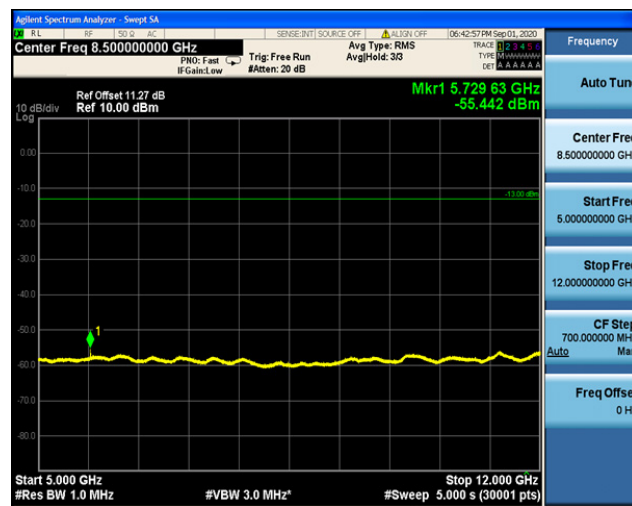
Test channel : 810



0.15~30MHz



30MHz~1GHz



5GHz ~12GHz



12GHz ~26.5GHz



4.6 Frequency Stability Test

TEST APPLICABLE

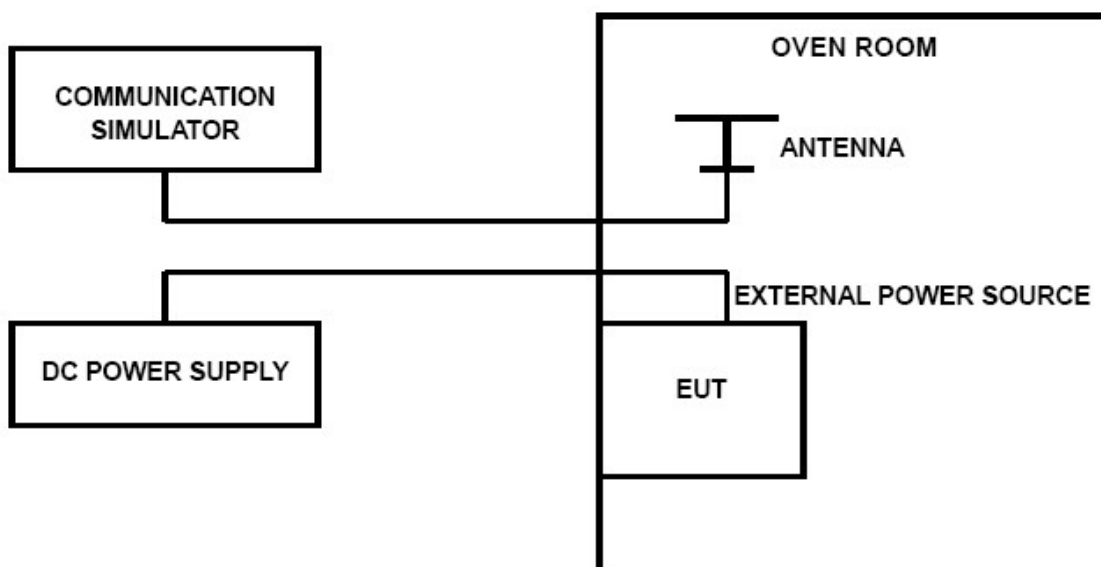
1. According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to $+50^{\circ}\text{C}$ centigrade.
2. According to FCC Part 2 Section 2.1055 (E) (2), for battery powered equipment, the frequency stability shall be measured 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 10.8V.

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°C ;
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°C increments from -30°C to $+50^{\circ}\text{C}$. 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 $+50^{\circ}\text{C}$;
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°C increments from $+50^{\circ}\text{C}$ to -30°C . Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
9. At all temperature levels hold the temperature to $\pm 0.5^{\circ}\text{C}$ 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 3.80 DC. 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

GPRS 850 Middle channel=190 channel=836.6MHz					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
3.42	25	-11.11	-0.013280	2.50	PASS
3.8	25	-10.72	-0.012814	2.50	PASS
4.18	25	-10.14	-0.012120	2.50	PASS
3.8	-30	-7.81	-0.009335	2.50	PASS
3.8	-20	-10.27	-0.012276	2.50	PASS
3.8	-10	-12.14	-0.014511	2.50	PASS
3.8	0	-7.68	-0.009180	2.50	PASS
3.8	10	-8.65	-0.010339	2.50	PASS
3.8	20	-9.10	-0.010877	2.50	PASS
3.8	30	-8.33	-0.009814	2.50	PASS
3.8	40	-10.07	-0.011864	2.50	PASS
3.8	50	-6.26	-0.007375	2.50	PASS

GPRS 1900 Middle channel=661 channel=1880MHz					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
3.42	25	-5.62	-0.002989	2.50	PASS
3.8	25	-7.94	-0.004223	2.50	PASS
4.18	25	-13.69	-0.007282	2.50	PASS
3.8	-30	-6.78	-0.003606	2.50	PASS
3.8	-20	-7.04	-0.003745	2.50	PASS
3.8	-10	-12.27	-0.006527	2.50	PASS
3.8	0	-9.17	-0.004878	2.50	PASS
3.8	10	-6.91	-0.003676	2.50	PASS
3.8	20	-3.68	-0.001957	2.50	PASS
3.8	30	-6.46	-0.003383	2.50	PASS
3.8	40	-10.33	-0.005409	2.50	PASS
3.8	50	-12.27	-0.006425	2.50	PASS



GSM 850 Middle channel=190 channel=836.6MHz					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
3.42	25	-14.40	-0.017213	2.50	PASS
3.8	25	-15.37	-0.018372	2.50	PASS
4.18	25	-13.95	-0.016675	2.50	PASS
3.8	-30	-14.85	-0.017750	2.50	PASS
3.8	-20	-12.40	-0.014822	2.50	PASS
3.8	-10	-13.75	-0.016436	2.50	PASS
3.8	0	-15.69	-0.018754	2.50	PASS
3.8	10	-15.63	-0.018683	2.50	PASS
3.8	20	-12.79	-0.015288	2.50	PASS
3.8	30	-7.94	-0.009354	2.50	PASS
3.8	40	-7.17	-0.008447	2.50	PASS
3.8	50	-7.10	-0.008365	2.50	PASS

GSM 1900 Middle channel=661 channel=1880MHz					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
3.42	25	-16.21	-0.008761	2.50	PASS
3.8	25	-11.30	-0.006107	2.50	PASS
4.18	25	-9.30	-0.005026	2.50	PASS
3.8	-30	-8.98	-0.004854	2.50	PASS
3.8	-20	-6.13	-0.003313	2.50	PASS
3.8	-10	-6.78	-0.003606	2.50	PASS
3.8	0	-3.87	-0.002059	2.50	PASS
3.8	10	-4.71	-0.002505	2.50	PASS
3.8	20	-1.42	-0.000755	2.50	PASS
3.8	30	-0.39	-0.000207	2.50	PASS
3.8	40	1.23	0.000654	2.50	PASS
3.8	50	3.36	0.001787	2.50	PASS



EGPRS 850 Middle channel=190 channel=836.6MHz					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
3.42	25	-6.39	-0.007638	2.50	PASS
3.8	25	-10.33	-0.012348	2.50	PASS
4.18	25	-11.49	-0.013734	2.50	PASS
3.8	-30	-8.43	-0.010077	2.50	PASS
3.8	-20	-9.33	-0.011152	2.50	PASS
3.8	-10	-6.81	-0.008140	2.50	PASS
3.8	0	-6.52	-0.007793	2.50	PASS
3.8	10	-9.85	-0.011774	2.50	PASS
3.8	20	-7.26	-0.008553	2.50	PASS
3.8	30	-5.91	-0.006963	2.50	PASS
3.8	40	-6.01	-0.007081	2.50	PASS
3.8	50	-7.20	-0.008483	2.50	PASS

EGPRS 1900 Middle channel=661 channel=1880MHz					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
3.42	25	-2.68	-0.001426	2.50	PASS
3.8	25	-18.34	-0.009755	2.50	PASS
4.18	25	-12.59	-0.006697	2.50	PASS
3.8	-30	-4.07	-0.002165	2.50	PASS
3.8	-20	-9.75	-0.005186	2.50	PASS
3.8	-10	-8.10	-0.004309	2.50	PASS
3.8	0	-7.30	-0.003883	2.50	PASS
3.8	10	-9.56	-0.005085	2.50	PASS
3.8	20	-8.46	-0.004500	2.50	PASS
3.8	30	-5.81	-0.003042	2.50	PASS
3.8	40	-7.14	-0.003739	2.50	PASS
3.8	50	-5.07	-0.002655	2.50	PASS

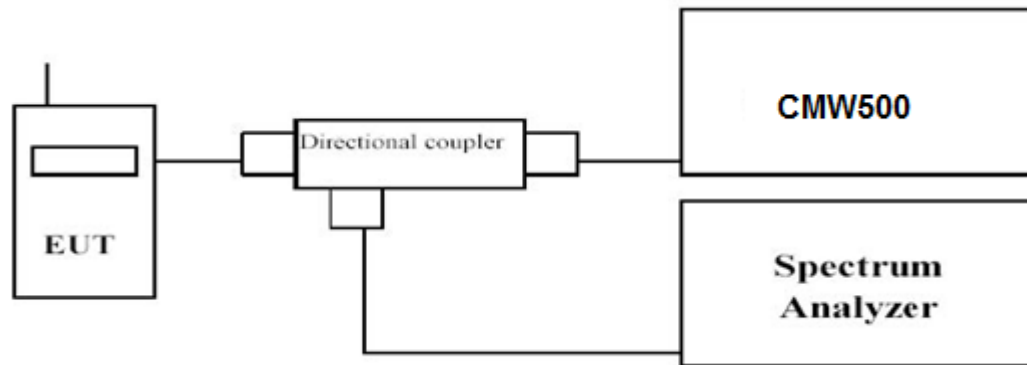


4.7 Peak-to-Average Ratio (PAR)

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:

$$\text{PAPR (dB)} = P_{Pk} \text{ (dBm)} - P_{Avg} \text{ (dBm)}.$$

TEST RESULTS

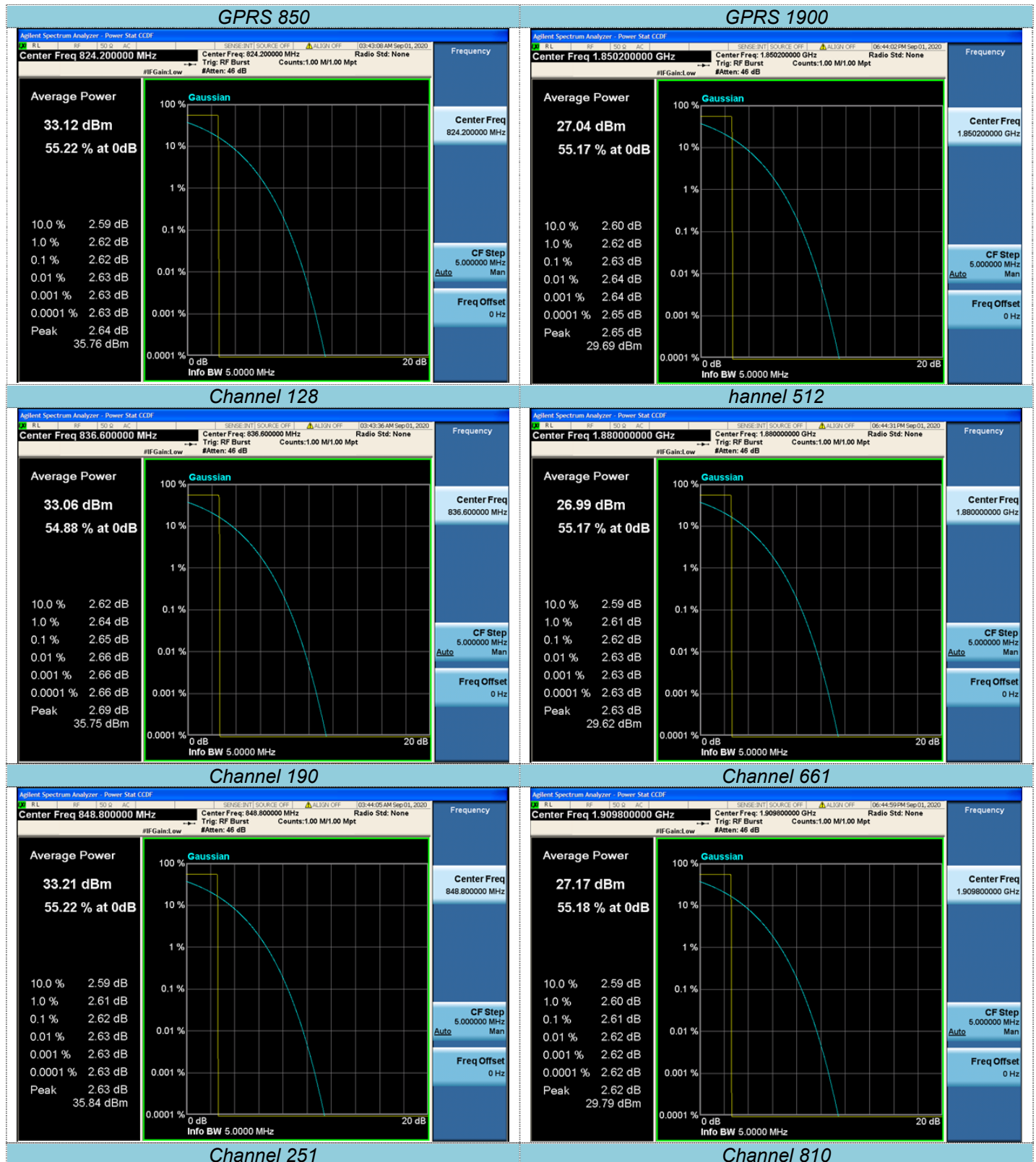
Note: We tested EGPRS/GPRS/GSM mode and recorded the worst case at the GPRS mode.

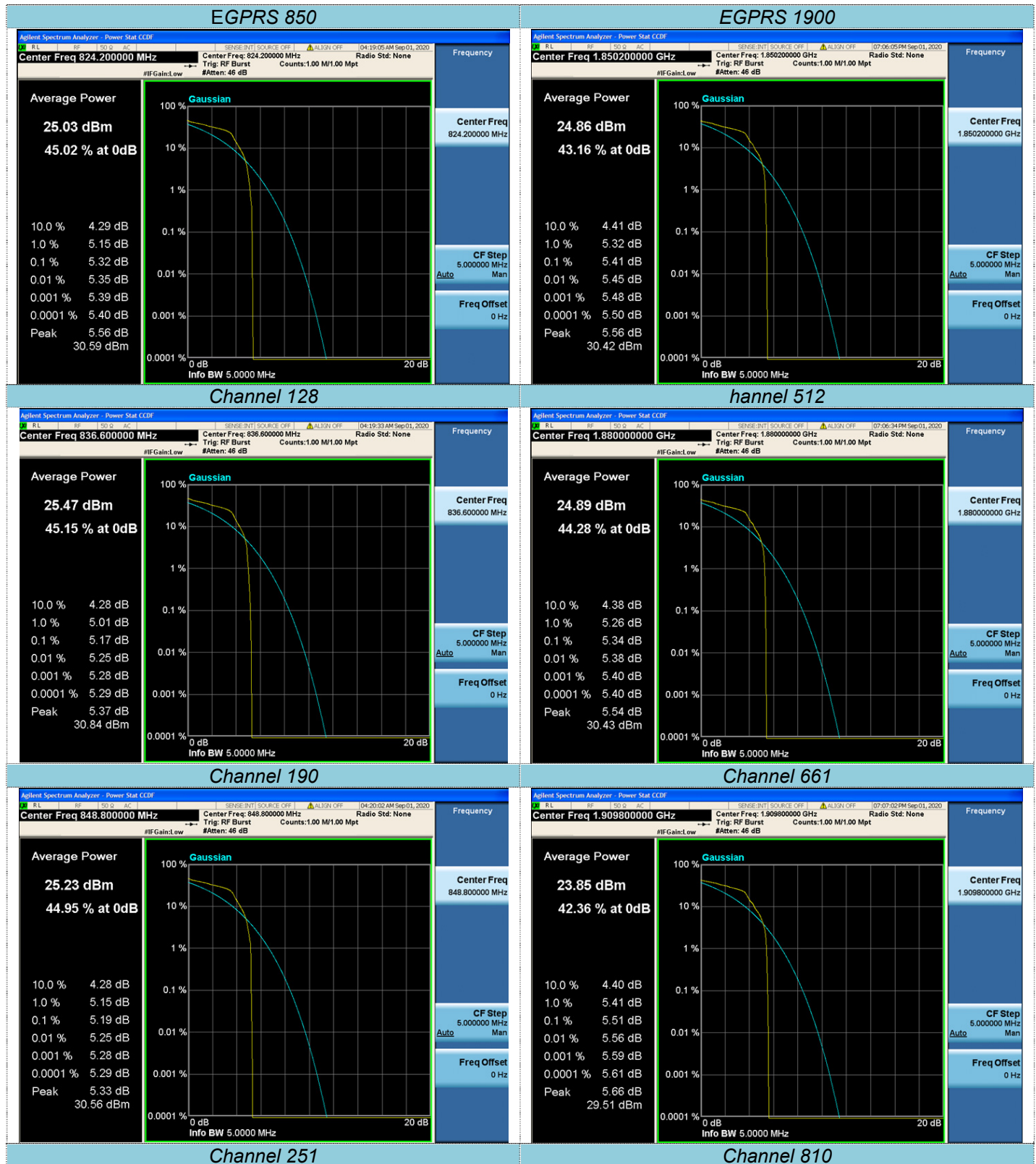
	GPRS 850		
Frequency (MHz)	Peak power	AV power	Measured (dB)
824.20	35.76	33.12	2.62
836.60	35.75	33.06	2.65
848.80	35.84	33.21	2.62

	GPRS 1900		
Frequency (MHz)	Peak power	AV power	Measured (dB)
1850.20	29.69	27.04	2.63
1880.00	29.62	26.99	2.62
1909.80	29.79	27.17	2.61

	EGPRS 850		
Frequency (MHz)	Peak power	AV power	Measured (dB)
824.20	30.59	25.03	5.32
836.60	30.84	25.47	5.17
848.80	30.56	25.23	5.19

	EGPRS 1900		
Frequency (MHz)	Peak power	AV power	Measured (dB)
1850.20	30.42	24.86	5.41
1880.00	30.43	24.89	5.34
1909.80	29.51	23.85	5.51







5 Test Setup Photos of the EUT

See the attached test photos

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