



Appendix

For

Test Report No.: SZEM1510006644CR



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3 Appendix_A: Effective (Isotropic) Radiated Power Output Data

Part I - Test Results

Part I – RF Conducted Power of Transmitter for GSM850

TEST CONDITIONS	RF Output Power(Conducted)					
	Channel128(L)		Channel192(M)		Channel251(H)	
	824.2MHz		836.6 MHz		848.8 MHz	
Tnom/ Vnom	Measured(dBm)	Limit (dBm)	Measured(dBm)	Limit (dBm)	Measured(dBm)	Limit (dBm)
GSM/TM1 (GSM ONLY)	33.41	38.5	33.39	38.5	33.15	38.5
GSM/TM1 GPRS(GMSK)	33.4	38.5	33.36	38.5	33.13	38.5

Part 2– Effective Radiated Power of Transmitter (ERP) for GSM850

Test Mode	Freq. (MHz)	Meas. Level (dBm)	Substitution Antenna Type	SGP (dBm)	Substitution Gain(dBi)	Cable Loss (dB)	Substitution Level(ERP) / dBm	Limit (dBm)	Result
GSM/TM1 (GSM ONLY)	824.2	30.26	BiConiLog Antenna	35.63	-2.75	0.6	30.13	38.5	Pass
GSM/TM1 (GSM ONLY)	836.6	29.16	BiConiLog Antenna	34.75	-2.87	0.6	29.13	38.5	Pass
GSM/TM1 (GSM ONLY)	848.8	29.75	BiConiLog Antenna	35.18	-2.85	0.6	29.58	38.5	Pass
GSM/TM1 (GPRS)	824.2	30.21	BiConiLog Antenna	35.62	-2.75	0.6	30.12	38.5	Pass
GSM/TM1 (GPRS)	836.6	29.12	BiConiLog Antenna	34.7	-2.87	0.6	29.08	38.5	Pass
GSM/TM1 (GPRS)	848.8	29.7	BiConiLog Antenna	35.22	-2.85	0.6	29.62	38.5	Pass

Note:

a: For getting the ERP (Efficient Radiated Power) in substitution method, the following formula should be taken to calculate it,

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBi]} - 2.15$$

b: SGP=Signal Generator Level

c: RBW > emission bandwidth, VBW > 3 x RBW.

Detector: RMS



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Part I – RF Conducted Power of Transmitter for GSM1900

TEST CONDITIONS	RF Output Power(Conducted)					
	Channel128(L)		Channel190(M)		Channel251(H)	
	1850.2MHz		1880.0 MHz		1909.8 MHz	
Tnom/ Vnom	Measured(dBm)	Limit (dBm)	Measured(dBm)	Limit (dBm)	Measured(dBm)	Limit (dBm)
GSM/TM1 (GSM ONLY)	31.02	33	30.69	33	30.13	33
GSM/TM1 (GPRS)	30.98	33	30.66	33	30.12	33

Part 2– Effective Isotropic Radiated Power of Transmitter (EIRP) for GSM1900

Test Mode	Freq. (MHz)	Meas. Level (dBm)	Substitution Antenna Type	SGP (dBm)	Substitution Gain(dBi)	Cable Loss (dB)	Substitution Level(EIRP) / dBm	Limit (dBm)	Result
GSM/TM1 (GSM ONLY)	1850.2	28.61	Horn Antenna	21.73	7.82	1	28.55	33	Pass
GSM/TM1 (GSM ONLY)	1880.0	28.81	Horn Antenna	21.92	7.86	1	28.78	33	Pass
GSM/TM1 (GSM ONLY)	1909.8	28.55	Horn Antenna	21.57	7.95	1	28.52	33	Pass
GSM/TM1 (GPRS)	1850.2	28.60	Horn Antenna	21.72	7.82	1	28.54	33	Pass
GSM/TM1 (GPRS)	1880.0	28.78	Horn Antenna	21.87	7.86	1	28.73	33	Pass
GSM/TM1 (GPRS)	1909.8	28.54	Horn Antenna	21.56	7.95	1	28.51	33	Pass

Note:

- a, For getting the EIRP (Efficient Isotropic Radiated Power) in substitution method, the following formula should be taken to calculate it,

$$\text{EIRP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBi]}$$

- b, SGP=Signal Generator Level

- c: RBW > emission bandwidth, VBW > 3 x RBW

Detector: RMS

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4 Appendix_B: Peak-to-Average Ratio

Part I - Test Results

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
GPRS850	GSM/TM1	LCH	0.65	13	PASS
		MCH	0.69	13	PASS
		HCH	0.54	13	PASS
GPRS1900	GSM/TM1	LCH	0.53	13	PASS
		MCH	0.46	13	PASS
		HCH	0.25	13	PASS



5 Appendix_C: Modulation Characteristics

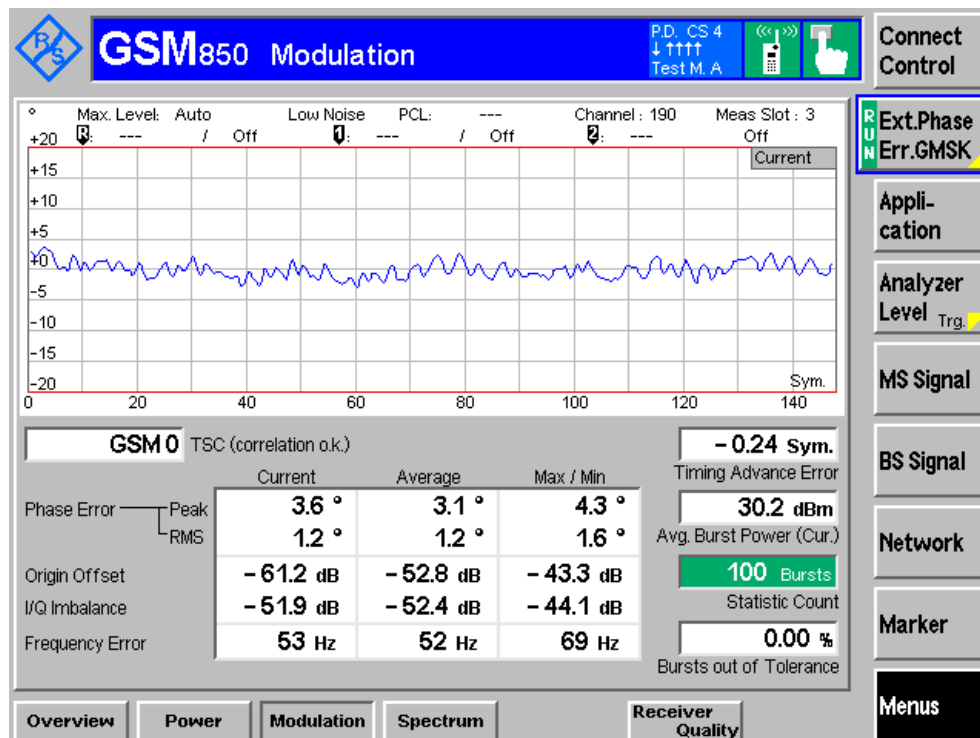
Part I - Test Plots

5.1 For GSM

5.1.1 Test Band = GPRS850

5.1.1.1 Test Mode = GPRS/TM1

5.1.1.1.1 Test Channel = MCH

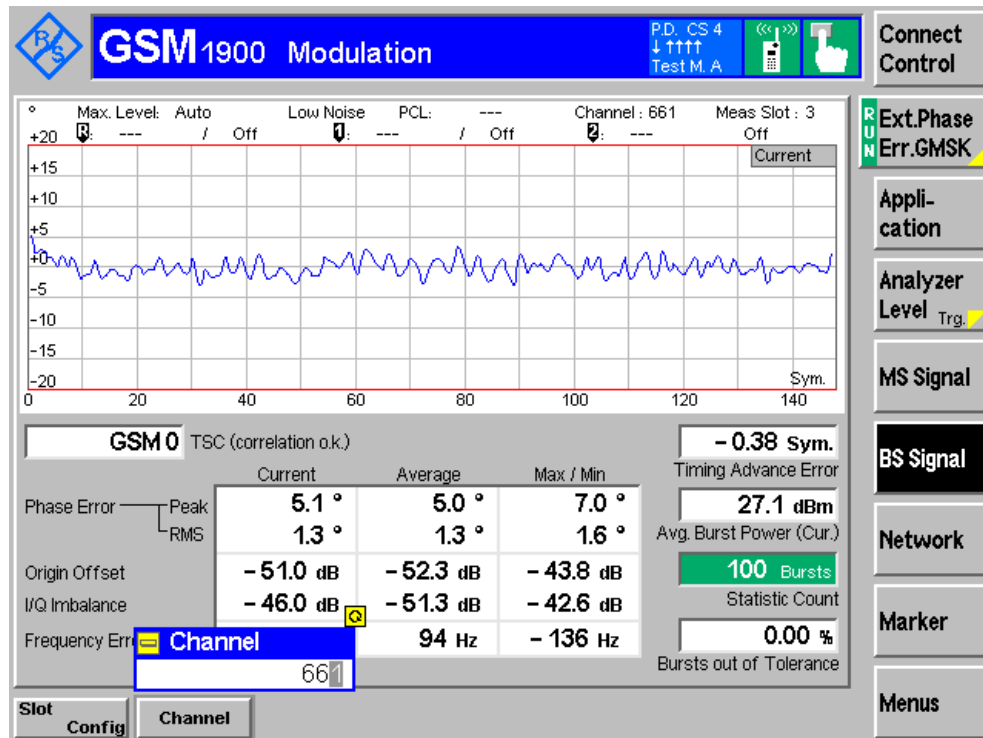




5.1.2 Test Band = GPRS1900

5.1.2.1 Test Mode = GPRS/TM1

5.1.2.1.1 Test Channel = MCH





6 Appendix_D: Bandwidth

Part I - Test Results

Test Band	Test Mode	Test Channel	Occupied Bandwidth [kHz]	Emission Bandwidth [kHz]	Verdict
GPRS850	GPRS/TM1	LCH	246.65	306.2	PASS
		MCH	246.49	315.8	PASS
		HCH	249.82	309.5	PASS
GPRS1900	GPRS/TM1	LCH	249.57	317.8	PASS
		MCH	249.72	316.0	PASS
		HCH	246.85	320.6	PASS



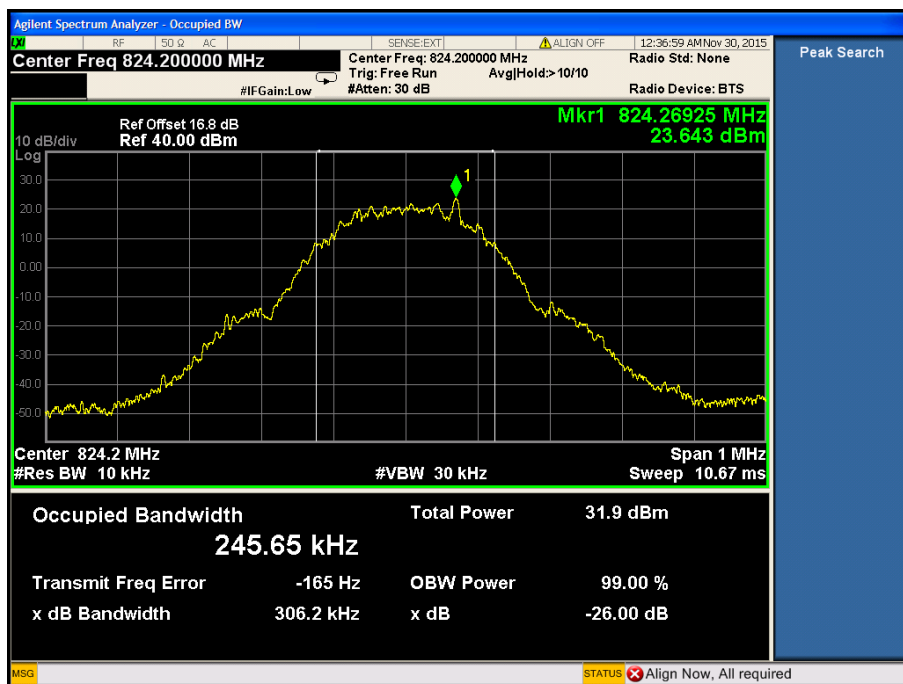
Part II - Test Plots

6.1 For GPRS

6.1.1 Test Band = GPRS850

6.1.1.1 Test Mode = GPRS/TM1

6.1.1.1.1 Test Channel = LCH



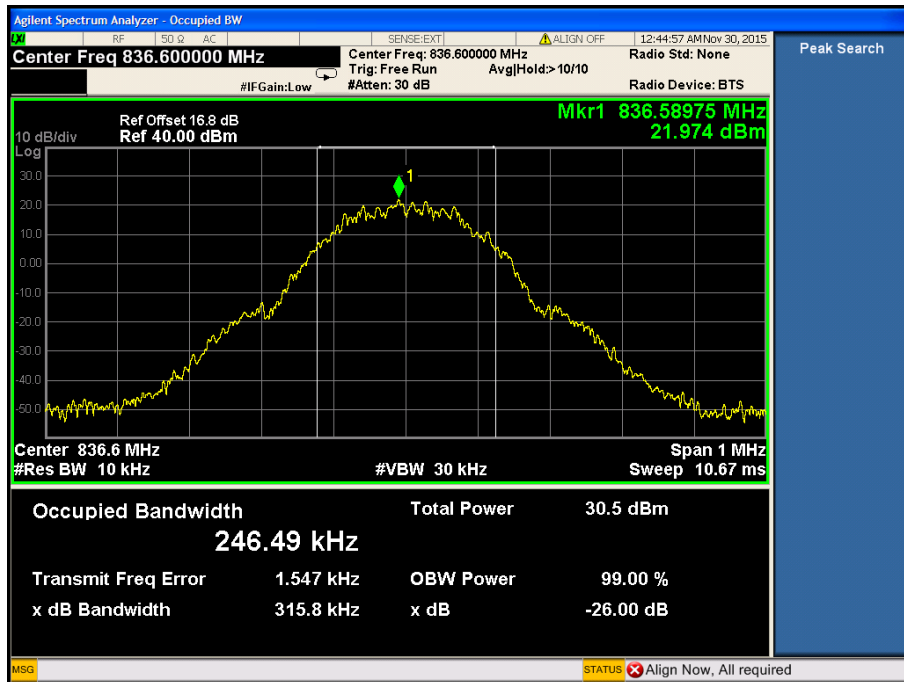


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6.1.1.1.2 Test Channel = MCH



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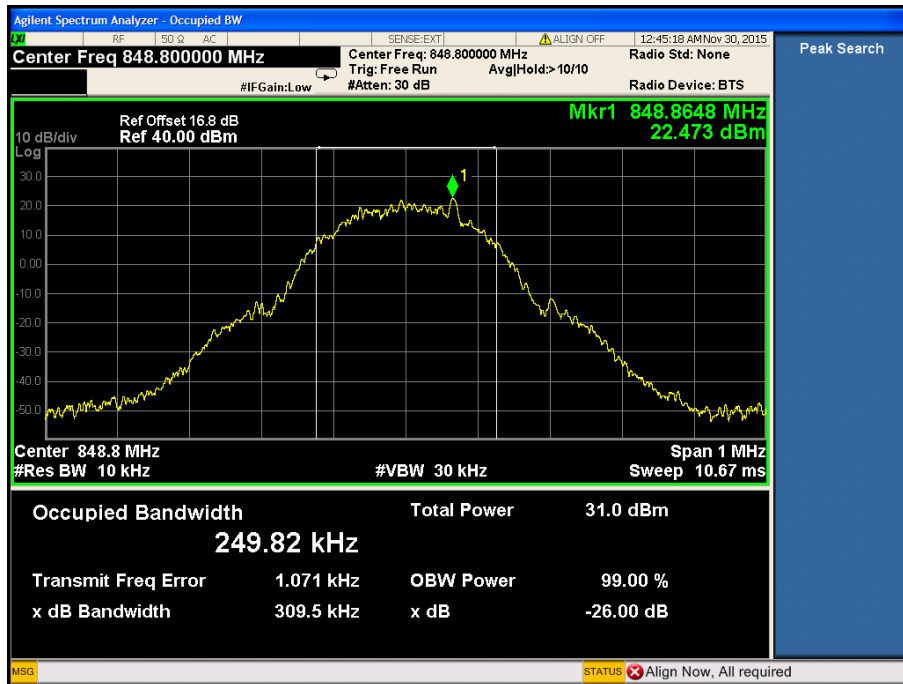


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6.1.1.1.3 Test Channel = HCH



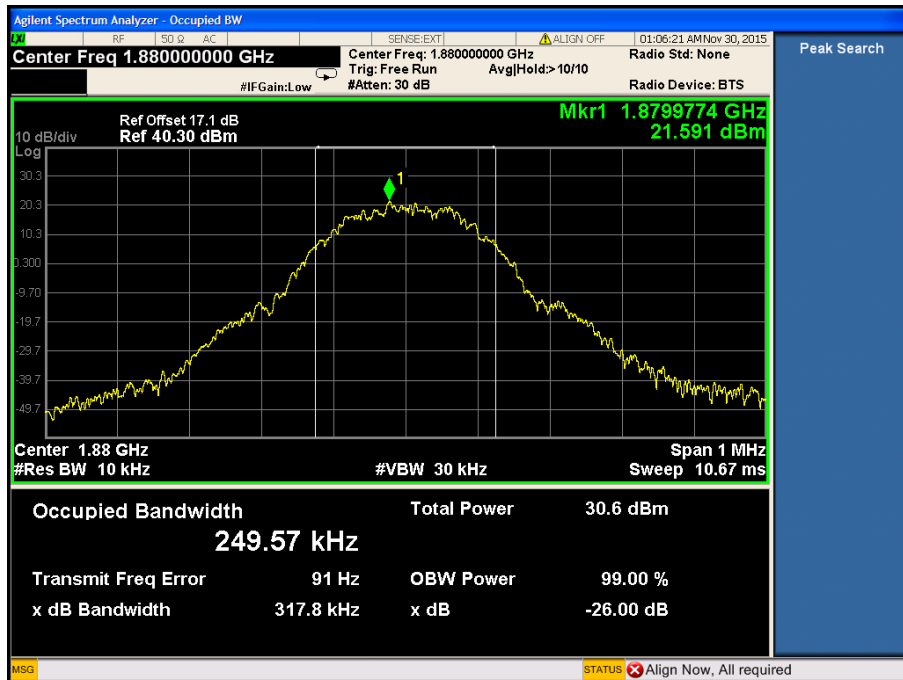
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6.2 Test Band = GPRS1900

6.2.1.1 Test Mode = GPRS/TM1

6.2.1.1.1 Test Channel = LCH



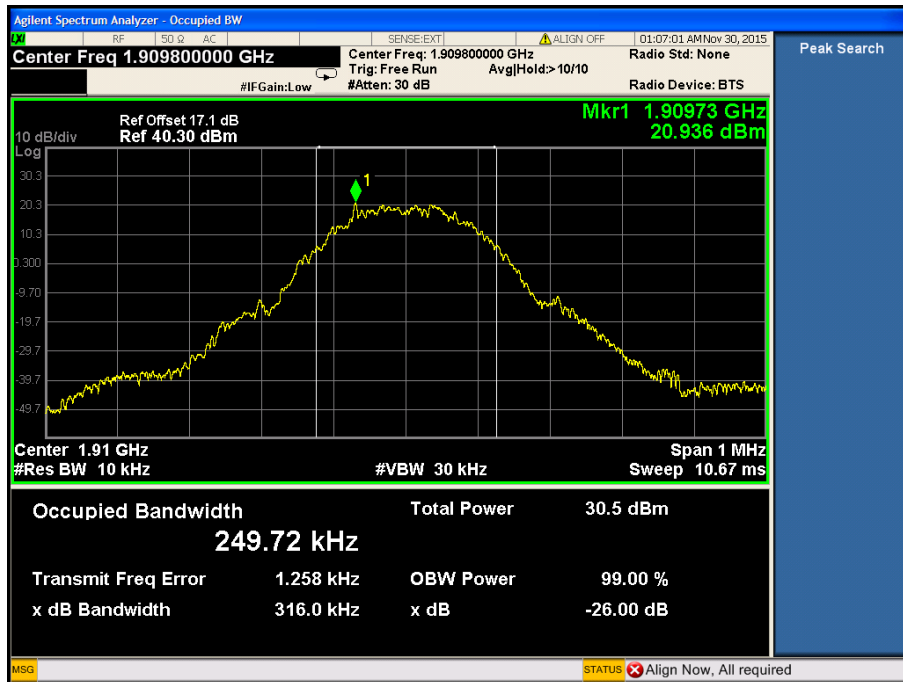


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6.2.1.1.2 Test Channel = MCH



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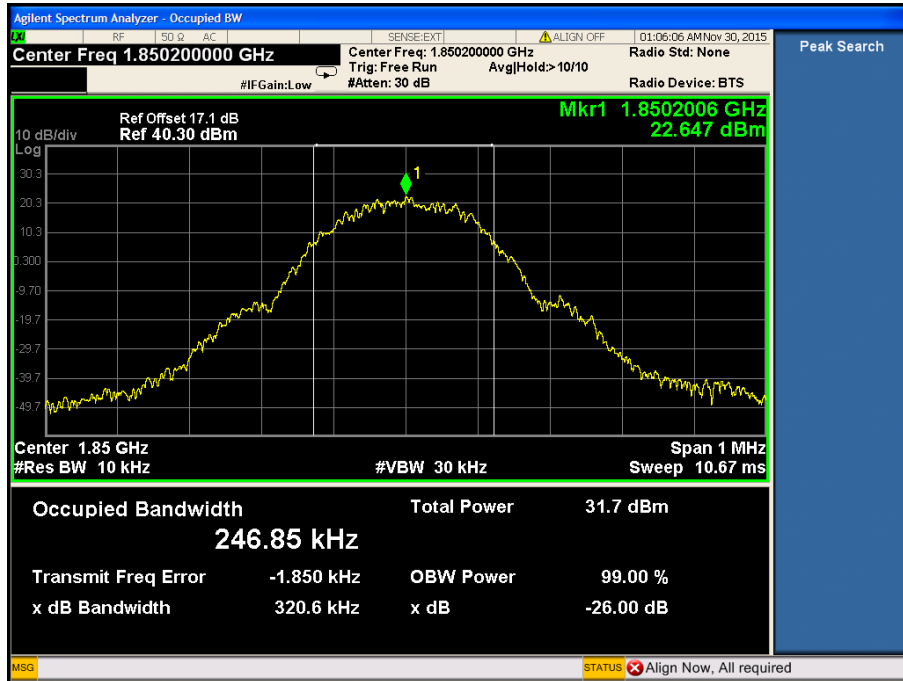


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6.2.1.1.3 Test Channel = HCH



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7 Appendix_E: Band Edges Compliance

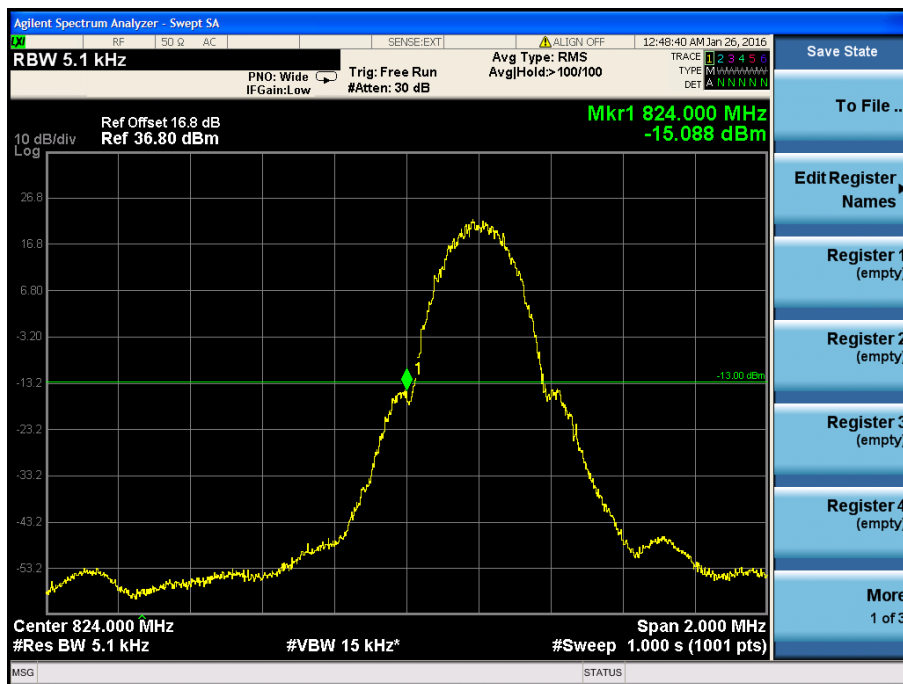
Part I - Test Plots

7.1 For GPRS

7.1.1 Test Band = GPRS850

7.1.1.1 Test Mode = GPRS/TM1

7.1.1.1.1 Test Channel = LCH



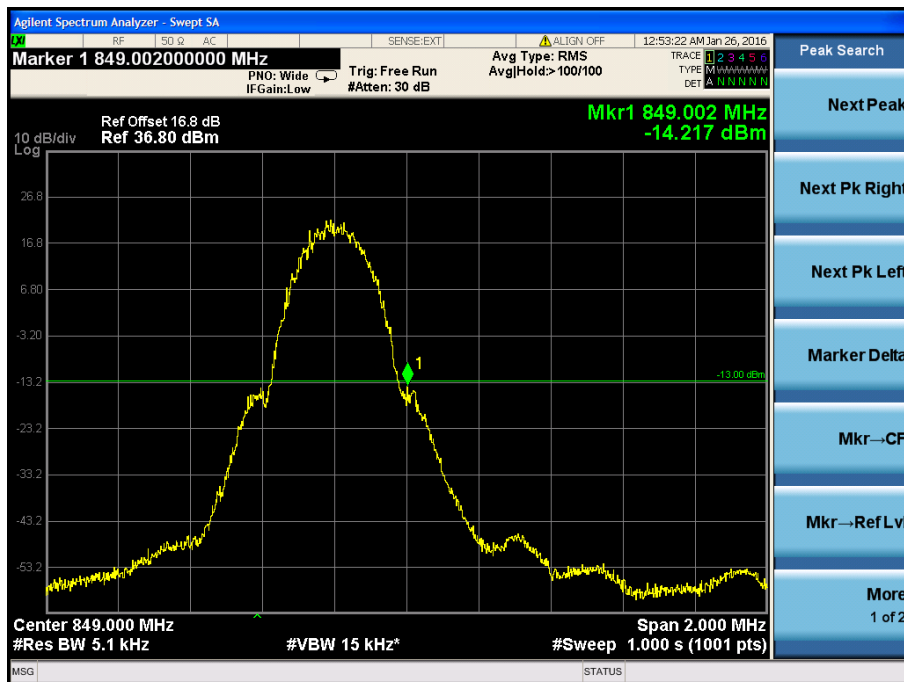


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7.1.1.1.2 Test Channel = HCH



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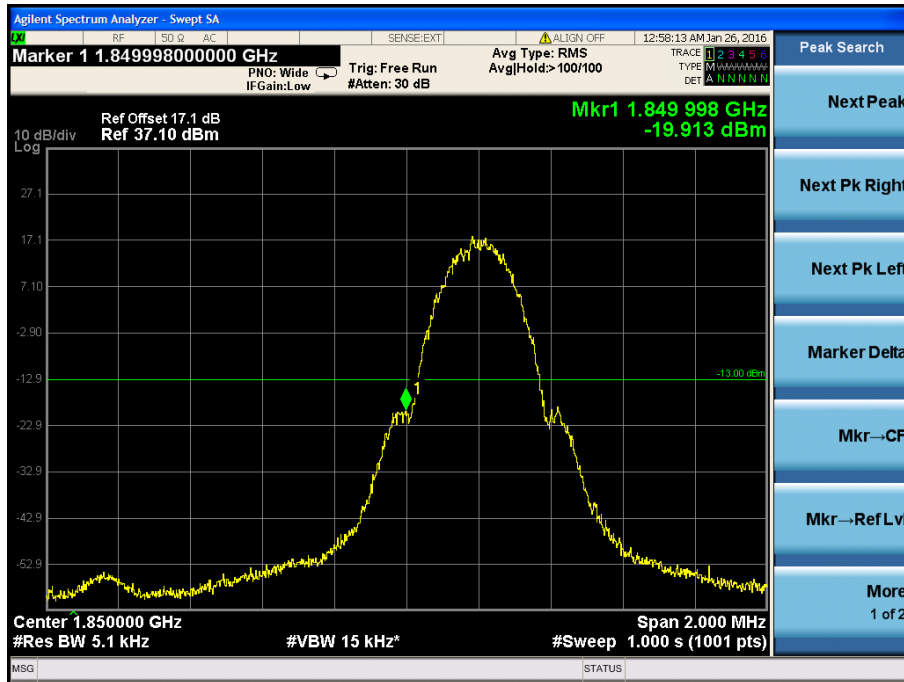
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7.1.2 Test Band = GPRS1900

7.1.2.1 Test Mode = GPRS/TM1

7.1.2.1.1 Test Channel = LCH



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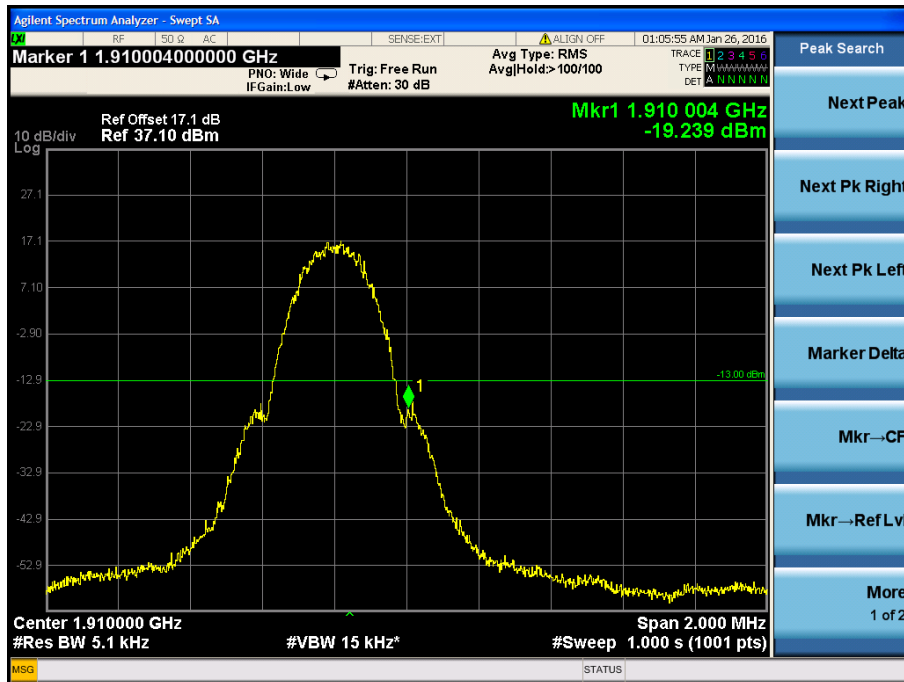


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7.1.2.1.2 Test Channel = HCH



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8 Appendix_F: Spurious Emission at Antenna Terminal

NOTE: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of $< RBW/2$ so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points = $k * (Span / RBW)$ " with k between 4 and 5, which results in an acceptable level error of less than 0.5 dB.

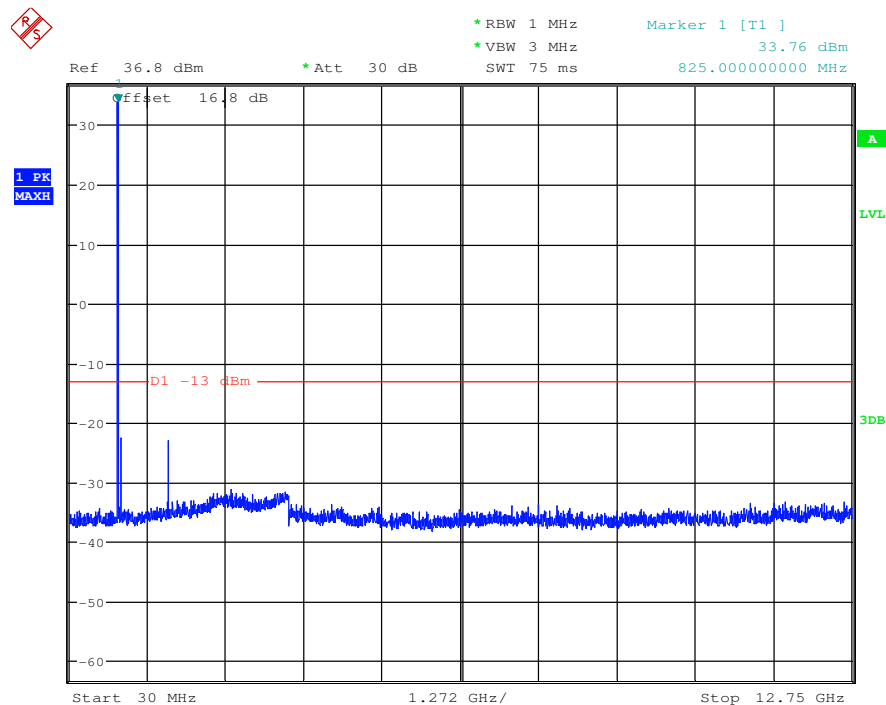
Part I - Test Plots

8.1 For GPRS

8.1.1 Test Band = GPRS850

8.1.1.1 Test Mode = GPRS/TM1

8.1.1.1.1 Test Channel = LCH



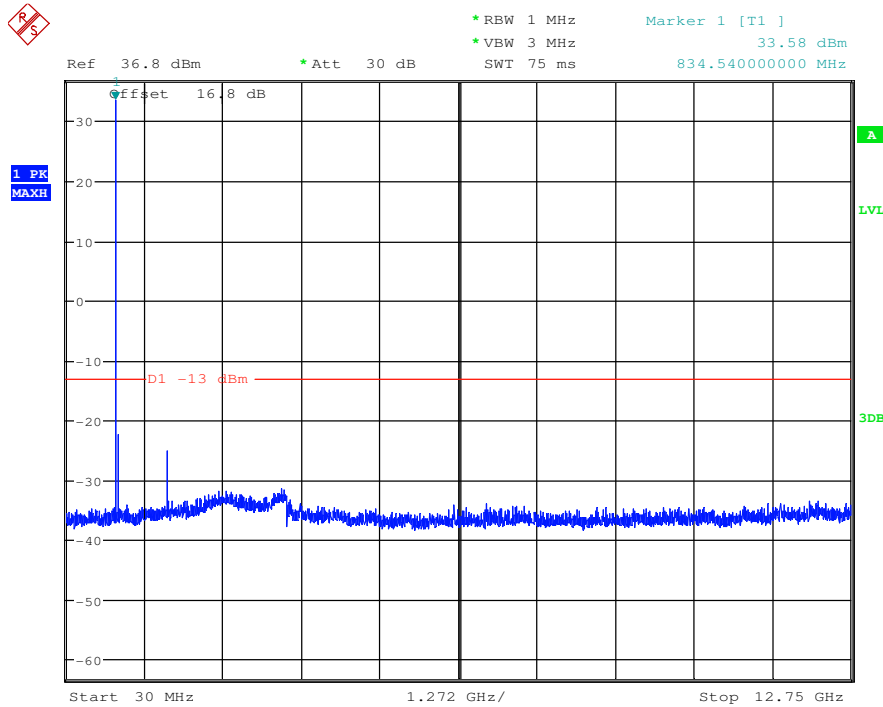


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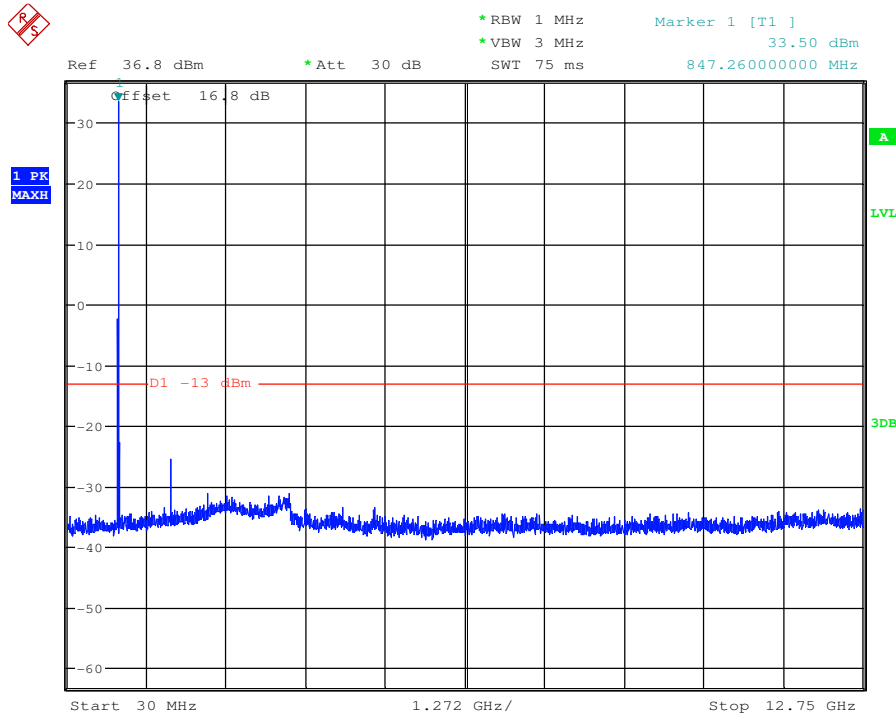
8.1.1.1.2 Test Channel = MCH



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8.1.1.1.3 Test Channel = HCH

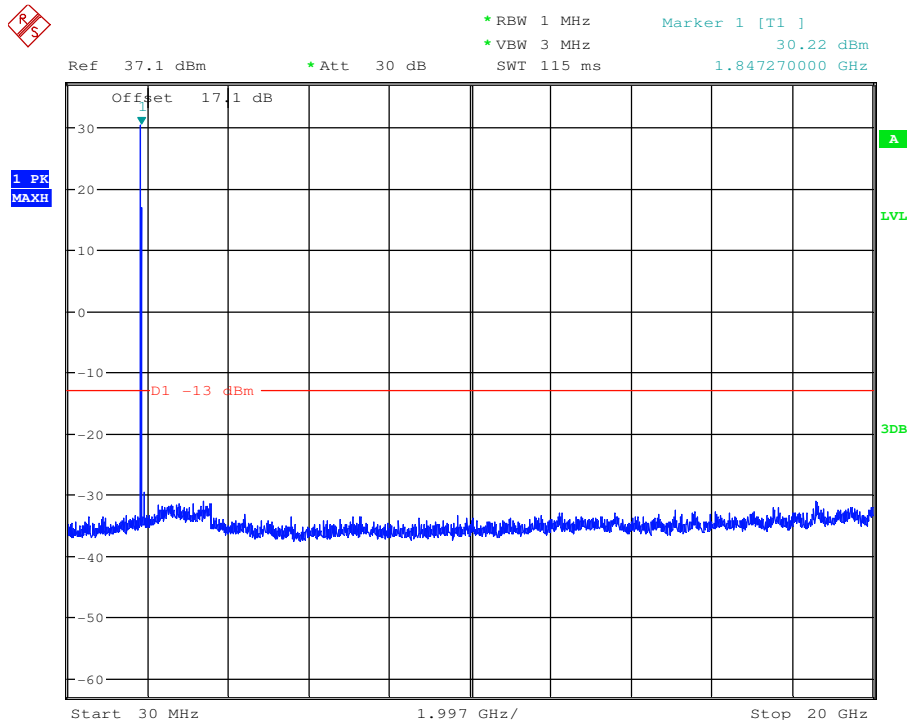




8.1.2 Test Band = GPRS1900

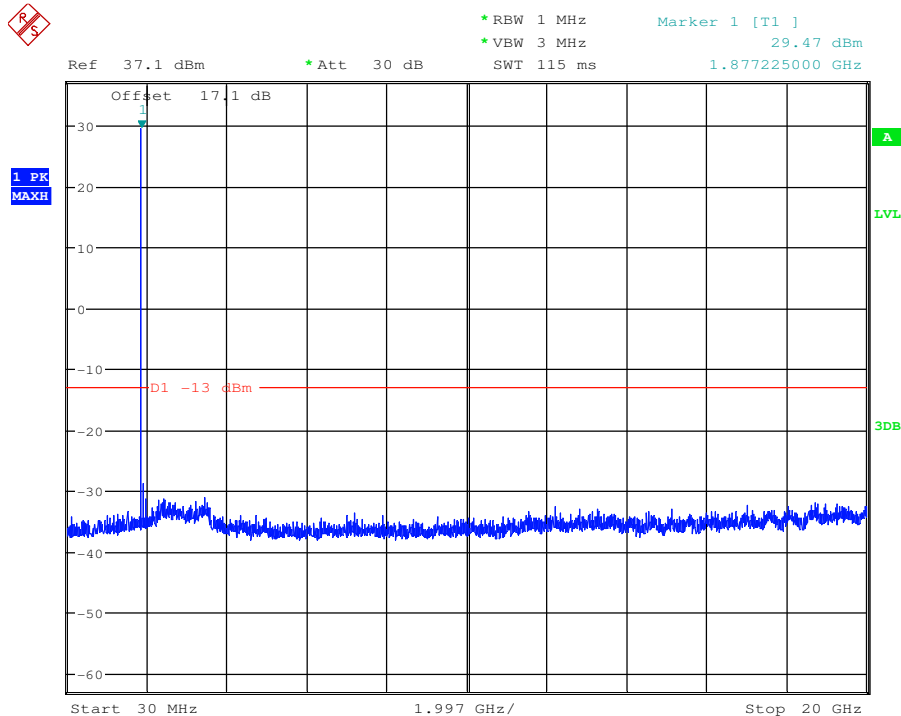
8.1.2.1 Test Mode = GPRS/TM1

8.1.2.1.1 Test Channel = LCH





8.1.2.1.2 Test Channel = MCH



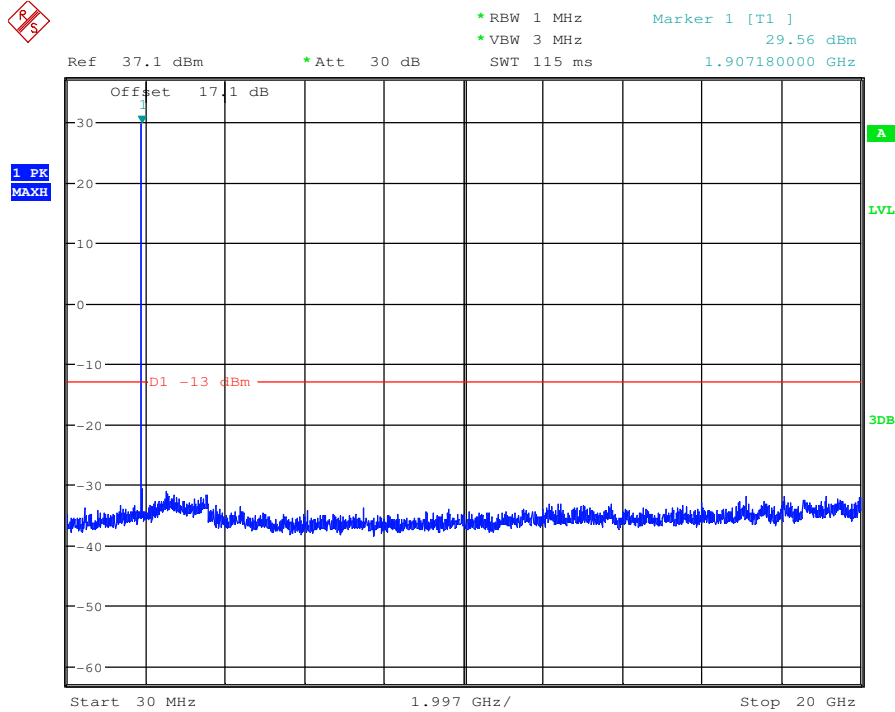


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8.1.2.1.3 Test Channel = HCH



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9 Appendix_G: Field Strength of Spurious Radiation

Part I - Test Plots

9.1 For GSM

9.1.1 Test Band = GSM850

9.1.1.1 Test Mode = GSM/TM1

GSM LCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
129.861	-73.03	-13.00	-60.03	Vertical
179.526	-86.64	-13.00	-73.64	Vertical
230.062	-83.09	-13.00	-70.09	Vertical
322.019	-78.94	-13.00	-65.94	Vertical
459.516	-78.74	-13.00	-65.74	Vertical
643.622	-75.74	-13.00	-62.74	Vertical
1224.775	-55.22	-13.00	-42.22	Vertical
2269.275	-48.89	-13.00	-35.89	Vertical
3515.200	-56.18	-13.00	-43.18	Vertical
5154.600	-55.10	-13.00	-42.10	Vertical
6994.200	-53.98	-13.00	-40.98	Vertical
9218.800	-53.06	-13.00	-40.06	Vertical

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
78.743	-85.88	-13.00	-72.88	Horizontal
126.952	-85.48	-13.00	-72.48	Horizontal
192.960	-83.04	-13.00	-70.04	Horizontal
282.006	-80.71	-13.00	-67.71	Horizontal
417.661	-73.50	-13.00	-60.50	Horizontal
678.688	-74.45	-13.00	-61.45	Horizontal
1648.575	-30.07	-13.00	-17.07	Horizontal
2472.525	-38.62	-13.00	-25.62	Horizontal
3296.800	-46.14	-13.00	-33.14	Horizontal
4121.400	-39.61	-13.00	-26.61	Horizontal
5734.900	-55.37	-13.00	-42.37	Horizontal
7417.350	-47.72	-13.00	-34.72	Horizontal



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GSM MCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
82.186	-82.19	-13.00	-69.19	Vertical
123.605	-81.97	-13.00	-68.97	Vertical
172.299	-72.83	-13.00	-59.83	Vertical
292.240	-79.73	-13.00	-66.73	Vertical
435.606	-79.71	-13.00	-66.71	Vertical
607.829	-75.51	-13.00	-62.51	Vertical
2276.550	-49.37	-13.00	-36.37	Vertical
3290.500	-57.56	-13.00	-44.56	Vertical
4317.750	-56.93	-13.00	-43.93	Vertical
5474.850	-55.27	-13.00	-42.27	Vertical
7440.450	-54.63	-13.00	-41.63	Vertical
9313.300	-52.83	-13.00	-39.83	Vertical

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
76.948	-84.70	-13.00	-71.70	Horizontal
131.899	-86.17	-13.00	-73.17	Horizontal
191.214	-84.44	-13.00	-71.44	Horizontal
287.778	-79.24	-13.00	-66.24	Horizontal
431.629	-74.56	-13.00	-61.56	Horizontal
624.173	-74.53	-13.00	-61.53	Horizontal
1672.950	-21.72	-13.00	-8.72	Horizontal
2509.650	-37.21	-13.00	-24.21	Horizontal
3340.550	-53.29	-13.00	-40.29	Horizontal
4183.000	-45.94	-13.00	-32.94	Horizontal
5856.700	-54.13	-13.00	-41.13	Horizontal
7529.000	-49.01	-13.00	-36.01	Horizontal

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GSM HCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
86.357	-85.69	-13.00	--72.69	Vertical
131.074	-76.89	-13.00	-63.89	Vertical
187.674	-86.65	-13.00	-73.65	Vertical
282.879	-80.40	-13.00	-67.40	Vertical
424.111	-64.43	-13.00	-51.43	Vertical
691.395	-75.77	-13.00	-62.77	Vertical
1697.625	-29.63	-13.00	-16.63	Vertical
2452.275	-47.54	-13.00	-34.54	Vertical
4243.550	-51.51	-13.00	-38.51	Vertical
5566.900	-56.22	-13.00	-43.22	Vertical
7639.250	-52.38	-13.00	-39.38	Vertical
9320.300	-53.15	-13.00	-40.15	Vertical

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
68.073	-78.69	-13.00	-65.69	Horizontal
110.365	-86.41	-13.00	-73.41	Horizontal
191.602	-84.00	-13.00	-71.00	Horizontal
288.408	-80.05	-13.00	-67.05	Horizontal
432.987	-78.30	-13.00	-65.30	Horizontal
614.086	-73.52	-13.00	-60.52	Horizontal
1697.550	-22.42	-13.00	-9.42	Horizontal
2546.100	-40.90	-13.00	-27.90	Horizontal
4243.900	-45.35	-13.00	-32.35	Horizontal
5700.950	-55.91	-13.00	-42.91	Horizontal
7639.250	-48.85	-13.00	-35.85	Horizontal
9695.850	-54.41	-13.00	-41.41	Horizontal

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9.1.2 Test Band = GPRS1900

9.1.2.1 Test Mode = GPRS/TM1

GPRS LCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
61.768	-66.43	-13.00	-53.43	Vertical
96.882	-77.57	-13.00	-64.57	Vertical
152.172	-68.77	-13.00	-55.77	Vertical
269.008	-80.54	-13.00	-67.54	Vertical
423.869	-77.87	-13.00	-64.87	Vertical
619.033	-60.54	-13.00	-47.54	Vertical
1648.200	-30.08	-13.00	-17.08	Vertical
2472.450	-38.24	-13.00	-25.24	Vertical
3290.850	-51.33	-13.00	-38.33	Vertical
4487.500	-56.10	-13.00	-43.10	Vertical
5769.200	-50.99	-13.00	-37.99	Vertical
7896.150	-53.23	-13.00	-40.23	Vertical

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
78.209	-86.13	-13.00	-73.13	Horizontal
141.502	-86.41	-13.00	-73.41	Horizontal
213.912	-83.25	-13.00	-70.25	Horizontal
326.966	-80.43	-13.00	-67.43	Horizontal
484.445	-76.38	-13.00	-63.38	Horizontal
739.119	-75.38	-13.00	-62.38	Horizontal
1648.425	-30.02	-13.00	-17.02	Horizontal
2472.450	-39.89	-13.00	-26.89	Horizontal
3290.850	-52.67	-13.00	-39.67	Horizontal
4121.050	-41.42	-13.00	-28.42	Horizontal
5769.200	-55.07	-13.00	-42.07	Horizontal
7417.350	-50.94	-13.00	-37.94	Horizontal

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GPRS MCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
68.558	-70.42	-13.00	-57.42	Vertical
105.951	-78.43	-13.00	-65.43	Vertical
153.772	-68.48	-13.00	-55.48	Vertical
250.627	-79.93	-13.00	-66.93	Vertical
418.388	-53.76	-13.00	-40.76	Vertical
625.677	-58.50	-13.00	-45.50	Vertical
1673.100	-33.82	-13.00	-20.82	Vertical
2509.875	-37.31	-13.00	-24.31	Vertical
3525.350	-49.78	-13.00	-36.78	Vertical
5019.500	-53.11	-13.00	-40.11	Vertical
6268.650	-54.25	-13.00	-41.25	Vertical
9202.700	-49.90	-13.00	-36.90	Vertical

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
65.890	-77.27	-13.00	-64.27	Horizontal
104.836	-77.87	-13.00	-64.87	Horizontal
165.461	-83.39	-13.00	-70.39	Horizontal
275.459	-78.94	-13.00	-65.94	Horizontal
418.340	-59.24	-13.00	-46.24	Horizontal
680.046	-75.46	-13.00	-62.46	Horizontal
1673.175	-35.42	-13.00	-22.42	Horizontal
2509.800	-38.99	-13.00	-25.99	Horizontal
3810.250	-51.40	-13.00	-38.40	Horizontal
5190.300	-56.22	-13.00	-43.22	Horizontal
7469.850	-54.81	-13.00	-41.81	Horizontal
9249.950	-52.01	-13.00	-39.01	Horizontal

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GPRS HCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
67.054	-75.88	-13.00	-62.88	Vertical
99.452	-75.39	-13.00	-62.39	Vertical
152.851	-67.82	-13.00	-54.82	Vertical
256.738	-80.56	-13.00	-67.56	Vertical
424.790	-63.83	-13.00	-50.83	Vertical
619.081	-67.81	-13.00	-54.81	Vertical
1697.325	-33.65	-13.00	-20.65	Vertical
2546.100	-38.57	-13.00	-25.57	Vertical
3395.150	-50.67	-13.00	-37.67	Vertical
4243.900	-51.76	-13.00	-38.76	Vertical
5710.050	-56.63	-13.00	-43.63	Vertical
8887.350	-53.50	-13.00	-40.50	Vertical

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
58.858	-68.79	-13.00	-55.79	Horizontal
93.632	-72.73	-13.00	-59.73	Horizontal
153.142	-62.25	-13.00	-49.25	Horizontal
255.574	-79.36	-13.00	-66.36	Horizontal
424.354	-64.18	-13.00	-51.18	Horizontal
619.178	-59.71	-13.00	-46.71	Horizontal
1697.625	-27.52	-13.00	-14.52	Horizontal
2546.700	-37.07	-13.00	-24.07	Horizontal
3575.400	-46.19	-13.00	-33.19	Horizontal
5092.300	-54.06	-13.00	-41.06	Horizontal
7063.500	-52.67	-13.00	-39.67	Horizontal
9337.450	-51.55	-13.00	-38.55	Horizontal

NOTE:

- 1) The disturbance above 16GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



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10 Appendix_H: Frequency Stability

10.1 For GSM

10.1.1 Frequency Error VS. Voltage:

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
GPRS850	GPRS/TM1	LCH	TN	VL	-3.10	-0.00376	PASS
				VN	-8.00	-0.00971	PASS
				VH	0.52	0.00063	PASS
		MCH	TN	VL	-7.74	-0.00925	PASS
				VN	-6.52	-0.00779	PASS
				VH	-5.16	-0.00617	PASS
		HCH	TN	VL	-0.80	-0.00094	PASS
				VN	-5.52	-0.00650	PASS
				VH	-8.94	-0.01053	PASS
GPRS1900	GPRS/TM1	LCH	TN	VL	-10.09	-0.00545	PASS
				VN	-8.54	-0.00462	PASS
				VH	-2.40	-0.00128	PASS
		MCH	TN	VL	-1.69	-0.00090	PASS
				VN	-7.38	-0.00393	PASS
				VH	-1.05	-0.00055	PASS
		HCH	TN	VL	-8.28	-0.00434	PASS
				VN	-18.93	-0.00991	PASS
				VH	3.80	0.00205	PASS



10.1.2 Frequency Error VS. Temperature:

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict
GPRS850	GPRS/TM1	LCH	VN	-30	-1.98	-0.00240	±2.5	PASS
				-20	-1.27	-0.00154	±2.5	PASS
				-10	-1.59	-0.00193	±2.5	PASS
				0	-3.53	-0.00428	±2.5	PASS
				10	1.25	0.00152	±2.5	PASS
				20	2.48	0.00301	±2.5	PASS
				30	2.57	0.00312	±2.5	PASS
				40	1.09	0.00132	±2.5	PASS
				50	6.19	0.00751	±2.5	PASS
		MCH	VN	-30	0.25	0.00030	±2.5	PASS
				-20	2.96	0.00354	±2.5	PASS
				-10	-0.61	-0.00073	±2.5	PASS
				0	-1.96	-0.00234	±2.5	PASS
				10	0.43	0.00051	±2.5	PASS
				20	-1.12	-0.00134	±2.5	PASS
				30	0.94	0.00112	±2.5	PASS
				40	1.52	0.00182	±2.5	PASS
				50	2.36	0.00282	±2.5	PASS
		HCH	VN	-30	0.32	0.00038	±2.5	PASS
				-20	4.97	0.00586	±2.5	PASS
				-10	-0.65	-0.00077	±2.5	PASS
				0	-1.10	-0.00130	±2.5	PASS
				10	-0.84	-0.00099	±2.5	PASS
				20	-1.10	-0.00130	±2.5	PASS
				30	-1.30	-0.00153	±2.5	PASS
				40	-2.20	-0.00259	±2.5	PASS
				50	-0.13	-0.00015	±2.5	PASS



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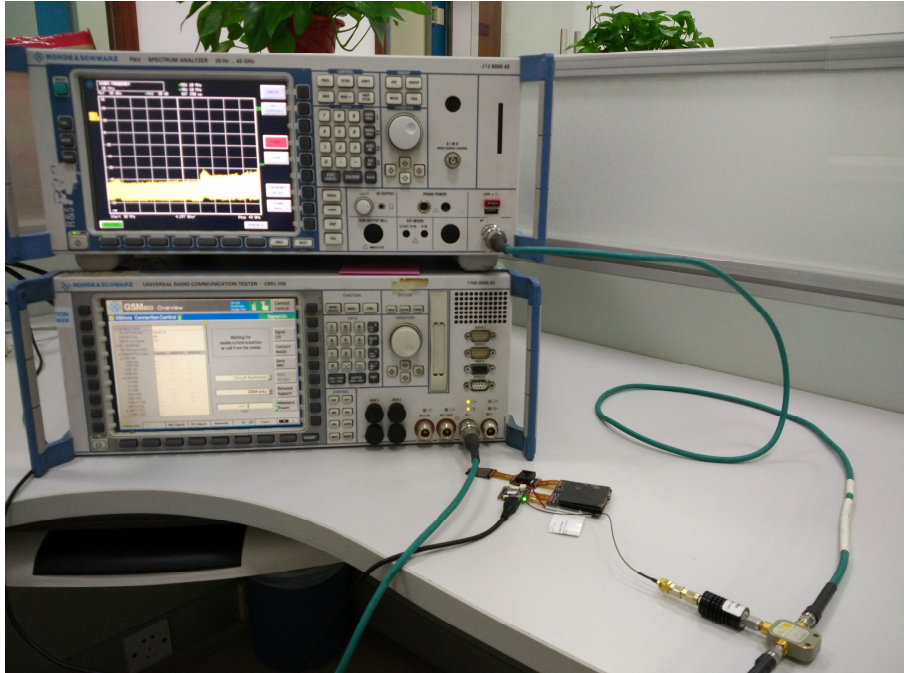
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GPRS1900	GPRS/TM1	LCH	VN	-30	-14.93	-0.00807	±2.5	PASS
				-20	-8.87	-0.00479	±2.5	PASS
				-10	-14.04	-0.00759	±2.5	PASS
				0	-2.22	-0.00120	±2.5	PASS
				10	1.65	0.00089	±2.5	PASS
				20	-5.06	-0.00273	±2.5	PASS
				30	-13.84	-0.00748	±2.5	PASS
				40	-10.42	-0.00563	±2.5	PASS
				50	1.33	0.00072	±2.5	PASS
		MCH	VN	-30	-5.77	-0.00307	±2.5	PASS
				-20	-7.39	-0.00393	±2.5	PASS
				-10	-13.13	-0.00698	±2.5	PASS
				0	-0.67	-0.00036	±2.5	PASS
				10	-15.33	-0.00815	±2.5	PASS
				20	-7.64	-0.00406	±2.5	PASS
				30	2.43	0.00129	±2.5	PASS
				40	-8.87	-0.00472	±2.5	PASS
				50	-11.96	-0.00636	±2.5	PASS
		HCH	VN	-30	-14.73	-0.00771	±2.5	PASS
				-20	-5.24	-0.00274	±2.5	PASS
				-10	-6.79	-0.00356	±2.5	PASS
				0	-11.76	-0.00616	±2.5	PASS
				10	1.02	0.00053	±2.5	PASS
				20	2.57	0.00135	±2.5	PASS
				30	-6.34	-0.00332	±2.5	PASS
				40	-13.64	-0.00714	±2.5	PASS
				50	-2.21	-0.00116	±2.5	PASS

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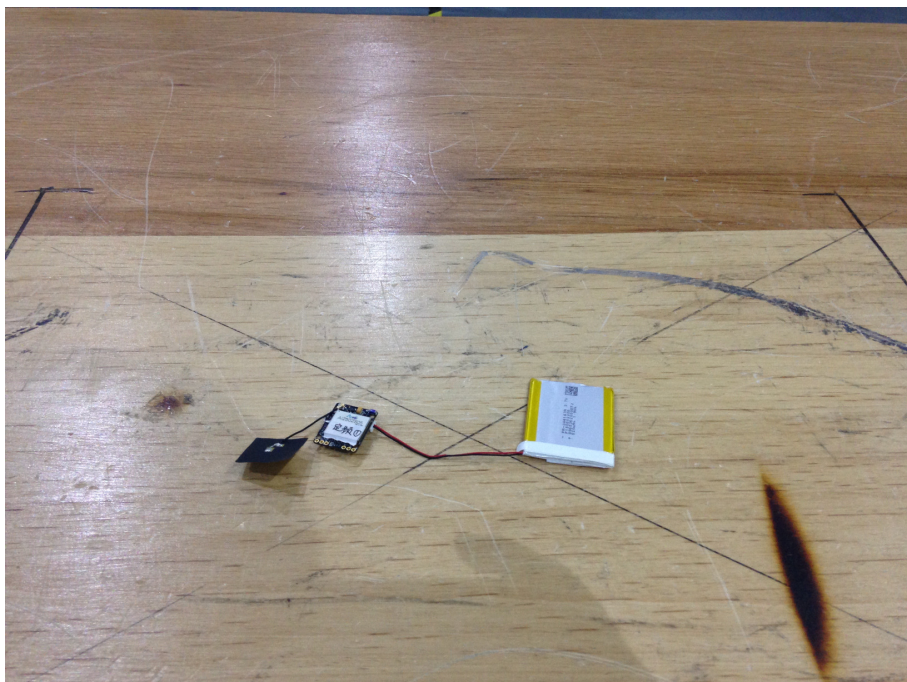
11 Appendix I: Test Setup

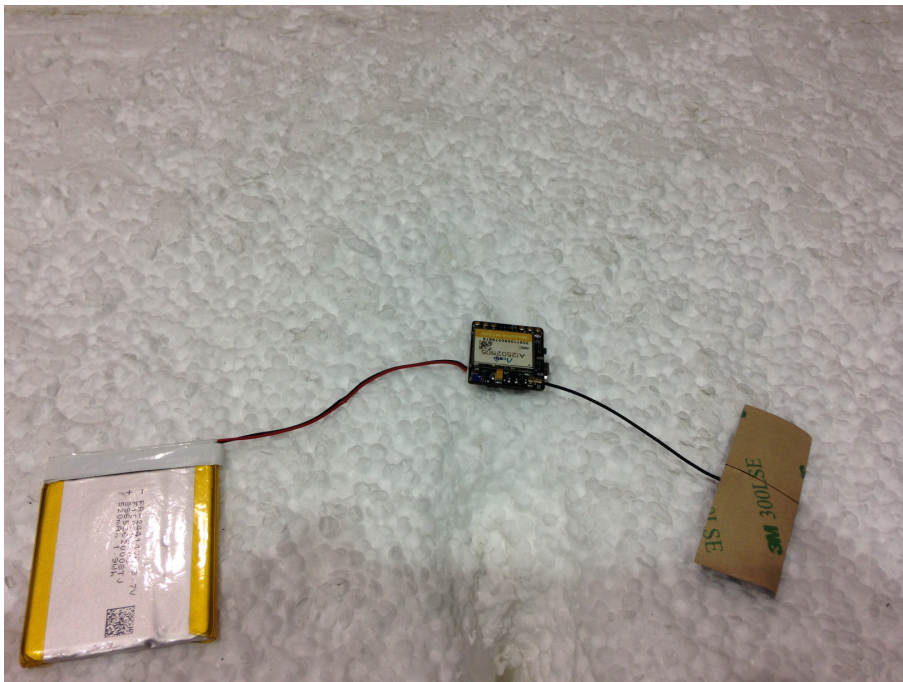
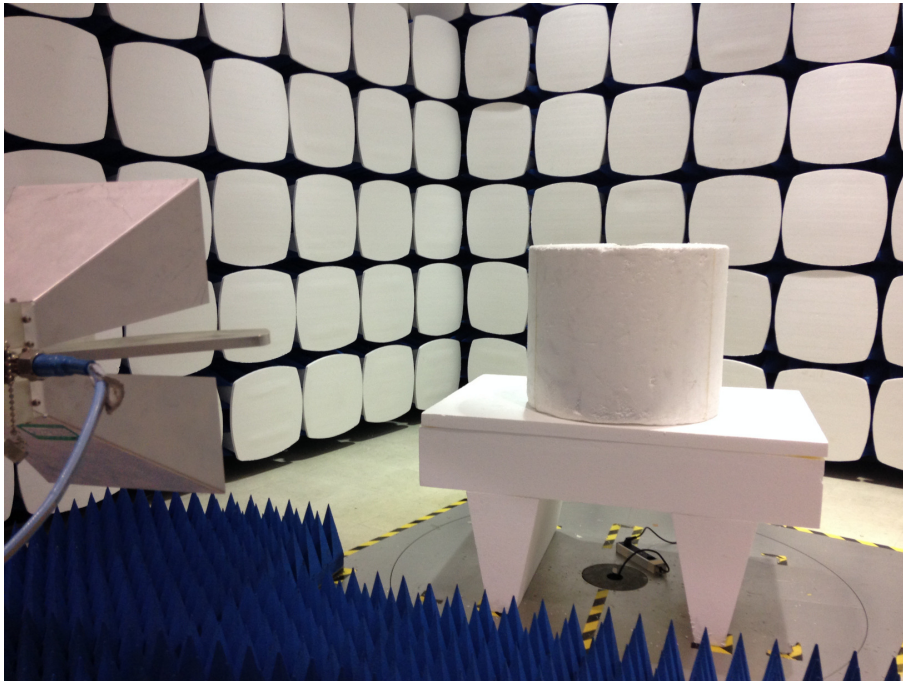
RF Conducted Test:





RSE





The End