



Appendix for test report

1Appendix_A: Effective (Isotropic) Radiated Power Output Data

Part I - Test Results

Test Band	Test Mode	Test Channel	Measured[dBm]	ERP [dBm]	Limit [dBm]	Verdict
GSM850	GSM/TM1	LCH	32.95	30.32	38.5	PASS
		MCH	33.02	30.40	38.5	PASS
		HCH	33.06	30.51	38.5	PASS
	GSM/TM2	LCH	26.71	24.13	38.5	PASS
		MCH	26.73	23.99	38.5	PASS
		HCH	26.67	23.92	38.5	PASS
Test Band	Test Mode	Test Channel	Measured[dBm]	EIRP [dBm]	Limit [dBm]	Verdict
GSM1900	GSM/TM1	LCH	30.07	30.22	33	PASS
		MCH	30.02	30.26	33	PASS
		HCH	29.8	30.10	33	PASS
	GSM/TM2	LCH	25.9	26.06	33	PASS
		MCH	25.9	26.17	33	PASS
		HCH	25.93	26.23	33	PASS

Note1:

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

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

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

b, SGP = Signal Generator Level

Note2:

$$\text{SET Span} = 1.5 * \text{OBW}$$

$$\text{SET RBW} = 1\% \text{ of the OBW, not to exceed } 1\text{MHz}$$

$$\text{SET VBW} \geq 3 * \text{RBW}$$

SET Sweep time = auto - couple.

Detector: RMS

2Appendix_B: Peak-to-Average Ratio

Part I - Test Results

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
GSM850	GSM/TM1	LCH	0.15	13	PASS
		MCH	0.16	13	PASS
		HCH	0.14	13	PASS
	GSM/TM2	LCH	2.75	13	PASS
		MCH	2.7	13	PASS
		HCH	2.78	13	PASS
GSM1900	GSM/TM1	LCH	0.16	13	PASS
		MCH	0.14	13	PASS
		HCH	0.14	13	PASS
	GSM/TM2	LCH	3.26	13	PASS
		MCH	3.29	13	PASS
		HCH	3.12	13	PASS

3Appendix_C: Modulation Characteristics

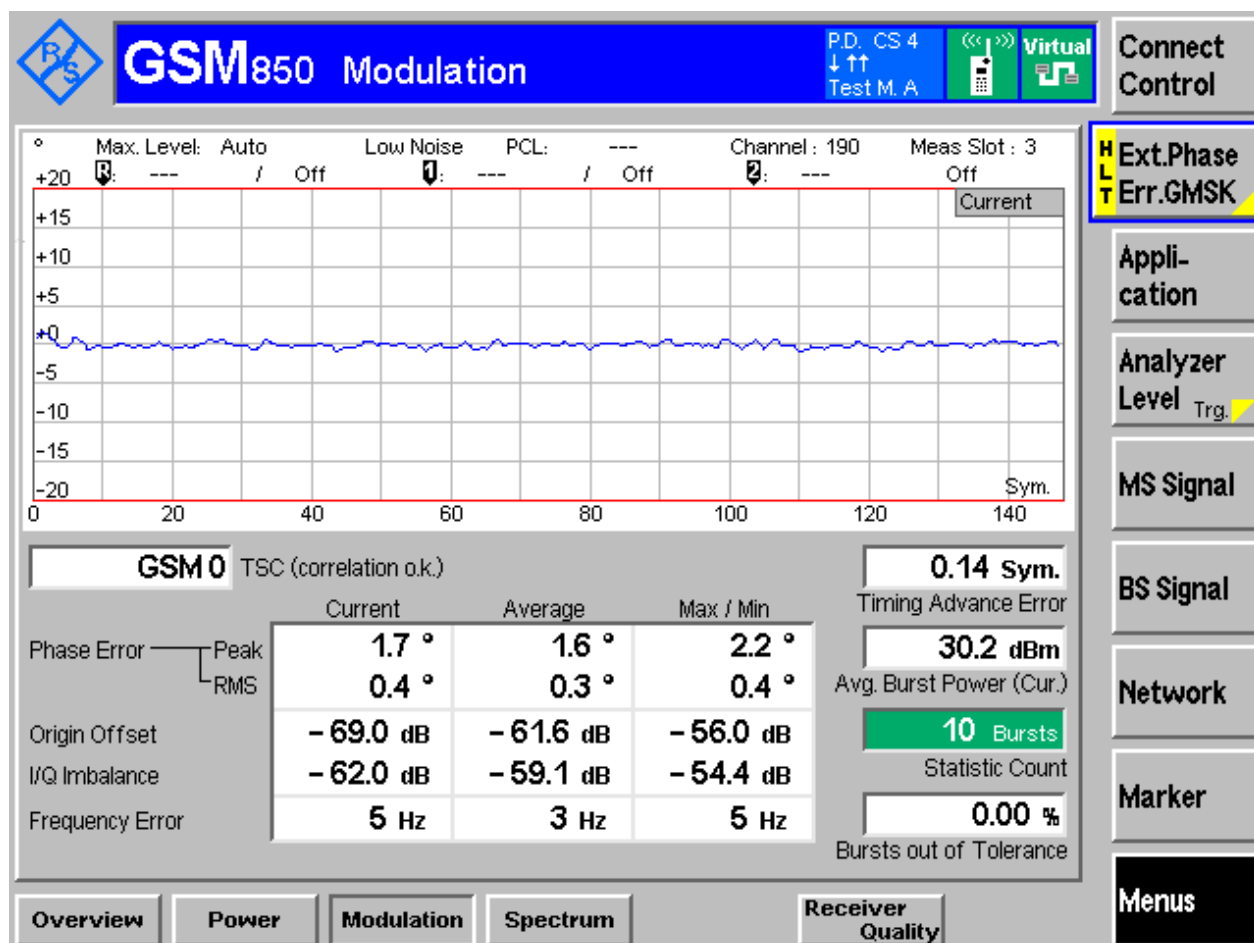
Part I - Test Plots

3.1 For GSM

3.1.1 Test Band = GSM850

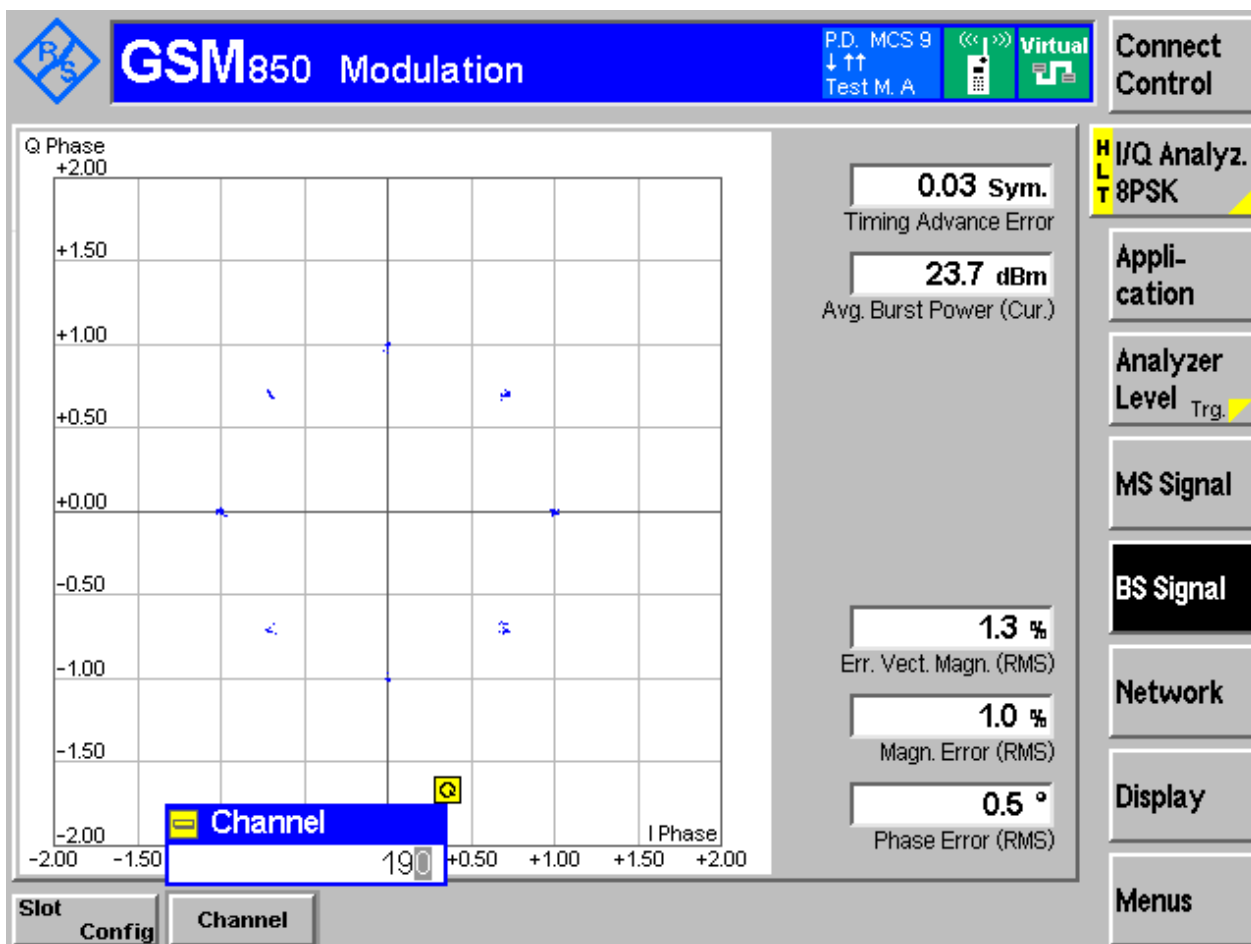
3.1.1.1 Test Mode = GSM/TM1

3.1.1.1.1 Test Channel = MCH



3.1.1.2 Test Mode = GSM/TM2

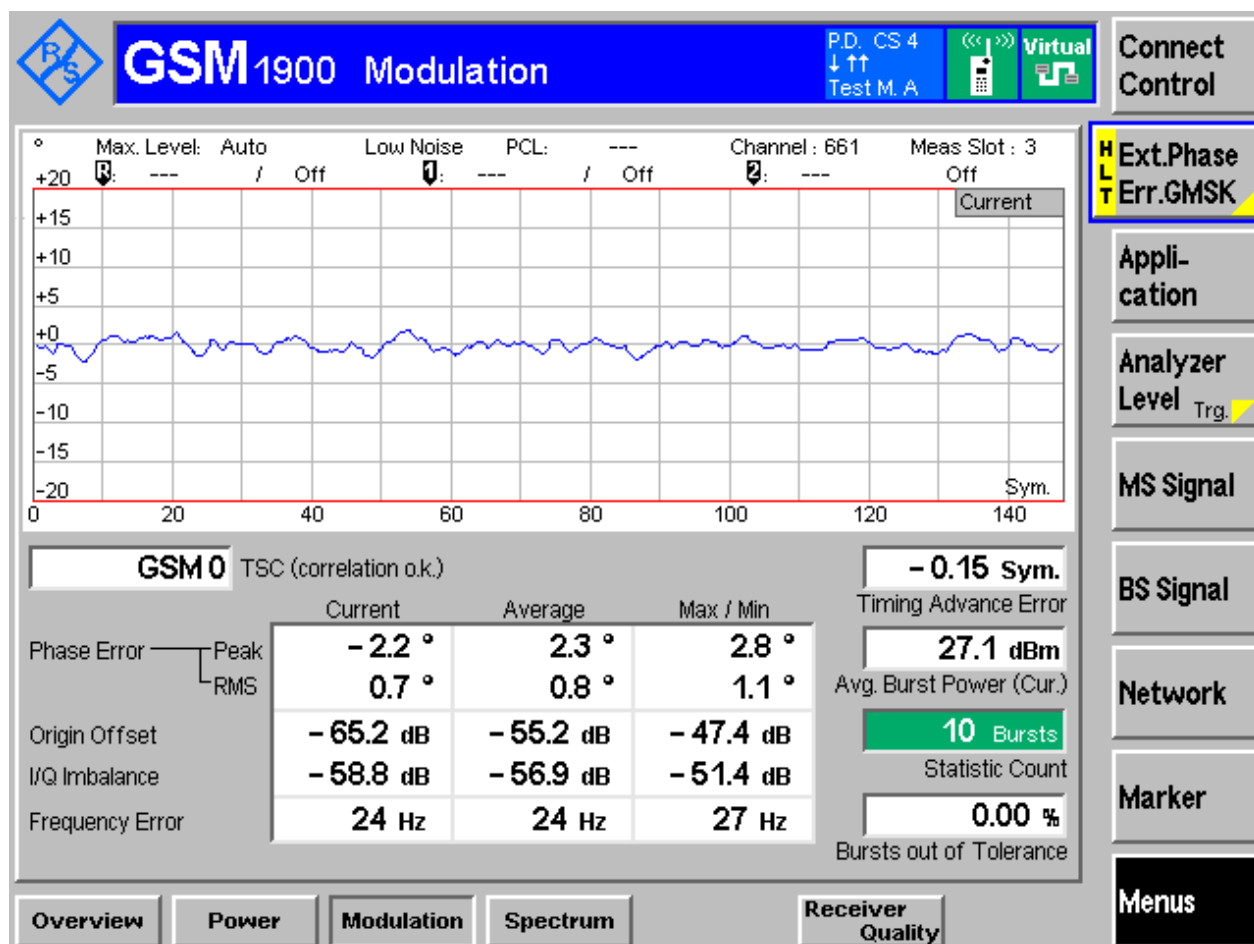
3.1.1.2.1 Test Channel = MCH



3.1.2 Test Band = GSM1900

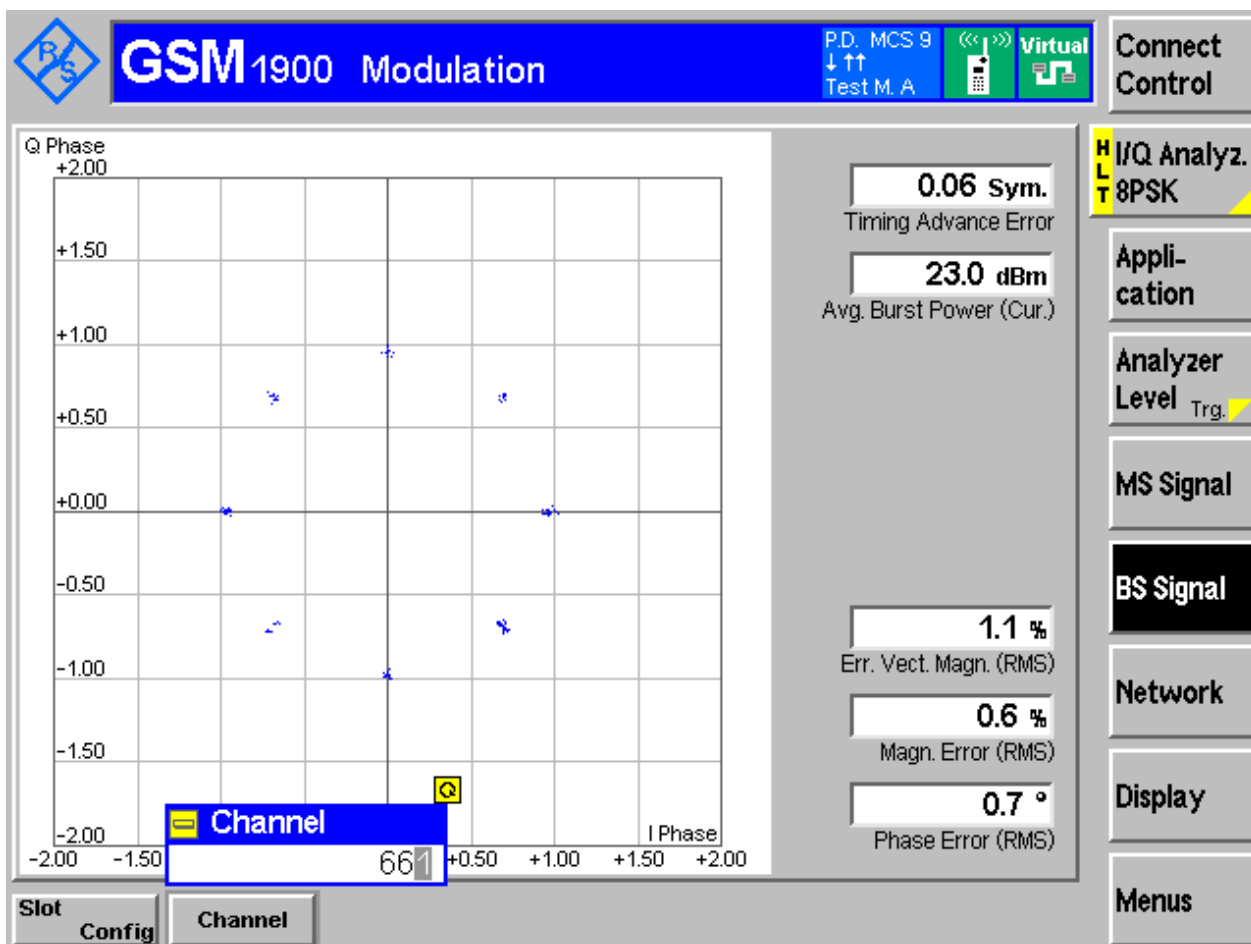
3.1.2.1 Test Mode = GSM/TM1

3.1.2.1.1 Test Channel = MCH



3.1.2.2 Test Mode = GSM/TM2

3.1.2.2.1 Test Channel = MCH



4Appendix_D: Bandwidth

Part I - Test Results

Test Band	Test Mode	Test Channel	Occupied Bandwidth [kHz]	Emission Bandwidth [kHz]	Verdict
GSM850	GSM/TM1	LCH	244.46	314.96	Pass
		MCH	247.94	321.36	Pass
		HCH	243.74	317.90	Pass
	GSM/TM2	LCH	246.18	321.42	Pass
		MCH	247.06	321.25	Pass
		HCH	251.54	325.12	Pass
GSM1900	GSM/TM1	LCH	243.46	315.75	Pass
		MCH	245.09	316.57	Pass
		HCH	244.15	319.86	Pass
	GSM/TM2	LCH	244.46	316.4	Pass
		MCH	247.44	309.4	Pass
		HCH	245.69	309.9	Pass

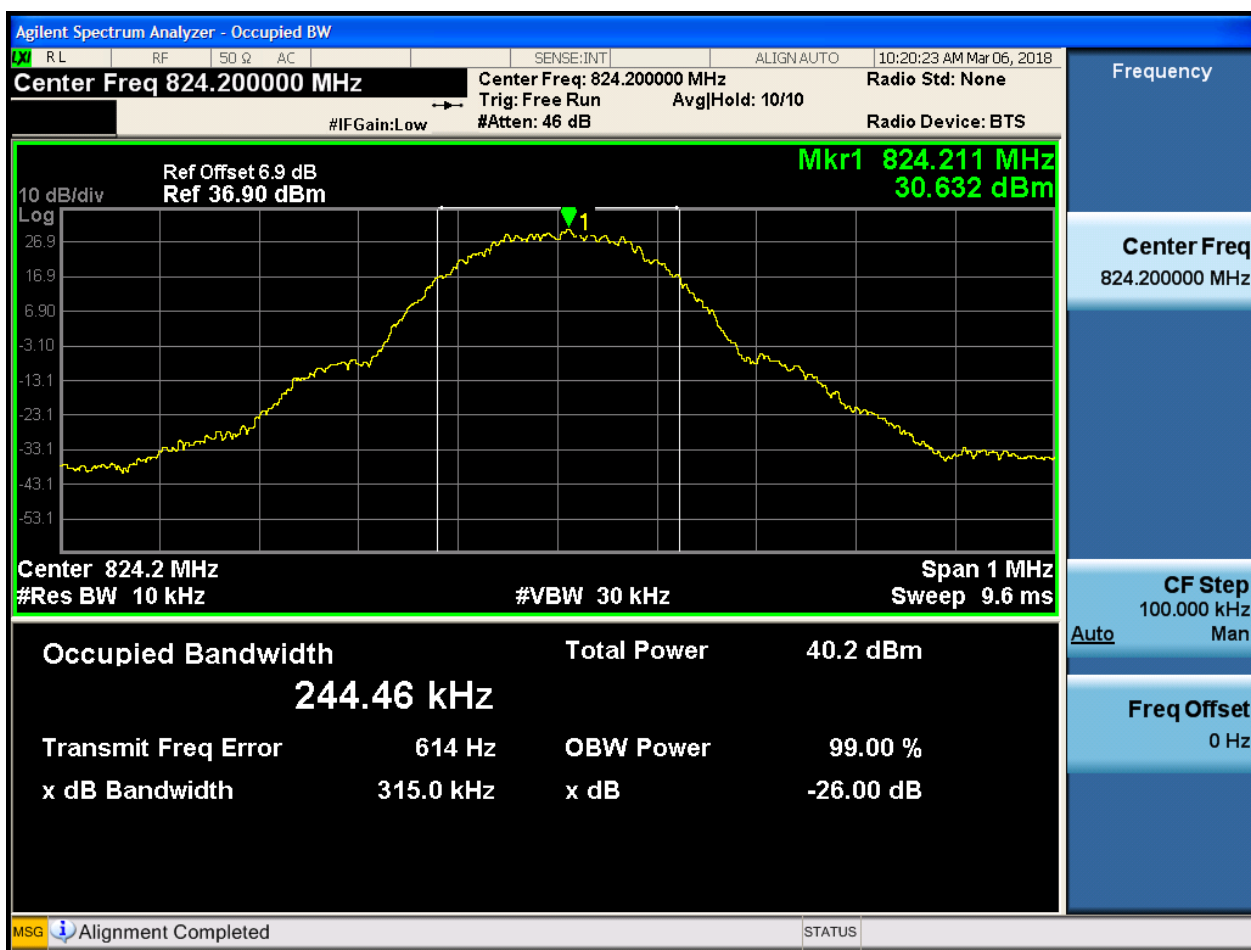
Part II - Test Plots

4.1 For GSM

4.1.1 Test Band = GSM850

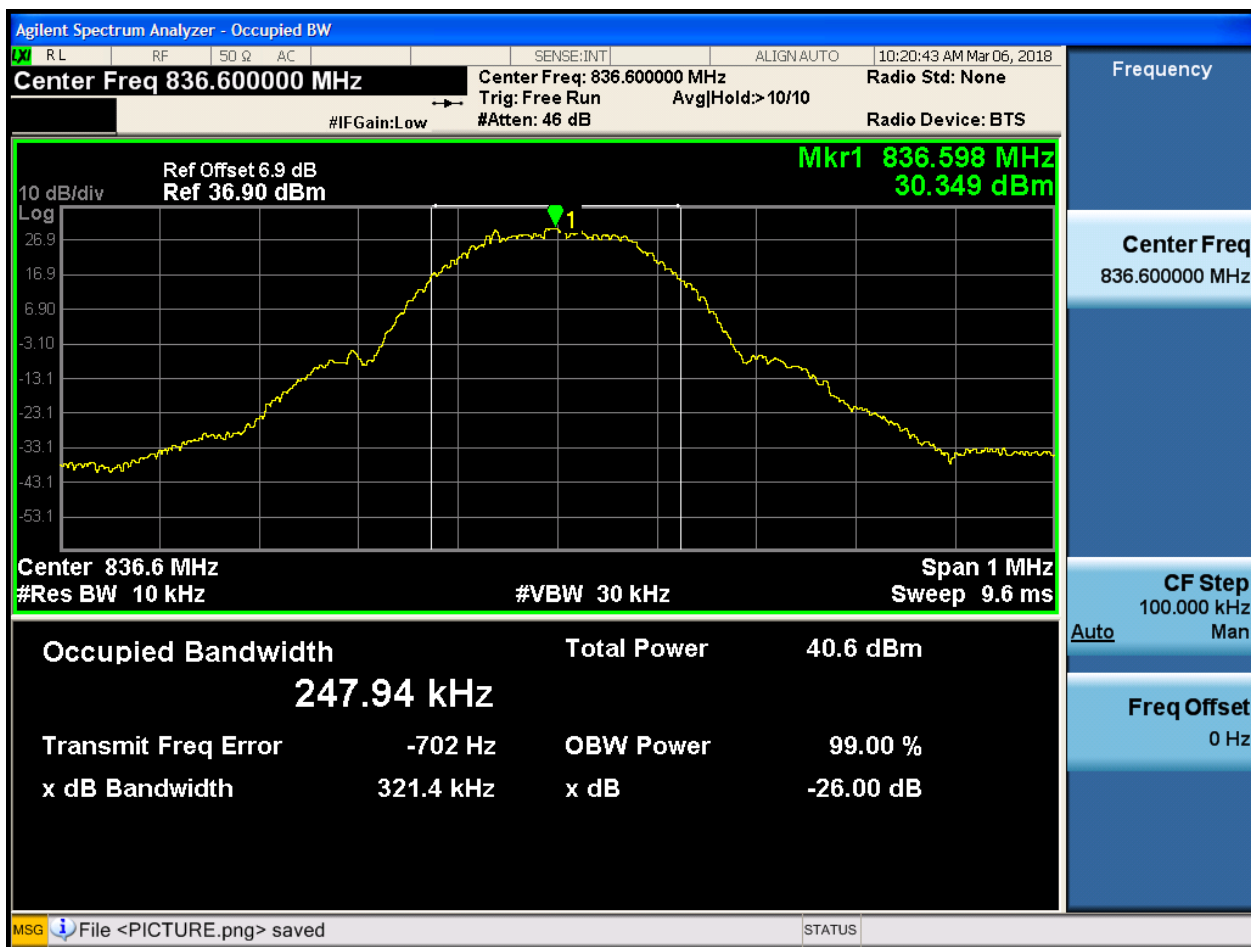
4.1.1.1 Test Mode = GSM/TM1

4.1.1.1.1 Test Channel = LCH





4.1.1.1.2 Test Channel = MCH





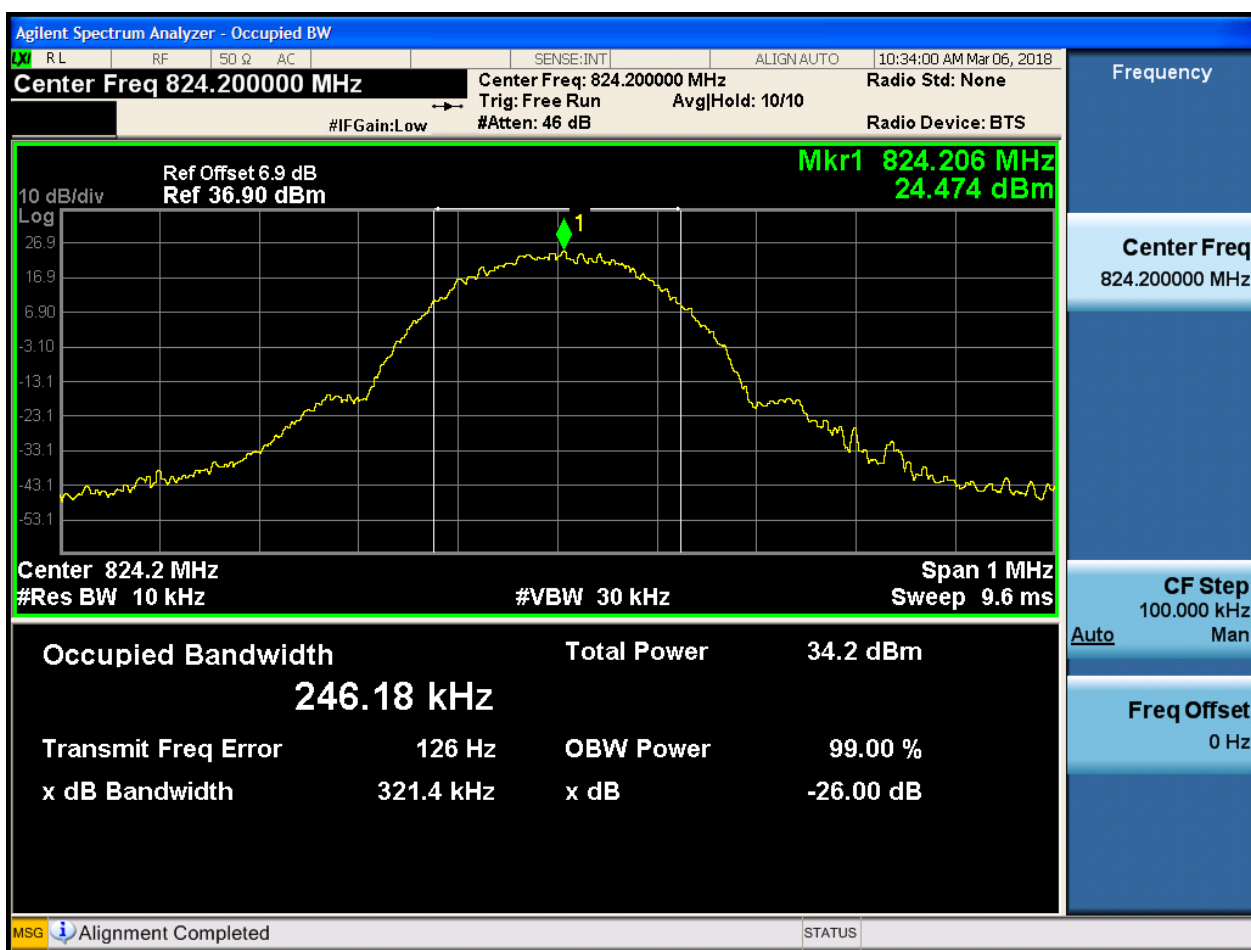
4.1.1.1.3 Test Channel = HCH





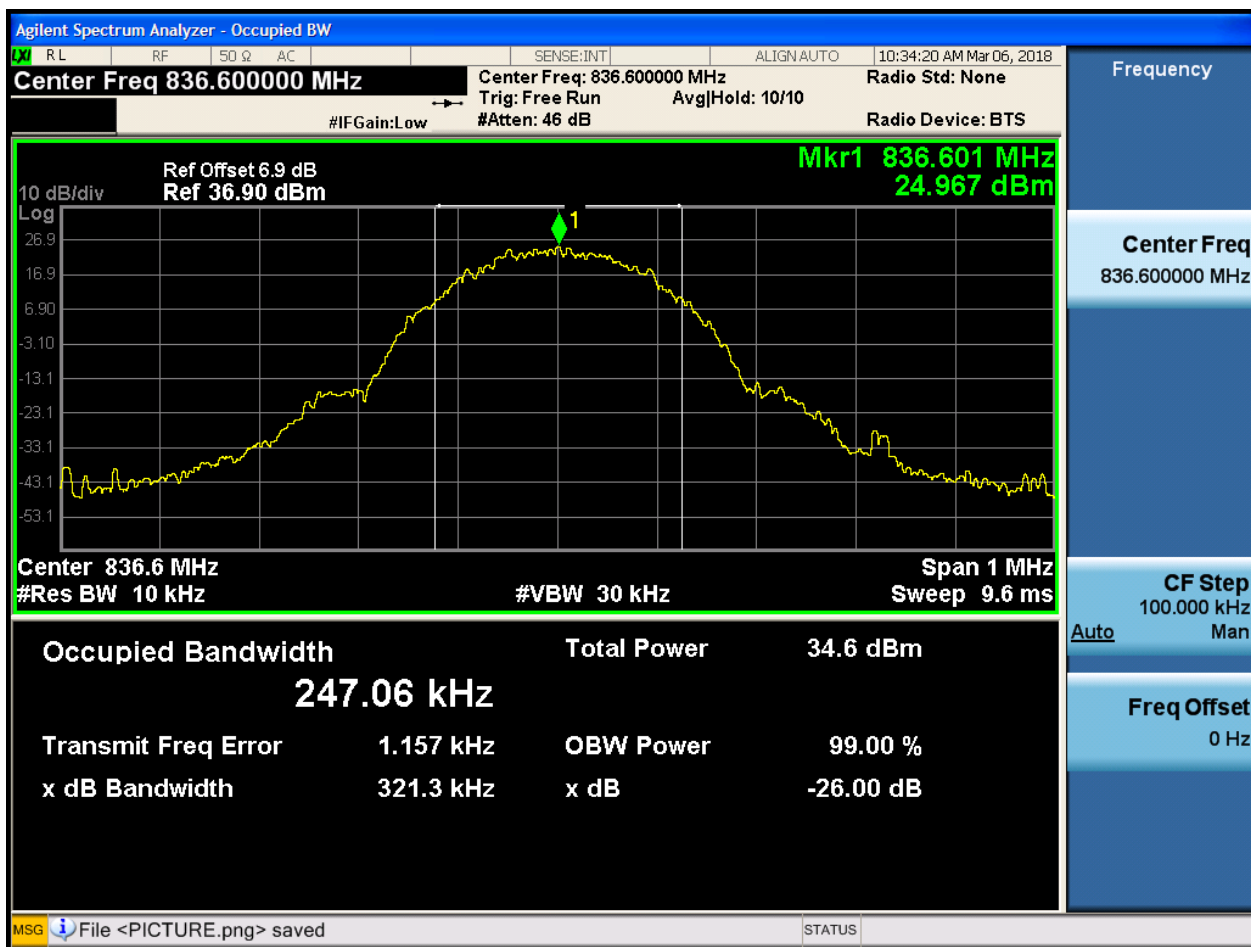
4.1.1.2 Test Mode = GSM/TM2

4.1.1.2.1 Test Channel = LCH



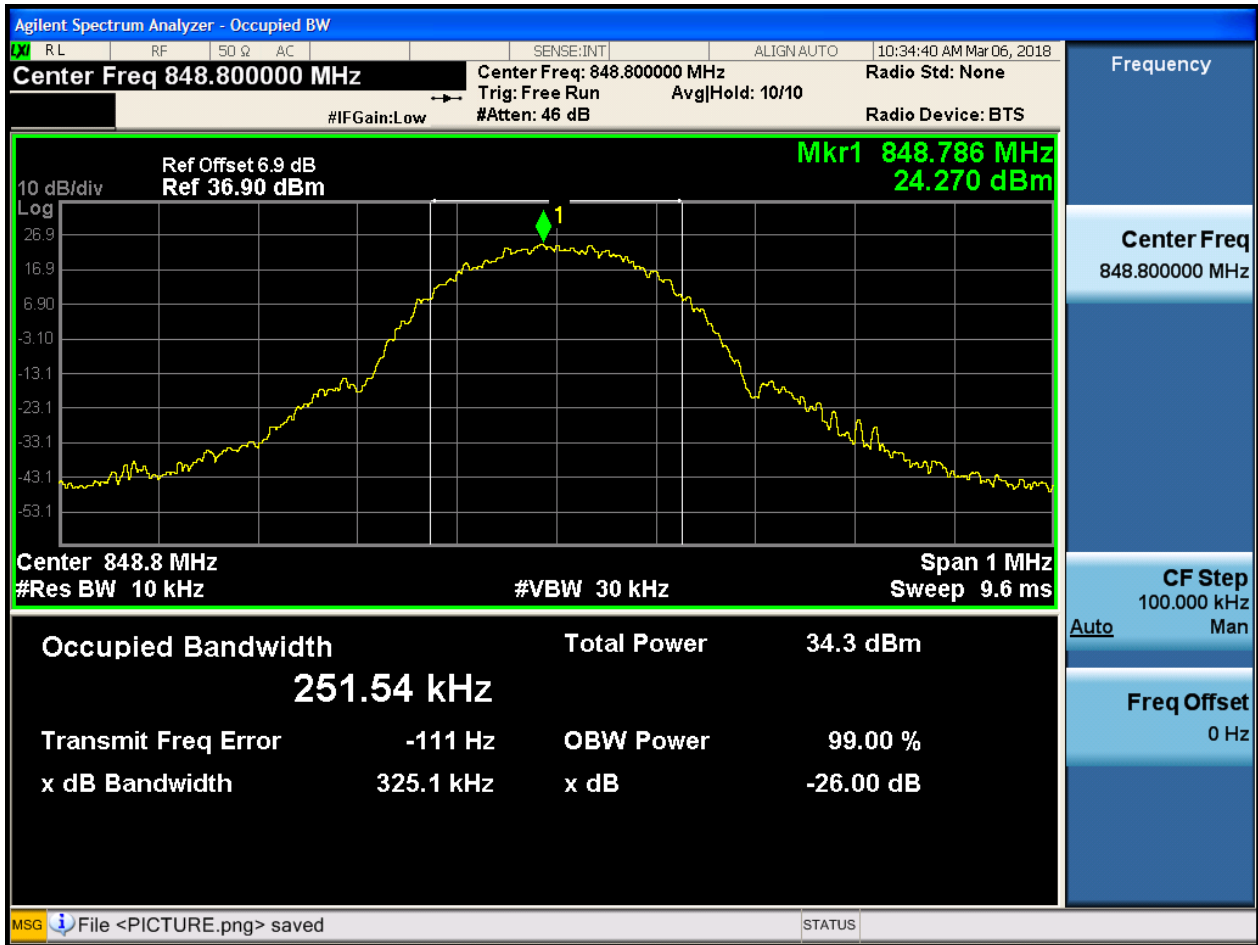


4.1.1.2.2 Test Channel = MCH





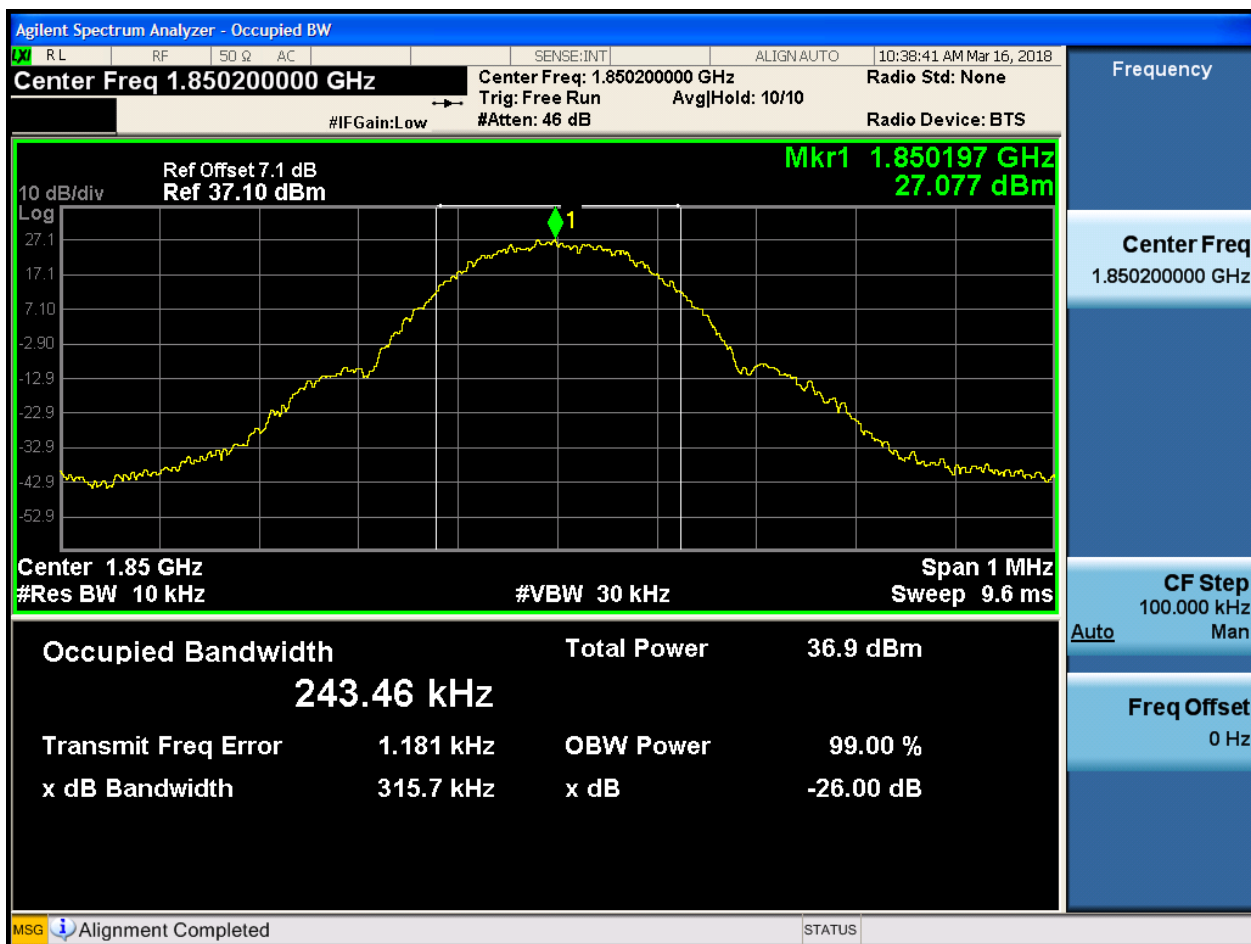
4.1.1.2.3 Test Channel = HCH



4.1.2 Test Band = GSM1900

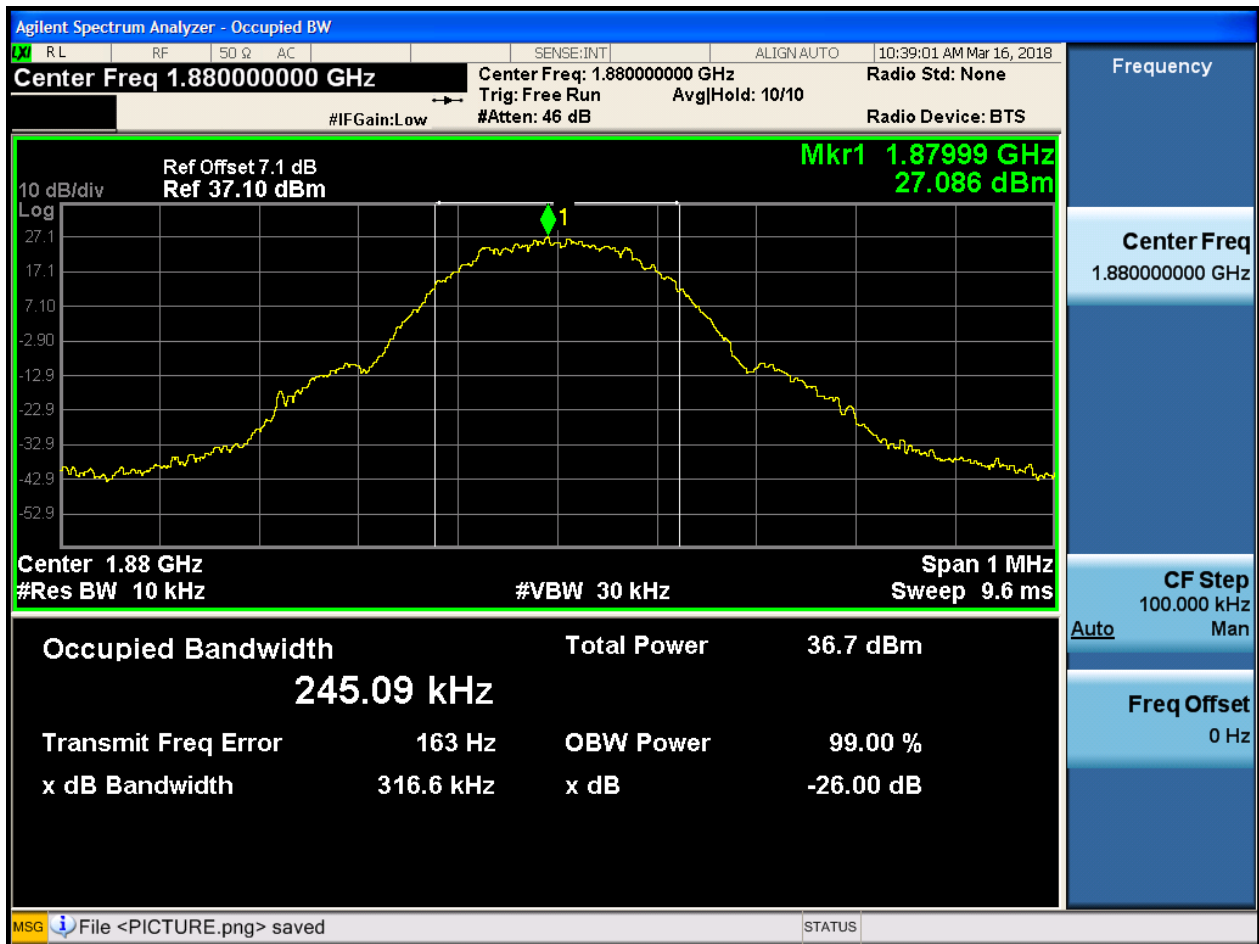
4.1.2.1 Test Mode = GSM/TM1

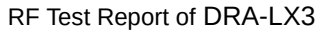
4.1.2.1.1 Test Channel = LCH





4.1.2.1.2 Test Channel = MCH





Agilent Spectrum Analyzer - Occupied BW

RL RF 50 Ω AC SENSE:INT ALIGN:AUTO 10:39:21 AM Mar 16, 2018

Center Freq 1.909800000 GHz Center Freq: 1.909800000 GHz Radio Std: None
 Trig: Free Run AvgJHold: 10/10
 #IFGain:Low #Atten: 46 dB Radio Device: BTS

10 dB/div Ref Offset 7.1 dB Mkr1 1.909809 GHz
 Log Ref 37.10 dBm 26.650 dBm

Center 1.91 GHz Span 1 MHz
 #Res BW 10 kHz #VBW 30 kHz Sweep 9.6 ms

Occupied Bandwidth		Total Power	
244.15 kHz		36.7 dBm	
Transmit Freq Error	-66 Hz	OBW Power	99.00 %
x dB Bandwidth	319.9 kHz	x dB	-26.00 dB

MSG File <PICTURE.png> saved STATUS

Frequency

Center Freq
1.909800000 GHz

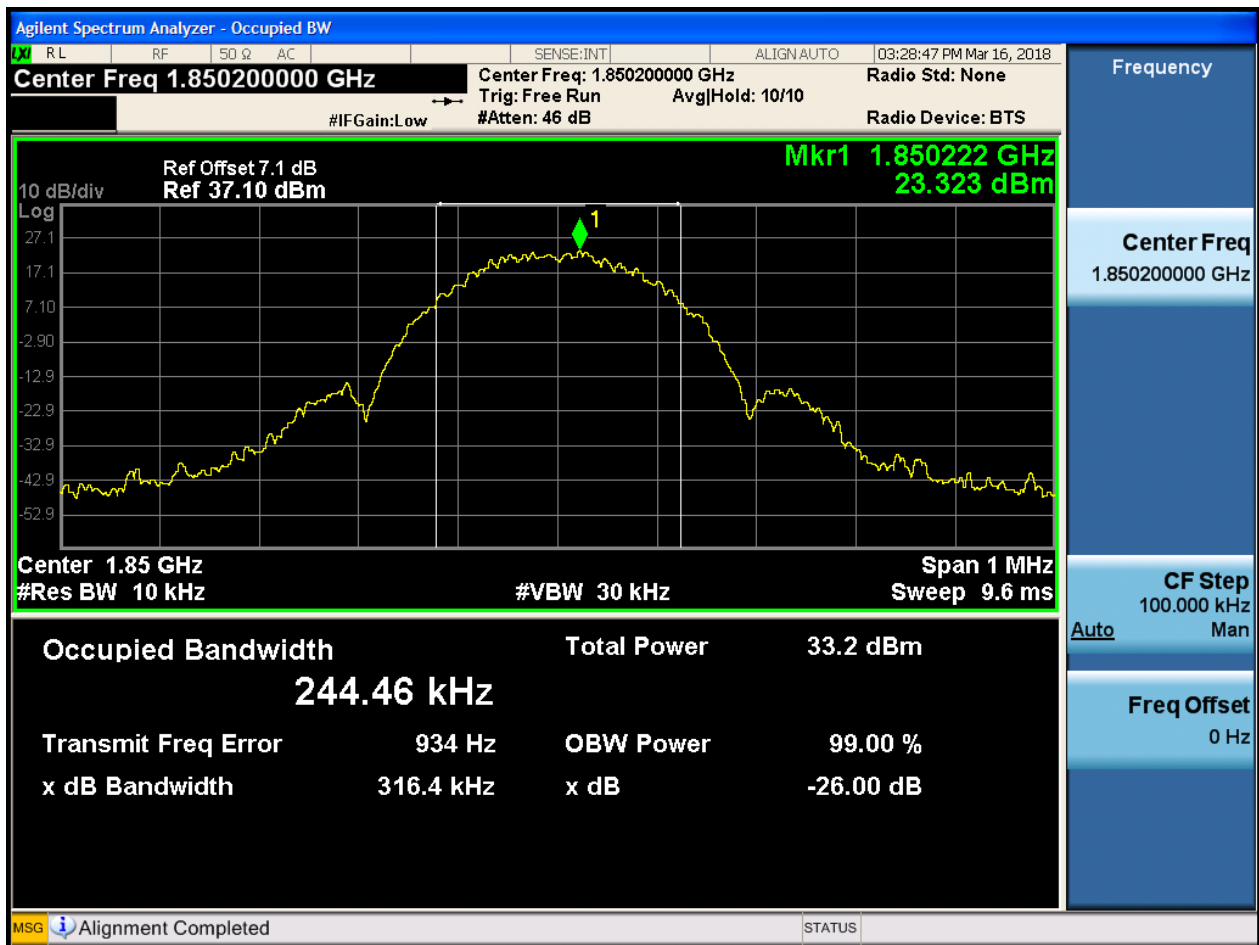
CF Step
100.000 kHz
Auto Man

Freq Offset
0 Hz



4.1.2.2 Test Mode = GSM/TM2

4.1.2.2.1 Test Channel = LCH



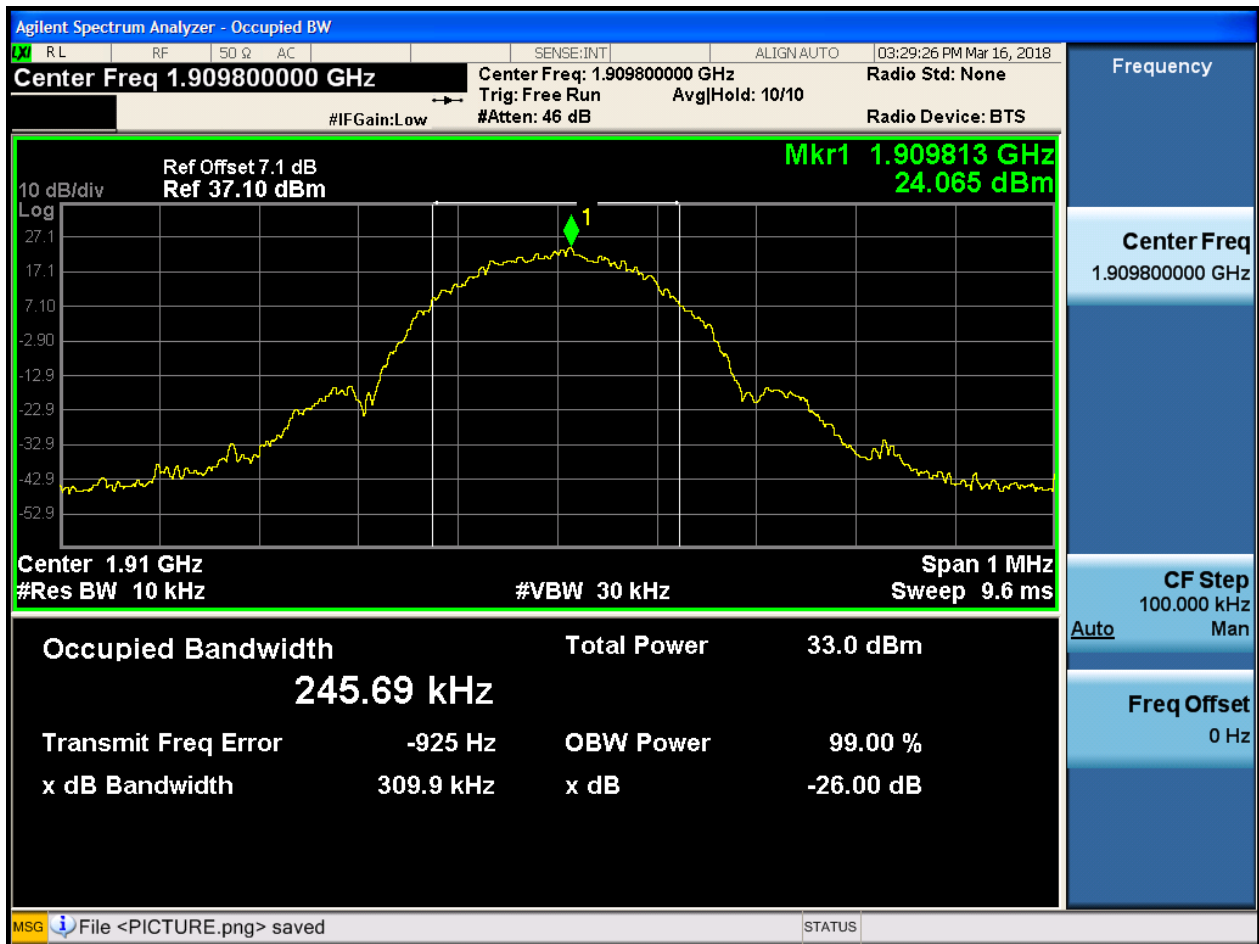


4.1.2.2.2 Test Channel = MCH





4.1.2.2.3 Test Channel = HCH



5Appendix_E: Band Edges Compliance

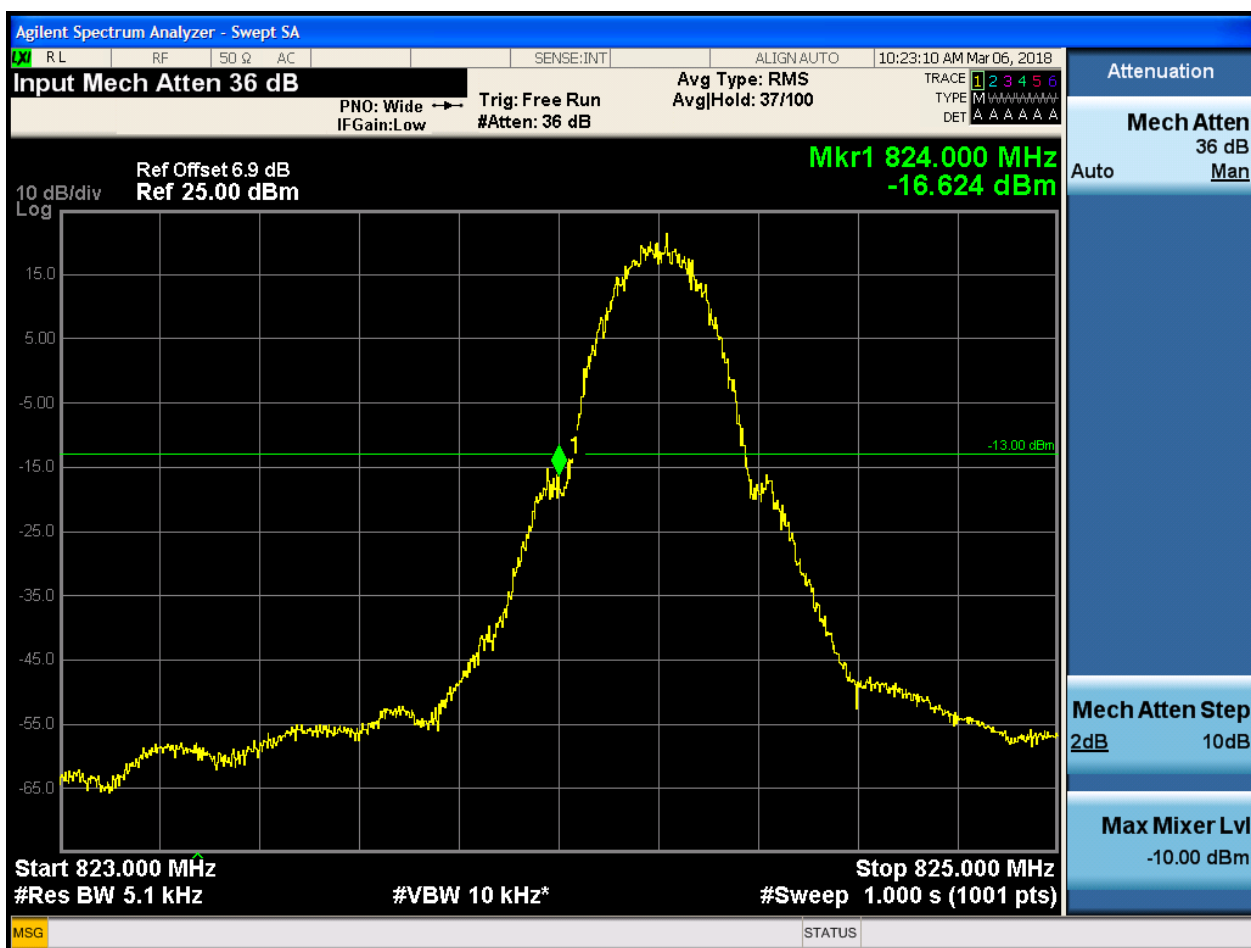
Part I - Test Plots

5.1 For GSM

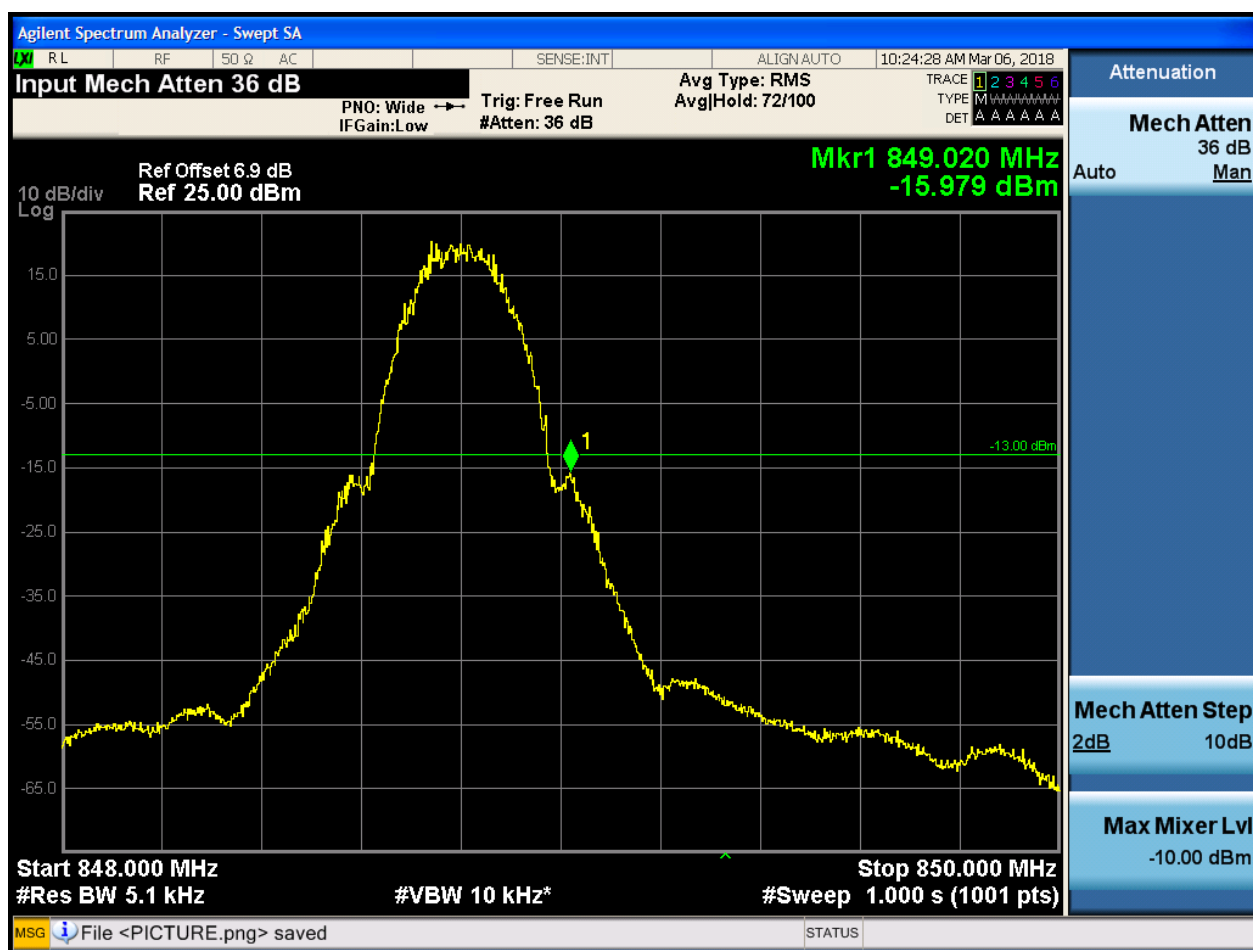
5.1.1 Test Band = GSM850

5.1.1.1 Test Mode = GSM/TM1

5.1.1.1.1 Test Channel = LCH

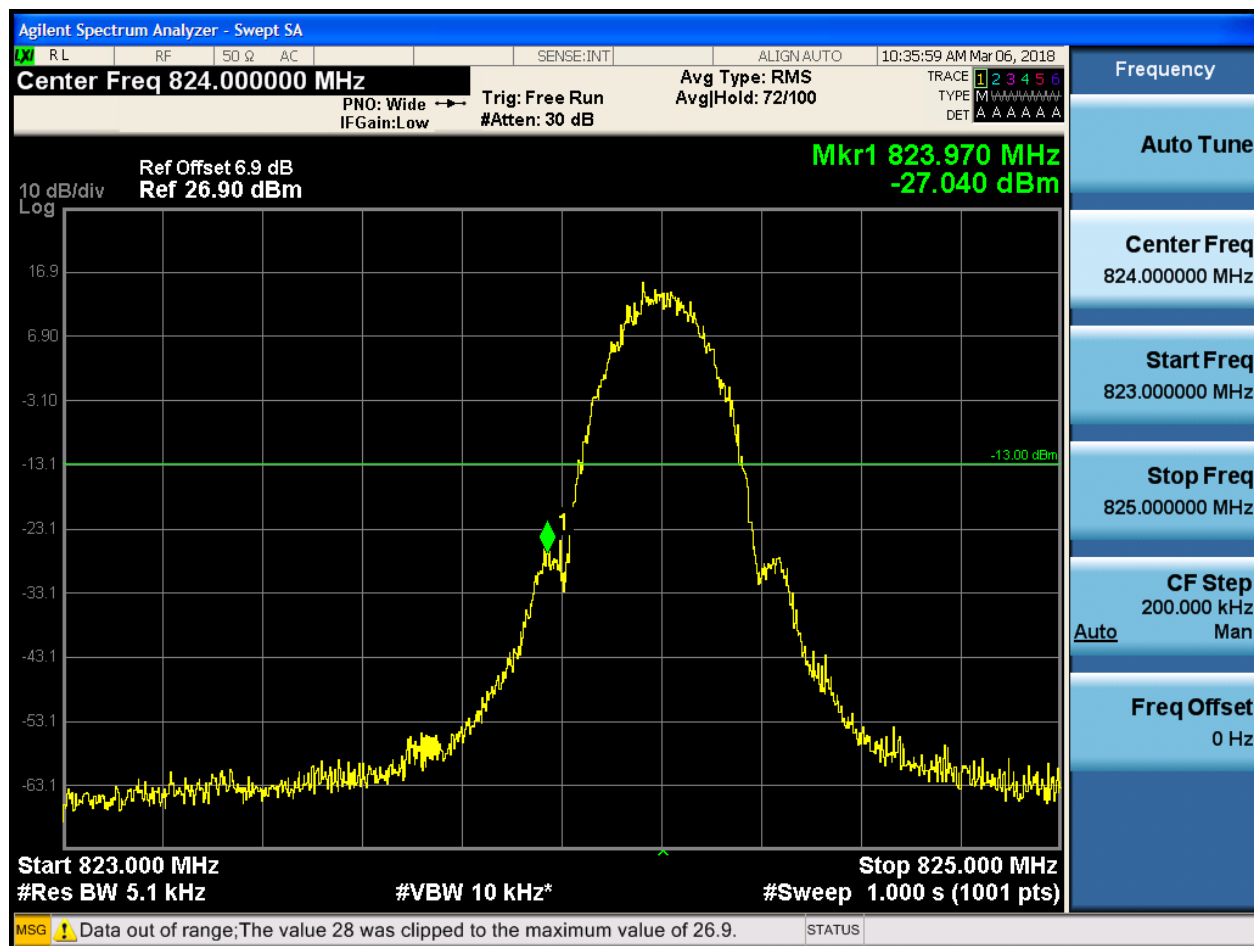


5.1.1.1.2 Test Channel = HCH

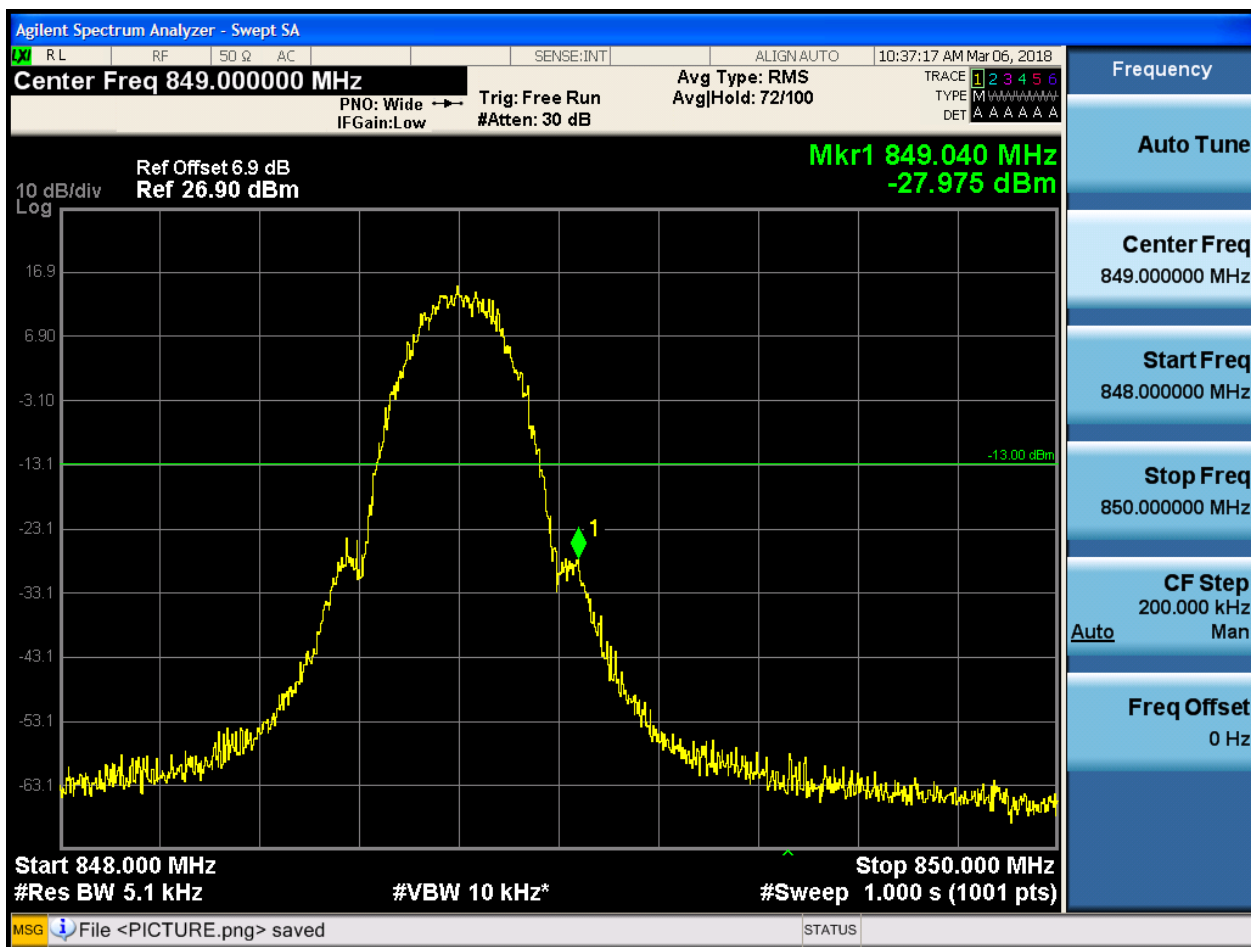


5.1.1.2 Test Mode = GSM/TM2

5.1.1.2.1 Test Channel = LCH



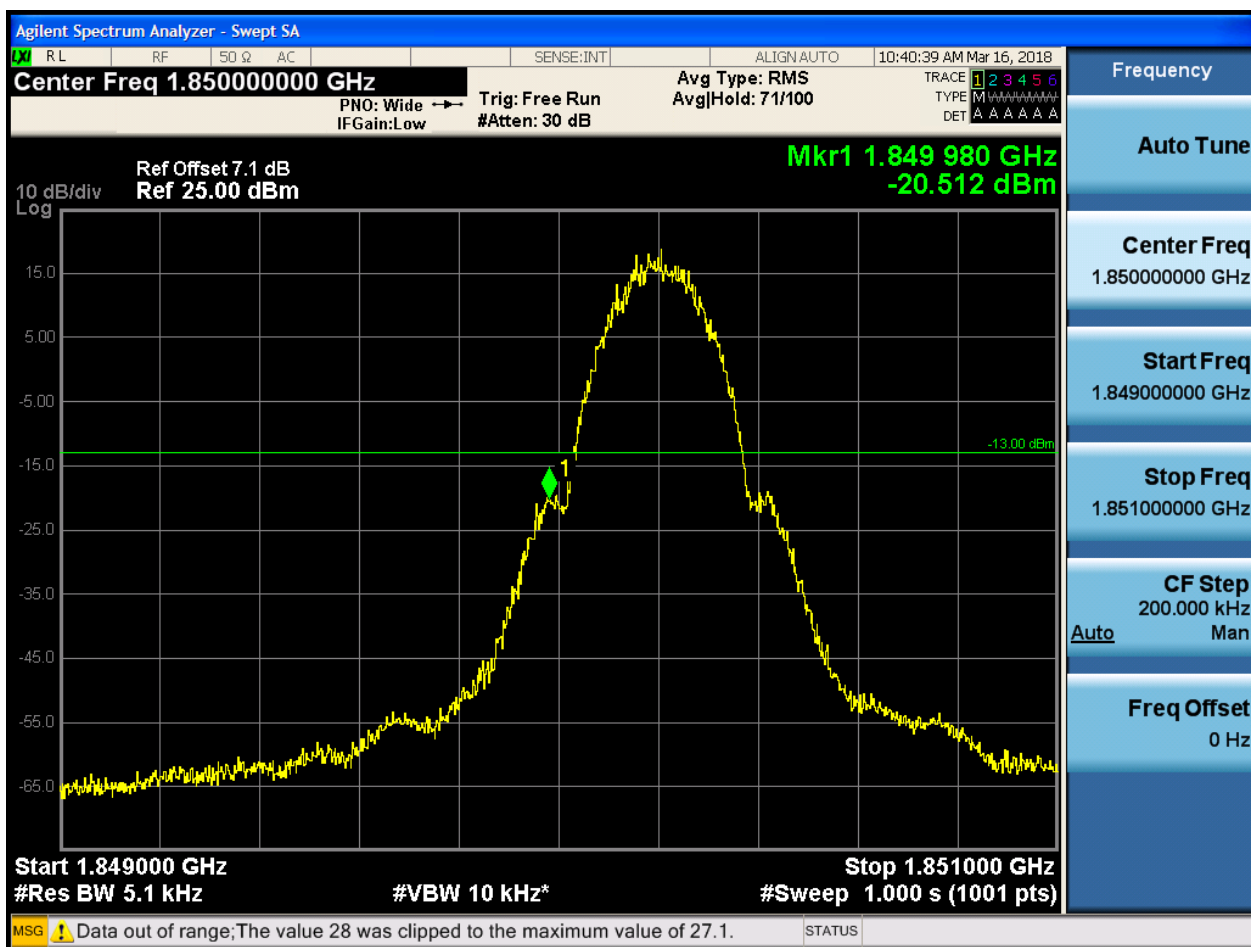
5.1.1.2.2 Test Channel = HCH



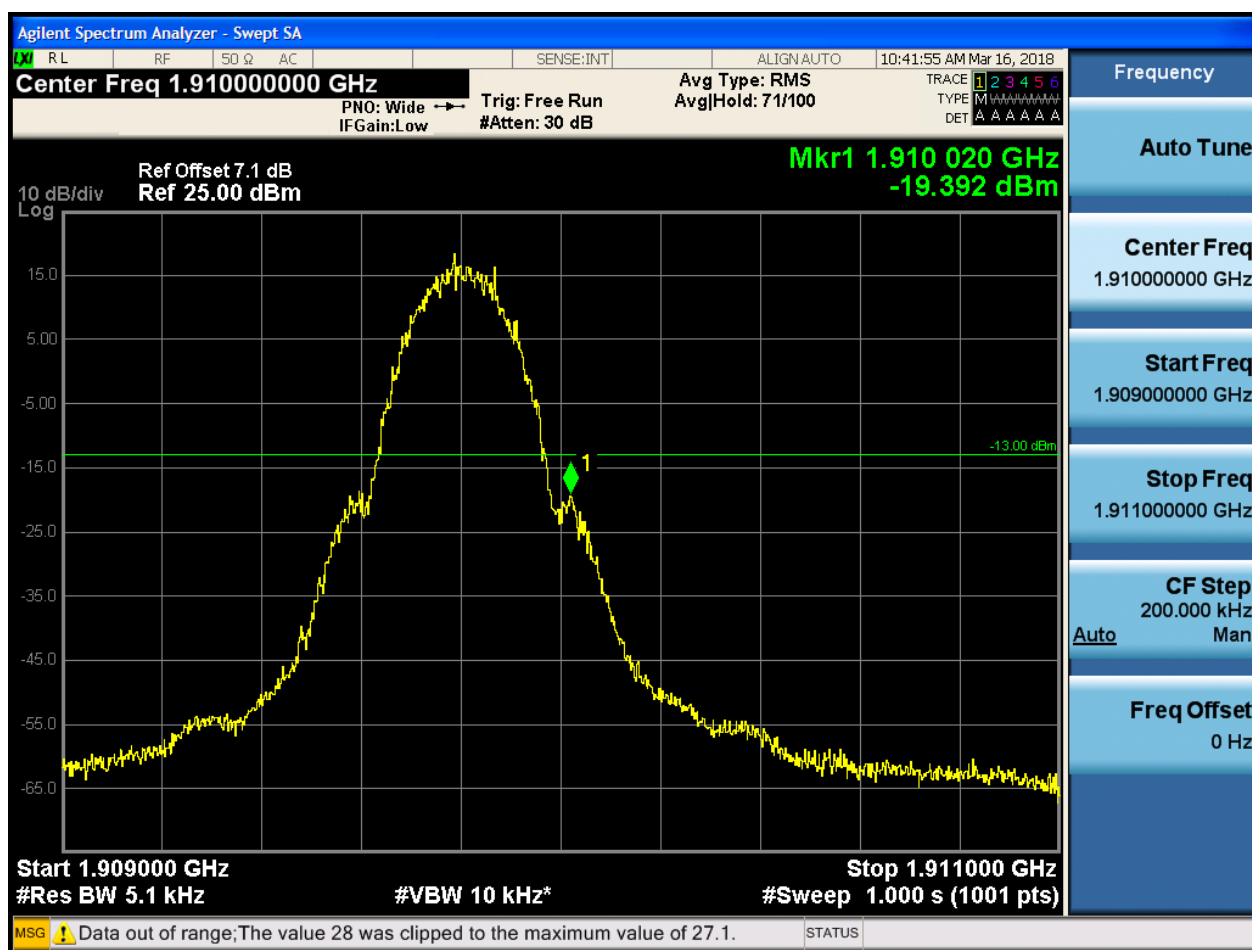
5.1.2 Test Band = GSM1900

5.1.2.1 Test Mode = GSM/TM1

5.1.2.1.1 Test Channel = LCH

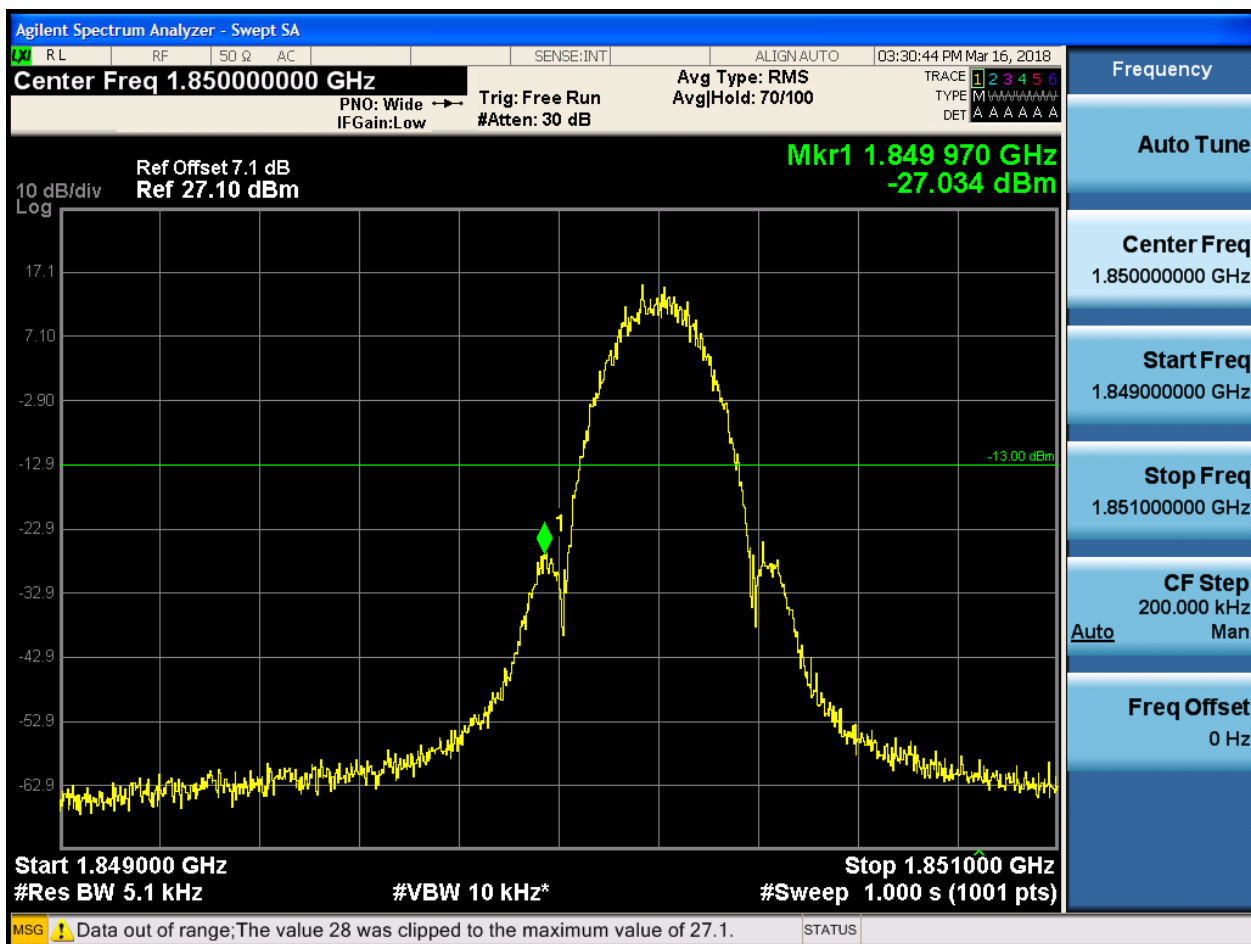


5.1.2.1.2 Test Channel = HCH

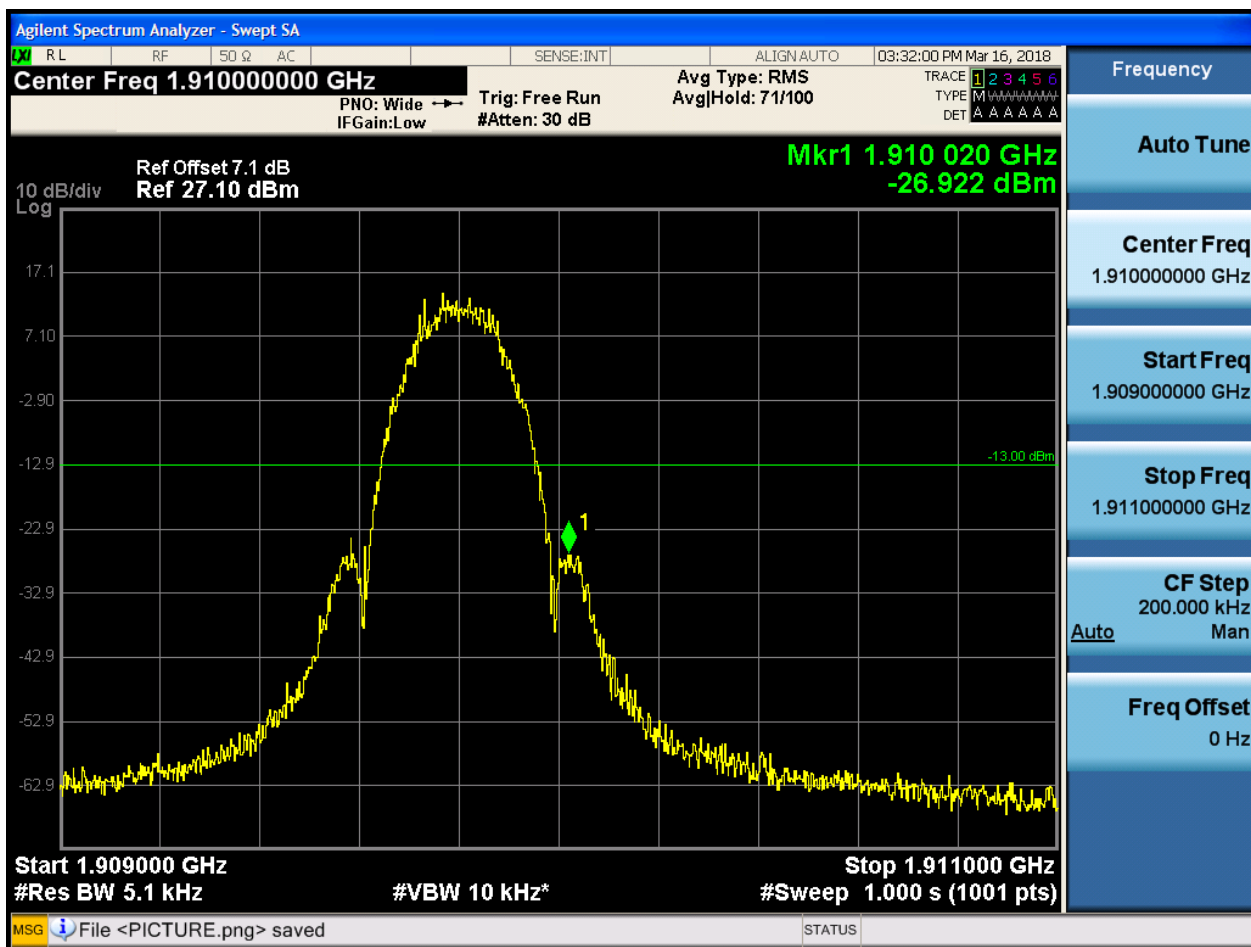


5.1.2.2 Test Mode = GSM/TM2

5.1.2.2.1 Test Channel = LCH



5.1.2.2.2 Test Channel = HCH



6Appendix_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.

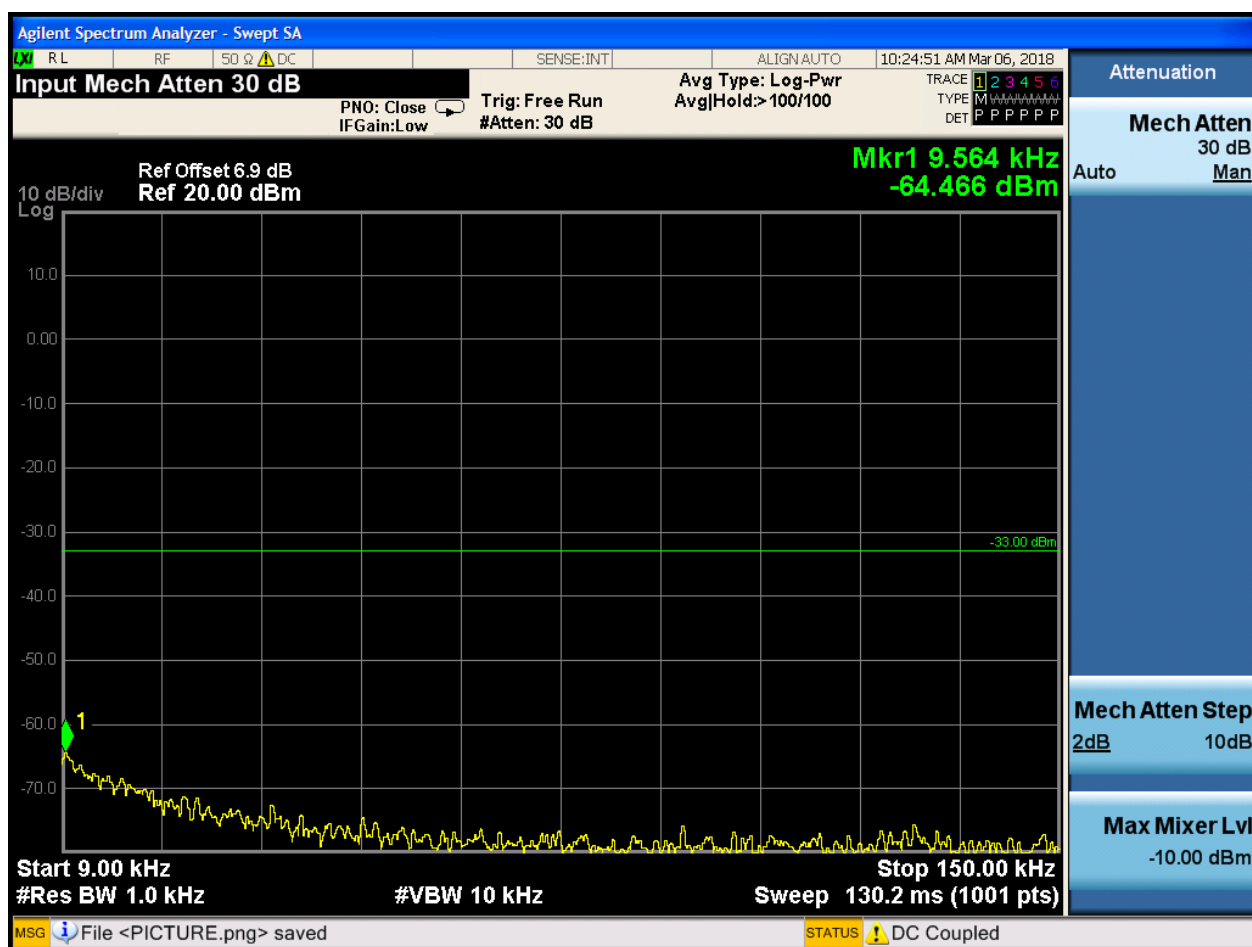
Part I - Test Plots

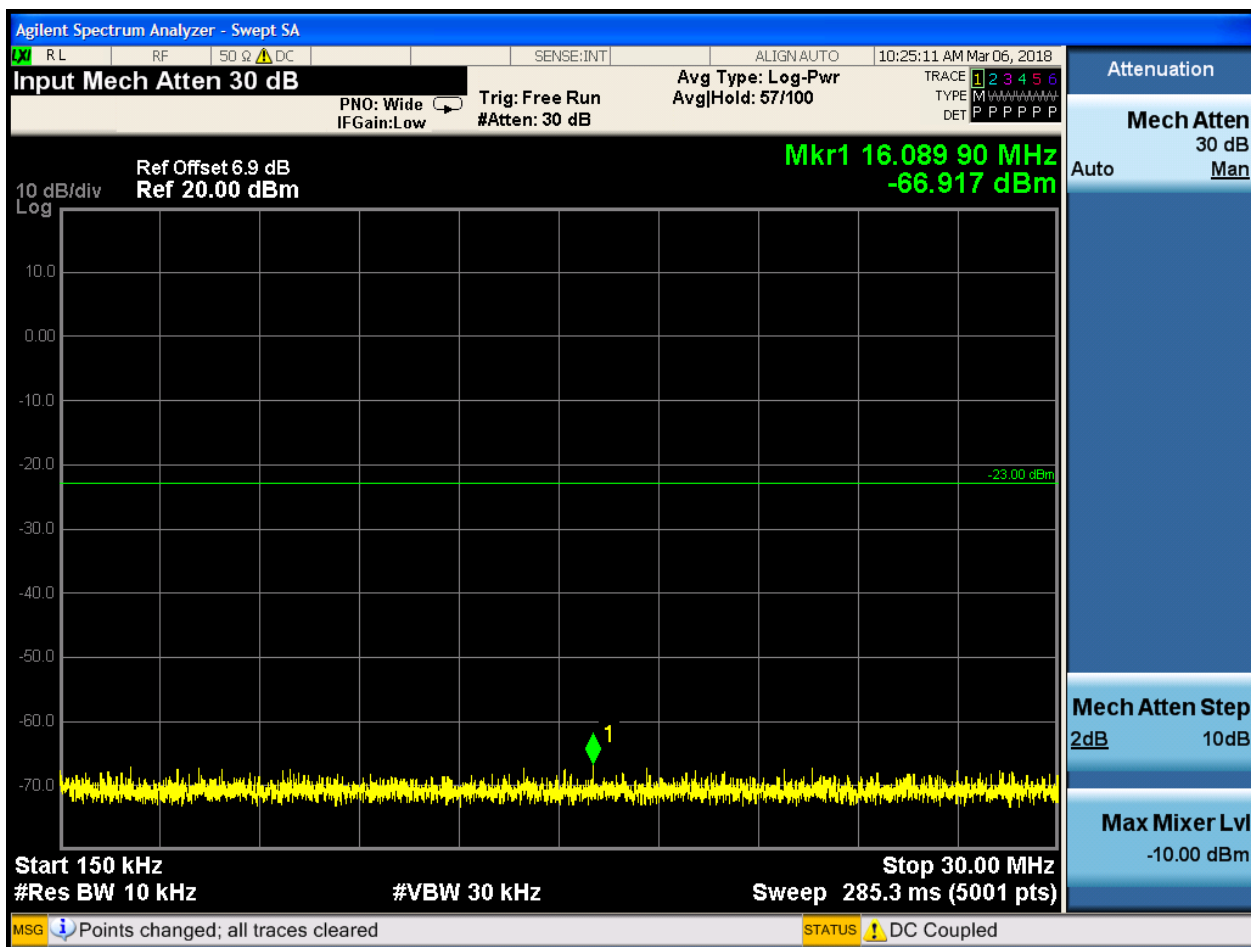
6.1 For GSM

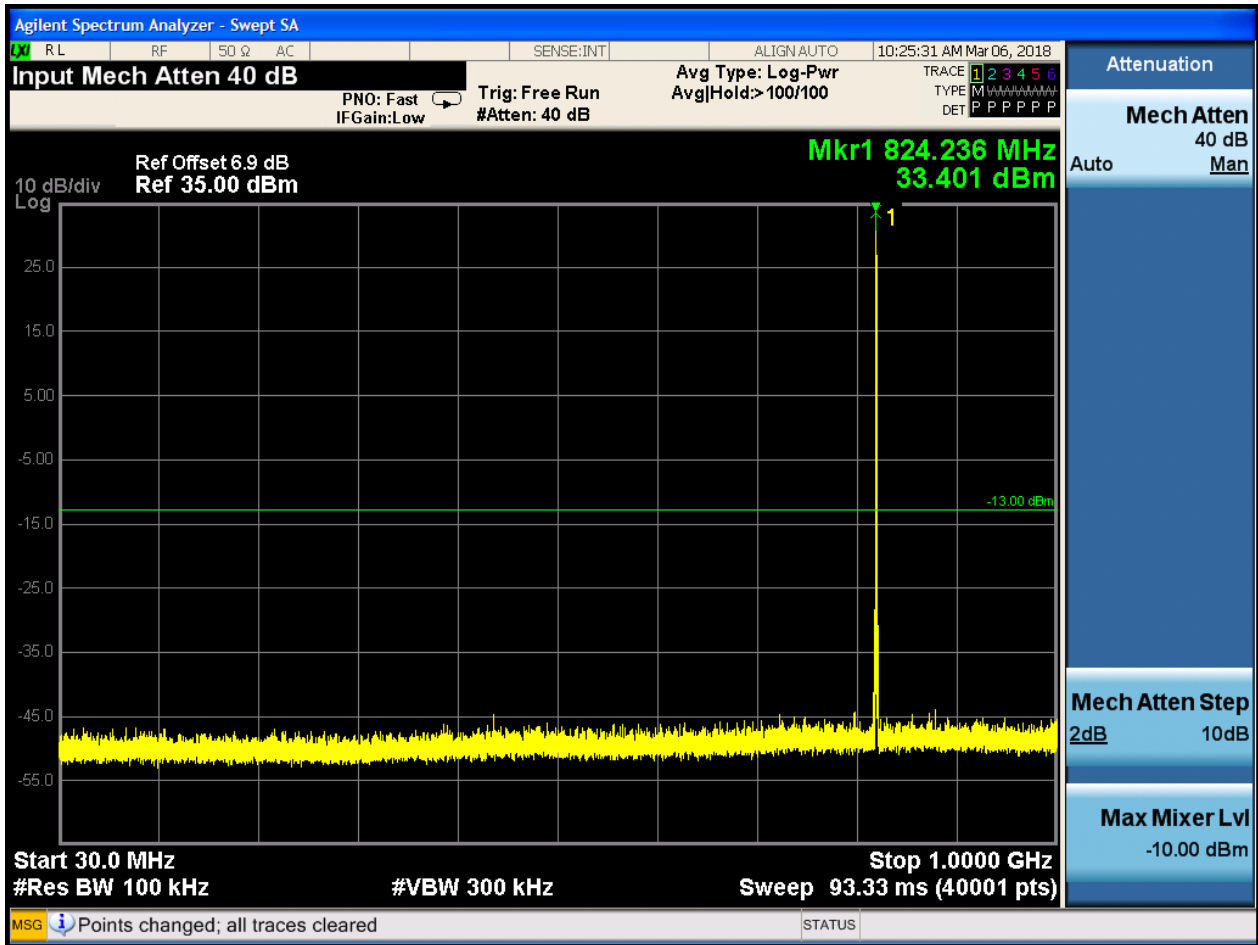
6.1.1 Test Band = GSM850

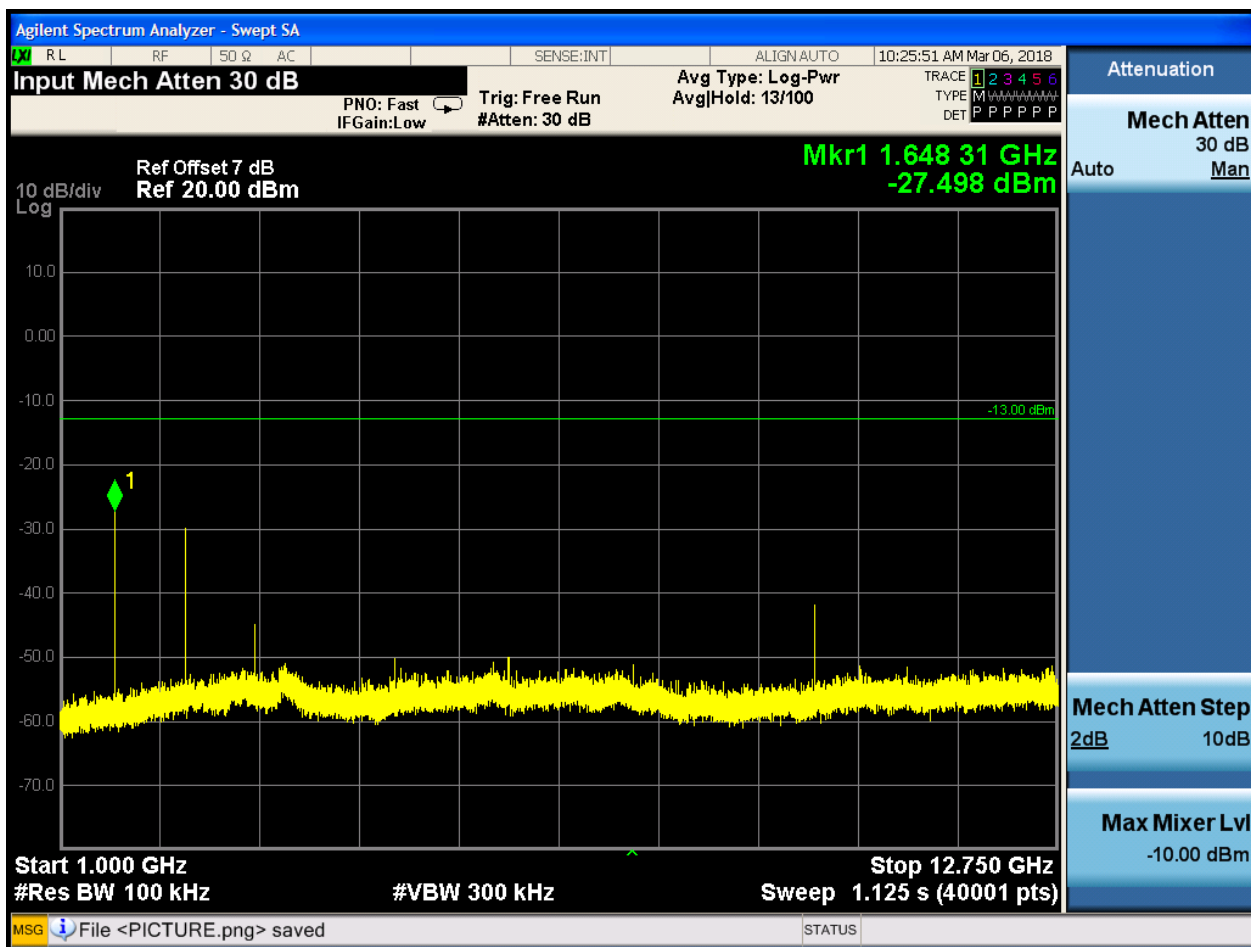
6.1.1.1 Test Mode = GSM/TM1

6.1.1.1.1 Test Channel = LCH

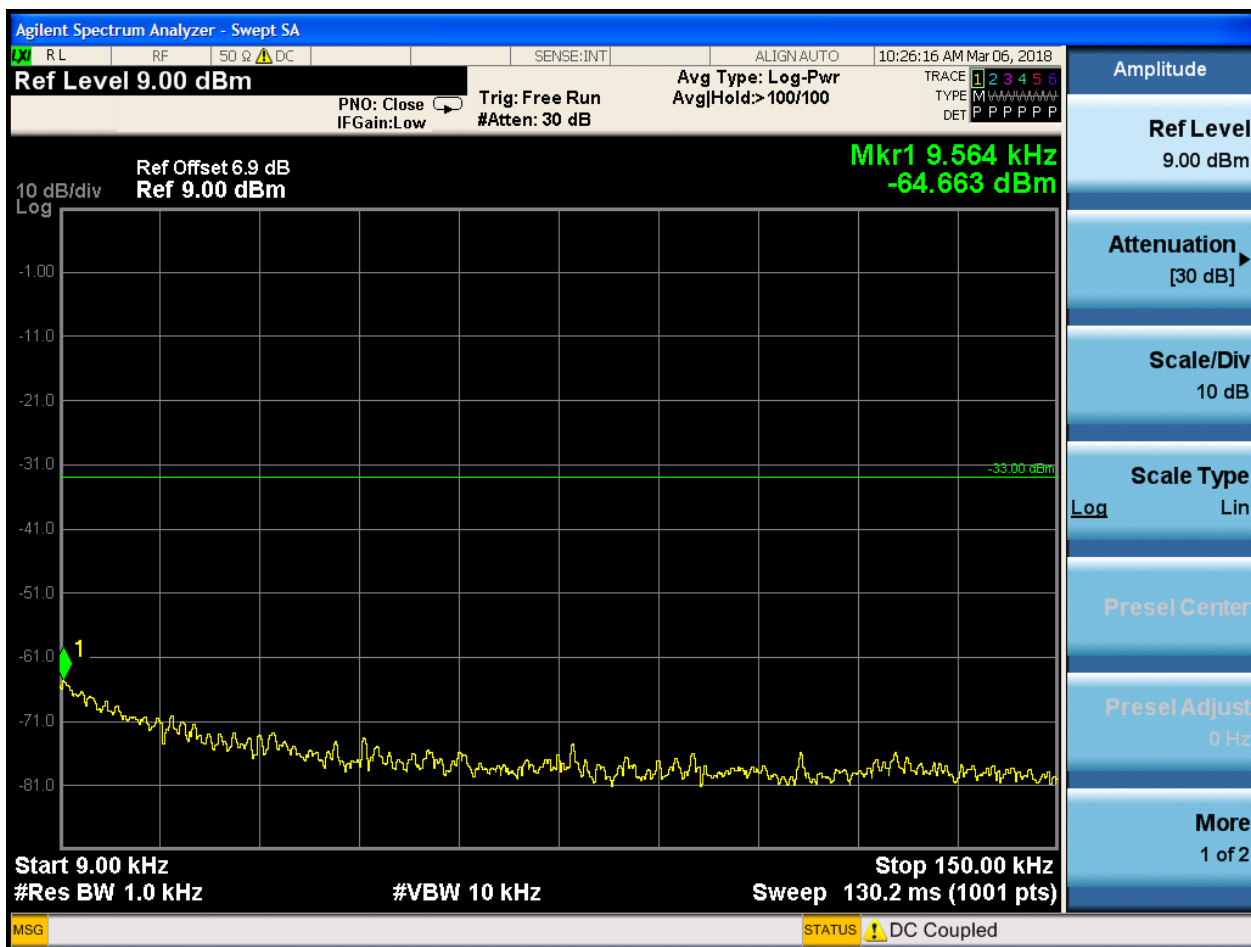


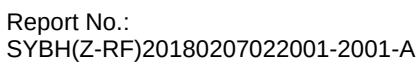
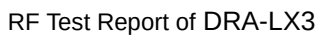


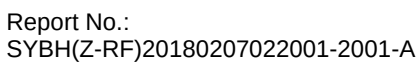
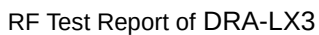


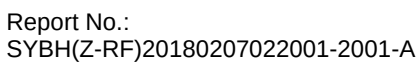
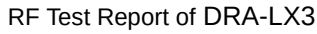


6.1.1.1.2 Test Channel = MCH



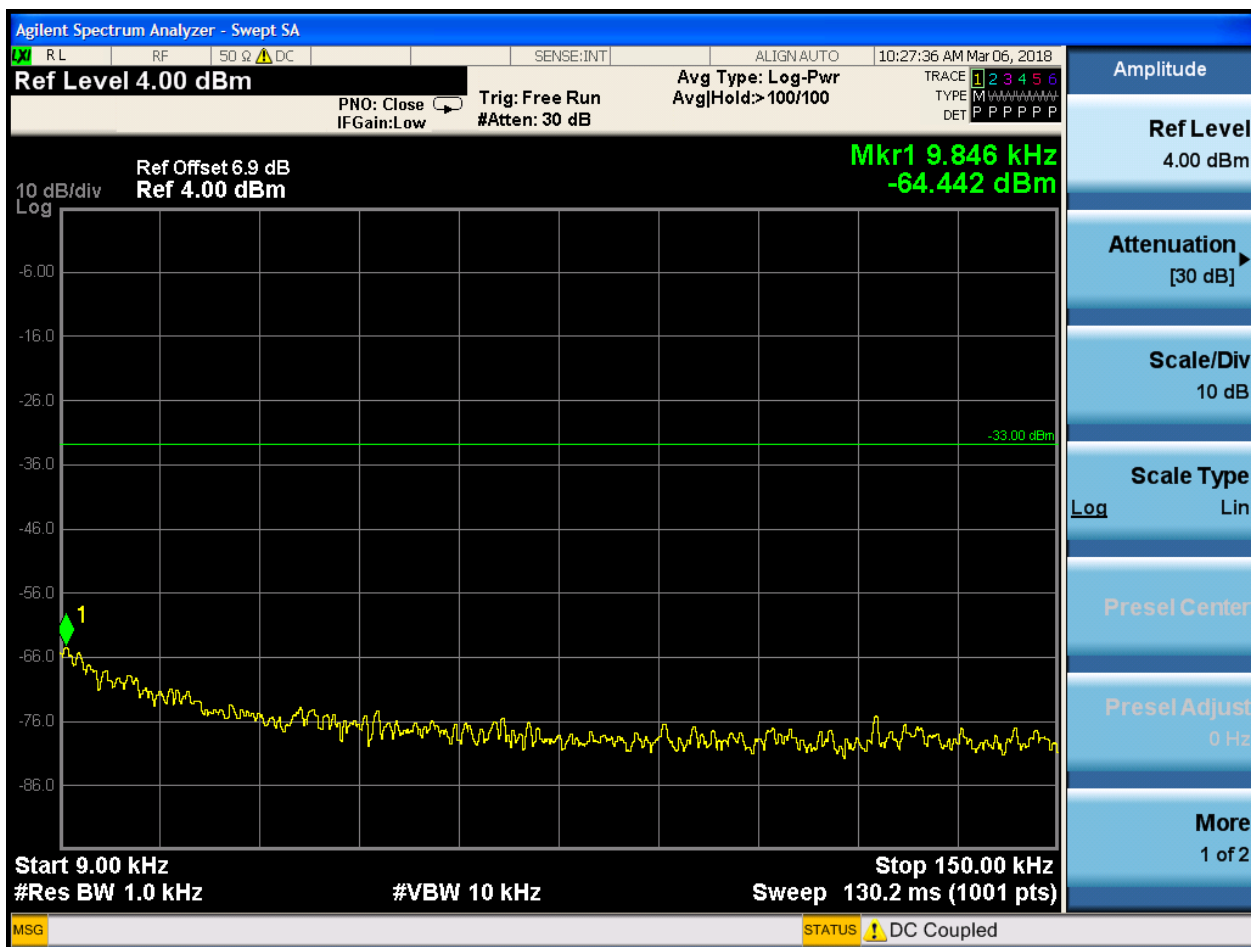


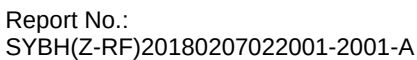
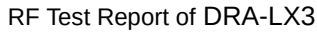


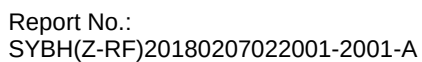
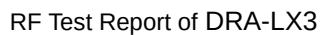


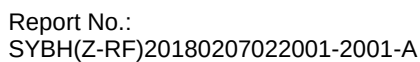
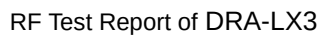


6.1.1.1.3 Test Channel = HCH



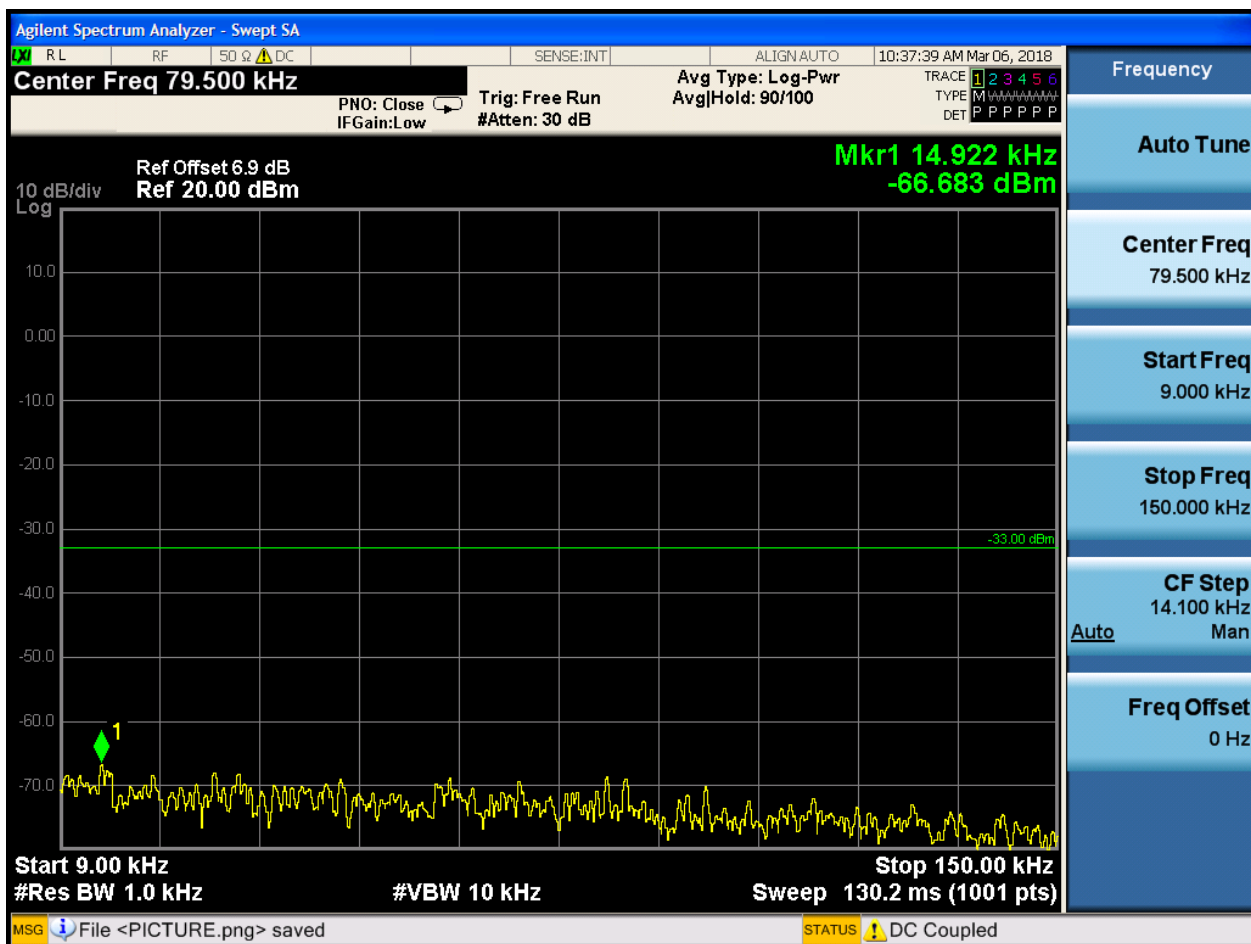


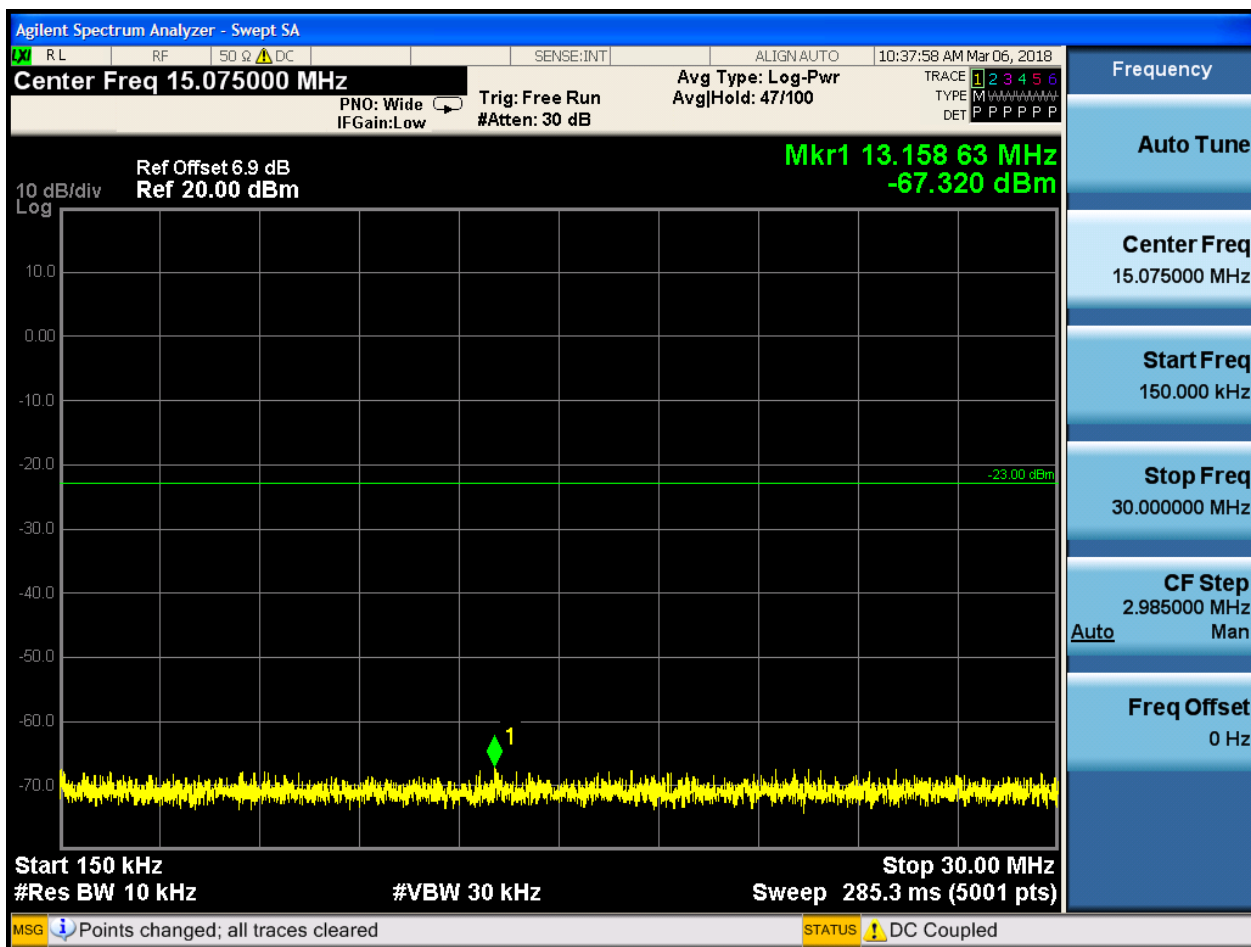


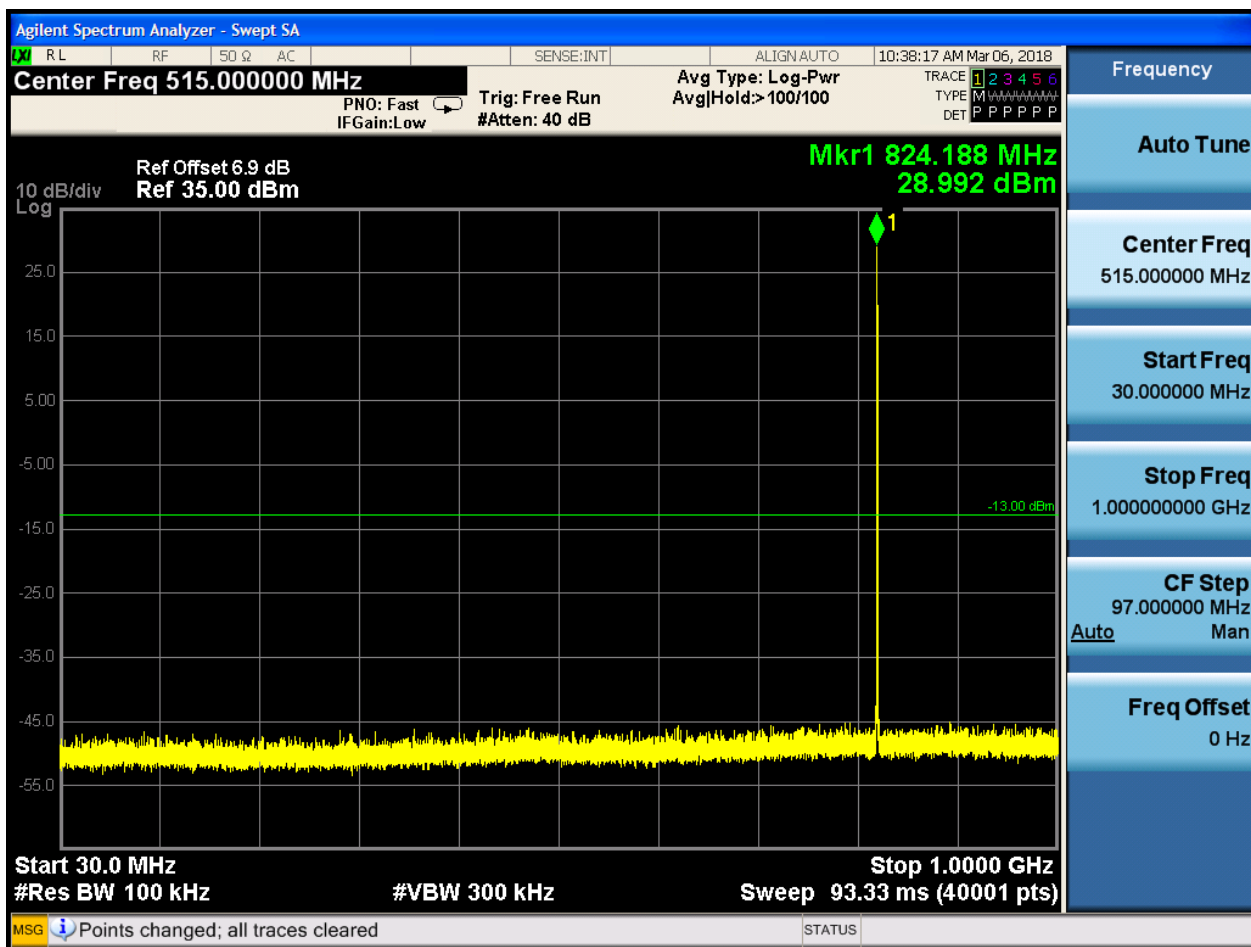


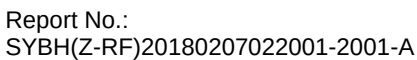
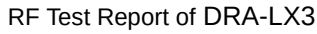
6.1.1.2 Test Mode = GSM/TM2

6.1.1.2.1 Test Channel = LCH



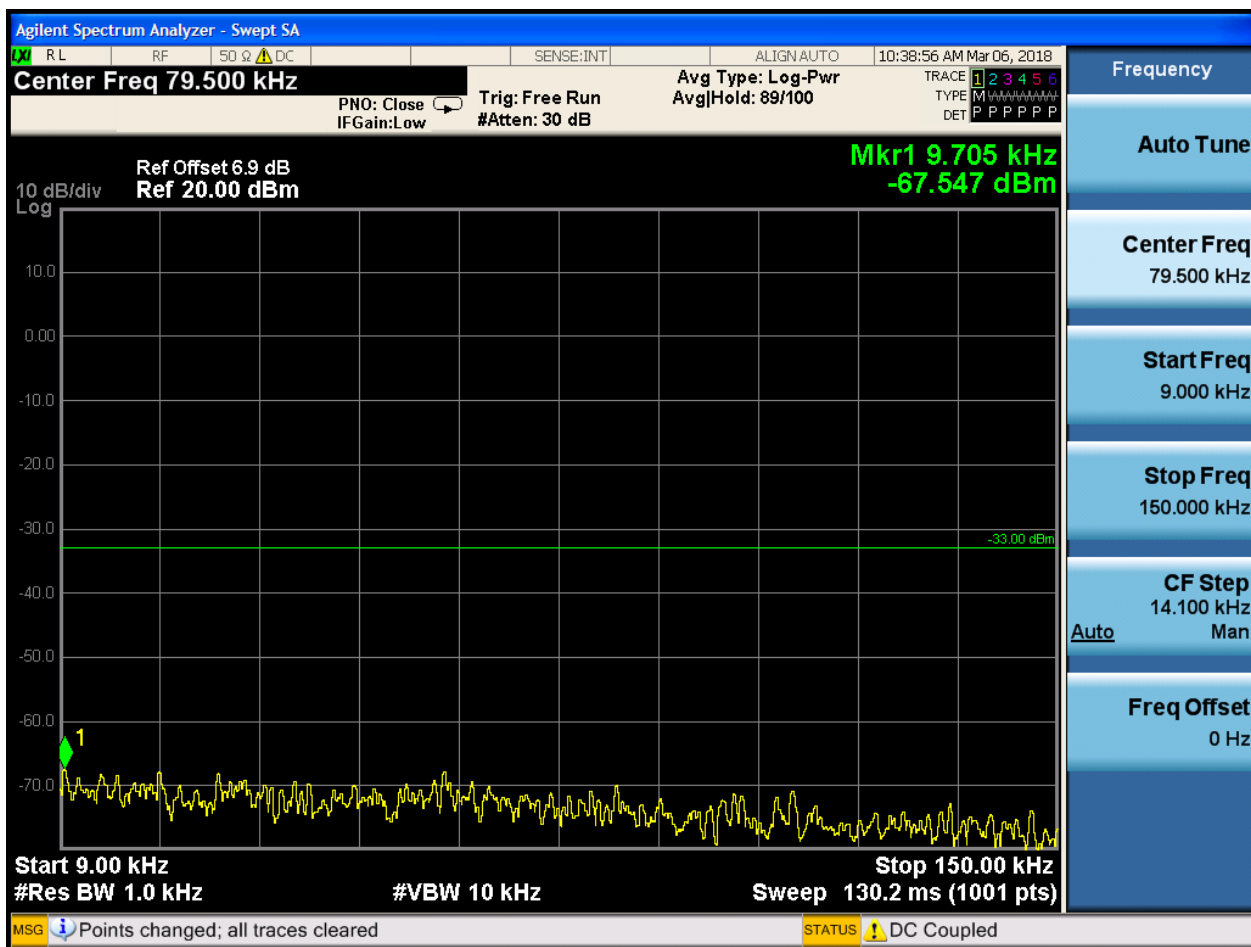


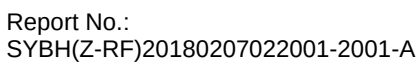
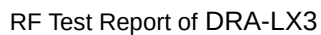


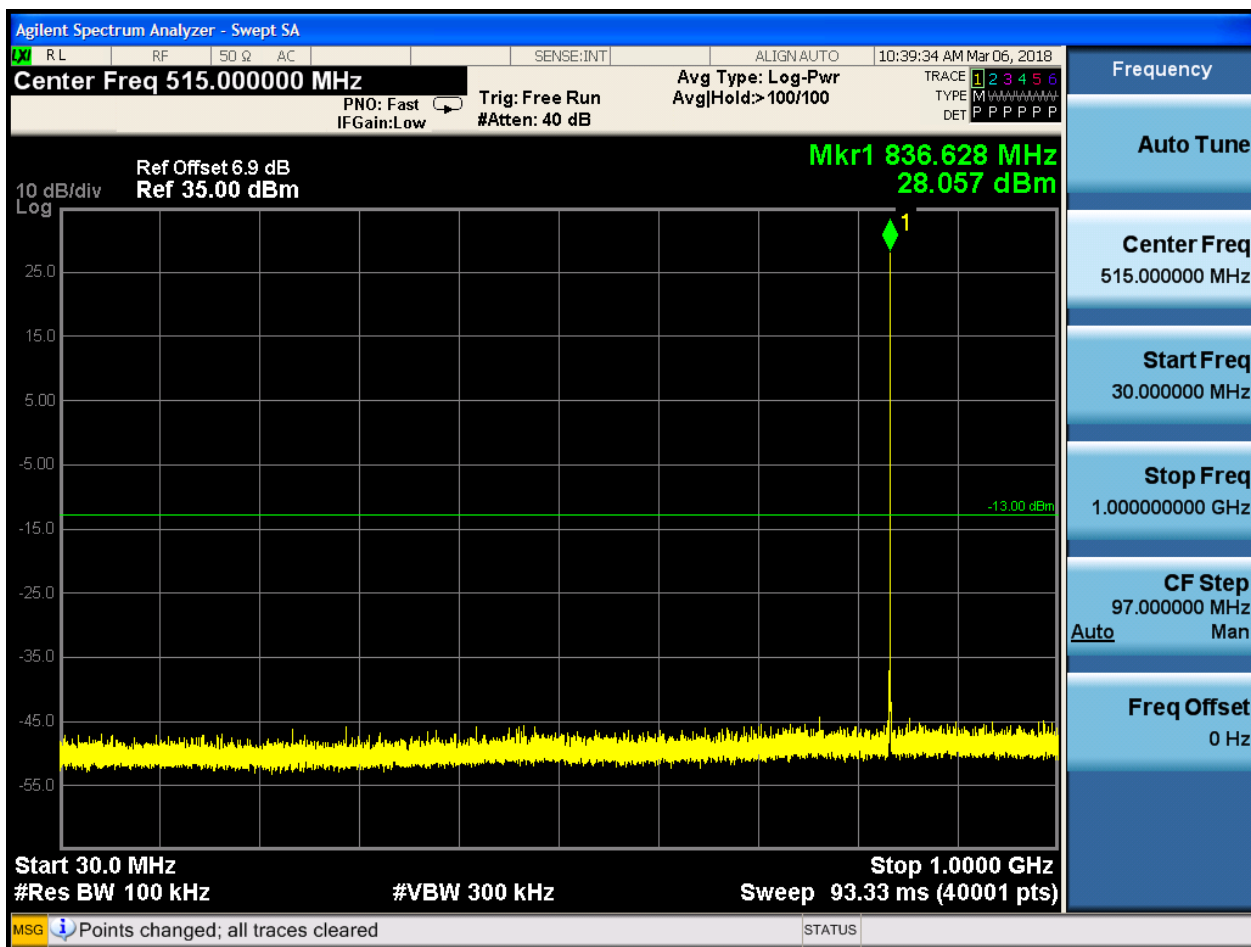


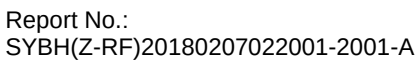
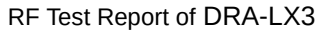


6.1.1.2.2 Test Channel = MCH



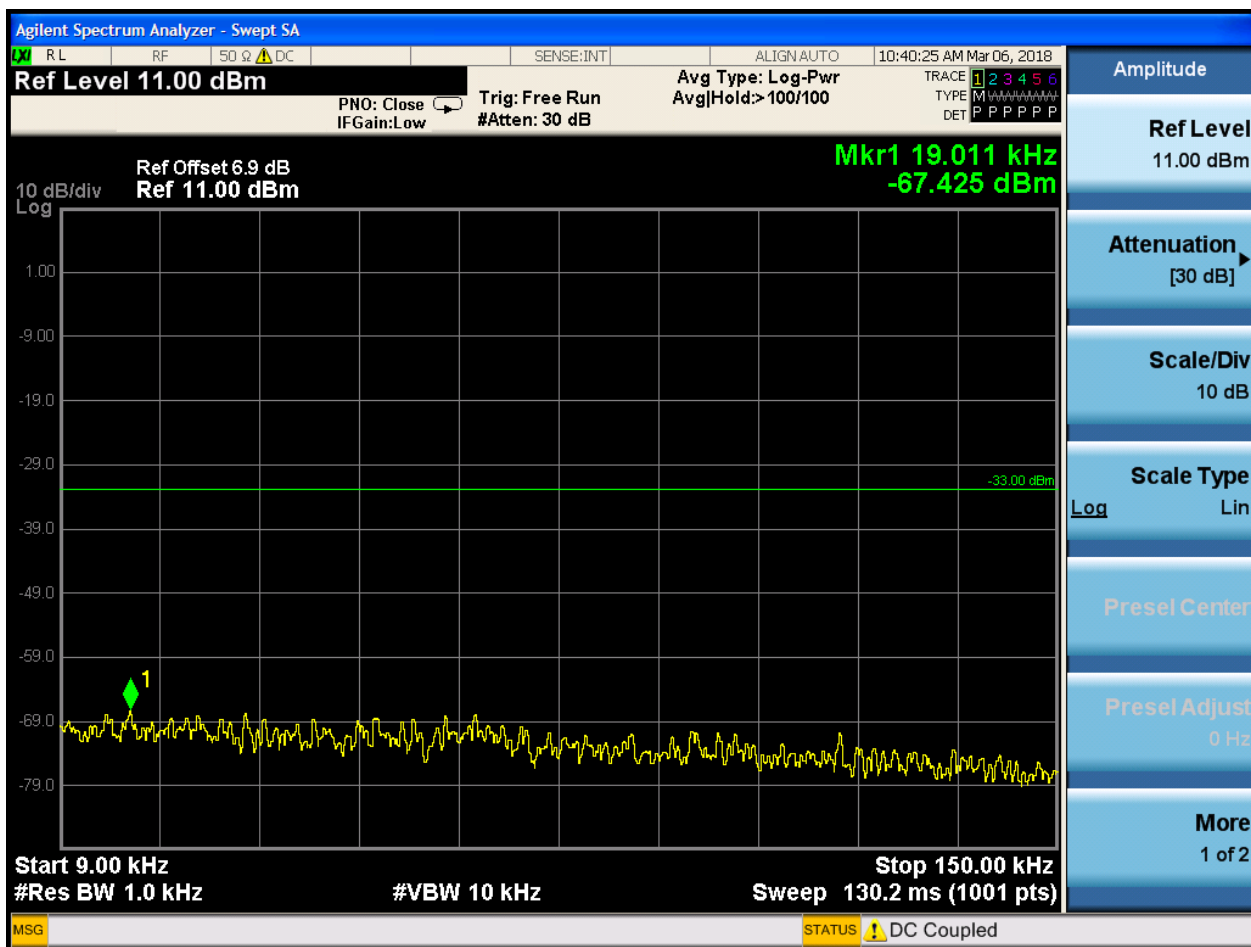


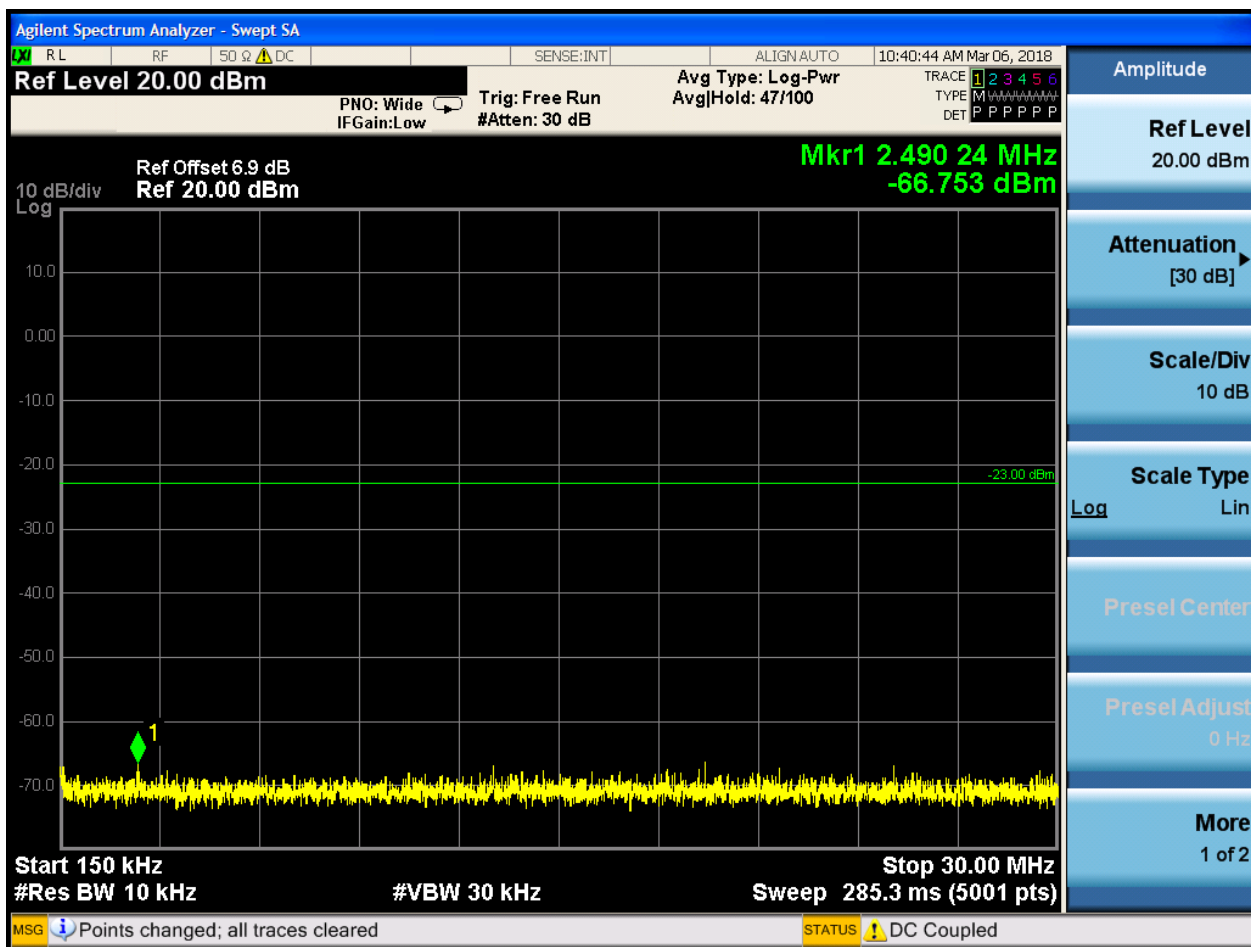


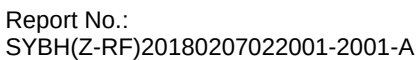
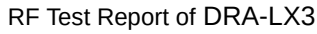


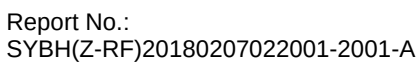
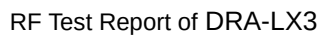


6.1.1.2.3 Test Channel = HCH





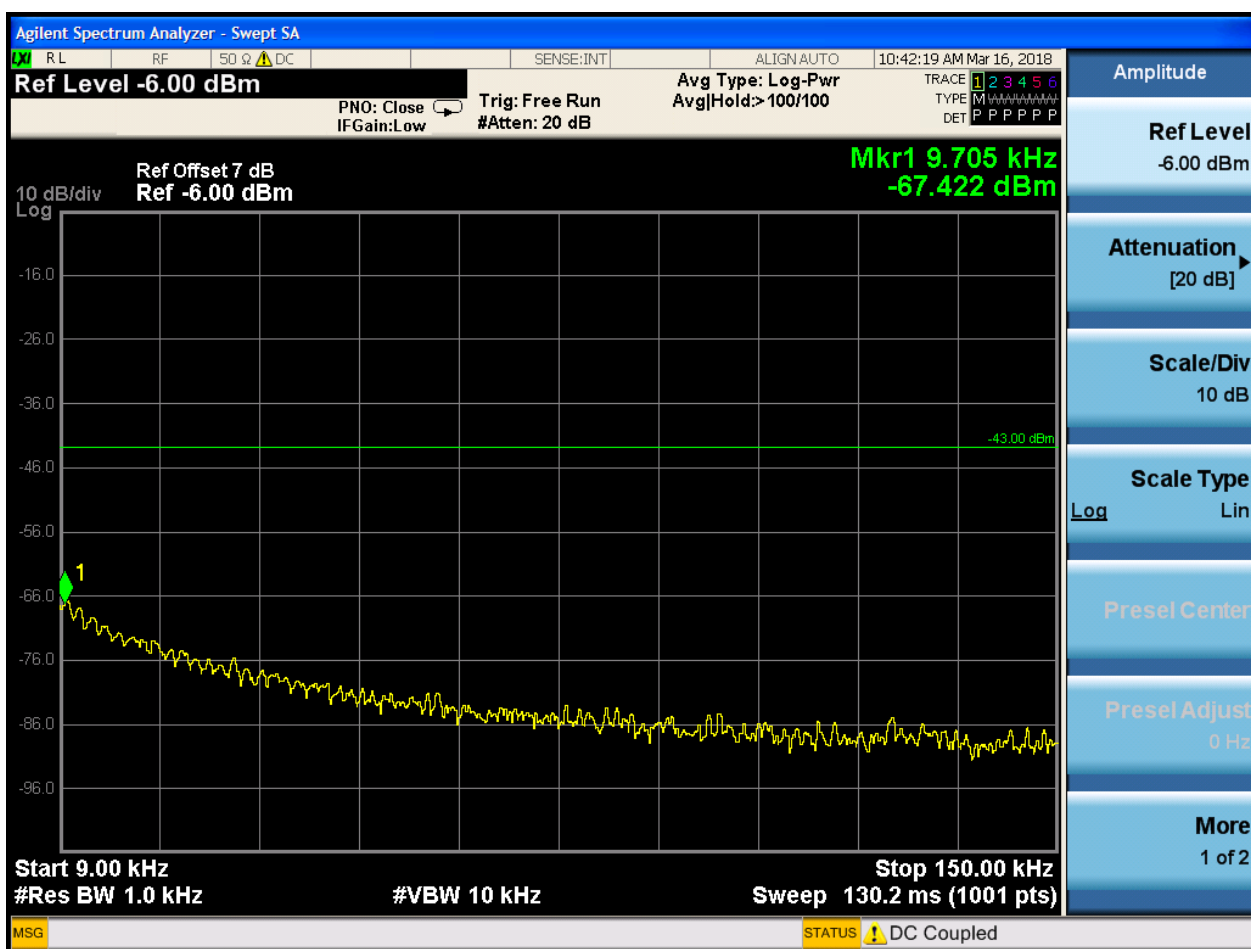


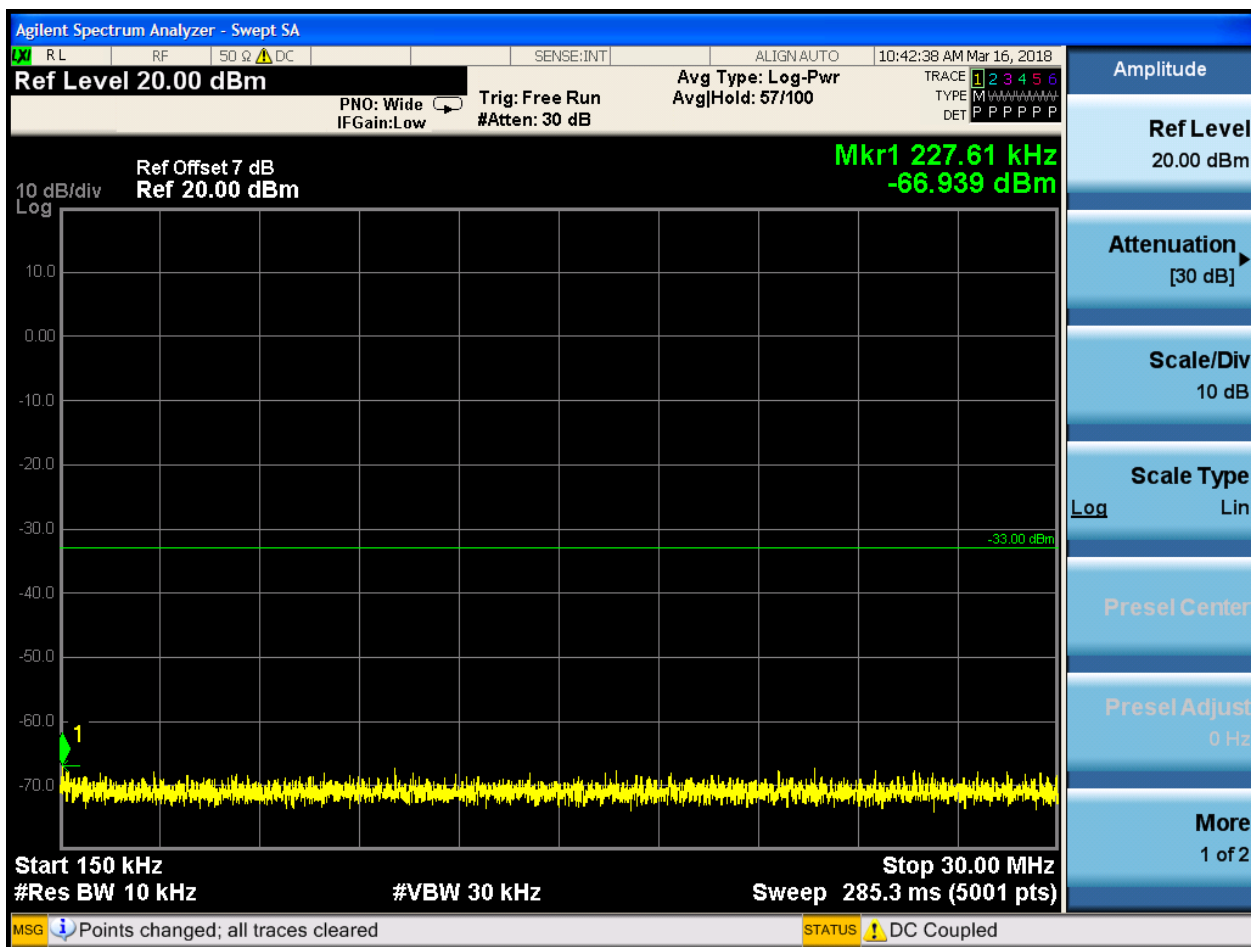
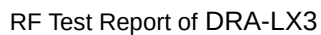


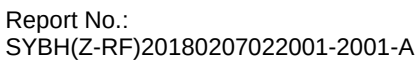
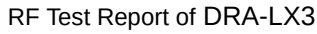
6.1.2 Test Band = GSM1900

6.1.2.1 Test Mode = GSM/TM1

6.1.2.1.1 Test Channel = LCH

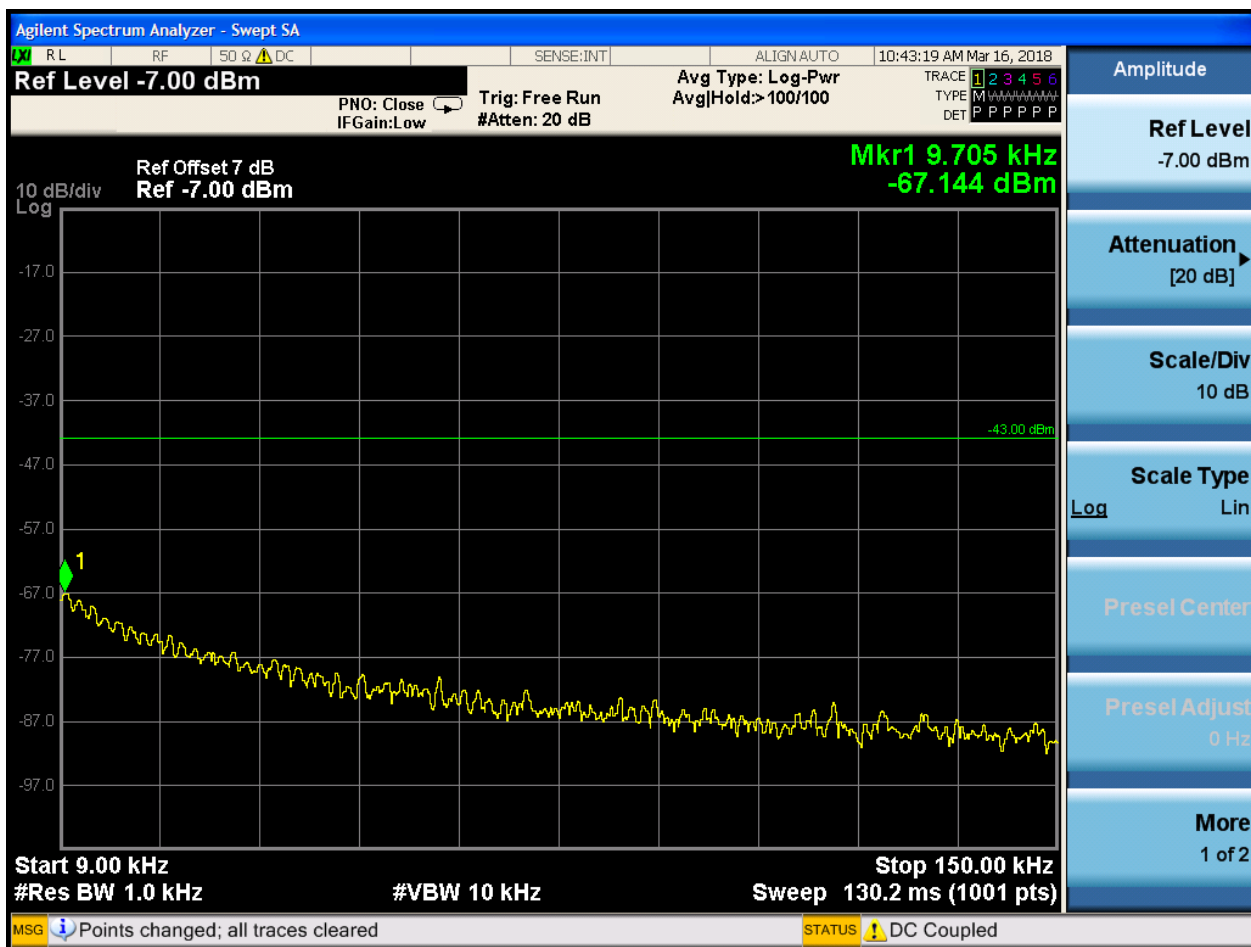


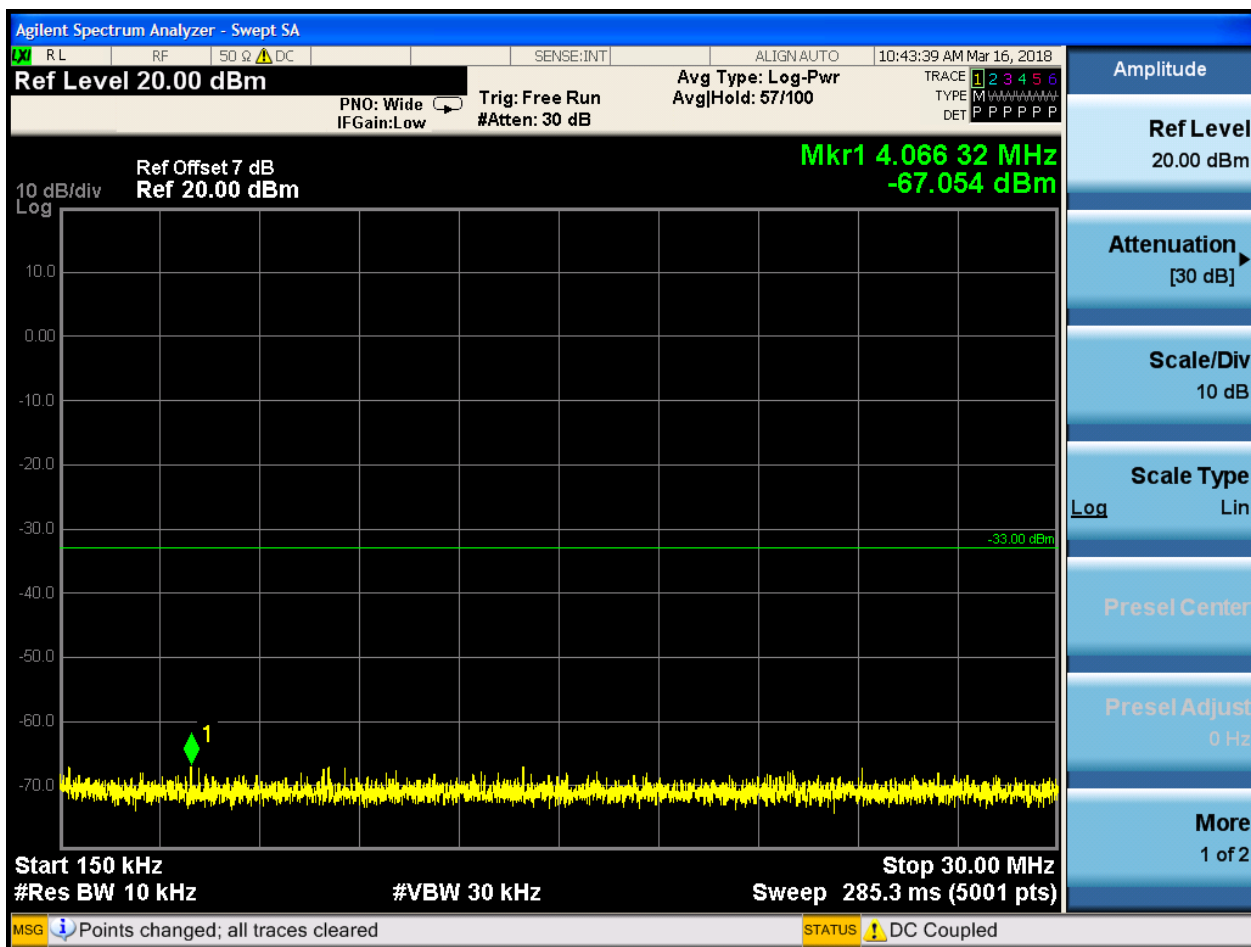


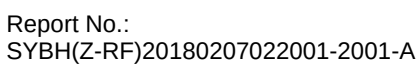
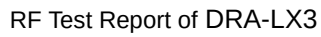




6.1.2.1.2 Test Channel = MCH

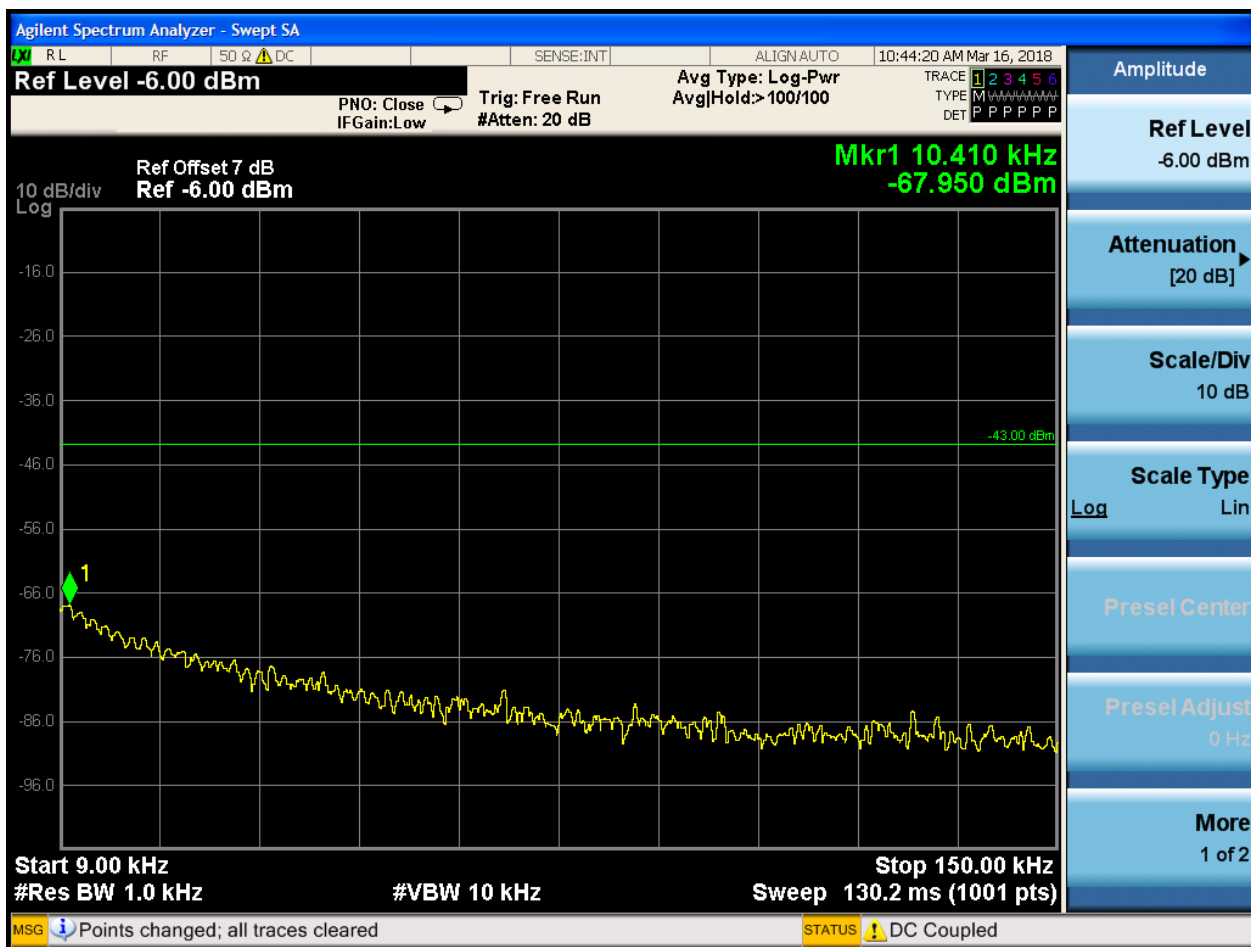


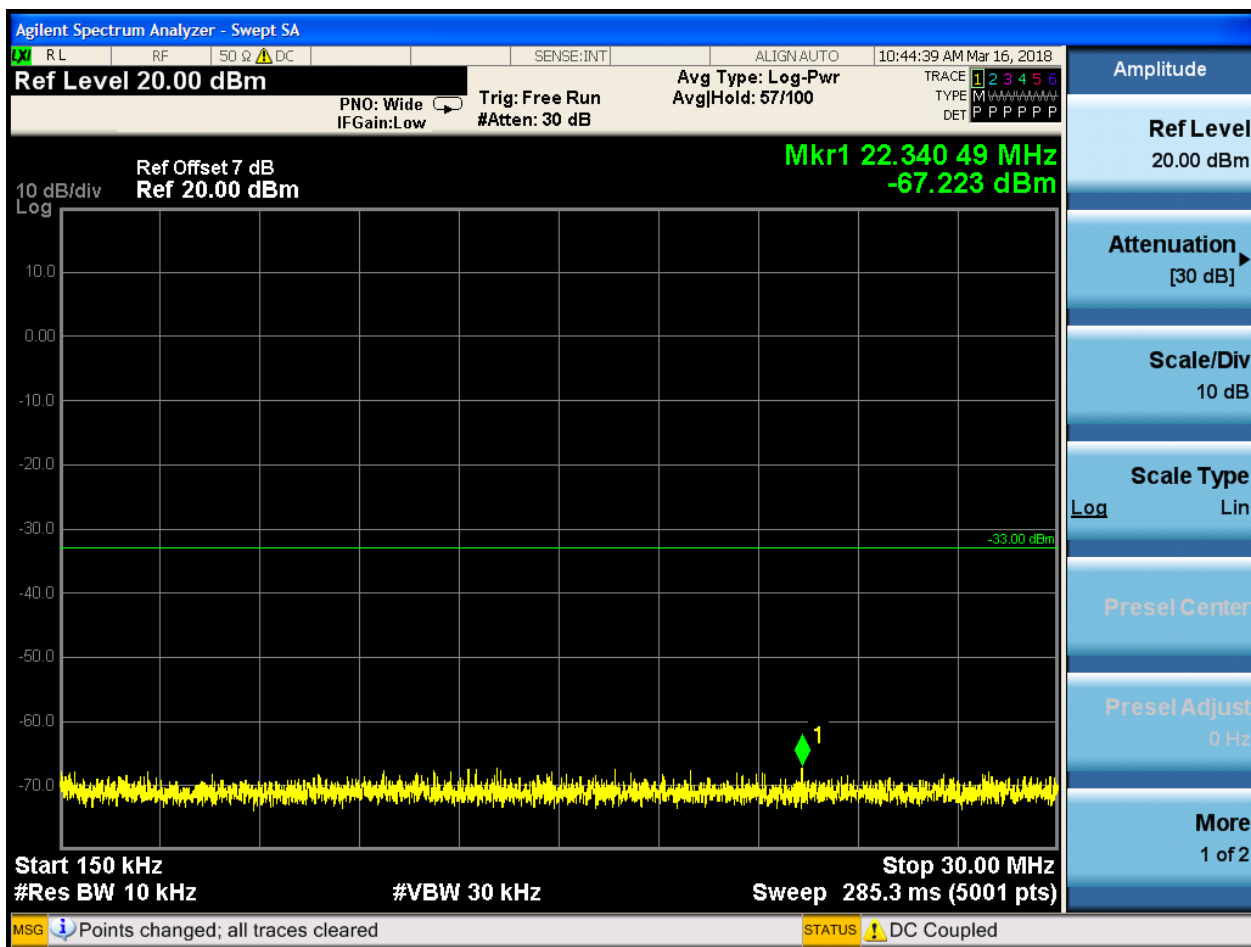


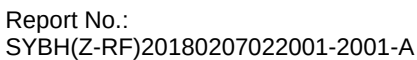
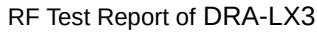




6.1.2.1.3 Test Channel = HCH



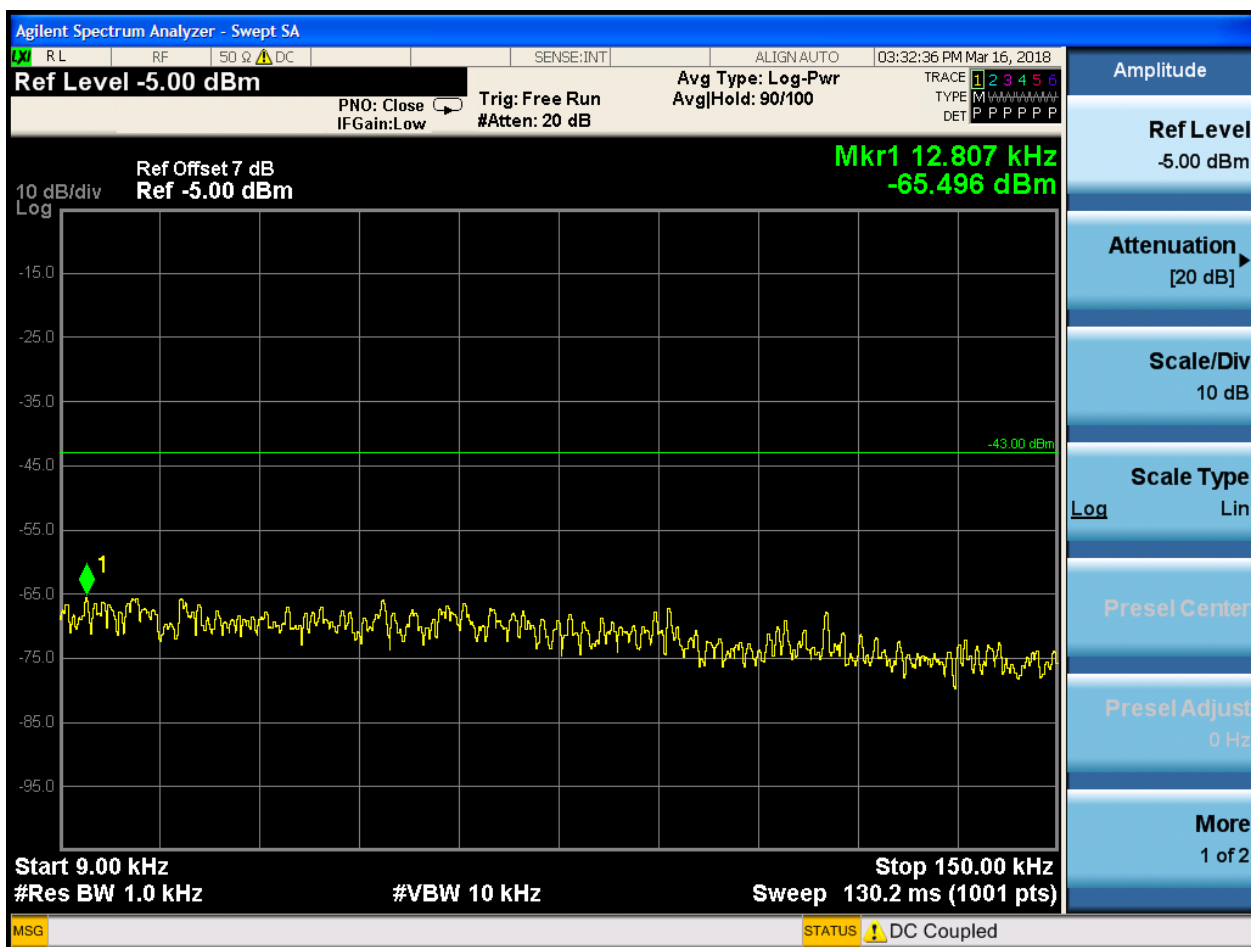


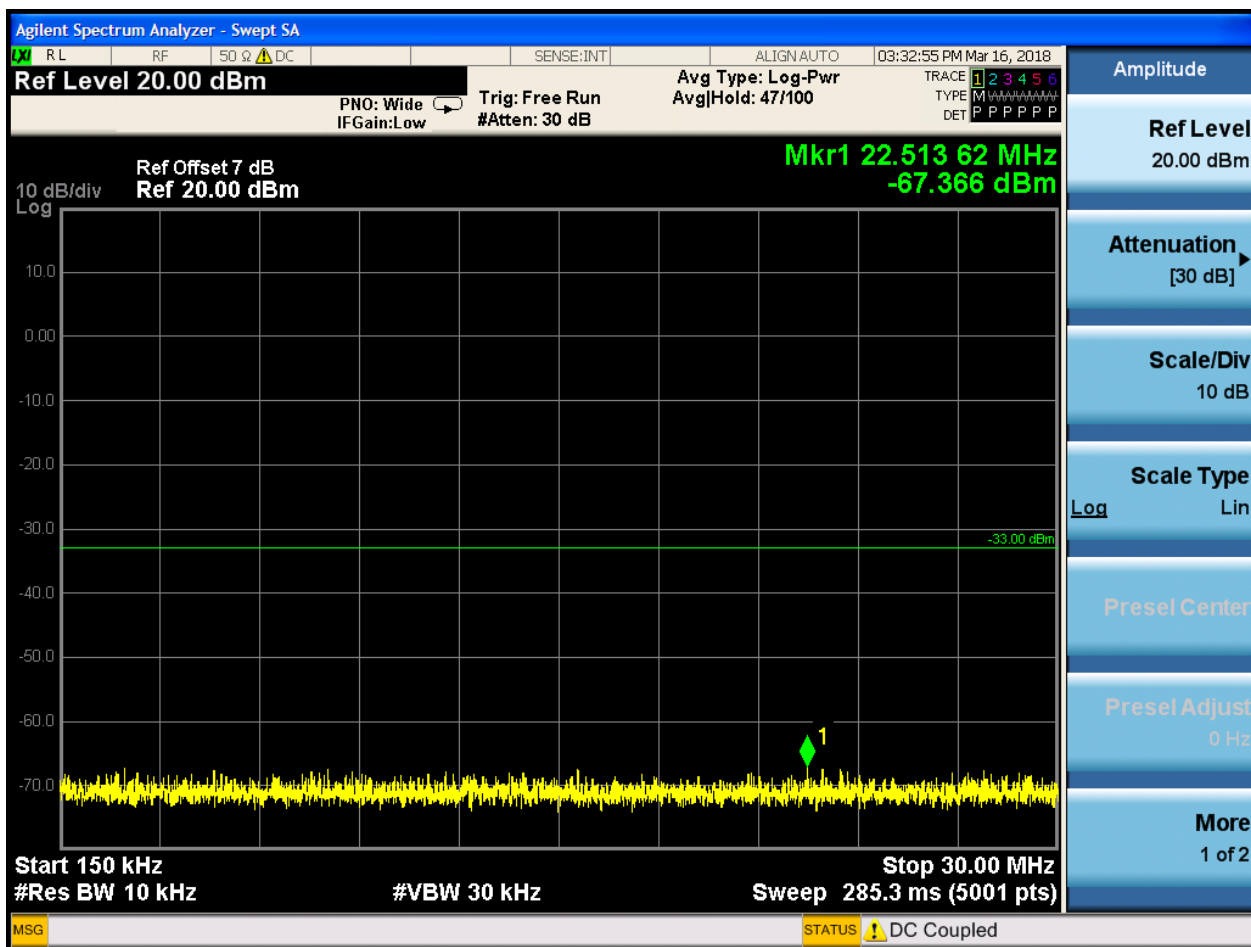


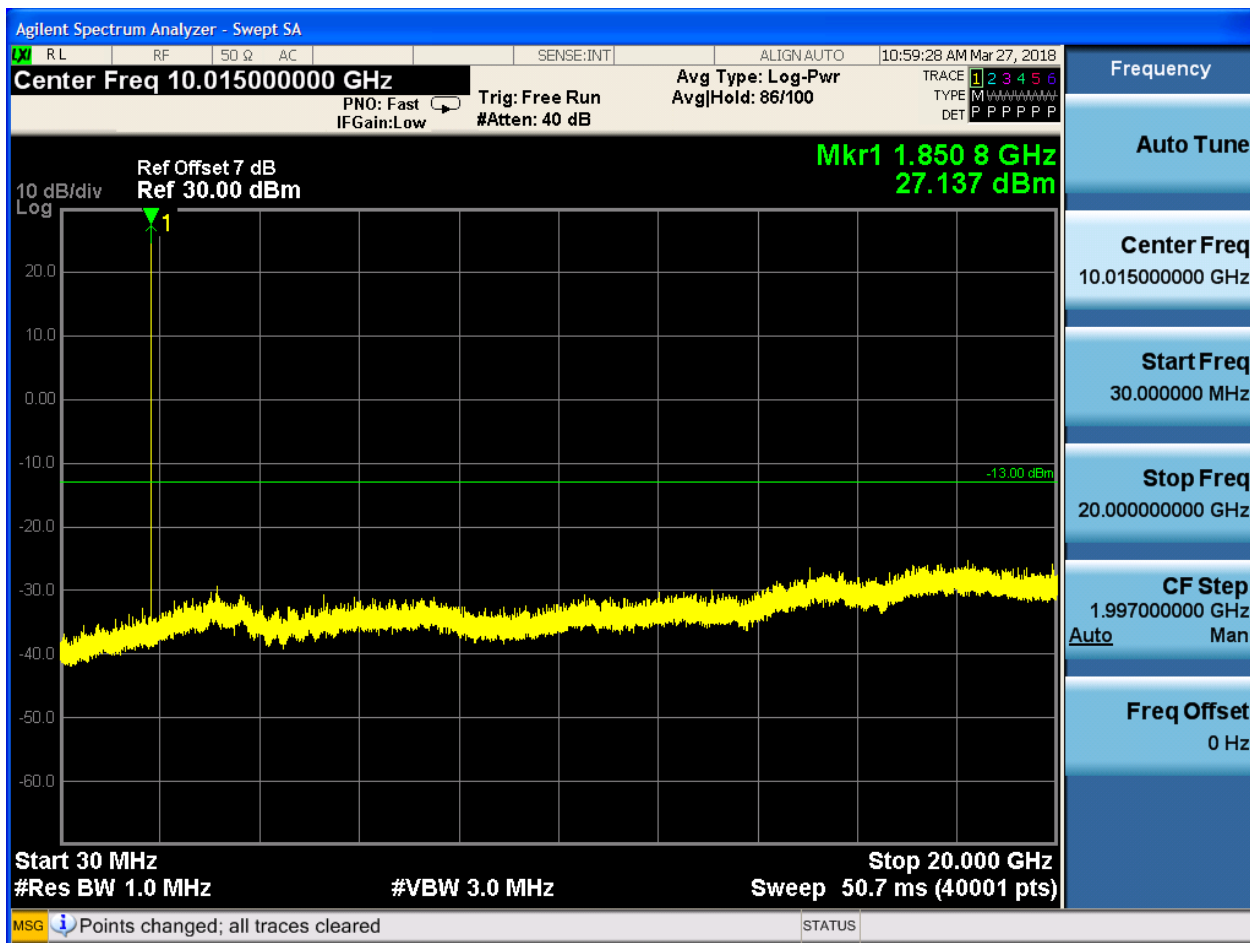


6.1.2.2 Test Mode = GSM/TM2

6.1.2.2.1 Test Channel = LCH

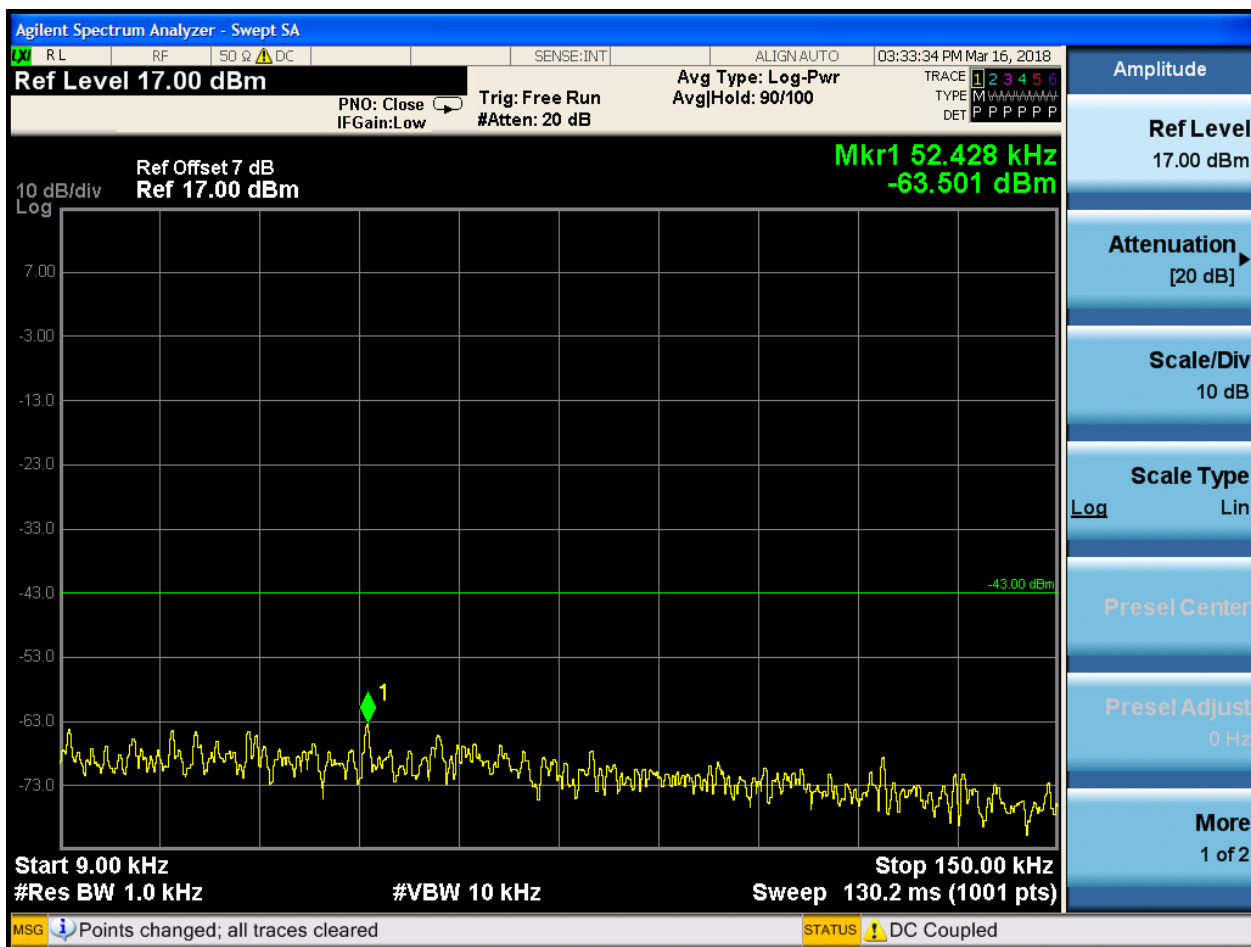


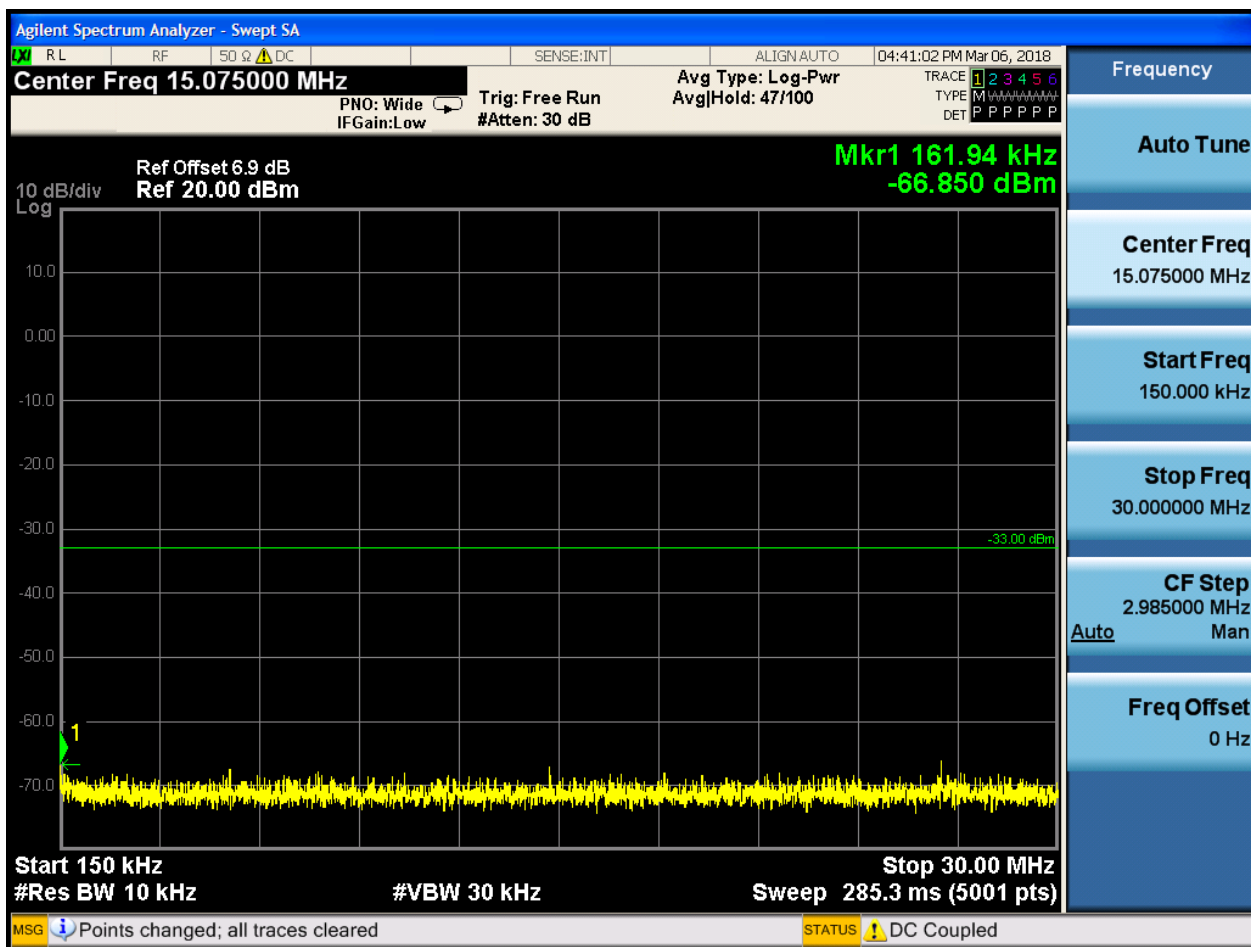


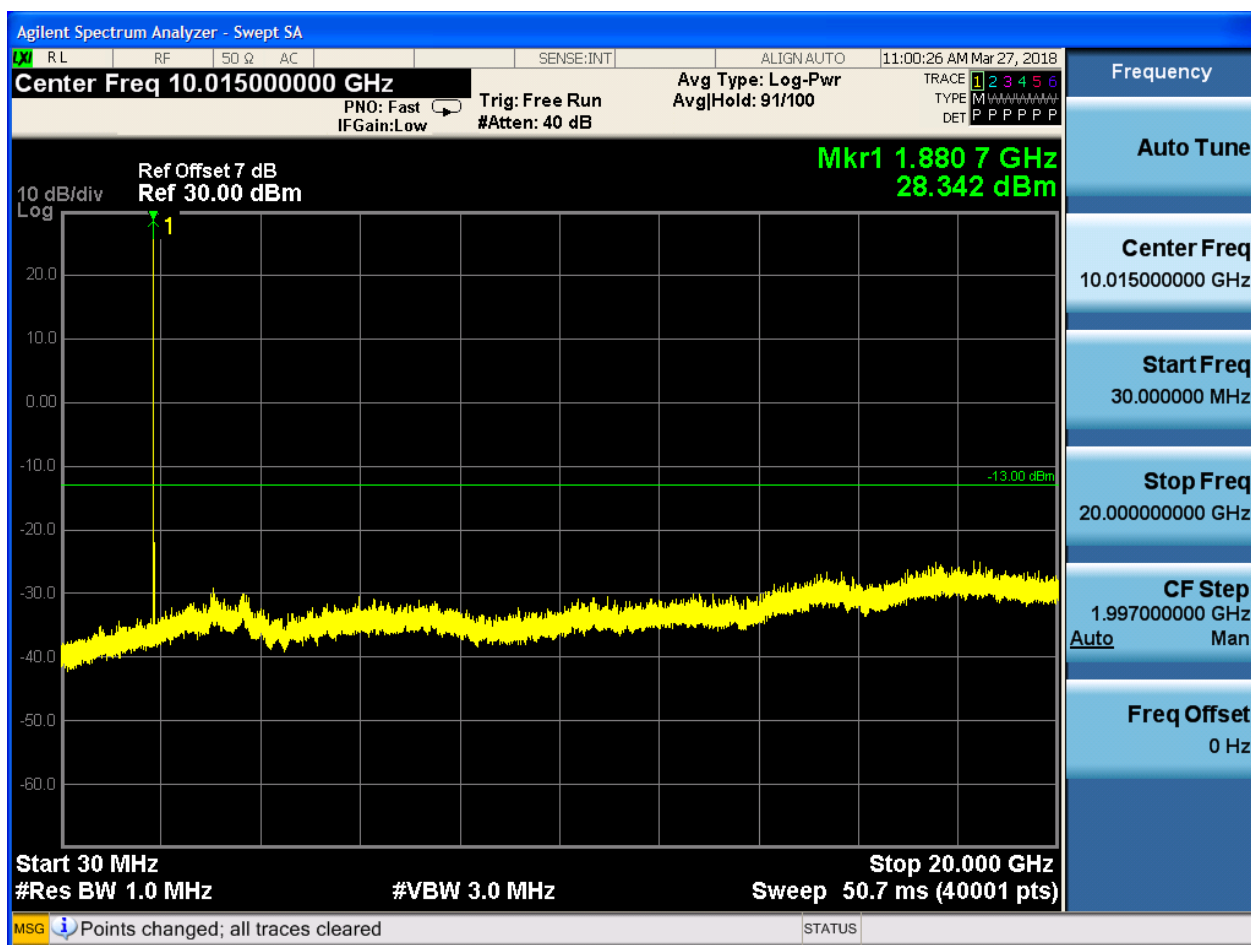




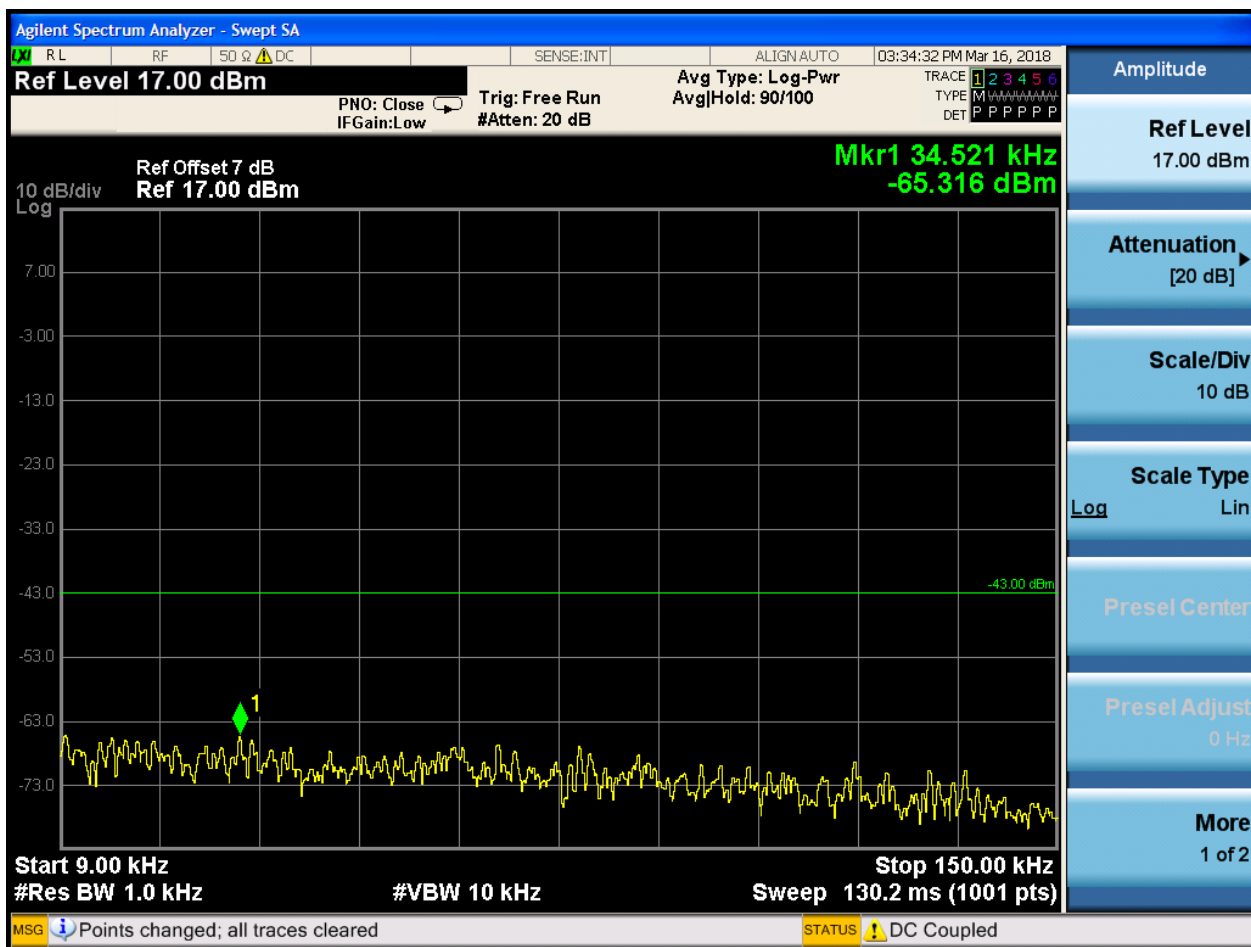
6.1.2.2.2 Test Channel = MCH

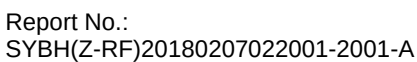
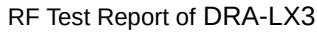


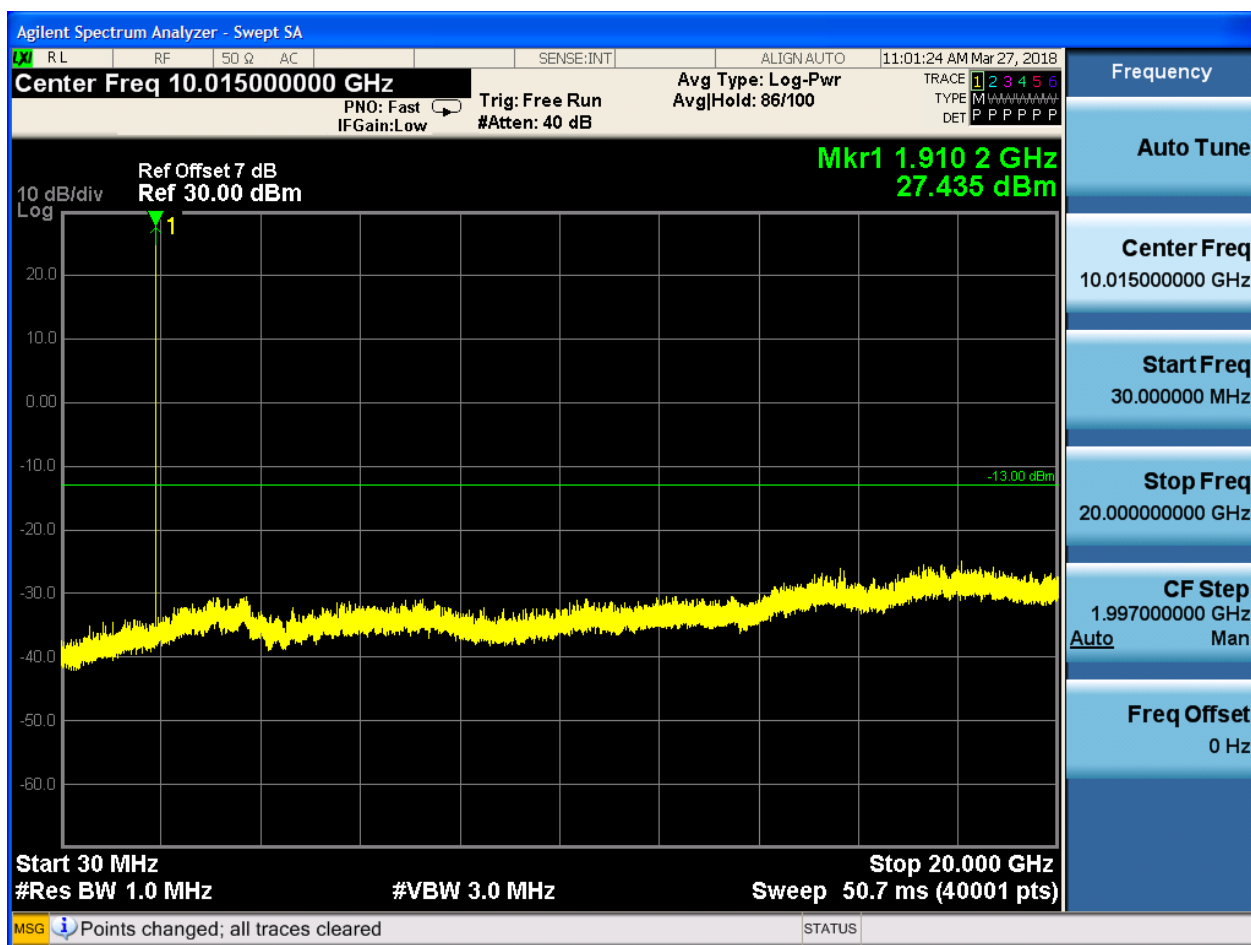




6.1.2.2.3 Test Channel = HCH







7Appendix_G: Field Strength of Spurious Radiation

Note: We tested all modes, but the data presented below is the worst case.

9kHz~150kHz, RBW = 200Hz, VBW = 600 Hz, Detector: PK

150kHz~30MHz, RBW = 9kHz, VBW = 30k Hz, Detector: PK

30MHz~1GHz, RBW = 100 kHz, VBW = 300 kHz. Detector: PK

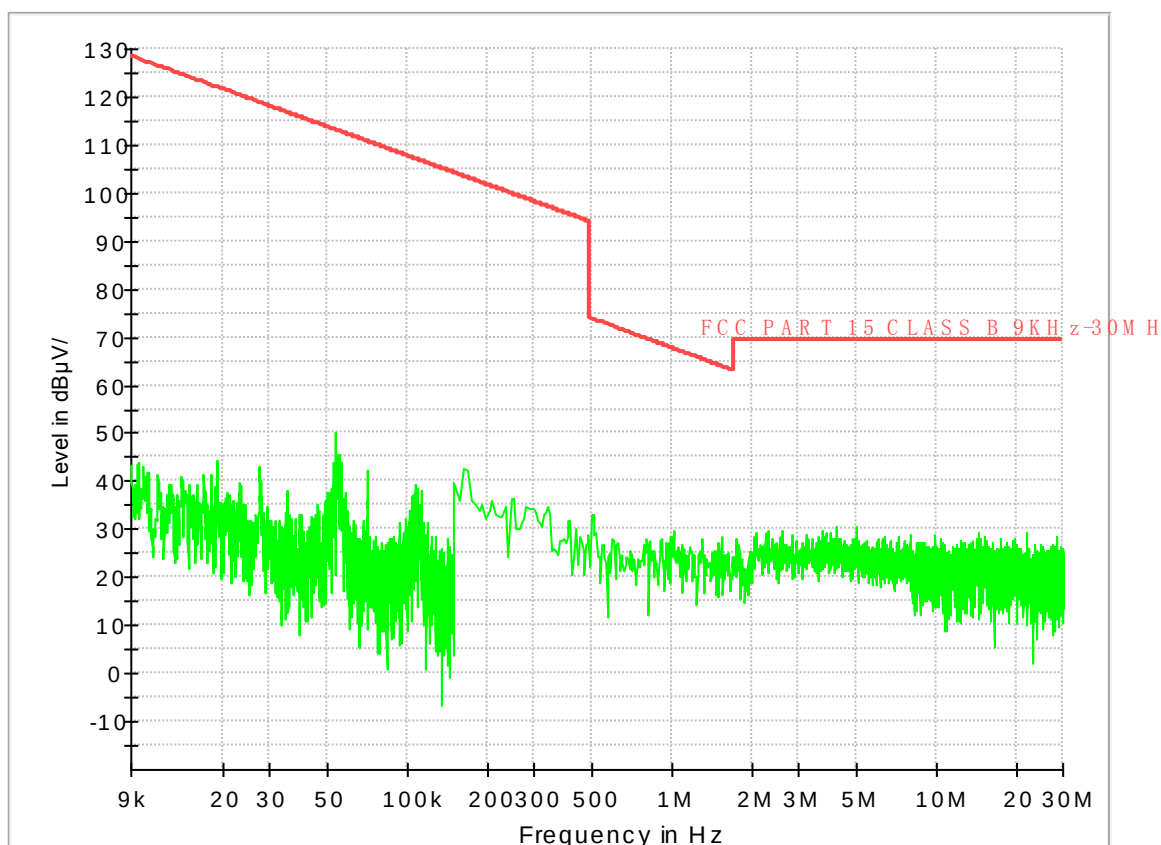
Above 1GHz, RBW = 1 MHz, VBW = 3 MHz. Detector: PK

Part I - Test Plots

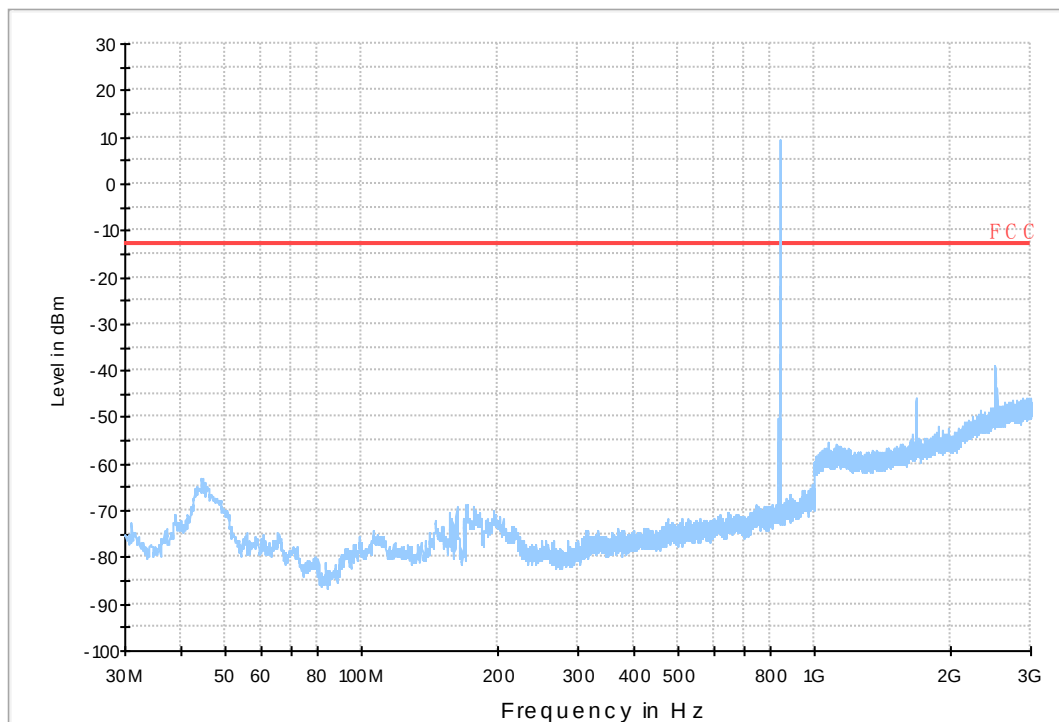
7.1 For GSM

7.1.1 Test Band = GSM850

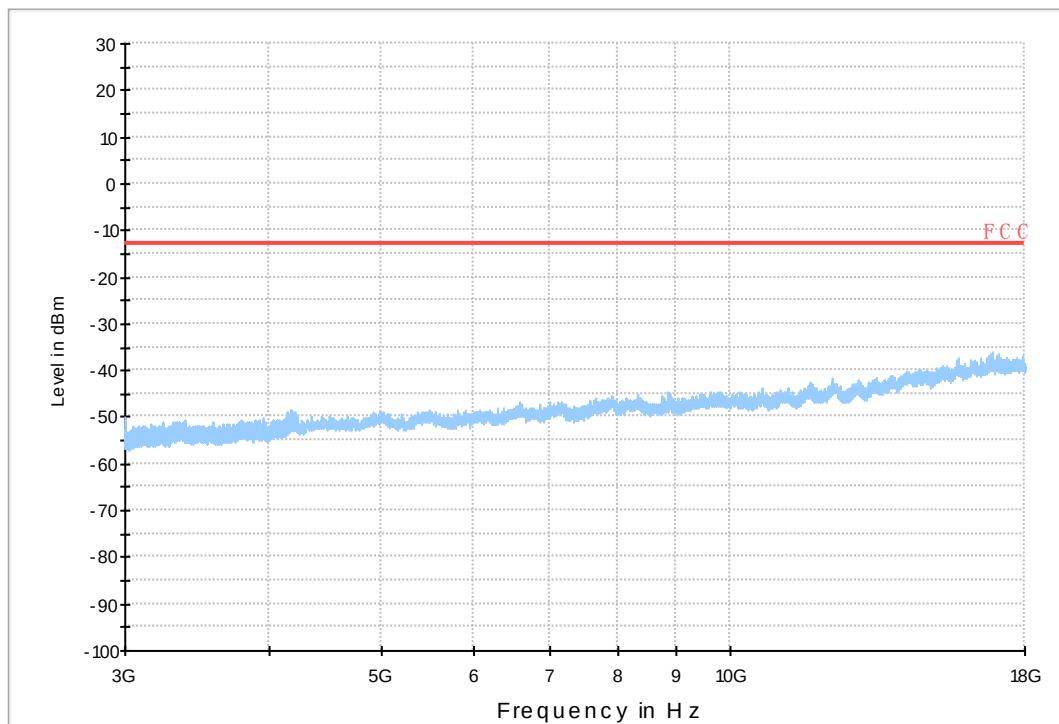
7.1.1.1 Test Mode = GSM/TM1



Copy of FCC PART22 GSM850_L

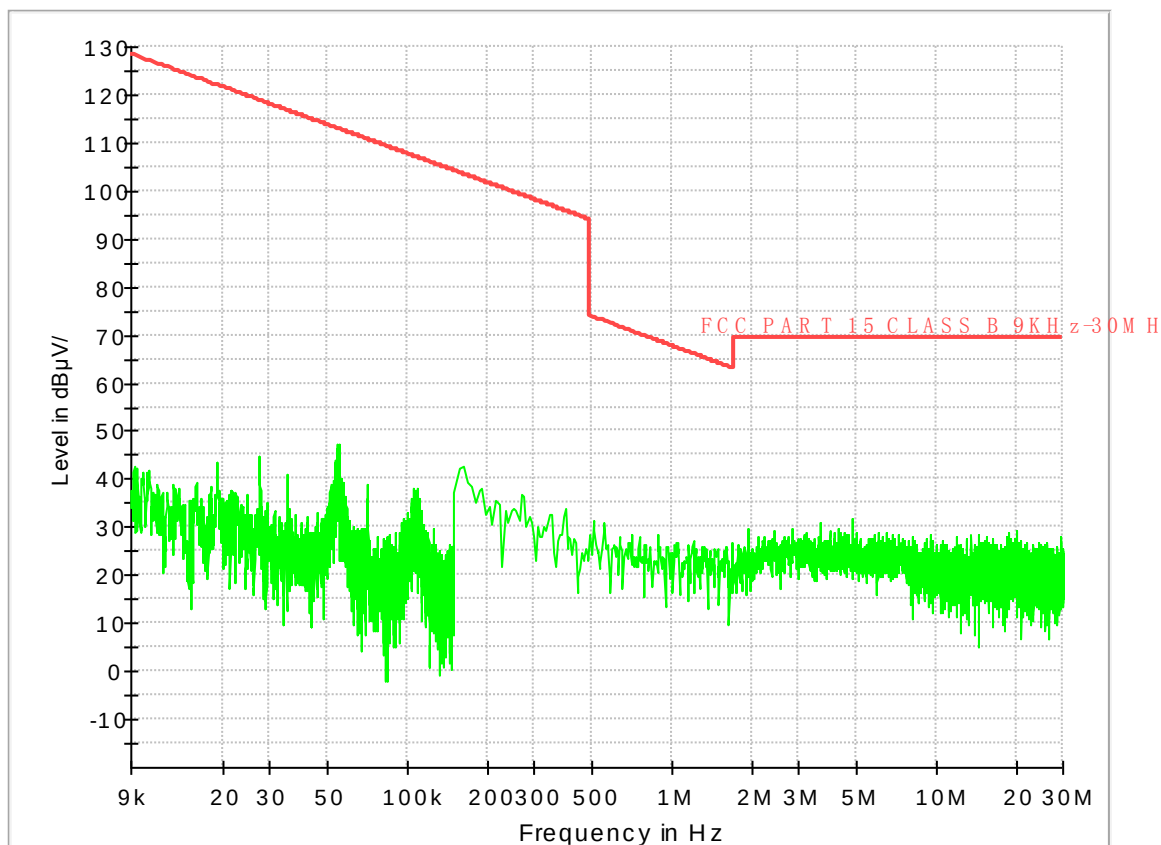


Copy of FCC PART22 GSM850_H

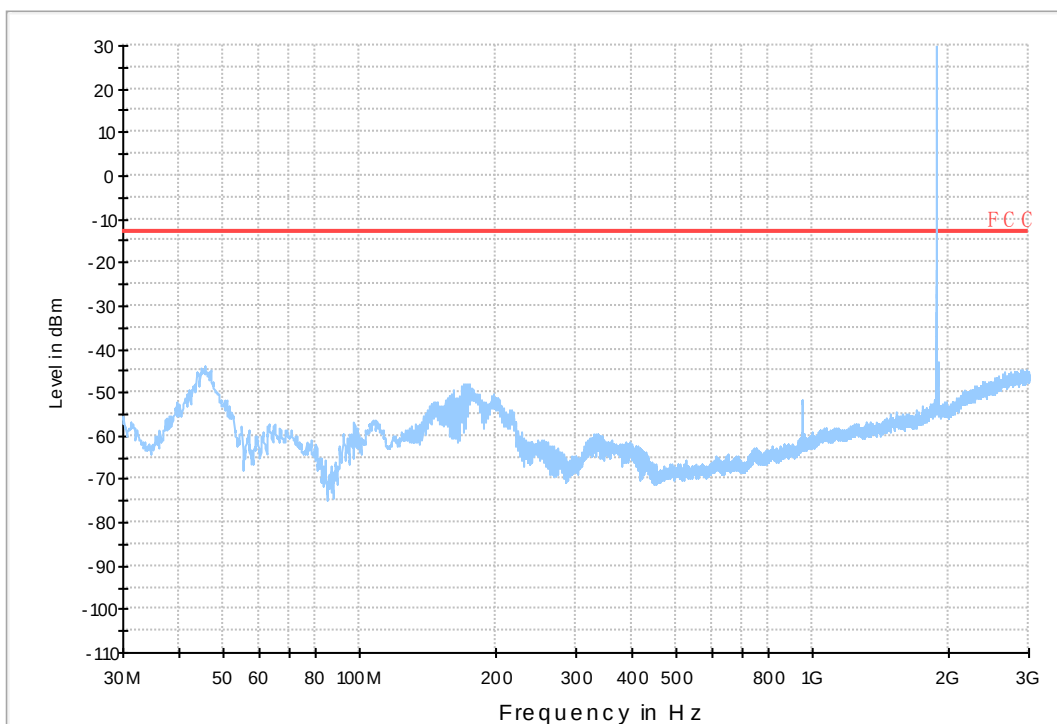


7.1.2 Test Band = GSM1900

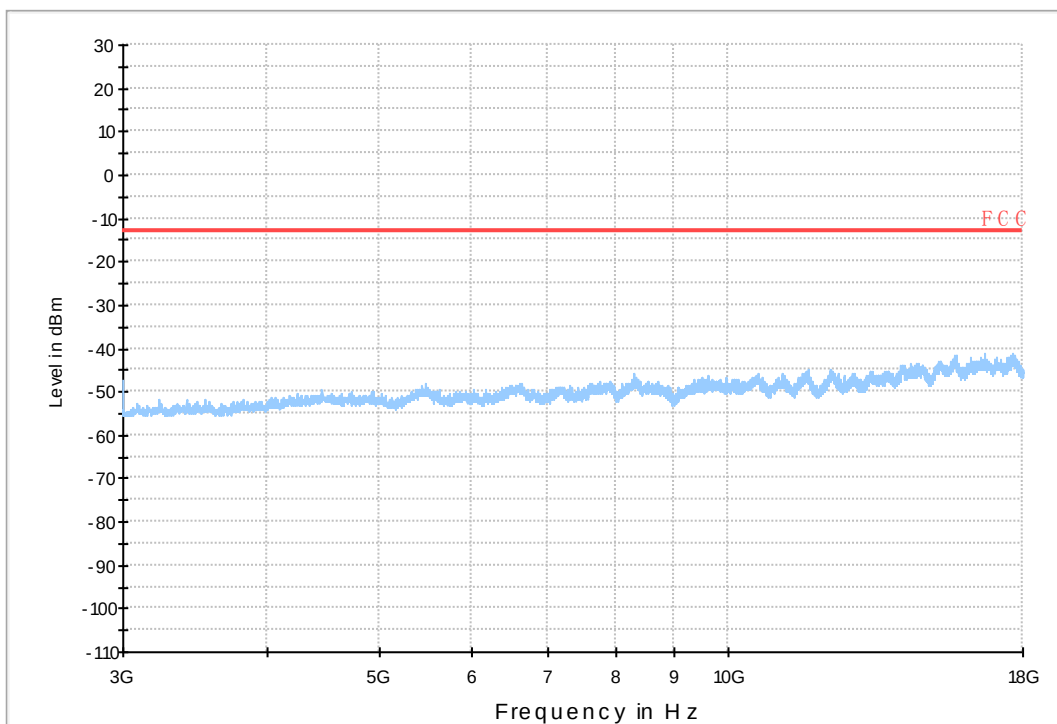
7.1.2.1 Test Mode = GSM/TM1



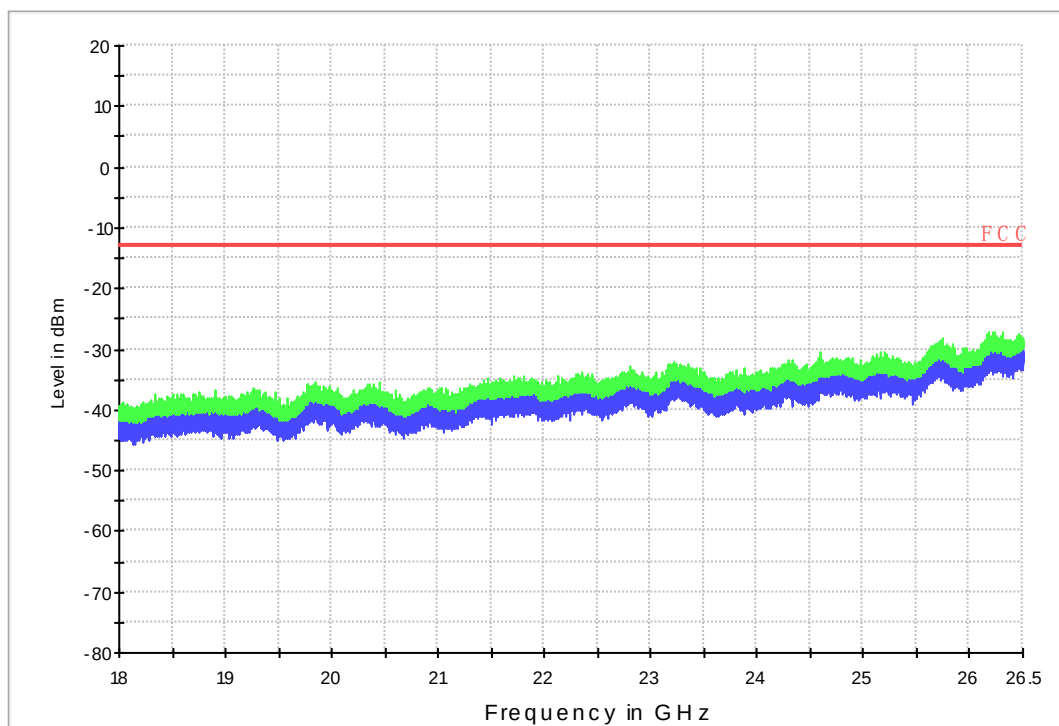
Copy of FCC PART24 GSM1900_L



Copy of FCC PART24 GSM1900_H



18G~26.5G RSE-TX-DIRECTOR ABOVE 1.5G PK



8Appendix_H: Frequency Stability

8.1 For GSM

8.1.1Frequency Error vs. Voltage:

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
GSM850	GSM/TM1	LCH	TN	VL	9.94	0.01206	PASS
				VN	11.95	0.0145	PASS
				VH	8.39	0.01018	PASS
		MCH	TN	VL	7.94	0.00949	PASS
				VN	10.40	0.01243	PASS
				VH	11.43	0.01366	PASS
		HCH	TN	VL	14.14	0.01666	PASS
				VN	14.21	.01674	PASS
				VH	15.11	0.0178	PASS
	GSM/TM2	LCH	TN	VL	9.91	0.01202	PASS
				VN	10.40	0.01262	PASS
				VH	8.88	0.01077	PASS
		MCH	TN	VL	7.94	0.00949	PASS
				VN	7.01	0.00838	PASS
				VH	3.16	0.00378	PASS
		HCH	TN	VL	13.20	0.01555	PASS
				VN	12.07	0.01422	PASS
				VH	4.97	0.00586	PASS
GSM1900	GSM/TM1	LCH	TN	VL	30.35	0.0164	PASS
				VN	26.09	0.0141	PASS
				VH	26.54	0.01434	PASS
		MCH	TN	VL	25.89	0.01377	PASS
				VN	20.73	0.01103	PASS
				VH	25.63	0.01363	PASS
		HCH	TN	VL	31.51	0.0165	PASS
				VN	24.54	0.01285	PASS
				VH	23.25	0.01217	PASS
	GSM/TM2	LCH	TN	VL	24.34	0.01316	PASS
				VN	19.40	0.01049	PASS
				VH	18.56	0.01003	PASS

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
		MCH	TN	VL	14.17	0.00754	PASS
				VN	17.79	0.00946	PASS
				VH	24.57	0.01307	PASS
		HCH	TN	VL	19.79	0.01036	PASS
				VN	28.80	0.01508	PASS
				VH	21.15	0.01107	PASS

8.1.2 Frequency Error vs. Temperature:

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
GSM850	GSM/TM1	LCH	VN	-30	6.07	.00736	PASS
				-20	9.81	0.0119	PASS
				-10	10.40	0.01262	PASS
				0	7.62	0.00925	PASS
				10	13.17	0.01598	PASS
				20	9.30	0.01128	PASS
				30	6.46	0.00784	PASS
				40	12.40	0.01504	PASS
				50	10.59	0.01285	PASS
		MCH	VN	-30	20.15	0.02409	PASS
				-20	8.14	0.00973	PASS
				-10	7.04	0.00842	PASS
				0	5.75	0.00687	PASS
				10	11.82	0.01413	PASS
				20	12.46	0.01489	PASS
				30	9.75	0.01165	PASS
				40	13.24	0.01583	PASS
				50	10.46	0.0125	PASS
		HCH	VN	-30	9.30	0.01096	PASS
				-20	12.27	0.01446	PASS
				-10	6.46	0.00761	PASS
				0	14.66	0.01727	PASS
				10	12.53	0.01476	PASS
				20	10.91	0.01285	PASS
				30	10.78	0.0127	PASS
				40	7.55	0.00889	PASS
				50	10.20	0.01202	PASS
	GSM/TM2	LCH	VN	-30	7.68	0.00932	PASS
				-20	10.65	0.01292	PASS
				-10	9.75	0.01183	PASS
				0	14.50	0.01759	PASS
				10	16.43	0.01993	PASS
				20	12.62	0.01531	PASS
				30	10.33	0.01253	PASS
				40	9.17	0.01113	PASS
				50	7.17	0.0087	PASS
		MCH	VN	-30	3.39	0.00405	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
				-20	5.68	0.00679	PASS
				-10	8.98	0.01073	PASS
				0	7.26	0.00868	PASS
				10	7.07	0.00845	PASS
				20	7.59	0.00907	PASS
				30	9.59	0.01146	PASS
				40	9.62	0.0115	PASS
				50	8.72	0.01042	PASS
		HCH	VN	-30	4.75	0.0056	PASS
				-20	7.65	0.00901	PASS
				-10	8.33	0.00981	PASS
				0	7.88	0.00928	PASS
				10	6.49	0.00765	PASS
				20	4.58	0.0054	PASS
				30	9.62	0.01133	PASS
				40	8.20	0.00966	PASS
				50	10.46	0.01232	PASS
GSM1900	GSM/TM1	LCH	VN	-30	26.86	0.01452	PASS
				-20	19.76	0.01068	PASS
				-10	25.89	0.01399	PASS
				0	19.63	0.01061	PASS
				10	27.12	0.01466	PASS
				20	26.86	0.01452	PASS
				30	28.22	0.01525	PASS
				40	23.25	0.01257	PASS
				50	23.12	0.0125	PASS
		MCH	VN	-30	24.86	0.01322	PASS
				-20	26.02	0.01384	PASS
				-10	20.53	0.01092	PASS
				0	31.06	0.01652	PASS
				10	19.05	0.01013	PASS
				20	17.69	0.00941	PASS
				30	21.63	0.01151	PASS
				40	24.02	0.01278	PASS
				50	27.51	0.01463	PASS
		HCH	VN	-30	20.99	0.01099	PASS
				-20	28.09	0.01471	PASS
				-10	30.74	0.0161	PASS
				0	25.51	0.01336	PASS
				10	30.15	0.01579	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
				20	28.15	0.01474	PASS
				30	27.06	0.01417	PASS
				40	27.89	0.0146	PASS
				50	31.83	0.01667	PASS
	GSM/TM2	LCH	VN	-30	26.38	0.01426	PASS
				-20	23.86	0.0129	PASS
				-10	28.44	0.01537	PASS
				0	16.95	0.00916	PASS
				10	23.99	0.01297	PASS
				20	34.64	0.01872	PASS
				30	24.54	0.01326	PASS
				40	29.35	0.01586	PASS
				50	23.44	0.01267	PASS
		MCH	VN	-30	19.66	0.01046	PASS
				-20	15.88	0.00845	PASS
				-10	16.43	0.00874	PASS
				0	19.44	0.01034	PASS
				10	18.44	0.00981	PASS
				20	22.89	0.01218	PASS
				30	21.44	0.0114	PASS
				40	14.37	0.00764	PASS
				50	21.11	0.01123	PASS
		HCH	VN	-30	24.34	0.01274	PASS
				-20	22.60	0.01183	PASS
				-10	15.40	0.00806	PASS
				0	19.37	0.01014	PASS
				10	19.63	0.01028	PASS
				20	18.21	0.00954	PASS
				30	26.64	0.01395	PASS
				40	19.95	0.01045	PASS
				50	19.95	0.01045	PASS

END