Appendix for test report

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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	31.58	31.93	38.5	PASS
		MCH	31.36	31.71	38.5	PASS
		HCH	31.47	31.82	38.5	PASS
	GSM/TM2	LCH	24.95	25.3	38.5	PASS
		MCH	24.93	25.28	38.5	PASS
		HCH	24.9	25.25	38.5	PASS
Test Band	**Test Mode**	**Test Channel**	**Measured[dBm]**	**EIRP [dBm]**	**Limit [dBm]**	**Verdict**
PCS1900	GSM/TM1	LCH	28.92	31.42	33	PASS
		MCH	28.88	31.38	33	PASS
		HCH	28.57	31.07	33	PASS
	GSM/TM2	LCH	25.12	27.62	33	PASS
		MCH	25.15	27.65	33	PASS
		HCH	25.11	27.61	33	PASS

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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,

ERP [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]

EIRP [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBi]

b, SGP=Signal Generator Level

Note2:

SET Span = 1.5 * OBW

SET RBW = 1% of the OBW,not to exceed 1MHz

SET VBW >= 3 * RBW

SET Sweep time = auto - couple.

Detector: RMS

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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	0.22	13	PASS
		MCH	0.25	13	PASS
		HCH	0.25	13	PASS
	GSM/TM2	LCH	2.86	13	PASS
		MCH	2.9	13	PASS
		HCH	2.79	13	PASS
GSM1900	GSM/TM1	LCH	0.19	13	PASS
		MCH	0.2	13	PASS
		HCH	0.2	13	PASS
	GSM/TM2	LCH	3.04	13	PASS
		MCH	3.03	13	PASS
		HCH	2.99	13	PASS

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3Appendix_C: Modulation Characteristics

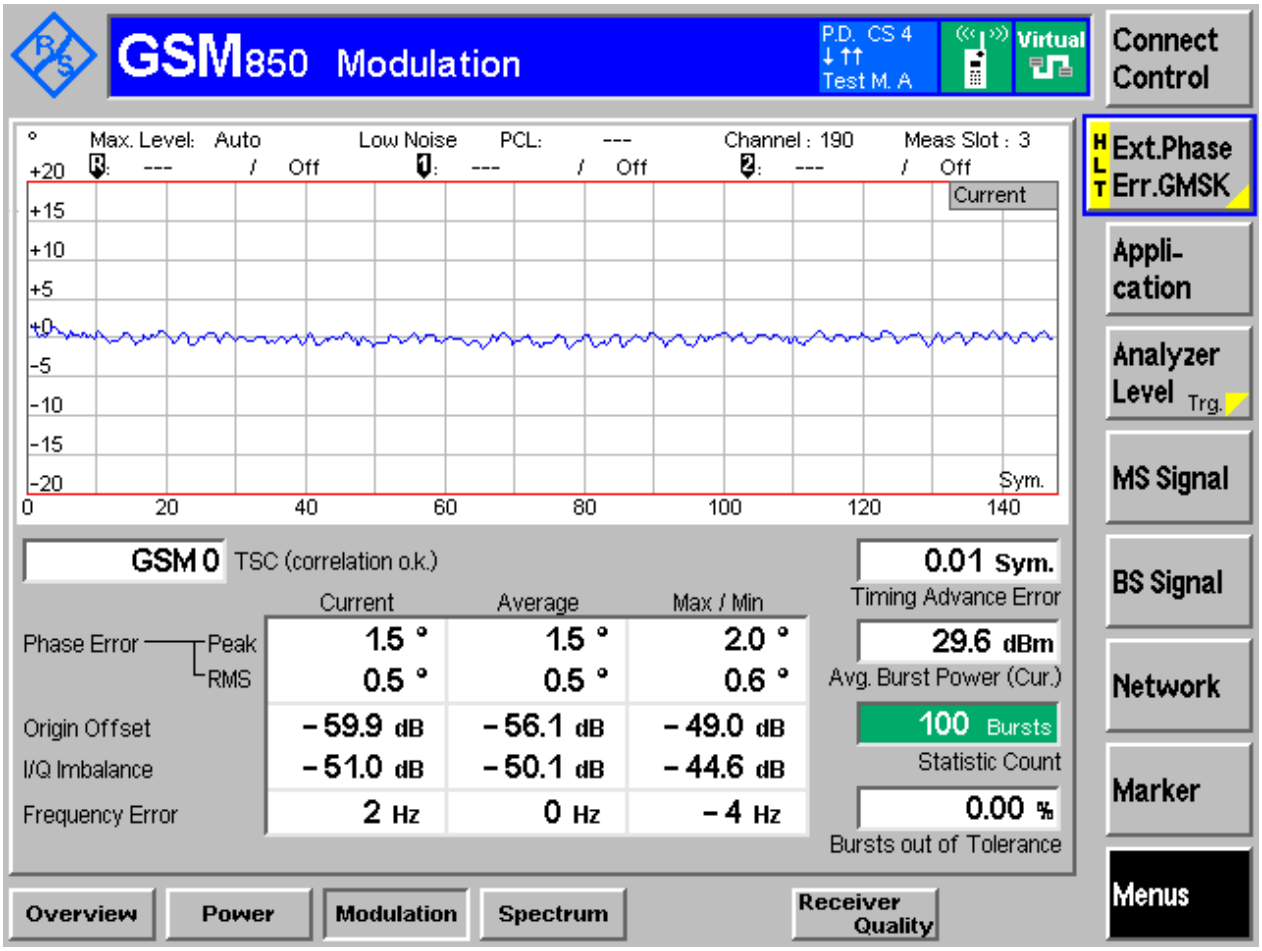
Part I - Test Plots

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



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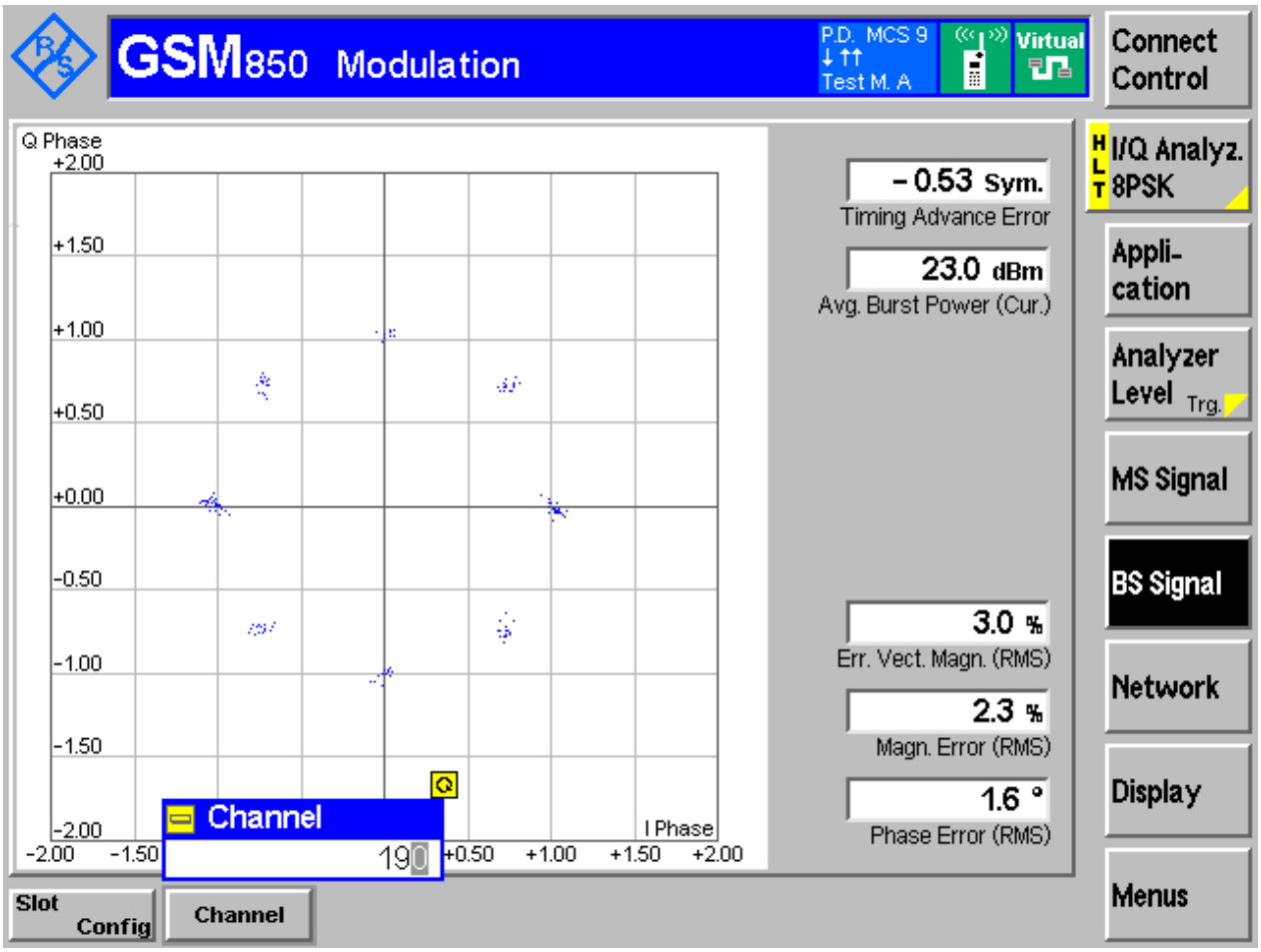
3.1.1.2 Test Mode = GSM/TM2

3.1.1.2.1 Test Channel = MCH



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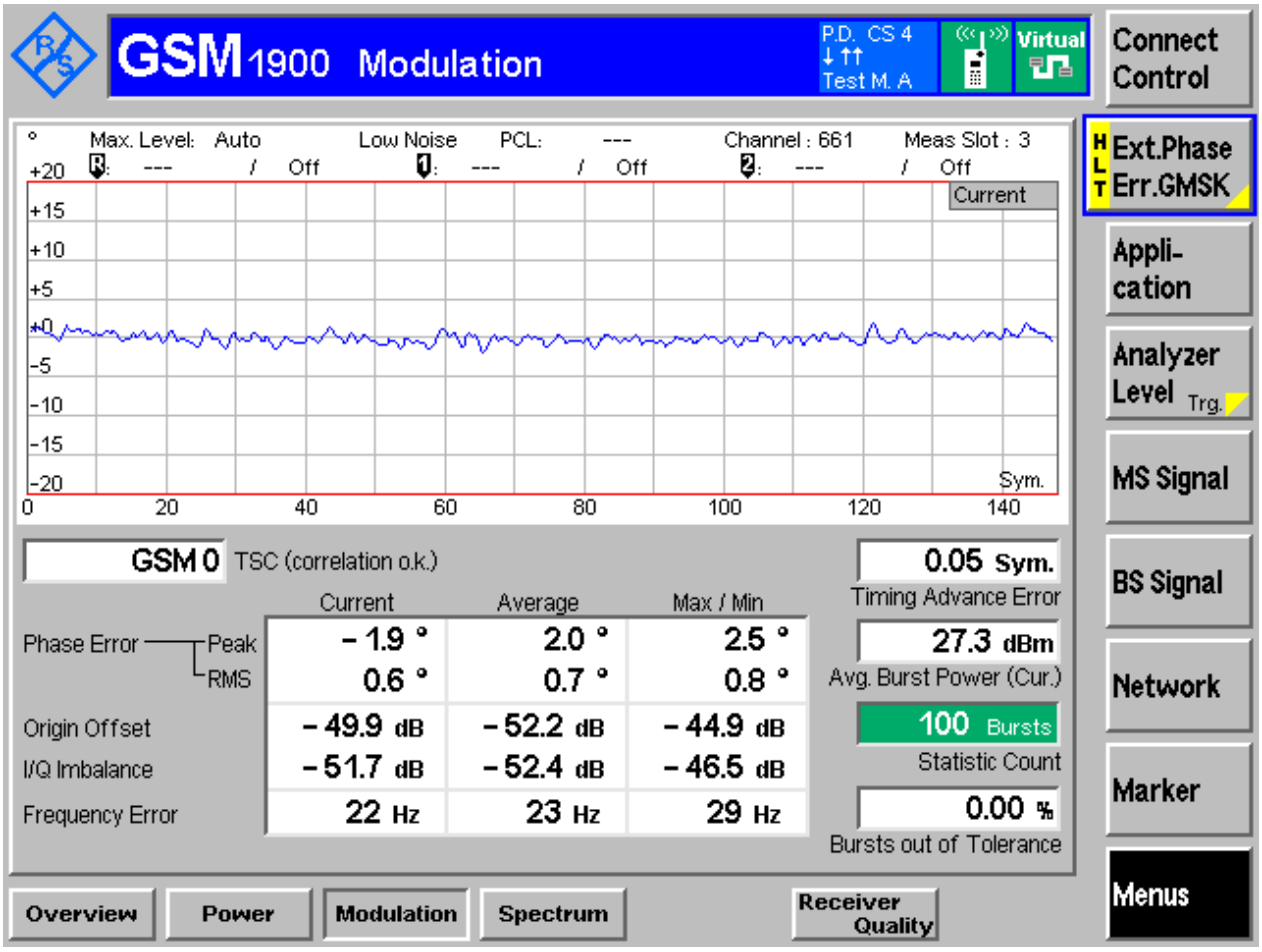
3.1.2 Test Band = GSM1900

3.1.2.1 Test Mode = GSM/TM1

3.1.2.1.1 Test Channel = MCH



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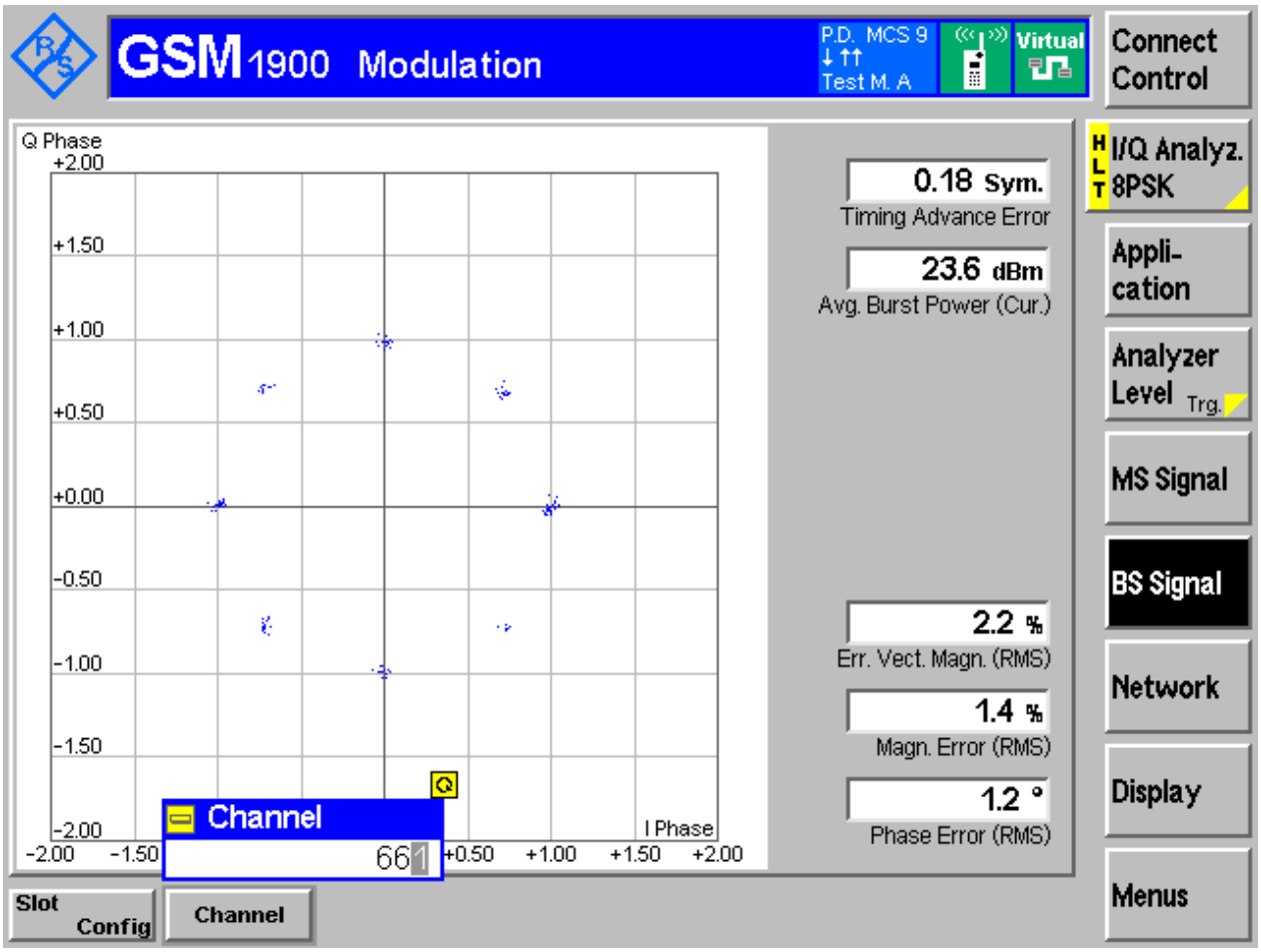
3.1.2.2 Test Mode = GSM/TM2

3.1.2.2.1 Test Channel = MCH



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4Appendix_D: Bandwidth

Part I - Test Results

Test Band	Test Mode	Test Channel	Occupied Bandwidth [kHz]	Emission Bandwidth [kHz]	Verdict
GSM850	GSM/TM1	LCH	244.60	317.53	Pass
		MCH	242.93	311.55	Pass
		HCH	243.88	316.31	Pass
	GSM/TM2	LCH	250.89	316.69	Pass
		MCH	243.66	317.61	Pass
		HCH	253.88	319.56	Pass
GSM1900	GSM/TM1	LCH	243.26	311.92	Pass
		MCH	246.90	314.76	Pass
		HCH	245.19	309.02	Pass
	GSM/TM2	LCH	240.12	314.98	Pass
		MCH	242.22	315.31	Pass
		HCH	242.51	305.62	Pass

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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

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4.1.1.1.2 Test Channel = MCH

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4.1.1.1.3 Test Channel = HCH

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4.1.1.2 Test Mode = GSM/TM2

4.1.1.2.1 Test Channel = LCH

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4.1.1.2.2 Test Channel = MCH

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4.1.1.2.3 Test Channel = HCH

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4.1.2 Test Band = GSM1900

4.1.2.1 Test Mode = GSM/TM1

4.1.2.1.1 Test Channel = LCH

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4.1.2.1.2 Test Channel = MCH

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4.1.2.1.3 Test Channel = HCH

Copyright © Huawei Technologies Co., Ltd.

4.1.2.2 Test Mode = GSM/TM2

4.1.2.2.1 Test Channel = LCH

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4.1.2.2.2 Test Channel = MCH

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4.1.2.2.3 Test Channel = HCH

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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

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5.1.1.1.2 Test Channel = HCH

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5.1.1.2 Test Mode = GSM/TM2

5.1.1.2.1 Test Channel = LCH

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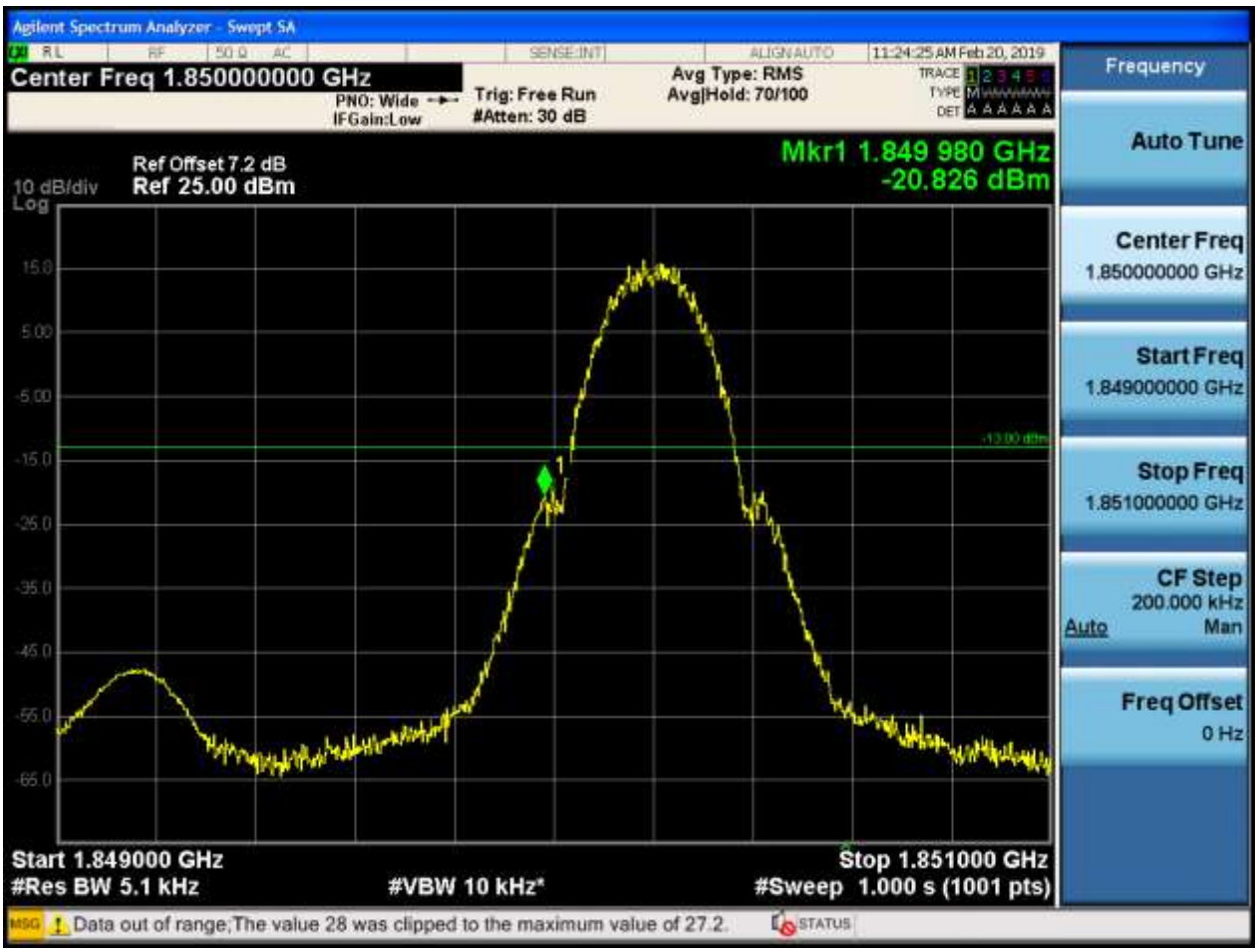
5.1.1.2.2 Test Channel = HCH

5.1.2 Test Band = GSM1900

5.1.2.1 Test Mode = GSM/TM1

5.1.2.1.1 Test Channel = LCH



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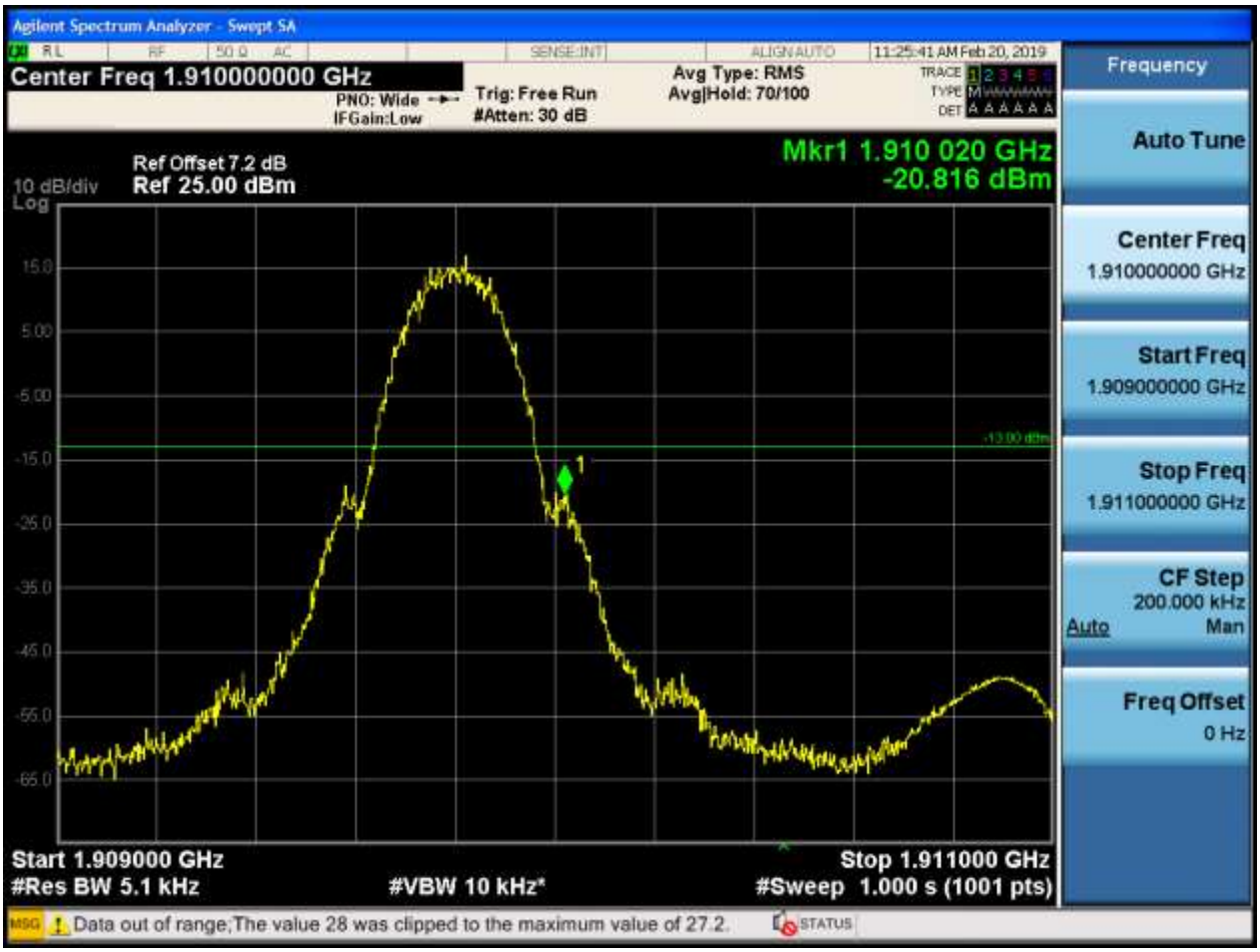
5.1.2.1.2 Test Channel = HCH



5.1.2.2 Test Mode = GSM/TM2

5.1.2.2.1 Test Channel = LCH

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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

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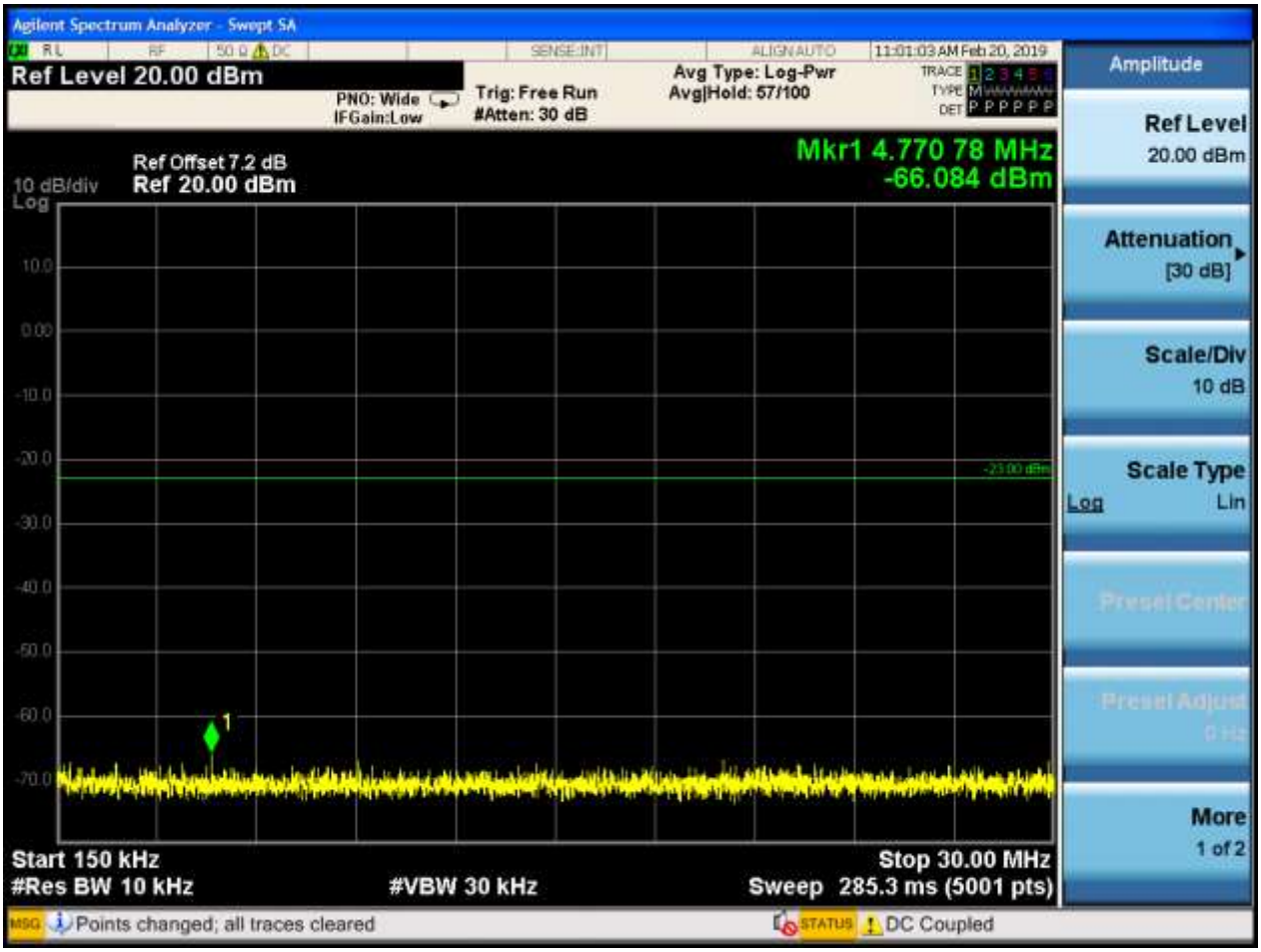

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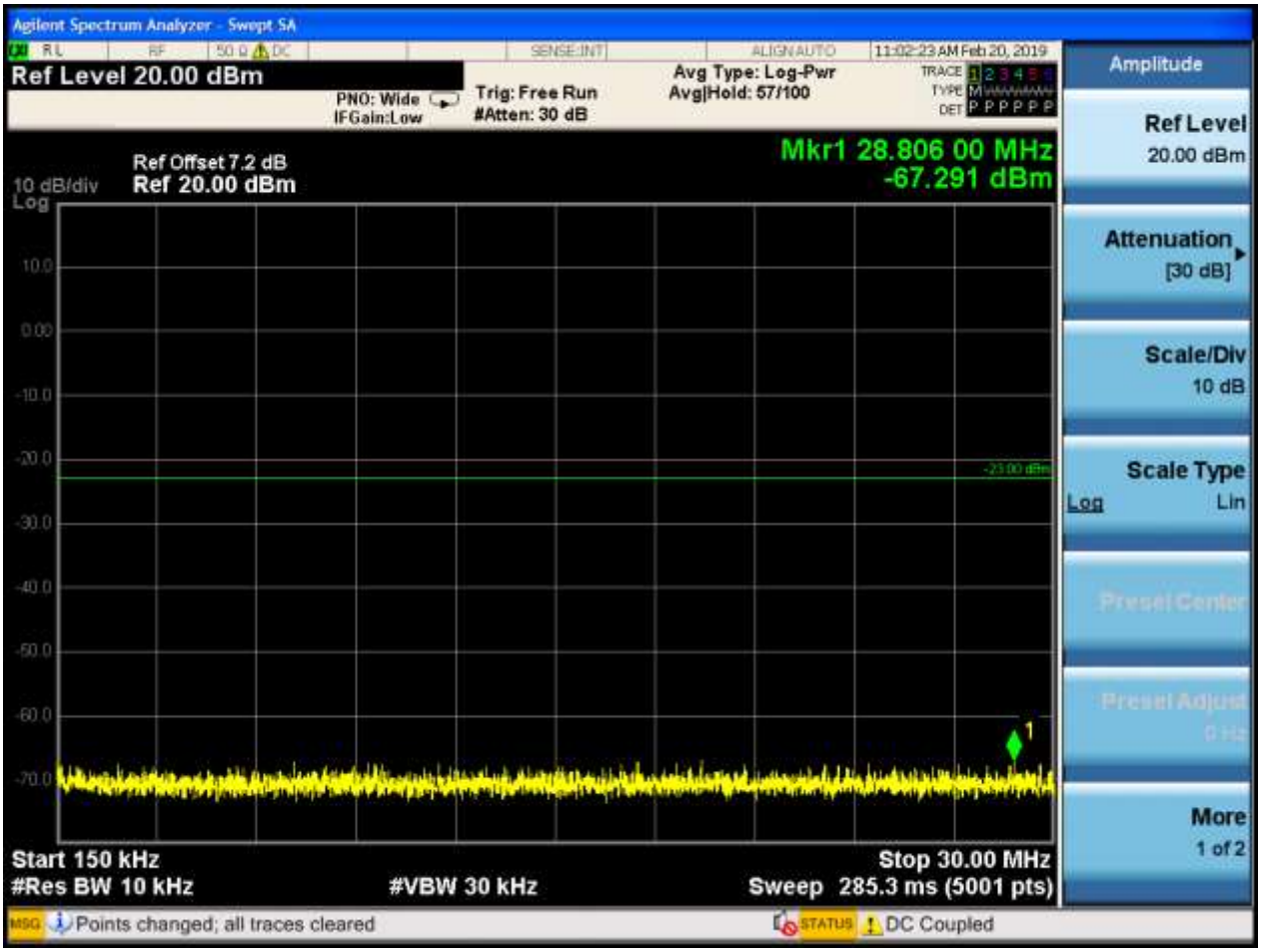
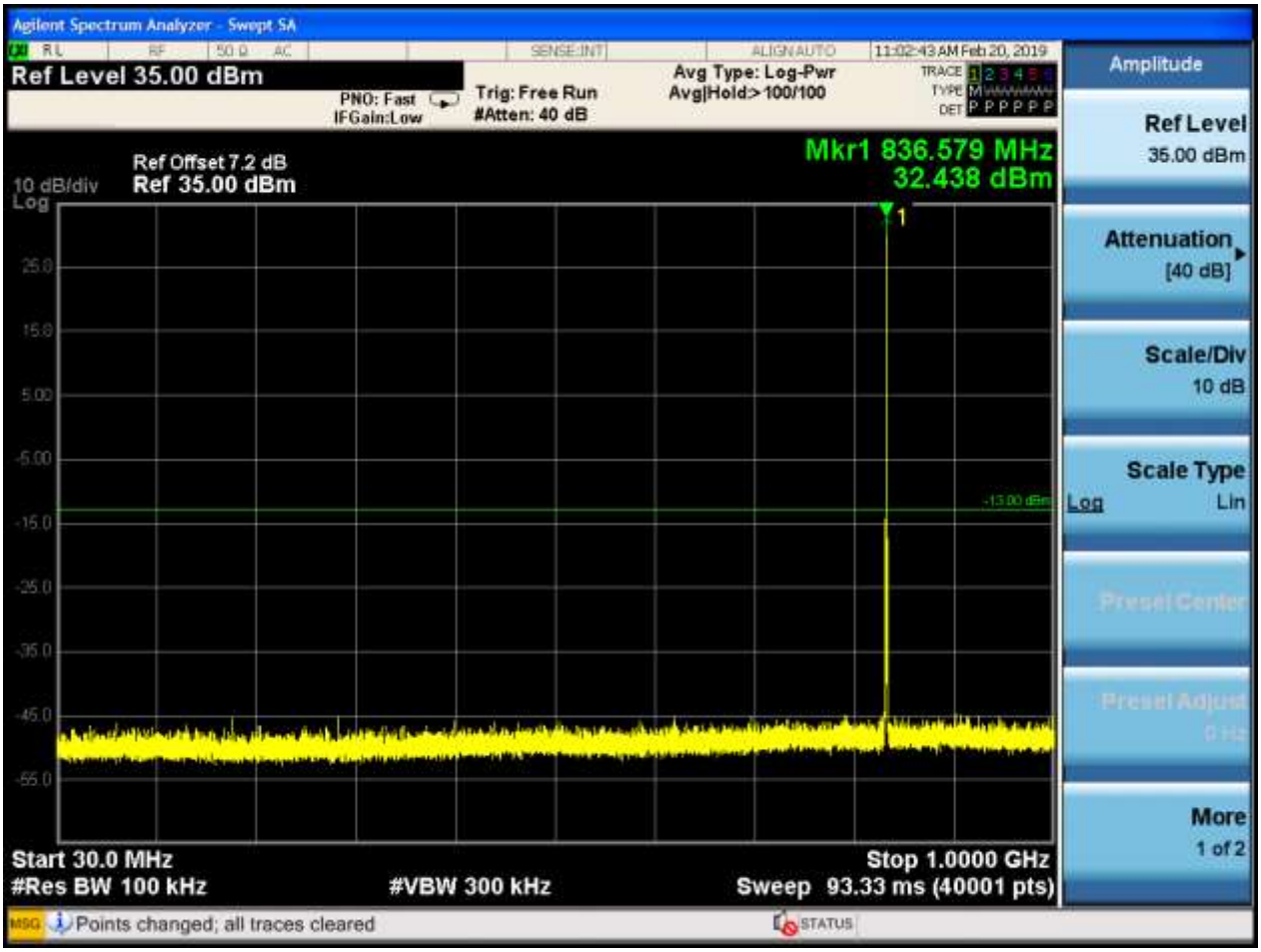
6.1.1.1.2 Test Channel = MCH



Copyright © Huawei Technologies Co., Ltd.



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6.1.1.1.3 Test Channel = HCH

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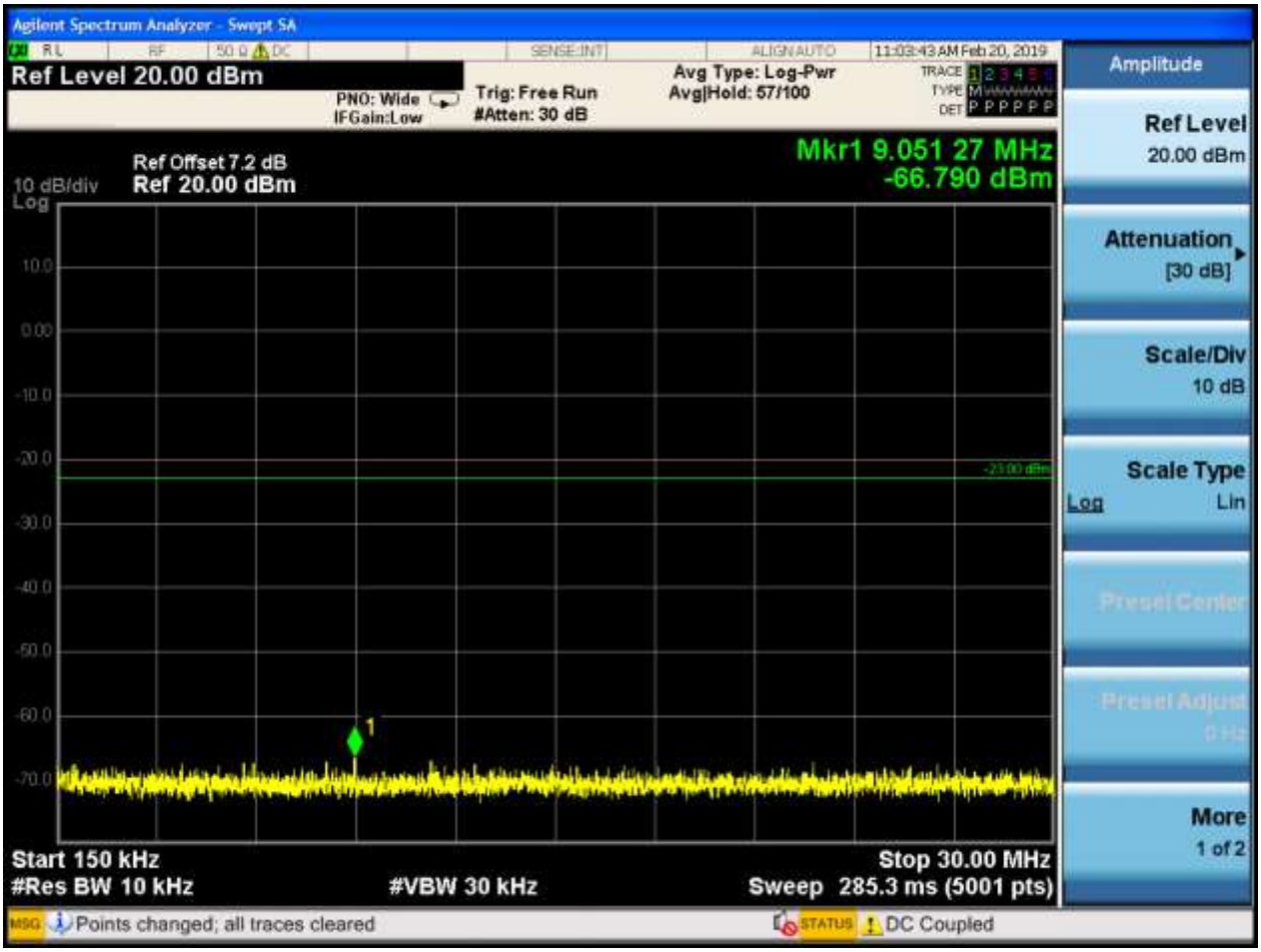
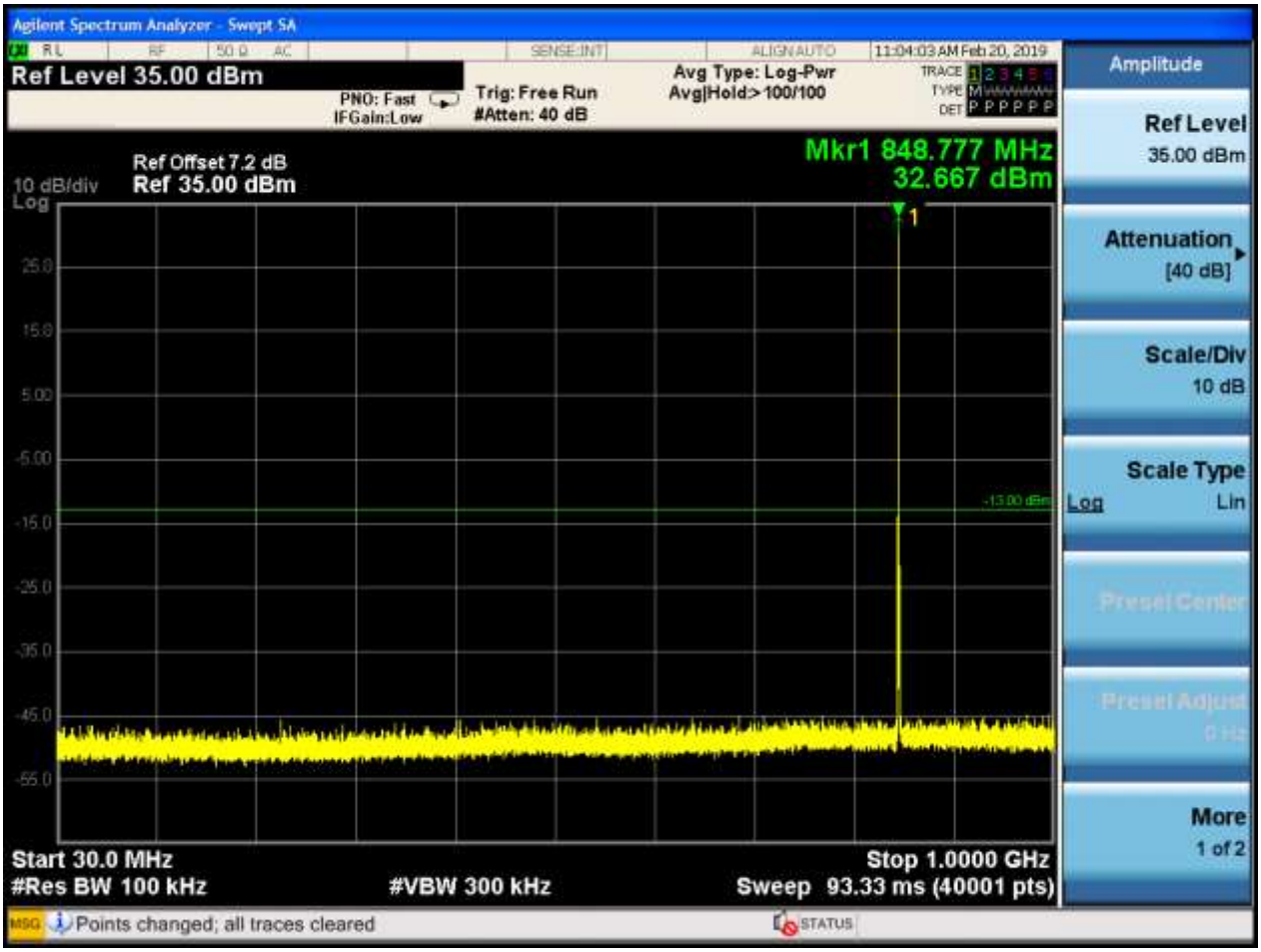


Copyright © Huawei Technologies Co., Ltd.



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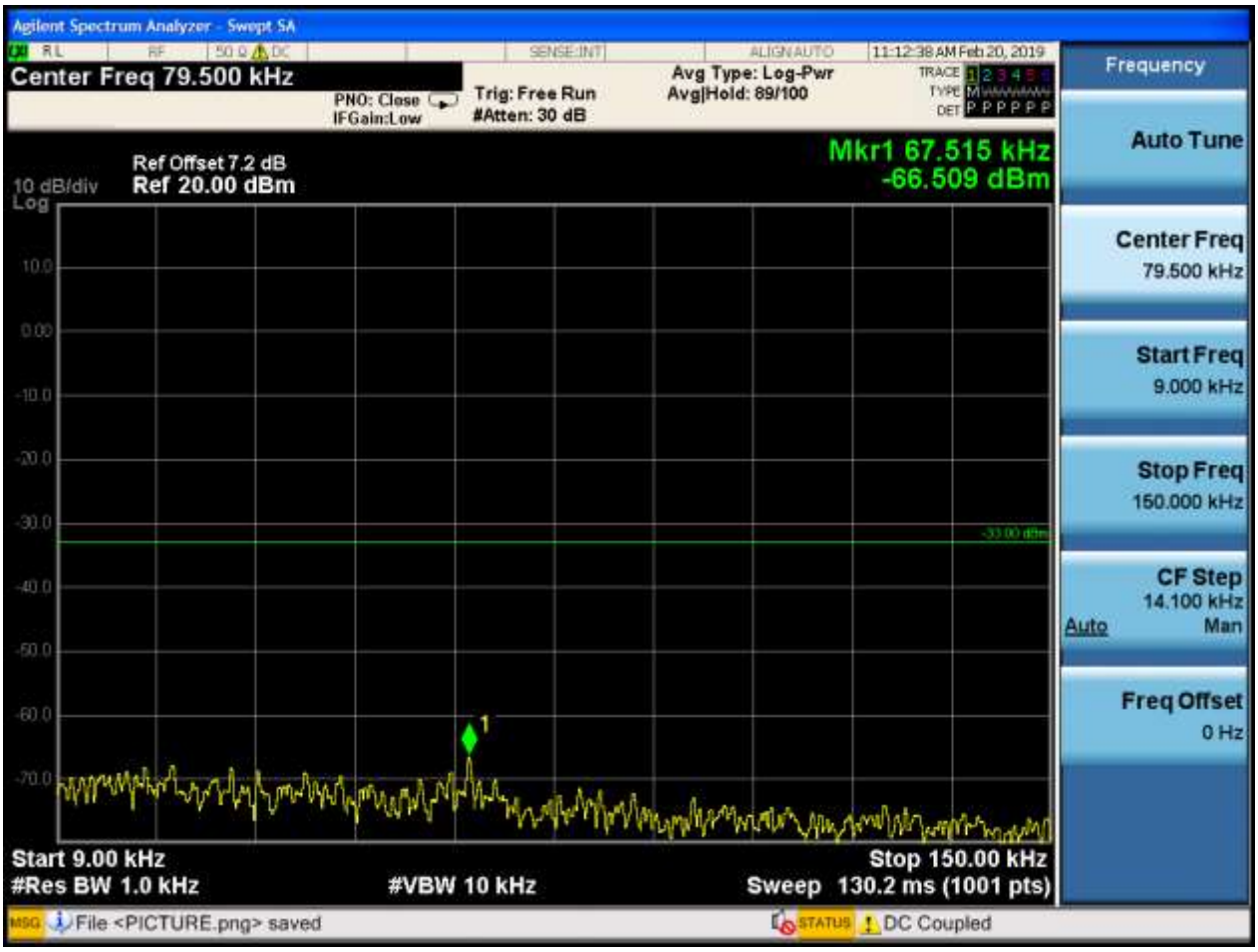
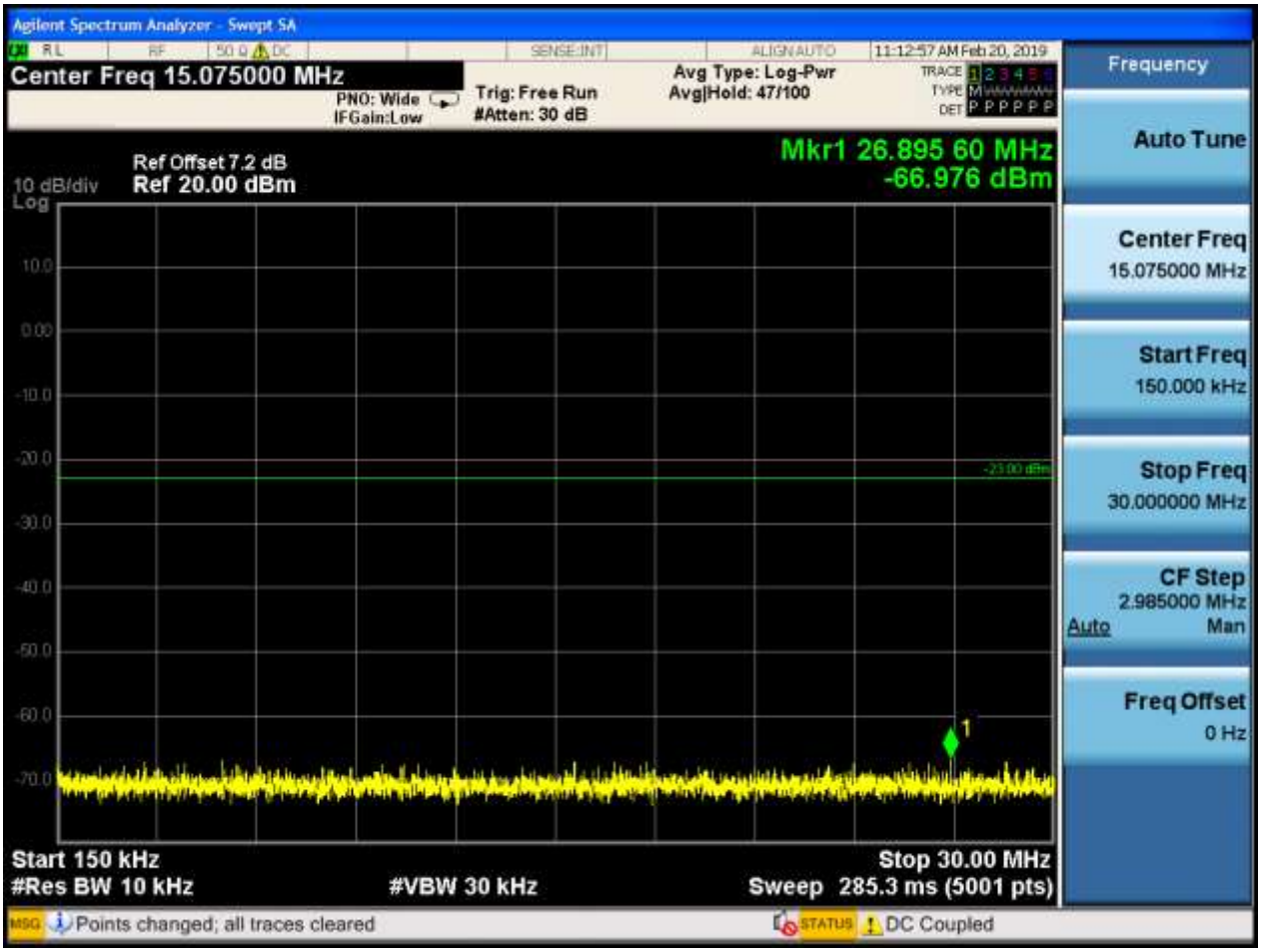
6.1.1.2 Test Mode = GSM/TM2

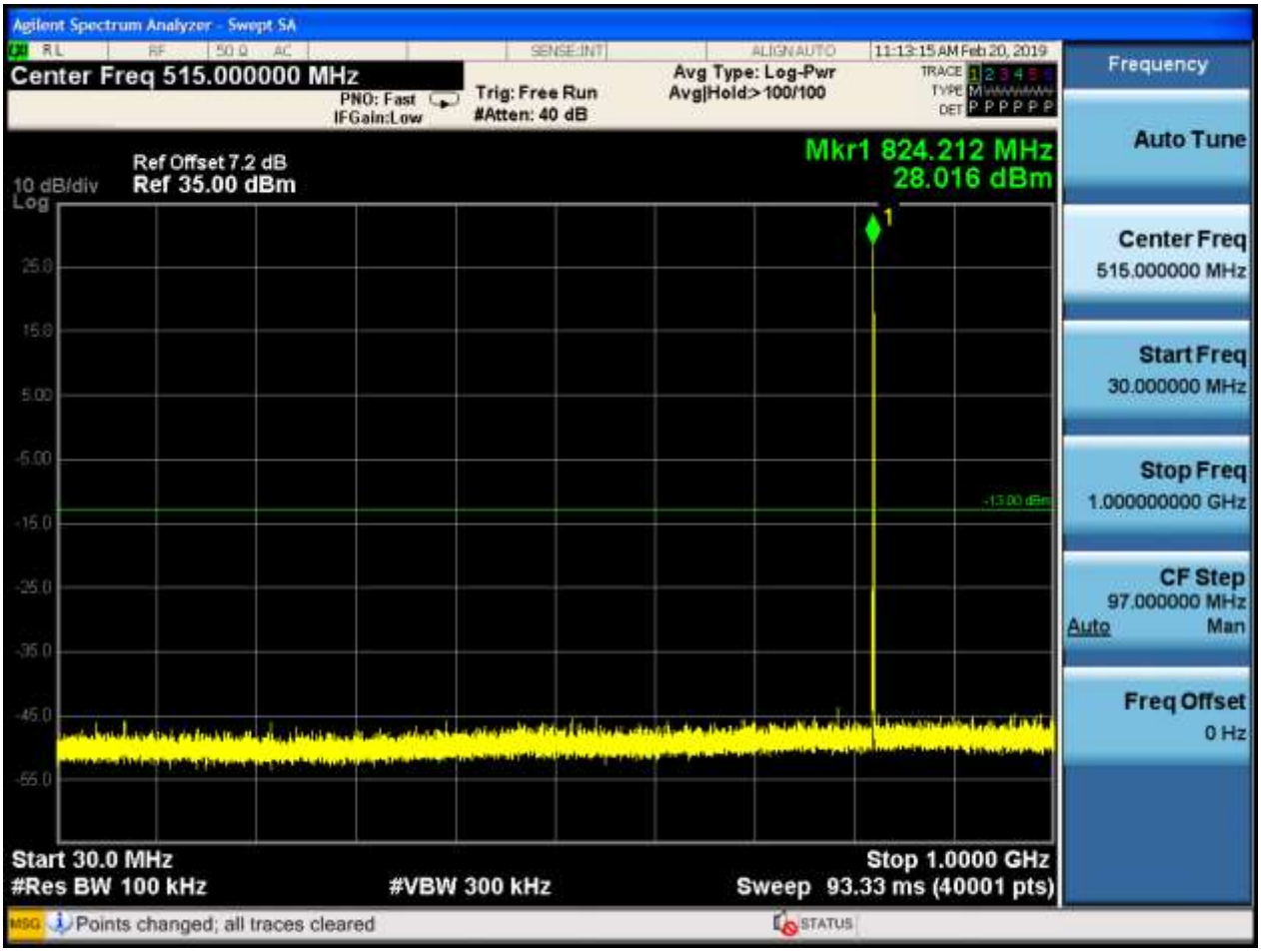
6.1.1.2.1 Test Channel = LCH



Copyright © Huawei Technologies Co., Ltd.



Copyright © Huawei Technologies Co., Ltd.



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6.1.1.2.2 Test Channel = MCH

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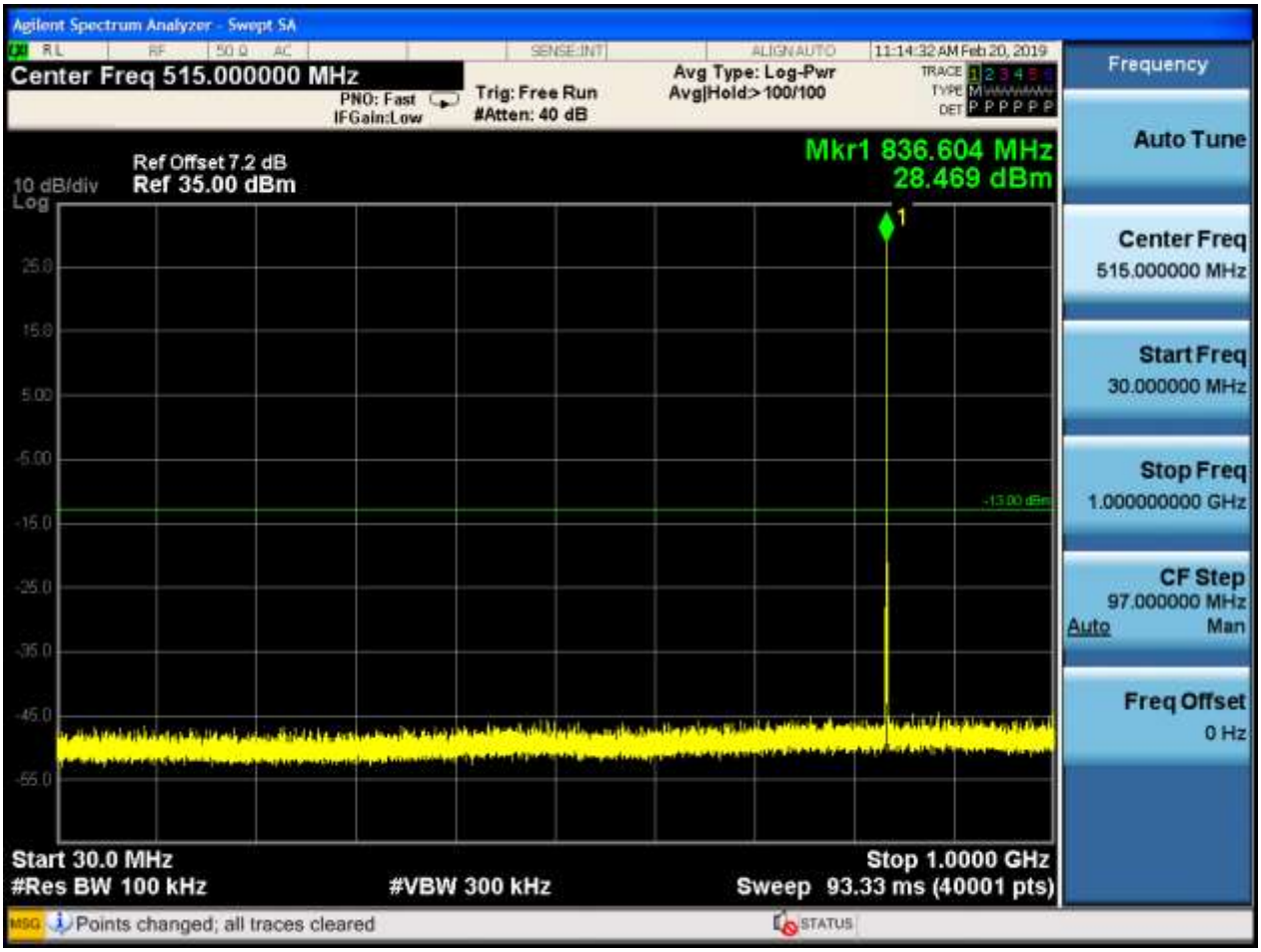
Agilent Spectrum Analyzer - Swept SA
Center Freq 515.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
11:14:32 AM Feb 20, 2019
Ref Offset 7.2 dB
10 dB/div
Ref 35.00 dBm
Log
Mkr1 836.604 MHz
28.469 dBm
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1.0000 GHz
Sweep 93.33 ms (40001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
515.000000 MHz
Start Freq
30.000000 MHz
Stop Freq
1.000000000 GHz
CF Step
97.000000 MHz
Auto
Man
Freq Offset
0 Hz

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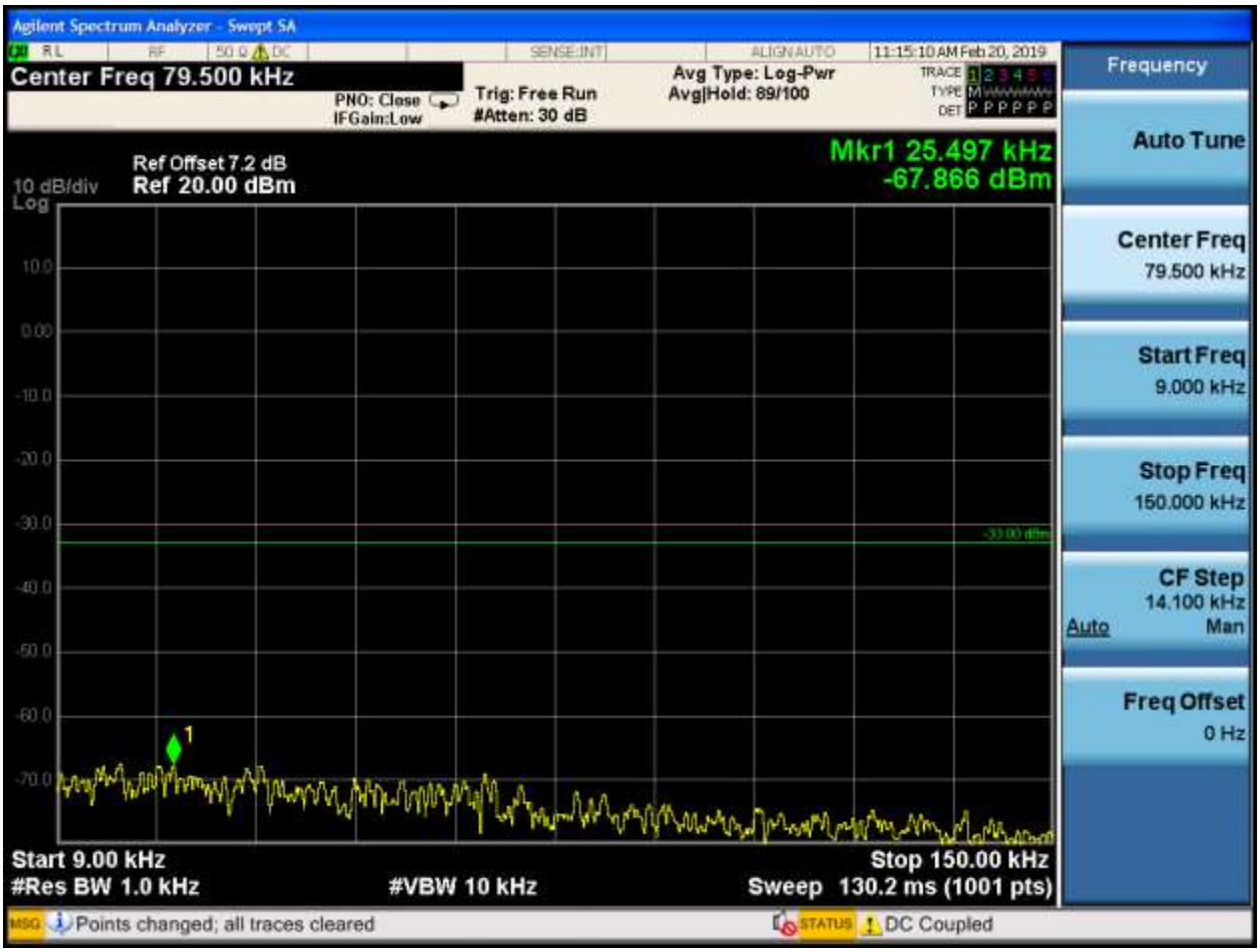
6.1.1.2.3 Test Channel = HCH



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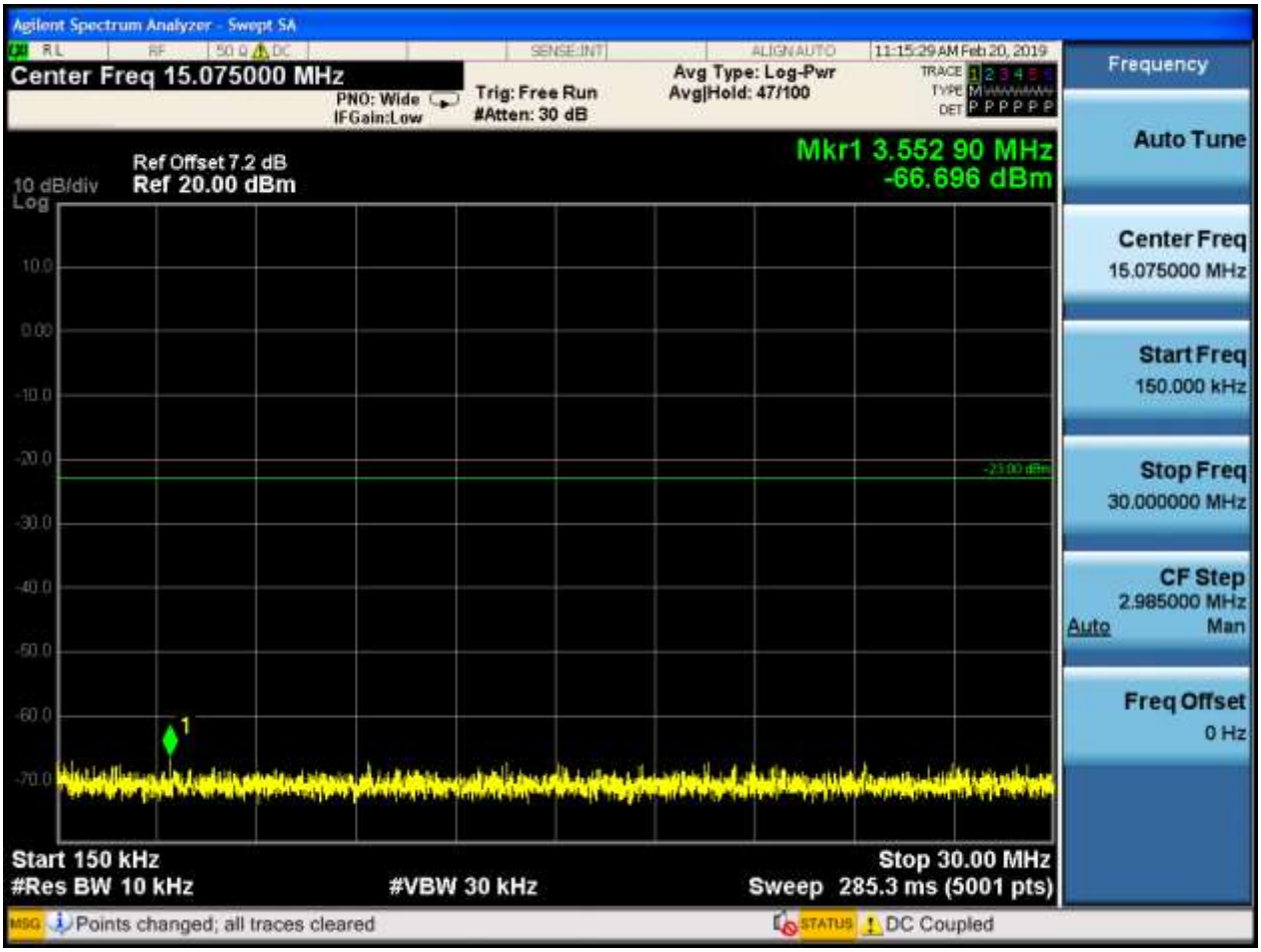
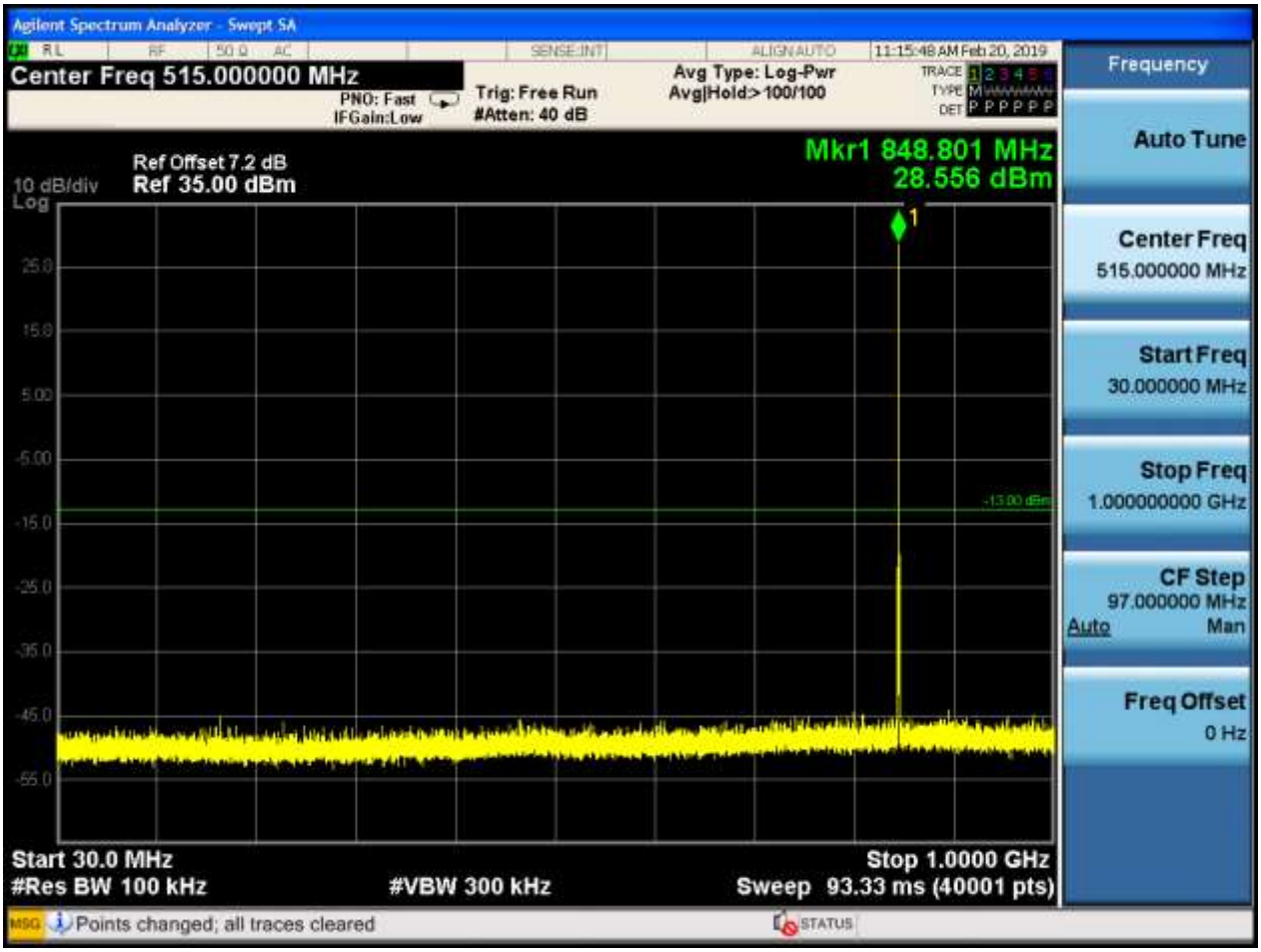

Agilent Spectrum Analyzer - Swept SA
Center Freq 15.075000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 47/100
11:15:29 AM Feb 20, 2019
Ref Offset 7.2 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 3.552 90 MHz
-66.696 dBm
Start 150 kHz
#Res BW 10 kHz
#VBW 30 kHz
Stop 30.00 MHz
Sweep 285.3 ms (5001 pts)
Points changed; all traces cleared
DC Coupled
Frequency
Auto Tune
Center Freq
15.075000 MHz
Start Freq
150.000 kHz
Stop Freq
30.000000 MHz
CF Step
2.985000 MHz
Auto
Man
Freq Offset
0 Hz


Agilent Spectrum Analyzer - Swept SA
Center Freq 515.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
11:15:48 AM Feb 20, 2019
Ref Offset 7.2 dB
10 dB/div
Ref 35.00 dBm
Log
Mkr1 848.801 MHz
28.556 dBm
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1.0000 GHz
Sweep 93.33 ms (40001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
515.000000 MHz
Start Freq
30.000000 MHz
Stop Freq
1.000000000 GHz
CF Step
97.000000 MHz
Auto
Man
Freq Offset
0 Hz

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6.1.2 Test Band = GSM1900

6.1.2.1 Test Mode = GSM/TM1

6.1.2.1.1 Test Channel = LCH

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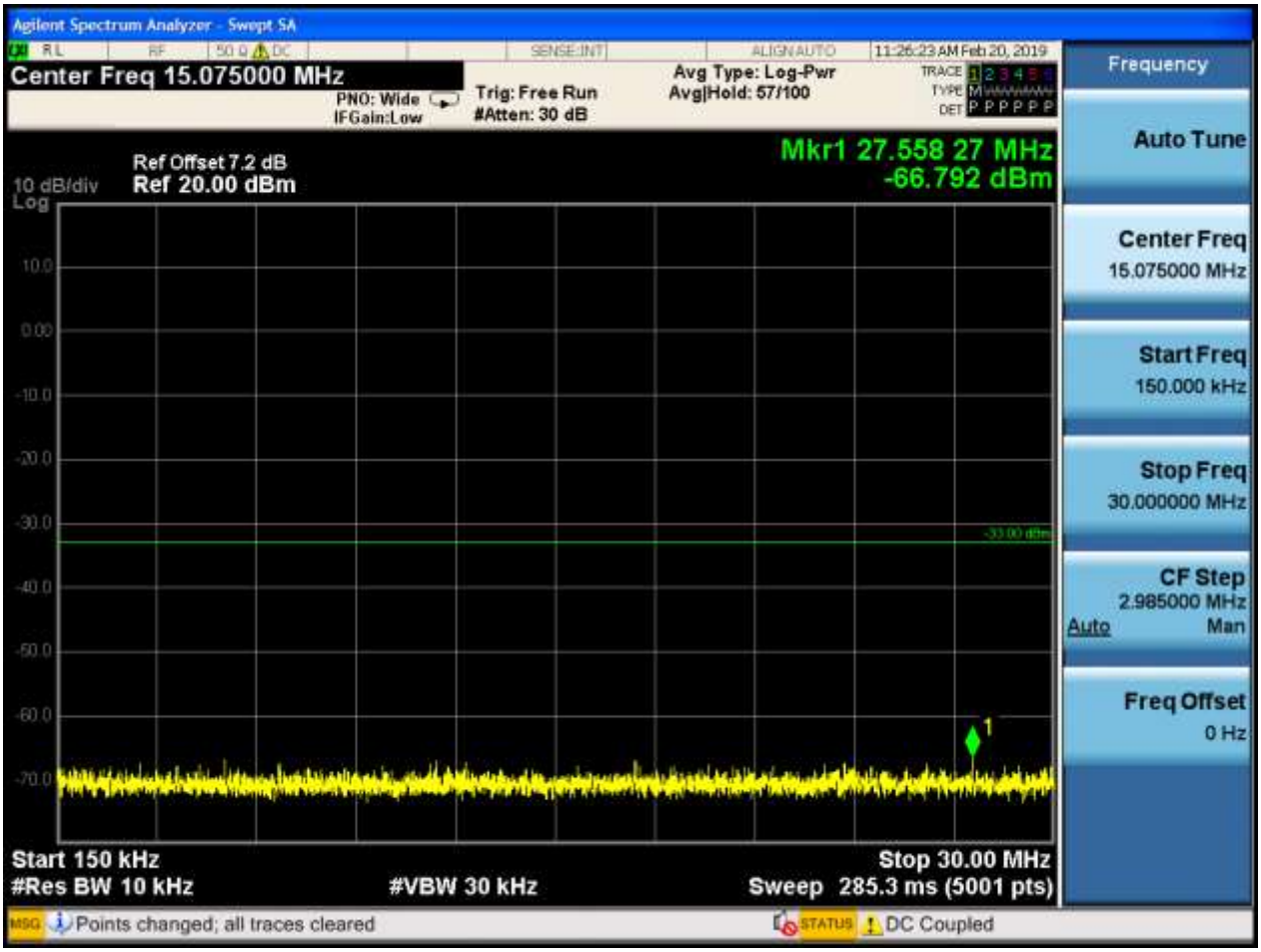

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Agilent Spectrum Analyzer - Swept SA
Center Freq 10.015000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold: 91/100
11:26:43 AM Feb 20, 2019
Ref Offset 7.2 dB
10 dB/div
Ref 35.00 dBm
Log
Mkr1 1.850 3 GHz
28.850 dBm
Start 30 MHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 20.000 GHz
Sweep 50.67 ms (40001 pts)
Frequency
Auto Tune
Center Freq
10.015000000 GHz
Start Freq
30.000000 MHz
Stop Freq
20.000000000 GHz
CF Step
1.997000000 GHz
Auto
Man
Freq Offset
0 Hz

6.1.2.1.2 Test Channel = MCH

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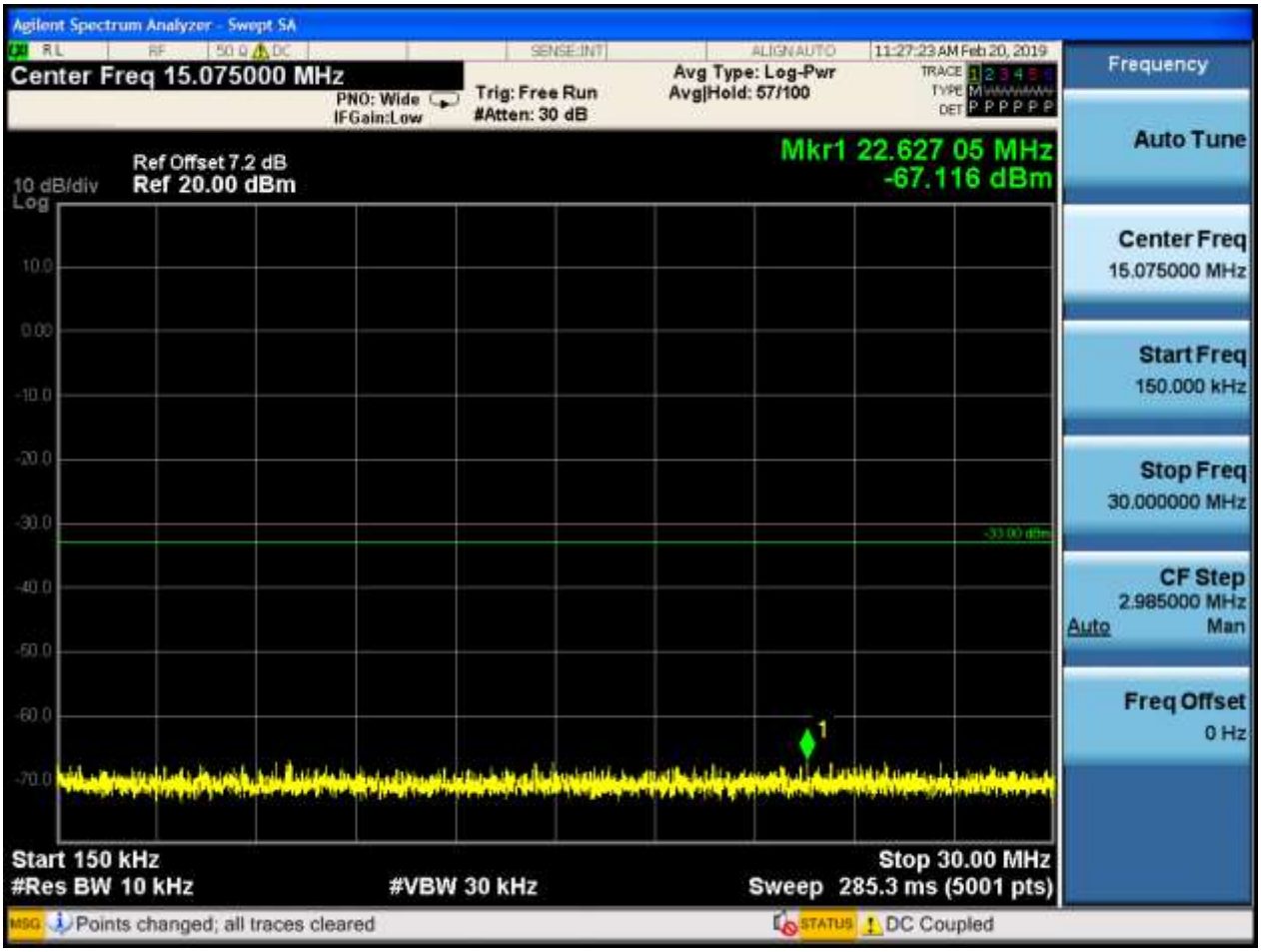

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6.1.2.1.3 Test Channel = HCH

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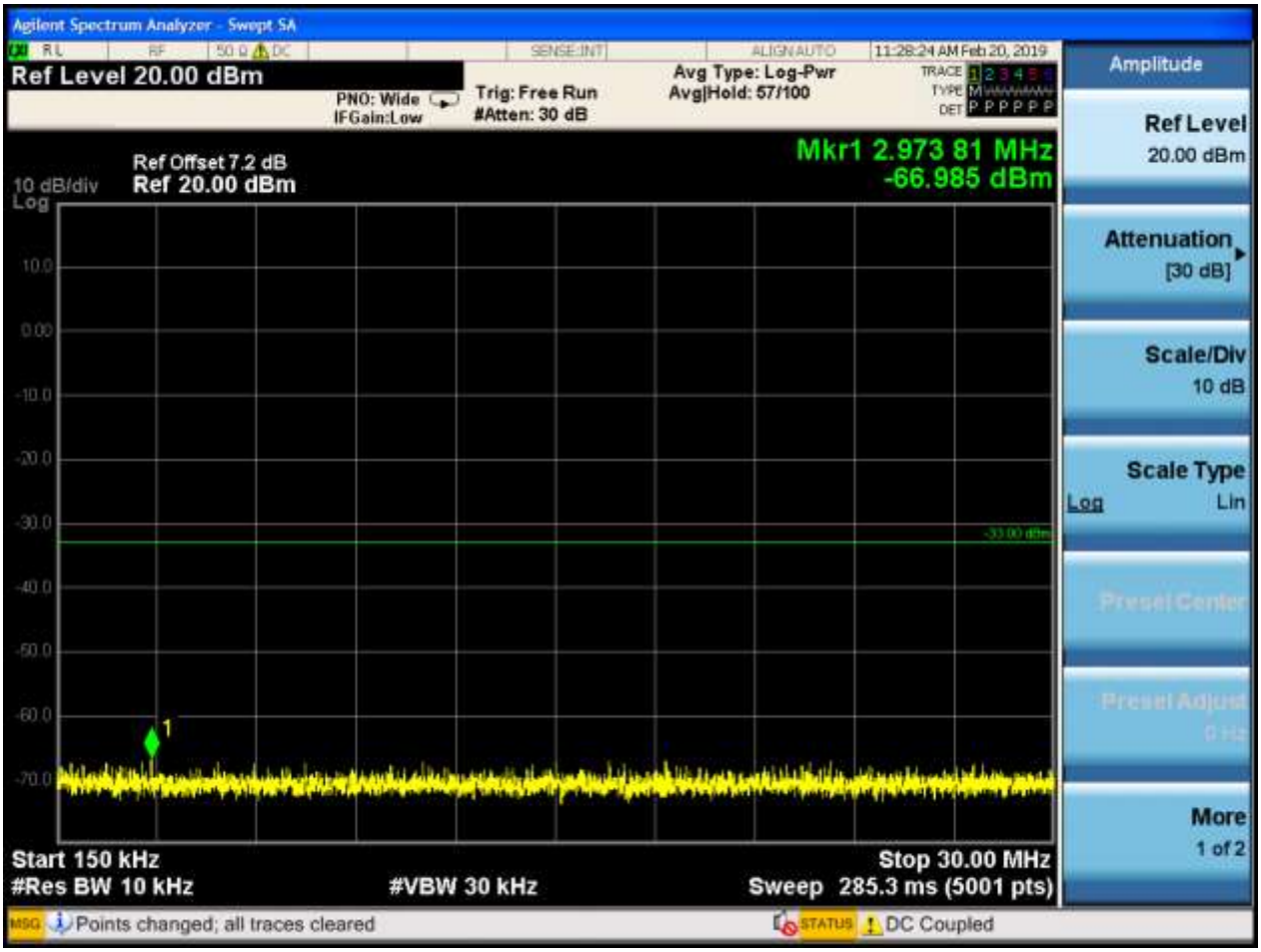

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6.1.2.2 Test Mode = GSM/TM2

6.1.2.2.1 Test Channel = LCH

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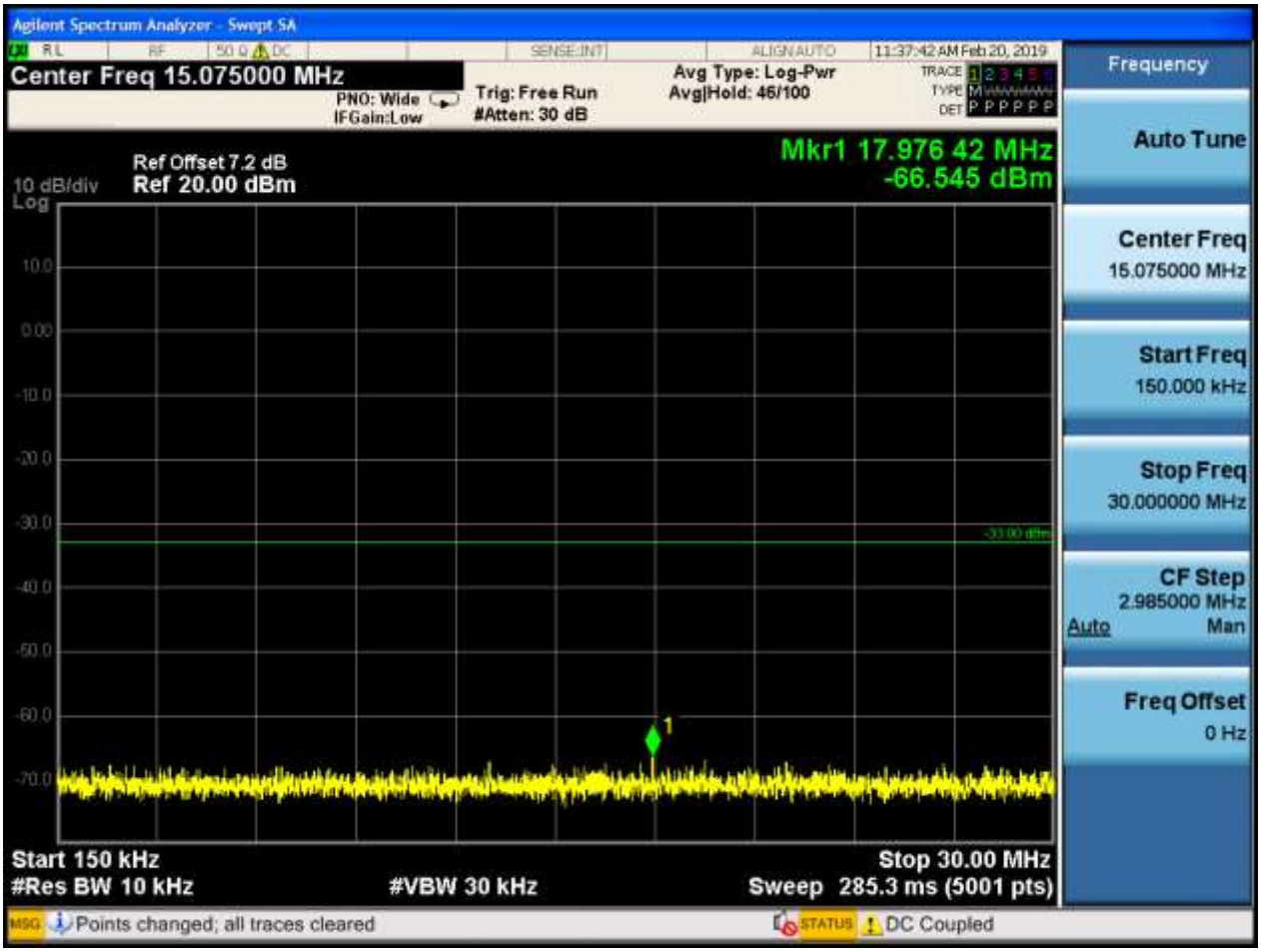
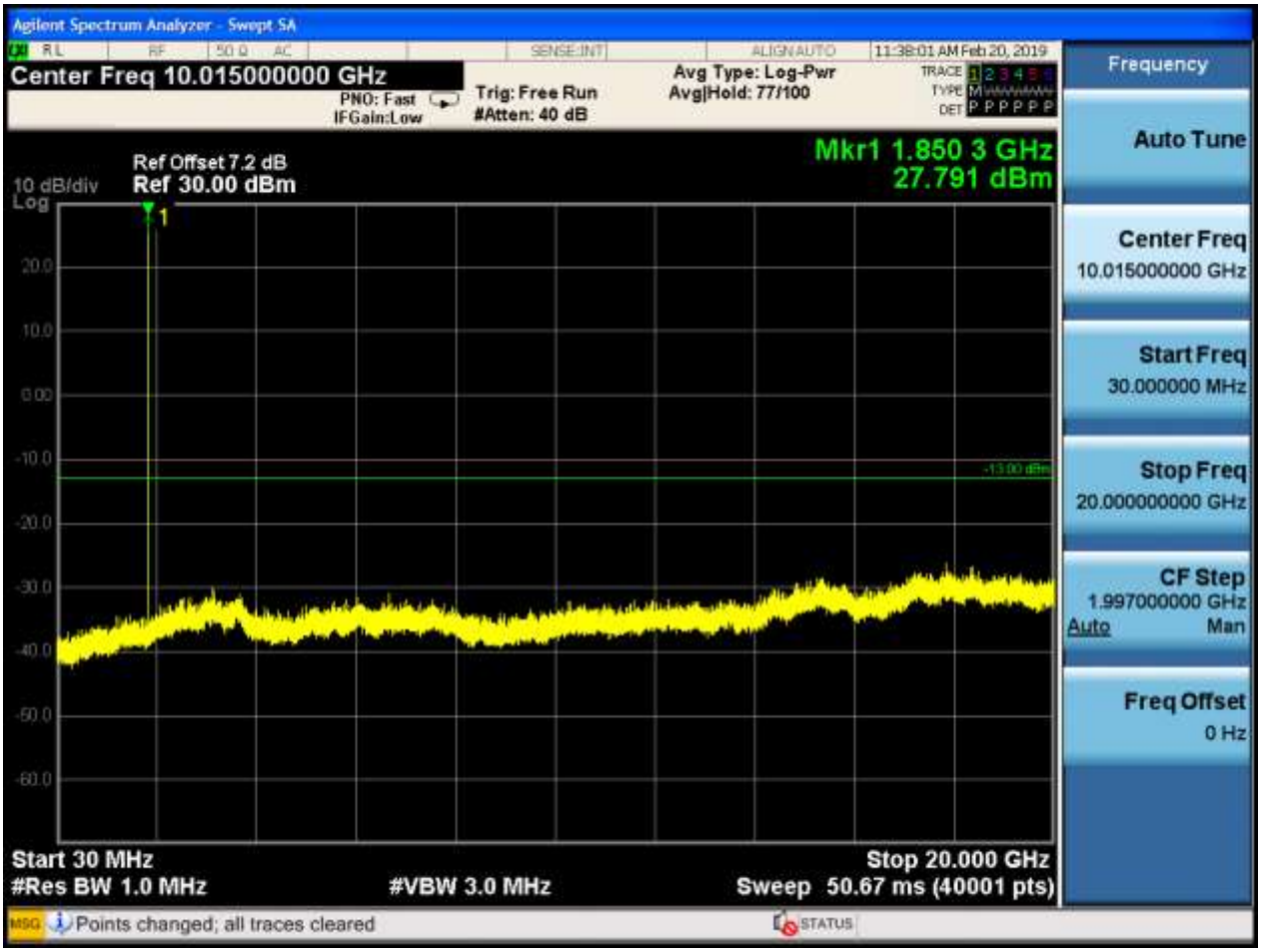


Copyright © Huawei Technologies Co., Ltd.



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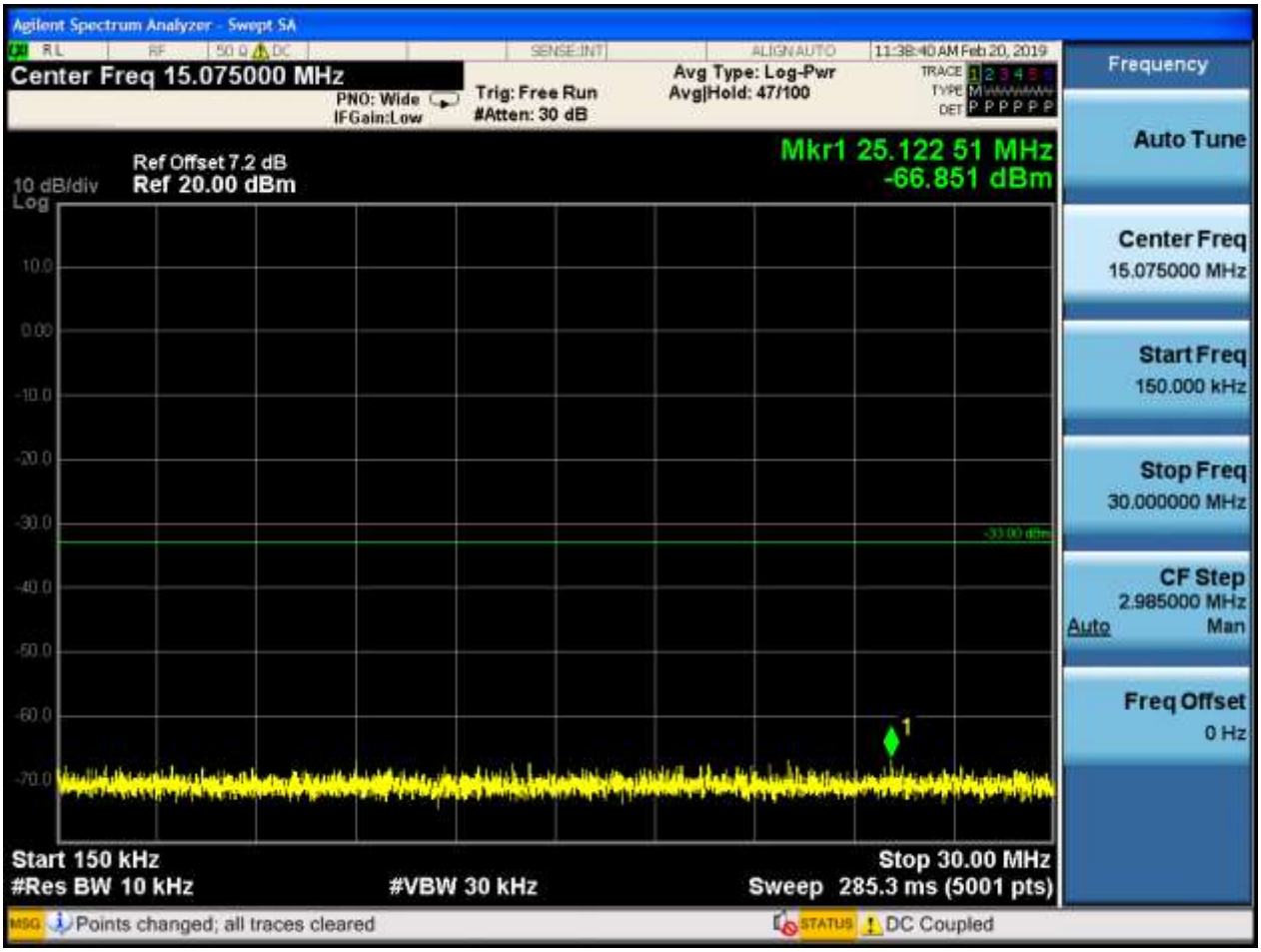
6.1.2.2.2 Test Channel = MCH



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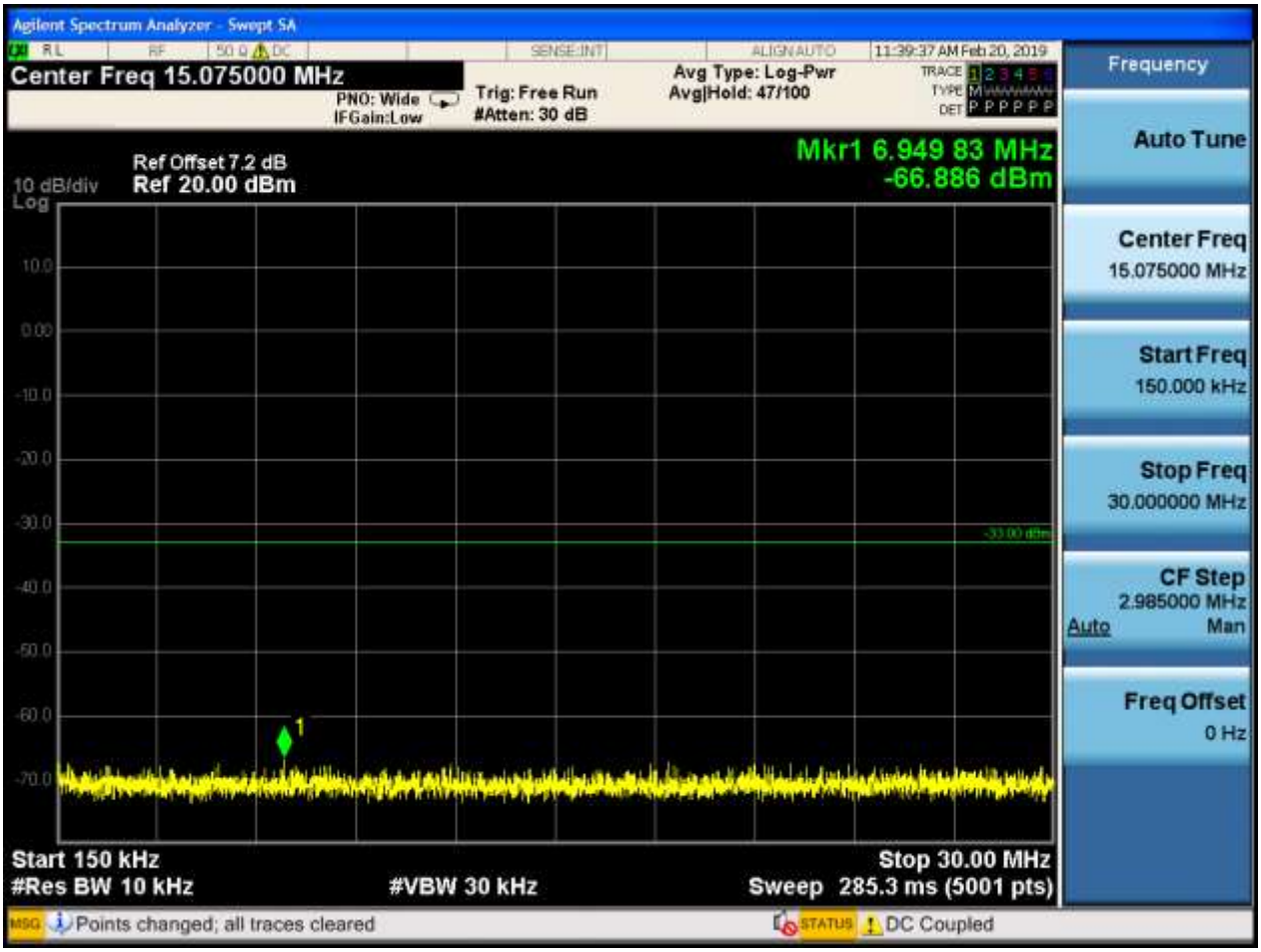
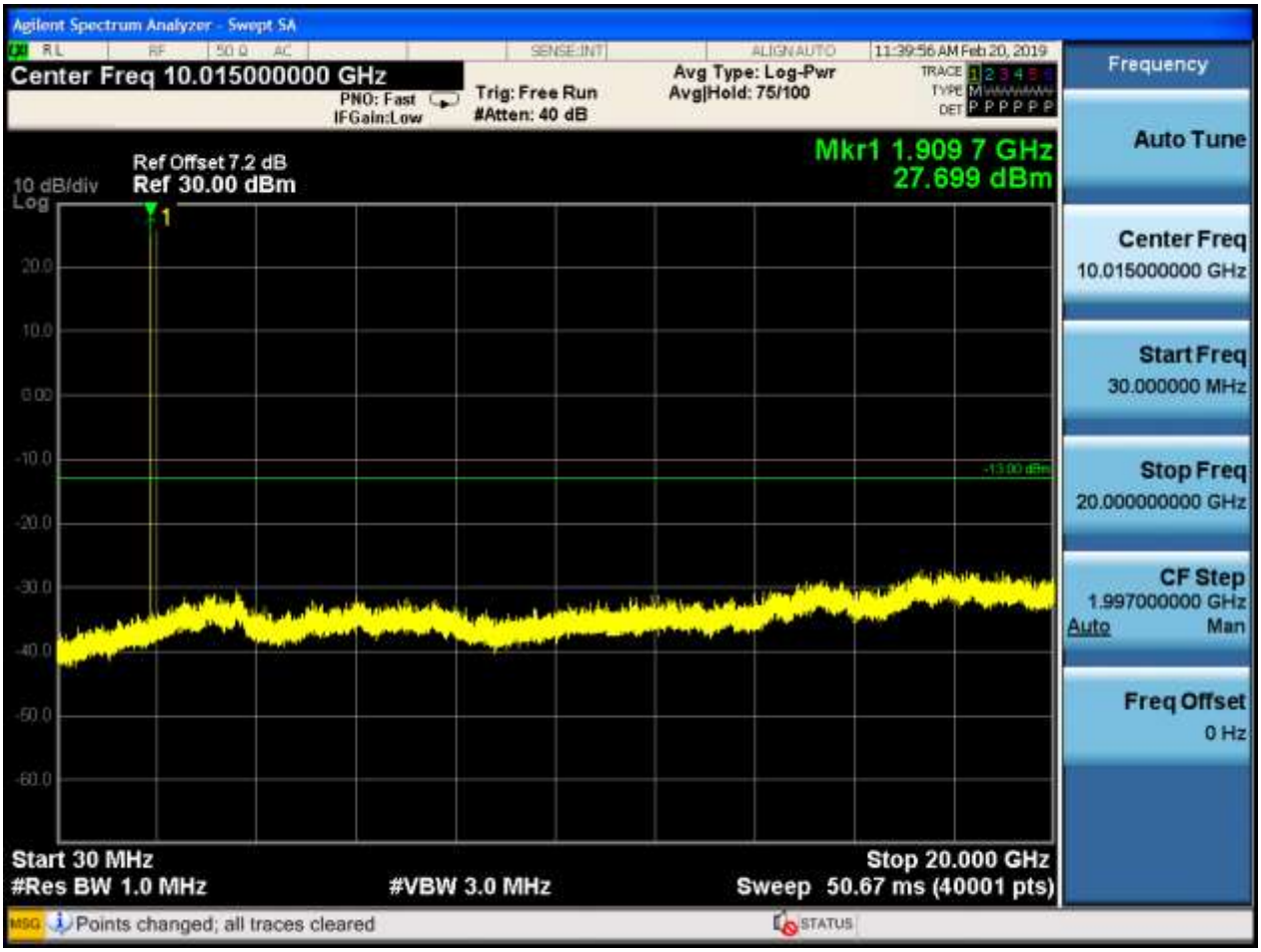
6.1.2.2.3 Test Channel = HCH



Copyright © Huawei Technologies Co., Ltd.



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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_ANT1

7.1.1 Test Band = GSM850

7.1.1.1 Test Mode = GSM/TM1

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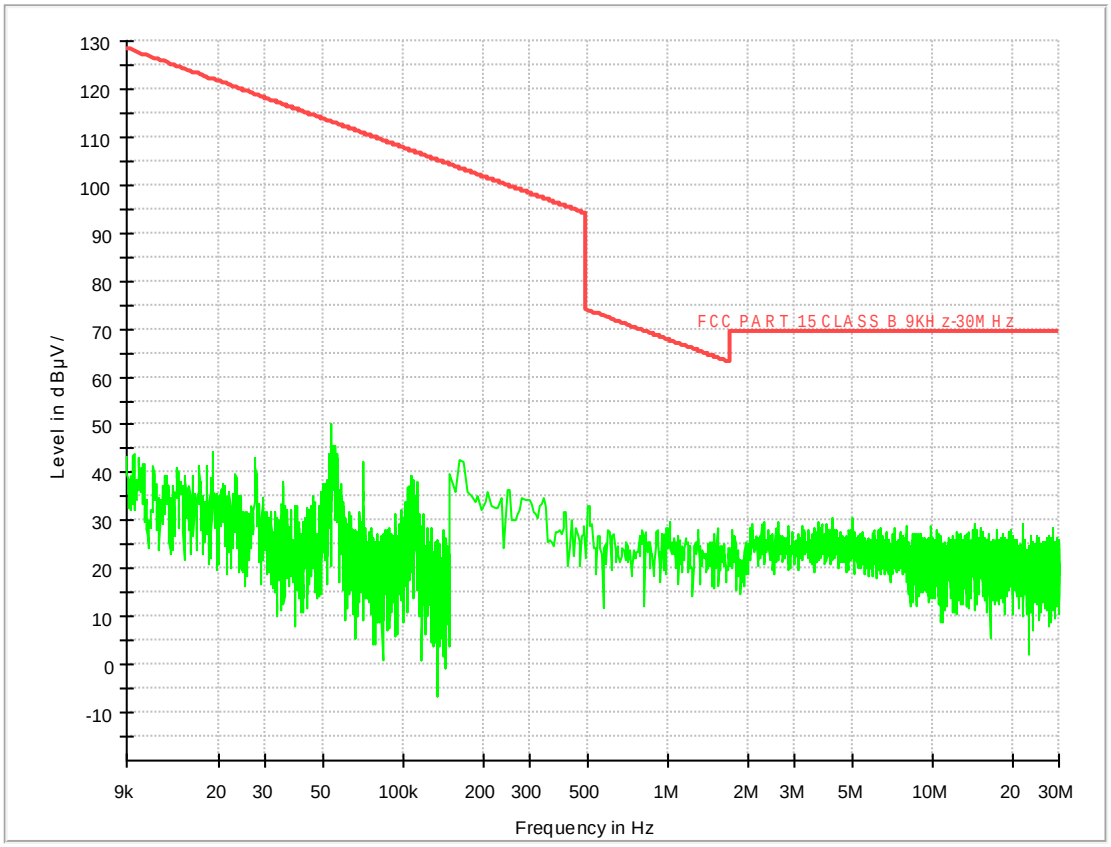

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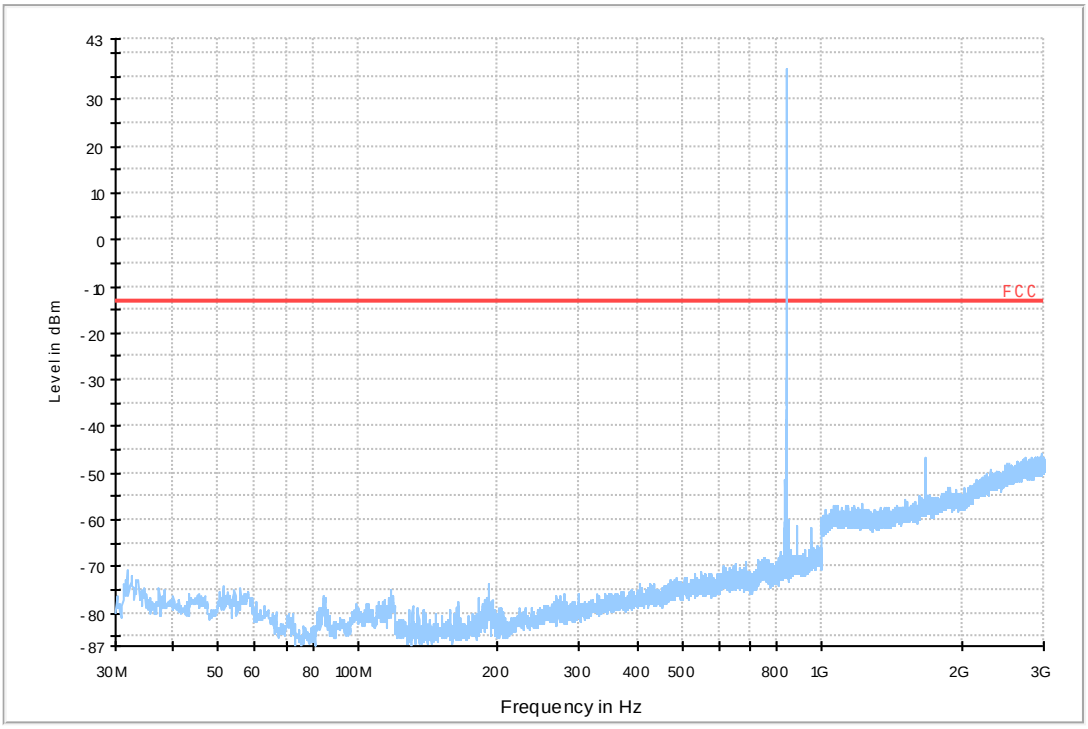
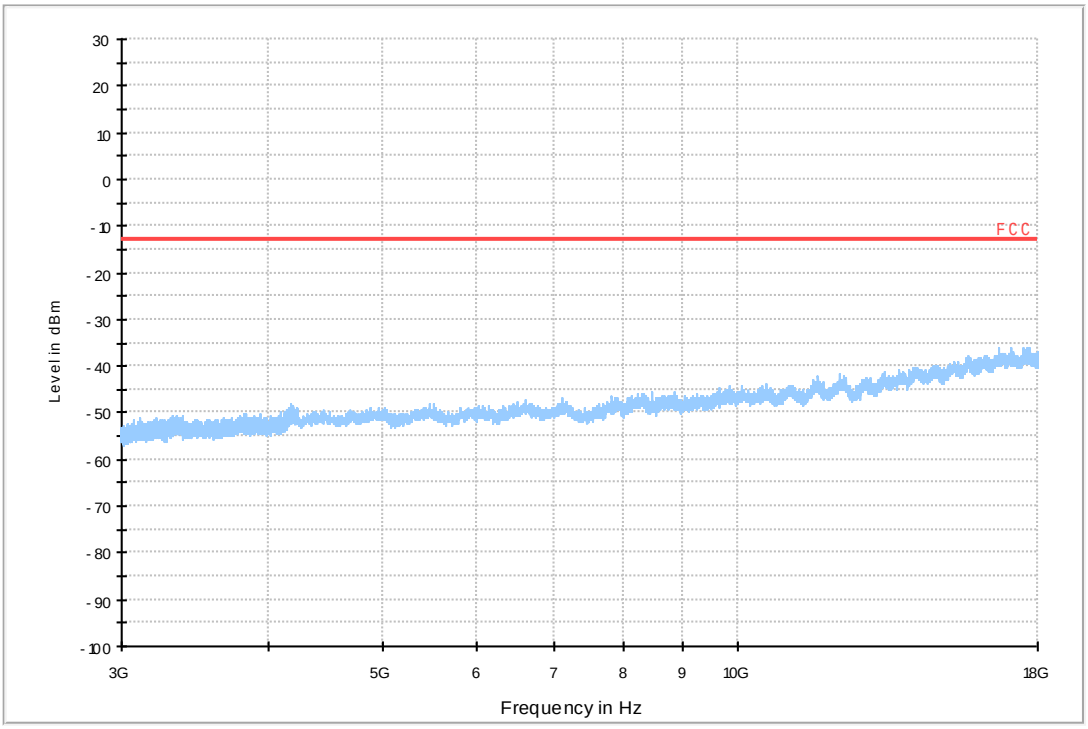
04 FCC PART 22 GSM850_L



03 FCC PART 22 GSM850_H



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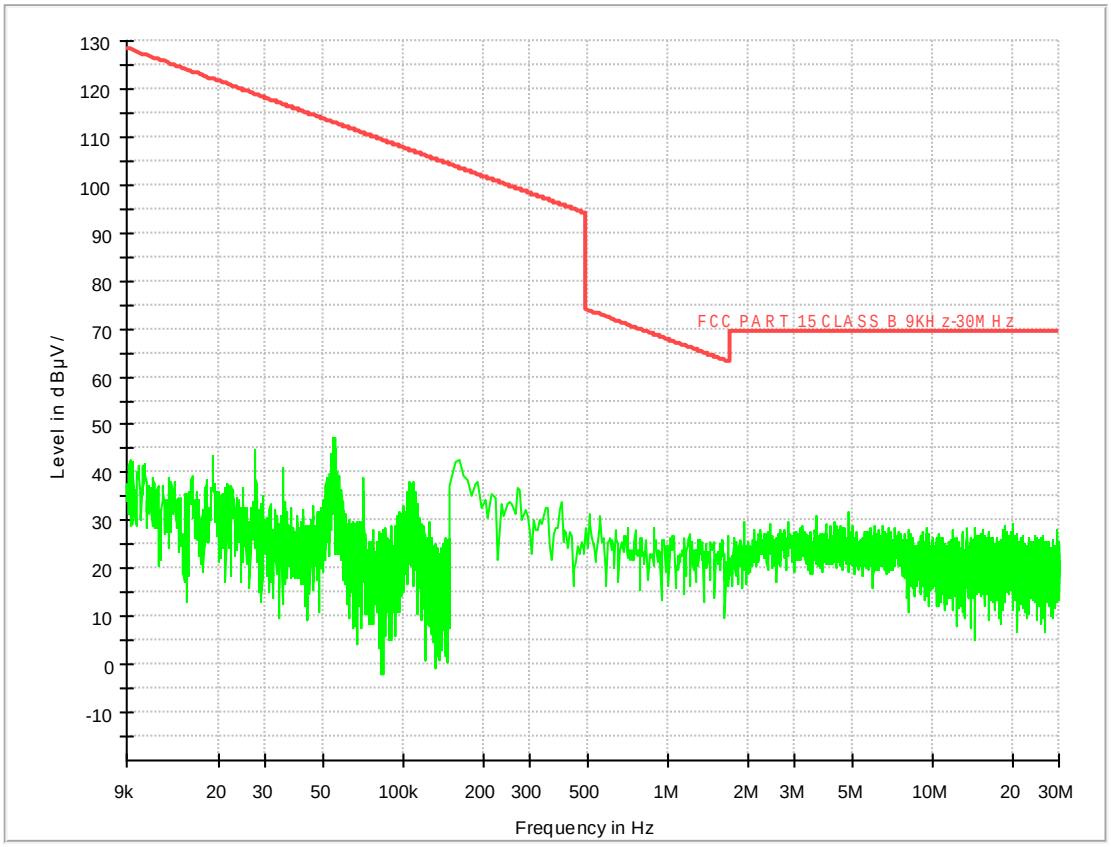
7.1.2 Test Band = PCS1900

7.1.2.1 Test Mode = GSM/TM1



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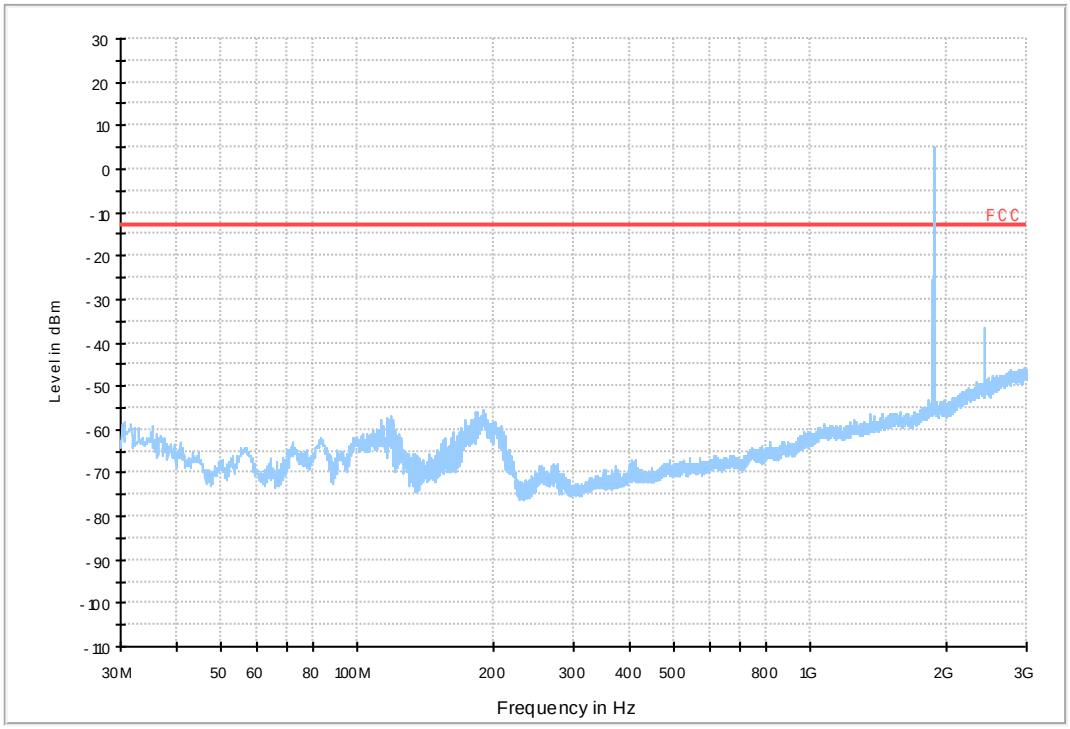
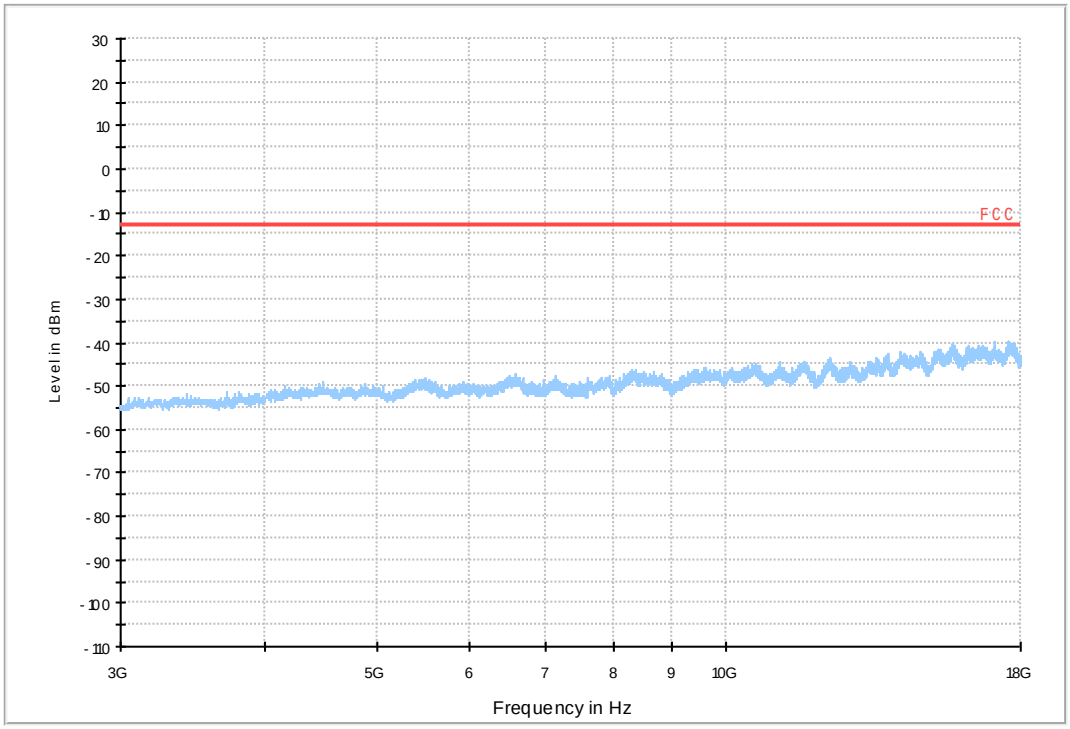
10 FCC PART 24 GSM1900_L



09 FCC PART 24 GSM1900_H



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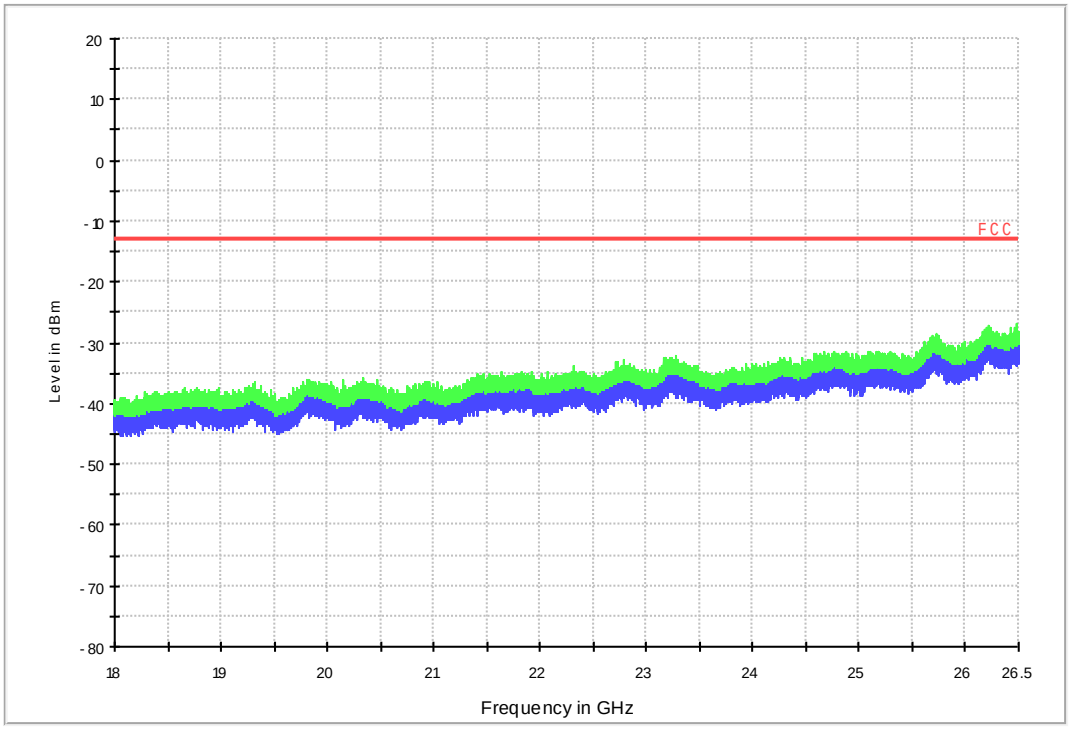
18G~26.5G RSE-TX-DIRECTOR ABOVE 1.5G PK



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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	-16.59	-0.02013	PASS
				VN	-15.37	-0.01865	PASS
				VH	-16.27	-0.01974	PASS
		MCH	TN	VL	-13.04	-0.01559	PASS
				VN	-13.95	-0.01667	PASS
				VH	-16.72	-0.01999	PASS
		HCH	TN	VL	-11.62	-0.01369	PASS
				VN	-12.59	-0.01483	PASS
				VH	-14.01	-0.01651	PASS
	GSM/TM2	LCH	TN	VL	-24.44	-0.02965	PASS
				VN	-22.50	-0.0273	PASS
				VH	-18.18	-0.02206	PASS
		MCH	TN	VL	-24.25	-0.02899	PASS
				VN	-22.83	-0.02729	PASS
				VH	-15.30	-0.01829	PASS
		HCH	TN	VL	-21.53	-0.02537	PASS
				VN	-17.98	-0.02118	PASS
				VH	-19.53	-0.02301	PASS
GSM1900	GSM/TM1	LCH	TN	VL	25.70	0.01389	PASS
				VN	24.54	0.01326	PASS
				VH	27.06	0.01463	PASS
		MCH	TN	VL	27.96	0.01487	PASS
				VN	25.25	0.01343	PASS
				VH	28.35	0.01508	PASS
		HCH	TN	VL	29.44	0.01542	PASS
				VN	24.99	0.01309	PASS
				VH	24.21	0.01268	PASS
	GSM/TM2	LCH	TN	VL	28.12	0.0152	PASS
				VN	23.73	0.01283	PASS
				VH	22.54	0.01218	PASS
		MCH	TN	VL	12.24	0.00651	PASS
				VN	14.82	0.00788	PASS

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Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
				VH	17.08	0.00909	PASS
		HCH	TN	VL	13.79	0.00722	PASS
				VN	25.54	0.01337	PASS
				VH	28.51	0.01493	PASS

8.1.2Frequency 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	-16.27	-0.01974	PASS
				-20	-13.88	-0.01684	PASS
				-10	-15.24	-0.01849	PASS
				0	-16.66	-0.02021	PASS
				10	-13.69	-0.01661	PASS
				20	-16.66	-0.02021	PASS
				30	-18.14	-0.02201	PASS
				40	-16.85	-0.02044	PASS
				50	-15.95	-0.01935	PASS
		MCH	VN	-30	-13.04	-0.01559	PASS
				-20	-14.14	-0.0169	PASS
				-10	-14.98	-0.01791	PASS
				0	-12.91	-0.01543	PASS
				10	-12.27	-0.01467	PASS
				20	-14.79	-0.01768	PASS
				30	-14.98	-0.01791	PASS
				40	-12.27	-0.01467	PASS
				50	-12.14	-0.01451	PASS
		HCH	VN	-30	-14.01	-0.01651	PASS
				-20	-12.91	-0.01521	PASS
				-10	-13.11	-0.01545	PASS
				0	-14.85	-0.0175	PASS
				10	-13.43	-0.01582	PASS
				20	-14.79	-0.01742	PASS
				30	-14.08	-0.01659	PASS
				40	-11.82	-0.01393	PASS
				50	-14.33	-0.01688	PASS
	GSM/TM2	LCH	VN	-30	-14.40	-0.01747	PASS
				-20	-20.50	-0.02487	PASS
				-10	-16.01	-0.01942	PASS
				0	-17.50	-0.02123	PASS
				10	-14.82	-0.01798	PASS

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Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
				20	-22.50	-0.0273	PASS
				30	-14.66	-0.01779	PASS
				40	-15.72	-0.01907	PASS
				50	-20.31	-0.02464	PASS
		MCH	VN	-30	-22.34	-0.0267	PASS
				-20	-17.08	-0.02042	PASS
				-10	-12.20	-0.01458	PASS
				0	-14.95	-0.01787	PASS
				10	-16.72	-0.01999	PASS
				20	-13.59	-0.01624	PASS
				30	-18.31	-0.02189	PASS
				40	-16.43	-0.01964	PASS
				50	-20.44	-0.02443	PASS
		HCH	VN	-30	-22.44	-0.02644	PASS
				-20	-17.85	-0.02103	PASS
				-10	-22.02	-0.02594	PASS
				0	-18.27	-0.02152	PASS
				10	-17.92	-0.02111	PASS
				20	-20.57	-0.02423	PASS
				30	-15.08	-0.01777	PASS
				40	-18.37	-0.02164	PASS
				50	-13.43	-0.01582	PASS
GSM1900	GSM/TM1	LCH	VN	-30	25.70	0.01389	PASS
				-20	28.61	0.01546	PASS
				-10	28.15	0.01521	PASS
				0	23.05	0.01246	PASS
				10	31.19	0.01686	PASS
				20	26.35	0.01424	PASS
				30	29.44	0.01591	PASS
				40	28.09	0.01518	PASS
				50	27.83	0.01504	PASS
		MCH	VN	-30	26.99	0.01436	PASS
				-20	22.21	0.01181	PASS
				-10	23.76	0.01264	PASS
				0	17.76	0.00945	PASS
				10	21.89	0.01164	PASS
				20	22.41	0.01192	PASS
				30	26.93	0.01432	PASS
				40	29.64	0.01577	PASS
				50	30.41	0.01618	PASS

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Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
		HCH	VN	-30	25.18	0.01318	PASS
				-20	21.95	0.01149	PASS
				-10	28.41	0.01488	PASS
				0	18.27	0.00957	PASS
				10	18.92	0.00991	PASS
				20	26.99	0.01413	PASS
				30	21.11	0.01105	PASS
				40	20.53	0.01075	PASS
				50	25.89	0.01356	PASS
	GSM/TM2	LCH	VN	-30	22.12	0.01196	PASS
				-20	36.97	0.01998	PASS
				-10	24.70	0.01335	PASS
				0	24.99	0.01351	PASS
				10	23.89	0.01291	PASS
				20	22.60	0.01221	PASS
				30	21.21	0.01146	PASS
				40	24.67	0.01333	PASS
				50	23.79	0.01286	PASS
		MCH	VN	-30	19.92	0.0106	PASS
				-20	29.80	0.01585	PASS
				-10	17.56	0.00934	PASS
				0	25.60	0.01362	PASS
				10	27.86	0.01482	PASS
				20	25.25	0.01343	PASS
				30	26.31	0.01399	PASS
				40	31.54	0.01678	PASS
				50	27.31	0.01453	PASS
		HCH	VN	-30	17.27	0.00904	PASS
				-20	25.89	0.01356	PASS
				-10	15.59	0.00816	PASS
				0	16.18	0.00847	PASS
				10	20.31	0.01063	PASS
				20	18.37	0.00962	PASS
				30	22.60	0.01183	PASS
				40	20.21	0.01058	PASS
				50	18.66	0.00977	PASS

END

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