

Appendix B.1

GSM850&1900

Table of Contents

1. MAIN TEST INSTRUMENTS	3
2. MEASUREMENT UNCERTAINTY	3
3. EFFECTIVE (ISOTROPIC) RADIATED POWER OUTPUT DATA	4
3.1. Test Result.....	4
4. PEAK-TO-AVERAGE RATIO	5
4.1. Test Result.....	5
4.2. Part II - Test Plots.....	5
5. MODULATION CHARACTERISTICS.....	8
5.1. For GSM	8
5.1.1. Test BAND = GSM 850.....	8
5.1.1.1. Test Mode = GSM/TM1.....	8
5.1.1.1.1. Test Channel = MCH.....	8
5.1.2. Test BAND = GSM 1900.....	9
5.1.2.1. Test Mode = GSM/TM1.....	9
5.1.2.1.1. Test Channel = MCH.....	9
6. 26dB BANDWIDTH AND OCCUPIED BANDWIDTH.....	10
6.1. Test Result.....	10
6.2. Test Plots.....	10
7. BAND EDGE COMPLIANCE	13
7.1. Test Plots.....	13
8. SPURIOUS EMISSION AT ANTENNA TERMINAL.....	15
8.1. Test Plots.....	15
9. FREQUENCY STABILITY	26
9.1. Frequency Error Vs Voltage	26
9.2. Frequency Error Vs Temperature.....	27

1. Main Test Instruments

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018/3/13	2021/3/12
Spectrum Analyzer (20Hz-43GHz)	Rohde & Schwarz	FSU43	SEM004-08	2019/3/2	2020/3/1
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017/6/27	2020/6/26
Horn Antenna (800MHz-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018/4/13	2021/4/12
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017/10/17	2020/10/16
Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2018/9/2	2019/9/2
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2018/9/2	2019/9/2
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	EMC2063	2018/10/20	2019/10/19
Pre-amplifier (26-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2019/3/2	2020/3/1
Band filter	N/A	N/A	N/A	N/A	N/A
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2018/7/12	2019/7/11
Wideband Radio Communication Tester	Anristu	MT8821C	6201462742	2019/4/3	2020/4/3
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	W005-02	2019/1/13	2020/1/12
RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
Dual Output Mobile Communication DC Source	Agilent Technologies Inc	66311B	W009-09	2018/11/2	2019/11/1
Signal Analyzer	Rohde & Schwarz	FSV	W005-02	2019/3/2	2020/3/1
Coaxial Cable	SGS	N/A	SEM031-01	2018/7/12	2019/7/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018/11/2	2019/11/1
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	HTC-1	W006-17	2018/11/2	2019/11/1
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2018/11/2	2019/11/1
Wideband Radio Communication Tester	Anristu	MT8821C	6201462742	2019/3/2	2020/3/1
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	W005-02	2018/11/2	2019/11/1

2. Measurement Uncertainty

For a 95% confidence level ($k = 2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item	Extended Uncertainty	Data
Transmit Output Power Data	Power [dBm]	$U = \pm 0.37 \text{ dB}$
Bandwidth	Magnitude [%]	$U = \pm 0.2\%$
Band Edge Compliance	Disturbance Power [dBm]	$U = \pm 2.0 \text{ dB}$
Spurious Emissions, Conducted	Disturbance Power [dBm]	$U = \pm 2.0 \text{ dB}$
Frequency Stability	Frequency Accuracy [ppm]	$U = \pm 0.24 \text{ ppm}$

3. Effective (Isotropic) Radiated Power Output Data

3.1. Test Result

BAND	Channel	Conducted Power(dBm)	ERP(dBm)	Limit(dBm)	Verdict
GSM850	128	32.71	28.66	38.45	PASS
GSM850	190	32.83	28.78	38.45	PASS
GSM850	251	32.77	28.72	38.45	PASS

BAND	Channel	Conducted Power(dBm)	EIRP(dBm)	Limit(dBm)	Verdict
GSM1900	512	29.95	28.55	33.00	PASS
GSM1900	661	30.22	28.82	33.00	PASS
GSM1900	810	30.11	28.81	33.00	PASS

Remark: a: For getting the EIRP (Efficient Isotropic Radiated Power), the following formula should be taken to calculate it,

$ERP [dBm] = \text{Conducted Power} [dBm] + \text{Gain} [dBd]$

$EIRP [dBm] = \text{Conducted Power} [dBm] + \text{Gain} [dBi]$

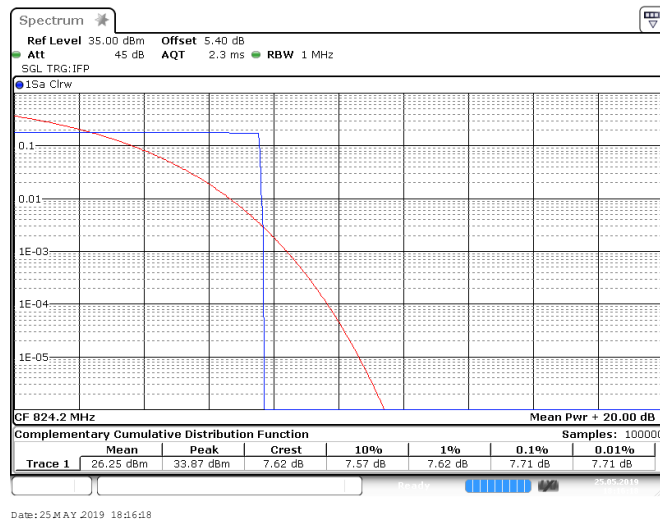
4. Peak-to-Average Ratio

4.1. Test Result

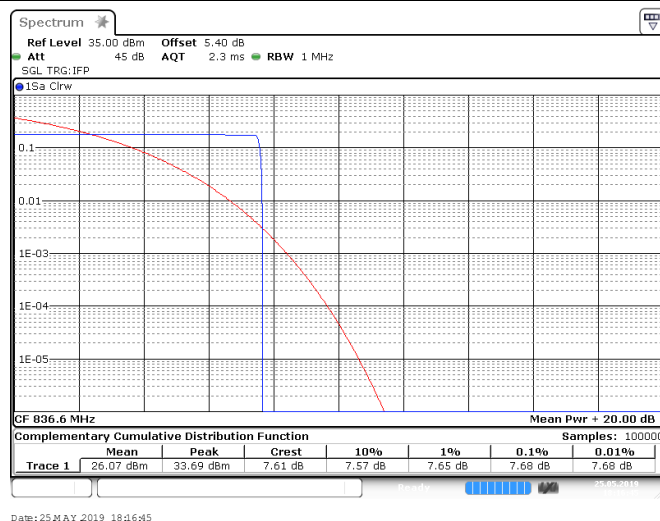
BAND	Channel	Peak-to-Average Ratio(dB)	Limit(dB)	Verdict
GSM850	128	7.71	13	PASS
GSM850	190	7.68	13	PASS
GSM850	251	7.68	13	PASS
GSM1900	512	7.68	13	PASS
GSM1900	661	7.71	13	PASS
GSM1900	810	7.65	13	PASS

4.2. Part II - Test Plots

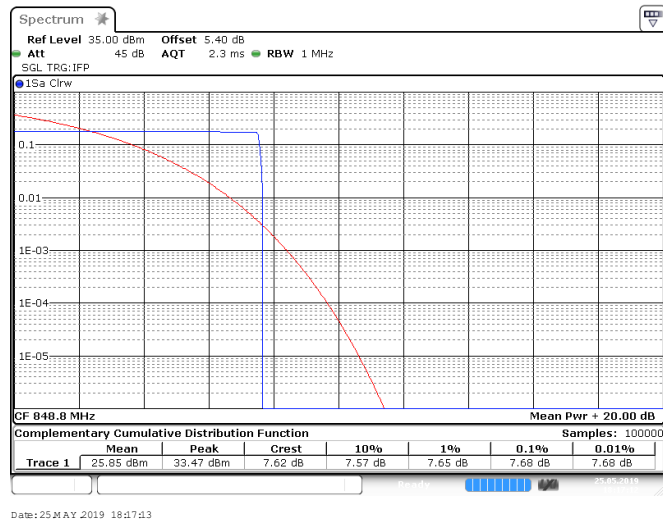
GSM850_128



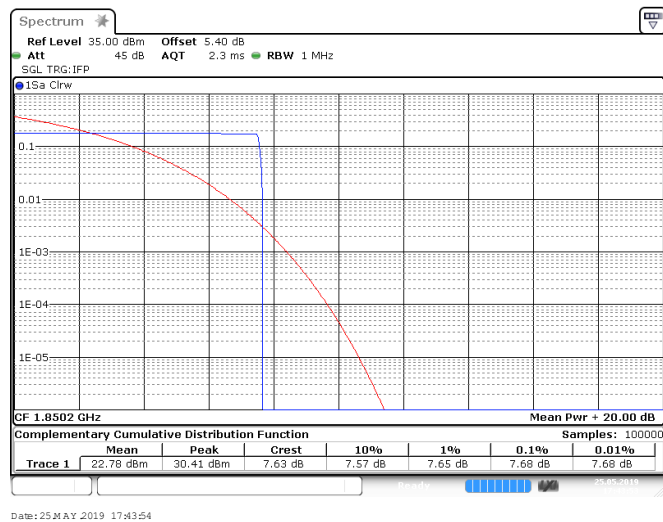
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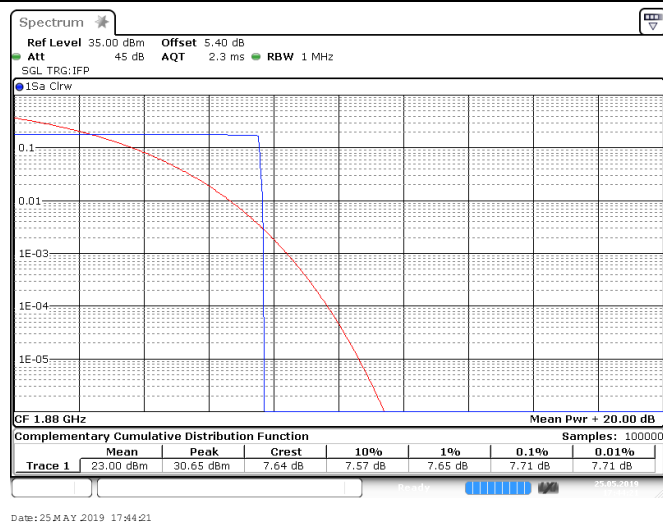
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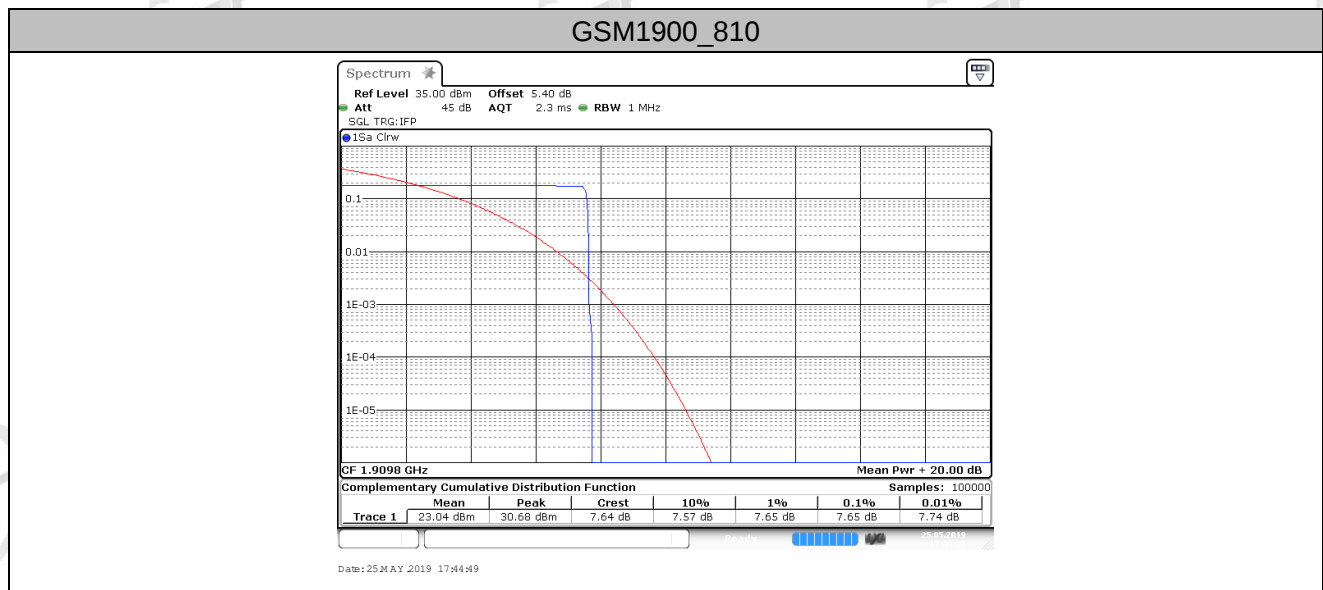


GSM1900_512



GSM1900_661





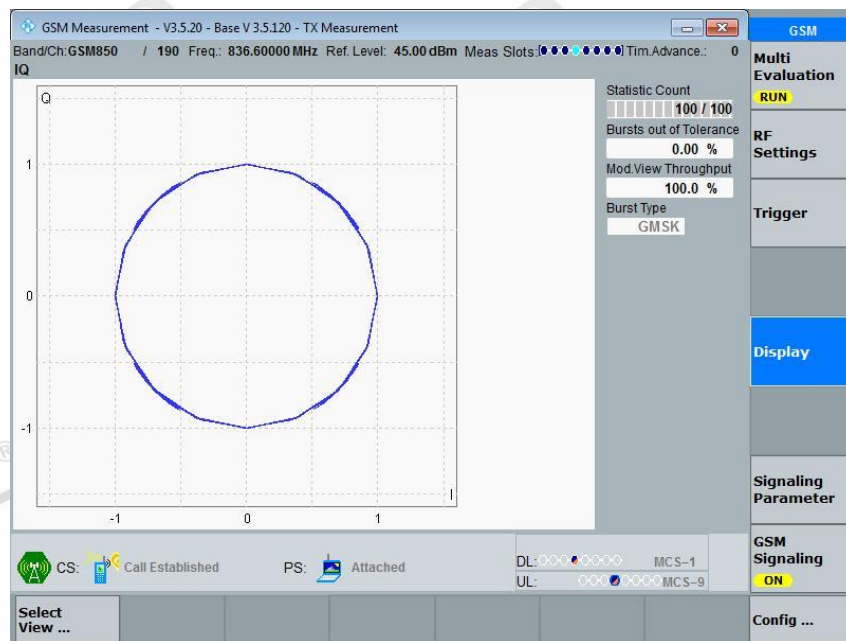
5. Modulation Characteristics

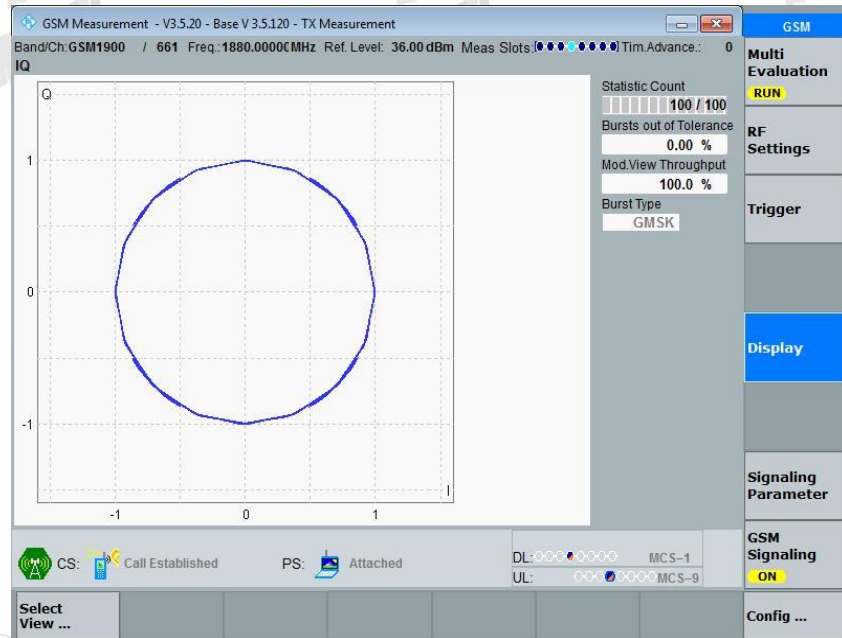
5.1. For GSM

5.1.1. Test BAND = GSM 850

5.1.1.1. Test Mode = GSM/TM1

5.1.1.1.1. Test Channel = MCH



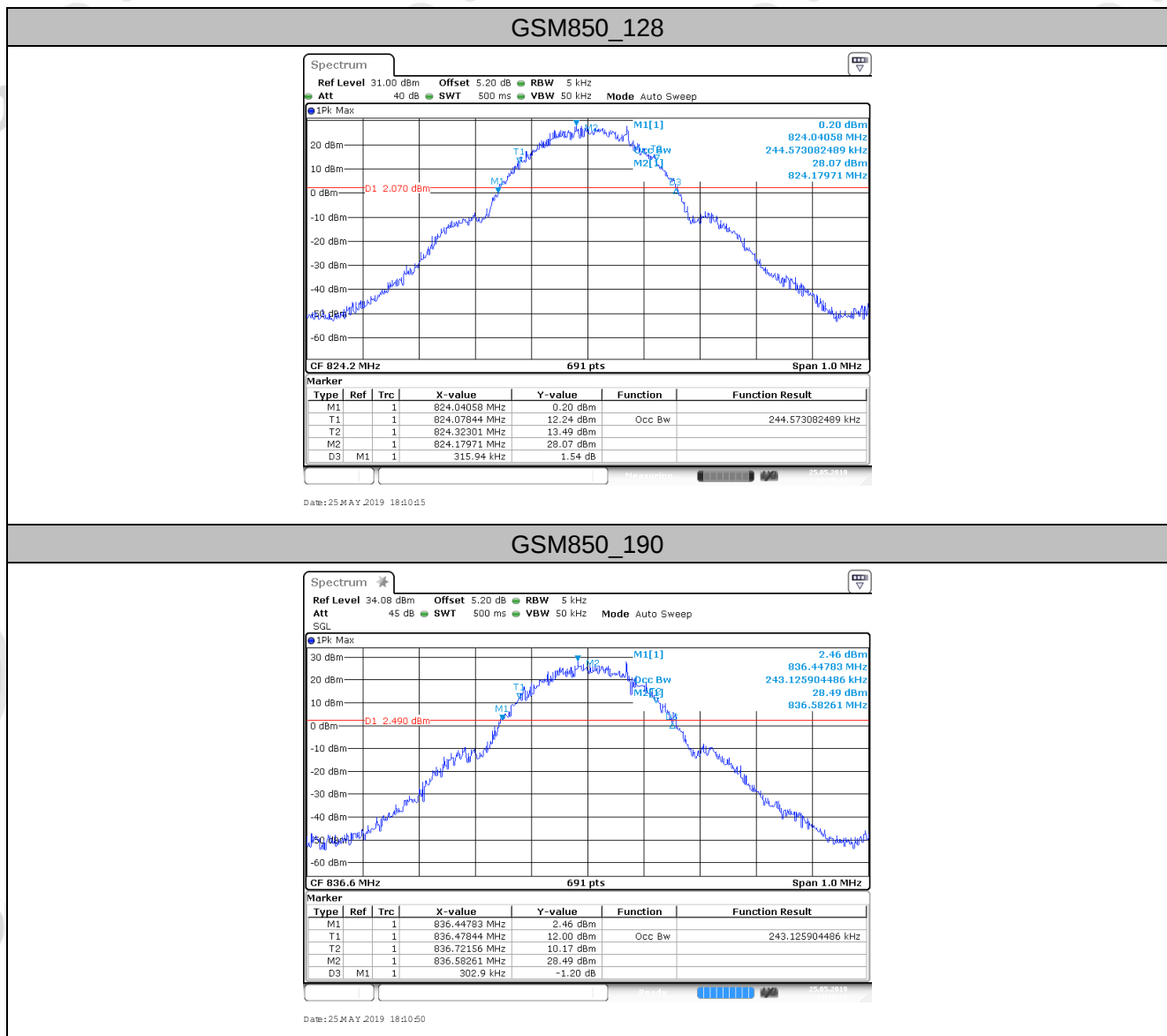
5.1.2. Test BAND = GSM 1900**5.1.2.1. Test Mode = GSM/TM1****5.1.2.1.1. Test Channel = MCH**

6. 26dB Bandwidth and Occupied Bandwidth

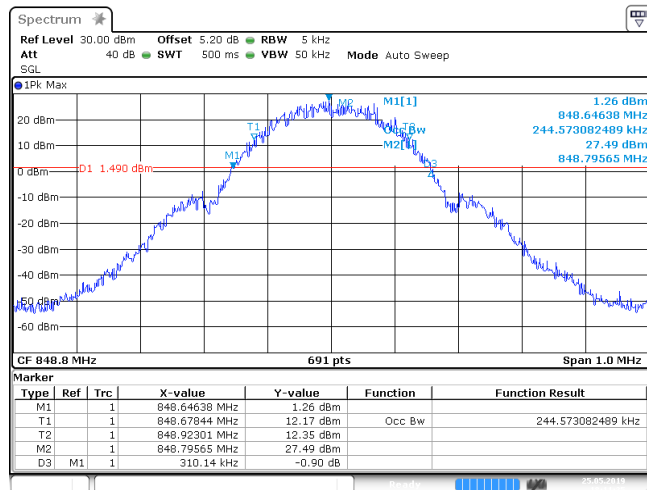
6.1. Test Result

BAND	Channel	Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)	Limit(kHz)	Verdict
GSM850	128	246.02	315.94	---	PASS
GSM850	190	243.13	302.90	---	PASS
GSM850	251	244.57	310.14	---	PASS
GSM1900	512	246.02	305.80	---	PASS
GSM1900	661	243.13	310.14	---	PASS
GSM1900	810	244.57	314.49	---	PASS

6.2. Test Plots

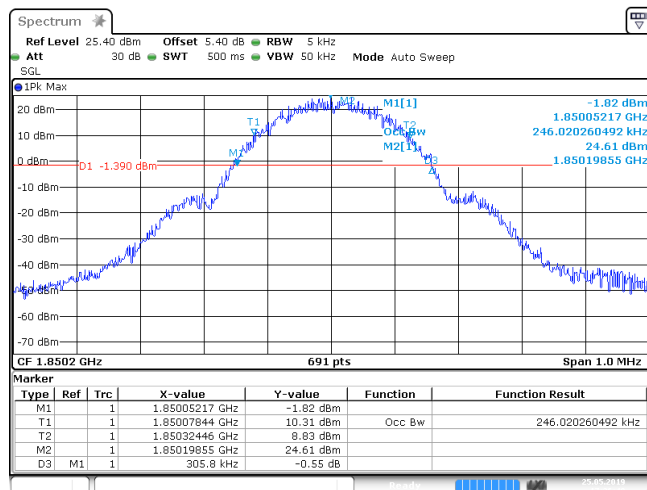


GSM850_251



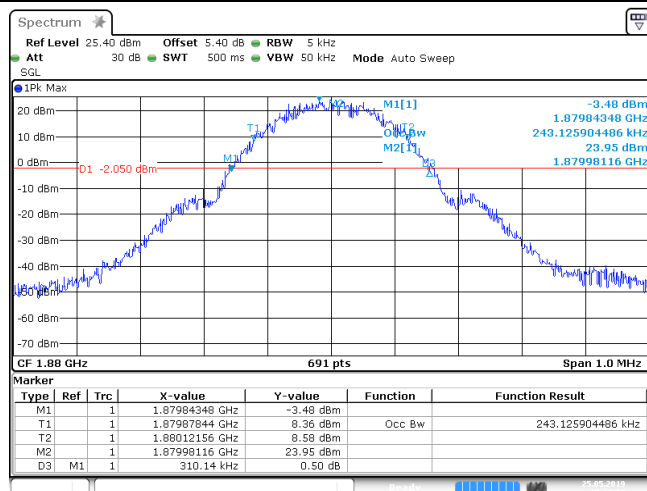
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GSM1900_512

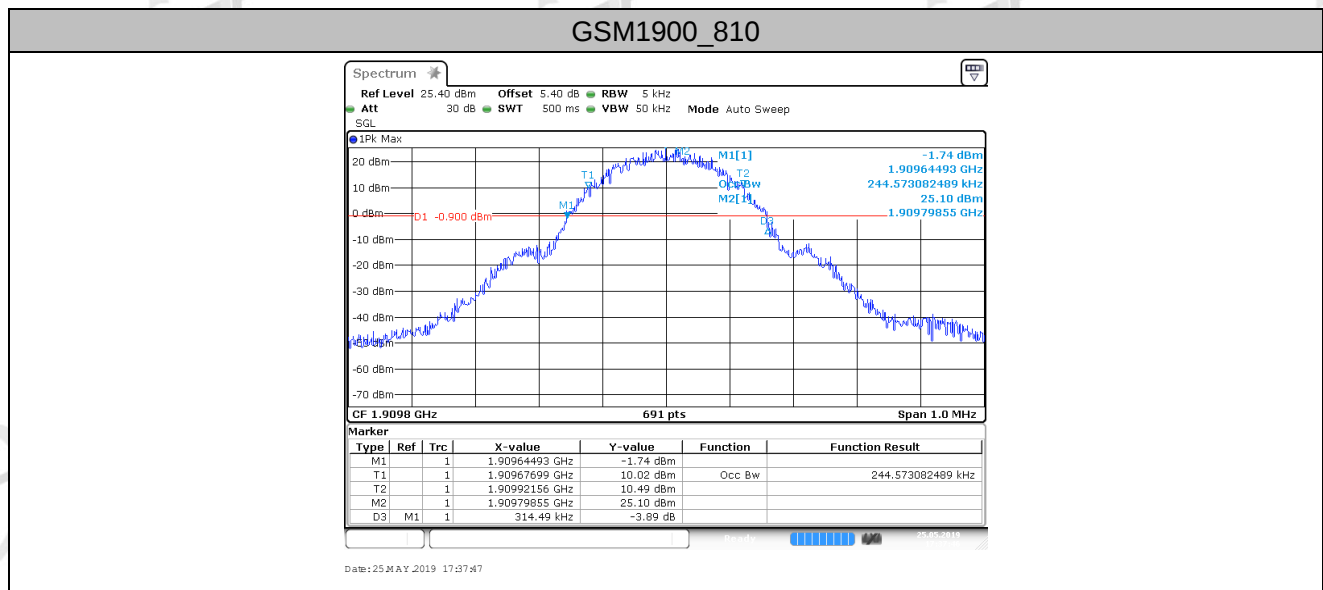


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GSM1900_661

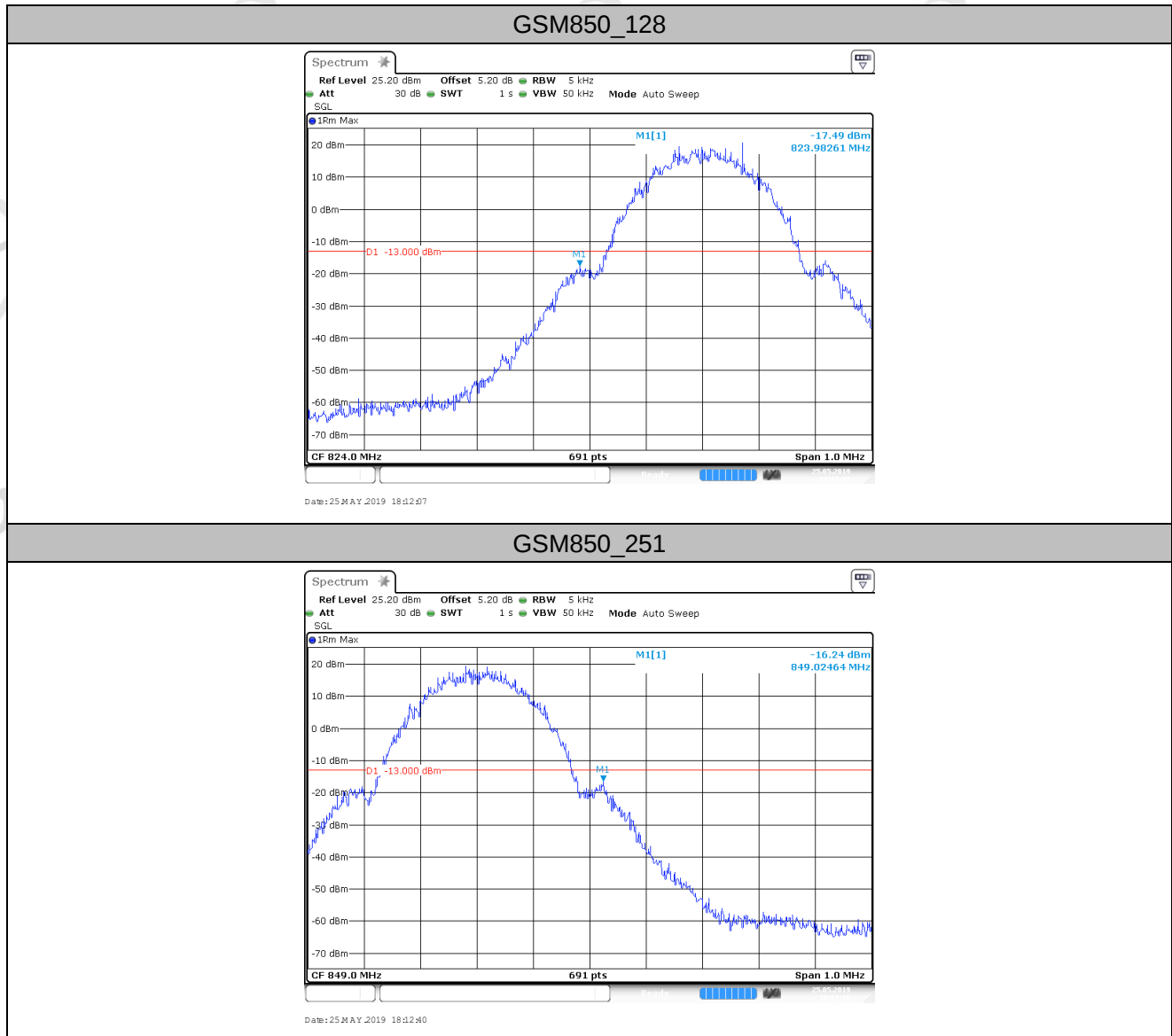


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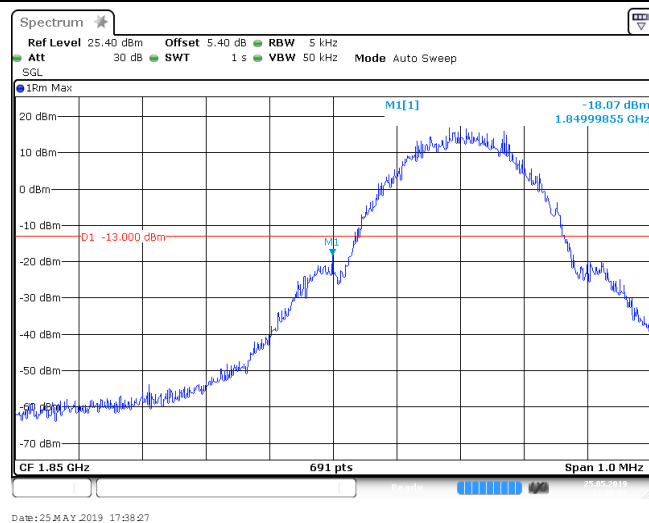


7. Band Edge Compliance

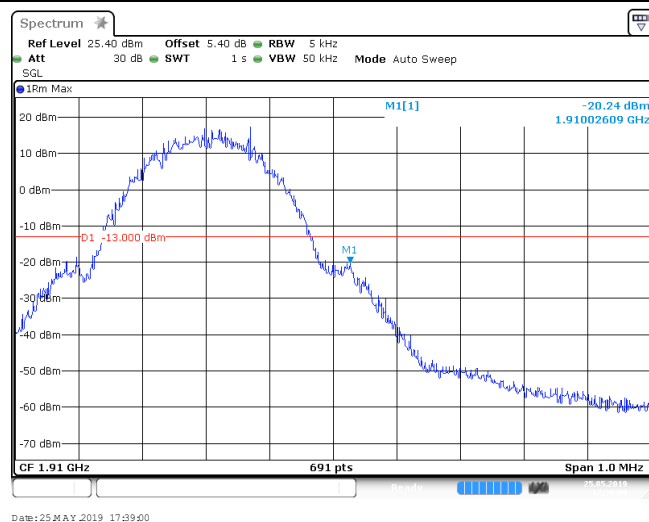
7.1. Test Plots



GSM1900_512



GSM1900_810

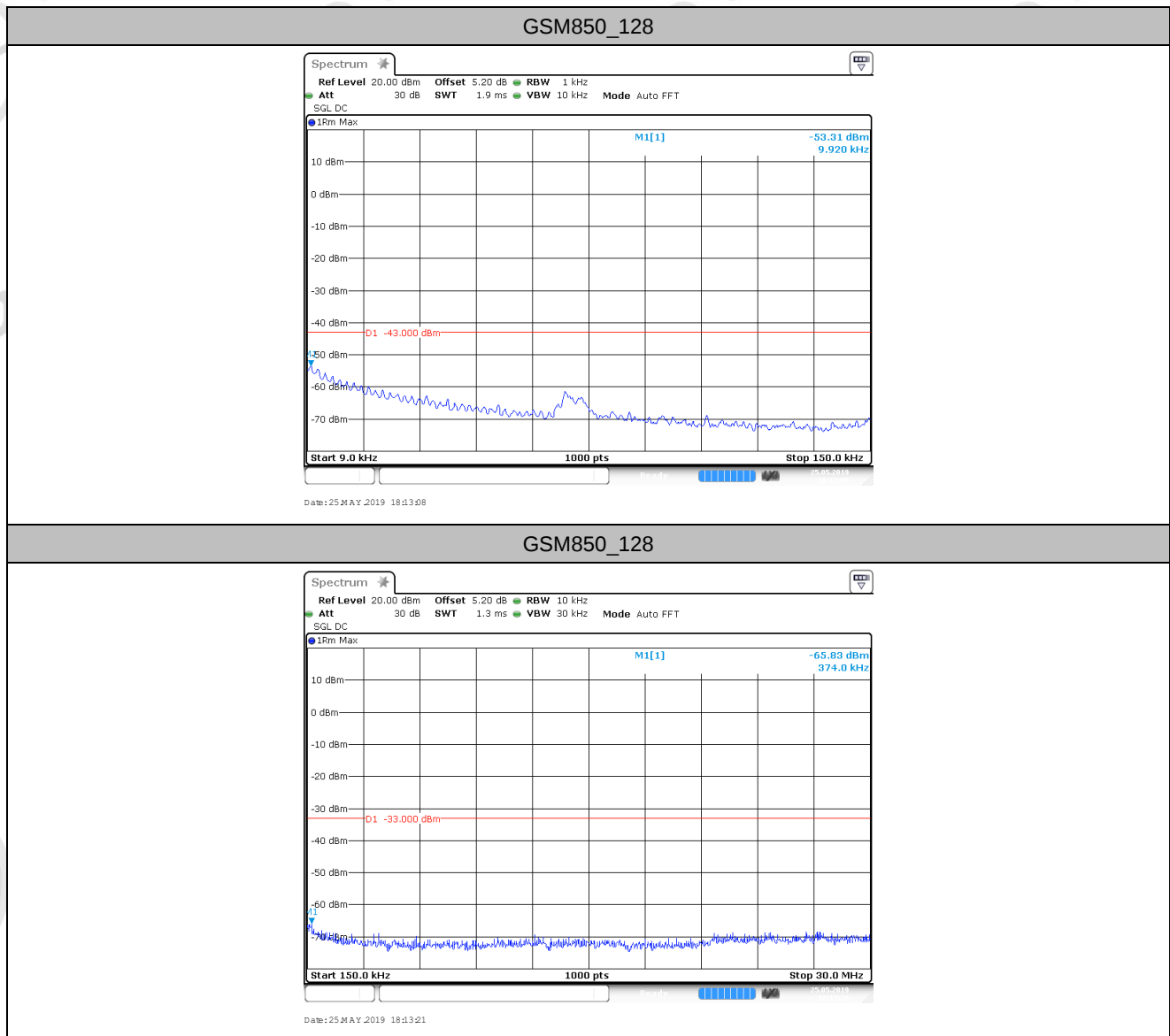


8. Spurious Emission at Antenna Terminal

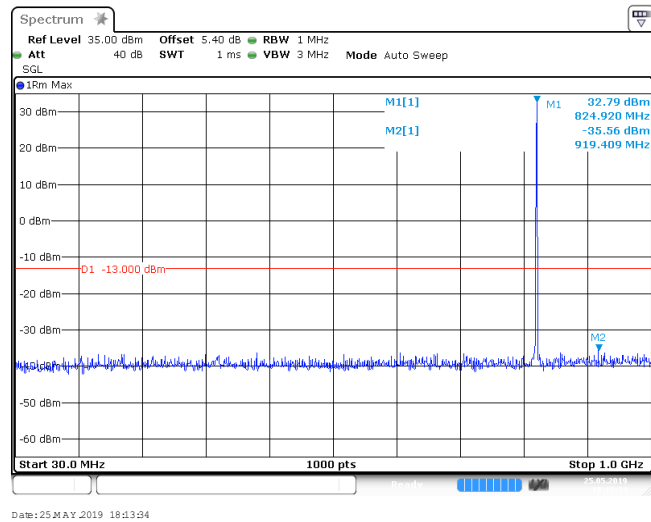
Remark1: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of $< RBW/2$ so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points = $k * (\text{Span} / RBW)$ " with k between 4 and 5, which results in an acceptable level error of less than 0.5 dB.

Remark2: only the worst case data displayed in this report.

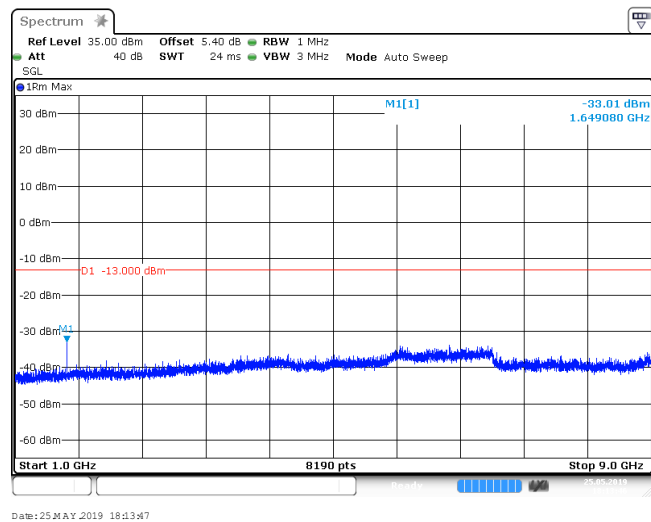
8.1. Test Plots



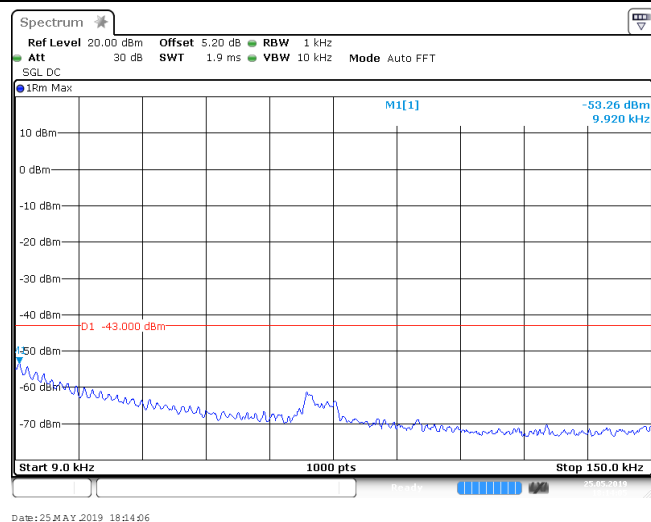
GSM850_128



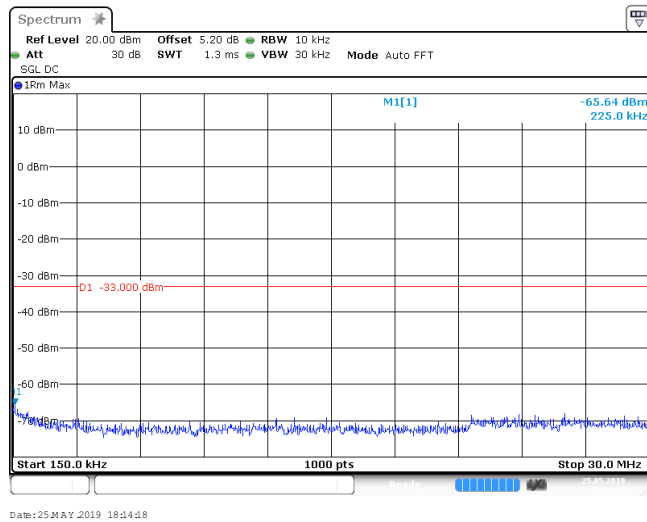
GSM850_128



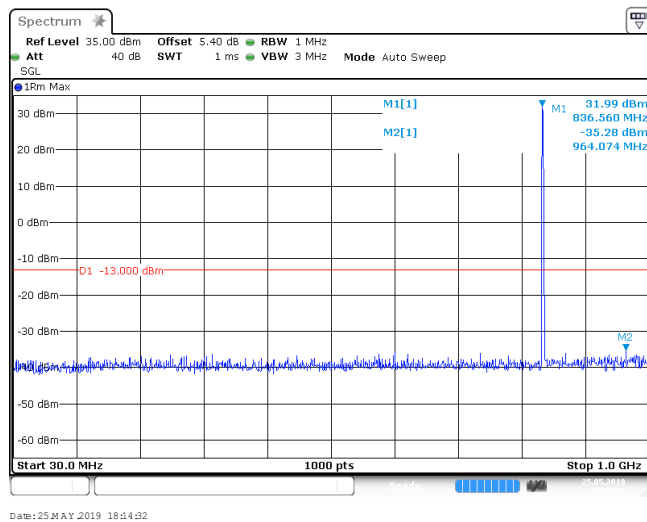
GSM850_190



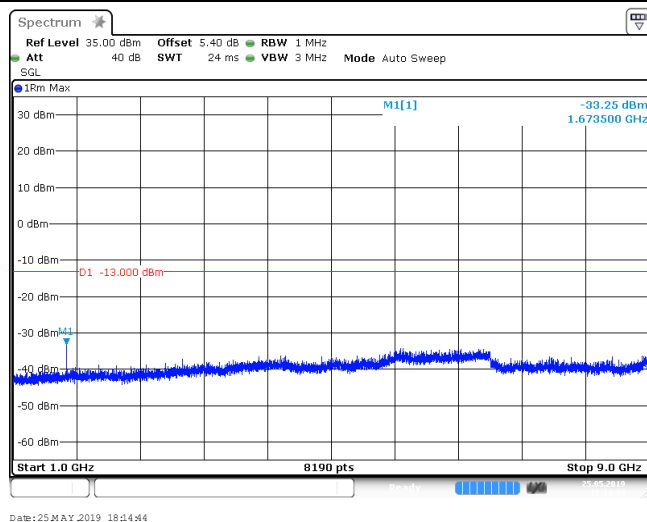
GSM850_190



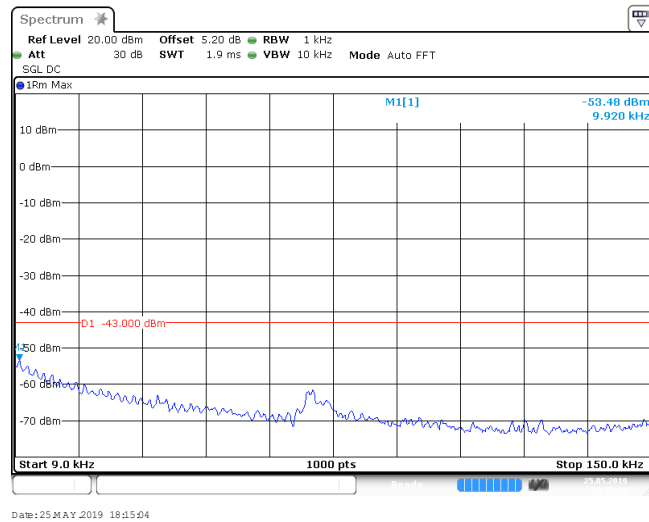
GSM850_190



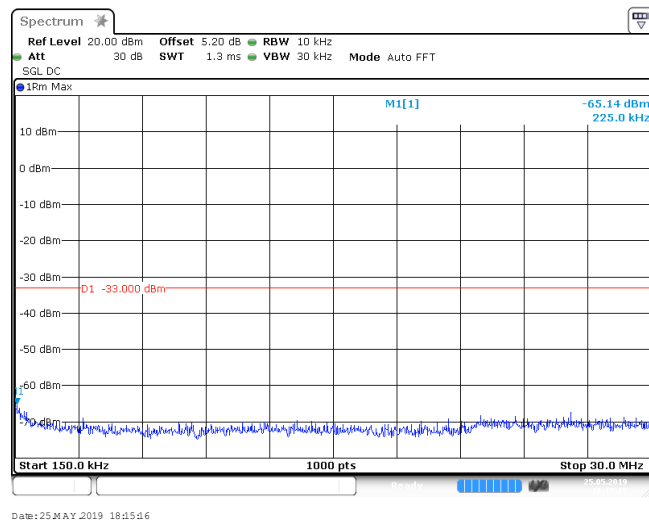
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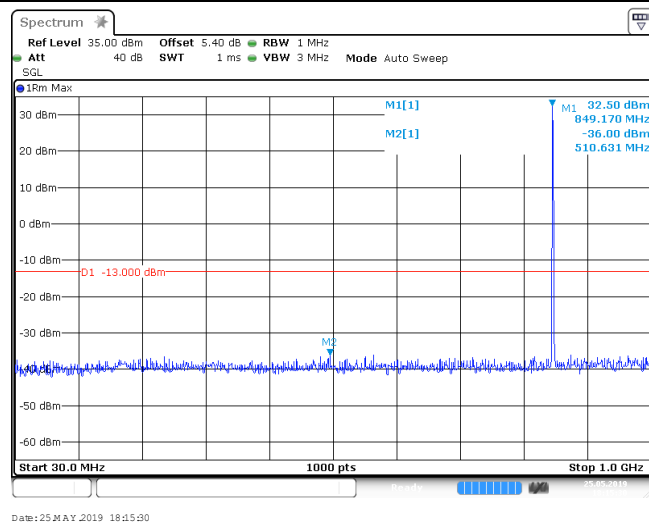
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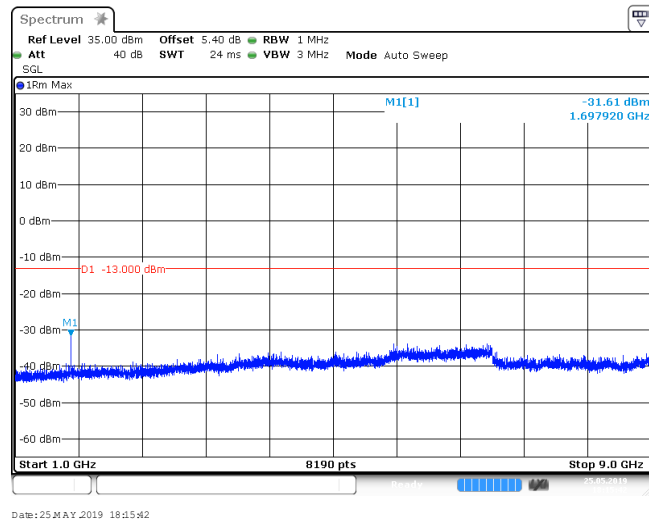
GSM850_251



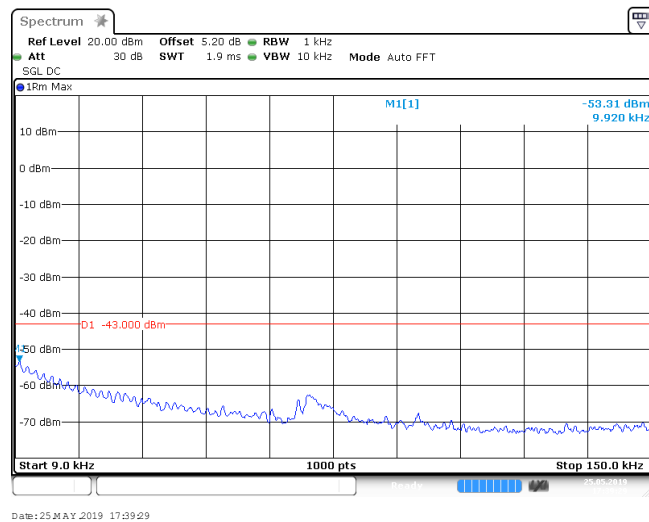
GSM850_251



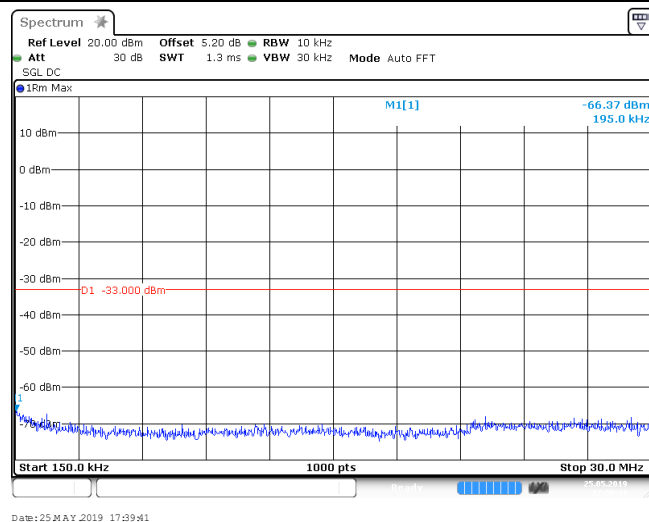
GSM850_251



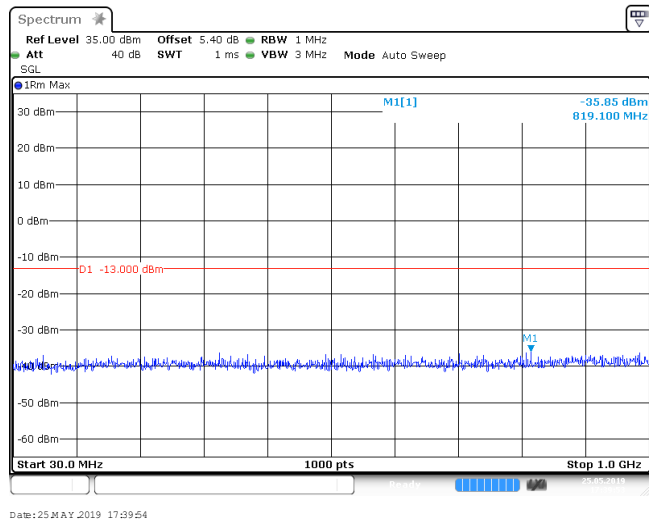
GSM1900_512



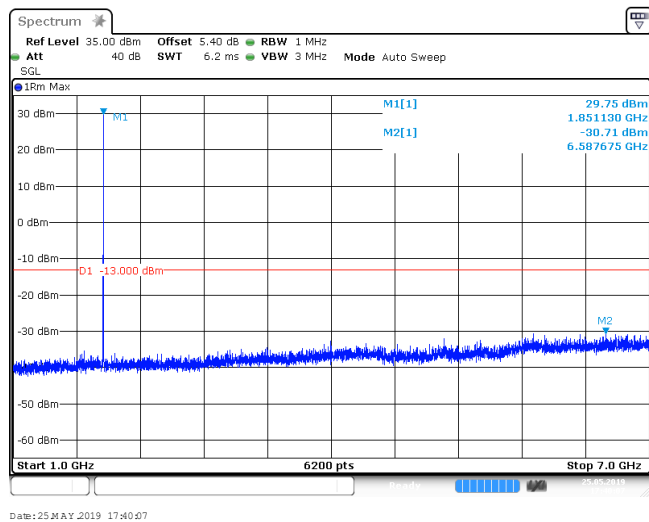
GSM1900_512



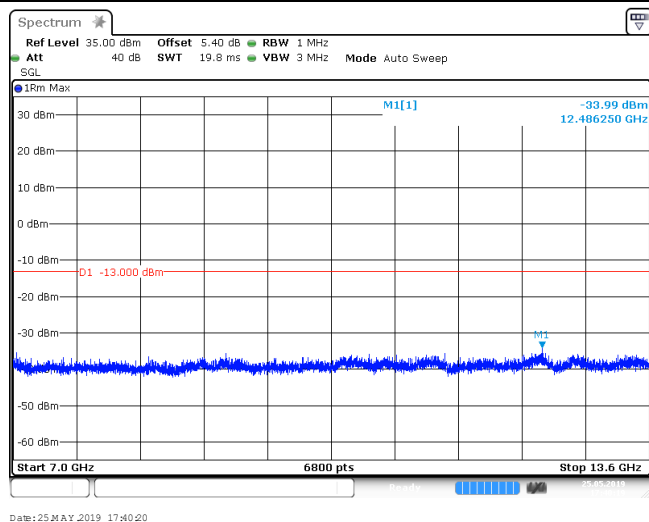
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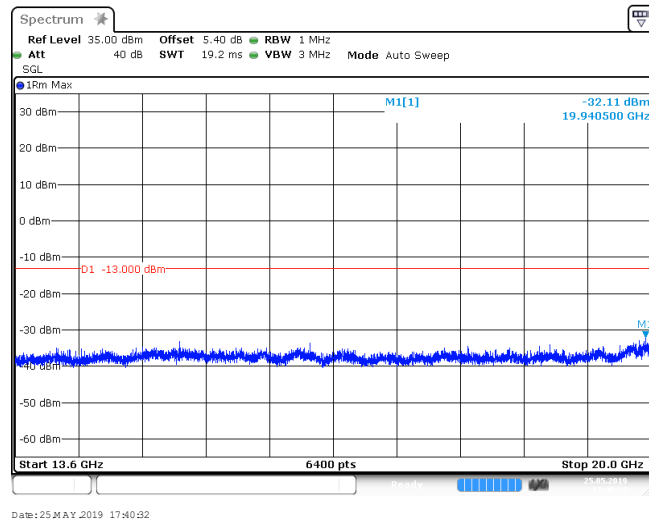
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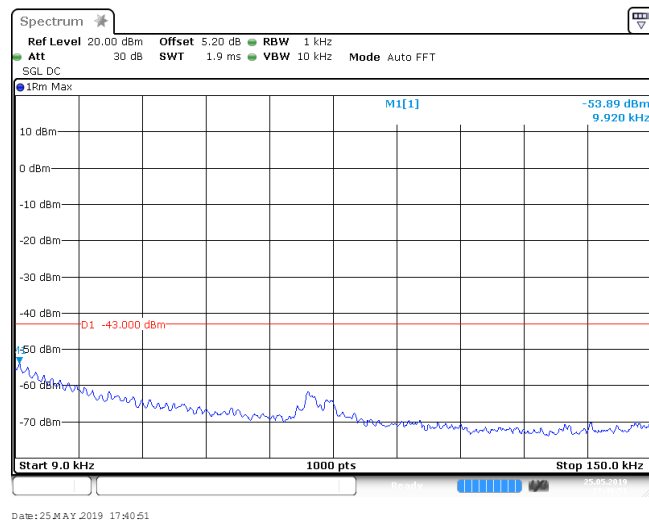
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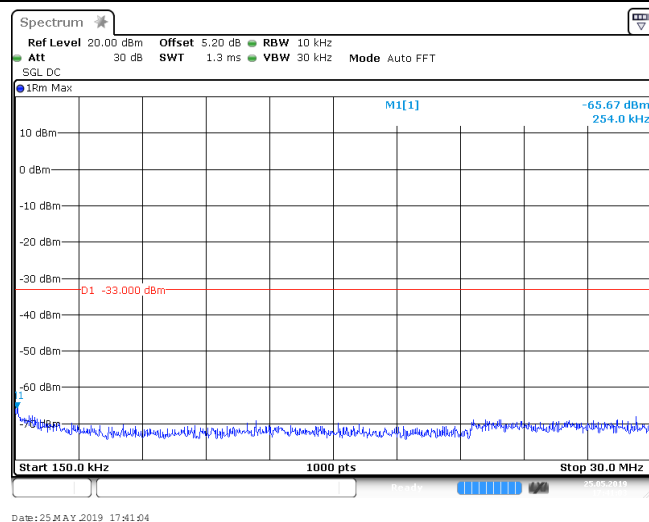
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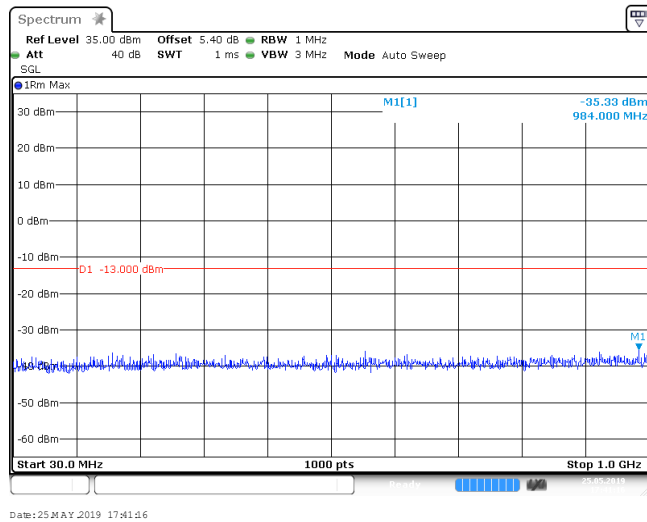
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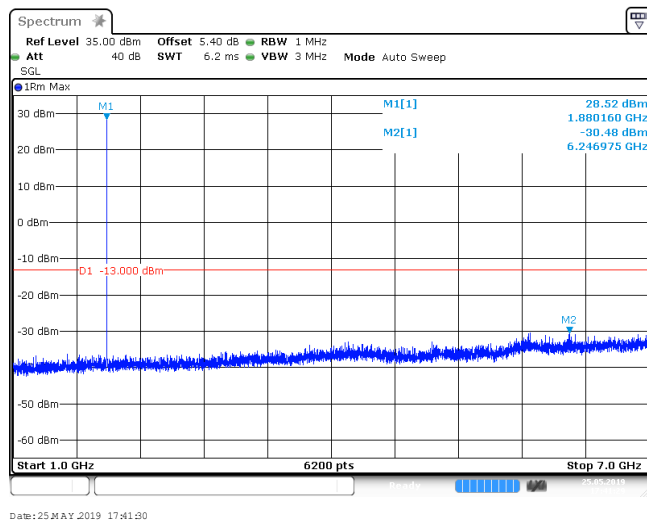
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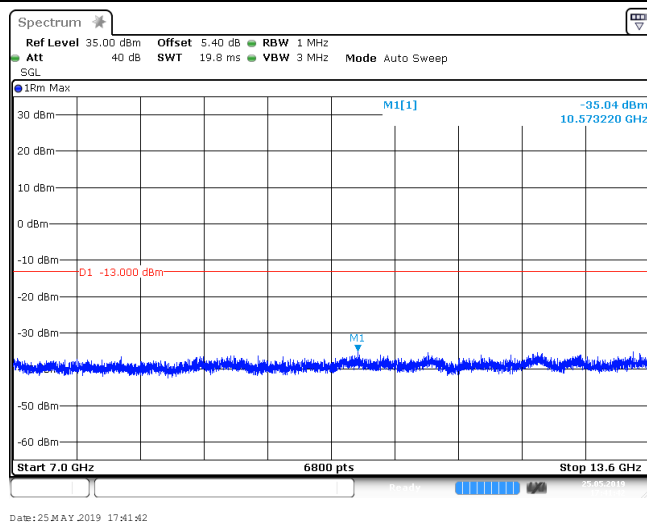
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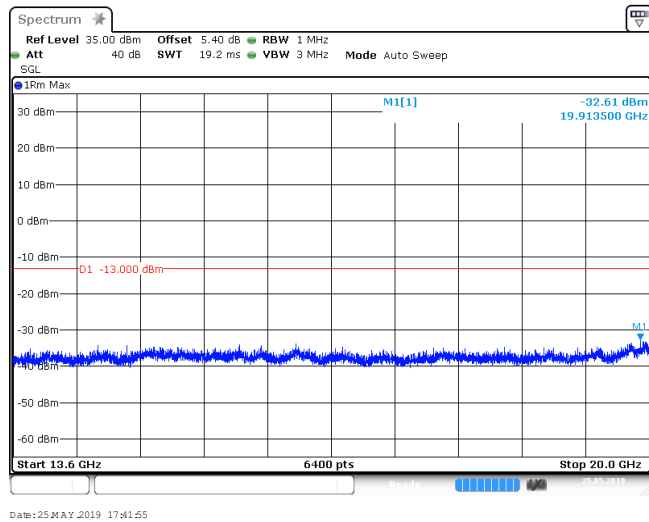
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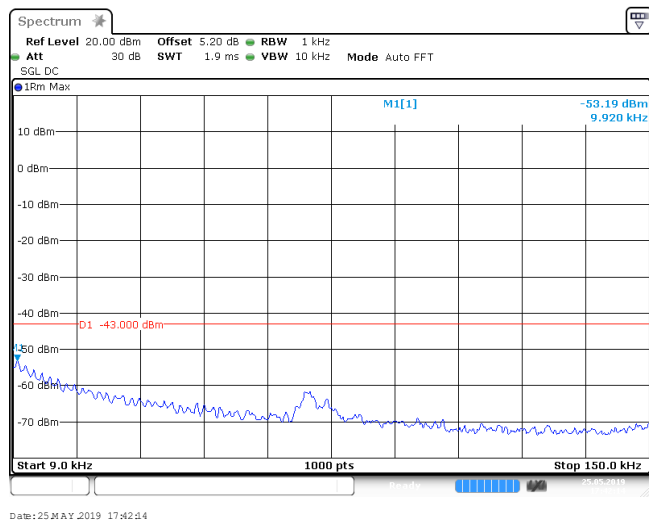
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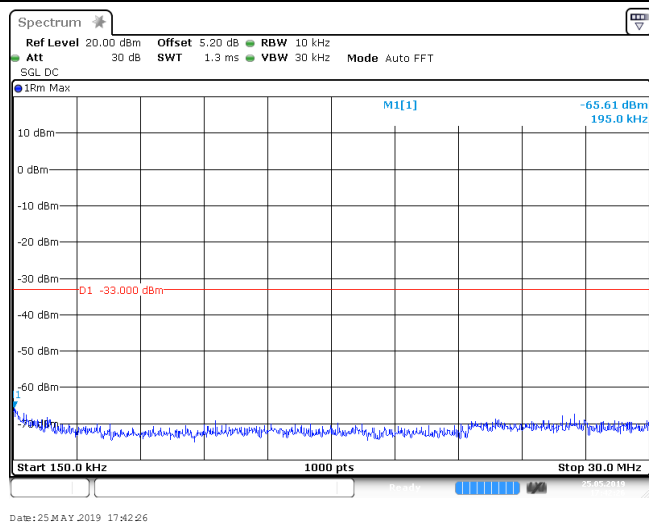
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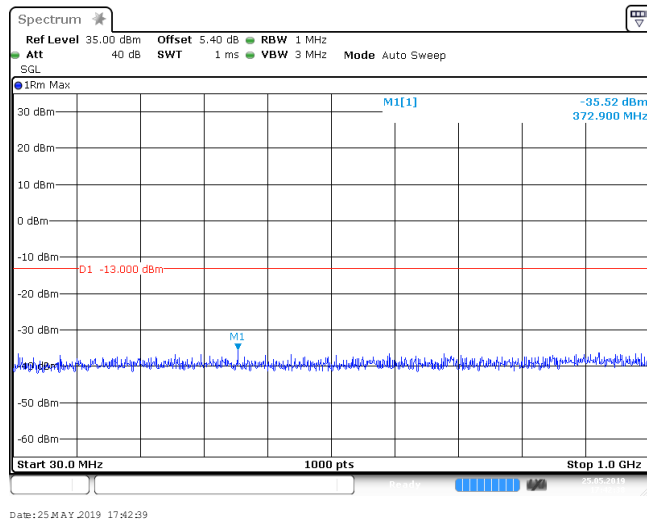
GSM1900_810



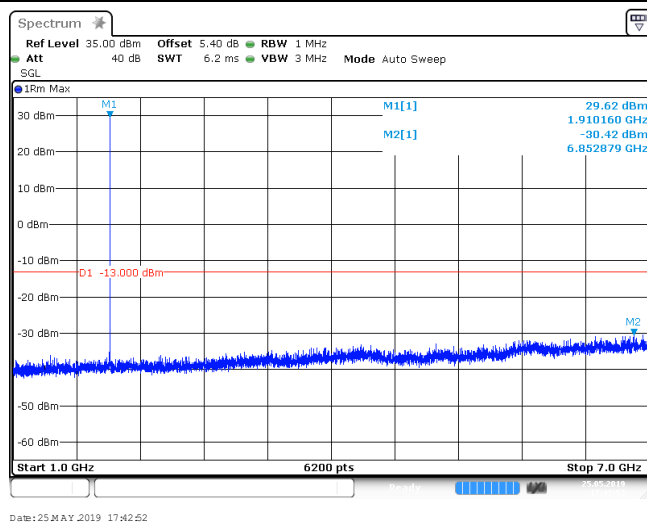
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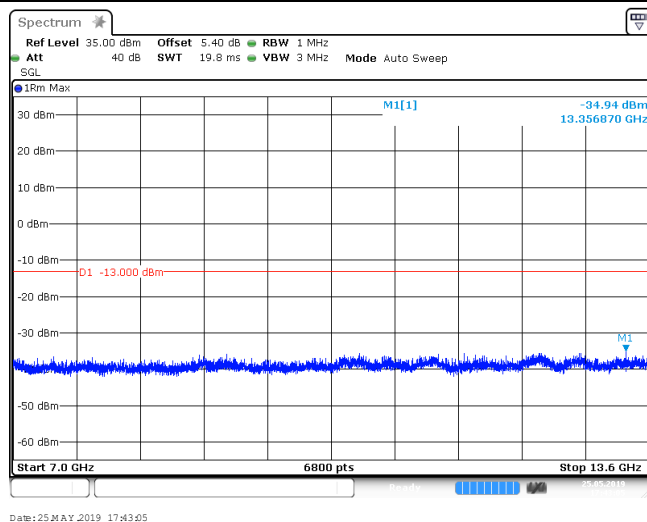
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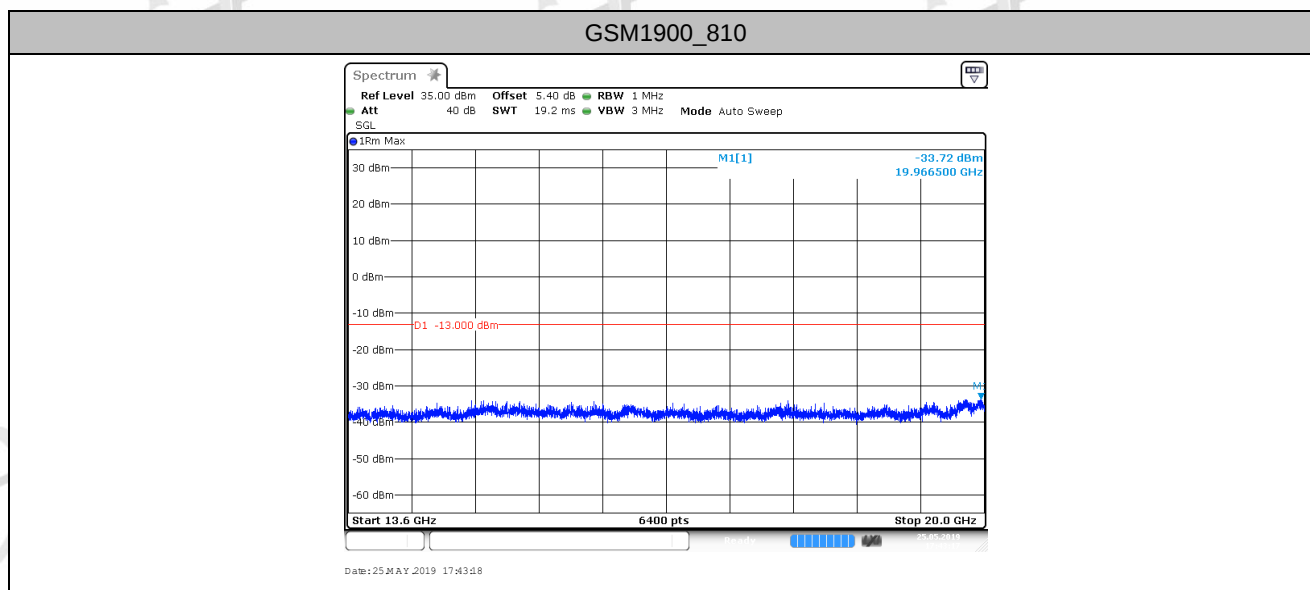


GSM1900_810



GSM1900_810





9. Frequency Stability

9.1.Frequency Error Vs Voltage

Voltage							
BAND	Channel	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GSM850	128	VL	TN	9.40	0.011399	±2.5	PASS
GSM850	128	VN	TN	11.24	0.013632	±2.5	PASS
GSM850	128	VH	TN	3.03	0.003682	±2.5	PASS
GSM850	190	VL	TN	10.07	0.012041	±2.5	PASS
GSM850	190	VN	TN	7.43	0.008876	±2.5	PASS
GSM850	190	VH	TN	8.10	0.009687	±2.5	PASS
GSM850	251	VL	TN	10.98	0.012933	±2.5	PASS
GSM850	251	VN	TN	10.46	0.012324	±2.5	PASS
GSM850	251	VH	TN	11.04	0.013009	±2.5	PASS
GSM1900	512	VL	TN	13.08	0.007067	±2.5	PASS
GSM1900	512	VN	TN	18.60	0.010051	±2.5	PASS
GSM1900	512	VH	TN	20.86	0.011273	±2.5	PASS
GSM1900	661	VL	TN	12.59	0.006698	±2.5	PASS
GSM1900	661	VN	TN	14.69	0.007814	±2.5	PASS
GSM1900	661	VH	TN	19.11	0.010167	±2.5	PASS
GSM1900	810	VL	TN	28.19	0.014758	±2.5	PASS
GSM1900	810	VN	TN	24.41	0.012780	±2.5	PASS
GSM1900	810	VH	TN	26.64	0.013947	±2.5	PASS

9.2.Frequency Error Vs Temperature

Temperature							
BAND	Channel	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GSM850	128	VN	-30	5.81	0.007051	±2.5	PASS
GSM850	128	VN	-20	6.10	0.007404	±2.5	PASS
GSM850	128	VN	-10	6.59	0.007991	±2.5	PASS
GSM850	128	VN	0	4.49	0.005445	±2.5	PASS
GSM850	128	VN	10	6.33	0.007678	±2.5	PASS
GSM850	128	VN	20	6.94	0.008422	±2.5	PASS
GSM850	128	VN	30	-0.61	-0.000744	±2.5	PASS
GSM850	128	VN	40	-0.71	-0.000862	±2.5	PASS
GSM850	128	VN	50	0.90	0.001097	±2.5	PASS
GSM850	190	VN	-30	8.72	0.010420	±2.5	PASS
GSM850	190	VN	-20	9.78	0.011693	±2.5	PASS
GSM850	190	VN	-10	7.04	0.008413	±2.5	PASS
GSM850	190	VN	0	3.55	0.004245	±2.5	PASS
GSM850	190	VN	10	7.49	0.008953	±2.5	PASS
GSM850	190	VN	20	8.85	0.010574	±2.5	PASS
GSM850	190	VN	30	9.72	0.011616	±2.5	PASS
GSM850	190	VN	40	6.39	0.007641	±2.5	PASS
GSM850	190	VN	50	11.04	0.013198	±2.5	PASS
GSM850	251	VN	-30	12.33	0.014530	±2.5	PASS
GSM850	251	VN	-20	8.14	0.009585	±2.5	PASS
GSM850	251	VN	-10	9.33	0.010993	±2.5	PASS
GSM850	251	VN	0	12.33	0.014530	±2.5	PASS
GSM850	251	VN	10	6.04	0.007113	±2.5	PASS
GSM850	251	VN	20	14.21	0.016736	±2.5	PASS
GSM850	251	VN	30	7.65	0.009015	±2.5	PASS
GSM850	251	VN	40	9.01	0.010612	±2.5	PASS
GSM850	251	VN	50	9.14	0.010764	±2.5	PASS
GSM1900	512	VN	-30	15.59	0.008428	±2.5	PASS
GSM1900	512	VN	-20	20.21	0.010924	±2.5	PASS
GSM1900	512	VN	-10	18.89	0.010208	±2.5	PASS
GSM1900	512	VN	0	11.95	0.006456	±2.5	PASS
GSM1900	512	VN	10	16.92	0.009144	±2.5	PASS
GSM1900	512	VN	20	-7.14	-0.003856	±2.5	PASS
GSM1900	512	VN	30	7.94	0.004293	±2.5	PASS
GSM1900	512	VN	40	-3.55	-0.001919	±2.5	PASS
GSM1900	512	VN	50	2.65	0.001431	±2.5	PASS
GSM1900	661	VN	-30	20.08	0.010682	±2.5	PASS
GSM1900	661	VN	-20	18.66	0.009926	±2.5	PASS
GSM1900	661	VN	-10	19.31	0.010270	±2.5	PASS
GSM1900	661	VN	0	9.85	0.005238	±2.5	PASS
GSM1900	661	VN	10	11.53	0.006131	±2.5	PASS
GSM1900	661	VN	20	7.07	0.003761	±2.5	PASS
GSM1900	661	VN	30	10.49	0.005581	±2.5	PASS
GSM1900	661	VN	40	23.08	0.012279	±2.5	PASS
GSM1900	661	VN	50	19.98	0.010630	±2.5	PASS
GSM1900	810	VN	-30	24.86	0.013017	±2.5	PASS
GSM1900	810	VN	-20	26.47	0.013862	±2.5	PASS
GSM1900	810	VN	-10	19.40	0.010160	±2.5	PASS

GSM1900	810	VN	0	10.56	0.005528	±2.5	PASS
GSM1900	810	VN	10	16.50	0.008639	±2.5	PASS
GSM1900	810	VN	20	21.57	0.011293	±2.5	PASS
GSM1900	810	VN	30	19.63	0.010278	±2.5	PASS
GSM1900	810	VN	40	13.11	0.006864	±2.5	PASS
GSM1900	810	VN	50	15.50	0.008115	±2.5	PASS

The End