

Appendix B.1

GSM850&1900

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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	2018/4/2	2019/4/1
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	2018/4/2	2019/4/1
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	Anritsu	MT8821C	6201462742	2018/5/2	2019/5/1
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	W005-02	2018/3/13	2019/3/12
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	2018/9/15	2019/9/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2018/3/13	2019/3/12
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	2018/9/2	2019/9/2
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	HTC-1	W006-17	2018/9/10	2019/9/10
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2018/11/27	2019/11/27
Wideband Radio Communication Tester	Anritsu	MT8821C	6201462742	2018/5/2	2019/5/1
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	W005-02	2018/3/13	2019/3/12

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	Slot Config	Channel	Power(dBm)	ERP(dBm)	Limit(dBm)	Verdict
GSM850	/	128	32.79	28.32	38.45	PASS
GSM850	/	190	32.93	28.46	38.45	PASS
GSM850	/	251	32.87	28.40	38.45	PASS
EGPRS850	1 Slot	128	26.12	21.65	38.45	PASS
EGPRS850	2 Slot	128	25.17	20.70	38.45	PASS
EGPRS850	3 Slot	128	23.71	19.24	38.45	PASS
EGPRS850	4 Slot	128	21.65	17.18	38.45	PASS
EGPRS850	1 Slot	190	25.94	21.47	38.45	PASS
EGPRS850	2 Slot	190	25.24	20.77	38.45	PASS
EGPRS850	3 Slot	190	24.20	19.73	38.45	PASS
EGPRS850	4 Slot	190	22.11	17.64	38.45	PASS
EGPRS850	1 Slot	251	26.42	21.95	38.45	PASS
EGPRS850	2 Slot	251	24.97	20.50	38.45	PASS
EGPRS850	3 Slot	251	24.11	19.64	38.45	PASS
EGPRS850	4 Slot	251	22.58	18.11	38.45	PASS

BAND	Slot Config	Channel	Power(dBm)	EIRP(dBm)	Limit(dBm)	Verdict
GSM1900	/	512	29.93	30.49	33.00	PASS
GSM1900	/	661	29.70	30.26	33.00	PASS
GSM1900	/	810	30.36	30.92	33.00	PASS
EGPRS1900	1 Slot	512	25.76	26.32	33.00	PASS
EGPRS1900	2 Slot	512	24.30	24.86	33.00	PASS
EGPRS1900	3 Slot	512	23.33	23.89	33.00	PASS
EGPRS1900	4 Slot	512	21.56	22.12	33.00	PASS
EGPRS1900	1 Slot	661	25.71	26.27	33.00	PASS
EGPRS1900	2 Slot	661	24.62	25.18	33.00	PASS
EGPRS1900	3 Slot	661	23.16	23.72	33.00	PASS
EGPRS1900	4 Slot	661	20.89	21.45	33.00	PASS
EGPRS1900	1 Slot	810	26.23	26.79	33.00	PASS
EGPRS1900	2 Slot	810	24.60	25.16	33.00	PASS
EGPRS1900	3 Slot	810	22.80	23.36	33.00	PASS
EGPRS1900	4 Slot	810	21.53	22.09	33.00	PASS

Remark:

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

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

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

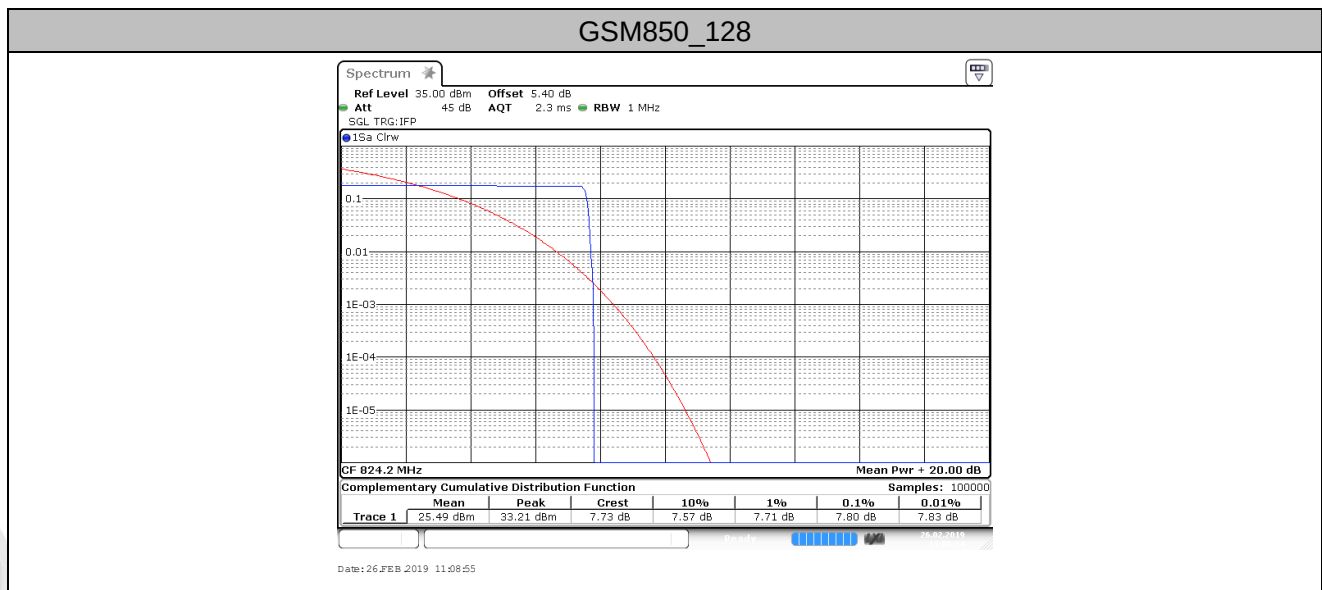
b: SGP=Signal Generator Level

4. Peak-to-Average Ratio

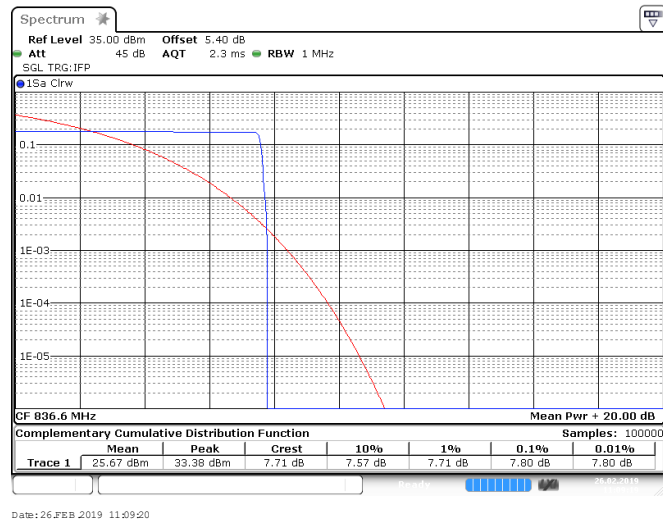
4.1. Test Result

BAND	Channel	Peak-to-Average Ratio(dB)	Limit(dB)	Verdict
GSM850	128	7.80	13	PASS
GSM850	190	7.80	13	PASS
GSM850	251	7.71	13	PASS
EGPRS850	128	10.75	13	PASS
EGPRS850	190	10.64	13	PASS
EGPRS850	251	10.90	13	PASS
GSM1900	512	7.71	13	PASS
GSM1900	661	7.65	13	PASS
GSM1900	810	7.71	13	PASS
EGPRS1900	512	10.52	13	PASS
EGPRS1900	661	10.49	13	PASS
EGPRS1900	810	10.84	13	PASS

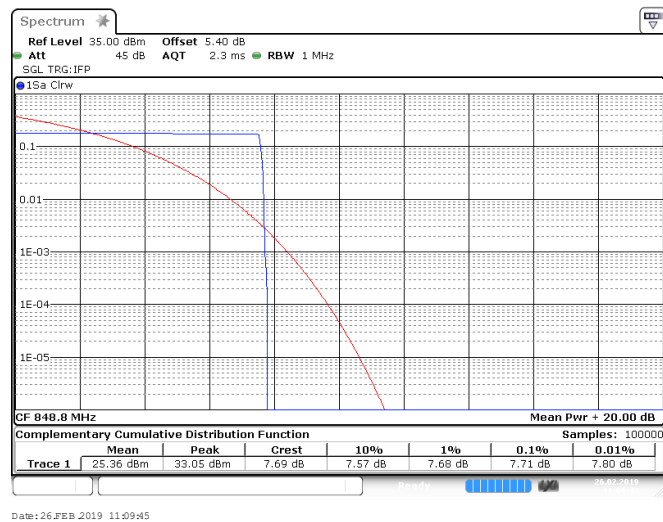
4.2. Part II - Test Plots



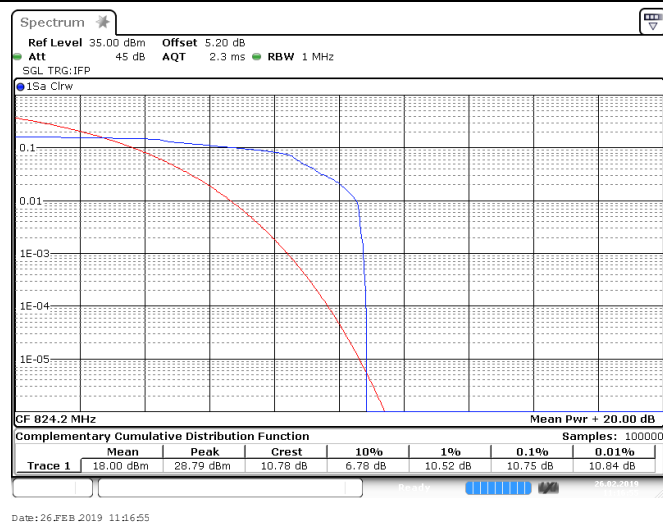
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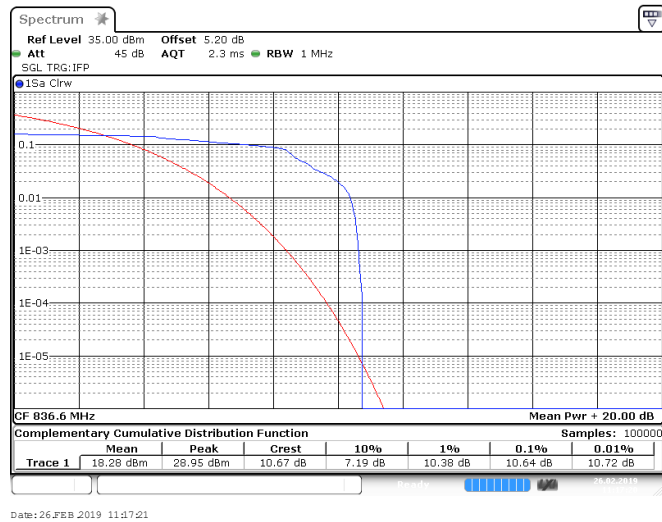
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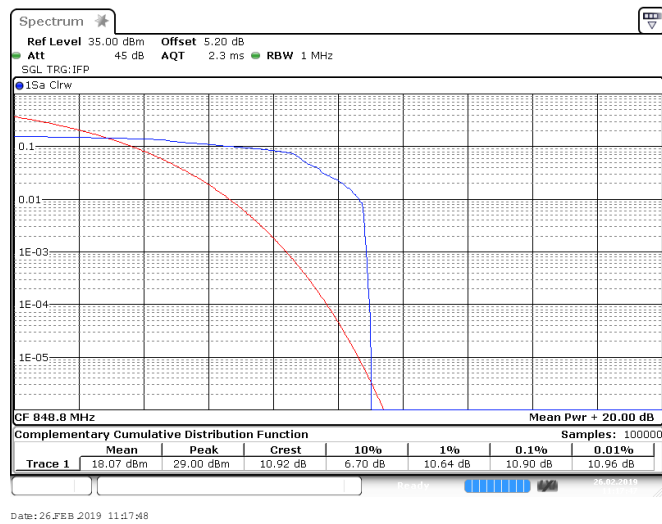
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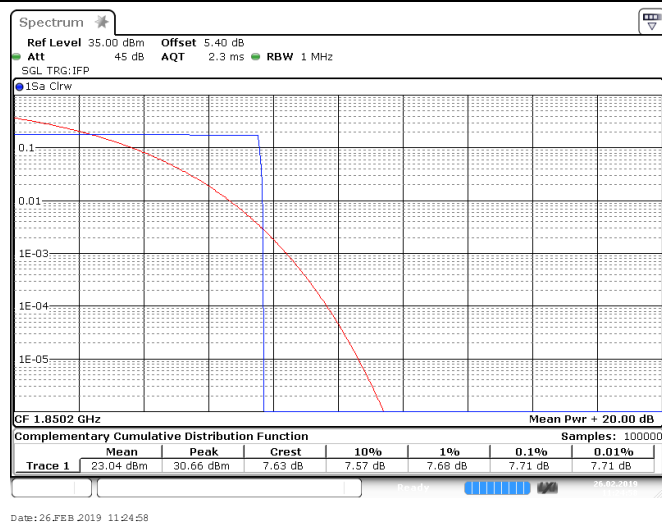
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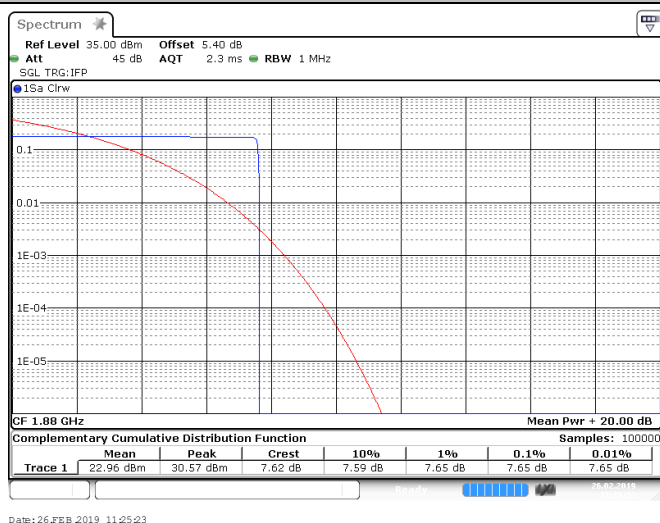
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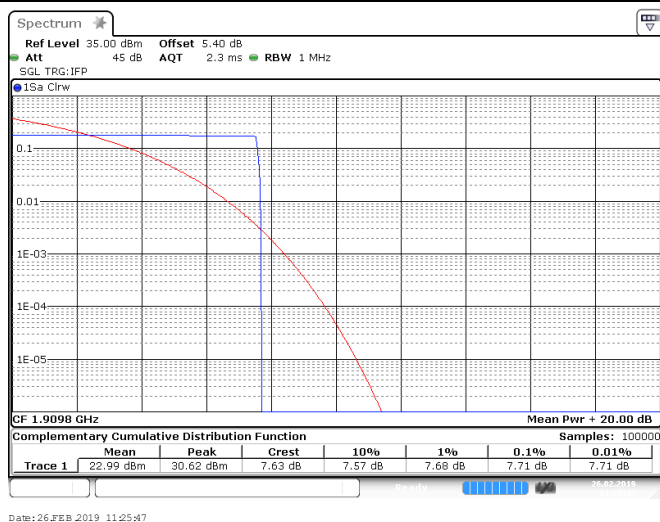
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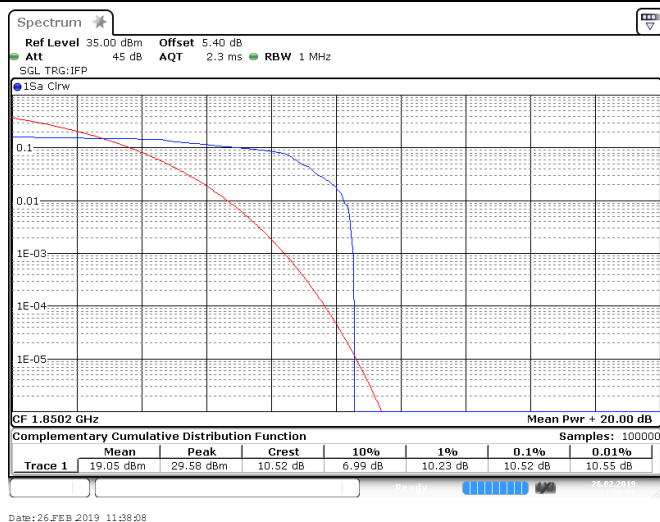
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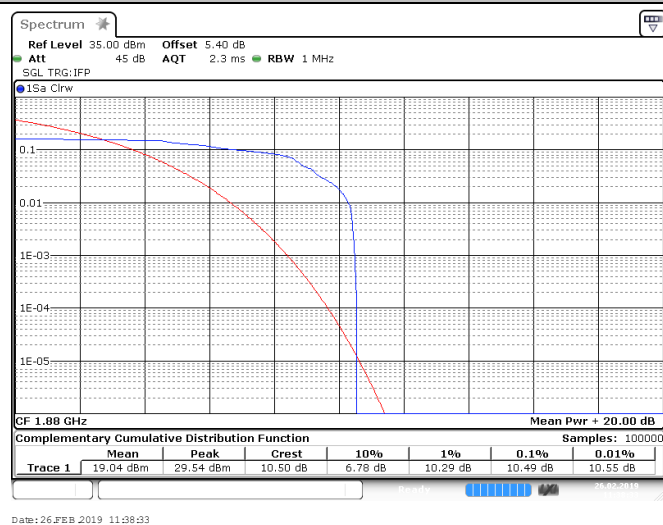
GSM1900_810



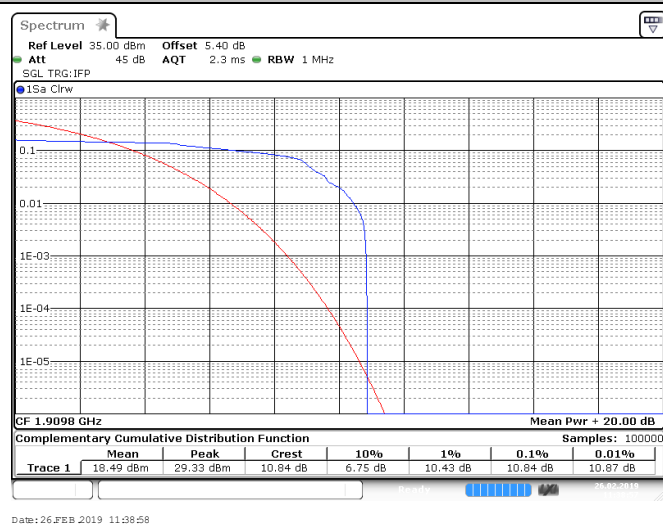
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EGPRS1900_661



EGPRS1900_810



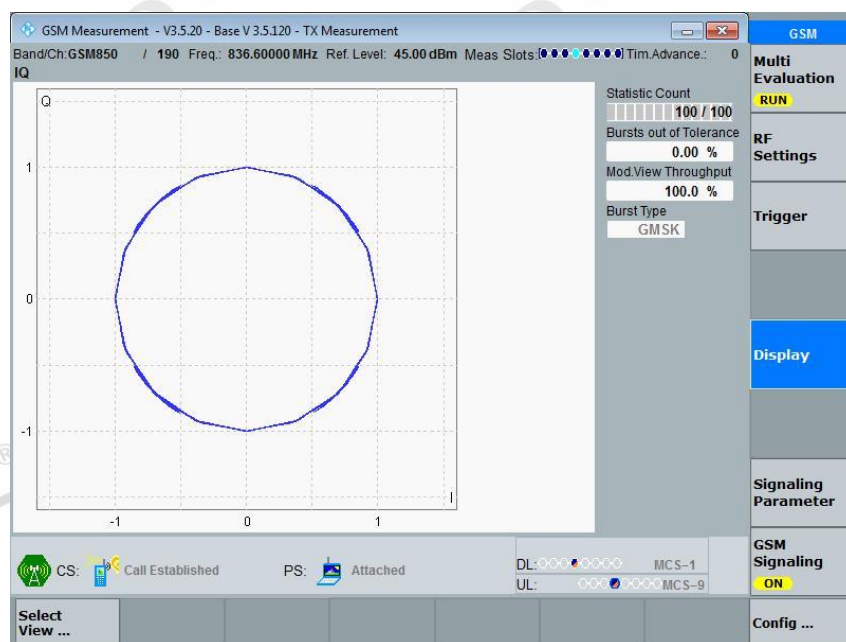
5. Modulation Characteristics

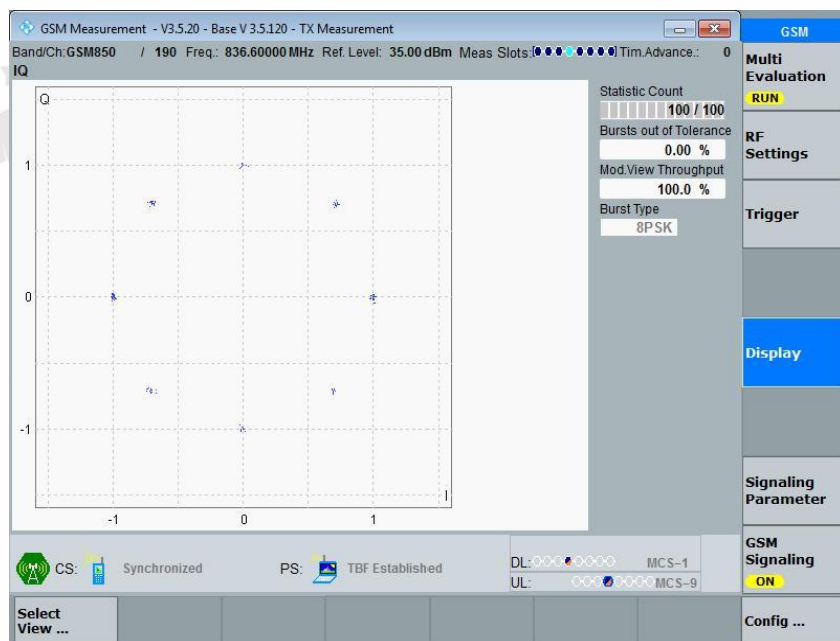
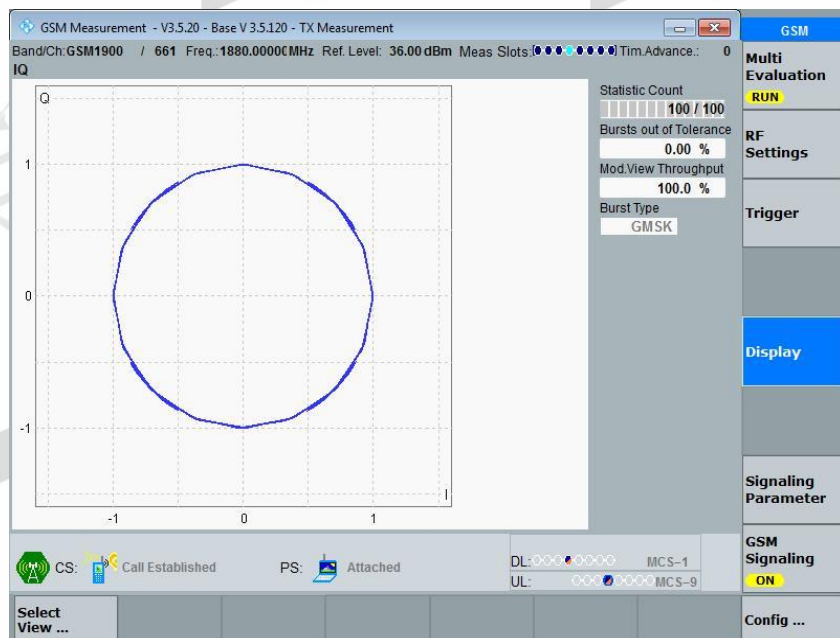
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5.1.1. Test BAND = GSM 850

5.1.1.1. Test Mode = GSM/TM1

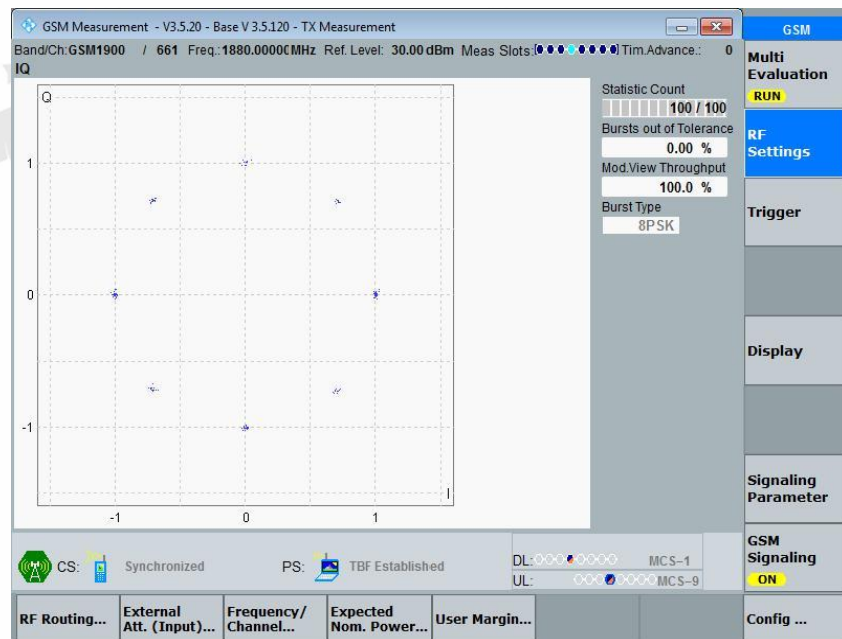
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5.1.1.2. Test Mode = GSM/TM2**5.1.1.2.1. Test Channel = MCH****5.1.2. Test BAND = GSM 1900****5.1.2.1. Test Mode = GSM/TM1****5.1.2.1.1. Test Channel = MCH**

5.1.2.2. Test Mode = GSM/TM2

5.1.2.2.1. Test Channel = MCH

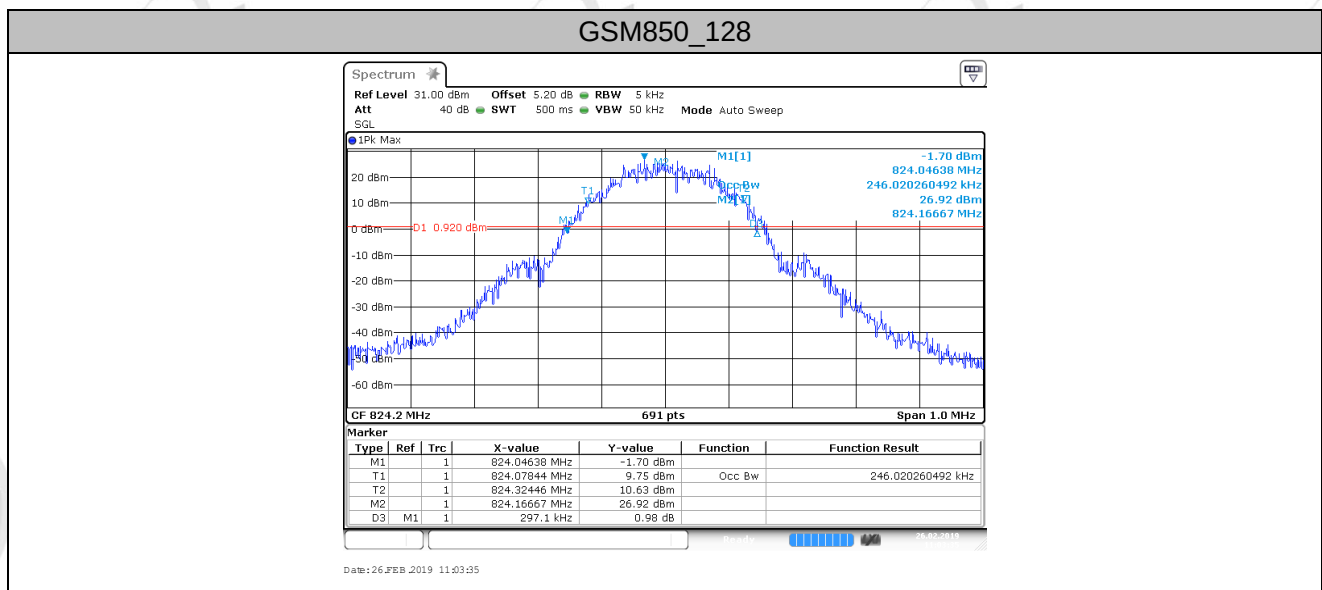


6. 26dB Bandwidth and Occupied Bandwidth

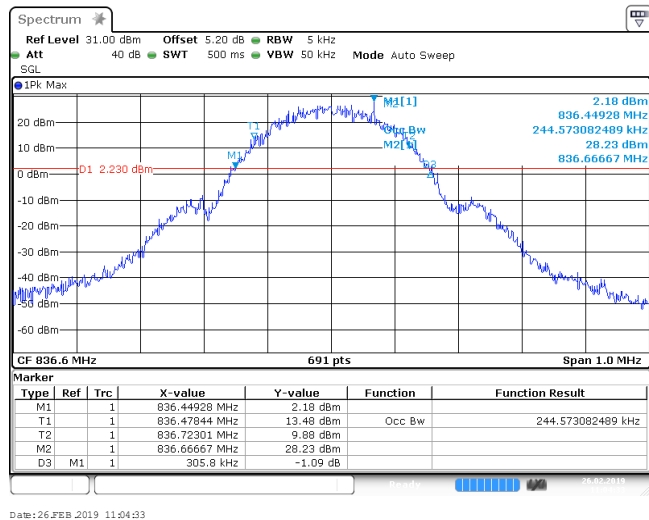
6.1. Test Result

BAND	Channel	Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)	Limit(kHz)	Verdict
GSM850	128	246.02	297.10	---	PASS
GSM850	190	244.57	305.80	---	PASS
GSM850	251	243.13	295.65	---	PASS
EGPRS850	128	244.57	292.75	---	PASS
EGPRS850	190	246.02	294.20	---	PASS
EGPRS850	251	244.57	294.20	---	PASS
GSM1900	512	244.57	307.25	---	PASS
GSM1900	661	247.47	302.90	---	PASS
GSM1900	810	247.47	300.00	---	PASS
EGPRS1900	512	246.02	307.25	---	PASS
EGPRS1900	661	251.81	291.30	---	PASS
EGPRS1900	810	247.47	305.80	---	PASS

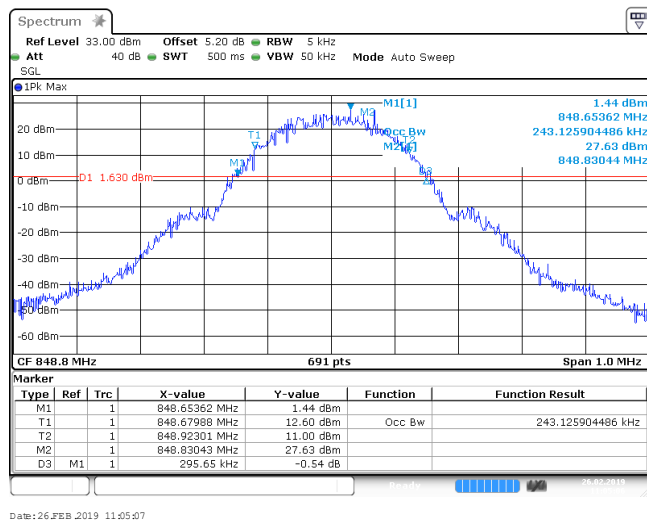
6.2. Test Plots



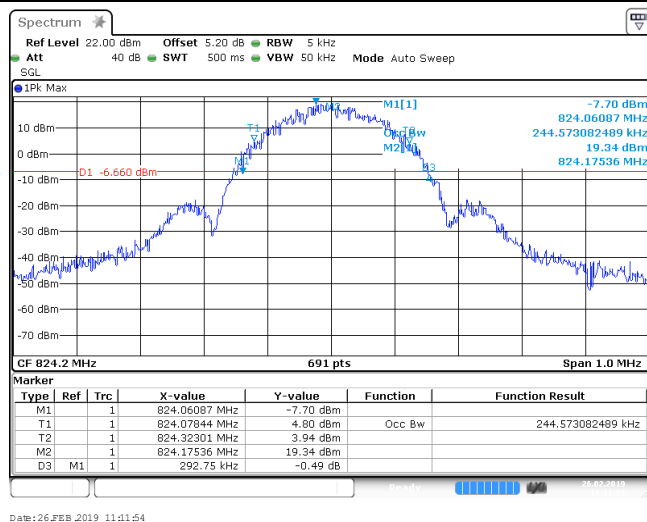
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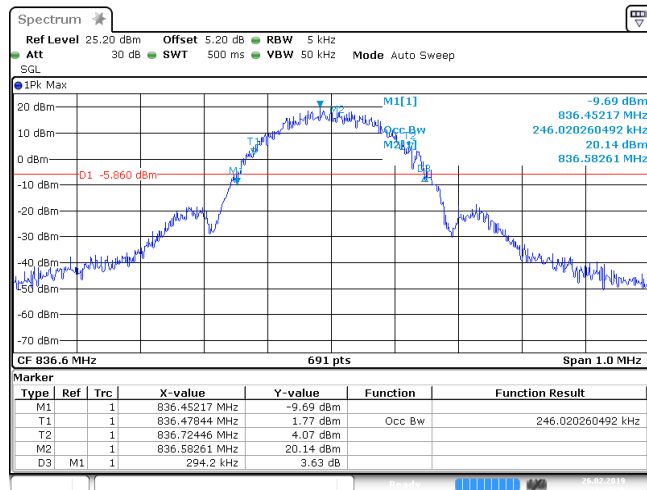
GSM850_251



EGPRS850_128

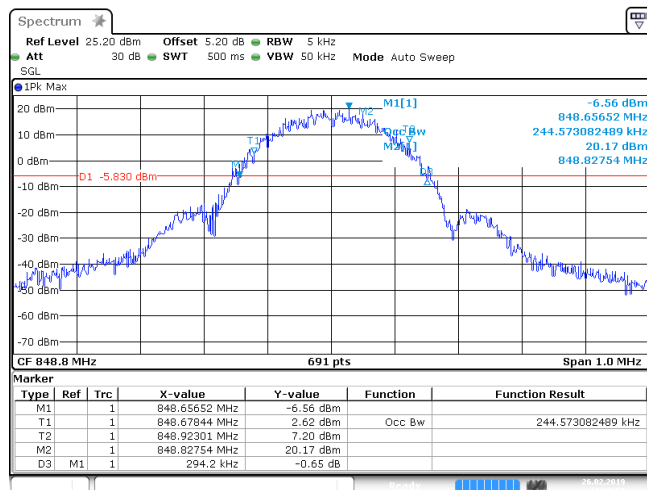


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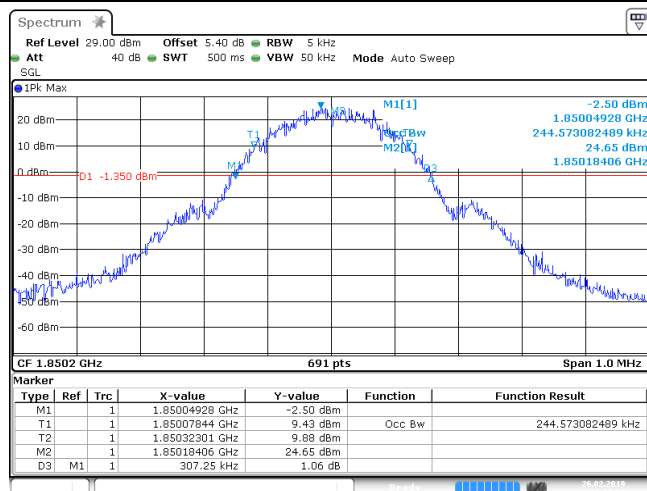
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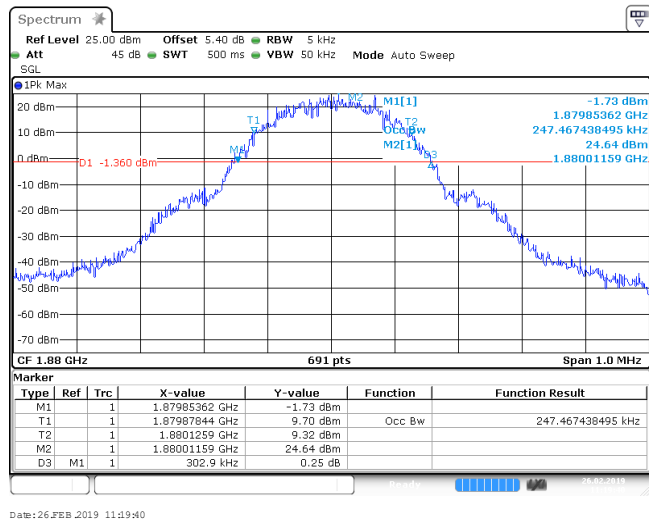
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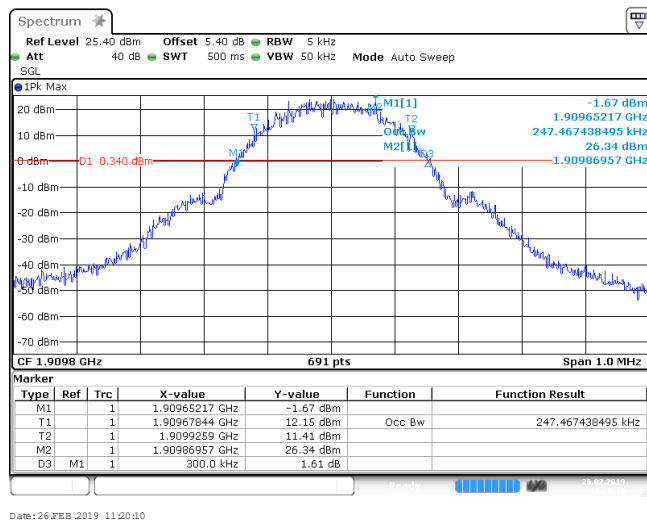


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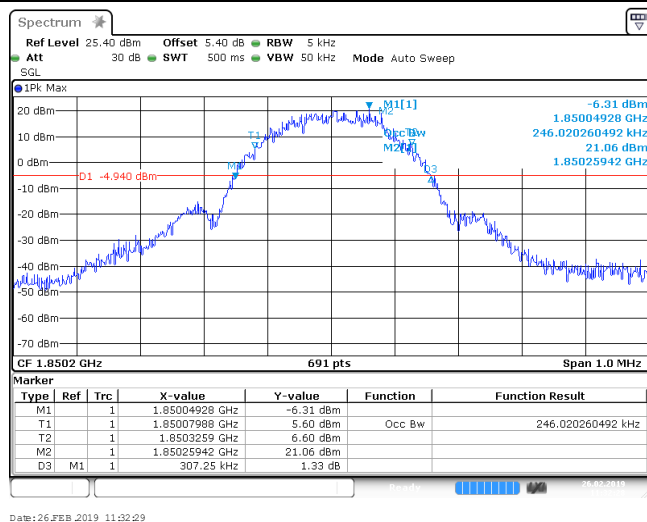
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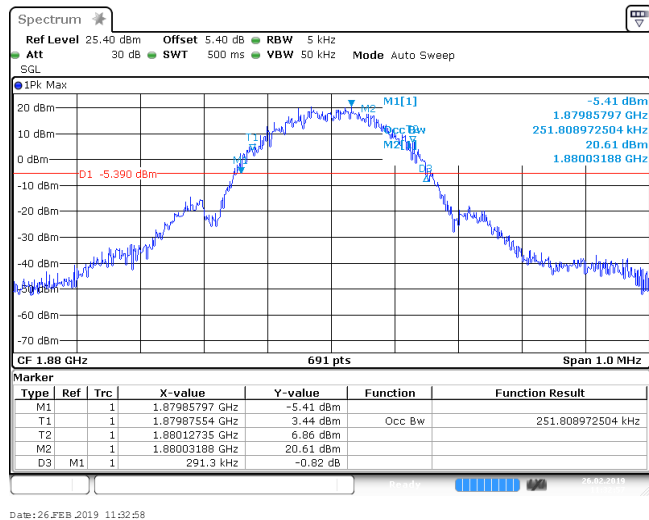
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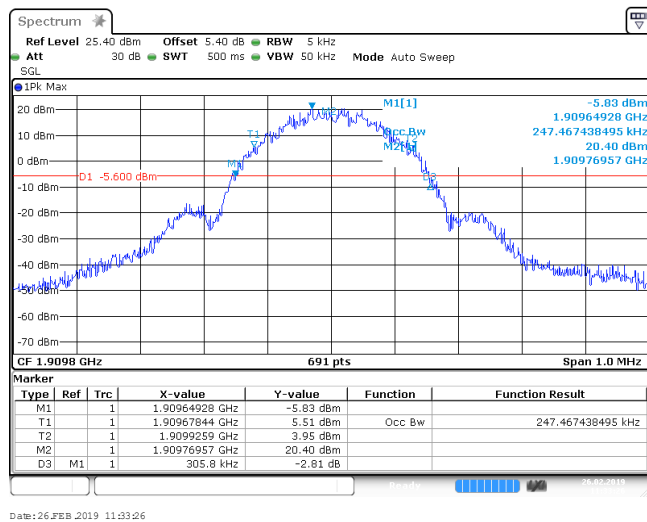
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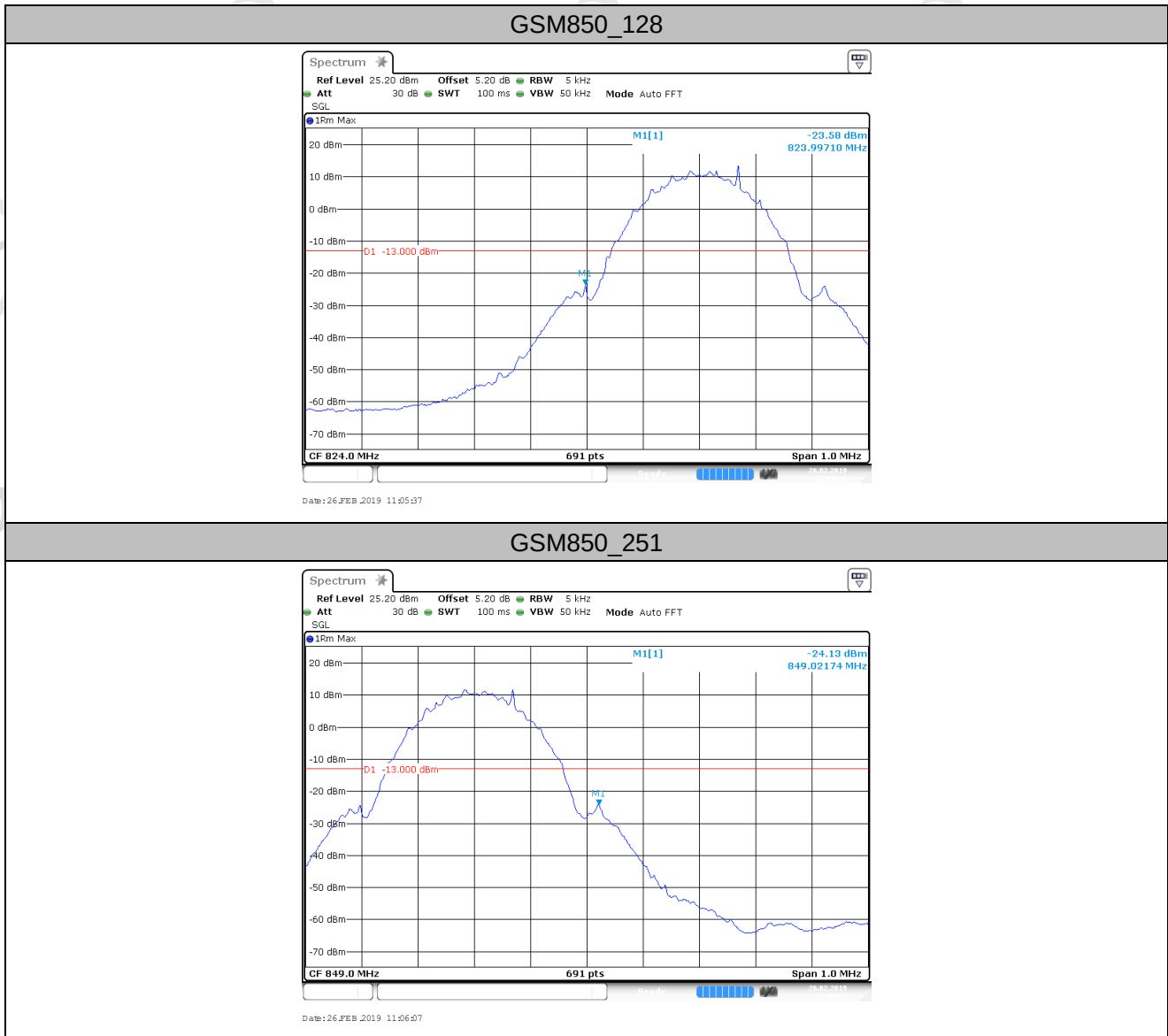


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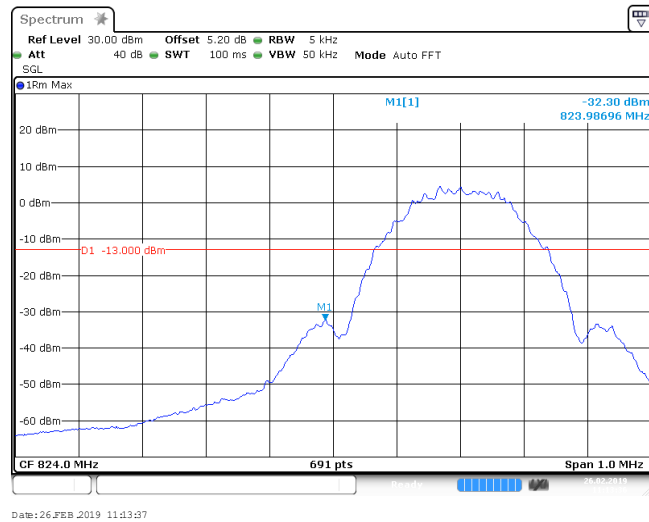


7. Band Edge Compliance

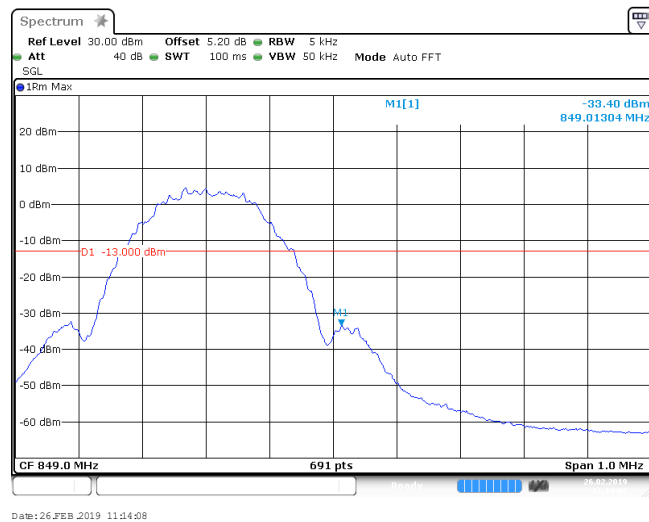
7.1. Test Plots



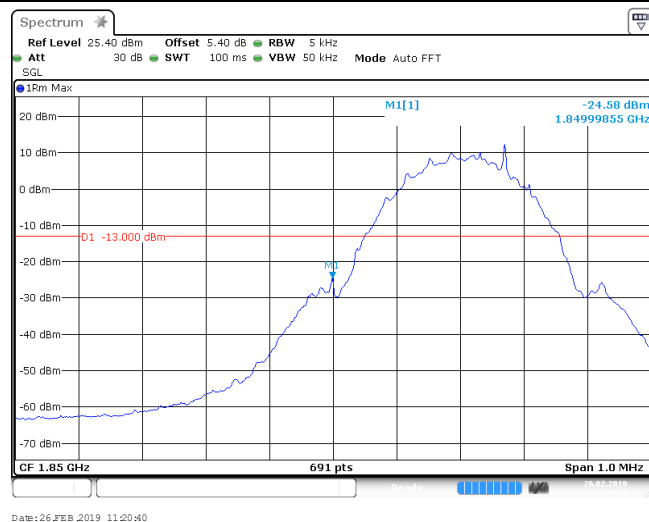
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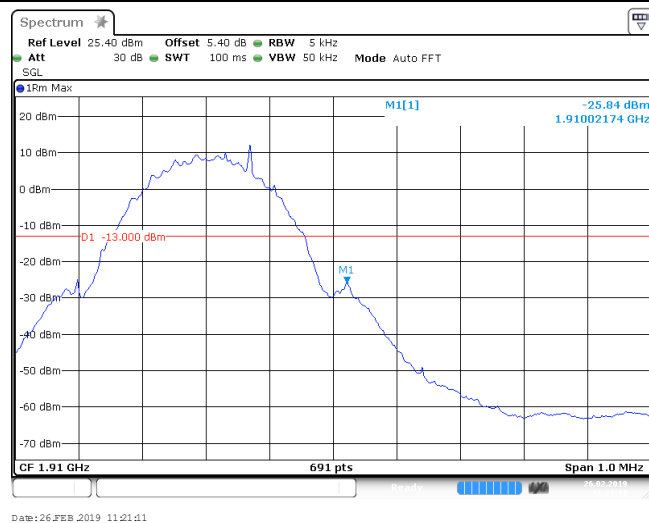
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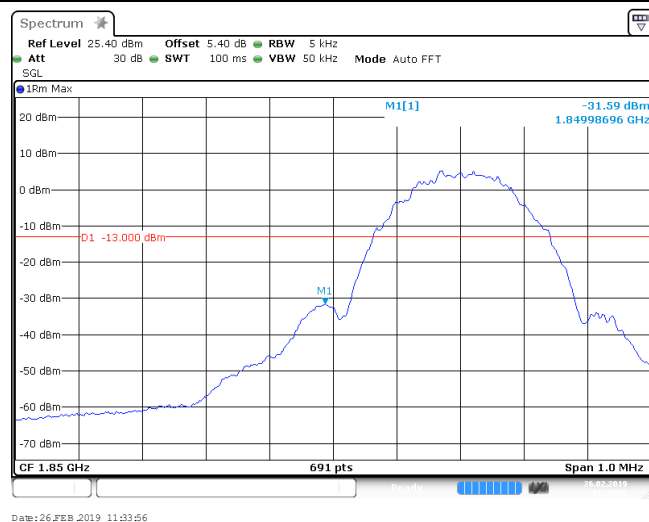
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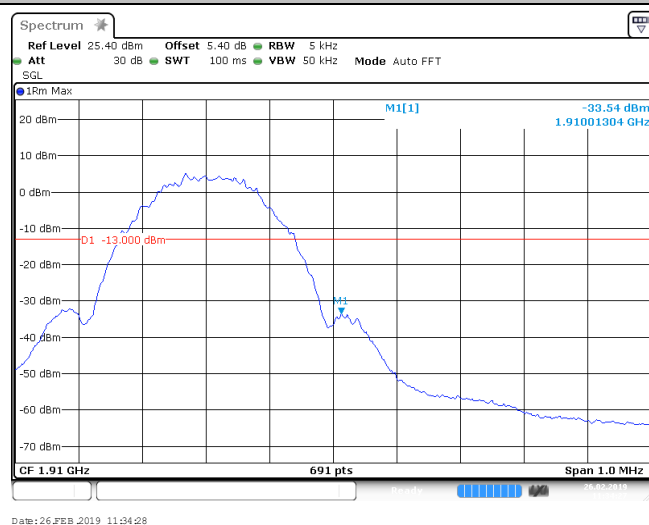
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EGPRS1900_512



EGPRS1900_810

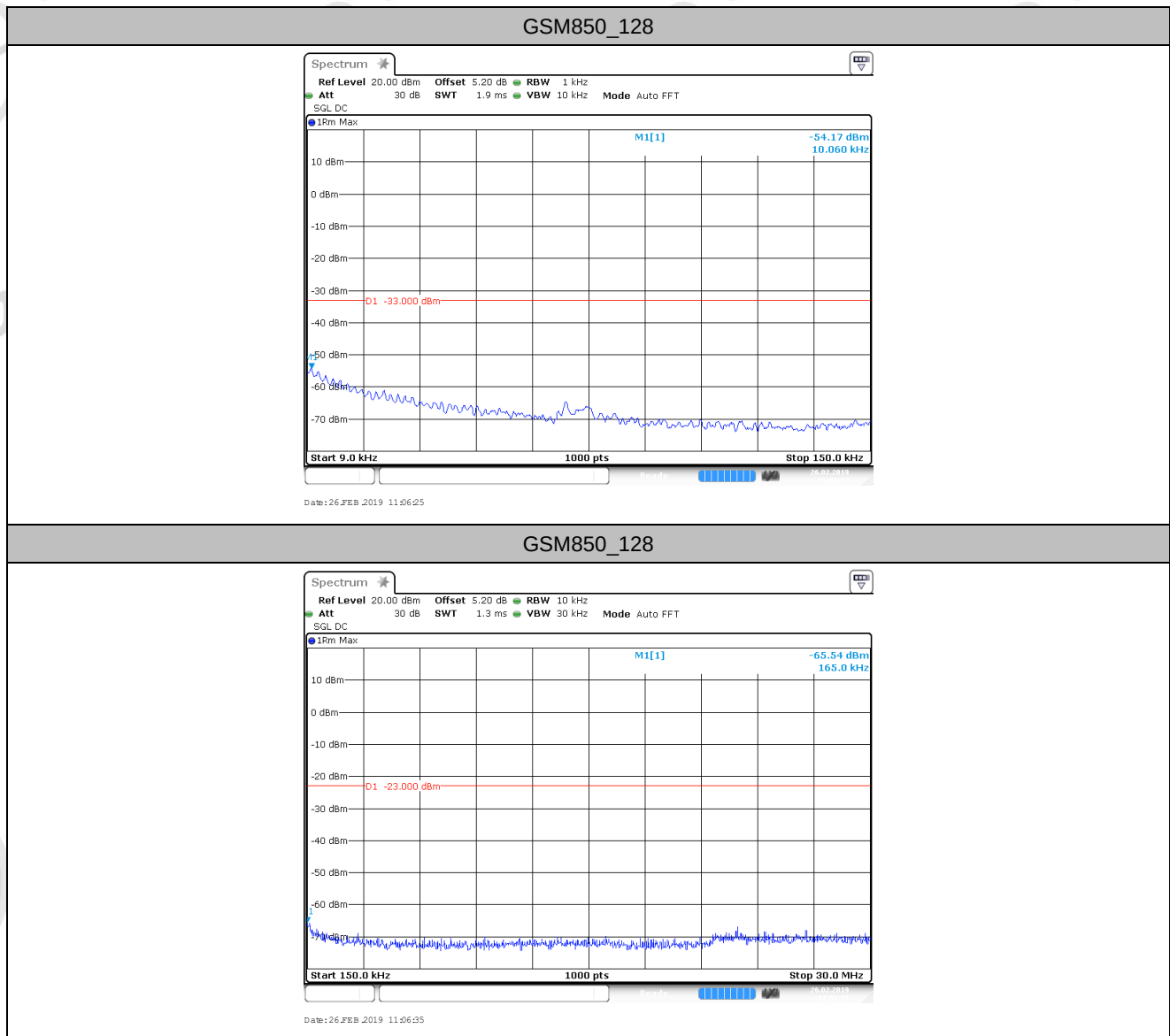


8. Spurious Emission at Antenna Terminal

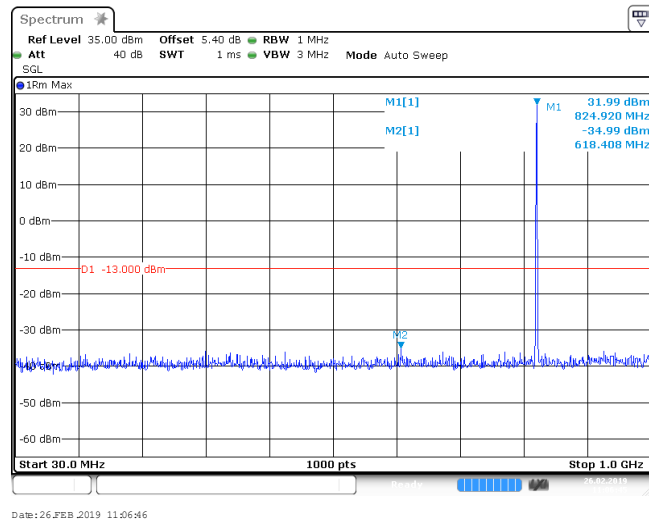
Remark1: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of $< RBW/2$ so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points =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

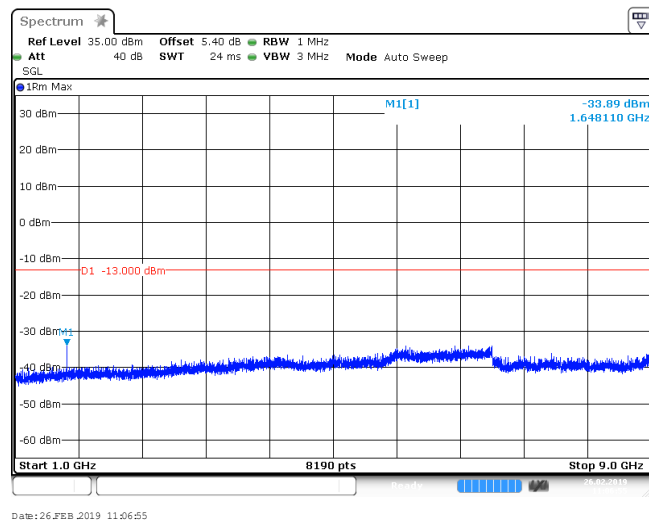
8.1. Test Plots



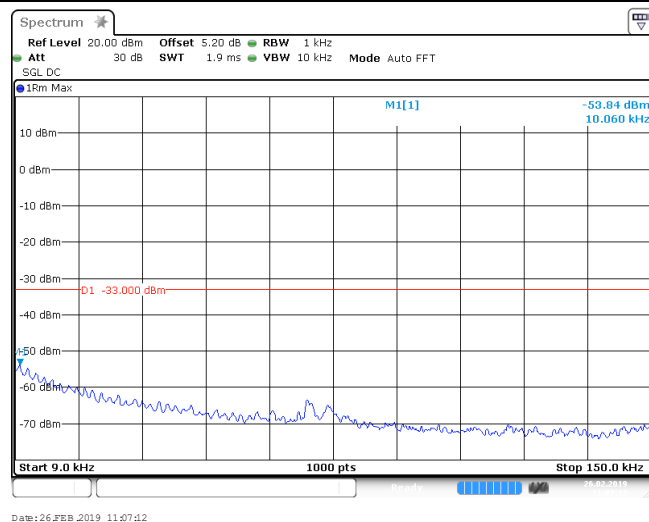
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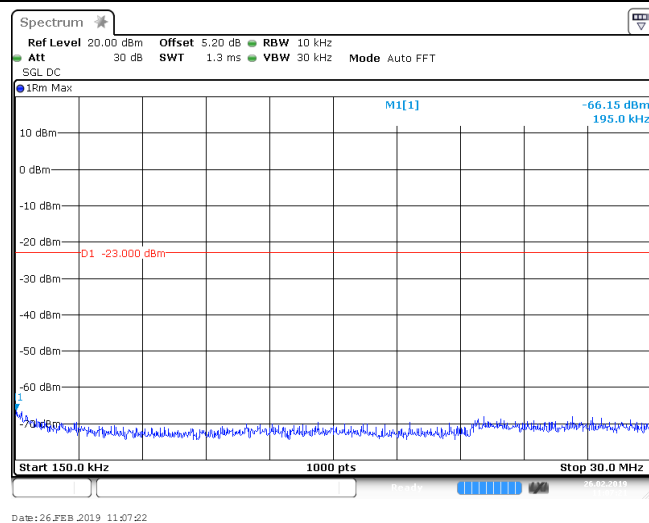
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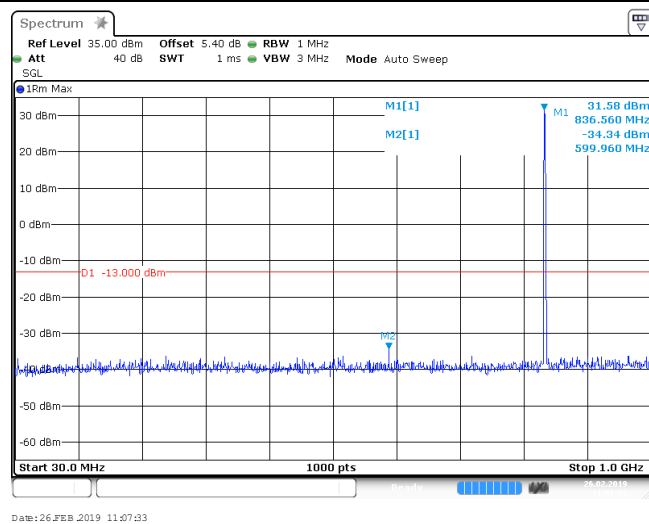
GSM850_190



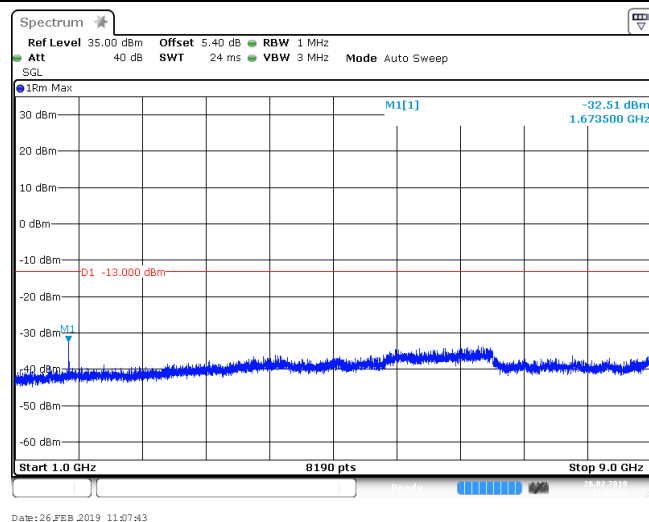
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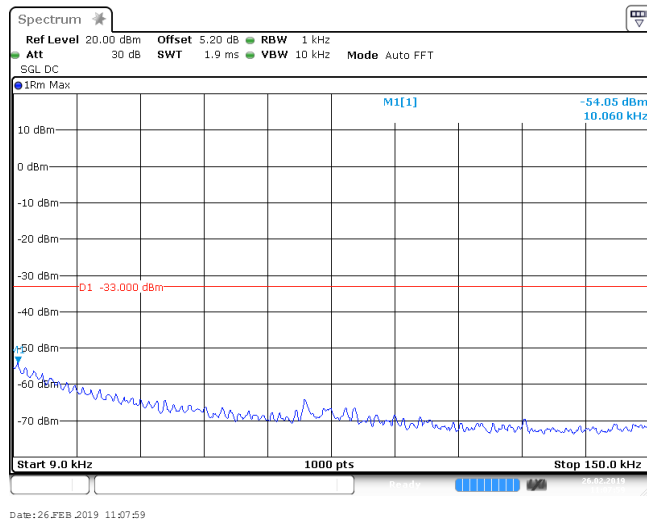
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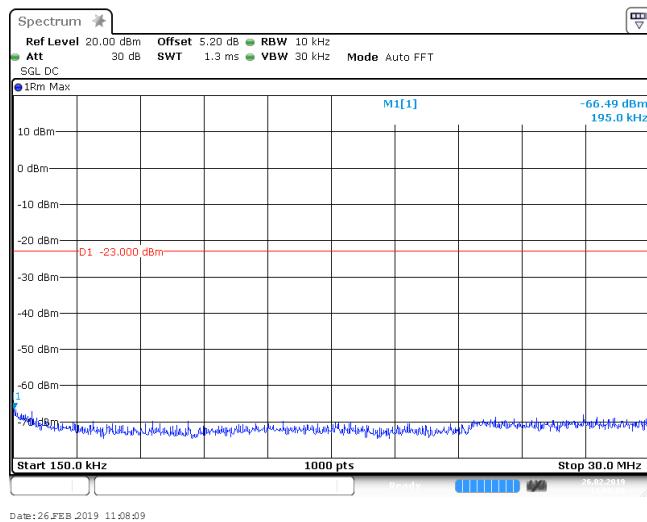
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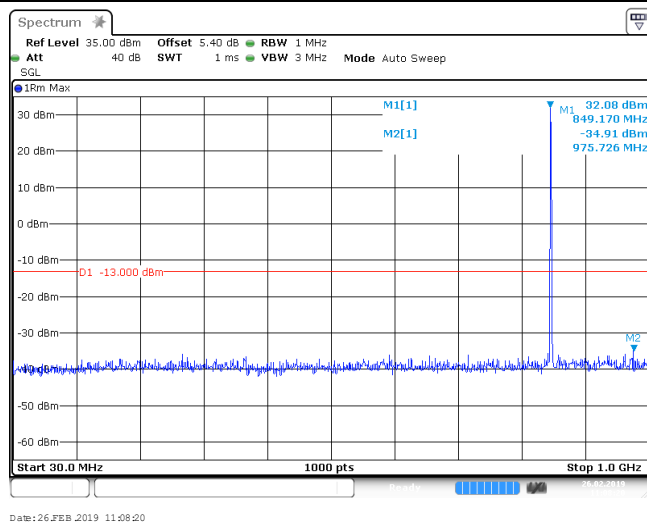
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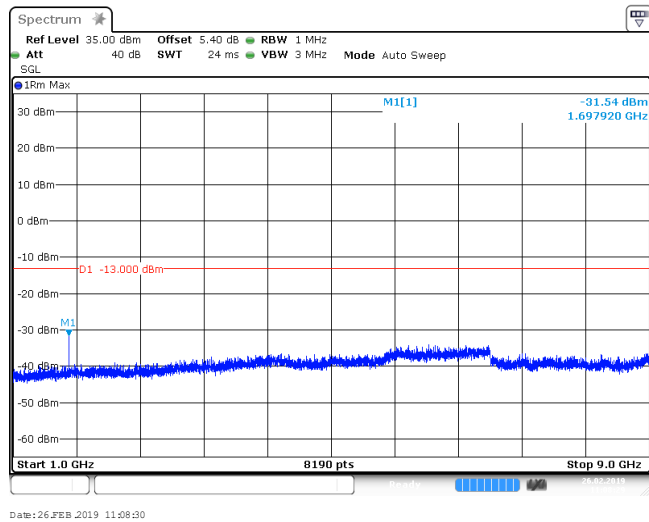
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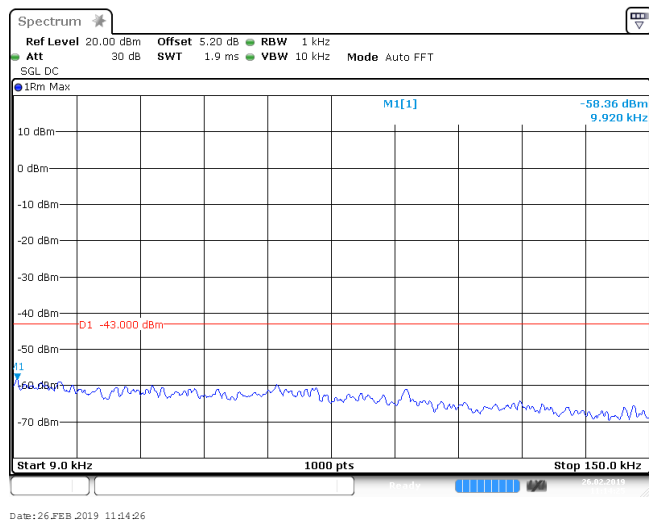
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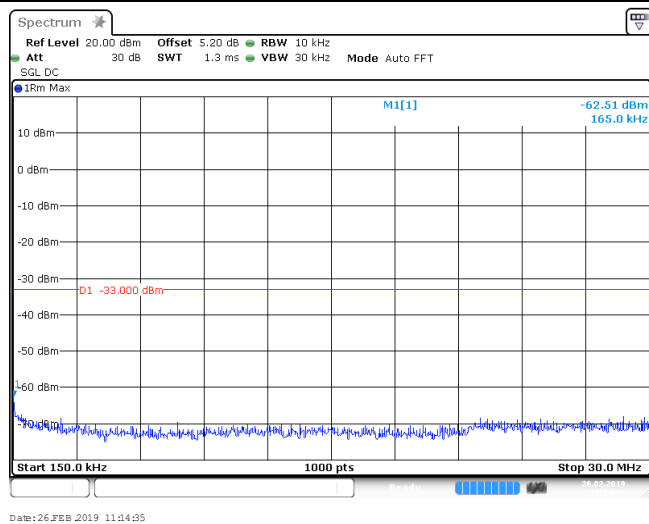
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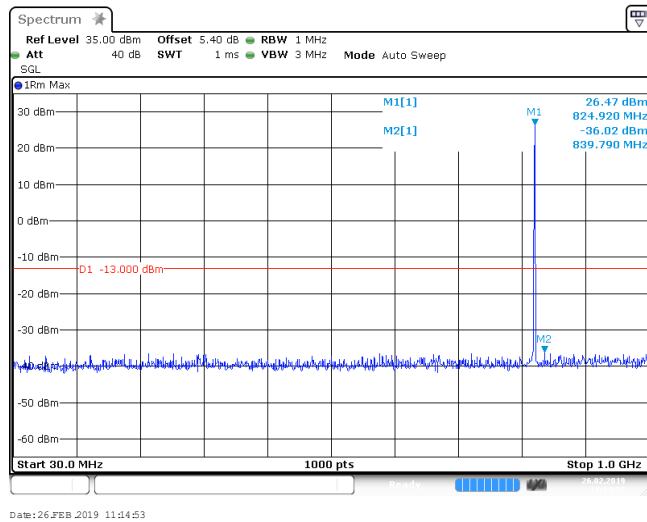
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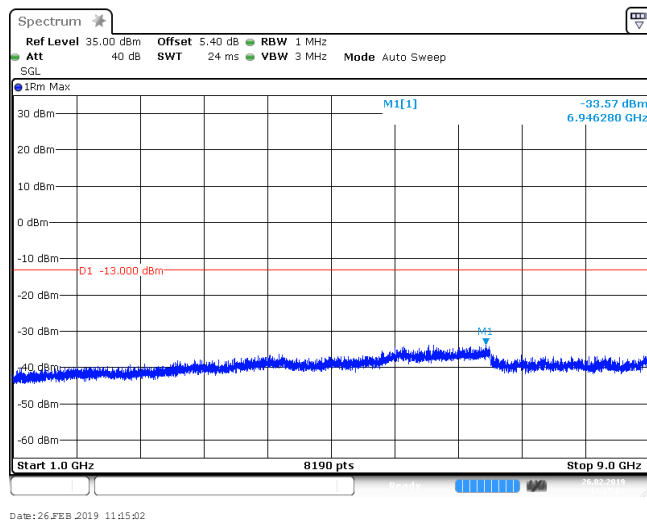
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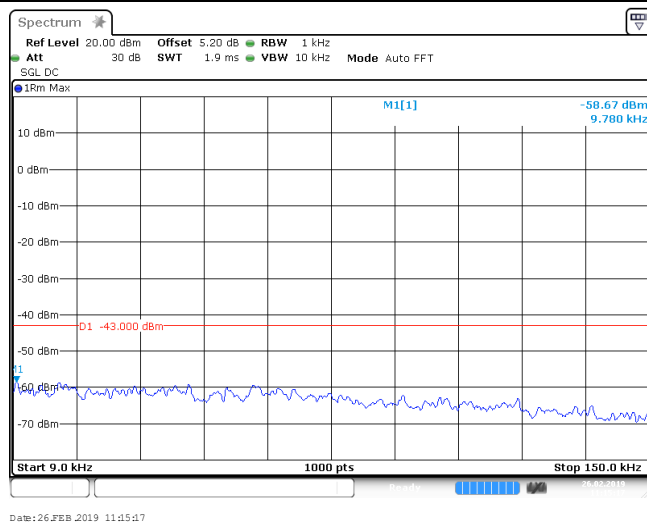
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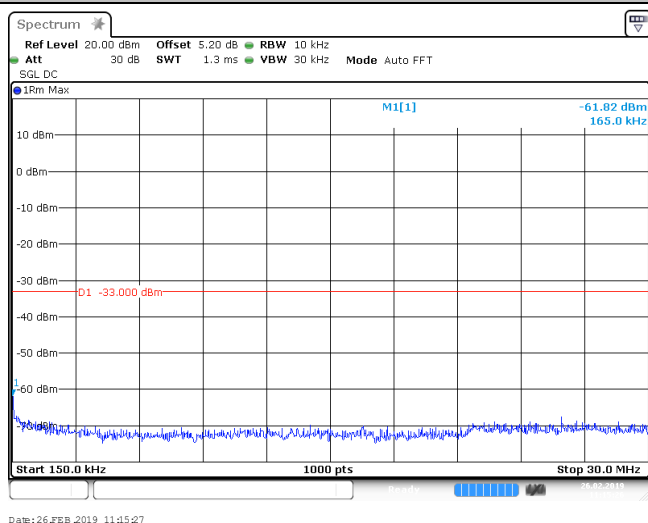
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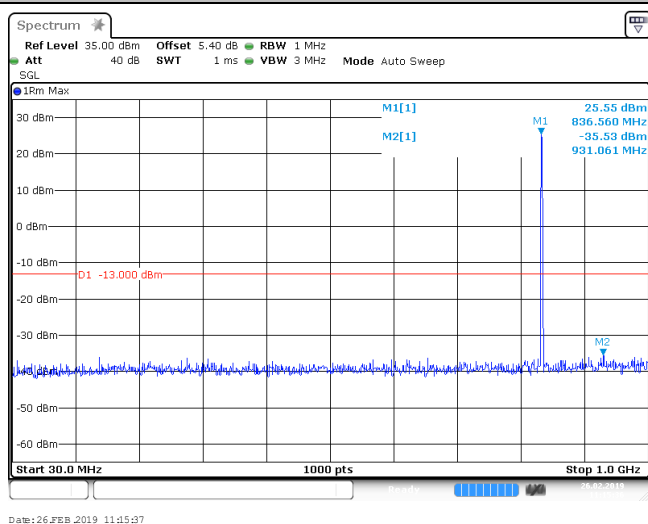
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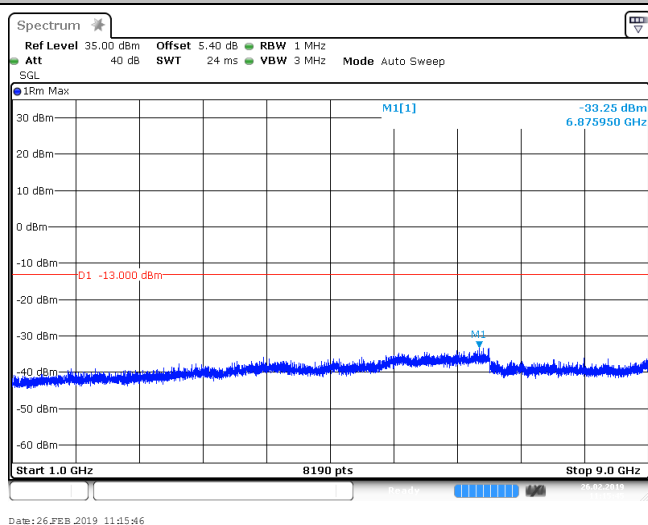
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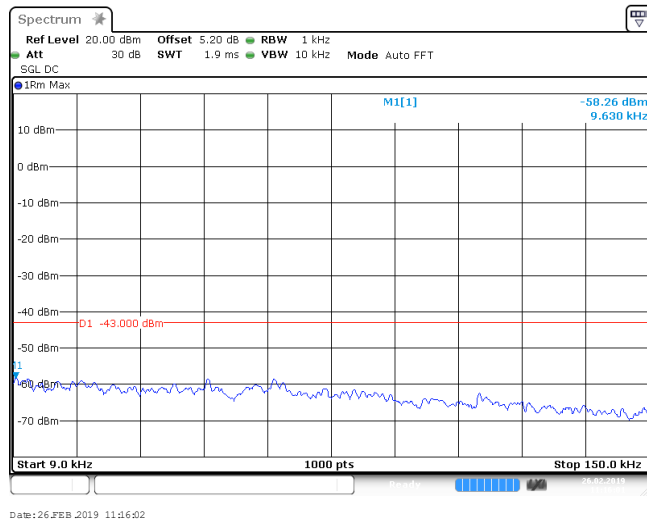
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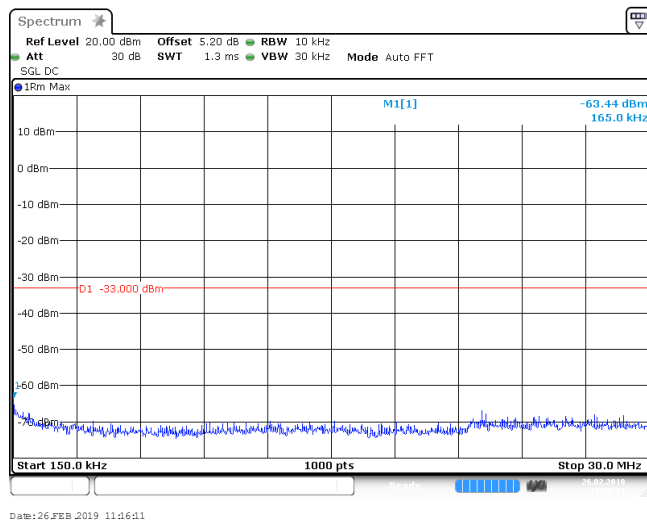
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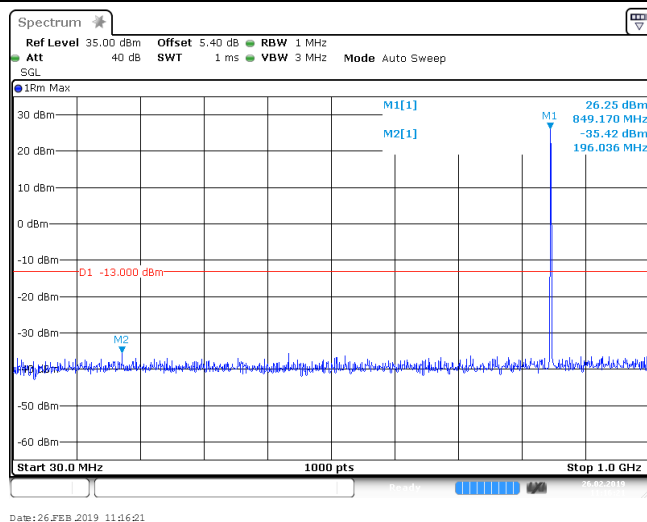
EGPRS850_251



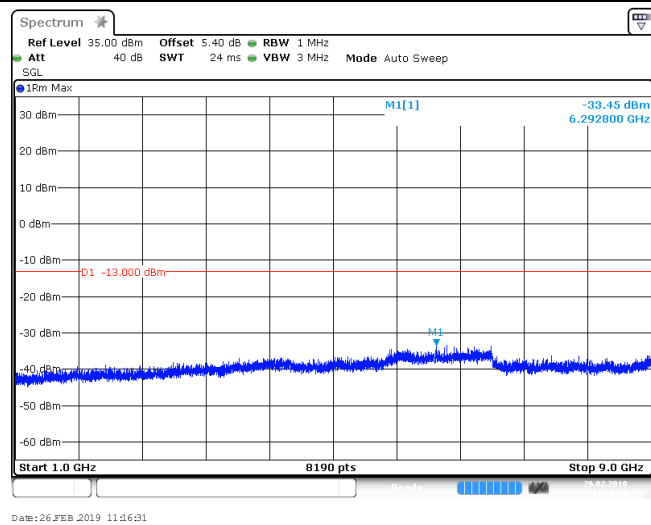
EGPRS850_251



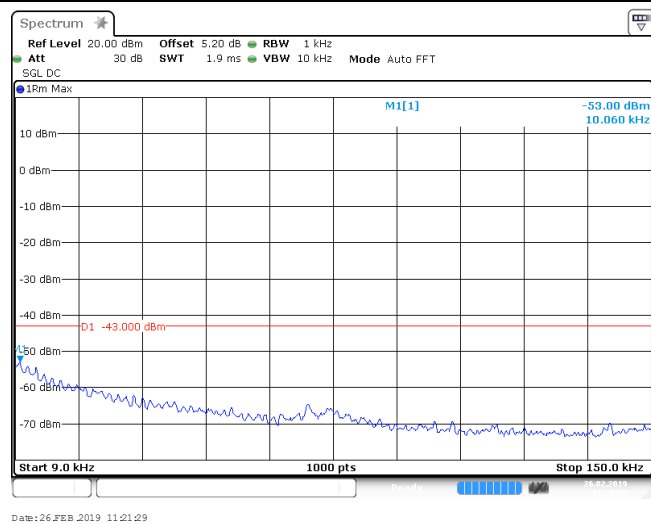
EGPRS850_251



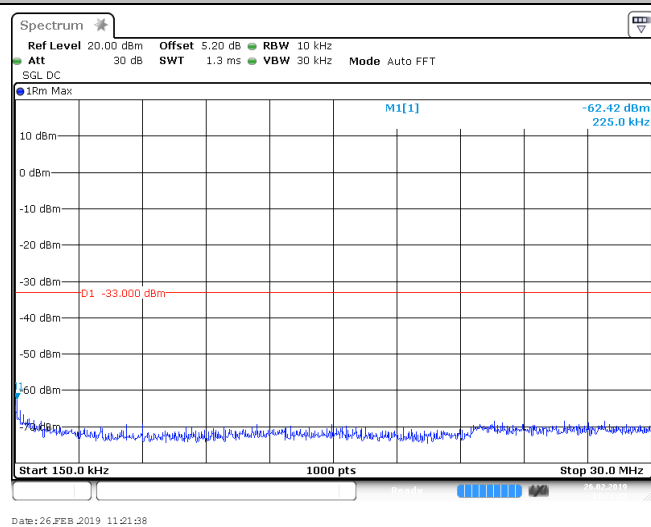
EGPRS850_251



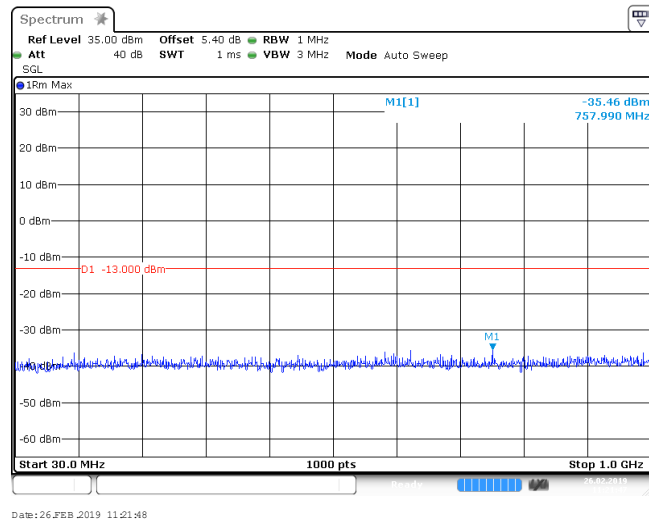
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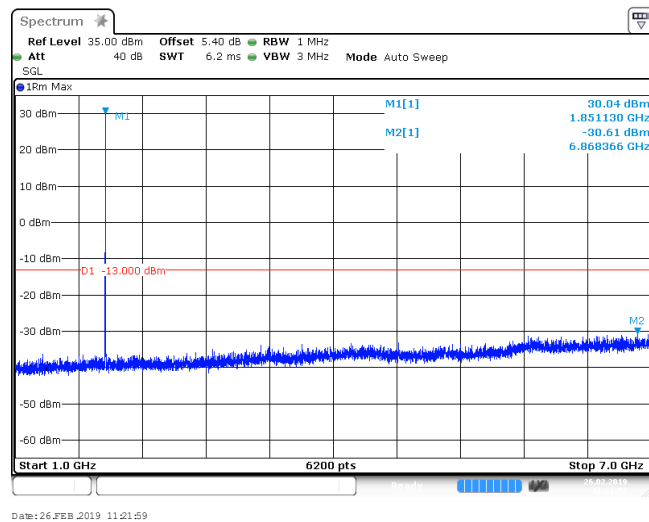
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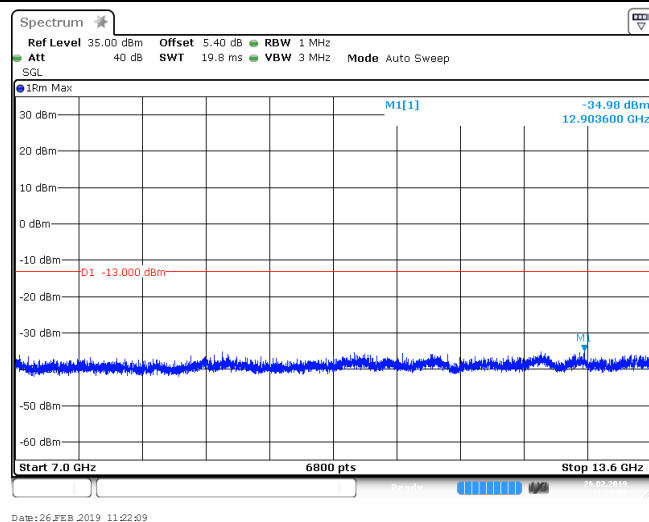
GSM1900_512



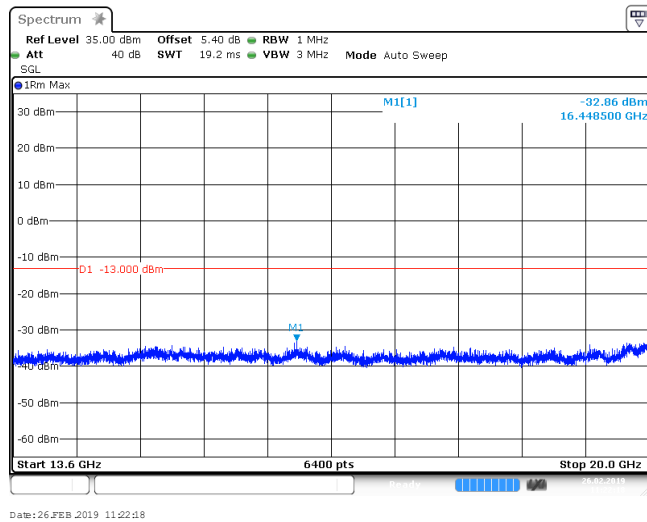
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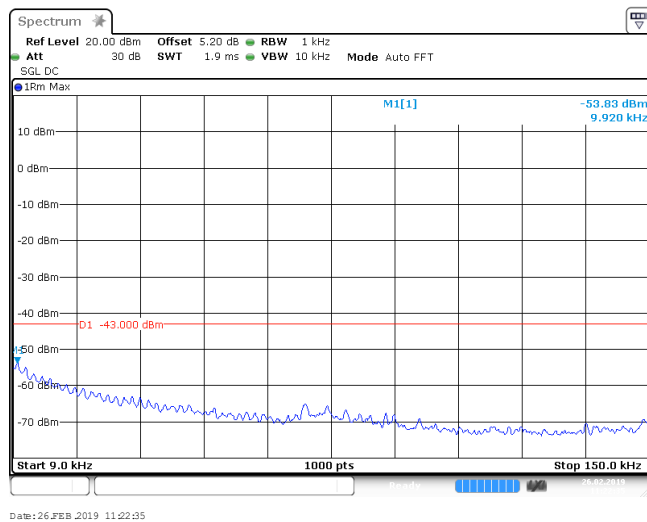
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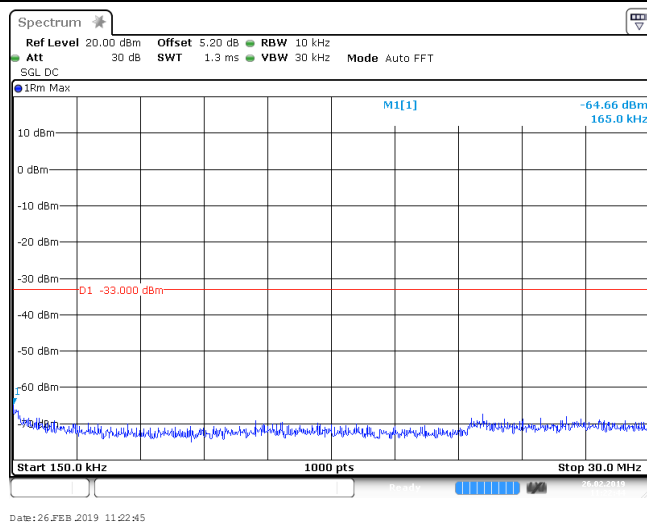
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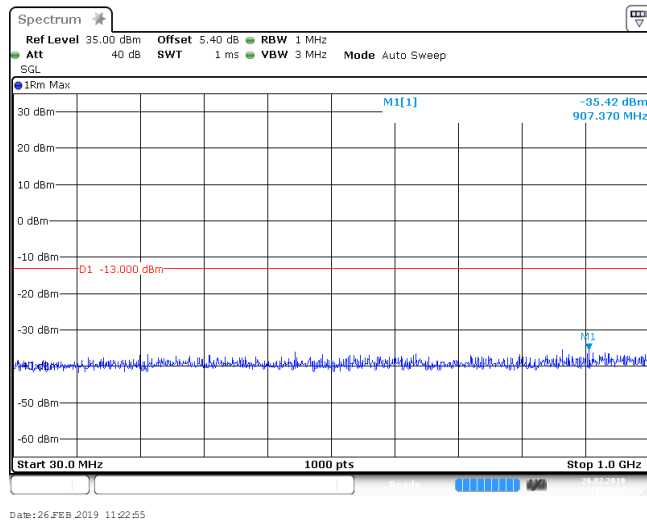
GSM1900_661



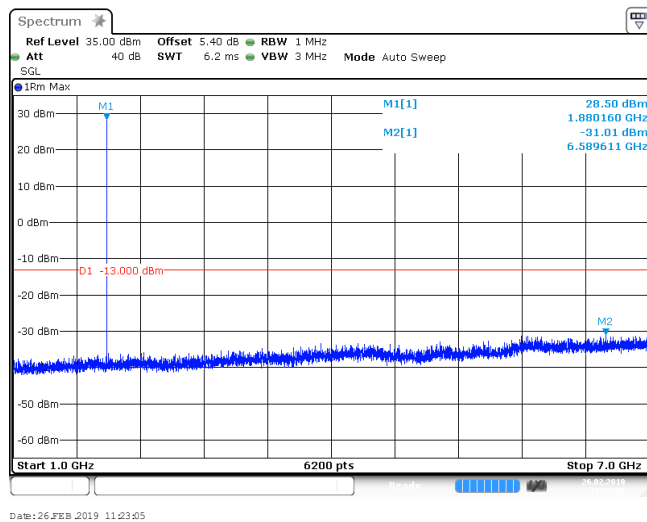
GSM1900_661



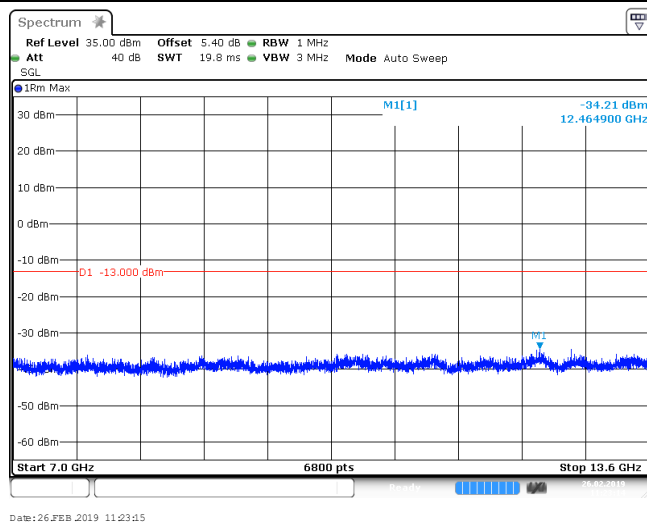
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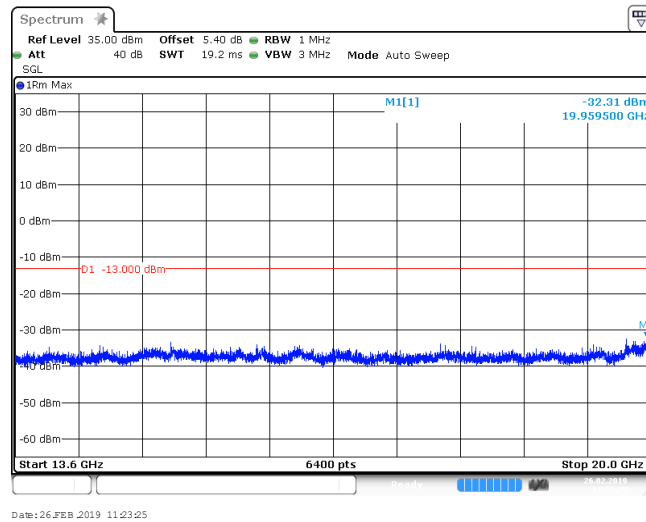
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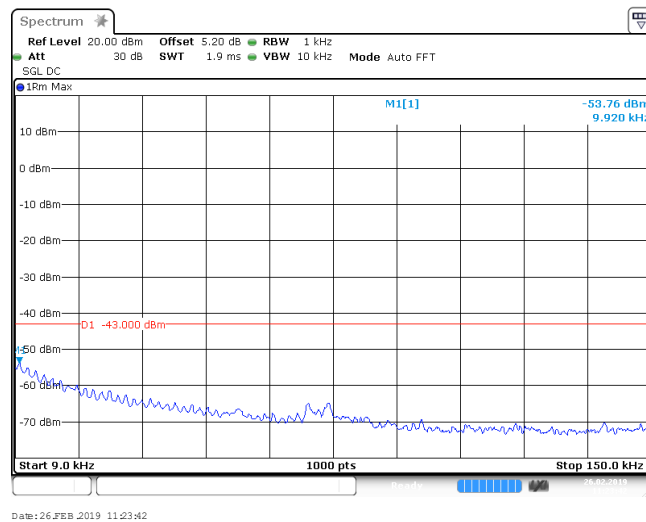
GSM1900_661



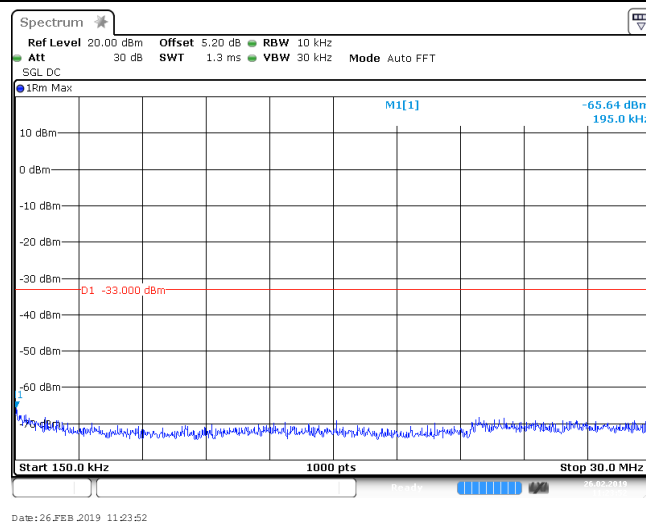
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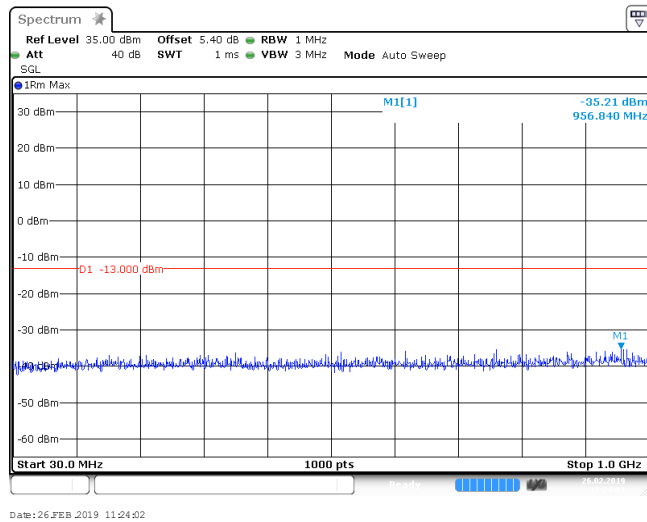
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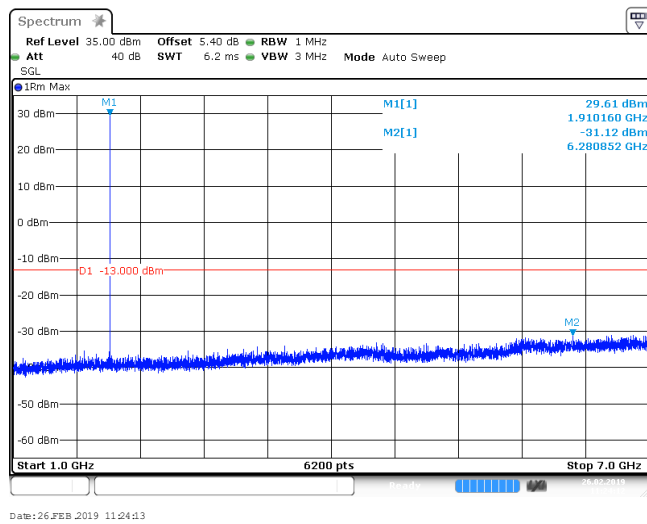
GSM1900_810



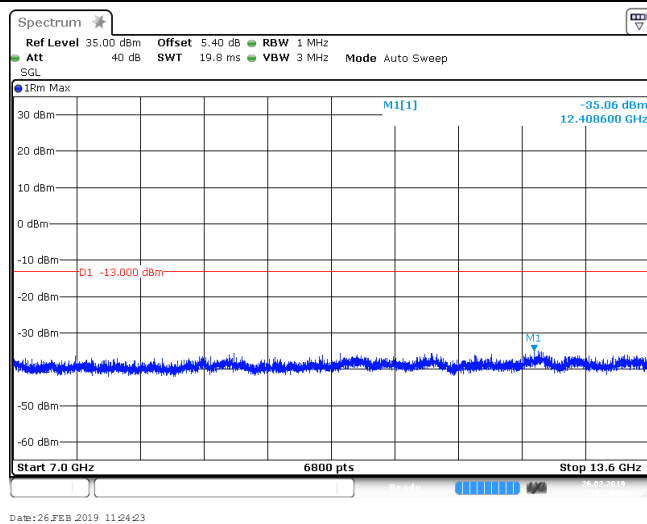
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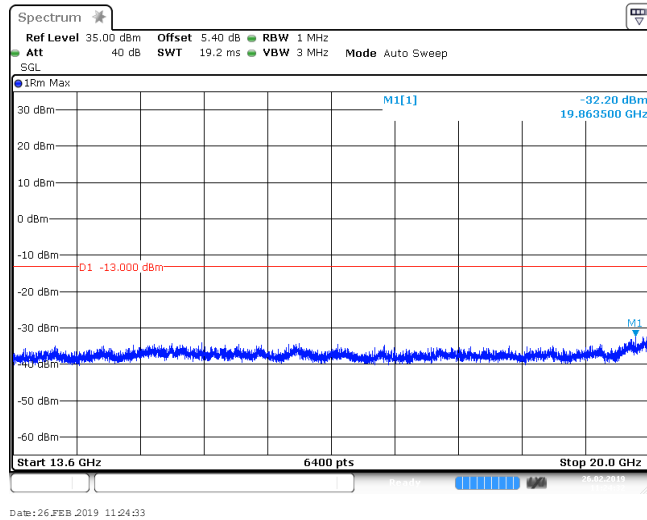
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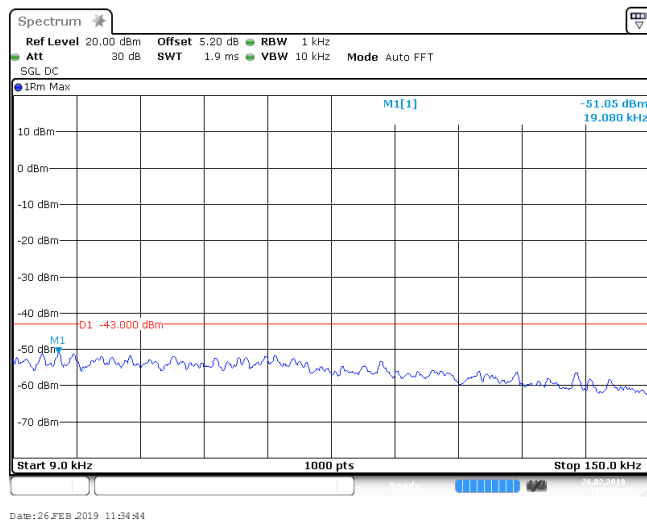
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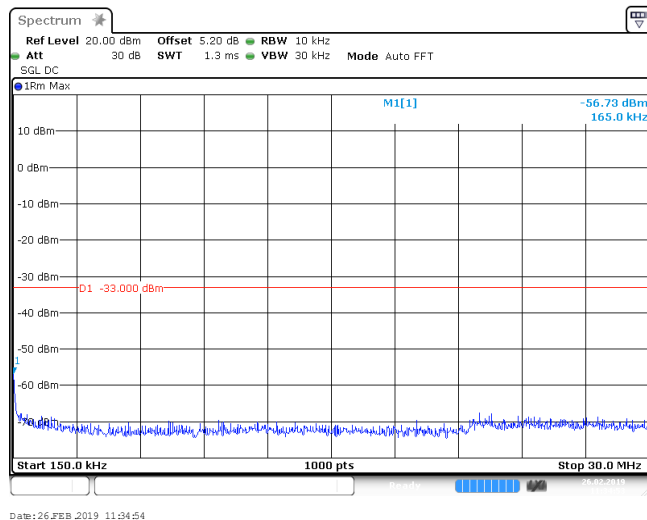
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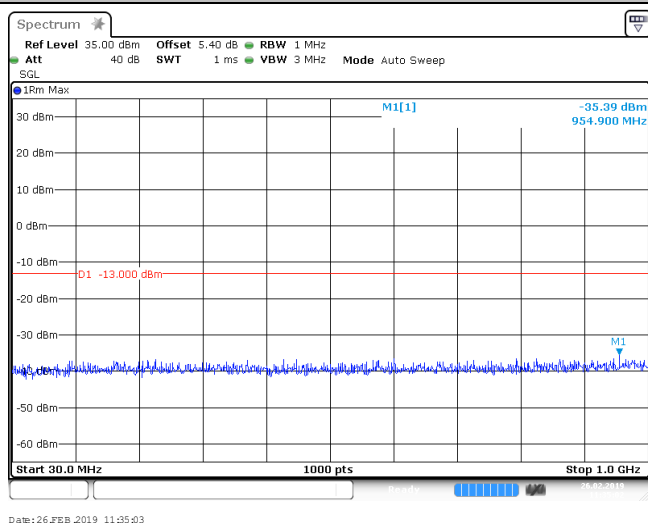
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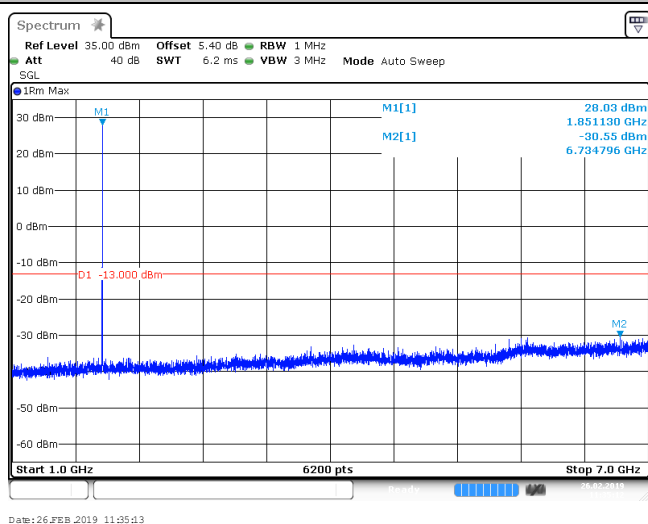
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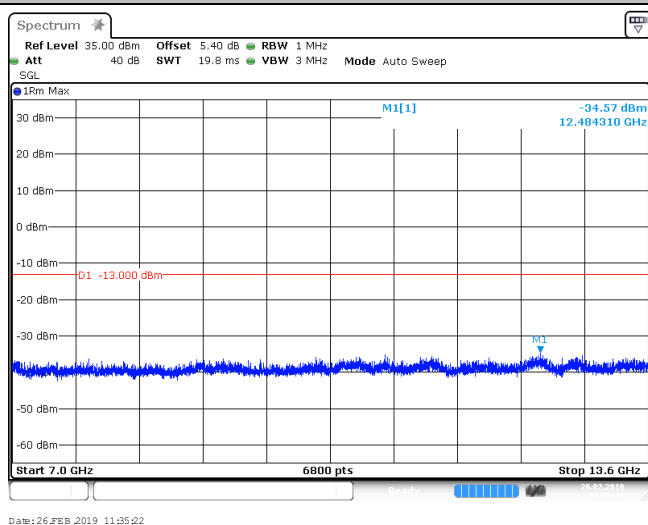
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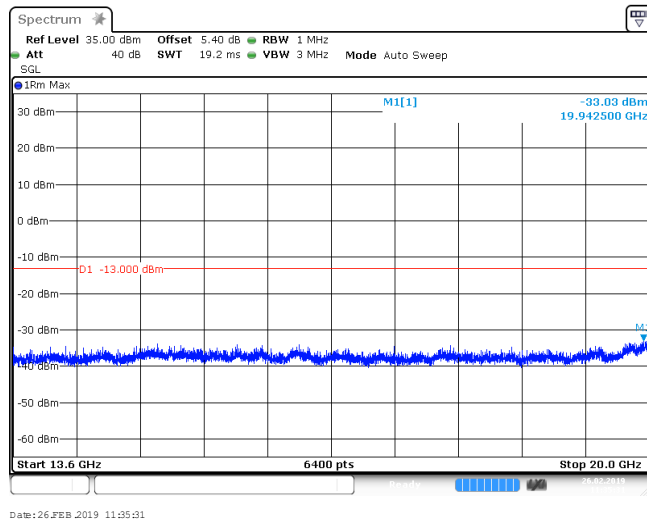
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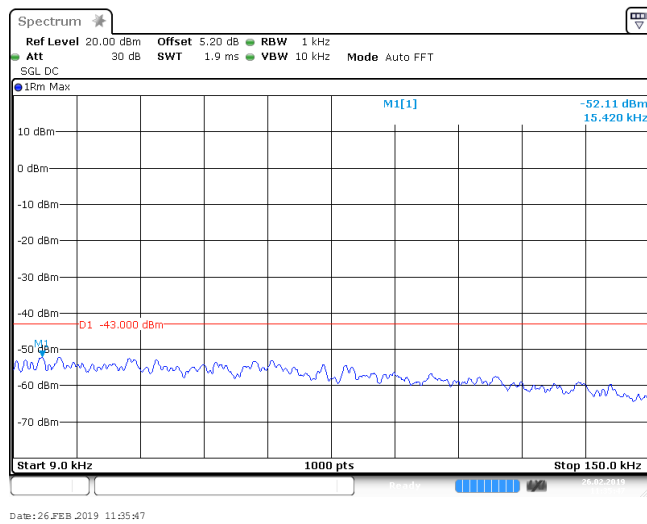
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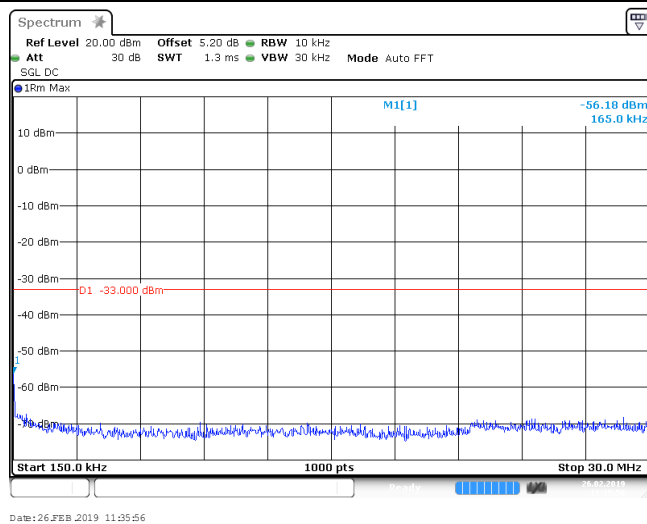
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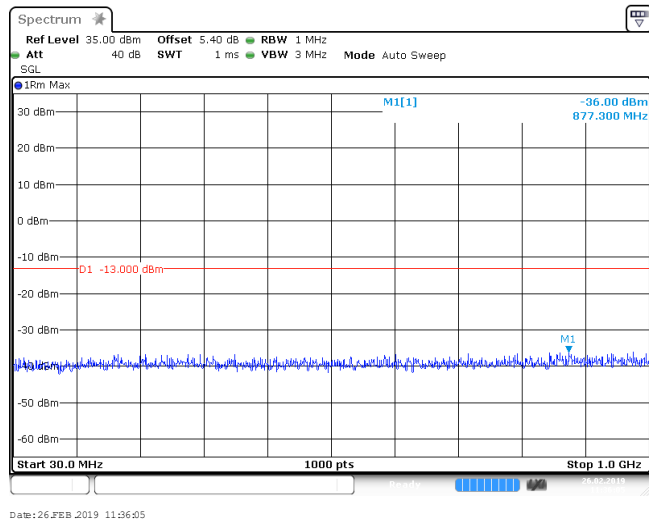
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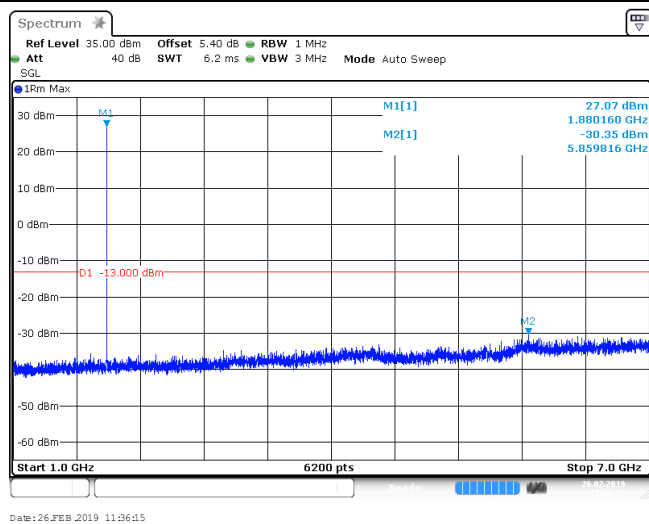
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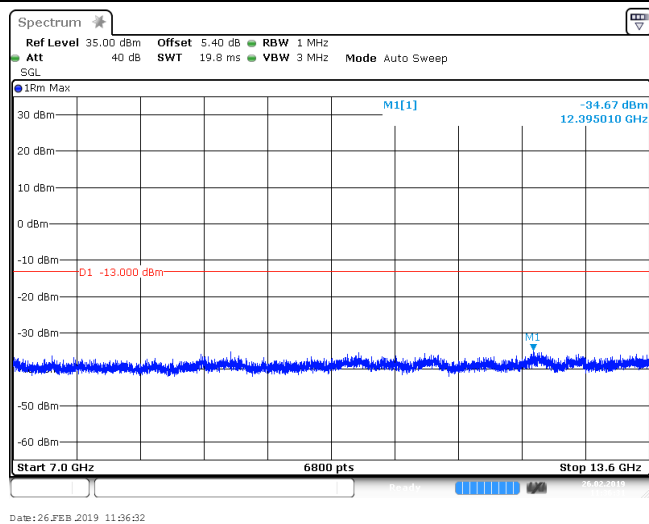
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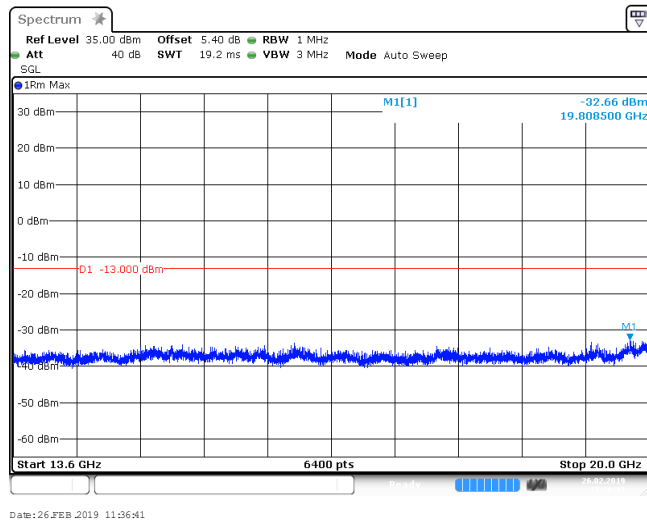
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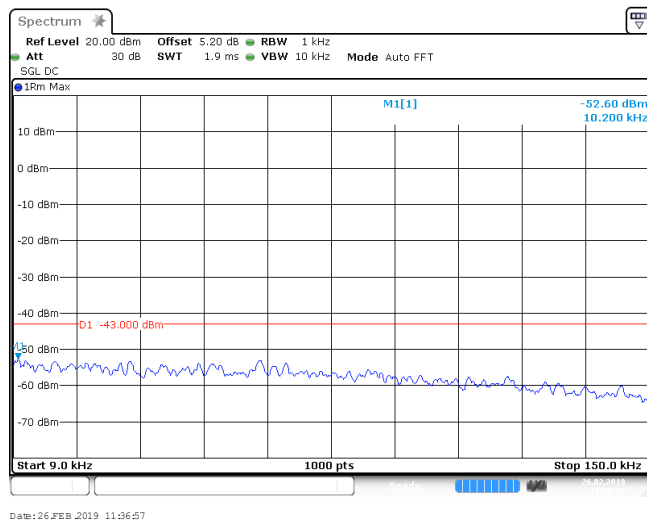
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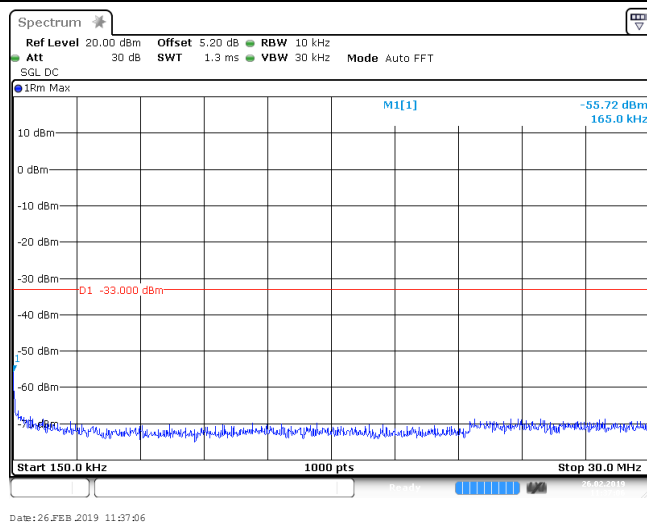
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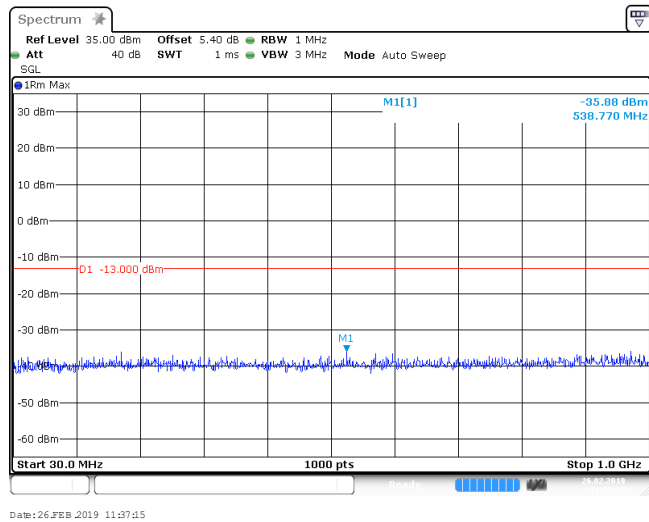
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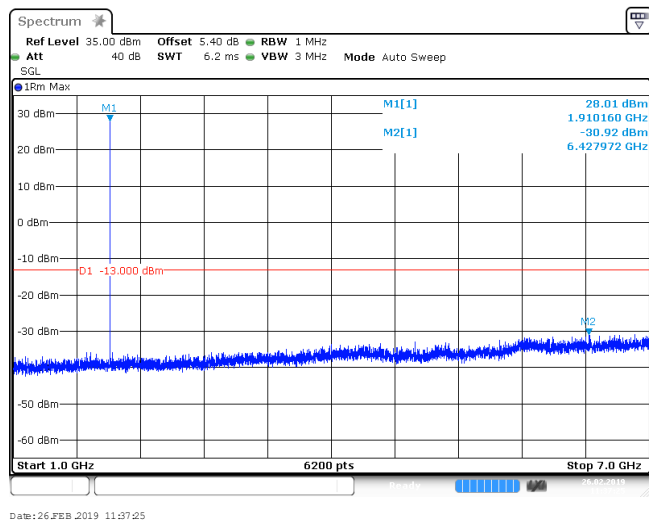
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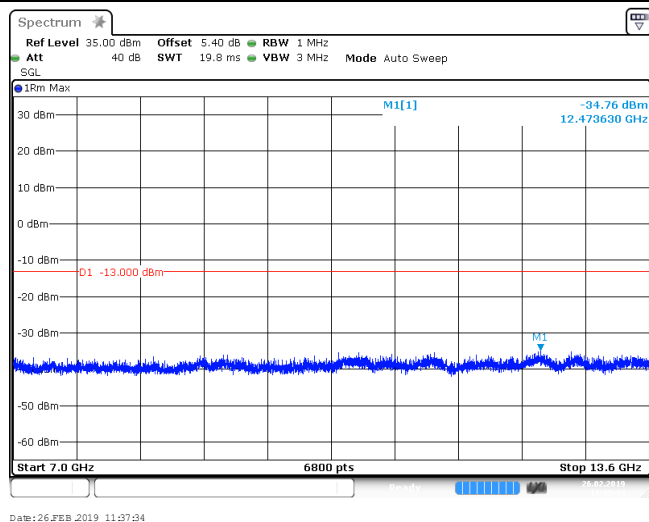
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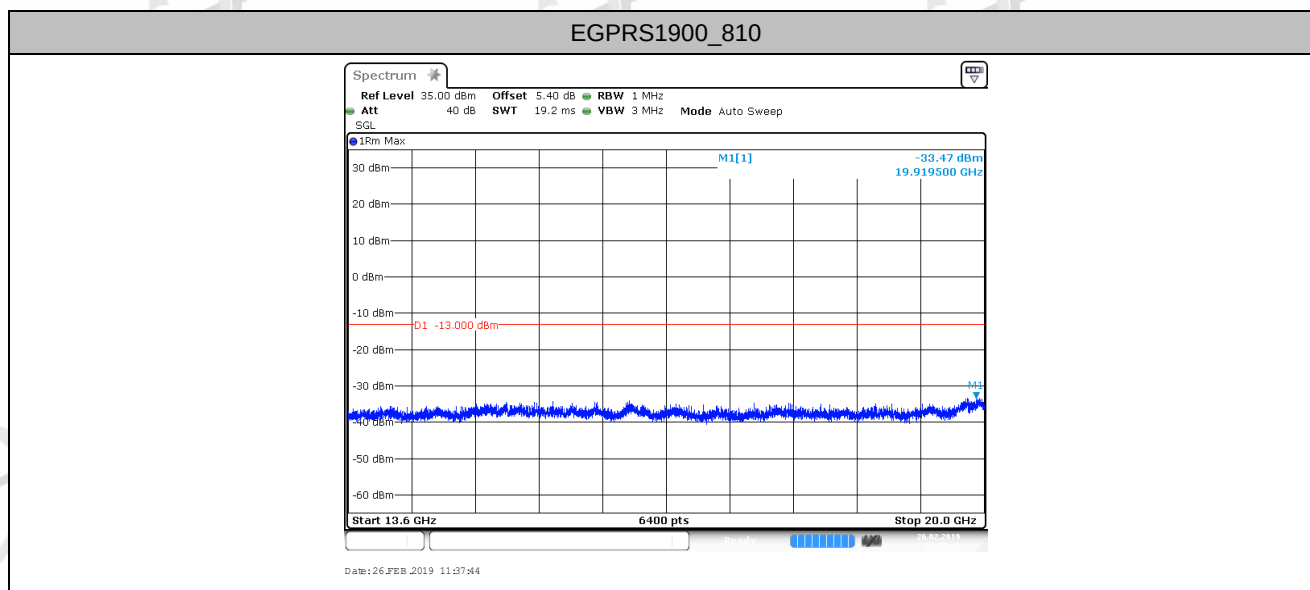


EGPRS1900_810



EGPRS1900_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	9.43	0.011438	±2.5	PASS
GSM850	128	VN	TN	3.20	0.003878	±2.5	PASS
GSM850	128	VH	TN	6.81	0.008265	±2.5	PASS
GSM850	190	VL	TN	5.20	0.006213	±2.5	PASS
GSM850	190	VN	TN	2.97	0.003550	±2.5	PASS
GSM850	190	VH	TN	5.68	0.006792	±2.5	PASS
GSM850	251	VL	TN	8.23	0.009699	±2.5	PASS
GSM850	251	VN	TN	8.10	0.009547	±2.5	PASS
GSM850	251	VH	TN	2.87	0.003385	±2.5	PASS
EGPRS850	128	VL	TN	19.21	0.023308	±2.5	PASS
EGPRS850	128	VN	TN	19.86	0.024091	±2.5	PASS
EGPRS850	128	VH	TN	20.76	0.025188	±2.5	PASS
EGPRS850	190	VL	TN	20.89	0.024969	±2.5	PASS
EGPRS850	190	VN	TN	20.21	0.024158	±2.5	PASS
EGPRS850	190	VH	TN	22.63	0.027053	±2.5	PASS
EGPRS850	251	VL	TN	20.95	0.024686	±2.5	PASS
EGPRS850	251	VN	TN	21.18	0.024952	±2.5	PASS
EGPRS850	251	VH	TN	20.08	0.023659	±2.5	PASS
GSM1900	512	VL	TN	0.87	0.000471	±2.5	PASS
GSM1900	512	VN	TN	-0.10	-0.000052	±2.5	PASS
GSM1900	512	VH	TN	-2.94	-0.001588	±2.5	PASS
GSM1900	661	VL	TN	-4.29	-0.002284	±2.5	PASS
GSM1900	661	VN	TN	-7.68	-0.004087	±2.5	PASS
GSM1900	661	VH	TN	0.36	0.000189	±2.5	PASS
GSM1900	810	VL	TN	-3.97	-0.002079	±2.5	PASS
GSM1900	810	VN	TN	-2.55	-0.001336	±2.5	PASS
GSM1900	810	VH	TN	0.32	0.000169	±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	0.71	0.000862	±2.5	PASS
GSM850	128	VN	-20	3.49	0.004231	±2.5	PASS
GSM850	128	VN	-10	5.46	0.006620	±2.5	PASS
GSM850	128	VN	0	9.01	0.010929	±2.5	PASS
GSM850	128	VN	10	4.33	0.005249	±2.5	PASS
GSM850	128	VN	20	10.14	0.012300	±2.5	PASS
GSM850	128	VN	30	9.14	0.011086	±2.5	PASS
GSM850	128	VN	40	2.13	0.002585	±2.5	PASS
GSM850	128	VN	50	4.55	0.005523	±2.5	PASS
GSM850	190	VN	-30	0.26	0.000309	±2.5	PASS
GSM850	190	VN	-20	3.68	0.004399	±2.5	PASS
GSM850	190	VN	-10	3.13	0.003743	±2.5	PASS
GSM850	190	VN	0	2.87	0.003435	±2.5	PASS
GSM850	190	VN	10	6.30	0.007525	±2.5	PASS
GSM850	190	VN	20	3.97	0.004747	±2.5	PASS
GSM850	190	VN	30	3.16	0.003782	±2.5	PASS
GSM850	190	VN	40	2.16	0.002586	±2.5	PASS
GSM850	190	VN	50	3.03	0.003628	±2.5	PASS
GSM850	251	VN	-30	6.26	0.007379	±2.5	PASS
GSM850	251	VN	-20	1.78	0.002092	±2.5	PASS
GSM850	251	VN	-10	2.84	0.003347	±2.5	PASS
GSM850	251	VN	0	6.59	0.007760	±2.5	PASS
GSM850	251	VN	10	6.13	0.007227	±2.5	PASS
GSM850	251	VN	20	2.52	0.002967	±2.5	PASS
GSM850	251	VN	30	2.00	0.002358	±2.5	PASS
GSM850	251	VN	40	2.71	0.003195	±2.5	PASS
GSM850	251	VN	50	4.75	0.005591	±2.5	PASS
EGPRS850	128	VN	-30	21.73	0.026363	±2.5	PASS
EGPRS850	128	VN	-20	22.86	0.027734	±2.5	PASS
EGPRS850	128	VN	-10	21.44	0.026010	±2.5	PASS
EGPRS850	128	VN	0	20.37	0.024718	±2.5	PASS
EGPRS850	128	VN	10	21.50	0.026089	±2.5	PASS
EGPRS850	128	VN	20	20.99	0.025462	±2.5	PASS
EGPRS850	128	VN	30	22.05	0.026755	±2.5	PASS
EGPRS850	128	VN	40	19.79	0.024013	±2.5	PASS
EGPRS850	128	VN	50	20.66	0.025070	±2.5	PASS
EGPRS850	190	VN	-30	20.50	0.024506	±2.5	PASS
EGPRS850	190	VN	-20	19.89	0.023773	±2.5	PASS
EGPRS850	190	VN	-10	19.60	0.023425	±2.5	PASS
EGPRS850	190	VN	0	22.86	0.027323	±2.5	PASS
EGPRS850	190	VN	10	19.08	0.022808	±2.5	PASS
EGPRS850	190	VN	20	20.24	0.024197	±2.5	PASS
EGPRS850	190	VN	30	20.24	0.024197	±2.5	PASS
EGPRS850	190	VN	40	19.82	0.023695	±2.5	PASS
EGPRS850	190	VN	50	18.79	0.022460	±2.5	PASS
EGPRS850	251	VN	-30	18.47	0.021757	±2.5	PASS
EGPRS850	251	VN	-20	19.63	0.023127	±2.5	PASS
EGPRS850	251	VN	-10	22.44	0.026436	±2.5	PASS

EGPRS850	251	VN	0	19.60	0.023088	±2.5	PASS
EGPRS850	251	VN	10	18.92	0.022290	±2.5	PASS
EGPRS850	251	VN	20	19.60	0.023088	±2.5	PASS
EGPRS850	251	VN	30	20.24	0.023849	±2.5	PASS
EGPRS850	251	VN	40	19.63	0.023127	±2.5	PASS
EGPRS850	251	VN	50	18.27	0.021529	±2.5	PASS
GSM1900	512	VN	-30	-0.26	-0.000140	±2.5	PASS
GSM1900	512	VN	-20	-5.94	-0.003211	±2.5	PASS
GSM1900	512	VN	-10	4.71	0.002548	±2.5	PASS
GSM1900	512	VN	0	3.55	0.001919	±2.5	PASS
GSM1900	512	VN	10	-2.58	-0.001396	±2.5	PASS
GSM1900	512	VN	20	-1.71	-0.000925	±2.5	PASS
GSM1900	512	VN	30	-2.68	-0.001448	±2.5	PASS
GSM1900	512	VN	40	-3.03	-0.001640	±2.5	PASS
GSM1900	512	VN	50	-1.81	-0.000977	±2.5	PASS
GSM1900	661	VN	-30	3.16	0.001683	±2.5	PASS
GSM1900	661	VN	-20	0.42	0.000223	±2.5	PASS
GSM1900	661	VN	-10	-0.52	-0.000275	±2.5	PASS
GSM1900	661	VN	0	-1.61	-0.000859	±2.5	PASS
GSM1900	661	VN	10	-0.48	-0.000258	±2.5	PASS
GSM1900	661	VN	20	-0.58	-0.000309	±2.5	PASS
GSM1900	661	VN	30	-2.29	-0.001219	±2.5	PASS
GSM1900	661	VN	40	-4.49	-0.002387	±2.5	PASS
GSM1900	661	VN	50	-1.97	-0.001048	±2.5	PASS
GSM1900	810	VN	-30	-0.23	-0.000118	±2.5	PASS
GSM1900	810	VN	-20	-3.84	-0.002012	±2.5	PASS
GSM1900	810	VN	-10	-1.78	-0.000930	±2.5	PASS
GSM1900	810	VN	0	-6.30	-0.003297	±2.5	PASS
GSM1900	810	VN	10	-1.23	-0.000642	±2.5	PASS
GSM1900	810	VN	20	-5.55	-0.002908	±2.5	PASS
GSM1900	810	VN	30	-3.10	-0.001623	±2.5	PASS
GSM1900	810	VN	40	-3.91	-0.002046	±2.5	PASS
GSM1900	810	VN	50	-7.17	-0.003753	±2.5	PASS

The End