

Appendix B.1

GSM 850 & 1900

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	2019/6/12	2020/6/11
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	2019/6/12	2020/6/11
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]	$U = \pm 0.37$ dB
Bandwidth	Magnitude [%]	$U = \pm 0.2\%$
Band Edge Compliance	Disturbance Power [dBm]	$U = \pm 2.0$ dB
Spurious Emissions, Conducted	Disturbance Power [dBm]	$U = \pm 2.0$ dB
Frequency Stability	Frequency Accuracy [ppm]	$U = \pm 0.24$ ppm

3. Effective (Isotropic) Radiated Power Output Data

1.1. Test Result

BAND	Channel	Slot	Conducted Power (dBm)	ERP (dBm)	Limit(dBm)	Verdict
GSM850	128	---	32.96	30.21	38.45	PASS
GSM850	190	---	32.75	30.00	38.45	PASS
GSM850	251	---	32.77	30.02	38.45	PASS
EGPRS850	128	1	27.19	24.44	38.45	PASS
EGPRS850	128	2	26.16	23.41	38.45	PASS
EGPRS850	128	3	24.14	21.39	38.45	PASS
EGPRS850	128	4	23.14	20.39	38.45	PASS
EGPRS850	190	1	27.32	24.57	38.45	PASS
EGPRS850	190	2	26.25	23.50	38.45	PASS
EGPRS850	190	3	24.22	21.47	38.45	PASS
EGPRS850	190	4	23.27	20.52	38.45	PASS
EGPRS850	251	1	27.31	24.56	38.45	PASS
EGPRS850	251	2	26.22	23.47	38.45	PASS
EGPRS850	251	3	24.18	21.43	38.45	PASS
EGPRS850	251	4	23.21	20.46	38.45	PASS

BAND	Channel	Slot	Conducted Power (dBm)	EIRP (dBm)	Limit(dBm)	Verdict
GSM1900	512	---	30.24	29.54	33.00	PASS
GSM1900	661	---	30.12	29.42	33.00	PASS
GSM1900	810	---	30.22	29.52	33.00	PASS
EGPRS1900	512	1	26.38	25.68	33.00	PASS
EGPRS1900	512	2	24.66	23.96	33.00	PASS
EGPRS1900	512	3	22.13	21.43	33.00	PASS
EGPRS1900	512	4	20.63	19.93	33.00	PASS
EGPRS1900	661	1	26.28	25.58	33.00	PASS
EGPRS1900	661	2	24.49	23.79	33.00	PASS
EGPRS1900	661	3	22.02	21.32	33.00	PASS
EGPRS1900	661	4	20.47	19.77	33.00	PASS
EGPRS1900	810	1	26.65	25.95	33.00	PASS
EGPRS1900	810	2	24.81	24.11	33.00	PASS
EGPRS1900	810	3	22.44	21.74	33.00	PASS
EGPRS1900	810	4	20.79	20.09	33.00	PASS

Remark:

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

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

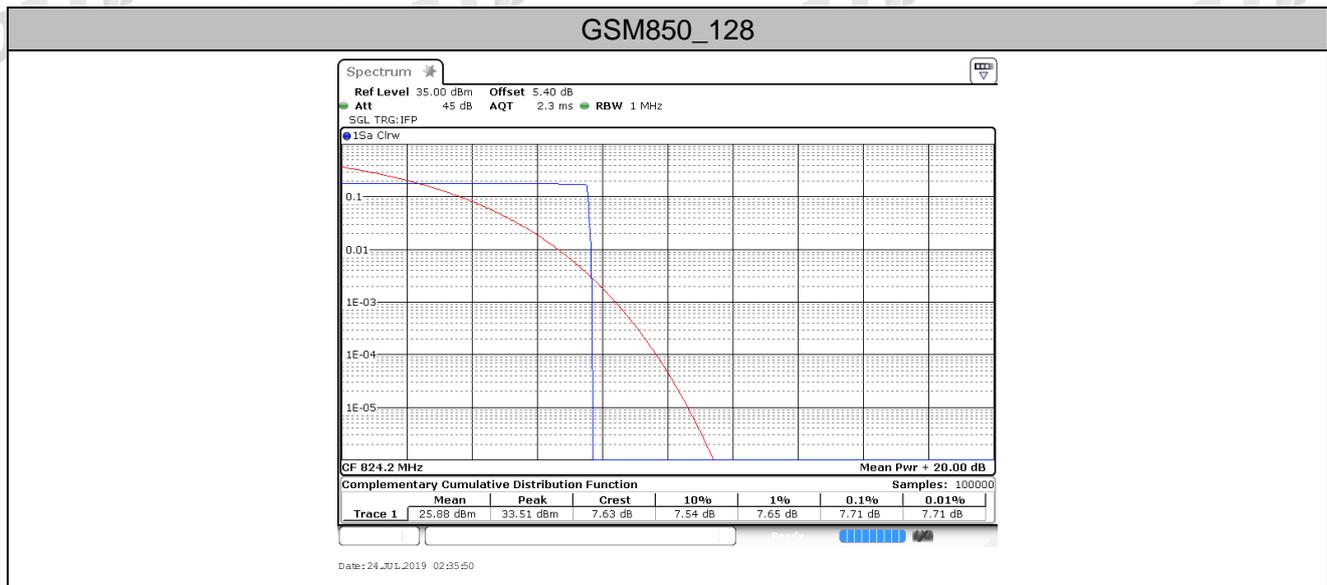
$$\text{EIRP [dBm]} = \text{Conducted Power [dBm]} + \text{Gain [dBi]}$$

4. Peak-to-Average Ratio

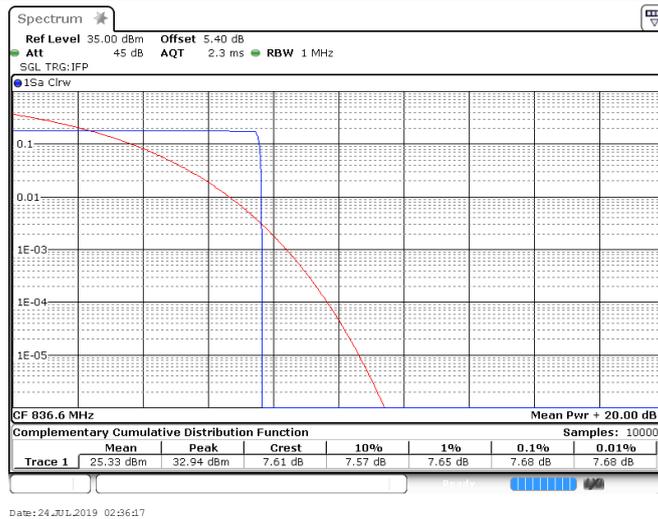
4.1. Test Result

BAND	Channel	Peak-to-Average Ratio(dB)	Limit(dB)	Verdict
GSM850	128	7.71	13	PASS
GSM850	190	7.68	13	PASS
GSM850	251	7.62	13	PASS
EGPRS850	128	10.72	13	PASS
EGPRS850	190	10.26	13	PASS
EGPRS850	251	10.23	13	PASS
GSM1900	512	7.68	13	PASS
GSM1900	661	7.68	13	PASS
GSM1900	810	7.68	13	PASS
EGPRS1900	512	10.58	13	PASS
EGPRS1900	661	11.22	13	PASS
EGPRS1900	810	10.52	13	PASS

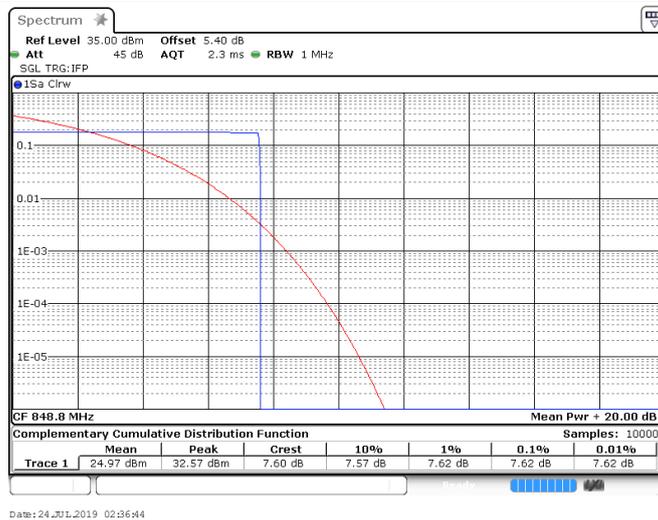
4.2. Part II - Test Plots



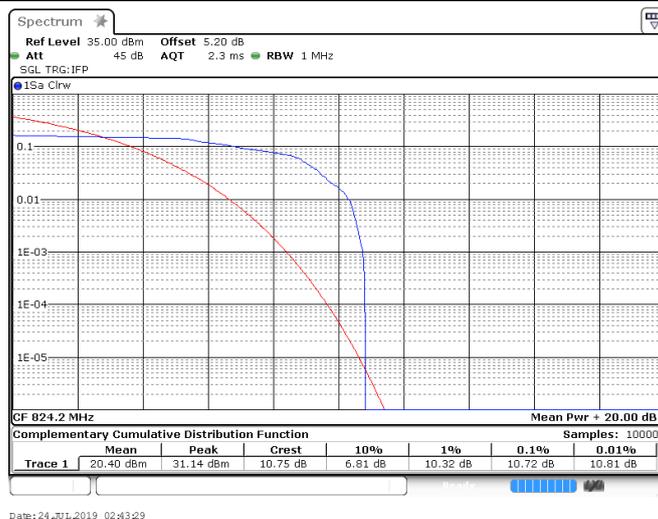
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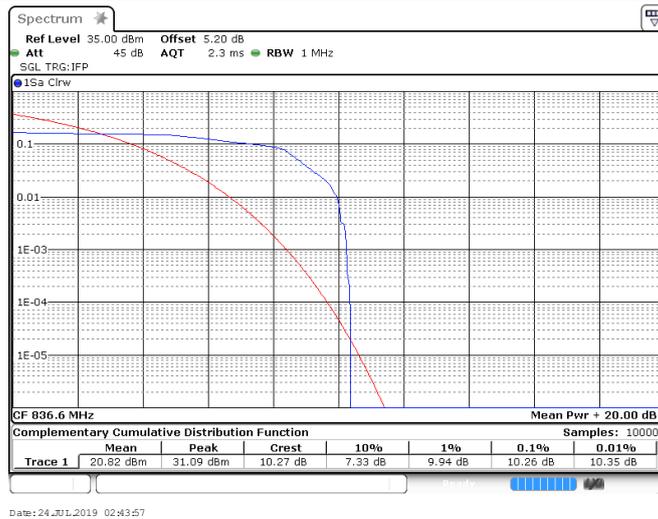
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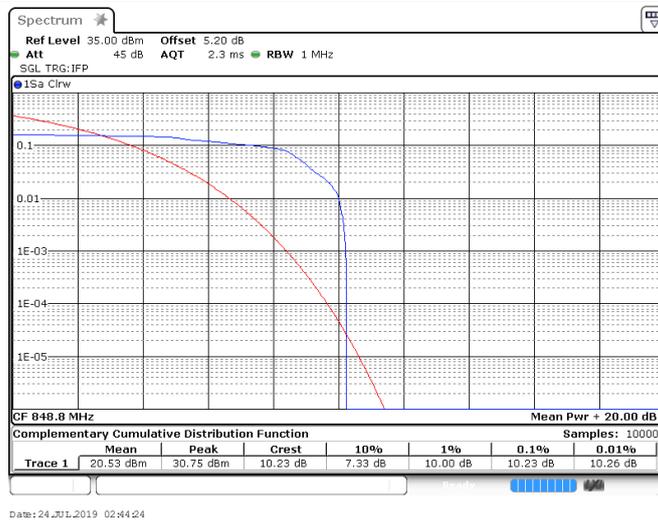
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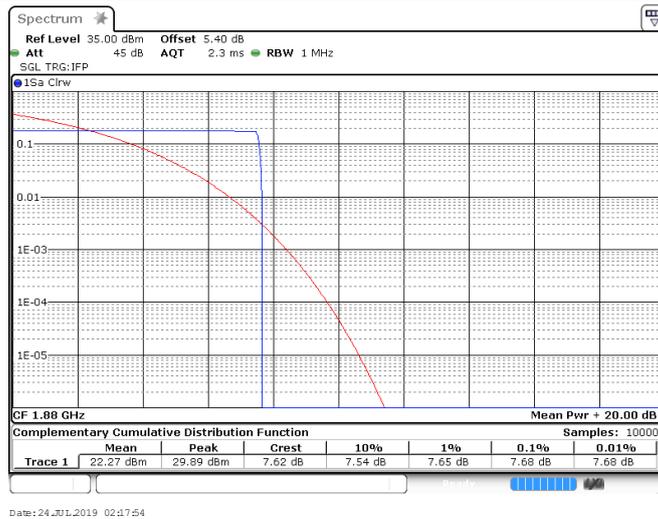
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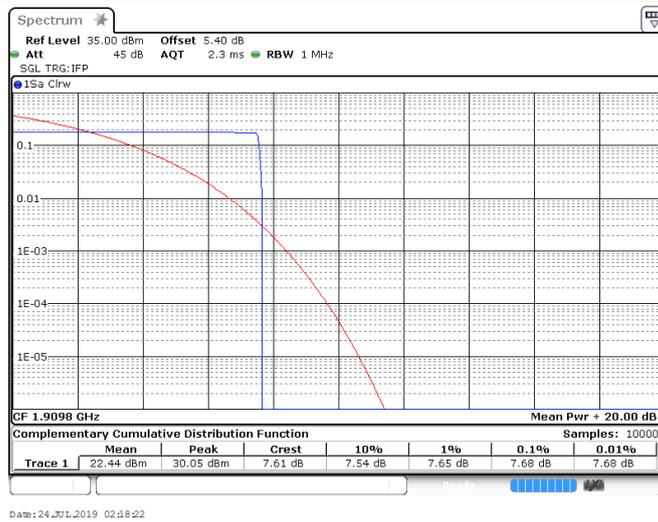
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GSM1900_661



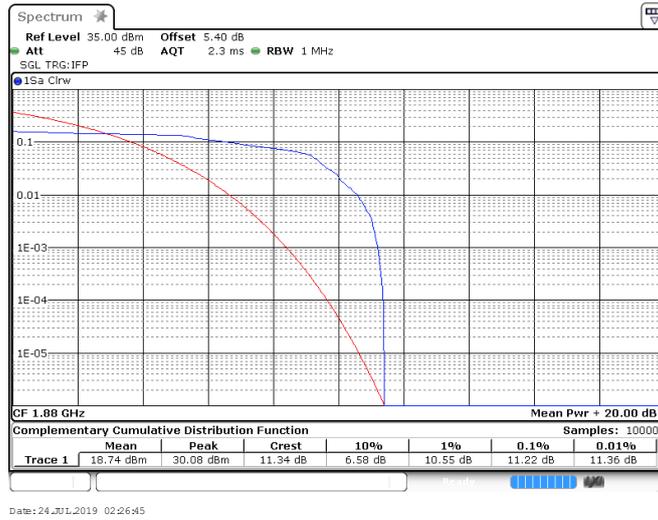
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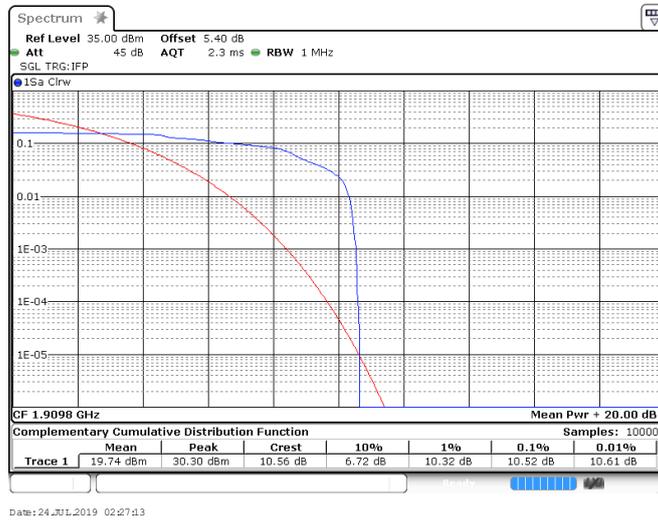
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EGPRS1900_661



EGPRS1900_810



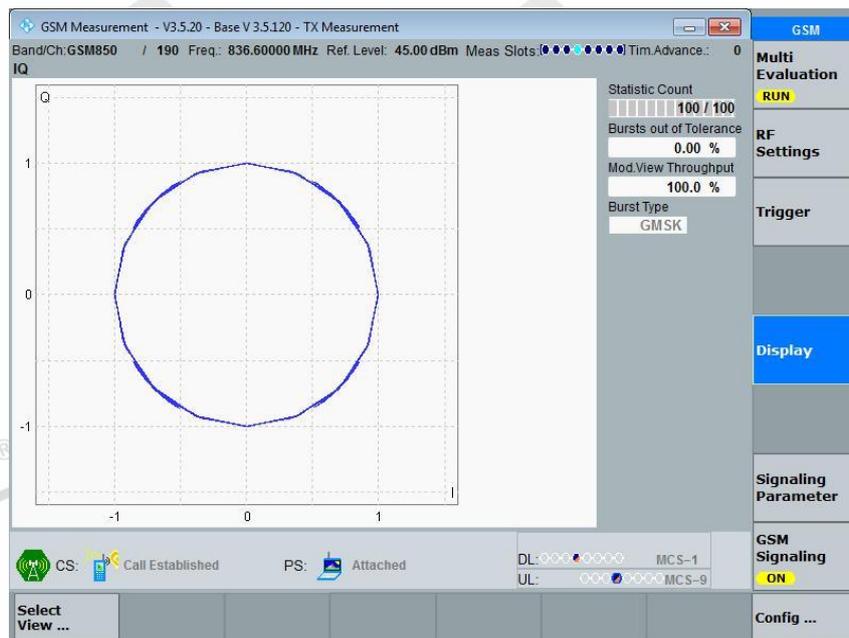
5. Modulation Characteristics

5.1. For GSM

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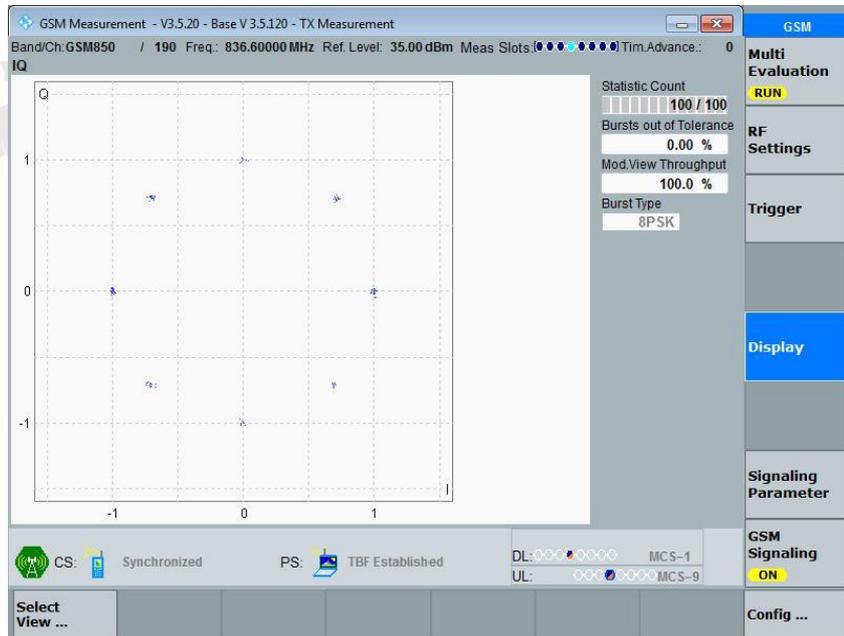
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5.1.1.1.1. Test Channel = MCH



5.1.1.2. Test Mode = GSM/TM2

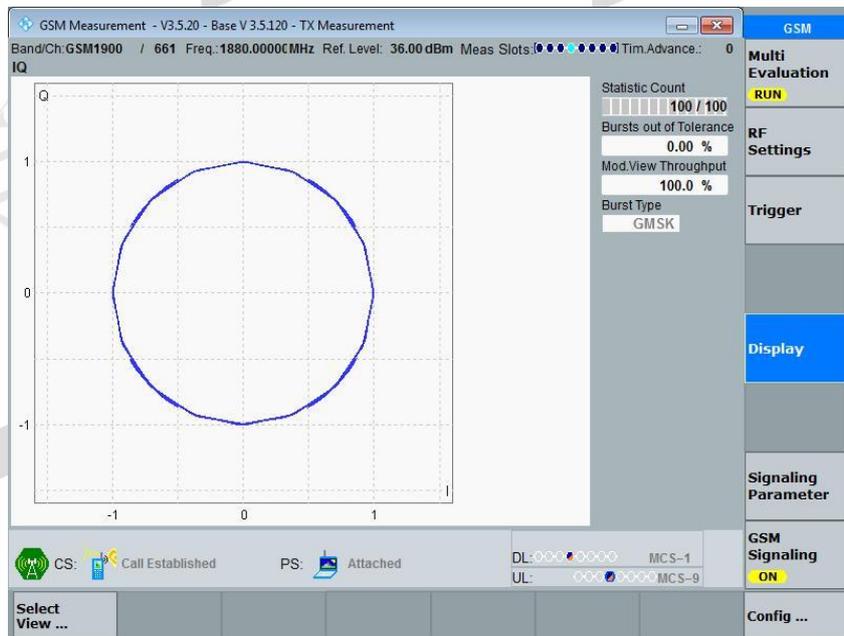
5.1.1.2.1. Test Channel = MCH



5.1.2. Test BAND = GSM 1900

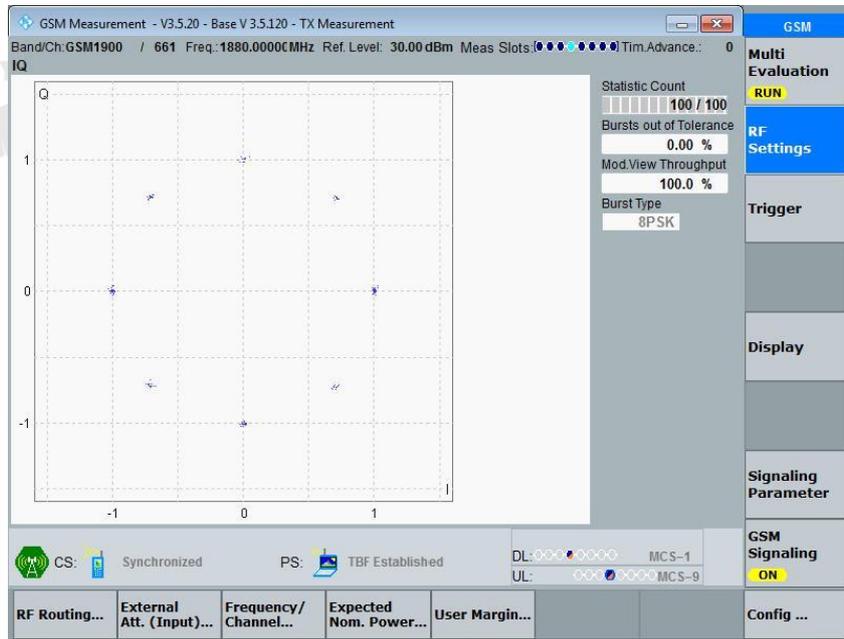
5.1.2.1. Test Mode = GSM/TM1

5.1.2.1.1. Test Channel = MCH



5.1.2.2. Test Mode = GSM/TM2

5.1.2.2.1. Test Channel = MCH

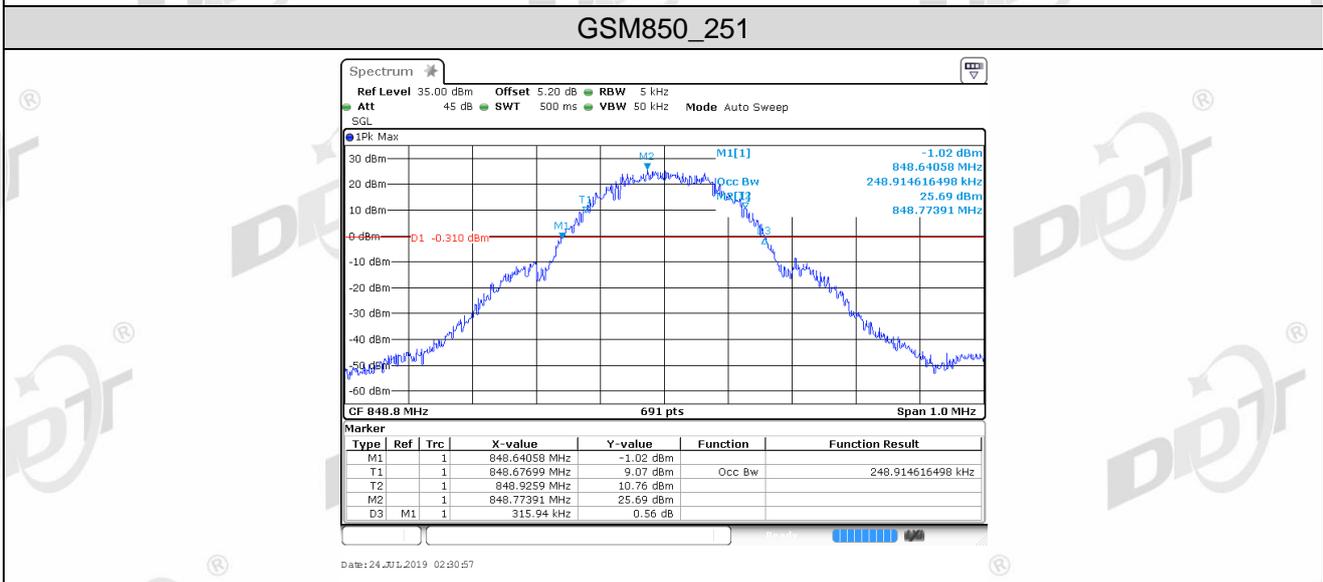
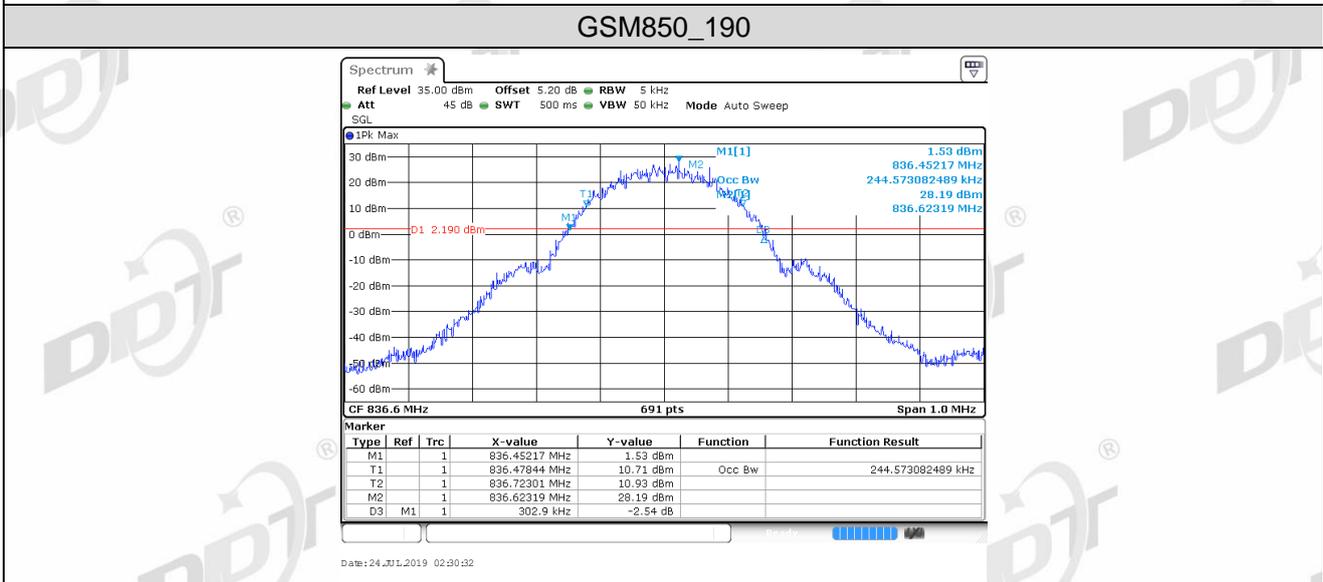
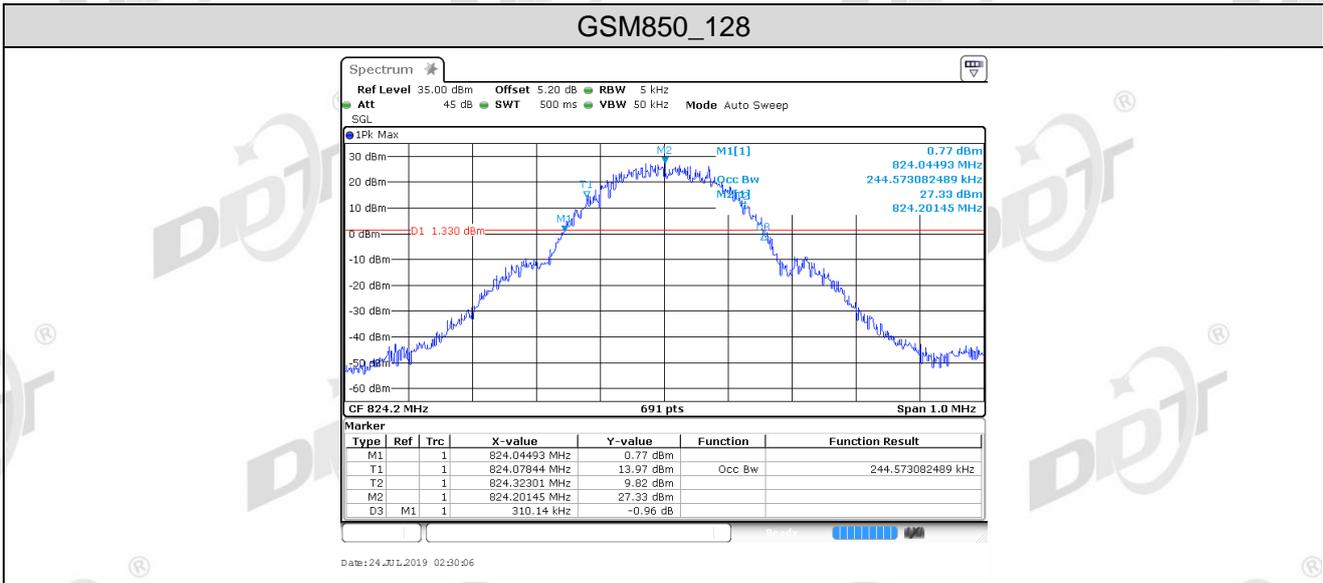


6. 26dB Bandwidth and Occupied Bandwidth

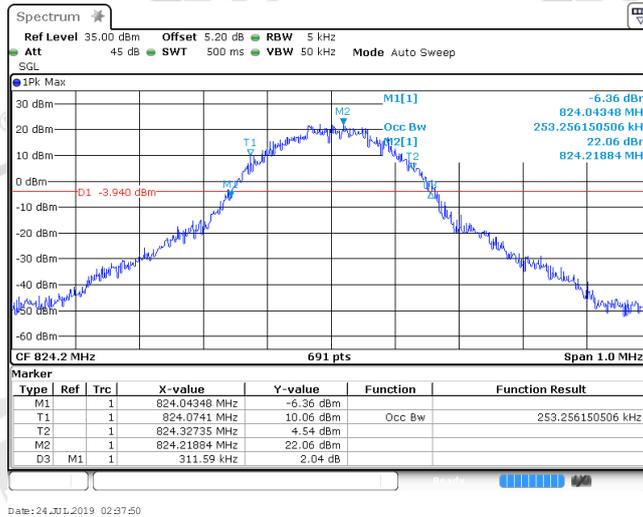
6.1. Test Result

BAND	Channel	Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)	Limit(kHz)	Verdict
GSM850	128	244.57	310.14	---	PASS
GSM850	190	244.57	302.90	---	PASS
GSM850	251	248.91	315.94	---	PASS
EGPRS850	128	253.26	311.59	---	PASS
EGPRS850	190	251.81	302.90	---	PASS
EGPRS850	251	256.15	305.80	---	PASS
GSM1900	512	246.02	314.49	---	PASS
GSM1900	661	244.57	307.25	---	PASS
GSM1900	810	246.02	291.30	---	PASS
EGPRS1900	512	244.57	308.70	---	PASS
EGPRS1900	661	244.57	305.80	---	PASS
EGPRS1900	810	243.13	302.90	---	PASS

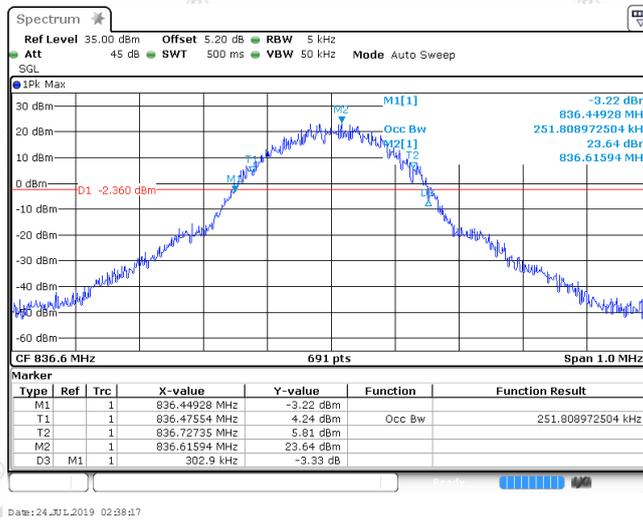
6.2. Test Plots



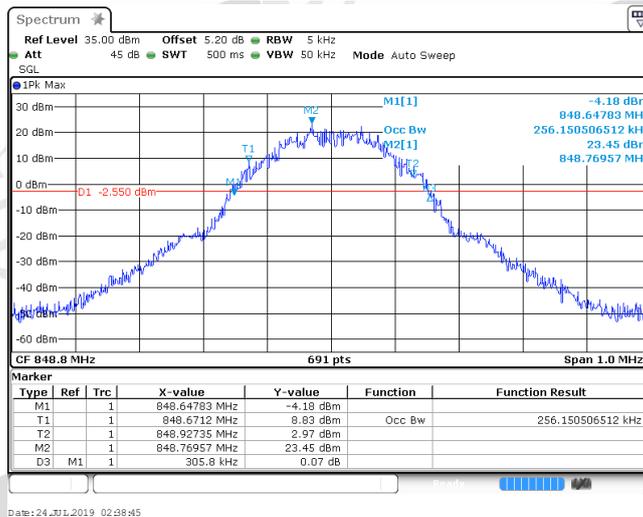
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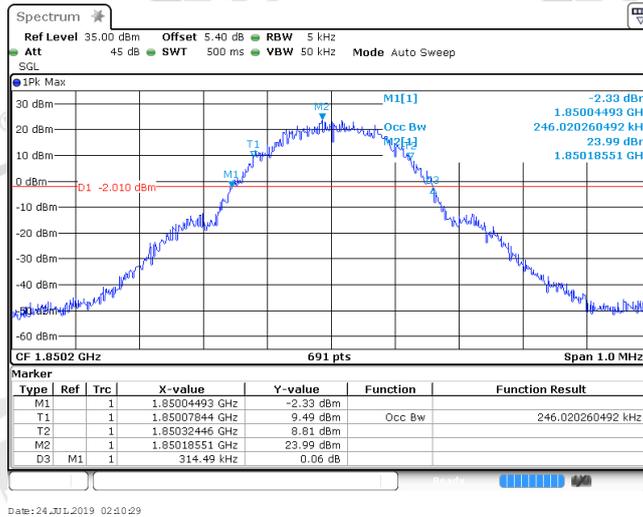
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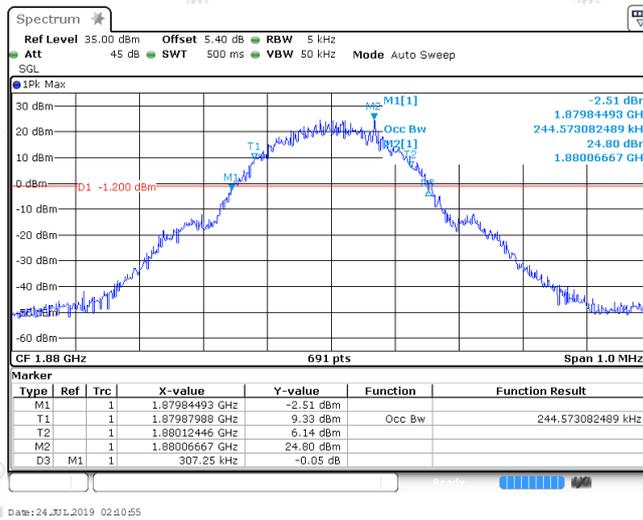
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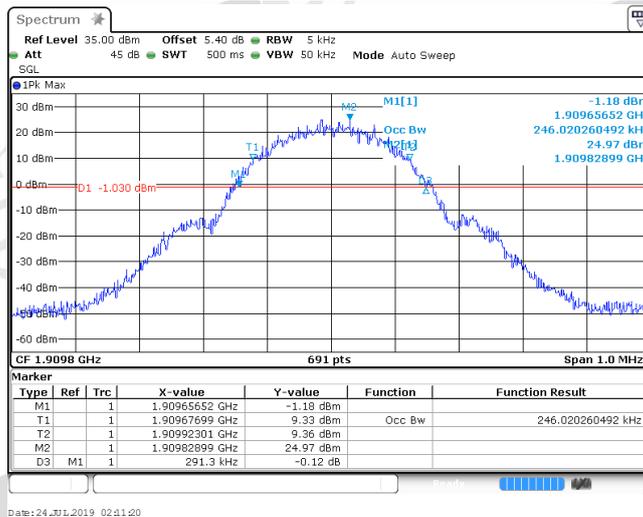
GSM1900_512



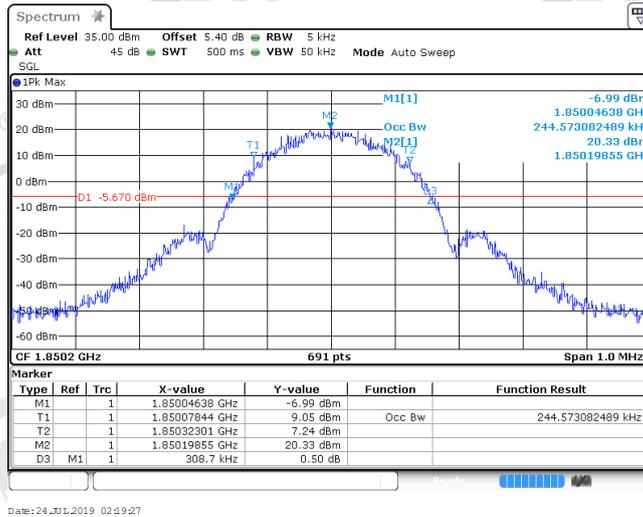
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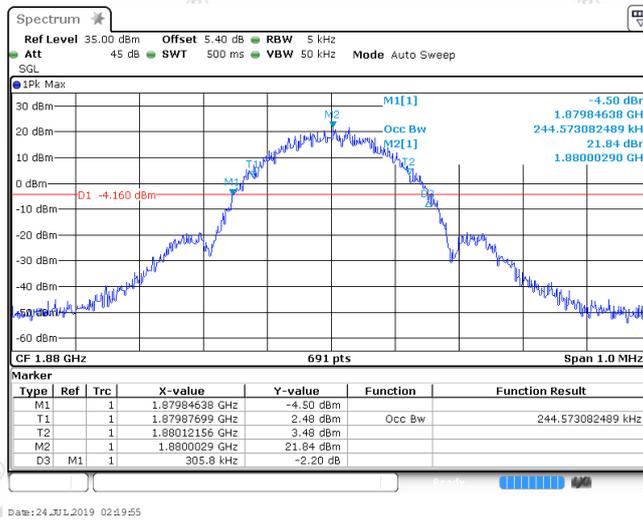
GSM1900_810



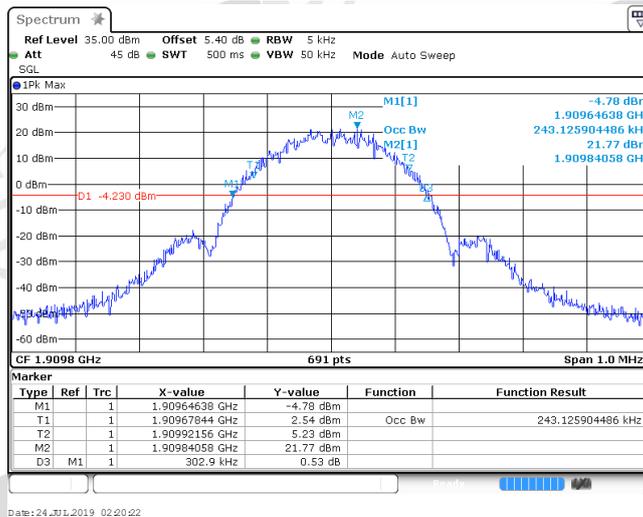
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EGPRS1900_661



EGPRS1900_810

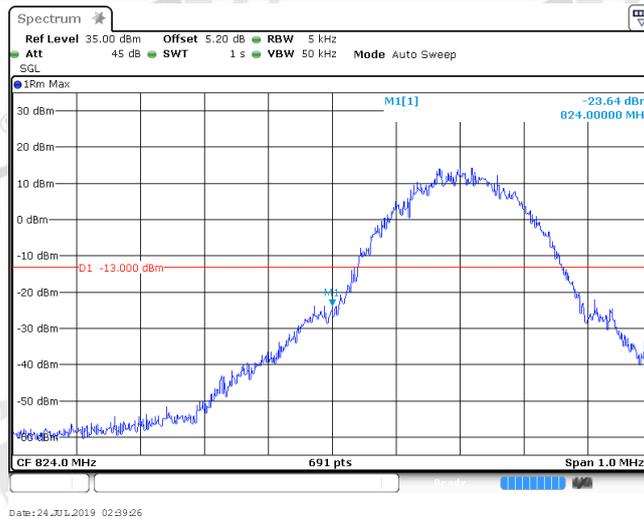


7. Band Edge Compliance

7.1. Test Plots

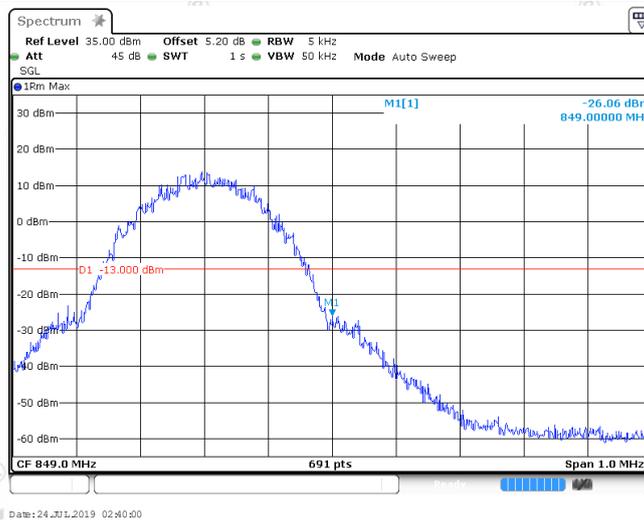


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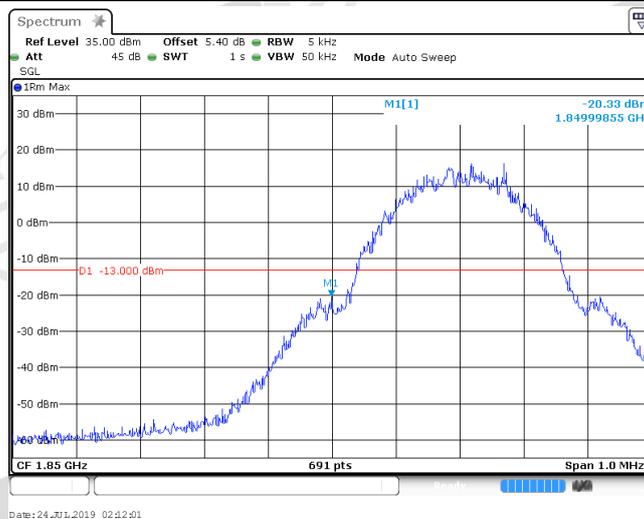
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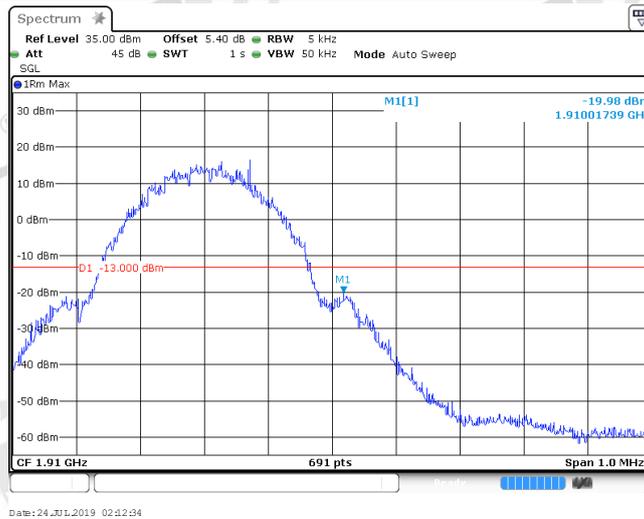
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GSM1900_512

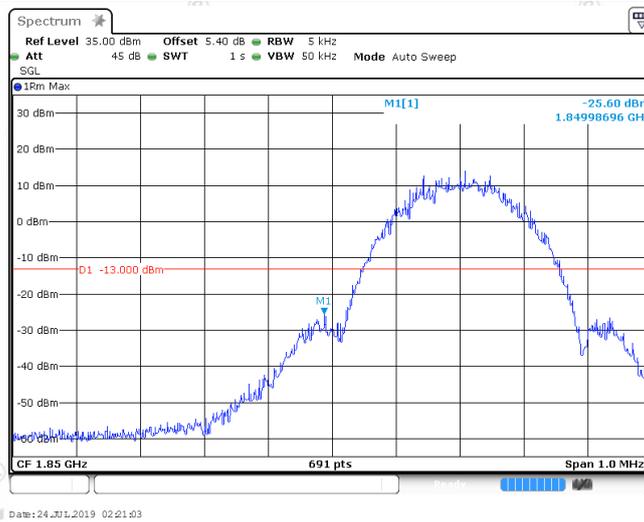


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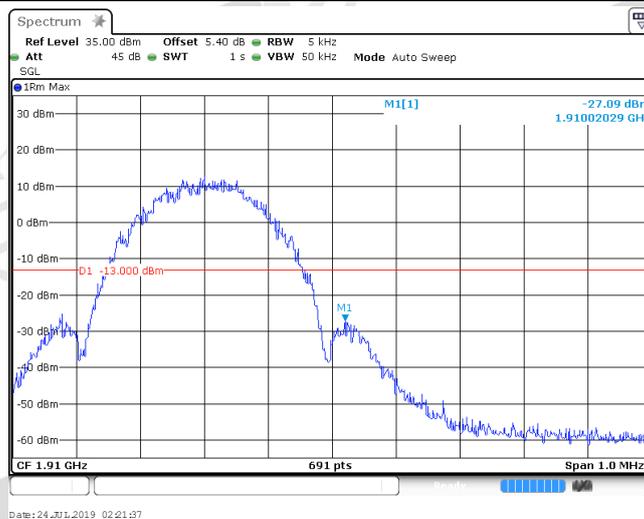
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EGPRS1900_512



EGPRS1900_810



8. Spurious Emission at Antenna Terminal

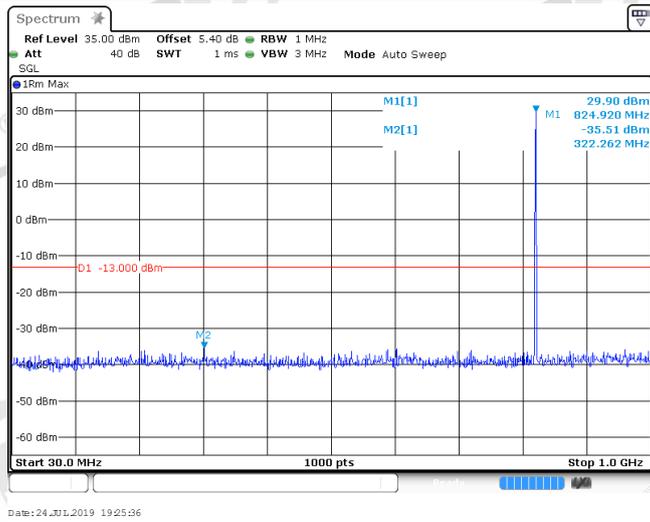
Remark1: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of $< RBW/2$ so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points =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

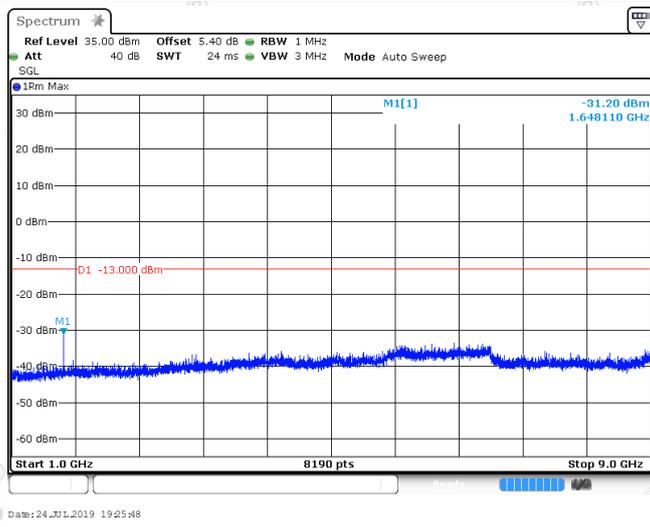
8.1. Test Plots



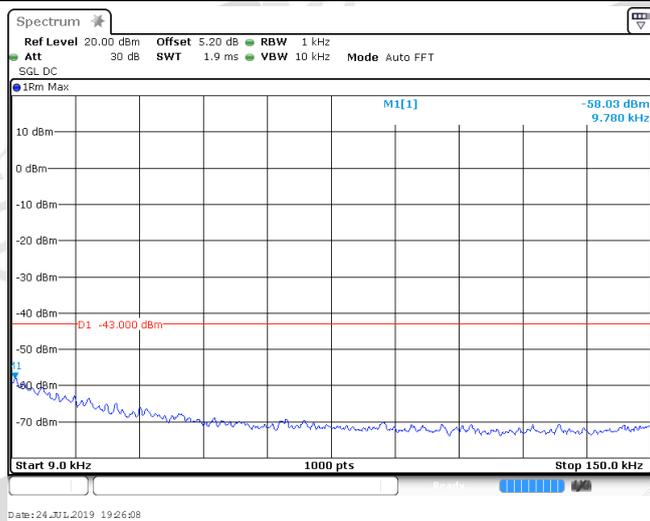
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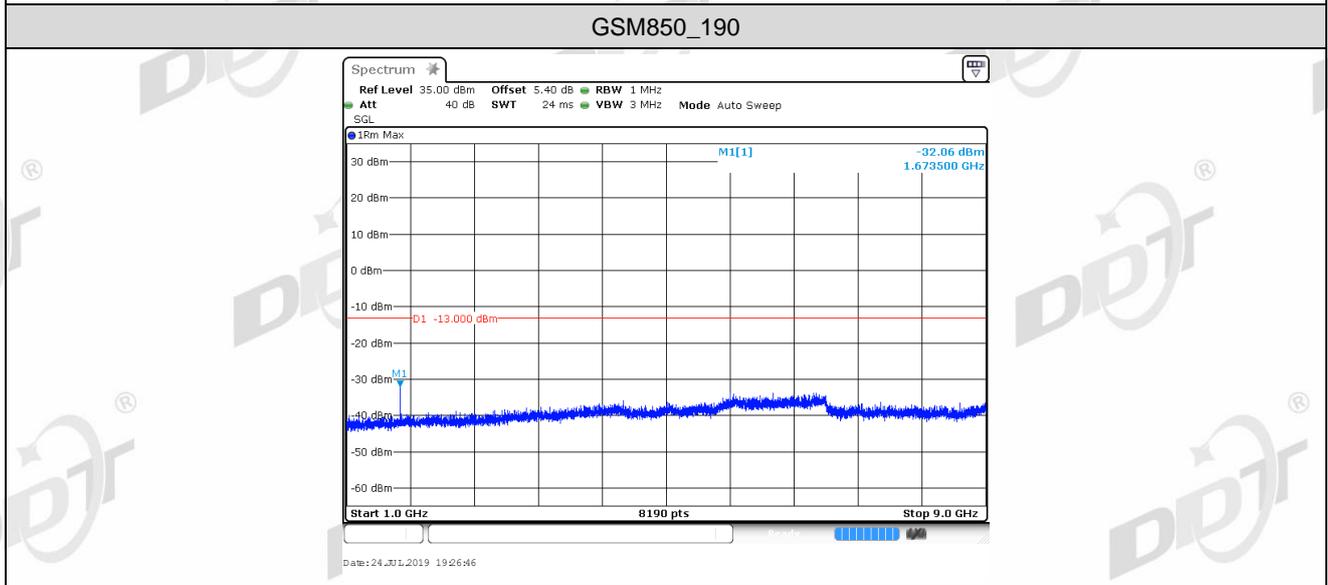
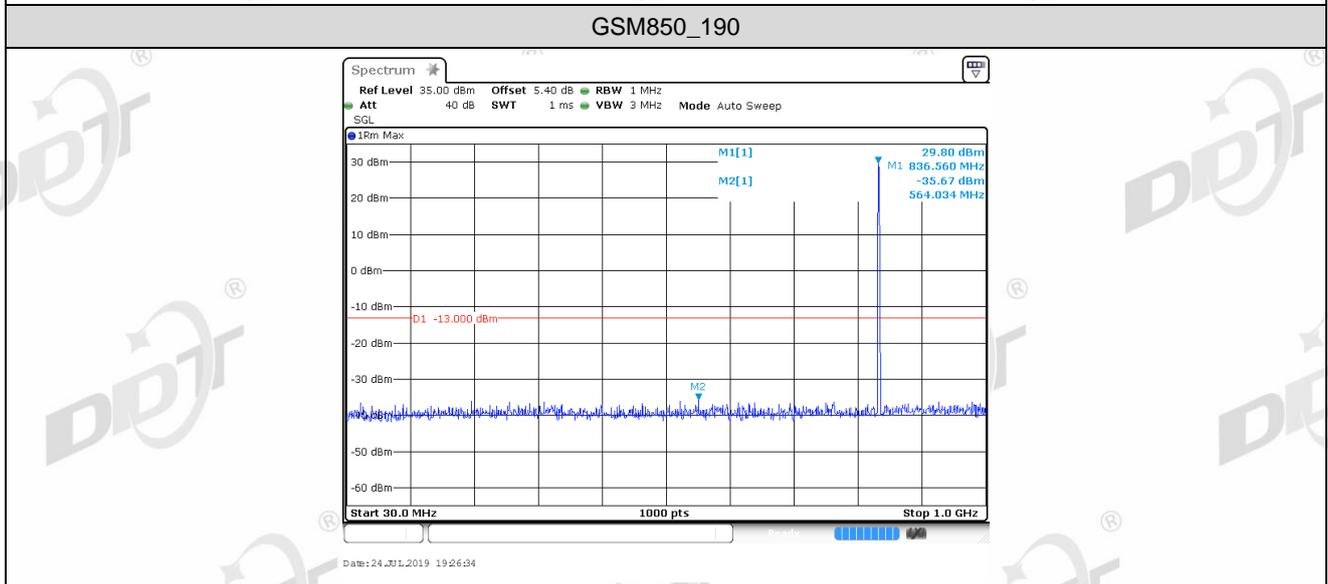
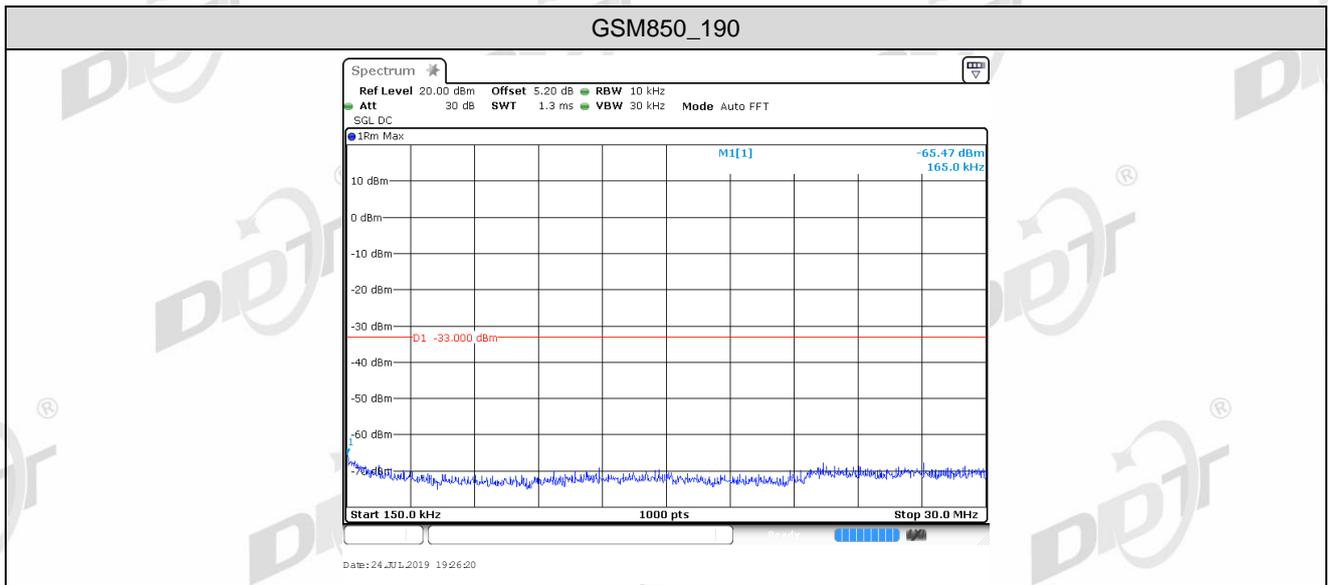


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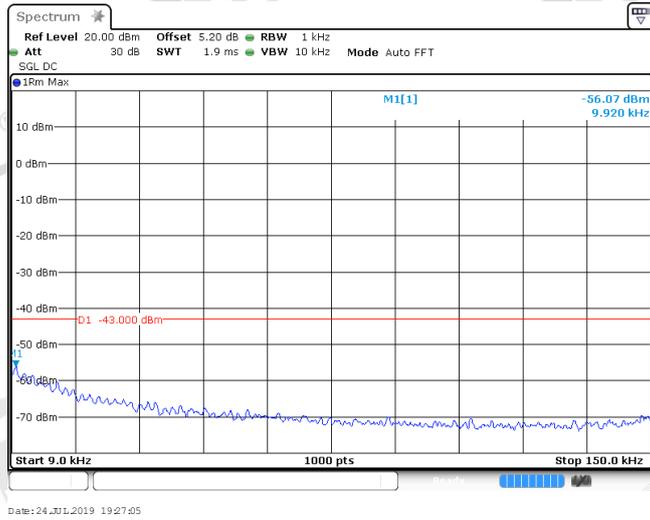


GSM850_190

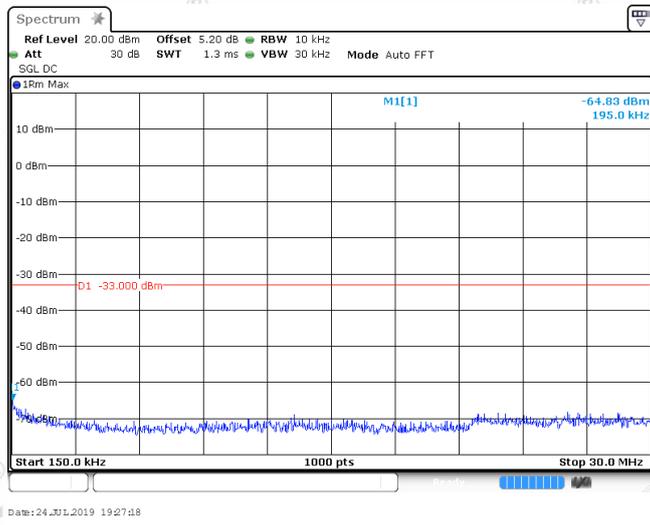




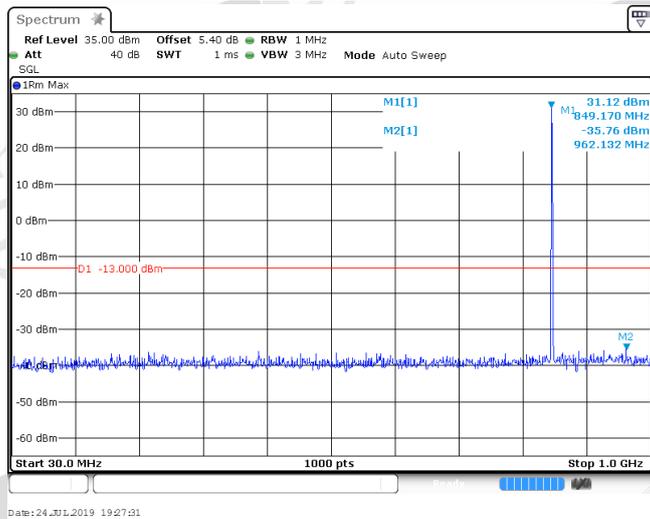
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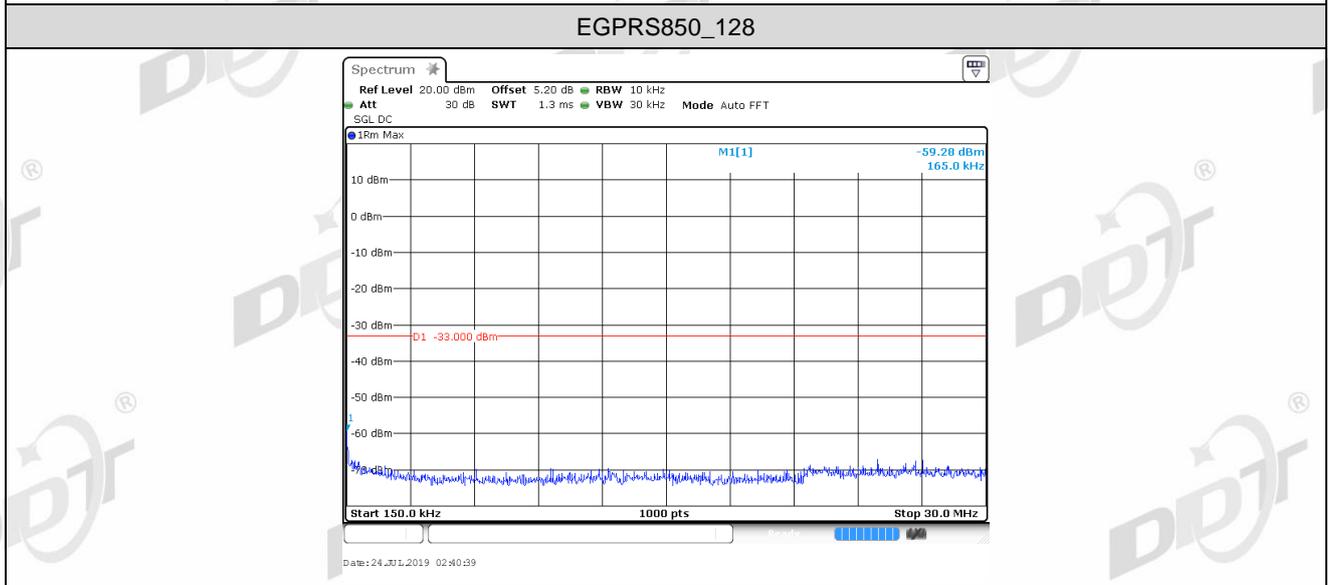
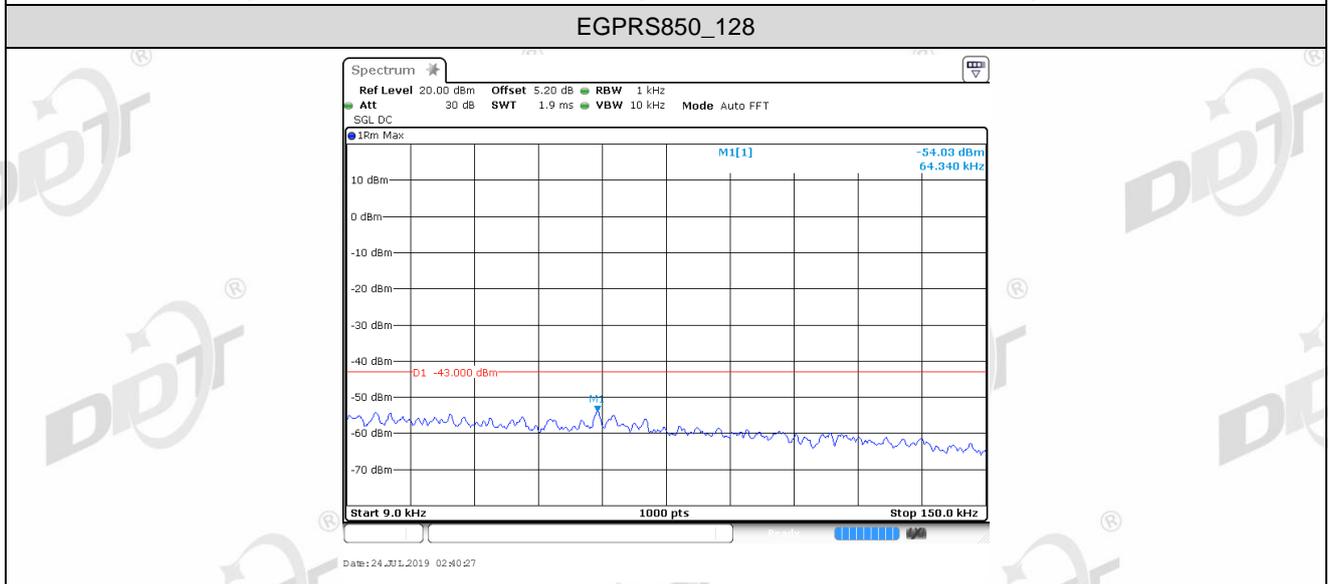
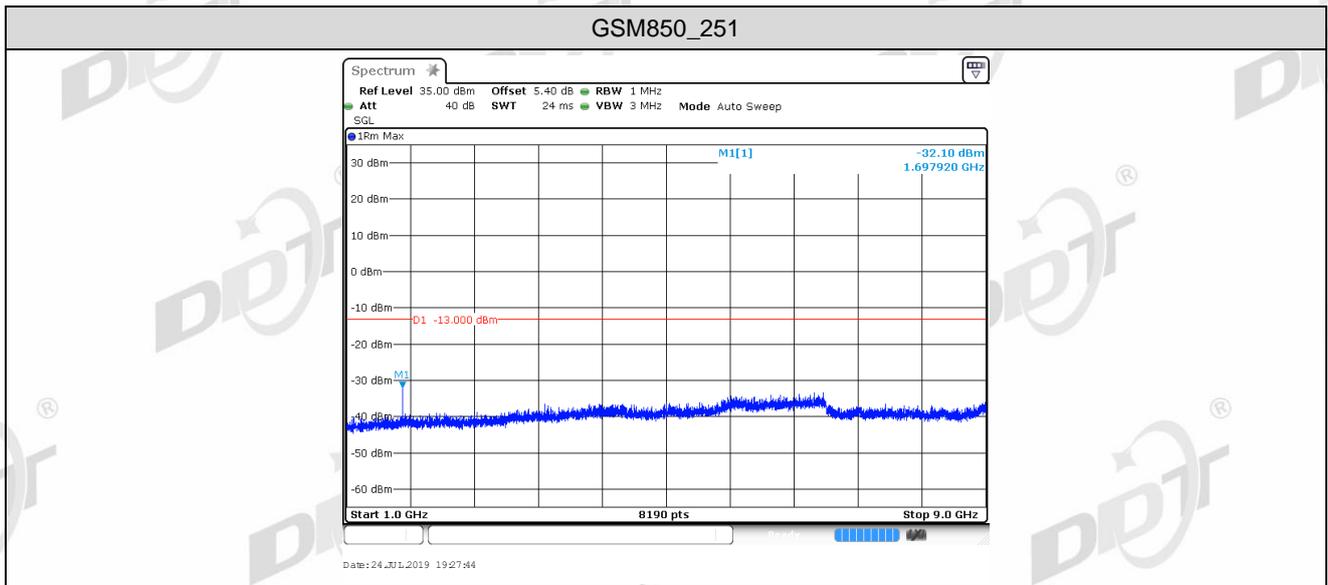


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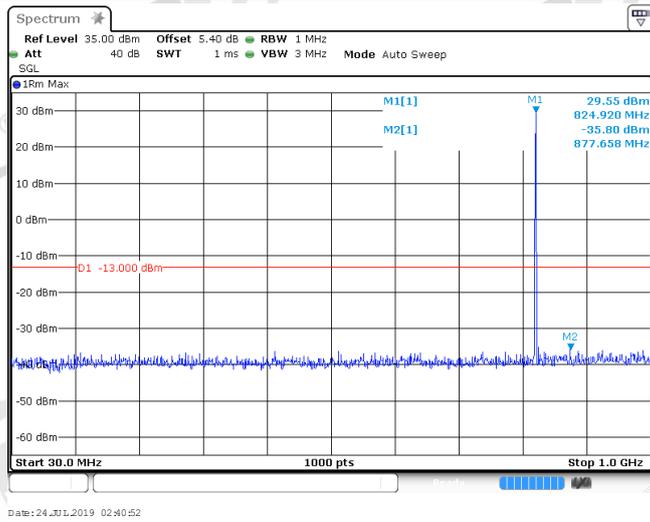


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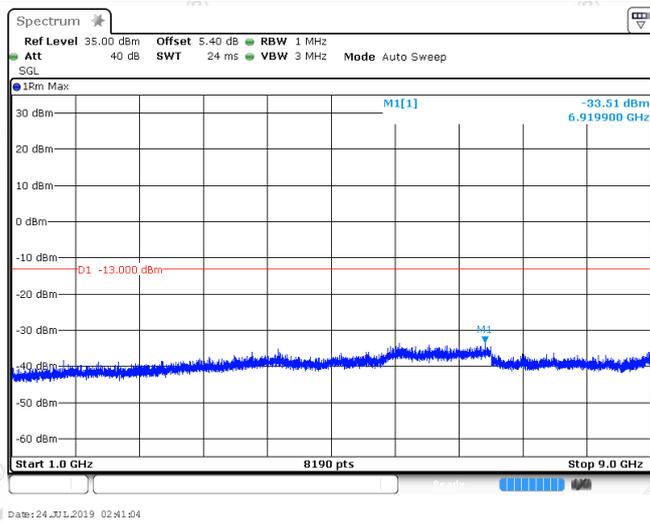




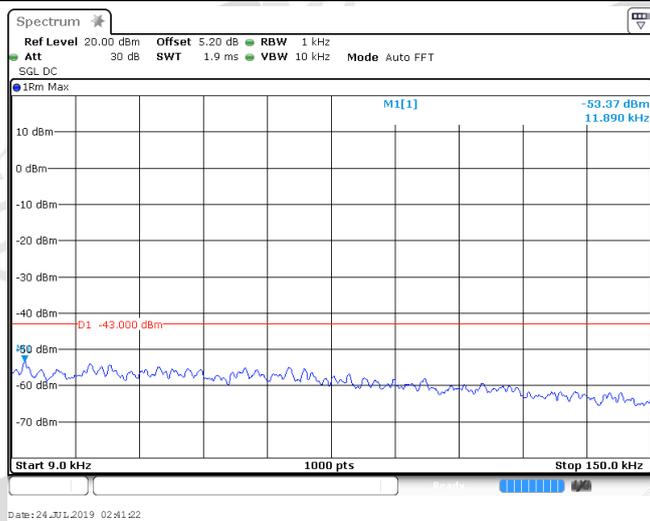
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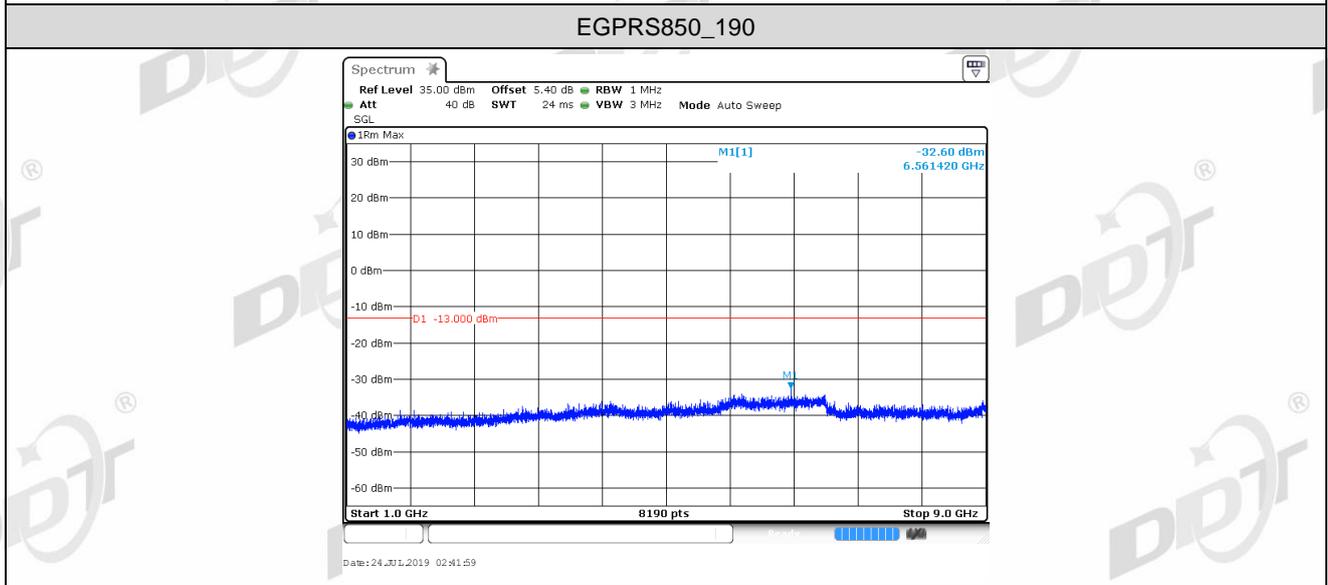
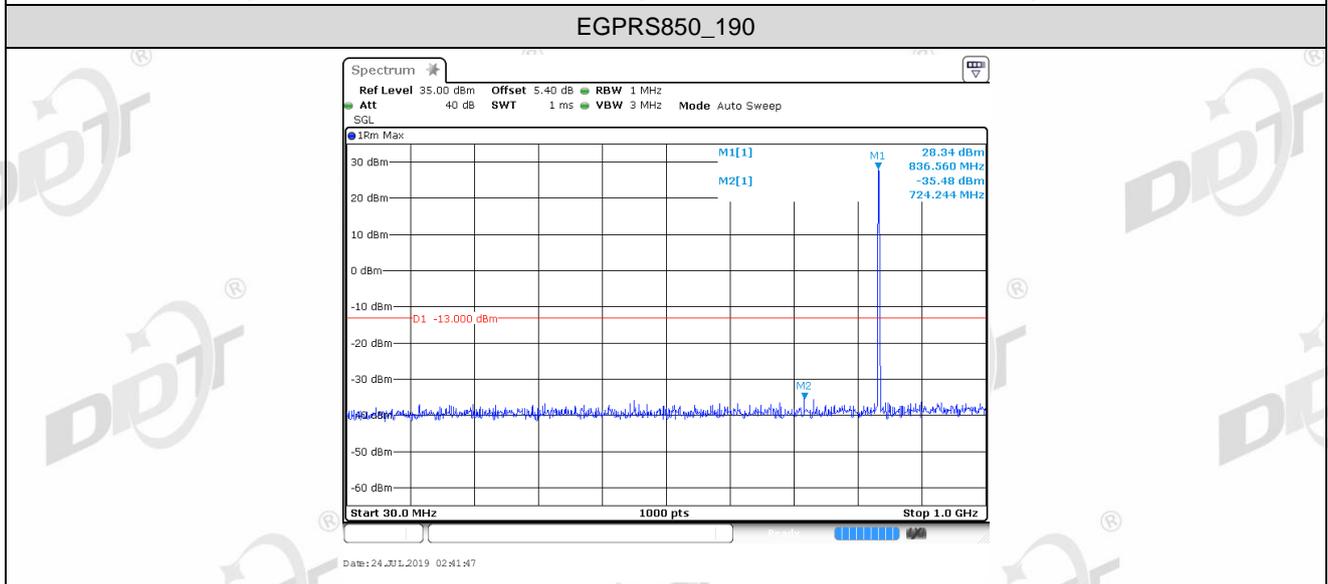
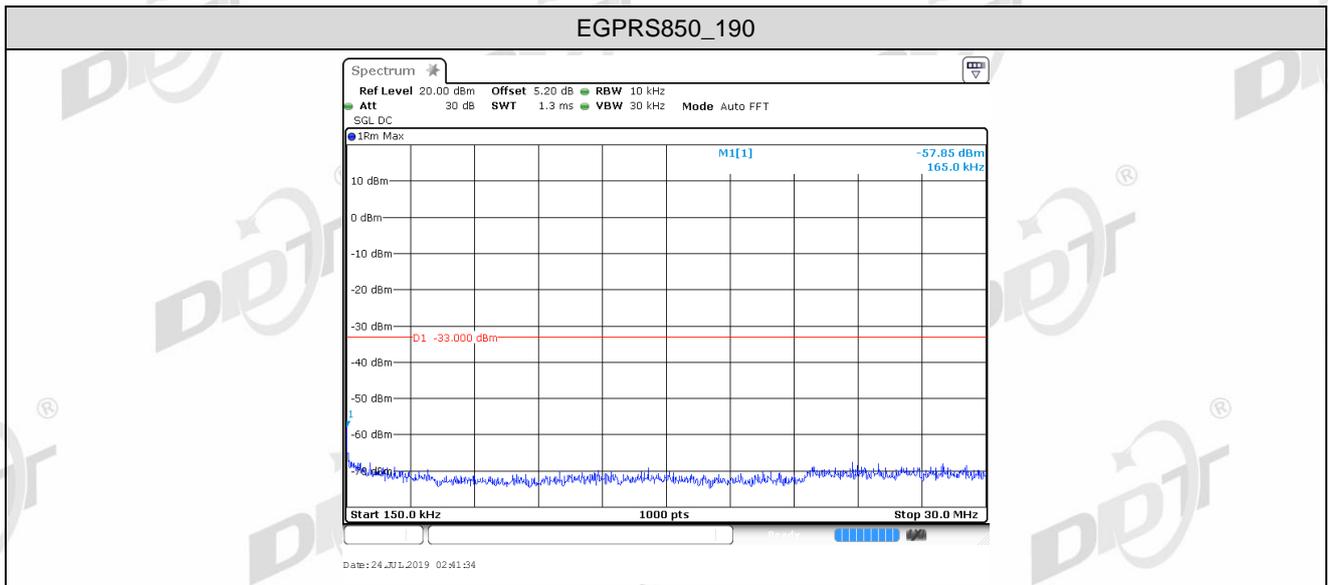


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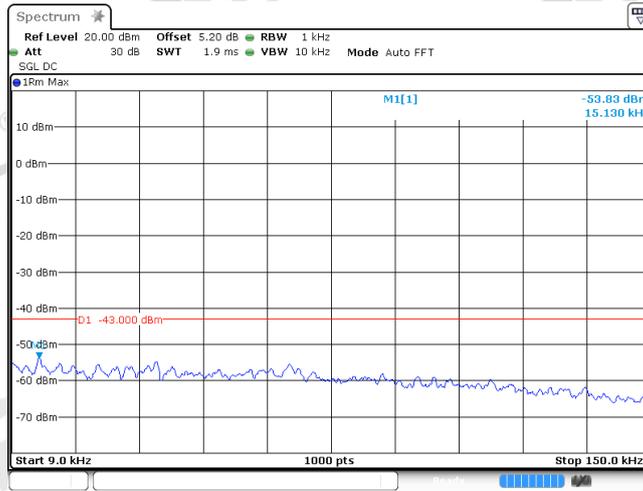


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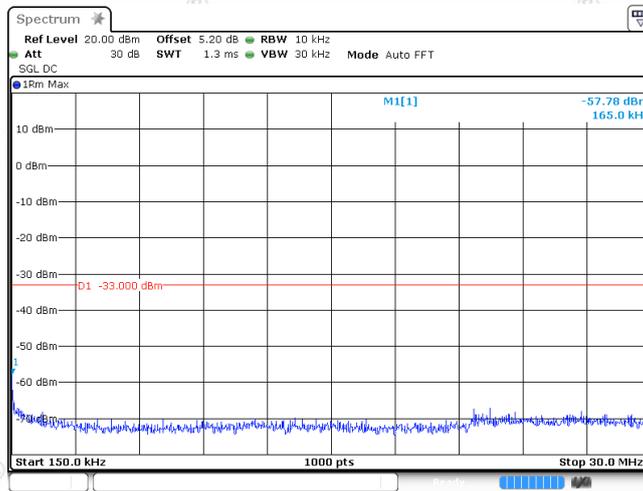


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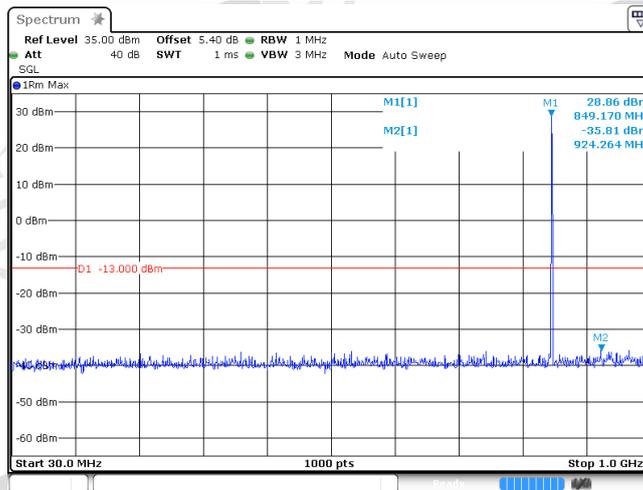
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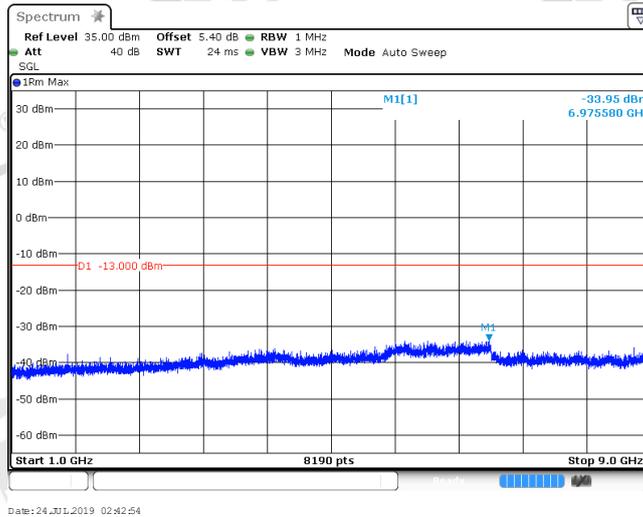
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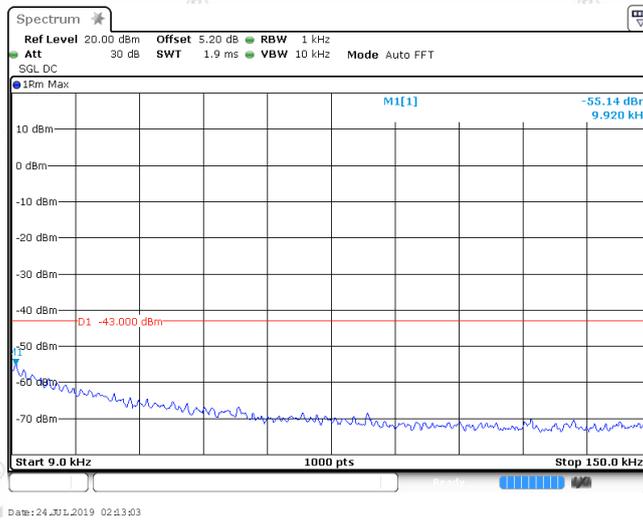


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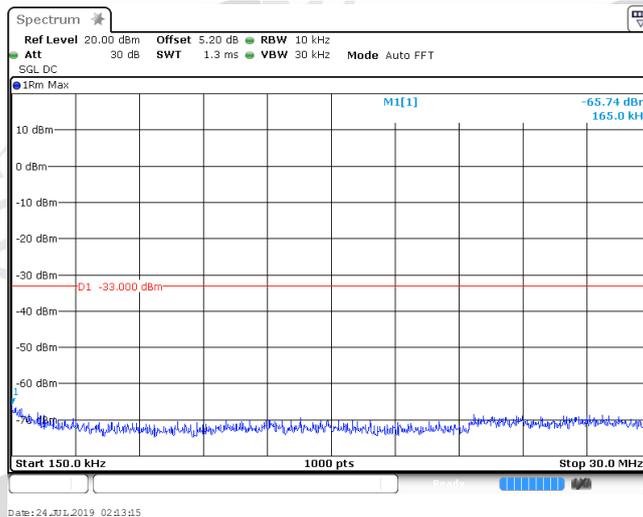
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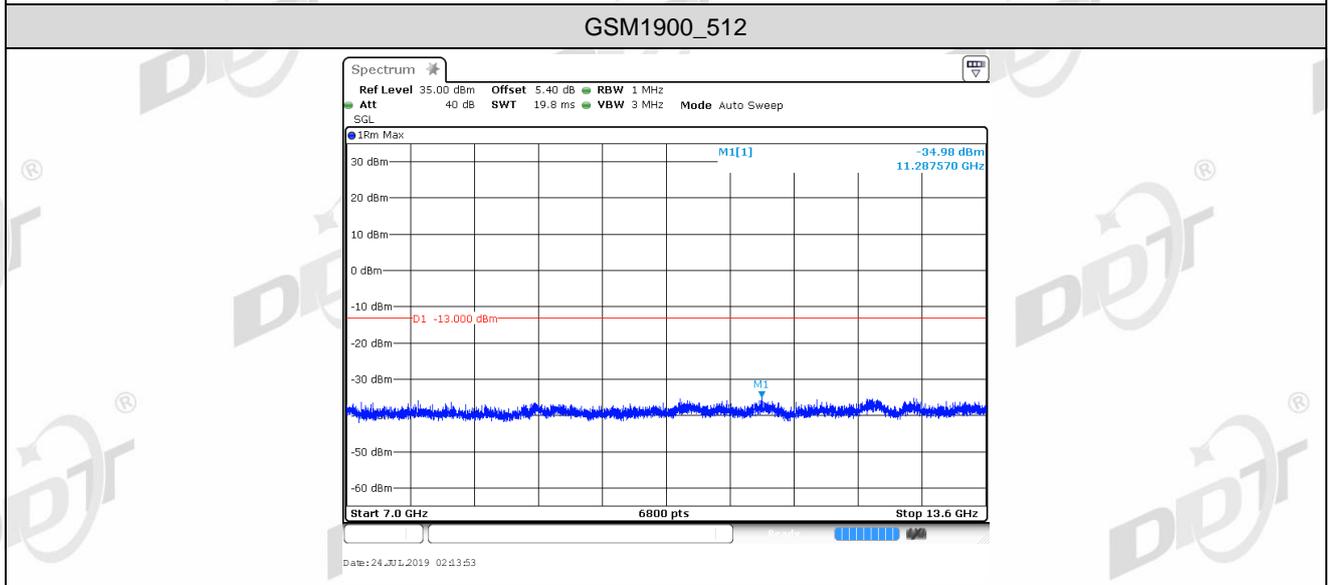
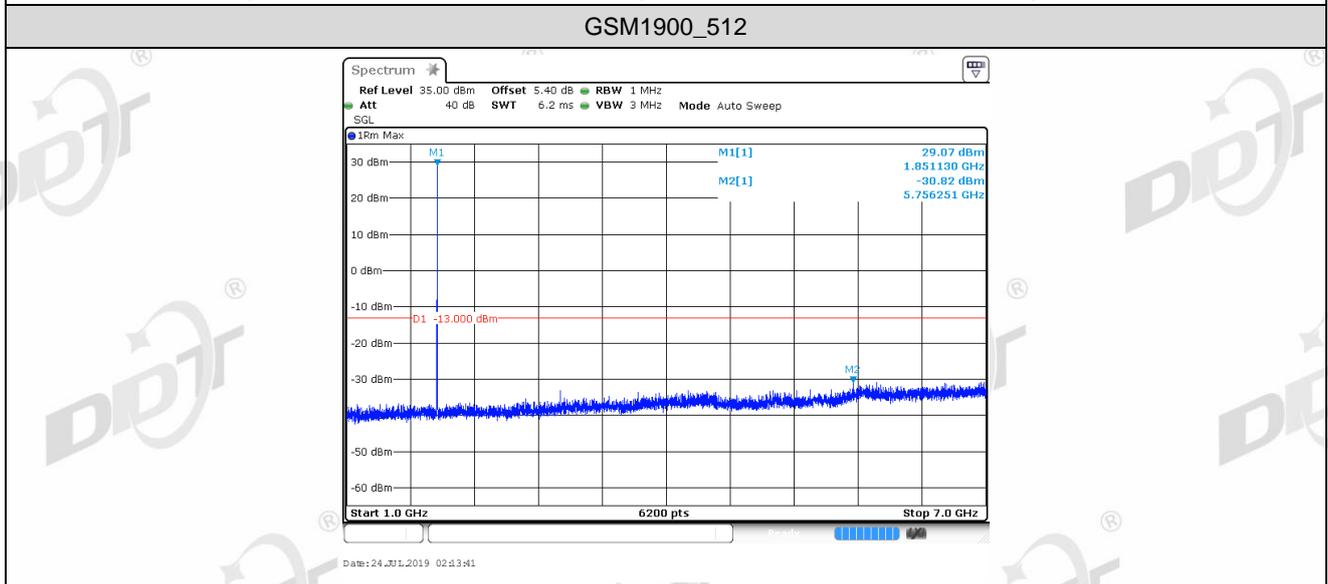
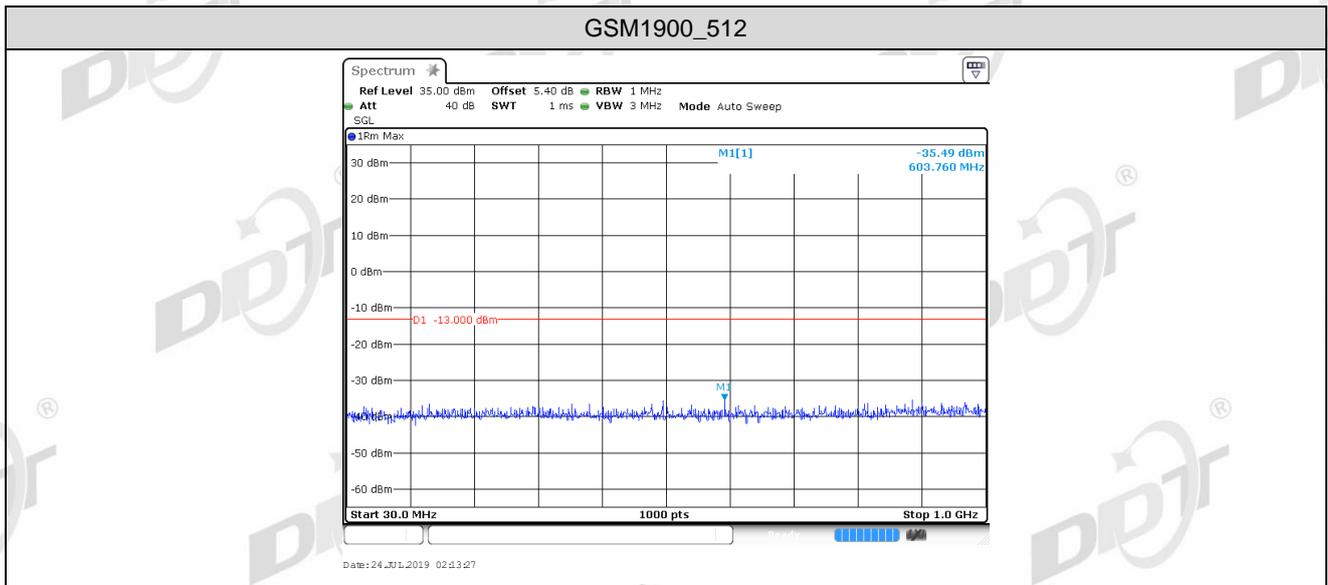


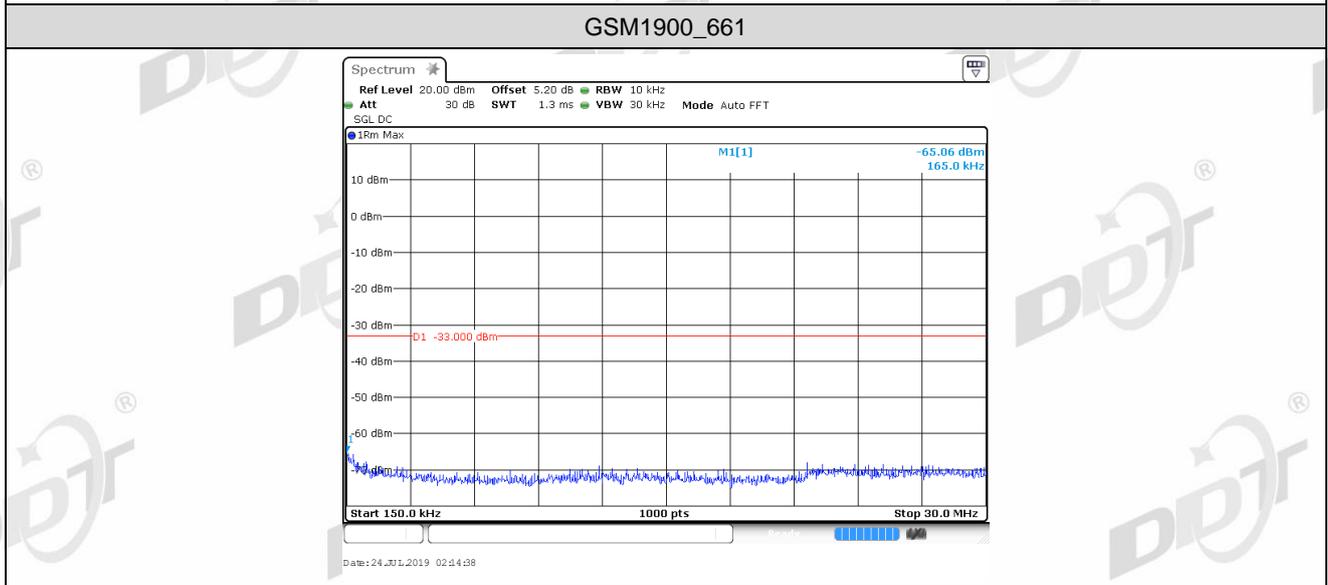
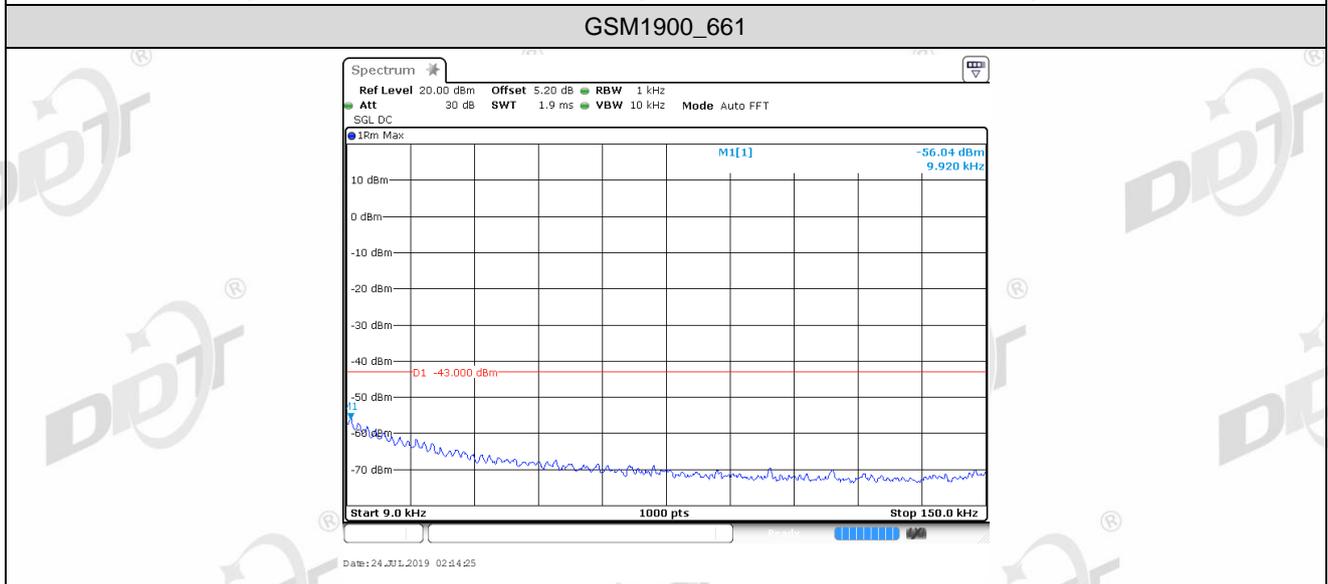
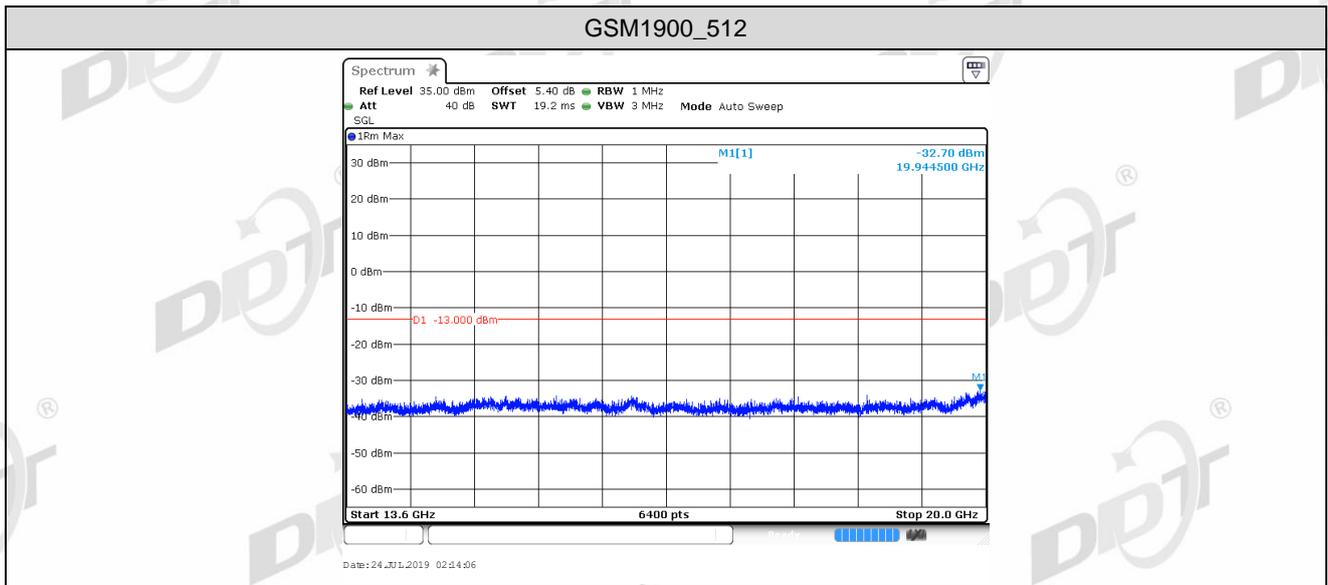
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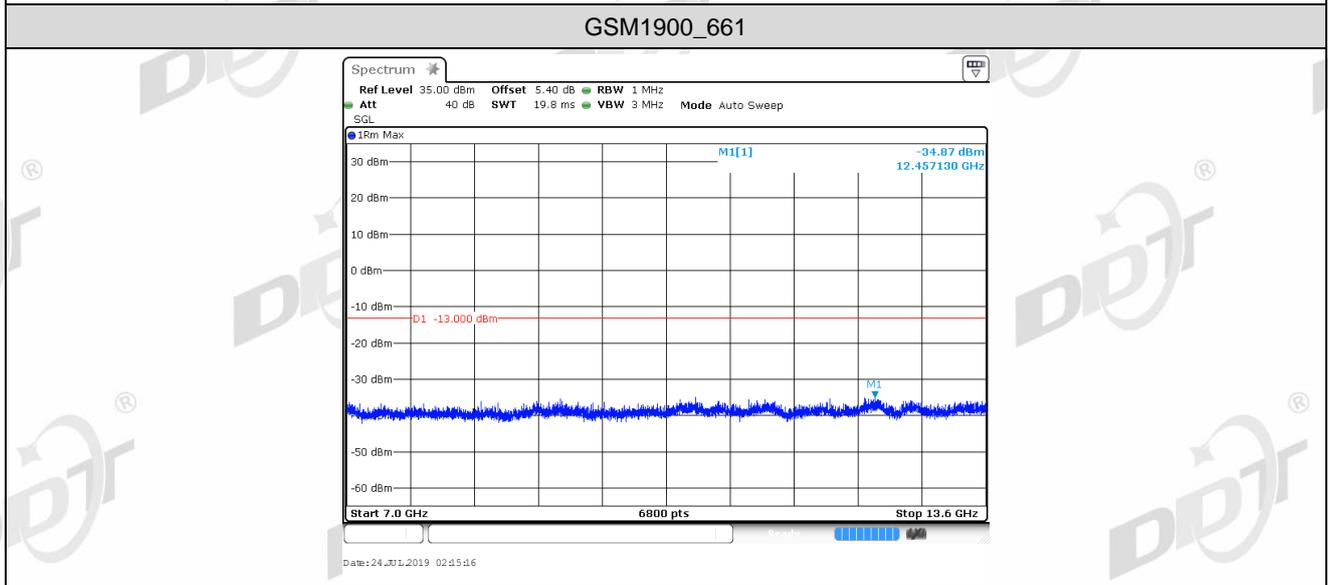
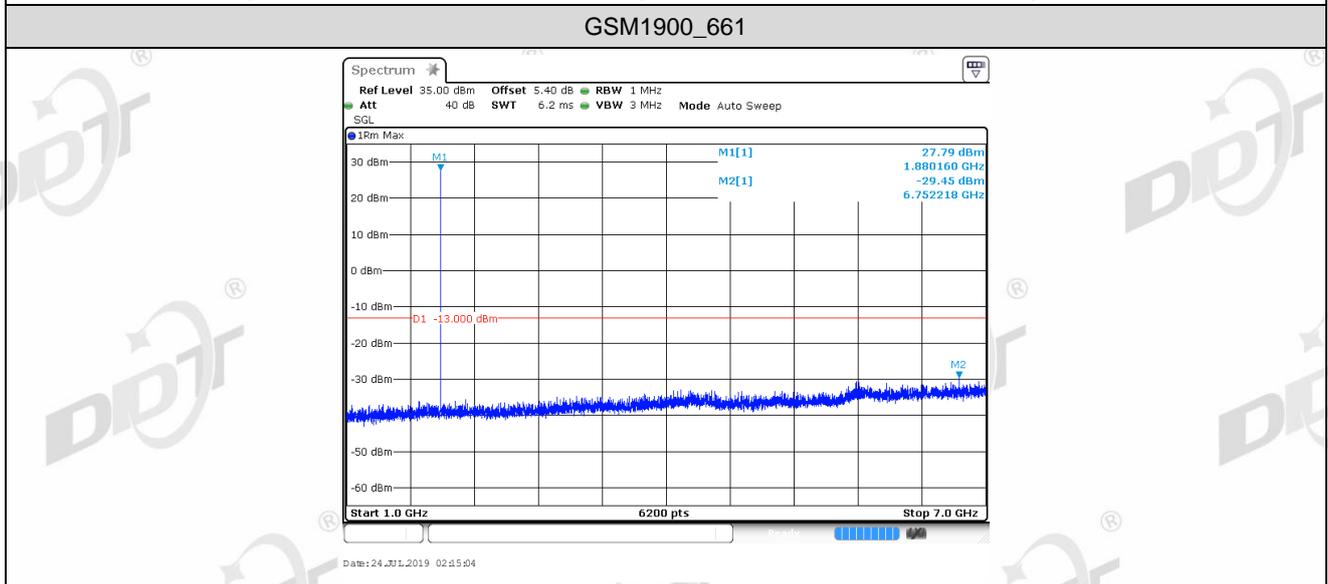
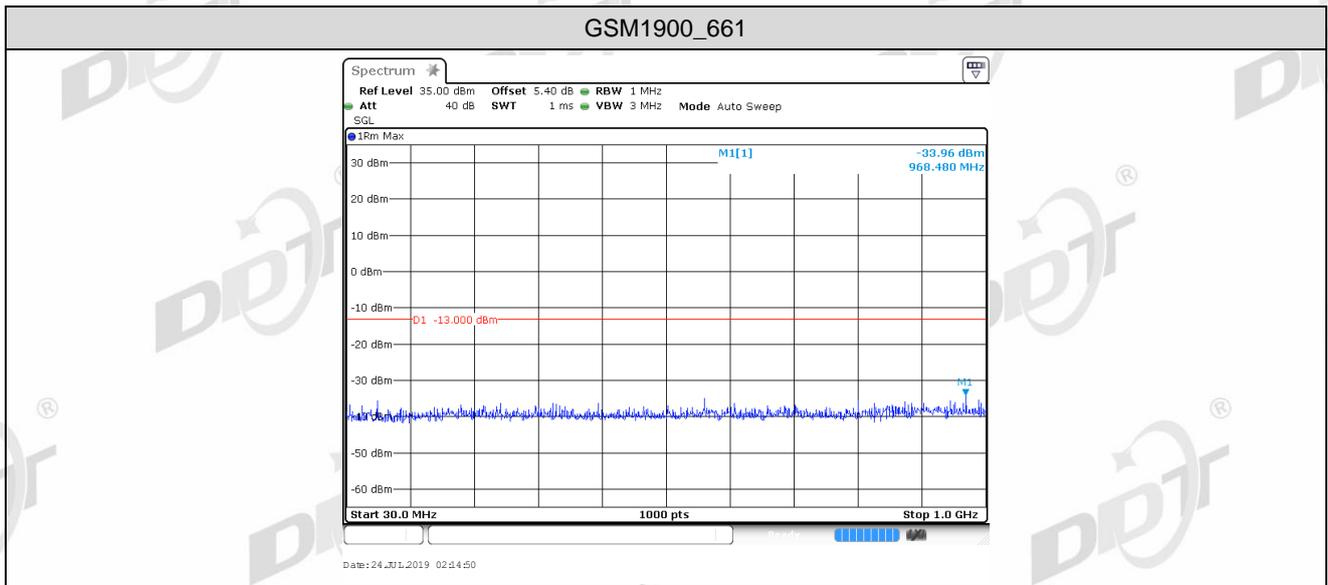


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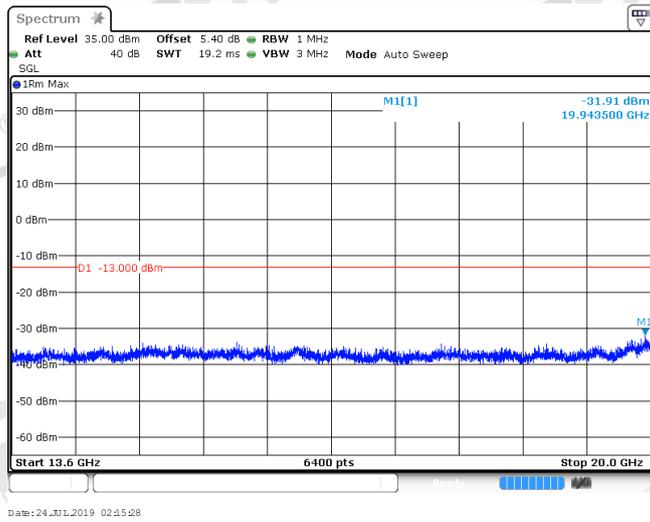




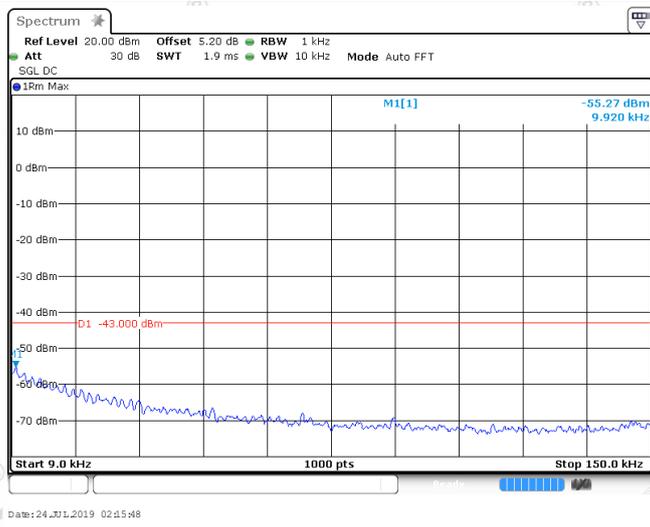




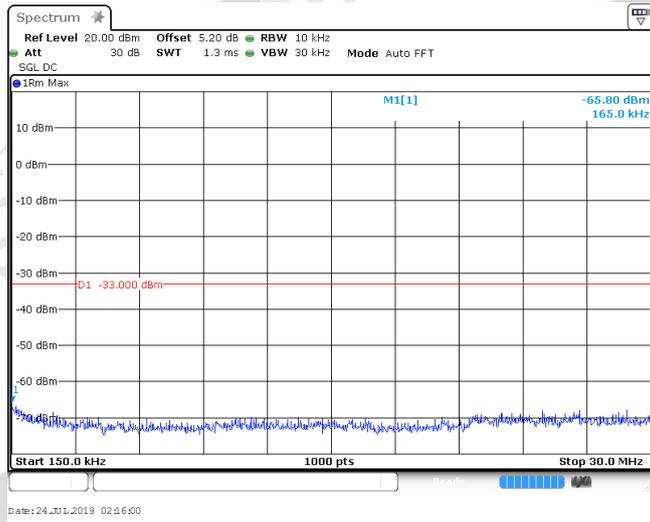
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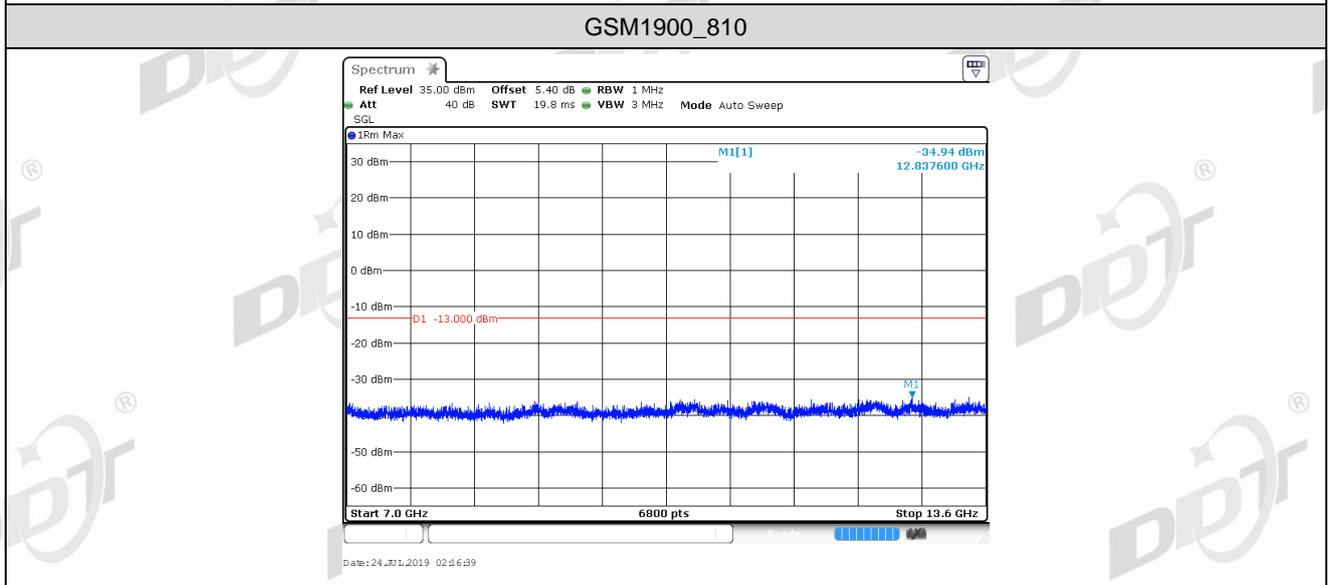
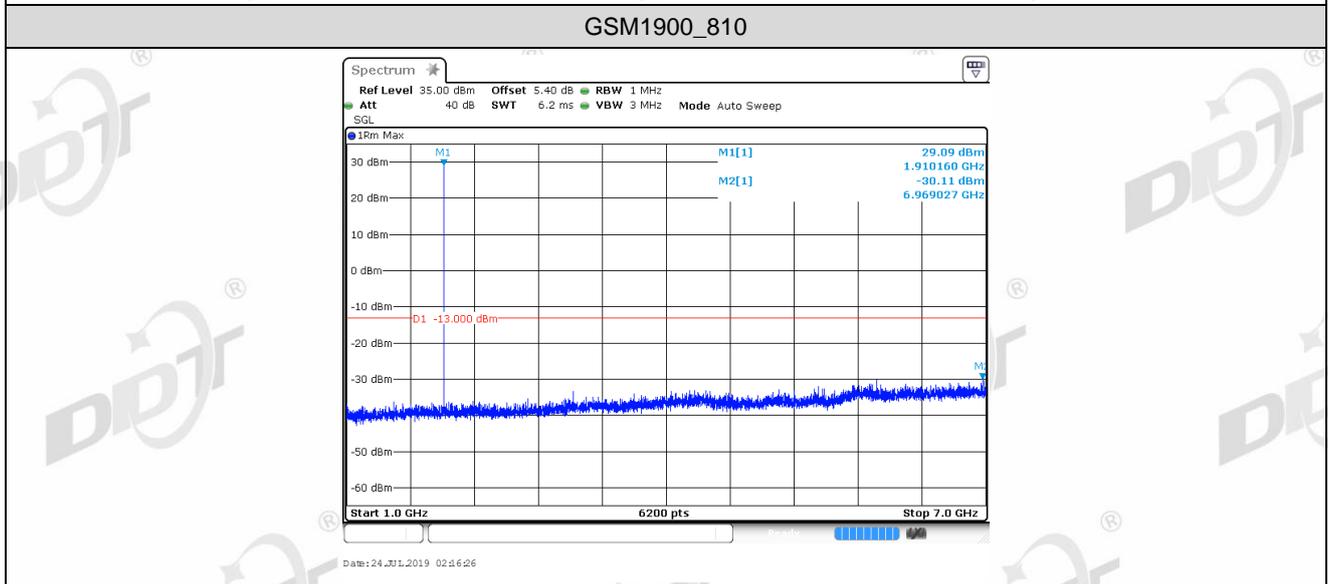
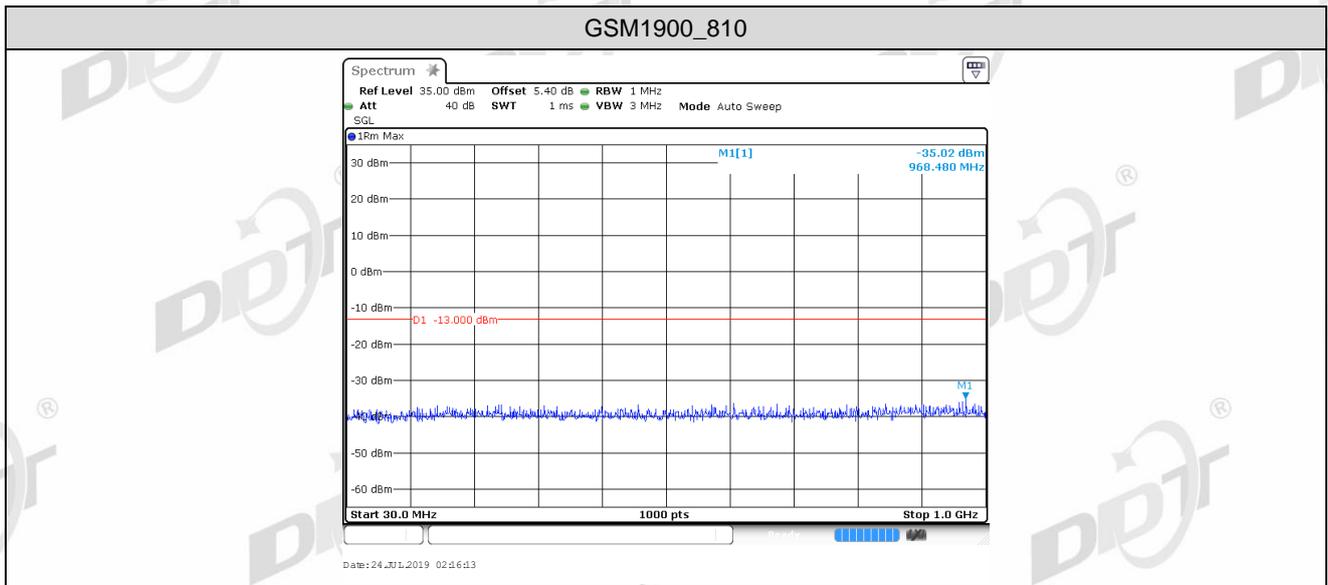


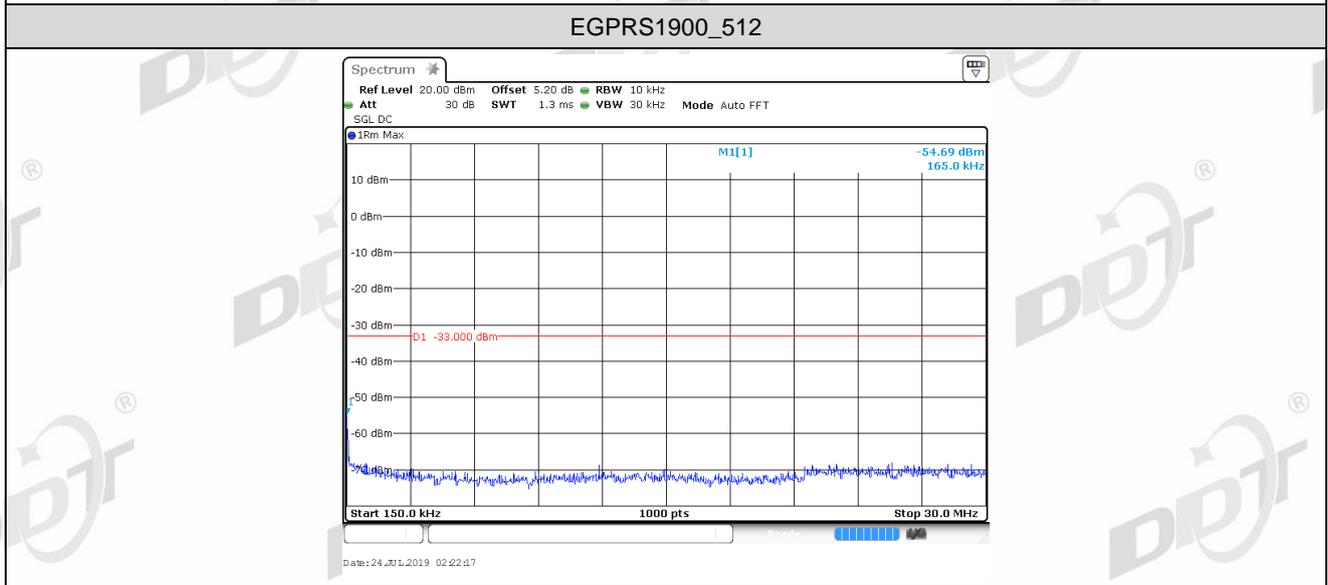
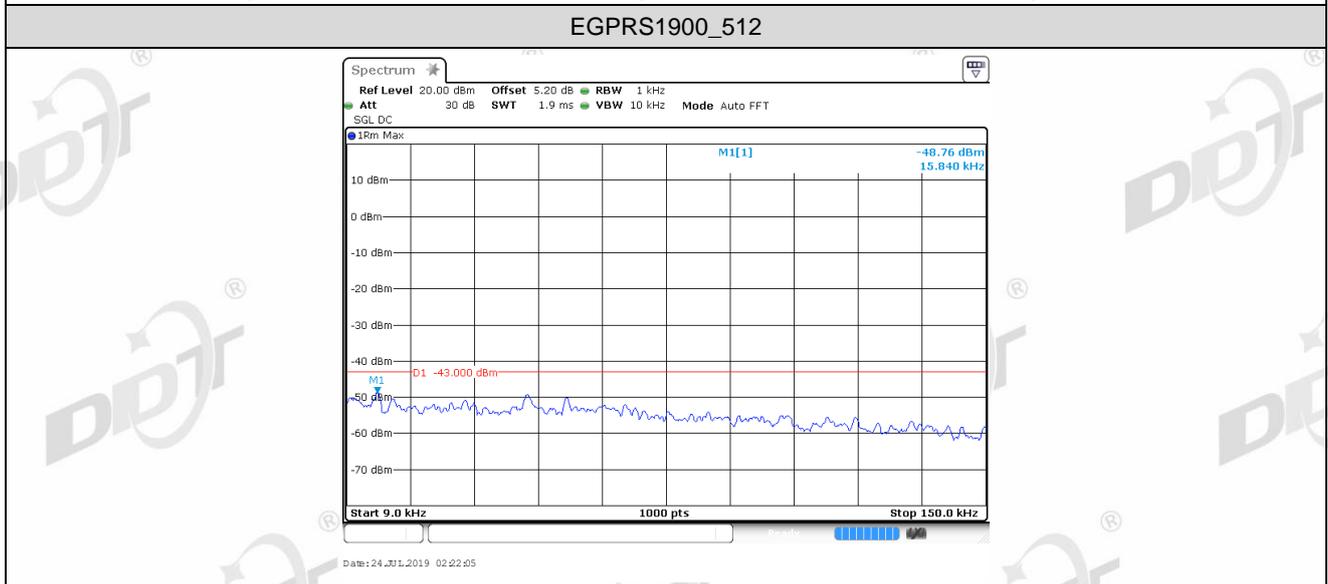
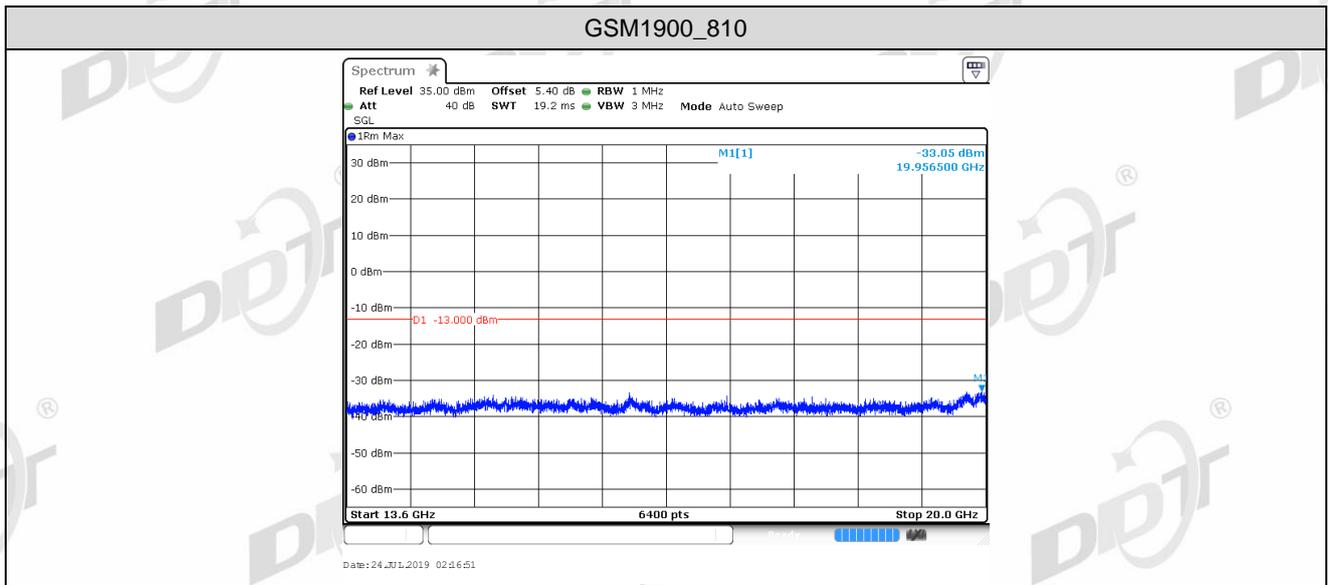
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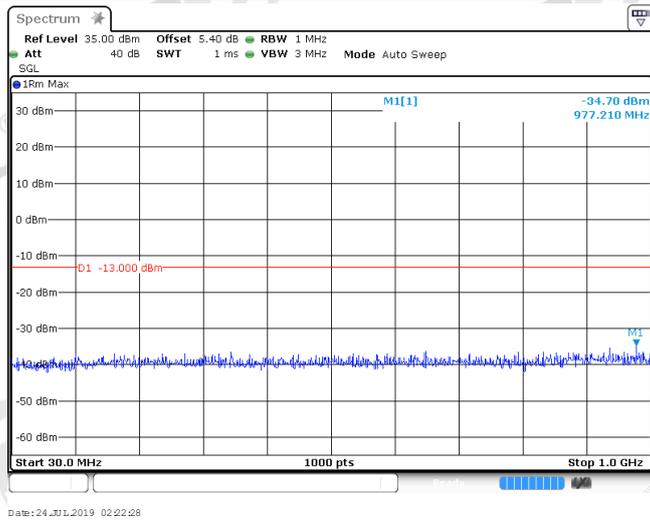
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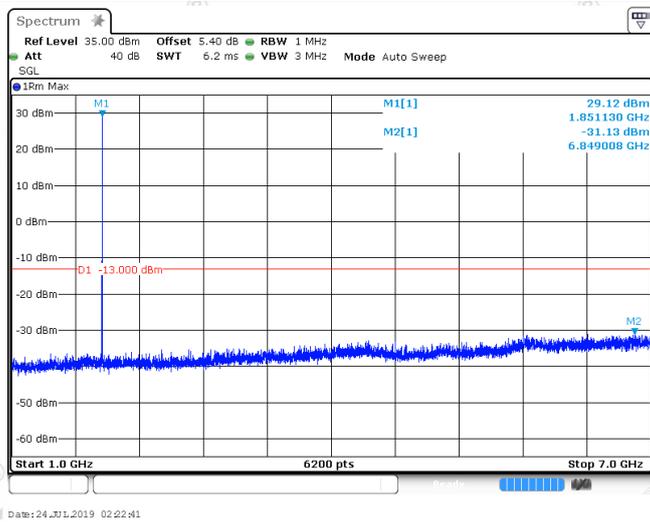


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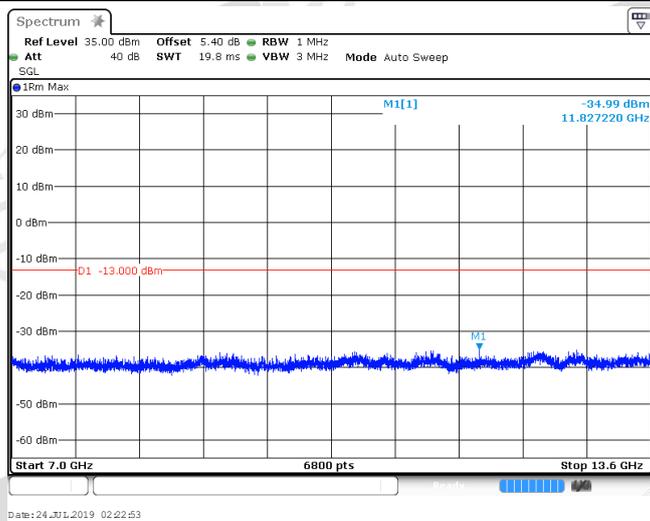
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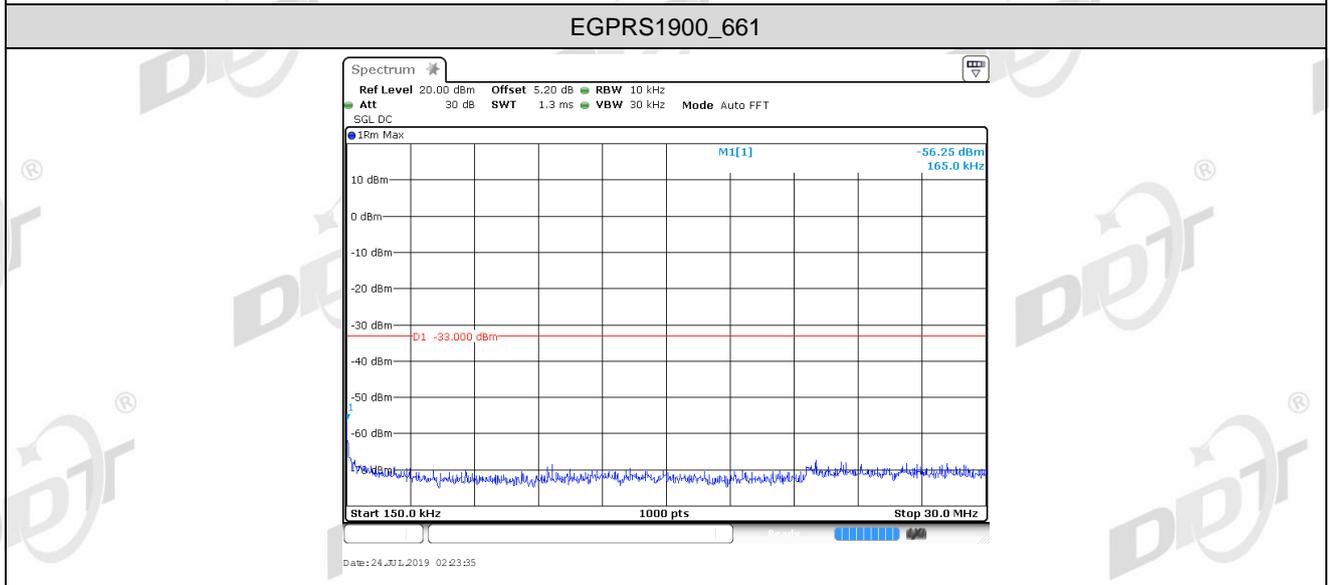
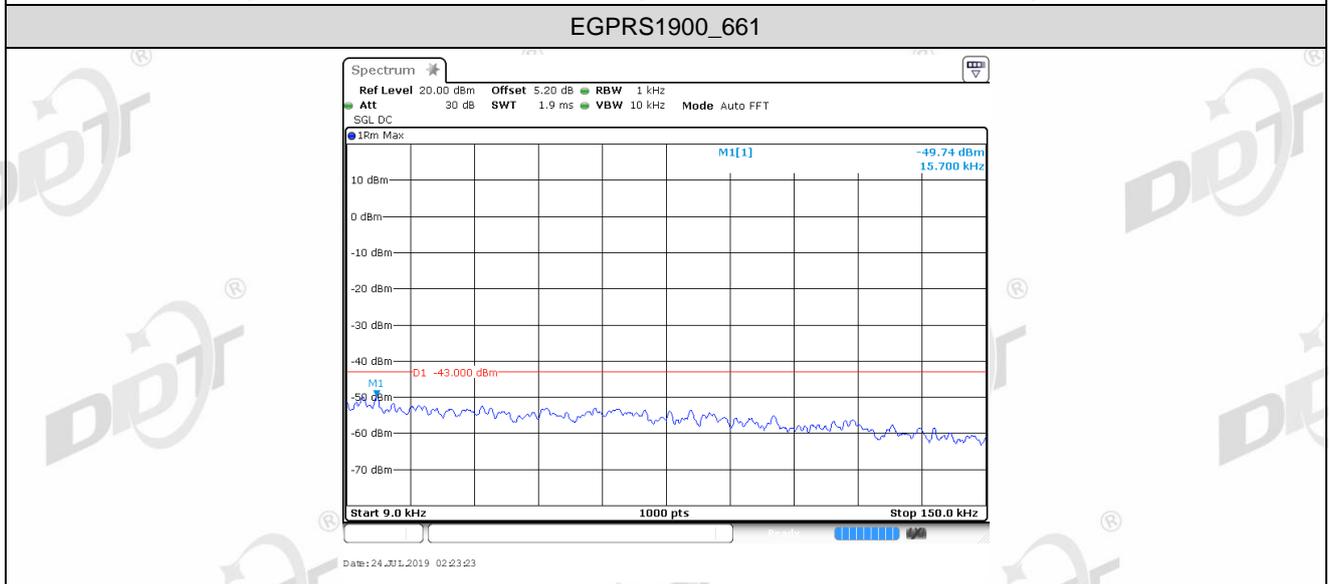
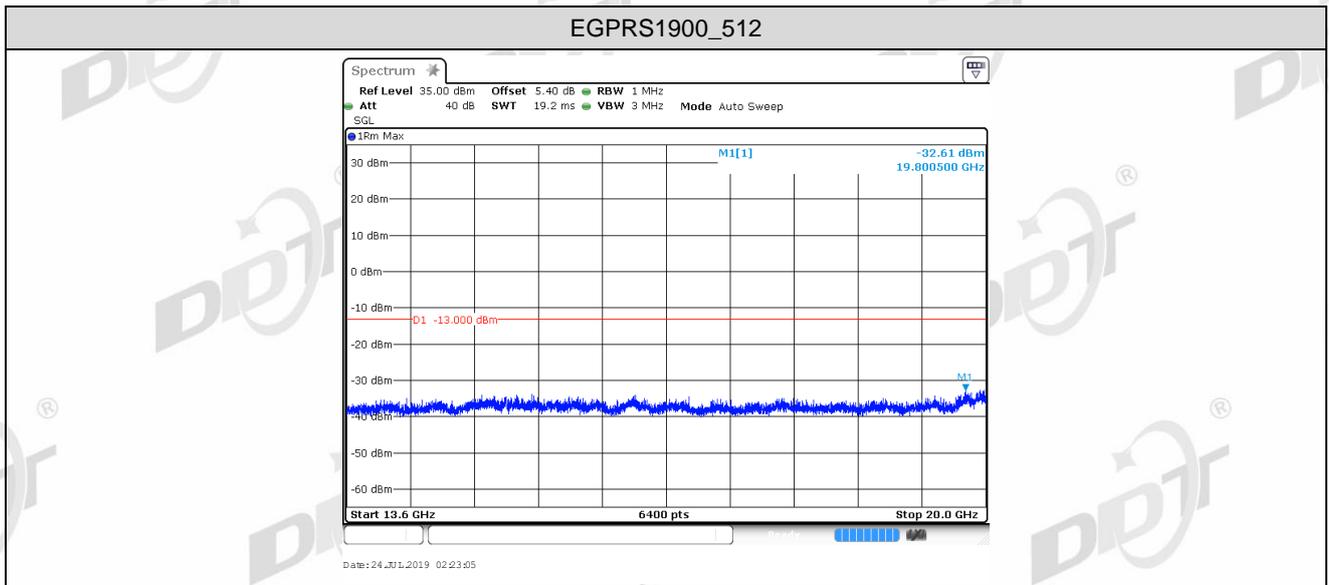


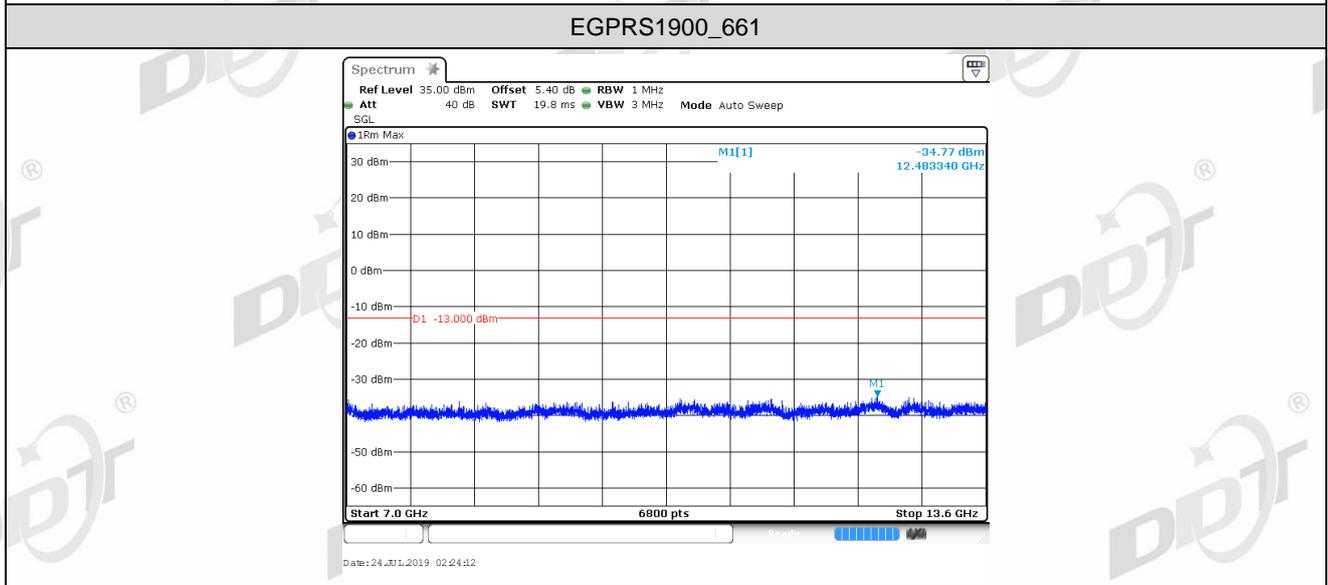
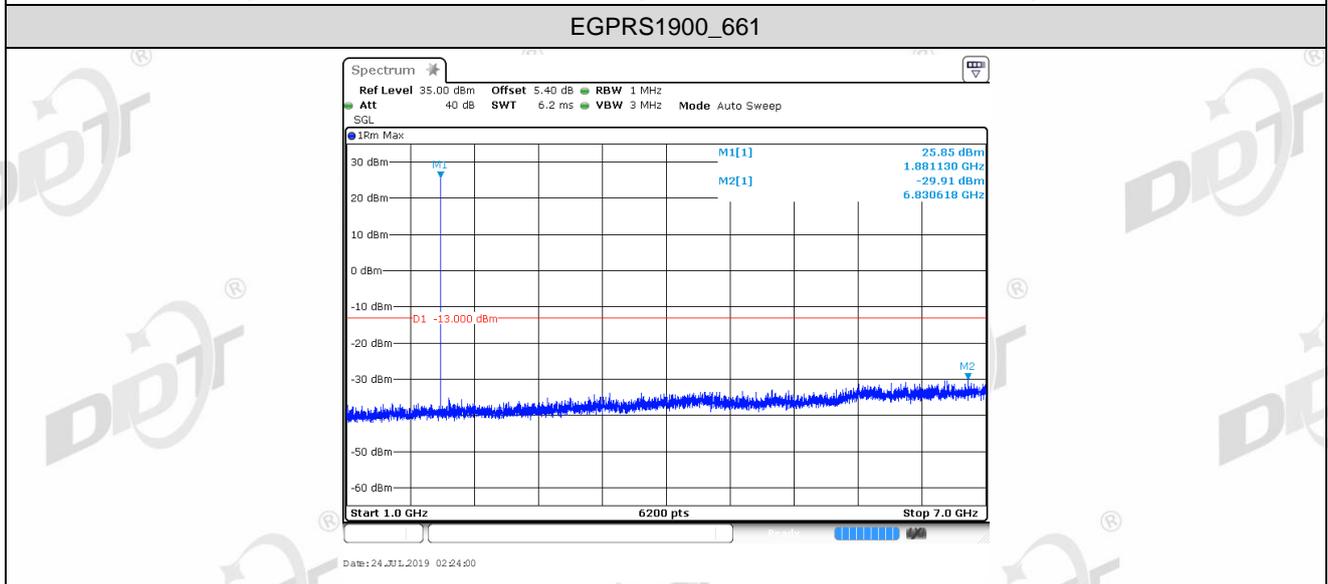
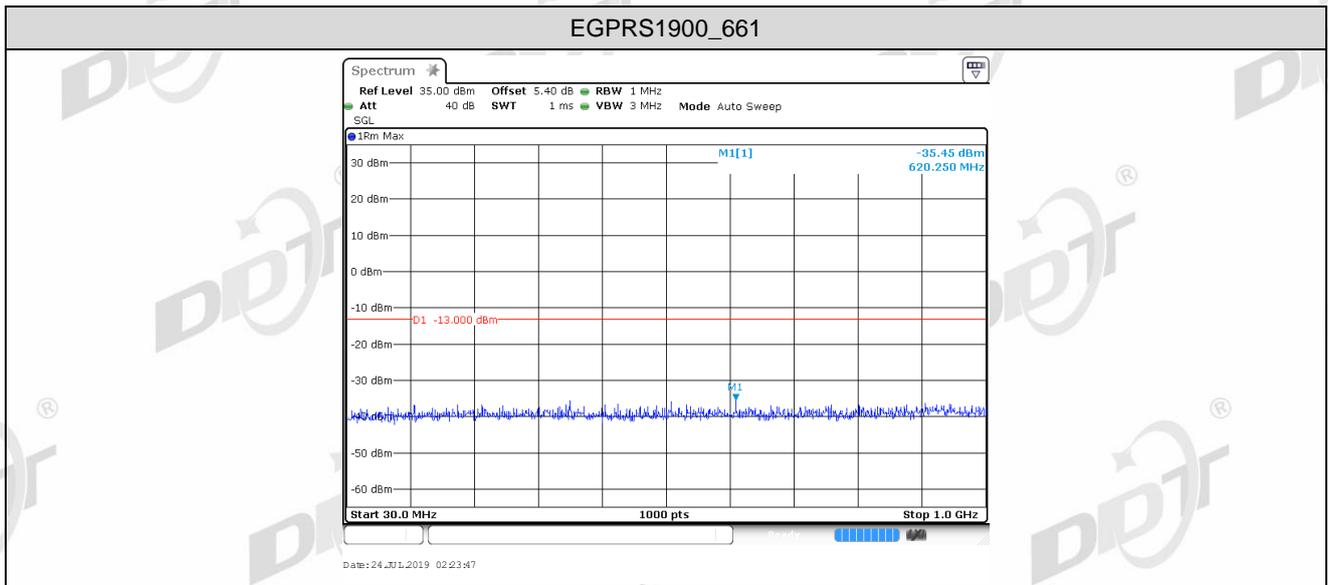
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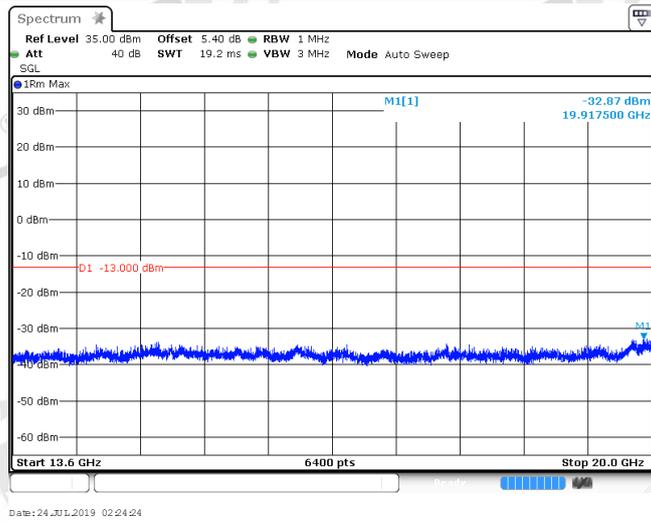


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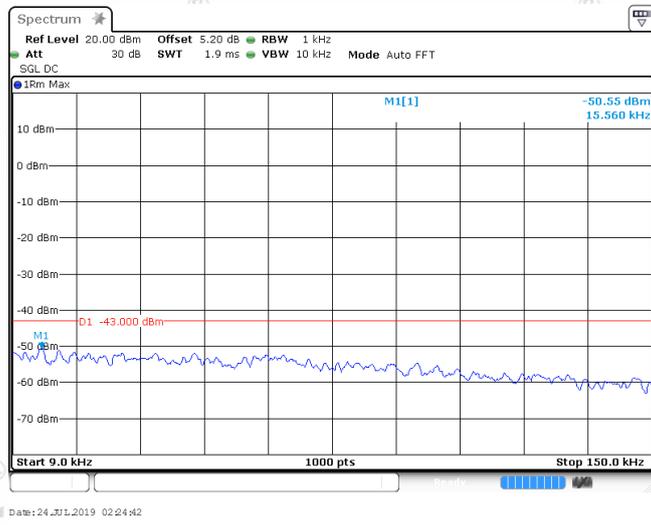




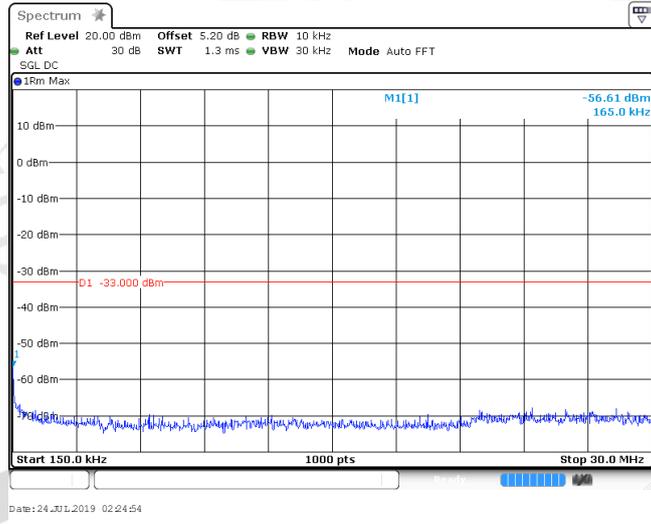
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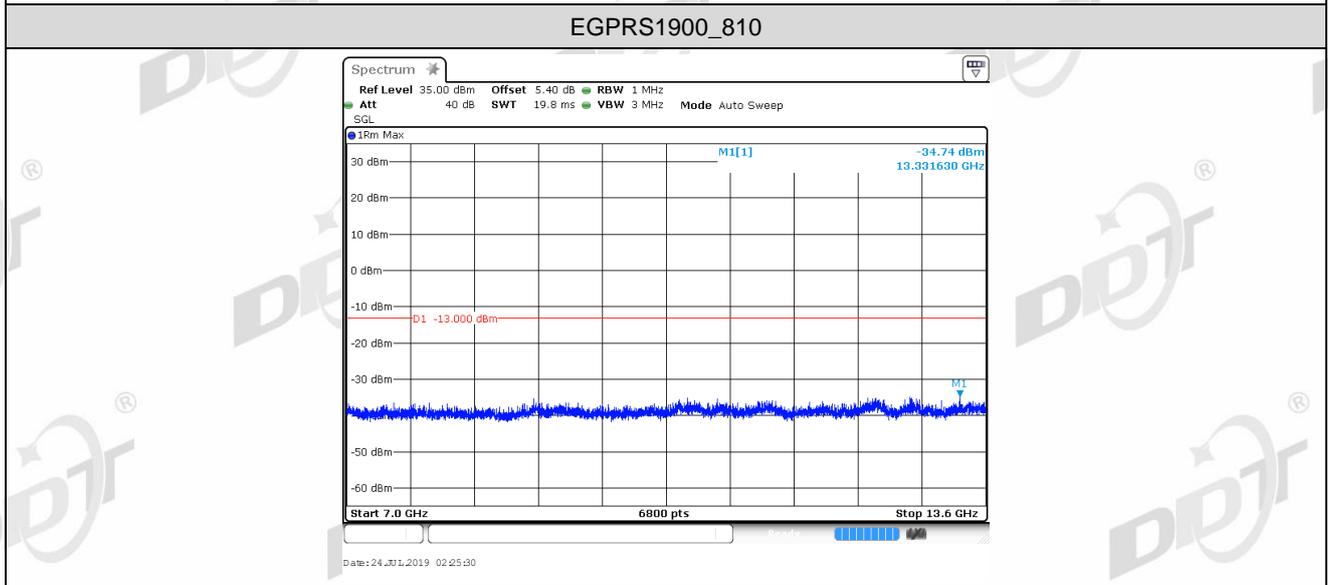
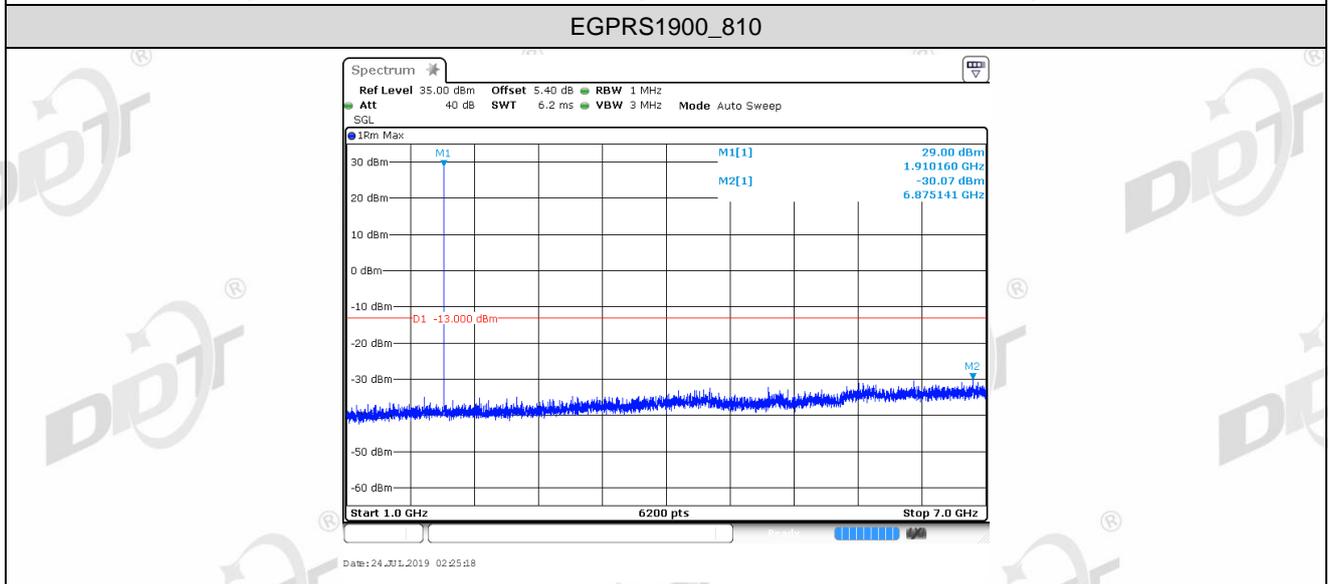
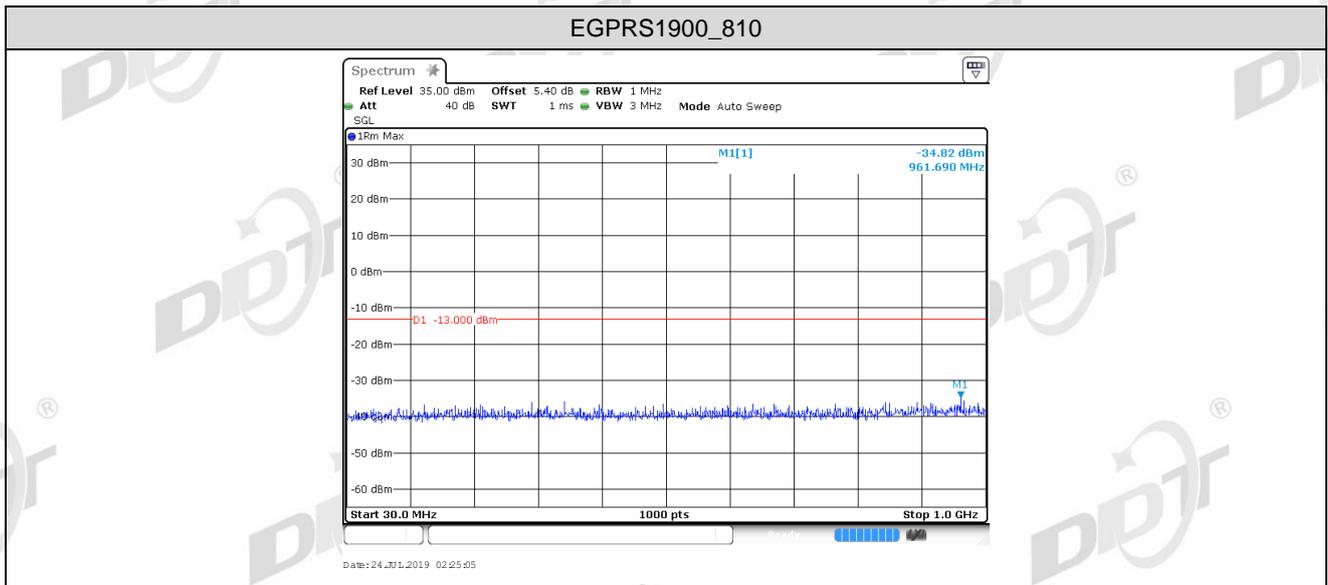


EGPRS1900_810



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	3.00	0.003643	±2.5	PASS
GSM850	128	VN	TN	3.33	0.004035	±2.5	PASS
GSM850	128	VH	TN	5.68	0.006894	±2.5	PASS
GSM850	190	VL	TN	6.52	0.007796	±2.5	PASS
GSM850	190	VN	TN	8.27	0.009879	±2.5	PASS
GSM850	190	VH	TN	4.81	0.005750	±2.5	PASS
GSM850	251	VL	TN	5.33	0.006276	±2.5	PASS
GSM850	251	VN	TN	1.94	0.002282	±2.5	PASS
GSM850	251	VH	TN	3.97	0.004679	±2.5	PASS
EGPRS850	128	VL	TN	0.45	0.000548	±2.5	PASS
EGPRS850	128	VN	TN	0.87	0.001058	±2.5	PASS
EGPRS850	128	VH	TN	-6.10	-0.007404	±2.5	PASS
EGPRS850	190	VL	TN	0.71	0.000849	±2.5	PASS
EGPRS850	190	VN	TN	-4.91	-0.005866	±2.5	PASS
EGPRS850	190	VH	TN	-0.16	-0.000193	±2.5	PASS
GSM1900	512	VL	TN	11.27	0.006090	±2.5	PASS
GSM1900	512	VN	TN	7.62	0.004118	±2.5	PASS
GSM1900	512	VH	TN	16.30	0.008812	±2.5	PASS
GSM1900	661	VL	TN	10.56	0.005616	±2.5	PASS
GSM1900	661	VN	TN	6.46	0.003435	±2.5	PASS
GSM1900	661	VH	TN	6.78	0.003606	±2.5	PASS
GSM1900	810	VL	TN	1.78	0.000930	±2.5	PASS
GSM1900	810	VN	TN	10.46	0.005477	±2.5	PASS
GSM1900	810	VH	TN	8.72	0.004564	±2.5	PASS
EGPRS1900	512	VL	TN	3.23	0.001745	±2.5	PASS
EGPRS1900	512	VN	TN	-5.59	-0.003019	±2.5	PASS
EGPRS1900	512	VH	TN	1.58	0.000855	±2.5	PASS
EGPRS1900	661	VL	TN	-0.90	-0.000481	±2.5	PASS
EGPRS1900	661	VN	TN	1.78	0.000945	±2.5	PASS
EGPRS1900	661	VH	TN	0.77	0.000412	±2.5	PASS
EGPRS1900	810	VL	TN	-7.10	-0.003719	±2.5	PASS
EGPRS1900	810	VN	TN	-4.94	-0.002587	±2.5	PASS
EGPRS1900	810	VH	TN	-0.84	-0.000440	±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	0.97	0.001175	±2.5	PASS
GSM850	128	VN	-20	4.07	0.004936	±2.5	PASS
GSM850	128	VN	-10	3.39	0.004113	±2.5	PASS
GSM850	128	VN	0	8.59	0.010420	±2.5	PASS
GSM850	128	VN	10	11.66	0.014141	±2.5	PASS
GSM850	128	VN	20	10.78	0.013084	±2.5	PASS
GSM850	128	VN	30	9.14	0.011086	±2.5	PASS
GSM850	128	VN	40	9.69	0.011752	±2.5	PASS
GSM850	128	VN	50	7.10	0.008618	±2.5	PASS
GSM850	190	VN	-30	6.30	0.007525	±2.5	PASS
GSM850	190	VN	-20	2.26	0.002701	±2.5	PASS
GSM850	190	VN	-10	3.07	0.003666	±2.5	PASS
GSM850	190	VN	0	4.75	0.005673	±2.5	PASS
GSM850	190	VN	10	5.17	0.006175	±2.5	PASS
GSM850	190	VN	20	8.36	0.009995	±2.5	PASS
GSM850	190	VN	30	3.87	0.004631	±2.5	PASS
GSM850	190	VN	40	-2.07	-0.002470	±2.5	PASS
GSM850	190	VN	50	-2.62	-0.003126	±2.5	PASS
GSM850	251	VN	-30	-0.19	-0.000228	±2.5	PASS
GSM850	251	VN	-20	2.36	0.002777	±2.5	PASS
GSM850	251	VN	-10	5.36	0.006314	±2.5	PASS
GSM850	251	VN	0	5.78	0.006809	±2.5	PASS
GSM850	251	VN	10	1.39	0.001636	±2.5	PASS
GSM850	251	VN	20	-0.16	-0.000190	±2.5	PASS
GSM850	251	VN	30	2.97	0.003499	±2.5	PASS
GSM850	251	VN	40	4.52	0.005325	±2.5	PASS
GSM850	251	VN	50	6.59	0.007760	±2.5	PASS
EGPRS850	128	VN	-30	-3.42	-0.004152	±2.5	PASS
EGPRS850	128	VN	-20	-0.13	-0.000157	±2.5	PASS
EGPRS850	128	VN	-10	1.07	0.001293	±2.5	PASS
EGPRS850	128	VN	0	-1.45	-0.001763	±2.5	PASS
EGPRS850	128	VN	10	2.58	0.003134	±2.5	PASS
EGPRS850	128	VN	20	13.33	0.016178	±2.5	PASS
EGPRS850	128	VN	30	9.65	0.011713	±2.5	PASS
EGPRS850	128	VN	40	4.29	0.005210	±2.5	PASS
EGPRS850	128	VN	50	8.49	0.010302	±2.5	PASS
EGPRS850	190	VN	-30	-0.16	-0.000193	±2.5	PASS
EGPRS850	190	VN	-20	-3.84	-0.004592	±2.5	PASS
EGPRS850	190	VN	-10	-1.55	-0.001852	±2.5	PASS
EGPRS850	190	VN	0	-1.68	-0.002007	±2.5	PASS
EGPRS850	190	VN	10	-0.90	-0.001081	±2.5	PASS
EGPRS850	190	VN	20	5.46	0.006522	±2.5	PASS
EGPRS850	190	VN	30	1.58	0.001891	±2.5	PASS
EGPRS850	190	VN	40	1.49	0.001775	±2.5	PASS
EGPRS850	190	VN	50	4.36	0.005210	±2.5	PASS
GSM1900	512	VN	-30	8.27	0.004467	±2.5	PASS
GSM1900	512	VN	-20	9.52	0.005148	±2.5	PASS

GSM1900	512	VN	-10	8.43	0.004554	±2.5	PASS
GSM1900	512	VN	0	20.60	0.011133	±2.5	PASS
GSM1900	512	VN	10	25.44	0.013751	±2.5	PASS
GSM1900	512	VN	20	28.35	0.015321	±2.5	PASS
GSM1900	512	VN	30	25.47	0.013768	±2.5	PASS
GSM1900	512	VN	40	16.95	0.009161	±2.5	PASS
GSM1900	512	VN	50	18.73	0.010121	±2.5	PASS
GSM1900	661	VN	-30	11.33	0.006028	±2.5	PASS
GSM1900	661	VN	-20	8.91	0.004740	±2.5	PASS
GSM1900	661	VN	-10	9.30	0.004946	±2.5	PASS
GSM1900	661	VN	0	16.47	0.008758	±2.5	PASS
GSM1900	661	VN	10	18.02	0.009583	±2.5	PASS
GSM1900	661	VN	20	15.59	0.008295	±2.5	PASS
GSM1900	661	VN	30	13.30	0.007075	±2.5	PASS
GSM1900	661	VN	40	5.81	0.003091	±2.5	PASS
GSM1900	661	VN	50	12.46	0.006629	±2.5	PASS
GSM1900	810	VN	-30	9.52	0.004987	±2.5	PASS
GSM1900	810	VN	-20	5.23	0.002739	±2.5	PASS
GSM1900	810	VN	-10	5.84	0.003060	±2.5	PASS
GSM1900	810	VN	0	7.94	0.004159	±2.5	PASS
GSM1900	810	VN	10	8.23	0.004311	±2.5	PASS
GSM1900	810	VN	20	-13.46	-0.007050	±2.5	PASS
GSM1900	810	VN	30	3.58	0.001876	±2.5	PASS
GSM1900	810	VN	40	15.21	0.007962	±2.5	PASS
GSM1900	810	VN	50	5.36	0.002806	±2.5	PASS
EGPRS1900	512	VN	-30	5.78	0.003124	±2.5	PASS
EGPRS1900	512	VN	-20	6.59	0.003560	±2.5	PASS
EGPRS1900	512	VN	-10	8.65	0.004677	±2.5	PASS
EGPRS1900	512	VN	0	8.23	0.004450	±2.5	PASS
EGPRS1900	512	VN	10	20.70	0.011185	±2.5	PASS
EGPRS1900	512	VN	20	24.67	0.013332	±2.5	PASS
EGPRS1900	512	VN	30	21.28	0.011499	±2.5	PASS
EGPRS1900	512	VN	40	28.12	0.015199	±2.5	PASS
EGPRS1900	512	VN	50	19.82	0.010714	±2.5	PASS
EGPRS1900	661	VN	-30	0.32	0.000172	±2.5	PASS
EGPRS1900	661	VN	-20	2.42	0.001288	±2.5	PASS
EGPRS1900	661	VN	-10	2.26	0.001202	±2.5	PASS
EGPRS1900	661	VN	0	1.29	0.000687	±2.5	PASS
EGPRS1900	661	VN	10	10.69	0.005684	±2.5	PASS
EGPRS1900	661	VN	20	10.27	0.005461	±2.5	PASS
EGPRS1900	661	VN	30	9.23	0.004912	±2.5	PASS
EGPRS1900	661	VN	40	12.14	0.006457	±2.5	PASS
EGPRS1900	661	VN	50	11.27	0.005993	±2.5	PASS
EGPRS1900	810	VN	-30	2.62	0.001369	±2.5	PASS
EGPRS1900	810	VN	-20	-2.16	-0.001133	±2.5	PASS
EGPRS1900	810	VN	-10	6.10	0.003195	±2.5	PASS
EGPRS1900	810	VN	0	-1.10	-0.000575	±2.5	PASS
EGPRS1900	810	VN	10	7.65	0.004007	±2.5	PASS
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EGPRS1900	810	VN	30	8.88	0.004649	±2.5	PASS
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EGPRS1900	810	VN	50	6.75	0.003533	±2.5	PASS

The End