

5.5. Peak-to-Average Power Ratio (PAPR)

Ambient condition

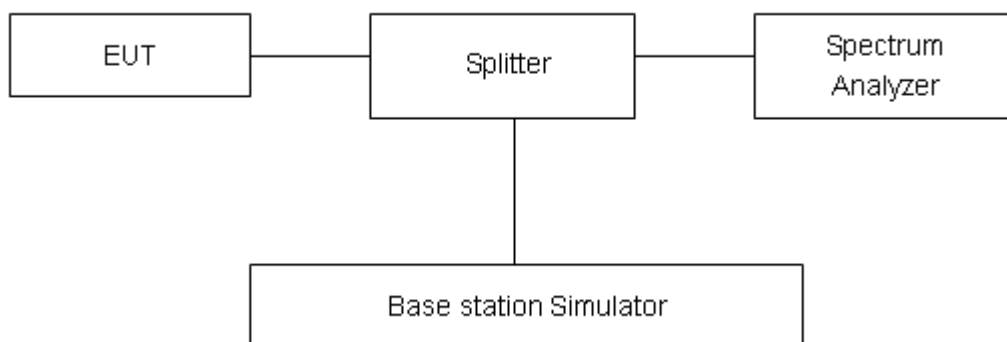
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as P_{Pk} . And measure the total average power and record as P_{Avg} . Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).$$

Test Setup



Limits

According to the Sec. 22.913(d), The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.4$ dB.



Test Results

Mode	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
GSM 850 (GSM)	128	824.2	33.50	32.29	1.21	≤13	PASS
	190	836.6	33.66	32.32	1.34	≤13	PASS
	251	848.8	33.59	32.34	1.25	≤13	PASS
GPRS 850 (GMSK)	128	824.2	33.76	32.5	1.26	≤13	PASS
	190	836.6	33.74	32.37	1.37	≤13	PASS
	251	848.8	33.53	32.31	1.22	≤13	PASS
EGPRS 850 (8-PSK)	128	824.2	29.54	27.03	2.51	≤13	PASS
	190	836.6	29.39	27.05	2.34	≤13	PASS
	251	848.8	29.13	26.67	2.46	≤13	PASS
WCDMA Band V (RMC)	4132	826.4	26.11	23.15	2.96	≤13	PASS
	4183	836.6	26.06	23.25	2.81	≤13	PASS
	4233	846.6	26.15	23.22	2.93	≤13	PASS
CDMA BC0	1013	824.7	27.72	24.10	3.62	≤13	PASS
	836.52	384	27.03	24.12	2.91	≤13	PASS
	848.31	777	27.26	23.99	3.27	≤13	PASS

LTE Band 5								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	1.4	20407	824.7	27.77	23.28	4.49	≤13	PASS
		20525	836.5	26.89	23.15	3.74	≤13	PASS
		20643	848.3	27.08	23.22	3.86	≤13	PASS
	3	20415	825.5	27.73	23.19	4.54	≤13	PASS
		20525	836.5	26.87	23.21	3.66	≤13	PASS
		20635	847.5	26.94	22.97	3.97	≤13	PASS
	5	20425	826.5	27.43	22.93	4.50	≤13	PASS
		20525	836.5	26.63	22.92	3.71	≤13	PASS
		20625	846.5	27.00	22.75	4.25	≤13	PASS
	10	20450	829	27.93	23.36	4.57	≤13	PASS
		20525	836.5	26.78	22.97	3.81	≤13	PASS
		20600	844	27.24	23.05	4.19	≤13	PASS
16QAM	1.4	20407	824.7	27.94	22.59	5.35	≤13	PASS



		20525	836.5	26.73	22.01	4.72	≤13	PASS
		20643	848.3	27.03	22.36	4.67	≤13	PASS
	3	20415	825.5	27.52	22.11	5.41	≤13	PASS
		20525	836.5	27.01	22.58	4.43	≤13	PASS
		20635	847.5	26.87	21.97	4.90	≤13	PASS
	5	20425	826.5	27.25	21.76	5.49	≤13	PASS
		20525	836.5	26.62	22.14	4.48	≤13	PASS
		20625	846.5	26.90	21.72	5.18	≤13	PASS
	10	20450	829	27.49	22.14	5.35	≤13	PASS
		20525	836.5	26.90	22.54	4.36	≤13	PASS
		20600	844	27.27	22.33	4.94	≤13	PASS



LTE Band 26								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	1.4	26797	824.7	27.49	22.90	4.59	≤13	PASS
		26915	836.5	26.79	22.99	3.80	≤13	PASS
		27033	848.3	26.84	22.77	4.07	≤13	PASS
	3	26805	825.5	27.52	22.92	4.60	≤13	PASS
		26915	836.5	26.58	22.66	3.92	≤13	PASS
		27025	847.5	26.75	22.64	4.11	≤13	PASS
	5	26815	826.5	27.44	22.88	4.56	≤13	PASS
		26915	836.5	26.59	22.83	3.76	≤13	PASS
		27015	846.5	26.88	22.64	4.24	≤13	PASS
	10	26840	829	27.14	22.74	4.40	≤13	PASS
		26915	836.5	26.58	22.77	3.81	≤13	PASS
		26990	844	27.21	22.87	4.34	≤13	PASS
	15	26865	831.5	27.38	22.90	4.48	≤13	PASS
		26915	836.5	26.69	22.72	3.97	≤13	PASS
		26965	841.5	26.52	22.69	3.83	≤13	PASS
16QAM	1.4	26797	824.7	27.65	22.17	5.48	≤13	PASS
		26915	836.5	26.70	21.81	4.89	≤13	PASS
		27033	848.3	26.76	21.76	5.00	≤13	PASS
	3	26805	825.5	27.22	21.72	5.50	≤13	PASS
		26915	836.5	26.72	22.02	4.70	≤13	PASS
		27025	847.5	26.54	21.45	5.09	≤13	PASS
	5	26815	826.5	27.39	22.07	5.32	≤13	PASS
		26915	836.5	26.59	22.05	4.54	≤13	PASS
		27015	846.5	26.78	21.76	5.02	≤13	PASS
	10	26840	829	27.35	22.28	5.07	≤13	PASS
		26915	836.5	26.39	21.69	4.70	≤13	PASS
		26990	844	26.94	21.56	5.38	≤13	PASS
	15	26865	831.5	27.13	21.64	5.49	≤13	PASS
		26915	836.5	26.91	22.17	4.74	≤13	PASS
		26965	841.5	26.21	21.34	4.87	≤13	PASS

5.6. Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -40°C to +85°C in 10°C step size,

(1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -40°C to +85°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements. Frequency Stability (Voltage Variation)

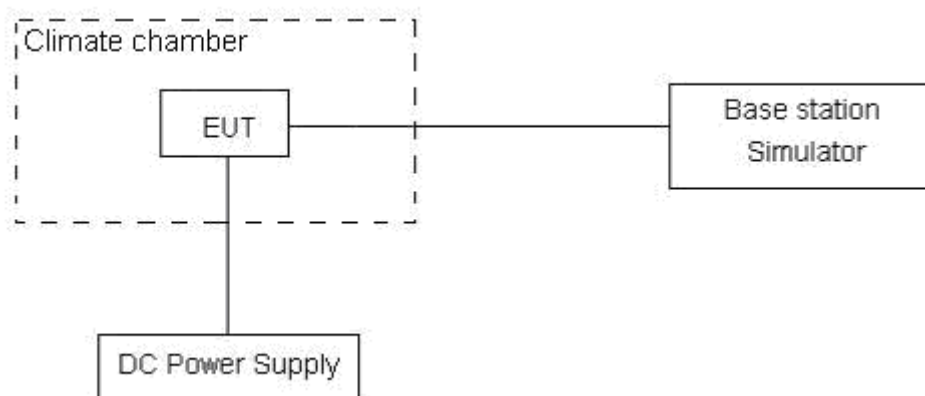
The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 3.3 V and 4.2 V, with a nominal voltage of 3.8V.

Test setup



**Limits**

According to the Sec. 22.355, the frequency stability of the carrier shall be accurate to within 2.5 ppm of the received frequency for mobile stations.

Limits	≤ 2.5 ppm
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 3$, $U = 0.01$ ppm.

Test Result

GSM 850						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
Temperature	Voltage	GMSK	8PSK	GMSK	8PSK	
Normal (25℃)	Normal	13.63	3.69	0.00725	0.00197	PASS
Extreme (90℃)		11.29	16.37	0.00601	0.00871	PASS
Extreme (80℃)		4.20	4.87	0.00224	0.00259	PASS
Extreme (70℃)		14.13	12.46	0.00752	0.00663	PASS
Extreme (60℃)		6.13	11.70	0.00326	0.00622	PASS
Extreme (50℃)		15.87	16.25	0.00844	0.00864	PASS
Extreme (40℃)		6.13	6.09	0.00326	0.00324	PASS
Extreme (30℃)		11.96	10.57	0.00636	0.00562	PASS
Extreme (20℃)		4.01	8.65	0.00213	0.00460	PASS
Extreme (10℃)		4.31	7.09	0.00229	0.00377	PASS
Extreme (0℃)		10.50	14.56	0.00558	0.00774	PASS
Extreme (-10℃)		10.47	11.23	0.00557	0.00598	PASS
Extreme (-20℃)		7.55	11.67	0.00402	0.00621	PASS
Extreme (-30℃)		9.23	11.12	0.00491	0.00591	PASS
Extreme (-40℃)		14.52	10.13	0.00772	0.00539	PASS
25℃	LV	10.74	9.70	0.00571	0.00516	PASS
	HV	16.93	16.84	0.00900	0.00896	PASS

WCDMA Band 5						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal (25℃)	Normal	9.95	9.30	0.00529	0.00495	PASS
Extreme (90℃)		13.53	10.00	0.00720	0.00532	PASS
Extreme (80℃)		16.30	9.78	0.00867	0.00520	PASS
Extreme (70℃)		2.67	8.67	0.00142	0.00461	PASS
Extreme (60℃)		12.29	9.27	0.00654	0.00493	PASS
Extreme (50℃)		11.52	16.55	0.00613	0.00880	PASS
Extreme (40℃)		3.13	10.30	0.00167	0.00548	PASS
Extreme (30℃)		8.41	11.75	0.00447	0.00625	PASS
Extreme (20℃)		16.19	9.40	0.00861	0.00500	PASS
Extreme (10℃)		17.28	1.85	0.00919	0.00098	PASS
Extreme (0℃)		3.63	5.34	0.00193	0.00284	PASS
Extreme (-10℃)		12.89	10.40	0.00686	0.00553	PASS
Extreme (-20℃)		2.66	6.02	0.00142	0.00320	PASS
Extreme (-30℃)		8.48	5.85	0.00451	0.00311	PASS
Extreme (-40℃)		14.86	2.07	0.00790	0.00110	PASS
25℃	LV	10.07	6.55	0.00536	0.00348	PASS
	HV	12.19	9.89	0.00648	0.00526	PASS

CDMA BC0						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal (25℃)	Normal	1.56	5.41	0.00083	0.00288	PASS
Extreme (90℃)		9.15	1.91	0.00487	0.00101	PASS
Extreme (80℃)		4.43	1.78	0.00236	0.00095	PASS
Extreme (70℃)		5.31	14.56	0.00282	0.00774	PASS
Extreme (60℃)		1.27	5.57	0.00068	0.00296	PASS
Extreme (50℃)		2.77	12.76	0.00147	0.00679	PASS
Extreme (40℃)		7.09	9.02	0.00377	0.00480	PASS
Extreme (30℃)		3.92	1.22	0.00208	0.00065	PASS
Extreme (20℃)		16.07	16.85	0.00855	0.00896	PASS
Extreme (10℃)		7.06	16.08	0.00375	0.00855	PASS
Extreme (0℃)		13.64	7.55	0.00725	0.00402	PASS



Extreme (-10℃)		12.77	17.99	0.00679	0.00957	PASS
Extreme (-20℃)		16.72	8.44	0.00889	0.00449	PASS
Extreme (-30℃)		14.79	15.91	0.00787	0.00846	PASS
Extreme (-40℃)		1.54	9.45	0.00082	0.00502	PASS
25℃	LV	16.65	11.58	0.00886	0.00616	PASS
	HV	10.20	6.36	0.00543	0.00338	PASS

LTE Band 5						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	10MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	13.27	11.76	0.00706	0.00626	PASS
Extreme (90℃)		11.64	13.12	0.00619	0.00698	PASS
Extreme (80℃)		5.04	6.41	0.00268	0.00341	PASS
Extreme (70℃)		16.22	14.51	0.00863	0.00772	PASS
Extreme (60℃)		4.22	11.96	0.00225	0.00636	PASS
Extreme (50℃)		3.82	15.41	0.00203	0.00820	PASS
Extreme (40℃)		6.80	2.19	0.00362	0.00117	PASS
Extreme (30℃)		7.17	9.65	0.00382	0.00513	PASS
Extreme (20℃)		13.91	12.76	0.00740	0.00679	PASS
Extreme (10℃)		7.98	14.59	0.00424	0.00776	PASS
Extreme (0℃)		4.62	11.39	0.00246	0.00606	PASS
Extreme (-10℃)		4.91	17.28	0.00261	0.00919	PASS
Extreme (-20℃)		10.44	12.99	0.00555	0.00691	PASS
Extreme (-30℃)		15.36	8.57	0.00817	0.00456	PASS
Extreme (-40℃)		16.36	2.48	0.00870	0.00132	PASS
25℃	LV	16.50	16.96	0.00878	0.00902	PASS
	HV	5.83	13.55	0.00310	0.00721	PASS

LTE Band 26						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	10MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	1.74	6.76	0.00093	0.00360	PASS
Extreme (90℃)		16.00	5.71	0.00851	0.00304	PASS
Extreme (80℃)		12.95	13.87	0.00689	0.00738	PASS
Extreme (70℃)		3.93	6.39	0.00209	0.00340	PASS
Extreme (60℃)		11.54	14.44	0.00614	0.00768	PASS
Extreme (50℃)		17.97	9.75	0.00956	0.00518	PASS
Extreme (40℃)		2.90	3.83	0.00154	0.00204	PASS
Extreme (30℃)		15.04	13.56	0.00800	0.00721	PASS
Extreme (20℃)		1.65	12.79	0.00088	0.00680	PASS
Extreme (10℃)		14.02	7.44	0.00746	0.00395	PASS
Extreme (0℃)		2.61	15.90	0.00139	0.00846	PASS
Extreme (-10℃)		13.92	16.25	0.00740	0.00865	PASS
Extreme (-20℃)		12.52	15.13	0.00666	0.00805	PASS
Extreme (-30℃)		14.37	8.32	0.00765	0.00442	PASS
Extreme (-40℃)		11.43	2.41	0.00608	0.00128	PASS
25℃	LV	8.88	14.48	0.00473	0.00770	PASS
	HV	17.31	11.13	0.00921	0.00592	PASS

5.7. Spurious Emissions at Antenna Terminals

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

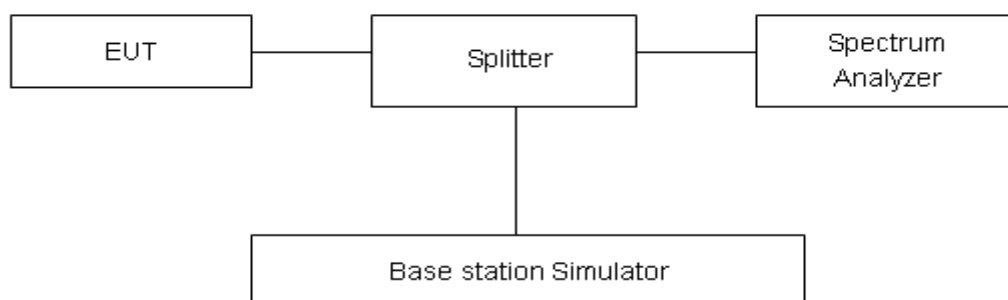
Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier.

The peak detector is used. RBW are set to 100 kHz and VBW are set to 300 kHz for below 1G, RBW are set to 1MHz and VBW are set to 3MHz for above 1G, Sweep is set to ATUO.

The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.”

Limit	-13 dBm
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-18GHz	1.407 dB

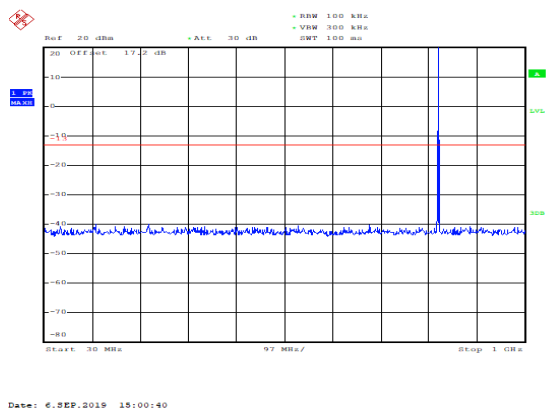


Test Result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

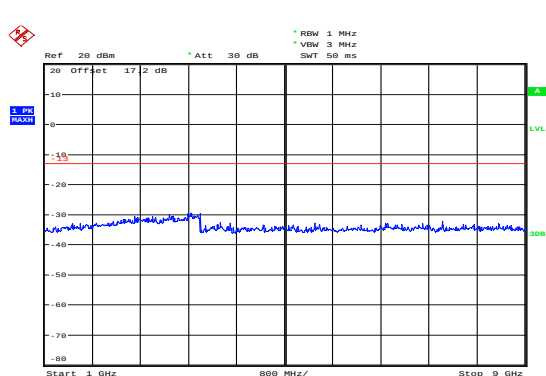
The signal beyond the limit is carrier.

GSM 850 CH-Low 30MHz ~ 1GHz



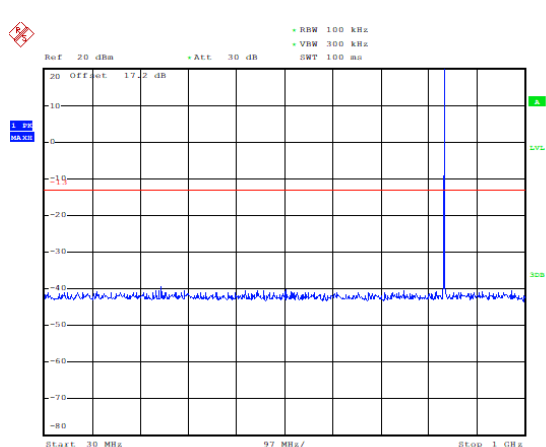
Date: 6.SEP.2019 15:00:40

GSM 850 CH-Low 1GHz ~ 9GHz



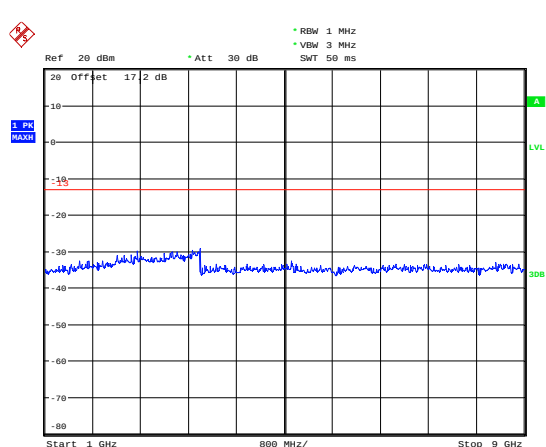
Date: 6.SEP.2019 15:09:18

GSM 850 CH-Middle 30MHz ~ 1GHz



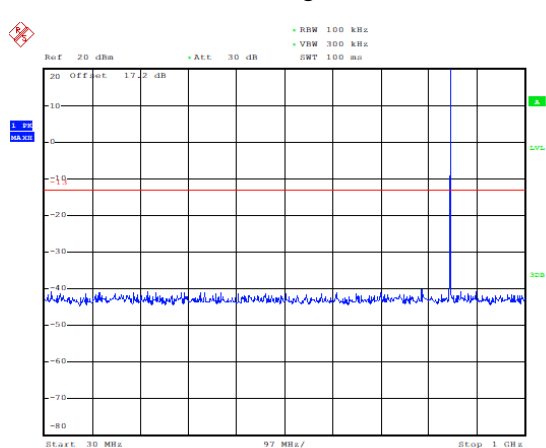
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GSM 850 CH-Middle 1GHz ~ 9GHz



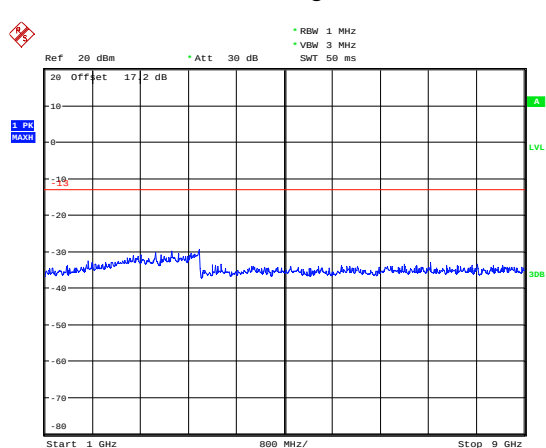
Date: 6.SEP.2019 15:09:39

GSM 850 CH-High 30MHz ~ 1GHz



Date: 6.SEP.2019 15:01:24

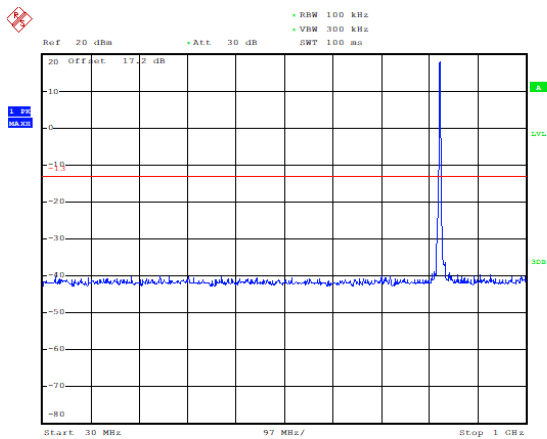
GSM 850 CH-High 1GHz ~ 9GHz



Date: 6.SEP.2019 15:09:50

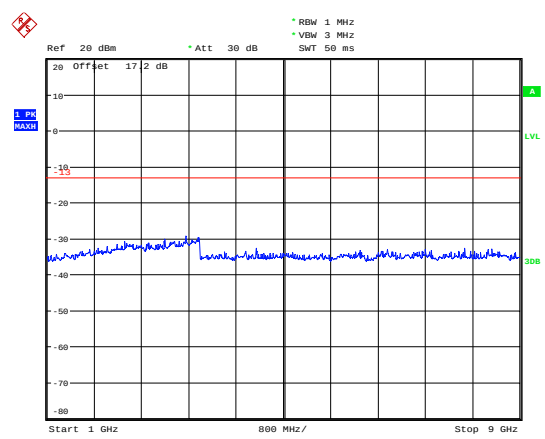


WCDMA Band V CH-Low 30MHz ~ 1GHz



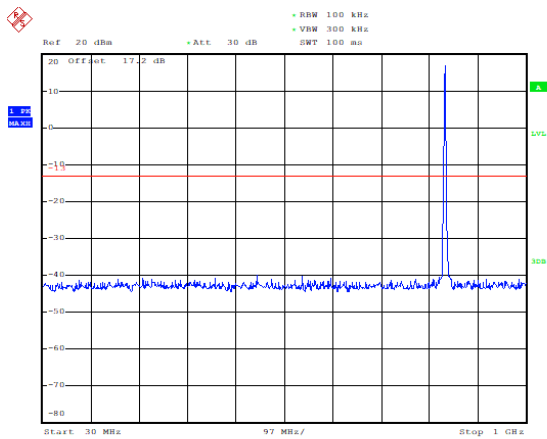
Date: 6.SEP.2019 13:26:49

WCDMA Band V CH-Low 1GHz ~ 9GHz



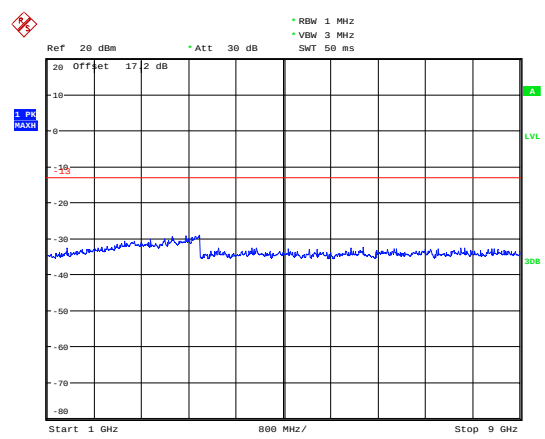
Date: 6.SEP.2019 16:22:19

WCDMA Band V CH-Middle 30MHz ~ 1GHz



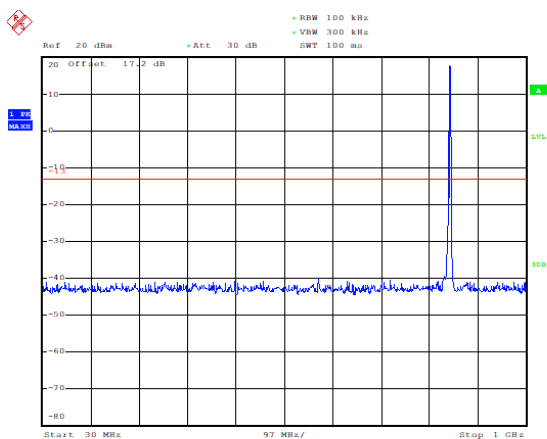
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WCDMA Band V CH-Middle 1GHz ~ 9GHz



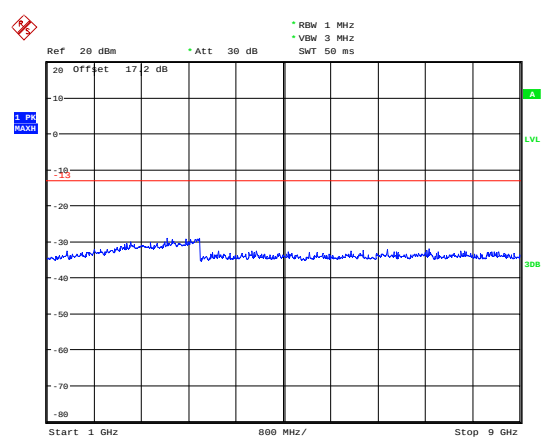
Date: 6.SEP.2019 16:22:40

WCDMA Band V CH-High 30MHz ~ 1GHz



Date: 6.SEP.2019 13:28:07

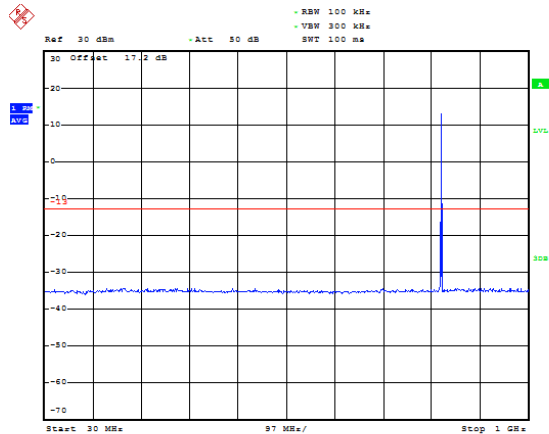
WCDMA Band V CH-High 1GHz ~ 9GHz



Date: 6.SEP.2019 16:22:58

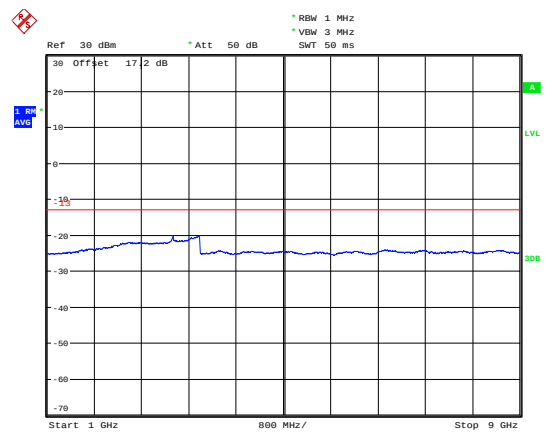


CDMA BC0 CH-Low 30MHz ~ 1GHz



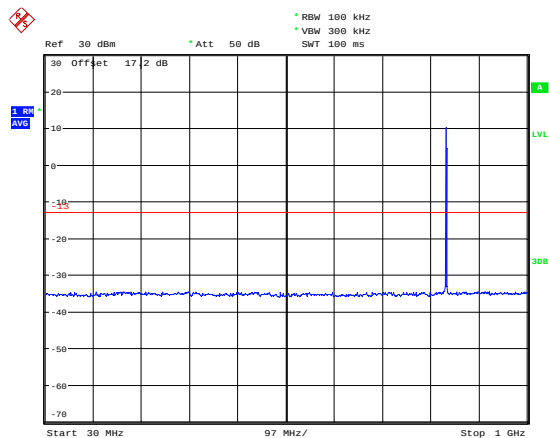
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CDMA BC0 CH-Low 1GHz ~ 9GHz



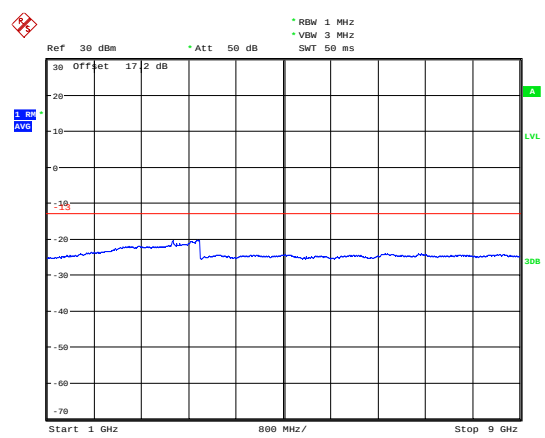
Date: 19_SEP.2019 12:08:50

CDMA BC0 CH-Middle 30MHz ~ 1GHz



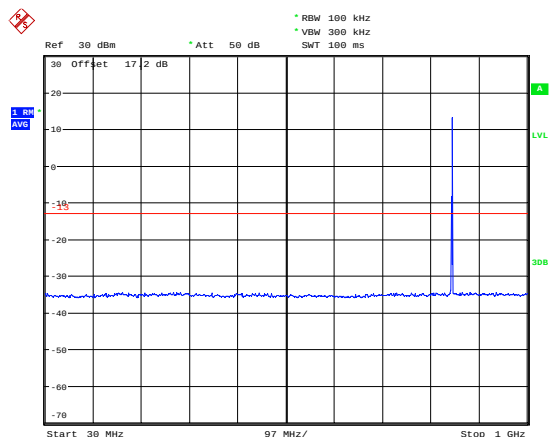
Date: 19_SEP.2019 12:07:58

CDMA BC0 CH-Middle 1GHz ~ 9GHz



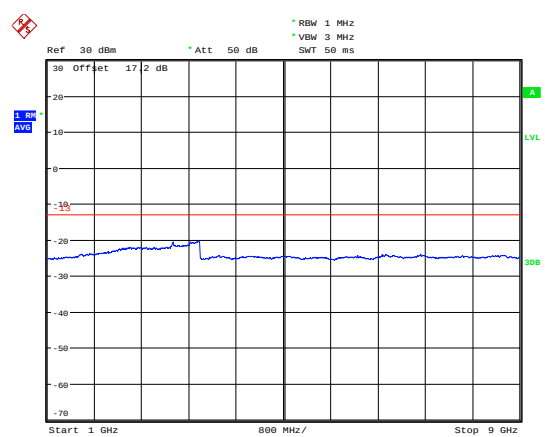
Date: 19_SEP.2019 12:09:04

CDMA BC0 CH-High 30MHz ~ 1GHz



Date: 19_SEP.2019 12:08:10

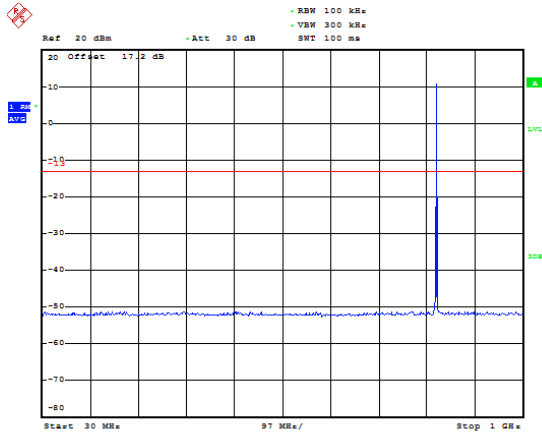
CDMA BC0 CH-High 1GHz ~ 9GHz



Date: 19_SEP.2019 12:09:25

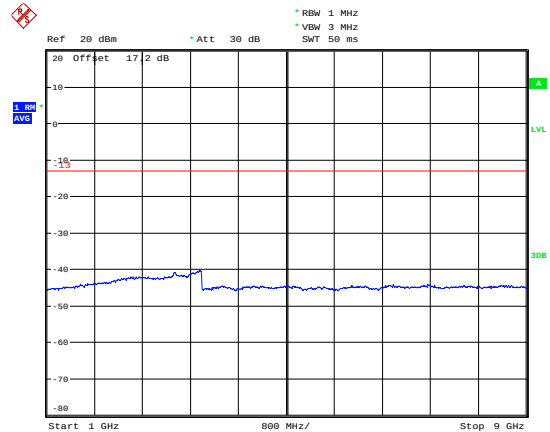


LTE Band 5 1.4MHz CH-Low 30MHz~1GHz



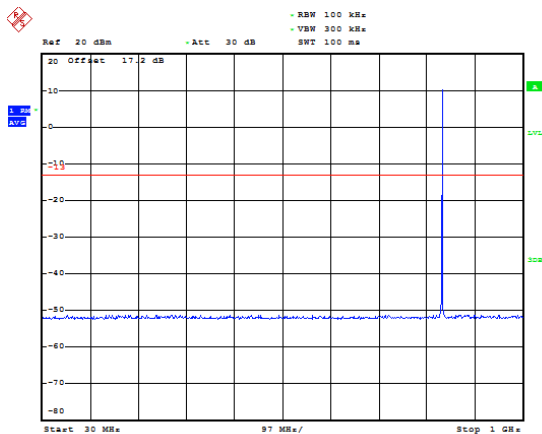
Date: 9.SEP.2019 20:06:11

LTE Band 5 1.4MHz CH-Low 1GHz~9GHz



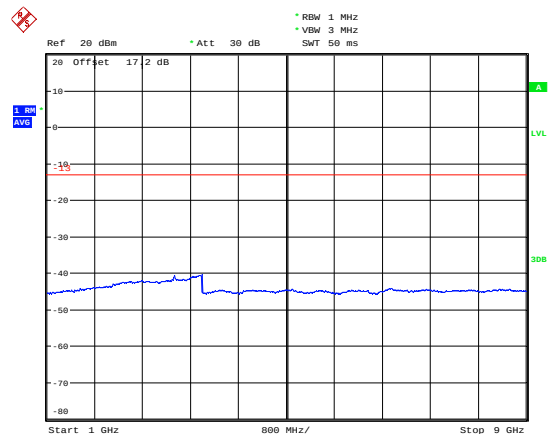
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LTE Band 5 1.4MHz CH-Middle 30MHz~1GHz



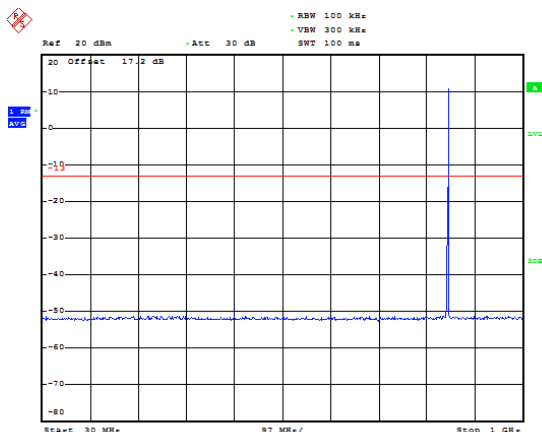
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LTE Band 5 1.4MHz CH-Middle 1GHz~9GHz



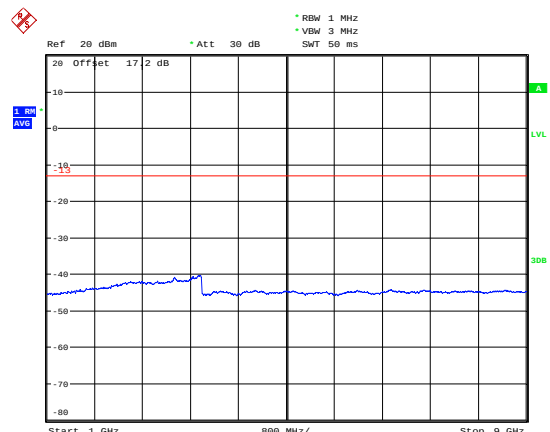
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LTE Band 5 1.4MHz CH-High 30MHz~1GHz



Date: 9.SEP.2019 20:07:11

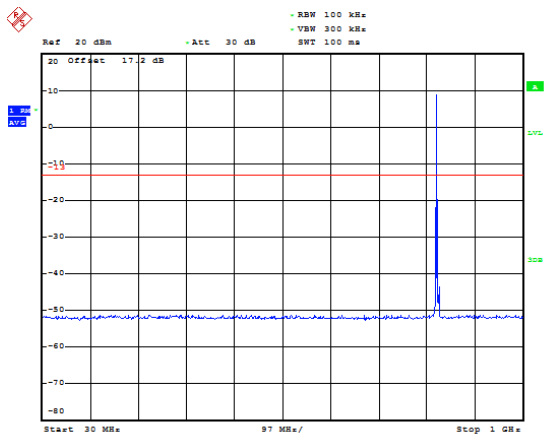
LTE Band 5 1.4MHz CH-High 1GHz~9GHz



Date: 9.SEP.2019 20:07:13

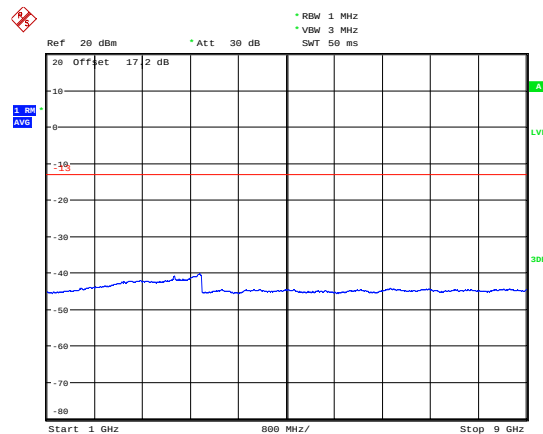


LTE Band 5 3MHz CH-Low 30MHz~1GHz



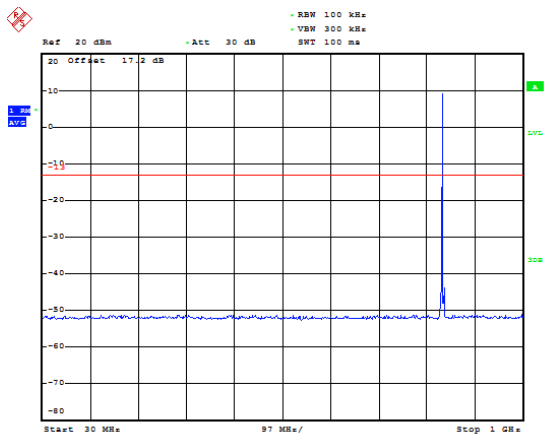
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LTE Band 5 3MHz CH-Low 1GHz~9GHz



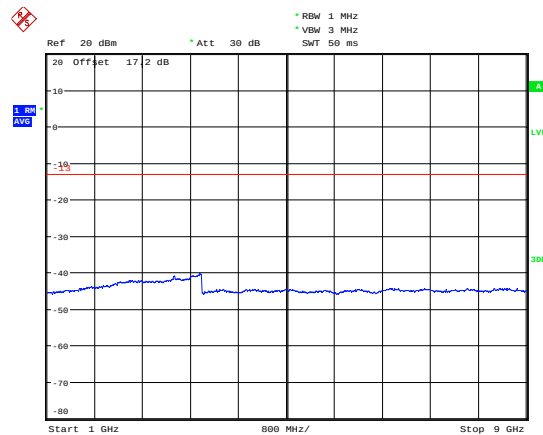
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LTE Band 5 3MHz CH-Middle 30MHz~1GHz



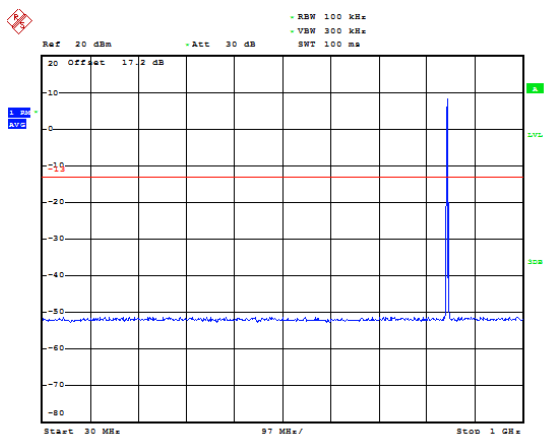
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LTE Band 5 3MHz CH-Middle 1GHz~9GHz



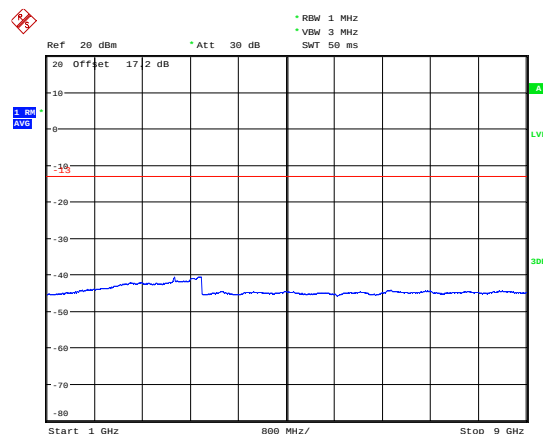
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LTE Band 5 3MHz CH-High 30MHz~1GHz



Date: 9.SEP.2019 20:08:02

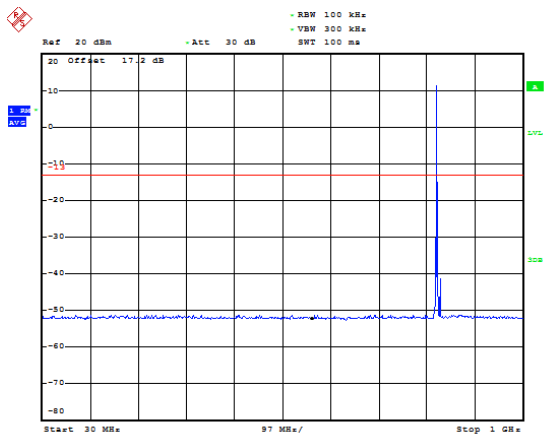
LTE Band 5 3MHz CH-High 1GHz~9GHz



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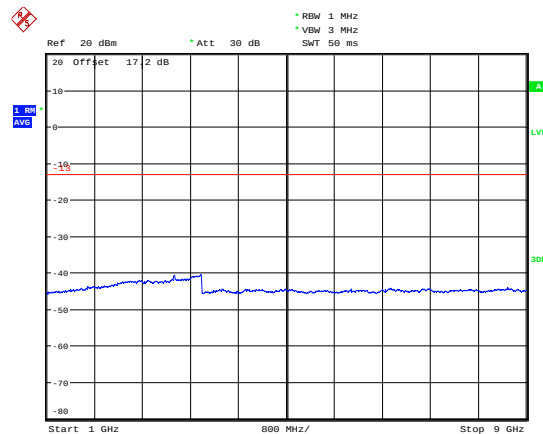


LTE Band 5 5MHz CH-Low 30MHz~1GHz



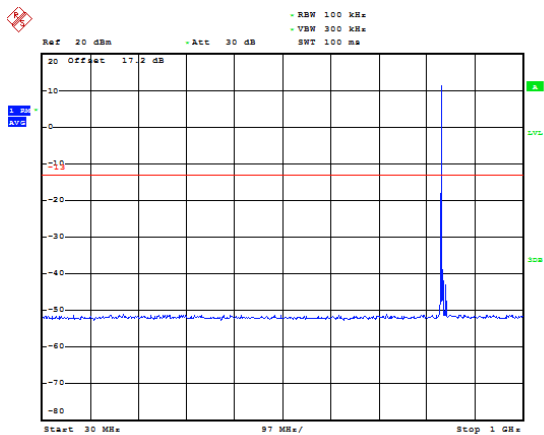
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LTE Band 5 5MHz CH-Low 1GHz~9GHz



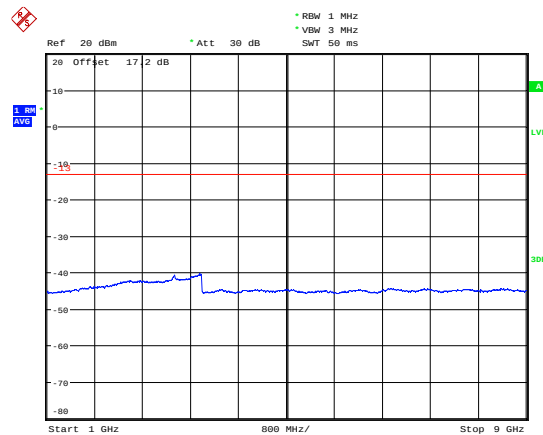
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LTE Band 5 5MHz CH-Middle 30MHz~1GHz



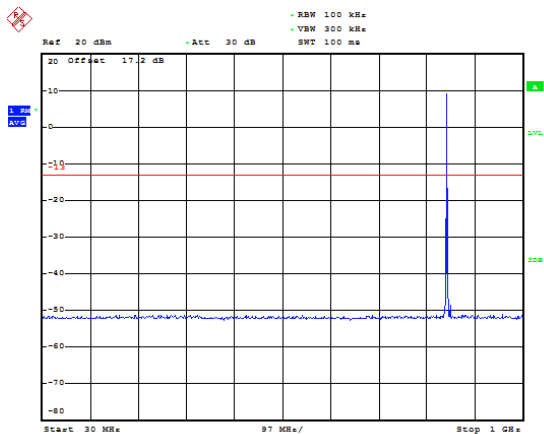
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LTE Band 5 5MHz CH-Middle 1GHz~9GHz



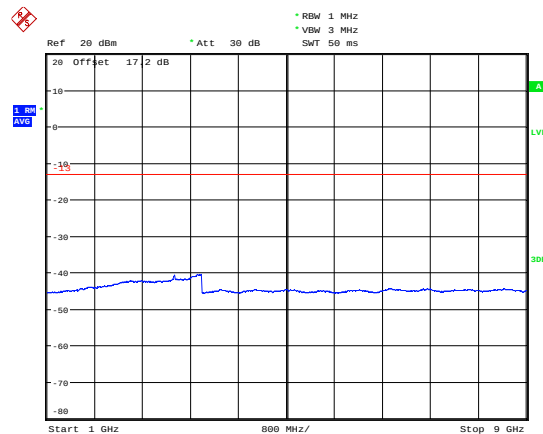
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LTE Band 5 5MHz CH-High 30MHz~1GHz



Date: 9.SEP.2019 20:09:24

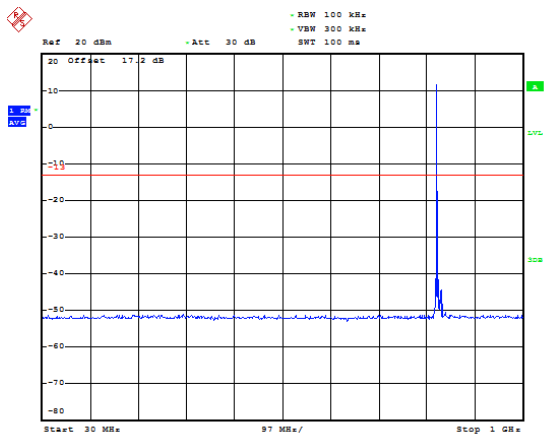
LTE Band 5 5MHz CH-High 1GHz~9GHz



Date: 9.SEP.2019 20:03:49

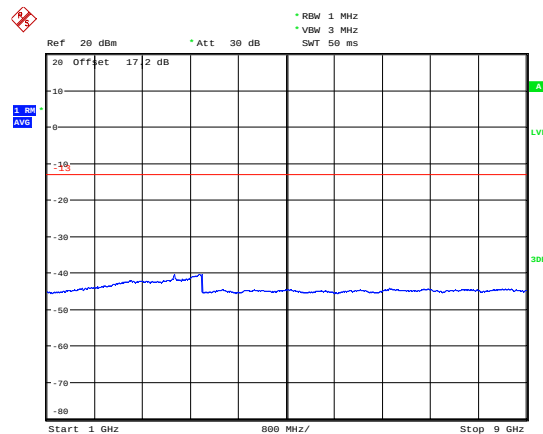


LTE Band 5 10MHz CH-Low 30MHz~1GHz



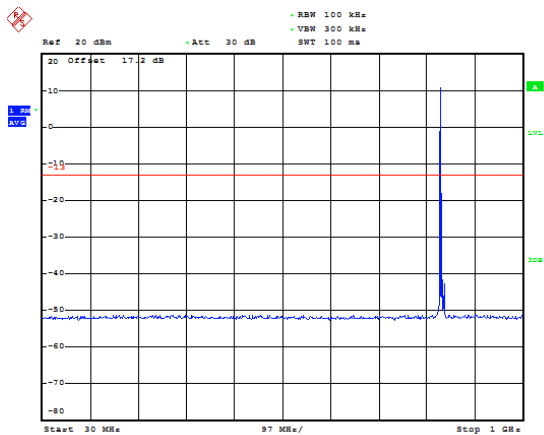
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LTE Band 5 10MHz CH-Low 1GHz~9GHz



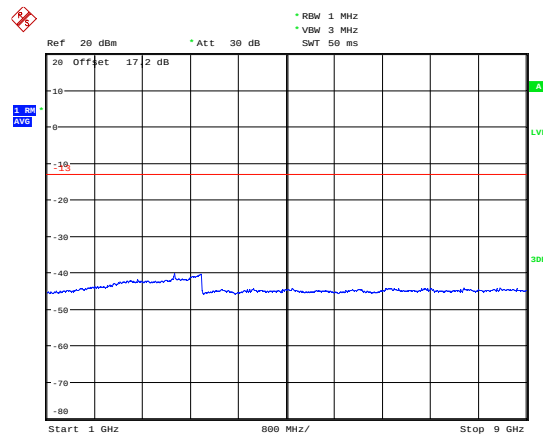
Date: 9.SEP.2019 20:04:14

LTE Band 5 10MHz CH-Middle 30MHz~1GHz



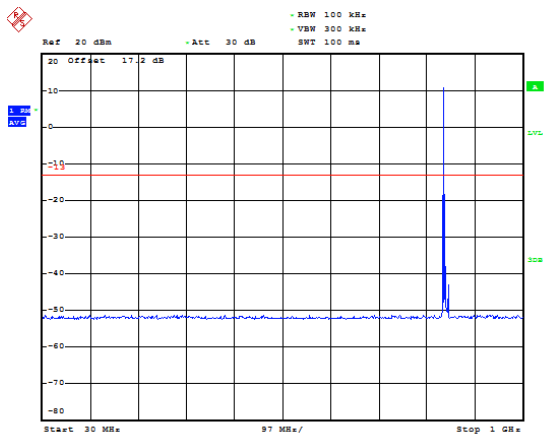
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LTE Band 5 10MHz CH-Middle 1GHz~9GHz



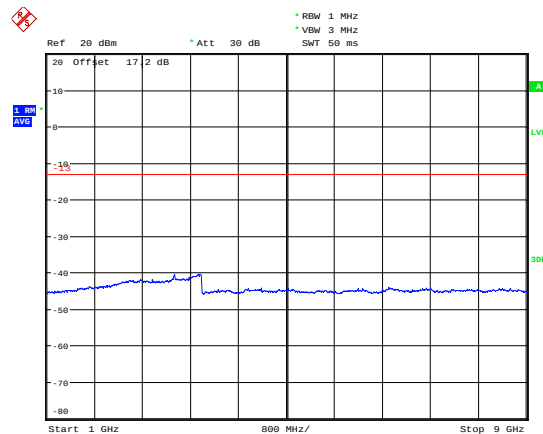
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LTE Band 5 10MHz CH-High 30MHz~1GHz



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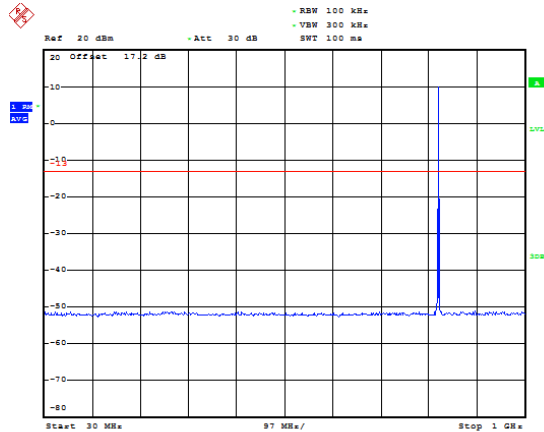
LTE Band 5 10MHz CH-High 1GHz~9GHz



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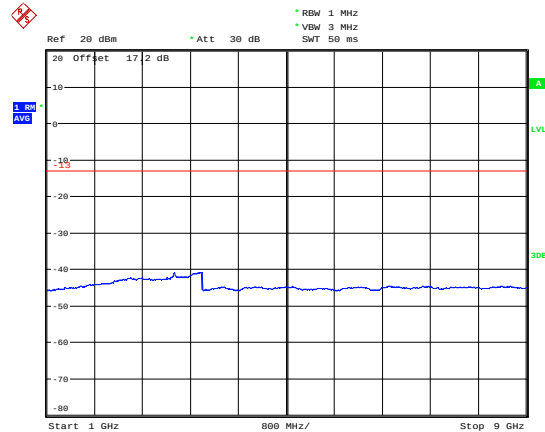


LTE Band 26 1.4MHz CH-Low 30MHz~1.5GHz



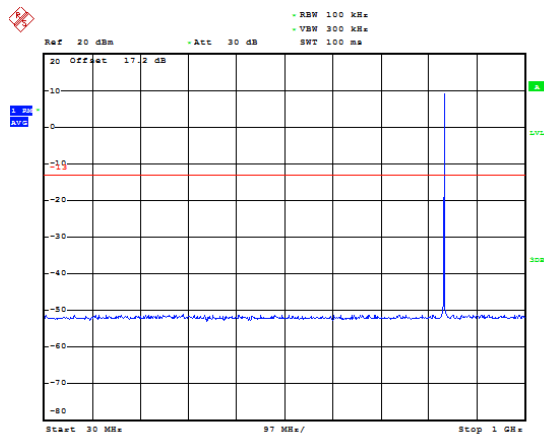
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LTE Band 26 1.4MHz CH-Low 1.5GHz~9GHz



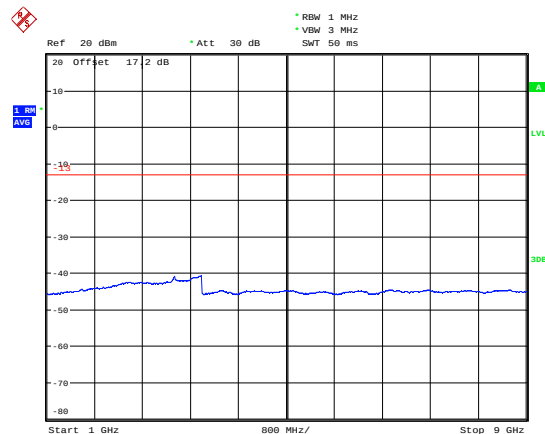
Date: 12.SEP.2019 11:23:18

LTE Band 26 1.4MHz CH-Middle 30MHz~1.5GHz



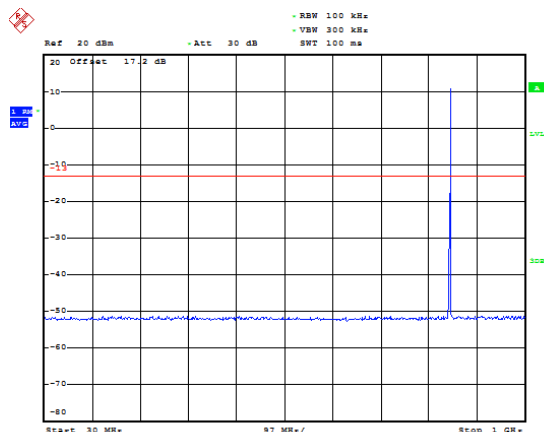
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LTE Band 26 1.4MHz CH-Middle 1.5GHz~9GHz



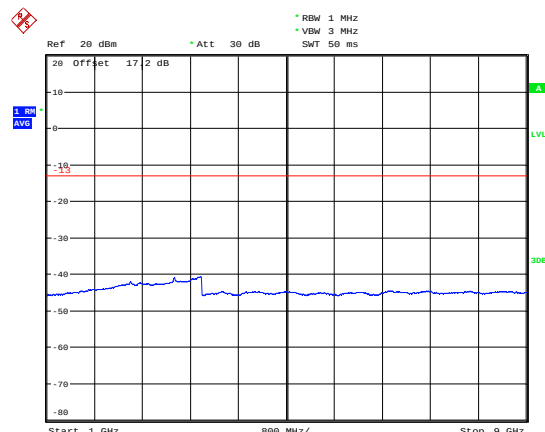
Date: 12.SEP.2019 11:23:45

LTE Band 26 1.4MHz CH-High 30MHz~1.5GHz



Date: 9.SEP.2019 20:49:07

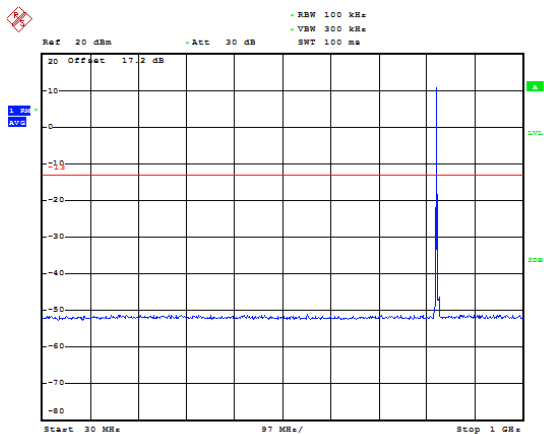
LTE Band 26 1.4MHz CH-High 1.5GHz~9GHz



Date: 12.SEP.2019 11:24:18

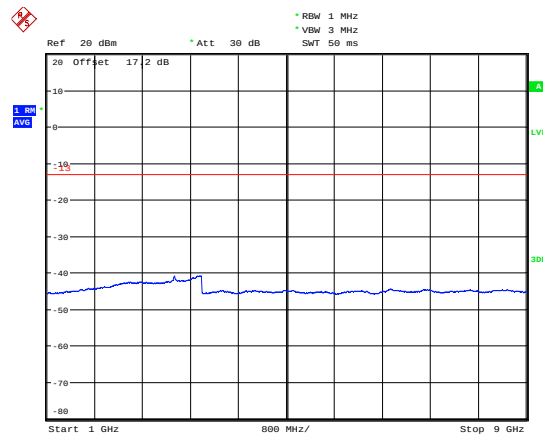


LTE Band 26 3MHz CH-Low 30MHz~1.5GHz



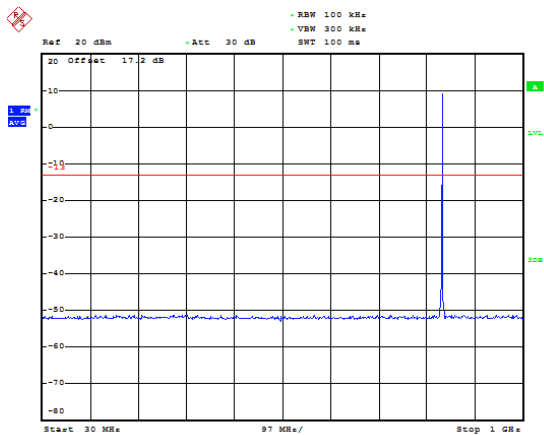
Date: 9.SEP.2019 20:49:26

LTE Band 26 3MHz CH-Low 1.5GHz~9GHz



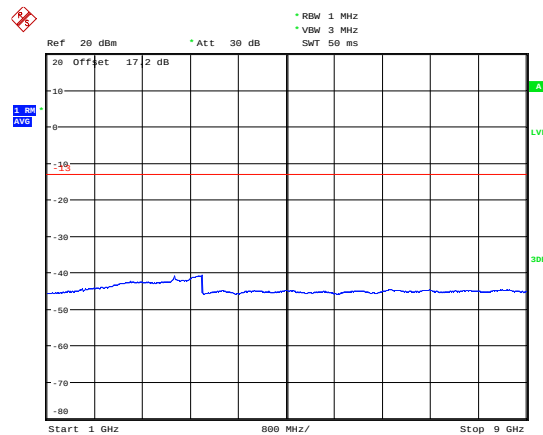
Date: 12.SEP.2019 11:29:37

LTE Band 26 3MHz CH-Middle 30MHz~1.5GHz



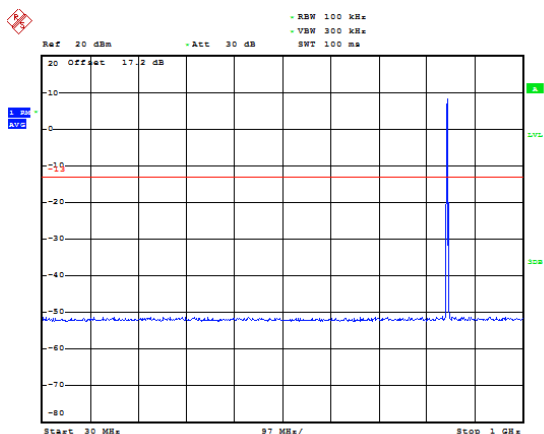
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LTE Band 26 3MHz CH-Middle 1.5GHz~9GHz



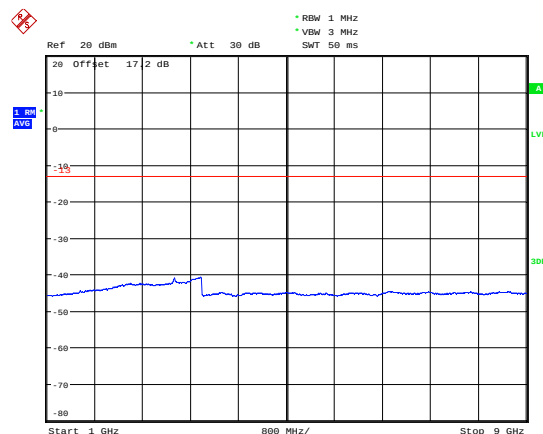
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LTE Band 26 3MHz CH-High 30MHz~1.5GHz



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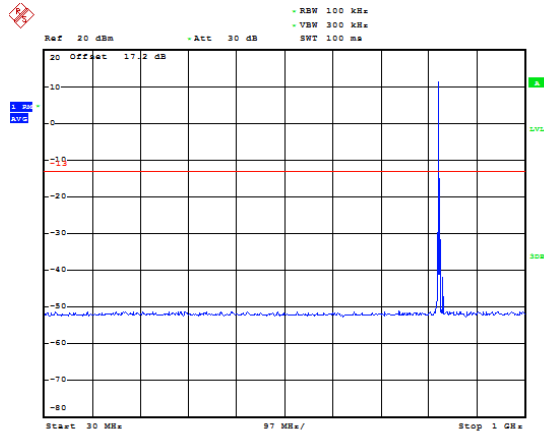
LTE Band 26 3MHz CH-High 1.5GHz~9GHz



Date: 12.SEP.2019 11:30:23

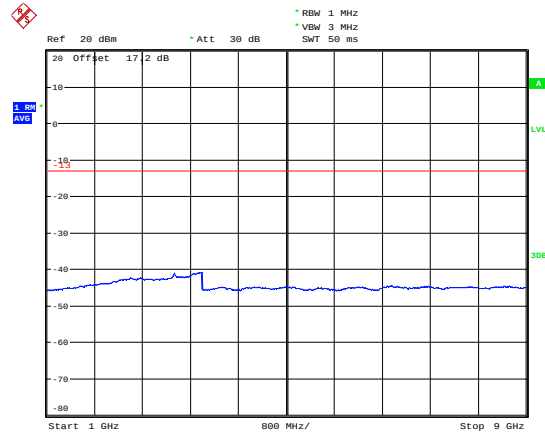


LTE Band 26 5MHz CH-Low 30MHz~1.5GHz



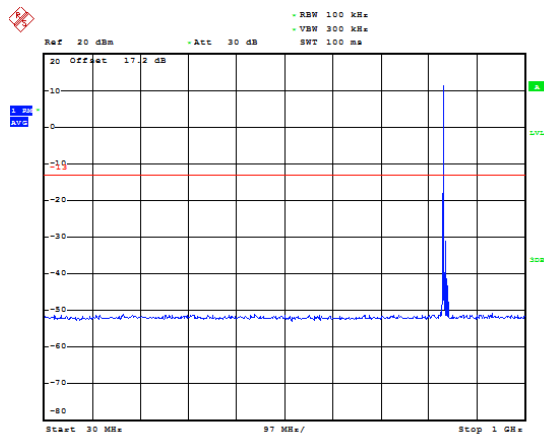
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LTE Band 26 5MHz CH-Low 1.5GHz~9GHz



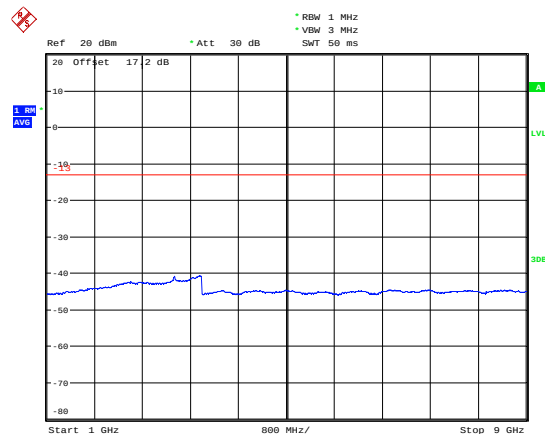
Date: 12.SEP.2019 11:30:41

LTE Band 26 5MHz CH-Middle 30MHz~1.5GHz



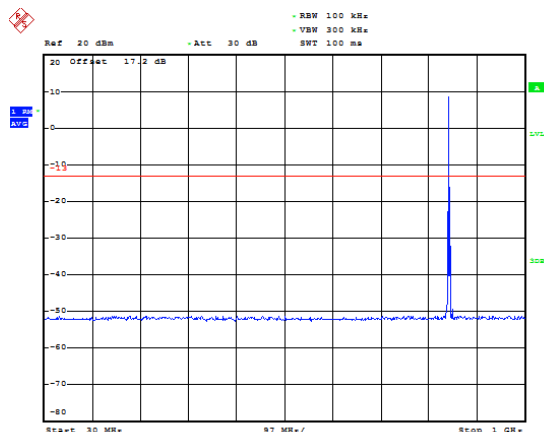
Date: 9.SEP.2019 20:51:01

LTE Band 26 5MHz CH-Middle 1.5GHz~9GHz



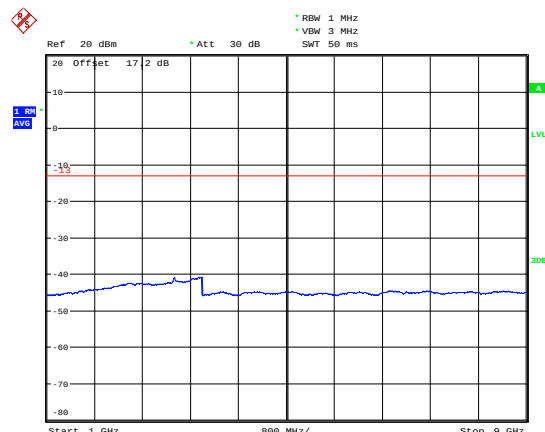
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LTE Band 26 5MHz CH-High 30MHz~1.5GHz



Date: 9.SEP.2019 20:51:16

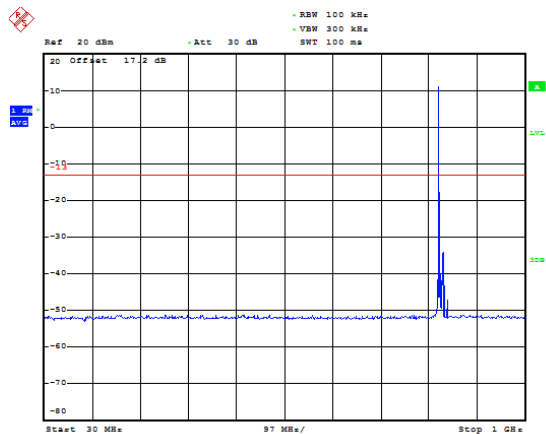
LTE Band 26 5MHz CH-High 1.5GHz~9GHz



Date: 12.SEP.2019 11:31:14

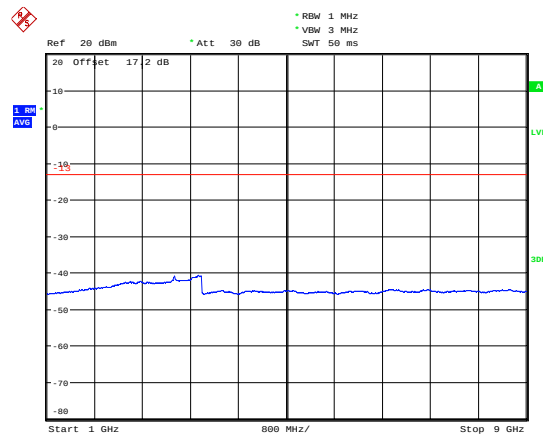


LTE Band 26 10MHz CH-Low 30MHz~1.5GHz



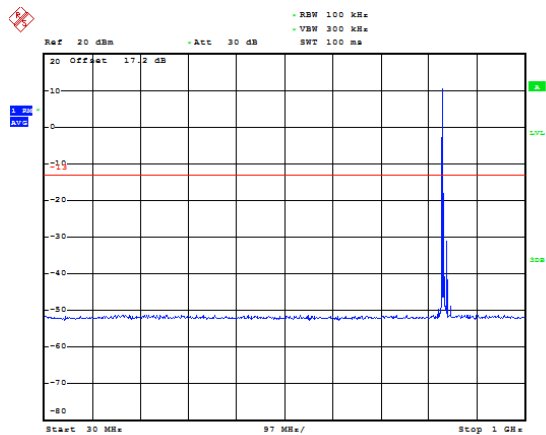
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LTE Band 26 10MHz CH-Low 1.5GHz~9GHz



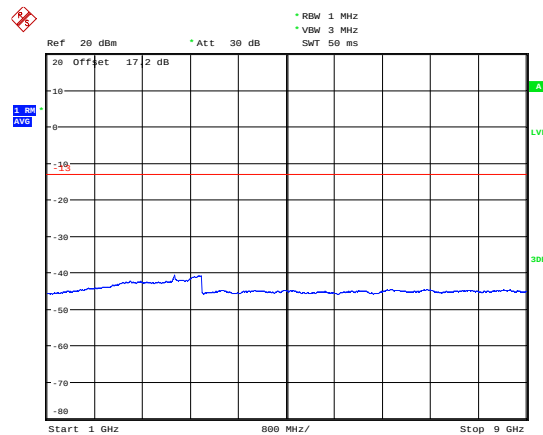
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LTE Band 26 10MHz CH-Middle 30MHz~1.5GHz



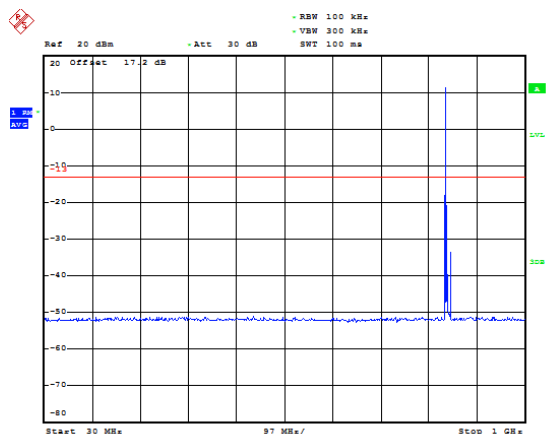
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LTE Band 26 10MHz CH-Middle 1.5GHz~9GHz



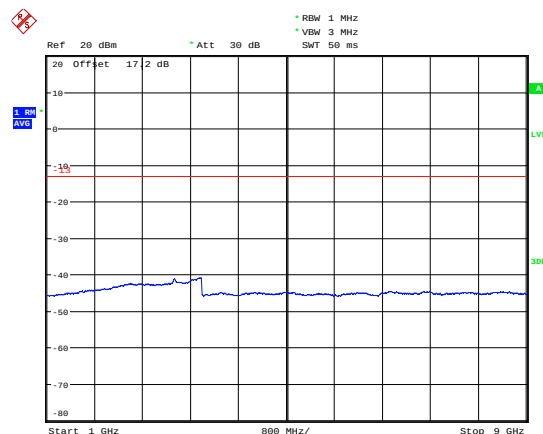
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LTE Band 26 10MHz CH-High 30MHz~1.5GHz



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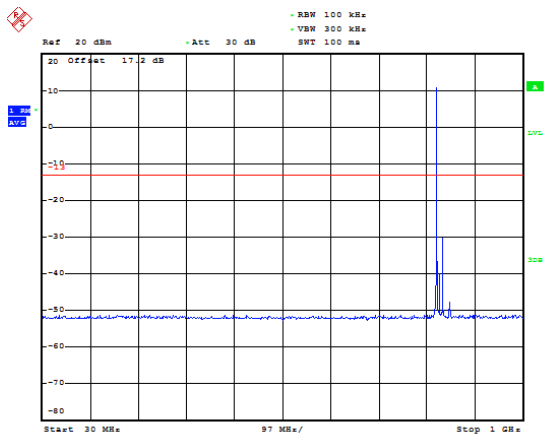
LTE Band 26 10MHz CH-High 1.5GHz~9GHz



Date: 12.SEP.2019 11:32:21

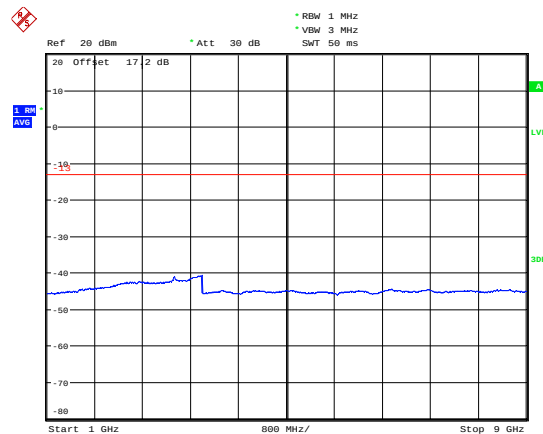


LTE Band 26 15MHz CH-Low 30MHz~1.5GHz



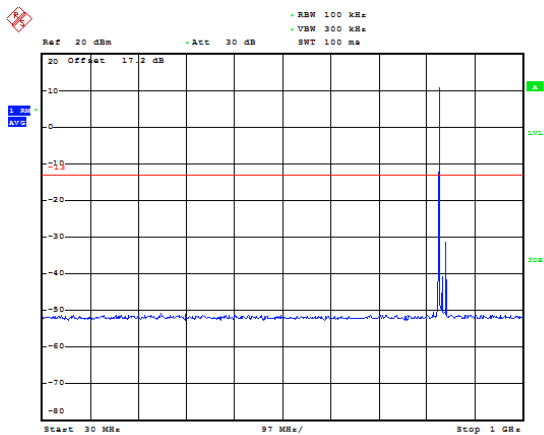
Date: 9.SEP.2019 20:52:49

LTE Band 26 15MHz CH-Low 1.5GHz~9GHz



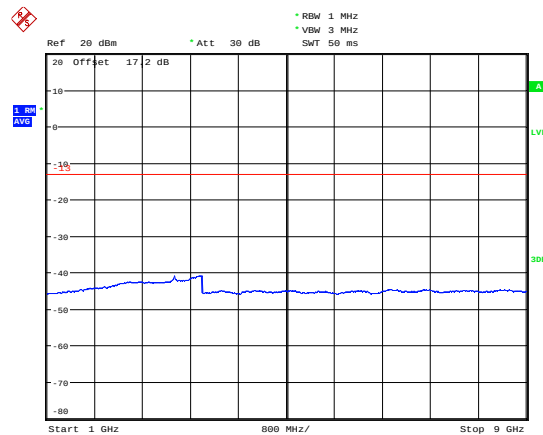
Date: 12.SEP.2019 11:32:43

LTE Band 26 15MHz CH-Middle 30MHz~1.5GHz



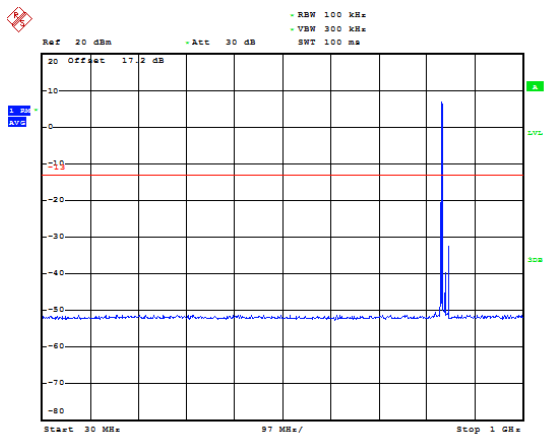
Date: 9.SEP.2019 20:56:18

LTE Band 26 15MHz CH-Middle 1.5GHz~9GHz



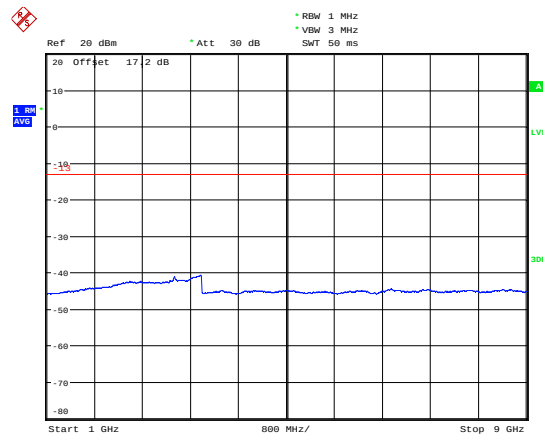
Date: 12.SEP.2019 11:33:06

LTE Band 26 15MHz CH-High 30MHz~1.5GHz



Date: 9.SEP.2019 20:56:47

LTE Band 26 15MHz CH-High 1.5GHz~9GHz



Date: 12.SEP.2019 11:33:26

5.8. Radiates Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI C63.26 (2015).
2. Below 1GHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A loop antenna, A log-periodic antenna or horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=200Hz,VBW=600Hz for 9kHz150kHz , RBW=10kHz, VBW=30kHz 150kHz-30MHz , RBW=100kHz,VBW=300kHz for 30MHz to 1GHz and RBW=1MHz, VBW=3MHz for above 1GHz, And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAG) should be recorded after test.
7. The measurement results are obtained as described below:

$$\text{Power(EIRP)} = \text{PMea} - \text{PAG} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:

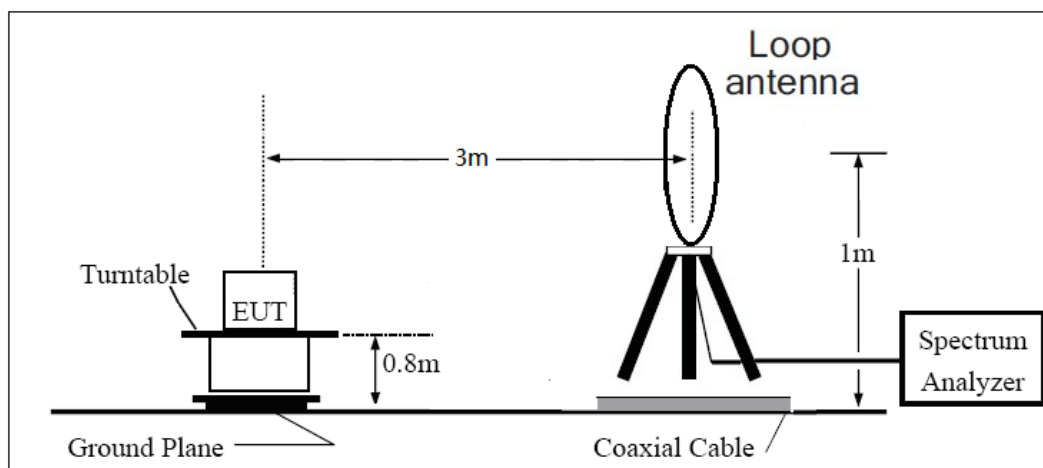
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi)

and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

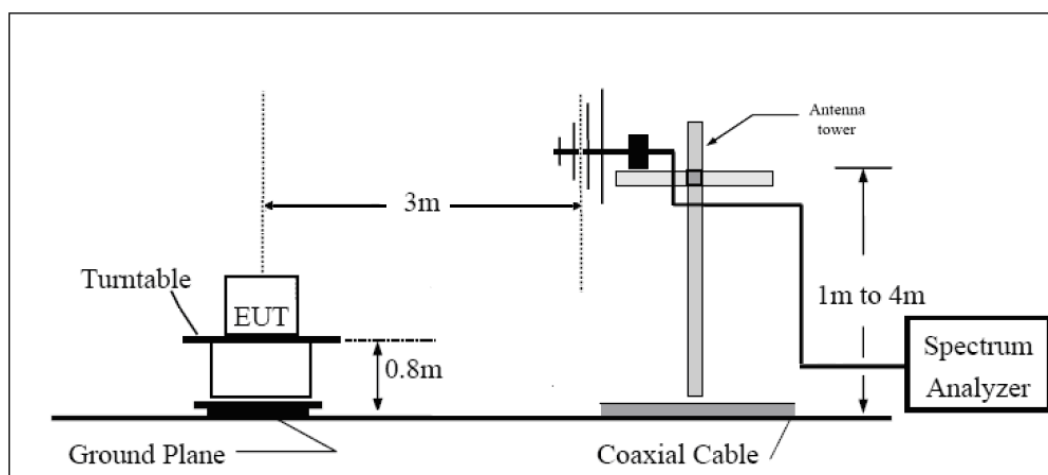
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

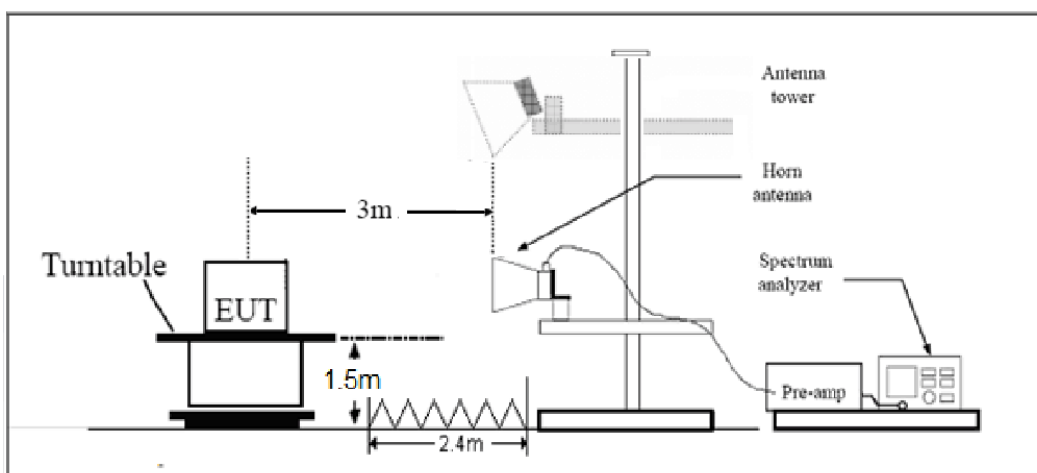
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz





Note: Area side:2.4mX3.6m

Limits

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.”

Limit	-13 dBm
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U = 3.55$ dB.

**Test Result**

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

GSM 850 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673	-61.10	2.00	10.75	Horizontal	-54.50	-13.00	41.50	135
3	2498	-56.58	2.51	11.05	Horizontal	-50.19	-13.00	37.19	90
4	3346	-53.80	4.20	11.15	Horizontal	-49.00	-13.00	36.00	315
5	4183	-53.50	5.20	11.15	Horizontal	-49.70	-13.00	36.70	225
6	5020	-55.20	5.50	11.95	Horizontal	-50.90	-13.00	37.90	180
7	5856	-52.50	5.70	13.55	Horizontal	-46.80	-13.00	33.80	135
8	6693	-52.80	6.30	13.75	Horizontal	-47.50	-13.00	34.50	45
9	7529	-59.40	6.80	13.85	Horizontal	-54.50	-13.00	41.50	135
10	8366	-55.39	6.90	14.25	Horizontal	-50.19	-13.00	37.19	90

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is Horizontal position.

CDMA BC0 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.04	-68.38	2.00	10.75	Horizontal	-61.78	-13.00	48.78	45
3	2509.56	-66.33	2.51	11.05	Horizontal	-59.94	-13.00	46.94	0
4	3346.08	-62.82	4.20	11.15	Horizontal	-58.02	-13.00	45.02	90
5	4182.60	-60.67	5.20	11.15	Horizontal	-56.87	-13.00	43.87	180
6	5019.12	-59.73	5.50	11.95	Horizontal	-55.43	-13.00	42.43	315
7	5855.64	-61.56	5.70	13.55	Horizontal	-55.86	-13.00	42.86	225
8	6692.16	-58.29	6.30	13.75	Horizontal	-52.99	-13.00	39.99	0
9	7528.68	-56.58	6.80	13.85	Horizontal	-51.68	-13.00	38.68	90
10	8365.20	-55.36	6.90	14.25	Horizontal	-50.16	-13.00	37.16	135

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is Horizontal position.

WCDMA Band V CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673	-65.70	2.00	10.75	Horizontal	-59.10	-13.00	46.10	180
3	2510	-64.99	2.51	11.05	Horizontal	-58.60	-13.00	45.60	90
4	3346	-63.30	4.20	11.15	Horizontal	-58.50	-13.00	45.50	45
5	4183	-59.30	5.20	11.15	Horizontal	-55.50	-13.00	42.50	315
6	5020	-58.00	5.50	11.95	Horizontal	-53.70	-13.00	40.70	0
7	5856	-60.00	5.70	13.55	Horizontal	-54.30	-13.00	41.30	45
8	6693	-58.10	6.30	13.75	Horizontal	-52.80	-13.00	39.80	135
9	8366	-55.00	6.80	13.85	Horizontal	-50.10	-13.00	37.10	90
10	3346	-55.30	6.90	14.25	Horizontal	-50.10	-13.00	37.10	180

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.

LTE Band 5 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.0	-64.74	2.00	10.75	Horizontal	-58.14	-13.00	45.14	315
3	2509.5	-61.18	2.51	11.05	Horizontal	-54.79	-13.00	41.79	90
4	3346.0	-63.46	4.20	11.15	Horizontal	-58.66	-13.00	45.66	45
5	4182.5	-62.23	5.20	11.15	Horizontal	-58.43	-13.00	45.43	225
6	5019.0	-60.64	5.50	11.95	Horizontal	-56.34	-13.00	43.34	0
7	5855.5	-61.96	5.70	13.55	Horizontal	-56.26	-13.00	43.26	270
8	6692.0	-60.24	6.30	13.75	Horizontal	-54.94	-13.00	41.94	315
9	7528.5	-56.40	6.80	13.85	Horizontal	-51.50	-13.00	38.50	45
10	8365.0	-57.10	6.90	14.25	Horizontal	-51.90	-13.00	38.90	135

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.



LTE Band 5 5MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.0	-66.03	2.00	10.75	Horizontal	-59.43	-13.00	46.43	135
3	2509.5	-60.29	2.51	11.05	Horizontal	-53.90	-13.00	40.90	45
4	3346.0	-63.47	4.20	11.15	Horizontal	-58.67	-13.00	45.67	225
5	4182.5	-57.56	5.20	11.15	Horizontal	-53.76	-13.00	40.76	135
6	5019.0	-59.86	5.50	11.95	Horizontal	-55.56	-13.00	42.56	45
7	5855.5	-61.72	5.70	13.55	Horizontal	-56.02	-13.00	43.02	270
8	6692.0	-58.86	6.30	13.75	Horizontal	-53.56	-13.00	40.56	0
9	7528.5	-56.40	6.80	13.85	Horizontal	-51.50	-13.00	38.50	90
10	8365.0	-56.88	6.90	14.25	Horizontal	-51.68	-13.00	38.68	45

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.

LTE Band 5 10MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.0	-66.59	2.00	10.75	Horizontal	-59.99	-13.00	46.99	0
3	2509.5	-60.92	2.51	11.05	Horizontal	-54.53	-13.00	41.53	90
4	3346.0	-64.29	4.20	11.15	Horizontal	-59.49	-13.00	46.49	225
5	4182.5	-61.97	5.20	11.15	Horizontal	-58.17	-13.00	45.17	90
6	5019.0	-57.02	5.50	11.95	Horizontal	-52.72	-13.00	39.72	315
7	5855.5	-62.28	5.70	13.55	Horizontal	-56.58	-13.00	43.58	125
8	6692.0	-59.44	6.30	13.75	Horizontal	-54.14	-13.00	41.14	90
9	7528.5	-56.40	6.80	13.85	Horizontal	-51.50	-13.00	38.50	180
10	8365.0	-56.26	6.90	14.25	Horizontal	-51.06	-13.00	38.06	45

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.

LTE Band 26 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1663.00	-66.08	2.00	10.75	Horizontal	-59.48	-13.00	46.48	225
3	2494.50	-60.97	2.51	11.05	Horizontal	-54.58	-13.00	41.58	90
4	3326.00	-63.61	4.20	11.15	Horizontal	-58.81	-13.00	45.81	180
5	4157.50	-62.78	5.20	11.15	Horizontal	-58.98	-13.00	45.98	45
6	4989.00	-60.44	5.50	11.95	Horizontal	-56.14	-13.00	43.14	225
7	5820.50	-61.42	5.70	13.55	Horizontal	-55.72	-13.00	42.72	90
8	6652.00	-59.27	6.30	13.75	Horizontal	-53.97	-13.00	40.97	315
9	7483.50	-57.59	6.80	13.85	Horizontal	-52.69	-13.00	39.69	90
10	8315.00	-55.31	6.90	14.25	Horizontal	-50.11	-13.00	37.11	225

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.

LTE Band 26 5MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1663.00	-65.01	2.00	10.75	Horizontal	-58.41	-13.00	45.41	90
3	2494.50	-62.63	2.51	11.05	Horizontal	-56.24	-13.00	43.24	135
4	3326.00	-65.44	4.20	11.15	Horizontal	-60.64	-13.00	47.64	315
5	4157.50	-61.38	5.20	11.15	Horizontal	-57.58	-13.00	44.58	45
6	4989.00	-59.76	5.50	11.95	Horizontal	-55.46	-13.00	42.46	90
7	5820.50	-61.42	5.70	13.55	Horizontal	-55.72	-13.00	42.72	45
8	6652.00	-58.98	6.30	13.75	Horizontal	-53.68	-13.00	40.68	315
9	7483.50	-56.80	6.80	13.85	Horizontal	-51.90	-13.00	38.90	90
10	8315.00	-56.49	6.90	14.25	Horizontal	-51.29	-13.00	38.29	45

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.



LTE Band 26 10MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1663.00	-64.59	2.00	10.75	Horizontal	-57.99	-13.00	44.99	135
3	2494.50	-63.66	2.51	11.05	Horizontal	-57.27	-13.00	44.27	225
4	3326.00	-63.38	4.20	11.15	Horizontal	-58.58	-13.00	45.58	225
5	4157.50	-61.40	5.20	11.15	Horizontal	-57.60	-13.00	44.60	135
6	4989.00	-60.54	5.50	11.95	Horizontal	-56.24	-13.00	43.24	45
7	5820.50	-62.01	5.70	13.55	Horizontal	-56.31	-13.00	43.31	90
8	6652.00	-58.60	6.30	13.75	Horizontal	-53.30	-13.00	40.30	225
9	7483.50	-56.31	6.80	13.85	Horizontal	-51.41	-13.00	38.41	180
10	8315.00	-56.82	6.90	14.25	Horizontal	-51.62	-13.00	38.62	90

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is Horizontal position.

6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	113824	2019-05-19	2020-05-18
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Spectrum Analyzer	Key sight	N9010A	MY50210259	2019-05-19	2020-05-18
Universal Radio Communication Tester	Key sight	E5515C	MY48367192	2019-05-19	2020-05-18
Signal Analyzer	R&S	FSV30	100815	2018-12-16	2019-12-15
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-09-26	2019-09-25
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2020-06-19
Signal generator	R&S	SMB 100A	102594	2019-05-19	2020-05-18
Climatic Chamber	ESPEC	SU-242	93000506	2017-12-17	2020-12-16
Preamplifier	R&S	SCU18	102327	2019-05-19	2020-05-18
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2019-05-20	2020-05-21
RF Cable	Agilent	SMA 15cm	0001	2019-06-14	2019-09-13
Software	R&S	EMC32	9.26.0	/	/

*****END OF REPORT *****