FCC TEST REPORT

FCC ID: 2BF9L-W80-30

Product	:	iMat ®Weigh -30 Smart office Vending machine
Model Name	:	W80-30, KT-MiniCtrl-G, KT-MiniCtrl-F, W90-30, S50-80, S50-80Plus, W60-30, G50-33B, G30-84, S20-60, S50-60, A10-864
Brand	:	N/A
Report No.	:	PTC24022617701E-FC04

Prepared for

ShenZhen KunTon Intelligent Storage Technology Co.,Ltd

No.14 building,Hua Lian Industrial Zone XinShi Community, DaLang Street,LongHua District,ShenZhen City,GuangDong Province

Prepared by

Precise Testing & Certification Co., Ltd

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

1 Test Result Certification

Applicant's name	:	ShenZhen KunTon Intelligent Storage Technology Co.,Ltd
Address	:	No.14 building,Hua Lian Industrial Zone XinShi Community, DaLang Street,LongHua District,ShenZhen City,GuangDong Province
Manufacture's name	:	ShenZhen KunTon Intelligent Storage Technology Co.,Ltd
Address	:	No.14 building,Hua Lian Industrial Zone XinShi Community, DaLang Street,LongHua District,ShenZhen City,GuangDong Province
Product name	:	iMat ®Weigh -30 Smart office Vending machine
Model name	:	W80-30, KT-MiniCtrl-G,KT-MiniCtrl-F,W90-30,S50-80,S50-80Plus,W60-30 ,G50-33B,G30-84,S20-60,S50-60,A10-864
Standards	:	47 CFR FCC Part 22 Subpart H,ANSI C63.26-2015, KDB 971168 D01 Power Meas License Digital Systems v03r01
Test Date	:	Apr. 01, 2024 to Jun. 26, 2024
Date of Issue	:	Jul. 25, 2024
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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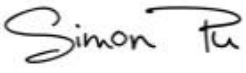
Test Engineer:

Jack zhou / Engineer

Technical Manager:



Simon Pu / Manager

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1. General Description Of Eut

Equipment Type:	POS SYSTEM
Hardware version:	N/A
Software version:	N/A
Frequency Bands:	GSM/GPRS/EDGE: ☒GSM 850 ☒PCS1900
Antenna Type:	External Antenna
Antenna gain:	GSM850: 2.14dBi PCS1900: 2.15dBi
Type of Modulation:	GSM/GPRS: GMSK
Adapter Information:	Input:85~264VAC Out:12VDC
Max power:	See Table 2.1
Extreme Vol. Limits:	DC 10.8V to 13.2V (Normal: DC 12V)
Test sample No.	PTC24022617701E-1/2,PTC24022617701E-2/2.

Table 2.1 The Basic Technical Specification for Working BAND(S).

OPERATION BAND(S)	Power Class	Mod.	Max Peak Power (dBm)
GSM850	Class 4	GMSK	30.32
DCS1900	Class 1	GMSK	30.35

2. Facilities And Accreditations

2.1. Test Facility

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A

2.2. Description Of Test Channels And Test Modes

Test channels:

GSM 850			
Test Channel	BW(MHz)	UL Channel	Frequency(MHz)
Low Range	0.2	128	824.2
Mid Range	0.2	190	836.6
High Range	0.2	251	848.8

PCS1900			
Test Channel	BW(MHz)	UL Channel	Frequency(MHz)
Low Range	0.2	512	1850.2
Mid Range	0.2	661	1880.0
High Range	0.2	810	1909.8

Note 1: The worst condition was recorded in the test report if no other modes test data.

2.3. Equipment Modifications

Not available for this EUT intended for grant.

3. Summary Of Test Requirements And Results

GSM850:

Test Item	FCC Rule No.	Requirements	Judgement
Effective (Isotropic) Radiated Power	§2.1046, §2.913(a)	EIRP ≤ 7W(38.5dBm)	Pass
Occupied Bandwidth	§2.1049	OBW: No limit.	Pass
Emission Bandwidth	22.917(b)	EBW: No limit.	Pass
Band Edges Compliance	§2.1051 §22.917(a)	≤-13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §22.917	FCC: ≤-13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	FCC: ≤-13 dBm/100 kHz.	Pass
Frequency Stability	§2.1055, §22.355	the fundamental emissions stay within the authorized bands of operation. (2.5ppm)	Pass
Peak-Average Ratio	§22.913	FCC: Limit≤13dB	Pass

PCS 1900:

Test Item	FCC Rule No.	Requirements	Judgement
Effective (Isotropic) Radiated Power	§2.1046, §24.232(c)	EIRP ≤ 2W(33dBm)	Pass
Bandwidth	§2.1049 §24.238(a)	OBW: No limit. EBW: No limit.	Pass
Band Edges	§2.1051, §24.238(a)	≤-13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §24.238(a)	FCC: ≤-13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §24.238(a)	-13dBm/1MHz	Pass
Frequency Stability	§2.1055, §24.235	the fundamental emission stays within the authorized frequency block. ≤±2.5ppm.	Pass
Peak to average ratio	§24.232(d)	≤13dB	Pass

4. Measurement Instruments

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Last Calibration	Calibration Interval
MXG Signal Analyzer	Agilent	N9020A	SER MY5111038	10Hz-30GHz	Aug.17, 2023	1 Year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Aug.17, 2023	1 Year
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Aug.17, 2023	1 Year
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Aug.17, 2023	1 Year
Signal Analyzer 40GHZ	Rohde&Schwarz	FSV40	101456	10Hz-40GHz	Aug.17, 2023	1 Year
Wireless Communication Tester	Rohde&Schwar	CMW500	134930	/	Aug.17, 2023	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Last Calibration	Calibration Interval
EMI Test Receiver	Rohde&Schwarz	ESCI7	101671	9KHz-7GHz	Aug. 17,2023	1 Year
Loop Antenna	Schwarzbeck	FMZB 1519B	192	9 KHz -30MHz	Aug. 17,2023	1 Year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug. 17,2023	1 Year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Mar. 23,2024	1 Year
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Aug. 17,2023	1 Year
Spectrum Analyzer	Rohde&Schwarz	FSV40	6625-01-588-5515	9KHz-40GHz	Aug.17, 2023	1 Year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 17, 2023	1 Year
Power Amplifier	ZHINAN	ZN3380C	15002	1GHz-26.5GHz	Aug. 17, 2023	1 Year
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-1066	15GHz-40GHz	Jul. 19, 2023	1 Year

Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Jul. 19, 2023	1 Year
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Aug. 17,2023	1 Year
RF Cable	R&S	R204	R21X	1GHz-40GHz	Aug. 17,2023	1 Year
MXG Vector Signal Generator	Agilent	N5182A	MY49060455	-	Aug. 17,2023	1 Year
ESG Series Analog signal generator	Agilent	E4421B	GB40051240	-	Aug. 17,2023	1 Year

5. Effective (Isotropic) Radiated Power and Conducted Output Power

5.1. Conducted Output Power

Measurement Procedure: FCC KDB 971168 D01 V03r01
The transmitter output was connected to a calibrated coaxial cable, attenuator and power meter, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the power reading. The tests were performed at three frequencies (low channel, middle channel and high channel) and on the highest power levels, which can be setup on the transmitters.

5.2. Effective (Isotropic) Radiated Power

Measurement Procedure: FCC KDB 971168 D01 V03r01 ; C63.26 (2015).
Calculate power in dBm by the following formula:
ERP (dBm) = Conducted Power (dBm) + antenna gain (dBd)
EIRP(dBm) = Conducted Power (dBm) + antenna gain (dBi)
EIRP=ERP+2.15dB

Test result:

GPRS 850 and GPRS 1900:

Band	Channel	Slot	Power(dBm)	ERP/EIRP(dBm)	Limit(dBm)	Verdict
GPRS850	128	1	29.98	29.97	38.5	PASS
GPRS850	128	2	27.92	27.91	38.5	PASS
GPRS850	128	3	26.79	26.78	38.5	PASS
GPRS850	128	4	25.49	25.48	38.5	PASS
GPRS850	190	1	29.98	29.97	38.5	PASS
GPRS850	190	2	27.66	27.65	38.5	PASS
GPRS850	190	3	26.51	26.50	38.5	PASS
GPRS850	190	4	25.18	25.17	38.5	PASS
GPRS850	251	1	**30.32**	**30.31**	38.5	PASS
GPRS850	251	2	28.01	28.00	38.5	PASS
GPRS850	251	3	26.67	26.66	38.5	PASS
GPRS850	251	4	25.53	25.52	38.5	PASS
GPRS1900	512	1	30.81	33.33	33	PASS
GPRS1900	512	2	29.77	32.29	33	PASS
GPRS1900	512	3	28.16	30.68	33	PASS
GPRS1900	512	4	26.83	29.35	33	PASS
GPRS1900	661	1	**30.35**	**32.87**	33	PASS
GPRS1900	661	2	29.24	31.76	33	PASS
GPRS1900	661	3	27.22	29.74	33	PASS
GPRS1900	661	4	26.20	28.72	33	PASS
GPRS1900	810	1	30.15	32.67	33	PASS
GPRS1900	810	2	29.08	31.60	33	PASS
GPRS1900	810	3	27.03	29.55	33	PASS
GPRS1900	810	4	26.02	28.54	33	PASS

EGPRS 850 and EGPRS 1900:

Band	Channel	Slot	Power(dBm)	ERP/EIRP(dBm)	Limit(dBm)	Verdict
EGPRS850	128	1	26.46	26.45	38.5	PASS
EGPRS850	128	2	25.24	25.23	38.5	PASS
EGPRS850	128	3	23.59	23.58	38.5	PASS
EGPRS850	128	4	22.44	22.43	38.5	PASS
EGPRS850	190	1	26.15	26.14	38.5	PASS
EGPRS850	190	2	24.93	24.92	38.5	PASS
EGPRS850	190	3	23.26	23.25	38.5	PASS
EGPRS850	190	4	22.11	22.10	38.5	PASS
EGPRS850	251	1	**26.36**	**26.35**	38.5	PASS
EGPRS850	251	2	25.22	25.21	38.5	PASS
EGPRS850	251	3	23.48	23.47	38.5	PASS
EGPRS850	251	4	22.35	22.34	38.5	PASS
EGPRS1900	512	1	27.35	29.87	33	PASS
EGPRS1900	512	2	26.55	29.07	33	PASS
EGPRS1900	512	3	25.02	27.54	33	PASS
EGPRS1900	512	4	23.66	26.18	33	PASS
EGPRS1900	661	1	**26.64**	**29.16**	33	PASS
EGPRS1900	661	2	25.76	28.28	33	PASS
EGPRS1900	661	3	24.27	26.79	33	PASS
EGPRS1900	661	4	22.90	25.42	33	PASS
EGPRS1900	810	1	26.40	28.92	33	PASS
EGPRS1900	810	2	25.57	28.09	33	PASS
EGPRS1900	810	3	24.02	26.54	33	PASS
EGPRS1900	810	4	22.67	25.19	33	PASS

Note:
For getting the EIRP (Efficient Isotropic Radiated Power), the following formula The following formula is used for calculation:
1.ERP [dBm] = Conducted Power [dBm] + Gain [dBd]
2.EIRP [dBm] = Conducted Power [dBm] + Gain [dBi]

6. Spurious Emission (Conducted and Radiated)

6.1. Measurement Result (Pre-measurement)

GSM850:

Test Channel	BW(MHz)	UL Channel	Frequency(MHz)	Judgment
Low Range	0.2	128	824.2	Pass
Middle Range	0.2	190	836.6	Pass
High Range	0.2	251	848.8	Pass

PCS1800:

Test Channel	BW(MHz)	UL Channel	Frequency(MHz)	Judgment
Low Range	0.2	512	1850.2	Pass
Middle Range	0.2	661	1880	Pass
High Range	0.2	810	1909.8	Pass

Test Plot(s)

Conducted method

Test limit:

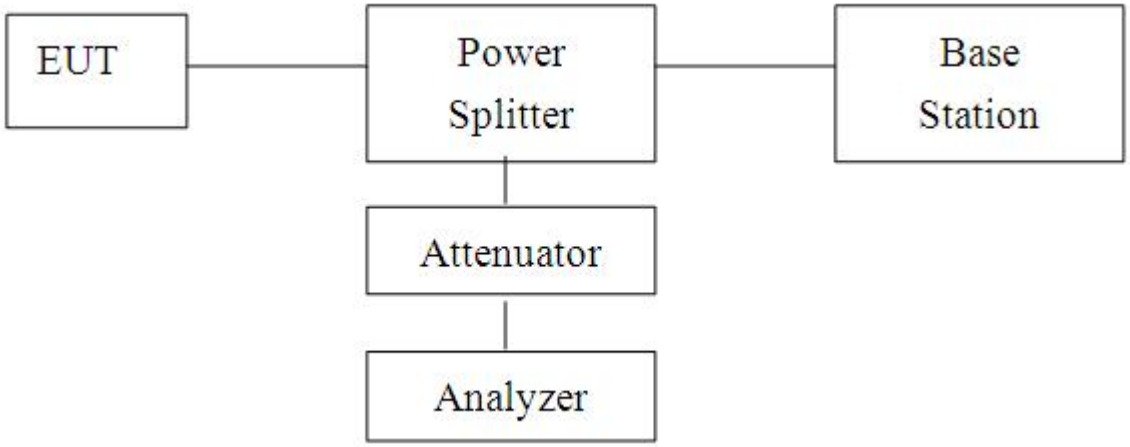
The spurious (unwanted) emission limits specified in the individual FCC rule parts applicable to licensed digital transmitters (typically referred to under the heading ‘emission limits’) normally apply to any and all emissions that are present outside of the authorized frequency band/block and apply to emissions in both the out-of-band and spurious domains. In some rule parts, the unwanted emission limits are specified by an emission mask that defines the applicable limit as a function of the frequency range relative to the authorized frequency block.

Typically, unwanted emissions are required by the licensed rule parts to be attenuated below the transmitter power by a factor of at least X + 10log(P) dB, where P represents the transmitter power expressed in watts and X is a specified scalar value (e.g., 43). This specification can be interpreted in one of two equivalent ways. First, the required attenuation can be construed to be relative to the mean carrier power, with the resultant of the equation X + 10log(P) being expressed in dBc (dB relative to the maximum carrier power). Alternatively, the specification can be interpreted as an absolute limit when the specified attenuation is actually subtracted from the maximum permissible transmitter power [i.e., 10log(P) – {X + 10log(P)}], resulting in an absolute level of -X dBW [or (-X + 30) dBm]. See section 4.

Test procedure:

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz below 1 GHz and 1 MHz above 1 GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonics.

Conducted Emission Test-Up:



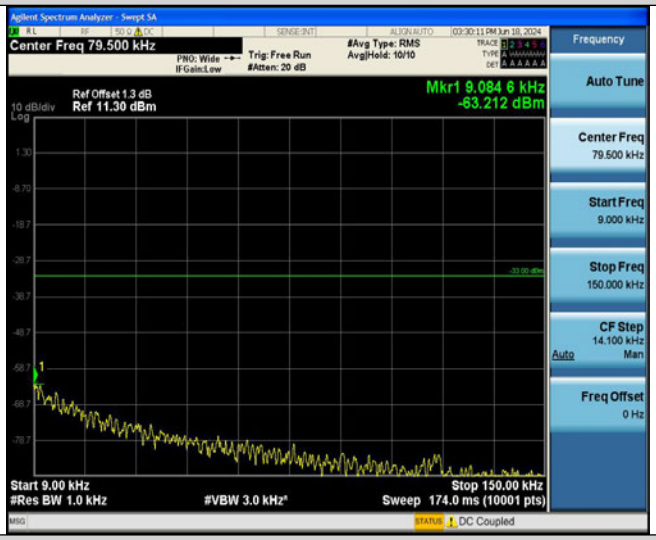
Test Result:

Band	Channel	Frequency Range(MHz)	Max.Freq. (MHz)	Result (dBm)	Limit (dBm)	Verdict
GPRS850	128	0.009~0.15MHz	0.01	-63.21	-33	PASS
GPRS850	128	0.15~30MHz	0.15	-52.94	-13	PASS
GPRS850	128	30~1000MHz	980.21	-55.12	-13	PASS
GPRS850	128	1000~10000MHz	1697.8	-48.06	-13	PASS
GPRS850	190	0.009~0.15MHz	0.01	-64.13	-33	PASS
GPRS850	190	0.15~30MHz	0.16	-52.81	-13	PASS
GPRS850	190	30~1000MHz	971.84	-55.09	-13	PASS
GPRS850	190	1000~10000MHz	3181.9	-48.43	-13	PASS
GPRS850	251	0.009~0.15MHz	0.01	-63.65	-33	PASS
GPRS850	251	0.15~30MHz	0.15	-51.89	-13	PASS
GPRS850	251	30~1000MHz	486.97	-55.32	-13	PASS
GPRS850	251	1000~10000MHz	3184.3	-48.54	-13	PASS
EGPRS850	128	0.009~0.15MHz	0.01	-65.57	-33	PASS
EGPRS850	128	0.15~30MHz	0.16	-53.74	-13	PASS
EGPRS850	128	30~1000MHz	957.61	-55.42	-13	PASS
EGPRS850	128	1000~10000MHz	3183.1	-48.49	-13	PASS
EGPRS850	190	0.009~0.15MHz	0.01	-65.11	-33	PASS
EGPRS850	190	0.15~30MHz	0.15	-55.63	-13	PASS
EGPRS850	190	30~1000MHz	185.91	-56.33	-13	PASS
EGPRS850	190	1000~10000MHz	3172.3	-48.45	-13	PASS
EGPRS850	251	0.009~0.15MHz	0.01	-65.58	-33	PASS
EGPRS850	251	0.15~30MHz	0.15	-51.29	-13	PASS
EGPRS850	251	30~1000MHz	683.13	-56.48	-13	PASS
EGPRS850	251	1000~10000MHz	3178.3	-48.46	-13	PASS
GPRS1900	512	0.009~0.15MHz	0.01	-64.27	-43	PASS
GPRS1900	512	0.15~30MHz	0.15	-51.93	-23	PASS
GPRS1900	512	30~1000MHz	827.18	-56.39	-13	PASS
GPRS1900	512	1000~3000MHz	2674.27	-51.88	-13	PASS
GPRS1900	512	3000~20000MHz	17003.47	-40.67	-13	PASS
GPRS1900	661	0.009~0.15MHz	0.01	-64.26	-43	PASS
GPRS1900	661	0.15~30MHz	0.17	-53.05	-23	PASS
GPRS1900	661	30~1000MHz	839.17	-55.37	-13	PASS
GPRS1900	661	1000~3000MHz	2687.6	-51.89	-13	PASS
GPRS1900	661	3000~20000MHz	17025	-40.72	-13	PASS
GPRS1900	810	0.009~0.15MHz	0.01	-64.7	-43	PASS
GPRS1900	810	0.15~30MHz	0.15	-52.03	-23	PASS
GPRS1900	810	30~1000MHz	886.12	-56.29	-13	PASS
GPRS1900	810	1000~3000MHz	2677.6	-51.9	-13	PASS
GPRS1900	810	3000~20000MHz	17010.83	-40.64	-13	PASS
EGPRS1900	512	0.009~0.15MHz	0.01	-64.94	-43	PASS
EGPRS1900	512	0.15~30MHz	0.22	-56.07	-23	PASS
EGPRS1900	512	30~1000MHz	780.49	-55.44	-13	PASS
EGPRS1900	512	1000~3000MHz	2675.67	-52.04	-13	PASS
EGPRS1900	512	3000~20000MHz	17010.83	-40.54	-13	PASS
EGPRS1900	661	0.009~0.15MHz	0.01	-66.01	-43	PASS
EGPRS1900	661	0.15~30MHz	0.15	-52.73	-23	PASS
EGPRS1900	661	30~1000MHz	780.94	-55.79	-13	PASS
EGPRS1900	661	1000~3000MHz	2672.6	-51.96	-13	PASS
EGPRS1900	661	3000~20000MHz	17032.37	-40.64	-13	PASS
EGPRS1900	810	0.009~0.15MHz	0.01	-64.3	-43	PASS
EGPRS1900	810	0.15~30MHz	0.16	-52.18	-23	PASS
EGPRS1900	810	30~1000MHz	926.51	-55.35	-13	PASS
EGPRS1900	810	1000~3000MHz	2682.73	-51.86	-13	PASS

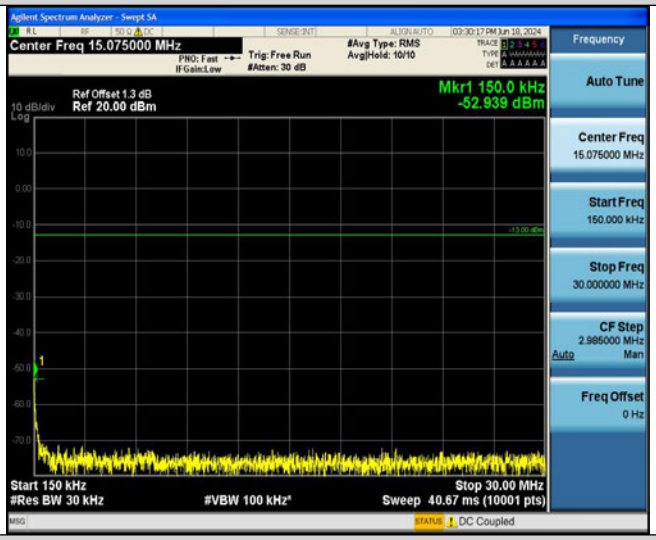
EGPRS1900	810	3000~20000MHz	17010.83	-40.62	-13	PASS

Test Graphs:

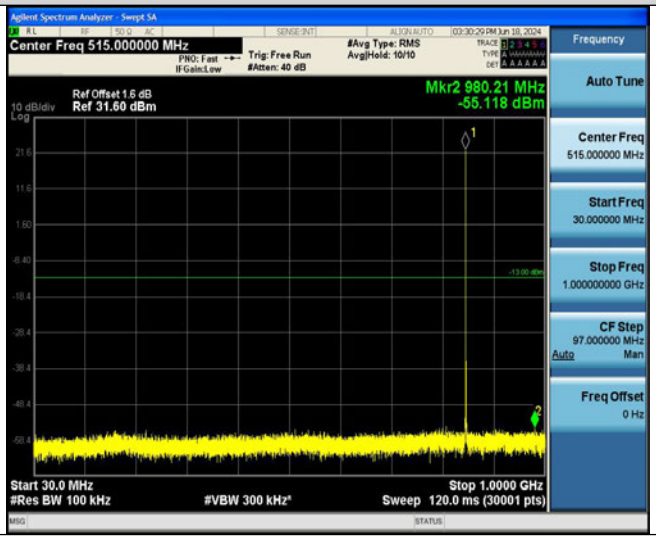
GPRS850-128-0.009~0.15MHz



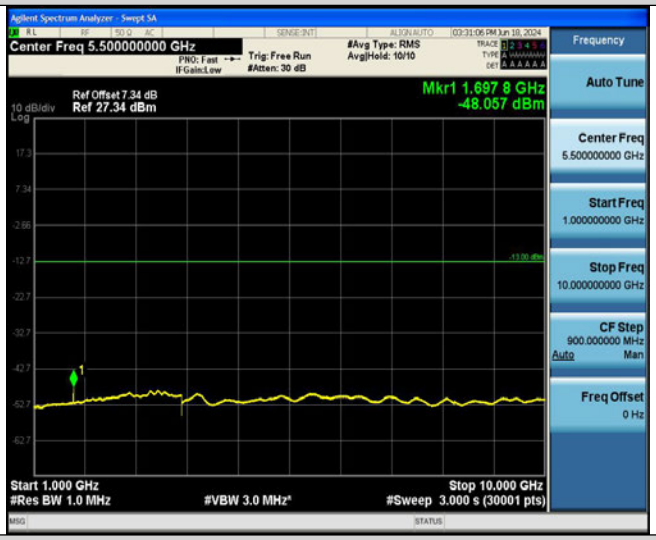
GPRS850-128-0.15~30MHz



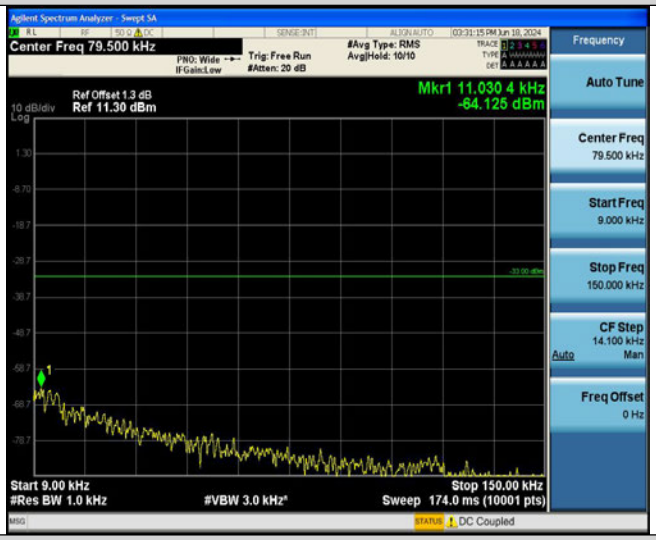
GPRS850-128-30~1000MHz



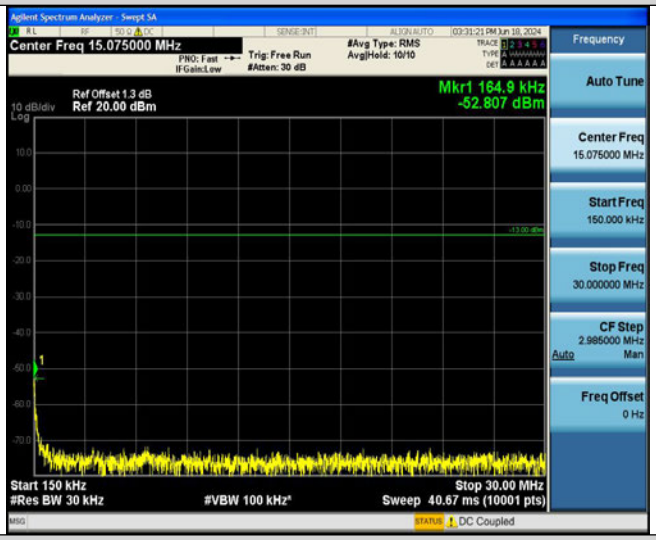
GPRS850-128-1000~10000MHz



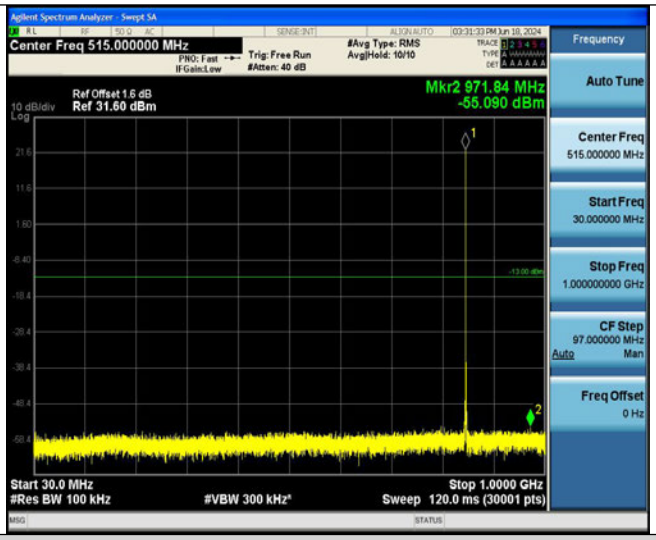
GPRS850-190-0.009~0.15MHz



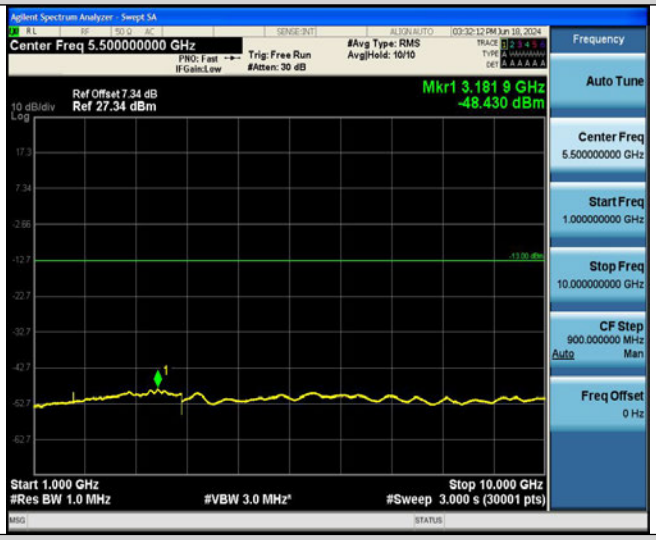
GPRS850-190-0.15~30MHz



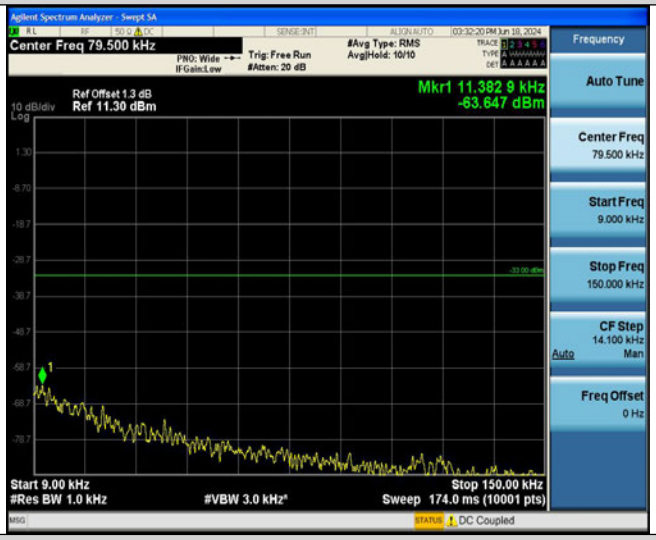
GPRS850-190-30~1000MHz



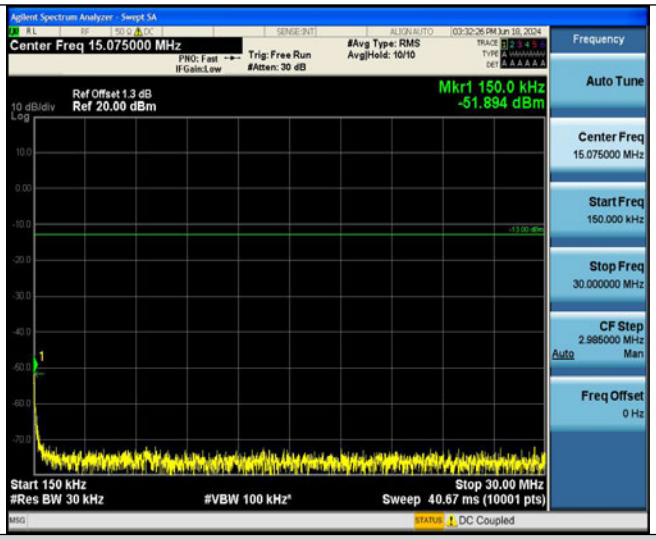
GPRS850-190-1000~10000MHz



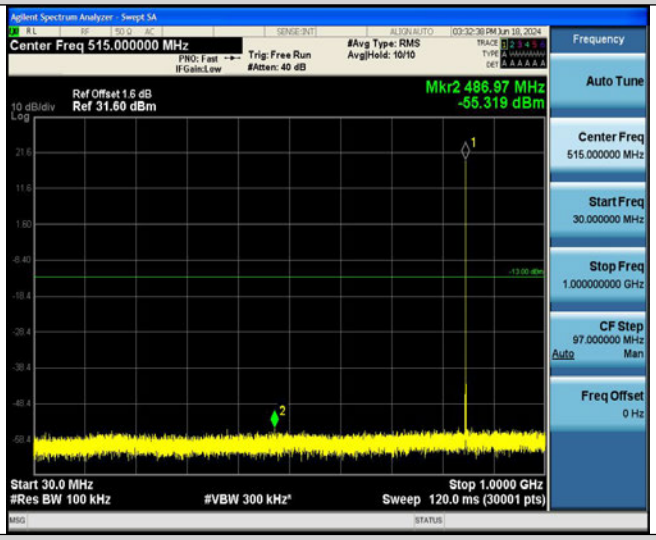
GPRS850-251-0.009~0.15MHz



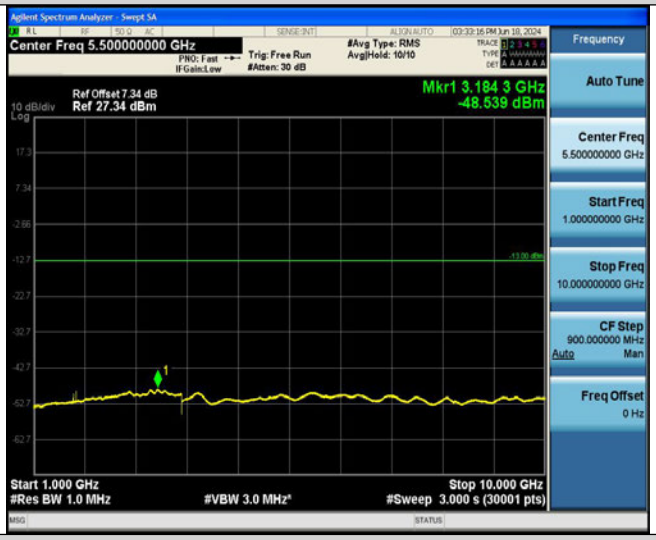
GPRS850-251-0.15~30MHz



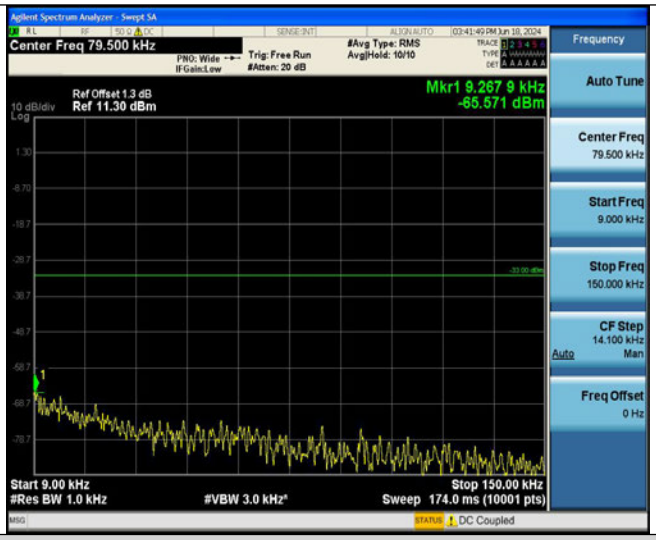
GPRS850-251-30~1000MHz



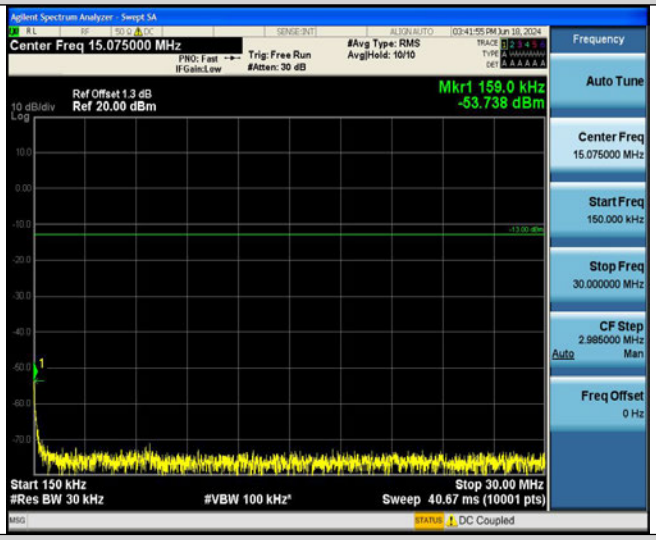
GPRS850-251-1000~10000MHz



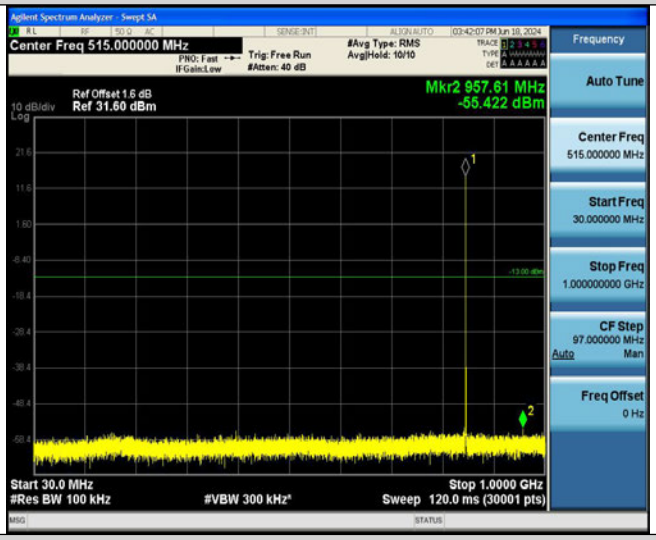
EGPRS850-128-0.009~0.15MHz



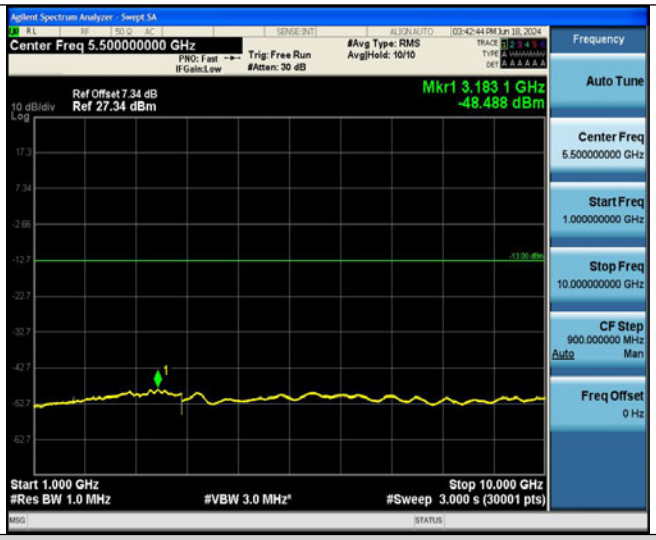
EGPRS850-128-0.15~30MHz



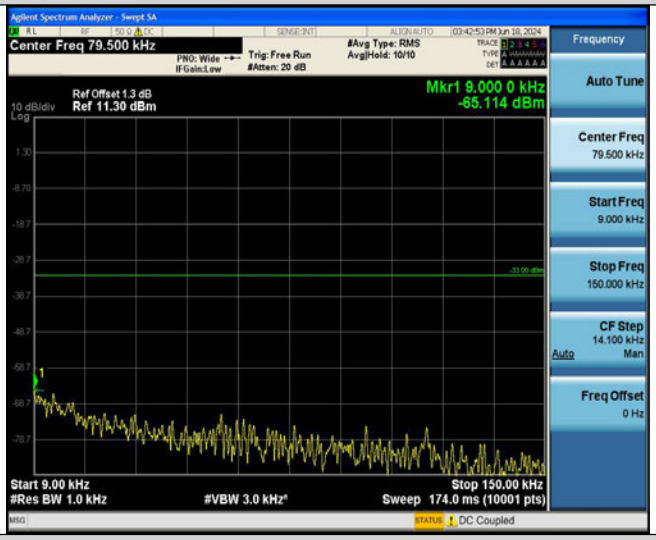
EGPRS850-128-30~1000MHz



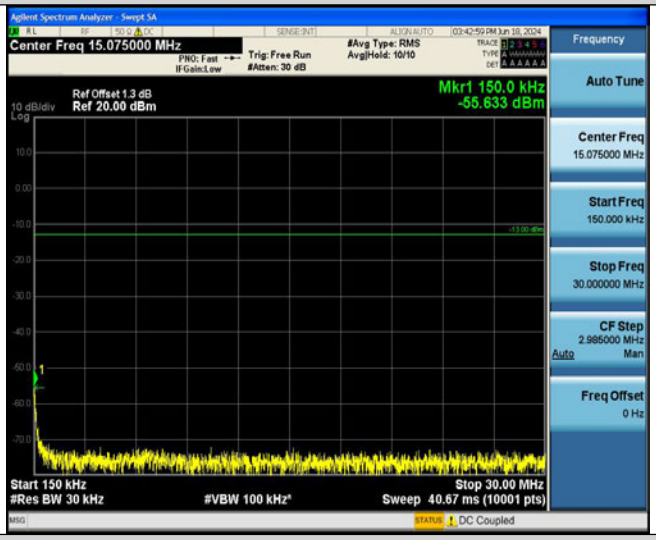
EGPRS850-128-1000~10000MHz



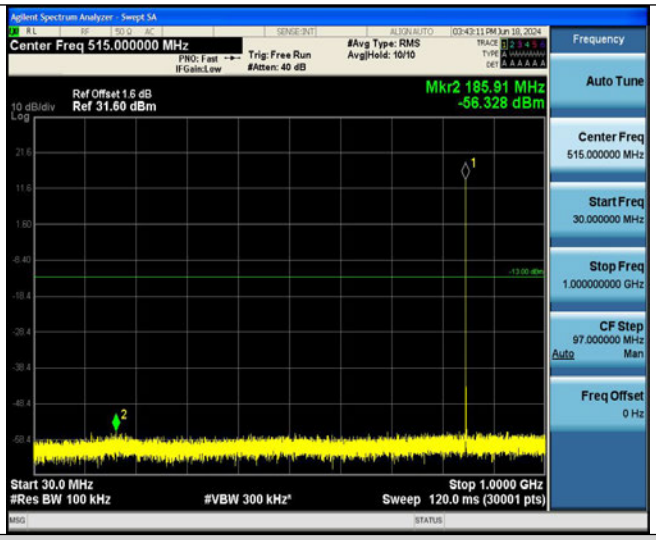
EGPRS850-190-0.009~0.15MHz



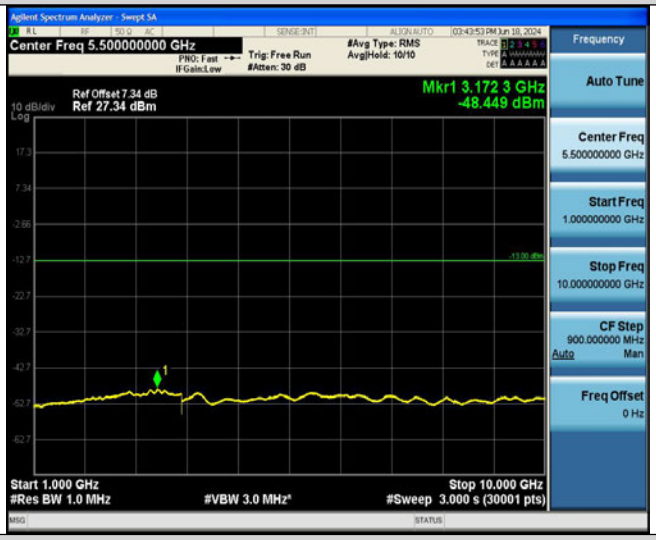
EGPRS850-190-0.15~30MHz



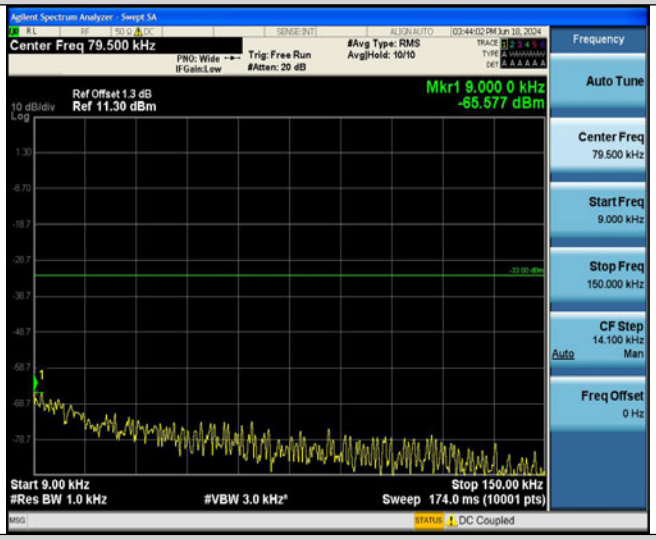
EGPRS850-190-30~1000MHz



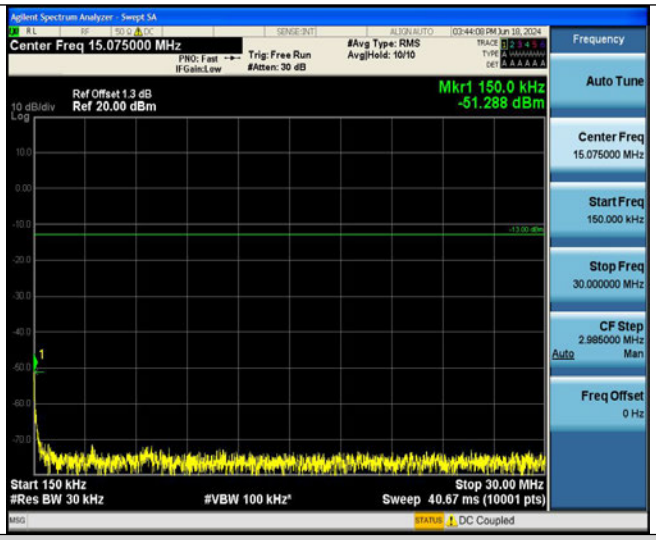
EGPRS850-190-1000~10000MHz



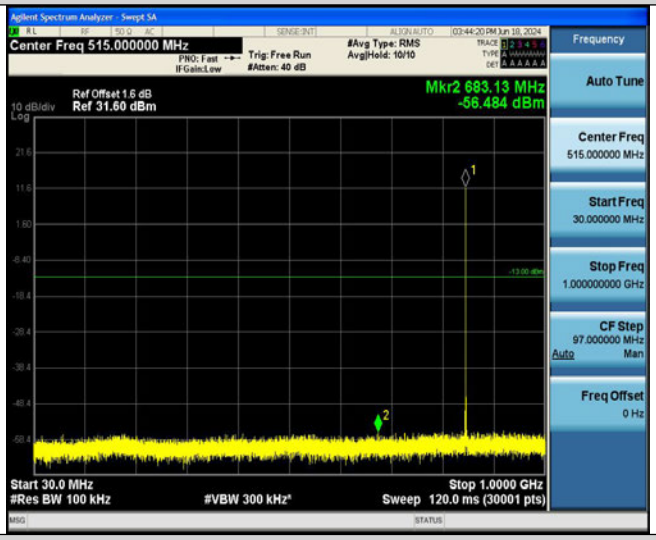
EGPRS850-251-0.009~0.15MHz



EGPRS850-251-0.15~30MHz

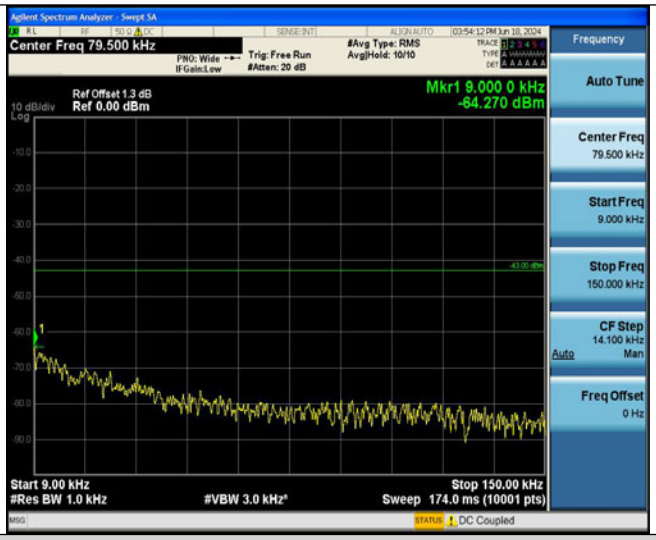


EGPRS850-251-30~1000MHz

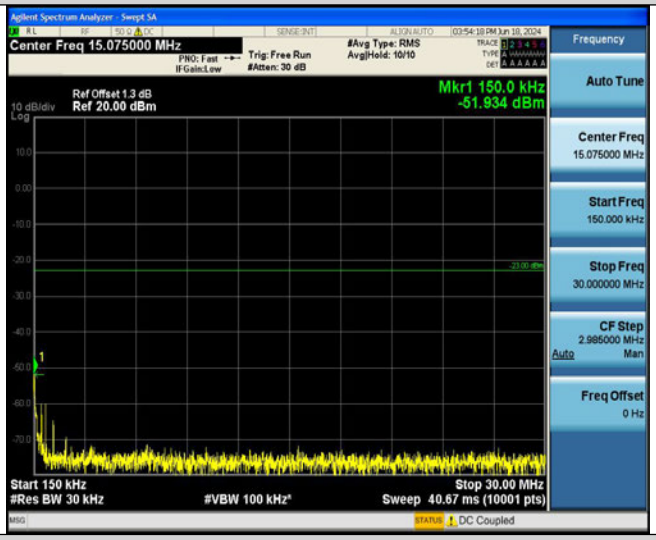


EGPRS850-251-1000~10000MHz

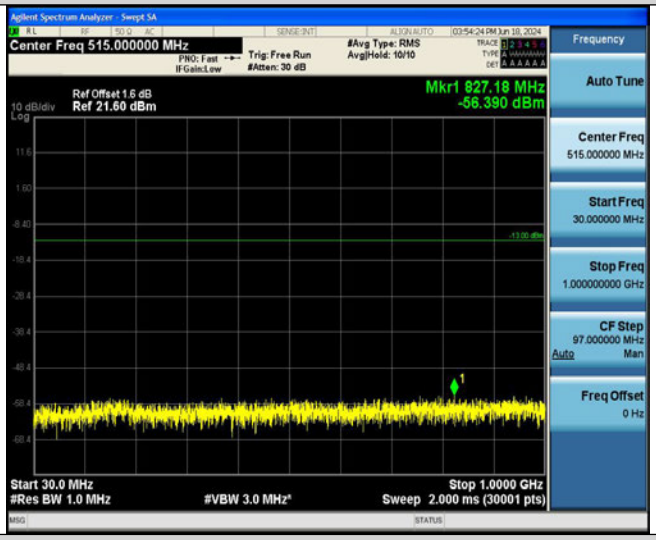
GPRS1900-512-0.009~0.15MHz



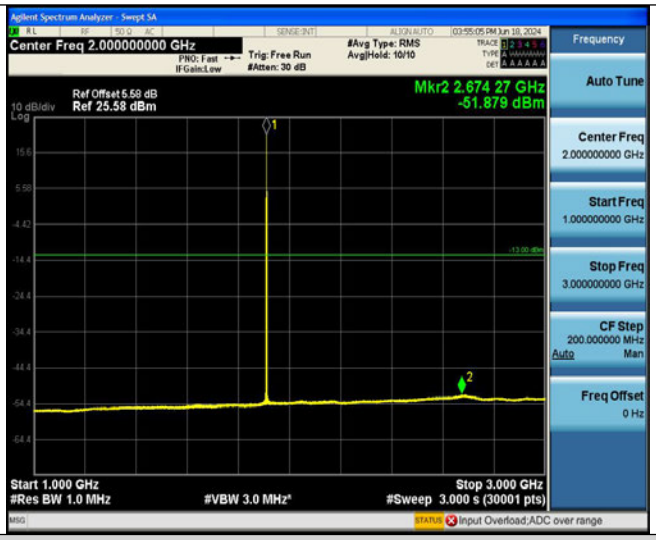
GPRS1900-512-0.15~30MHz



GPRS1900-512-30~1000MHz

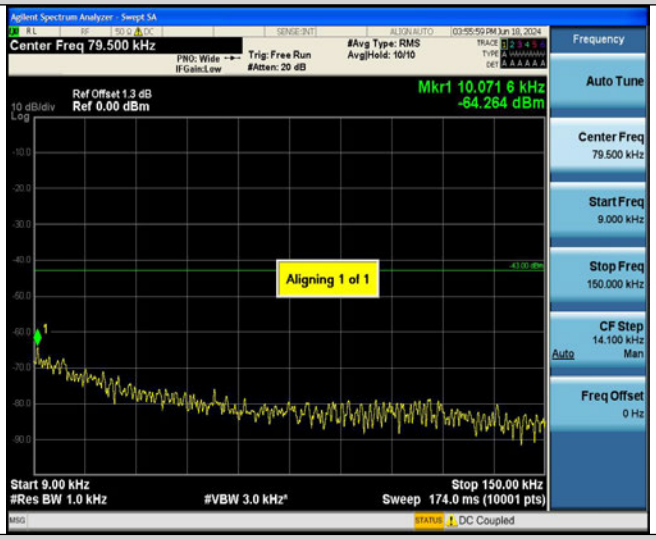


GPRS1900-512-1000~3000MHz

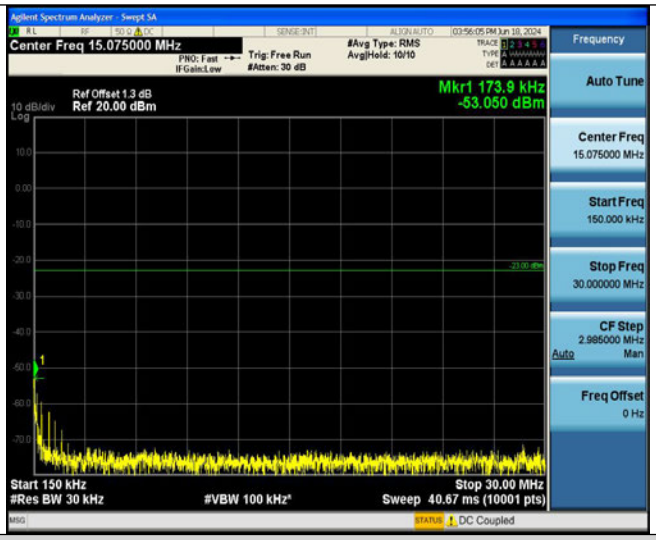


GPRS1900-512-3000~20000MHz

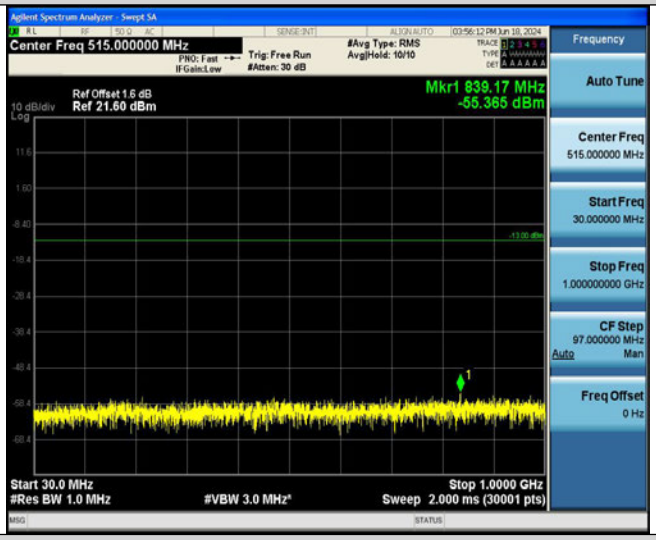
GPRS1900-661-0.009~0.15MHz



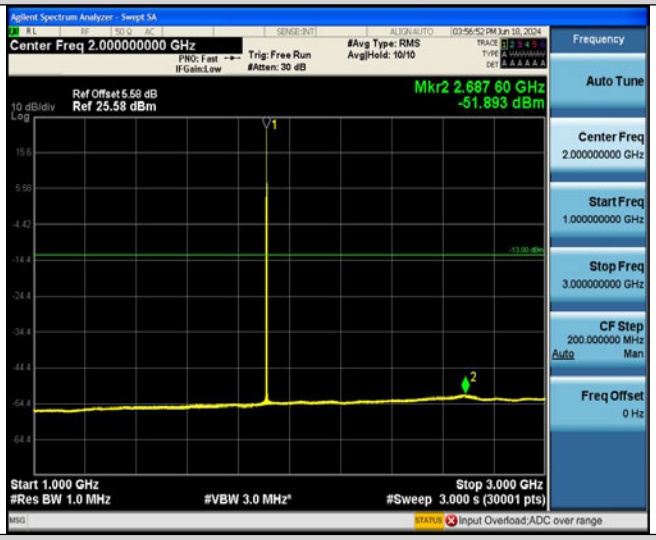
GPRS1900-661-0.15~30MHz



GPRS1900-661-30~1000MHz

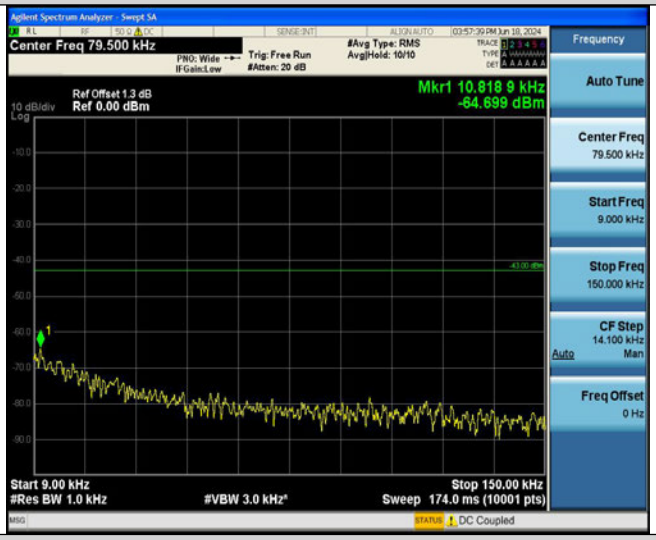


GPRS1900-661-1000~3000MHz

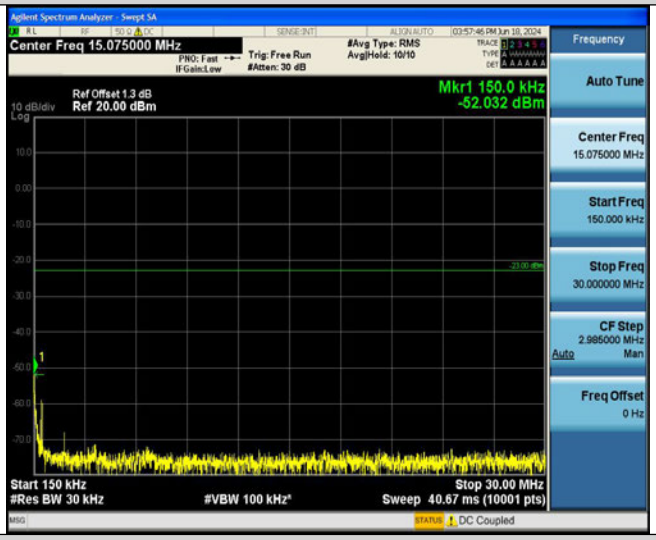


GPRS1900-661-3000~20000MHz

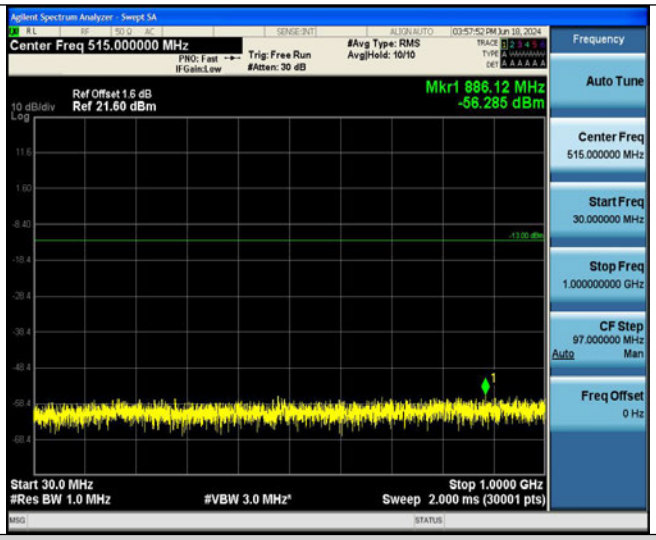
GPRS1900-810-0.009~0.15MHz



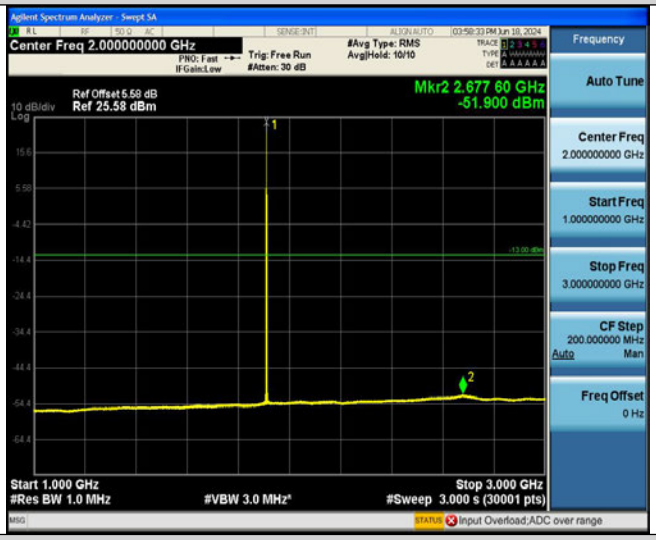
GPRS1900-810-0.15~30MHz



GPRS1900-810-30~1000MHz

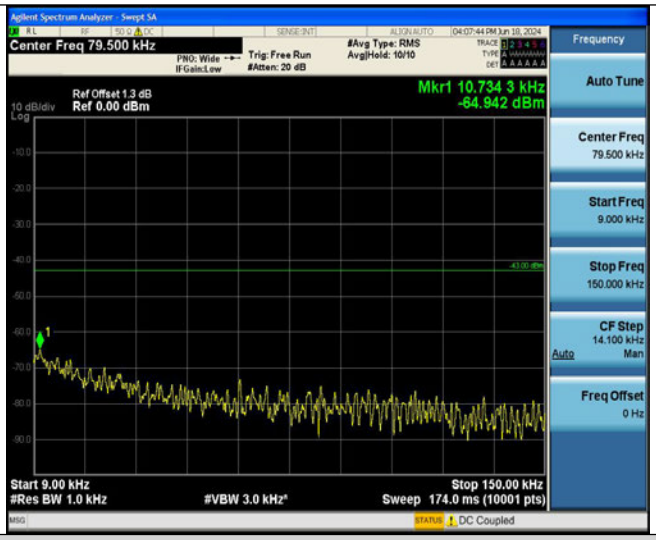


GPRS1900-810-1000~3000MHz

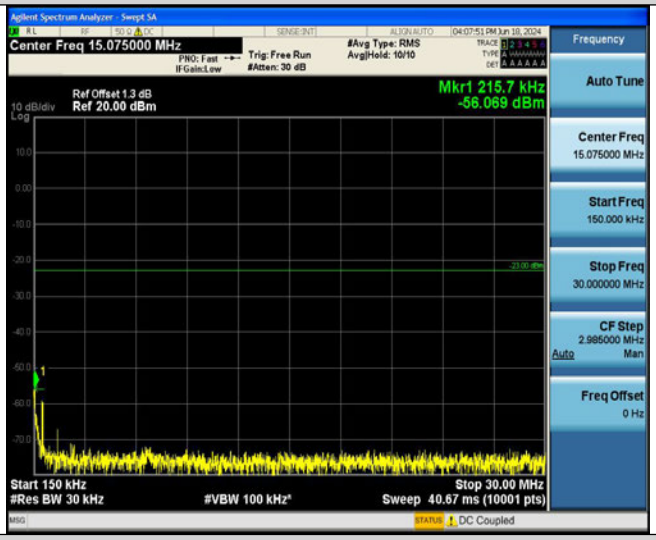


GPRS1900-810-3000~20000MHz

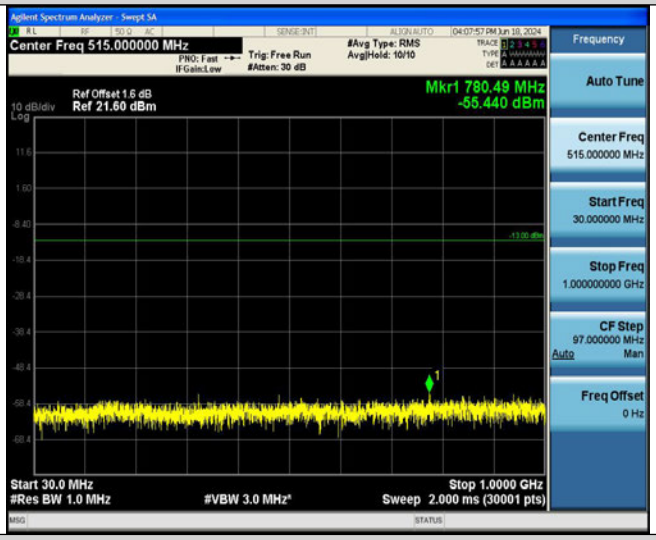
EGPRS1900-512-0.009~0.15MHz



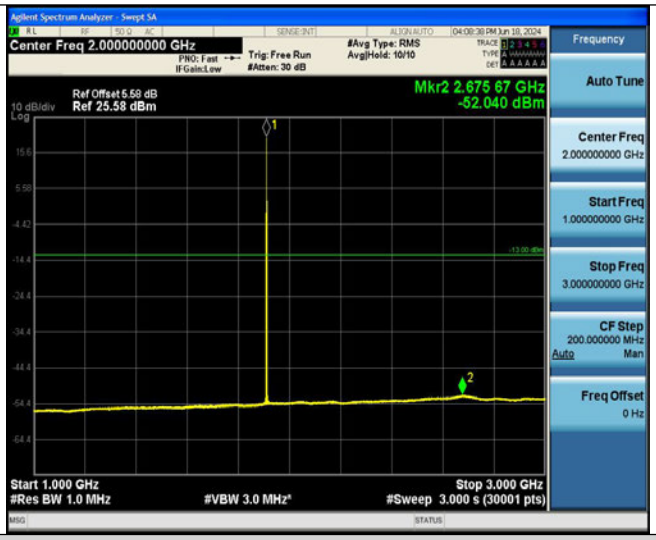
EGPRS1900-512-0.15~30MHz



EGPRS1900-512-30~1000MHz

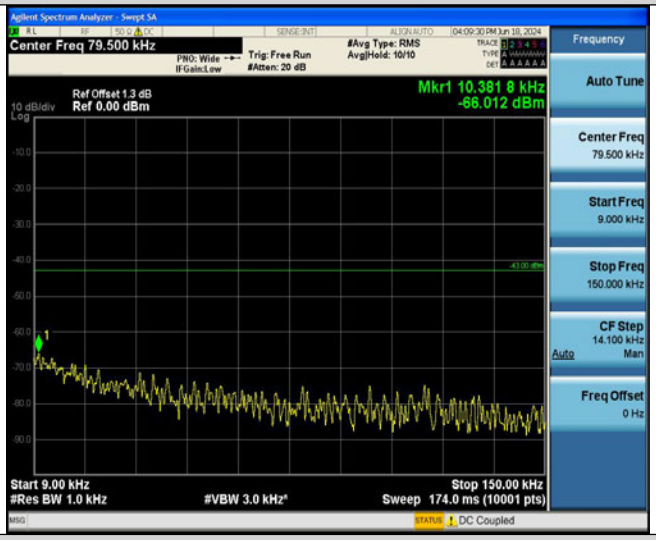


EGPRS1900-512-1000~3000MHz

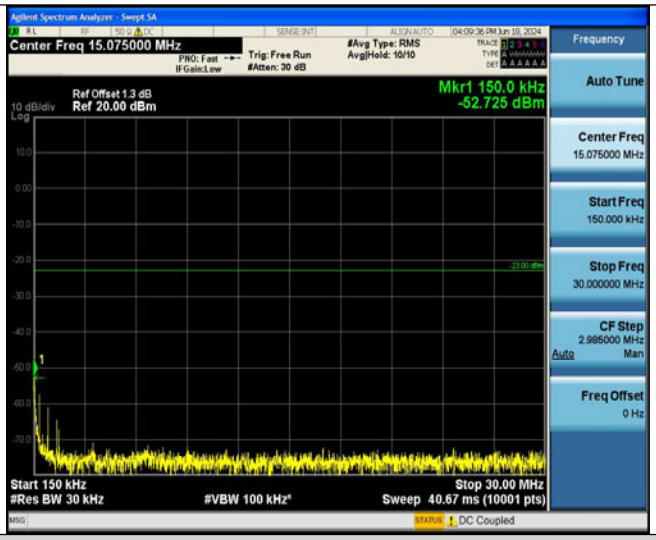


EGPRS1900-512-3000~20000MHz

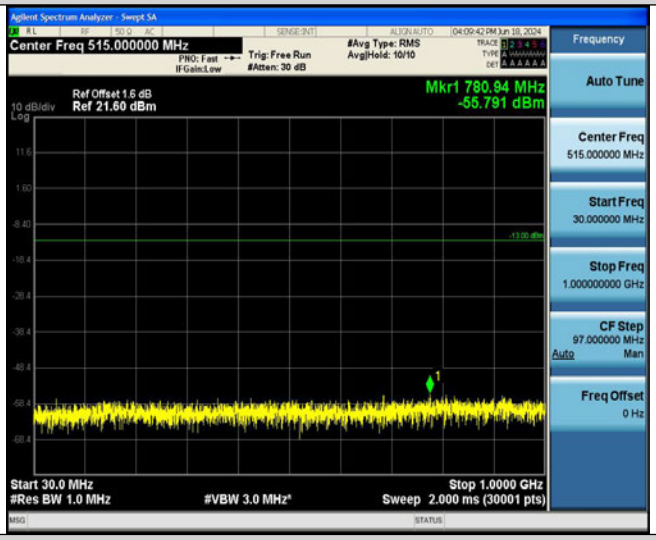
EGPRS1900-661-0.009~0.15MHz



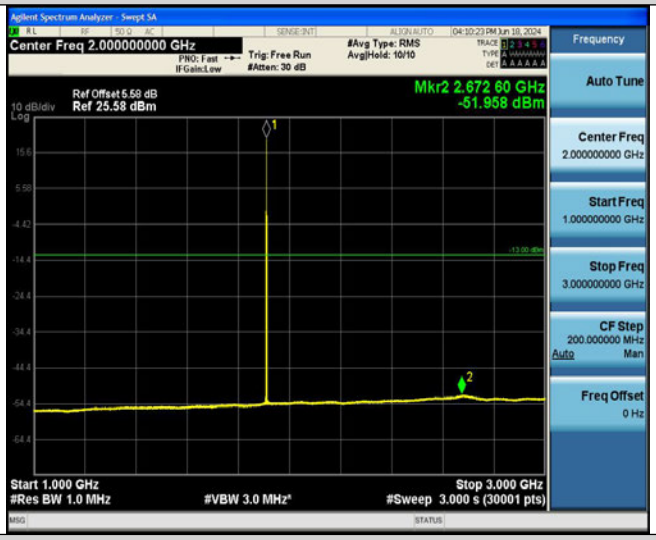
EGPRS1900-661-0.15~30MHz



EGPRS1900-661-30~1000MHz

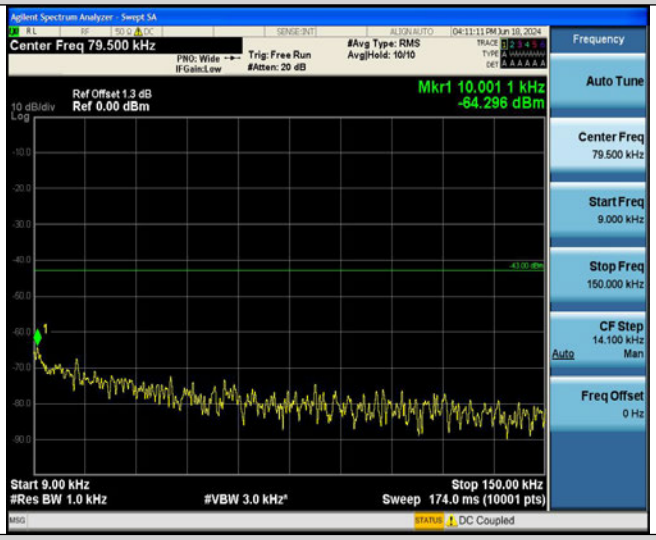


EGPRS1900-661-1000~3000MHz

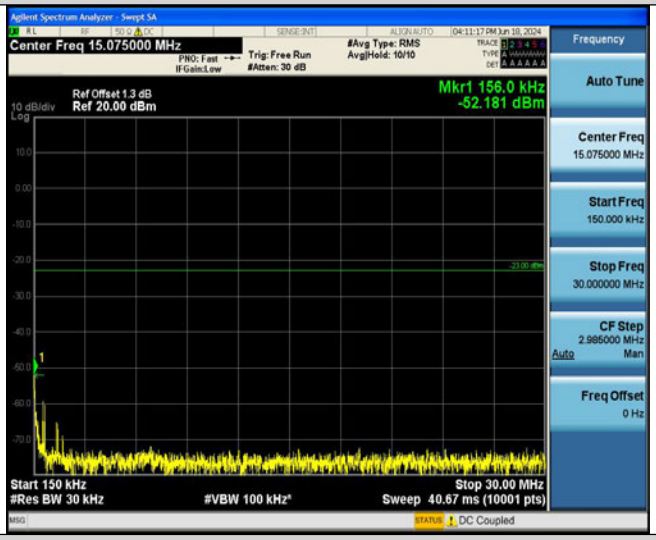


EGPRS1900-661-3000~20000MHz

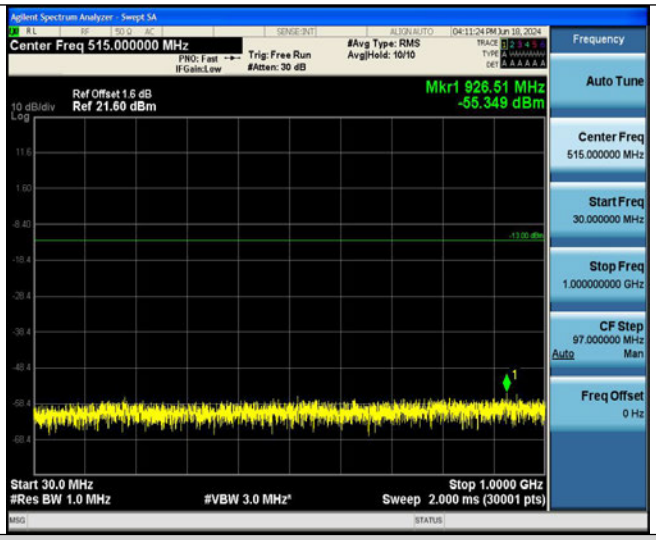
EGPRS1900-810-0.009~0.15MHz



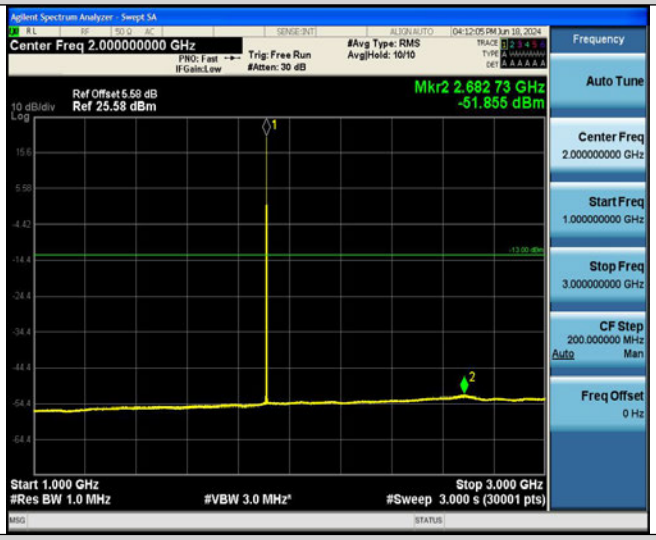
EGPRS1900-810-0.15~30MHz



EGPRS1900-810-30~1000MHz



EGPRS1900-810-1000~3000MHz



EGPRS1900-810-3000~20000MHz

Radiated method

Test limit:

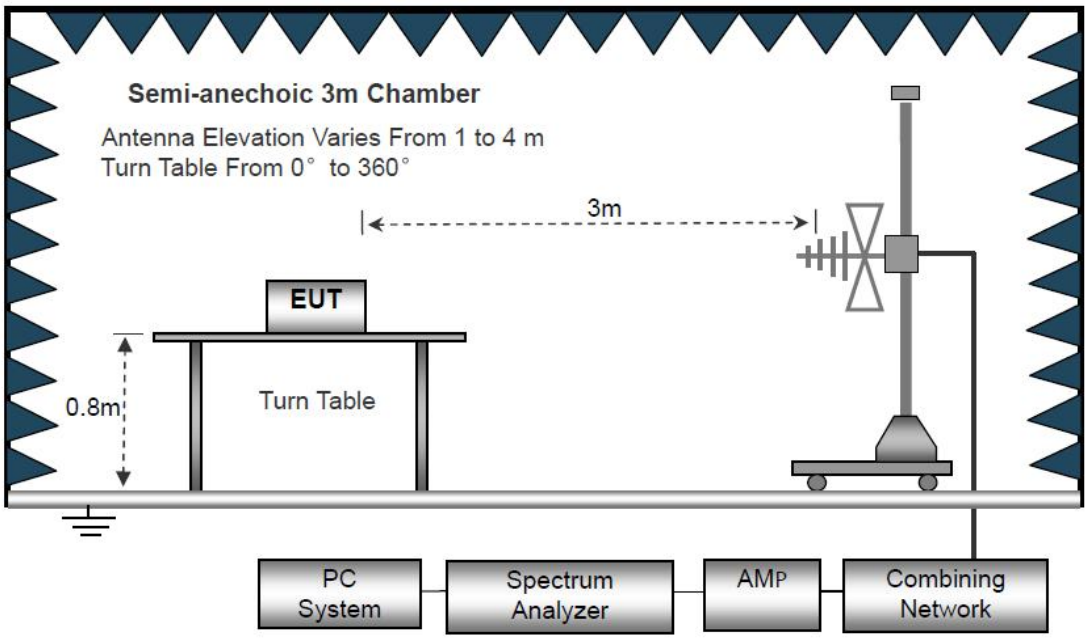
The spurious (unwanted) emission limits specified in the individual FCC rule parts applicable to licensed digital transmitters (typically referred to under the heading ‘emission limits’) normally apply to any and all emissions that are present outside of the authorized frequency band/block and apply to emissions in both the out-of-band and spurious domains. In some rule parts, the unwanted emission limits are specified by an emission mask that defines the applicable limit as a function of the frequency range relative to the authorized frequency block.
Typically, unwanted emissions are required by the licensed rule parts to be attenuated below the transmitter power by a factor of at least X + 10log(P) dB, where P represents the transmitter power expressed in watts and X is a specified scalar value (e.g., 43). This specification can be interpreted in one of two equivalent ways. First, the required attenuation can be construed to be relative to the mean carrier power, with the resultant of the equation X + 10log(P) being expressed in dBc (dB relative to the maximum carrier power). Alternatively, the specification can be interpreted as an absolute limit when the specified attenuation is actually subtracted from the maximum permissible transmitter power [i.e., 10log(P) – {X + 10log(P)}], resulting in an absolute level of -X dBW [or (-X + 30) dBm]. See section 4.

Test procedure:

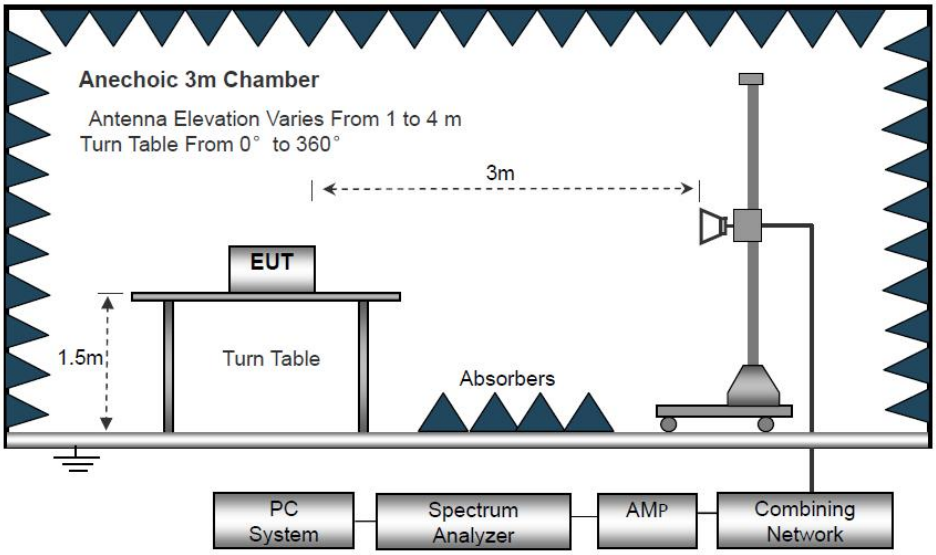
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site. The resolution bandwidth of the spectrum analyzer was set at 100 kHz below 1 GHz and 1 MHz above 1 GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonics.

Test setup:

（A）Radiated Emission Test-Up Frequency 30MHz~1GHz



（B）Radiated Emission Test-Up Frequency Above 1GHz



Note:
1, Below 30MHz no Spurious found.
2, UE is poistioned at 3 axis at the pre-scan stage, and only the measurement of the worst case is reported in this part.

List of final test modes:
GSM850:

Mode	UL Channel	Frequency	Judgement
1	128	824.2	Pass
2	190	836.6	Pass
3	251	848.8	Pass

WCDMA BANDS

PCS 1900:

Mode	UL Channel	Frequency	Judgement
1	512	1850.2	Pass
2	661	1880	Pass
3	810	1909.8	Pass

Test record:

GSM850:

Lowest Channel

Frequency(MHz)	Reading level(dBm)	Factor(dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Polarity
1648.40	-49.07	-11.00	-60.07	-13.00	47.07	Horizontal
2472.60	-40.13	-6.08	-46.21	-13.00	33.21	Horizontal
3296.80	-46.77	-4.81	-51.58	-13.00	38.58	Horizontal
1648.40	-48.76	-11.00	-59.76	-13.00	46.76	Vertical
2472.60	-30.59	-6.08	-36.67	-13.00	23.67	Vertical
3296.80	-46.04	-4.81	-50.85	-13.00	37.85	Vertical

Middle Channel

Frequency(MHz)	Reading level(dBm)	Factor(dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Polarity
1673.20	-49.27	-11.02	-60.29	-13.00	47.29	Horizontal
2509.80	-40.88	-6.13	-47.01	-13.00	34.01	Horizontal
3346.40	-46.82	-4.93	-51.75	-13.00	38.75	Horizontal
1673.20	-49.37	-11.02	-60.39	-13.00	47.39	Vertical
2509.80	-31.47	-6.13	-37.60	-13.00	24.60	Vertical
3346.40	-46.10	-4.93	-51.03	-13.00	38.03	Vertical

Highest Channel

Frequency(MHz)	Reading level(dBm)	Factor(dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Polarity
1697.60	-49.34	-11.08	-60.42	-13.00	47.42	Horizontal
2546.40	-39.82	-6.35	-46.17	-13.00	33.17	Horizontal
3395.20	-46.80	-5.17	-51.97	-13.00	38.97	Horizontal
1697.60	-48.55	-11.08	-59.63	-13.00	46.63	Vertical
2546.40	-30.56	-6.35	-36.91	-13.00	23.91	Vertical
3395.20	-46.06	-5.17	-51.23	-13.00	38.23	Vertical

Note:1. Level= Reading level+ Factor. Margin=Limit-Level.

PCS 1900:

Lowest Channel

Frequency(MHz)	Reading level(dBm)	Factor(dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Polarity
3700.40	-49.19	-1.60	-50.79	-13.00	37.79	Horizontal
5550.60	-40.16	5.38	-34.78	-13.00	21.78	Horizontal
3700.40	-49.37	-2.08	-51.45	-13.00	38.45	Vertical
5550.60	-31.07	3.81	-27.26	-13.00	14.26	Vertical

Middle Channel

Frequency(MHz)	Reading level(dBm)	Factor(dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Polarity
3760.00	-49.05	-1.31	-50.36	-13.00	37.36	Horizontal
5640.00	-39.84	6.94	-32.90	-13.00	19.90	Horizontal
3760.00	-48.87	-1.82	-50.69	-13.00	37.69	Vertical
5640.00	-31.27	4.26	-27.01	-13.00	14.01	Vertical

Highest Channel

Frequency(MHz)	Reading level(dBm)	Factor(dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Polarity
3819.60	-48.40	-1.01	-49.41	-13.00	36.41	Horizontal
5729.40	-40.59	8.23	-32.36	-13.00	19.36	Horizontal
3819.60	-49.49	-1.49	-50.98	-13.00	37.98	Vertical
5729.40	-31.28	5.74	-25.54	-13.00	12.54	Vertical

Note:1. Level= Reading level+ Factor. Margin=Limit-Level.

7. Occupied Bandwidth and Emission Bandwidth

Test limit:

The occupied bandwidth (OBW), that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission, shall be measured when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user. [¡ì2.1049(h)]

Many of the individual rule parts specify a relative OBW in lieu of the 99% OBW. In such cases, the OBW is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated by at least X dB below the transmitter power, where the value of X is typically specified as 26.

The relative OBW must be measured and reported when it is specified in the applicable rule part; otherwise, the 99% OBW shall be measured and reported. The test report shall specify which OBW is reported.

A spectrum/signal analyzer or other instrument providing a spectral display is recommended for these measurements and the video bandwidth shall be set to a value at least three times greater than the IF/resolution bandwidth to avoid any amplitude smoothing. Video filtering shall not be used during occupied bandwidth tests.

The OBW shall be measured for all operating conditions that will affect the bandwidth results (e.g. variable modulations, coding, or channel bandwidth settings). See section 4.

Test procedure:

Occupied bandwidth – relative measurement procedure

The reference value is the highest level of the spectral envelope of the modulated signal.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.

b) The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

c) Set the reference level of the instrument as required to prevent the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

d) NOTE—Steps a) through c) may require iteration to adjust within the specified tolerances.

e) The dynamic range of the spectrum analyzer at the selected RBW shall be at least 10 dB below the target “-X dB down” requirement (i.e., if the requirement calls for measuring the –26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference value).

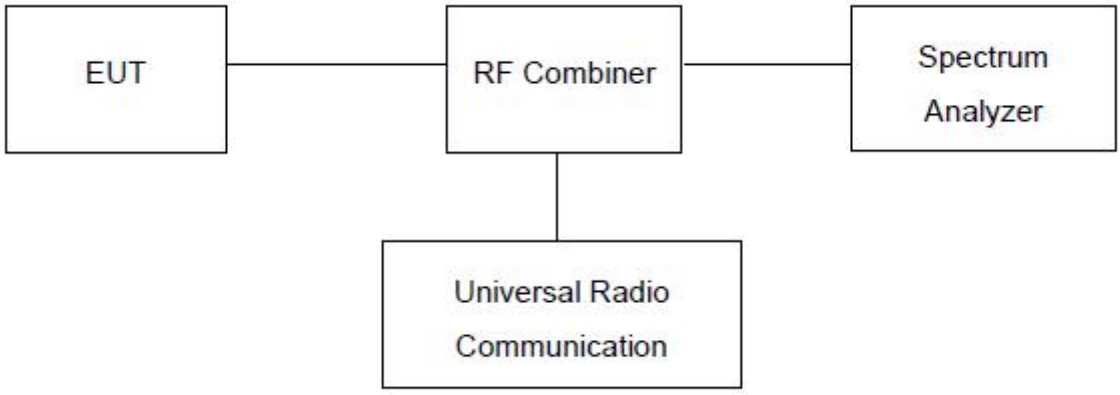
f) Set the detection mode to peak, and the trace mode to max hold.

g) Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

h) Determine the “-X dB down amplitude” as equal to (Reference Value – X). Alternatively,

this calculation can be performed by the analyzer by using the marker-delta function.
i) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "–X dB down amplitude" determined in step g). If a marker is below this "-X dB down amplitude" value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
j) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display. The frequency and amplitude axes and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).
Occupied bandwidth – power bandwidth (99%) measurement procedure
The following procedure shall be used for measuring (99 %) power bandwidth
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.
d) NOTE—Steps a) through c) may require iteration to adjust within the specified tolerances.
e) Set the detection mode to peak, and the trace mode to max hold..
f) Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.
g) If the instrument does not have a 99 % power bandwidth function, the trace data points are to be recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % power bandwidth is the difference between these two frequencies.
h) The OBW shall be reported by providing plot(s) of the measuring instrument display. The frequency and amplitude axes and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

Test setup:



Measurement Result

Band	Channel	Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Verdict
GPRS850	128	0.24582	0.3140	---	PASS
GPRS850	190	0.24528	0.3178	---	PASS
GPRS850	251	0.24256	0.3091	---	PASS
EGPRS850	128	0.24973	0.3084	---	PASS
EGPRS850	190	0.24750	0.3073	---	PASS
EGPRS850	251	0.24693	0.3028	---	PASS
GPRS1900	512	0.24575	0.3116	---	PASS
GPRS1900	661	0.24736	0.3189	---	PASS
GPRS1900	810	0.24642	0.3126	---	PASS
EGPRS1900	512	0.24107	0.2986	---	PASS
EGPRS1900	661	0.24943	0.3044	---	PASS
EGPRS1900	810	0.24517	0.2994	---	PASS

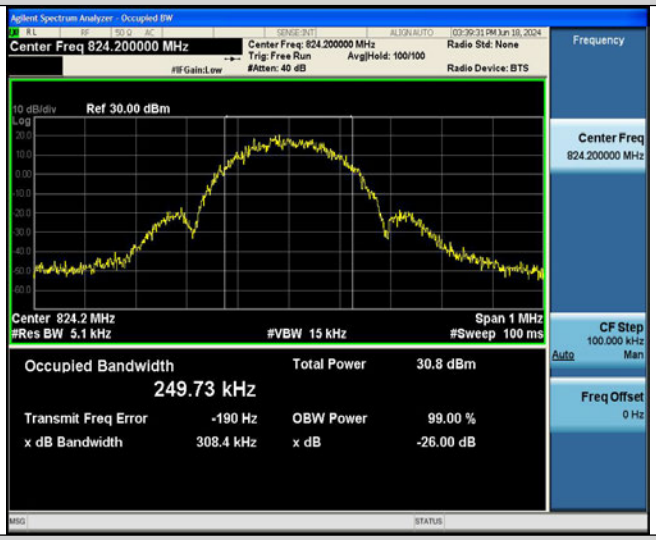
Test Plot(s)

GPRS850-128

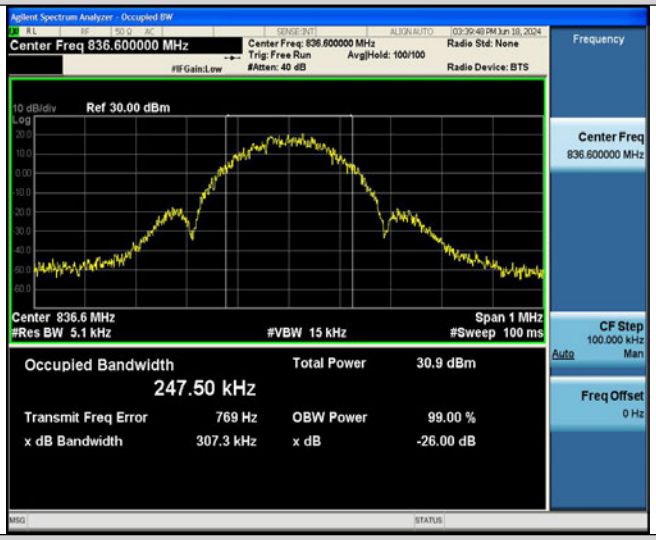
GPRS850-190

GPRS850-251

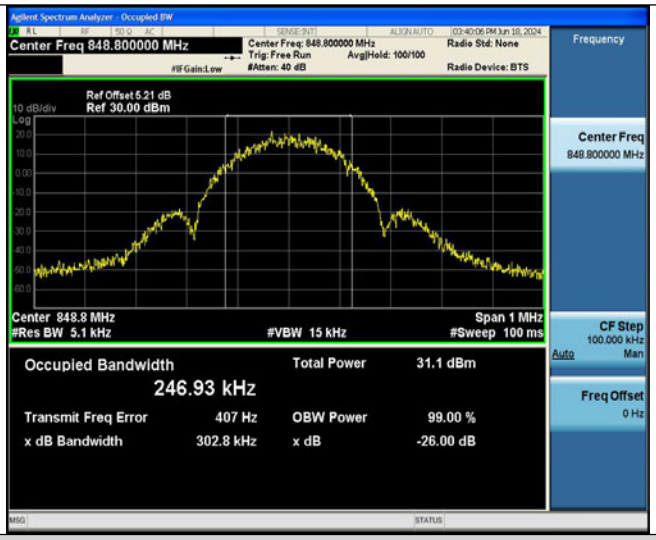
EGPRS850-128



EGPRS850-190



EGPRS850-251

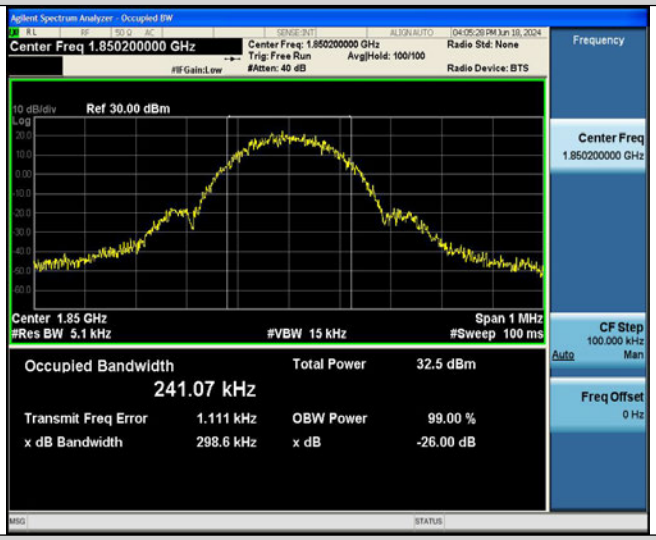


GPRS1900-512

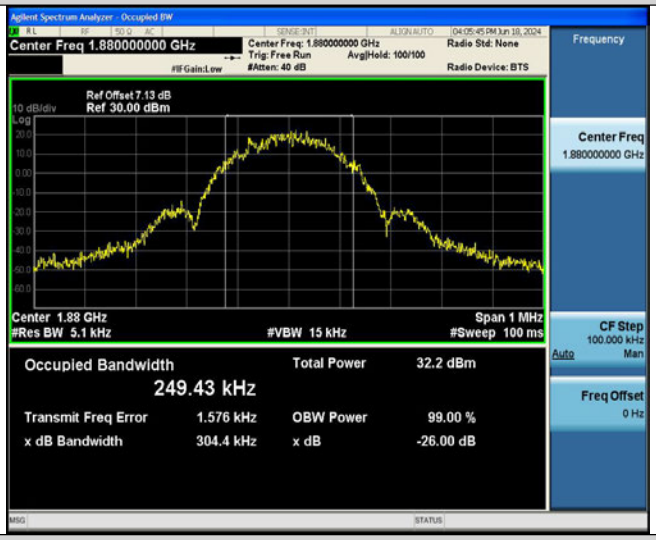
GPRS1900-661

GPRS1900-810

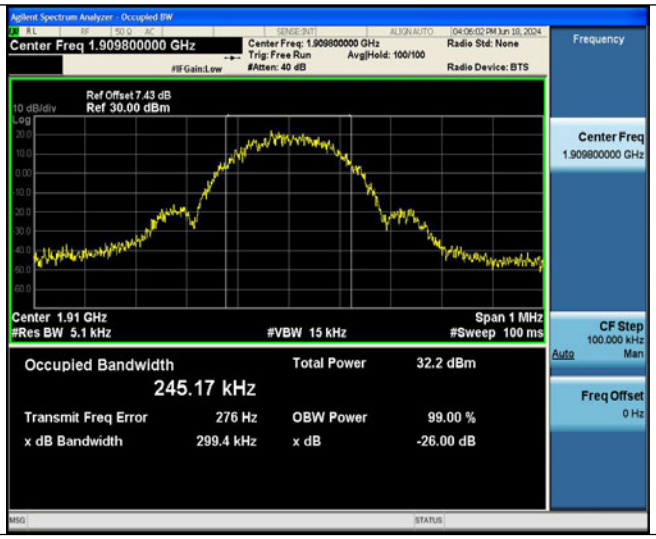
EGPRS1900-512



EGPRS1900-661



EGPRS1900-810


Agilent Spectrum Analyzer - Occupied BW
Center Freq 1.909800000 GHz
Center Freq: 1.909800000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 7.43 dB
10 dB/div
Ref 30.00 dBm
Log
Center Freq
1.909800000 GHz
Center 1.91 GHz
#Res BW 5.1 kHz
#VBW 15 kHz
Span 1 MHz
#Sweep 100 ms
CF Step
100.000 kHz
Auto
Man
Occupied Bandwidth
245.17 kHz
Total Power
32.2 dBm
Freq Offset
0 Hz
Transmit Freq Error
276 Hz
OBW Power
99.00 %
x dB Bandwidth
299.4 kHz
x dB
-26.00 dB
MSG
STATUS

8. Band Edge

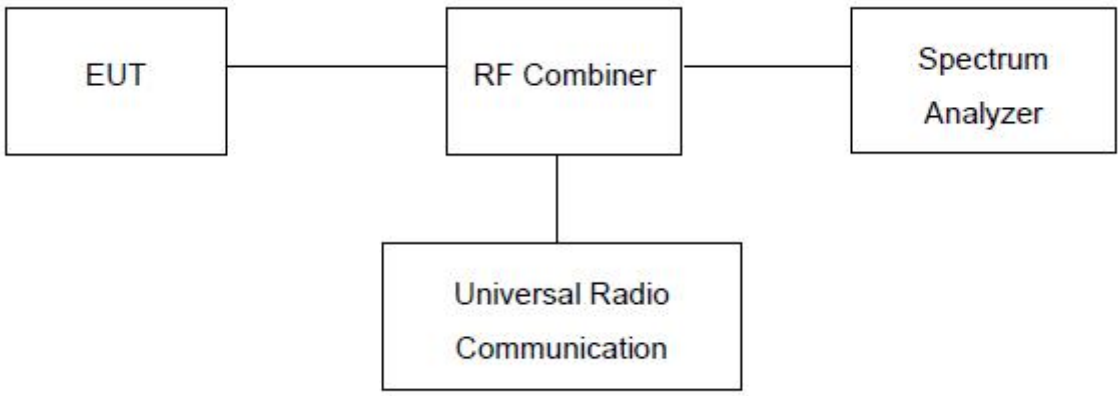
Test Limit:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified. See section 4.

Test procedure:

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Test setup:

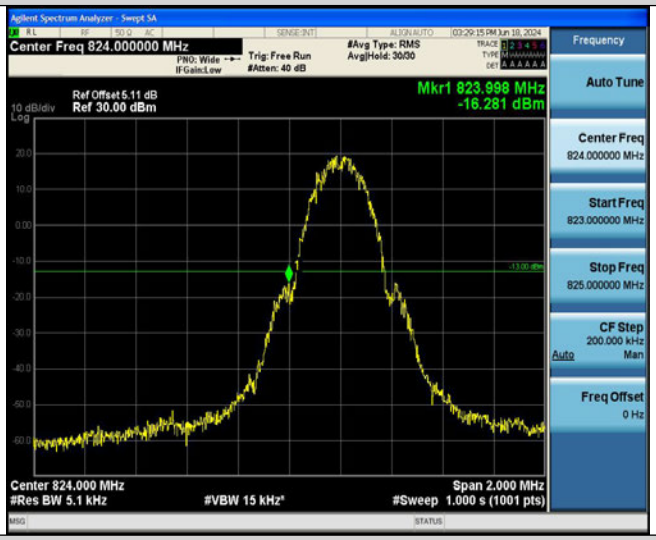


Measurement Result:

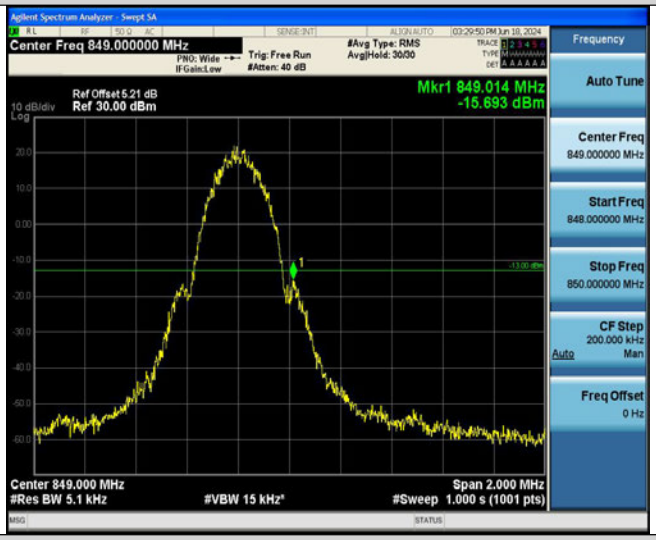
Band	Channel	Freq (MHz)	Result (dBm)	Limit(dBm)	Verdict
GPRS850	128	824.00	-16.28	-13	PASS
GPRS850	251	849.01	-15.69	-13	PASS
EGPRS850	128	823.98	-24.06	-13	PASS
EGPRS850	251	849.02	-24.40	-13	PASS
GPRS1900	512	1849.98	-16.94	-13	PASS
GPRS1900	810	1910.00	-16.61	-13	PASS
EGPRS1900	512	1849.99	-20.66	-13	PASS
EGPRS1900	810	1910.04	-23.42	-13	PASS

Test Graphs:

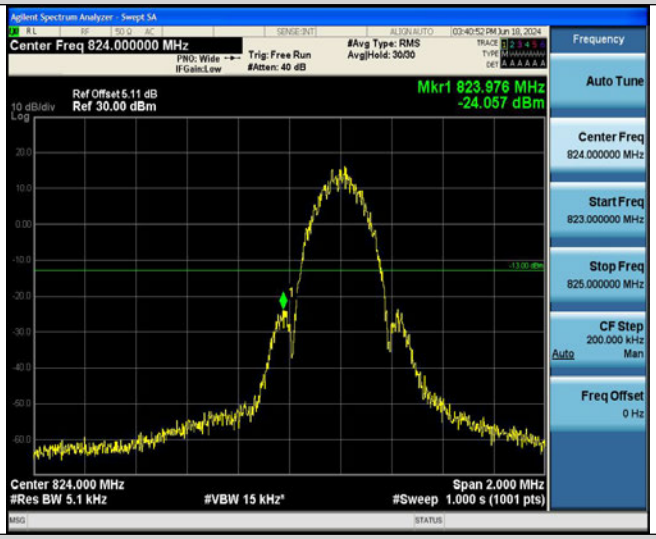
GPRS850-128



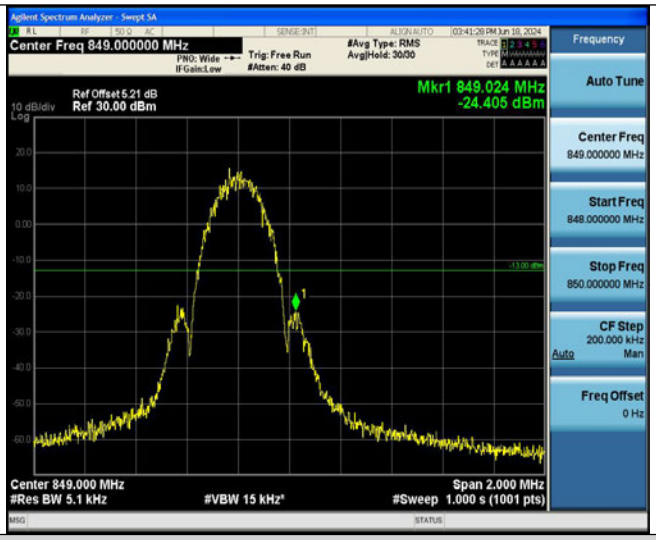
GPRS850-251



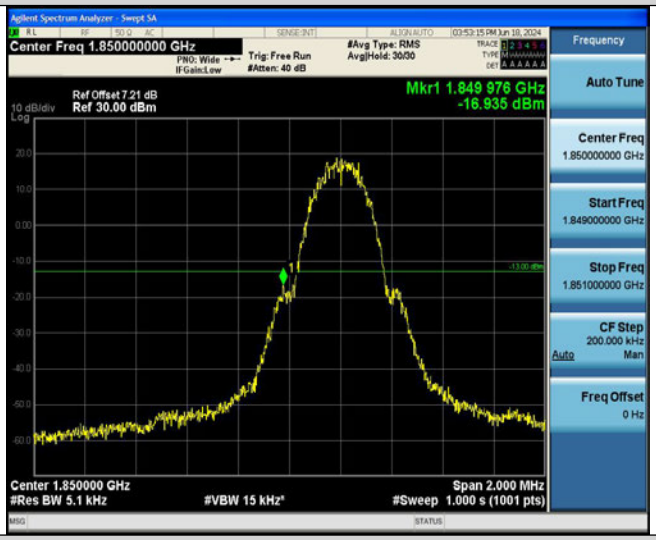
EGPRS850-128



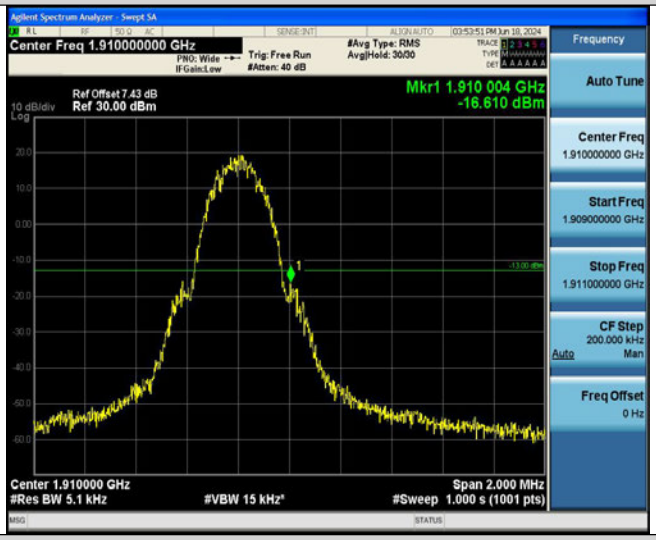
EGPRS850-251



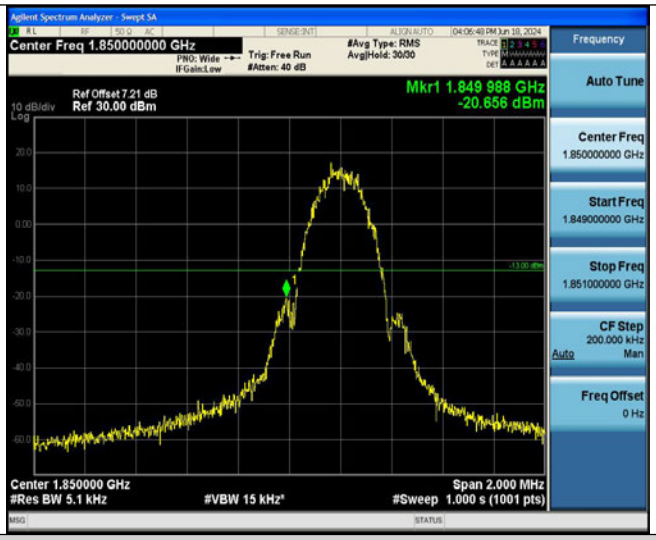
GPRS1900-512



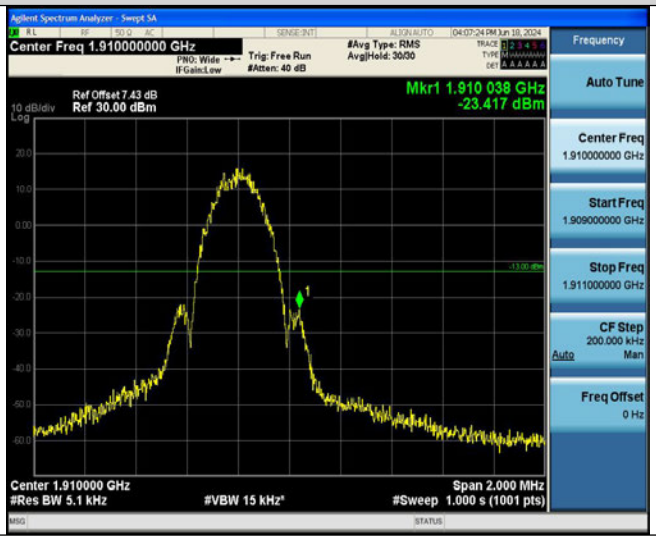
GPRS1900-810



EGPRS1900-512



EGPRS1900-810



9. Frequency Stability

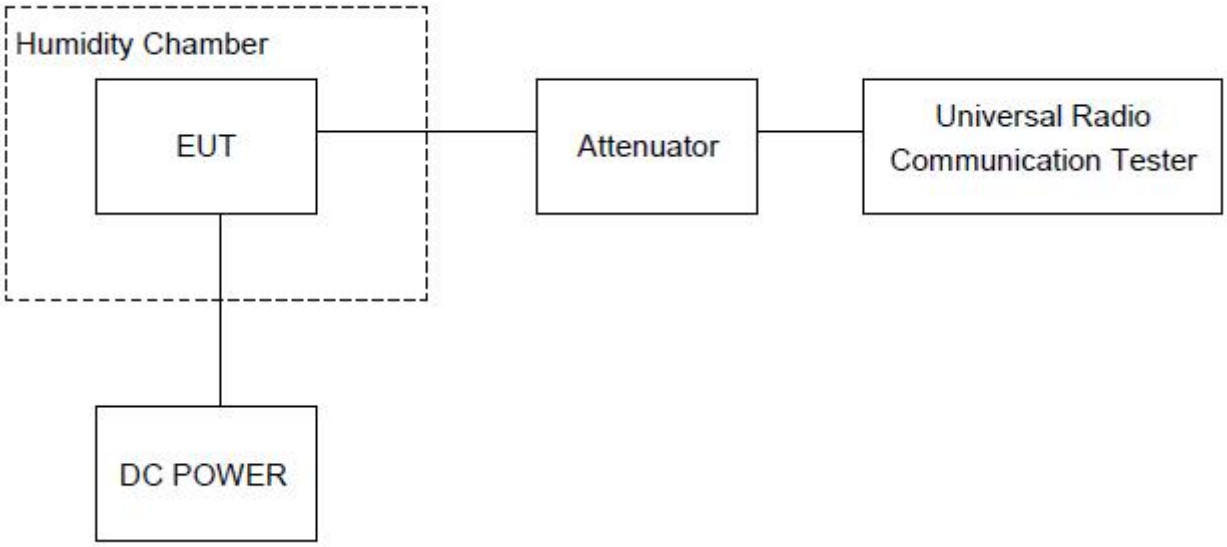
Test limit:

The frequency stability of the transmitter shall be measured while varying the ambient temperatures and supply voltages over the ranges specified in §2.1055. The specific frequency stability limits are provided in the relevant rules section(s). see section 4.

Test procedure:

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

Test setup:



9.1. Measurement Result (Worst)

Voltage							
Band	Channel	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GPRS850	128	VL	NT	30.64	0.037175	±2.5	PASS
GPRS850	128	VN	NT	31.27	0.037940	±2.5	PASS
GPRS850	128	VH	NT	32.41	0.039323	±2.5	PASS
GPRS850	190	VL	NT	30.25	0.036158	±2.5	PASS
GPRS850	190	VN	NT	32.68	0.039063	±2.5	PASS
GPRS850	190	VH	NT	30.62	0.036601	±2.5	PASS
GPRS850	251	VL	NT	29.54	0.034802	±2.5	PASS
GPRS850	251	VN	NT	31.86	0.037535	±2.5	PASS
GPRS850	251	VH	NT	30.17	0.035544	±2.5	PASS
EGPRS850	128	VL	NT	26.85	0.032577	±2.5	PASS
EGPRS850	128	VN	NT	27.81	0.033742	±2.5	PASS
EGPRS850	128	VH	NT	30.68	0.037224	±2.5	PASS
EGPRS850	190	VL	NT	28.54	0.034114	±2.5	PASS
EGPRS850	190	VN	NT	28.02	0.033493	±2.5	PASS
EGPRS850	190	VH	NT	26.96	0.032226	±2.5	PASS
EGPRS850	251	VL	NT	27.37	0.032246	±2.5	PASS
EGPRS850	251	VN	NT	30.32	0.035721	±2.5	PASS
EGPRS850	251	VH	NT	27.12	0.031951	±2.5	PASS
GPRS1900	512	VL	NT	18.98	0.010258	±2.5	PASS
GPRS1900	512	VN	NT	16.69	0.009021	±2.5	PASS
GPRS1900	512	VH	NT	22.01	0.011896	±2.5	PASS
GPRS1900	661	VL	NT	26.58	0.014138	±2.5	PASS
GPRS1900	661	VN	NT	20.94	0.011138	±2.5	PASS
GPRS1900	661	VH	NT	22.91	0.012186	±2.5	PASS
GPRS1900	810	VL	NT	22.20	0.011624	±2.5	PASS
GPRS1900	810	VN	NT	22.81	0.011944	±2.5	PASS
GPRS1900	810	VH	NT	24.48	0.012818	±2.5	PASS
EGPRS1900	512	VL	NT	18.39	0.009939	±2.5	PASS
EGPRS1900	512	VN	NT	18.83	0.010177	±2.5	PASS
EGPRS1900	512	VH	NT	16.18	0.008745	±2.5	PASS
EGPRS1900	661	VL	NT	20.19	0.010739	±2.5	PASS
EGPRS1900	661	VN	NT	17.49	0.009303	±2.5	PASS
EGPRS1900	661	VH	NT	17.93	0.009537	±2.5	PASS
EGPRS1900	810	VL	NT	19.53	0.010226	±2.5	PASS
EGPRS1900	810	VN	NT	21.58	0.011300	±2.5	PASS
EGPRS1900	810	VH	NT	20.97	0.010980	±2.5	PASS

Temperature							
Band	Channel	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GPRS850	128	NV	-30	32.46	0.039384	±2.5	PASS
GPRS850	128	NV	-20	33.35	0.040463	±2.5	PASS
GPRS850	128	NV	-10	32.06	0.038898	±2.5	PASS
GPRS850	128	NV	0	31.21	0.037867	±2.5	PASS

GPRS850	128	NV	10	32.02	0.038850	±2.5	PASS
GPRS850	128	NV	20	30.61	0.037139	±2.5	PASS
GPRS850	128	NV	30	29.83	0.036193	±2.5	PASS
GPRS850	128	NV	40	31.99	0.038813	±2.5	PASS
GPRS850	128	NV	50	30.85	0.037430	±2.5	PASS
GPRS850	190	NV	-30	31.52	0.037676	±2.5	PASS
GPRS850	190	NV	-20	30.93	0.036971	±2.5	PASS
GPRS850	190	NV	-10	30.72	0.036720	±2.5	PASS
GPRS850	190	NV	0	30.03	0.035895	±2.5	PASS
GPRS850	190	NV	10	30.45	0.036397	±2.5	PASS
GPRS850	190	NV	20	30.65	0.036636	±2.5	PASS
GPRS850	190	NV	30	30.06	0.035931	±2.5	PASS
GPRS850	190	NV	40	31.63	0.037808	±2.5	PASS
GPRS850	190	NV	50	33.23	0.039720	±2.5	PASS
GPRS850	251	NV	-30	32.00	0.037700	±2.5	PASS
GPRS850	251	NV	-20	30.18	0.035556	±2.5	PASS
GPRS850	251	NV	-10	29.78	0.035085	±2.5	PASS
GPRS850	251	NV	0	32.07	0.037783	±2.5	PASS
GPRS850	251	NV	10	30.92	0.036428	±2.5	PASS
GPRS850	251	NV	20	31.08	0.036616	±2.5	PASS
GPRS850	251	NV	30	30.91	0.036416	±2.5	PASS
GPRS850	251	NV	40	29.27	0.034484	±2.5	PASS
GPRS850	251	NV	50	29.32	0.034543	±2.5	PASS
EGPRS850	128	NV	-30	29.28	0.035525	±2.5	PASS
EGPRS850	128	NV	-20	29.46	0.035744	±2.5	PASS
EGPRS850	128	NV	-10	28.03	0.034009	±2.5	PASS
EGPRS850	128	NV	0	28.78	0.034919	±2.5	PASS
EGPRS850	128	NV	10	29.29	0.035537	±2.5	PASS
EGPRS850	128	NV	20	27.61	0.033499	±2.5	PASS
EGPRS850	128	NV	30	28.93	0.035101	±2.5	PASS
EGPRS850	128	NV	40	27.93	0.033887	±2.5	PASS
EGPRS850	128	NV	50	28.19	0.034203	±2.5	PASS
EGPRS850	190	NV	-30	27.29	0.032620	±2.5	PASS
EGPRS850	190	NV	-20	27.71	0.033122	±2.5	PASS
EGPRS850	190	NV	-10	28.76	0.034377	±2.5	PASS
EGPRS850	190	NV	0	28.01	0.033481	±2.5	PASS
EGPRS850	190	NV	10	28.54	0.034114	±2.5	PASS
EGPRS850	190	NV	20	27.13	0.032429	±2.5	PASS
EGPRS850	190	NV	30	19.88	0.023763	±2.5	PASS
EGPRS850	190	NV	40	30.02	0.035883	±2.5	PASS
EGPRS850	190	NV	50	30.61	0.036589	±2.5	PASS
EGPRS850	251	NV	-30	29.40	0.034637	±2.5	PASS
EGPRS850	251	NV	-20	28.84	0.033977	±2.5	PASS
EGPRS850	251	NV	-10	28.91	0.034060	±2.5	PASS
EGPRS850	251	NV	0	28.93	0.034083	±2.5	PASS
EGPRS850	251	NV	10	26.12	0.030773	±2.5	PASS
EGPRS850	251	NV	20	27.90	0.032870	±2.5	PASS
EGPRS850	251	NV	30	28.79	0.033918	±2.5	PASS
EGPRS850	251	NV	40	26.79	0.031562	±2.5	PASS
EGPRS850	251	NV	50	29.39	0.034625	±2.5	PASS

GPRS1900	512	NV	-30	22.30	0.012053	±2.5	PASS
GPRS1900	512	NV	-20	21.25	0.011485	±2.5	PASS
GPRS1900	512	NV	-10	21.59	0.011669	±2.5	PASS
GPRS1900	512	NV	0	21.97	0.011874	±2.5	PASS
GPRS1900	512	NV	10	19.30	0.010431	±2.5	PASS
GPRS1900	512	NV	20	22.32	0.012064	±2.5	PASS
GPRS1900	512	NV	30	18.18	0.009826	±2.5	PASS
GPRS1900	512	NV	40	23.97	0.012955	±2.5	PASS
GPRS1900	512	NV	50	18.72	0.010118	±2.5	PASS
GPRS1900	661	NV	-30	25.62	0.013628	±2.5	PASS
GPRS1900	661	NV	-20	24.09	0.012814	±2.5	PASS
GPRS1900	661	NV	-10	24.24	0.012894	±2.5	PASS
GPRS1900	661	NV	0	21.98	0.011691	±2.5	PASS
GPRS1900	661	NV	10	26.85	0.014282	±2.5	PASS
GPRS1900	661	NV	20	26.16	0.013915	±2.5	PASS
GPRS1900	661	NV	30	24.50	0.013032	±2.5	PASS
GPRS1900	661	NV	40	25.74	0.013691	±2.5	PASS
GPRS1900	661	NV	50	26.94	0.014330	±2.5	PASS
GPRS1900	810	NV	-30	24.50	0.012829	±2.5	PASS
GPRS1900	810	NV	-20	26.21	0.013724	±2.5	PASS
GPRS1900	810	NV	-10	25.30	0.013247	±2.5	PASS
GPRS1900	810	NV	0	26.03	0.013630	±2.5	PASS
GPRS1900	810	NV	10	25.87	0.013546	±2.5	PASS
GPRS1900	810	NV	20	22.19	0.011619	±2.5	PASS
GPRS1900	810	NV	30	25.06	0.013122	±2.5	PASS
GPRS1900	810	NV	40	25.42	0.013310	±2.5	PASS
GPRS1900	810	NV	50	23.49	0.012300	±2.5	PASS
EGPRS1900	512	NV	-30	17.85	0.009648	±2.5	PASS
EGPRS1900	512	NV	-20	19.42	0.010496	±2.5	PASS
EGPRS1900	512	NV	-10	17.90	0.009675	±2.5	PASS
EGPRS1900	512	NV	0	17.84	0.009642	±2.5	PASS
EGPRS1900	512	NV	10	16.64	0.008994	±2.5	PASS
EGPRS1900	512	NV	20	18.35	0.009918	±2.5	PASS
EGPRS1900	512	NV	30	16.36	0.008842	±2.5	PASS
EGPRS1900	512	NV	40	16.32	0.008821	±2.5	PASS
EGPRS1900	512	NV	50	16.68	0.009015	±2.5	PASS
EGPRS1900	661	NV	-30	14.79	0.007867	±2.5	PASS
EGPRS1900	661	NV	-20	21.16	0.011255	±2.5	PASS
EGPRS1900	661	NV	-10	18.61	0.009899	±2.5	PASS
EGPRS1900	661	NV	0	18.77	0.009984	±2.5	PASS
EGPRS1900	661	NV	10	18.68	0.009936	±2.5	PASS
EGPRS1900	661	NV	20	18.39	0.009782	±2.5	PASS
EGPRS1900	661	NV	30	15.70	0.008351	±2.5	PASS
EGPRS1900	661	NV	40	23.05	0.012261	±2.5	PASS
EGPRS1900	661	NV	50	22.32	0.011872	±2.5	PASS
EGPRS1900	810	NV	-30	22.66	0.011865	±2.5	PASS
EGPRS1900	810	NV	-20	23.90	0.012514	±2.5	PASS
EGPRS1900	810	NV	-10	19.86	0.010399	±2.5	PASS
EGPRS1900	810	NV	0	19.34	0.010127	±2.5	PASS
EGPRS1900	810	NV	10	20.47	0.010718	±2.5	PASS

EGPRS1900	810	NV	20	19.55	0.010237	±2.5	PASS
EGPRS1900	810	NV	30	17.49	0.009158	±2.5	PASS
EGPRS1900	810	NV	40	20.87	0.010928	±2.5	PASS
EGPRS1900	810	NV	50	21.37	0.011190	±2.5	PASS

15 APPENDIX I -- TEST SETUP PHOTOGRAPH

Refer to ”Test Setup Photos”.

16 APPENDIX II -- EUT PHOTOGRAPH

Refer to " External Photos" and "Internal Photos".

******THE END REPORT******