



**CFR 47 FCC PART 22 H
CFR 47 FCC PART 24 E**

TEST REPORT

For

MD-PH-001

MODEL NUMBER: MD-PH-001

REPORT NUMBER: 4791159315-3-RF-6

ISSUE DATE: July 31, 2024

FCC ID: 2AY45-MD-PH-001

Prepared for

**Chengdu Shuiyueyu Technology Co.,Ltd.
4th Floor, Building 2, No. 606, West Section of Haike Road, Chengdu Cross-Strait
Science and Technology Industrial Development Park, Wenjiang District,
Chengdu**

Prepared by

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
<u>V0</u>	<u>July 31, 2024</u>	<u>Initial Issue</u>	<u>\</u>

Note:

1. This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

2. The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 22 H >< CFR 47 FCC PART 24 E> > < when <Simple Acceptance> decision rule is applied.

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Chengdu Shuiyueyu Technology Co., Ltd.
 Address: 4th Floor, Building 2, No. 606, West Section of Haike Road, Chengdu Cross-Strait Science and Technology Industrial Development Park, Wenjiang District, Chengdu

Manufacturer Information

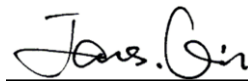
Company Name: Chengdu Shuiyueyu Technology Co., Ltd.
 Address: 4th Floor, Building 2, No. 606, West Section of Haike Road, Chengdu Cross-Strait Science and Technology Industrial Development Park, Wenjiang District, Chengdu

EUT Information

EUT Name: MD-PH-001
 Model: MD-PH-001
 Brand: \
 Sample Received Date: Mar. 21, 2024
 Sample Status: Normal
 Sample ID: 7236063
 Date of Tested: March 22, 2024 to July 31, 2024

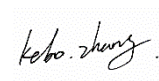
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 22 H	PASS
CFR 47 FCC PART 24 E	PASS

Prepared By:



James Qin
 Project Engineer

Checked By:



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 Senior Project Engineer

Approved By:



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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.26-2015, 971168 D01 Power Meas License Digital Systems v03r01, 971168 D02 Misc Rev Approv License Devices v02r01, 412172 D01 v01r01 Determining ERP and EIRP, CFR 47 FCC Part 2, Part 22 H, Part 24 E.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	<p>A2LA (Certificate No.: 4102.01) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA.</p> <p>FCC (FCC Designation No.: CN1187) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules</p> <p>ISED (Company No.: 21320) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046.</p> <p>VCCI (Registration No.: G-20192, C-20153, T-20155 and R-20202) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20192 and R-20202. Shielding Room B, the VCCI registration No. is C-20153 and T-20155.</p>
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Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30 MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30 MHz had been correlated to measurements performed on an OFS.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conduction emission	3.62 dB
Radiated Emission (Included Fundamental Emission) (9 kHz ~ 30 MHz)	2.2 dB
Radiated Emission (Included Fundamental Emission) (30 MHz ~ 1 GHz)	4.00 dB
Radiated Emission (Included Fundamental Emission) (1 GHz to 40 GHz)	5.78 dB (1 GHz-18 GHz)
	5.23dB (18 GHz-26 GHz)
	5.64 dB (26 GHz-40 GHz)
Bandwidth	1.1 %
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name:	MD-PH-001
Model:	MD-PH-001

5.2. TEST CHANNEL CONFIGURATION

Band	Mode	Low	Middle	High
GSM850	GRPS/EGPRS	128	190	251
		824.2 MHz	836.6 MHz	848.8 MHz
GSM1900	GRPS/EGPRS	512	661	810
		1850.2 MHz	1880.0 MHz	1909.8 MHz

5.3. MAXIMUM AVERAGE OUTPUT POWER

GSM 850					
Part 22H					
ERP Limit(W)		7			
Antenna Gain (dBi)		-0.23			
Mode	Frequency Range (MHz)	Conducted Average power (dBm)	ERP (W)	99% OBW (MHz)	Emission Designator
GSM	824.2 ~ 848.8	33.55	1.31	0.244	244KGXW
GRPS(GMSK)	824.2 ~ 848.8	33.49	1.29	0.243	243KGXW
EGPRS(8PSK)	824.2 ~ 848.8	33.45	1.28	0.249	249KG7W

GSM 1900					
Part 24					
EIRP Limit(W)		2.0			
Antenna Gain (dBi)		0.78			
Mode	Frequency Range (MHz)	Conducted Average power (dBm)	EIRP (W)	99% OBW (MHz)	Emission Designator
GSM	1850.2 ~ 1909.8	29.35	1.03	0.244	244KGXW
GRPS(GMSK)	1850.2 ~ 1909.8	29.34	1.03	0.248	248KGXW
EGPRS(8PSK)	1850.2 ~ 1909.8	29.38	1.04	0.255	255KG7W

5.4. WORST-CASE CONFIGURATION AND MODE

The radiated spurious emissions measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that X orientation was the worst-case orientation.

Radiated spurious emissions were investigated below 30 MHz, 30 MHz - 1 GHz and above 1 GHz. There were no emissions found on below 1GHz and above 18 GHz, the emissions between 1 GHz – 18 GHz were tested at the low, mid, high channel and the worst configuration.

For GSM850/1900, GPRS worst results are shown in test report.

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

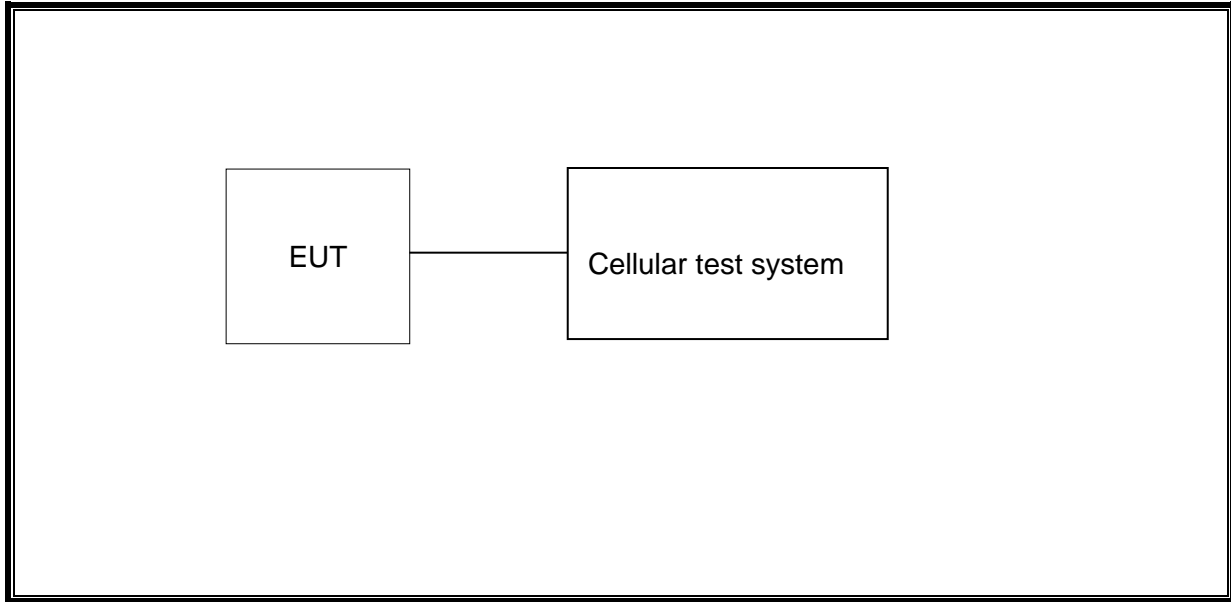
Antenna	Band	Antenna Type	MAX Antenna Gain (dBi)
Ant0	GSM850	LDS Antenna	-0.23
Ant0	GSM1900	LDS Antenna	0.78

Band	Transmit and Receive Mode	Description
GSM850	<input checked="" type="checkbox"/> 1TX, 2RX	Ant0 antenna can be used as transmitting/receiving antenna, DIV antenna can be used as receiving antenna
GSM1900	<input checked="" type="checkbox"/> 1TX, 2RX	Ant0 antenna can be used as transmitting/receiving antenna, DIV antenna can be used as receiving antenna

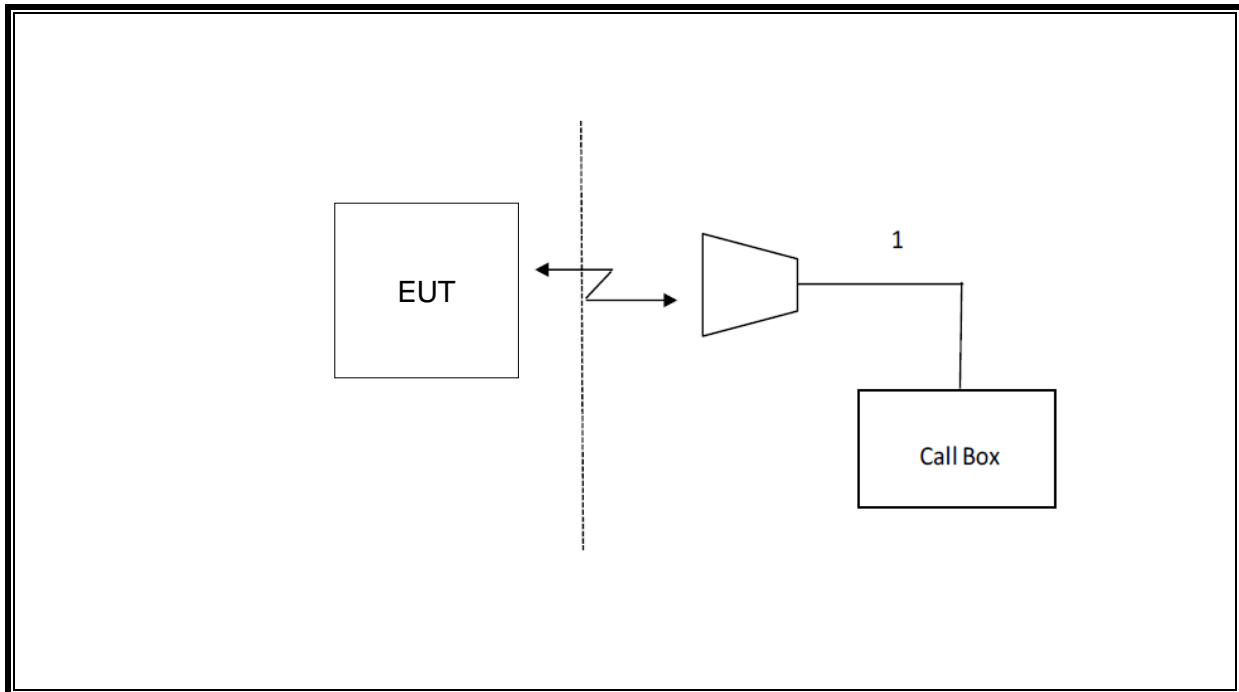
Note: The value of the antenna gain was declared by customer.

5.6. DESCRIPTION OF TEST SETUP

Conducted



Radiated



6. MEASURING INSTRUMENT AND SOFTWARE USED

Antenna Terminal Test						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	R&S	FSV40	S422060001	Oct.12, 2023	Oct.11, 2024
<input checked="" type="checkbox"/>	Wideband Radio Communication Tester	R&S	CMW500	155523	Oct.12, 2023	Oct.11, 2024
Software						
Used	Description	Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Tonsend Cellular Test System	Tonsend	JS1120 RF Auto Test System	3.1.46		
Radiated Test						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Oct.12, 2023	Oct.11, 2024
<input checked="" type="checkbox"/>	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130959	Aug.02, 2021	Aug.01, 2024
<input checked="" type="checkbox"/>	Preamplifier	HP	8447D	2944A09099	Oct.12, 2023	Oct.11, 2024
<input checked="" type="checkbox"/>	EMI Measurement Receiver	R&S	ESR26	101377	Oct.12, 2023	Oct.11, 2024
<input checked="" type="checkbox"/>	Horn Antenna	TDK	HRN-0118	130939	April 29, 2022	April 30, 2025
<input checked="" type="checkbox"/>	Horn Antenna	Schwarzbeck	BBHA9170	856	Feb 28, 2022	Feb 28, 2025
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-0118	TRS-305-00067	Oct.12, 2023	Oct.11, 2024
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-2	TRS-307-00003	Oct.12, 2023	Oct.11, 2024
<input checked="" type="checkbox"/>	Loop antenna	Schwarzbeck	1519B	00008	Dec.14, 2021	Dec.13, 2024
<input checked="" type="checkbox"/>	High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Oct.12, 2023	Oct.11, 2024
Software						
Used	Description	Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance	Farad	EZ-EMC	Ver. UL-3A1		

7. ANTENNA TERMINAL TEST RESULTS

7.1. EFFECTIVE (ISOTROPIC) RADIATED POWER OF TRANSMITTER

RULE PART(S)

FCC: §2.1046, §22.913, §24.232

LIMITS

22.913(a) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50(c) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

27.50(d) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watts EIRP.

27.50(h) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

TEST PROCEDURE

Refer to ANSI C63.26:2015 and KDB 971168 D01 Section 5.6

$ERP/ EIRP = P_{Meas} + GT - LC$

where:

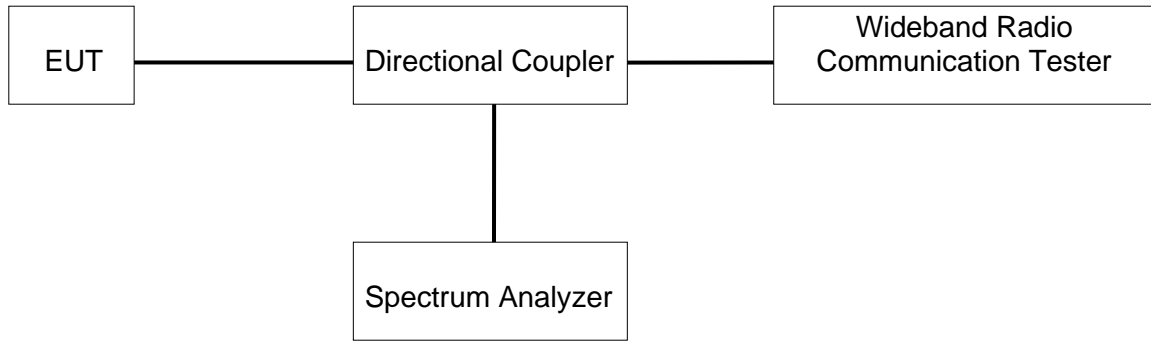
ERP or EIRP = effective or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas} , typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB

The transmitter has a maximum radiated ERP / EIRP output powers as follows:

TEST SETUP

TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	64.3%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.87 V

Test Result

Band		Channel	Channel	Channel
		128	190	251
GSM850 (CS)		33.55	33.47	33.22
GPRS/EGPRS (GMSK)	1 TimeSlot	33.49	33.42	33.16
	2 TimeSlots	32.70	32.62	32.39
	3 TimeSlots	30.97	30.84	30.59
	4 TimeSlots	29.87	29.79	29.53
EGPRS (8PSK)	1 TimeSlot	33.45	33.36	33.11
	2 TimeSlots	32.67	32.59	32.36
	3 TimeSlots	30.94	30.82	30.57
	4 TimeSlots	29.86	29.77	29.52

Band		Channel	Channel	Channel
		512	661	810
GSM1900 (CS)		28.33	29.35	28.67
GPRS/EGPRS (GMSK)	1 TimeSlot	28.30	29.34	28.67
	2 TimeSlots	27.62	28.65	27.97
	3 TimeSlots	25.88	26.89	26.32
	4 TimeSlots	24.83	25.81	25.25
EGPRS (8PSK)	1 TimeSlot	28.35	29.38	28.69
	2 TimeSlots	27.64	28.66	27.99
	3 TimeSlots	25.93	26.90	26.31
	4 TimeSlots	24.87	25.83	25.26

7.2. PEAK TO AVERAGE RADIO

LIMITS

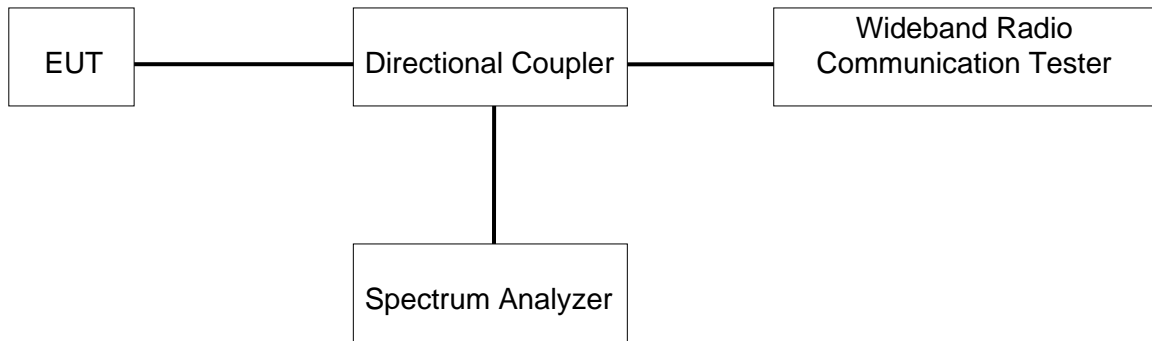
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

TEST PROCEDURE

Refer to KDB 971168 D01 Power Meas License Digital Systems v03r01;

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The PAR was measured on the Spectrum Analyzer.

TEST SETUP



TEST ENVIRONMENT

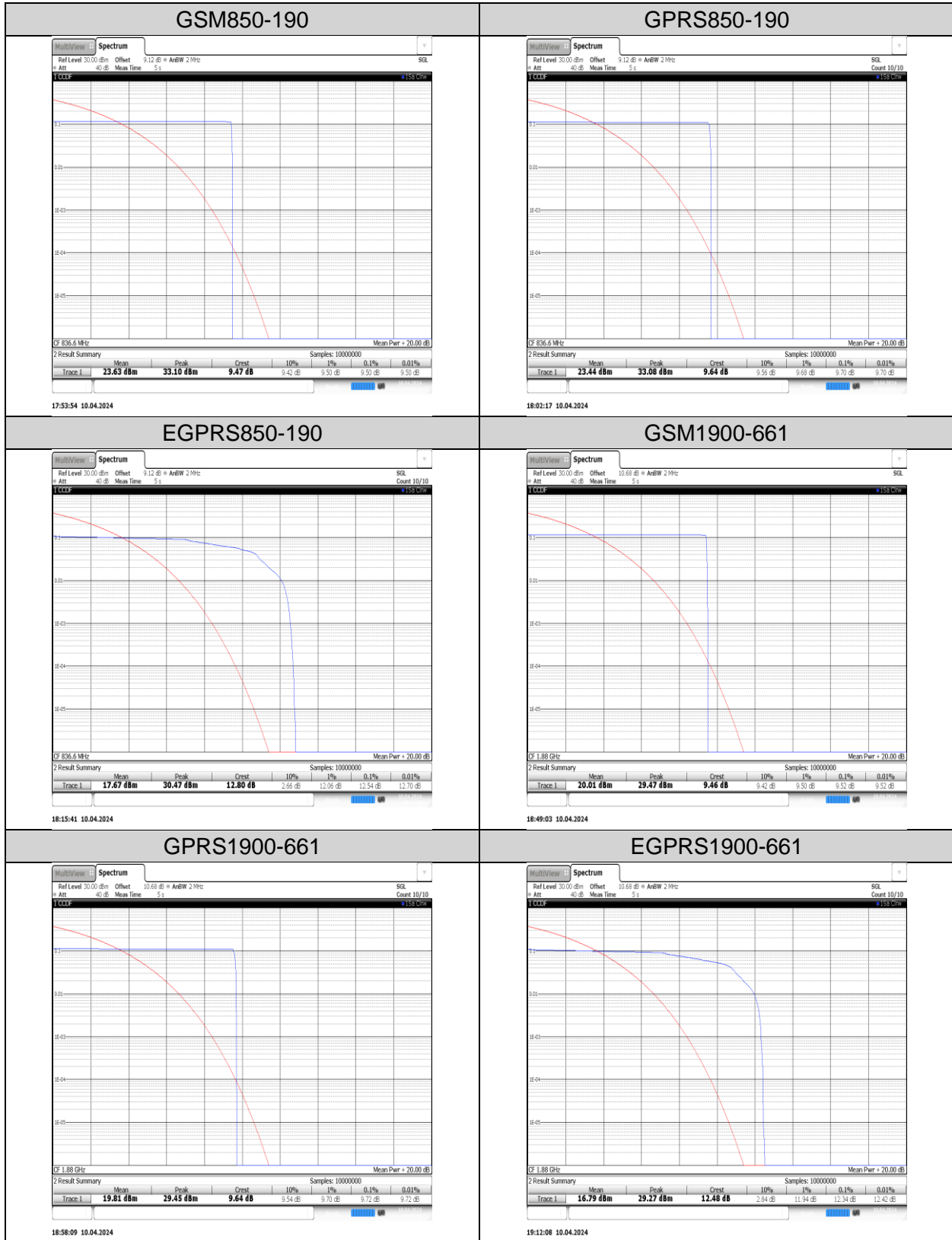
Temperature	23.4°C	Relative Humidity	64.3%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.87 V

Test Result

Middle was used to measure as the worst case. The results from all CCDF plots are passed with 13dB peak-to-average power ratio criteria.

Band	Channel	Result(dB)	Limit(dB)	Verdict
GSM850	190	9.50	13	PASS
GPRS850	190	9.70	13	PASS
EGPRS850	190	12.54	13	PASS
GSM1900	661	9.52	13	PASS
GPRS1900	661	9.72	13	PASS
EGPRS1900	661	12.34	13	PASS

Test Graphs



7.3. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049.

LIMITS

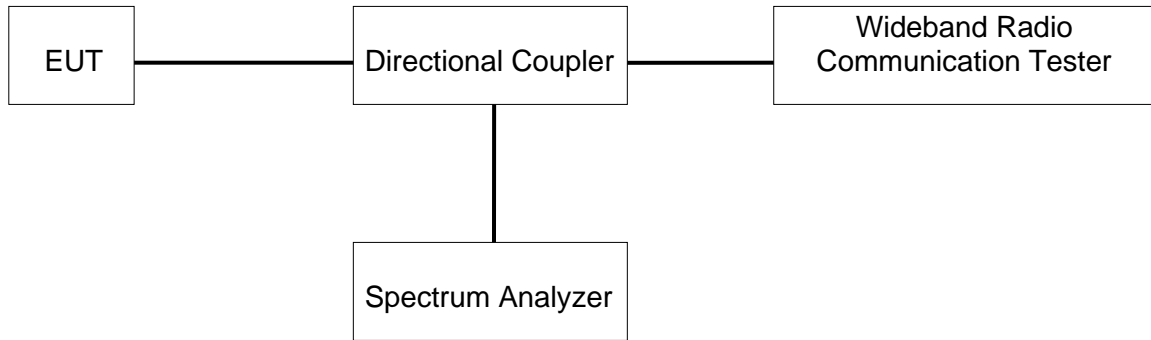
For reporting purposes only.

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

(Refer to KDB 971168 D01 Power Meas License Digital Systems v03r01)

TEST SETUP



TEST ENVIRONMENT

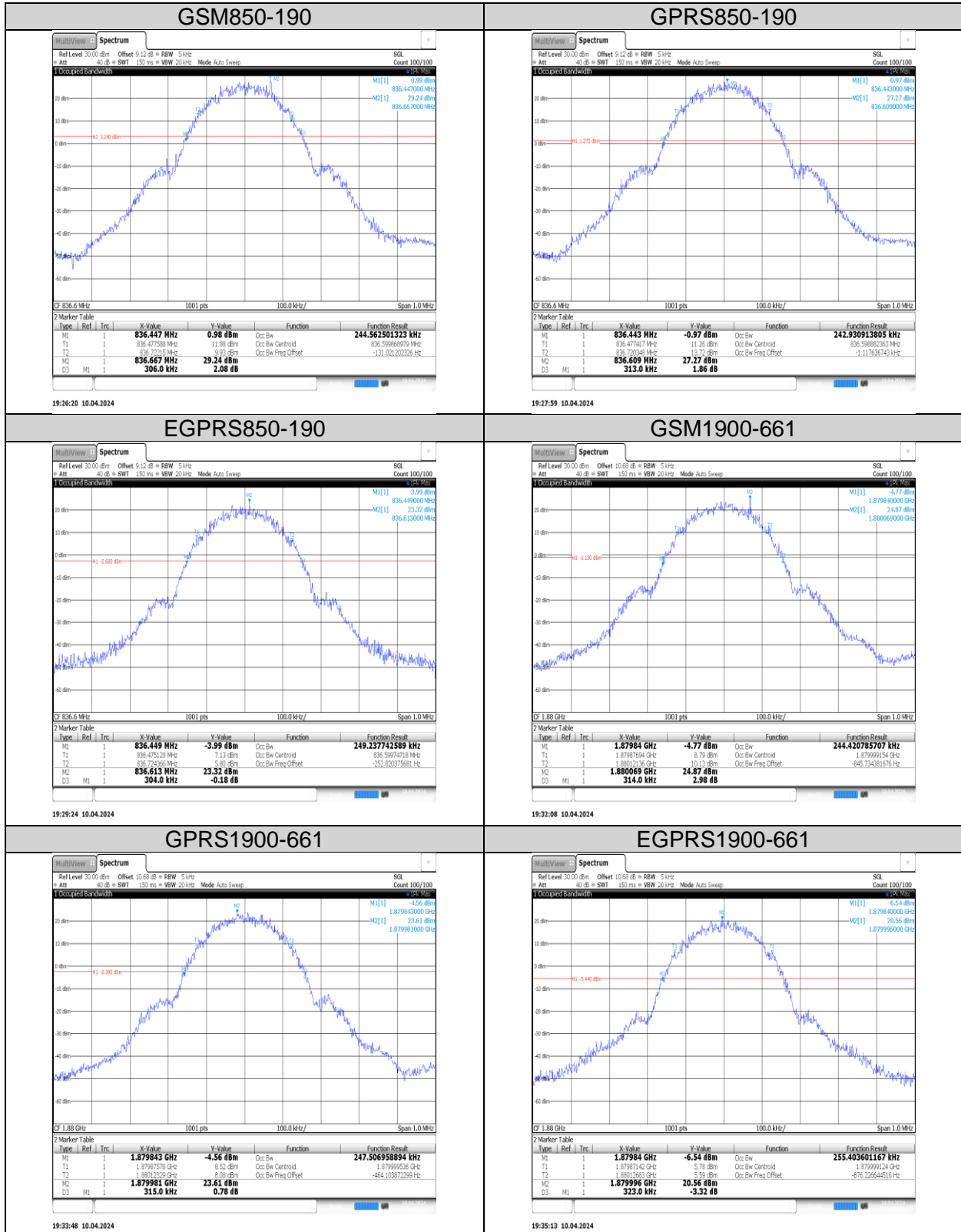
Temperature	23.4°C	Relative Humidity	64.3%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.87 V

Test Result

There is no limit required and power is the same for low, middle and high channel, therefore, only middle channel was tested.

Band	Channel	Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Verdict
GSM850	190	0.245	0.31	---	PASS
GPRS850	190	0.243	0.31	---	PASS
EGPRS850	190	0.249	0.30	---	PASS
GSM1900	661	0.244	0.31	---	PASS
GPRS1900	661	0.248	0.31	---	PASS
EGPRS1900	661	0.255	0.32	---	PASS

Test Graphs



7.4. BAND EDGE EMISSIONS

RULE PART(S)

FCC §2.1051, §22.917, §24.238

LIMITS

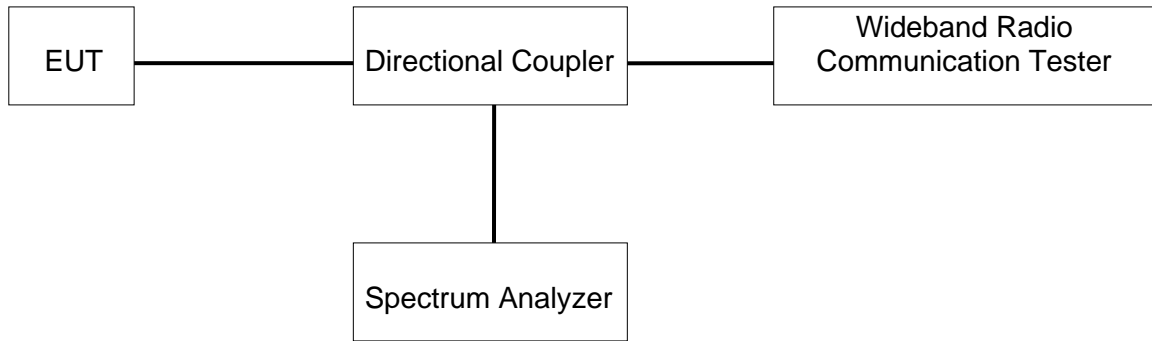
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

TEST PROCEDURE

Refer to KDB 971168 D01 Power Meas License Digital Systems v03r01

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

- a) Set the RBW = 1 ~ 1.5 % of OBW (Typically limited to a minimum RBW of 1% of the OBW)
- b) Set VBW $\geq 3 \times$ RBW;
- c) Set span ≥ 1.5 times the OBW;
- d) Sweep time = Auto;
- e) Detector = RMS;
- f) Ensure that the number of measurement points $\geq 2 \times$ Span/RBW;
- g) Trace mode = Average (100);

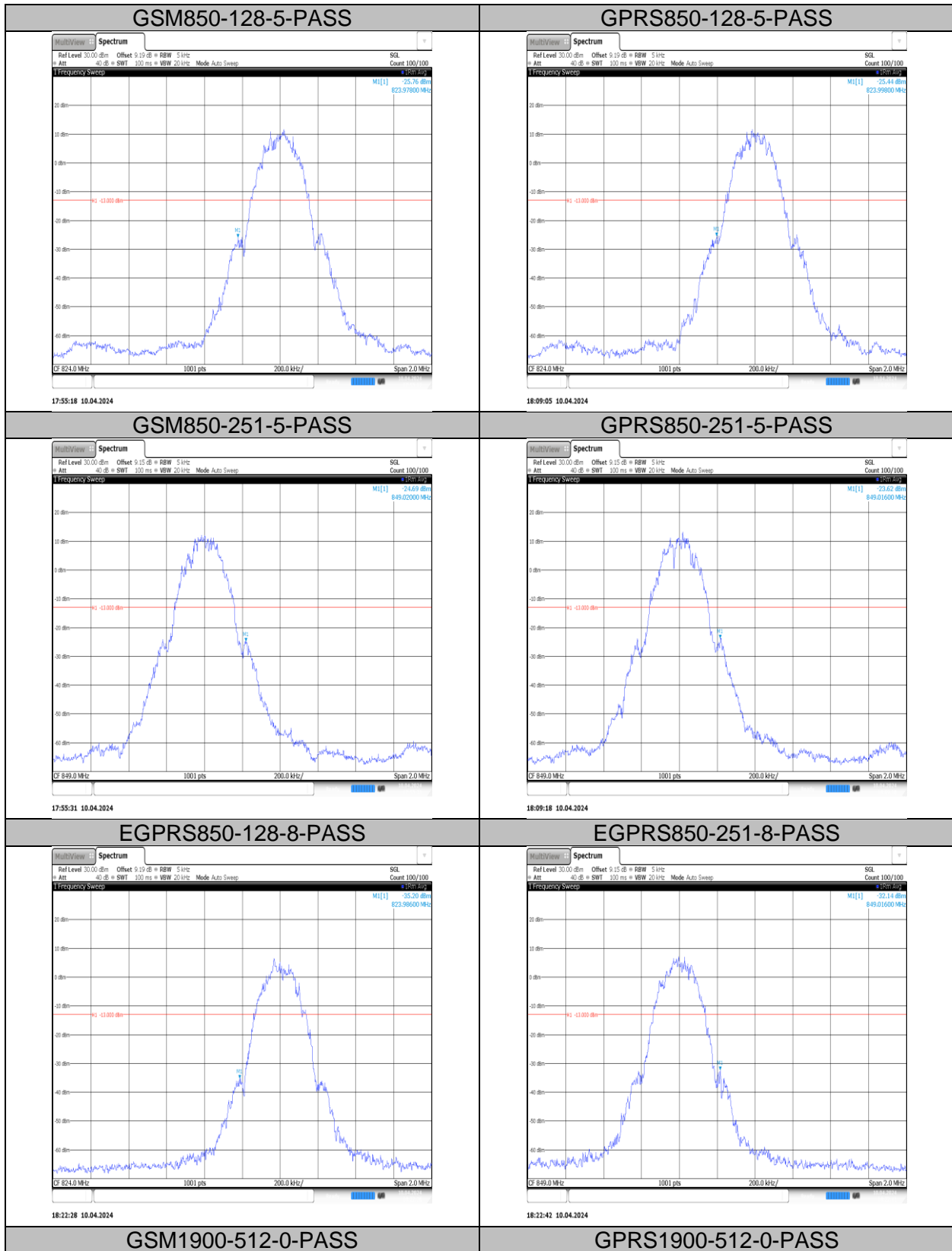
TEST SETUP

TEST ENVIRONMENT

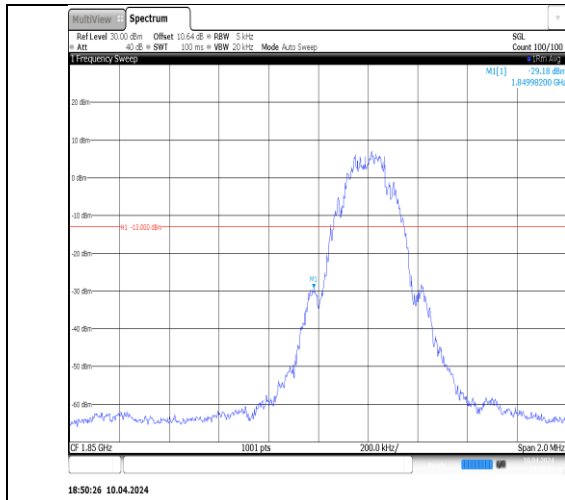
Temperature	23.4°C	Relative Humidity	64.3%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.87 V

Test Result

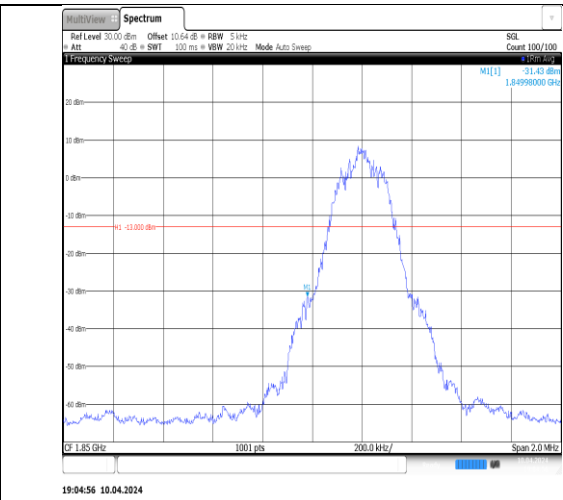
Band	Channel	Freq (MHz)	Result (dBm)	Limit(dBm)	Verdict
GSM850	128	823.98	-25.76	-13	PASS
GPRS850	128	824.00	-25.44	-13	PASS
GSM850	251	849.02	-24.69	-13	PASS
GPRS850	251	849.02	-23.62	-13	PASS
EGPRS850	128	823.99	-35.20	-13	PASS
EGPRS850	251	849.02	-32.14	-13	PASS
GSM1900	512	1849.98	-29.18	-13	PASS
GPRS1900	512	1849.98	-31.43	-13	PASS
GSM1900	810	1910.02	-28.51	-13	PASS
GPRS1900	810	1910.01	-30.08	-13	PASS
EGPRS1900	512	1849.99	-36.56	-13	PASS
EGPRS1900	810	1910.03	-37.66	-13	PASS

Test Graphs

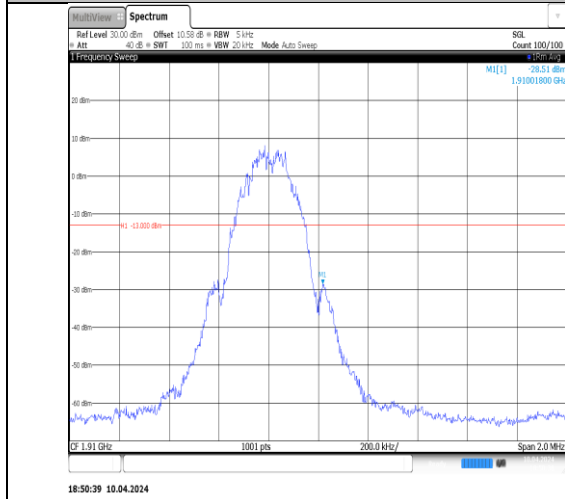




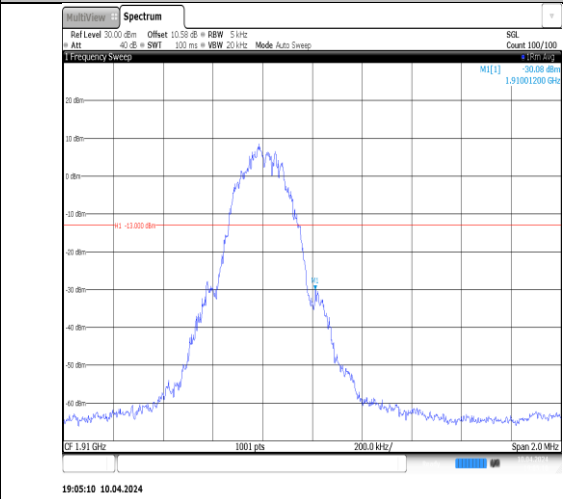
GSM1900-810-0-PASS



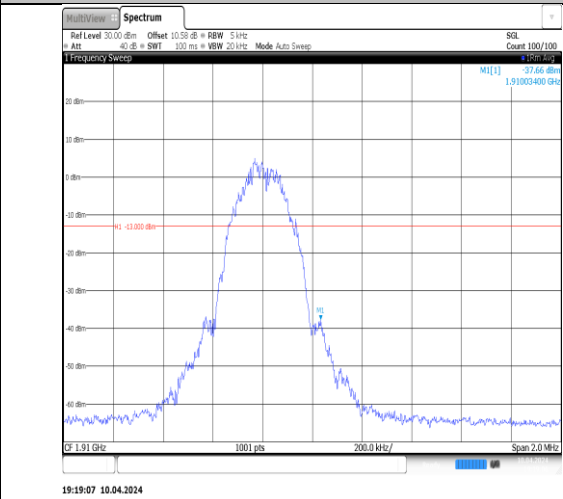
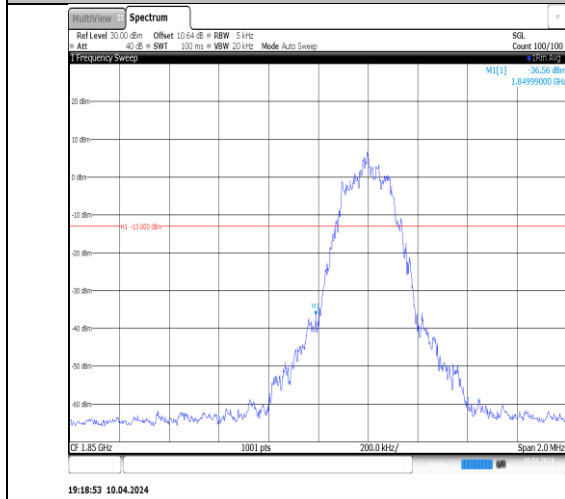
GPRS1900-810-0-PASS



EGPRS1900-512-2-PASS



EGPRS1900-810-2-PASS



7.5. SPURIOUS EMISSION AT ANTENNA TERMINAL

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238

LIMITS

FCC: §22.901, §22.917, §24.238

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.

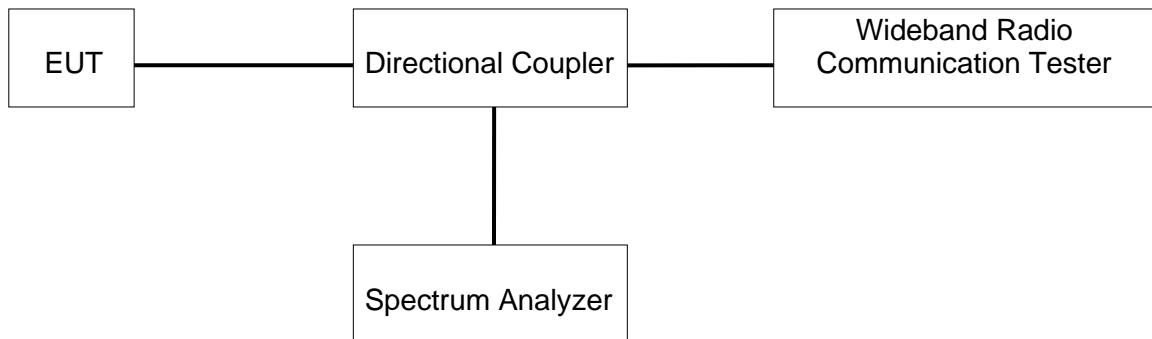
TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

- a) Set the RBW = 100 kHz for emission below 1GHz and 1MHz for emissions above 1GHz (Tests were performed 1 MHz [Worst case], to sweep 1 time for all frequency range)
- b) Set VBW $\geq 3 \times$ RBW;
- c) Set span ≥ 1.5 times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points = Max (40001);
- g) Trace mode = trace average for continuous emissions, max hold for pulse emissions;

TEST SETUP



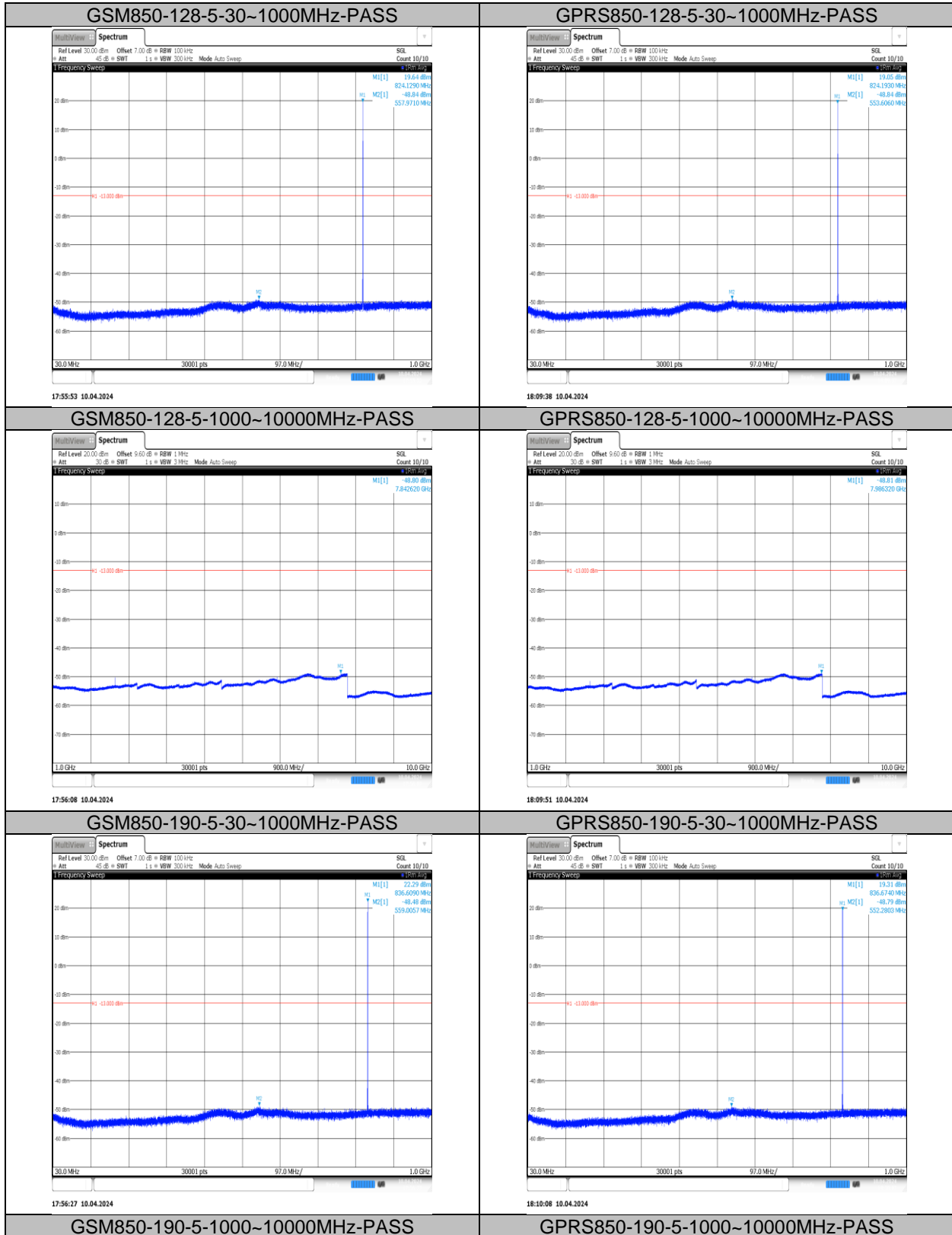
TEST ENVIRONMENT

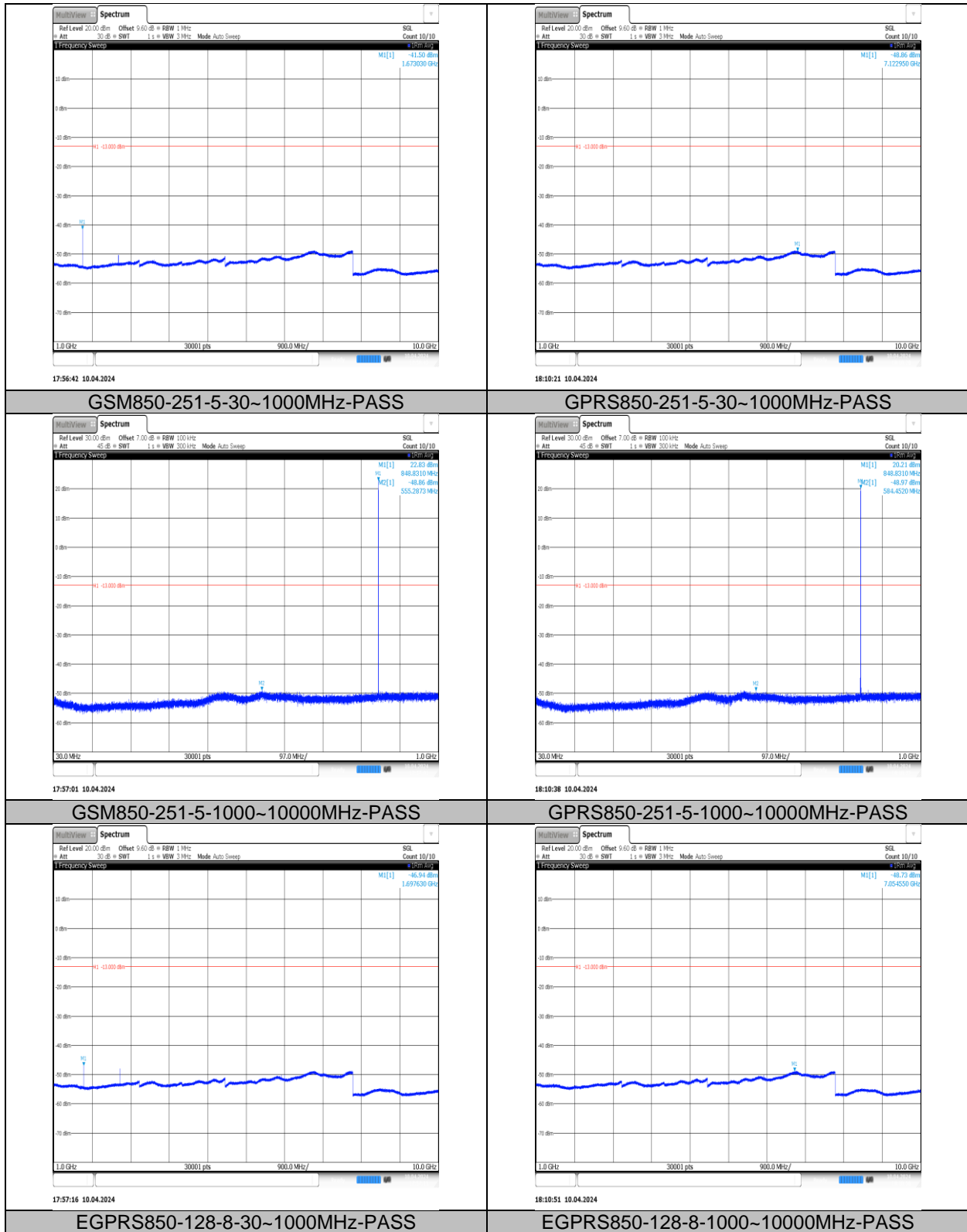
Temperature	23.4°C	Relative Humidity	64.3%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.87 V

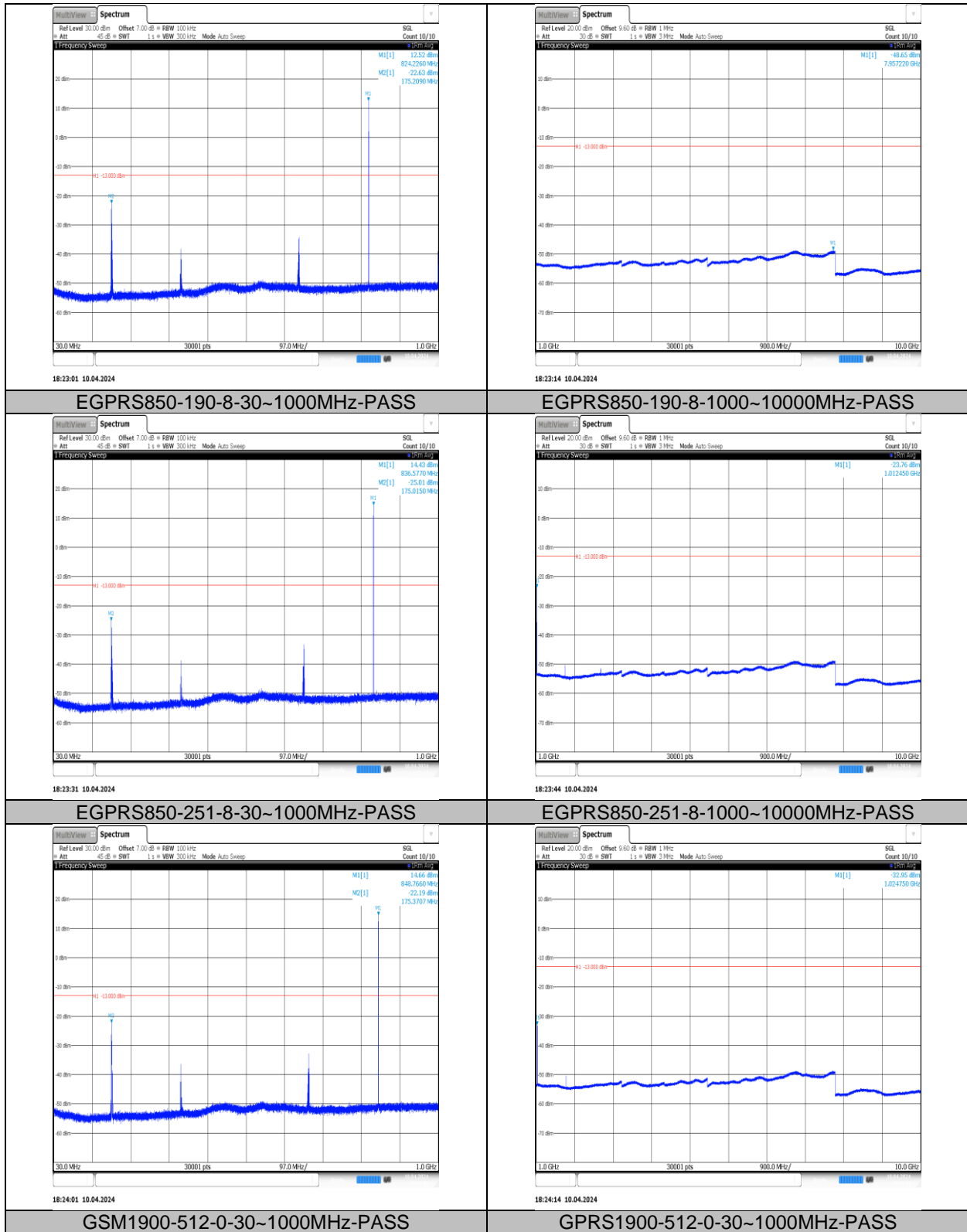
Test Result

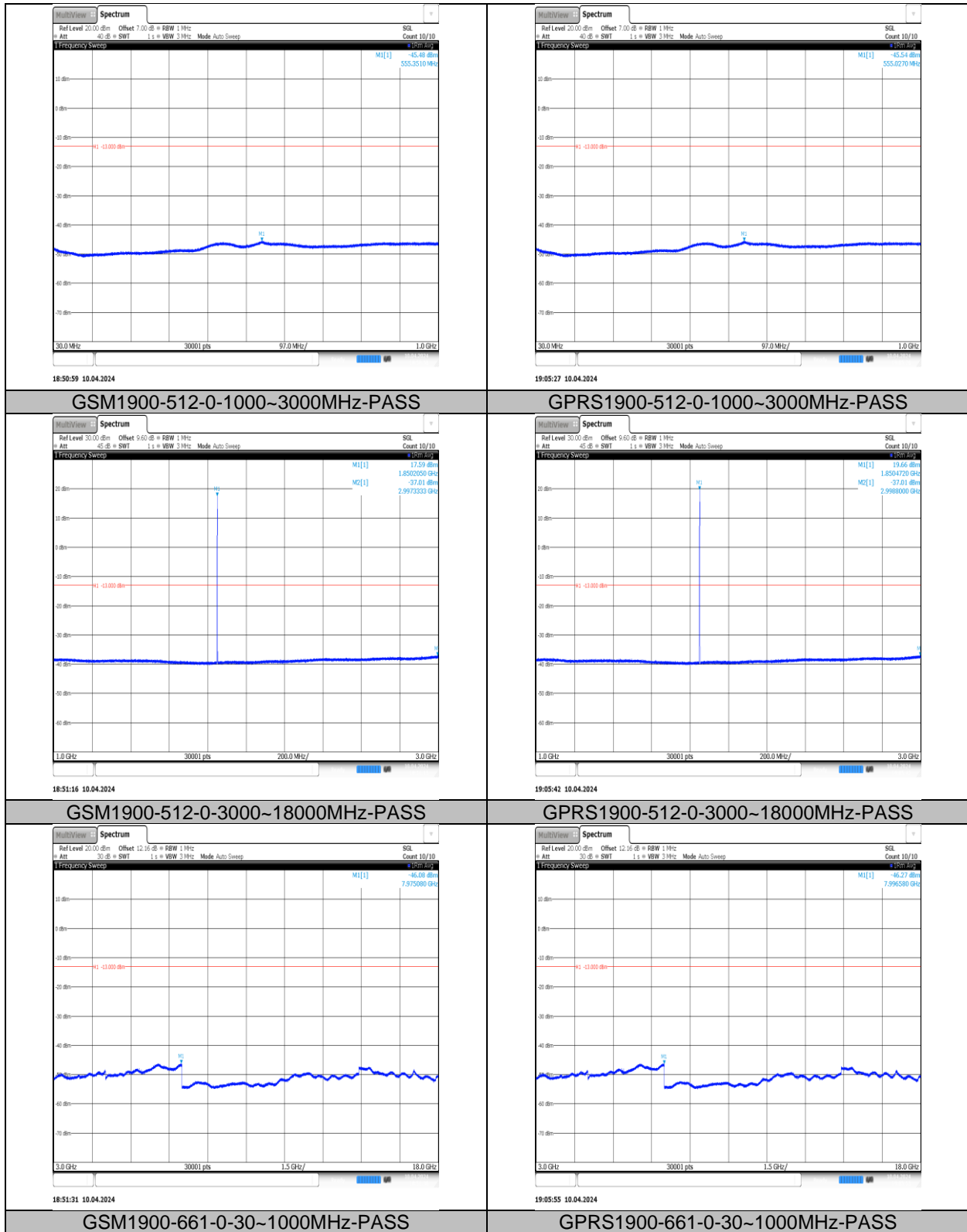
Band	Channel	Frequency Range(MHz)	Max.Freq. (MHz)	Result (dBm)	Limit (dBm)	Verdict
GSM850	128	30~1000MHz	557.97	-48.84	-13	PASS
GPRS850	128	30~1000MHz	553.61	-48.84	-13	PASS
GSM850	128	1000~10000MHz	7842.62	-48.8	-13	PASS
GPRS850	128	1000~10000MHz	7986.32	-48.81	-13	PASS
GSM850	190	30~1000MHz	559.01	-48.48	-13	PASS
GPRS850	190	30~1000MHz	552.28	-48.79	-13	PASS
GSM850	190	1000~10000MHz	1673.03	-41.5	-13	PASS
GPRS850	190	1000~10000MHz	7122.95	-48.86	-13	PASS
GSM850	251	30~1000MHz	555.29	-48.86	-13	PASS
GPRS850	251	30~1000MHz	584.45	-48.97	-13	PASS
GSM850	251	1000~10000MHz	1697.63	-46.94	-13	PASS
GPRS850	251	1000~10000MHz	7054.55	-48.73	-13	PASS
EGPRS850	128	30~1000MHz	175.21	-22.63	-13	PASS
EGPRS850	128	1000~10000MHz	7957.22	-48.65	-13	PASS
EGPRS850	190	30~1000MHz	175.02	-25.01	-13	PASS
EGPRS850	190	1000~10000MHz	1012.45	-23.76	-13	PASS
EGPRS850	251	30~1000MHz	175.37	-22.19	-13	PASS
EGPRS850	251	1000~10000MHz	1024.75	-32.95	-13	PASS
GSM1900	512	30~1000MHz	555.35	-45.48	-13	PASS
GPRS1900	512	30~1000MHz	555.03	-45.54	-13	PASS
GSM1900	512	1000~3000MHz	2997.33	-37.01	-13	PASS
GPRS1900	512	1000~3000MHz	2998.8	-37.01	-13	PASS
GSM1900	512	3000~18000MHz	7975.08	-46.08	-13	PASS
GPRS1900	512	3000~18000MHz	7996.58	-46.27	-13	PASS
GSM1900	661	30~1000MHz	554.03	-45.38	-13	PASS
GPRS1900	661	30~1000MHz	555.32	-45.4	-13	PASS
GSM1900	661	1000~3000MHz	2997.73	-37.04	-13	PASS
GPRS1900	661	1000~3000MHz	2987.07	-36.84	-13	PASS
GSM1900	661	3000~18000MHz	7945.09	-46.2	-13	PASS
GPRS1900	661	3000~18000MHz	7132.11	-46.27	-13	PASS
GSM1900	810	30~1000MHz	555.87	-45.31	-13	PASS
GPRS1900	810	30~1000MHz	555.12	-45.42	-13	PASS
GSM1900	810	1000~3000MHz	2999.33	-36.89	-13	PASS
GPRS1900	810	1000~3000MHz	2977.6	-36.93	-13	PASS
GSM1900	810	3000~18000MHz	7926.09	-46.18	-13	PASS
GPRS1900	810	3000~18000MHz	7957.58	-46.09	-13	PASS
EGPRS1900	512	30~1000MHz	554.09	-45.34	-13	PASS
EGPRS1900	512	1000~3000MHz	2976.67	-36.92	-13	PASS
EGPRS1900	512	3000~18000MHz	7938.09	-46.23	-13	PASS
EGPRS1900	661	30~1000MHz	555.58	-45.29	-13	PASS
EGPRS1900	661	1000~3000MHz	2971	-37.03	-13	PASS
EGPRS1900	661	3000~18000MHz	7928.09	-46.17	-13	PASS
EGPRS1900	810	30~1000MHz	555.35	-45.36	-13	PASS
EGPRS1900	810	1000~3000MHz	2998.93	-36.92	-13	PASS
EGPRS1900	810	3000~18000MHz	7098.11	-46.22	-13	PASS

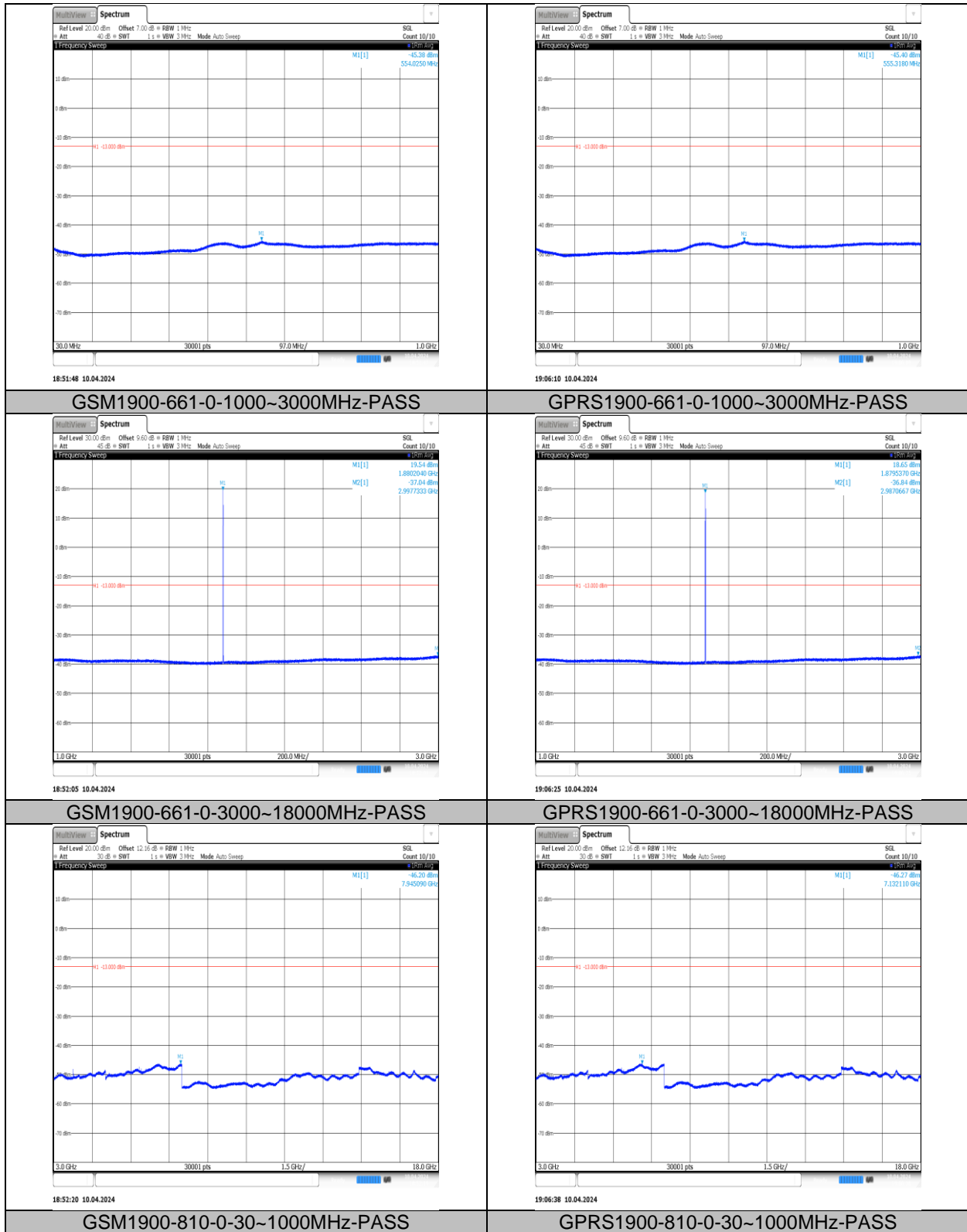
Test Graphs

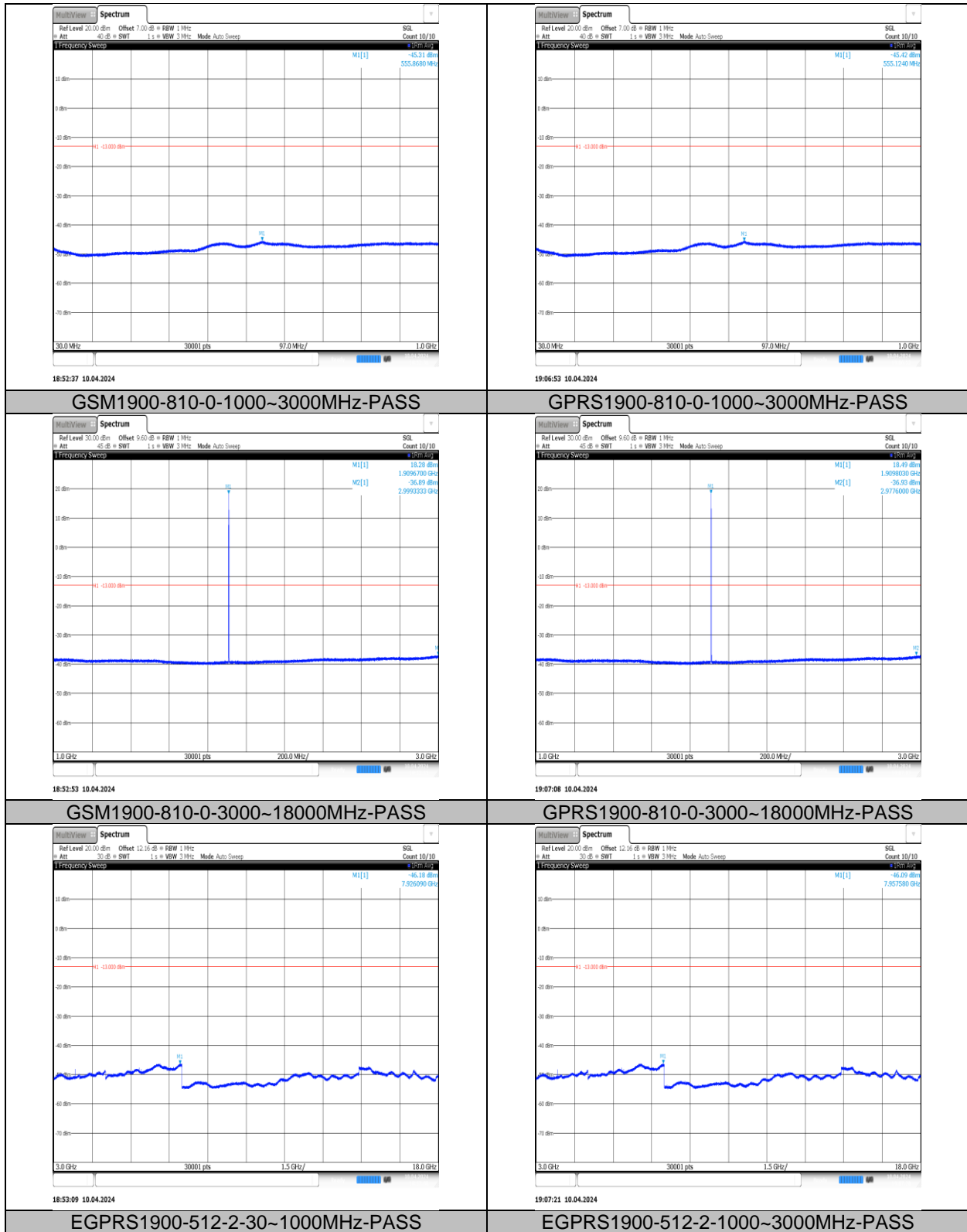


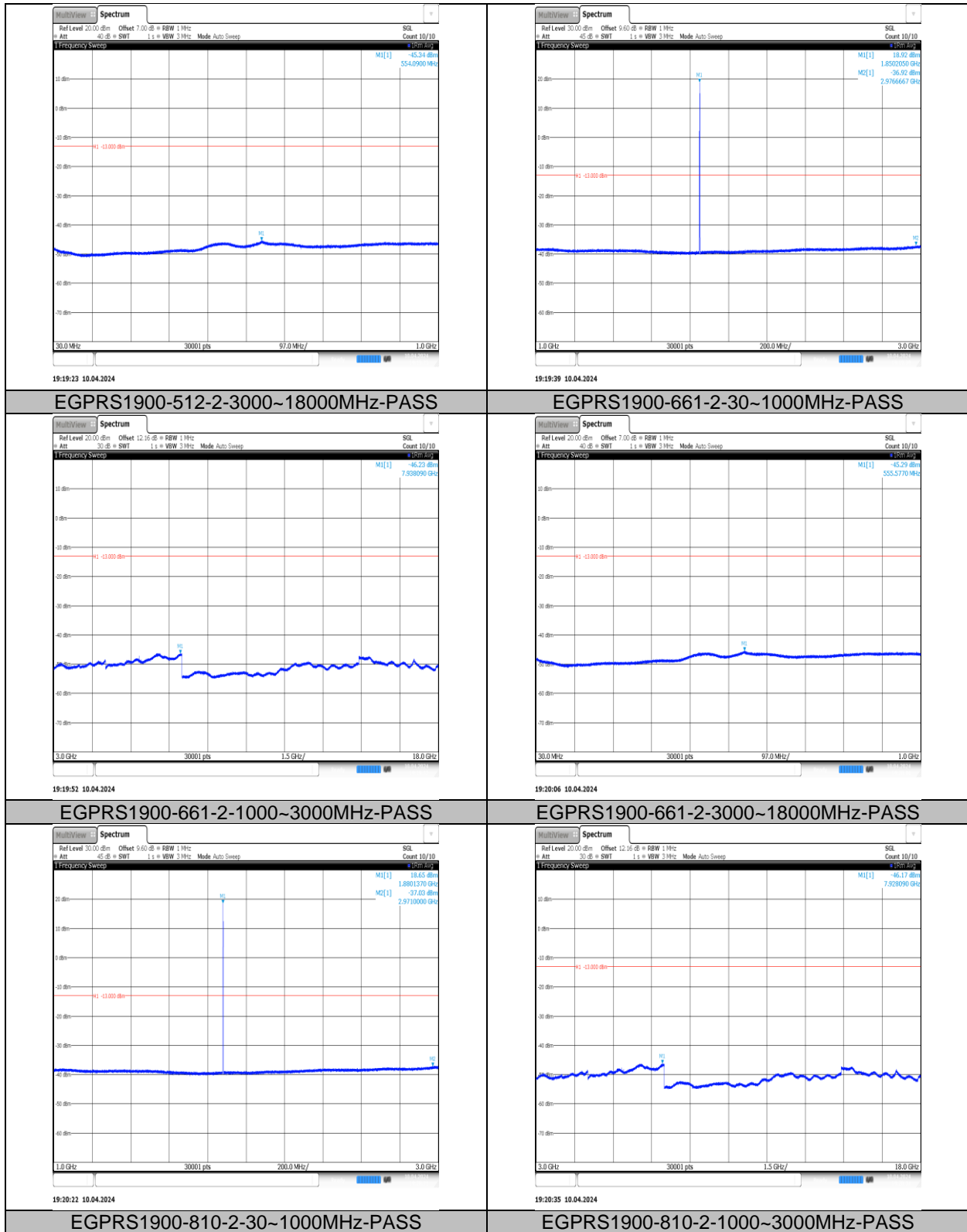


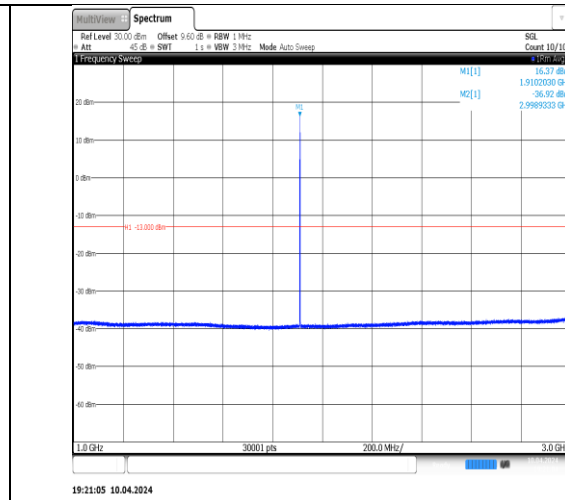
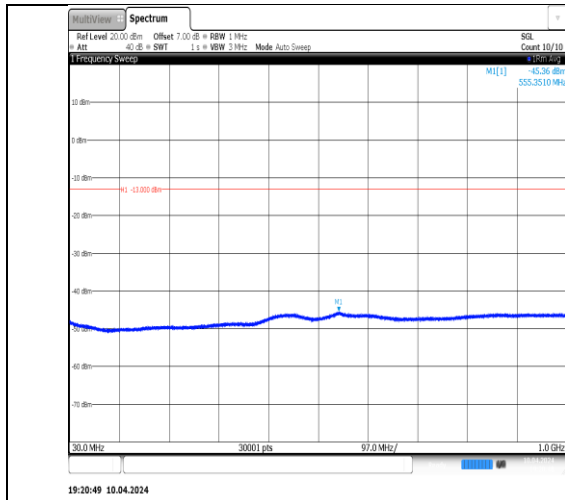




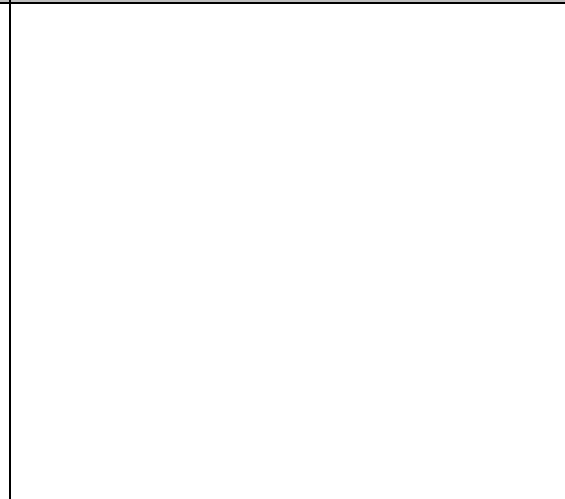
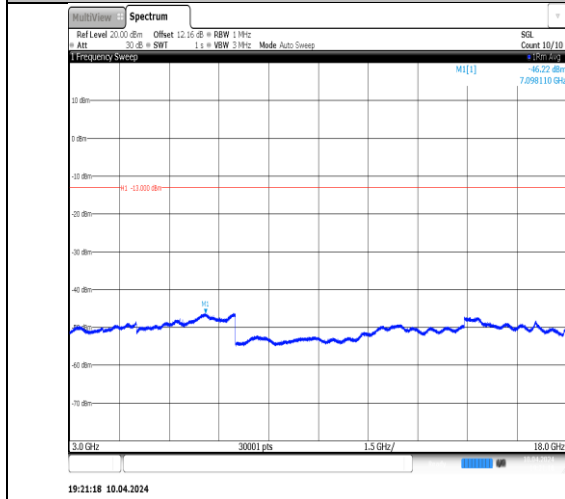








EGPRS1900-810-2-3000~18000MHz-PASS



7.6. FREQUENCY STABILITY

Rule Part:

FCC: §2.1055, §22.355, §24.235

LIMITS

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

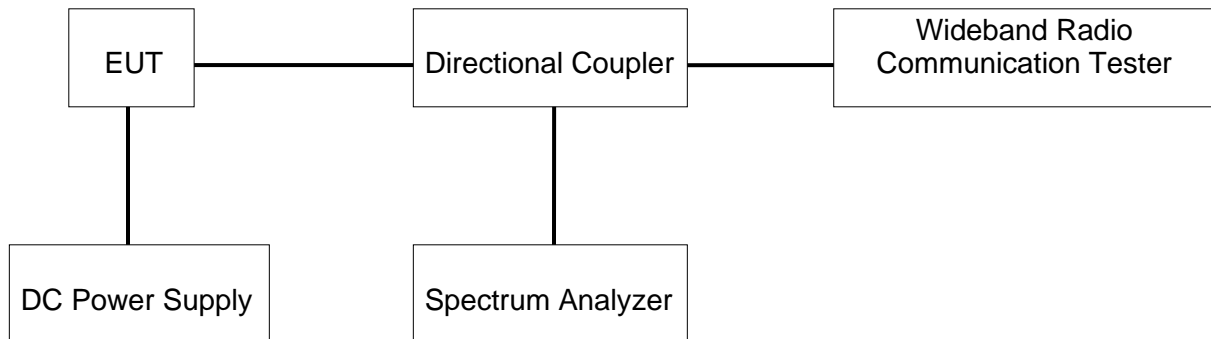
§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

TEST PROCEDURE

Refer to KDB 971168 D01 Power Meas License Digital Systems v03r01.

	Normal Test Conditions	Extreme Test Conditions
Relative Humidity	45 % - 75 %	/
Atmospheric Pressure	100 kPa ~102 kPa	/
Temperature	T _N (Normal Temperature): 24.5 °C	T _L (Low Temperature): -30 °C
		T _H (High Temperature): 50 °C
Supply Voltage	V _N (Normal Voltage): DC 3.87 V	V _L (Low Voltage): DC 3.3V
		V _H (High Voltage): DC 4.5 V

TEST SETUP



TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	64.3%
Atmosphere Pressure	101kPa	Test Voltage	/

Test Result

The peak frequency error is recorded (worst-case).

Temperature							
Band	Channel	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GSM850	190	NV	-30	-2.97	-0.003550	±2.5	PASS
GSM850	190	NV	-20	-1.16	-0.001387	±2.5	PASS
GSM850	190	NV	-10	-0.55	-0.000657	±2.5	PASS
GSM850	190	NV	0	-10.65	-0.012730	±2.5	PASS
GSM850	190	NV	10	-5.55	-0.006634	±2.5	PASS
GSM850	190	NV	20	-7.36	-0.008798	±2.5	PASS
GSM850	190	NV	30	-1.45	-0.000771	±2.5	PASS
GSM850	190	NV	40	-3.20	-0.001702	±2.5	PASS
GSM850	190	NV	50	0.65	0.000346	±2.5	PASS
GPRS850	190	NV	-30	-3.45	-0.004124	±2.5	PASS
GPRS850	190	NV	-20	-5.46	-0.006526	±2.5	PASS
GPRS850	190	NV	-10	-4.07	-0.004865	±2.5	PASS
GPRS850	190	NV	0	-5.88	-0.007028	±2.5	PASS
GPRS850	190	NV	10	0.03	0.000036	±2.5	PASS
GPRS850	190	NV	20	-2.42	-0.002893	±2.5	PASS
GPRS850	190	NV	30	-0.42	-0.000502	±2.5	PASS
GPRS850	190	NV	40	1.55	0.001853	±2.5	PASS
GPRS850	190	NV	50	-5.04	-0.006024	±2.5	PASS
EGPRS850	190	NV	-30	-9.40	-0.011236	±2.5	PASS
EGPRS850	190	NV	-20	-4.36	-0.005212	±2.5	PASS
EGPRS850	190	NV	-10	-7.59	-0.009072	±2.5	PASS
EGPRS850	190	NV	0	-10.69	-0.012778	±2.5	PASS
EGPRS850	190	NV	10	-5.10	-0.006096	±2.5	PASS
EGPRS850	190	NV	20	-8.10	-0.009682	±2.5	PASS
EGPRS850	190	NV	30	-7.75	-0.009264	±2.5	PASS
EGPRS850	190	NV	40	-7.07	-0.008451	±2.5	PASS
EGPRS850	190	NV	50	-12.07	-0.014427	±2.5	PASS
GSM1900	661	NV	-30	6.01	0.003248	±2.5	PASS
GSM1900	661	NV	-20	8.07	0.004362	±2.5	PASS
GSM1900	661	NV	-10	7.59	0.004102	±2.5	PASS
GSM1900	661	NV	0	8.52	0.004605	±2.5	PASS
GSM1900	661	NV	10	7.07	0.003821	±2.5	PASS
GSM1900	661	NV	20	5.04	0.002724	±2.5	PASS
GSM1900	661	NV	30	7.07	0.003821	±2.5	PASS
GSM1900	661	NV	40	7.55	0.004081	±2.5	PASS
GSM1900	661	NV	50	10.43	0.005637	±2.5	PASS
GPRS1900	661	NV	-30	-2.71	-0.001441	±2.5	PASS
GPRS1900	661	NV	-20	-2.87	-0.001527	±2.5	PASS
GPRS1900	661	NV	-10	-1.68	-0.000894	±2.5	PASS
GPRS1900	661	NV	0	-7.52	-0.004000	±2.5	PASS
GPRS1900	661	NV	10	-3.49	-0.001856	±2.5	PASS
GPRS1900	661	NV	20	-0.71	-0.000378	±2.5	PASS

GPRS1900	661	NV	30	2.16	0.001149	±2.5	PASS
GPRS1900	661	NV	40	0.26	0.000138	±2.5	PASS
GPRS1900	661	NV	50	-2.39	-0.001271	±2.5	PASS
EGPRS1900	661	NV	-30	-5.39	-0.002867	±2.5	PASS
EGPRS1900	661	NV	-20	-3.33	-0.001771	±2.5	PASS
EGPRS1900	661	NV	-10	-6.23	-0.003314	±2.5	PASS
EGPRS1900	661	NV	0	-4.04	-0.002149	±2.5	PASS
EGPRS1900	661	NV	10	-11.91	-0.006335	±2.5	PASS
EGPRS1900	661	NV	20	-8.10	-0.004309	±2.5	PASS
EGPRS1900	661	NV	30	-11.17	-0.005941	±2.5	PASS
EGPRS1900	661	NV	40	-4.84	-0.002574	±2.5	PASS
EGPRS1900	661	NV	50	-10.98	-0.005840	±2.5	PASS

8. RADIATED SPURIOUS EMISSIONS

LIMIT

FCC: §24.238(a) (GSM1900)

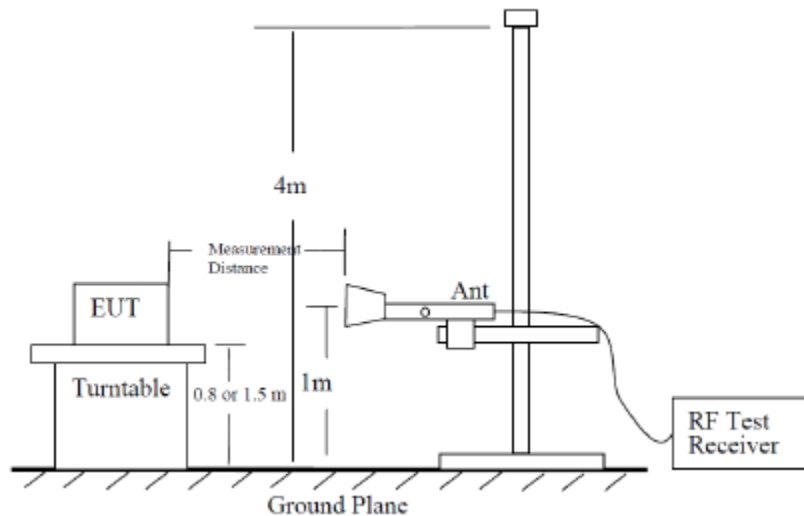
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

FCC: §22.917(a) (GSM850)

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.

TEST PROCEDURE

Following the test configuration shown below, radiated emissions measured directly from the EUT and convert the measured field strength or received power to ERP or EIRP, as required, for comparison to the applicable limits. As stated in section 5.5.1 of ANSI C63.26-2015. The field strength measurement method by using a test site validated to the requirement of ANSI C63.4 is an alternative method to the substitution measurement.



Radiated Power Measurement Calculation According to ANSI C63.26-2015

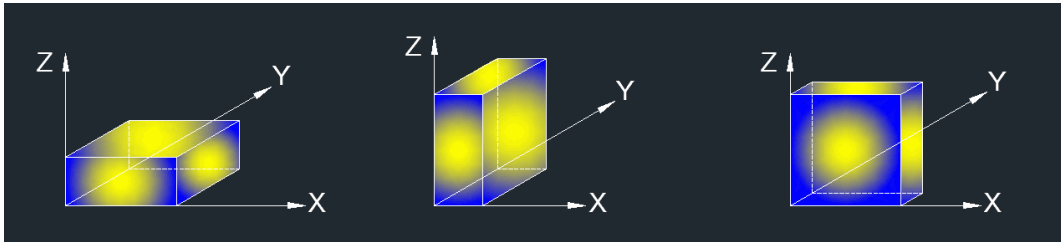
- a) $E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$.
- b) $E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$.
- c) $E \text{ (dB}\mu\text{V/m)} = \text{EIRP (dBm)} - 20\log(D) + 104.8$, where D is the measurement distance (in the far field region) in m.
- d) $\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8$, where D is the measurement distance (in the far field region) in m.

So, from d)

The measuring distance is at 3m, then $20 \cdot \log(3) = 9.5424$

Then, $\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 9.5424 - 104.8 = E \text{ (dB}\mu\text{V/m)} - 95.2576$

X axis, Y axis, Z axis:



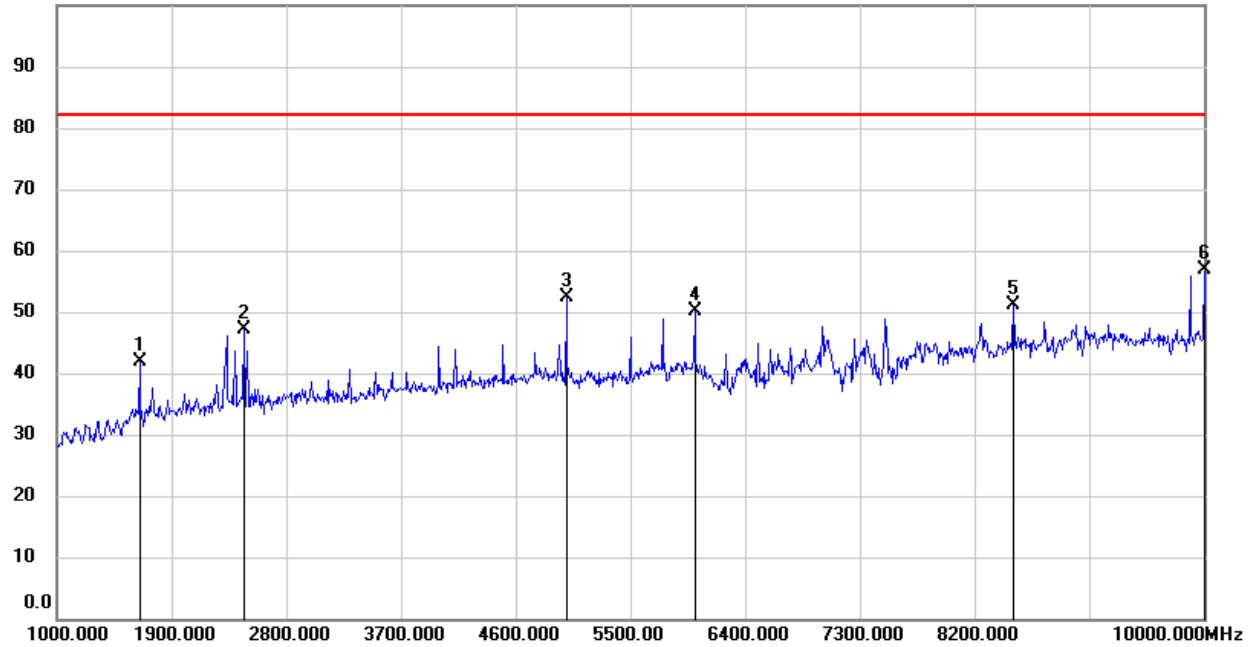
Note: The EUT was investigated in three orthogonal orientations X/Y/Z on ANT0 to determine the worst-case orientation. X orientation is finally determined the worst.

TEST ENVIRONMENT

Temperature	24.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.87 V

Test Result

GSM 850
GPRS- Low Channel- Horizontal
100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1648.000	53.20	-11.26	41.94	82.25	-40.31	peak
2	2467.000	55.11	-7.88	47.23	82.25	-35.02	peak
3	4996.000	51.86	0.42	52.28	82.25	-29.97	peak
4	6004.000	47.22	2.82	50.04	82.25	-32.21	peak
5	8506.000	43.25	7.79	51.04	82.25	-31.21	peak
6	10000.000	44.81	12.01	56.82	82.25	-25.43	peak

GPRS- Low Channel- Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2494.000	52.66	-7.88	44.78	82.25	-37.47	peak
2	3997.000	51.76	-3.45	48.31	82.25	-33.94	peak
3	4996.000	50.76	0.42	51.18	82.25	-31.07	peak
4	6004.000	49.60	2.82	52.42	82.25	-29.83	peak
5	7498.000	43.26	6.77	50.03	82.25	-32.22	peak
6	9892.000	47.89	11.50	59.39	82.25	-22.86	peak

GPRS- Mid Channel- Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2332.000	55.18	-8.31	46.87	82.25	-35.38	peak

2	4501.000	46.20	-1.57	44.63	82.25	-37.62	peak
3	4996.000	51.46	0.42	51.88	82.25	-30.37	peak
4	6004.000	47.15	2.82	49.97	82.25	-32.28	peak
5	7498.000	42.99	6.77	49.76	82.25	-32.49	peak
6	10000.000	43.32	12.01	55.33	82.25	-26.92	peak

GPRS- Mid Channel- Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2494.000	53.18	-7.88	45.30	82.25	-36.95	peak
2	3997.000	50.57	-3.45	47.12	82.25	-35.13	peak
3	4996.000	51.84	0.42	52.26	82.25	-29.99	peak
4	6004.000	50.88	2.82	53.70	82.25	-28.55	peak
5	7498.000	42.29	6.77	49.06	82.25	-33.19	peak
6	10000.000	43.95	12.01	55.96	82.25	-26.29	peak

GPRS- High Channel- Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2539.000	60.13	-7.90	52.23	82.25	-30.02	peak
2	4996.000	50.77	0.42	51.19	82.25	-31.06	peak
3	6004.000	46.31	2.82	49.13	82.25	-33.12	peak
4	7498.000	42.95	6.77	49.72	82.25	-32.53	peak
5	8506.000	43.57	7.79	51.36	82.25	-30.89	peak
6	10000.000	43.34	12.01	55.35	82.25	-26.90	peak

GPRS- High Channel- Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2494.000	52.92	-7.88	45.04	82.25	-37.21	peak
2	3997.000	50.89	-3.45	47.44	82.25	-34.81	peak
3	4996.000	51.84	0.42	52.26	82.25	-29.99	peak
4	6004.000	51.14	2.82	53.96	82.25	-28.29	peak
5	7498.000	44.46	6.77	51.23	82.25	-31.02	peak
6	10000.000	44.55	12.01	56.56	82.25	-25.69	peak

GSM 1900
GPRS- Low Channel- Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4995.000	51.86	0.83	52.69	82.25	-29.56	peak
2	8505.000	43.48	8.24	51.72	82.25	-30.53	peak
3	10005.000	42.50	12.48	54.98	82.25	-27.27	peak
4	12495.000	36.75	18.56	55.31	82.25	-26.94	peak
5	14010.000	33.65	22.73	56.38	82.25	-25.87	peak
6	17940.000	29.95	26.61	56.56	82.25	-25.69	peak

GPRS- Low Channel- Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4995.000	51.28	0.83	52.11	82.25	-30.14	peak
2	6000.000	50.58	3.11	53.69	82.25	-28.56	peak
3	10005.000	43.23	12.48	55.71	82.25	-26.54	peak
4	12675.000	35.50	18.54	54.04	82.25	-28.21	peak
5	14010.000	34.31	22.73	57.04	82.25	-25.21	peak
6	17925.000	29.71	26.55	56.26	82.25	-25.99	peak

GPRS- Mid Channel- Horizontal

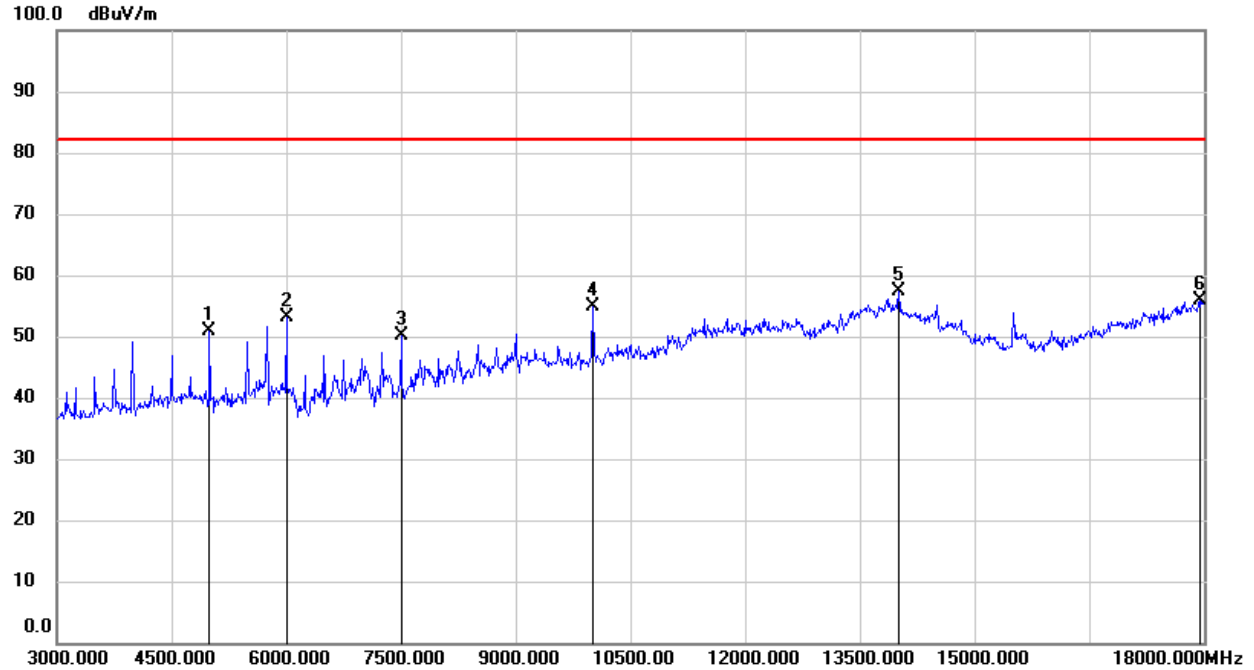
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6000.000	47.78	3.11	50.89	82.25	-31.36	peak
2	8505.000	44.05	8.24	52.29	82.25	-29.96	peak
3	10005.000	43.25	12.48	55.73	82.25	-26.52	peak
4	12495.000	36.18	18.56	54.74	82.25	-27.51	peak
5	14010.000	34.39	22.73	57.12	82.25	-25.13	peak
6	17955.000	29.21	26.66	55.87	82.25	-26.38	peak

GPRS- Mid Channel- Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6000.000	52.54	3.11	55.65	82.25	-26.60	peak
2	7500.000	42.88	7.18	50.06	82.25	-32.19	peak
3	10005.000	42.87	12.48	55.35	82.25	-26.90	peak
4	11745.000	35.74	17.47	53.21	82.25	-29.04	peak
5	14010.000	34.42	22.73	57.15	82.25	-25.10	peak
6	17970.000	28.88	26.72	55.60	82.25	-26.65	peak

GPRS- High Channel- Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4995.000	49.40	0.83	50.23	82.25	-32.02	peak
2	7500.000	42.37	7.18	49.55	82.25	-32.70	peak
3	10005.000	42.43	12.48	54.91	82.25	-27.34	peak
4	12495.000	36.75	18.56	55.31	82.25	-26.94	peak
5	14010.000	34.31	22.73	57.04	82.25	-25.21	peak
6	17505.000	31.95	23.74	55.69	82.25	-26.56	peak

GPRS- High Channel- Vertical


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4995.000	49.97	0.83	50.80	82.25	-31.45	peak
2	6000.000	50.10	3.11	53.21	82.25	-29.04	peak
3	7500.000	42.92	7.18	50.10	82.25	-32.15	peak
4	10005.000	42.49	12.48	54.97	82.25	-27.28	peak
5	14010.000	34.71	22.73	57.44	82.25	-24.81	peak
6	17940.000	29.20	26.61	55.81	82.25	-26.44	peak

END OF REPORT