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

TEST REPORT

For

Smart POS

MODEL NUMBER: D60

FCC ID: 2AGQ6-D60

REPORT NUMBER: 4790950508-1-RF-6

ISSUE DATE: October 22, 2023

Prepared for

Dspread Technology (Beijing) Inc
Rm.407, B12C, #10(Universal Business Park), Jiuxianqiao Road, Chaoyang District, Beijing, 100015, China

Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch
Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-Tech Development Zone Dongguan, 523808, People's Republic of China

Tel: +86 769 22038881
Fax: +86 769 33244054
Website: www.ul.com

Revision History

Rev.	Issue Date	Revisions	Revised By
V0	October 22, 2023	Initial Issue	\

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.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 4

2. TEST METHODOLOGY 5

3. FACILITIES AND ACCREDITATION 5

4. CALIBRATION AND UNCERTAINTY 6

4.1. MEASURING INSTRUMENT CALIBRATION 6

4.2. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. TEST CHANNEL CONFIGURATION 7

5.3. MAXIMUM AVERAGE OUTPUT POWER 8

5.4. WORST-CASE CONFIGURATION AND MODE 9

5.5. DESCRIPTION OF AVAILABLE ANTENNAS 10

5.6. DESCRIPTION OF TEST SETUP 11

6. MEASURING INSTRUMENT AND SOFTWARE USED 12

7. ANTENNA TERMINAL TEST RESULTS 13

7.1. EFFECTIVE (ISOTROPIC) RADIATED POWER OF TRANSMITTER 13

7.2. PEAK TO AVERAGE RADIO 15

7.3. OCCUPIED BANDWIDTH 17

7.4. BAND EDGE EMISSIONS 19

7.5. SPURIOUS EMISSION AT ANTENNA TERMINAL 23

7.6. FREQUENCY STABILITY 34

8. RADIATED SPURIOUS EMISSIONS 37

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	Dspread Technology (Beijing) Inc
Address:	Rm.407, B12C, #10(Universal Business Park), Jiuxianqiao Road, Chaoyang District, Beijing, 100015, China

Manufacturer Information

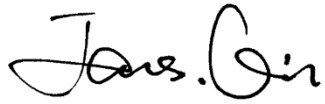
Company Name:	Dspread Technology (Beijing) Inc
Address:	Rm.407, B12C, #10(Universal Business Park), Jiuxianqiao Road, Chaoyang District, Beijing, 100015, China

EUT Information

EUT Name:	Smart POS
Model:	D60
Sample Received Date:	August 2, 2023
Sample Status:	Normal
Sample ID:	6327587
Date of Tested:	August 12, 2023 to October 12, 2023

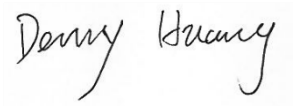
APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 22 H	PASS
CFR 47 FCC PART 24 E	PASS

Prepared By:



James Qin
Project Engineer

Checked By:



Denny Huang
Senior Project Engineer

Approved By:

Stephen Guo
Operations Manager

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	**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. **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 Delcaration of Conformity (DoC) and Certification rules **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. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** 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-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

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	Smart POS
Model	D60

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)	7.0
Antenna Gain (dBi)	-0.23

Mode	Frequency Range (MHz)	Conducted Average power (dBm)	ERP (W)	99% OBW (MHz)	Emission Designator
GRPS(GMSK)	824.2 ~ 848.8	31.97	0.910	0.247	247KGXW
EGPRS(8PSK)	824.2 ~ 848.8	24.68	0.170	0.245	245KG7W

GSM 1900	
Part 24	
EIRP Limit(W)	2.0
Antenna Gain (dBi)	1.19

Mode	Frequency Range (MHz)	Conducted Average power (dBm)	EIRP (W)	99% OBW (MHz)	Emission Designator
GRPS(GMSK)	1850.2 ~ 1909.8	28.35	0.899	0.246	246KGXW
EGPRS(8PSK)	1850.2 ~ 1909.8	24.26	0.203	0.251	251KG7W

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

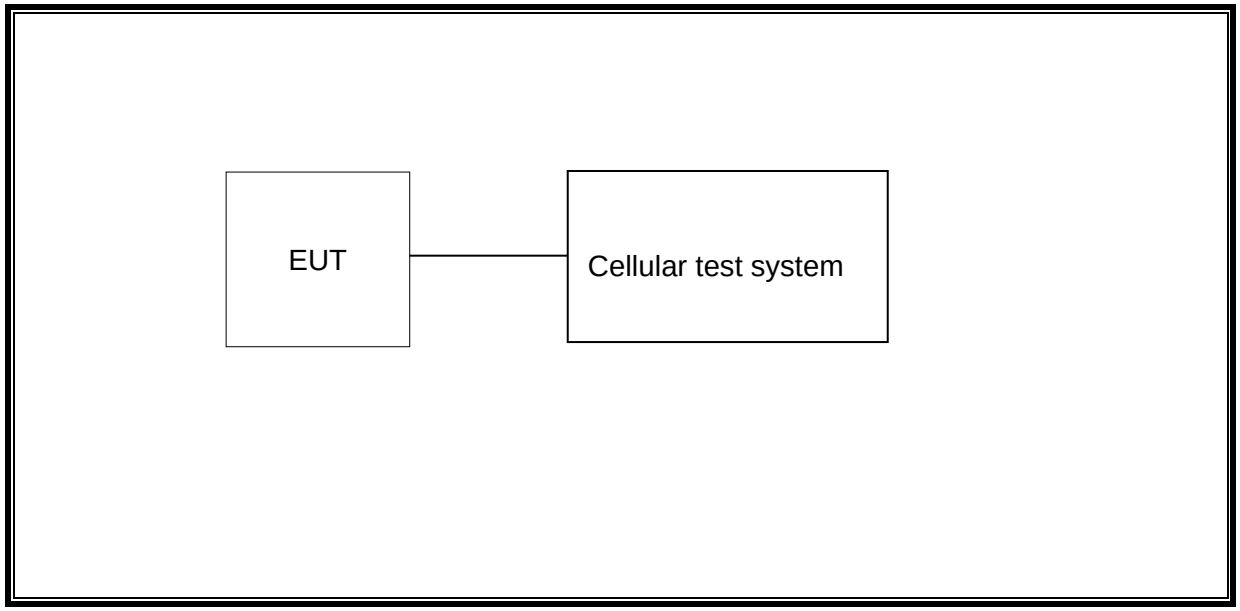
Antenna	Band	Antenna Type	MAX Antenna Gain (dBi)
Main	GSM850	FPC	-0.23
Main	GSM1900	FPC	1.19

Band	Transmit and Receive Mode	Description
GSM850	☒1TX, 2RX	Main antenna can be used as transmitting/receiving antenna, DIV antenna can be used as receiving antenna
GSM1900	☒1TX, 2RX	Main antenna can be used as transmitting/receiving antenna, DIV antenna can be used as receiving antenna

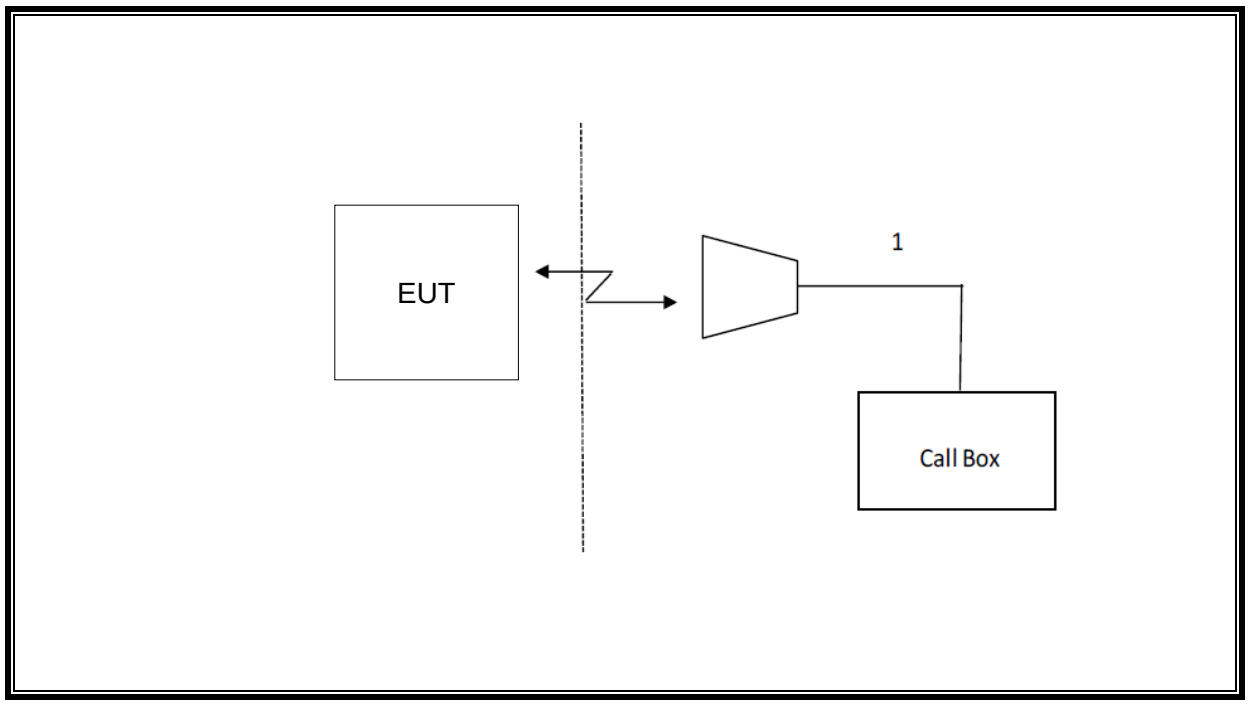
Note: The value of the antenna gain was declared by customer.

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.
☑	Spectrum Analyzer	R&S	FSV40	S422060001	Oct.17, 2022	Oct.16, 2023
☑	Wideband Radio Communication Tester	R&S	CMW500	155523	Oct.17, 2022	Oct.16, 2023
☑	DC Power Supply	Array	3662A	A1512015	Oct.17, 2022	Oct.16, 2023
Software						
Used	Description		Manufacturer	Name		Version
☑	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.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Oct.17, 2022	Oct.16, 2023
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130959	Aug.02, 2021	Aug.01, 2024
☑	Preamplifier	HP	8447D	2944A09099	Oct.17, 2022	Oct.16, 2023
☑	EMI Measurement Receiver	R&S	ESR26	101377	Oct.17, 2022	Oct.16, 2023
☑	Horn Antenna	TDK	HRN-0118	130940	July 20, 2021	July 19, 2024
☑	Horn Antenna	Schwarzbeck	BBHA9170	697	July 20, 2021	July 19, 2024
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00067	Oct.17, 2022	Oct.16, 2023
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Oct.17, 2022	Oct.16, 2023
☑	Loop antenna	Schwarzbeck	1519B	00008	Dec.14, 2021	Dec.13, 2024
☑	High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Oct.17, 2022	Oct.16, 2023
Software						
Used	Description		Manufacturer	Name		Version
☑	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

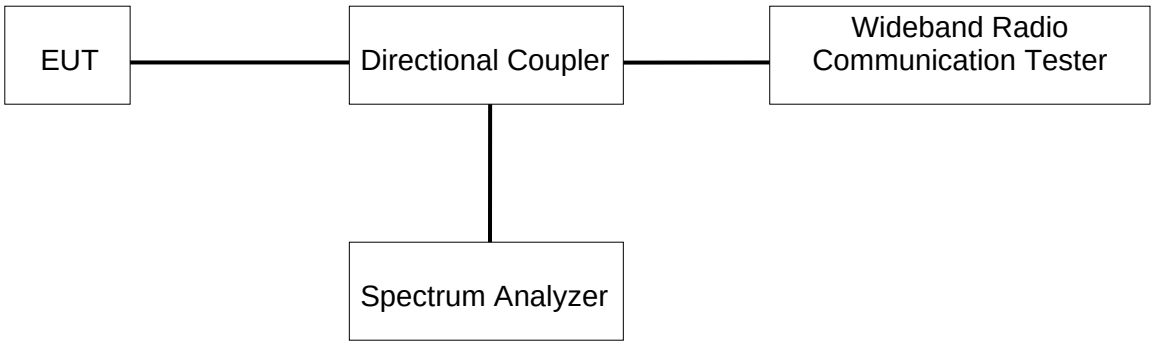
22.913(a) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.
24.232(c) Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.
27.50(c) Portable 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 = PMeas + GT − LC
where:
ERP or EIRP = effective or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
PMeas = 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	23.1°C	Relative Humidity	63.8%
Atmosphere Pressure	101kPa	Test Voltage	DC 7.2 V

Test Result

GSM 850MHz		Burst-Averaged Power (dBm)			ERP (W)		
		128CH	190CH	251CH	128CH	190CH	251CH
GPRS 850	1 Tx Slots	31.71	31.88	31.97	0.857	0.891	0.910
	2 Tx Slots	30.96	31.14	31.27	0.721	0.752	0.774
	3 Tx Slots	29.25	29.45	29.62	0.486	0.509	0.530
	4 Tx Slots	28.09	28.30	28.45	0.372	0.391	0.405
EGPRS 850	1 Tx Slots	24.49	24.35	24.68	0.163	0.157	0.170
	2 Tx Slots	23.12	23.05	23.35	0.119	0.117	0.125
	3 Tx Slots	20.77	20.73	21.02	0.069	0.068	0.073
	4 Tx Slots	19.46	19.40	19.70	0.051	0.050	0.054

GSM 1900MHz		Burst-Averaged Power (dBm)			EIRP (W)		
		512CH	661CH	810CH	512CH	661CH	810CH
GPRS 1900	1 Tx Slots	28.17	28.32	28.35	0.863	0.893	0.899
	2 Tx Slots	27.53	27.69	27.72	0.745	0.773	0.778
	3 Tx Slots	25.91	26.09	26.09	0.513	0.535	0.535
	4 Tx Slots	24.77	24.94	24.94	0.394	0.410	0.410
EGPRS 1900	1 Tx Slots	24.26	24.14	23.69	0.351	0.341	0.308
	2 Tx Slots	23.28	23.23	22.79	0.280	0.277	0.250
	3 Tx Slots	21.31	21.29	20.90	0.178	0.177	0.162
	4 Tx Slots	20.28	20.22	19.79	0.140	0.138	0.125

7.2. PEAK TO AVERAGE RADIO

LIMITS

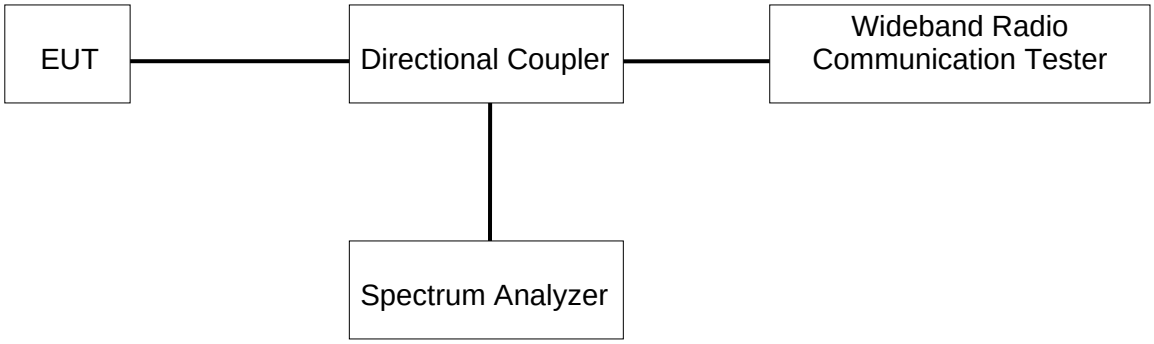
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

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

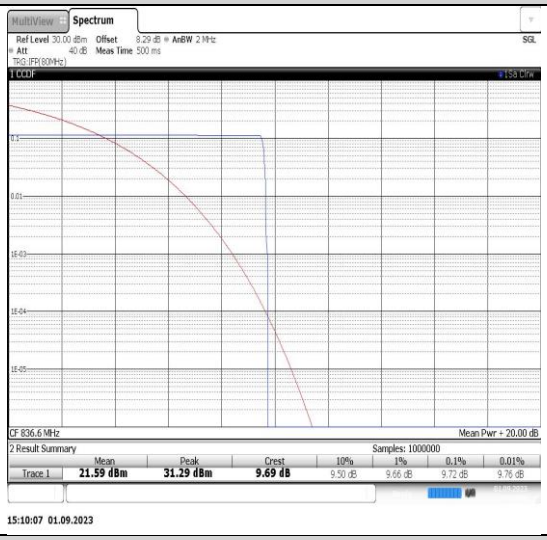
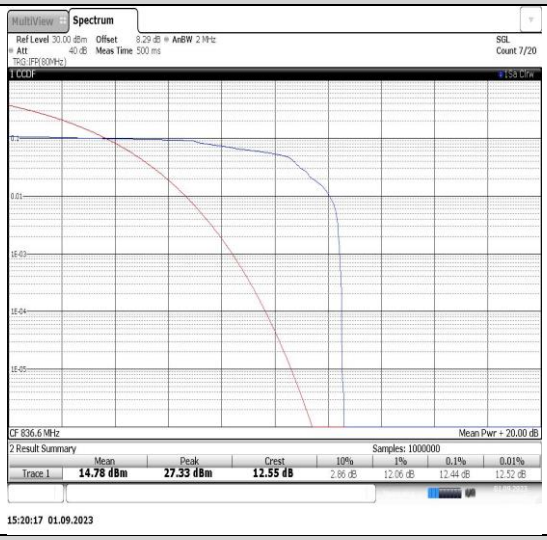
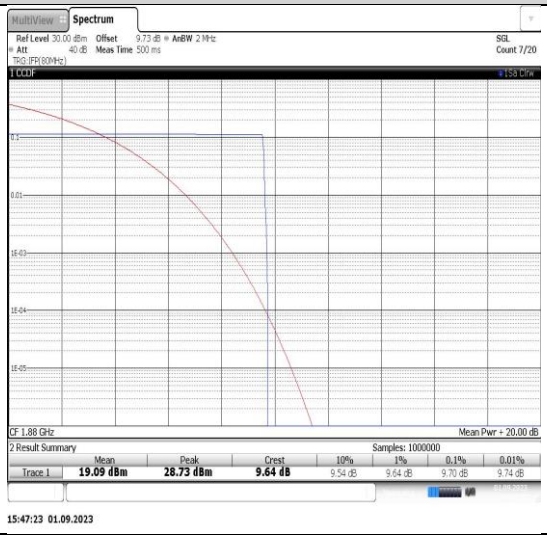
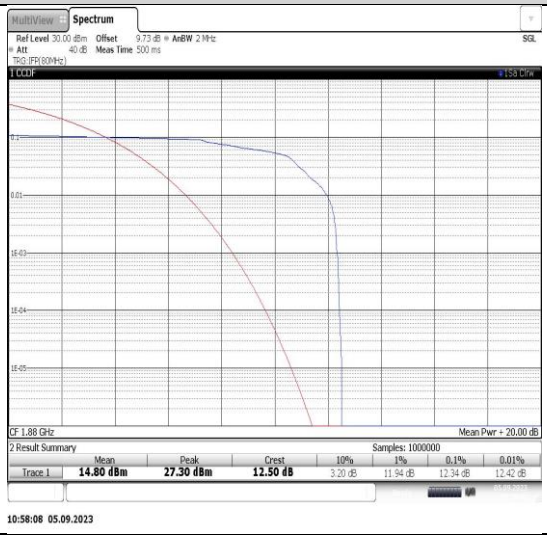
Temperature	23.1°C	Relative Humidity	63.8%
Atmosphere Pressure	101kPa	Test Voltage	DC 7.2 V

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
GPRS850	190	9.72	13	PASS
EGPRS850	190	12.44	13	PASS
GPRS1900	661	9.70	13	PASS
EGPRS1900	661	12.34	13	PASS

Test Graphs

GPRS850-190	EGPRS850-190
	
GPRS1900-661	**EGPRS1900-661**
	

7.3. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049.

LIMITS

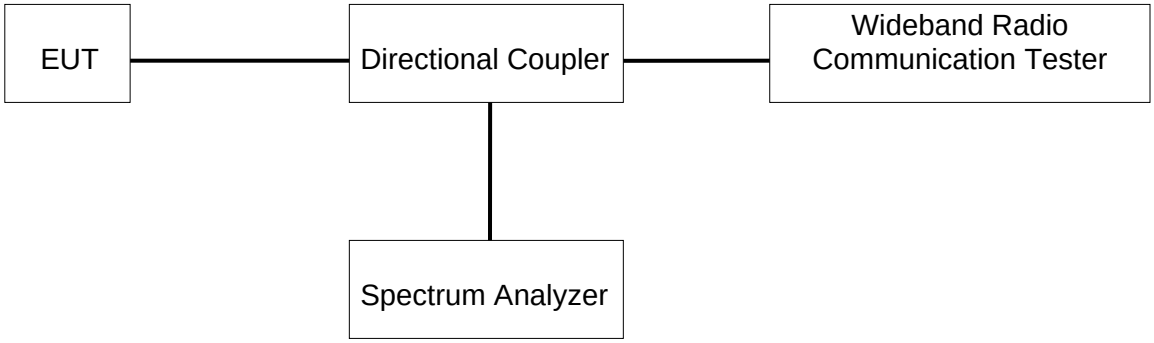
For reporting purposes only.

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

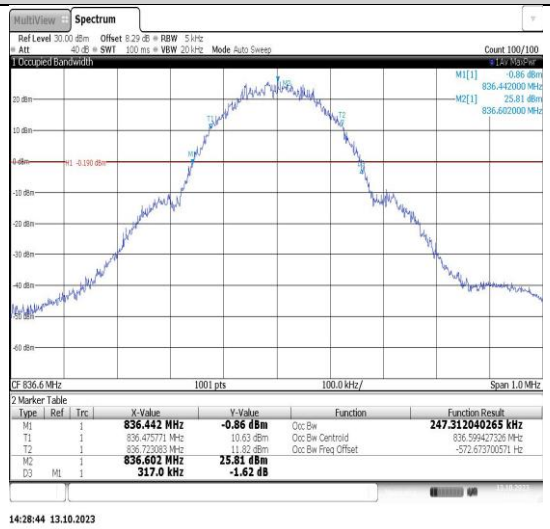
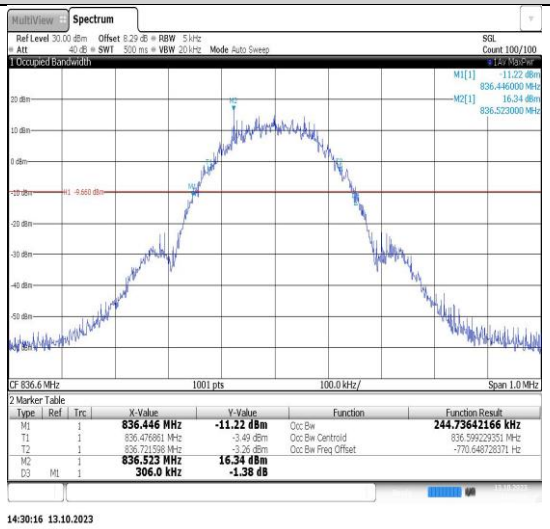
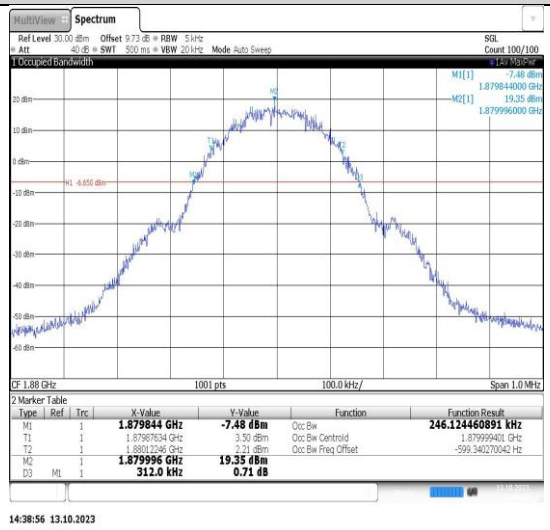
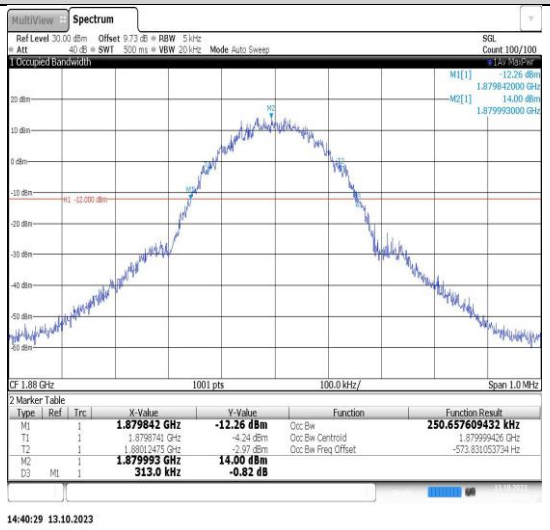
Temperature	23.1°C	Relative Humidity	66.3%
Atmosphere Pressure	101kPa	Test Voltage	DC 7.2 V

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
GPRS850	190	0.247	0.32	---	PASS
EGPRS850	190	0.245	0.31	---	PASS
GPRS1900	661	0.246	0.31	---	PASS
EGPRS1900	661	0.251	0.31	---	PASS

Test Graphs

GPRS850-190	EGPRS850-190
	
GPRS1900-661	**EGPRS1900-661**
	

7.4. BAND EDGE EMISSIONS

RULE PART(S)

FCC §2.1051, §22.917, §24.238

LIMITS

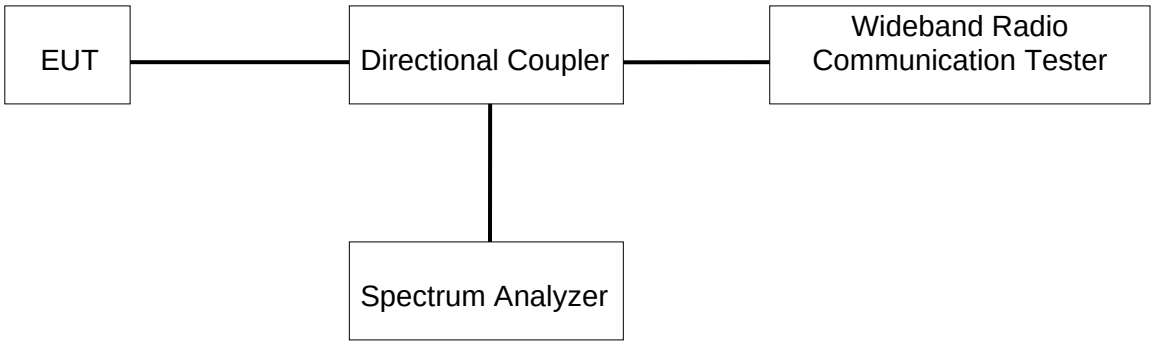
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

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 ≥ 3 × RBW;
c) Set span ≥ 1.5 times the OBW;
d) Sweep time = Auto;
e) Detector = RMS;
f) Ensure that the number of measurement points ≥ 2*Span/RBW;
g) Trace mode = Average (100);

TEST SETUP



TEST ENVIRONMENT

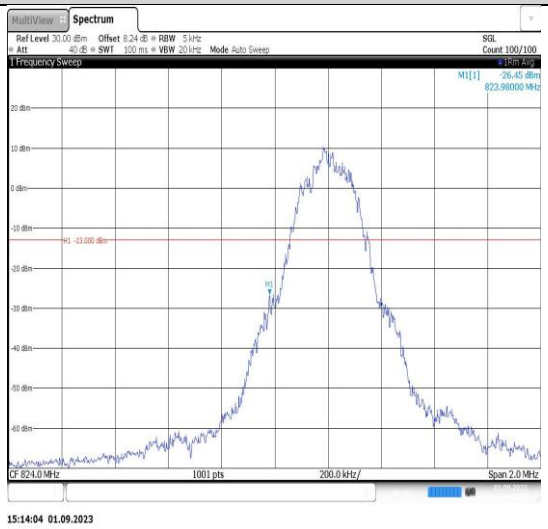
Temperature	23.1°C	Relative Humidity	66.3%
Atmosphere Pressure	101kPa	Test Voltage	DC 7.2 V

Test Result

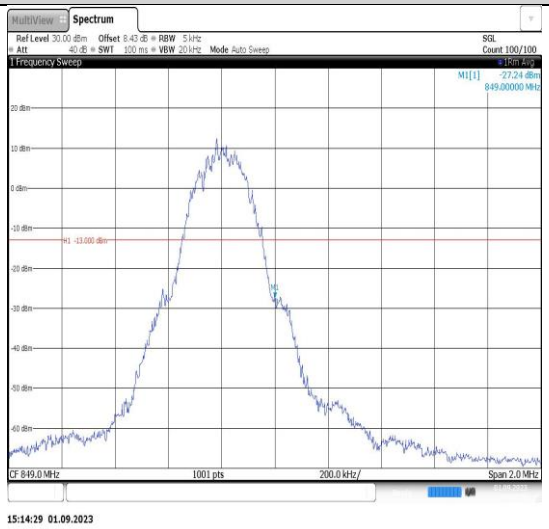
Band	Channel	Freq (MHz)	Result (dBm)	Limit(dBm)	Verdict
GPRS850	128	823.98	-26.45	-13	PASS
GPRS850	251	849.00	-27.24	-13	PASS
EGPRS850	128	823.98	-38.17	-13	PASS
EGPRS850	251	849.04	-36.35	-13	PASS
GPRS1900	512	1850.00	-29.00	-13	PASS
GPRS1900	810	1910.02	-28.39	-13	PASS
EGPRS1900	512	1850.00	-35.94	-13	PASS
EGPRS1900	810	1910.04	-38.06	-13	PASS

Test Graphs

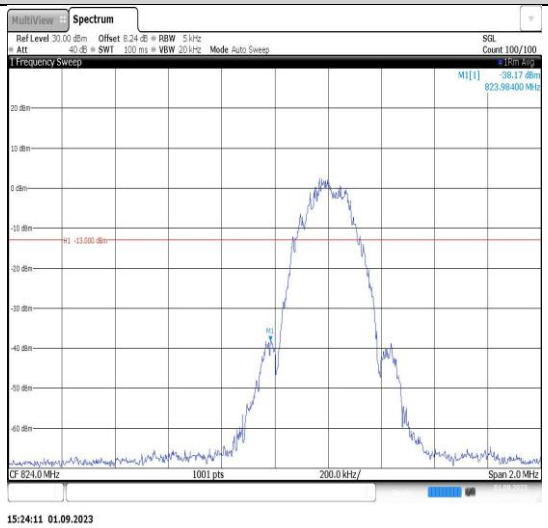
GPRS850-128



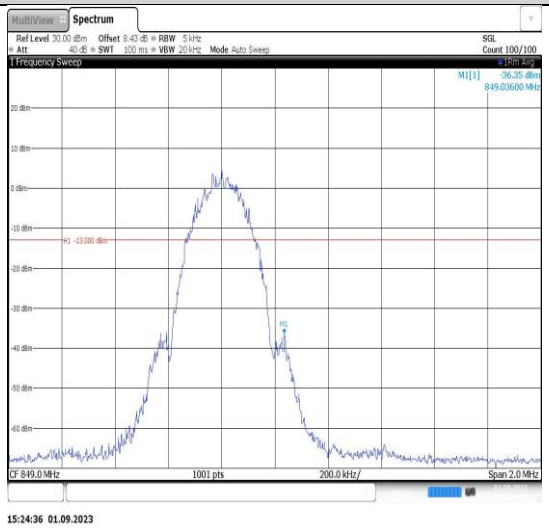
GPRS850-251



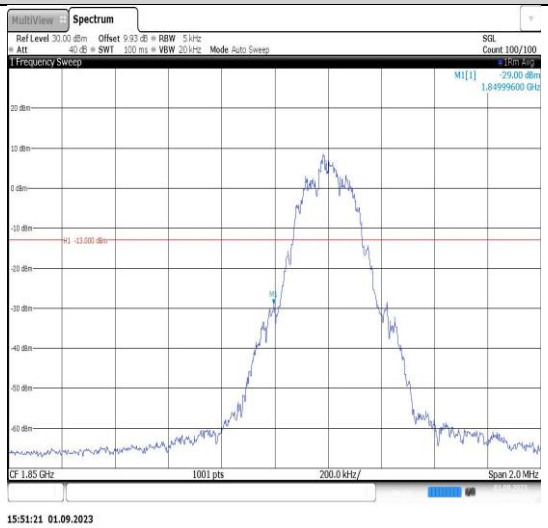
EGPRS850-128



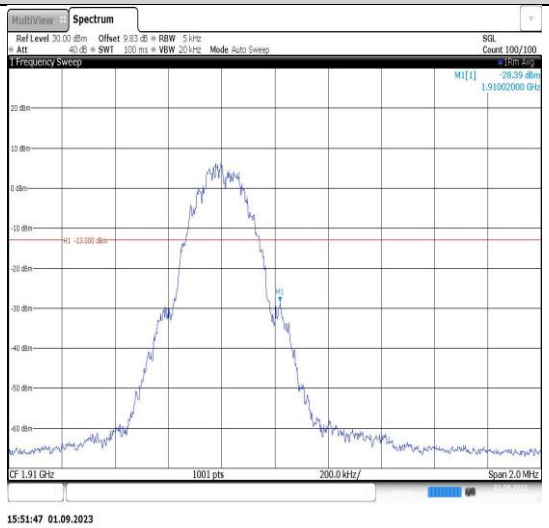
EGPRS850-251

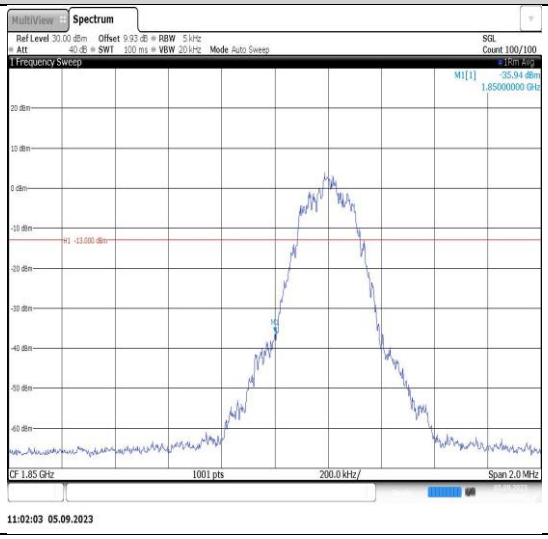
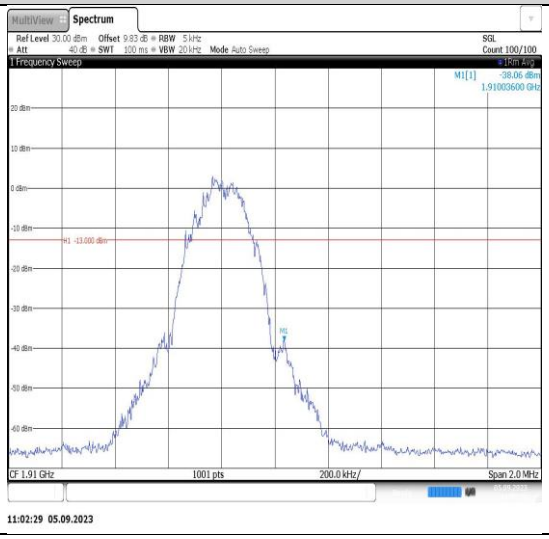


GPRS1900-512



GPRS1900-810



EGPRS1900-512	EGPRS1900-810
	

7.5. SPURIOUS EMISSION AT ANTENNA TERMINAL

RULE PART(S)

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

LIMITS

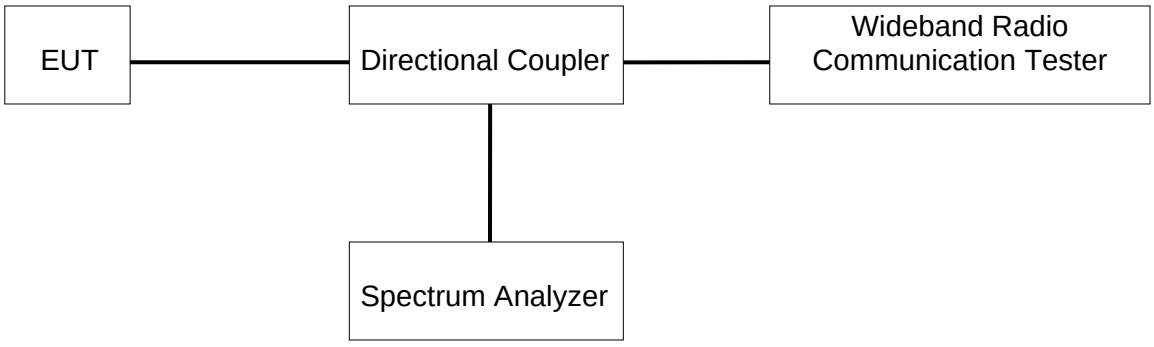
FCC: §22.901, §22.917, §24.238
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

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 ≥ 3 × 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

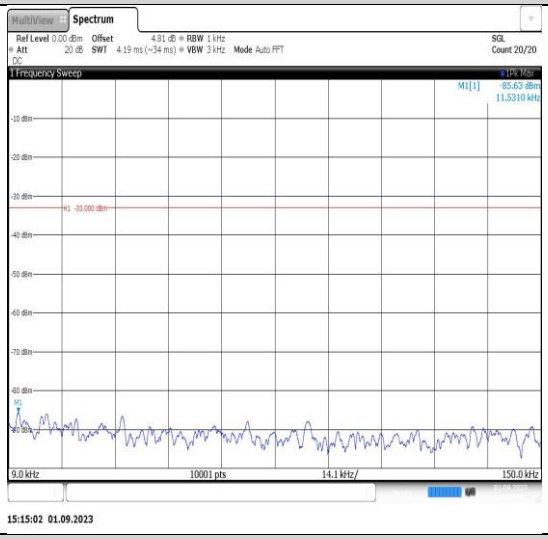
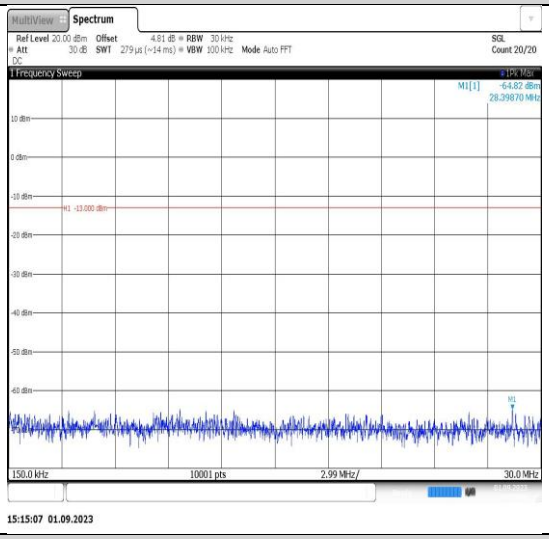
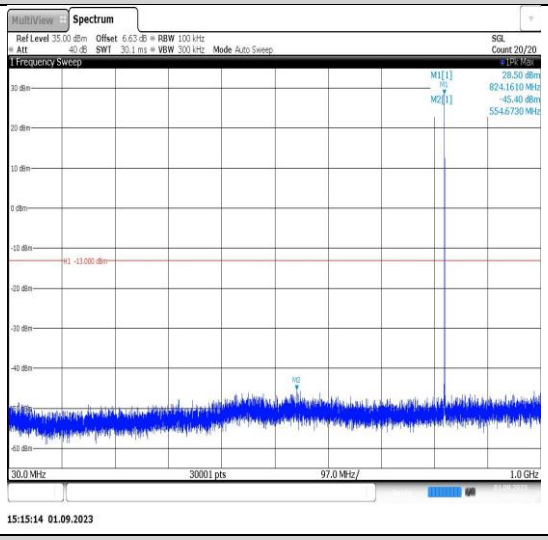
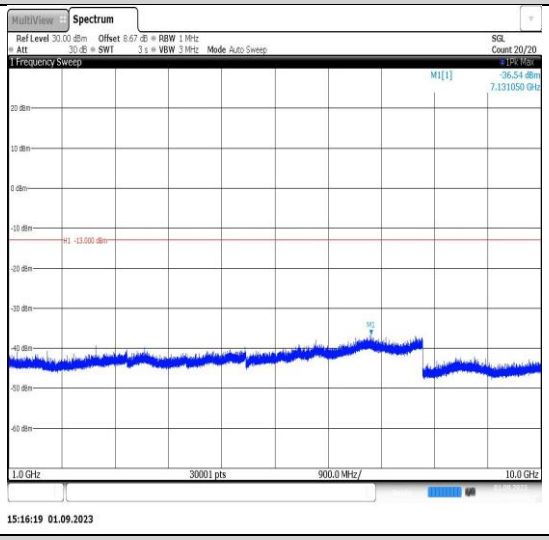
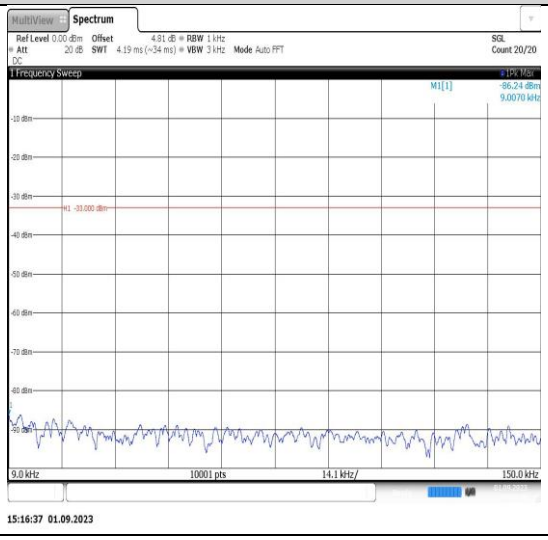
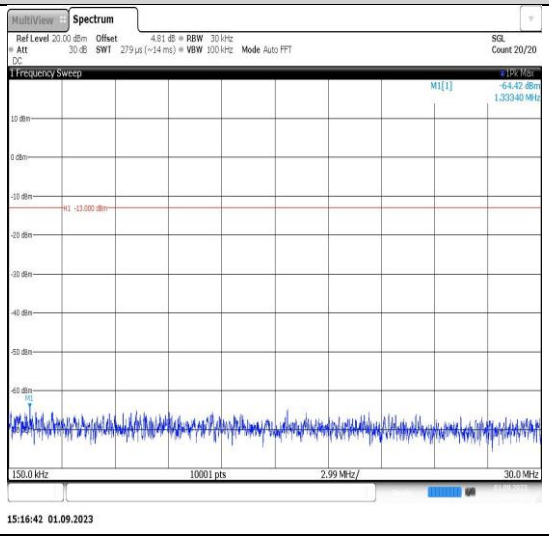
Temperature	23.1°C	Relative Humidity	66.3%
Atmosphere Pressure	101kPa	Test Voltage	DC 7.2 V

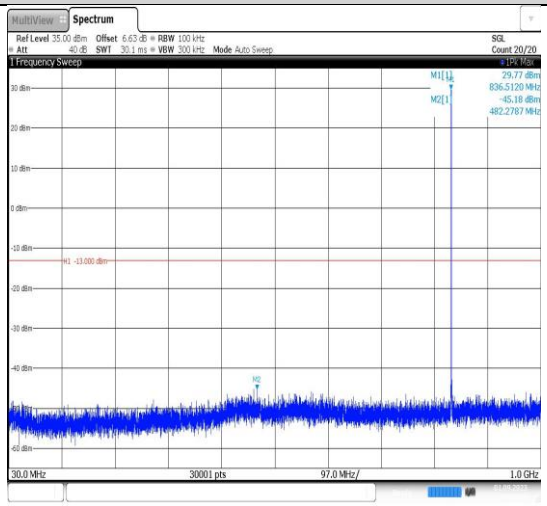
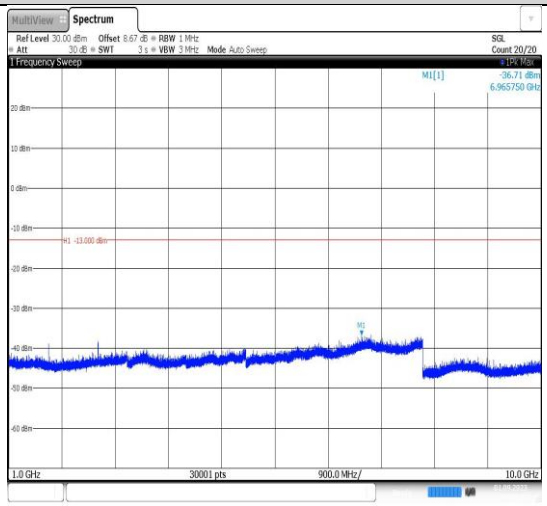
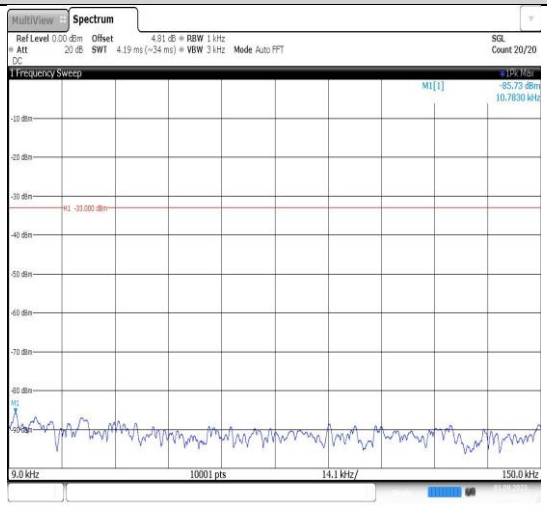
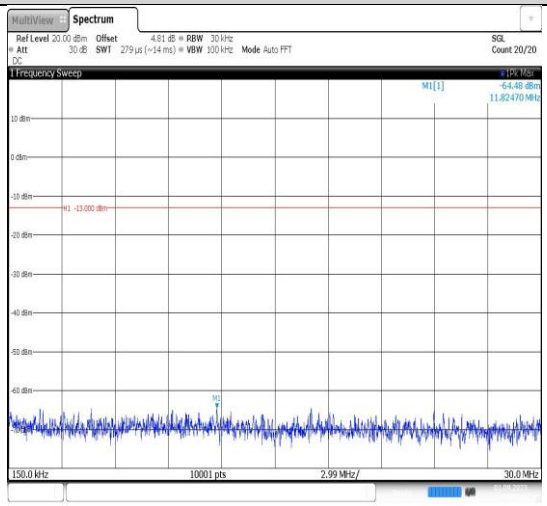
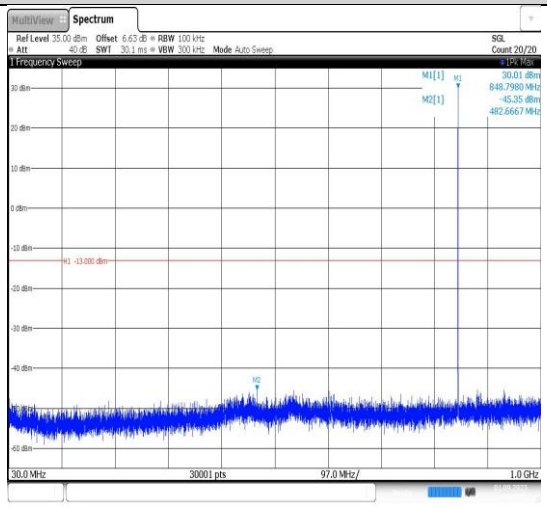
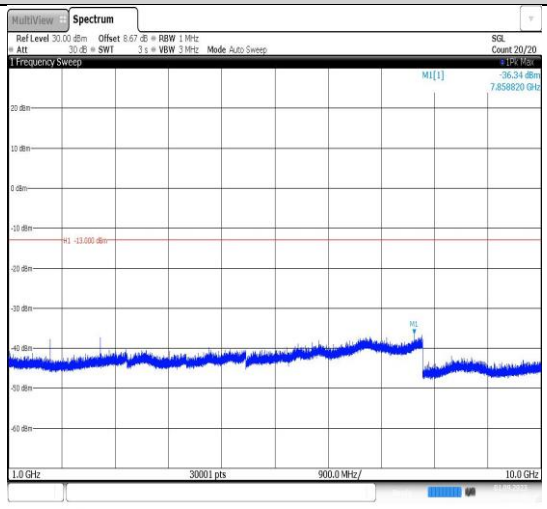
Test Result

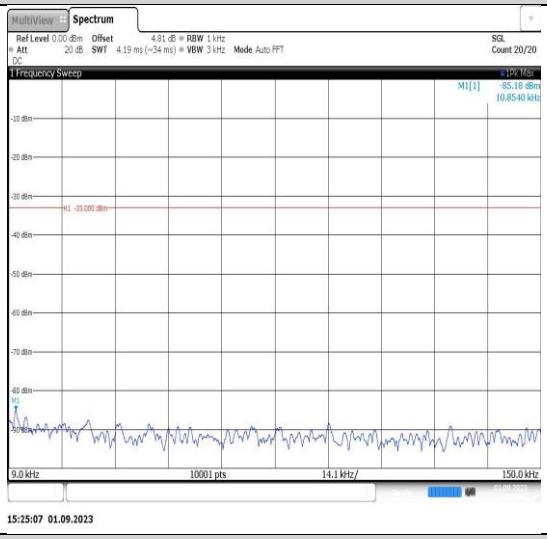
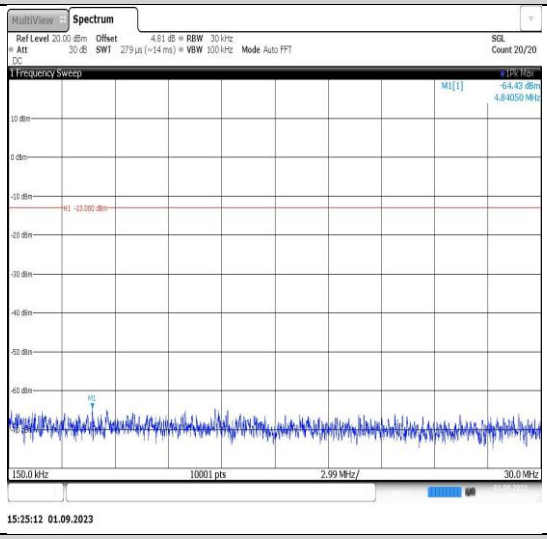
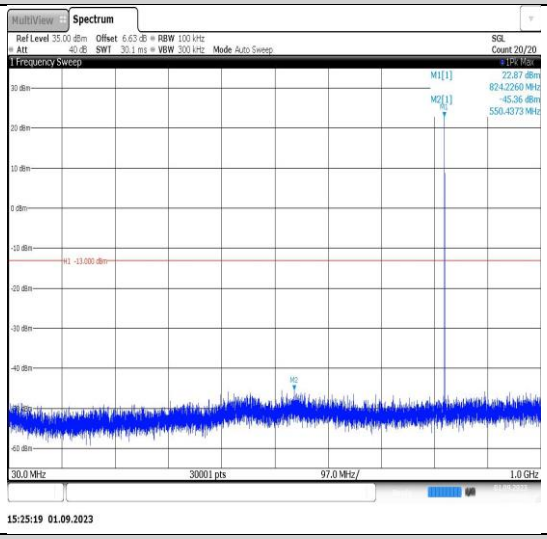
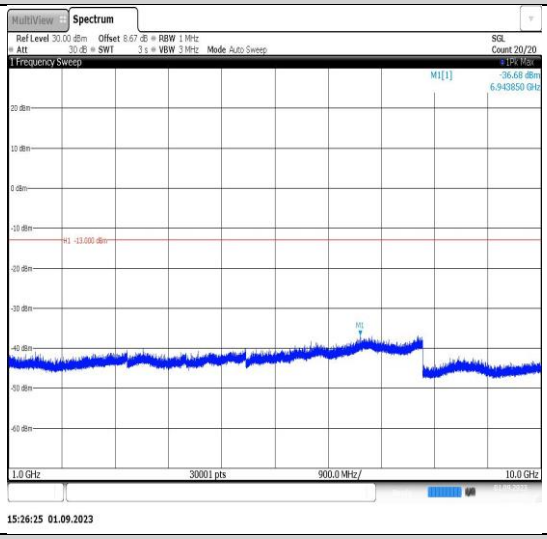
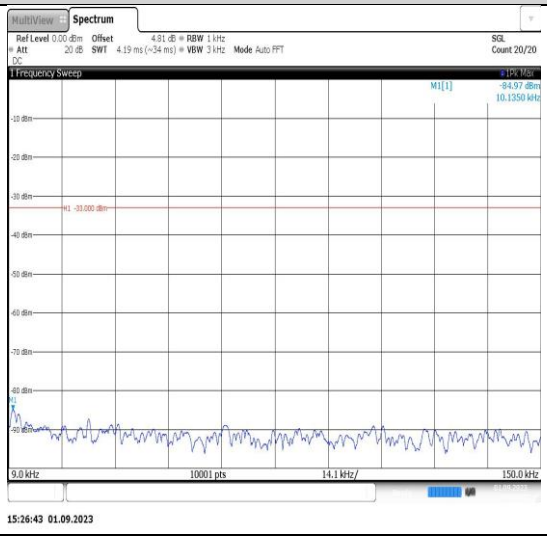
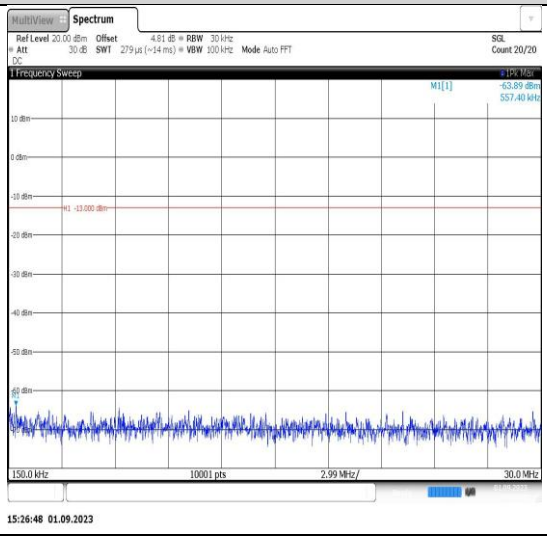
Band	Channel	Frequency Range(MHz)	Max.Freq. (MHz)	Result (dBm)	Limit (dBm)	Verdict
GPRS850	128	0.009~0.15MHz	0.01	-85.63	-33	PASS
GPRS850	128	0.15~30MHz	28.4	-64.82	-18	PASS
GPRS850	128	30~1000MHz	554.67	-45.4	-13	PASS
GPRS850	128	1000~10000MHz	7131.05	-36.54	-13	PASS
GPRS850	190	0.009~0.15MHz	0.01	-86.24	-33	PASS
GPRS850	190	0.15~30MHz	1.33	-64.42	-18	PASS
GPRS850	190	30~1000MHz	482.28	-45.18	-13	PASS
GPRS850	190	1000~10000MHz	6965.75	-36.71	-13	PASS
GPRS850	251	0.009~0.15MHz	0.01	-85.73	-33	PASS
GPRS850	251	0.15~30MHz	11.82	-64.48	-18	PASS
GPRS850	251	30~1000MHz	482.67	-45.35	-13	PASS
GPRS850	251	1000~10000MHz	7858.82	-36.34	-13	PASS
EGPRS850	128	0.009~0.15MHz	0.01	-85.18	-33	PASS
EGPRS850	128	0.15~30MHz	4.84	-64.43	-18	PASS
EGPRS850	128	30~1000MHz	550.44	-45.36	-13	PASS
EGPRS850	128	1000~10000MHz	6943.85	-36.68	-13	PASS
EGPRS850	190	0.009~0.15MHz	0.01	-84.97	-33	PASS
EGPRS850	190	0.15~30MHz	0.56	-63.89	-18	PASS
EGPRS850	190	30~1000MHz	554.12	-45.53	-13	PASS
EGPRS850	190	1000~10000MHz	7079.45	-36.52	-13	PASS
EGPRS850	251	0.009~0.15MHz	0.01	-84.67	-33	PASS
EGPRS850	251	0.15~30MHz	0.2	-64.51	-18	PASS
EGPRS850	251	30~1000MHz	451.66	-45.71	-13	PASS
EGPRS850	251	1000~10000MHz	7109.15	-36.53	-13	PASS
GPRS1900	512	0.009~0.15MHz	0.02	-86.13	-43	PASS
GPRS1900	512	0.15~30MHz	2.2	-64.43	-23	PASS
GPRS1900	512	30~1000MHz	541	-42.72	-13	PASS
GPRS1900	512	1000~18000MHz	7901.43	-36.31	-13	PASS
GPRS1900	661	0.009~0.15MHz	0.01	-84.97	-43	PASS
GPRS1900	661	0.15~30MHz	11.95	-63.65	-23	PASS
GPRS1900	661	30~1000MHz	538.31	-43.39	-13	PASS
GPRS1900	661	1000~18000MHz	7318.33	-36.84	-13	PASS
GPRS1900	810	0.009~0.15MHz	0.01	-86.19	-43	PASS
GPRS1900	810	0.15~30MHz	0.25	-64.11	-23	PASS
GPRS1900	810	30~1000MHz	466.37	-43.73	-13	PASS
GPRS1900	810	1000~18000MHz	7029.9	-36.67	-13	PASS
EGPRS1900	512	0.009~0.15MHz	0.01	-86.35	-43	PASS
EGPRS1900	512	0.15~30MHz	22.5	-64.92	-23	PASS
EGPRS1900	512	30~1000MHz	549.37	-42.66	-13	PASS
EGPRS1900	512	1000~18000MHz	7007.23	-36.62	-13	PASS
EGPRS1900	661	0.009~0.15MHz	0.02	-85.85	-43	PASS

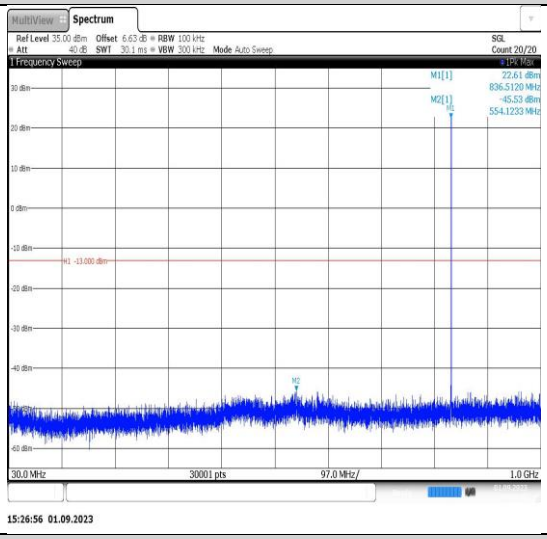
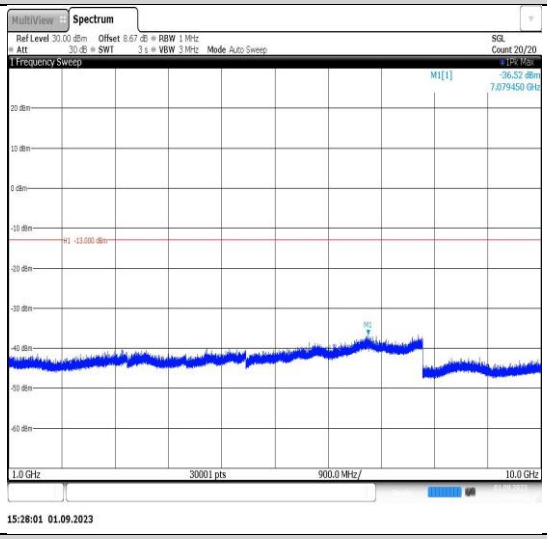
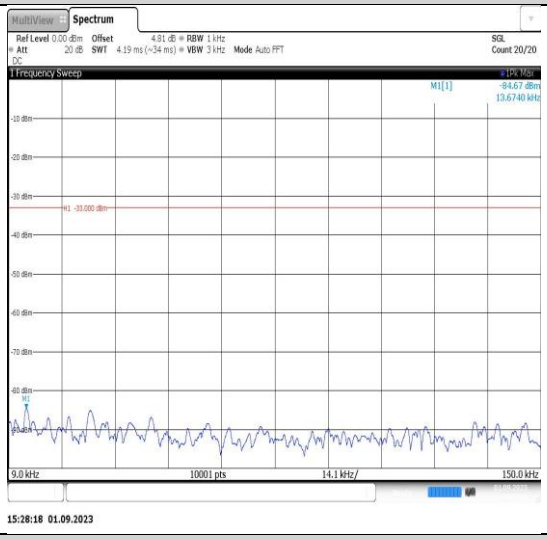
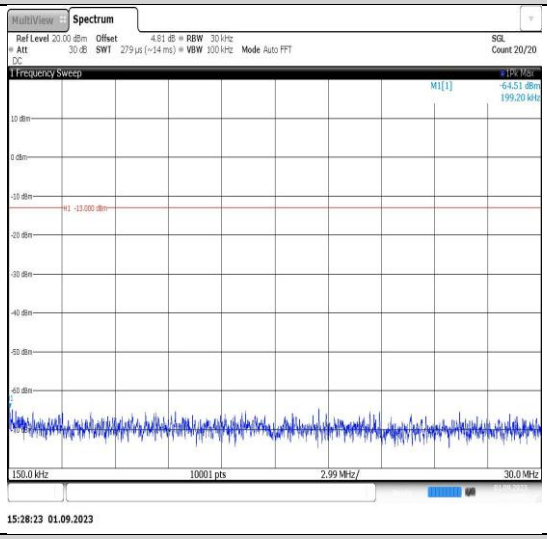
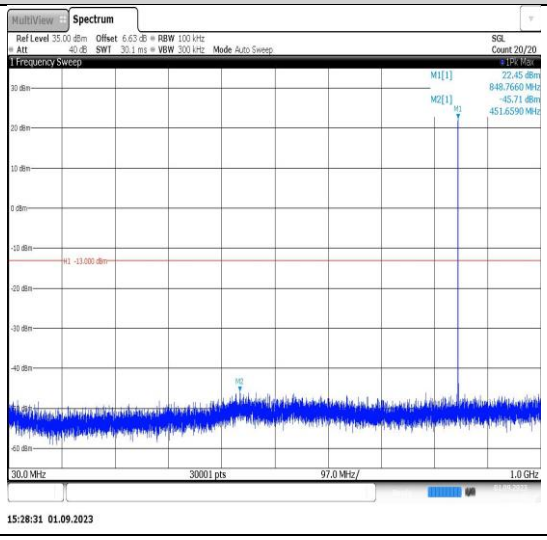
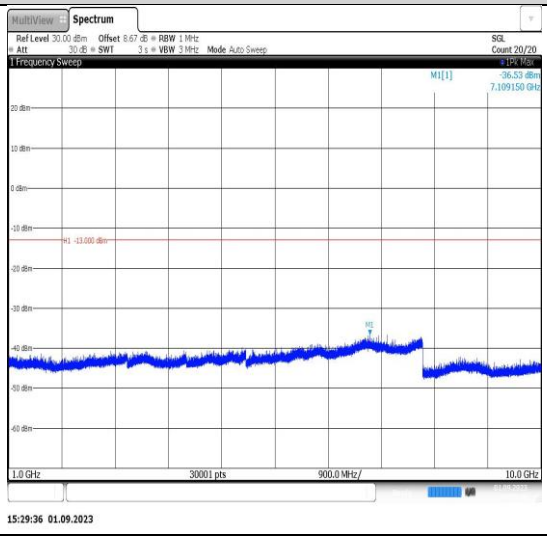
EGPRS1900	661	0.15~30MHz	3.26	-64.51	-23	PASS
EGPRS1900	661	30~1000MHz	450.17	-43.46	-13	PASS
EGPRS1900	661	1000~18000MHz	7930.33	-36.86	-13	PASS
EGPRS1900	810	0.009~0.15MHz	0.01	-85.04	-43	PASS
EGPRS1900	810	0.15~30MHz	8.6	-63.69	-23	PASS
EGPRS1900	810	30~1000MHz	548.46	-42.66	-13	PASS
EGPRS1900	810	1000~18000MHz	7915.6	-36.9	-13	PASS

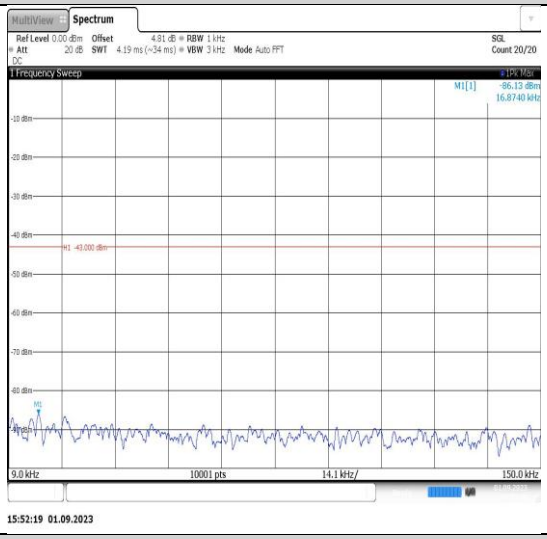
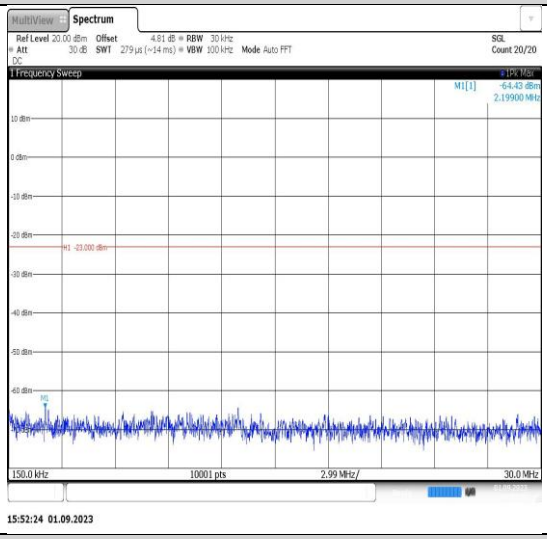
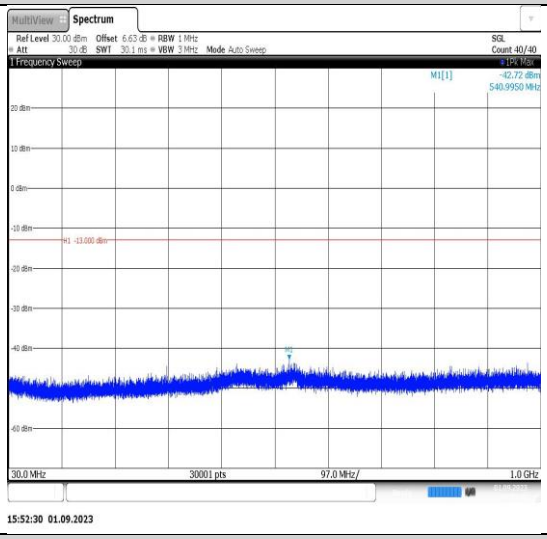
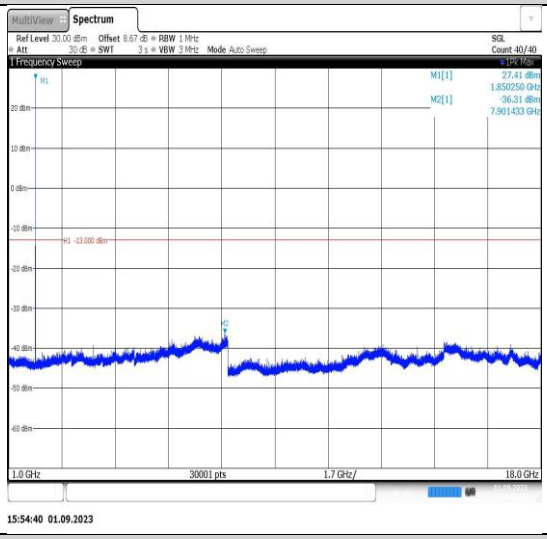
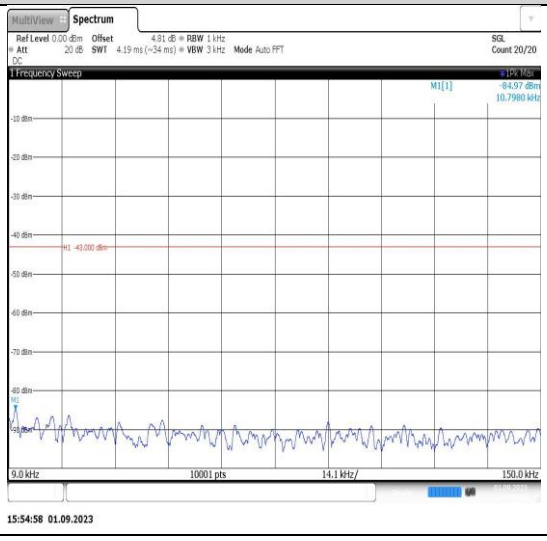
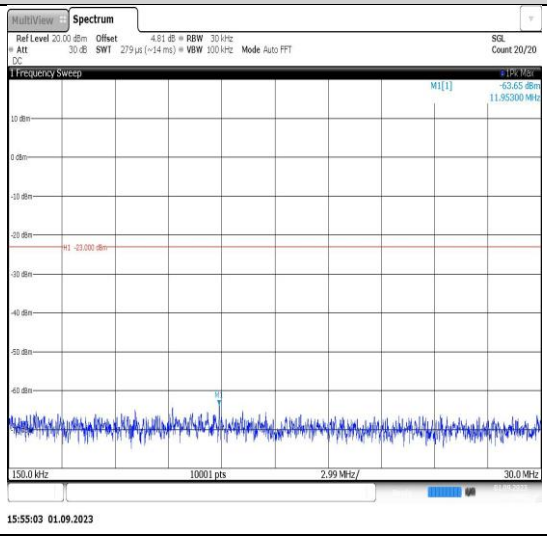
Test Graphs

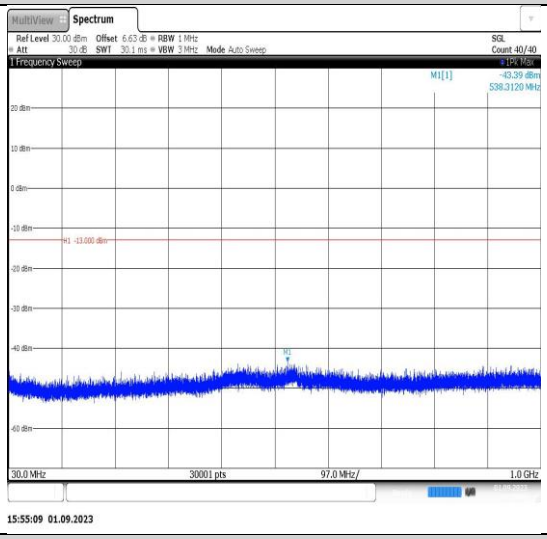
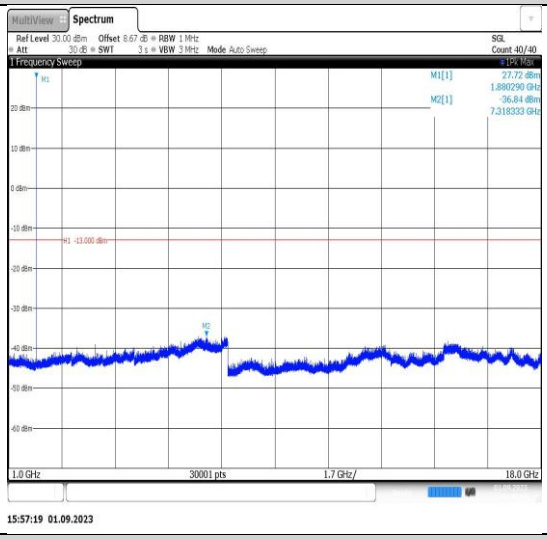
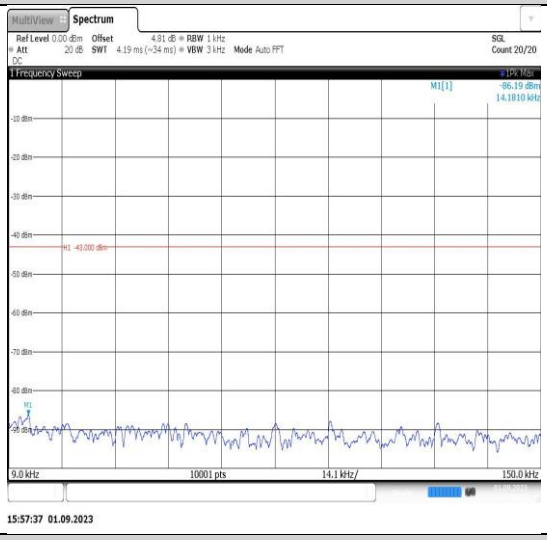
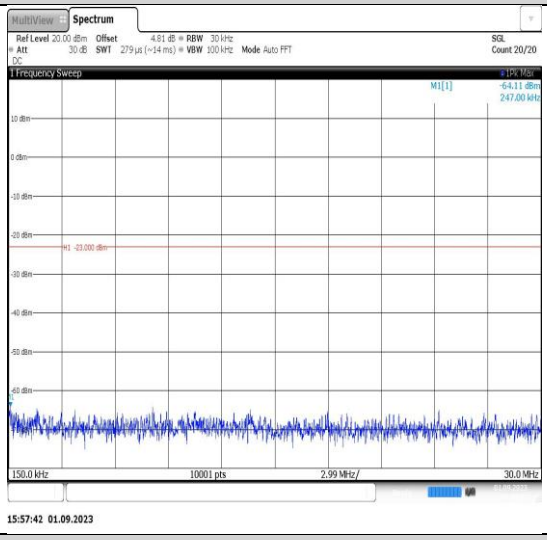
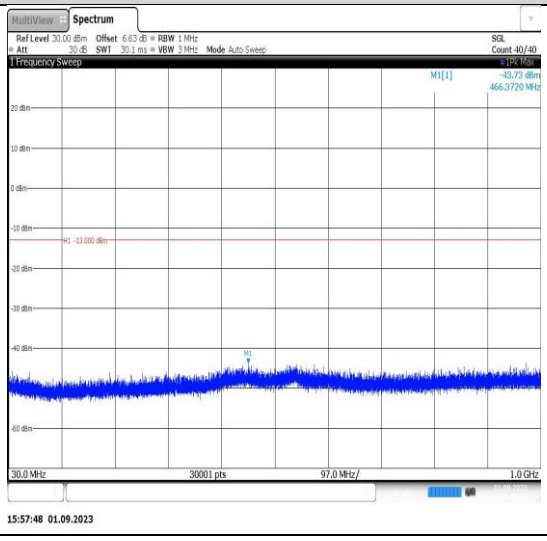
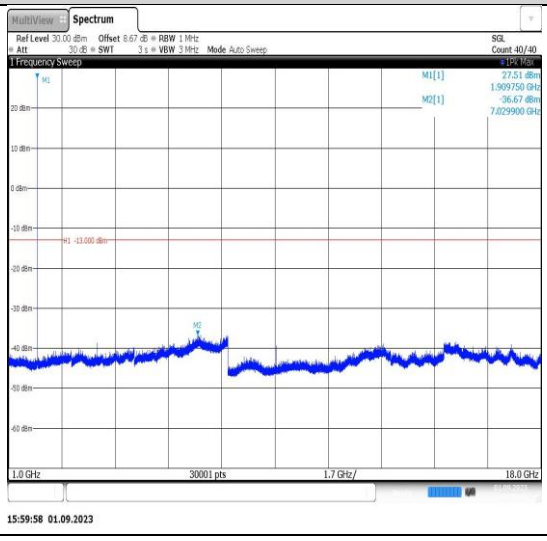
GPRS850-128-0.009~0.15MHz	GPRS850-128-0.15~30MHz
	
GPRS850-128-30~1000MHz	GPRS850-128-1000~10000MHz
	
GPRS850-190-0.009~0.15MHz	GPRS850-190-0.15~30MHz
	

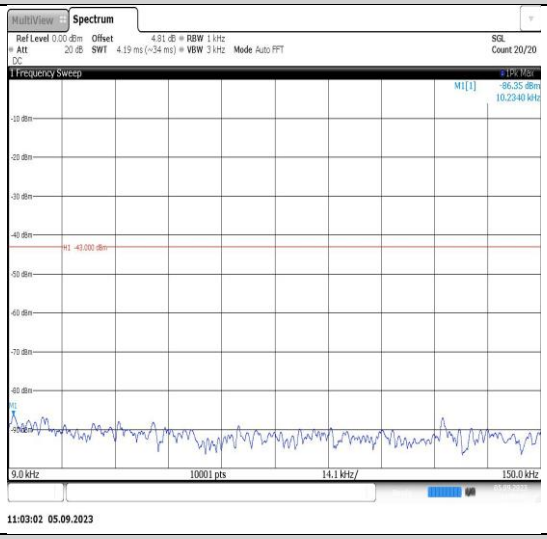
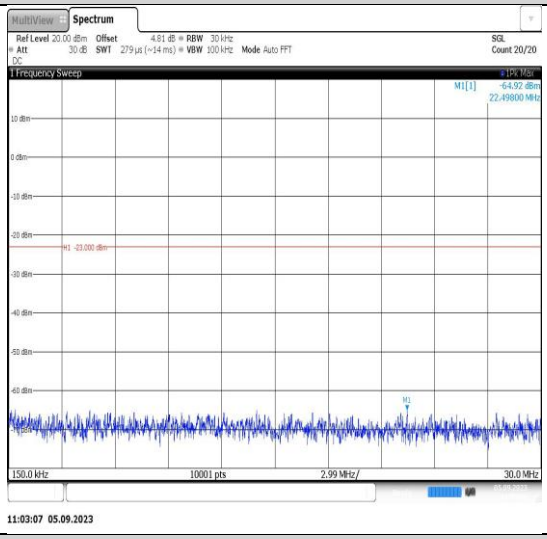
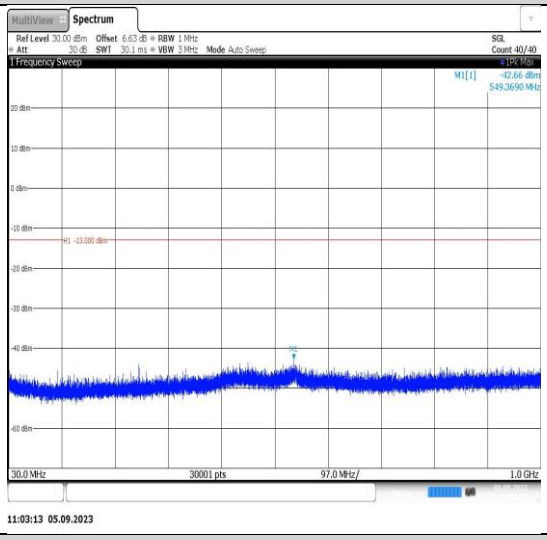
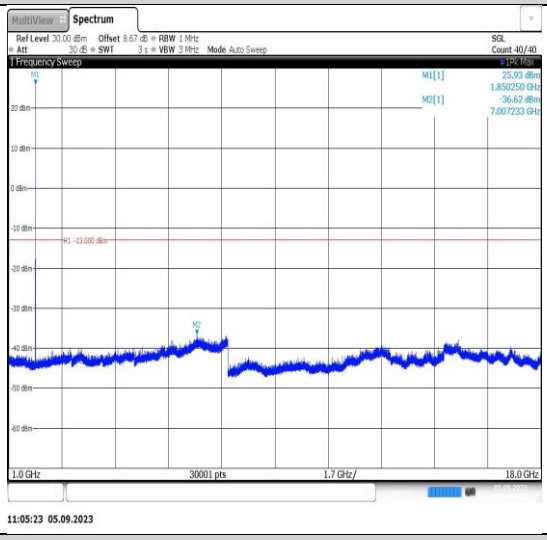
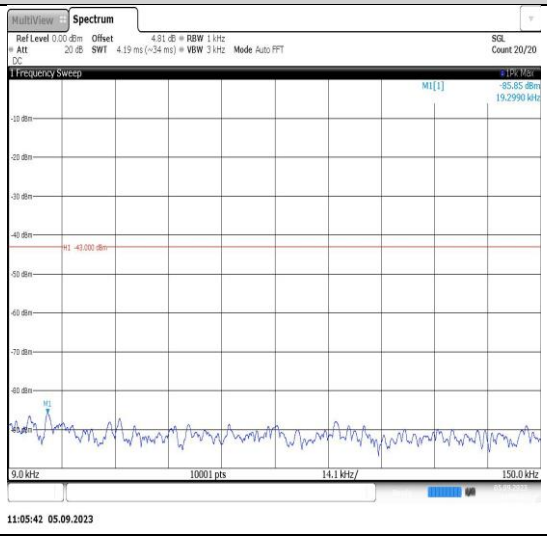
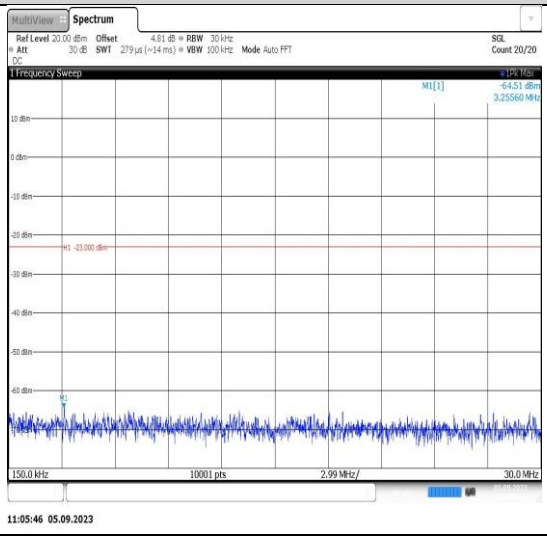
GPRS850-190-30~1000MHz	GPRS850-190-1000~10000MHz
	
GPRS850-251-0.009~0.15MHz	GPRS850-251-0.15~30MHz
	
GPRS850-251-30~1000MHz	GPRS850-251-1000~10000MHz
	

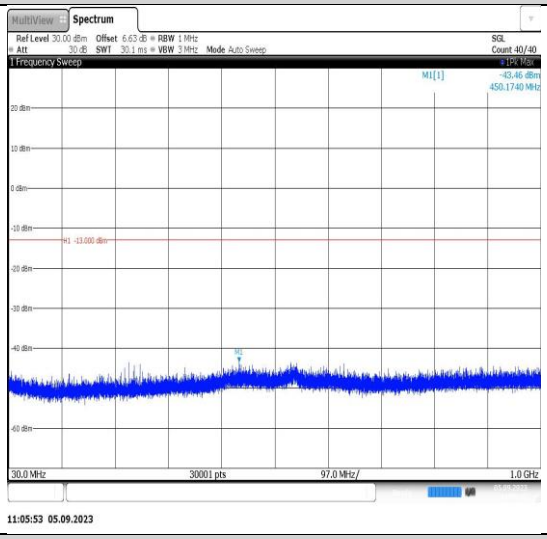
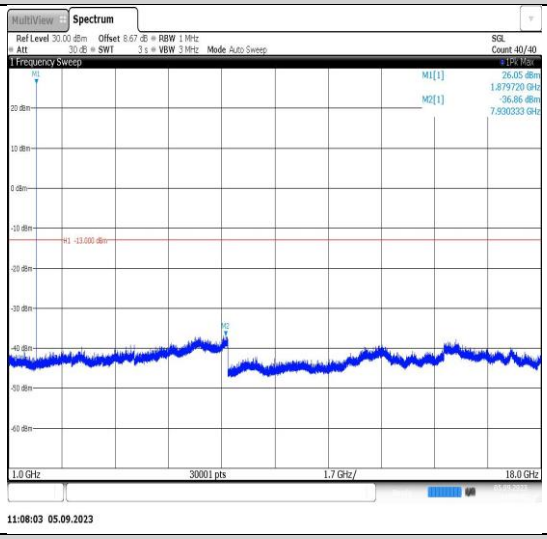
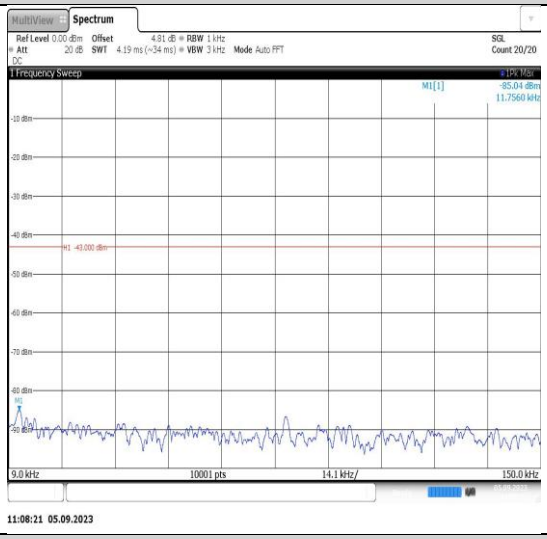
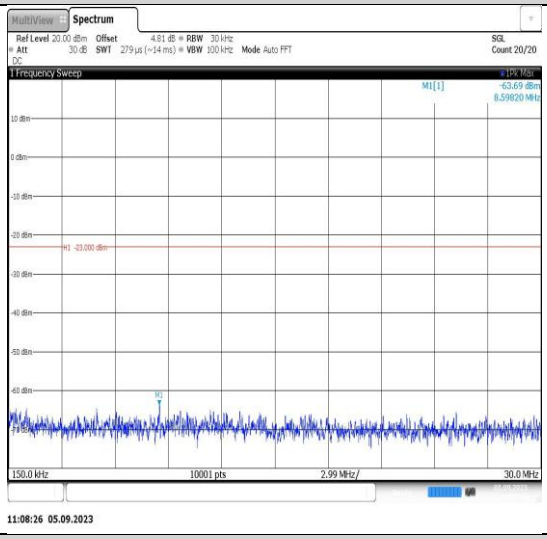
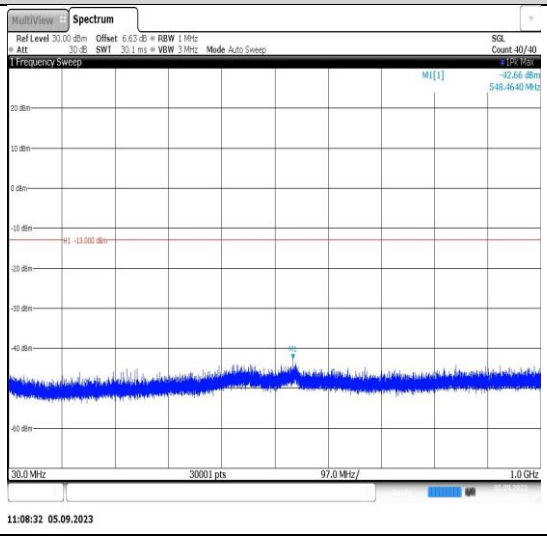
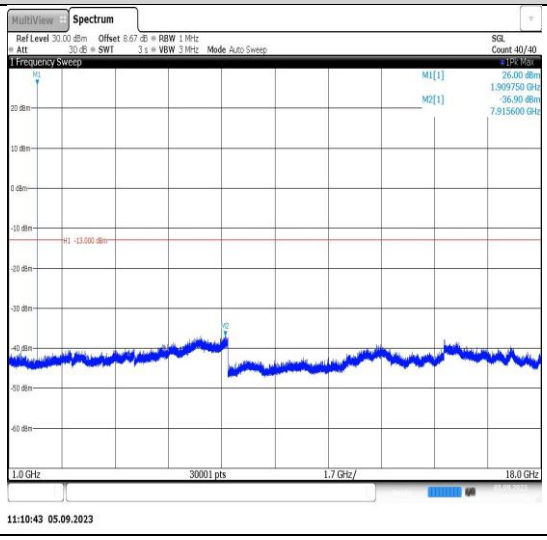
EGPRS850-128-0.009~0.15MHz	EGPRS850-128-0.15~30MHz
	
EGPRS850-128-30~1000MHz	EGPRS850-128-1000~10000MHz
	
EGPRS850-190-0.009~0.15MHz	EGPRS850-190-0.15~30MHz
	

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	GPRS1900-512-1000~18000MHz
	
GPRS1900-661-0.009~0.15MHz	GPRS1900-661-0.15~30MHz
	

GPRS1900-661-30~1000MHz	GPRS1900-661-1000~18000MHz
	
GPRS1900-810-0.009~0.15MHz	GPRS1900-810-0.15~30MHz
	
GPRS1900-810-30~1000MHz	GPRS1900-810-1000~18000MHz
	

EGPRS1900-512-0.009~0.15MHz	EGPRS1900-512-0.15~30MHz
	
EGPRS1900-512-30~1000MHz	EGPRS1900-512-1000~18000MHz
	
EGPRS1900-661-0.009~0.15MHz	EGPRS1900-661-0.15~30MHz
	

EGPRS1900-661-30~1000MHz	EGPRS1900-661-1000~18000MHz
	
EGPRS1900-810-0.009~0.15MHz	EGPRS1900-810-0.15~30MHz
	
EGPRS1900-810-30~1000MHz	EGPRS1900-810-1000~18000MHz
	

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.

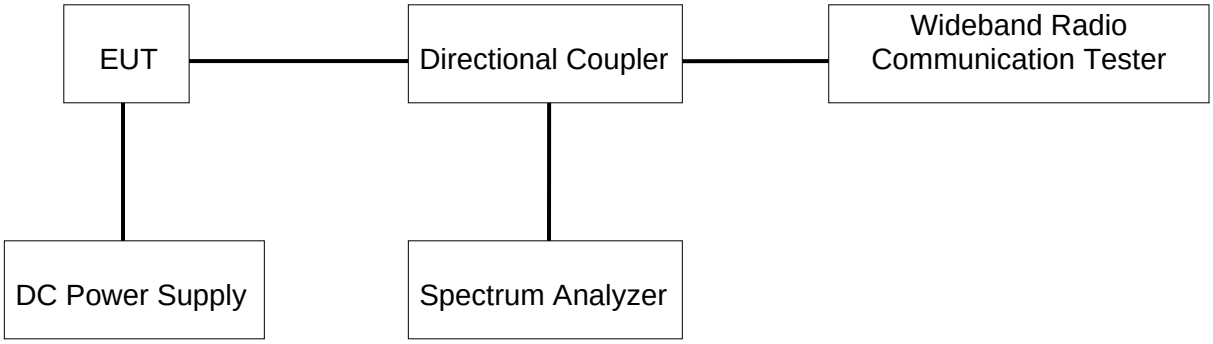
§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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 7.2 V	V_L (Low Voltage): DC 6.1V
		V_H (High Voltage): DC 8.3 V

TEST SETUP



TEST ENVIRONMENT

Temperature	23.1°C	Relative Humidity	66.3%
Atmosphere Pressure	101kPa	Test Voltage	/

Test Result

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

Voltage							
Band	Channel	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GPRS850	190	VL	NT	14.17	0.016938	±2.5	PASS
GPRS850	190	VN	NT	6.17	0.007375	±2.5	PASS
GPRS850	190	VH	NT	11.07	0.013232	±2.5	PASS
EGPRS850	190	VL	NT	7.85	0.009383	±2.5	PASS
EGPRS850	190	VN	NT	7.55	0.009025	±2.5	PASS
EGPRS850	190	VH	NT	10.78	0.012885	±2.5	PASS
GPRS1900	661	VL	NT	3.23	0.001718	±2.5	PASS
GPRS1900	661	VN	NT	22.96	0.012213	±2.5	PASS
GPRS1900	661	VH	NT	7.30	0.003883	±2.5	PASS
EGPRS1900	661	VL	NT	15.69	0.008346	±2.5	PASS
EGPRS1900	661	VN	NT	22.83	0.012144	±2.5	PASS
EGPRS1900	661	VH	NT	14.72	0.007830	±2.5	PASS

Temperature							
Band	Channel	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GPRS850	190	NV	-30	13.43	0.016053	±2.5	PASS
GPRS850	190	NV	-20	15.53	0.018563	±2.5	PASS
GPRS850	190	NV	-10	15.69	0.018754	±2.5	PASS
GPRS850	190	NV	0	16.34	0.019531	±2.5	PASS
GPRS850	190	NV	10	6.91	0.008260	±2.5	PASS
GPRS850	190	NV	20	14.24	0.017021	±2.5	PASS
GPRS850	190	NV	30	8.72	0.010423	±2.5	PASS
GPRS850	190	NV	40	15.98	0.019101	±2.5	PASS
GPRS850	190	NV	50	17.85	0.021336	±2.5	PASS
EGPRS850	190	NV	-30	8.17	0.009766	±2.5	PASS
EGPRS850	190	NV	-20	6.62	0.007913	±2.5	PASS
EGPRS850	190	NV	-10	8.78	0.010495	±2.5	PASS
EGPRS850	190	NV	0	8.78	0.010495	±2.5	PASS
EGPRS850	190	NV	10	9.01	0.010770	±2.5	PASS
EGPRS850	190	NV	20	5.65	0.006754	±2.5	PASS
EGPRS850	190	NV	30	8.23	0.009837	±2.5	PASS
EGPRS850	190	NV	40	10.88	0.013005	±2.5	PASS
EGPRS850	190	NV	50	9.33	0.011152	±2.5	PASS
GPRS1900	661	NV	-30	5.55	0.002952	±2.5	PASS
GPRS1900	661	NV	-20	17.79	0.009463	±2.5	PASS
GPRS1900	661	NV	-10	18.27	0.009718	±2.5	PASS
GPRS1900	661	NV	0	13.85	0.007367	±2.5	PASS
GPRS1900	661	NV	10	19.57	0.010410	±2.5	PASS
GPRS1900	661	NV	20	13.37	0.007112	±2.5	PASS
GPRS1900	661	NV	30	13.33	0.007090	±2.5	PASS
GPRS1900	661	NV	40	23.92	0.012723	±2.5	PASS
GPRS1900	661	NV	50	11.62	0.006181	±2.5	PASS

EGPRS1900	661	NV	-30	5.42	0.002883	±2.5	PASS
EGPRS1900	661	NV	-20	11.75	0.006250	±2.5	PASS
EGPRS1900	661	NV	-10	6.04	0.003213	±2.5	PASS
EGPRS1900	661	NV	0	12.69	0.006750	±2.5	PASS
EGPRS1900	661	NV	10	22.12	0.011766	±2.5	PASS
EGPRS1900	661	NV	20	14.85	0.007899	±2.5	PASS
EGPRS1900	661	NV	30	25.47	0.013548	±2.5	PASS
EGPRS1900	661	NV	40	10.75	0.005718	±2.5	PASS
EGPRS1900	661	NV	50	14.53	0.007729	±2.5	PASS

8. RADIATED SPURIOUS EMISSIONS

RULE PART(S)

FCC: §2.1053, §22.917, §24.238

LIMIT

Part §22.917(a), §24.238(a)
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

KDB 971168 D01 Section 7

Below 1GHz test procedure as below:

1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. Calculate power in dBm by the following formula:

ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

Where:

Pd is the dipole equivalent power, Pg is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to Pg [dBm] – cable loss [dB]. The calculated Pd levels are then compared to the absolute spurious emission limit of -13 dBm which is equivalent to the required minimum attenuation of 43 + 10log10(Power [Watts]).

Above 1GHz test procedure as below:

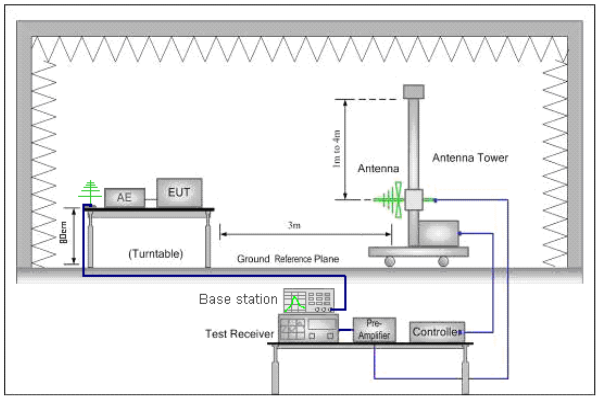
1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.

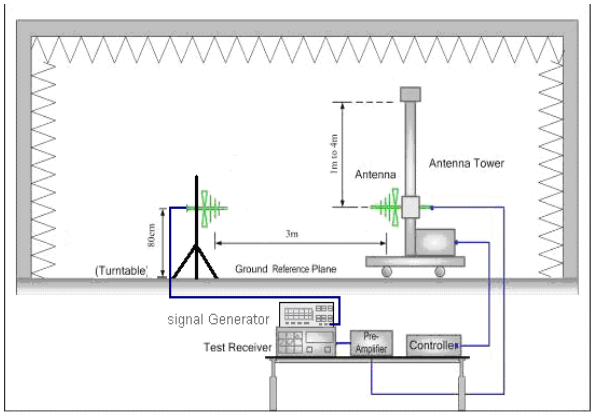
9. Repeat step 7 to step 8 for another polarization.
10. Calculate power in dBm by the following formula:
EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)
EIRP=ERP+2.15dB
Where: Pg is the generator output power into the substitution antenna.
11. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
= P(W)- [43 + 10log(P)] (dB)
= [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
= -13dBm.

EIRP[dBm] =E[dBμV/m] − 95.25
E[dBμV/m]= 95.25- EIRP[dBm]
E[dBμV/m]= 82.25

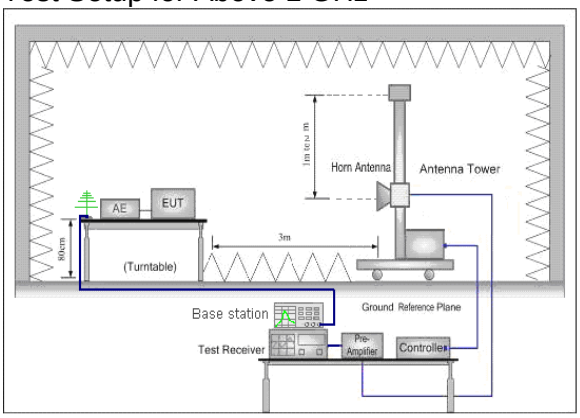
NOTE 1: Radiated spurious emissions were investigated below 30 MHz, 30 MHz – 1 GHz and above 1 GHz. There were no emissions found on below 30 MHz and 30 MHz – 1 GHz.
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.

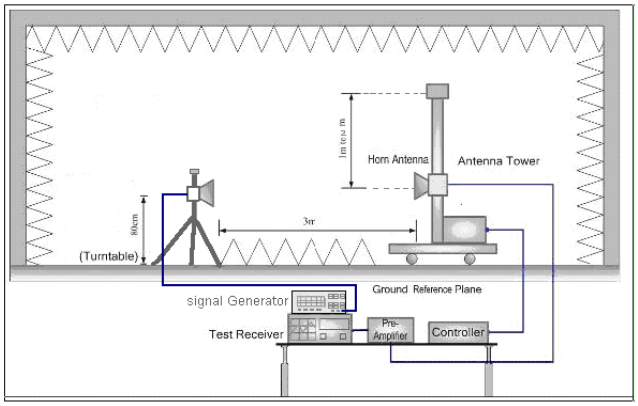
TEST SETUP
Test Setup for Below 1 GHz



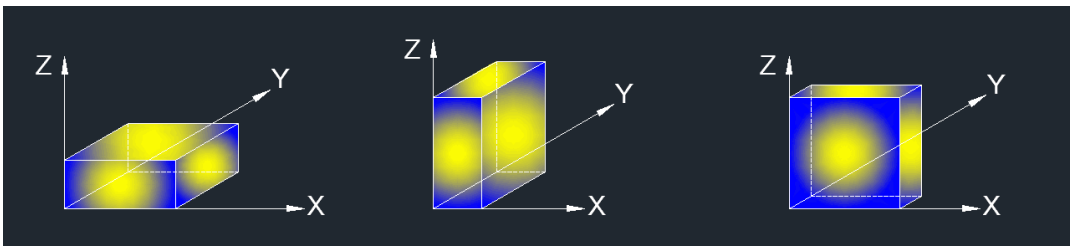


Test Setup for Above 1 GHz





X axis, Y axis, Z axis positions:



Note 1: The manufacturer has recommended that the EUT only be used in the desktop (horizontal) orientation; therefore, all radiated testing was performed in desktop orientation.

TEST ENVIRONMENT

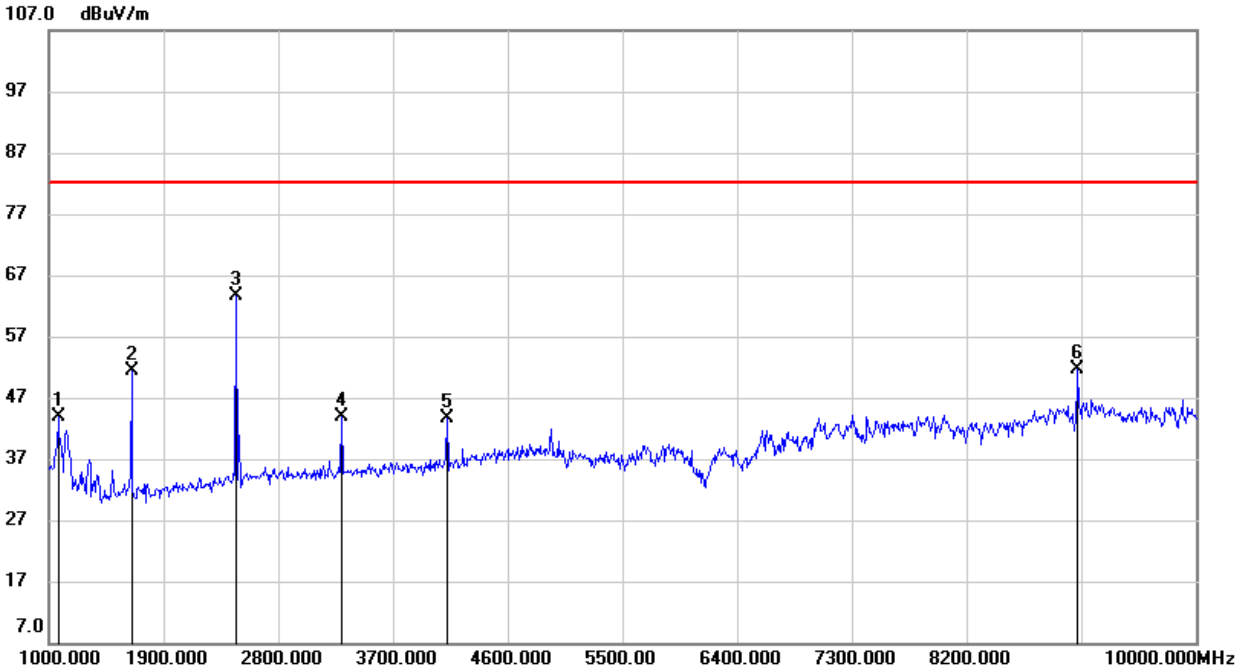
Temperature	24.3°C	Relative Humidity	61%
Atmosphere Pressure	101kPa	Test Voltage	DC 7.2 V

Test Result

GSM 850
GPRS- Low Channel- Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1081.000	60.02	-14.65	45.37	82.25	-36.88	peak
2	1648.000	61.92	-12.22	49.70	82.25	-32.55	peak
3	2467.000	68.88	-8.66	60.22	82.25	-22.03	peak
4	3295.000	49.82	-6.32	43.50	82.25	-38.75	peak
5	4123.000	48.09	-3.90	44.19	82.25	-38.06	peak
6	9073.000	42.64	9.77	52.41	82.25	-29.84	peak

GPRS- Low Channel- Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1072.000	58.50	-14.70	43.80	82.25	-38.45	peak
2	1648.000	63.50	-12.22	51.28	82.25	-30.97	peak
3	2467.000	72.35	-8.66	63.69	82.25	-18.56	peak
4	3295.000	50.18	-6.32	43.86	82.25	-38.39	peak
5	4123.000	47.52	-3.90	43.62	82.25	-38.63	peak
6	9073.000	41.97	9.77	51.74	82.25	-30.51	peak

GPRS- Mid Channel- Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1666.000	61.40	-12.16	49.24	82.25	-33.01	peak
2	2503.000	66.89	-8.48	58.41	82.25	-23.84	peak
3	3340.000	56.15	-6.22	49.93	82.25	-32.32	peak
4	4177.000	50.18	-3.66	46.52	82.25	-35.73	peak
5	5860.000	47.73	1.45	49.18	82.25	-33.07	peak
6	9208.000	42.65	9.82	52.47	82.25	-29.78	peak

GPRS- Mid Channel- Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1666.000	60.87	-12.16	48.71	82.25	-33.54	peak
2	2503.000	69.25	-8.48	60.77	82.25	-21.48	peak
3	3349.000	50.71	-6.19	44.52	82.25	-37.73	peak
4	4186.000	47.91	-3.61	44.30	82.25	-37.95	peak
5	5860.000	42.23	1.45	43.68	82.25	-38.57	peak
6	9208.000	43.34	9.82	53.16	82.25	-29.09	peak

GPRS- High Channel- Horizontal

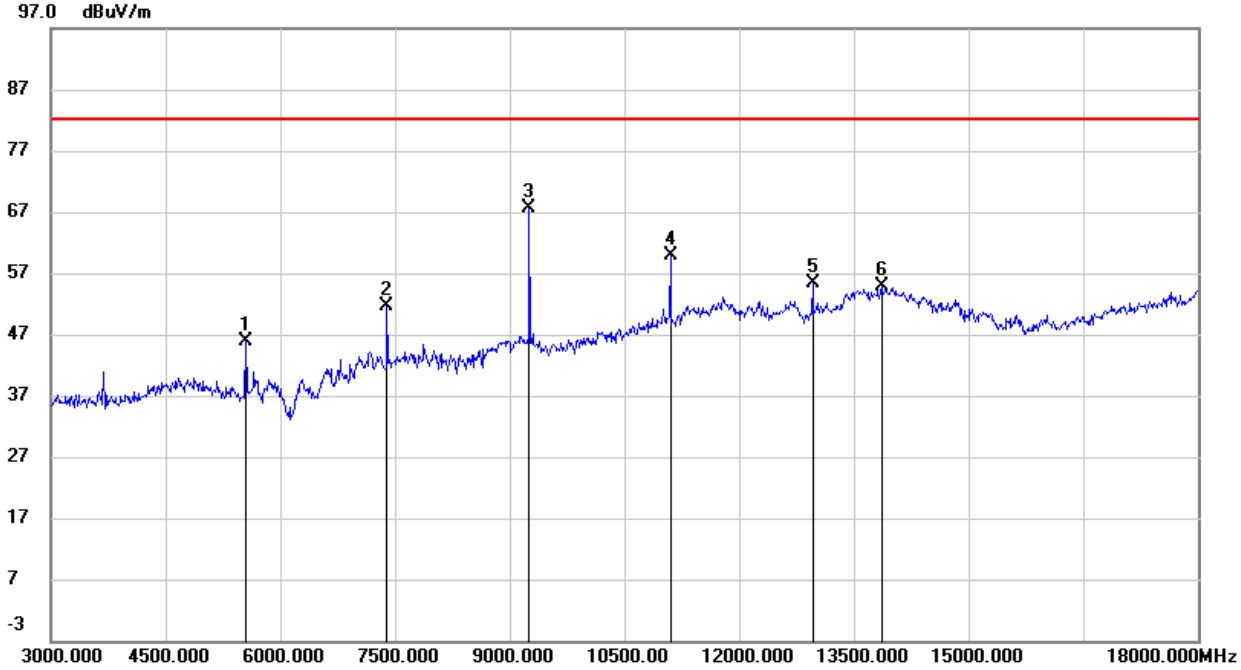
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1693.000	60.88	-12.08	48.80	82.25	-33.45	peak
2	2539.000	64.88	-8.37	56.51	82.25	-25.74	peak
3	3394.000	55.39	-6.09	49.30	82.25	-32.95	peak
4	5941.000	44.45	1.68	46.13	82.25	-36.12	peak
5	8488.000	45.46	6.21	51.67	82.25	-30.58	peak
6	9343.000	48.97	9.88	58.85	82.25	-23.40	peak

GPRS- High Channel- Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1693.000	58.51	-12.08	46.43	82.25	-35.82	peak
2	2548.000	67.55	-8.35	59.20	82.25	-23.05	peak
3	3394.000	51.61	-6.09	45.52	82.25	-36.73	peak
4	7642.000	42.04	5.69	47.73	82.25	-34.52	peak
5	8488.000	49.13	6.21	55.34	82.25	-26.91	peak
6	9343.000	46.53	9.88	56.41	82.25	-25.84	peak

GSM 1900

GPRS- Low Channel- Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5550.000	44.84	0.98	45.82	82.25	-36.43	peak
2	7395.000	45.14	6.40	51.54	82.25	-30.71	peak
3	9255.000	57.05	10.59	67.64	82.25	-14.61	peak
4	11100.000	44.78	15.14	59.92	82.25	-22.33	peak
5	12960.000	36.86	18.63	55.49	82.25	-26.76	peak
6	13860.000	33.30	21.67	54.97	82.25	-27.28	peak

GPRS- Low Channel- Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5550.000	42.63	0.98	43.61	82.25	-38.64	peak
2	7395.000	45.49	6.40	51.89	82.25	-30.36	peak
3	9255.000	54.84	10.59	65.43	82.25	-16.82	peak
4	11100.000	46.73	15.14	61.87	82.25	-20.38	peak
5	12960.000	36.68	18.63	55.31	82.25	-26.94	peak
6	13575.000	33.66	21.06	54.72	82.25	-27.53	peak

GPRS- Mid Channel- Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5640.000	42.90	1.24	44.14	82.25	-38.11	peak
2	7515.000	48.94	6.33	55.27	82.25	-26.98	peak
3	9405.000	52.52	10.66	63.18	82.25	-19.07	peak
4	11280.000	44.75	15.80	60.55	82.25	-21.70	peak
5	13170.000	37.70	19.46	57.16	82.25	-25.09	peak
6	15045.000	39.20	17.84	57.04	82.25	-25.21	peak

GPRS- Mid Channel- Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5640.000	48.03	1.24	49.27	82.25	-32.98	peak
2	7515.000	47.22	6.33	53.55	82.25	-28.70	peak
3	9405.000	52.34	10.66	63.00	82.25	-19.25	peak
4	11280.000	47.04	15.80	62.84	82.25	-19.41	peak
5	13155.000	39.72	19.40	59.12	82.25	-23.13	peak
6	15045.000	38.71	17.84	56.55	82.25	-25.70	peak

GPRS- High Channel- Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5730.000	44.21	1.49	45.70	82.25	-36.55	peak
2	7635.000	48.41	6.33	54.74	82.25	-27.51	peak
3	9555.000	50.95	10.85	61.80	82.25	-20.45	peak
4	11460.000	45.42	16.46	61.88	82.25	-20.37	peak
5	13365.000	36.54	20.31	56.85	82.25	-25.40	peak
6	15285.000	41.50	17.62	59.12	82.25	-23.13	peak

GPRS- High Channel- Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	3810.000	52.38	-4.24	48.14	82.25	-34.11	peak
2	5730.000	47.06	1.49	48.55	82.25	-33.70	peak
3	7635.000	50.78	6.33	57.11	82.25	-25.14	peak
4	9555.000	48.76	10.85	59.61	82.25	-22.64	peak
5	11460.000	45.46	16.46	61.92	82.25	-20.33	peak
6	13365.000	41.79	20.31	62.10	82.25	-20.15	peak

END OF REPORT