

FCC TEST REPORT

(PART 22)

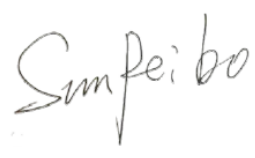
Applicant:	MUNIC
Address:	39 Avenue de Paris 94800 Villejuif – France

Manufacturer or Supplier:	MUNIC
Address:	39 Avenue de Paris 94800 Villejuif – France
Product:	telematics embedded system ALARM.COM CAR CONNECTOR
Brand Name:	MUNIC ALARM.COM
Model Name:	C4D-4MUSAC_V8 ADC-CC110
FCC ID	A6GC4D-4MUSACV8
Date of tests	Aug. 23, 2024 ~ Sep. 20, 2024

The tests have been carried out according to the requirements of the following standard:

- ☒ **FCC PART 22, Subpart H** ☒ **FCC Part 2**
☒ **ANSI/TIA/EIA-603-D** ☒ **ANSI C63.26-2015**
☒ **ANSI/TIA/EIA-603-E**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by Hanwen Xu Engineer / Mobile Department	Approved by Peibo Sun Manager / Mobile Department
	
Date: Sep. 20, 2024	Date: Sep. 20, 2024

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
PSU-QBJ2408220111RF01	Original release	Sep. 20, 2024

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 22 & Part 2			
STANDARD SECTION	TEST TYPE	RESULT	Test lab*
§2.1046	Coducted Output Power	Compliance	A
§22.913 (a)(5)	Equivalent Isotropic Radiated Power	Compliance	A
§2.1055 §22.355	Frequency Stability	Compliance	A
§2.1049	Occupied Bandwidth	Compliance	A
§22.913 (d)	Peak to average ratio*	Compliance	A
§2.1051 §22.917(a)	Band Edge Measurements	Compliance	A
§2.1051 §22.917(a)	Conducted Spurious Emissions	Compliance	A
§2.1053 §22.917(a)	Radiated Spurious Emissions	Compliance	A

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

*Test Lab Information Reference

Lab A:

Huarui 7Layers High Technology (Suzhou) Co., Ltd.

Lab Address:

Tower N, Innovation Center, 88 Zuyi Road, High-tech District, Suzhou City, Anhui Province

Accredited Test Lab Cert 6613.01

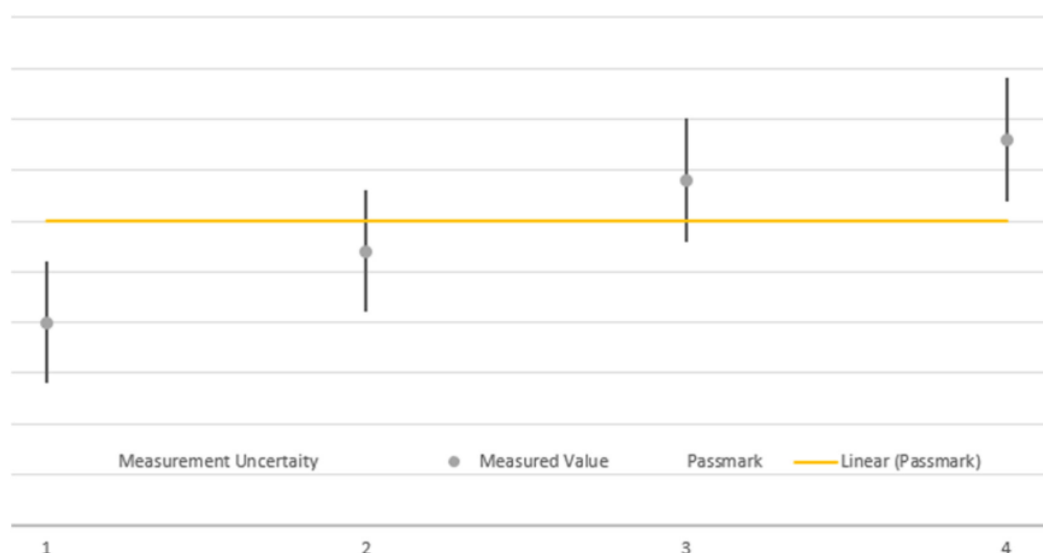
The FCC Site Registration No. is 434559; The Designation No. is CN1325.

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	UNCERTAINTY
Maximum Peak Output Power	$\pm 2.06\text{dB}$
Frequency Stability	$\pm 76.97\text{Hz}$
Radiated emissions (9KHz~30MHz)	$\pm 2.68\text{dB}$
Radiated emissions (30MHz~1GHz)	$\pm 4.98\text{dB}$
Radiated emissions (1GHz ~6GHz)	$\pm 4.70\text{dB}$
Radiated emissions (6GHz ~18GHz)	$\pm 4.60\text{dB}$
Radiated emissions (18GHz ~40GHz)	$\pm 4.12\text{dB}$
Conducted emissions	$\pm 4.01\text{dB}$
Occupied Channel Bandwidth	$\pm 43.58\text{KHz}$
Band Edge Measurements	$\pm 4.70\text{dB}$
Peak to average ratio	$\pm 0.76\text{dB}$

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



The verdicts in this test report are given according the above diagram:

Case	Measured Value	Uncertainty Range	Verdict
1	below pass mark	below pass mark	Passed
2	below pass mark	within pass mark	Passed
3	above pass mark	within pass mark	Failed
4	above pass mark	above pass mark	Failed

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so-called shared risk principle.



1.2 TEST SITE AND INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Pre-Amplifier	R&S	SCU18F1	100815	Aug.30,22	Aug.29,24
Pre-Amplifier	R&S	SCU18F1	100815	Aug.29,24	Aug.28,26
Pre-Amplifier	R&S	SCU08F1	101028	Sep.16,22	Sep.15,24
Pre-Amplifier	R&S	SCU08F1	101028	Sep.15,24	Sep.14,26
Vector Signal Generator	R&S	SMBV100B	102176	Mar.29,24	Mar.28,26
Signal Generator	R&S	SMB100A	182185	Mar.29,24	Mar.28,26
3m Fully-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-E MC-01Chamber	Nov.25,22	Nov.24,25
3m Semi-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-E MC-02Chamber	Nov.25,22	Nov.24,25
EMI TEST Receiver	R&S	ESR26	101734	Mar.28,24	Mar.27,26
EMI TEST Receiver	R&S	ESW44	101973	Mar.28,24	Mar.27,26
Bilog Antenna	SCHWARZBECK	VULB 9163	1264	Dec.26,23	Dec.25,25
Horn Antenna	ETS-LINDGREN	3117	227836	Aug.21,24	Aug.20,26
Horn Antenna (18GHz-40GHz)	Steatite Q-par Antennas	QMS 00880	23486	Jul.15,24	Jul.14,26
Horn Antenna	Steatite Q-par Antennas	QMS 00208	23485	Aug.21,24	Aug.20,26
Loop Antenna	SCHWARZ	HFH2-Z2/Z2E	100976	Feb.22,24	Feb.21,26
WIDEBANDRADIO COMMUNICATION TESTER	R&S	CMW500	169399	Jun.19,24	Jun.18,26
Test Software	EMC32	EMC32	N/A	N/A	N/A
6DB attenuator	Tonscend Technology Co., Ltd	N/A	23062787	N/A	N/A
Test Software	ELEKTRA	ELEKTRA4.32	N/A	N/A	N/A
Open Switch and Control Unit	R&S	OSP220	101964	Oct.01,22	Sep.30,24
DC Source	HYELEC	HY3010B	551016	Aug.31,22	Aug.30,24
DC Source	HYELEC	HY3010B	551016	Aug.30,24	Aug.29,26
Hygrothermograph	DELI	20210528	SZ014	Sep.06,22	Sep.05,24
Hygrothermograph	DELI	20210528	SZ014	Sep.05,24	Sep.04,26
PC	LENOVO	E14	HRSW0024	N/A	N/A
TMC-AMI18843A(CABLE)	R&S	HF290-NMNM-7.00M	N/A	N/A	N/A
TMC-AMI18843A(CABLE)	R&S	HF290-NMNM-4.00M	N/A	N/A	N/A
CABLE	R&S	W13.02	N/A	Apr.27,24	Apr.26,25
CABLE	R&S	W12.14	N/A	Apr.27,24	Apr.26,25
CABLE	R&S	J12J103539-00-1	SEP-03-20-069	Apr.27,24	Apr.26,25
CABLE	R&S	J12J103539-00-1	SEP-03-20-	Apr.27,24	Apr.26,25



BUREAU
VERITAS

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			070		
Temperature Chamber	votsch	VT4002	5856607810 0050	May.30,24	May.29,26

- NOTE:**
1. The calibration interval of the above test instruments is 12/ 24/ 36 months and the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.
 2. The test was performed in 3m Semi-anechoic Chamber and RF Oven Room.
 3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 434559; The Designation No. is CN1325.

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT*	telematics embedded system ALARM.COM CAR CONNECTOR	
BRAND NAME*	MUNIC ALARM.COM	
MODEL NAME*	C4D-4MUSAC_V8 ADC-CC110	
NOMINAL VOLTAGE*	DC 13.5V/27V	
MODULATION TYPE	GSM/EDGE	GMSK, 8PSK
FREQUENCY RANGE	GSM/EDGE	824.2MHz ~ 848.8MHz
MAX. ERP POWER	GSM	1172.2mW
	EDGE	246.6mW
EMISSION DESIGNATOR GOGN	GSM	245KGXW
	EDGE	249KG7W
ANTENNA TYPE*	Fixed Internal Antenna with 0.5 dBi gain for GSM850	
HW VERSION*	HC4D-4MUSAC_V8.01	
SW VERSION*	SC4D-4MUSAC_V8.01	
I/O PORTS*	Refer to user's manual	
CABLE SUPPLIED*	N/A	
EXTREME TEMPERATURE*	-20-55 °C	
EXTREME VOLTAGE*	8V-30V	

NOTE:

- *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, Test Lab is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.
- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- The EUT incorporates a SISO function. Physically, the EUT provides one completed transmitter and one receiver.

MODULATION MODE	TX FUNCTION
GSM/EDGE	1TX/1RX

- For the test results, the EUT had been tested with all conditions. But only the worst case was shown in the test report.



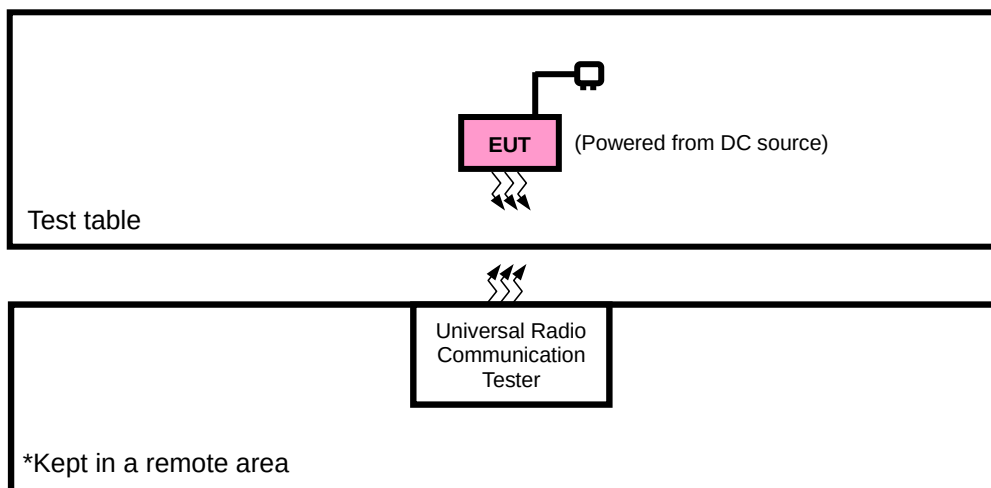
5. The differences between model C4D-4MUSAC_V8 and ADC-CC110 are as following.

Description	1st	2nd
Product name	Telematic Embedded System	ALARM.COM CAR CONNECTOR
Brand Name	MUNIC	ALARM.COM
Model Name	C4D-4MUSAC_V8	ADC-CC110
Differences	/	Use of a different product name (ALARM.COM CAR CONNECTOR), model name (ADC-CC110) and a different trademark (ALARM.COM) for marketing and client requirements.

6. **List of Accessory:**

ACCESSORIES	BRAND	MODEL	SPECIFICATION
Battery	Howell	Li-polymer 552535H	Capacity: Li-ion, 450mAh

2.2 CONFIGURATION OF SYSTEM UNDER TEST FOR RADIATION EMISSION



2.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Laptop	Lenovo	ThinkPad E14	HRSW00024	N/A
2	DC Source	HYELEC	HY3010B	551016	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	DC Line: Unshielded, Detachable, 1.0m;

2.4 TEST ITEM AND TEST CONFIGURATION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case in ERP and radiated emission was found when positioned on X-plane for GSM /EDGE /WCDMA /LTE. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	DESCRIPTION
A	EUT + DC source with GSM or WCDMA or LTE link

GSM MODE

EUT CONFIGURE MODE	TEST ITEM	Available Channel	Tested Channel	MODE
A	ERP	128 to 251	128, 189, 251	GSM,EDGE
A	FREQUENCY STABILITY	128 to 251	128, 189, 251	GSM,EDGE
A	OCCUPIED BANDWIDTH	128 to 251	128, 189, 251	GSM,EDGE
A	BAND EDGE	128 to 251	128, 251	GSM,EDGE
A	CONDUCTED EMISSION	128 to 251	128, 189, 251	GSM,EDGE
A	RADIATED EMISSION	128 to 251	128, 189, 251	GSM,EDGE
A	PEAK TO AVERAGE RATIO	128 to 251	128, 189, 251	GSM,EDGE

TEST CONDITION:

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
ERP	23deg. C, 70%RH	DC 13.5V/27V By DC Source	Hanwen Xu
FREQUENCY STABILITY	23deg. C, 70%RH	DC 13.5V/27V By DC Source	Hanwen Xu
OCCUPIED BANDWIDTH	23deg. C, 70%RH	DC 13.5V/27V By DC Source	Hanwen Xu
BAND EDGE	23deg. C, 70%RH	DC 13.5V/27V By DC Source	Hanwen Xu
CONDCUDED EMISSION	23deg. C, 70%RH	DC 13.5V/27V By DC Source	Hanwen Xu
RADIATED EMISSION	23deg. C, 70%RH	DC 13.5V/27V By DC Source	Hanwen Xu
PEAK TO AVERAGE RATIO	23deg. C, 70%RH	DC 13.5V/27V By DC Source	Hanwen Xu

2.5 EUT OPERATING CONDITIONS

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency



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2.6 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 22

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-D

ANSI/TIA/EIA-603-E

ANSI C63.26-2015

NOTE: All test items have been performed and recorded as per the above standards.

3 TEST TYPES AND RESULTS

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

Mobile / Portable station are limited to 7 watts e.r.p.

3.1.2 TEST PROCEDURES

EIRP / ERP MEASUREMENT:

Per KDB 971168 D01 Power Meas License Digital Systems v03r01 or subclause 5.2.5.5 of ANSI C63.26-2015, the relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_T - L_C$$

Where:

ERP or EIRP = effective radiated power 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;

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

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

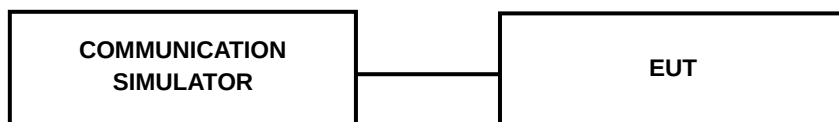
CONDUCTED POWER MEASUREMENT:

The EUT was set up for the maximum power with WCDMA link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

3.1.3 TEST SETUP

EIRP / ERP Measurement:

CONDUCTED POWER MEASUREMENT:



3.1.4 TEST RESULTS

CONDUCTED OUTPUT POWER (dBm):

Band	GSM850		
Channel	128	189	251
Frequency	824.2	836.4	848.8
GPRS 1Tx Slot	32.09	31.89	32.34
GPRS 2Tx Slot	32.02	31.90	32.23
GPRS 3Tx Slot	31.09	31.09	31.20
GPRS 4Tx Slot	29.47	29.33	29.33
EDGE 1Tx Slot	25.57	25.42	25.57
EDGE 2Tx Slot	25.13	25.27	25.38
EDGE 3Tx Slot	25.00	25.11	25.01
EDGE 4Tx Slot	24.99	24.72	24.45

ERP POWER (dBm)

GSM 850

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	ERP (dBm)	ERP (mW)	Limit (W)
128	824.2	32.09	0.5	30.44	1106.62	7
189	836.4	31.9	0.5	30.25	1059.25	7
251	848.8	32.34	0.5	30.69	1172.2	7

EDGE 850

Channel	Frequency (MHz)	Conducted Power (dBm)	G _T -L _C (dB)	ERP (dBm)	ERP (mW)	Limit (W)
128	824.2	25.57	0.5	23.92	246.6	7
189	836.4	25.42	0.5	23.77	238.23	7
251	848.8	25.57	0.5	23.92	246.6	7

REMARKS: ERP Output Power (dBm) = EIRP (dBm) -2.15(dB).

3.2 FREQUENCY STABILITY MEASUREMENT

3.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

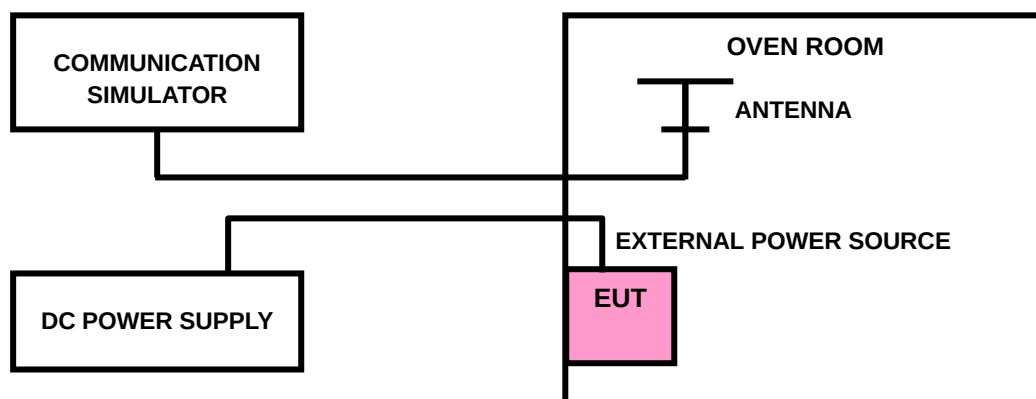
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

3.2.2 TEST PROCEDURE

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded frequency error from the communication simulator.

3.2.3 TEST SETUP





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3.2.4 TEST RESULTS

Please Refer to Appendix Of this test report.

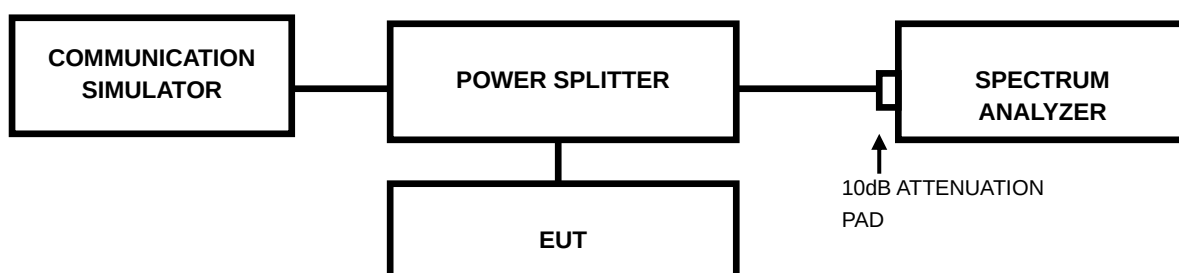
Note: 1.VL = Low voltage(8V); VN/NV = Normal voltage(13.5V/ 27V); VH = High voltage(30V);
NT = Normal temperature (25°C)
2. The frequency fundamental emissions stay within the authorized frequency block.

3.3 OCCUPIED BANDWIDTH MEASUREMENT

3.3.1 LIMITS OF OCCUPIED BANDWIDTH MEASUREMENT

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

3.3.2 TEST SETUP



3.3.3 TEST PROCEDURES

- The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.



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3.3.4 TEST RESULTS

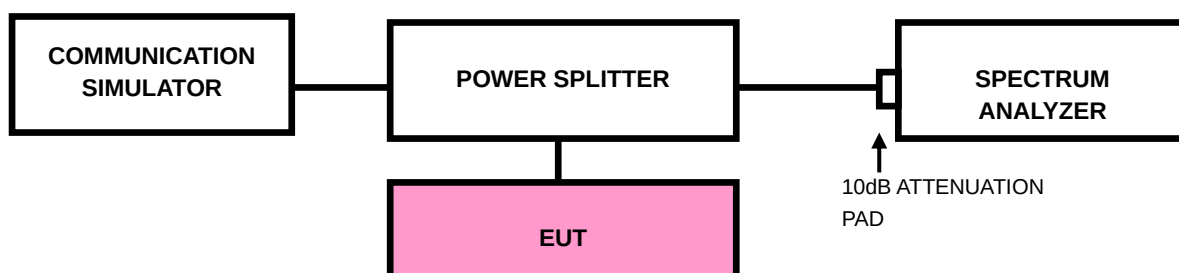
Please Refer to Appendix Of this test report.

3.4 BAND EDGE MEASUREMENT

3.4.1 LIMITS OF BAND EDGE MEASUREMENT

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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.4.2 TEST SETUP



3.4.3 TEST PROCEDURES

- a) All measurements were done at low and high operational frequency range
- b) Connect the transmitter to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
- c) Tune the analyzer to the nominal center frequency of the emission bandwidth (EBW)
- d) .Set the resolution bandwidth (RBW) $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
- e) Beyond the 1MHz band from the band edge, RBW=1MHz was used.
- f) Set the video bandwidth (VBW) to $\geq 3 \times$ RBW.
- g) Select the average power (RMS) display detector.
- h) Set the number of measurement points to ≥ 1001 .
- i) Use auto-coupled sweep time.
- j) Perform the measurement over an interval of time when the transmission is continuous and at its maximum power level.
- k) The RF fundamental frequency should be excluded against the limit line in the operating frequency band and use RBW is 10KHz or 100KHz.
- l) Record the max trace plot into the test report.



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3.4.4 TEST RESULTS

Please Refer to Appendix Of this test report.

3.5 CONDUCTED SPURIOUS EMISSIONS

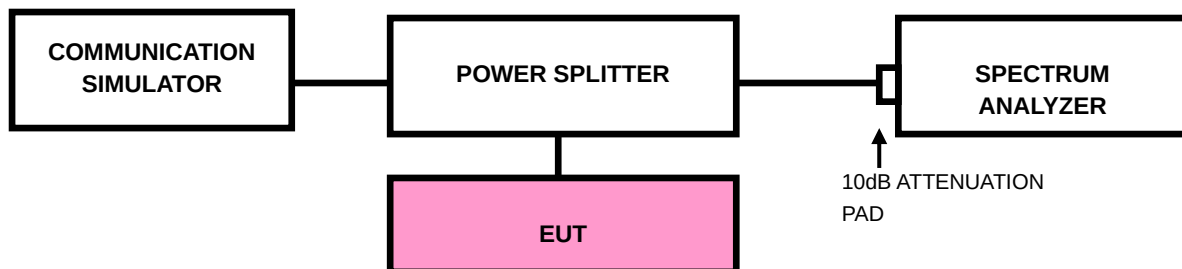
3.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

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. The emission limit equal to -13dBm .

3.5.2 TEST PROCEDURE

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9kHz up to a frequency including its 10th harmonic. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

3.5.3 TEST SETUP





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3.5.4 TEST RESULTS

NOTE : The 9K~30MHz amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

Please Refer to Appendix Of this test report.

3.6 RADIATED EMISSION MEASUREMENT

3.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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. The emission limit equal to -13dBm .

3.6.2 TEST PROCEDURES

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value " of step a. Record the power level of S.G
- c. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$.
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,
 $\text{E.R.P power} = \text{E.I.P.R power} - 2.15\text{dBi}$.

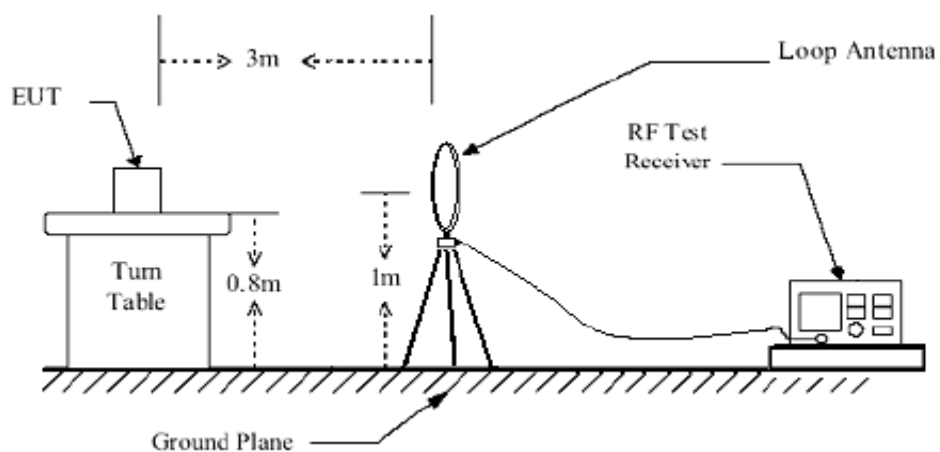
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

3.6.3 DEVIATION FROM TEST STANDARD

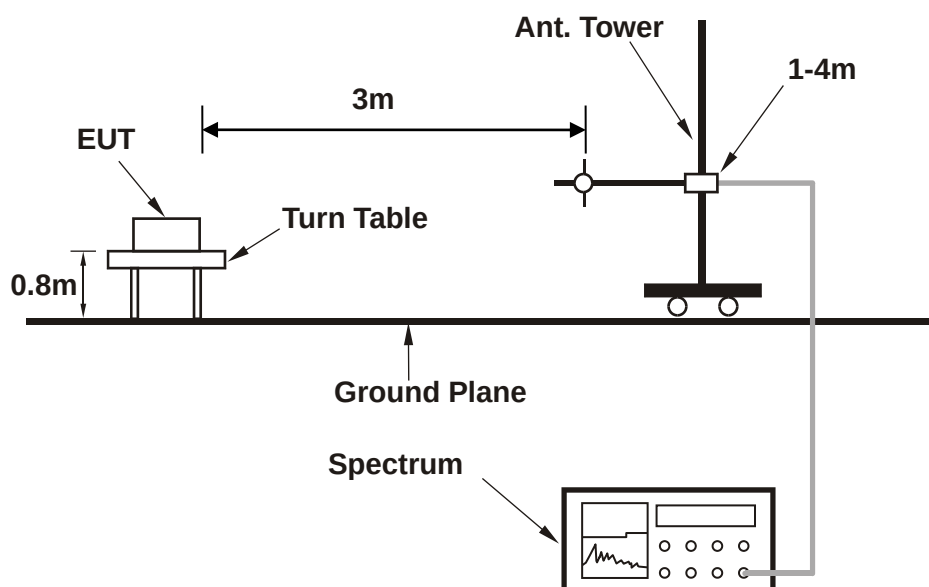
No deviation

3.6.4 TEST SETUP

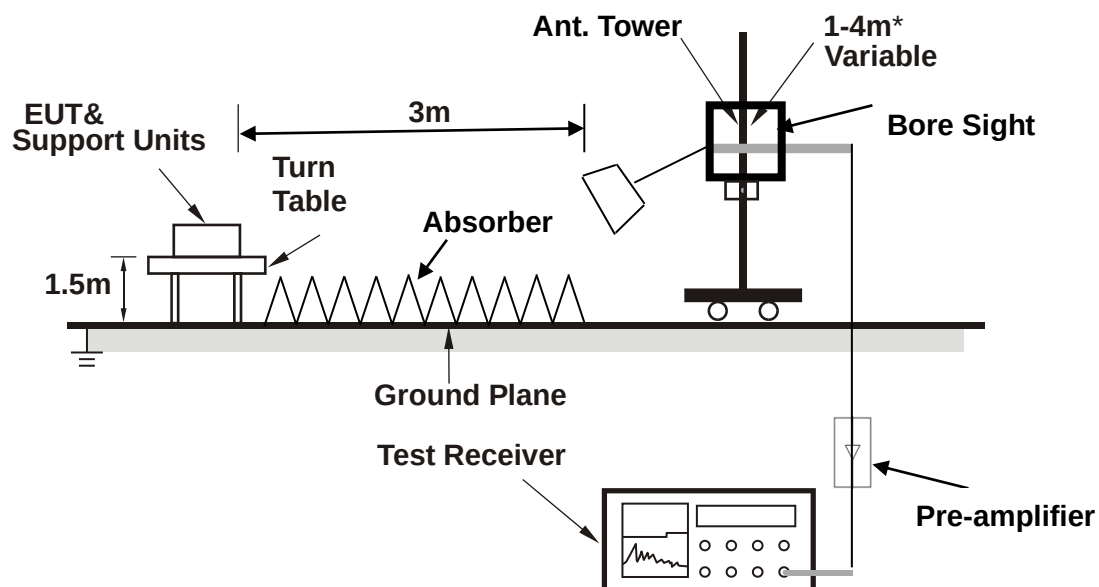
< Frequency Range below 30MHz >



< Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



Note: Above 1G is a directional antenna

Depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.6.5 TEST RESULTS

NOTE : The 9K~30MHz amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

BELOW 1GHz WORST-CASE DATA

30 MHz – 1GHz data:

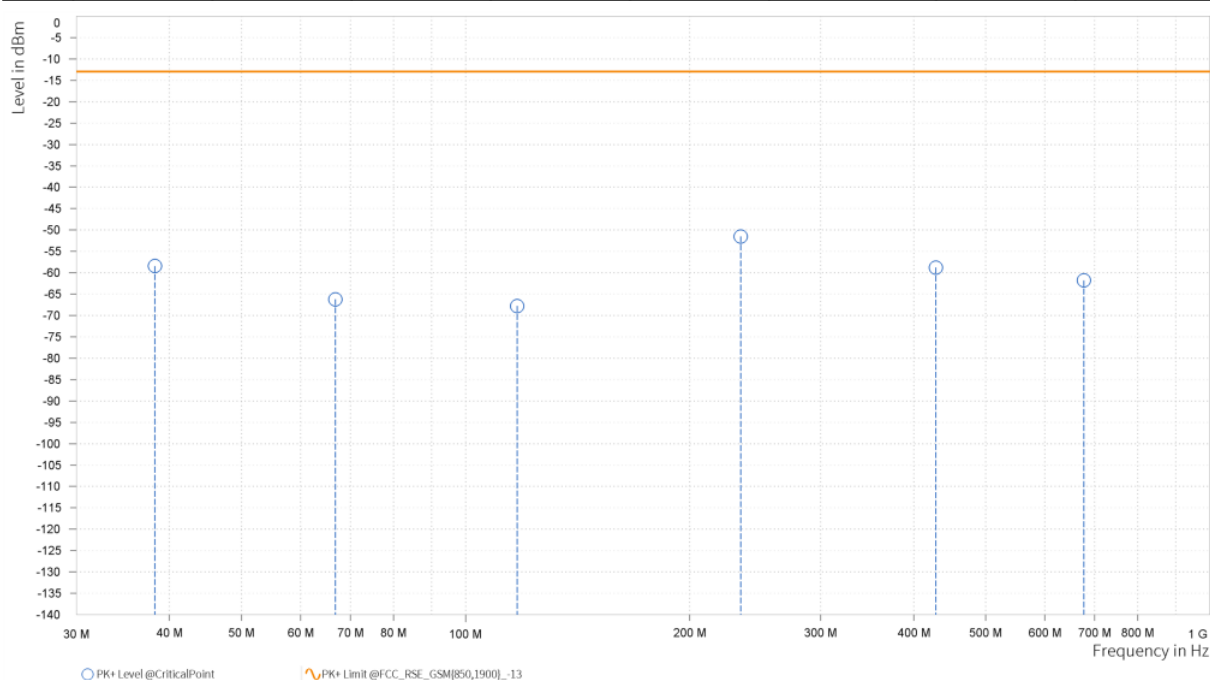
GSM 850 :

CHANNEL BANDWIDTH: 128

MODE	TX channel 128	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 27V
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	38.245	-58.44	-13.0	45.44	-1.64	H	32.0	2.0
1	66.86	-66.22	-13.0	53.22	-9.6	H	199.4	2.0
1	117.3	-67.8	-13.0	54.8	-12.85	H	275.4	1.0
1	234.185	-51.53	-13.0	38.53	1.53	H	163.0	1.0
1	428.185	-58.78	-13.0	45.78	2.6	H	163.0	1.0
1	677.475	-61.82	-13.0	48.82	1.64	H	199.4	2.0





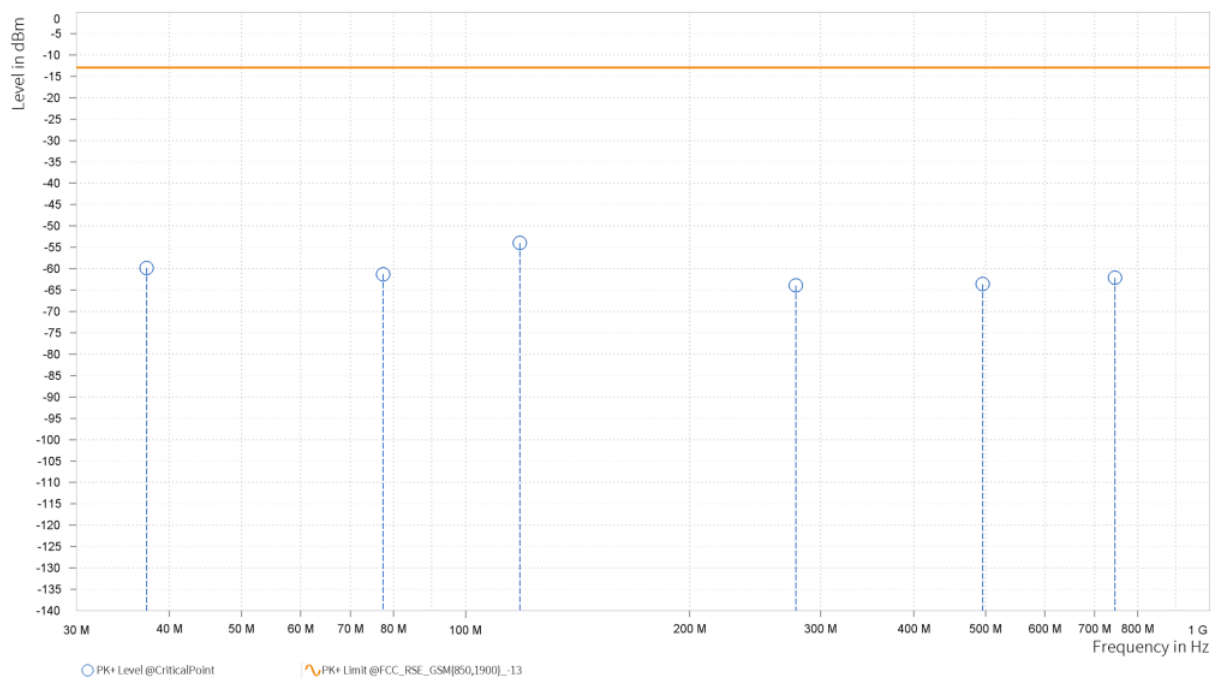
BUREAU
VERITAS

Test Report No.: PSU-QBJ2408220111RF01

MODE	TX channel 20525	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	DC 27V
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	37.275	-59.83	-13.0	46.83	-9.68	V	163.0	1.0
1	77.53	-61.31	-13.0	48.31	-11.97	V	359.1	1.0
1	118.27	-53.97	-13.0	40.97	-3.66	V	1.1	2.0
1	277.835	-63.93	-13.0	50.93	-2.04	V	355.8	2.0
1	495.115	-63.6	-13.0	50.6	0.68	V	120.5	2.0
1	745.375	-62.13	-13.0	49.13	3.1	V	108.0	1.0





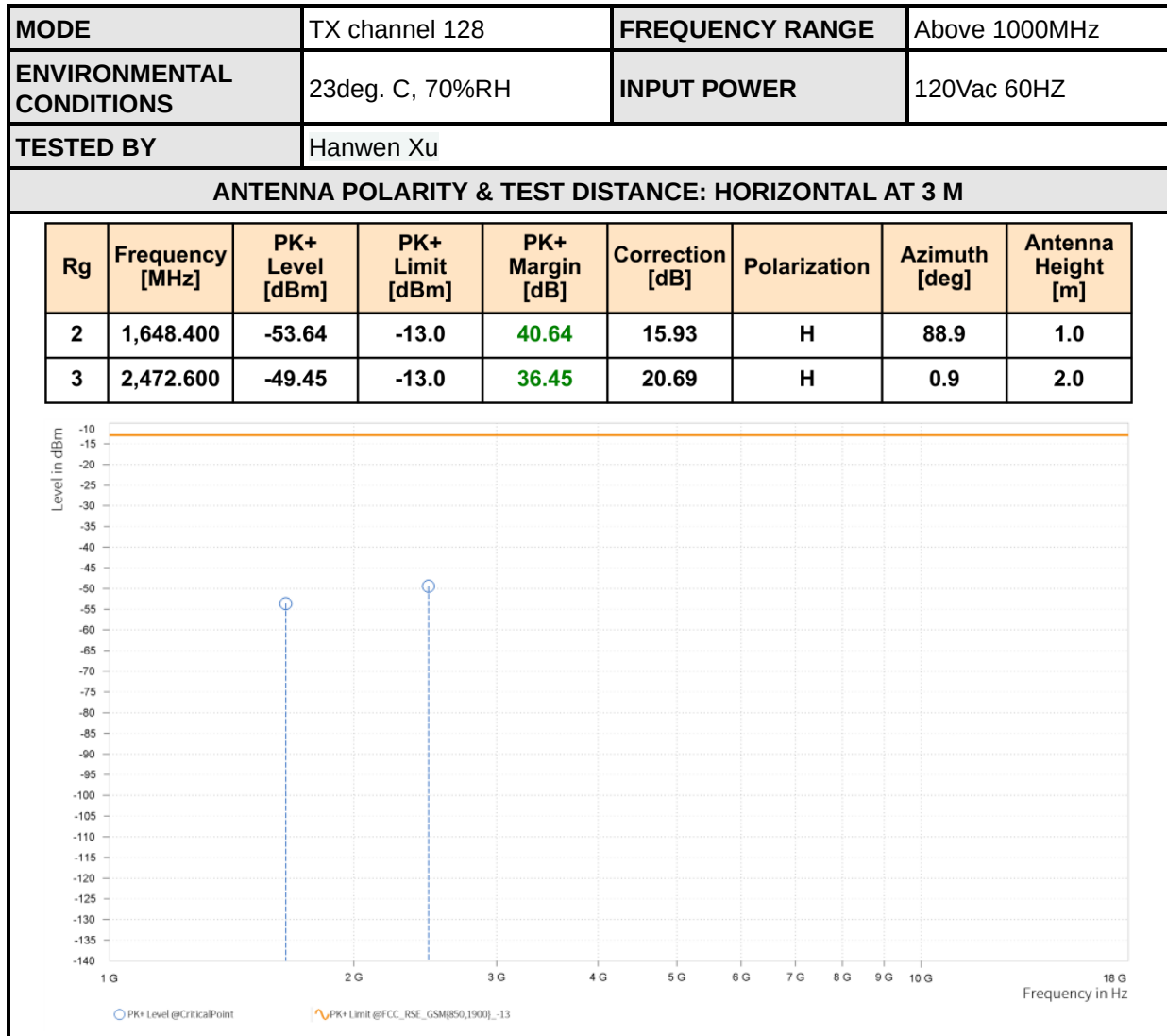
Test Report No.: PSU-QBJ2408220111RF01

ABOVE 1GHz DATA

Note: For higher frequency, the emission is too low to be detected.\

GSM 850

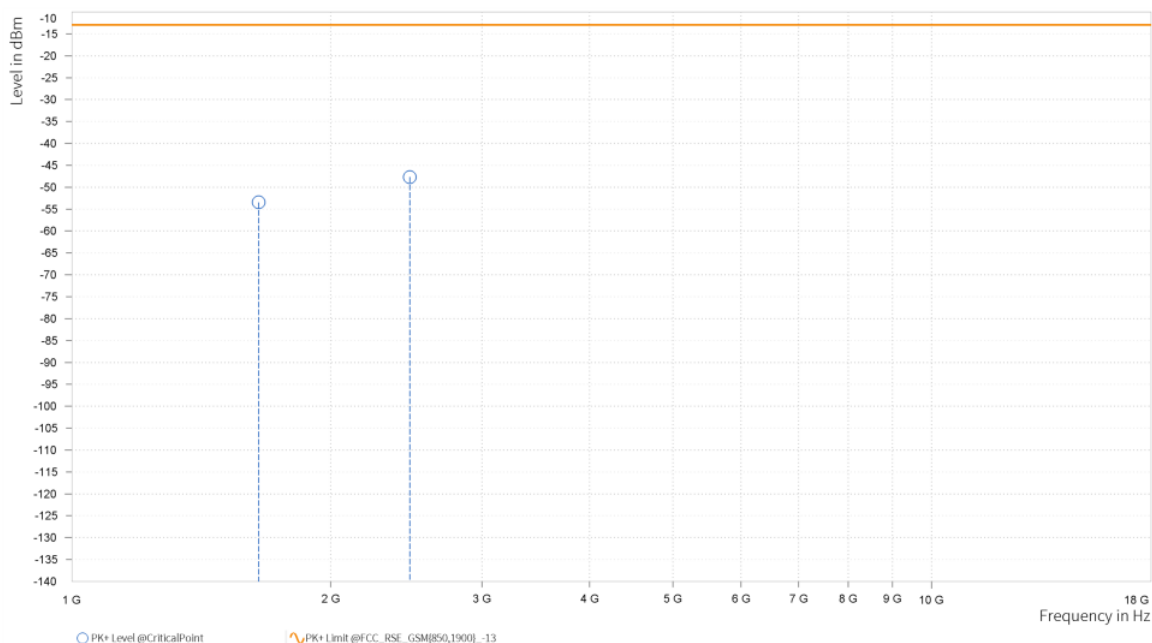
CH 128:



MODE	TX channel 128	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	120Vac 60HZ
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
2	1,648.400	-53.46	-13.0	40.46	15.51	V	271.0	2.0
3	2,472.600	-47.68	-13.0	34.68	20.95	V	196.9	2.0

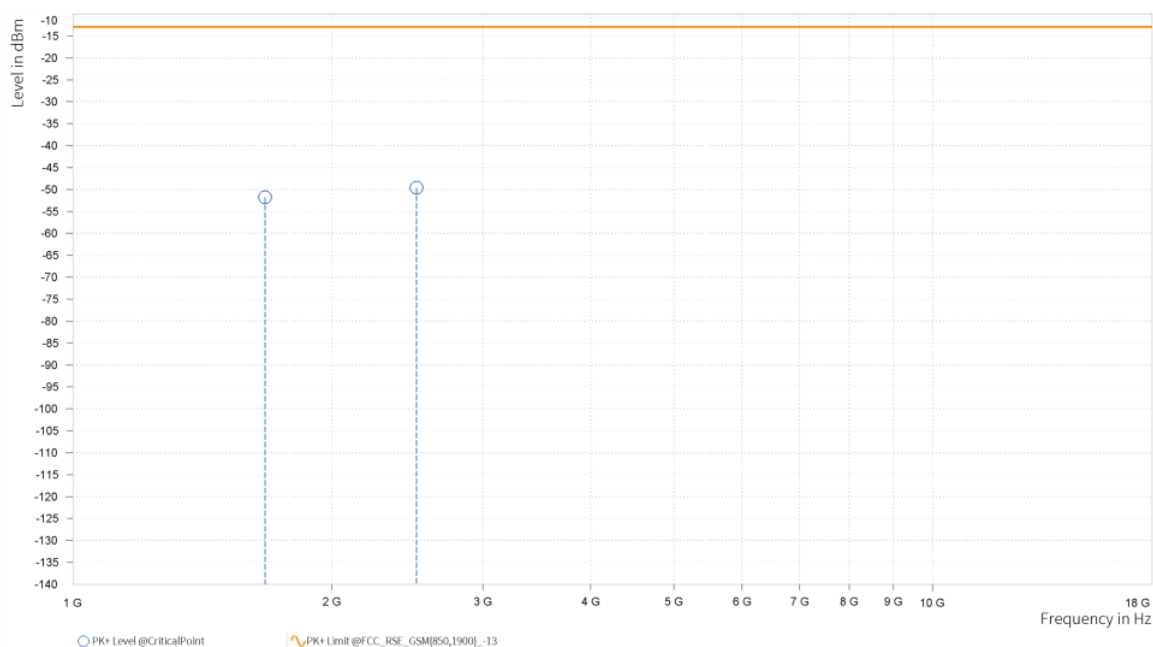


CH 189:

MODE	TX channel 189	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	120Vac 60HZ
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

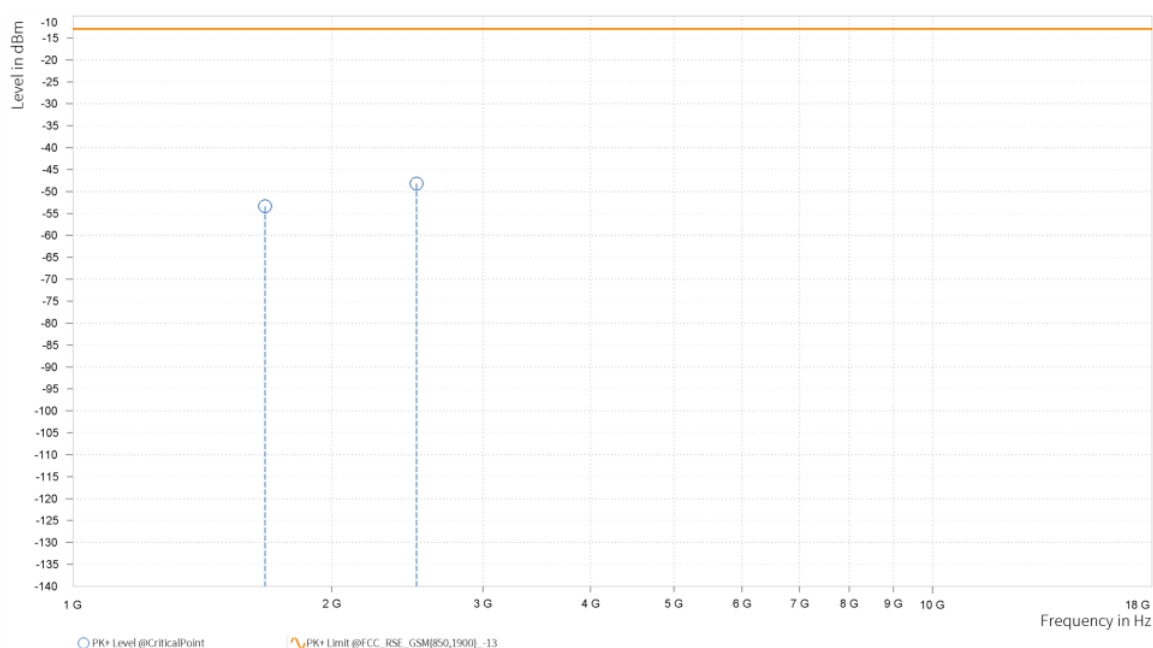
Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
2	1,672.800	-51.74	-13.0	38.74	16.68	H	88.8	1.0
3	2,509.200	-49.59	-13.0	36.59	21.0	H	164.2	1.0



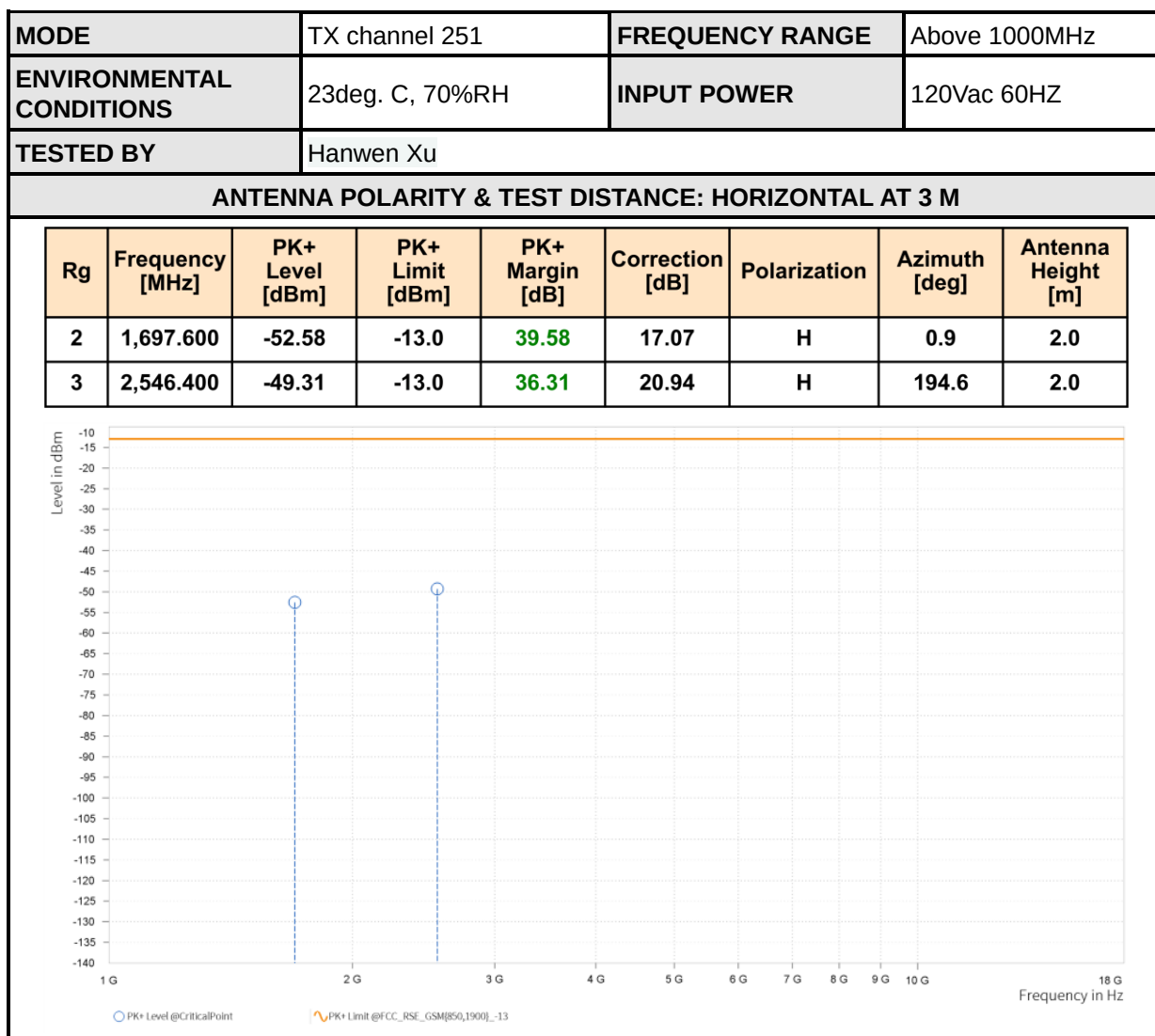
MODE	TX channel 189	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	120Vac 60HZ
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
2	1,672.800	-53.39	-13.0	40.39	15.57	V	1	2.0
3	2,509.200	-48.17	-13.0	35.17	21.61	V	163	1.0



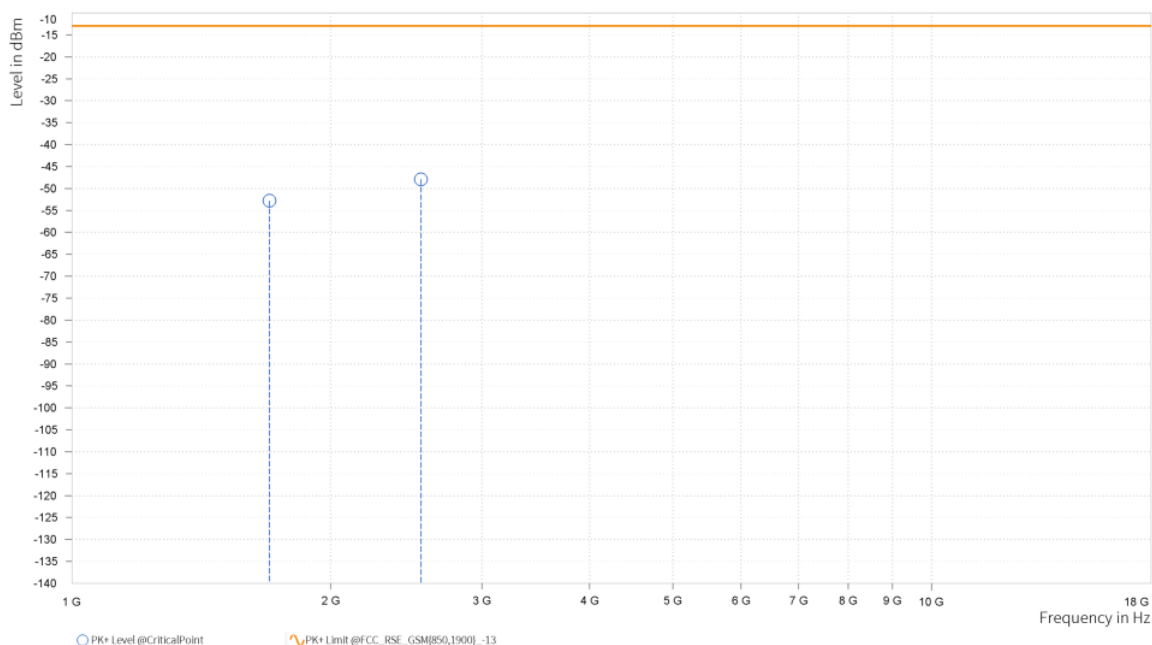
CH 251:



MODE	TX channel 251	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	120Vac 60HZ
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
2	1,697.600	-52.79	-13.0	39.79	16.29	V	358.8	1.0
3	2,546.400	-47.91	-13.0	34.91	21.56	V	163.0	1.0



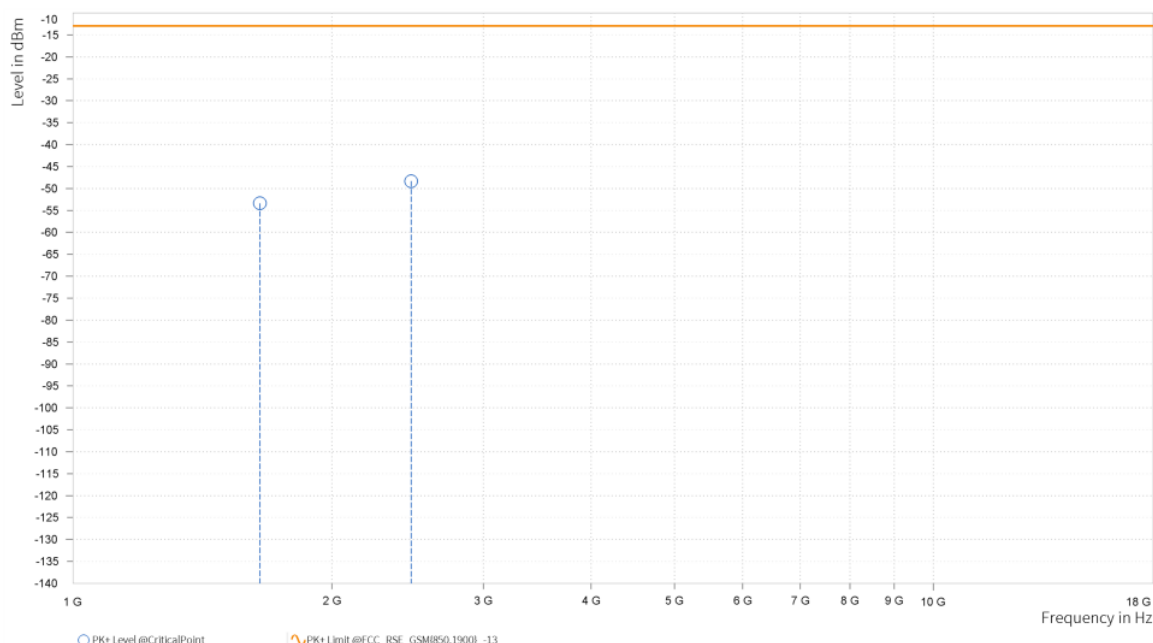
EDGE 850:

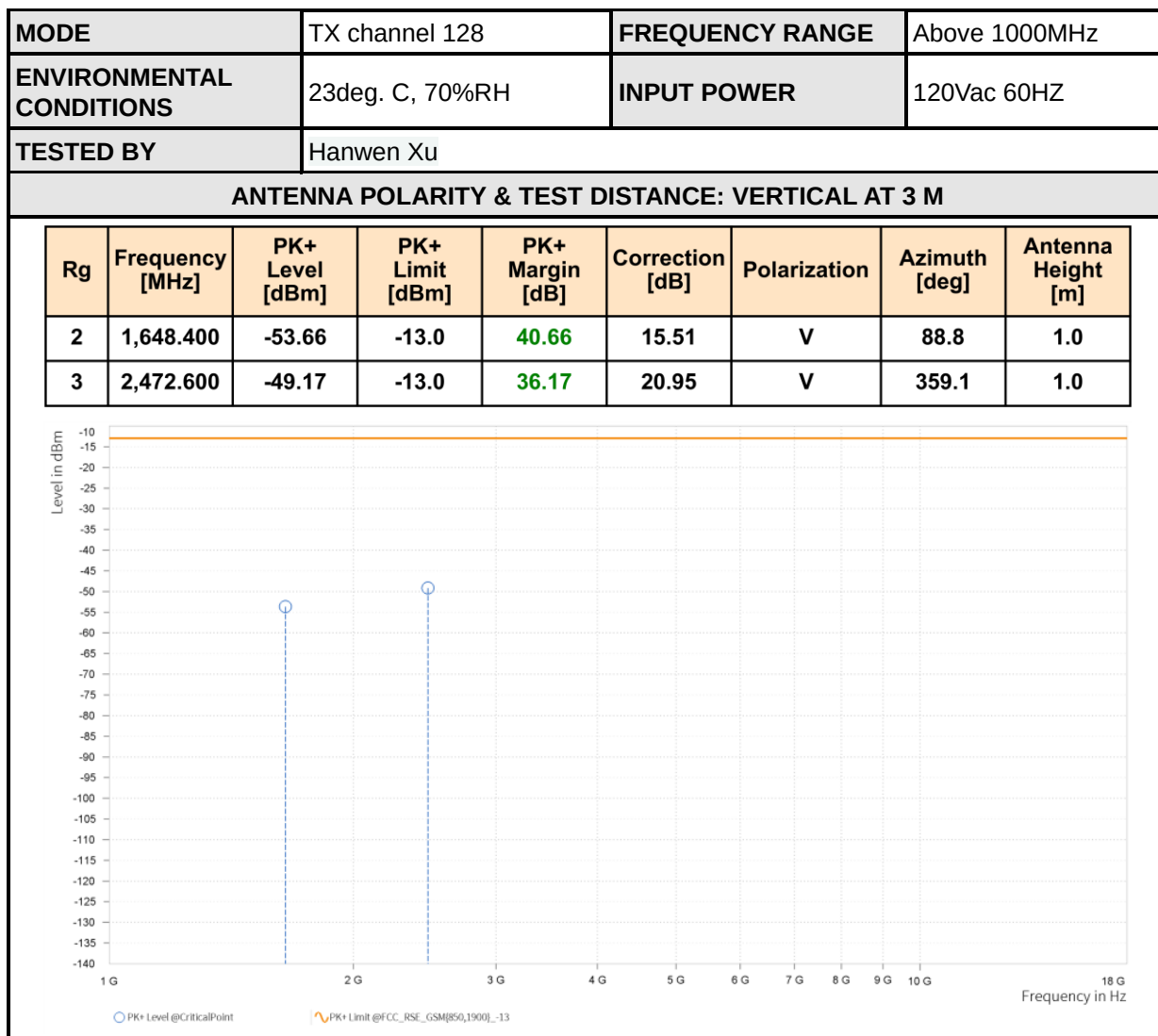
CH 128:

MODE	TX channel 128	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	120Vac 60HZ
TESTED BY	Hanwen Xu		

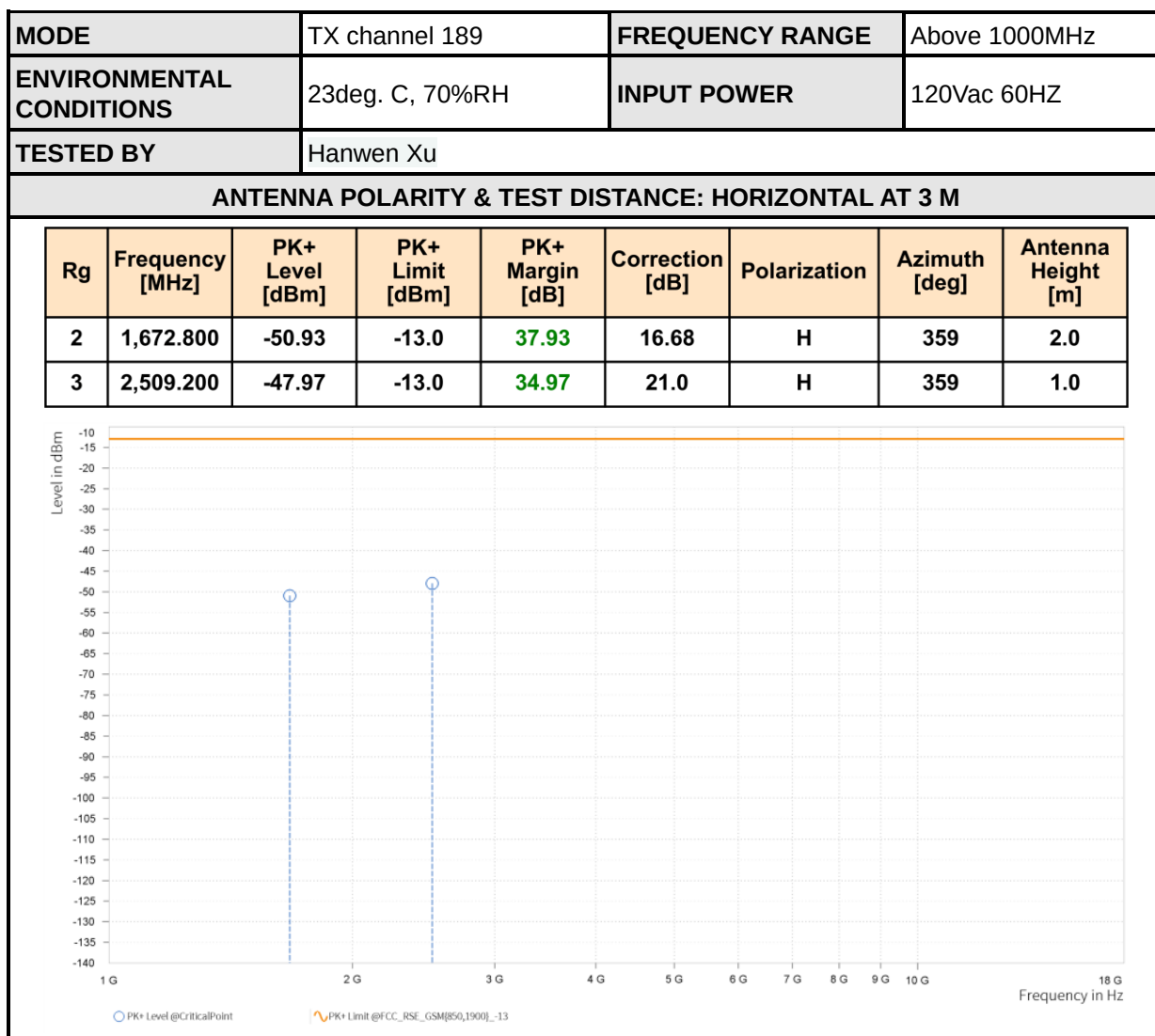
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
2	1,648.400	-53.36	-13.0	40.36	15.93	H	88.9	1.0
3	2,472.600	-48.32	-13.0	35.32	20.69	H	359.0	2.0





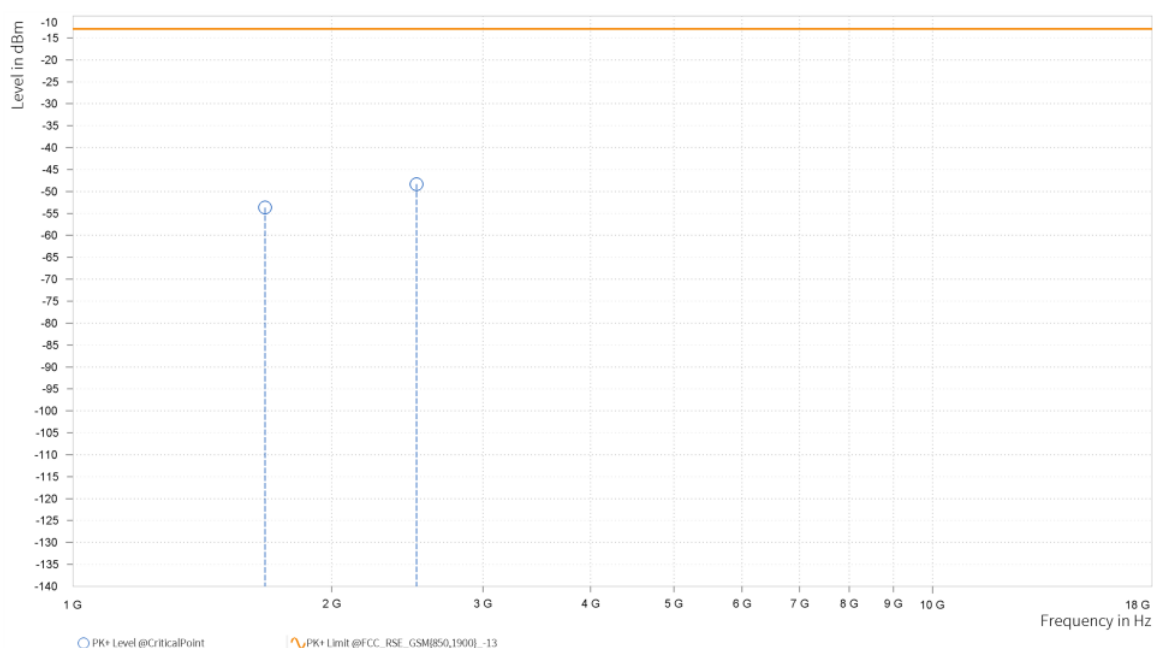
CH 189:



MODE	TX channel 189	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	120Vac 60HZ
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
2	1,672.800	-53.66	-13.0	40.66	15.57	V	359	2.0
3	2,509.200	-48.33	-13.0	35.33	21.61	V	163	1.0

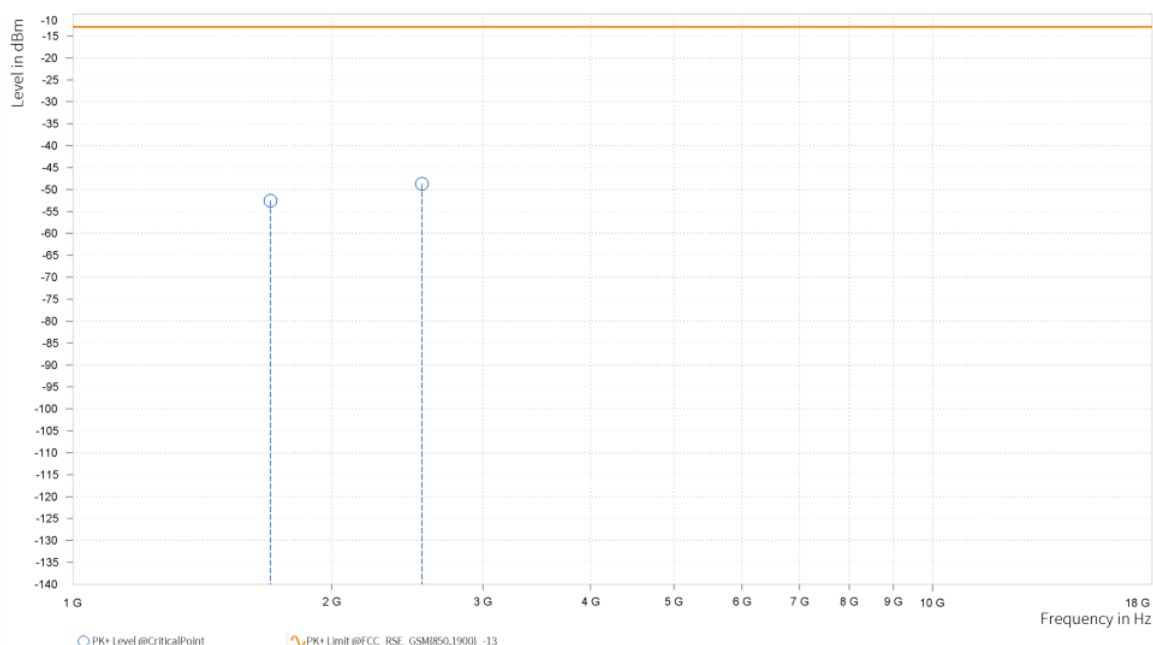


CH 251:

MODE	TX channel 251	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	120Vac 60HZ
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

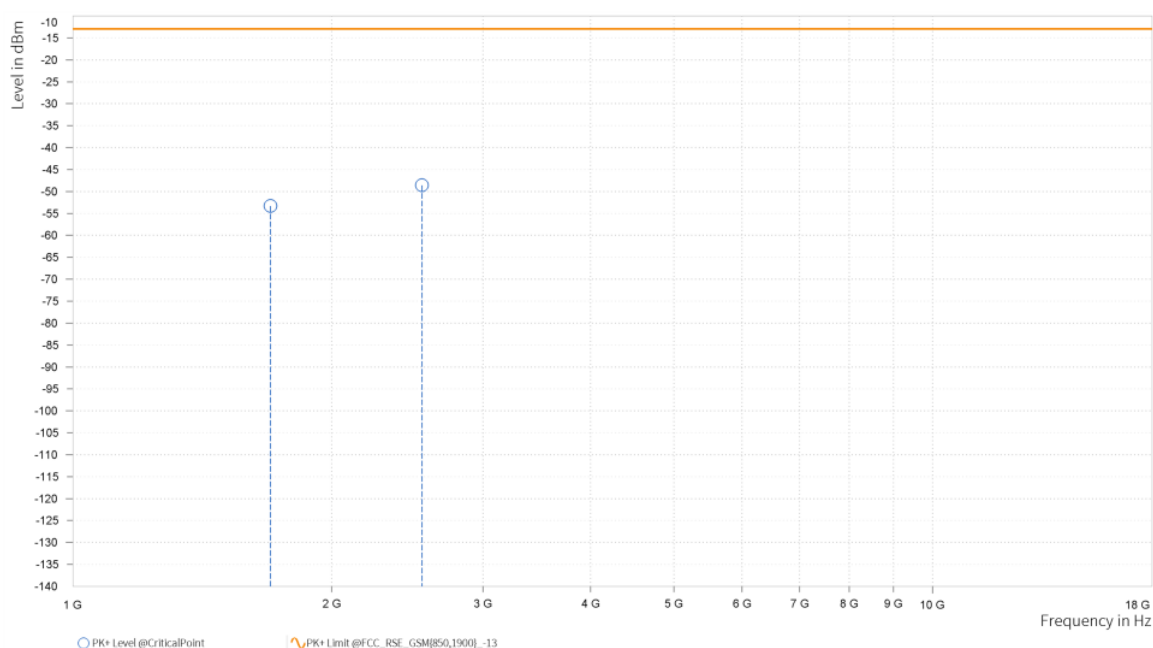
Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
2	1,697.600	-52.53	-13.0	39.53	17.07	H	272.2	2.0
3	2,546.400	-48.7	-13.0	35.7	20.94	H	0.9	2.0



MODE	TX channel 251	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	INPUT POWER	120Vac 60HZ
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBm]	PK+ Limit [dBm]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
2	1,697.600	-53.31	-13.0	40.31	16.29	V	1	1.0
3	2,546.400	-48.58	-13.0	35.58	21.56	V	163	1.0

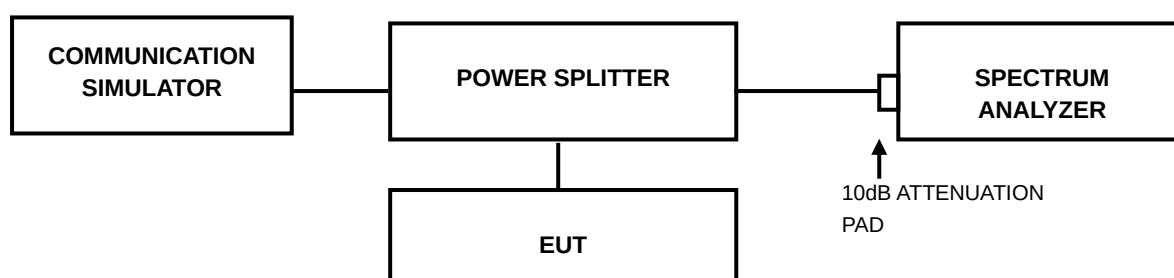


3.7 PEAK TO AVERAGE RATIO

3.7.1 LIMITS OF PEAK TO AVERAGE RATIO MEASUREMENT

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

3.7.2 TEST SETUP



3.7.3 TEST PROCEDURES

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.



Test Report No.: PSU-QBJ2408220111RF01

3.7.4 TEST RESULTS

Please Refer to Appendix Of this test report.



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4 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



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5 INFORMATION ON THE TESTING LABORATORIES

We, Huarui 7layers High Technology (Suzhou) Co., Ltd. ,were founded in 2020 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Huarui 7Layers High Technology (Suzhou) Co., Ltd.

Lab Address:

Tower N, Innovation Center, 88 Zuyi Road, High-tech District, Suzhou City, Anhui Province

Accredited Test Lab Cert 6613.01

If you have any comments, please feel free to contact us at the following:

Suzhou EMC/RF Lab:

Tel: +86 (0557) 368 1008

6 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

7 APPENDIX:

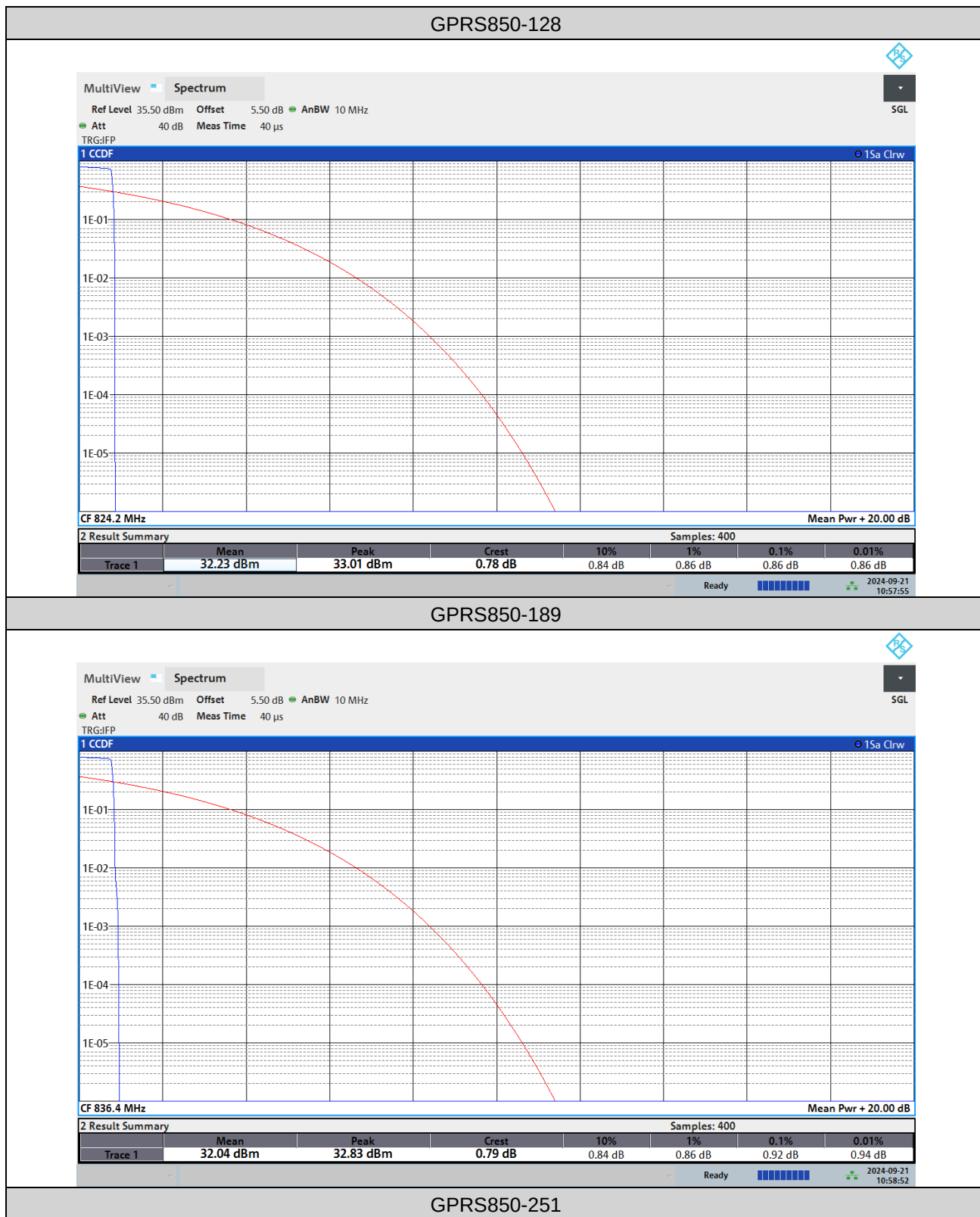
GSM850

PEAK-TO-AVERAGE RATIO(CCDF)

Test Result

Band	Channel	Result(dB)	Limit(dB)	Verdict
GPRS850	128	0.85	13	PASS
GPRS850	189	0.92	13	PASS
GPRS850	251	0.94	13	PASS
EGPRS850	128	3.58	13	PASS
EGPRS850	189	2.54	13	PASS
EGPRS850	251	3.58	13	PASS

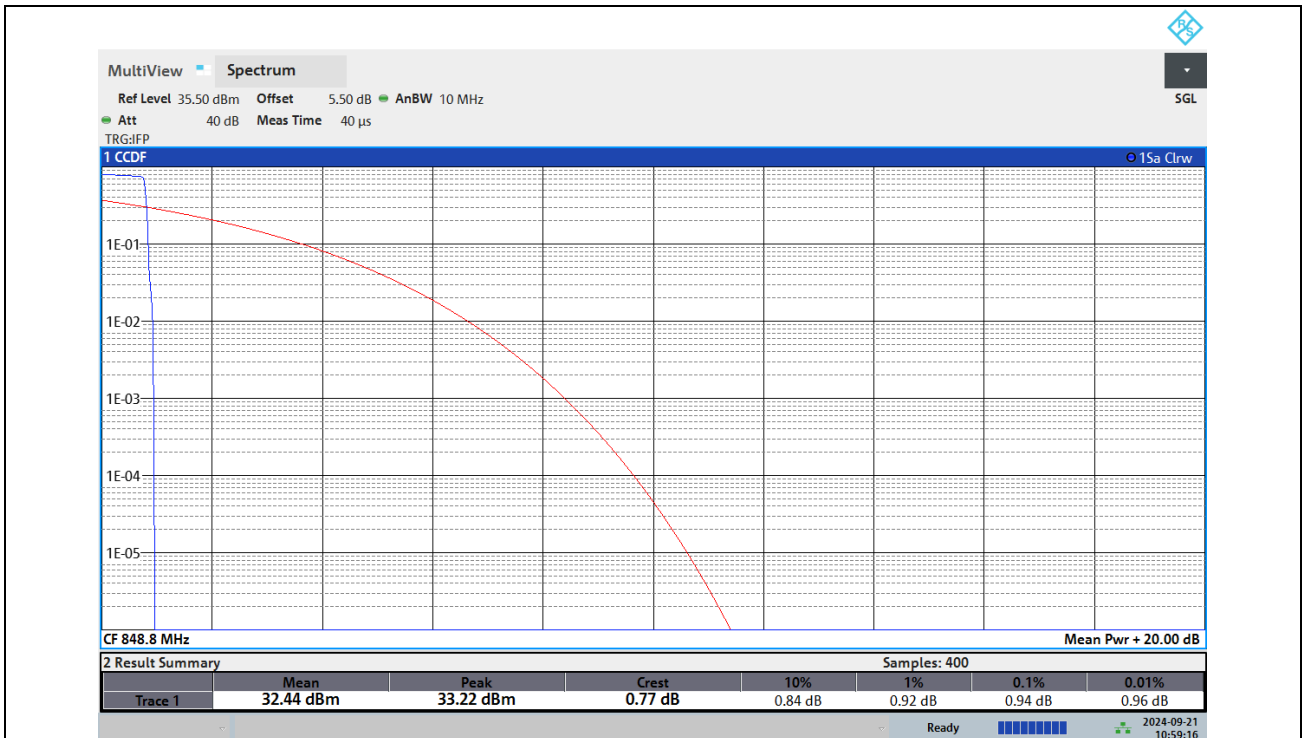
Test Graphs



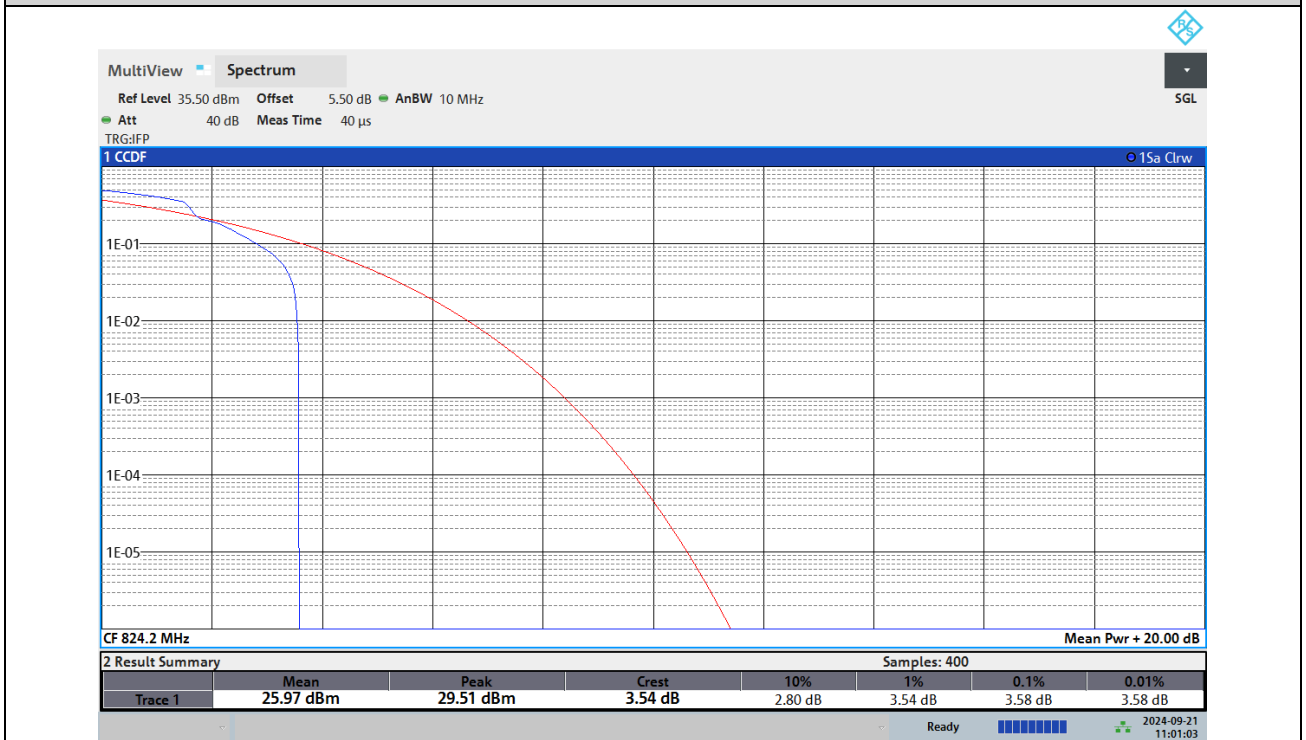


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VERITAS

Test Report No.: PSU-QBJ2408220111RF01



EGPRS850-128

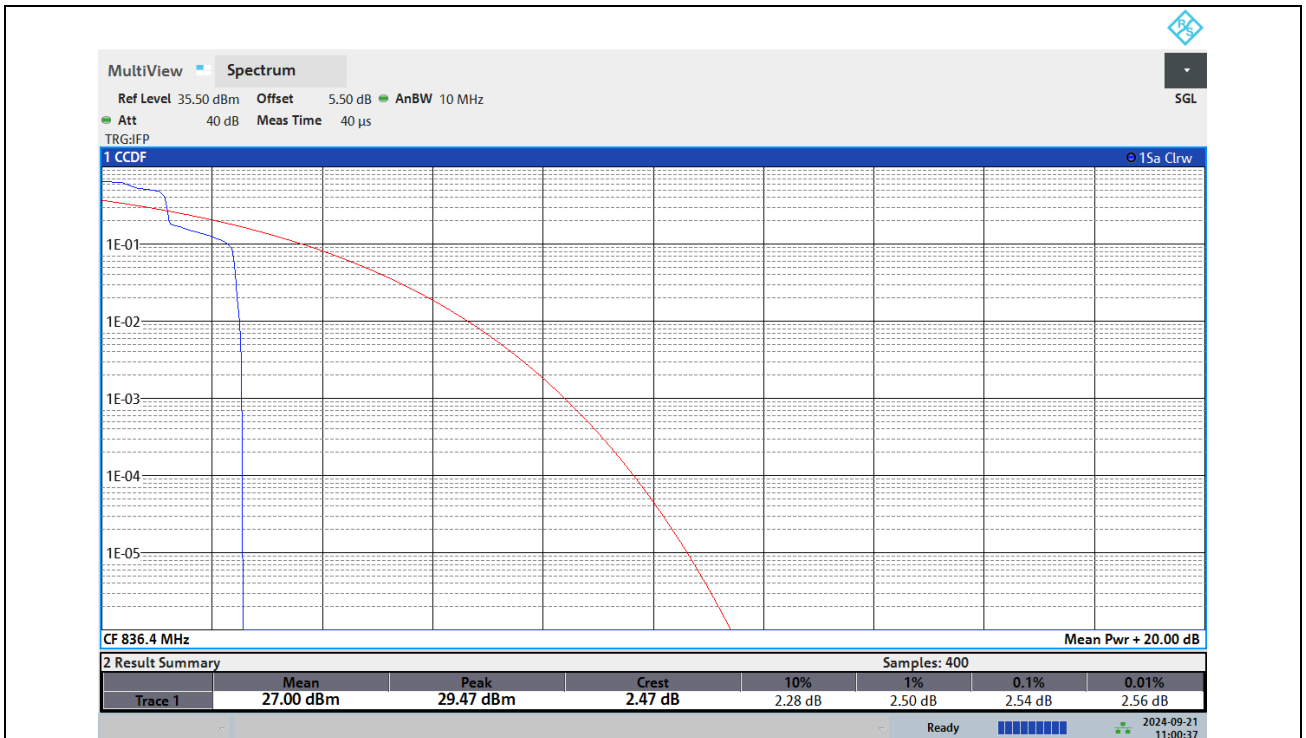


EGPRS850-189

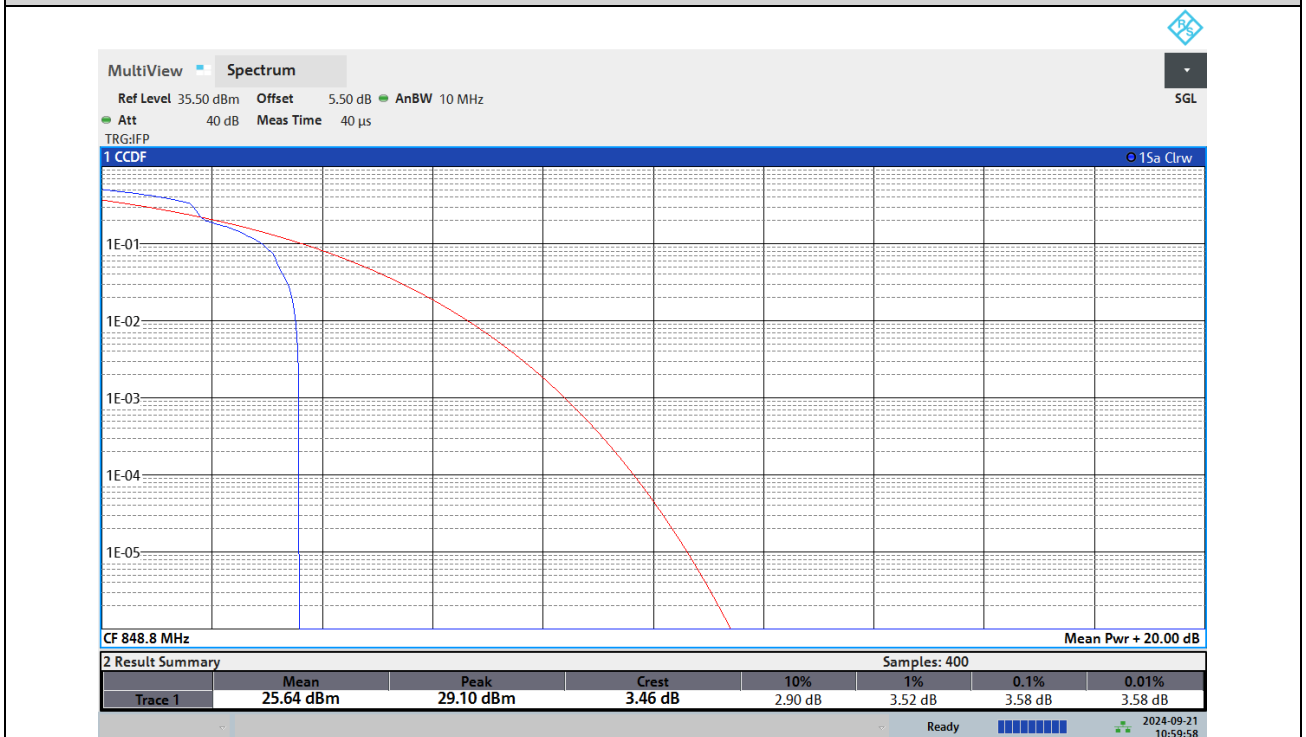


BUREAU
VERITAS

Test Report No.: PSU-QBJ2408220111RF01



EGPRS850-251



26DB BANDWIDTH AND OCCUPIED BANDWIDTH

Test Result

Band	Channel	Occupied Bandwidth (KHz)	26dB Bandwidth (KHz)	Verdict
GPRS850	128	243.479	315.68	PASS
GPRS850	189	243.406	314.19	PASS
GPRS850	251	245.143	315.18	PASS
EGPRS850	128	248.967	312.19	PASS
EGPRS850	189	247.105	317.18	PASS
EGPRS850	251	247.782	314.19	PASS

Test Graphs

Occupied Bandwidth





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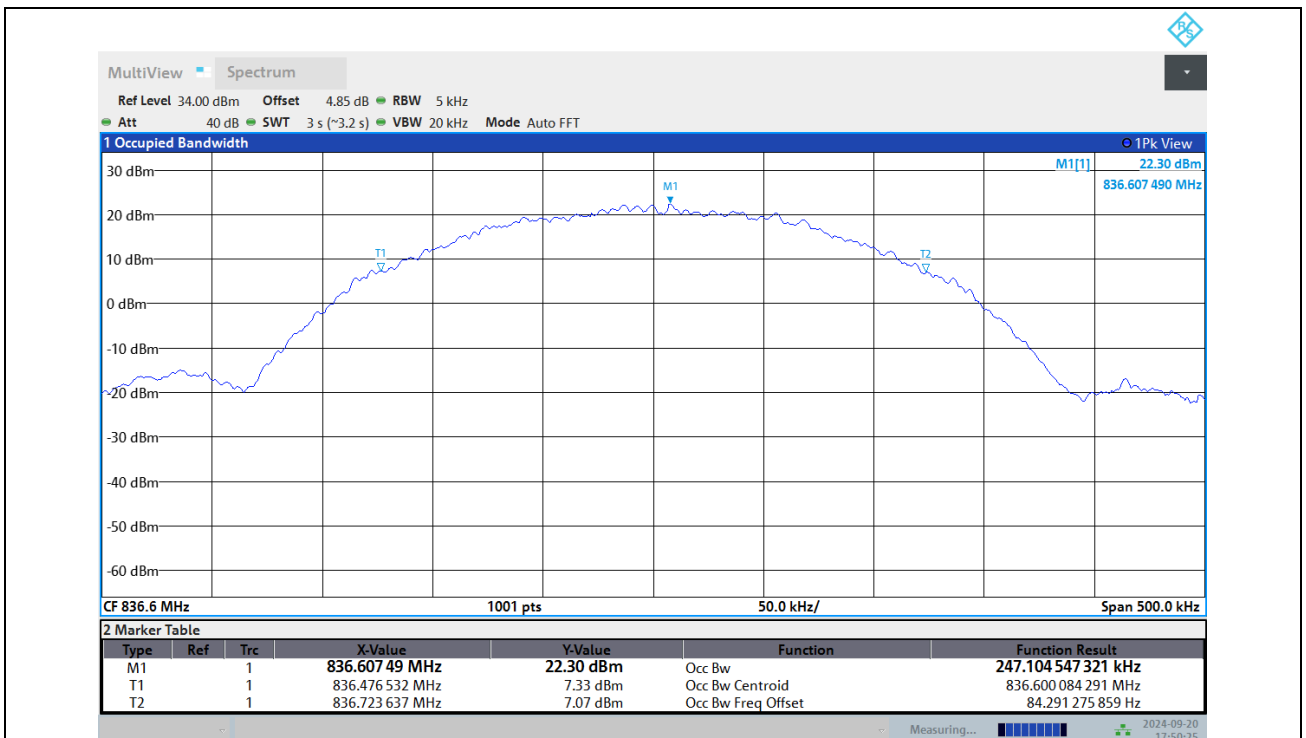
Test Report No.: PSU-QBJ2408220111RF01



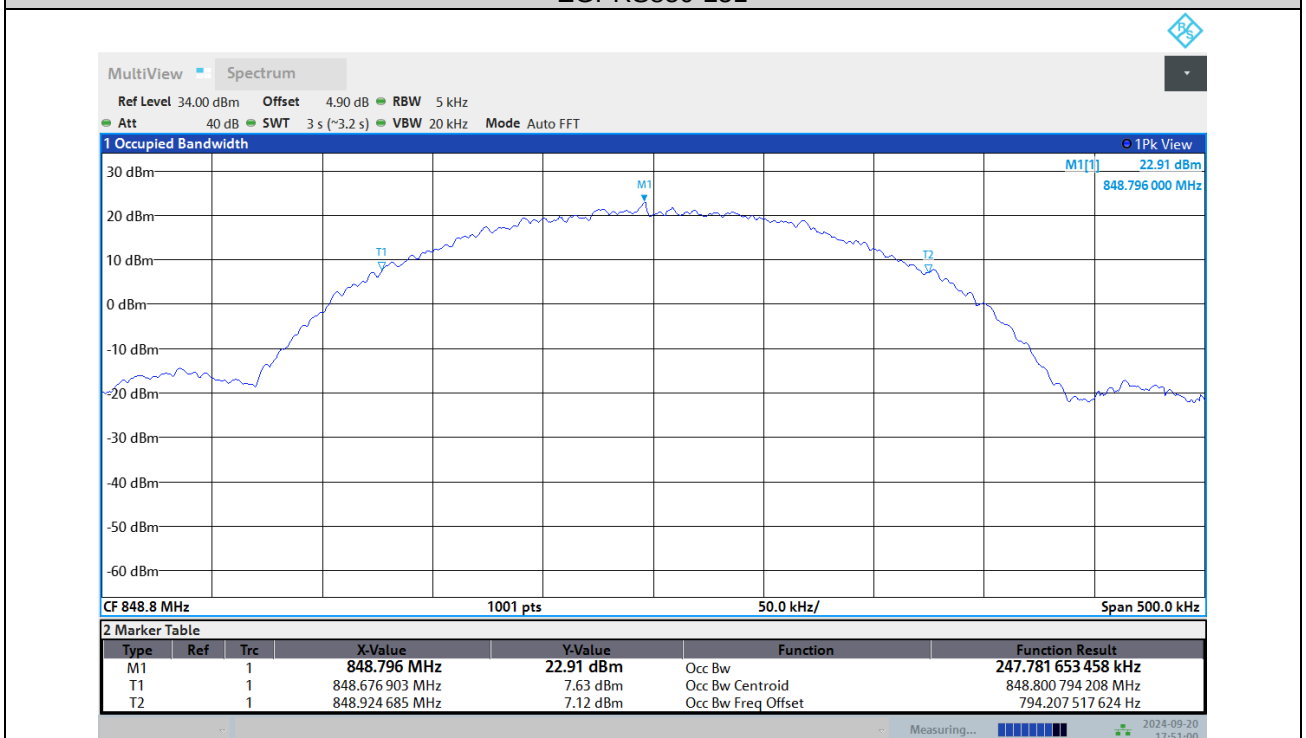


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VERITAS

Test Report No.: PSU-QBJ2408220111RF01



EGPRS850-251



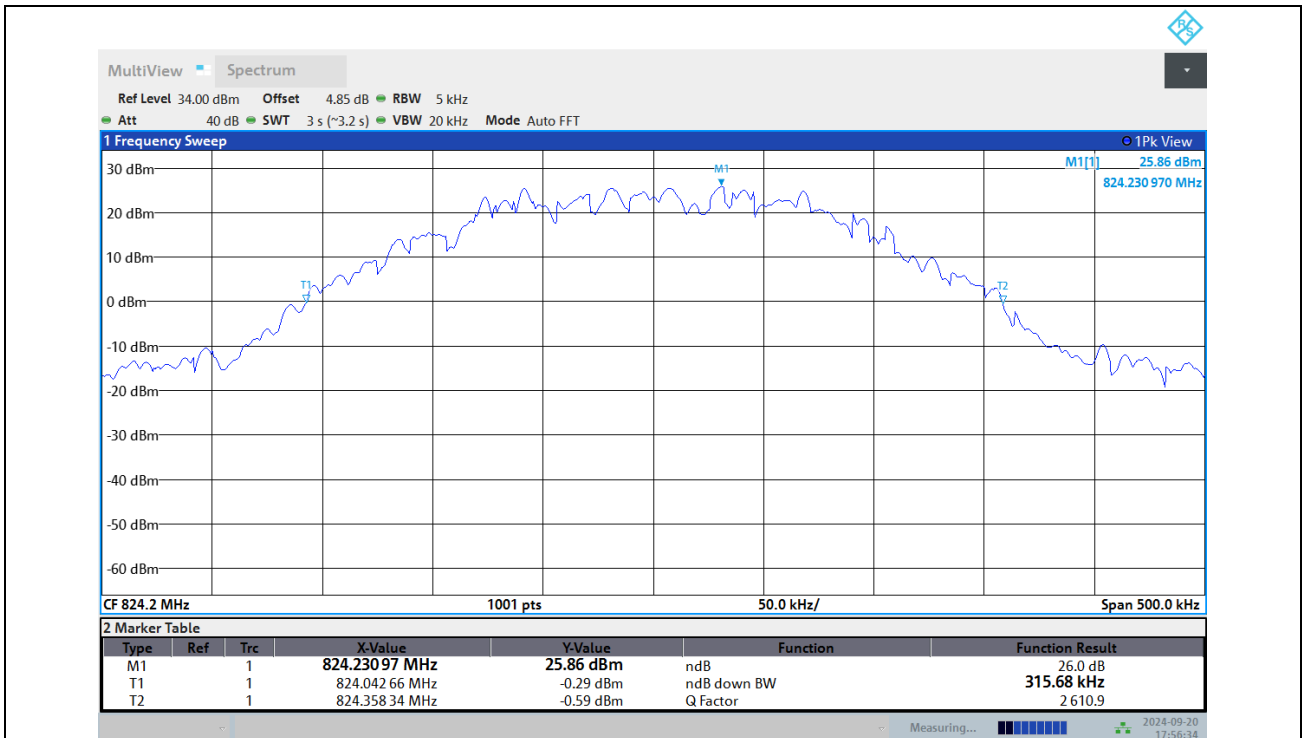
26dB Bandwidth

GPRS850-128

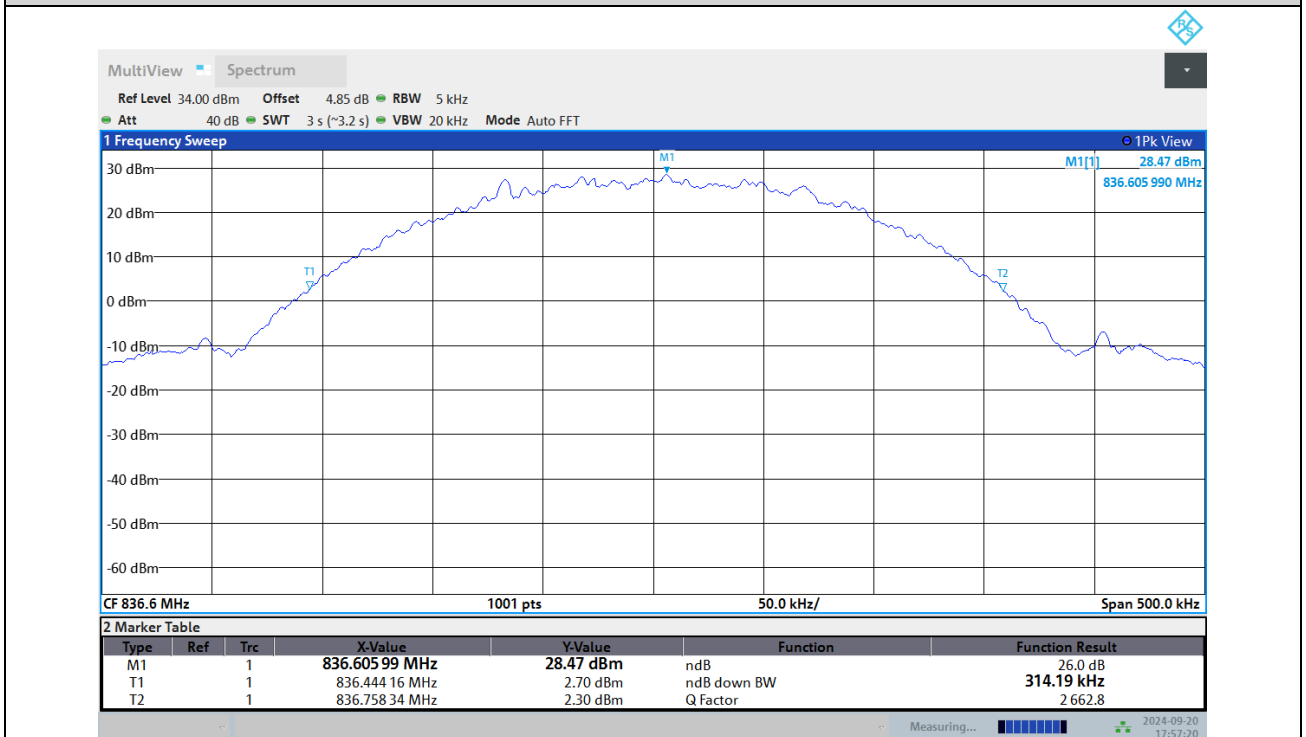


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VERITAS

Test Report No.: PSU-QBJ2408220111RF01



GPRS850-189

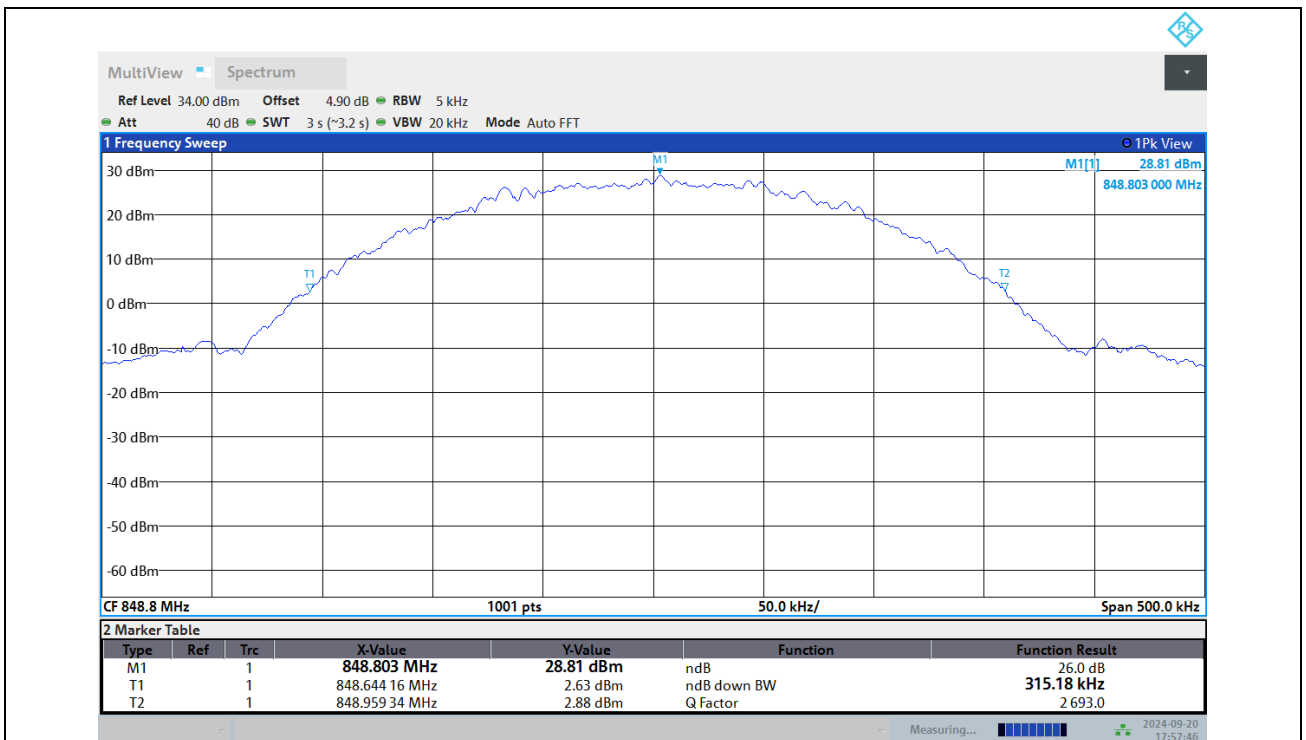


GPRS850-251

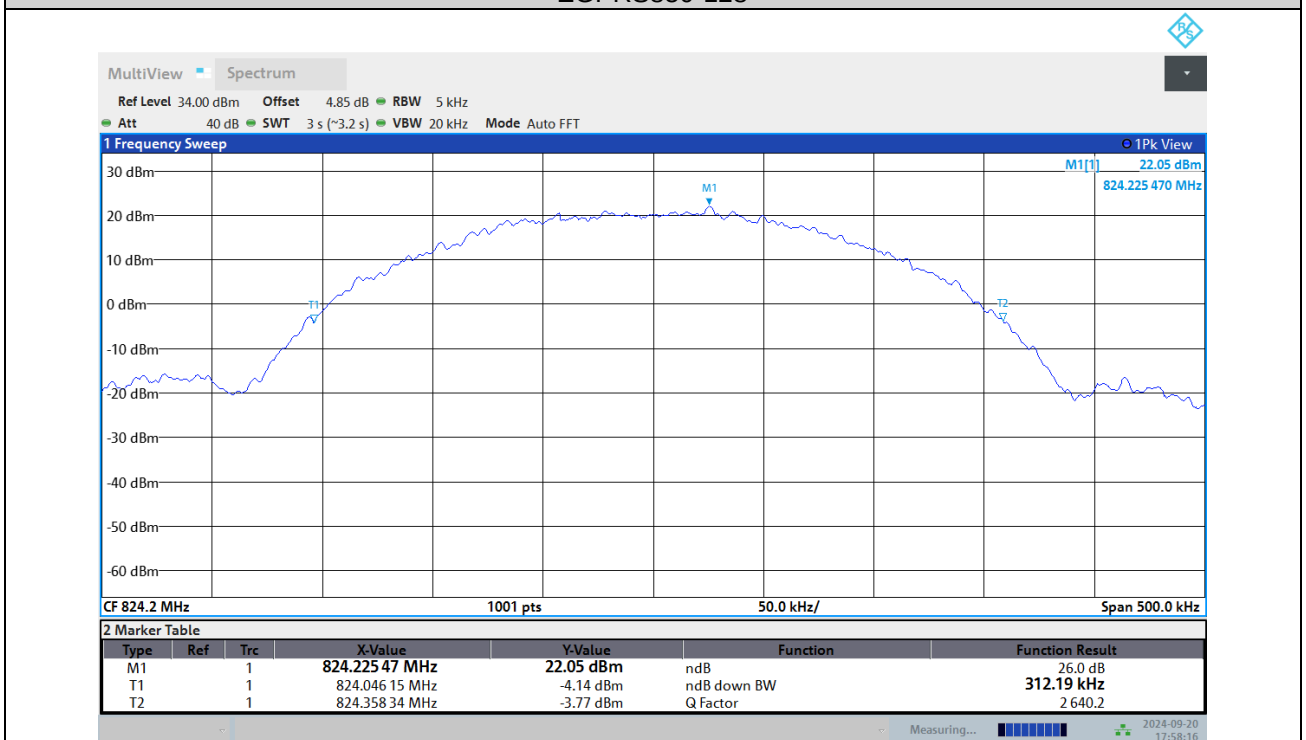


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VERITAS

Test Report No.: PSU-QBJ2408220111RF01



EGPRS850-128



EGPRS850-189



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VERITAS

Test Report No.: PSU-QBJ2408220111RF01





Test Report No.: PSU-QBJ2408220111RF01

BAND EDGE

Test Result

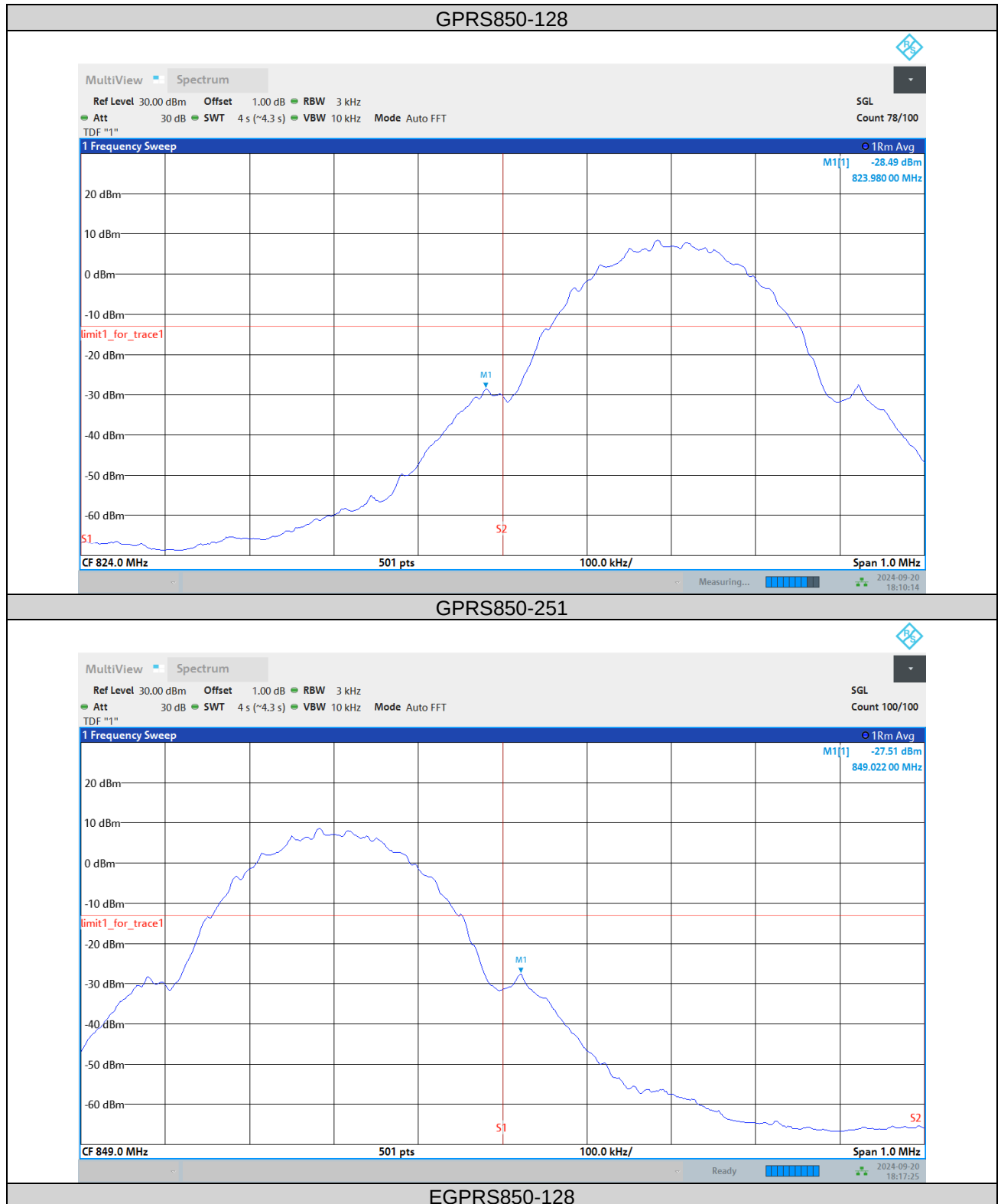
Band	Channel	Freq (MHz)	Result (dBm)	Limit(dBm)	Verdict
GPRS850	128	823.9800	-28.49	-13	PASS
GPRS850	251	849.0220	-27.51	-13	PASS
EGPRS850	128	823.9880	-35.88	-13	PASS
EGPRS850	251	849.0359	-38.29	-13	PASS



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VERITAS

Test Report No.: PSU-QBJ2408220111RF01

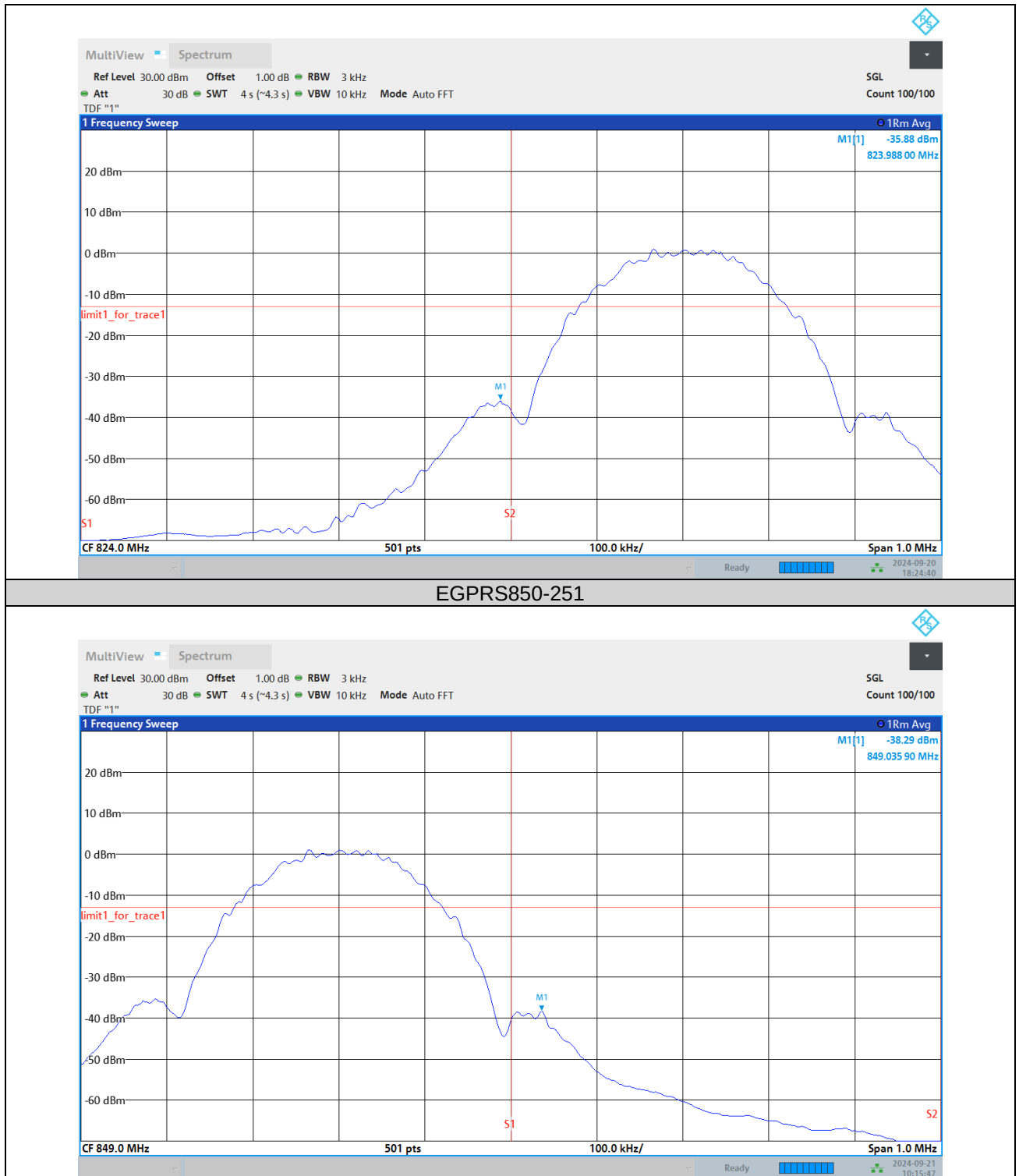
Test Graphs





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VERITAS

Test Report No.: PSU-QBJ2408220111RF01

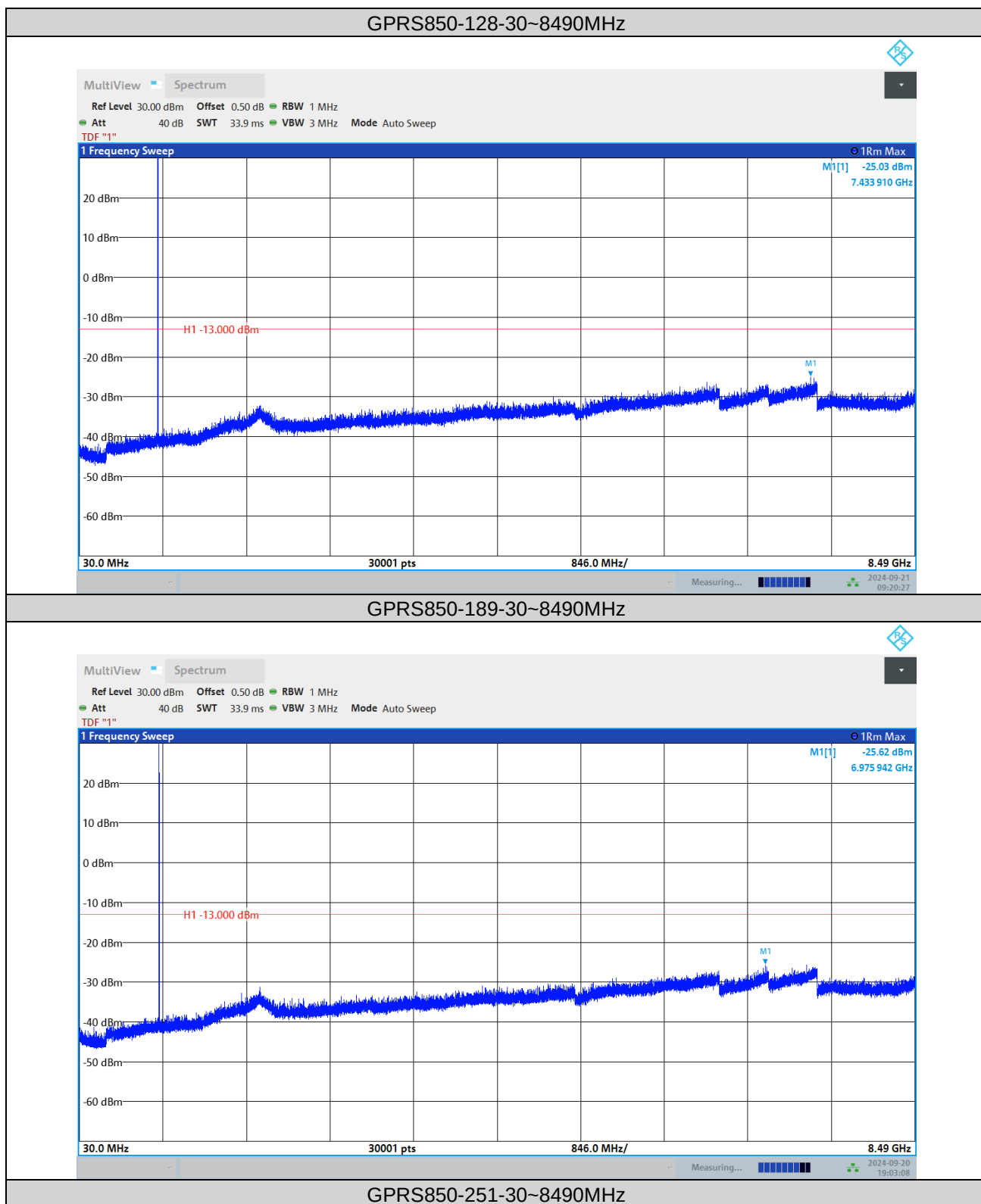


CONDUCTED SPURIOUS EMISSION

Test Result

Band	Channel	Frequency Range(MHz)	Max.Freq. (MHz)	Result (dBm)	Limit (dBm)	Verdict
GPRS850	128	30~8490MHz	7433.910	-25.03	-13	PASS
GPRS850	189	30~8490MHz	6975.942	-25.62	-13	PASS
GPRS850	251	30~8490MHz	7499.052	-25.16	-13	PASS
EGPRS850	128	30~8490MHz	7495.104	-25.14	-13	PASS
EGPRS850	189	30~8490MHz	7490.874	-25.60	-13	PASS
EGPRS850	251	30~8490MHz	7477.338	-25.77	-13	PASS

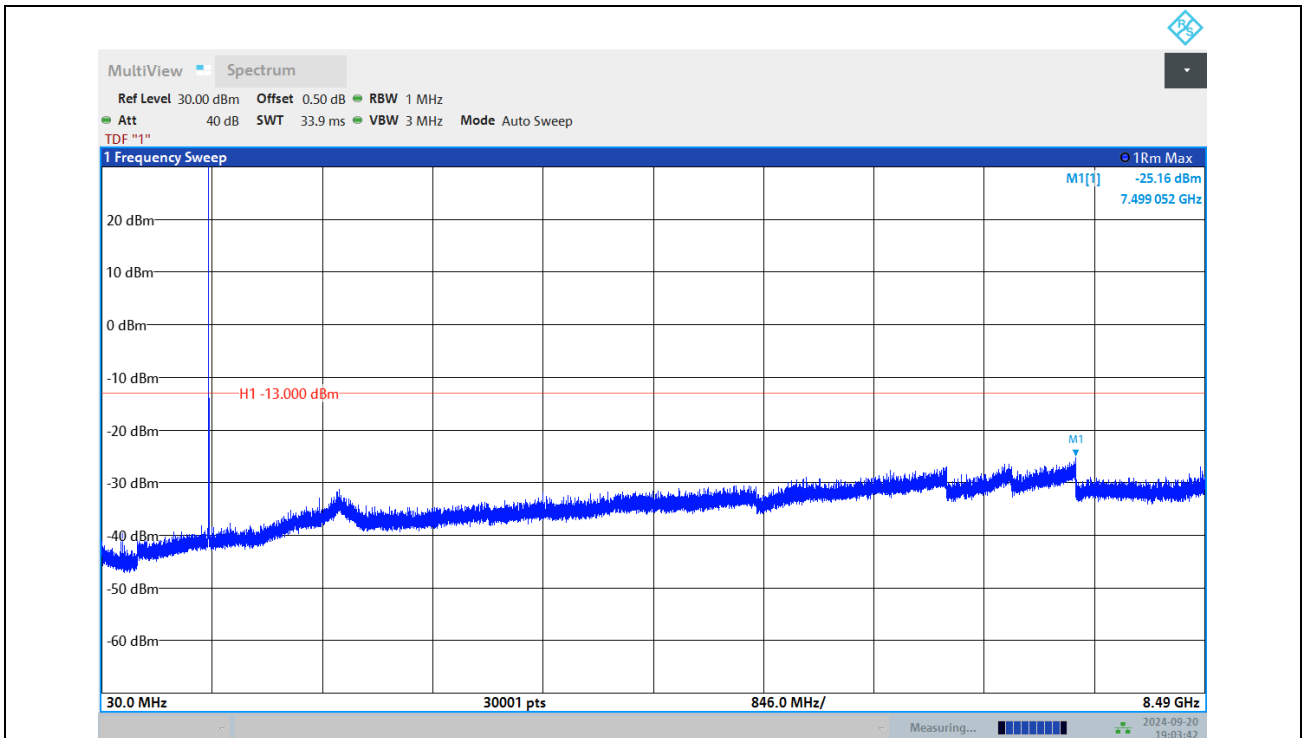
Test Graphs



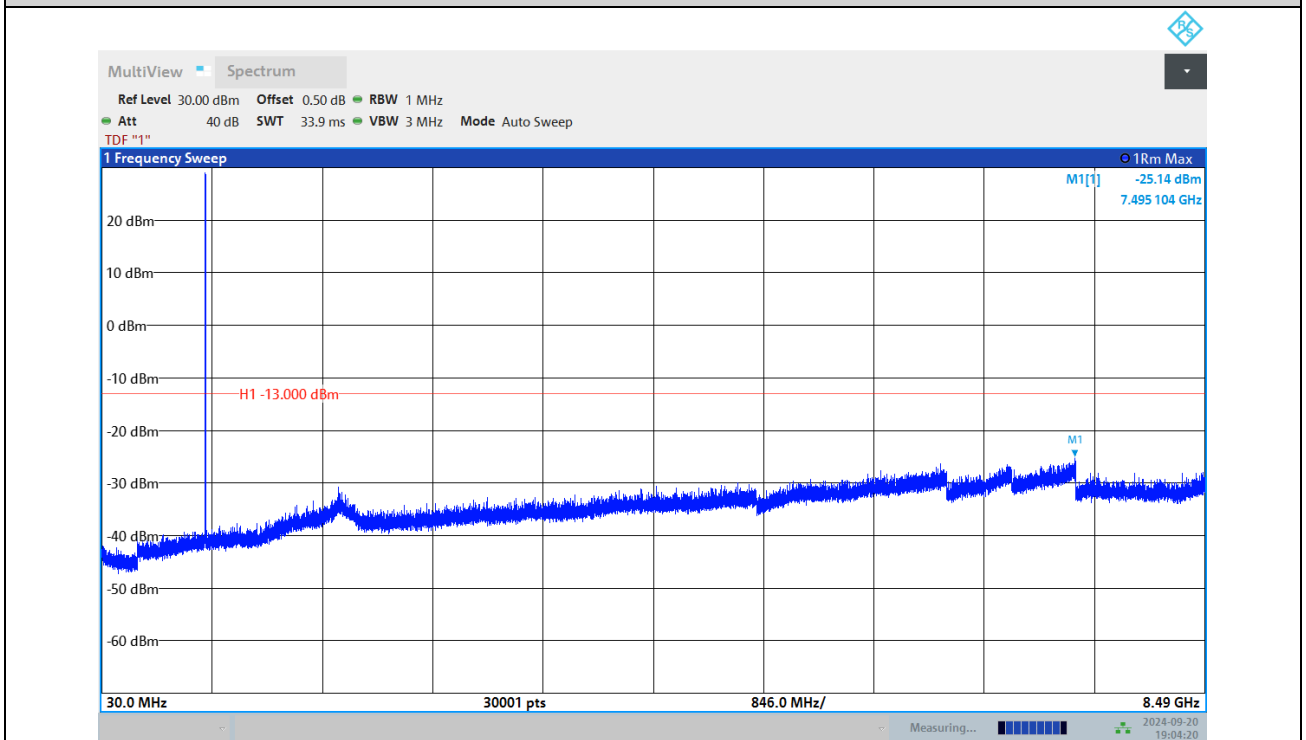


BUREAU
VERITAS

Test Report No.: PSU-QBJ2408220111RF01



EGPRS850-128-30~8490MHz

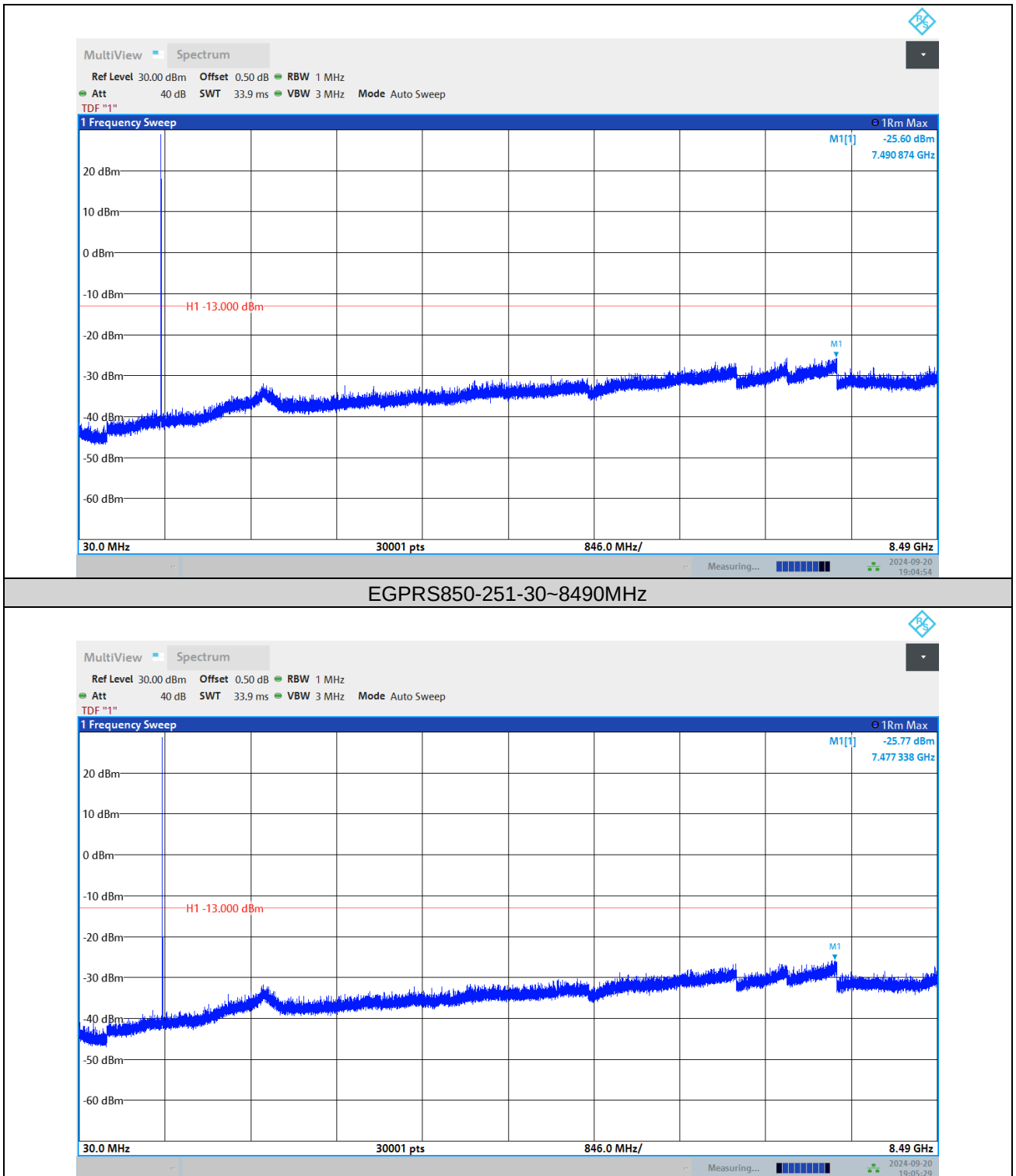


EGPRS850-189-30~8490MHz



BUREAU
VERITAS

Test Report No.: PSU-QBJ2408220111RF01



FREQUENCY STABILITY

Test Result

Voltage							
Band	Channel	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GPRS850	189	LV	NT	5.79	0.0070	±2.5	PASS
GPRS850	189	NV	NT	-2.75	-0.0033	±2.5	PASS
GPRS850	189	HV	NT	1.25	0.0015	±2.5	PASS
GPRS850	128	LV	NT	3.77	0.0045	±2.5	PASS
GPRS850	128	NV	NT	-7.73	-0.0092	±2.5	PASS
GPRS850	128	HV	NT	-4.79	-0.0057	±2.5	PASS
GPRS850	251	LV	NT	8.37	0.0099	±2.5	PASS
GPRS850	251	NV	NT	-2.63	-0.0031	±2.5	PASS
GPRS850	251	HV	NT	-4.41	-0.0052	±2.5	PASS

Temperature							
Band	Channel	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
GPRS850	189	NV	-30	-8.90	-0.0108	±2.5	PASS
GPRS850	189	NV	-20	-8.93	-0.0108	±2.5	PASS
GPRS850	189	NV	-10	9.08	0.0110	±2.5	PASS
GPRS850	189	NV	0	8.70	0.0106	±2.5	PASS
GPRS850	189	NV	10	-5.58	-0.0068	±2.5	PASS
GPRS850	189	NV	20	-5.37	-0.0065	±2.5	PASS
GPRS850	189	NV	30	8.88	0.0108	±2.5	PASS
GPRS850	189	NV	40	3.92	0.0048	±2.5	PASS
GPRS850	189	NV	50	9.41	0.0114	±2.5	PASS
GPRS850	128	NV	-30	7.97	0.0095	±2.5	PASS
GPRS850	128	NV	-20	-7.29	-0.0087	±2.5	PASS
GPRS850	128	NV	-10	7.61	0.0091	±2.5	PASS
GPRS850	128	NV	0	-0.85	-0.0010	±2.5	PASS
GPRS850	128	NV	10	-2.51	-0.0030	±2.5	PASS
GPRS850	128	NV	20	-1.98	-0.0024	±2.5	PASS
GPRS850	128	NV	30	4.66	0.0056	±2.5	PASS
GPRS850	128	NV	40	1.80	0.0022	±2.5	PASS
GPRS850	128	NV	50	7.96	0.0095	±2.5	PASS
GPRS850	251	NV	-30	6.00	0.0071	±2.5	PASS
GPRS850	251	NV	-20	-8.09	-0.0095	±2.5	PASS
GPRS850	251	NV	-10	0.00	0.0000	±2.5	PASS
GPRS850	251	NV	0	-3.47	-0.0041	±2.5	PASS
GPRS850	251	NV	10	0.14	0.0002	±2.5	PASS
GPRS850	251	NV	20	1.09	0.0013	±2.5	PASS
GPRS850	251	NV	30	1.93	0.0023	±2.5	PASS
GPRS850	251	NV	40	1.72	0.0020	±2.5	PASS
GPRS850	251	NV	50	-2.98	-0.0035	±2.5	PASS

MAX Deviation calculation



Test Report No.: PSU-QBJ2408220111RF01

Frequency Stability	Frequency(MHz)	Limit Line(MHz)	Result
fL- MAX(Δ f)	824.0782511	≥ 824	PASS
fH+ MAX(Δ f)	848.6774379	≤ 849	

- Note: 1. |MAX(Δ f)| = Max Deviation
2. fL = Occ low channel fL(-13dBm/MHz)
3. fH = Occ High channel fH(-13dBm/MHz)
4. |MAX(Δ f)| = 9.41Hz.

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