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

TEST REPORT

For

ActiveHome

Model: AH11-11-11

Trade Name: Upstreem

Issued to

UPSTREEM S.A
Rue de Gosselies 13/9, Jumet, Belgium 6040

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
Issued Date: December 13, 2019

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 4, 2019	Initial Issue	ALL	May Lin
01	December 13, 2019	See the following Note Rev. (01)	P.7, P.47-52	May Lin

Rev (01):

1. *Revised the section 4.3.*
2. *Added section 8.7 and note.*

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1. TEST RESULT CERTIFICATION

Applicant:	UPSTREEM S.A
	Rue de Gosselies 13/9, Jumet, Belgium 604**0**
Manufacturer:	IMEC Taiwan Co.
	4F. No.6-2, Dusing Rd., Hsinchu Science Park, Hsinchu, Taiwan
Equipment Under Test:	ActiveHome
Trade Name:	Upstreem
Model Number:	AH11-11-11
Date of Test:	October 02 ~ 29, 2019

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 22 Subpart H & Part 24 Subpart E	No non-compliance noted
Statements of Conformity	
Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.	

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA-603-E and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rule FCC PART 22 Subpart H and PART 24 Subpart E.

The test results of this report relate only to the tested sample identified in this report.

Approved by:

Kevin Tsai
Deputy Manager
Compliance Certification Services Inc.

Tested by:

Dally Hong
Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	ActiveHome
Trade Name	Upstreem
Model Number	AH11-11-11
Received Date	February 19, 2019
Power Supply	VDC from Power Adapter Model: EUPLUGBLACK1A I/P: 100-240Vac, 0.2A, 50/60Hz O/P: 5Vdc, 1A
Frequency Range	GPRS: 850: 824.2 ~ 848.8 MHz GPRS: 1900: 1850.2 ~ 1909.8 MHz
Transmit Power (ERP & EIRP Power)	GPRS 850: 25.42dBm GPRS 1900: 30.9dBm
Cellular Phone Protocol	GPRS: GMSK
Antenna Gain	FXP40.07.0085A / PCB Antenna GPRS 850: -3.83 dBi GPRS 1900: 1.03 dBi

Remark:

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*

3. TEST SUMMARY

FCC Standard Section	Report Section	Test Item	Result
-	2	Antenna Requirement	Pass
2.1049	8.1	99% Bandwidth	Pass
22.913(a), 24.232(c)	8.2	ERP and EIRP Measurement	Pass
2.1051, 22.917(a), 24.238(a)	8.3	Out of Band Emission At Antenna Terminals	Pass
2.1053	8.4	Field Strength of Spurious Radiation Measurement	Pass
2.1055, 22.355, 24.235	8.5	Frequency Stability V.S. Temperature Measurement	Pass
2.1055, 22.355, 24.235	8.6	Frequency Stability V.S. Voltage Measurement	Pass
22.913(d) 24.232(d)	8.7	Peak to Average Ratio	Pass

4. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures document on TIA-603-E and FCC CFR 47, Part 2, PART 22 SUBPART H AND PART 24 SUBPART E, KDB 971168 D01 Power Meas License Digital Systems.

4.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

4.3 DESCRIPTION OF TEST MODES

The EUT had been tested under operating condition.

EUT staying in continuous transmitting mode was programmed.

GPRS 850:
Channel Low (CH128), Channel Mid (CH190) and Channel High (CH251) were chosen for full testing.

GPRS 1900:
Channel Low (CH512), Channel Mid (CH661) and Channel High (CH810) were chosen for full testing.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

AC Power Line Conducted Emission	
Test Condition	**AC Power line conducted emission for line and neutral**
Power supply Mode	**Mode 1: EUT power by Host system** **Mode 2: EUT power by Battery (DC 3.7V)**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Radiated Emission Measurement	
Test Condition	**Band edge, Emission for Unwanted and Fundamental**
Power supply Mode	**Mode 1: EUT power by Host system** **Mode 2: EUT power by Battery (DC 3.7V)**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**
Position	☐ **P**laced in fixed position. ☐ **P**laced in fixed position at X-Plane (E2-Plane) ☐ **P**laced in fixed position at Y-Plane (E1-Plane) ☒ **P**laced in fixed position at Z-Plane (H-Plane)

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Host system** **Mode 2: EUT power by Battery (DC 3.7V)**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis, X, Y, Z for radiated measurement. The worst case(Z-Plane) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

5. INSTRUMENT CALIBRATION

5.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Conducted Emissions Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Coaxial Cable	Woken	WC12	CC003	06/28/2019	06/27/2020
Digital Radio Communication Tester	R&S	CMU200	116604	07/15/2019	07/14/2020
Power Divider	Solvang Technology	STI08-0015	008	08/06/2019	08/05/2020
Signal Analyzer	R&S	FSV 40	101073	09/25/2019	09/24/2020
Software	N/A				

Wugu 966 Chamber A					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Digital Radio Communication Tester	R&S	CMU200	116604	07/15/2019	07/14/2020
Band Reject Filters	MICRO TRONICS	BRM 50702	120	02/26/2019	02/25/2020
Bilog Antenna	Sunol Sciences	JB3	A030105	07/26/2019	07/25/2020
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/26/2019	02/25/2020
Coaxial Cable	EMCI	EMC105	190914+25111	09/20/2019	09/19/2020
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/30/2019	01/29/2020
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	10/04/2019	10/03/2020
High Pass Filter	SOLVANG TECHNOLOGY INC.	STI15	9923	02/26/2019	02/25/2020
High Pass Filters	MICRO TRONICS	HPM13195	003	02/26/2019	02/25/2020
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	02/26/2019	02/25/2020
K Type Cable	Huber+Suhner	SUCOFLEX 102	22470/2	02/26/2019	02/25/2020
Loop Ant	COM-POWER	AL-130	121051	03/22/2019	03/21/2020
Pre-Amplifier	EMEC	EM330	060609	02/26/2019	02/25/2020
Pre-Amplifier	HP	8449B	3008A00965	02/26/2019	02/25/2020
Pre-Amplifier	MITEQ	AMF-6F-260400-40-8P	985646	02/26/2019	02/25/2020
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/29/2019	05/28/2020
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 6.11-20180413				

Remark: *Each piece of equipment is scheduled for calibration once a year.*

5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87

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

6. FACILITIES AND ACCREDITATIONS

6.1 FACILITIES

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

6.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

7.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	FCC ID	Series No.	Data Cable
	N/A					

Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

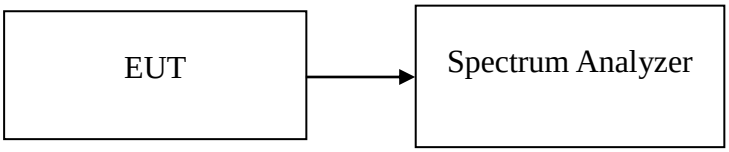
8. FCC PART 22 & 24 REQUIREMENTS

8.1 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

TEST RESULTS

No non-compliance noted.

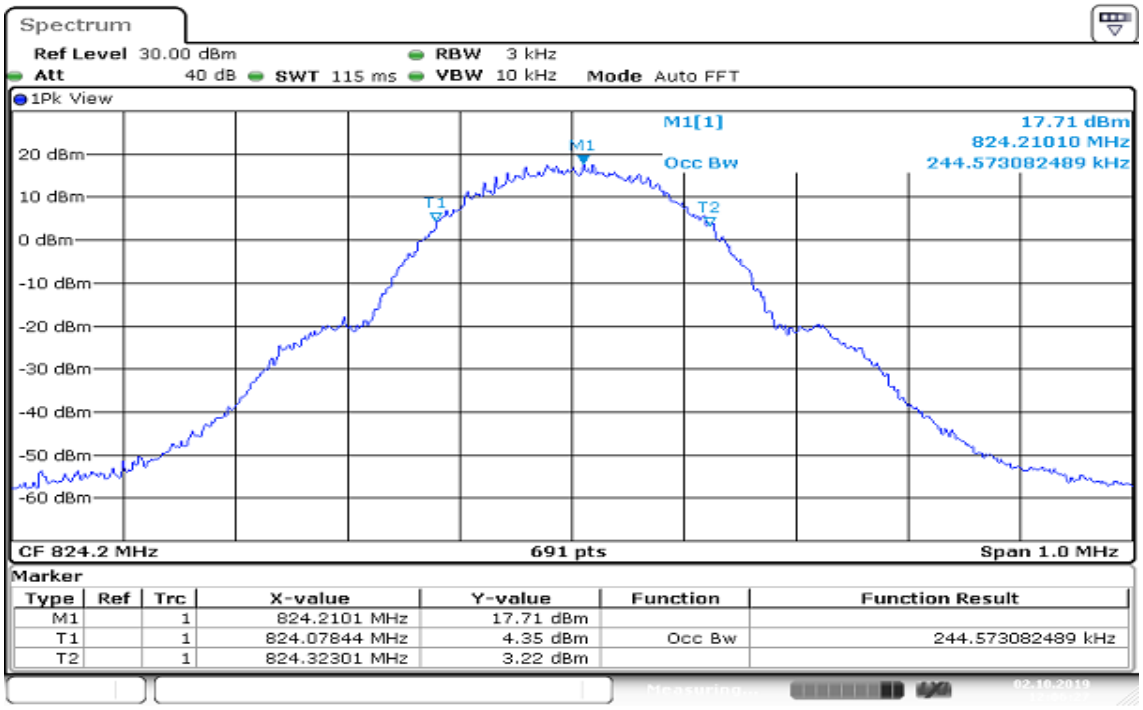
Test Data

Test Mode	CH	Frequency (MHz)	99% Bandwidth (kHz)
GPRS 850	128	824.2101	244.5730
	190	836.5942	243.1259
	251	848.7942	246.0202

Test Mode	CH	Frequency (MHz)	99% Bandwidth (kHz)
GPRS 1900	512	1850.1957	244.5730
	661	1879.9797	243.1259
	810	1909.7797	244.5730

Test Plot

GPRS 850 (CH Low)



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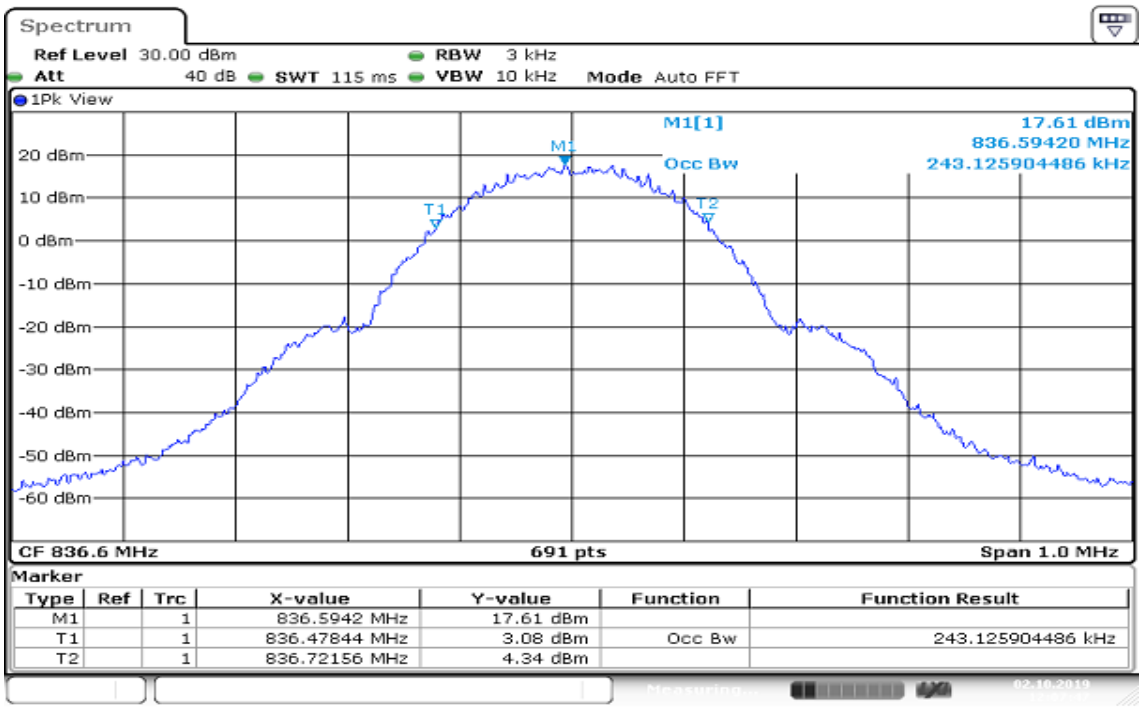
GPRS 850 (CH Mid)



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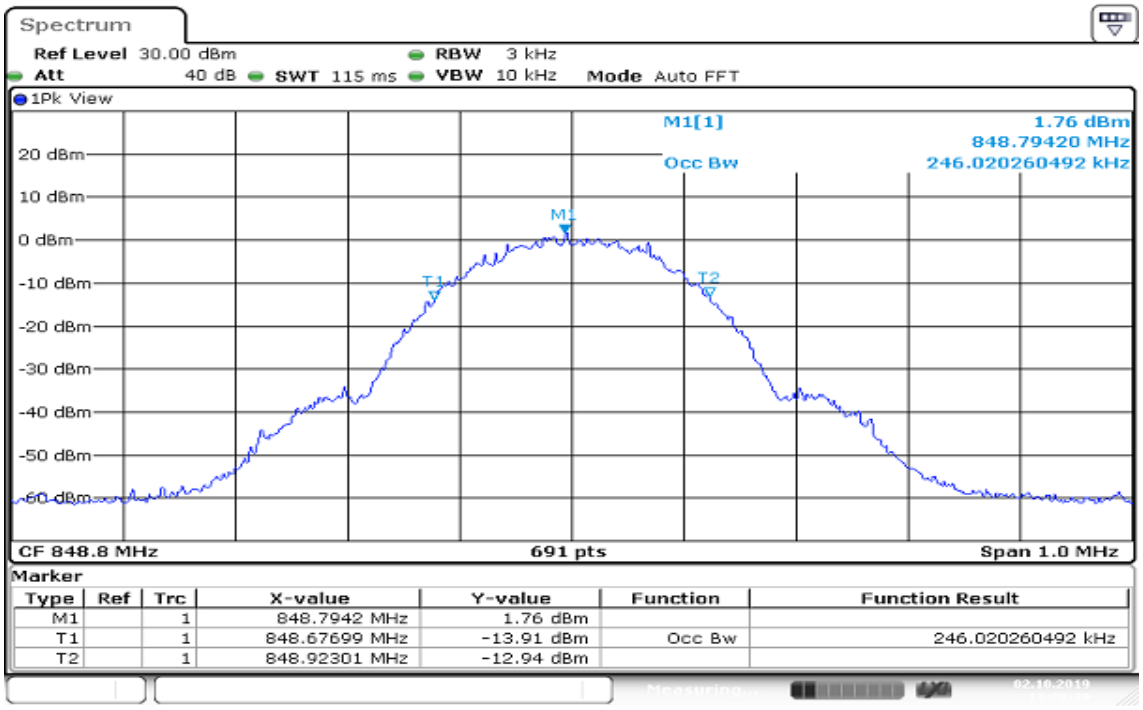
GPRS 850(CH High)



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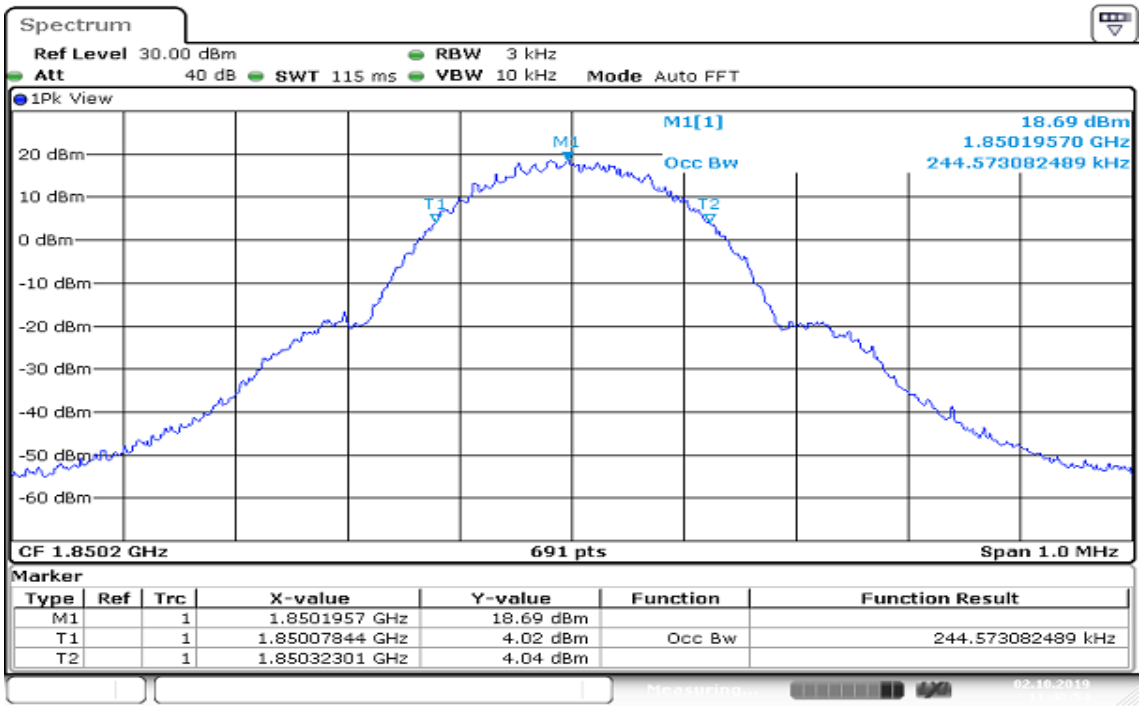
GPRS 1900 (CH Low)



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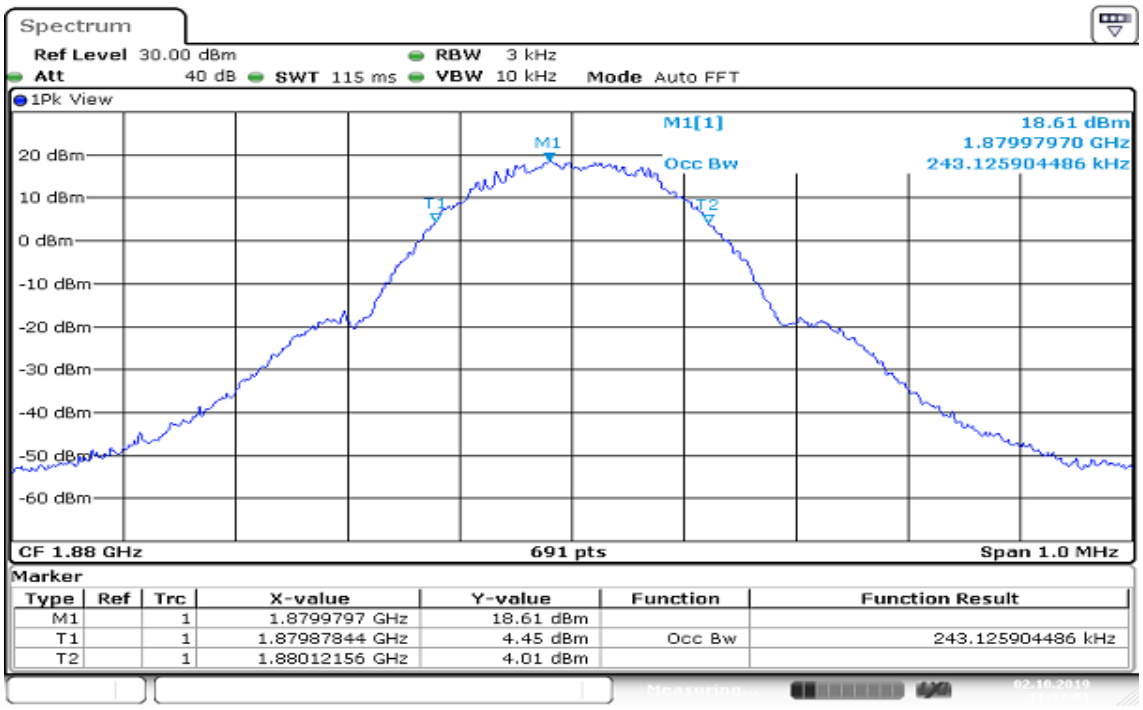
GPRS 1900 (CH Mid)



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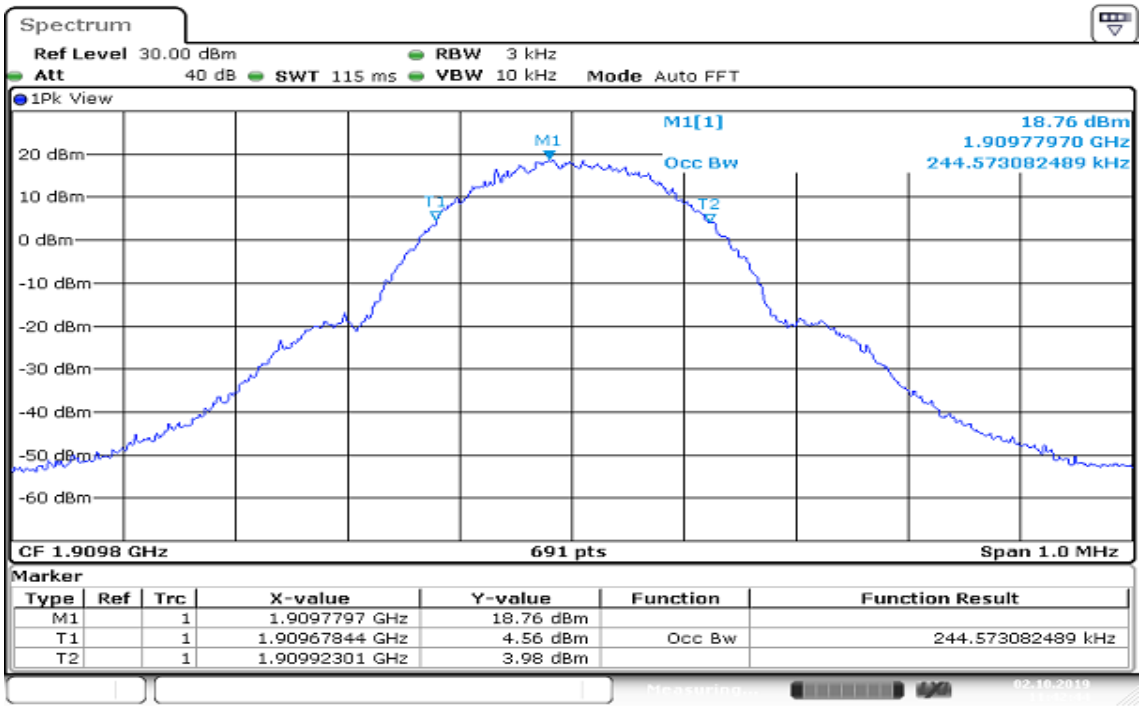
GPRS 1900 (CH High)



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8.2 ERP & EIRP MEASUREMENT

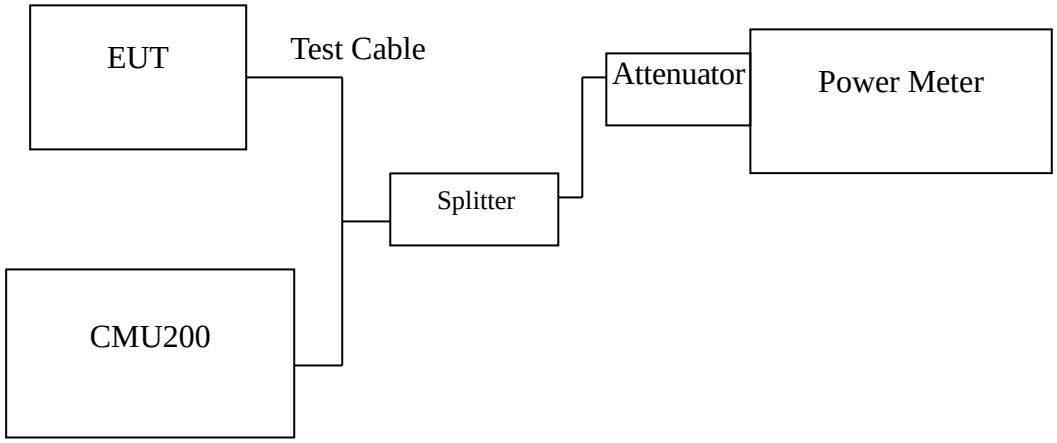
LIMIT

According to FCC §2.1049

According to FCC 22.913(a): The Effective Radiated Power (ERP) of mobile transmitters must not exceed 7 Watts.

According to FCC 24.232(b): The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

Test Configuration



Remark: *Measurement setup for testing on Antenna connector*

TEST PROCEDURE

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

ERP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)-2.15
EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

TEST RESULTS

No non-compliance noted.

GPRS 850 TEST DATA

Test Mode	CH	Frequency (MHz)	Output Power (dBm)	Output Power (W)	ERP/EIRP (dBm)	ERP/EIRP (W)
GPRS 850	128	824.2	31.4	1.380	25.42	0.348
	190	836.6	31.4	1.380	25.42	0.348
	251	848.8	31.4	1.380	25.42	0.348

GPRS 1900 TEST DATA

Test Mode	CH	Frequency (MHz)	Output Power (dBm)	Output Power (W)	ERP/EIRP (dBm)	ERP/EIRP (W)
GPRS 1900	512	1850.2	29.7	0.933	30.7	1.183
	661	1880.0	29.9	0.977	30.9	1.239
	810	1909.8	29.9	0.977	30.9	1.239

8.3 OUT OF BAND EMISSION AT ANTENNA TERMINALS

LIMIT

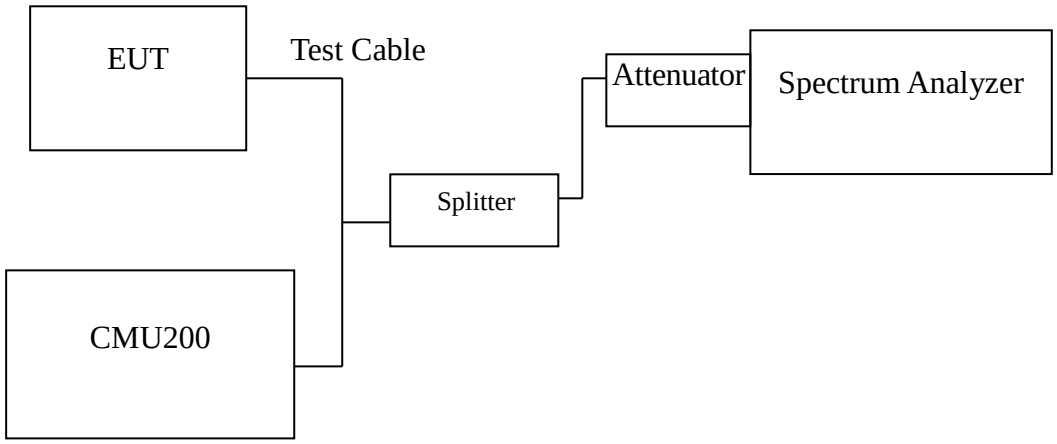
According to FCC §2.1051, FCC §22.917(a), FCC §24.238(a).

Out of Band Emissions: The mean power of emission must be attenuated below the mean power of the non-modulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at lease 43 + 10 log P dB.

Mobile Emissions in Base Frequency Range: The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not exceed –80 dBm at the transmit antenna connector.
Band Edge Requirements: In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at lease 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the Out of band Emission

Test Configuration

Out of band emission at antenna terminals:



TEST PROCEDURE

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10 th harmonic. Limit = -13dBm

Band Edge Requirements (824 MHz and 849 MHz /1850MHz and 1910MHz): In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit, -13dBm.

TEST RESULTS

No non-compliance noted.

Test Data

Mode	CH	Location	Description
GPRS 850	128	Figure 8-1	Conducted spurious emissions, 30MHz - 20GHz
	190	Figure 8-2	Conducted spurious emissions, 30MHz - 20GHz
	251	Figure 8-3	Conducted spurious emissions, 30MHz - 20GHz

Mode	CH	Location	Description
GPRS 1900	512	Figure 9-1	Conducted spurious emissions, 30MHz - 20GHz
	661	Figure 9-2	Conducted spurious emissions, 30MHz - 20GHz
	810	Figure 9-3	Conducted spurious emissions, 30MHz - 20GHz

Mode	CH	Location	Description
GPRS 850	128	Figure 10-1	Band Edge emissions
	251	Figure 10-2	Band Edge emissions

Mode	CH	Location	Description
GPRS 1900	512	Figure 11-1	Band Edge emissions
	810	Figure 11-2	Band Edge emissions

Test Plot

GPRS 850

Figure 8-1: Out of Band emission at antenna terminals – GPRS CH Low

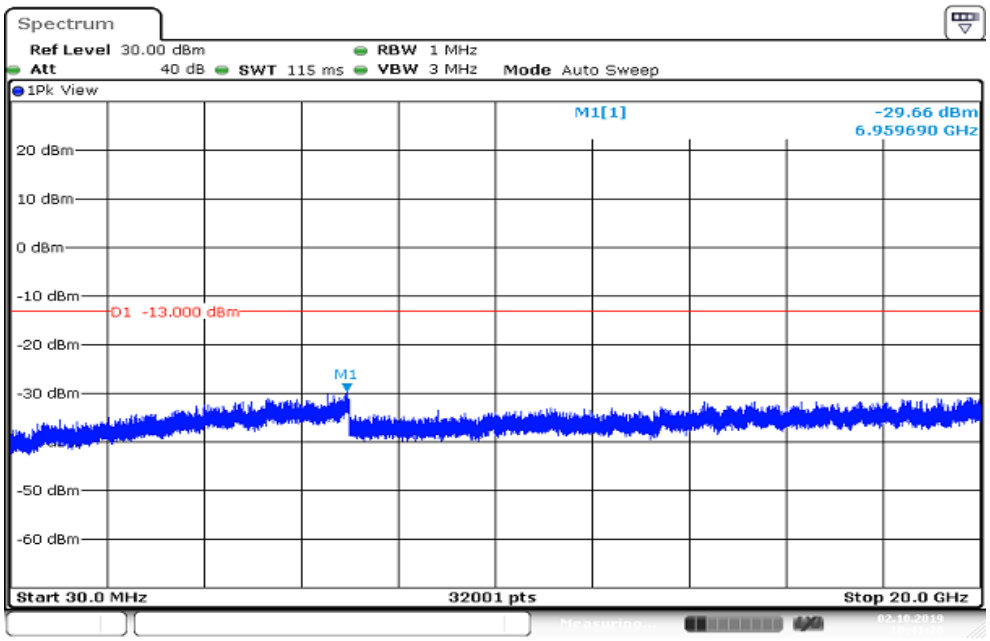


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Figure 8-2: Out of Band emission at antenna terminals – GPRS CH Mid

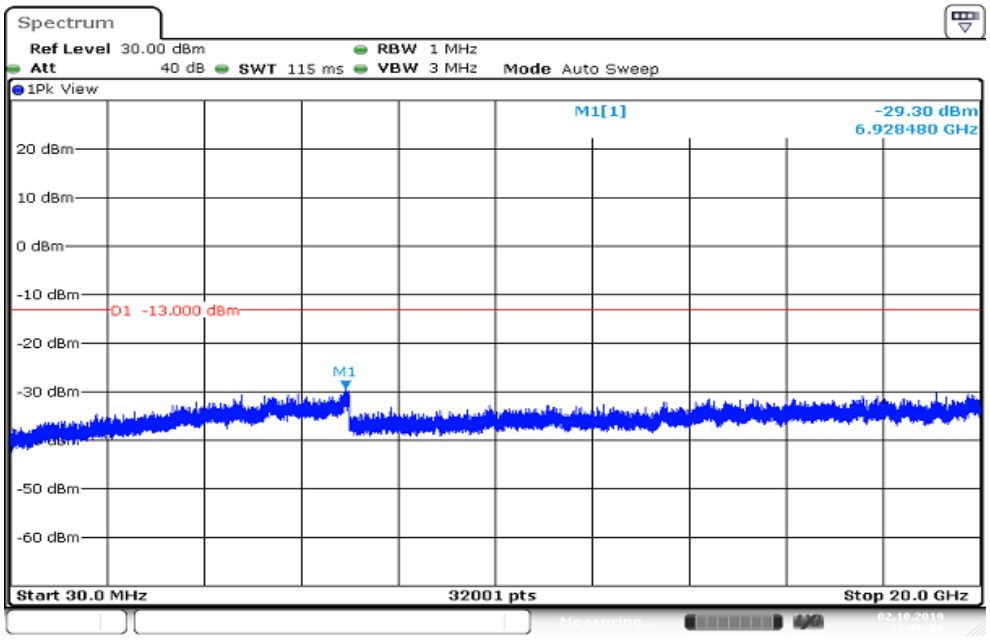

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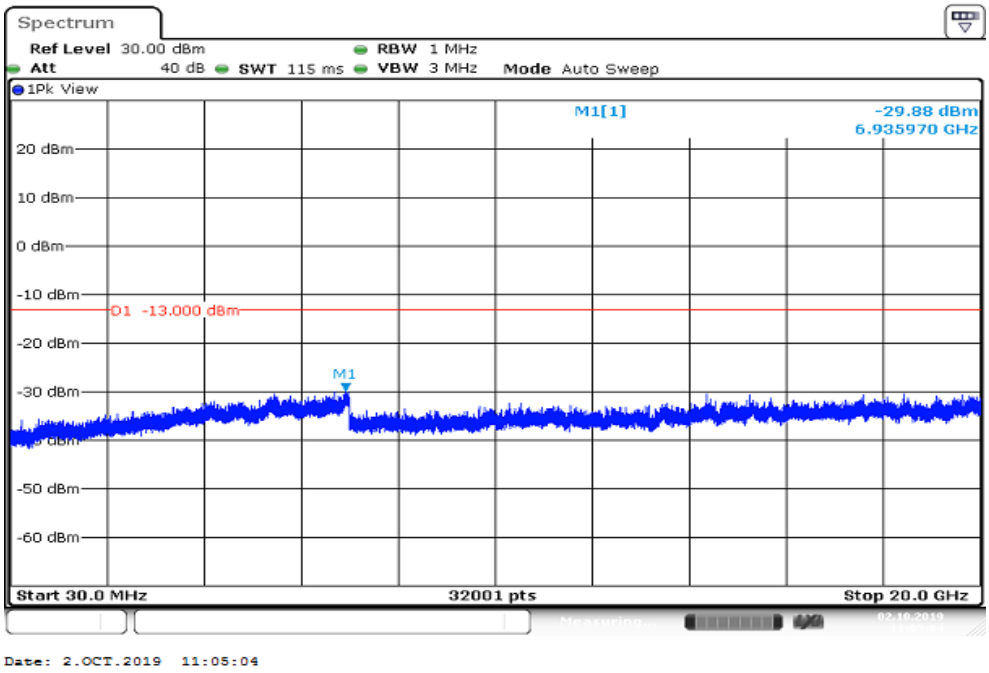
Figure 8-3: Out of Band emission at antenna terminals – GPRS CH High



GPRS 1900

Figure 9-1: Out of Band emission at antenna terminals – GPRS CH Low

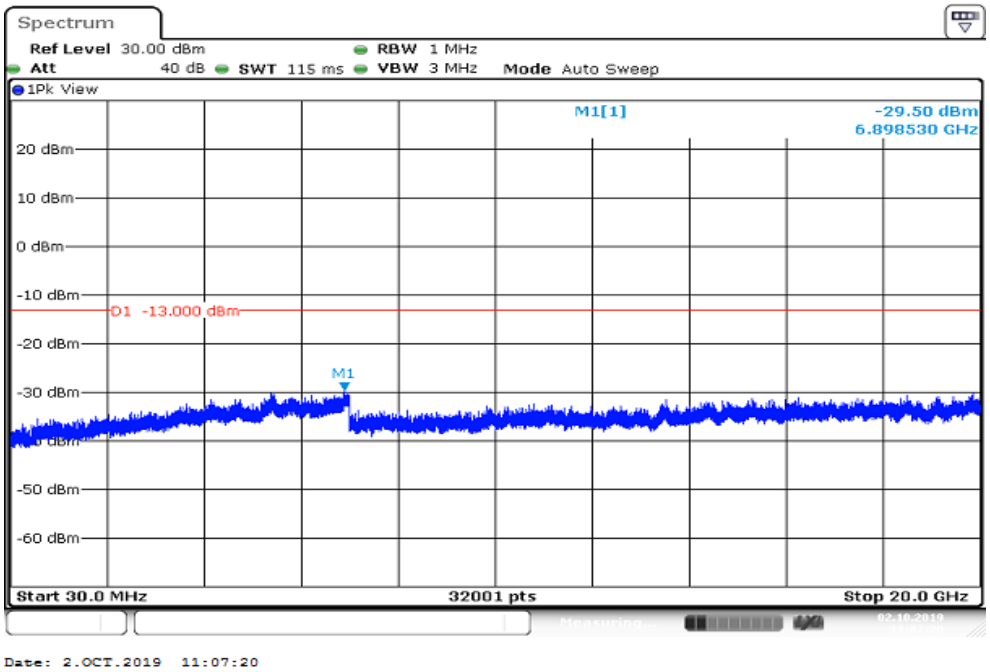


Figure 9-2: Out of Band emission at antenna terminals – GPRS CH Mid

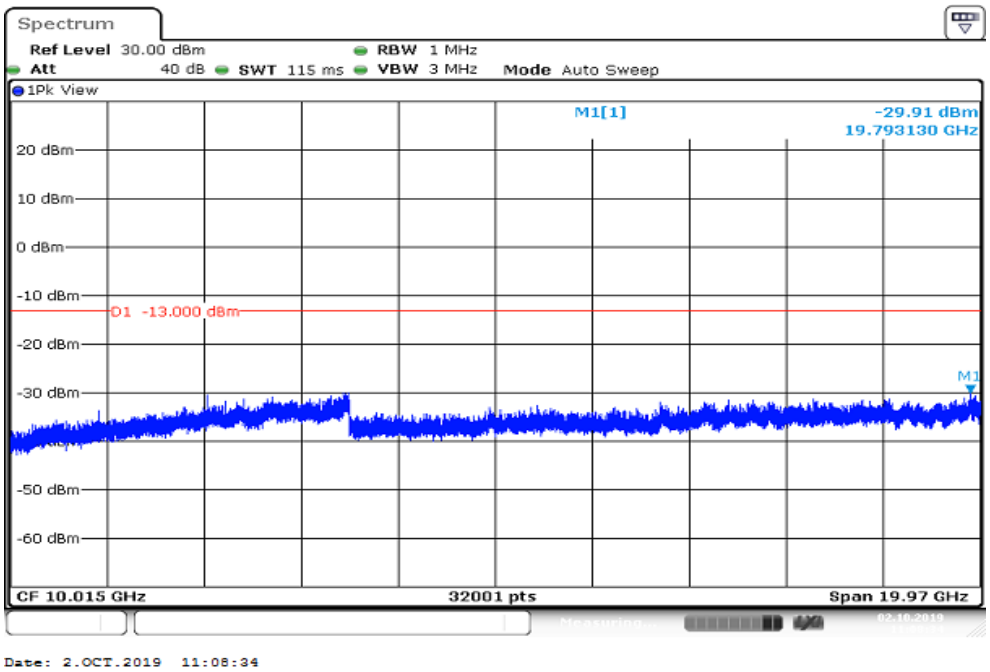
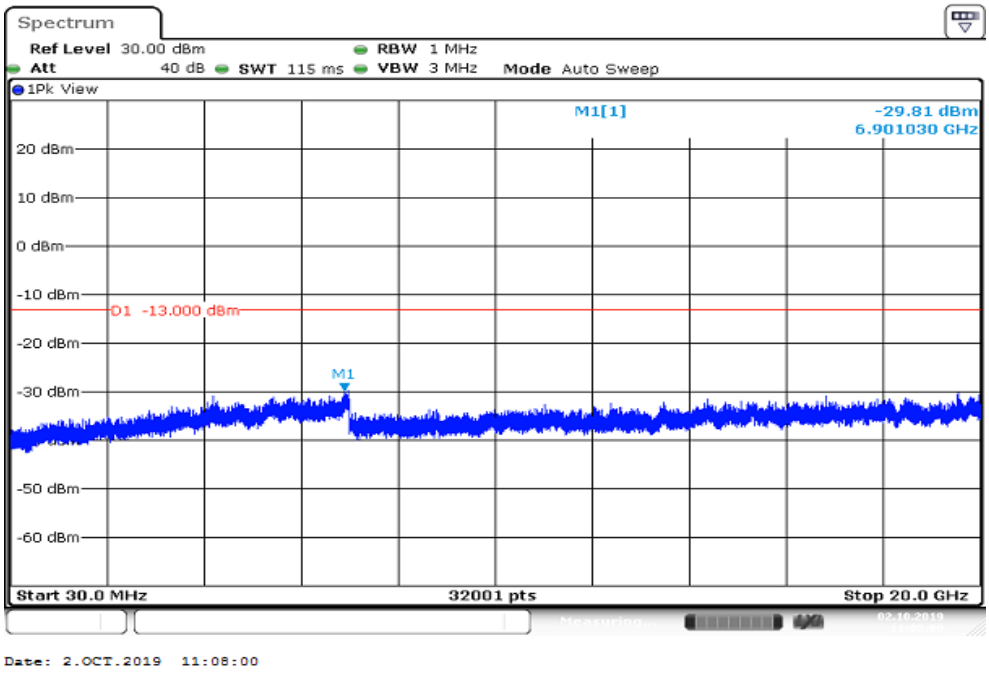


Figure 9-3: Out of Band emission at antenna terminals – GPRS CH High



GPRS 850

Figure 10-1: Band Edge emissions – GPRS CH Low

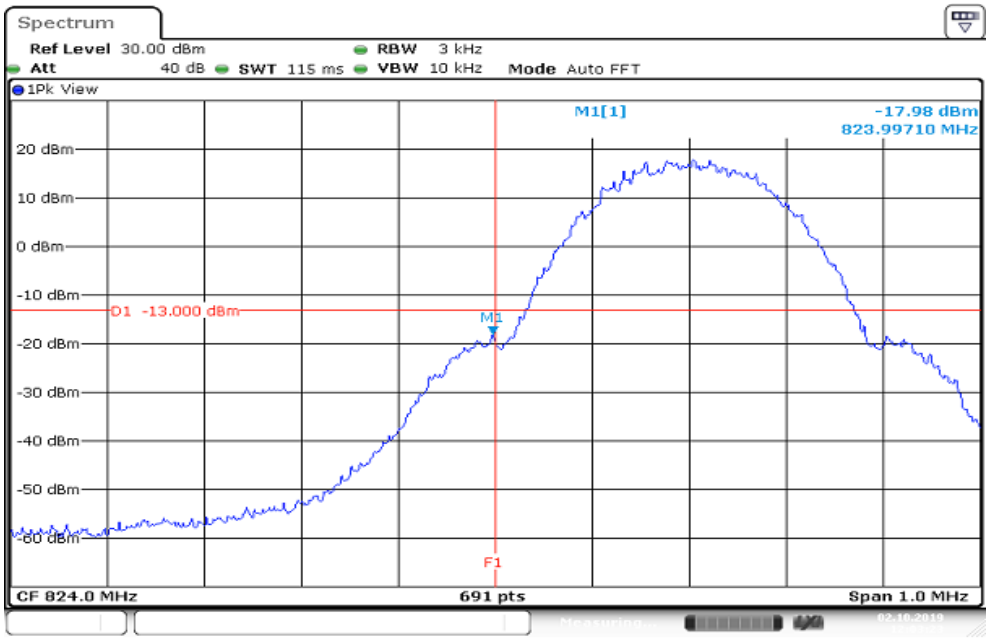


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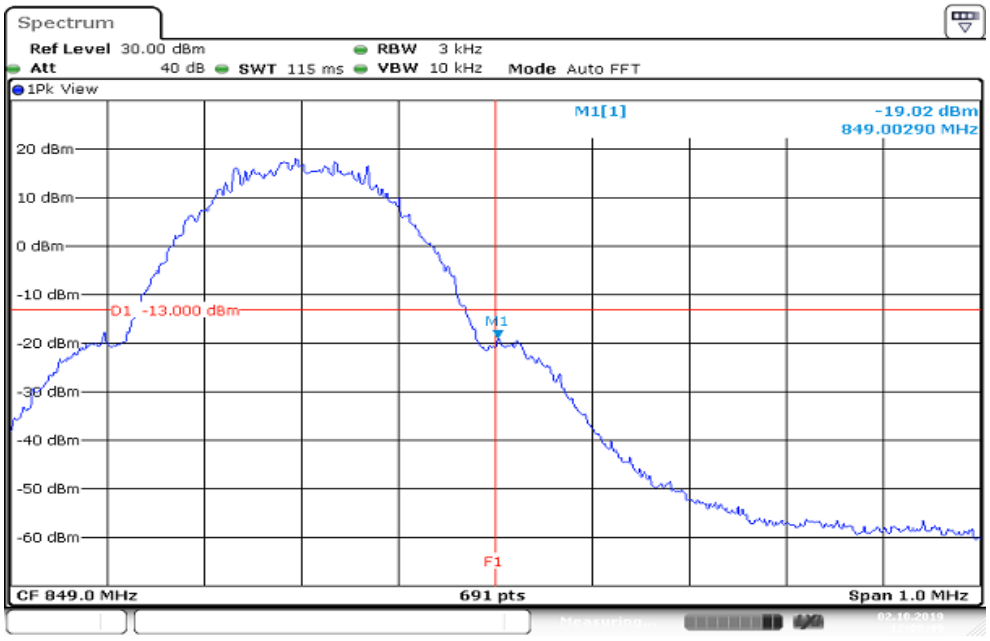
Figure 10-2: Band Edge emissions –GPRS CH High



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GPRS 1900

Figure 11-1: Band Edge emissions – GPRS CH Low

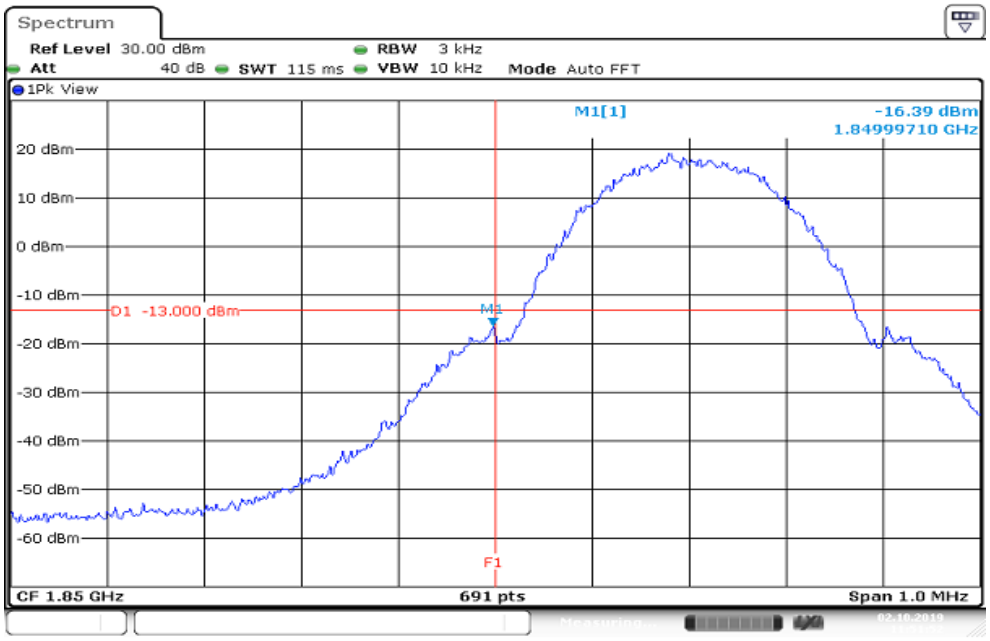

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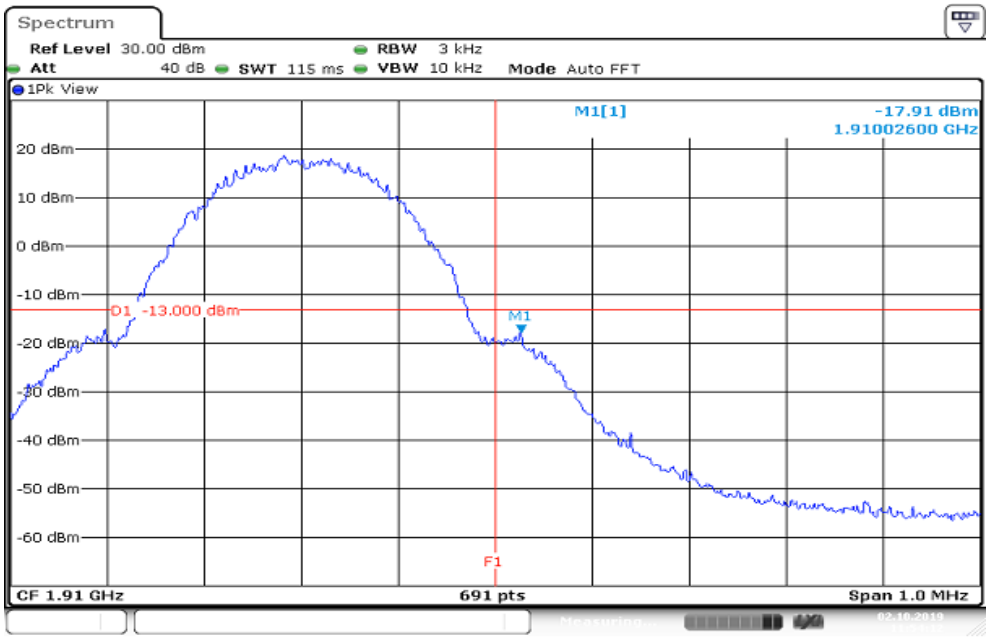
Figure 11-2: Band Edge emissions – GPRS CH High



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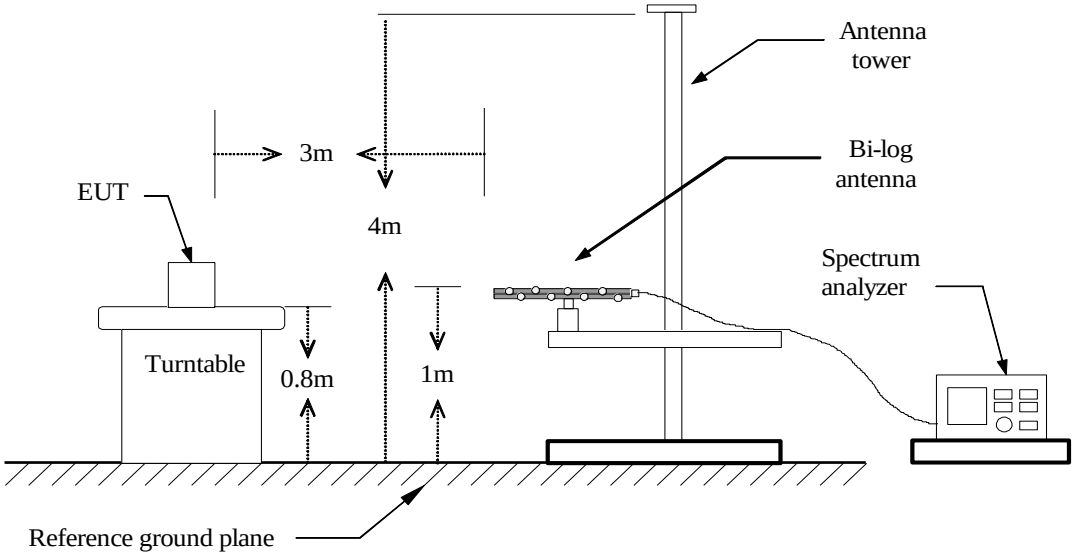
8.4 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

LIMIT

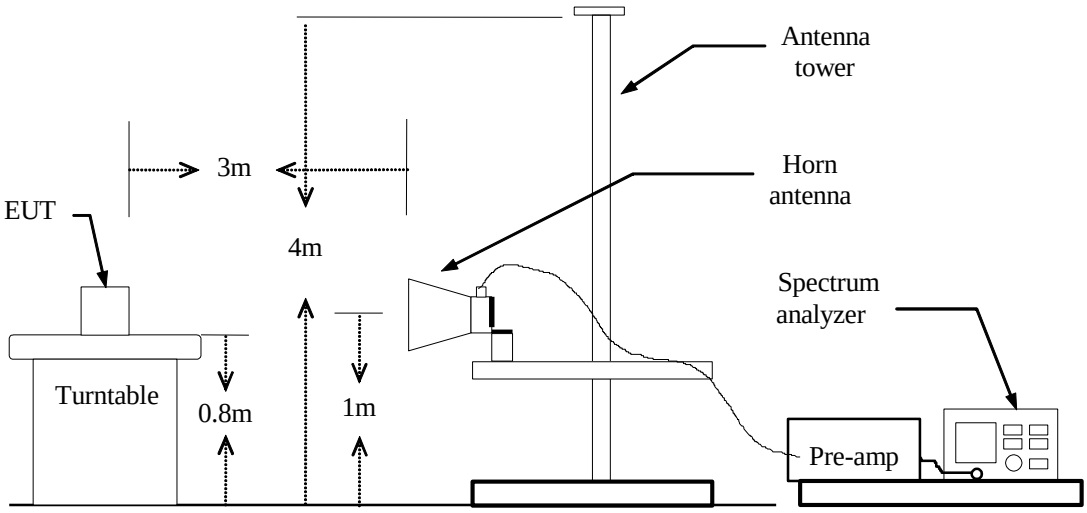
According to FCC §2.1053

Test Configuration

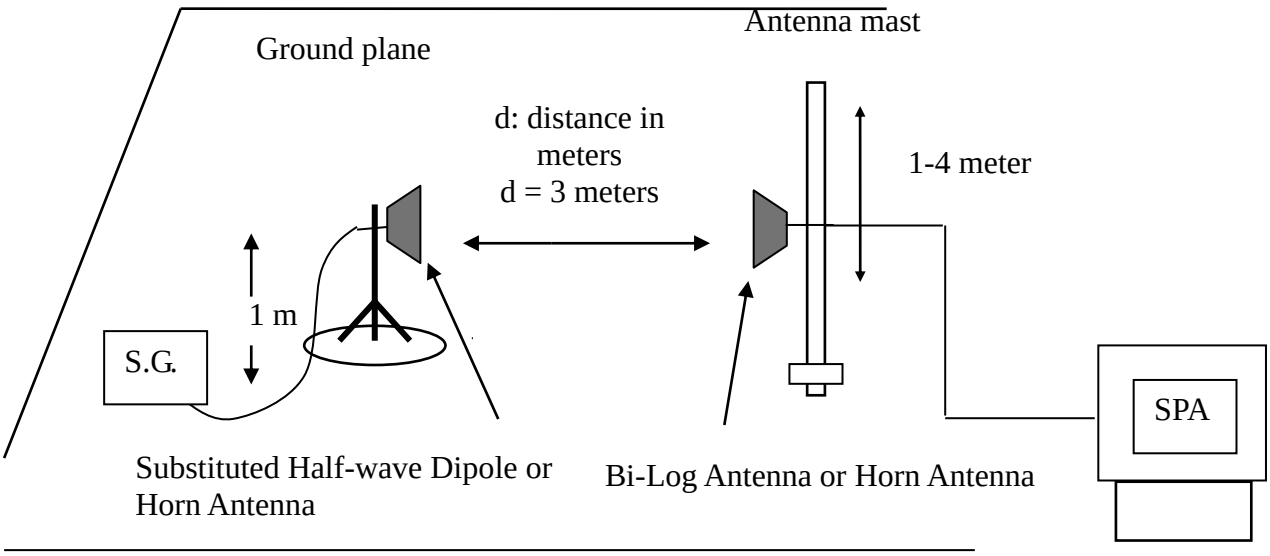
Below 1 GHz



Above 1 GHz



Substituted Method Test Set-up



TEST PROCEDURE

1. According to KDB 971168 D01 Power Meas License Digital Systems.. Section 5.8 and TIA-603-E Section 2.2.12.
2. The EUT was placed on a turntable
   (1) Below 1G : 0.8m
   (2) Above 1G : 0.8m
   (3) EUT set 3m from the receiving antenna
   (4) The table was rotated 360 degrees of the highest spurious emission to determine the position.
3. Set the spectrum analyzer , RBW=1MHz, VBW=3MHz.
4. A horn antenna was driven by a signal generator.
5. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission

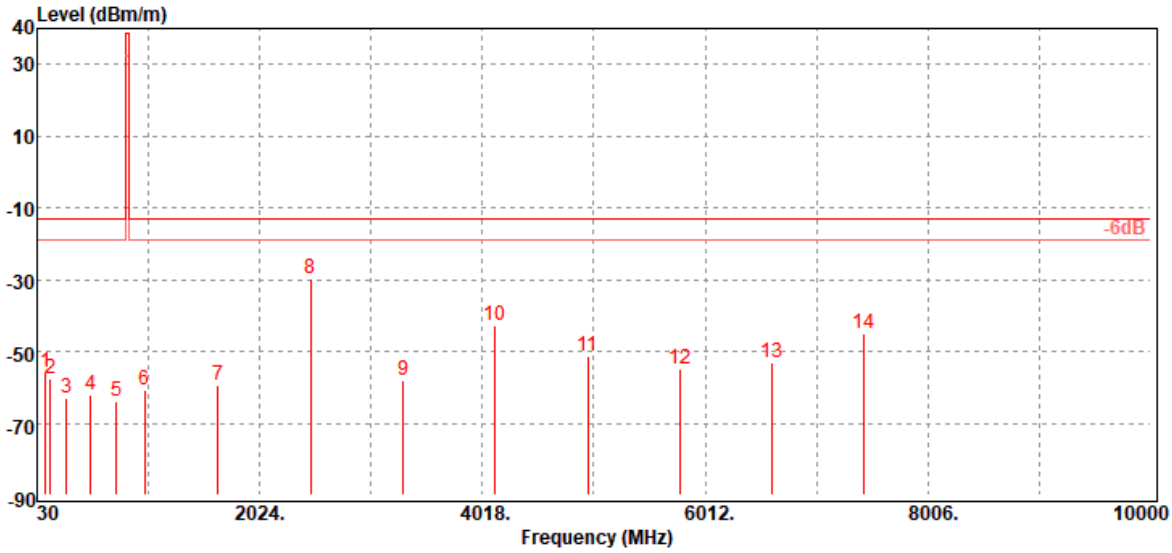
ERP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)-2.15
EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

TEST RESULTS

Refer to the attached tabular data sheets.

Radiated Spurious Emission Measurement Result

Operation Mode:	GPRS 850 / Low CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Ver.

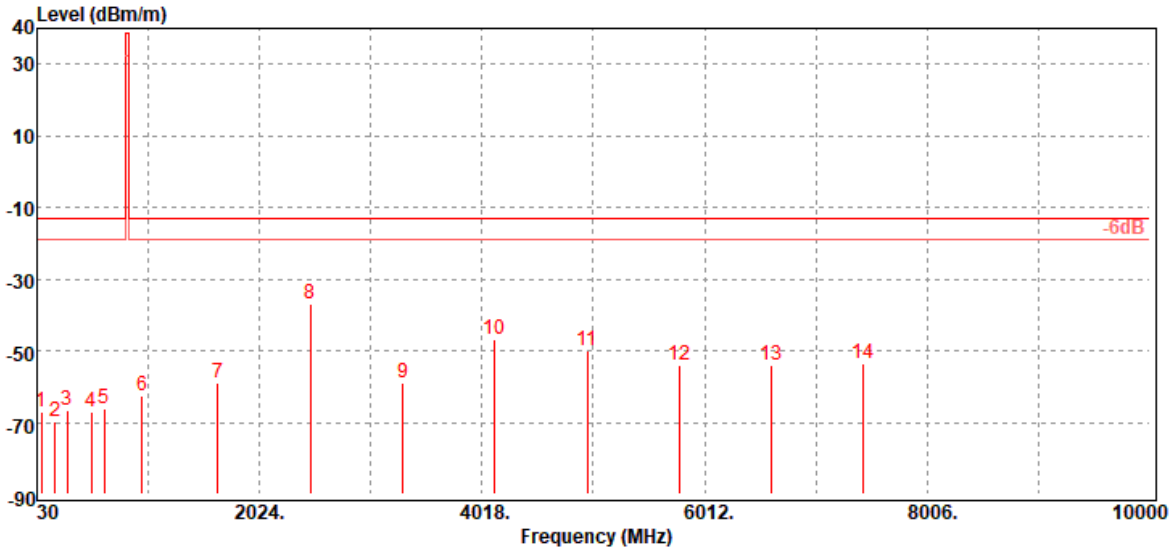


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
105.66	-55.71	-9.37	-0.84	-13.00	-42.71	V
149.31	-57.51	-7.17	-1.00	-13.00	-44.51	V
293.84	-62.97	-2.12	-1.42	-13.00	-49.97	V
512.09	-62.21	-1.62	-1.90	-13.00	-49.21	V
742.95	-63.73	-1.36	-2.30	-13.00	-50.73	V
990.30	-60.95	-1.40	-2.66	-13.00	-47.95	V
1652.80	-59.55	9.72	-3.55	-13.00	-46.55	V
2479.20	-29.93	10.72	-4.55	-13.00	-16.93	V
3305.60	-58.22	12.63	-5.40	-13.00	-45.22	V
4132.00	-42.98	12.86	-6.04	-13.00	-29.98	V
4958.40	-51.52	12.58	-6.54	-13.00	-38.52	V
5784.80	-54.88	13.03	-7.22	-13.00	-41.88	V

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 850 / Low CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Hor.

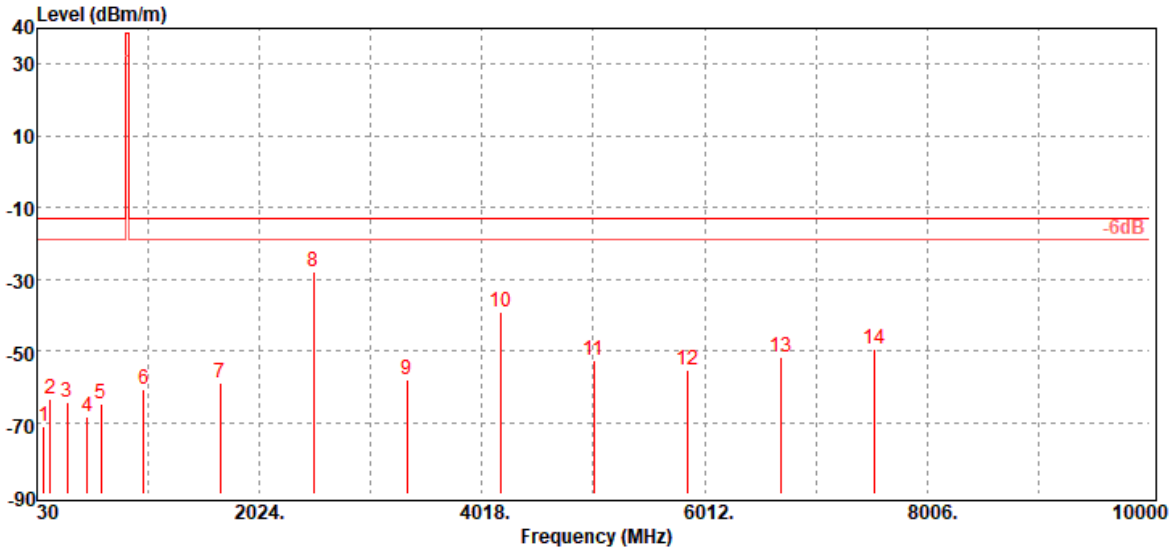


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
71.71	-67.07	-9.60	-0.70	-13.00	-54.07	H
191.99	-69.78	-4.10	-1.14	-13.00	-56.78	H
299.66	-66.43	-2.01	-1.43	-13.00	-53.43	H
519.85	-67.26	-1.40	-1.91	-13.00	-54.26	H
631.40	-65.99	-1.56	-2.12	-13.00	-52.99	H
972.84	-62.53	-1.36	-2.64	-13.00	-49.53	H
1652.80	-58.82	9.72	-3.55	-13.00	-45.82	H
2479.20	-36.75	10.72	-4.55	-13.00	-23.75	H
3305.60	-58.88	12.63	-5.40	-13.00	-45.88	H
4132.00	-46.80	12.86	-6.04	-13.00	-33.80	H
4958.40	-49.79	12.58	-6.54	-13.00	-36.79	H
5784.80	-53.94	13.03	-7.22	-13.00	-40.94	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 850 / Mid CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Ver.

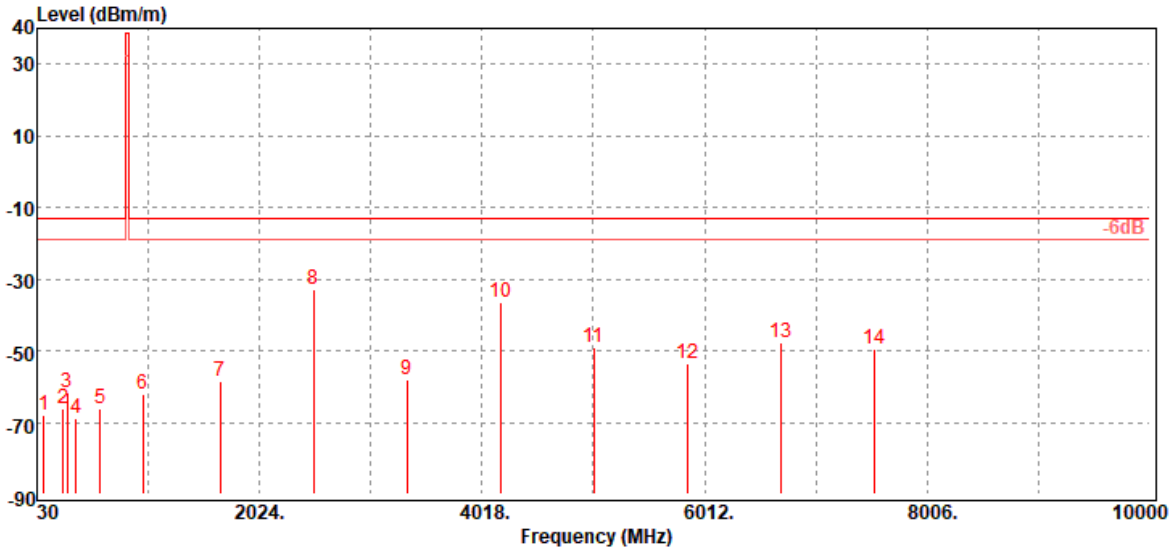


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
91.11	-71.14	-6.91	-0.78	-13.00	-58.14	V
149.31	-63.46	-7.17	-1.00	-13.00	-50.46	V
303.54	-64.14	-1.93	-1.44	-13.00	-51.14	V
478.14	-68.20	-2.40	-1.82	-13.00	-55.20	V
604.24	-64.61	-0.98	-2.07	-13.00	-51.61	V
982.54	-60.59	-1.35	-2.65	-13.00	-47.59	V
1673.20	-59.03	9.84	-3.58	-13.00	-46.03	V
2509.80	-27.74	10.80	-4.59	-13.00	-14.74	V
3346.40	-57.86	12.88	-5.44	-13.00	-44.86	V
4183.00	-39.34	12.90	-6.07	-13.00	-26.34	V
5019.60	-52.79	12.46	-6.57	-13.00	-39.79	V
5856.20	-55.37	13.09	-7.26	-13.00	-42.37	V

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 850 / Mid CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Hor.

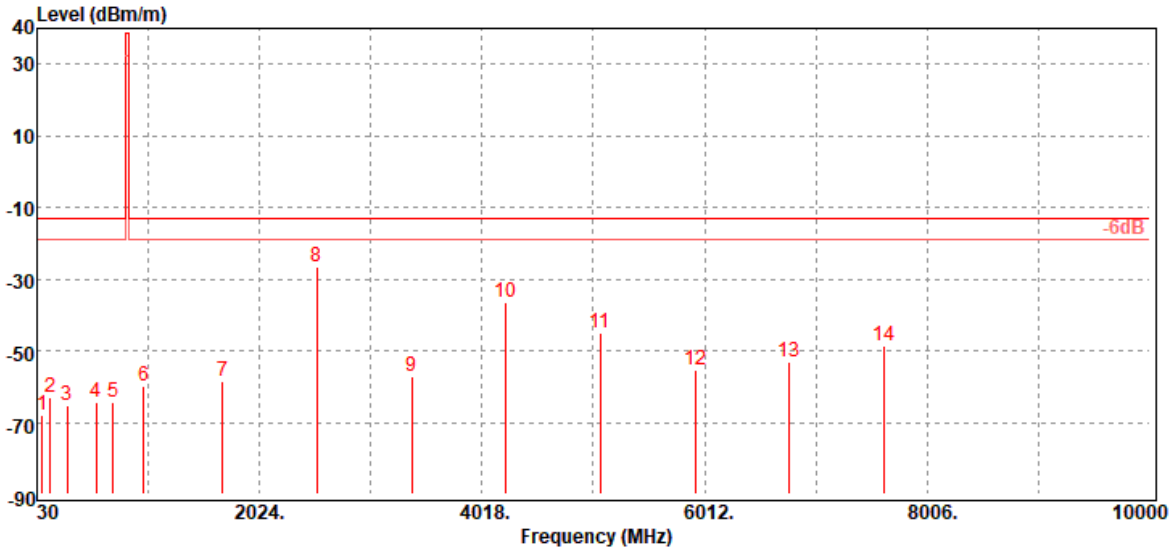


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
91.11	-67.74	-6.91	-0.78	-13.00	-54.74	H
260.86	-66.14	-1.90	-1.33	-13.00	-53.14	H
299.66	-61.62	-2.01	-1.43	-13.00	-48.62	H
382.11	-68.71	-1.46	-1.62	-13.00	-55.71	H
594.54	-66.38	-0.82	-2.06	-13.00	-53.38	H
978.66	-62.03	-1.33	-2.65	-13.00	-49.03	H
1673.20	-58.47	9.84	-3.58	-13.00	-45.47	H
2509.80	-32.77	10.80	-4.59	-13.00	-19.77	H
3346.40	-57.88	12.88	-5.44	-13.00	-44.88	H
4183.00	-36.43	12.90	-6.07	-13.00	-23.43	H
5019.60	-48.93	12.46	-6.57	-13.00	-35.93	H
5856.20	-53.42	13.09	-7.26	-13.00	-40.42	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 850 / High CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Ver.

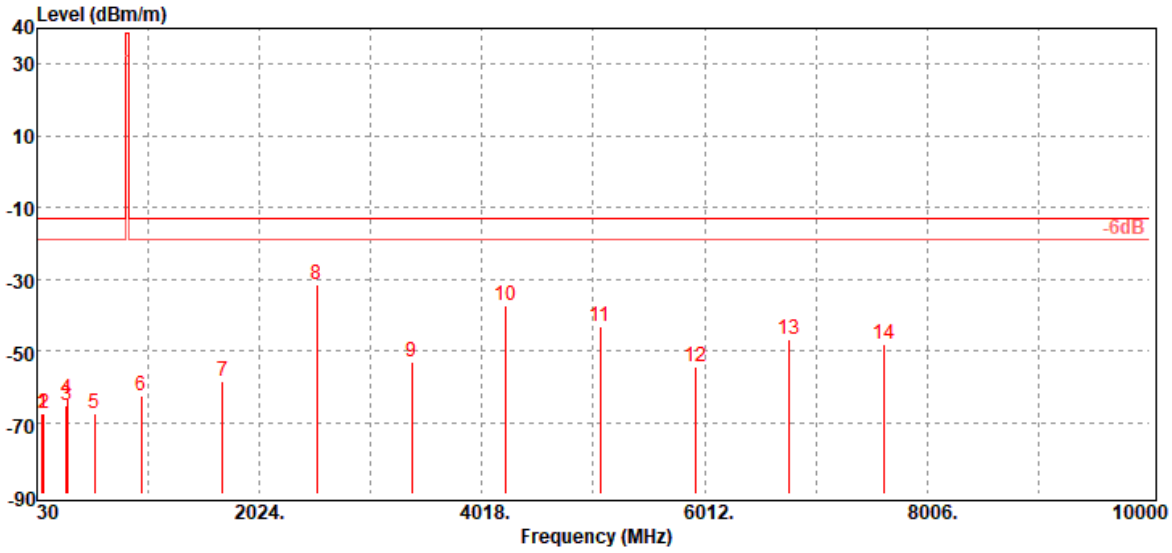


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
73.65	-68.18	-9.10	-0.70	-13.00	-55.18	V
149.31	-63.09	-7.17	-1.00	-13.00	-50.09	V
303.54	-65.36	-1.93	-1.44	-13.00	-52.36	V
556.71	-64.18	-1.33	-1.96	-13.00	-51.18	V
713.85	-64.51	-1.40	-2.25	-13.00	-51.51	V
985.45	-59.75	-1.40	-2.66	-13.00	-46.75	V
1693.20	-58.41	9.96	-3.60	-13.00	-45.41	V
2539.80	-26.65	10.80	-4.62	-13.00	-13.65	V
3386.40	-57.09	12.83	-5.47	-13.00	-44.09	V
4233.00	-36.43	12.83	-6.11	-13.00	-23.43	V
5079.60	-45.09	12.52	-6.63	-13.00	-32.09	V
5926.20	-55.39	12.95	-7.30	-13.00	-42.39	V

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 850 / High CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Hor.



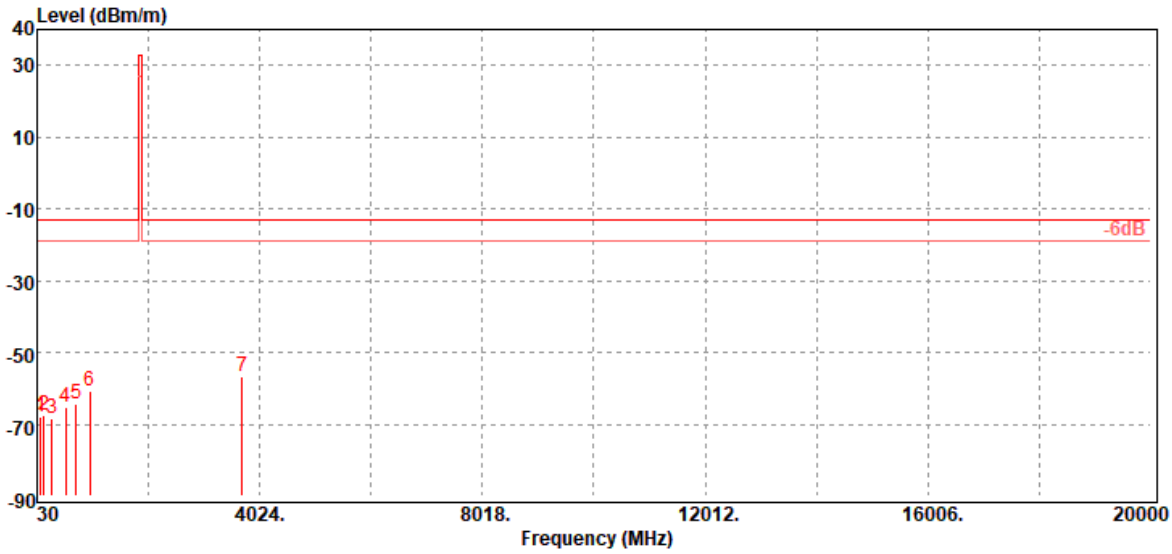
Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
73.65	-67.47	-9.10	-0.70	-13.00	-54.47	H
93.05	-67.61	-7.20	-0.79	-13.00	-54.61	H
294.81	-65.39	-2.10	-1.42	-13.00	-52.39	H
303.54	-63.38	-1.93	-1.44	-13.00	-50.38	H
544.10	-67.41	-1.22	-1.94	-13.00	-54.41	H
963.14	-62.38	-1.30	-2.63	-13.00	-49.38	H
1693.20	-58.55	9.96	-3.60	-13.00	-45.55	H
2539.80	-31.50	10.80	-4.62	-13.00	-18.50	H
3386.40	-53.16	12.83	-5.47	-13.00	-40.16	H
4233.00	-37.20	12.83	-6.11	-13.00	-24.20	H
5079.60	-43.07	12.52	-6.63	-13.00	-30.07	H
5926.20	-54.37	12.95	-7.30	-13.00	-41.37	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Radiated Spurious Emission Measurement Result

Operation Mode:	GPRS 1900 / Low CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Ver.

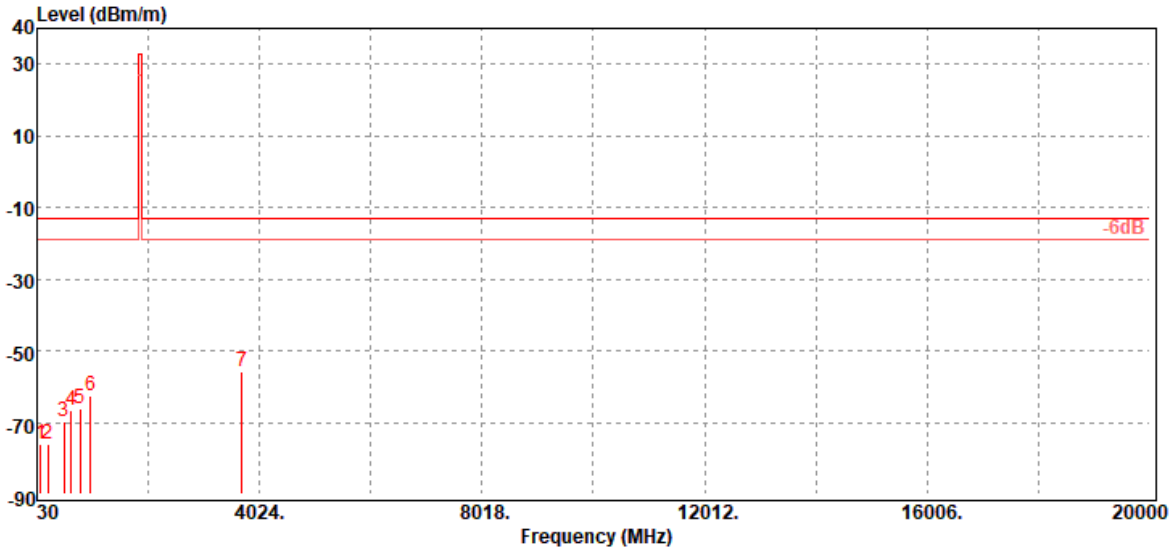


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
95.96	-67.95	-7.40	-0.80	-13.00	-54.95	V
150.28	-67.35	-7.10	-1.01	-13.00	-54.35	V
299.66	-68.30	-2.01	-1.43	-13.00	-55.30	V
544.10	-65.39	-1.22	-1.94	-13.00	-52.39	V
735.19	-64.42	-1.30	-2.29	-13.00	-51.42	V
975.75	-60.67	-1.38	-2.64	-13.00	-47.67	V
3700.40	-56.67	12.50	-5.71	-13.00	-43.67	V

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 1900 / Low CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Hor.

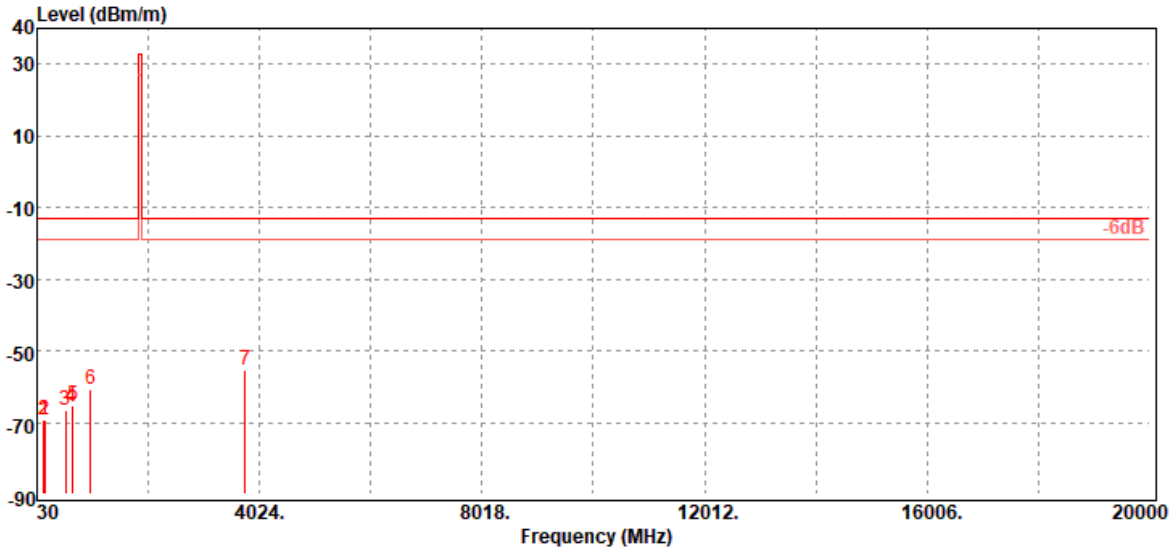


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
94.99	-76.14	-7.30	-0.80	-13.00	-63.14	H
224.00	-76.12	-1.92	-1.23	-13.00	-63.12	H
507.24	-69.61	-1.81	-1.89	-13.00	-56.61	H
644.01	-66.51	-1.62	-2.14	-13.00	-53.51	H
803.09	-66.26	-1.36	-2.38	-13.00	-53.26	H
987.39	-62.48	-1.40	-2.66	-13.00	-49.48	H
3700.40	-55.96	12.50	-5.71	-13.00	-42.96	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 1900 / Mid CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Ver.

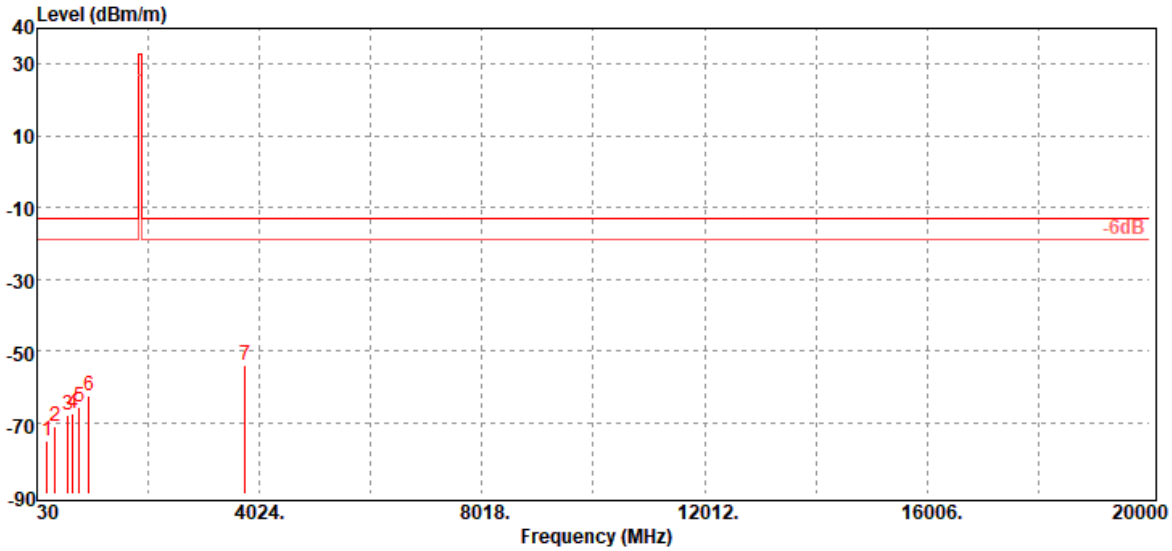


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
153.19	-69.20	-6.72	-1.02	-13.00	-56.20	V
163.86	-69.19	-5.91	-1.05	-13.00	-56.19	V
541.19	-66.52	-1.28	-1.94	-13.00	-53.52	V
660.50	-65.50	-1.41	-2.17	-13.00	-52.50	V
676.99	-65.41	-1.30	-2.19	-13.00	-52.41	V
993.21	-60.87	-1.40	-2.67	-13.00	-47.87	V
3760.00	-55.16	12.42	-5.76	-13.00	-42.16	V

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 1900 / Mid CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Hor.

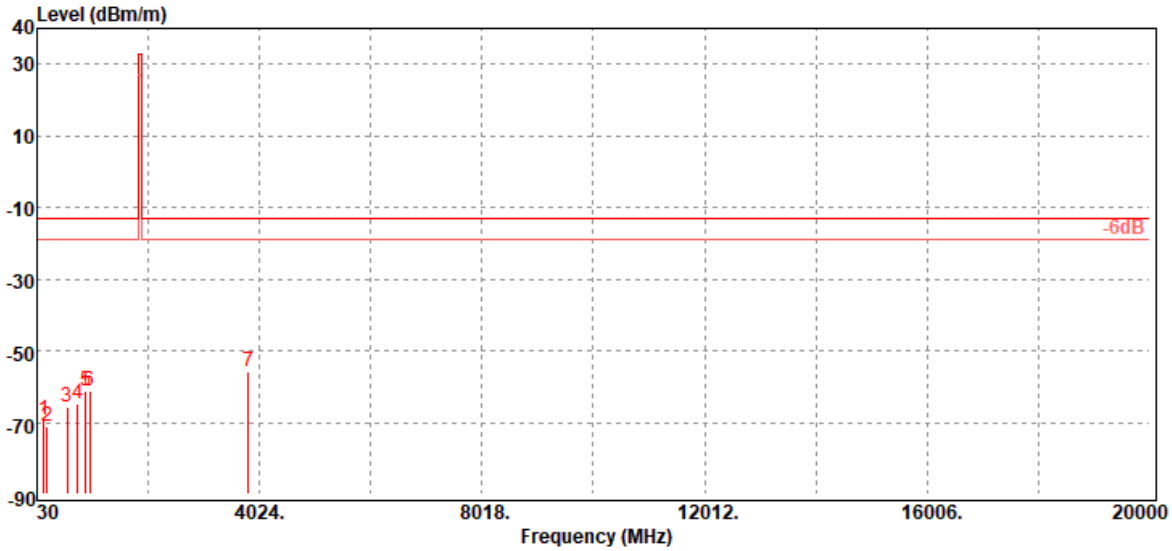


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
209.45	-75.17	-2.18	-1.19	-13.00	-62.17	H
356.89	-71.18	-1.55	-1.56	-13.00	-58.18	H
582.90	-67.81	-1.28	-2.03	-13.00	-54.81	H
675.05	-67.30	-1.30	-2.19	-13.00	-54.30	H
786.60	-65.74	-1.30	-2.35	-13.00	-52.74	H
956.35	-62.69	-1.23	-2.62	-13.00	-49.69	H
3760.00	-53.87	12.42	-5.76	-13.00	-40.87	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 1900 / High CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Ver.

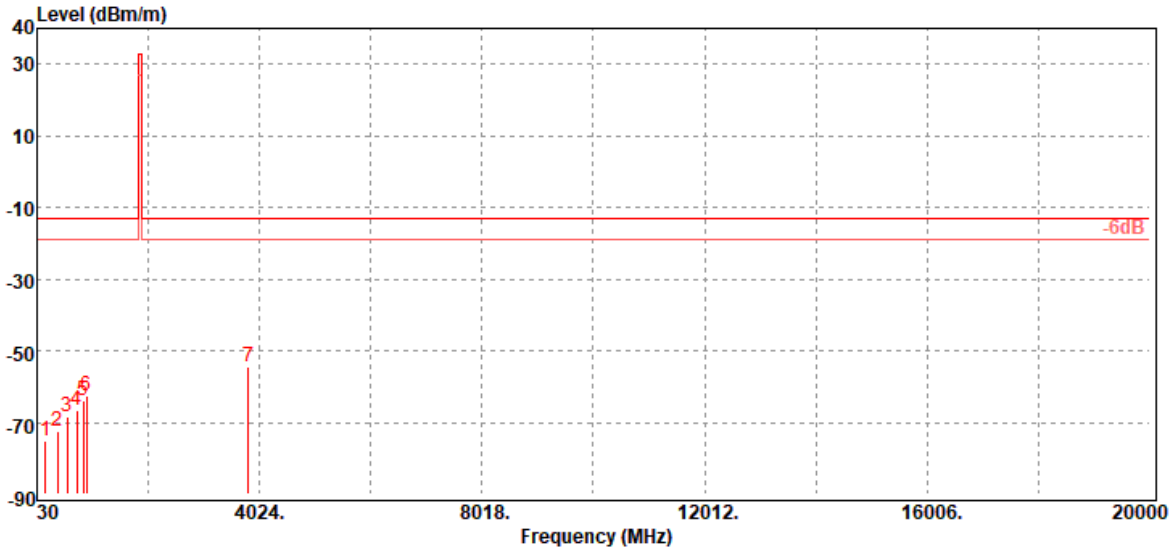


Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
151.25	-69.12	-7.05	-1.01	-13.00	-56.12	V
209.45	-70.96	-2.18	-1.19	-13.00	-57.96	V
573.20	-65.74	-1.40	-2.01	-13.00	-52.74	V
757.50	-64.74	-1.40	-2.32	-13.00	-51.74	V
907.85	-61.16	-1.36	-2.56	-13.00	-48.16	V
975.75	-61.00	-1.38	-2.64	-13.00	-48.00	V
3819.60	-55.68	12.46	-5.81	-13.00	-42.68	V

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	GPRS 1900 / High CH	**Test Date:**	October 29, 2019
Temperature:	25.4℃	**Tested by:**	Dally Hong
Humidity:	45 % RH	**Polarity:**	Hor.



Frequency (MHz)	ERP/EIRP. (dBm)	Ant.Gain (dBi)	Cable Loss (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
178.41	-75.02	-4.56	-1.10	-13.00	-62.02	H
391.81	-72.45	-1.47	-1.64	-13.00	-59.45	H
573.20	-68.40	-1.40	-2.01	-13.00	-55.40	H
742.95	-66.71	-1.36	-2.30	-13.00	-53.71	H
861.29	-64.11	-1.30	-2.47	-13.00	-51.11	H
925.31	-62.73	-1.30	-2.58	-13.00	-49.73	H
3819.60	-54.64	12.46	-5.81	-13.00	-41.64	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

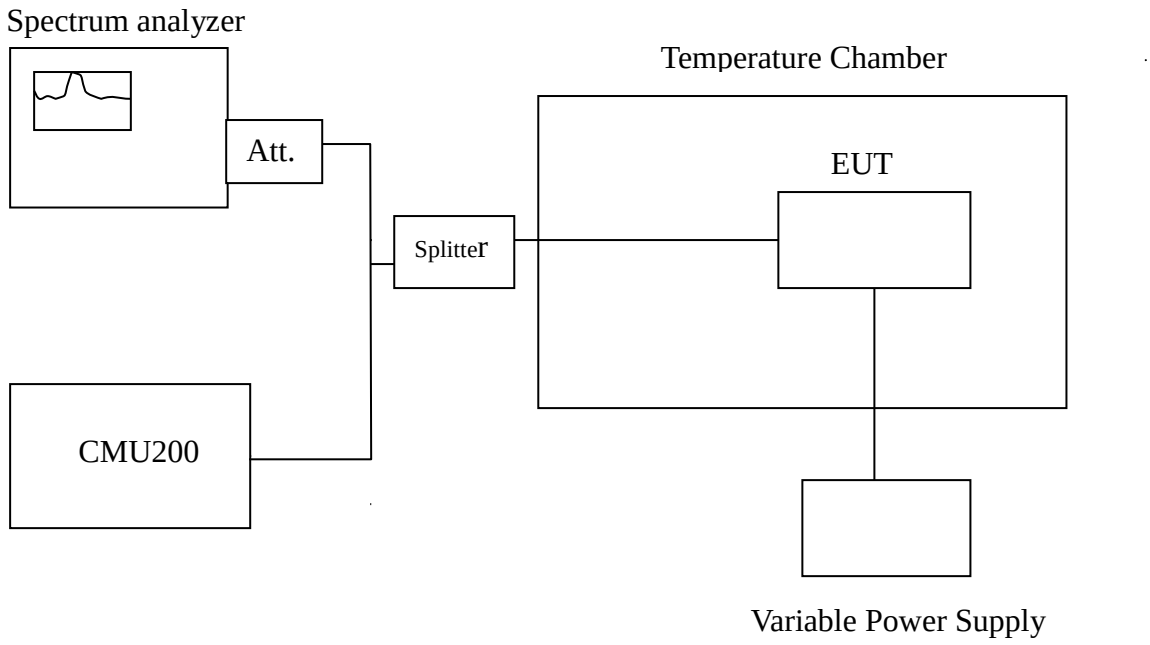
8.5 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

LIMIT

According to FCC §2.1055, FCC §22.355, .FCC §24.235.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Configuration



Remark: *Measurement setup for testing on Antenna connector*

TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

TEST RESULTS

No non-compliance noted.

Reference Frequency: GPRS Mid Channel 836.6 MHz @ 20°C		
Limit: 824.2 ~ 848.8 MHz		
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)
5	45	6
	40	3
	30	0
	20	1
	10	-1
	0	2

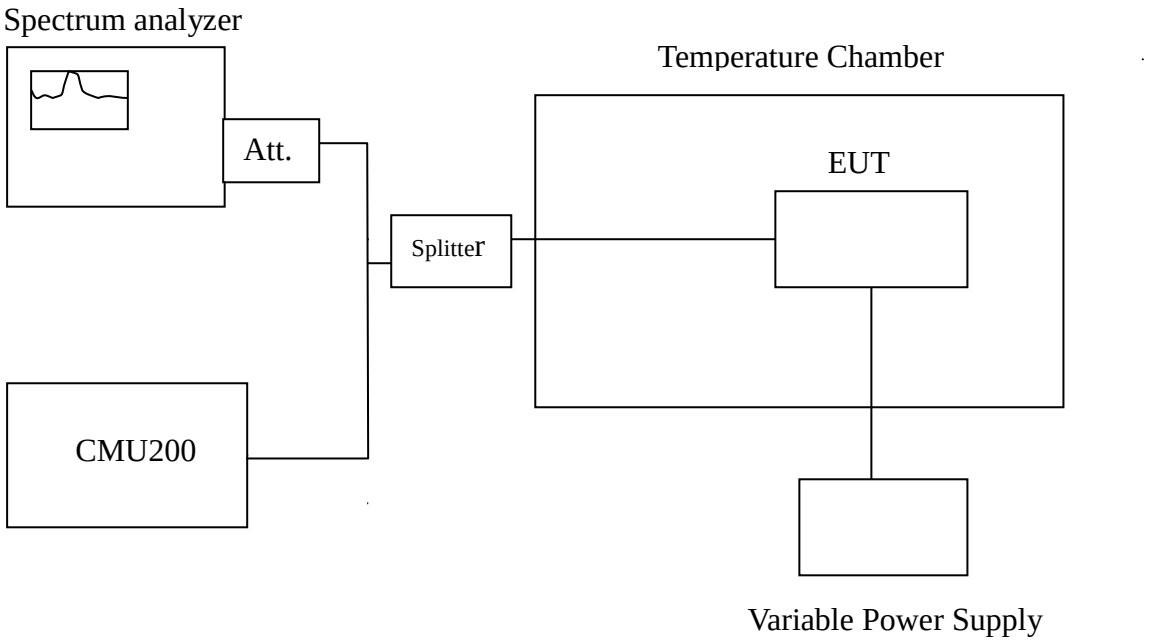
Reference Frequency: GPRS Mid Channel 1880 MHz @ 20°C		
Limit: 1850.2 ~ 1909.8 MHz		
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)
5	50	9
	40	7
	30	3
	20	4
	10	2
	0	7

8.6 FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT

LIMIT

According to FCC §2.1055, FCC §22.355, FCC §24.235,

Test Configuration



Remark: *Measurement setup for testing on Antenna connector.*

TEST PROCEDURE

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (± 15%) and endpoint, record the maximum frequency change.

TEST RESULTS

No non-compliance noted.

Reference Frequency: GPRS Mid Channel 836.6 MHz @ 20°C		
Limit: 824.2 ~ 848.8 MHz		
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)
4.25	20	4
5		3
5.75		2

Reference Frequency: GPRS Mid Channel 1880 MHz @ 20°C		
Limit: 1850.2 ~ 1909.8 MHz		
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)
4.25	20	3
5		1
5.75		4

Note: This sample supports USB 5V and battery, the USB 5V is the worst case.

8.7 PEAK TO AVERAGE RATIO

LIMIT

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.

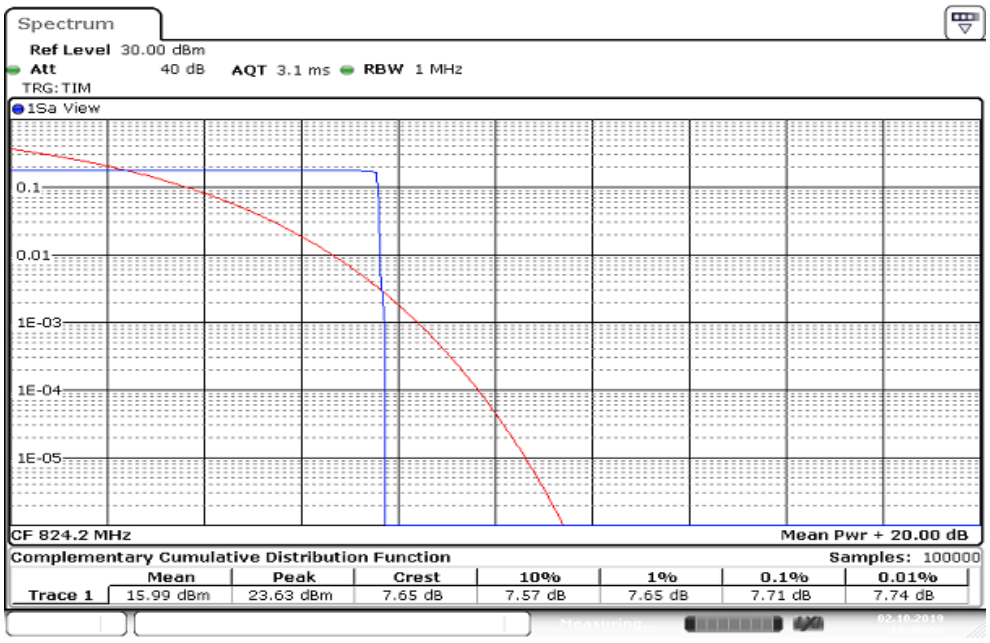
TEST PROCEDURES

1. Set resolution/measurement bandwidth ≥ 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 DATA

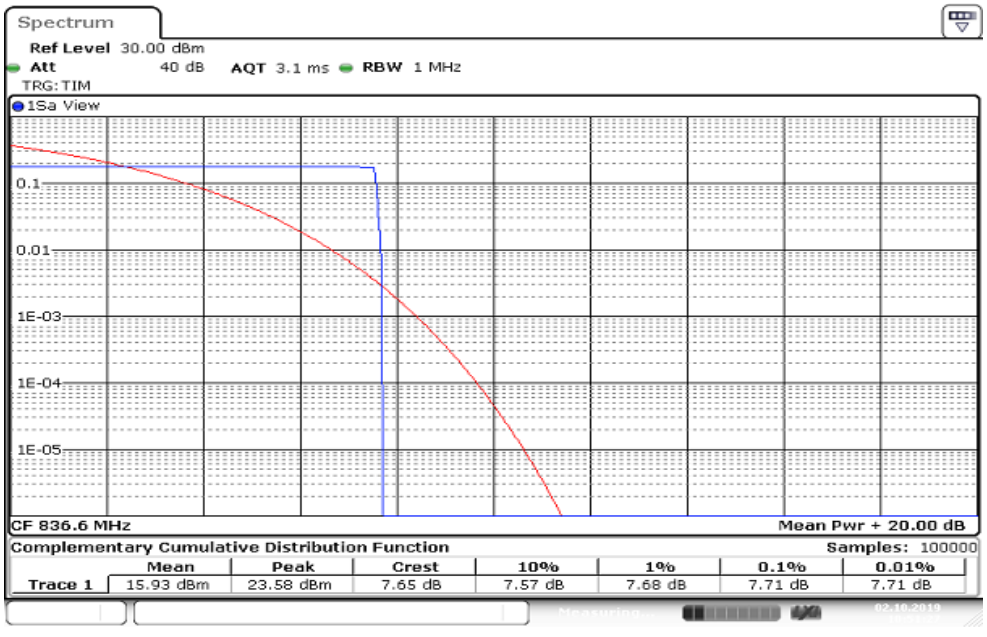
GPRS 850

Low CH



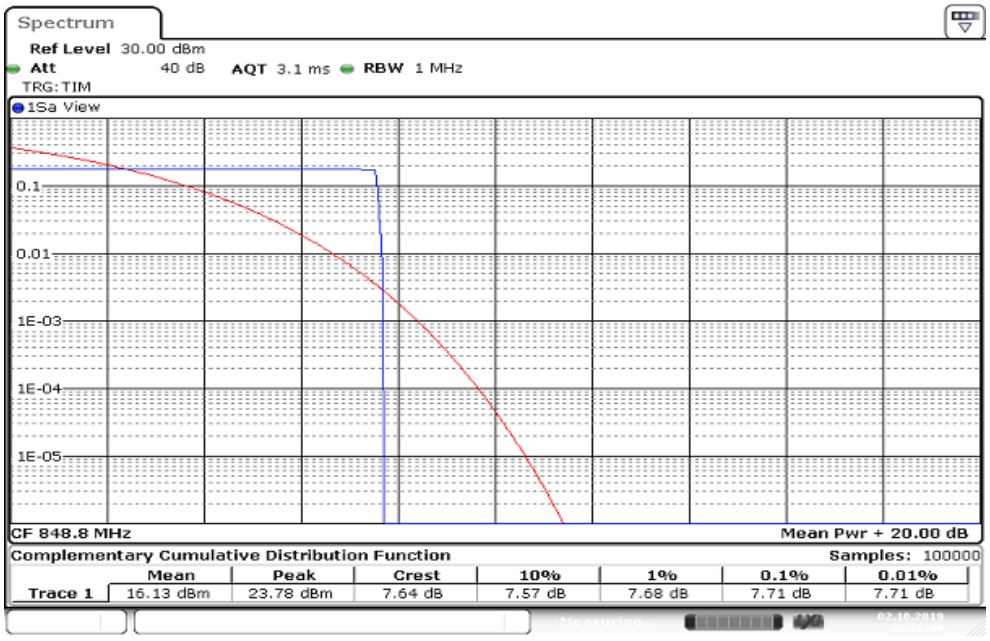
Date: 2.OCT.2019 10:46:50

Mid CH



Date: 2.OCT.2019 10:51:27

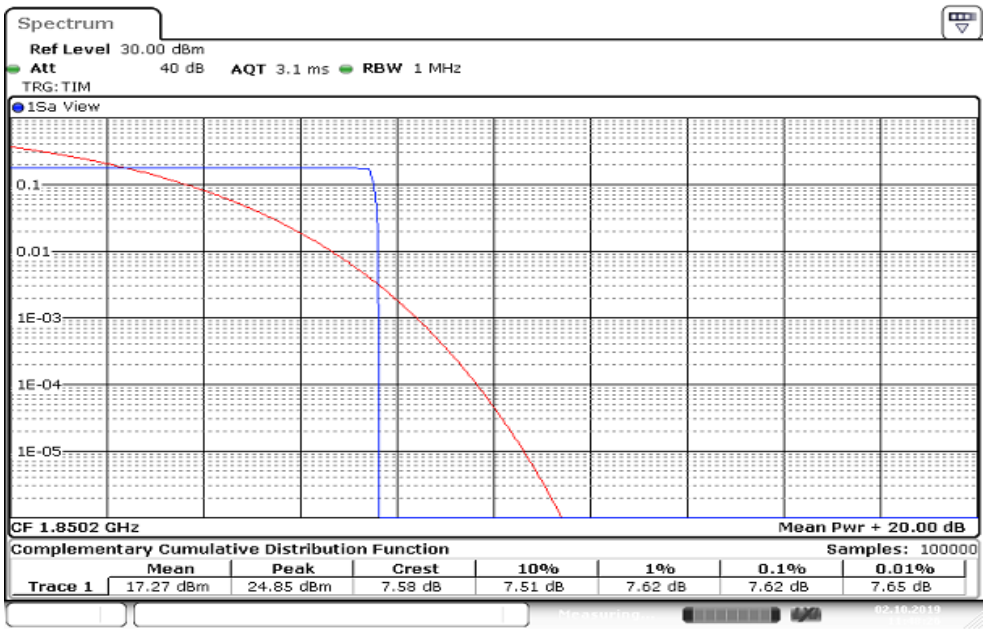
High CH



Date: 2.OCT.2019 10:52:49

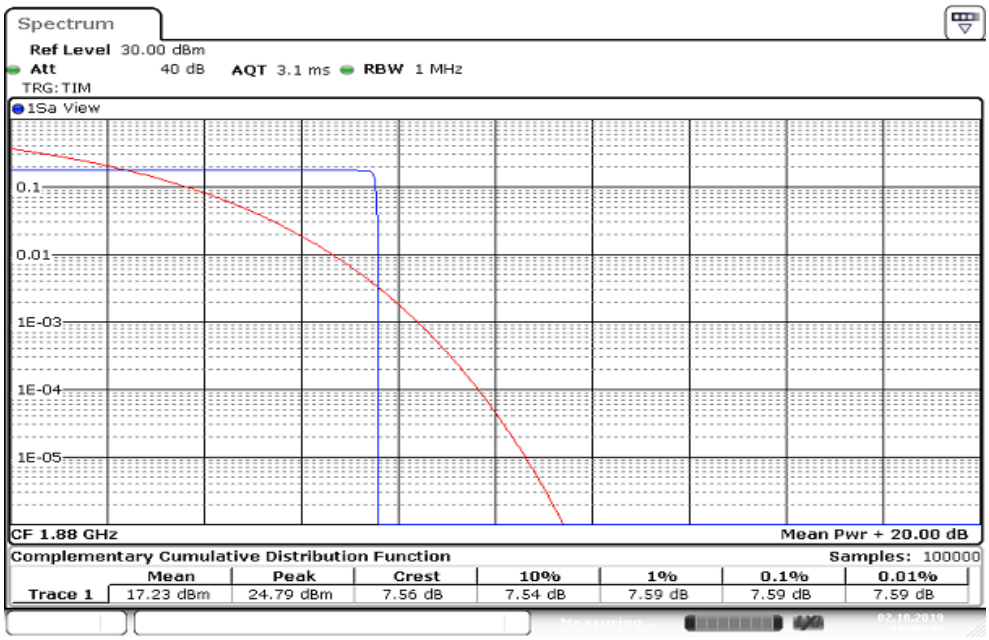
GPRS 1900

Low CH



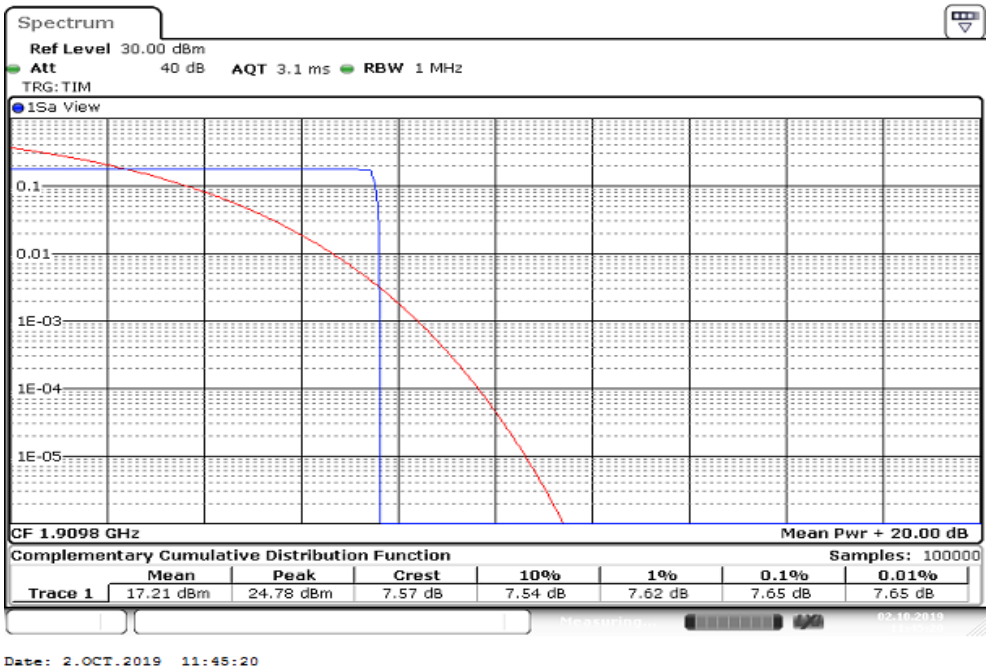
Date: 2.OCT.2019 11:48:26

Mid CH



Date: 2.OCT.2019 11:46:30

High CH



-- End of Test Report --