FCC Part 22H&24E Test Report

Product Name	:	Module
Trade Name	:	AirPrime
Model No.	:	HL7802
FCC ID	:	N7NHL7802
IC ID	:	2417C-HL7802

Applicant	:	Sierra Wireless, Inc.
Address	:	13811 Wireless Way, Richmond, BC, Canada V6V 3A4 Canada

Date of Receipt	:	Dec. 20, 2019
Issued Date	:	Feb. 24, 2020
Report No.	:	19C0344R-HPUSP28V00
Report Version	:	V1.0

Test Report Certification

Issued Date : Feb. 24, 2020
Report No. : 19C0344R-HPUSP28V00

Product Name	:	Module
Applicant	:	Sierra Wireless, Inc.
Address	:	13811 Wireless Way, Richmond, BC, Canada V6V 3A4 Canada
Manufacturer	:	Sierra Wireless, Inc.
Address	:	13811 Wireless Way, Richmond, BC, Canada V6V 3A4 Canada
Model No.	:	HL7802
FCC ID	:	N7NHL7802
IC ID	:	2417C-HL7802
EUT Voltage	:	DC 3.7V
Testing Voltage	:	DC 3.7V
Trade name	:	AirPrime
Applicable Standard	:	FCC CFR Title 47 Part 2, ANSI/TIA-603-D FCC Part 22 Subpart H, FCC Part 24 Subpart E Industry Canada RSS-132, Issue 3 Industry Canada RSS-133, Issue 6 RSS Gen Issue 4
Test Lab	:	Hsin Chu Laboratory
Address	:	No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan, R.O.C. TEL: +886-3-582-8001 / FAX: +886-3-582-8958
Test Result	:	Complied

Documented By : Fonbo Fang

(Fonbo Fang / Engineering Adm. Specialist)

Tested By : Clemens Fang

(Clemens Fang / Senior Engineer)

Approved By : Louis Hsu

(Louis Hsu / Deputy Manager)

Revision History

Report No.	Version	Description	Issued Date
19C0344R-HPUSP28V00	V1.0	Initial issue of report	Feb. 24, 2020

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1. General Information

1.1. EUT Description

Product Name	Module
Trade Name	AirPrime
Model No.	HL7802
Tx Frequency Range/ Channel number	GSM 850: 824.2-848.8 MHz PCS 1900: 1850.2-1909.8 MHz
Rx Frequency Range/ Channel number	GSM 850: 869.2-893.8 MHz PCS 1900: 1930.2-1989.8 MHz
Type of Modulation	GPRS
HW Version	1.0
FW Version	4.3.6.0
IMEI No.	359459090002929

Accessories Information	
Antenna Type	3 Pcs (2pcs for GSM, LTE / 1 pc for GPS)

Antenna Information	
MFR. / Model	Pulse / SPDA24700/2700
Antenna Type	Dipole Antenna
Antenna Gain	2dBi

Note:

1. This HL7802 support Cat-M1/ NB-IoT-LTE Band 2/4/5/12/13/25/26/66.& GPS & 2G functions.
2. Regarding frequency band operation, the lowest, middle and highest frequency of channel were selected to perform the test, and the details were shown on this report.
3. The EUT description is from the customer declaration.

1.2. Mode of Operation

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: GSM 850
Mode 2: PCS1900

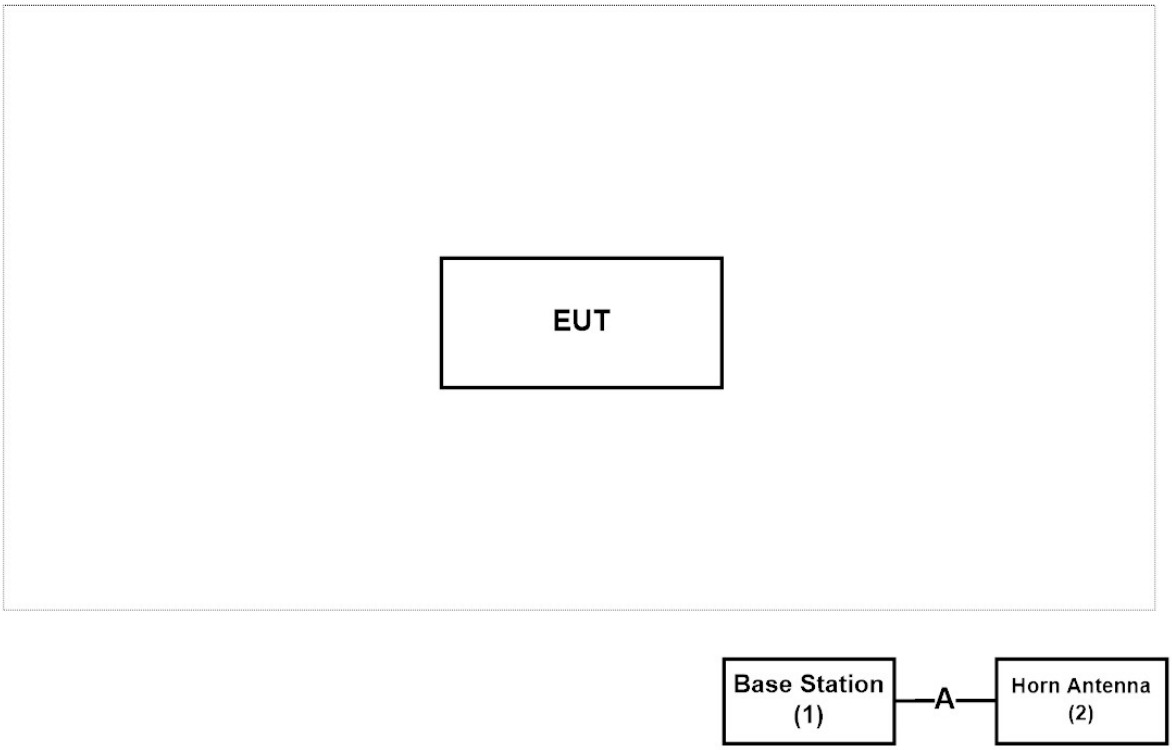
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1	Base Station	R&S	CMW500	106071	DoC	Non-Shielded, 2m.
2	Horn Antenna	scnwahzbeck	BBHA 9120D	1640	DoC	--

1.4. Configuration of Tested System

Connection Diagram



Signal Cable Type		Signal cable Description
A	RF Cable	Shielded, 6m

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on on 1.4.
2	Turn on the power of all equipment.
3	The EUT will continue receive the signal from GSM function.
4	Repeat the above procedure.

2. Technical Test

2.1. Summary of Test Result

☒ No deviations from the test standards

☐ Deviations from the test standards as below description:

For GSM 850

(FCC Part 22 Subpart H, Industry Canada RSS-132, Issue 3, Industry Canada RSS-GEN)

Performed Item	FCC Rule	IC Rule	Limit	Result
Maximum Output Power	§2.1033 §2.1046 §22.913	§5.4	< 7 Watts	Pass
Modulation characteristic	§2.1047	§5.2	N/A	Pass
Occupied Bandwidth	§2.1049	RSS-GEN §4.2	N/A	Pass
Peak To Average Ratio	§22.913(d)	§5.4	≦ 13dB	Pass
Conducted Band Edge	§22.917	§5.5	< -13dBm	Pass
Spurious Emission	§2.1053 §22.917	§5.5	< -13dBm	Pass
Frequency Stability	§2.1055 §22.335	§5.3	< ±2.5 ppm	Pass

For PCS 1900

(FCC Part 24 Subpart E, Industry Canada RSS-133, Issue 6, Industry Canada RSS-GEN)

Performed Item	FCC Rule	IC Rule	Limit	Result
Maximum Output Power	§2.1033 §2.1046 §24.232	§6.4	< 2 Watts	Pass
Modulation characteristic	§2.1047	§6.2	N/A	Pass
Occupied Bandwidth	§2.1049	RSS-GEN §4.2	N/A	Pass
Peak To Average Ratio	§24.232(d)	§6.4	≦ 13dB	Pass
Conducted Band Edge	§24.238	§6.5	< -13dBm	Pass
Spurious Emission	§2.1053 §24.238	§6.5	< -13dBm	Pass
Frequency Stability	§2.1055 §24.235	§6.3	< ±2.5 ppm	Pass

2.2. Test Environment

Items	Test Item	Required	Test Site
Temperature (°C)	RF Output Power	15-35	3
Humidity (%RH)		25-75	
Temperature (°C)	Occupied Bandwidth	15-35	3
Humidity (%RH)		25-75	
Temperature (°C)	Peak To Average Ratio	15-35	3
Humidity (%RH)		25-75	
Temperature (°C)	Conducted Band Edge	15-35	3
Humidity (%RH)		25-75	
Temperature (°C)	Spurious Emission	15-35	2/3
Humidity (%RH)		25-75	
Temperature (°C)	Frequency Stability	15-35	3
Humidity (%RH)		25-75	

Note: Test site information refers to Laboratory Information.

Laboratory Information

USA	**:**	**FCC Registration Number: TW3024**
Canada	**:**	**IC Registration Number: 22397-1 / 22397-2 / 22397-3**

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw

If you have any comments, please don't hesitate to contact us. Our test sites as below:

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
Address	1. No. 75-2, 3rd Lin, WangYe Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan, R.O.C. 2. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. 3. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.
Phone number	1. +886-3-592-8858 2. +886-3-582-8001 3. +886-3-582-8001
Fax number	1. +886-3-592-8859 2. +886-3-582-8958 3. +886-3-582-8958
E mail address	info.tw@dekra.com
Website	http://www.dekra.com.tw

2.3. List of Test Equipment

RF Output Power / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
High Speed Peak Power Meter Dual Input	Anritsu	ML2496A	1602004	2019/12/02	2020/12/01
Pulse Power Sensor	Anritsu	MA2411B	1531043	2019/12/02	2020/12/01
Pulse Power Sensor	Anritsu	MA2411B	1531044	2019/12/02	2020/12/01
Wideband Radio Communication Tester	R&S	CMW500	106071	2020/02/03	2021/02/02

Occupied Bandwidth / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Keysight	N9030B	MY57140404	2019/06/18	2020/06/17
Spectrum Analyzer	Keysight	N9010B	MY57110159	2019/05/03	2020/05/02
Spectrum Analyzer	Agilent	N9010A	US47140172	2019/06/28	2020/06/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2019/09/11	2020/09/10
Wideband Radio Communication Tester	R&S	CMW500	106071	2020/02/03	2021/02/02

Peak To Average Ratio / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Keysight	N9030B	MY57140404	2019/06/18	2020/06/17
Spectrum Analyzer	Keysight	N9010B	MY57110159	2019/05/03	2020/05/02
Spectrum Analyzer	Agilent	N9010A	US47140172	2019/06/28	2020/06/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2019/09/11	2020/09/10
Wideband Radio Communication Tester	R&S	CMW500	106071	2020/02/03	2021/02/02

Conducted Band Edge / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Keysight	N9030B	MY57140404	2019/06/18	2020/06/17
Spectrum Analyzer	Keysight	N9010B	MY57110159	2019/05/03	2020/05/02
Spectrum Analyzer	Agilent	N9010A	US47140172	2019/06/28	2020/06/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2019/09/11	2020/09/10
Wideband Radio Communication Tester	R&S	CMW500	106071	2020/02/03	2021/02/02

Conducted Spurious Emissions / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Keysight	N9030B	MY57140404	2019/06/18	2020/06/17
Spectrum Analyzer	Keysight	N9010B	MY57110159	2019/05/03	2020/05/02
Spectrum Analyzer	Agilent	N9010A	US47140172	2019/06/28	2020/06/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2019/09/11	2020/09/10
Wideband Radio Communication Tester	R&S	CMW500	106071	2020/02/03	2021/02/02

Radiated Spurious Emissions / CB2-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Analyzer	R&S	FSVA40	101455	2019/10/21	2020/10/20
Signal & Spectrum Analyzer	R&S	FSV40	101049	2019/09/11	2020/09/10
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2019/03/15	2020/03/14
Bilog Antenna	Teseq	CBL6112D	23191	2019/06/17	2020/06/16
Horn Antenna	Schwarzbeck	BBHA 9120D	639	2019/05/28	2020/05/27
Horn Antenna	Schwarzbeck	BBHA 9170	202	2019/12/27	2020/12/26
Pre-Amplifier	DEKRA	AP-025C	12183122	2019/09/24	2020/09/23
Pre-Amplifier	EMCI	EMC11830I	980366	2019/12/03	2020/12/02
Pre-Amplifier	DEKRA	AP-400C	201801231	2019/12/03	2020/12/02
Horn Antenna	Schwarzbeck	BBHA 9120D	01656	2019/10/25	2020/10/24
Band Reject Filter	Micro-Tronics	BRM50702	G192	2019/03/27	2020/03/26
Signal Analyzer	R&S	FSV40	101435	2019/07/08	2020/070/7
Coaxial Cable(16m)	Huber+Suhner	SF104	CB2-H	2019/07/25	2020/07/24
EMI system	DEKRA	Version 1.0	CB2-H	NA	NA
Wideband Radio Communication Tester	R&S	CMW500	106071	2020/02/03	2021/02/02

Frequency Stability / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Keysight	N9030B	MY57140404	2019/06/18	2020/06/17
Spectrum Analyzer	Keysight	N9010B	MY57110159	2019/05/03	2020/05/02
Spectrum Analyzer	Agilent	N9010A	US47140172	2019/06/28	2020/06/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2019/09/11	2020/09/10
Wideband Radio Communication Tester	R&S	CMW500	106071	2020/02/03	2021/02/02

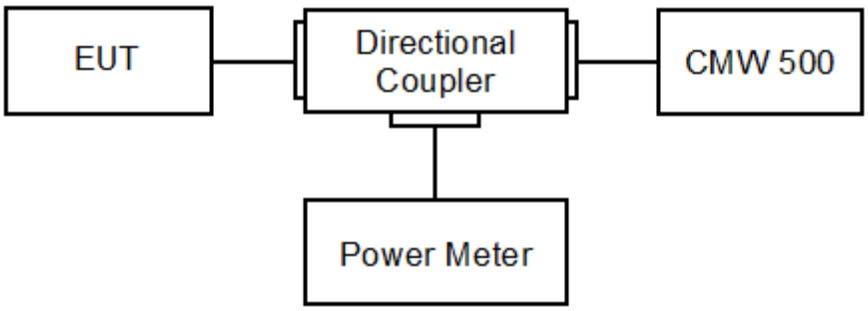
Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.4. Uncertainty

Test Item	Uncertainty
RF Output Power	± 1.27 dB
Occupied Bandwidth	± 10 Hz
Peak To Average Ratio	In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13dB.
Conducted Band Edge	± 1.2 dB
Spurious Emissions	The measurement uncertainty is defined as ± 1.27 dB for Conducted Measurement. The measurement uncertainty is defined as ± 3.2 dB for Radiated Measurement.
Frequency Stability	± 10 Hz

3. RF Output Power

3.1. Test Setup



3.2. Test Procedure

a. The RF output of the transmitter was connected to base station simulator.
b. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
c. Set EUT at maximum average power by base station simulator.
d. Measure lowest, middle, and highest channels for each bandwidth and different modulation.

Effective Isotropic Radiated Power = Conducted Power(dBm) + Antenna Gain(dBi)
Effective Radiated Power = Conducted Power(dBm) + Antenna Gain(dBi) - 2.15dB

3.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 5.2.4
ANSI C63.26-2015 Sub-clause 5.2.4.2

3.4. Test Result

Product	Module		
Test Item	RF Output Power		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/04	Test Site	SR12-H
Temperature (°C)	19.0	Humidity (%RH)	46.0

GSM 850_GPRS

Frequency (MHz)	Average Power		Limit (dBm)
	Reading Level (dBm)	Measure Level (dBm)	
824.2	31.85	31.70	38.45
836.6	31.73	31.58	38.45
848.8	31.62	31.47	38.45

Note: Measure Level (ERP) = Reading Level (Conducted Output Power) + Antenna Gain -2.15

Product	Module		
Test Item	RF Output Power		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/04	Test Site	SR12-H
Temperature (°C)	19.0	Humidity (%RH)	46.0

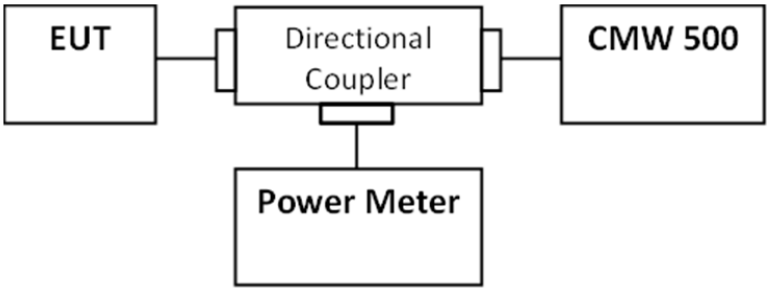
PCS 1900_GPRS

Frequency (MHz)	Average Power		Limit (dBm)
	Reading Level (dBm)	Measure Level (dBm)	
1850.2	29.73	31.73	36.99
1880	29.54	31.43	36.99
1909.8	29.43	31.43	36.99

Note: Measure Level (EIRP) = Reading Level (Conducted Output Power) + Antenna Gain

4. Occupied Bandwidth

4.1. Test Setup



4.2. Test Procedure

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 26 dB bandwidth and 99% occupied bandwidth of the low & middle & high channel for the highest RF powers were measured.

4.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 4.2 & 4.3
ANSI C63.26-2015 Sub-clause 5.4.3 & 5.4.4

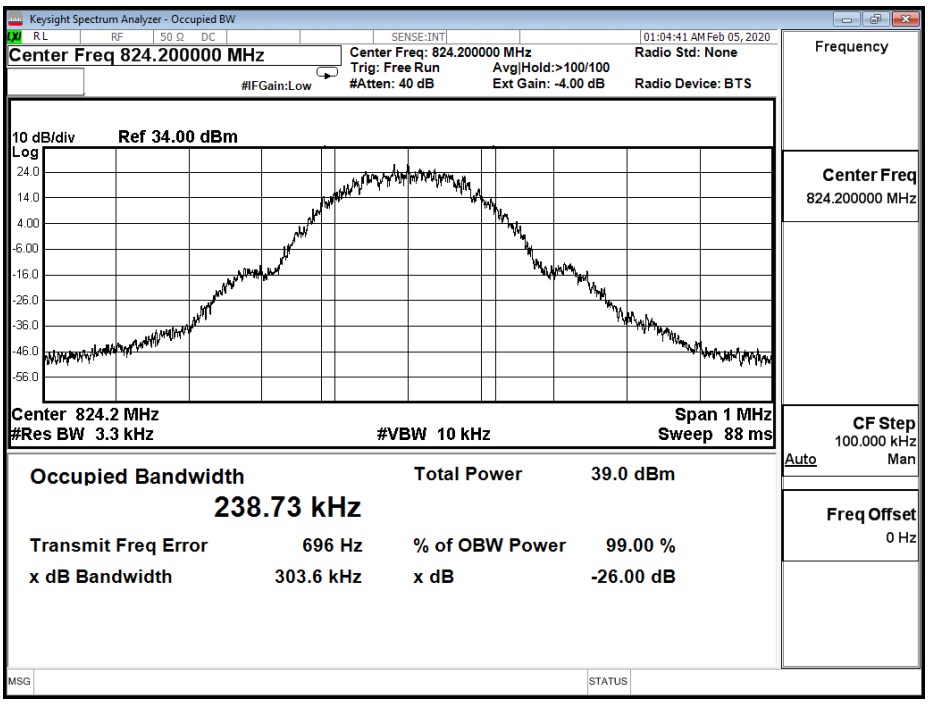
4.4. Test Result

Product	Module		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/05	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	48.0

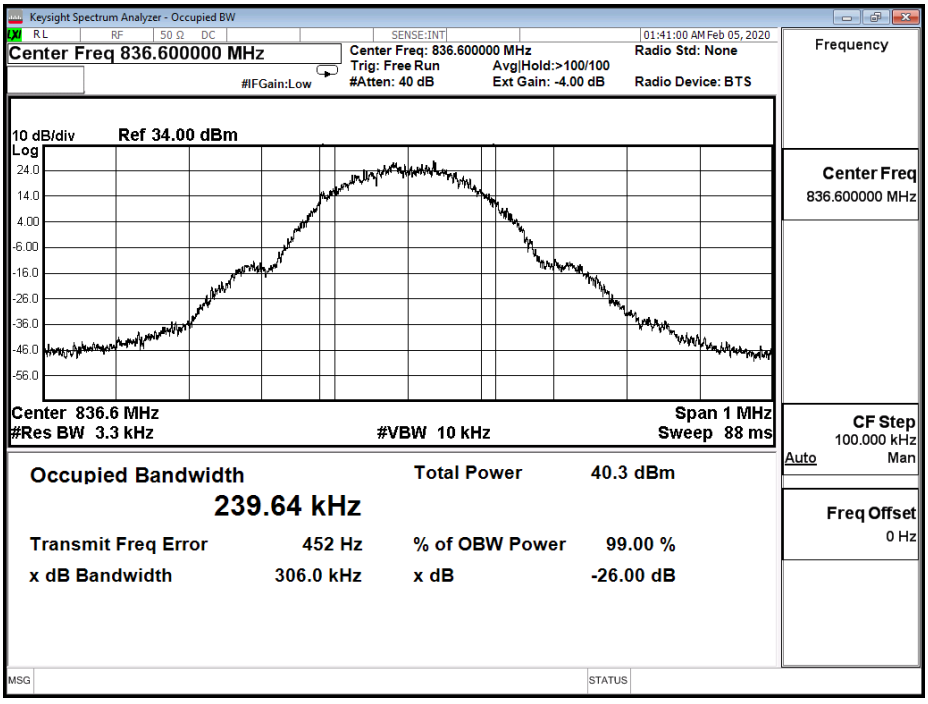
GSM 850_GPRS

Channel No.	MHz	Mode	Occupied Bandwidth Measure Level (kHz)		Limit (MHz)
			99% BW	26dB BW	
128	824.2	GPRS	238.73	303.6	NA
190	836.6	GPRS	239.64	306.0	NA
251	848.8	GPRS	237.95	305.1	NA

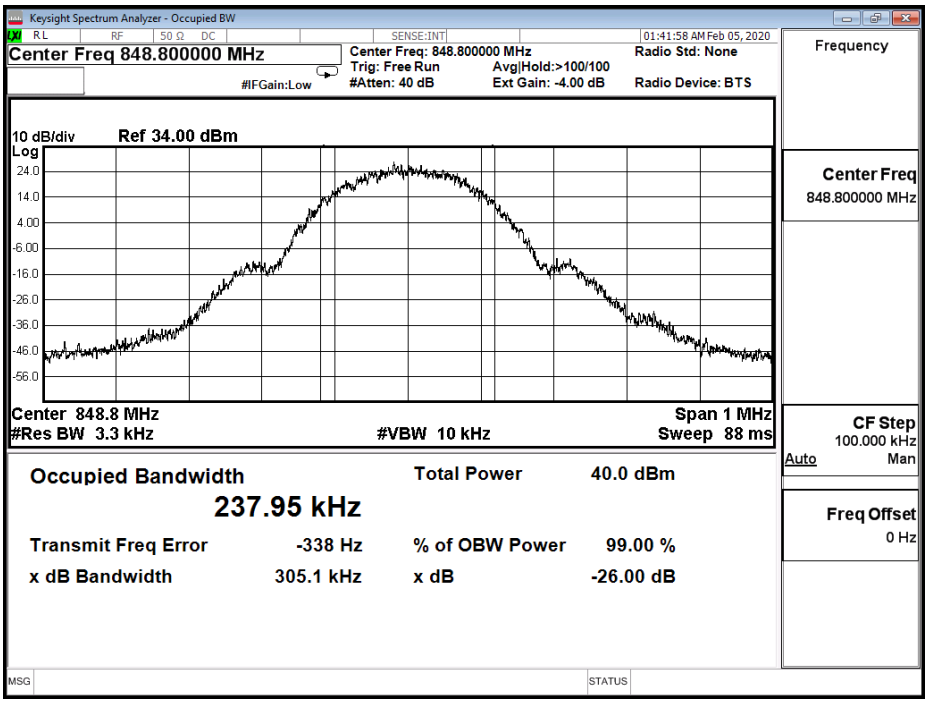
GSM_850_GPRS_824.2



GSM_850_GPRS_836.6



GSM_850_GPRS_848.8

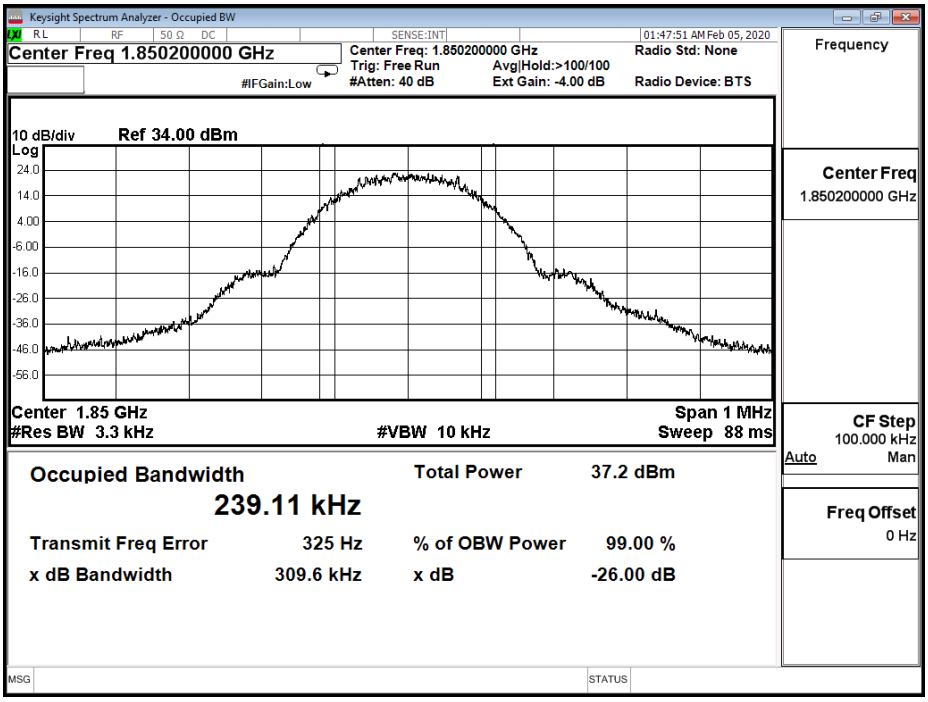


Product	Module		
Test Item	Occupied Bandwidth		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/05	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	48.0

PCS 1900_GPRS

Channel No.	MHz	Mode	Occupied Bandwidth Measure Level (kHz)		Limit (MHz)
			99% BW	26dB BW	
512	1850.2	GPRS	239.11	309.6	NA
661	1880	GPRS	239.14	311.9	NA
810	1909.8	GPRS	237.16	308.0	NA

GSM_1900_GPRS_1850.2



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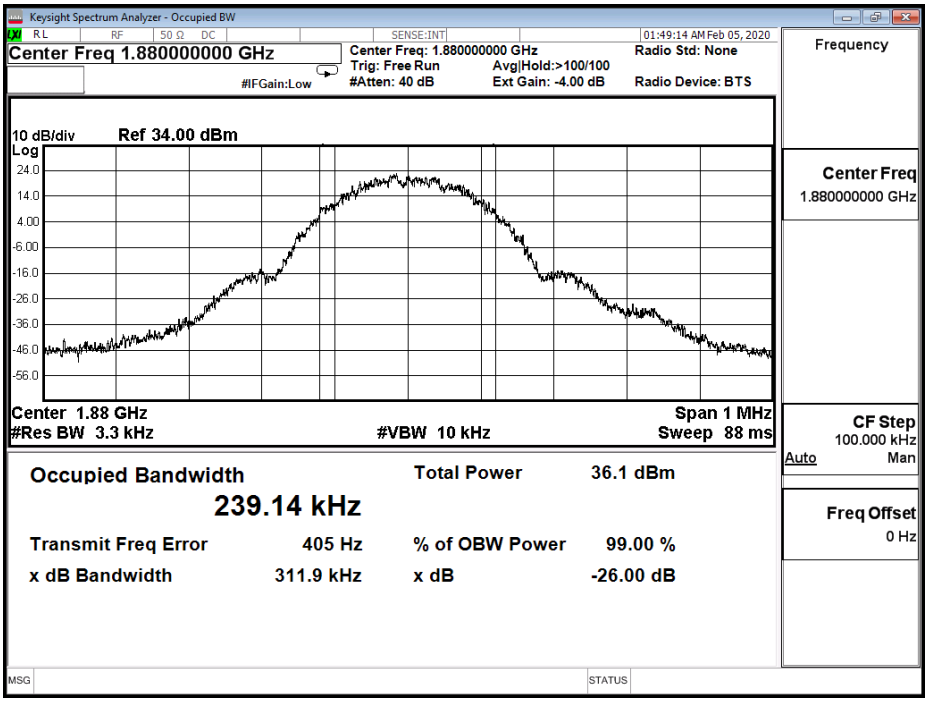
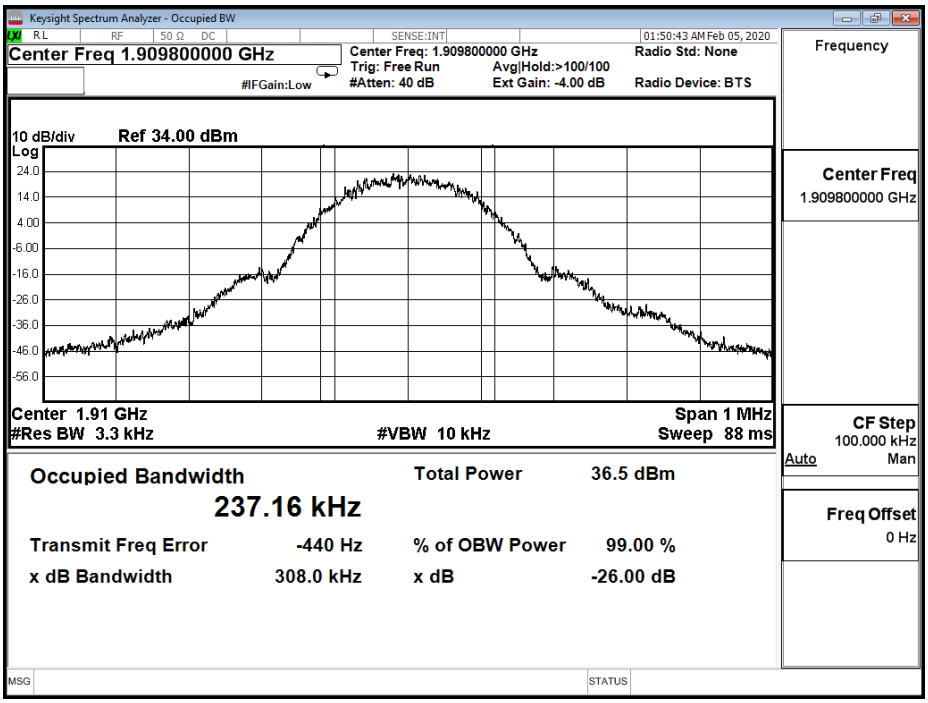
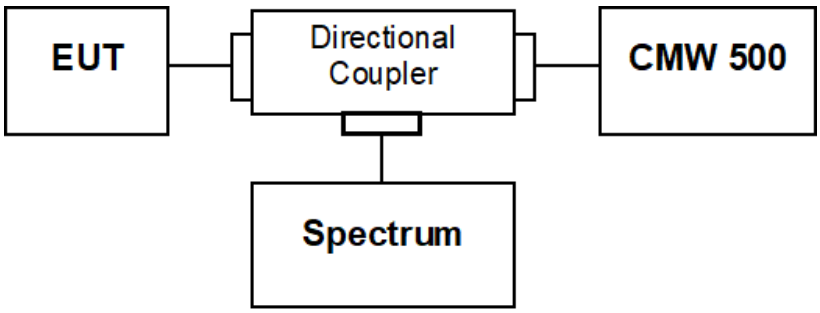


GSM_1900_GPRS_1909.8



5. Peak To Average Ratio

5.1. Test Setup



5.2. Test Procedure

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 %.

5.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 5.7.2

ANSI C63.26-2015 Sub-clause 5.2.3.4

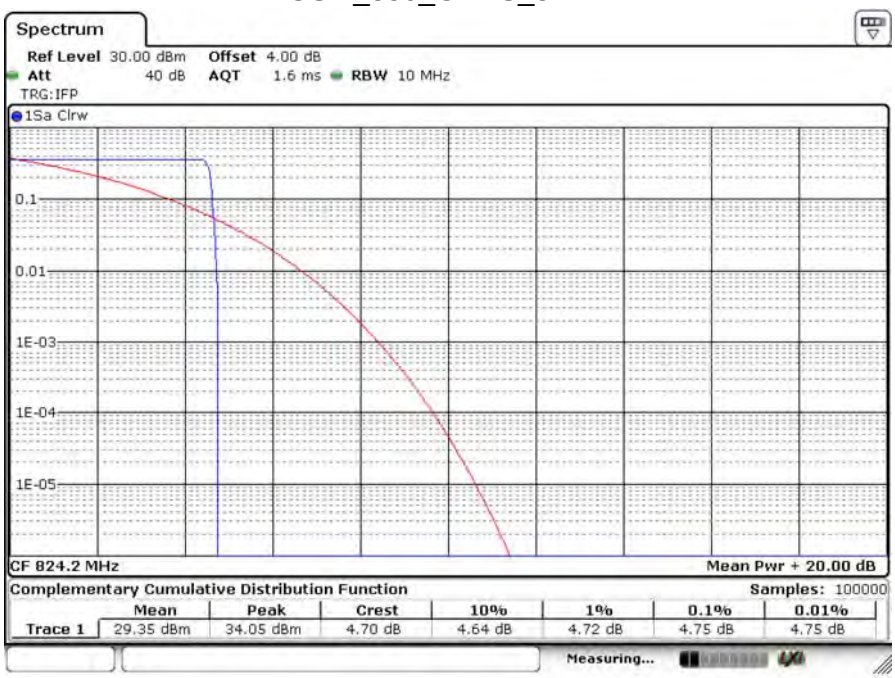
5.4. Test Result

Product	Module		
Test Item	Peak To Average Ratio		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/04	Test Site	SR12-H
Temperature (°C)	19.0	Humidity (%RH)	66.0

GSM 850_GPRS

Channel No.	Frequency (MHz)	Modulation	Peak (dBm)	Average (dBm)	PAPR (dB)
128	824.2	GPRS	34.05	29.35	4.75
190	836.6	GPRS	34.01	29.30	4.75
251	848.8	GPRS	33.91	29.21	4.78

GSM_850_GPRS_824.2



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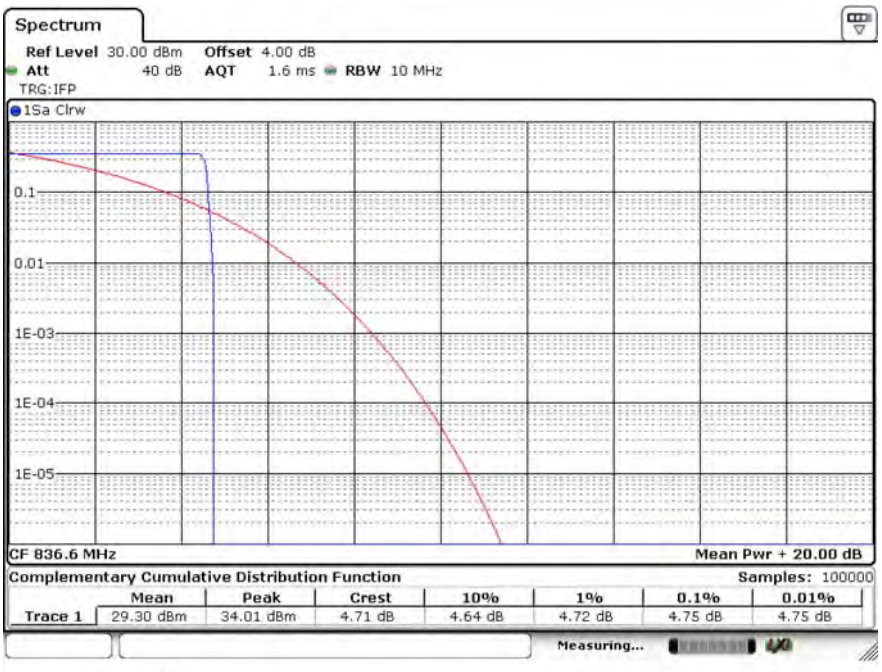
GSM_850_GPRS_836.6



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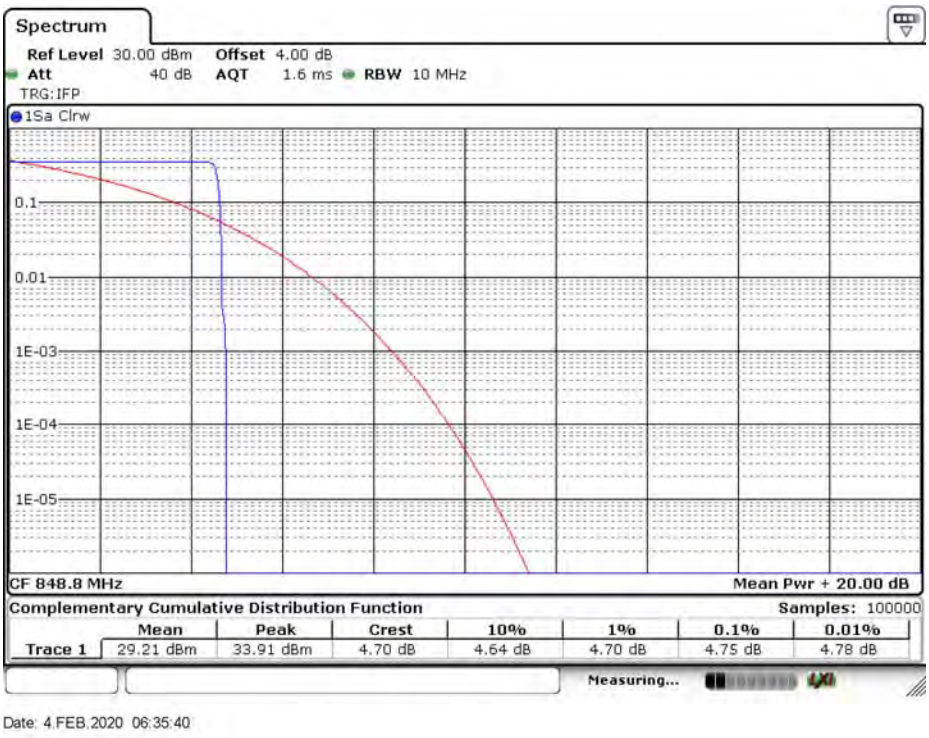
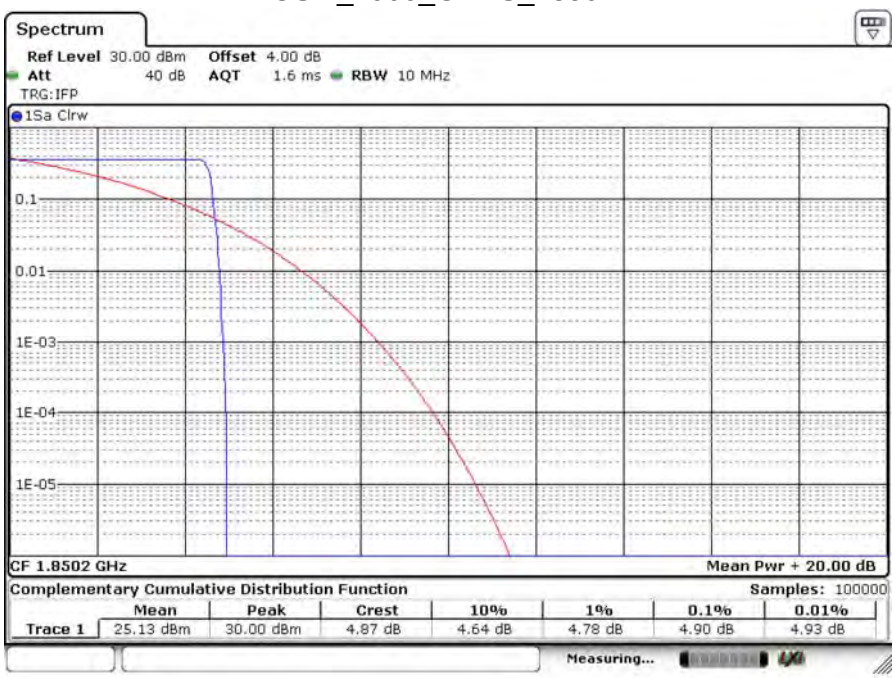


Product	Module		
Test Item	Peak To Average Ratio		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/04	Test Site	SR12-H
Temperature (°C)	19.0	Humidity (%RH)	66.0

PCS 1900_GPRS

Channel No.	Frequency (MHz)	Modulation	Peak (dBm)	Average (dBm)	PAPR (dB)
512	1850.2	GPRS	30.00	25.13	4.93
661	1880	GPRS	29.88	25.08	4.90
810	1909.8	GPRS	29.95	25.16	4.87

GSM_1900_GPRS_1850.2



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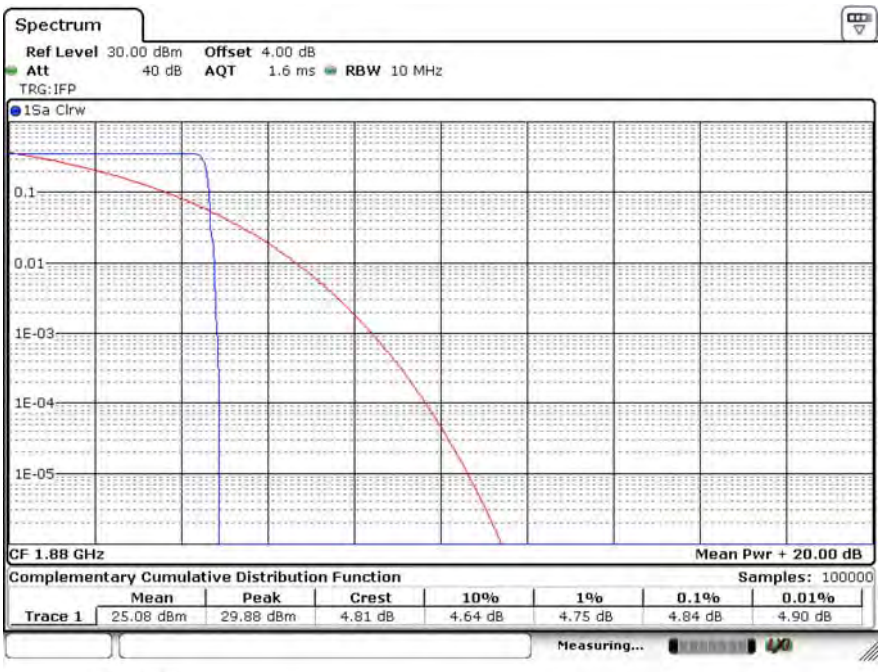
GSM_1900_GPRS_1880



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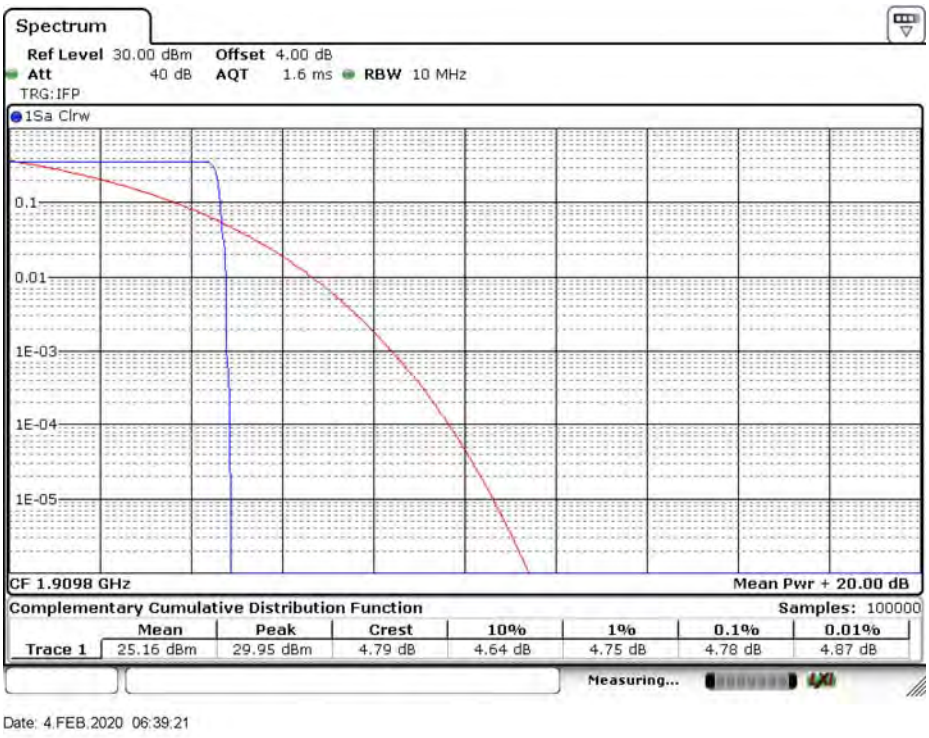
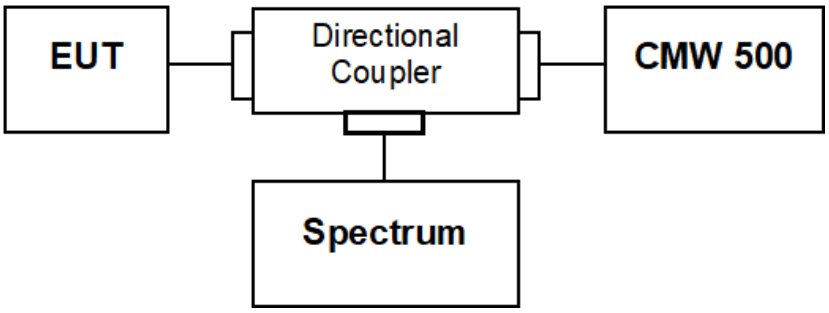


6. Conducted Band Edge

6.1. Test Setup



6.2. Test Procedure

1. The EUT was connected to spectrum analyzer and System Simulator via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The conducted spurious emission for the whole frequency range was taken.
4. In the 1MHz 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 to measure the out of band Emissions.

6.3. Test Method

Conducted Spurious Measurement:

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 6.1

ANSI C63.26: 2015 Sub-clause 5.7

Radiated Spurious Measurement:

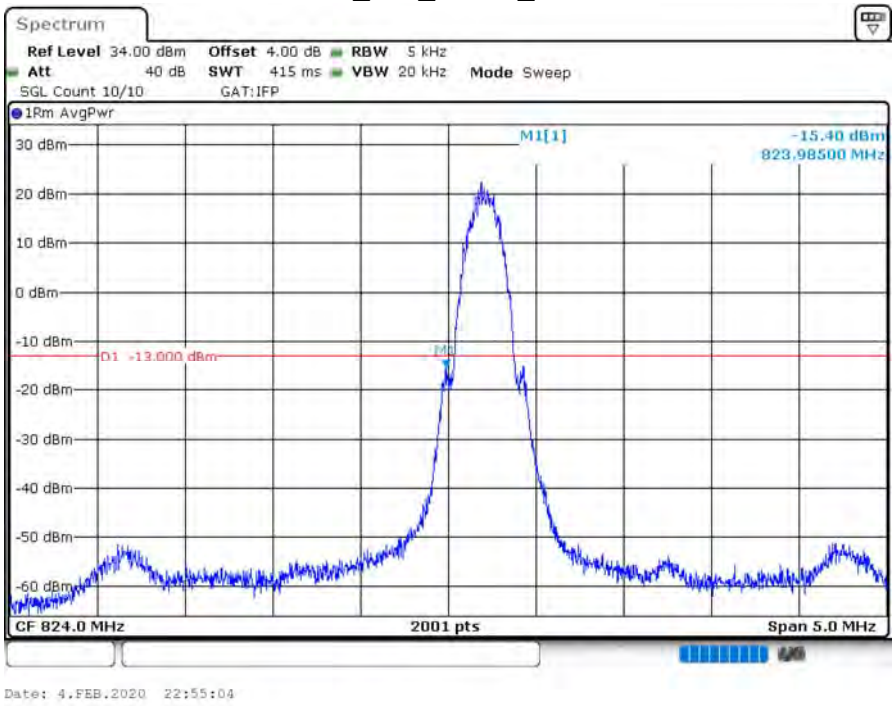
KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 5.8

ANSI C63.26: 2015 Sub-clause 5.5.3.2

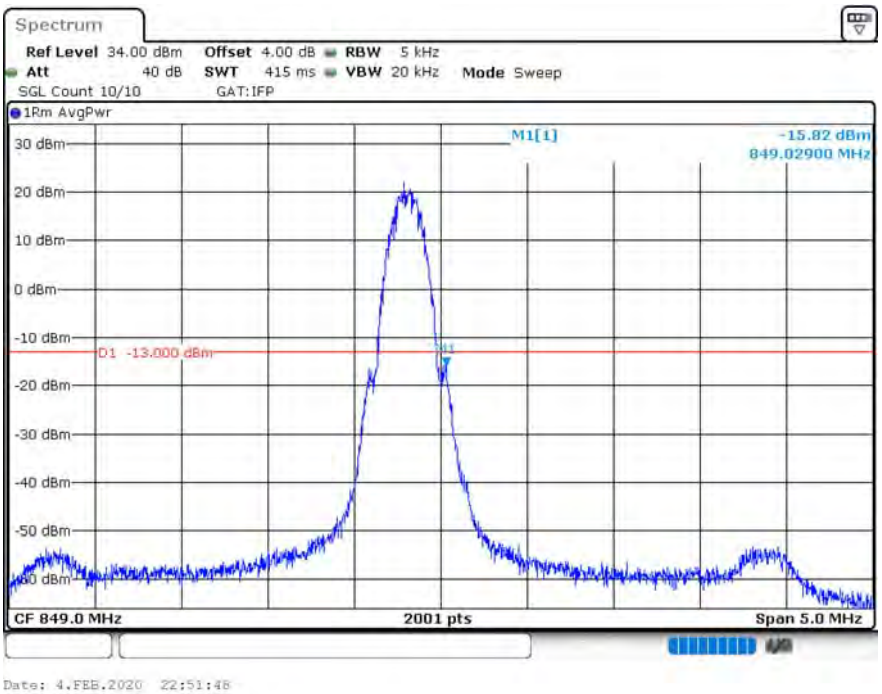
6.4. Test Result

Product	Module		
Test Item	Conducted Band Edge		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/04	Test Site	SR12-H
Temperature (°C)	19.0	Humidity (%RH)	66.0

GSM_850_GPRS_824.2

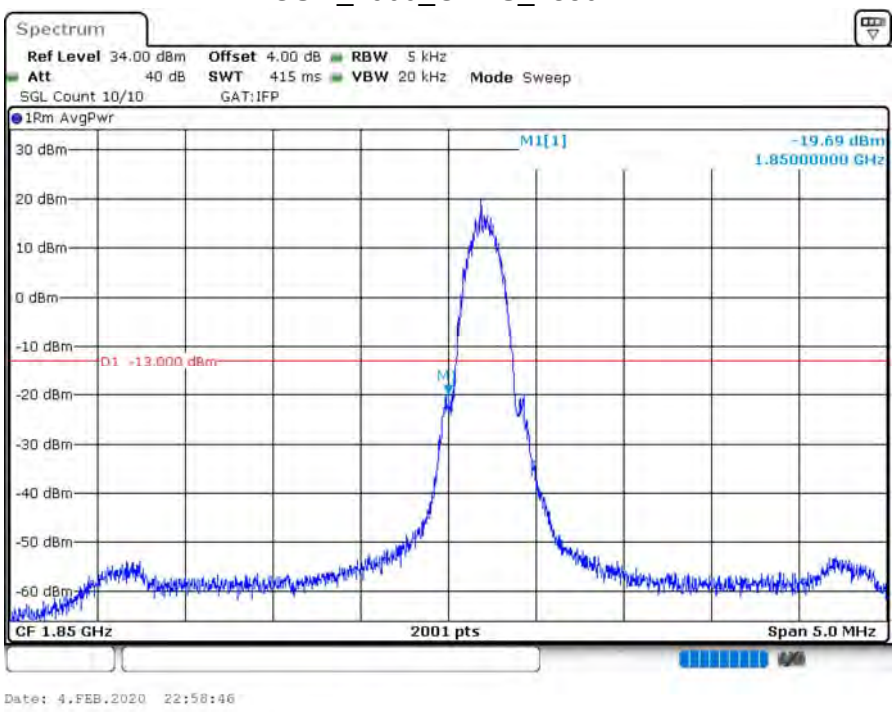


GSM_850_GPRS_848.8

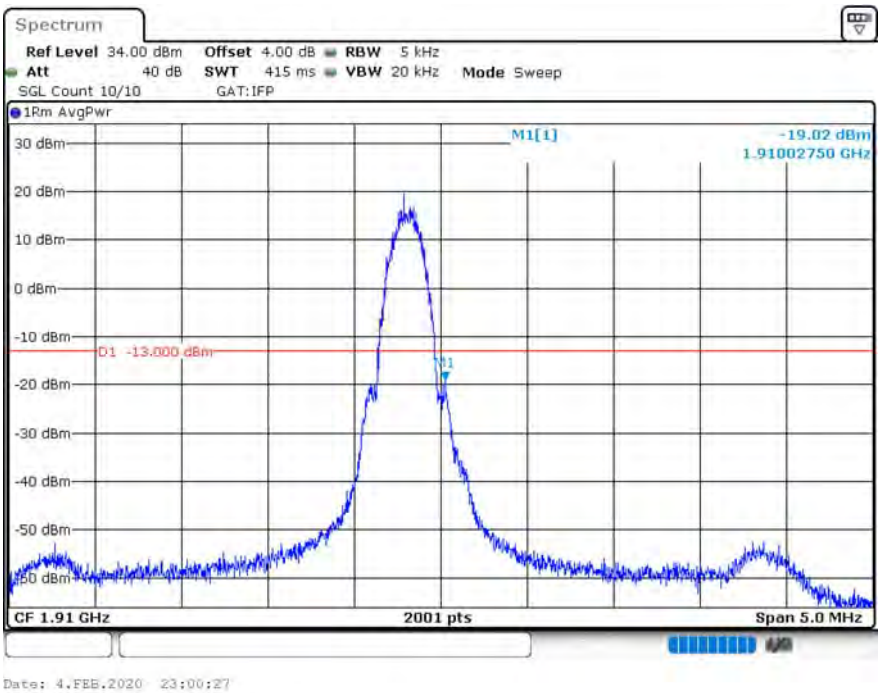


Product	Module		
Test Item	Conducted Band Edge		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/04	Test Site	SR12-H
Temperature (°C)	19.0	Humidity (%RH)	66.0

GSM_1900_GPRS_1850.2



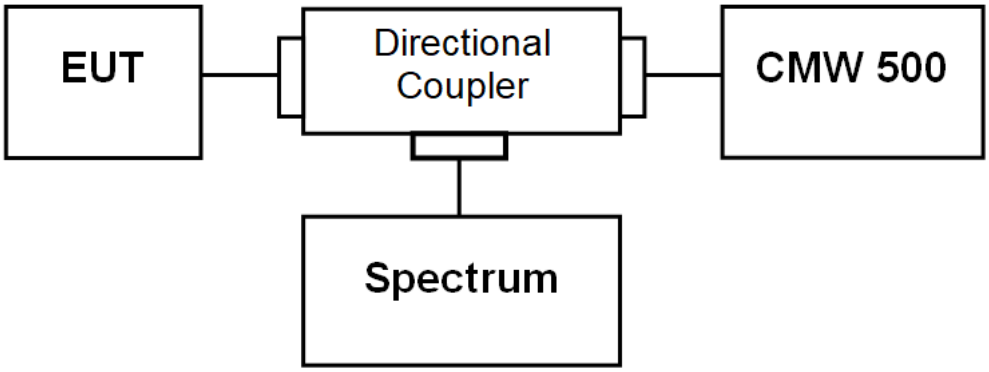
GSM_1900_GPRS_1909.8



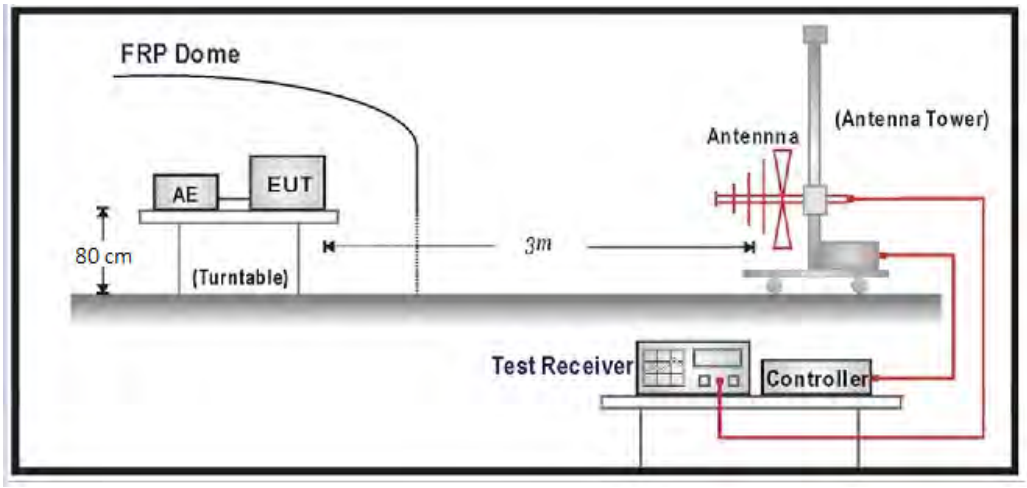
7. Spurious Emission

7.1. Test Setup

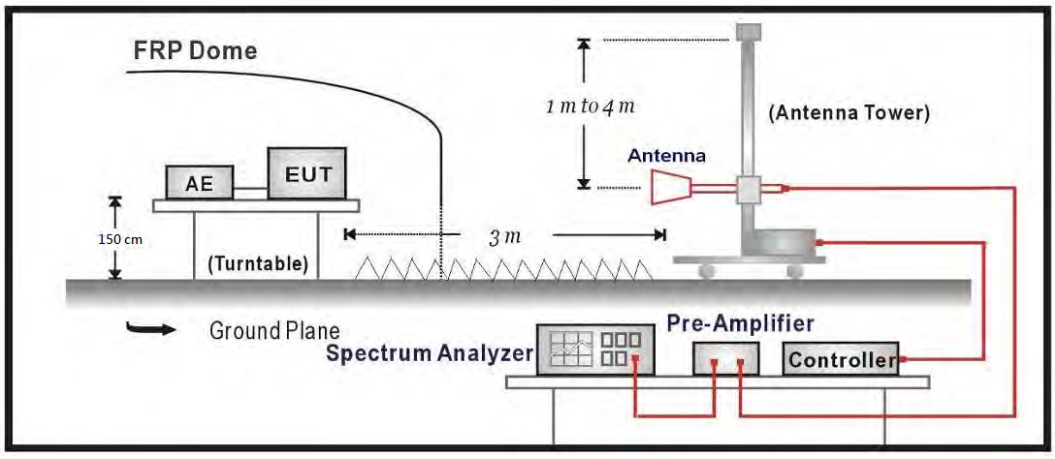
Conducted Spurious Measurement (below 1GHz)



Radiated Spurious Measurement (below 1GHz)



Radiated Spurious Measurement (above 1GHz)



7.2. Test Procedure

Conducted Spurious Measurement:

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and Base station by a Directional Couple.
c) EUT Communicate with Base station, then select a channel for testing.
d) Add a correction factor to the display of spectrum, and then test.
e) The resolution bandwidth of the spectrum analyzer was set at 1 MHz, sufficient scans were taken to show the out of band Emission if any up to 10^{th} harmonic.

Radiated Spurious Measurement:

a) The EUT was placed on a rotatable wooden table with 1.5 meter above ground.
b) The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
c) The table was rotated 360 degrees to determine the position of the highest spurious emission.
d) 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.
e) Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 1MHz, Sweep 500ms, Taking the record of maximum spurious emission.
f) A horn antenna was substituted in place of the EUT and was driven by a signal generator.
g) Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
h) Taking the record of output power at antenna port
i) Repeat step 7 to step 8 for another polarization.
j) EIRP = SG - Cable loss + Antenna Gain

7.3. Test Method

Conducted Spurious Measurement:

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 6.1
ANSI C63.26-2015 Sub-clause 5.7

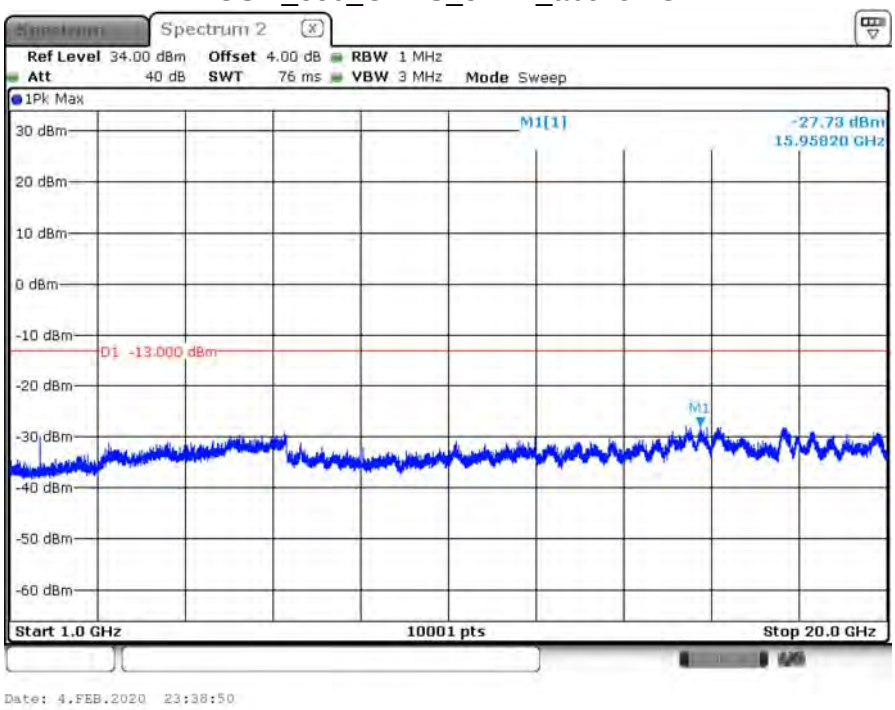
Radiated Spurious Measurement:

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 5.8
ANSI C63.26-2015 Sub-clause 5.5.3.2

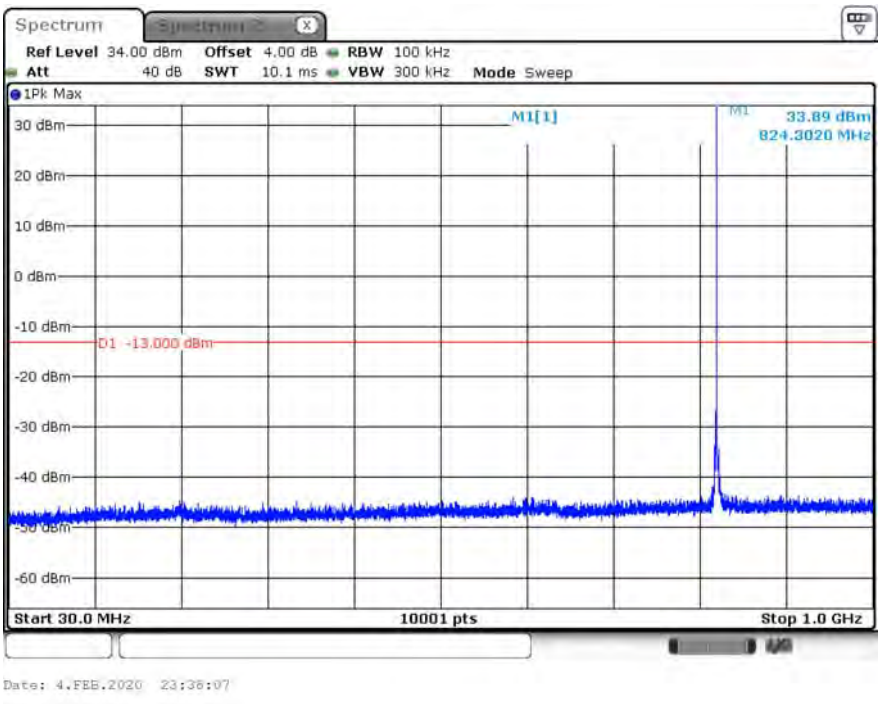
7.4. Test Result

Product	Module		
Test Item	Conducted Spurious Emission		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/04	Test Site	SR12-H
Temperature (°C)	19.0	Humidity (%RH)	66.0

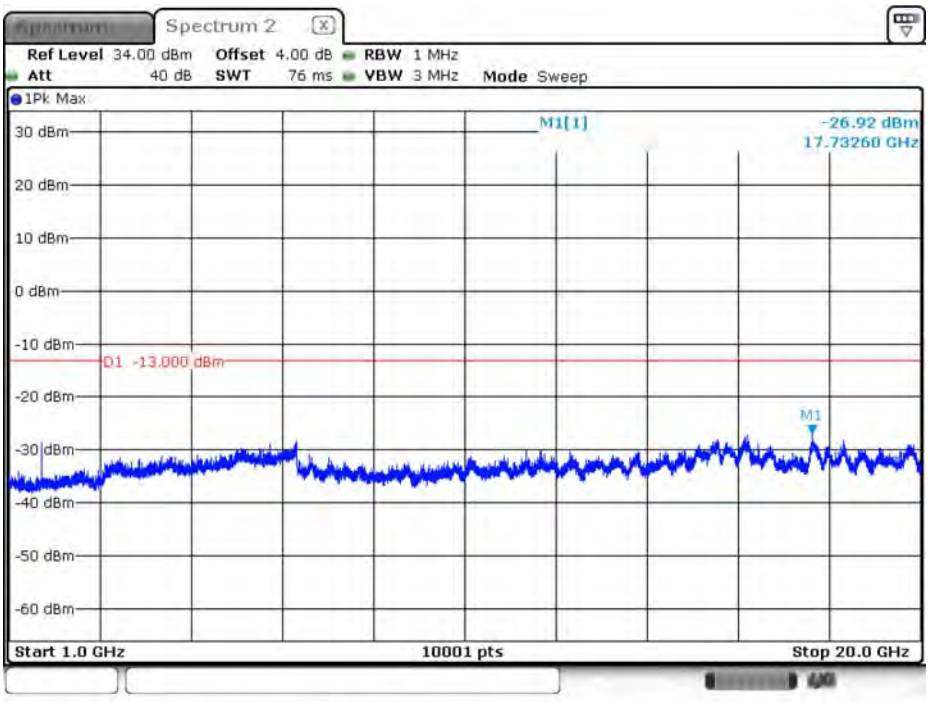
GSM_850_GPRS_824.2_above 1G



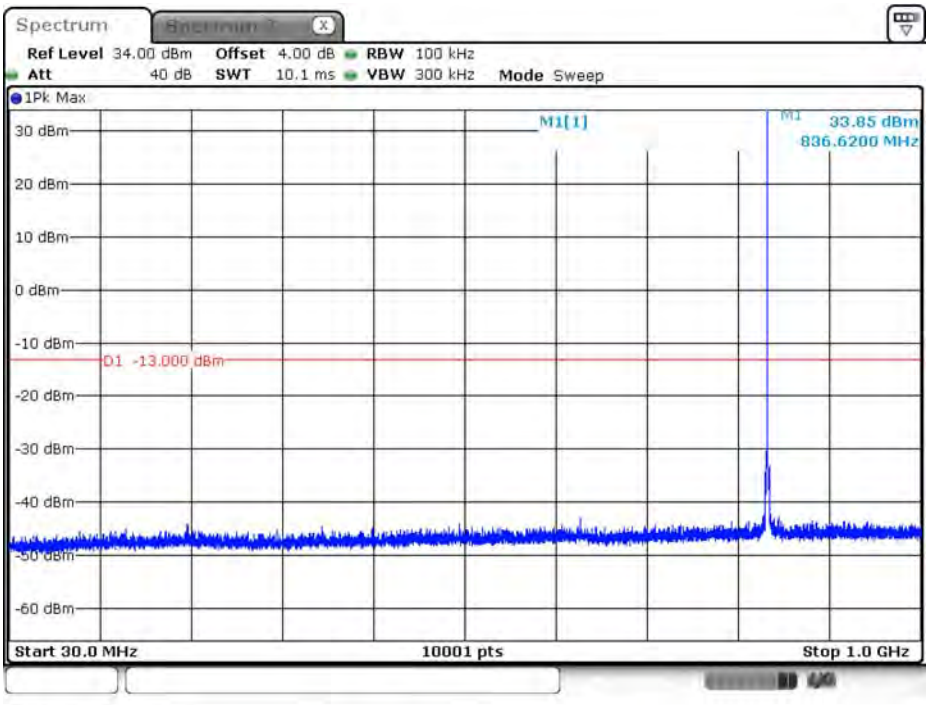
GSM_850_GPRS_824.2_under 1G



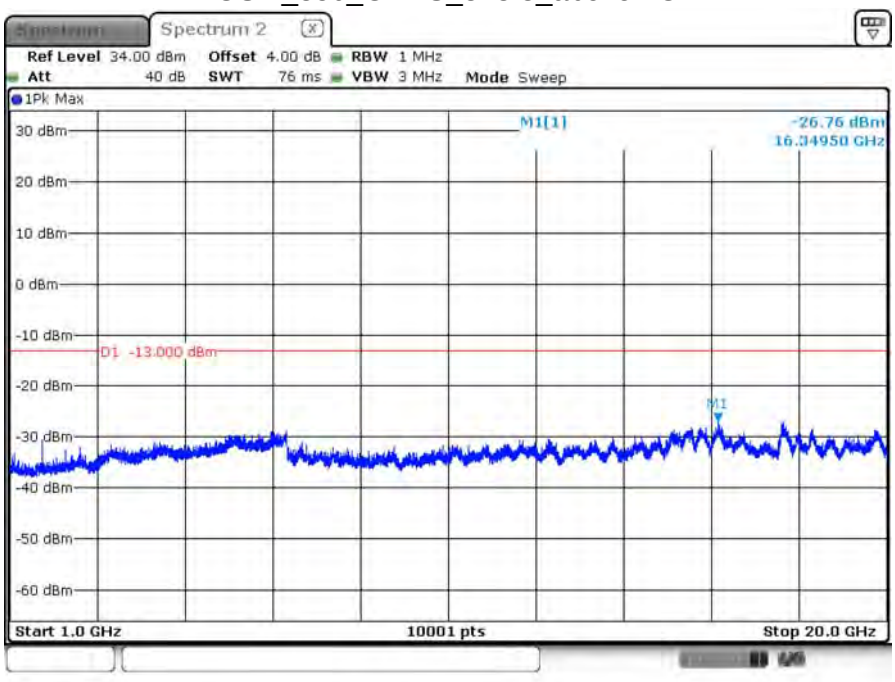
GSM_850_GPRS_836.6_above 1G



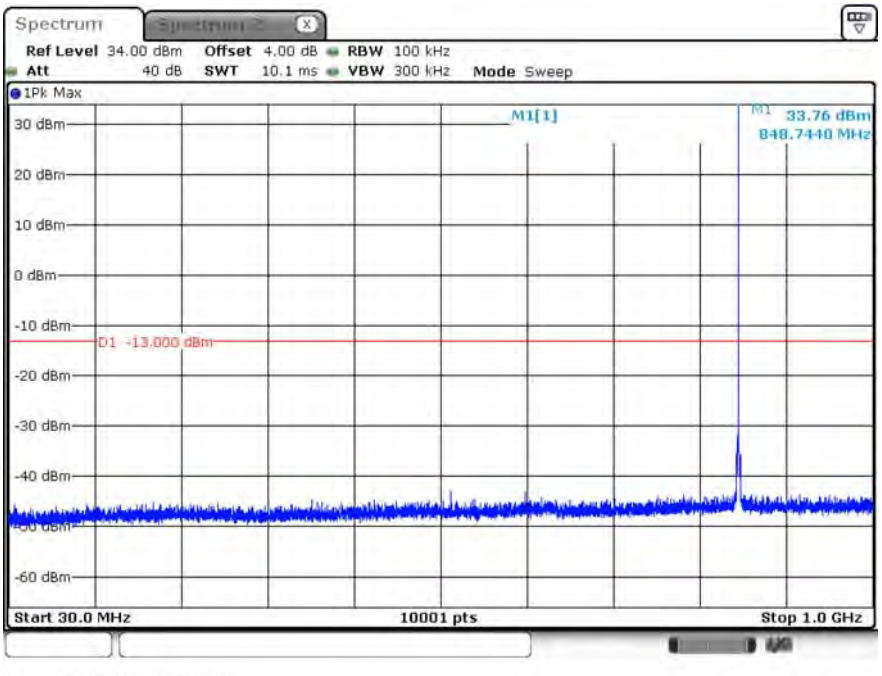
GSM_850_GPRS_836.6_under 1G



GSM_850_GPRS_848.8_above 1G

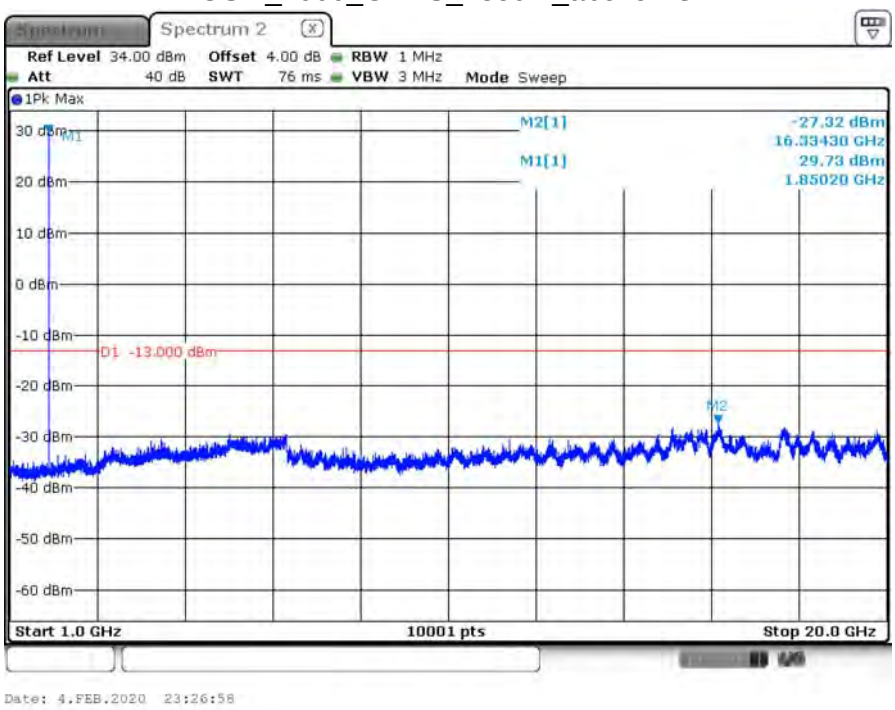


GSM_850_GPRS_848.8_under 1G

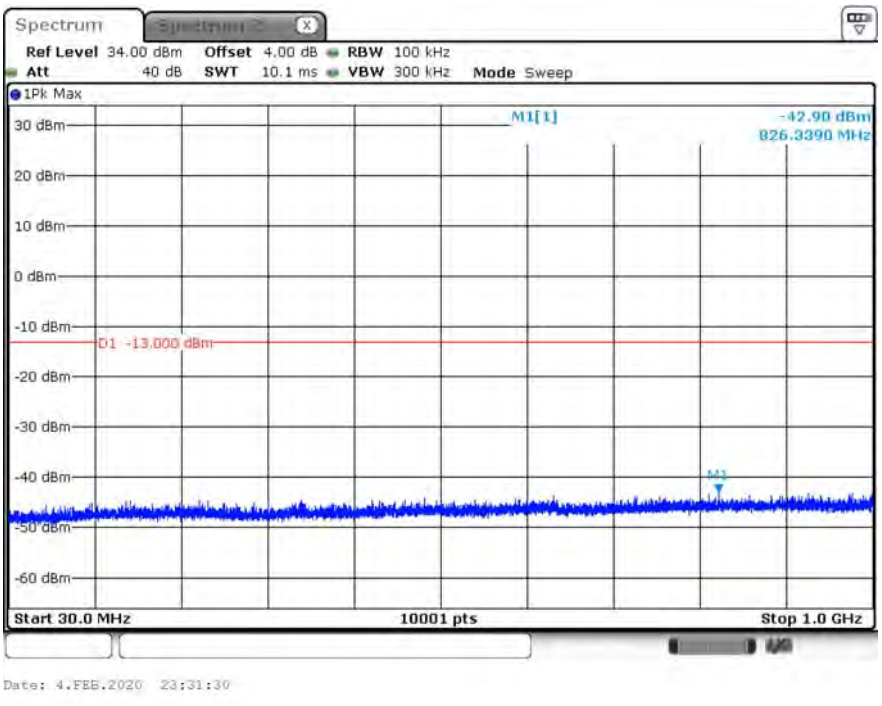


Product	Module		
Test Item	Conducted Spurious Emission		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/04	Test Site	SR12-H
Temperature (°C)	19.0	Humidity (%RH)	66.0

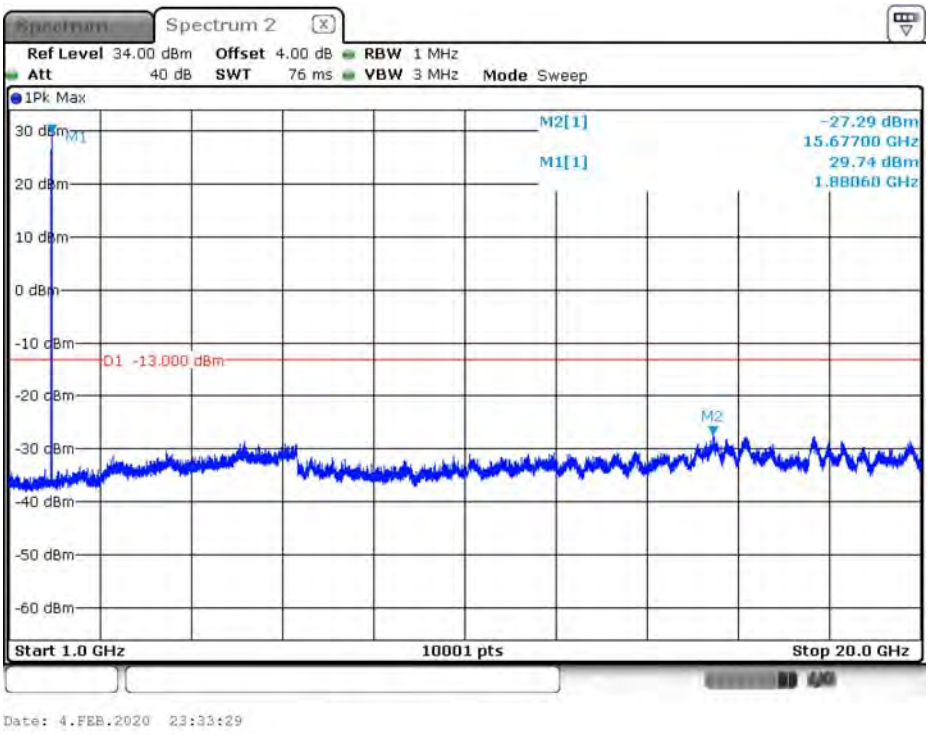
GSM_1900_GPRS_1850.2_above 1G



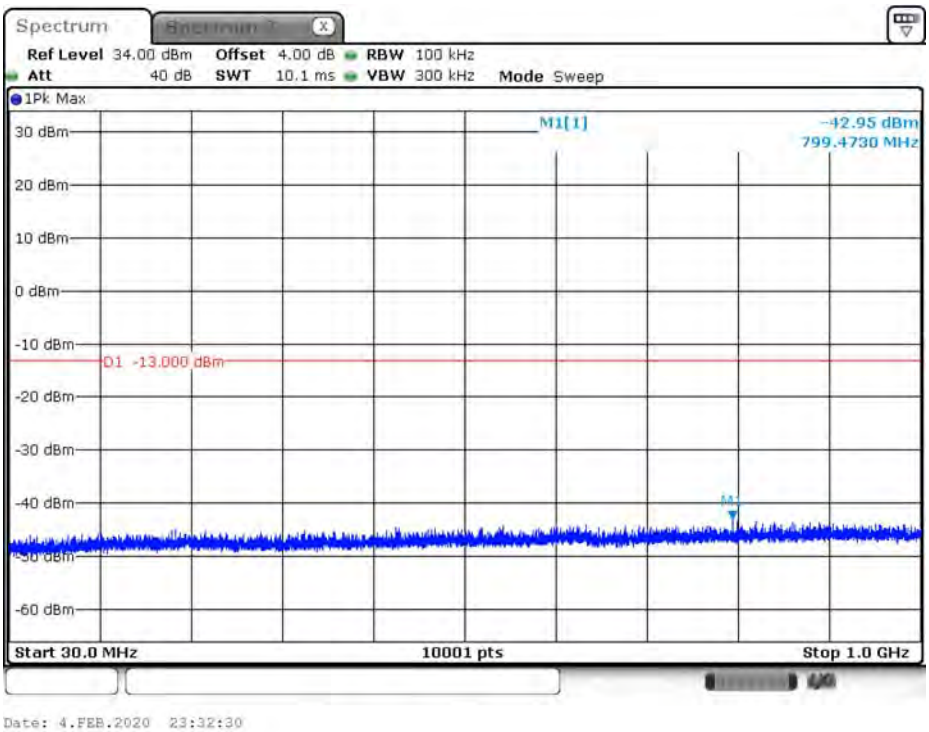
GSM_1900_GPRS_1850.2_under 1G



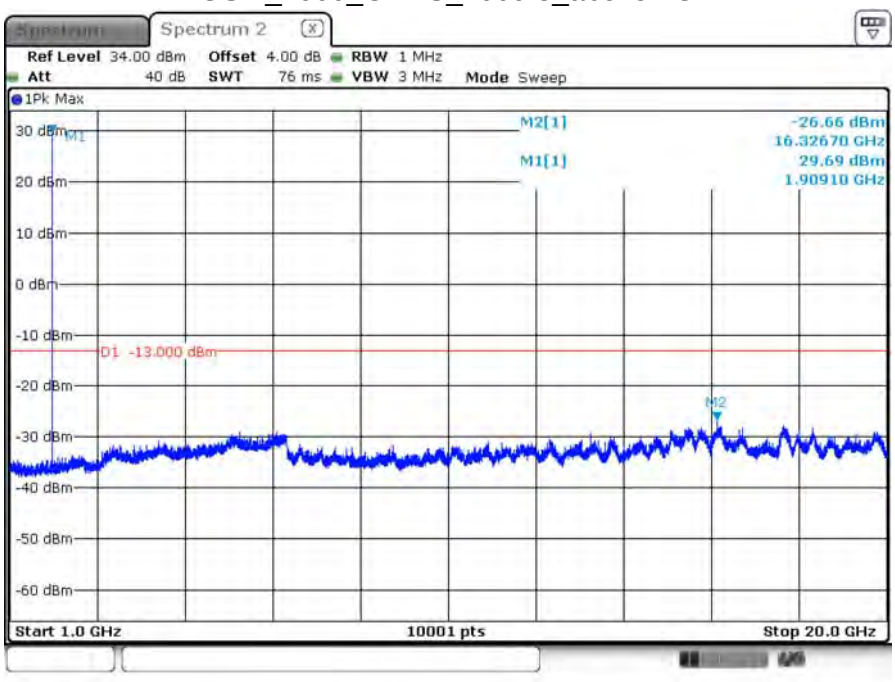
GSM_1900_GPRS_1880_above 1G



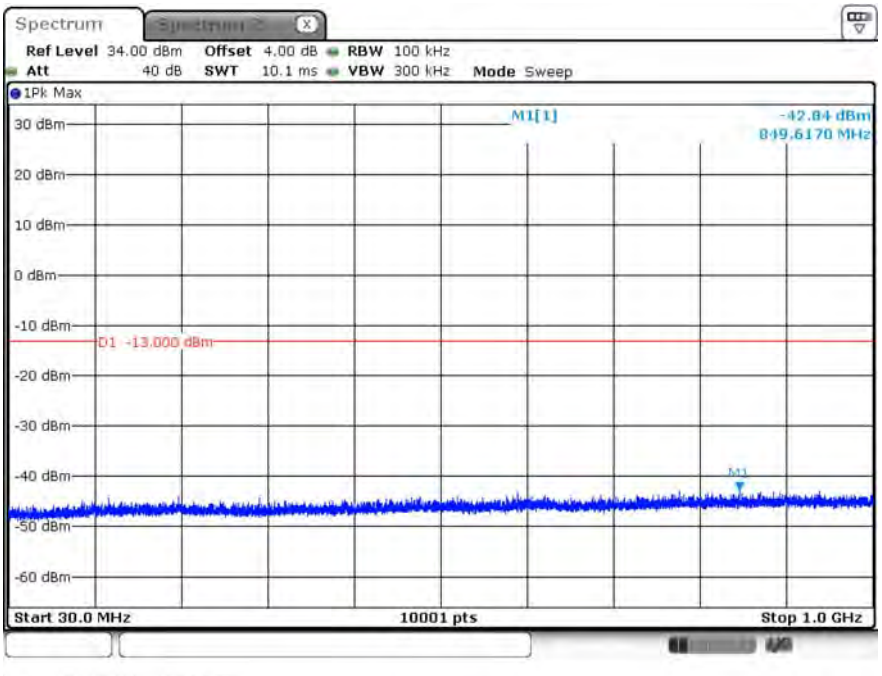
GSM_1900_GPRS_1880_under 1G



GSM_1900_GPRS_1909.8_above 1G



GSM_1900_GPRS_1909.8_under 1G



Product	Module		
Test Item	Radiated Spurious Emission		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/04	Test Site	CB2-H
Temperature (°C)	19.0	Humidity (%RH)	46.0

BW 0.000_CH 128_GPRS_

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	1648.400	-34.47	-13	-21.47	-40.77	9.29	2.99
	2472.600	-46.52	-13	-33.52	-53.42	10.59	3.68
	3296.800	-51.91	-13	-38.91	-59.82	12.17	4.26
	4121.000	-48.94	-13	-35.94	-56.82	12.61	4.74
	4945.200	-48.58	-13	-35.58	-55.97	12.65	5.26
	5769.400	-46.00	-13	-33.00	-53.32	13.06	5.74
V	1648.400	-36.90	-13	-23.90	-43.20	9.29	2.99
	2472.600	-43.41	-13	-30.41	-50.31	10.59	3.68
	3296.800	-51.72	-13	-38.72	-59.63	12.17	4.26
	4121.000	-49.40	-13	-36.40	-57.28	12.61	4.74
	4945.200	-49.13	-13	-36.13	-56.52	12.65	5.26
	5769.400	-46.79	-13	-33.79	-54.11	13.06	5.74

Emission Level=SG(Signal Generator) Level+Antenna Gain-Cable Loss.

BW 0.000_CH 190_GPRS_

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	1673.200	-32.25	-13	-19.25	-38.60	9.36	3.01
	2509.800	-43.05	-13	-30.05	-49.96	10.62	3.71
	3346.400	-50.31	-13	-37.31	-58.29	12.28	4.30
	4183.000	-49.11	-13	-36.11	-56.95	12.62	4.78
	5019.600	-48.40	-13	-35.40	-55.76	12.67	5.31
	5856.200	-45.00	-13	-32.00	-52.27	13.04	5.77
V	1673.200	-37.64	-13	-24.64	-43.99	9.36	3.01
	2509.800	-39.72	-13	-26.72	-46.63	10.62	3.71
	3346.400	-50.64	-13	-37.64	-58.62	12.28	4.30
	4183.000	-48.74	-13	-35.74	-56.58	12.62	4.78
	5019.600	-47.84	-13	-34.84	-55.20	12.67	5.31
	5856.200	-44.97	-13	-31.97	-52.24	13.04	5.77

Emission Level=SG(Signal Generator) Level+Antenna Gain-Cable Loss.

BW 0.000_CH 251_GPRS_

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	1697.600	-37.04	-13	-24.04	-43.44	9.44	3.03
	2546.400	-40.43	-13	-27.43	-47.38	10.69	3.74
	3395.200	-49.91	-13	-36.91	-57.96	12.38	4.33
	4244.000	-48.20	-13	-35.20	-56.00	12.63	4.82
	5092.800	-47.42	-13	-34.42	-54.80	12.74	5.36
	5941.600	-45.63	-13	-32.63	-52.85	13.02	5.80
V	1697.600	-40.18	-13	-27.18	-46.58	9.44	3.03
	2546.400	-38.73	-13	-25.73	-45.68	10.69	3.74
	3395.200	-48.94	-13	-35.94	-56.99	12.38	4.33
	4244.000	-49.00	-13	-36.00	-56.80	12.63	4.82
	5092.800	-47.49	-13	-34.49	-54.87	12.74	5.36
	5941.600	-46.74	-13	-33.74	-53.96	13.02	5.80

Emission Level=SG(Signal Generator) Level+Antenna Gain-Cable Loss.

Product	Module		
Test Item	Radiated Spurious Emission		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/04	Test Site	CB2-H
Temperature (°C)	19.0	Humidity (%RH)	46.0

BW 0.000_CH 512_GPRS_

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	3700.400	-48.77	-13	-35.77	-56.87	12.61	4.51
	5550.600	-47.15	-13	-34.15	-54.61	13.13	5.67
	7400.800	-40.83	-13	-27.83	-45.55	11.32	6.60
	9251.000	-42.64	-13	-29.64	-47.26	11.83	7.21
	11101.200	-39.43	-13	-26.43	-43.14	11.66	7.96
	12951.400	-41.26	-13	-28.26	-46.25	13.63	8.63
V	3700.400	-49.27	-13	-36.27	-57.37	12.61	4.51
	5550.600	-45.24	-13	-32.24	-52.70	13.13	5.67
	7400.800	-41.87	-13	-28.87	-46.59	11.32	6.60
	9251.000	-42.71	-13	-29.71	-47.33	11.83	7.21
	11101.200	-39.66	-13	-26.66	-43.37	11.66	7.96
	12951.400	-40.14	-13	-27.14	-45.13	13.63	8.63

Emission Level=SG(Signal Generator) Level+Antenna Gain-Cable Loss.

BW 0.000_CH 661_GPRS_

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	3760.000	-48.30	-13	-35.30	-56.37	12.60	4.54
	5640.000	-48.98	-13	-35.98	-56.38	13.10	5.70
	7520.000	-42.18	-13	-29.18	-46.80	11.24	6.61
	9400.000	-41.29	-13	-28.29	-45.79	11.79	7.29
	11280.000	-38.98	-13	-25.98	-42.84	11.92	8.06
	13160.000	-38.84	-13	-25.84	-43.46	13.33	8.70
V	3760.000	-48.36	-13	-35.36	-56.43	12.60	4.54
	5640.000	-49.40	-13	-36.40	-56.80	13.10	5.70
	7520.000	-40.61	-13	-27.61	-45.23	11.24	6.61
	9400.000	-40.34	-13	-27.34	-44.84	11.79	7.29
	11280.000	-38.07	-13	-25.07	-41.93	11.92	8.06
	13160.000	-39.05	-13	-26.05	-43.67	13.33	8.70

Emission Level=SG(Signal Generator) Level+Antenna Gain-Cable Loss.

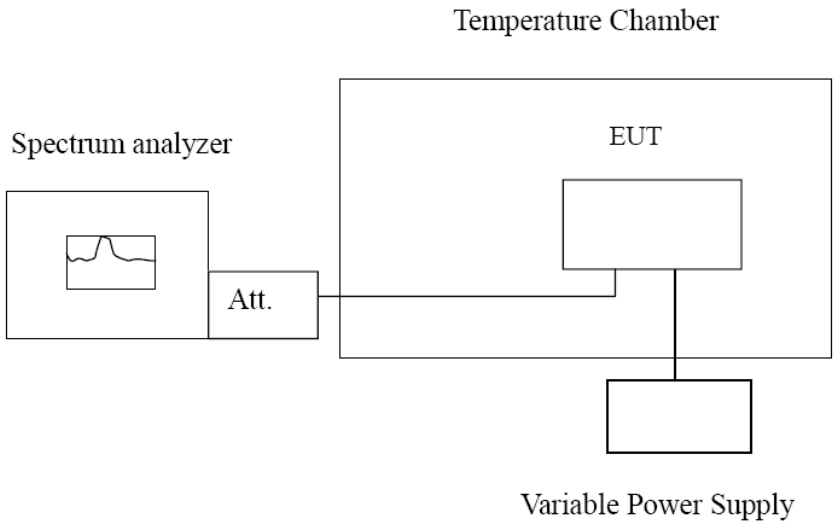
BW 0.000_CH 810_GPRS_

Antenna Polarity	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	SG Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)
H	3819.600	-50.43	-13	-37.43	-58.47	12.60	4.57
	5729.400	-47.12	-13	-34.12	-54.47	13.08	5.73
	7639.200	-40.92	-13	-27.92	-45.57	11.24	6.60
	9549.000	-41.16	-13	-28.16	-45.60	11.80	7.35
	11458.800	-39.17	-13	-26.17	-43.19	12.17	8.16
	13368.600	-41.48	-13	-28.48	-45.69	12.97	8.76
V	3819.600	-49.90	-13	-36.90	-57.94	12.60	4.57
	5729.400	-41.52	-13	-28.52	-48.87	13.08	5.73
	7639.200	-40.27	-13	-27.27	-44.92	11.24	6.60
	9549.000	-42.22	-13	-29.22	-46.66	11.80	7.35
	11458.800	-38.82	-13	-25.82	-42.84	12.17	8.16
	13368.600	-41.37	-13	-28.37	-45.58	12.97	8.76

Emission Level=SG(Signal Generator) Level+Antenna Gain-Cable Loss.

8. Frequency Stability

8.1. Test Setup



8.2. Test Procedure

Frequency Stability under Temperature Variations:

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℃ operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30℃. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

Frequency Stability under Voltage Variations:

Set chamber temperature to 20℃. 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.

8.3. Test Method

KDB 971168 D01 Power Meas License Digital Systems v03 sub-clause 9

ANSI C63.26-2015 Sub-clause 5.6

8.4. Test Result

Product	Module		
Test Item	Frequency Stability		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/05	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	48.0

GSM 850_824.2MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.35	-11	-0.0133
3.7	-8	-0.0097
3.2	-7	-0.0085

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	-14	-0.0170
-20	0	0.0000
-10	-5	-0.0061
0	-9	-0.0109
10	6	0.0073
20	-3	-0.0036
30	13	0.0158
40	-9	-0.0109
50	13	0.0158
60	10	0.0121
70	3	0.0036

Product	Module		
Test Item	Frequency Stability		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/05	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	48.0

GSM 850_836.6MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.35	-6	-0.0073
3.7	-4	-0.0049
3.2	7	0.0085

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	-13	-0.0158
-20	-3	-0.0036
-10	4	0.0049
0	9	0.0109
10	14	0.0170
20	-12	-0.0146
30	-13	-0.0158
40	-8	-0.0097
50	8	0.0097
60	11	0.0133
70	7	0.0085

Product	Module		
Test Item	Frequency Stability		
Test Mode	Mode 1: GSM 850		
Date of Test	2020/02/05	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	48.0

GSM 850_848.8MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.35	-4	-0.0049
3.7	1	0.0012
3.2	7	0.0085

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	-11	-0.0133
-20	15	0.0182
-10	4	0.0049
0	-4	-0.0049
10	11	0.0133
20	12	0.0146
30	-2	-0.0024
40	2	0.0024
50	-7	-0.0085
60	-4	-0.0049
70	9	0.0109

Product	Module		
Test Item	Frequency Stability		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/05	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	48.0

PCS 1900_1850.2MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.35	-7	-0.0038
3.7	6	0.0032
3.2	2	0.0011

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	-9	-0.0049
-20	9	0.0049
-10	14	0.0076
0	2	0.0011
10	-4	-0.0022
20	12	0.0065
30	-14	-0.0076
40	13	0.0070
50	-13	-0.0070
60	2	0.0011
70	11	0.0059

Product	Module		
Test Item	Frequency Stability		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/05	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	48.0

PCS 1900_1880MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.35	-10	-0.0054
3.7	-4	-0.0022
3.2	5	0.0027

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	-9	-0.0049
-20	-2	-0.0011
-10	-7	-0.0038
0	2	0.0011
10	4	0.0022
20	2	0.0011
30	-11	-0.0059
40	-6	-0.0032
50	-4	-0.0022
60	5	0.0027
70	13	0.0070

Product	Module		
Test Item	Frequency Stability		
Test Mode	Mode 2: PCS1900		
Date of Test	2020/02/05	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	48.0

PCS 1900_1909.8MHz

Voltage

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
4.35	1	0.0059
3.7	-12	-0.0049
3.2	13	0.0032

Temperature

Temperature	Frequency Error (Hz)	Frequency Error (ppm)
-30	11	0.0059
-20	-9	-0.0049
-10	6	0.0032
0	-2	-0.0011
10	-14	-0.0076
20	-1	-0.0005
30	14	0.0076
40	5	0.0027
50	-13	-0.0070
60	9	0.0049
70	12	0.0065