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FCC LTE REPORT

Certification

Applicant Name:
Infomark Co.,Ltd.

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Date of Issue:
April 08, 2019

Location:
HCT CO., LTD.,
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Report No.: HCT-RF-1903-FC049-R1

FCC ID:	**YCOIFW522T**
APPLICANT:	**Infomark Co.,Ltd.**

Model(s): IF-W522T
EUT Type: Kids Watch
FCC Classification: PCS Licensed Transmitter (PCB)
FCC Rule Part(s): §24, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band2 (1.4)	1850.7 - 1909.3	1M10G7D	QPSK	0.048	16.81
		1M10W7D	16QAM	0.036	15.53
LTE – Band2 (3)	1851.5 - 1908.5	2M71G7D	QPSK	0.048	16.79
		2M70W7D	16QAM	0.033	15.23
LTE – Band2 (5)	1852.5 - 1907.5	4M52G7D	QPSK	0.048	16.82
		4M51W7D	16QAM	0.035	15.41
LTE – Band2 (10)	1855.0 - 1905.0	8M97G7D	QPSK	0.050	16.99
		8M97W7D	16QAM	0.036	15.60
LTE – Band2 (15)	1857.5 - 1902.5	13M4G7D	QPSK	0.049	16.87
		13M5W7D	16QAM	0.034	15.32
LTE – Band2 (20)	1860.0 - 1900.0	18M0G7D	QPSK	0.050	16.97
		17M9W7D	16QAM	0.032	15.06

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.
HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by : Jae Ryang Do
Engineer of Telecommunication Testing Center

Report approved by : Kwon Jeong
Manager of Telecommunication Testing Center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1903-FC049	March 26, 2019	- First Approval Report
HCT-RF-1903-FC049-R1	April 08, 2019	- Added the Accessory Infromation on page 5. - Added the note on pages 15, 16.

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	Infomark Co.,Ltd.
Address:	3rd Floor, Humaxvillage, 216, Hwangsaeul-ro Bundang-gu Seongnam-Si, Gyonggi-Do, 463-875 South Korea
FCC ID:	YCOIFW522T
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§24, §2
EUT Type:	Kids Watch
Model(s):	W522T
Tx Frequency:	1850.7 MHz – 1909.3 MHz (LTE – Band2 (1.4 MHz)) 1851.5 MHz – 1908.5 MHz (LTE – Band2 (3 MHz)) 1852.5 MHz – 1907.5 MHz (LTE – Band2 (5 MHz)) 1855.0 MHz – 1905.0 MHz (LTE – Band2 (10 MHz)) 1857.5 MHz – 1902.5 MHz (LTE – Band2 (15 MHz)) 1860.0 MHz – 1900.0 MHz (LTE – Band2 (20 MHz))
Date(s) of Tests:	March 06, 2019 ~ March 21, 2019

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Kids Watch with LTE.

It also supports IEEE 802.11 b/g/n, Bluetooth.

The EUT was a Watch with Cradle.

(Cradle - Model : IF-A522T, Manufacture : Infomark)

2.2. 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.

2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Occupied Bandwidth	- KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4
Band Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Conducted Output Power	- N/A (See SAR Report)
Peak- to- Average Ratio	- KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4 - ANSI C63.26-2015 – Section 5.2.6(only GSM)
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Effective Radiated Power/ Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI C63.26-2015 – Section 5.2 - ANSI/TIA-603-E-2016 – Section 2.2.17
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12

3.2 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Note

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

   The power is calculated by the following formula;

   $$P_{d(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

   Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.
3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value.

   These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration
4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

3.3 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA-603-E-2016.

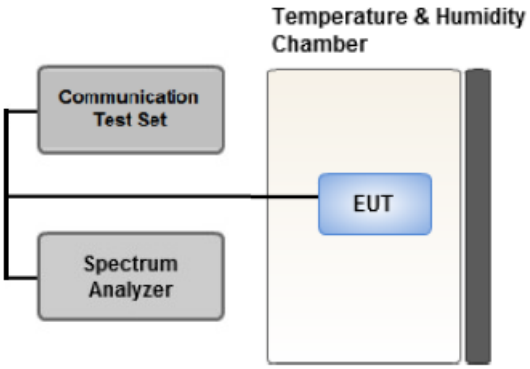
Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points > 2 x span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10^{th} harmonics from 9 kHz.

Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
   The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① **CCDF Procedure for PAPR**

Test Settings

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. Set the measurement interval as follows:
   .- for continuous transmissions, set to 1 ms,
   .- or burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1%.

② **Alternate Procedure for PAPR**

Use one of the procedures presented in 5.2(ANSI C63.26-2015) to measure the total peak power and record as P_{Pk}.

Use one of the applicable procedures presented 5.2(ANSI C63.26-2015) to measure the total average power and record as P_{Avg}. Determine the P.A.R. from:

$$P.A.R_{(dB)} = P_{Pk\ (dBm)} - P_{Avg\ (dBm)}\ (P_{Avg} = \text{Average Power} + \text{Duty cycle Factor})$$

Test Settings(Peak Power)

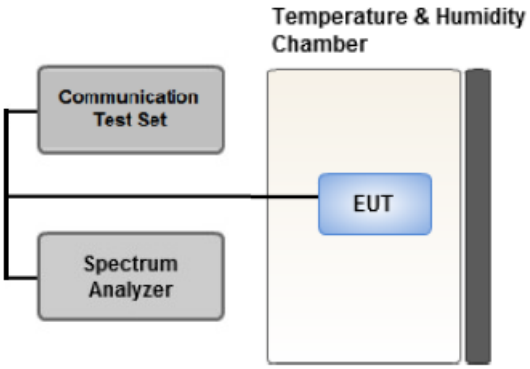
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

1. Set the RBW ≥ OBW.
2. Set VBW ≥ 3 × RBW.
3. Set span ≥ 2 × OBW.
4. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period).
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

Test Settings(Average Power)

1. Set span to 2 × to 3 × the OBW.
2. Set RBW ≥ OBW.
3. Set VBW ≥ 3 × RBW.
4. Set number of measurement points in sweep ≥ 2 × span / RBW.
5. Sweep time:
   Set ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. The transmission period is the (on + off) time.
6. Detector = power averaging (rms).
7. Set sweep trigger to “free run.”
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. (To accurately determine the average power over the on and off period of the transmitter, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.)
9. Use the peak marker function to determine the maximum amplitude level.
10. Add [10 log (1/duty cycle)] to the measured maximum power level to compute the average power during continuous transmission. For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is a constant 25%.

3.5 OCCUPIED BANDWIDTH.



Test setup

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.

The EUT makes a call to the communication simulator.

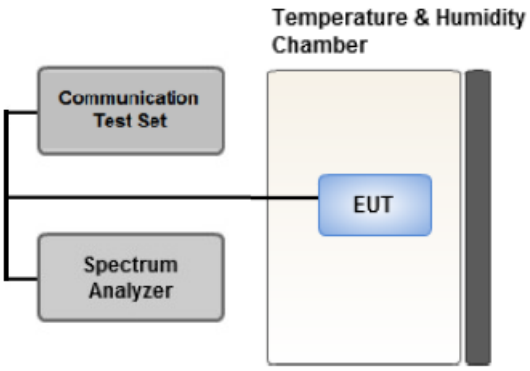
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

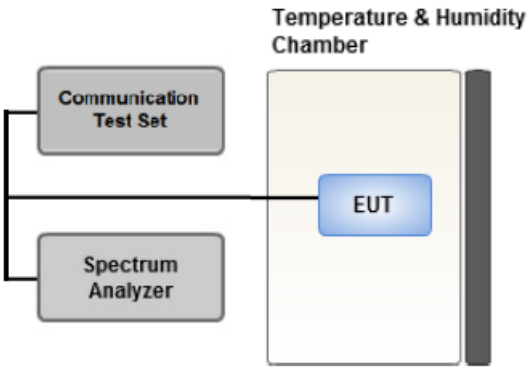
Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Settings

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = RMS
4. Trace Mode = Average
5. Sweep time = auto
6. Number of points in sweep ≥ 2 * Span / RBW

3.7 BAND EDGE



Test setup

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

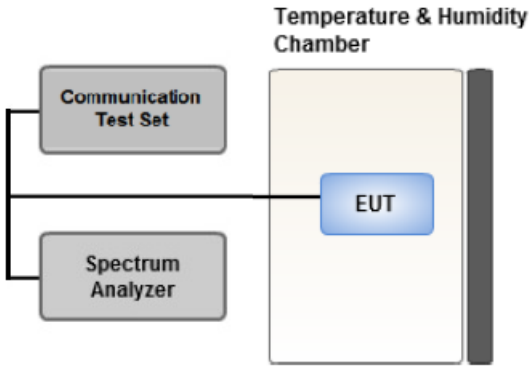
Test Notes

According to FCC 22.917, 24.238, 27.53 specified that 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.

All measurements were done at 2 channels(low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015.

The frequency stability of the transmitter is measured by:

1. Temperature:

   The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

2. Primary Supply Voltage:

   .- Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.

   .- For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

3.8 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
- The worst case is reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data.
- Please refer to the table below.

[Worst case]

Test Description	Modulation	RB size	RB offset	Axis
Effective Isotropic Radiated Power	QPSK, 16QAM,	1	0	Y
Radiated Spurious and Harmonic Emissions	QPSK	1	0	Z

Note:

- W522T Stand alone &with Cradle were tested and the worst case results are reported.

(Worst case : Stand alone)

3.9 WORST CASE(CONDUCTED TEST)

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM,	1.4, 3, 5, 10, 15, 20	Mid	Full RB	0
Band Edge	* QPSK	1.4	Low	1	0
			High	1	5
		3	Low	1	0
			High	1	14
		5	Low	1	0
			High	1	24
		10	Low	1	0
			High	1	49
		15	Low	1	0
			High	1	74
		20	Low	1	0
			High	1	99
		1.4, 3, 5, 10, 15, 20	Low, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	* QPSK	1.4, 3, 5, 10, 15, 20	Low, Mid, High	1	0

* Worst case : Of all modulation, We have tested modulation of the high Conducted Output Power.
Conducted Output Power value can be confirmed on the SAR report.

Note:

- W522T Stand alone &with Cradle were tested and the worst case results are reported.
(Worst case : Stand alone)

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
REOHDE & SCHWARZ	SCU 18 / AMPLIFIER	10094	04/17/2018	Annual	04/17/2019
Wainwright	WHK1.2/15G-10EF/H.P.F	4	04/04/2018	Annual	04/04/2019
Wainwright	WHK3.3/18G-10EF/H.P.F	2	04/04/2018	Annual	04/04/2019
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	5001	06/07/2018	Annual	06/07/2019
Agilent	E3632A/DC Power Supply	KR75303243	05/09/2018	Annual	05/09/2019
Schwarzbeck	UHAP/ Dipole Antenna	557	03/31/2017	Biennial	03/31/2019
Schwarzbeck	UHAP/ Dipole Antenna	558	03/31/2017	Biennial	03/31/2019
ESPEC	SU-642 / Chamber	93000718	08/07/2018	Annual	08/07/2019
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	147	09/14/2018	Annual	09/14/2019
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1298	10/04/2018	Annual	10/04/2019
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	04/25/2017	Biennial	04/25/2019
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	04/25/2017	Biennial	04/25/2019
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY52090906	06/08/2018	Annual	06/08/2019
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/21/2018	Annual	06/21/2019
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	100931	10/22/2018	Annual	10/22/2019
Agilent	8960 (E5515C)/ Base Station	MY48360800	09/27/2018	Annual	09/27/2019
Schwarzbeck	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	08/23/2018	Biennial	08/23/2020
Schwarzbeck	VULB9160/ Bilog Antenna	9160-3368	08/09/2018	Biennial	08/09/2020
Schwarzbeck	VULB9160/ Hybrid Antenna	760	04/06/2017	Biennial	04/06/2019
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6201502997	08/13/2018	Annual	08/13/2019
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6201026545	01/30/2019	Annual	01/30/2020
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/19/2018	Annual	07/19/2019
REOHDE & SCHWARZ	ESU40 / EMI TEST RECEIVER	100524	07/27/2018	Annual	07/27/2019
HCT CO., LTD.,	FCC LTE Mobile Conducted RF Automation Test Software	-	-	-	-

Note:

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.71

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §24.238(a)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§2.1046	N/A	**See Note1**
Peak- to- Average Ratio	§24.232(d)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§24.235	Emission must remain in band	PASS

Note:

1. See SAR Report
2. The same samples were used for SAR and EMC

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§24.232(c)	< 2 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §24.238(a)	< 43 + 10log10 (P[Watts]) for all out-of band emissions	PASS

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

Ch./ Freq.		Measured Level(dBm)	Substitute Level(dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
channel	Freq.(MHz)						W	dBm
128	824.20	-21.37	38.40	-10.61	0.95	H	0.483	26.84

ERP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
2) During the test , the turn table is rotated until the maximum signal is found.
3) Record the field strength meter's level.
4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

7.2 EIRP Sample Calculation

Ch./ Freq.		Measured Level(dBm)	Substitute Level(dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
channel	Freq.(MHz)						W	dBm
20175	1,732.50	-15.75	18.45	9.90	1.76	H	0.456	26.59

EIRP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
2) During the test , the turn table is rotated until the maximum signal is found.
3) Record the field strength meter's level.
4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
6) The signal generator output level with Ant. Gain and cable loss are the rating of equivalent isotropic radiated power.

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

16QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

8. TEST DATA

8.1 EQUIVALENT ISOTROPIC RADIATED POWER

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1850.7	LTE B2/ 1.4 MHz	QPSK	-24.16	7.88	10.27	1.34	H	< 2.00	0.048	16.81
		16-QAM	-25.44	6.60	10.27	1.34	H		0.036	15.53
1880.0		QPSK	-24.71	7.42	10.29	1.36	H		0.043	16.35
		16-QAM	-26.10	6.03	10.29	1.36	H		0.031	14.96
1909.3		QPSK	-26.03	6.50	10.31	1.37	H		0.035	15.44
		16-QAM	-27.67	4.86	10.31	1.37	H		0.024	13.80

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1851.5	LTE B2/ 3 MHz	QPSK	-24.18	7.86	10.27	1.34	H	< 2.00	0.048	16.79
		16-QAM	-25.74	6.30	10.27	1.34	H		0.033	15.23
1880.0		QPSK	-25.00	7.13	10.29	1.36	H		0.040	16.06
		16-QAM	-26.45	5.68	10.29	1.36	H		0.029	14.61
1908.5		QPSK	-25.95	6.58	10.31	1.37	H		0.036	15.52
		16-QAM	-27.49	5.04	10.31	1.37	H		0.025	13.98

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1852.5	LTE B2/ 5 MHz	QPSK	-24.15	7.89	10.27	1.34	H	< 2.00	0.048	16.82
		16-QAM	-25.56	6.48	10.27	1.34	H		0.035	15.41
1880.0		QPSK	-24.43	7.70	10.29	1.36	H		0.046	16.63
		16-QAM	-26.34	5.79	10.29	1.36	H		0.030	14.72
1907.5		QPSK	-25.79	6.74	10.31	1.37	H		0.037	15.68
		16-QAM	-27.37	5.16	10.31	1.37	H		0.026	14.10

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1855.0	LTE B2/ 10 MHz	QPSK	-23.94	8.06	10.28	1.34	H	< 2.00	0.050	16.99
		16-QAM	-25.33	6.67	10.28	1.34	H		0.036	15.60
1880.0		QPSK	-24.88	7.25	10.29	1.36	H		0.042	16.18
		16-QAM	-26.25	5.88	10.29	1.36	H		0.030	14.81
1905.0		QPSK	-25.72	6.70	10.31	1.37	H		0.037	15.64
		16-QAM	-26.56	5.86	10.31	1.37	H		0.030	14.80

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1857.5	LTE B2/ 15 MHz	QPSK	-24.03	7.93	10.28	1.34	H	< 2.00	0.049	16.87
		16-QAM	-25.58	6.38	10.28	1.34	H		0.034	15.32
1880.0		QPSK	-24.58	7.55	10.29	1.36	H		0.044	16.48
		16-QAM	-26.23	5.90	10.29	1.36	H		0.030	14.83
1902.5		QPSK	-25.65	6.66	10.31	1.36	H		0.036	15.61
		16-QAM	-27.28	5.03	10.31	1.36	H		0.025	13.98

Freq (MHz)	Mod/ Bandwidth	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain(dBi)	C.L	Pol	Limit	EIRP	
								W	W	dBm
1860.0	LTE B2/ 20 MHz	QPSK	-23.93	8.03	10.28	1.34	H	< 2.00	0.050	16.97
		16-QAM	-25.86	6.10	10.28	1.34	H		0.032	15.04
1880.0		QPSK	-24.51	7.62	10.29	1.36	H		0.045	16.55
		16-QAM	-26.00	6.13	10.29	1.36	H		0.032	15.06
1900.0		QPSK	-25.18	7.13	10.31	1.36	H		0.041	16.08
		16-QAM	-26.89	5.42	10.31	1.36	H		0.027	14.37

8.2 RADIATED SPURIOUS EMISSIONS

▣ OPERATING FREQUENTY: 1850.7 MHz

▣ MEASURED OUTPUT POWER: 16.81 dBm = 0.048 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 1.4 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 29.81 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
18607 (1850.7)	3,701.40	-48.37	12.51	-55.17	1.98	H	-44.64	61.45
	5,552.10	-52.06	13.62	-53.34	2.72	H	-42.44	59.25
	7,402.80	-54.63	11.50	-49.62	2.92	V	-41.04	57.85
18900 (1880.0)	3,760.00	-49.81	12.40	-56.25	2.00	H	-45.85	62.66
	5,640.00	-51.92	13.78	-52.75	2.70	V	-41.67	58.48
	7,520.00	-54.80	11.57	-49.59	2.93	V	-40.95	57.76
19193 (1909.3)	3,818.60	-51.16	12.52	-57.40	2.05	H	-46.93	63.74
	5,727.90	-50.67	13.69	-50.62	2.72	H	-39.65	56.46
	7,637.20	-55.40	11.99	-50.60	2.93	V	-41.54	58.35

▣ OPERATING FREQUENTY: 1851.5 MHz

▣ MEASURED OUTPUT POWER: 16.79 dBm = 0.048 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 3 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 29.79 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
18615 (1851.5)	3,703.00	-47.38	12.51	-54.18	1.98	H	-43.65	60.44
	5,554.50	-55.37	13.63	-56.63	2.72	H	-45.72	62.51
	7,406.00	-56.69	11.50	-51.54	2.93	H	-42.97	59.76
18900 (1880.0)	3,760.00	-49.37	12.40	-55.81	2.00	H	-45.41	62.20
	5,640.00	-54.40	13.78	-55.23	2.70	H	-44.15	60.94
	7,520.00	-57.30	11.57	-52.09	2.93	H	-43.45	60.24
19185 (1908.5)	3,817.00	-53.64	12.52	-59.88	2.05	H	-49.41	66.20
	5,725.50	-51.79	13.70	-51.61	2.72	H	-40.64	57.43
	7,634.00	-56.38	11.97	-51.57	2.96	H	-42.56	59.35

▣ OPERATING FREQUENTY: 1852.5 MHz

▣ MEASURED OUTPUT POWER: 16.82 dBm = 0.048 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 29.82 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
18625 (1852.5)	3,705.00	-47.14	12.50	-53.77	2.00	H	-43.26	60.08
	5,557.50	-54.92	13.64	-56.16	2.71	H	-45.23	62.05
	7,410.00	-55.57	11.50	-50.28	2.93	H	-41.71	58.53
18900 (1880.0)	3,760.00	-49.16	12.40	-55.60	2.00	H	-45.20	62.02
	5,640.00	-54.90	13.78	-55.73	2.70	H	-44.65	61.47
	7,520.00	-57.56	11.57	-52.35	2.93	H	-43.71	60.53
19175 (1907.5)	3,815.00	-54.07	12.52	-60.44	2.06	H	-49.97	66.79
	5,722.50	-52.85	13.70	-52.54	2.72	H	-41.56	58.38
	7,630.00	-56.30	11.95	-51.49	2.98	H	-42.52	59.33

▣ OPERATING FREQUENTY: 1855.00 MHz

▣ MEASURED OUTPUT POWER: 16.99 dBm = 0.050 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 29.99 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
18650 (1855.0)	3,710.00	-48.17	12.49	-54.63	2.01	H	-44.15	61.14
	5,565.00	-54.39	13.65	-55.67	2.71	H	-44.73	61.72
	7,420.00	-55.47	11.51	-50.09	2.94	H	-41.52	58.52
18900 (1880.0)	3,760.00	-48.67	12.40	-55.11	2.00	H	-44.71	61.70
	5,640.00	-56.30	13.78	-57.13	2.70	H	-46.05	63.04
	7,520.00	-57.39	11.57	-52.18	2.93	H	-43.54	60.54
19150 (1905.0)	3,810.00	-49.83	12.52	-56.33	2.06	H	-45.87	62.86
	5,715.00	-53.32	13.70	-53.14	2.72	H	-42.16	59.15
	7,620.00	-57.18	11.90	-52.38	2.94	H	-43.42	60.41

▣ OPERATING FREQUENTY: 1857.5 MHz

▣ MEASURED OUTPUT POWER: 16.87 dBm = 0.049 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 29.87 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
18675 (1857.5)	3,715.00	-49.27	12.49	-55.92	2.02	H	-45.45	62.32
	5,572.50	-54.96	13.66	-56.28	2.71	H	-45.33	62.19
	7,430.00	-57.97	11.51	-52.75	2.94	H	-44.18	61.05
18900 (1880.0)	3,760.00	-46.45	12.40	-52.89	2.00	H	-42.49	59.36
	5,640.00	-56.82	13.78	-57.65	2.70	H	-46.57	63.44
	7,520.00	-56.99	11.57	-51.78	2.93	H	-43.14	60.01
19125 (1902.5)	3,805.00	-50.55	12.52	-56.79	2.09	H	-46.36	63.23
	5,707.50	-53.17	13.70	-53.12	2.72	H	-42.14	59.01
	7,610.00	-56.67	11.87	-51.65	3.00	H	-42.78	59.65

▣ OPERATING FREQUENTY: 1860.0 MHz

▣ MEASURED OUTPUT POWER: 16.97 dBm = 0.050 W

▣ MOD: LTE B2

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 log_{10} (W) = 29.97 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	dBc
18700 (1860.0)	3,720.00	-49.05	12.48	-55.89	2.03	H	-45.44	62.40
	5,580.00	-53.03	13.69	-54.09	2.69	H	-43.09	60.06
	7,440.00	-56.94	11.52	-51.85	2.89	H	-43.22	60.19
18900 (1880.0)	3,760.00	-49.29	12.40	-55.73	2.00	H	-45.33	62.30
	5,640.00	-56.03	13.78	-56.86	2.70	H	-45.78	62.75
	7,520.00	-57.30	11.57	-52.09	2.93	H	-43.45	60.42
19100 (1900.0)	3,800.00	-51.47	12.52	-57.46	2.12	H	-47.06	64.03
	5,700.00	-50.94	13.71	-51.27	2.74	H	-40.30	57.27
	7,600.00	-58.19	11.85	-52.92	2.90	H	-43.97	60.94

8.3 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
2	1.4 MHz	1880.0	QPSK	6	0	4.54
			16-QAM	6	0	5.31
	3 MHz		QPSK	15	0	4.73
			16-QAM	15	0	5.46
	5 MHz		QPSK	25	0	4.73
			16-QAM	25	0	5.52
	10 MHz		QPSK	50	0	4.69
			16-QAM	50	0	5.47
	15 MHz		QPSK	75	0	4.71
			16-QAM	75	0	5.50
	20 MHz		QPSK	100	0	4.80
			16-QAM	100	0	5.59

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 65 ~ 76.

8.4 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
2	1.4 MHz	1880.0	QPSK	6	0	1.0968
			16-QAM	6	0	1.0968
	3 MHz		QPSK	15	0	2.7109
			16-QAM	15	0	2.7018
	5 MHz		QPSK	25	0	4.5169
			16-QAM	25	0	4.5128
	10 MHz		QPSK	50	0	8.9652
			16-QAM	50	0	8.9744
	15 MHz		QPSK	75	0	13.423
			16-QAM	75	0	13.472
	20 MHz		QPSK	100	0	17.990
			16-QAM	100	0	17.888

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 53 ~ 64.

8.5 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
2	1.4	1850.7	3.7010	27.976	-75.297	-47.321	-13.00
		1880.0	7.5190	28.591	-75.645	-47.054	
		1909.3	3.8201	27.976	-73.204	-45.228	
	3	1851.5	3.7010	27.976	-76.538	-48.562	
		1880.0	7.5155	28.591	-76.351	-47.760	
		1908.5	3.8201	27.976	-75.617	-47.641	
	5	1852.5	3.7010	27.976	-76.599	-48.623	
		1880.0	7.5120	28.591	-76.546	-47.955	
		1907.5	3.8201	27.976	-75.711	-47.735	
	10	1855.0	3.7015	27.976	-76.405	-48.429	
		1880.0	7.5030	28.591	-75.949	-47.358	
		1905.0	3.8196	27.976	-74.264	-46.288	
	15	1857.5	3.7024	27.976	-75.613	-47.637	
		1880.0	3.7010	27.976	-77.061	-49.085	
		1902.5	3.8186	27.976	-73.863	-45.887	
	20	1860.0	3.7134	27.976	-77.163	-49.187	
		1880.0	3.7024	27.976	-77.268	-49.292	
		1900.0	3.8186	27.976	-74.214	-46.238	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 113 ~ 148.
2. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0
3. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
4. Factor(dB) = Cable Loss + Attenuator + Power Splitter

Frequency Range (GHz)	Factor [dB]
0.03 – 1	25.270
1 – 5	27.976
5 – 10	28.591
10 – 15	29.116
15 – 20	29.489
Above 20	30.131

8.6 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 77 ~ 112.

8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: LTE B2

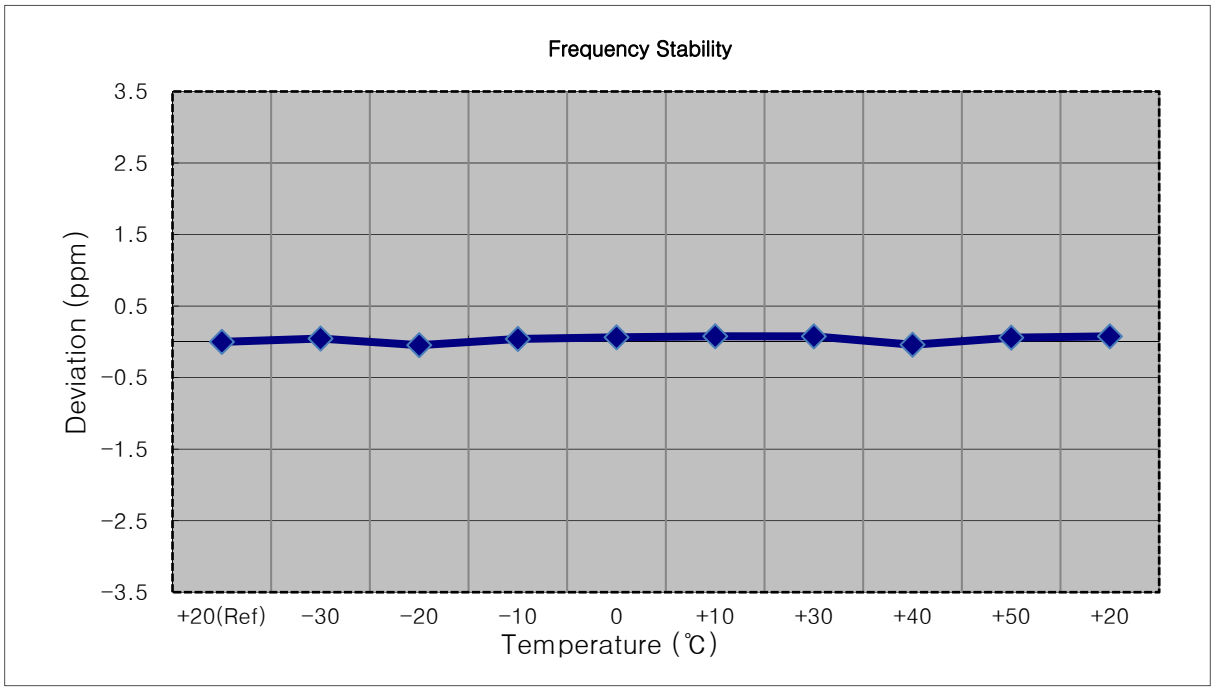
▣ OPERATING FREQUENCY: 1850,700,000 Hz

▣ CHANNEL: 18607 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1850 700 141	0.0	0.000 000	0.000
100%		-30	1850 700 226	85.5	0.000 005	0.046
100%		-20	1850 700 055	-86.0	-0.000 005	-0.046
100%		-10	1850 700 217	76.4	0.000 004	0.041
100%		0	1850 700 258	117.3	0.000 006	0.063
100%		+10	1850 700 284	143.2	0.000 008	0.077
100%		+30	1850 700 283	142.4	0.000 008	0.077
100%		+40	1850 700 066	-74.5	-0.000 004	-0.040
100%		+50	1850 700 250	109.2	0.000 006	0.059
Batt. Endpoint	3.400	+20	1850 700 282	141.6	0.000 008	0.077



▣ MODE: LTE B2

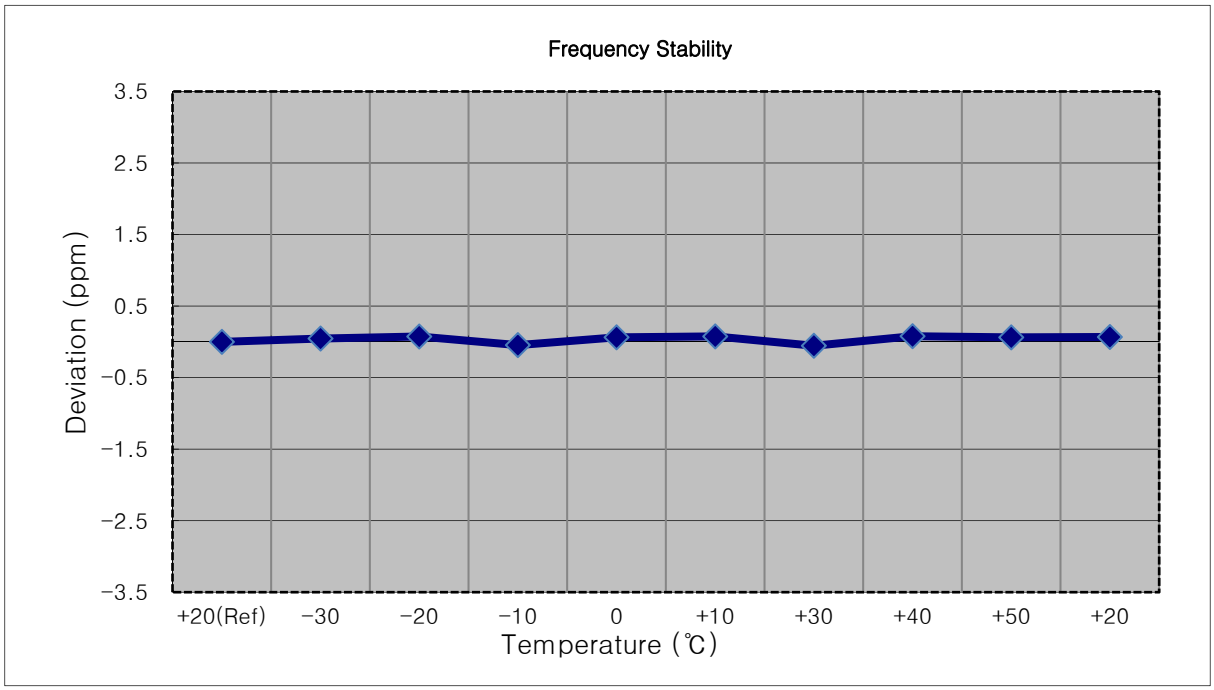
▣ OPERATING FREQUENCY: 1851,500,000 Hz

▣ CHANNEL: 18615 (3 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1851 500 132	0.0	0.000 000	0.000
100%		-30	1851 500 218	86.1	0.000 005	0.047
100%		-20	1851 500 270	137.6	0.000 007	0.074
100%		-10	1851 500 049	-83.6	-0.000 005	-0.045
100%		0	1851 500 250	117.8	0.000 006	0.064
100%		+10	1851 500 272	140.2	0.000 008	0.076
100%		+30	1851 500 031	-101.4	-0.000 005	-0.055
100%		+40	1851 500 279	146.4	0.000 008	0.079
100%		+50	1851 500 248	116.2	0.000 006	0.063
Batt. Endpoint	3.400	+20	1851 500 258	125.9	0.000 007	0.068



▣ MODE: LTE B2

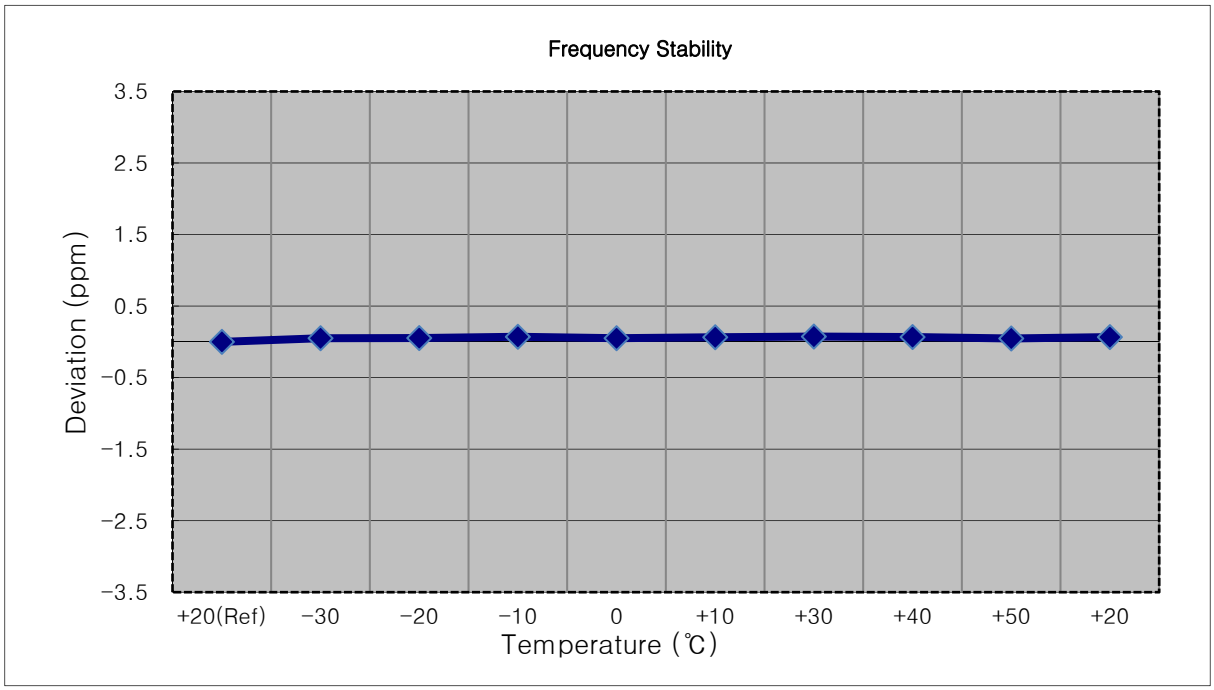
▣ OPERATING FREQUENCY: 1852,500,000 Hz

▣ CHANNEL: 18625 (5 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1852 500 099	0.0	0.000 000	0.000
100%		-30	1852 500 193	94.1	0.000 005	0.051
100%		-20	1852 500 197	98.1	0.000 005	0.053
100%		-10	1852 500 230	131.4	0.000 007	0.071
100%		0	1852 500 192	93.4	0.000 005	0.050
100%		+10	1852 500 218	119.1	0.000 006	0.064
100%		+30	1852 500 235	136.4	0.000 007	0.074
100%		+40	1852 500 222	123.7	0.000 007	0.067
100%		+50	1852 500 186	87.5	0.000 005	0.047
Batt. Endpoint	3.400	+20	1852 500 222	123.0	0.000 007	0.066



▣ MODE: LTE B2

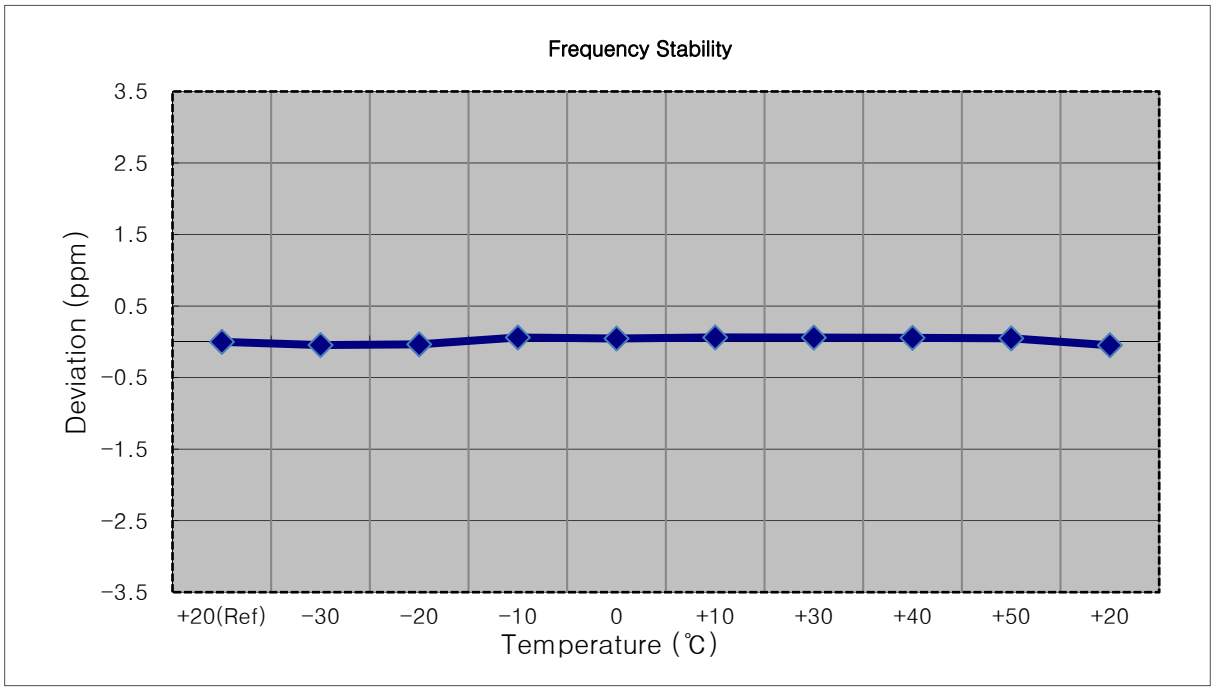
▣ OPERATING FREQUENCY: 1855,000,000 Hz

▣ CHANNEL: 18650 (10 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1855 000 113	0.0	0.000 000	0.000
100%		-30	1855 000 030	-82.7	-0.000 004	-0.045
100%		-20	1855 000 048	-64.5	-0.000 003	-0.035
100%		-10	1855 000 226	113.5	0.000 006	0.061
100%		0	1855 000 198	85.1	0.000 005	0.046
100%		+10	1855 000 227	114.3	0.000 006	0.062
100%		+30	1855 000 223	110.1	0.000 006	0.059
100%		+40	1855 000 216	103.8	0.000 006	0.056
100%		+50	1855 000 204	91.5	0.000 005	0.049
Batt. Endpoint	3.400	+20	1855 000 025	-88.0	-0.000 005	-0.047



▣ MODE: LTE B2

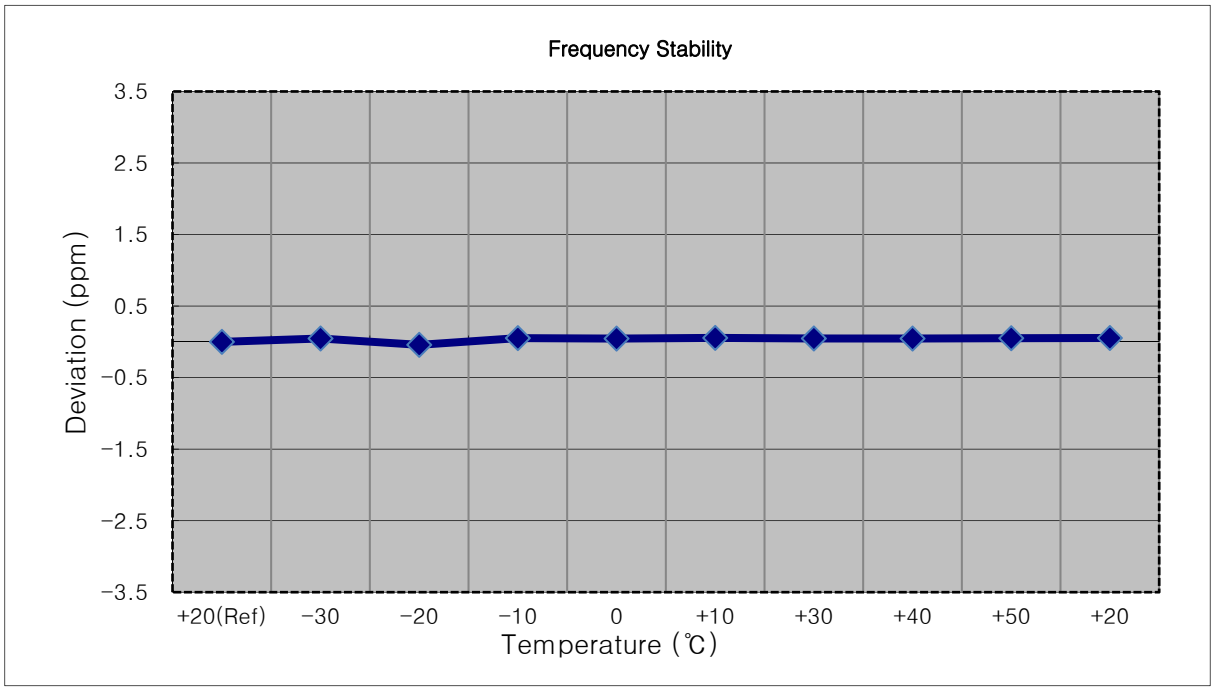
▣ OPERATING FREQUENCY: 1857,500,000 Hz

▣ CHANNEL: 18675 (15 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1857 499 932	0.0	0.000 000	0.000
100%		-30	1857 500 019	87.5	0.000 005	0.047
100%		-20	1857 499 855	-77.3	-0.000 004	-0.042
100%		-10	1857 500 029	97.0	0.000 005	0.052
100%		0	1857 500 016	84.2	0.000 005	0.045
100%		+10	1857 500 035	103.0	0.000 006	0.055
100%		+30	1857 500 019	86.6	0.000 005	0.047
100%		+40	1857 500 018	86.2	0.000 005	0.046
100%		+50	1857 500 027	94.8	0.000 005	0.051
Batt. Endpoint	3.400	+20	1857 500 031	99.5	0.000 005	0.054



▣ MODE: LTE B2

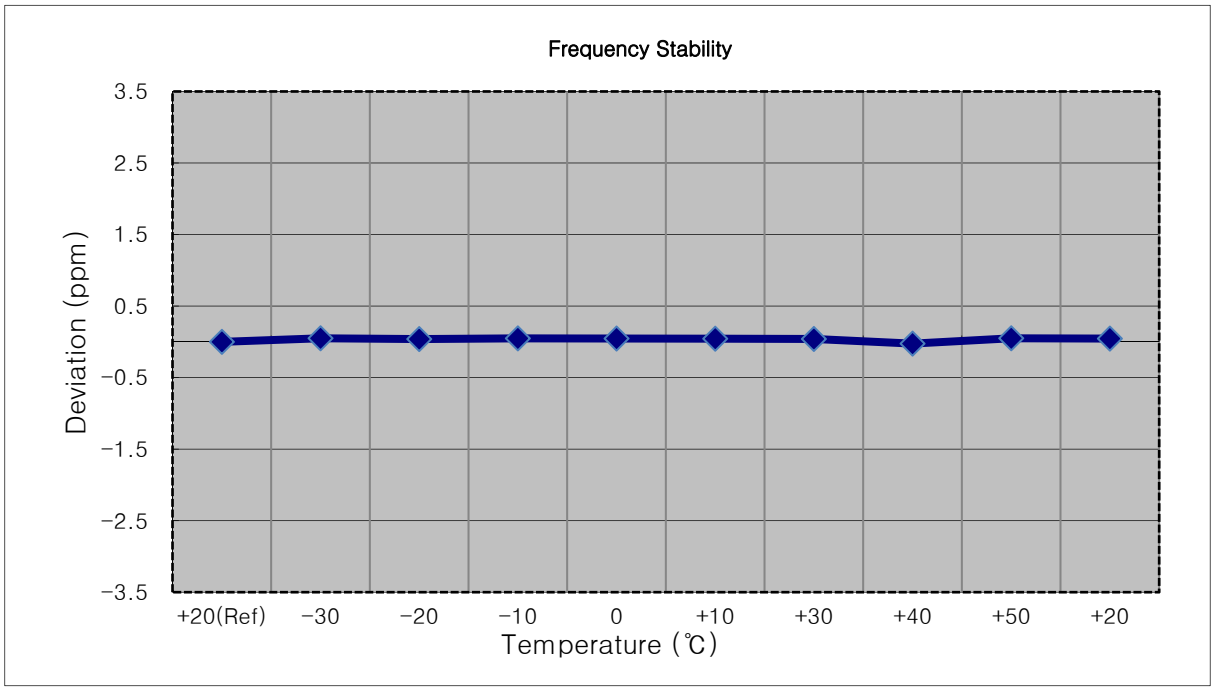
▣ OPERATING FREQUENCY: 1860,000,000 Hz

▣ CHANNEL: 18700 (20 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1860 000 090	0.0	0.000 000	0.000
100%		-30	1860 000 183	93.5	0.000 005	0.050
100%		-20	1860 000 161	71.6	0.000 004	0.038
100%		-10	1860 000 179	89.5	0.000 005	0.048
100%		0	1860 000 176	85.7	0.000 005	0.046
100%		+10	1860 000 171	81.1	0.000 004	0.044
100%		+30	1860 000 165	75.1	0.000 004	0.040
100%		+40	1860 000 044	-45.4	-0.000 002	-0.024
100%		+50	1860 000 183	93.2	0.000 005	0.050
Batt. Endpoint	3.400	+20	1860 000 175	84.8	0.000 005	0.046



▣ MODE: LTE B2

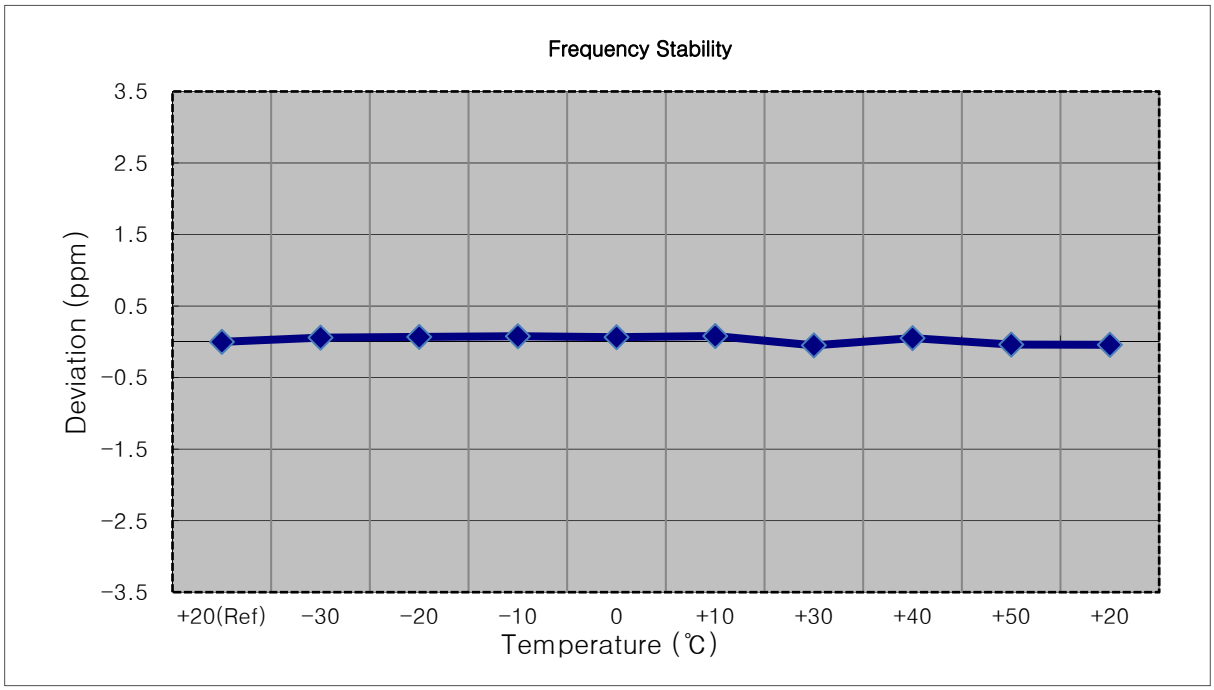
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1880 000 152	0.0	0.000 000	0.000
100%		-30	1880 000 263	110.9	0.000 006	0.059
100%		-20	1880 000 281	129.0	0.000 007	0.069
100%		-10	1880 000 299	146.8	0.000 008	0.078
100%		0	1880 000 275	122.4	0.000 007	0.065
100%		+10	1880 000 305	153.1	0.000 008	0.081
100%		+30	1880 000 060	-92.3	-0.000 005	-0.049
100%		+40	1880 000 250	97.6	0.000 005	0.052
100%		+50	1880 000 081	-71.0	-0.000 004	-0.038
Batt. Endpoint	3.400	+20	1880 000 075	-77.6	-0.000 004	-0.041



▣ MODE: LTE B2

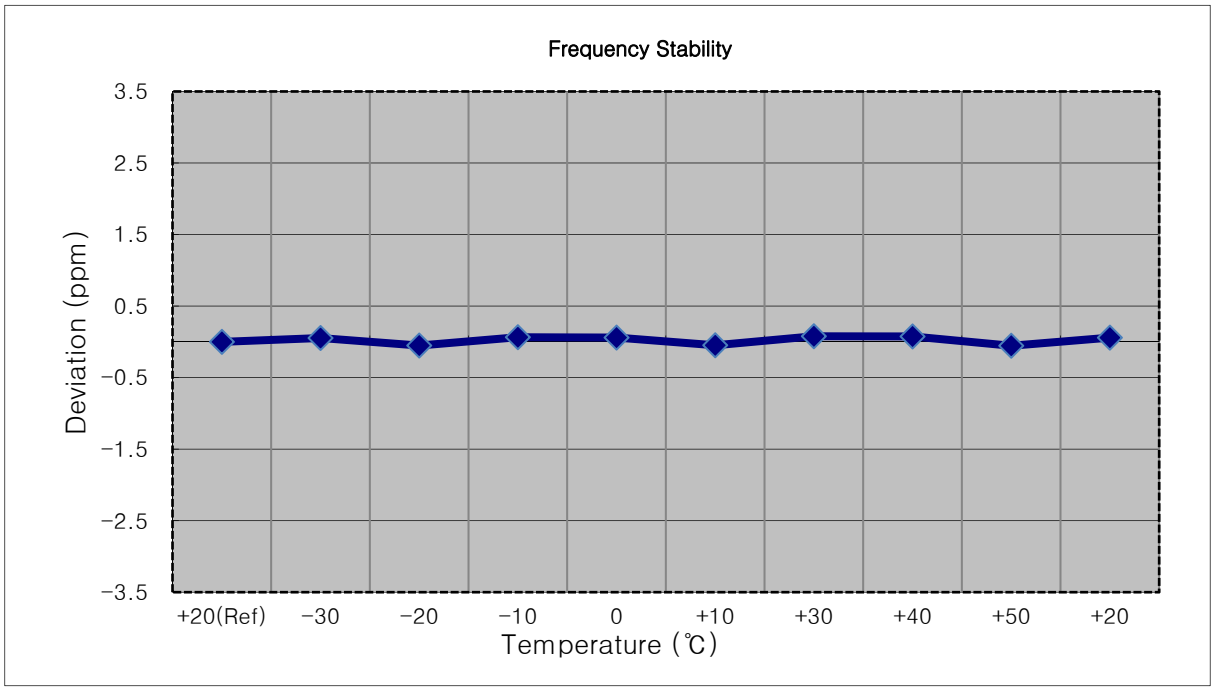
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (3 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1880 000 139	0.0	0.000 000	0.000
100%		-30	1880 000 239	100.2	0.000 005	0.053
100%		-20	1880 000 042	-96.3	-0.000 005	-0.051
100%		-10	1880 000 261	122.1	0.000 006	0.065
100%		0	1880 000 251	112.2	0.000 006	0.060
100%		+10	1880 000 049	-89.7	-0.000 005	-0.048
100%		+30	1880 000 285	146.5	0.000 008	0.078
100%		+40	1880 000 280	141.0	0.000 007	0.075
100%		+50	1880 000 036	-102.4	-0.000 005	-0.054
Batt. Endpoint	3.400	+20	1880 000 249	110.7	0.000 006	0.059



▣ MODE: LTE B2

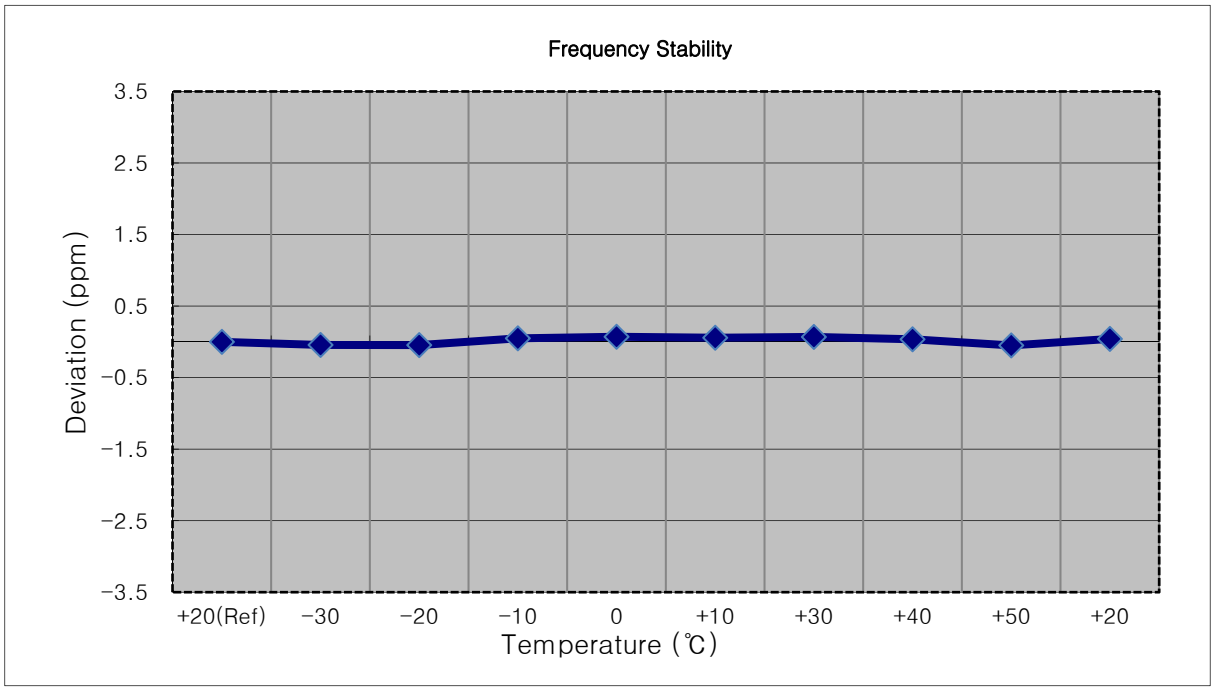
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (5 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1880 000 109	0.0	0.000 000	0.000
100%		-30	1880 000 028	-81.1	-0.000 004	-0.043
100%		-20	1880 000 024	-85.0	-0.000 005	-0.045
100%		-10	1880 000 202	92.5	0.000 005	0.049
100%		0	1880 000 243	133.4	0.000 007	0.071
100%		+10	1880 000 217	107.7	0.000 006	0.057
100%		+30	1880 000 238	128.9	0.000 007	0.069
100%		+40	1880 000 177	67.5	0.000 004	0.036
100%		+50	1880 000 015	-94.4	-0.000 005	-0.050
Batt. Endpoint	3.400	+20	1880 000 186	76.7	0.000 004	0.041



▣ MODE: LTE B2

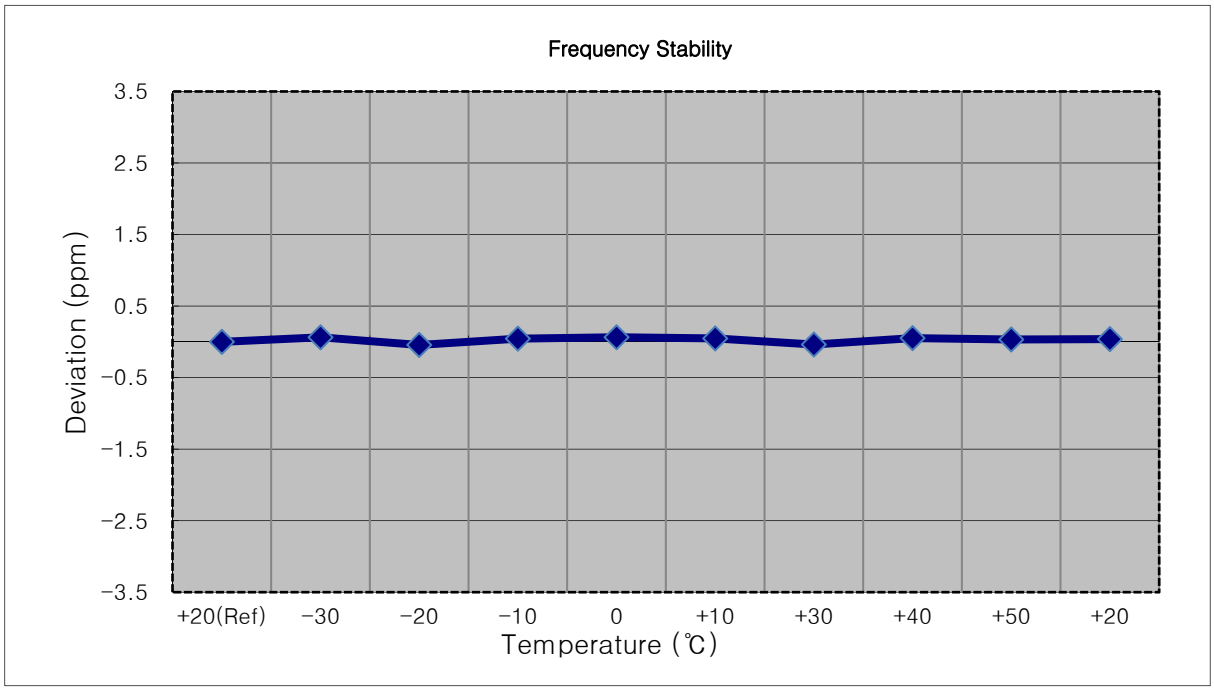
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (10 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1879 999 914	0.0	0.000 000	0.000
100%		-30	1880 000 033	118.5	0.000 006	0.063
100%		-20	1879 999 833	-81.4	-0.000 004	-0.043
100%		-10	1879 999 999	84.7	0.000 005	0.045
100%		0	1880 000 035	120.9	0.000 006	0.064
100%		+10	1880 000 004	89.5	0.000 005	0.048
100%		+30	1879 999 844	-70.2	-0.000 004	-0.037
100%		+40	1880 000 012	98.0	0.000 005	0.052
100%		+50	1879 999 976	62.0	0.000 003	0.033
Batt. Endpoint	3.400	+20	1879 999 986	71.7	0.000 004	0.038



▣ MODE: LTE B2

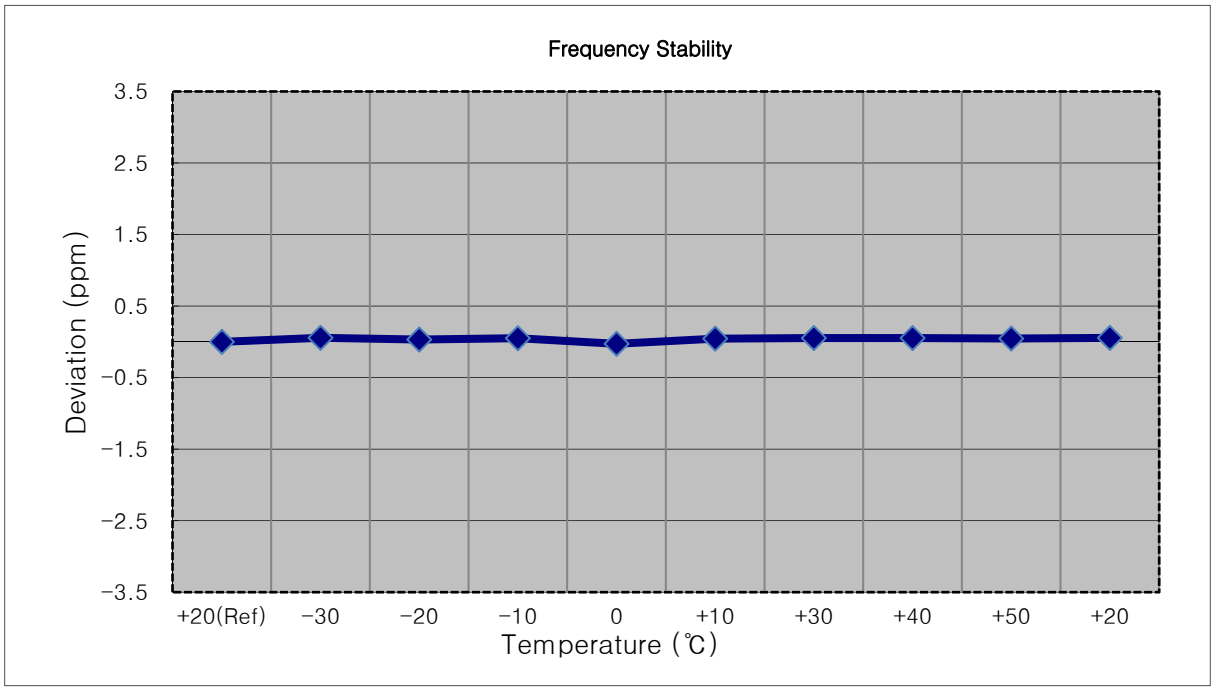
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (15 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1880 000 104	0.0	0.000 000	0.000
100%		-30	1880 000 210	105.9	0.000 006	0.056
100%		-20	1880 000 164	60.4	0.000 003	0.032
100%		-10	1880 000 199	95.4	0.000 005	0.051
100%		0	1880 000 052	-52.3	-0.000 003	-0.028
100%		+10	1880 000 188	84.0	0.000 004	0.045
100%		+30	1880 000 204	99.9	0.000 005	0.053
100%		+40	1880 000 204	99.5	0.000 005	0.053
100%		+50	1880 000 191	87.3	0.000 005	0.046
Batt. Endpoint	3.400	+20	1880 000 208	104.3	0.000 006	0.055



▣ MODE: LTE B2

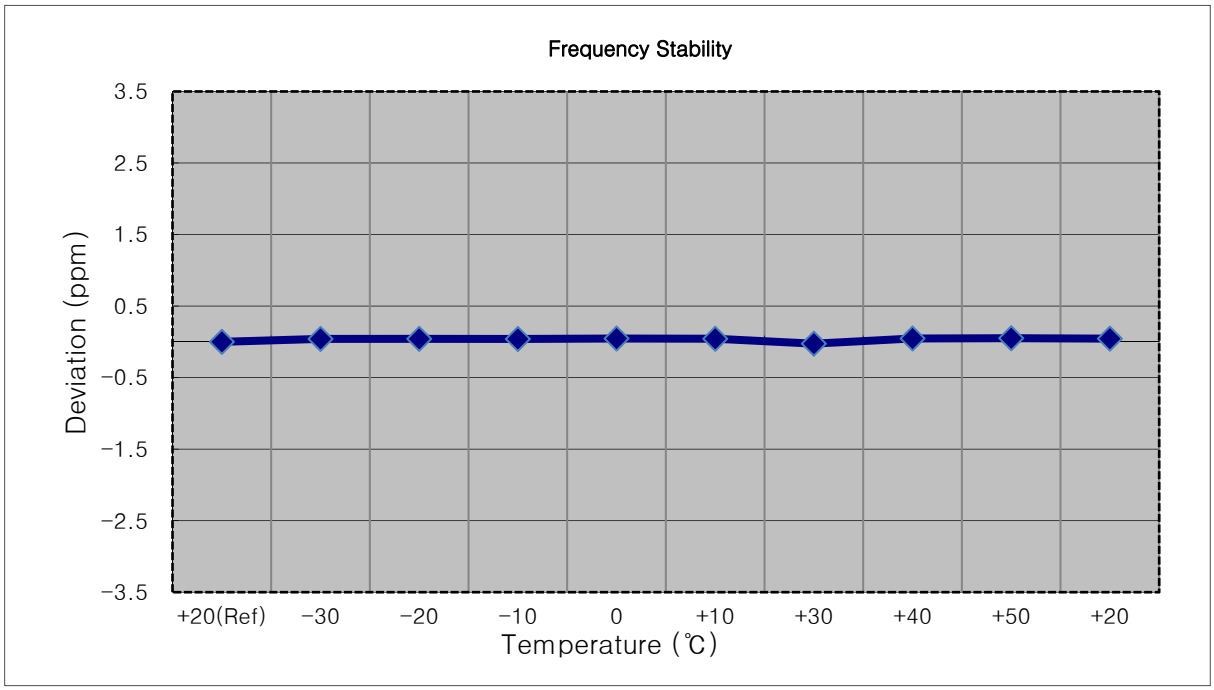
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 18900 (20 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1880 000 087	0.0	0.000 000	0.000
100%		-30	1880 000 164	77.4	0.000 004	0.041
100%		-20	1880 000 166	78.9	0.000 004	0.042
100%		-10	1880 000 163	76.3	0.000 004	0.041
100%		0	1880 000 174	86.9	0.000 005	0.046
100%		+10	1880 000 168	80.8	0.000 004	0.043
100%		+30	1880 000 039	-47.5	-0.000 003	-0.025
100%		+40	1880 000 175	87.9	0.000 005	0.047
100%		+50	1880 000 182	94.9	0.000 005	0.050
Batt. Endpoint	3.400	+20	1880 000 170	83.4	0.000 004	0.044



▣ MODE: LTE B2

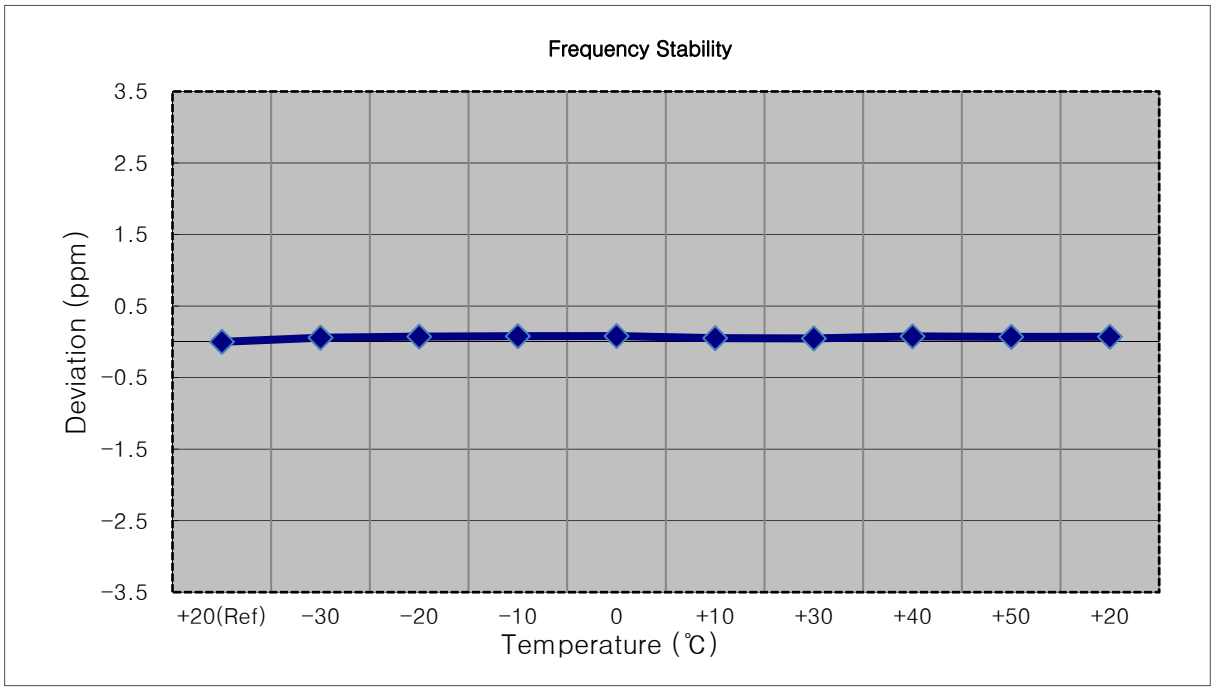
▣ OPERATING FREQUENCY: 1909,300,000 Hz

▣ CHANNEL: 19193 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1909 299 911	0.0	0.000 000	0.000
100%		-30	1909 300 022	110.4	0.000 006	0.058
100%		-20	1909 300 051	139.4	0.000 007	0.073
100%		-10	1909 300 062	151.3	0.000 008	0.079
100%		0	1909 300 065	153.7	0.000 008	0.081
100%		+10	1909 300 009	98.0	0.000 005	0.051
100%		+30	1909 300 002	91.3	0.000 005	0.048
100%		+40	1909 300 057	145.5	0.000 008	0.076
100%		+50	1909 300 043	131.9	0.000 007	0.069
Batt. Endpoint	3.400	+20	1909 300 046	134.8	0.000 007	0.071



▣ MODE: LTE B2

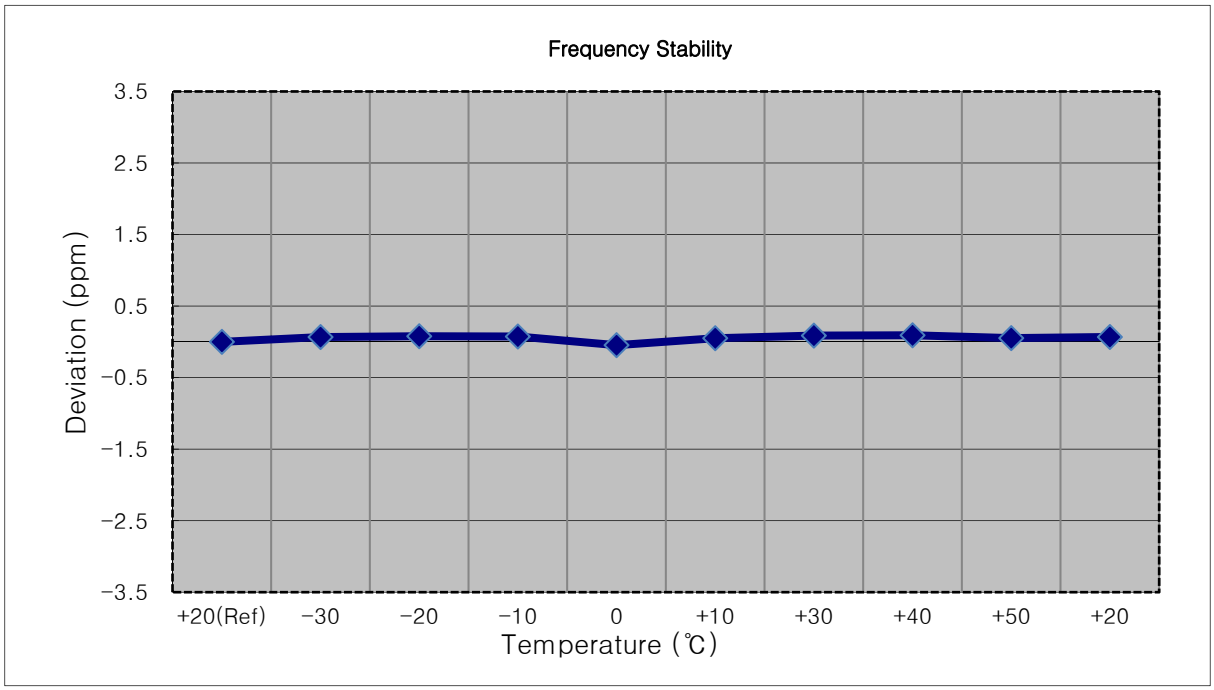
▣ OPERATING FREQUENCY: 1908,500,000 Hz

▣ CHANNEL: 19185 (3 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1908 500 161	0.0	0.000 000	0.000
100%		-30	1908 500 290	128.4	0.000 007	0.067
100%		-20	1908 500 311	149.7	0.000 008	0.078
100%		-10	1908 500 304	142.9	0.000 007	0.075
100%		0	1908 500 072	-88.9	-0.000 005	-0.047
100%		+10	1908 500 258	97.0	0.000 005	0.051
100%		+30	1908 500 328	167.0	0.000 009	0.088
100%		+40	1908 500 336	175.1	0.000 009	0.092
100%		+50	1908 500 261	99.4	0.000 005	0.052
Batt. Endpoint	3.400	+20	1908 500 290	129.3	0.000 007	0.068



▣ MODE: LTE B2

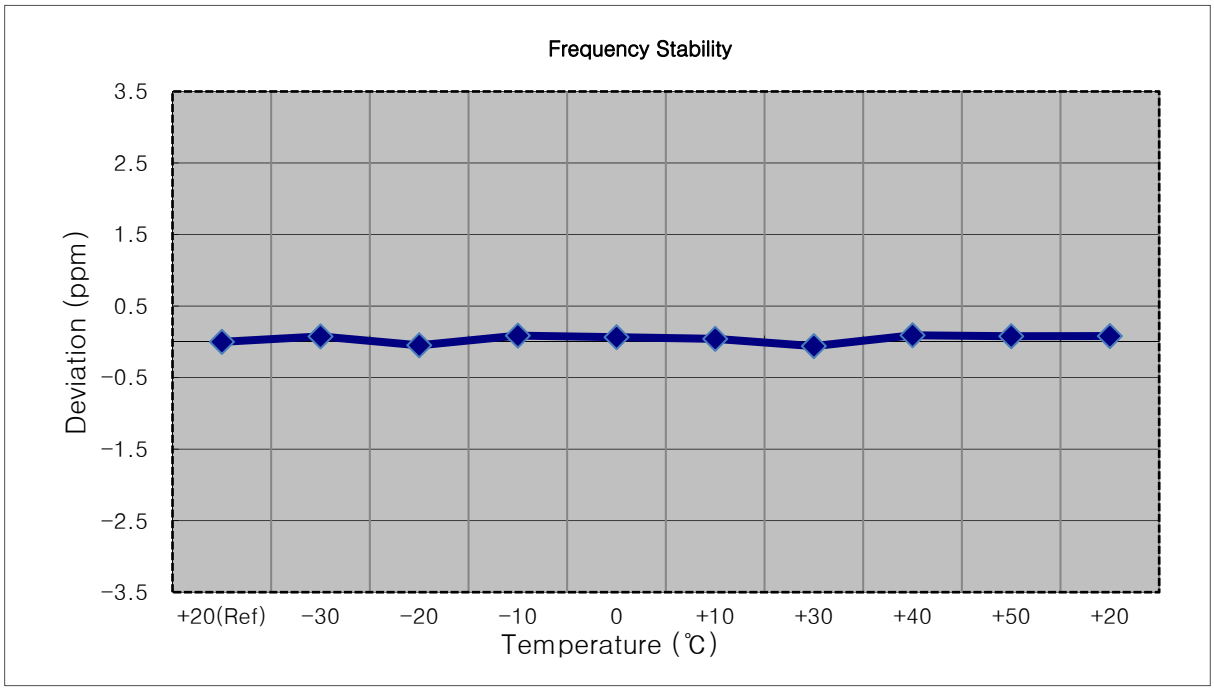
▣ OPERATING FREQUENCY: 1907,500,000 Hz

▣ CHANNEL: 19175 (5 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1907 500 171	0.0	0.000 000	0.000
100%		-30	1907 500 317	145.6	0.000 008	0.076
100%		-20	1907 500 079	-92.6	-0.000 005	-0.049
100%		-10	1907 500 338	167.0	0.000 009	0.088
100%		0	1907 500 295	123.4	0.000 006	0.065
100%		+10	1907 500 251	79.5	0.000 004	0.042
100%		+30	1907 500 058	-113.7	-0.000 006	-0.060
100%		+40	1907 500 346	174.6	0.000 009	0.092
100%		+50	1907 500 320	148.7	0.000 008	0.078
Batt. Endpoint	3.400	+20	1907 500 324	153.1	0.000 008	0.080



▣ MODE: LTE B2

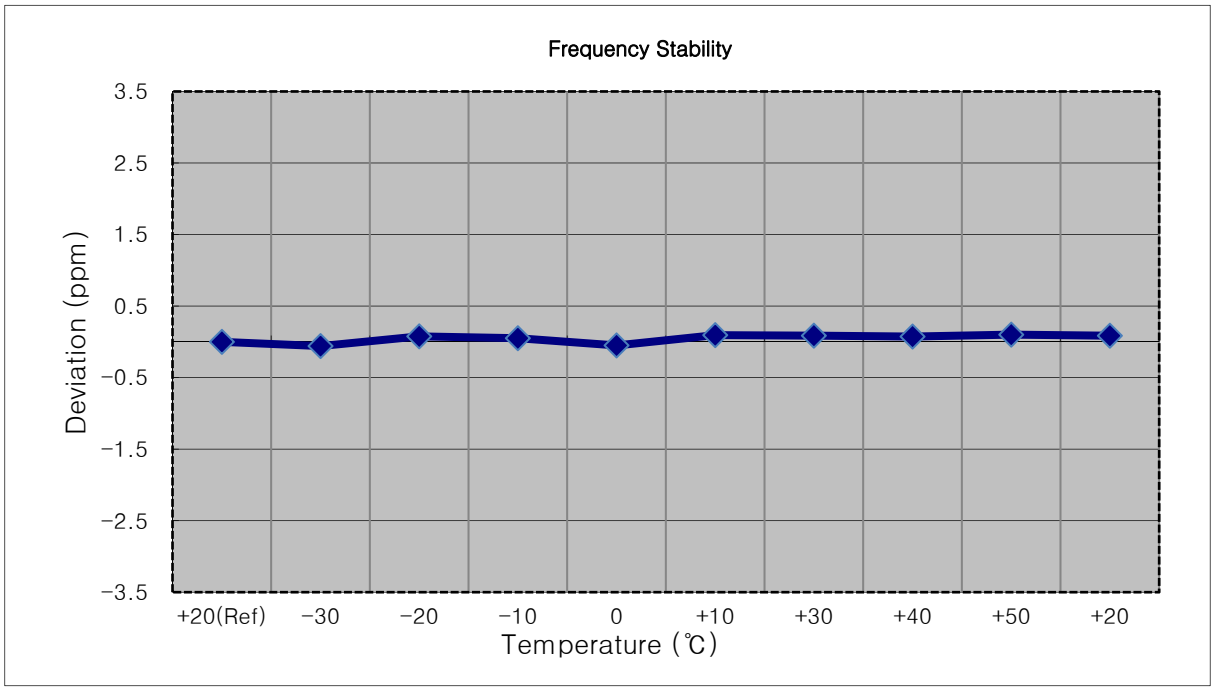
▣ OPERATING FREQUENCY: 1905,000,000 Hz

▣ CHANNEL: 19150 (10 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1905 000 132	0.0	0.000 000	0.000
100%		-30	1905 000 020	-112.3	-0.000 006	-0.059
100%		-20	1905 000 279	146.5	0.000 008	0.077
100%		-10	1905 000 229	96.4	0.000 005	0.051
100%		0	1905 000 037	-94.9	-0.000 005	-0.050
100%		+10	1905 000 312	179.5	0.000 009	0.094
100%		+30	1905 000 296	164.1	0.000 009	0.086
100%		+40	1905 000 273	140.7	0.000 007	0.074
100%		+50	1905 000 324	191.3	0.000 010	0.100
Batt. Endpoint	3.400	+20	1905 000 296	163.2	0.000 009	0.086



▣ MODE: LTE B2

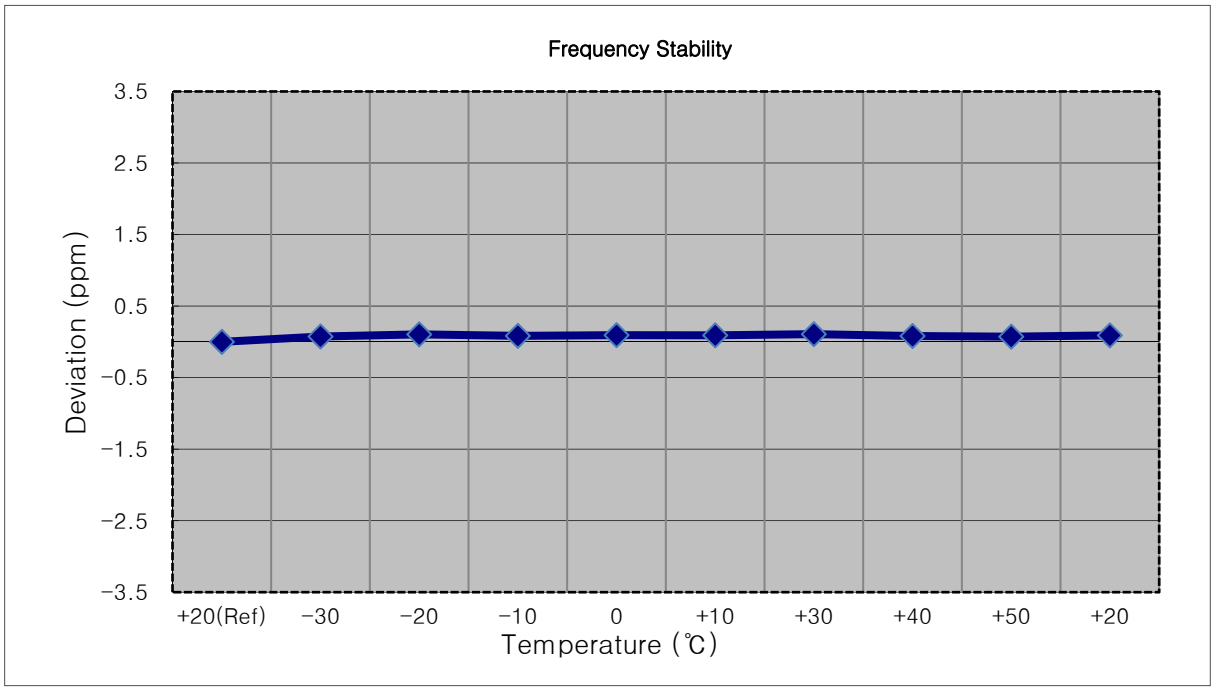
▣ OPERATING FREQUENCY: 1902,500,000 Hz

▣ CHANNEL: 19125 (15 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1902 500 188	0.0	0.000 000	0.000
100%		-30	1902 500 330	141.5	0.000 007	0.074
100%		-20	1902 500 386	198.1	0.000 010	0.104
100%		-10	1902 500 347	159.0	0.000 008	0.084
100%		0	1902 500 366	178.0	0.000 009	0.094
100%		+10	1902 500 361	172.4	0.000 009	0.091
100%		+30	1902 500 393	204.6	0.000 011	0.108
100%		+40	1902 500 342	153.9	0.000 008	0.081
100%		+50	1902 500 326	138.1	0.000 007	0.073
Batt. Endpoint	3.400	+20	1902 500 360	172.0	0.000 009	0.090



▣ MODE: LTE B2

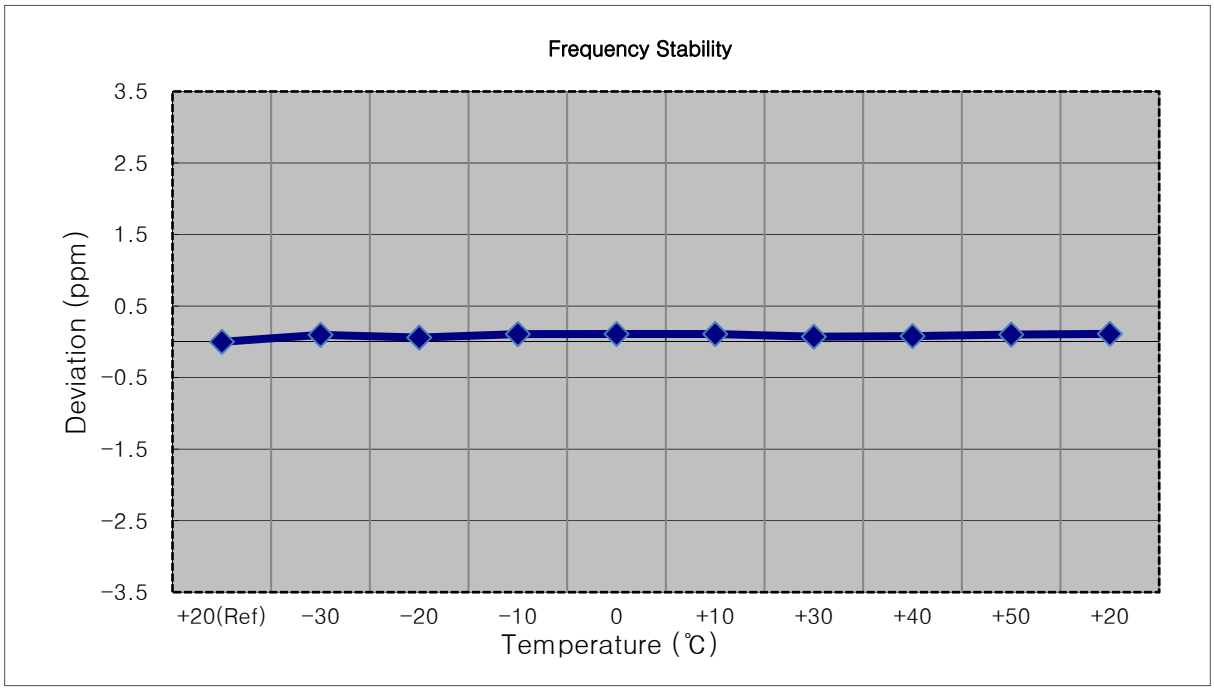
▣ OPERATING FREQUENCY: 1900,000,000 Hz

▣ CHANNEL: 19100 (20 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

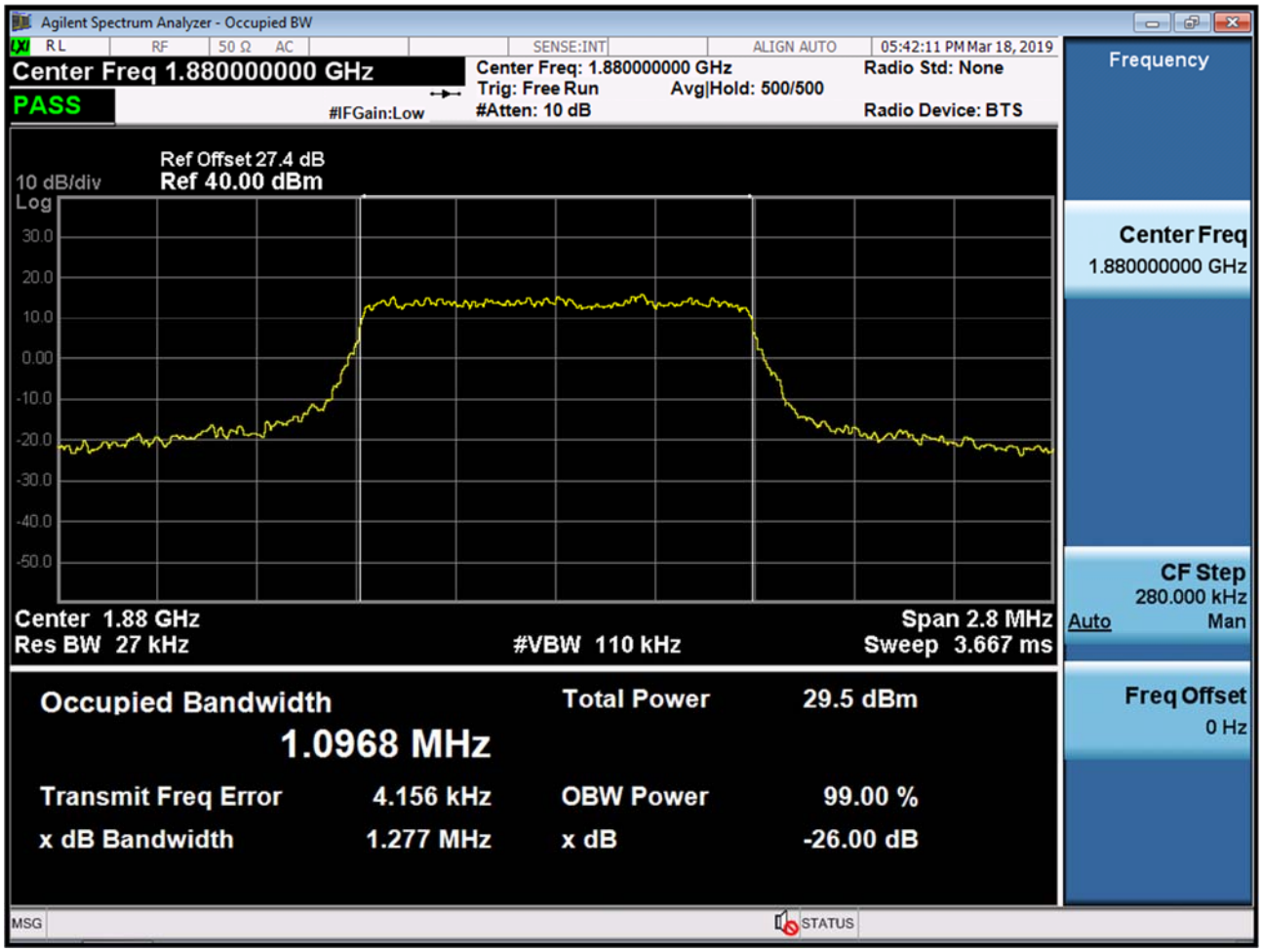
▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.850	+20(Ref)	1899 999 887	0.0	0.000 000	0.000
100%		-30	1900 000 073	186.2	0.000 010	0.098
100%		-20	1900 000 000	112.6	0.000 006	0.059
100%		-10	1900 000 092	204.8	0.000 011	0.108
100%		0	1900 000 096	208.5	0.000 011	0.110
100%		+10	1900 000 094	207.2	0.000 011	0.109
100%		+30	1900 000 023	136.1	0.000 007	0.072
100%		+40	1900 000 038	151.1	0.000 008	0.080
100%		+50	1900 000 080	192.6	0.000 010	0.101
Batt. Endpoint	3.400	+20	1900 000 098	211.1	0.000 011	0.111

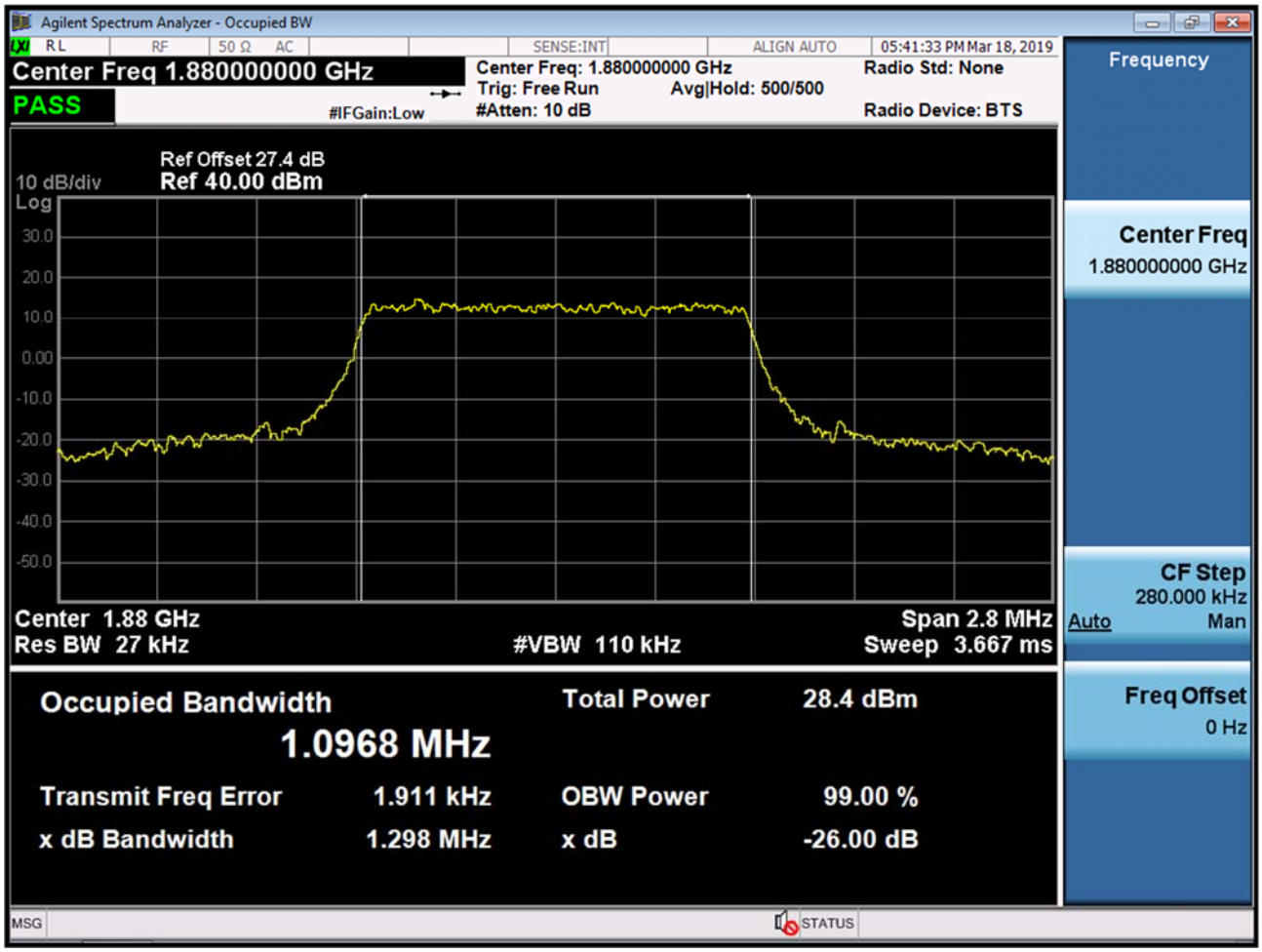


9. TEST PLOTS

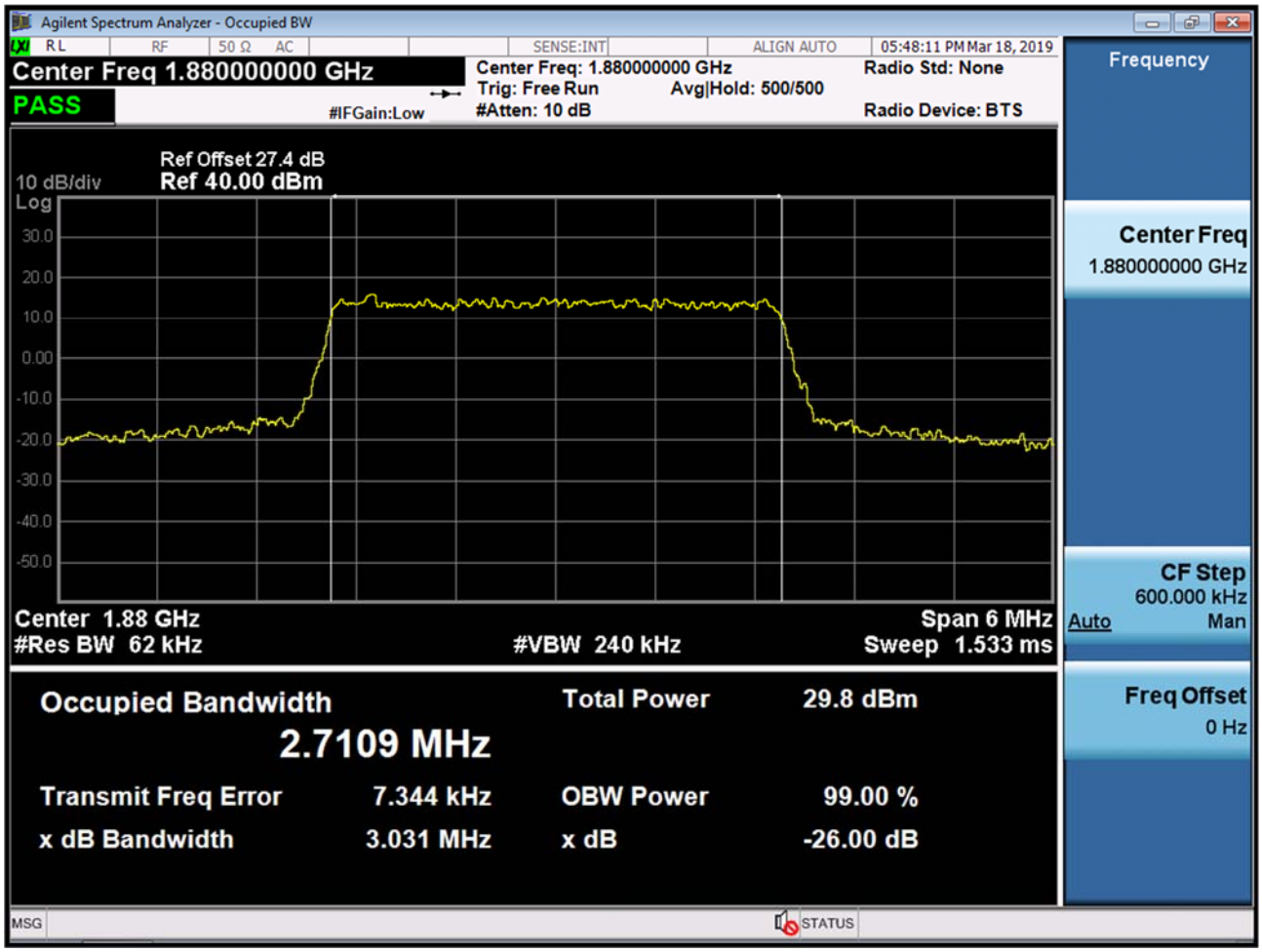
BAND 2. Occupied Bandwidth Plot (1.4M BW Ch.18900 QPSK RB 6_0)



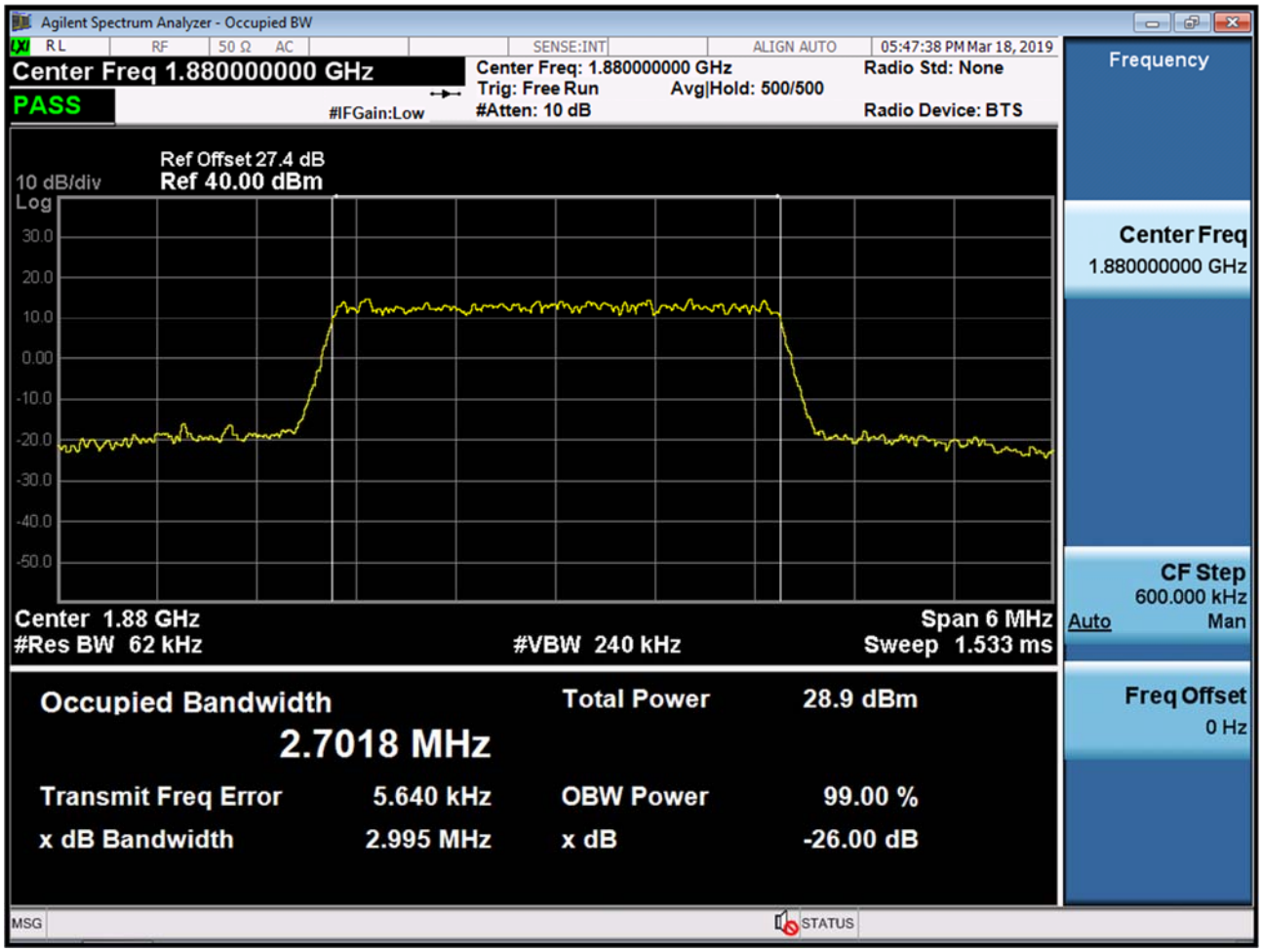
BAND 2. Occupied Bandwidth Plot (1.4M BW Ch.18900 16QAM RB 6_0)



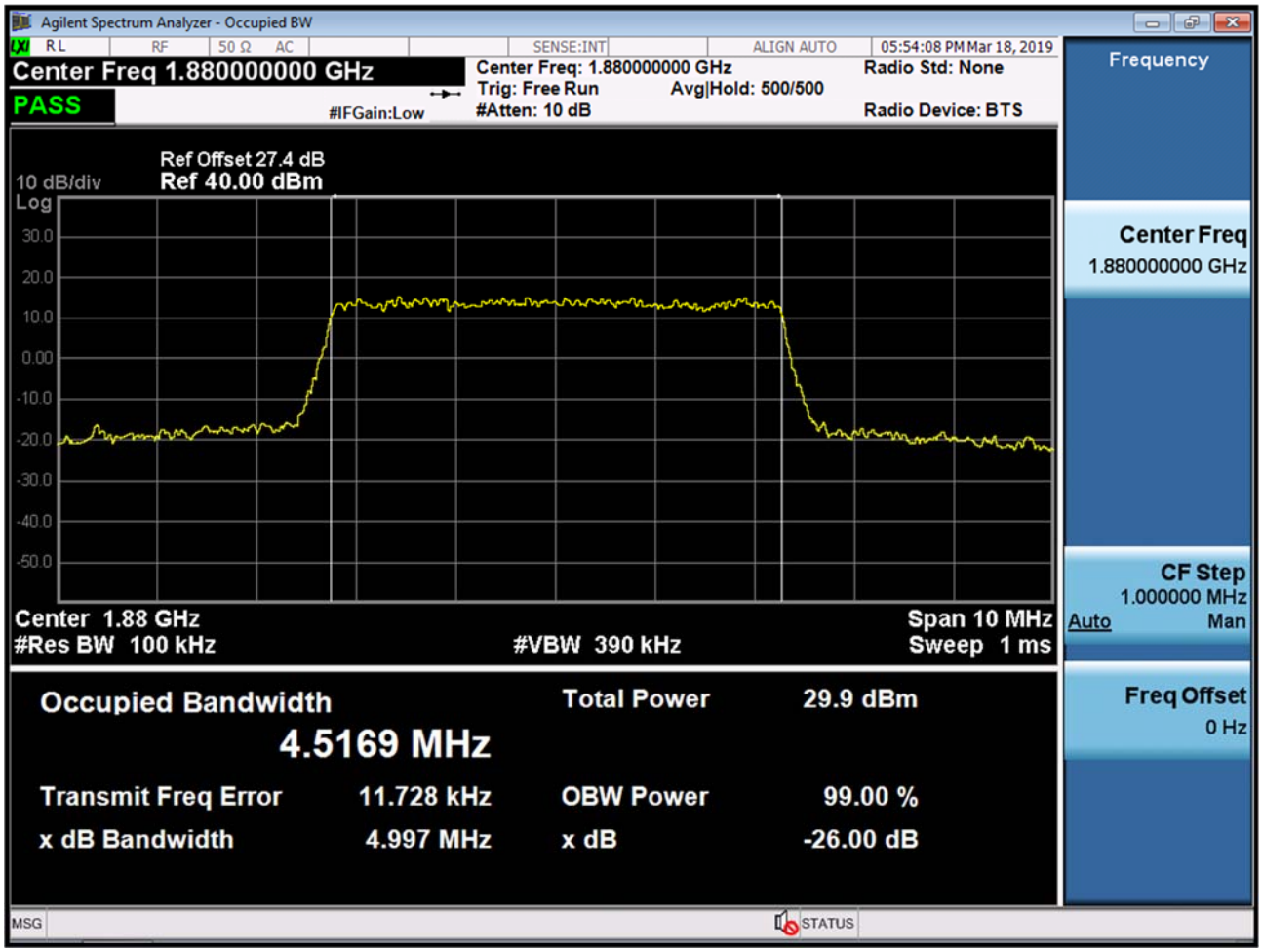
BAND 2. Occupied Bandwidth Plot (3M BW Ch.18900 QPSK RB 15_0)



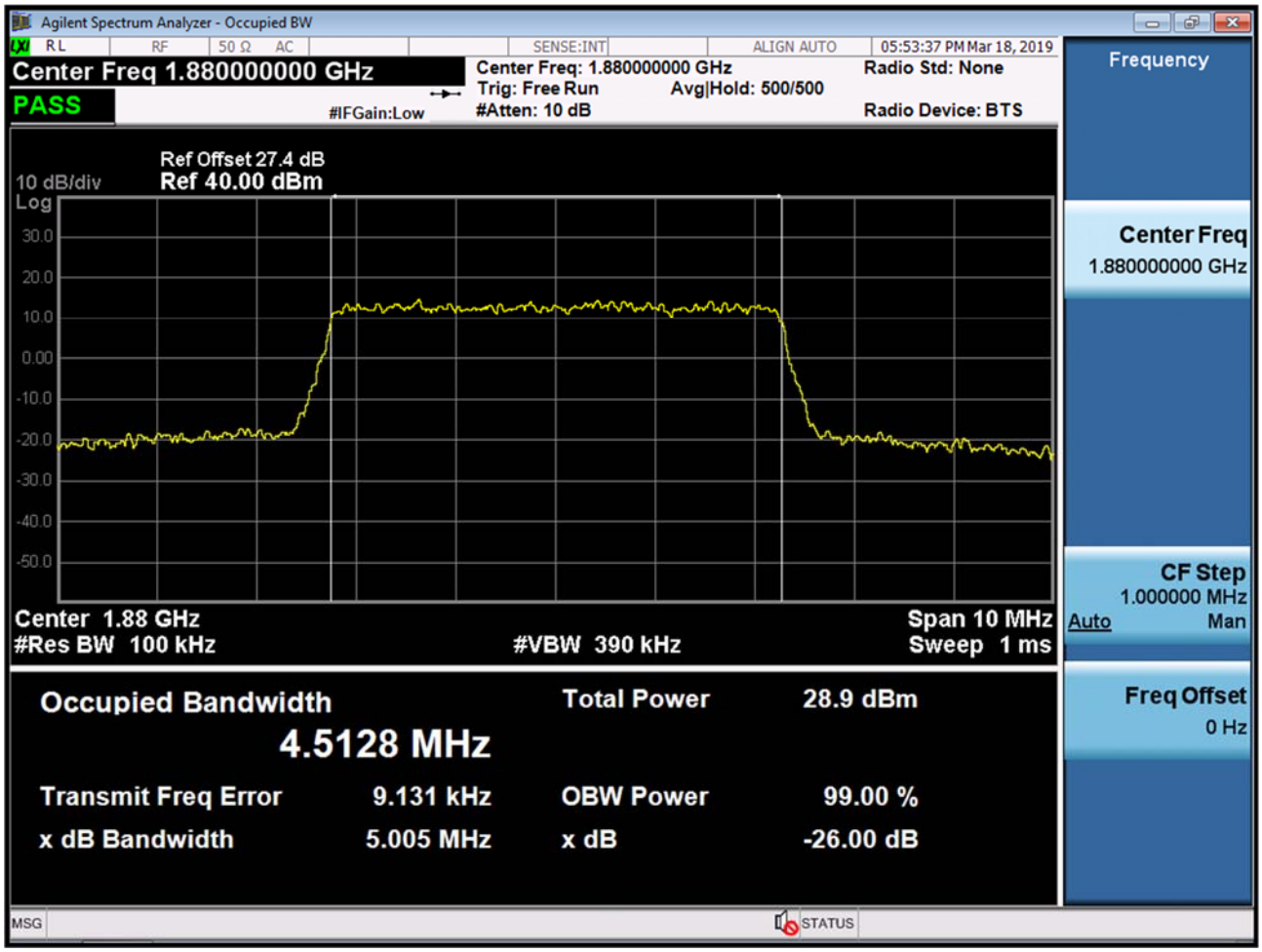
BAND 2. Occupied Bandwidth Plot (3M BW Ch.18900 16QAM RB 15_0)



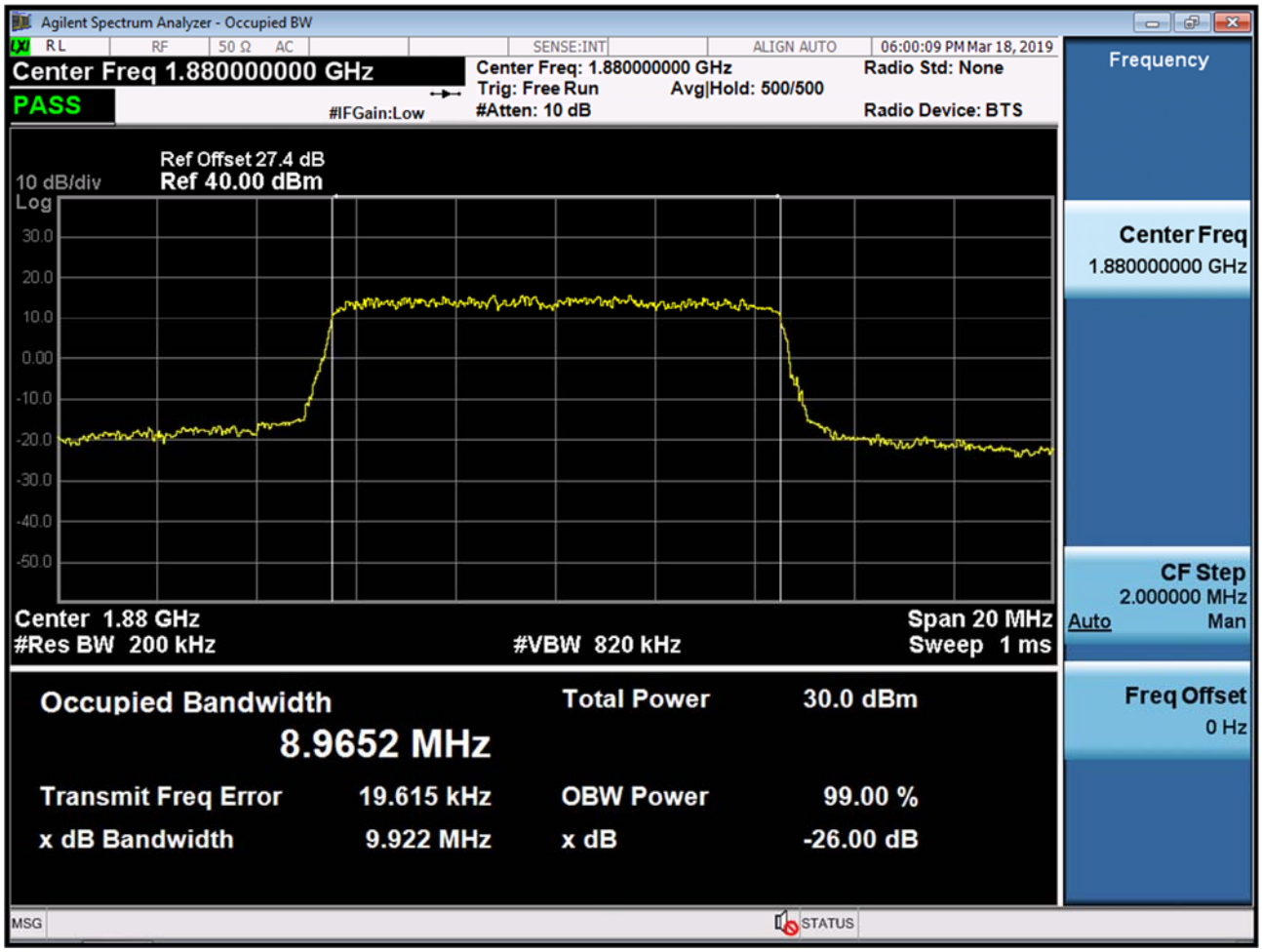
BAND 2. Occupied Bandwidth Plot (5M BW Ch.18900 QPSK RB 25_0)



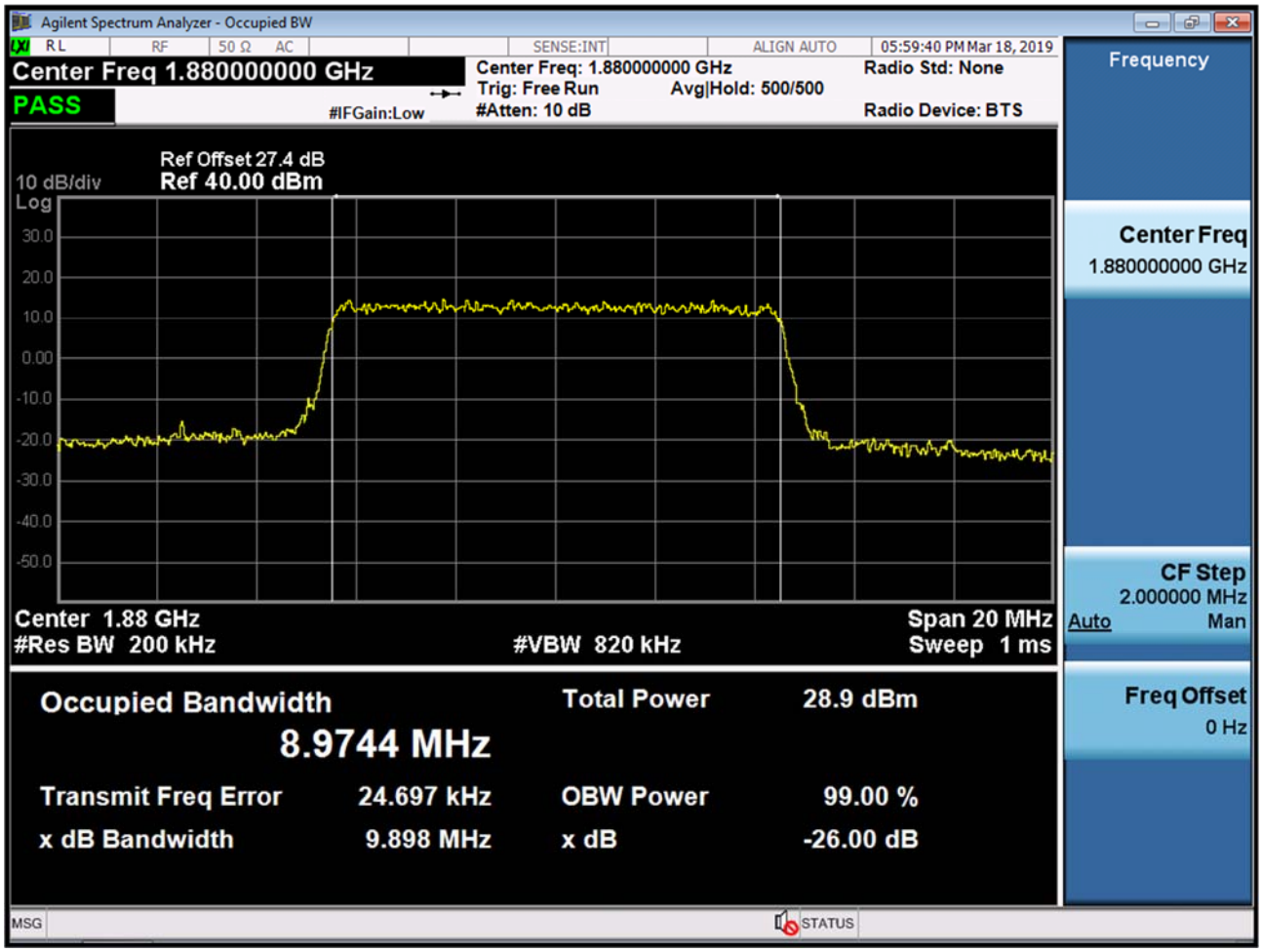
BAND 2. Occupied Bandwidth Plot (5M BW Ch.18900 16QAM RB 25_0)



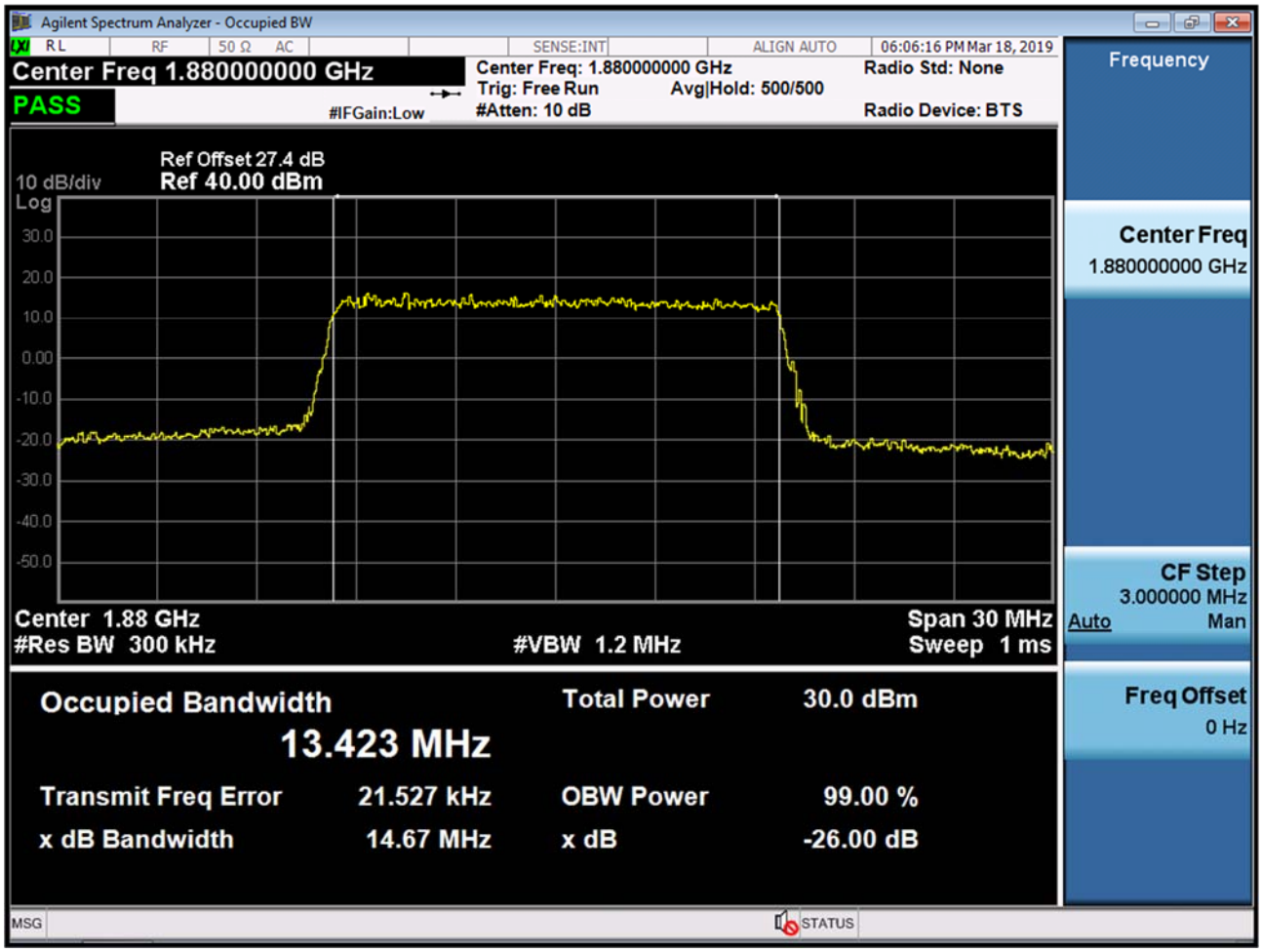
BAND 2. Occupied Bandwidth Plot (10M BW Ch.18900 QPSK RB 50_0)



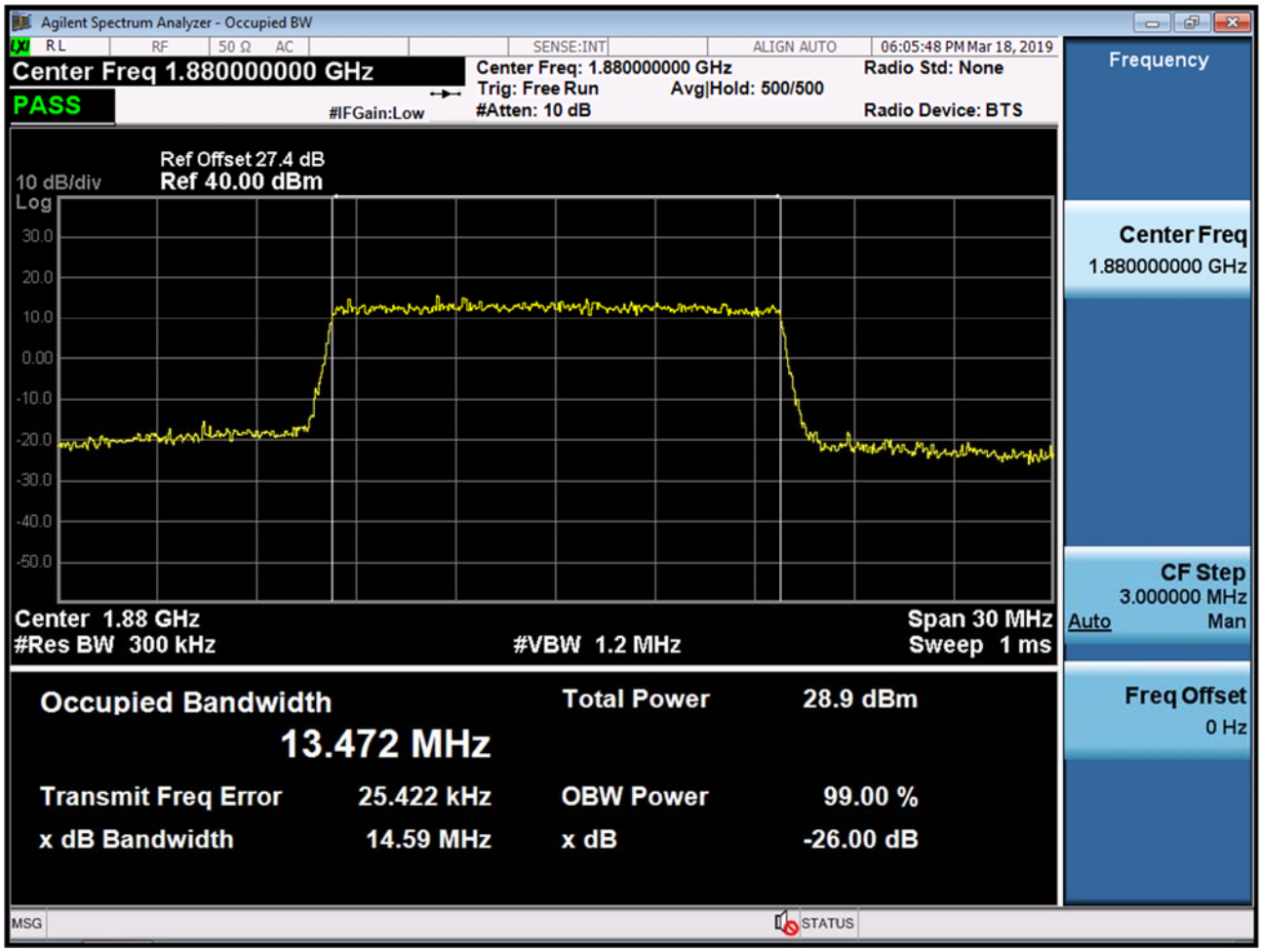
BAND 2. Occupied Bandwidth Plot (10M BW Ch.18900 16QAM RB 50_0)



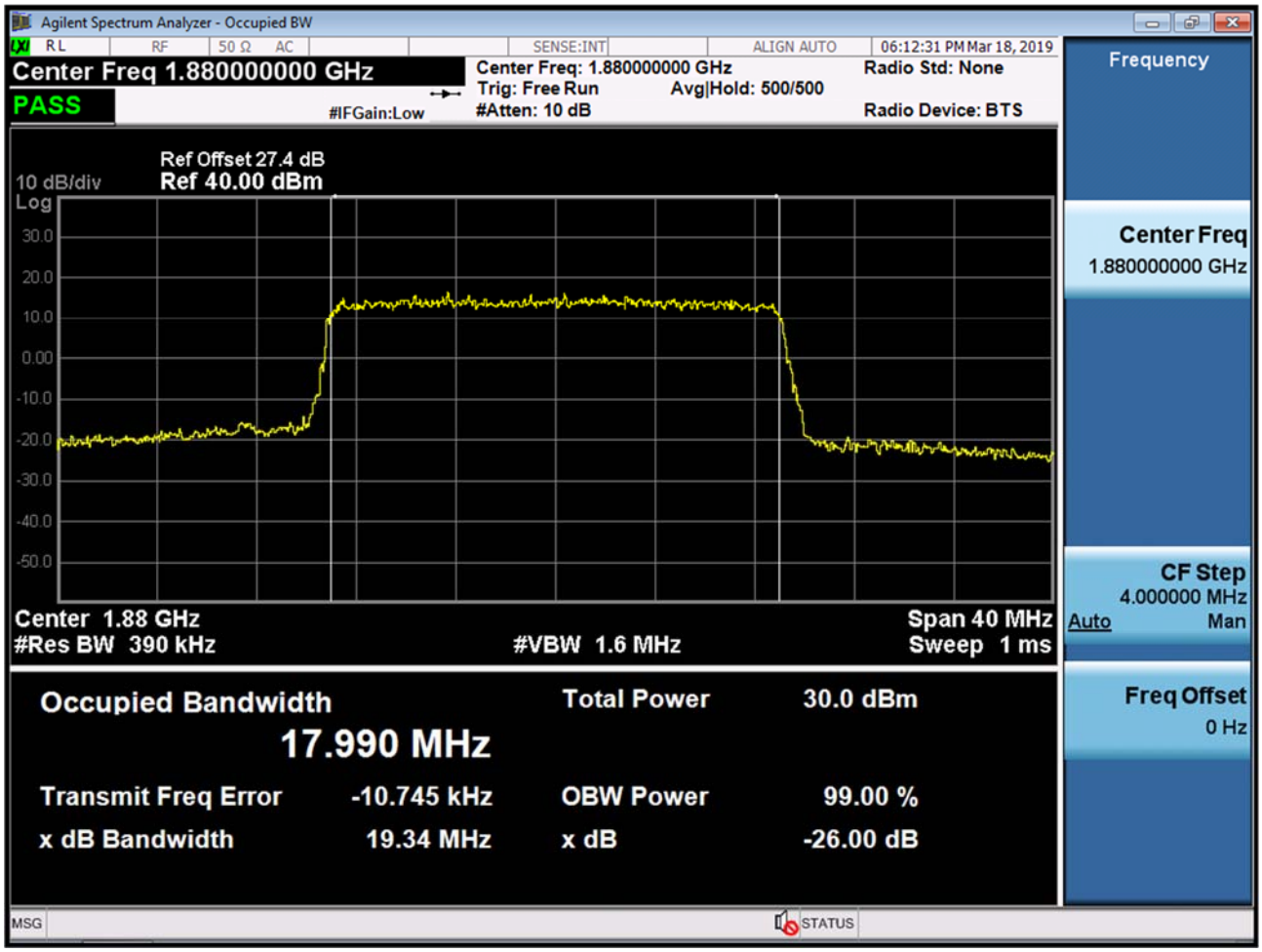
BAND 2. Occupied Bandwidth Plot (15M BW Ch.18900 QPSK RB 75_0)



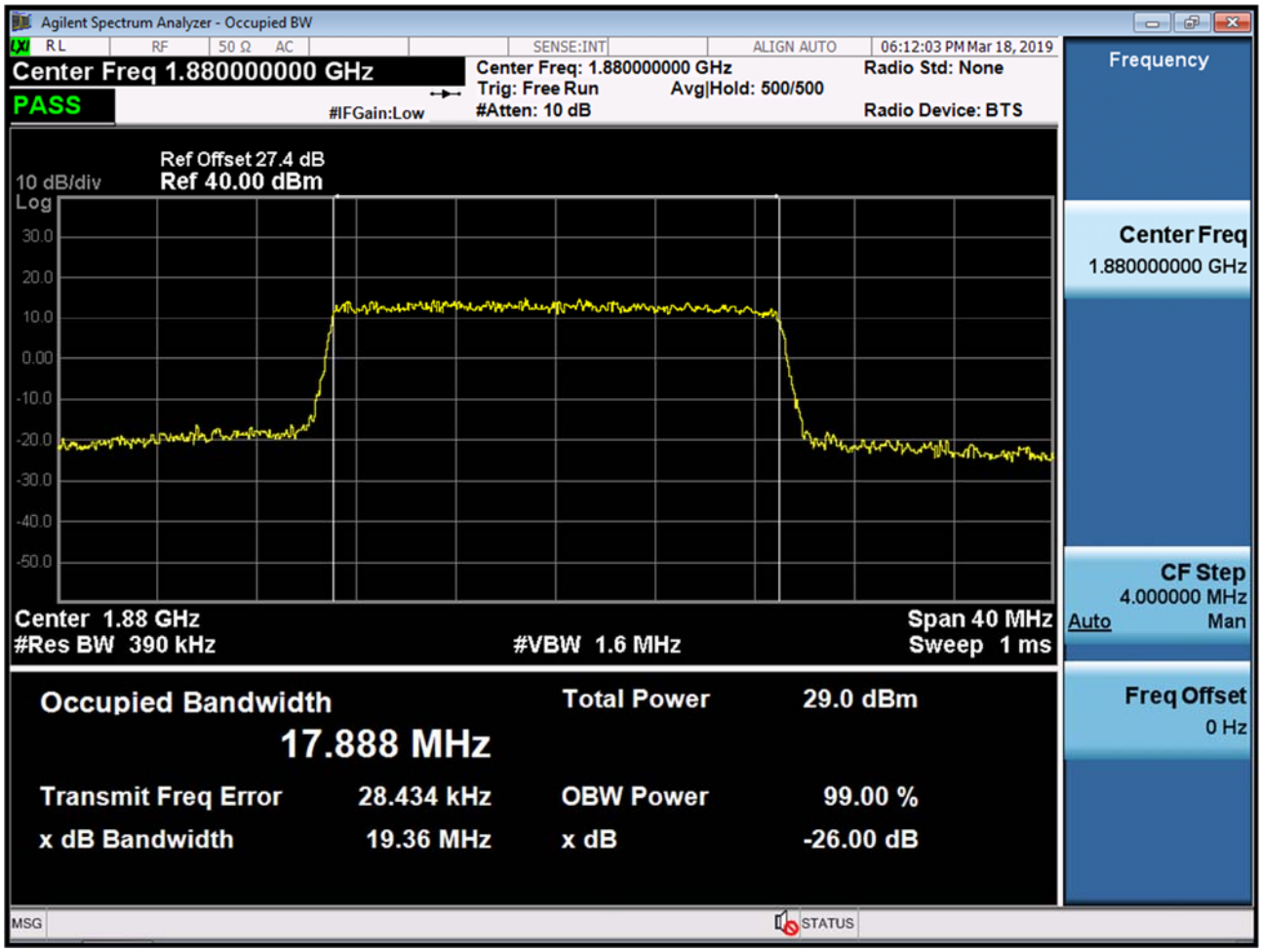
BAND 2. Occupied Bandwidth Plot (15M BW Ch.18900 16QAM RB 75_0)



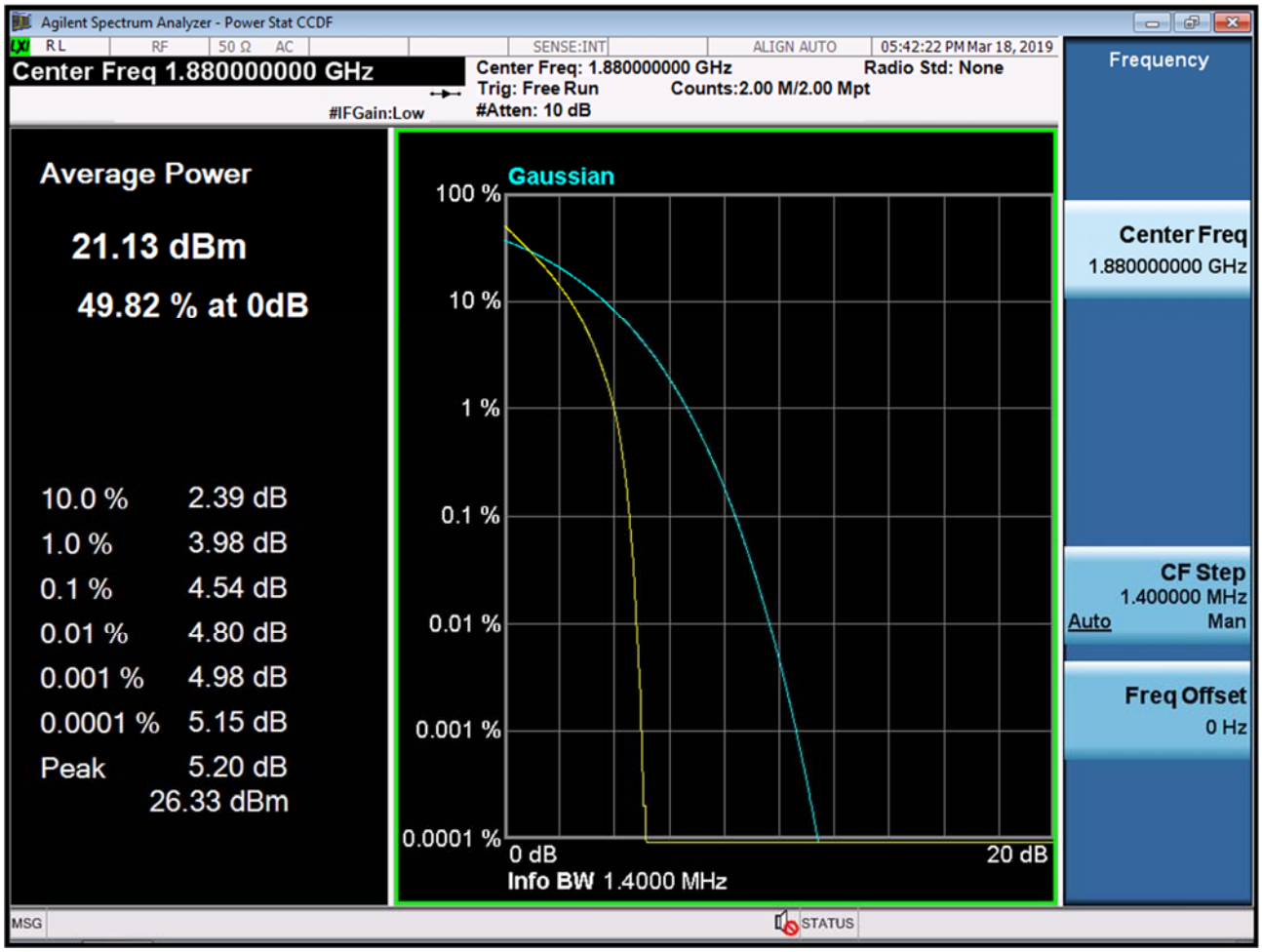
BAND 2. Occupied Bandwidth Plot (20M BW Ch.18900 QPSK RB 100_0)



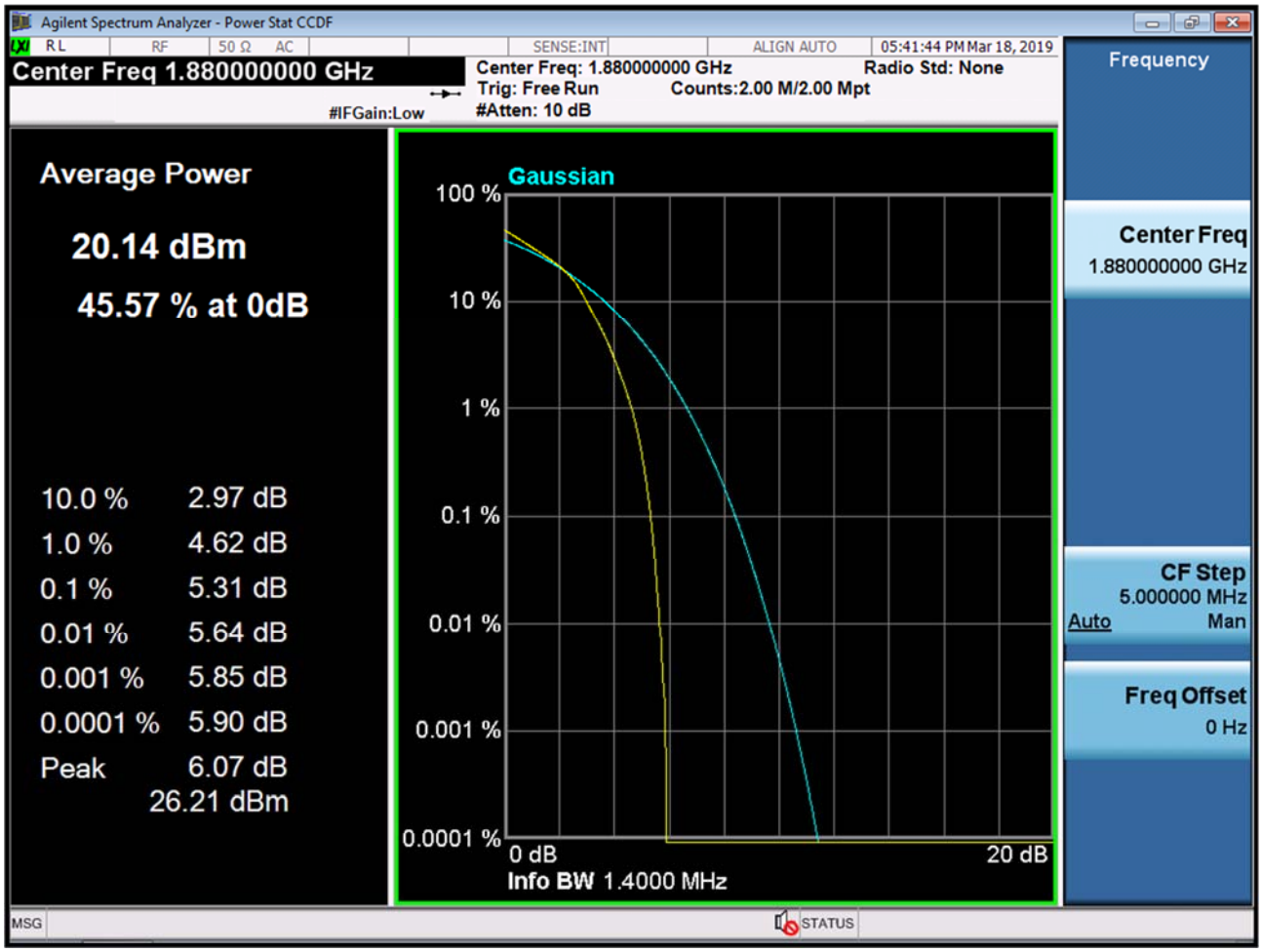
BAND 2. Occupied Bandwidth Plot (20M BW Ch.18900 16QAM RB 100_0)



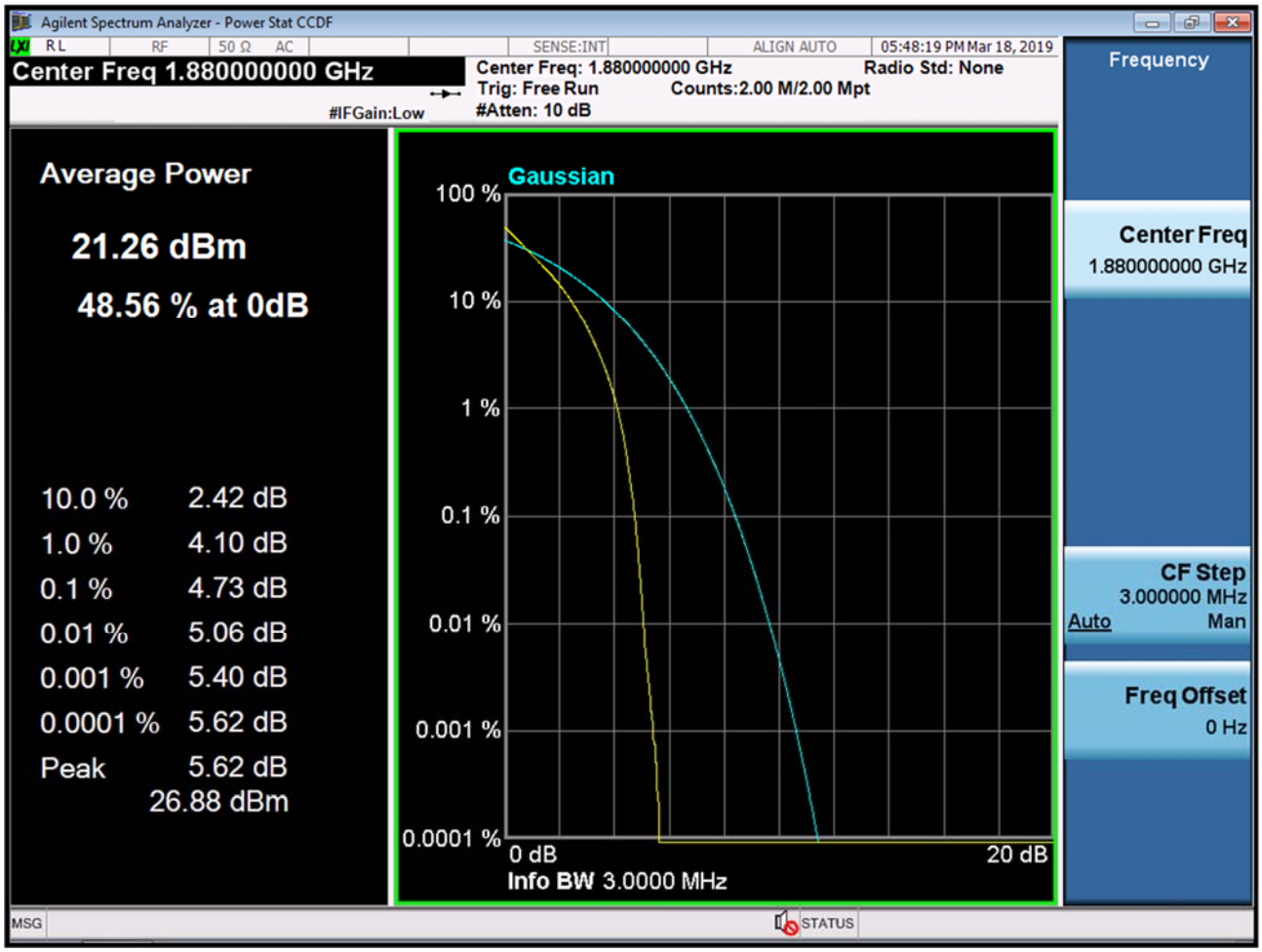
BAND 2. PAR Plot (1.4M BW Ch.18900 QPSK RB 6_0)



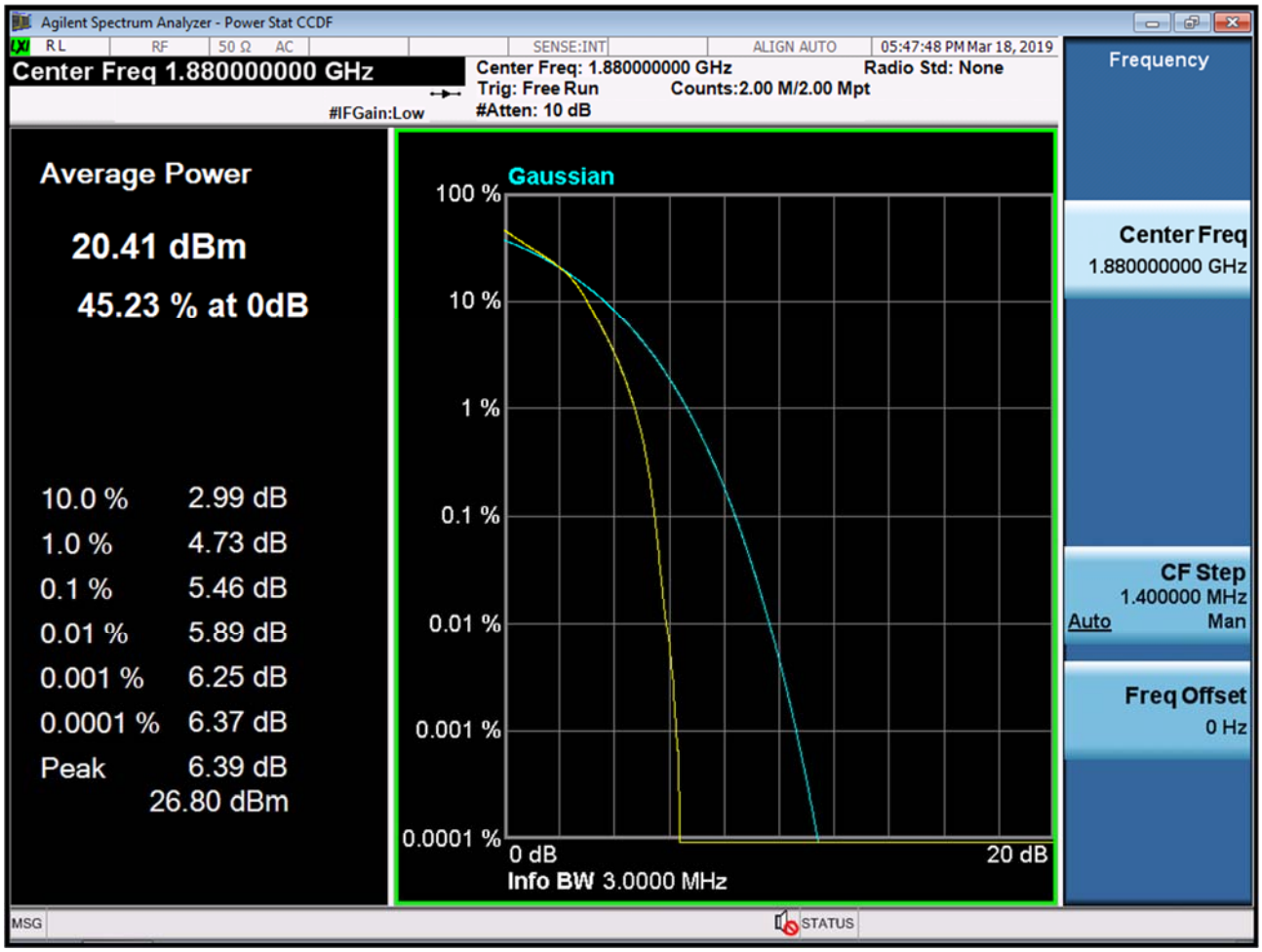
BAND 2. PAR Plot (1.4M BW Ch.18900 16QAM RB 6_0)



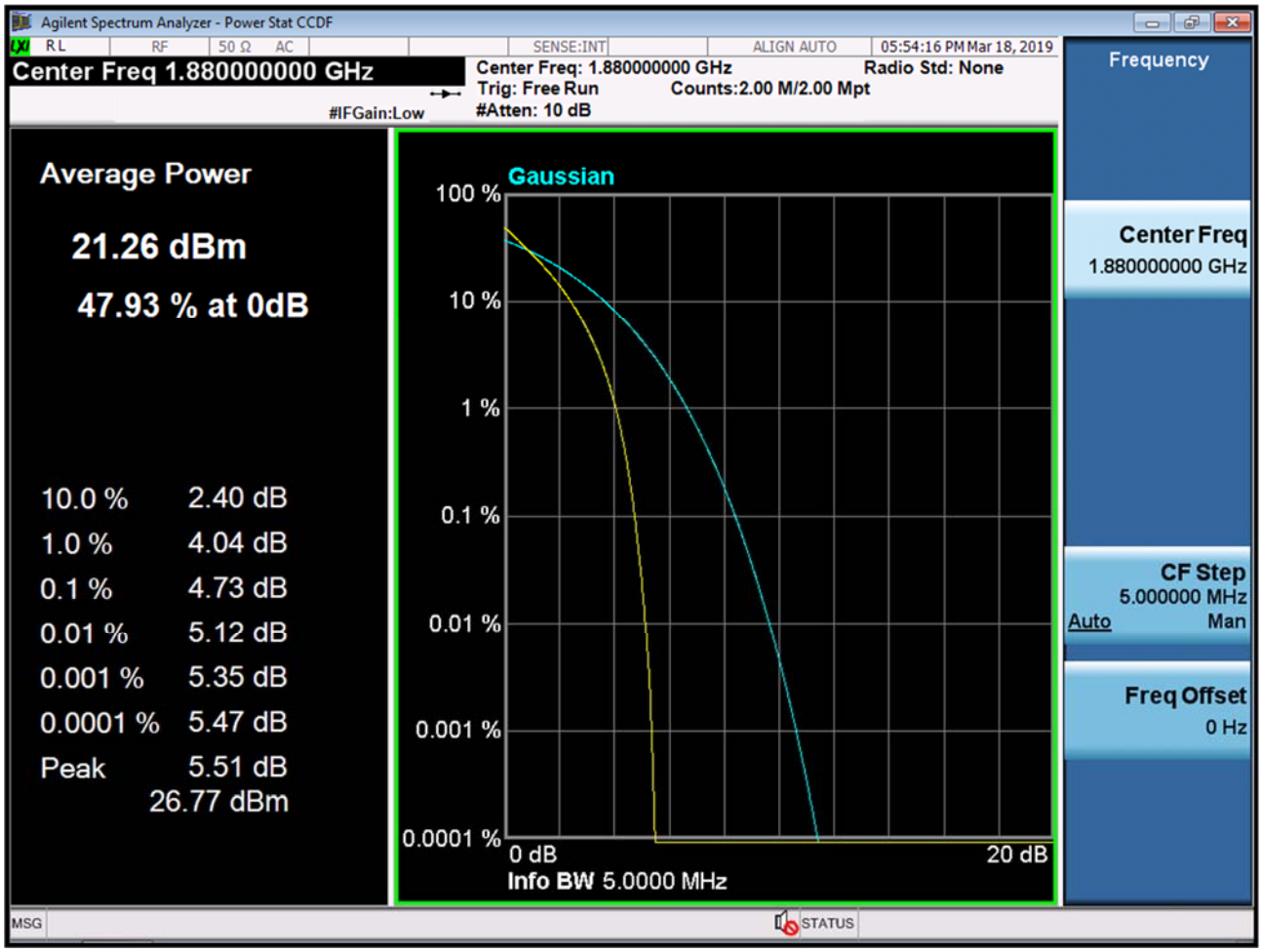
BAND 2. PAR Plot (3M BW Ch.18900 QPSK RB 15_0)



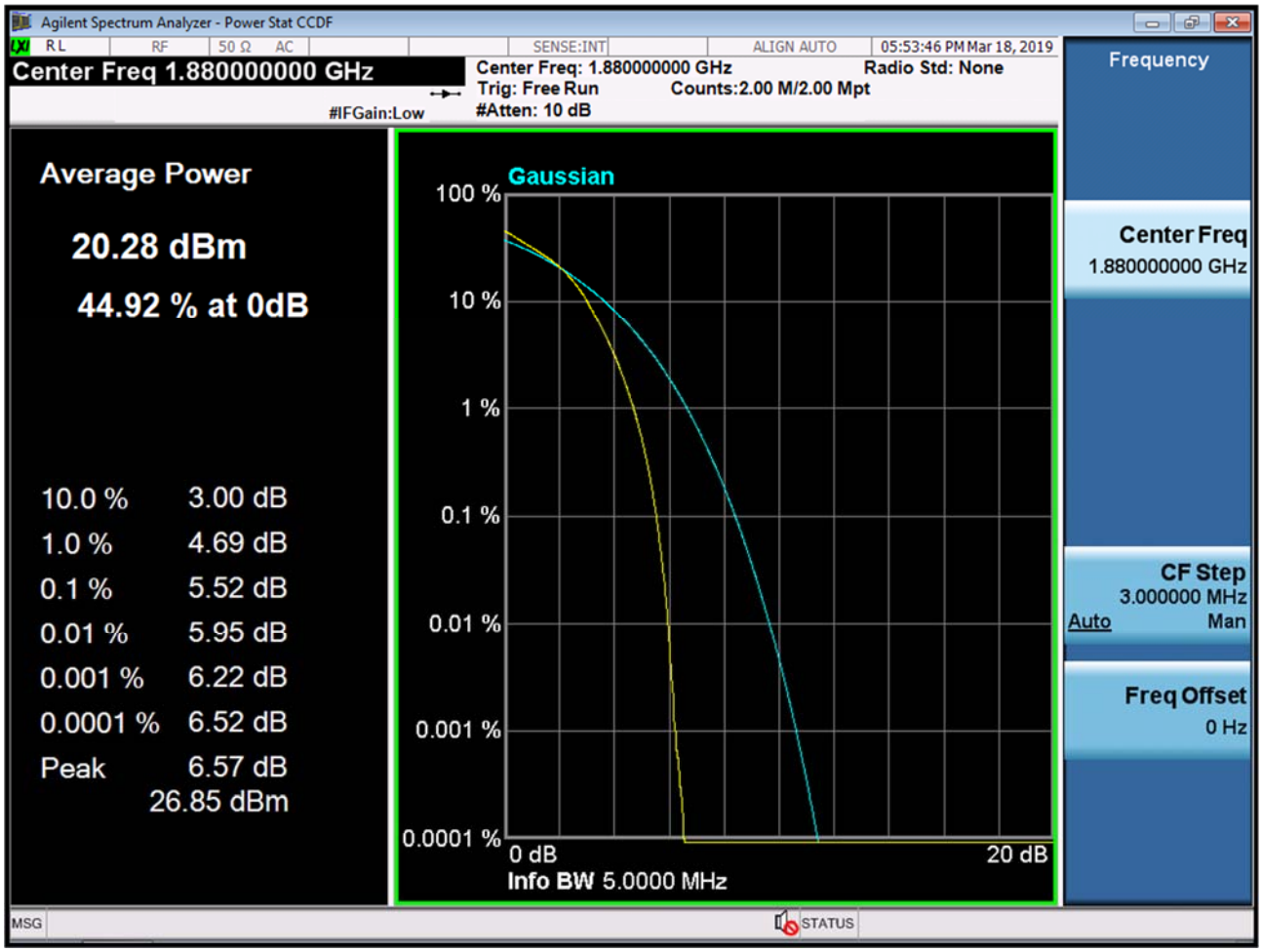
BAND 2. PAR Plot (3M BW Ch.18900 16QAM RB 15_0)



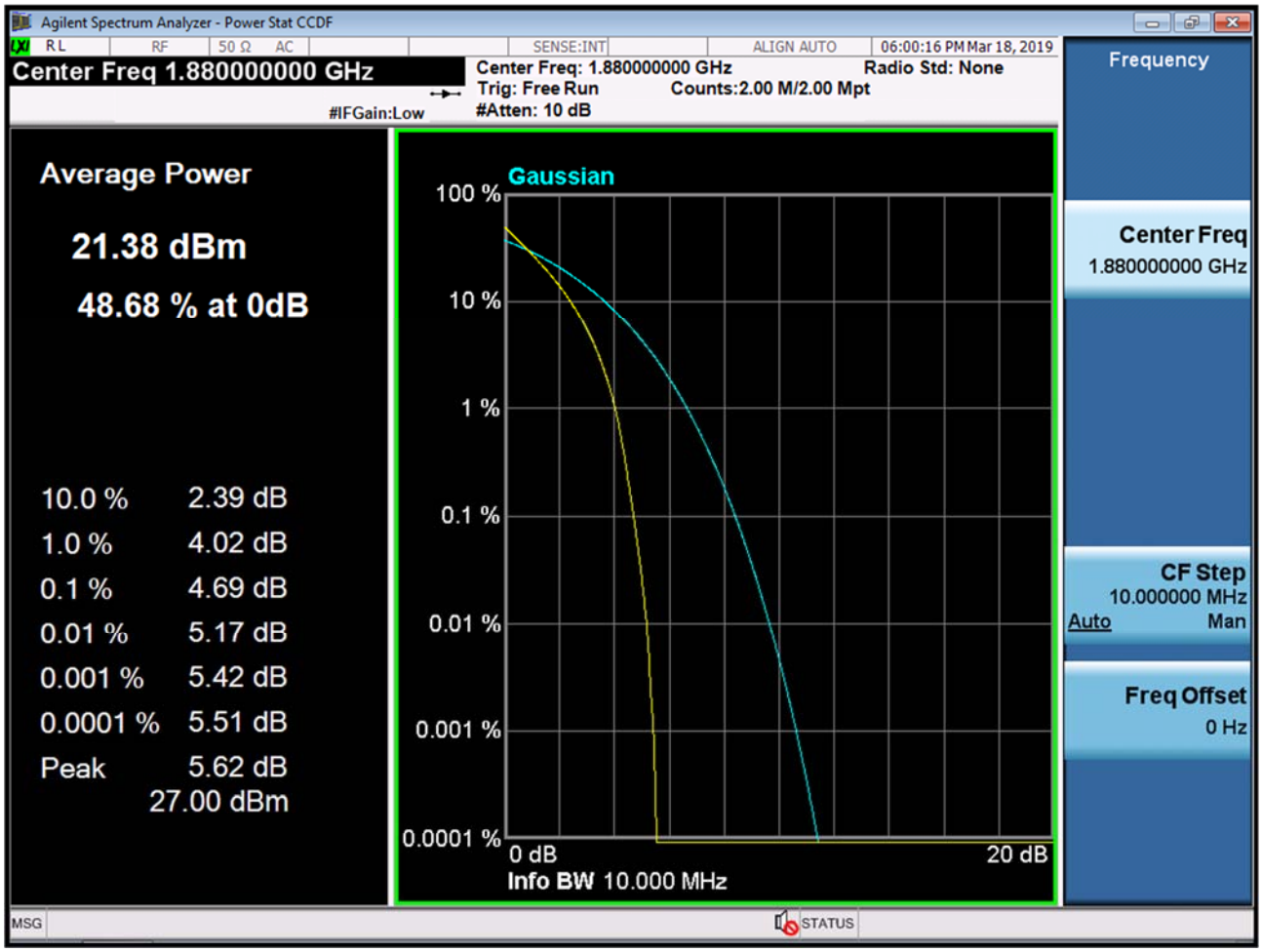
BAND 2. PAR Plot (5M BW Ch.18900 QPSK RB 25_0)



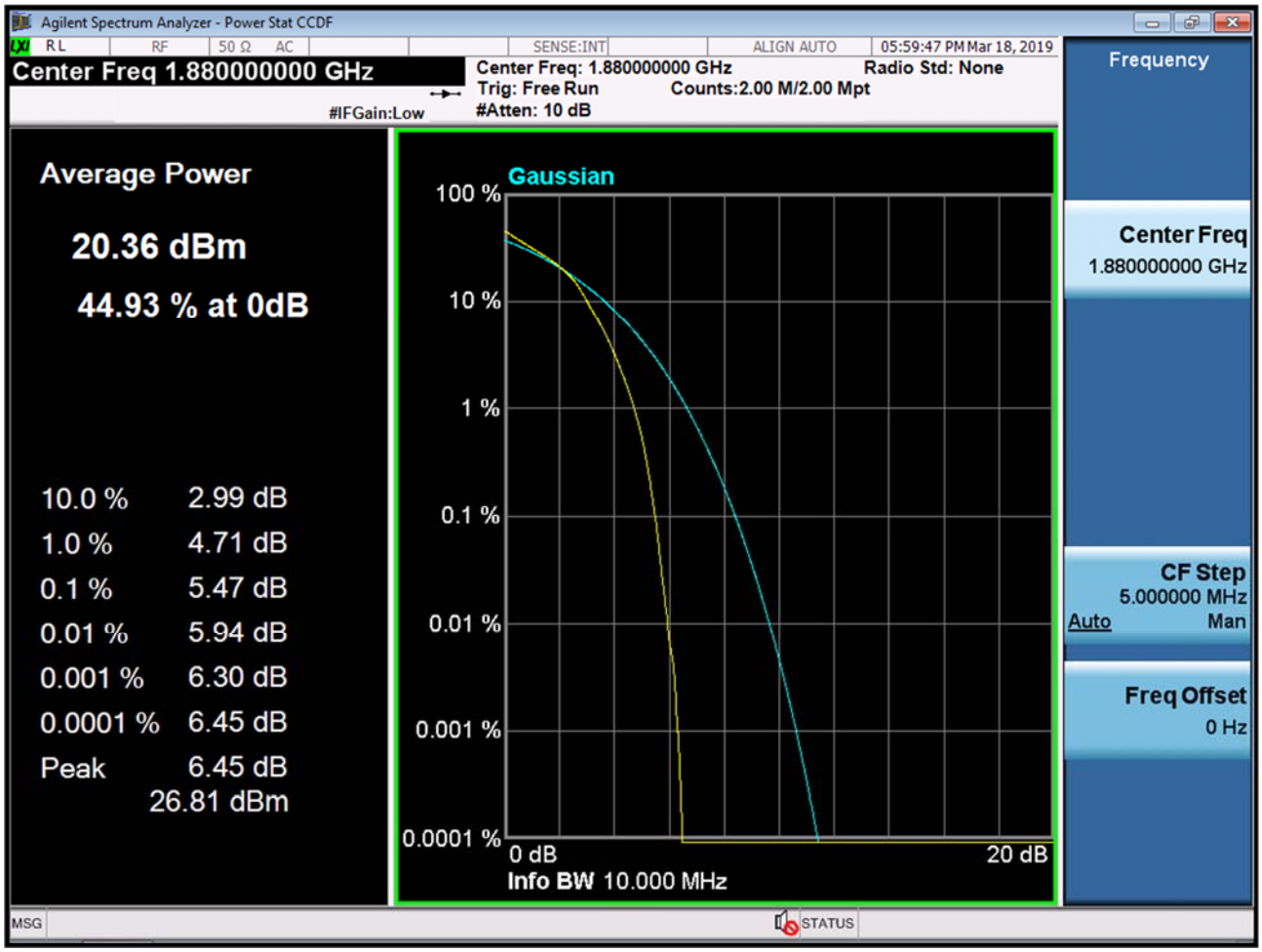
BAND 2. PAR Plot (5M BW Ch.18900 16QAM RB 25_0)



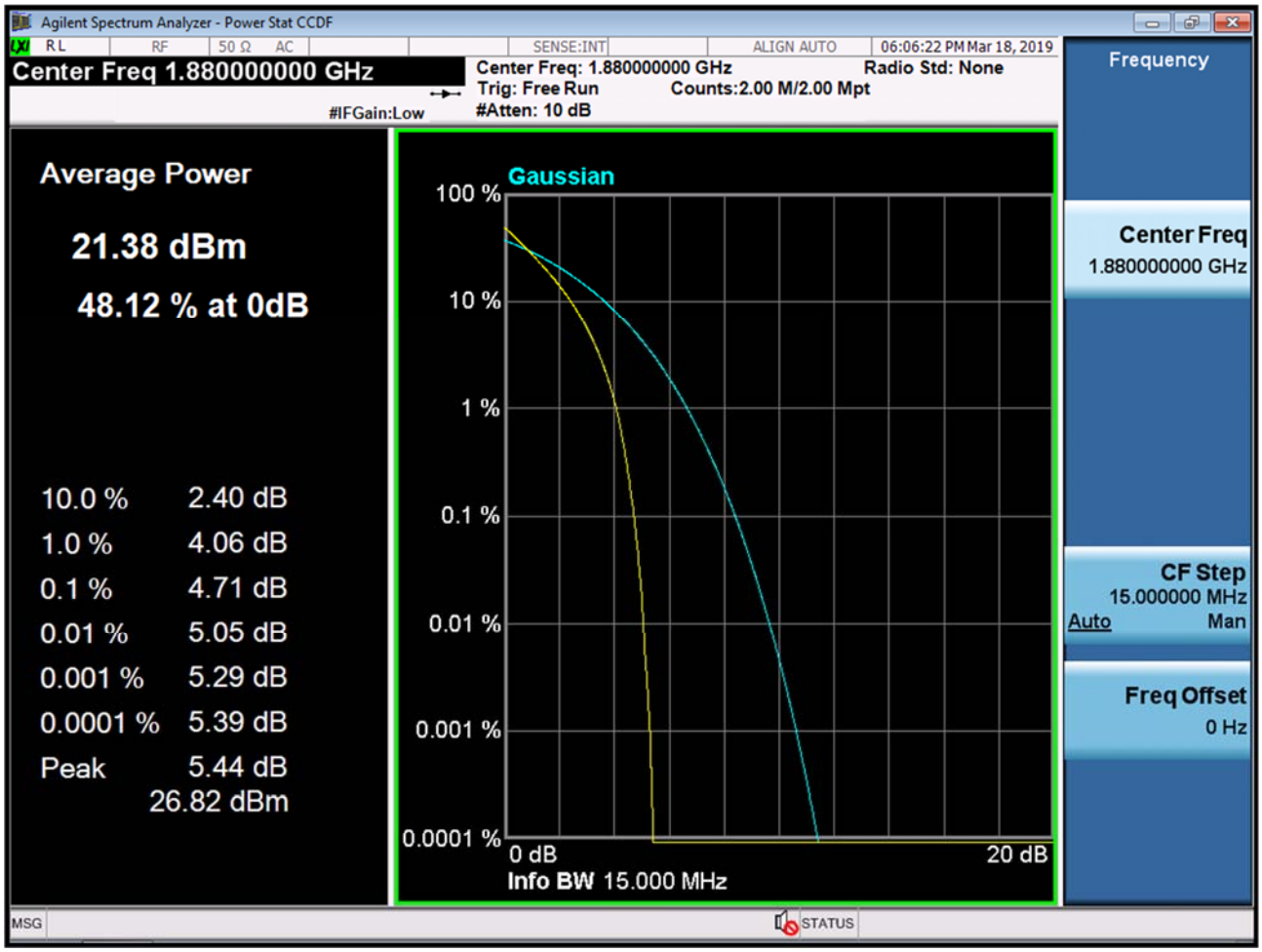
BAND 2. PAR Plot (10M BW Ch.18900 QPSK RB 50_0)



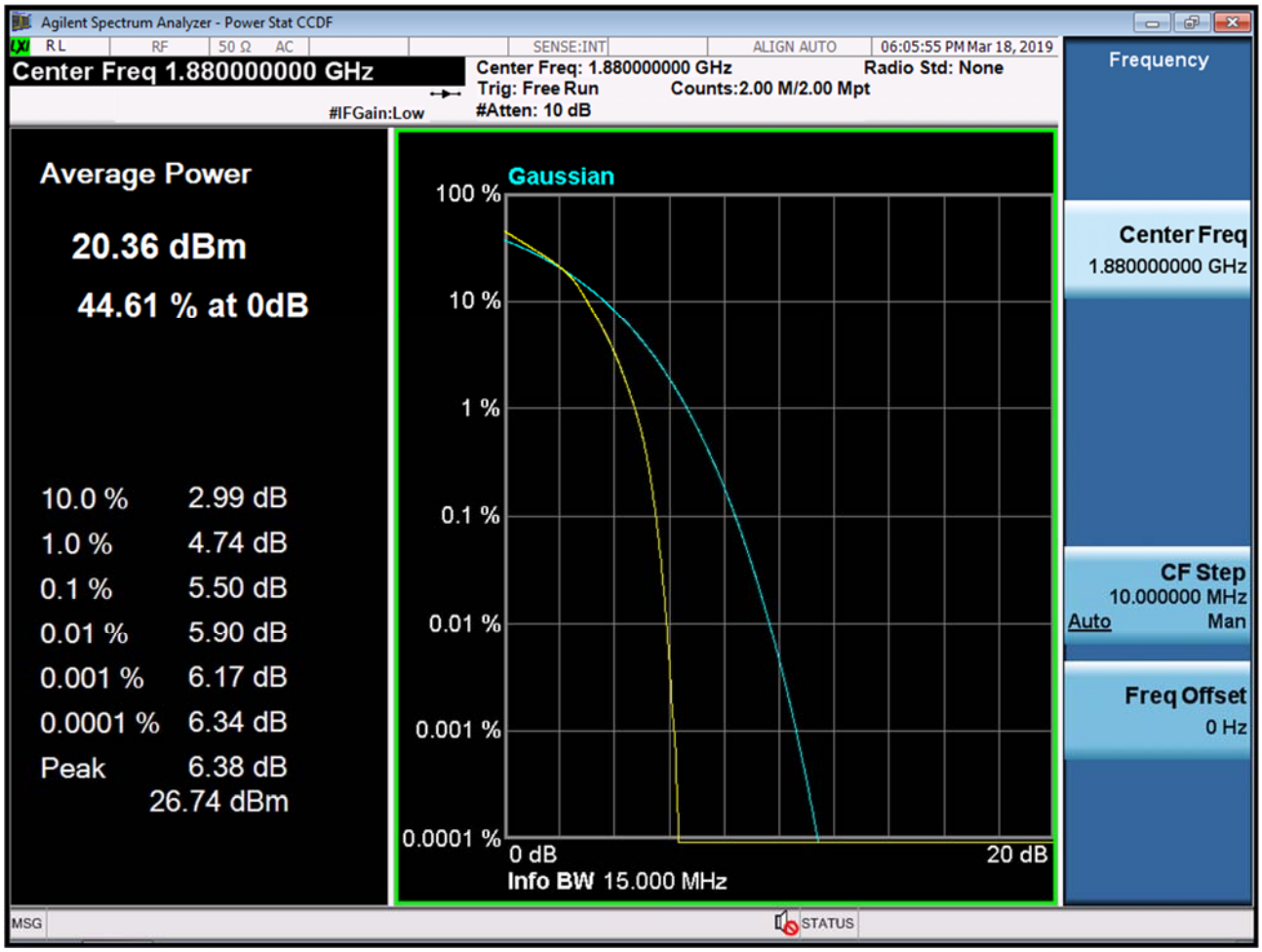
BAND 2. PAR Plot (10M BW Ch.18900 16QAM RB 50_0)



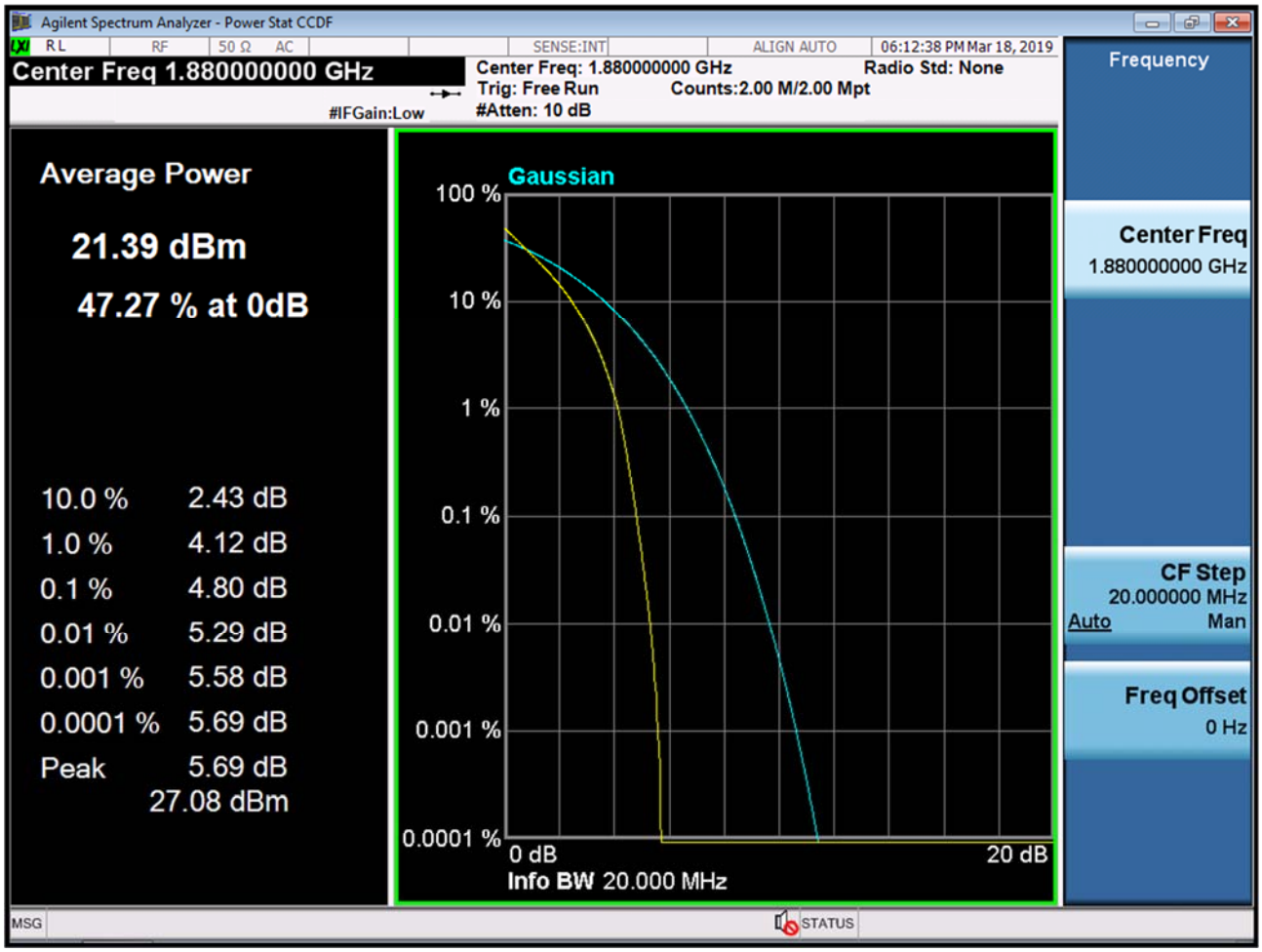
BAND 2. PAR Plot (15M BW Ch.18900 QPSK RB 75_0)



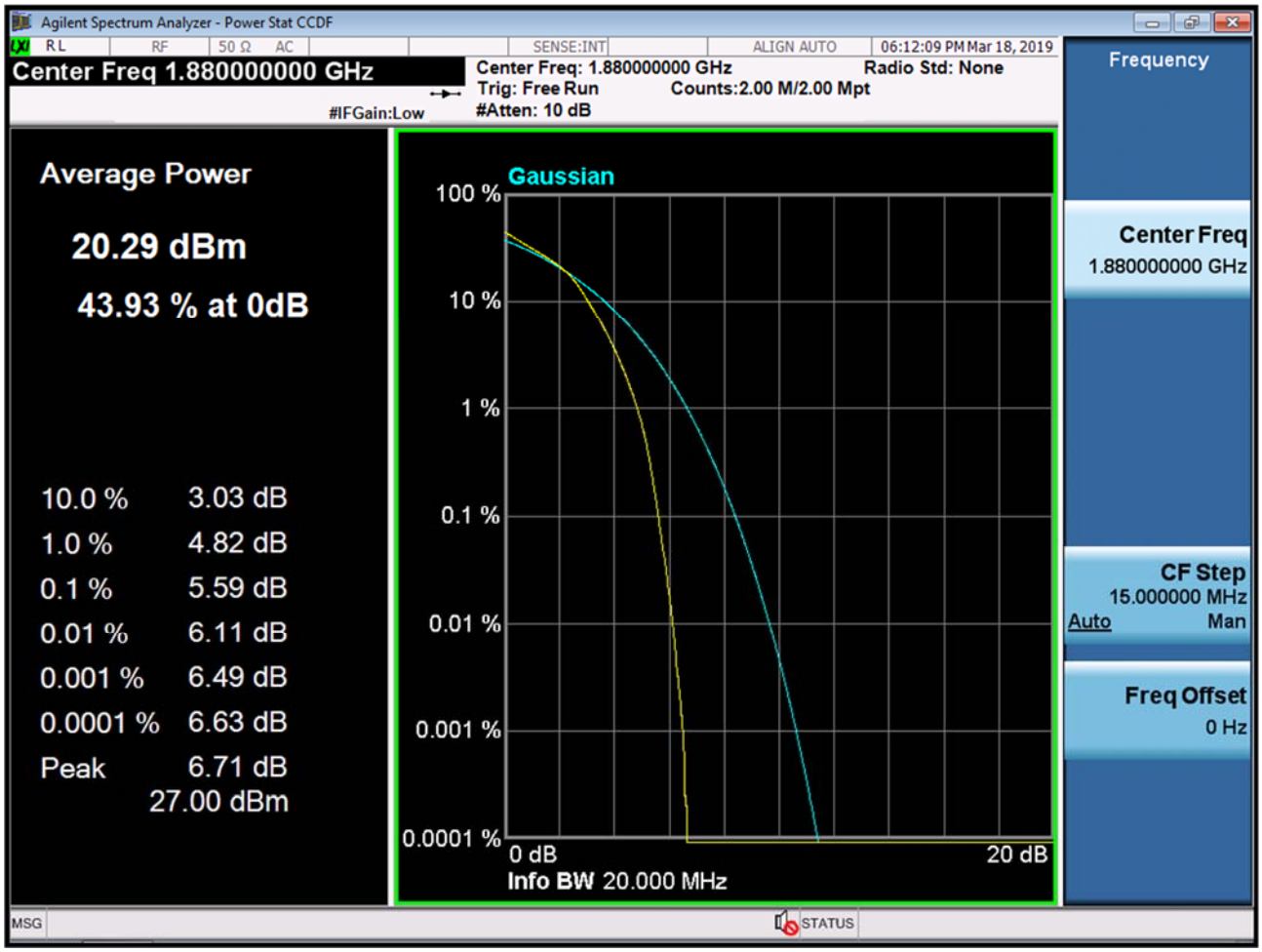
BAND 2. PAR Plot (15M BW Ch.18900 16QAM RB 75_0)



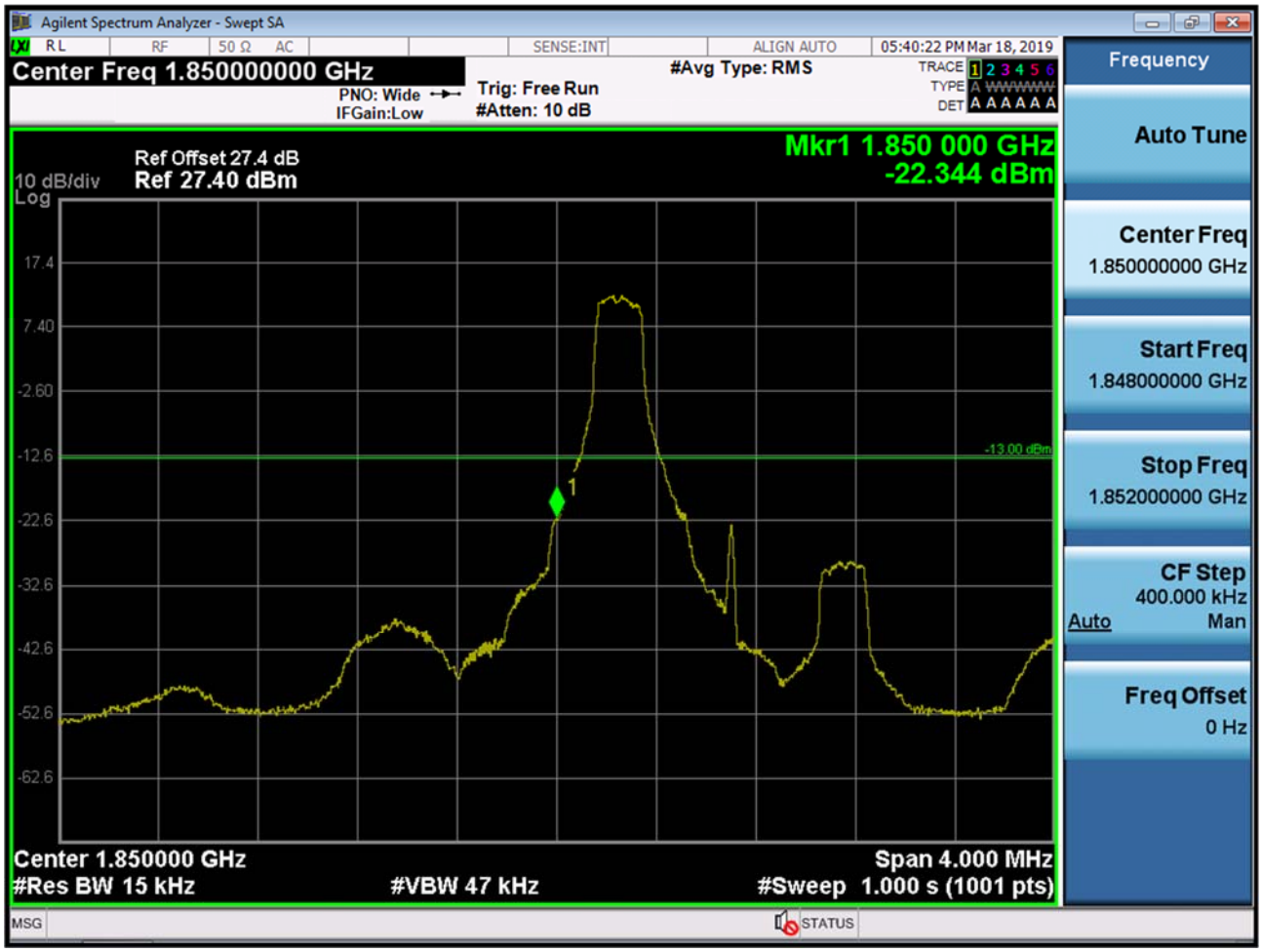
BAND 2. PAR Plot (20M BW Ch.18900 QPSK RB 100_0)



BAND 2. PAR Plot (20M BW Ch.18900 16QAM RB 100_0)



BAND 2. Lower Band Edge Plot (1.4M BW Ch.18607 QPSK_RB1_Offset 0) -1



BAND 2. Lower Band Edge Plot (1.4M BW Ch.18607 QPSK_RB6_Offset 0) -2

BAND 2. Lower Extended Band Edge Plot (1.4M BW Ch.18607 QPSK_RB6_0) -3