

FCC LTE REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Date of Issue:
May 25, 2023

Address:
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Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Location:
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Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-2305-FC071-R1

FCC ID: A3LSMF946B

APPLICANT: SAMSUNG Electronics Co., Ltd.

Model(s): SM-F946B/DS
 Additional Model(s): SM-F946B
 EUT Type: Mobile phone
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 FCC Rule Part(s): §27, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band12 (1.4)	699.7 – 715.3	1M10G7D	QPSK	0.052	17.19
		1M10W7D	16QAM	0.044	16.44
		1M11W7D	64QAM	0.034	15.37
		1M10W7D	256QAM	0.017	12.28
LTE – Band12 (3)	700.5 – 714.5	2M71G7D	QPSK	0.052	17.16
		2M71W7D	16QAM	0.044	16.39
		2M73W7D	64QAM	0.034	15.34
		2M71W7D	256QAM	0.017	12.21
LTE – Band12/17 (5)	701.5 – 713.5	4M50G7D	QPSK	0.052	17.18
		4M51W7D	16QAM	0.044	16.43
		4M53W7D	64QAM	0.034	15.35
		4M51W7D	256QAM	0.017	12.21
LTE – Band12/17 (10)	704.0 – 711.0	8M98G7D	QPSK	0.054	17.32
		9M00W7D	16QAM	0.045	16.52
		8M98W7D	64QAM	0.035	15.45
		8M97W7D	256QAM	0.017	12.28

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 No.: HCT-RF-2305-FC071-R1

REVIEWED BY



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

Report approved by : Kwon Jeong
Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked *.

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2305-FC071	May 19, 2023	- First Approval Report
HCT-RF-2305-FC071-R1	May 25, 2023	- Added a description of conducted test.(Page 15)

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
FCC ID:	A3LSMF946B
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§27, §2
EUT Type:	Mobile phone
Model(s):	SM-F946B/DS
Additional Model(s):	SM-F946B
Tx Frequency:	699.7 MHz – 715.3 MHz (LTE – Band 12 (1.4 MHz)) 700.5 MHz – 714.5 MHz (LTE – Band 12 (3 MHz)) 701.5 MHz – 713.5 MHz (LTE – Band 12/17 (5 MHz)) 704.0 MHz – 711.0 MHz (LTE – Band 12/17 (10 MHz))
Date(s) of Tests:	March 27, 2023 ~ May 09, 2023
Serial number:	Radiated: R3CW30A3AVJ Conducted: R3CW30A3CMX

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE, Sub6.

It also supports IEEE 802.11 a/b/g/n/ac/ax (20/40/80/160 MHz), WIFI 6E, WPT, AIT, Bluetooth, BT LE, NFC.

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)
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/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 1 MHz
3. VBW \geq 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 1 GHz, 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;

$$P_d \text{ (dBm)} = P_g \text{ (dBm)} - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

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 = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $> 2 \times$ 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 10th 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. For spurious emissions above 1 GHz, 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 spurious emissions is calculated by the following formula;

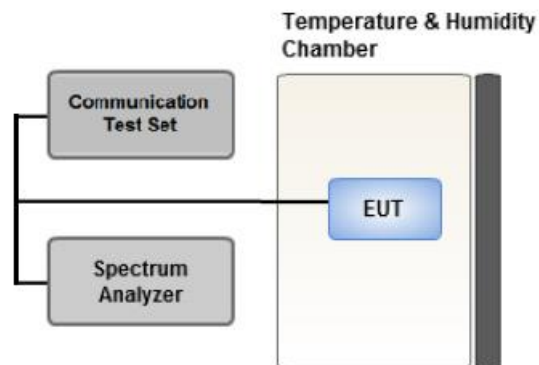
$$\text{Result}_{(dBm)} = P_g_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

Where: P_g is the generator output power into the substitution antenna.

If the fundamental frequency is below 1 GHz, RF output power has been converted to EIRP.

$$\text{EIRP}_{(dBm)} = \text{ERP}_{(dBm)} + 2.15$$

3.4 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.

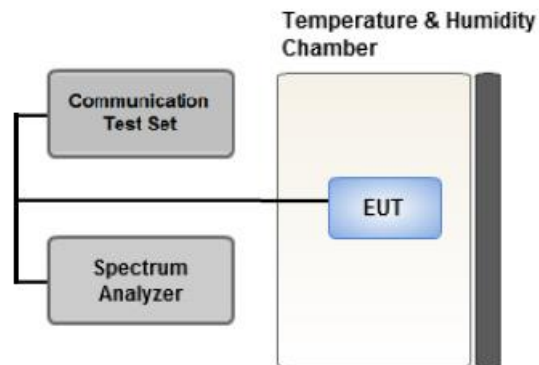
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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 26 dB 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 $\geq 3 \times$ 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

3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

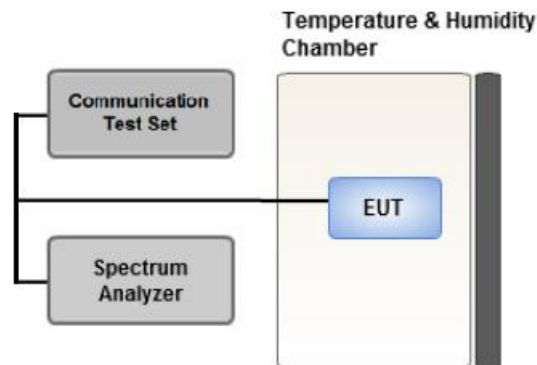
Test Overview

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 \geq 3 MHz
3. Detector = RMS
4. Trace Mode = trace average
5. Sweep time = auto
6. Number of points in sweep \geq 2 * Span / RBW

3.6 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 $\geq 2 \times \text{Span/RBW}$
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.

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.

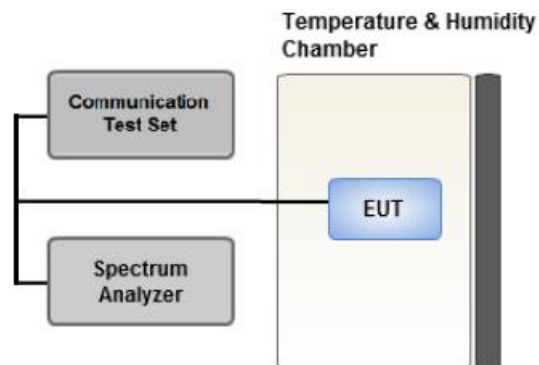
However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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.

Where Margin < 1 dB the emission level is either corrected by $10 \log(1 \text{ MHz/ RB})$ or the emission is integrated over a 1 MHz bandwidth to determine the final result. When using the integration method the integration window is either centered on the emission or, for emissions at the band edge, centered by an offset of 500 kHz from the block edge so that the integration window is the 1 MHz adjacent to the block edge.

3.7 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.
- The EUT was tested in three modes(Open, Half-open, Closed), the worst case configuration results are reported.
Worst case: Open mode.
- All modes of operation were investigated and the worst case configuration results are reported.
Mode : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)
Worst case : Stand alone
- We were performed the RSE test in condition of co-location.
Mode : Stand alone, Simultaneous transmission scenarios
Worst case : Stand alone
- This device supports two additional antenna configurations for Low bands
All antenna configurations were investigated and the worst case configuration results are reported.
Antenna configurations: Only Main1, AFS(Main1+Main2)
Worst case: AFS(Main1+Main2)
- In the case of radiated spurious emissions, all bandwidth of operation were investigated and the worst case bandwidth results are reported. (Worst case : 10 MHz)
- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- LTE Band 12 (699 – 716 MHz, 5/10 MHz bandwidth) overlaps the entire frequency range of LTE Band 17 (704 - 716 MHz) and they have the same Tune-up power.
Therefore, test data provided in this report covers Band 17 as well as Band 12.
- Please refer to the table below.
- SM-F946B/DS & additional models were tested and the worst case results are reported.
(Worst case : SM-F946B/DS)

[Worst case]

Test Description	Modulation	RB size	RB offset	Axis
Effective Radiated Power	QPSK, 16QAM, 64QAM, 256QAM	1	0	Y
Radiated Spurious and Harmonic Emissions	QPSK	1	0	Y

3.9 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- LTE Band 12 (699 – 716 MHz, 5/10 MHz bandwidth) overlaps the entire frequency range of LTE Band 17 (704 - 716 MHz) and they have the same Tune-up power.

Therefore, test data provided in this report covers Band 17 as well as Band 12.

- SM-F946B/DS & additional models were tested and the worst case results are reported.
(Worst case : SM-F946B/DS)
- Both Main1 Ant & AFS(Main1 Ant+Main2 Ant) has same antenna port.

So conducted tests were performed Main1 Ant port.

[Worst case]

Test Description	Modulation	Bandwidth (MHz)	Frequency	RB size	RB offset
Occupied Bandwidth	QPSK, 16QAM, 64QAM, 256QAM	1.4, 3, 5, 10	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
		1.4, 3, 5, 10	Low, High	Full RB	0
Spurious and Harmonic Emissions at Antenna Terminal	QPSK	1.4, 3, 5, 10	Low, Mid, High	1	0

4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
H.P.F	FBSR-02B(WHK1.2/15 G-10EF)	T&M SYSTEM	-	01/19/2024	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	01/19/2024	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	5001	04/19/2024	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/21/2023	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	03/09/2025	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	03/09/2025	Biennial
Chamber	SU-642	ESPEC	93008124	02/22/2024	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/30/2023	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/15/2023	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	09/29/2024	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Signal Analyzer(10 Hz ~ 26.5 GHz)	N9020A	Agilent	MY52090906	04/20/2024	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	04/19/2024	Annual
Spectrum Analyzer(10 Hz ~ 40 GHz)	FSV40	REOHDE & SCHWARZ	100931	08/29/2023	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/18/2023	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/17/2024	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	895	08/16/2024	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	1135	03/21/2024	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262094331	12/01/2023	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	01/05/2024	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/05/2023	Annual
Signal Analyzer(5 Hz ~ 40.0 GHz)	N9030B	KEYSIGHT	MY55480167	05/30/2023	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

Note:

- Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
- Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

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 (\pm dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.90 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.14 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.16 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.57 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.76 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (Above 40 GHz)	5.52 (Confidence level about 95 %, $k=2$)

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, §27.53(g)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§2.1046	N/A	<u>See Note1</u>
Frequency stability / variation of ambient temperature	§2.1055, §27.54	Emission must remain in band	PASS

Note:

1. See SAR Report

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Effective Radiated Power	§27.50(c)(10)	< 3 Watts max. ERP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §27.53(g)	< 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

$$\text{ERP} = \text{Substitute LEVEL(dBm)} + \text{Ant. Gain} - \text{CL(Cable Loss)}$$

- 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

$$\text{EIRP} = \text{Substitute LEVEL(dBm)} + \text{Ant. Gain} - \text{CL(Cable Loss)}$$

- 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

QAM 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 EFFECTIVE RADIATED POWER

Freq (MHz)	Mod (Bandwidth)	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol	Limit W	ERP	
									W	dBm
699.7	LTE B12 (1.4 MHz)	QPSK	-31.55	28.20	-9.89	1.29	V	< 3.00	0.050	17.02
		16-QAM	-32.27	27.48	-9.89	1.29	V		0.043	16.30
		64-QAM	-33.34	26.41	-9.89	1.29	V		0.033	15.23
		256-QAM	-36.45	23.30	-9.89	1.29	V		0.016	12.12
707.5		QPSK	-31.71	28.28	-9.80	1.29	V		0.052	17.19
		16-QAM	-32.47	27.52	-9.80	1.29	V		0.044	16.43
		64-QAM	-33.53	26.46	-9.80	1.29	V		0.034	15.37
		256-QAM	-36.62	23.37	-9.80	1.29	V		0.017	12.28
715.3		QPSK	-31.62	28.22	-9.78	1.30	V		0.052	17.14
		16-QAM	-32.32	27.52	-9.78	1.30	V		0.044	16.44
		64-QAM	-33.41	26.43	-9.78	1.30	V		0.034	15.35
		256-QAM	-36.53	23.31	-9.78	1.30	V		0.017	12.23

Freq (MHz)	Mod (Bandwidth)	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol	Limit W	ERP	
									W	dBm
700.5	LTE B12 (3 MHz)	QPSK	-31.54	8.53	9.86	1.29	V	< 3.00	0.051	17.09
		16-QAM	-32.29	7.78	9.86	1.29	V		0.043	16.34
		64-QAM	-33.35	6.72	9.86	1.29	V		0.034	15.28
		256-QAM	-36.45	3.62	9.86	1.29	V		0.017	12.18
707.5		QPSK	-31.74	28.25	-9.80	1.29	V		0.052	17.16
		16-QAM	-32.51	27.48	-9.80	1.29	V		0.044	16.39
		64-QAM	-33.56	26.43	-9.80	1.29	V		0.034	15.34
		256-QAM	-36.69	23.30	-9.80	1.29	V		0.017	12.21
714.5		QPSK	-31.69	28.13	-9.79	1.30	V		0.051	17.04
		16-QAM	-32.43	27.39	-9.79	1.30	V		0.043	16.30
		64-QAM	-33.48	26.34	-9.79	1.30	V		0.034	15.25
		256-QAM	-36.56	23.26	-9.79	1.30	V		0.017	12.17

Freq (MHz)	Mod (Bandwidth)	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol	Limit W	ERP	
									W	dBm
701.5	LTE B12/17 (5 MHz)	QPSK	-31.61	28.16	-9.82	1.29	V	< 3.00	0.051	17.05
		16-QAM	-32.29	27.48	-9.82	1.29	V		0.043	16.37
		64-QAM	-33.37	26.40	-9.82	1.29	V		0.034	15.29
		256-QAM	-36.51	23.26	-9.82	1.29	V		0.016	12.15
707.5		QPSK	-31.72	28.27	-9.80	1.29	V		0.052	17.18
		16-QAM	-32.47	27.52	-9.80	1.29	V		0.044	16.43
		64-QAM	-33.55	26.44	-9.80	1.29	V		0.034	15.35
		256-QAM	-36.69	23.30	-9.80	1.29	V		0.017	12.21
713.5		QPSK	-31.69	28.11	-9.79	1.30	V		0.050	17.02
		16-QAM	-32.45	27.35	-9.79	1.30	V		0.042	16.26
		64-QAM	-33.52	26.28	-9.79	1.30	V		0.033	15.19
		256-QAM	-36.66	23.14	-9.79	1.30	V		0.016	12.05

Freq (MHz)	Mod (Bandwidth)	Modulation	Measured Level (dBm)	Substitute Level (dBm)	Ant. Gain (dBd)	C.L	Pol	Limit W	ERP	
									W	dBm
704.0	LTE B12/17 (10 MHz)	QPSK	-31.58	28.28	-9.81	1.29	V	< 3.00	0.052	17.18
		16-QAM	-32.31	27.55	-9.81	1.29	V		0.044	16.45
		64-QAM	-33.36	26.50	-9.81	1.29	V		0.035	15.40
		256-QAM	-36.53	23.33	-9.81	1.29	V		0.017	12.23
707.5		QPSK	-31.58	28.41	-9.80	1.29	V		0.054	17.32
		16-QAM	-32.38	27.61	-9.80	1.29	V		0.045	16.52
		64-QAM	-33.45	26.54	-9.80	1.29	V		0.035	15.45
		256-QAM	-36.62	23.37	-9.80	1.29	V		0.017	12.28
711.0		QPSK	-31.76	28.00	-9.79	1.29	V		0.049	16.92
		16-QAM	-32.47	27.29	-9.79	1.29	V		0.042	16.21
		64-QAM	-33.58	26.18	-9.79	1.29	V		0.032	15.10
		256-QAM	-36.66	23.10	-9.79	1.29	V		0.016	12.02

8.2 RADIATED SPURIOUS EMISSIONS

- ▣ MODE: LTE B12(17)
- ▣ MODULATION SIGNAL: 10 MHz QPSK
- ▣ DISTANCE: 3 meters

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitute Level (dBm)	C.L	Pol	Result (dBm)	Limit
23060 (704.0)	1 408.00	-50.89	7.68	-60.31	1.84	H	-54.47	-13.00
	2 112.00	-49.07	9.52	-53.56	2.33	H	-46.37	-13.00
	2 816.00	-55.99	10.80	-57.33	2.69	H	-49.21	-13.00
	3 520.00	-55.92	12.40	-55.88	3.01	H	-46.49	-13.00
	4 224.00	-58.25	12.75	-55.78	3.38	H	-46.41	-13.00
23095 (707.5)	1 415.00	-50.70	7.72	-59.82	1.85	V	-53.95	-13.00
	2 122.50	-49.75	9.44	-52.97	2.31	V	-45.84	-13.00
	2 830.00	-56.26	10.80	-57.84	2.69	H	-49.73	-13.00
	3 537.50	-56.54	12.40	-55.94	3.08	V	-46.62	-13.00
	4 245.00	-57.81	12.79	-54.76	3.41	V	-45.38	-13.00
23130 (711.0)	1 422.00	-49.67	7.76	-58.48	1.86	V	-52.58	-13.00
	2 133.00	-50.14	9.36	-53.93	2.30	V	-46.87	-13.00
	2 844.00	-55.53	10.80	-57.43	2.71	V	-49.34	-13.00
	3 555.00	-57.01	12.39	-56.19	3.08	H	-46.88	-13.00
	4 266.00	-58.21	12.77	-55.19	3.38	V	-45.81	-13.00

8.3 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
12	1.4 MHz	707.5	QPSK	6	0	1.0994
			16-QAM			1.0979
			64-QAM			1.1051
			256-QAM			1.0961
	3 MHz		QPSK	15		2.7092
			16-QAM			2.7136
			64-QAM			2.7245
			256-QAM			2.7072
12(17)	5 MHz	QPSK	25	4.4974		
		16-QAM		4.5132		
		64-QAM		4.5255		
		256-QAM		4.5072		
	10 MHz	QPSK	50	8.9809		
		16-QAM		9.0004		
		64-QAM		8.9778		
		256-QAM		8.9705		

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 44 ~ 59.

8.4 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
12	1.4	699.7	3.6905	27.976	-66.978	-39.002	-13.00
		707.5	3.7024	27.976	-66.698	-38.722	
		715.3	3.7015	27.976	-66.751	-38.775	
	3	700.5	3.7044	27.976	-67.168	-39.192	
		707.5	3.7199	27.976	-67.150	-39.174	
		714.5	3.7129	27.976	-66.881	-38.905	
12(17)	5	701.5	3.7034	27.976	-67.246	-39.270	
		707.5	3.1915	27.976	-67.152	-39.176	
		713.5	3.1676	27.976	-67.139	-39.163	
	10	704.0	3.1805	27.976	-67.163	-39.187	
		707.5	3.7059	27.976	-67.178	-39.202	
		711.0	3.7054	27.976	-67.035	-39.059	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 88 ~ 99.
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(26.5)	30.131

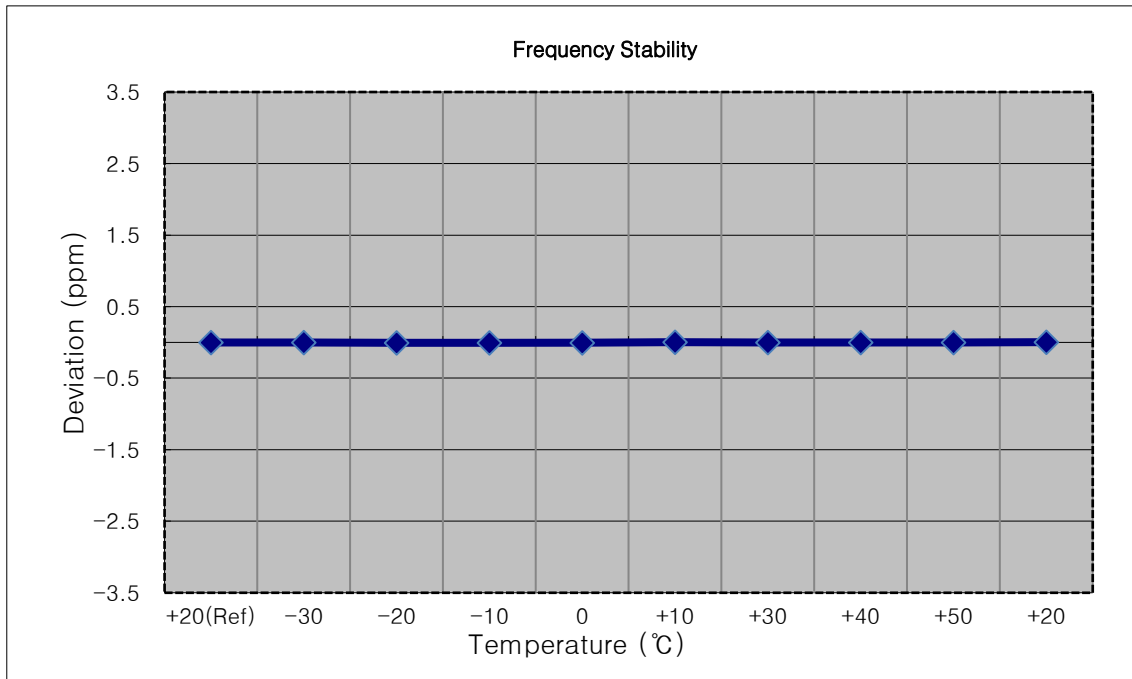
8.5 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 60 ~ 87.

8.6 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

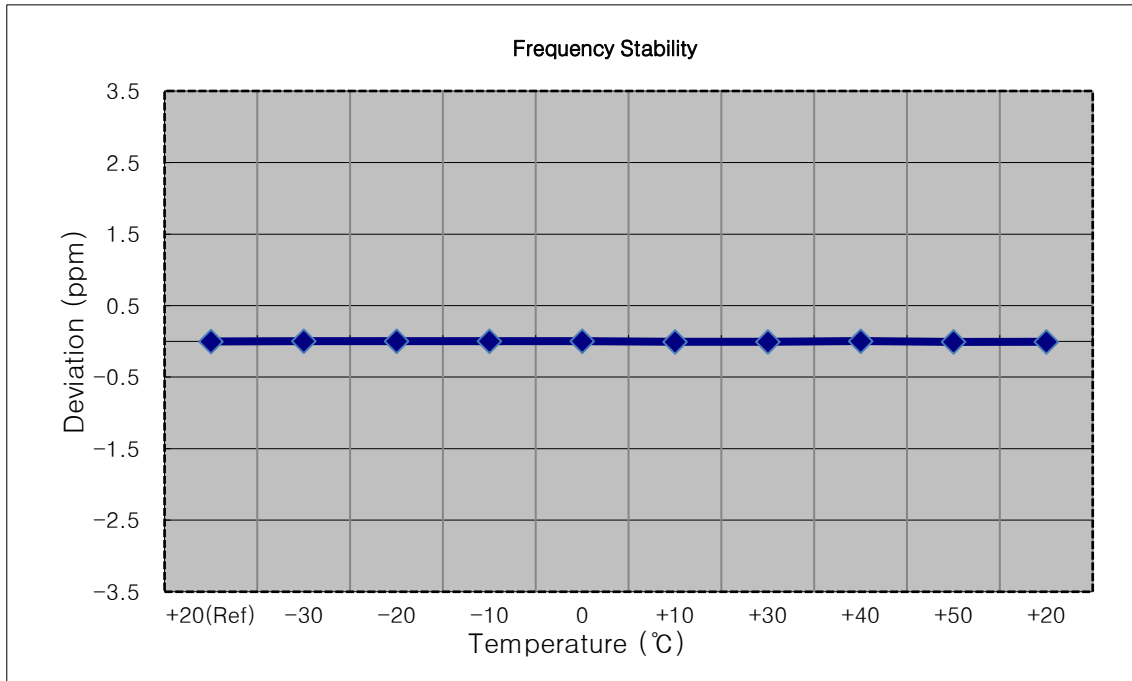
- ▣ MODE: LTE B12
- ▣ OPERATING FREQUENCY: 699,700,000 Hz
- ▣ CHANNEL: 23017 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	699 699 998	0.0	0.000 000	0.000
100 %		-30	699 699 997	-1.5	0.000 000	-0.002
100 %		-20	699 699 996	-2.4	0.000 000	-0.003
100 %		-10	699 699 996	-2.4	0.000 000	-0.003
100 %		0	699 699 995	-3.0	0.000 000	-0.004
100 %		+10	699 700 000	1.5	0.000 000	0.002
100 %		+30	699 699 996	-1.6	0.000 000	-0.002
100 %		+40	699 699 996	-2.2	0.000 000	-0.003
100 %		+50	699 699 996	-1.7	0.000 000	-0.002
Batt. Endpoint		3.350	+20	699 700 000	2.2	0.000 000



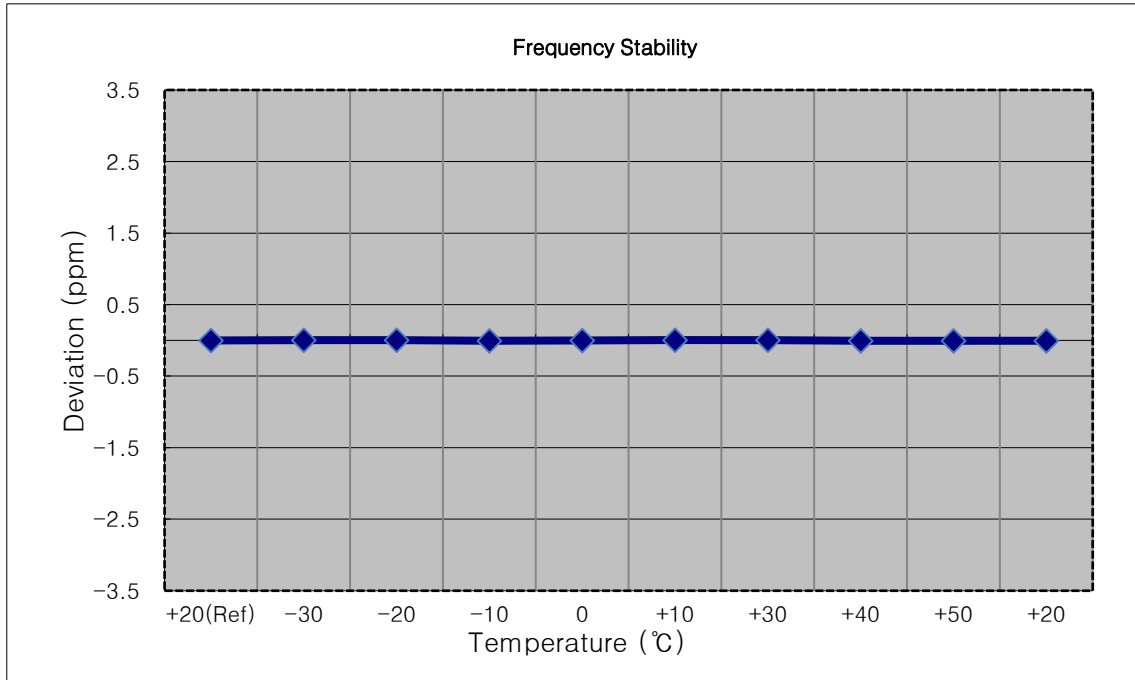
- ▣ MODE: LTE B12
- ▣ OPERATING FREQUENCY: 700,500,000 Hz
- ▣ CHANNEL: 23025 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	700 499 998	0.0	0.000 000	0.000
100 %		-30	700 500 000	2.1	0.000 000	0.003
100 %		-20	700 500 001	2.9	0.000 000	0.004
100 %		-10	700 500 001	3.0	0.000 000	0.004
100 %		0	700 500 000	2.4	0.000 000	0.003
100 %		+10	700 499 995	-2.8	0.000 000	-0.004
100 %		+30	700 499 995	-2.7	0.000 000	-0.004
100 %		+40	700 500 001	3.3	0.000 000	0.005
100 %		+50	700 499 993	-5.3	-0.000 001	-0.008
Batt. Endpoint		3.350	+20	700 499 995	-3.2	0.000 000



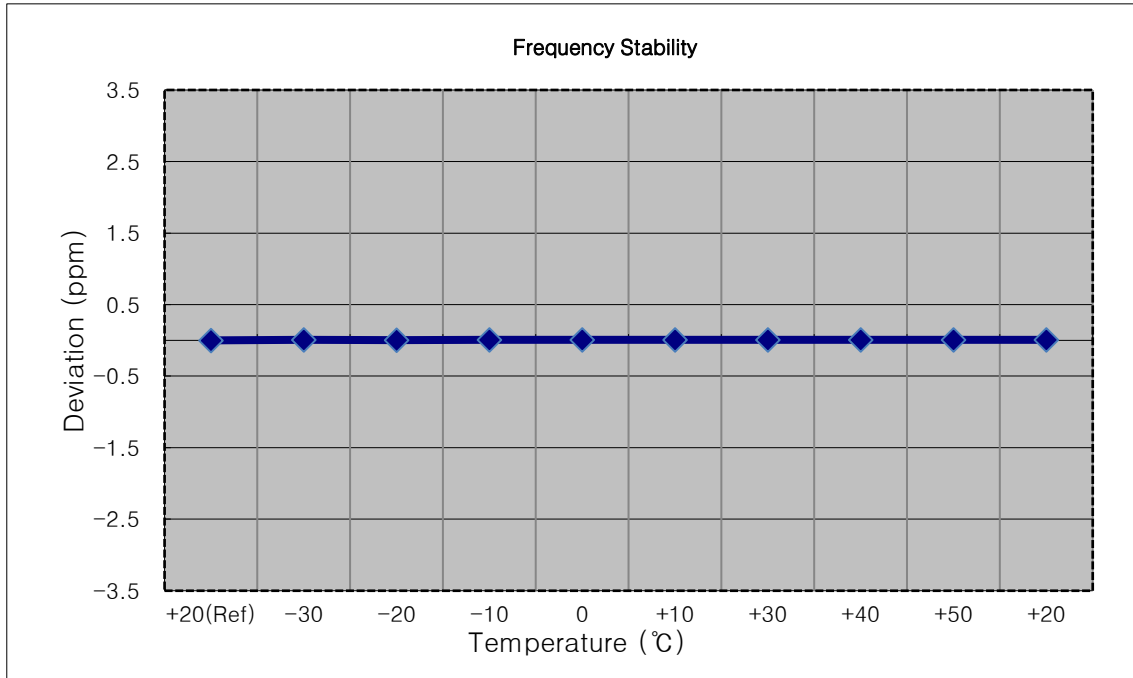
- ▣ MODE: LTE B12/17
- ▣ OPERATING FREQUENCY: 701,500,000 Hz
- ▣ CHANNEL: 23035 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	701 499 997	0.0	0.000 000	0.000
100 %		-30	701 499 999	1.5	0.000 000	0.002
100 %		-20	701 500 000	2.8	0.000 000	0.004
100 %		-10	701 499 994	-2.7	0.000 000	-0.004
100 %		0	701 499 995	-2.3	0.000 000	-0.003
100 %		+10	701 500 000	3.0	0.000 000	0.004
100 %		+30	701 499 999	2.4	0.000 000	0.003
100 %		+40	701 499 995	-2.4	0.000 000	-0.003
100 %		+50	701 499 994	-2.9	0.000 000	-0.004
Batt. Endpoint	3.350	+20	701 499 993	-3.7	-0.000 001	-0.005



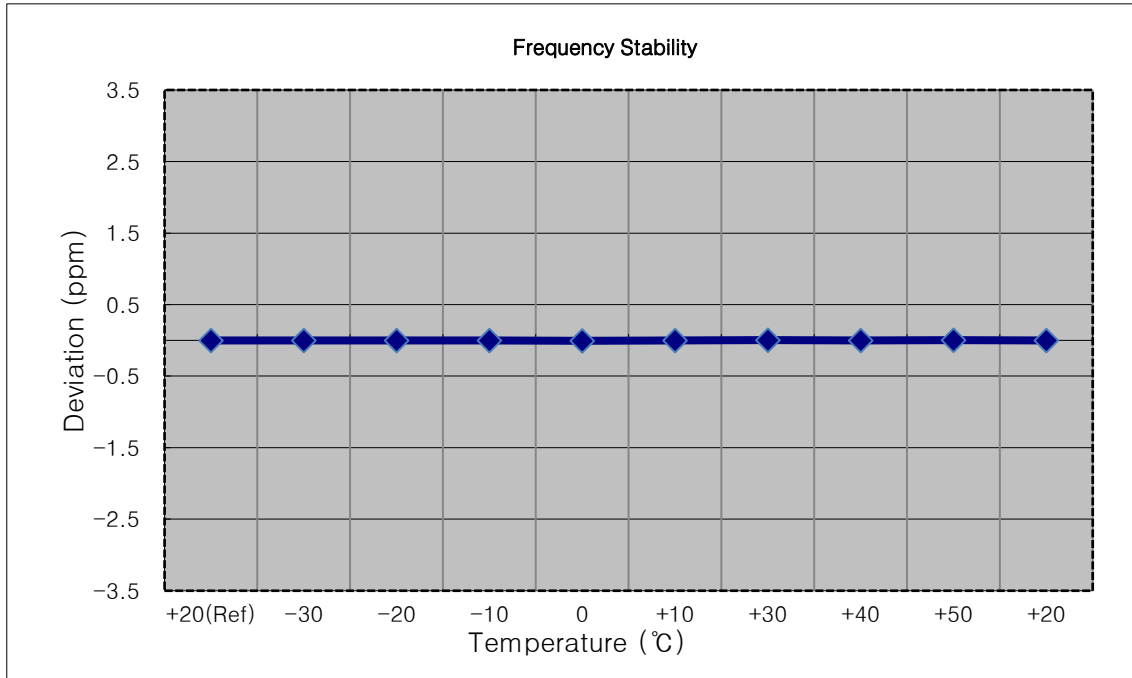
- ▣ MODE: LTE B12/17
- ▣ OPERATING FREQUENCY: 704,000,000 Hz
- ▣ CHANNEL: 23060 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	704 000 004	0.0	0.000 000	0.000
100 %		-30	704 000 008	4.1	0.000 001	0.006
100 %		-20	704 000 008	3.9	0.000 001	0.006
100 %		-10	704 000 009	5.0	0.000 001	0.007
100 %		0	704 000 008	4.3	0.000 001	0.006
100 %		+10	704 000 008	4.2	0.000 001	0.006
100 %		+30	704 000 009	4.5	0.000 001	0.006
100 %		+40	704 000 009	4.5	0.000 001	0.006
100 %		+50	704 000 008	4.3	0.000 001	0.006
Batt. Endpoint	3.350	+20	704 000 009	5.2	0.000 001	0.007



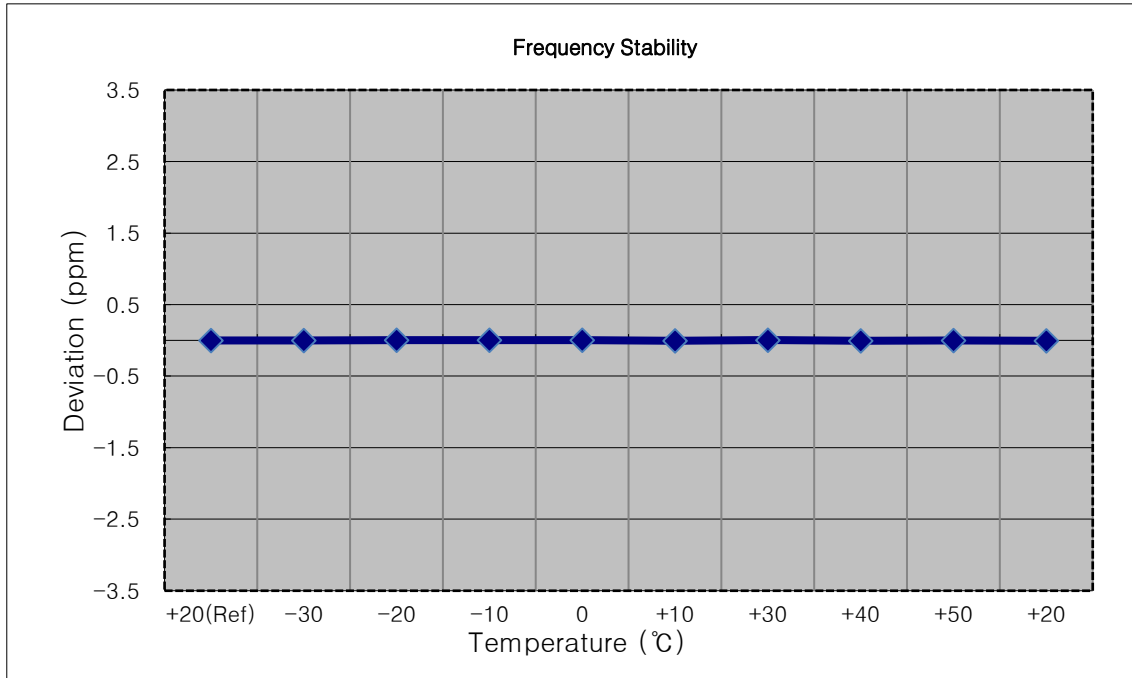
- ▣ MODE: LTE B12
- ▣ OPERATING FREQUENCY: 707,500,000 Hz
- ▣ CHANNEL: 23095 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	707 499 998	0.0	0.000 000	0.000
100 %		-30	707 499 996	-2.3	0.000 000	-0.003
100 %		-20	707 499 996	-2.0	0.000 000	-0.003
100 %		-10	707 499 996	-2.0	0.000 000	-0.003
100 %		0	707 499 994	-4.3	-0.000 001	-0.006
100 %		+10	707 499 997	-1.0	0.000 000	-0.001
100 %		+30	707 500 001	2.8	0.000 000	0.004
100 %		+40	707 499 996	-2.0	0.000 000	-0.003
100 %		+50	707 499 999	1.0	0.000 000	0.001
Batt. Endpoint	3.350	+20	707 499 997	-1.0	0.000 000	-0.001



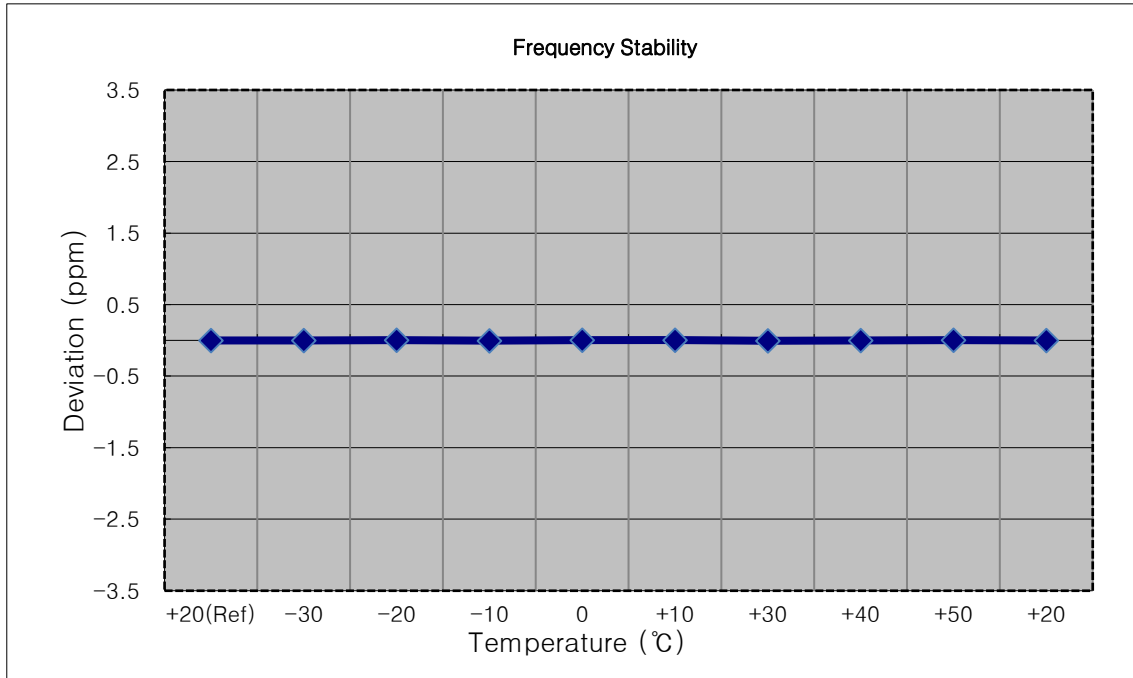
- ▣ MODE: LTE B12
- ▣ OPERATING FREQUENCY: 707,500,000 Hz
- ▣ CHANNEL: 23095 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	707 499 998	0.0	0.000 000	0.000
100 %		-30	707 499 996	-2.2	0.000 000	-0.003
100 %		-20	707 500 000	1.8	0.000 000	0.003
100 %		-10	707 500 000	2.0	0.000 000	0.003
100 %		0	707 500 000	1.8	0.000 000	0.003
100 %		+10	707 499 995	-3.4	0.000 000	-0.005
100 %		+30	707 500 002	3.3	0.000 000	0.005
100 %		+40	707 499 995	-2.8	0.000 000	-0.004
100 %		+50	707 499 997	-0.9	0.000 000	-0.001
Batt. Endpoint	3.350	+20	707 499 994	-3.9	-0.000 001	-0.006



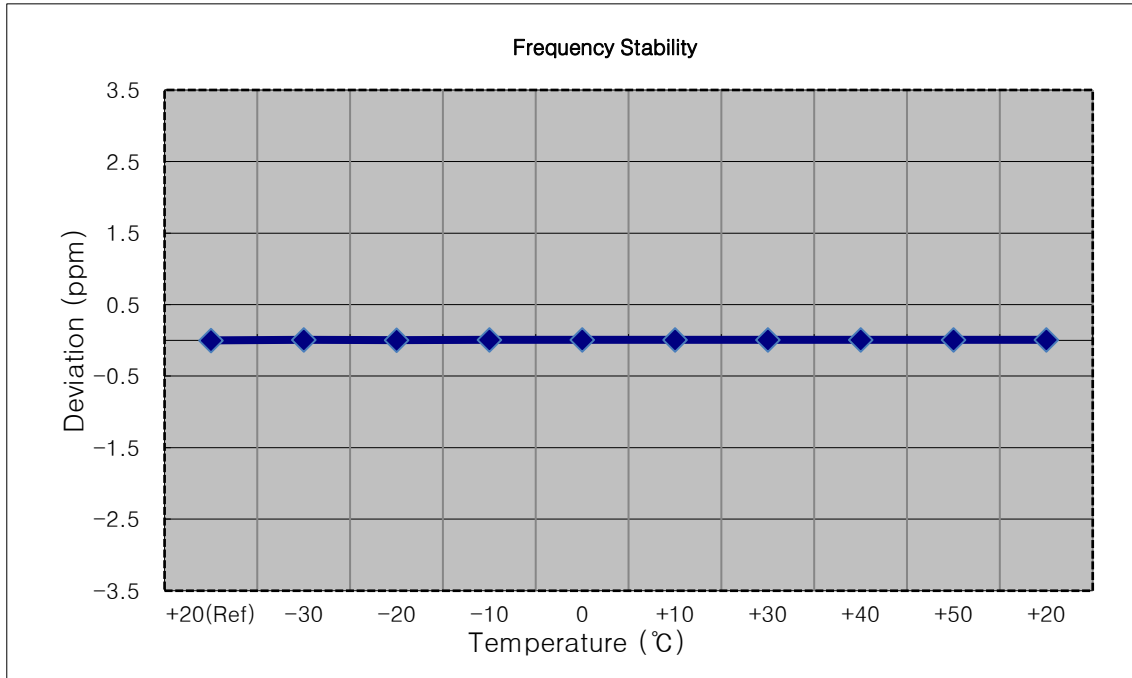
- ▣ MODE: LTE B12/17
- ▣ OPERATING FREQUENCY: 707,500,000 Hz
- ▣ CHANNEL: 23095 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	707 500 003	0.0	0.000 000	0.000
100 %		-30	707 500 001	-2.2	0.000 000	-0.003
100 %		-20	707 500 006	2.5	0.000 000	0.004
100 %		-10	707 500 000	-2.6	0.000 000	-0.004
100 %		0	707 500 005	1.5	0.000 000	0.002
100 %		+10	707 500 006	3.1	0.000 000	0.004
100 %		+30	707 500 001	-2.5	0.000 000	-0.004
100 %		+40	707 500 001	-1.7	0.000 000	-0.002
100 %		+50	707 500 006	3.0	0.000 000	0.004
Batt. Endpoint	3.350	+20	707 500 001	-2.0	0.000 000	-0.003



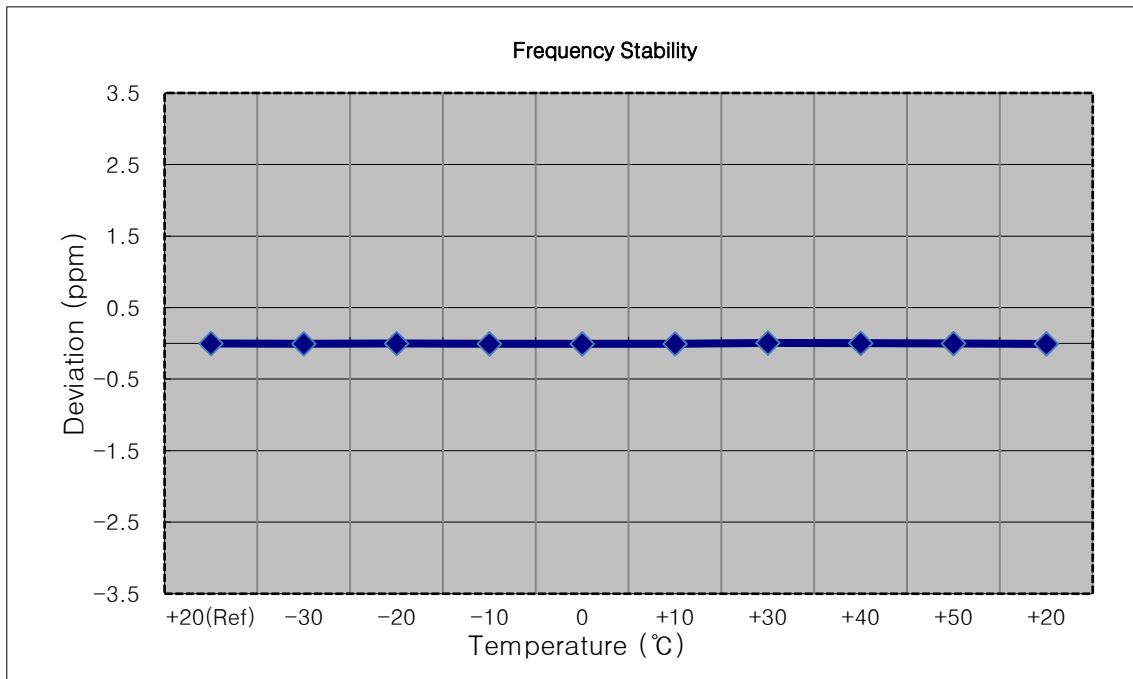
- ▣ MODE: LTE B12/17
- ▣ OPERATING FREQUENCY: 707,500,000 Hz
- ▣ CHANNEL: 23095 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	707 500 004	0.0	0.000 000	0.000
100 %		-30	707 500 010	5.5	0.000 001	0.008
100 %		-20	707 500 008	3.7	0.000 001	0.005
100 %		-10	707 500 009	4.4	0.000 001	0.006
100 %		0	707 500 009	5.0	0.000 001	0.007
100 %		+10	707 500 008	4.3	0.000 001	0.006
100 %		+30	707 500 010	5.4	0.000 001	0.008
100 %		+40	707 500 009	4.5	0.000 001	0.006
100 %		+50	707 500 009	4.4	0.000 001	0.006
Batt. Endpoint	3.350	+20	707 500 009	5.0	0.000 001	0.007



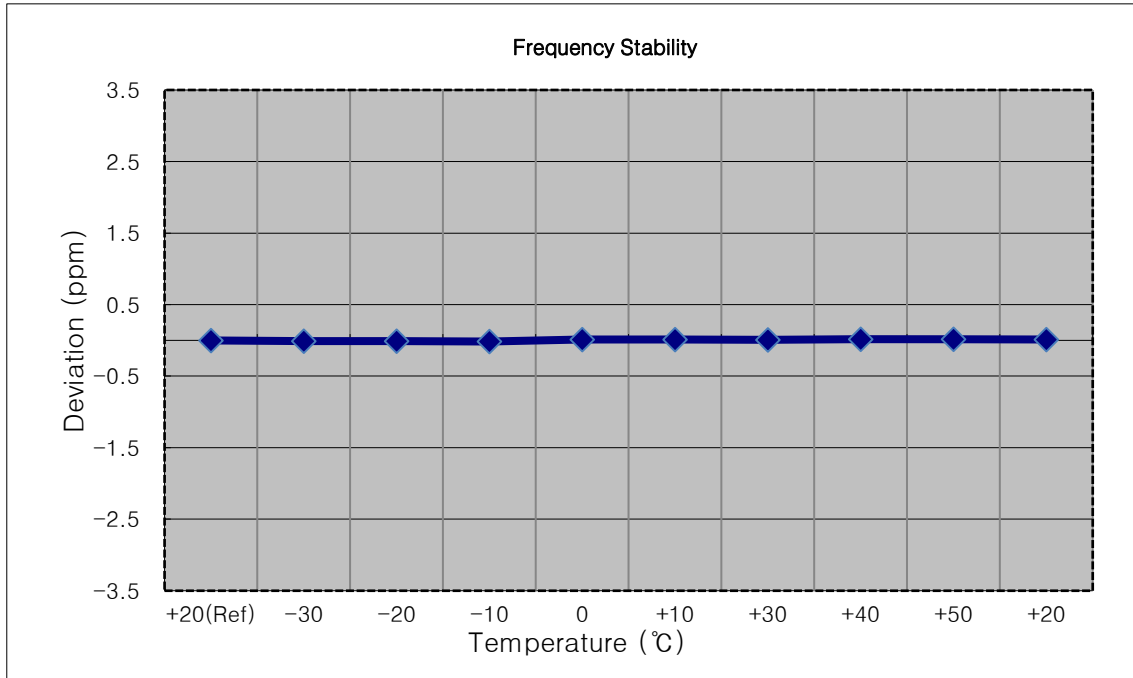
- ▣ MODE: LTE B12
- ▣ OPERATING FREQUENCY: 715,300,000 Hz
- ▣ CHANNEL: 23173 (1.4 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	715 299 996	0.0	0.000 000	0.000
100 %		-30	715 299 993	-3.2	0.000 000	-0.004
100 %		-20	715 299 994	-2.2	0.000 000	-0.003
100 %		-10	715 299 994	-2.7	0.000 000	-0.004
100 %		0	715 299 992	-4.4	-0.000 001	-0.006
100 %		+10	715 299 993	-3.6	-0.000 001	-0.005
100 %		+30	715 300 000	4.2	0.000 001	0.006
100 %		+40	715 300 000	3.3	0.000 000	0.005
100 %		+50	715 299 994	-1.8	0.000 000	-0.003
Batt. Endpoint	3.350	+20	715 299 991	-5.5	-0.000 001	-0.008



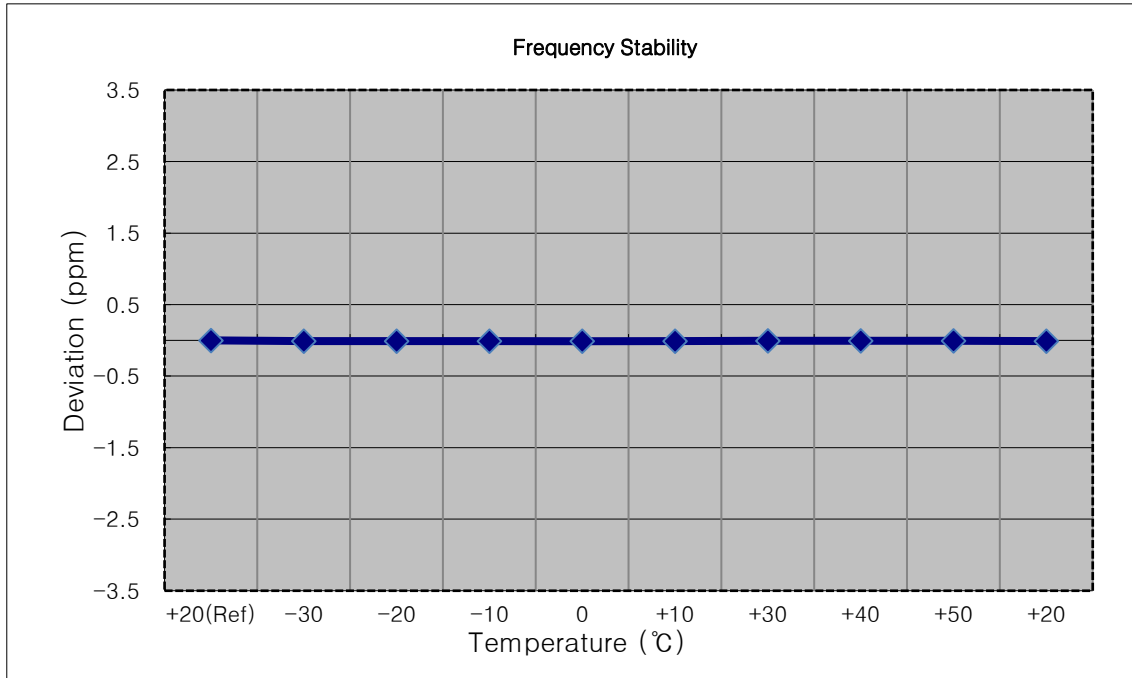
- ▣ MODE: LTE B12
- ▣ OPERATING FREQUENCY: 714,500,000 Hz
- ▣ CHANNEL: 23165 (3 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	714 499 993	0.0	0.000 000	0.000
100 %		-30	714 499 985	-7.7	-0.000 001	-0.011
100 %		-20	714 499 985	-8.2	-0.000 001	-0.011
100 %		-10	714 499 982	-11.5	-0.000 002	-0.016
100 %		0	714 500 001	7.5	0.000 001	0.010
100 %		+10	714 500 001	8.3	0.000 001	0.012
100 %		+30	714 500 000	6.6	0.000 001	0.009
100 %		+40	714 500 004	11.1	0.000 002	0.016
100 %		+50	714 500 004	11.2	0.000 002	0.016
Batt. Endpoint	3.350	+20	714 500 002	8.8	0.000 001	0.012



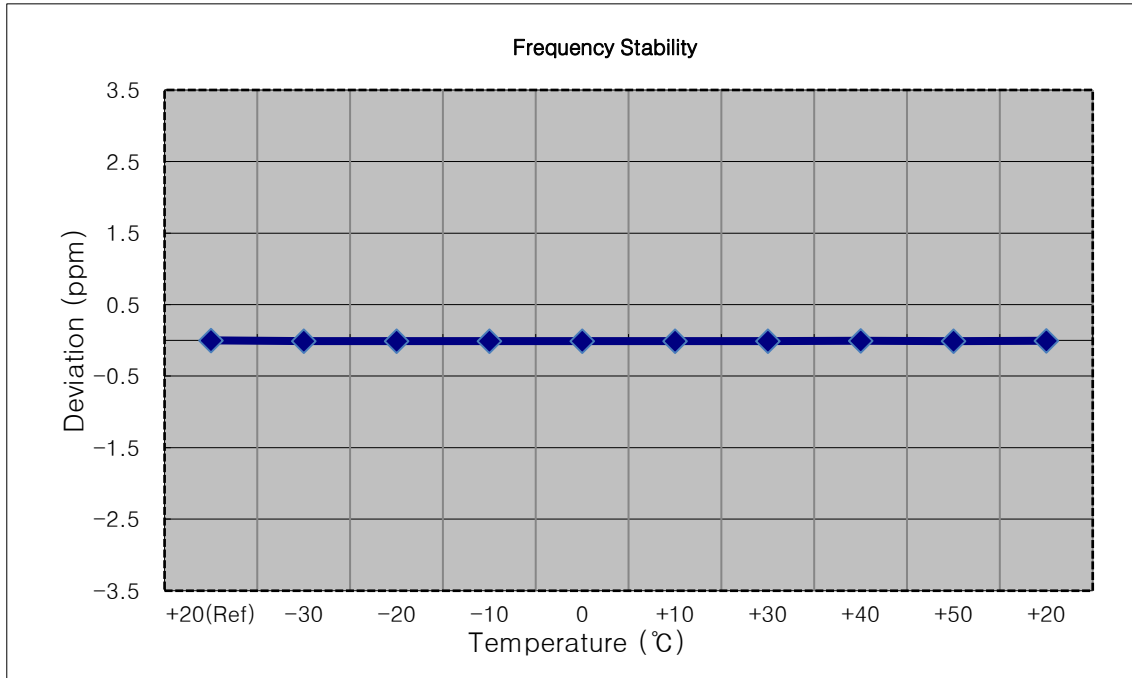
- ▣ MODE: LTE B12/17
- ▣ OPERATING FREQUENCY: 713,500,000 Hz
- ▣ CHANNEL: 23155 (5 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	713 499 994	0.0	0.000 000	0.000
100 %		-30	713 499 988	-5.8	-0.000 001	-0.008
100 %		-20	713 499 987	-7.1	-0.000 001	-0.010
100 %		-10	713 499 988	-5.7	-0.000 001	-0.008
100 %		0	713 499 986	-8.5	-0.000 001	-0.012
100 %		+10	713 499 988	-5.9	-0.000 001	-0.008
100 %		+30	713 499 991	-3.5	0.000 000	-0.005
100 %		+40	713 499 989	-5.5	-0.000 001	-0.008
100 %		+50	713 499 988	-5.6	-0.000 001	-0.008
Batt. Endpoint	3.350	+20	713 499 988	-5.9	-0.000 001	-0.008



- ▣ MODE: LTE B12/17
- ▣ OPERATING FREQUENCY: 711,000,000 Hz
- ▣ CHANNEL: 23130 (10 MHz)
- ▣ REFERENCE VOLTAGE: 3.880 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	3.880	+20(Ref)	710 999 993	0.0	0.000 000	0.000
100 %		-30	710 999 987	-5.9	-0.000 001	-0.008
100 %		-20	710 999 987	-6.0	-0.000 001	-0.008
100 %		-10	710 999 986	-7.5	-0.000 001	-0.011
100 %		0	710 999 986	-7.5	-0.000 001	-0.011
100 %		+10	710 999 987	-6.2	-0.000 001	-0.009
100 %		+30	710 999 986	-7.5	-0.000 001	-0.011
100 %		+40	710 999 988	-5.4	-0.000 001	-0.008
100 %		+50	710 999 985	-7.8	-0.000 001	-0.011
Batt. Endpoint	3.350	+20	710 999 988	-5.3	-0.000 001	-0.007



8.7 UPLINK CARRIER AGGREGATION

Test Note

1. All tests were evaluated for the two bands using various combinations of RB size, RB offset, modulation, and channel bandwidth.
2. All modes of operation were investigated and the worst case configuration results are reported in this section.
Please refer to the table below.
3. The worst case is reported with the modulations, RB sizes and offsets.
 - 4A(Main 2 Ant)-12A (PCC - Modulation: QPSK, RB: 1, RB Offset: 0, SCC - Modulation: QPSK, RB: 1, RB Offset: 49)
 - 4A(Sub 2 Ant)-12A (PCC - Modulation: QPSK, RB: 1, RB Offset: 0, SCC - Modulation: QPSK, RB: 1, RB Offset: 0)
 - 12A-4A(Main 2 Ant) (PCC - Modulation: QPSK, RB: 1, RB Offset: 49, SCC - Modulation: QPSK, RB: 1, RB Offset: 0)
 - 12A-4A(Sub 2 Ant) (PCC - Modulation: QPSK, RB: 1, RB Offset: 0, SCC - Modulation: QPSK, RB: 1, RB Offset: 0)
 - 12A-66A(Main 2 Ant) (PCC - Modulation: QPSK, RB: 1, RB Offset: 0, SCC - Modulation: QPSK, RB: 1, RB Offset: 0)
 - 12A-66A(Sub 2 Ant) (PCC - Modulation: QPSK, RB: 1, RB Offset: 0, SCC - Modulation: QPSK, RB: 1, RB Offset: 0)
 - 66A(Main 2 Ant)-12A (PCC - Modulation: QPSK, RB: 1, RB Offset: 0, SCC - Modulation: QPSK, RB: 1, RB Offset: 49)
 - 66A(Sub 2 Ant)-12A (PCC - Modulation: QPSK, RB: 1, RB Offset: 0, SCC - Modulation: QPSK, RB: 1, RB Offset: 0)

Radiated Spurious Emissions

PCC	SCC	PCC		SCC	
		BW(MHz)	Channel	BW(MHz)	Channel
4A(Main 2 Ant)	12A	3	19965	10	23095
4A(Sub 2 Ant)	12A	5	20175	10	23095
12A	4A(Main 2 Ant)	10	23095	3	19965
12A	4A(Sub 2 Ant)	10	23095	5	20175
12A	66A(Main 2 Ant)	10	23095	3	131987
12A	66A(Sub 2 Ant)	10	23095	20	132322
66A(Main 2 Ant)	12A	3	131987	10	23095
66A(Sub 2 Ant)	12A	20	132322	10	23095

8.7.1 RADIATED SPURIOUS EMISSIONS

4A(Main 2 Ant)(PCC)-12A(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 423.00	-54.79	12.56	-61.53	2.99	V	-51.96	-13.00
5 134.50	-55.50	12.27	-52.84	3.73	H	-44.30	-13.00
6 846.00	-55.10	12.00	-48.52	4.38	V	-40.89	-13.00
8 557.50	-59.04	11.48	-46.31	4.95	V	-39.78	-13.00
10 269.00	-58.09	11.50	-40.30	5.78	H	-34.58	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
1 415.00	-52.46	7.72	-61.58	1.85	H	-55.71	-13.00
2 122.50	-42.24	9.44	-45.46	2.31	H	-38.33	-13.00
2 830.00	-57.13	10.80	-58.71	2.69	V	-50.60	-13.00
3 537.50	-58.12	12.40	-57.52	3.08	H	-48.20	-13.00
4 245.00	-59.38	12.79	-56.33	3.41	H	-46.95	-13.00

4A(Sub 2 Ant)(PCC)-12A(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 465.00	-54.69	12.47	-61.21	2.96	V	-51.70	-13.00
5 197.50	-56.18	12.50	-55.23	3.78	V	-46.51	-13.00
6 930.00	-56.26	11.78	-48.62	4.38	H	-41.22	-13.00
8 662.50	-58.46	11.16	-45.20	5.00	H	-39.04	-13.00
10 395.00	-58.98	11.40	-41.74	5.79	H	-36.13	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
1 415.00	-51.62	7.72	-60.74	1.85	V	-54.87	-13.00
2 122.50	-42.79	9.44	-46.01	2.31	H	-38.88	-13.00
2 830.00	-57.35	10.80	-58.93	2.69	V	-50.82	-13.00
3 537.50	-57.49	12.40	-56.89	3.08	V	-47.57	-13.00
4 245.00	-59.04	12.79	-55.99	3.41	V	-46.61	-13.00

12A(PCC)-4A(Main 2 Ant)(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
1 415.00	-52.06	7.72	-61.18	1.85	V	-55.31	-13.00
2 122.50	-42.93	9.44	-46.15	2.31	H	-39.02	-13.00
2 830.00	-57.11	10.80	-58.69	2.69	H	-50.58	-13.00
3 537.50	-57.35	12.40	-56.75	3.08	H	-47.43	-13.00
4 245.00	-59.30	12.79	-56.25	3.41	V	-46.87	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 423.00	-55.32	12.56	-62.06	2.99	V	-52.49	-13.00
5 134.50	-56.76	12.27	-54.10	3.73	H	-45.56	-13.00
6 846.00	-55.87	12.00	-49.29	4.38	H	-41.66	-13.00
8 557.50	-57.56	11.48	-44.83	4.95	H	-38.30	-13.00
10 269.00	-58.62	11.50	-40.83	5.78	H	-35.11	-13.00

12A(PCC)-4A(Sub 2 Ant)(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
1 415.00	-51.25	7.72	-60.37	1.85	V	-54.50	-13.00
2 122.50	-41.25	9.44	-44.47	2.31	H	-37.34	-13.00
2 830.00	-57.41	10.80	-58.99	2.69	V	-50.88	-13.00
3 537.50	-56.61	12.40	-56.01	3.08	V	-46.69	-13.00
4 245.00	-59.11	12.79	-56.06	3.41	V	-46.68	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 465.00	-54.82	12.47	-61.34	2.96	H	-51.83	-13.00
5 197.50	-57.68	12.50	-56.73	3.78	H	-48.01	-13.00
6 930.00	-56.82	11.78	-49.18	4.38	H	-41.78	-13.00
8 662.50	-57.03	11.16	-43.77	5.00	H	-37.61	-13.00
10 395.00	-58.58	11.40	-41.34	5.79	V	-35.73	-13.00

12A(PCC)-66A(Main 2 Ant)(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
1 415.00	-52.30	7.72	-61.42	1.85	H	-55.55	-13.00
2 122.50	-40.95	9.44	-44.17	2.31	H	-37.04	-13.00
2 830.00	-56.81	10.80	-58.39	2.69	V	-50.28	-13.00
3 537.50	-57.23	12.40	-56.63	3.08	V	-47.31	-13.00
4 245.00	-59.15	12.79	-56.10	3.41	V	-46.72	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 423.00	-55.35	12.56	-62.09	2.99	V	-52.52	-13.00
5 134.50	-56.41	12.27	-53.75	3.73	V	-45.21	-13.00
6 846.00	-56.12	12.00	-49.54	4.38	H	-41.91	-13.00
8 557.50	-58.75	11.48	-46.02	4.95	H	-39.49	-13.00
10 269.00	-58.65	11.50	-40.86	5.78	V	-35.14	-13.00

12A(PCC)-66A(Sub 2 Ant)(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
1 415.00	-52.35	7.72	-61.47	1.85	H	-55.60	-13.00
2 122.50	-40.11	9.44	-43.33	2.31	H	-36.20	-13.00
2 830.00	-57.15	10.80	-58.73	2.69	V	-50.62	-13.00
3 537.50	-58.41	12.40	-57.81	3.08	H	-48.49	-13.00
4 245.00	-58.66	12.79	-55.61	3.41	H	-46.23	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 490.00	-55.06	12.42	-60.93	2.99	V	-51.50	-13.00
5 235.00	-56.70	12.71	-55.93	3.82	V	-47.03	-13.00
6 980.00	-56.07	11.52	-48.34	4.41	V	-41.23	-13.00
8 725.00	-58.29	10.95	-44.39	5.01	V	-38.45	-13.00
10 470.00	-58.50	11.26	-40.90	5.85	H	-35.49	-13.00

66A(Main 2 Ant)(PCC)-12A(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 423.00	-54.88	12.56	-61.62	2.99	V	-52.05	-13.00
5 134.50	-56.50	12.27	-53.84	3.73	V	-45.30	-13.00
6 846.00	-56.44	12.00	-49.86	4.38	V	-42.23	-13.00
8 557.50	-58.01	11.48	-45.28	4.95	H	-38.75	-13.00
10 269.00	-58.83	11.50	-41.04	5.78	H	-35.32	-13.00

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
1 415.00	-52.10	7.72	-61.22	1.85	V	-55.35	-13.00
2 122.50	-41.85	9.44	-45.07	2.31	H	-37.94	-13.00
2 830.00	-56.99	10.80	-58.57	2.69	V	-50.46	-13.00
3 537.50	-58.10	12.40	-57.50	3.08	V	-48.18	-13.00
4 245.00	-58.58	12.79	-55.53	3.41	H	-46.15	-13.00

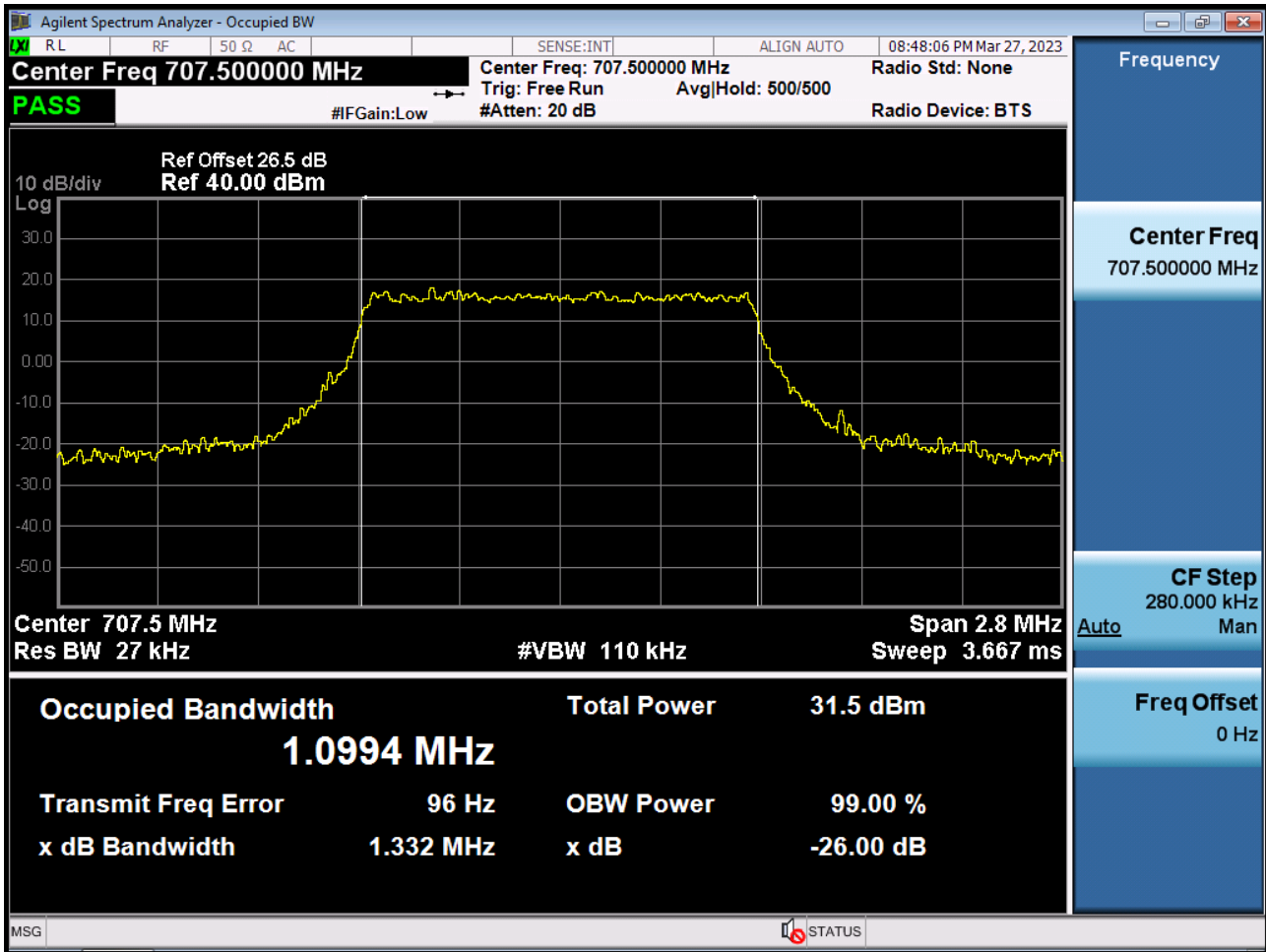
66A(Sub 2 Ant)(PCC)-12A(SCC)

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
3 490.00	-53.59	12.42	-59.46	2.99	V	-50.03	-13.00
5 235.00	-57.52	12.71	-56.75	3.82	V	-47.85	-13.00
6 980.00	-56.77	11.52	-49.04	4.41	H	-41.93	-13.00
8 725.00	-58.01	10.95	-44.11	5.01	V	-38.17	-13.00
10 470.00	-58.67	11.26	-41.07	5.85	V	-35.66	-13.00

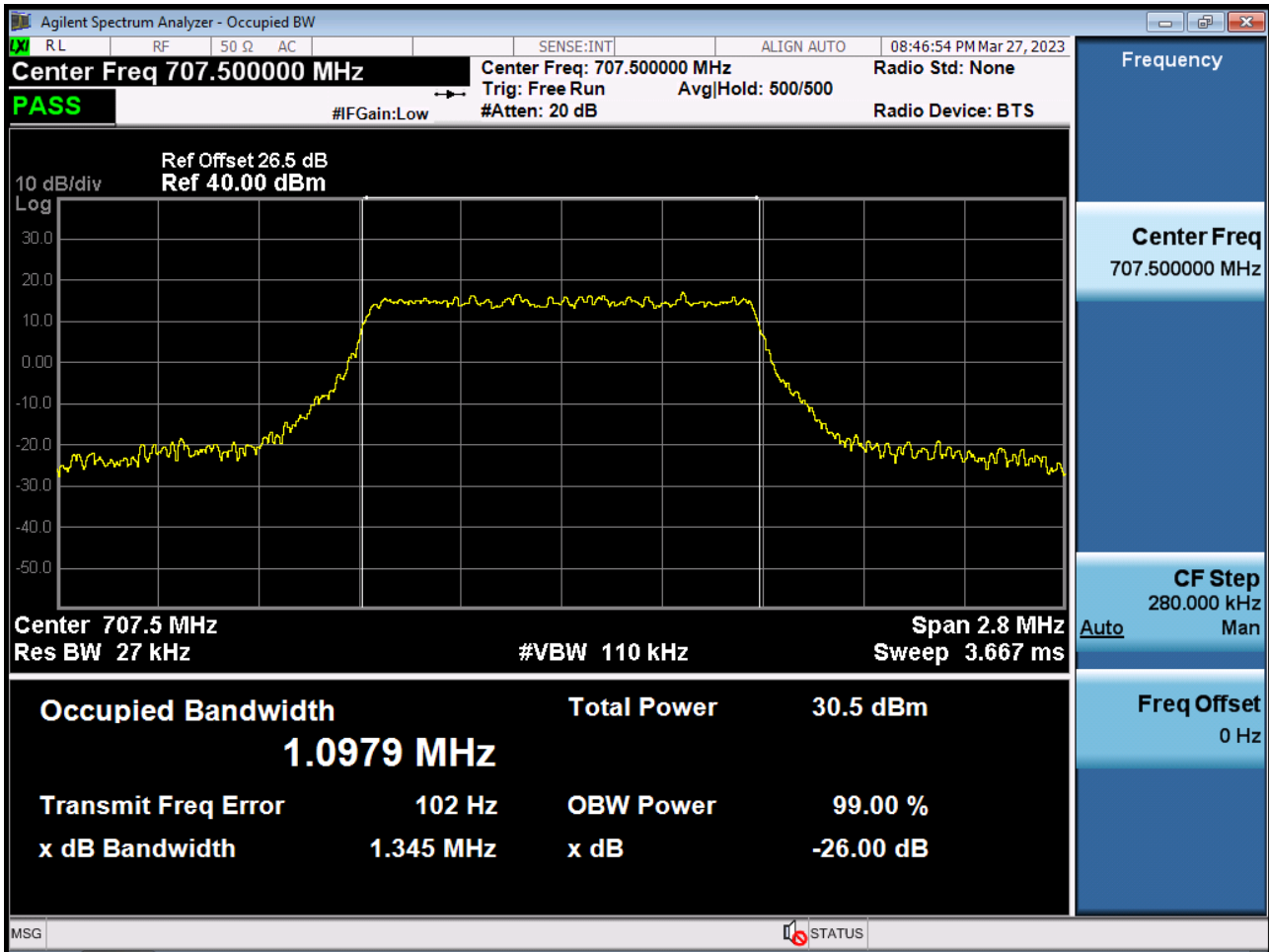
Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit (dBm)
1 415.00	-51.84	7.72	-60.96	1.85	H	-55.09	-13.00
2 122.50	-39.46	9.44	-42.68	2.31	H	-35.55	-13.00
2 830.00	-56.62	10.80	-58.20	2.69	H	-50.09	-13.00
3 537.50	-58.15	12.40	-57.55	3.08	H	-48.23	-13.00
4 245.00	-57.87	12.79	-54.82	3.41	V	-45.44	-13.00

9. TEST PLOTS

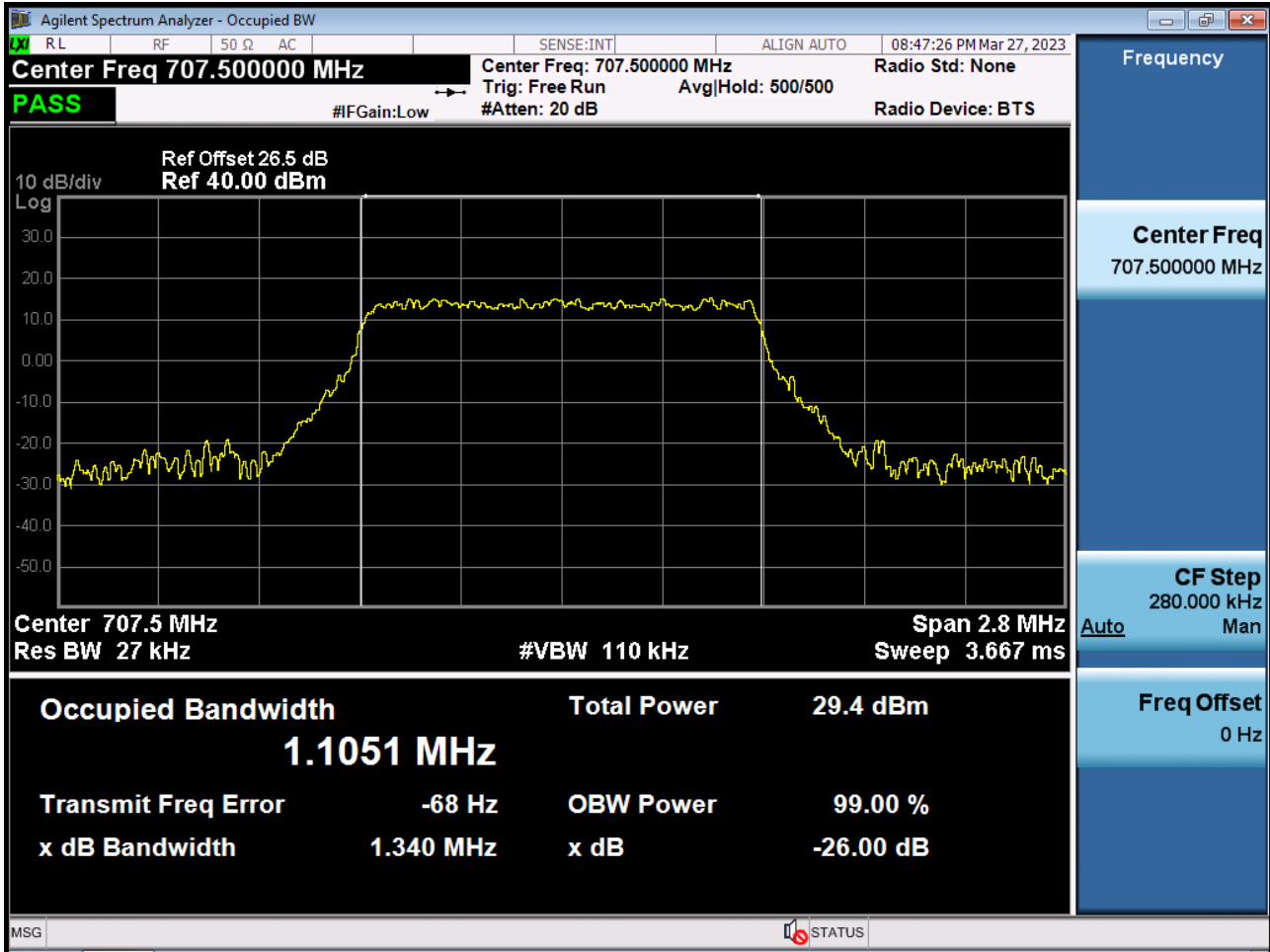
BAND 12. Occupied Bandwidth Plot (1.4 M BW Ch.23095 QPSK_RB6_0)



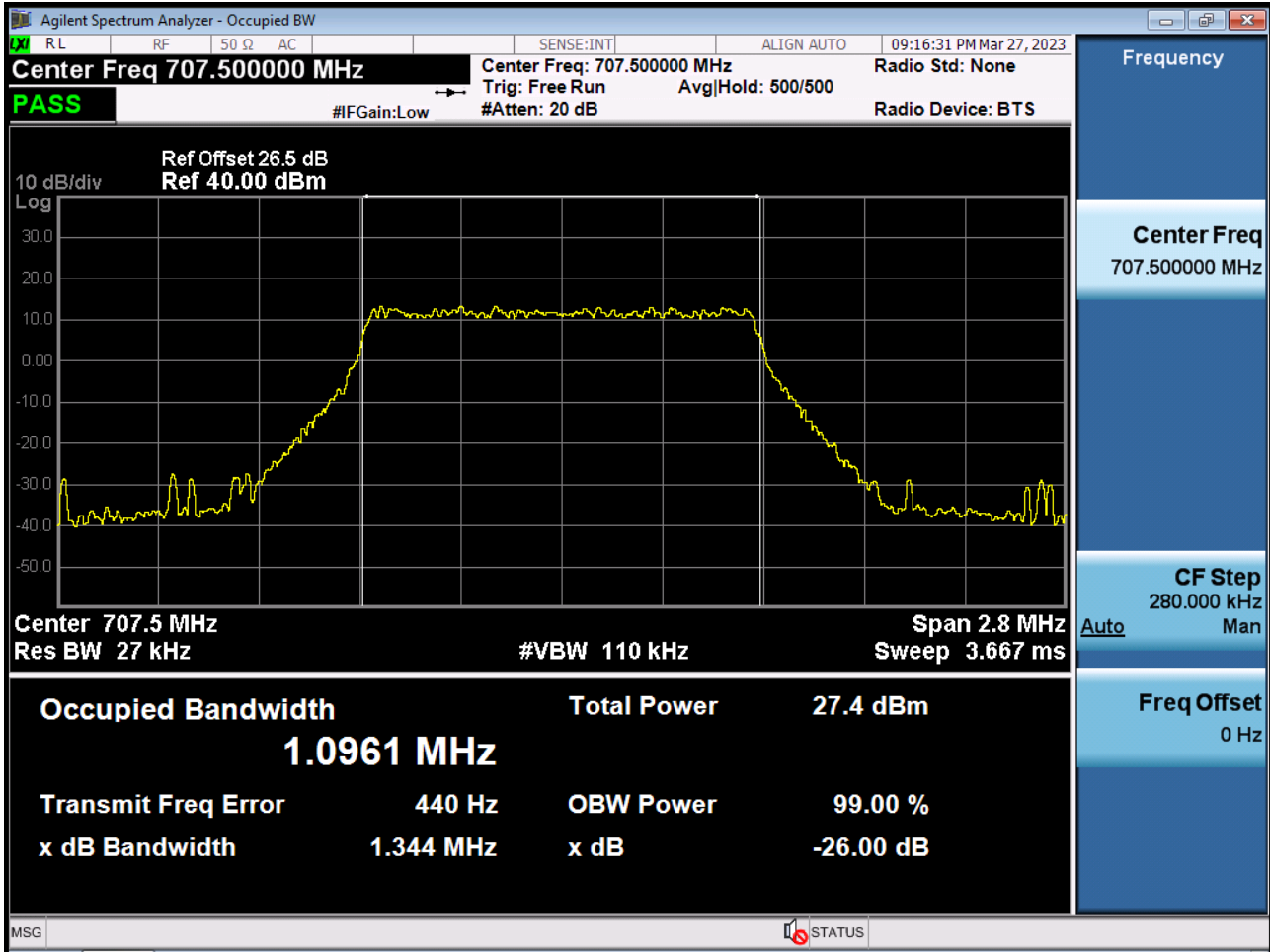
BAND 12. Occupied Bandwidth Plot (1.4 M BW Ch.23095 16QAM_RB6_0)



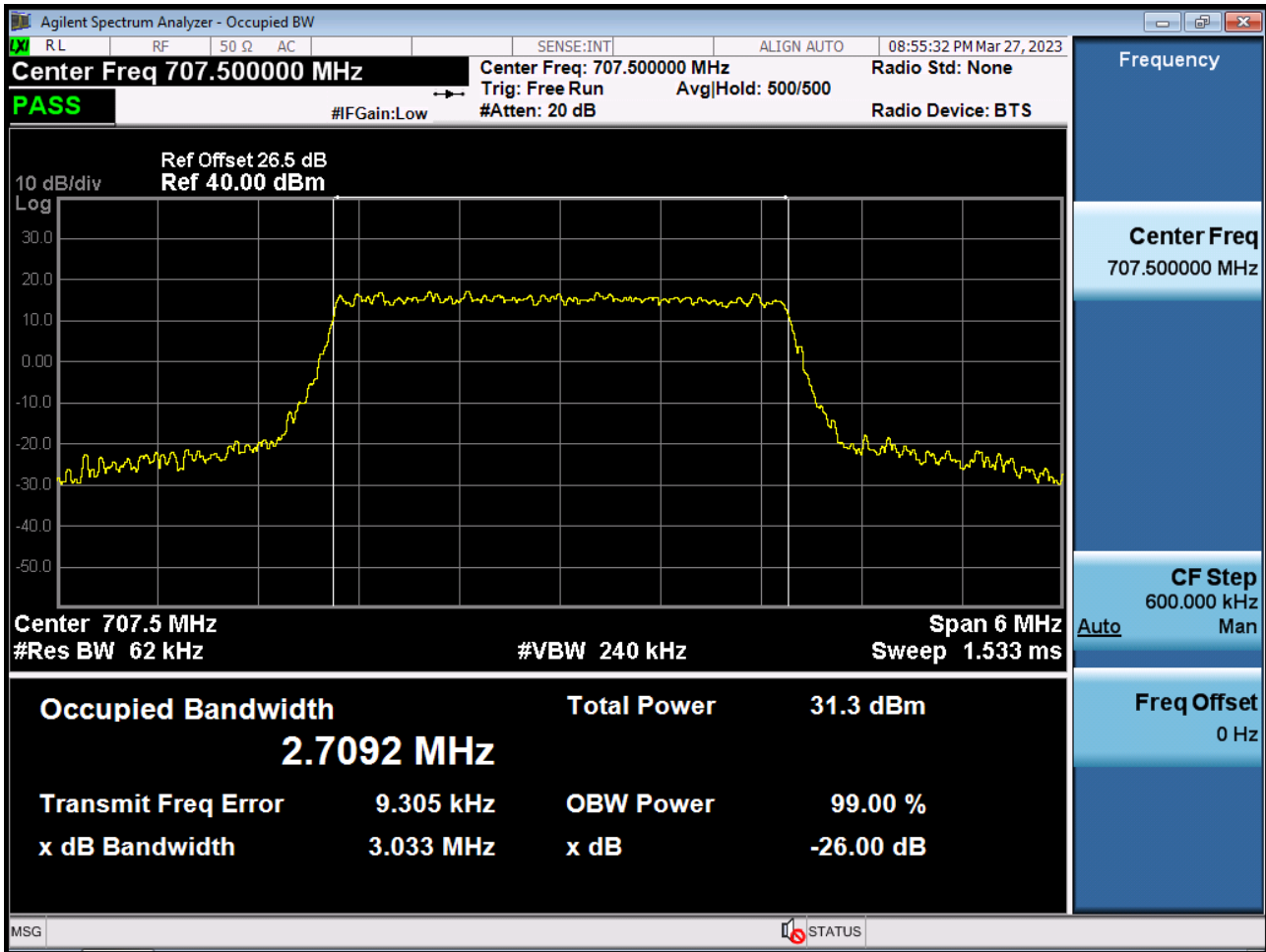
BAND 12. Occupied Bandwidth Plot (1.4 M BW Ch.23095 64QAM_RB6_0)



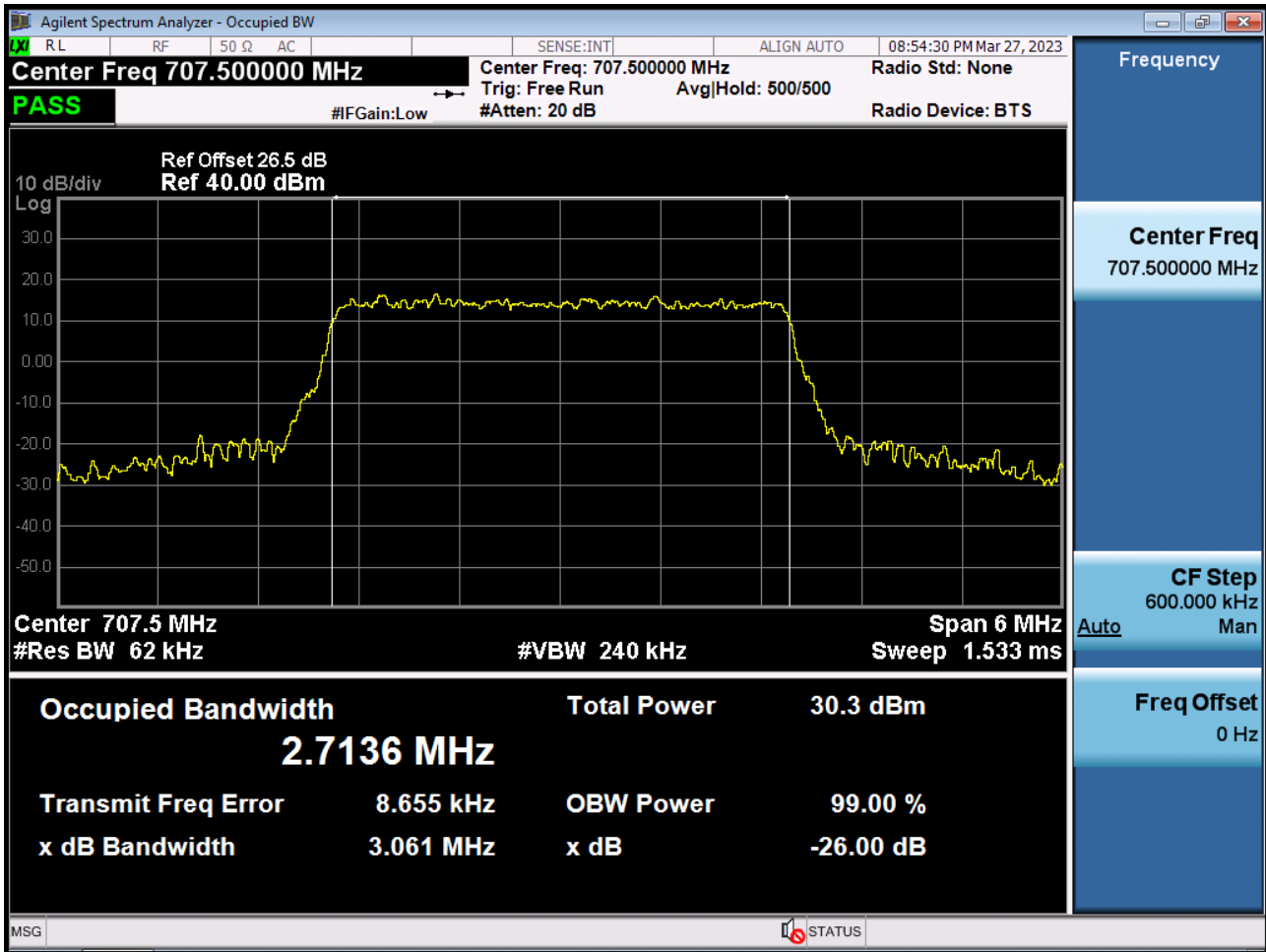
BAND 12. Occupied Bandwidth Plot (1.4 M BW Ch.23095 256QAM_RB6_0)



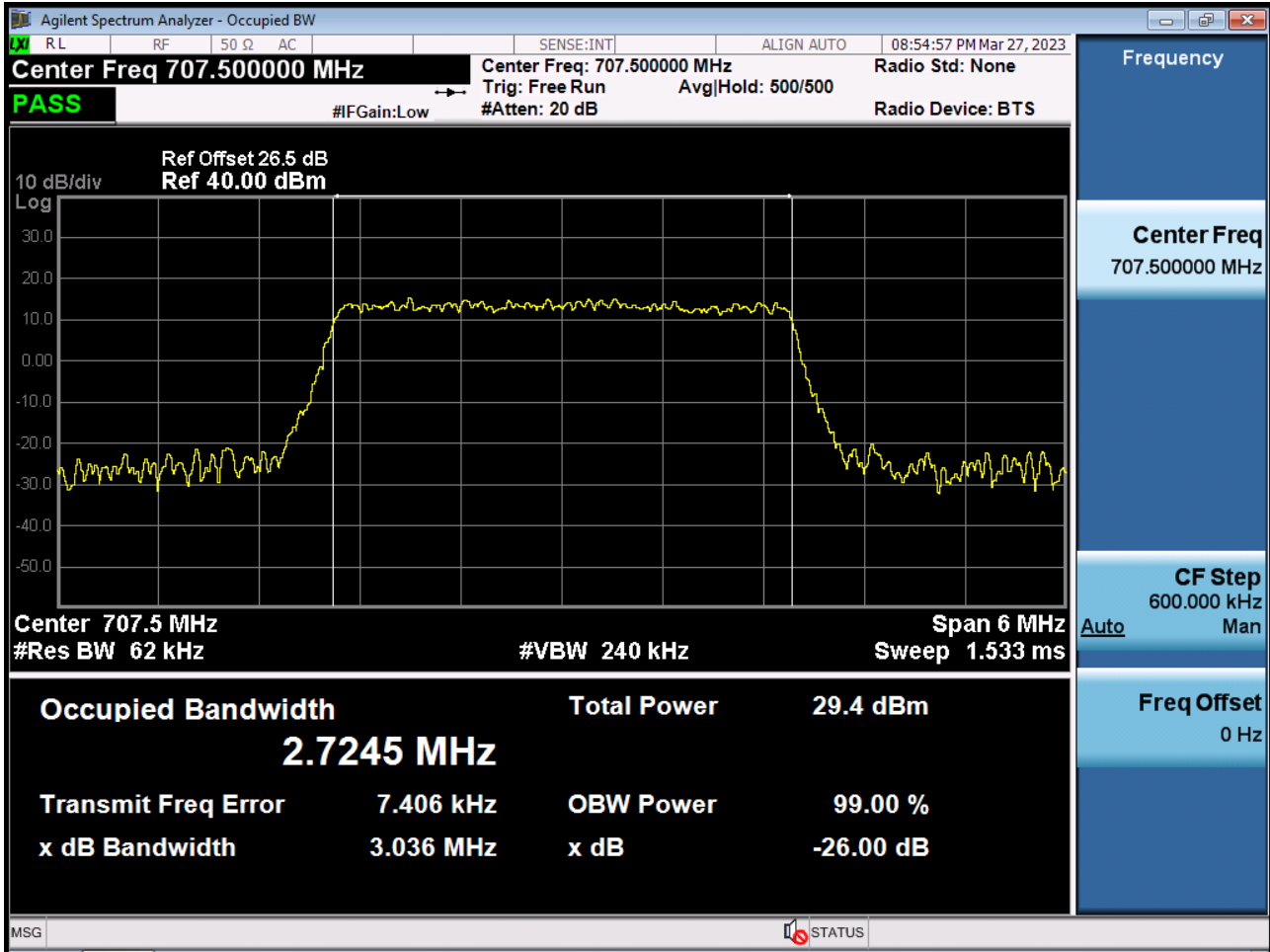
BAND 12. Occupied Bandwidth Plot (3 M BW Ch.23095 QPSK_RB15_0)



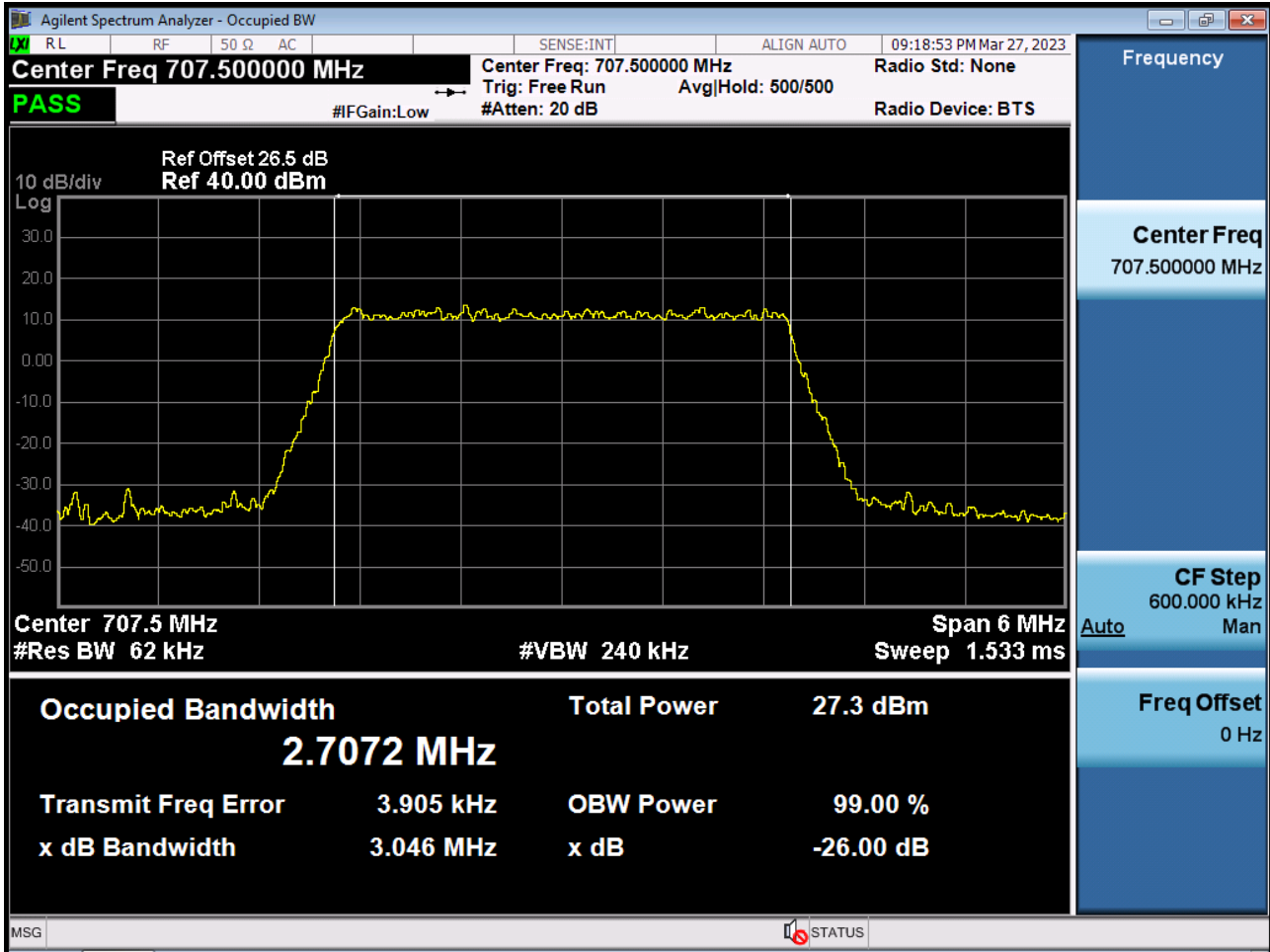
BAND 12. Occupied Bandwidth Plot (3 M BW Ch.23095 16QAM_RB15_0)



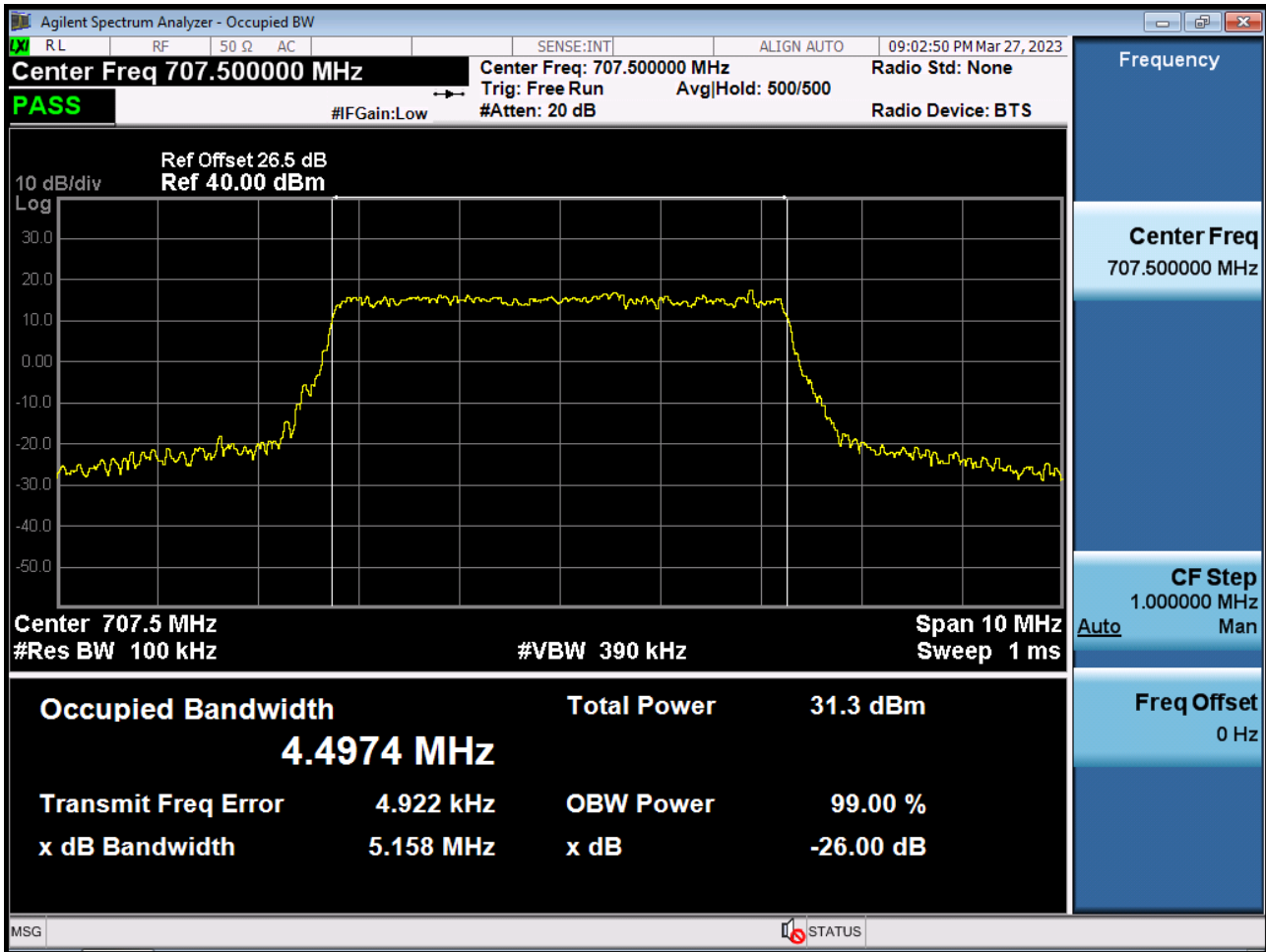
BAND 12. Occupied Bandwidth Plot (3 M BW Ch.23095 64QAM_RB15_0)



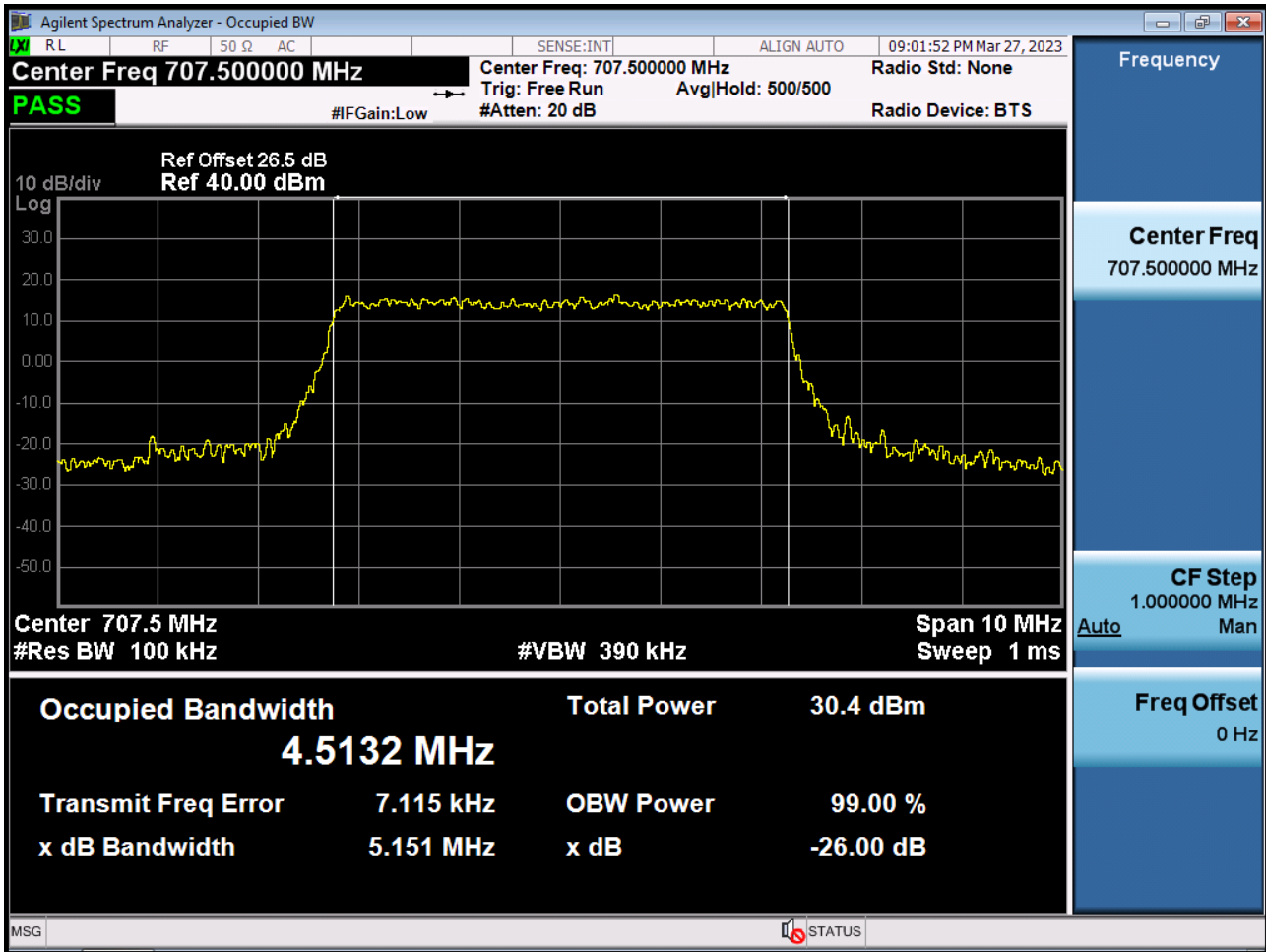
BAND 12. Occupied Bandwidth Plot (3 M BW Ch.23095 256QAM_RB15_0)



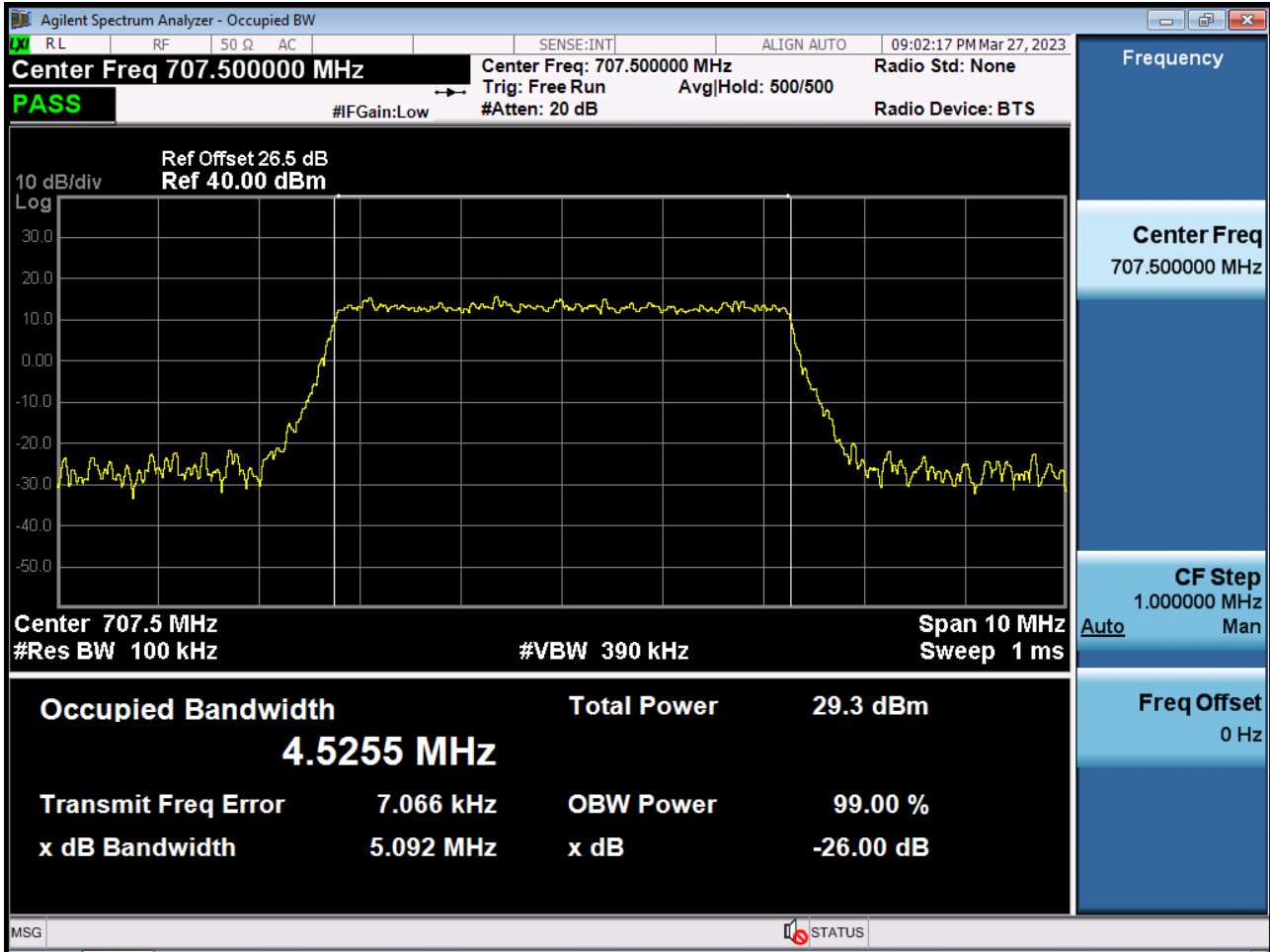
BAND 12/17. Occupied Bandwidth Plot (5 M BW Ch.23095 QPSK_RB25_0)



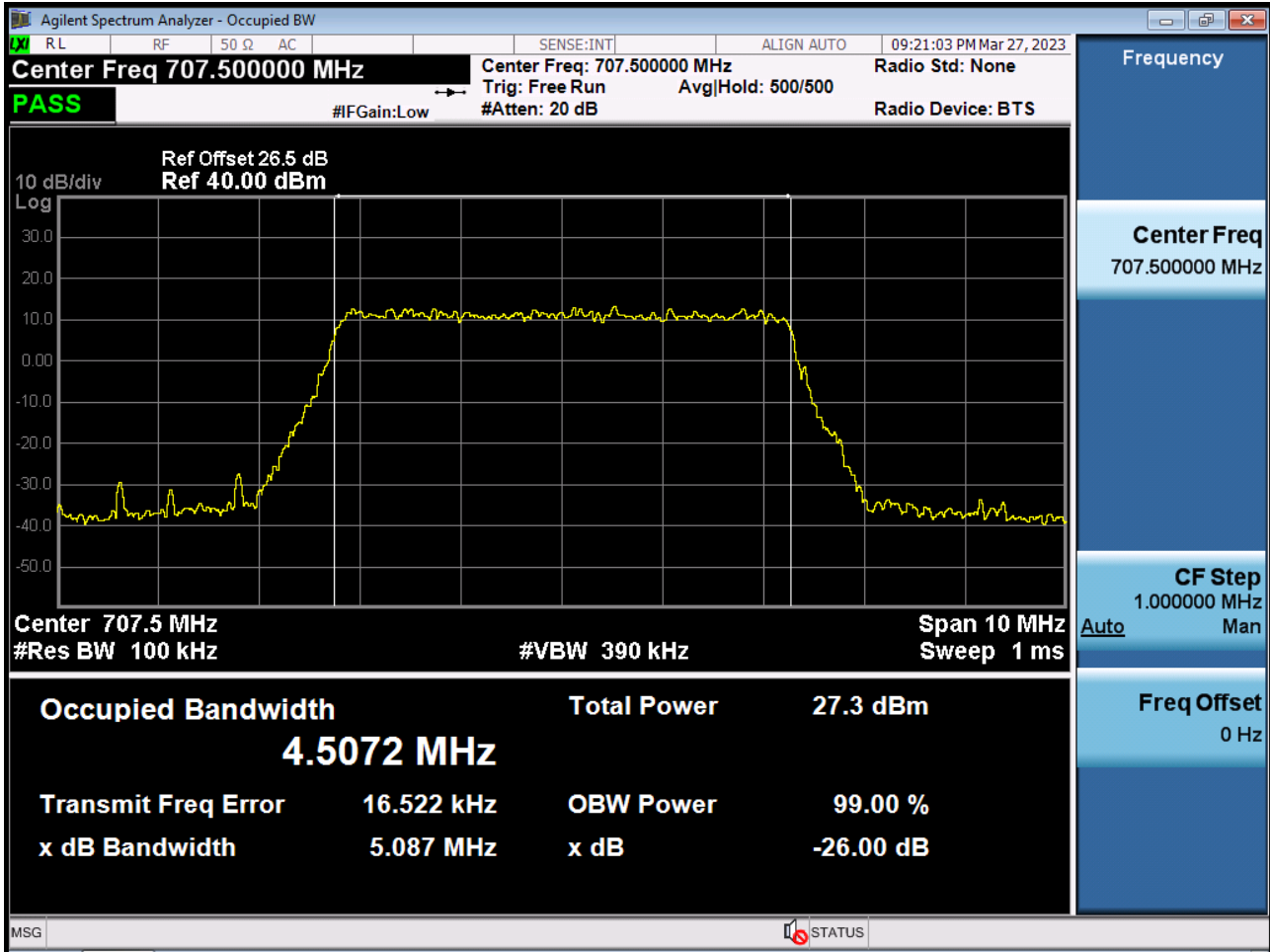
BAND 12/17. Occupied Bandwidth Plot (5 M BW Ch.23095 16QAM_RB25_0)



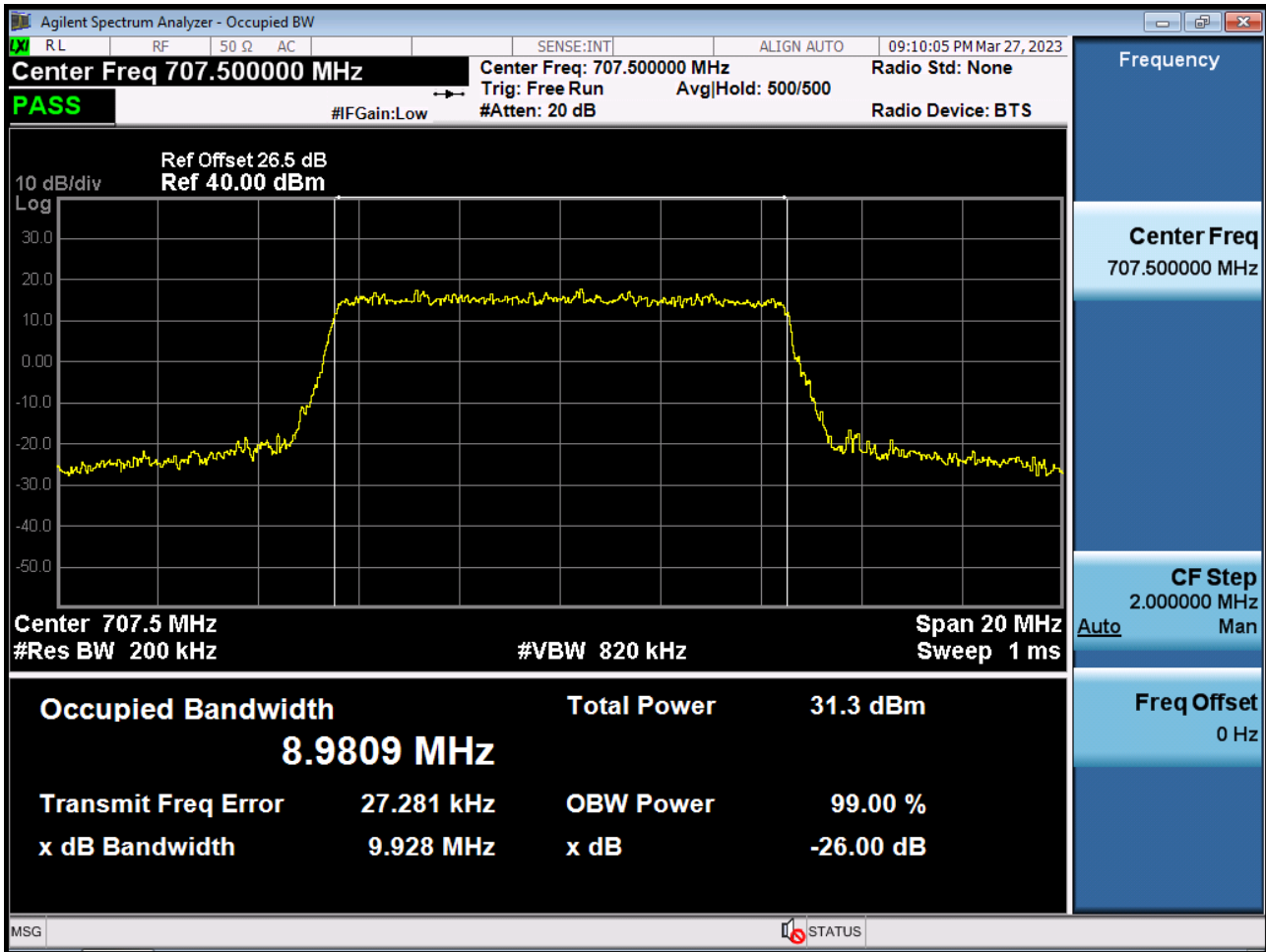
BAND 12/17. Occupied Bandwidth Plot (5 M BW Ch.23095 64QAM_RB25_0)



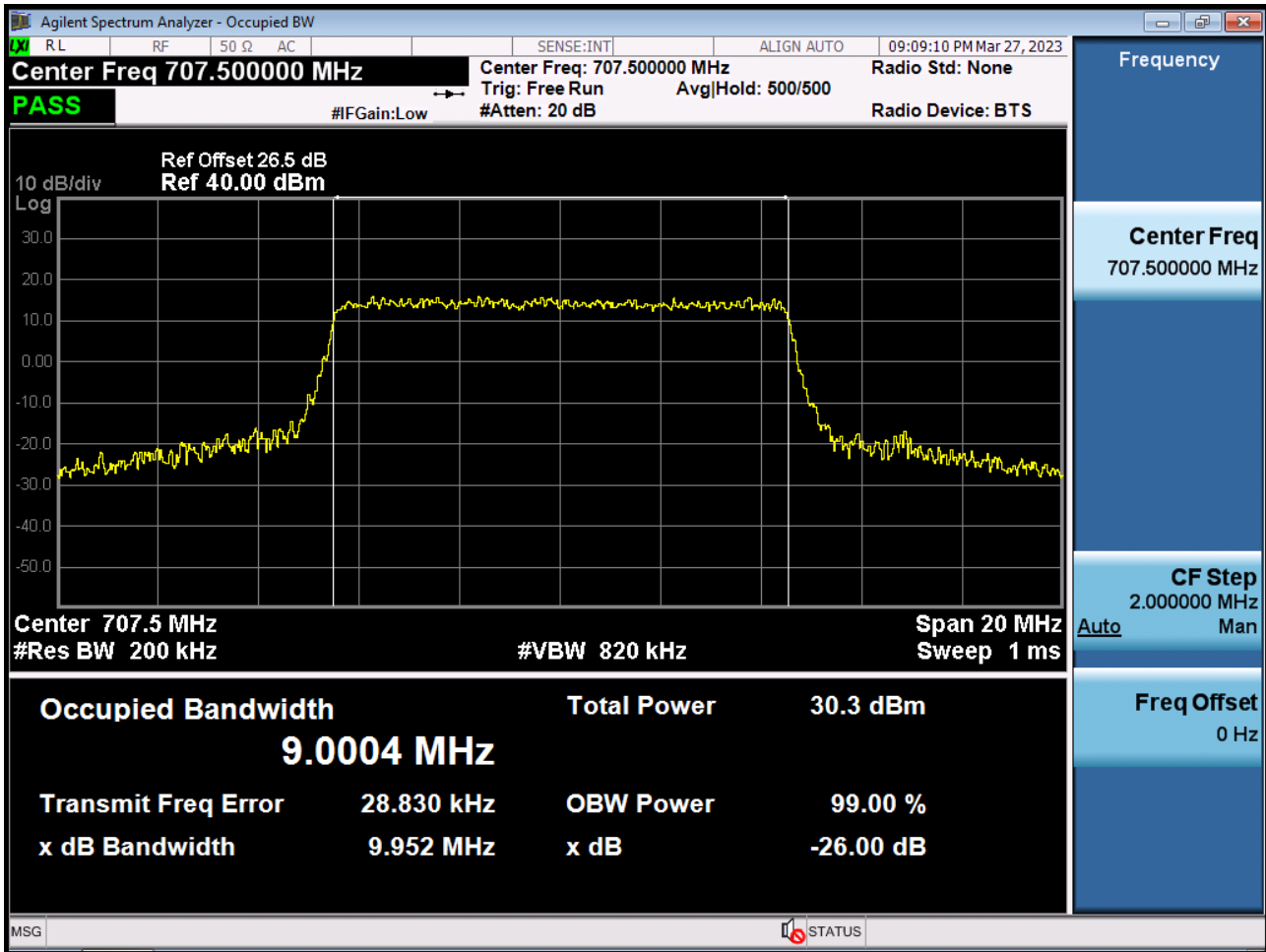
BAND 12/17. Occupied Bandwidth Plot (5 M BW Ch.23095 256QAM_RB25_0)



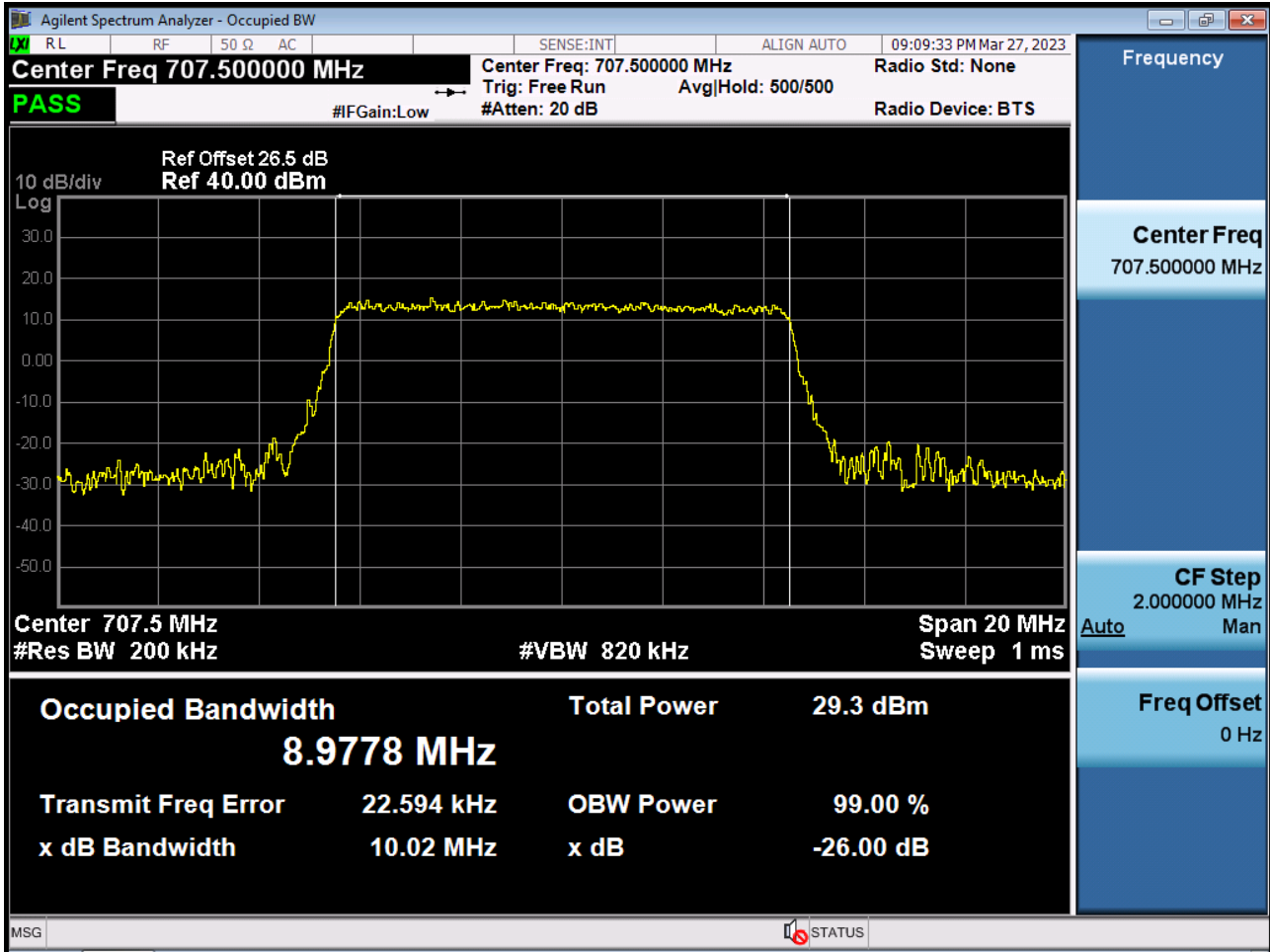
BAND 12/17. Occupied Bandwidth Plot (10 M BW Ch.23095 QPSK_RB50_0)



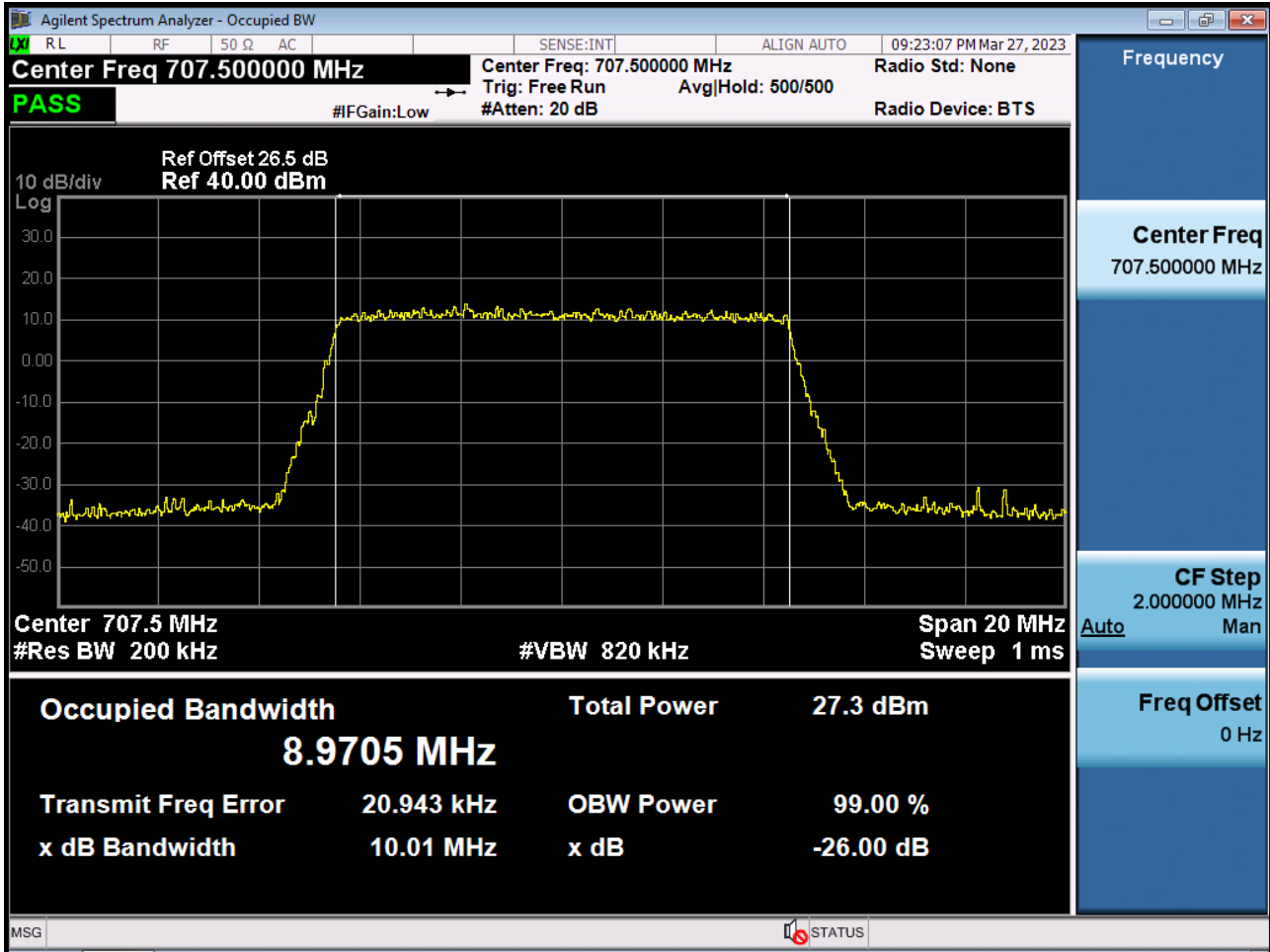
BAND 12/17. Occupied Bandwidth Plot (10 M BW Ch.23095 16QAM_RB50_0)



BAND 12/17. Occupied Bandwidth Plot (10 M BW Ch.23095 64QAM_RB50_0)



BAND 12/17. Occupied Bandwidth Plot (10 M BW Ch.23095 256QAM_RB50_0)



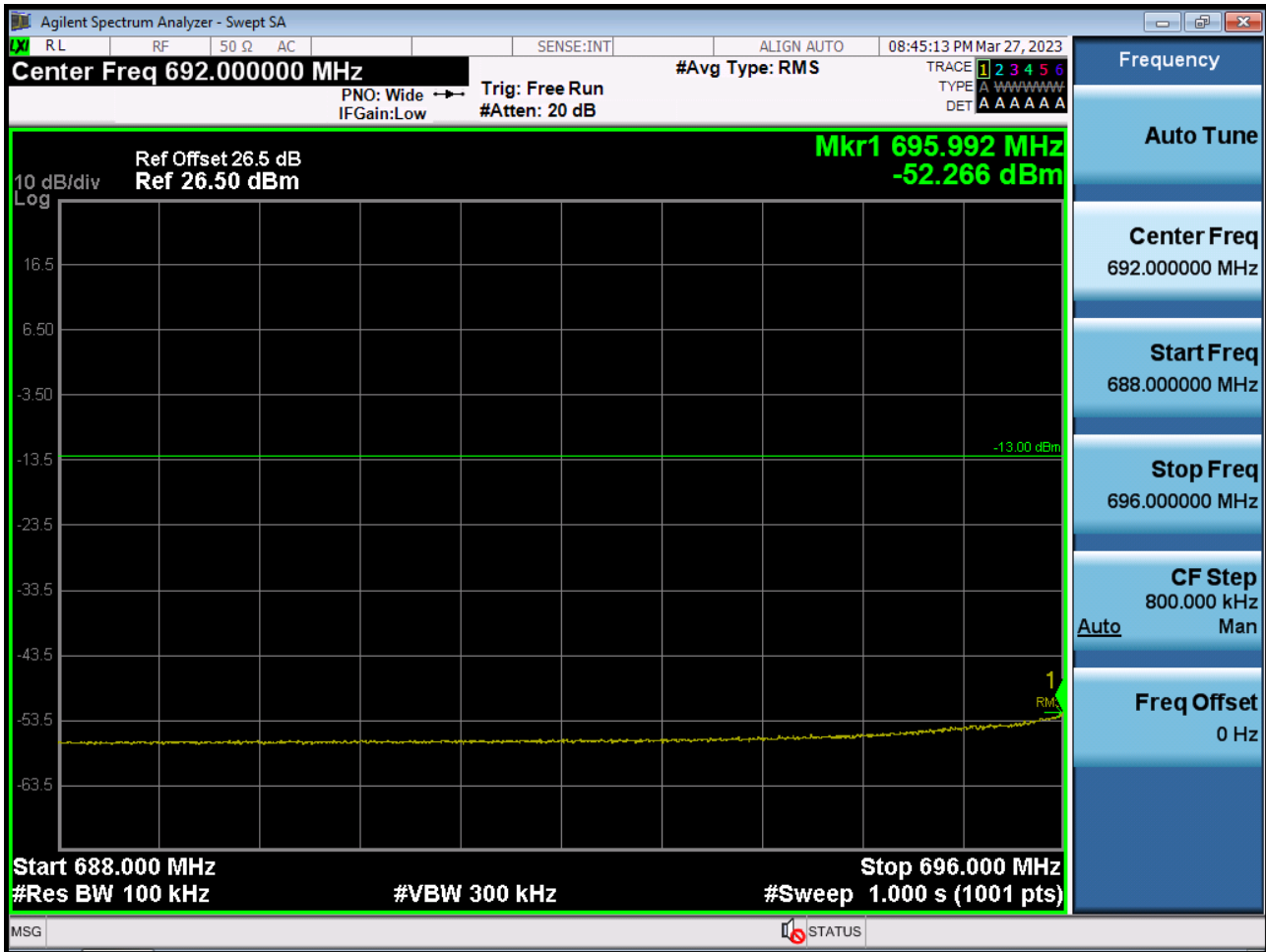
BAND 12. Lower Band Edge Plot (1.4 M BW Ch.23017 QPSK_RB1_Offset 0)



BAND 12. Lower Band Edge Plot (1.4 M BW Ch.23017 QPSK_RB6_Offset 0)



BAND 12. Lower Extended Band Edge Plot (1.4 M BW Ch.23017 QPSK_RB6_0)



BAND 12. Lower Band Edge Plot (3 M BW Ch.23025 QPSK_RB1_Offset 0)



BAND 12. Lower Band Edge Plot (3 M BW Ch.23025 QPSK_RB15_Offset 0)



BAND 12. Lower Extended Band Edge Plot (3 M BW Ch.23025 QPSK_RB15_0)



BAND 12/17. Lower Band Edge Plot (5 M BW Ch.23035 QPSK_RB1_Offset 0)



BAND 12/17. Lower Band Edge Plot (5 M BW Ch.23035 QPSK_RB25_Offset 0)



BAND 12/17. Lower Extended Band Edge Plot (5 M BW Ch.23035 QPSK_RB25_0)



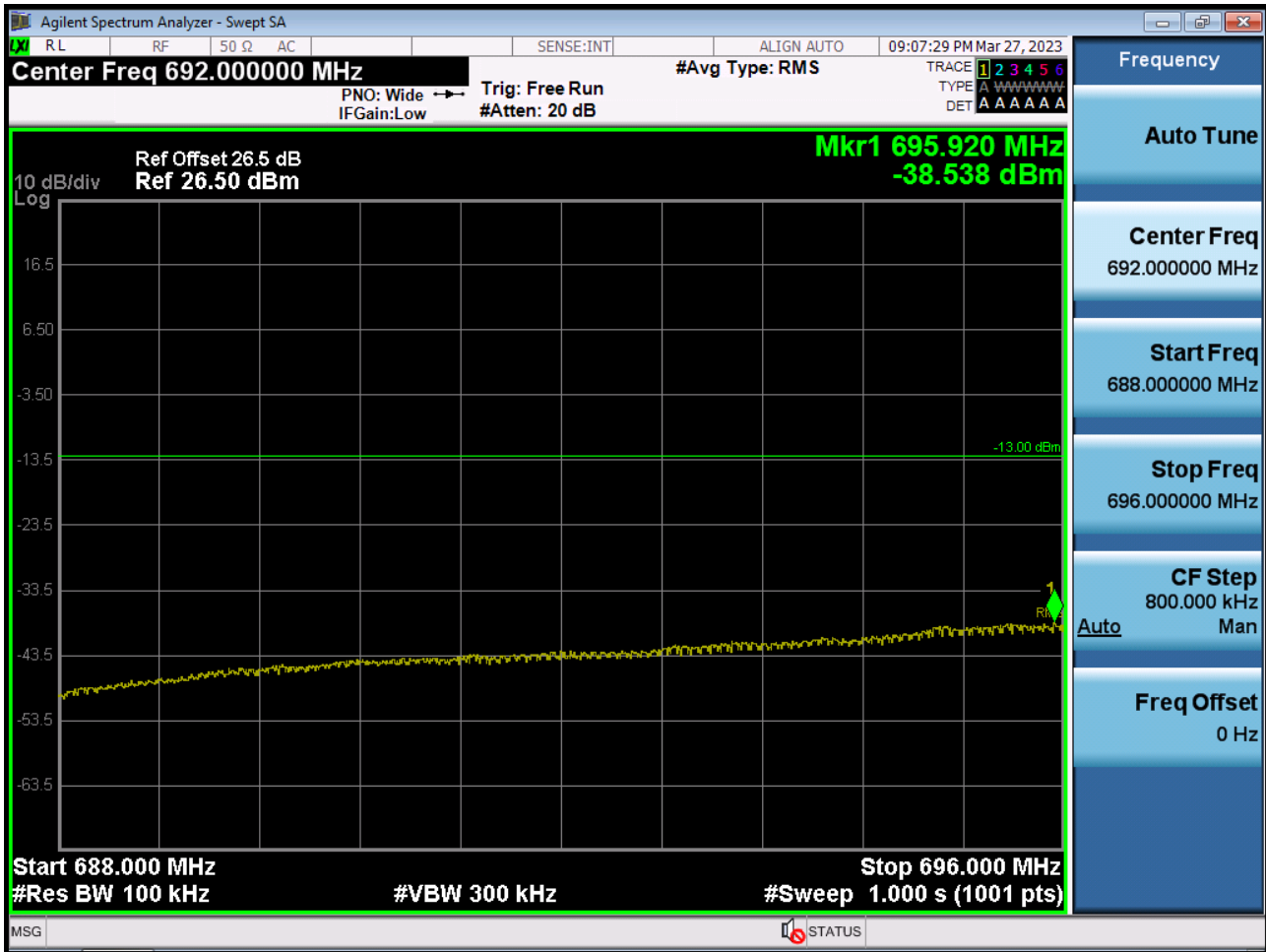
BAND 12/17. Lower Band Edge Plot (10 M BW Ch.23060 QPSK_RB1_Offset 0)



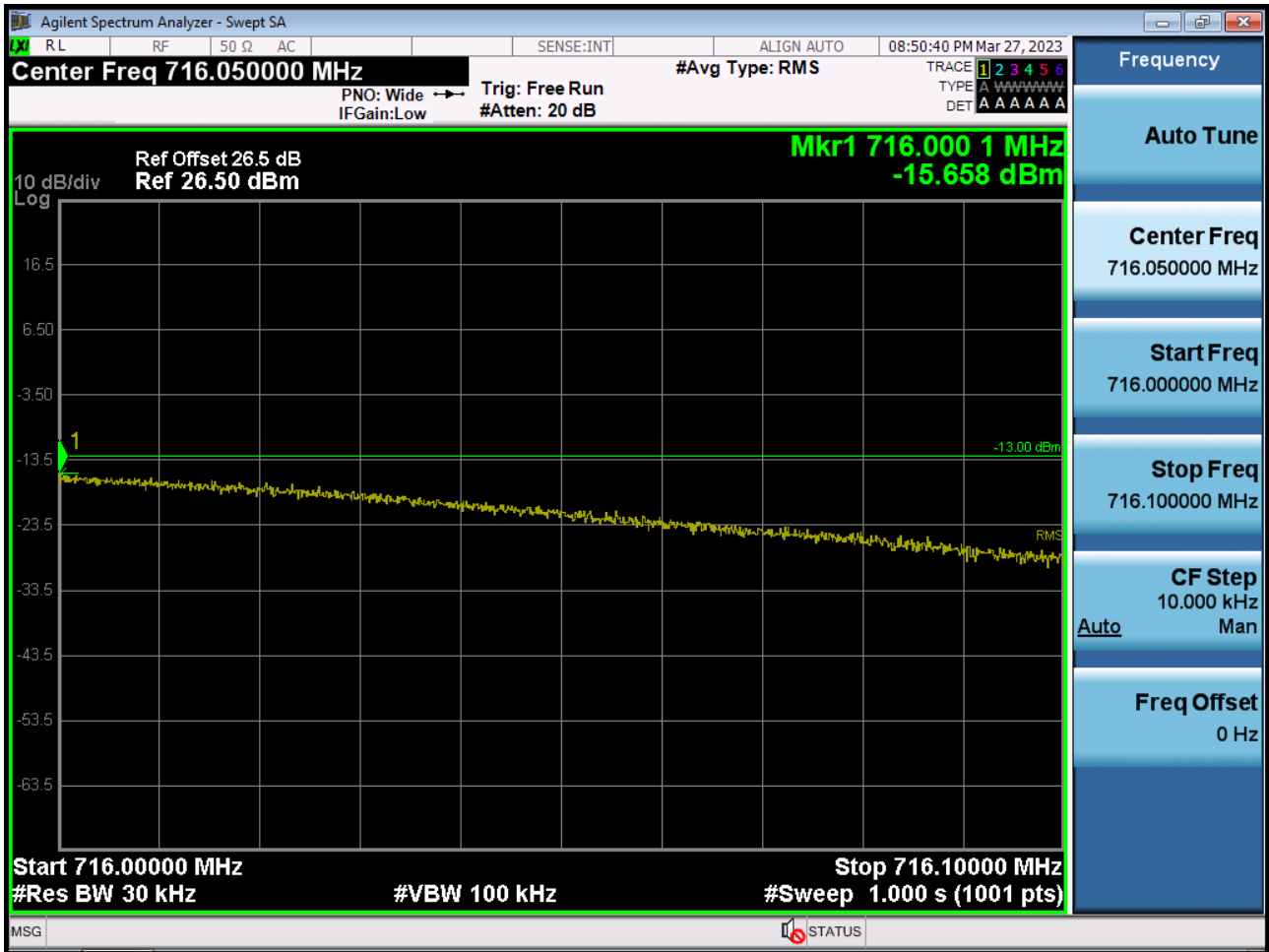
BAND 12/17. Lower Band Edge Plot (10 M BW Ch.23060 QPSK_RB50_Offset 0)



BAND 12/17. Lower Extended Band Edge Plot (10 M BW Ch.23060 QPSK_RB50_0)



BAND 12. Upper Band Edge Plot (1.4 M BW Ch.23173 QPSK_RB1_Offset 5)_1



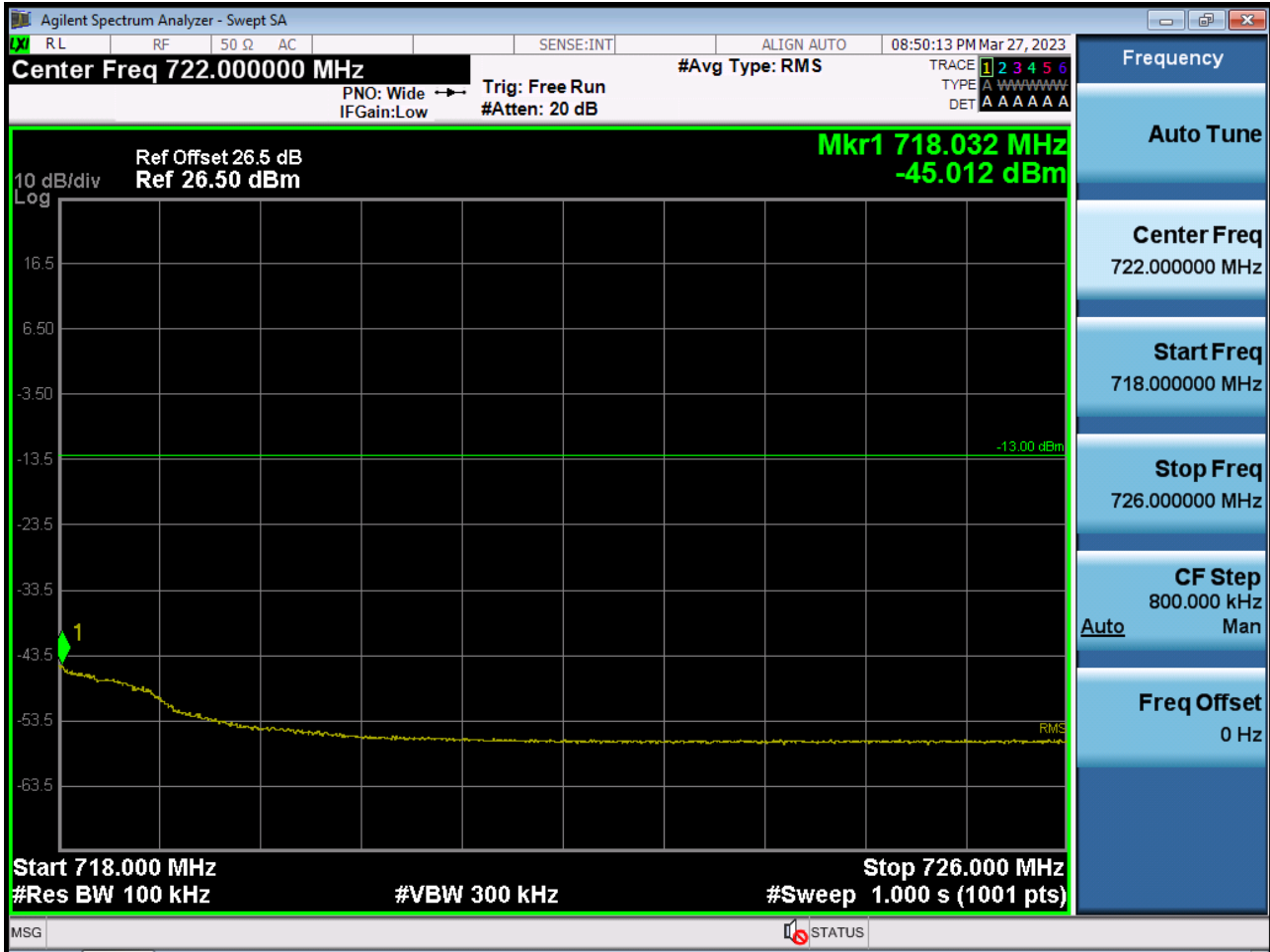
BAND 12. Upper Band Edge Plot (1.4 M BW Ch.23173 QPSK_RB1_Offset 5)_2



BAND 12. Upper Band Edge Plot (1.4 M BW Ch.23173 QPSK_RB6_Offset 0)



BAND 12. Upper Extended Band Edge Plot (1.4 M BW Ch.23173 QPSK_RB6_0)



BAND 12. Upper Band Edge Plot (3 M BW Ch.23165 QPSK_RB1_Offset 14)-1



BAND 12. Upper Band Edge Plot (3 M BW Ch.23165 QPSK_RB1_Offset 14)-2



BAND 12. Upper Band Edge Plot (3 M BW Ch.23165 QPSK_RB15_Offset 0)



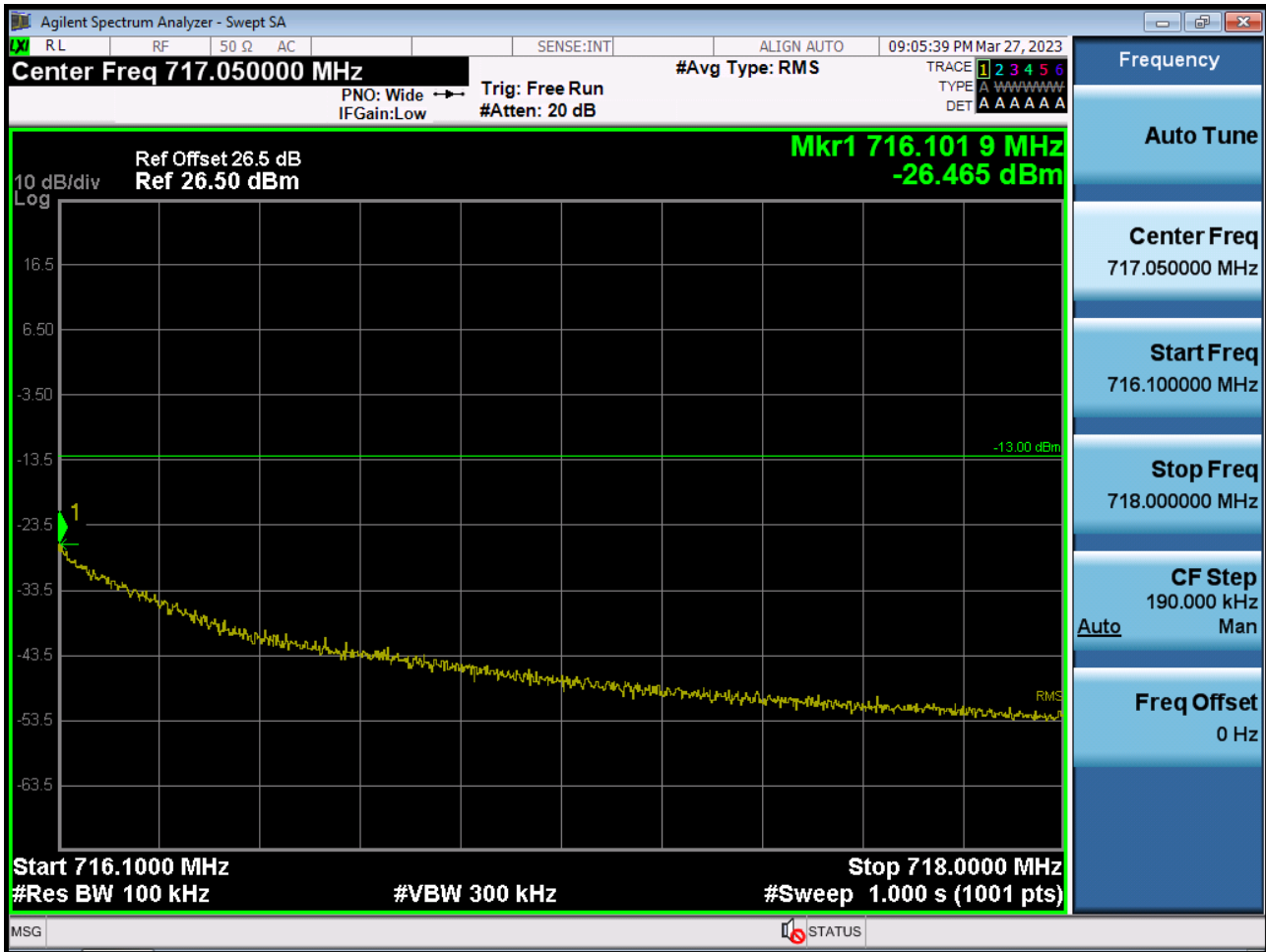
BAND 12. Upper Extended Band Edge Plot (3 M BW Ch.23165 QPSK_RB15_0)



BAND 12/17. Upper Band Edge Plot (5 M BW Ch.23155 QPSK_RB1_Offset 24)_1



BAND 12/17. Upper Band Edge Plot (5 M BW Ch.23155 QPSK_RB1_Offset 24)_2



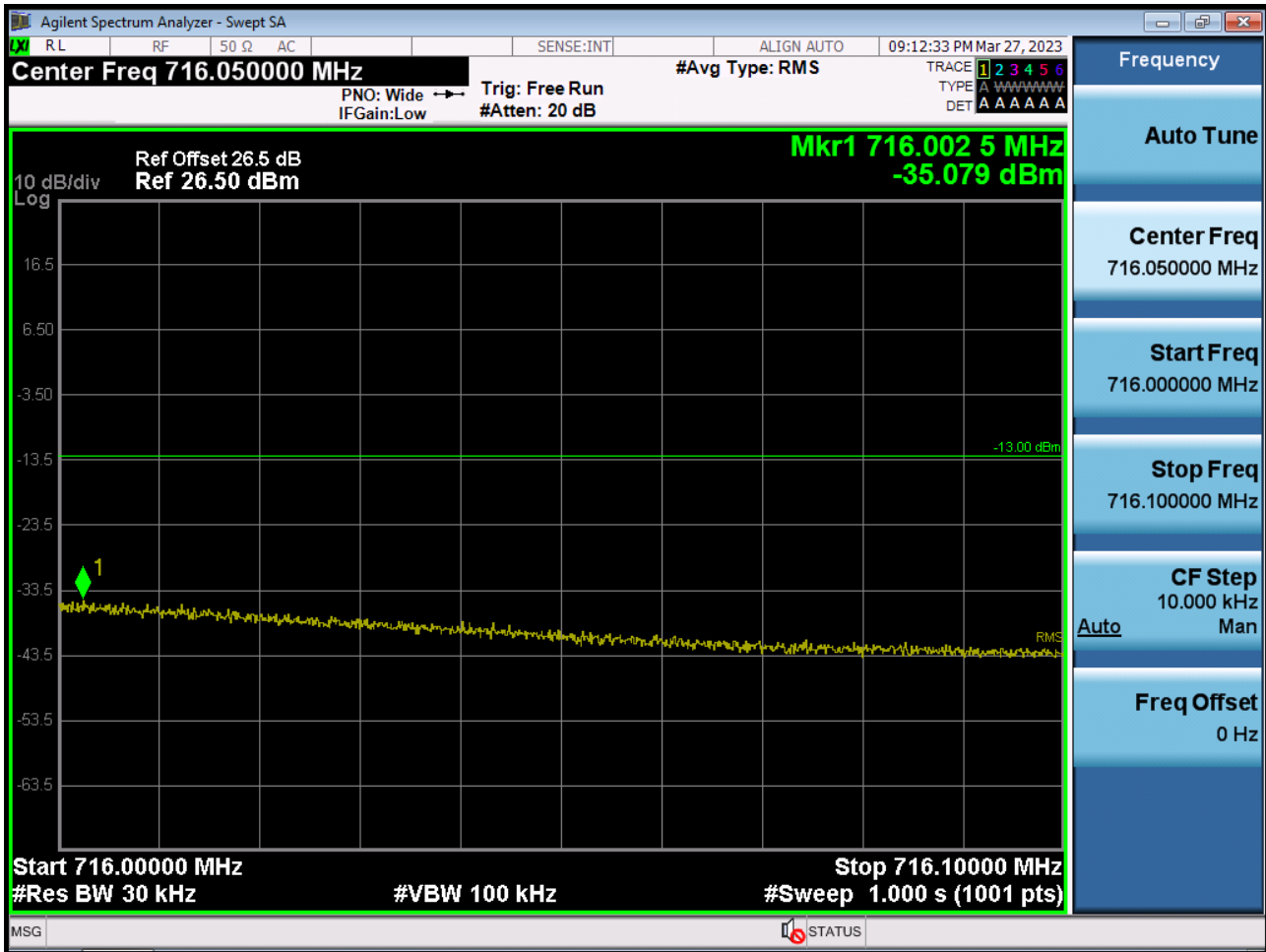
BAND 12/17. Upper Band Edge Plot (5 M BW Ch.23155 QPSK_RB25_Offset 0)



BAND 12/17. Upper Extended Band Edge Plot (5 M BW Ch.23155 QPSK_RB25_0)



BAND 12/17. Upper Band Edge Plot (10 M BW Ch.23130 QPSK_RB1_Offset 49)_1



BAND 12/17. Upper Band Edge Plot (10 M BW Ch.23130 QPSK_RB1_Offset 49)_2



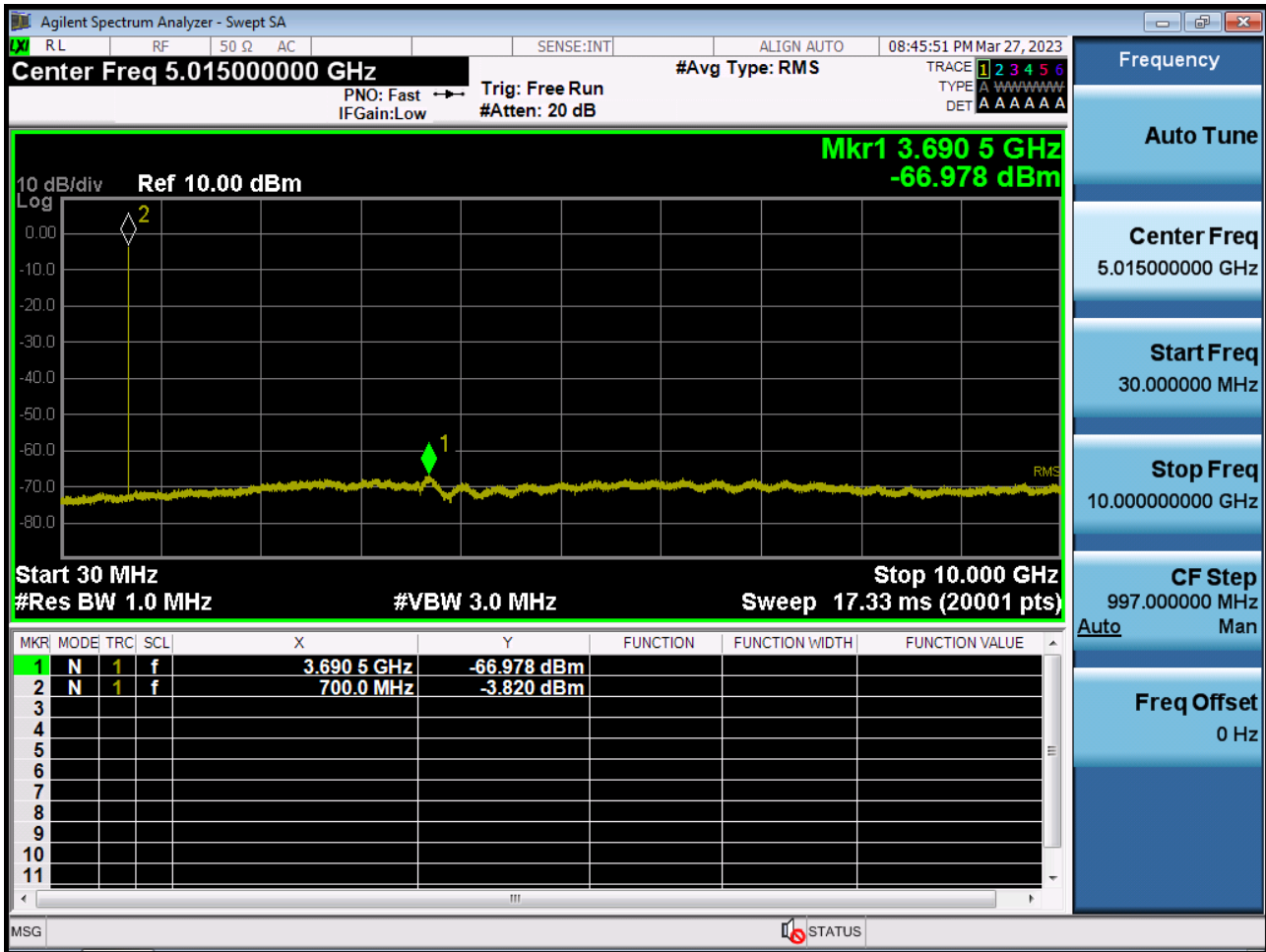
BAND 12/17. Upper Band Edge Plot (10 M BW Ch.23130 QPSK_RB50_Offset 0)



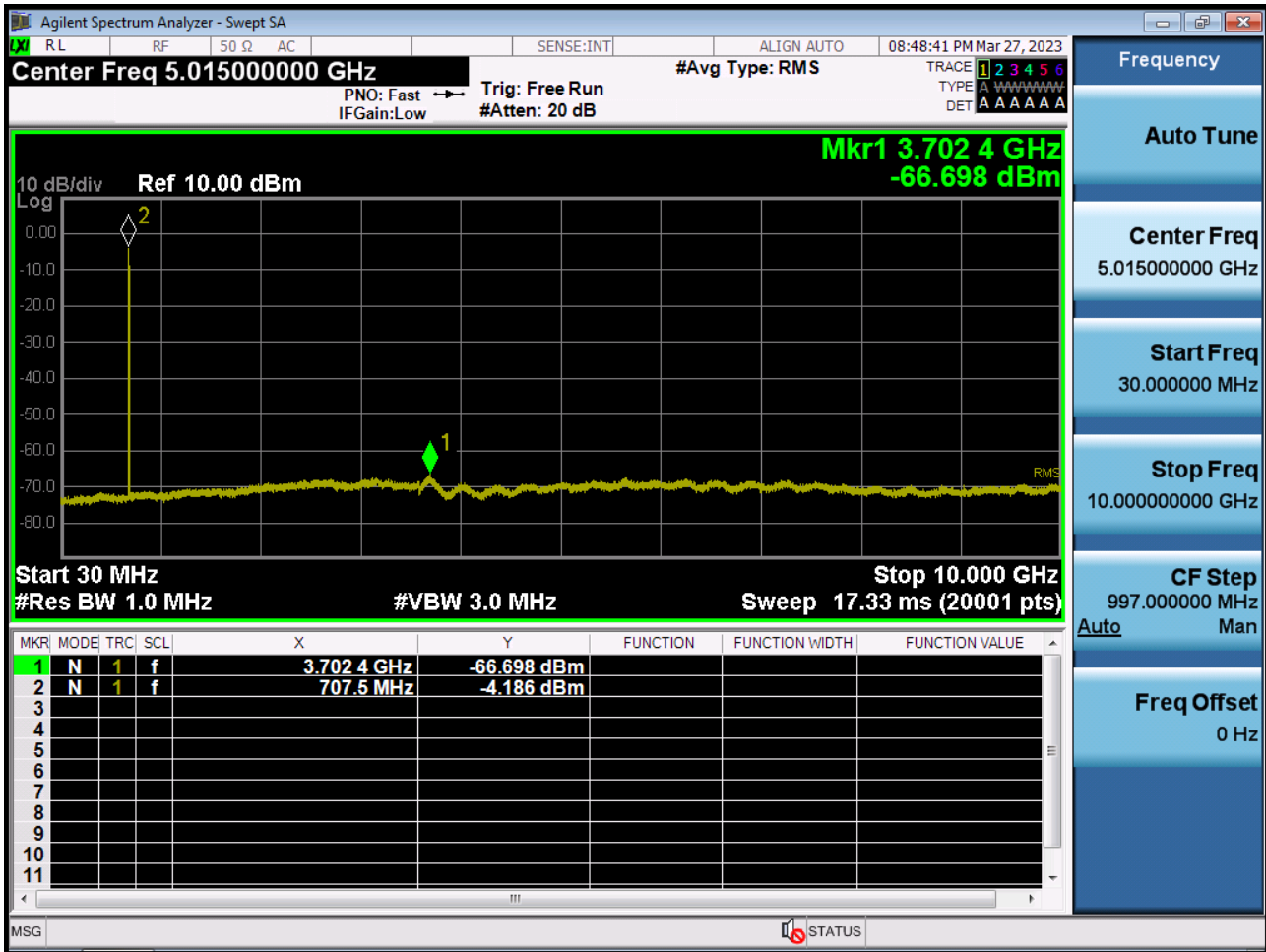
BAND 12/17. Upper Extended Band Edge Plot (10 M BW Ch.23130 QPSK_RB50_0)



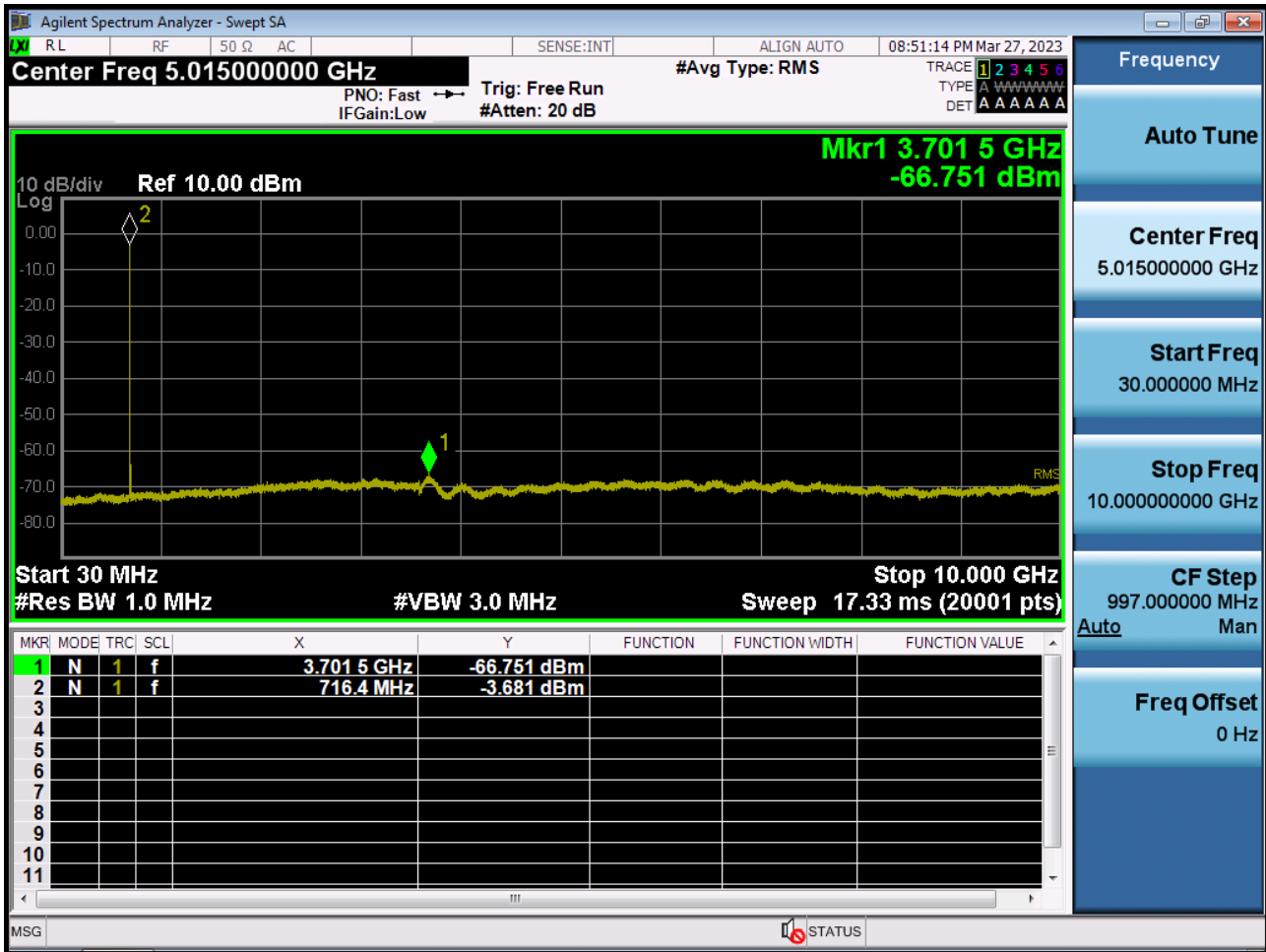
BAND 12. Conducted Spurious Plot _ (23017ch_1.4 MHz_QPSK_RB 1_0)



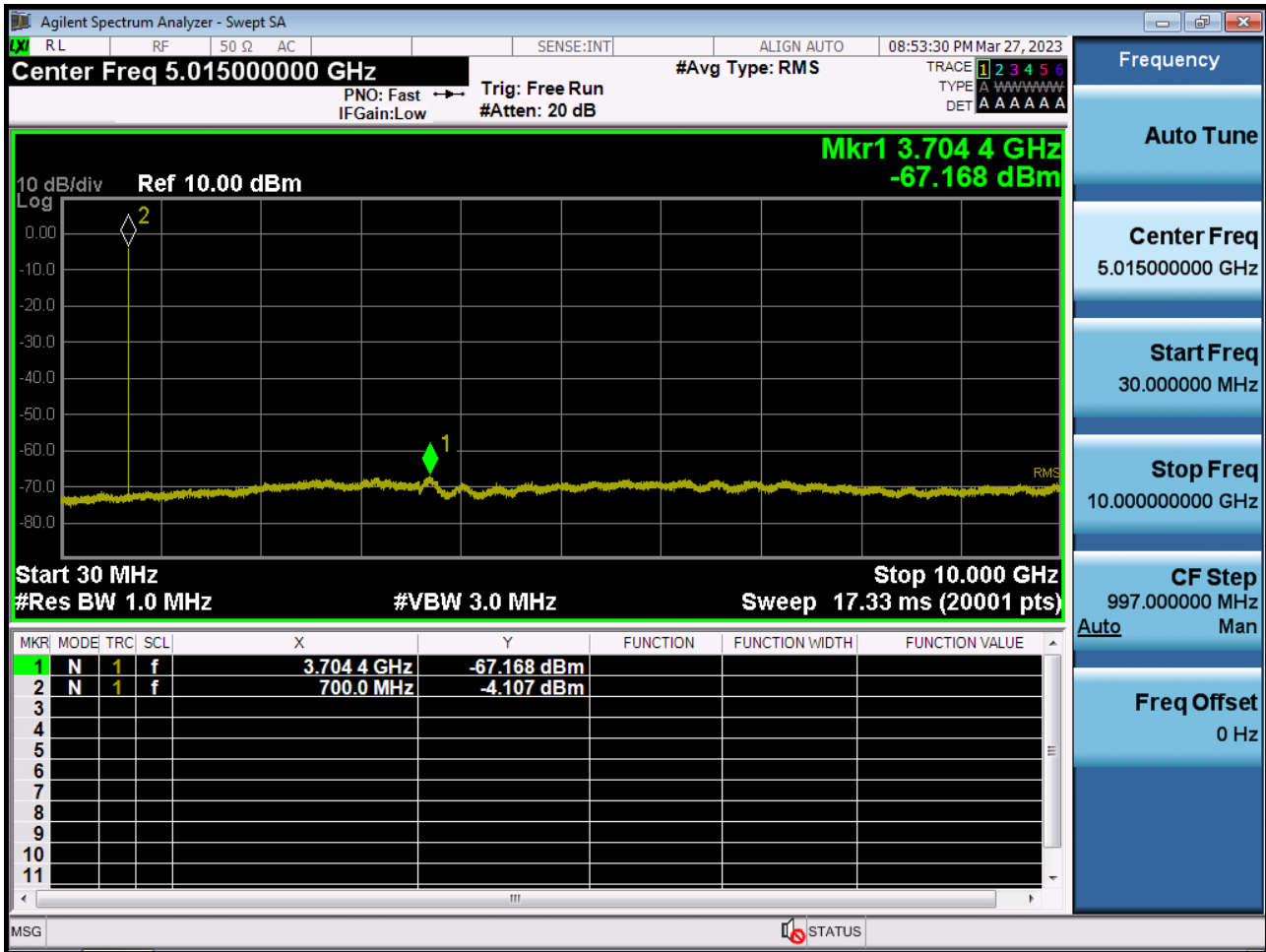
BAND 12. Conducted Spurious Plot _ (23095ch_1.4 MHz_QPSK_RB 1_0)



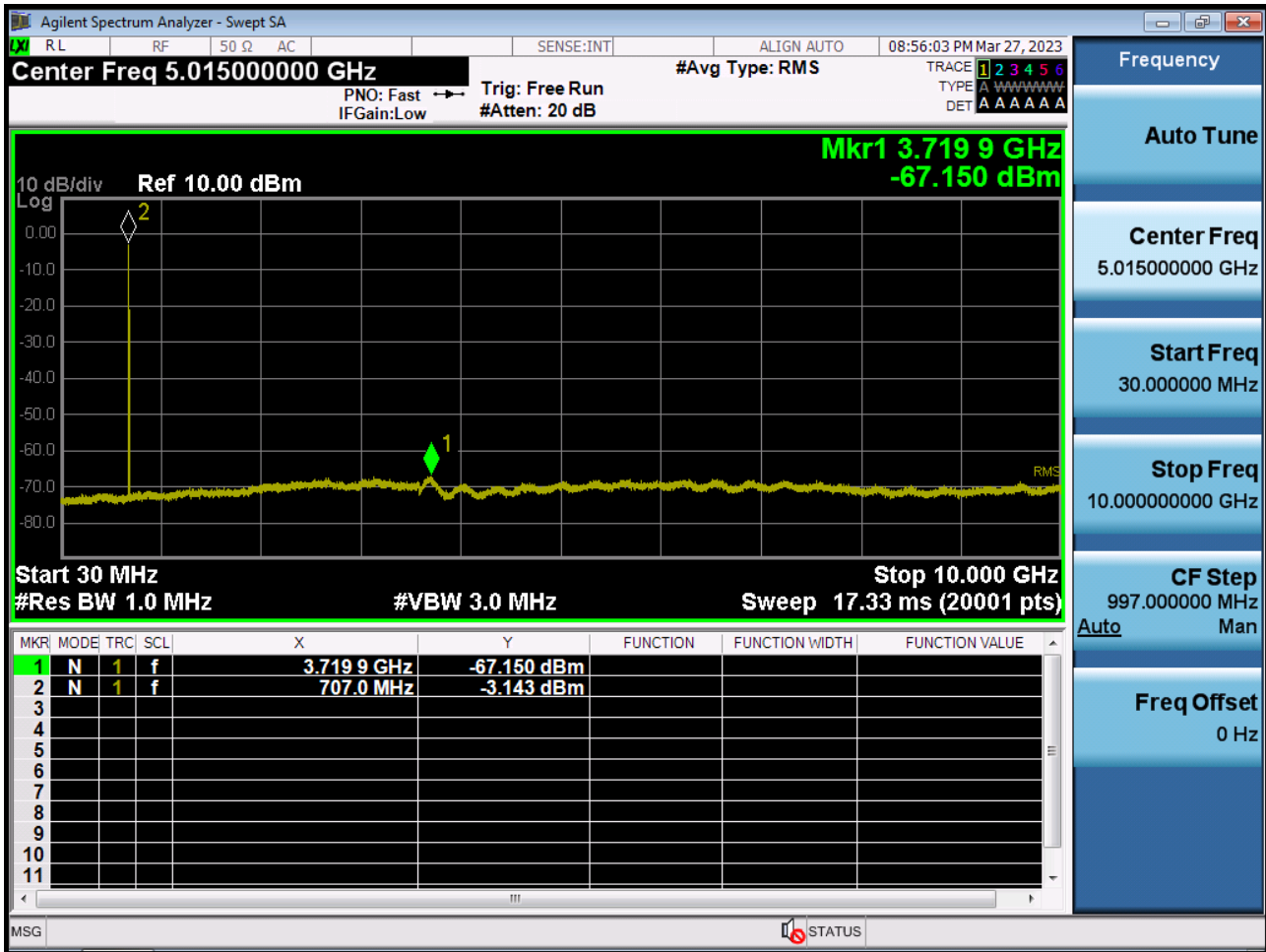
BAND 12. Conducted Spurious Plot _ (23173ch_1.4 MHz_QPSK_RB 1_0)



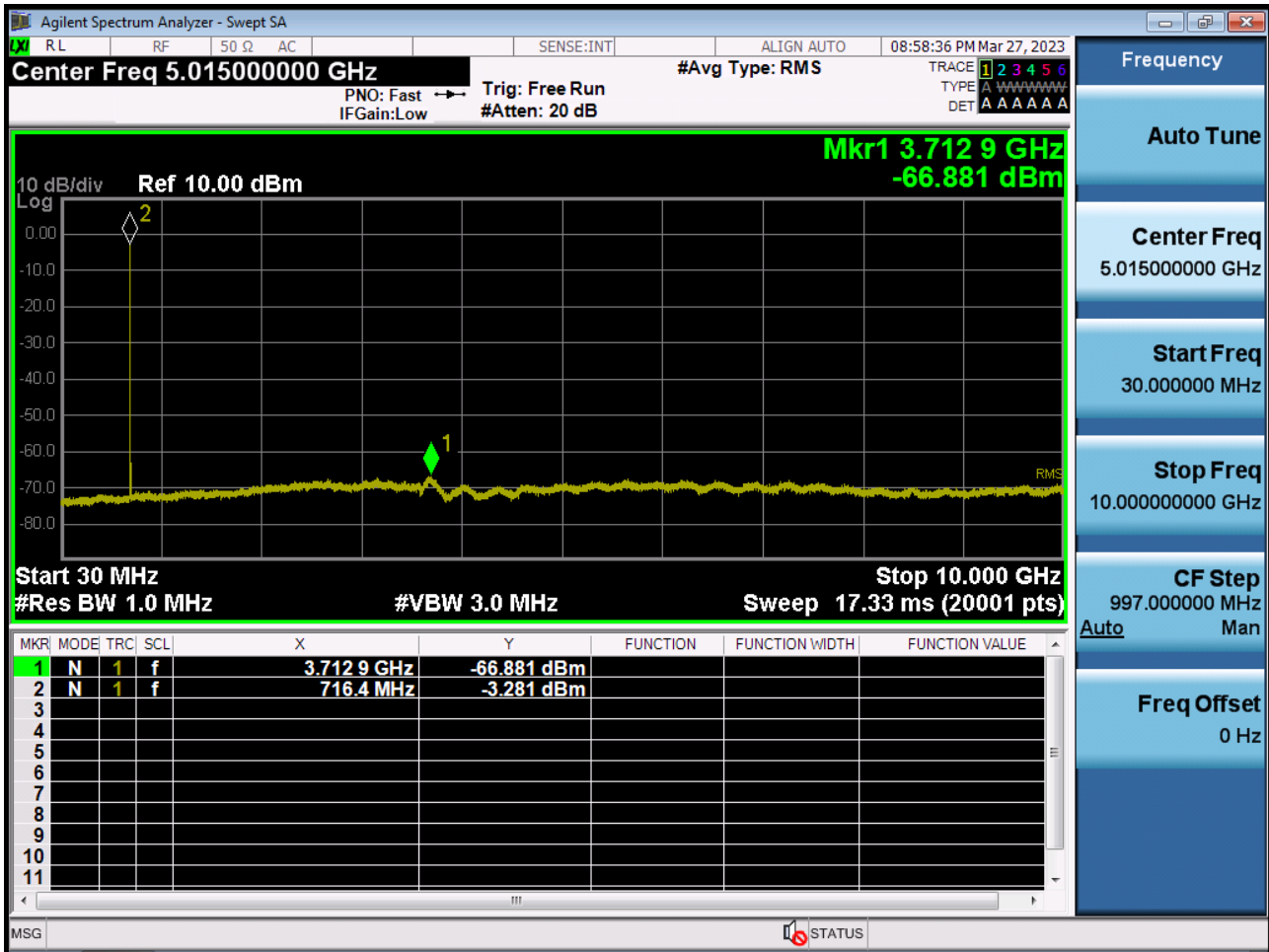
BAND 12. Conducted Spurious Plot _ (23025ch_3 MHz_QPSK_RB 1_0)



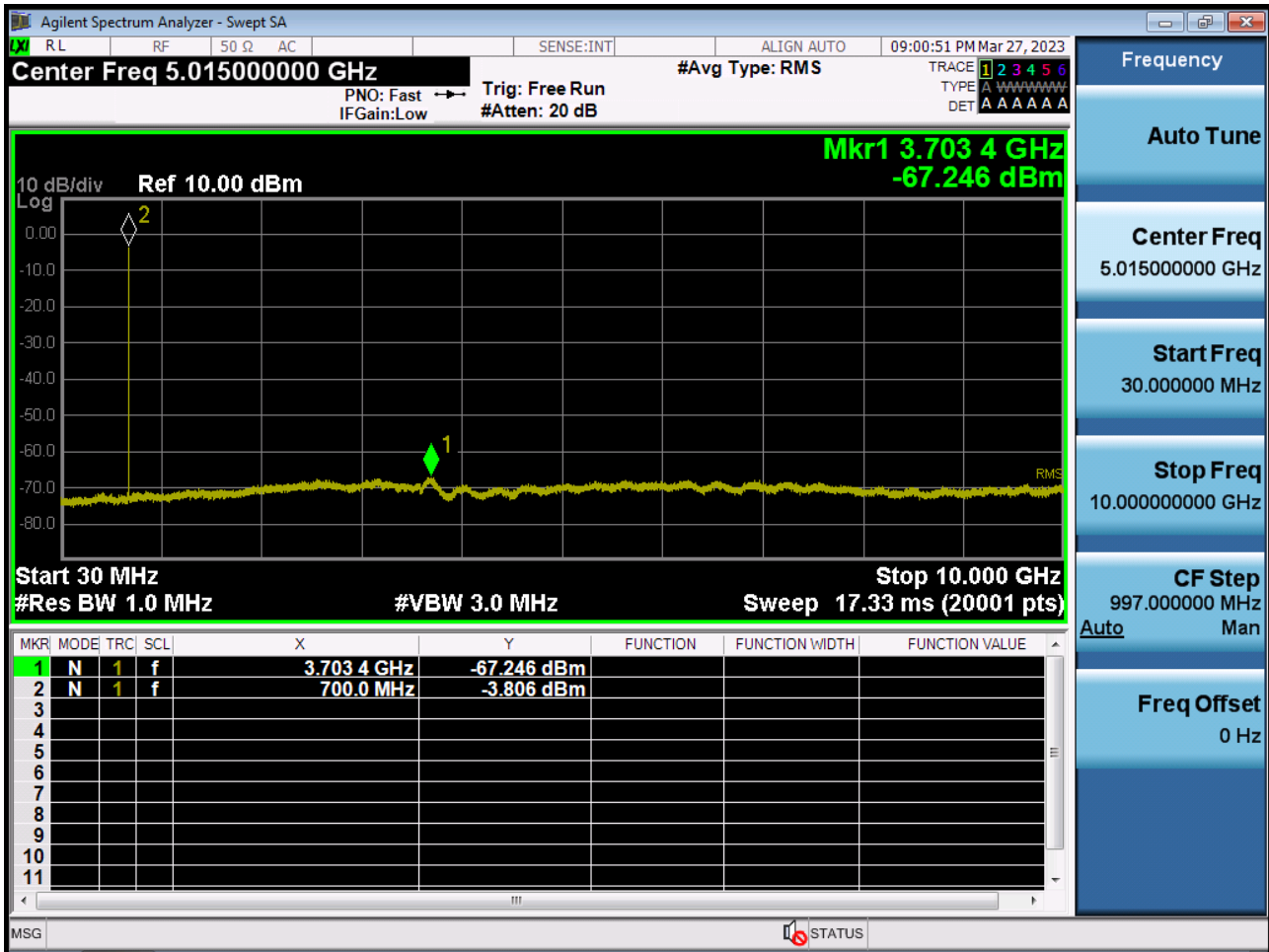
BAND 12. Conducted Spurious Plot _ (23095ch_3 MHz_QPSK_RB 1_0)



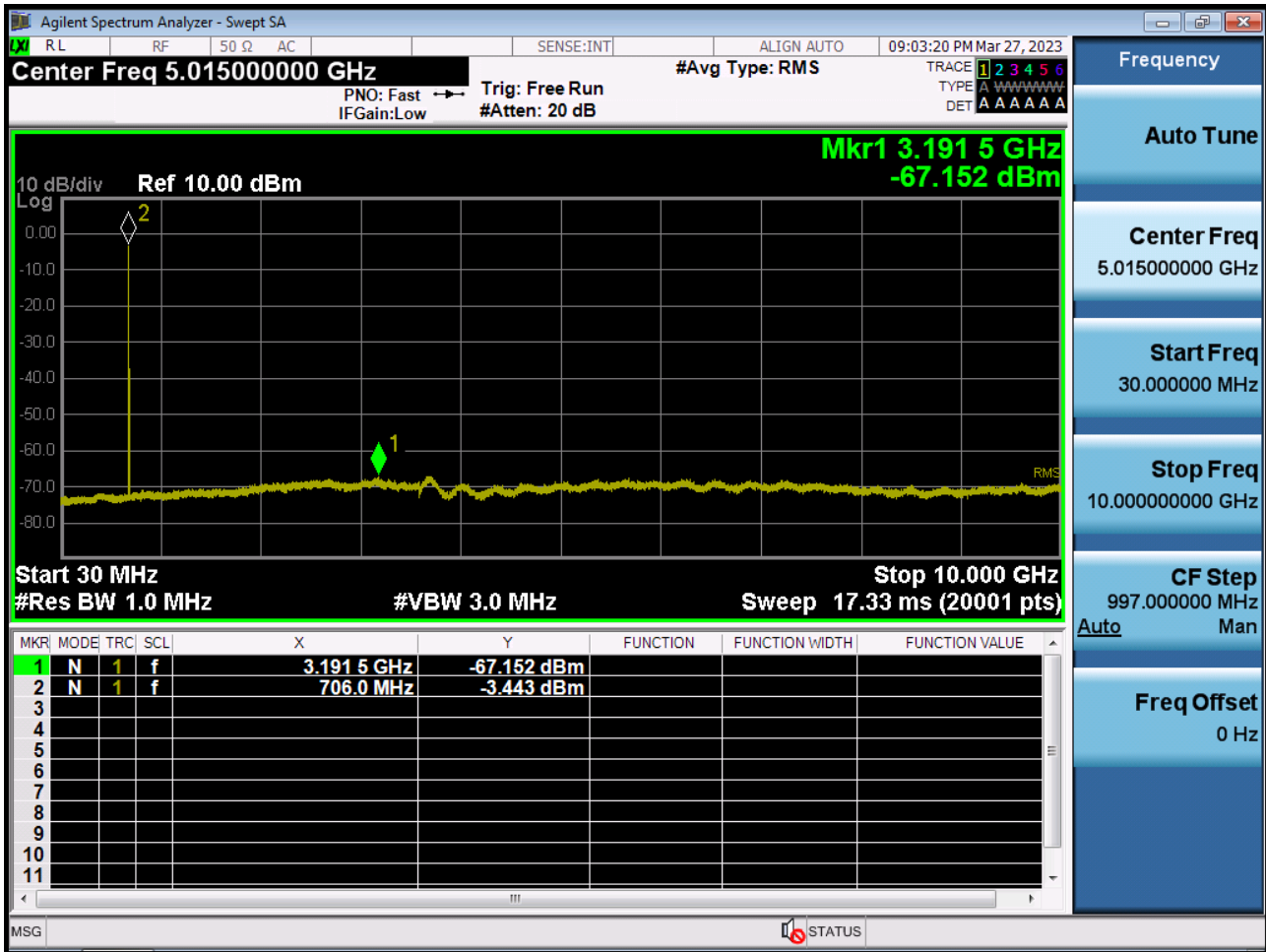
BAND 12. Conducted Spurious Plot _ (23165ch_3 MHz_QPSK_RB 1_0)



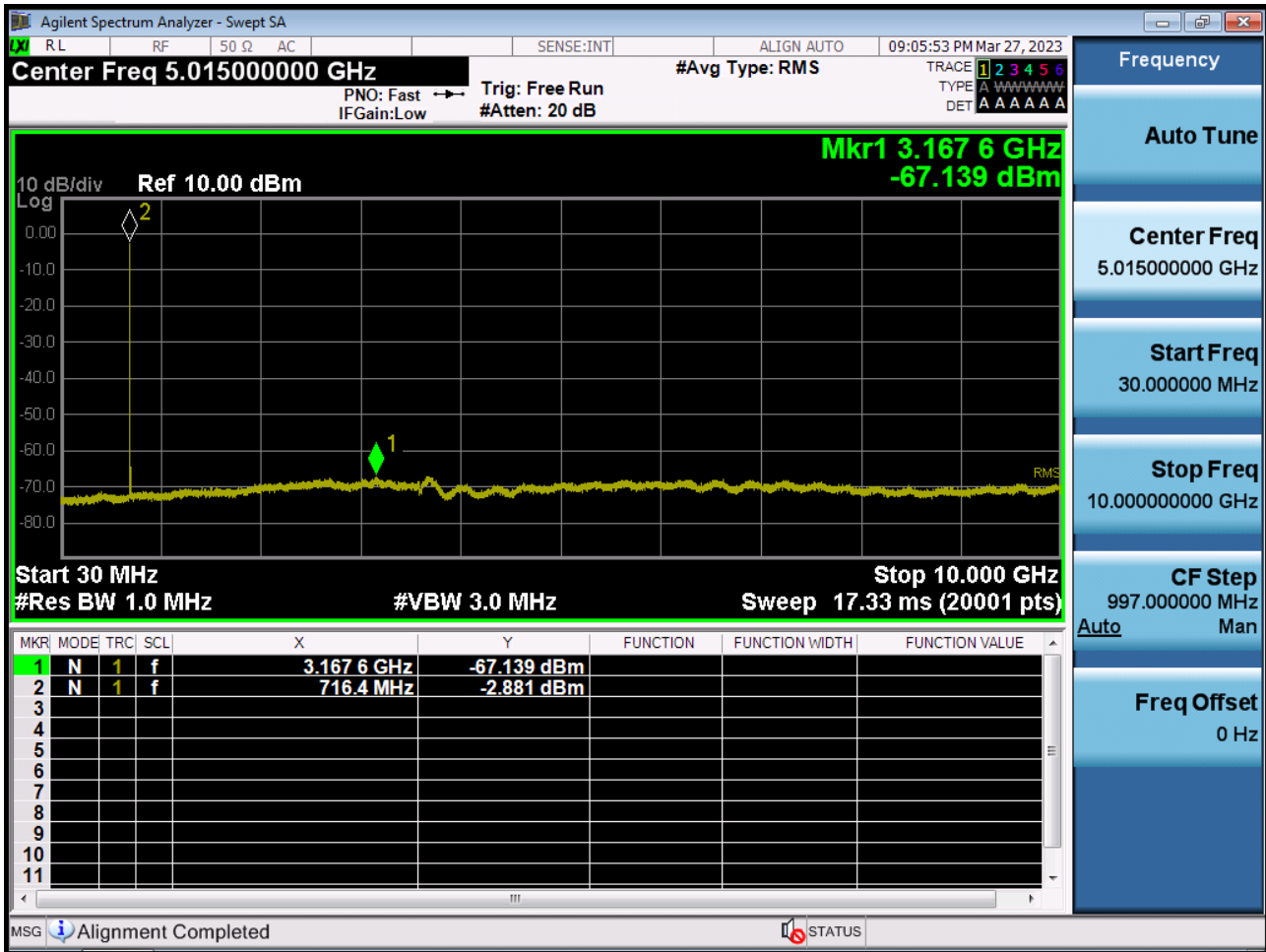
BAND 12/17. Conducted Spurious Plot _ (23035ch_5 MHz_QPSK_RB 1_0)



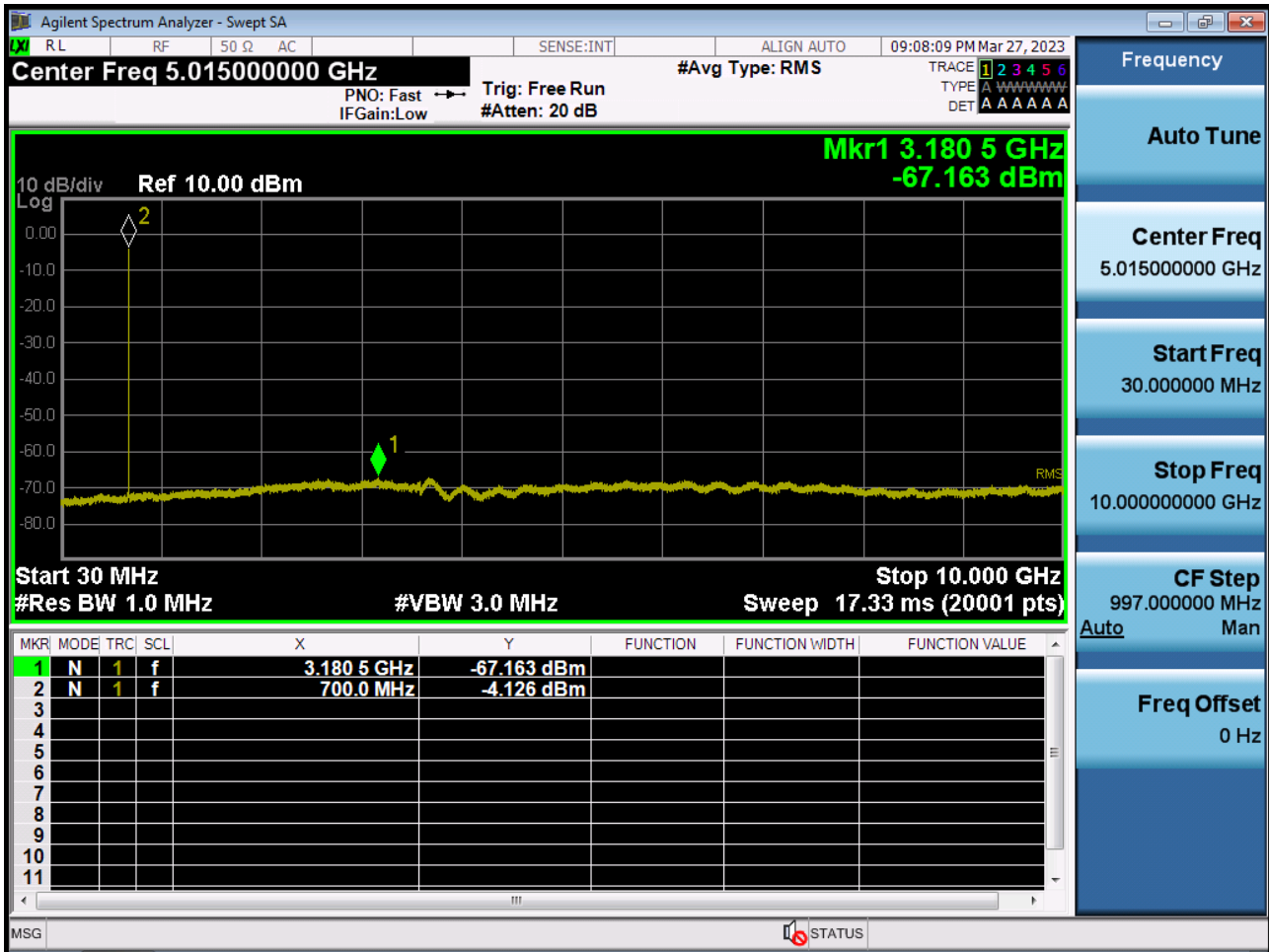
BAND 12/17. Conducted Spurious Plot _ (23095ch_5 MHz_QPSK_RB 1_0)



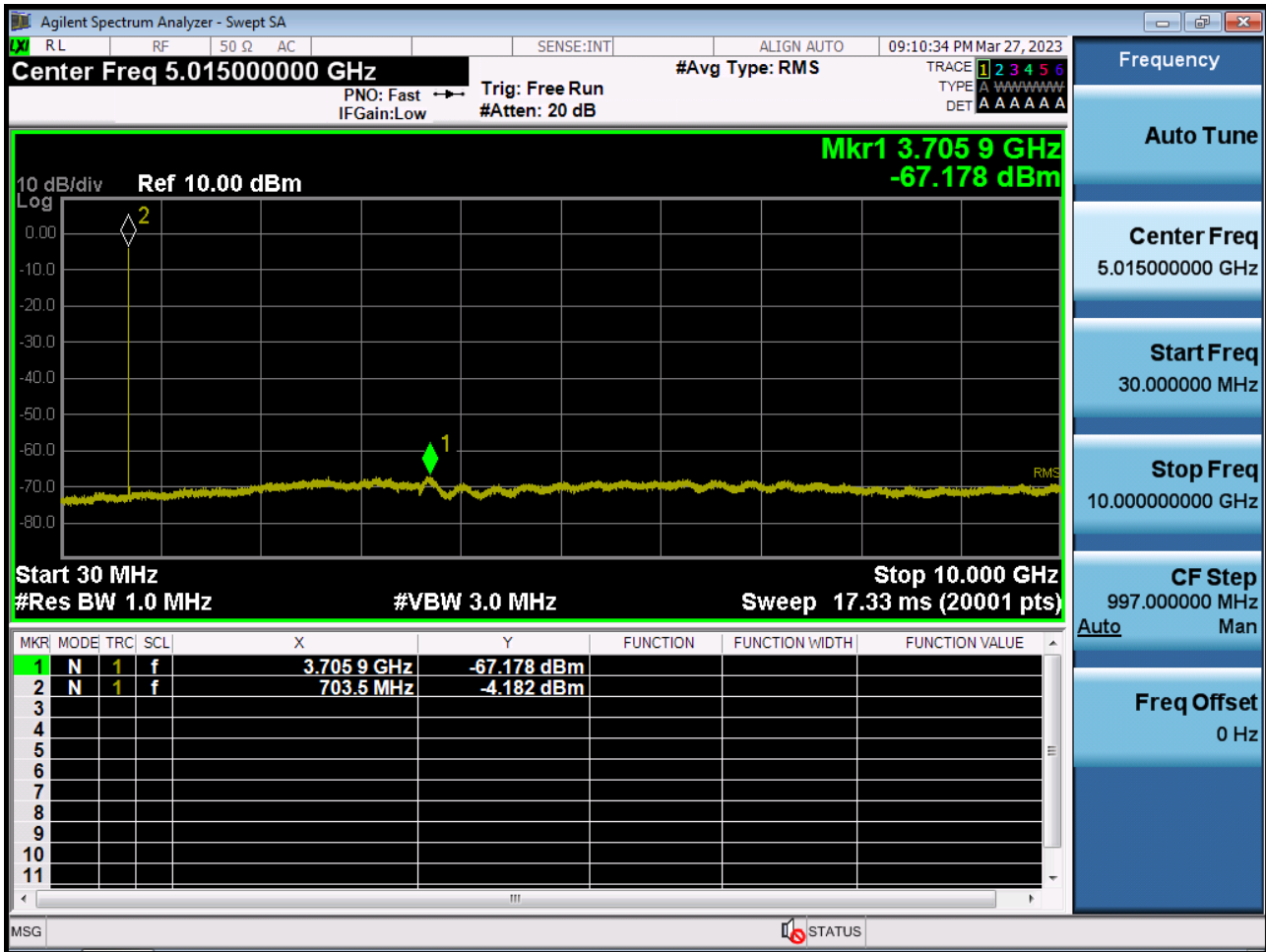
BAND 12/17. Conducted Spurious Plot _ (23155ch_5 MHz_QPSK_RB 1_0)



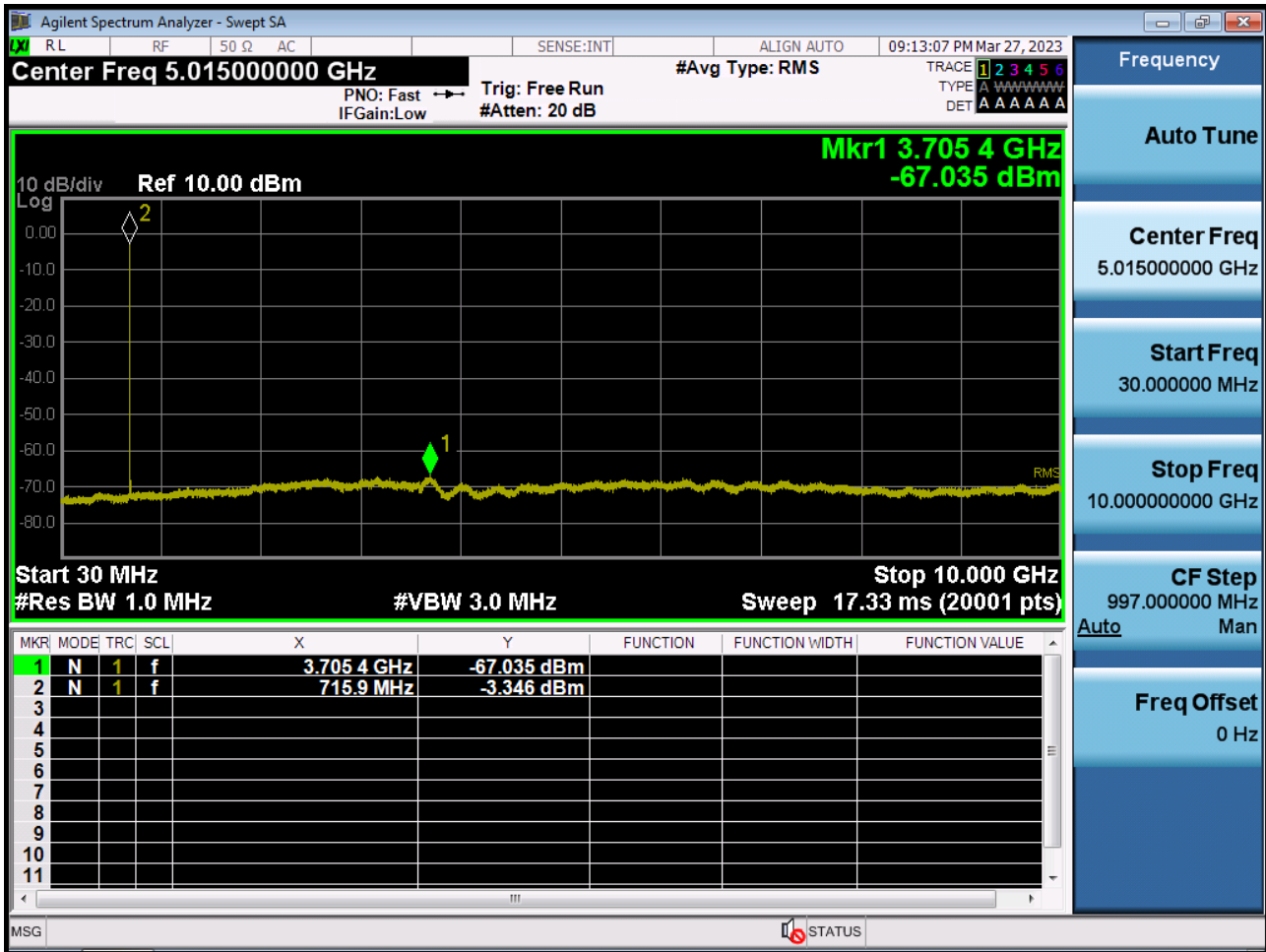
BAND 12/17. Conducted Spurious Plot _ (23060ch_10 MHz_QPSK_RB 1_0)



BAND 12/17. Conducted Spurious Plot _ (23095ch_10 MHz_QPSK_RB 1_0)



BAND 12/17. Conducted Spurious Plot _ (23130ch_10 MHz_QPSK_RB 1_0)



10. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2305-FC071-P