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TEST REPORT

FCC CDMA Test for T720C
Certification

APPLICANT
Franklin Technology Inc.

REPORT NO.
HCT-RF-2112-FC025

DATE OF ISSUE
December 16, 2021

Tested by
Jae Mun Do

Technical Manager
Jong Seok Lee

HCT CO., LTD.
BongJai Huh / CEO

HCT CO., LTD.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si,
Gyeonggi-do, 17383 KOREA
Tel. +82 31 634 6300 Fax. +82 31 645 6401

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CUSTOMER SECRET

HCT Co., Ltd.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
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TEST REPORT

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Additional Model
-

Applicant	**Franklin Technology Inc.** 906 JEI Platz, 186, Gasan digital 1-ro, Gumcheon-Gu, Seoul 08502, South Korea
Eut Type Model Name	Home Phone Connect T720C
FCC ID	XHG-T720C
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§ 22, § 24, § 2

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	December 16, 2021	Initial Release

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)

According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : XHG-T720 report.(Report no : HCT-RF-1902-FC010)

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	Franklin Technology Inc.
Address:	906 JEI Platz, 186, Gasan digital 1-ro, Gumcheon-Gu, Seoul 08502, South Korea
FCC ID:	XHG-T720C
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule(s):	§ 22, § 24, § 2
EUT Type:	Home Phone Connect
Model(s):	T720C
Additional Model:	-
Tx Frequency:	824.70 — 848.31 MHz (CDMA BC0) 1 851.25 – 1 908.75 MHz (PCS CDMA BC1)
Rx Frequency:	869.70 — 893.31 MHz (CDMA BC0) 1 931.25 – 1 988.75 MHz (PCS CDMA BC1)
Date(s) of Tests:	Original : December 26, 2018 ~ January 28, 2019 Re-use : November 30, 2021 ~ December 13, 2021
Serial number:	Radiated: TTLC007266 Conducted: TTLC007267

1.1. MAXIMUM OUTPUT POWER

Mode	Tx Frequency (MHz)	Rx Frequency (MHz)	Emission Designator	ERP	
				Max. Power (W)	Max. Power (dBm)
CDMA	824.70– 848.31	869.70– 893.31	1M28F9W	0.401	26.04
CDMA EVDO_Rev.0			1M28F9W	0.401	26.03
CDMA EVDO_Rev.A			1M29F9W	0.401	26.03

Mode	Tx Frequency (MHz)	Rx Frequency (MHz)	Emission Designator	EIRP	
				Max. Power (W)	Max. Power (dBm)
PCS CDMA	1851.25– 1 908.75	1 931.25– 1 988.75	1M28F9W	0.536	27.30
PCS CDMA EVDO_Rev.0			1M28F9W	0.532	27.26
PCS CDMA EVDO_Rev.A			1M29F9W	0.532	27.26

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Home Phone Connect with CDMA(BC0, 1) and LTE.

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

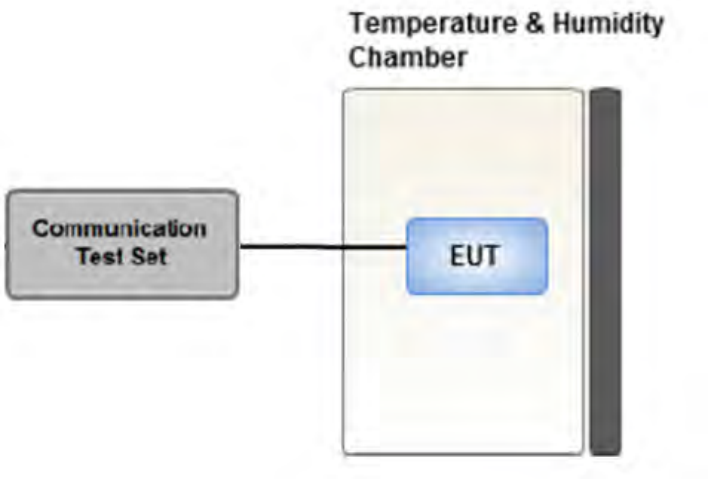
The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.**

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	- KDB 971168 D01 v03r01 – Section 5.2
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 CONDUCTED OUTPUT POWER



Test setup

Test Overview

When an average power meter is used to perform RF output power measurements, the fundamental condition that measurements be performed only over durations of active transmissions at maximum output power level applies.

Conducted Output Power was tested in accordance with KDB971168 D01 Power Meas License Digital Systems v03r01, Section 5.2.

3.3 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 ≥ 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;

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

   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.

3.4 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 ≥ 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. 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;

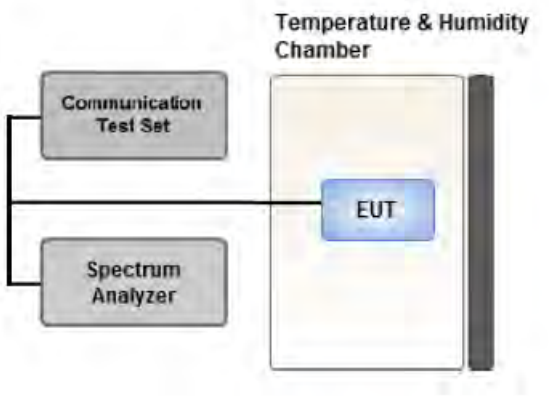
$$\text{Result}_{(dBm)} = \text{Pg}_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

   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.

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

3.5 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 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:

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

Test Settings(Peak Power)

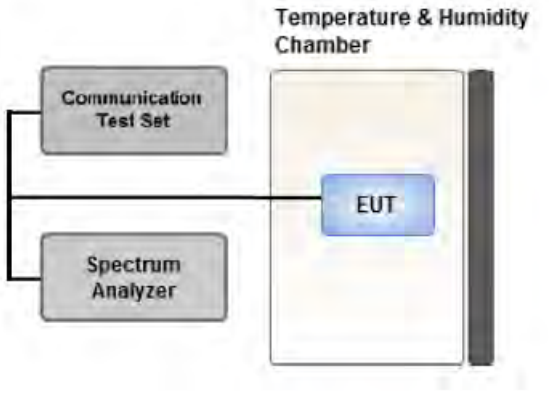
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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 %.

3.6 OCCUPIED BANDWIDTH.



Test setup

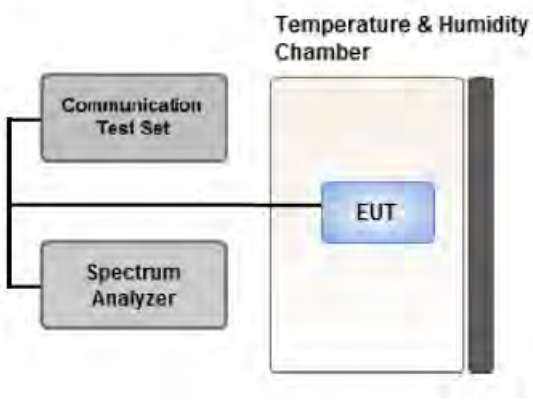
The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

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 ≥ 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

3.7 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

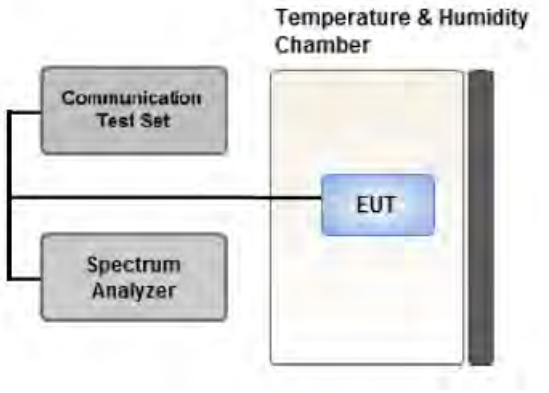
Test Overview

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 x Span / RBW

3.8 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

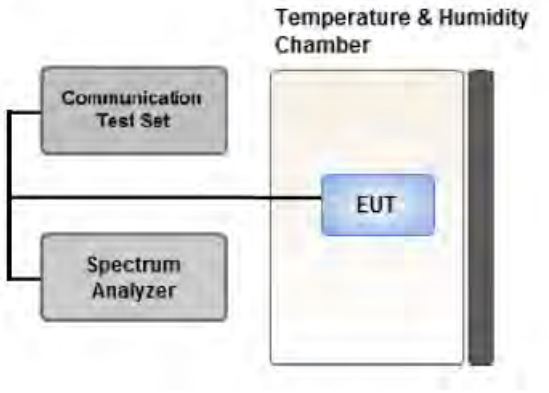
Test Notes

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.

3.9 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.

3.10 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.

[Worst case]

Test Description	Modulation	Test Channel
Occupied Bandwidth	BC 0: CDMA 1xRTT 1xEVDO_Rev.0 1xEVDO_Rev.A	Low, Mid, High
	BC 1: CDMA 1xRTT 1xEVDO_Rev.0 1xEVDO_Rev.A	Low, Mid, High
Band Edge	BC 0: CDMA 1xRTT BC 1: CDMA 1xRTT	Low, High
Spurious and Harmonic Emissions at Antenna Terminal	BC 0: CDMA 1xRTT BC 1: CDMA 1xRTT	Low, Mid, High

[Test Channel]

	UplinkChannel	
	CDMA (BC0)	CDMA (PCS BC1)
Low	1013	25
Mid	384	600
High	777	1175

3.11 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.
  mode : A wall-hanging, Table top (Worst : Table top)
- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- Please refer to the table below.

[Worst case]

Test Description	Modulation	Axis	Test Channel
Radiated Spurious and Harmonic Emissions	CDMA BC0_1xRTT	CDMA BC0 : X CDMA BC1 : Z	Low, Mid, High
	CDMA BC1_1xRTT		

[Test Channel]

	UplinkChannel	
	CDMA (BC0)	CDMA (PCS BC1)
Low	1013	25
Mid	384	600
High	777	1175

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	-	03/02/2022	Annual
H.P.F	FBSR-02B(WHK3.3/18 G-10EF)	T&M SYSTEM	-	03/02/2022	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	11275	04/07/2022	Annual
DC Power Supply	E3632A	Agilent	MY40010147	06/28/2022	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	04/05/2023	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	04/05/2023	Biennial
Chamber	SU-642	ESPEC	93008124	03/15/2022	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/30/2022	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/15/2023	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
Horn Antenna(15 ~ 40 GHz)	BBHA 9170	Schwarzbeck	BBHA9170124	02/11/2022	Biennial
Signal Analyzer(10 Hz ~ 26.5 GHz)	N9020A	Agilent	MY52090906	05/18/2022	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	06/01/2022	Annual
Spectrum Analyzer(10 Hz ~ 40 GHz)	FSV40	REOHDE & SCHWARZ	100931	09/29/2022	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/18/2022	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/19/2022	Biennial
Bilog Antenna	VULB9160	Schwarzbeck	3150	03/03/2023	Biennial
Hybrid Antenna	VULB9168	Schwarzbeck	760	02/22/2023	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262116770	07/12/2022	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	01/07/2022	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/05/2022	Annual
Signal Analyzer(5 Hz ~ 40.0 GHz)	N9030B	KEYSIGHT	MY55480167	06/02/2022	Annual
FCC LTE Mobile Conducted RF Automation Test Software	-	HCT CO., LTD.,	-	-	-

Note:

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
2. 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 (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (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, § 22.917(a), § 24.238(a)	< 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Effective Radiated Power	§ 22.913(a)(5)	< 7 Watts max. ERP	PASS
Equivalent Isotropic Radiated Power	§ 24.232(c)	< 2 Watts max. EIRP	PASS
Peak- to- Average Ratio	§ 24.232(d)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§ 2.1055, § 22.355	< 2.5 ppm	PASS
	§ 24.235	Emission must remain in band	PASS

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Radiated Spurious and Harmonic Emissions	§ 2.1053, § 22.917(a), § 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

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(CDMA Mode)

· **Conducted Power (CDMA BC0)**

Band	Channel	SO2	SO2	SO55	SO55	TDSO SO32	1xEvDO Rev.0	1xEvDO Rev.0	1xEvDO Rev.A	1xEvDO Rev.A
		RC1/1 (dBm)	RC3/3 (dBm)	RC1/1 (dBm)	RC3/3 (dBm)	RC3/3 (dBm)	(FTAP)	(RTAP)	(FETAP)	(RETAP)
CDMA	1013	23.31	23.31	23.31	23.29	23.28	23.30	23.30	23.28	23.30
	384	23.18	23.14	23.15	23.08	23.12	23.07	23.12	23.09	23.14
	777	22.89	22.92	22.96	22.95	22.91	22.91	22.88	22.86	22.90

· **E.R.P (CDMA BC0)**

Band	Channel	SO2	SO2	SO55	SO55	TDSO SO32	1xEvDO Rev.0	1xEvDO Rev.0	1xEvDO Rev.A	1xEvDO Rev.A
		RC1/1 (dBm)	RC3/3 (dBm)	RC1/1 (dBm)	RC3/3 (dBm)	RC3/3 (dBm)	(FTAP)	(RTAP)	(FETAP)	(RETAP)
CDMA	1013	26.04	26.04	26.04	26.02	26.01	26.03	26.03	26.01	26.03
	384	25.91	25.87	25.88	25.81	25.85	25.80	25.85	25.82	25.87
	777	25.62	25.65	25.69	25.68	25.64	25.64	25.61	25.59	25.63

Note:

1. E.R.P = Conducted Power + Peak. Ant Gain(dBd)
2. Peak. Ant Gain(dBi) = 4.876 dBi
3. Peak. Ant Gain(dBd) = 4.876 - 2.15 = 2.726 dBd

4 Limit = 7 Watts(= 38.45 dBm)

8.2 EQUIVALENT ISOTROPIC RADIATED POWER(PCS CDMA Mode)

· **Conducted Power (CDMA BC1)**

Band	Channel	SO2	SO2	SO55	SO55	TDSO SO32	1xEvDO Rev.0	1xEvDO Rev.0	1xEvDO Rev.A	1xEvDO Rev.A
		RC1/1 (dBm)	RC3/3 (dBm)	RC1/1 (dBm)	RC3/3 (dBm)	RC3/3 (dBm)	(FTAP)	(RTAP)	(FETAP)	(RETAP)
PCS CDMA	25	21.89	21.91	21.90	21.80	21.92	21.85	21.98	21.87	21.86
	600	22.41	22.38	22.32	22.30	22.41	22.37	22.33	22.37	22.32
	1175	22.32	22.30	22.33	22.37	22.38	22.30	22.31	22.27	22.28

· **E.I.R.P (CDMA BC1)**

Band	Channel	SO2	SO2	SO55	SO55	TDSO SO32	1xEvDO Rev.0	1xEvDO Rev.0	1xEvDO Rev.A	1xEvDO Rev.A
		RC1/1 (dBm)	RC3/3 (dBm)	RC1/1 (dBm)	RC3/3 (dBm)	RC3/3 (dBm)	(FTAP)	(RTAP)	(FETAP)	(RETAP)
PCS CDMA	25	26.78	26.80	26.79	26.69	26.81	26.74	26.87	26.76	26.75
	600	27.30	27.27	27.21	27.19	27.30	27.26	27.22	27.26	27.21
	1175	27.21	27.19	27.22	27.26	27.27	27.19	27.20	27.16	27.17

Note:

1. E.I.R.P = Conducted Power + Peak. Ant Gain(dBi)
2. Peak. Ant Gain = 4.885 dBi
3. Limit = 2 Watts(= 33.01 dBm)

8.3 RADIATED SPURIOUS EMISSIONS

8.3.1 CDMA Mode

▣ MODULATION SIGNAL: CDMA

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 log10 (W)

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBd)	Substitute Level [dBm]	C.L	Pol.	ERP (dBm)	Margin (dB)
1013 (824.7)	1,649.40	-49.13	7.46	-58.02	1.27	H	-53.98	40.98
	2,474.10	-51.90	8.68	-58.06	1.59	V	-53.12	40.12
	3,298.80	-56.99	10.30	-63.04	1.86	H	-56.75	43.75
384 (836.5)	1,673.00	-48.04	7.53	-57.03	1.28	H	-52.93	39.93
	2,509.50	-52.97	8.83	-59.29	1.62	V	-54.23	41.23
	3,346.00	-56.21	10.51	-62.53	1.91	H	-56.08	43.08
777 (848.3)	1,696.60	-47.28	7.71	-56.30	1.29	H	-52.03	39.03
	2,544.90	-55.97	8.86	-62.00	1.62	H	-56.91	43.91
	3,393.20	-56.94	10.56	-63.20	1.95	H	-56.74	43.74

Note:

1. Limit = 43 + 10 $\log_{10}$ (W) = -13.0 dBm

8.3.2 PCS Mode

▣ MODULATION SIGNAL: CDMA PCS

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 log10 (W)

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	EIRP (dBm)	Margin (dB)
25 (1851.3)	3,702.60	-55.63	12.51	-62.43	1.98	V	-51.90	38.90
	5,553.90	-50.93	13.62	-52.21	2.72	V	-41.31	28.31
	7,405.20	-54.01	11.50	-48.86	2.93	V	-40.29	27.29
600 (1880.0)	3,760.00	-56.65	12.40	0.00	2.00	V	-52.69	39.69
	5,640.00	-50.16	13.78	-62.43	2.70	V	-39.91	26.91
	7,520.00	-57.19	11.57	-52.21	2.93	H	-43.34	30.34
1175 (1908.8)	3,817.60	-54.04	12.52	11.63	2.05	H	-49.81	36.81
	5,726.40	-49.61	13.70	-63.09	2.72	V	-38.46	25.46
	7,635.20	-55.59	11.97	-50.99	2.96	V	-41.77	28.77
	9,544.00	-54.06	11.16	-51.98	3.46	V	-37.27	24.27

Note:

1. Limit = 43 + 10 $\log_{10}$ (W) = -13.0 dBm

8.4 PEAK-TO-AVERAGE RATIO

Band	Ch.	Measured P_{Pk} (dBm)	Measured P_{Avg} (dBm)	P_{Avg} (Duty Cycle)			P.A.R. = P_{Pk} - P_{Avg} (dB)	Limit (dB)	Pass / Fail
				Tx_{Total} (ms)	Tx_{On} (ms)	Factor (dB)			
PCS	600	CCDF Procedure					3.82	13	Pass
PCS_Rev.0							4.75		
PCS_Rev.A							4.77		

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 55 ~ 57.
2. Only GSM(include EDGE) Mode was tested by alternate procedure for PAPR

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

Duty cycle Factor = 10 log (1/x), x = Tx_{On} / Tx_{Total}

8.5 OCCUPIED BANDWIDTH

Band	Channel	Frequency(MHz)	Data (MHz)
CDMA	1013	824.7	1.2746
	384	836.5	1.2790
	777	848.3	1.2771
CDMA EVDO_Rev.0	1013	824.7	1.2732
	384	836.5	1.2754
	777	848.3	1.2757
CDMA EVDO_Rev.A	1013	824.7	1.2734
	384	836.5	1.2768
	777	848.3	1.2763
PCS	25	1851.3	1.2824
	600	1880.0	1.2783
	1175	1908.8	1.2795
PCS EVDO_Rev.0	25	1851.3	1.2838
	600	1880.0	1.2743
	1175	1908.8	1.2793
PCS EVDO_Rev.A	25	1851.3	1.2852
	600	1880.0	1.2795
	1175	1908.8	1.2790

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 37 ~ 54.

8.6 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result	Limit (dBm)
CDMA	1013	2.4751	27.976	-73.781	-45.805	-13.00
	384	2.5105	27.976	-75.375	-47.399	
	777	3.7059	27.976	-78.827	-50.851	
PCS	25	5.5554	28.591	-77.140	-48.549	
	600	5.6411	28.591	-77.265	-48.674	
	1175	3.6965	27.976	-78.477	-50.501	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 66 ~ 74.
2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
3. 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

8.7 BAND EDGE

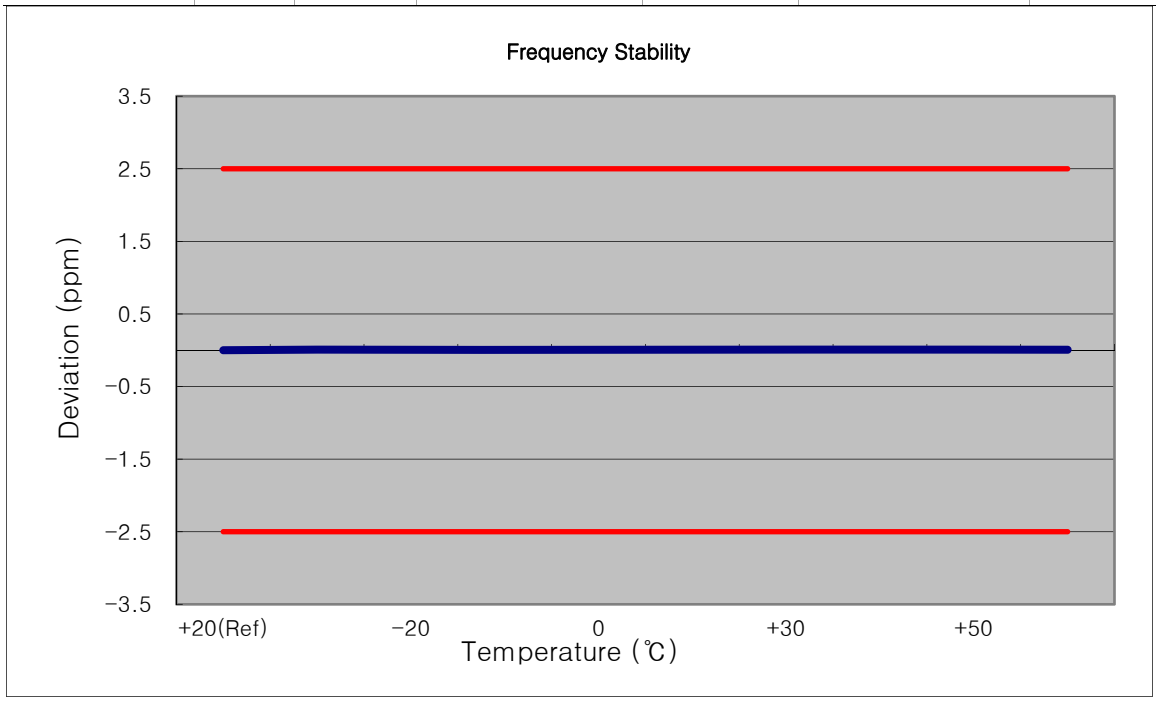
- Plots of the EUT's Band Edge are shown Page 58 ~ 65.

8.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

8.8.1 CDMA Mode

▣OPERATING FREQUENCY: 836,520,000 Hz
▣CHANNEL: 384
▣REFERENCE VOLTAGE: 3.80 VDC
▣DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

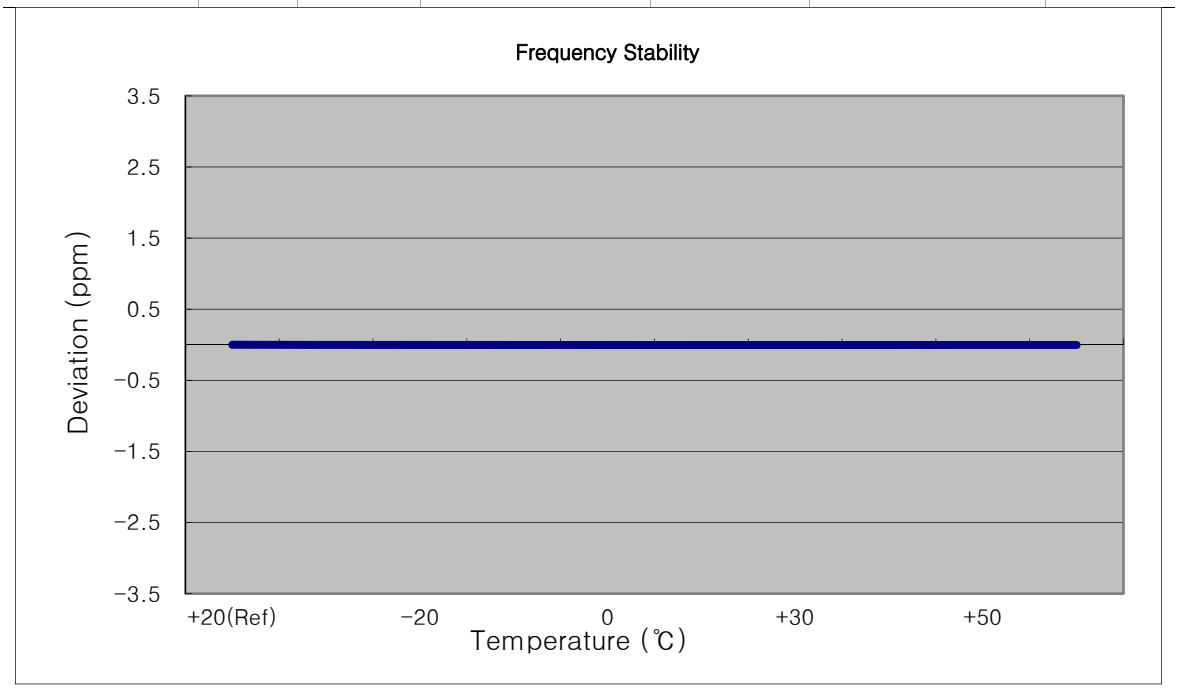
Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100%	3.80	+20(Ref)	836 519 987	0.0	0.000 000	0.000
100%		-30	836 519 994	7.3	0.000 001	0.009
100%		-20	836 519 992	5.1	0.000 001	0.006
100%		-10	836 519 992	4.9	0.000 001	0.006
100%		0	836 519 991	4.3	0.000 001	0.005
100%		+10	836 519 994	6.5	0.000 001	0.008
100%		+30	836 519 994	7.1	0.000 001	0.008
100%		+40	836 519 994	6.8	0.000 001	0.008
100%		+50	836 519 994	7.3	0.000 001	0.009
Batt. Endpoint	3.40	+20	836 519 993	5.7	0.000 001	0.007



8.8.2 PCS Mode

▣OPERATING FREQUENCY: 1880,000,000 Hz
▣CHANNEL: 600
▣REFERENCE VOLTAGE: 3.80 VDC
▣DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100%	3.80	+20(Ref)	1880 000 012	0.0	0.000 000	0.000
100%		-30	1880 000 007	-4.8	0.000 000	-0.003
100%		-20	1880 000 003	-9.1	0.000 000	-0.005
100%		-10	1880 000 005	-7.3	0.000 000	-0.004
100%		0	1880 000 002	-9.8	-0.000 001	-0.005
100%		+10	1880 000 007	-5.0	0.000 000	-0.003
100%		+30	1880 000 006	-5.8	0.000 000	-0.003
100%		+40	1880 000 004	-8.2	0.000 000	-0.004
100%		+50	1880 000 005	-7.3	0.000 000	-0.004
Batt. Endpoint	3.40	+20	1880 000 004	-7.7	0.000 000	-0.004



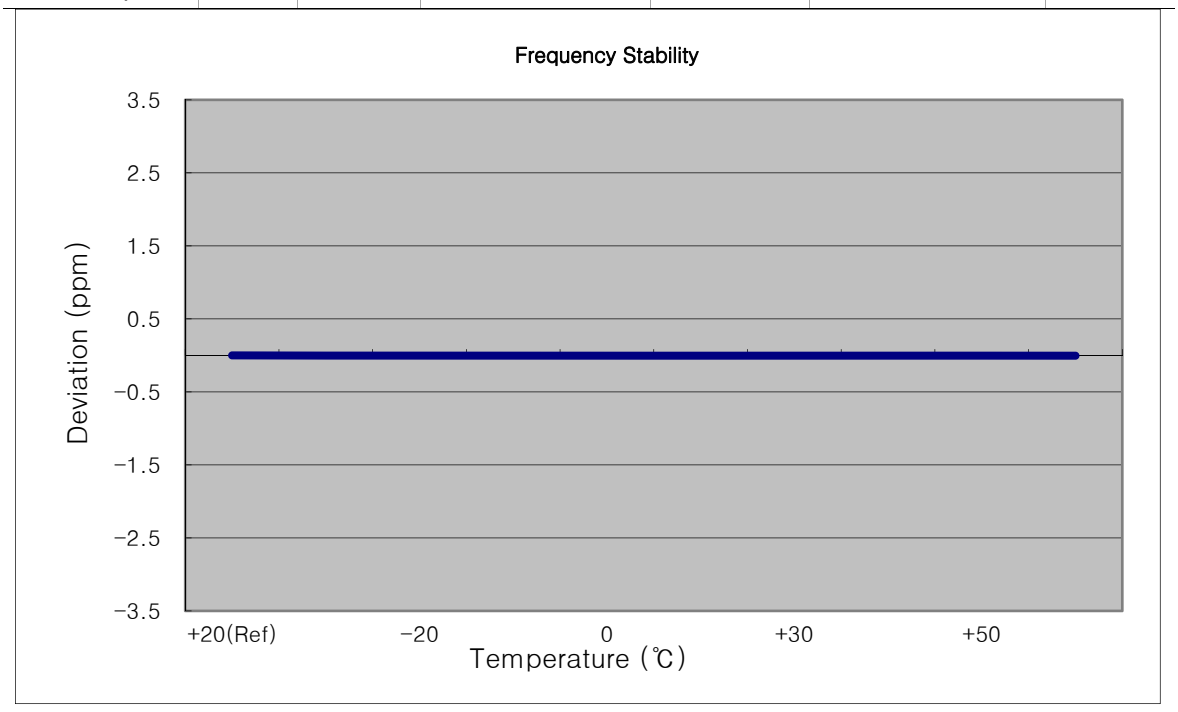
▣OPERATING FREQUENCY: 1851,250,000 Hz

▣CHANNEL: 25

▣REFERENCE VOLTAGE: 3.80 VDC

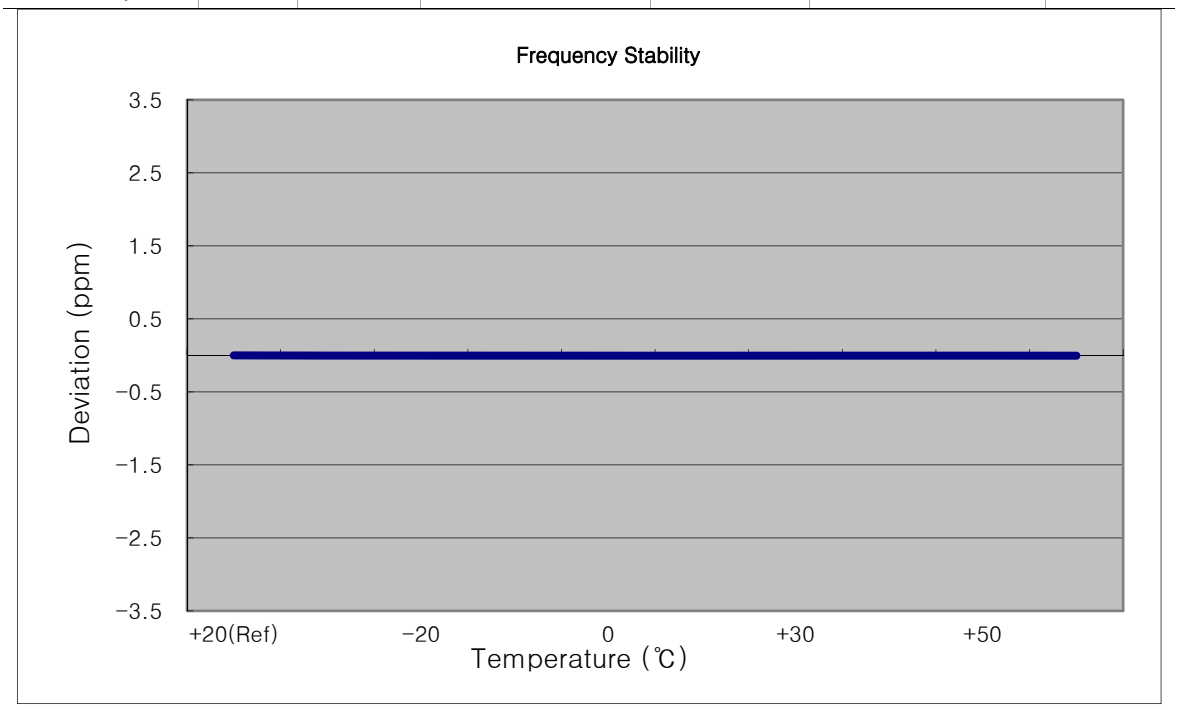
▣DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100%	3.80	+20(Ref)	1851 250 013	0.0	0.000 000	0.000
100%		-30	1851 250 008	-5.1	0.000 000	-0.003
100%		-20	1851 250 004	-8.7	0.000 000	-0.005
100%		-10	1851 250 007	-6.3	0.000 000	-0.003
100%		0	1851 250 009	-3.8	0.000 000	-0.002
100%		+10	1851 250 011	-1.9	0.000 000	-0.001
100%		+30	1851 250 017	3.7	0.000 000	0.002
100%		+40	1851 250 018	4.5	0.000 000	0.002
100%		+50	1851 250 003	-9.8	-0.000 001	-0.005
Batt. Endpoint	3.40	+20	1851 250 010	-3.2	0.000 000	-0.002



▣OPERATING FREQUENCY: 1908,750,000 Hz
▣CHANNEL: 1175
▣REFERENCE VOLTAGE: 3.80 VDC
▣DEVIATION LIMIT: Emission must remain in band

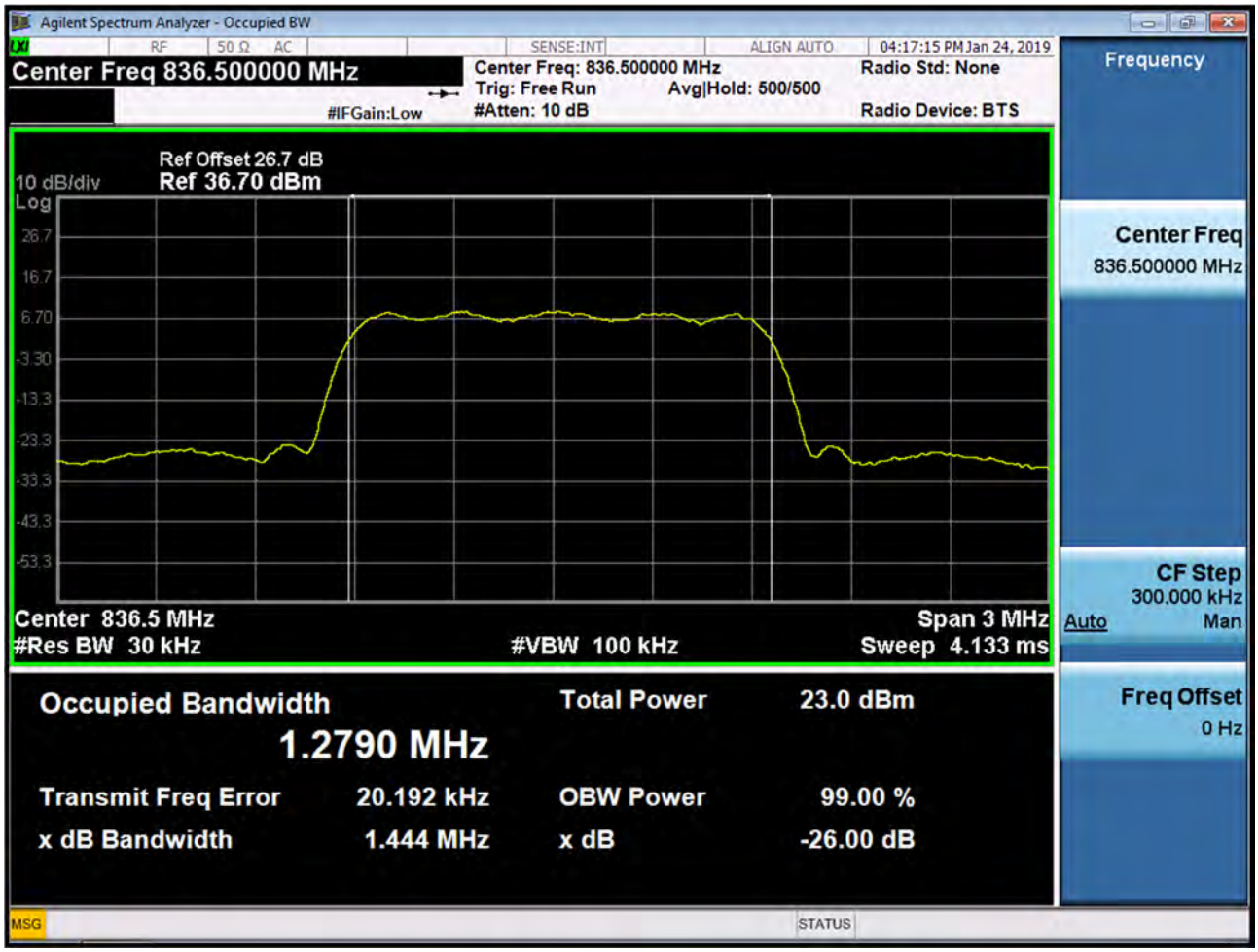
Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100%	3.80	+20(Ref)	1908 749 987	0.0	0.000 000	0.000
100%		-30	1908 749 979	-8.5	0.000 000	-0.004
100%		-20	1908 749 980	-7.3	0.000 000	-0.004
100%		-10	1908 749 976	-11.5	-0.000 001	-0.006
100%		0	1908 749 977	-10.3	-0.000 001	-0.005
100%		+10	1908 749 981	-6.1	0.000 000	-0.003
100%		+30	1908 749 981	-5.9	0.000 000	-0.003
100%		+40	1908 749 984	-2.8	0.000 000	-0.001
100%		+50	1908 749 990	3.1	0.000 000	0.002
Batt. Endpoint	3.40	+20	1908 749 978	-8.7	0.000 000	-0.005



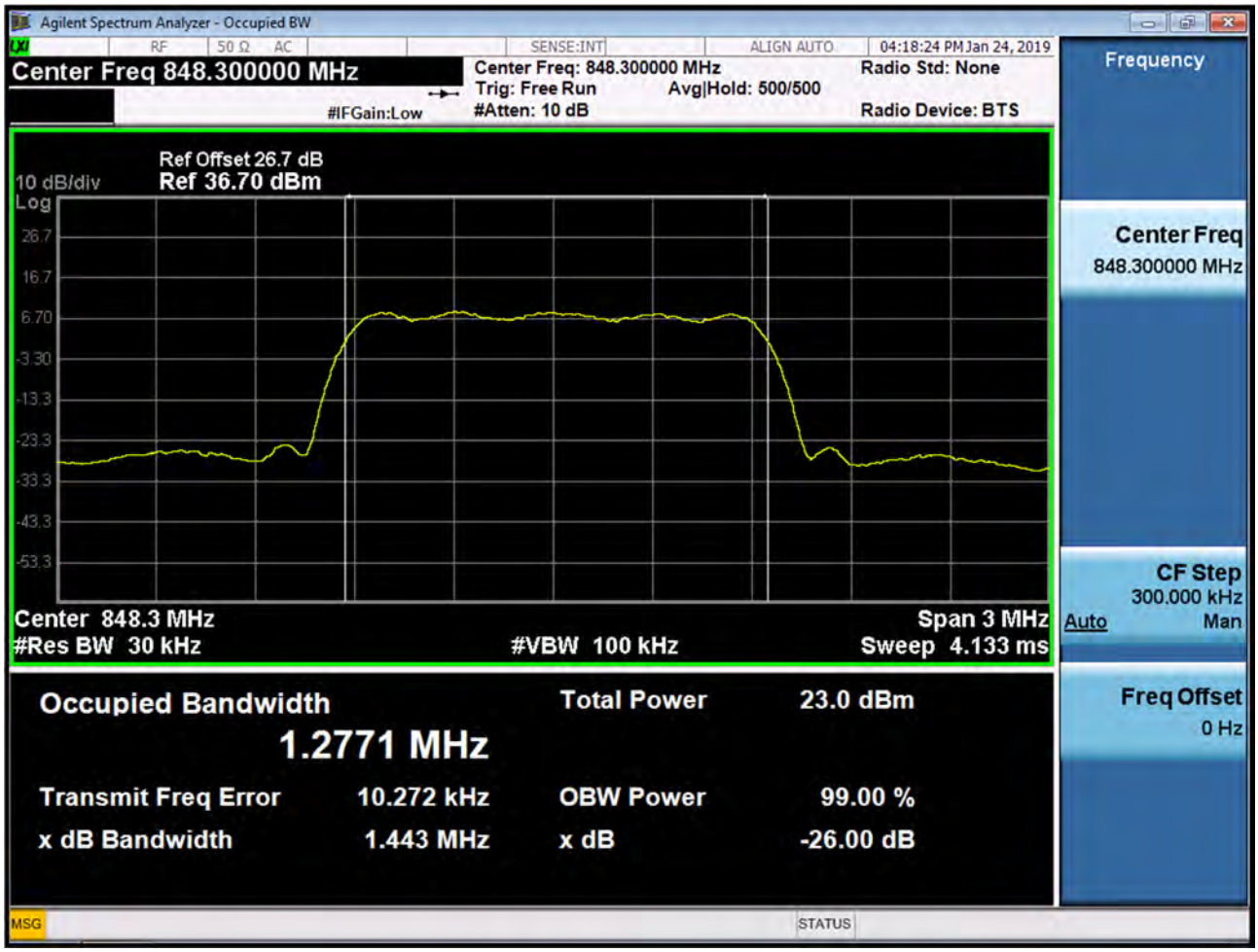
9. TEST PLOTS

■ CDMA MODE (1013 CH.) Occupied Bandwidth

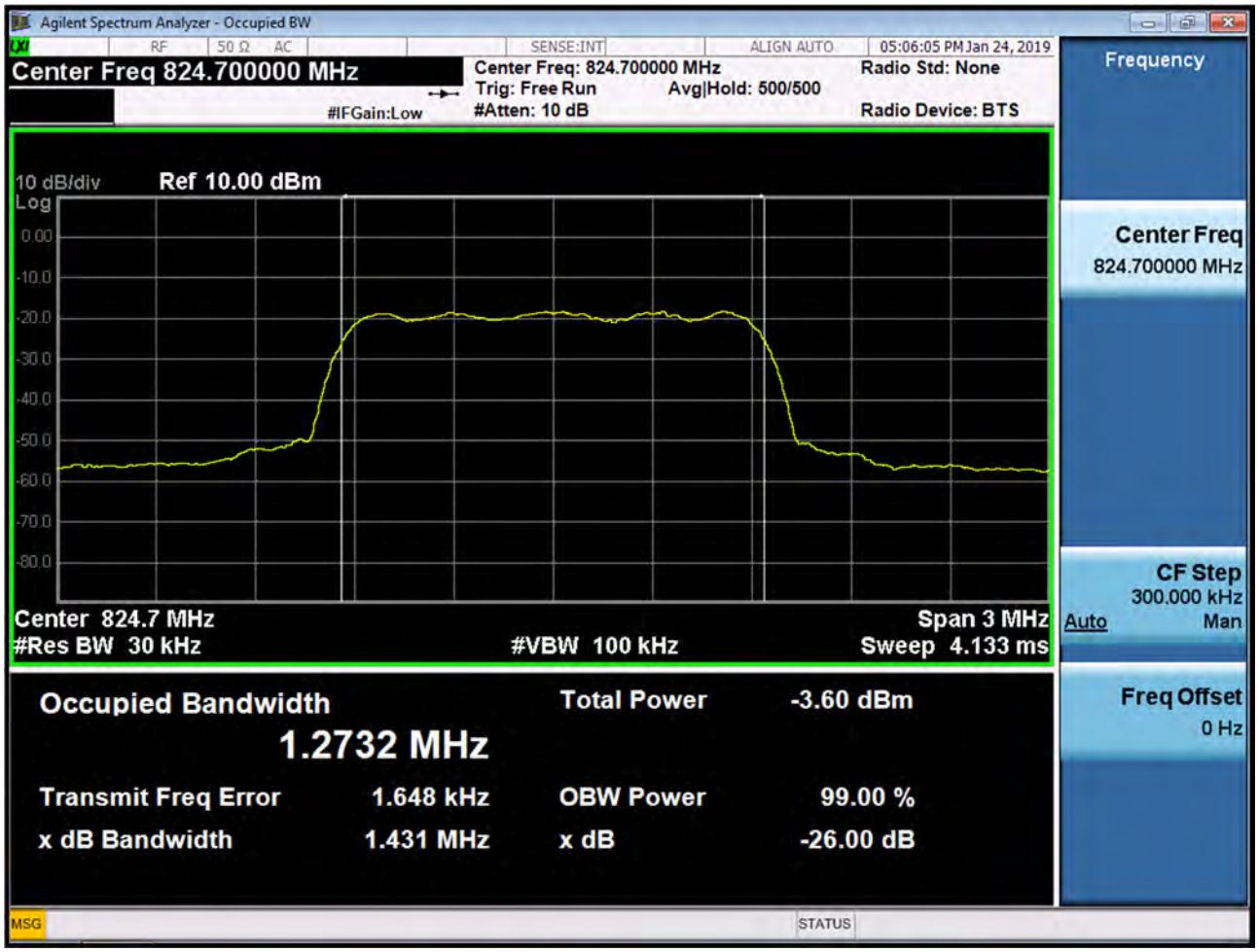
■ CDMA MODE (384 CH.) Occupied Bandwidth



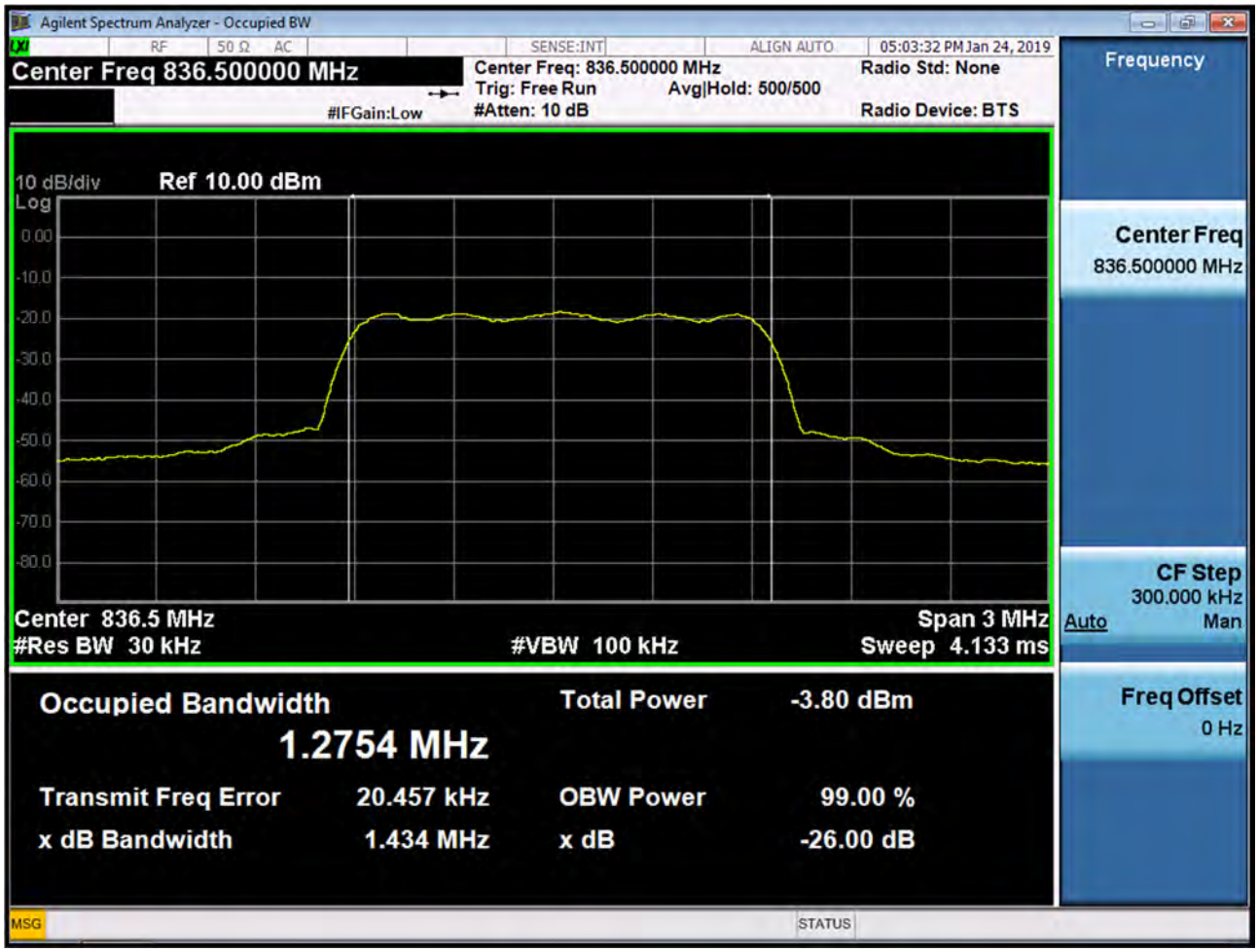
■ CDMA MODE (777 CH.) Occupied Bandwidth



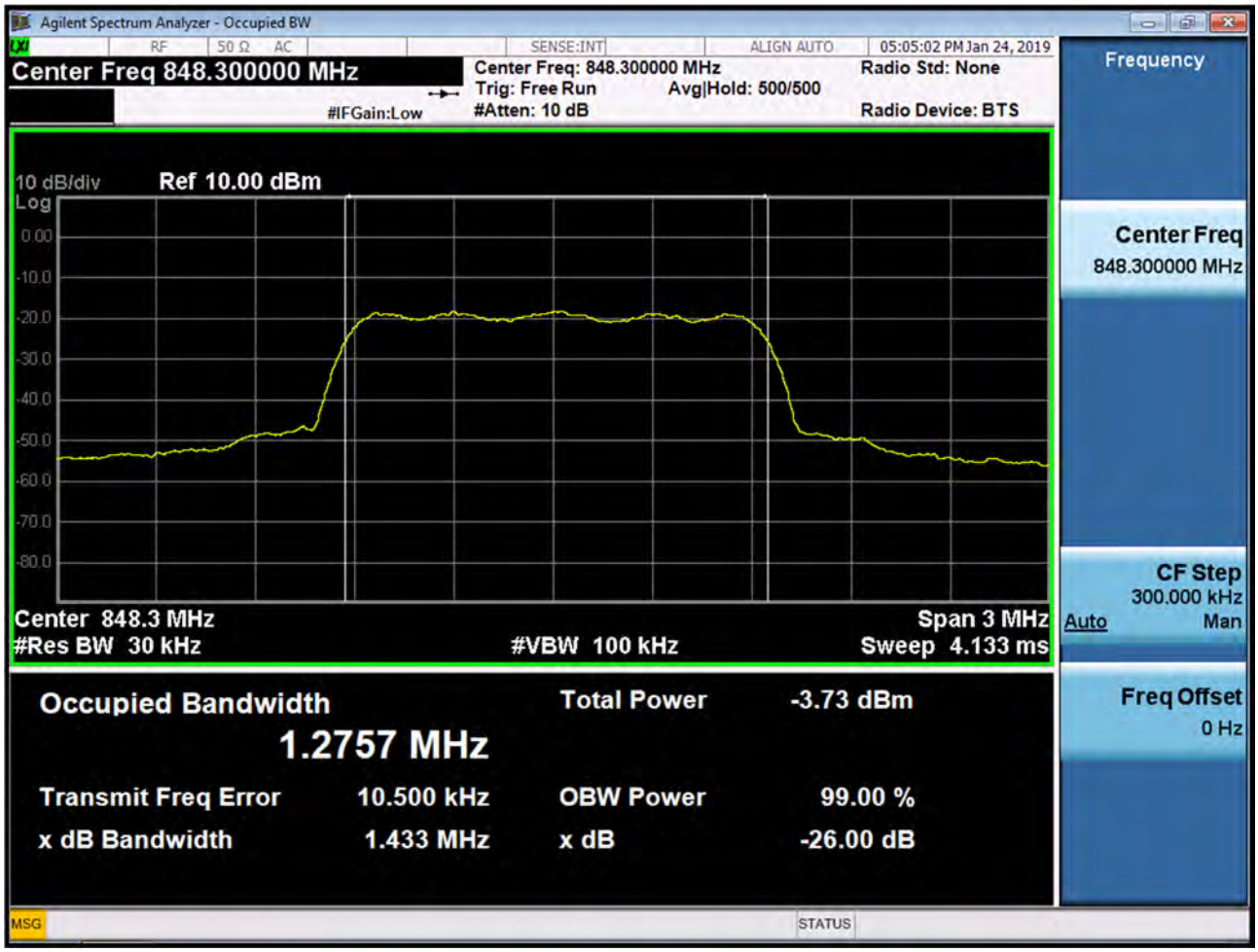
■ CDMA EVDO_Rev.0 MODE (1013 CH.) Occupied Bandwidth



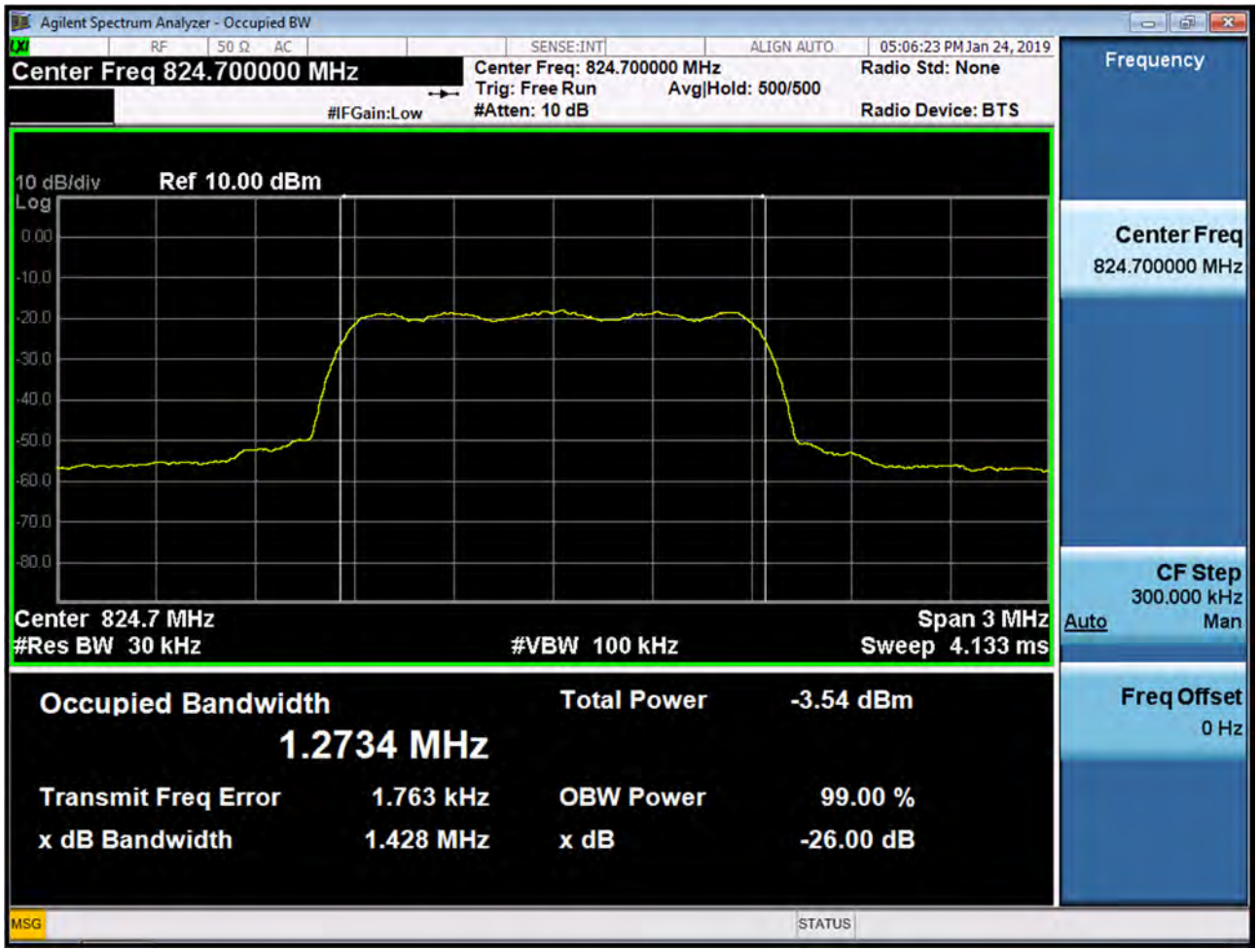
■ CDMA EVDO_Rev.0 MODE (384 CH.) Occupied Bandwidth



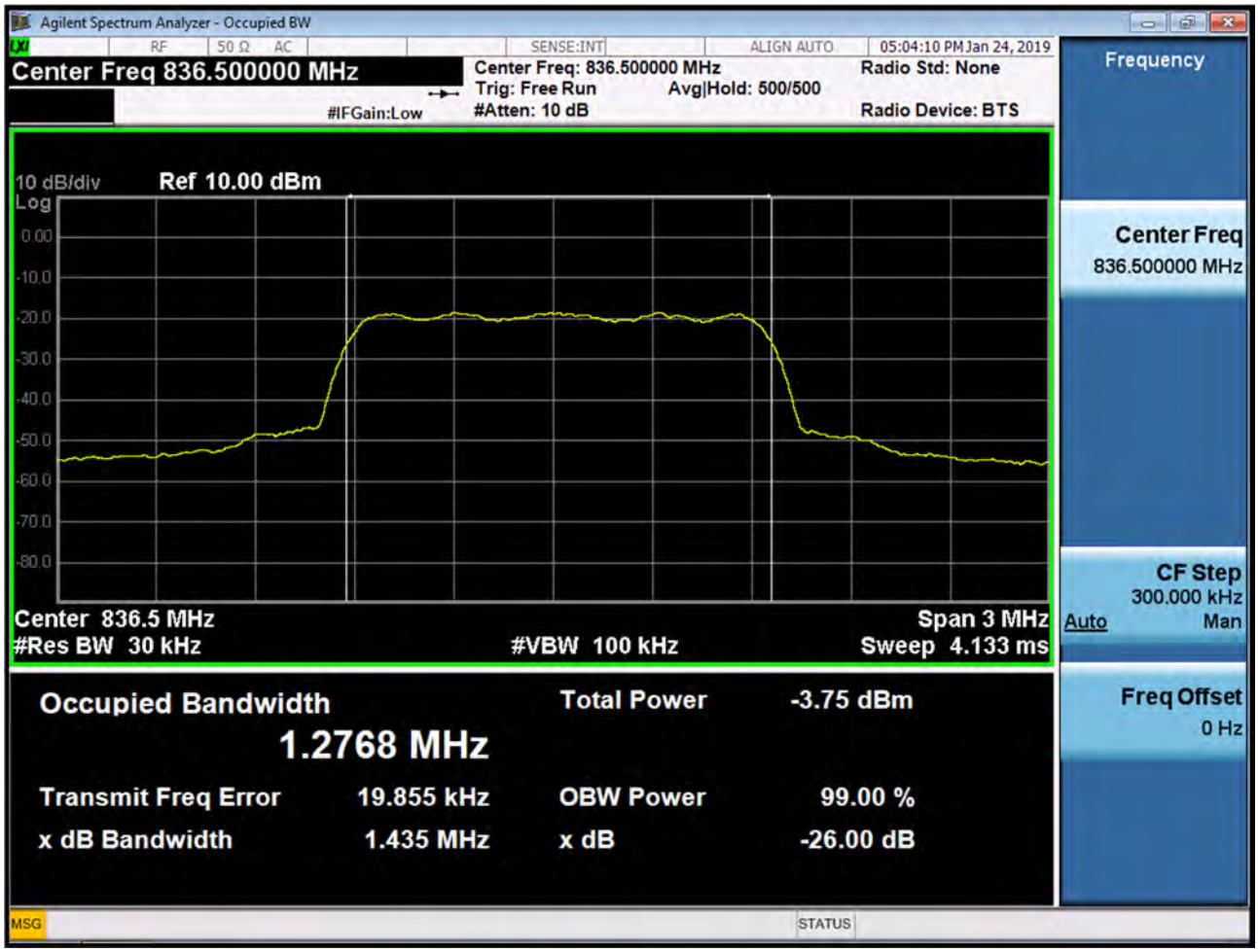
■ CDMA EVDO_Rev.0 MODE (777 CH.) Occupied Bandwidth



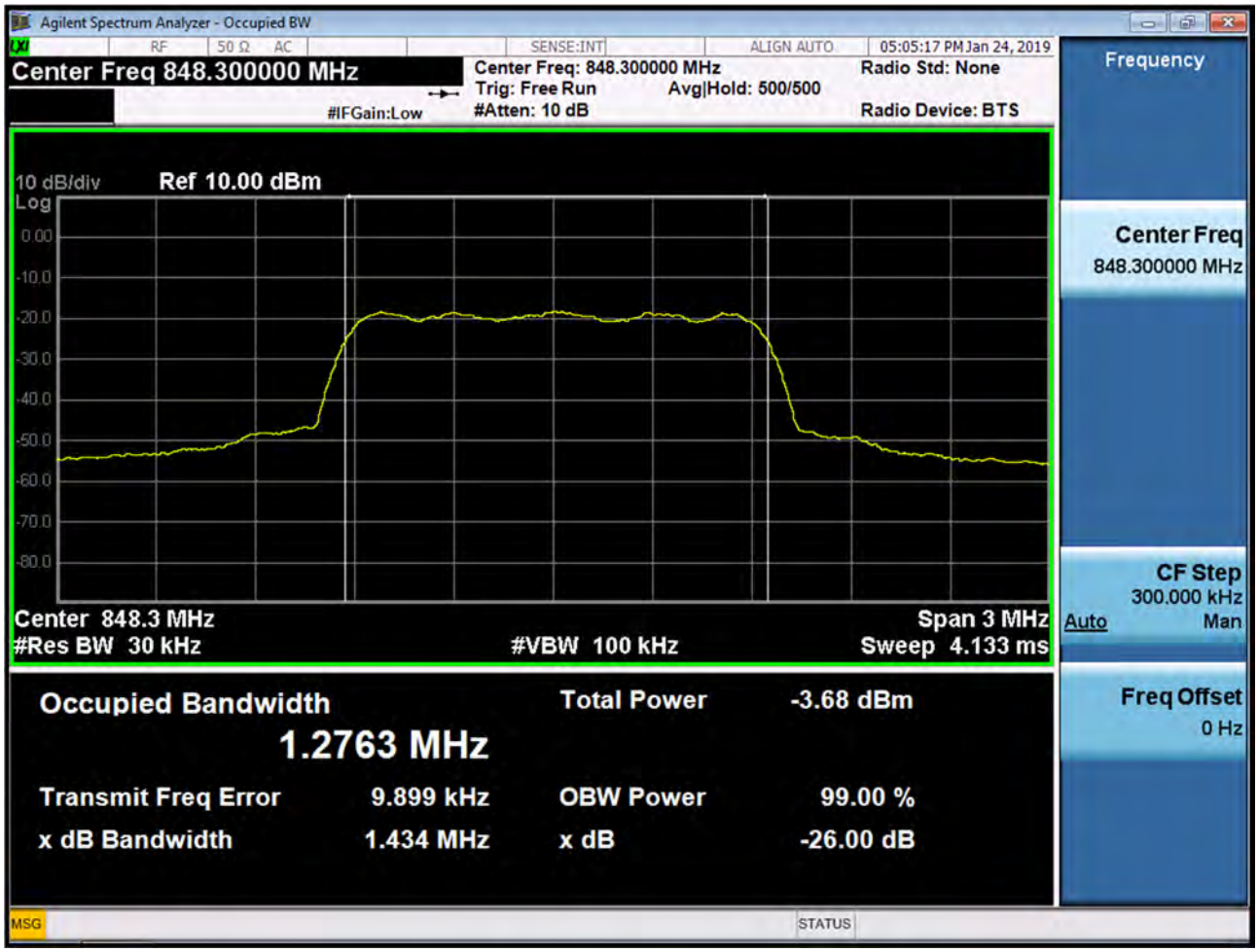
■ CDMA EVDO_Rev.A MODE (1013 CH.) Occupied Bandwidth



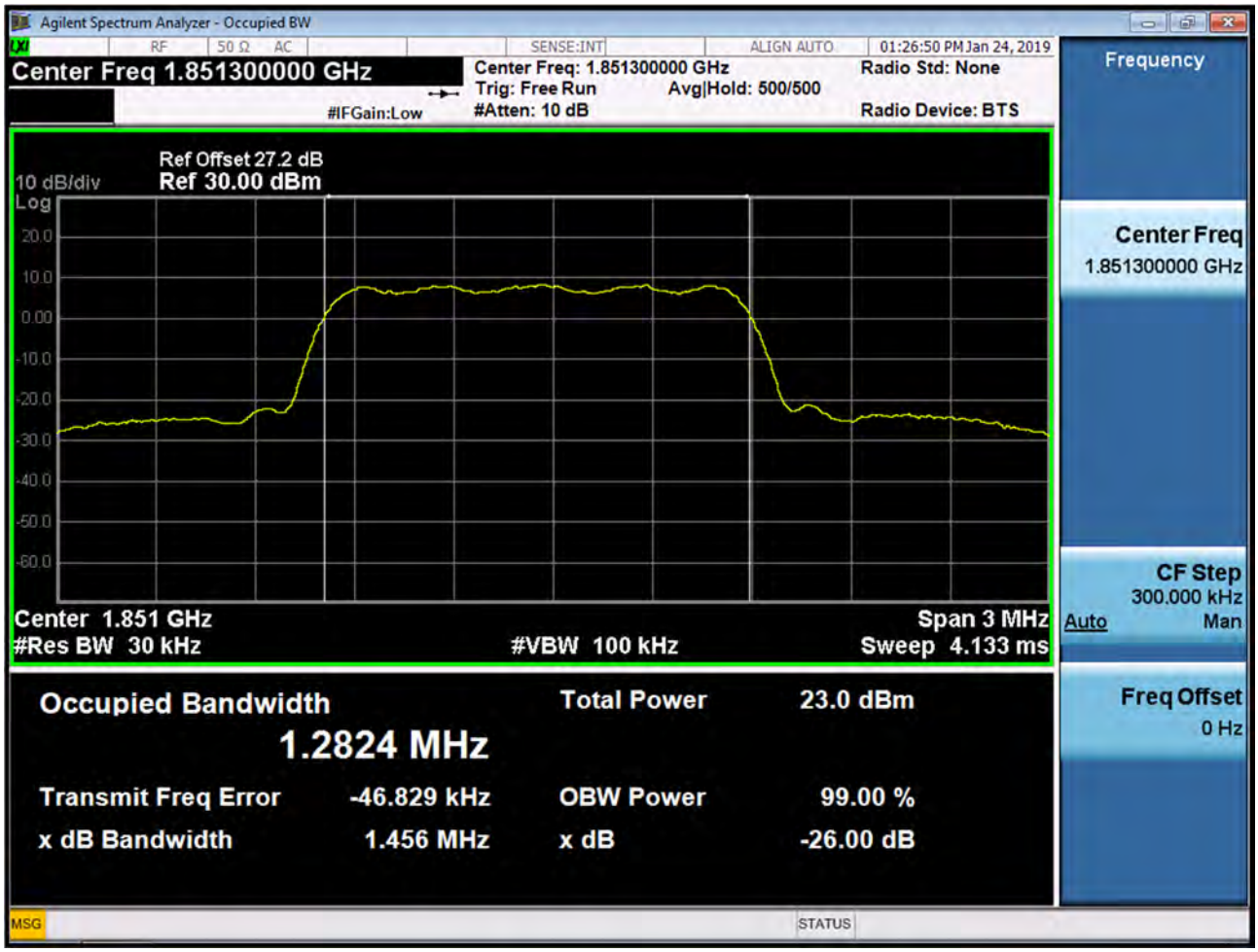
■ CDMA EVDO_Rev.A MODE (384 CH.) Occupied Bandwidth



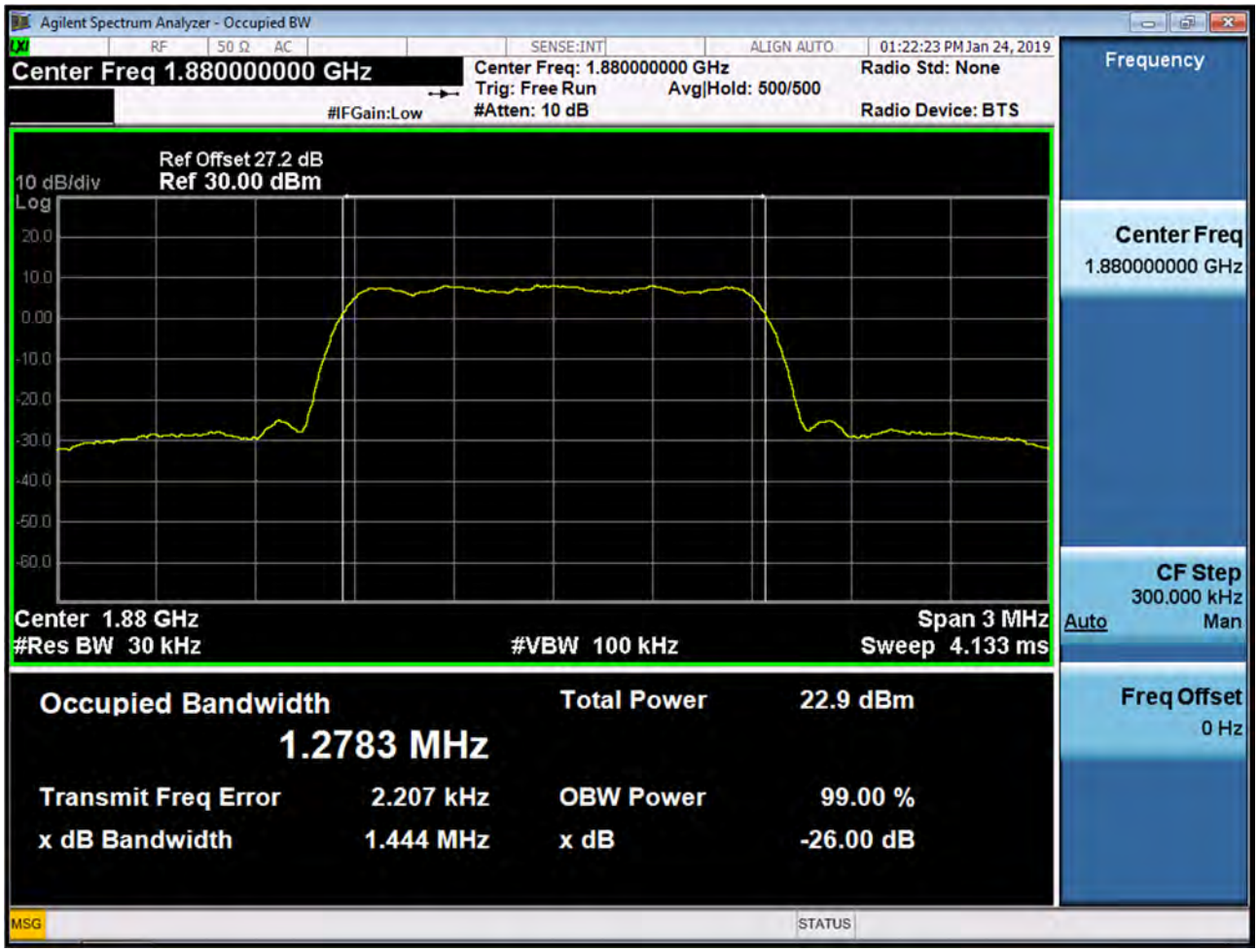
■ CDMA EVDO_Rev.A MODE (777 CH.) Occupied Bandwidth



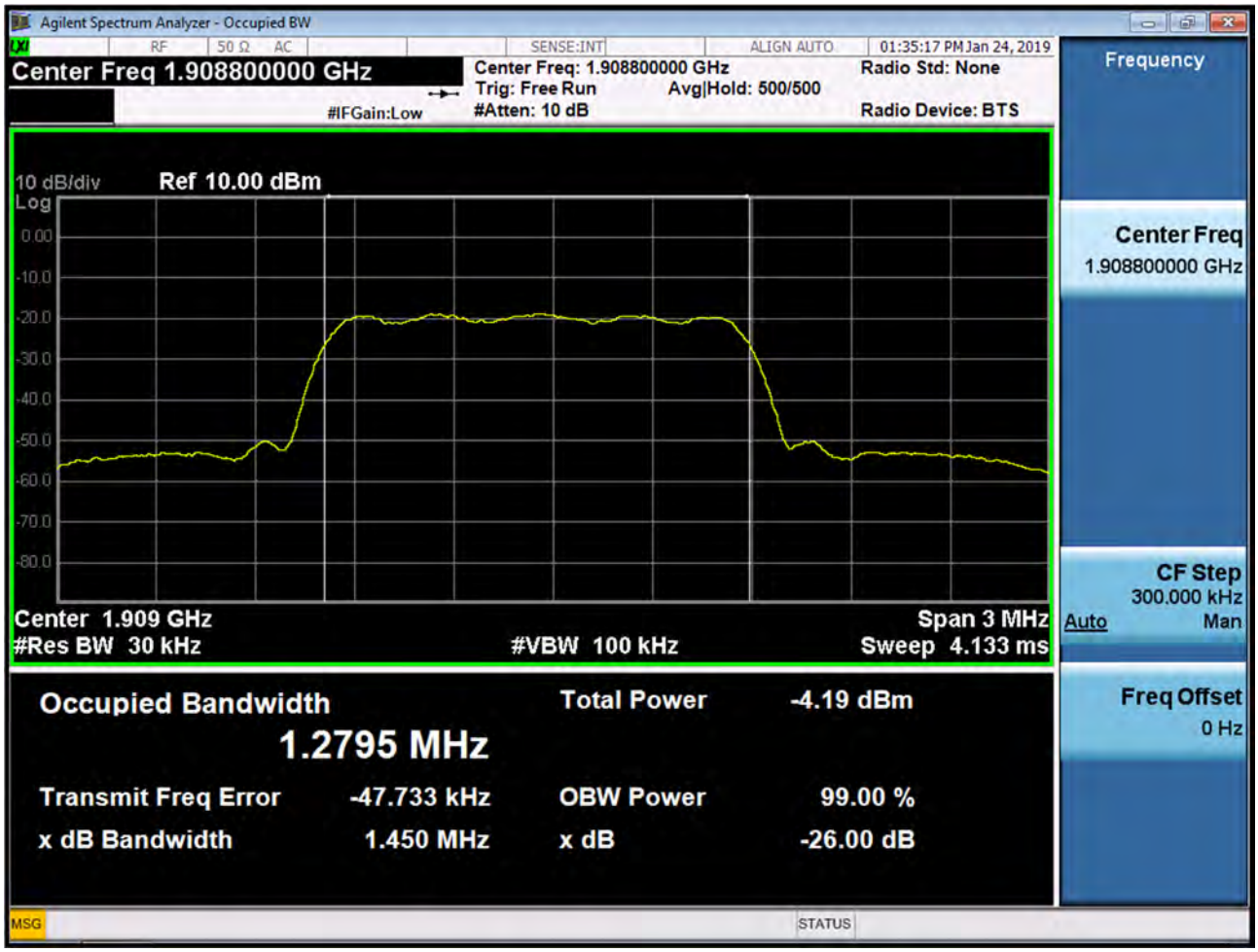
■ PCS MODE (25 CH.) Occupied Bandwidth



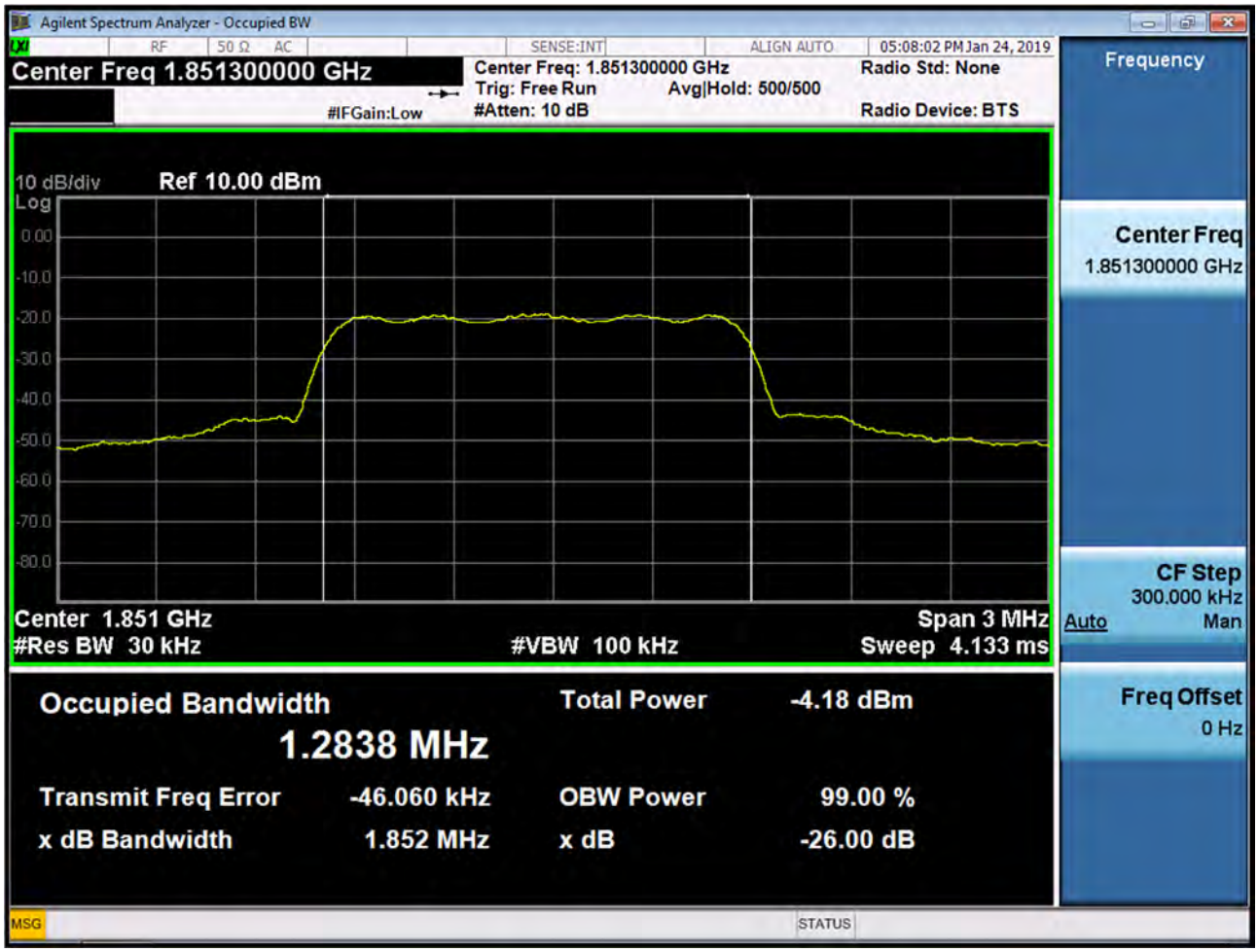
■ PCS MODE (600 CH.) Occupied Bandwidth



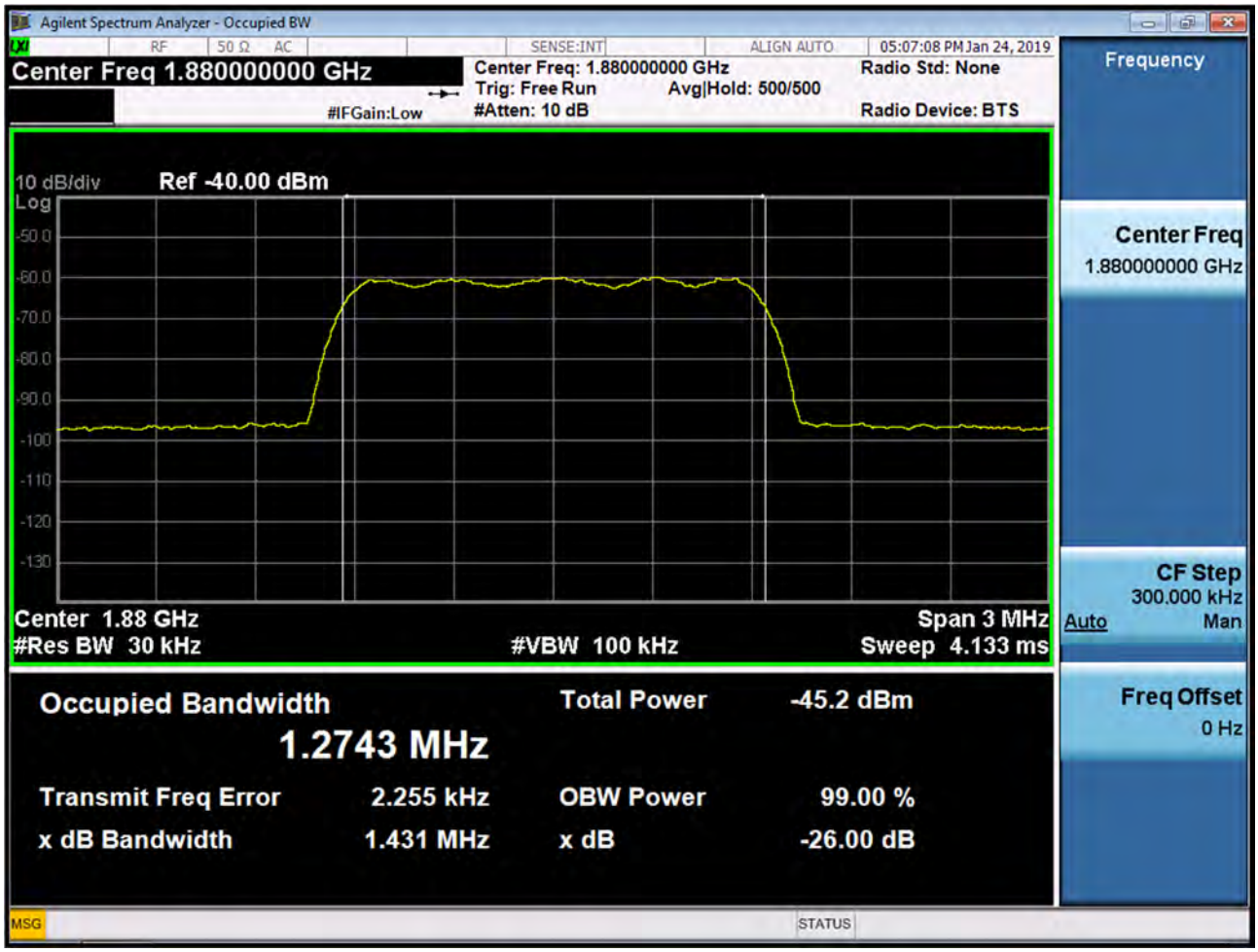
■ PCS MODE (1175 CH.) Occupied Bandwidth



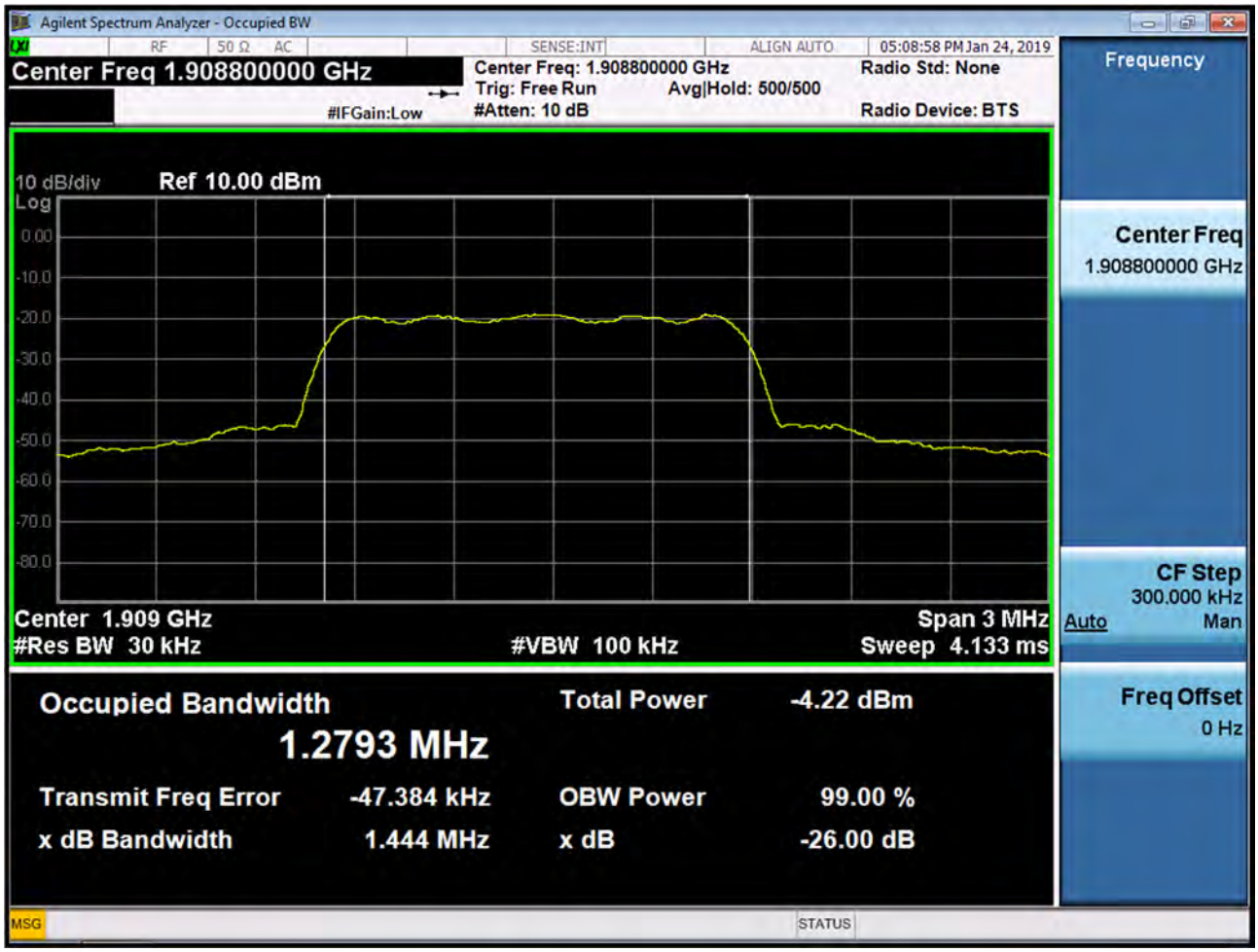
■ PCS EVDO_Rev.0 MODE (25 CH.) Occupied Bandwidth



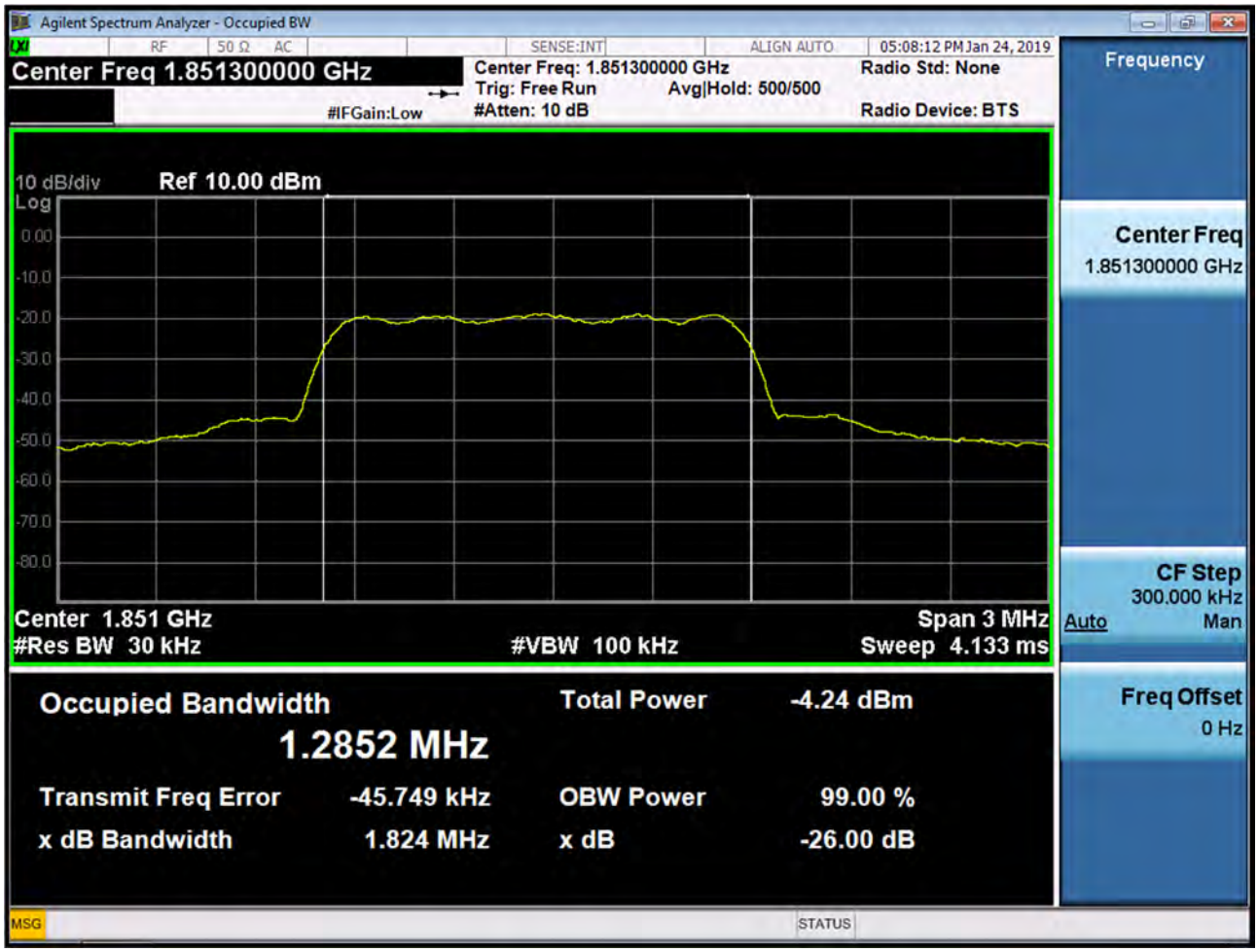
■ PCS EVDO_Rev.0 MODE (600 CH.) Occupied Bandwidth



■ PCS EVDO_Rev.0 MODE (1175 CH.) Occupied Bandwidth

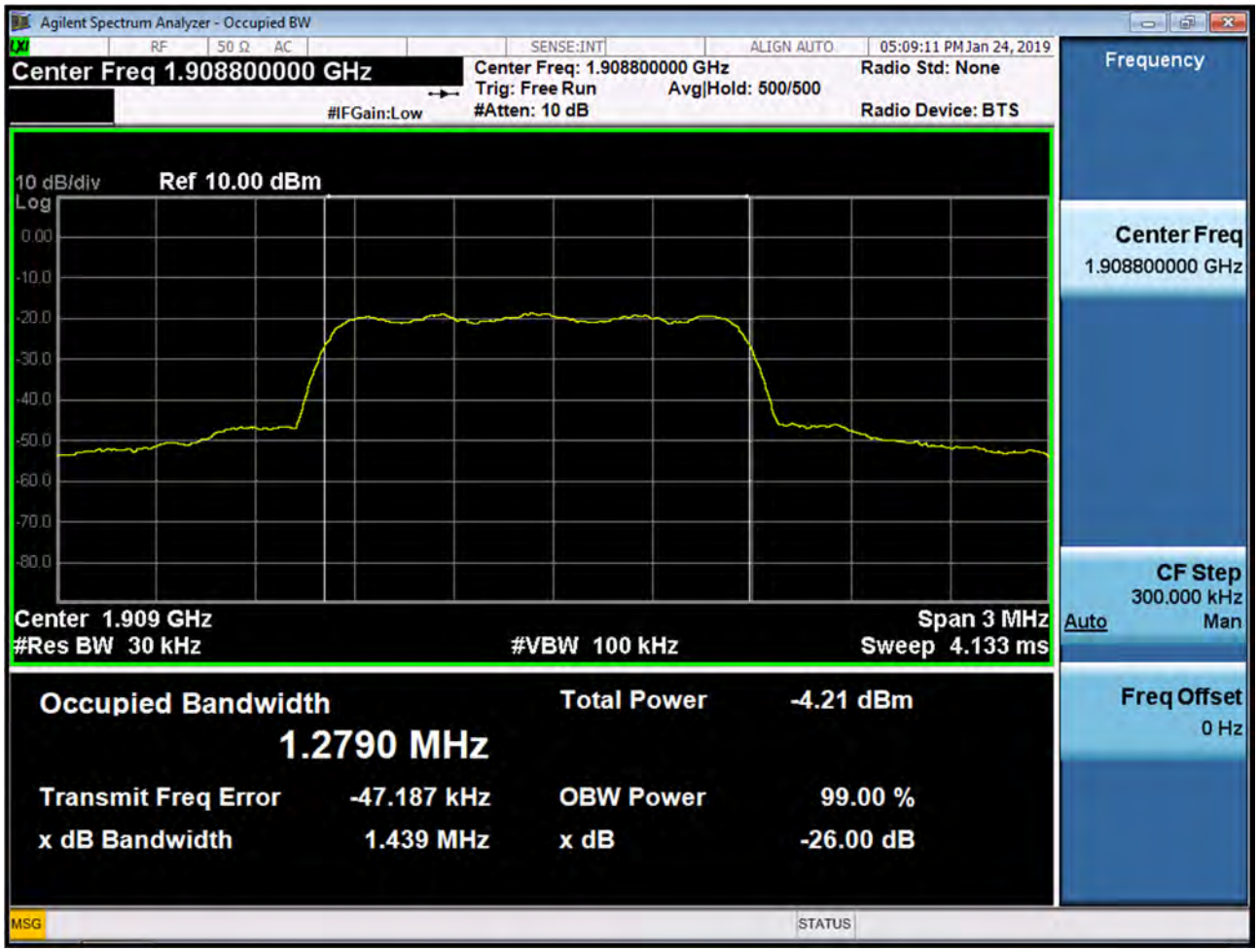


■ PCS EVDO_Rev.A MODE (25 CH.) Occupied Bandwidth

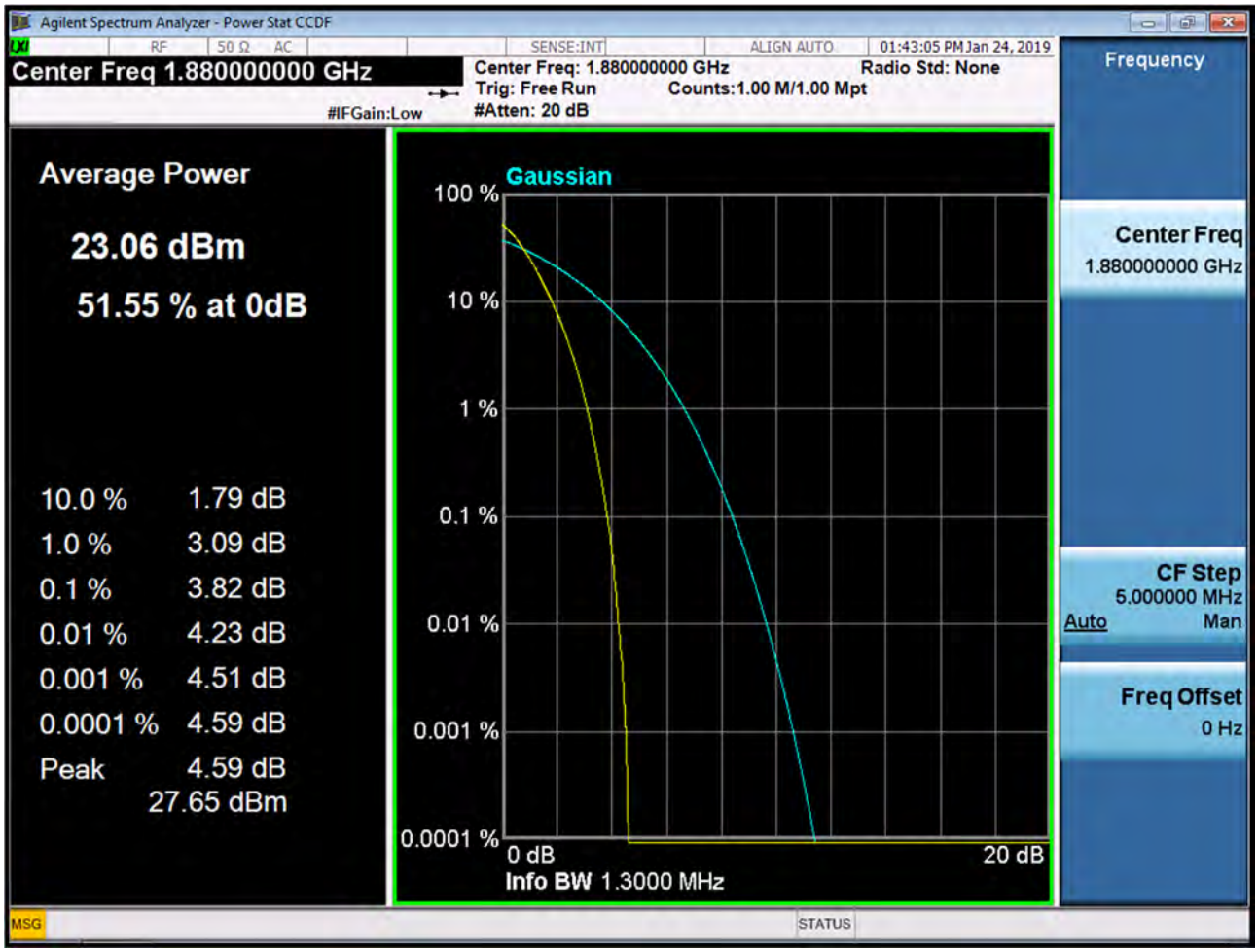


■ PCS EVDO_Rev.A MODE (600 CH.) Occupied Bandwidth

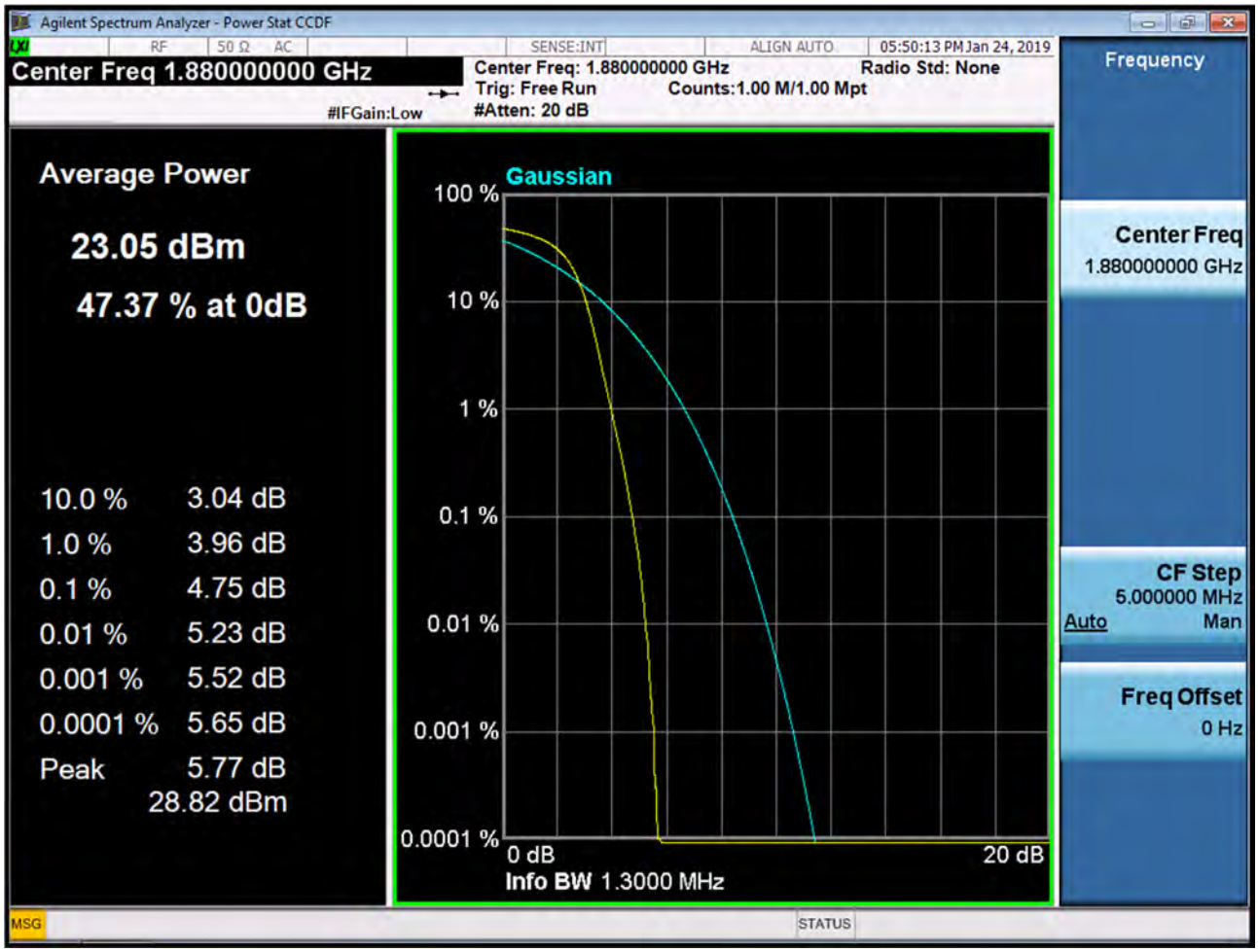
■ PCS EVDO_Rev.A MODE (1175 CH.) Occupied Bandwidth



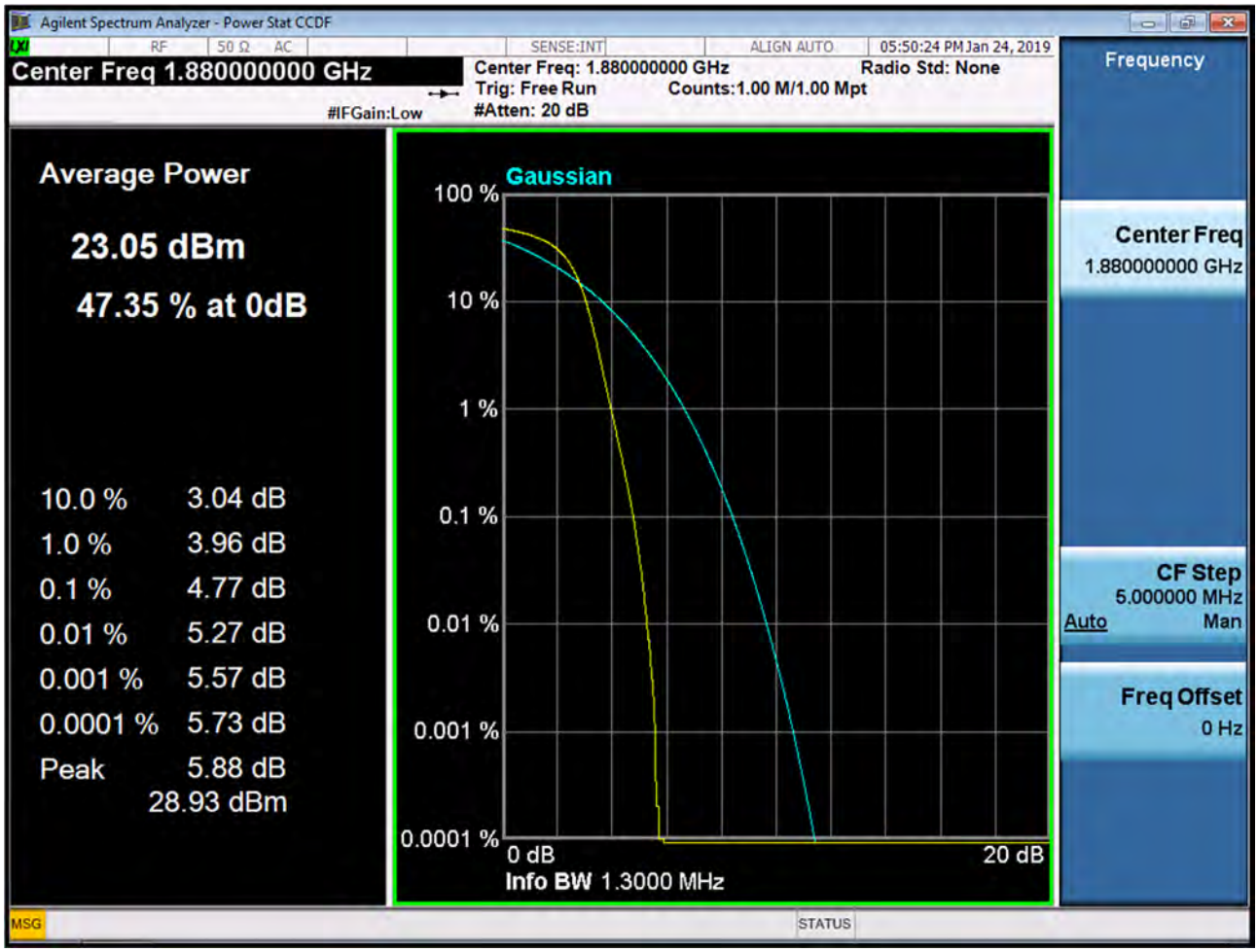
■ PCS CDMA MODE (600 CH.) Peak-to-Average Ratio



■ PCS CDMA EVDO_Rev.0 MODE (600 CH.) Peak-to-Average Ratio



■ PCS CDMA EVDO_Rev.A MODE (600 CH.) Peak-to-Average Ratio



■ CDMA MODE (1013 CH.) Block Edge

■ CDMA MODE (1013 CH.) 4 MHz Span

■ CDMA MODE (777 CH.) Block Edge

■ CDMA MODE (777 CH.) 4 MHz Span

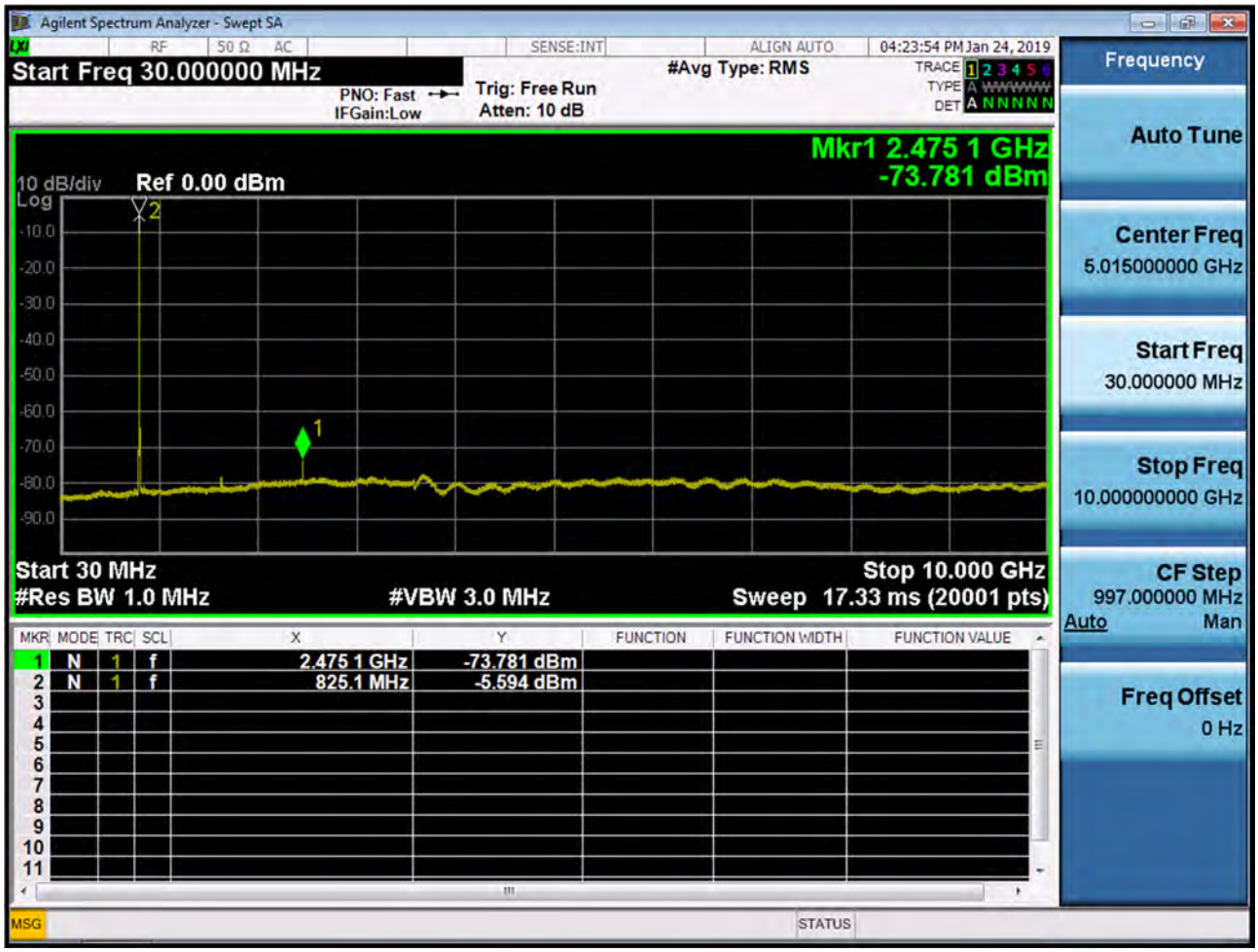
■ PCS MODE (25 CH.) Block Edge pan

■ PCS MODE (25 CH.) 4 MHz Span

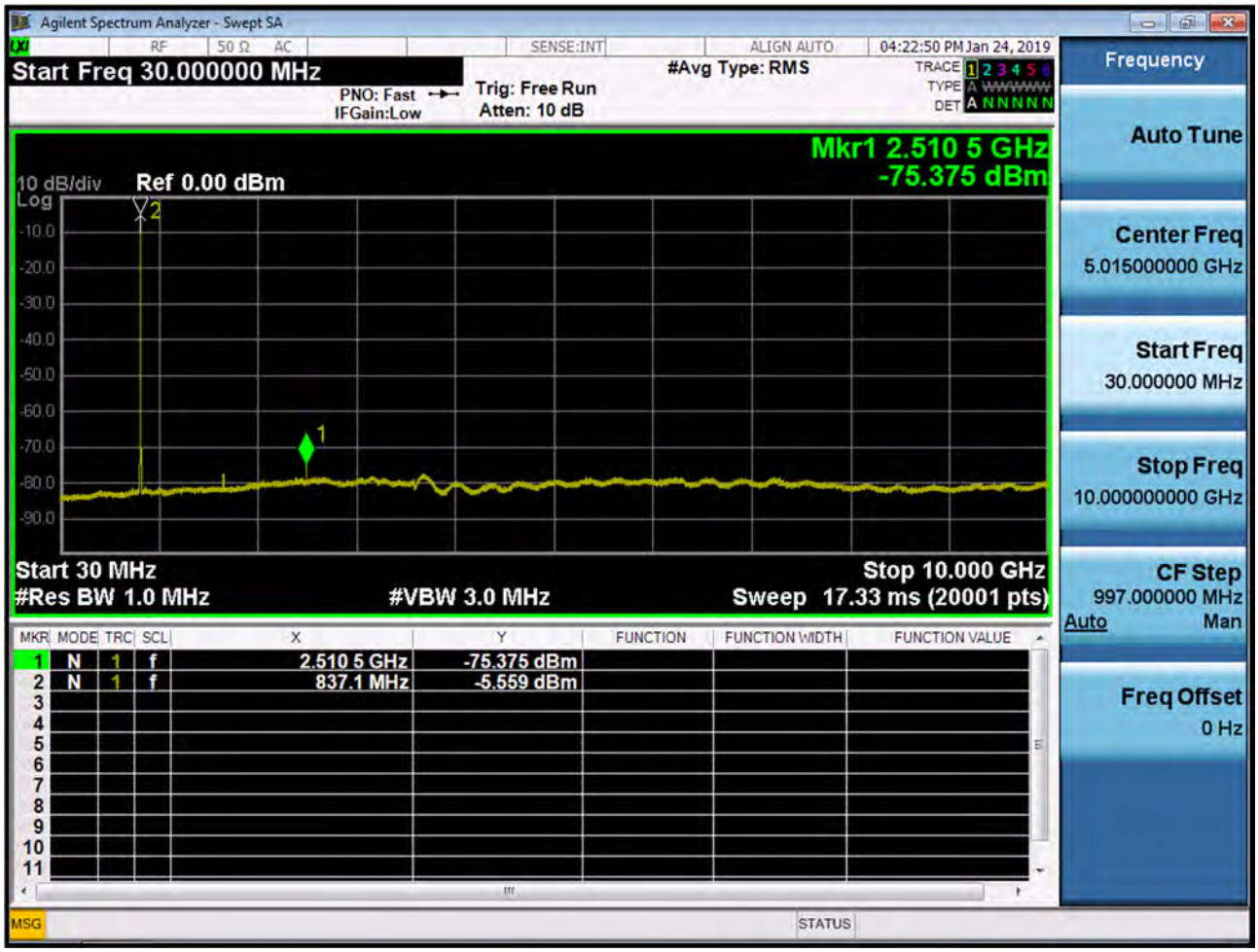
■ PCS MODE (1175 CH.) Block Edge

■ PCS MODE (1175 CH.) 4 MHz Span

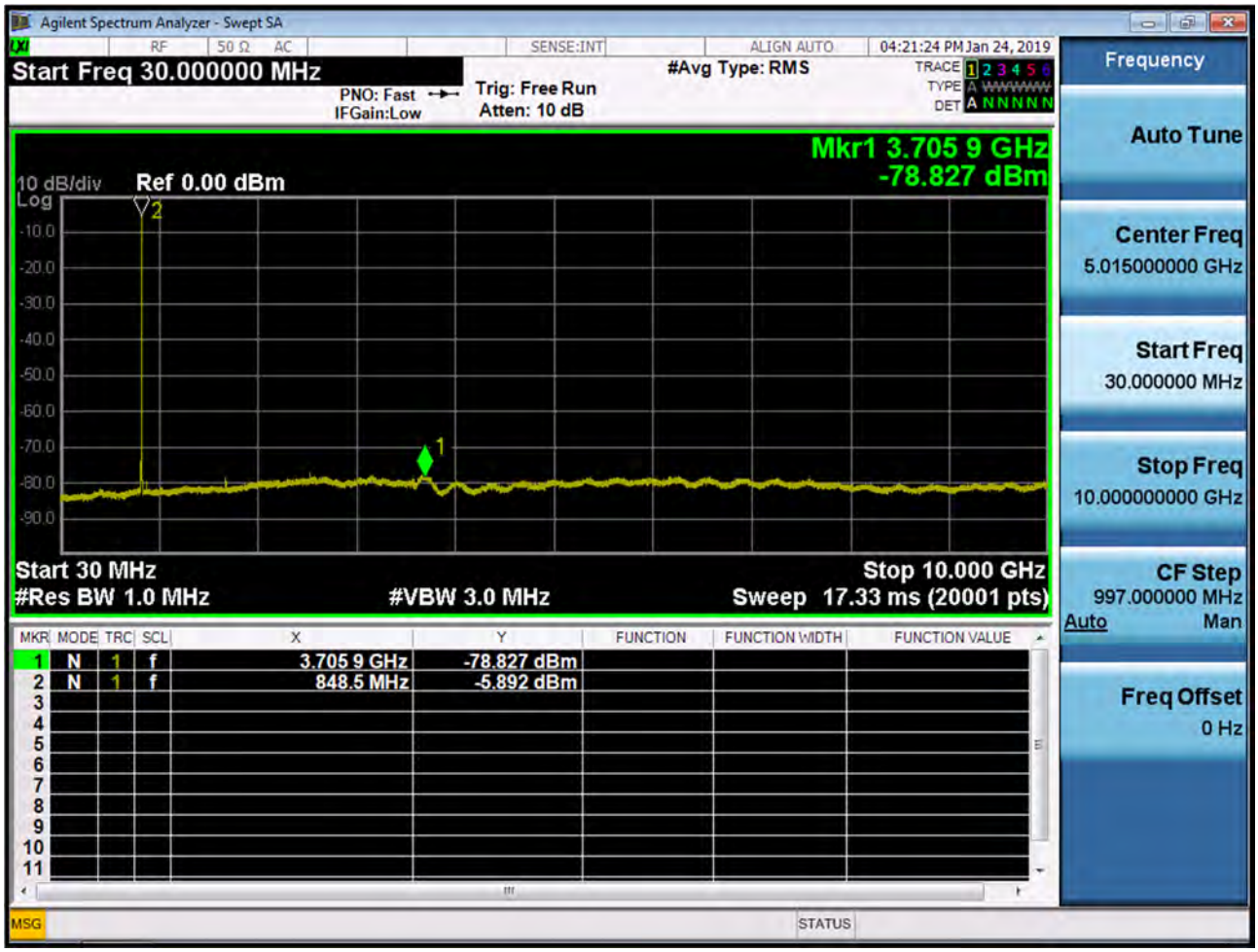
■ CDMA MODE (1013 CH.) Conducted Spurious Emissions



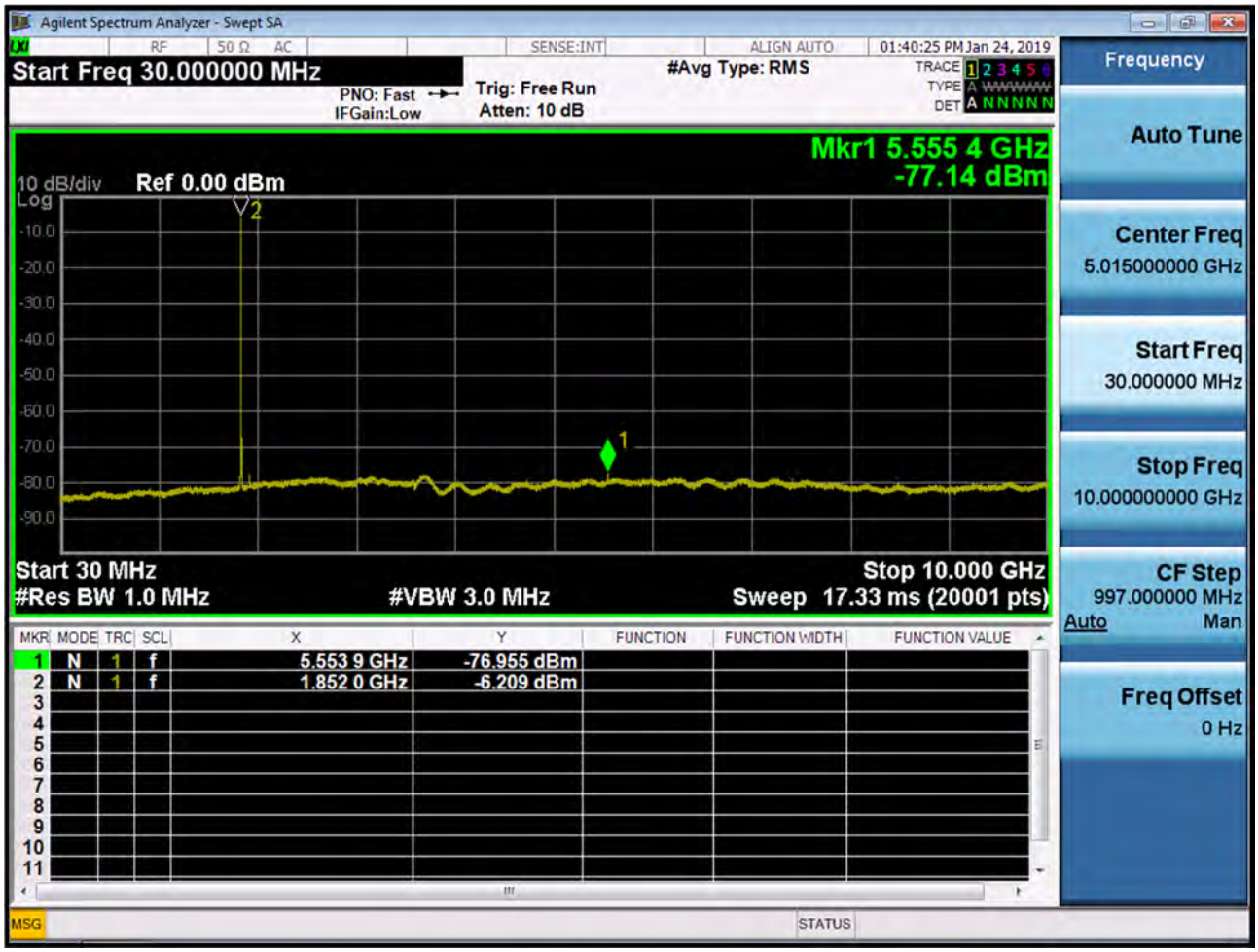
■ CDMA MODE (384 CH.) Conducted Spurious Emissions



■ CDMA MODE (777 CH.) Conducted Spurious Emissions

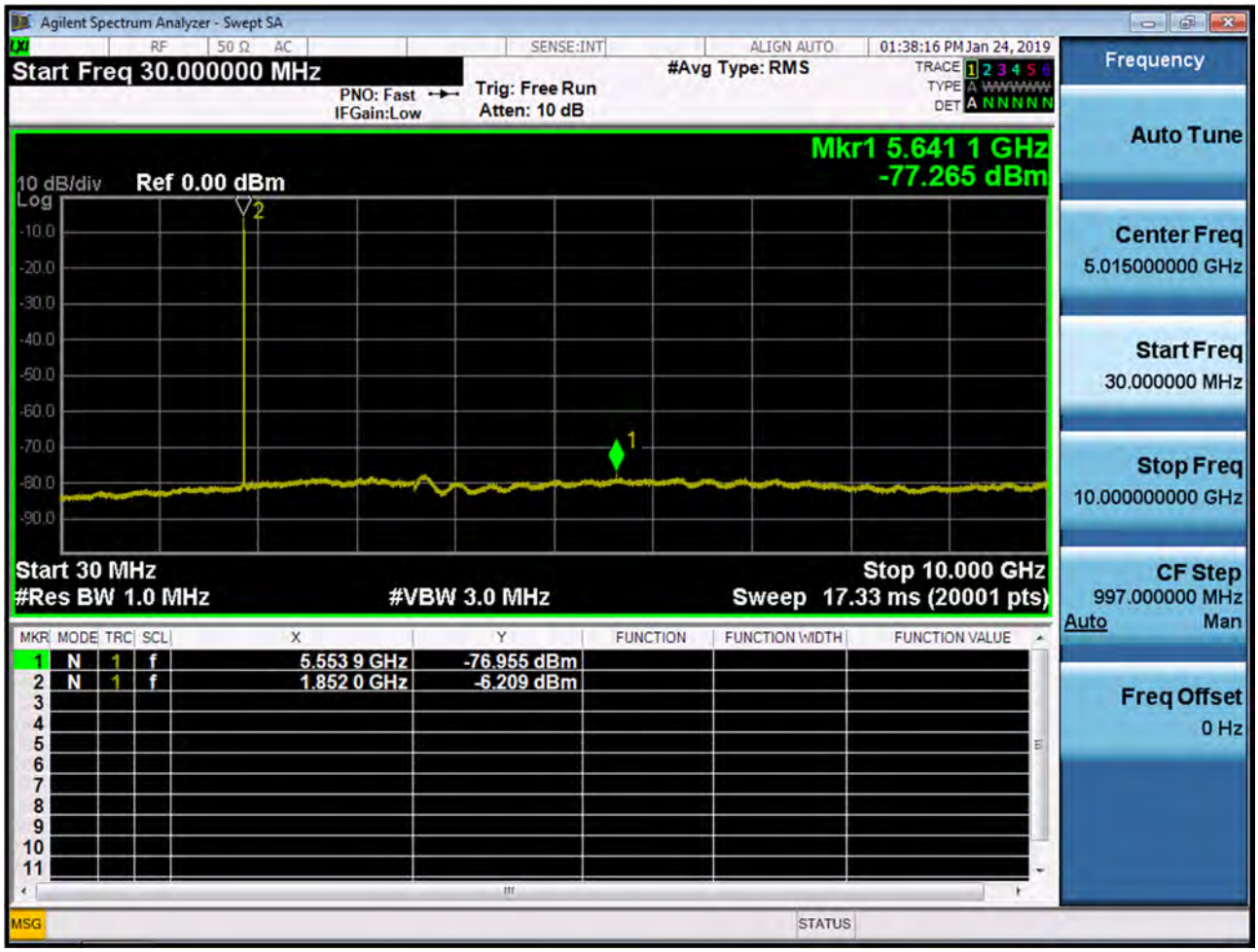


■ PCS MODE (25 CH.) Conducted Spurious Emissions -1



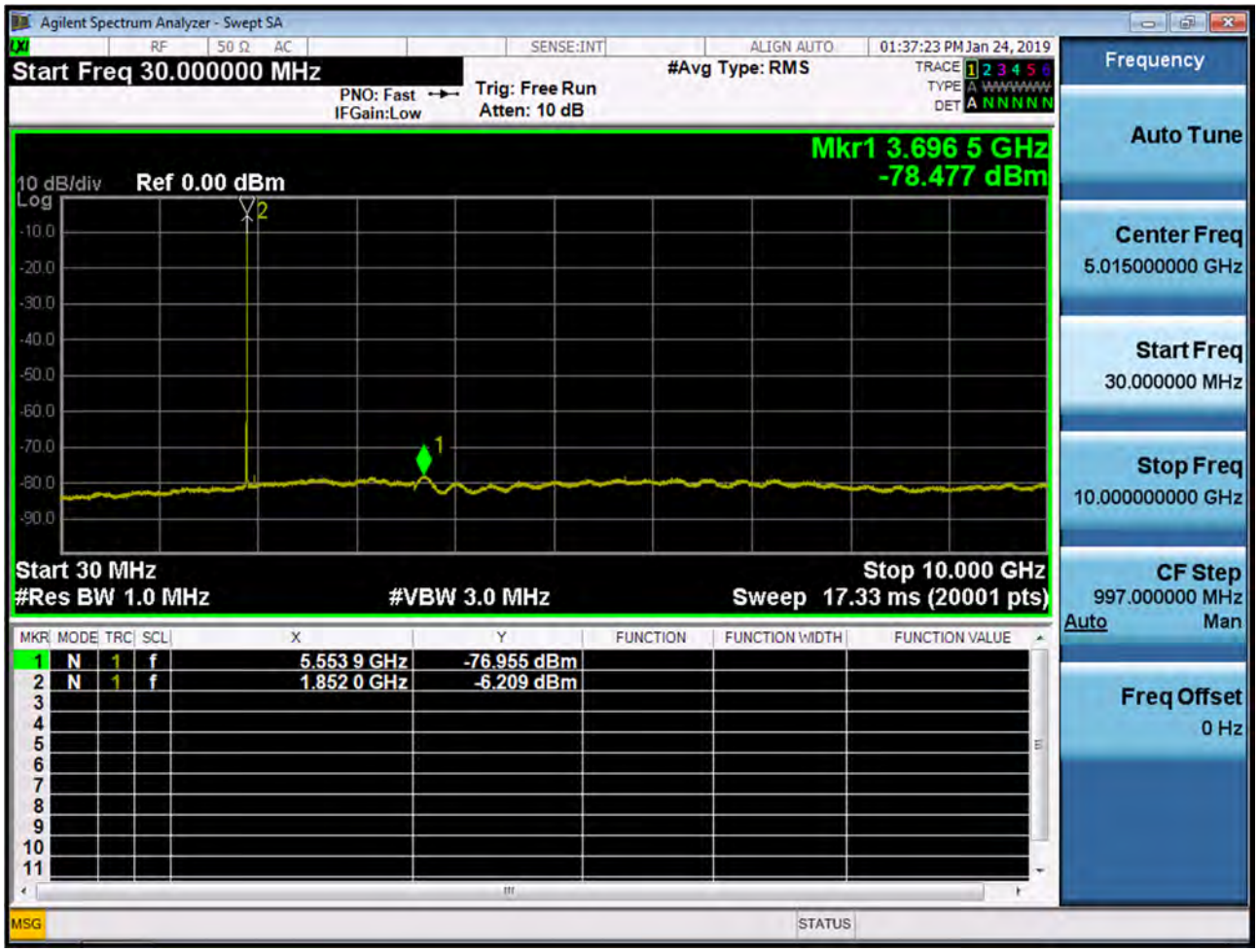
■ PCS MODE (25 CH.) Conducted Spurious Emissions -2

■ PCS MODE (600 CH.) Conducted Spurious Emissions -1



■ PCS MODE (600 CH.) Conducted Spurious Emissions -2

■ PCS MODE (1175 CH.) Conducted Spurious Emissions -1



■ PCS MODE (1175 CH.) Conducted Spurious Emissions -2

10. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2112-FC025-P