TEST REPORT

FCC 2G3G Test for SM-S721U
Certification

APPLICANT
SAMSUNG Electronics Co., Ltd.

REPORT NO.
HCT-RF-2407-FC013

DATE OF ISSUE
July 19, 2024

Tested by
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TEST REPORT

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HCT-RF-2407-FC013

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Additional Model
SM-S721U1

Applicant	**SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Product Name Model Name	Mobile Phone SM-S721U
Date of Test	May 16, 2024 ~ July 19, 2024
FCC ID	A3LSMS721U
Location of Test	■ Permanent Testing Lab ☐ On Site Testing (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 Republic of Korea)
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Test Standard Used	FCC Rule Part: § 22, § 24, § 27
Test Results	PASS

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	July 19, 2024	Initial Release

Notice

Content
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)
The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s).
The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***.
When confirmation of authenticity of this test report is required, please contact www.hct.co.kr
The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

CONTENTS

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:	A3LSMS721U
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§ 22, § 24, § 27
EUT Type:	Mobile Phone
Model(s):	SM-S721U
Additional Model(s)	SM-S721U1
Tx Frequency:	824.20 - 848.80 MHz (GSM850) 826.40 - 846.60 MHz (WCDMA850) 1 850.20 - 1 909.80 MHz (GSM1900) 1 852.4 – 1 907.6 MHz (WCDMA1900) 1 712.4 – 1 752.6 MHz (WCDMA1700)
Rx Frequency:	869.20 - 893.80 MHz (GSM850) 871.40 - 891.60 MHz (WCDMA850) 1 930.20 - 1 989.80 MHz (GSM1900) 1 932.4 – 1 987.6 MHz (WCDMA1900) 2 112.4 – 2 152.6 MHz (WCDMA1700)
Date(s) of Tests:	May 16, 2024 ~ July 19, 2024
Serial number:	Radiated : 67d50ecc63197ece Conducted : R3CX40SV75R

1.1. MAXIMUM OUTPUT POWER

Mode	Tx Frequency (MHz)	Rx Frequency (MHz)	Emission Designator	ERP	
				Max. Power (W)	Max. Power (dBm)
GSM850	824.2 – 848.8	869.2 – 893.8	248KGXW	0.528	27.23
GSM850 EDGE			256KG7W	0.125	20.96
WCDMA850	826.4 – 846.6	871.4 – 891.6	4M16F9W	0.086	19.33

Mode	Tx Frequency (MHz)	Rx Frequency (MHz)	Emission Designator	EIRP	
				Max. Power (W)	Max. Power (dBm)
GSM1900	1850.2 – 1909.8	1930.2 – 1989.8	249KGXW	0.547	27.38
GSM1900 EDGE			244KG7W	0.174	22.41
WCDMA1900	1852.4 – 1907.6	1932.4 – 1987.6	4M20F9W	0.119	20.76
WCDMA1700	1712.4 – 1752.6	2112.4 – 2152.6	4M22F9W	0.166	22.20

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE, Sub 6, mmWave.
It also supports IEEE 802.11 a/b/g/n/ac/ax (20/40/80/160 MHz), Bluetooth(iPA, ePA), BT LE(iPA, ePA), NFC, WPT, WIFI 6E.

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
Peak- to- Average Ratio	- KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4 - ANSI C63.26-2015 – Section 5.2.6(only GSM)
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Effective Radiated Power/ Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI C63.26-2015 – Section 5.2 - ANSI/TIA-603-E-2016 – Section 2.2.17
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12

3.2 RADIATED POWER

Test Overview

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

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5 % of the expected OBW, not to exceed 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;

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

   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 ≥ 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 dat
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;

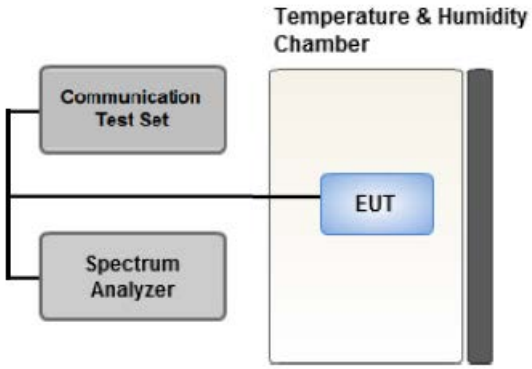
$$\text{Result}_{(dBm)} = P_{g\,(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dBi)}$$

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

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

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

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① CCDF Procedure for PAPR

Test Settings

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Set the measurement interval as follows:
   .- for continuous transmissions, set to 1 ms,
   .- or burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1 %.

② Alternate Procedure for PAPR

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

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

Test Settings(Peak Power)

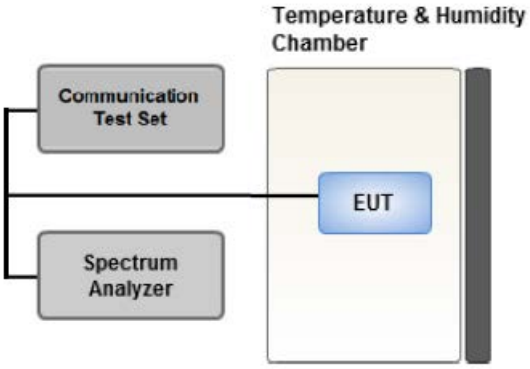
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

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

Test Settings(Average Power)

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

3.5 OCCUPIED BANDWIDTH.



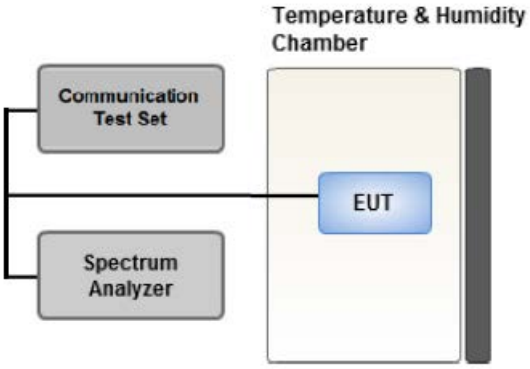
Test setup

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.
The EUT makes a call to the communication simulator.
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 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

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

Test Overview

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

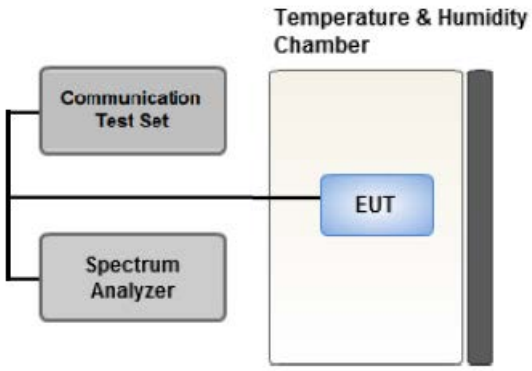
Test Settings(GSM)

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = Peak
4. Trace Mode = max hold
5. Sweep time = auto
6. Number of points in sweep ≥ 2 x Span / RBW

Test Settings(WCDMA)

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

3.7 BAND EDGE



Test setup

Test Overview

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

Test Settings

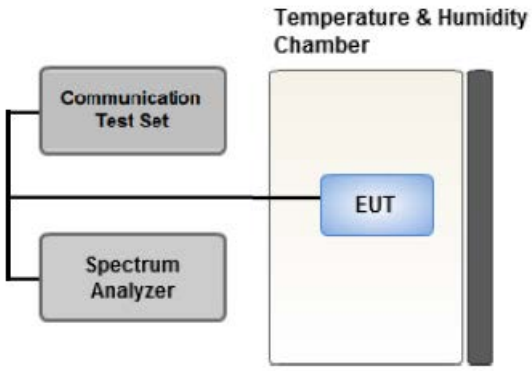
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1 % of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW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

Test Notes

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 x 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.

Where Margin < 1 dB the emission level is either corrected by 10 log(1 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.

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

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

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

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20 °C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter.

   Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10 °C intervals ranging from -30 °C to +50 °C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

3.9 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- SM-S721U & additional models were tested and the worst case results are reported.
(Worst case : SM-S721U)

[Worst case]

Test Description	Modulation	Test Channel
Occupied Bandwidth	GSM : Voice & EDGE(1 TX Slot) WCDMA : QPSK(RMC)	Low, Mid, High
Band Edge	GSM : Voice & EDGE(1 TX Slot) WCDMA : QPSK(RMC)	Low, High
Peak-To-Average Ratio	GSM : Voice & EDGE(1 TX Slot) WCDMA : QPSK(RMC)	Mid
Spurious and Harmonic Emissions at Antenna Terminal	GSM : Voice WCDMA : QPSK(RMC)	Low, Mid, High

[Test Channel]

	Uplink Channel				
	2G (GSM850)	2G (GSM1900)	3G (WCDMA B2)	3G (WCDMA B4)	3G (WCDMA B5)
Low	128	512	9262	1312	4132
Mid	190	661	9400	1412	4183
High	251	810	9538	1513	4233

3.10 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 : Stand alone, Stand alone + External accessories (Earphone, AC adapter, etc)
  Worst case : Stand alone
- All simultaneous transmission scenarios of operation were investigated, and the test results showed no additional significant emissions relative to the least restrictive limit were observed.
  Therefore, only the worst case(stand-alone) results were reported.
- 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.
- SM-S721U & additional models were tested and the worst case results are reported.
  (Worst case : SM-S721U)

[Worst case_3G]

Test Description	Modulation	Paging Service	Axis	Test Channel
Effective Radiated Power, Effective Isotropic Radiated Power	QPSK (WCDMA)	12.2 kbps RMC	WCDMA B2 : Z WCDMA B4 : Z WCDMA B5 : X	Low, Mid, High
Radiated Spurious and Harmonic Emissions	QPSK (WCDMA)	12.2 kbps RMC	WCDMA B2 : Y WCDMA B4 : Z WCDMA B5 : X	Low, Mid, High

[Worst case_2G]

Test Description	Modulation	Axis	Test Channel
Effective Radiated Power, Effective Isotropic Radiated Power	Voice	GSM850 : X GSM1900 : Z	Low, Mid, High
	EDGE (1 TX Slot)	GSM850 : X GSM1900 : Z	GSM 850 : High GSM1900 : Mid
Radiated Spurious and Harmonic Emissions	Voice	GSM850 : Z GSM1900 : Y	Low, Mid, High

[Test Channel]

	UplinkChannel				
	2G (GSM850)	**2G (GSM1900)**	**3G (WCDMA B2)**	**3G (WCDMA B4)**	**3G (WCDMA B5)**
Low	128	512	9262	1312	4132
Mid	190	661	9400	1412	4183
High	251	810	9538	1513	4233

4. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacture	Serial No.	Due to Calibration	Calibration Interval
RF Switching System	FBSR-02B(1.2G HPF+LNA)	T&M SYSTEM	F1L1	12/11/2024	Annual
RF Switching System	FBSR-02B(3.3G HPF+LNA)	T&M SYSTEM	F1L2	12/11/2024	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	5001	04/17/2025	Annual
DC Power Supply	E3632A	Agilent	KR01009150	04/18/2025	Annual
Dipole Antenna	UHAP	Schwarzbeck	557	03/09/2025	Biennial
Dipole Antenna	UHAP	Schwarzbeck	558	03/09/2025	Biennial
Chamber	SU-642	ESPEC	93008124	02/19/2025	Annual
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	147	08/17/2025	Biennial
Horn Antenna(1 ~ 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-1298	09/11/2025	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	04/19/2025	Annual
ATTENUATOR(20 dB)	8493C	Hewlett Packard	17280	04/17/2025	Annual
Spectrum Analyzer(10 Hz ~ 40 GHz)	FSV40	REOHDE & SCHWARZ	100931	08/17/2024	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/10/2024	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/07/2026	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	895	09/16/2024	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	1135	09/16/2024	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262094331	11/17/2024	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	12/11/2024	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMW200A	REOHDE & SCHWARZ	100988	02/26/2025	Annual
Signal Analyzer(5 Hz ~ 40.0 GHz)	N9030B	KEYSIGHT	MY55480167	05/17/2025	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)	1.98 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.36 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.52 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.66 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.58 (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), § 27.53(h)	< 43 + 10 x log10 (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§ 2.1046	N/A	See Note1
Peak- to- Average Ratio	§ 22.913(d), § 24.232(d), § 27.50(d)(5)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§ 2.1055, § 22.355	< 2.5 ppm	PASS
	§ 24.235, § 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	§ 22.913(a)(5)	< 7 Watts max. ERP	PASS
Equivalent Isotropic Radiated Power	§ 24.232(c), § 27.50(d)(4)	< 2 Watts max. EIRP < 1 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§ 2.1053, § 22.917(a), § 24.238(a), § 27.53(h)	< 43 + 10 x log10 (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

Mode	Ch./ Freq.		Measured Level (dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBd)	C.L	Pol.	Limit	ERP	
	channel	Freq.(MHz)						W	W	dBm
GSM850	128	824.2	-23.44	37.46	-10.05	1.38	H	< 7.00	0.401	26.03
	190	836.6	-22.90	38.39	-10.05	1.40	H		0.494	26.94
	251	848.8	-22.89	38.69	-10.05	1.41	H		0.528	27.23
EDGE	251	848.8	-29.16	32.42	-10.05	1.41	H		0.125	20.96

Mode	Ch./ Freq.		Measured Level (dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBd)	C.L	Pol.	Limit	ERP	
	channel	Freq.(MHz)						W	W	dBm
WCDMA850	4132	826.4	-31.66	29.26	-10.05	1.39	H	< 7.00	0.061	17.82
	4183	836.6	-31.26	30.03	-10.05	1.40	H		0.072	18.58
	4233	846.6	-30.85	30.79	-10.05	1.41	H		0.086	19.33

8.2 EQUIVALENT ISOTROPIC RADIATED POWER

Mode	Ch./ Freq.		Measured Level (dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBi)	C.L	Pol.	Limit	EIRP	
	channel	Freq.(MHz)						W	W	dBm
GSM1900	512	1850.2	-14.90	18.92	10.31	2.23	V	< 2.00	0.501	27.00
	661	1880.0	-15.34	19.36	10.35	2.33	V		0.547	27.38
	810	1909.8	-15.59	18.45	10.40	2.29	V		0.453	26.56
EDGE	661	1880.0	-20.31	14.39	10.35	2.33	V		0.174	22.41

Mode	Ch./ Freq.		Measured Level (dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBi)	C.L	Pol.	Limit	EIRP	
	channel	Freq.(MHz)						W	W	dBm
WCDMA1900	9262	1852.4	-21.21	12.68	10.31	2.23	V	< 2.00	0.119	20.76
	9400	1880.0	-22.12	12.58	10.35	2.33	V		0.115	20.60
	9538	1907.6	-22.02	12.02	10.40	2.29	V		0.103	20.13

Mode	Ch./ Freq.		Measured Level (dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBi)	C.L	Pol.	Limit	EIRP	
	channel	Freq.(MHz)						W	W	dBm
WCDMA1700	1312	1712.4	-19.23	14.50	9.94	2.24	V	< 1.00	0.166	22.20
	1412	1732.4	-19.89	13.80	10.07	2.17	V		0.148	21.70
	1513	1752.6	-20.11	13.60	10.17	2.15	V		0.145	21.62

8.3 RADIATED SPURIOUS EMISSIONS

▣ MODULATION SIGNAL: GSM850

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit
128 (824.2)	1 648.40	-54.57	9.20	-63.56	2.02	H	-56.38	-13.00
	2 472.60	-52.23	10.20	-56.37	2.49	H	-48.66	-13.00
	3 296.80	-58.47	10.90	-60.69	2.92	H	-52.71	-13.00
190 (836.6)	1 673.20	-55.62	9.20	-64.76	2.04	V	-57.60	-13.00
	2 509.80	-53.00	10.30	-57.53	2.50	H	-49.73	-13.00
	3 346.40	-59.51	11.00	-62.42	2.89	H	-54.31	-13.00
251 (848.8)	1 697.60	-57.01	9.60	-65.76	1.99	H	-58.15	-13.00
	2 546.40	-54.77	10.20	-59.39	2.55	H	-51.74	-13.00
	3 395.20	-58.87	11.05	-61.78	2.93	H	-53.65	-13.00

▣ MODULATION SIGNAL: GSM1900

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit
512 (1850.2)	3 700.40	-22.41	12.29	-27.45	3.13	V	-18.29	-13.00
	5 550.60	-41.10	13.03	-39.40	3.98	H	-30.35	-13.00
	7 400.80	-55.60	10.80	-45.38	4.68	V	-39.26	-13.00
661 (1880.0)	3 760.00	-40.32	12.22	-44.95	3.27	H	-36.00	-13.00
	5 640.00	-49.46	13.12	-47.33	4.07	H	-38.28	-13.00
	7 520.00	-56.86	10.82	-46.05	4.71	V	-39.94	-13.00
810 (1909.8)	3 819.60	-43.31	12.16	-47.97	3.26	H	-39.07	-13.00
	5 729.40	-50.50	13.04	-48.10	4.12	H	-39.18	-13.00
	7 639.20	-57.80	11.21	-47.65	4.73	H	-41.17	-13.00

▣ MODULATION SIGNAL: WCDMA850

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit
4132 (826.4)	1 652.80	-59.05	9.20	-68.04	2.02	H	-60.86	-13.00
	2 479.20	-58.91	10.20	-62.16	2.45	H	-54.41	-13.00
	3 305.60	-60.08	10.90	-62.12	2.92	H	-54.14	-13.00
4183 (836.6)	1 673.20	-57.86	9.20	-67.00	2.04	H	-59.84	-13.00
	2 509.80	-60.40	10.30	-64.93	2.50	H	-57.13	-13.00
	3 346.40	-60.34	10.95	-63.23	2.89	H	-55.17	-13.00
4233 (846.6)	1 693.20	-58.40	9.20	-66.89	2.00	H	-59.69	-13.00
	2 539.80	-57.73	10.30	-62.56	2.52	H	-54.78	-13.00
	3 386.40	-60.40	11.00	-63.11	2.94	H	-55.05	-13.00

▣ MODULATION SIGNAL: WCDMA1900

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit
9262 (1852.4)	3 704.80	-33.75	12.29	-38.80	3.14	V	-29.65	-13.00
	5 557.20	-51.85	13.04	-50.22	3.92	H	-41.10	-13.00
	7 409.60	-57.03	10.79	-47.02	4.68	V	-40.91	-13.00
9400 (1880.0)	3 760.00	-52.45	12.22	-56.97	3.27	V	-48.02	-13.00
	5 640.00	-55.75	13.12	-53.48	4.07	H	-44.43	-13.00
	7 520.00	-56.76	10.82	-45.95	4.71	V	-39.84	-13.00
9538 (1907.6)	3 815.20	-53.15	12.16	-58.00	3.25	H	-49.09	-13.00
	5 722.80	-57.77	13.06	-55.24	4.15	V	-46.33	-13.00
	7 630.40	-57.64	11.18	-47.48	4.74	V	-41.04	-13.00

▣ MODULATION SIGNAL: WCDMA1700

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)	Limit
1312 (1712.4)	3 424.80	-54.74	12.43	-61.42	3.06	H	-52.05	-13.00
	5 137.20	-57.69	12.35	-54.94	3.92	V	-46.51	-13.00
	6 849.60	-57.12	11.90	-50.64	4.49	V	-43.23	-13.00
1412 (1732.4)	3 464.80	-54.56	12.35	-61.20	3.11	H	-51.96	-13.00
	5 197.20	-57.21	12.63	-56.13	3.86	V	-47.36	-13.00
	6 929.60	-58.84	11.65	-51.71	4.52	V	-44.58	-13.00
1513 (1752.6)	3 505.20	-55.35	12.34	-61.57	3.11	V	-52.34	-13.00
	5 257.80	-56.44	12.99	-56.12	3.83	H	-46.96	-13.00
	7 010.40	-57.13	11.26	-49.15	4.56	H	-42.45	-13.00

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)			
GSM1900	661	31.469	22.04	4.6160	0.5475	9.26	0.17	13	Pass
GSM1900 EDGE	661	30.257	17.40	4.616	0.5475	9.26	3.60		
GSM850	190	CCDF Procedure					3.01		
GSM850 EDGE	190						5.56		
WCDMA850	4408						3.03		
WCDMA1900	9400						3.04		
WCDMA1700	1412						3.46		

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 65 ~ 75.
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 x log (1/X), $X = Tx_{On} / Tx_{Total}$

8.5 OCCUPIED BANDWIDTH

Band	Channel	Frequency (MHz)	Data (GSM: kHz / WCDMA : MHz)
GSM850	128	824.20	246.23
	190	836.60	246.82
	251	848.80	247.99
GSM850 EDGE	128	824.20	245.43
	190	836.60	256.41
	251	848.80	247.73
GSM1900	512	1850.20	243.81
	661	1880.00	249.28
	810	1909.80	244.95
GSM1900 EDGE	512	1850.20	243.97
	661	1880.00	237.46
	810	1909.80	241.94
WCDMA850	4132	826.40	4.1464
	4183	836.60	4.1640
	4233	846.60	4.1553
WCDMA1900	9262	1852.40	4.1991
	9400	1880.00	4.1887
	9538	1907.60	4.1779
WCDMA1700	1312	1712.40	4.2209
	1412	1732.40	4.1990
	1513	1752.60	4.1901

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 48 ~ 64.

8.6 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result	Limit (dBm)
GSM850	128	3.6970	27.976	-57.57	-29.593	-13.00
	190	3.6785	27.976	-57.23	-29.254	
	251	6.5449	28.591	-57.35	-28.759	
GSM1900	512	18.88597	29.489	-51.764	-22.275	
	661	19.15898	29.489	-52.808	-23.319	
	810	19.55099	29.489	-53.460	-23.971	
WCDMA850	4132	2.4831	27.976	-75.731	-47.755	
	4183	2.5080	27.976	-76.245	-48.269	
	4233	2.5380	27.976	-75.592	-47.616	
WCDMA1900	9262	18.9317	29.489	-72.195	-42.706	
	9400	18.9355	29.489	-72.623	-43.134	
	9538	18.9085	29.489	-72.636	-43.147	
WCDMA1700	1312	18.91697	29.489	-72.363	-42.874	
	1412	18.93722	29.489	-72.615	-43.126	
	1513	18.91522	29.489	-72.701	-43.212	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 112 ~ 135.
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(26.5)	30.131

8.7 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 76 ~ 111.

8.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

▣ MODE: GSM850

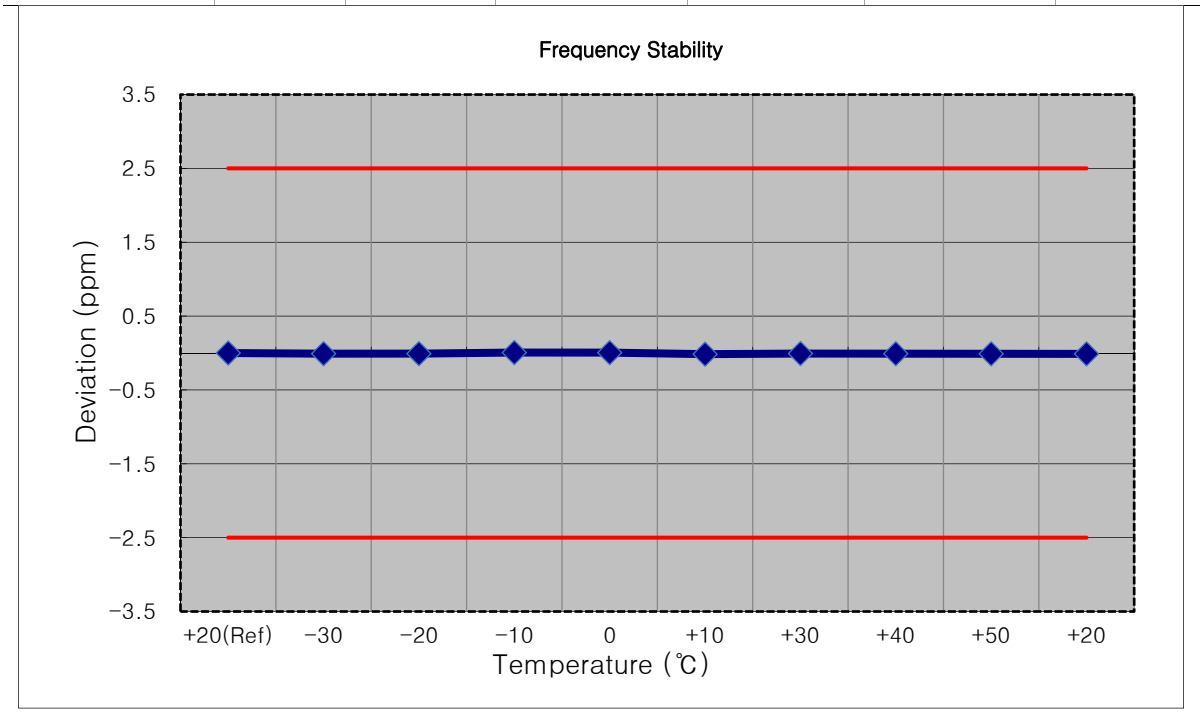
▣ OPERATING FREQUENCY: 836,600,000 Hz

▣ CHANNEL: 190

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	836 599 991	0.0	0.000 000	0.0000
100 %		-30	836 599 983	-7.6	-0.000 001	-0.0091
100 %		-20	836 599 984	-7.1	-0.000 001	-0.0085
100 %		-10	836 599 996	5.0	0.000 001	0.0060
100 %		0	836 599 995	4.5	0.000 001	0.0054
100 %		+10	836 599 978	-13.0	-0.000 002	-0.0155
100 %		+30	836 599 985	-6.0	-0.000 001	-0.0072
100 %		+40	836 599 983	-7.7	-0.000 001	-0.0092
100 %		+50	836 599 982	-8.9	-0.000 001	-0.0106
Batt. Endpoint	3.300	+20	836 599 981	-9.8	-0.000 001	-0.0117



▣ Mode: GSM1900

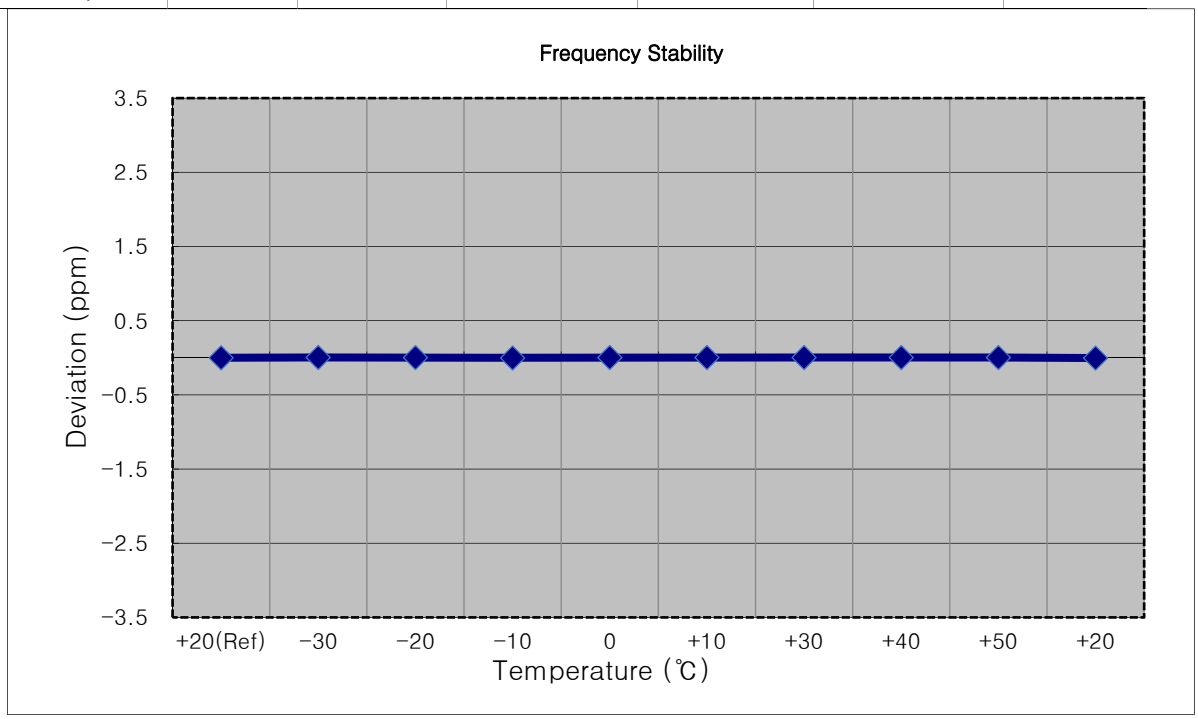
▣ OPERATING FREQUENCY: 1850,200,000 Hz

▣ CHANNEL: 512

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1850 200 008	0.0	0.000 000	0.0000
100 %		-30	1850 200 015	7.8	0.000 000	0.0042
100 %		-20	1850 200 013	5.2	0.000 000	0.0028
100 %		-10	1850 200 002	-5.4	0.000 000	-0.0029
100 %		0	1850 200 014	6.4	0.000 000	0.0035
100 %		+10	1850 200 014	6.2	0.000 000	0.0033
100 %		+30	1850 200 013	6.0	0.000 000	0.0032
100 %		+40	1850 200 013	5.7	0.000 000	0.0031
100 %		+50	1850 200 014	6.4	0.000 000	0.0034
Batt. Endpoint	3.300	+20	1850 200 001	-7.0	0.000 000	-0.0038



▣ Mode: GSM1900

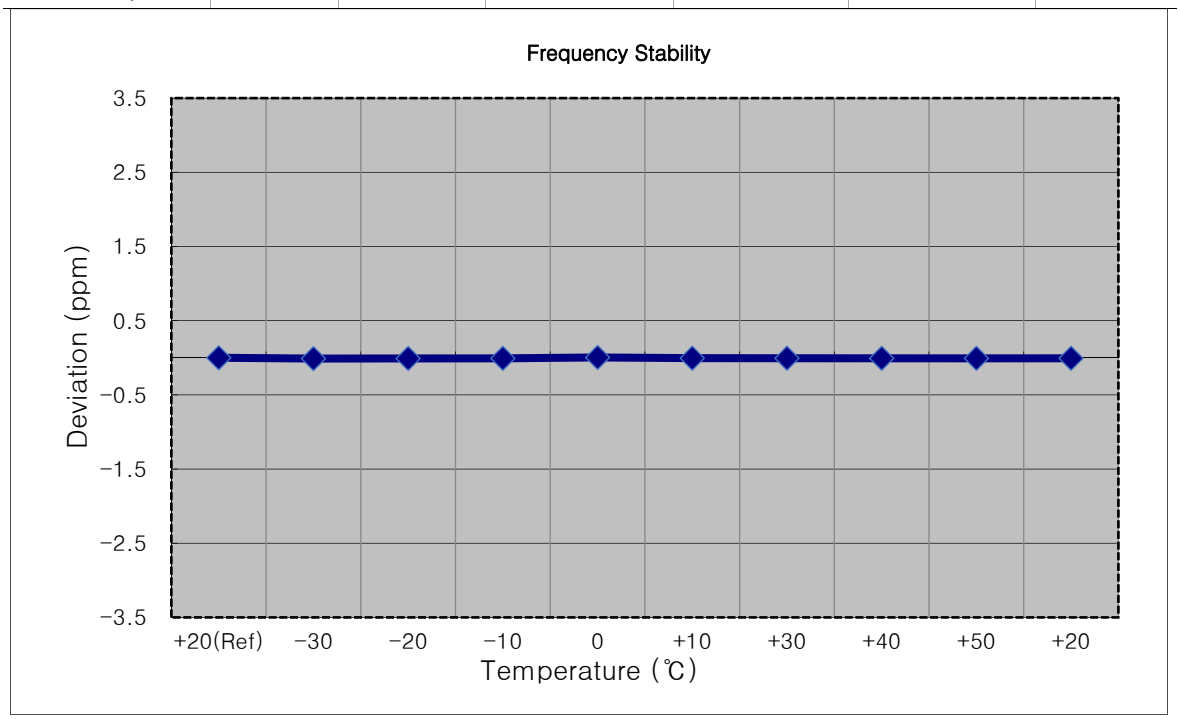
▣ OPERATING FREQUENCY: 1880,000,000 Hz

▣ CHANNEL: 661

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1880 000 014	0.0	0.000 000	0.000
100 %		-30	1879 999 993	-20.4	-0.000 001	-0.011
100 %		-20	1879 999 997	-17.1	-0.000 001	-0.009
100 %		-10	1880 000 000	-14.1	-0.000 001	-0.008
100 %		0	1880 000 023	8.8	0.000 000	0.005
100 %		+10	1880 000 004	-9.5	-0.000 001	-0.005
100 %		+30	1880 000 002	-11.9	-0.000 001	-0.006
100 %		+40	1880 000 001	-13.0	-0.000 001	-0.007
100 %		+50	1880 000 000	-14.2	-0.000 001	-0.008
Batt. Endpoint	3.300	+20	1880 000 000	-13.3	-0.000 001	-0.007



▣ Mode: GSM1900

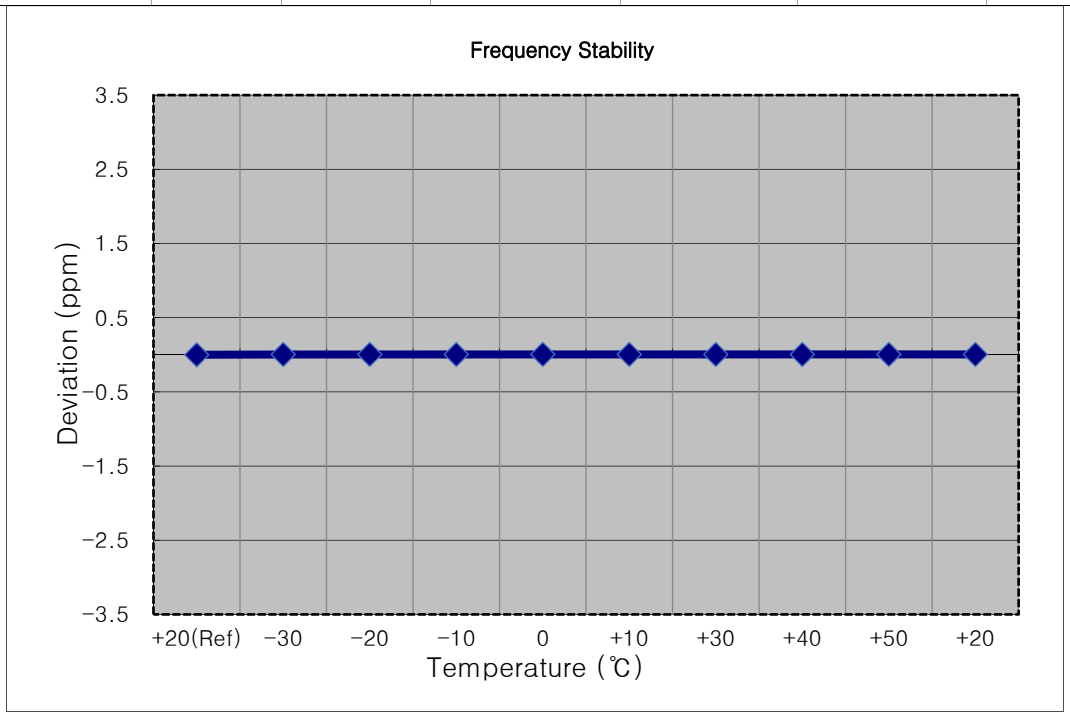
▣ OPERATING FREQUENCY: 1909,800,000 Hz

▣ CHANNEL: 810

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1909 800 008	0.0	0.000 000	0.000
100 %		-30	1909 800 016	7.7	0.000 000	0.004
100 %		-20	1909 800 017	9.2	0.000 000	0.005
100 %		-10	1909 800 016	7.7	0.000 000	0.004
100 %		0	1909 800 019	10.6	0.000 001	0.006
100 %		+10	1909 800 017	8.5	0.000 000	0.004
100 %		+30	1909 800 015	7.1	0.000 000	0.004
100 %		+40	1909 800 016	7.6	0.000 000	0.004
100 %		+50	1909 800 018	9.5	0.000 000	0.005
Batt. Endpoint	3.300	+20	1909 800 017	8.7	0.000 000	0.005



▣ Mode: WCDMA850

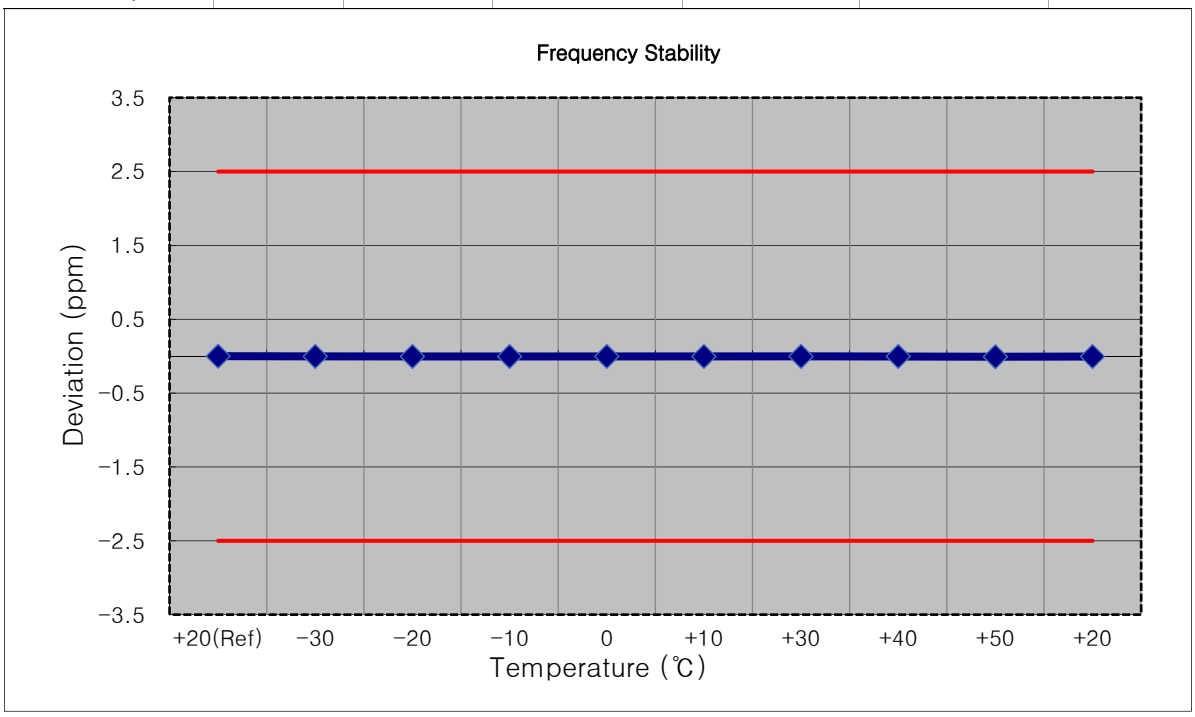
▣ OPERATING FREQUENCY: 836,600,000 Hz

▣ CHANNEL: 4183

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	836 599 998	0.0	0.000 000	0.0000
100 %		-30	836 599 996	-2.2	0.000 000	-0.0026
100 %		-20	836 599 995	-3.1	0.000 000	-0.0037
100 %		-10	836 599 995	-2.7	0.000 000	-0.0033
100 %		0	836 599 995	-2.4	0.000 000	-0.0029
100 %		+10	836 599 995	-2.8	0.000 000	-0.0033
100 %		+30	836 599 995	-2.7	0.000 000	-0.0033
100 %		+40	836 599 995	-2.5	0.000 000	-0.0030
100 %		+50	836 599 992	-6.2	-0.000 001	-0.0074
Batt. Endpoint	3.300	+20	836 599 994	-3.8	0.000 000	-0.0045



▣ Mode: WCDMA1900

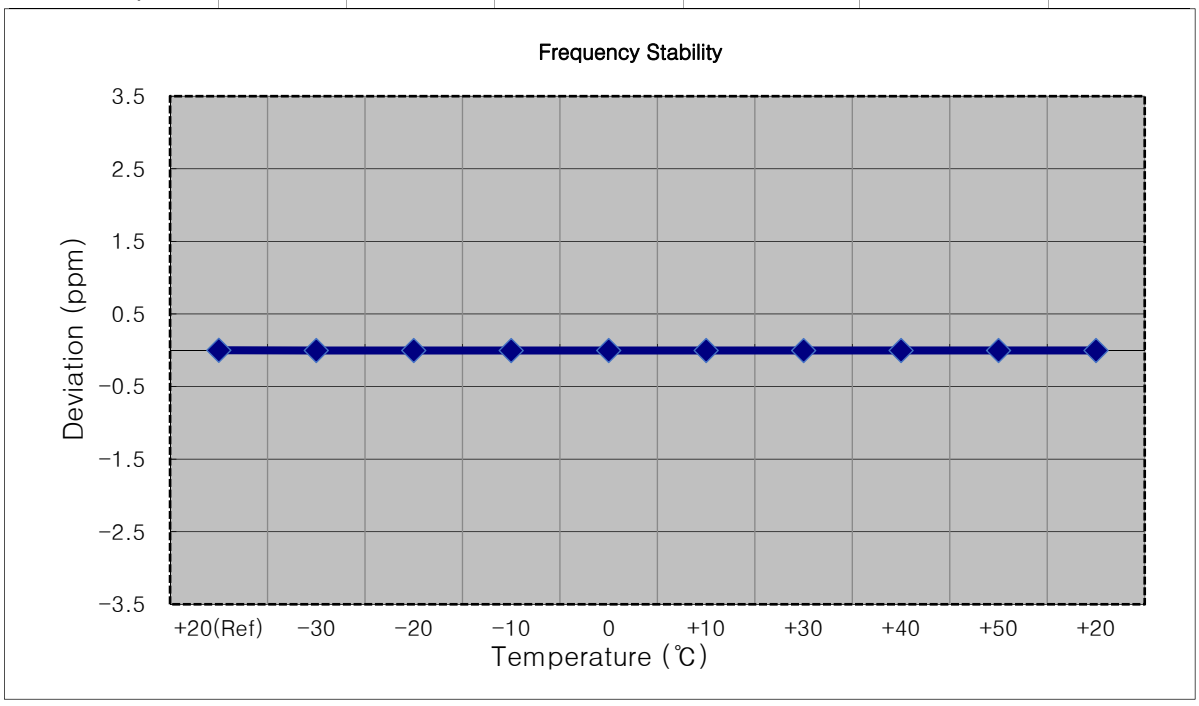
▣ OPERATING FREQUENCY: 1,852,400,000 Hz

▣ CHANNEL: 9262

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1852 399 995	0.0	0.000 000	0.0000
100 %		-30	1852 399 989	-6.4	0.000 000	-0.0035
100 %		-20	1852 399 989	-5.7	0.000 000	-0.0031
100 %		-10	1852 399 988	-6.8	0.000 000	-0.0037
100 %		0	1852 399 989	-6.2	0.000 000	-0.0034
100 %		+10	1852 399 989	-6.2	0.000 000	-0.0033
100 %		+30	1852 399 988	-6.8	0.000 000	-0.0037
100 %		+40	1852 399 990	-5.3	0.000 000	-0.0029
100 %		+50	1852 399 990	-5.2	0.000 000	-0.0028
Batt. Endpoint	3.300	+20	1852 399 990	-5.4	0.000 000	-0.0029



▣ Mode: WCDMA1900

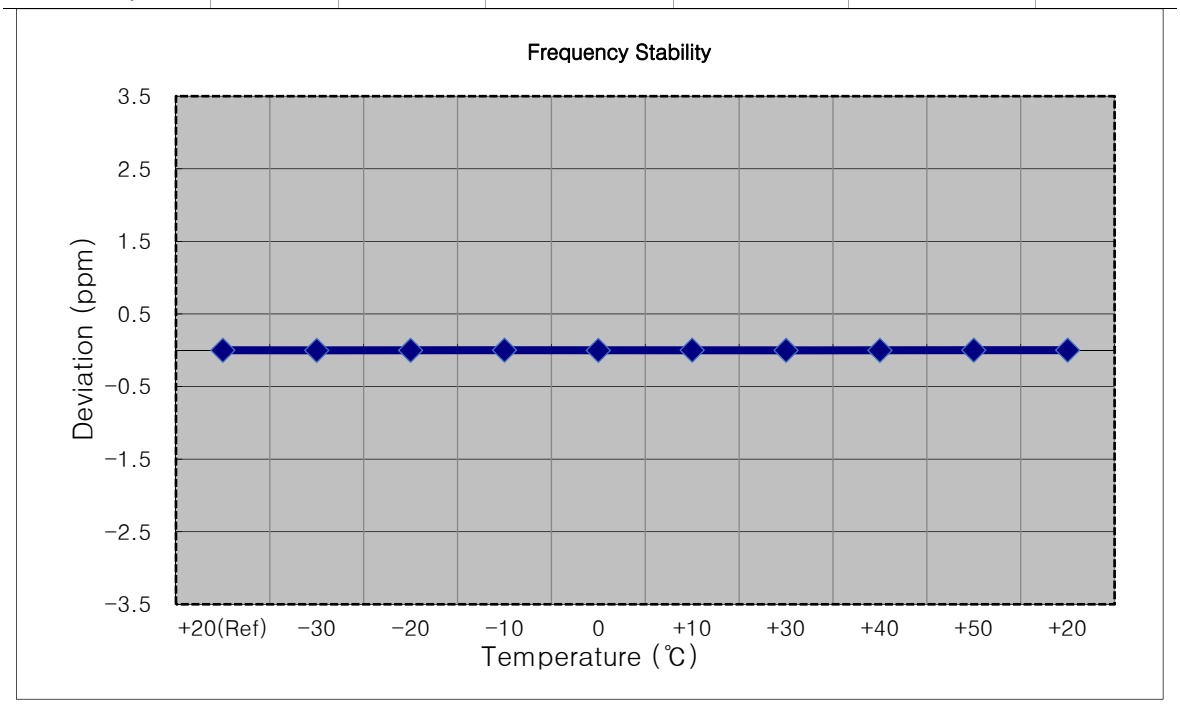
▣ OPERATING FREQUENCY: 1,880,000,000 Hz

▣ CHANNEL: 9400

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1879 999 997	0.0	0.000 000	0.0000
100 %		-30	1879 999 994	-3.0	0.000 000	-0.0016
100 %		-20	1879 999 994	-2.3	0.000 000	-0.0012
100 %		-10	1880 000 000	3.0	0.000 000	0.0016
100 %		0	1879 999 994	-2.5	0.000 000	-0.0013
100 %		+10	1879 999 999	2.0	0.000 000	0.0011
100 %		+30	1879 999 995	-2.0	0.000 000	-0.0011
100 %		+40	1879 999 994	-3.0	0.000 000	-0.0016
100 %		+50	1879 999 999	2.2	0.000 000	0.0012
Batt. Endpoint	3.300	+20	1879 999 999	1.9	0.000 000	0.0010



▣ Mode: WCDMA1900

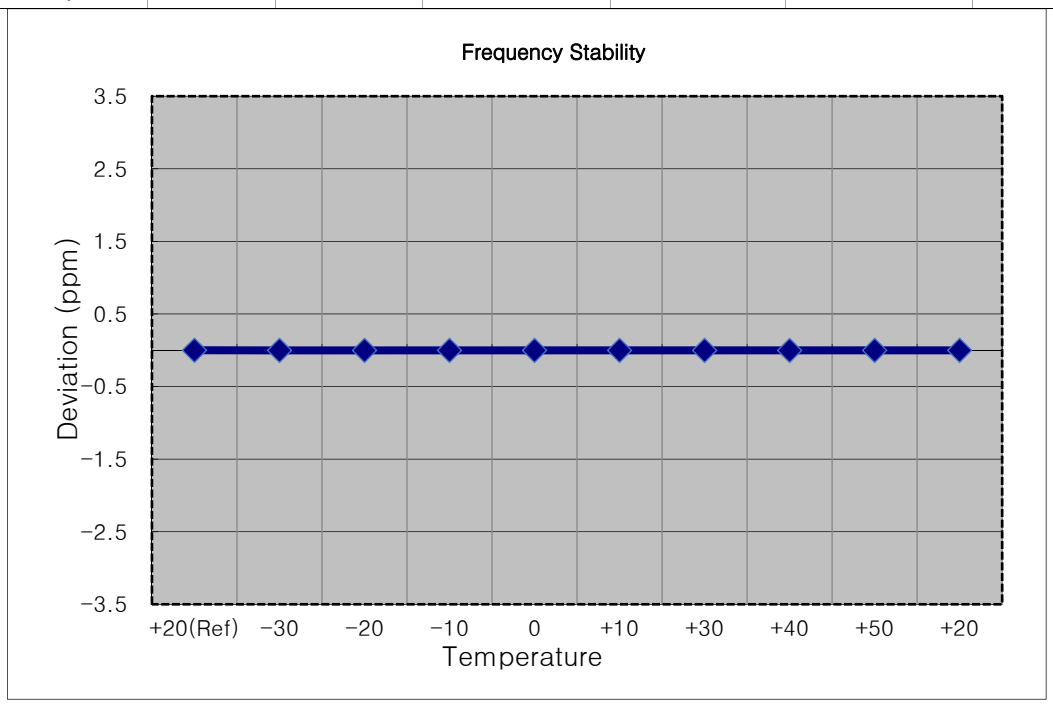
▣ OPERATING FREQUENCY: 1,907,600,000 Hz

▣ CHANNEL: 9538

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1907 599 997	0.0	0.000 000	0.0000
100 %		-30	1907 599 993	-3.8	0.000 000	-0.0020
100 %		-20	1907 599 994	-3.2	0.000 000	-0.0017
100 %		-10	1907 599 994	-3.6	0.000 000	-0.0019
100 %		0	1907 599 994	-3.1	0.000 000	-0.0016
100 %		+10	1907 599 994	-3.0	0.000 000	-0.0016
100 %		+30	1907 599 994	-2.9	0.000 000	-0.0015
100 %		+40	1907 599 993	-4.2	0.000 000	-0.0022
100 %		+50	1907 599 994	-2.8	0.000 000	-0.0015
Batt. Endpoint	3.300	+20	1907 599 995	-2.4	0.000 000	-0.0013



▣ Mode: WCDMA1700

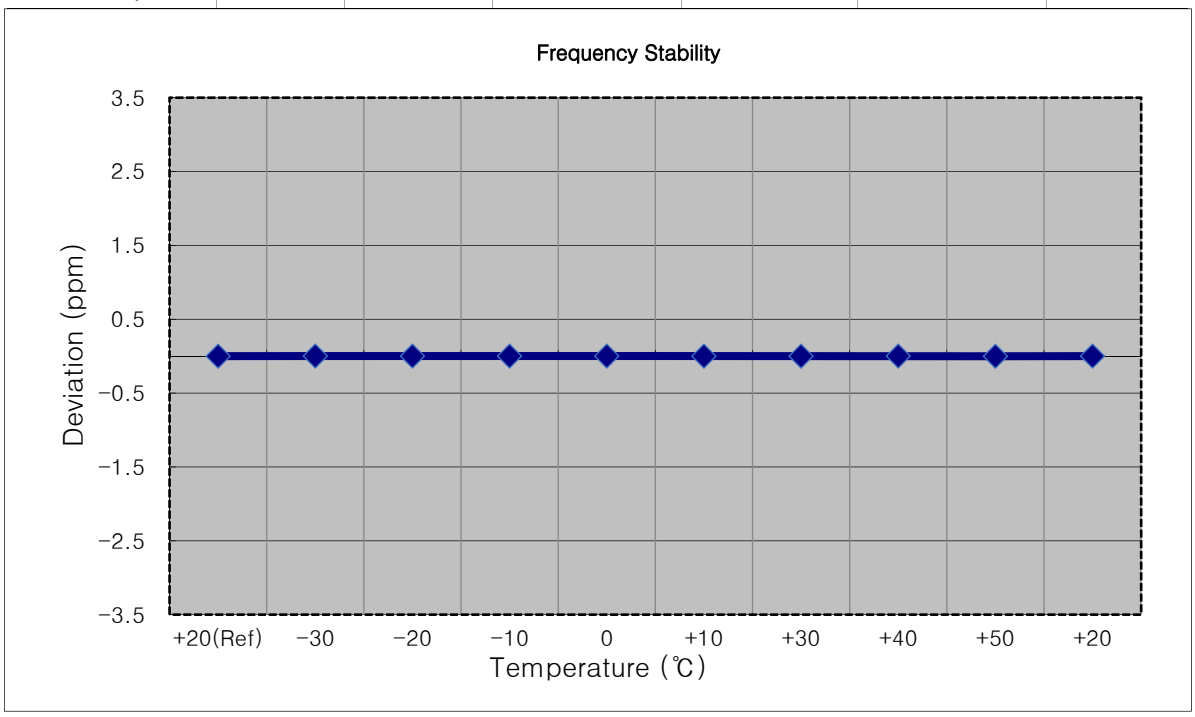
▣ OPERATING FREQUENCY: 1,712,400,000 Hz

▣ CHANNEL: 1312

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1712 399 998	0.0	0.000 000	0.0000
100 %		-30	1712 400 001	3.1	0.000 000	0.0018
100 %		-20	1712 400 000	2.1	0.000 000	0.0012
100 %		-10	1712 400 001	2.9	0.000 000	0.0017
100 %		0	1712 400 001	2.7	0.000 000	0.0016
100 %		+10	1712 400 000	1.8	0.000 000	0.0011
100 %		+30	1712 399 999	1.4	0.000 000	0.0008
100 %		+40	1712 400 001	3.1	0.000 000	0.0018
100 %		+50	1712 399 996	-1.8	0.000 000	-0.0011
Batt. Endpoint	3.300	+20	1712 400 000	2.3	0.000 000	0.0013



▣ Mode: WCDMA1700

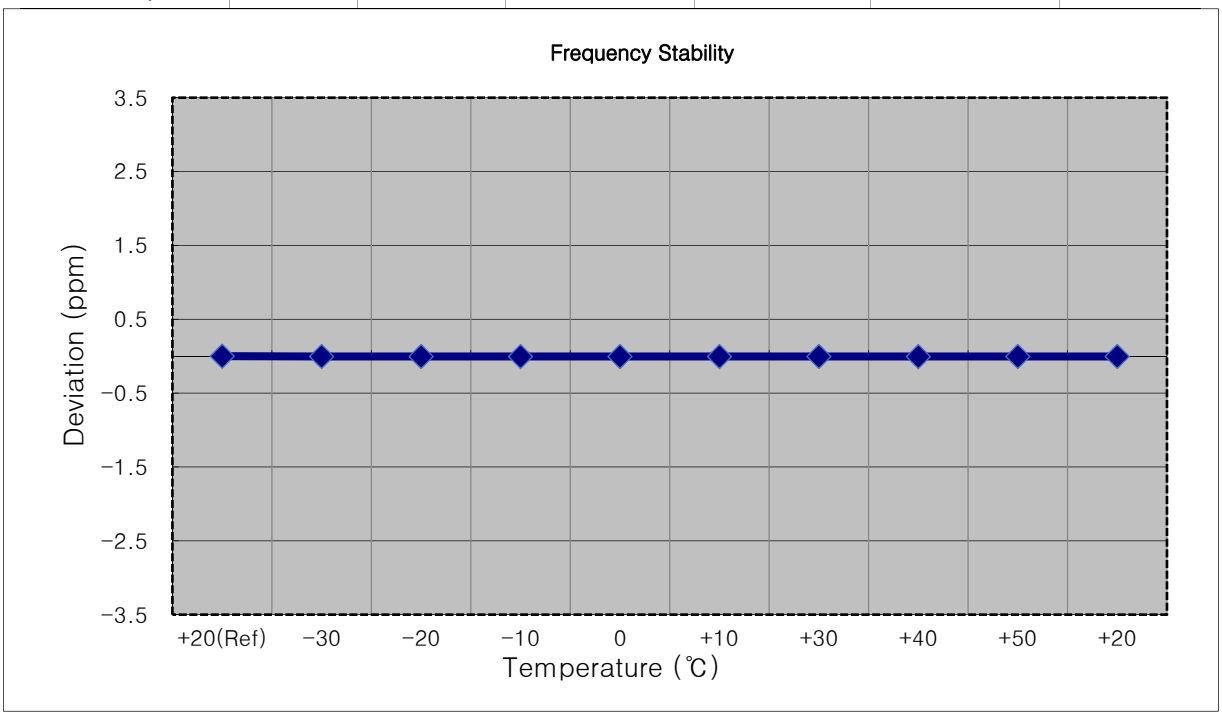
▣ OPERATING FREQUENCY: 1,732,400,000 Hz

▣ CHANNEL: 1412

▣ REFERENCE VOLTAGE: 3.880 VDC

▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1732 399 992	0.0	0.000 000	0.0000
100 %		-30	1732 399 985	-6.9	0.000 000	-0.0040
100 %		-20	1732 399 985	-7.1	0.000 000	-0.0041
100 %		-10	1732 399 985	-7.2	0.000 000	-0.0042
100 %		0	1732 399 985	-7.2	0.000 000	-0.0042
100 %		+10	1732 399 985	-7.2	0.000 000	-0.0041
100 %		+30	1732 399 986	-5.9	0.000 000	-0.0034
100 %		+40	1732 399 984	-8.2	0.000 000	-0.0047
100 %		+50	1732 399 986	-6.4	0.000 000	-0.0037
Batt. Endpoint	3.300	+20	1732 399 986	-6.4	0.000 000	-0.0037



▣ Mode: WCDMA1700

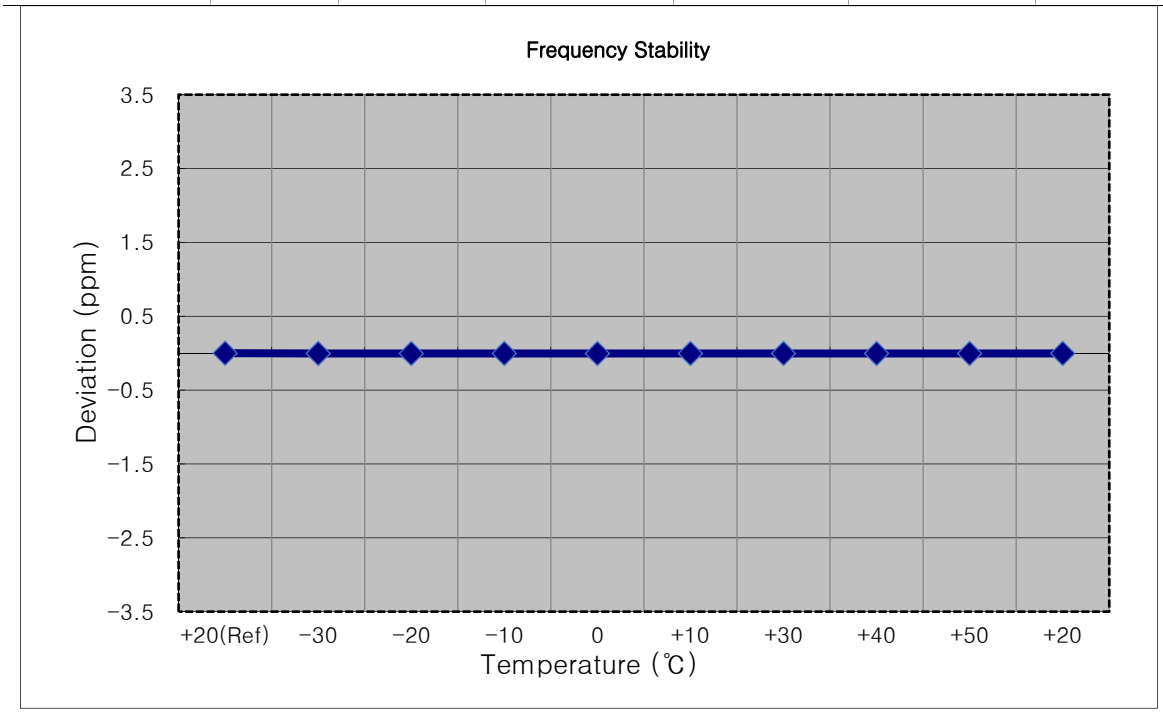
▣ OPERATING FREQUENCY: 1,752,600,000 Hz

▣ CHANNEL: 1513

▣ REFERENCE VOLTAGE: 3.880 VDC

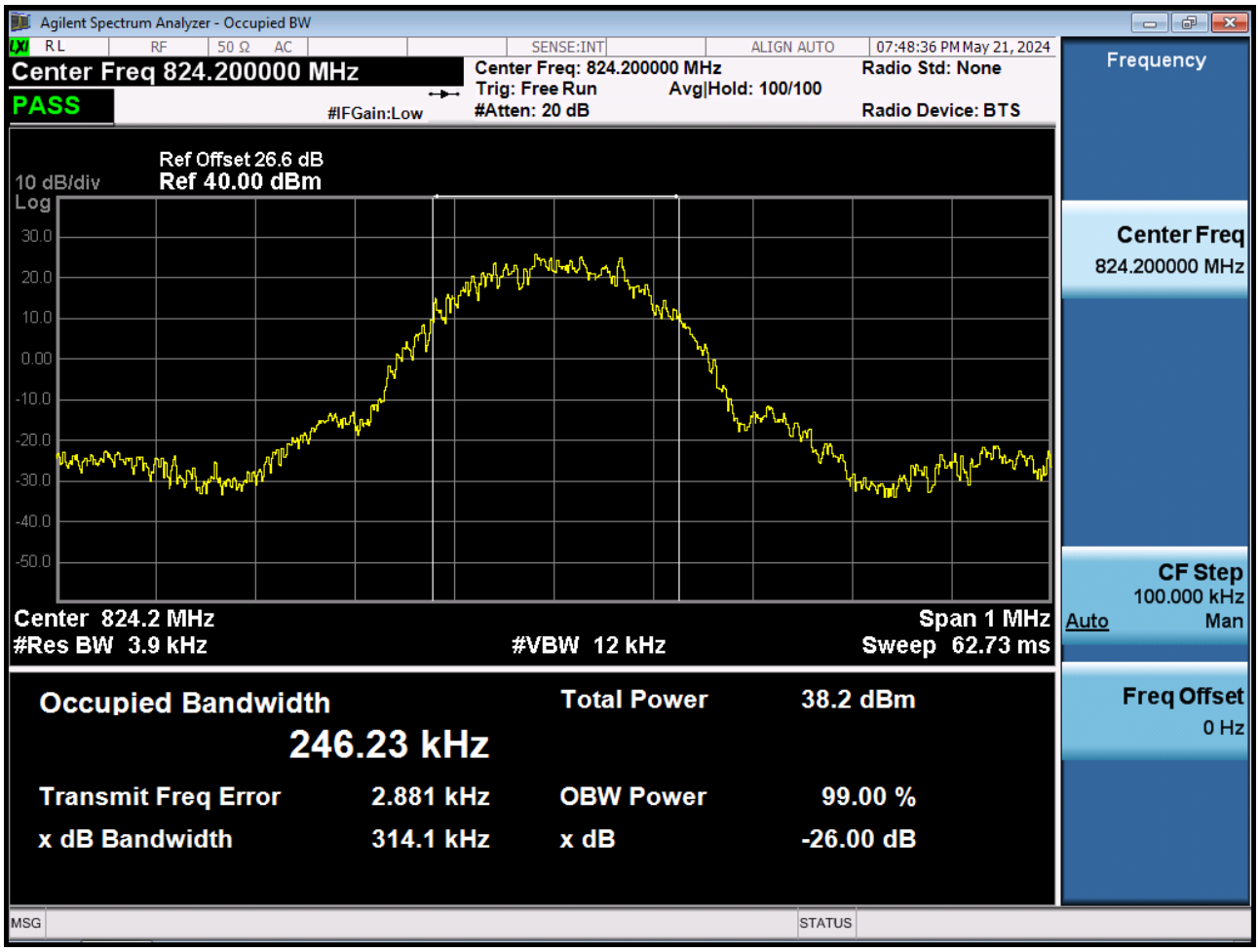
▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(℃)	(Hz)	Error (Hz)	(%)	
100 %	3.880	+20(Ref)	1752 599 994	0.0	0.000 000	0.0000
100 %		-30	1752 599 987	-6.8	0.000 000	-0.0039
100 %		-20	1752 599 986	-7.5	0.000 000	-0.0043
100 %		-10	1752 599 987	-7.0	0.000 000	-0.0040
100 %		0	1752 599 987	-7.2	0.000 000	-0.0041
100 %		+10	1752 599 987	-6.7	0.000 000	-0.0038
100 %		+30	1752 599 987	-6.6	0.000 000	-0.0038
100 %		+40	1752 599 987	-6.9	0.000 000	-0.0039
100 %		+50	1752 599 987	-6.7	0.000 000	-0.0038
Batt. Endpoint	3.300	+20	1752 599 988	-5.7	0.000 000	-0.0032

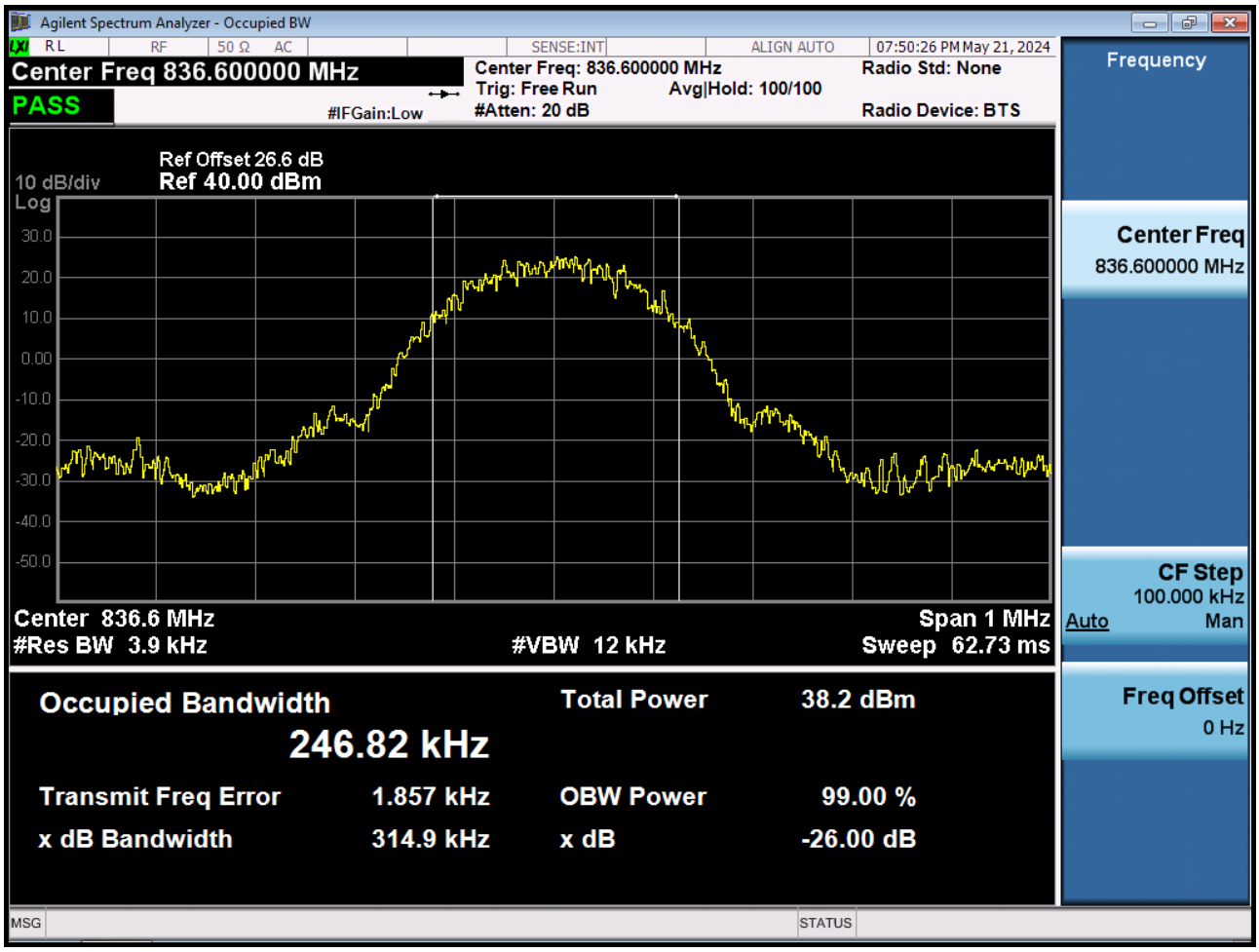


9. TEST PLOTS

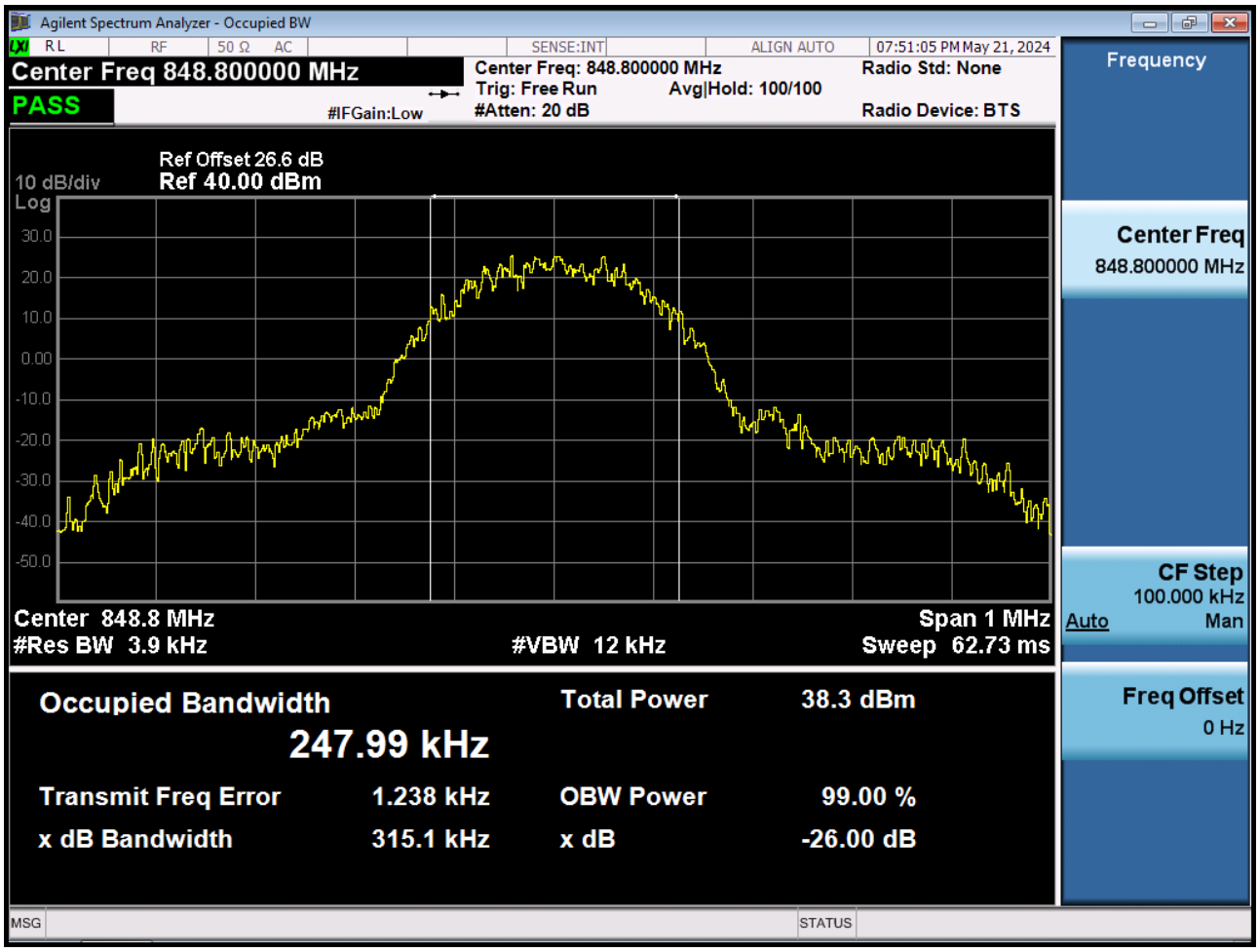
■ GSM850 MODE (128 CH.) Occupied Bandwidth



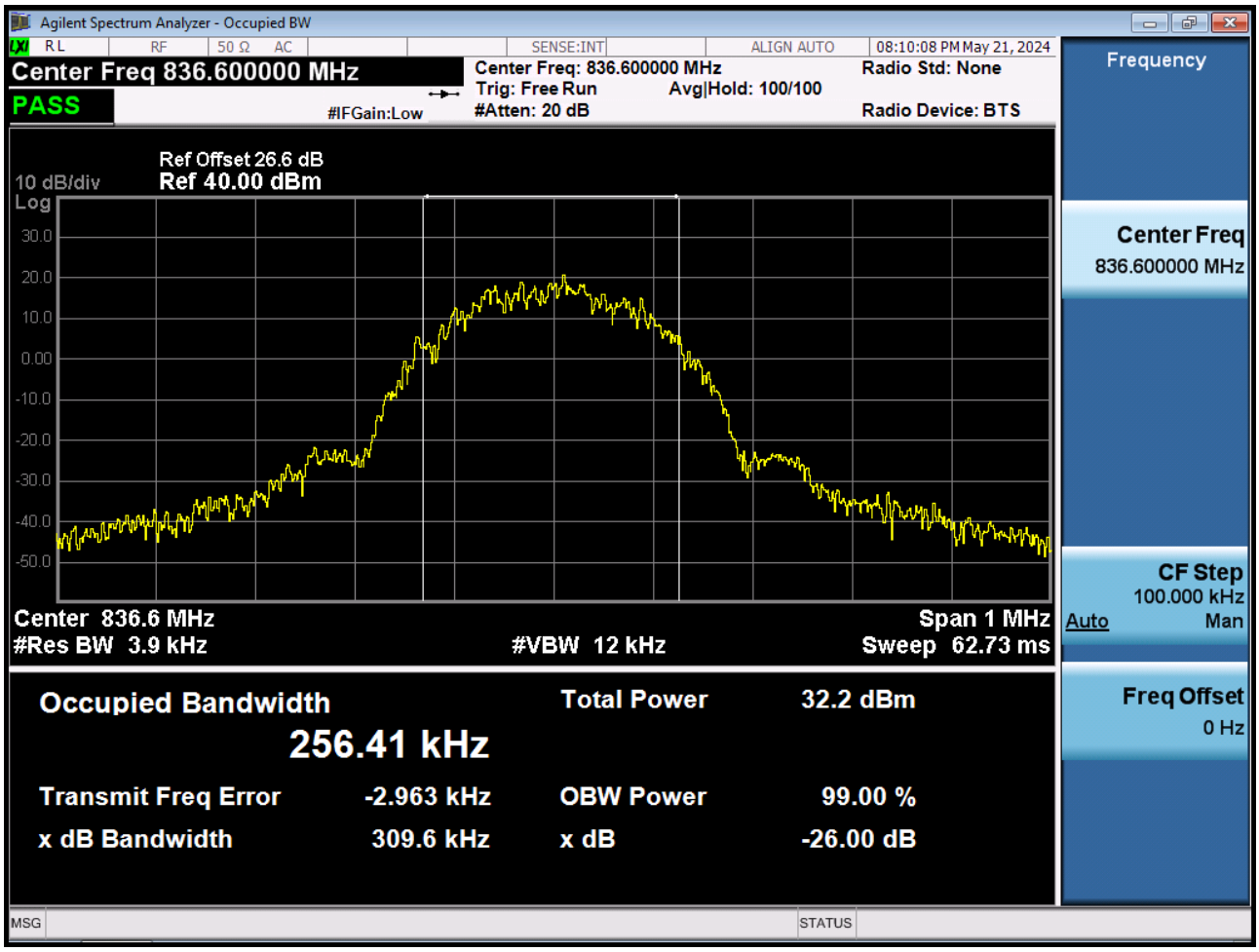
■ GSM850 MODE (190 CH.) Occupied Bandwidth



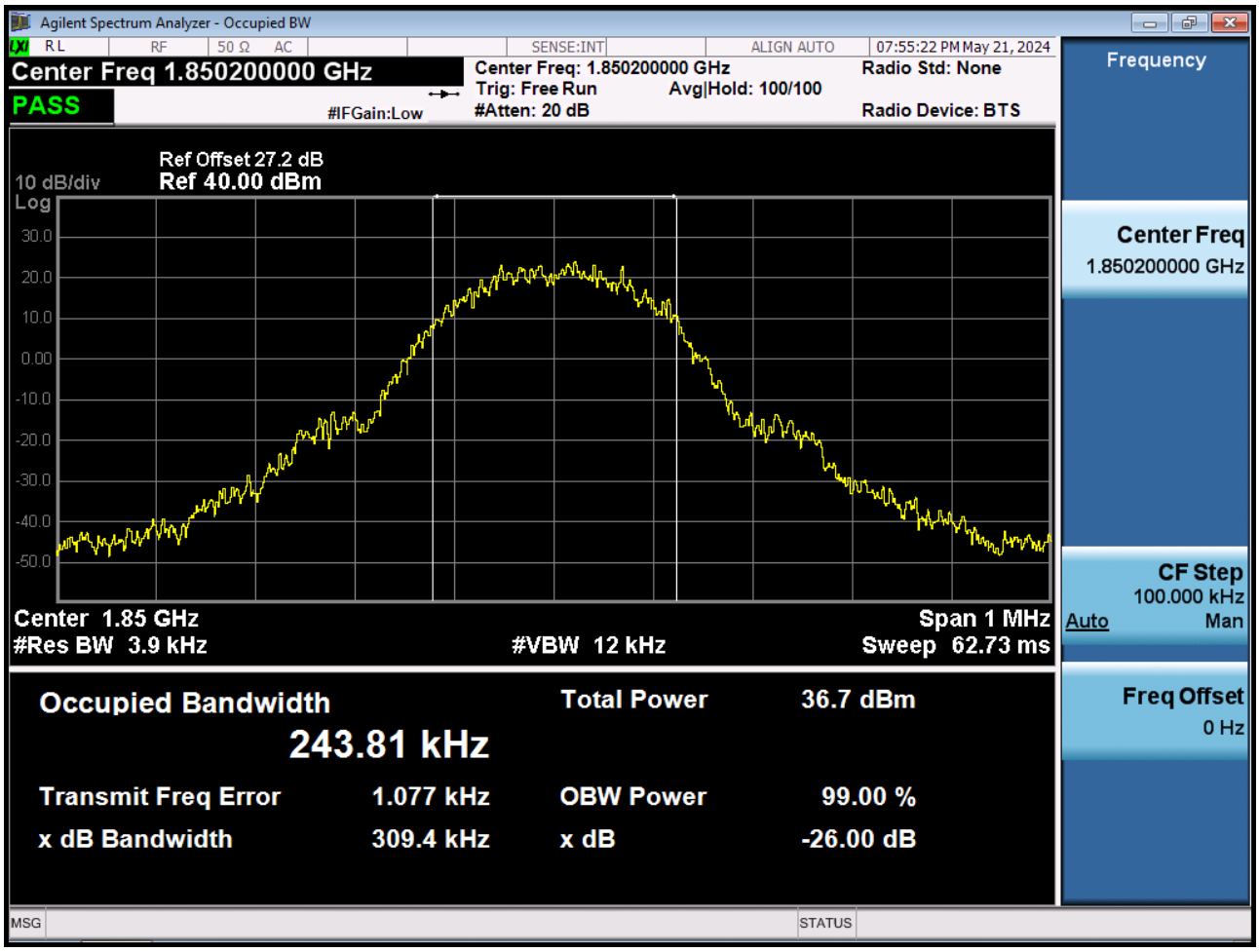
■ GSM850 MODE (251 CH.) Occupied Bandwidth



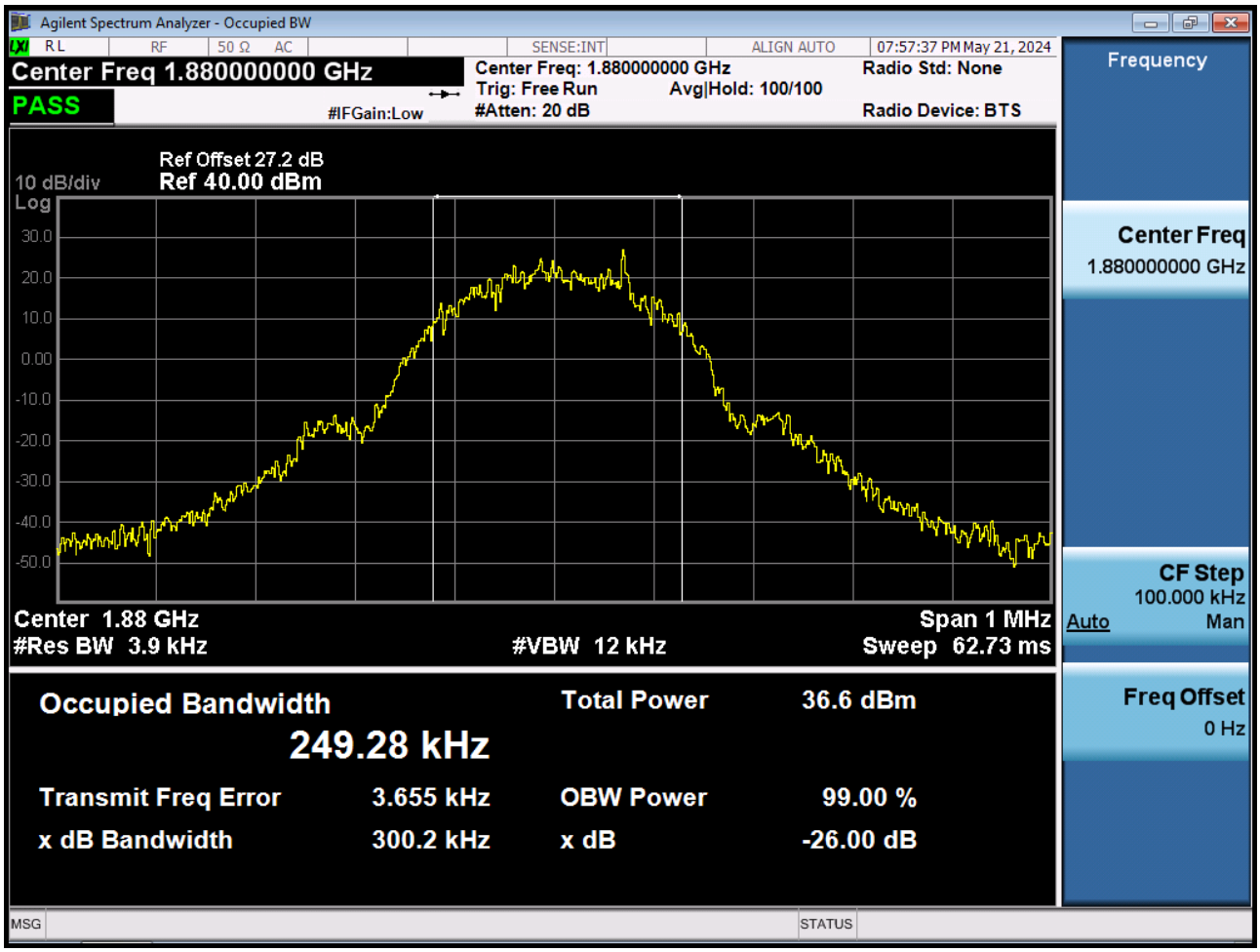
■ GSM850 EDGE (190 CH.) Occupied Bandwidth



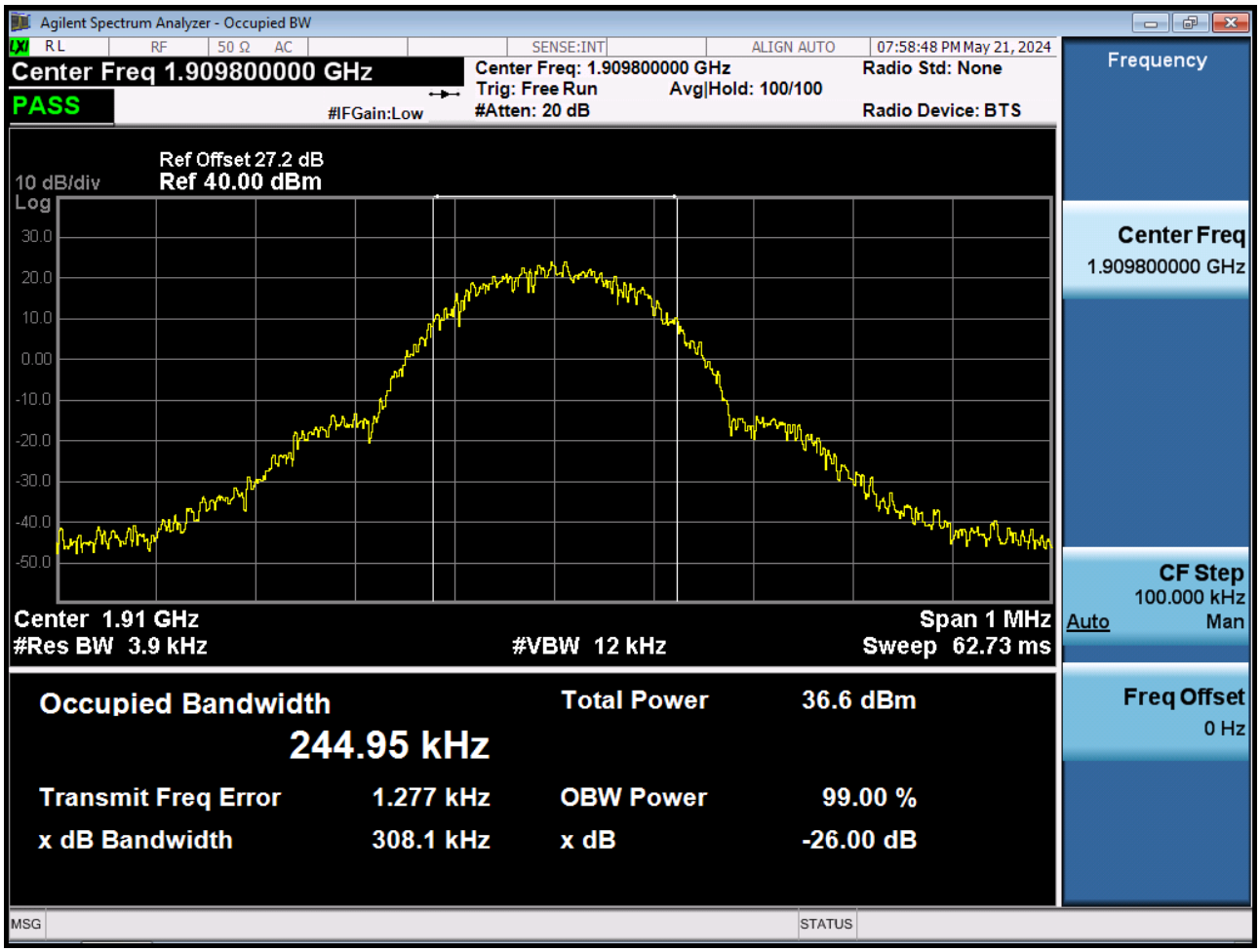
■ GSM1900 MODE (512 CH.) Occupied Bandwidth



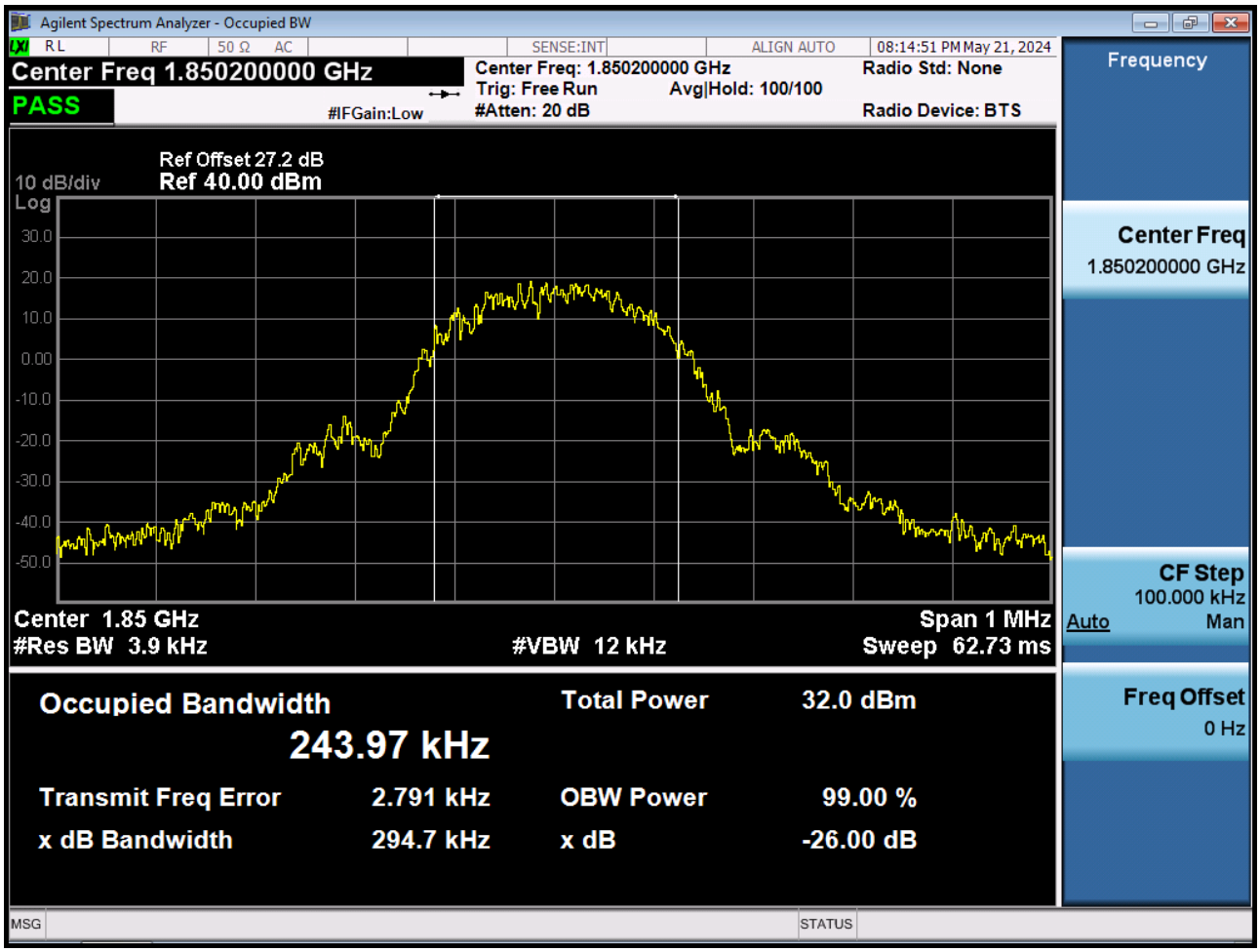
■ GSM1900 MODE (661 CH.) Occupied Bandwidth



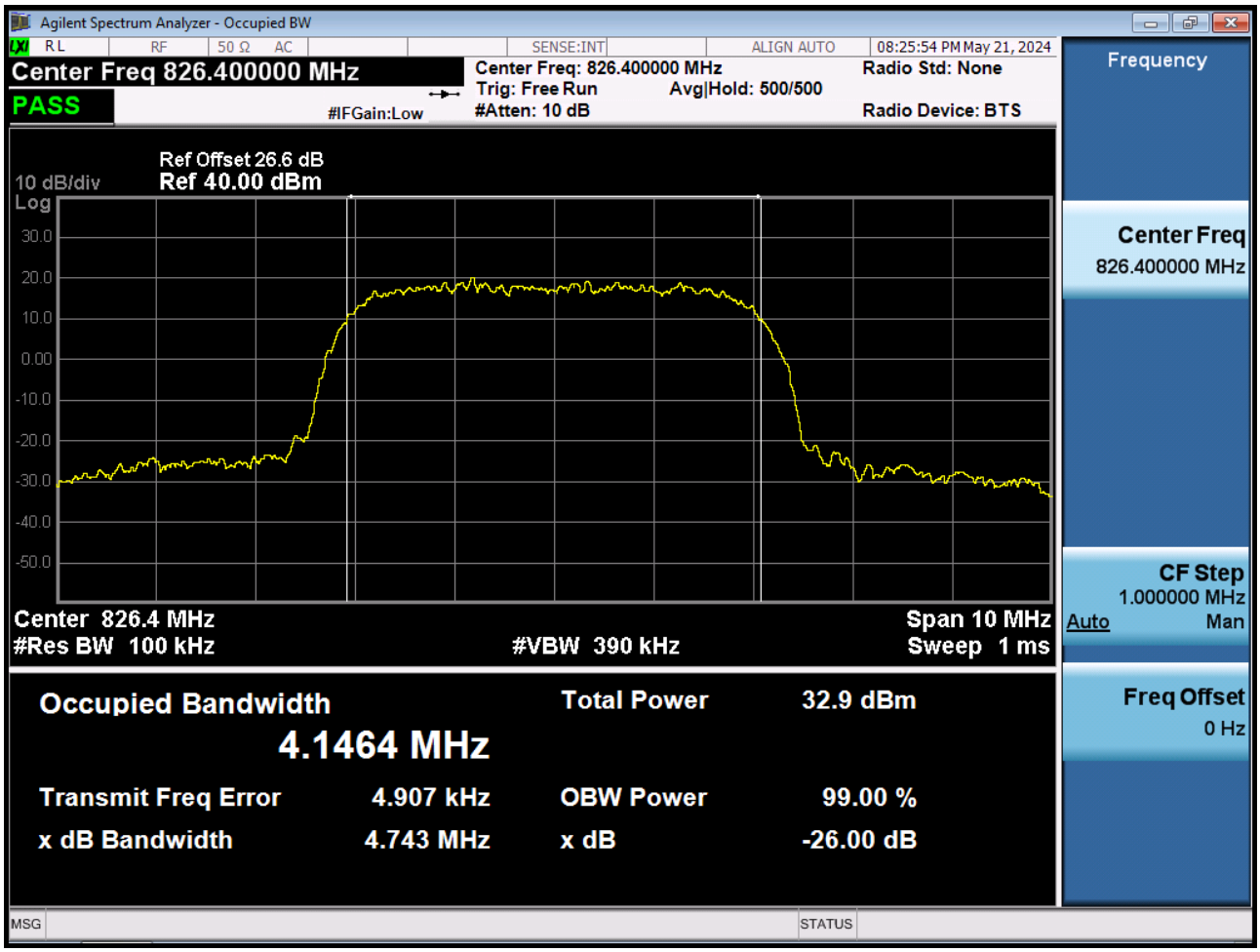
■ GSM1900 MODE (810 CH.) Occupied Bandwidth



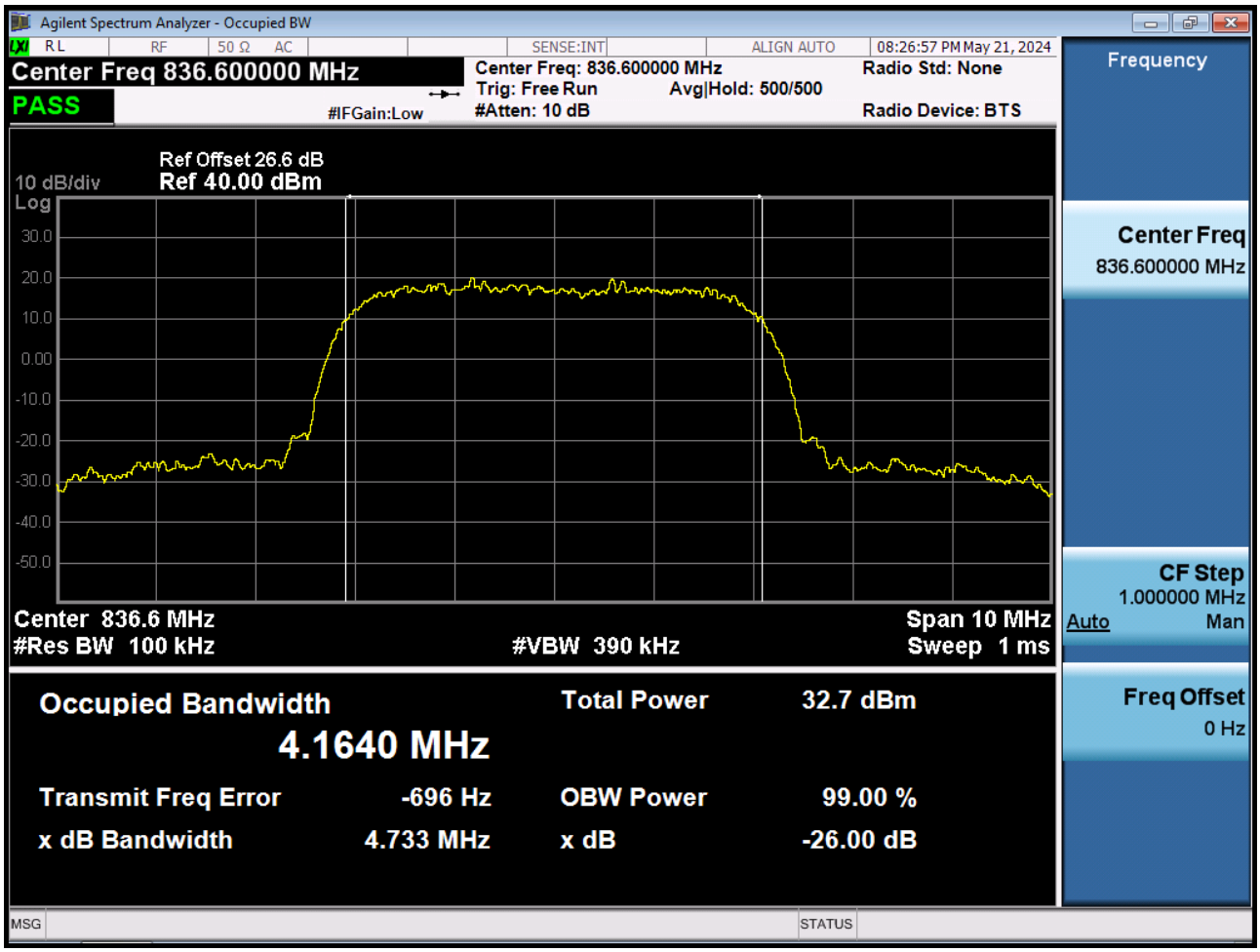
■ GSM1900 EDGE (512 CH.) Occupied Bandwidth



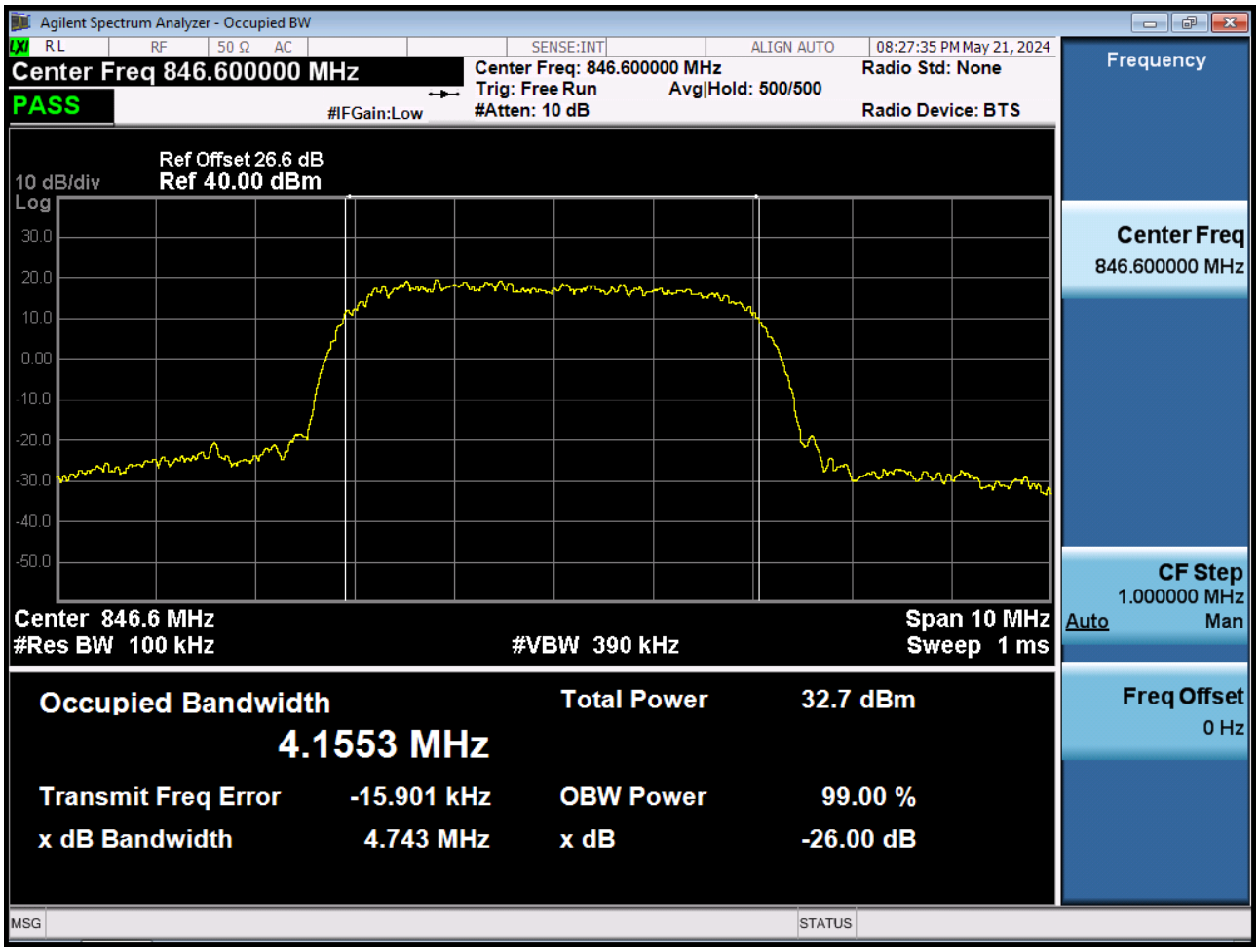
■ WCDMA850 MODE (4132 CH.) Occupied Bandwidth



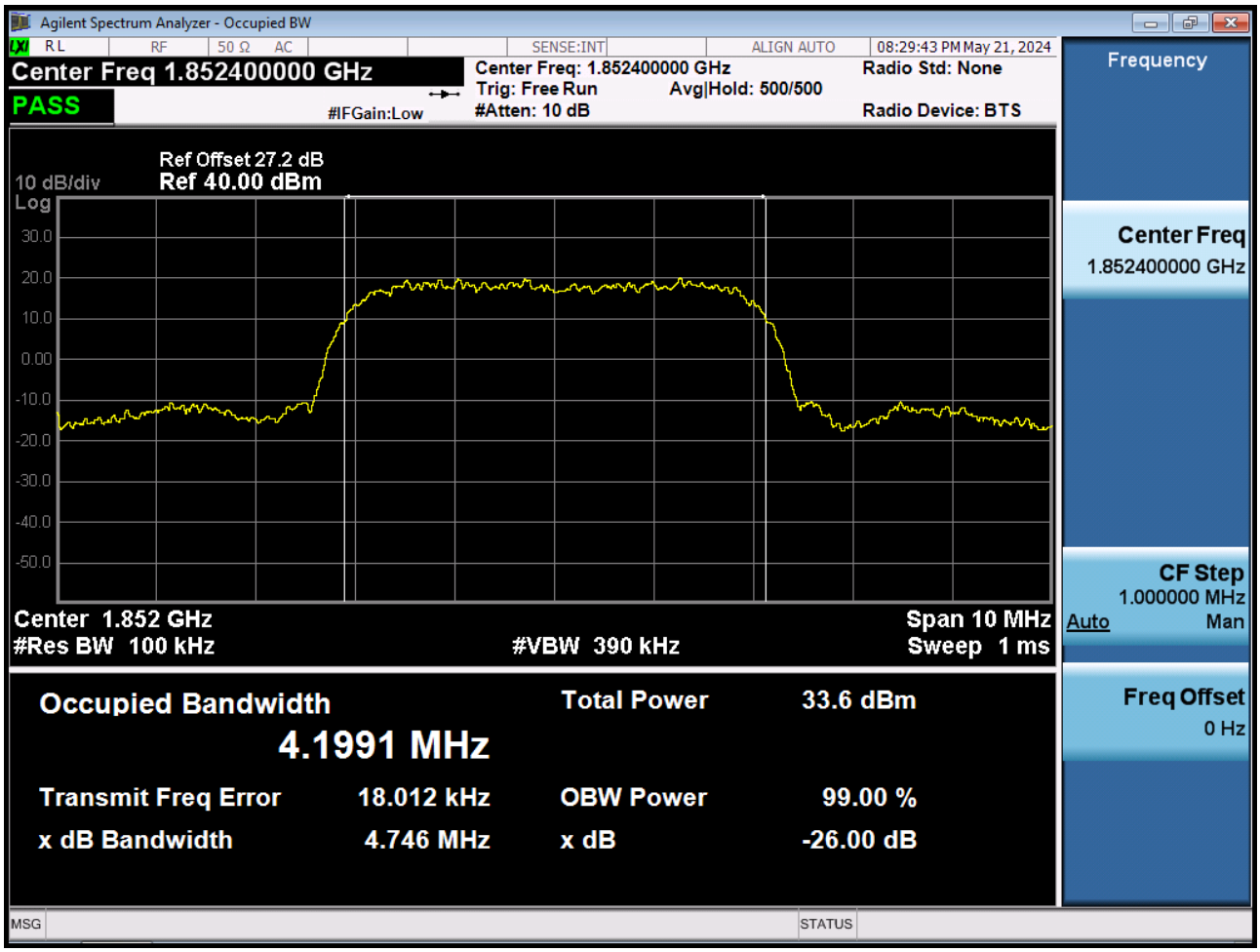
■ WCDMA850 MODE (4183 CH.) Occupied Bandwidth



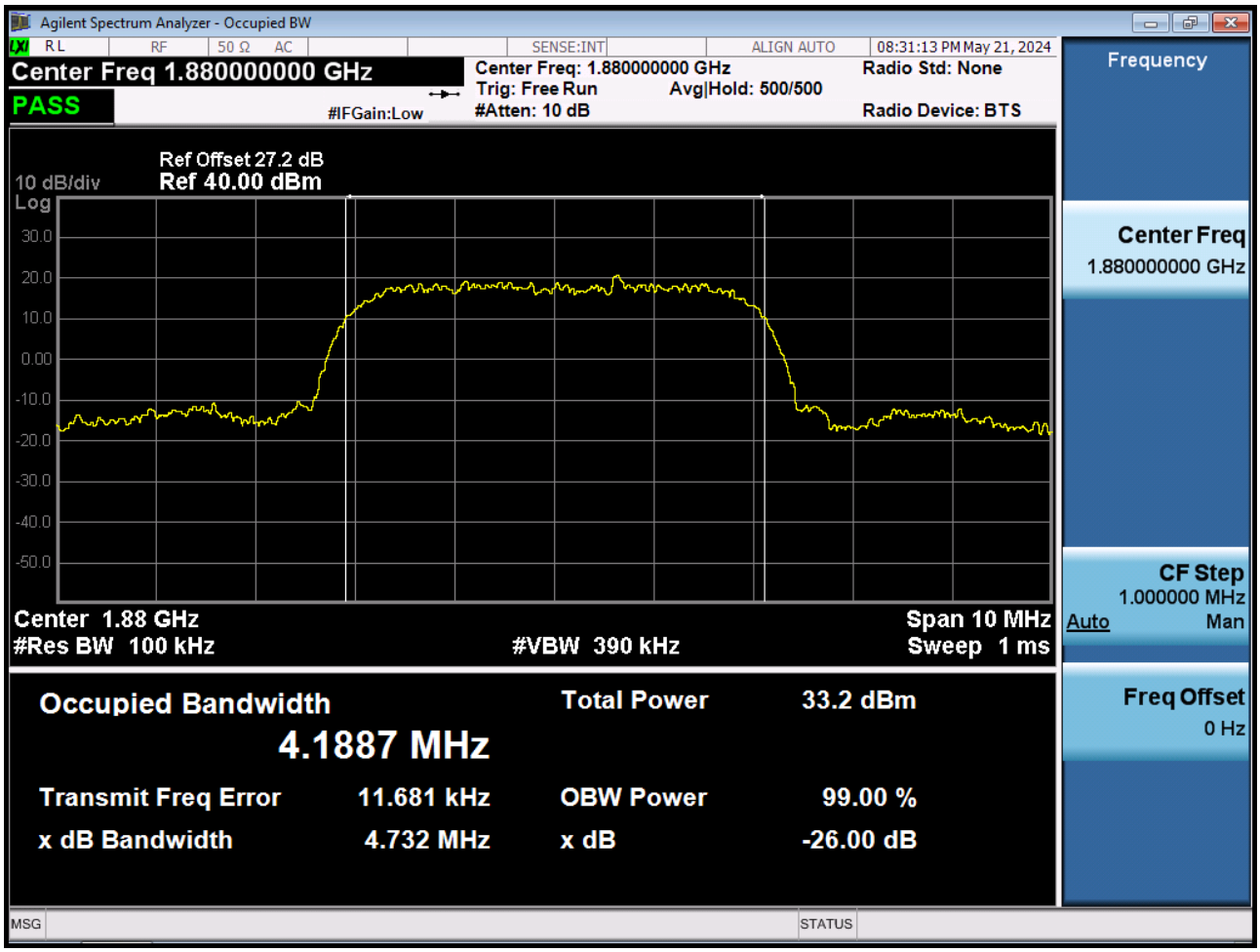
■ WCDMA850MODE (4233 CH.) Occupied Bandwidth



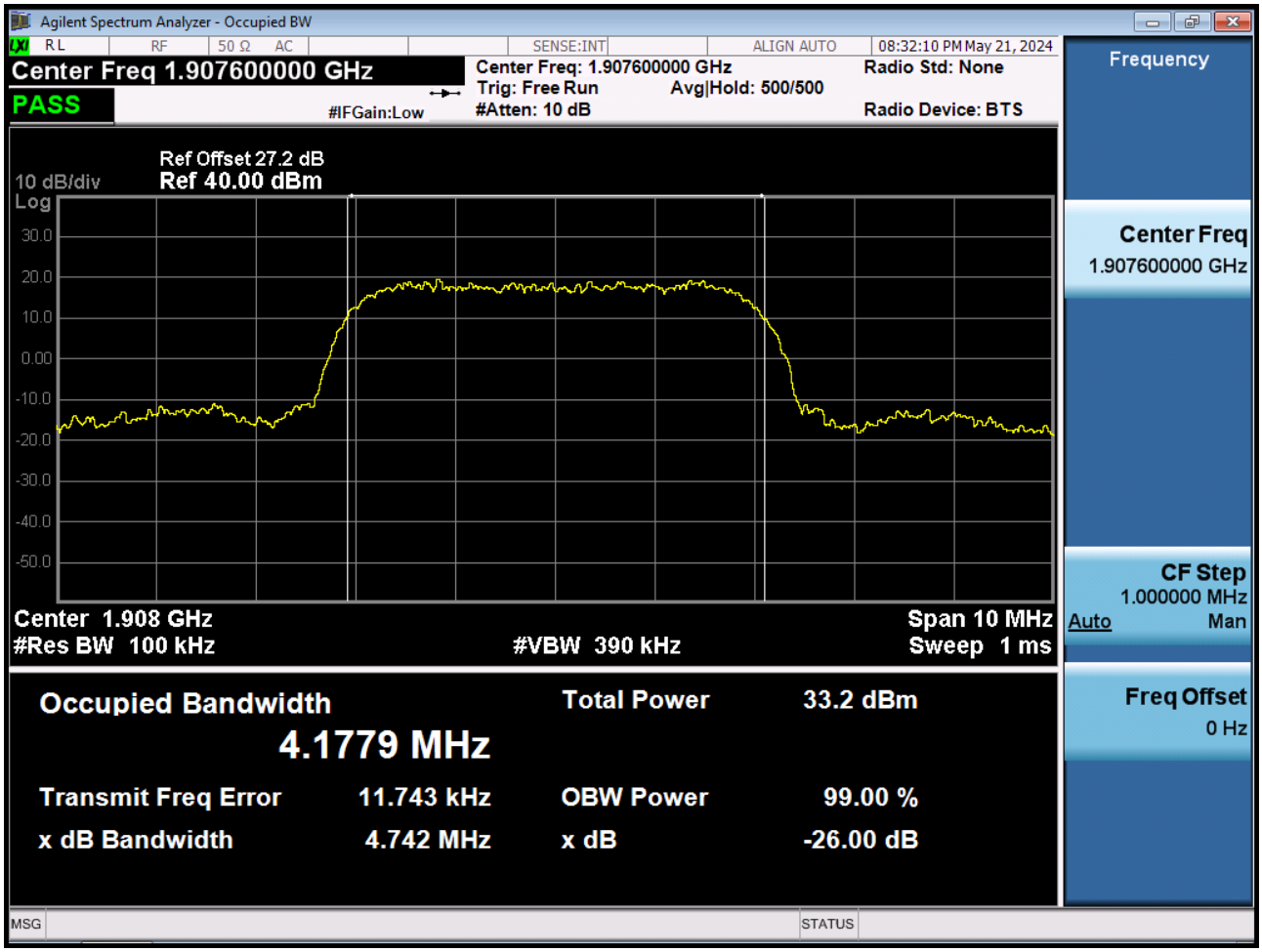
■ WCDMA1900 MODE (9262 CH.) Occupied Bandwidth



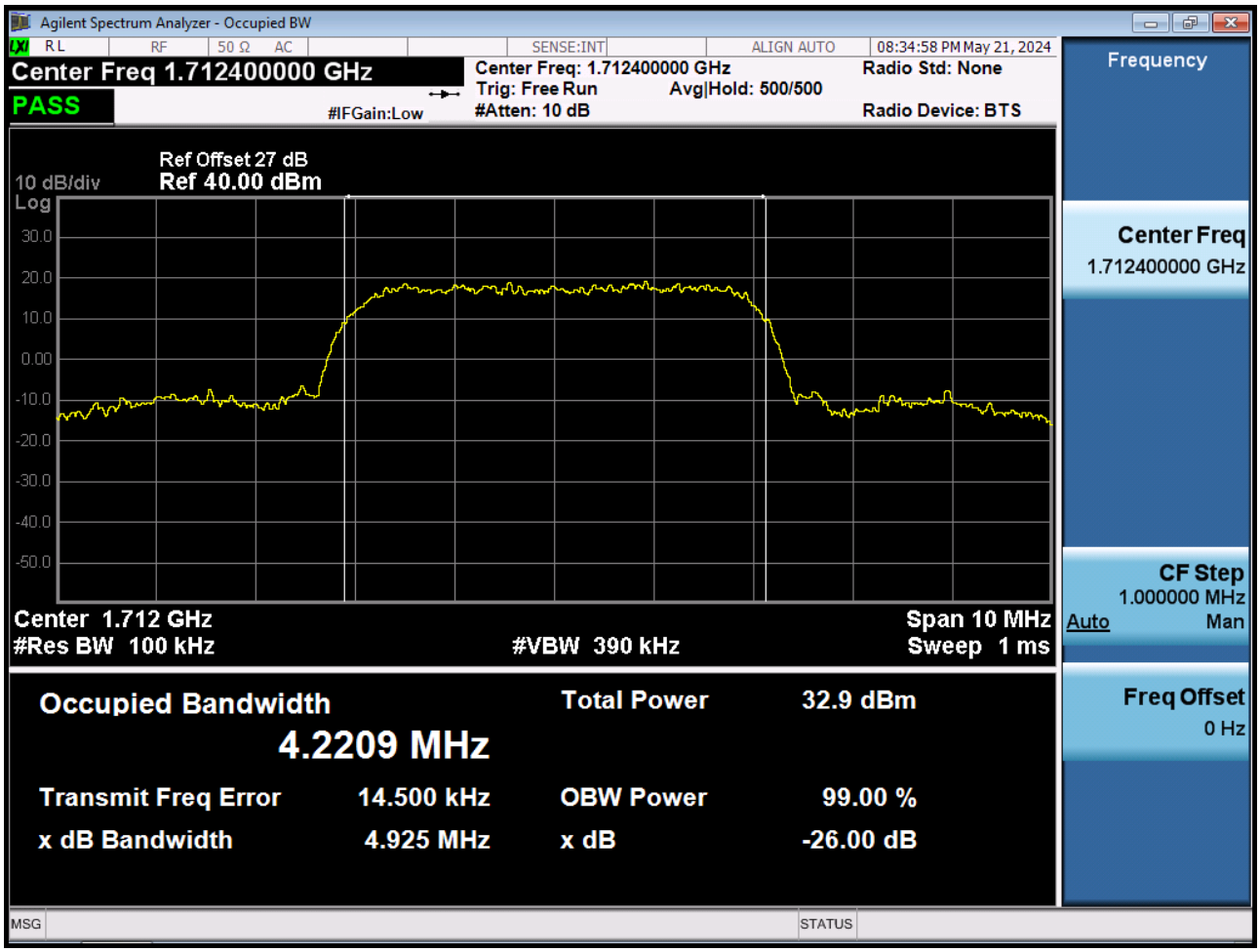
■ WCDMA1900 MODE (9400 CH.) Occupied Bandwidth



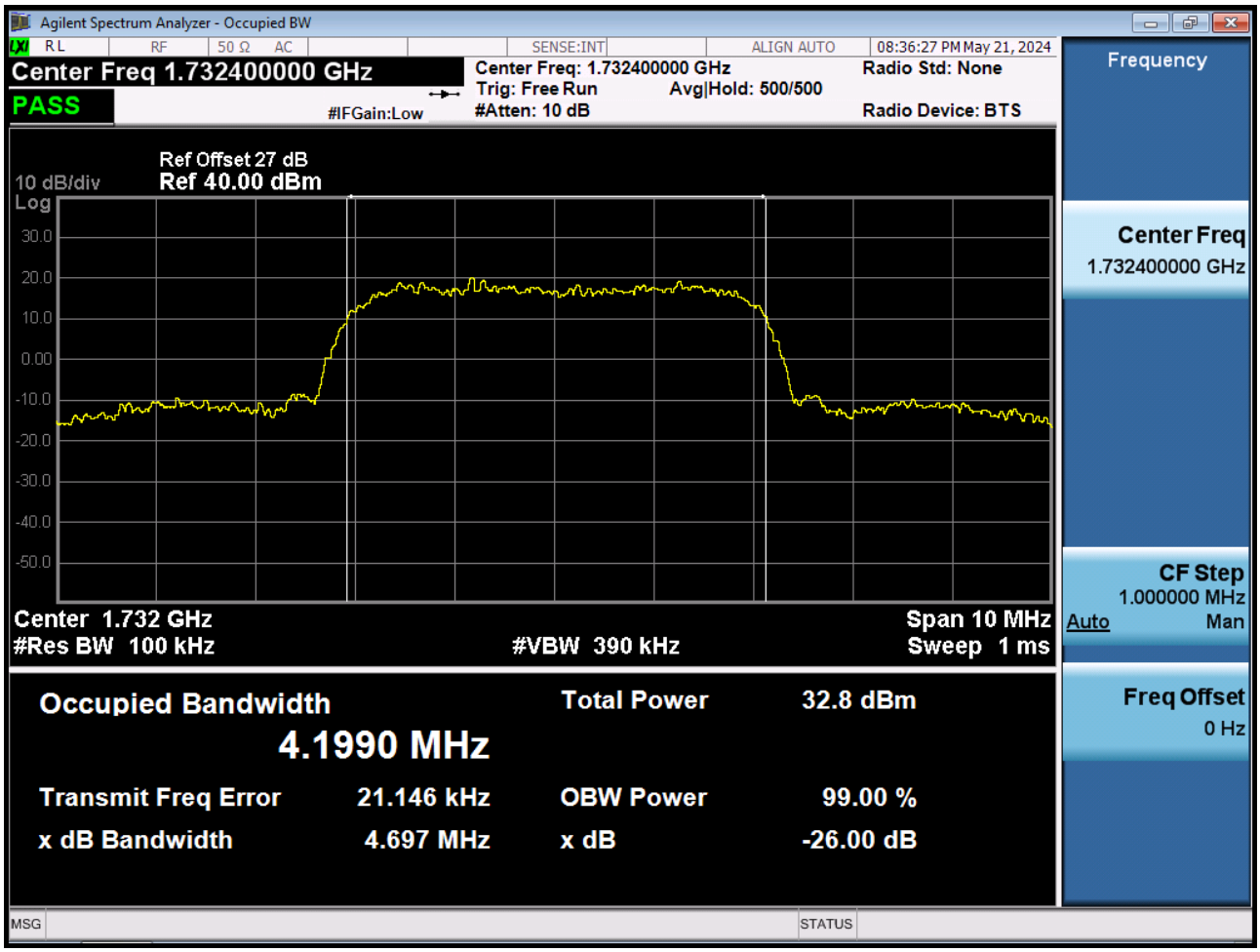
■ WCDMA1900 MODE (9538 CH.) Occupied Bandwidth



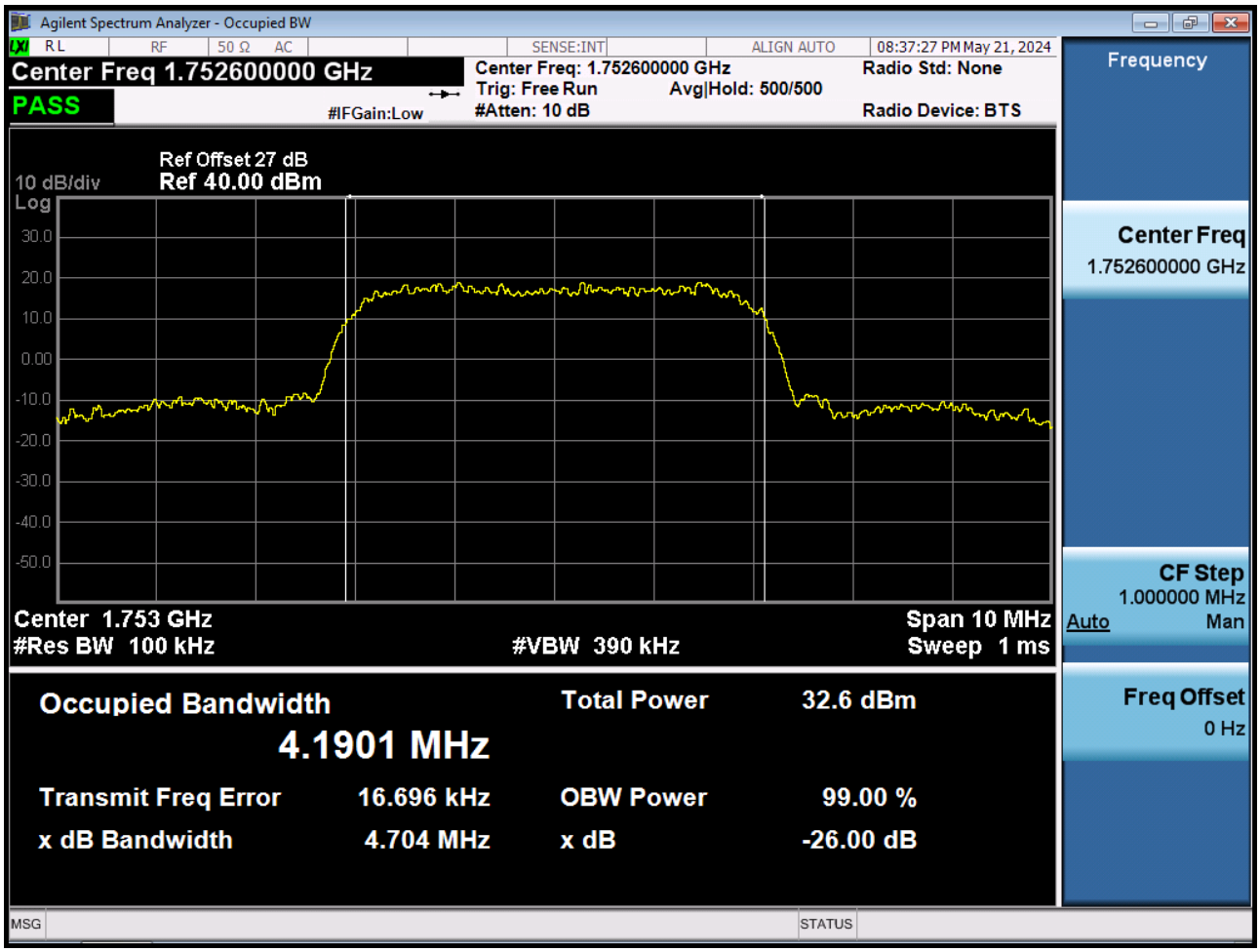
■ WCDMA1700 MODE (1312 CH.) Occupied Bandwidth



■ WCDMA1700 MODE (1412 CH.) Occupied Bandwidth

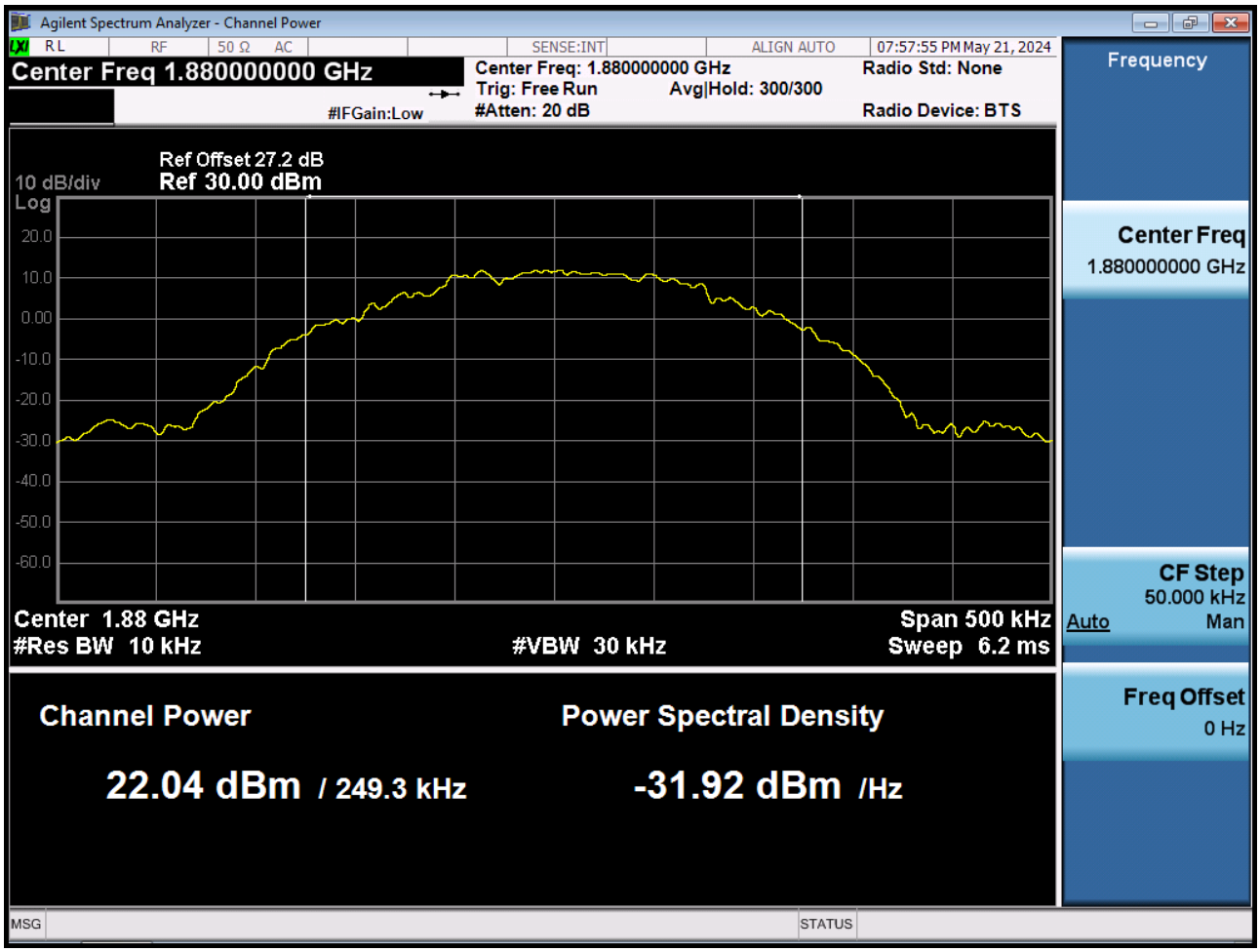


■ WCDMA1700 MODE (1513 CH.) Occupied Bandwidth

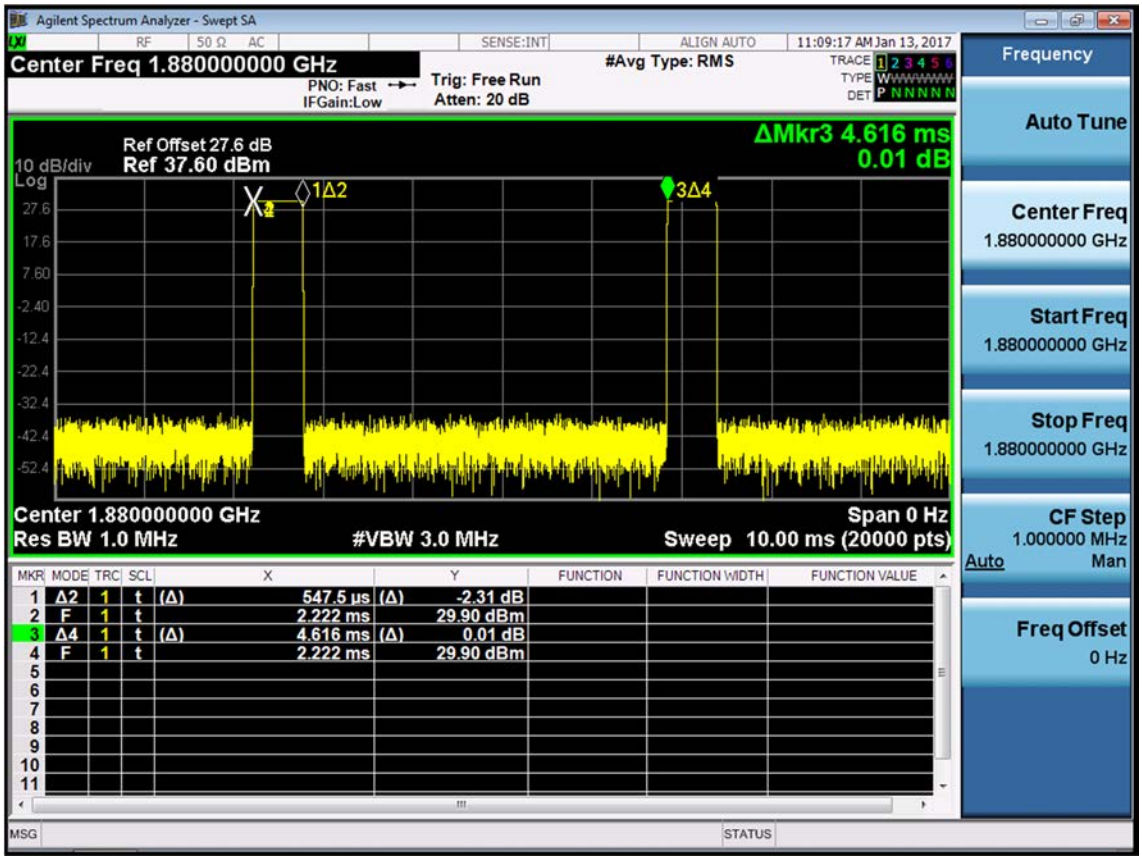


■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio P_{Pk}

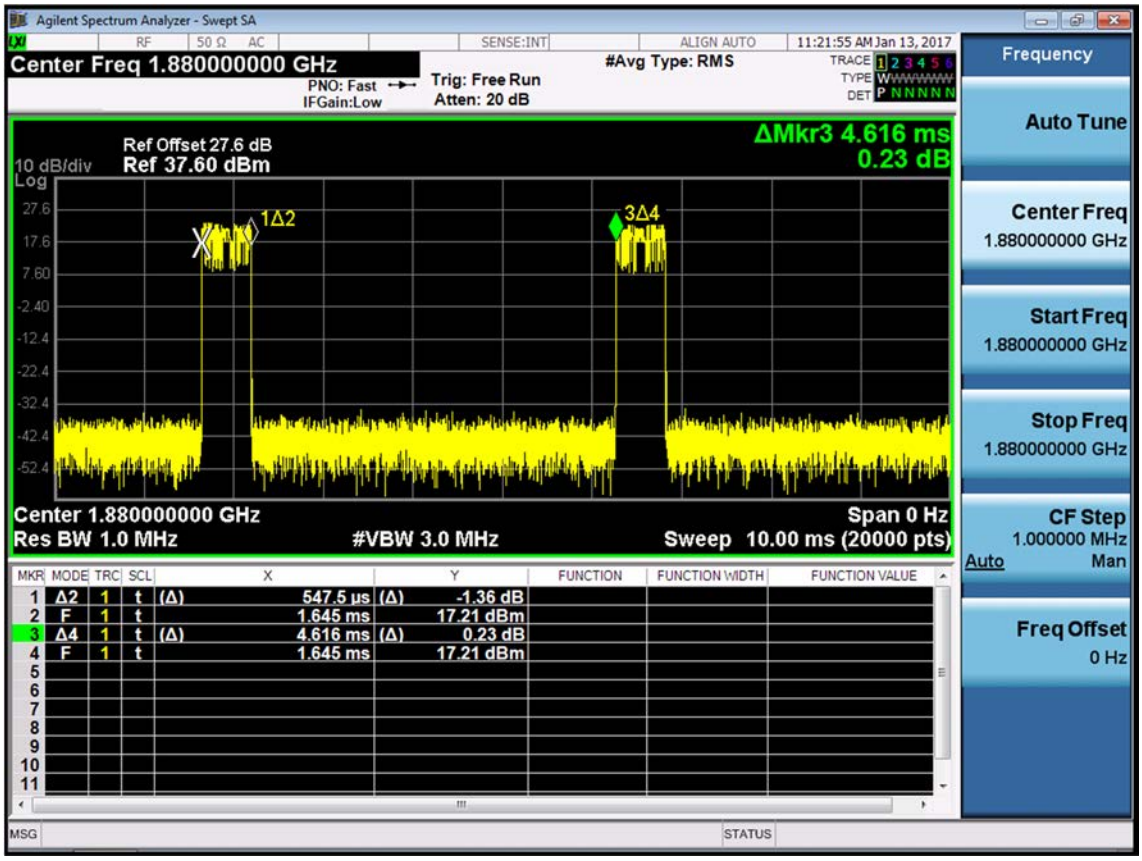
■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio P_{Avg}



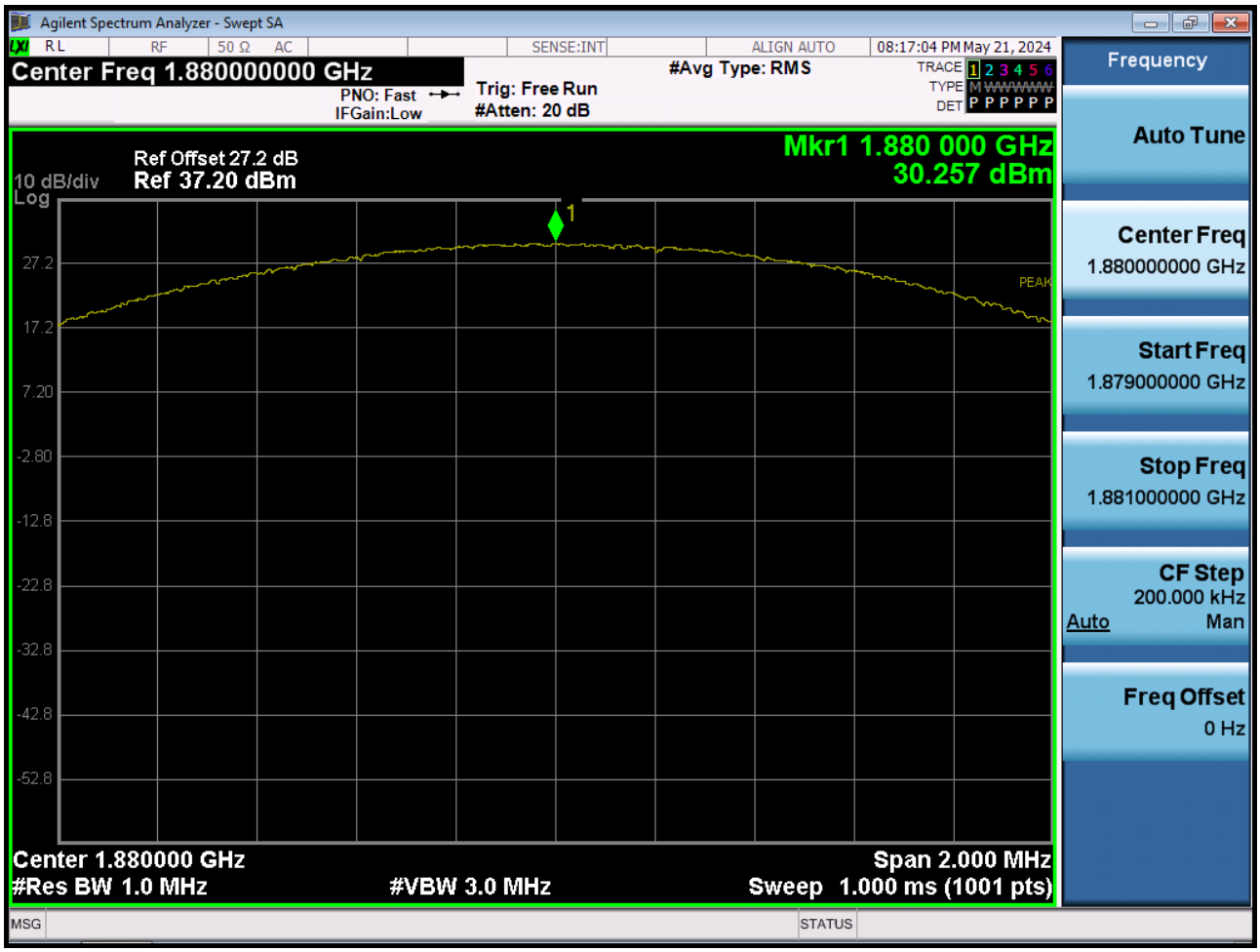
■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio Duty



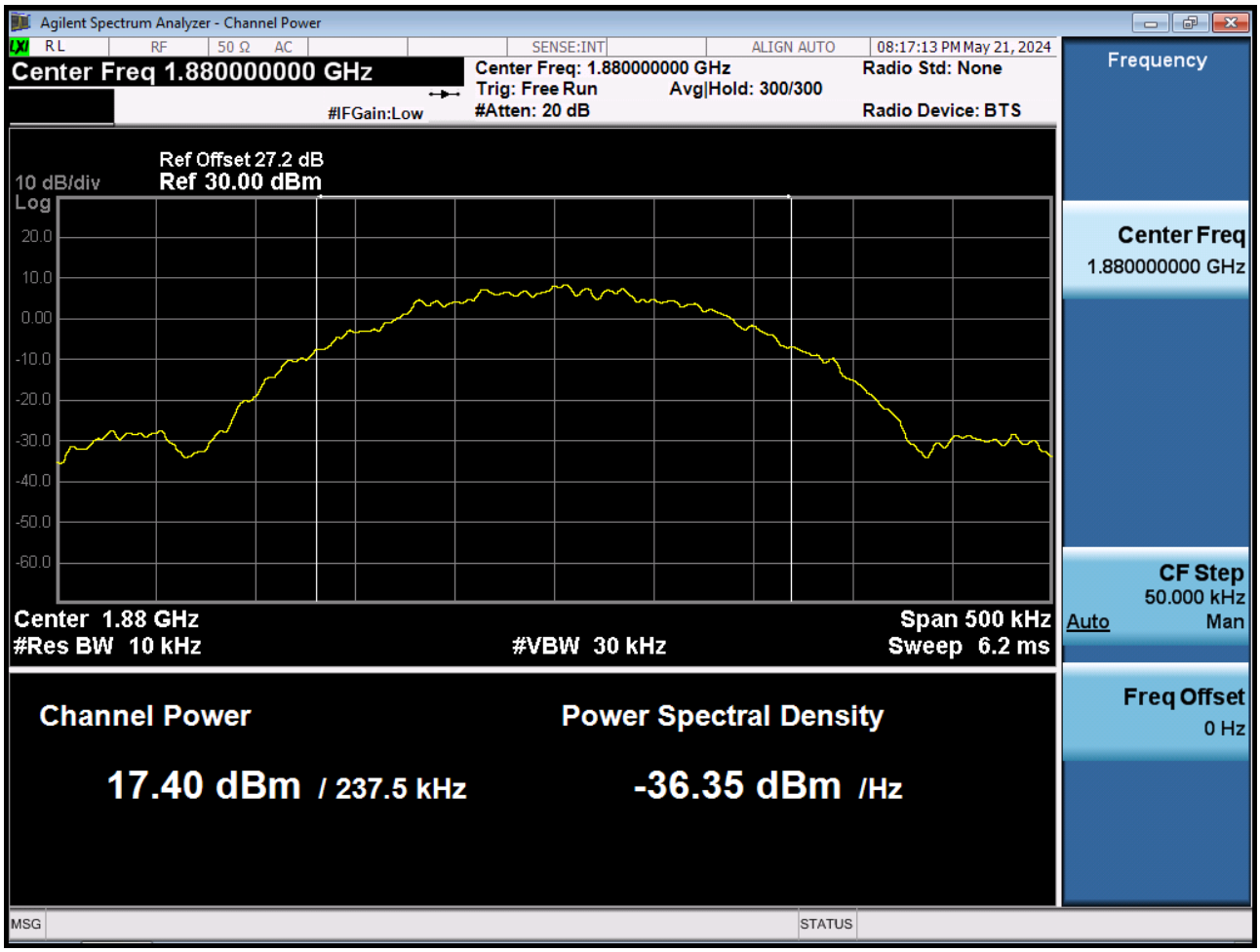
■ GSM1900 EDGE (661 CH.) Peak-to-Average Ratio Duty



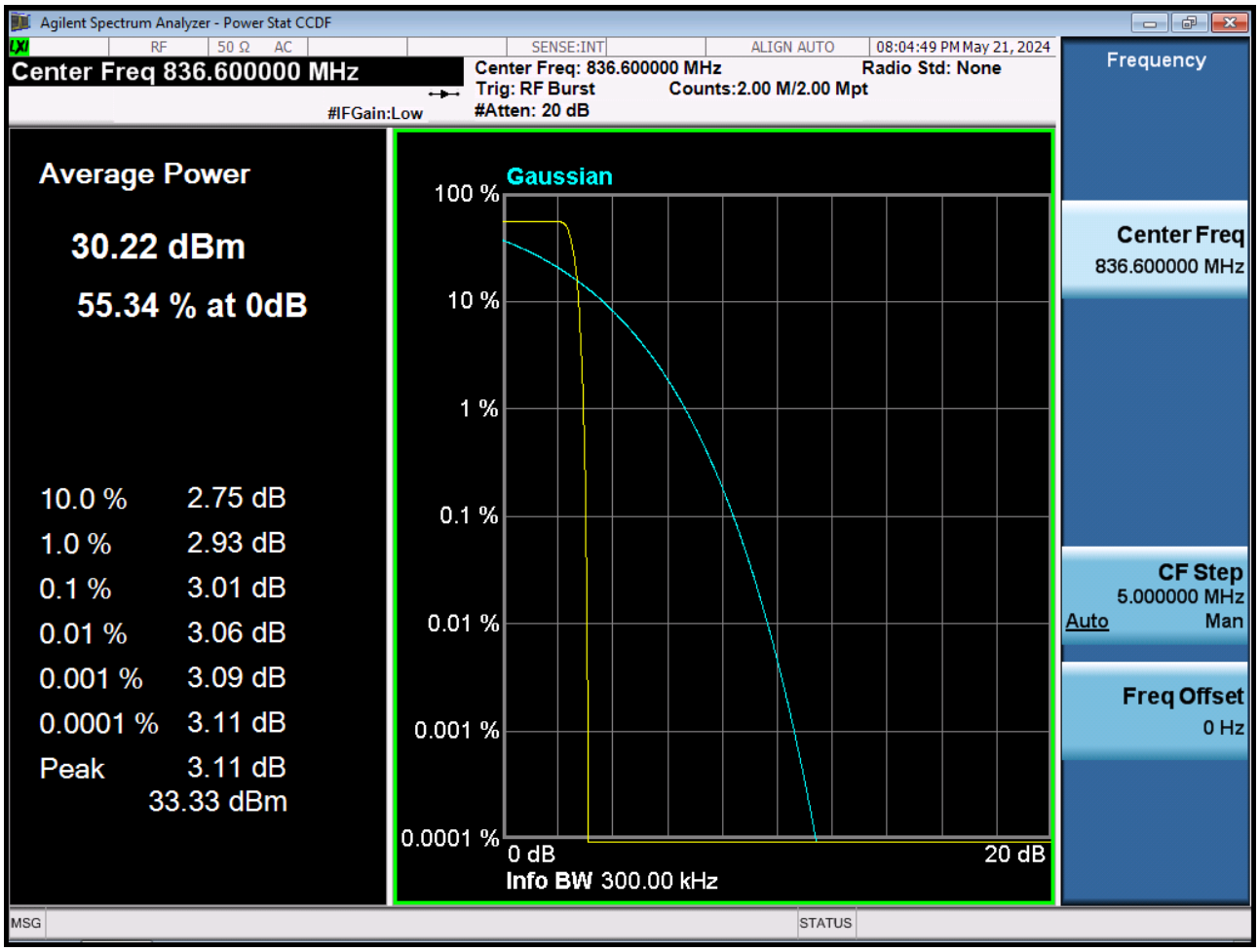
■ GSM1900 EDGE (661 CH.) Peak-to-Average Ratio P_{Pk}



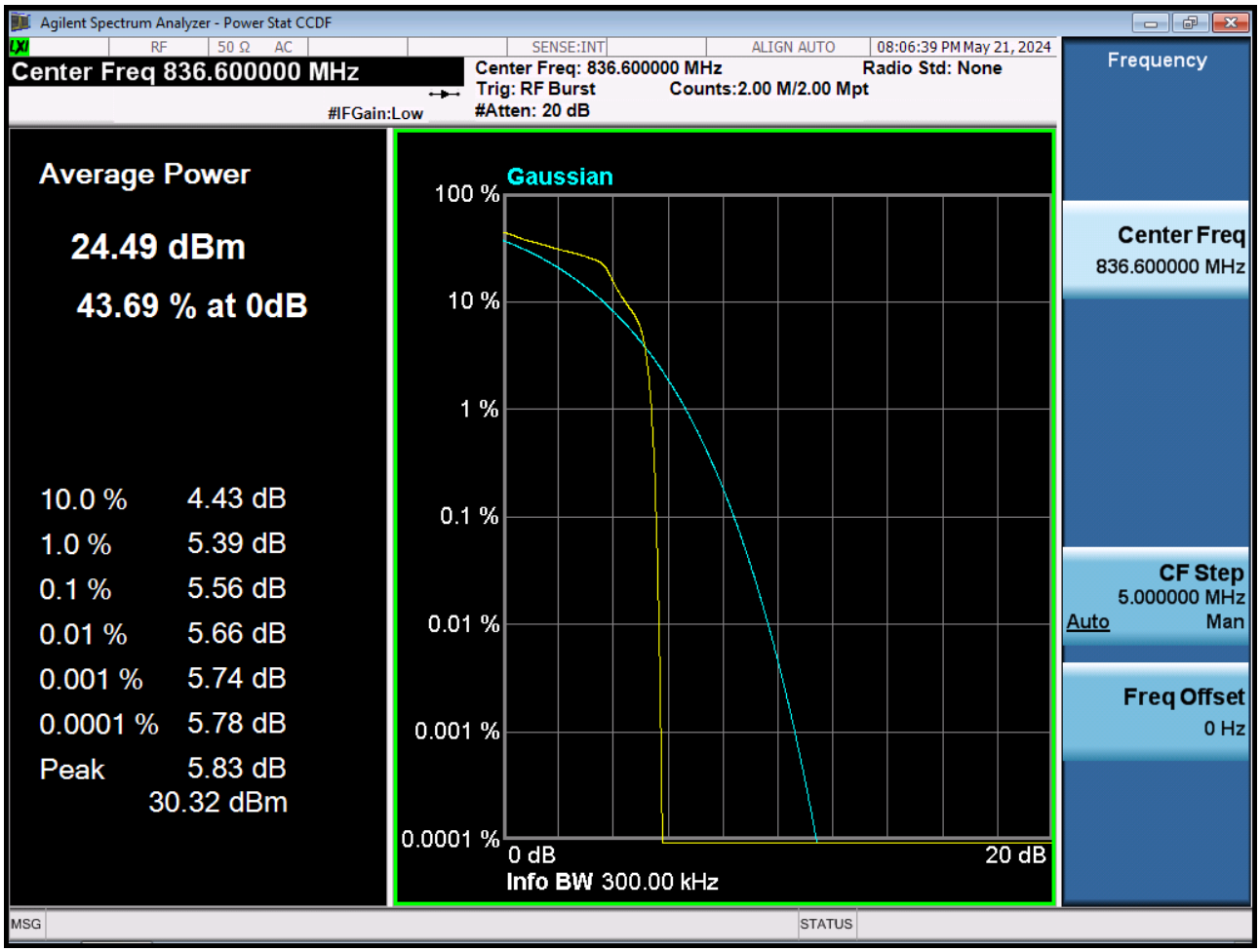
■ GSM1900 EDGE (661 CH.) Peak-to-Average Ratio P_{Avg}



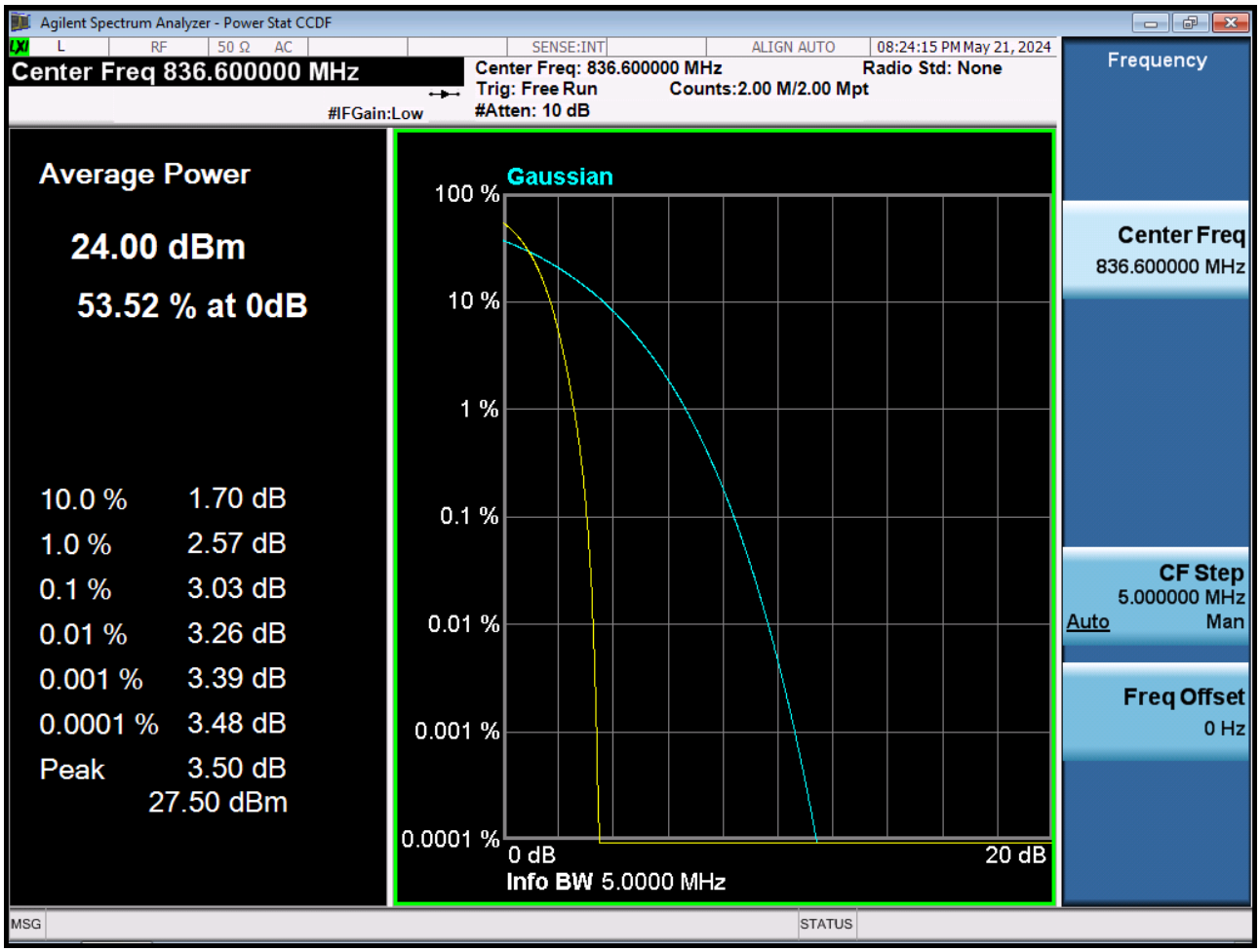
■ GSM850 MODE (190 CH.) Peak-to-Average Ratio



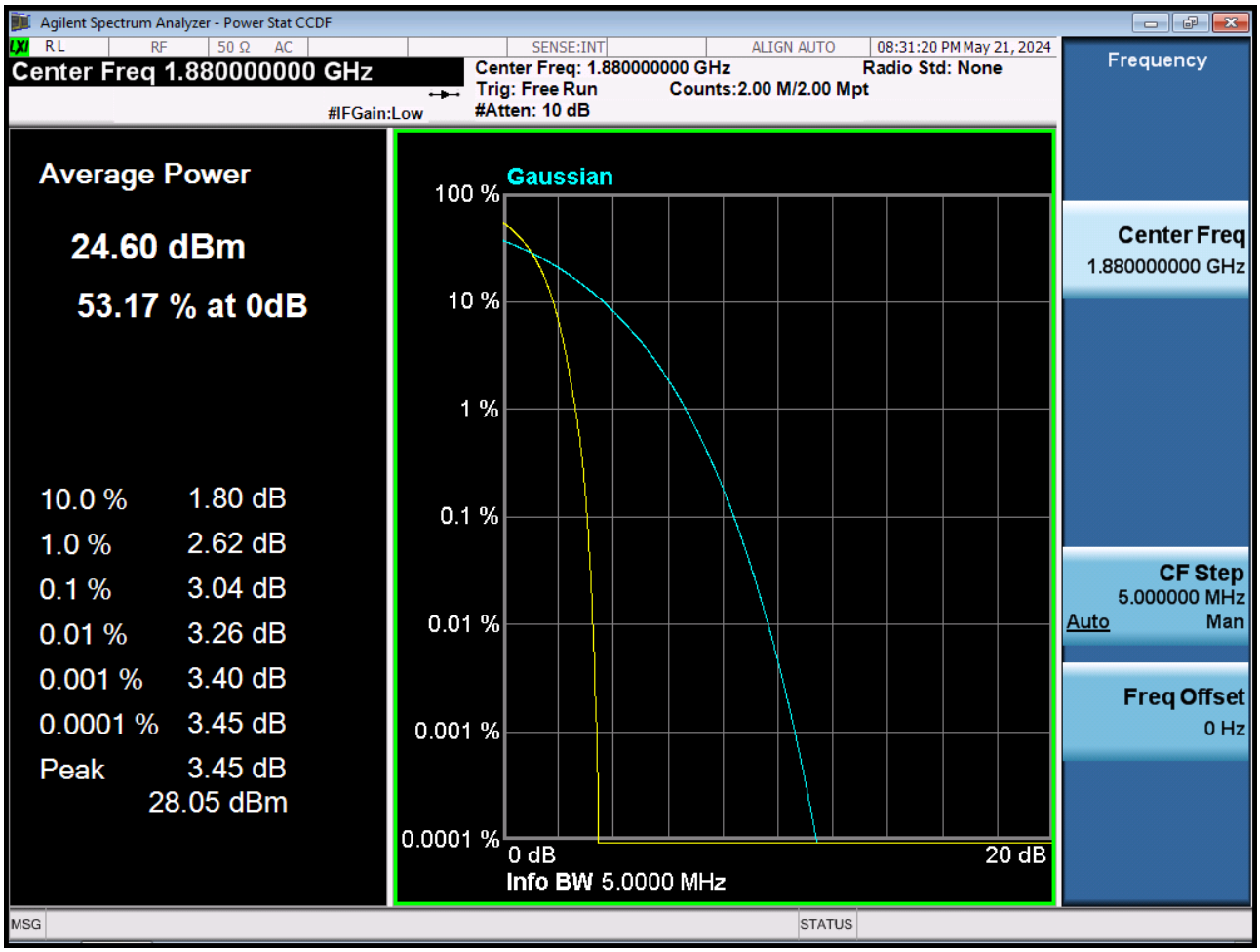
■ GSM850 EDGE (190 CH.) Peak-to-Average Ratio



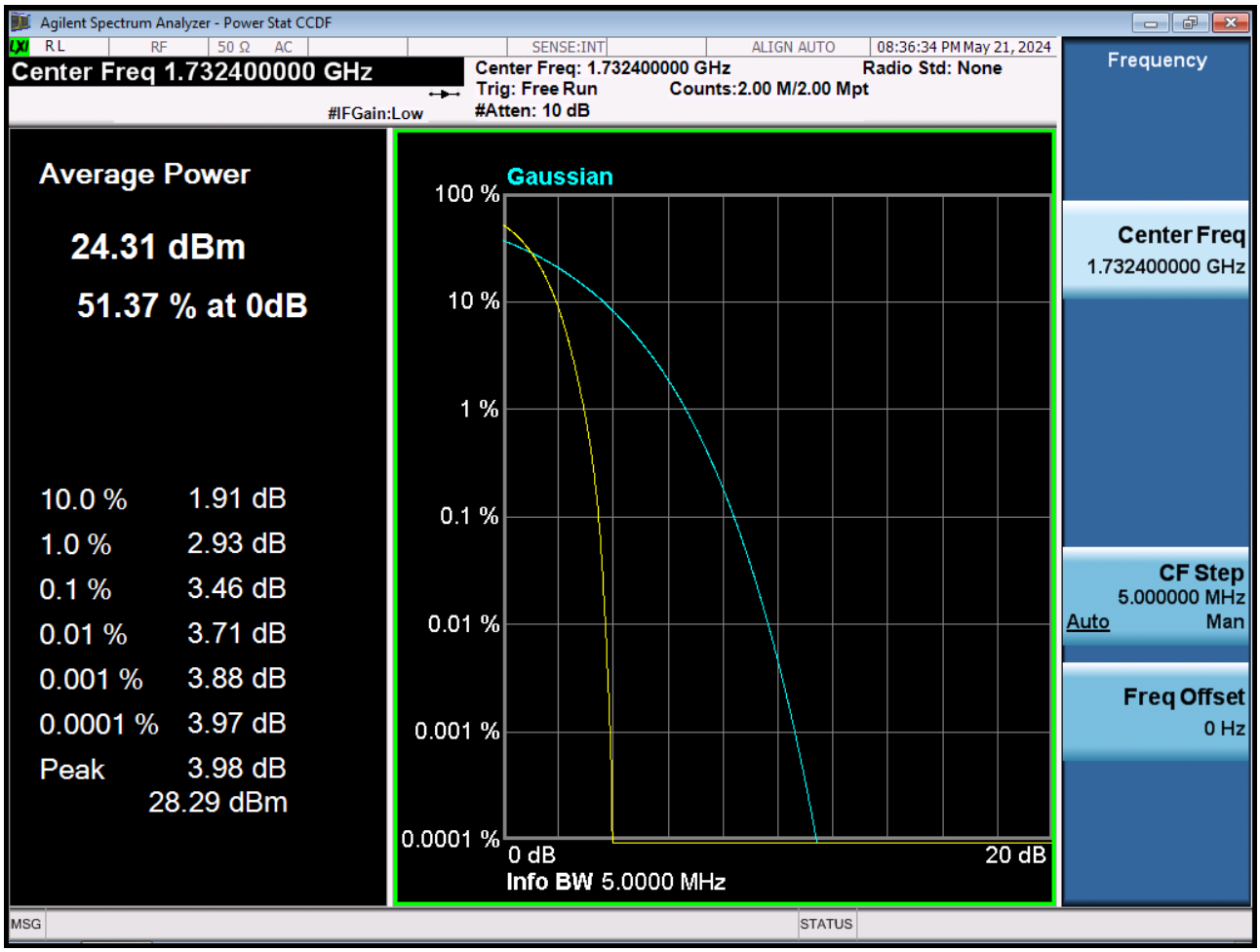
■ WCDMA850 MODE (4408 CH.) Peak-to-Average Ratio



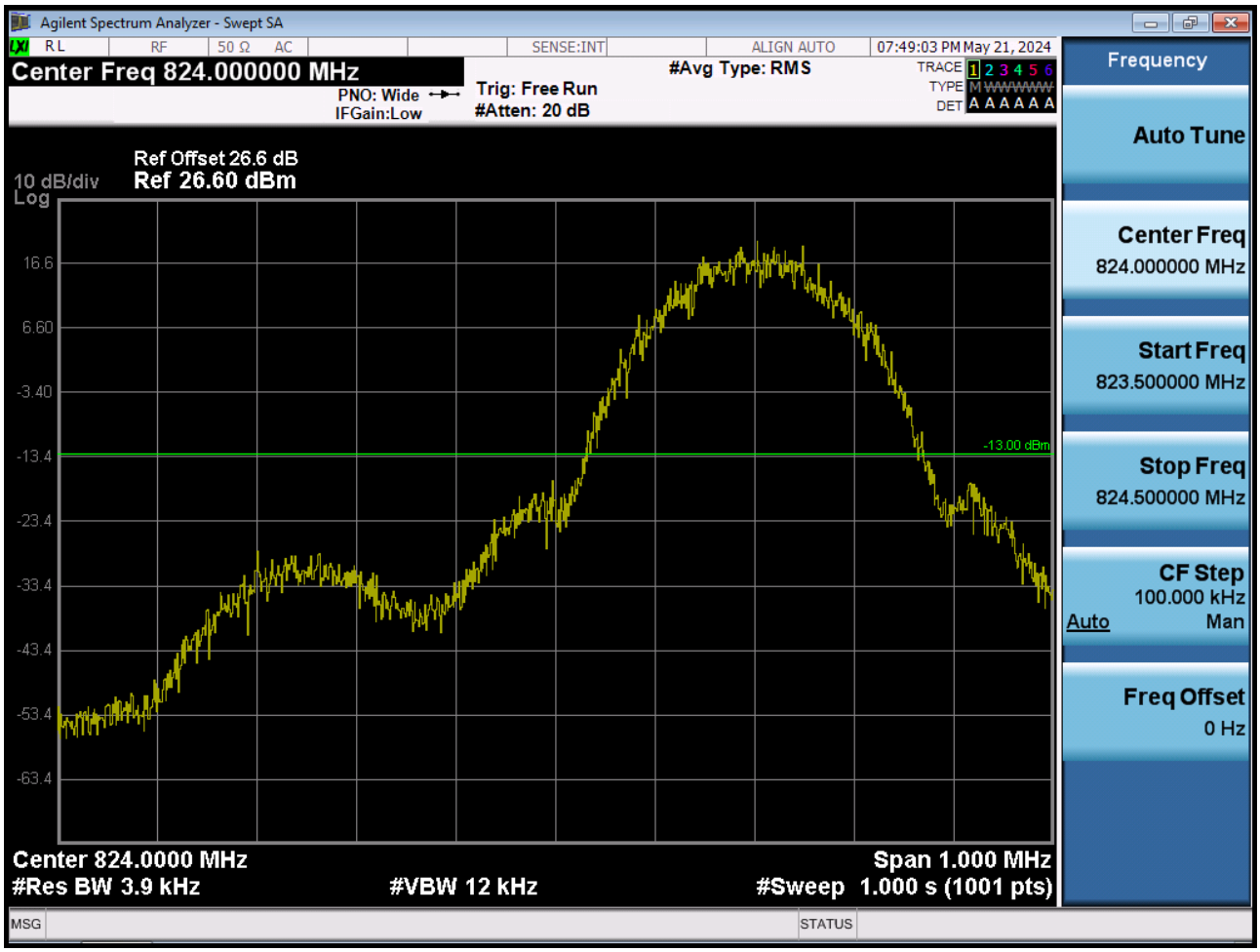
■ WCDMA1900 MODE (9400 CH.) Peak-to-Average Ratio



■ WCDMA1700 MODE (1412 CH.) Peak-to-Average Ratio



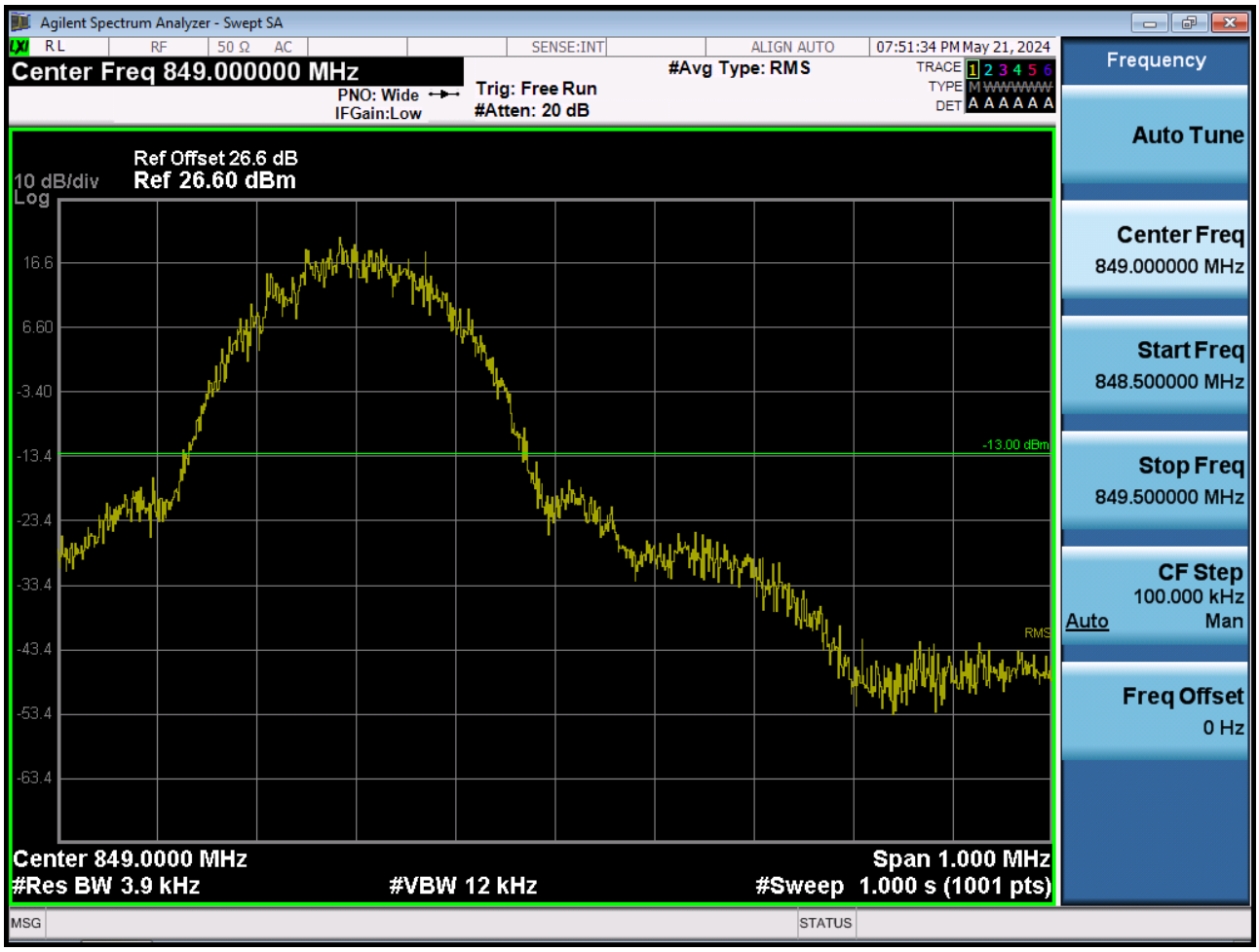
■ GSM850 MODE (128 CH.) Block Edge 1



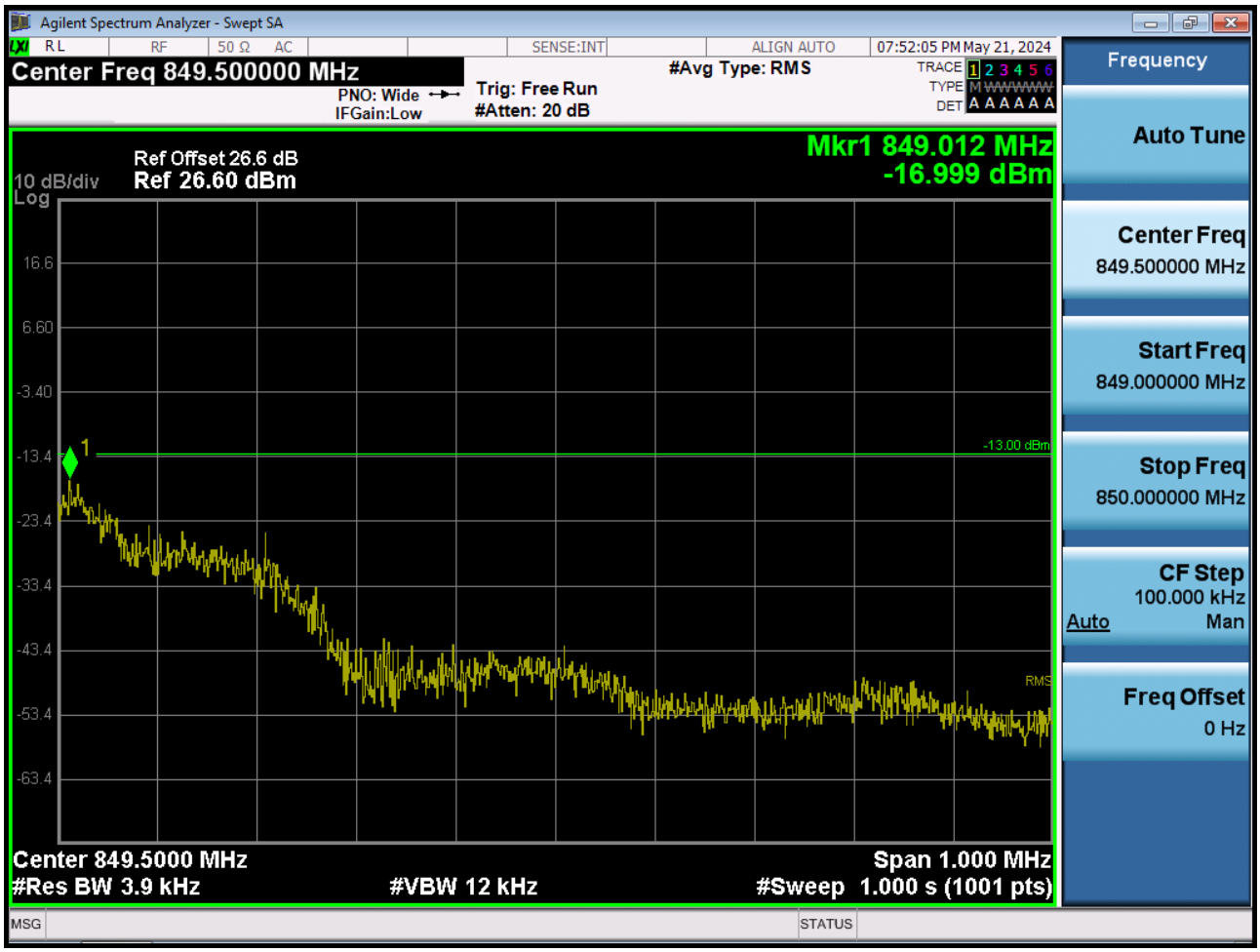
■ GSM850 MODE (128 CH.) Block Edge 2

■ GSM850 MODE (128 CH.) Block Edge 3

■ GSM850 MODE (251 CH.) Block Edge 1

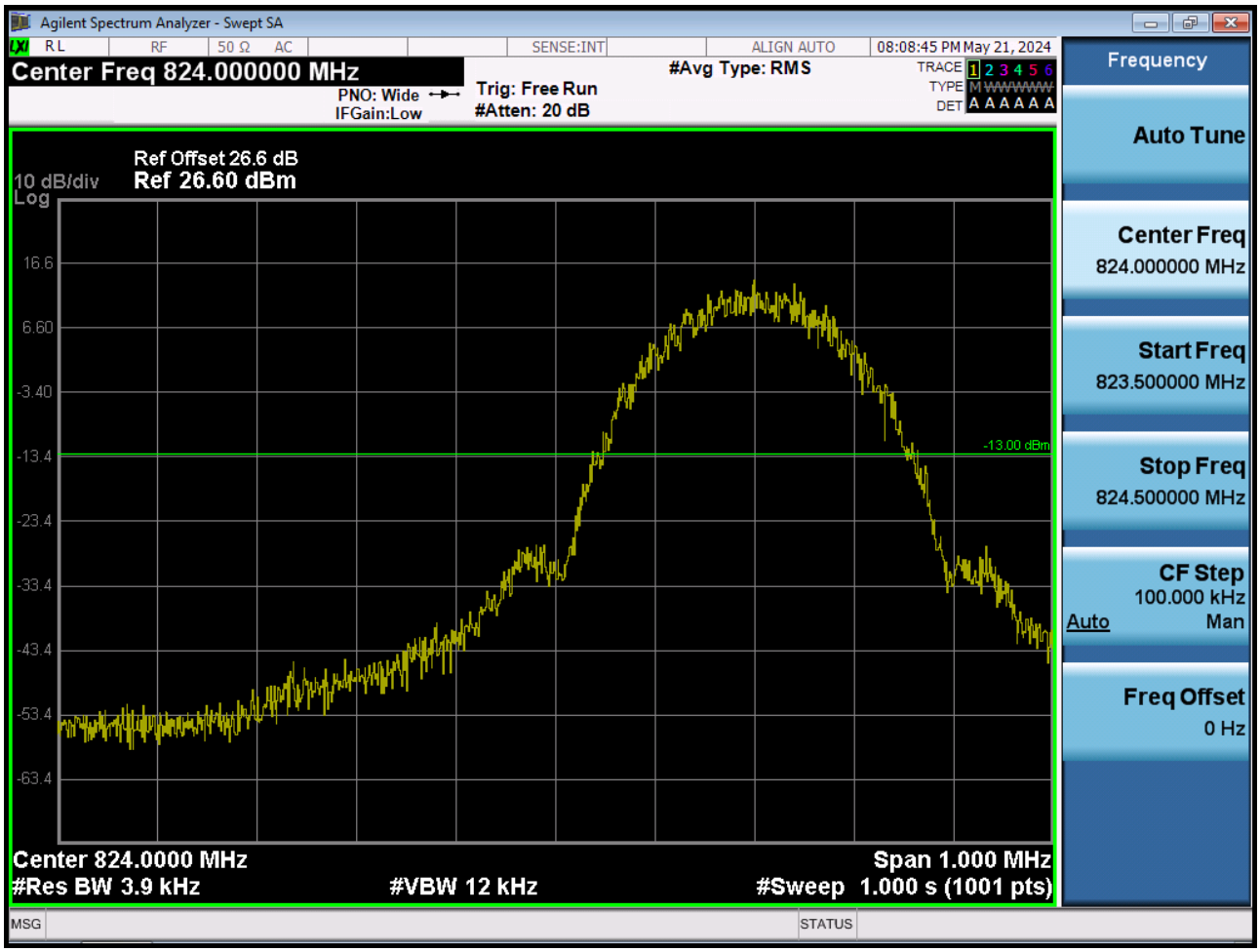


■ GSM850 MODE (251 CH.) Block Edge 2

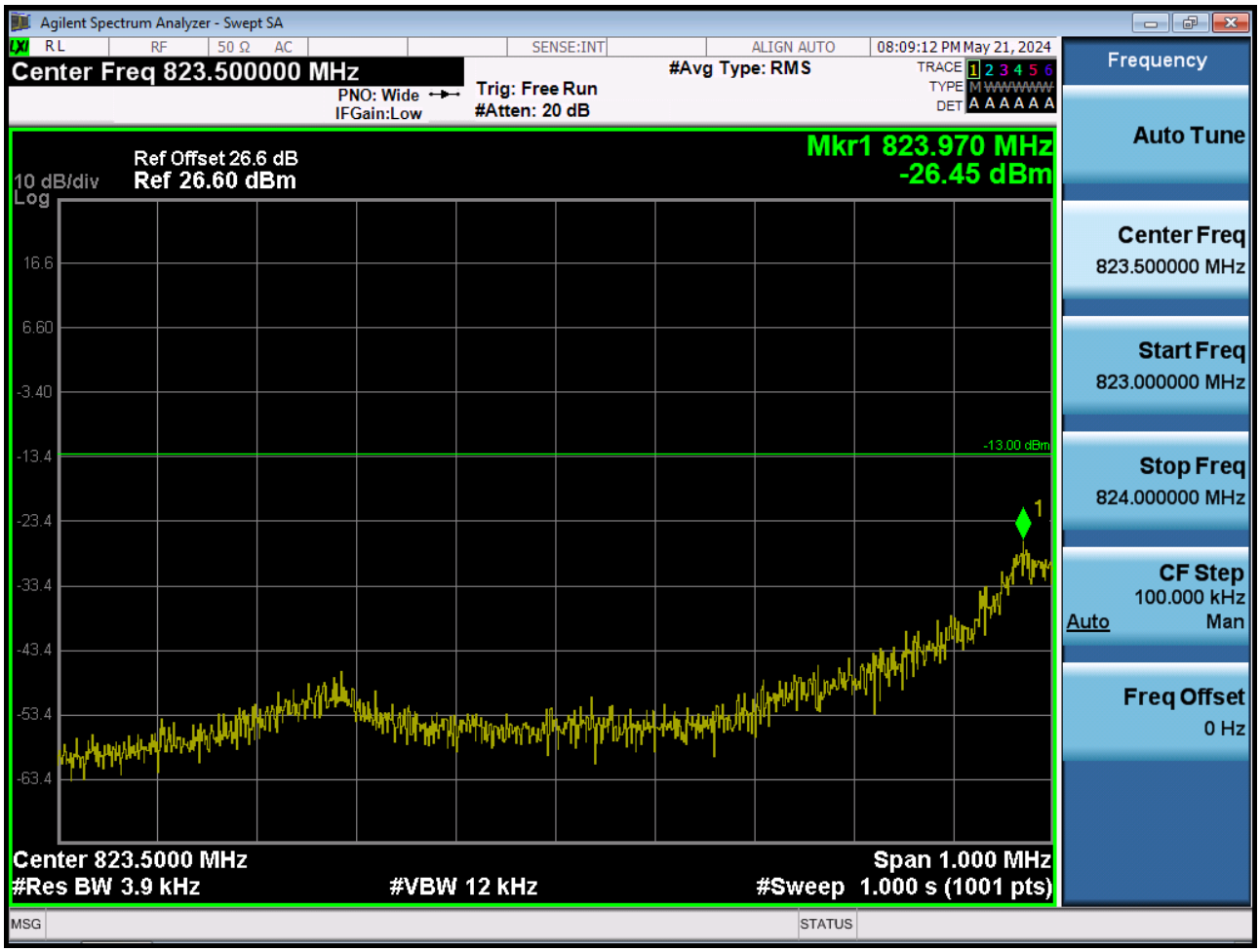


■ GSM850 MODE (251 CH.) Block Edge 3

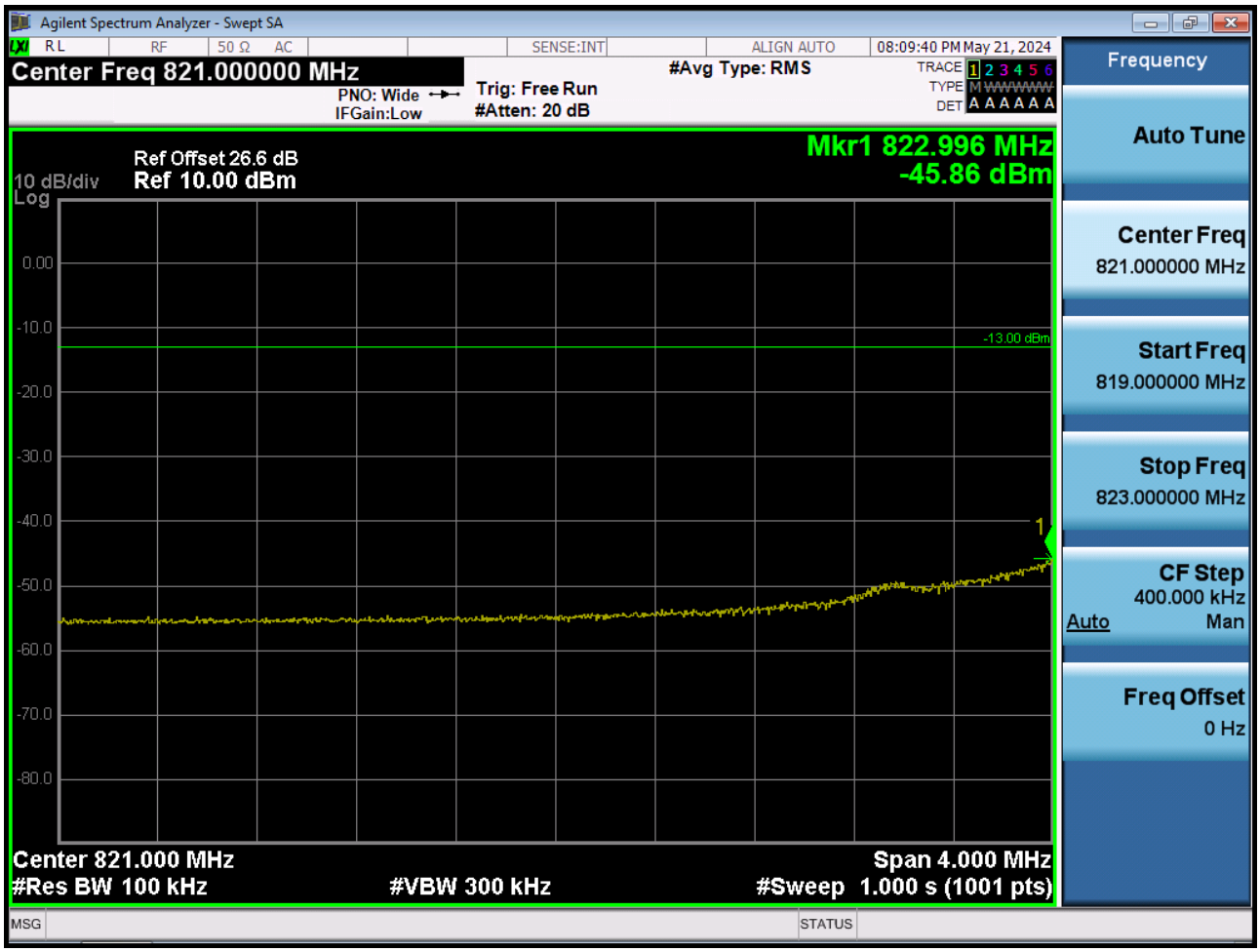
■ EDGE MODE (128 CH.) Block Edge 1



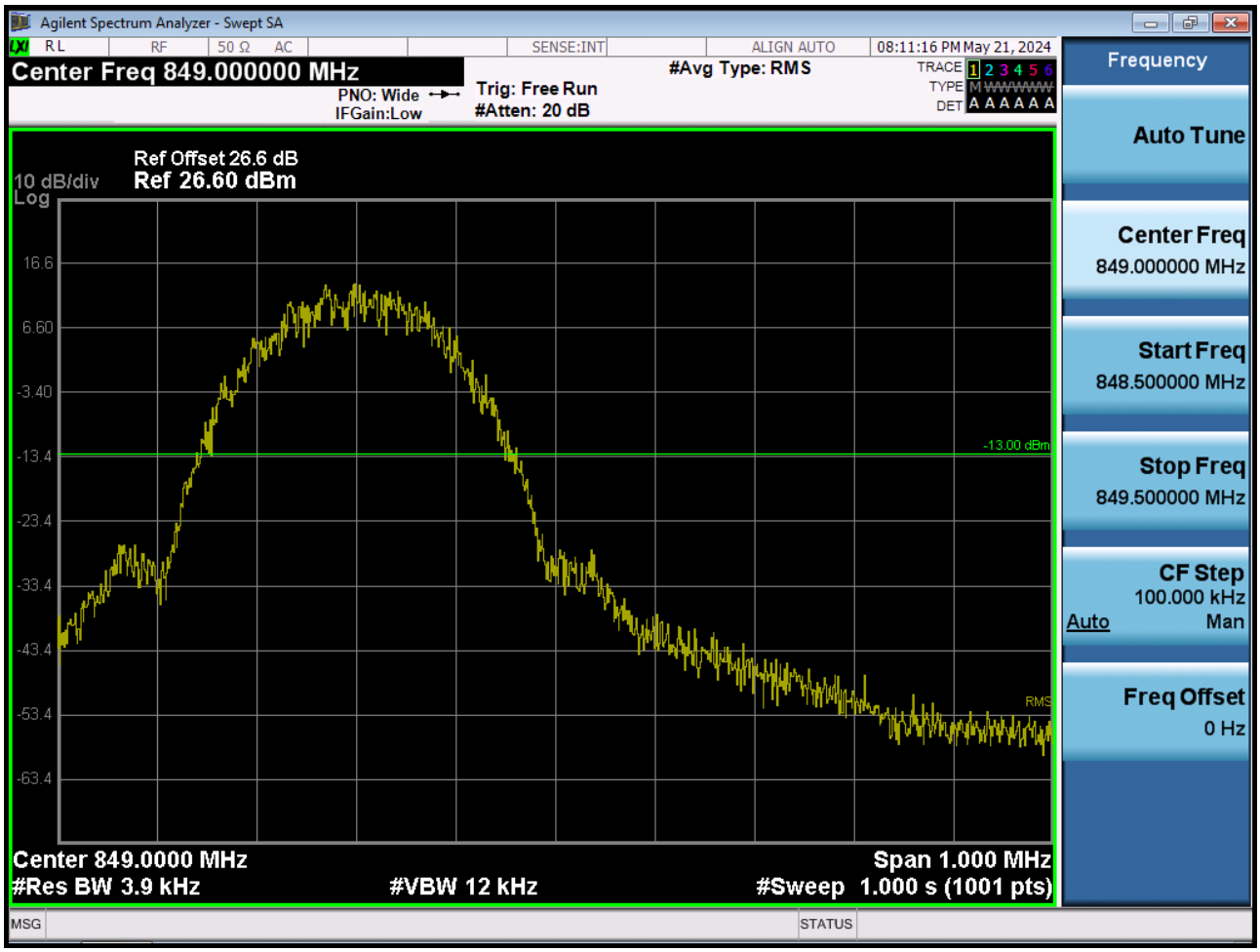
■ EDGE MODE (128 CH.) Block Edge 2



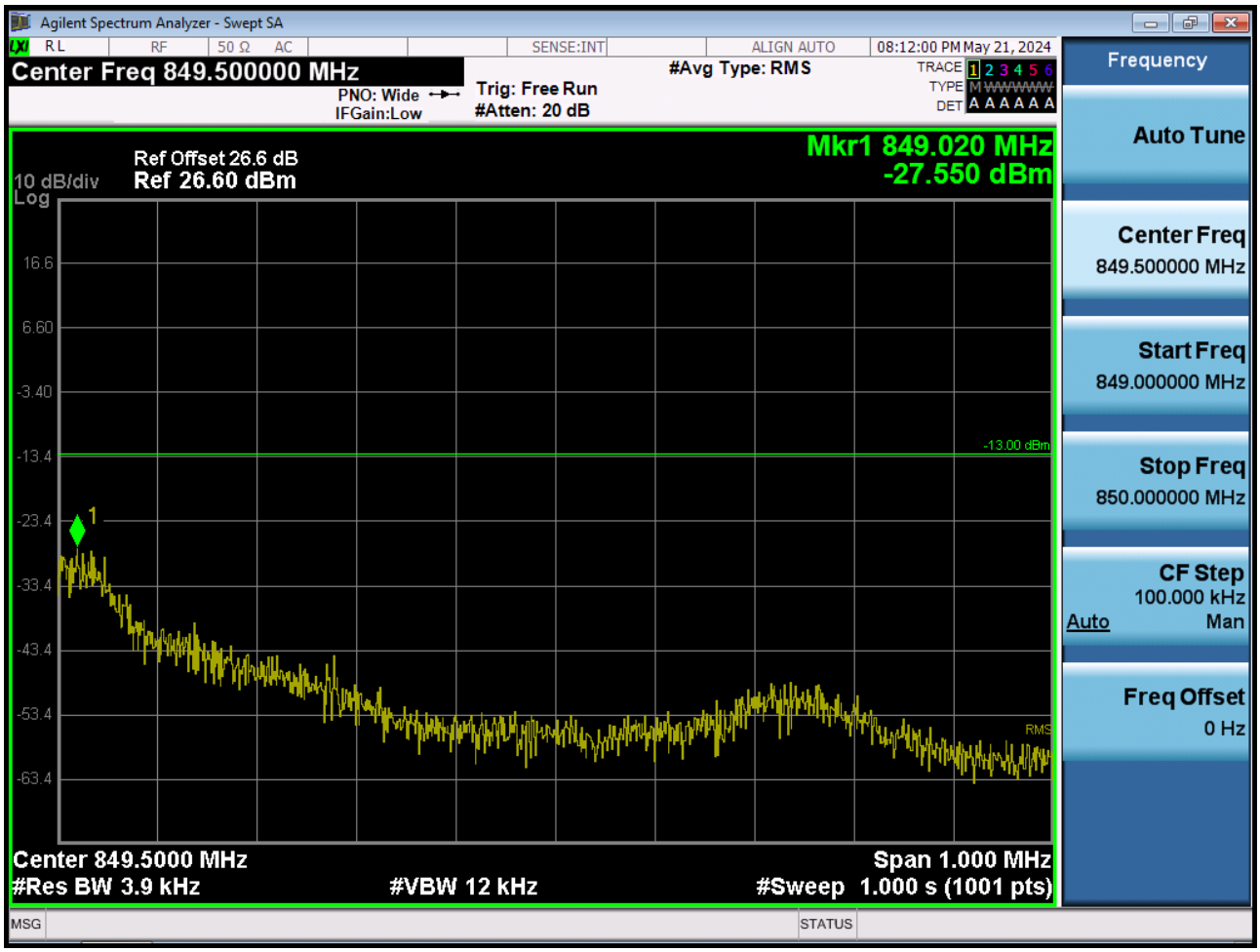
■ EDGE MODE (128 CH.) Block Edge 3



■ EDGE MODE (251 CH.) Block Edge 1

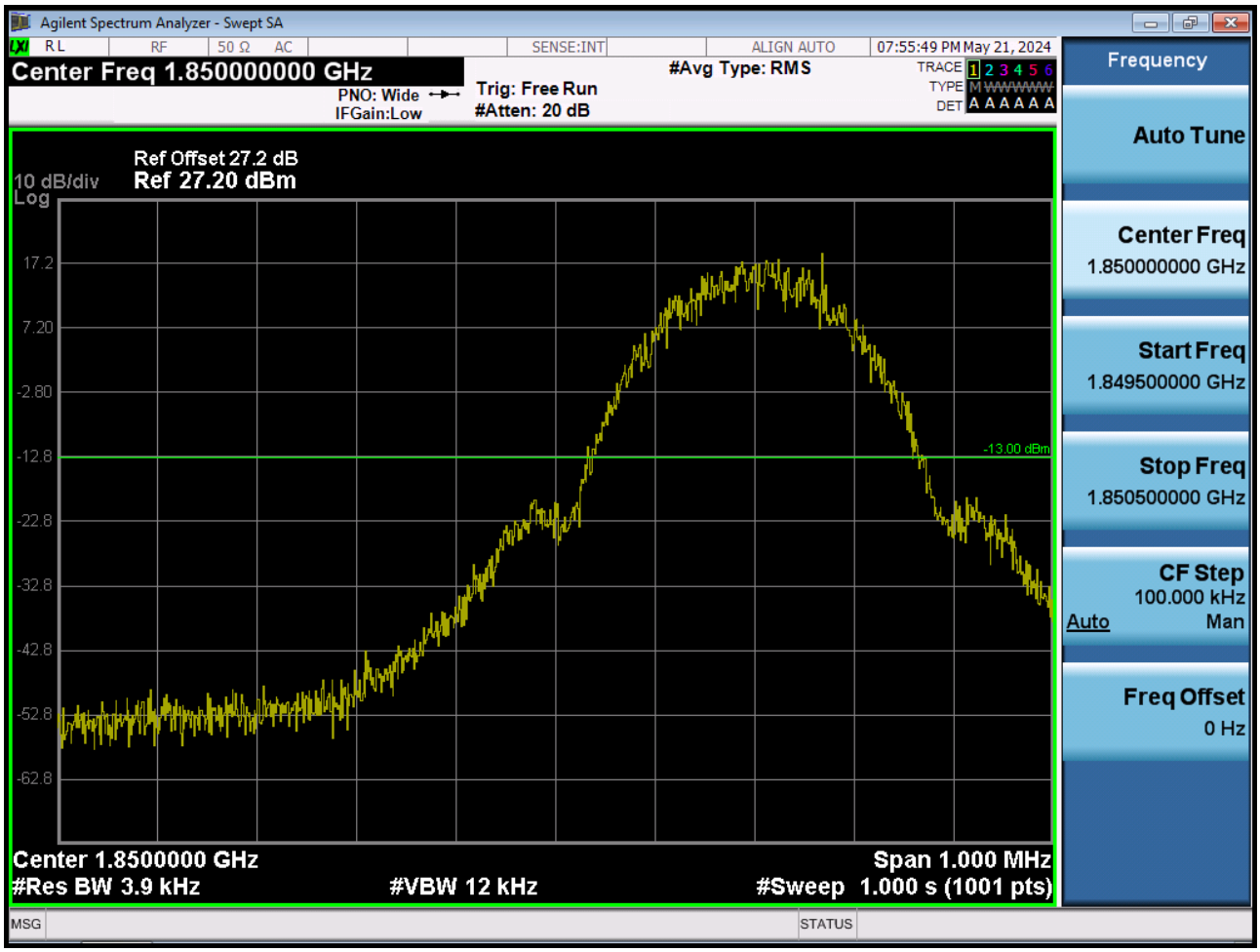


■ EDGE MODE (251 CH.) Block Edge 2

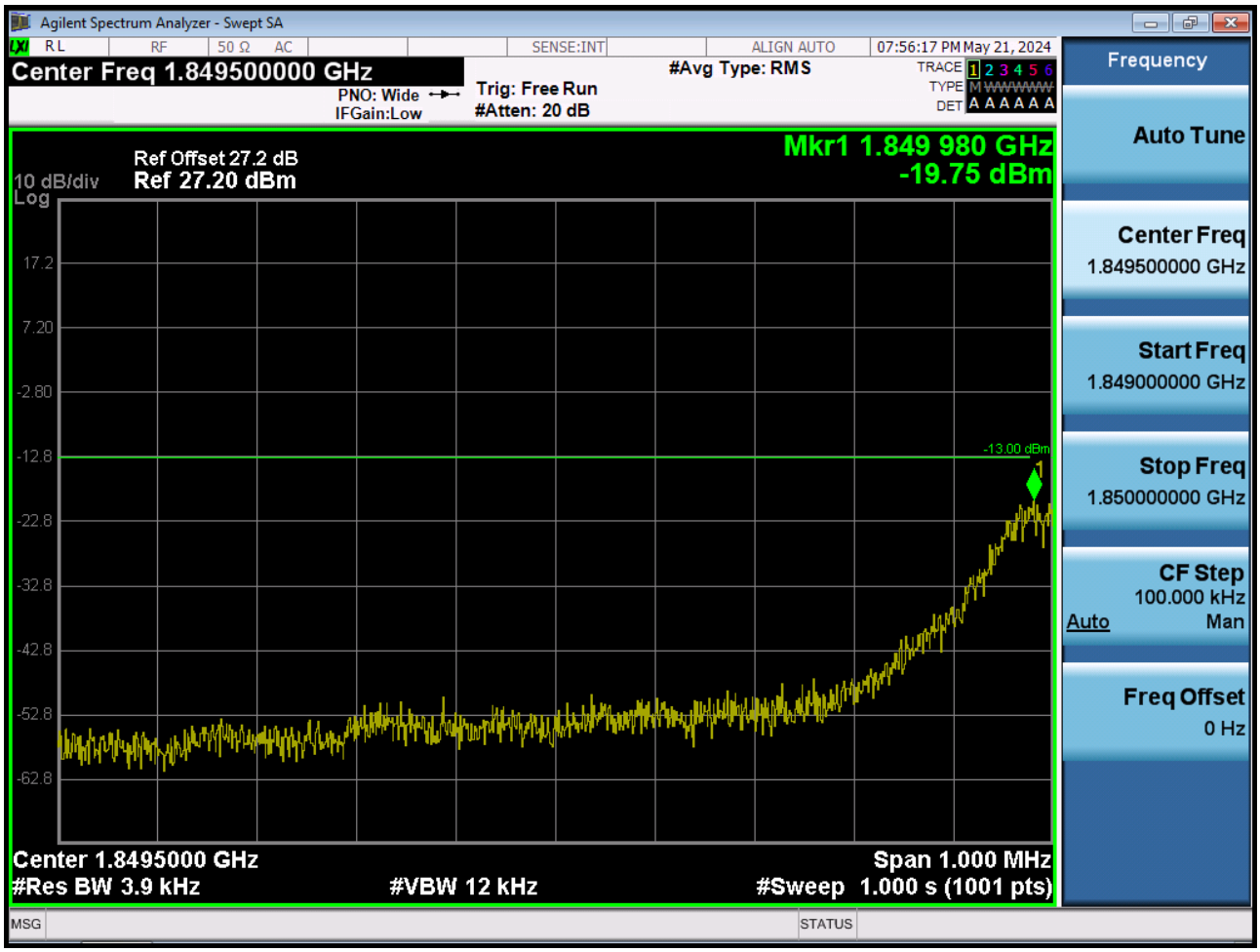


■ EDGE MODE (251 CH.) Block Edge 3

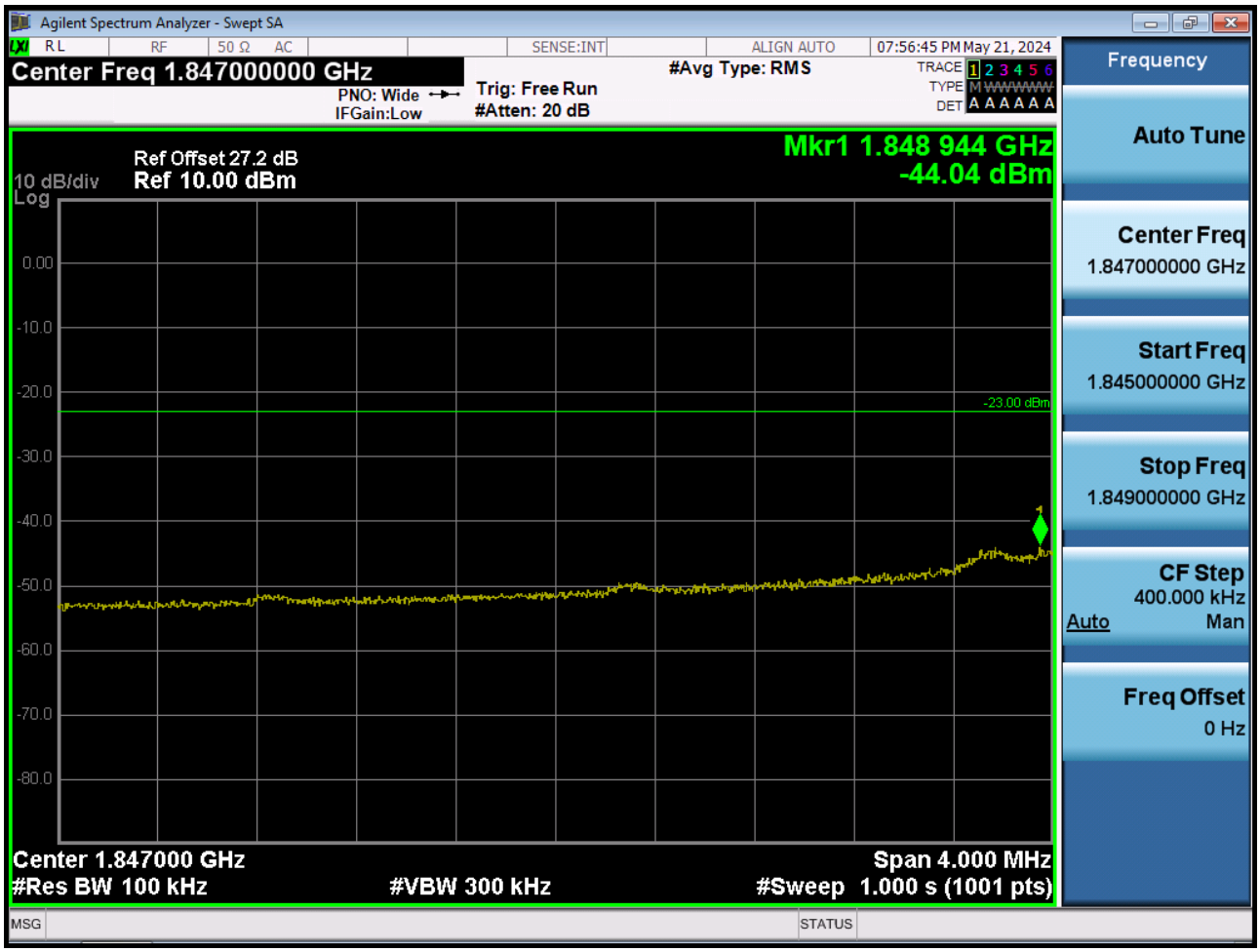
■ GSM1900 MODE (512 CH.) Block Edge 1



■ GSM1900 MODE (512 CH.) Block Edge 2



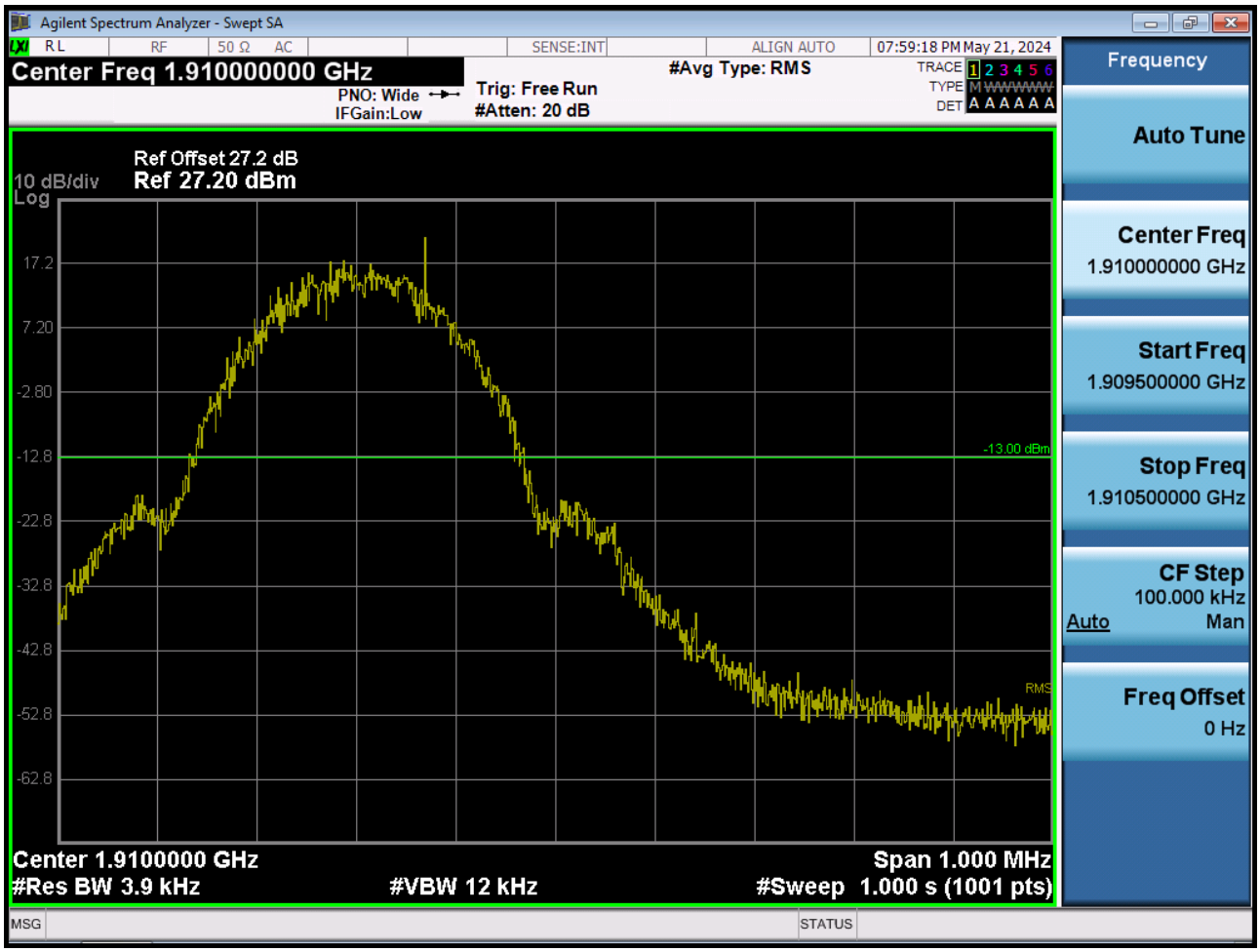
■ GSM1900 MODE (512 CH.) Block Edge 3



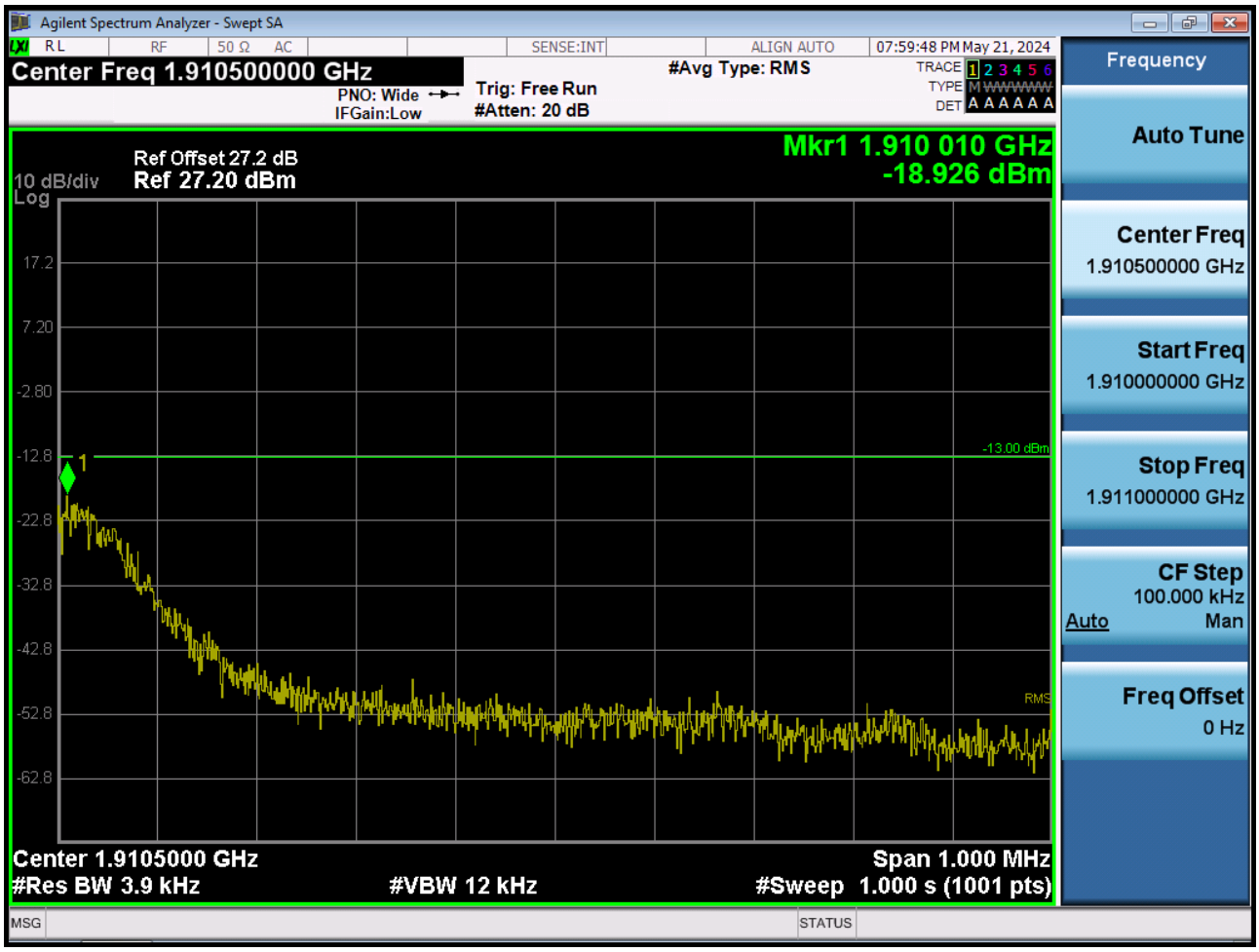
Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -44.04 dBm + 10 dB = -34.04 dBm

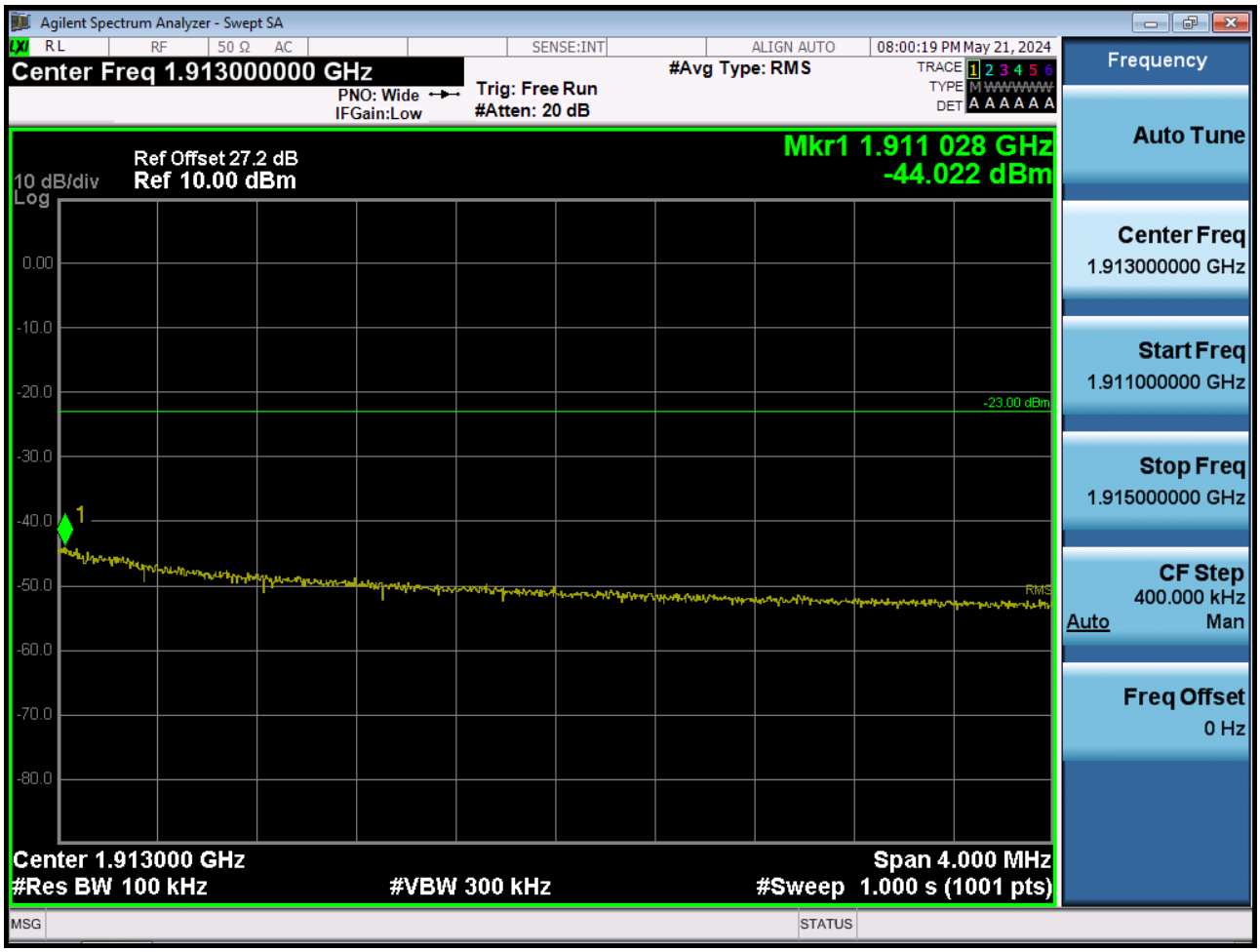
■ GSM1900 MODE (810 CH.) Block Edge 1



■ GSM1900 MODE (810 CH.) Block Edge 2



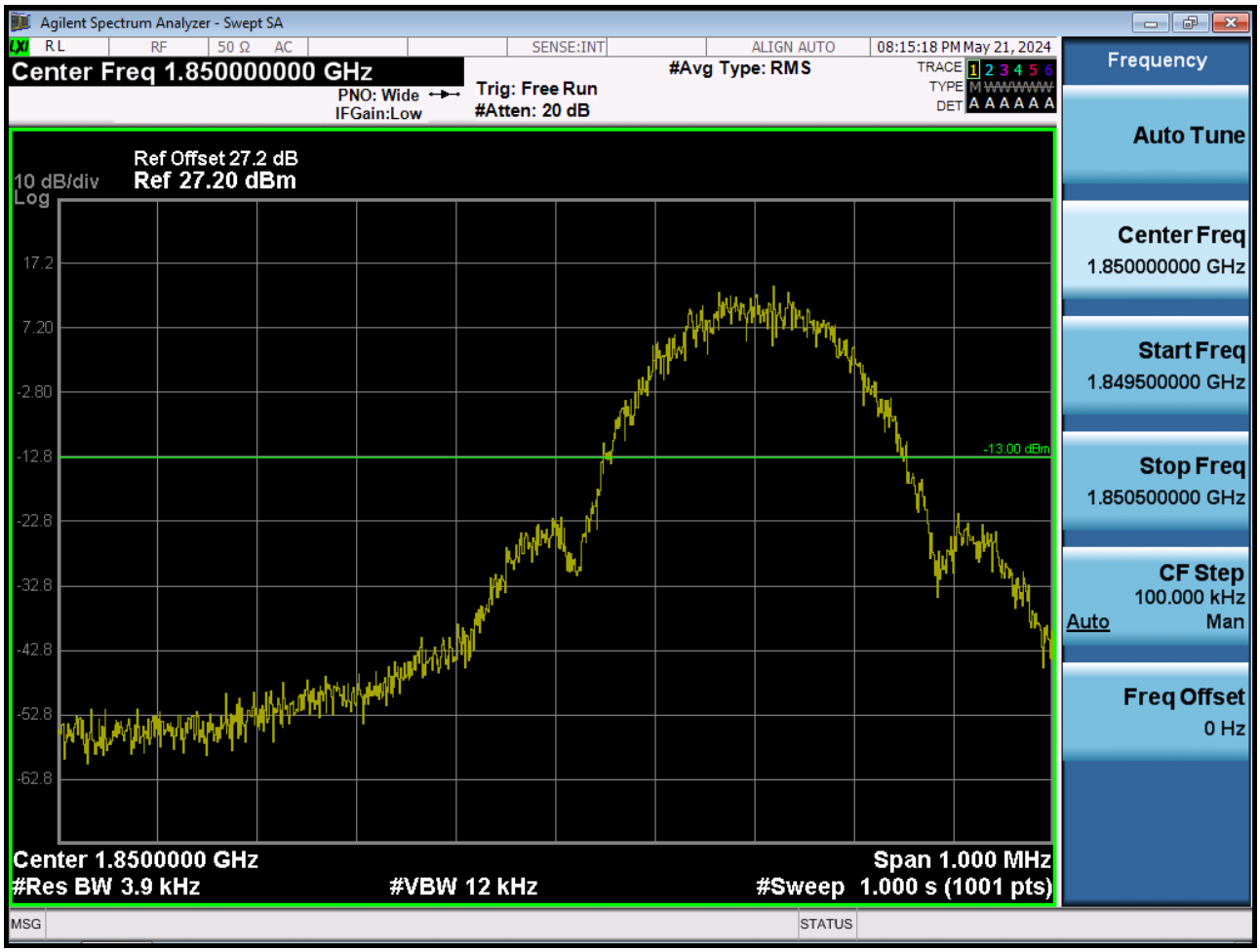
■ GSM1900 MODE (810 CH.) Block Edge 3



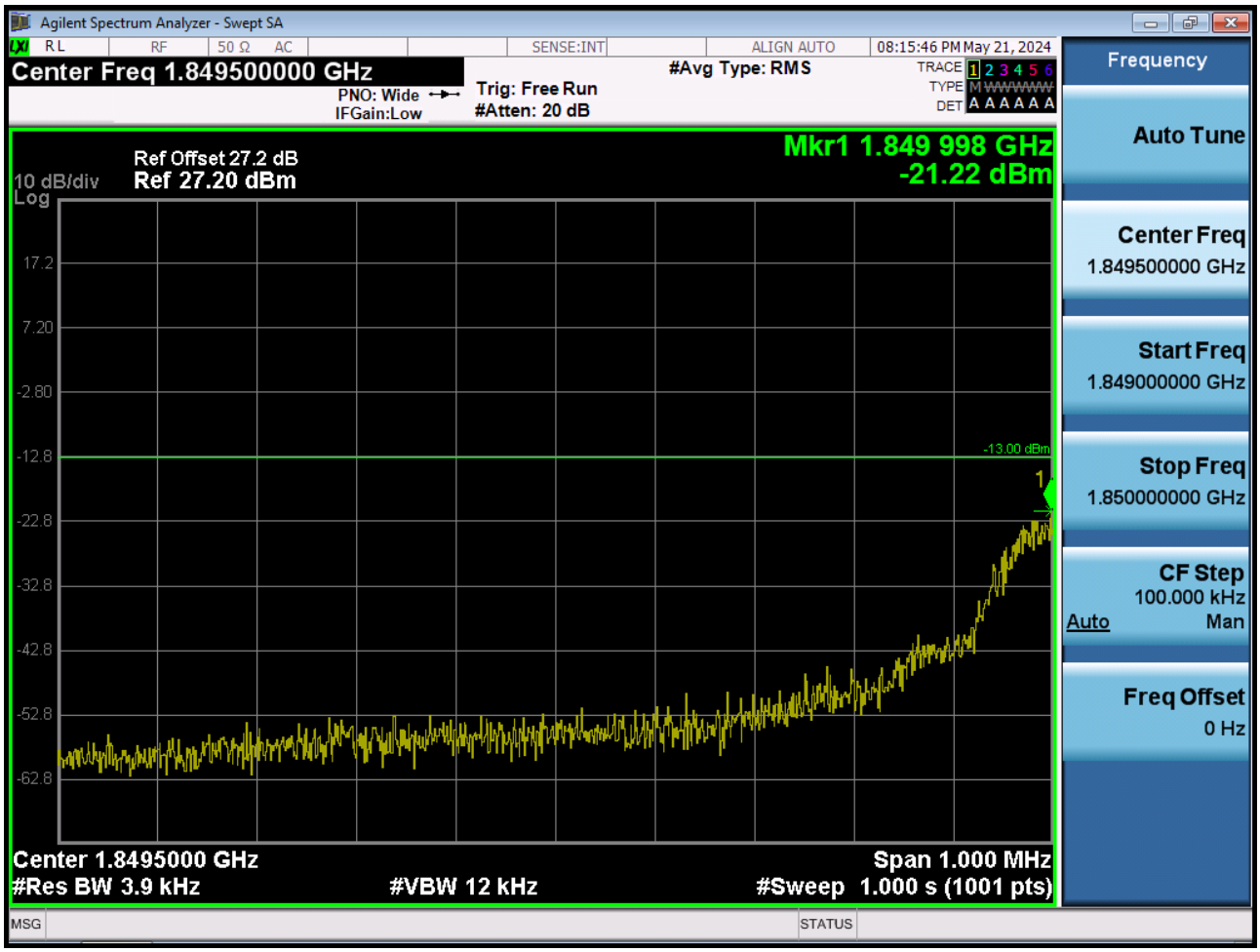
Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -44.022 dBm + 10 dB = -34.022 dBm

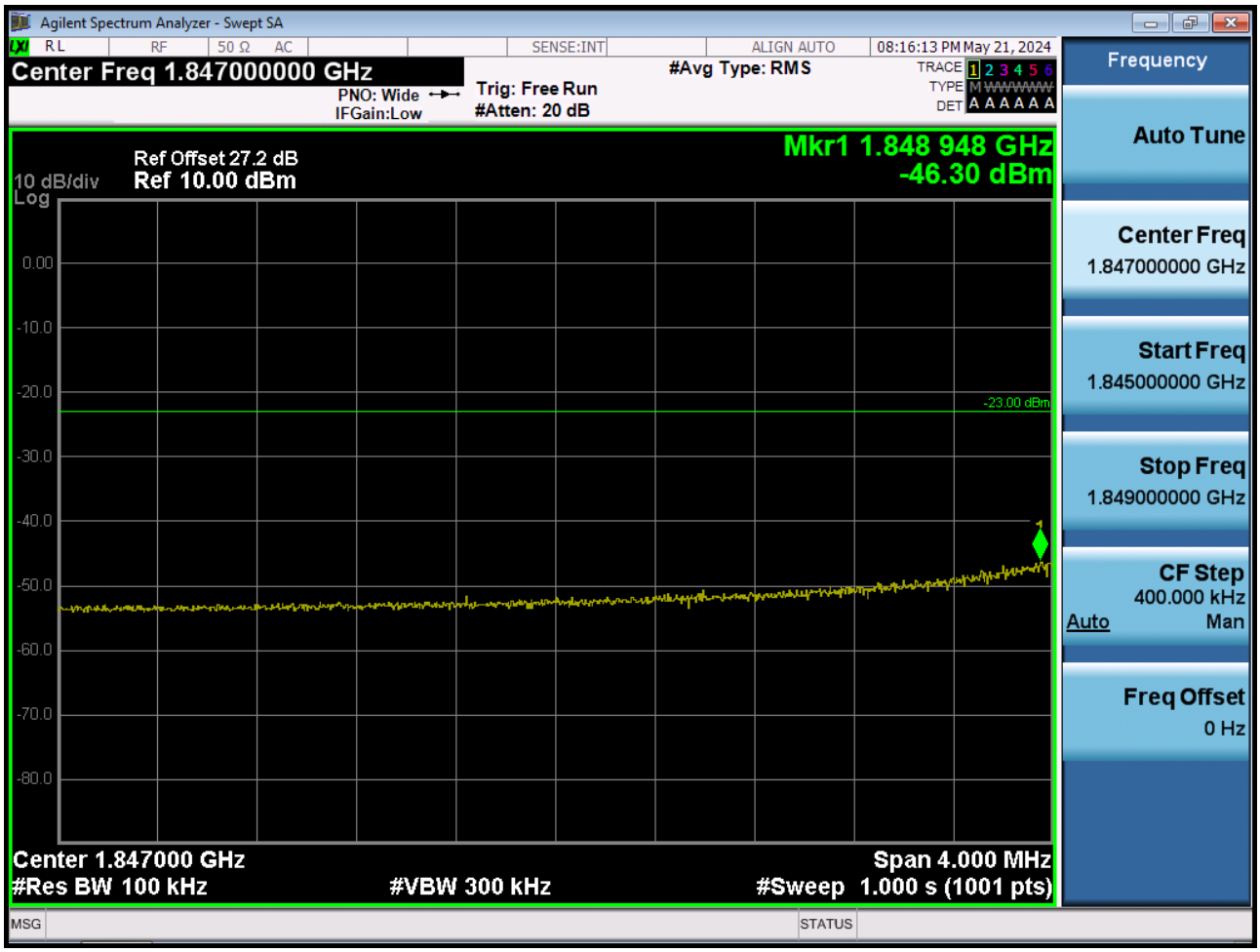
■ EDGE MODE (512 CH.) Block Edge 1



■ EDGE MODE (512 CH.) Block Edge 2



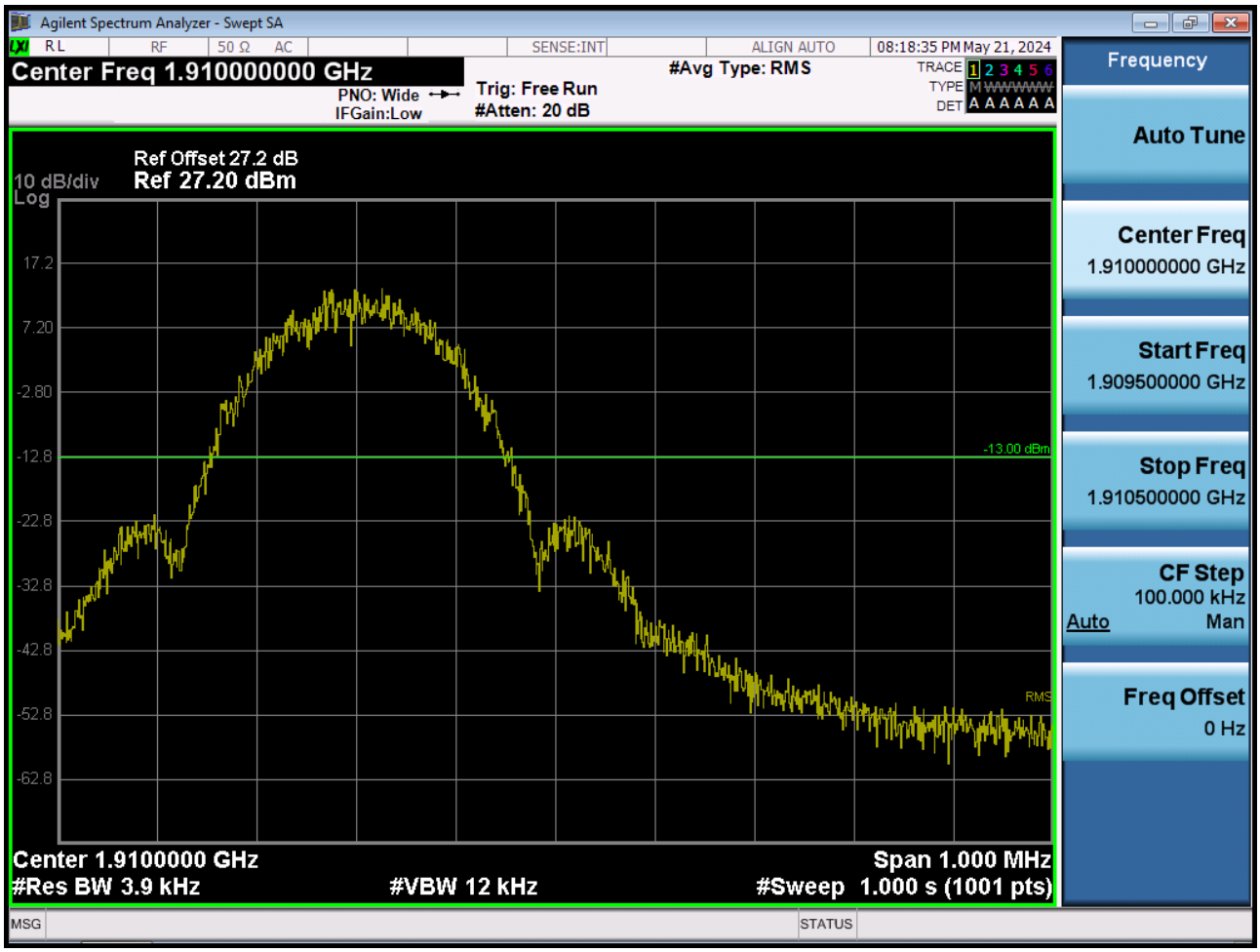
■ EDGE MODE (512 CH.) Block Edge 3



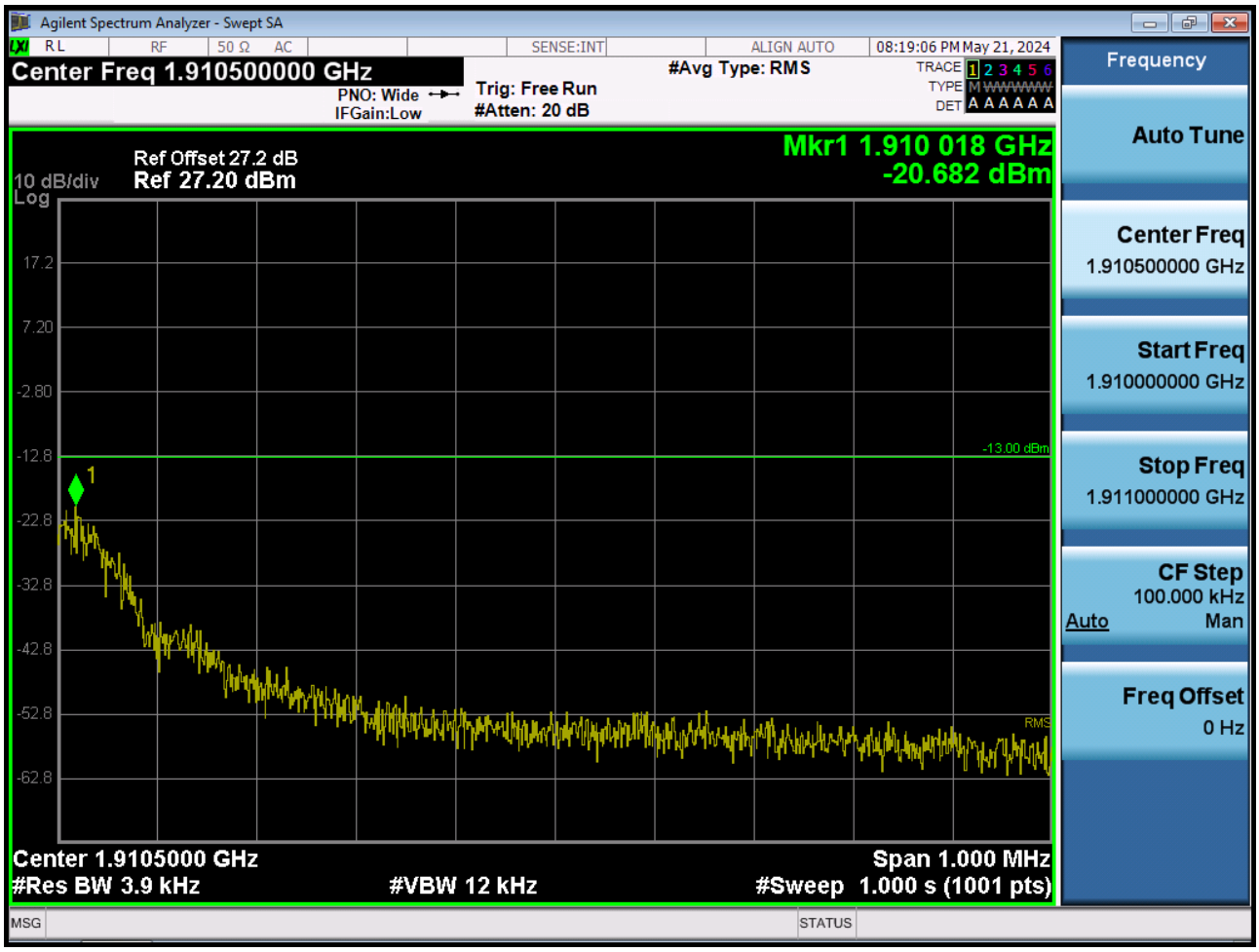
Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -46.30 dBm + 10 dB = -36.30 dBm

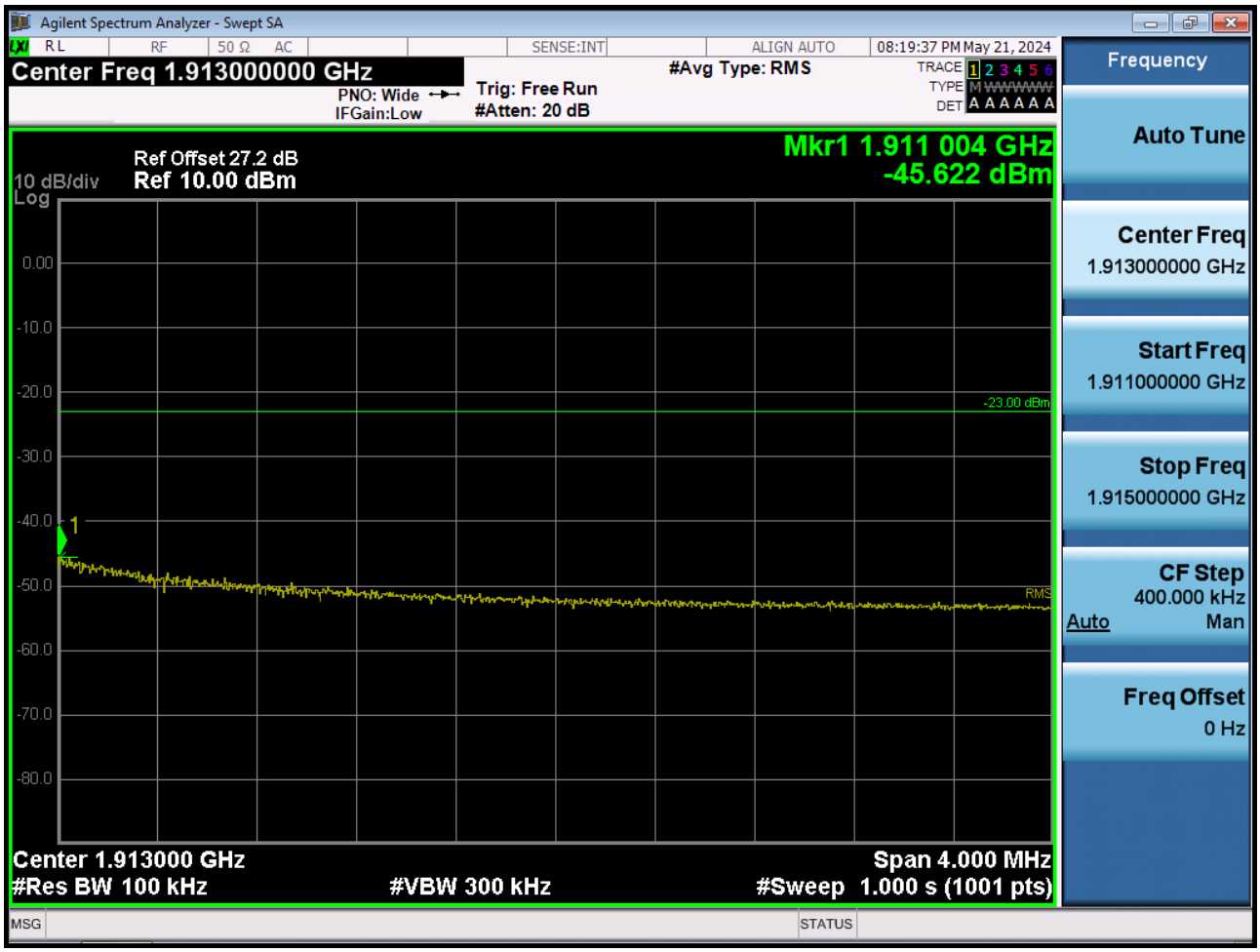
■ EDGE MODE (810 CH.) Block Edge 1



■ EDGE MODE (810 CH.) Block Edge 2



■ EDGE MODE (810 CH.) Block Edge 3



Note : We used a narrower RBW in order to increase accuracy.

Calculation = Reading Value + 10 x log(1 MHz/100 kHz) dB = -45.622 dBm + 10 dB = -35.622 dBm

■ WCDMA850 MODE (4132 CH.) Block Edge

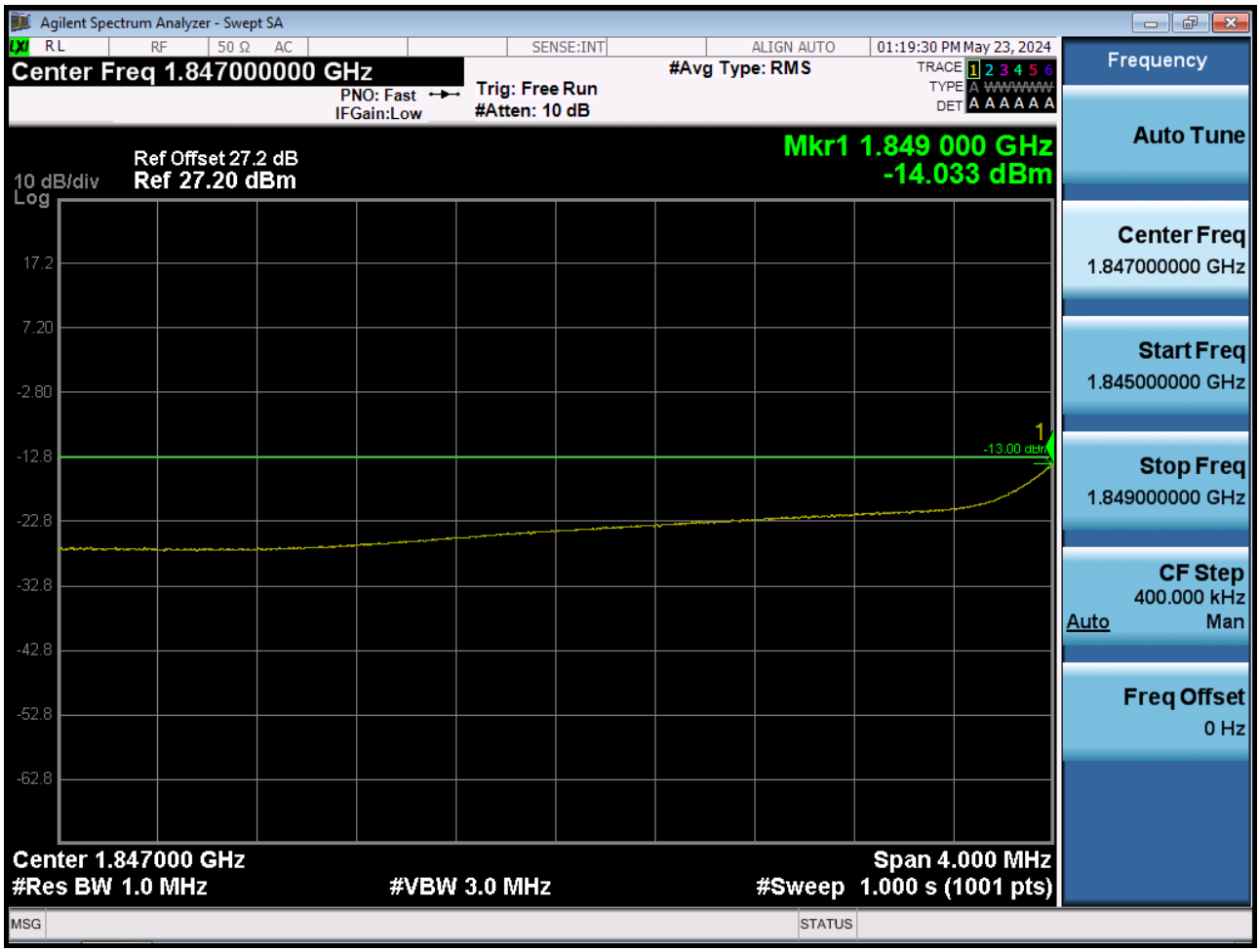
■ WCDMA850 MODE (4132 CH.) – 4 MHz Span

■ WCDMA850MODE (4233 CH.) Block Edge

■ WCDMA850MODE (4233 CH.) – 4 MHz Span

■ WCDMA1900 MODE (9262 CH.) Block Edge

■ WCDMA1900 MODE (9262 CH.) – 4 MHz Span

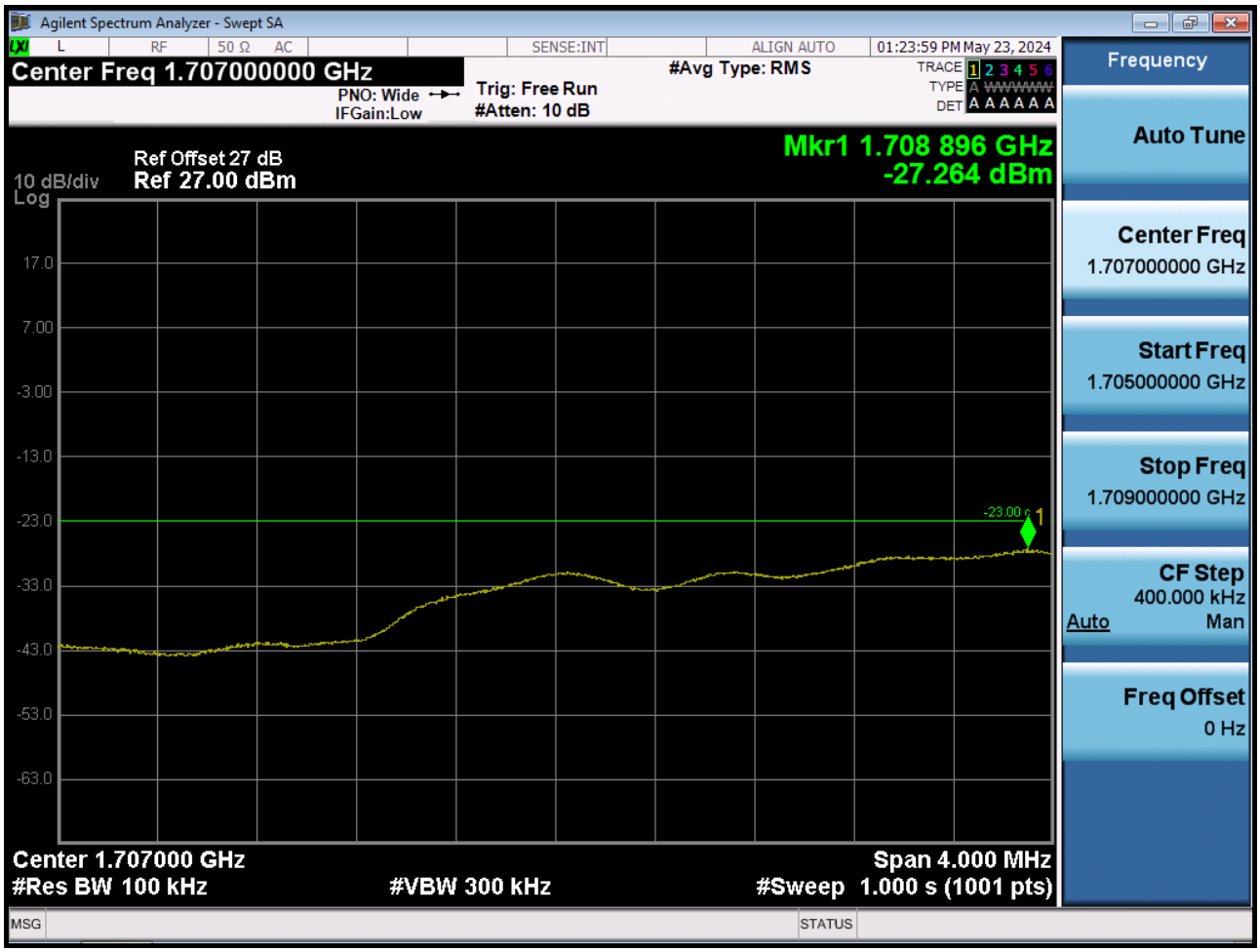


■ WCDMA1900 MODE (9538 CH.) Block Edge

■ WCDMA1900 MODE (9538 CH.) – 4 MHz Span

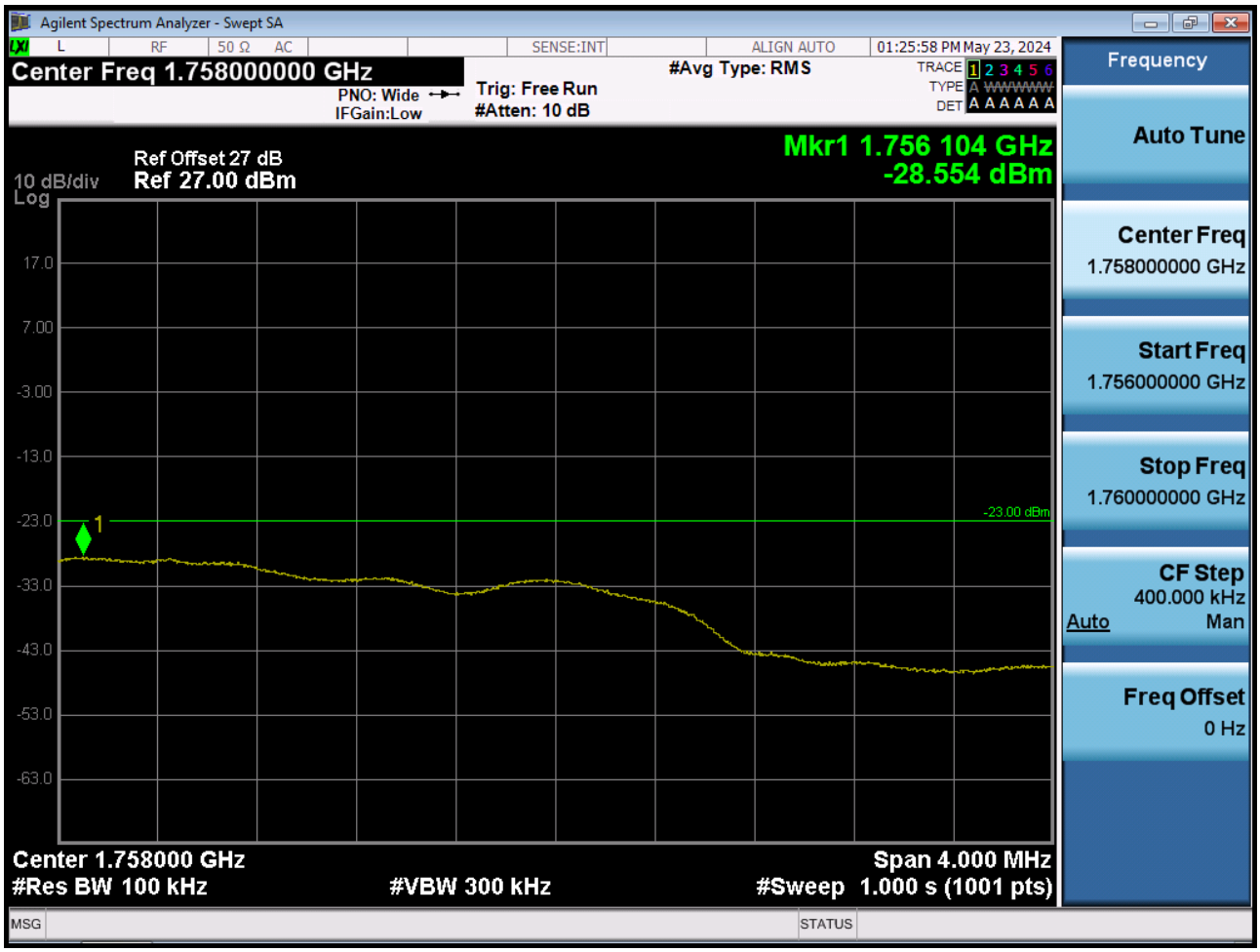
■ WCDMA1700 MODE (1312 CH.) Block Edge

■ WCDMA1700 MODE (1312 CH.) – 4 MHz Span

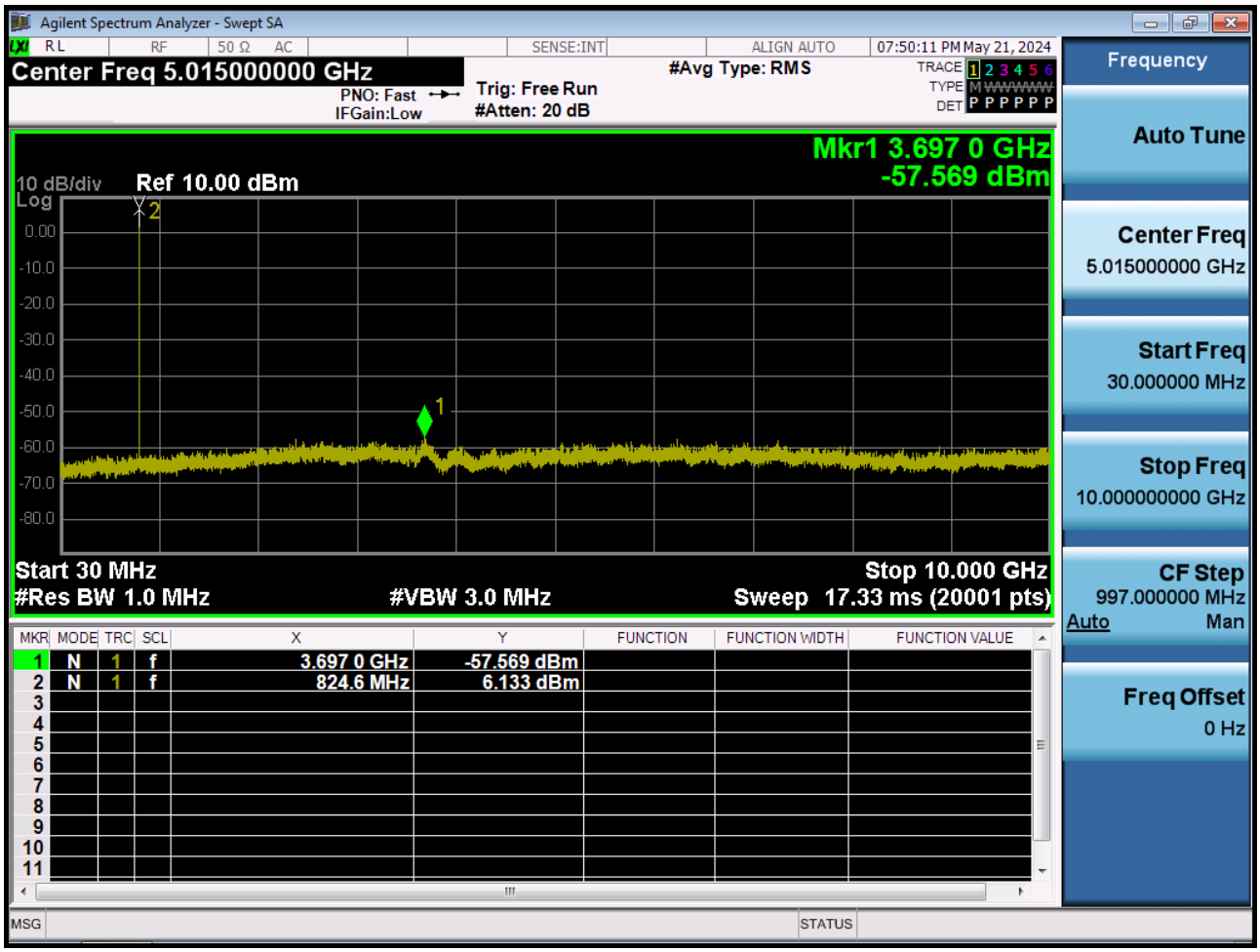


■ WCDMA1700 MODE (1513 CH.) Block Edge

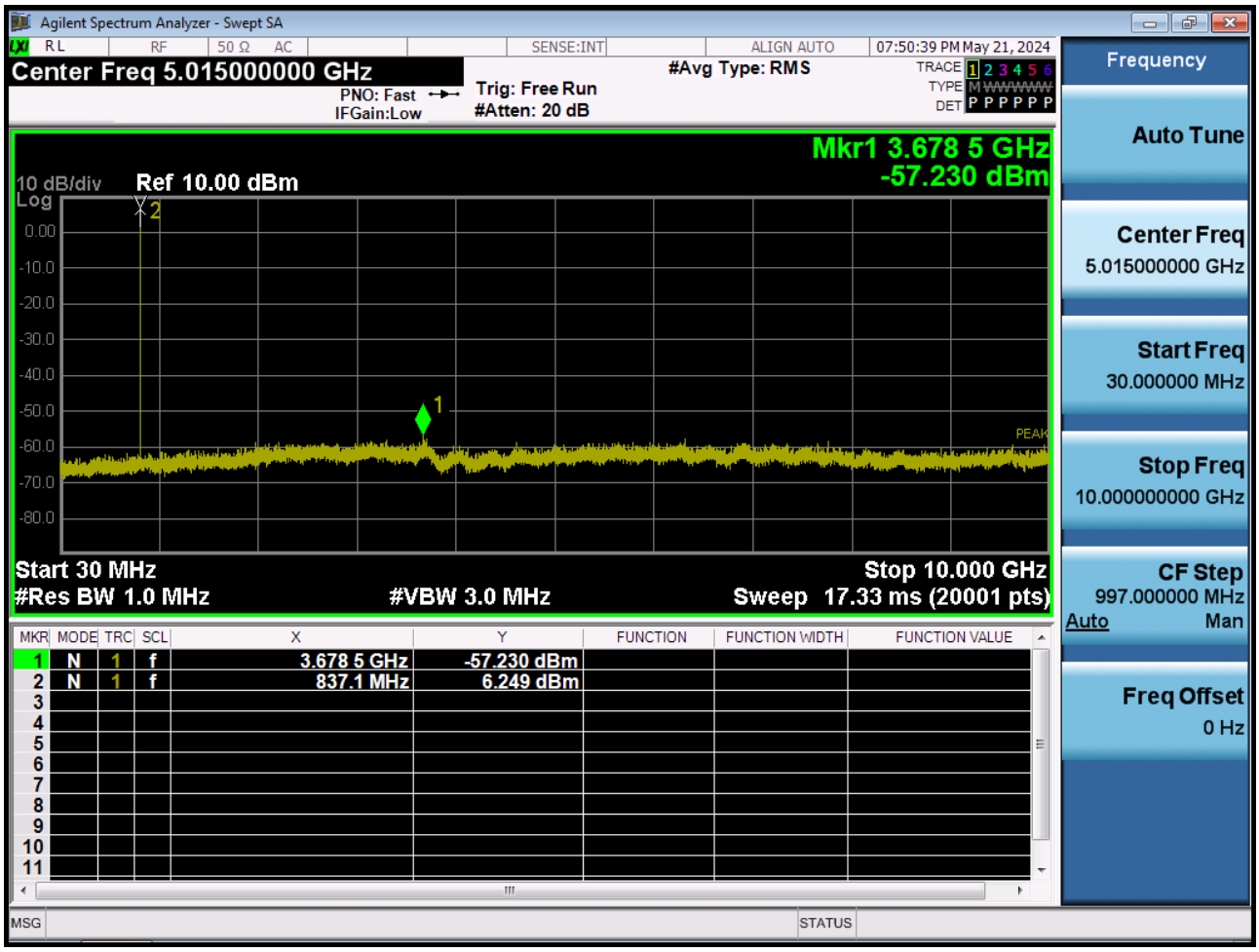
■ WCDMA1700 MODE (1513 CH.) – 4 MHz Span



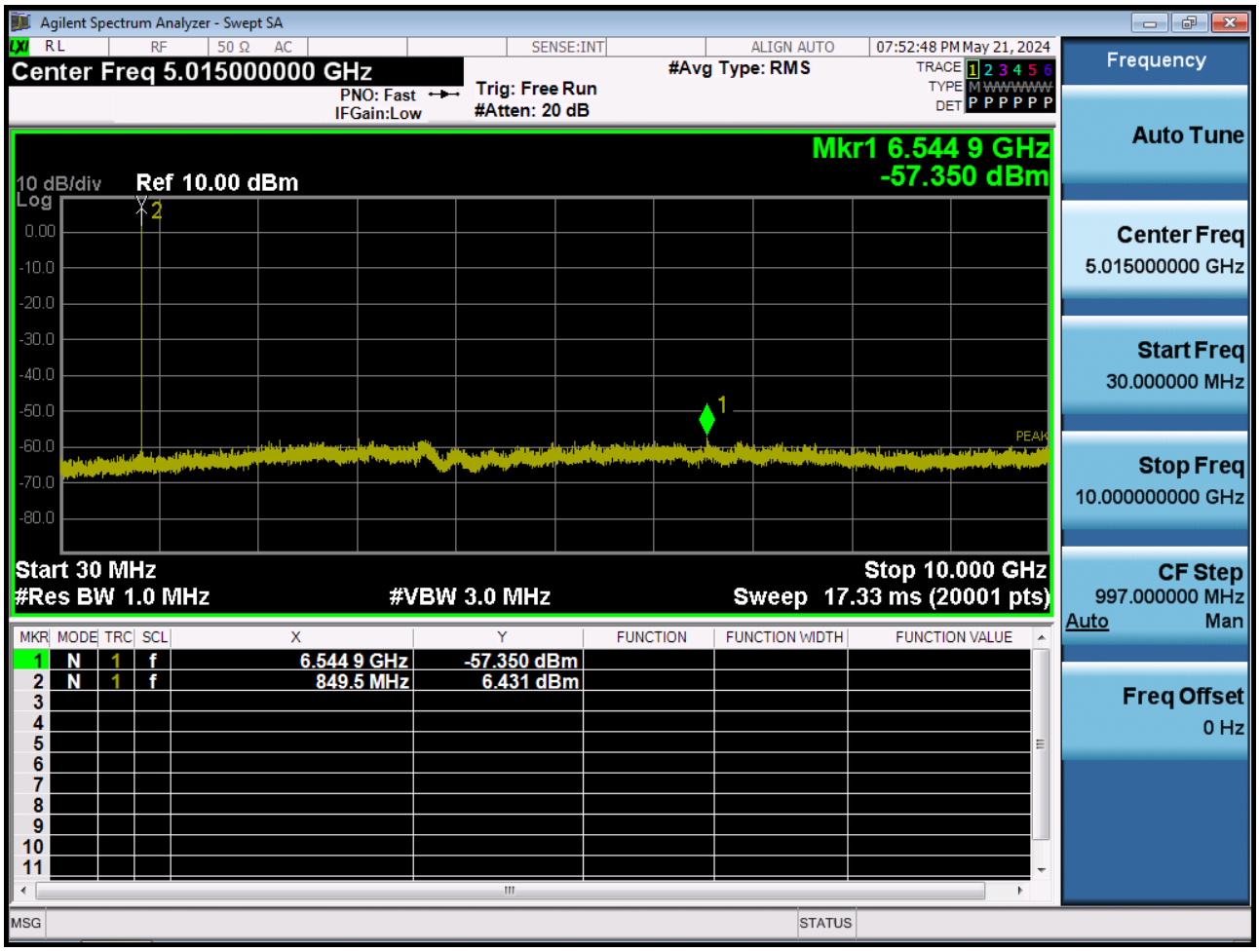
■ GSM850 MODE (128 CH.) Conducted Spurious Emissions



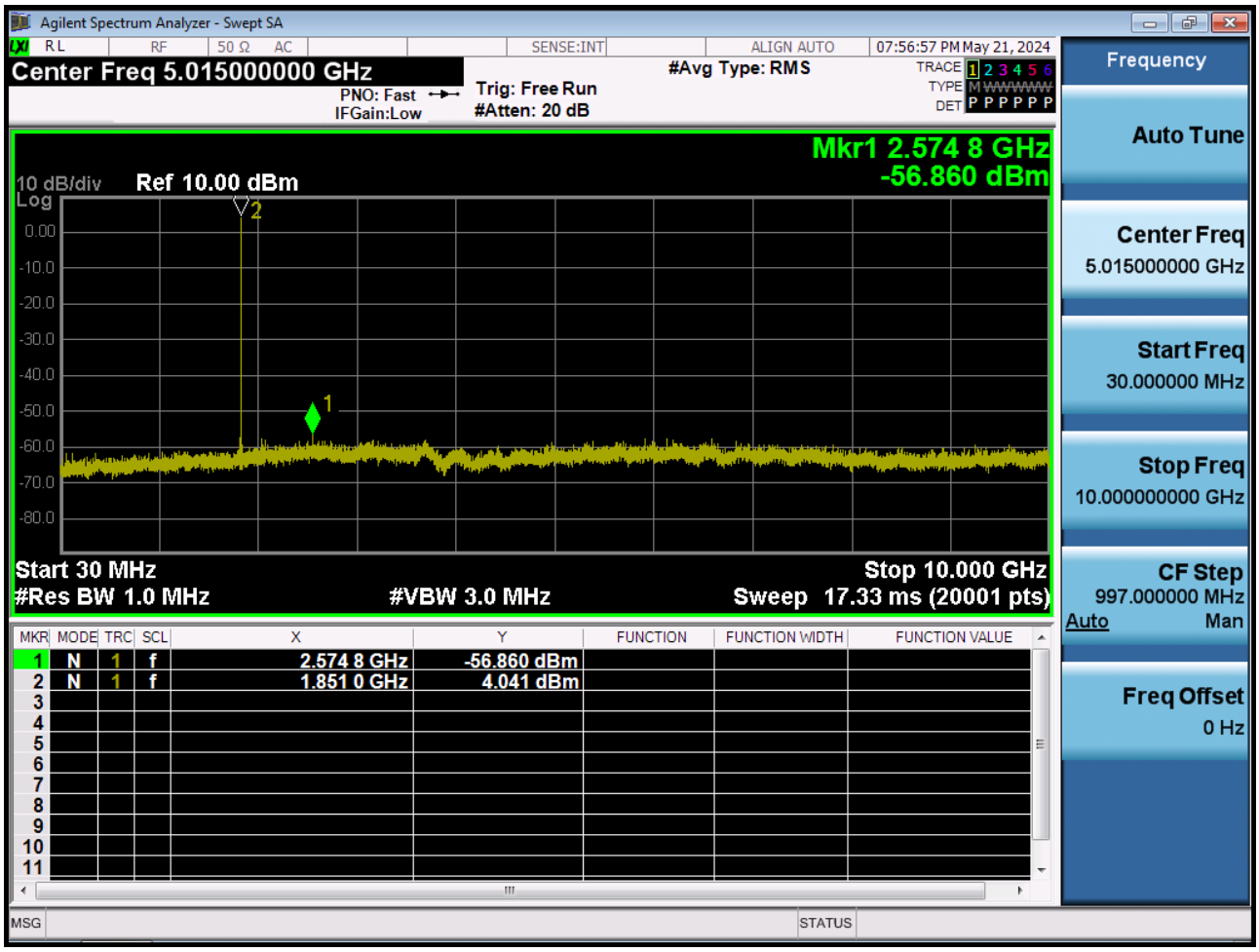
■ GSM850 MODE (190 CH.) Conducted Spurious Emissions



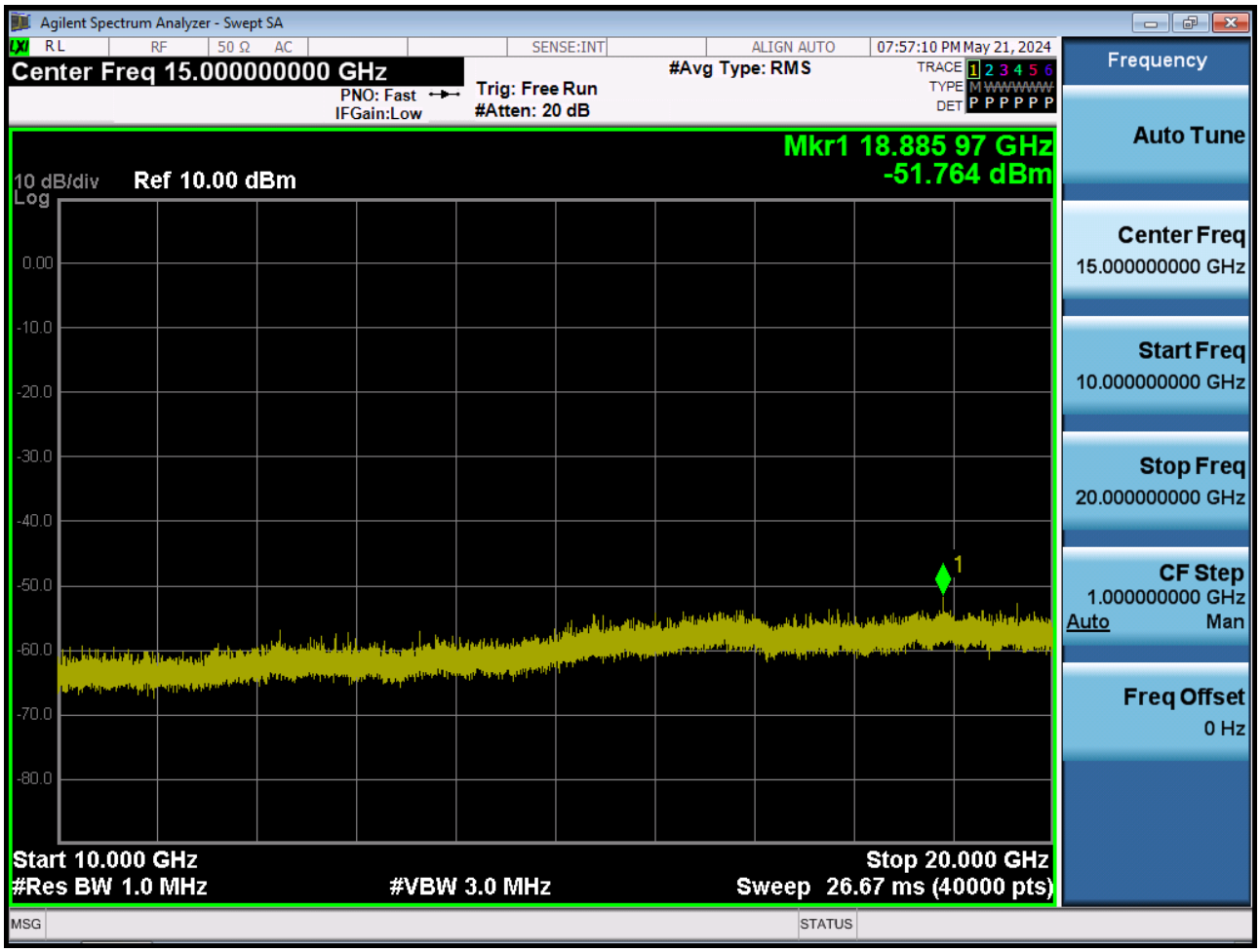
■ GSM850 MODE (251 CH.) Conducted Spurious Emissions



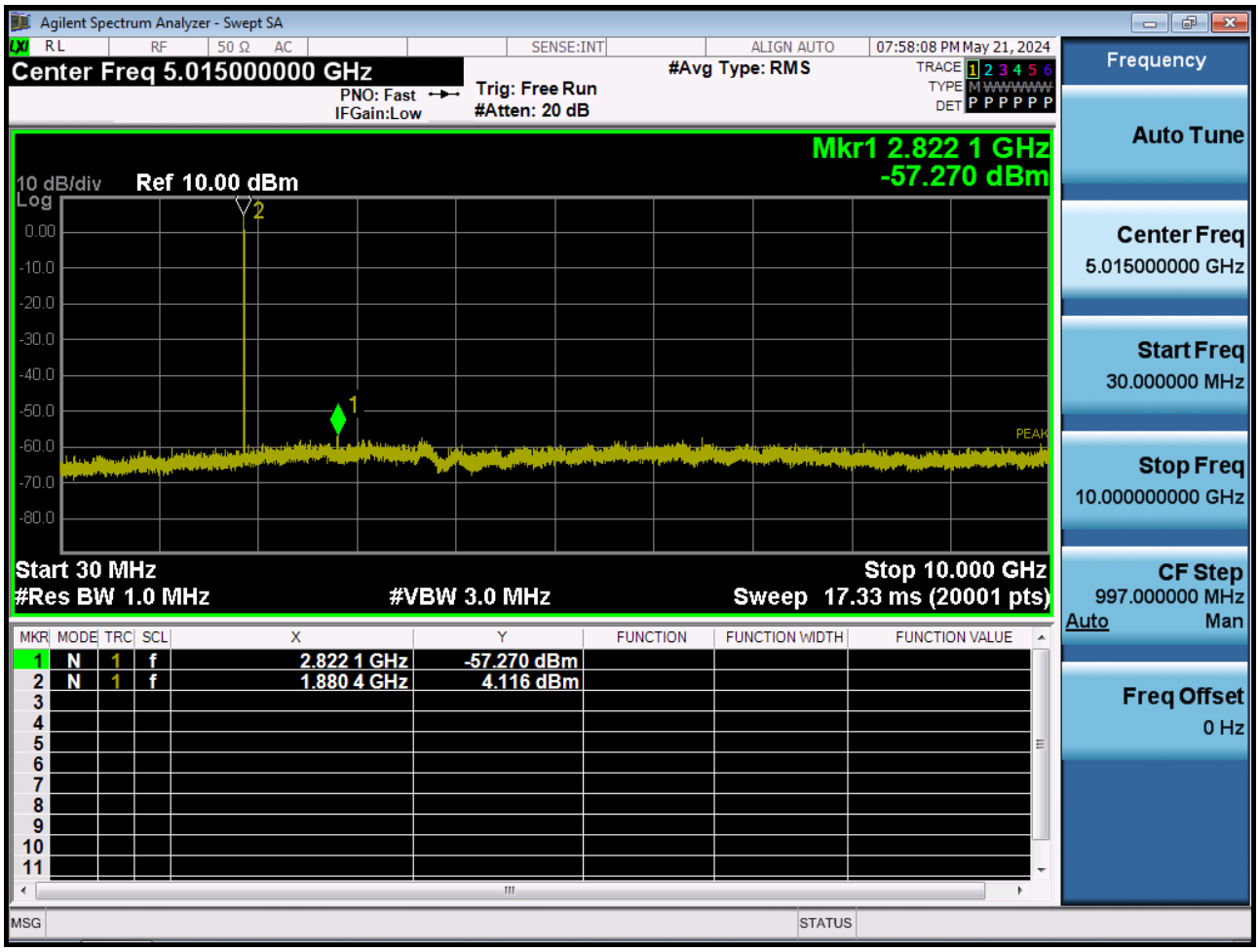
■ GSM1900 MODE (512 CH.) Conducted Spurious Emissions1



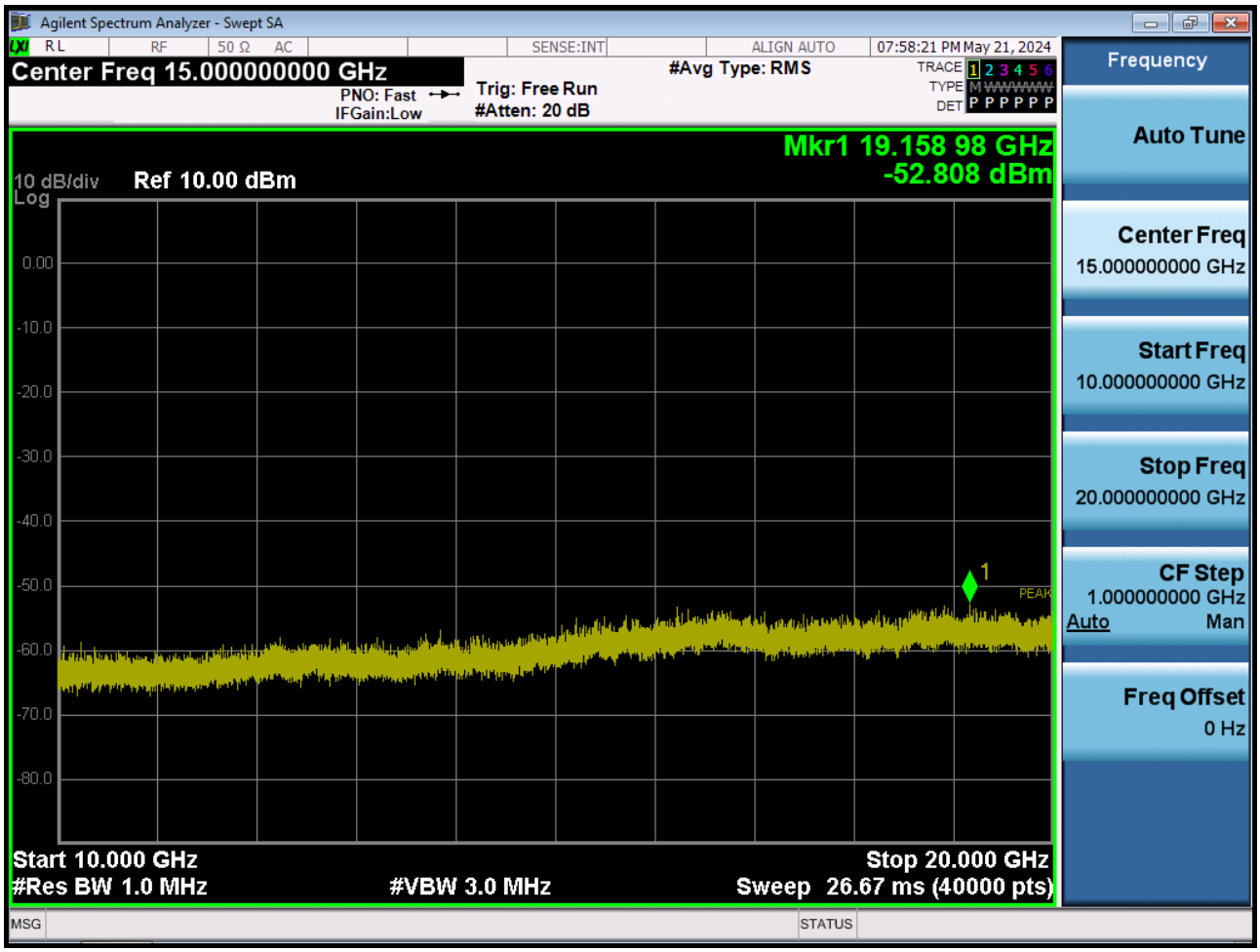
■ GSM1900 MODE (512 CH.) Conducted Spurious Emissions2



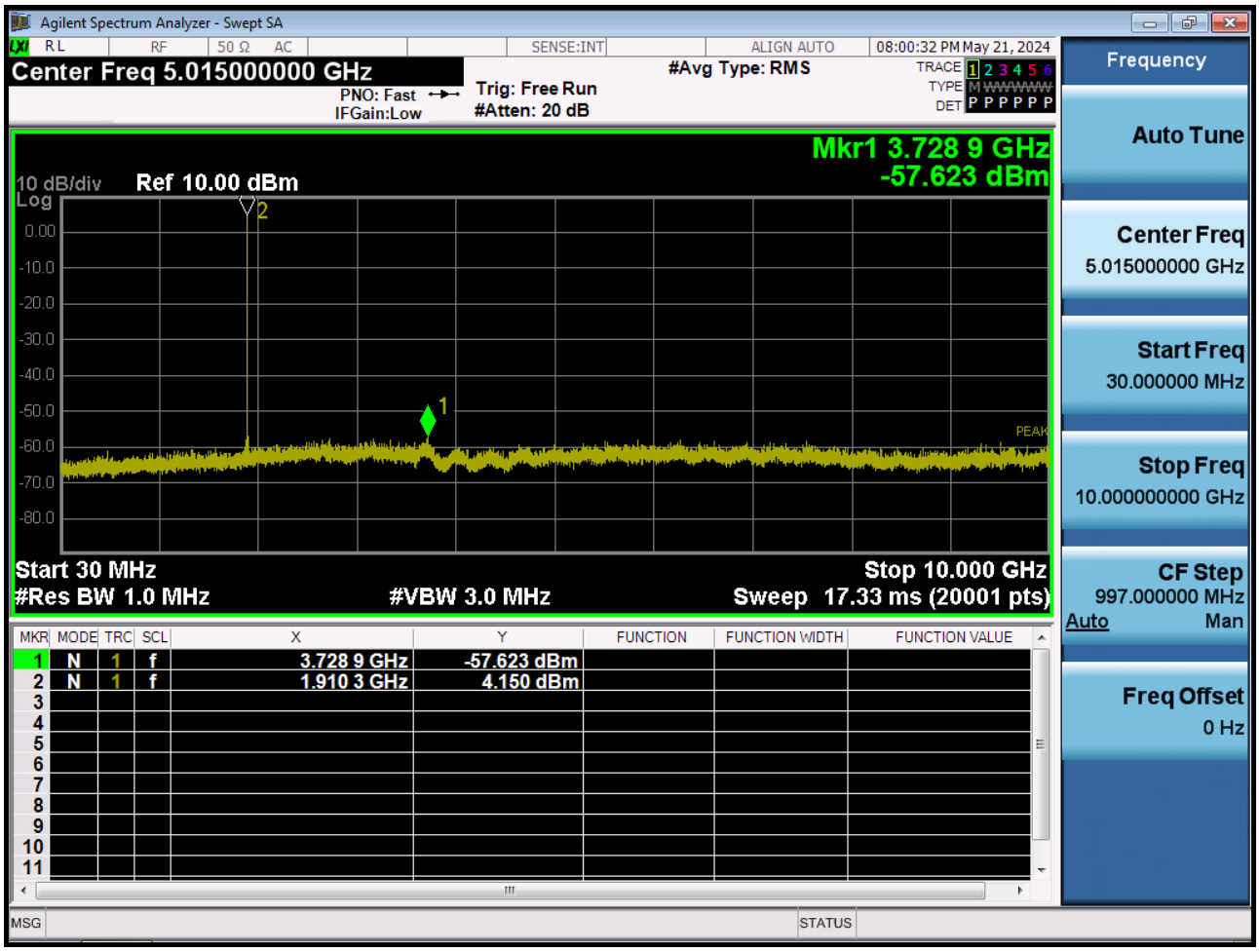
■ GSM1900 MODE (661 CH) Conducted Spurious Emissions1



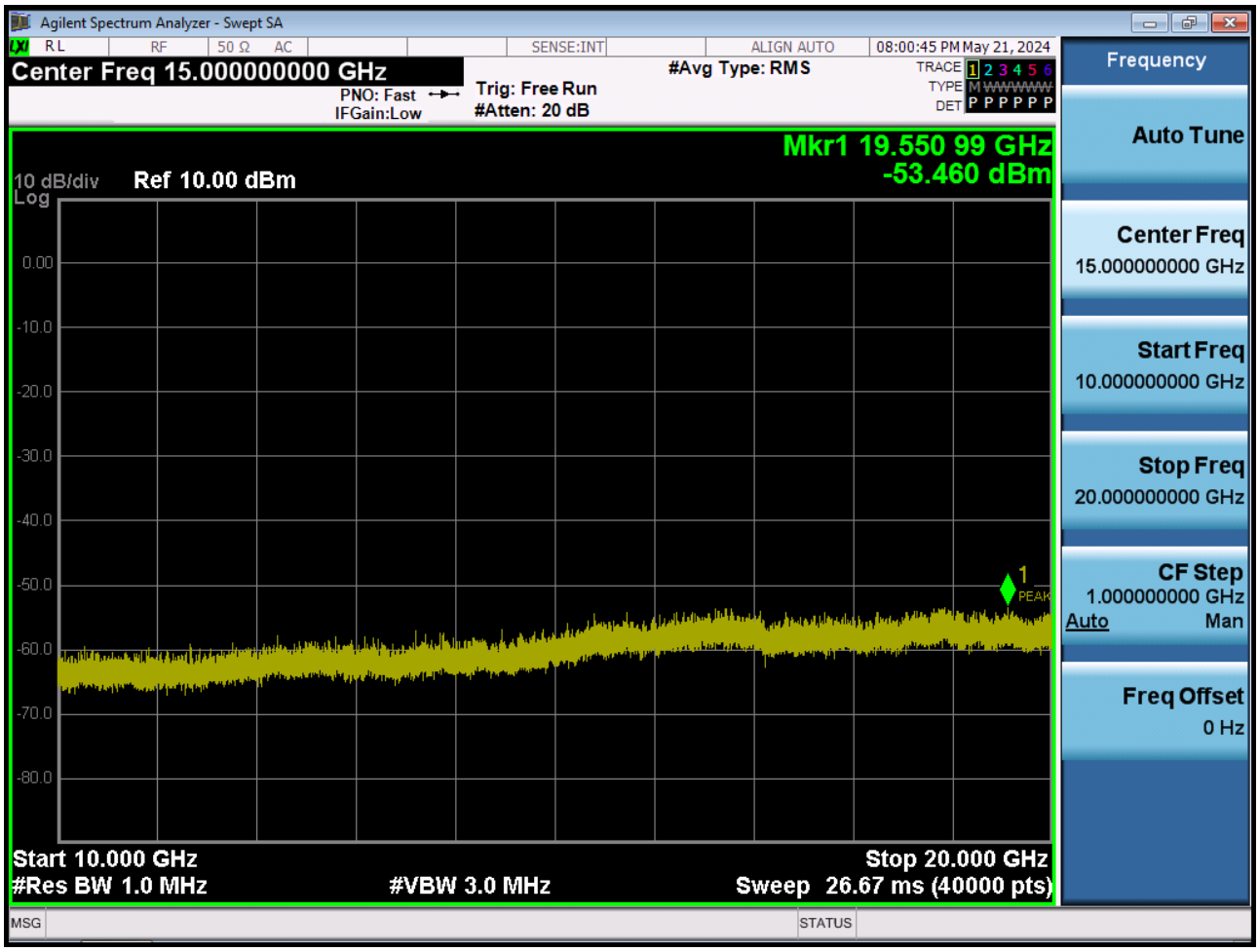
■ GSM1900 MODE (661 CH.) Conducted Spurious Emissions2



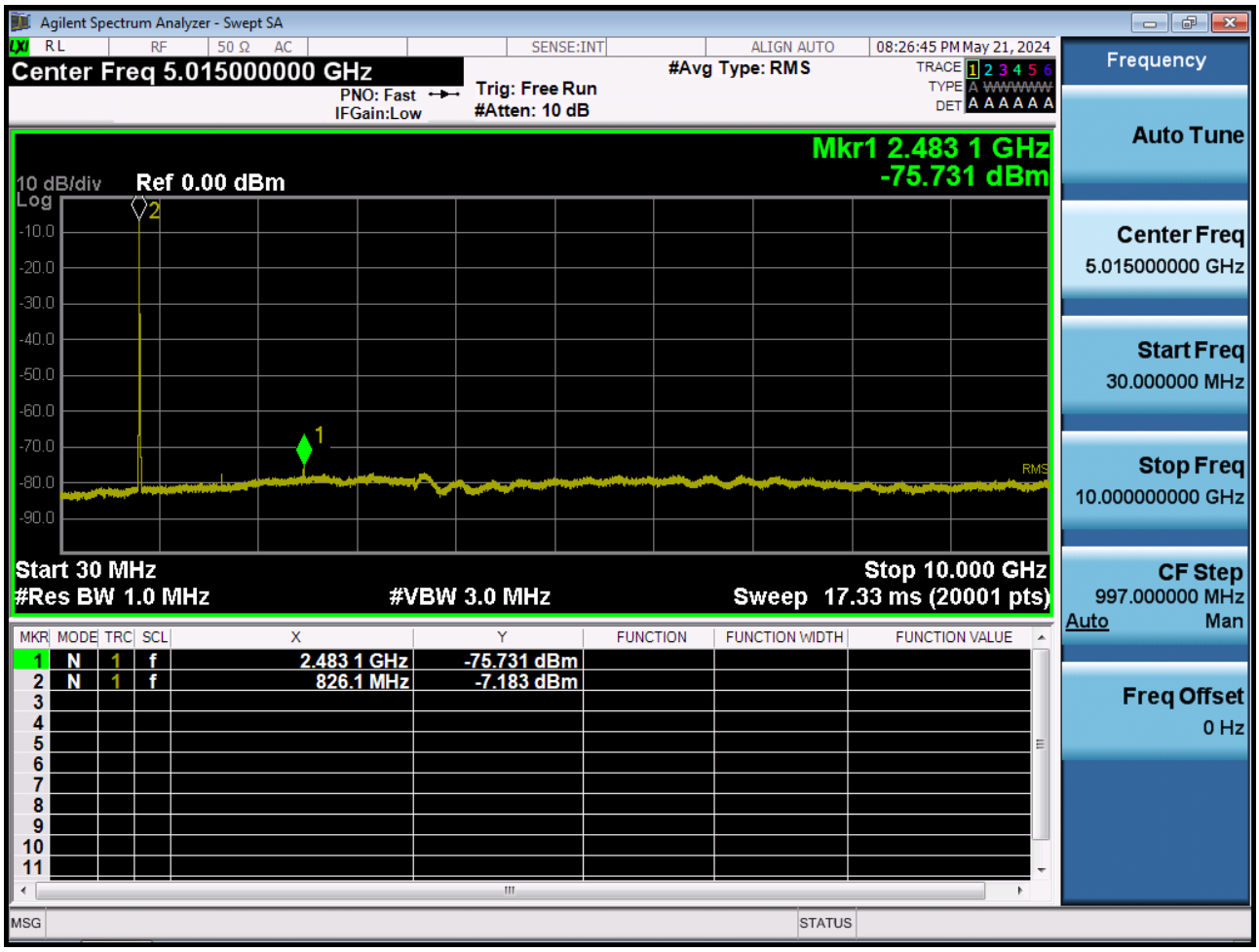
■ GSM1900 MODE (810 CH.) Conducted Spurious Emissions1



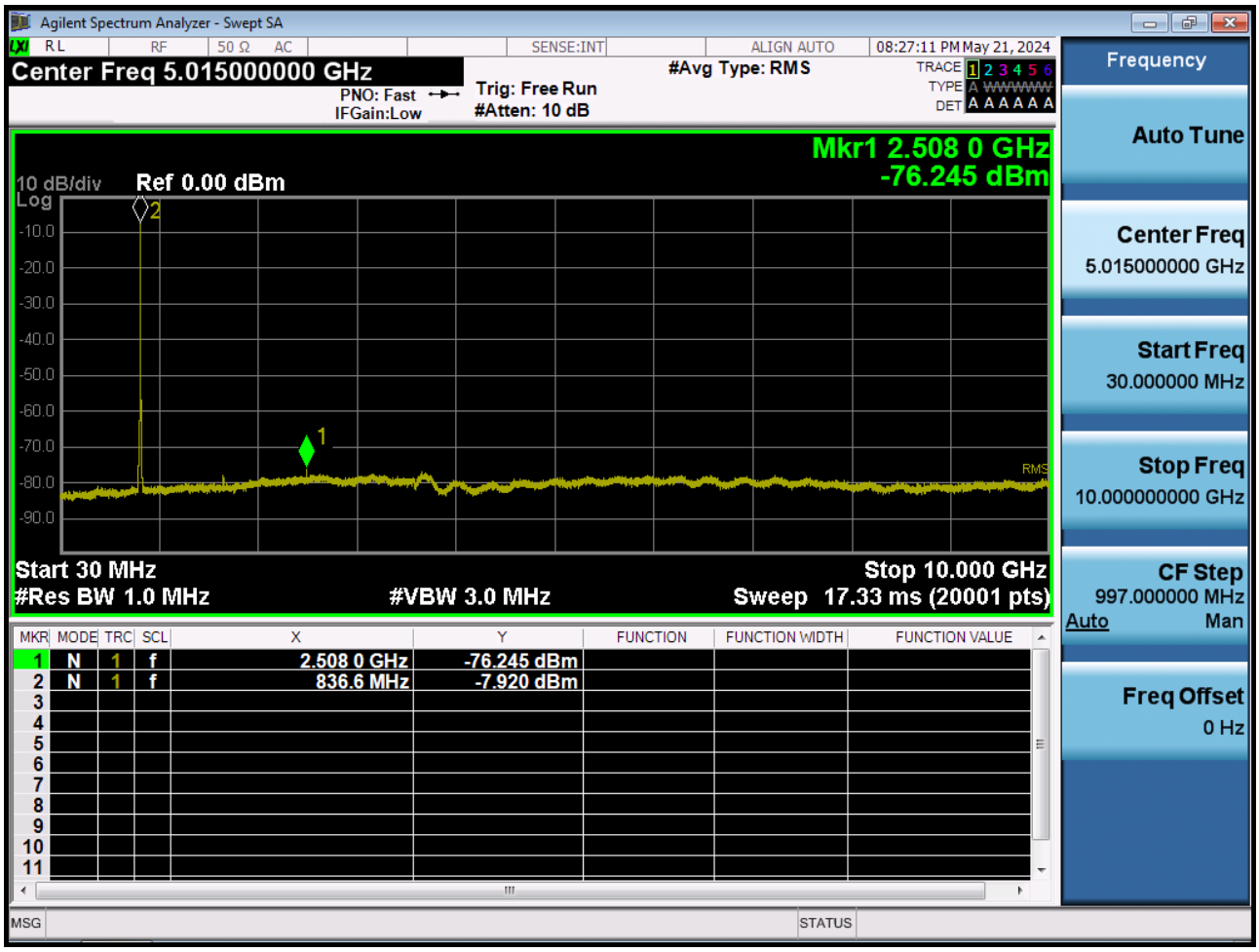
■ GSM1900 MODE (810 CH.) Conducted Spurious Emissions2



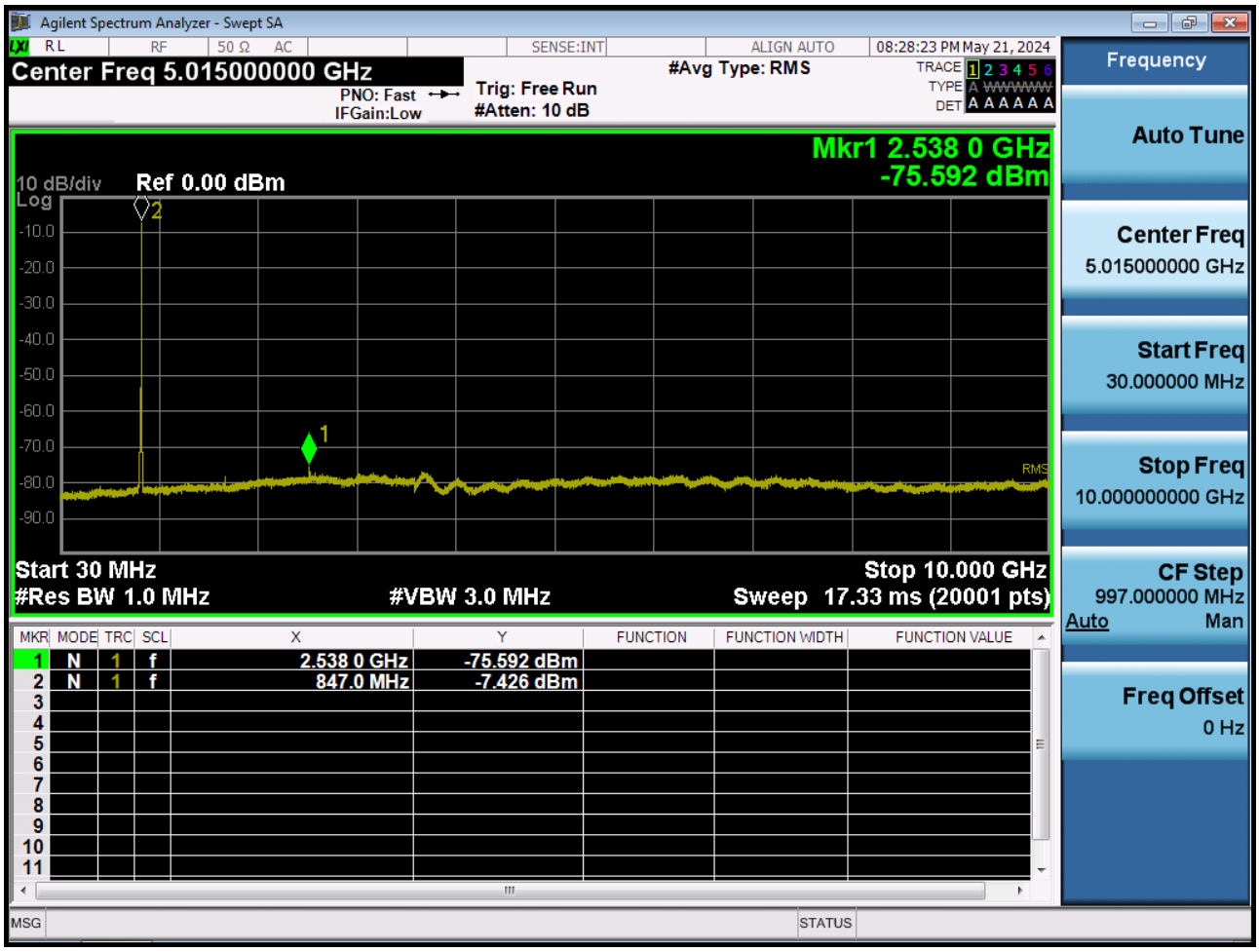
■ WCDMA850 MODE (4132 CH.) Conducted Spurious Emissions



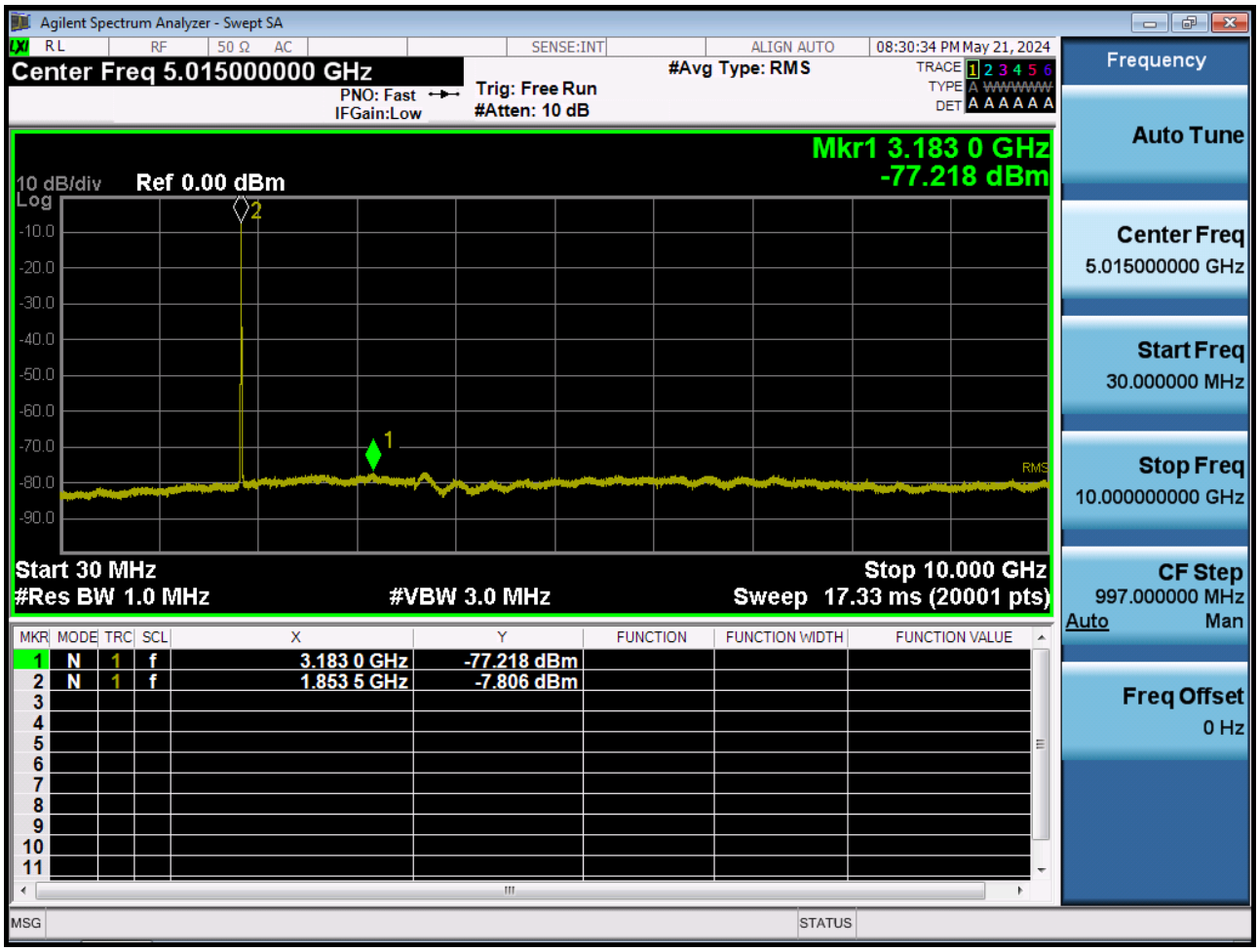
■ WCDMA850 MODE (4183 CH.) Conducted Spurious Emissions



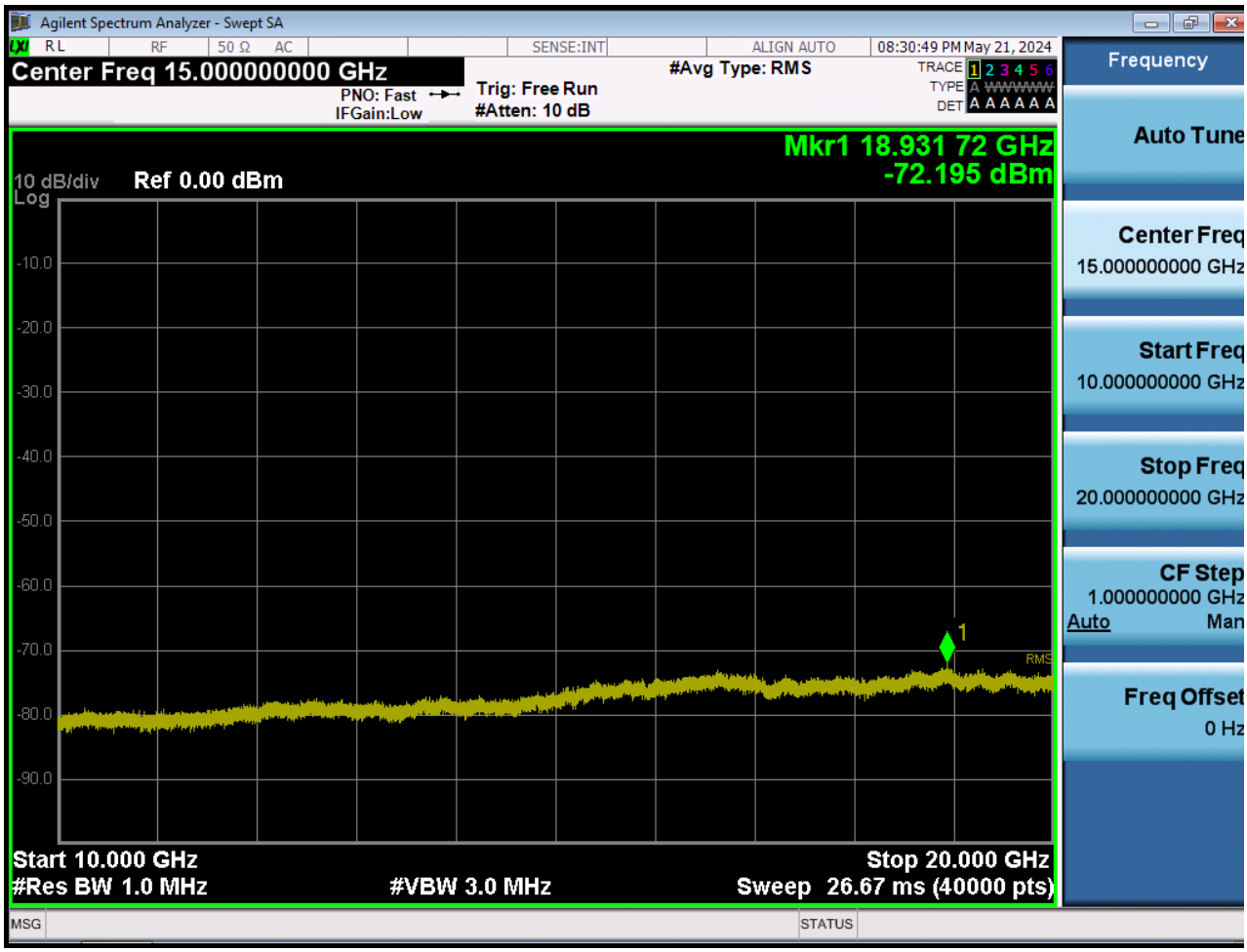
■ WCDMA850MODE (4233 CH.) Conducted Spurious Emissions



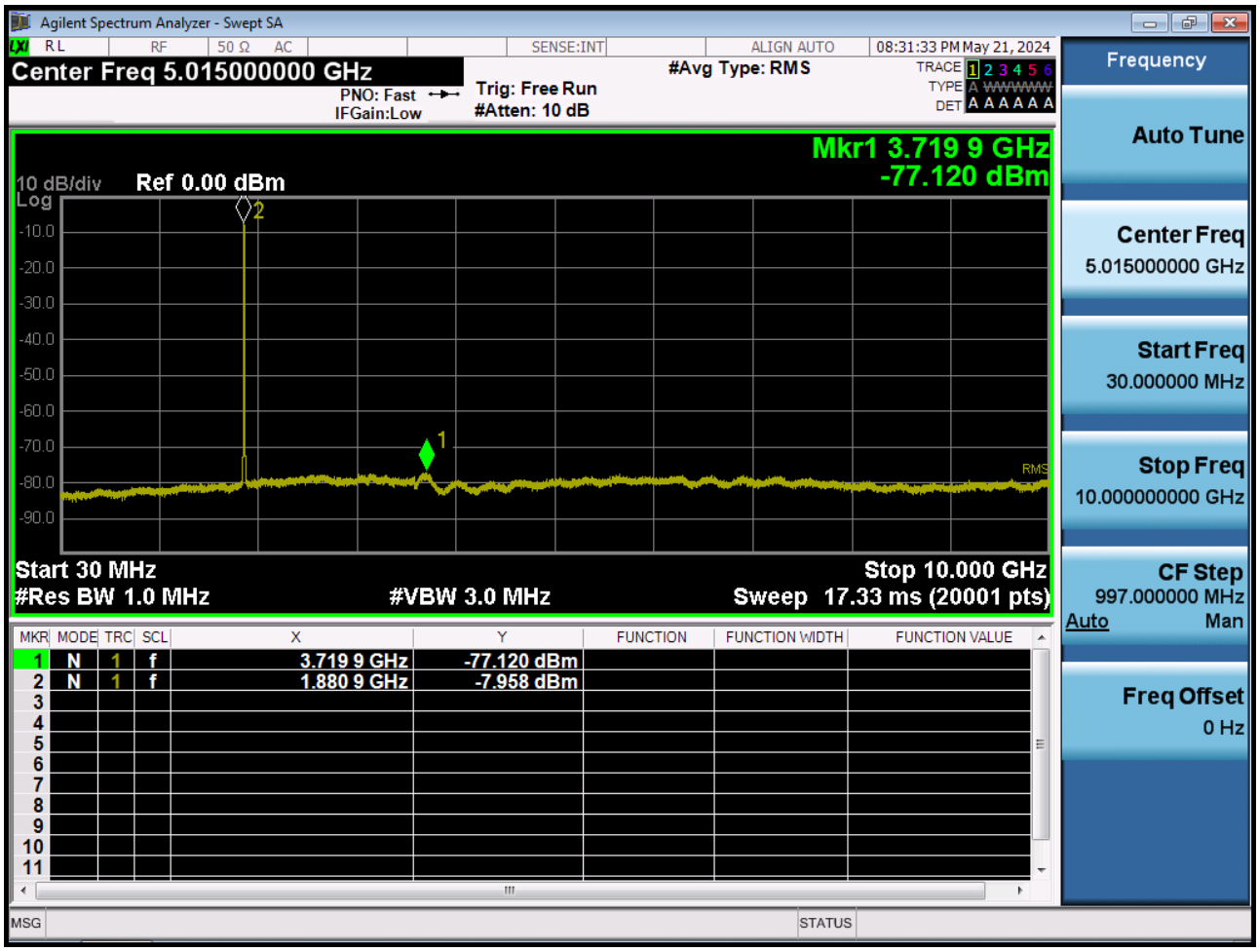
■ WCDMA1900 MODE (9262 CH.) Conducted Spurious Emissions1



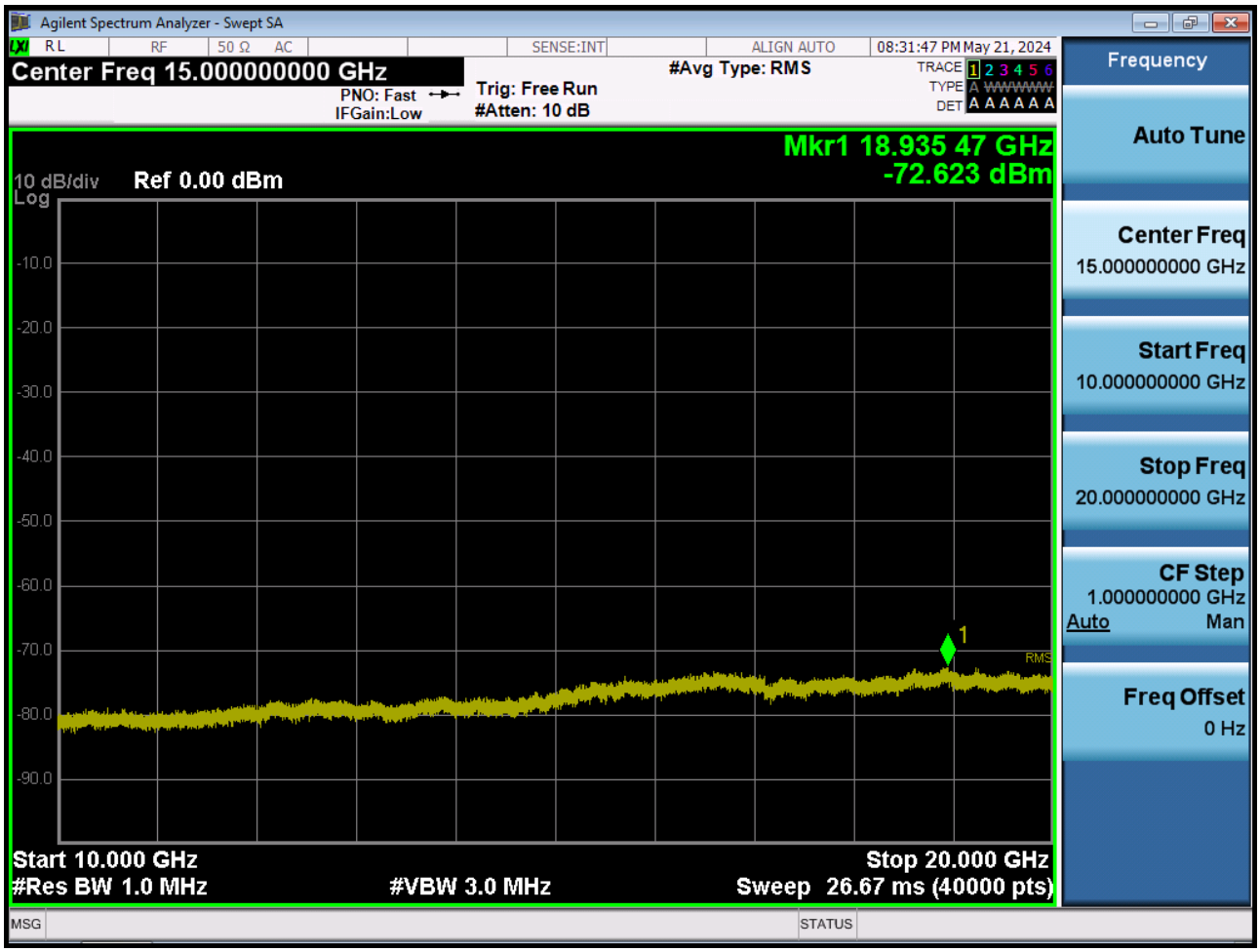
■ WCDMA1900 MODE (9262 CH.) Conducted Spurious Emissions2



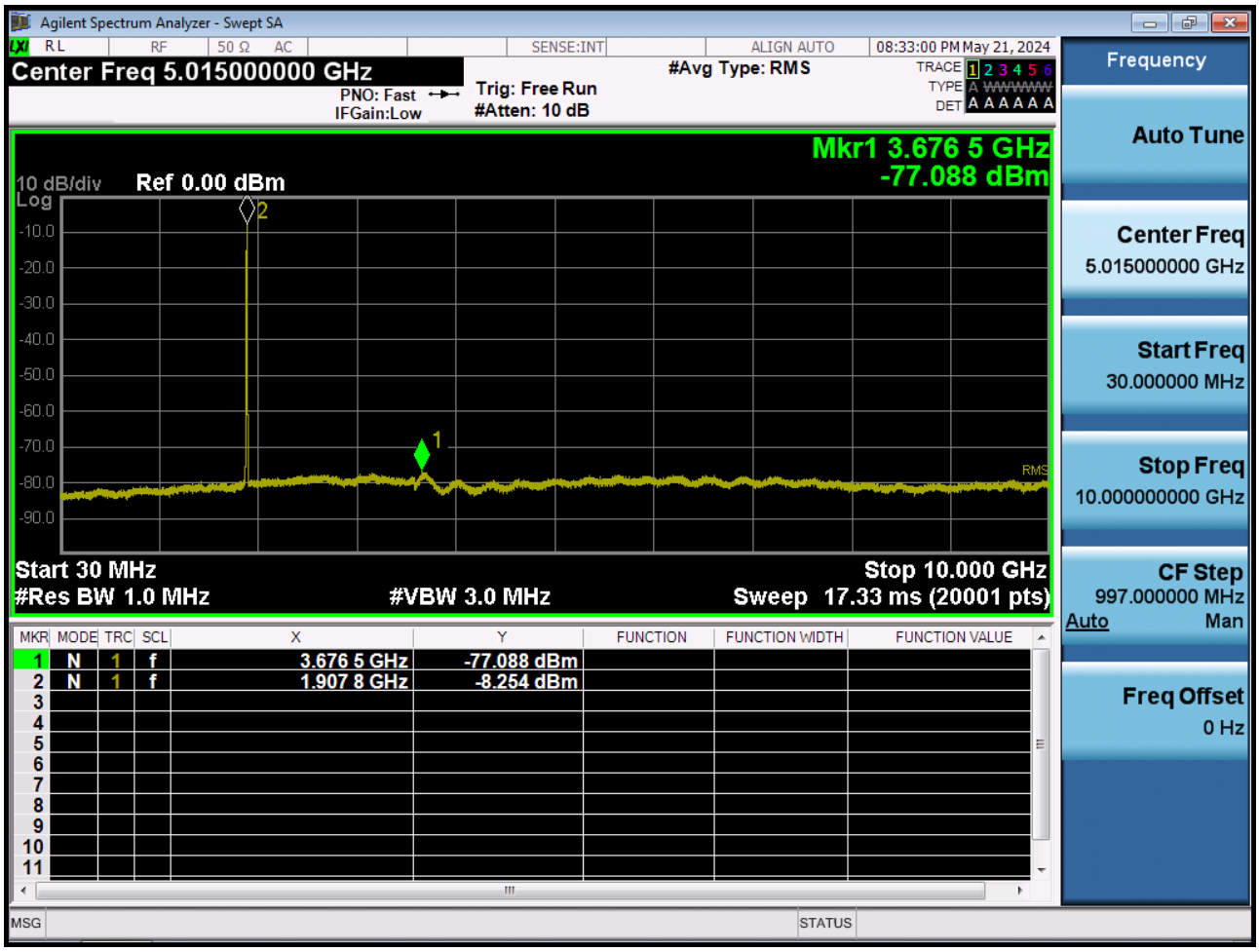
■ WCDMA1900 MODE (9400 CH.) Conducted Spurious Emissions1



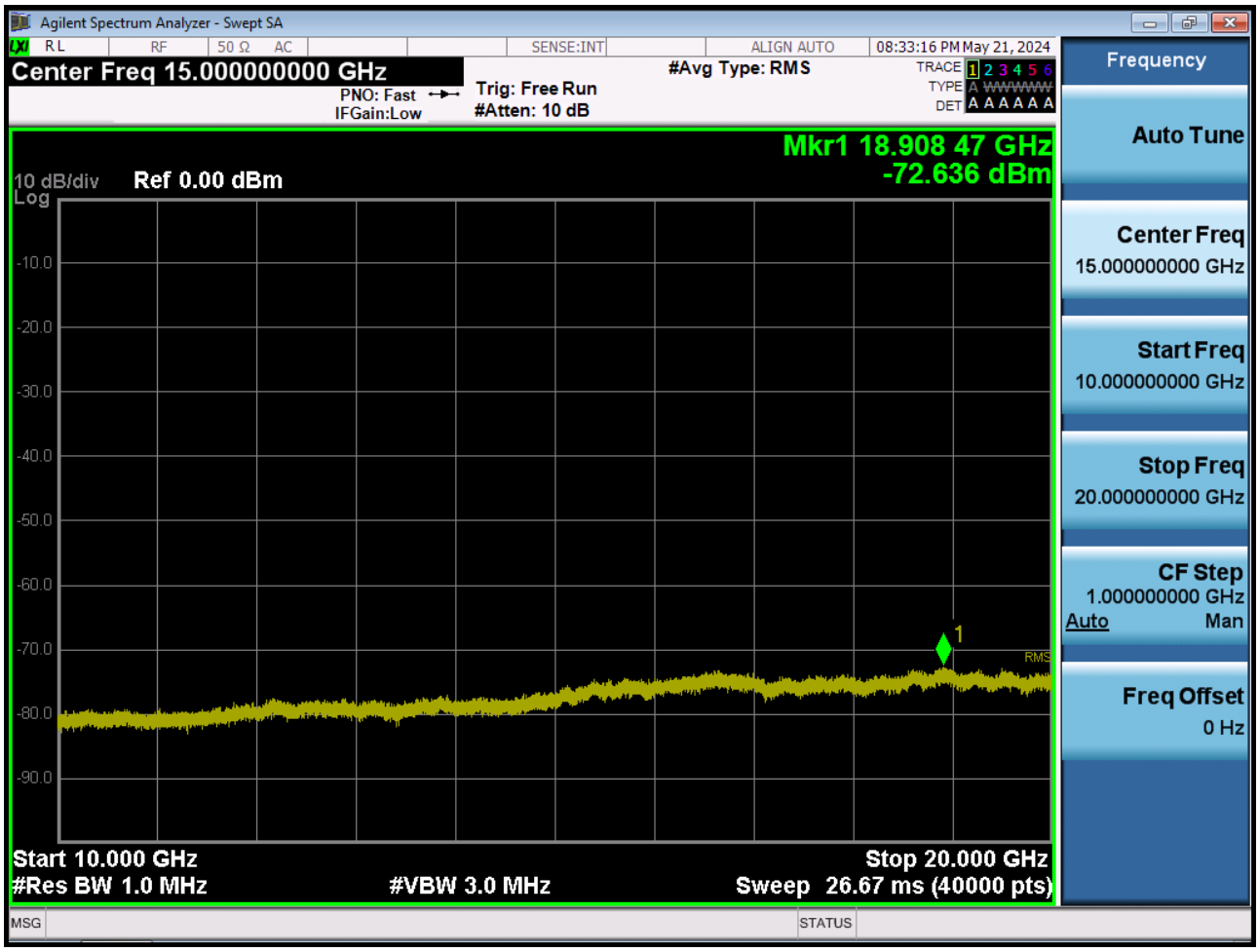
■ WCDMA1900 MODE (9400 CH.) Conducted Spurious Emissions2



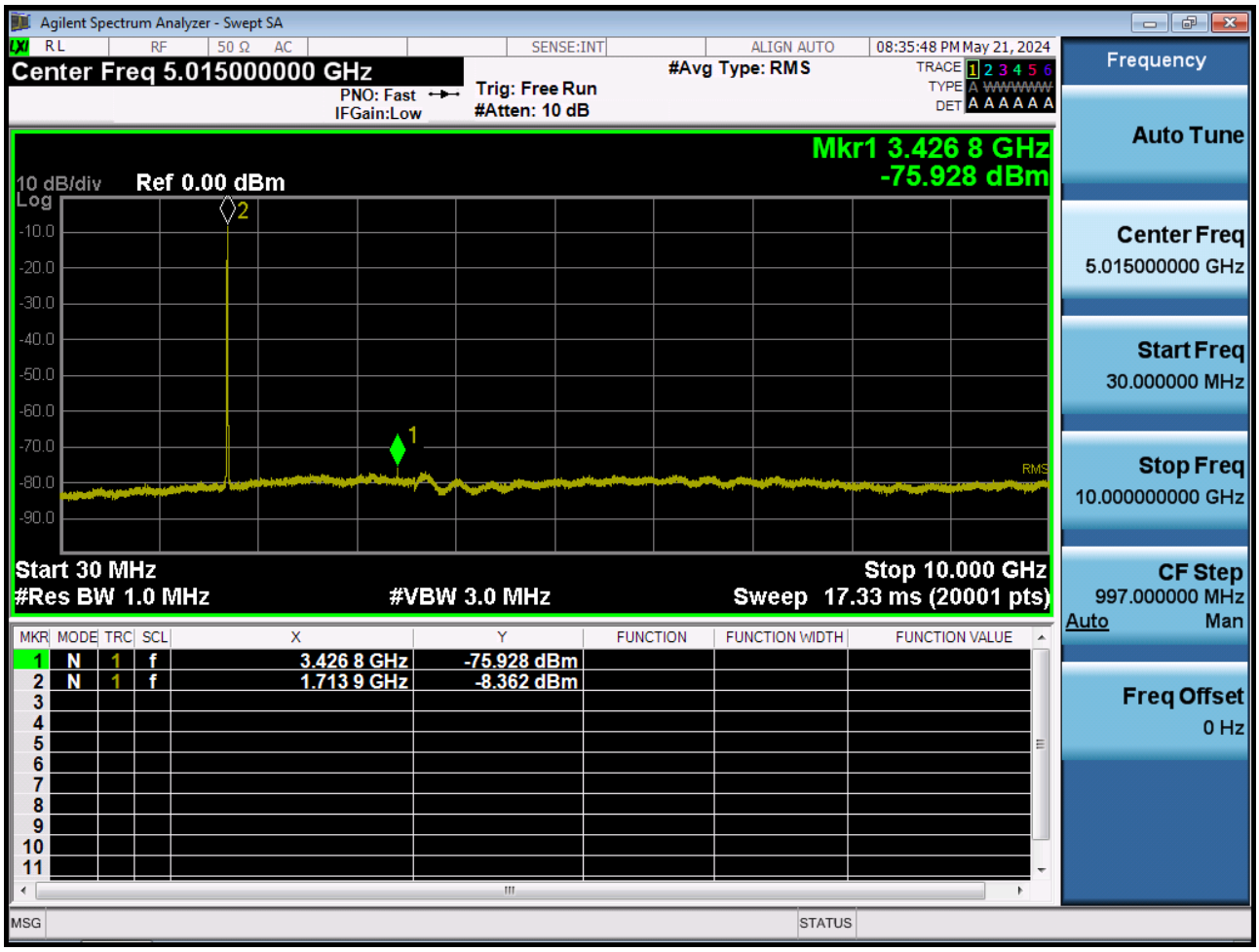
■ WCDMA1900 MODE (9538 CH.) Conducted Spurious Emissions1



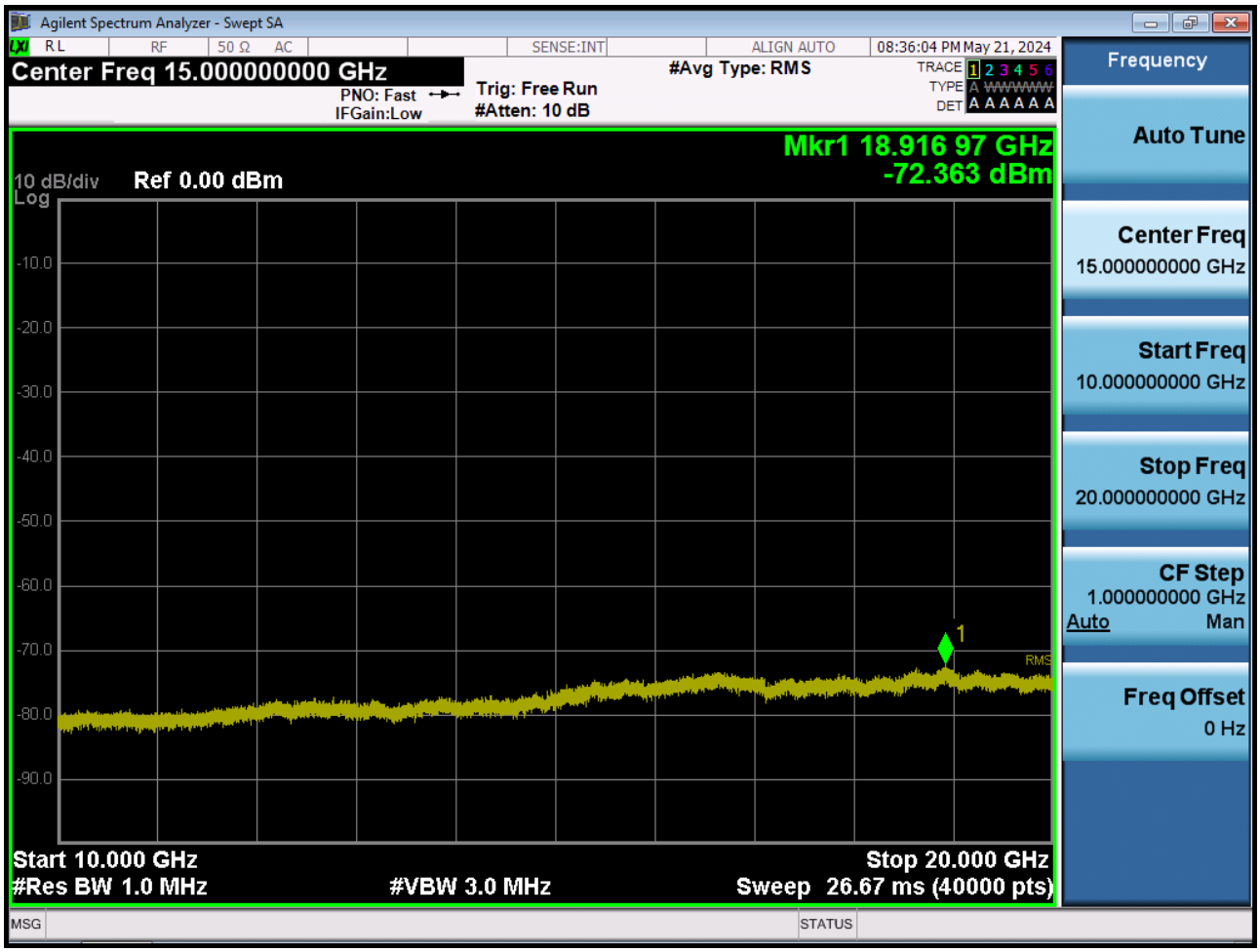
■ WCDMA1900 MODE (9538 CH.) Conducted Spurious Emissions2



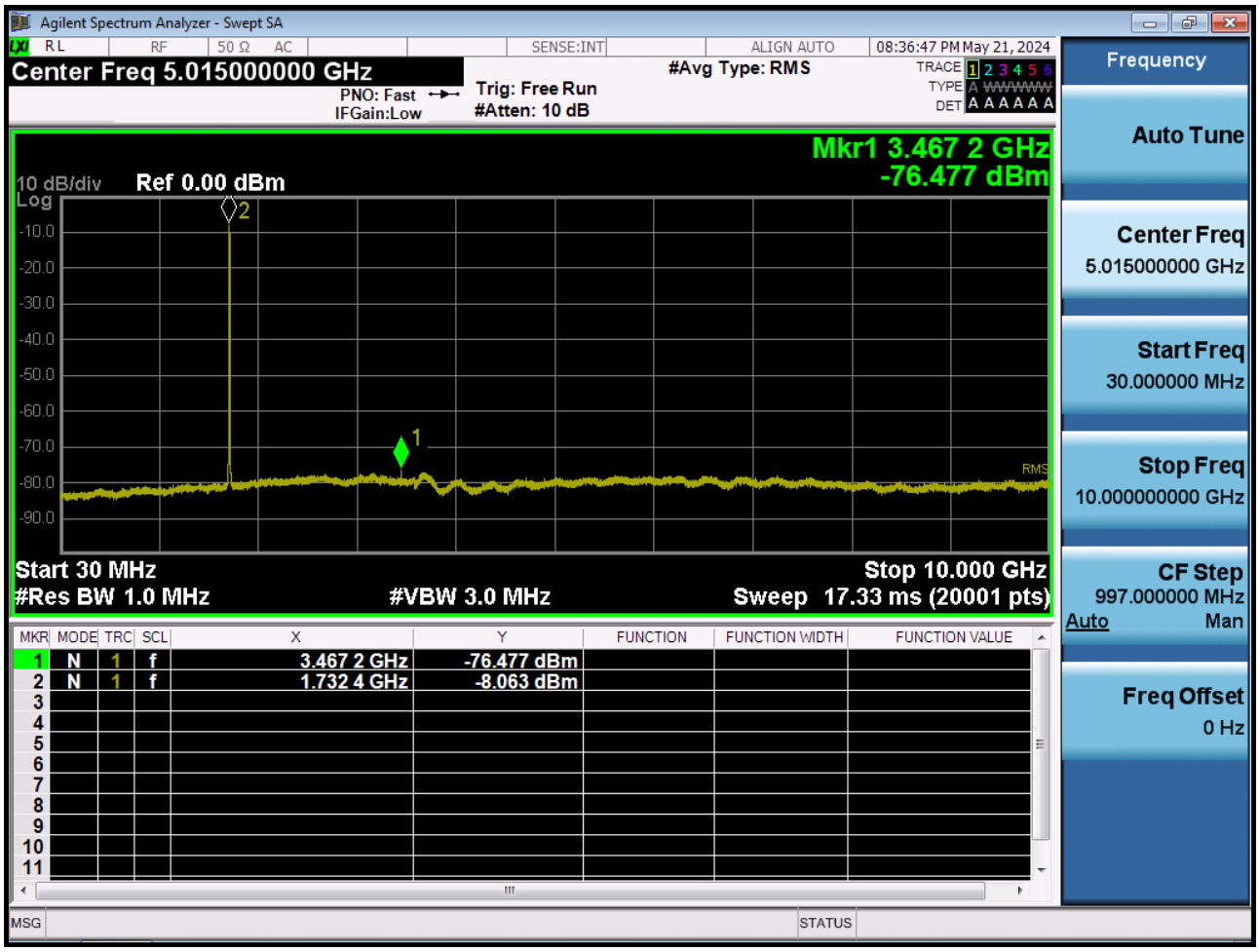
■ WCDMA1700 MODE (1312 CH.) Conducted Spurious Emissions1



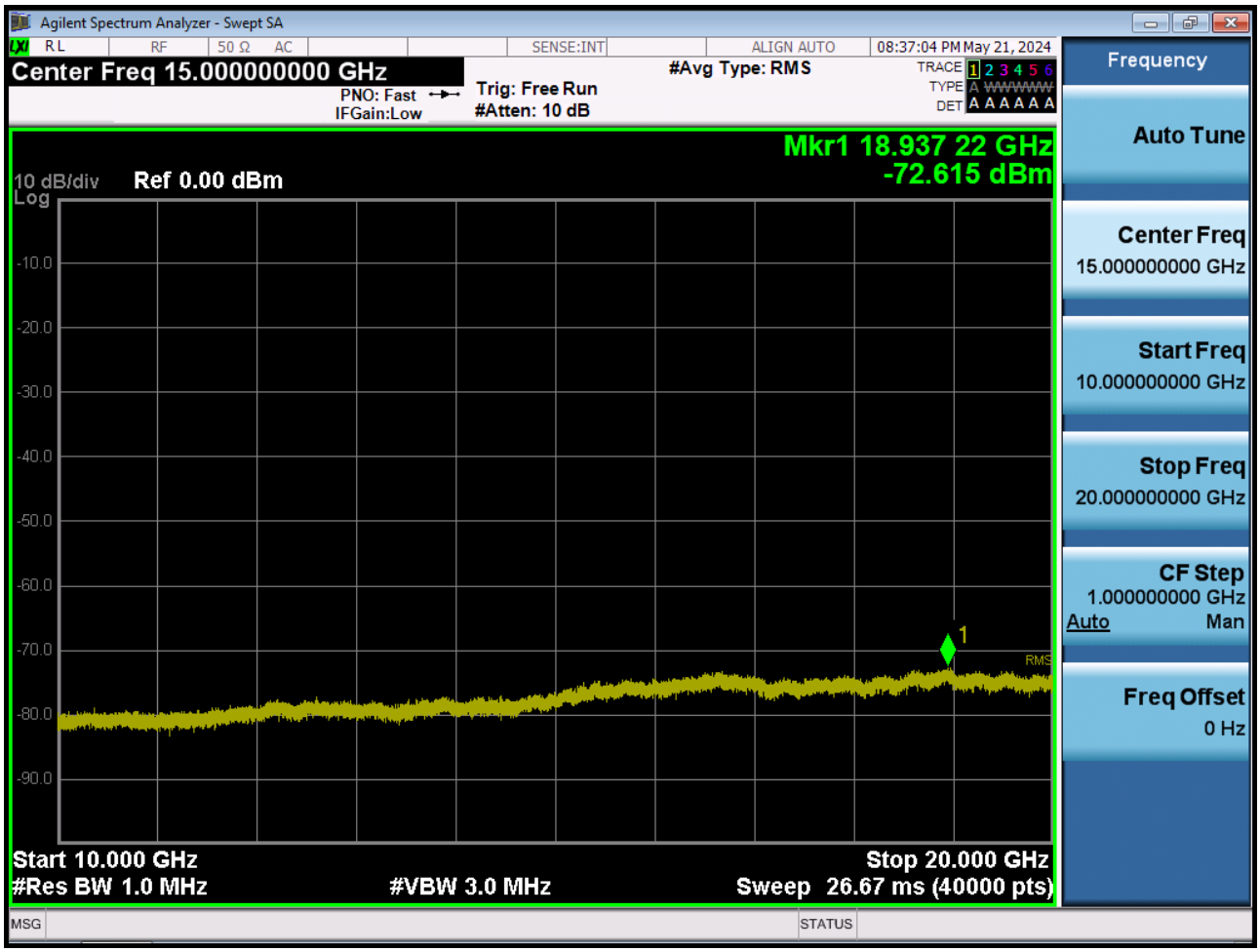
■ WCDMA1700 MODE (1312 CH.) Conducted Spurious Emissions2



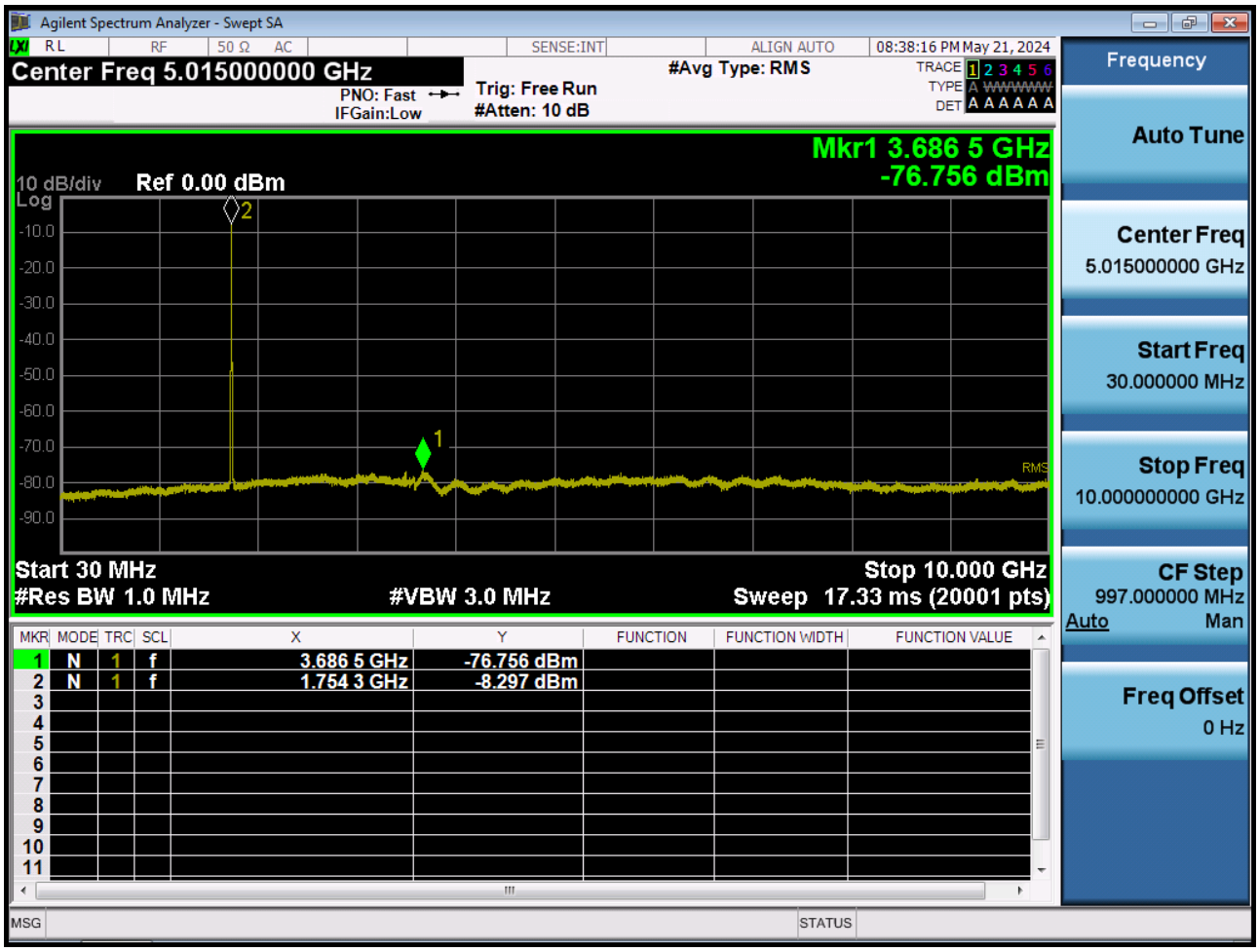
■ WCDMA1700 MODE (1412 CH.) Conducted Spurious Emissions1



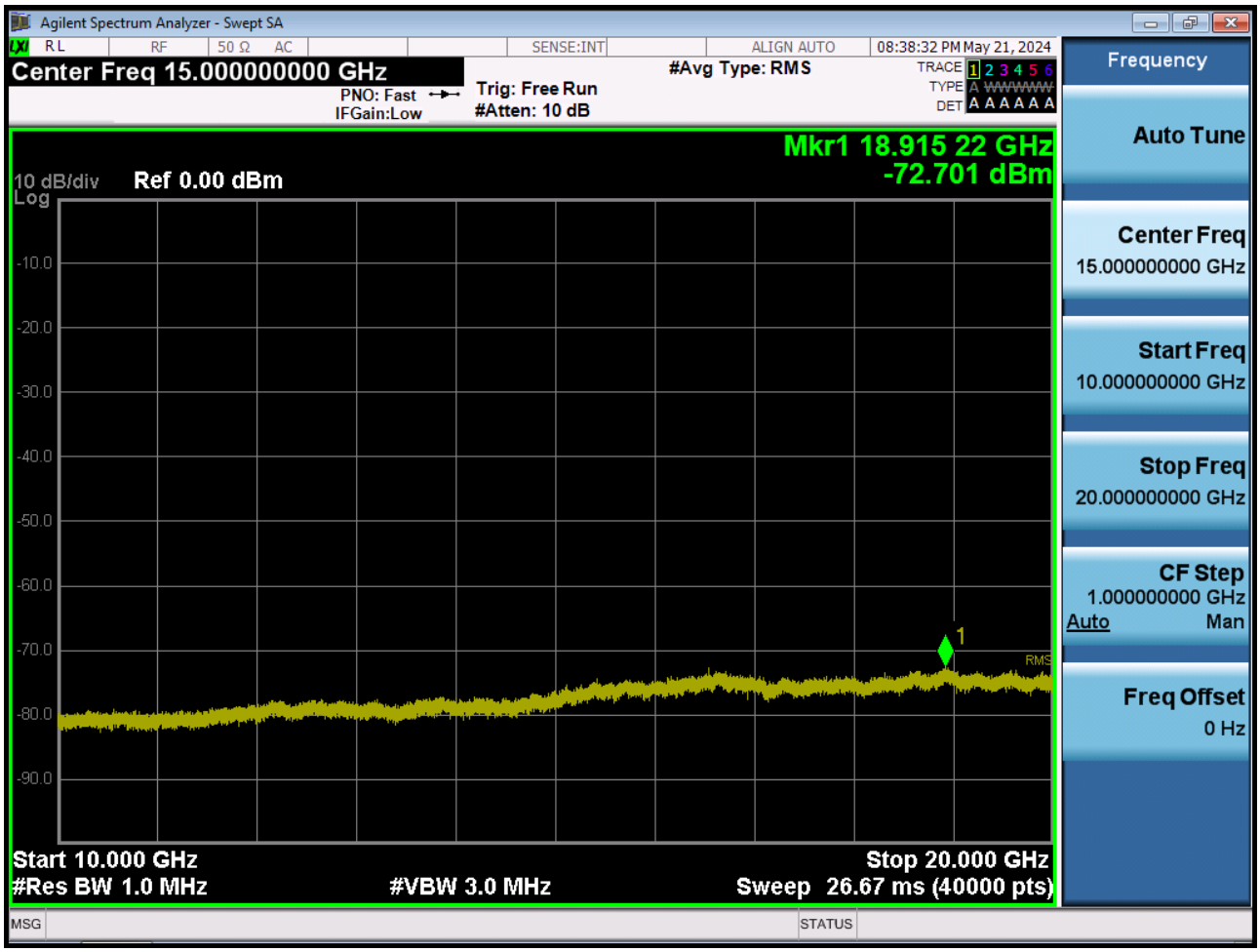
■ WCDMA1700 MODE (1412 CH.) Conducted Spurious Emissions2



■ WCDMA1700 MODE (1513 CH.) Conducted Spurious Emissions1



■ WCDMA1700 MODE (1513 CH.) Conducted Spurious Emissions2



10. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2407-FC013-P