

TEST REPORT

FCC 2G3G Test for SM-A566E/DS
Certification

APPLICANT
SAMSUNG Electronics Co., Ltd.

REPORT NO.
HCT-RF-2412-FC061

DATE OF ISSUE
December 23, 2024

Tested by
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TEST REPORT

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Additional Model

SM-A566E

Applicant**SAMSUNG Electronics Co., Ltd.**

129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Product Name

Mobile Phone

Model Name

SM-A566E/DS

Date of Test

November 25, 2024 ~ December 20, 2024

FCC ID

A3LSMA566E

Location of Test

☒ Permanent Testing Lab ☐ On Site Testing

(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 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	December 23, 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).

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
FCC ID:	A3LSMA566E
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-A566E/DS
Additional Model(s)	SM-A566E
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:	November 25, 2024 ~ December 20, 2024
Serial number:	Radiated : R3CXB08Q36K Conducted : R3CXB08Q33H
Antenna Information	Please refer to the Antenna Approval Specification document.

1.1. MAXIMUM OUTPUT POWER

Main 1 ANT

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	247KGXW	0.697	28.43
GSM850 EDGE			246KG7W	0.138	21.4
WCDMA850	826.4 – 846.6	871.4 – 891.6	4M17F9W	0.079	18.98

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	246KGXW	0.655	28.16
GSM1900 EDGE			253KG7W	0.265	24.23
WCDMA1900	1852.4 – 1907.6	1932.4 – 1987.6	4M18F9W	0.172	22.35
WCDMA1700	1712.4 – 1752.6	2112.4 – 2152.6	4M17F9W	0.139	21.43

Sub 1 ANT

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	249KGXW	0.207	23.15
GSM850 EDGE			254KG7W	0.043	16.30
WCDMA850	826.4 – 846.6	871.4 – 891.6	4M22F9W	0.075	18.74

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

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

2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.3. TEST FACILITY

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

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Occupied Bandwidth	- KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4
Band Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Conducted Output Power	- N/A (See SAR Report)
Peak- to- Average Ratio	- KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4
Frequency stability	- ANSI C63.26-2015 – Section 5.6
Radiated Power	- ANSI C63.26-2015 – Section 5.2.4.4 - KDB 971168 D01 v03r01 – Section 5.8
Radiated Spurious and Harmonic Emissions	- ANSI C63.26-2015 – Section 5.5.3 - KDB 971168 D01 v03r01 – Section 5.8

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.

Test Settings

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

Test Note

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

The power is calculated by the following formula;

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

Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.

3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value.

These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

3.3 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method.

Test Settings

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

Test Note

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

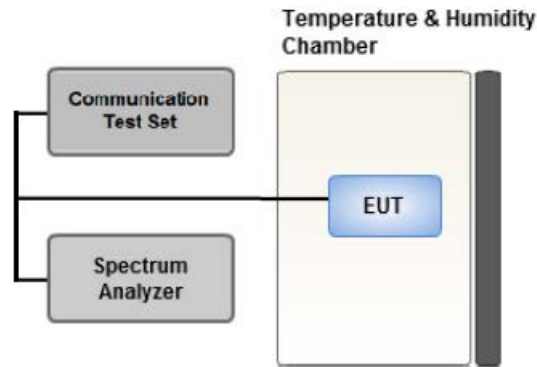
$$\text{Result}_{(\text{dBm})} = P_{g(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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.

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

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① CCDF Procedure for PAPR

Test Settings

1. Set resolution/measurement bandwidth $\geq$ 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:

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

Test Settings(Peak Power)

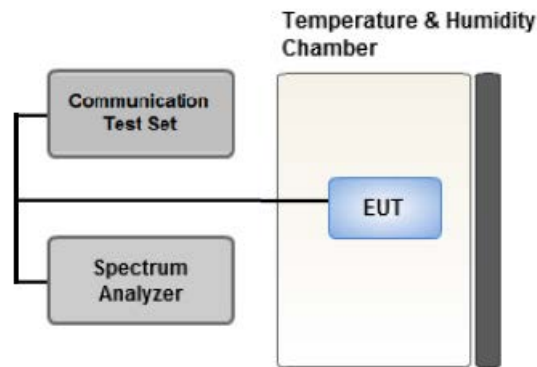
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW $\geq 3 \times$ RBW.

1. Set the RBW $\geq$ OBW.
2. Set VBW $\geq 3 \times$ RBW.
3. Set span $\geq 2 \times$ OBW.
4. Sweep time $\geq 10 \times$ (number of points in sweep) $\times$ (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 $2 \times$ to $3 \times$ the OBW.
2. Set RBW $\geq$ OBW.
3. Set VBW $\geq 3 \times$ RBW.
4. Set number of measurement points in sweep $\geq 2 \times$ span / RBW.
5. Sweep time:
Set $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$ 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 $[10 \times \log (1/\text{duty cycle})]$ to the measured maximum power level to compute the average power during continuous transmission. For example, add $[10 \times \log (1/0.25)] = 6 \text{ dB}$ 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.

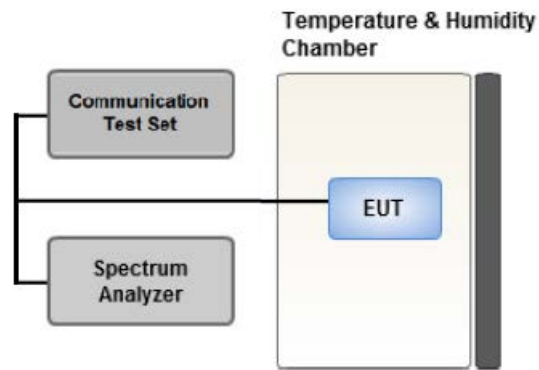
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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 $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5 % of the 99 % occupied bandwidth observed in Step 7

3.6 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.

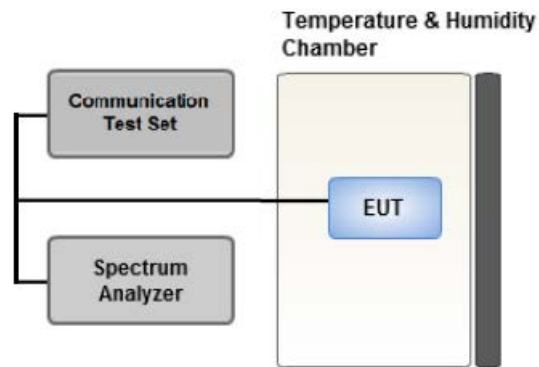
Test Settings(GSM)

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

Test Settings(WCDMA)

1. RBW = 1 MHz
2. VBW $\geq$ 3 MHz
3. Detector = Peak
4. Trace Mode = Max Hold
5. Sweep time = auto
6. Number of points in sweep $\geq$ 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 $\geq 2 \times \text{Span/RBW}$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Notes

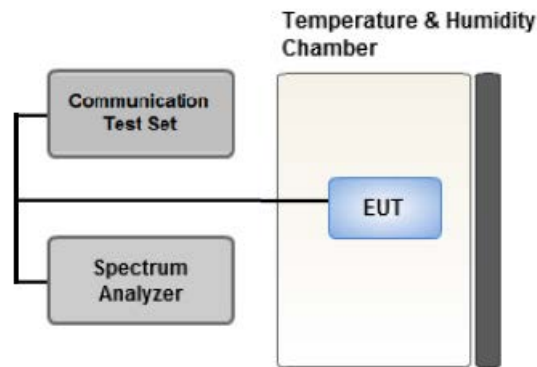
According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \times \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency 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 $\text{Margin} < 1$ dB the emission level is either corrected by $10 \log(1 \text{ MHz} / \text{RB})$ 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-A566E/DS & additional models were tested and the worst case results are reported.
- (Worst case : SM-A566E/DS)

[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-A566E/DS & additional models were tested and the worst case results are reported.
(Worst case : SM-A566E/DS)

[Main 1 ANT Worst case_3G]

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

[Main 1 ANT Worst case_2G]

Test Description	Modulation	Axis	Test Channel
Effective Radiated Power, Equivalent 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 : X GSM1900 : X	Low, Mid, High

[Sub 1 ANT Worst case_3G]

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

[Sub 1 ANT Worst case_2G]

Test Description	Modulation	Axis	Test Channel
Effective Radiated Power,	Voice	GSM850 : X	Low, Mid, High
	EDGE (1 TX Slot)	GSM850 : X	GSM 850 : High
Radiated Spurious and Harmonic Emissions	Voice	GSM850 : X	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	Switch box(1.2 G HPF+LNA)	HCT CO., LTD.,	F1L1	08/21/2025	Annual
RF Switching System	Switch box(3.3 G HPF+LNA)	HCT CO., LTD.,	F1L2	08/21/2025	Annual
RF Switching System	Switch box(LNA)	HCT CO., LTD.,	F1L4	08/21/2025	Annual
RF Switching System	Switch box(6 G HPF+LNA)	HCT CO., LTD.,	F1L7	08/21/2025	Annual
Power Splitter(DC ~ 26.5 GHz)	11667B	Hewlett Packard	5001	04/17/2025	Annual
DC Power Supply	E3632A	Agilent	MY40010147	08/06/2025	Annual
Dipole Antenna	UHAP	Schwarzbeck	01274	03/10/2026	Biennial
Dipole Antenna	UHAP	Schwarzbeck	01288	08/07/2026	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	09/20/2026	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	08/06/2025	Annual
Base Station	8960 (E5515C)	Agilent	MY48360800	08/05/2025	Annual
Loop Antenna(9 kHz ~ 30 MHz)	FMZB1513	Schwarzbeck	1513-333	03/07/2026	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	895	08/28/2026	Biennial
Trilog Broadband Antenna	VULB9168	Schwarzbeck	1135	08/19/2026	Biennial
Wideband Radio Communication Tester	MT8821C	Anritsu Corp.	6262094331	11/13/2025	Annual
Wideband Radio Communication Tester	MT8820C	Anritsu Corp.	6201026545	11/20/2025	Annual
SIGNAL GENERATOR (100 kHz ~ 40 GHz)	SMB100A	REOHDE & SCHWARZ	177633	07/26/2025	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:

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

5. MEASUREMENT UNCERTAINTY

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

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

Parameter	Expanded Uncertainty ($\pm$ kHz)
Occupied Bandwidth	95 (Confidence level about 95 %, $k=2$)
Frequency stability	28 (Confidence level about 95 %, $k=2$)

Parameter	Expanded Uncertainty ($\pm$ dB)
Block Edge	0.70 (Confidence level about 95 %, $k=2$)
Conducted Spurious Emissions	1.18 (Confidence level about 95 %, $k=2$)
Peak- to- Average Ratio	0.68 (Confidence level about 95 %, $k=2$)
Radiated Power	4.74 (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 log ₁₀ (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§ 2.1046	N/A	<u>See Note1</u>
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 log ₁₀ (P[Watts]) for all out-of band emissions	PASS

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

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

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

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

7.2 EIRP Sample Calculation

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

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

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

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW
GSM BW = 249 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W
GSM BW = 249 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W
WCDMA BW = 4.17 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D
LTE BW = 4.48 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D
LTE BW = 4.48 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

8. TEST DATA(Main 1 ANT)

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	-25.37	36.93	-10.24	1.44	H	< 7.00	0.335	25.25
	190	836.6	-23.45	38.96	-10.18	1.45	H		0.541	27.33
	251	848.8	-22.75	39.99	-10.11	1.45	H		0.697	28.43
EDGE	251	848.8	-29.78	32.96	-10.11	1.45	H		0.138	21.40

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	-33.10	29.31	-10.23	1.44	H	< 7.00	0.058	17.64
	4183	836.6	-32.45	29.96	-10.18	1.45	H		0.068	18.33
	4233	846.6	-32.20	30.56	-10.13	1.45	H		0.079	18.98

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	-14.84	19.68	10.40	2.07	V	< 2.00	0.632	28.01
	661	1880.0	-14.98	19.97	10.40	2.21	V		0.655	28.16
	810	1909.8	-15.35	19.59	10.40	2.17	V		0.605	27.82
EDGE	661	1880.0	-18.91	16.04	10.40	2.21	V		0.265	24.23

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	-21.02	13.50	10.40	2.07	V	< 2.00	0.152	21.83
	9400	1880.0	-20.79	14.16	10.40	2.21	V		0.172	22.35
	9538	1907.6	-20.90	14.04	10.40	2.17	V		0.169	22.27

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	-20.48	12.89	10.04	2.06	H	< 1.00	0.122	20.87
	1412	1732.4	-20.05	13.39	10.12	2.08	H		0.139	21.43
	1513	1752.6	-20.45	13.08	10.21	2.08	H		0.132	21.21

8.3 RADIATED SPURIOUS EMISSIONS

■ MODULATION SIGNAL: GSM850
 ■ DISTANCE: 3 meters

Ch.	Freq. (MHz)	<u>Measured</u> <u>Level</u> <u>[dBm]</u>	Ant. Gain (dBi)	<u>Substitute</u> <u>Level</u> <u>[dBm]</u>	C.L	Pol.	Result (dBm)	Limit
128 (824.2)	1 648.40	-45.72	9.58	-61.31	2.02	H	-53.75	-13.00
	2 472.60	-43.01	10.30	-54.30	2.57	H	-46.57	-13.00
	3 296.80	-47.26	12.13	-56.45	2.95	V	-47.27	-13.00
190 (836.6)	1 673.20	-46.12	9.72	-61.77	2.05	V	-54.10	-13.00
	2 509.80	-41.20	10.59	-52.37	2.51	H	-44.29	-13.00
	3 346.40	-48.33	12.37	-58.12	2.96	V	-48.71	-13.00
251 (848.8)	1 697.60	-45.26	9.88	-60.74	2.07	V	-52.93	-13.00
	2 546.40	-39.66	10.66	-50.80	2.53	H	-42.67	-13.00
	3 395.20	-49.21	12.50	-59.16	2.98	H	-49.64	-13.00

▣ MODULATION SIGNAL: GSM1900

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	<u>Measured</u> <u>Level</u> <u>[dBm]</u>	Ant. Gain (dBi)	<u>Substitute</u> <u>Level</u> <u>[dBm]</u>	C.L	Pol.	Result (dBm)	Limit
512 (1850.2)	3 700.40	-49.79	12.29	-57.04	3.07	H	-47.82	-13.00
	5 550.60	-53.57	13.03	-53.19	3.89	V	-44.05	-13.00
	7 400.80	-52.86	10.80	-42.58	4.58	V	-36.36	-13.00
661 (1880.0)	3 760.00	-50.02	12.22	-55.75	3.12	H	-46.65	-13.00
	5 640.00	-52.25	13.12	-52.14	3.92	V	-42.94	-13.00
	7 520.00	-53.69	10.82	-42.85	4.61	V	-36.64	-13.00
810 (1909.8)	3 819.60	-49.85	12.16	-57.03	3.19	V	-48.06	-13.00
	5 729.40	-51.92	13.04	-51.79	4.00	H	-42.75	-13.00
	7 639.20	-54.46	11.21	-44.25	4.68	H	-37.72	-13.00

▣ MODULATION SIGNAL: WCDMA850

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	<u>Measured</u> <u>Level</u> <u>[dBm]</u>	Ant. Gain (dBi)	<u>Substitute</u> <u>Level</u> <u>[dBm]</u>	C.L	Pol.	Result (dBm)	Limit
4132 (826.4)	1 652.80	-44.02	9.61	-59.57	2.02	H	-51.98	-13.00
	2 479.20	-46.10	10.34	-57.32	2.55	V	-49.53	-13.00
	3 305.60	-47.57	12.18	-56.89	2.97	H	-47.68	-13.00
4183 (836.6)	1 673.20	-43.78	9.72	-59.43	2.05	V	-51.76	-13.00
	2 509.80	-45.41	10.59	-56.58	2.51	H	-48.50	-13.00
	3 346.40	-46.73	12.37	-56.52	2.96	H	-47.11	-13.00
4233 (846.6)	1 693.20	-45.84	9.85	-61.37	2.07	V	-53.59	-13.00
	2 539.80	-47.15	10.67	-58.20	2.53	V	-50.06	-13.00
	3 386.40	-48.04	12.52	-58.07	2.99	V	-48.54	-13.00

▣ MODULATION SIGNAL: WCDMA1900

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	<u>Measured</u> <u>Level</u> <u>[dBm]</u>	Ant. Gain (dBi)	<u>Substitute</u> <u>Level</u> <u>[dBm]</u>	C.L	Pol.	Result (dBm)	Limit
9262 (1852.4)	3 704.80	-48.02	12.28	-55.31	3.08	V	-46.11	-13.00
	5 557.20	-53.45	13.03	-53.02	3.88	V	-43.87	-13.00
	7 409.60	-51.28	10.79	-41.25	4.57	H	-35.03	-13.00
9400 (1880.0)	3 760.00	-48.84	12.22	-54.57	3.12	V	-45.47	-13.00
	5 640.00	-51.73	13.12	-51.62	3.92	H	-42.42	-13.00
	7 520.00	-54.41	10.82	-43.57	4.61	V	-37.36	-13.00
9538 (1907.6)	3 815.20	-46.97	12.16	-53.98	3.20	H	-45.02	-13.00
	5 722.80	-51.02	13.05	-51.10	4.00	H	-42.05	-13.00
	7 630.40	-54.45	11.18	-43.99	4.66	V	-37.47	-13.00

▣ MODULATION SIGNAL: WCDMA1700

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	<u>Measured</u> <u>Level</u> [dBm]	Ant. Gain (dBi)	<u>Substitute</u> <u>Level</u> [dBm]	C.L	Pol.	Result (dBm)	Limit
1312 (1712.4)	3 424.80	-48.28	12.43	-57.03	2.99	V	-47.59	-13.00
	5 137.20	-51.62	12.33	-52.25	3.81	V	-43.73	-13.00
	6 849.60	-54.58	11.90	-47.94	4.36	V	-40.40	-13.00
1412 (1732.4)	3 464.80	-48.76	12.34	-57.38	3.02	H	-48.06	-13.00
	5 197.20	-51.79	12.60	-52.35	3.79	H	-43.54	-13.00
	6 929.60	-50.90	11.65	-44.28	4.40	H	-37.03	-13.00
1513 (1752.6)	3 505.20	-47.04	12.34	-55.31	3.05	H	-46.02	-13.00
	5 257.80	-52.89	12.99	-53.09	3.79	H	-43.89	-13.00
	7 010.40	-52.33	11.26	-44.61	4.42	H	-37.77	-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
				T_{XTotal} (ms)	T_{XOn} (ms)	Factor (dB)			
GSM1900	661	30.487	20.42	4.6160	0.5475	9.26	0.81	13	Pass
GSM1900 EDGE	661	28.674	16.16	4.616	0.5475	9.26	3.25		
GSM850	190	CCDF Procedure					3.83		
GSM850 EDGE	190						6.35		
WCDMA850	4408						3.41		
WCDMA1900	9400						2.96		
WCDMA1700	1732.4						2.95		

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 74 ~ 84.
2. Only GSM(include EDGE) Mode was tested by alternate procedure for PAPR

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

$$\text{Duty cycle Factor} = 10 \times \log (1/X), \quad X = T_{XOn} / T_{XTotal}$$

8.5 OCCUPIED BANDWIDTH

Band	Channel	Frequency (MHz)	Data (GSM: kHz / WCDMA : MHz)
GSM850	128	824.20	247.02
	190	836.60	244.09
	251	848.80	246.17
GSM850 EDGE	128	824.20	246.04
	190	836.60	246.27
	251	848.80	245.71
GSM1900	512	1850.20	242.35
	661	1880.00	244.46
	810	1909.80	245.67
GSM1900 EDGE	512	1850.20	249.79
	661	1880.00	249.19
	810	1909.80	253.37
WCDMA850	4132	826.40	4.1650
	4183	836.60	4.1531
	4233	846.60	4.1549
WCDMA1900	9262	1852.40	4.1813
	9400	1880.00	4.1651
	9538	1907.60	4.1547
WCDMA1700	1712.4	1712.40	4.1698
	1732.4	1732.40	4.1593
	1752.6	1752.60	4.1738

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 57 ~ 73.

8.6 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result	Limit (dBm)
GSM850	128	3.6990	27.976	-57.846	-29.870	-13.00
	190	6.4906	28.591	-57.158	-28.567	
	251	3.1905	27.976	-58.210	-30.230	
GSM1900	512	18.91000	29.489	-52.809	-23.320	
	661	18.92000	29.489	-53.392	-23.903	
	810	18.90000	29.489	-52.453	-22.964	
WCDMA850	4132	3.7089	27.976	-66.639	-38.663	
	4183	3.6691	27.976	-67.129	-39.153	
	4233	3.1905	27.976	-67.856	-39.880	
WCDMA1900	9262	16.6400	29.489	-64.250	-34.761	
	9400	19.5600	29.489	-62.971	-33.482	
	9538	16.4500	29.489	-63.444	-33.955	
WCDMA1700	1712.4	16.63000	29.489	-64.257	-34.768	
	1732.4	18.79000	29.489	-63.972	-34.483	
	1752.6	18.95000	29.489	-63.440	-33.951	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 121 ~ 144.
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

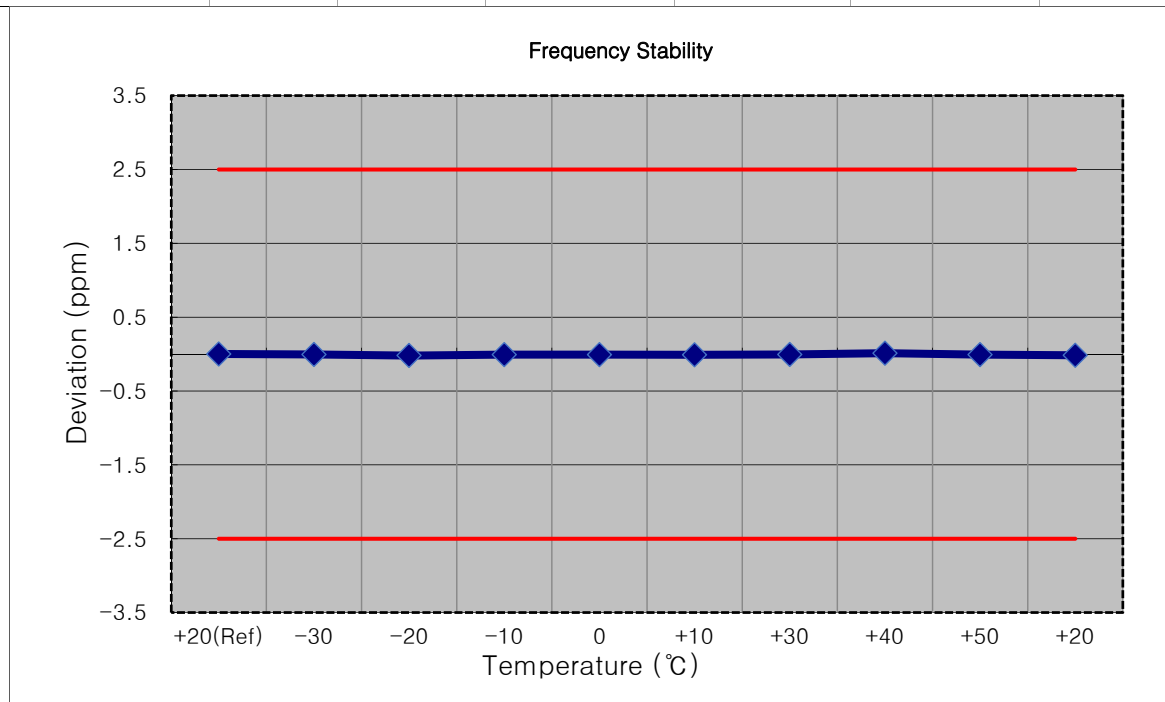
8.7 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 85 ~ 120.

8.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

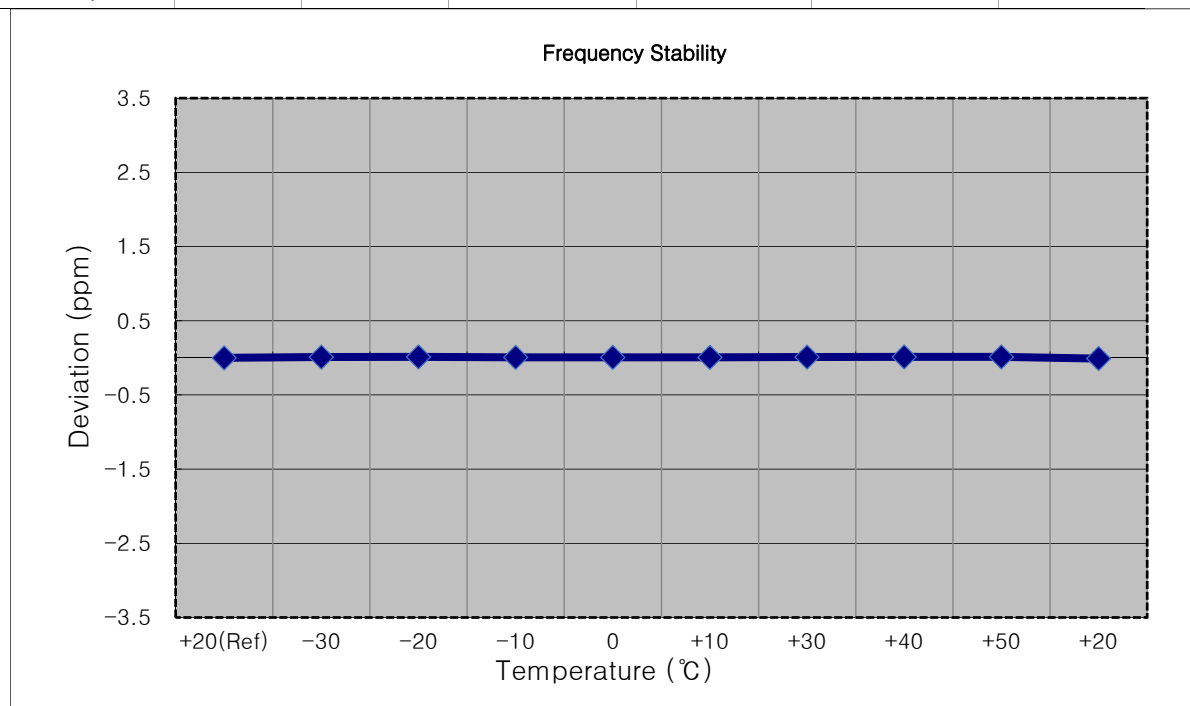
- ▣ MODE: GSM850
- ▣ OPERATING FREQUENCY: 836,600,000 Hz
- ▣ CHANNEL: 190
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	836 599 991	0.0	0.000 000	0.0000
100 %		-30	836 599 986	-5.8	-0.000 001	-0.0069
100 %		-20	836 599 975	-16.5	-0.000 002	-0.0198
100 %		-10	836 599 984	-7.3	-0.000 001	-0.0088
100 %		0	836 599 985	-6.7	-0.000 001	-0.0081
100 %		+10	836 599 984	-7.9	-0.000 001	-0.0094
100 %		+30	836 599 986	-5.0	-0.000 001	-0.0060
100 %		+40	836 600 001	9.5	0.000 001	0.0114
100 %		+50	836 599 985	-6.6	-0.000 001	-0.0079
Batt. Endpoint	3.300	+20	836 599 977	-14.2	-0.000 002	-0.0170



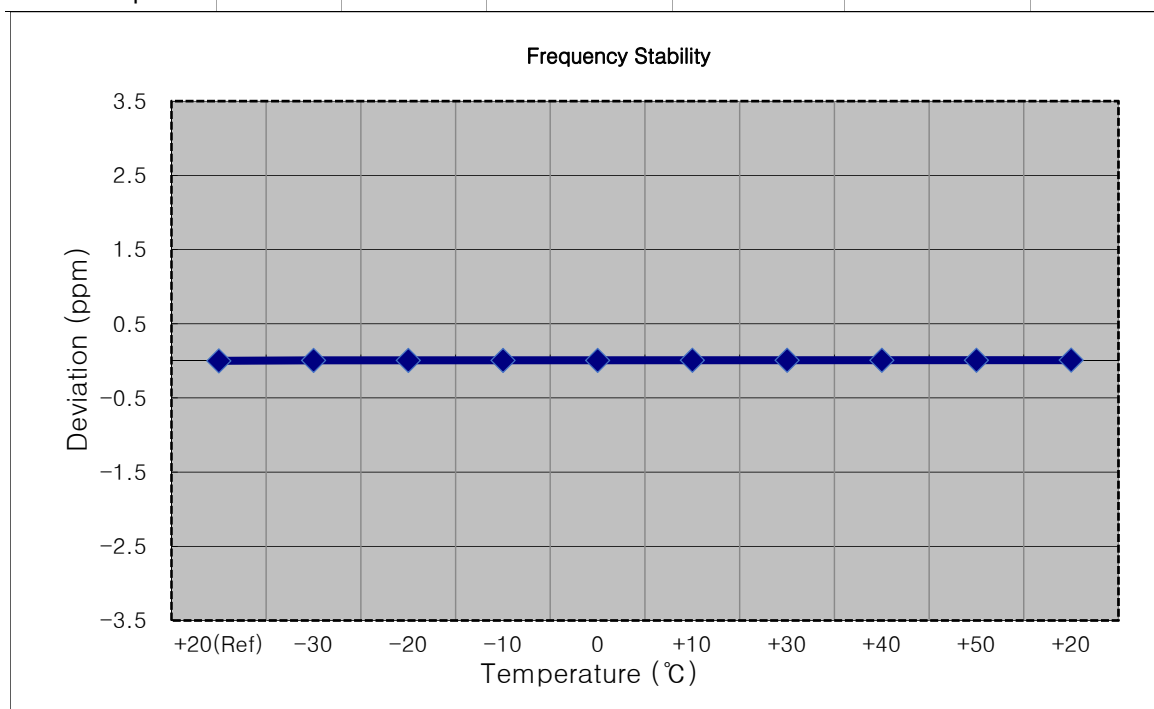
■ Mode: GSM1900
 ■ OPERATING FREQUENCY: 1850,200,000 Hz
 ■ CHANNEL: 512
 ■ REFERENCE VOLTAGE: 4.200 VDC
 ■ DEVIATION LIMIT: Emission must remain in band

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100 %	4.200	+20(Ref)	1850 200 013	0.0	0.000 000	0.0000
100 %		-30	1850 200 033	20.6	0.000 001	0.0111
100 %		-20	1850 200 034	21.1	0.000 001	0.0114
100 %		-10	1850 200 023	10.6	0.000 001	0.0057
100 %		0	1850 200 021	8.9	0.000 000	0.0048
100 %		+10	1850 200 024	11.4	0.000 001	0.0062
100 %		+30	1850 200 031	18.8	0.000 001	0.0101
100 %		+40	1850 200 035	22.1	0.000 001	0.0120
100 %		+50	1850 200 036	23.6	0.000 001	0.0128
Batt. Endpoint	3.300	+20	1850 199 995	-17.4	-0.000 001	-0.0094



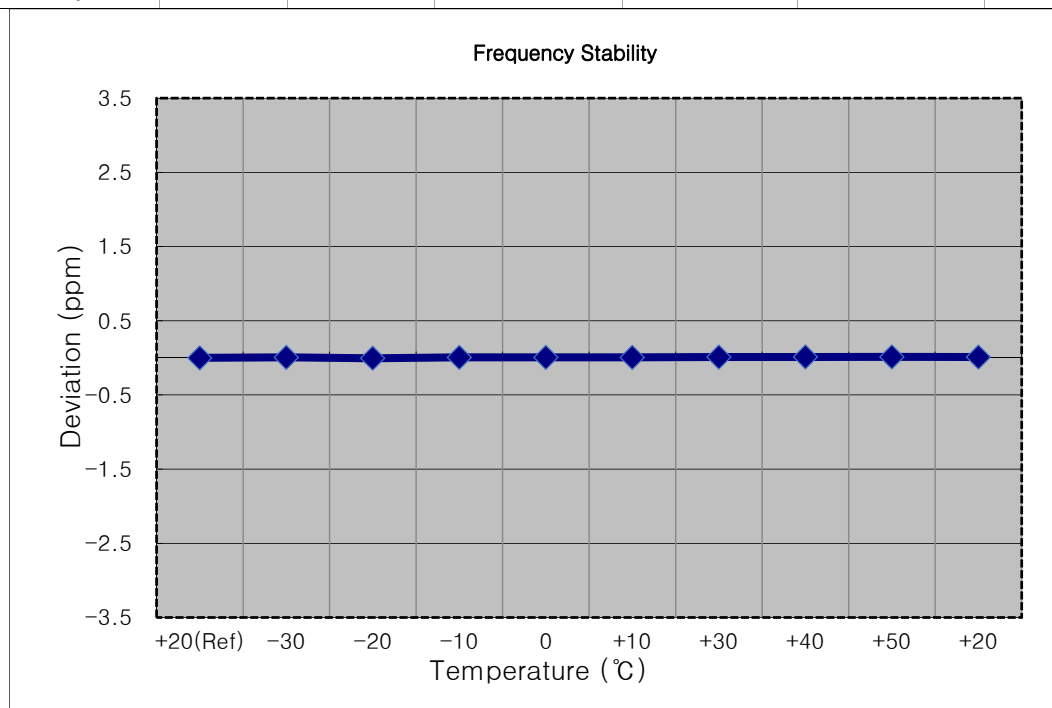
- ▣ Mode: GSM1900
- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 661
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	1879 999 990	0.0	0.000 000	0.000
100 %		-30	1880 000 000	9.6	0.000 001	0.005
100 %		-20	1879 999 999	9.1	0.000 000	0.005
100 %		-10	1880 000 001	11.1	0.000 001	0.006
100 %		0	1880 000 000	9.5	0.000 001	0.005
100 %		+10	1880 000 006	15.8	0.000 001	0.008
100 %		+30	1880 000 004	13.7	0.000 001	0.007
100 %		+40	1880 000 005	15.1	0.000 001	0.008
100 %		+50	1880 000 006	15.5	0.000 001	0.008
Batt. Endpoint	3.300	+20	1880 000 008	17.5	0.000 001	0.009



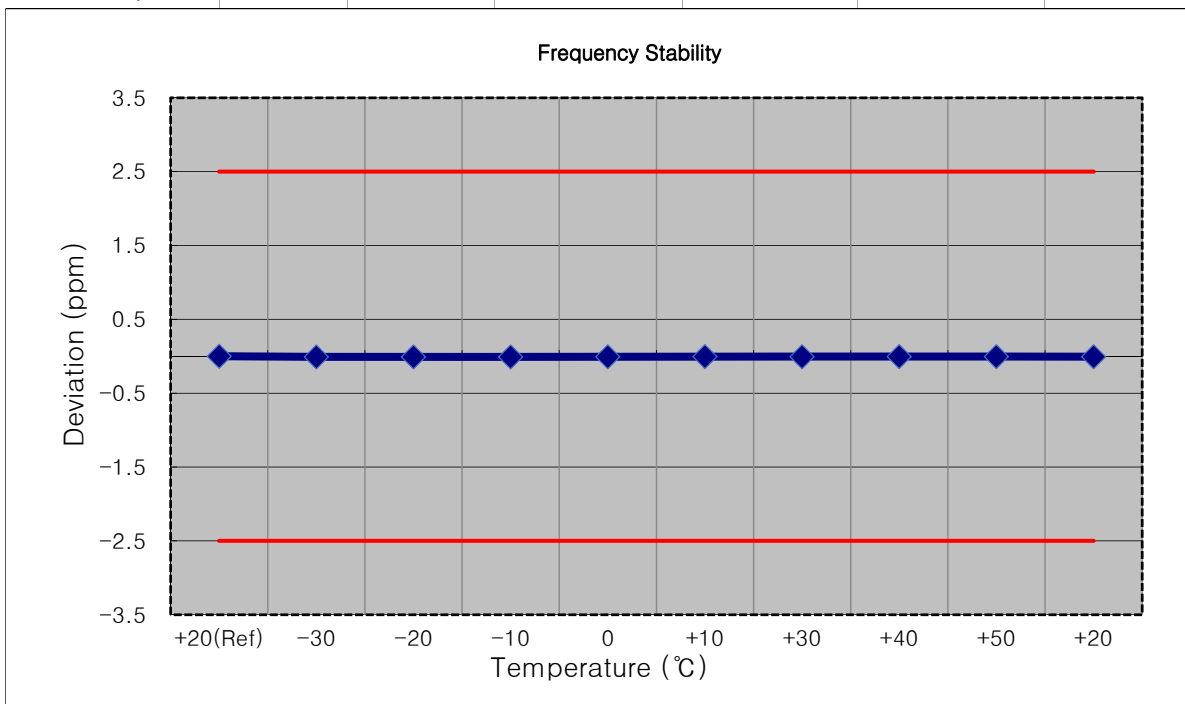
Mode:	<u>GSM1900</u>
OPERATING FREQUENCY:	<u>1909,800,000 Hz</u>
CHANNEL:	<u>810</u>
REFERENCE VOLTAGE:	<u>4.200 VDC</u>
DEVIATION LIMIT:	<u>Emission must remain in band</u>

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	1909 799 984	0.0	0.000 000	0.000
100 %		-30	1909 799 994	9.5	0.000 000	0.005
100 %		-20	1909 799 974	-10.0	-0.000 001	-0.005
100 %		-10	1909 799 995	10.9	0.000 001	0.006
100 %		0	1909 799 996	11.9	0.000 001	0.006
100 %		+10	1909 799 996	12.2	0.000 001	0.006
100 %		+30	1909 800 003	18.6	0.000 001	0.010
100 %		+40	1909 800 007	22.6	0.000 001	0.012
100 %		+50	1909 800 006	21.6	0.000 001	0.011
Batt. Endpoint	3.300	+20	1909 800 005	21.0	0.000 001	0.011



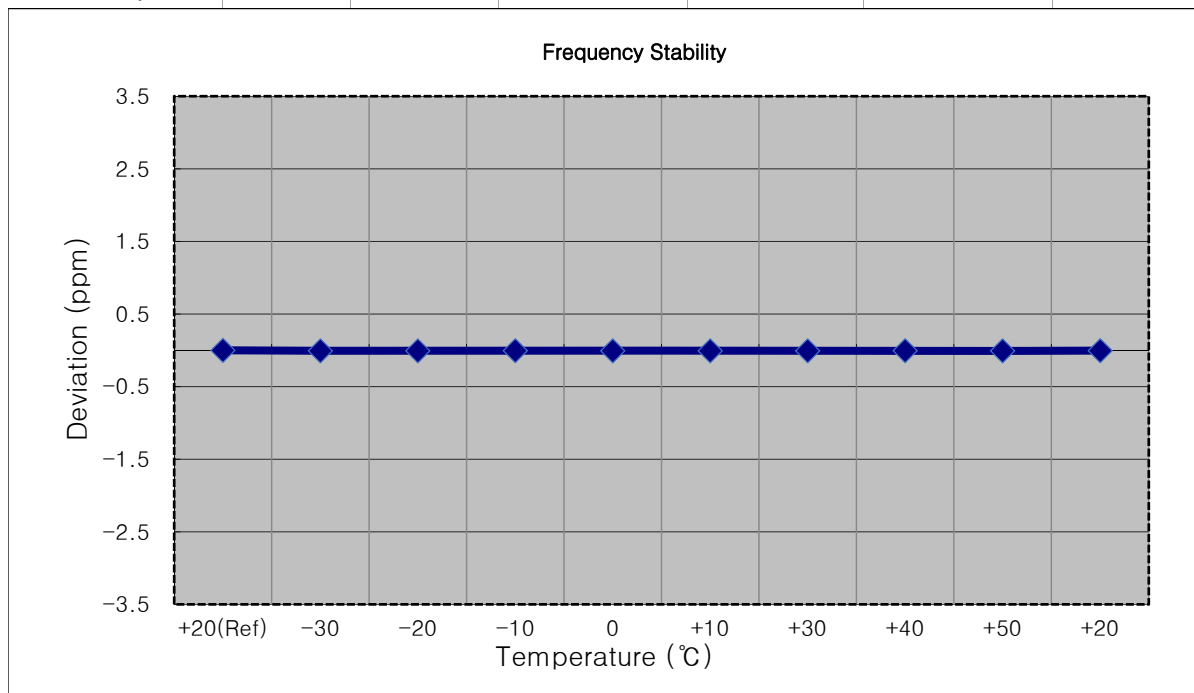
Mode: WCDMA850
 OPERATING FREQUENCY: 836,600,000 Hz
 CHANNEL: 4183
 REFERENCE VOLTAGE: 4.200 VDC
 DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	836 599 995	0.0	0.000 000	0.0000
100 %		-30	836 599 988	-6.8	-0.000 001	-0.0082
100 %		-20	836 599 987	-7.8	-0.000 001	-0.0093
100 %		-10	836 599 987	-7.8	-0.000 001	-0.0094
100 %		0	836 599 988	-6.6	-0.000 001	-0.0079
100 %		+10	836 599 990	-4.6	-0.000 001	-0.0055
100 %		+30	836 599 989	-6.2	-0.000 001	-0.0074
100 %		+40	836 599 990	-4.8	-0.000 001	-0.0058
100 %		+50	836 599 990	-4.6	-0.000 001	-0.0055
Batt. Endpoint	3.300	+20	836 599 990	-5.1	-0.000 001	-0.0061



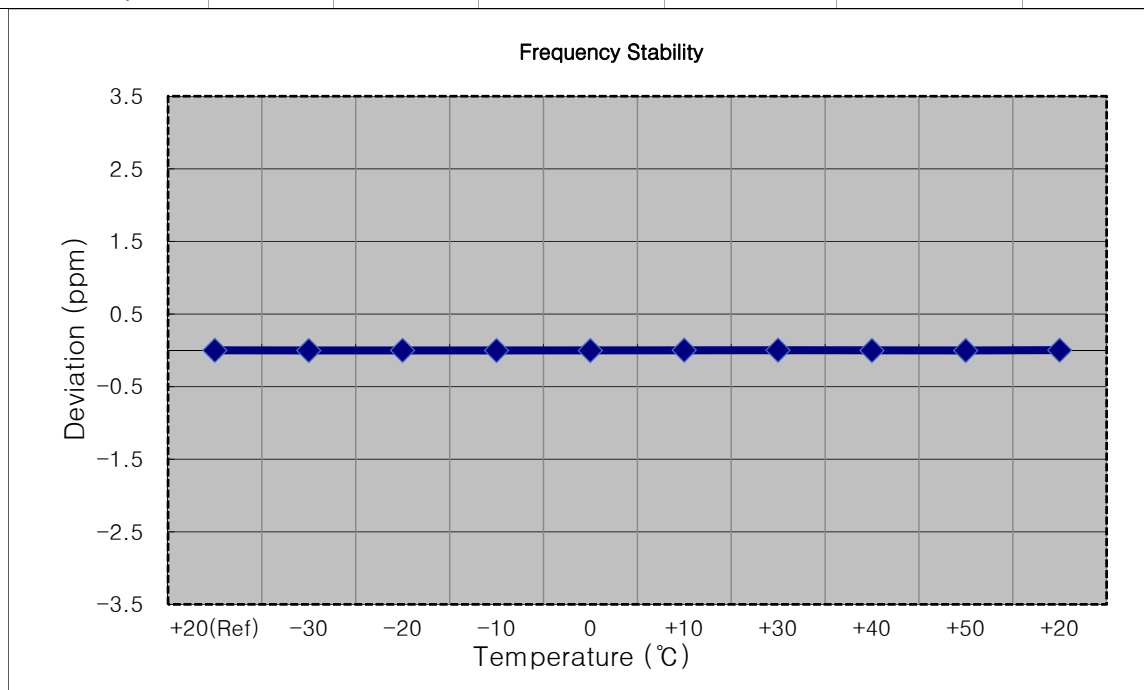
Mode: WCDMA1900
 OPERATING FREQUENCY: 1,842,400,000 Hz
 CHANNEL: 9262
 REFERENCE VOLTAGE: 4.200 VDC
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	1842 399 988	0.0	0.000 000	0.0000
100 %		-30	1842 399 977	-11.8	-0.000 001	-0.0064
100 %		-20	1842 399 975	-13.4	-0.000 001	-0.0073
100 %		-10	1842 399 978	-10.7	-0.000 001	-0.0058
100 %		0	1842 399 975	-13.7	-0.000 001	-0.0075
100 %		+10	1842 399 976	-12.8	-0.000 001	-0.0070
100 %		+30	1842 399 975	-13.5	-0.000 001	-0.0073
100 %		+40	1842 399 978	-10.8	-0.000 001	-0.0059
100 %		+50	1842 399 974	-14.2	-0.000 001	-0.0077
Batt. Endpoint	3.300	+20	1842 399 977	-11.2	-0.000 001	-0.0061



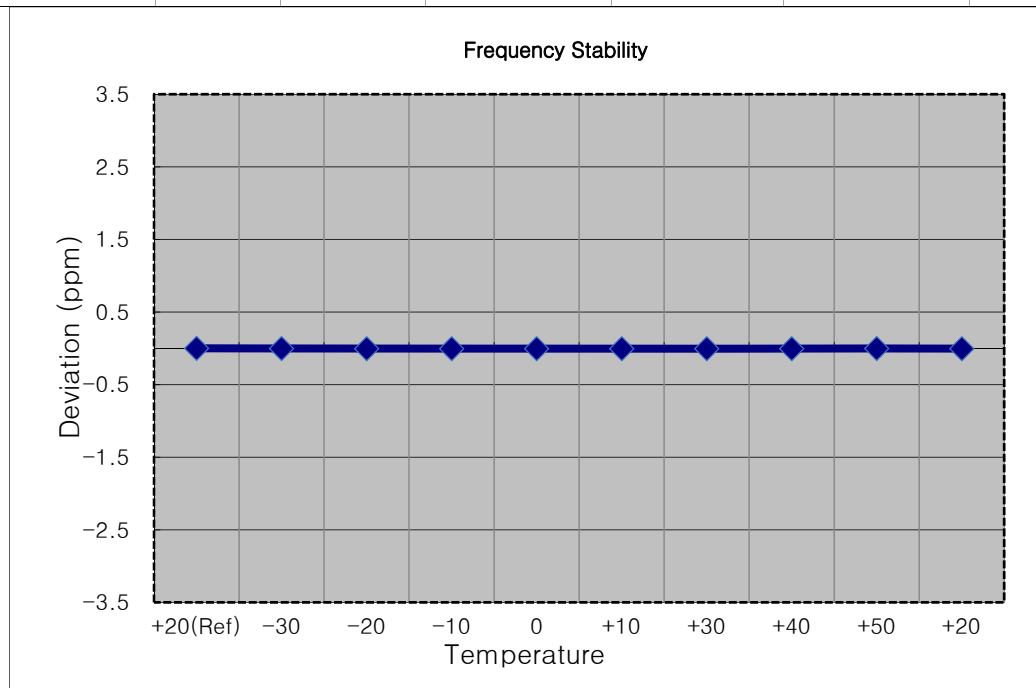
- ▣ Mode: WCDMA1900
- ▣ OPERATING FREQUENCY: 1,880,000,000 Hz
- ▣ CHANNEL: 9400
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	1879 999 995	0.0	0.000 000	0.0000
100 %		-30	1879 999 990	-4.7	0.000 000	-0.0025
100 %		-20	1879 999 992	-2.9	0.000 000	-0.0015
100 %		-10	1879 999 990	-4.8	0.000 000	-0.0025
100 %		0	1879 999 989	-5.8	0.000 000	-0.0031
100 %		+10	1879 999 999	3.7	0.000 000	0.0020
100 %		+30	1880 000 000	5.0	0.000 000	0.0026
100 %		+40	1879 999 991	-4.4	0.000 000	-0.0023
100 %		+50	1879 999 990	-5.3	0.000 000	-0.0028
Batt. Endpoint	3.300	+20	1879 999 998	3.5	0.000 000	0.0018



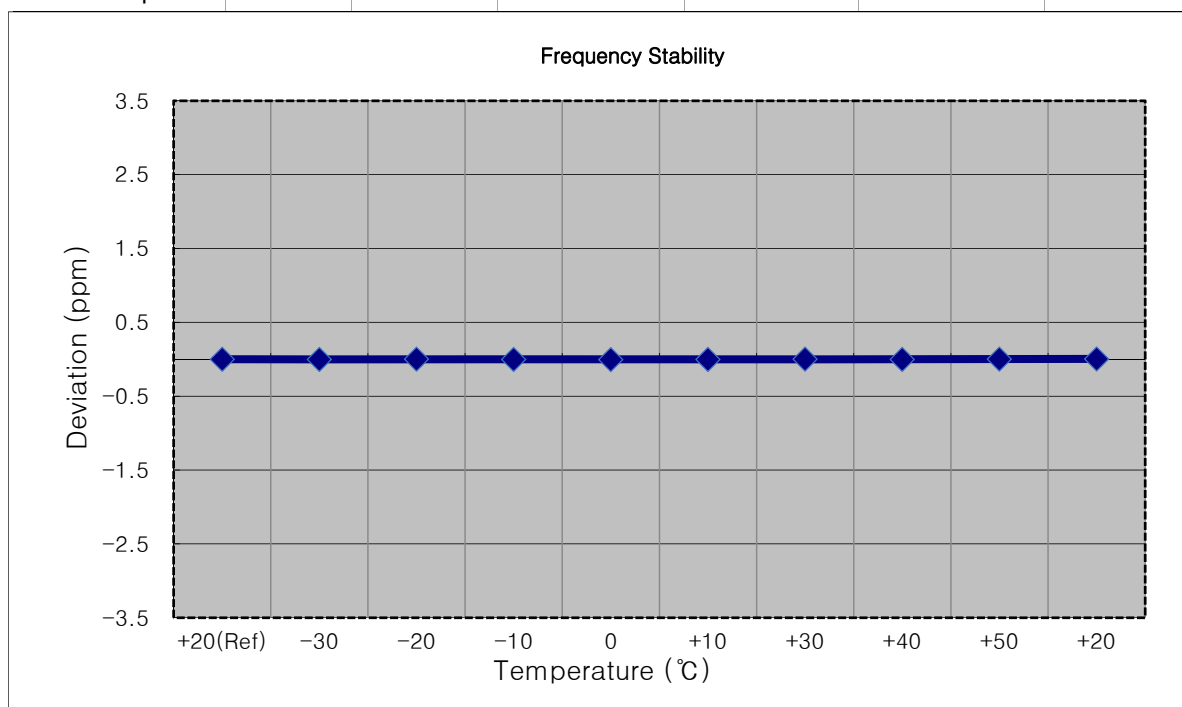
Mode: WCDMA1900
 OPERATING FREQUENCY: 1,907,600,000 Hz
 CHANNEL: 9538
 REFERENCE VOLTAGE: 4.200 VDC
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	1907 599 991	0.0	0.000 000	0.0000
100 %		-30	1907 599 985	-6.4	0.000 000	-0.0033
100 %		-20	1907 599 982	-9.5	0.000 000	-0.0050
100 %		-10	1907 599 983	-8.7	0.000 000	-0.0046
100 %		0	1907 599 984	-7.5	0.000 000	-0.0039
100 %		+10	1907 599 983	-8.6	0.000 000	-0.0045
100 %		+30	1907 599 981	-10.6	-0.000 001	-0.0055
100 %		+40	1907 599 982	-9.8	-0.000 001	-0.0051
100 %		+50	1907 599 984	-7.4	0.000 000	-0.0039
Batt. Endpoint	3.300	+20	1907 599 982	-9.0	0.000 000	-0.0047



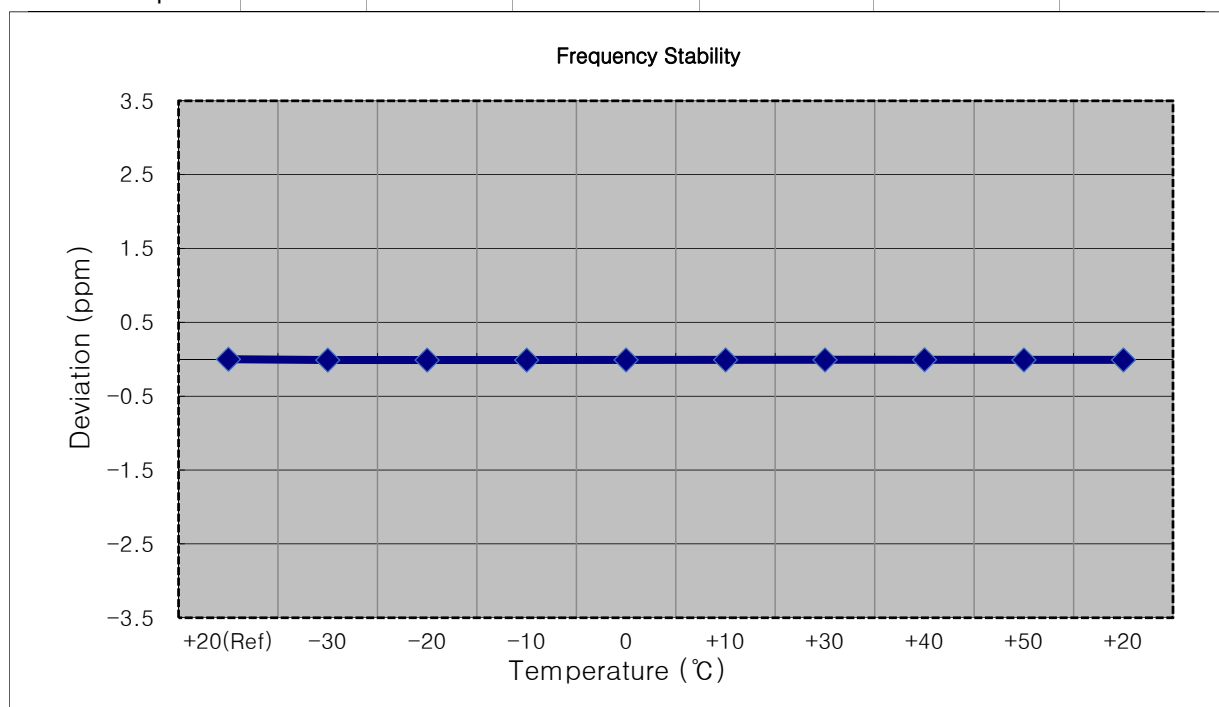
- ▣ Mode: WCDMA1700
- ▣ OPERATING FREQUENCY: 1,712,400,000 Hz
- ▣ CHANNEL: 1312
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	1712 400 004	0.0	0.000 000	0.0000
100 %		-30	1712 400 000	-3.7	0.000 000	-0.0021
100 %		-20	1712 400 007	3.6	0.000 000	0.0021
100 %		-10	1712 400 000	-4.1	0.000 000	-0.0024
100 %		0	1712 399 997	-6.5	0.000 000	-0.0038
100 %		+10	1712 399 999	-4.6	0.000 000	-0.0027
100 %		+30	1712 400 008	4.6	0.000 000	0.0027
100 %		+40	1712 399 998	-5.7	0.000 000	-0.0033
100 %		+50	1712 400 008	4.3	0.000 000	0.0025
Batt. Endpoint	3.300	+20	1712 400 012	8.5	0.000 000	0.0049



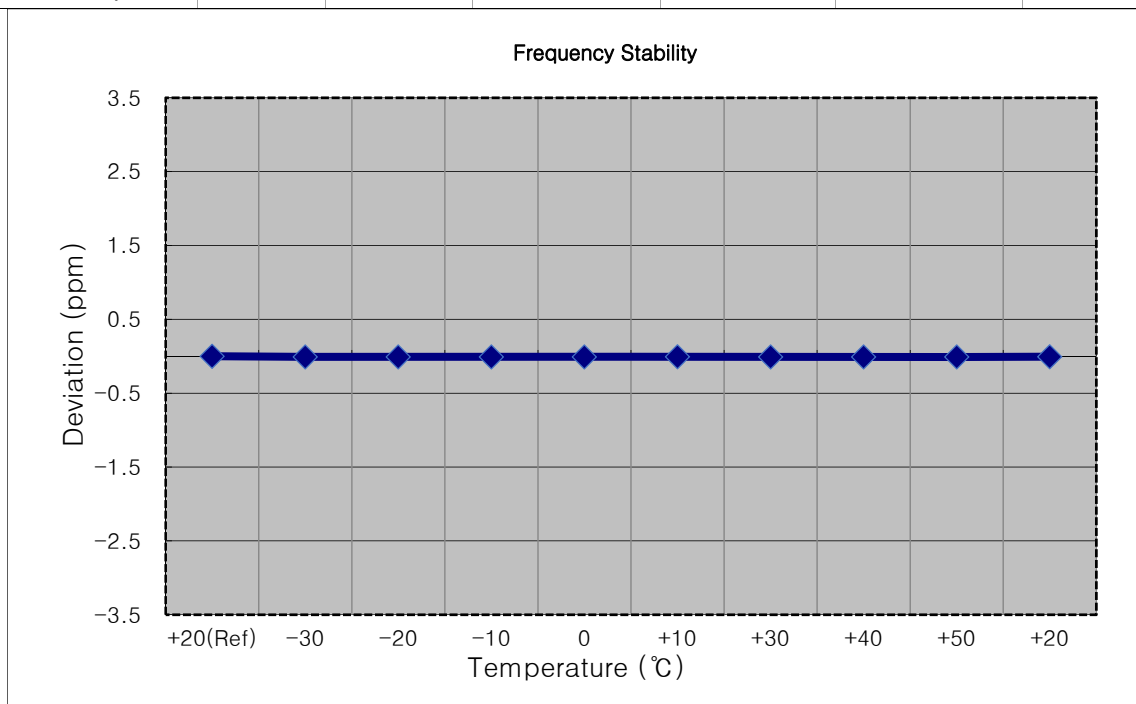
Mode: WCDMA1700
 OPERATING FREQUENCY: 1,732,400,000 Hz
 CHANNEL: 1412
 REFERENCE VOLTAGE: 4.200 VDC
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	1732 399 985	0.0	0.000 000	0.0000
100 %		-30	1732 399 967	-18.3	-0.000 001	-0.0105
100 %		-20	1732 399 967	-17.6	-0.000 001	-0.0102
100 %		-10	1732 399 966	-18.6	-0.000 001	-0.0107
100 %		0	1732 399 970	-14.9	-0.000 001	-0.0086
100 %		+10	1732 399 968	-17.0	-0.000 001	-0.0098
100 %		+30	1732 399 970	-14.3	-0.000 001	-0.0083
100 %		+40	1732 399 971	-13.8	-0.000 001	-0.0080
100 %		+50	1732 399 971	-14.2	-0.000 001	-0.0082
Batt. Endpoint	3.300	+20	1732 399 969	-15.4	-0.000 001	-0.0089



Mode: WCDMA1700
 OPERATING FREQUENCY: 1,752,400,000 Hz
 CHANNEL: 1513
 REFERENCE VOLTAGE: 4.200 VDC
 DEVIATION LIMIT: Emission must remain in band

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	1752 399 985	0.0	0.000 000	0.0000
100 %		-30	1752 399 968	-16.7	-0.000 001	-0.0095
100 %		-20	1752 399 970	-14.8	-0.000 001	-0.0084
100 %		-10	1752 399 970	-15.1	-0.000 001	-0.0086
100 %		0	1752 399 970	-15.1	-0.000 001	-0.0086
100 %		+10	1752 399 973	-12.6	-0.000 001	-0.0072
100 %		+30	1752 399 969	-16.2	-0.000 001	-0.0092
100 %		+40	1752 399 969	-15.7	-0.000 001	-0.0090
100 %		+50	1752 399 968	-17.3	-0.000 001	-0.0099
Batt. Endpoint	3.300	+20	1752 399 972	-13.3	-0.000 001	-0.0076



9. TEST DATA(Sub 1 ANT)

9.1 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	-28.98	33.32	-10.24	1.44	H	< 7.00	0.146	21.64
	190	836.6	-28.28	34.13	-10.18	1.45	H		0.178	22.50
	251	848.8	-28.03	34.71	-10.11	1.45	H		0.207	23.15
EDGE	251	848.8	-34.88	27.86	-10.11	1.45	H		0.043	16.30

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	-32.84	29.57	-10.23	1.44	H	< 7.00	0.062	17.90
	4183	836.6	-32.24	30.17	-10.18	1.45	H		0.071	18.54
	4233	846.6	-32.44	30.32	-10.13	1.45	H		0.075	18.74

9.2 RADIATED SPURIOUS EMISSIONS

■ MODULATION SIGNAL: GSM850
 ■ DISTANCE: 3 meters

Ch.	Freq. (MHz)	<u>Measured</u> <u>Level</u> <u>[dBm]</u>	Ant. Gain (dBi)	<u>Substitute</u> <u>Level</u> <u>[dBm]</u>	C.L	Pol.	Result (dBm)	Limit
128 (824.2)	1 648.40	-42.52	9.58	-58.11	2.02	H	-50.55	-13.00
	2 472.60	-45.30	10.30	-56.59	2.57	V	-48.86	-13.00
	3 296.80	-48.96	12.13	-58.15	2.95	V	-48.97	-13.00
190 (836.6)	1 673.20	-43.02	9.72	-58.67	2.05	H	-51.00	-13.00
	2 509.80	-46.87	10.59	-58.04	2.51	V	-49.96	-13.00
	3 346.40	-47.66	12.37	-57.45	2.96	V	-48.04	-13.00
251 (848.8)	1 697.60	-43.30	9.88	-58.78	2.07	H	-50.97	-13.00
	2 546.40	-46.85	10.66	-57.99	2.53	V	-49.86	-13.00
	3 395.20	-47.97	12.50	-57.92	2.98	V	-48.40	-13.00

▣ MODULATION SIGNAL: WCDMA850

▣ DISTANCE: 3 meters

Ch.	Freq. (MHz)	<u>Measured</u> <u>Level</u> [dBm]	Ant. Gain (dBi)	<u>Substitute</u> <u>Level</u> [dBm]	C.L	Pol.	Result (dBm)	Limit
4132 (826.4)	1 652.80	-44.86	9.61	-60.41	2.02	V	-52.82	-13.00
	2 479.20	-47.77	10.34	-58.99	2.55	V	-51.20	-13.00
	3 305.60	-48.44	12.18	-57.76	2.97	V	-48.55	-13.00
4183 (836.6)	1 673.20	-43.91	9.72	-59.56	2.05	V	-51.89	-13.00
	2 509.80	-45.18	10.59	-56.35	2.51	V	-48.27	-13.00
	3 346.40	-46.92	12.37	-56.71	2.96	V	-47.30	-13.00
4233 (846.6)	1 693.20	-44.03	9.85	-59.56	2.07	V	-51.78	-13.00
	2 539.80	-47.61	10.67	-58.66	2.53	H	-50.52	-13.00
	3 386.40	-48.90	12.52	-58.93	2.99	H	-49.40	-13.00

9.3 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)				
GSM850	190	CCDF Procedure						3.80	13	Pass
GSM850 EDGE	190							6.34		
WCDMA850	4408							3.13		

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 153 ~ 155.
2. Only GSM(include EDGE) Mode was tested by alternate procedure for PAPR

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

$$\text{Duty cycle Factor} = 10 \times \log (1/X), \quad X = Tx_{On} / Tx_{Total}$$

9.4 OCCUPIED BANDWIDTH

Band	Channel	Frequency (MHz)	Data (GSM: kHz / WCDMA : MHz)
GSM850	128	824.20	244.59
	190	836.60	249.19
	251	848.80	245.98
GSM850 EDGE	128	824.20	250.67
	190	836.60	246.77
	251	848.80	253.90
WCDMA850	4132	826.40	4.2244
	4183	836.60	4.1732
	4233	846.60	4.2004

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 146 ~ 152.

9.5 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result	Limit (dBm)
GSM850	128	2.4727	27.976	-55.76	-27.782	-13.00
	190	2.5125	27.976	-56.81	-28.838	
	251	2.5424	27.976	-52.78	-24.800	
WCDMA850	4132	3.6990	27.976	-67.692	-29.716	
	4183	3.7388	27.976	-67.515	-39.539	
	4233	5.3540	28.591	-68.078	-39.487	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 172 ~ 177.
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

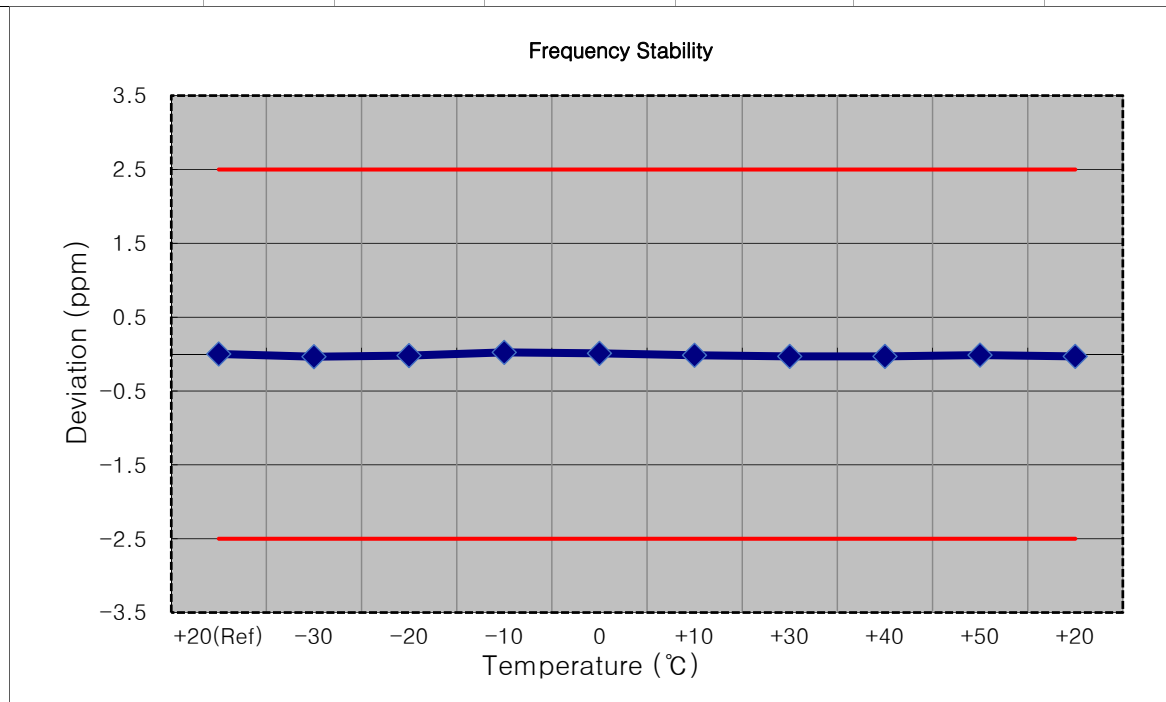
9.7 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 156 ~ 171.

9.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

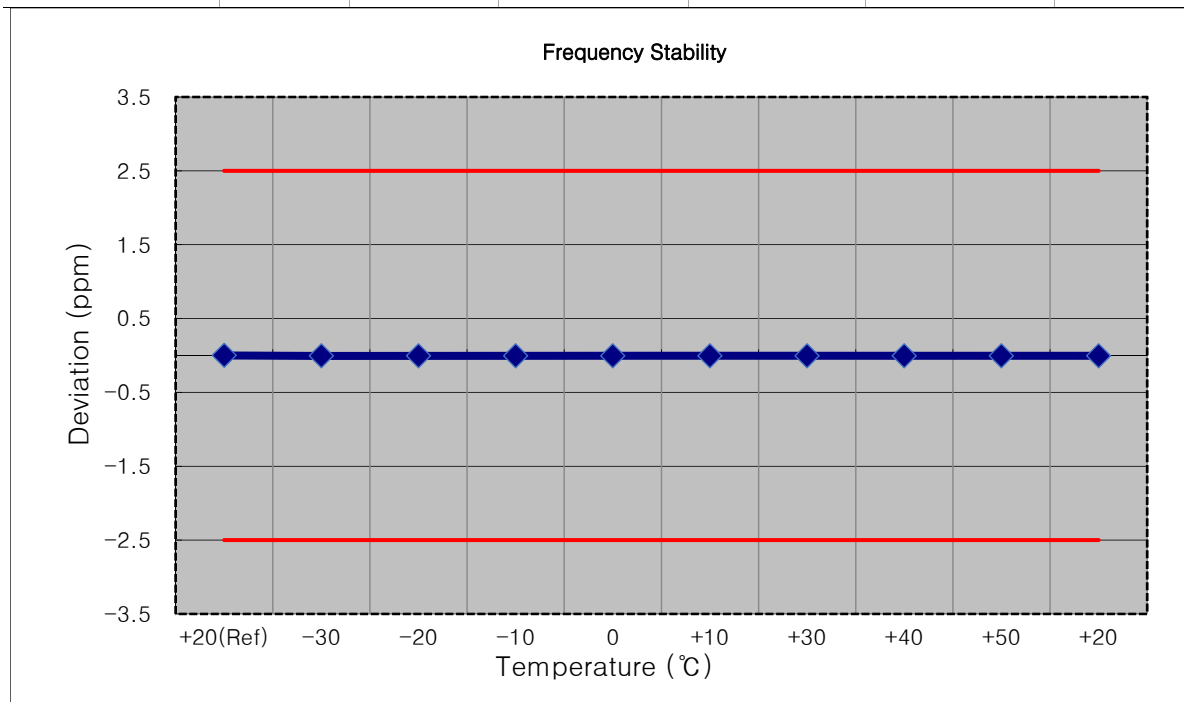
- ▣ MODE: GSM850
- ▣ OPERATING FREQUENCY: 836,600,000 Hz
- ▣ CHANNEL: 190
- ▣ REFERENCE VOLTAGE: 4.200 VDC
- ▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	836 599 985	0.0	0.000 000	0.0000
100 %		-30	836 599 955	-30.2	-0.000 004	-0.0361
100 %		-20	836 599 967	-18.3	-0.000 002	-0.0219
100 %		-10	836 600 004	19.2	0.000 002	0.0229
100 %		0	836 599 994	8.6	0.000 001	0.0102
100 %		+10	836 599 971	-13.6	-0.000 002	-0.0163
100 %		+30	836 599 958	-27.2	-0.000 003	-0.0325
100 %		+40	836 599 959	-26.3	-0.000 003	-0.0314
100 %		+50	836 599 973	-11.7	-0.000 001	-0.0140
Batt. Endpoint	3.300	+20	836 599 959	-26.4	-0.000 003	-0.0316



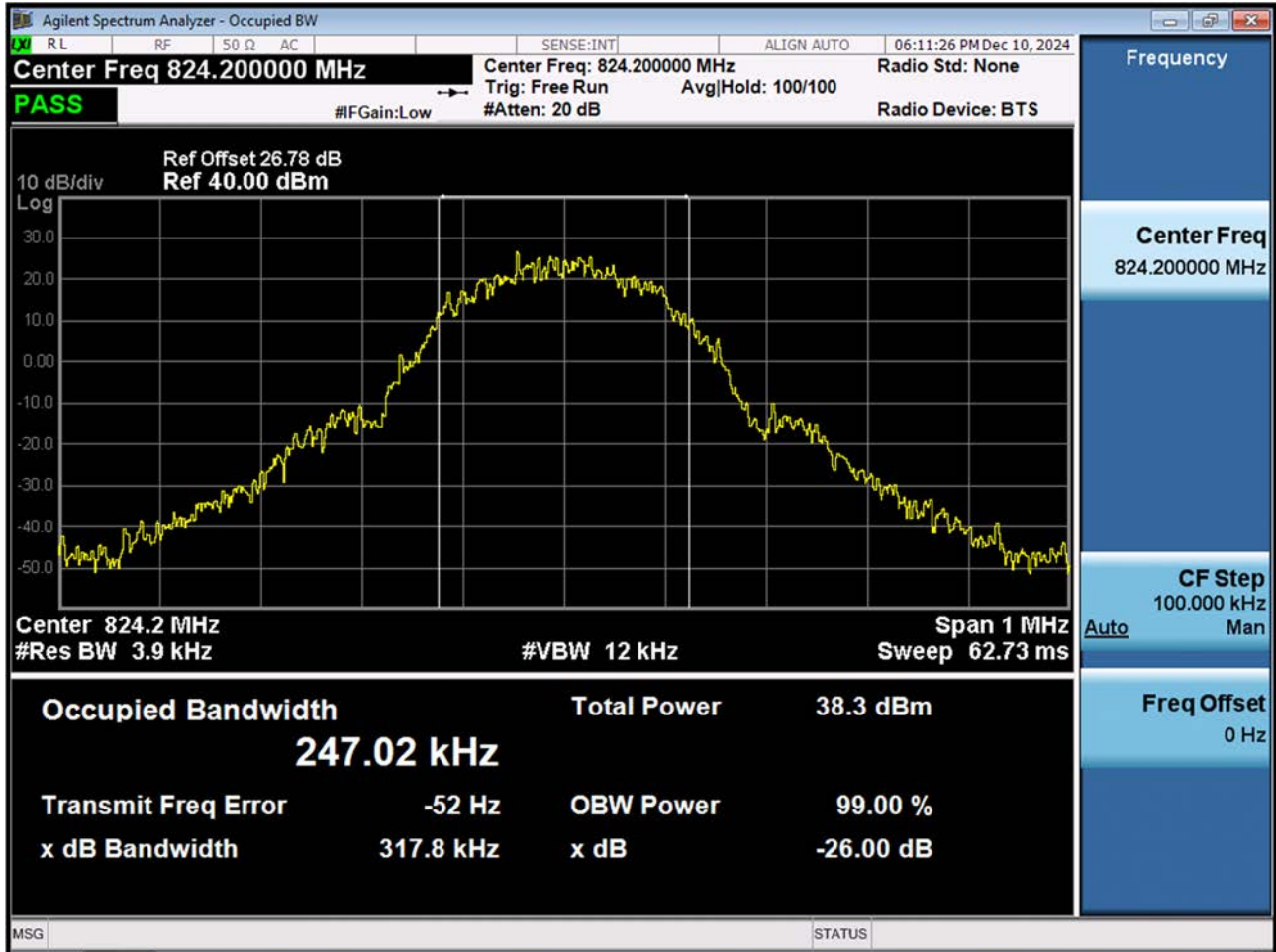
Mode:	WCDMA850
OPERATING FREQUENCY:	836,600,000 Hz
CHANNEL:	4183
REFERENCE VOLTAGE:	4.200 VDC
DEVIATION LIMIT:	$\pm 0.000\ 25\ \%$ or $2.5\ \text{ppm}$

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	
100 %	4.200	+20(Ref)	836 599 995	0.0	0.000 000	0.0000
100 %		-30	836 599 990	-5.5	-0.000 001	-0.0066
100 %		-20	836 599 991	-4.1	0.000 000	-0.0049
100 %		-10	836 599 990	-5.4	-0.000 001	-0.0064
100 %		0	836 599 991	-4.0	0.000 000	-0.0048
100 %		+10	836 599 990	-5.0	-0.000 001	-0.0059
100 %		+30	836 599 990	-5.0	-0.000 001	-0.0060
100 %		+40	836 599 991	-4.5	-0.000 001	-0.0053
100 %		+50	836 599 991	-4.3	-0.000 001	-0.0052
Batt. Endpoint	3.300	+20	836 599 991	-4.0	0.000 000	-0.0047

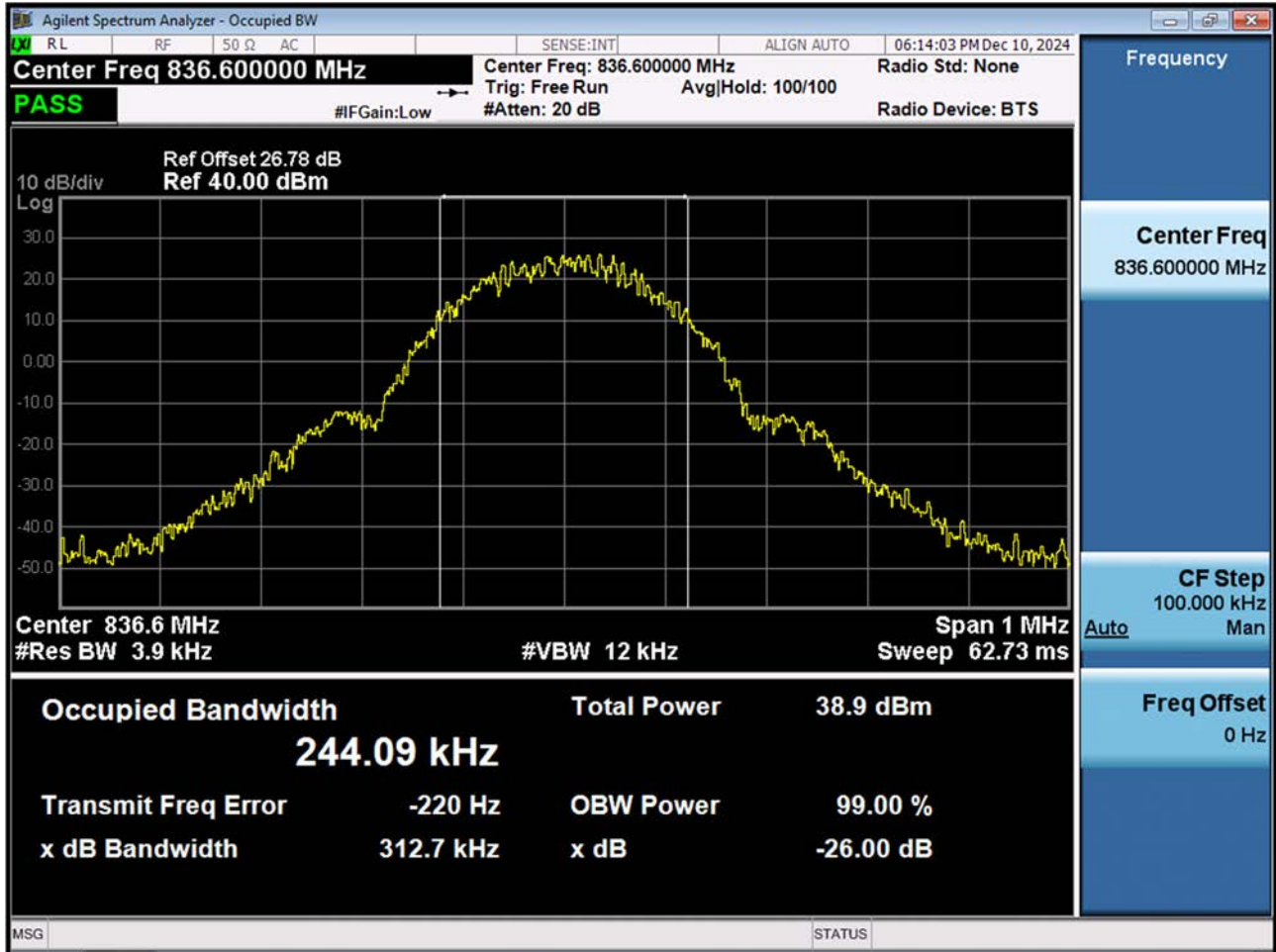


10. TEST PLOTS(Main 1 ANT)

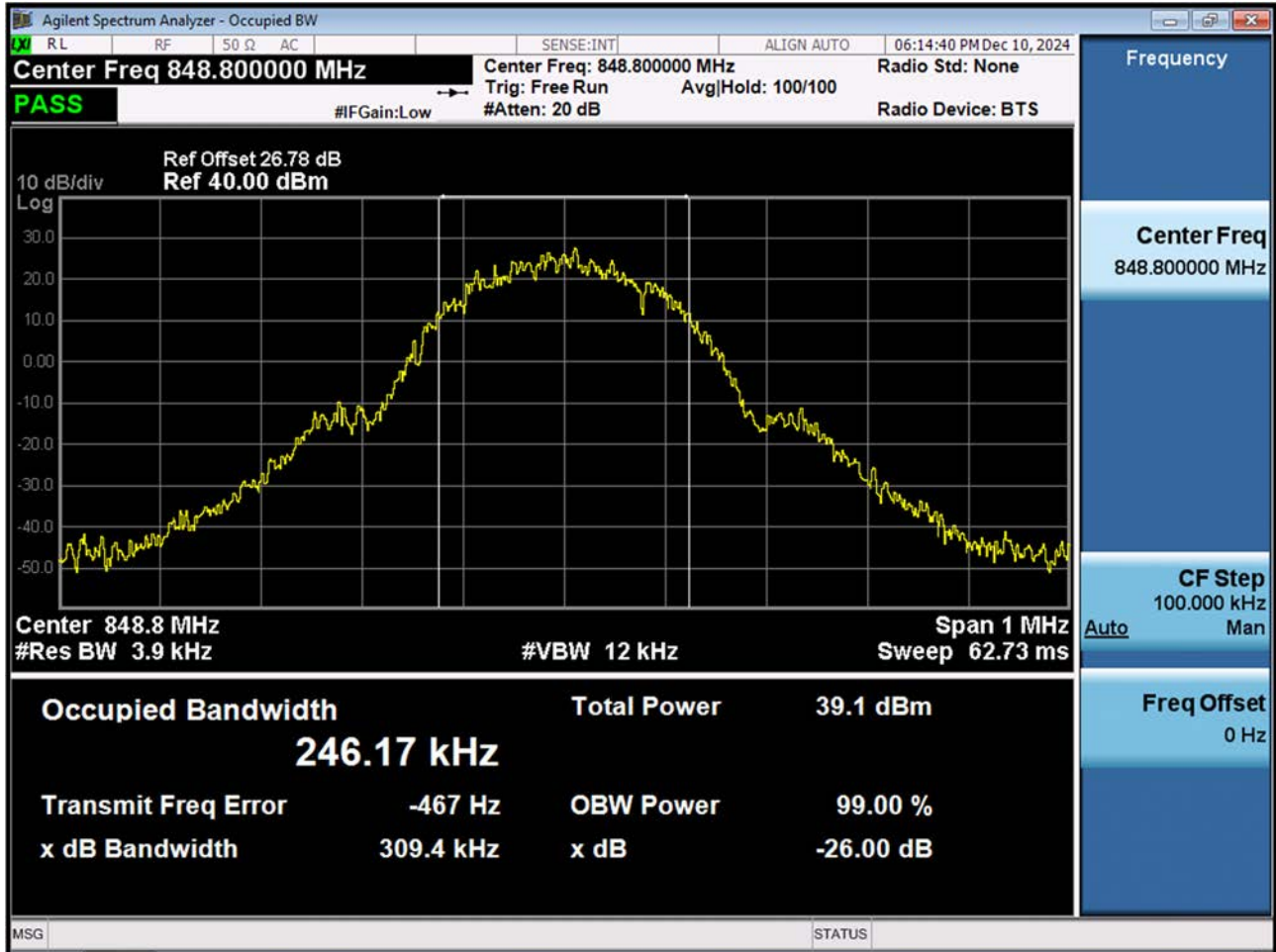
■ GSM850 MODE (128 CH.) Occupied Bandwidth



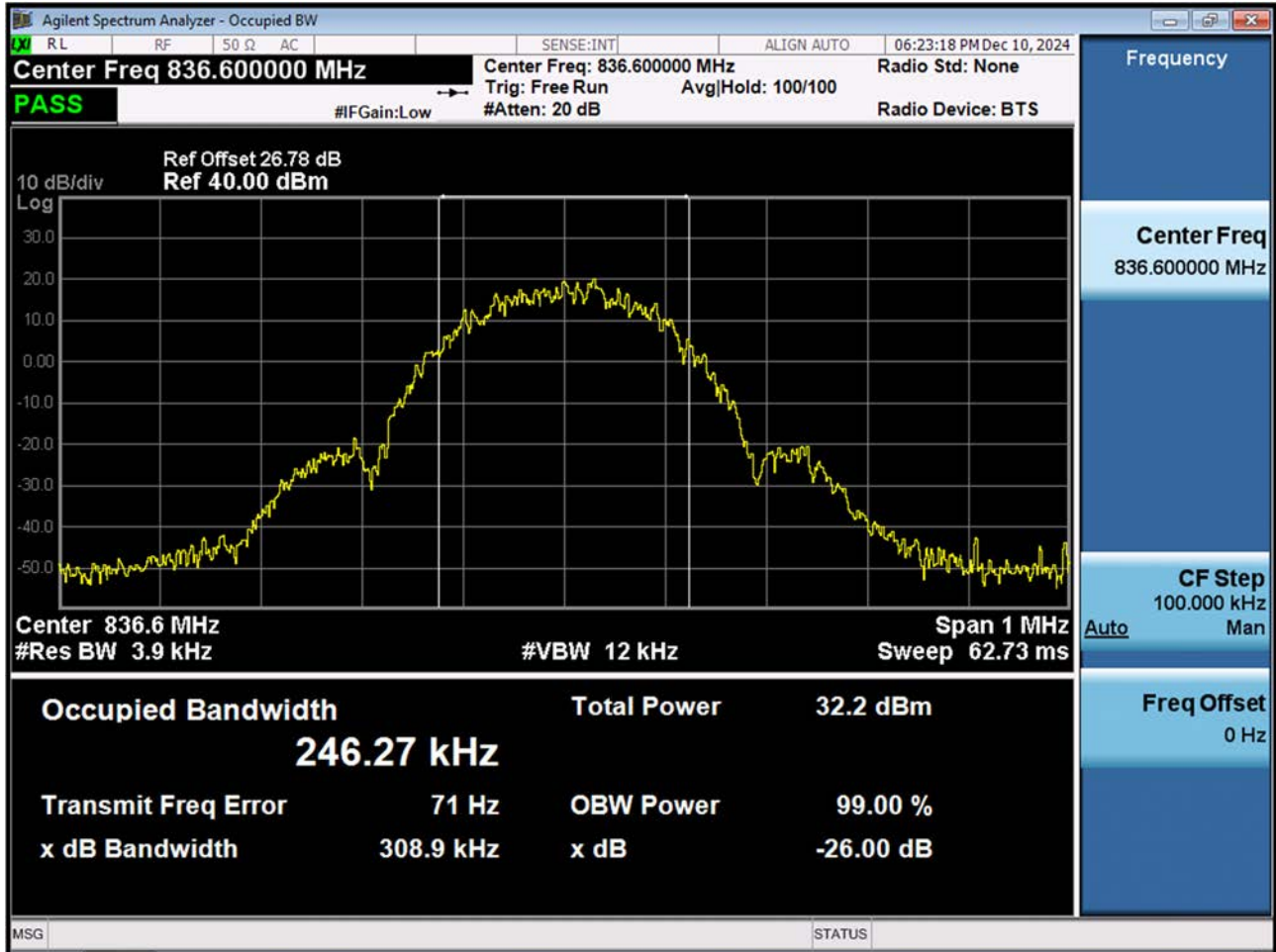
■ GSM850 MODE (190 CH.) Occupied Bandwidth



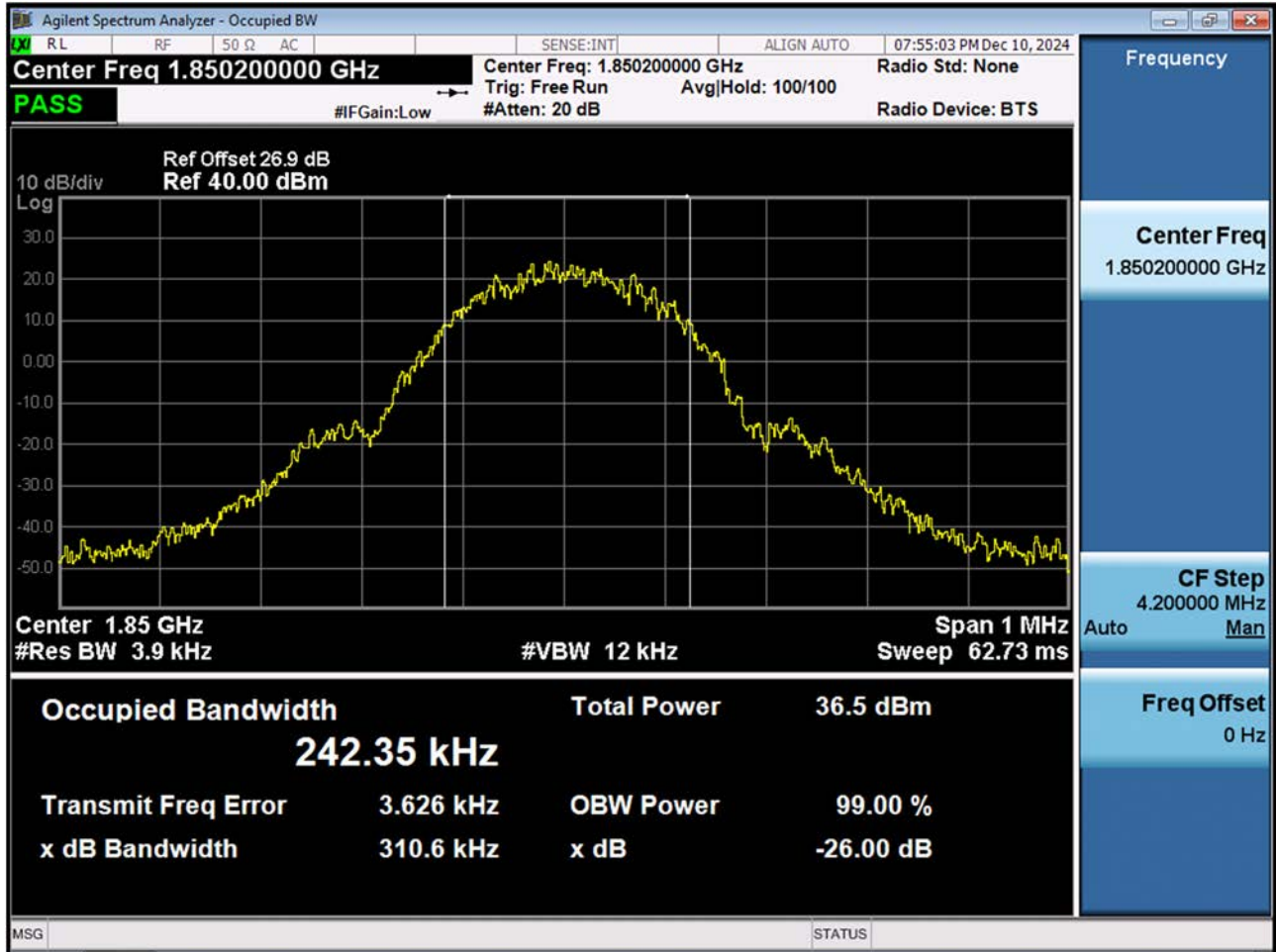
■ GSM850 MODE (251 CH.) Occupied Bandwidth



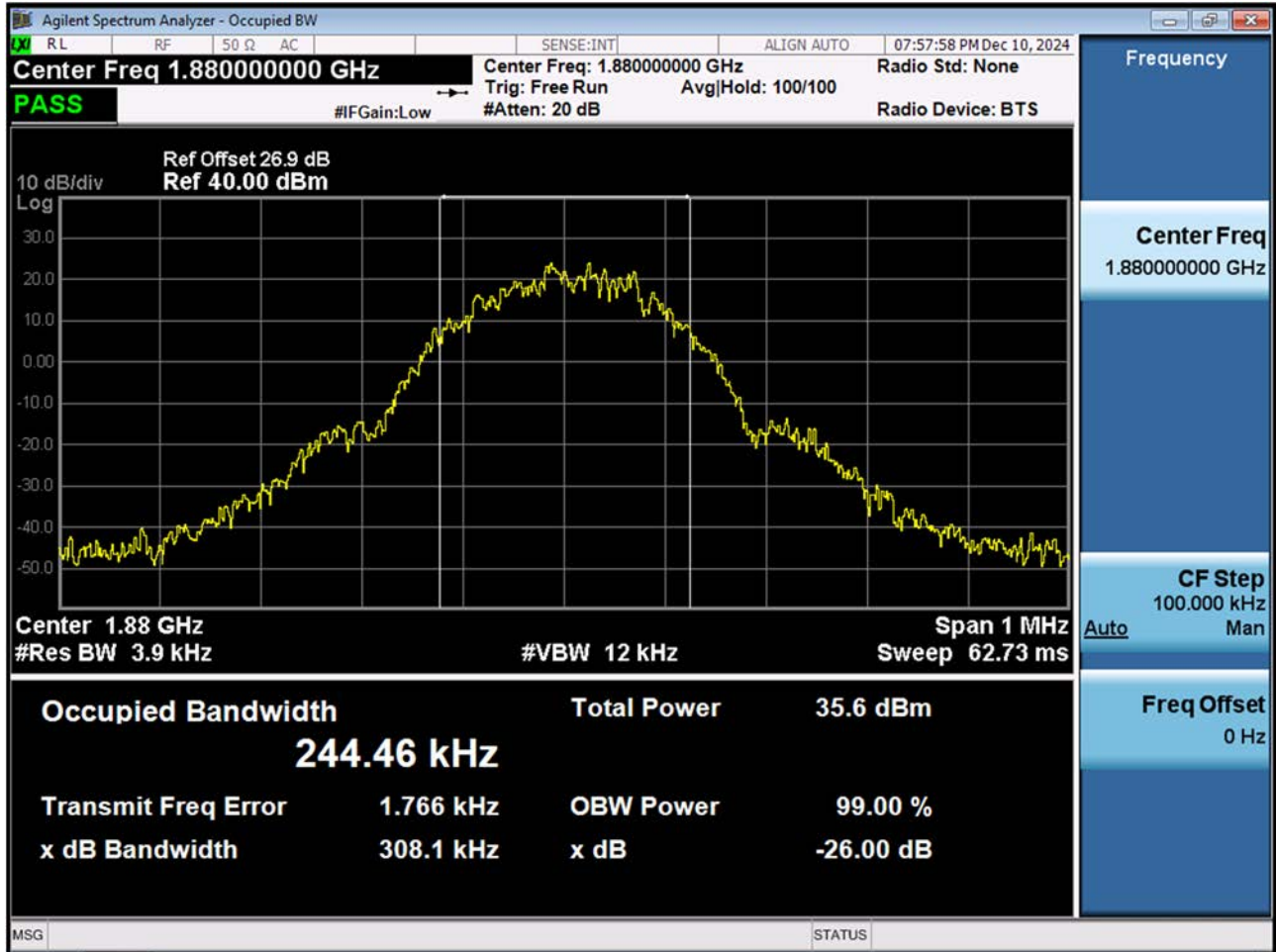
■ GSM850 EDGE (190 CH.) Occupied Bandwidth



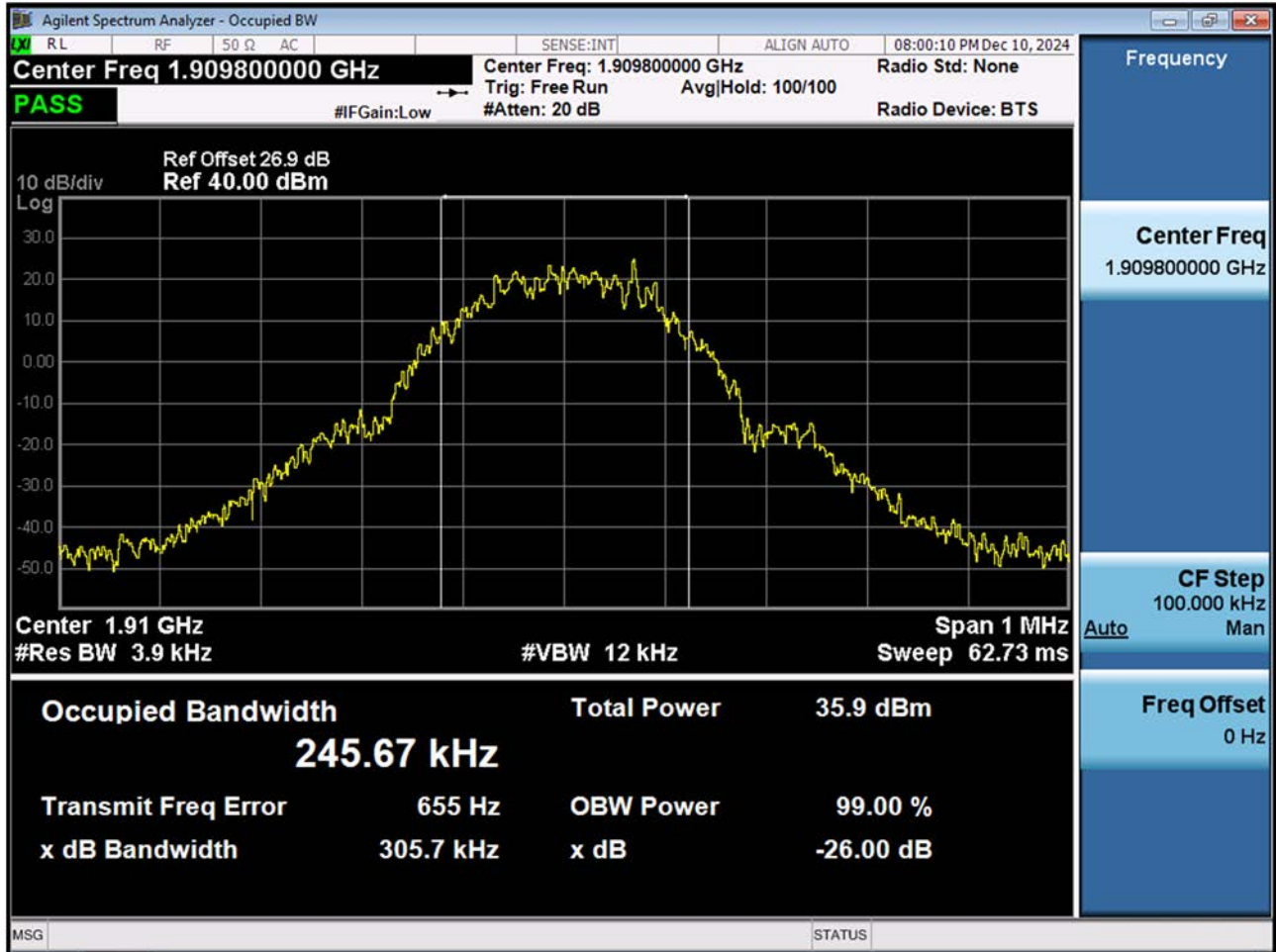
■ GSM1900 MODE (512 CH.) Occupied Bandwidth



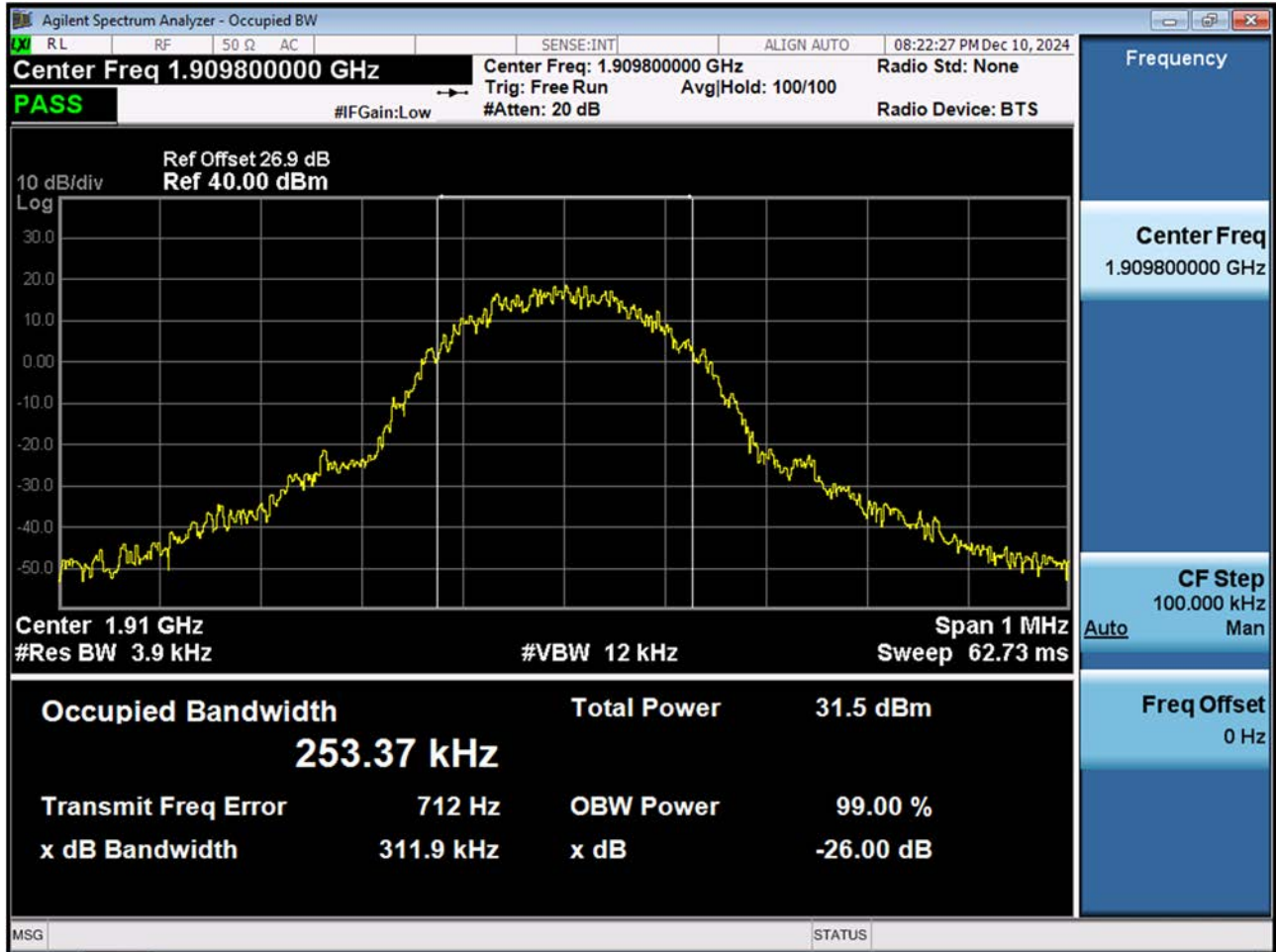
■ GSM1900 MODE (661 CH.) Occupied Bandwidth



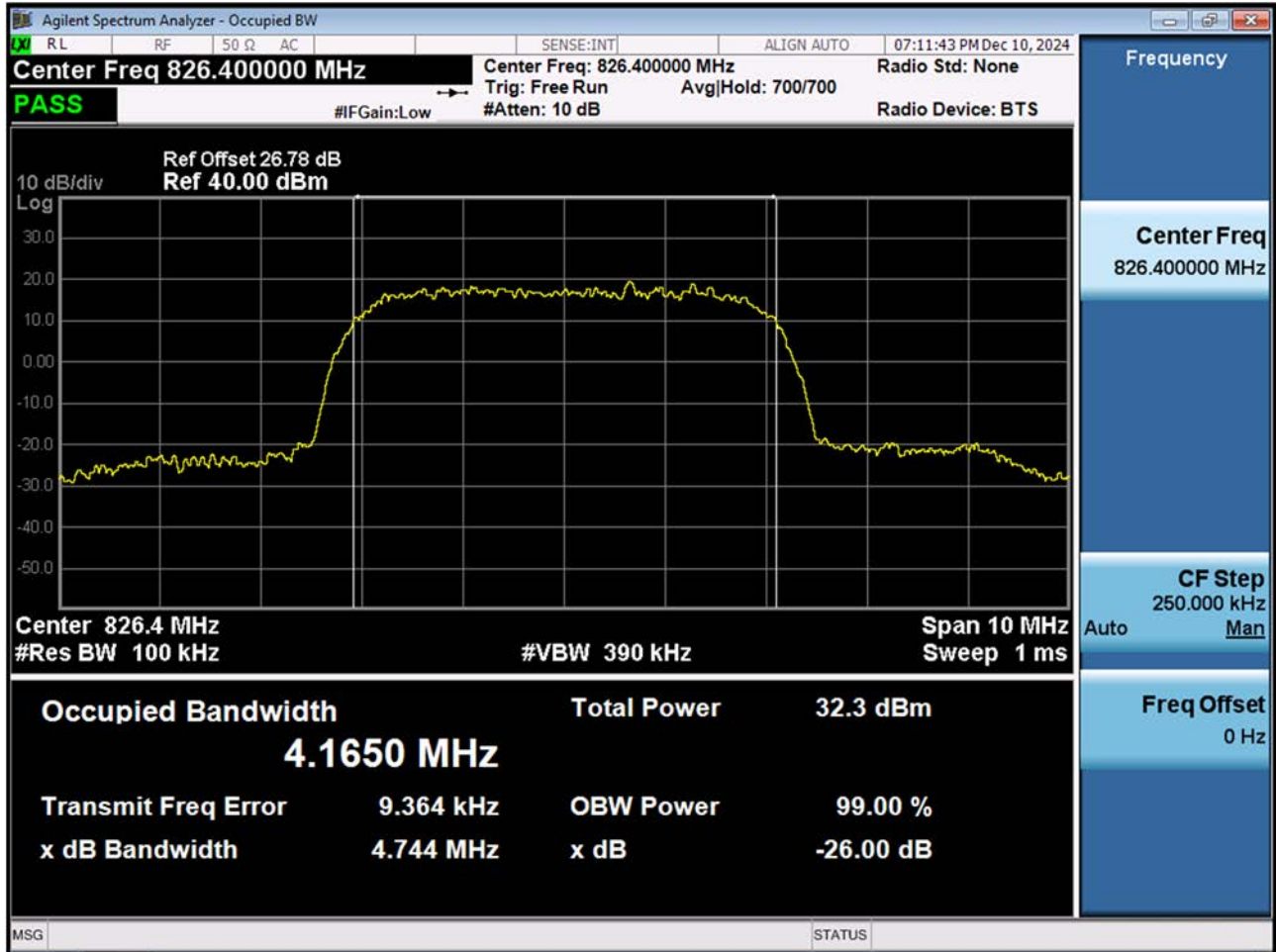
■ GSM1900 MODE (810 CH.) Occupied Bandwidth



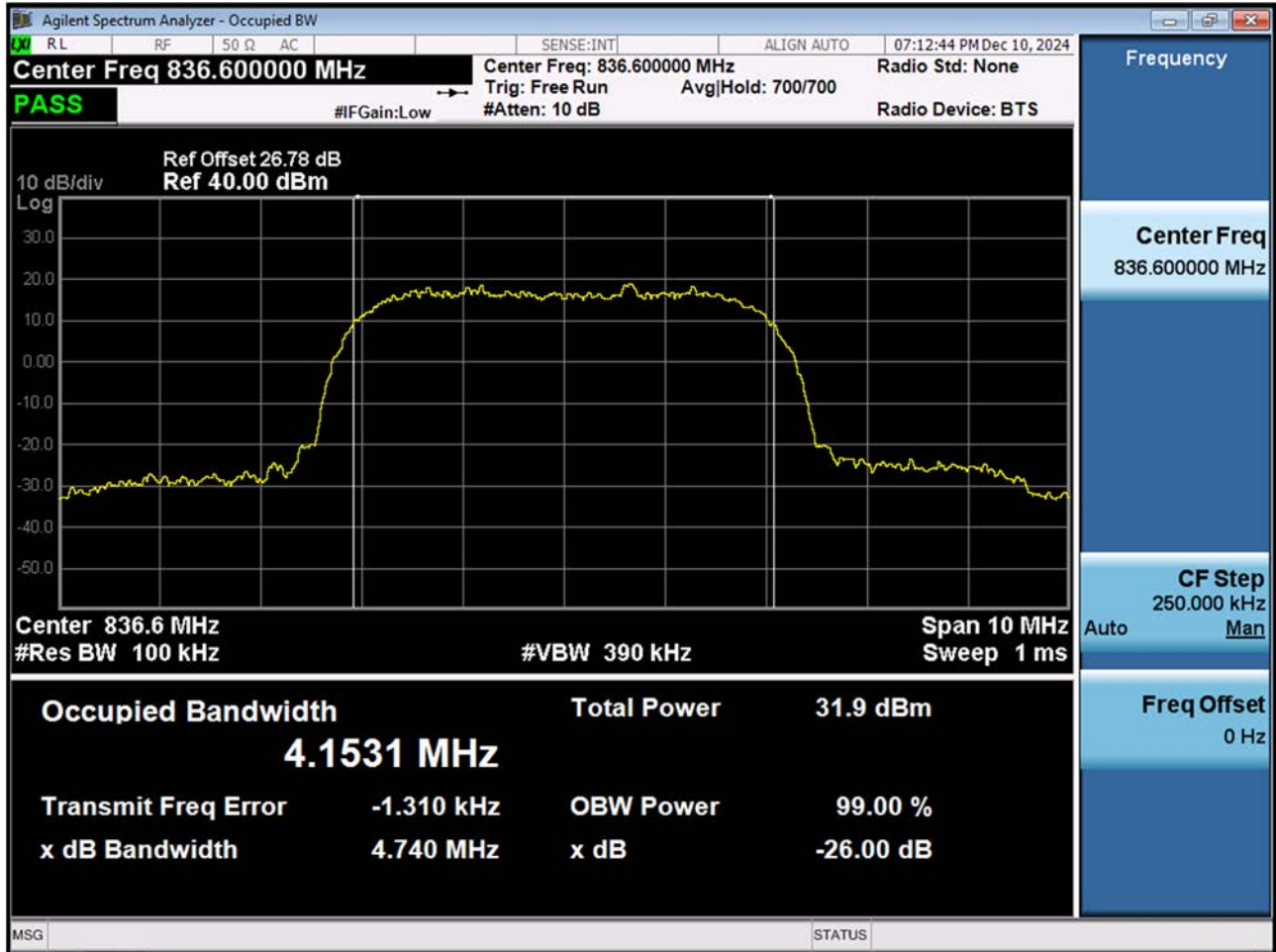
■ GSM1900 EDGE (810 CH.) Occupied Bandwidth



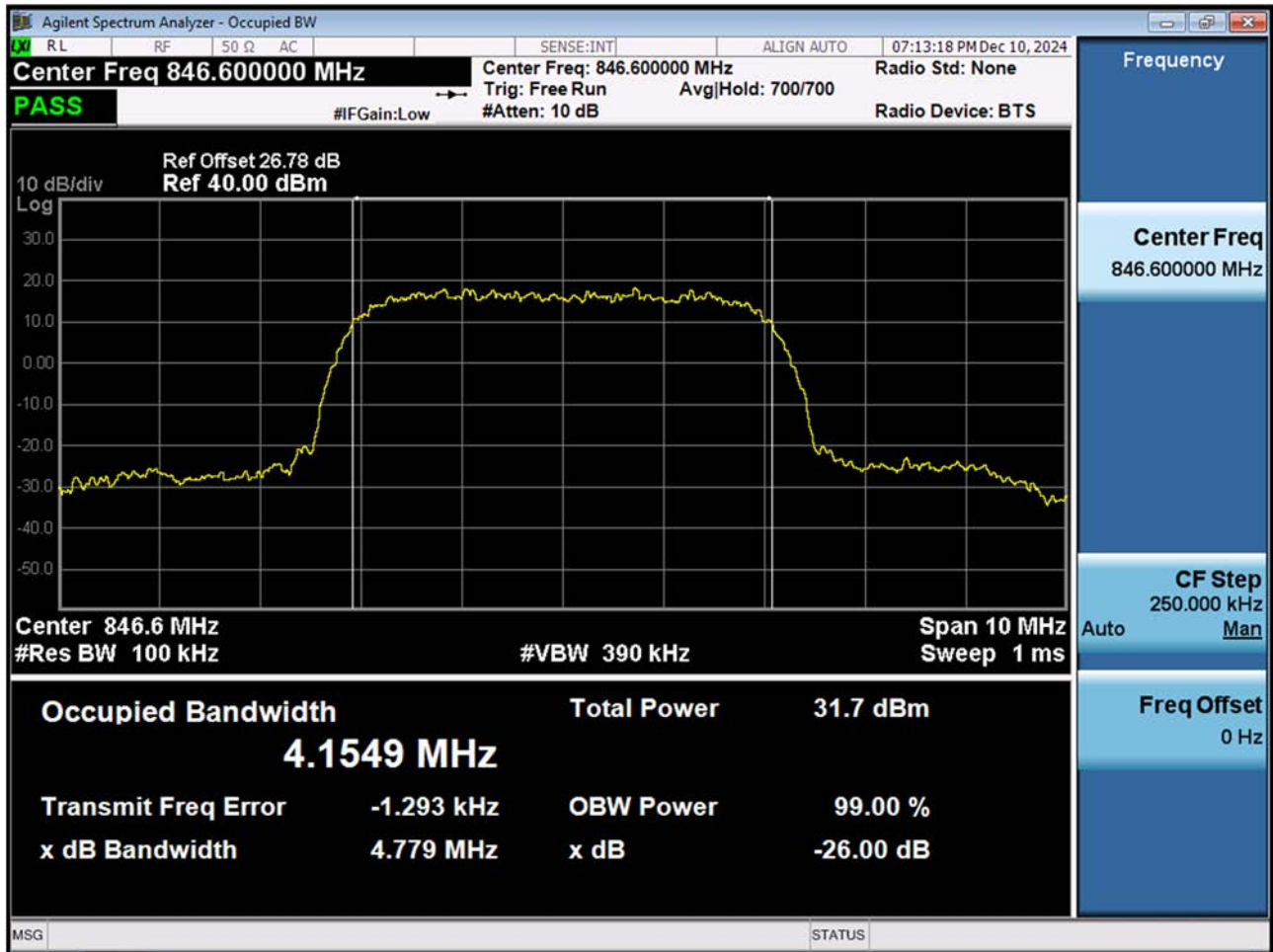
■ WCDMA850 MODE (4132 CH.) Occupied Bandwidth



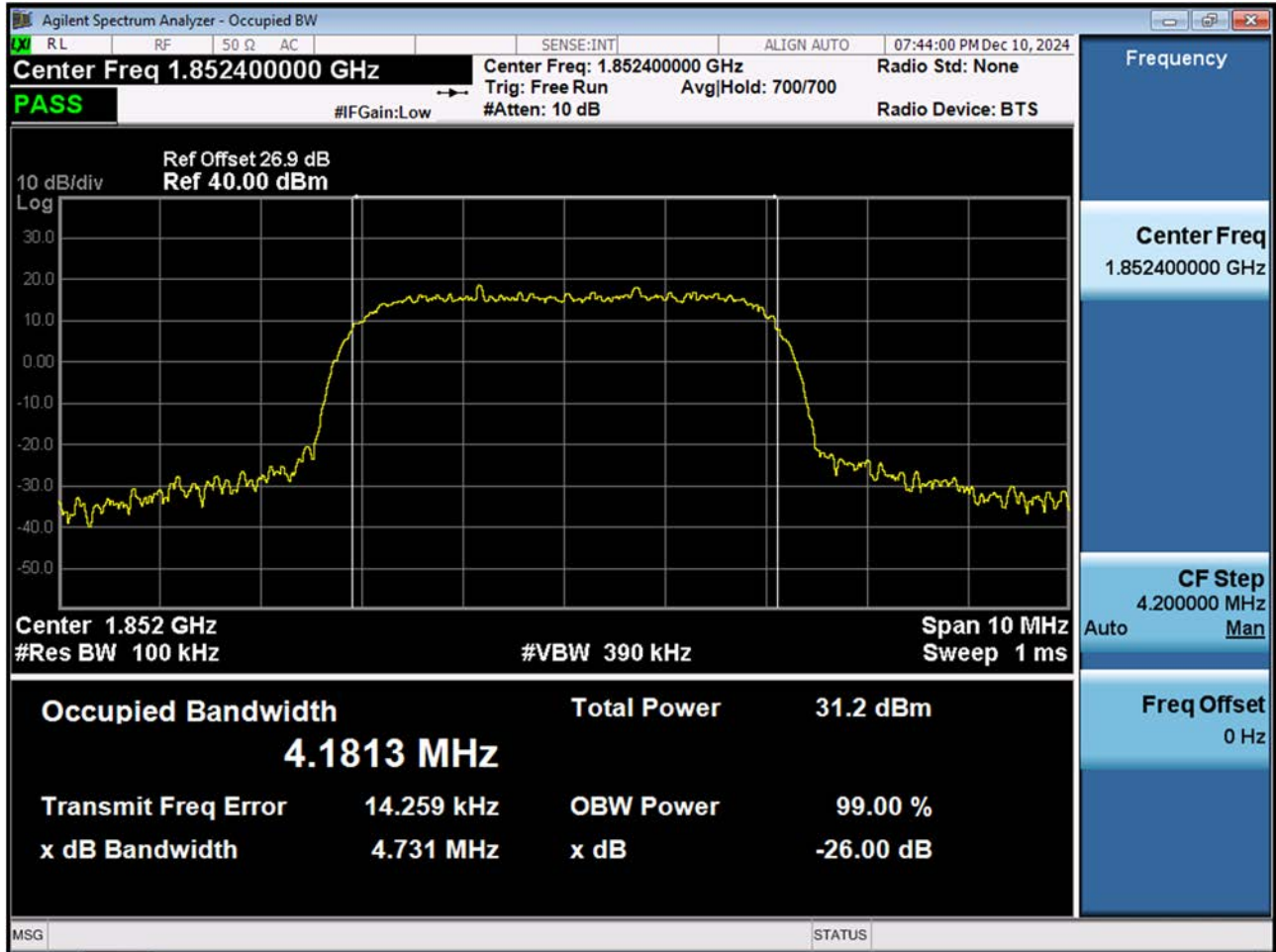
■ WCDMA850 MODE (4183 CH.) Occupied Bandwidth



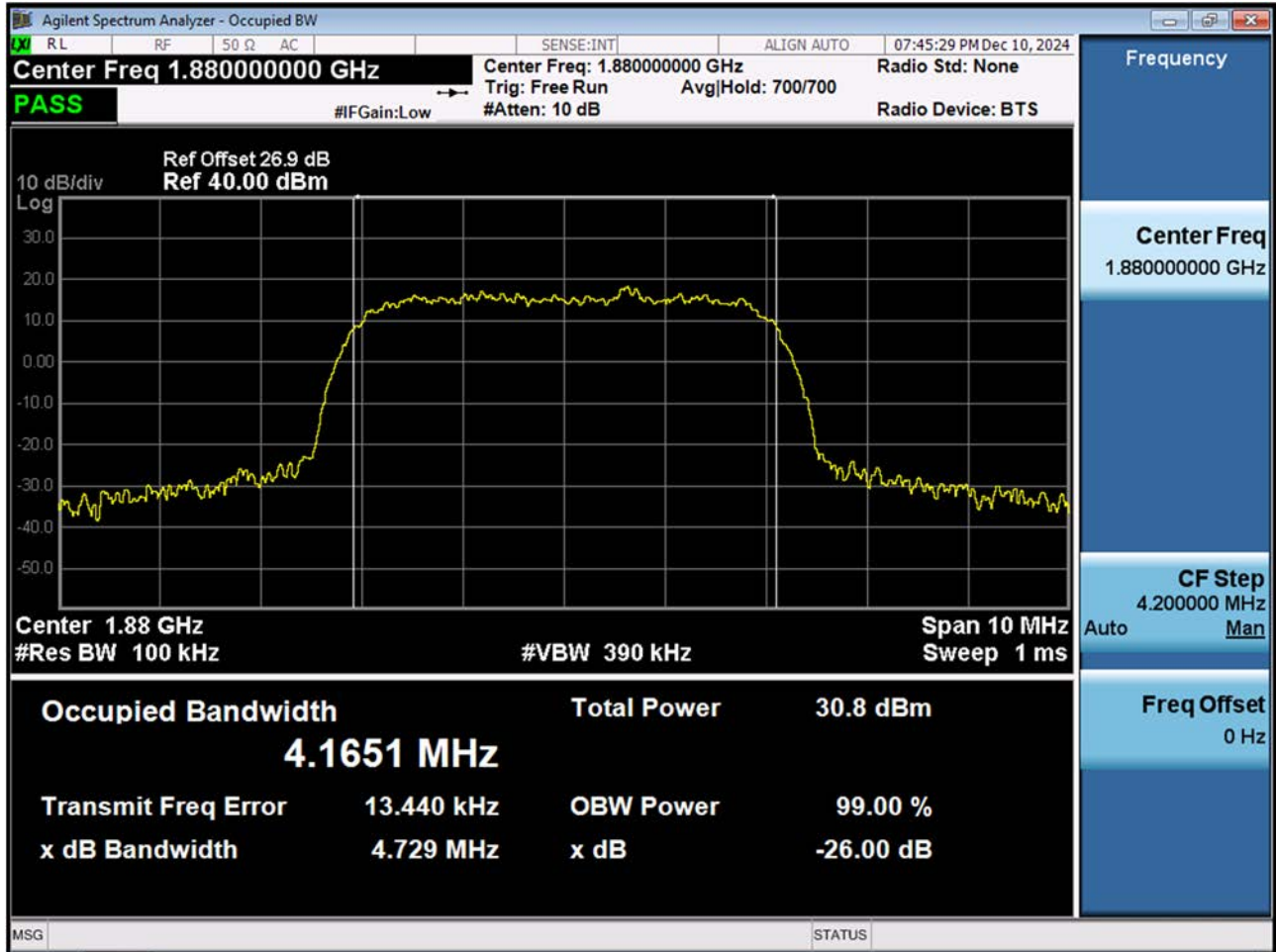
■ WCDMA850MODE (4233 CH.) Occupied Bandwidth



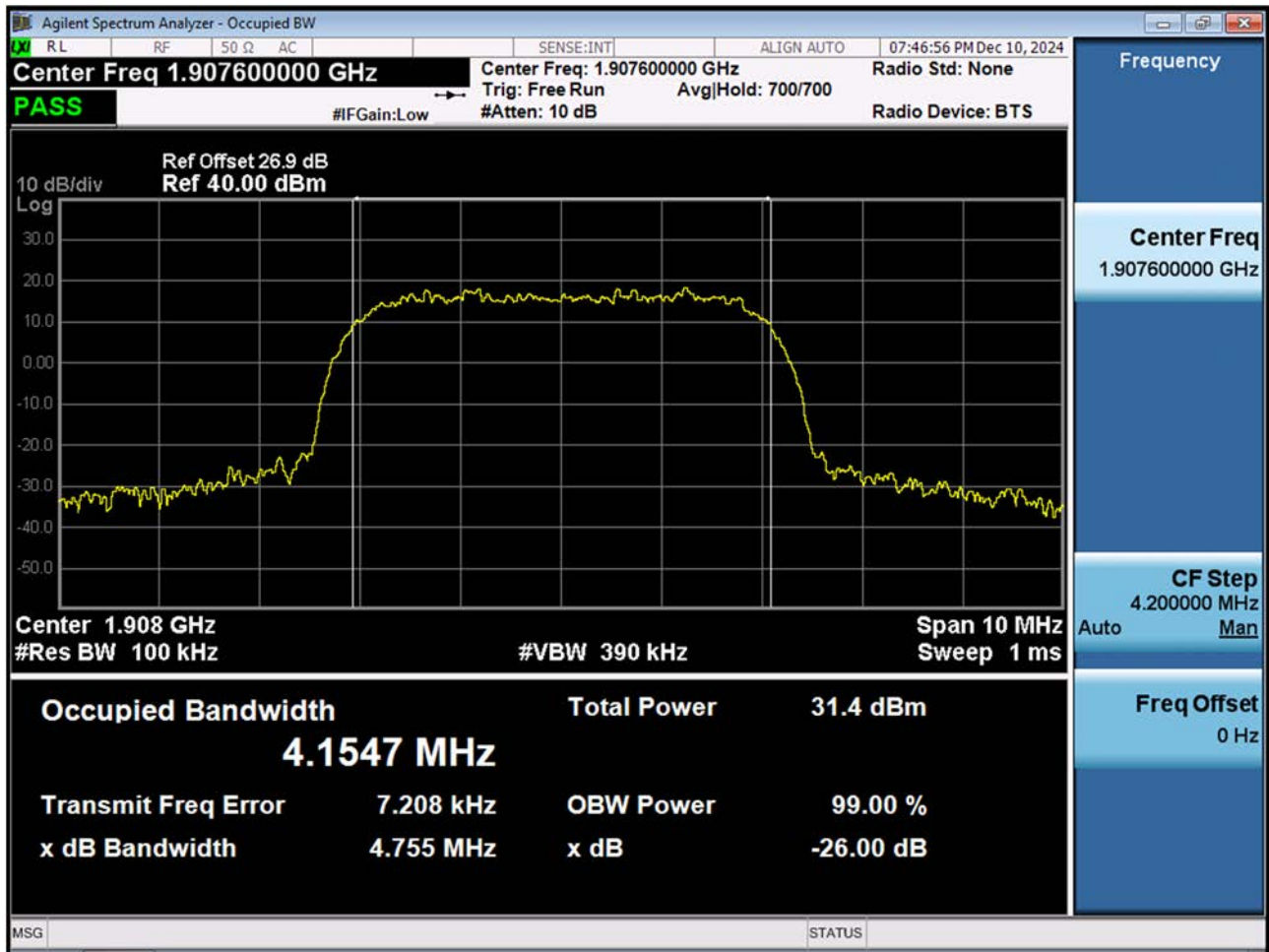
■ WCDMA1900 MODE (9262 CH.) Occupied Bandwidth



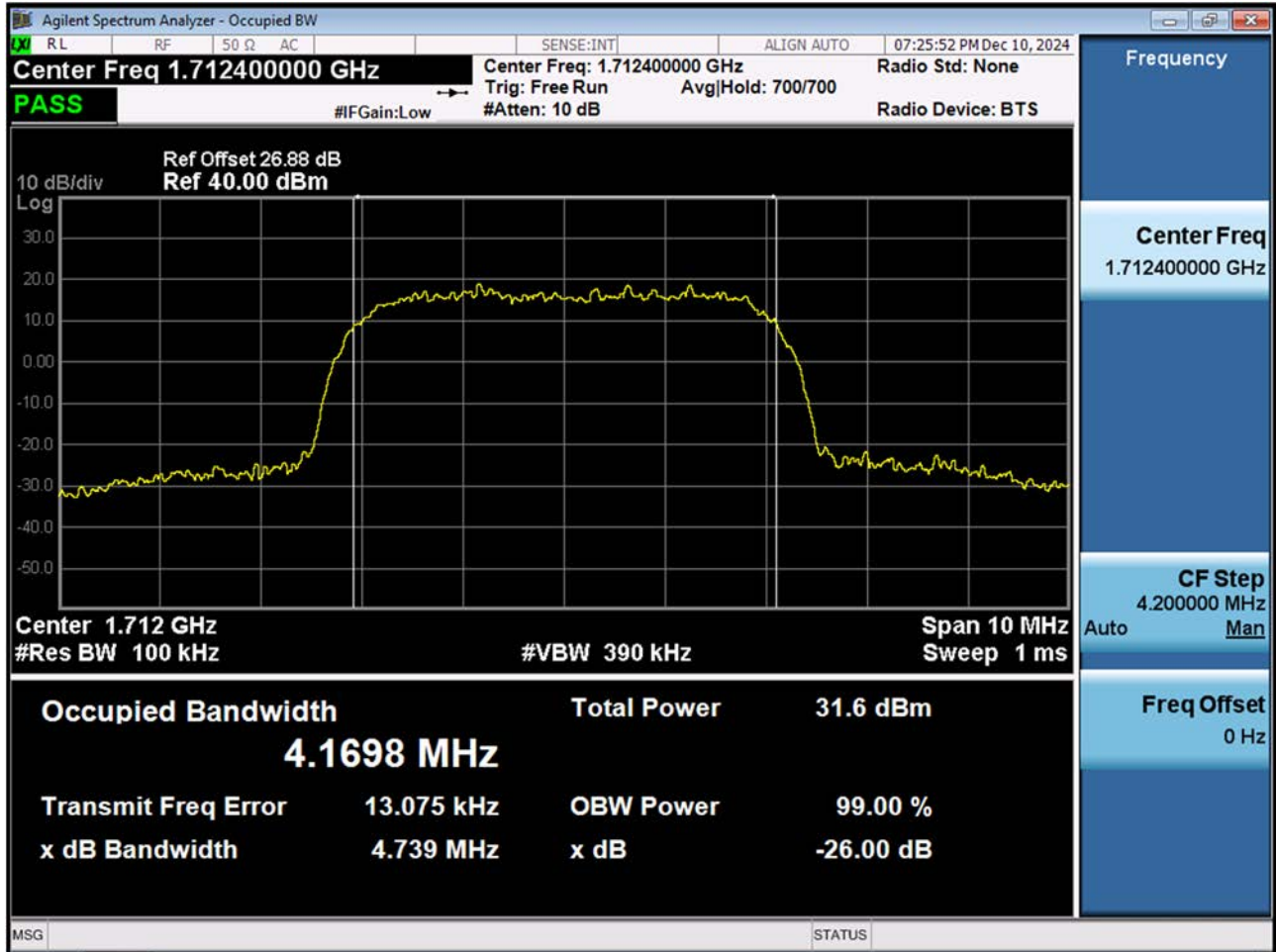
■ WCDMA1900 MODE (9400 CH.) Occupied Bandwidth



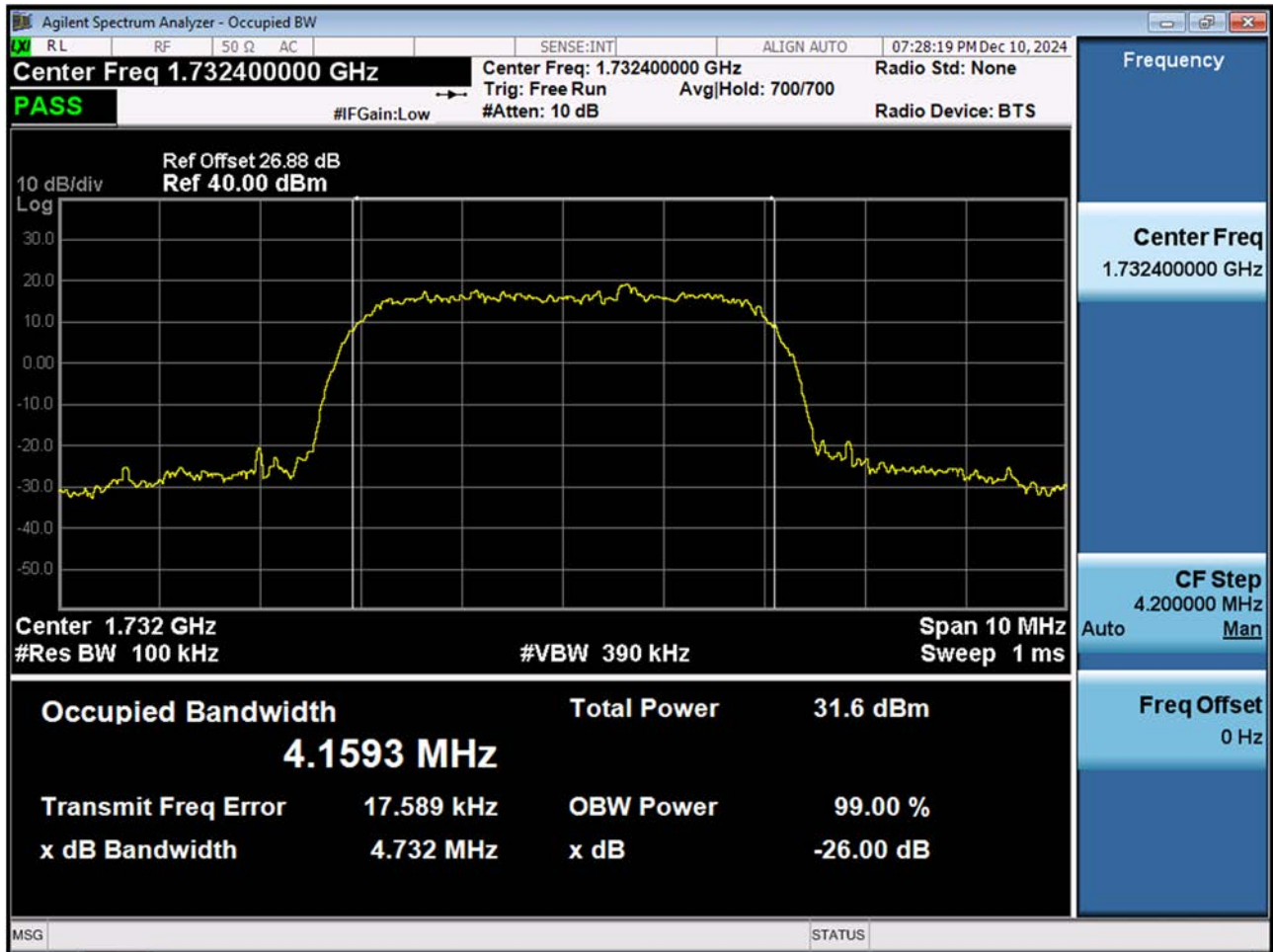
WCDMA1900 MODE (9538 CH.) Occupied Bandwidth



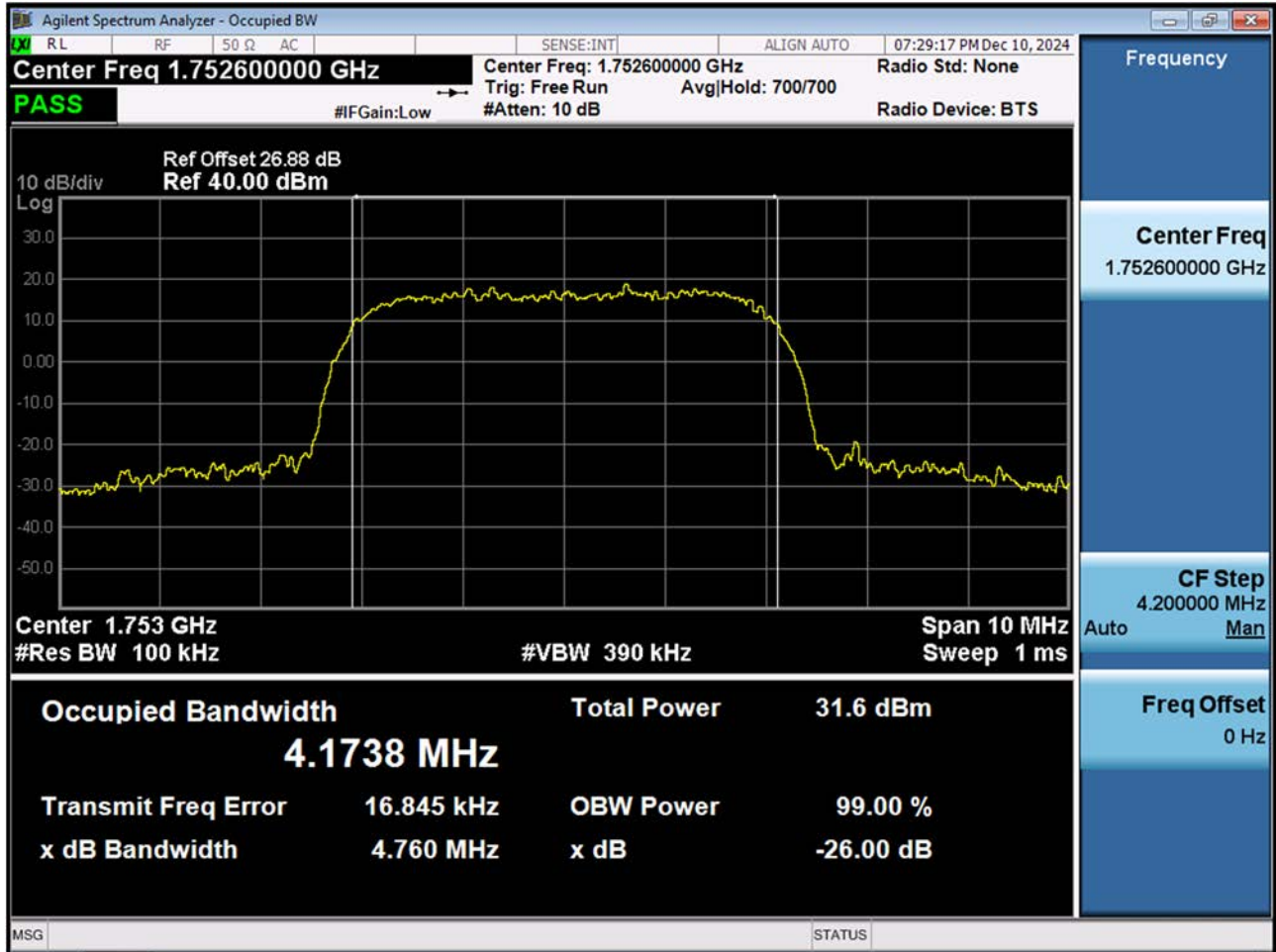
■ WCDMA1700 MODE (1312 CH.) Occupied Bandwidth



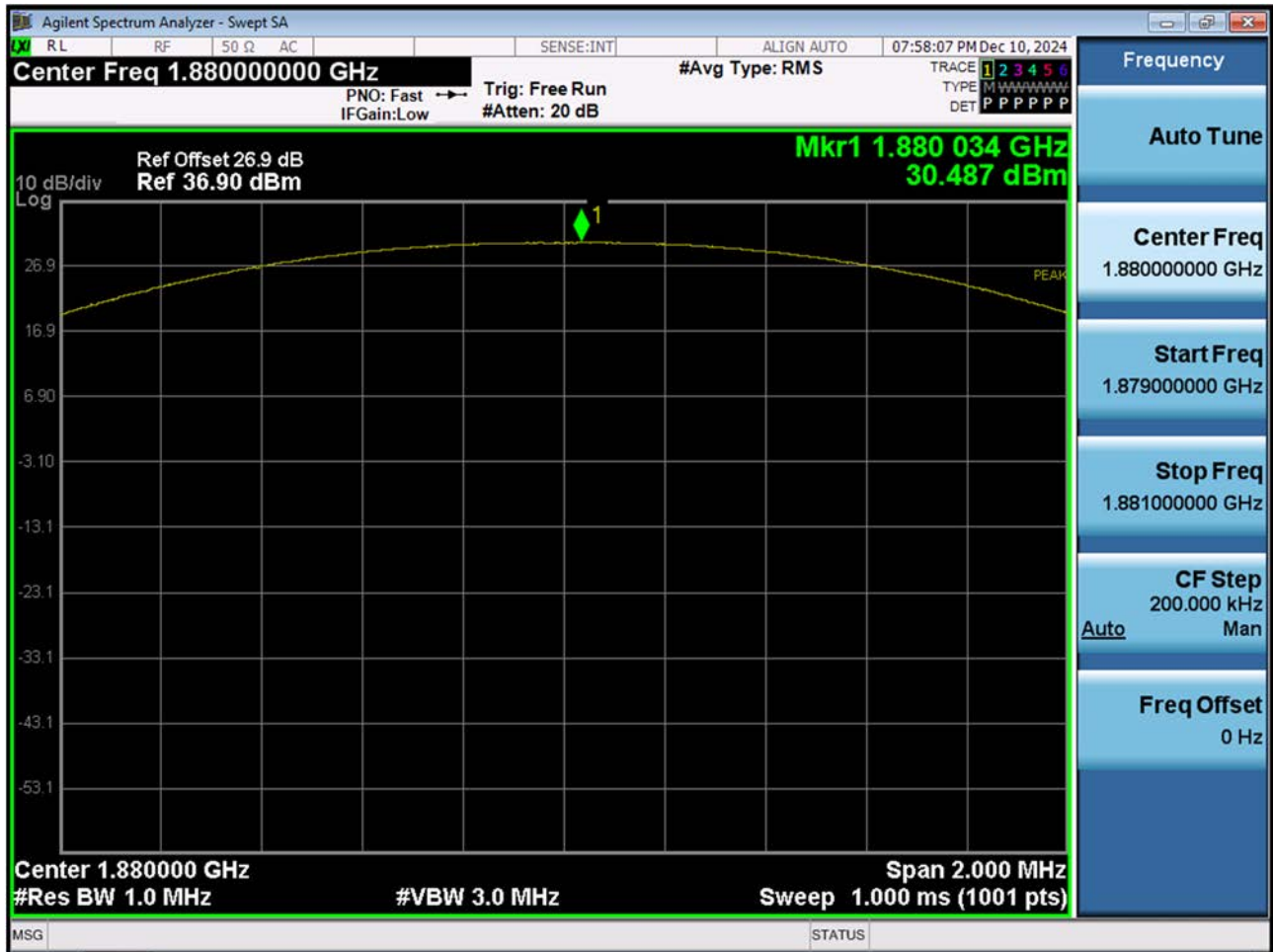
■ WCDMA1700 MODE (1412 CH.) Occupied Bandwidth



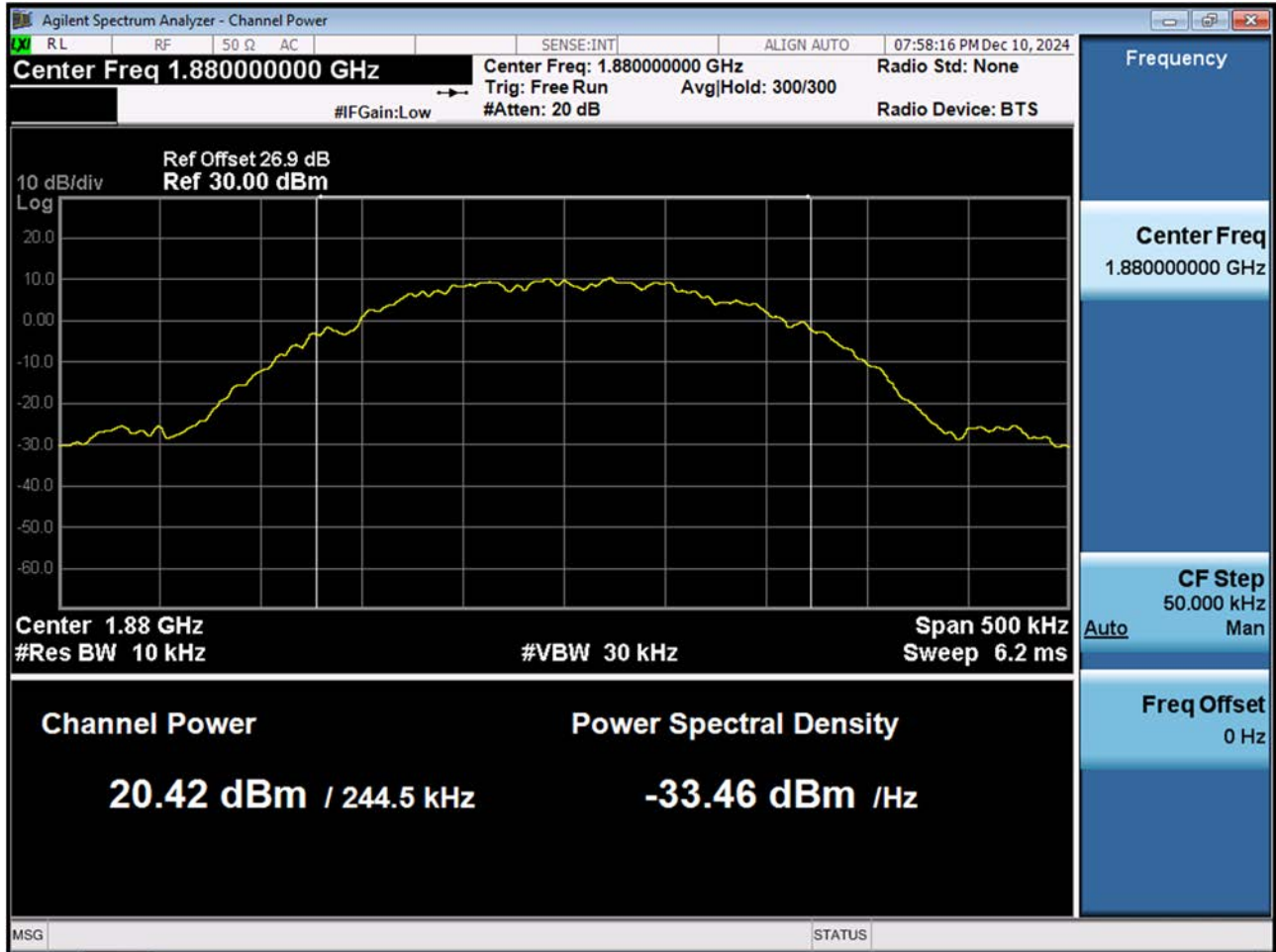
■ WCDMA1700 MODE (1513 CH.) Occupied Bandwidth



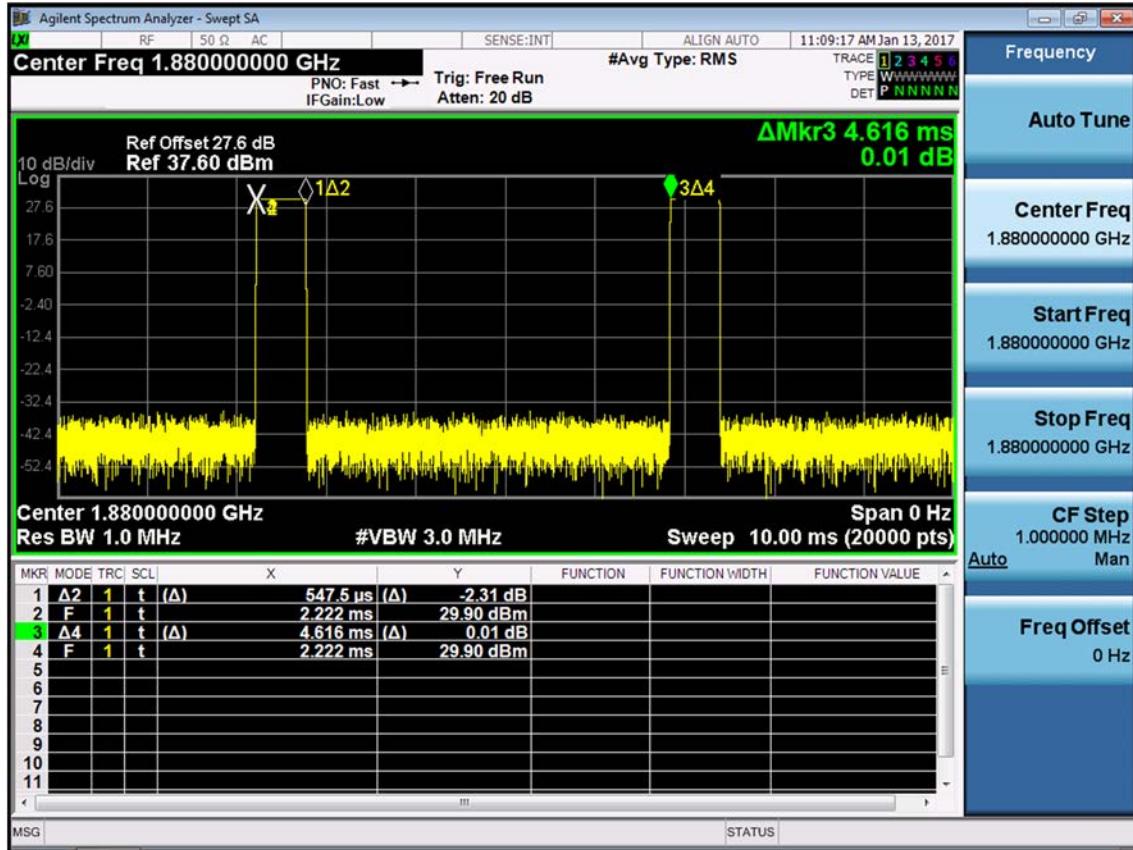
■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio P_{pk}



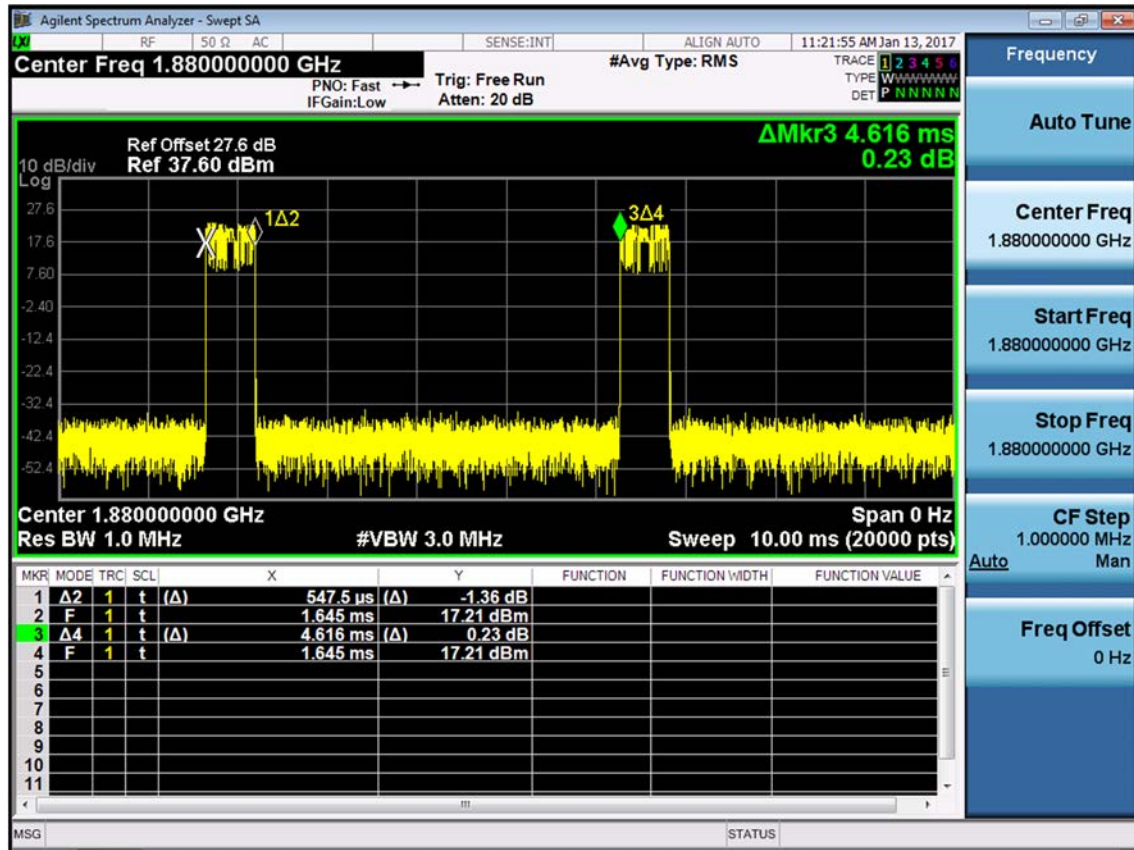
■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio P_{Avg}



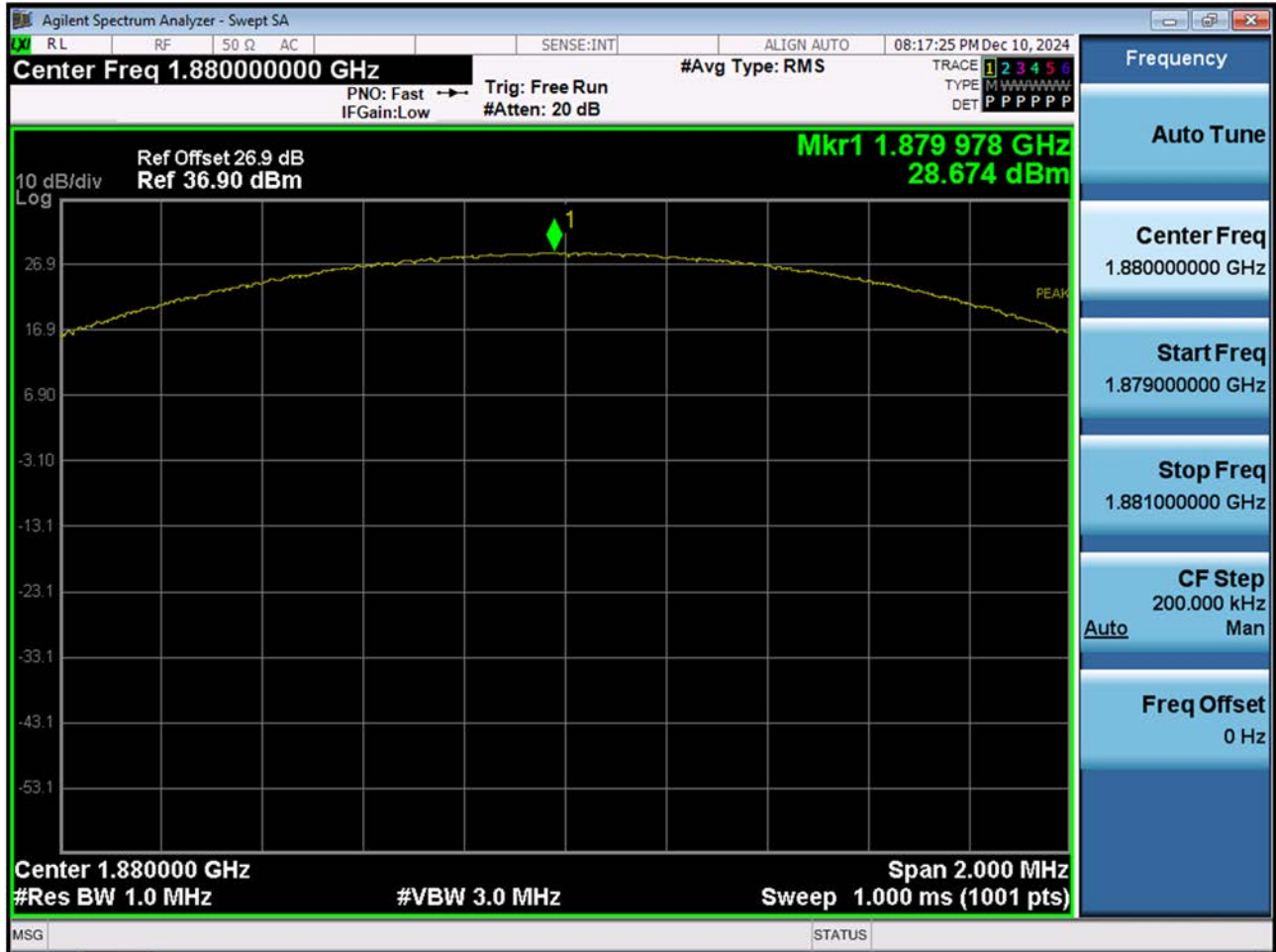
■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio Duty



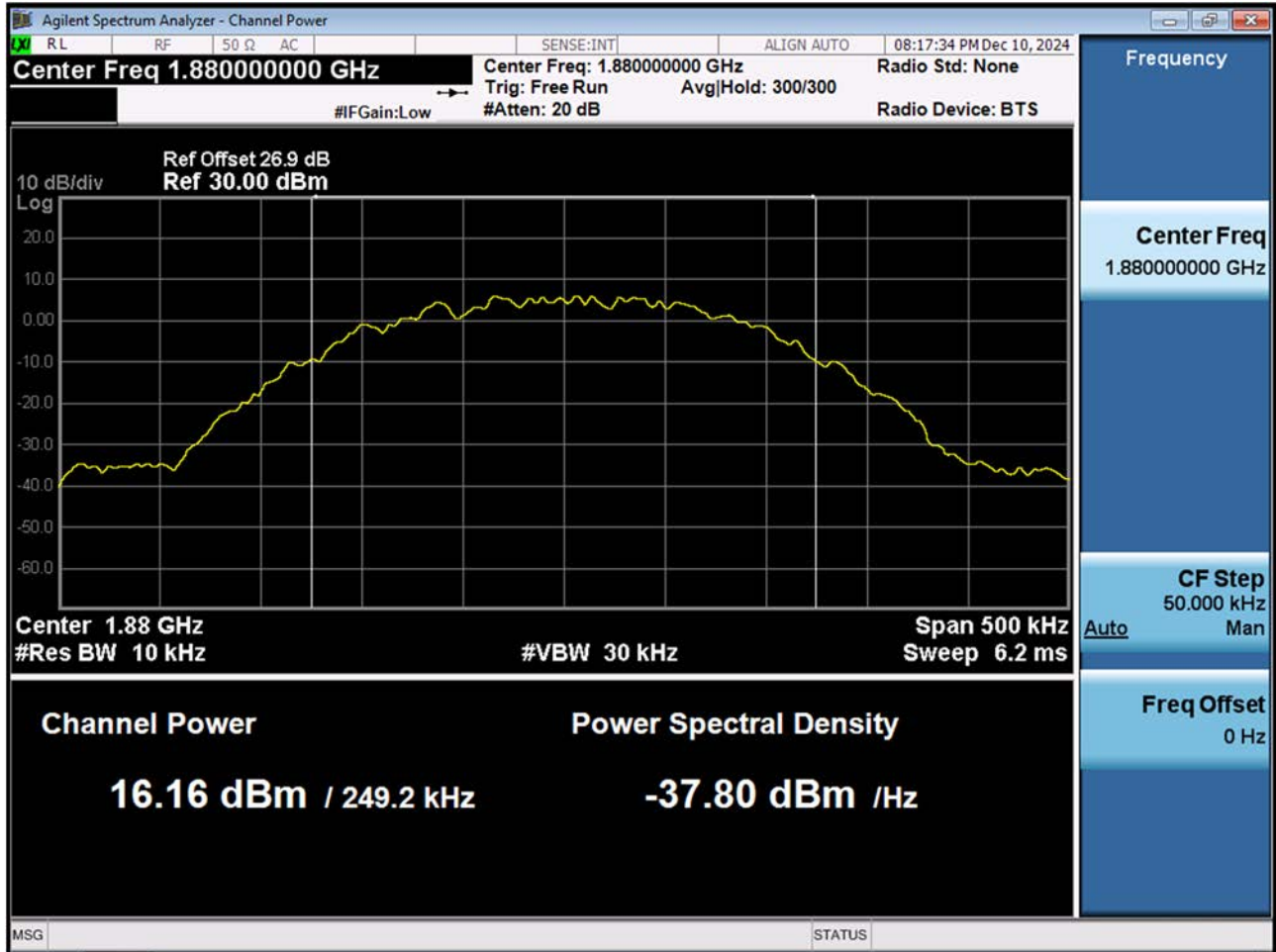
■ GSM1900 EDGE (661 CH.) Peak-to-Average Ratio Duty



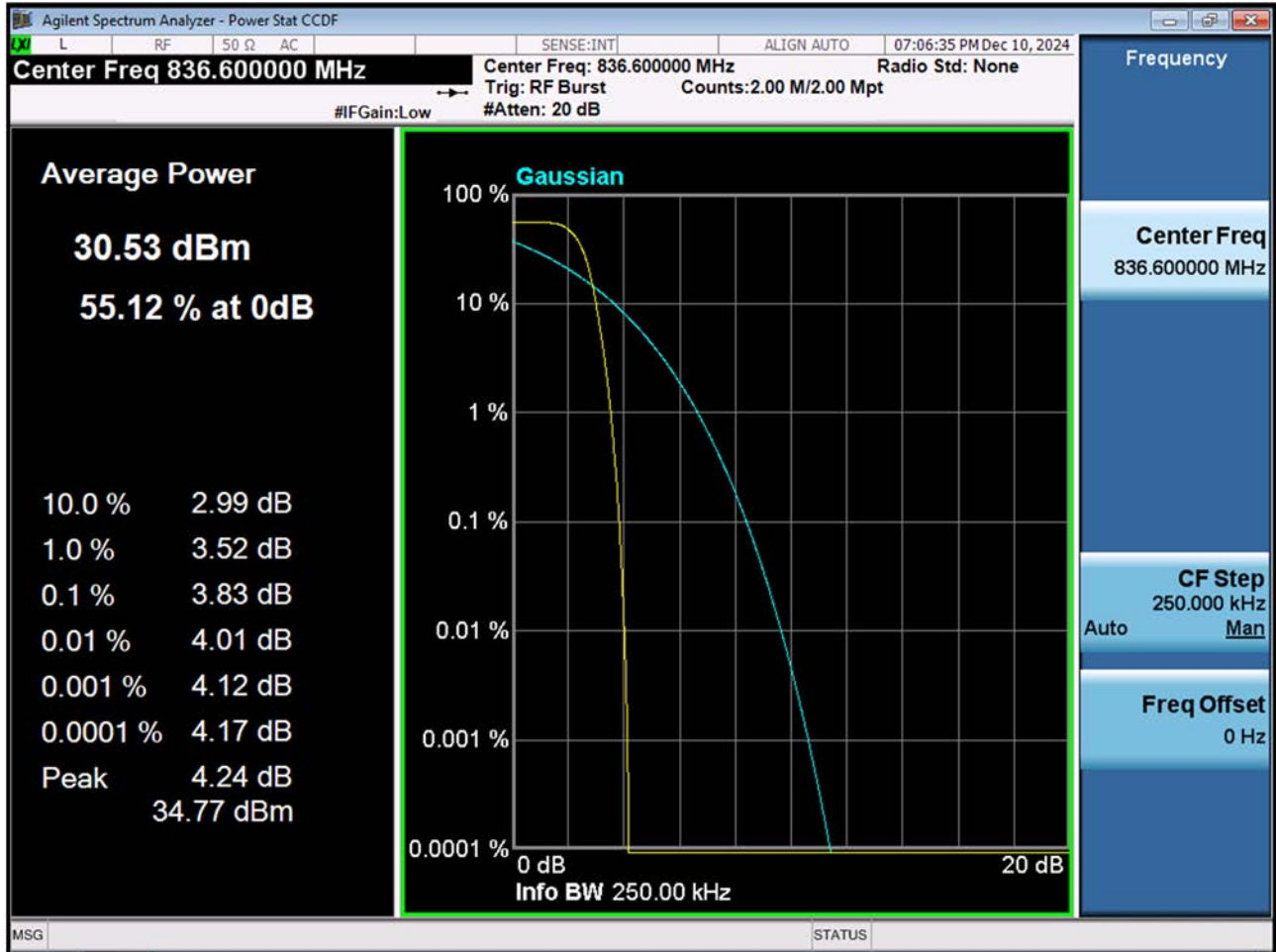
■ GSM1900 EDGE (661 CH.) Peak-to-Average Ratio P_{Pk}



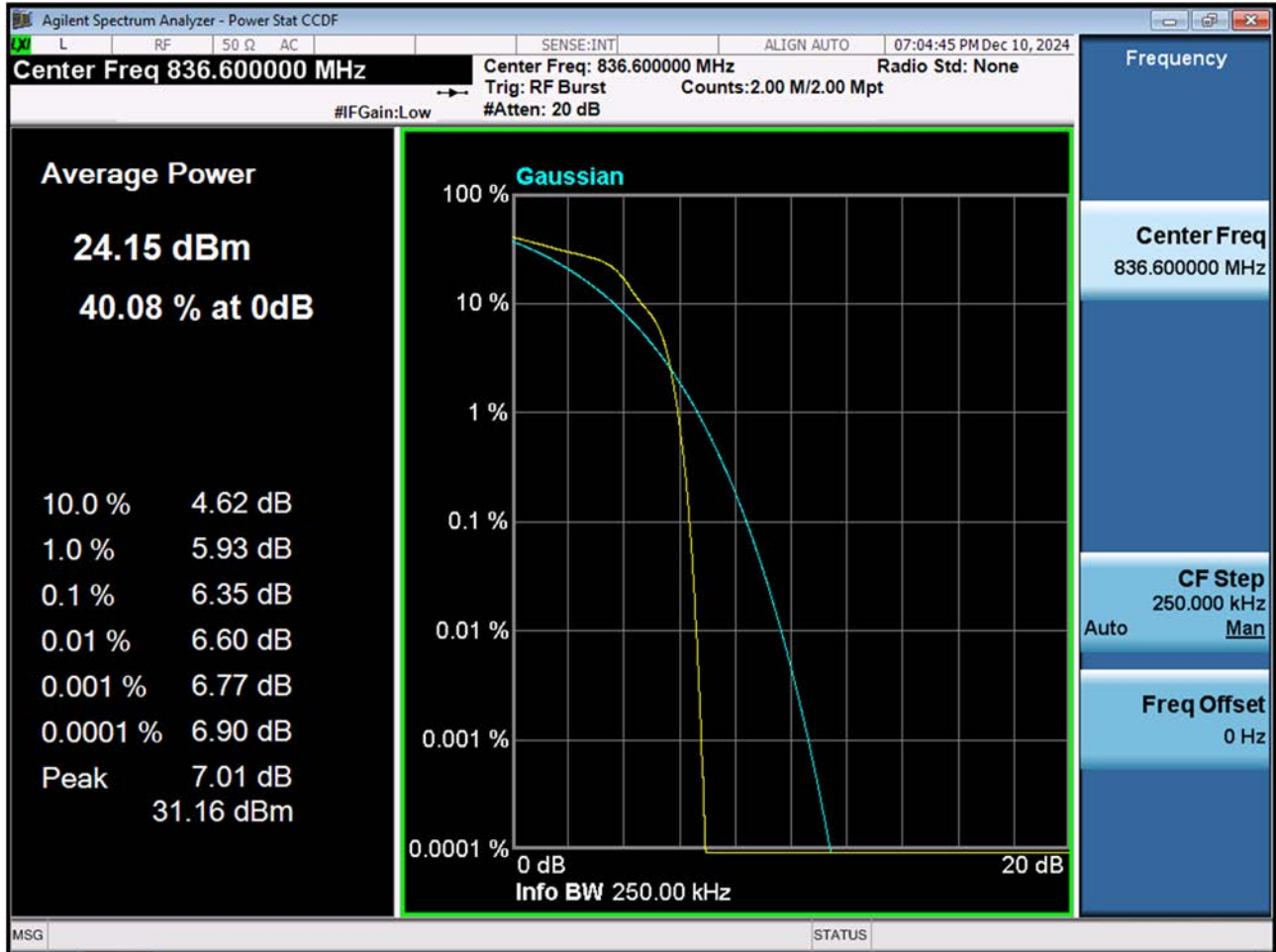
■ GSM1900 EDGE (661 CH.) Peak-to-Average Ratio P_{Avg}



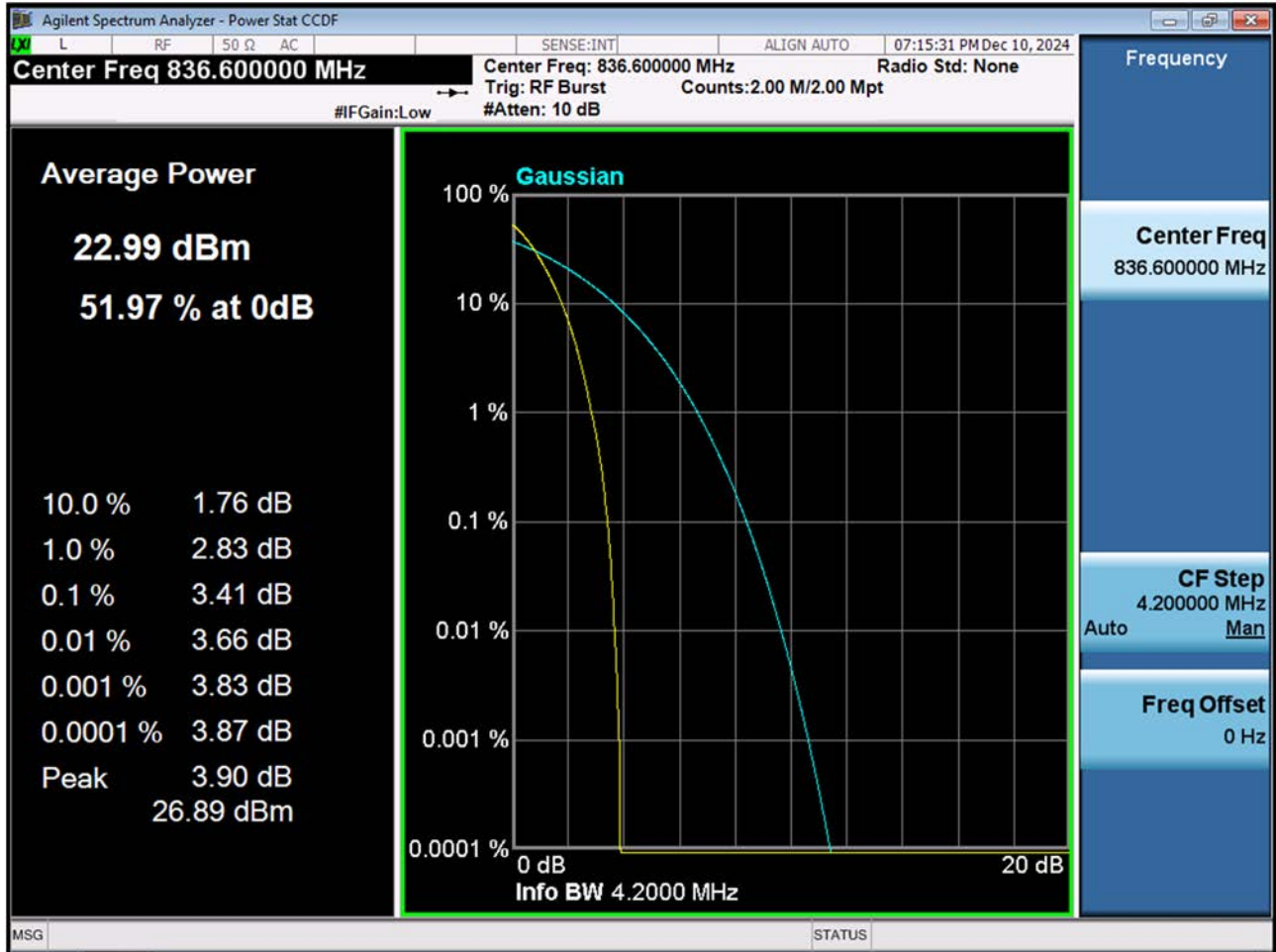
■ GSM850 MODE (190 CH.) Peak-to-Average Ratio



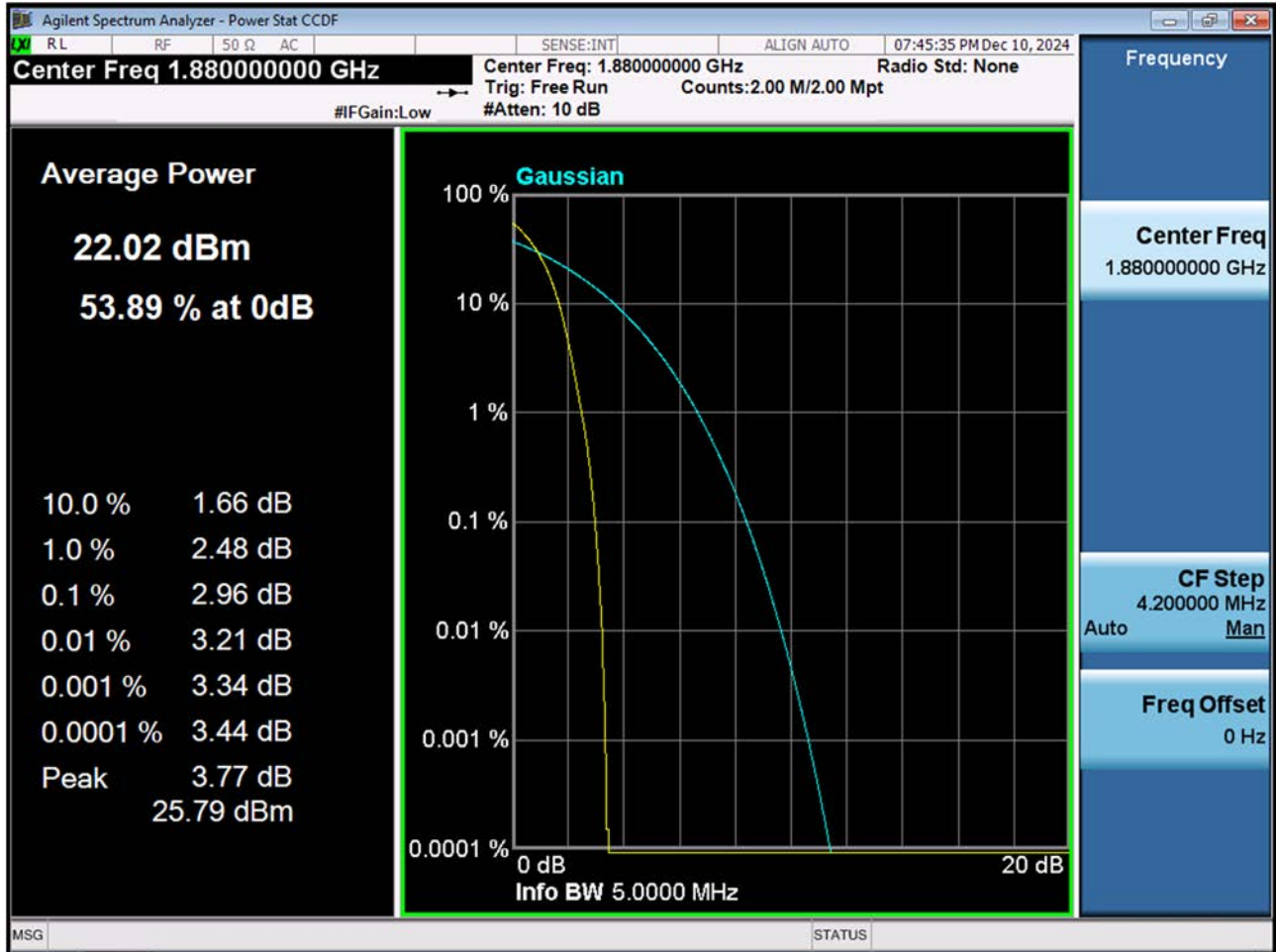
■ GSM850 EDGE (190 CH.) Peak-to-Average Ratio



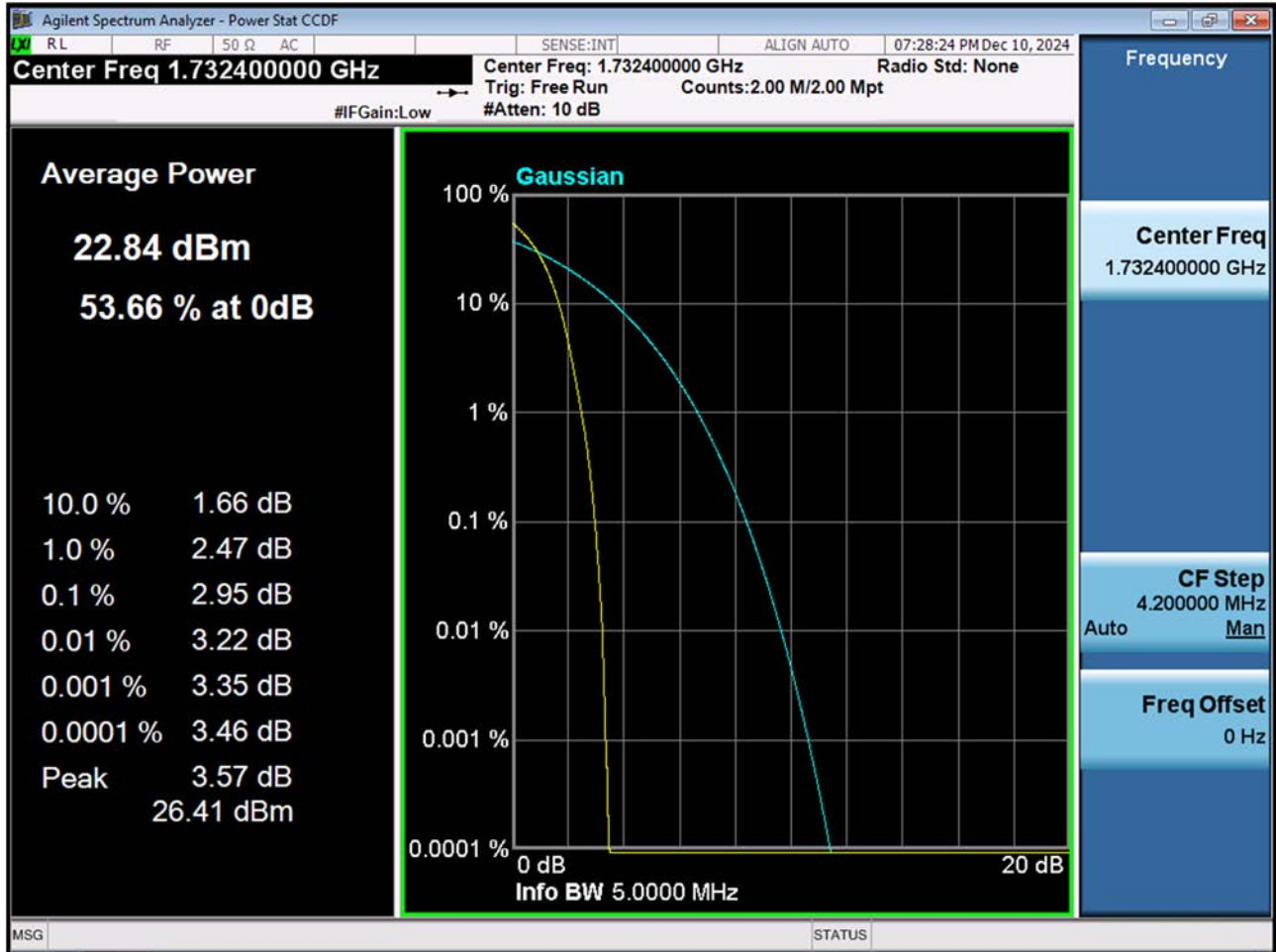
■ WCDMA850 MODE (4408 CH.) Peak-to-Average Ratio



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

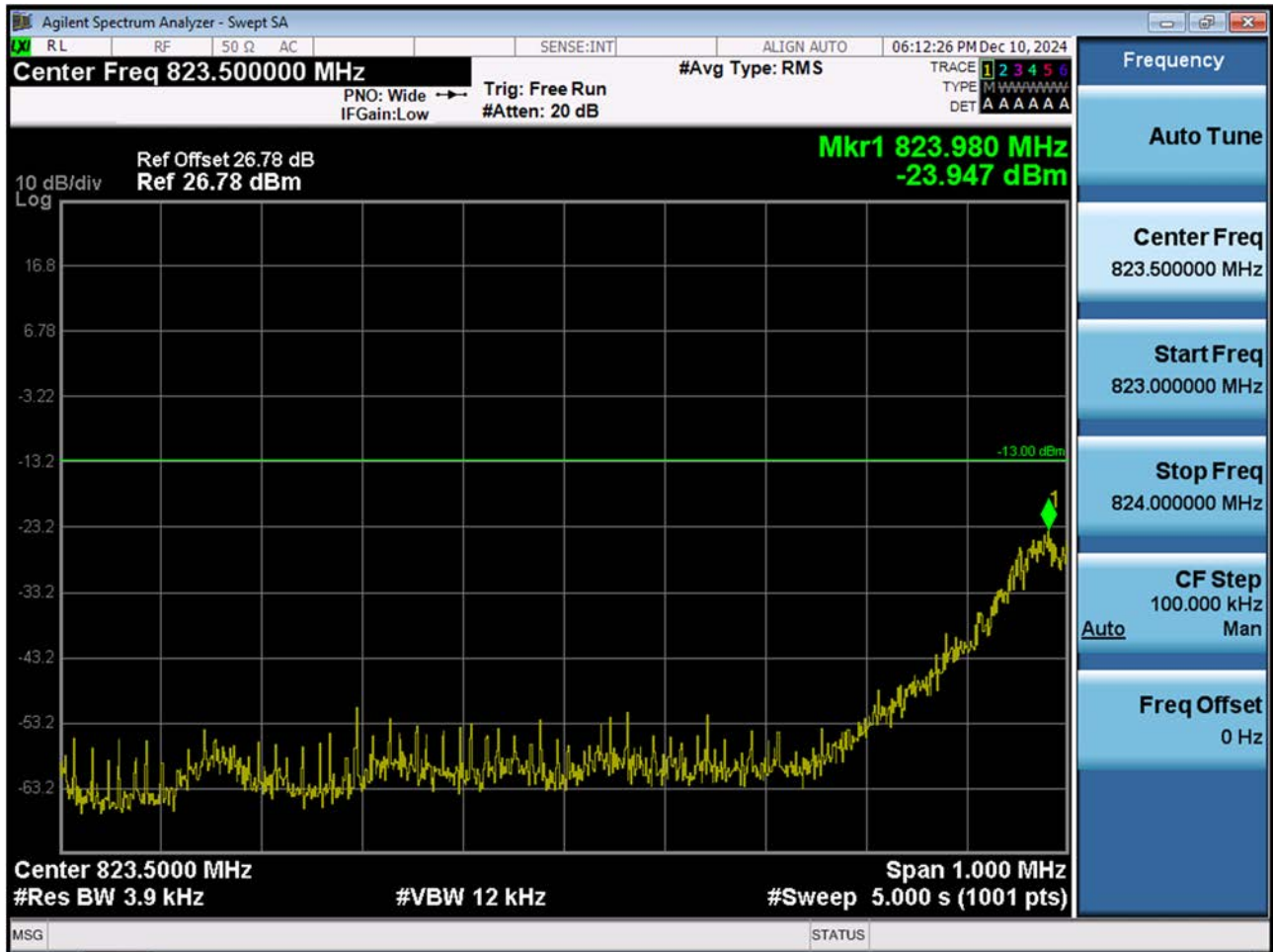


■ WCDMA1700 MODE (1412 CH.) Peak-to-Average Ratio

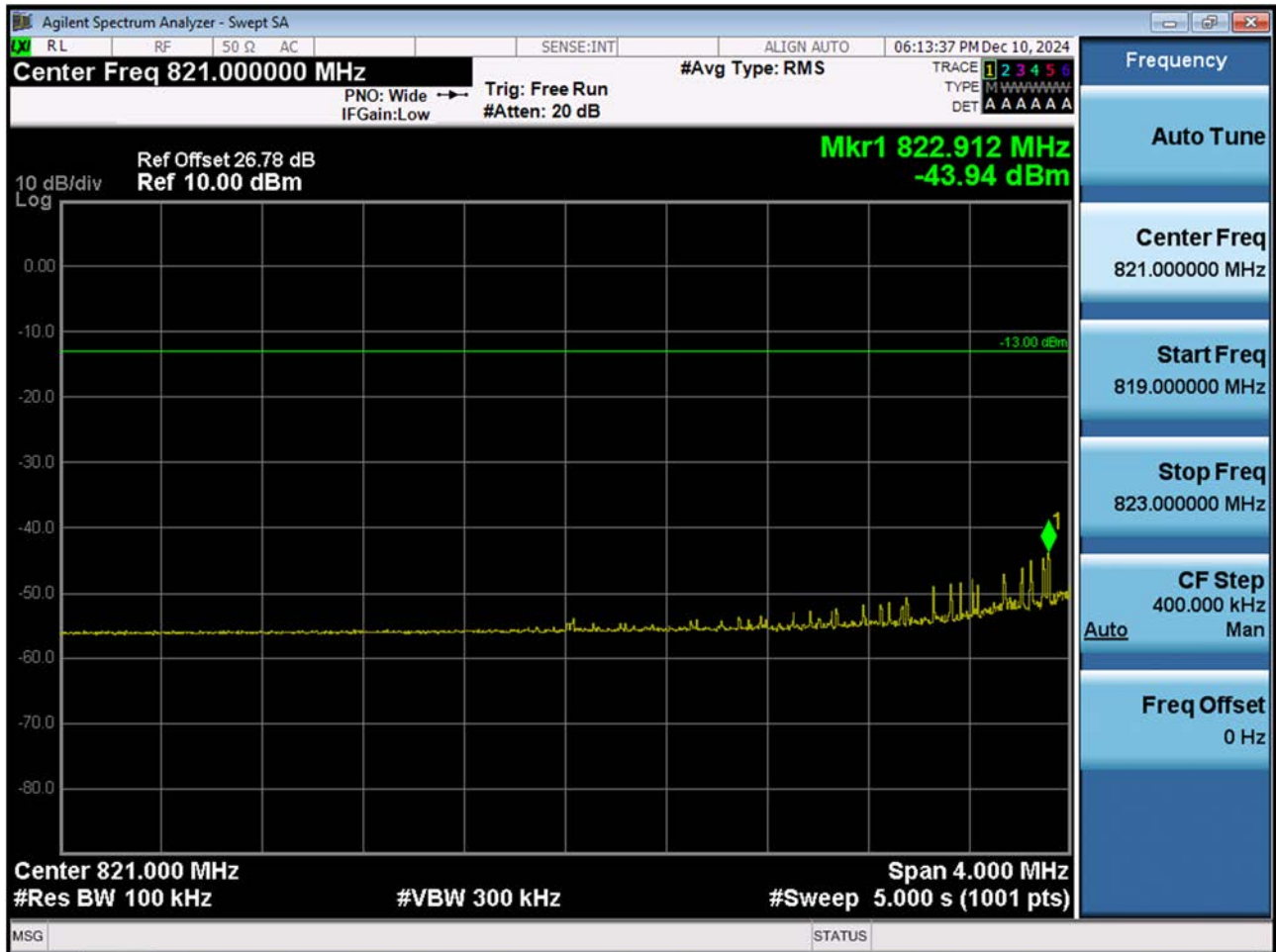


[illegible]

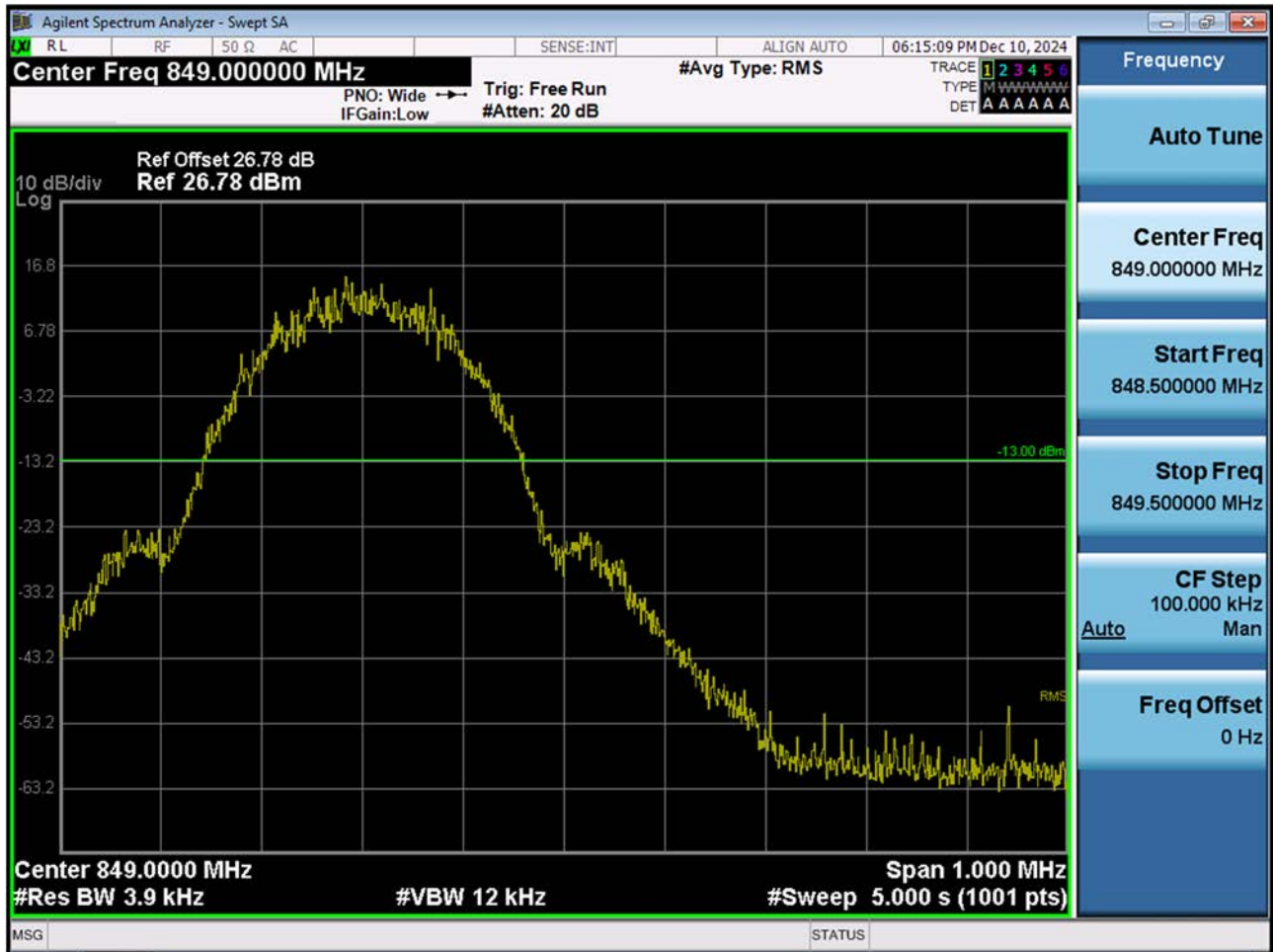
■ GSM850 MODE (128 CH.) Block Edge 2



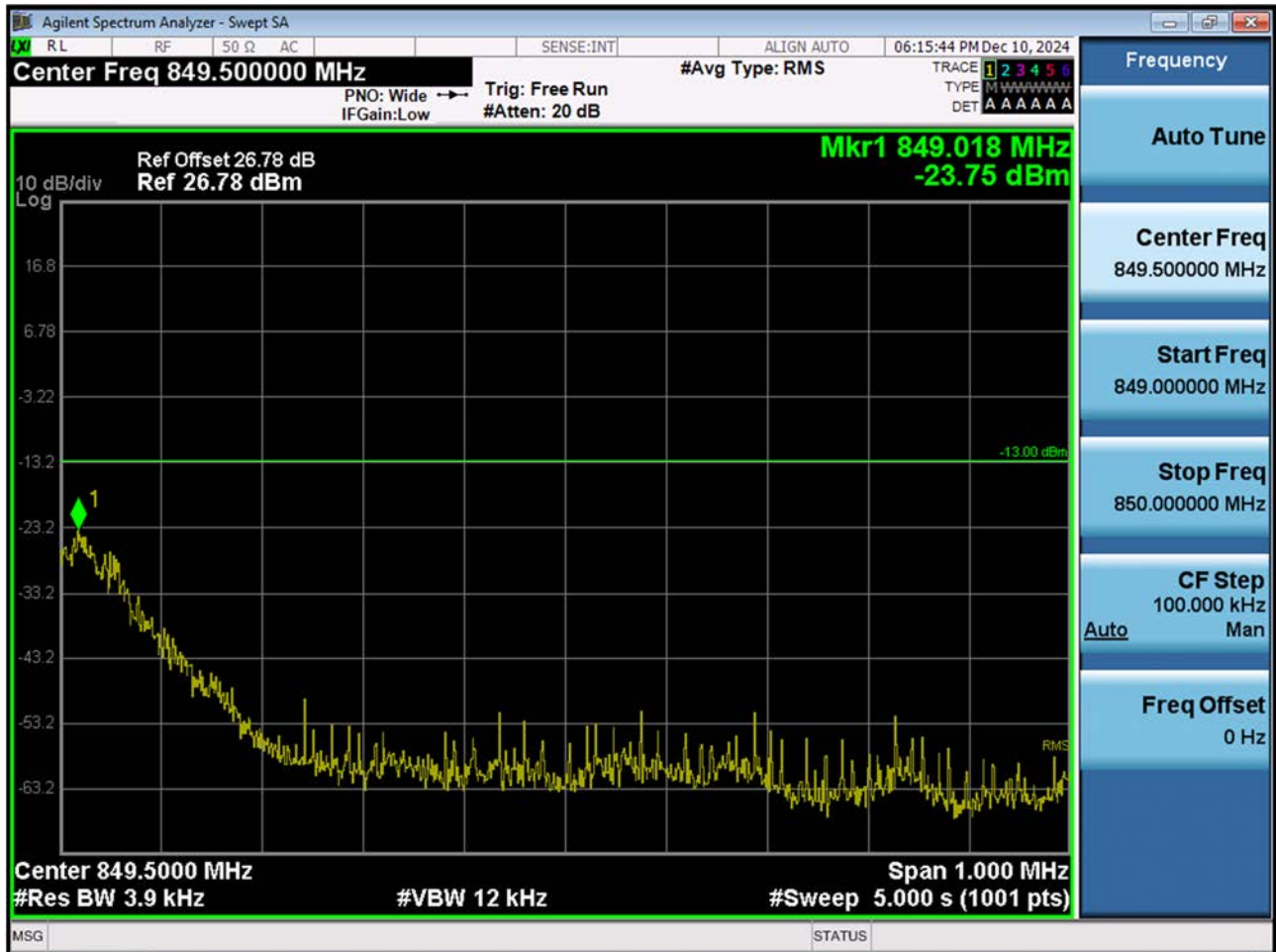
■ GSM850 MODE (128 CH.) Block Edge 3



■ GSM850 MODE (251 CH.) Block Edge 1

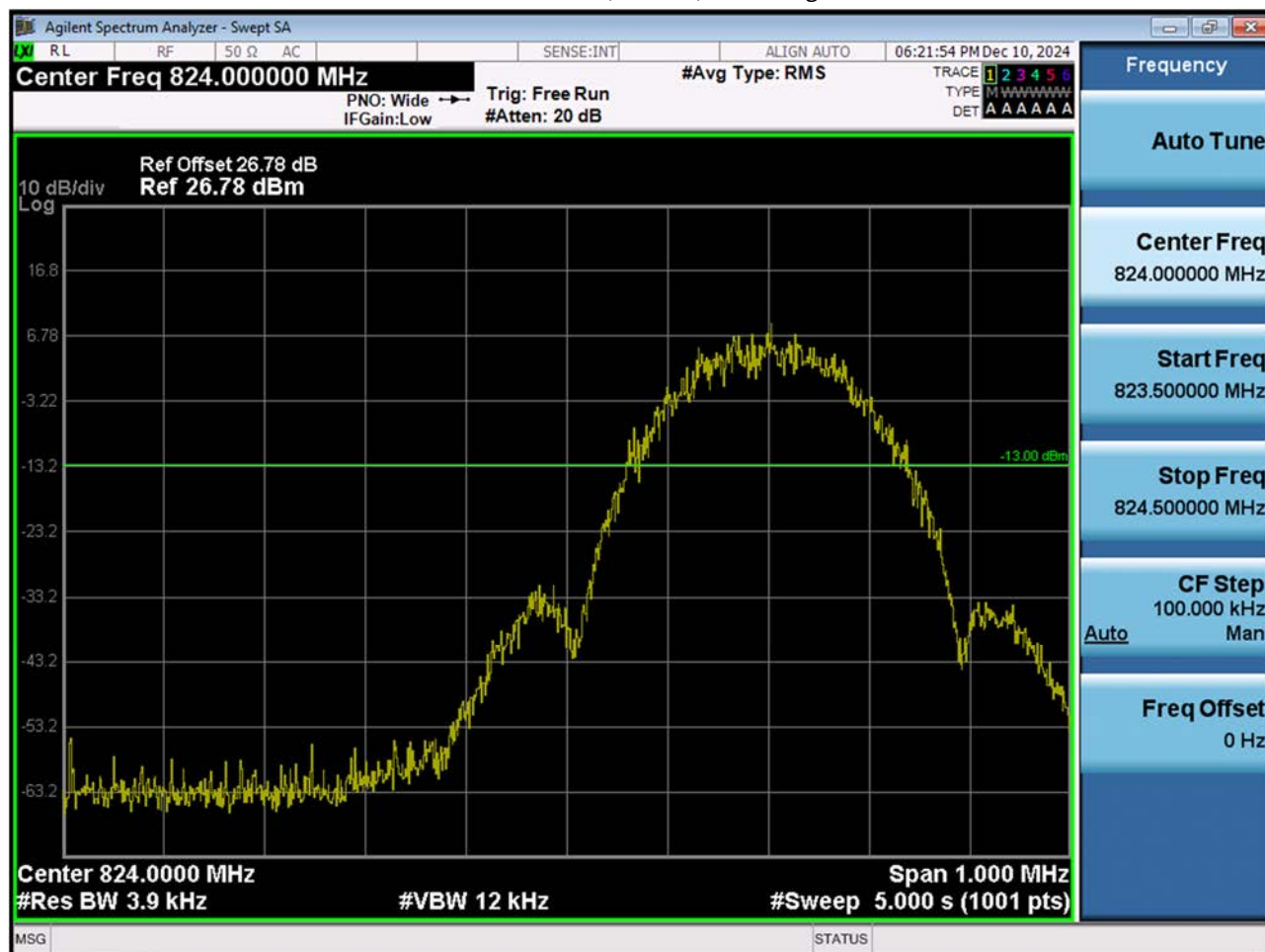


■ GSM850 MODE (251 CH.) Block Edge 2

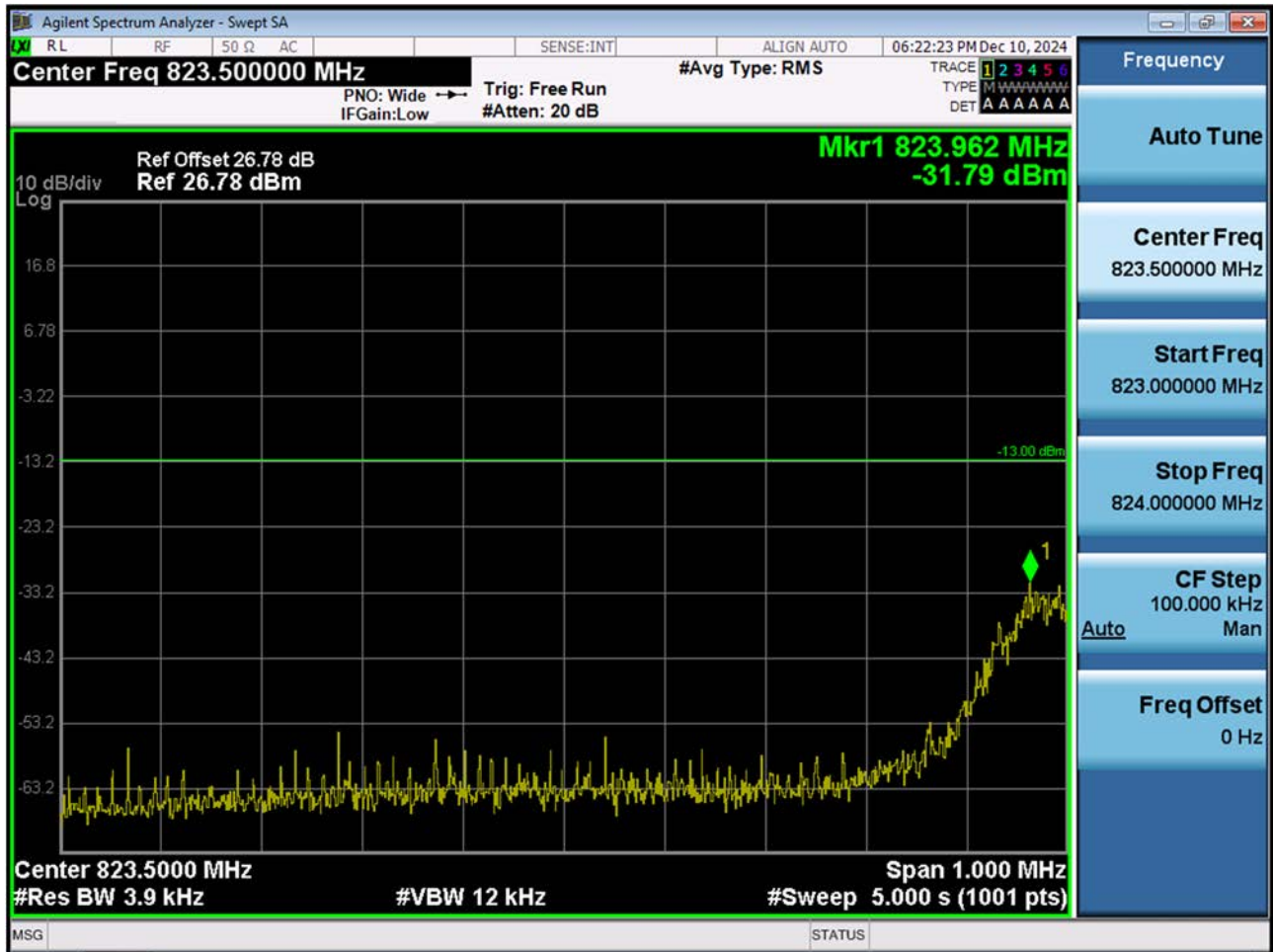


■ GSM850 MODE (251 CH.) Block Edge 3





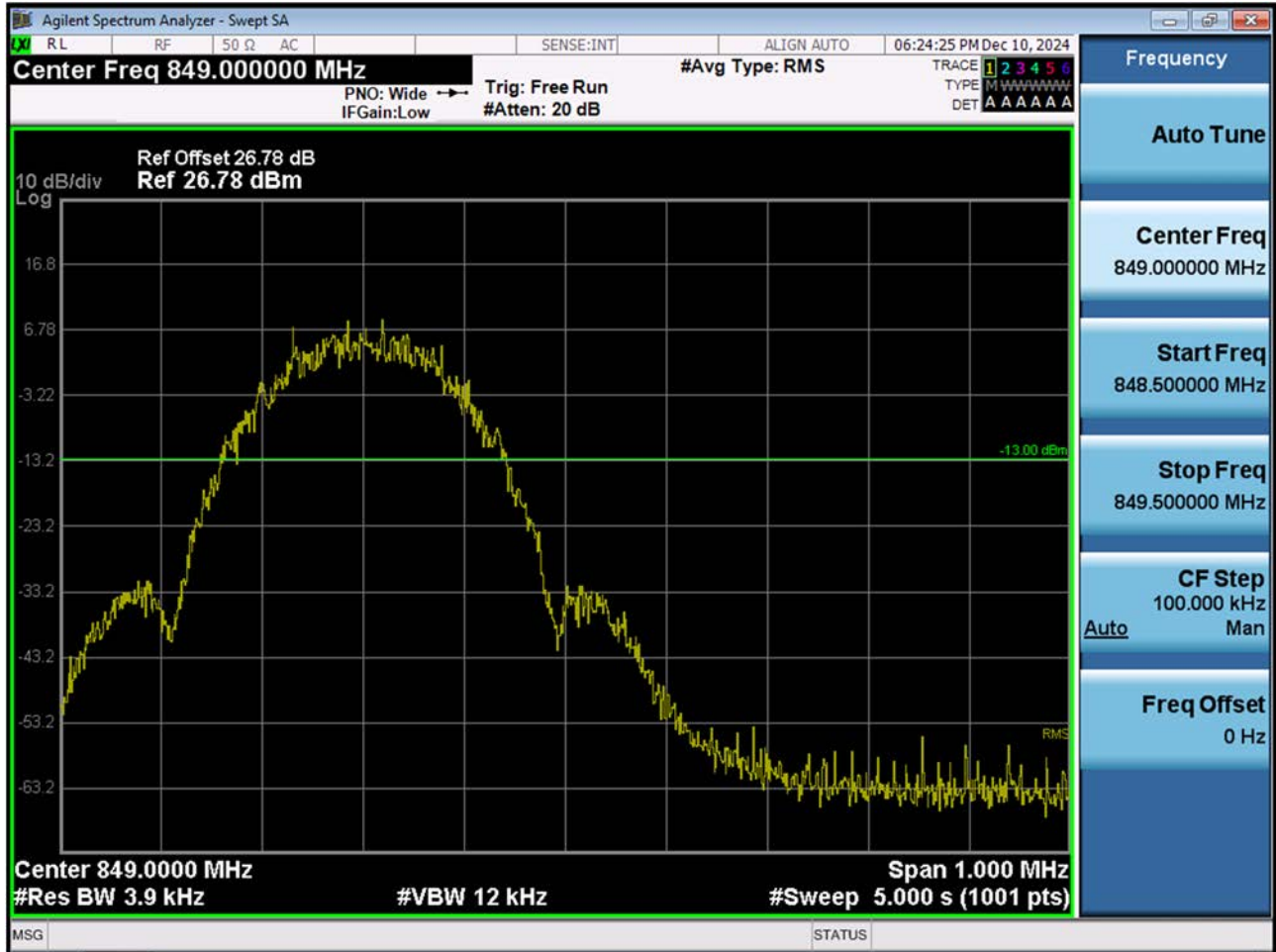
■ EDGE MODE (128 CH.) Block Edge 2



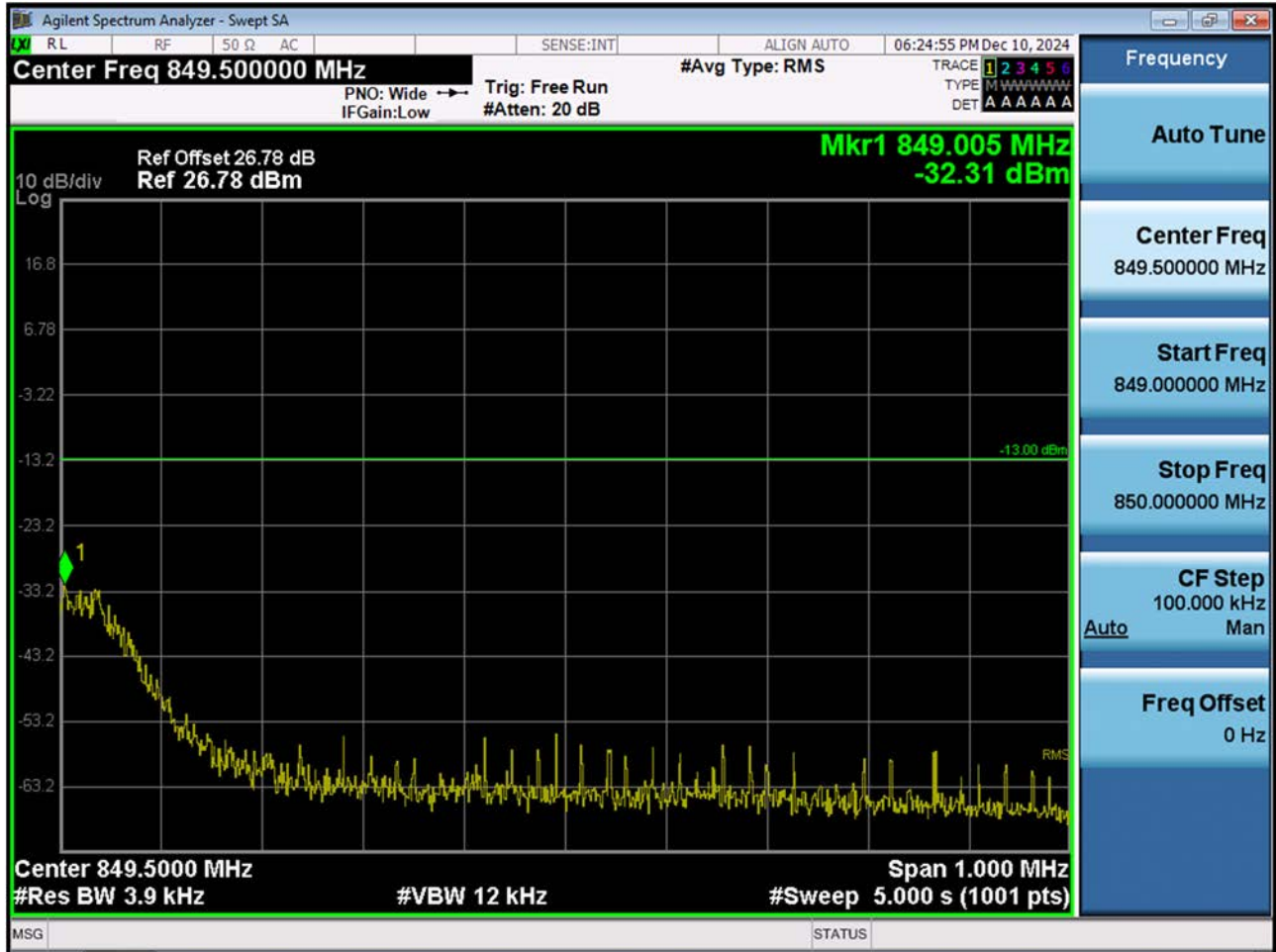
■ EDGE MODE (128 CH.) Block Edge 3



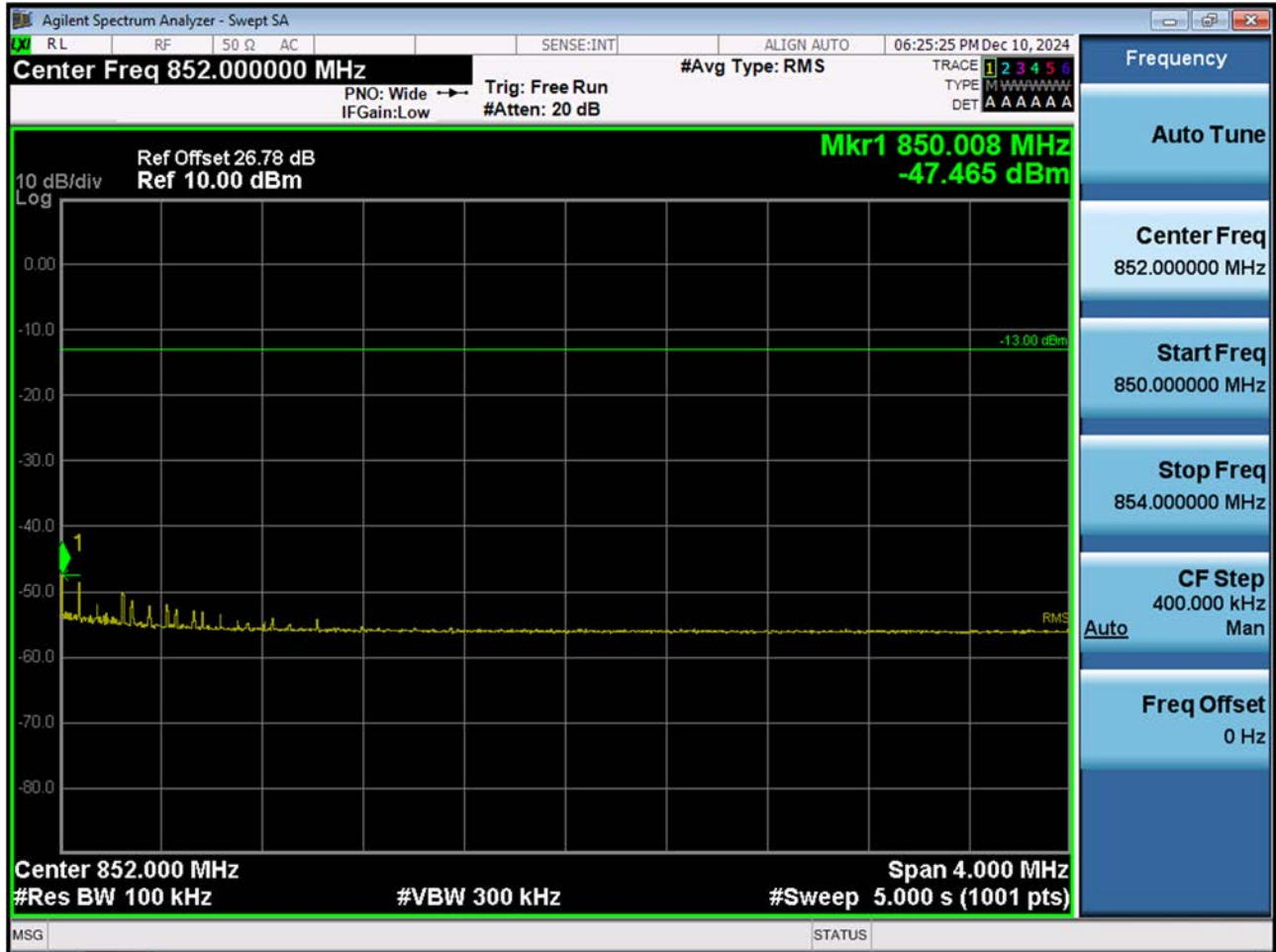
■ EDGE MODE (251 CH.) Block Edge 1



■ EDGE MODE (251 CH.) Block Edge 2

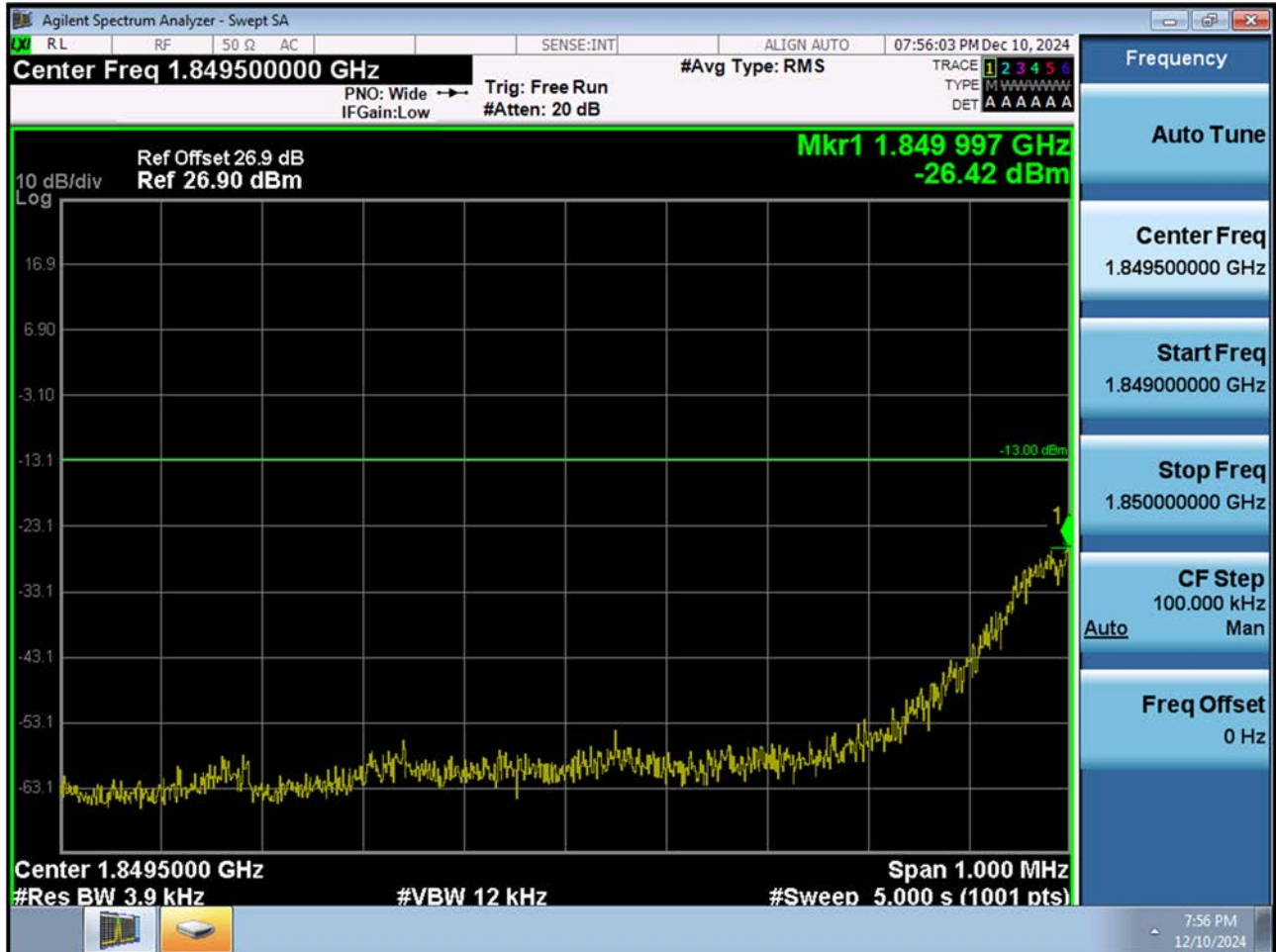


■ EDGE MODE (251 CH.) Block Edge 3



[illegible]

■ GSM1900 MODE (512 CH.) Block Edge 2



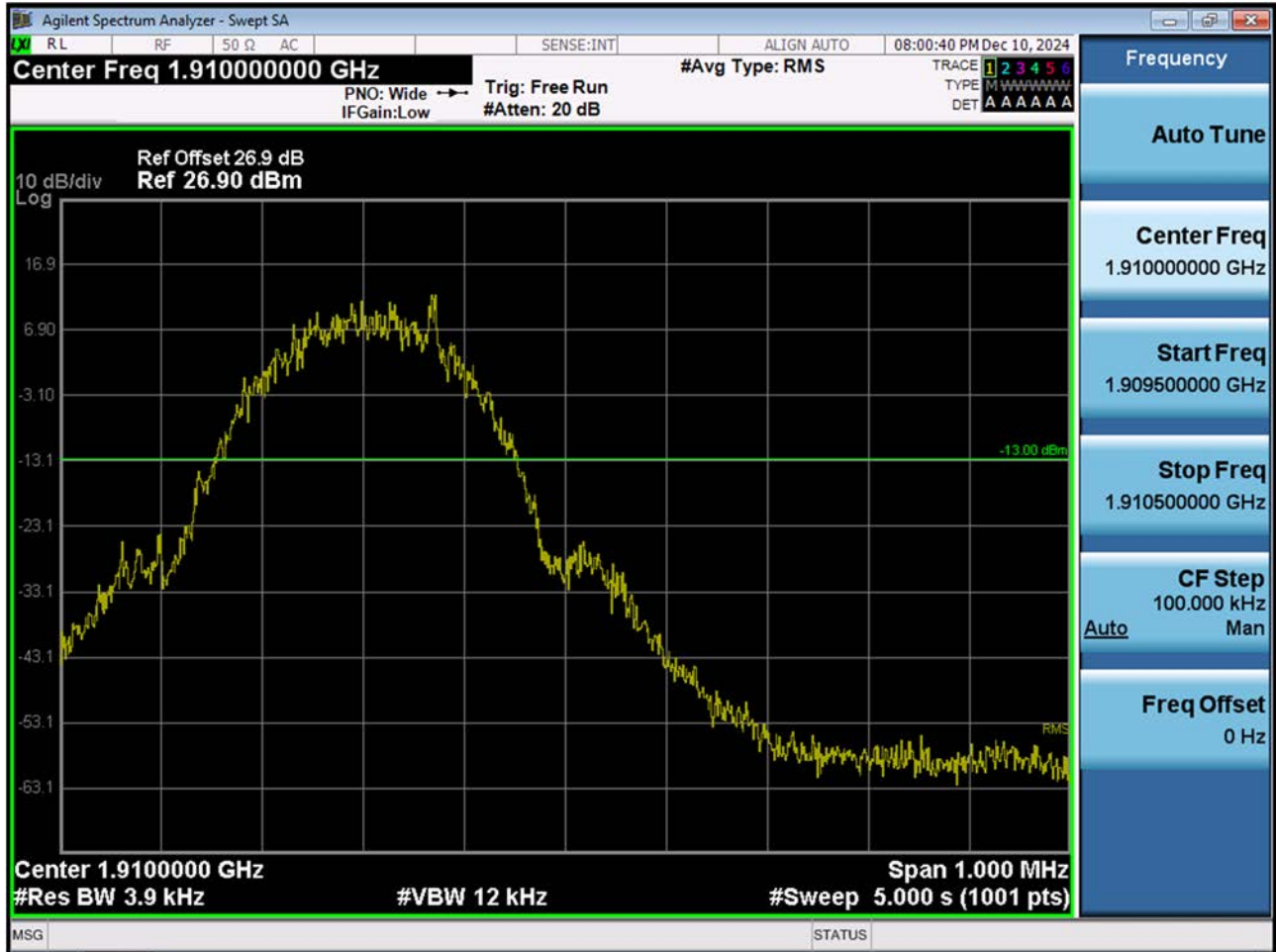
■ GSM1900 MODE (512 CH.) Block Edge 3



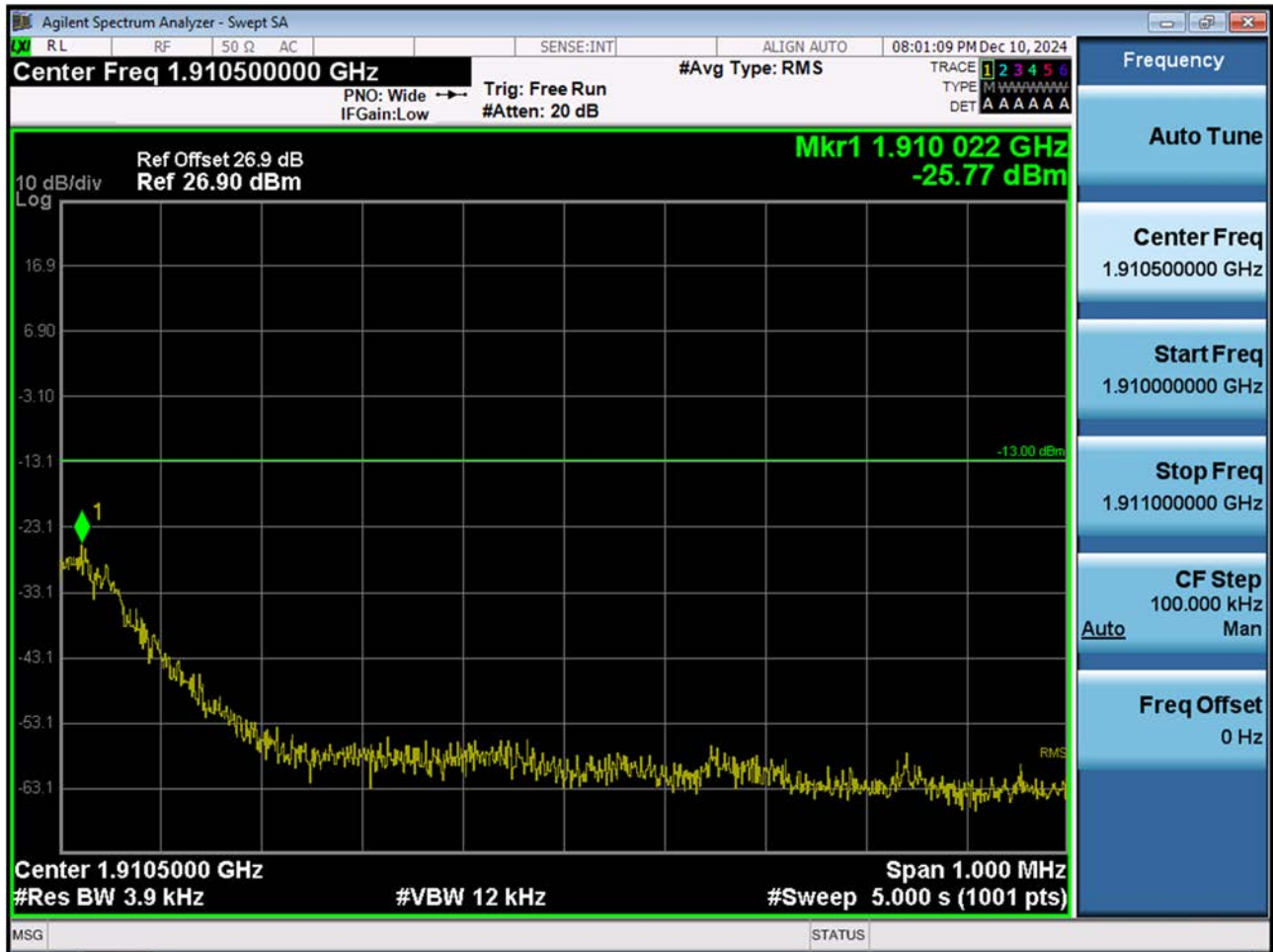
Note : We used a narrower RBW in order to increase accuracy.

$$\text{Calculation} = \text{Reading Value} + 10 \times \log(1 \text{ MHz}/100 \text{ kHz}) \text{ dB} = -49.71 \text{ dBm} + 10 \text{ dB} = -39.71 \text{ dBm}$$

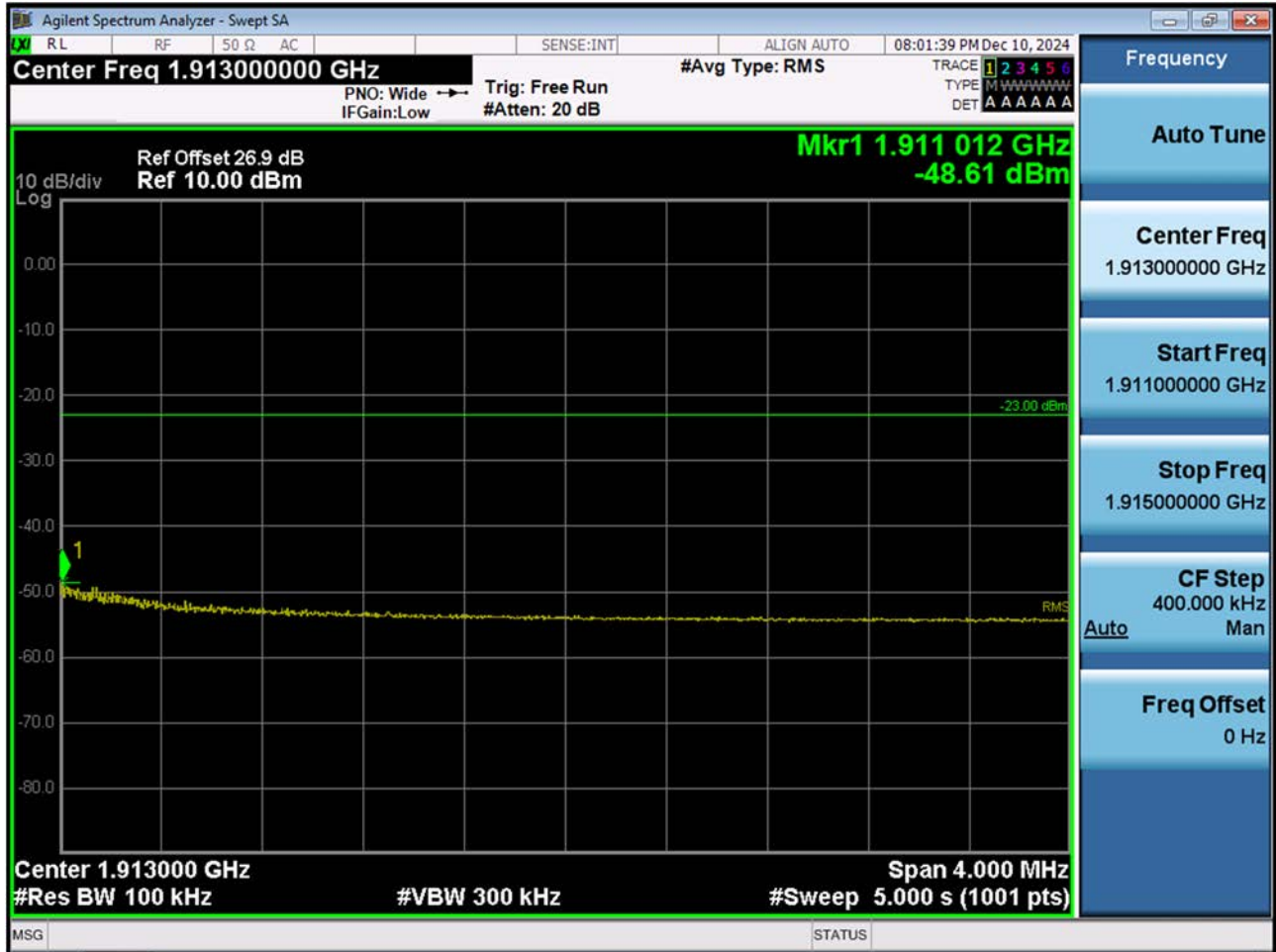
■ GSM1900 MODE (810 CH.) Block Edge 1



■ GSM1900 MODE (810 CH.) Block Edge 2



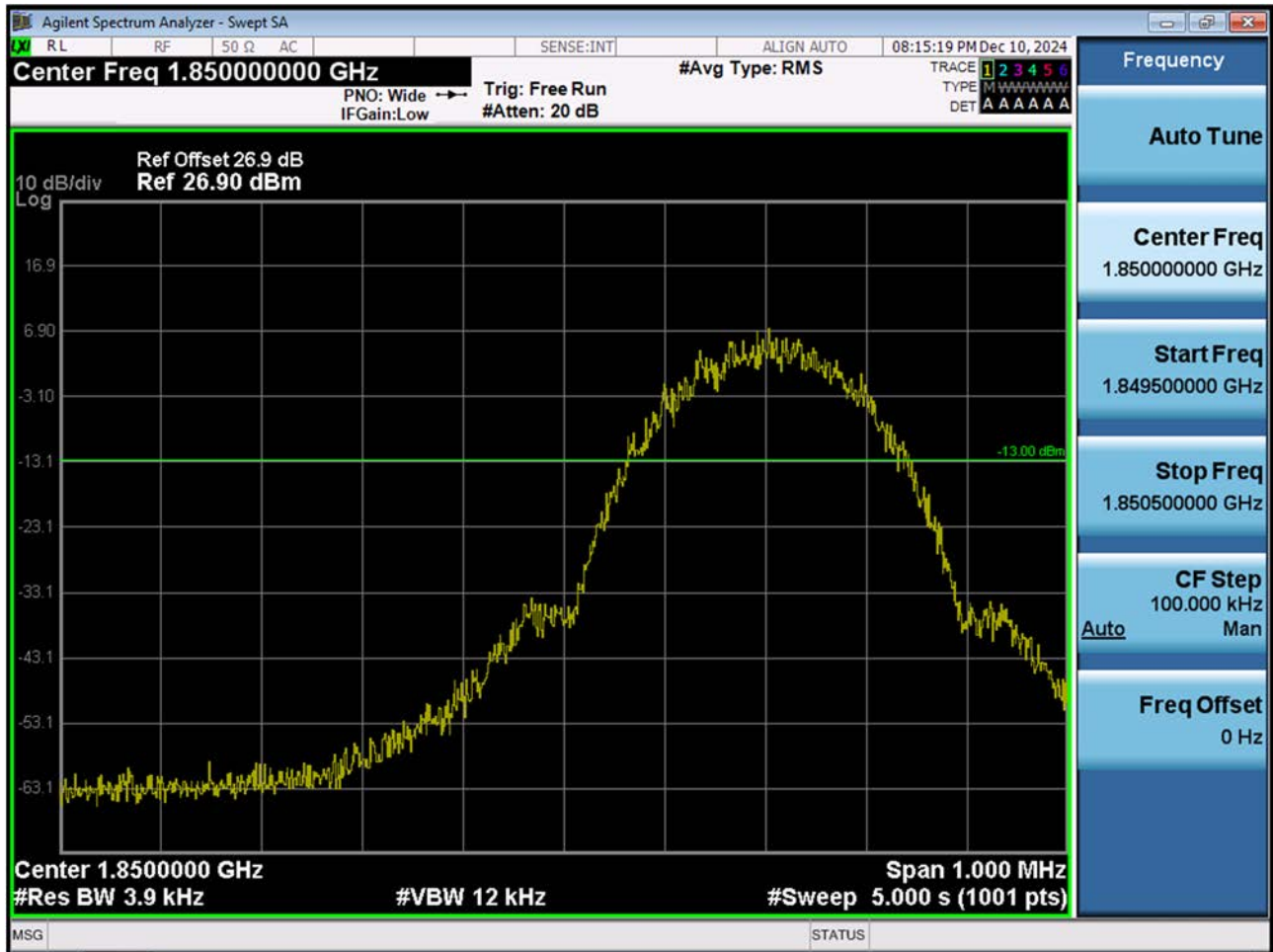
■ GSM1900 MODE (810 CH.) Block Edge 3



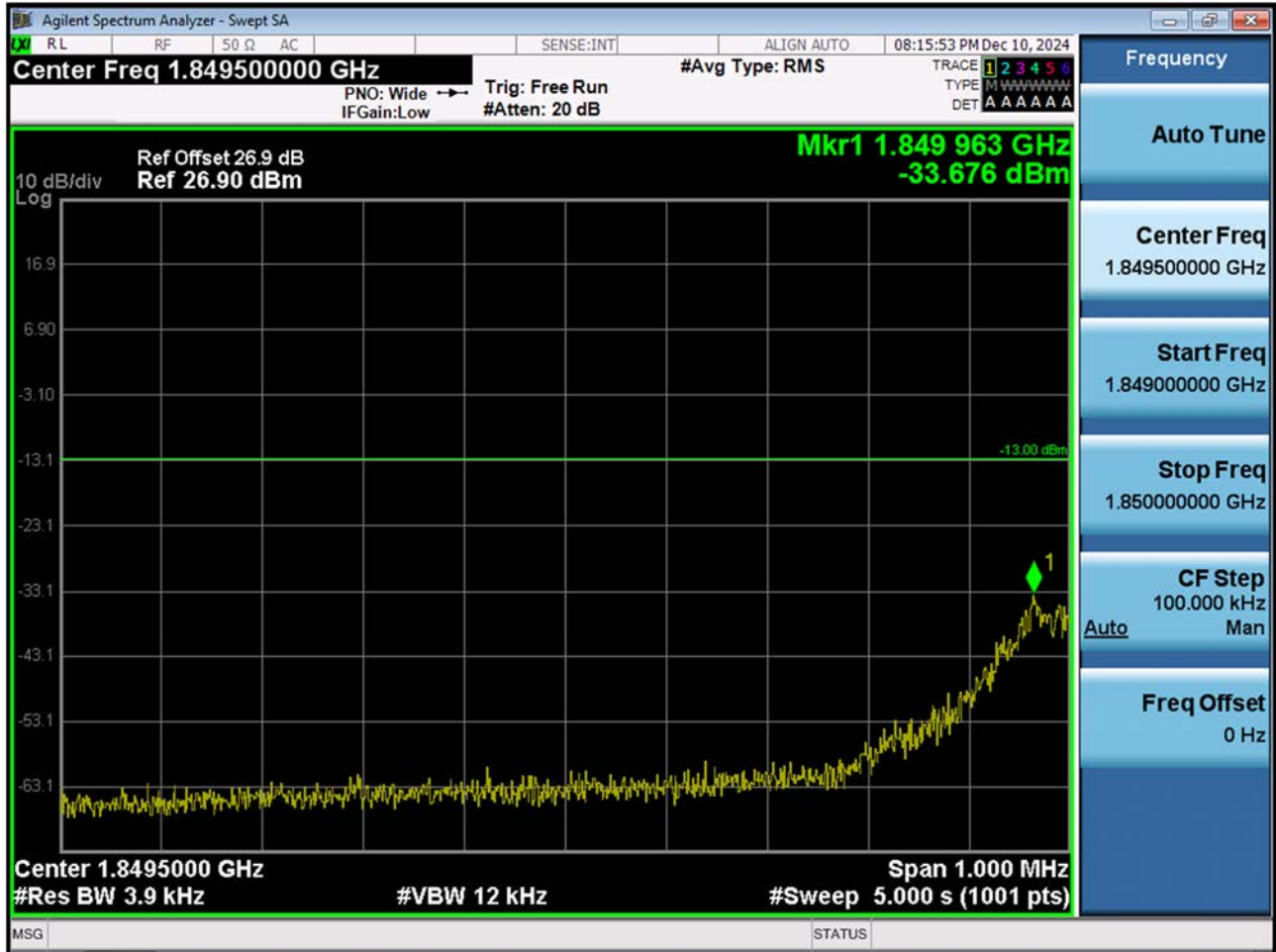
Note : We used a narrower RBW in order to increase accuracy.

$$\text{Calculation} = \text{Reading Value} + 10 \times \log(1 \text{ MHz}/100 \text{ kHz}) \text{ dB} = -48.61 \text{ dBm} + 10 \text{ dB} = -38.61 \text{ dBm}$$

■ EDGE MODE (512 CH.) Block Edge 1



■ EDGE MODE (512 CH.) Block Edge 2



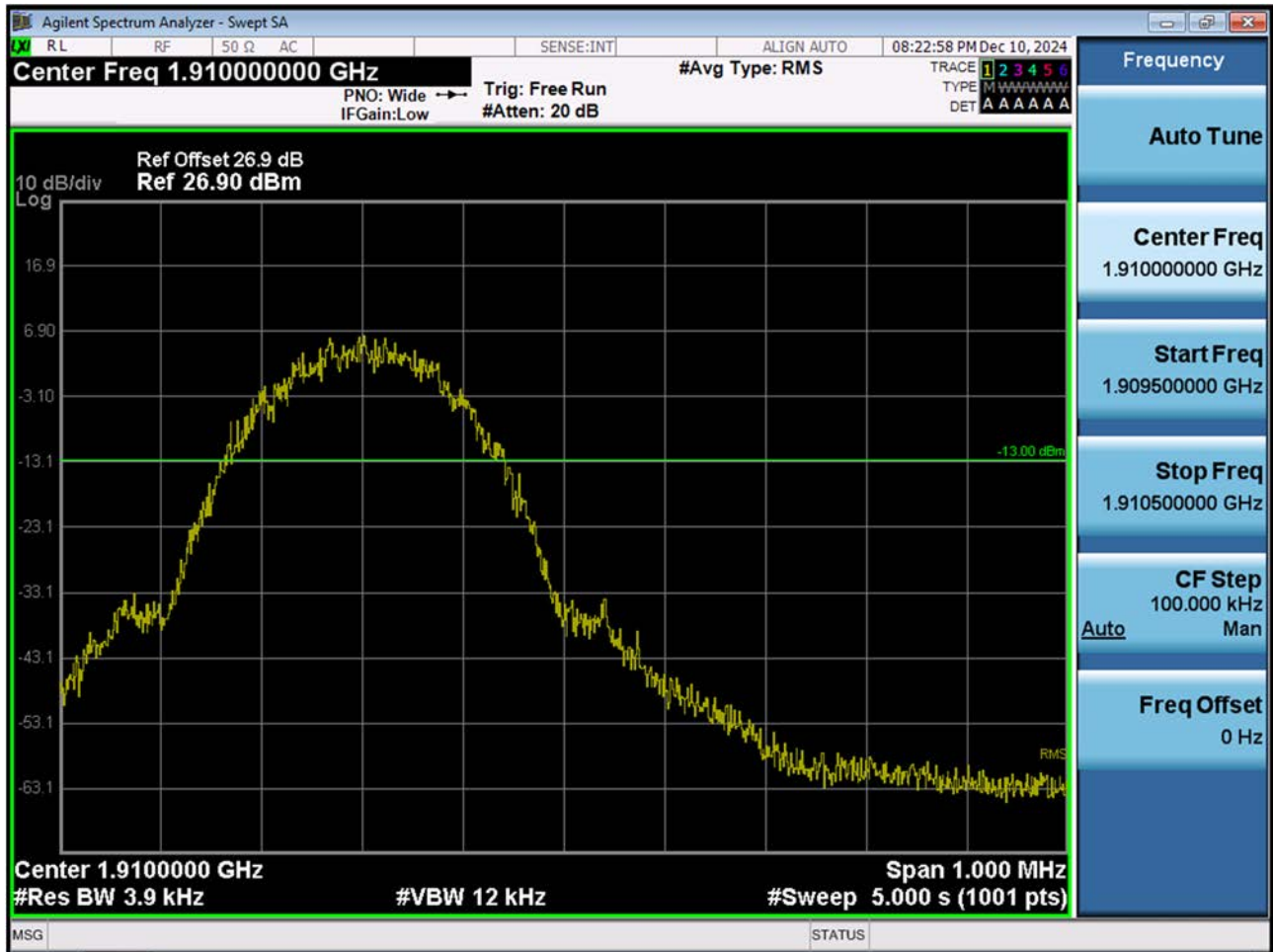
■ EDGE MODE (512 CH.) Block Edge 3



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

$$\text{Calculation} = \text{Reading Value} + 10 \times \log(1 \text{ MHz}/100 \text{ kHz}) \text{ dB} = -50.91 \text{ dBm} + 10 \text{ dB} = -40.91 \text{ dBm}$$

■ EDGE MODE (810 CH.) Block Edge 1



■ EDGE MODE (810 CH.) Block Edge 2

