

TEST REPORT

FCC CDMA Test for LT-91AABJ
Class II Permissive Change

APPLICANT
LG Electronics Inc.

REPORT NO.
HCT-RF-2011-FC022

DATE OF ISSUE
November 20, 2020

Tested by
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TEST REPORT

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LT-91A AFBJ

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Additional Model

LT-91AABJU, LT-91CBB, LT-91GABJ, LT-91GAFB, LT-91GAFBJ,
LT-91GAFBJU, TC96AAFTJU

Applicant

LG Electronics Inc.

222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea

**Eut Type
Model Name**

Cellular/PCS CDMA Transceiver with Bluetooth
LT-91A AFBJ

FCC ID:

BEJLTGEN90L

FCC Rule Part(s):

§ 22, § 24, § 2

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

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

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	November 20, 2020	Initial Release

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section § 2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S. C.853(a)

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	LG Electronics Inc.
Address:	222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea
FCC ID:	BEJLTGEN90L
Application Type:	Class II Permissive Change
FCC Rule Part(s):	§ 22, § 24, § 2
EUT Type:	Cellular/PCS CDMA Transceiver with Bluetooth
Model(s):	LT-91AABFBJ
Additional Model:	LT-91AABJU, LT-91CBB, LT-91GABJ, LT-91GAFB, LT-91GAFBJ, LT-91GAFBJU, TC96AAFTJU
Tx Frequency:	824.70 — 848.31 MHz (CDMA BC0) 1 851.25 – 1 908.75 MHz (PCS CDMA BC1)
Rx Frequency:	869.70 — 893.31 MHz (CDMA BC0) 1 931.25 – 1 988.75 MHz (PCS CDMA BC1)
Date(s) of Tests:	November 05, 2020 ~ November 13, 2020

1.1. MAXIMUM OUTPUT POWER

Mode	Tx Frequency (MHz)	Rx Frequency (MHz)	Emission Designator	ERP	
				Max. Power (W)	Max. Power (dBm)
CDMA 850	824.70– 848.31	869.70– 893.31	1M28F9W	0.099	19.97
Mode	Tx Frequency (MHz)	Rx Frequency (MHz)	Emission Designator	EIRP	
				Max. Power (W)	Max. Power (dBm)
CDMA PCS	1851.25– 1 908.75	1 931.25– 1 988.75	1M29F9W	0.127	21.03

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Cellular/PCS CDMA Transceiver with Bluetooth with CDMA(BC0, 1).

It also supports BT.

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.**

For ISED, test facility was accepted dated February 14, 2019 (CAB identifier: KR0032).

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

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

3.2 CONDUCTED OUTPUT POWER

Test Overview

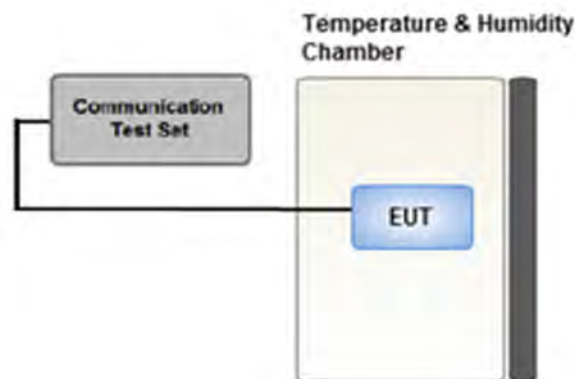
According to ANSI C63.26-2015 Section 5.2.1 when measuring the maximum RF output power from such devices, control over the EUT must be provided either through special test software (provided by manufacturer specifically for compliance testing, but not accessible by an end user) or through use of a base station emulator, communications test set, call box, or similar instrumentation that is capable of establishing a communications link with the EUT to enable control over variable parameters (e.g., output power, OBW, etc.).

In some cases, these instruments also include basic digital spectrum analyzer and/or power meter capabilities that can be utilized to measure the RF output power if the specified detectors and requirements can be realized and the measurement functions have been calibrated.

Test Procedure

1. The RF port of the EUT was connected to the Communication Tester via an RF cable.
2. Conducted average power was measured using a calibrated Radio Communication Tester.

Test setup



3.3 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
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 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

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

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.

3.4 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

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

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
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 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated. The spurious emissions is calculated by the following formula;

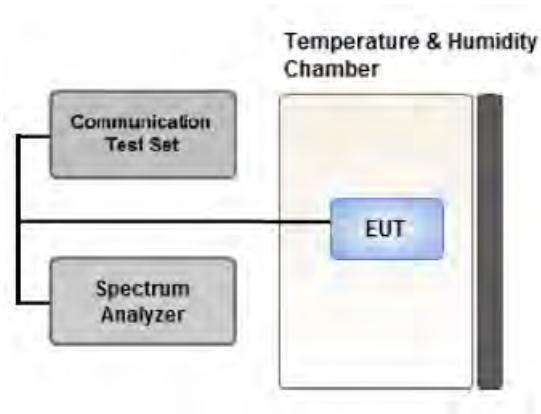
$$\text{Result}_{(\text{dBm})} = P_{g(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

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

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

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

3.5 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)

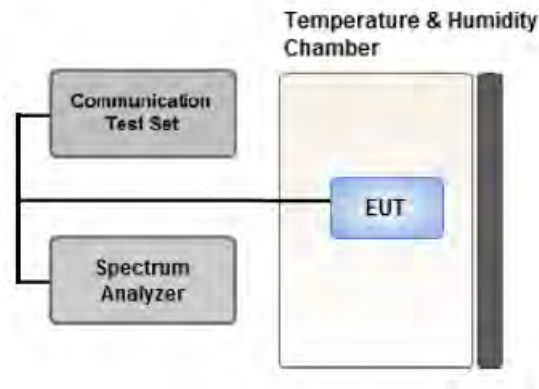
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW $\geq 3 \times$ RBW.

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 $[10 \log (1/\text{duty cycle})]$ to the measured maximum power level to compute the average power during continuous transmission. For example, add $[10 \log (1/0.25)] = 6 \text{ dB}$ if the duty cycle is a constant 25%.

3.6 OCCUPIED BANDWIDTH.



Test setup

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

The EUT makes a call to the communication simulator.

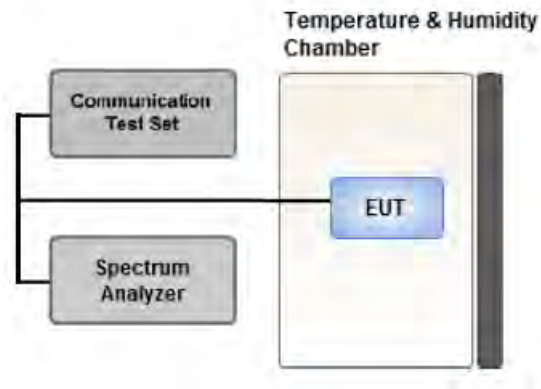
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

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

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq 3 \times$ 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

3.7 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

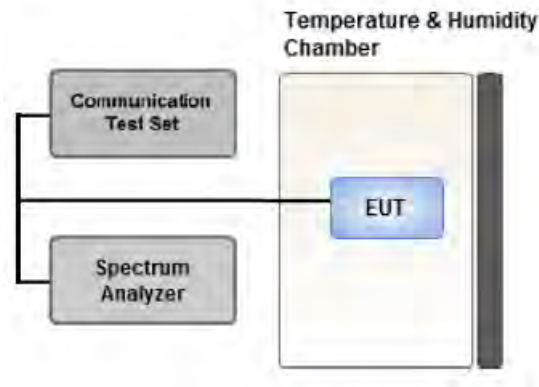
Test Overview

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

Test Settings

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

3.8 BAND EDGE



Test setup

Test Overview

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

Test Settings

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

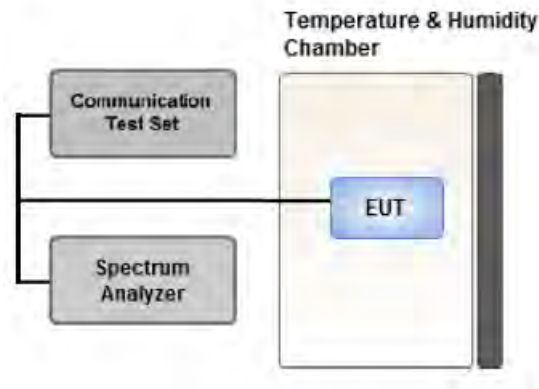
Test Notes

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

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

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

3.9 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

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

The frequency stability of the transmitter is measured by:

1. Temperature:

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

2. Primary Supply Voltage:

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

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

Test Settings

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

3.10 WORST CASE(CONDUCTED TEST)

- All modes of operation were investigated and the worst case configuration results are reported.
- LT-91AABFBJ & additional models were tested and the worst case results are reported.

(Worst case : LT-91AABFBJ)

[Worst case]

Test Description	Modulation	Test Channel
Occupied Bandwidth	CDMA : RC3/SO55	Low, Mid, High
Band Edge	CDMA : RC3/SO55	Low, High
Spurious and Harmonic Emissions at Antenna Terminal	CDMA : RC3/SO55	Low, Mid, High

[Test Channel]

	UplinkChannel	
	CDMA (BC 0)	CDMA (BC 1)
Low	1013	25
Mid	384	600
High	777	1175

3.11 WORST CASE(RADIATED TEST)

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst case configuration results are reported.
- 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.
- LT-91AABFBJ & additional models were tested and the worst case results are reported.

(Worst case : LT-91AABFBJ)

[Worst case_CDMA]

Test Description	Modulation	Axis	Test Channel
Effective Radiated Power, Effective Isotropic Radiated Power	RC3/SO55	CDMA BC0 : X CDMA BC1 : X	Low, Mid, High
Radiated Spurious and Harmonic Emissions	RC3/SO55	CDMA BC0 : X CDMA BC1 : X	Low, Mid, High

[Test Channel]

	UplinkChannel	
	CDMA (BC 0)	CDMA (BC 1)
Low	1013	25
Mid	384	600
High	777	1175

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
T&M SYSTEM	FBSR-02B(WHK1.2/15G-10EF)/H.P.F	-	03/09/2020	Annual	03/09/2021
T&M SYSTEM	FBSR-02B(WHK3.3/18G-10EF)/H.P.F	-	03/09/2020	Annual	03/09/2021
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	11275	04/27/2020	Annual	04/27/2021
Hewlett Packard	E3632A/DC Power Supply	MY40004427	09/16/2020	Annual	09/16/2021
Schwarzbeck	UHAP/ Dipole Antenna	557	03/29/2019	Biennial	03/29/2021
Schwarzbeck	UHAP/ Dipole Antenna	558	03/29/2019	Biennial	03/29/2021
ESPEC	SU-642 / Chamber	93008124	03/18/2020	Annual	03/18/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	147	08/29/2019	Biennial	08/29/2021
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1298	09/25/2019	Biennial	09/25/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	04/29/2019	Biennial	04/29/2021
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	02/11/2020	Biennial	02/11/2022
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY51110063	04/27/2020	Annual	04/27/2021
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/04/2020	Annual	06/04/2021
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	100931	10/14/2020	Annual	10/14/2021
Agilent	8960 (E5515C)/ Base Station	MY48360800	08/26/2020	Annual	08/26/2021
Schwarzbeck	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	04/26/2019	Biennial	04/26/2021
Schwarzbeck	VULB9160/ Bilog Antenna	3150	03/12/2019	Biennial	03/12/2021
Schwarzbeck	VULB9160/ Hybrid Antenna	760	03/22/2019	Biennial	03/22/2021
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6262116770	07/22/2020	Annual	07/22/2021
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6201026545	01/22/2020	Annual	01/22/2021
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/13/2020	Annual	07/13/2021
KEYSIGHT	N9030B / Signal Analyzer(5Hz~40.0GHz)	MY55480167	06/04/2020	Annual	06/04/2021
HCT CO., LTD.,	FCC LTE Mobile Conducted RF Automation Test Software	-	-	-	-

Note:

1. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
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 ($\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§ 2.1049	N/A	PASS
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§ 2.1051, § 22.917(a), § 24.238(a)	< 43 + 10 x log ₁₀ (P[Watts]) at Band Edge and for all out-of-band emissions	PASS
Conducted Output Power	§ 2.1046	N/A	PASS
Peak- to- Average Ratio	§ 24.232(d)	< 13 dB	PASS
Frequency stability / variation of ambient temperature	§ 2.1055, § 22.355	< 2.5 ppm	PASS
	§ 24.235	Emission must remain in band	PASS

Note:

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

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Effective Radiated Power	§ 22.913(a)(5)	< 7 Watts max. ERP	PASS
Equivalent Isotropic Radiated Power	§ 24.232(c)	< 2 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§ 2.1053, § 22.917(a), § 24.238(a)	< 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.

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 CONDUCTED OUTPUT POWER

Band	Channel	S055
		RC3/3
CDMA(BC0)	1013	24.34
	384	24.70
	777	24.63
PCS(BC1)	25	24.61
	600	24.46
	1175	24.60

(CDMA Conducted Output Powers)

Note : Detecting mode is average.

8.2 EFFECTIVE RADIATED POWER

Mode	Ch./ Freq.		Measure d Level (dBm)	Substitut e LEVEL (dBm)	Ant. Gain (dBd)	C.L	Pol .	Limit	ERP	
	channe l	Freq.(MHz)						W	W	dBm
CDMA850	1013	824.7	-36.88	26.62	-10.24	1.40	H	< 7.00	0.031	14.98
	384	836.5	-34.59	29.34	-10.19	1.41	H		0.059	17.74
	777	848.3	-32.61	31.53	-10.14	1.42	H		0.099	19.97

8.3 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
CDMA PCS	25	1851.3	-21.04	13.04	10.10	2.11	V	< 2.00	0.127	21.03
	600	1880.0	-22.63	11.92	10.15	2.15	V		0.098	19.92
	1175	1908.8	-23.40	11.14	10.23	2.15	V		0.084	19.22

8.4 RADIATED SPURIOUS EMISSIONS

MODULATION SIGNAL: CDMA850

DISTANCE: 3 meters

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitut e Level [dBm]	C.L	Pol.	Result (dBm)	Limit
1013 (824.7)	1 649.40	-34.42	9.50	-44.03	1.99	H	-36.52	-13.00
	2 474.10	-55.88	10.60	-60.09	2.47	H	-51.96	-13.00
	3 298.80	-57.75	12.30	-58.81	2.89	V	-49.40	-13.00
384 (836.5)	1 673.00	-40.79	9.65	-50.56	2.01	H	-42.92	-13.00
	2 509.50	-56.03	10.75	-59.75	2.50	V	-51.50	-13.00
	3 346.00	-58.57	12.48	-59.56	2.92	V	-50.00	-13.00
777 (848.3)	1 696.60	-31.40	9.76	-40.99	2.04	H	-33.27	-13.00
	2 544.90	-55.74	10.88	-59.03	2.52	H	-50.67	-13.00
	3 393.20	-55.44	12.65	-56.25	2.94	H	-46.54	-13.00

MODULATION SIGNAL: CDMA PCS

DISTANCE: 3 meters

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitut e Level [dBm]	C.L	Pol.	Result (dBm)	Limit
25 (1851.3)	3 702.60	-55.81	12.40	-59.88	3.08	H	-50.56	-13.00
	5 553.90	-56.38	13.13	-54.54	3.81	V	-45.22	-13.00
	7 405.20	-57.27	11.12	-47.20	4.45	V	-40.53	-13.00
600 (1880.0)	3 760.00	-53.01	12.48	-56.88	3.10	H	-47.50	-13.00
	5 640.00	-57.48	13.30	-55.31	3.85	H	-45.86	-13.00
	7 520.00	-56.66	11.30	-46.09	4.46	H	-39.25	-13.00
1175 (1908.8)	3 817.60	-51.10	12.40	-55.53	3.14	V	-46.27	-13.00
	5 726.40	-56.88	13.35	-54.06	3.88	H	-44.59	-13.00
	7 635.20	-58.06	11.63	-47.63	4.48	V	-40.48	-13.00

8.5 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)				
CDMA PCS	600	CCDF Procedure						4.33	13	Pass
CDMA850	384							4.54		

Note:

1. Plots of the EUT's Peak- to- Average Ratio are shown Page 39 ~ 40.

8.6 OCCUPIED BANDWIDTH

Band	Channel	Frequency(MHz)	Data (CDMA : MHz)
CDMA850	1013	824.7	1.2776
	384	836.5	1.2782
	777	848.3	1.2748
CDMA PCS	25	1851.3	1.2767
	600	1880.0	1.2740
	1175	1908.8	1.2889

Note:

1. Plots of the EUT's Occupied Bandwidth are shown Page 37 ~ 38.

8.7 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result	(dBm)
CDMA850	1013	2.4751	27.976	-71.399	-43.423	-13.00
	384	2.5100	27.976	-73.592	-45.616	
	777	1.6970	27.976	-73.505	-45.529	
CDMA1900	25	3.7034	27.976	-71.666	-43.690	
	600	3.7608	27.976	-71.890	-43.914	
	1175	3.8181	27.976	-70.005	-42.029	

Note:

1. Plots of the EUT's Conducted Spurious Emissions are shown Page 49 ~ 57.
2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)
3. Factor(dB) = Cable Loss + Attenuator + Power Splitter

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

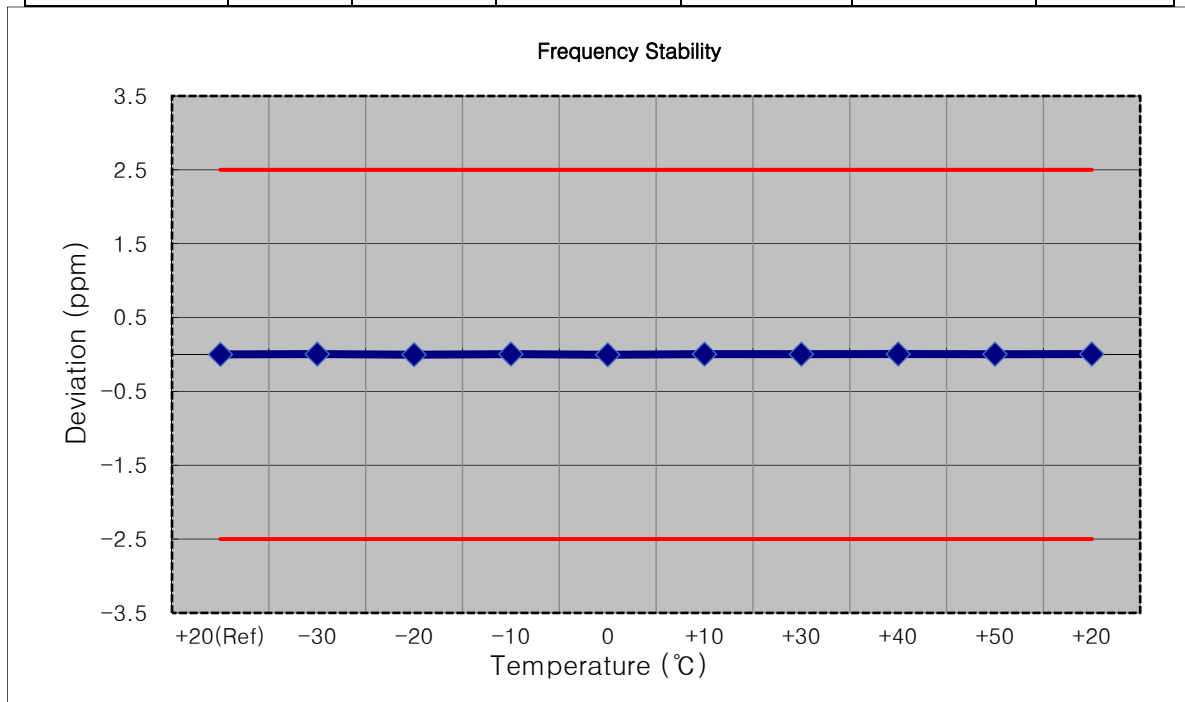
8.8 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 41 ~ 48.

8.9 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

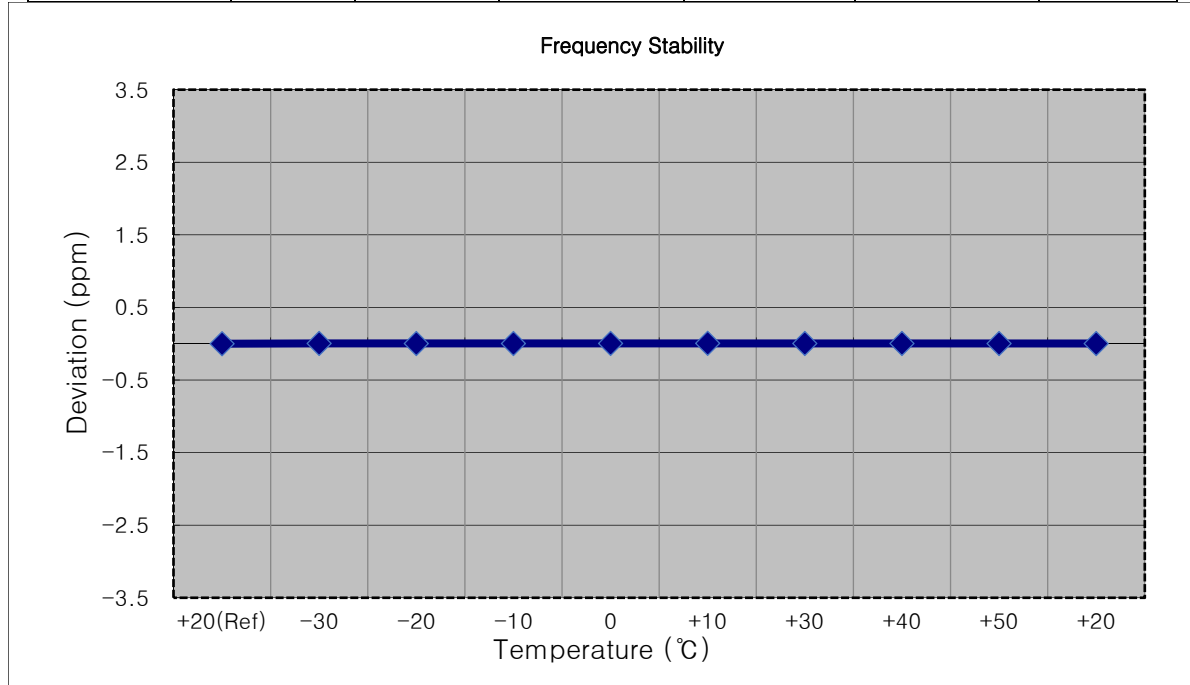
- ☐ Mode: CDMA850
- ☐ OPERATING FREQUENCY: 836,500,000 Hz
- ☐ CHANNEL: 384
- ☐ REFERENCE VOLTAGE: 12.00 VDC
- ☐ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.000	+20(Ref)	836 520 006	0.0	0.000 000	0.0000
100%		-30	836 520 010	3.6	0.000 000	0.0043
100%		-20	836 520 003	-3.3	0.000 000	-0.0040
100%		-10	836 520 009	3.4	0.000 000	0.0041
100%		0	836 520 002	-3.6	0.000 000	-0.0044
100%		+10	836 520 009	3.2	0.000 000	0.0038
100%		+30	836 520 009	2.5	0.000 000	0.0030
100%		+40	836 520 011	4.6	0.000 001	0.0055
100%		+50	836 520 008	2.2	0.000 000	0.0027
Batt. Endpoint	10.200	+20	836 520 010	3.6	0.000 000	0.0043



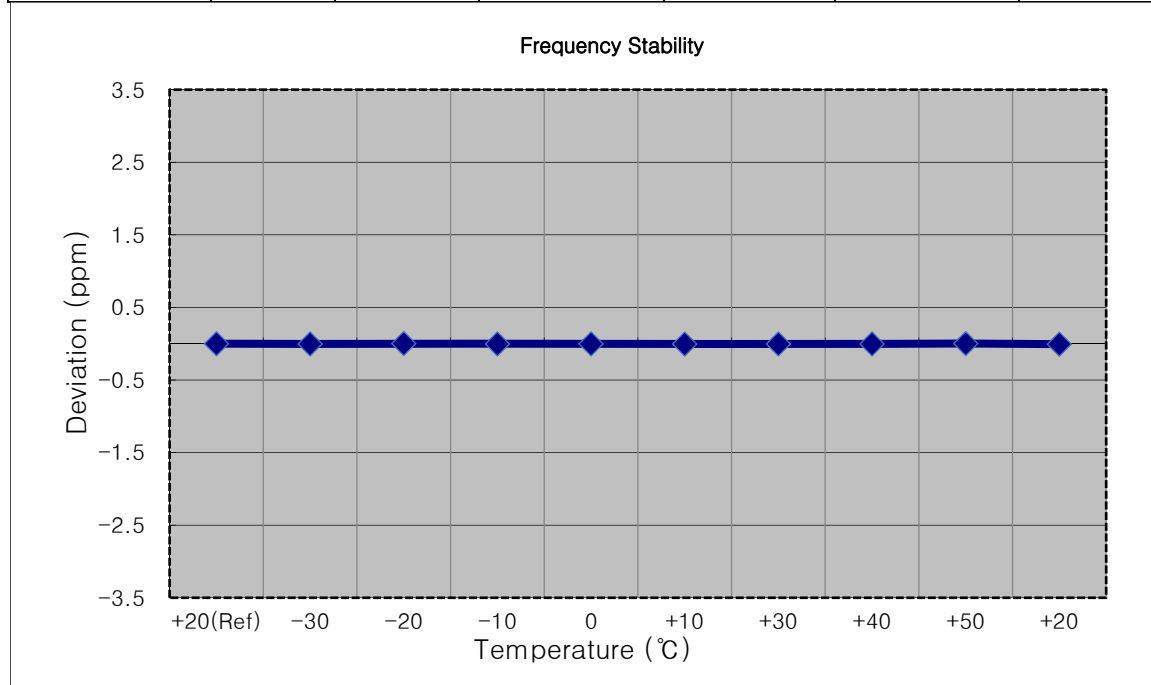
☐ Mode: CDMA PCS
☐ OPERATING FREQUENCY: 1,851,250,000 Hz
☐ CHANNEL: 25
☐ REFERENCE VOLTAGE: 12.00 VDC
☐ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.000	+20(Ref)	1851 250 007	0.0	0.000 000	0.0000
100%		-30	1851 250 014	7.8	0.000 000	0.0042
100%		-20	1851 250 012	5.6	0.000 000	0.0030
100%		-10	1851 250 012	5.0	0.000 000	0.0027
100%		0	1851 250 014	7.9	0.000 000	0.0043
100%		+10	1851 250 017	10.8	0.000 001	0.0059
100%		+30	1851 250 013	6.5	0.000 000	0.0035
100%		+40	1851 250 014	7.1	0.000 000	0.0038
100%		+50	1851 250 012	5.3	0.000 000	0.0028
Batt. Endpoint	10.200	+20	1851 250 011	4.2	0.000 000	0.0023



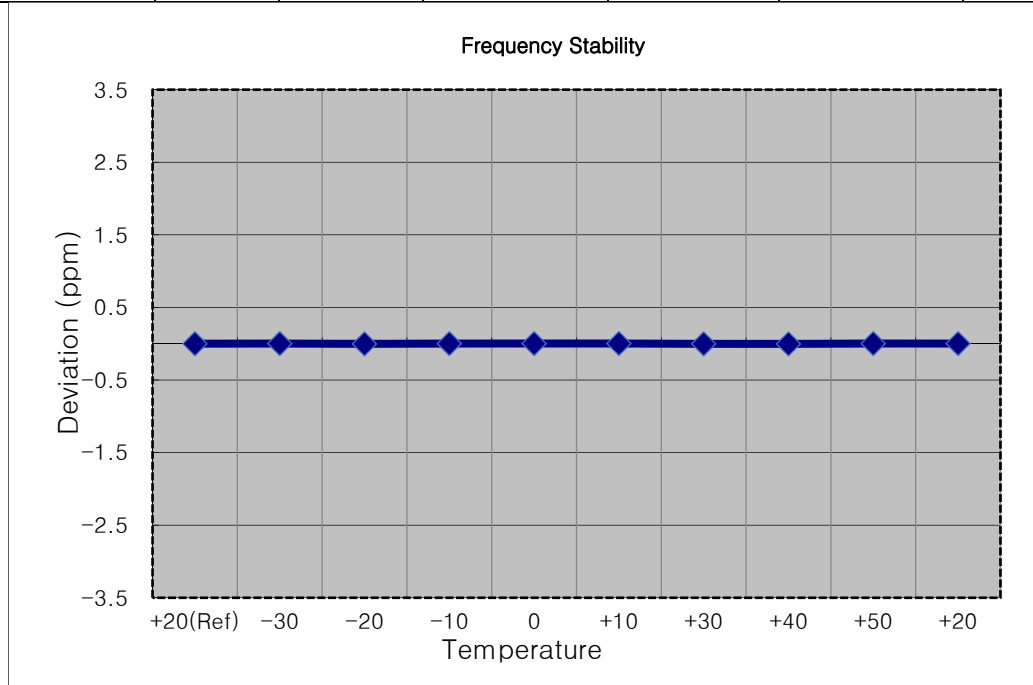
☐ Mode: CDMA PCS
☐ OPERATING FREQUENCY: 1,880,000,000 Hz
☐ CHANNEL: 600
☐ REFERENCE VOLTAGE: 12.00 VDC
☐ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.000	+20(Ref)	1879 999 993	0.0	0.000 000	0.0000
100%		-30	1879 999 987	-6.3	0.000 000	-0.0034
100%		-20	1879 999 998	5.3	0.000 000	0.0028
100%		-10	1879 999 987	-6.4	0.000 000	-0.0034
100%		0	1879 999 989	-3.9	0.000 000	-0.0021
100%		+10	1879 999 985	-7.9	0.000 000	-0.0042
100%		+30	1879 999 988	-5.4	0.000 000	-0.0029
100%		+40	1879 999 987	-5.4	0.000 000	-0.0029
100%		+50	1879 999 997	4.6	0.000 000	0.0024
Batt. Endpoint	10.200	+20	1879 999 981	-11.9	-0.000 001	-0.0063



☐ Mode: CDMA PCS
☐ OPERATING FREQUENCY: 1,908,750,000 Hz
☐ CHANNEL: 1175
☐ REFERENCE VOLTAGE: 12.00 VDC
☐ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.000	+20(Ref)	1908 750 003	0.0	0.000 000	0.0000
100%		-30	1908 750 006	3.4	0.000 000	0.0018
100%		-20	1908 749 999	-3.9	0.000 000	-0.0020
100%		-10	1908 750 007	3.8	0.000 000	0.0020
100%		0	1908 750 008	4.6	0.000 000	0.0024
100%		+10	1908 750 009	5.8	0.000 000	0.0030
100%		+30	1908 749 999	-3.7	0.000 000	-0.0019
100%		+40	1908 749 999	-4.3	0.000 000	-0.0023
100%		+50	1908 750 007	4.2	0.000 000	0.0022
Batt. Endpoint	10.200	+20	1908 750 007	3.8	0.000 000	0.0020



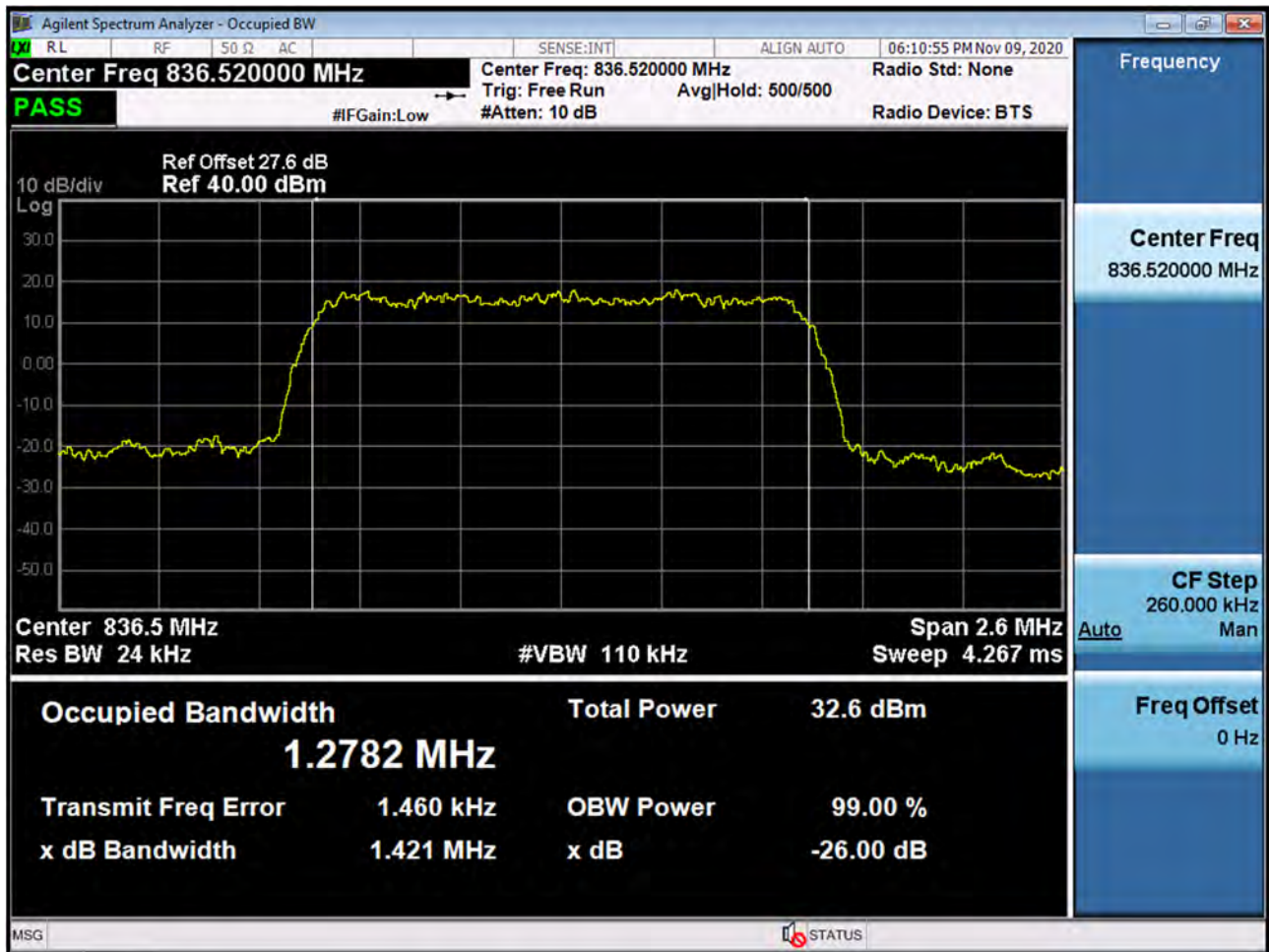


9. TEST PLOTS

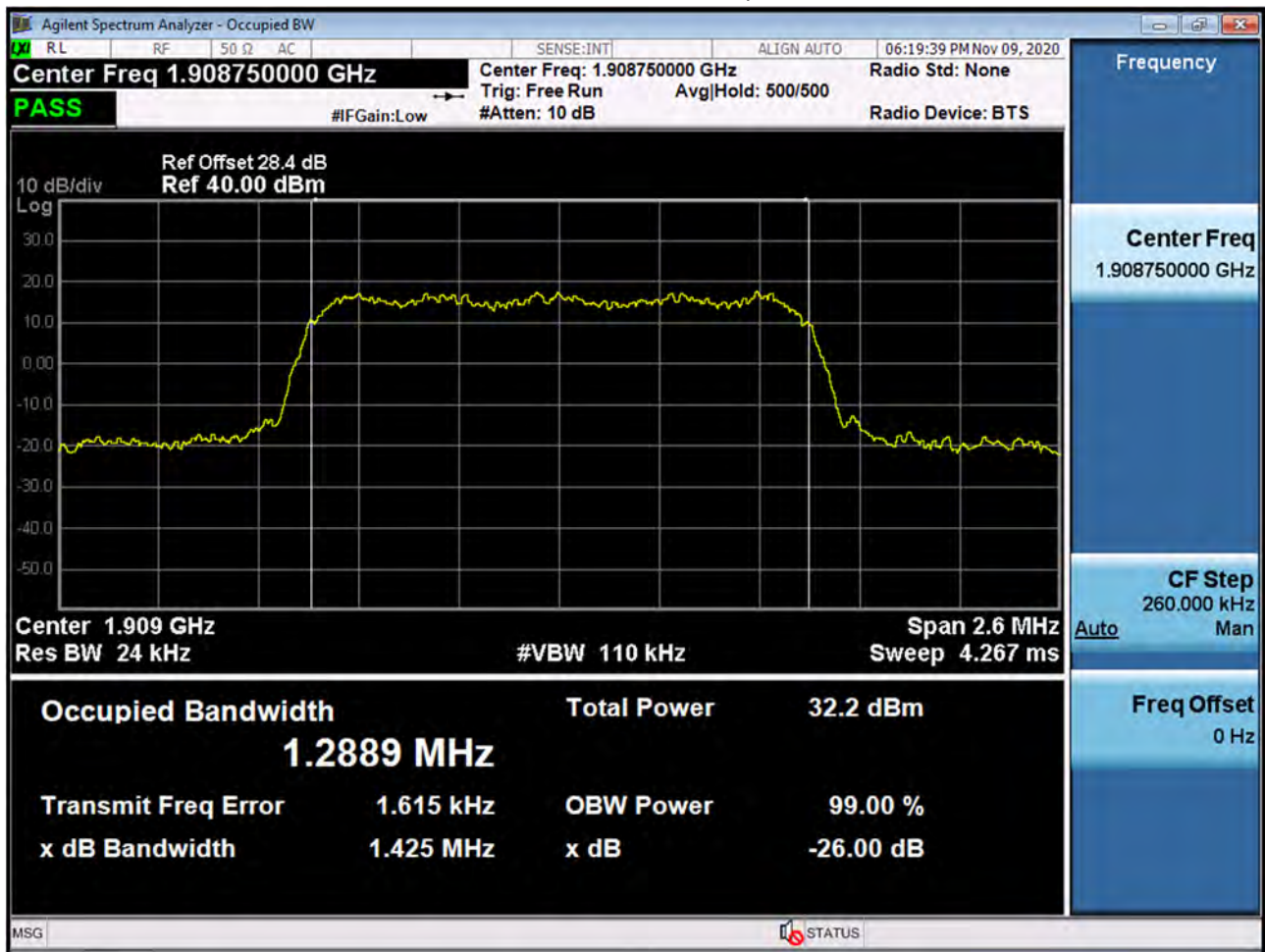
고객비밀
CUSTOMER SECRET

Report No. HCT-RF-2011-FC022

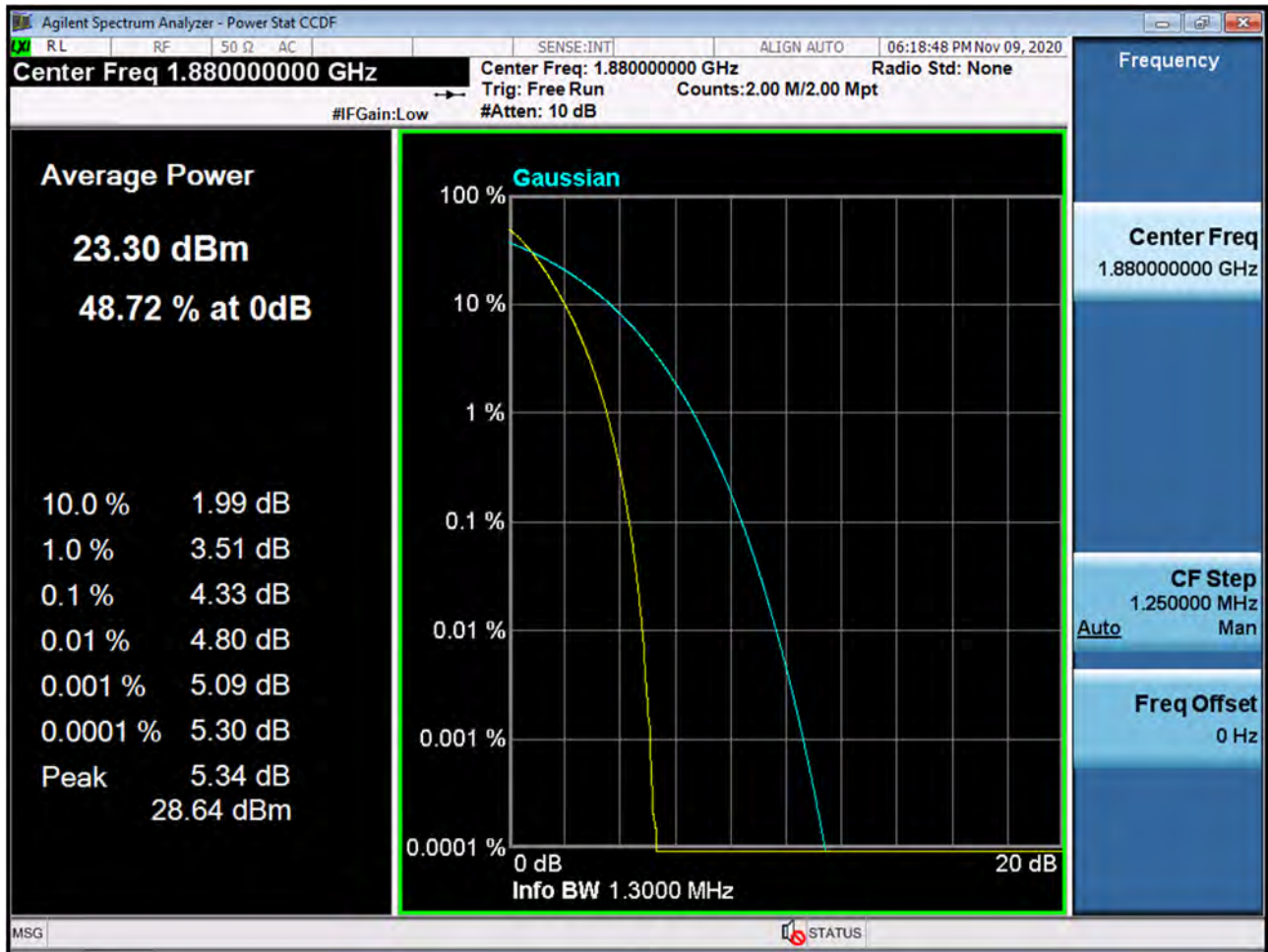
■ CDMA850_BC0 MODE (384 CH.) Occupied Bandwidth



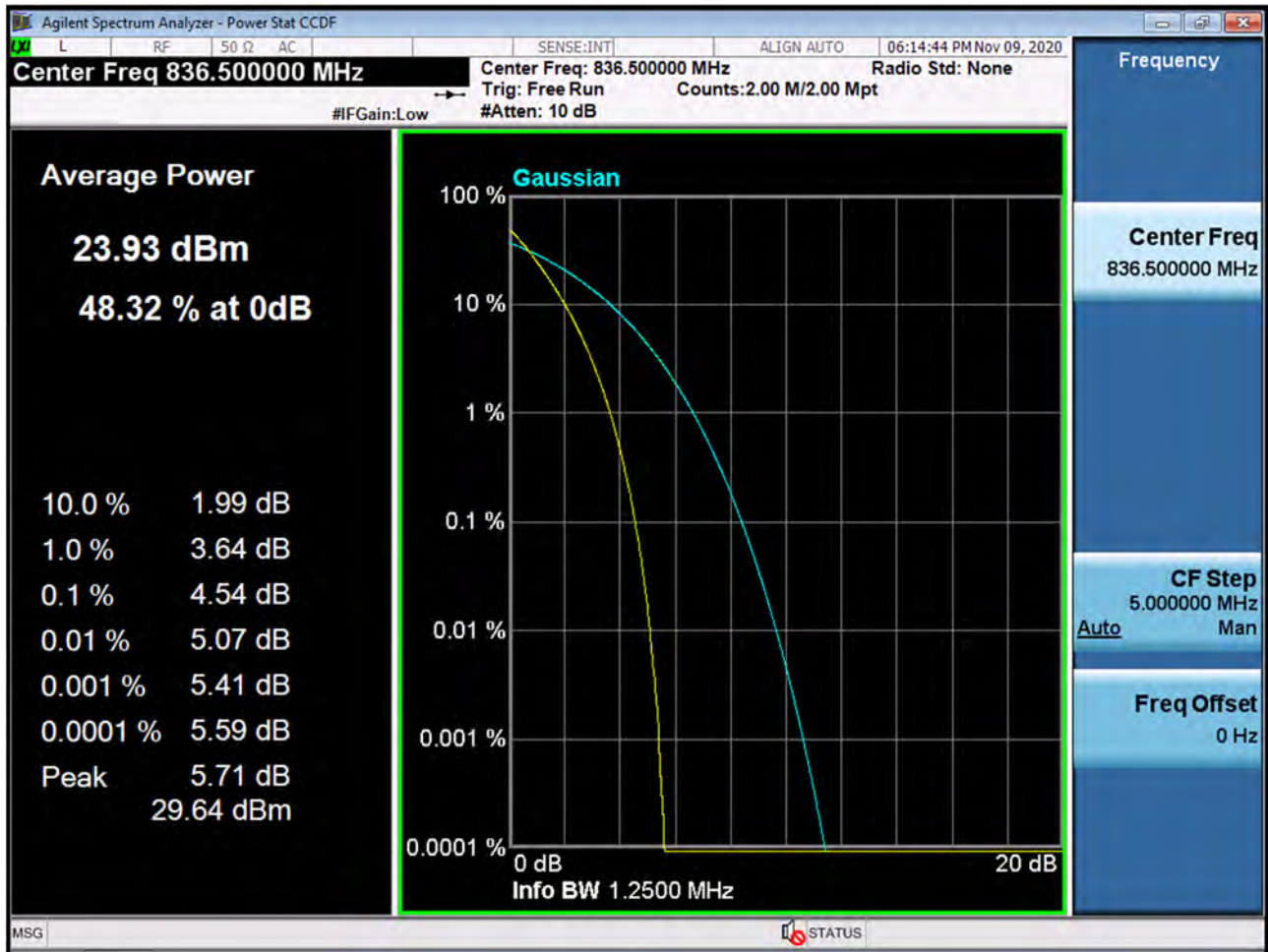
■ PCS CDMA MODE (1175 CH.) Occupied Bandwidth



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



■ CDMA850 MODE (384 CH.) Peak-to-Average Ratio



■ CDMA850 MODE (1013 CH.) Block Edge



CDMA850 MODE (1013 CH.) 4 MHz Span



■ CDMA850 MODE (777 CH.) Block Edge



■ CDMA850 MODE (777 CH.) 4 MHz Span



■ CDMA PCS MODE (25 CH.) Block Edge pan



■ CDMA PCS MODE (25 CH.) 4 MHz Span



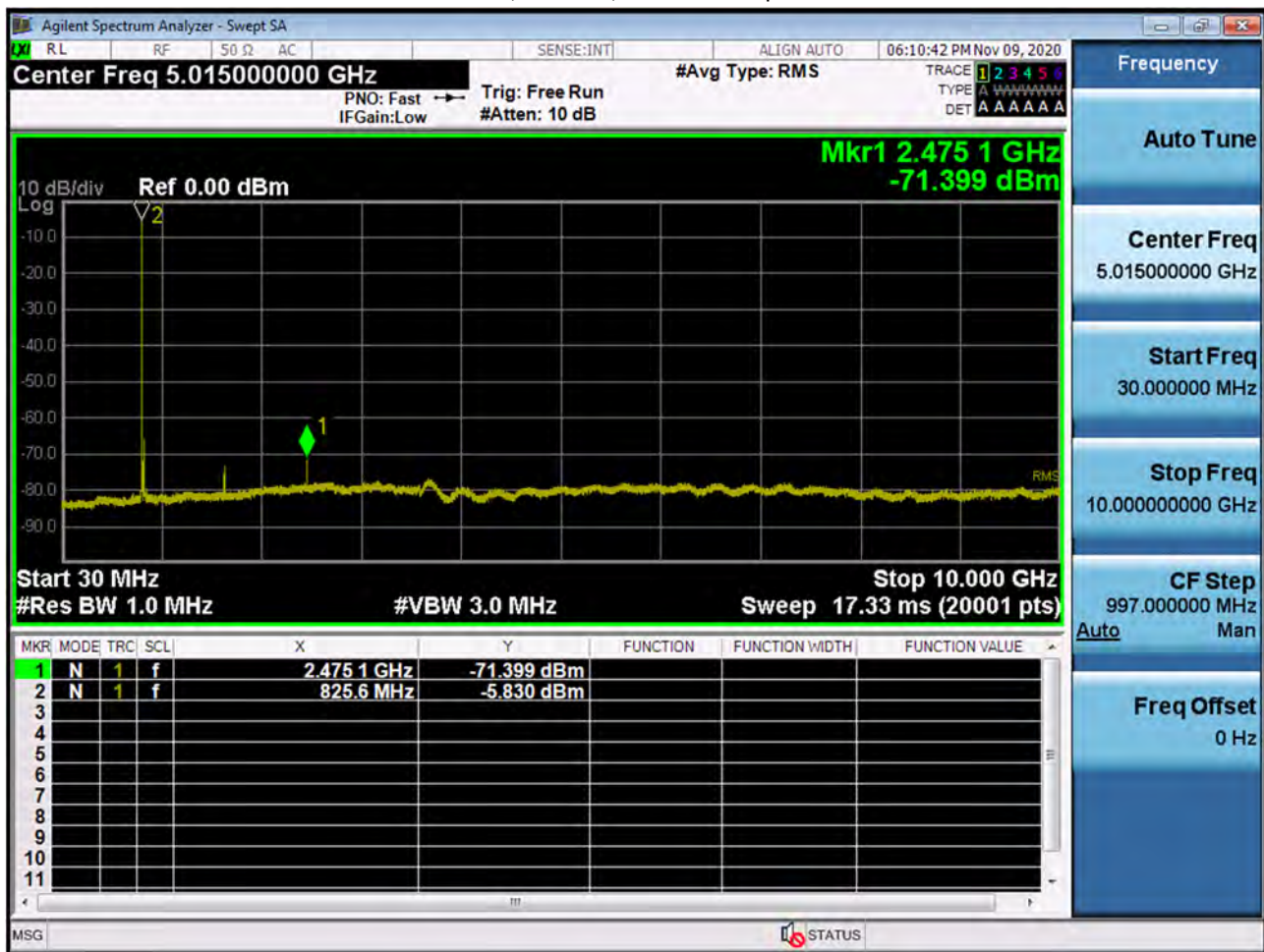
■ CDMA PCS MODE (1175 CH.) Block Edge



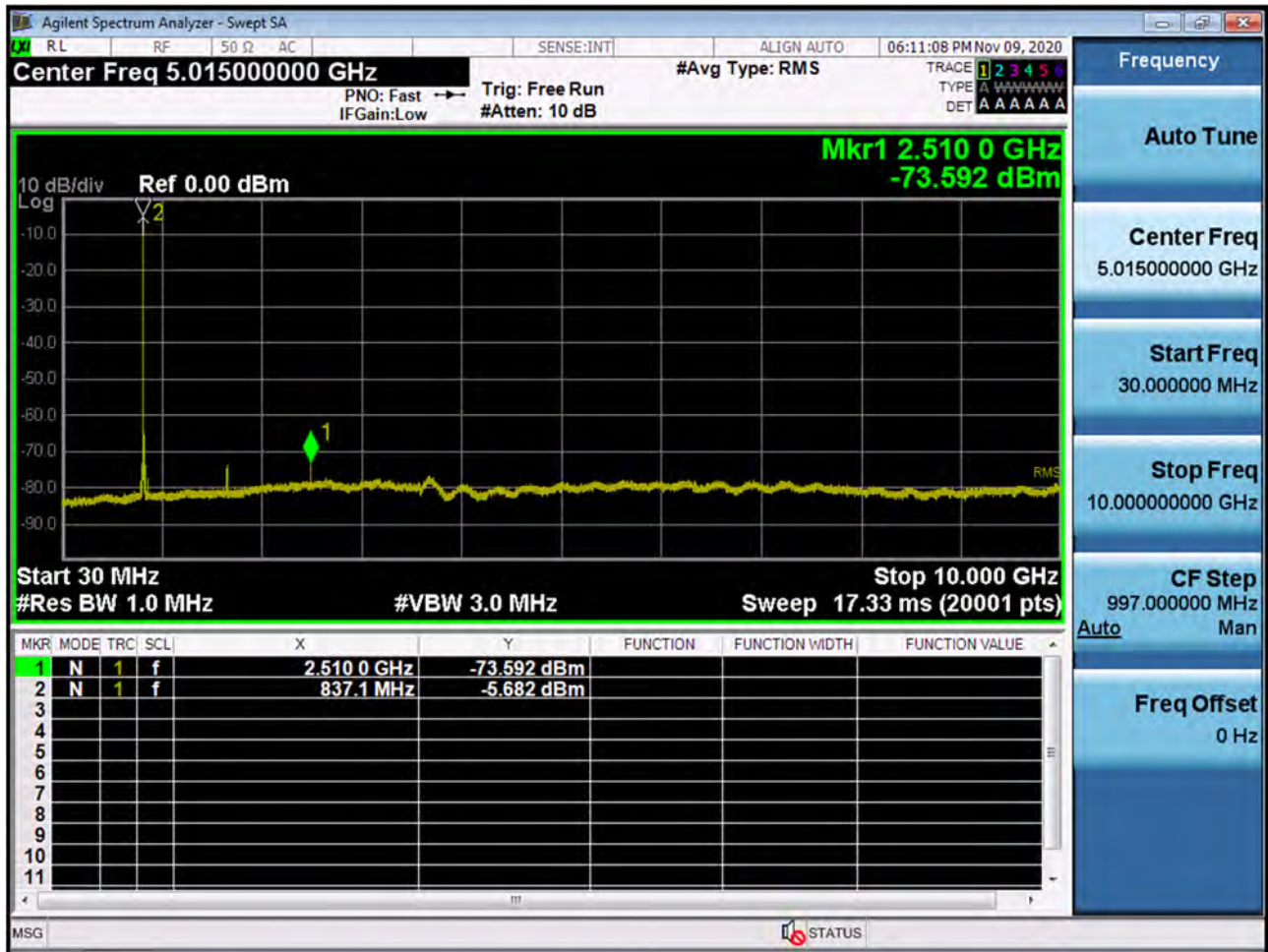
■ CDMA PCS MODE (1175 CH.) 4 MHz Span



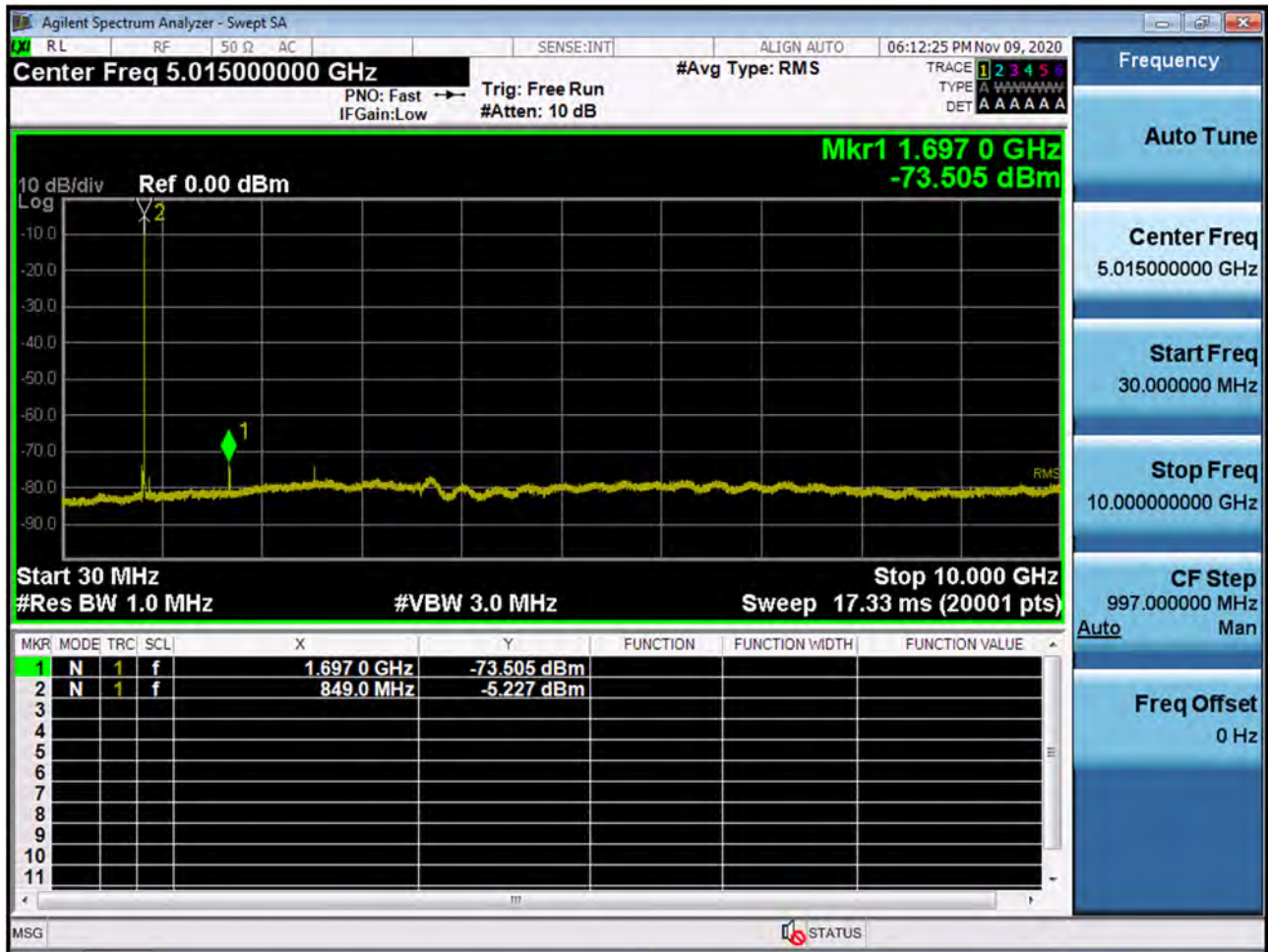
■ CDMA850 MODE (1013 CH.) Conducted Spurious Emissions1



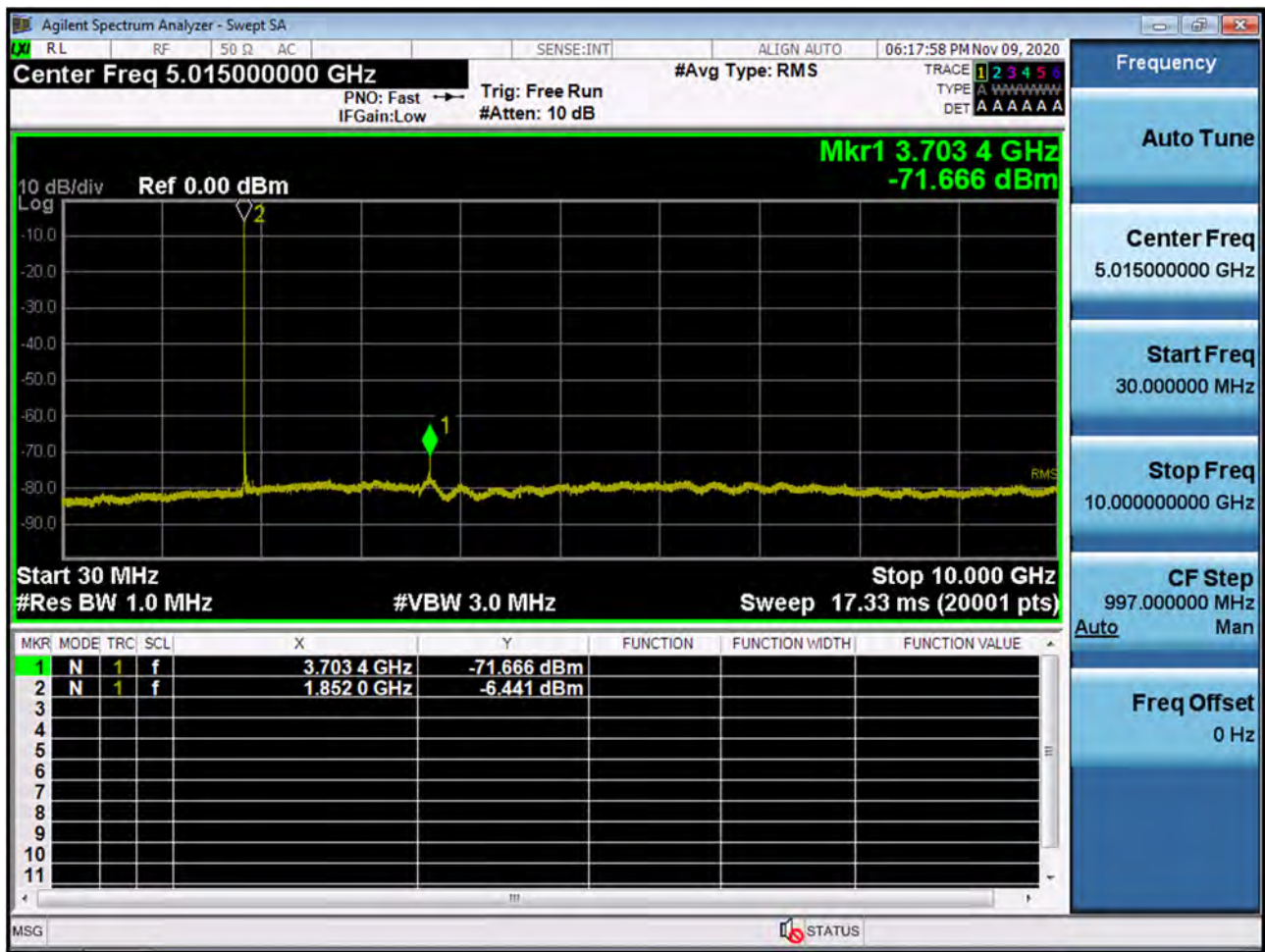
■ CDMA850 MODE (384 CH.) Conducted Spurious Emissions1



■ CDMA850 MODE (777 CH.) Conducted Spurious Emissions1



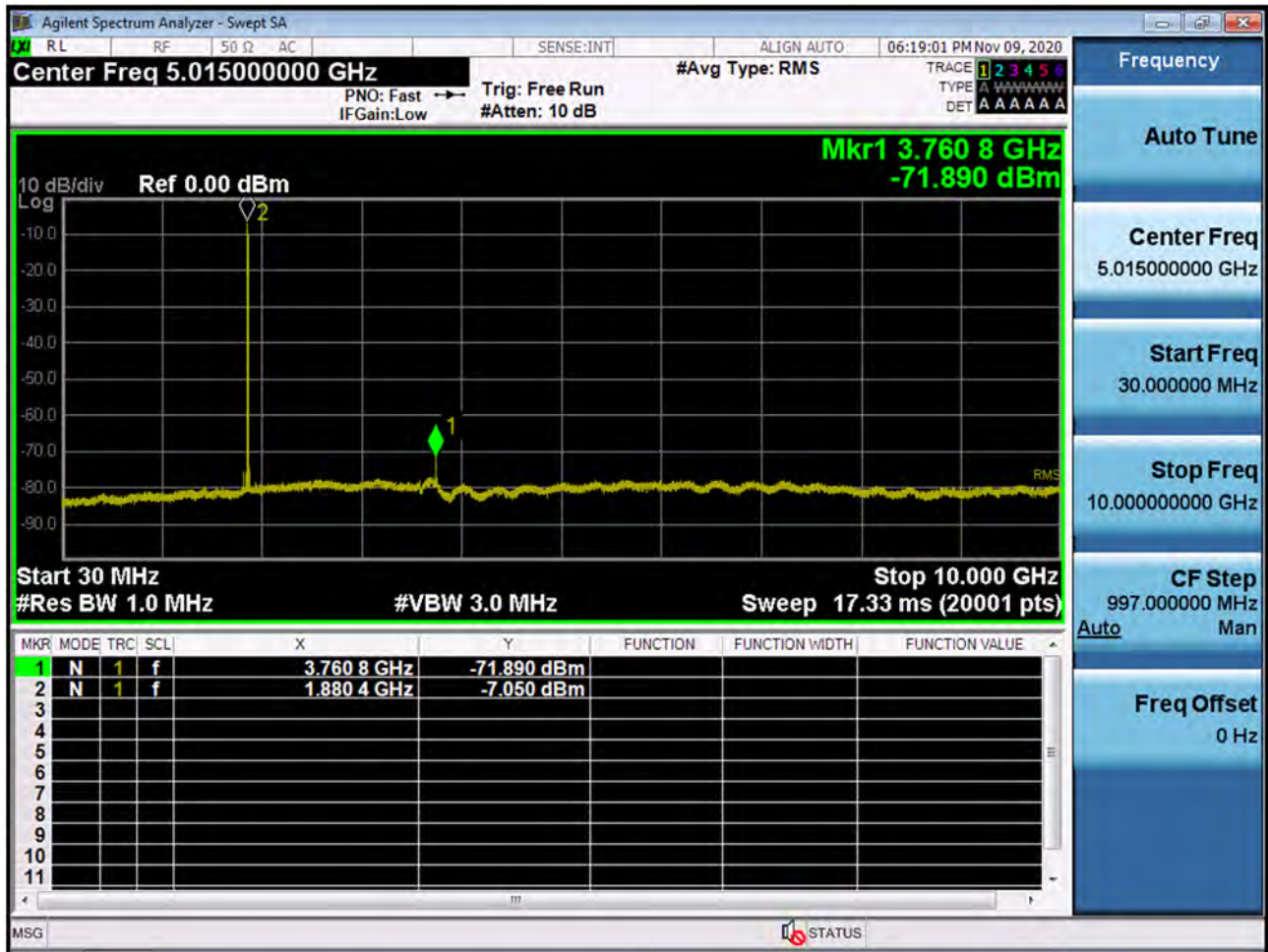
■ CDMA PCS MODE (25 CH.) Conducted Spurious Emissions1



■ CDMA PCS MODE (25 CH.) Conducted Spurious Emissions2



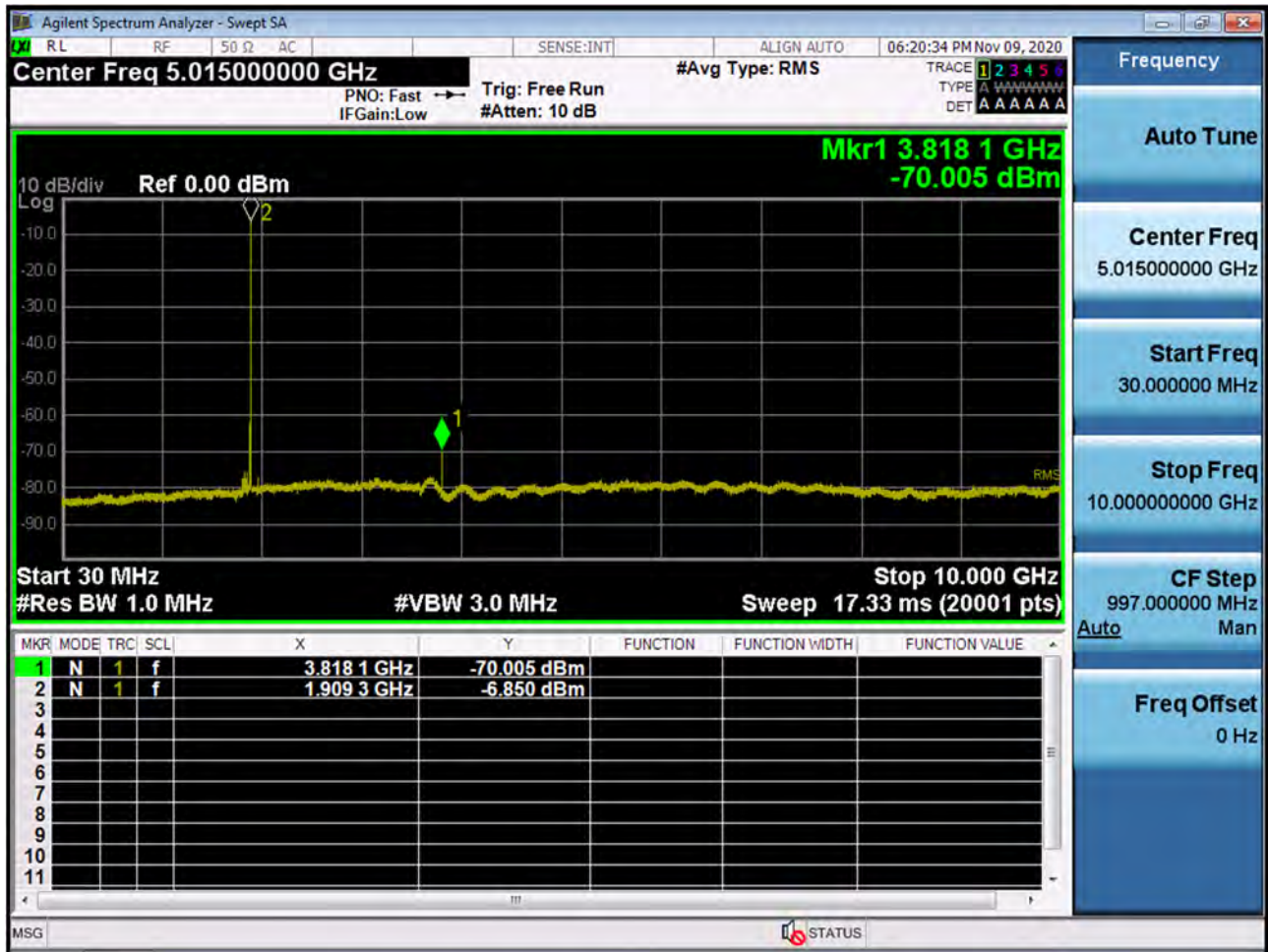
■ CDMA PCS MODE (600 CH.) Conducted Spurious Emissions1



■ CDMA PCS MODE (600 CH.) Conducted Spurious Emissions2



■ CDMA PCS MODE (1175 CH.) Conducted Spurious Emissions1



■ CDMA PCS MODE (1175 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-2011-FC022-P