PCTEST ENGINEERING LABORATORY, INC.
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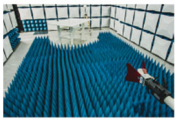

MEASUREMENT REPORT
CBSD-SAS Interoperability

Applicant Name:
Samsung Electronics Co. Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
10/18/2018 – 11/29/2018
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1811300217-R1.A3L

FCC ID:	**A3LSOL230-48D**
APPLICANT:	**Samsung Electronics Co. Ltd.**

Application Type:	Certification
Model:	SOL230-48D
EUT Type:	LTE Small Cell
Frequency Range:	3550 – 3700 MHz
FCC Classification:	Citizens Band Category A and B Devices (CBD)
FCC Rule Part(s):	Part 96
Test Procedure(s):	KDB 940660 D01 v01, WINNF-TS-0122-V1.0.0, CBRSA-TS-9001 V.1.0.0

This revised Test Report (S/N: 1M1811300217-R1.A3L) supersedes and replaces the previously issued test report (S/N: 1M1811300217.A3L) on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in the test procedures listed above. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

Authorized Test Lab

ACCREDITED
TESTING CERT#2041.01

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of compliance with the technical rules and regulations of the Federal Communications Commission.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is a CBRS Alliance (OnGo) Approved Test Lab
- PCTEST is a WInnForum Approved Test Lab
- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for CBRS Alliance Certification Test Plan and WInnForum Conformance and Performance Test Technical Standard.
- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung LTE Small Cell FCC ID: A3LSOL230-48D.** The test data contained in this report pertains only to CBSD-SAS interoperability. The EUT is not a Domain Proxy.

Test Device Serial No.: SLS-BP00SV02CH

2.2 Device Capabilities

This device contains the following capabilities:

LTE B48 4 x 4 MIMO Small Cell, Wi-Fi

2.3 Test Configuration

The EUT was connected to the SAS Test Harness developed by WINNF WG4-CBSD. The latest version of the SAS Test Harness (V1.0.0.2) was downloaded from the Github link provided by CBRS Alliance. The SAS Test Harness is synchronized to UTC time.

See Sections 3 of this test report for further information.

2.4 Modifications

No modifications were made to EUT during testing.

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3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedure described in KDB 940660 D01 v01, WINNF-TS-0122-V1.0.0, CBRSA-TS-9001 was used in the measurement of the EUT.

Deviation from measurement procedure…….....None

3.2 SAS Test Setup

The UUT (CBSD/DP) has been tested per the guidance of KDB 940660 D01 Part 96 CBRS Eqpt v01 and WINNF-TS-0122 V1.0.0. The SAS Test Harness developed by WINNF WG4-CBSD, downloaded from the Github link provided by CBRS Alliance is used for test setup.

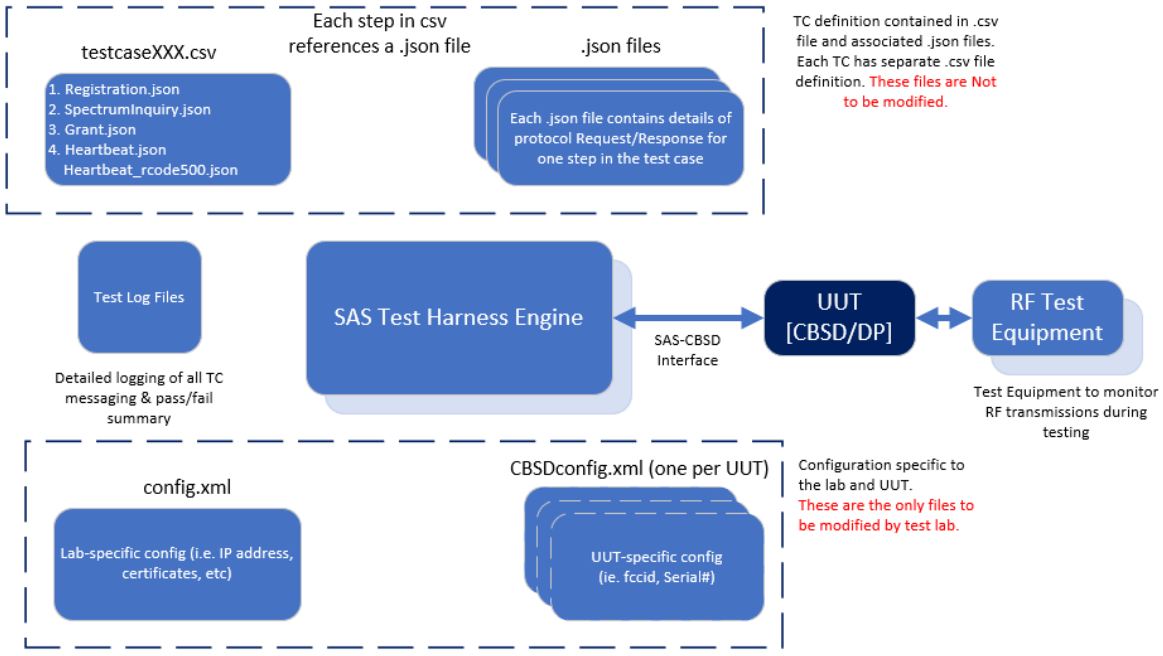

Figure 3-1 SAS Test Harness Setup

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3.3 RF Test Equipment Setup

Many test cases require RF Test Equipment to monitor the RF transmission output of the CBSD based on SAS commands and interactions. The RF Test Equipment used is a Keysight Spectrum analyzer (e.g. MXA, PXA) calibrated by an ISO 17025 accredited calibration laboratory. Based on UUT (either CBSD for DP), the RF test equipment shall be setup according to the following diagram.

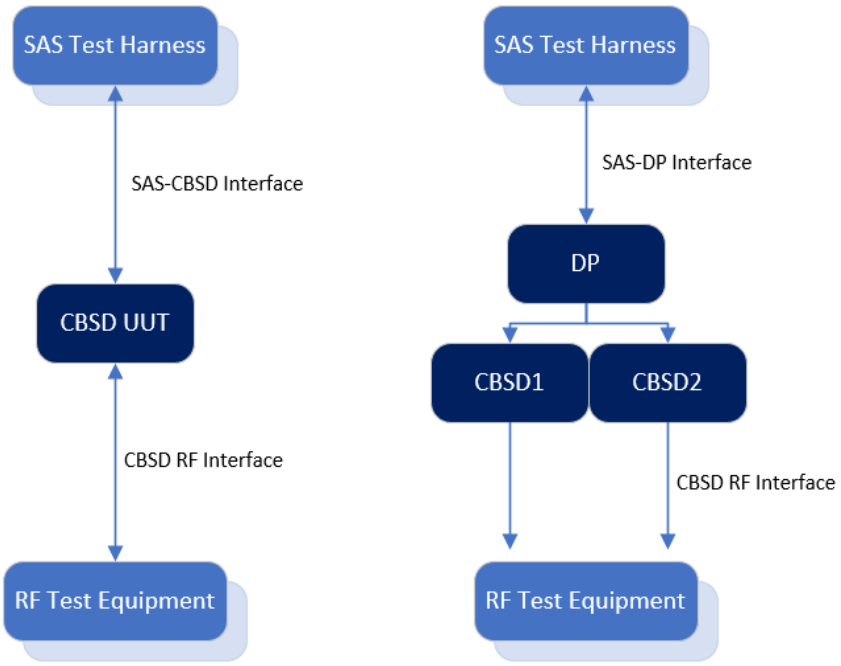

Figure 3-2 RF Test Equipment Setup

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3.4 General Test Procedure

These test procedures are generally used for all/most test cases to begin testing.

1. Generate PKI certificates/keys and store inside the “certificates” folder.
2. Modify conf.xml per the appropriate test computer settings (IP address, etc).
3. Modify cbsdc1.xml to include s/n of CBSD UUT.
4. Run python file “StartOfProject.py” for all test cases except WINNF.PT.C.HBT.1. (For WINNF.PT.C.HBT.1, use “StartPowMeas.py”)
5. The following test flow shall be followed:

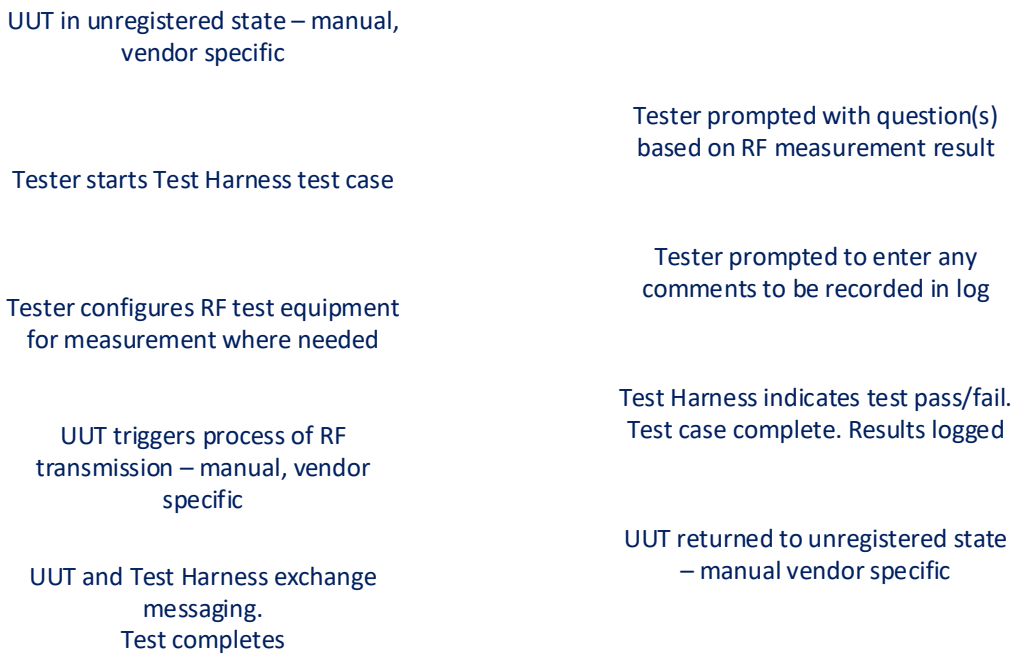

Figure 3-3 General Test Process

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3.5 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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4.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	N9038A	MXE EMI Receiver	6/11/2018	Annual	6/11/2019	MY51210133
Dell	Latitude 5580	Test Harness Laptop	N/A	N/A	N/A	N/A
Bird	25-A-MFN-20	20dB Attenuator	N/A	N/A	N/A	505
Samsung	VZW	UE Handset	N/A	N/A	N/A	108250

Table 4-1. Annual Test Equipment Calibration Schedule

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5.0 TEST SUMMARY

5.1 Summary

Company Name: Samsung Electronics Co. Ltd.

FCC ID: A3LSOL230-48D

FCC Part Section(s)	KDB940660 D01 Section 3.3 a)	Test Case Description	WInnForum Test Case	Test Result
96.39 (c)	1	Confirm that the device will only transmit after it receives authorization from a SAS	WINNF.FT.C.REG.1 WINNF.FT.C.REG.8 WINNF.FT.C.REG.10 WINNF.FT.C.REG.12 WINNF.FT.C.REG.14 WINNF.FT.C.REG.16 WINNF.FT.C.REG.18 WINNF.FT.C.GRA.1 WINNF.FT.C.GRA.2	Pass
96.39 (c)	2	Check the device registration and authorization with the SAS – determine if the device behaves appropriately for successful and unsuccessful registrations. The device should not be transmitting without authorization from the SAS.	WINNF.FT.C.REG.1 WINNF.FT.C.REG.8 WINNF.FT.C.REG.10 WINNF.FT.C.REG.12 WINNF.FT.C.REG.14 WINNF.FT.C.REG.16 WINNF.FT.C.REG.18	Pass
96.39(c)(1)	3	Confirm that the device changes its operating power and/or channel in response to a command from the SAS.	WINNF.FT.C.HBT.1	Pass
96.39	4	Confirm that the device correctly configures based on the different license classes	N/A	
96.39(c)(1)	5	Confirm that the device transmits at a power level less than or equal to the maximum power level approved by the SAS.	WINNF.PT.C.HBT	Pass
96.39(b)(c)	6	Confirm that the device transmits with a bandwidth less than or equal to the SAS specified bandwidth.	WINNF.FT.C.HBT.1	Pass
96.39(c)(2)	7	Confirm that the device transmits on the SAS specified frequency.	WINNF.FT.C.HBT.1	Pass
96.39(c)(2)	8	Confirm that the device stops transmission in response to a command from the SAS, within a period as required by Part 96.	WINNF.FT.C.HBT.3 WINNF.FT.C.HBT.4 WINNF.FT.C.HBT.5 WINNF.FT.C.HBT.6 WINNF.FT.C.HBT.7 WINNF.FT.C.HBT.10 WINNF.FT.C.RLQ.1 WINNF.FT.C.DRG.1	Pass
96.39 (c)	9	Confirm that the device sends measurements data in response to the command from the SAS.	WINNF.FT.C.MES.1	Pass
96.39(a)	10	For devices with geo-location, confirm that it notifies the SAS of a new location when it is beyond the required distance parameter (±50 m) within the required time frame.	N/A	

Table 5-1. Summary of Test Results

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96.39 (c)	11	Confirm that the device is capable of reporting the signal level (measurement data) and frequency to SAS.	WINNF.FT.C.MES.1	Pass
96.43, 96.45	12	For a device that operates as a Category A CBSD and then desires to operate as a Category B CBSD (or vice versa), confirm that it re-registers with the SAS for the updated authorization status.	N/A	
96 E	13	When CBSDs communicate through a management system, confirm compliance with all requirements.	N/A	
96.39	14	When communication between the CBSD and SAS is lost: i) Describe how the CBSD would react if the communications between the device and the SAS is lost. Confirm that the CBSD stops transmission once it loses the link to the SAS. ii) Describe the process for re-establishment of the communications and confirm that the CBSD acts accordingly. iii) Confirm power-on restart process for registration (re-registration) occurs as expected. iv) Confirm the process for de-registration occurs as expected	WINNF.FT.C.HBT.9 WINNF.FT.C.HBT.10	Pass
96.39(f)	KDB940660 D01 Section 4	SAS and Device Security Requirements	WINNF.FT.C.SCS.1 WINNF.FT.C.SCS.2 WINNF.FT.C.SCS.3 WINNF.FT.C.SCS.4 WINNF.FT.C.SCS.5	Pass

Table 5-2. Summary of Test Results (continued)

Notes:

- Test cases denoted as “N/A” in the table above are not applicable to the EUT and are either Optional or Conditional per Section 6 of WINNF-TS-0122.
- Please see Appendix for test data.

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6.0 UUT RF TRANSMIT POWER MEASUREMENT SUMMARY

Testing is performed per KDB 971168 D01 and test case WINNF.PT.C.HBT of WINNF-TS-0122-V1.0.0 across the transmit dynamic range of 26dBm/MHz to 16dBm/MHz for both 20MHz and 10MHz Bandwidths. Per manufacturer, Tx1 and Tx2 produce correlated signals per KDB 662911 D01. The PSD of each transmitter was measured and summed in linear term. Then the antenna gain was added to yield the maxEIRP.

Frequency [MHz]	Bandwidth [MHz]	SAS Granted maxEIRP [dBm/MHz]	Tx1 Conducted PSD [dBm/MHz]	Tx2 Conducted PSD [dBm/MHz]	Omni Antenna Gain (Correlated Chains) [dBi]	maxEIRP [dBm/MHz]	Margin [dB]
3625	10	26	14.64	13.97	6.01	23.34	-2.66
3625	10	20	8.62	8.97	6.01	17.82	-2.18
3625	10	16	7.26	3.86	6.01	14.91	-1.09
3620	20	26	14.42	14.06	6.01	23.26	-2.74
3620	20	20	8.99	8.42	6.01	17.73	-2.27
3620	20	16	4.85	4.62	6.01	13.76	-2.24
3560 (low)	10	16	7.02	3.70	6.01	14.69	-1.31
3690 (High)	10	16	6.94	3.79	6.01	14.66	-1.34

Table 6-1 RF Output Power Measurements for Omni Antenna (WINNF.PT.C.HBT)

Frequency [MHz]	Bandwidth [MHz]	SAS Granted maxEIRP [dBm/MHz]	Tx1 Conducted PSD [dBm/MHz]	Tx2 Conducted PSD [dBm/MHz]	Directional Antenna Gain (Correlated Chains) [dBi]	maxEIRP [dBm/MHz]	Margin [dB]
3625	10	26	12.96	12.85	10.01	25.93	-0.07
3625	10	20	5.79	6.35	10.01	19.10	-0.90
3625	10	16	2.03	2.67	10.01	15.38	-0.62
3620	20	26	12.82	12.94	10.01	25.90	-0.10
3620	20	20	5.88	6.41	10.01	19.17	-0.83
3620	20	16	3.24	2.46	10.01	15.89	-0.11
3560 (low)	10	26	12.50	12.63	10.01	25.59	-0.41
3690 (High)	10	26	12.12	12.74	10.01	25.46	-0.54

Table 6-2 RF Output Power Measurements for Directional Antenna (WINNF.PT.C.HBT)

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7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung LTE Small Cell FCC ID: A3LSOL230-48D** has been tested to show compliance with Part 96 and KDB 940660 D01 v01.

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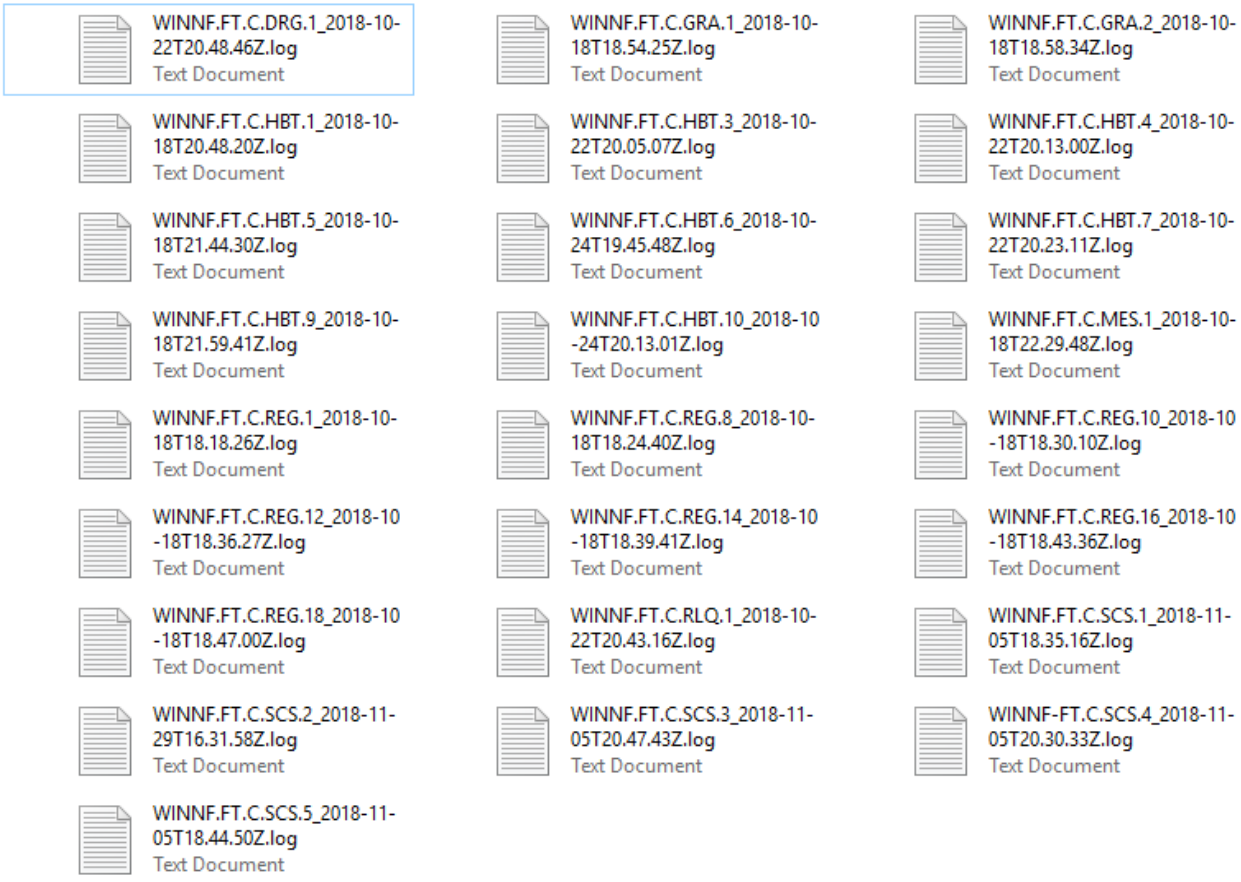
APPENDIX A – TEST DATA: LOGS AND PLOTS



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