Qualification Report

OpenCellular - Connect-1
System DVT

Revision: 1.1

[13-FEB-2017]

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1. Purpose

The purpose of this document is to capture test data for Connect-1 system DVT as part of OpenCellular Base Transceiver Station (BTS). The document is intended to provide a formal report of measured and validated parameters to qualify Connect-1 system as part of design validation testing to ensure consistent and reliable operation across all supported operating and environmental conditions.

2. Scope

Perform DVT of Connect-1 GSM BTS, version-life 2 for system test cases. GSM 900 and GSM1900 bands are identified for DVT.

3. Device-Under-Test (DUT) Details

a. System : OpenCellular Connect -1
b. Sub-system : System
c. Hardware version : Life – 1 & Life -2
d. Software version : To be updated
    a. Openbsc: 5085e0b
    b. Osmo-trx: 2e5e2c5
    c. Uhd: f70dd85
e. Sample Count : 01

4. Qualification Test Condition

Ambient Temperature - 25˚C

5. Qualification Result Summary

Board / System	Test ID	Function	Test cases/specification	Status
System	Sys Clock 1.1	CLOCK	Frequency accuracy (TX EVM)	Fail
System	Sys Clock 1.2	CLOCK	Lock detect	Pass
System	Sys Ctrl 1.1	SYSTEM CONTROLS	LDO enables	Pass
System	Sys Ctrl 1.2	SYSTEM CONTROLS	Power amplifier enables	Pass
System	Sys Ctrl 1.3	SYSTEM CONTROLS	Regulator enables	Pass
System	Sys Ctrl 1.4	SYSTEM CONTROLS	Switch controls and enabling 4 bands and 2 chains both on TX and RX side	Pass
System	Sys Ctrl 1.5	SYSTEM CONTROLS	Reset sequencing	Pass
System	Sys Ctrl 1.6	SYSTEM CONTROLS	System Alarms	Pass
System	Sys Ctrl 1.7	SYSTEM CONTROLS	LED status	Pass
System	Sys Pwr 1.1	SYSTEM POWER	Total Power consumption	Pass
System	Sys Pwr 1.2	System POWER	Power sequencing	Pass
System	Sys Pwr 1.3	System POWER	Cold start with POE++ / Solar / Battery (internal/External)	Pass
System	Sys Pwr 1.4	System POWER	Testing with POE++	Pass
System	Sys Pwr 1.5	System POWER	Testing with Solar	Pass
System	Sys Pwr 1.6	System POWER	Testing with Battery - Internal	Pass
System	Sys Pwr 1.7	System POWER	Testing with Battery - External	Pass
System	Sys Pwr 1.8	System POWER	Testing with DC source	Pass
System	Sys Tx 1.2	System RF Tx	Mean transmitted RF carrier power	Pass
System	Sys Tx 1.7	System RF Tx	Intermodulation attenuation	Fail
System	Sys GPS 1.1	System RF GPS	Sync module - GPS lock	Pass
System	Sys GPS 1.2	System RF GPS	Sync module - GPS/ GSM Coex	Open

NOTE: System RF Tx (Sys Tx 1.2, Sys Tx 1.7, Sys Tx 1.1, Sys Tx 1.3, Sys Tx 1.4, Sys Tx 1.5, Sys Tx 1.6, Sys Tx 1.7),
System RF Rx (Sys Rx 1.1, Sys Rx 1.1,Sys Rx 1.2,Sys Rx 1.3,Sys Rx 1.4,Sys Rx 1.5,Sys Rx 1.6,Sys Rx 1.7,Sys Rx 1.8,Sys Rx 1.9,Sys Rx 1.10,Sys Rx 1.11,Sys Rx 1.12,Sys Rx 1.13,Sys Rx 1.14) and
System Compliance (Sys Comp 1.1, Sys Comp 2.1, Sys Comp 3.1, Sys Comp 3.2, Sys Comp 3.3, Sys Comp 3.4, Sys Comp 3.5, Sys Comp 4.1, Sys Comp 4.2, Sys Comp 4.3, Sys Comp 4.4, Sys Comp 4.5, Sys Comp 5.1) tests are moved to Rev C release

9.1 System Clock

9.1.1 Test ID

Sys Clock 1.1

9.1.2 Purpose

The purpose of this test case is to check system clock PLL performance

9.1.3 Test and Measurement Method

Refer to section 3 of OpenCellular - Connect-1 System Test Specification document

9.1.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.1.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.1.6 Test Results

Lock Status

Test Condition	PASS / FAIL
GPS lock detect	PASS
Clock PLL detect	PASS

GMSK Modulation accuracy

		ARFCN	Middle Channel			Test Result PASS / FAIL
			Frequency (MHz)	RMS phase error (deg)	Margin	
Specification				< 5 deg	deg	
Chain 1	GSM 900	35	942	0.8	4.2	PASS
	GSM 1800	696	1842	0.5	4.5	PASS
Chain 2	GSM 900	35	942	0.9	4.1	PASS
	GSM 1800	696	1842	0.7	4.3	PASS

		ARFCN	Middle Channel			Test Result PASS / FAIL
			Frequency (MHz)	Peak phase error (deg)	Margin	
Specification				< 20deg	deg	
Chain 1	GSM 900	35	942	2.3	17.7	PASS
	GSM 1800	696	1842	1.8	18.2	PASS
Chain 2	GSM 900	35	942	2.3	17.7	PASS
	GSM 1800	696	1842	2.1	17.9	PASS

		ARFCN	Middle Channel			Test Result PASS / FAIL
			Frequency (MHz)	Mean frequency error (Hz)	Margin	
Specification				GSM900 < 50Hz, GSM1800 < 90Hz	Hz	
Chain 1	GSM 900	35	942	2	48	PASS
	GSM 1800	696	1842	2	88	PASS
Chain 2	GSM 900	35	942	1.6	48.4	PASS
	GSM 1800	696	1842	1	49	PASS

		ARFCN	Middle Channel					Test Result PASS / FAIL
			Frequency (MHz)	RMS phase error (deg)	Peak phase error (deg)	Mean frequency error (Hz)	Mean frequency error (ppm)	
Specification				< 5 deg	< 20 deg	GSM900 < 50Hz, GSM1800 < 90Hz	< 0.05 ppm	
Chain 1	GSM 900	35	942	0.8	2.3	2	2.123E-09	PASS
	GSM 1800	696	1842	0.5	1.8	2	1.086E-09	PASS
Chain 2	GSM 900	35	942	0.9	2.3	1.57	1.667E-09	PASS
	GSM 1800	696	1842	0.7	2.12	1	5.429E-10	PASS

9.2 System Controls - 1.1, 1.2, 1.3, 1.4

9.2.1 Test ID

Sys Ctrl 1.1, 1.2, 1.3, 1.4

9.2.2 Purpose

The purpose of this test is to validate the response of System control functions. This test covers the following test ID

Test ID	Subsystem	Test case
Sys Ctrl 1.1	SYSTEM CONTROLS	LDO enables
Sys Ctrl 1.2	SYSTEM CONTROLS	Power amplifier enables
Sys Ctrl 1.3	SYSTEM CONTROLS	Regulator enables
Sys Ctrl 1.4	SYSTEM CONTROLS	Switch controls and enabling 4 bands and 2 chains both on TX and RX side

9.2.3 Test and Measurement Method

Refer to section 4.1.1 of OpenCellular - Connect-1 System Test Specification document

9.2.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Typical

System/Test Load: Typical

9.2.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.2.6 Test Results

GSM band configuration, Attenuation control

Tx Chain	Band	AD9361 att = -20					Test RESULT PASS / FAIL
		Tx Att = 0	Tx Att = 1	Tx Att = 5	Tx Att = 10	Tx Att = 15	
		dBm	dB	dB	dB	dB	
Ch1	GSM850	27.5	0.7	4.3	9	13.9	PASS
	GSM900	28.2	1	4.9	9.7	14.6	PASS
	GSM1800	22.4	0.8	4.6	10.4	14.4	PASS
	GSM1900	19.5	0.9	4.9	9.8	14.8	PASS
Ch2	GSM850	27.8	0.6	4.3	9	13.9	PASS
	GSM900	28.4	0.8	4.7	9.6	14.5	PASS
	GSM1800	22.4	0.86	4.7	9.6	14.5	PASS
	GSM1900	20.8	0.83	4.7	9.7	14.6	PASS

Rx Chain	Band	Rx Att = 0	Rx Att = 5	Rx Att = 10	Rx Att = 15	Test RESULT PASS / FAIL
		dBm	dB	dB	dB	
Ch1	GSM850	-22	5.5	10.4	15.3	PASS
	GSM900	-21.1	4.9	9.8	14.7	PASS
	GSM1800	-40	5.5	10.4	15.4	PASS
	GSM1900	-27	4.8	9.8	14.7	PASS
Ch2	GSM850	-22.5	5	10	14.9	PASS
	GSM900	-21.2	4.9	9.8	14.8	PASS
	GSM1800	-35.9	5.3	10.5	15.4	PASS
	GSM1900	-28	4.7	9.7	14.6	PASS

Bypass configuration

		Chain 1	Chain 2
Bypass A	Config	Bypass 1	Bypass 2
	RF path	Tx	Rx
Bypass B	Config	Bypass 2	Bypass 1
	RF path	Rx	Tx

Tx Attn Settings	AD9361	10dB
	Digital Att	10dB
Rx Attn Settings	ANT input	-30 dBm

			Power (dBm)				Test RESULT PASS / FAIL
			GSM850	GSM900	GSM1800	GSM1900	
Bypass A	Tx	Ch1	2.8	2.8	0.5	0.4	PASS
	Rx	Ch2	-37	-37.8	-40	-43.3	PASS
Bypass B	Tx	Ch2	2.66	2.7	-0.19	-0.8	PASS
	Rx	Ch1	-38	-37.8	-39.8	-41.3	PASS

9.3 System Controls - LED

9.3.1 Test ID

Sys Ctrl 1.7

9.3.2 Purpose

The purpose of this test is to validate the response of front PANEL LED to system state

9.3.3 Test and Measurement Method

Refer to section 4.1.4 of OpenCellular - Connect-1 System Test Specification document

9.3.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Typical

System/Test Load: Typical

9.3.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.3.6 Test Results

#	SYSTEM STATUS	LED STATUS	LED COLOR	SYSTEM TEST CONDITION	TEST STATUS	Remarks
1	System Boot	Circulating	GREEN	System BOOT	PASS	System BOOT (TIVA tasking issue, circulating stops in between) LED needs to circulate clockwise. For this the TASK needs to run continuously in TIVA. But in between some other task will take over TIVA and for that period LED circulation will stop.
2	System Running	Pulsing	GREEN	System BOOT completes	PASS	SYSTEM RUNNING: LED panel need to pulsate in GREEN (N RESET toggle every 5 second)
3	System Failure	Pulsing	RED	Associate this to any alarm on GBC (temperature, Over current) We can set the threshold for any temperature sensor low enough to trigger this alarm and get the LED status.	PASS	SYSTEM failure: LED panel need to pulsate in RED. (N reset toggle every 5 seconds) Temperature: (INTEL three temperature limits , LOW, HIGH, CRITICAL: HIGH limit set to 34degC) Current : (TIVA default current ~152 mA, Set limit to 100mA to simulate alarm
4	Radio Failure	Flash – Left	RED	Associate this to Radio alarms (RF power, return loss failure, lock detect failure) GPS lock alarm (delay set to 2minutes)	PASS	
5	Backhaul Failure	Flash - Right	RED	N/A	N/A	Test can be performed when BACKHAUL feature is up

9.4 System Controls - ALARM

9.4.1 Test ID

Sys Ctrl 1.6

9.4.2 Purpose

The purpose of this test is to validate the system ALARM reporting.

9.4.3 Test and Measurement Method

Refer to section 4.1.3 of OpenCellular - Connect-1 System Test Specification document

9.4.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Typical

System/Test Load: Typical

9.4.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

Test Results

Device	Refdes	I2C address	Alert condition	PASS/ FAIL	MODULE	Comments
INA226	U239	45	MSATA current sensing	PASS	GBC	
INA226	U183	41	PWR_12V_ALRT	PASS		
INA226	U185	44	PWR_12V_ALRT	PASS		
INA226	U182	40	PWR_12V_ALRT	PASS		
SE98ATP,547	U210	18	TEMPSEN_TIVA_EVNT1	PASS		Checked for both high and low temperature alerts
SE98ATP,547	U211	19	TEMPSEN_TIVA_EVNT1	PASS		Checked for both high and low temperature alerts
SE98ATP,547	U212	1A	TEMPSEN_TIVA_EVNT1	PASS		Checked for both high and low temperature alerts
SE98ATP,547	U213	1C	TEMPSEN_TIVA_EVNT2	PASS		Checked for both high and low temperature alerts
SE98ATP,547	U214	1D	TEMPSEN_TIVA_EVNT2	PASS		Checked for both high and low temperature alerts
SE98ATP,547	U215	1F	TEMPSEN_TIVA_EVNT2	PASS		Checked for both high and low temperature alerts
INA226	U2104	40	SYS_ALERT	PASS	RFSDR	
INA226	U2105	41	SYS_ALERT	PASS		
INA226	U32	44	12V_ALRT	N/A		Not connected to SYSALERT
SE98ATP,547	U1803	18	CH1_TEMP_SEN_ALERT_CPU	N/A		not implemented, Parts being changed in REVC
SE98ATP,547	U2003	1F	CH2_TEMP_SEN_ALERT_CPU	N/A		not implemented, Parts being changed in REVC

9.5 System Controls - RESET

9.5.1 Test ID

Sys Ctrl 1.5

9.5.2 Purpose

The purpose of this test is to validate the RESETs.

9.5.3 Test and Measurement Method

Refer to section 4.1.2 of OpenCellular - Connect-1 System Test Specification document

9.5.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Typical

System/Test Load: Typical

9.5.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR00008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.5.6 Test Results

S.No.	Device	RESET through	RESULT PASS / FAIL	REMARKS
1	TIVA	U187, BU4329G-TR, used for monitoring 3.3VDC TIVA	PASS	3.3VDC bus voltage is less than 2.9V than TIVA stays in RESET
2	INTEL	through TIVA , TIVA_RESET_TO_PROC	PASS	
6	ETHERNET switch	through TIVA, TIVA_ETHSW_RESET	PASS	
7	RFSDR RESET	through TIVA, TIVA_TRXFE_RESET	PASS	Requires rework, updated in revC
8	FX3	through TIVA, IOE_FX3_RESE (IO xepander, address 0x1B)	PASS	
11	RFSDR I/O expander	through TIVA, TIVA_TRXFECONN_GPIO1 through TIVA, TIVA_RESET_TO_PROC	PASS	Requires rework, updated in revC
12	SYNC	Through TIVA, - TIVA_SYNC_RESET	PASS	Requires rework, updated in revC

9.6 System Tx – Mean Transmitted RF carrier power

9.6.1 Test ID

Sys Tx 1.2

9.6.2 Purpose

The purpose of this test case is to validate system Tx performance such that the mean transmitted RF carrier power at the system antenna port is within acceptable limits.

9.6.3 Test and Measurement Method

Refer to section 6.1.2 of OpenCellular - Connect-1 System Test Specification document

9.6.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.6.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.6.6 Test Results

BAND	Tx Chain	ARFCN	Freq MHz	RF power dBm	Dig Attn	Power Supply current (A)	Spec 33+/-2dBm	RF Power Margin (dBm)	RESULT PASS / FAIL
GSM900	1	63	947.6	33	12	2.1	33 +/-2	2	PASS
GSM900	2	63	947.6	33.5	12	2.1	33 +/-2	1.5	PASS
GSM1800	1	698	1842.4	33.4	2	2.1	33 +/-2	1.6	PASS
GSM1800	2	698	1842.4	34	2	2.1	33 +/-2	1	PASS

Specification: 33 ± 2 dBm

9.7 System Tx - Intermodulation Attenuation

9.7.1 Test ID

Sys Tx 1.7

9.7.2 Purpose

The purpose of this test case is to check system Tx performance for Intermodulation Attenuation performance.

9.7.3 Test and Measurement Method

Refer to section 6.1.8 of OpenCellular - Connect-1 System Test Specification document

9.7.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.7.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.7.6 Test Results

GSM900

CHAIN	BAND	ARFCN	FREQUENCY	Tx Power	Interfere Power
1	GSM900	38	942.6 MHz	32.5 dBm	3 dBm

Interferer Freq (MHz)	Interferer Offset (kHz)	IM3- (dBm)	IM3+ (dBm)	Measure BW (kHz)	SPEC	PASS /FAIL	Margin (dB)
934.6	8		-30	**300**	-36dBm (300KHz)	FAIL	-6
936.6	6		-34	100	-32dBm (100kHz)	PASS	2
938.6	4		-33	100	-32dBm (100kHz)	PASS	1
940.8	1.8		-34	100	-32dBm (100kHz)	PASS	2
944.4	1.8	-33		100	-32dBm (100kHz)	PASS	1
946.6	4	-31		100	-32dBm (100kHz)	FAIL	-1
948.6	6	-31		100	-32dBm (100kHz)	FAIL	-1
950.6	8	-26		**300**	-36dBm (300KHz)	FAIL	-10

CHAIN	BAND	ARFCN	FREQUENCY	Tx Power	Interfere Power
2	GSM900	38	942.6 MHz	32.5 dBm	3 dBm

Interferer Freq (MHz)	Interferer Offset (kHz)	IM3- (dBm)	IM3+ (dBm)	Measure BW (kHz)	SPEC	PASS /FAIL	Margin (dB)
934.6	8		-31	**300**	-36dBm (300KHz)	FAIL	-5
936.6	6		-33	100	-32dBm (100kHz)	PASS	1
938.6	4		-36	100	-32dBm (100kHz)	PASS	4
940.8	1.8		-36	100	-32dBm (100kHz)	PASS	4
944.4	1.8	-34		100	-32dBm (100kHz)	PASS	2
946.6	4	-32		100	-32dBm (100kHz)	FAIL	0
948.6	6	-31		100	-32dBm (100kHz)	FAIL	-1
950.6	8	-26		**300**	-36dBm (300KHz)	FAIL	-10

GSM1800

CHAIN	BAND	ARFCN	FREQUENCY	Tx Power	Interfere Power
1	GSM1800	699	1842.6	33.4 dBm	3 dBm

Interferer Freq (MHz)	Interferer Offset (kHz)	IM3- (dBm)	IM3+ (dBm)	Measure BW (kHz)	SPEC	PASS /FAIL	Margin (dB)
1834.6	8		-43	**300**	-36dBm (300KHz)	PASS	7
1836.6	6		-48	100	-32dBm (100kHz)	PASS	14
1838.6	4		-47	100	-32dBm (100kHz)	PASS	15
1840.8	1.8		-47	100	-32dBm (100kHz)	PASS	15
1844.4	1.8	-44		100	-32dBm (100kHz)	PASS	12
1846.6	4	-47		100	-32dBm (100kHz)	PASS	15
1848.6	6	-48		100	-32dBm (100kHz)	PASS	16
1850.6	8	-43		**300**	-36dBm (300KHz)	PASS	7

CHAIN	BAND	ARFCN	FREQUENCY	Tx Power	Interfere Power
2	GSM1800	699	1842.6	33 dBm	3 dBm

Interferer Freq (MHz)	Interferer Offset (kHz)	IM3- (dBm)	IM3+ (dBm)	Measure BW (kHz)	SPEC	PASS /FAIL	Margin (dB)
1834.6	8		-41	**300**	-36dBm (300KHz)	PASS	5
1836.6	6		-43	100	-32dBm (100kHz)	PASS	10
1838.6	4		-43	100	-32dBm (100kHz)	PASS	8
1840.8	1.8		-43	100	-32dBm (100kHz)	PASS	11
1844.4	1.8	-43		100	-32dBm (100kHz)	PASS	11
1846.6	4	-41		100	-32dBm (100kHz)	PASS	9
1848.6	6	-39		100	-32dBm (100kHz)	PASS	7
1850.6	8	-36		**300**	-36dBm (300KHz)	PASS	0

9.7.7 Failure resolution

Intermod products are failing by worst case by 10dB. The intermods are getting generated at PA. For every 1dB reduction in interferer the intermod is expected to reduce by 3dB. In revC isolator is added at PA output. The isolator provides typical isolation of 15dB. With this the intermod levels are expected to come down by ~45dB thereby meeting specs by good margins.

9.8 System Power – AUX source, total power consumption

9.8.1 Test ID

Sys Pwr 1.1, 1.8

9.8.2 Purpose

The purpose of this test case is to ensure systems total power consumption is within specified limits. This test also validates the functionality with DC (AUX) source for power system during max power transmission along with supporting external battery charging.

9.8.3 Test and Measurement Method

Refer to section 5.1.1 of OpenCellular - Connect-1 System Test Specification document

9.8.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.8.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.8.6 Test Results

WITHOUT BATTERY CHARGING

POWER SOURCE – AUX 18VDC

GSM900

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	Freq	26	12	2	1600	6845	262	29627	965	9747	14060	8.707	24.772
	Chain 2					Power (mW)								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	33.5	12	2.1	1595	6710	260	29962	960	9552	14430	8.565	24.942
SWAP carrier														
	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	33	12	2.1	1597	6812	262	30155	965	16347	7877	8.671	25.189
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	26.5	12	2.1	1617	6747	262	30387	965	16655	7717	8.626	25.337

TOTAL POWER CONSUMPTION				
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	RESULT (PASS /FAIL)
Spec (10W)	Spec (35W)	Spec (45W)		
8.64	31.74	40.38	4.62	PASS

Note:-

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

GSM1800

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.4	26.3	2	2.1	1600	6770	262	29940	965	8640	15470	8.632	25.075
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.4	34	2	2.1	1600	6705	262	29390	965	8847	14905	8.567	24.717
	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.4	33.4	2	2.1	1600	6832	260	29037	970	15942	7355	8.692	24.267
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.4	26.9	1842.4	2	1615	6752	260	28907	970	15800	7240	8.627	24.01

TOTAL POWER CONSUMPTION				
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	RESULT (PASS /FAIL)
Spec (10W)	Spec (35W)	Spec (45W)		
6.47	30.85	37.32	7.68	PASS

Note: -

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

WITH BATTERY CHARGING

POWER SOURCE – AUX 22VDC

GSM900

				Chain 1					Power								
STEP 1 (18V)				ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
	GSM900	4.8	Middle	63	947.2	24.3	12	2.1	1622	7062	265	29375	997	9265	13925	8.949	24.187
				Chain 2					Power								
				ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
			Middle	63	947.2	33.1	12	2.1	1650	6902	265	29565	995	9460	14175	8.817	24.63
				Chain 1					Power								
STEP 2 (22V)				ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
	GSM900	4.8	Middle	63	947.2	24.1	12	1.7	1627	7045	265	29365	997	9457	14172	8.937	24.626
				Chain 2					Power								
				ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
			Middle	63	947.2	32.8	12	1.7	1650	7040	265	29592	997	9340	14197	8.955	24.534
				Chain 1					Power								
STEP3 (22V, 8A)				ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
, LeadAcid connected	GSM900		Middle	63	947.2	24.2	12	4.3	1617	7052	265	29560	1002	9515	14152	8.934	24.669
				Chain 2					Power								
				ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
			Middle	63	947.2	33.1	12	4.3	1660	7012	265	29592	1002	9340	14152	8.937	24.494

STEP 1 (BASELINE)

TOTAL POWER CONSUMPTION				RESULT (PASS /FAIL)
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	
Spec (10W)	Spec (35W)	Spec (45W)		
8.95	24.63	33.58	11.42	PASS

Note: -

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

STEP 2 (at 22VDC without battery charging)

TOTAL POWER CONSUMPTION				RESULT (PASS /FAIL)
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	
Spec (10W)	Spec (35W)	Spec (45W)		
8.94	24.53	33.47	11.53	PASS

Note: -

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

STEP 3 (at 22VDC with battery charging)

TOTAL POWER CONSUMPTION				**Battery Charging**	**Battery Charge Current A**	RESULT (PASS /FAIL)
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)			
Spec (10W)	Spec (35W)	Spec (45W)		Functional	Spec < 10.8A	
8.93	23.49	32.43	12.57	OK	5.7	PASS

Note: -

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

9.9 System Power – Solar power

9.9.1 Test ID

Sys Pwr 1.5

9.9.2 Purpose

The purpose of this test case is to validate system performance when operated with Solar power source.

9.9.3 Test and Measurement Method

Refer to section 5.1.5 of OpenCellular - Connect-1 System Test Specification document

9.9.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.9.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.9.6 Test Results

WITHOUT BATTERY CHARGING

GSM900

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	25.9	12	1.97	1612	10447	262	28975	978	9505	13790	12.321	24.273
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	33.2	12	1.97	1682	10327	280	29382	972	9535	14190	12.289	24.697
SWAP carrier														
	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	32.8	12	1.95	1607	10570	262	29827	975	16335	7800	12.439	25.11
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	26.4	12	1.95	1592	10702	262	29742	972	16427	7597	12.556	24.996

TOTAL POWER CONSUMPTION				RESULT (PASS /FAIL)
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	
Spec (10W)	Spec (35W)	Spec (45W)		
12.40	31.50	43.90	1.1	PASS

GSM1800

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.2	25.7	2	1.89	1730	10665	262	29705	975	8572	15452	12.657	24.999
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.2	33.5	2	1.89	1697	10695	262	29210	980	8697	14762	12.654	24.439
SWAP carrier														
	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.2	32.8	2	1.86	1600	10775	377	28692	980	15802	7147	12.752	23.929
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.2	30	2	1.86	1590	10682	377	28770	980	15705	7417	12.649	24.102

TOTAL POWER CONSUMPTION				
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	RESULT (PASS /FAIL)
Spec (10W)	Spec (35W)	Spec (45W)		
12.68	31.54	44.22	0.78	PASS

WITH BATTERY CHARGING

NOTE: No RF transmission, with electronic load

STEP 1: No battery connected

	Value	**Parameter**	**Units**	**Specification**
Solar Source	21.48	Voltage on Solar Source Display	V	
	2.05	Current on Solar Source Display	A	
	44.034	Power from Solar Source	W	< 45W
	21.86	Voltage on GBC Front panel connector	V	
Electronic Load	3.4	Current on Electronic load	A	
	12	Voltage on electronic load terminals	V	
	40.8	Power to Electronic Load	W	

STEP 2: External battery connected

	Value	**Parameter**	**Units**	**Specification**
Solar Source	20.1	Voltage on Solar Source Display	V	
	5.06	Current on Solar Source Display	A	
	101.706	Power from Solar Source	W	< 165W

	20.3	Voltage on GBC Front panel connector	V	
Electronic Load	3.4	Current on Electronic load	A	
	12	Voltage on electronic load terminals	V	
	40.8	Power to Electronic Load	W	

Lead Acid Battery - TIVA Log							
Sl.No	**Register**	**Register Address**	**Hex Value**	**Decimal Value**	**Parameter**	**Value**	**Comments**
1	VBAT	0x3A	3fb8	16312	Vbatsense/cellcount (V)	2.09	
2	VIN	0x3B	3011	12305	Input Voltage(V)	20.28	
3	VSYS	0x3C	2fde	12254	System Voltage(V)	20.19	
4	IBAT	0x3D	2b8a	11146	Battery current(A)	3.27	At battery voltage
5	IIN	0x3E	1ff8	8184	Input current(A)	5.99	
6	DIE_TEMP	0x3F	34fc	13564	LTC4015 temperature(deg	34.08	
1	ICHARGE_TARGET	0x1A	1f	31	Charge current target(A)	10.67	
2	VCHARGE_SETTING	0x1B	1	1	Charge voltage target(V/ce	2.01	

Charge Current	Margin (in Amp)	RESULT (PASS/FAIL)
Spec (< 10.8A)		
6A	4.8A	PASS

STEP 3: Internal battery connected

	Value	**Parameter**	**Units**	**Specification**
Solar Source	21.26	Voltage on Solar Source Display	V	
	2.522	Current on Solar Source Display	A	
	53.61772	Power from Solar Source	W	< 65.4W
	21.55	Voltage on GBC Front panel connector	V	
Electronic Load	3.4	Current on Electronic load	A	
	12	Voltage on electronic load terminals	V	
	40.8	Power to Electronic Load	W	

Lithium Ion Battery - TIVA Log							
Sl.No	**Register**	**Register Address**	**Hex Value**	**Decimal Value**	**Parameter**	**Value**	**Comments**
1	VBAT	0x3A	4fd8	20440	Vbatsense/cellcount (V)	3.93	
2	VIN	0x3B	3388	13192	Input Voltage(V)	21.74	
3	VSYS	0x3C	3343	13123	System Voltage(V)	21.63	
4	IBAT	0x3D	2a9c	10908	Battery current(A)	3.20	At battery voltage
5	IIN	0x3E	8fa	2298	Input current(A)	1.68	At 18V
6	DIE_TEMP	0x3F	3695	13973	LTC4015 temperature(deg C)	43.05	

Charge Current	Margin	RESULT (PASS/FAIL)

	(in Amp)	
Spec (< 1.8A)		
1.7A	0.1 A	PASS

Note:-

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

9.10 System Power - POE

9.10.1 Test ID

Sys Pwr 1.4

9.10.2 Purpose

The purpose of this test case is to ensure systems functions normally when powered with POE source.

9.10.3 Test and Measurement Method

Refer to section 5.1.4 of OpenCellular - Connect-1 System Test Specification document

9.10.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.10.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.10.6 Test Results

GSM900

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	25.4	16		1605	6785	260	29152	965	9585	13565	8.65	24.115
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	33.1	16		1605	6775	260	29327	965	9650	13742	8.64	24.357
SWAP carrier														
	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	32.5	16		1595	6765	262	29402	965	15715	7855	8.622	24.535
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	26	16		1610	6825	262	29945	962	16162	7902	8.697	25.026

TOTAL POWER CONSUMPTION				RESULT (PASS /FAIL)
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	
Spec (10W)	Spec (35W)	Spec (45W)		
8.65	30.42	39.07	5.93	PASS

Note:-

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

GSM1800

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.2	23.9	6		1640	6822	262	28257	972	8520	13935	8.724	23.427
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.2	32	6		1637	6690	260	27710	975	8727	13242	8.587	22.944
	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.2	31	6		1637	6730	262	27150	977	14085	7117	8.629	22.179
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.2	25.7	6		1642	6845	260	27087	977	14077	7330	8.747	22.384

TOTAL POWER CONSUMPTION				
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	RESULT (PASS /FAIL)
Spec (10W)	Spec (35W)	Spec (45W)		
8.67	28.30	36.97	8.03	PASS

Note: -

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

9.11 System Power – External Battery

9.11.1 Test ID

Sys Pwr 1.7

9.11.2 Purpose

The purpose of this test case is to ensure systems functions normally when powered with External battery.

9.11.3 Test and Measurement Method

Refer to section 5.1.7 of OpenCellular - Connect-1 System Test Specification document

9.11.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.11.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.11.6 Test Results

GSM900

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	31.3	18		1557	7375	265	28705	995	10170	12615	9.197	23.78
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	31.7	18		1592	7070	265	27687	990	9092	12612	8.927	22.694
SWAP carrier														
	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	31.2	18		1552	7225	265	28120	992	14565	7705	9.042	23.262
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	31.4	18		1587	7187	265	28620	992	15012	7660	9.039	23.664

TOTAL POWER CONSUMPTION				
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	RESULT (PASS /FAIL)
Spec (10W)	Spec (35W)	Spec (45W)		
9.05	28.17	37.22	7.78	PASS

Note:-

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

GSM1800

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.4	31.8	4		1592	7195	265	28571	1002	8407	14125	9.052	23.534
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	698	1842.4	32.2	4		1595	7140	265	27935	1005	8572	13505	9	23.082
SWAP carrier														
	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle			31.7	4		1687	7112	265	27715	1007	14430	7410	9.064	22.847
	Chain 2					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle			32.5	4		1602	7192	377	27582	1007	14360	7160	9.171	22.527

TOTAL POWER CONSUMPTION				
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	RESULT (PASS /FAIL)
Spec (10W)	Spec (35W)	Spec (45W)		
9.07	28.94	38.01	6.99	PASS

Note:-

GBC Power (in W) = TIVA + ATOM + MSATA
RFSDR Power (in W) = FPGA + Ch1 + Ch2

Total Power (in W) = GBC Power + RFSDR Power

9.12 System Power – Internal Battery

9.12.1 Test ID

Sys Pwr 1.6

9.12.2 Purpose

The purpose of this test case is to ensure systems functions normally when powered with Internal battery.

9.12.3 Test and Measurement Method

Refer to section 5.1.6 of OpenCellular - Connect-1 System Test Specification document

9.12.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.12.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0018

9.12.6 Test Results

GSM900

	Chain 1					Power								
	ARFCN	Freq MHz	RF power dBm	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC W	Total RFSDR W
Middle	63	947.6	26	12		1557	8800	380	29325	972	9477	14042	10.737	24.491
	Chain 2					Power								
	ARFCN	Freq	RF power	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC power	Total RF power
Middle	63	947.6	33.5	12		1540	8792	265	29835	967	9580	14365	10.597	24.912
SWAP carrier														
	Chain 1					Power								
	ARFCN	Freq	RF power	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC power	Total RF power
Middle	63	947.6	33	12		1535	8682	265	29875	967	16272	7919	10.482	25.158
	Chain 2					Power								
	ARFCN	Freq	RF power	Dig Attn	Current Power Supply	TIVA	ATOM	MSATA	TRXFE	FPGA	Ch1	Ch2	Total GBC power	Total RF power
Middle	63	947.6	26.4	12		1577	8672	265	30347	965	16607	7877	10.514	25.449

TOTAL POWER CONSUMPTION				
GBC W	**RFSDR W**	**Total W**	Total Power Margin (in W)	RESULT (PASS /FAIL)
Spec (10W)	Spec (35W)	Spec (45W)		
10.58	31.61	42.19	2.79	PASS

9.13 System Power – Cold Start

9.13.1 Test ID

Sys Pwr 1.3

9.13.2 Purpose

The purpose of this test case is to validate the logic for COLD start

9.13.3 Test and Measurement Method

Refer to section 5.1.3 of OpenCellular - Connect-1 System Test Specification document

9.13.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.13.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.13.6 Test Results

VALIDATION STEP	OBSERVATION	REMARKS
Ambient temperature	21 degC	
Threshold value	30 degC	for INTEL temperature Sensor
Before temperature threshold		
GBC power	OK	
RF board power	ON HOLD	
PA enables	ON HOLD	
FX3 reset (active low)	ON HOLD	
After temperature threshold		
GBC power	OK	
RF board power	OK	
PA enables	OK	
FX3 reset (active low)	OK	
Test result (PASS / FAIL)	**PASS**	Functional Validation of COLD START LOGIC

9.14 System Power – Power (Initialization) Sequence

9.14.1 Test ID

Sys Pwr 1.2

9.14.2 Purpose

The purpose of this test case is to validate the logic for system power up (initialization sequence)

9.14.3 Test and Measurement Method

Refer to section 5.1.2 of OpenCellular - Connect-1 System Test Specification document

9.14.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.14.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.14.6 Test Results

S.No		Initialization Process Step	Device involved	RESULT OK / NOK	REMARKS
1	a	Check Power source	POE	OK	POE not connected
	b		Solar/AUX	OK	Detected AUX power source
	c		Lithium-ion Battery	OK	Detected Li-ion battery
	d		Lead Acid Battery	OK	Lead acid not Connected
	e		PSE	OK	POE not connected, powered by AUX
2	a	Check - INTEL out of RESET	PSTRST	OK	Checking INTEL out of RESET
	b		COREPOWER	OK	Checking INTEL power OK
3	a	Check - MSATA out of RESET		OK	Checking MSATA out of RESET
4	a	Check - RF out of RESET		OK	Checking RFSDR out of RESET
5	a	Checking Device presense	INA226 - GBC (4)	OK	Checks the presence of Current and Voltage monitoring devices on GBC
	b		INA226 - RF (3)	OK	Checks the presence of Current and Voltage monitoring devices on RFSDR
	c		Temp Sensor - GBC (6)	OK	Checks the presence of temperature sensors on GBC
	d		Temp Sensor - RF (2)	OK	Checks the presence of temperature sensors on RFSDR
	e		Sync module	OK	Checks the presence of Sync Module
	f		LED module	OK	Checks the presence of LED module
6	a	Configuration / Initialization of Sensors	INA226 - GBC (4)	OK	Configuring INA226 on GBC
	b		INA226 -RF (3)	OK	Configuring INA226 on RFSDR
	c		PSE	OK	no POE connected
	d		Lead Acid	OK	Configuring charge controller for Lead Acid battery
	e		Lithium-ion	OK	Configuring charge controller for Li-ion battery
	f		Temp Sensor - GBC (6)	OK	Configuring temperature sensor limits for GBC
	g		Temp Sensor - RF (2)	OK	Configuring temperature sensor limits for RFSDR

S.No		Initialization Process Step	Device involved	RESULT OK / NOK	REMARKS
	h		Sync module	OK	Configuring I/O expander for SYNC module
	i		LED module	OK	Configuring I/O expander for LED module
7	a	Checking device Status	INA226 - GBC (4)	OK	Monitoring bus currents and voltages for GBC
	b		INA226 - RF (3)	OK	Monitoring bus currents and voltages for GBC
	c		Temp Sensor - GBC (6)	OK	Monitoring temperature reading on GBC
	d		Temp Sensor - RF (2)	OK	Monitoring temperature reading on RFSDR
FINAL STATUS				PASS	

9.15 System RF – GPS lock

9.15.1 Test ID

Sys GPS 1.1

9.15.2 Purpose

The purpose of this test case is to validate GPS receiver performance.

9.15.3 Test and Measurement Method

Refer to section 8.1.1 of OpenCellular - Connect-1 System Test Specification document

9.15.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.15.5 DUT Sample Information

RF-SDR Board Serial Number – WZ1630LIFE2SDR0008

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.15.6 Test Results

GPSDO Lock detect	GPSDO lock time (Spec < 15mts)	Margin For GPSDO Lock	40MHz reference output	RESULT PASS /FAIL
OK	10 minutes	5 Minutes	OK	PASS

9.16 System RF – GPS-GSM Coexistence

9.16.1 Test ID

Sys GPS 1.2

9.16.2 Purpose

Purpose: To test the coexistence of GPS-GSM in the same BOX. GSM signal transmission should have no impact on GPS signal reception.

9.16.3 Test and Measurement Method

Refer to section 8.1.2 of OpenCellular - Connect-1 System Test Specification document

9.16.4 Test Condition

Ambient Temperature: 25˚C

Operating Voltage: Nominal

System/Test Load: Typical

9.16.5 DUT Sample Information

RF-SDR Board Serial Number –WZ1630LIFE2SDR00 08

GBC Board Serial Number – WZ1630LIFE2GBC0022

9.16.6 Test Results

GPS - Standalone

S.No	GPS Signal Level (dBm)	C/No (dBm/Hz)	Remarks
1	-140	26	No GPS Fix
2	-135	31	GPS fix
3	-130	38	GPS fix
4	-125	42	GPS fix
5	-120	45	GPS fix
6	-115	49	GPS fix
7	-110	51	GPS fix
8	-105	51	GPS fix

GPS-GSM900 Coexistence

GSM Tx Power = 33dBm
GPS Signal Input = -130dBm

Variable Attenuation (dB)	**Total GSM - GPS Isolation (dB)**	**C/No**	**Remarks**
no GSM transmission		38	GPS Fix
40	50	35	GPS Fix
35	45	33	GPS Fix
30	40	31	GPS Fix
25	35	29	GPS Fix
20	30	28	GPS Fix
15	25	25	no GPS fix

GPS-GSM1800 Coexistence

GSM Tx Power = 33dBm
GPS Signal Input = -130dBm

Variable Attenuation (dB)	Total Gsm - GPS Isolation (dB)	C/No (dBc / Hz)	Remarks
no GSM transmission		35	GPS Fix
40	50	34	GPS Fix
35	45	33	GPS Fix
30	40	31	GPS Fix
25	35	31	GPS Fix
20	30	30	GPS Fix
15	25	29	no GPS fix

Parameter	Specification	Result	Margin	RESULT PASS / FAIL
With and input of -130dBm, GPS Fix and PLL Lock to be achieved for up to a minimum of GPS-GSM isolation of	35 dB	30dB	5 dB	PASS
Time for GPSDO lock detect for GPS input of -130dBm and GPS-GSM coupling of 35dB	< 15 minutes	6 minutes	9 Minutes	PASS

9.17 History

SL.no	Date	Version	Author	Comments
1	February 9th ,2017	1.0	OpenCellular Team	First Release
2	February 13th, 2017	1.1	OpenCellular Team	Incorporated comments on 1st and 2nd page of the report