Factory Scorpius Char Test Plan for J5xx

Module: Scorpius
Station: Scorpius Char (DEV40)
Build: P1
Release Date: 03 April 2020

This Document Covers the Following Products: J5xx
Revision: P1_V1.4
<rdar://problem/56766302> J5xx Scorpius Factory ERS
<rdar://problem/60027625> J3xx&J5xx Scorpius ERS - Foxconn

[Note: Anything in brackets is expected to be updated / deleted for the official document]

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1. Revision

Build Type	Version	Date	Notes	Author
Please refer to last section of this document for Details/Comments on change to this document				
P0	1.0	8 January 2020	Initial release for J5xx P0 Build. Based on J307 P1. Limits need to be updated.	Bhushan Koli
	1.1	21 January 2020	General updates on limits and smokey commands	Bhushan Koli/Alberto M/Nan Liu/ Frank B
P1	1.2	19 February 2020	Reverted back to original smokey commands	Bhushan Koli
	1.3	21 February 2020	Updated Minimum Vboost requirement from 6V to 6.1V	Bhushan Koli/Mikhal
	1.3	21 February 2020	Updated Minimum Vboost requirement from 6V to 6.1V	Bhushan Koli/Rex H/Nan Liu
	1.4	3 April 2020	Updated power flow test procedure to include VCC main and Vbatt measurements Updated LPP limits Added Dotara Temperature measurement Updated command and response format of LPP and VCTx respectively Updated procedure to disable LFOD during Vsense & Isense measurement	Bhushan Koli/Rex H/Nan Liu/ Frank

2. Purpose

This document describes the FATP Scorpius Char test plan for the J5xx inductive charging Tx module for P0.

3. Scope

The scope of this document is the Scorpius only module of the J5xx products. It covers FATP tests of the following high level features:

Test	Scorpius Test
LPP ping and delta calculation	✓
Power Flow & Efficiency	✓
Comms - PingPong	✓

4. References

<rdar://problem/47434171> J4xx Scorpius factory ERS
<rdar://problem/48910417> Dotara Data-sheet
<rdar://problem/48964978> Dotara Block initializations
<rdar://problem/49391712> J5xx FW specifications
<rdar://problem/54853341> Radar for Scorpius Factory FW releases
J5xx Schematic

5. Glossary & Definitions

Acronym	Term	Description
AMPL	Amplitude	-
ASK	Amplitude shift keying	-
Ballast	Ballast Load	Internal load within Aculeus/Iktara that maintains a constant current load.
CAL	Calibratied	These are after calibration values.
COMM's	Communications	Referring to ASK and FSK communications
CPLG	Coupling	-
CTX	-	Series resonant capacitance.
DC	Duty Cycle	-
DSBL	Disable	-
ENBL	Enable	-
FOD	Foreign Object Detection	Detection mechanism for metallic objects near the inductive power link
FREQ	Frequency	-
FSK	Frequency shift keying	-
FXST	Fixture Setup	-
Kmax	-	Maximum Coupling Coefficient
Kmin	-	Minimum Coupling Coefficient
LPP	Low Power Ping	Object/Rx detection system
MPE	Maximum Permissible Exposure	Protection scheme to limit the maximum leakage H-field when Scorpius is charging
Rx	Receiver	Wireless Power Receiver. Also referred to as PRx
SCRP	Scorpius	Reference for searching Scorpius Module related Data in Insight.
Tx	Transmitter	Wireless Power Transmitter. Also referred to as PTx(J5xx MLB)
VCTX	-	Voltage across Tx coil
VBoost	-	Voltage across Boost output
VRect	-	Voltage across Rx Rectifier

6. Critical and Frequently Used Commands

6.1. Quiesce Test Mode

After programming the Tx defaults to NominalMode (LPP > Digital Ping > Power negotiation > Closed loop).
The following command needs to be sent to the Tx to enable QuiesceMode whereby certain test commands are then enabled.

A power cycle will mean the unit needs to be re-programmed as the firmware application is run from SRAM.

This is the test mode whereby additional commands for test/validation are active.This command will disable everything except the MCU i.e. Boost, Bridge, LPP switch will be disabled.

Resets into the quiesce mode with the bridge disabled.

smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"

Note: *This command i.e. Quiesce Mode needs to be set once at beginning of testing i.e. from* ***Section 8.1. Load FW*** *or unless unit is reset or power cycled or Nominal Mode has been set.* ***If the unit is power cycled you will need to load fw again.*** *Nominal Mode*

6.2. Nominal Mode

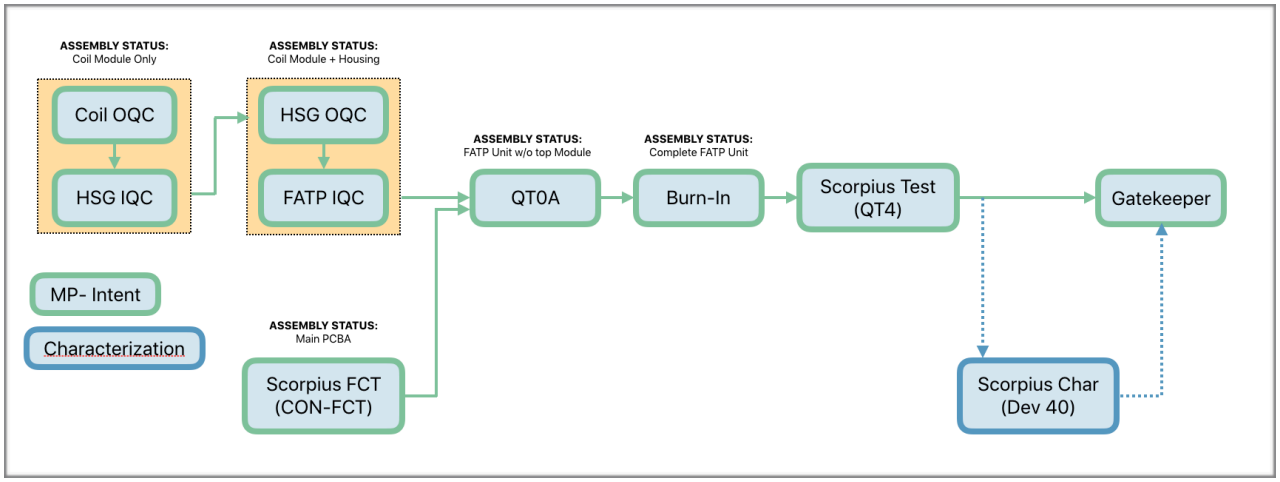
This is the normal runtime mode. Here, a subset of commands used for test/validation are deactivated.

smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x00}"

Resets into the nominal mode where it will start the LPP-> Digital Ping-> Power Negotiation-> Closed loop sequence.

7. Overview

The block diagram below shows the overall end-end test coverage for the inductive Scorpius module. This document covers Scorpius Char Station.



7.1. Summary of Test Coverage

	Kmax	Knom	Kmin
LPP	no load	no load	no load
Digital Ping	0.1C	n/a	0.1C
Open Loop + Ping Pong	0.1C, 3C, 10C	0.1C, 3C, 10C	0.1C, 3C, 10C

7.2. Fixture Coupling specs

Throughout this document various tests will have different limits depending on the offset position i.e. coupling. Ensure close attention is paid to the tables shown for the different coupling positions, loads and limits.

All = all possible positions (MaxK, NomK,MinK)

Physical parameter / InSight Keys Recorded	Position (mm)	K Spec	Measured Results (averaged after 5 readings)
KMax	0, 0.83, 0	0.535 - 0.610	Limits to be used need to be same as IQC_coupling station. FYI only. To be updated.
KNom	D1.1, 0.88, L1.1	-	
KMin	D1.5, 0.93, L1.5	0.440 - 0.530	

8. Test Coverage @ Scorpius Char Station

8.1. Load Tx FW & Read Version

Description:- Load Tx FW. Dotara has no NVRAM and therefore will lose all the memory/setting after power cycling or load fw. Dotara will need to load the fw after each power cycling.

Failure Mode(s) Captured:TBD

Test Setup and Procedure:

Step	Description	Interface	Command / Notes
Note: *This command i.e. Quiesce Mode needs to be set once at beginning of testing i.e. from* ***Section 8.1. Load FW*** *or unless unit is reset or power cycled or Nominal Mode has been set.* ***If the unit is power cycled you will need to load fw again.***			
A	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 **Note:-Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.**
B	Tell Tx to enter Quiesce Mode	TX HID	**Note:** Need to send the below command after every 2nd time of the above command within 3sec or with minimum or no delay as possible of above command. You cannot enter Quiesce mode without exiting the standalone mode. smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"
1	Set Vin 3.6V. Or Preparation to pull high: PMU_TO_DOTARA_EN_EXT	Fixture	pmugpio --pin 14 --output 1 --pushpull
2	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 **Note:-Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.**
3	Load Tx FW	Tx HID	**Note**: Need to send this command every time within **3sec** of above command. You cannot enter Load FW without exiting the standalone mode. ***Path for FW might change.*** smokey ScorpiusHid --run --test "FwLoad" --args "PathToFwLoad='nandfs:\\AppleInternal\\Diags\\Scorpius\\J517J522\\ScorpiusTx-dotara.bin'"
4	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 **Note:-Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.**
5	Tell Tx to enter Quiesce Mode	TX HID	**Note**: Need to send the below command after every 2nd time of the above command within **3sec** or with minimum or no delay as possible of above command. You cannot enter Quiesce mode without exiting the standalone mode. smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"
6	Read Status (Version)	Tx HID	smokey ScorpiusHid --run --test "Get" --args "ReportID=0xBB"

Command to read Tx FW version:

smokey ScorpiusHid --run --test "Get" --args "ReportID=0xBB"

Example:-This reads back 4 bytes: 0x01 0x00 0x13 0x05

Main FW Type (byte1&2): 0x0001

Main FW Version (byte3&4): 0x0513

Test Parameter	Insight Keys Recorded	Notes
Tx Fw Version	**SCRP_Tx_Version**	

8.2. Rx FW Version

Ginger SN: diags get mlbsn

Eload SN: diags get eloadsn

Versions: get versions ——> application: 2.6.19, this line is the Ginger FW version

B332 Dev Board Command to read Rx FW version:

i2c lock charger

i2c rawwrite charger 0x10 0x00 0x02 0x00 0x00 0x00

i2c rawread charger 04

i2c unlock charger

Read 4 byte packet: x x x x

Last 3 bytes will determine Rx version:

8.3. Initial MTP Sector Check Before Tests.

Description: Make sure FW is in a good state at the Before of the test. [TBD]
Failure Mode(s) Captured: TBD
Test Setup and Procedure: Refer below

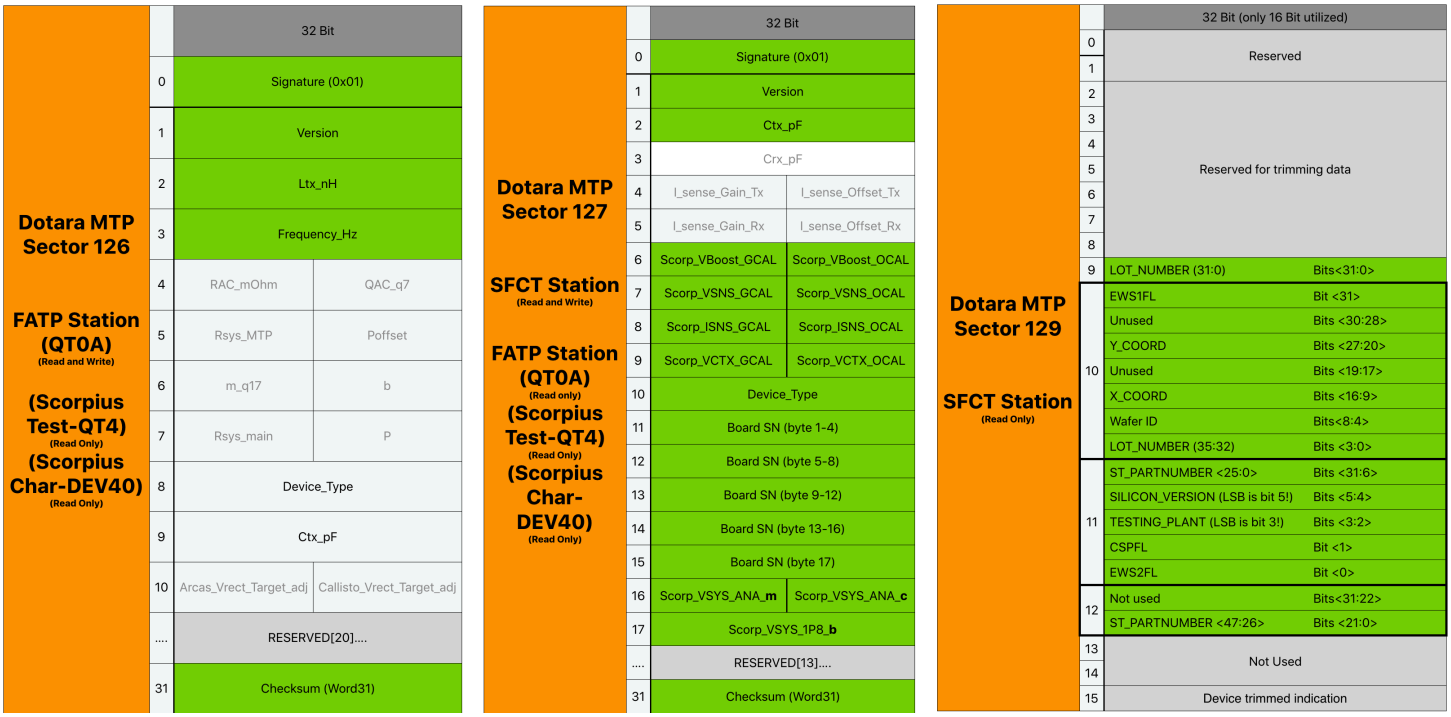


Figure 1 : MTP Word Locations

Step	Description	Interface	Command / Notes
Note: *This command i.e. Quiesce Mode needs to be set once at beginning of testing i.e. from Section 8.3 MTP Sector Check or unless unit is rest/power cycled or Nominal Mode has been set. If the unit is power cycled you will need to load fw again.*			
1	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 **Note:-Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.**
2	Tell Tx to enter Quiesce Mode	TX HID	**Note**: Need to send the below command after every 2nd time of the above command within **3sec** or with minimum or no delay as possible of above command. You cannot enter Quiesce mode without exiting the standalone mode. smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"
Skip the above 2 steps if the unit is already in Quiesce Mode			
3	Read MTP Sector 127	Tx HID	smokey ScorpiusHid --run --test "Print_Sector" --args "MTP_sector=127" **Example:-Overlay will read Words that are printed:-** **Word 0 : 0x00000001** / **Word 1 : 0x00000002** / **Word 2 : 0x00030570** / Word 3 : 0x00023F00 Word 4 : 0x00000000 / Word 5 : 0x00000000 / **Word 6 : 0x0A0A0A0A** / **Word 7 : 0x0B0B0B0B** **Word 8 : 0x0C0C0C0C** / **Word 9 : 0x0D0D0D0D** / **Word 10 : 0x05170000** / **Word 11 : 0x00000000** **Word 12 : 0x00000000** / **Word 13 : 0x00000000** / **Word 14 : 0x00000000** / **Word 15 : 0x00000000** **Word 16 : 0x00000000** / **Word 17 : 0x00000000** / Word 18 : 0x00000000 / Word 19 : 0x00000000 Word 20 : 0x00000000 / Word 21 : 0x00000000 / Word 22 : 0x00000000 / Word 23 : 0x00000000 Word 24 : 0x00000000 / Word 25 : 0x00000000 / Word 26 : 0x00000000 / Word 27 : 0x00000000 Word 28 : 0x00000000 / Word 29 : 0x00000000 / Word 30 : 0x00000000 / **Word 31 : 0xF29D9024**
4	Read MTP Sector 126	Tx HID	smokey ScorpiusHid --run --test "Print_Sector" --args "MTP_sector=126" **Example:-Overlay will read Words that are printed:-** **Word 0 : 0x0000001** / **Word 1 : 0x00000002** / **Word 2 : 0x0E0E0E0E** / **Word 3 : 0x0F0F0F0F** Word 4 : 0x0000000 / Word 5 : 0x0000000 / Word 6 : 0x0000000 / Word 7 : 0x0000000 Word 8 : 0x0000000 / Word 9 : 0x0000000 / Word 10 : 0x0000000 / Word 11 : 0x0000000 Word 12 : 0x0000000 / Word 13 : 0x0000000 / Word 14 : 0x0000000 / Word 15 : 0x0000000 Word 16 : 0x0000000 / Word 17 : 0x0000000 / Word 18 : 0x0000000 / Word 19 : 0x0000000 Word 20 : 0x0000000 / Word 21 : 0x0000000 / Word 22 : 0x0000000 / Word 23 : 0x0000000 Word 24 : 0x0000000 / Word 25 : 0x0000000 / Word 26 : 0x0000000 / Word 27 : 0x0000000 Word 28 : 0x0000000 / Word 29 : 0x0000000 / Word 30 : 0x0000000 / **Word 31 : 0xDDD9E0E1**
5	Location of Calibrated values of VBoost, Vsense, Isense, LFOD & CTx into MTP and other values into MTP :- Signature, Version,HWID, MLB SN, Checksum Follow Figure 1 Bellow for Reference	Test Overlay	Sector 127 :-Word 0(Signature = 0x01); Word 1(Version = 0x02); Word 2(CTx); Word 6(VBoost); Word 7(Vsense); Word 8(Isense); Word 9(LFOD); Word 10(HWID); Word 11 - 15(MLB SN - 17 byte), Word 31(Checksum)
6	Location to store Calibrated values of Inductance (Ltx_nH) & frequency_Hz into MTP and also Signature and version.	Test Overlay	Sector 126 :- Word 0(Signature = 0x01); Word 1(Version = 0x02); Word 2(Ltx_nH); Word 3(frequency_Hz)

Acceptance:

Test Parameter	Insight Keys Recorded	Comments/Notes
Sector 127		
Check Sum - Sector 127 (Word 31)	**SCRP_Check Sum_127_MTP_BEFORE**	Will need this Values to be compared against MTP Check after test **Section 8.7.**
Version (Word 1)	**SCRP_Version_127_MTP_BEFORE**	
Signature (Word 0)	**SCRP_Signature_127_MTP_BEFORE**	
Tx HWID_MTP (Word 10):- J51x - 0x05170000 J52x - 0x05200000	**SCRP_TX_HWID_127_MTP_BEFORE**	
CTx MTP (Word 2)	**SCRP_CTx_127_MTP_BEFORE**	
VBoost_Control MTP (Word 6)	**SCRP_VBoost_127_MTP_BEFORE**	
Vsense MTP (Word 7)	**SCRP_VSense_127_MTP_BEFORE**	
Isense MTP (Word 8)	**SCRP_Isense_127_MTP_BEFORE**	
LFOD MTP (Word 9)	**SCRP_LFOD_127_MTP_BEFORE**	
VSYS_ANA (Word 16)	**SCRP_VSYS_ANA_127_MTP_BEFORE**	
VSYS_1P8 (Word 17)	**SCRP_VSYS_1P8_127_MTP_BEFORE**	
MLB Serial No. (Word 11 to Word 15 - Bits<1:17>)	**SCRP_MLB_SN_127_MTP_BEFORE**	
Sector 126		
Check Sum - Sector 126 (Word 31)	**SCRP_Check Sum_126_MTP_BEFORE**	Will need this Values to be compared against MTP Check after test **Section 8.7.**
Version (Word 1)	**SCRP_Version_126_MTP_BEFORE**	
Signature (Word 0)	**SCRP_Signature_126_MTP_BEFORE**	
LPP Inductance_MTP (Word 2)	**SCRP_LPP_L_126_MTP_BEFORE**	
LPP Frequency_MTP (Word 3)	**SCRP_LPP_FREQ_126_MTP_BEFORE**	

8.4. Low Power Ping (LPP)

Description: Check the frequency and inductance for LPP at free air vs nominal position coupling.
Failure Mode(s) Captured: Poorly assembled / manufactured coils
Test Setup and Procedure:

Step	Description	Interface	Command / Notes
1	Connect coils at nominal position	Fixture	
2	Send 1.4uS LPP pulse	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x05, ReportPayload={0x00; 0x46}" **Note:** 0x46 gives 70 * 20ns = 1.4uS is the duration of the pulse.
3	Delay 15mS before proceeding	Fixture	
4	Read output parameters of F and L and raw ADC data	Tx HID	To read Frequency, Inductance and Raw ADC data: smokey ScorpiusHid --run --test"Get" --args"ReportID=0x05" **Response: (Received LSB First, Length should be 23bytes)** Byte0: ReportId (should equal 0x05) Byte1: Error code (0x00-> no error) Byte2: Sub-cmd (should be 0x00) bytes3-6: Floating point value of frequency Bytes7-10: Floating point value of inductance Bytes19-22: Buffer address of raw ADC data Bytes23-26: Number of raw ADC data elements (of size uint16_t)
5	Collect raw ADC samples and upload to Insight	Tx HID & Fixture	Collect Pointer to raw LPP data by sending the following command from bytes19-22 in the above response.Use the above info to read the raw data and upload to insight. Use the command Below to read the raw ADC buffered data smokey ScorpiusHid --run --test "Mem16" --args "Address=<*address*>, Length=<number of bytes to read>" smokey ScorpiusHid --run --test "Mem16" --args "Address=<buffer address>, Length=220" The LPP data is 660 bytes. Therefore 3 loops of above should finished reading all the LPP data
6	Repeat steps 2 - 5 x 100 times	Fixture & Tx HID	Save all of the data as a single log file for each unit and upload to InSight.
7	Calculate Free Air Δ Tx Frequency & Δ Tx Inductance Averaged over 100 repeats vs MTP sector Value	Tx HID & Fixture	Δ Tx Frequency = SCRP_LPP_FREQ_MTP_BEFORE (From Section 8.3) - **Kxx_LPP_Frequency_100_avg** Δ Tx Inductance = **Kxx_LPP_Inductance_100_avg** - SCRP_LPP_L_MTP_BEFORE (From Section 8.3)
8	Record parameters as per the table below	Fixture	Apply limits accordingly
9	Repeat steps 2 - 8 at all coupling position	Fixture & Tx HID	Coupling Position :- KMax, KNom & KMin

Acceptance:

Physical Parameter	InSight Keys Recorded	LL	UL	Unit	Comments/Notes
LPP Frequency	**KMax_LPP_Frequency**	63.4	71.5	kHz	Updated based on J5xx FEA MSS table
	KNom_LPP_Frequency	64.6	72.8		
	KMin_LPP_Frequency	68.5	77.2		
	KMax_LPP_Frequency_avg	63.4	71.5		
	KNom_LPP_Frequency_avg	64.6	72.8		
	KMin_LPP_Frequency_avg	68.5	77.2		
LPP Inductance	**KMax_LPP_Inductance**	22.3	26.7	µH	
	KNom_LPP_Inductance	21.5	25.7		
	KMin_LPP_Inductance	19.1	22.9		
	KMax_LPP_Inductance_avg	22.3	26.7		
	KNom_LPP_Inductance_avg	21.5	25.7		
	KMin_LPP_Inductance_avg	19.1	22.9		
Δ Tx Frequency	**KMax_LPP_Frequency_FA_delta**	5.0	22.3	kHz	
	KNom_LPP_Frequency_FA_delta	5.0	20.8		
	KMin_LPP_Frequency_FA_delta	5.0	17.3		
Δ Tx Inductance	**KMax_LPP_Inductance_FA_delta**	3.74	11.2	µH	
	KNom_LPP_Inductance_FA_delta	2.92	10.2		
	KMin_LPP_Inductance_FA_delta	2.13	7.4		
LPP Frequency STD	**Kxxx_LPP_Frequency_STDEV**	-	0.4	-	
LPP Inductance STD	**Kxxx_LPP_Inductance_STDEV**	-	0.4	-	
LPP_repeatability		100	100	-	

8.5. Digital Ping Level Tests

Description: This test required ginger/B332 dev board, both Tx and Rx coil. Test digital ping level (6Vboost and 100deg bridge phase) at 0.1C charge rate at various positions and Vrect and Ping Pong Tests. Ping Pong test is performed to check In-band comms by sending a train of bits as ASK (ginger board/B332 Dev Board).

Failure Mode(s) Captured:

1. Vrect: - Ginger/[B332-TBD] reach UVP or OVP at the digital ping level
2. Ping Pong :-Test Dotara's Internal ASK/FSK Communication.

Test Setup and Procedure:

Order of load ramping as follows:

- Set VBOOST to **6.1V**
- Adjust bridge phase from **100 degrees**
- Set loading to 40mA ballast (No Eload i.e. turn Eload off/Set Eload to 0A)

Description	Interface	Command
Set coupling position	Fixture	Loads @ all Couplings

Step	Description	Interface	Command
	Digital Ping Testing		
	For DP @ 0.1C		
1	Set boost to meet the load conditions. **Note:** Minimum Vboost is 6100mV, Don't set Vboost < 6100mV.	TX Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x03, ReportPayload={0xD4; 0x17; 0x88; 0x13}" **Payload: ——>** Byte0-1: Boost voltage (eg. 0x17D4 = 6100mV)
2	Set the Bridge phase **110deg**	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x04, ReportPayload={0x1C; 0xF3; 0x01; 0x00; 0xF8; 0x2A; 0x50; 0x46}" **Eg 0x2AF8:** 11000cdeg = 110deg phase
3	Command for following variables: Rx:- Vrect	Tx HID/Rx I2C	Vrect:- ~~scorpius get vrect [B332]~~ / ikt adc (Ginger)
4	Tell Rx to go into static mode	Rx I2C	**Write I2C packet:** (39) c0 ae 80 80 1e 09 02 01 AE **Ginger command:** set mode none **Ginger command:** set mode rx **Ginger command**: ikt write 0xF0000B80 0xAE010209 **Read one byte:** Should be 0x60 **B332 DevBoard:** i2c rawwrite charger 0x0f 0x00 0x2E 0x09 0x01 0x01 //set Aculeus to static closed loop mode
5	Choose Comm1	Rx I2C	**Write I2C packet**: (39) c0 ae 80 80 1e 01 00 05 AD **Ginger command:** ikt write 0x0xF0000B80 0xAD050001 **B332 DevBoard :** i2c rawwrite charger 0x0F 0x00 0x2d 0x01 0x00 0x05 //Select Comm cap1 - For IpadTx
6	Tell Tx to initiate ping pong with the Rx i.e. 10 packets, 100ms packet delay	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x02, ReportPayload={0x0A; 0x00; 0x64; 0x00}" Payload:----> byte0-1: Number of packets to send: 10 byte2-3: Delay between packets: 100ms
7	Wait 3 second for RX to send packets before reading buffer	Fixture	Wait 3 second
8	Read back data that was captured from the Tx.	Tx HID	smokey ScorpiusHid --run --test "Get" --args "ReportID=0x02" Response: byte0: ID *(PingPongID = 0x02)* byte1: Status *(eg. 0x00 = complete)* [0 = Complete; 1 = In-Progress] byte2-3: Pings Sent *(eg. 0x000A = 10 pings sent)* byte4-5: Pongs Received *(eg. 0x000A = 10 pongs received)* byte6: Last error *(e.g. 0x00 = no errors)* ***Note:-****If byte1:Status is in process then repeat the step*
9	Repeat step 2 to 8 At Kmax & Kmin		

Acceptance criteria:

Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
Vrect_FXST @ DP	**Kmax_SCRP_Vrect@DPxxC**	7000	7500	mV	
	Kmin_SCRP_Vrect@DPxxC	5800	6200	mV	
Number of Pings Sent @ DP	**Kxxx_Pings_Sent@DP**	10	10	-	
Number of Pongs Received @ DP	**Kxxx_Pongs_Recieved@DP**	10	10	-	

8.6. Power, Efficiency & Ping Pong Tests

Description: This test required Ginger/~~B332 dev~~ board, both Tx and Rx coil. Transferring power at various loads / charge rates (0.1C, 3C, 10C) at various positions and measuring power and efficiency and Ping Pong Tests. Ping Pong test is performed to check In-band comms by sending a train of bits as ASK (Ginger board/~~B332 Dev~~ Board).

Failure Mode(s) Captured:

1. Power & efficiency:-Unit is not able to transfer required power at different load conditions at required efficiency
2. Ping Pong :-Test Dotara's Internal ASK/FSK Communication.

Test Setup and Procedure:

Order of load ramping as follows:

- Adjust bridge phase from 0 - 180 degrees to reach target Vrect at desired load.
- If target Vrect still cannot be achieved with a phase shift of 180 degrees?
- Start increasing VBoost.
- VBoost should only be adjusted when phase = 180 degrees.
- To reach the desired Vrect start ramping the boost voltage.
- To reach the 10C load step the load with 50mA to avoid OVP.

Charge Rate	0.1C @ 6.5V Vrect	3C @ 8V Vrect	10C @ 14V Vrect
Loading	40mA ballast No Eload i.e. turn Eload off/Set Eload to 0A	~0.9W Set Eload to~112.5mA	3W Set Eload to ~214mA

Description	Interface	Command
Set load and coupling position	Fixture	Repeat all below tests for the following Load conditions **0.1C; 3C; 10C**

Step	Description	Interface	Command
			Power & Efficiency Testing
A	PPVCC_MAIN(VSYS_ANA) Record this as x**1**	Tx HID	**PPVCC_MAIN(VSYS_ANA)**: smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x06; 0x00; 0x8C}" note: the last part "0x8C" donates the number of samples with a multiplier of 32x. i.e 0x8C = 140 x 32 = 4480 samples **------> Fixture wait 2 sec <------** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" **Response-->** byte0: [u8] ID (GetAdcID = 0x31) byte1-4: [u32] Floating point value read from ADC (eg 0xYYYYYYYY) byte5: [u8] Error Code (eg. 0x00 - no error) byte6: [u8] Reserved (eg. 0x00) byte7-8: [u16] ADC raw value (eg. 0xXXXX) byte9-12: [u32] Channel_Id that was read (eg. 0x00000007 = VSYS_1P8)
B	Calculate PPVCC_MAIN(VSYS_ANA) actual **VSYS_ANA_Actual = y1**	Overlay	$y_1 = m\,x_1 + c$ Where m = slope & c = offset —>from Word16 = VSYS_ANA_Offset_MTP <<16 || VSYS_ANA_Slope_MTP **Note : Convert m & c values into decimal before calculating y1**
C	Record value of VSYS_1P8 Record this as **x1**	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x07; 0x00; 0x8C}" note: the last part "0x8C" donates the number of samples with a multiplier of 32x. i.e 0x8C = 140 x 32 = 4480 samples **------> Fixture wait 2 sec <------** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" **Response-->** byte0: [u8] ID (GetAdcID = 0x31) byte1-4: [u32] Floating point value read from ADC (eg 0xYYYYYYYY) byte5: [u8] Error Code (eg. 0x00 - no error) byte6: [u8] Reserved (eg. 0x00) byte7-8: [u16] ADC raw value (eg. 0xXXXX) byte9-12: [u32] Channel_Id that was read (eg. 0x00000007 = VSYS_1P8)
D	Calculate VSYS_1P8 actual **VSYS_1P8_Actual = y1**	Overlay	$y_1 = x_1 + b$ Where b = offset —>from Word17 = value from step 14 above in Hex **Note : Convert b value into decimal before calculating y1**
E	Command for following variables: Tx:- Vbatt, Ibatt	Tx (Diags & HID)	pmuadc --read all **Vbatt**:- potomac vbat : xxxx.xxxx mV; **Ibatt:-** ibat_out: xxxx.xxx mA **Example --->**00024088:2240013A] :-) pmuadc --read all vddout: 4199.9389 mV; vbat: 3036.0195 mV; brick_id: 3.6630 mV; brick_id_usb_d+: 0mV; brick_id_usb_d-: 0mV brick_id2: 3.6630 mV; .....; .....; .....; ..... ibuck9: 0.0000 mA; ibuck11: 0.0000 mA; ibuck14: 0.0000 mA; ***ibat_out: 23858.3638 mA***; BIST buck0: 775.0915 mV BIST buck1: 7.5091 mV; .....; .....; .....; ..... potomac vsys_lo : 4214.2857 mV; potomac ich_1a : 0.2442 mA; potomac tbat : -2.0451 C; **potomac vbat : 4225.2747 mV**; potomac ich_6a : 1.4652 mA
F	Difference between VSYS-ANA & Vbatt	Fixture	$V_{Flex_Drop} = V_{batt} - V_{SYS_ANA_actual}$
			For 0.1C & 3C
1	Repeat Step A to F	Tx Diags & Fixture	@Standby i.e. before 0.1C testing

	Description	Interface	Command
2	Set boost to meet the load conditions. **Note:** Minimum Vboost is 6100mV, Don't set Vboost < 6100mV.	TX Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x03, ReportPayload={0xD4; 0x17; 0x88; 0x13}" **Payload: ——>** Byte0-1: Boost voltage (eg. 0x17D4 = 6100mV)
3	Set the Bridge phase to meet the load condition (Set Bridge phase to 0-180)	Tx Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x04, ReportPayload={0x1C; 0xF3; 0x01; 0x00; 0x50; 0x46; 0x50; 0x46}" **Eg 0x4650:** 18000cdeg = 180deg phase
4	Command for following variables: Vsense, Isense, LFOD (VCTx) **Note :** Disable LFOD before taking Vsense & Isense Reading and Enable LFOD back before taking LFOD(VCTx) reading.	TX Diags	**Disable LFOD before reading Isense:** **smokey ScorpiusHid --run --test "Set" --args "ReportID=0x41, ReportPayload={0x98; 0x36; 0x00; 0x40; 0x80; 0x01; 0x00; 0x00}"** Check status of LFOD smokey ScorpiusHid --run --test "Set" --args "ReportID=0x40, ReportPayload={0x98; 0x34; 0x00; 0x40}" **——> Fixture wait 2 sec <——** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x40" **Response —>** bits 7 & bit 8 = 0 if Disabled, 1 if enabled Note: Here, a "set" report command is first sent followed by a "get" report to return the requested data. **VSense:** smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x00; 0x00; 0x0F}" **——> Fixture wait 2 sec <——** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" **Response —>** bytes1-4 = Floating point value from ADC **—> VSense_kmxx_MCU** **Isense:** smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x12; 0x00; 0x0F}" **——> Fixture wait 2 sec <——** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" **Response —>** bytes1-4 = Floating point value from ADC **—> Isense_kmxx_MCU** **Enabled LFOD after Isense reading:** **smokey ScorpiusHid --run --test "Set" --args "ReportID=0x41, ReportPayload={0x98; 0x35; 0x00; 0x40; 0x80; 0x01; 0x00; 0x00}"** **Wait 1 sec after setting back LFOD before doing next test.** **LFOD(VCTx)**: smokey ScorpiusHid --run --test "Set" --args "ReportID=0x0B, ReportPayload={0x18; 0x03}" **——> Fixture wait 2 sec <——** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x0B" **Response—>** byte0 = report **byte16-17 = [u16] Read averaged ictx peak value in mA (based on factory calibrated** **byte18-19 = [u16] Accumulated ADC raw averaged sampling value** Note: Upload this raw data into Insight.
5	Measure Dotara (U6200) Temp at all Load conditions	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x08; 0x00; 0x8C}" **<-- Trigger reading of Temp1 (channel 8)** smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x09; 0x00; 0x8C}" **<--Trigger reading of Temp2 (channel 9)** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31"
6	Repeat Step A to F	Tx Diags & Fixture	During 0.1C & 3C loading
	For 10C		
7	Set the Full phase to meet the load condition (Set Bridge phase to 180)	Tx Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x04, ReportPayload={0x1C; 0xF3; 0x01; 0x00; 0x50; 0x46; 0x50; 0x46}" **Eg 0x4650:** 18000cdeg = 180deg phase
8	Set boost to meet the load conditions. **Note:** Minimum Vboost is 6100mV, Don't set Vboost < 6100mV.	TX Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x03, ReportPayload={0xD4; 0x17; 0x88; 0x13}" **Payload: ——>** Byte0-1: Boost voltage (eg. 0x17D4 = 6100mV)
9	Repeat Step A to F	Tx Diags & Fixture	During 10C loading

	Description	Interface	Command
10	Command for following variables: Vsense, Isense, LFOD (VCTx) **Note :** Disable LFOD before taking Vsense & Isense Reading and Enable LFOD back before taking LFOD(VCTx) reading.	TX Diags	**Disable LFOD before reading Isense:** **smokey ScorpiusHid --run --test "Set" --args "ReportID=0x41, ReportPayload={0x98; 0x36; 0x00; 0x40; 0x80; 0x01; 0x00; 0x00}"** Check status of LFOD smokey ScorpiusHid --run --test "Set" --args "ReportID=0x40, ReportPayload={0x98; 0x34; 0x00; 0x40}" **———> Fixture wait 2 sec <———** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x40" **Response —>** bits 7 & bit 8 = 0 if Disabled, 1 if enabled Note: Here, a "set" report command is first sent followed by a "get" report to return the requested data. **VSense:** smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x00; 0x00; 0x0F}" **———> Fixture wait 2 sec <———** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" **Response —>** bytes1-4 = Floating point value from ADC **—> VSense_kmxx_MCU** **Isense:** smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x12; 0x00; 0x0F}" **———> Fixture wait 2 sec <———** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" **Response —>** bytes1-4 = Floating point value from ADC **—> Isense_kmxx_MCU** **Enabled LFOD after Isense reading:** **smokey ScorpiusHid --run --test "Set" --args "ReportID=0x41, ReportPayload={0x98; 0x35; 0x00; 0x40; 0x80; 0x01; 0x00; 0x00}"** **Wait 1 sec after setting back LFOD before doing next test.** **LFOD(VCTx)**: smokey ScorpiusHid --run --test "Set" --args "ReportID=0x0B, ReportPayload={0x18; 0x03}" **———> Fixture wait 2 sec <———** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x0B" **Response—>** byte0 = report **byte16-17 = [u16] Read averaged ictx peak value in mA (based on factory calibrated** **byte18-19 = [u16] Accumulated ADC raw averaged sampling value** Note: Upload this raw data into Insight.
11	Measure Dotara (U6200) Temp at all Load conditions	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x08; 0x00; 0x8C}" **<-- Trigger reading of Temp1 (channel 8)** smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x09; 0x00; 0x8C}" **<--Trigger reading of Temp2 (channel 9)** smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31"
	Ping Pong Testing		
12	Tell Rx to go into static mode	Rx I2C	Write I2C packet: (39) c0 ae 80 80 1e 09 02 01 AE Ginger command: set mode none Ginger command: set mode rx Ginger command: ikt write 0xF0000B80 0xAE010209 Read one byte: Should be 0x60
13	Choose Comm1	Rx I2C	Write I2C packet: (39) c0 ae 80 80 1e 01 00 05 AD Ginger command: ikt write 0x0xF0000B80 0xAD050001
14	Tell Tx to initiate ping pong with the Rx i.e. 10 packets, 100ms packet delay	Tx Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x02, ReportPayload={0x0A; 0x00; 0x64; 0x00}" **Payload:——>** byte0-1: Number of packets to send: 10 byte2-3: Delay between packets: 100ms
15	Wait 1 second for RX to send packets before reading buffer	Fixture	Wait 1 second
16	Read back data that was captured from the Tx.	Tx Diags	smokey ScorpiusHid --run --test "Get" --args "ReportID=0x02" **Response:** byte0: ID(PingPongID = 0x02) byte1: Status(eg. 0x00 = complete) [0 = Complete; 1 = In-Progress] byte2: Last error(e.g. 0x00 = no errors) byte3-4: Pings Sent(eg. 0x000A = 10 pings sent) byte5-6: Pongs Received(eg. 0x000A = 10 pongs received) ***Note:- If byte1:Status is in process then repeat the step***
17	Repeat step 1 to 16 with All loading and coupling positions		

Acceptance criteria:

Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
Load 0.1C					
PPVCC_MAIN@ 0.1C	KMax_PPVCC_MAIN@0.1C	TBD	TBD	mV	
	KNom_PPVCC_MAIN@0.1C	TBD	TBD		
	KMin_PPVCC_MAIN@0.1C	TBD	TBD		
Vbatt@ 0.1C	KMax_Vbatt@0.1C	TBD	TBD	mV	
	KNom_Vbatt@0.1C	TBD	TBD		
	KMin_Vbatt@0.1C	TBD	TBD		
	KMax_VSYS_1P8@0.1C	TBD	TBD		

Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
VSYS_1P8 @ 0.1C	KNom_VSYS_1P8@0.1C	TBD	TBD	mV	
	KMin_VSYS_1P8@0.1C	TBD	TBD		
VFlex_Drop@0.1C	KMax_VFlex_Drop@0.1C	TBD	TBD	mA	
	KNom_VFlex_Drop@0.1C	TBD	TBD		
	KMin_VFlex_Drop@0.1C	TBD	TBD		
Ibatt @ 0.1C	KMax_Ibatt@0.1C	TBD	TBD	mA	
	KNom_Ibatt@0.1C	TBD	TBD		
	KMin_Ibatt@0.1C	TBD	TBD		
Vsense @ 0.1C	KMax_Vsense@0.1C	5905	6200	mV	
	KNom_Vsense@0.1C	5905	6200		
	KMin_Vsense@0.1C	5905	6200		
Isense @ 0.1C	KMax_Isense@0.1C	75	90	mA	
	KNom_Isense@0.1C	85	100		
	KMin_Isense@0.1C	95	110		
Vctx_IPeak @ 0.1C	KMax_VCtx_IctxPeakFactory@0.1C	375	715	mA	
	KNom_VCtx_IctxPeakFactory@0.1C	375	715		
	KMin_VCtx_IctxPeakFactory@0.1C	375	715		
Vrect_FXST @ 0.1C	KMax_Vrect_FXST@0.1C	6300	6700	mV	Fixture Cmd: Vrect Target = 6.5V ±2% Use Filtered Vrect Value from 'Ikt Adc' command
	KNom_Vrect_FXST@0.1C	6300	6700		
	KMin_Vrect_FXST@0.1C	6300	6700		
Irect_FXST @ 0.1C	KMax_Irect_FXST@0.1C	40	45	mA	Iktara ballast load = 40mA. **No fixture load required.**
	KNom_Irect_FXST@0.1C				
	KMin_Irect_FXST@0.1C				
Rx_Loading_Power @ 0.1C	KMax_Rx_Loading_Power@0.1C	252	301.5	mW	Vrect * Irect
	KNom_Rx_Loading_Power@0.1C	252	301.5		
	KMin_Rx_Loading_Power@0.1C	252	301.5		
Efficiency @ 0.1C	KMax_Efficiency@0.1C	45.16	68.08	%	Rx_Power / (Vsense * Isense)
	KNom_Efficiency@0.1C	40.65	60.07		
	KMin_Efficiency@0.1C	36.95	53.75		
Number of Pings Sent @ 0.1C	Kxxx_Pings_Sent@0.1C	10	10	-	
Number of Pongs Received @ 0.1C	Kxxx_Pongs_Recieved@0.1C	10	10	-	
Dotara Surface Temperature @ 0.1C	Kxxx_Temp1_MCU@0.1C Kxxx_Temp2_MCU@0.1C	20	61	℃	Based on J307 P1 data
Load 3C					
PPVCC_MAIN@ 3C	KMax_PPVCC_MAIN@3C	TBD	TBD	mV	
	KNom_PPVCC_MAIN@3C	TBD	TBD		
	KMin_PPVCC_MAIN@3C	TBD	TBD		
Vbatt@ 3C	KMax_Vbatt@3C	TBD	TBD	mV	
	KNom_Vbatt@3C	TBD	TBD		
	KMin_Vbatt@3C	TBD	TBD		
VSYS_1P8 @ 3C	KMax_VSYS_1P8@3C	TBD	TBD	mV	
	KNom_VSYS_1P8@3C	TBD	TBD		
	KMin_VSYS_1P8@3C	TBD	TBD		
VFlex_Drop@3C	KMax_VFlex_Drop@3C	TBD	TBD	mA	
	KNom_VFlex_Drop@3C	TBD	TBD		
	KMin_VFlex_Drop@3C	TBD	TBD		

Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
Ibatt @ 3C	KMax_Ibatt@3C	TBD	TBD	mA	
	KNom_Ibatt@3C	TBD	TBD		
	KMin_Ibatt@3C	TBD	TBD		
Vsense @ 3C	KMax_Vsense@3C	5800	6500	mV	
	KNom_Vsense@3C	5800	6500		
	KMin_Vsense@3C	6200	7000		
Isense @ 3C	KMax_Isense@3C	210	300	mA	
	KNom_Isense@3C	210	300		
	KMin_Isense@3C	210	300		
Vctx_IPeak_ @ 3C	KMax_VCtx_IctxPeakFactory@3C	420	600	mA	
	KNom_VCtx_IctxPeakFactory@3C	420	600		
	KMin_VCtx_IctxPeakFactory@3C	500	820		
Vrect_FXST @ 3C	KMax_Vrect_FXST@3C	7800	8300	mV	Fixture Cmd: Vrect Target = 8V ±2%
	KNom_Vrect_FXST@3C	7800	8300		
	KMin_Vrect_FXST@3C	7800	8300		
Irect_FXST @ 3C	KMax_Irect_FXST@3C	110	125	mA	Fixture Cmd: Irect Target = 113mA +iktara load(~0 to 15mA)
	KNom_Irect_FXST@3C	110	125		
	KMin_Irect_FXST@3C	110	125		
Rx_Loading_Power @ 3C	KMax_Rx_Loading_Power@3C	858	1037.5	mW	Vrect * Irect
	KNom_Rx_Loading_Power@3C	858	1037.5		
	KMin_Rx_Loading_Power@3C	858	1037.5		
Efficiency @ 3C	KMax_Efficiency@3C	44.00	85.18	%	Rx_Power / (Vsense * Isense)
	KNom_Efficiency@3C	44.00	85.18		
	KMin_Efficiency@3C	40.86	79.69		
Number of Packets Sent @ 3C	Kxxx_Packets_Sent@3C	10	10	-	
Number of Packets Received @ 3C	Kxxx_Packets_Recieved@3C	10	10	-	
Dotara Surface Temperature @ 3C	Kxxx_Temp1_MCU@3C Kxxx_Temp2_MCU@3C	20	61	℃	Based on J307 P1 data
Load 10C					
PPVCC_MAIN@ 10C	KMax_PPVCC_MAIN@ 10C	TBD	TBD	mV	
	KNom_PPVCC_MAIN@ 10C	TBD	TBD		
	KMin_PPVCC_MAIN@ 10C	TBD	TBD		
Vbatt@ 10C	KMax_Vbatt@ 10C	TBD	TBD	mV	
	KNom_Vbatt@ 10C	TBD	TBD		
	KMin_Vbatt@ 10C	TBD	TBD		
VSYS_1P8 @ 10C	KMax_VSYS_1P8@10C	TBD	TBD	mV	
	KNom_VSYS_1P8@10C	TBD	TBD		
	KMin_VSYS_1P8@10C	TBD	TBD		
VFlex_Drop@ 10C	KMax_VFlex_Drop@10C	TBD	TBD	mA	
	KNom_VFlex_Drop@10C	TBD	TBD		
	KMin_VFlex_Drop@10C	TBD	TBD		
Ibatt @ 10C	KMax_Ibatt@ 10C	TBD	TBD	mA	
	KNom_Ibatt@ 10C	TBD	TBD		
	KMin_Ibatt@ 10C	TBD	TBD		
Vsense @ 10C	KMax_Vsense@10C	9500	11000	mV	
	KNom_Vsense@10C	9800	12000		

Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
	KMin_Vsense@10C	9800	12000		
Isense @ 10C	KMax_Isense@10C	420	500	mA	
	KNom_Isense@10C	420	500		
	KMin_Isense@10C	420	500		
Vctx_IPeak_ @ 10C	KMax_VCtx_IctxPeakFactory@10C	700	1100	mA	
	KNom_VCtx_IctxPeakFactory@10C	700	1100		
	KMin_VCtx_IctxPeakFactory@10C	1000	1400		
Vrect_FXST @ 10C	KMax_Vrect_FXST@10C	13500	14500	mV	Fixture Cmd: Vrect Target = 14v
	KNom_Vrect_FXST@10C	13500	14500		
	KMin_Vrect_FXST@10C	13500	14500		
Irect_FXST @ 10C	KMax_Irect_FXST@10C	215	225	mA	Fixture Cmd: Irect Target = 214mA
	KNom_Irect_FXST@10C	215	225		
	KMin_Irect_FXST@10C	215	225		
Rx_Loading_Power @ 10C	KMax_Rx_Loading_Power@10C	2902.50	3262.50	mW	Vrect * Irect
	KNom_Rx_Loading_Power@10C	2902.50	3262.50		
	KMin_Rx_Loading_Power@10C	2902.50	3262.50		
Efficiency @ 10C	KMax_Efficiency@10C	52.77	81.77	%	Rx_Power / (Vsense * Isense)
	KNom_Efficiency@10C	48.38	79.26		
	KMin_Efficiency@10C	48.38	79.26		
Number of Packets Sent @ 10C	Kxxx_Packets_Sent@10C	10	10	-	
Number of Packets Received @ 10C	Kxxx_Packets_Recieved@10C	10	10	-	
Dotara Surface Temperature @ 10C	Kxxx_Temp1_MCU@10C Kxxx_Temp2_MCU@10C	20	61	℃	Based on J307 P1 data

8.7. Final MTP Sector Check After Tests.

Description: Make sure FW is in a good state at the end of the test. [TBD]
Failure Mode(s) Captured: TBD
Test Setup and Procedure: Refer below

Step	Description	Interface	Command / Notes
1	Pull Low test pin **TP93EF** i.e. **"AOP_TO_DOTARA_RESET_L"** to reset Scorpius	Tx Diags	pmugpio --pin 18 --output 0 --pushpull
	Wait 500ms	Fixture	
	Pull High test pin **TP93EF** i.e. **"AOP_TO_DOTARA_RESET_L "**	Tx Diags	pmugpio --pin 18 --output 1 --pushpull
2	Wait 1s	Fixture	
3	Preparation	Tx Diags	pmugpio --pin 14 --output 1 --pushpull
4	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 **Note:-Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.**
5	Load Tx FW	Tx HID	**Note**: Need to send this command every time within **3sec** of above command. You cannot enter Load FW without exiting the standalone mode. ***Path for FW might change.*** smokey ScorpiusHid --run --test "FwLoad" --args "PathToFwLoad='nandfs:\\AppleInternal\\Diags\\Scorpius\\J517J522\\ScorpiusTx-dotara.bin'"
6	Wait 1s	Fixture	Scorpius FW will take less than 1 second to boot
7	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 **Note:-Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.**
8	Tell Tx to enter Quiesce Mode	TX HID	**Note**: Need to send the below command after every 2nd time of the above command within **3sec** or with minimum or no delay as possible of above command. You cannot enter Quiesce mode without exiting the standalone mode. smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"

Step	Description	Interface	Command / Notes
9	Read MTP Sector 127	Tx HID	smokey ScorpiusHid --run --test "Print_Sector" --args "MTP_sector=127" **Example:-Overlay will read Words that are printed:-** **Word 0 : 0x00000001** Word 4 : 0x00000000 **Word 8 : 0x0C0C0C0C** **Word 12 : 0x00000000** Word 16 : 0x00000000 Word 20 : 0x00000000 Word 24 : 0x00000000 Word 28 : 0x00000000 **Word 1 : 0x00000002** Word 5 : 0x00000000 **Word 9 : 0x0D0D0D0D** **Word 13 : 0x00000000** Word 17 : 0x00000000 Word 21 : 0x00000000 Word 25 : 0x00000000 Word 29 : 0x00000000 **Word 2 : 0x00030570** **Word 6 : 0x0A0A0A0A** **Word 10 : 0x05170000** **Word 14 : 0x00000000** Word 18 : 0x00000000 Word 22 : 0x00000000 Word 26 : 0x00000000 Word 30 : 0x00000000 Word 3 : 0x00023F00 **Word 7 : 0x0B0B0B0B** **Word 11 : 0x00000000** **Word 15 : 0x00000000** Word 19 : 0x00000000 Word 23 : 0x00000000 Word 27 : 0x00000000 **Word 31 : 0xF29D9024**
10	Read MTP Sector 126	Tx HID	smokey ScorpiusHid --run --test "Print_Sector" --args "MTP_sector=126" **Example:-Overlay will read Words that are printed:-** **Word 0 : 0x0000001** Word 4 : 0x0000000 Word 8 : 0x0000000 Word 12 : 0x0000000 Word 16 : 0x0000000 Word 20 : 0x0000000 Word 24 : 0x0000000 Word 28 : 0x0000000 **Word 1 : 0x00000002** Word 5 : 0x0000000 Word 9 : 0x0000000 Word 13 : 0x0000000 Word 17 : 0x0000000 Word 21 : 0x0000000 Word 25 : 0x0000000 Word 29 : 0x0000000 **Word 2 : 0x0E0E0E0E** Word 6 : 0x0000000 Word 10 : 0x0000000 Word 14 : 0x0000000 Word 18 : 0x0000000 Word 22 : 0x0000000 Word 26 : 0x0000000 Word 30 : 0x0000000 **Word 3 : 0x0F0F0F0F** Word 7 : 0x0000000 Word 11 : 0x0000000 Word 15 : 0x0000000 Word 19 : 0x0000000 Word 23 : 0x0000000 Word 27 : 0x0000000 **Word 31 : 0xDDD9E0E1**
11	Pull Low test pin **TP93EF** i.e. **"AOP_TO_DOTARA_RESET_L"** to reset Scorpius	Tx Diags	pmugpio --pin 18 --output 0 --pushpull
	Wait 500ms	Fixture	
	Pull High test pin **TP93EF** i.e. **"AOP_TO_DOTARA_RESET_L "**	Tx Diags	pmugpio --pin 18 --output 1 --pushpull

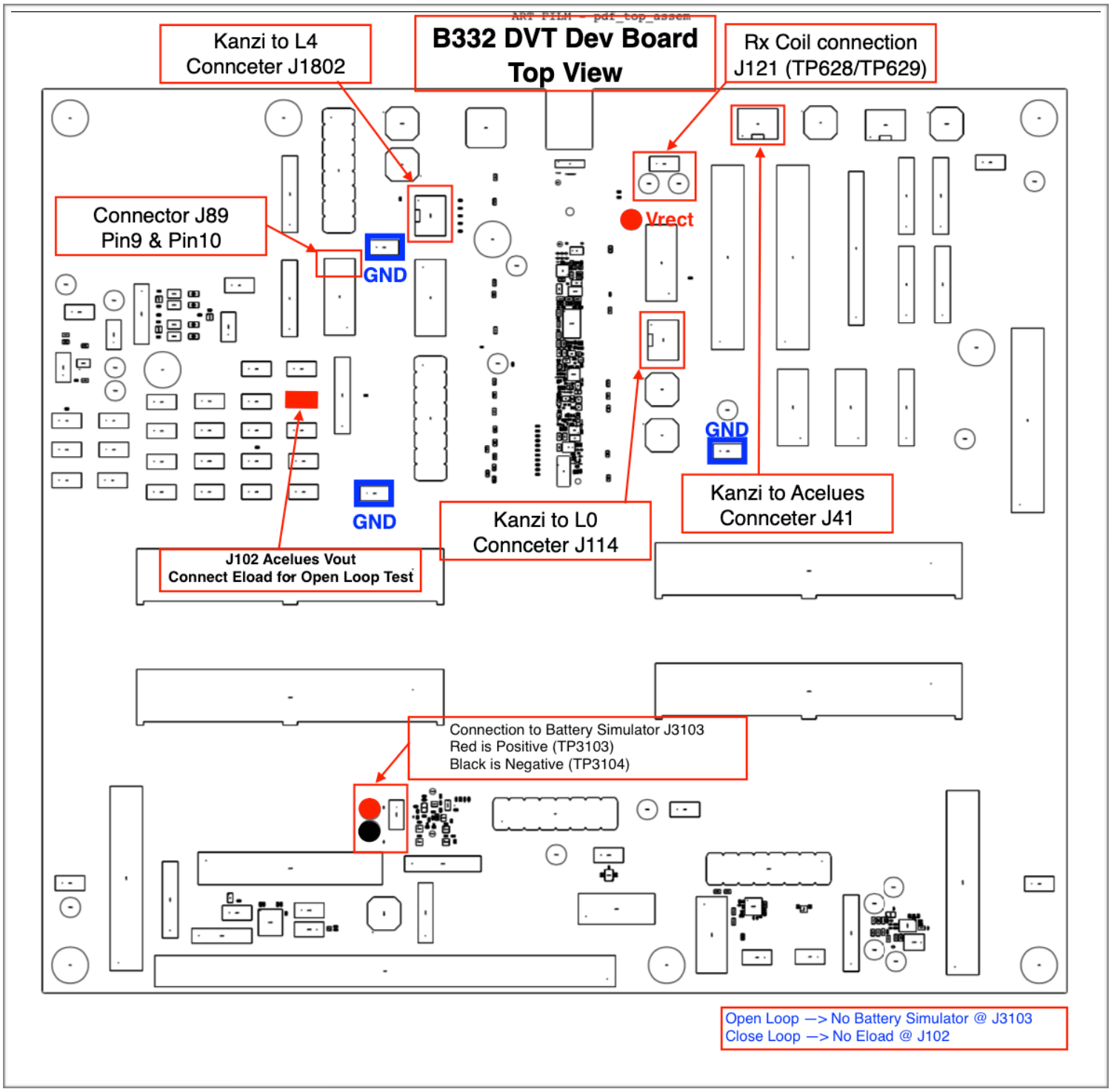
Acceptance:

Test Parameter	Insight Keys Recorded	Comments/Notes
Sector 127		
Check Sum - Sector 127 (Word 31)	**SCRP_Check Sum_127_MTP_AFTER**	Pass if this values match with MTP check before test i.e. **Section 8.3**
Version (Word 1)	**SCRP_Version_127_MTP_AFTER**	
Signature (Word 0)	**SCRP_Signature_127_MTP_AFTER**	
Tx HWID_MTP (Word 10):- J51x - 0x05170000 J52x - 0x05200000	**SCRP_TX_HWID_127_MTP_AFTER**	
CTx MTP (Word 2)	**SCRP_CTx_127_MTP_AFTER**	
VBoost_Control MTP (Word 6)	**SCRP_VBoost_127_MTP_AFTER**	
Vsense MTP (Word 7)	**SCRP_VSense_127_MTP_AFTER**	
Isense MTP (Word 8)	**SCRP_Isense_127_MTP_AFTER**	
LFOD MTP (Word 9)	**SCRP_LFOD_127_MTP_AFTER**	
VSYS_ANA (Word 16)	**SCRP_VSYS_ANA_127_MTP_AFTER**	
VSYS_1P8 (Word 17)	**SCRP_VSYS_1P8_127_MTP_AFTER**	
MLB Serial No. (Word 11 to Word 15 - Bits<1:17>)	**SCRP_MLB_SN_127_MTP_AFTER**	
Sector 126		
Check Sum - Sector 126 (Word 31)	**SCRP_Check Sum_126_MTP_BEFORE**	Pass if this values match with MTP check before test i.e. **Section 8.3**
Version (Word 1)	**SCRP_Version_126_MTP_BEFORE**	
Signature (Word 0)	**SCRP_Signature_126_MTP_BEFORE**	
LPP Inductance_MTP (Word 2)	**SCRP_LPP_L_126_MTP_BEFORE**	
LPP Frequency_MTP (Word 3)	**SCRP_LPP_FREQ_126_MTP_BEFORE**	

A. Appendix - B332 Dev Board UART Baud rate

The B332 Dev Board is used to send commands to I2C of Aculeus using UART cable. Follow the steps below to open the B332 Dev Board UART.

1. Connect UART (1MBite baudrate, 1.8V) to J89 (Pin9 & Pin 10)
2. Open Terminal
3. nanocom -w 0 -c 1000000,n,8,1
4. Select your Connected UART option.



Note:-Testing with Ginger Rx board is a backup incase factory is not able to get B332 open loop test up and running on time.

B. Feature DRI Comments for Changes to this Document

Feature	DRI	Description/Comments/Reason for Change	Date	Approved and released in Version:
General	Bhushan/Alberto/Nan/ Frank	Limits update from J307P0 to J5xx, data based on 4 units. Updated all the smokey command. Added command to measure Vbatt, Ibatt, PPVCC_MAIN	21 January 2020	P0_V1.1
General	Bhushan	Reverted back to original smokey command.	19 February 2020	Bhushan/P1_V1.2
Power Transfer	Mikhal	Minimum boost requirement has changed from 6000mV to 6100mV.	21 February 2020	Mikhal/Bhushan/ P1_V1.2
Power Transfer	Bhushan/Rex	Updated power flow test procedure to include VCC main and Vbatt measurements	11 March 2020	Rex/Nan/Bhushan/ Frank/P1_V1.3
LPP	Frank	Updated LPP limits		
Dotara	Bhushan	Added Dotara Temperature measurement	3 April 2020	Bhushan/Rex/Nan/ P1_V1.4
LPP & VCTX	Bhushan	Updated command and response format of LPP and VCTx respectively		
Power Transfer	Bhushan/Jin/Nan	Updated procedure to disable LFOD during Vsense & Isense measurement		