

☐ Risk Review ☐ Design Review ☐ Milestone Review ☒ Technical Review ☐

Overview			
Project Topic:	NAATOS Sample Prep Module Technical Design Review		
Meeting Date:	August 21, 2024	Notes taken by:	Ming Dong
Attachments:			
Attendance			
Attendee	Representing	Attendee	Representing
Josh Bishop	GHL, Product Development	Mark Flanagan	CCG
Ryan Calderon	GHL, Product Development	James Paolino	CCG
Carlos Gonzalez	GHL, Product Development	Rob Filipkowski	Odic (sub-contractor to CCG)
Andy Miller	GHL, Product Development	Ian O'Neil	Odic (sub-contractor to CCG)
Chin Ng	GHL, Product Development		
Ming Dong	GHL, Product Development		
Nikki Sanchez Comeau	GHL, Program Management		

Meeting Minutes

Agenda
<p>Review Design Changes to the Sample Prep Module</p> <ul style="list-style-type: none">- Mechanical Design: CCG to present a summary of the design improvements compared to the previous prototype and explain the rationale behind the changes.- Electrical and Firmware Design: CCG/Odic to walk through the schematic changes and how they address the bugs identified in the tracker.
Objectives
<p>Review and align on design changes to the Sample Prep module based on failures observed during SG3 testing.</p>

Notes

Here is a summary of design changes based on the issues encountered during SG3 testing, and the current implementation status as of September 3, 2024.

Sub-system	Observations/Failures	Possible Causes	Design Mitigations	Design Implementation Status (09/03)
Mechanical	Failed fatigue/cycling test (less than 72hrs)	Performance of motor not meeting spec requirement	Use a motor with larger outer shaft diameter and internal bearing with better fit to motor case	Design completed, will verify via mechanical reliability testing
		Mechanical system is not stable	Upsize on cam bearing to 1/2 inches and use permanently sealed lubrication bearings	
		Extended wear on shaft	Change shaft material to chrome plated. Shaft ground to OD after plating Added Delrin AF with 13% Teflon fill for carriage	
		Wear on flex cable	Added a spacer to the carriage to keep the flex cable straight for an extended distance from the connector. Using 4926 VHB (thinner) for FFC strain relief at both ends. Verified adhesion to Delrin AF carriage.	
	Delay in thermal transfer (ramp time) with tube	Tube doesn't have good thermal contact with heating plate	Increase heat spreader height to increase thermal contact with tube and added thermal paste at junction between aluminum heat spreader and heater PCB heating element trace	Design completed, will verify once received new PCBA board
			Adding a small retention clip (multi-slide design) over the tube flange for retention.	Design completed; fitment of tube will be evaluated via functional testing
	High vibration level causing shifting of the module during operation	High reacted load and unbalanced load	Added vibration suction cups and more mass at maximal front/rear will help reduce unwanted vibration.	Design completed, will assess vibration via functional testing
	New requirement- Add externally accessible kill switch to enable shipping	N/A	N/A	Design completed, will verify functionality once received new PCBA board.




Electrical/Firmware	New requirement- Add externally accessible killer switch to enable shipping	N/A	N/A	Design completed, will verify functionality once received new PCBA board
	Delay in thermal transfer (ramp time) with tube	Insufficient power PWM	TBD, design mitigation to be identified.	
	Current "power switch" operation engage battery protection FETs, thus locking out battery connection. The USER must connect USB-C to enable operation again		Add an RL circuit that will trigger a FET to temporarily short protection circuit grounds to eliminate the need for USB to close Q1/Q2	Design completed, will verify functionality once received new PCBA board
	Fuel Gauge algorithm relies on accurate battery temperature during Charge/discharge. Not measuring battery temperature will create fuel gauge error and thus Software based thresholds (undervoltage lockout) will not be accurate		Adding temperature sensor between battery packs directly above the FFC to monitor cell temperature for fuel gage purposes and if the FFC has opens that cause resistive heating issues (FFC potential failure mode)	Design completed, will verify functionality once received new PCBA board
	Shutting down Motor PWM causes voltage spike on MOTOR-VCC	Inductive load causing sudden voltage spike when supply current is cut	Operate motor under minimum specified voltage to give peripheral electronics margin when spike occurs Firmware: Config variable for Hall effect sensor threshold Move I2C devices around on lines/IO allocations Graceful motor off timing of PWM and power supply off sequence Enable low battery lockout	Design in progress Following test are in-progress - Motor has been tested and stressed to prove new proposed circuit will work properly. - Reworked PCAs from first build using an additional 220uF cap are running motors at CCG and Odic
	Missing temperature measurement of battery may lead to incorrect SoC calculation thus battery pack may not deliver rated number of RUNs per battery charge (over lifetime)		Verify energy consumption for single RUN cycle - Quantify to SoC change - Map to number of cycles per charge GHL would like to understand battery degradation based on	Design in progress

			load conditions, ambient conditions, and charging conditions - Test: how many charge cycles will the battery pack not be able to do 24 RUNS on a single charge	
	Battery fatigue mismatch may cause individual cell premature failure	Battery configuration in 4P, not accounted for by battery charger circuit	TBD, design mitigation to be identified	
Inputs / Outputs				
Inputs: <ul style="list-style-type: none">- Mechanical:<ul style="list-style-type: none">o Sample Prep CAD 2024-08-01- Electrical:<ul style="list-style-type: none">o NAATOS Sample Prep Rev. B Complete List of Schematic Changes, 2024-08-19o NAATOS Sample Prep Heater Board- Rev A, 2024-08-19o NAATOS Sample Prep Main Board- Rev B, 2024-08-19- Firmware:<ul style="list-style-type: none">o Software Code: NAATOS_V2.0ao CCG Bug Tracker				
Outputs: <ul style="list-style-type: none">- Shared understanding of design status of the Sample Prep Module and alignment on next steps				

Next Steps

Decisions Made		
<p>GHL and CCG have aligned on the current design mitigations and the follow-up testing needed to verify that these mitigations address the failures observed during SG3.</p> <p>A few remaining issues (noted in table above) still require additional design mitigations, which CCG will work on in collaboration with Odic to resolve.</p>		
Action Items		
Description	Owner(s)	Target Date
Follow up design review once all design mitigations have been implemented	Ming Dong (GHL) Mark Flanagan (CCG)	Beginning of Oct

Approval Signatures

Print Name	Title	Signature	Date
Ming Dong	Director, Product Development NAATOS Technical Lead	 Ming Dong (Oct 1, 2024 09:05 PDT)	1-Oct-2024
Jamie Purell	Director, Product Development NAATOS Project Lead	 Jamie Purell (Oct 1, 2024 22:21 GMT+5.5)	1-Oct-2024
Mark Flanagan	President, CCG/Scitus Engineering		4-Oct-2024











NAATOS V1 Sample Prep Module Technical Review 2024 Aug 21

Final Audit Report

2024-10-04

Created:	2024-10-01
By:	Stacy Hyatt (stacy.hyatt@ghlabs.org)
Status:	Signed
Transaction ID:	CBJCHBCAABAA3VibXNvkx7edAbo_hC1QJ1SZ2bTkrOcc

"NAATOS V1 Sample Prep Module Technical Review 2024 Aug 21" History

-  Document created by Stacy Hyatt (stacy.hyatt@ghlabs.org)
2024-10-01 - 3:29:59 PM GMT
-  Document emailed to Ming Dong (ming.dong@ghlabs.org) for signature
2024-10-01 - 3:30:04 PM GMT
-  Document emailed to Jamie Purcell (jamie.purcell@ghlabs.org) for signature
2024-10-01 - 3:30:04 PM GMT
-  Document emailed to Mark Flanagan (mflanagan@ccgonline.net) for signature
2024-10-01 - 3:30:05 PM GMT
-  Email viewed by Ming Dong (ming.dong@ghlabs.org)
2024-10-01 - 3:57:24 PM GMT
-  Document e-signed by Ming Dong (ming.dong@ghlabs.org)
Signature Date: 2024-10-01 - 4:05:28 PM GMT - Time Source: server
-  Email viewed by Jamie Purcell (jamie.purcell@ghlabs.org)
2024-10-01 - 4:50:13 PM GMT
-  Document e-signed by Jamie Purcell (jamie.purcell@ghlabs.org)
Signature Date: 2024-10-01 - 4:51:18 PM GMT - Time Source: server
-  Email viewed by Mark Flanagan (mflanagan@ccgonline.net)
2024-10-04 - 11:43:58 AM GMT
-  Document e-signed by Mark Flanagan (mflanagan@ccgonline.net)
Signature Date: 2024-10-04 - 11:48:37 AM GMT - Time Source: server

✔ Agreement completed.

2024-10-04 - 11:48:37 AM GMT