




	<h1>REXUS/BEXUS</h1> <h2>Critical Design Review</h2>	Experiment Team:	CHAOS
		Vehicle and Flight number:	BX35
Location: ESA ESTEC		Date: 17.05.2024	
			 

Review Board Members:

Simon Mawn (ZARM, chair)
 Steffen Calmer (ZARM)
 Sophia Wolters (ZARM)
 Merle Cornelius (ZARM)
 Esmée Menting (SSC)
 Emil Nordqvist (SSC)

Lars Pepermans (SSC)
 Romina Gaudio (SSC)
 Maximilian Nürnberger (ESA)
 Gloria Gelosa (ESA)
 Koen DeBeule (ESA)
 Dorota Budzyn (ESA)

Experiment Team Members:







Ava Pohley (TL, present)
 Hannes Ebeling (TL, present)
 Pierre Bornfleth (present)
 Hannah Sophie Grimm (present)
 Janna Martens

Jasper Mess (present)
 Justus Mickausch
 Clara Pittschellis (present)
 Nicolas Rohrbeck
 Lars Rahn (present)



Review Result: pass

Next SED version V3 due to 22.07.2024

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 German Space Agency at DLR	 Rymdstyrelsen Swedish National Space Agency			

Explanation of the Report:

In the following document the board member comments are sorted by the chapters of the SED beginning with SED chapter 2. Comments are divided into RIDS and Remarks:

- **RID** (Review Items Discrepancy) is the mechanism used to record questions or identified problems and solutions arising from examination of the review documentation and discussion. They are issues, identified by a reviewer, that are not compliant with a requirement, a review objective or a design goal. A RID will be followed up during the next project steps by the organizers and must be fulfilled by the team in order to pass the review.
- **Remarks** contain considerations a team should make and recommendations from the board members.

1 General

1.1 Presentation

1.2 SED (editorial)

- No comments!

2 REQUIREMENTS AND CONSTRAINTS

REMARK: Not all comments from PDR were followed

REMARK: P.2.1.: Base the requirements on your science and look for components based on the requirements.

REMARK: All requirements need verification.

REMARK: Include range, accuracy, and frequency for measurements.

REMARK: Missing design requirement regarding vibration and shock.

REMARK: Define an acceptable leak rate.

REMARK: 14kg is quite high, make the upper limit lower. The mass affects the altitude the balloon can reach.



REMARK: Design is what you need, constraint could be if your professor wants you to use a specific sensor.

3 PROJECT PLANNING

3.1 WBS

REMARK: The descriptions of work packages are not consistent with figure 3.1.

REMARK: Maybe mark which subtasks are completed in figure 3.1.

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REMARK: Some groups only have one work package. Split it up and provide more details. If it is on the same person, it is easier to keep track.

3.2 Schedule

REMARK: Don't plan on finishing work packages at launch campaign. Mechanical, software, and tests should be done before. Make sure it is clear in your schedule to have the respective deadlines in mind.

3.3 Resources

REMARK: Don't note ZARM only. DLR/ZARM

3.4 Outreach

3.5 Risks

REMARK: Reduce the probability after testing e.g. TC02-1 / TC02-2.

REMARK: High-voltage severity is 4 not 5. Maybe separate into pre-flight ground handling and recovery.

REMARK: Section 6 is meant for externals who don't care that much about your experiment. For them it is important what can impact personnel or gondola, mission, flight... other details go in section 3.

4 EXPERIMENT

4.1 Mechanics

RID: Explain the sealing of the housing in more detail, check for compliance and performance at the temperature expected.



REMARK: Concerns about the stiffness of the U-profiles since they have a cut out. Think about welding the two pieces.

REMARK: Specify the torque for the rods, make it a reliable and repeatable process.

REMARK: Go into more detail regarding the aerogel block fixation with springs. Add pictures and/or technical drawings.

REMARK: Explain the fixation of the electrical components.

REMARK: Structural integrity of long bolts is critical. Maybe lower the dampers into the bottom insulation, put experiment closer to the rails. Think about just mounting the experiment on the rails and then do foam housing around. Additionally, maybe use countersunk screws to mount directly to the baseplate and skip standoffs. Maybe do a FEA to make sure it holds all loads of the flight sequence.

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REMARK: Missing justification on 10g if requirement on the loads is met.

REMARK: Show the mounting of all parts in the SED. Use schematics or similar and make it more visible.

REMARK: Descriptions on how to mount everything inside the box is missing in the SED. Make it more visible. Connections of shelves on L-brackets? Thicknesses? Bending radii? How is it manufactured? More information needed on the mechanical parts, good mix of explanatory CAD renderings and technical drawings.

4.2 Electronics

REMARK: It would be nice to have the schematics beside the description for better understanding.

REMARK: The grounding concept is okay, but more details on how it would physically work on your experiment is needed.

REMARK: Is the power microcontroller the master? Seems like it from the text, make clear that it is only for the HV part.

REMARK: HV multiplier voltages is not mentioned in the SED, was already commented during PDR.

REMARK: How many pins, where what connected, interfaces? Provide more details in the SED, maybe exploded view of the stack.

REMARK: Missing description on physical interfaces of electronic parts.

REMARK: Power budget is not based. How much do your self-made boards draw? Give a break down and where your numbers come from. Your network, microcontrollers, converters all draw power and this needs to be included. Since this is also your only heating source and no active control exists this needs to be precise.

REMARK: Which power regulator are you using?

REMARK: Give details in the SED about the interface between the e-box to detectors.

REMARK: Ethernet to DSub – give more details in the SED.

REMARK: consider coating your HV board.

REMARK: For flight heritage: describe the interfaces and characteristics but you don't have to go into detail regarding its design (reference the old SED or similar where it is described). Of course, you have to understand it to handle it and fix errors.

REMARK: Section 4.6.5 mentions ethernet on the HV board. Please make sure your block diagram is updated.

REMARK: In section 4.6.7 it is not clear what the nominal end voltage of the HV multiplier is.







4.3 Thermal

REMARK: Define the thermal critical components.

REMARK: Please also add diagrams shown in the presentation to the SED or mention in the according place that it is uploaded.

REMARK: Your concept is very dependent on testing. Think about how you would tackle different test outcomes, plan options ahead.

REMARK: Prove thermal resistance of the sealing in the expected environment.

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4.4 Software

REM: Experiment Shut down is controlled via pressure sensor logic. Make sure to have possibility to manually and remotely overwrite logic in case of sensor malfunction.

5 VERIFICATION AND TESTING

5.1 Verification Matrix

REMARK: Use not only review but also test for performance requirements.

REMARK: The experiment must be on during vibration test and maybe connected to the ground station.

6 LAUNCH CAMPAIGN PREPARATION

REMARK: Give the position of the centre of gravity in numbers.

REMARK: Provide IP number and addresses, peak power and current (both).

REMARK: Dare to state flight requirements more clearly and demanding.