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PRELIMINARY DESIGN REVIEW OF THE FAST BEAM INTERLOCK SYSTEM CHARGE DOCUMENT

1. OBJECTIVE AND PURPOSE

The Fast Beam Interlock System (FBIS) is part of the Machine Protection System of Systems that, together with the other MP-related systems, realizes the ESS *Protection Functions*. Consequently, the FBIS specification (System Requirements Specification, System Architecture Specification, Sub-System Requirements Specification, etc.) directly depends on the Protection Functions, which themselves are based on the overall ESS Hazard and Risk Analysis.

The overall ESS Hazard and Risk Analysis, as well as the definition of Protection Functions, are still under development. Therefore, a *Concept of Operation*, *Benchmark Use Cases*, *Driving Requirements* and drafts of Protection Functions have guided the FBIS development.

A finalized System Requirements Specification for the FBIS is not yet available but exists in a draft version. The same applies to a finalized System Architecture Specification. Nevertheless, architectural design options have carefully been analyzed and documented and a proposal for the FBIS architecture exists.

This PDR will cover:

- The FBIS Concept of Operation
- The FBIS driving requirements and design constraints
- The FBIS System Requirements Specification and the verification strategy
- The FBIS architecture design options
- The proposed FBIS architectural building blocks:
 - The concept behind these blocks
 - The interfaces of them
 - The functional behavior of the blocks
 - The combination possibilities to form concrete architectures

The primary goal of this PDR is to:

- Assess whether the building blocks are fit for their purpose
- Assess whether the ESS protection integrity and availability requirements are likely to be satisfied with the proposed blocks and their interfaces
- Decide whether work on the FBIS can continue as up to now

Once the Protection Functions have been finalized and passed the reviews, the concrete FBIS System Architecture Specification can be developed, which then formally acts as work product for the coming FBIS development phases. The FBIS System Architecture Specification will simply reflect one concrete “setup” of the architectural building blocks reviewed in this PDR.

2. REVIEW ATTENDANTS

2.1. Review Committee

- Rüdiger Schmidt (chair)
- Jan Uythoven
- Bruno Puccio
- Annika Nordt
- Timo Korhonen

2.2. Reviewers

- Szandra Kövecses (via Skype)
- Enric Bargalló
- Stephane Gabourin
- Simone Farina
- Manuel Zaera-Sanz
- Riccard Andersson

2.3. Presenters

- Christian Hilbes
- Martin Rejzek
- Sven Krauss

3. CHARGE QUESTIONS

1. Has the FBIS preliminary design been documented appropriately and presented in a suitable format to enable review?
2. Does the Concept of Operation fulfill the ESS needs? Does the concept integrate well with other systems?
3. Have all relevant driving requirements for the FBIS been identified? Have they been assessed adequately?
4. Have the major architectural design options been successfully identified? Have they been adequately analyzed?
5. Is the architectural design proposal likely to fulfill the concrete architectural FBIS requirements?
6. Have the components, interfaces and functions of the architectural design proposal been adequately defined for this stage of the project?
7. Is the verification and validation strategy appropriate for the FBIS?
8. Have reliability and availability aspects been considered in the design choices at a level appropriate for this stage of design?
9. Have the project risks and opportunities been properly identified and their impact considered? If required, is there a mitigation plan?
10. Is the conceptual design mature enough to begin detailed design?

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11. Is additional input from ESS or the other partners required for ZHAW to proceed with the detailed FBIS design?

12. Were any other issues identified during the review?

The results of the review should be summarized in a short report, outlining the answers to the review charge questions and whether the review is considered passed, passed with action items, or failed. The report may also provide findings, comments, and recommended actions.

4. DELIVERABLES

The following documents are to be delivered to the review committee before the review takes place. The sequence represents *the proposed reading sequence!*

Sequence	Document Name	Description	Status
1.)	FBIS_ConceptOfOperation	This document explains how the Fast Beam Interlock System (FBIS) will behave as part of ESS Machine Protection in the context of ESS operation.	Reviewed by ZHAW and ESS
2.)	FBIS_Architectural_Design_Options	This document systematically summarizes and analyzes the driving requirements for the architectural design of the ESS Fast Beam Interlock System (FBIS) and collects the main architectural design options that have been considered so far. ¹	Reviewed by ZHAW ¹
3.)	FBIS_Architectural_Design_Proposal	This document contains a proposal for architectural building blocks and their interfaces. To some extent also realization ideas are included. The proposal is based on the evaluation of 2.). The document does not contain the final, concrete FBIS architecture.	Reviewed by ZHAW

¹ This document was originally planned as ZHAW-internal document. It is written in a rather informal style. However, as it helps to understand the architectural design proposal and provides a lot of background information, this document has been added to the list of deliverables for this PDR.

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4.)	FBIS_SRS	<p>This document contains the complete specification for functional and non-functional requirements for the FBIS on system level.</p> <p><i>This document is provided for your reference. It will not be further discussed during the PDR.</i></p>	Draft
5.)	FBIS_VCRM	<p>This document contains the verification ideas and techniques for the FBIS_SRS including acceptance criteria.</p> <p><i>This document is provided for your reference. It will not be further discussed during the PDR.</i></p>	Draft
-	MP Glossary	<p>Document containing definitions and explanations of terms that are used in the context of Machine Protection at ESS.</p>	-