

CHARGE DOCUMENT FOR THE LOKI PERSONNEL SAFETY SYSTEM PRELIMINARY DESIGN REVIEW

Preliminary Design Review (PDR)
10 December 2021, Lund, Sweden

Charge for the PDR

1. PURPOSE OF THIS PDR

The purpose of this PDR is:

- To confirm that the requirements derived from the LoKI hazard analysis (HA), initiating events, required safety functions, and safety integrity requirements are well understood, defined and documented.
- To confirm that preliminary design and concepts of operation for LoKI PSS sufficiently cover derived requirements from the LoKI HA.
- To confirm that functional architecture and concepts of operation for ESS PSS sufficiently cover the functions and interfaces required by the instruments.
- To clarify requirements for radiation monitoring for instruments and potential interfaces with PSS.
- To clarify requirements and procedures for shielding management for the LoKI and instruments in general (e.g. requirements for shielding blocks interfaced by PSS vs the ones interfaced/managed by RP).
- To confirm that proper components have been selected for LoKI PSS (e.g. with regards to the ambient conditions) and to clarify the impact of this selection on PSS requirements for maintenance and proof testing.
- To clarify requirements on instrument PSS maintenance modes and their interaction with other ESS PSS system.

The PDR also covers planning for future LoKI PSS activities.

2. SUPPORTING DOCUMENTATION

The expected outputs of ESS PSS concepts, LoKI PSS safety analysis and preliminary design, which should be presented and reviewed in this PDR, will be documented in the following documents:

- LoKI Hazard Analysis (IHA) [ESS-1084771](#)
- SIL Assessment for LoKI PSS [ESS-3731373](#)
- Concepts of Operation (ConOps) for LoKI PSS [ESS-2698795](#)
- Concepts of Operation for ESS PSS [ESS-2595616](#)
- ICD for LoKI PSS [ESS-2443067](#)
- Verification and Validation Plan for LoKI PSS [ESS-3739994](#)

Optional:

- Safety Requirements Specification for LoKI PSS [ESS-3731374](#)

3. PDR COMMITTEE AND OBSERVERS

The PDR committee consists of:

- Timo Korhonen, ICS, Chief Engineer (chair)
 - *to review as ICS division technical lead, and also integration into ICS.*
- Jonathan Taylor, Acting Head of Division NSS, DMSC Division
 - *to review from NSS overall perspective and provide input when a general decision on NSS PSS is required*
- Andrew Jackson, Group Leader for Instrument Scientists Group
 - *to review requirements derived from instrument IHA*
- Thomas Gahl, Group Leader for Motion Control & Automation Group
 - *to review instrument PSS interfaces with MCA*
- Sigrid Kozielski, Group Leader Radiation Protection, Radiation Protection Group
 - *to review RP requirements to instrument PSS*
- Linda Coney, Group Leader for Target Control and Safety Group
 - *to review impacts of instrument PSS functions on Target*
- William Halcrow, LoKI lead engineer, ISIS, STFC, UK
 - *to review the design and interfaces as a LoKI lead engineer*
- Helen Boyer, Group Leader for Occupational Health & Safety Group
 - *to review OHS requirements to instrument PSS*

Observers:

- Joanna Weng ZHAW, Switzerland
- Pascale Deen, Instrument Scientist - Cold Neutron Spectroscopy, Instrument Scientists Group
- Judith Houston, Instrument Scientist for LOKI, Instrument Scientists Group
- Clara Lopez, Senior Mechanical Engineer, Mechanical Engineering & Technology Section
- Kristina Jurisic, Automation Engineer Motion Control, Motion Control & Automation Group
- Gábor László, Instrument Engineer Section Leader, NSS Instrument Engineering
- Ari Benderly, Senior Security Officer, ESH&Q Directorate
- Thomas Hansson, Senior Radiation Safety Engineer, ES&H Division
- Helena Ramsing, Occupational Health and Safety Engineer, NSS Planning & Coordination Group
- Martin Carroll, Engineer for Safety Critical Control Systems, ICS

4. COMMITTEE CHARGE

The supporting documentation will be provided to the committee at least 5 days in advance on the Indico page, which will also contain the agenda and presentations:

<https://indico.ess.lu.se/event/2883/>

- 09:00 Committee discussion (closed)
- 09:15 The overview of ESS PSS Concepts of Operation
 - *Presented by: Morteza Mansouri, Technical Lead/Senior Engineer for PSS, ICS, Protection Systems Group*
- 09:45 The summary of LoKI hazard identification and risk assessment
 - *Presented by: William Halcrow, LoKI lead engineer, ISIS, STFC, UK*
- 10:15 LoKI PSS safety analysis
 - *Presented by: Denis Paulic, Deputy Group Leader for Protection Systems Group, ICS, (on behalf of Fan Ye, PSS Safety Engineer and Isograph Expert, ESC, UK)*
- 10:45 Coffee break
- 11:00 Strategy for RP and REMS for instruments
 - *Presented by: Joffrey Germa, Radiation Protection Engineer, Radiation Protection Group, ES&H*
- 11:30 LoKI PSS overview, ConOps and interfaces
 - *Presented by: Jessica Lastow, Technical Documentation Specialist (LoKI PSS integrator), Protection Systems Group*
- 12:15 Lunch break
- 13:15 Requirements for Instrument PSS components selection and electrical design
 - *Presented by: Anton Andersson, Electrical Designer, Electrical and I&C Section*
- 13:45 LoKI PSS plan and schedule
 - *Presented by: Annika Nordt, Group Leader for Protection Systems Group, ICS*
- 14:10 Committee deliberations (closed)
- 15:10 Closeout

The committee is asked to consider the following questions:

1. Are all or a sufficient coverage of requirements, safety objectives and specifications within the scope of this PDR properly documented and understood?
2. Does the LoKI IHA cover all hazards and hazardous events where PSS function is or could be required as a mitigation?
3. Have all safety requirements from the LoKI IHA been addressed and all initiating events sufficiently evaluated in the LoKI PSS SIL assessment?
4. Is the approach for the initiating event where a person is missed by search and operation initiated acceptable?
5. Are the presented set of identified Safety Instrumented Functions (SIFs) properly formulated, and do they fulfil the overall safety functions derived from the LOKI IHA?
6. Is the LoKI PSS preliminary design and procedures in line with the RP strategy for instruments? Is the link between LoKI PSS (as a typical instrument PSS) and REMS clearly and appropriately defined?

7. Should LoKI PSS interface the radiation monitor next to the instrument shutter in order to have an independent signal to inform people about the shutter's position?
8. Are all operating concepts for LoKI PSS (as a typical instrument PSS) and interfaces with other systems understood and properly documented?
9. Are the operating concepts for LoKI PSS and overall concept for ESS PSS good enough to be used as a basis for other Instrument PSS systems?
10. Do the components to be used in LoKI PSS fulfil the requirements for environmental conditions in LoKI (e.g. level of radiation, magnetic field, EMI, etc.)? Can they be generally used in other instrument PSS?
11. Are the maintenance intervals for PSS components in line with the maintenance plan for LoKI? Can it be generally applied to other instrument PSS?
12. Is the verification and validation sequence for LoKI PSS well understood? have all dependencies on other systems been identified?
13. Does the presented planning for LoKI PSS follow the NSS commissioning planning?
14. Are there any outstanding agreements to be made or other actions necessary to allow the PSS team to proceed with system design and preparation for the critical design review?

The results of the review should be summarized in a short report, outlining the answers to the above review questions and whether the review is considered passed, passed with action items, or failed.

The report may also provide findings, comments, and recommended actions. Actions should be clearly categorized as one of the following:

- Shall be addressed before PDR is considered closed
- Shall be addressed prior to the CDR