EUROPEAN
SPALLATION
SOURCE

Motion Control & Automation (MCA)

System Acceptance Review LOKI

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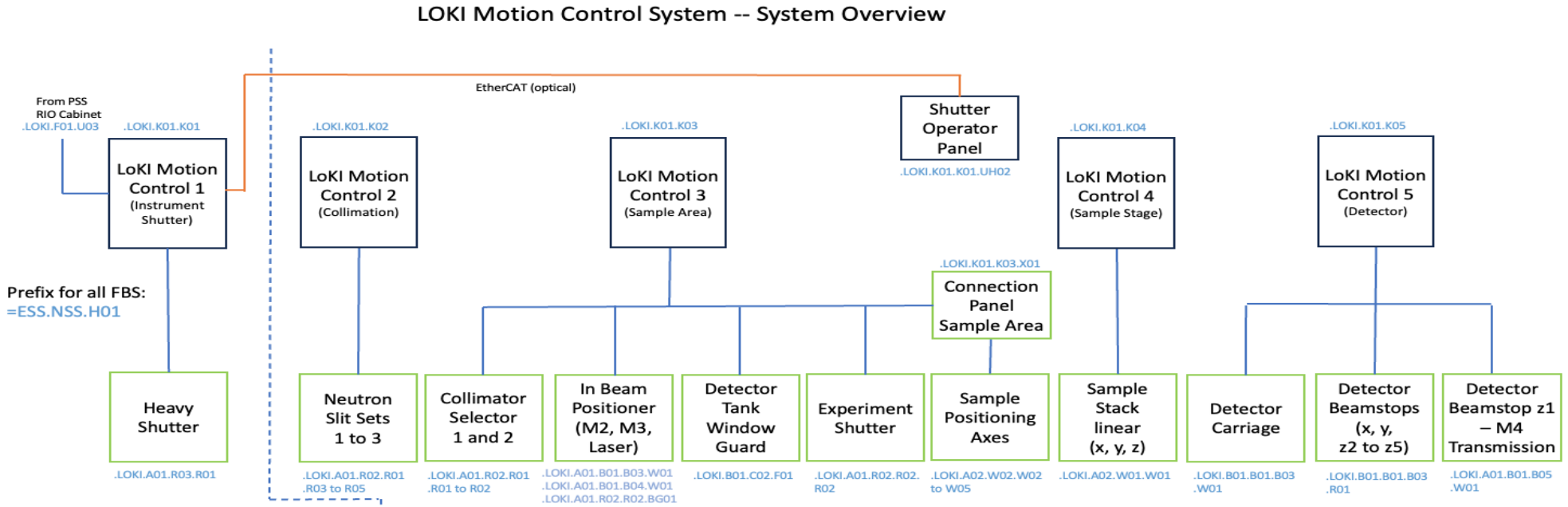
LOKI Local Test (SAT 1)



MCA Control System	Connected Instrument Subsystems	Test Reports	Status
MC1 Instrument Shutter	Instrument Shutter	ESS-5694413	Passed w/ Minor Issues
MC2 Collimation	Neutron Slit sets 1 to 3	ESS-5694417	Passed w/ Minor Issues
MC3 Sample Area	Collimator Selectors 1 and 2, In-Beam Positioner M2 and M3, Laser Mirror, Window Guard, Experiment Shutter, Sample Positioning Axes	ESS-5694420	Passed w/ Minor Issues
MC4 Sample Stage	Sample Stack x, y and z	ESS-5770634	Passed w/ Medium Issues
MC5 Detector	Detector Carriage, Detector Beamstops x, y, z2 to z5, Detector Beamstop z1–M4 Transmission	ESS-5699646	Passed w/ Minor Issues

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LOKI Local Test (SAT 1) – MC 1 (Instrument Shutter)
Report ESS-5694413

System name	FBS	FAT/DAT Status	SAT1 Status	Issue Tracker	Issues	To be fixed before
LOKI Instrument Shutter	LOKI.A01.R03.R01	No issues	Minor Issues	NIT-127	Type of pneumatic error not shown in Epics/Nicos.	Before SRR.

- Test cases for motion control functionality passed.
- SAT 2 with PSS and CUP passed.
- Shutter Operation via Shutter Operator Panel works.
- Descriptive error handling for pneumatics development on going.

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LOKI Local Test (SAT 1) – MC 2 (Collimation)
Report ESS-5694417

System name	FBS	FAT/DAT Status	SAT1 Status	Issue Tracker	Issues	To be fixed before
Neutron Slit Set 1	LOKI.A01.R02.R01.R03	No issues	Minor Issues	NIT-208	Update TwinCAT software to be able to define the centre and the gap for the neutron slits from Epics/Nicos.	Before ORR.
Neutron Slit Set 2	LOKI.A01.R02.R01.R04					
Neutron Slit Set 3	LOKI.A01.R02.R01.R05					
MCC2	LOKI.K01.K02	No issues	Minor issues	NIT-333	As-built ePlan drawings.	Before ORR.

- Test cases for motion control functionality passed.
- Update software to be able to define the center and the gap of the slits from Epics/Nicos.
- As-built ePlan drawings.

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LOKI Local Test (SAT 1) – MC 3 (Sample Area)
Report ESS-5694420

System name	FBS	FAT/DAT Status	SAT1 Status	Issue Tracker	Issues	To be fixed before
Window Safety Guard	LOKI.B01.C02.F01	No issues	Minor Issues	NIT-214	Type of pneumatic error not shown in Epics/Nicos.	Before SRR.
Experiment shutter	LOKI.A01.R02.R02.R02	No issues	Minor Issues	NIT-185	Type of pneumatic error not shown in Epics/Nicos.	Before SRR.
MCC3	LOKI.K01.K02	No issues	Minor Issues	NIT-335	As-built ePlan drawings.	Before ORR.

- Test cases for motion control functionality passed.
- Descriptive error handling for pneumatics development on going.
- As-built ePlan drawings.

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LOKI Local Test (SAT 1) – MC 4 (Sample Stage)
Report ESS-5770634

System name	FBS	FAT/DAT Status	SAT1 Status	Issue Tracker	Issues	To be fixed before
Sample Stack	LOKI.A02.W01.W01	Sample stack Axis Z not tested during DAT.	Issue	NIT-215	Absolute encoder used for the axis does not read correctly during the whole travel range. The reason is misalignment of the encoder reading head and the scale tape, due to the type of the scale tape used for this axis. Mitigation: Change the encoder scale tape to self-adhesive one, for easier alignment to the reading head.	Before ORR.
MCC4	LOKI.K01.K04	No issues	Minor Issues	NIT-336	As-built ePlan drawings.	Before ORR.

- Test cases for motion control functionality for axes x and y of sample stack passed.
- Test cases for motion control functionality in closed loop for axis z of sample stack has failed.
- Replacement encoder measuring tape has been ordered, estimated delivery time ~12 weeks.
- As-built ePlan drawings.

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LOKI Local Test (SAT 1) – MC 5 (Detector)
Report ESS-5699646

System name	FBS	FAT/DAT Status	SAT1 Status	Issue Tracker	Issues	To be fixed before
Detector Beamstop adjustment x, y	LOKI.B01.B01.B03.R01	Issues fixed after the replacement of encoder reading head on axis x adjustment.	Minor issue	NIT-340	Cabling management in the detector vessel for the Beamstops needs improvement. Some labels missing.	Before ORR.
Detector Beamstop 1 – M4 Monitor	LOKI.A01.B01.B05.W01					
Detector Beamstop 2 to 5	LOKI.B01.B01.B03.R01					
MCC5	LOKI.K01.K05	No issues	Minor issue	NIT-337	As-built ePlan drawings	Before ORR.

- Test cases for motion control functionality passed.
- Interlock for the Detector Beamstops selection tested.
- Improve cable management for the Beamstops subsystem inside the detector vessel.
- As-built ePlan drawings.

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LOKI Local Test (SAT 1) – Status of Motion Safety (compliance to Machine Directive)

- The cabinet design includes safety circuits according to EN ISO 13849-1 for a safe stop of the moving parts of the instrument subsystems. E-stops are either installed permanently or temporarily. These stop categories according to EN 61800-5-2 can be implemented:
  - Safety Torque Off (**STO**)
  - Safe Stop 1 (**SS1**)
- IHA is reviewed; hazards related to motion safety systems controlled by MCA control systems have been transferred to the MCA documentation (sheet 3 of Table-of-Motion, ESS-0114726); work will be executed by the Common MCA (CMCA) project.

- Hazard analysis has been started according to ESS-5467337 - Motion Risk Analysis of Neutron Instruments:
  - Operation = Hazards in Areas accessible to the user; Implementation of hazard mitigation in the control system (SRP/CS)
  - Maintenance: Hazards in shielded areas accessible to trained personnel only; Implementation of hazard mitigation with procedures (RAMS, fencing, signage etc.)

- The full motion safety system verification and validation will be done together with PSS before the Safety Readiness Review (i-SRR).

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LOKI Local Test (SAT 1) – Summary

- All test cases for motion control functionality and performance passed, except for LOKI MCC4 Sample stack Z axis. Retesting of the subsystem will be done after the needed encoder part is delieverd and installed.
- Minor issues, mainly software related like proprely propagating pneumatic errors from motion control software to Epics/Nicos.
- We will release as-built ePlan drawings for MCC2, MCC3, MCC4 and MCC5.

- Tickets filed in the NSS Issue Tracker (NIT):
  - NIT-127: Pneumatics Errors handling; to be resolved before SRR, in progress
  - NIT-214: Pneumatics Errors handling for Window Guard; to be resolved before SRR, in progress
  - NIT-185: Pneumatics Errors handling for Experiment Shutter; to be resolved before SRR, in progress
  - NIT-208: Define width/height of the LOKI neutron slits; to be resolved before hot commissioning
  - NIT-333: As-built ePlan drawings for MCC2; to be resolved before hot commissioning
  - NIT-335: As-built ePlan drawings for MCC3; to be resolved before hot commissioning
  - NIT-215: Replace encoder on the LOKI sample stack Z Axis; encoder parts ordered
  - NIT 336: As-built ePlan drawings for MCC4; to be resolved before hot commissioning
  - NIT-340: Improve cable management for the Beamstops subsystem inside the detector vessel
  - NIT 337: As-built ePlan drawings for MCC5; to be resolved before hot commissioning

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LOKI Local Test (SAT 1) – Next steps

- After fixing the NIT issues, the motion control systems for LOKI are ready for operation in Hot Commissioning.

- MCA group is planning to support hot commissioning with these activities:
  - Support instrument team with motion related issues.
  - Technician support if requested.
  - Engineering support if requested.

- User and maintenance manuals for the cabinets are available:
  - ESS-5483415 - Service & Maintenance Plan for MCA Cabinets and Boxes
  - ESS-5669197 - Operation Manual - MCU6001: Shutter Motion Control Cabinet
  - ESS-5669198 - Operation Manual - MCU5001: 16Ax. Motion Control Cabinet
  - ESS-5669199 - Operation Manual - MCU5002: Servo Motion Control Cabinet
  - ESS-5669200 - Operation Manual - MCU5003: Piezo Motion Control Cabinet

- No displaced working hours or on-call support planned.


Thank You!
2025-09-17