

ATLAS-ALFA interlock validation

Sune Jakobsen (EP-UAT) on behalf of ATLAS-ALFA

152th MPP 22-09-2017

ALFA Interlock validation - overview

ALFA has been asked to get ready for special runs already in 2017 (originally foreseen for 2018).

NOTHING of the ALFA movement and interlock system has been touched since the validation in 2016.

MPP has requested “To move all pots during TS#2 and test the various position interlocks” and “To only do a few sample tests of beam mode related interlocks ”

Tests performed in TS2:

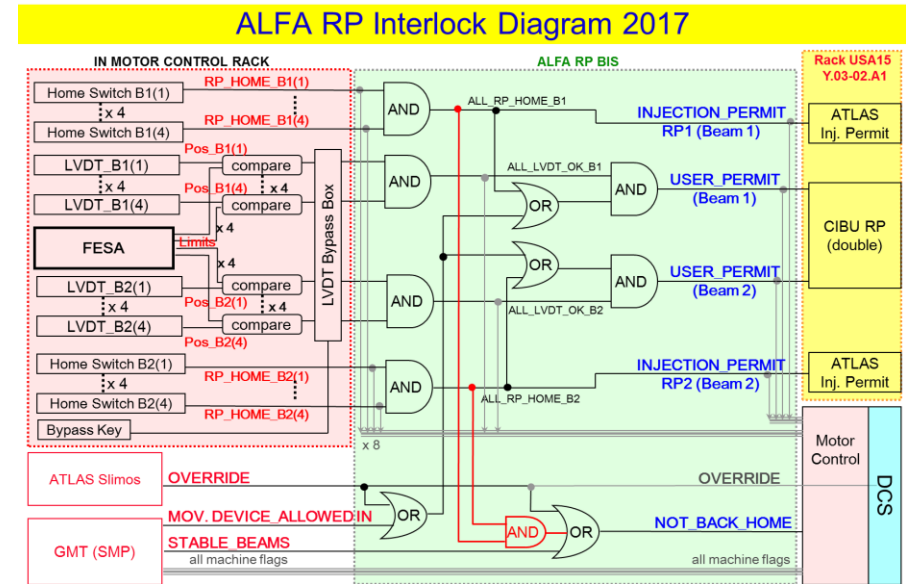
Test of Injection Permits

Test of response to the LVDT-to-limit comparison

Test of USER_PERMIT and automatic extraction as a function of all input flags – foreseen but not possible as it would delay LHC startup.

~~Test of the LVDT-bypass box~~

~~Test of hardware and software buttons~~



ALFA Interlock validation – Injection Permits result

Test performed separately on each Roman Pot on 18-05-2017 (details in collimation logbook and procedure in backup slides).

All worked correctly.

Summary table:

Short name	Station name	INJECTION_PERMIT lost [elog]	INJECTION_PERMIT recovered [elog]	INJECTION_PERMIT affected
B7L1U	XRPV.B7L1.B2	16:27	16:29	Beam2
B7L1L	XRPV.B7L1.B2	16:30	16:31	Beam2
A7L1U	XRPV.A7L1.B2	16:32	16:32	Beam2
A7L1L	XRPV.A7L1.B2	16:33	16:34	Beam2

Short name	Station name	INJECTION_PERMIT lost [elog]	INJECTION_PERMIT recovered [elog]	INJECTION_PERMIT affected
A7R1U	XRPV.A7R1.B1	16:35	16:36	Beam1
A7R1L	XRPV.A7R1.B1	16:37	16:39	Beam1
B7R1U	XRPV.B7R1.B1	16:39	16:40	Beam1
B7R1L	XRPV.B7R1.B1	16:40	16:41	Beam1

AFP Interlock validation – LVDT-to-limit comparison result

Test performed separately on each Roman Pot on 18-09-2017 (details in collimation logbook and procedure in backup slides).

All worked correctly.

Summary table:

Beam 2 (Sector 8-1)			Old Inner warning				Old Inner Dump				New Inner Dump			
			USER_PERMIT (B1, B2)				USER_PERMIT (B1, B2)				USER_PERMIT (B1, B2)			
Name	#RP	Station name	React	Extraction?	Final	Time	React	Extraction?	Final	Time	React	Extraction?	Final	Time
B7L1U	1	XRPV.B7L1.B2	1,1	Yes	1,1	17:05	1,0	Yes	1,1	17:07	1,0	Yes	1,1	17:12
B7L1L	2	XRPV.B7L1.B2	1,1	Yes	1,1	17:19	1,0	Yes	1,1	17:21	1,0	Yes	1,1	17:24
A7L1U	3	XRPV.A7L1.B2	1,1	Yes	1,1	17:29	1,0	Yes	1,1	17:31	1,0	Yes	1,1	17:33
A7L1L	4	XRPV.A7L1.B2	1,1	Yes	1,1	17:35	1,0	Yes	1,1	17:37	1,0	Yes	1,1	17:39

Beam 1 (Sector 1-2)			Old Inner warning				Old inner Dump				New inner Dump			
			USER_PERMIT (B1, B2)				USER_PERMIT (B1, B2)				USER_PERMIT (B1, B2)			
Name	#RP	Station name	React	Extraction?	Final	Time	React	Extraction?	Final	Time	React	Extraction?	Final	Time
A7R1U	5	XRPV.A7R1.B2	1,1	Yes	1,1	17:43	0,1	Yes	1,1	17:45	0,1	Yes	1,1	17:47
A7R1L	6	XRPV.A7R1.B2	1,1	Yes	1,1	17:51	0,1	Yes	1,1	17:53	0,1	Yes	1,1	17:55
B7R1U	7	XRPV.B7R1.B2	1,1	Yes	1,1	17:58	0,1	Yes	1,1	18:00	0,1	Yes	1,1	18:02
B7R1L	8	XRPV.A7L1.B2	1,1	Yes	1,1	18:05	0,1	Yes	1,1	18:07	0,1	Yes	1,1	18:08

“Ringing” (one time only) for the USER PERMIT observed for all Roman Pots.

ALFA Interlock validation – Reaction to flags

This test was NOT performed in TS2 as it would delay LHC startup.

The test is very invasive on both LHC OP and all the experiments.

Is this test really needed?

NOTHING has been touched since last validation in 2016.

All ALFA operation in 2017 will be in ADJUST with the use of the OVERRIDE key.

During all Stable Beam operation, ALFA will be in “holiday mode”, meaning LVDT-comparison bypassed and motors off by hardware.

AFP Interlock validation – Conclusion

The injection and LVDT-to-limit comparison has been performed for all ALFA Roman Pots.

All is working correctly.

Beam-mode depending tests NOT performed and suggested not to be needed.


Some “ringing observed” (one time only) on the USER PERMITS, but has no influence on safety aspects.

EDMS note in preparation: 1847628

ATLAS Project Document No.
ATL-UR-ER-0011

CERN Div./Group or Supplier/Contractor Document No.
CERN EP-ADO

EDMS Document No.
1847628



Date: 21 September 2017

Functional Specification and Test Report

**THE ATLAS-ALFA INTERLOCK LOGIC IN 2017:
SPECIFICATION AND TEST RESULTS**

Abstract

This document summarizes the re-commissioning tests performed on the ATLAS-ALFA interlock system September 2017.

<p>Prepared by : Sune Jakobsen (EP-UAT) Patrick Fassnacht (PH-ADO)</p>	<p>Checked by : Siegfried Wenig (PH-ADO)</p>	<p>Approved by : Jörg Wenninger (BE-OP) Jan Uythoven (TE-MPE) Markus Zerlauth (TE-MPE) Stefano Redaelli (BE-ABP) Daniel Wollmann (TE-MPE)</p>
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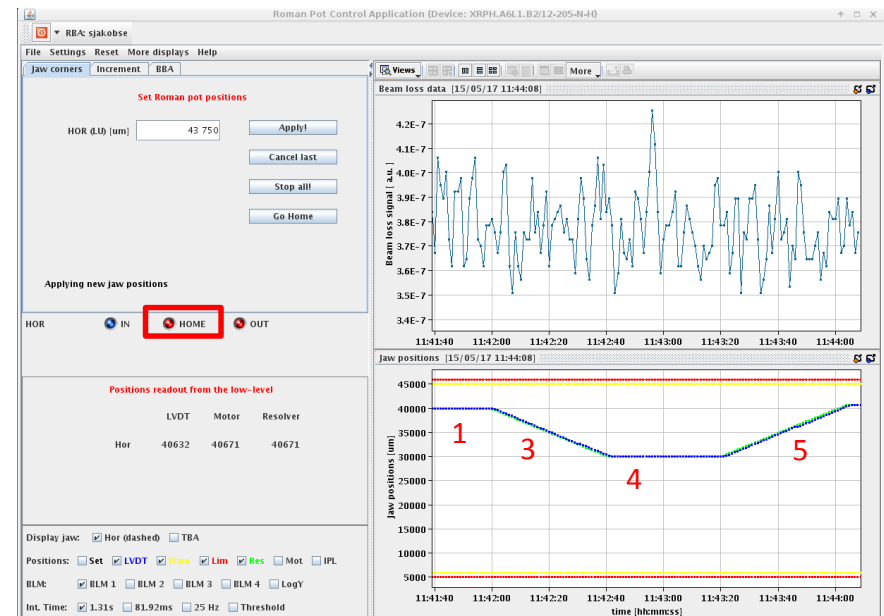
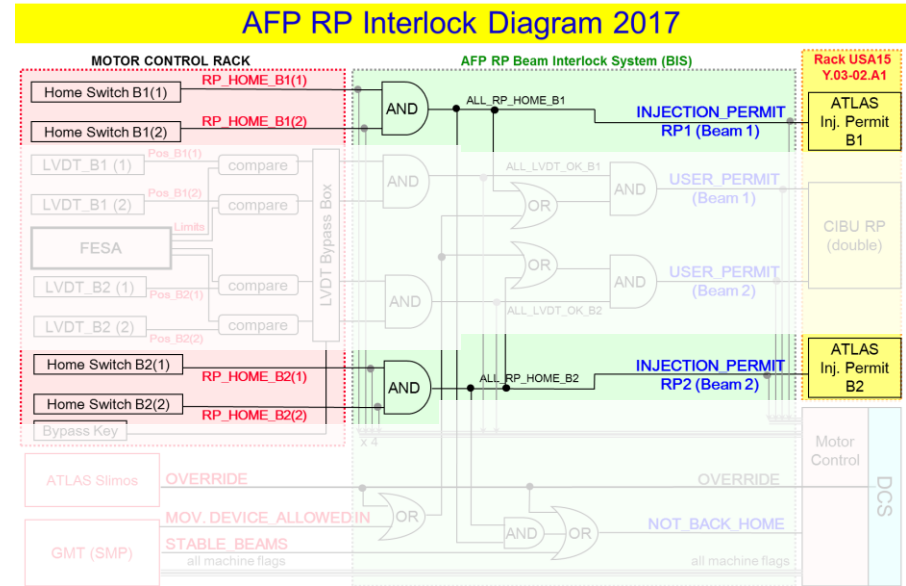
Backup

AFP Interlock validation – Injection Permits

Purpose: Check that the Injection Permit is removed if a Roman Pot is out of garage position.

Test sequence:

1. All Roman Pots at HOME position.
2. Observe that the AFP inputs to the ATLAS injection permit are TRUE.
3. Move in the Roman Pot to be tested.
4. Observe that the AFP to the ATLAS injection input for the correct beam is FALSE.
5. Move the Roman Pot to be tested to HOME.
6. Observe that the AFP inputs to the ATLAS injection permit are TRUE.



ATLAS Injection Permit = **NO**

PERMIT from BIS HARDWARE

- = INJECTION PERMIT
- = NO PERMIT, ACTION REQUIRED
- X = MASKED
- = NO PERMIT, OK

					 X	 X				
BCM	BLM	Pixel	SCT	Muons	RP1 ALFA	RP2 ALFA	RP1 AFP	RP2 AFP	Inj.Key	Global Permit

Permit without masking:

BCM	BLM	Pixel	SCT	Muons	RP1 ALFA	RP2 ALFA	RP1 AFP	RP2 AFP	PLC Connection
yes	yes	no	no	no	yes	yes	yes	no	1

AFP Interlock validation – LVDT-to-limit comparison

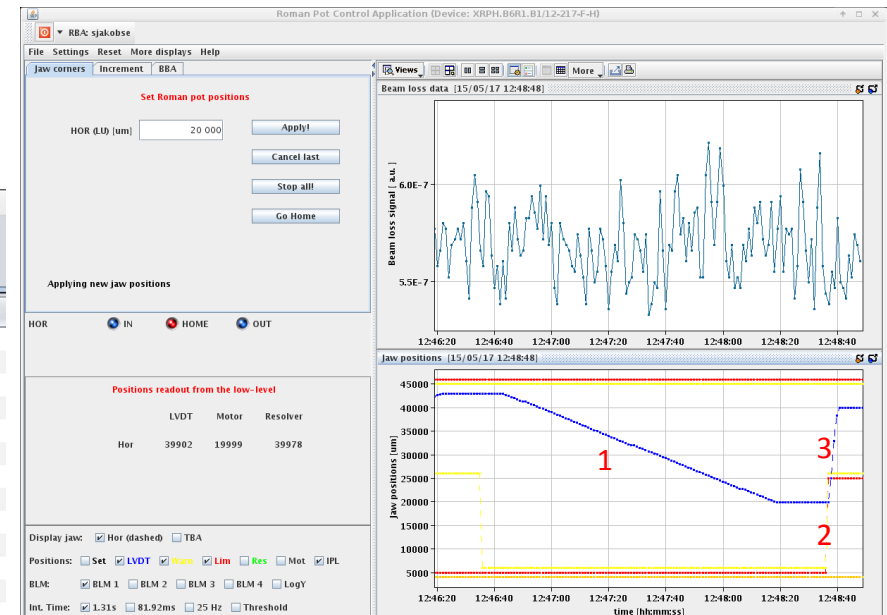
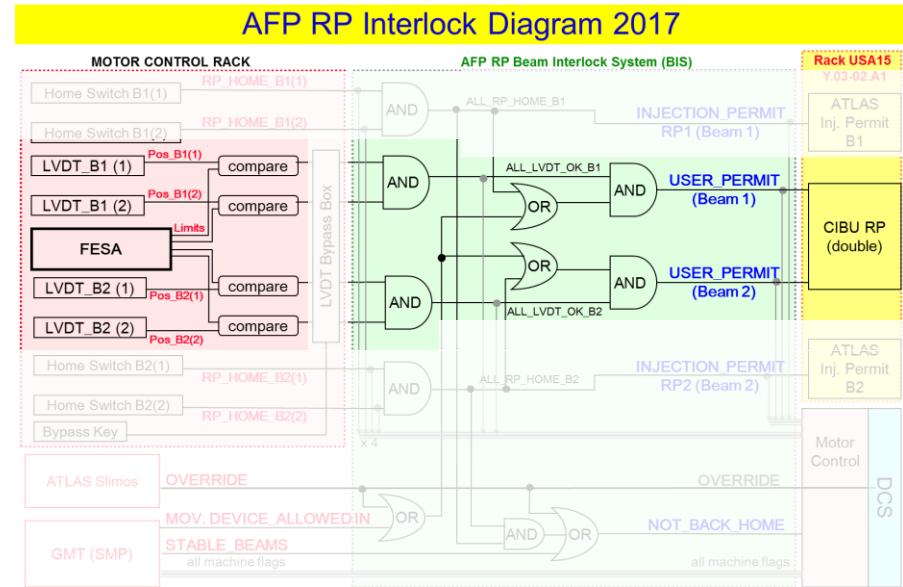
Purpose: Check of the automatic extraction and loss of USER_PERMITS when a limit is violated.

Test sequence:

Not possible to move to illegal position, therefore:

1. Move in the Roman Pot to be tested.
2. Make position illegal by changing limit.
3. Observed automatic extraction and (not for WARNING) loss of USER PERMIT for the beam affected.
4. When extracted beyond the limit, observe the return of the USER PERMIT.
5. “Ringing” observed for several Roman Pots (not a problem for safety, but not nice for the log).

Permit	Timestamp	Visibility	Event Type	Description
🚩	15-05-17 12:48:37.153267	ALL	USER_PERMIT	3 B F-T
🚩	15-05-17 12:48:37.153267	4 ALL	USER_PERMIT	3 A F-T
🚩	15-05-17 12:48:37.153192	ALL	USER_PERMIT	3 A T-F
🚩	15-05-17 12:48:37.153192	5 ALL	USER_PERMIT	3 B T-F
🚩	15-05-17 12:48:37.153037	ALL	USER_PERMIT	3 B F-T
🚩	15-05-17 12:48:37.153037	5 ALL	USER_PERMIT	3 A F-T
🚩	15-05-17 12:48:36.673092	ALL	USER_PERMIT	3 A T-F
🚩	15-05-17 12:48:36.673092	3 ALL	USER_PERMIT	3 B T-F
🚩	15-05-17 12:41:40.830322	ALL	USER_PERMIT	3 B F-T
🚩	15-05-17 12:41:40.830322	ALL	USER_PERMIT	3 A F-T
🚩	15-05-17 12:41:40.829712	ALL	USER_PERMIT	3 A T-F
🚩	15-05-17 12:41:40.829712	ALL	USER_PERMIT	3 B T-F



AFP Interlock validation – Reaction to flags

Purpose: Check of the reaction to SMP flags and the override key.

Test sequence (simplified):

1. Cycle through STABLE_BEAM, UNSTABLE_BEAM and ADJUST and observed extraction and loss of USER PERMITS.
2. Observe correct behavior to LVDT-to-limit comparison in all relevant combinations.
3. Repeat with OVERRIDE in place.

