ATLAS Forward Proton Detectors
Summary of Commissioning Results

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AFP BIS Tests – Overview

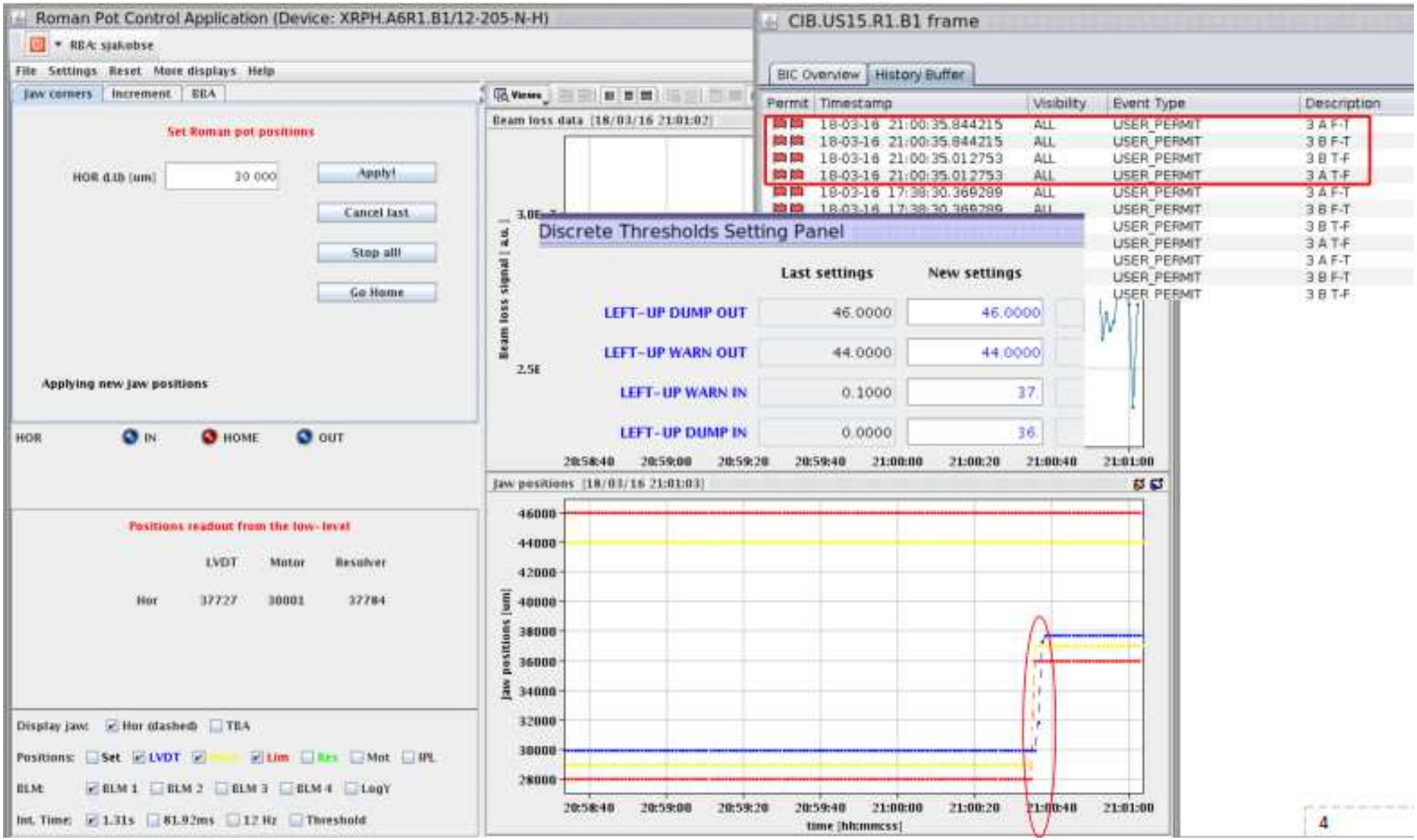
Tests:

- INJECTION-PERMIT and LVDT out-of-limits responses:
  - successful quick check done by S. Jakobsen (18 March, noon)
  - repeated and fully documented in LHC e-log by M. Rijssenbeek (21 March, afternoon)
- BEAM-PERMIT and AFP response to various beam modes tested by M. Trzebiński and M. Rijssenbeek (18 March, evening)
- BYPASS key tested by X. Pons and M. Rijssenbeek (22 March, afternoon)

Conclusions:

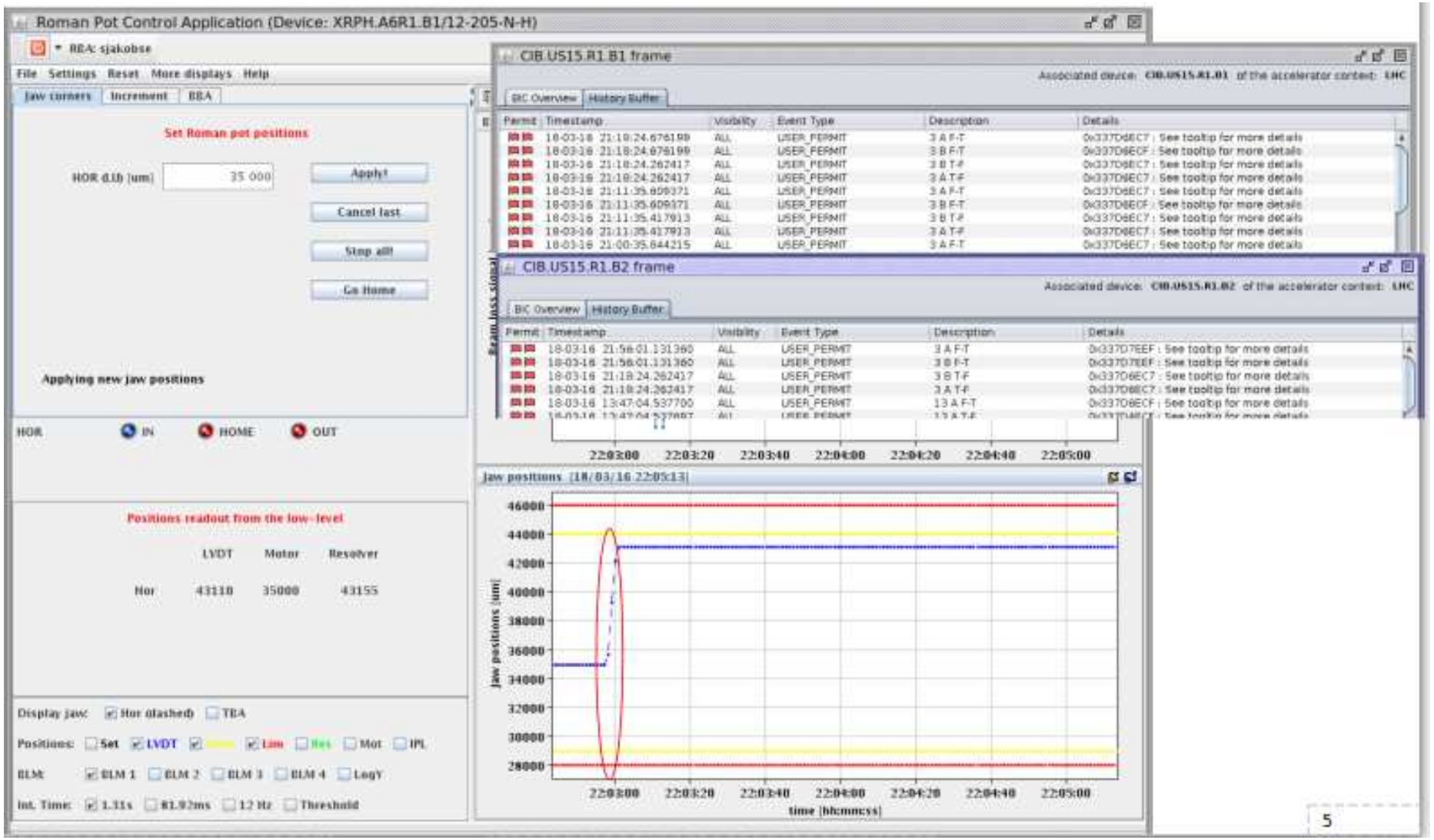
- validation tests were successful,
- **details in EDMS 1608103 v.1.0; ATL-UR-ER-0009 v.1.0,**
- observations:
  - in a few cases Beam 2 PERMIT was lost:
    - reason: HOME switches of non-instrumented stations are "False",
    - solution: short at input to logic,
    - **problem understood and solved**,
    - in addition: AFP BEAM_PERMIT and INJECTION_PERMITs for B2 were MASKed.
  - HOME switch bounces:
    - mechanical property of switch,
    - 2-3 bounces in < 1 ms, **not an issue**.
- AFP BYPASS is currently TRUE
- AFP BYPASS Key is at CCC

Test Example (1): Illegal Pot Position During Stable Beam



Auto-retraction and setting USER_PERMIT to 0.

Test Example (2): Illegal Pot Position During Unstable Beam



Auto-retraction but USER_PERMIT remains.

AFP BIS TESTS IN CCC 21-MAR-2016 - INJECTION PERMIT AND USER PERMIT B1 & B2
RESPONSES TO ILLEGAL POT POSITIONS

Test & Action	OVERRIDE	Pot	Action on Limits	INJECTION PERMIT B1	INJECTION PERMIT B2	OK/X
TEST INJECTION PERMIT RESPONSE TO POT AWAY FROM HOME						
16:06 INJECTION PERMITS 1 & 2 ON		ALL @ HOME	46, 44, 0.1, 0	16:03:34.101 INJB1 0↗1	16:03:34.101 INJB2 0↗1	
16:20 NEAR & FAR Pots at HOME; OVERRIDE	0↗1			UPB1=1	16:18:42.0075 UPB2 0↗1	
16:23 NEAR Pot -> 35	1	NEAR ->35	46, 44, 0.1, 0	16:23:23.028 INJB1 1↘0	16:23:23.028 INJB2 1↘0	OK
16:26 NEAR Pot -> HOME	1	NEAR->HOME	46, 44, 0.1, 0	16:26:08.849 INJB1 0↗1	16:26:08.849 INJB2 0↗1	OK
16:30 FAR Pot -> 35	1	FAR ->35	46, 44, 0.1, 0	16:30:22.464 INJB1 1↘0	16:30:22.464 INJB2 1↘0	OK
16:33 FAR Pot -> HOME	1	FAR->HOME	46, 44, 0.1, 0	16:34:32.239 INJB1 0↗1	16:34:32.239 INJB2 0↗1	OK
TEST USER PERMIT RESPONSE				USER PERMIT B1	USER PERMIT B2	
16:36 NO AFP ACTION				UPB1=1	16:36:52.9687 UPB2 1↘0	?
17:09 NO AFP ACTION				UPB1=1	17:09:00.5707 UPB2 0↗1	?
17:29 NEAR Pot: Change Limits; Pot -> 20	1	NEAR ->20	46, 44, 6, 5	UPB1=1	UPB2=1	OK
17:31 NEAR Pot: Change Warn & Dump Limits	1	20	46, 44, 6->26, 5->25	UPB1=1	UPB2=1	OK
17:31 NEAR Pot: Auto Retract with Dump	1	->HOME	46, 44, 26, 25	17:31:18.8910 UPB1 1↘0	UPB2=1	OK
				17:31:19.3623 UPB1 0↗1	UPB2=1	OK
				17:31:19.3624 UPB1 1↘0	UPB2=1	-
			After-bounce of	17:31:19.3626 UPB1 0↗1	UPB2=1	-
			HOME switch	17:31:19.3628 UPB1 1↘0	UPB2=1	-
				17:31:19.3628 UPB1 0↗1	UPB2=1	-
18:18 FAR Pot: RESET, Reset Limits; Pot ->20	1	FAR ->20	46, 44, 6, 5	UPB1=1	UPB2=1	OK
18:21 FAR Pot: Change Warn Limit	1	20	46, 44, 6->26, 5	UPB1=1	UPB2=1	OK
18:21 FAR Pot Auto Retract w/o Dump	1	->HOME	46, 44, 26, 5	UPB1=1	UPB2=1	OK
18:26 FAR Pot: Change Limits; Pot -> 20	1	FAR ->20	46, 44, 6, 5	UPB1=1	UPB2=1	OK
18:29 FAR Pot: Change Warn & Dump Limits	1	20	46, 44, 6->26, 5->25	UPB1=1	UPB2=1	OK
18:29 FAR Auto Retract with Dump	1	->HOME	46, 44, 26, 25	18:29:38.4694 UPB1 1↘0	UPB2=1	OK
				18:29:38.9495 UPB1 0↗1	UPB2=1	OK
			After-bounce of	18:29:38.9497 UPB1 1↘0	UPB2=1	-
			HOME switch	18:29:39.9500 UPB1 0↗1	UPB2=1	-
18:34 NEAR Pot: RESET; Reset Limits; Pot ->20	1	->20	46, 44, 26->6, 25->5	UPB1=1	UPB2=1	OK
18:38 NEAR Pot: Change Warn Limit	1	20	46, 44, 6->26, 5	UPB1=1	UPB2=1	OK
18:38 NEAR Pot: Auto Retract w/o Dump	1	->HOME	46, 44, 26, 5	UPB1=1	UPB2=1	OK
END OF AFP TESTS						

AFP BIS Tests – Summary Table (2)

AFP BIS TESTS IN CCC 18-MAR-2016 - USER_PERMIT RESPONSE TO (CHANGES IN) BEAM MODE AND NEAR POT POSITION					
Beam Mode & Action	OVERRIDE	Pot	Action on NEAR Pot Limits	Interlock Reaction	OK/X
20:27 STABLE BEAMS	0	30	46, 44, 29, 28	B1P=1	OK
20:34 OVERRIDE Key->ON	0↗1	30	46, 44, 29, 28	B1P=1	OK
20:57 -> UNSTABLE BEAMS	1	30	46, 44, 29, 28	B1P=1	OK
20:58 Illegal Pot Position	1	30	46, 44, **29->37, 28->36**	21:00:35.012 B1P↘0	OK
	1	Auto Extract	46, 44, 37, 36	21:00:35.844 B1P↗1	OK
21:02 Reset limits	1	45	46, 44, **37->29, 36->28**	B1P=1	OK
21:03 Reset Motor (Pot -> STOP-OL	1	45	46, 44, 29, 28	B1P=1	OK
21:05 Pot -> 35	1	45->35	46, 44, 29, 28	B1P=1	OK
21:07 Pot -> HOME	1	30->43.75	46, 44, 29, 28	B1P=1	OK
21:09 -> STABLE BEAMS	1	44	46, 44, 29, 28	B1P=1	OK
21:09 Pot -> 35	1	44->35	46, 44, 29, 28	B1P=1	OK
21:11 Illegal Pot Position	1	35	46, 44, **29->37, 28->36**	21:11:35.418 B1P↘0	OK
	1	Auto Extract	46, 44, 37, 36	21:11:35.609 B1P↗1	OK
21:12 Reset limits	1	45	46, 44, **37->29, 36->28**	B1P=1	OK
21:14 Reset Motor (Pot -> STOP-OL	1	45	46, 44, 29, 28	B1P=1	OK
21:15 Pot -> 35	1	45->35	46, 44, 29, 28	B1P=1	OK
21:17 OVERRIDE Key->OFF	**1↘0**	35	46, 44, 29, 28	B1P=1	OK
21:17 -> ADJUST	0	35	46, 44, 29, 28	21:18:24.262 B1P↘0	OK
			understood HOME 3, 4="F" =>	21:18:24.262 B2P↘0	OK
	0	Auto Extract	46, 44, 29, 28	21:18:24.676 B1P↗1	OK
21:21 -> STABLE BEAMS	0	44	46, 44, 29, 28	B1P=1	OK
MOV_DEV_ALLWD_IN=0 prevents Pot motion		44	46, 44, 29, 28	B1P=1	OK
21:57 MOV_DEV_ALLWD_IN=1	0	44	46, 44, 29, 28	B1P=1	OK
			understood M_D_A_In="T" =>	21:56:01.131 B2P↗1	OK
21:57 Reset Motor; Pot -> 35	0	44->35	46, 44, 29, 28	B1P=1	OK
22:02 -> UNSTABLE BEAMS	0	35	46, 44, 29, 28	B1P=1	OK
	0	Auto Extract	46, 44, 29, 28	B1P=1	OK
22:07 -> STABLE BEAMS	0	44	46, 44, 29, 28	B1P=1	OK
22:07 Reset Motor; Pot -> 35	0	44->35	46, 44, 29, 28	B1P=1	OK
22:08 Illegal Pot Position	0	35	46, 44, **29->37, 28->36**	22:09:22.245 B1P↘0	OK
	0	Auto Extract	46, 44, 37, 36	22:09:22.446 B1P↗1	OK
22:10 Reset limits	0	44	46, 44, **37->29, 36->28**	B1P=1	OK
22:10 Reset Motor; Pot -> 35	0	44->35	46, 44, 29, 28	B1P=1	OK
22:15 -> ADJUST	0	35	46, 44, 29, 28	22:15:29.237 B1P↘0	OK
			understood HOME 3, 4="F" =>	22:15:29.237 B2P↘0	OK
	0	Auto Extract	46, 44, 29, 28	22:15:29.699 B1P↗1	OK
22:21 END OF AFP TESTS	0	44	46, 44, **29->0.1, 28->0**	B1P=1	OK

AFP BIS Tests – Summary Table (3)

AFP BIS TESTS IN CCC 22-MAR-2016 - INJECTION PERMIT AND USER PERMIT B1 RESPONSE TO PXI AND MOTOR POWER FAILURE AND BYPASS KEY						
Time/Action	OVERRIDE	FAR Pot	Limits	INJECTION PERMIT B1	USER PERMIT B1	OK/X
13:39 Initialize FAR Pot	0↗1	at HOME	46, 45, 36, 35		13:41:11.0774 UPB1 1↘0	OK
	1		46, 45, 36, 35	13:41:11.7371 INJPB1 0↗1	13:41:11.7371 UPB1 0↗1	OK
	1	Leaves HOMI	46, 45, 36, 35	13:42:31.9000 INJPB1 1↘0	UPB1=1	OK
	1	Returns HOM	46, 45, 36, 35	13:43:00.9390 INJPB1 0↗1	UPB1=1	OK
13:54 FAR Pot -> 37	1	Leaves HOMI	46, 45, 36, 35	13:54:15.1717 INJPB1 1↘0	UPB1=1	OK
14:00 Switch OFF PXI Crate	1	Unknown	Unknown	14:00:35.7402 INJPB1 0↗1	14:00:35.0051 UPB1 1↘0	OK
14:02 Switch ON BYPASS Key	1	Unknown	Unknown	INJPB1=1	14:02:12.1888 UPB1 0↗1	OK
14:06 PXI Restarts	1	HOME	46, 45, 36, 35	INJPB1=1	UPB1=1	OK
14:09 Switch OFF BYPASS Key	1	HOME	46, 45, 36, 35	INJPB1=1	UPB1=1	OK
14:16 Check: Move Both Pots away from HOME and back HOME				INJPB1 1↘0↗1	UPB1=1	OK
END OF AFP TESTS						

- Beam-Based Alignment and Loss Maps:
  - needs:
    - stand-alone AFP data taking (done),
    - ATLAS Central Trigger Processor rates (done),
    - monitoring histograms (in preparation).
  - **AFP will be ready by 14 April.**
- Integration with ATLAS TDAQ and DCS:
  - expected to be ready by/around MD1/TS1 (June 2016).
- **Physics at Low Luminosity:**
  - **goals: commissioning and data taking (measure single diffraction)**,
  - requirements: AFP TDAQ integrated with ATLAS,
  - run types: low pile-up ($\mu \sim 0.1 - 1$), standard (low β^*) optics,
  - operation: join parasitically whenever a block of few hours is available,
  - under discussion within ATLAS; request will be made by ATLAS-RC.
- **Physics at High Luminosity:**
  - **goals:**
    - study beam environment and alignment,
    - prove safe AFP insertion at high luminosity,
    - debug and prove efficient co-running AFP+ATLAS,
  - run types: standard optics and high luminosity,
  - data taking together with ATLAS (NO AFP trigger),
  - under discussion within ATLAS.

Backup

AFP RP Interlock Diagram 2016