

ATLAS Forward Proton Detectors

Summary of Commissioning Results

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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

The screenshot displays the Roman Pot Control Application interface. The main window is titled "Roman Pot Control Application (Device: XRPH.A6R1.B1/12-205-N-H)". It features a "Set Roman pot positions" section with a "HOR d10 (um)" input field set to 30,000 and buttons for "Apply", "Cancel last", "Stop all", and "Go Home". Below this is a "Positions readout from the low-level" section with columns for "LVDT", "Motor", and "Resolver", showing values for "Hor" as 37727, 30001, and 37784 respectively. At the bottom, there are checkboxes for "Display jaw", "Positions", and "BLM".

Overlaid on the interface is a "Discrete Thresholds Setting Panel" with two columns: "Last settings" and "New settings". The settings are as follows:

Setting	Last settings	New settings
LEFT-UP DUMP OUT	46.0000	46.0000
LEFT-UP WARN OUT	44.0000	44.0000
LEFT-UP WARN IN	0.1000	37
LEFT-UP DUMP IN	0.0000	36

On the right side, a "CIB.US15.R1.B1 frame" window shows a "BIC Overview" and a "History Buffer" table:

Permit	Timestamp	Visibility	Event Type	Description
3 A F-T	18-03-16 21:00:35.844215	ALL	USER_PERMIT	3 A F-T
3 B F-T	18-03-16 21:00:35.844215	ALL	USER_PERMIT	3 B F-T
3 B T-F	18-03-16 21:00:35.012753	ALL	USER_PERMIT	3 B T-F
3 A T-F	18-03-16 21:00:35.012753	ALL	USER_PERMIT	3 A T-F
3 A F-T	18-03-16 17:38:30.366209	ALL	USER_PERMIT	3 A F-T
3 B F-T	18-03-16 17:38:30.366209	ALL	USER_PERMIT	3 B F-T
3 B T-F			USER_PERMIT	3 B T-F
3 A T-F			USER_PERMIT	3 A T-F
3 A F-T			USER_PERMIT	3 A F-T
3 B F-T			USER_PERMIT	3 B F-T
3 B T-F			USER_PERMIT	3 B T-F

Below the table is a "Beam loss signal [a.u.]" plot showing a sharp peak at approximately 21:00:35. At the bottom, a "Jaw positions [um]" plot shows the horizontal positions of the jaws over time. A red oval highlights a period between 21:00:30 and 21:00:40 where the jaw positions deviate from their setpoints, corresponding to the event log entries.

Auto-retraction and setting USER_PERMIT to 0.

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

The screenshot displays the Roman Pot Control Application interface, which is divided into several panels:

- Top Panel:** Shows the application title "Roman Pot Control Application (Device: XRPH.A6R1.B1/12-205-N-H)" and a menu bar with "File", "Settings", "Reset", "More displays", and "Help". Below the menu is a "Jaw currents" section with a "Increment" button and a "BLA" label.
- Left Panel:** Contains a "Set Roman pot positions" section with a text input field for "HOR d10 (um)" set to "35 000". Below this are "Apply", "Cancel last", "Stop all", and "Go Home" buttons. A status section shows "Applying new jaw positions" and "HOR" status with "IN", "HOME", and "OUT" indicators.
- Bottom Left Panel:** Displays "Positions readout from the low-level" with a table of LVDT, Motor, and Resolver values for "Hor". Below this are checkboxes for "Display jaw:" (Hor dashed, TEA) and "Positions:" (Set, LVDT, Lm, Rm, Mot, IPL). It also includes "BLM" status (BLM 1-4, LogY) and "Int. Time:" settings (1.31s, 81.92ms, 12 Hz, Threshold).
- Right Panel:** Shows two event logs for "CIB.US15.R1.B1 frame" and "CIB.US15.R1.B2 frame". Each log has a table with columns: Permit, Timestamp, Visibility, Event Type, Description, and Details. The events are listed with red status icons and include "USER_PERMIT" and "3 A F T" descriptions.
- Bottom Right Panel:** A graph titled "Jaw positions [18/03/16 22:05:13]" showing "Jaw positions (um)" on the y-axis (ranging from 28000 to 46000) and "time (hh:mm:ss)" on the x-axis (ranging from 22:03:00 to 22:05:00). The graph shows a blue line representing the jaw position, which starts at approximately 34000 um, rises to a peak of about 44000 um, and then falls back to 34000 um. A red oval highlights the peak, and a dashed blue line indicates the trajectory.

Auto-retraction but USER_PERMIT remains.

AFP BIS Tests – Summary Table (1)

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 71	16:03:34.101 INJB2 0 71	
16:20 NEAR & FAR Pots at HOME; OVERRIDE	0 71			UPB1=1	16:18:42.0075 UPB2 0 71	
16:23 NEAR Pot -> 35	1	NEAR ->35	46, 44, 0.1, 0	16:23:23.028 INJB1 1 50	16:23:23.028 INJB2 1 50	OK
16:26 NEAR Pot -> HOME	1	NEAR->HOME	46, 44, 0.1, 0	16:26:08.849 INJB1 0 71	16:26:08.849 INJB2 0 71	OK
16:30 FAR Pot -> 35	1	FAR ->35	46, 44, 0.1, 0	16:30:22.464 INJB1 1 50	16:30:22.464 INJB2 1 50	OK
16:33 FAR Pot -> HOME	1	FAR->HOME	46, 44, 0.1, 0	16:34:32.239 INJB1 0 71	16:34:32.239 INJB2 0 71	OK
TEST USER PERMIT RESPONSE				USER PERMIT B1	USER PERMIT B2	
16:36 NO AFP ACTION				UPB1=1	16:36:52.9687 UPB2 1 50	?
17:09 NO AFP ACTION				UPB1=1	17:09:00.5707 UPB2 0 71	?
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 50	UPB2=1	OK
				17:31:19.3623 UPB1 0 71	UPB2=1	OK
				17:31:19.3624 UPB1 1 50	UPB2=1	-
			After-bounce of	17:31:19.3626 UPB1 0 71	UPB2=1	-
			HOME switch	17:31:19.3628 UPB1 1 50	UPB2=1	-
				17:31:19.3628 UPB1 0 71	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 50	UPB2=1	OK
				18:29:38.9495 UPB1 0 71	UPB2=1	OK
			After-bounce of	18:29:38.9497 UPB1 1 50	UPB2=1	-
			HOME switch	18:29:39.9500 UPB1 0 71	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 $\bar{1}$	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 $\bar{1}$	OK
	1	Auto Extract	46, 44, 37, 36	21:00:35.844 B1P $\bar{1}$	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 $\bar{1}$	OK
	1	Auto Extract	46, 44, 37, 36	21:11:35.609 B1P $\bar{1}$	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 $\bar{1}$	35	46, 44, 29, 28	B1P=1	OK
21:17 -> ADJUST	0	35	46, 44, 29, 28	21:18:24.262 B1P $\bar{1}$	OK
	0	Auto Extract	46, 44, 29, 28	21:18:24.262 B2P $\bar{1}$	OK
	0	Auto Extract	46, 44, 29, 28	21:18:24.676 B1P $\bar{1}$	OK
21:21 -> STABLE BEAMS	0	44	46, 44, 29, 28	B1P=1	OK
MOV_DEV_ALLWD_IN=0 prevents Pot motion	0	44	46, 44, 29, 28	B1P=1	OK
21:57 MOV_DEV_ALLWD_IN=1	0	44	46, 44, 29, 28	B1P=1	OK
	0	Auto Extract	46, 44, 29, 28	21:56:01.131 B2P $\bar{1}$	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 $\bar{1}$	OK
	0	Auto Extract	46, 44, 37, 36	22:09:22.446 B1P $\bar{1}$	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 $\bar{1}$	OK
	0	Auto Extract	46, 44, 29, 28	22:15:29.237 B2P $\bar{1}$	OK
	0	Auto Extract	46, 44, 29, 28	22:15:29.699 B1P $\bar{1}$	OK
22:21 END OF AFP TESTS	0	44	46, 44, 29->0.1, 28->0	B1P=1	OK

**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	071	at HOME	46, 45, 36, 35		13:41:11.0774 UPB1 1↘0	OK
	1		46, 45, 36, 35	13:41:11.7371 INJPB1 071	13:41:11.7371 UPB1 071	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 071	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 071	14:00:35.0051 UPB1 1↘0	OK
14:02 Switch ON BYPASS Key	1	Unknown	Unknown	INJPB1=1	14:02:12.1888 UPB1 071	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↘071	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

