

Memorandum

Michael Lindgren
Chief Accelerator Officer

Accelerator Division
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Kirk Road and Pine Street
Batavia, Illinois 60510-5011
USA
Office 630.840.8409
mlindgre@fnal.gov

Date: September 28, 2022
To: Todd Sullivan
From: Michael Lindgren Michael Lindgren, UID:mlindgre
Re: Approval for running beam to Booster

Digitally signed by Michael Lindgren, UID:mlindgre
Date: 2022.09.28 14:29:51 -0500

Message:

Safety documentation and procedures for restart of beam operations to the Booster are now complete and in place. Therefore, you are hereby authorized to deliver beam to Booster.

Cc: S. Chaurize
J. Compton
P. Czarapata
R. Lewis
M. Quinn
B. Russel
M. Schoell
C.Y. Tan
A. Valishev

RESCINDED
Date 8/11/2023 BR

SYSTEM START-UP SIGN-OFF

The signatures below, unless noted in the comments section, indicate that the relevant systems are ready for the restart of beam operation. Indicate in the comments section any remaining work that would affect the restart of beam operations. Indicate N/A for departments that did not do any work on the system.

SYSTEM BEING SIGNED OFF: Linac NIF MTA Booster [8-GeV Line-MI-10 Region]
(Circle as Applicable) [MI-20-MI-62/Recycler] BNB NuMI P1-P2 Muon P3-Switchyard
Meson Primary MT MC NM FAST

<u>DEPARTMENT</u>	<u>DATE</u>	<u>SIGNATURE (Department Head/Designee)</u>
1. Controls		Denise Finstrom, UID:finstrom <small>Digitally signed by Denise Finstrom, UID:finstrom Date: 2022.09.22 08:19:19 -05'00'</small>
2. Cryogenics		N/A
3. E/E Support	9/21/22	Chris Jensen <small>Digitally signed by Chris Jensen Date: 2022.09.21 08:56:30 -05'00'</small>
4. RPO Manager		Maddie Schoell, UID:maddiew <small>Digitally signed by Maddie Schoell, UID:maddiew Date: 2022.09.28 14:01:16 -05'00'</small>
5. LSO		N/A
6. External Beamlines		N/A
7. Instrumentation	9/22/22	Craig Drennan <small>Digitally signed by Craig Drennan Date: 2022.09.22 11:52:08 -05'00'</small>
8. Interlocks	9/28/22	Randy Zifko, UID:rmzifko <small>Digitally signed by Randy Zifko, UID:rmzifko Date: 2022.09.28 13:58:13 -05'00'</small>
9. Main Injector		David Capista, UID:capista <small>Digitally signed by David Capista, UID:capista Date: 2022.09.22 10:50:30 -05'00'</small>
10. Mechanical Support	9/27/22	Mayling Wong-Squires, UID:mlwong <small>Digitally signed by Mayling Wong-Squires, UID:mlwong Date: 2022.09.27 13:11:32 -05'00'</small>
11. Muon		N/A
12. Operations	9/27/22	Todd Sullivan <small>Digitally signed by Todd Sullivan Date: 2022.09.28 14:02:54 -05'00'</small>
13. Proton Source	9/27/22	Cheng-Yang Tan, UID:cytan <small>Digitally signed by Cheng-Yang Tan, UID:cytan Date: 2022.09.27 19:11:20 -05'00'</small>
14. RF		Paul Derwent, UID:derwent <small>Digitally signed by Paul Derwent, UID:derwent Date: 2022.09.27 15:45:17 -05'00'</small>
15. ENG Support	9/23/22	Paul C Czarapata <small>Digitally signed by Paul C Czarapata Date: 2022.09.23 08:18:24 -05'00'</small>
16. Target Systems		N/A
17. Shutdown Coordinator	9/23/22	Consolato Gattuso <small>Digitally signed by Consolato Gattuso Date: 2022.09.23 15:25:13 -05'00'</small>

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Comments and special conditions (please mark comment with department # to connect comment with appropriate department):

#3. A few systems still LOTOed, GMPS fuses not installed. Requested PS to boot unused/spare ion pump cables in BGE.
9/28/22 comments: remaining cables are not connected to power supplies, no risk to safe accelerator operations

#4. Booster interlock testing was completed for Booster Dump Mode. RSO will ensure configuration control to keep Booster in Dump Mode until tests completed to permit MI Mode.

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The Booster radiation shielding meets the requirements documented in the 2017 "Booster Shielding Assessment"

_____ shielding assessment.

FINAL APPROVALS

System Department Head	Cheng-Yang Tan, UID:cytan <small>Digitally signed by Cheng-Yang Tan, UID:cytan Date: 2022.09.28 14:10:30 -05'00'</small>	Date _____
Assigned RSO	Maddie Schoell, UID:maddiew <small>Digitally signed by Maddie Schoell, UID:maddiew Date: 2022.09.28 14:07:49 -05'00'</small>	Date _____
AD Division Head	Michael Lindgren, UID:mlindgre <small>Digitally signed by Michael Lindgren, UID:mlindgre Date: 2022.09.28 14:18:37 -05'00'</small>	Date _____

BEAM PERMIT
9/28/2022

Booster Accelerator Safety Envelope (ASE) Limit

The maximum hourly beam power transmitted through the Booster accelerator is limited to:
 1.80×10^{19} protons per hr at 8 GeV.

No accelerator or beam line will transmit beam without an operational beam interlock safety system.

Booster Beamline Operating Limits

The maximum charge transmitted through the Booster is limited to:
 2.70×10^{17} protons per hour at 8 GeV.

Examples: Charge/hr = number of pulses/hr x number of protons/pulse

#1 54,000 pulses per hour (15 Hz) at 5.00×10^{12} protons per pulse = 2.70×10^{17} protons per hour.

#2 36,000 pulses per hour (10 Hz) at 7.50×10^{12} protons per pulse = 2.70×10^{17} protons per hour.

Special conditions and comments:

Reviewed by	Todd Sullivan	Digitally signed by Todd Sullivan Date: 2022.09.28 14:14:46 -05'00'
	Operations Department Head	
Reviewed by	Cheng-Yang Tan, UID:cytan	Digitally signed by Cheng-Yang Tan, UID:cytan Date: 2022.09.28 14:11:10 -05'00'
	Systems Department Head	
Reviewed by	Maddie Schoell, UID:maddiew	Digitally signed by Maddie Schoell, UID:maddiew Date: 2022.09.28 14:08:06 -05'00'
	Assigned RSO	
Reviewed by	Maddie Schoell, UID:maddiew	Digitally signed by Maddie Schoell, UID:maddiew Date: 2022.09.28 14:08:13 -05'00'
	ES&H Radiation Physics Operations Department Head	
Approved by	Michael Lindgren, UID:mlindgre	Digitally signed by Michael Lindgren, UID:mlindgre Date: 2022.09.28 14:18:01 -05'00'
	Accelerator Division Head	

Operator Signatures

Crew Chiefs

Mike Ruff 9/28/22 ✓
Dan Allen 9/29/22 ✓
Gene Skelton 9/29/22 ✓
Robert Powell 9/29/22 ✓
Ken P. McDaniel 10/1/22 ✓

Crew A

Jay Imbrain 9-28-22 ✓
Andy Patton 9-28-22 ✓
Kit Fice 9-28-22 ✓
Hayden Howard 10/28/22 ✓
O. Valenzuela 9/22/23 ✓

Crew B

Daniel Bleser 9/28/22 ✓
Dan Allen 9/28/22 ✓
Wally 9/28/22 ✓
Ty Tr 9-28-22 ✓
George Williams 9/28/22 ✓

Crew C

Jim T. Hogan 9/30/22 ✓
Carson White 9/30/22 ✓
Kevin Ballou 10/1/22 ✓
Timothy 10/1/22 ✓
Garrett 10/1/22 ✓

Crew D

Laura Bow 9/29/22 ✓
Tom 9/30/22 ✓
Jalques Ntshahuri 10/4/22 ✓
Ashley Sete 10/4/22 ✓
Matthew Garding 2/23/23 ✓

Crew E

Cassandra 9-29-22 ✓
Robert 9-29-22 ✓
Conrad 10-1-22 ✓
Kidaki 10/1/22 ✓
Luca 10/1/22 ✓

Other

140114
Don 29 Sept 22 ✓
Alex Kellert 2/23/23 ✓

Kell 10/17/2022 ✓
Wally 10-18-22 ✓

Running Condition Booster

September 28, 2022
Maddie Schoell

Area RSO

Mode of Operation Booster Operation

Beam Limits	Beam Energy 8 GeV	ASE Limit 1.80 E19 protons/hr	Operating Limit 2.70 E17 protons/hr
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Critical Devices B:MH1 & B:LAM

Enclosures Protected Booster, 8 GeV Line

Preferred Monitoring Devices* Booster intensity is monitored via B:CHGBBM
 Booster Absorber intensity is monitored via B:BBMDMP
 *Other methods of monitoring intensity may be used

Requirements

Access Devices B:MH1 and B:LAM must be disabled in order to access Booster, or the 8 GeV enclosures.

Off Period none

Special Interlocks The CDC Inputs including failure mode devices may all be found on the Safety System Status pages.

Special Concerns Any work performed on critical devices or obtaining a critical device key requires prior RSO approval.
 There are two operating modes for Booster: Extraction to 8 GeV line and beam to the Dump (Absorber). In order to change modes from sending beam to the dump (absorber) to extracting beam to areas downstream, the Booster permit should be disabled, otherwise the interlock system may interpret the change as a failure.

Gates, Fencing and Passive Shielding Requirements There is no access to radiologically fenced areas without prior RSO approval.
 Shielding, fencing and posting are in accordance with the 2017 "Booster shielding assessment".

Assigned RSO approval also signifies that all necessary Interlock Tests have been completed and Removable Shielding is installed.

Dept. Head Approval Todd Sullivan
Digitally signed by Todd Sullivan
Date: 2022.09.28 14:15:11 -05'00'

Sys. Dept. Head Approval Cheng-Yang Tan
Digitally signed by Cheng-Yang Tan, UID:cytan
Date: 2022.09.28 14:11:50 -05'00'

Assigned RSO Approval Maddie Schoell
Digitally signed by Maddie Schoell, UID:maddiew
Date: 2022.09.28 14:08:31 -05'00'

AD Head Approval Michael Lindgren
Digitally signed by Michael Lindgren, UID:mlindgre
Date: 2022.09.28 14:19:05 -05'00'

Running Condition Booster

September 28, 2022

Area RSO

Maddie Schoell

Operational Comments

Booster is able to run in two modes: MI-10 (MI) Mode and Dump Mode
B:BS809 is OUT for MI-10 Mode, and IN for the Dump Mode.

Based on thermal considerations, the repetition rate is limited to 7 Hz when sending beam to the absorber.

MCR must be appropriately staffed according to the Accelerator Safety Envelope.

Instrument Information

Running Condition Booster

September 28, 2022

Area RSO

Maddie Schoell

Operator Signatures

Crew Chiefs

~~John F. ...~~ 9/28/22
 Dan ... 9/29/22
 Eric ... 9/29/22
 ... 9/29/22
 Ken P. Mc ... 10/1/22

Crew B

Doshal ... 9/28/22
 Dan ... 9/28/22
 ... 9/28/22
 ... 9-28-22
 George Williams 9/28/22

Crew D

Lana ... 9/29/22
 Ken ... 9/30/22
 Julius ... 10/4/22
 Ashley ... 10/4/22
 Matthew ... 2/23/23

Alex ... 29 Sept 22
 Alex Kelle ... 2/23/23

Crew A

Jay ... 9-28-22
 Kit ... 9-28-22
 ... 9-28-22
 ... 10/22/22
 C. ... 3/22/23

Crew C

John T. ... 9/30/22
 ... 9/30/22
 ... 10/1/22
 ... 10/1/22
 ... 10/1/22

Crew E

Cassandra ... 9/29/22
 ... 9/24/22
 ... 10-1-22
 ... 10/1/22
 Colin Barrett 10/19/22

Other

... 10/17/2022
 ... 10-18-2022