

# Memorandum

Michael Lindgren  
Division Head

**Accelerator Division**  
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Batavia, Illinois 60510-5011

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[mlindgren@fnal.gov](mailto:mlindgren@fnal.gov)

**Date:** November 26, 2019  
**To:** Todd Sullivan  
**From:** Michael Lindgren   
**Re:** Approval for Running IOTA/FAST Electron Injector

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**Message:**

Safety documentation and procedures for running IOTA/FAST Electron Injector are in place. Therefore, you are hereby authorized to accelerate and transport beam up to 300 MeV.

c.c. M. Convery  
D. Broemmelsiek  
E. McHugh  
M. Schoell  
S. McGimpsey

**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** PIP-II

DEPARTMENT	DATE	SIGNATURE (Department Head/Designee)
1. Controls	10/1/19	<i>Janet Patrick</i>
2. Cryogenics	10/1/19	<i>Greg Hill</i>
3. E/E Support	10/3/19	<i>Ed Jones</i>
4. RPO Manager	10/26/19	<i>Madeleine Schreier</i>
5. LSO	11/25/19	<i>Mark G</i>
<del>6. External Beamlines</del>	n/a	
7. Instrumentation	10/1/2019	<i>Bob O</i>
8. Interlocks	10/3/19	<i>Kenneth M. Zeff</i>
<del>9. Main Injector</del>	n/a	
10. Mechanical Support	1 Oct 2019	<i>W. Wong - Segura</i>
<del>11. Muon</del>	n/a	
12. Operations	10/26/19	<i>Tom Hill</i>
13. Proton Source	n/a	
14. RF	10-15-19	<i>John Beard</i>
15. ENG Support	10/6/19	<i>Paul C. Szarapata</i>
16. Target Systems	n/a	
17. Shutdown Coordinator	10/23/19	<i>Lawrence J. Crawford</i>

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

The \_\_\_\_\_ radiation shielding meets the requirements documented in the ADVANCED SUPERCONDUCTING TEST ACCELERATOR (ASTA) (12/14) & THE SHIELDING ASSESSMENT FOR THE ASTA/FAST EXTERNAL INJECTOR AT 300 MeV (8/14) shielding assessment.

**FINAL APPROVALS**

System Department Head *Daniel K. Dummer* Date 11/26/19  
Assigned RSO *Tommy* Date 11/26/19  
AD Division Head *Mark G* Date 11/26/2019

**BEAM PERMIT**

11/26/2019

**FAST/IOTA Accelerator Safety Envelope (ASE) Limit**

The maximum beam intensity transmitted through the FAST Beamline is limited to:  
 $1.96 \times 10^{19}$  electrons/hr up to 300 MeV

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

**IOTA Beamline Operating Limits**

The maximum beam intensity for the IOTA Beamline is limited to:

$3.6 \times 10^{13}$  electrons/hr at 150 MeV at injection

$2.0 \times 10^{10}$  electrons at 150 MeV circulating

**FAST Beamline Operating Limits**

The maximum beam intensity transmitted through the FAST Beamline is limited to:  
 $1.96 \times 10^{17}$  electrons/hr at 55 MeV and  $3.37 \times 10^{18}$  up to 300 MeV

Examples:      Electrons/hr = {Current (A)/ $1.6 \times 10^{-19}$  C/electron} x 3600 sec/hr

Where: Current (A) = #Bunches x 1 nC/bunch @ 1 Hz

(100 bunches) x ( $8.7 \times 10^{-8}$  C/bunch) x (1/sec) =  $8.8 \times 10^{-6}$  C/sec) = 8.7  $\mu$ A

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Special conditions and comments:

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Reviewed by Tom Fullin 11/26/19  
Operations Department Head/Date

Reviewed by Daniel R. Drenth  
Systems Department Head/Date

Reviewed by Madelyn Schoell 11/26/2019  
ESH&Q RPE Manager/Date

Reviewed by [Signature] 11/26/19  
ESH&Q Radiation Safety Officer/Date

Approved by [Signature] 11/26/2019  
Accelerator Division Head/Date

# Running Condition FAST

November 26, 2019

Sue McGimpsey

Area RSO

**Mode of Operation** 55 MeV electrons to LEA; Up to 300 MeV electrons to HEA

Beam Limits	Beam Energy	ASE Limit	Operating Limit
	55 MeV	1.96E19 electrons/hr	1.96E17 electrons/hr
	300 MeV	1.96E19 electrons/hr	3.37E18 electrons/hr

**Critical Devices** N:LGXBS1 and N:LGXBS2

**Enclosures Protected** FAST/IOTA

**Preferred Monitoring Devices\*** 55 MeV electrons to the LEA is monitored via N:T124, 300 MeV electrons to the HEA is monitored via N:T612

\*Other methods of monitoring intensity may be used.

## Requirements

**Access Devices** None

**Cool Off Period** None

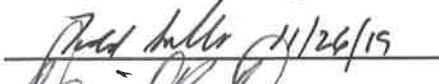
**Special Interlocks** The CDC Inputs including failure mode devices may all be found on the Safety System Status pages.

**Special Concerns** Any work performed on critical devices or obtaining a critical device key requires prior RSO approval.

**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 shielding assessment for the Advanced Superconducting Test Accelerator (ASTA) (December 2014) and the shielding assessment for the IOTA/FAST Electron Injector at 300 MeV (August 2017).

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

Ops. Dept. Head Approval  11/26/19 Assigned RSO Approval   
 Sys. Dept. Head Approval  AD Head Approval  11/26/2019

November 26, 2019

Area RSO

Sue McGimpsey

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## Operational Comments

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

If beam power remains below 8 watts, FAST is permitted to go into Supervised Access without a radiation survey. Contact RSO/RCT if beam power goes above 8 watts to perform a new radiation survey prior to going into Supervised Access.



November 26, 2019

Sue McGimpsey

Area RSO

## Operator Signatures

Crew Chiefs

Crew A

Crew B

Crew C

Crew D

Crew E

Other

# Running Condition IOTA

November 26, 2019

Sue McGimpsey

Area RSO

**Mode of Operation** 150 MeV electrons to IOTA

<b>Beam Limits</b>	<b>Beam Energy</b>	<b>ASE Limit</b>	<b>Operating Limit</b>
	150 MeV injection	1.96E19 electrons/hr	3.60E13 electrons/hr
	150 MeV circulating	n/a*	2.00E10 electrons

\*ASE limit is based on injection

**Critical Devices** N:LGXBS1 and N:LGXBS2

**Enclosures Protected** FAST/IOTA

**Preferred Monitoring Devices\*** Injected beam is monitored via the Wall Current Monitor (WCM) (N:IBEAMW), and circulating beam is monitored via the DCCT (N:IBEAM)

\*Other methods of monitoring intensity may be used.

## Requirements

**Access Devices** None

**Cool 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.

**Gates, Fencing and Passive Shielding Requirements** There is no access to radiologically fenced areas without prior RSO approval.  
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Ops. Dept. Head Approval *Tom Hall 11/26/19* Assigned RSO Approval *Sue McGimpsey*  
 Sys. Dept. Head Approval *David R. Cummings* AD Head Approval *Mark ... 11/26/2019*

November 26, 2019

Area RSO

Sue McGimpsey

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**Operator Signatures**

Crew Chiefs

Crew A

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Crew B

Crew C

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Crew D

Crew E

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Other

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