

Prepared by Haixin Huang

Date: December 7, 2011

Reviewed by: Van Lewis

Date: 12/12/11

Approved by: Haixin Huang

Date: 12/12/11

**AGS RING RADIATION SECURITY CHECK-OFF LIST
For Polarized Proton Operation
C-A Run Plan FY2012 –December 2011**

Note: Extraction of protons from the Booster into the AGS is not allowed until this check-off list is completed.

To prevent extraction of beam from the Booster the extraction septum (F6) and the bending magnets DH2 and DH3 in the BTA transfer line must remain off.

This is accomplished by locking and HOLD tagging the power supplies for the F6 septum and for DH2&3.

1a. _____ F6 septum

_____, _____ (tag #s)
_____, _____ (Date/time applied) _____ (Person)

and

1b. _____ DH2&3 HOLD tags

_____, _____ (tag #s)
_____, _____ (Date/time applied) _____ (Person)

OR

when either the Booster or AGS access control system has undergone re-certification, by locking and HOLD tagging of the Booster Extraction Key.

1c. ___ (ACG) Booster Access control system functional testing completed _____ (Date completed)
or

1d. ___ (ACG) AGS Access control system functional testing completed _____ (Date completed)

1e. ___ (LPA) Booster extraction key

Tag number: 5807

July 22, 2011, 11:17 (Date/time applied) Haixin Huang (Person)

2. The following chipmunk monitors must be in place and have undergone their regular “re-verification” and interlock check. IG will sign for the location and computer aspects and ACG will sign for the interlocks.

- 2a. ____ (ACG) NMO54&55 Crossing of Cockcroft Road over AGS ring
____ (BCIG)
- 2b. ____ (ACG) NMO56 B fan house
____ (BCIG)
- 2c. ____ (ACG) NMO57 C fan house
____ (BCIG)
- 2d. ____ (ACG) NMO46 D fan house
____ (BCIG)
- 2e. ____ (ACG) NMO47 E fan house
____ (BCIG)
- 2f. ____ (ACG) NMO48 South plug door
____ (BCIG)
- 2g. ____ (ACG) NMO22 North plug door
____ (BCIG)
- 2h. ____ (ACG) NMO49 NCA labyrinth
____ (BCIG)
- 2i. ____ (ACG) NMO77 NCA shield wall
____ (BCIG)
- 2j. ____ (ACG) NMO31 South wiring tunnel
____ (BCIG)
- 2k. ____ (ACG) NMO32 Target building north
____ (BCIG)
- 2l. ____ (ACG) NMO76 Northwest corner of the target building
____ (BCIG)
- 2m. ____ (ACG) NMO29 Switchyard head wall
____ (BCIG)
- 2n. ____ (ACG) NMO30 Switchyard head wall #2
____ (BCIG)

3. ____ (LEA) AGS ring penetrations and shielding visually inspected for physical integrity, i.e. without gaps, removal of shielding blocks, and other openings.

From the South gate that are counterclockwise: SEB beam line exit, South wiring tunnel, North wiring tunnel, North gate plug door, North gate man gate, FEB beam line exit, North conjunction area man gate, K7 escape hatch, Booster transfer line (BTA) entrance, Booster/AGS shield wall, Booster /AGS labyrinth gate, HEBT man gate, HEBT Injection line entrance, C14 escape hatch, old HILL penetration, South plug door, South man gate.

- 3a. ____ (LEA) Shielding inside the AGS ring near I-14, I-17 and I-19 back in place
- 3b. ____ (LEA) Shielding in the AGS ring near F-13 in place.
- 3c. ____ (LEA) Shielding in the aisle between the South plug and the AGS ring in place.
- 3d. ____ (LEA) Shielding in the aisle between the North plug and the AGS ring has been changed to the following _____.
- 3e. ____ (LEA) Steel (buoy anchor) shielding in place in the North conjunction area.
- 3f. ____ (LEA) Shielding in the AGS ring towards the zero degree port of the U-line in place.

3g. ____ (LEA) Shielding in the AGS ring near B19 which covers beam pipe for the old west experimental area.

3.1. ____ (LES) Inspect for physical integrity: Target Building Shielding and North Conjunction Area Shield Wall

3.2 ____ (LES) Holes in AGS to switchyard 10 foot shielding checked and plugged.

3.3 ____ (LES) Shielding in the vertical cracks on the side of AD2 checked.

3.4 ____ (LES) Barrier in place between AD3 and AD4 to prevent access to AD2 area.

4. ____ (RCD) Posting on barrier inside switchyard --entry prohibited.

5. ____ (LPA) Fences on the berm of the external perimeter of AGS ring in place.

6. ____ (LPU) AGS extraction into the U line. One of the following must be signed

____ (LPU) RSC No FEB check-off list satisfied

OR

____ (LPU) RSC Check-off list allowing AGS extraction (ion beams) into the U line satisfied

***** See drawing D10-M-489-4 for Berm radiation boundaries *****

7. ____ (RCD) AGS Ring interior posted as Radiation Area except for :
Region posted as Controlled Area to allow access to building 928 (the building housing the Siemens Motor Generator). This means that Cockroft Road (the road over the AGS ring berm), and the extension of that road to building 928 are posted as Controlled Areas.

8. ____ (RCD) Ramp area from Bldg. 911 to Bldg. 912 posted as RMA-Controlled Area.

Signs and postings in place – Radiation Area

9. ____ (RCD) At the AGS berm perimeter fences, including the North Conjunction Area and the fences between Bldg. 914 and Bldg. 919 and between the U-line and Bldg. 912.

10. ____ (RCD) Approaches to the South wiring tunnel from the Westinghouse area and from the MCR terminal room.

11. ____ (RCD) At the fence defining the radiation area at the South plug door.

112. ____ (RCD) At the area around the North Gate (or Bldg. 912).

13. ____ (RCD) Gates that provide access to the SEB switchyard.

Signs and postings in place—High Radiation Area

14. ____ (RCD) At all the entrances of the AGS ring, i.e. at the South plug door and the South gate, at the North gate and North plug door, at the North conjunction area and at the entry hatch to the AGS ring from the South wiring tunnel.
 15. ____ (RCD) Fences around the C14 and K7 escape hatches.
- Sign and postings in place- High Radiation Area with beam on
16. ____ (RCD) Fan houses A, B, C, D and E
 17. ____ (RCD) NW corner of exterior wall of target building
 18. ____ (RCD) At the fence at the tunnel from HIIL to the AGS ring.
 19. ____ (RCD) On the entry hatch of the North wiring tunnel.
 20. ____ (ACG) Active temporary changes or bypasses for AGS have been reviewed with RSCC.
 21. ____ (CME) Limits for proton beam onto the J10 dump/scrapper given to MCR.
 21. ____ (LP) J7 stripping target ready for protons in the AGS ring for which is not intended to be Used.
 22. ____ (RSCC) Changes to the North Conjunction Area shield wall have been reviewed and approved.
 23. ____ (RSCC) Shielding has been removed from the north gate tunnel and RCD informed to conduct surveys due to the change pending potential fault studies.
 24. ____ (LPA) The berm and all AGS shielding are ready for beam operations.

Given that the above list is complete:

22. ____ (LPA) Beam may be injected and accelerated in the AGS.
23. ____ (OC) Verified that the above list is complete.

See next page for Chipmunk lists

List of chipmunks relevant to AGS with their alarm and interlock levels.

Location	NMO number	Interlock level	Alarm level
Trench EEA ramp	1	50	10
AGS North Gate	22	20	16
South wiring tunnel	31	20	16
Target bldg North catwalk	32	20	10
D fan house	46	50	20
E fan house	47	N/A	40
South plug door	48	2.5	2
N. conjunction labyrinth gate	49	2.5	2
AGS ring road west	54	2.5	2
AGS ring road east	55	2.5	2
B fan house	56	50	20
C fan house	57	50	40
N'west corner of the target bldg.	76	2.5	1.6
NCA shield wall	77	20	5
Switchyard Headwall	29	50	10
Switchyard headwall #2	30	50	10

List of Titles

OC	Operation Coordinator on Shift
MCR	Main Control Room (P.F. Ingrassia or designee)
RSCC	Radiation Safety Committee Chair (D. Beavis or designee)
RCD	Radiation Control Division (P. Bergh or designee)
ACG	Access Control Group (J. Reich or designee)
LEA	Liaison Engineer for AGS ring (J. Tuozzolo or designee)
LPA	Liaison Physicist for AGS ring (H. Huang or designee)
LPU	Liaison Physicist for U-Line (V. Schoefer or designee)
LES	Liaison Engineer for target building shielding (A. Pendzick)
LEU	Liaison Engineer for U-Line (D. Phillips)
BCIG	Beam Components and Instrumentation Group (R. Atkins or designee)
CME	Chief mechanical Engineer (Joe Tuozzolo or designee)

Booster Radiation Safety Check-Off List for
operation with **Protons from Linac**
during (or immediately following)
operation with Ions from Tandem and EBIS

December 12, 2011

Prepared by: C.J. Gardner

Sign and Date: Chris J. Gardner 12/12/11

Reviewed by: D.R. Beavis

Sign and Date: D.R. Beavis 12/12/11

Approved by: T. Rose

Sign and Date: T. Rose 12/12/11

Protons from Linac may be injected and accelerated in Booster **only upon completion of this check-off list**. Before proceeding with the numbered check-off items, the **LTB** Beamstops must be **Inserted, Locked, and Tagged**. If necessary, equivalent devices and/or procedures may be substituted with appropriate LP and RSC approval.

The LTB Beamstop Lock and Tag are as follows:

_____ (LPB) LOTO Booster **LTB** Beamstop Enable Key (Bldg. 914):

Tag Number 5767

Lock Number 10L240

Person/Date: Chris Gardner 6 July 2011

The following items are to be initialed as complete:

1 LTB Status

1. _____ (LPL) No changes have been made to the physical configuration of LTB.

2 Booster Operational Status

1. _____ (LPB) Radiation Safety Check-Off List for Booster operation with **Ions from Tandem and EBIS** in effect.

3 Security System

1. _____ (ACG) All Booster interlocks have current functional checks.
2. _____ (ACG) Any active bypasses have been discussed with the RSCC as allowed with proton startup.

4 Administrative Items

1. _____ (LPB) Memo stating Booster Parameter Limits that are consistent with the Booster Operational Safety Limit in OPM 2.5 has been issued to MCR for required reading.
2. _____ (CME) Linac proton beam may be put into the B6 dump at an average rate of no more than _____ protons per 4 second repetition period.

5 Booster Extraction to AGS

Either Item 1 or Item 2 must be completed:

1. _____ (LPA) The AGS is ready to accept proton beam.

OR

2. _____ (LPA) Booster Extraction to AGS is LOTO:

Tag No. _____

Lock No. _____

Person/Date: _____

6 Booster Extraction to NSRL

Either Item 1 or Item 2 must be completed:

1. _____ (LPN) NSRL (R-line) is ready to accept beam.

OR

2. _____ (LPN) Booster Extraction to NSRL is LOTO:

Tag No. _____

Lock No. _____

Person/Date: _____

7 Verification and Permission

All of the above check-off items have been initialed as complete.

_____ (OC)

_____ (Date/Time) The RSC LOTO(s) that prevent
Linac proton beams from entering the Booster may be removed. The **LTB**
beamstop remote enable key (in Bldg. 914) may be inserted and turned (or
equivalent devices enabled) to allow beam enable from the MCR.

_____ (LPB)

_____ (Date/Time)

Abbreviations LPL = Liaison Physicist Linac (**Deepak Raparia** or designee)

LPA = Liaison Physicist AGS (**Haixin Huang** or designee)

LPB = Liaison Physicist Booster (**Chris Gardner** or designee)

LPN = Liaison Physicist NSRL (**Adam Rusek** or designee)

CME = Chief Mechanical Engineer, ME (**Joe Tuozzolo** or designee)

RSCC = Radiation Safety Committee Chair (**Dana Beavis** or designee)

ACG = Access Control Group (**Jonathan Reich** or designee)

MCR = Main Control Room

OC = Operations Coordinator