Accelerator Issues

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BROOKHAVEN NATIONAL LABORATORY

Office of Science
U.S. DEPARTMENT OF ENERGY

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LINAC

- Performance

13 January '09 to 08 July '09			
Hi Intensity source failures	(BLIP only)	=	0.97 hr
p^ source failures	(RHIC only)	=	24.96 hr
RFQ failures	(RHIC + BLIP)	=	2.64 hr
RFQ failures	(BLIP only)	=	0.29 hr
total Linac failures	105.7 hr		
total scheduled Linac hours	4224 hr		
RHIC availability	80.2%		
Linac availability	97.4%		

- Maintenance
  - 50 hours operations maintenance over the 4200 hour Run 9 period.
  - 31 man-weeks of shutdown maintenance

- Schedule
  - Linac schedule is determined by RHIC polarized proton program.
  - Typically try to schedule at least 10 weeks of operations every other year.
  - PHENIX and STAR run-use proposal requests, PAC advice and ALD decision determines the schedule.

C-AD vs. BLIP Responsibilities

- The intent of this agreement is to ensure that all work is evaluated for safety, security and environmental protection and that responsibility for work on the BLIP related facilities or BLIP operations is clearly understood by both organizations.

- The memorandum of agreement (see additional material) includes;

  - Work Planning and Control
  - Conduct of Operations
  - Operations Authority and Conduct of Maintenance

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Operating Modes

Mode	Description	Cost Algorithm
1	Dedicated Running	BLIP assumes all start-up and operating costs including a 6 operator shift rotation
2	RHIC Polarized Proton Running	BLIP runs during RHIC fills. Higher tube currents for BLIP increase tube replacement component of the rate. Linac start up cost paid by RHIC
3	NSRL Running with Tandem	NSRL runs 12 hour day shift/no weekends. BLIP assumes all start-up costs, overnight and weekend operating costs.
4	NSRL Running with Linac	NSRL runs 12 hour day shift/no weekends. BLIP assumes all overnight and weekend operating costs. Linac start up costs paid by RHIC.
5	RHIC Heavy Ion Running	BLIP pays dedicated costs associated with Linac operations and tube use. RHIC Program pays MCR labor cost.

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Rate Components by Operating Mode

Mode	Description	Power	Tube Replacement	Linac Maintenance	MCR Labor
1	Dedicated Running	Power use estimated for each of 4 operating energy levels. BNL balanced billing power rates utilized.	Weekly cost of tube usage based on purchase history and estimated hourly lifetime by tube for each of 6 tube types. Number of tubes in use varies by type for each of 4 operating energy levels. Modes 2 and 4 share cost of tubes with RHIC.	40 hours per week for technical support. Misc trade labor and materials based on historical data for Linac maintenance	168 hours per week for Main Control Room Operator
2	RHIC Polarized Protons			Paid by RHIC Program	Paid by RHIC Program
3	NSRL with Tandem			40 hours per week for technical support. Misc trade labor and materials based on historical data for Linac maintenance	112 hours per week for Main Control Room Operator
4	NSRL with Linac			40 hours per week for technical support. Misc trade labor and materials based on historical data for Linac maintenance	56 hours per week for Main Control Room Operator
5	RHIC Heavy Ions			40 hours per week for technical support. Misc trade labor and materials based on historical data for Linac maintenance	Paid by RHIC Program

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Operating Cost for Dedicated Running

(FY 2010 @ $72 / MWH)

Operating Energy Level	Power MWH	Power Cost	Tube Replacement Cost	Linac Maintenance	MCR Operations	Weekly Cost	Start-Up Cost
200 MeV	2.19	$27K	$44K	$33K	$22K	$126K	$153K
116 MeV	1.53	$19K	$25K	$33K	$22K	$99K	$125K
90 MeV	1.36	$17K	$20K	$33K	$22K	$92K	$118K
66 MeV	1.19	$14K	$16K	$33K	$22K	$85K	$110K

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Weekly Operating Cost by Mode
(FY 2010 @ $72 / MWH)

Mode	Description	200 MeV	116 MeV	90 MeV	66 MeV
1	Dedicated Running	$126K	$99K	$92K	$85K
2	RHIC Polarized Proton	$48K	$29K	$24K	$19K
3	NSRL with Tandem	$118K	$91K	$85K	$78K
4	NSRL with Linac	$93K	$73K	$68K	$64K
5	RHIC Heavy Ion Running	$104K	$77K	$70K	$63K

Future Charging Plan

- Will the current DOE funding plan for BLIP accelerator operations continue?
  - The present scheme leaves BLIP as a parasitic operation that is overwhelmingly dependent on RHIC operations.
  - C-AD support personnel are purchased, when available, to support target, hot cell, CIRC etc. engineering and technical support.

- If it remains as is, we will continue to treat BLIP as if it was a WFO user that pays full cost recovery for dedicated operations and incremental costs for parasitic operations, to RHIC.

- C-AD would urge consideration of a base budget to support a minimum number of weeks in parallel with RHIC operations.
  - The base budget would include personnel, power, materials purchases and linac power tubes. There would be a small increment in C-AD staff to support the base program.

- Running weeks beyond the minimum parallel operations would be costed on an incremental basis for parasitic operations to RHIC, and a full cost recovery basis outside of RHIC operations.

ADDITIONAL MATERIAL

C-AD vs. BLIP Responsibilities

Work Planning and Control for BLIP

The intent of this agreement is to ensure that all work is evaluated for safety, security and environmental protection and that responsibility for review of work on the BLIP related facilities or BLIP operations is clearly understood by both organizations.

The Medical Department is responsible for reviewing and approving operations, new construction or modification work on BLIP Building 931 and associated utilities. This includes radiation shielding and environmental emissions.

The Medical Department is responsible, via the BLIP Facility Supervisor, for notifying C-AD for all new construction or modification work on the BLIP Facility or Building 931 and associated utilities. C-AD will make the decision on whether or not there is an impact on contiguous C-AD facilities or operations.

The Collider-Accelerator Department (C-AD) is responsible for reviewing construction or modification work to the BLIP building that relates to beam interlocks or any work involving the adjacent Linac or Building 930.

C-AD is responsible for assigning a Liaison Physicist and a Liaison Engineer to interface with the BLIP Facility Supervisor.

Conduct of Operations

The Linac and BLIP spur tunnel in Building 930 and the BLIP facility in Building 931 shall operate-with-beam from the C-AD Main Control Room (MCR) in Building 911. Responsibility for safe and reliable operation-with-beam shall reside with the on-duty C-AD Operations Coordinator (OC). The OC is the supervisor for operating personnel and the person to whom all operations related questions shall be addressed. BLIP operational issues (i.e., tuning) are to be communicated to the C-AD OC, MCR Operator or Linac Liaison Physicist. Minor operational issues, such as increasing or decreasing intensity or moving the beam spot, are to be communicated directly to Linac staff for correction; however, the Linac Liaison Physicist is responsible to review these communications between Linac staff and BLIP staff. Moreover, the Linac Liaison Physicist must be contacted directly for significant issues such as beam energy change and significant change to beam spot shape with octupoles.

The C-AD Scheduling Physicist shall set the schedule for daily operation-with-beam of the Linac, BLIP spur tunnel and BLIP Facility. This schedule shall be authorized by the C-AD Experimental Support and Facilities Division Head with the joint concurrence of C-AD Accelerator Division Head and Medical Department's BLIP Facility Supervisor. The C-AD OC is charged with implementing this schedule.

A regular weekly Time Meeting shall be held during operations with beam. The Time Meeting shall bring together members of the C-AD, RHIC Users, NSRL Users and the BLIP Facility staff. These meetings shall be scheduled during all running periods. The weekly Time Meetings are to be coordinated by the C-AD Scheduling Physicist.

Operations Authority and Conduct of Maintenance

The beam in Linac and the BLIP spur tunnel in Building 930, and the beam inside the BLIP Facility must be operated by authorized C-AD Accelerator Division personnel only. All C-AD Operators are authorized to shut down beam-transport systems whenever an unsafe condition arises, or whenever in their judgment they believe that continued beam operation is not safe. C-AD Operators shall be authorized to operate beamline systems only after completion of appropriate training programs related to the C-AD Operations Procedure Manual and BLIP orientation training. C-AD Operators shall operate beamline systems under the direct supervision of the on-duty C-AD OC.

All scheduled maintenance performed by BLIP or Medical Department personnel or guests inside the BLIP spur tunnel in Building 930 must be done with the authorization of the C-AD Maintenance Coordinator.

If work on components related to beam delivery to the BLIP Facility inside Building 931 is required during a running period (e.g., turning off and then on for target manipulations or maintenance, etc.), then the on-duty OC or MCR Operator shall be informed by BLIP staff.