Project Overview

Jim Alessi

September 19-20, 2007

Agenda

ELECTRON BEAM ION SOURCE

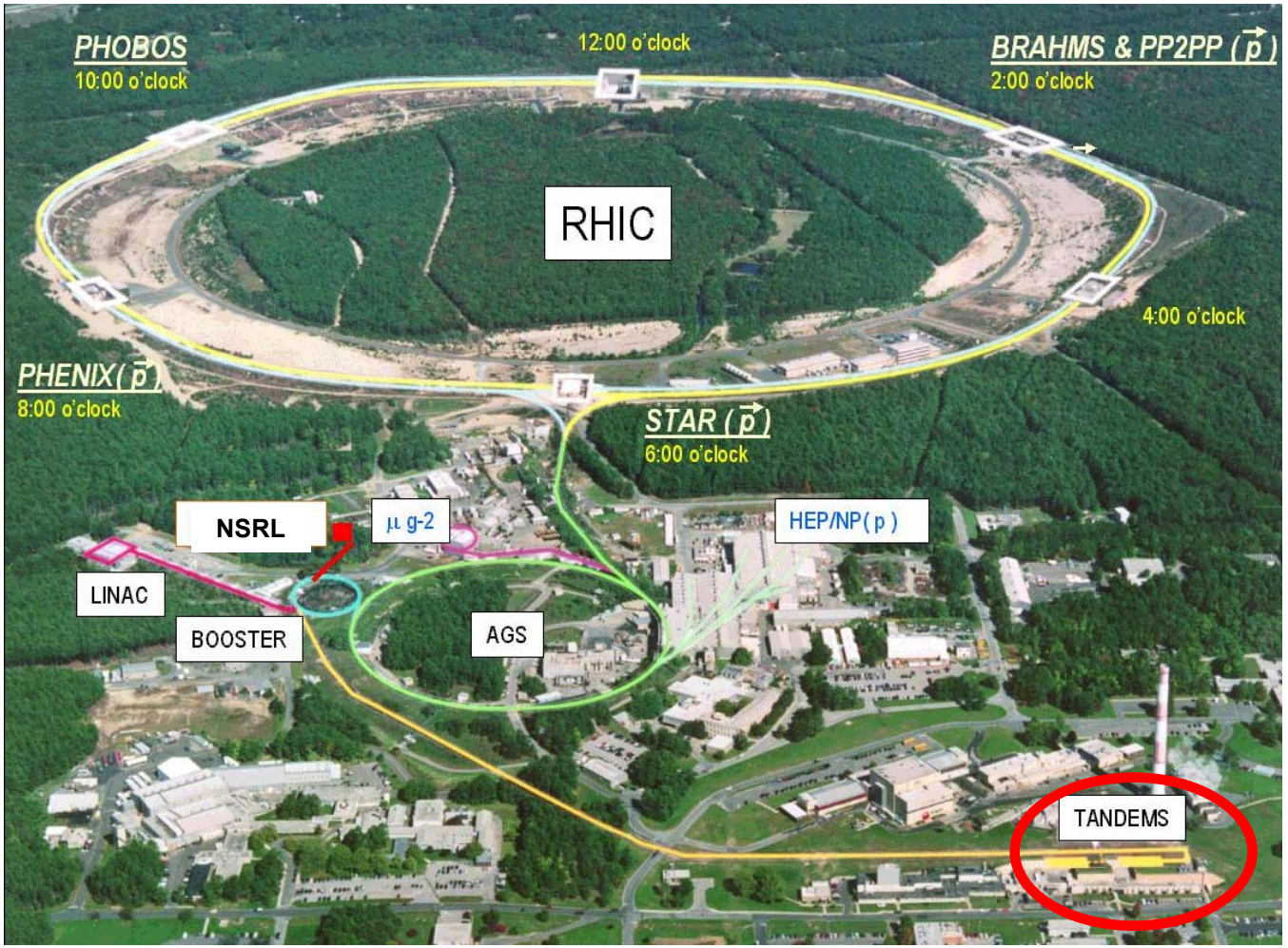
Wednesday, September 19, 2007

8:30 – 9:00	Executive Session
9:00 – 9:10	Welcome - S. Vigdor *(Assoc. Lab Director for Nuclear and Particle Physics)*
9:10 – 10:00	Project Overview ……J. Alessi
10:00 – 10:20	Safety……E. Lessard
10:20 – 10:35	BREAK
10:35 – 11:05	EBIS & LEBT Tests ……E. Beebe
11:05 – 11:35	Physics Design……D. Raparia
11:35 – 12:15	Cost, Schedule, Financial ……K. Mirabella
12:15 – 13:30	LUNCH
13:30 – 14:00	Structural Components (WBS 1.1)……L. Snydstrup
14:00 – 14:20	Magnet Designs & Status (WBS 1.4)……M. Okamura
14:20 – 14:40	Power Supply Status (WBS 1.5)……R. Lambiase
14:40 – 15:00	BREAK
15:00 – 15:20	RF Systems Status (WBS 1.6)……A. Zaltsman
15:20 – 15:45	Other Subsystems & Installation ……L. Snydstrup (WBS 1.2, 1.3, 1.7, 1.8, 1.9, 1.10)
15:45 – 16:00	Summary……J. Alessi

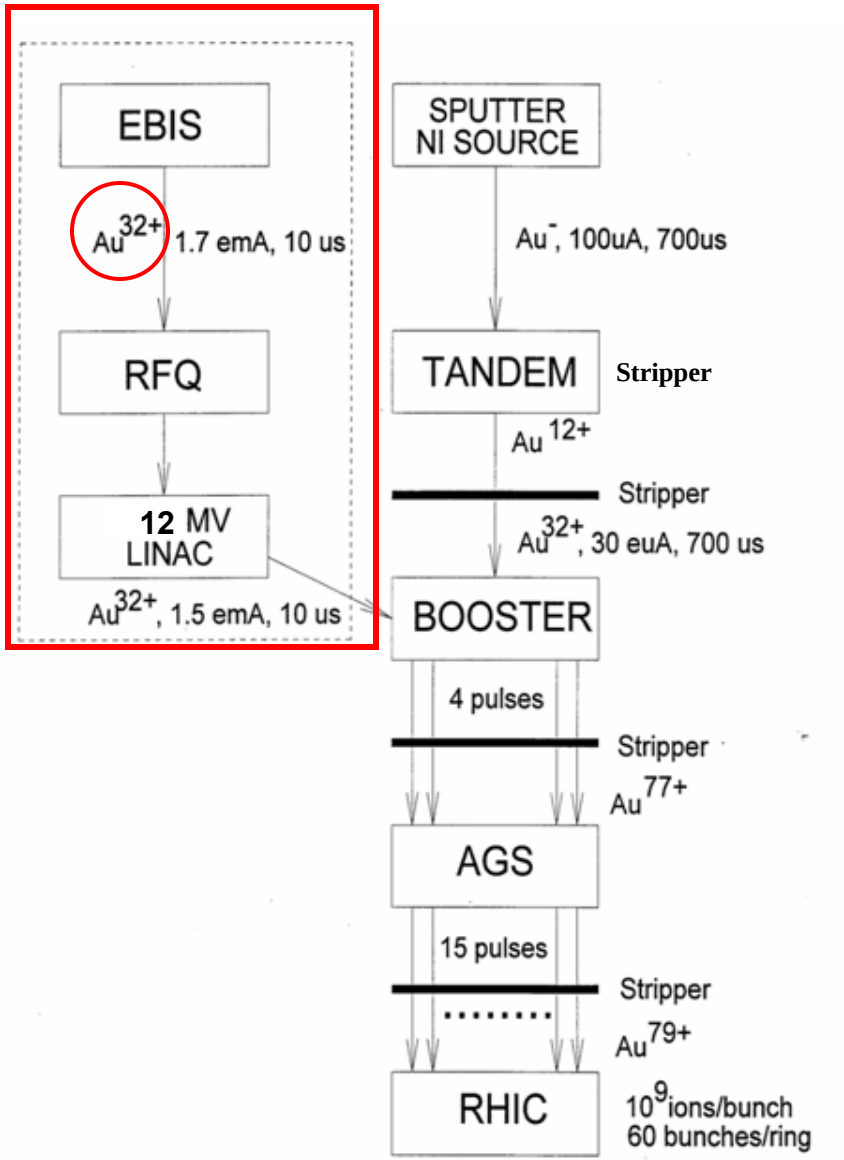
Outline of Talk

- Motivation
- 2006 DOE Review recommendations and responses
- Project Organization, WBS
- Technical overview of the project
- Activities since last review
- Technical changes since last review
- CR impact
- Schedule; status on milestones
- Financial status; use of contingency
- Summary

Tandems are the present heavy ion preinjectors for RHIC



860 m long transport line from the Tandems to the Booster



ELECTRON BEAM ION SOURCE

Advantages of the new preinjector:

- **Simple, modern, low maintenance**
- **Lower operating cost**
- **Can produce any ions (noble gases, U, $He^{3\uparrow}$)**
- **Higher Au injection energy into Booster**
- **Fast switching between species, without constraints on beam rigidity**
- **Short transfer line to Booster (30 m)**
- **Few-turn injection**
- **No stripping needed before the Booster, resulting in more stable beams**
- **Expect future improvements to lead to higher intensities**

There has been no change to the motivations for the project.

Project history

- August, 2004: CD-0 Approval – Mission need
- July, 2005 –Technical, Cost, Schedule, & Management review (NASA & DOE)
- September, 2005 – DOE CD-1 approval - Alternative Selection and Cost Range
- May, 2006 – Technical, Cost, Schedule, & Management Review (NASA & DOE)
- September, 2006 – DOE Independent Project Review
- September 29, 2006 – DOE CD-2 approval (Performance Baseline), and CD-3 approval (Construction Start)
- May, 2007 – BHSO Project Review

April, 2007 – Start of DOE Construction funds

September 19-20, 2007 – DOE/NASA Annual Review

Prior to Critical Decision-2 (CD-2), revise the Startup Plan to incorporate comments made at the review, as well as task duration and integration. Comments were incorporated into the EBIS Startup Plan. The plan was then sent to DOE-NP, and their final additional comments were incorporated in the present version. **This action is complete.**

Prior to CD-2, re-evaluate the Systems Requirement document for consistency in parameter definition. The document was corrected, the new version was sent to DOE-NP and accepted without any further changes. **This action is complete.**

End-to-end beam dynamics simulations of the LEBT-RFQ-MEBT-Linac systems, including all known types of errors, should be completed prior to completion of final design. At the May review, complete end to end simulations were presented. Error studies had been done and were also presented at the May review. We are confident that normal errors arising from the fabrication process for the RFQ and linac are acceptable, based on previously fabricated very similar RFQ and IH structures, where the as-built devices performed as calculated. Following the completion of the physics designs for the RFQ and Linac, full end-to-end simulations with errors were completed. **This action is complete. (Will be reported on by Raparia)**

Develop a detailed Quality Assurance (QA) Plan for the fabrication and testing of the Radio Frequency Quadrupole (RFQ) and include it in the final vendor contract. The specification for the RFQ already had a detailed QA plan at the time of the review, but was not seen by the committee. However, some additions were made to the RFQ Specification based on suggestions from committee members during the review. **This action is complete.**

Prior to CD-2, integrate low level RF design efforts supported outside the project scope and design reviews into the project schedule. Deadline schedule dates for the low level RF design efforts were added to the EBIS Project schedule. **This action is complete.**

Perform a critical path analysis, based on a first Quarter Fiscal Year 2010 (1QFY10) project completion, prior to CD-2 and incorporate results into project planning and documentation. A critical path analysis was performed and incorporated into Project planning and documentation. The analysis accommodates the NASA preferred 1QFY10 completion with its Early Finish dates, but leaves the CD-4 date as 2QFY10. **This action is complete.**

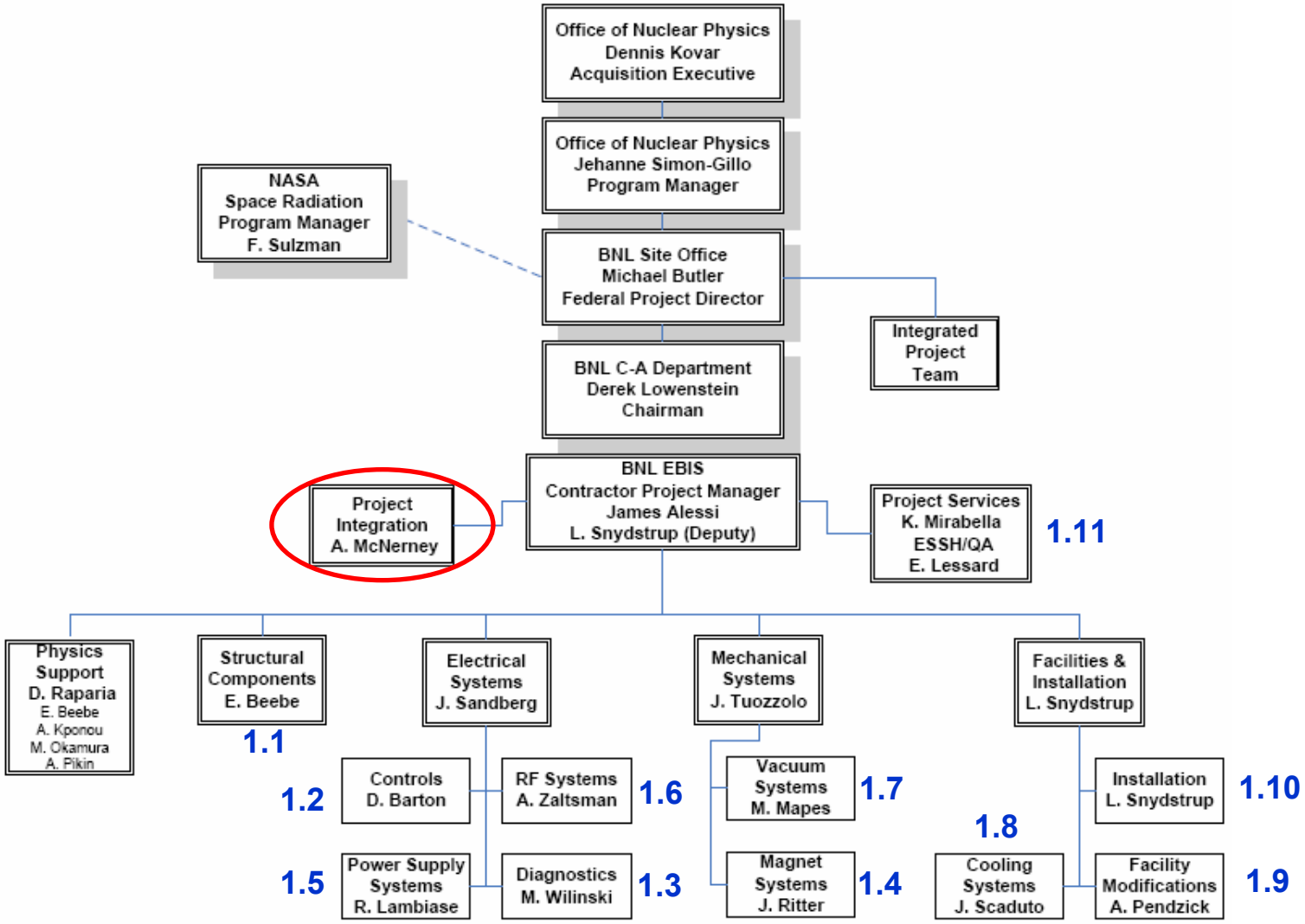
Compare the obligations profile to the funding profile. Re-assess the contingency analysis upon completion of the critical path analysis and refinement of risk assessment. Optimize the contingency profile with respect to the planned obligation profile. Risk and Contingency were reassessed before performing a review of funding vs. planned obligations by fiscal year. The results have been discussed with Federal Project Director Mike Butler as manager of the EBIS contingency funds. **This action is complete.**

Review and adjust, as necessary, the Level 2 and 3 milestones to ensure that progress can be adequately evaluated. Additional milestones and deadline dates were added to the schedule. **This action is complete.**

Appoint an Integration Manager to the project team. An Integration manager was appointed to the team and added to the organization chart. **This action is complete.**

The risk assessment should be re-evaluated upon the completion of a critical path analysis and to incorporate feedback from this review. This should occur prior to CD-2 and the results incorporated into project planning and documentation. Risks have been reassessed and results incorporated into the Project schedule and documentation. Reassessment of risks, tracking closely high risk items, and continuous development of mitigation plans, will be ongoing throughout the project. **This action is complete.**

Project Organization



WBS Description

- **1.1 Structural Components**
  - Source components, and accelerators; the EBIS hardware, RFQ, Linac, and bunchers
- **1.2 Control Systems**
  - All controls for the project. Networked, front-end interfaces will be connected via Ethernet to control console workstations and central C-AD servers.
- **1.3 Diagnostics**
  - Faraday cups, current transformers, and profile monitors in LEBT, MEBT, and HEBT
- **1.4 Magnet Systems**
  - EBIS warm solenoids, HEBT dipoles, MEBT and HEBT quads
- **1.5 Power supplies**
  - All power supplies for the EBIS, external ion sources, and transport lines.
- **1.6 RF Systems**
  - High and low level rf systems for operation of the RFQ, Linac, and bunchers

WBS Descriptions (cont.)

- **1.7 Vacuum Systems**
  - Vacuum components for EBIS, external ion sources, all transport lines, and accelerators. Excludes specialized vacuum chambers on EBIS and LEBT, which are in Structural Components.
- **1.8 Cooling Systems**
  - All cooling water systems for EBIS, RFQ, Linac, transport line magnets, and power supplies.
- **1.9 Facility Modifications**
  - Relocation of existing power to disconnect switches and then all equipment, plus a port allowing the HEBT line to pass through earth shielding between the Linac and Booster.
- **1.10 Installation**
  - Installation in the final location of all structural components, control systems, diagnostic and instrumentation systems, magnets, power supplies, RF systems, vacuum systems, and cooling systems.
- **1.11 Project Services**
  - Level of effort tasks associated with the daily management, oversight, and statusing of the project.
- **1.12 Commissioning**
  - All final testing with beam.

Regular EBIS project meetings, etc.

- DOE Quarterly reports (teleconference)
- DOE Monthly teleconference with the Federal Program Manager
- Bi-weekly meetings with C-AD Management and the FPD.
  - Alessi (CPM), Snydstrup (Deputy), Mirabella (Proj Controls), LaMontagne (Admin), Lowenstein (Dept. Chair), Roser (Division Head), Butler (FPD)
- Bi-weekly project meetings with the Subsystem Managers and other key personnel (Safety, Procurement, Financial, etc.)
- Smaller group/subsystem meetings (weekly EBIS source, controls, vacuum, etc.)

Safety reviews held

- Radiation Safety Committee review of the EBIS Project (ongoing)
  - New emergency exit near Booster berm
  - Radiation from the new beam port
  - X-rays from the linac and buncher cavities
  - Critical devices for beam shutoff
- Safety review of emergency egress from Booster after installation of the new dipoles
- Safety review of Test EBIS prior to restart after move
- Safety review of high voltage pulser prior to start of construction
- ES&H review of the beam port
- Cryogenic Safety Review for the SC Solenoid – preliminary, 6/06
- Beam port fault studies – evaluation by the Radiation Safety Committee in process (no dogleg will be required)
- Accelerator Systems Safety Review Committee meeting - project overview.

Preinjector requirements

The preinjector must be able to switch both species and transport line rigidity in ~1 second, so that there are no restrictions on compatibility between RHIC and NSRL operations.

For example:

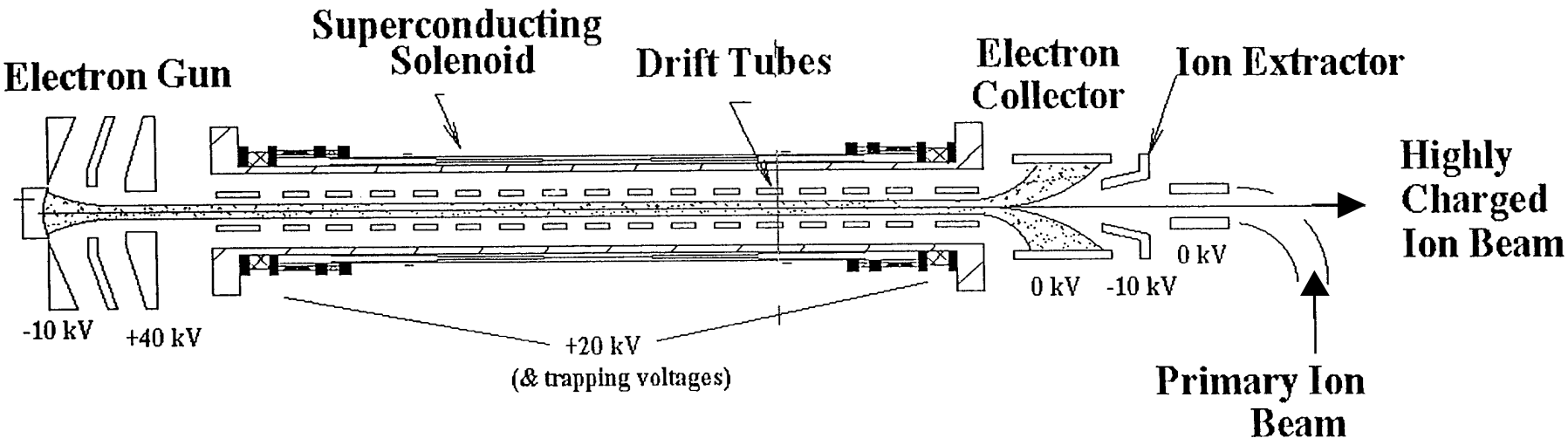
Requirement for RHIC : 1.7 emA of Au^{32+}, 10 μs; 5 Hz

plus….NSRL (NASA Space Radiation Laboratory) – *a* second species, 1 second later:

He^{2+}, C^{5+}, O^{8+}, Si^{13+}, Ti^{18+}, Fe^{20+}, Cu^{22+}, at ~2-3 emA, ~ 10 μs

- **short pulses**
- **fast beam changes**
- **any species**

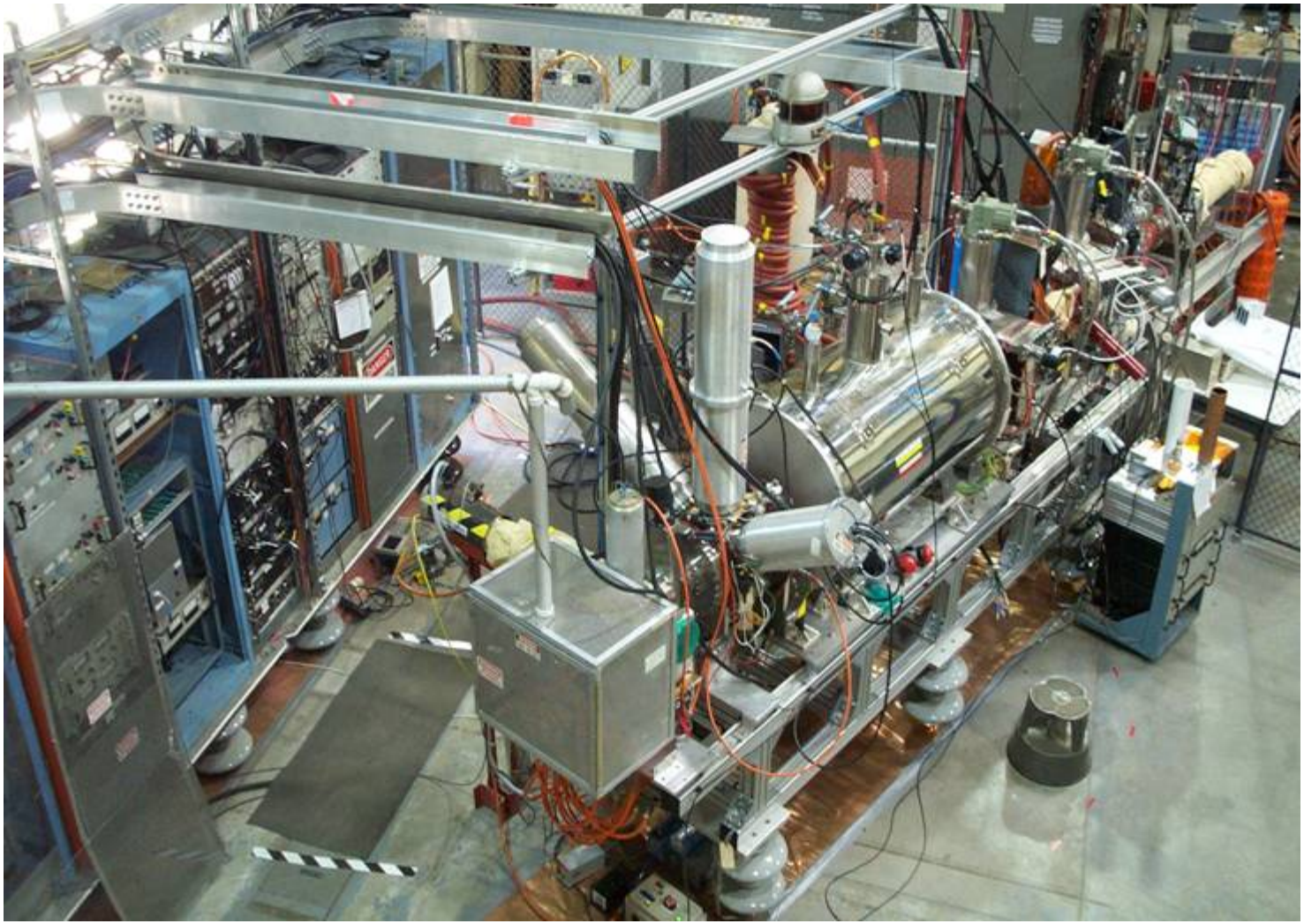
Principle of EBIS Operation



Radial trapping of ions by the space charge of the electron beam.
Axial trapping by applied electrostatic potentials on electrode at ends of trap.

- **The total charge of ions extracted per pulse is ~ (0.5 – 0.8) x (# electrons in the trap)**
- **Ion output per pulse is proportional to the trap length and electron current.**
- **Ion charge state increases with increasing confinement time.**
- **Charge per pulse (or electrical current) ~ independent of species or charge state!**

Test EBIS on 100 kV platform



RHIC EBIS

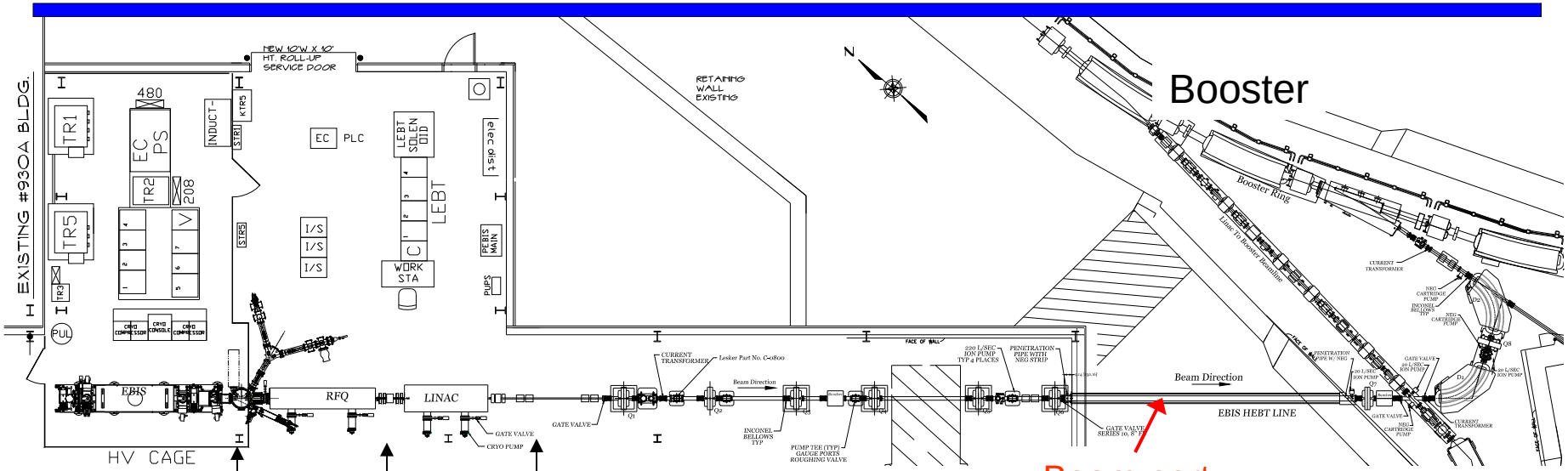
Design changes relative to the Test EBIS, needed to meet RHIC requirements:

1. Longer SC solenoid and ion trap region
2. Collector design for higher average power

Improvements to increase operational reliability and safety margin:

3. Collector design for higher peak power
4. Electron gun capable of 20 A operation
5. Increases to the solenoid bore and maximum field

Placement of EBIS Preinjector in lower equipment bay of 200 MeV Linac



EBIS 17 keV/u | RFQ 300 keV/u | Linac 2 MeV/u

100 MHz

Ion	He - U
Q/m	≥1/6
Current	> 1.5 emA (for 1 turn inj)
Pulse Length	10 μs
Rep. Rate	5 Hz
Time to switch species	1 second

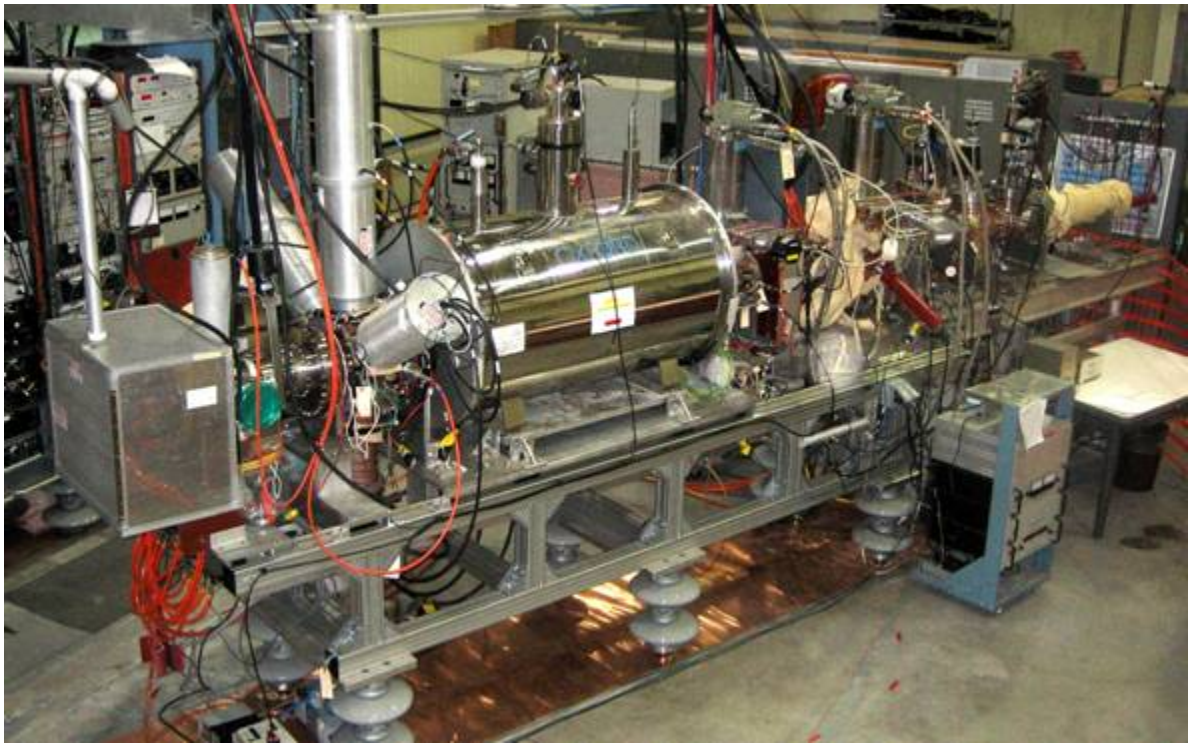
What's been accomplished since the last review? (Details in later talks)

- CD-2 and CD-3 achieved
- Operation of the Test EBIS at 100 kV, including emittance measurements
- RFQ procurement placed, design reviews held, and fabrication is in progress.
- Linac procurement placed, and detailed design is well advanced.
- RF amp procurement placed, design review held, and fabrication is in progress.
- Prototype LEBT chamber designed, fabricated, tested (including internal deflectors, ESQ's, …)
- Prototypes of the LEBT solenoid magnet and MEBT quadrupole magnet were designed, fabricated, and tested
- Beam port installed, including chamber in Booster and vacuum pipe through wall.
- Dipole magnetic calculations were completed, and we are in the process of evaluating the vendor proposals for fabrication.
- The Beneficial Operational Readiness Evaluation for the building extension which will house many of the EBIS power supplies is schedule for mid-September.
- Orders were placed for power supplies, vacuum components, and controls hardware.
- Safety reviews addressing operation of the Test EBIS at high voltage, cryogenic safety of the superconducting solenoid, and an overview of safety issues of the entire EBIS preinjector.

Problem areas

- Electron collector delivery has been delayed due to difficulties encountered by the vendor during fabrication. (to reduce schedule risk, a second collector is being fabricated in the BNL shops using an alternative material).
- The superconducting solenoid delivery has been delayed due to a failure following a forced quench as part of the factory acceptance testing.
- It appears that there will be a delay in the delivery of the linac, relative to the contract delivery date of Sept, 2008. With the present estimate of March, 2009, the linac is on the critical path. (IAP is making an effort to reduce manufacturing time).

Test EBIS on stand with high voltage isolation

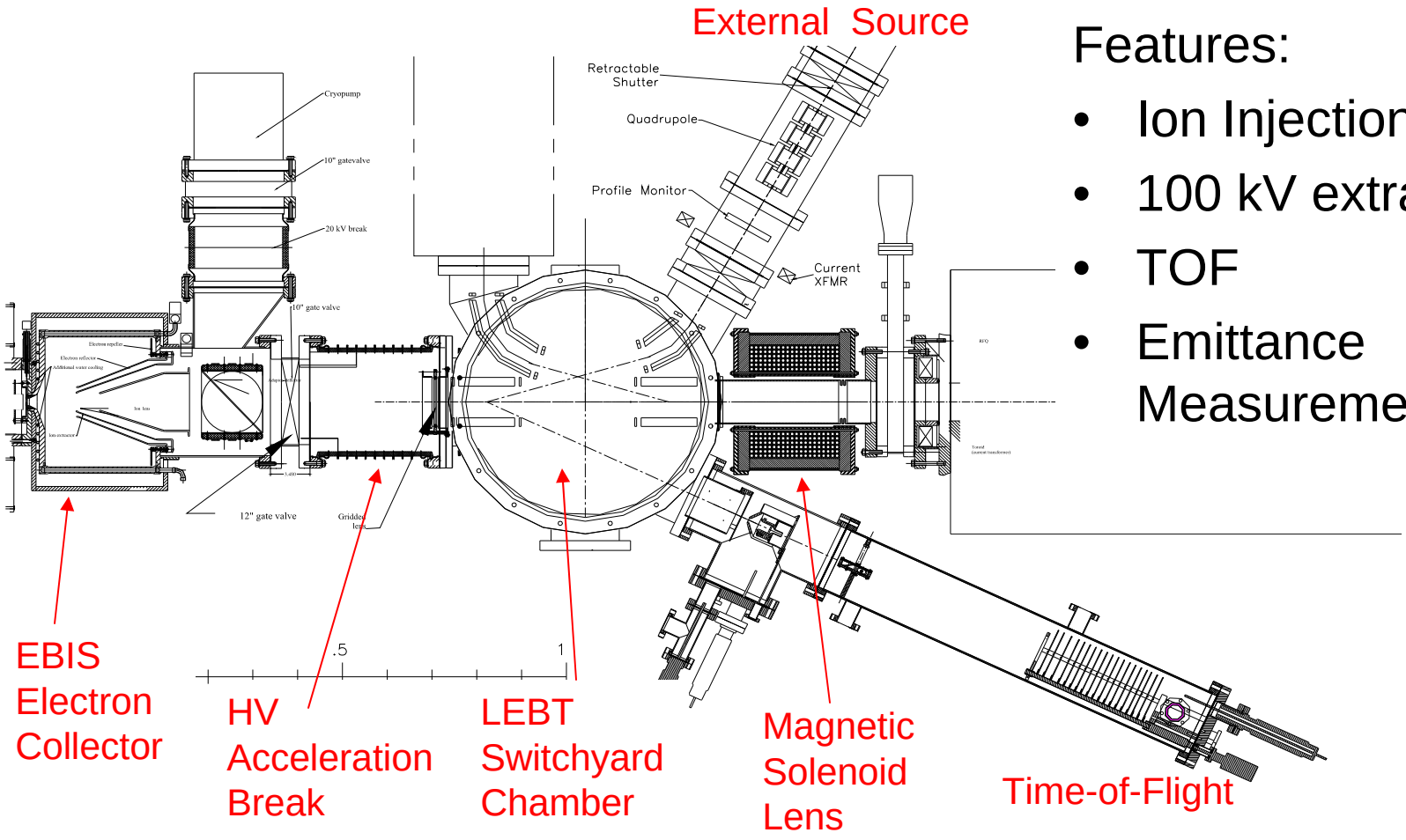


Operation of the Test EBIS at 80 kV extraction has been very successful.

(an important test which validated method for HV isolation, HV iso transformer, HV pulser design, and no change in performance when platforms are pulsing)

Emittance measurements are ongoing.

Prototype LEBT has been installed on Test EBIS

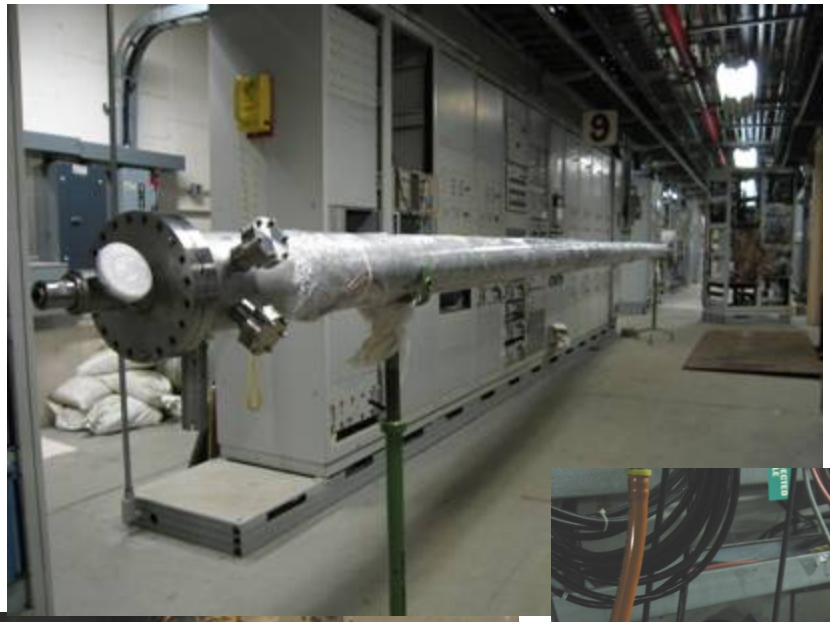


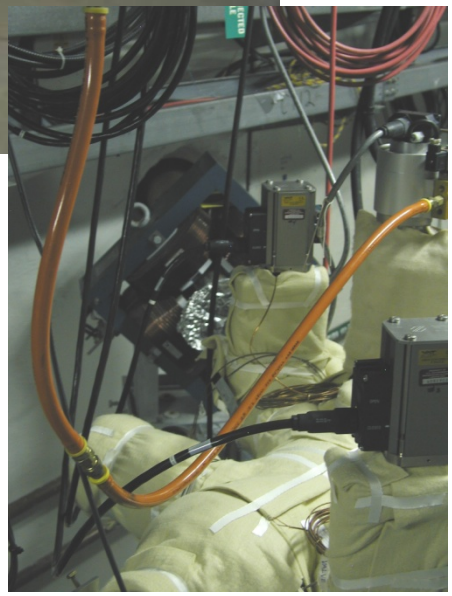
Features:

- Ion Injection
- 100 kV extraction
- TOF
- Emittance Measurements

Drilling of beam port (July, 2006)

Beam pipe through port; crossing chamber





Radiation fault studies with protons from the Linac have confirmed that a “dogleg” won’t be needed in the HEBT line.

Extension Building (NYS Funds)

The building is on schedule, with beneficial occupancy planned for this month.


ENTRY BY AUTHORIZED PERSONEL ONLY

Technical changes since the last review

- No changes in physics parameters
- Linac – 2 internal triplets → one internal + 1 external, shorter cavity (improved design)
- Building second collector from alternative material
- Procurement of inductrol to allow control of collector ps voltage

(Not in the project scope, but new developments by Okamura raise the possibility of a simple laser ion source for primary 1+ ion injection into EBIS)

Impact of FY'07 Continuing Resolution

- The FY07 Continuing Resolution delayed the receipt of DOE Construction funds for the EBIS Project by 6 months (3 months from the planned start of major procurements) and reduced the planned allocation by $2.4M.
- To reduce the impact of this CR, NASA and DOE agreed to some replanning of the DOE/NASA scope split. The resultant impact on the schedule was a 4 month delay to the baselined finish date, from Aug. 2009, to December 2009.
- The CD-4 date was planned for March 2010. To avoid the loss of this schedule float the CD-4 date was shifted to July 2010.
- The one year delay in the planned $2.4 M, and the 4 month schedule delay, increased the estimated project cost by $140 k. This cost increase has been taken from project contingency.

DOE and NASA funding profiles

Total

	FY 05	FY 06	FY 07	FY 08	Total
R&D	0.5	0.7	-	-	1.2
CDR	0.2	-	-	-	0.2
PED/EDIA	-	1.98	0.12	-	2.1
Cons	0.5	2.4	5.0	7.6	15.5
Pre-Ops	-	-	-	0.3	0.3
TEC	0.5	4.38	5.12	7.6	17.6
TPC	1.2	5.08	5.12	7.9	19.3

DOE Contribution

	FY 05	FY 06	FY 07	FY 08	Total
R&D	0.5	0.1			0.6
CDR	0.2				0.2
PED/EDIA		1.98	0.12		2.1
Cons			5.0	6.6	11.6
Pre-Ops				0.3	0.3
TEC		1.98	5.12	6.6	13.7
TPC	0.7	2.08	5.12	6.9	14.8

2.4 M$ of DOE $ shifted from FY'07 to FY'08

NASA Contribution

	FY 05	FY 06	FY 07	FY 08	Total
R&D		0.6			0.6
CDR					-
PED/EDIA					-
Cons	0.5	2.4	x ←	1.0	3.9
Pre-Ops					-
TEC	0.5	2.4	x ←	1.0	3.9
TPC	0.5	3.0	-	1.0	4.5

Early arrival of NASA FY'08 funds

Technical scope

The **NASA scope** is the procurement of the following items:

a. EBIS superconducting solenoid
b. Beam port between Linac and Booster.
c. Radio Frequency Quadrupole accelerator
d. Linac
e. Buncher cavities
f. Two HEBT dipole magnets and their power supplies
g. Electron collector power supply
h. All quadrupole magnet and steerer magnet power supplies for the Linac, MEBT, and HEBT → DOE
i. Fast pulsing power supplies for the EBIS drift tubes and platform bias.

Some change in scope to reduce schedule slip from CR.

The **DOE scope** is the following activities or procurements:

a. All PED, installation, and commissioning for the entire project
b. All EBIS chambers, internal structures, and warm magnets
c. LEBT and external ion injection lines → NASA
d. All vacuum components, controls, diagnostics, and cooling water systems
e. All MEBT and HEBT beamline components, except for two HEBT dipoles
f. All RF systems for operation of the RFQ, Linac, and bunchers
g. All power supplies for EBIS, LEBT, and external ion sources, except for the electron collector and fast pulsing EBIS platform supplies.
h. Electrical services required for the operation of the preinjector

Use of Contingency

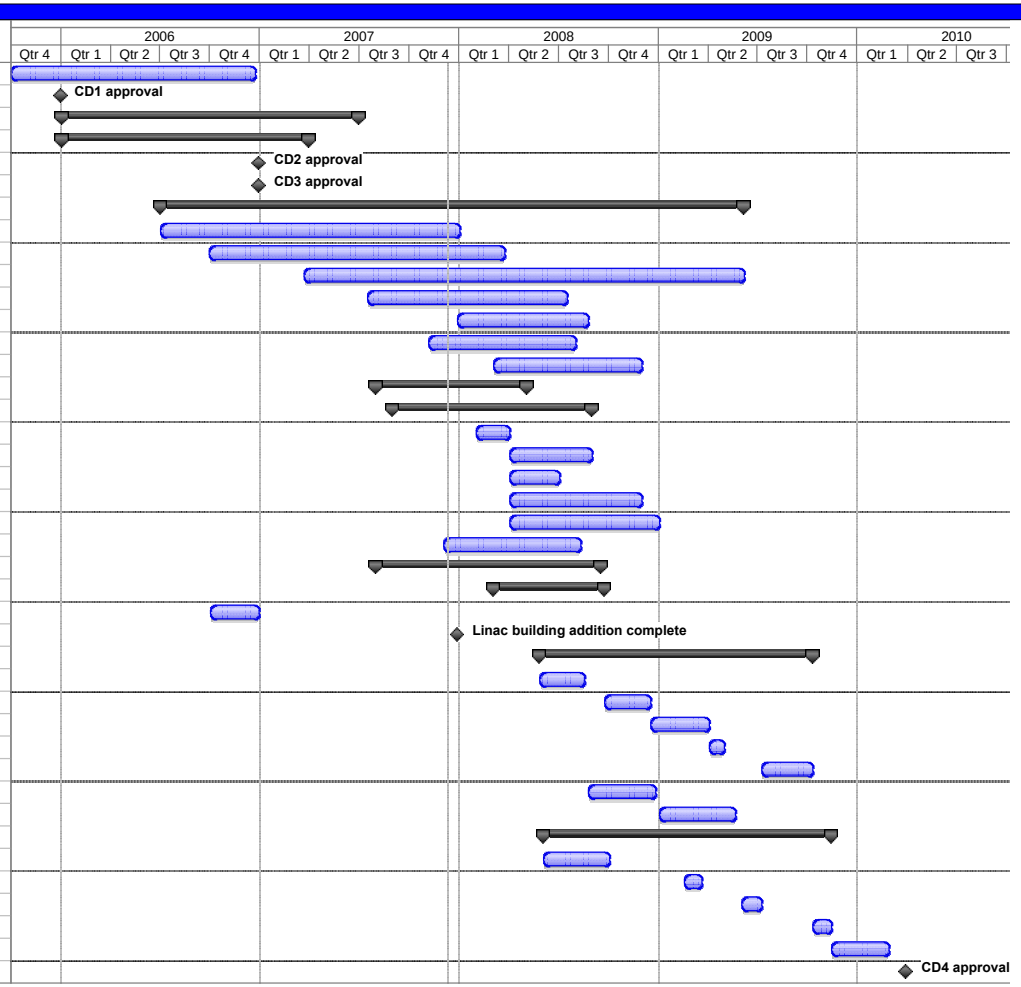
			Burdened K$
Contingency from 9/06 Baseline			3000
PCR number	**Date Approved**	**Title**	
PCR-EB-07-002	Jan-07	HV Platform + power for Test EBIS	(100)
PCR-EB-07-003	Jun-07	Impact of Continuing Resolution	(140)
PCR-EB-07-004	May-07	Linac vendor price exceeds baseline estimate	(324)
PCR-EB-07-005	May-07	RF Amps vendor price exceeds baseline estimate	(157)
PCR-EB-07-006	Jul-07	Change in CD-4 Date	0
PCR-EB-07-007	7-Sep	Use of NASA R&D Contingency	(100)
PCR-EB-07-008	needs FPM approval	Milestone change due to CD-4 date change	0
Contingency Allocated by PCR			(821)
Remaining Contingency			2179

Coming:
- **Second collector ~$85 k**
- **Dipole magnets ~$125 k**
- **Inductrol - $85 k**

Anticipating – remaining power supplies - ~$235 k

EBIS Project Schedule

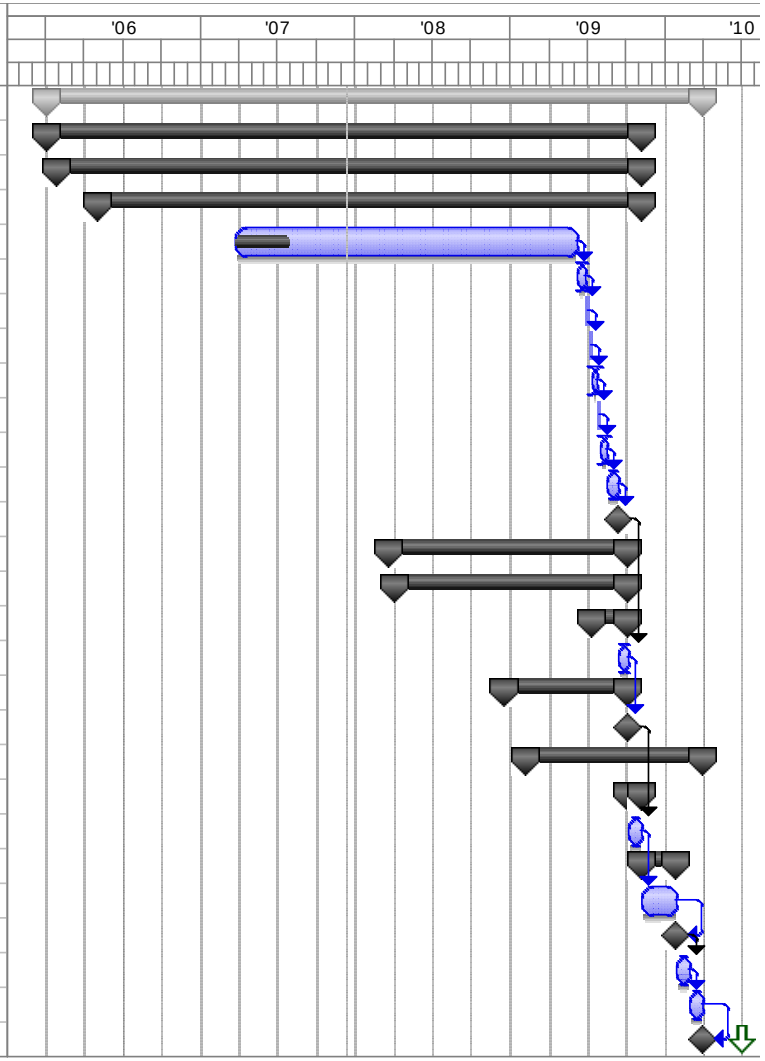
ID	Task Name	Start	Finish
1	**R&D**	7/1/05	9/21/06
2	**CD1 approval**	9/30/05	9/30/05
3	**Engineering & Design**	**10/3/05**	**3/30/07**
9	**Specifications**	**10/3/05**	**12/29/06**
14	**CD2 approval**	9/29/06	9/29/06
15	**CD3 approval**	9/29/06	9/29/06
16	**Procurement**	**3/31/06**	**3/4/09**
17	Superconducting solenoid	3/31/06	10/1/07
18	RFQ	6/29/06	12/21/07
19	Linac, Bunchers	12/20/06	3/4/09
20	RF amplifiers	4/16/07	4/14/08
21	HEBT Dipole magnet	9/28/07	5/25/08
22	Electron collector ps	8/6/07	4/30/08
23	HEBT Dipole ps	12/3/07	8/29/08
24	**Other EBIS procurements**	**5/1/07**	**1/31/08**
28	**LEBT procurements**	**6/1/07**	**5/30/08**
31	RFQ vacuum	11/1/07	12/31/07
32	Controls (excluding EBIS)	1/1/08	5/30/08
33	Vacuum (MEBT-to-HEBT)	1/1/08	3/31/08
34	Power supplies (MEBT-HEBT)	1/1/08	8/29/08
35	Diagnostics	1/1/08	9/30/08
36	RF coax, LLRF, circulators	9/3/07	5/9/08
37	**Manufacturing**	**5/1/07**	**6/16/08**
45	**Pre-assembly**	**12/3/07**	**6/23/08**
48	Beam access port	7/1/06	9/29/06
49	Linac building addition complete	9/28/07	9/28/07
50	**Installation**	**2/25/08**	**7/8/09**
51	EBIS, platform	2/25/08	5/16/08
52	LEBT	6/24/08	9/15/08
53	RFQ	9/16/08	12/30/08
54	MEBT	12/31/08	1/27/09
55	Linac	4/6/09	7/8/09
56	HEBT (Booster side)	5/25/08	9/25/08
57	HEBT (Linac side)	10/1/08	2/17/09
58	**Beam Testing**	**3/3/08**	**8/11/09**
59	RFQ with Test EBIS	3/3/08	6/30/08
60	RHIC EBIS / LEBT	11/17/08	12/18/08
61	EBIS & RFQ	3/2/09	4/6/09
62	EBIS/RFQ/Linac	7/9/09	8/11/09
63	**Commissioning (final)**	8/12/09	11/25/09
64	**CD4 approval**	12/29/09	12/29/09



This is the schedule we are building to. (There is 9 months float to official CD-4 date).

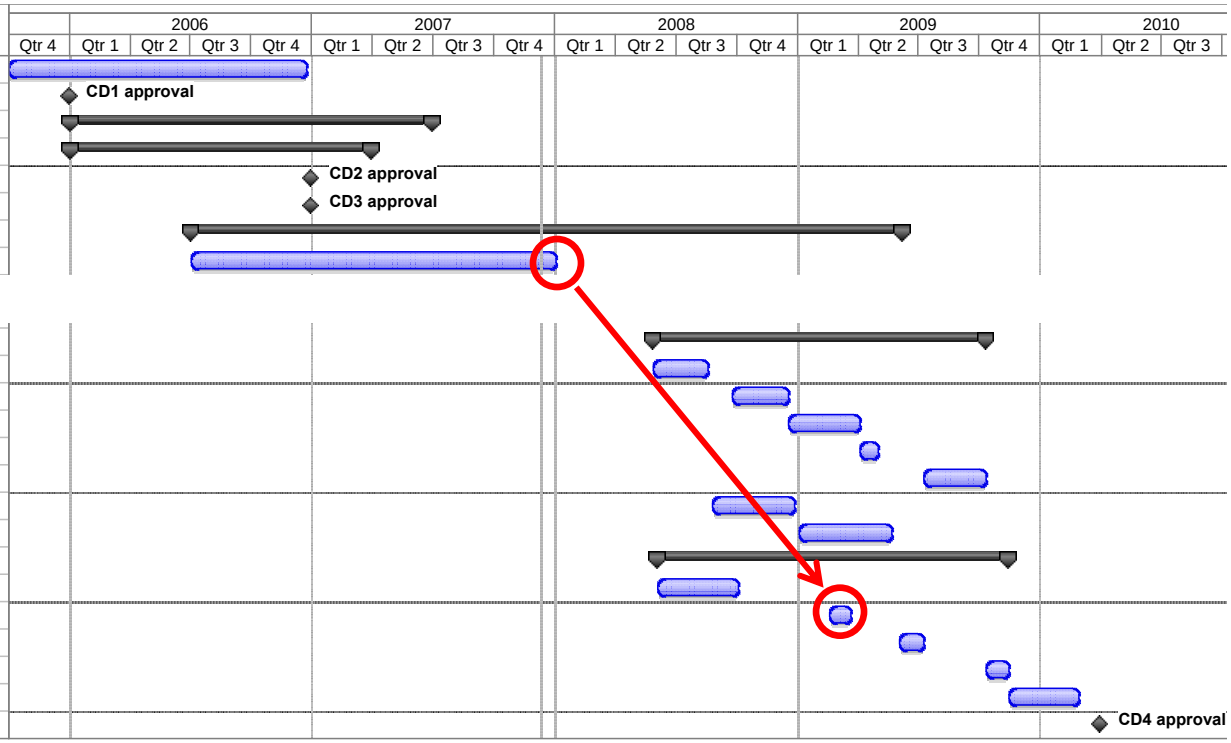
Critical Path

ID	WBS	Task Name	Start	Finish
0	**1.**	**Project Summary**	**10/3/05**	**12/29/09**
1	**1.1**	**Structural Components**	**10/3/05**	**8/3/09**
146	**1.1.8**	**RF Structures**	**10/24/05**	**8/3/09**
165	**1.1.8.2**	**Linac**	**2/1/06**	**8/3/09**
169	1.1.8.2.4	**Linac Procurement 14397**	12/20/06	3/4/09
177	1.1.8.2.12	**Linac Shipping to BNL 14397**	3/4/09	3/25/09
178	1.1.8.2.13	**Linac Incoming Inspection 14397**	3/25/09	4/1/09
183	1.1.8.2.18	**Linac Mount on Stand 71175**	4/1/09	4/8/09
184	1.1.8.2.19	**Linac Assist Vacuum and Leak Checking 7117**	4/8/09	4/22/09
185	1.1.8.2.20	**Linac Assist Water Connections 71175**	4/22/09	4/29/09
186	1.1.8.2.21	**Linac Assist RF Hookup 71175**	4/29/09	5/13/09
187	1.1.8.2.22	**Linac Low/High Power Tests 71175**	5/13/09	6/11/09
188	1.1.8.2.23	**Linac Ready for Beam 71175**	6/11/09	6/11/09
775	**1.10**	**EBIS Installation E**	**12/19/07**	**7/6/09**
777	**1.10.2**	**Structural components**	**1/2/08**	**7/6/09**
791	**1.10.2.5**	**LINAC**	**4/8/09**	**7/6/09**
793	1.10.2.5.2	**Linac Mech Install 71275**	6/11/09	7/6/09
965	**1.10.11**	**Installation Completion Milestones**	**9/16/08**	**7/6/09**
969	1.10.11.4	**LINAC Install Complete**	7/6/09	7/6/09
1050	**1.12**	**Commissioning**	**11/6/08**	**12/29/09**
1059	**1.12.3**	**Linac**	**7/6/09**	**8/3/09**
1060	1.12.3.1	**Linac Test with Beam**	7/6/09	8/3/09
1062	**1.12.4**	**HEBT**	**8/3/09**	**10/27/09**
1063	1.12.4.1	**HEBT Test with Beam**	8/3/09	10/27/09
1065	1.12.4.3	**HEBT Test with Beam Complete**	10/27/09	10/27/09
1066	1.12.5	**Performance Validation & Document Development**	10/27/09	11/25/09
1067	1.12.6	**CD4 Presentation & Approval**	11/25/09	12/29/09
1068	1.12.7	**CD4 Complete**	12/29/09	12/29/09



Impact of the solenoid delay

ID	Task Name	Start	Finish
1	**R&D**	7/1/05	9/21/06
2	**CD1 approval**	9/30/05	9/30/05
3	**Engineering & Design**	**10/3/05**	**3/30/07**
9	**Specifications**	**10/3/05**	**12/29/06**
14	**CD2 approval**	9/29/06	9/29/06
15	**CD3 approval**	9/29/06	9/29/06
16	**Procurement**	**3/31/06**	**3/4/09**
17	Superconducting solenoid	3/31/06	10/1/07
50	**Installation**	**2/25/08**	**7/8/09**
51	EBIS, platform	2/25/08	5/16/08
52	LEBT	6/24/08	9/15/08
53	RFQ	9/16/08	12/30/08
54	MEBT	12/31/08	1/27/09
55	Linac	4/6/09	7/8/09
56	HEBT (Booster side)	5/25/08	9/25/08
57	HEBT (Linac side)	10/1/08	2/17/09
58	**Beam Testing**	**3/3/08**	**8/11/09**
59	RFQ with Test EBIS	3/3/08	6/30/08
60	RHIC EBIS / LEBT	11/17/08	12/18/08
61	EBIS & RFQ	3/2/09	4/6/09
62	EBIS/RFQ/Linac	7/9/09	8/11/09
63	**Commissioning (final)**	8/12/09	11/25/09
64	**CD4 approval**	12/29/09	12/29/09



EBIS beam testing is scheduled to start 14 months from now.
We will still proceed with the installation of EBIS and all ps's, even without the solenoid. When the solenoid arrives, we estimate 2 months to install it, re-establish EBIS vacuum, etc. With this workaround, **the solenoid can be delayed an additional 12 months without affecting our finish date, or 21 months without affecting CD-4.**

Project Milestones – past year, and upcoming

		Baseline Date	Actual/Planned
L1	RFQ Procurement Placed	4Q FY06	6/06 (A)
L0	CD-2 – Approve Performance Baseline	4Q FY06	9/06 (A)
L0	CD-3 – Start of Construction	1Q FY07	9/06 (A)
L1	Beam Port Complete	4Q FY07	9/06 (A)
L1	Linac Procurement Placed	2Q FY07	12/06 (A)
L2	R&D High Voltage Beam Tests Begin	3Q FY07	12/06 (A)
L1	SC Solenoid Factory/Acceptance Test	1Q FY08	3QFY07
L2	Electron Collector Pressure & Vacuum Tested	1Q FY08	1Q FY08

Major upcoming activities (before the end of the calendar year)

- SC solenoid repair activities
- Place buncher procurement
- Place dipole power supply procurement
- Start preassembly of EBIS
- Collector testing
- Place procurement of LEBT solenoid power supply
- Install electrical services in the new building

Also – Spring, 2008:

RFQ testing on Test EBIS

(have rf amplifier in house for these tests)

Summary

- There has been very good progress this past year on the project.
- Major Procurements placed:
  - RFQ
  - Linac
  - RF Amplifiers
- Beam port installed last summer; no “dogleg” required
- Building construction on schedule for completion 9/07.
- Test EBIS and power supplies on high voltage platform; routine operation at high voltage; LEBT chamber and components fabricated and tested; LEBT solenoid fabricated
- 4 month delay and 140 k$ cost increase due to the Continuing Resolution (took from contingency) plus 2.4 M$ reduction in FY’07 DOE funds. Possibility of another CR in FY’08 is also a concern.
- Difficulties with the electron collector (confidence now in the second unit) and superconducting solenoid (committee of experts formed to address the problem). Linac schedule needs to be watched closely.
- Within budget (~9.1M$ cost + commitments; ~25% contingency on remaining items) (Kerry will cover).

Backup - Scientific/Technical Motivation

- Replaces the two Tandems as the Booster preinjector, resulting in more stable beam intensities (no stripping foils).

- Eliminates the need to use the 860-meter long transport line from Tandem to Booster, using instead a much simpler and economic 30-meter long line from EBIS, which will reduce setup time and allow fast switching between beams of different rigidities.

- Simplifies the Booster injection scheme (few turn vs. present 40 turn).

- Capable of providing ions not presently available for the NASA program, such as noble gas ions (major components of galactic cosmic rays), as well as more massive ions such as uranium, and with additional enhancements, polarized helium-3, for the RHIC program.

Backup - Scientific/Technical Motivation (2)

ELECTRON BEAM ION SOURCE

- Increases flexibility in handling the multiple simultaneous needs of RHIC, NSRL and AGS. Currently, two Tandems are needed for fast beam switching, while the EBIS preinjector will be designed to switch between species in 1 second.

- Improved reliability, setup time and stability should lead to increased integrated luminosity in RHIC and increased productivity for NSRL.

- Reduces operating costs. The Tandem facility requires a staff of approximately 12 FTEs to support maintenance and a 24-hour shift rotation during operations. The Linac-based pre-injector should be able to run unattended at most times, as with the present proton Linac, and will require only a staff of approximately 3 FTEs.