MONTHLY REPORT

May 1-31, 2009

Performing Organization:	Brookhaven Science Associates
Location:	Brookhaven National Laboratory Upton, New York 11973-5000
Contract Period of Performance:	FY2005 – FY2010

Brookhaven National Laboratory
EBIS MONTHLY PROGRESS REPORT
May 2009

I. Contractor Project Manager's Assessment

Technical Progress and Accomplishments

The major accomplishment this reporting period was the successful acceptance testing of the superconducting solenoid to full magnetic field. The final assembly of the EBIS can now start. The Linac fabrication continues on schedule and both electron collectors have been finished. The "big bend" dipole power supply was successfully tested at the vendor's facility and shipment to BNL is expected in mid July. Manpower remains at the proper level for the installation activities.

Issues and Concerns

There were no major concerns during this reporting period.

II. Detailed Status by WBS

WBS 1.1 – Structural components

EBIS Hardware

Superconducting Solenoid

A technician from Bruker Advanced Supercon (BASC, formerly ACCEL) arrived on Monday, 11 May 2009 to assemble the new inner bore tube for the superconducting solenoid. The magnet was fully assembled and the cooldown was started on Sunday, 17 May. The engineer arrived on Monday, 18 May for LHe cooldown. On Tuesday, the magnet was full with LHe and the heat shield cold enough for powering. The field was slowly ramped up until a quench occurred at half-field. The cause of the quench could not be determined. On Wednesday after LHe delivery the magnet was refilled, brought to full field without incident, and acceptance testing started. Magnetic field measurements, helium evaporation rate measurements, and 10% over nominal field operation tests were completed and found acceptable. BASC departed BNL on Thursday, 21 May. BNL continued testing to evaluate the field decay rate, which was also found to be within the specification. On 28 May warming up of the magnet system was started, to prepare for the transfer of the solenoid to the EBIS stand.

The design of the spare superconducting solenoid by Cryomagnetics is currently in process. The Preliminary Design Review was held at the factory on Tuesday, May 12. The review went very well, and authorization to order long lead items was given by BNL. The Final Design/Safety Review was scheduled for 23 June. Teleconferences continue weekly.

Electron Collector

The manufacture of both electron collectors is complete. The manufacture of the iron shield for the BeCu RHIC unit is complete, and the manufacture of the internal electrostatic lenses for the unit is in process and about 75% complete.

The electron current load on the repeller and reflector electrodes was analyzed, simulating current and power loads on internal electrodes and parts of electron collector from backscattered and reflected electrons. Several versions of the repeller electrode were evaluated for minimum load and acceptable power density on the electron collector.

Central drift tube vacuum chamber

The radial forces in the central vacuum chamber external heat shield coming from eddy currents during a quench of the superconducting solenoid have been analyzed. As a result, this external heat shield (for baking of the center bore) was modified to isolate the semi-cylinders from each other and isolate transverse coils from the copper substrate.

LEBT and External Ion Injection

The production of the electrostatic quadrupole quadruplets (3 assemblies) is complete. The following items are currently in the Central Shop for manufacture: switch chamber top and bottom plates, switch chamber internal electrostatic components, and cylindrical deflectors near the ion sources.

RF Structures

IH-Linac

The three linac cavity sections are at GSI for copper plating, and manufacture of the internal quadrupole triplet is now in process at Bruker.

Buncher Cavities

The debuncher cavity (C-3) design is nearly complete.

Test EBIS

During this month, there were a few initial measurements of Test EBIS ion beams accelerated through the RFQ and then mass analyzed in the new beam analysis line after the RFQ. The RFQ output energy was measured, but energy spread measurements have not yet been done.

WBS 1.2 – Controls
Power supply interface modules were modified to correct an erroneous ground connection and to incorporate a gate array change for units requiring an external fast interlock. Work continued on interface software and database configuration for EBIS power supplies.

WBS 1.3 – Diagnostic Systems

This month there were many discussions regarding the location of the electronics for diagnostics and the need for local preamps/drivers (if any) for some systems. For the Faraday cups it was decided to install local bias with a cable driver circuit. The profile monitors will remain as planned previously. The current transformer decision will be made once the electronics have been tested at the Test EBIS. As of the end of the month, issues with the transformer amplifier offsets have been solved and the electronics now work on the bench with a prototype transformer. It will be brought over to Test EBIS for checkout on a transformer in the beam line. Also this month, the workstation for diagnostics was delivered.

A new pepperpot emittance meter for use in the HEBT beam line after Linac has been designed and a complete set of drawing files is available for device fabrication.

WBS 1.4 – Magnet Systems

<u>MEBT Quadrupoles</u>
The MEBT quadrupole lamination stacks are due to be shipped in early July. Design for the installation of the quad magnets continues. A vertical and horizontal stepper motor driven stage has been selected as the best method of moving the magnets for beam tuning. A change was made to utilize water cooled conductor in place of air cooled conductor for the magnet coils.

<u>Warm Solenoids</u>
The coils for the second electron gun solenoid have been wound and the coil assembly has been epoxy potted. The assembly of the electron collector solenoid has been completed.

<u>HEBT Dipoles</u>
Planning and design work has been completed for the upcoming summer shutdown installation of the water cooled bus and coil temperature interlocks for the HEBT dipoles.

WBS 1.5 – Power Supply Systems

Acceptance testing of the HEBT dipoles' "Big Bend" power supply was held at the vendor's facility. The unit met specifications with two minor exceptions. These are being addressed and the unit will be delivered to BNL in July. Good progress continues in fabrication and installation on all the major sub systems.

The vendor has begun the design of the fast pulsed quadrupole power supplies for MEBT and the Linac triplets, and a design review is scheduled for June 24.

WBS 1.6 – RF Systems

All systems (RFQ, linac, and three bunchers) continue to be prepared for high power testing.

WBS 1.7 – Vacuum Systems

Summary of activity for this reporting period:

1. The ion pumps have been ordered for the Linac.
2. The C-3 rebuncher drawings have been reviewed and information for metal seals forwarded to the vendor .
3. HEBT instrumentation box stands have been fabricated.
4. Shutters have been designed for the ion injection line.
5. All heating jackets have been received.
6. Vacuum gauge and pump controllers have been installed in Building 930.
7. Vacuum gauge analog signals have been tested on the Global Interlock System.
8. Ethernet communication was tested with an EBIS PLC.
9. Cable material for various pump and valve control have been received.
10. Turbo pump extension cables have been ordered.

WBS 1.8 – Cooling Systems

No activity this reporting period.

WBS 1.9 – Facility Modifications

No activity scheduled for this reporting period.

WBS 1.10 – Installation

The new fiber optic trunk cable for the control system was pulled from the existing infrastructure rack in the Linac upper equipment bay to the EBIS racks and fibers were terminated and connected to patch boxes. A network switch was installed.

Excellent progress was made on the electrical power distribution system installation and cable trays and conduit for interconnection of the scientific equipment. Power for all major systems will be available in mid June and cable installation has begun.

WBS 1.11 – Project Services

Tasks in the installation WBS have been rescheduled and are being reviewed prior to submittal as a PCR.

The quarterly telecon to review data through March took place on May 29th, but more recent information was discussed as well, including upcoming PCRs which will request contingency funds for some of the additional scope items discussed at the annual review. The monthly telecon with the Office of Science took place on May 14th.

WBS 1.12 – Commissioning

No activity scheduled.

SAFETY

The draft Unreviewed Safety Issue (USI) document for the EBIS Preinjector remains at 90% complete.

PHYSICS

No activity this reporting period.

Financial Status

EBIS Project		Burdened k$					
WBS	Title	May Actuals	FY09 to date	Project to date (PTD) costs*	Commit-ments		Budget at Comple-tion
1.1	Structural components	36	504	3446	409		3395
1.2	Controls	12	122	739	0		756
1.3	Diagnostics/instrumentation	32	206	516	60		696
1.4	Magnet Systems	5	25	500	15		863
1.5	Power Supply Systems	56	624	2098	537		2332
1.6	RF Systems	4	280	2358	40		2760
1.7	Vacuum systems	71	365	1794	40		1609
1.8	Cooling Systems		24	216	0		259
1.9	Facility Modifications	136	235	722	63		550
1.10	Installation	115	803	1348	63		2018
1.11	Project Services	24	214	1089	0		1074
1.12	Commissioning		0	0	0		217
1.13	R&D/CDR		0	1398	0		1400
	Contingency						1371
	Total	490	3404	16224	1227		19300
* costs through May 2009							