

HEP Programs at BNL and the FY 2003 Budget

**Presented to
HEPAP**

**by
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Elements of the BNL HEP Program

The following elements comprise the current HEP Program*:

? **Performance of a world class, in-house program of basic research in theoretical and experimental particle physics**

- theory group of broad capability with productive links to nuclear physics
- experimental groups in forefront efforts at BNL, CERN and Fermilab

? **Construction and operation of forefront user facilities for HEP experiments**

- AGS Complex (highest intensity proton synchrotron in the world)
- accelerator and detector subsystems for use at Fermilab and CERN
- Tier-1 computing center for support of the US ATLAS HEP program

? **Performance of a leading R&D effort in the development of advanced accelerator and particle detector concepts plus provision of computing support for HEP**

- operation of ATF user facility for development of novel accelerator concepts
- muon collider/storage ring conceptual design and enabling experiments
- development (with Instrumentation Division) of novel particle detectors
- R&D for superconducting magnet concepts applicable to HEP uses

*Many of these areas of expertise provide benefit to programs outside DOE-HEP

Current HEP Programs with BNL Involvement

The following HEP programs are currently active at BNL:

? HEP Experiments using the AGS

- E949 [K⁺ ? ? ? ? ?] taking data in FY02; *FY03 run zeroed out in Pres. Budget*

? BNL participation in the CERN LHC Construction Project & Research Program

- Host Laboratory and Project Office for the US ATLAS Detector Project
- ATLAS Detector subsystem lead role (LAr EM Calorimeter and Muon System)
- Host Laboratory for US ATLAS Computing Project & Tier-1 computing center
- contributions to LHC physics analysis and accelerator science efforts
- ATLAS Host Lab for Maintenance & Operations and Upgrade R&D
- LHC SC dipole prod. at BNL; testing of all LHC SC cable; LHC accel. R&D

? BNL participation in the MINOS and D0 Programs at Fermilab

- major contributors to off-line physics analysis (top, W, SUSY/higgs searches)
- on-line and off-line computer program upgrades and maintenance
- operation of the Forward Preshower (FPS) Detector
- Jon Kotcher is the Run-2 Upgrade project manager for D0 Phase-2
- Milind Diwan leads the BNL contributions to the MINOS Experiment

Current HEP Programs with BNL Involvement

? **BNL in-house research in Experimental and Theoretical Physics**

- 4 HEP analysis efforts using data from HEP experiments at AGS and D0
- 1 HEP design/construction/computing effort for LHC ATLAS
- 2 design/prototyping R&D efforts for planned AGS Exps., KOPIO & MECO*
- 1 design/construction/physics effort for the MINOS Experiment
- HEP Theory is active on topics of current particle physics interest
- a very productive physics interaction with the Riken BNL Research Center
- this program is annually reviewed by DOE and a BSA Visiting Committee

? **Accelerator and Detector R&D Program**

- Accelerator Test Facility (BNL's unique user facility for accelerator science expts.)
- continuing accelerator R&D using BNL accelerator facilities (Booster/AGS/RHIC)
- muon collider/storage ring R&D studies (with FNAL, LBNL and university groups)
- AGS has completed a first test run for the Muon Collider Targetry Exp., E951
- superconducting magnet R&D is performed in the SC Magnet Division
- development and testing of novel particle detectors (with BNL Instr. Div.)

* KOPIO and MECO are experiments in the RSVP Project in NSF's MRE Program; project funding is anticipated in FY03 or FY04; R&D work is ongoing.

AGS Complex - Other Program Missions

Other missions and venues in the sponsor-paid 'Work for Others' Program:

<u>Current Work</u>	<u>Sponsor</u>	<u>Expected Future Work</u>
AGS Machine & Staff biological effects of heavy ions proton radiography n-spallation target tests	NASA NNSA DOE-BES	biological effects of heavy ions dynamic testing/proof-of-principle n-spallation target development
Spallation Neutron Source design/construction of SNS Ring	DOE-BES	commissioning involvement
Booster Applications Facility construction of the BAF	NASA	expanded radiobiology studies
Proton Linac BLIP Facility medical isotope production	DOE NE	medical isotope production
Cyclotron Isotope Research Center construction of the facility	DOE NE	medical isotope production
Medical Treatment Synchrotron Finish CDR; consolidate consortium	Private	market to other hospital facilities
Tandem Van de Graaff Facility various heavy-ion irradiations	36 Orgs.	continued commercial sales

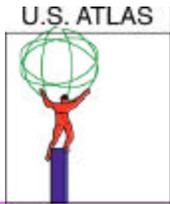
Recent HEP Physics Highlights

- ? **US ATLAS Detector Project** on-budget on-schedule ; [U.S. Host Lab is BNL](#)
- ? **US ATLAS Computing Project** [well started](#) but under-funded in FY01,02
- ? **LHC Accel. Project** at BNL on-budget on-schedule [LHC dipole production & cable testing](#)
- ? **AGS E949, K + ? ? + ???** , [taking data at AGS in FY 2002](#)
- ? ['RSVP' MRE Project](#) in R&D phase; construction project start in FY03 or FY04
- ? **DOE Phase-I SciDAC** grant for FY01-02; we plan a [5 Tflops* Lattice Gauge Center at BNL](#)
- ? **Neutrino Physics Study** at BNL; exciting venue for future program with [AGS Superbeam](#)
- ? **Bill Marciano** won the 2002 [J.J. Sakurai Prize awarded by APS](#)
- ? **Nick Samios** won the 2002 [Bruno Pontecorvo Prize awarded by JINR – Dubna](#)

* Sustained speed

U.S. ATLAS Project Status

- ⌘ Overall, U.S. ATLAS Detector Project is about 60% complete; the whole project is on-budget and deliverables will meet the CERN schedules
- ⌘ BNL is the U.S. leader of the LAr, CSC Subprojects and ATLAS Technical Coord.; projects are on-budget and will meet the CERN delivery schedules
- ⌘ The BNL-based Tier-1 Computing Center is operational (**but under-funded**); U.S. ATLAS software efforts pace International ATLAS Computing
- ⌘ Torre Wenaus now ATLAS Applications Coordinator in the LHC Grid Computing Project's *Project Execution Board* – a key ATLAS mgmt. role
- ⌘ The U.S. ATLAS *Project Advisory Panel* reviewed plans for the U.S. role in the LHC Research Program phase on March 25-26, 2002 and provided recommendations for improvements of the plans
- ⌘ BNL, as ATLAS Host Laboratory, envisions a Physics Analysis Center at Brookhaven to enhance the physics impact of U.S. collaborators



Signal Feedthroughs

High density connectors and cables to transfer signals from cold to warm

US is providing:

Overall design, production of 64 Barrel Feedthroughs +spares,
components for Endcaps feedthroughs, installation, commissioning

Slow controls: temperature, pressure, gas flow

Engineering support

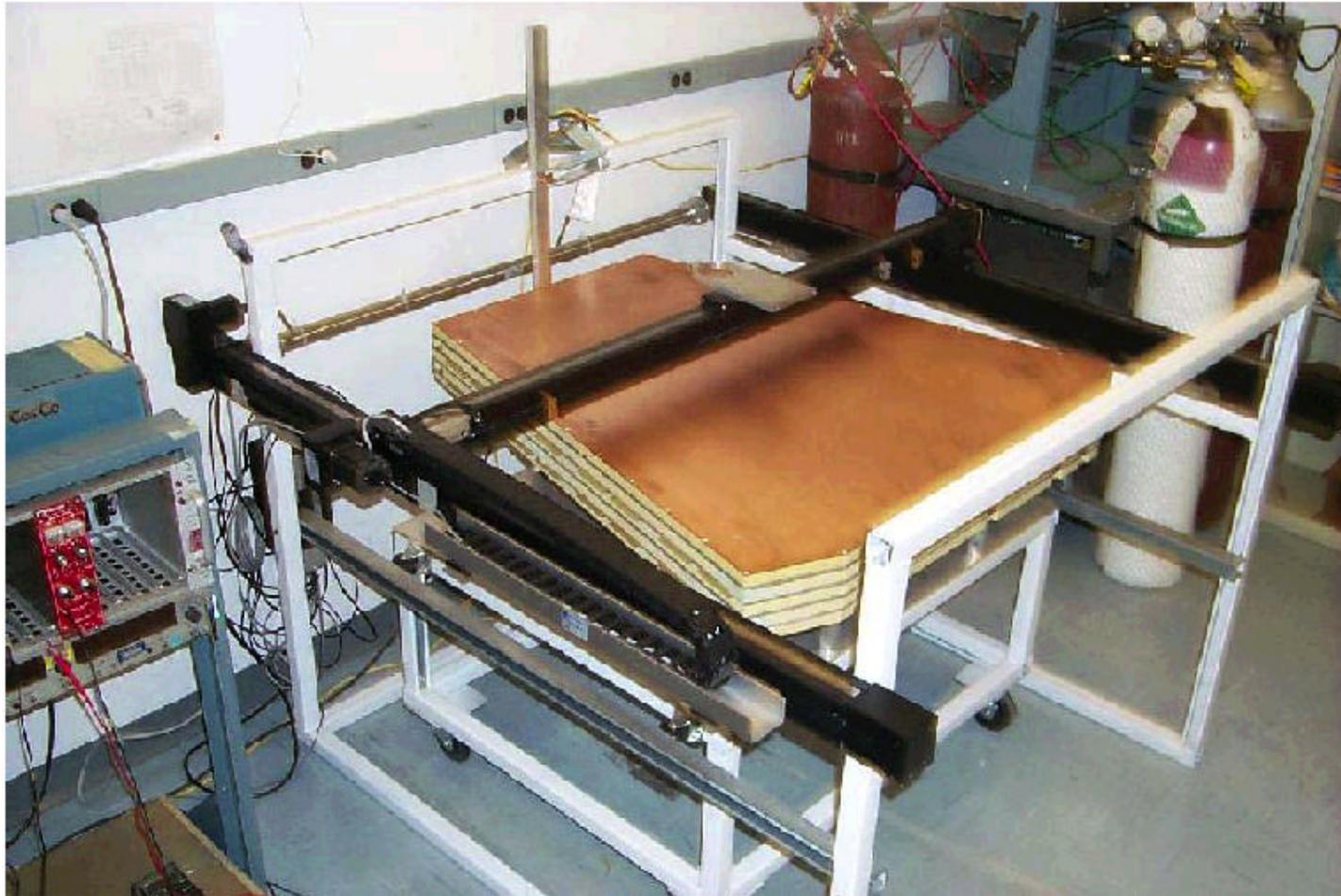
Status:

Installation on the barrel cryostat
completed. Production of spares
will be finished in 5 weeks





Final Acceptance Test, Gas Gain Msmnt



100 mCi Americium Source mounted on a Gantry system maps gas gain with fine granularity with a simple current measurement

Dec. 17, 2001

CSC ASSO Review - V. Polychronakos

U.S. ATLAS Physics Analysis Center

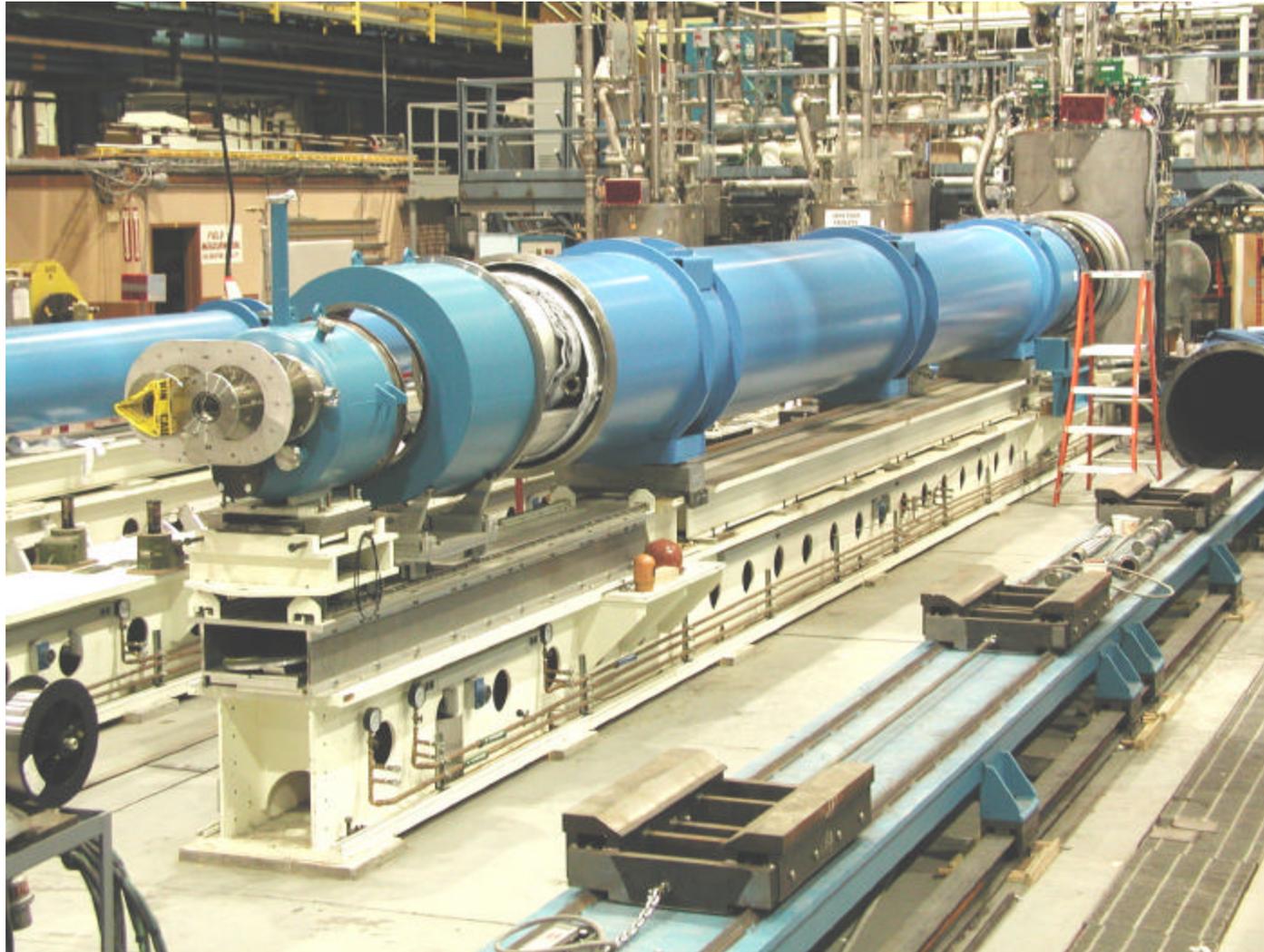
- ? The Tier 1 Computing Center located at BNL will participate in the upcoming (mock) data challenges**
- ? BNL has started a Physics Applications Software group which is contributing to the U.S. ATLAS framework and data base effort**
- ? BNL has leaders in the Physics, Liquid Argon and Muon software**
- ? BMNL plans to enlarge the latter two groups, starting in FY04, as well as provide space for visitors to be an ATLAS Physics Analysis Center**

BNL LHC Accelerator Project Status

(Courtesy M. Harrison, LHC Accelerator Project)

- ⌘ **D1 production complete (5 magnets), 3 tested (2 to quench, and one with a full set of measurements), one is ready to ship - end of May ?**
- ⌘ **D2: 5 magnets complete, 1 cold mass complete, 2 more in progress, all coils are complete. First magnet in testing**
- ⌘ **D4 coils complete, all materials are available for the production schedule**
- ⌘ **D3 drawings cryostat assembly, rest complete, D1 interconnect to DFBX in design, QQS final drawings in checking**
- ⌘ **Quad beam tubes at BNL and in production**
- ⌘ **Issues**
 - **D3 ends - CERN interface not available**
 - **Lamination delivery schedule (stamping die now O.K.)**

LHC Dipole Testing at BNL – April 2002



US Department of Energy
Brookhaven Science Associates

T. Kirk
April 26, 2002

BROOKHAVEN
NATIONAL LABORATORY

Status of AGS HEP Experiments

? Muon (g-2) Continuation

- the FY01 run completed the DOE approved running for E821
- full success of the experiment and *importance of the result requires more data*
- to get equal μ^+ and μ^- event samples requires an additional 16 week run in FY03
- P962 proposed this running; run approved by BNL and submitted to DOE in 2001
- approval by DOE on hold at present time...

? Rare Kaon Decay E949 ($K \rightarrow \pi^0 \pi^0 \pi^0$ bar)

- *measurement* of this important CP-violating rare decay is the goal of E949
- DOE approved E949 for three years running, FY01, 02, 03 (if funding available)
- E949 demonstrated the success of their upgrade in FY01 commissioning run
- funding provided in FY02 for the very successful data run now in progress
- *FY03 President's Budget zeroed-out AGS running for FY03!*

? E952 (muon neutrino mass) submitted to DOE-HEP for approval

- the experiment was accorded 'must do' status by the BNL PAC & approved by BNL
- E952 can run parasitically on E949 at very low cost using crystal-extracted protons
- Spokesperson Prisca Cushman is exploring NSF & State funding possibilities
- BNL will pursue DOE support of the experiment if budgets improve...

? E951 (Muon collider target R&D)

- this experiment completed one run in FY01 using MC R&D Program resources