Operation of the BNL Tandem


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• Introduction
  • Layout of MP6 and MP7
  • Beamline Configuration
• FY 2020 summary
• FY 2021 summary
• New NMR system
• Alphatross Source Operational
• Challenges
• MP6 and MP7
• First Beam 1970
• Both upgraded to >14MV Terminal
• Applied program in local target rooms
• Injector of pulsed beam into the Booster for NSRL and RHIC
• Full cost recovery basis
FY 2020 (10/19-09/20)

- Proton for Nasa Space Radiation Lab (NSRL) experiments
- Gold for Relativistic Heavy Ion Collider (RHIC)
- Min-safe Mid March 2020 until June 2020
- Restart problems: Pre-accel Vacuum leak
- Limited Users due to NY Travel Restrictions
- 1531 Hours of beam time
Pre-Accel Vacuum Leak

- First glass section broken on Pre-acceleration tube between Ion Source platform and ground.
- Spare tube also broken (same section)
- Wasik Associates replaced broken section ($5k per tube)
- BNL supplied spare glass section
• Removed Electrostatic lens from beamline
• Tube wrapped in Teflon allows tube to rotate to pick up bolt holes
• Teflon lined Aluminum channel allows tube to slide into place
• Hoisting fixtures inside and outside faraday cage to lift tube into place and held while bolted to supports
FY 2021 (10/20-present)

- Gold beam for RHIC (01/18/21-05/02/21)
- Heated SiC Wafer project assembly begins (see presentation by T. Kubley)
- NY State eases travel restrictions allowing more users to access facility
- 2763+ Hours of beam time
Injector for Booster

- Ion Source Operated in Pulsed Beam Mode
- Pulse Length variable to >1000 µsec
- 5Hz repetition rate
- Spare for EBIS
- Protons for NSRL
- Au for RHIC
Low Energy Au Experiment

- Ion Source in pulsed mode
- Pulse width 400-900 μsec
- Burst of 8 pulses at 5Hz
- 6 sec between bursts
- 25 minute store times
- 250 μA peak LE, 1200 μA HE, ~50 μA of Au+31
- ~3x10⁹ ions per pulse
- 550 terminal foils used over 14 weeks run
- 2 μg/cm² LPA Foils
New NMR System

- Caylar Instrumentation Scientifique
- Mux 4 different magnets
- 6 different probes
- Two magnets range from 0.08 - 1.75 T
- Two magnets range from 0.24 - 1.20 T
- Integrated Hall probes for fast tracking
Layout of NMR System

NMR20 SYSTEM

Control Room 1

NMR Gaussmeter
Description:
- HALL Option
- Fast search 5%
- Trap Input
- Analog field recopy
- Output for control feedback system
  SN: 2210-046

Switch MUX
Description:
- SWMUX + HALL
  SN: 0280-011

100m

100m

100m

100m

2.5 m

2.5 m

2.5 m

2.5 m

PAMUX 1
Description:
- PAMUX2 + HALL
  SN: 4120-57

PAMUX 2
Description:
- PAMUX2 + HALL
  SN: 4120-058

PAMUX 3
Description:
- PAMUX1 + HALL
  SN: 4110-055

PAMUX 4
Description:
- PAMUX1 + HALL
  SN: 4110-056

Probe Case B 0.080 T - 0.400 T
Option: HALL
SN: 3100-115

Probe Case B 0.350 T - 1.750 T
Option: HALL
SN: 3100-119

Probe Case B 0.080 T - 0.400 T
Option: HALL
SN: 3100-116

Probe Case B 0.350 T - 2.750 T
Option: HALL
SN: 3100-120

Probe Case B 0.240 T - 1.200 T
Option: HALL
SN: 3100-117

Probe Case B 0.240 T - 1.200 T
Option: HALL
SN: 3100-118

Analyzer from MP6 to Target Room
Analyzer from MPL to Target Room
2nd Magnet for Booster
Alphatross Source

- Purchased from NEC with funding from NASA
- Installed on MP6
- Limited operational experience
- ~1 μA of He$^{+2}$
Challenges (2018)

• Retirements. Lost ~100 years experience in last 5 years
• 3 new hires. Training on operations and maintenance
• Old Equipment. First beam 1970 many parts original
• Spare parts
• Funding. Full cost-recovery. So dependent on our outside user program.
Challenges (2021)

- Retirements. Lost ~100 years experience in last 5 years
  - More retirements but new hire T. Kubley brings experience
- 3 new hires. Training on operations and maintenance
  - New operators have gained experience
- Old Equipment. First beam 1970 many parts original
  - New NMR, Alphatross, in talks with NEC about upgraded control system, replacing HVEC ICT with new isolation transformers
- Spare parts
  - Still problem but replacing older equipment with new models
- Funding. Full cost-recovery. Dependent on our outside user program.
  - Last few years have been good. Need to grow User program
- DOE Accelerator Safety Review