

# *Did you know?*

- Flash-pick-flash-conf
  - Two callers on separate lines that need to talk to each other?
    - Put one on hold, pick up the other.
    - Hit “flash”, then “pick”
    - Enter the extension of caller on hold
    - Hit “flash”, then “conf”
    - The three of you are now on a conference call. You may hang up, your two callers can still converse.

# *Introduction to RHIC Operations*



## Part II: AGS to RHIC

# Objectives

- Following this presentation, operators should:
  - Have a basic understanding of the instrumentation used in the AtR line.
  - Be familiar with the managers and applications used for AtR transport.
  - Be able to recognize and troubleshoot some common failures in beam transport to RHIC.
- This presentation does not cover transport start-up/setup, but should introduce the tools needed to follow other setup documents to that end.

# Overview

- All AGS extraction, transport, and RHIC injection parameters are based on RHIC injection RF frequency as the fundamental.
  - AGS extraction frequency, field, radius
  - AtR magnet (design) currents
  - RHIC injection field
- $f=c\beta/2\pi R$
- Historically,  $B\rho$  based on proton extracted at  $G\gamma=46.5$

# AGS Extraction

- See [AGS Extraction Practical](#), for more information.
- See RMS Web page Start-up instructions for [extraction setup](#).
- In order to proceed, AGS RF sweep frequency at extraction should match RHIC injection RF frequency (proportionally), with bunches timed to the peak of the G10 kicker current, and at a reasonable position as seen on the H10 septum flag.
- Tools to use
  - AGS Orbit Display
  - AGS Loss Monitor
  - LeCroy 7200 scope with FKG10 current and G5 wall current monitor
  - Frequency Analyzer with AGS RF sweep signal
  - SMH10, UF1 flag (VBAR, Flag Profile Monitor)
  - pet pages
    - AGS/Rf/TimeInterval, in conjunction with 7200 scope
    - AGS/eXtraction/Tune

# AGS Extraction

21-Nov-4 19:58:07  
Record Traces

7200 Precision Digital Oscilloscope LeCroy

Learn Program

Turn On XY Display

Turn On Persistence

Configure System

Turn Off Horizontal

Select Cursor

Move ↓

Turn On Multi Zoom

AgvOscilloscope - FPM User: Pafabara4\_Presson\_14

Setup EPM Data Files Diagnostics

Sat Mar 26 08:53:51 2005

Cycles: 38802

Gate Width: 200 us

Trod File: OffsetsFrom20035

Horz Overall Gain: 0.0423

Vert Overall Gain: 0.05

Average Position:

Scan Times-Horz: Vert:

900014 us 4.708 -0.315

1000018 us 2.867 -0.903

SAD HORIZONTAL BPMS:

A18 B04 B08 S14

G18 C04 C12 S04

F08 F14 G14 J02

K18 L02

SAD VERTICAL BPMS:

A18 B04 B08 S12

G18 C04 C12 S04

F08 F14 G14 H04

J14 L02

HORIZONTAL

VERTICAL

ScanGateWidth(us): 200 ScanLines: No Cycles: 1 Avg: No Sigmas: No

Graph: DataOloc DataSource: Current DataType: Hor&Ver DispTimes: All Scale

DiffOrbit: No RedisplayData AcquireOnce AcquireCont StopAcquiring

RefFile: ext SaveRef DataFile: dExtNet SaveData SetupFile: default SaveSetup

Agv Loss Monitor - SUN VERSION - FPM User: RHIC\_Cu\_11

Setup Data Files EngineeringOptions

DATA: CURRENT ACQUISITION DATE: Fri Nov 26 13:06:46 2004

GAIN SETTING: HIGH AQS CYCLE: 12469 12468 12465 12462 12462

WINDOWS: 8 mm	180 mm	1200 mm	1700 mm	2000 mm	2700 mm	3000 mm	3010 mm	3020 mm
SIMS: 53485 cts	22950 cts	22557 cts	39944 cts	2747 cts	11443 cts	14088 cts	62774 cts	41280 cts
XF DIFF: -34 cts	273 cts	1275 cts	8 cts	7 cts	-10 cts	-128 cts	-16 cts	0 cts

K.E.: 8.85 GeV 8.43 GeV 1.68 GeV 39.46 GeV 26.68 GeV 23.39 GeV 21.81 GeV 18.28 GeV 17.74 GeV

RAW COMBS (V)

LOCATIONS

Setup File: scratch Save Setup Save as... Setup Mode: Operations

Data: Current No Groups: 12 Display Sigmas: No Max Y: 50000

Windows: Window Display: all\_windows Monitor Group Setup: all\_monitors

Gains: High DIFF: No Saved File: TestC Reference: TestC

FPM - Framgrabber: F01

Names

fg1

h10-flag

Horizontal

Vertical

Profile

X [mm]

Y [mm]

X = 417.143, 10.4743 mm Y = 660.403, -21.0203 mm DATA = 0

Description

Timestamp = Wed Dec 03, 2003 17:59:40.69027336

Center [mm] = (-3.28612, -5.37398) Centroid [mm] = (0.863881, -0.952688)

Sigma [mm] = (10.9375, 7.92956) BE Error = (0.579233, 0.650675)

Ellipse [mm] = (10.8563, 8.3465) Theta = 0.612125

Intensity = 718929 Xmission = 100% Plunger State = Unknown

Eg. Sub. Mode = Off Signal Range = 0.207

Comment

Close Update Save Save-Emit Print...

# *AtR Transport*



- Tools to use
  - AtR Orbit Display
  - AtR Loss Monitor
  - Flag Profile Monitor
  - RHIC Injection Tuning
  - pet pages
    - AGS/eXtraction/tRansport/\*
    - AGS/eXtraction/Tune
    - RHIC/Injection/Tuning

# AtR Transport (cont'd)

- Demystifying magman
  - Similar to RHIC ramp editor
    - From design file + trim settings, knowing magnet properties, server calculates power supply current.
    - $B = \mu_0 NI/d$ ,  $\theta \approx B \cdot L/B\rho$
  - Magman page
    - “Parameters” column fixed: part of design file
      - Charge important when stripping ions in line
    - Note multiple stepstones
    - Init, reconnect
    - Loading files: design, species, etc.
  - Quad page
    - In general, no deviations from design
      - Trims should always be zero for all quads
  - Tune page
    - OnSeq, OffSeq, Idle, IdleArcs
    - Tune by ps current or trim strength

# *AtR Transport* (cont'd)

- Tuning concerns
  - Arc dipoles, lambertson magnets have small vertical aperture; pitching magnets have small horizontal aperture.
  - Zero orbit is not always ideal
    - Example: Less losses in upstream W-arc with positive vertical position.
    - Zero orbit in BPM does not necessarily correspond to center of flag, or beam pipe.
    - The “golden orbit” and auto correction is still work in progress.
  - Try hysteresis loop first
  - G10 or H10 error?

## *For more information...*

- [RMS web page](#)
- [Morning Numbers web page](#) (regarding AtR emittance measurements with FPM)
- C.J. Gardner, “[Booster, AGS, and RHIC Parameters for the 2004-2005 RHIC Run](#)”  
January 2005.