

**Intensity**

Not much new to say, just adequate,  
no major break-throughs on the horizon

BtA transfer – 5 out of 6 bunches

**Transverse Emittance**

Table of measurements from the '99 run  
AGS flying wire: new diagnostic tool – results

**Longitudinal Emittance**

Table of measurements from the '99 run  
Mountain range display of beam coming into AGS

Emittance growth at AtR transfer – driven by extraction orbit bump.  
Fast bump created by powering unbalanced backleg windings – interacts with  
AGS main magnet, creates trouble for rf synchronization – which is happening on  
same time scale. Phase jitter in RHIC.

**AtR post mortem**

List of observations and issues

**Booster-AGS Au '99 Transverse Emittance**

		fwhm mm	sigma (/2.34)	x(95%) (*2.5)	beta* m	emitt xsq/beta*	norm emitt pi*(mm mr)
<b>Hori</b>							
Boo inj	(theoretical max if no acc blowup, no coupling)					150	6.9
						(ignoring dp/p, dispersion)	
Boo ext	mw006h	5	2.13675	5.34188	3.368	8.47259	3.8
AGS inj	A20mw (multi turn)	17	7.26496	18.1624	17	19.4043	8.8
AGS	ipm				22		6.0
AGS ext	flywire	1.83	0.78205	1.95513	13	0.29404	3.5
<b>Vert</b>							
Boo inj	(theoretical max if no acc blowup, no coupling)					50	2.3
Boo ext	mw006v	14	5.98291	14.9573	15.31	14.6127	6.6
AGS inj	A20mw	15	6.41026	16.0256	13	19.7555	8.9
	A20mw (multi turn)	18	7.69231	19.2308	13	28.4479	12.9
AGS	ipm				22		6.0
AGS ext	flywire	2.79	1.19231	2.98077	17	0.52265	6.3

(Willem van Asselt)  
(Haixin Huang)

AtoB 850

Printed: Sat Aug 7 07:33:07 1999

Setup Data Display Diagnostics Help

Dataset Name	Source	Info	Data	Lock	Graph
AtoB990807.0733	File	No	No	No	Yes
AtoB990807.0730	File	No	No	No	No

PhotoMultiplier-Horz::Raw

Volts

Wire Sample(mu)

Acquire Once

Fly Now  Park

Print Window

Acquisition Orientation

Horizontal

Motor Scan Timing

VMexSync(uS)	Event
1900000	

Device Name	Measmnt
AGS.HOR_FLYW_EPOS	# 2602.5
AGS.HOR_FLYW_RPOS	# 2600
AGS.VER_FLYW_EPOS	# 97.5
AGS.VER_FLYW_RPOS	# 100

Requesting reports...  
Data successfully stored to file /operations/app\_store/FlyingWire/data/AtoB990807.0733.

from Kevin Smith

Booster - AGS Au '99 Emittance Performance									
Time In Cycle	B dot	RF Freq	Harmonic	Volts / Turn	Q	Bunch Length	Bunch Area	dE (half)	$\Delta p/p$ $\times 10^{-3}$
Booster Extraction	2.8 T/s	3.75 MHz	6	35 kV	31	55 ns	0.01 ev*s/u	23 MeV	.63
AGS Injection + 200ms	0	3.691 MHz	24	310 kV	77	90 ns	0.06 ev*s/u	82 MeV	2.4
Psuedo Shottky gives dE = 81.5 MeV for booster bunches injected into Vrf = 0 in AGS.									
After debunch	Psuedo Shottky gives dE = 18 MeV for adiabatic debunch on h=24 (too perfect according to bbat).								
After h=4 rebunch	0	615 kHz	4	22 kV	77	750 ns	0.41 ev*s/u	70 MeV	
Psuedo Shottky gives dE = 70 MeV after h=4 rebunch and snap-off.									
AGS Extraction	0	4.442 MHz	12	262 kV	77	20ns	0.41 ev*s/u	2.6 GeV	1.2
Bunches after h=4 rebunch have shoulders which make the 750ns a best guess.									
Psuedo Shottky also shows shoulders making the 70MeV a best estimate.									
There is some beam in satellite bunches at AGS extraction.									

Bunch Area  
 $\times 6 \rightarrow .06 \text{ ev}^2/\text{u}$   
 $\times 6 \rightarrow .36 \text{ ev}^2/\text{u}$   
 $\times 1 \rightarrow .41 \text{ ev}^2/\text{u}$   
 $\times 1 \rightarrow .41 \text{ ev}^2/\text{u}$

PREVIOUS JMB PLOTS SAYS  $\Delta E_L$  DURING BSIR CYCLE IS 100%

CALL ME AND I'LL 'SPLAIN NUMBERS ABOVE.

(KSS)

071200 0:22 PM

Scope settings

Bandwidth 10 MHz

Delay 0.000000

Timebase 100 ns

Memory 1024 B

Bunch Amp Factor 1000

RF Amp (dBm) 20.00136

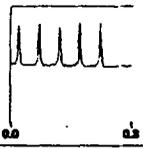
Gate Width 0.00

Normalise 0

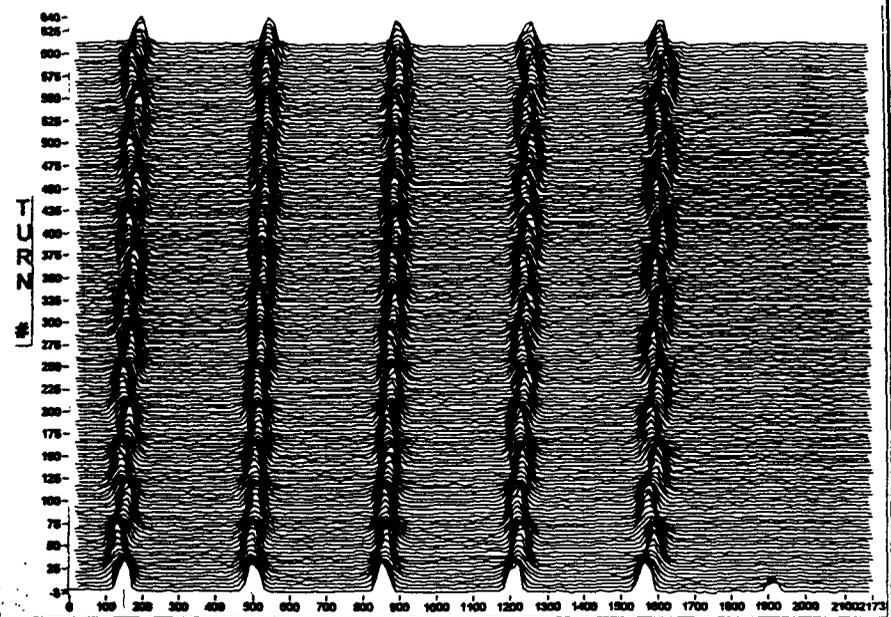
Trace per trace 1

Sampling Rate (ns) 10

Trace # in trace 12



Comment: Injection trigger by F200 delayed by 8 micro sec



File Location: 270cur 350°  
 1/C:Barrier

bunch ~ 50°  
 FWHM ~ 40 ns

Turn\_by\_turn\_with\_fdot.vi  
 Last modified on 6/12/99 at 8:13 PM

071200 0:22 PM

Scope settings

Bandwidth 10 MHz

Delay 0.000000

Timebase 100 ns

Memory 1024 B

Bunch Amp Factor 1000

RF Amp (dBm) 20.00136

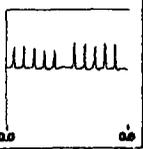
Gate Width 0.00

Normalise 0

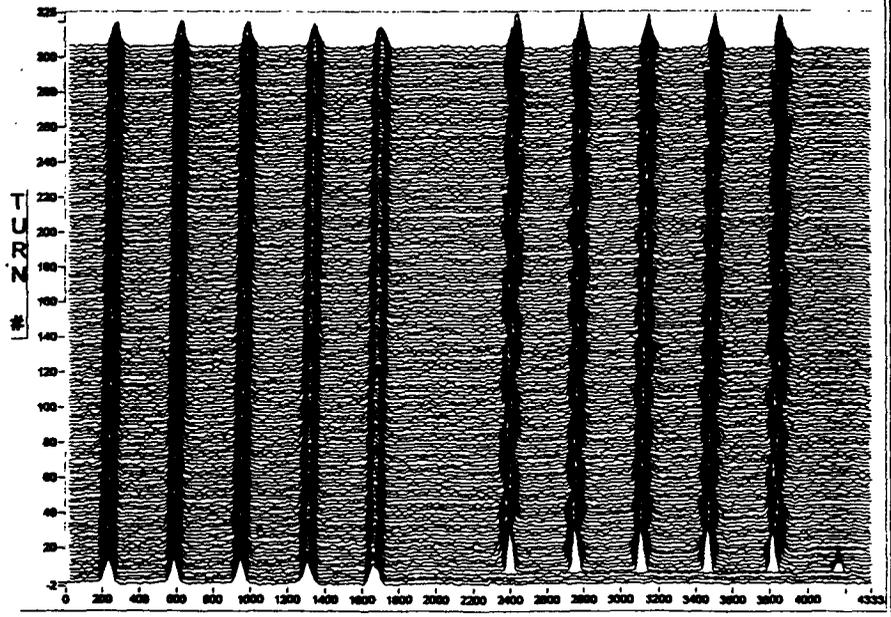
Trace per trace 1

Sampling Rate (ns) 10

Trace # in trace 12



Comment: Beamlet bunch existing in, trigger F200 delayed by 8 micro sec



File Location: 1/C:Barrier

CH1 data array TEMP.XLS

visibility 100% offset (ns) 0

DISPLAY CH1 1 CHANNEL "ABOVE"

CH 1 data array data 1

Display every 10 These

GP2B address 19

## **AtR post mortum**

Discussion primarily with Woody Glenn, who is talking with Dave Gassner  
(Instrumentation)

### **Problems:**

#### **Readbacks from the AtR magnets:**

- 1) the calibration of the reported currents is not right – allegedly a data base problem
- 2) the readbacks are noisy (an improvement is possible – 1 man month adding filtering)

#### **BPMs**

- 1) where checked the centerline of BPM agrees with the center of the quads
- 2) are the signs all right now?
- 3) large chunks of the AtR system would completely disappear for days during the run. The fix came quickly when the knowing person got involved.

#### **Flags**

- 1) "most" are installed wrong (up/down, right/left)
- 2) position reproducibility: on average, over many plunges, .25mm, and on beam line, but 1mm "plunge-to-plunge variation.

#### **Loss Monitors:**

- 1) during the run usually Operations-associated support solved problems, at least one time an apparent gain change turned out to be loss of a subset of the high voltage supplies, and Pat was involved. Do we have adequate alarmed readbacks?
- 2) is the chronic upstream loss just the spray from the stripping foil? Straight forward to check but not done(?).

**Jitter of the beam trajectory down the line:**

- 1) qualitatively confirmed by the systematic shifts in the arc oscillations seen in RHIC
- 2) if have good readbacks, use them to find problems directly
- 3) if we have confidence in AtR BPMs, use them to find source of the trajectory change. GPM is the tool, (AtR -> RHIC) and (AGS -> AtR) trajectory connection?

**AtR model**

- 1) Not rigorously tested. Significant error found in a quad late in the run, despite earlier indication of success.
- 2) Straight forward to test, but takes dedicated time, with knowledgeable resources involved. (Safety envelope enlargement? – water proof the dump?)

**Other:**

- 1) Stripping using the flag = win win, useful always available diagnostic
- 2) hopefully not implementing the partially existing collimation system – not robust.

**Open Issues:**

Do we have the option to extract AGS beam to the AtR dump – for realistic set up?  
Explicitly pulled the plug on this trigger for G10 during the run.

The need for different extraction radii in AGS as the bunch filling pattern in RHIC is changed.

.....