AGS Commissioning Plan

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RHIC Spin Collaboration Meeting
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Status of last run:

LINAC 200MeV polarimeter: 60~70%
before extraction from AGS: 30~50%
average extracted from AGS: 33%
average injected into RHIC: 19%

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New Development since last run

Source polarization reached 60~70% last year. 75% polarization has been measured at LINAC end with 180μA. See no problem to reach 75% with 200μA for the coming run.

AGS will use less powerful Westinghouse for next run. The acceleration rate will be about half of Siemens. This will have direct impact on beam polarization.

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Polarization in the AGS

Problems during last run:

1. Tune setting is critical for AC dipole operation. A hardware problem prevented us from monitoring the betatron tunes constantly. (fixed).
2. Beam emittance not stable. Horizontal emittance reduced to 15π, but still have room to go further down.
3. Total of >10% depolarization at weak resonances $24+\nu_y$ and $48-\nu_y$ not touched.
4. Polarization measured at end of LINAC disagreed with measured at AGS injection.

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Update on AGS polarimeter

Install forward arms to detect inclusive p-p scattering for several low energies: $G\gamma$=4.7, 7.5, 13.5. Combined with the recoil arms, we can select elastic scattering. The hope is to solve the puzzle of injection beam polarization. The installation will be done soon.

To standardize the polarized proton operation, the E880 polarimeter will be controlled by VME modules for normal operation. The system we currently use should still be used as testing and debugging tool. The hardware has been installed.

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Spin Tracking for the AGS

Resonance	$\lvert P_f/P_i \rvert$ 5% snake, Siemens	$\lvert P_f/P_i \rvert$ 3% snake, Westinghouse
$0+\nu$	0.9640	0.9460
$24-\nu$	0.9864*	0.9729
$12+\nu$	0.9863	0.9907
$36-\nu$	0.9718	0.9870
$24+\nu$	0.9692*	0.9357
$48-\nu$	0.9051*	0.8294
$36+\nu$	0.9142	0.9452
Total	73.1%	66.0%
75% LINAC	54.8%	49.5%
AtR 96%	52.6%	47.5%

* (no correction)

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Attacking the weak resonances

1.Change the quads setting around $24+\nu_y$ and $48-\nu_y$ to reduce the weak depolarizing resonance strength. The optimum setting requires move vertical tune from 8.70 to 8.83(need to confirm beam is happy with this tune setting). The consequence is that the AC dipole frequency will have to be moved. The improvement factor is 1.06. More simulation is underway. (Vahid Ranjbar)

2.Use polarized proton tune quads to correct the resonances. With 2 quads, the resonance crossing speed can be increased by a factor 2. The improvement factor is 1.04. Beam test will be done with gold beam. (Mei Bai).

3. Reduce horizontal emittance to 10π. The improvement factor is 1.04.

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AGS Performance

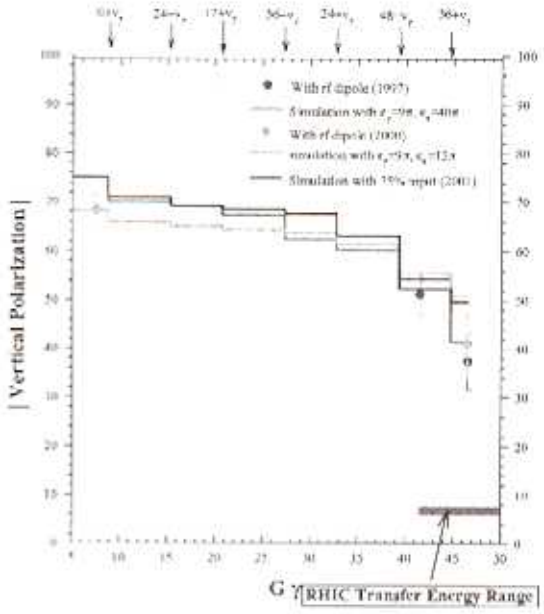
Green line: Simulation with 2000 commissioning conditions, 68% as input from LINAC.

The two expt. points:

68 +-3% at Gγ=7.5;
(taken at the end of the run)

41+-7% at Gγ=46.5
(averaged over 6 consecutive runs in 2 hours) .

Blue line: same beam condition except higher input from LINAC: 75% and Westinghouse.



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Polarization expectation

Machine chains	$\lvert P_f/P_i \rvert$
LINAC to AGS	100%
AGS	66.0%
AtR	96%
RHIC	100%
Total	63.4%

LINAC input 75% ------>47.5%

If better efficiency at $24+\nu_y$ and $48-\nu_y$ and coupling resonances achieved, the output will be higher: 50% to 55%.

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