TBD 5-7 March 2002
RHIC Retreat
~~G. Bunce~~ for the Polarimeter Group

## Remarks on Polarimetry for RHIC

1. What did the polarimeters do?
2. Issues and planned improvements for 2003

a) measured P to 2% statistical error in <1 minute, little emittance blowup
a) only gets better with higher intensity, polarization: less emittance blowup with higher intensity, measure to only Delta P=5% with more polarization

b) distributed results for average polarization and for each bunch (raw scaler data). Can be adjusted (analyzing power, throwing out bad bunches as determined by ongoing studies), normalized to luminosity at each experiment.
b) distribution plan fine, I think, but run numbers should be fill numbers with additional tags for ring, energy, sequence in fill

c) online plots of P vs. time
c) more automatic plots should be available in real time, including polarization transmission for AGS to RHIC, up the RHIC ramp, over store

d) false asymmetries observed at P=5% level
---worse when the injection was ragged
d) study present data for false asymmetries, develop scheme to flag problem bunches, assign systematic error for false asymmetries "online"

e) observed dependence of P on intensity in some cases
e) FPGA code will be changed to eliminate known problem that caused energy dependence. More information will be kept to allow correction later. For 2003, polarimeter will use 48 channels of the "new" version of Yale wave form digitizer (for 2002, 24 channels were "old-style", 24 "new"). The new style allows many more distributions to be kept.

f) revisit procedure used to notify exptr. of polarization measurement

f) observed gain reduction of silicon pulse height during run
---originally thought to be from radiation damage of silicon
---observe gain has now increased to or above initial level--?
f) need easier way to monitor and correct gains. Also need plan on how we do any correction.

g) convert from raw asymmetry to polarization using analyzing power from E950--only available at 24 GeV.
---issues of using downramp to transfer A_N to 100 GeV
---possible bounds on analyzing power from data (investigating-Hal Spinka)
g) need downramp in 2003, if possible. We may find that polarization is reduced over the up and down cycle and we will need to develop a plan to set limits on A_N(100 GeV) in this case.
---possible measurement of A_N(24 GeV) to 5% with polarized target in external beam of AGS (Doug Fields, Don Crabb)

h) group--measurements done by RBRC/RIKEN/ITEP (checking results each day, presentations to 9am meetings, etc.)
h) hardware and standard measurement responsibility needs to move to C-AD. The experiments need to continue strong involvement in evaluating results, checking for problems

i) new for 2003: spin flipping, possibly recogging. We need plans to handle these for the V124 modules. We also need to make the polarization measurements at the source, for each bunch, available to the experiments. Also need to study and develop plan to deal with pile-up for higher intensity (this will already be an issue for the AGS CNI polarimeter).

Overall--the proton-carbon CNI polarimeter is a truly beautiful device, built by a collaboration of many with critical contributions by many.

We are also now building a CNI polarimeter for the AGS for 2003.

For 2004 we plan to install a polarized jet target at the 2 o'clock IP of RHIC to measure the absolute beam polarization to +/-5% (this will surely involve a learning curve).

Also in 2003: local polarimeters at PHENIX, STAR to set up and monitor spin rotators.