

# RHIC Spin Flipper Status

*M. Bai*

RHIC Spin Collaboration Meeting  
October 1, 2001  
RIKEN BNL Research Center, Brookhaven National Laboratory

---

## RHIC Spin Flipper Status

Mei Bai

Collider Accelerator Department

RHIC Spin Collaboration Meeting  
Oct. 1, 2001

---

- RHIC Spin flipper

- a dipole magnet with horizontally oriented oscillating magnetic field.
- maximum magnetic field:  
100 Gauss-m, spin resonance strength:
- oscillating frequency: 37.5 kHz
- time for getting a full spin flip: 2seconds
- capable of independantly achieve spin flipping in each ring.

RHIC Spin Collaboration Meeting  
Oct. 1, 2001

---

- project status

- Magnet:

- DC magnetic field measurement:
      - transfer function:  
106.8 Gauss-m/kAmp
      - multipole components: < 1%
      - integral field angle: 6 mrad
    - AC magnetic field measurement:
      - 2nd & 3rd harmonic distortion: -60 dB
    - ready for installation.
    - Location : IP4

RHIC Spin Collaboration Meeting  
Oct. 1, 2001

---

- project status

- Electric system:

- magnet inductance:
      - 104.96  $\mu\text{H}$  @ 37.5 kHz
      - 26.362  $\mu\text{H}$  @ 64.0 kHz
    - Q factor:
      - 320 @ 37.5 kHz
      - 309 @ 64.0 kHz
    - 6 kwatt power supply testing done
    - cap-bank assembly done
    - vertical testing

RHIC Spin Collaboration Meeting  
Oct. 1, 2001

---

- project status

- Control system:

- Front end computer installed
    - PA remote control PLC in progress.
    - Programing the Lecroy scope for digitizing magnet current readback done.
    - Application ready for integrated testing.

RHIC Spin Collaboration Meeting  
Oct. 1, 2001

---

- schedule

- magnet installation:

- estimated time for installation: 2 -3 shifts
    - between Oct. 1 and Oct. 15

- system review:

- before Oct. 15

- system testing:

- second week of Oct.

- Power supply and cap-bank installation:

- estimated time for installation: 1-2 shifts
    - after Oct. 15

RHIC Spin Collaboration Meeting  
Oct. 1, 2001

- 
- commission the RHIC spin flipper
    - at injection
      - with both snakes
      - move the spin tune away from half integer by tuning the two snakes' axis slightly away from being perpendicular.
      - Slowly ramp the spin flipper frequency across the spin tune and measure the beam polarization after the frequency ramping.
    - At storage:
      - with both snakes
      - with one snake

RHIC Spin Collaboration Meeting  
Oct. 1, 2001

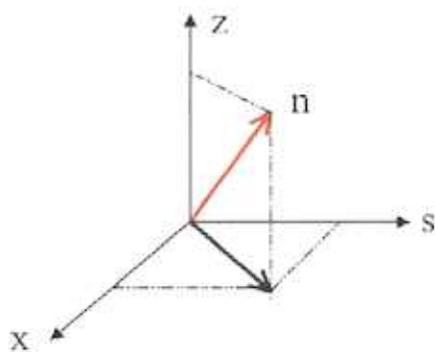
- 
- application of the RHIC spin flipper
    - flip the spin direction for reducing the systematic error.
    - measure the spin tune:
      - slowly move the spin flipper frequency towards the spin tune and then let the induced spin resonance be on top of the spin tune.
      - measure the beam polarization
      - the spin tune=

RHIC Spin Collaboration Meeting  
Oct. 1, 2001

- in the frame which rotates at the same frequency as the spin flipper's frequency, the stable spin direction is

$$\hat{n} = \frac{\delta}{\lambda} \hat{e}_z + \frac{\epsilon_1}{\lambda} \hat{e}_x + \frac{\epsilon_2}{\lambda} \hat{e}_y$$

$$\lambda = \sqrt{\delta^2 + \epsilon_1^2 + \epsilon_2^2} \quad \delta = \gamma_n - \gamma_s$$



RHIC Spin Collaboration Meeting  
Oct. 1, 2001