Overview of RHIC PP Run 5

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Outline

- Goal for RHIC pp RUN 5
  - Machine goals
  - RHIC pp projections
- Status
  - Machine preparation
  - RHIC polarimeter
- RUN Plan
  - Set-up: 2 weeks
    - Physics data taking starts at the end of the setup
  - Ramp-up
    - Improve the machine performance
  - Physics run
    - Machine tuning saturates
- Machine developments for the future

RUN 5 Goal

- Physics data taking
- RHIC Machine developments
  - Spin tune measurement
  - Explore pp accelerating beyond 100 GeV towards 250 GeV
  - Spin flipping commissioning
  - Establish injection with both snake and spin rotators on at full field
- AGS cold snake commissioning

RHIC pp Run 5 projection

	bunch intensity [10^{11}]	# of bunch	# of collision points	$\mathcal{L}_{store\ average}$* [$10^{30}$ $cm^{-2}s^{-1}$]	$\mathcal{L}_{per\ week}$** [pb-1]	polarization at store
Run5 min	0.7	56	4	4.0	0.9	40%
Run5 goal	1.0	56	4	8.0	2.0	45%
Run5 max w/o cold snake	1.0	79	4	9.0	3.0	45~50%
Run5 max w cold snake	1.5	56	4	15.0	4.5	50~60%

Machine Parameters

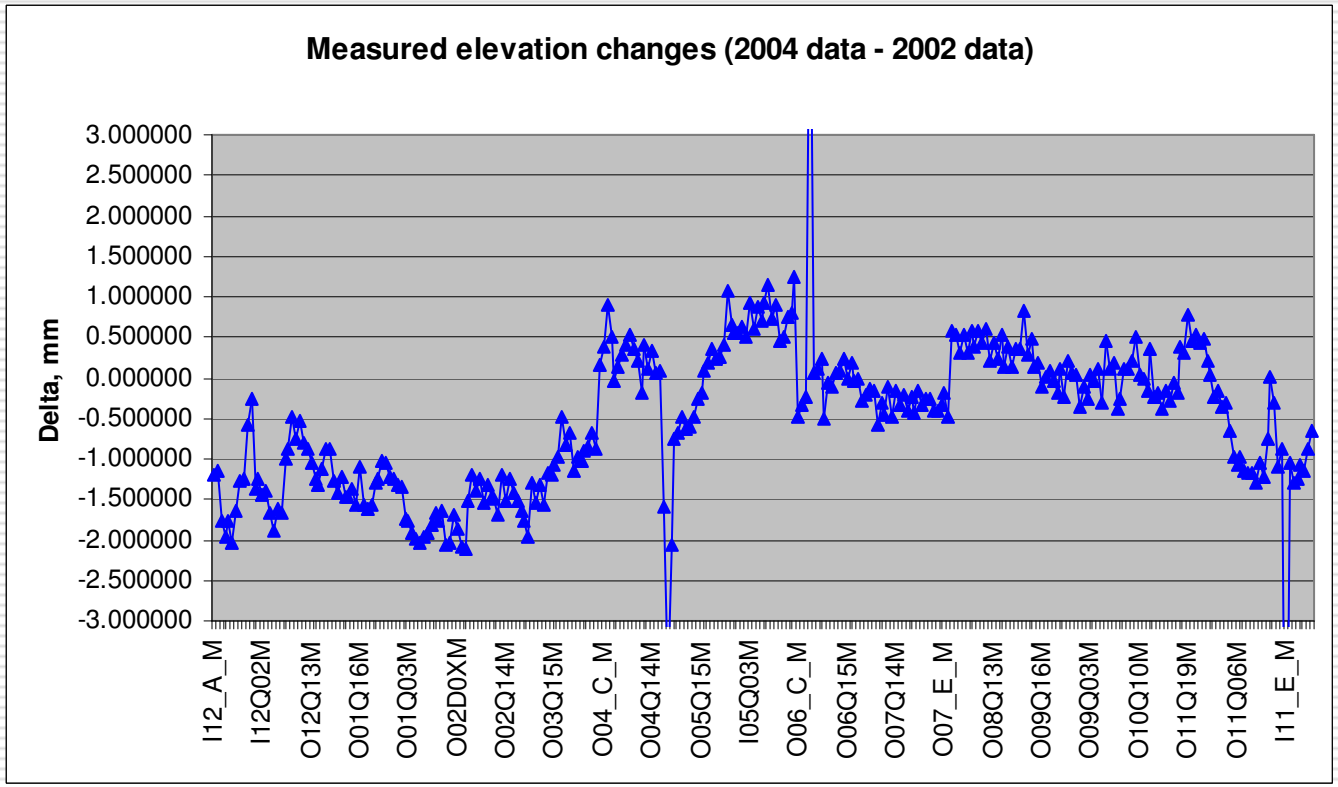
RHIC			AGS		
Energy at injection	24.3	GeV/u	Energy at injection	2.2	GeV/c
Energy at Store	100.2	GeV/c	Energy at extraction	24.3	GeV/c
Interaction points	6 8 10 12 2 4	clock	Imperfection spin resonance	Warm snake	
β* at injection	10 10 10 10 10 10	m	4 strong Intrinsic spin resonances at 0+Qy, 12+Qy, 36+Qy and 36-Qy	Ac dipole	
β* at store	1 1 3 10 3 10	m			
Working points	(28.73, 28.72)				
Snakes current	DC		All the other spin resonances	No correction	
Spin rotator current	Ramp up after store				
Experimental magnets	STAR, PHENIX: on DC from inj. to top Phobos: only turns on and gets ramped up during the rotator ramp				

Machine Status

- RHIC in preparation for Cu run. First dry run done.
- Snake no configuration change
- Online model
  - optimize the lattice fitting so that the β^* will be more close to 1m. In the working progress.
- New applications
  - Skew quad modulation decoupling. This is will allow one to decouple the machine during the ramp. The application is expected to be commissioned during the Cu Run.
  - RHIC polarimeter application: working progress, expect to be ready around Nov.

Machine Status

- New survey was done along the ring and confirmed an additional 2mm sinking in IP12 between year 2002 and year 2004



RHIC polarimeter Status

- Hardware
  - Targets will be installed at the end of Sept.
  - Silicon detectors will remain unchanged during the early part of the run
  - New WFDs are ordered to allow one to take polarization measurement in Blue and in Yellow at the same time
- software
  - RHIC polarimeter application
    - Consolidate many functionalities which used to require several pet page access
    - Auto-target scan
    - Auto-polarization scan
    - Allow one to examine the data quality through the banana plots

Run Plan: 2-week setup

- Goal: establish pp collision with reasonable polarization
  - 3-day shutdown
    - Jets target installation
    - AGS synchro setup
    - others
  - Injection setup
    - Establish Injection
      - Injection kicker timing, spin pattern confirmatioin
      - Circulating beam, capturing
      - Set the RF frequency based on $B\rho$ and adjust the dipole field to center the beam
      - Rf loop setup
      - Orbit, chromaticity & coupling correction

Run Plan: 2-week setup

- Injection setup
  - Instrumentation setup
    - BPM, esp. the DX BPMs
    - Polarimeter: Blue and Yellow
    - PLL and Schottky
    - IPM
- Energy ramp development
  - use similar ramp as Run 4
  - Rf loop: Brho loop
  - Decoupling along the ramp. Adjust tunes/orbits/chromaticities to maximize beam/polarization transmission efficiency
  - Establish orbit/tune/chromaticity/decoupling at store
  - Cogging setup
  - Polarization ramp measurement

Run Plan: 2-week setup

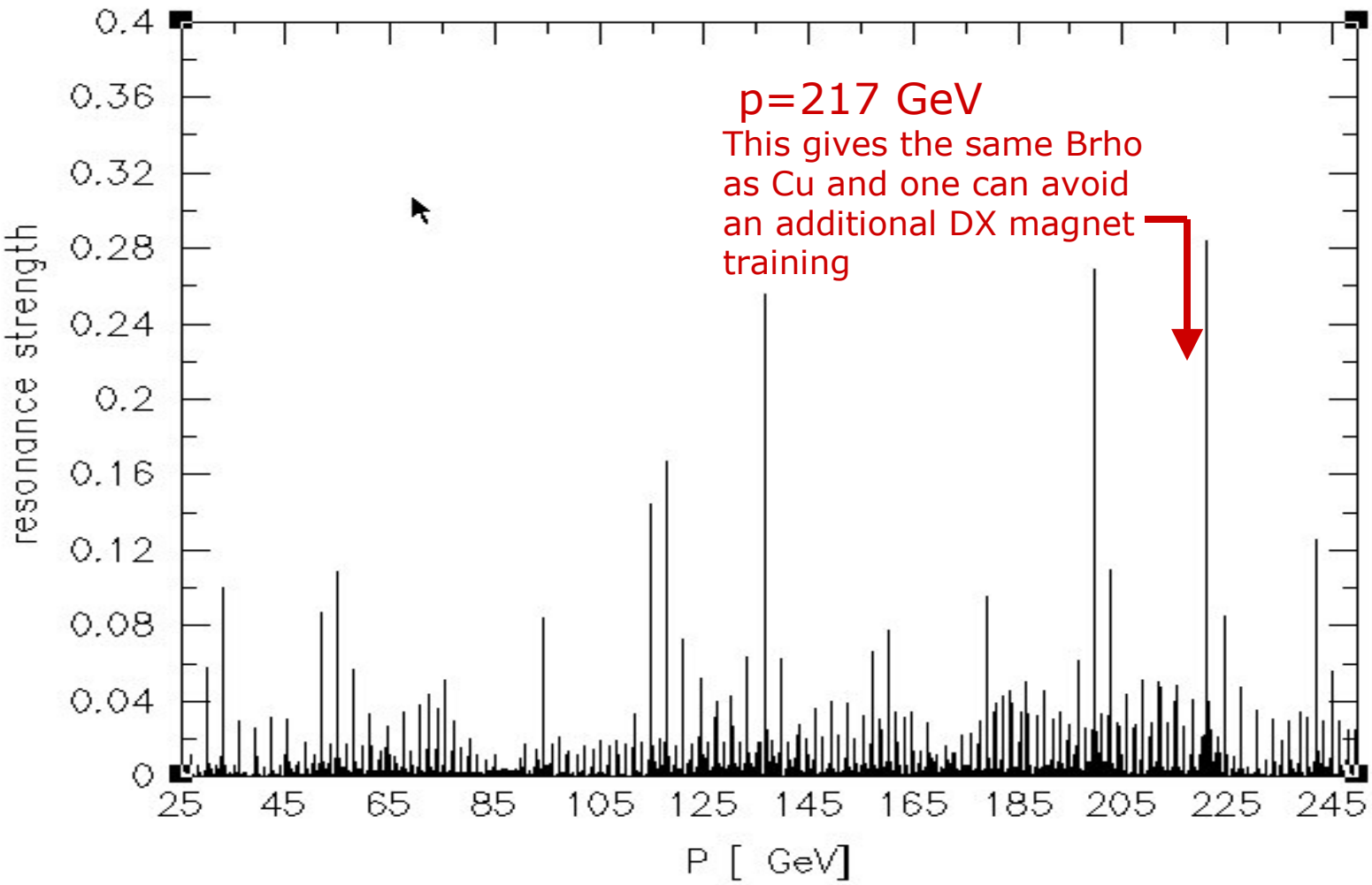
- Rotator ramp development: 6 bunch
  - Establish tunes/chromaticities along the ramp, optimize the beam/polarization transmission efficiency
  - Adjust rf frequency at store to compensate the path length difference due to spin rotators
- Establish collisions
  - IR steering
  - Fine cogging tuning
- 56x56 bunch development
  - Provide stores for experiments
  - Collimator setup
  - Vernier scan

Run Plan: 1-week ramp-up

- Goal: improve the polarization as well as luminosity
  - Polarization tuning
    - Polarization ramp measurement
      - Locate the energy where polarization gets lost
      - Fine tuning the optics
    - Improve the orbit distortion
  - Luminosity tuning
    - Improve the beam transmission efficiency along the ramp

Machine development

- Polarimeter development
  - Turn-by-turn spin precession measurement
- Spin tune measurement
- Explore pp acceleration beyond 100 GeV towards 250 GeV
- Spin flipping commissioning
- Establish injection with both snake and spin rotators on at full field
  - This will allow us to save ~7 minutes per store.

Challenge of going beyond 100 GeV

Intrinsic spin resonance
Qx=28.73, Qy=29.72, emit= 10