Acceleration beyond 100 GeV

- Goal
  - To evaluate the spin dynamics beyond 100 GeV
    - What's the impact of 1mm rms orbit distortion(achieved) on the polarization transmission efficiency?
    - How much can we correct the orbit with the existing RHIC orbit correction system at higher energy?
  - To provide a guidance/justification for the full ring re-alignment of RHIC during summer of 2005
- Expection
  - Little or no polarization is expected at energy of 205 GeV with 1mm orbit distortion
  - Polarization ramp measurement will be the key technique in exploring the depolarization mechanisms and locations.

Machine Configuration for pp to 205 GeV

- Energy
  - Injection: 46.5
  - Store: 391.5
- Working point
  - Ramp I: 28.72, 29.73 (injection to 100 GeV)
  - Ramp II: 28.68, 29.69 (100 GeV to 205 GeV)
  - Store: 28.68, 29.69
- Lattice: IP 6 8 10 12 2 4
  - Injection: 10 10 10 10 10 10
  - Store: 2.0 2.0 10 5 3 10
- Collision Pt (option): 6 8 10
- RF:
  - No re-bucketing at store

Plan for 205 GeV development

- Ramp development
  - Goal:
    - Adjust tunes, chromaticity, orbits and etc to maximize the beam transmission efficiency
    - Keep the tunes stay in the snake-resonance free region and minimize the orbit distortion as much as possible
    - Polarization ramp measurement once a working ramp is available. Expect to use 2 ramps
  - Estimate time: 9 consecutive shifts

Plan for 205 GeV development

- Polarization development
  - Goal:
    - Understand the spin dynamics beyond 100 GeV. This will allow us to benchmark our simulation model and provide guideline.
  - Task list
    - Measure the polarization as a function of orbit distortion around 135 GeV where a strong intrinsic resonance is
      - Intrinsic resonance strength: 0.3 for a 10 pi mm-mrad particle
      - imperfect: 0.12 for 1mm rms orbit distortion
      - 4 datapts: 0.5mm, 1mm, 2mm, 4mm
      - Keep Qy at 0.68
      - 12 ramps in total: 2 shifts
    - Measure the polarization as a function of tune with an fixed orbit distortion
      - The orbit distortion will depend on the previous study
      - 4 datapts: 0.74, 0.70, 0.67
      - 10 ramps in total: 2 shifts

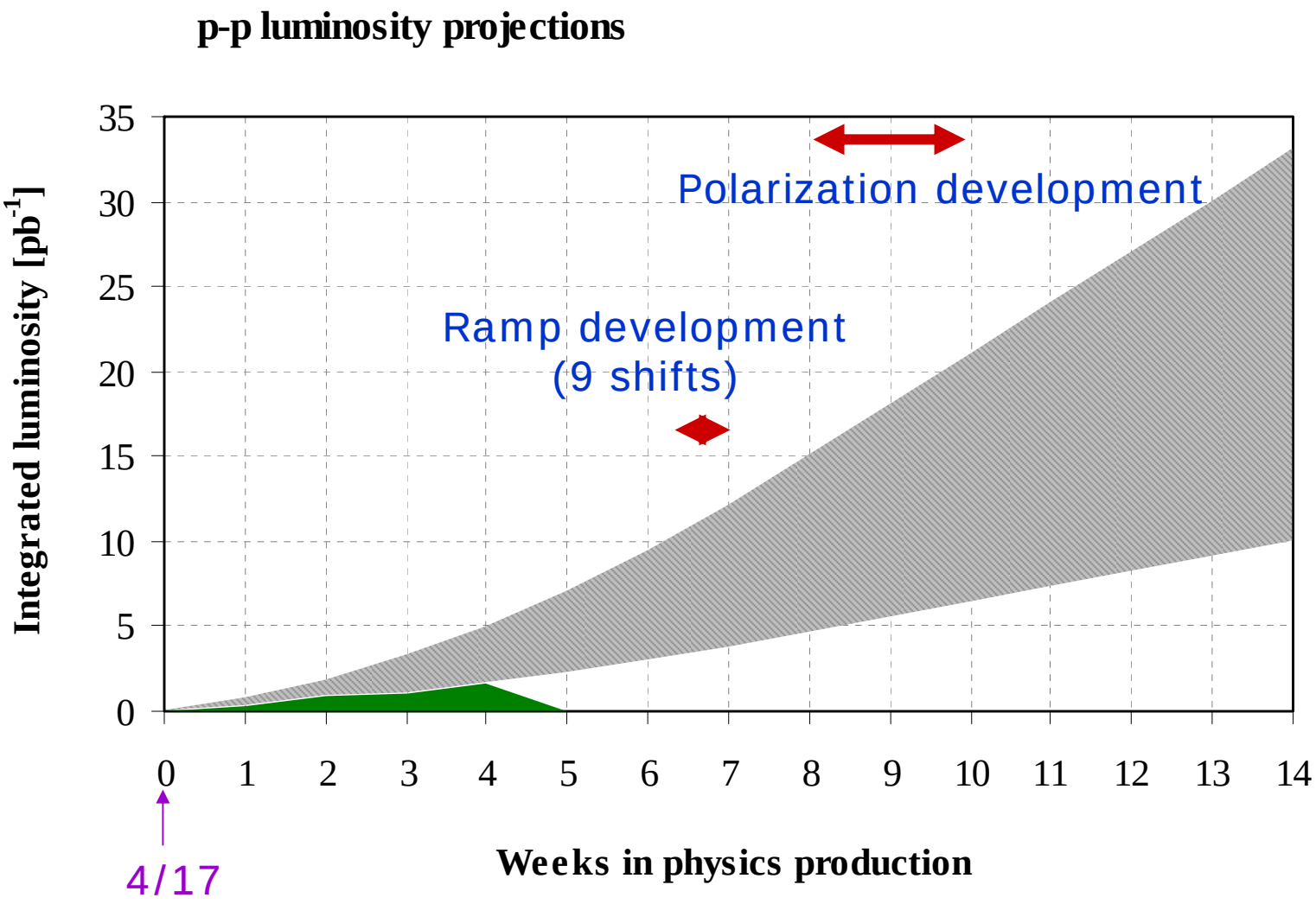
Schedule: May 31 0800 – June 3 0800

- May 31 0800 – May 31 2400
  - 8 bunch ramp development
    - Adjust orbits/tunes/chromaticities along the ramp to maximize transmission efficiency
    - Global decoupling along the ramp
    - Tunes: Qx=0.69, Qy=0.68
    - Orbits: rms ~ 0.5mm or better
    - Separation bump through the ramp
- May 31 2400 – June 1 1600
  - Global decoupling along the ramp
  - Local IR non-linear correction
- June 1 1600 – June 2 0800
  - 56 bunch ramp development
    - Fine adjustment of tunes/chromaticities
    - Polarization measurement along the ramp
    - Collision setup
      - Cog beam into collision, fine adjust orbits/optics to minimize the beam decay
- June 2 0800 – June 2 1600
  - Store setup: IP6, IP8, IP10
    - Steering setup
    - Collimation setup
- June 2 1600 – June 3 0800: store at 205 GeV
  - Parasitically study the dependence of the resonance strength at 135GeV on the orbit distortion

RHIC Shift leader Schedule

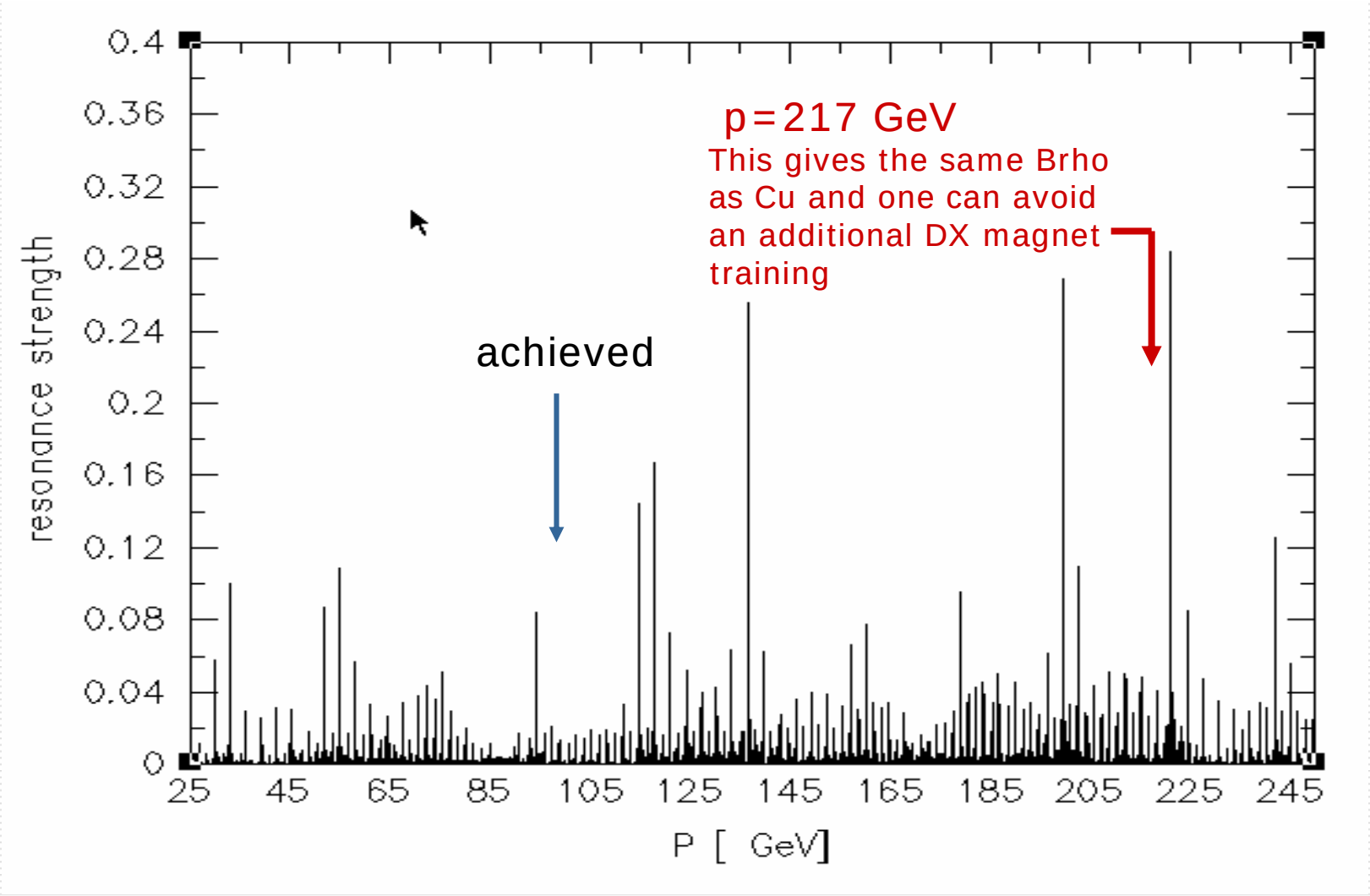
- May 31 0800 – May 31 1600: Todd
- May 31 1600 – May 31 2400: Vadim
- May 31 2400 – June 1 0800: Yun
- June 1 0800 – June 1 1600: Fulvia
- June 1 1600 – June 1 2400: Jorg
- June 1 2400 – June 2 0800: Mei
- June 2 0800 – June 2 1600: Angelika

Timeline for 205 GeV development



Challenge of going beyond 100 GeV

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



Q&A

- ramp development to 200 GeV (9 shifts)--the main spin goal is actually the study at 135 GeV, not so much above. What if we did that only, with blue only--what time does that take roughly?
  - The 9 shifts do not focus on 135 GeV. It focus on the resonances at 135 GeV as well as the one close to 200 GeV. The other focus is to evaluate the ramp&store at high energy. This will be critical for making projections for the program at 500 GeV

Q&A

- the study of varying the orbit rms could also be done below 100 GeV, but has not been done. Why not determine the margin using a resonance below 100 GeV. The interpretation of the result (polarization loss vs. orbit rms) will depend on all else being stable, which seems to be reasonable for blue. However, it seems to me to need a demonstration that the polarization loss behaves as it should for different strength spin resonances, hence the question about a study below 100 GeV.
  - We do have BE proposed to study the snake resonances below 100GeV. The snake resonance strength dependence on the intrinsic resonance strength will be studied.

Q&A

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Q&A

- do blue only? I doubt that we will learn anything from yellow, unless we want to study beam-beam effects on blue.
  - I don't think there are extra costs on studying yellow at the same time as blue. And yes indeed, it will be valuable to exam the beam-beam beyond 100GeV

- I assume that the goal is to learn whether we need to realign RHIC this summer. To decide against realigning RHIC, we would need to see a margin of polarization survival vs. orbit rms at 135 GeV? What margin? Is continuing to 200 GeV important information also? (Your slide emphasizes just the 135 GeV study for the orbit rms.)
  - Not only this but also to find out whether there is any surprises

Q&A

- trade-offs of this study time vs. additional studies below 100 GeV, for example to try to understand yellow. This, of course, could directly improve this year's run if we finally found a smoking gun. Are there a series of studies that could help with this, but are seen to take too much time and therefore have not been proposed?
- is there value for spin of the ramp development to 200 GeV?
  - *See answers of the previous questions*
- One value for spin is if one of the beams (blue) is polarized at 200 GeV. Then, during the Phobos measurements, STAR and PHENIX could measure the analyzing power of the local polarimeters. Can we assign a probability (via spin tracking?) that the blue polarization will survive to 200 GeV with the present orbit rms?
  - If our current model is correct, there could be a fair chance to see polarization at 200GeV with carefully steering the working point as well as orbits. So far, we have demonstrated we can achieve a rms of orbit of 0.5mm.