RHIC $\sqrt{s}$=500 GeV Run

Milestones of pp250GeV Run

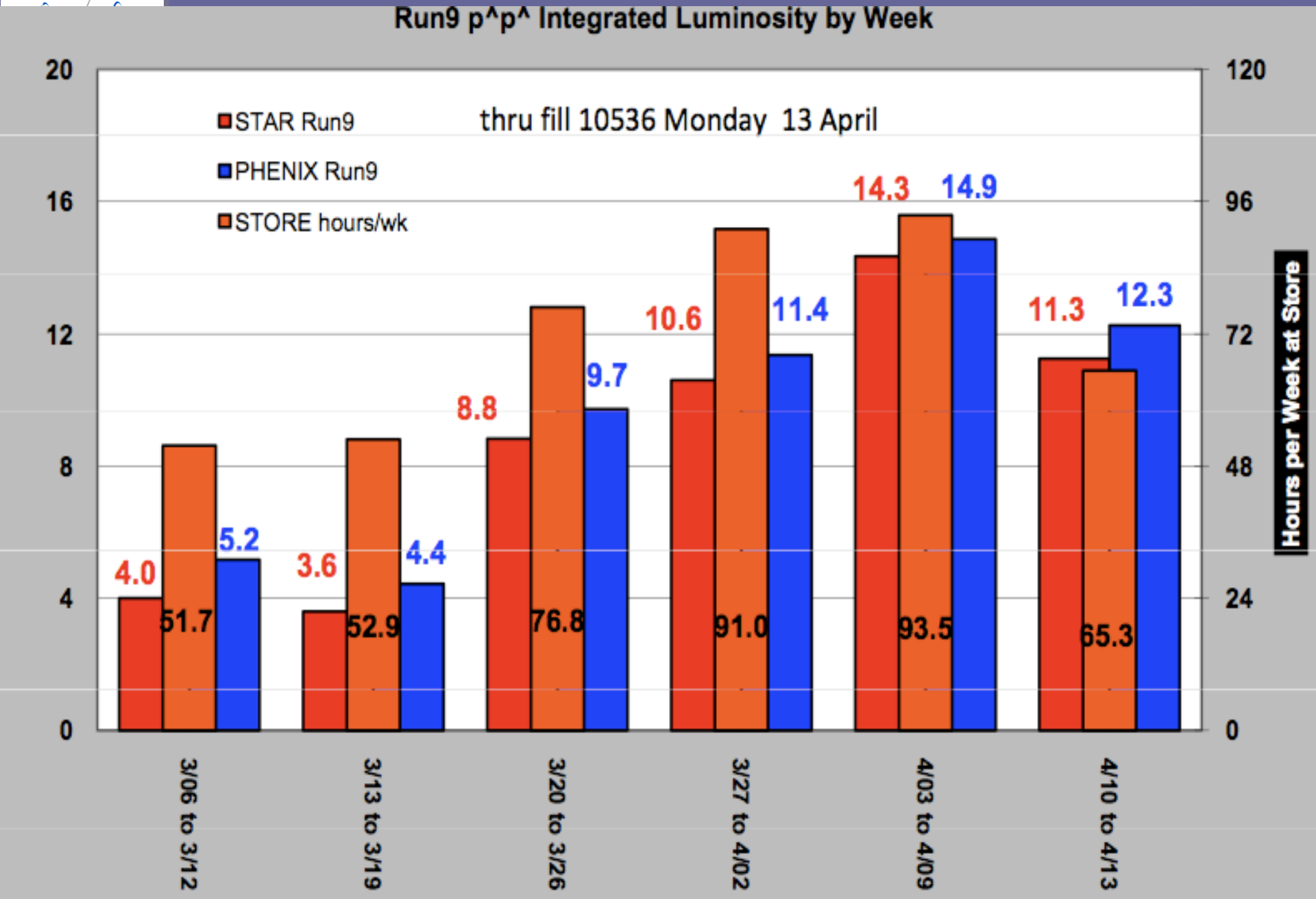
- 2/5 – 2/12: establish/tuning Blue injection
- 2/9 – 2/14: Yellow injection including DX training
- 2/14 – 2/24 : ramp development
  - 2/16: 6x6 bunches reached 250GeV w. tune/coupling feedback
  - 2/17: first collision with 6x6 at 250 GeV
  - 2/17: change ramp from pp90 to pp91 to address the Blue q89 current overflow problem
  - 2/18: 28x28 bunch ramp
  - 2/19 first successful Blue only ramp with 9MHz
  - 2/22 blue CNI polarimeters were ready for relative measurements
  - 2/22 store setup
- 2/23-24 midnight: first overnight collision for detectors
  - 56x56, fill number 10215

Milestones of pp250GeV Run

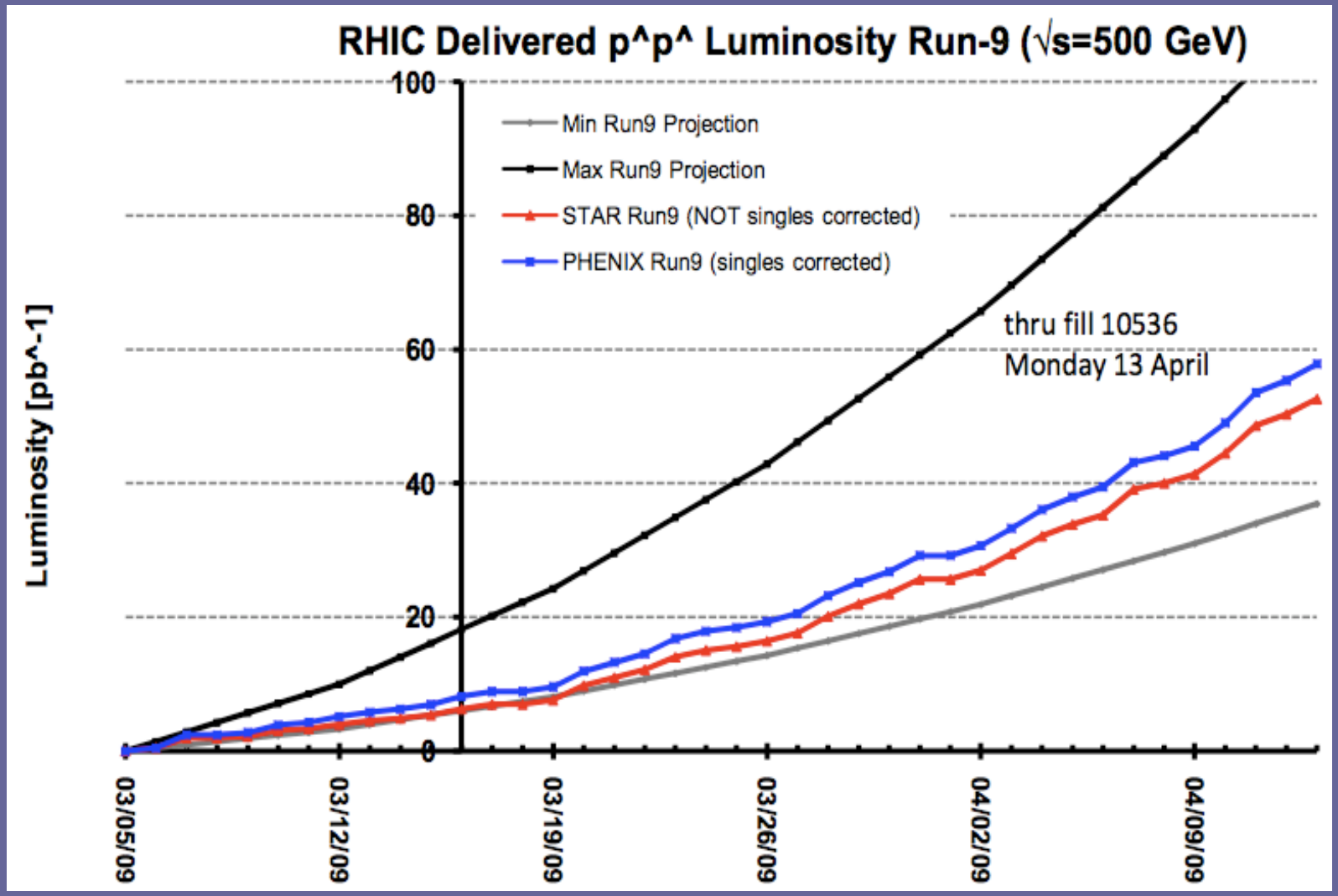
- 2/23: Carl was convinced with main ps glitches. Solutions like staying with ramp ps for main quadrupoles were proposed and tested
- 3/7: CNI polarimeters were ready for polarization ramp measurement: 10307
- 3/10: achieved ~ 45% at 250 GeV by lowering Qy below 0.68
- 3/12: first trial of rotator ramp development
- 3/16 rotator ramp was developed and physics was on
- 3/20 Jets started to take data
- 3/24: more polarization ramp meaurement
- 4/14: dedicated polarization studies
  - Complete detailed polarization scan as function of Qy
  - Measure spin tune as function of orbital angle between snakes

RHIC √s=500 GeV Run Performance

Weekly Luminosity & Store hours

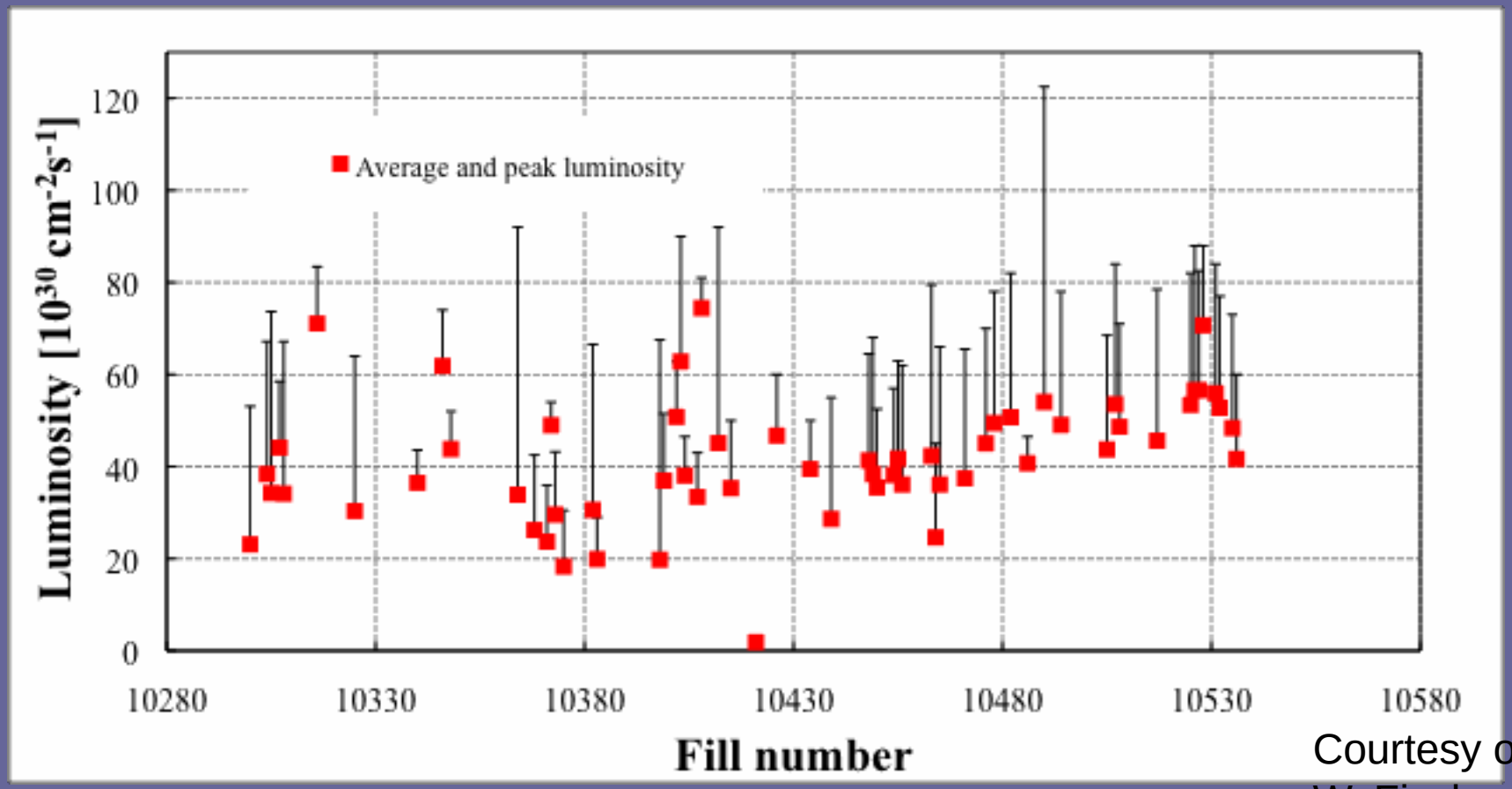


Integrated Luminosity



Courtesy of
P. Ingrassia

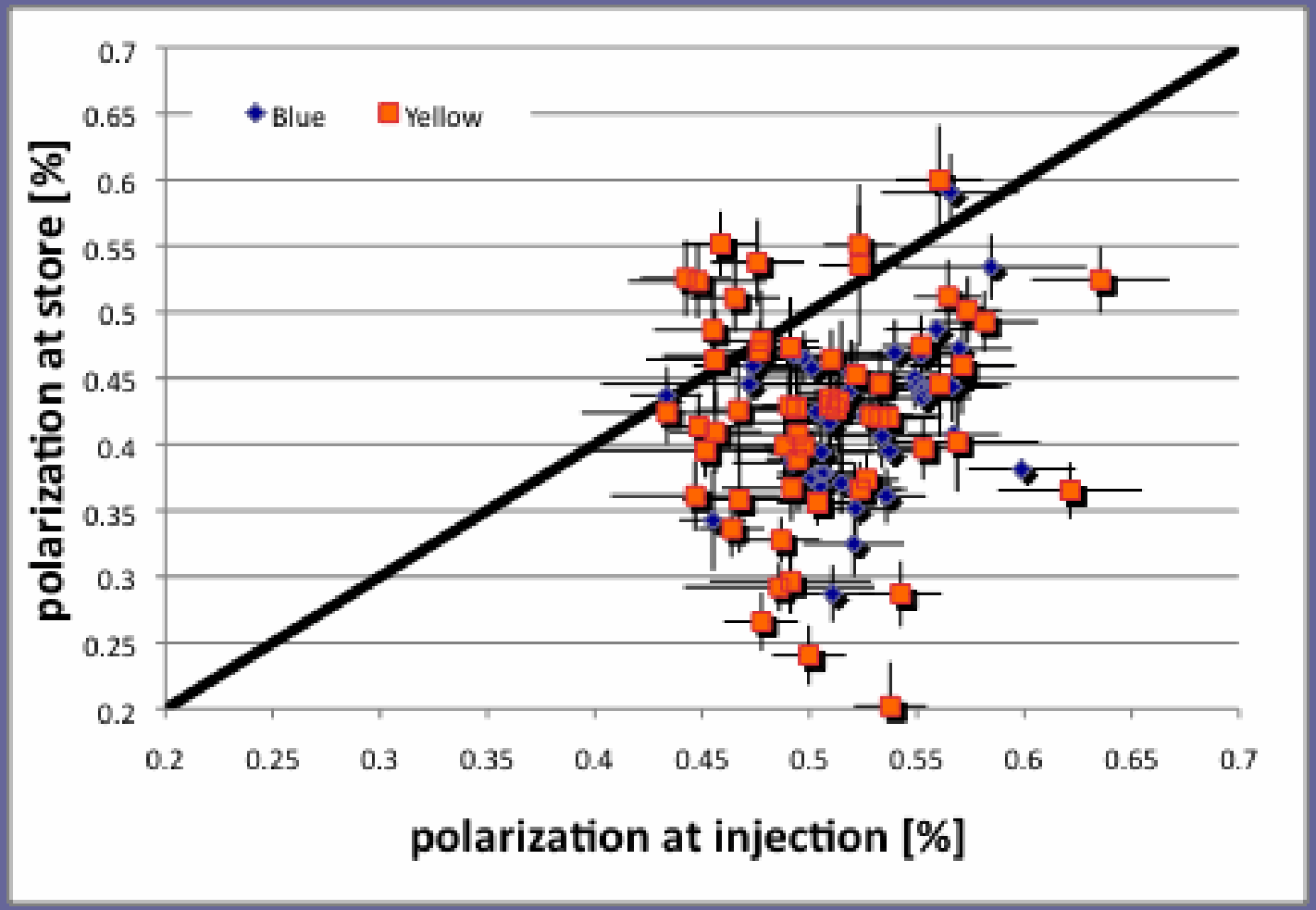
Average and Peak Luminosity



Courtesy of W. Fischer

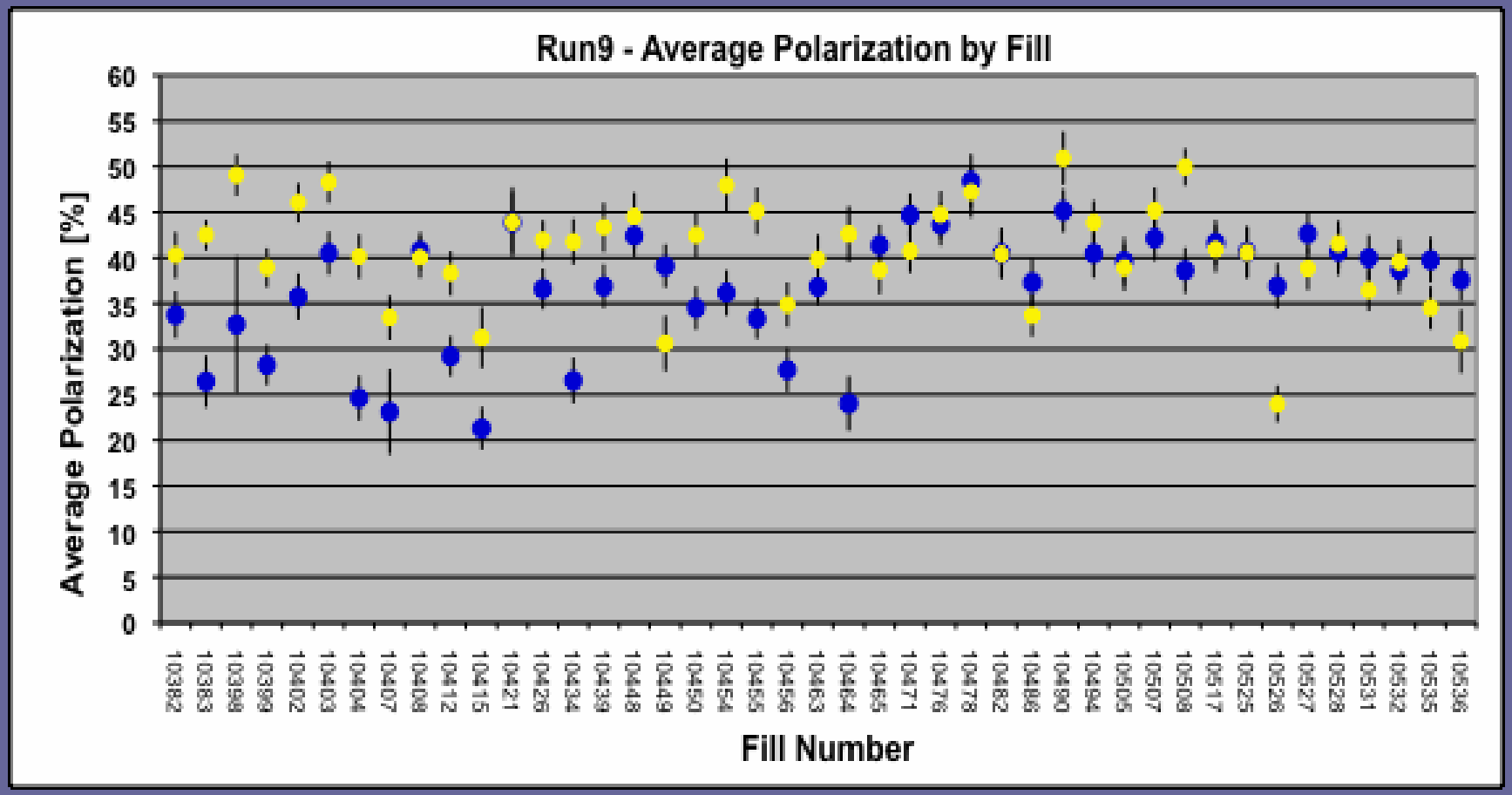
- beta*: 0.7m
- # of bunches: 109
- Bunch intensity: 1.2x10^11 protons

Polarization performance w.o. rotator



- Average beam polarization: ~42%
- Best polarization achieved: ~54%

Average Store Polarization



- Average beam polarization: Yellow ~40.6%, Blue ~36.6%
- Best polarization achieved: Yellow ~50.9%, Blue ~48.4%

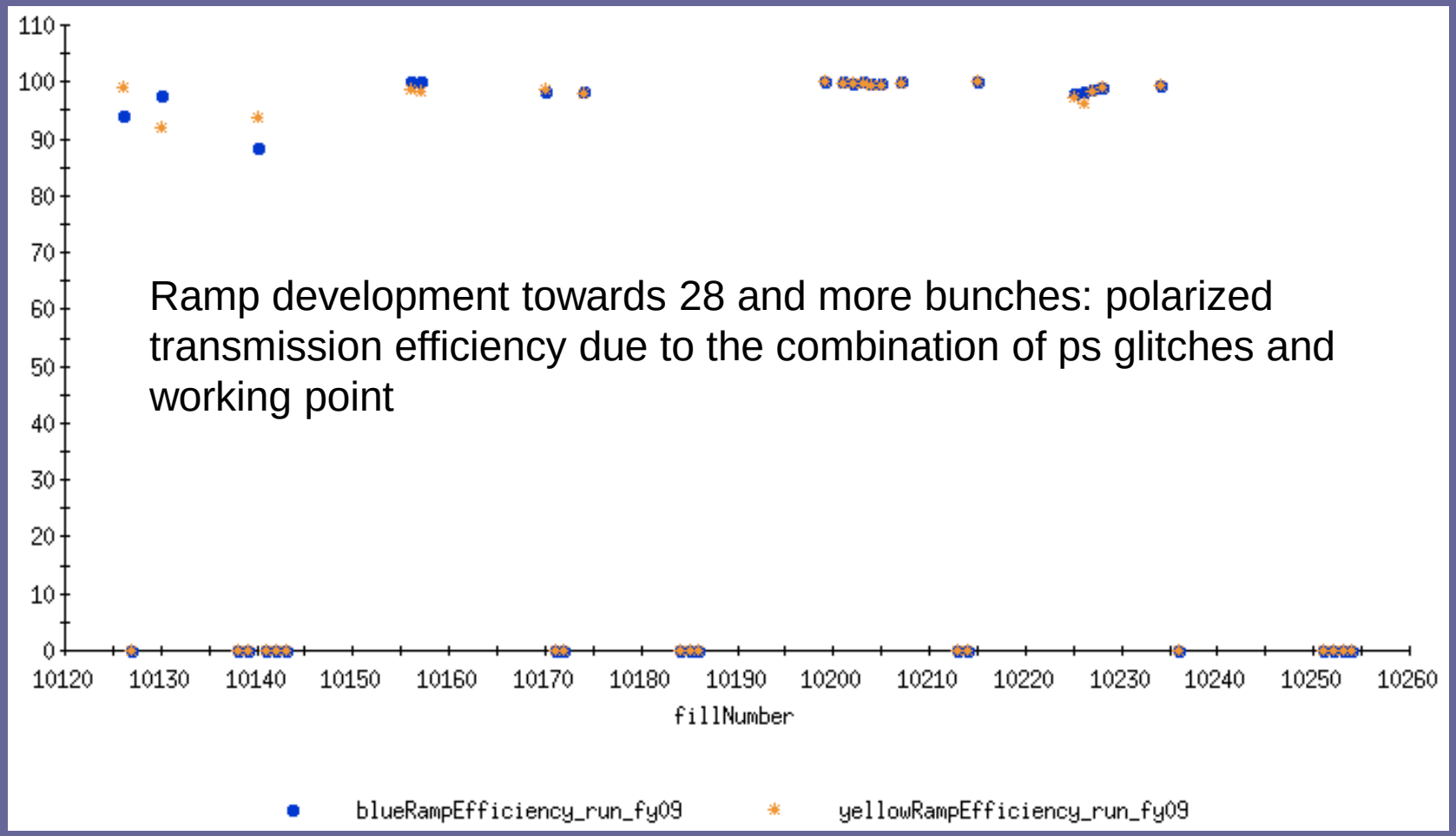
Highlights

- Non-zero crossing angle in non-colliding IPs helped to reduce the number of DX trainings
- The tune/coupling feedback worked robustly and allowed us to establish ramps with 6 or 12 bunches very quickly
- Successfully accelerated polarized protons in Blue with 9MHz cavity.
- Good luminosity lifetime
- Extensive polarization studies
  - Detailed polarization measurements as function of working point
  - Multiple polarization ramp measurements
- Demonstrated ramp with 56x56 2x10^11 protons per bunch. ~30% polarization was measured

Features, Issues and lessons

- power supply system
  - Reliability:
    - see Carl and Don's talks on Thursday afternoon
    - Good reliability is very crucial for both machine setup as well as physics running, especially for a new program like 250 GeV
  - Power supply for mains
    - Coefficient is very critical. Needs dedicated time to be tunned at the beginning of the ramp development
    - The loss of power on 3/18 impacted the back2physics after maintenance and had to tune the trim to match the archived redundant DCCT
    - Glitches of the main ps for ramp at 20 sec, 52 sec, and 265 sec.
      - **made the ramp development longer than planed**
      - **significantly reduce the reproducibility of ramp**

Ramp transmission efficiency

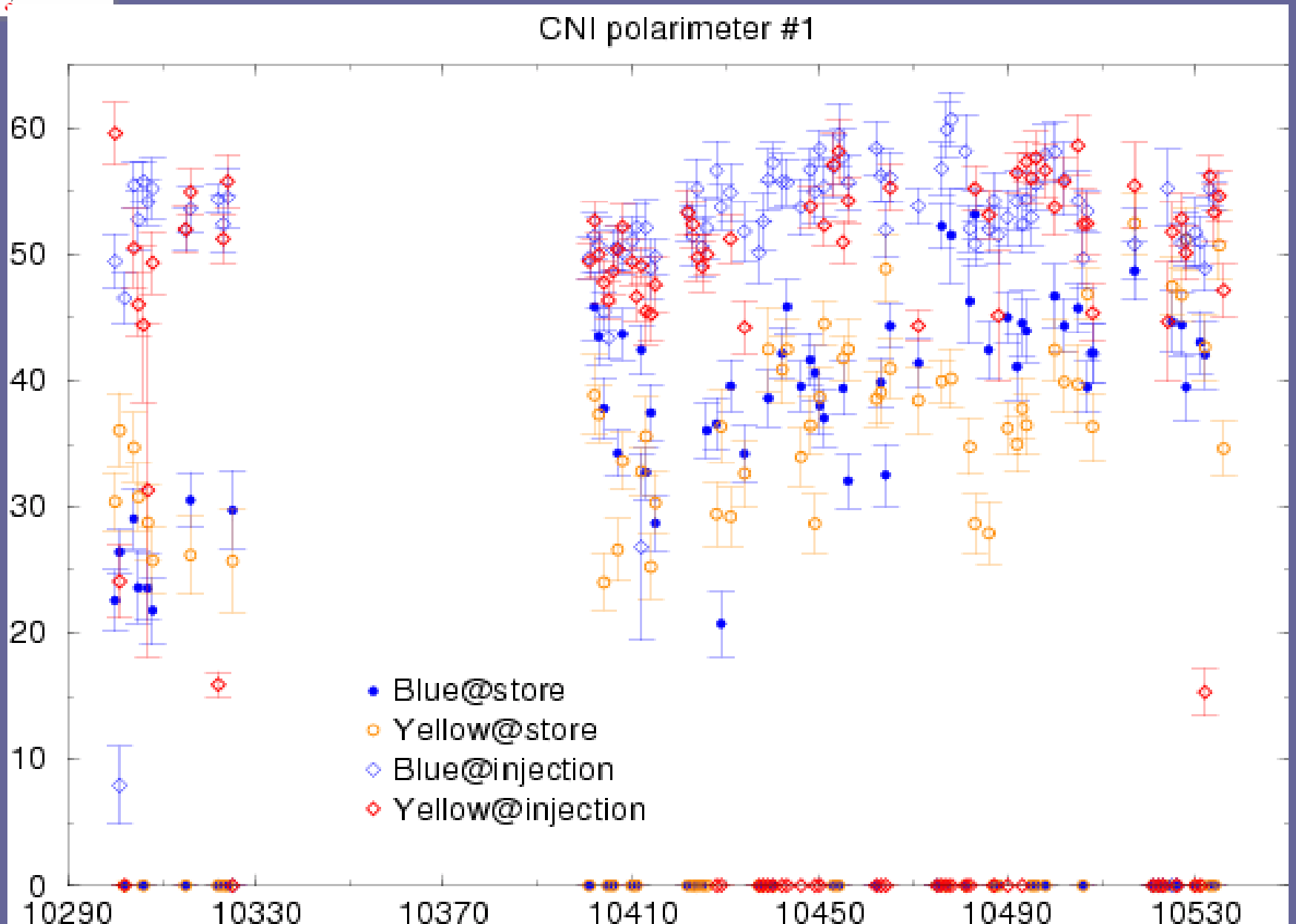


Ramp development towards 28 and more bunches: polarized transmission efficiency due to the combination of ps glitches and working point

Features, Issues and lessons

- Polarimetry
  - CNI polarimeter: see Haixin's talk in the afternoon
    - Longer setup time, weren't available till 2/22
    - The combination of two polarimeters giving two independent results and lack of calibration until Jet measurements were available caused a lot of confusion
    - Rate issues both instaneous and integrated
    - Automatic ramp measurement didn't work
  - My wish list
    - Would be great if we had Jet measurements earlier.
    - Automatic ramp measurement which allows the target to track beam orbit
    - The two independent polarimeters are not completely independent. The second polarimeter measurement has to wait until the first polarimeter measurement finishes data analysis even though the target is out

Polarization History



Features, Issues and lessons

- Rotator ramp development
  - Discovered a lot of surprises
    - Single ramp approach exceeded limit of maximum stones that current WFG has
    - First trial of dual ramp approach wasn't successful due to
      - Corrupted target orbit
      - Missing blm event to arm the blms for rotators
  - Should have included it as part of the dry run
  - Is one big combined ramp really better than two separate ramps?
    - Pros:
      - more efficient for various machine tunings/studies including polarization which don't have to involve rotators
    - Cons:
      - dedicated steps in tape for instrumentation setups as well as others systems.
      - But durable as shown in the 250 GeV run

Issues and lessons

- Tune/chromaticity excursion at the beginning of ramp while drift compensation got phased out
- Online/Ramp editor
  - Corrupted target orbits
- Phenix background
- Orbit variations
  - 24 hour variation
  - Affect ramp to ramp reproducibility

Outlook

- Polarization
  - Revisit the spin track
    - Bench marking the spin simulations with the experimental data of 250 GeV run
    - Explore what's the best working point for polarization
  - Explore the possibility of accelerating polarized protons at working point between 0.67-0.675
    - Keep the working point between injection and 100 GeV above 0.7.
    - Can the mains glitch be eliminated especially towards higher energy?
- Polarimetry
  - Resolution for rate
    - CNI: How to correct the rate dependence?
    - Add a PHENIX type of polarimeter which allows a continuous polarization monitoring
  - Automatic ramp measurement