Update on the CNI Polarimeter Results for RUN 02

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for

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RIKEN BNL Research Center

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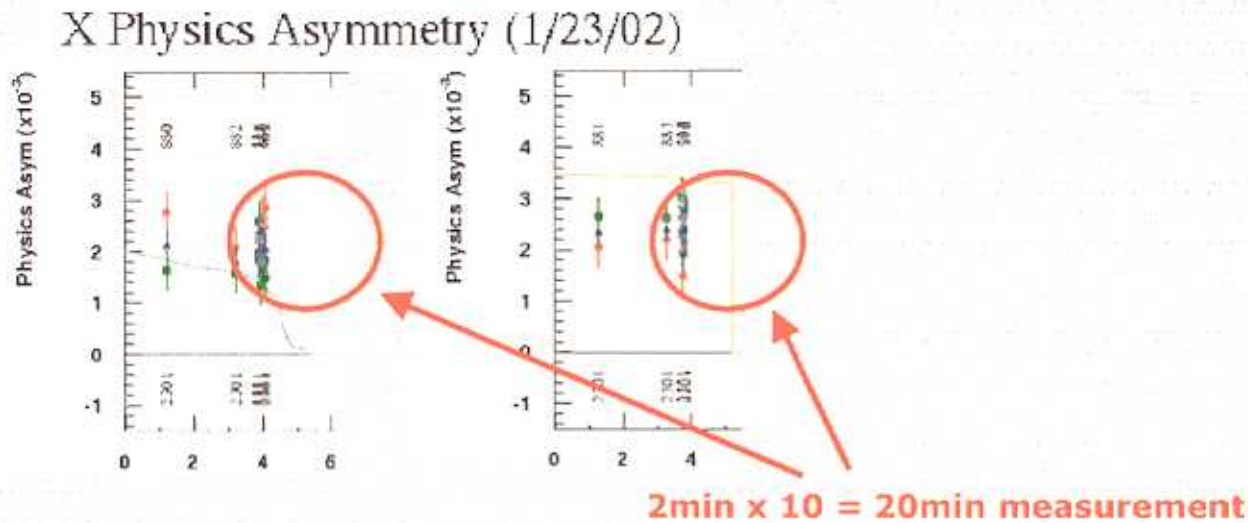
1. Bunch-by-bunch polarization study
2. Profiles of 0-pol bunches

1. Bunch by bunch polarization study

- Interests
  - for spin physics analysis
    - Luminosity weighted polarization info (bunch per bunch polarization) is needed
    - Each detector sees different bunch combinations (clockwise ,anti-clockwise)
      - STAR (i,i+20) 6 o'clock
      - PHENIX,pp2pp,BRAHMS (i,i+40) 2 or 8 o'clock
      - PHOBOS (i,i) 10 o'clock
  - for machine physicists
    - Bunch profile
      - Is there any weird bunches?
      - Polarization profile within 55-bunches

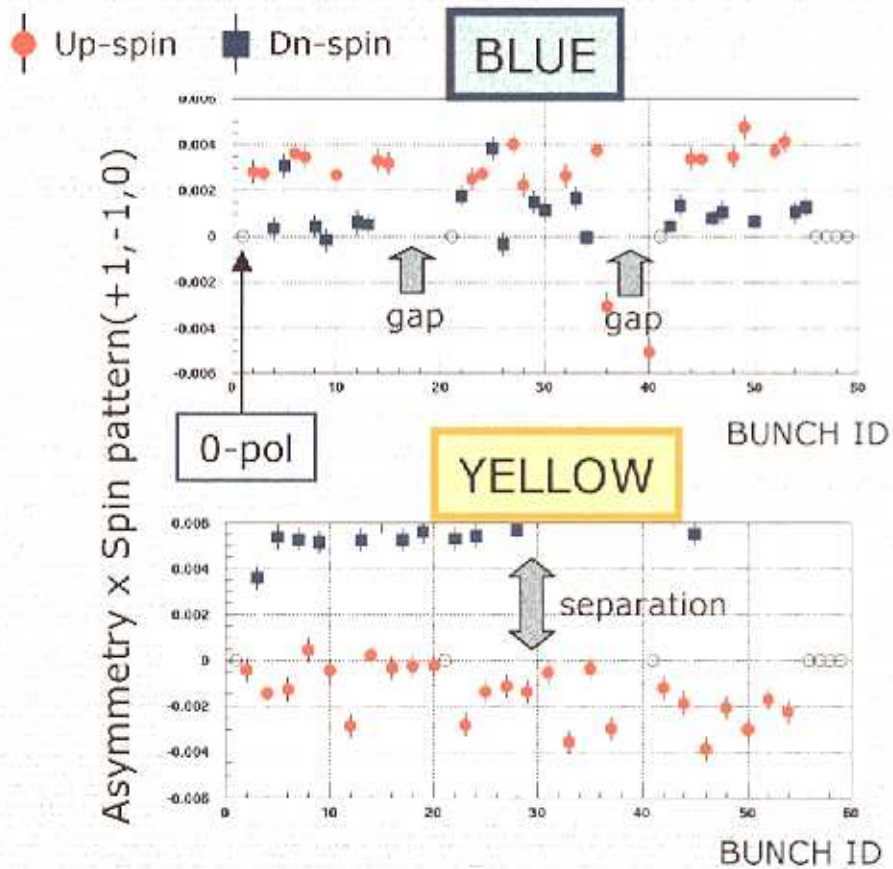
Polarimeter dedicated run



- 10 successive measurements at the end of store for both rings (fill ID :2301 Jan. 23th, 02)
- The data can be summed up to gain statistics
- 0-pol bunches are available
  - (3-bunches 1st,21st,41st)

Bunch by bunch asymmetry

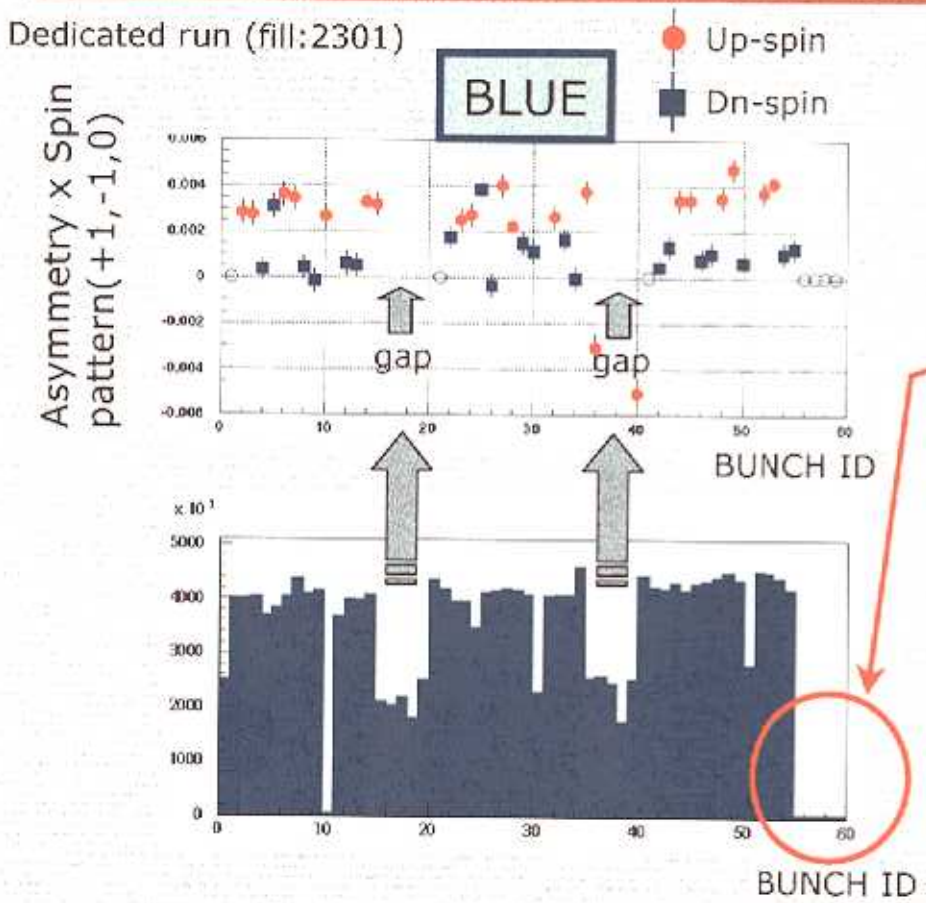
Naive calculation shows terrible distributions



- Good statistics
- Used square-root formula
- The values are averages of X90 and X45

1. Origin of gaps
2. Separation of Plus spin and Minus spin
   - → can we trust 0-pol bunches ?

Origin of gaps



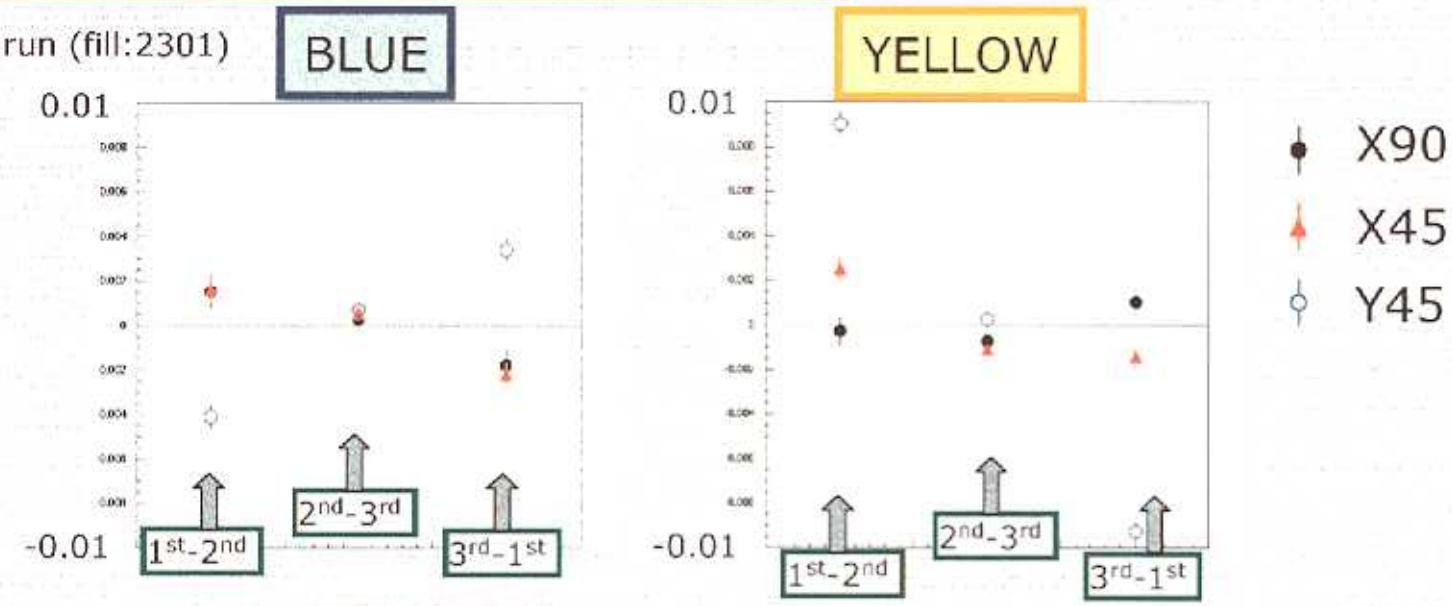
Bunch luminosity at RHIC polarimeter

- Location of the gaps are corresponding to small population bunches
- There are hits on the empty bunches (56-60th)
  → Found out that several strips are noisy

1. Noisy strips can be excluded from calculation
2. How about other normal fills?

Consistency between 0-pol bunches

Dedicated run (fill:2301)

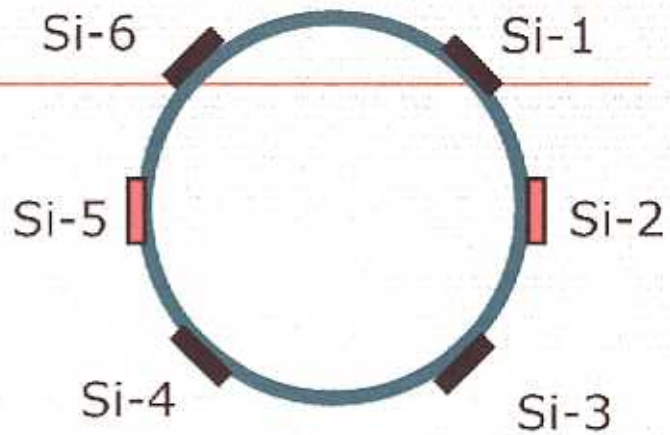


Square-root asymmetries

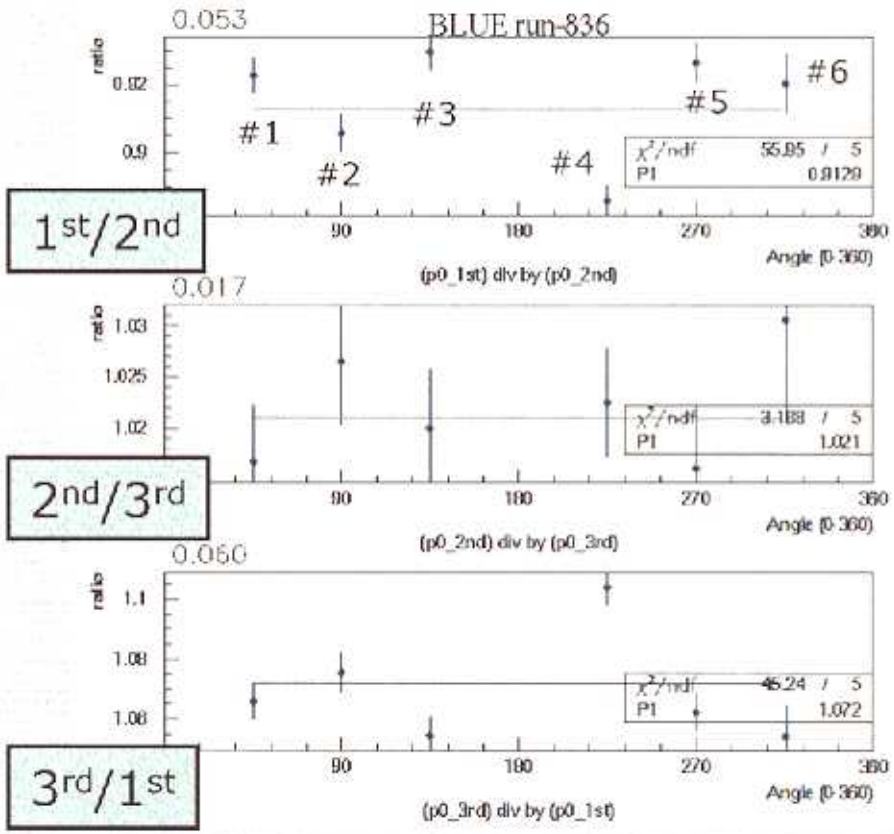
- Triplets turned out to be identical twins (2nd – 3rd pair)
- Y components are rather large (vertical target)
- Generating false asymmetries of comparable size

1. How about other fills?

Luminosity ratio

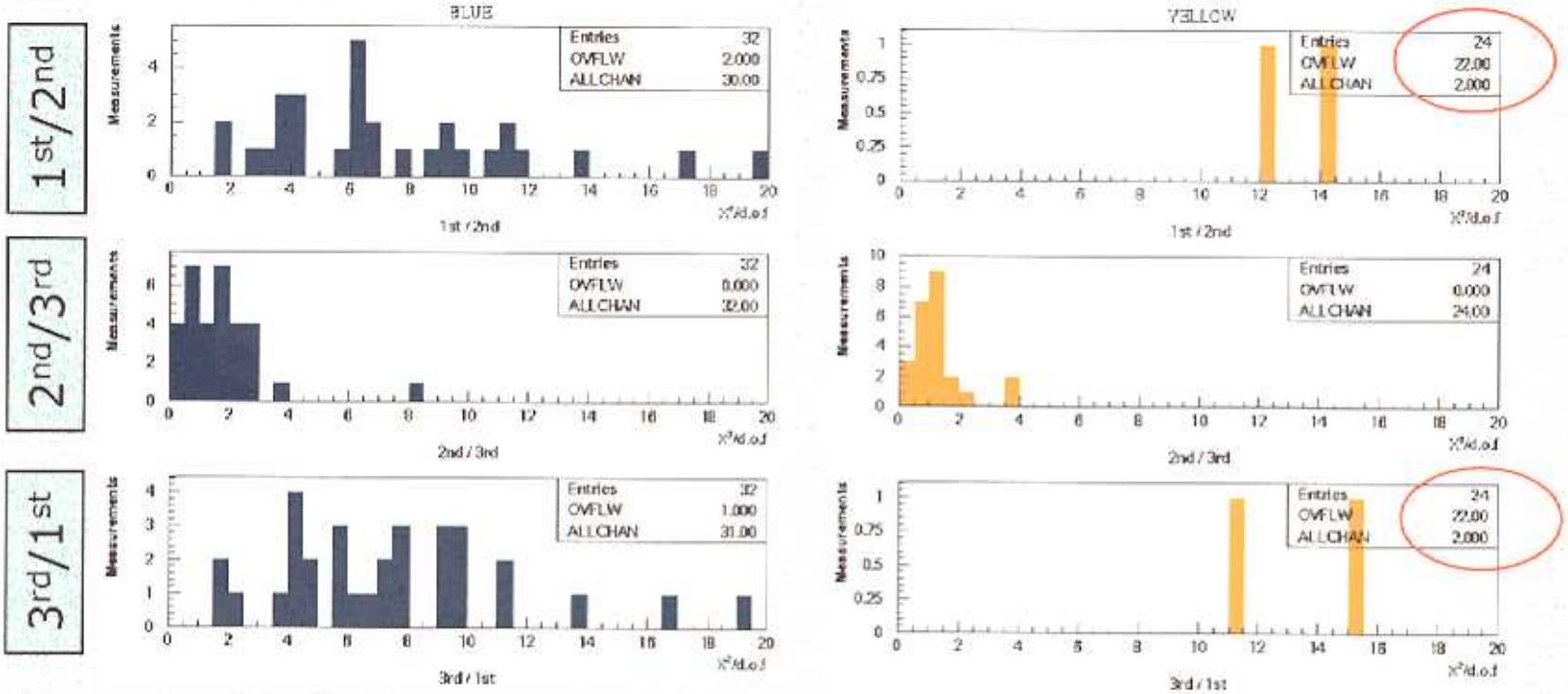


Count ratio for each detector



- Typical run (fill ID:2277)
- Supposed to be flat if two bunches are identical
- Fit with horizontal line and yield reduced chi-square

Luminosity ratio (cont'd)



- Reduced Chi-square dists. for all the fills including 0-pol bunches (fill id: 2277~ last)
- Generally 1st 0-pol bunch is strange

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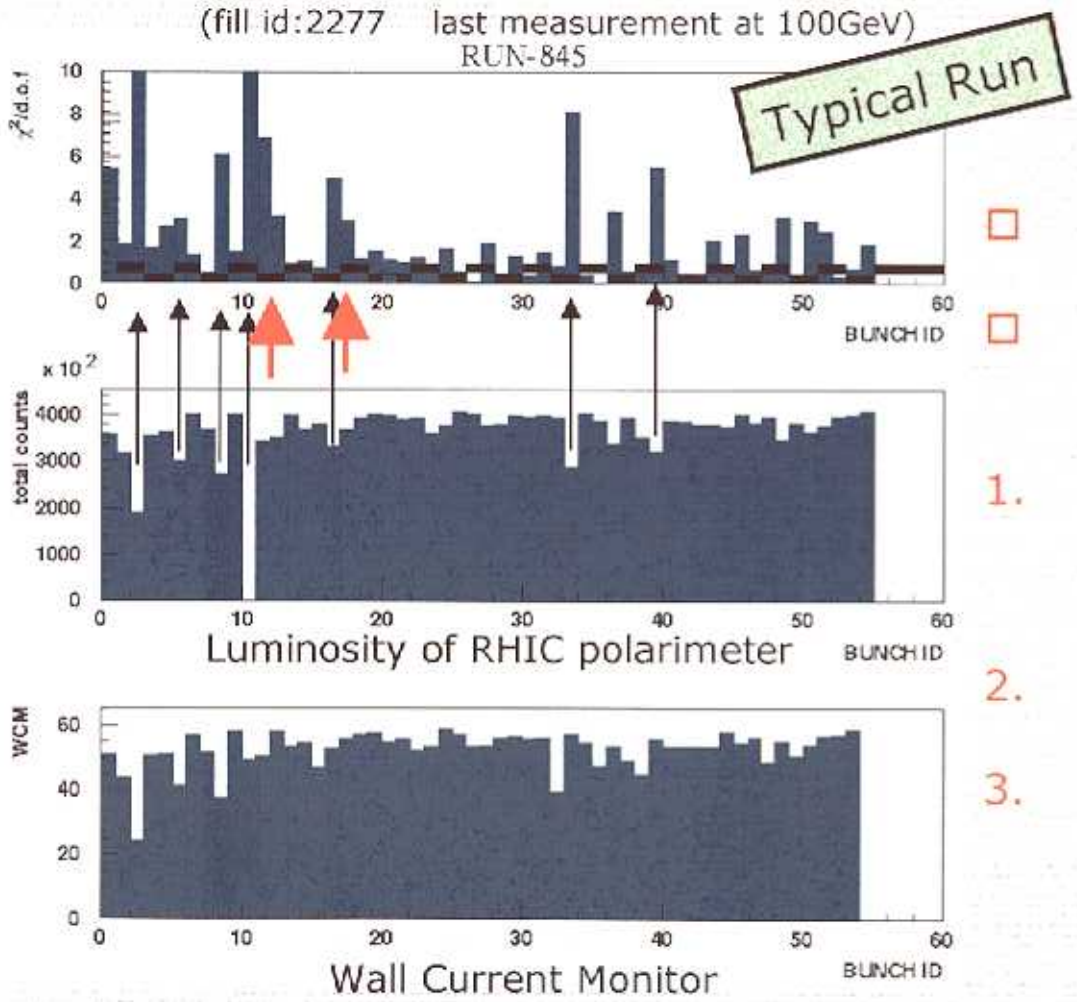
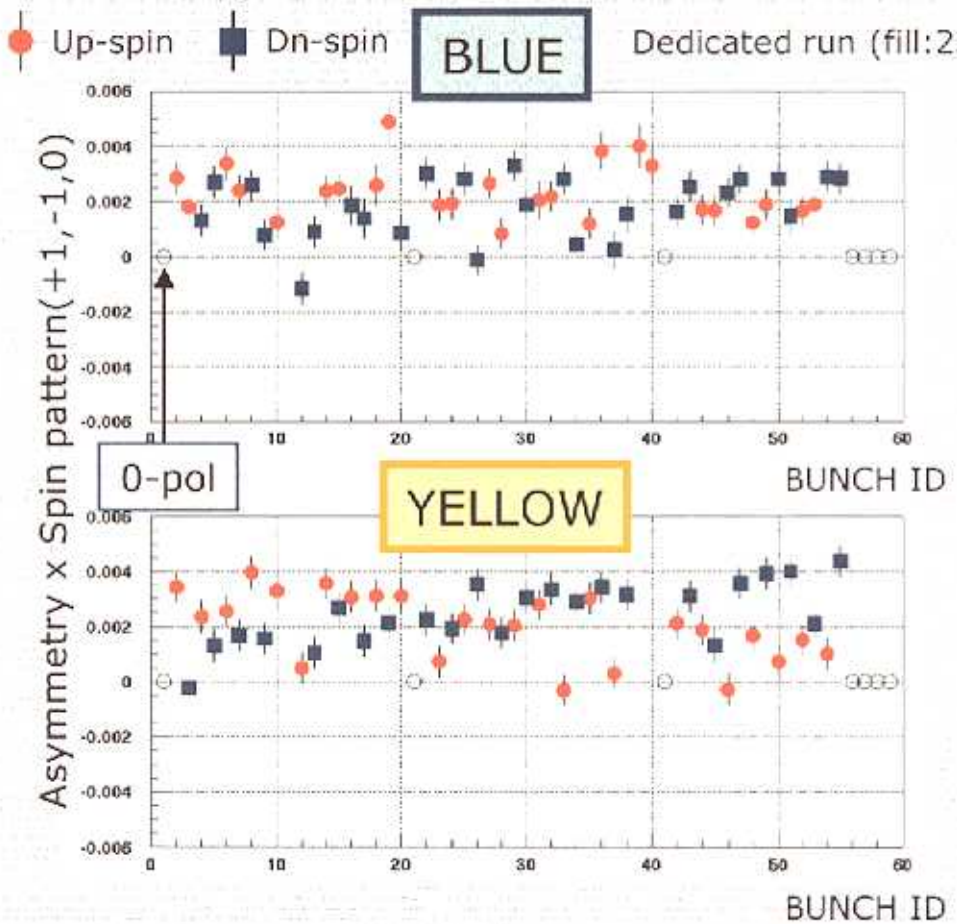
Bunch profile



- Similar analysis applied for polarized bunches
- Fitting with Sin function instead of flat constant

1. Luminosity ratio is getting worse at low populated bunches, which would result in false asymmetry
2. Adjacent bunches are also affected
3. Need a criteria to throw away those weird bunches

Improved bunch by bunch asymmetry



- Exclude noisy strips
  - Gaps disappeared
- Use combined 0-pol (2nd and 3rd)
  - Separation disappeared

1. Still some bunches behave strange
   - low populated bunches introduce false asymmetries
2. Tendency *up* drops and *down* grows in yellow
   - Need further study

Summary

- 1st 0-pol bunch is strange
  - Tail effect of the kicker field?
- Low populated bunches will create false asymmetries
  - Need certain criteria to throw them away (fitting χ^2 is a good candidate)