Bunch Merging at 24 GeV

- Goal: 16 Tp per bunch
- The scheme
- Set-up problems
- Result
- Future work to increase bunch intensity
The Scheme

- h=6 bunches (SEB) limited to 12 Tp
- Booster can deliver >15 Tp/bunch
- Combine(merge) two Booster bunches
- AGS
  - Accelerate on h = 12
  - Total beam loading is low
  - Merge at 24 GeV/c into h = 6
  - Extract to target!
Set-Up Problems

• Booster-to AGS (BTA) cogging
  – Forgot to use h=6 as AGS target at transfer
  – Hacking the software created some “confusion”
  – A hardware patch was left in when the software was fixed…etc.

• Harmonic jump in AGS Beam Control loops
  – Loops work on bunch-to-bucket phase
  – At the “critical time” the loops have to switch from h=12 to h=6
  – The trigger for this switch failed (fired on noise)
  – Had to STOP the loops at the “critical time”
  – Stopping loops with a transient is tricky
Result

- The rf gymnastic was set up and stable (caveat above)
- Merged bunch at 10Tp was extracted
Future Work

• Fix the problems
  – BTA cogging
  – Beam control loops at merge
• Optimize Booster
  – Longitudinal painting at injection
  – Switch on h=2 rf (beam loading)
• AGS
  – Momentum match between machines (capture frequency)
  – Optimize VHF “dilution” cavity
  – Improve acceleration cycle
    • Time on injection porch (flat bottom)
    • Acceleration rate, Westinghouse to Siemens PS, x2 B-dot