of BDS with reoptimized betatron collimation: ILCFF8

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• Bandwidth of the collimator alone
- Needed changes:
  - E-collimation bends *0.72 to keep the total angle zero
  - combine with upstream diagnostic (etc.) section
  - Mark is working on E-spectrometer to be inserted after E-collimator
• BDS bandwidth (tracking)
• The bandwidth is about twice bigger in the new version
• (SR not included)
- Case with bends in E-collimator reduced (*0.72)
- SR growth due to bends is small
- SR growth due to FD is larger, but would be acceptable
- However, may need to replace FD in energy upgrade if need to keep gradient at 140T/m level (for 20mrad IR)
nominal beam with $\sigma_E = 0.07\%$

- $E$ error $\Rightarrow$ $\beta$-mismatch $\Rightarrow$ smaller size at spoilers, damage
- In the worst case of $\Delta E = -4.7\%$ the beam size is $225 \times 3.5 \ \mu\text{m}^2$ which is only 10% less than the beam size at SP2 or SP3
- But $\eta_E$ was not $0.72$!
- Need to be further improved
SP2 & SP3 are at 12*75 σ, SPE at +-1.5%
With black spoilers, the halo at FD has sharp edge
Performance with scattering and full set of collimators is being evaluated by Fermilab colleagues
Angle feedback

- Location for angle feedback kicker: near QM16
- Beam size variation is reasonably small for $\pm 5\sigma$ of y-angle range
Summary

- ILC-FF8 is improved in comparison with the previous version
  - Both IP and FD bandwidth appear adequate
  - SR effects are reasonable
  - Compact SC FD may need to be changed at 1TeV upgrade
  - There is presently an issue with reduced beam size at SPE with -5% energy error – this can be further optimized
  - Collimation performance is being investigated