Summary 2: Beam Delivery, Final Focus & Collimation

Optics design and layout

Optics is in a state of flux...

- Final Focus (Raimondi scheme)
  - design reproducibility and clear recipe
  - fine-tuning
  - scaling laws for different energies and emittances
- Collimation (non-linear)
  - chromatics corrections and propagation of high-order aberrations to FF
  - efficiency and collimator survival
  - balance between length and performance
  - octupole tail folding
  - particle transport at large amplitudes

For both schemes an experimental verification of the optics in an existing facility at lower energy could be very useful.....

Simulations tools

Much progress has been made....

- BDS Optics design

Is it possible to get a "engine" for designing these systems?

- Code comparison
  - MAD problems without SR and energy spread
- Bakground
  - Full simulation
    - magnet errors
    - tail distribution
    - ....
  - Independent and consistent cross-checks

Where are the ultimate limits?

- Quantum nature of electrons allows focusing the spot size down to 1pm or less (next will be picobeam workshop)
- From fundamental principles even the Planck scale can be reached with $L\alpha\gamma^2$.
- Synchrotron radiation in final quads (Oide effect and beamstrahlung) at IP constrain already the present design

new ideas and approaches are welcome