CHEF Upgrades, Summer/Fall 07

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Goals

- Functionality
  - Support for new Beamline elements, or upgrades of existing one (i.e. WakeField in Cavities)
  - XSIF parser improvement!
- Speed Performance:
  - Faster Wake based on FFT for convolution/integration.
  - Other Speed improvement in propagate methods
- Maintenance, code quality
  - Use of smart pointers (automated and safe memory management)

Upgrade Process..

- As usual..
  - Took a little longer than expected... But, this was a major restructure of the code.
- Technique
  - Use of versions, CVS, etc.. Crucial!
- Opinion
  - Functionality specs needs to be defined better!. When differences show up, what is it due to, and what is expected!

Status

- Functional, successful benchmark on trajectory and emittance
  - With respect to PAC07 results on LET sims of Main Linac
  - Lucretia/CHEF, Fall 07: For a misaligned lattice, trajectories agree within 10 microns, while the maximum trajectory excursion is about 800 microns Emittance agree with ~5 to 10 percent.
  - Francois O., Nikolay S and myself are checking further the tracking accuracy, and emittance definition.
- Upgrade of ChefSteering done, but....
  - Difficulty in defining correct way to run off-momentum when “Gkicks” and “VKicks” are used

Correct Rules Off momentum

- Checking consistent calculation of Dispersion
  - Reference Momentum: obtained with all cavity on nominal voltage/phase.
  - $\Delta P/P$ and "Momentum" are kept consistent, but not all elements are aware of this momentum change: "Optical elements", such as "Kicks", are no longer correct: their strength is a kick angle, which are implicitly defined "On momentum"
  - So, Currently, Dispersion must be computed by setting $\Delta P/P$, not changing the "Momentum" !
  - But this is a crude way of simulating a cavity voltage change.
- Note: Previous, PAC07, was done with "Sbends", which in CHEF are "true magnetic elements", i.e., with a defined Brho and not an angle kick.

Prospects

- Document the business of DFS weight and “Singular Value Decomposition suppression of null space” a bit better..
- Once the Dispersion Matched Steering (DFS) is recommissioned, study issue of of voltage stability criteria and other aspect of dynamic steering in the main linac.

AML comments

- For “future” (i..e, not in the next 6 month...)
  - Francois O. and Spentz a bit skeptical
  - I am actually more supportive: we need a more sophisticated Machine Description Language. XML is one of the industry standard for hierarchical data structure
- Need Editor, graphical viewer, multi-language parser..*Documentation!!!* Partnership with Industry?

Outlook

- Settle the DMS Benchmark with “Kicks”
- Use the latest Main Linac lattice.
- Study... (overdue!)