Minutes of the ABP Computing Working Group meeting

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General Information

- Issues encountered in the usage of the HTCondor are being collected on a wiki page hosted on the ABP-CWG website.
- The foreseen upgrade for the HPC cluster at INFN-CNAF (Bologna) is ongoing (purchasing process launched).

PATH/TRAVEL

The PATH/TRAVEL code was presented by A. Lombardi. Slides are available here.

- PATH/TRAVEL is a multi-particle tracking code for linacs and transfer lines.
- The simulation is setup by specifying the initial particle coordinates and a sequence of elements and instructions.
- Each particle is described by nine quantities: x, xp, y, yp, phase, energy, charge, mass, flag (whether the particle has been lost). The simulation of particle sets including multiple species is possible. The initial particle coordinates can be generated by the code or imported.
- The sequence of elements can be specified in text form or using a GUI.
- In the sequence physical elements (in red in the slides) can be interleaved with instructions. Switches are available to switch ON/OFF effects like space charge, second order effects etc. Tracking output can be recorded at every element or at specified locations.
- The effect of magnetic and electric elements can be calculated with a linear transfer matrix or with integration through a field map. Steps within the elements are still needed to take into account the effect of space charge.
- Space charge effects can be simulated with two models: the SCHEFF routine, assuming uniform distribution over thoroids, or a full 3D space charge using point-to-point calculations. It is possible to switch between space charge routines along the line.
- Other important features available in the code are: possibility of statistic error studies, a steering algorithm, an emittance reconstruction algorithm, back-tracing, an interface with MADX for survey data.
- Example studies include: statistical error studies (beam size at PSB injection septa with beam from linac 4 under energy, quad gradient and bending field jitter), emittance reconstruction and envelope tracking in LINAC3, back-tracking to reconstruct the distribution at the exit of the LINAC4 source.
- Computational time depends strongly on the study. Error studies can be quite heavy due to the large number of realizations to be simulated. When studying losses a large number of particle needs to be simulated to have enough statistics at the tails of the distribution.

- The tool is heavily used in the design, commissioning and operation of CERN linear accelerators.
- The code is implemented in fortran, Visual Basic is used for the GUI. Different programming styles are used in different parts of the code. The Lahey compiler is used to compile the code (no fundamental reason behind, just lack of manpower to generalize). Parallelization was attempted with an external collaboration but the project did not got very far. The code is always used in Windows.
- The performance is adequate to the present needs in HSL. Still speed-up and a more user-friendly interface would be very appreciated.
- At the moment it is considered an "internal tool". Nevertheless several people previously at CERN are now using the tool in other labs. The code is not open source. The executable is provided for free to anybody asking.
- The available manpower only allows for minimal maintenance. 0.5 FTE would be needed for a more systematic followup and for proper support to the users.