Wire Scanner design meeting

Meeting held on 15-04-2008

Present: Délio, Bernd, Jan, Mohamed, Mariusz, Pep

Carbon fibers
Mariusz presented his research on properties of carbon fibers based on the book by Donnet and Bansal (see slides). Properties at high temperatures are not widely available and further research is necessary. Délio will contact the TS/MME materials specialists and Bernd the person involved in the CNGS and collimators design. Délio and Mariusz will start a finite element analysis to simulate the stresses and displacements on the carbon fiber wire, it shall include the transient loads due to temperature, acceleration and momentum transfer from the beam.

Required accuracy for the wire scanner based on F. Roncarolo’s thesis
Bernd explained the work made by Roncarolo. In order to achieve a total rms error on the beam size measured by the wire scanner lower than 1%, we start by setting the upper limit of each error source at a value of 0.5%. Assuming they are random and uncorrelated, these errors can be added quadratically.

- A minimum resolution of 3 bins per sigma is required. Therefore, to measure a 200 micron beam size we need a maximum spacing between position measurements of the order of 70 micron.
- Considering a signal to noise ratio of 100 on the photomultiplier, the beam size relative statistical error would be 0.5%.
- The influence of the error from the wire position measurement is given in figure 3.38. At 3 bins per sigma we need a beam size to noise ratio on the position of the order of 50, for 0.5% relative statistical error. Taking again a beam size of 200 microns we obtain a maximum allowable rms error on the position of 4 micron.

Inductosyn sensors
Mohamed presented his report on inductosyn sensors. From the information collected until now it looks possible to obtain a design that satisfies the requirements in terms of speed, resolution and repeatability. The influence of the acceleration has to be checked. Délio contacted the inductosyn manufacturer in the USA and Maccon, the vendor in Germany, the decision on further work will depend on the answers obtained.

Future accelerators
The requirements for the future PS2 are more stringent than those considered today, particularly in terms of wire speed. For the moment wire scanner design will be based on the requirements from the PS.

Other actions
Délio will start the preparation of a preliminary specification for the motor and position sensor based on the requirements discussed in this meeting. Input on the electronics will be provided by Jan.