

## **Topic 22: Ce+BAF Concept and High Power Target**

The design study of the Ce+BAF positron concept was presented as well as the requirements for the high-power positron production target. There is a strong scientific case for positron CEBAF operation developed from an organized large potential user base. The present scheme would use the LERF facility to house an accelerator to produce a high-power polarized electron beam which would be converted to either polarized or non-polarized positron beams. The e- injector would accelerate e- to 123 MeV at about 1 mA and then place them on the positron conversion target. The resulting generated polarized positrons would be manipulated in a collection section to maximize the yield. Studies using simulations of optimum positron target thickness, positron phase space, and collection of non-polarized and polarized positrons have been made. Several target types are under study. Rotating and liquid metal targets are under investigation. Temperature studies are ongoing. Thermal cycling calculations are being used to study target stresses and fatigue. Tests of target properties are planned at the Mainz Microtron and at the LERF laser lab to investigate material damage thresholds. Phase I tests would be with fixed targets and Phase II tests with rotating targets. An industrial partner is studying liquid metal targets. A technical report is expected at the end of the year. External accelerator collaborators have contributed to the positron system design.

### **Comments:**

The addition of a positron generation system in LERF is likely a very big project. Electron and positron spin rotators are needed. The shielding needed around the positron target and collection area is likely massive. Remote positron target removal, installation and handling are likely needed.

### **Recommendations:**

**R37: Design a shielding configuration for LERF covering the target and positron capture areas.**

**R38: Determine if remote handling is needed for removal of used targets and capture hardware.**

**R39: Study the need for activated water cooling systems associated with production and capture systems.**

### **Topic 23: Positron Collection Scheme for Ce+BAF**

The accelerator physics of positron generation and collection is well underway and the early results were shown. The positrons from the target have been characterized. A quarter wave transformer of 1-2 Tesla may be advantageous to help with positron capture. Both transverse and longitudinal collimation are needed. Phase space rotation is used to reduce and optimize the bunch length and energy spread. Different acceleration optimizations are needed for non-polarized and polarized positrons. Two collimation chicanes were described. The desired goals for the positron phase space were shown along with the simulation optimized result. Many of the requirements were met but emittance and the horizontal beam size needs additional work.

#### **Recommendations:**

**R40: Continue to optimize the positron parameters to reduce the normalized emittances and horizontal beam size.**

**R41: Since real world positron collection rates are typically lower than simulated, add as many technical effects as possible to the simulations including e- space charge and errors of component fields and alignment to optimize positron phase space collection.**

**R42: Have a detailed technical review of the positron target and capture sections to see if external experts can help with more detailed aspects of the design.**