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Memo

DATE: *April 23, 2004*

TO: RHIC E-Coolers

FROM: *Ady Hershcovitch*

SUBJECT: **Minutes of the April 23, 2004 Meeting**

Present: Ilan Ben-Zvi, Andrew Burrill, Xiangyun Chang, Yury Eidelman (ORNL & BINP Novosibirsk, Russia), Alexei Fedotov, Ady Hershcovitch, Animesh Jain, Jorg Kewisch, Thomas Roser, Dejan Trbojevic, Jie Wei.

Topics discussed: Electron Beam Cooler Layout, RHIC II Meeting at Yale, Revised Cooling Code, Superconducting Electron Gun.

Electron Beam Cooler Layout: Jorg opened the meeting by showing a new layout for the electron beam cooler. It has a number of advantages over the previous configuration:

1. Layout has a lower beta function, lower beam chromaticity, and a smaller beam radius.
2. Present layout does not protrude into the experimental hall.
3. It is easier to design shielding that enable work to be done on cryogenic components (like cavities, electron gun, etc.) while RHIC is running.

To Ilan's question about the optics at lower electron energy, Jorg replied that it would not change. Thomas asked whether this new lattice should be adopted; Ilan replied that it is a good development and should be adopted but more studies are obviously needed.

Attached is the new lattice.

RHIC II Meeting at Yale: Thomas reported on a RHIC II meeting at Yale, where he gave a talk on RHIC II. Although the meeting focused on a new detector, a very important aspect of the physics requires a beam energy scan from the current 100 GeV/u down to injection energy. Thomas was asked whether it can be done without luminosity loss, or even increase luminosity (which decreases as gamma square). A short discussion ensued regarding this new challenge for RHIC electron beam cooling.

Revised Cooling Code: Alexei presented new cooling simulations that are based on a much improved SIMCOOL code. For the past 6 months major improvements and refinements were introduced into the code. Among the changes are: addition of Synchrotron motion. IBS diffusion coefficients were adjusted, dispersion was included in transverse IBS growth rates. Calculation of electron density for both Gaussian and uniform beam with corresponding

electron bunch length to ion bunch length. The results are that cooling no longer occurs with the old electron beam parameters. Increasing electron beam bunch charge to 20 nC and the magnetic field to 2 T, cooling resumes for low emittance electron beams.

Attached is a copy Alexei's presentation. It can be seen that for an electron beam emittance of about 10 mm-mrad, factor of 10 gain in luminosity can be achieved for 20 nC, and solenoid magnetic fields of 4 or 5 Tesla.

Superconducting Electron Gun: Xiangyun made the final presentation. He showed a superconducting electron gun that may generate the needed parameters although his initial calculations did not include any optimization. What is clear already is that the beam performance of this injector is much superior to the normal-conducting gun. One feature of the electron gun is a magnetized curved cathode. A short discussion followed regarding the attainments of these features, especially the magnetization of the cathode in a superconducting gun.

The meeting concluded with Animesh being questioned about the feasibility and cost of building a 5 Tesla magnet, and about needed changes in the magnet development program. Animesh replied that the magnet is possible, but it must be redesigned from scratch, since a new superconductor must be selected. Regarding the present program, Animesh suggested staying with the same 2 T prototype and start thinking on a conceptual design of the 5 T magnet.