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Memo

DATE: *July 28, 2002*

TO: RHIC E-Coolers

FROM: *Ady Hershcovitch*

SUBJECT: **Minutes of the July 26, 2002 Meeting**

Present: Leif Ahrens, Philip Baudrenghien (visitor from CERN) Ilan Ben-Zvi, Michael Brennan, Xiang Yun Chang, Ady Hershcovitch, Michael Iarocci, Jorg Kewisch, William Mackay, Christoph Montag, Thomas Roser, Triveni Srinivasan-Rao, Dejan Trbojevic, Dong Wang, Qiang Zhao.

Topics discussed: General Program, Simulation & Calculations.

General Program: Thomas opened the meeting with a short preview of his forthcoming presentation at DOE. Attached are copies of the viewgraphs presented at the meeting. Intrabeam Scattering (IBS) in RHIC leads to emittance increase (from 15 to 40 $\pi\mu$m), and hence degradation in luminosity. In present machine, luminosity can be enhanced by a factor of 4 by doubling the number of bunches to 112, and by decreasing β^* from 2 to 1 m. Further luminosity upgrades (by "pushing" beam parameters) are limited by intrabeam scattering. A solution is to cool the RHIC beam at full energy. RHIC II would require a 5 MW electron beam (a 54 MeV beam with an average current of about 100 mA). Vasily Parkhomchuk from BINP Novosibirsk performed a feasibility study, which showed that such an electron beam could increase the luminosity in RHIC by a factor of 10. A magnetized electron beam with a high transverse temperature is needed to avoid recombinations. Final emittance (95%) in RHIC II (with electron beam cooling) is expected to be 5 $\pi\mu$m. Since burn-off is high, only 5-hour stores are expected. Proton luminosity (for spin physics) can also be enhanced by electron beam cooling. However, due to strong beam – beam scattering the effect is not as strong as in heavy ions [emittance (95%) is decreased from 20 to 12 $\pi\mu$m].

Simulation & Calculations: Xiang Yun reported new simulation results of the 700 MHz electron gun with a laser light that had a Gaussian distribution (as oppose to uniform). Longitudinal phase space improved dramatically with only slight increase in electron temperature. The final energy spread is very good, 5×10^{-4}, even without the stretcher and debunching cavity.

Dong showed electron beam transport results from cathode to cooler entrance, in which a bunching cavity is included. Energy spread was dramatically reduced, mostly through the removal of a linear correlation produced by space charge. It is possible that some additional improvement was due to reduction of the bunch length, but Dong did not have the data to

corroborate this. Following the stretcher and debunching cavity the energy spread was reduced to 0.8×10^{-4}. Computations were performed for a magnetized round beam.