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Memo

DATE: *October 25, 2002*

TO: RHIC E-Coolers

FROM: *Ady Hershcovitch*

SUBJECT: **Minutes of the October 25, 2002 Meeting**

Present: Leif Ahrens, Ilan Ben-Zvi, Michael Brennan, Xiang Yun Chang, Gregory Citver, Ady Hershcovitch, Michael Iarocci, Jorg Kewisch, William MacKay, Christoph Montag, Satoshi Ozaki, Stephen Peggs, Dejan Trbojevic, Dong Wang, Jie Wei.

Topics discussed: Simulation & Calculations.

Simulation & Calculations: the meeting consisted of a presentation by Dong of simulations performed with a PARMELA version that was modified by Lloyd Young for studies of magnetized beams. In that modification Lloyd Young added an optional rotational frame and angular velocity was introduced. This allows for direct observations of angular momentum, which is great for magnetization studies. Essentially, this PARMELA version is based on the same physics. However, it allows for direct observation of angular momentum.

In these simulations a 1 Tesla solenoid is used (field calculated by POISSON). A short discussion regarding the best magnetic field value took place. In answer to Satoshi's question, Ilan said that at this field cooling is to be accomplished in less than one hour. Ilan further pointed out that at higher magnetic fields the cooling rate is faster and that alignment becomes easier.

Dong showed that injecting a non-magnetized beam into the solenoid results is a large increase in the transverse emittance. Physically, this occurs due to the fringe fields at the solenoid entrance. When Dong started to show the magnetized case, a "hole" was noticed in the angular velocity versus radius phase space diagram. It occurs at the source. Steve, Ady, and Waldo attempted explain it first as a real phenomenon. But, Ilan claimed that it is most likely an artifact of the transformation of the beam from x,x',y,y' to r,r*theta'. Dong proceeded to show the beam envelope and emittance of a magnetized electron beam injected into the solenoid. He showed cases of "perfect" and "imperfect" matching between the electron gun and the cooling solenoids (with only a matching solenoid between them). As expected, first had miniscule oscillations, while the latter was characterized by large oscillations. Dong concluded by showing a simulation with all elements that matching can, in principle, be achieved with the emittance preserved and energy spread reduced.