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Memo

DATE: *October 11, 2002*

TO: RHIC E-Coolers

FROM: *Ady Hershcovitch*

SUBJECT: **Minutes of the October 11, 2002 Meeting**

Present: Leif Ahrens, Ilan Ben-Zvi, Xiang Yun Chang, Derek Lowenstein, Ady Hershcovitch, Michael Iarocci, Jorg Kewisch, William MacKay, Stephen Peggs Thomas Roser, Triveni Srinivasan-Rao, Dejan Trbojevic, Dong Wang, Jie Wei.

Topics discussed: Simulation & Calculations.

Simulation & Calculations: the meeting started with a presentation by Xiang Yun, in which the 1.3 GHz LINAC for electron beam cooling is compared to a 700 MHz LINAC system. The main reason for pursuing a 1.3 GHz system is the cost. Xiang Yun showed results of simulation with PARMELA for electron beam parameters after the LINAC, and after correction cavities. Comparisons were made among 700 MHz LINACs with and without a buncher and a 1.3 GHz LINAC (that must have a buncher). Best results (after correction cavities) are obtained with a 700 MHz LINAC without a buncher. Normalized longitudinal emittance (in degree-keV) is 49 for the 700 MHz LINAC without a buncher compared to 57 for the 1.3 GHz LINAC and 60 for the 700 MHz LINAC with a buncher. The transverse emittance (millimeter-milliradians) is 28 for the 700 MHz LINAC without a buncher compared to 40 for the 1.3 GHz LINAC and 37 for the 700 MHz LINAC with a buncher. And, the fractional energy spread for the 700 MHz LINAC is also the lowest.

In conclusion, the 700 MHz LINAC has a number of advantages over the 1.3 GHz LINAC, the most notable of which are:

1. Simpler system since no buncher cavity is needed.
2. Lower wake field power loss by a factor of 4!
3. Lower transverse emittance.
4. More flexibility in aperture size for the correction cavity.

Ilan pointed out that another major reason for proceeding with the 700 MHz LINAC is that it is desired to have a RHIC electron beam cooling system that can be scaled up to E-RHIC. With the 1.3 GHz LINAC, a 100-mA electron beam is close to the beam breakup threshold (of 120 mA), while that threshold is more than doubled for the 700 MHz LINAC. Ilan indicated that the harmonic correction cavity has to be placed in the middle of the LINAC. A short discussion ensued regarding a more desirable location for the harmonic correction cavity. However, no suitable alternatives were found.

Jorg showed his draft start-to-end simulation of the 700 MHz LINAC without a buncher. In these computations Jorg used PARMELA and a file, which contains what comes out from the end of the LINAC, he had received from Xiang Yun. There seem to be inconsistencies. Jorg's simulation shows a clear "sine-wave" in energy spread (of about 50 keV), which is not visible in Xiang Yun's. However, it may be difficult to observe it in Xiang Yun's plot whose scale is 250 keV/division. Thomas noticed another problem in Jorg's simulation: there is no "stretching." Dong managed to do the proper simulation for the 1.3 GHz system with 5 nC bunches. Here we have a 700 MHz system with 10 nC bunches. Ilan concluded the meeting by pointing out that although this inconsistency is not a showstopper, more work is needed.

Reminder: Waldo has been posting meeting minutes on the web. They can be found at http://www.rhichome.bnl.gov/RHIC/luminosity/upgrade/minutes/. Additional pages of interest are: http://www.rhichome.bnl.gov/RHIC/luminosity/ a general page for luminosity issues in RHIC; and, http://www.rhichome.bnl.gov/RHIC/luminosity/upgrade/ a page for upgrade issues.