Minutes of spin meeting 08/29/07

Ernest first reported his results on the hotly debated $G\gamma$ vs $1+G\gamma$ factor in the spin dynamics. The issue comes up recently in the analysis of deuteron polarization data obtained at COSY, in which case both G and γ are small. The experimental data suggests a factor $G\gamma$ while the prevailing formula has a $1 + G\gamma$ factor there. The key to understand the issue is that there is a subtle difference between the reference orbit and the real particle trajectory, which results the usually defined vertical axis on the reference orbit not the instantaneous vertical axis at the particle trajectory. The later one has physical significance in calculation of polarization and spin resonance strength. As the result, the rotation matrix has extra terms which change the factor. In conclusion, the factor $G\gamma$ should be used when calculating polarization and spin resonance strength. He is going to publish the results as a CAD tech note. Haixin asked if the resonance strength calculated from DEPOL is still valid. Ernest commented that the resonance strength calculation is still valid except the strength should be multiplied by a factor $(G\gamma)$ / $(1+G\gamma)$. This will have impact on the actual resonance strength at low energies in the AGS, such as $0 + \nu \approx 9$. In addition, the partial snake strength could be over estimated at lower energies if ignoring this factor. However, the partial snake rotation angle calculated by Alfredo is on the particle trajectory and it may already reflect the effect. We need to check with Alfredo on the details of the code.

Anatoly then reported the plan to modify the LEBT/MEBT lines in the beginning of the linac. The plan is to replace the solenoid before tank1 with an Einzel lens to avoid additional spin rotation due to the solenoid. He estimated that we can gain 1-2% polarization by simplify the spin menipulation here. Such a change does not affect the intensity of polarized proton beam but will reduce the intnesity of unpolarized proton beam by 5% due to space charge. In a couple weeks, the modification will be done and a Faraday cup before linac tank one will be used to check the effect. He believe that the polarization from this year was better than from last year. He acknoledged that the 200MeV polarimeter had background problem. Unless the linac was "well-tuned" which took quite some efforts, the reported polarization was always lower. Kevin also pointed out that the NSRL run should avoid pp setup period, when tandem is occupied by d/Au. Otherwise, we may lose the ability to run the 200MeV polarimeter.

Haixin