Informal Report on the Fourth Meeting on Computing $\sigma(dd \to \alpha\pi^0)$ and Charge Symmetry Breaking

Jerry Miller (edited by Bira van Kolck)

Here are the minutes of the Fourth CSB Meeting that was held at the Loews Philadelphia Hotel on Apr. 4, 2003. In attendance: Jouni, Andy , Bira , Ed, Chuck, Anders, Jerry , Allena.

1. Allena reported on the $np \to d\pi^0$ experiment. A signal of

$$A_{fb} = (17 \pm 5.5 \pm 8) \times 10^{-4} \tag{1}$$

is the final result. The use of eqn (15) from Phys Lett B 493,65 (2000) (published version) leads to a result:

$$\begin{aligned} \delta m_N &= 1.66 \pm 0.27 \text{ MeV}, \\ \bar{\delta} m_N &= -0.36 \pm 0.27 \text{ MeV}. \end{aligned} \tag{2}$$

These values for δm_N are small compared to expectation from models. Some of the assumptions and limitations involved in obtaining eqns (2) were discussed. It is probably desirable to obtain an improved treatment of this reaction. Both the strong and csb amplitudes need to be re-examined. This was considered a highly interesting endeavor, now that the experimental results are out.

2. Ed reported on the $dd \to \alpha\pi^0$ experiment. Several technical improvements leading to the final result were discussed. The results are the truly impressive:

$$\begin{aligned} \sigma &= 12.7 \pm 2.2 \text{ pb at } E = 228.5 \text{ MeV}, \\ \sigma &= 15.1 \pm 3.1 \text{ pb at } E = 231.5 \text{ MeV}. \end{aligned} \tag{3}$$

3. Chuck went through the operators and results using pwa and gaussian wavefunctions. He will post his notes on the web site. The rho-omega exchange with Z graph gives a contribution that is somewhat smaller than the one-body operator, but is still significant, making the sum of a variety of Z graph effects close to the first results reported last August. This effect should be included in the $np \to d\pi^0$.

4. Bira went through recent results of Andreas and Antonio. Andreas's notes will be posted on the website. The effects of the one-body term, Weinberg term and sigma exchange have been computed. Initial-state interactions have been included for some cases, and are in general very important. The pwa results are dominated by the one-body term. The Weinberg term is enhanced by fsi, but the results are very model dependent. This is worrisome and indicates something is left out. Bira and Jerry agreed to study the model dependence.

5. Jerry discussed the factor of $\sqrt{6}$ disagreement between Antonio and Andreas. Andreas's formulas lead to a solution of the hw2 problem (proposed by Chuck in the Aug 02 meeting) in agreement with Chuck, Anders, and Jerry. Thus consensus is that there is no $\sqrt{6}$ in front of the matrix element, in agreement with Andreas. The source of the problem may be that the if Antonio's initial state wave function is used, the flux factor must be recomputed and including this would cancel a factor of 6 in the cross section. All agreed to think further about this issue.

6. Anders and Chuck will write the first draft of a "plane wave paper".