Polarization phenomena by deuteron fragmentation into pions

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The fragmentation of deuterons into pions emitted forward in the kinematic region forbidden for free nucleon-nucleon collisions is analyzed. The inclusive relativistic invariant spectrum of pions and the tensor analyzing power T_{20} are investigated within the framework of an impulse approximation using various deuteron wave functions. The influence of $\mathcal{P}$-wave inclusion in the deuteron wave function is also studied. The invariant spectrum is shown to be more sensitive to the amplitude of the $NN \to \pi X$ process than the tensor analyzing power T_{20}. It is shown that the inclusion of the non-nucleonic degrees of freedom in a deuteron results in a satisfactory description of the data for the inclusive pion spectrum [1] and improves the description of the data about T_{20} [2]. According to the data [2], T_{20} has very small positive values, less than 0.2, which contradicts the theoretical calculations ignoring these degrees of freedom.

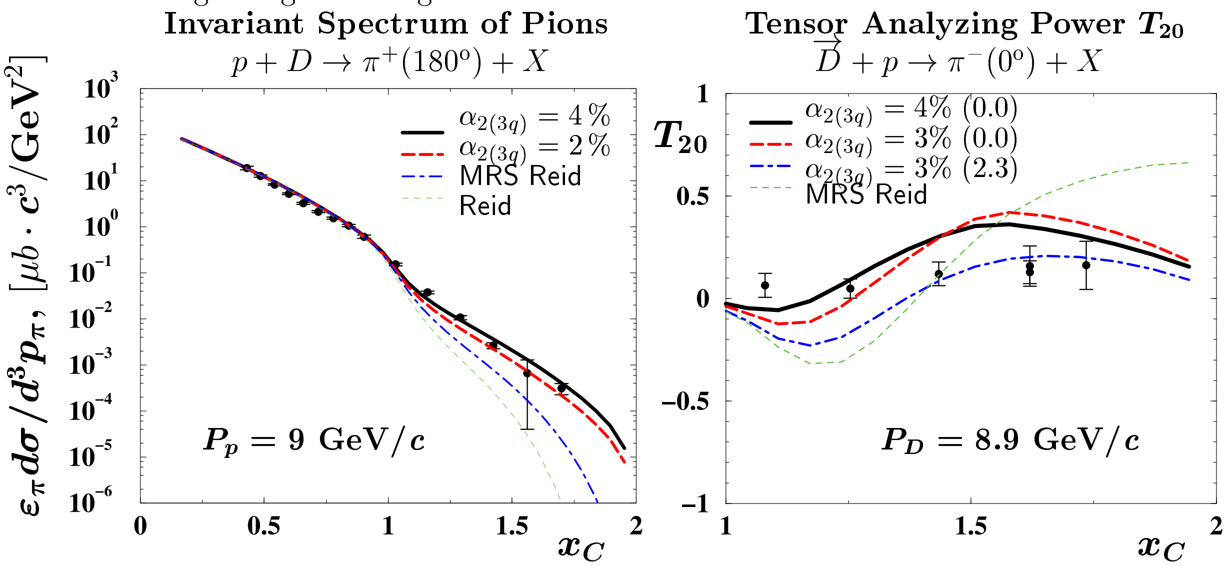

Figure: The invariant pion spectrum (left panel) and the tensor analyzing power (right panel) calculated within the relativistic impulse approximation where non-nucleonic components in the deuteron wave function have been included; its probability $\alpha_{2(3q)}$ is $2\% \div 4\%$. One can have a good description of the inclusive pion spectrum data [1] for all cumulative $x_{\mathcal{C}}$ and satisfactory description of the T_{20} data [2] at $x_{\mathcal{C}} \geq 1.5$. The Reid and MRS Reid curves correspond to the nonrelativistic Reid deuteron wave function and to the Reid deuteron wave function obtained by the minimal relativistic scheme (MRS) [3], respectively.

References

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[3] L.L. Frankfurt and M.I. Strikman, *Phys. Rep.* **76** (1981) 215.