

Comment on the **Robust** Tensor Polarimetry at eIC

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Beam polarization and polarimetry at eIC, June 26 - July1 , 2020

Summary:

- Quadrupole deformation of deuterons because of 6% D-wave
- pd total X-section and pd **elastic amplitude** depend on the dumbbell orientation
- **V. Franco & R. Glauber, Phys. Rev. Lett. 22 (1969) 370**: strong SD
- interference at $q \sim 400-600$ MeV/c, very large tensor analyzing power. Tons of exptl data from ANL, SATURNE, Dubna...
- **Fundamental point**: dumbbell is energy independent + NN scattering is dominated by spin-independent amplitude \rightarrow **energy independent tensor** effect in the eIC energy range
- **Good theoretical understanding of the tensor effect**
- **Easy calibration** with polarized deuteron ABS in unpolarized proton beam

A tribute to classic Franco-Glauber prediction from 1969

Three spin quantization axes

- Momentum transfer axis
- Collision axis
- Normal to the scattering plane

Two extreme tensor polarizations:
 $m=0$ and $m=1$

Very large tensor analyzing power!

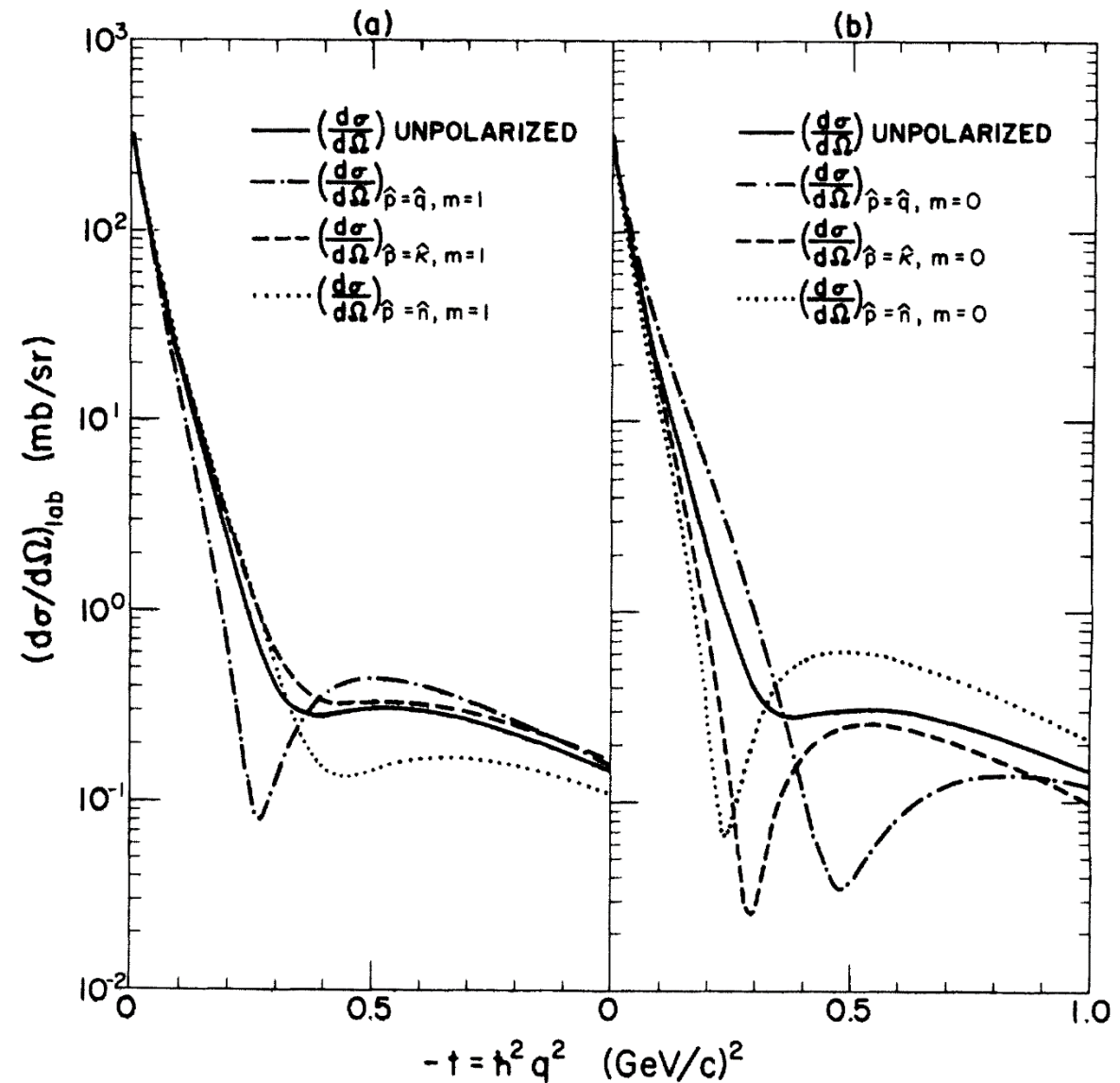
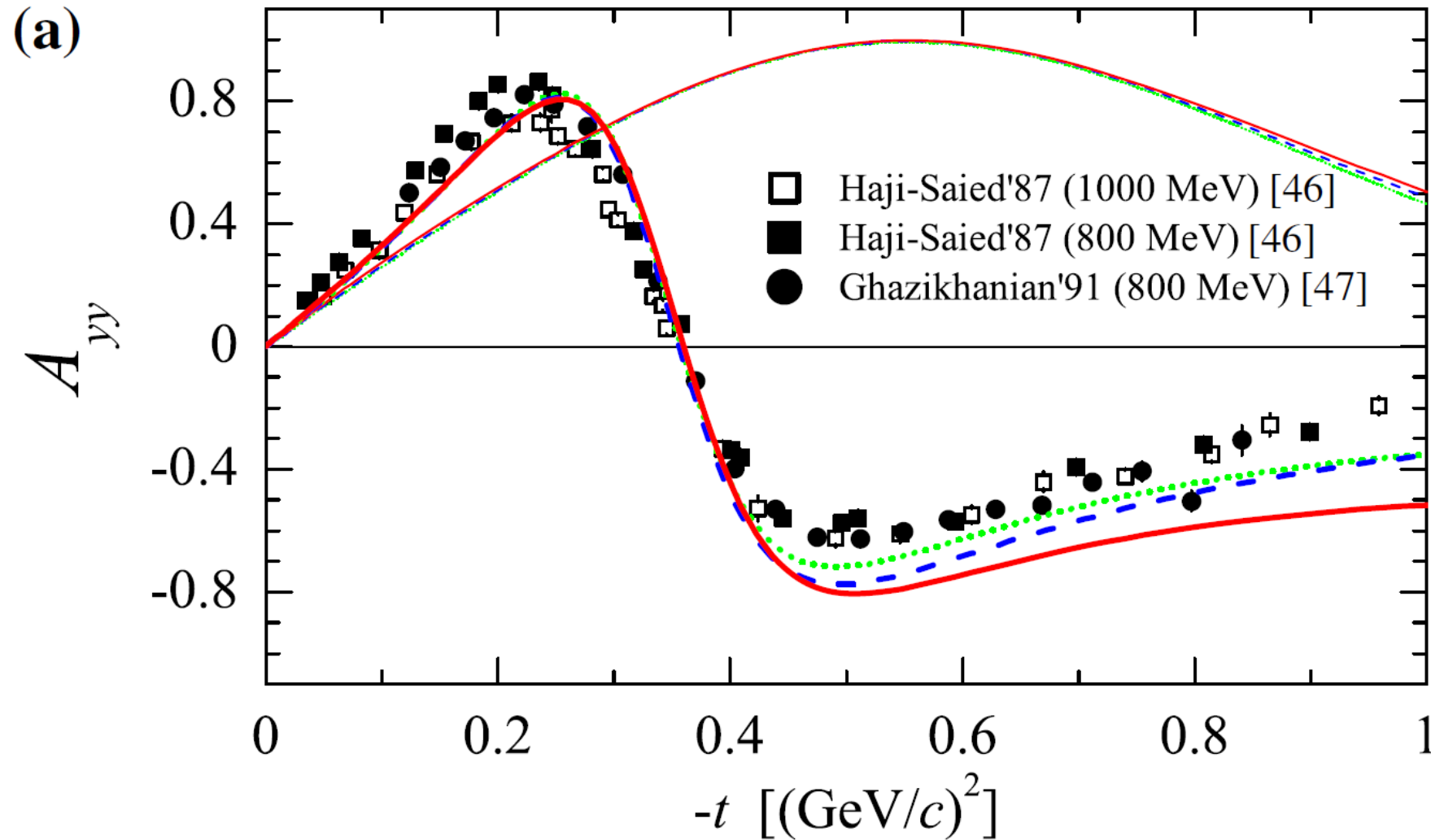


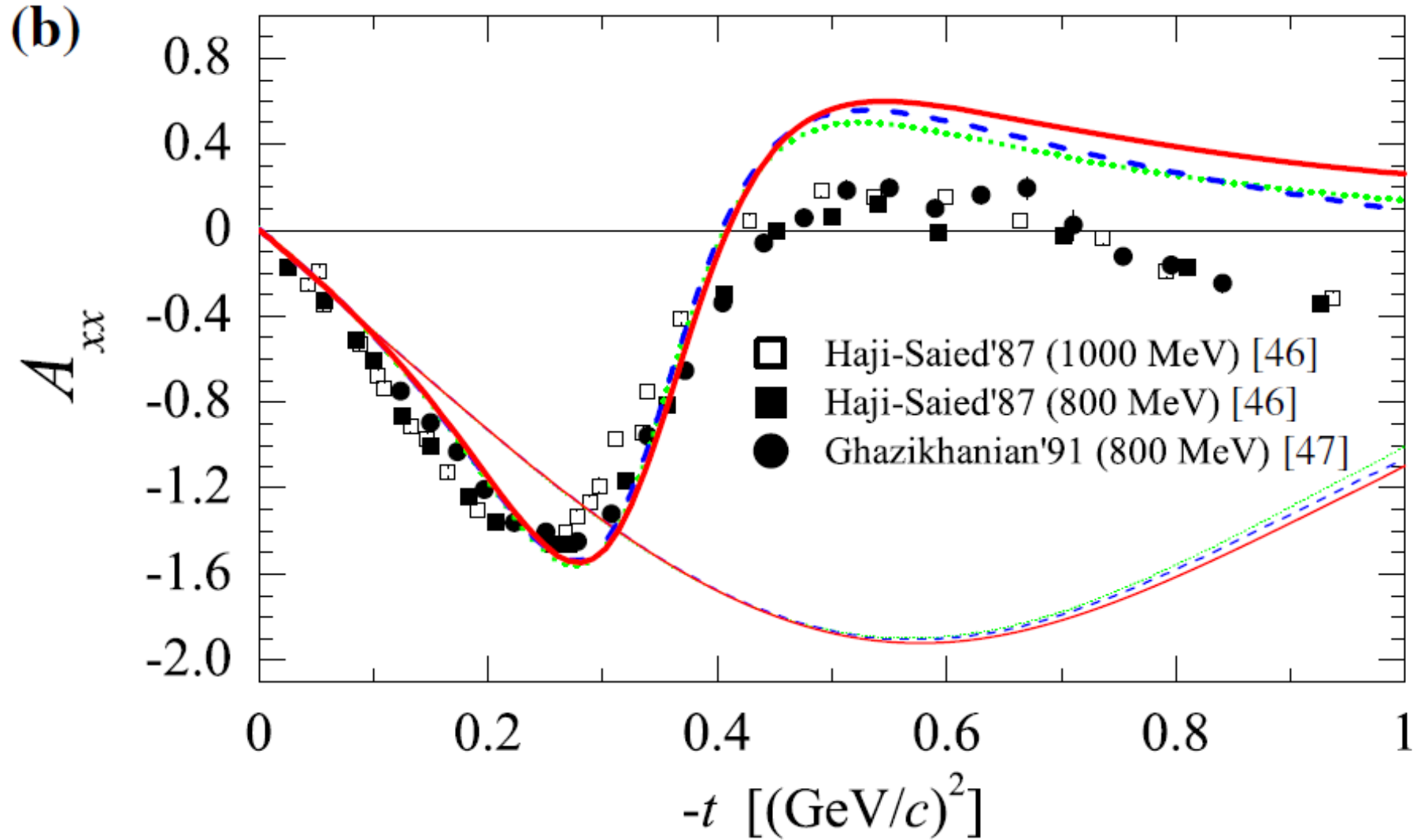
FIG. 2. Scattering of 1-GeV protons by unpolarized deuterons (solid curves) together with those found for the three principal polarization directions for (a) $m = 1$ and (b) $m = 0$.

Glauber theory vs. elastic pd exptl data (30+ years ago)

M. Paltonova, V. Kuklulin. EPJ A56 (2020) 132



Glauber theory vs. elastic pd exptl data



Don't need anything beyond proton jet target

- Calibration with stored protons and polarized deuteron ABS target: ask Anatoly Zelenski for help
- Direct experimental test of the effect and studies of impact of deuteron breakup background with polarized deuteron ABS target: ask Anatoly Zelenski for help
- Transverse spin quantization axis and T_{yy} come for free for vertically polarized deuterons
- Oscillating longitudinal (and radial) spin and T_{zz} (T_{xx}) can be realized rotating deuteron spin into the ring midplane
- Additional interesting signal from oscillating T_{xz} (F. Rathmann's talk)