

## Working group -- Low energy observables:

an opportunity to study relativistic effects and benchmark relativistic calculations

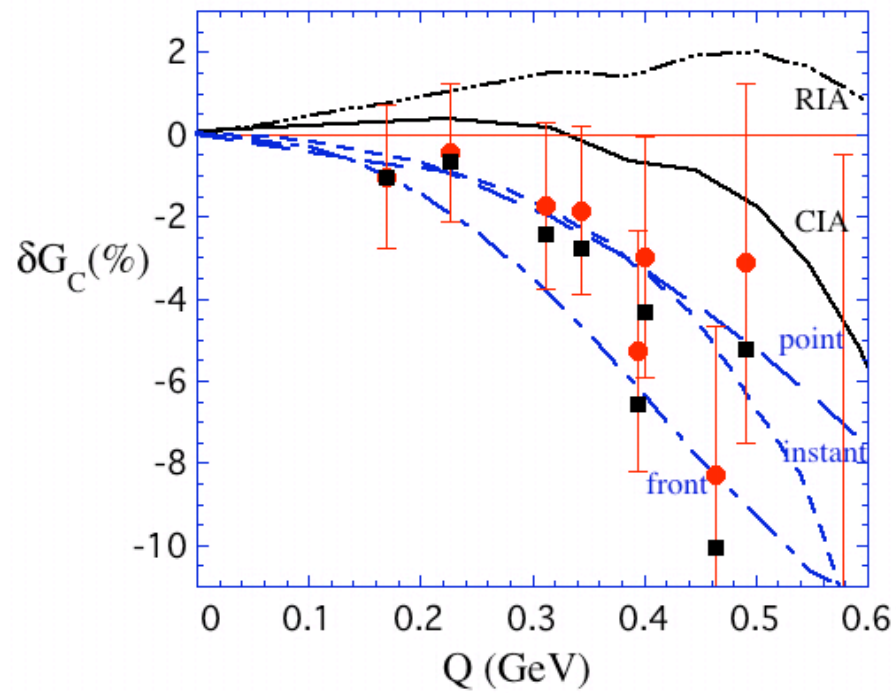
- ★ Some relativistic effects are due to recoil (Lorentz vs Galilean boosts). These can be studied by comparing relativistic and nonrelativistic predictions, with an eye to
  - finding cases where differences are large enough to be experimentally observable and
  - comparing different relativistic calculations of these observables with data.
  
- ★ Low energy observables are a good area for study because even calculations limited to first order in  $(v/c)^2$  (including chiral perturbation theory) should give reliable predictions.

## Questions we might discuss are:

- ★ How do we define those relativistic effects that are due to recoil (take form factors as an example)?
- ★ What observables are particularly fruitful for such study (my proposal: deuteron form factors at low  $Q^2$ , currently being measured at JLab)
- ★ In such comparisons, how should we standardize (i.e. define) the nonrelativistic limit?
- ★ Are there toy models that would be particularly helpful in comparing different theoretical approaches, even if there is no data for such systems?

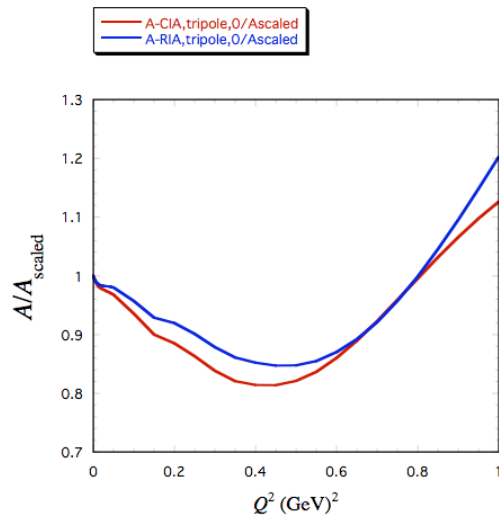
# Example: $G_E$ at low $Q^2$

★  $G_C$ :

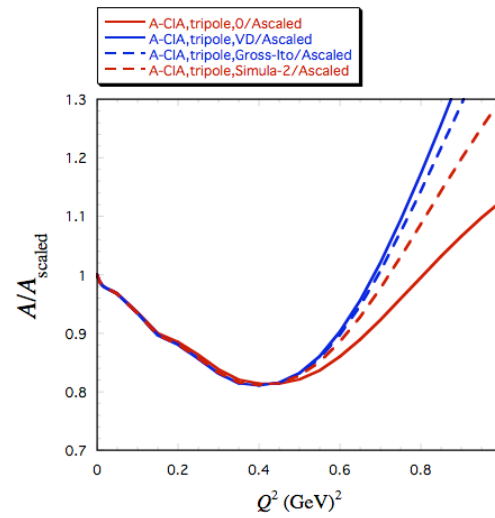


# A at low $Q^2$ (CST with theoretical "errors")

CIA vs RIA,



$\rho\pi\gamma$  dependence,



$F_3$  dependence

