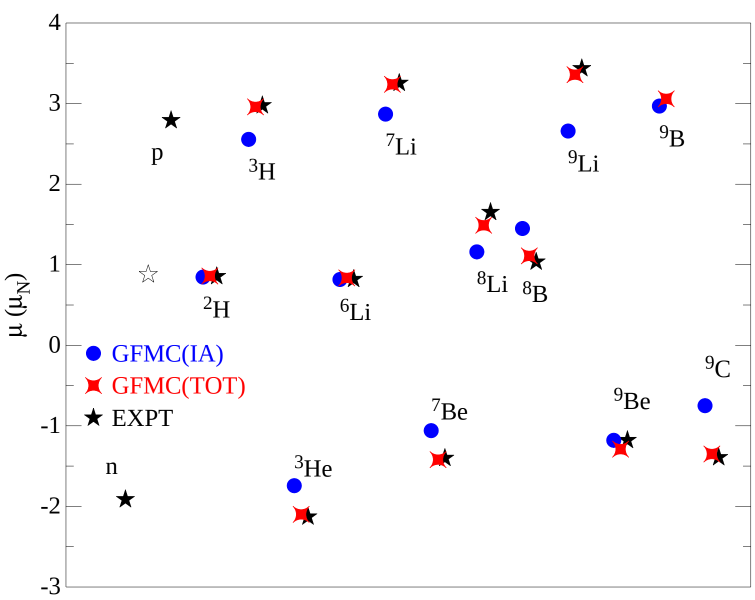
ELECTROWEAK PROPERTIES OF LIGHT NUCLEI

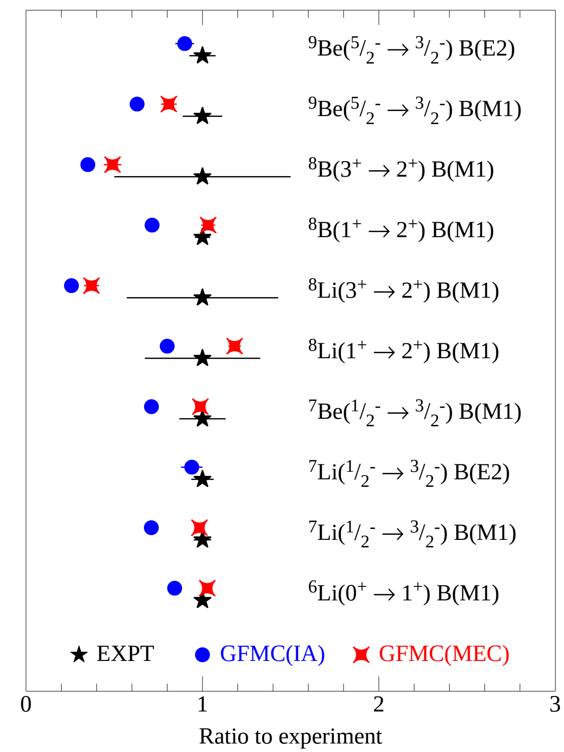
- Great progress has been made in *ab initio* calculations of nuclear binding energies starting from realistic Hamiltonians with two- and three-nucleon potentials
- Current efforts aimed at studying electroweak structure and response in s- and p-shell nuclei
- Two-body terms in nuclear electroweak currents are crucial to reproduce experimental magnetic moments and $M1$ transitions

Magnetic Moments



Green's function Monte Carlo (GFMC) calculations of light nuclei give accurate binding energies but a lowest-order theory of one-body currents (blue) fails to reproduce magnetic moments and $M1$ transitions (black). Including recently constructed two-body currents using effective field theory (red) greatly improves agreement with data!

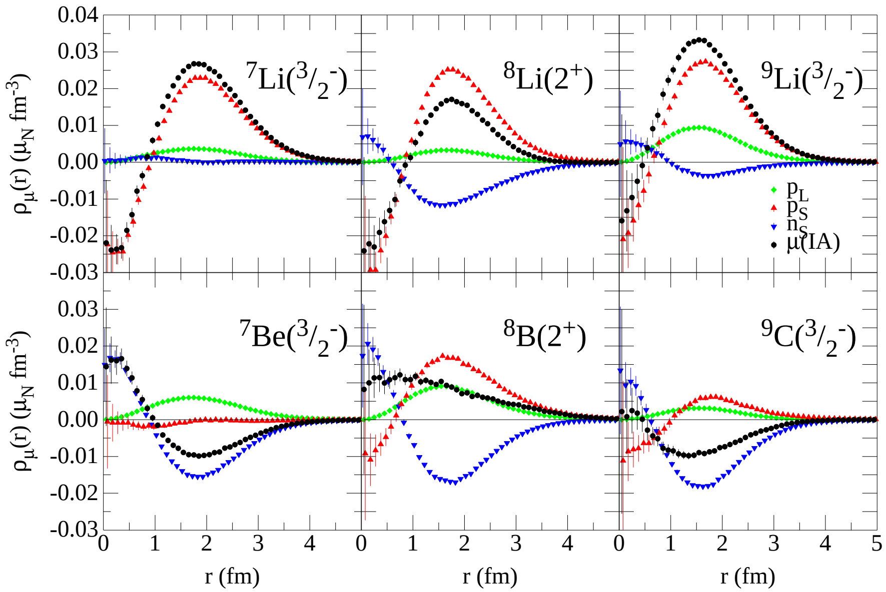
EM Transitions



Future Opportunities and Challenges

- Predictions made for transitions in rare isotopes that have not yet been measured
- Predictions of magnetic densities and radii call for new high-quality experiments

Magnetic Densities



Variational Monte Carlo (VMC) calculations of magnetic densities (black) with contributions from proton spin (red), neutron spin (blue) and proton convection (green) terms in impulse approximation.

Integration with r^2 factor gives prediction for magnetic radii which are measurable in electron scattering; exchange current contributions must also be folded in.

Magnetic radii data for stable nuclei have large experimental errors. Can they be measured more accurately and can they be measured for rare isotopes?

- Superallowed weak decays of ^{6}He, ^{7}Be have only small corrections from two-body currents, but these will be much more important in allowed decays like ^{8}He, ^{8,9}Li, ^{9}C
- Important to test both conventional and χEFT modeling of currents in known transitions for application to neutrino-nucleus scattering where effects can be large