Fig 1 RCS:

Survey of existing RCS models showing a large variation in the expected initial-state Asymmetry A_{LL} and the two existing JLab 6 GeV-era measurements with their uncertainties. Also shown are the anticipated data points to be measured at JLab using the CPS. A similar improvement in both the number and quality of the data points is expected for the A_{LS} asymmetry.

Fig 2 TCS:

Schematic of the TCS reaction mechanism identifying quantities relevant for this analysis in both the photon-nucleon Center of Mass (top left) and the e+ e- Center of mass (top right). The expected uncertainties in extraction Compton Form Factors pertaining to various GPDs using TCS (red) are shown together with the uncertainties stemming from DVCS-based extraction of the same. Note that while providing an independent check and occasionally (Im(H)) improvement on the DVCS data, TCS is also able to access the elusive “E” GPD.

Longer explanation aimed at providing non-physicists with a “glimpse” of what these experiments try to accomplish (language is kept very-very general!):

About 50 years ago, deep inelastic scattering of high energy electron beams revealed that the proton and neutron are not fundamental particles but they do have structure; we know depict them as three quark objects. While a wealth of information was/is obtained through a sustained inclusive electron-scattering research program, obtaining a detailed picture of the proton (or neutron) requires more sensitive tools.

Polarization experiments add a new set of variables that can be studied. These are related to the polarization of either the projectile (electron beam) or the target (proton or neutron).

To really complete the 3D picture of a proton (neutron) one really needs to consider double polarization experiments where the beam and the target are simultaneously polarized. These are exactly the kind of experiments CPS (and the usage of the UVA target) will make possible.

To use a sports analogy unpolarized electron scattering is similar to a game of tennis where:

- all balls are hit flat, with no spin. This would be the unpolarized scattering experiment.

- balls are hit with either topspin or bottom spin and one studies how high/low balls bounce, thus learning about the nature (grass, clay, asphalt?) of the court (target) at the point of impact.

- balls are hit with spin but also the playing surface is moving, allowing one to map out the whole court. This would be the case of a double polarization experiment: a game of tennis with lots (CPS) of balls hit with either topspin or bottom spin toward a conveyor belt-like playing surface that moves either toward (longitudinally polarized) or sideways (transversely polarized) with respect to the direction of the ball.

If carried out carefully, precisely, and completely, this program should achieve taking a snapshot of a proton at the $10^-{15}$ m or below.