**Time-like Compton Scattering with Transverse Polarized Target**

January 2017 Status – per Vardan's presentation

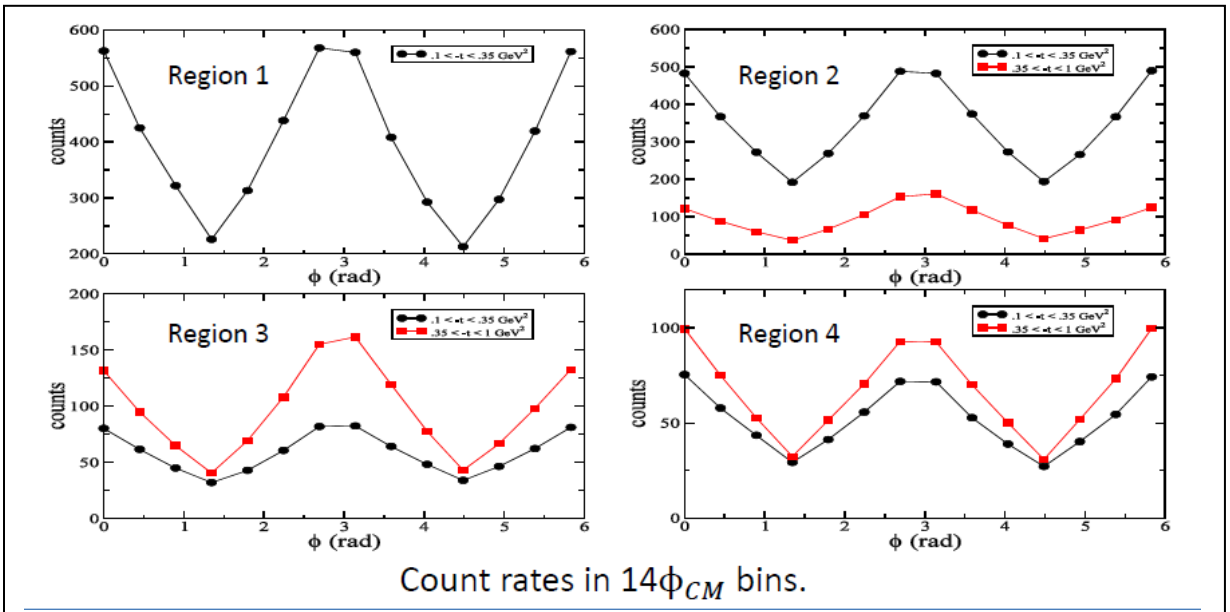
Experimental setup: two NPS-type electromagnetic calorimeters

- Each the equivalent of 1000 PbWO4 crystals in active area (one more PbF2?)
- at a central angle of 16 degrees
- at a distance of 1.5 meter
- solid angle of roughly 100 msr (not including outer crystals to capture shower)

Luminosity assumed:

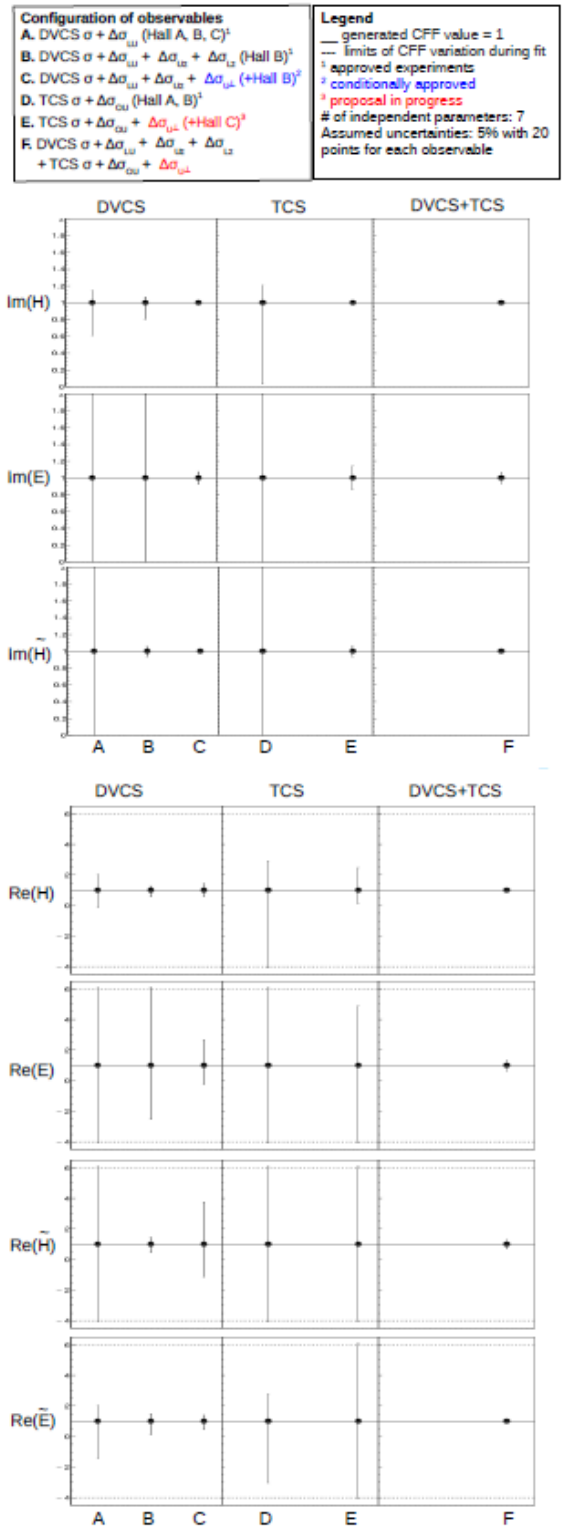
- $2.3 \times 10^{41}$ $cm^{-2}$ (assumes 3 cm NH3 target with 60% packing fraction, 90 nA beam current and 30 PAC days)
- With CPS can get a FOM improvement of roughly a factor of 30. Let's assume a factor of 10 → Vardan's projected uncertainties get reduced by factor of 3.

At that time projected counts, for four bins:




Projected uncertainties (slide 17 of last year's presentation on TCS with transverse polarized target).

With CPS the number of counts roughly gets to be 1000 per phi bin, or roughly 10000 integrated over all phi bins. Marie had assumed a 5% uncertainty in each helicity-dependent TCS cross section ($\sigma^+$ and $\sigma^-$) to get to her projections, or a 7% uncertainty in the asymmetry. Asymmetries A are of scale 0.1, so that is an uncertainty $\Delta A = 0.007$. With ~10000 counts one gets to a $\Delta A = 0.01$, so close. These means that we may, with CPS and two NPS-like calorimeters, get close to the assumed projections Marie had made, with similar fit results on the Compton Form Factors, see figure below.

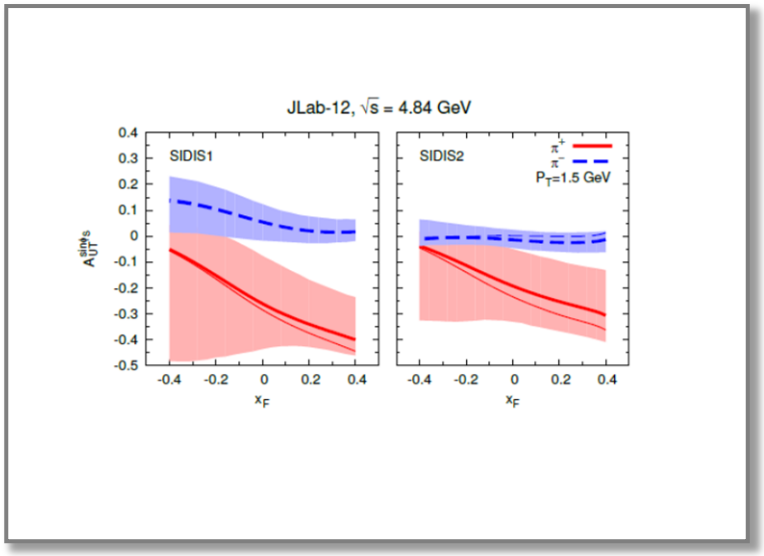



Projected uncertainties for fits of Compton Form Factors from various DVCS (left), TCS (middle) and combined (right) observables.

Assuming this, and universality of GPDs be they extracted from DVCS or TCS, we would get a very competitive (or unique if DVCS measurements with transverse polarized target will prove prohibitively difficult) constraint on the imaginary part of Compton Form Factor E. Plus the universality would be tested by the extraction of the imaginary part of Compton Form Factor H (or H-tilde).

**Run Group Possibilities:**

1. Single-Spin Asymmetry in quasi-real photon production off transversely polarized target




See presentation by Carlo Flore at Transversity 2017 (https://agenda.infn.it/conferenceOtherViews.py?view=standard&confId=12263)

For a 4 GeV/c neutral pion at an angle of say 16 degrees, p_T = 1.1 GeV so one has a hard scale. (Can we also do charged pions by adding a BigBite magnet and aerogel detector on one arm?)
For comparison, at 24 degrees this p_T would 1.6 GeV.

Per the WISER code, cross section is of order 1 nB/GeV/sr. Let's assume a 100 msr solid angle of the calorimeter and a 0.2 GeV momentum acceptance. For the assumed CPS scenario, the rough luminosity is $10^{36}$, so one ends up with ~20 Hz? Projected asymmetry is 0.3 for Feynman-x = 0.4 (we have an 11 GeV beam energy and measure a particle with 4 GeV momentum, so this is about right).

Shown in the plot is the calculation by Carlo Flore et al.

2. Exclusive pion production – cf Bogdan