

LDMX Electro-nuclear measurements

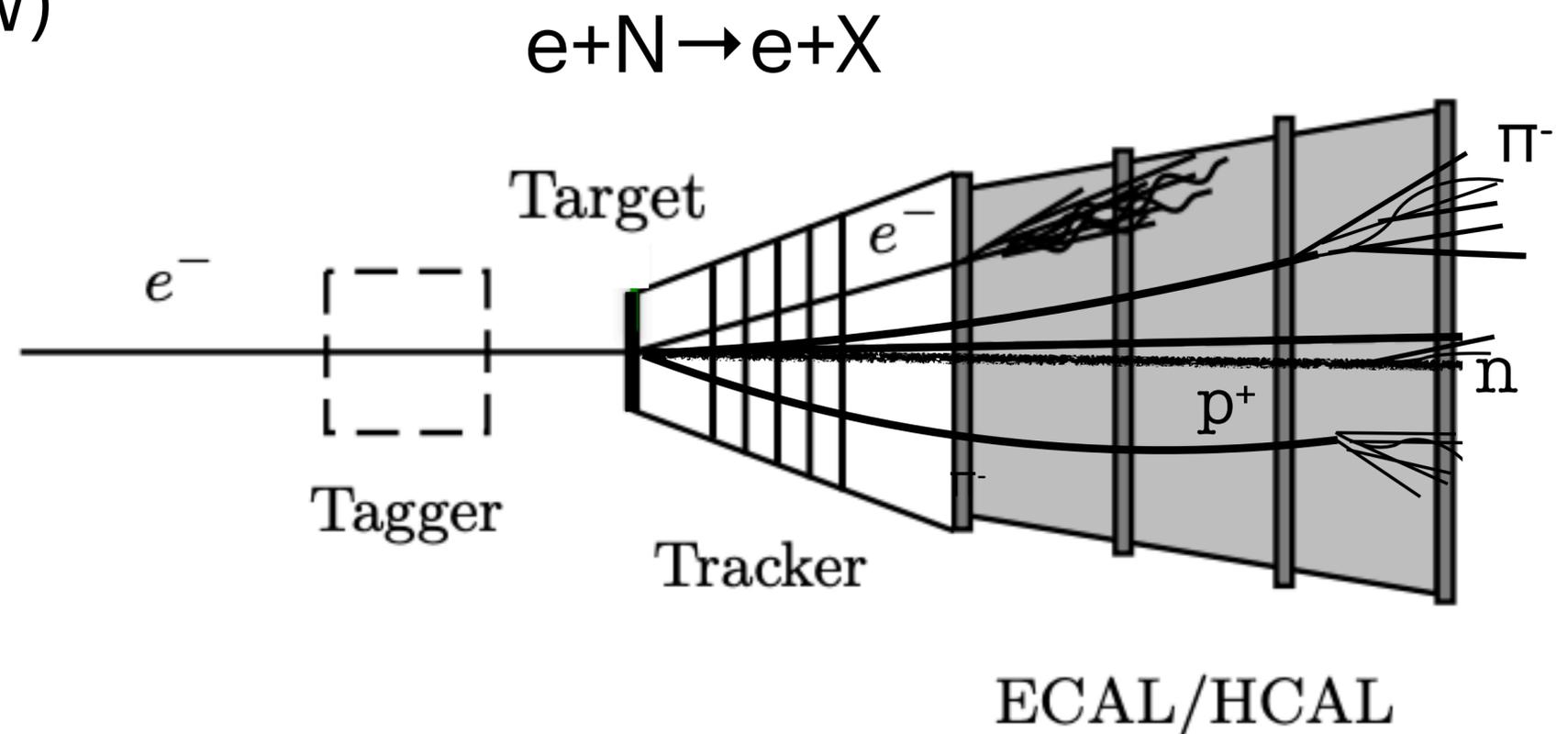
Cristina Mantilla Suarez on behalf of the LDMX EN team



Electron-nucleon scattering in LDMX

- The Light Dark Matter Experiment is a proposed sub-GeV DM detection experiment with a high intensity **electron beam** on a fixed target
- It can **measure electron-nucleus scattering** as shown in [arXiv:1912.06140](https://arxiv.org/abs/1912.06140)

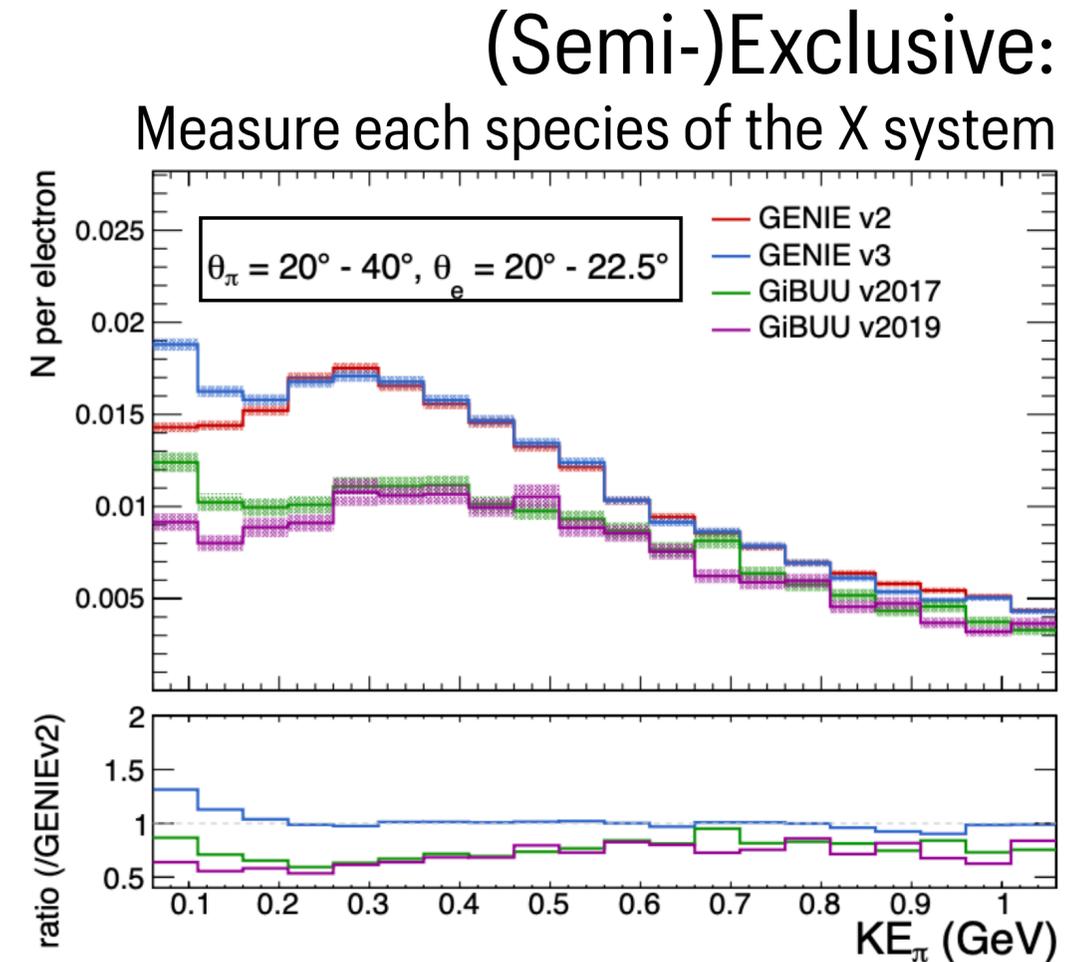
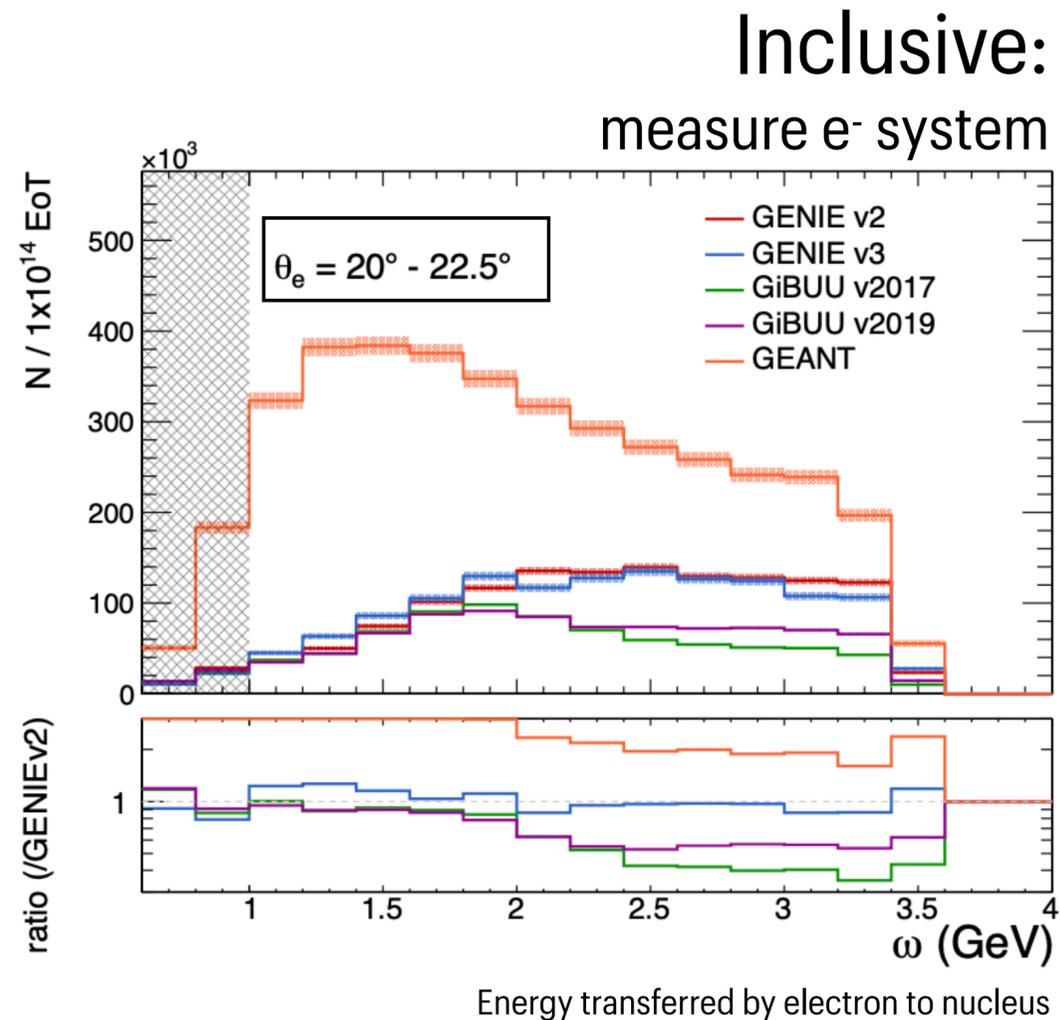
- 4 GeV electron beam (possibly 8 GeV)
- Forward reconstruction:
 - 40° angular acceptance (tracker) + 65° angular acceptance (HCal)
- PID between pions/protons (dE/dX) for energies < 1 GeV
- Low-energy threshold for tracks (down to ~60 MeV)



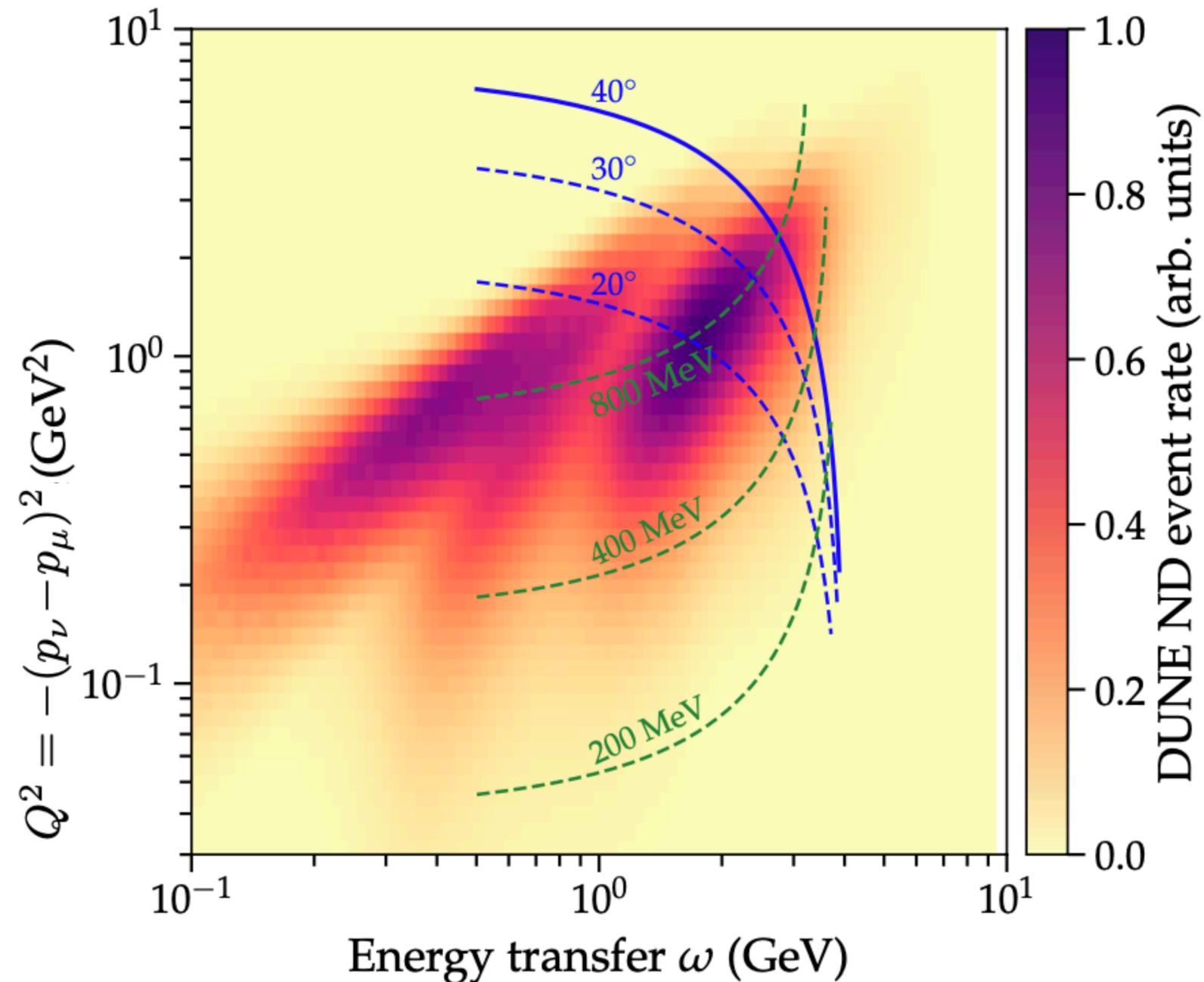
Measurements proposed

In [arXiv:1912.06140](https://arxiv.org/abs/1912.06140)

- Differential measurements in $(\theta_{\text{recoil-e}}, \omega = E_{\text{beam}} - E_{\text{recoil}})$



Possible coverage of LDMX



- LDMX sensitivity:
 - $\theta_{\text{recoil-e}} < 40^\circ$ and $\omega > 1$ GeV,
 $p_{T \text{ recoil-e}} > 200$ MeV
 - Sensitive to DIS region (high Q^2 and high ω - lepton scattering w individual quarks
 - Uses W as target but possibly Ti/Ar
 - Possibly 8 GeV energy beam

Big questions for Snowmass

- How well can we trigger on useful topologies? (high- p_T electron, total had-E, exclusive states)
 - Estimate: Electron energy resolution $\sim 5\text{-}10\%$ and p_T resolution < 10 MeV
 - Requires **rates and efficiency studies** with Ecal/Hcal trigger algorithms.
- How well can we measure the hadronic system?
 - Estimate: Neutron energy resolution $\sim 5\% \oplus 40\% \sqrt{E/GeV}$
 - Requires **realistic simulation** of HCal and ECal association
 - Requires **tracking** resolution and PID measurements

Neutrino community impact

- How to be maximally useful to neutrino community?
 - **Unfolding** cross section measurements:
 - What are the common formats, definitions for comparisons and tunes?
 - Covering all **important observables**:
 - Now considering: ω , E fraction + angle for exclusive
 - Understanding **differences in e-/ ν interactions**

Thanks!