Motivation for better data on H/D targets

- ANL, BNL, FNAL, and BEBC bubble chambers provide unavoidable input for neutrino event generators

- Input for radiative corrections to β decay and test of CKM unitarity

- Clean signal for hadrophilic and leptophobic new physics

- Flux measurements: clean prediction of cross sections

complementary to (anti)neutrino-H
talk by Roberto Petti

- Scattering on H(D) is not (just slightly) affected by nuclear physics

- D measurement: understanding of np interaction in the simplest nucleus

"Neutrino scattering measurements on H and D", Snowmass 2021 LOI
Laura Fields, Alan Bross, Tom Junk, Jorge Morphin, Richard Hill, Luis Alvarez-Ruso et al

related seminars and talks: seminar of Tom Junk at University of Kentucky
Snowmass working group meetings

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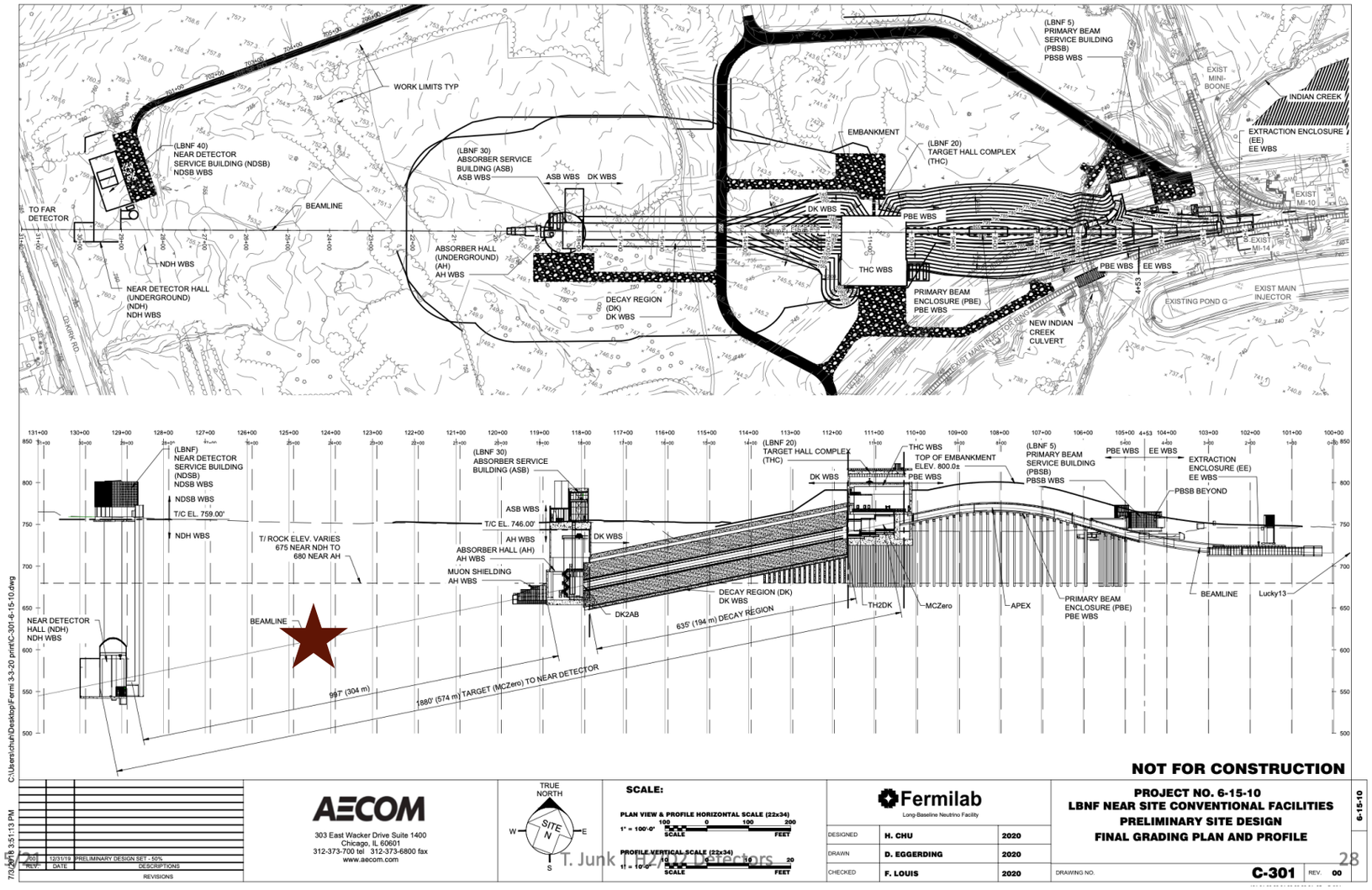
Problems and solutions

- Safety requirements: no more than 40 kg of flammable gas/liquid
- DUNE PRISM: no space for a new detector in Near Detector Hall



seminar by Tom Junk at UK

- Build new Hall, operate without people: no safety problems
- Beam is there, no interference with DUNE

Measurements with polarized targets

- Independent way to access nucleon axial form factor

  talks by Beata Kowal, Atika Fatima

- Provide inputs for resonance production, reduce number of assumption

  talks by Fernando Alvarado, Astrid Blin, Gustavo Navarro, Kajetan Niewczas

- One step closer to developed field of eN scattering

  BC fit, FFs, MAID, SAID, Bonn-Gatchina PWA solutions

- Hydrogen can be polarized as part of a molecule

- $: need a lot of space, a lot of R&D and cold T to keep polarization

Future directions:

- Study spin-dependent interactions of dark matter with nucleons

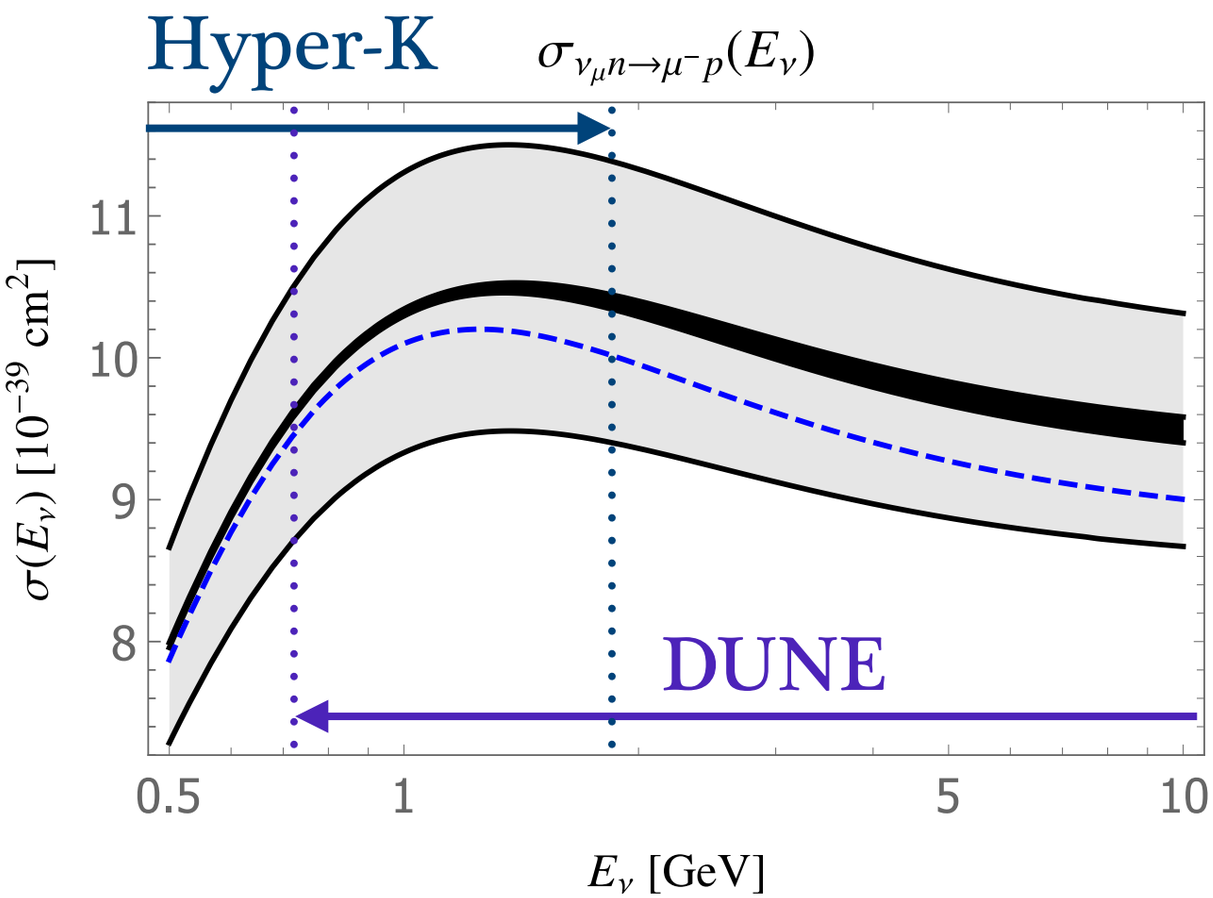
- Alternative constraints on new physics scenarios

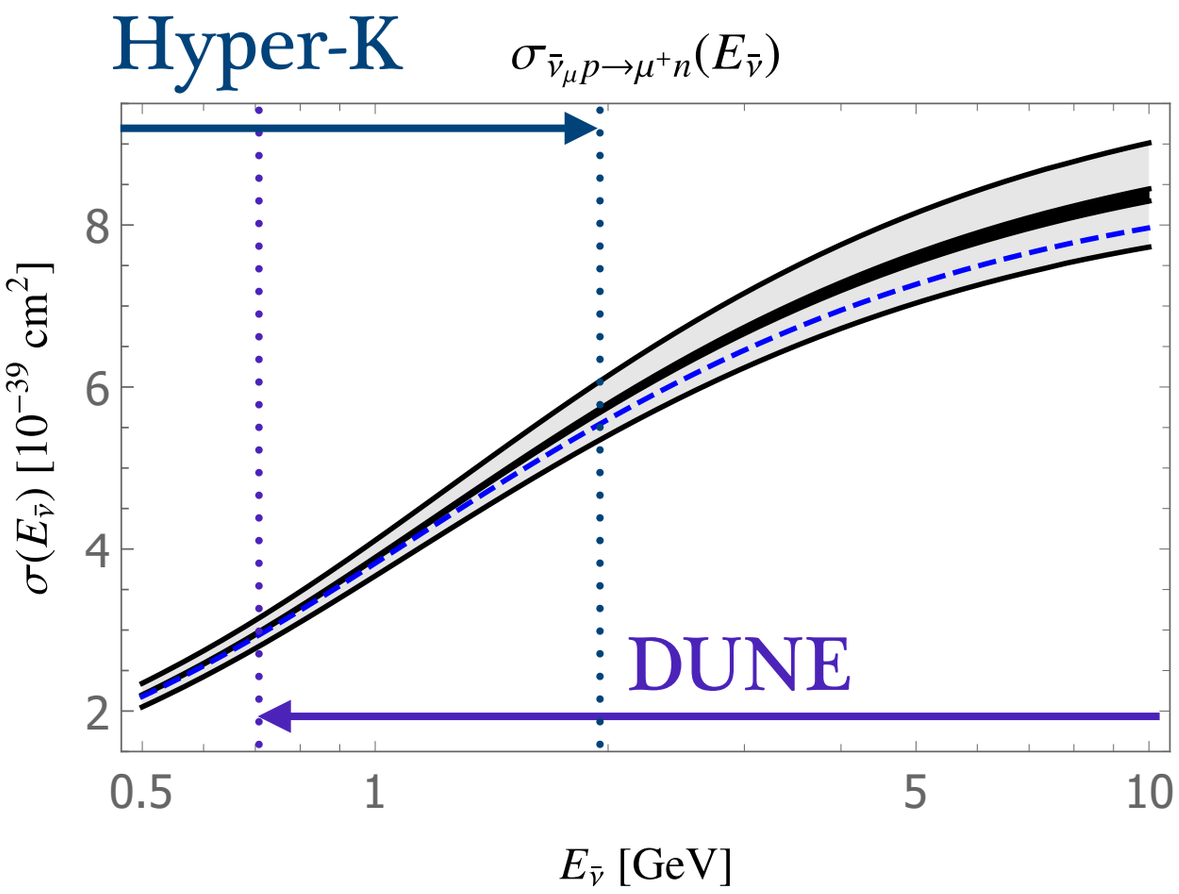
One of research directions

- Axial form factor and axial radius from neutrino scattering

talks by Aaron Meyer and others

- Improve cross sections (QE, pion production, etc) on elementary targets





- dark band: uncertainty of iso 1 fit (default result)
- light band: uncertainty of axial form factor
- blue line: BBBA2005 fit of electromagnetic form factors

need measurement of proton magnetic form factor