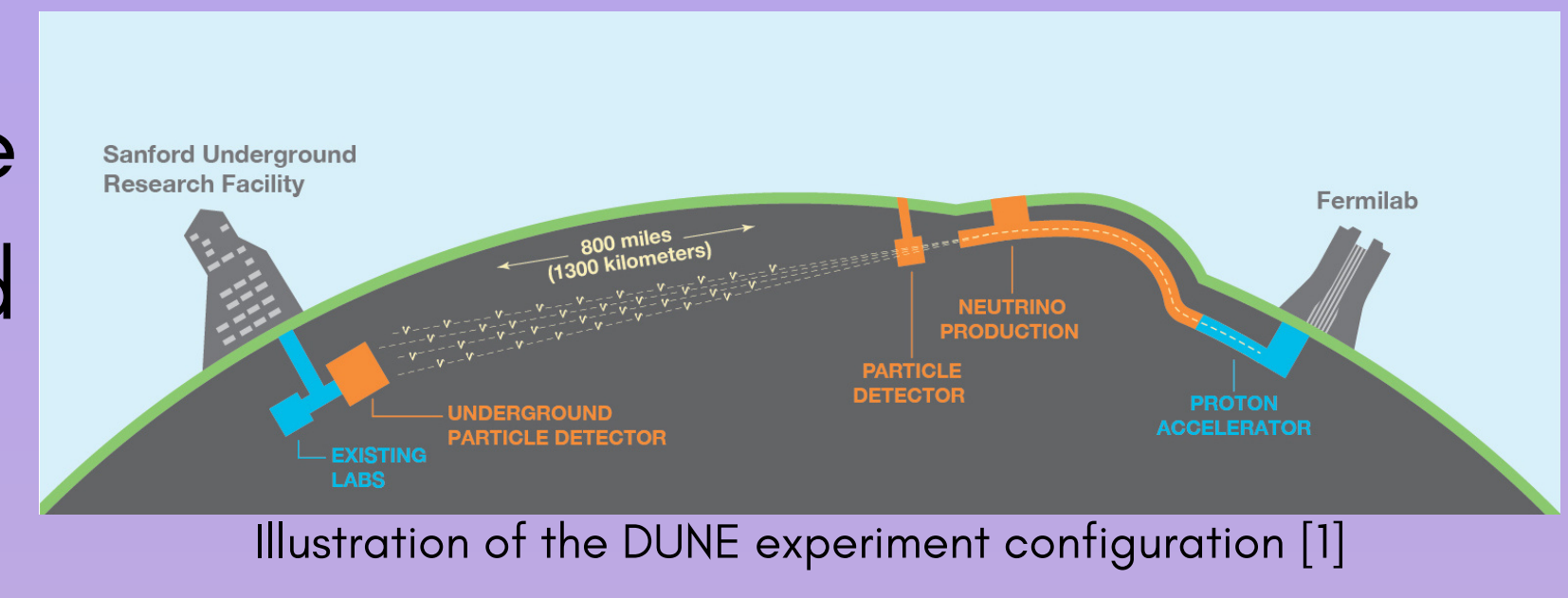


Sensitivity to solar neutrinos in DUNE, data reconstruction and analysis with DUNE's prototypes

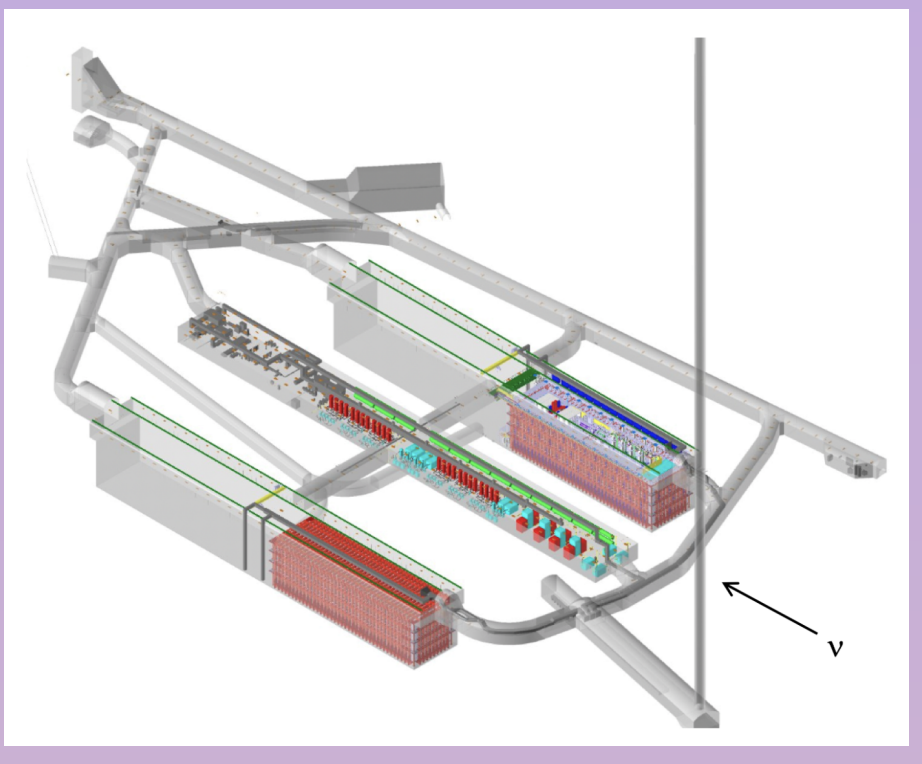
The Deep Underground Neutrino Experiment

Next-generation long-baseline experiment being constructed in the United States



DUNE physics program :

- Measure δ_{CP}
- The mass ordering
- Supernova neutrinos
- Solar and atmospheric neutrinos



DUNE's far detector :

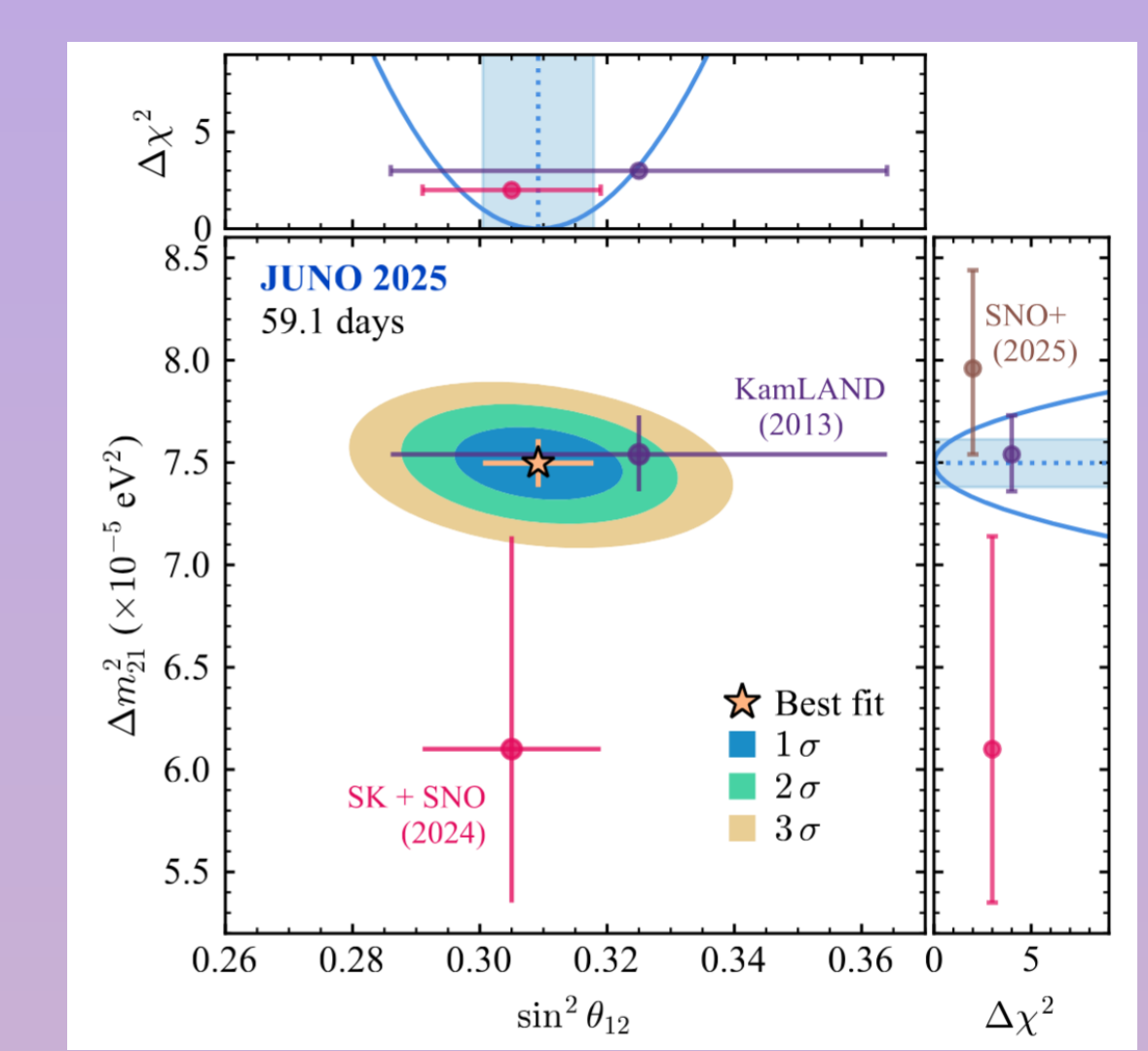
- 40 kTons of LArTPCs
- 2 full-scale prototypes at CERN

Solar neutrinos

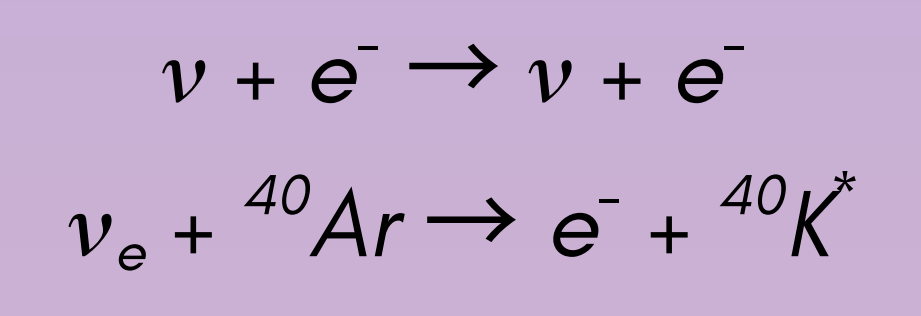
DUNE is capable to measure MeV-scale neutrinos → Supernova and **solar** neutrinos



- Oscillation parameters
- Matter effect with measurement : θ_{12} and Δm_{21}^2 day/night asymmetry



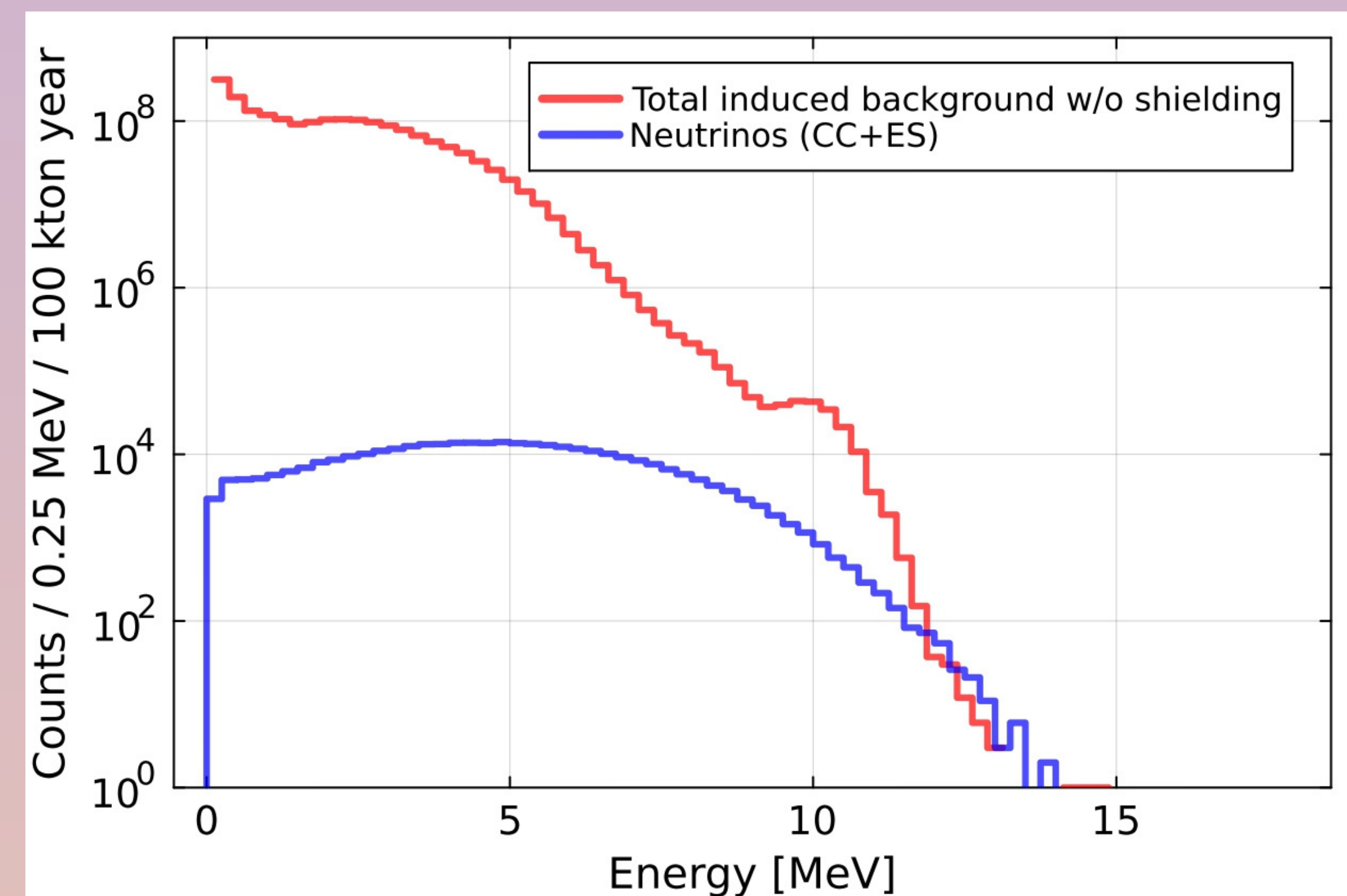
- **Discrepancy of 2σ** between reactor and solar measurements
- **First measurement** of the **Hep** flux
- Two channels : **ES (120k*)** and **CC (220k*)**



*: events per module for 10 years

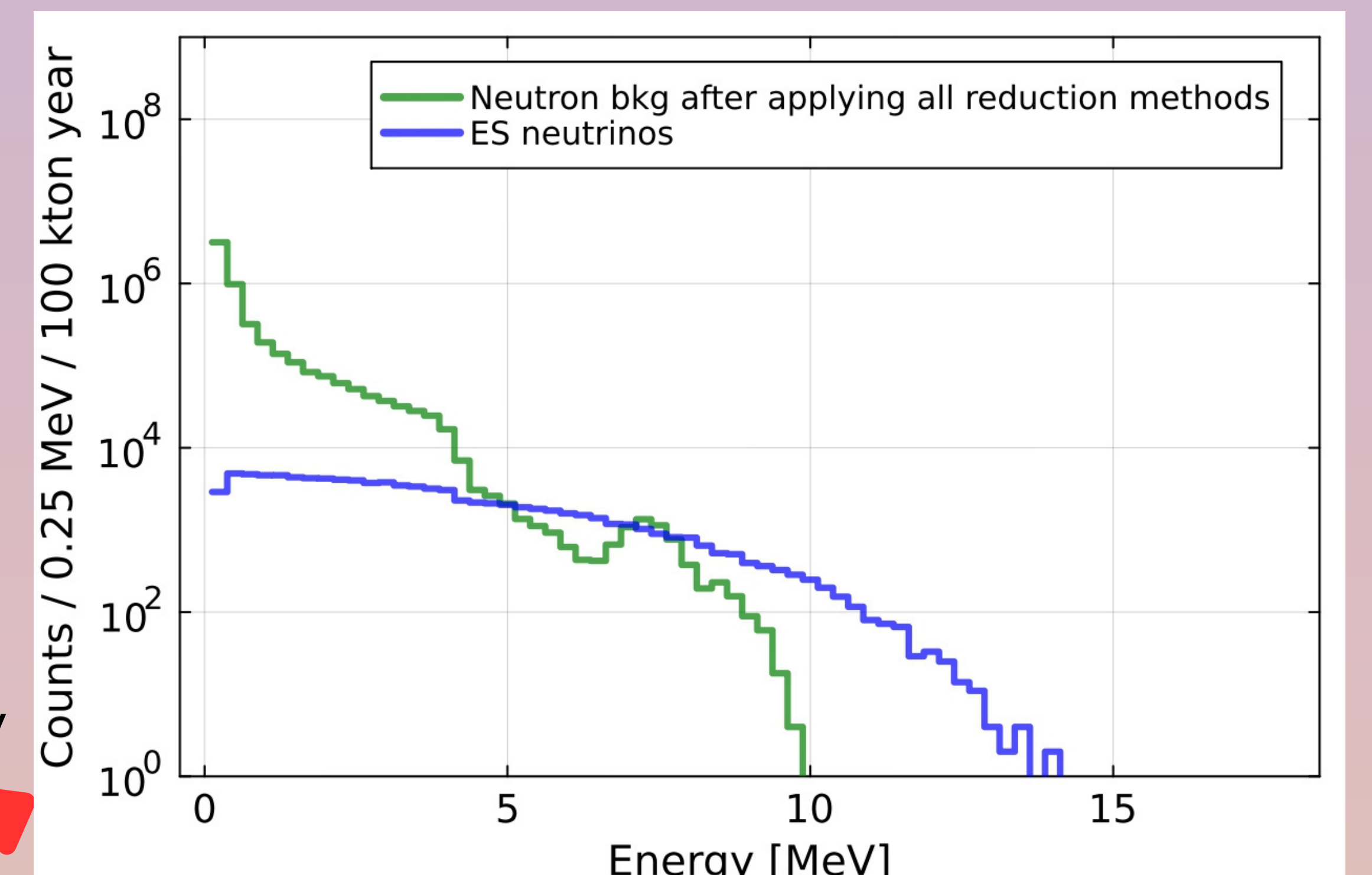
Low Energy signals in DUNE

At MeV-Scale, DUNE faces significant background coming from **neutrons**, radiogenic γ rays and cosmogenic isotopes



Reduction methods applied :

- Shielding
- Fiducialization cut
- Topological cuts
- Pointing
- Muon veto time window



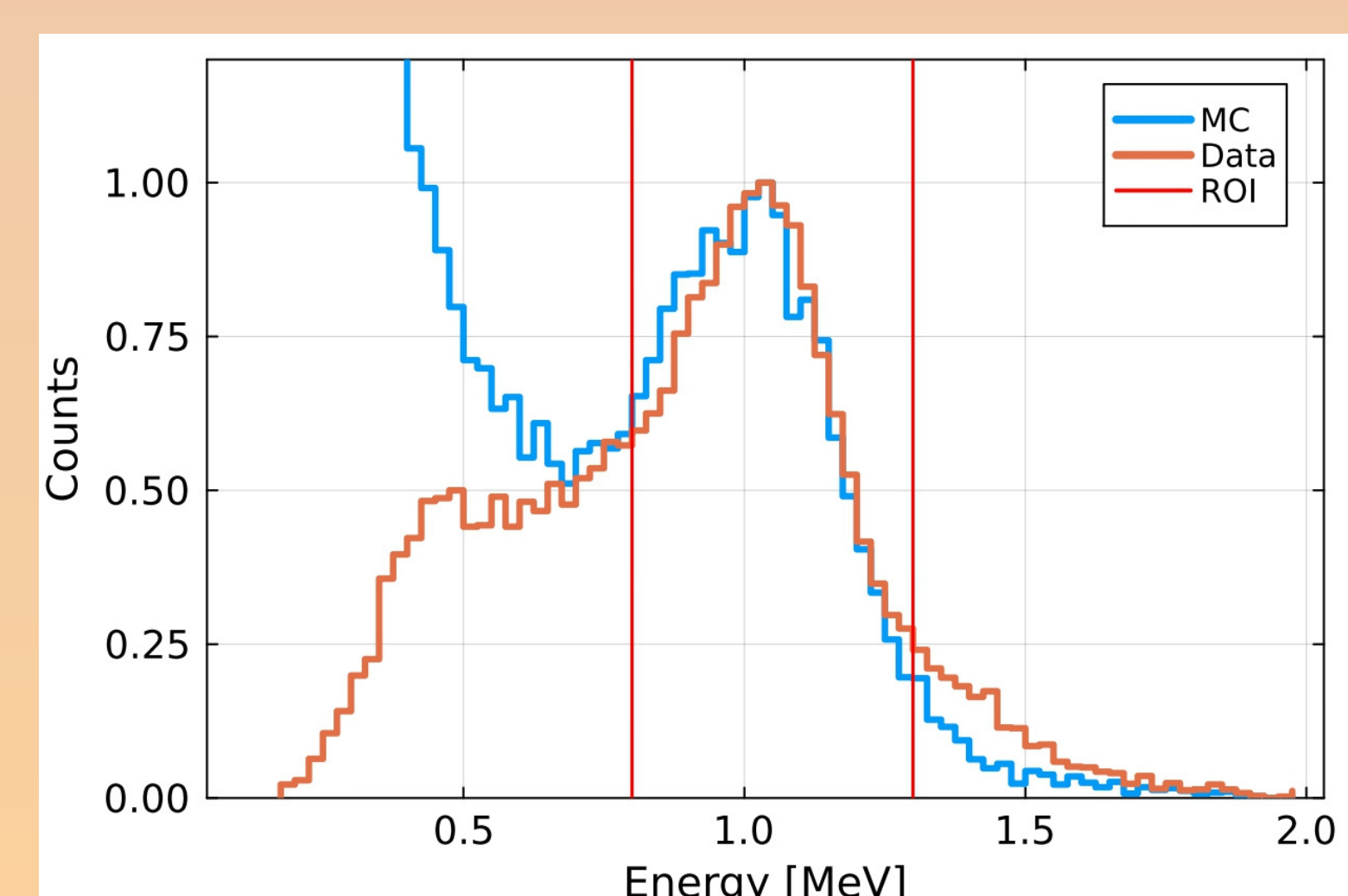
- Neutrons are the principal background at low energy : $\approx 10^4$ greater than the ν signal
- N captures can produce γ cascade up to 12 MeV

- Increase the **S/B ratio by a factor of 10^2**
- **Neutron signal becomes inferior to ν signal** above 5 MeV after applying all reduction methods

Energy resolution

We computed the energy resolution in ProtoDUNE-HD by comparing Bismuth sources data and Monte-Carlo simulation

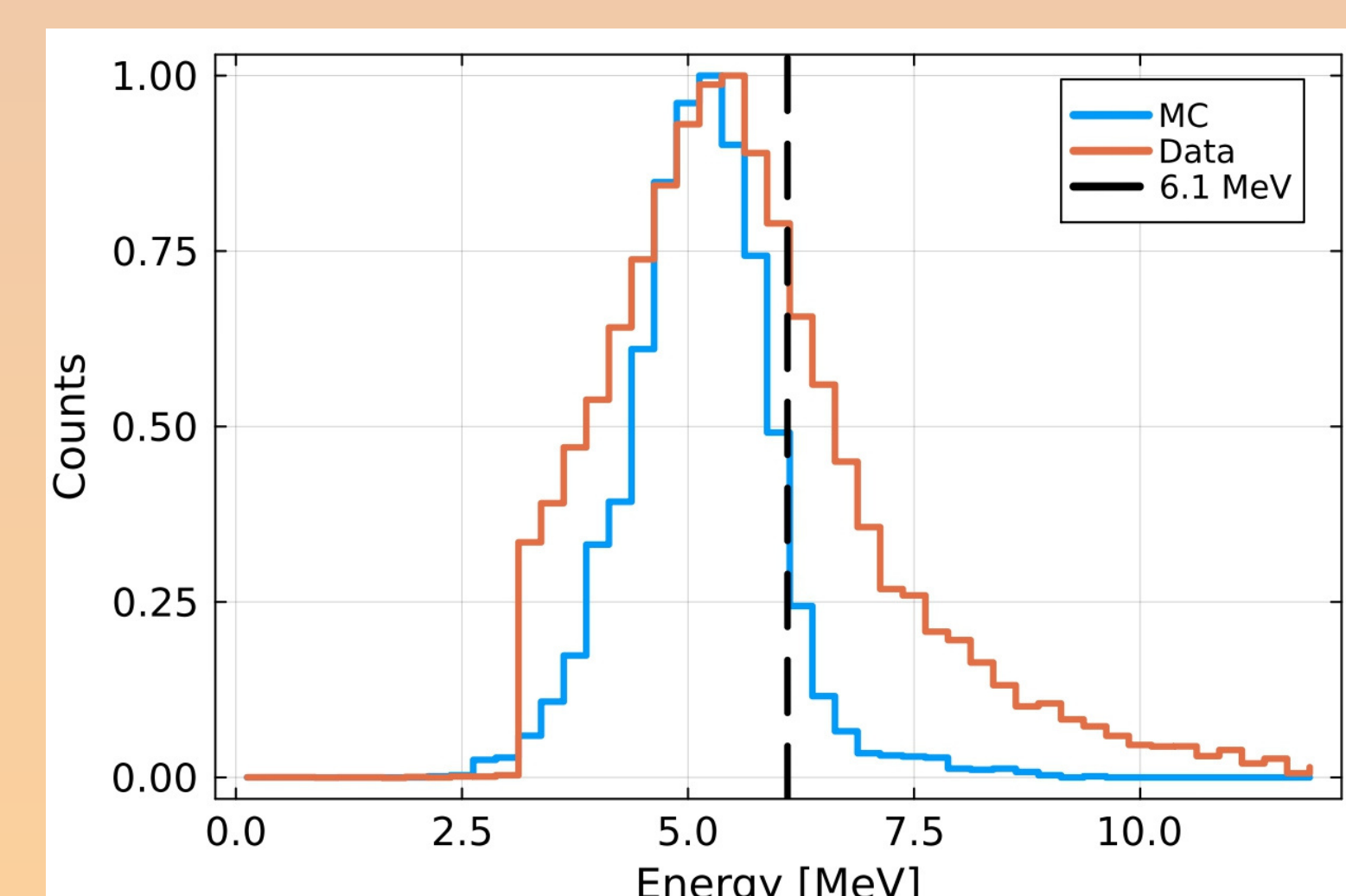
Preliminary result : 15% at 1 MeV



Energy Reconstruction

We reconstructed the 6.1 MeV γ cascade after N cap in ProtoDUNE-VD with PNS data and a Monte-Carlo simulation

Encouraging preliminary results



Conclusion

DUNE has a high potential to measure solar neutrinos through both channels (ES and CC)

- ES neutrinos might be observable after the application of reduction methods on neutron background
- 15 % energy resolution at 1 MeV with ProtoDUNE-HD data analysis
- Reconstruction methods development by using Pulsed Neutron Source data in ProtoDUNE-VD