



# Extending the Sensitivity of Heavy Sterile Neutrino Searches with Solar Neutrino Experiments

---

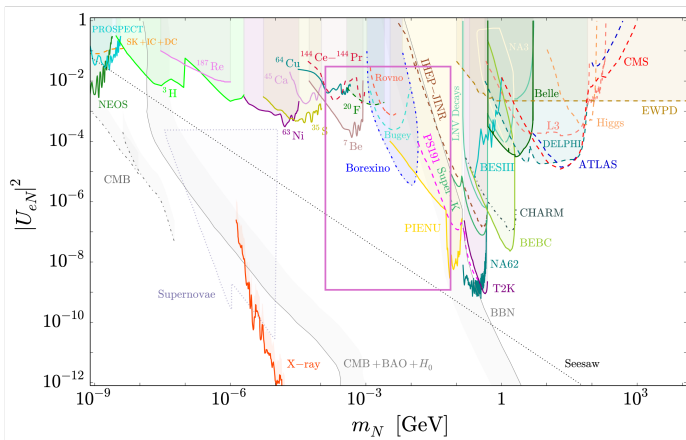
Yutao Zhu   Zhicai Zhang

July 14, 2026

Department of Engineering Physics, Tsinghua University

# Motivation: MeV-scale sterile neutrinos

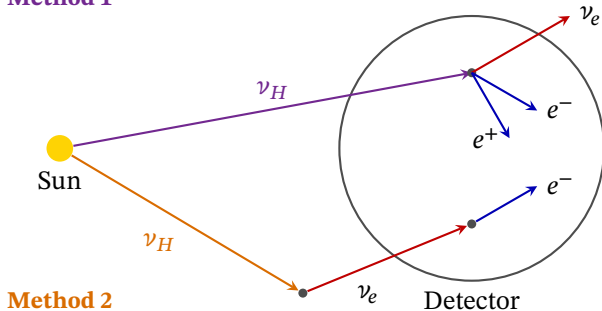
- Neutrino oscillations  $\rightarrow$  non-zero masses  $\rightarrow$  physics beyond the SM
- Heavy sterile  $\nu_H$  suppresses active masses through mixing  $|U_{eH}|^2$



**Goal:** extend sensitivity of MeV  $\nu_H$  searches with a 500-ton detector (e.g. JNE-500)

# Method: two detection paths

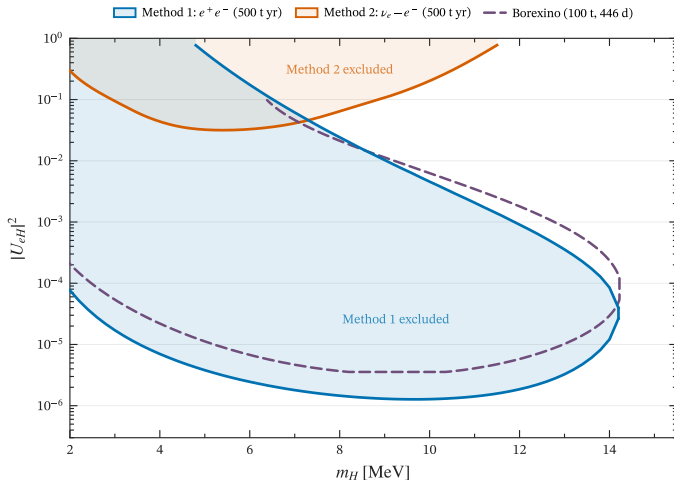
## Method 1



- **Method 1:**  $\nu_H$  decays **inside** detector  $\rightarrow e^+e^-$  pair
- **Method 2:**  $\nu_H$  decays **outside** detector  $\rightarrow$  detect  $\nu_e$  from decay

# Result: predicted sensitivity

We obtain the sensitivity of both methods using profile likelihood ratio test (with 5% energy and 25° angle smearing). Two methods are **complementary**.



# Thank you

Questions and discussion