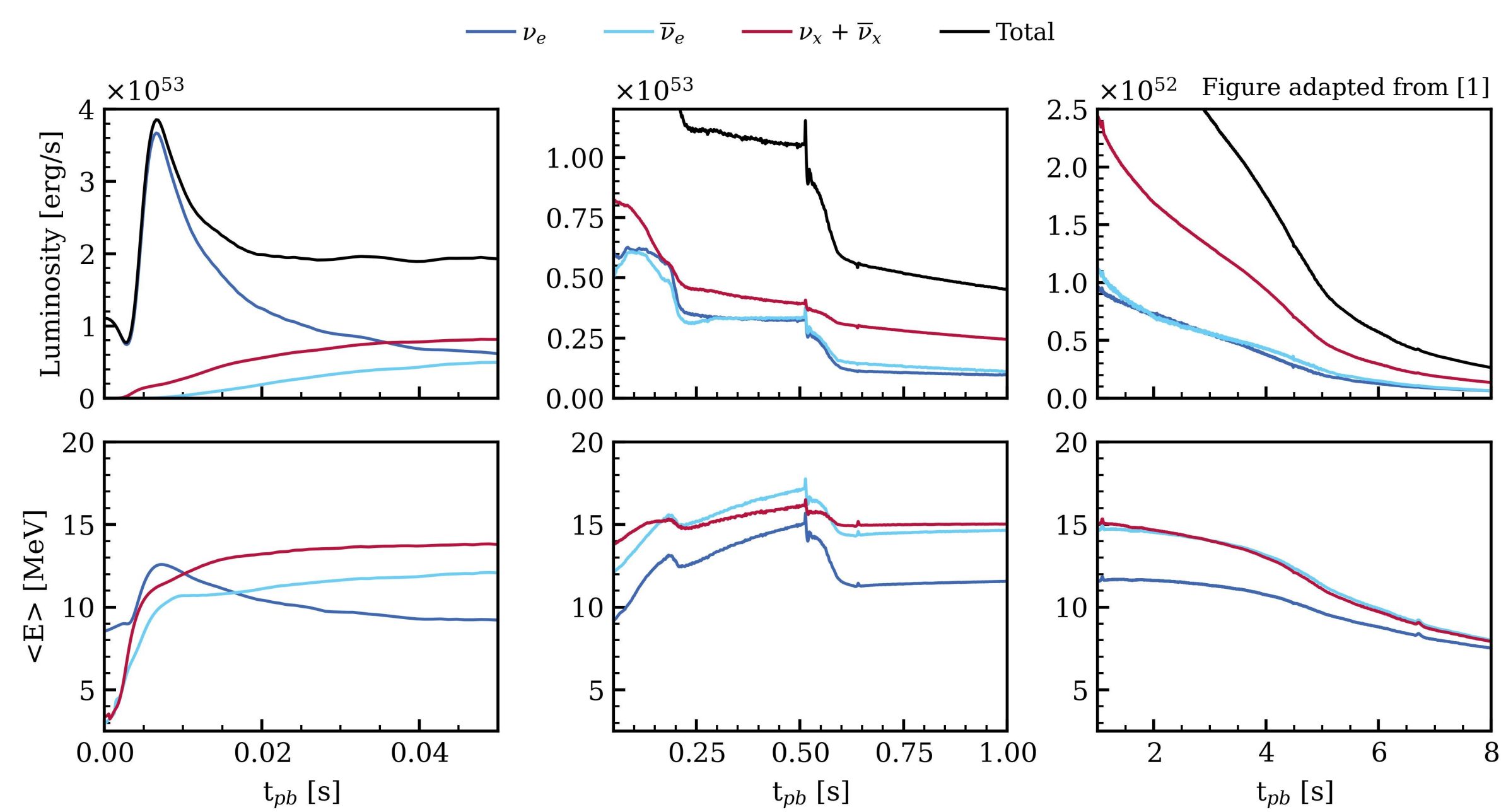


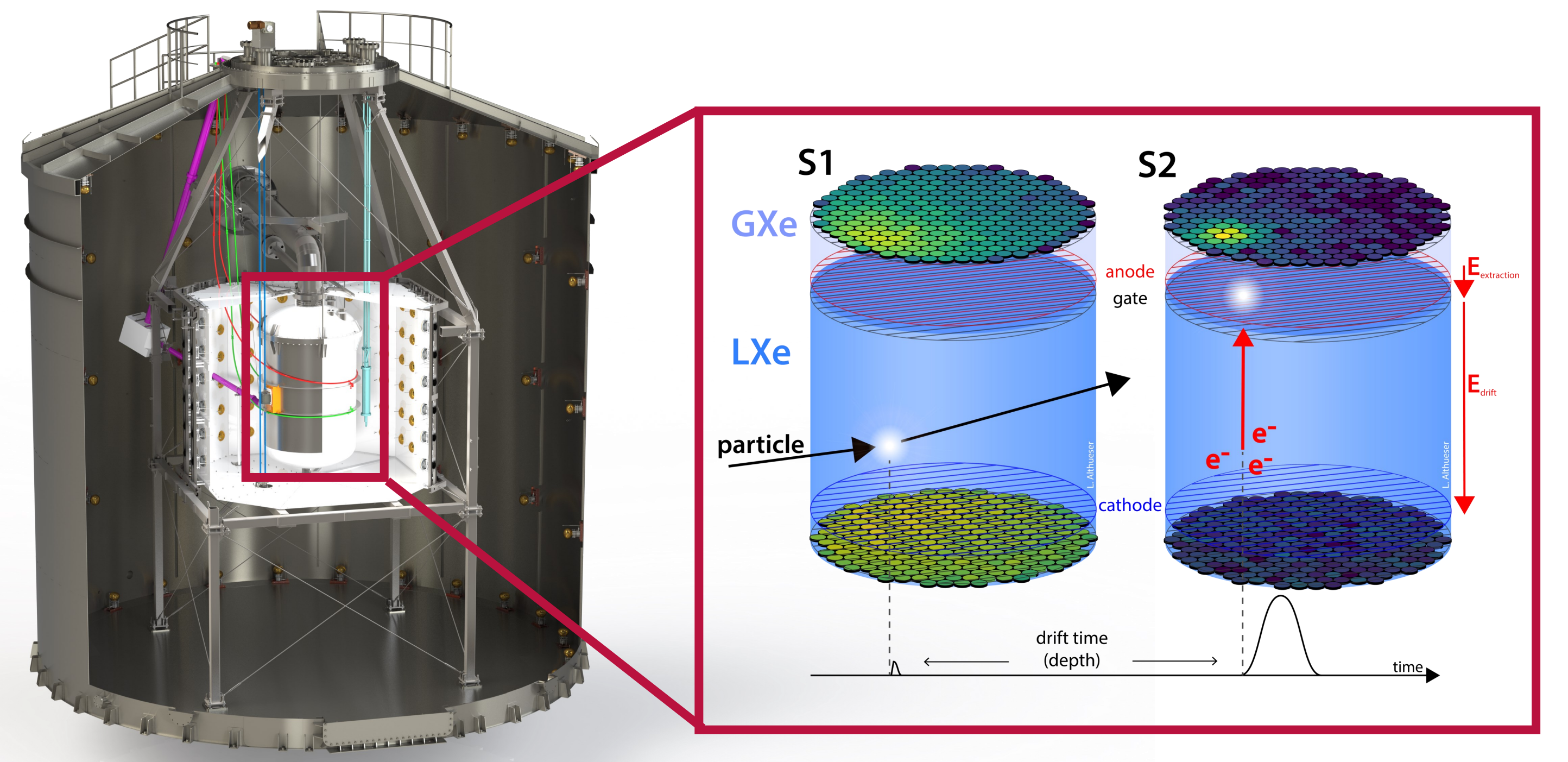


## Supernova neutrinos

- Type II core-collapse supernovae emit ~99% of their progenitor gravitational energy as neutrinos
- Neutrinos of O(10) MeV
- Burst-type event mostly in a 10 s window



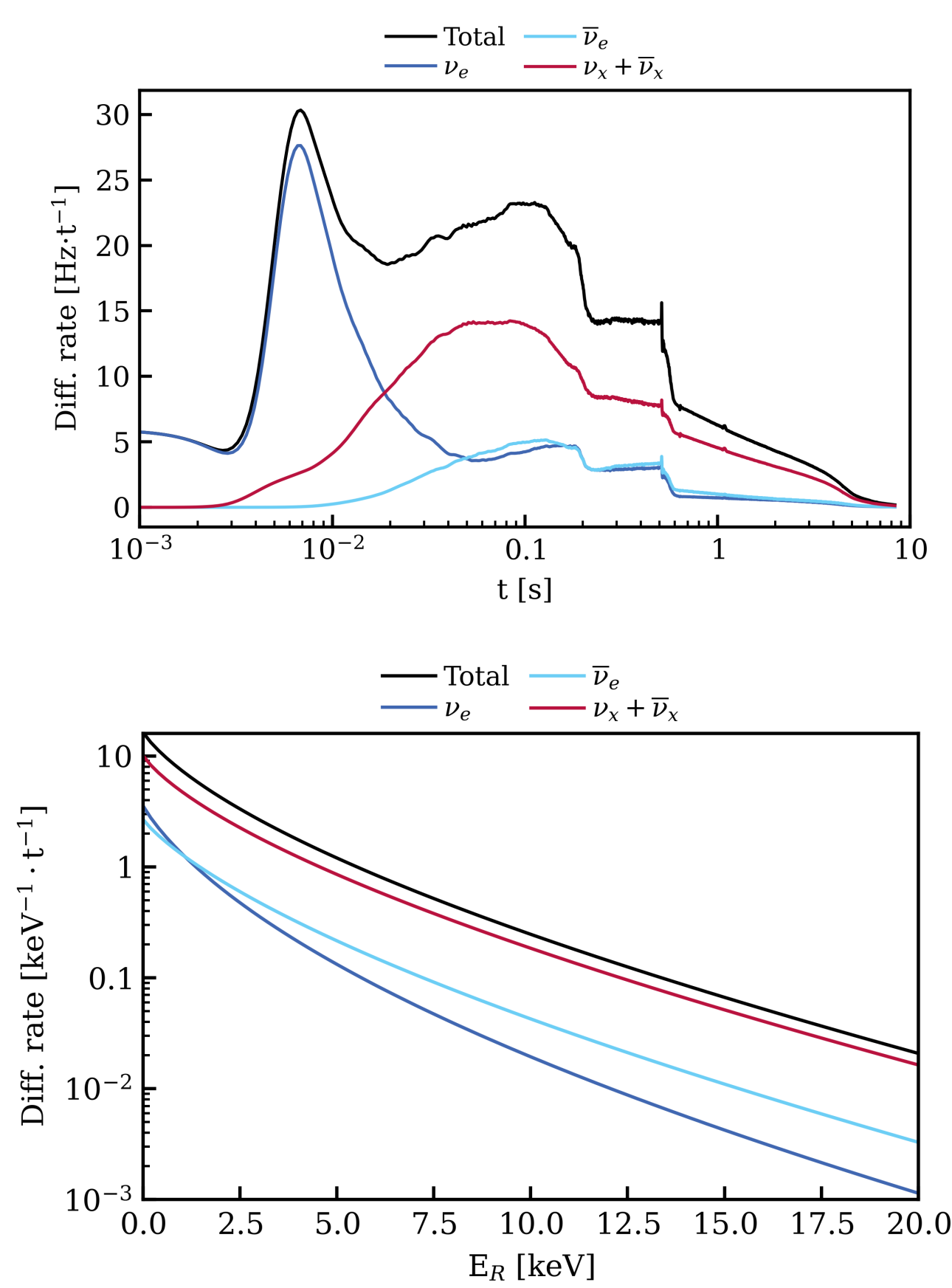
## The XENONnT detector



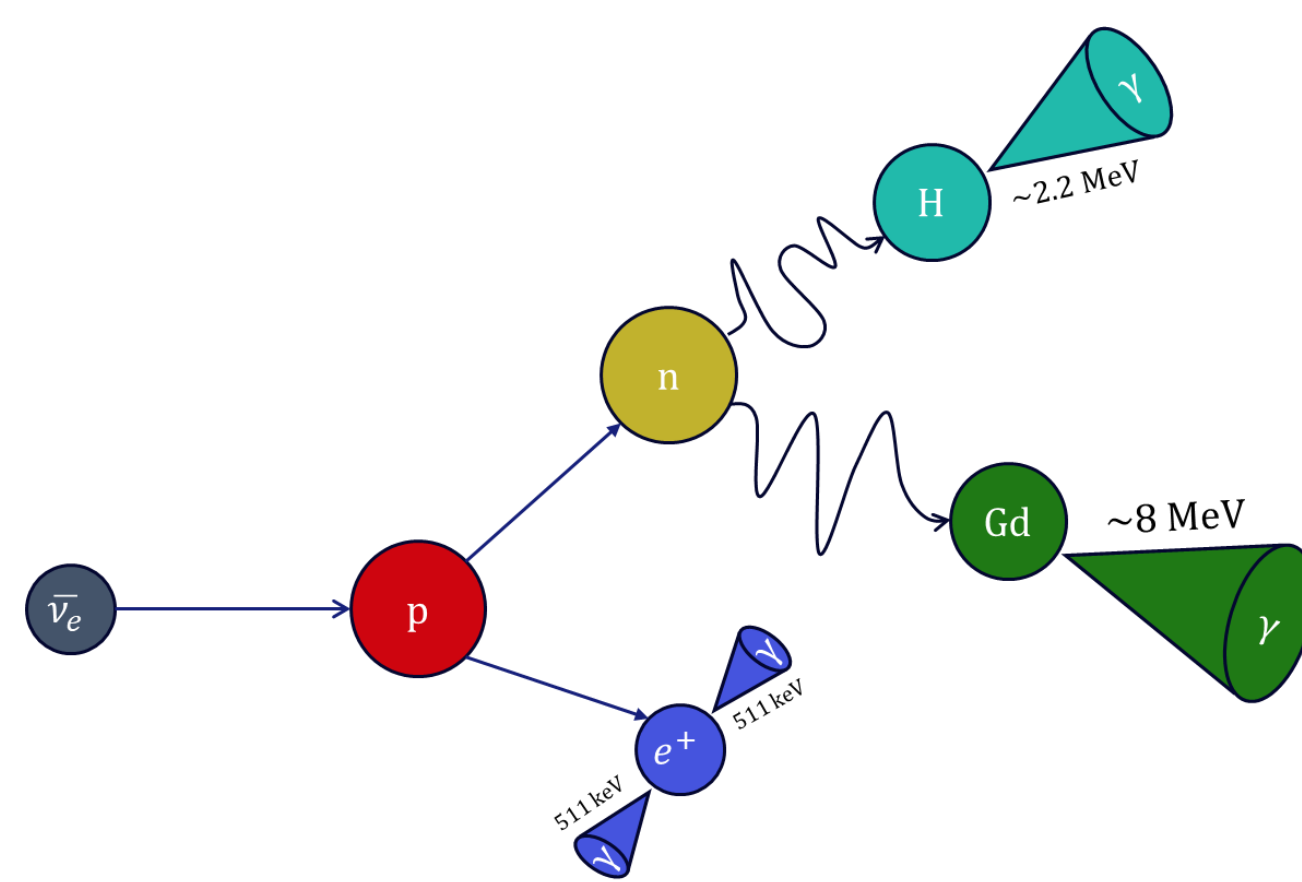
- Located at Laboratori Nazionali del Gran Sasso (LNGS) - 3600 m.w.e.
- Dual-phase xenon time projection chamber (TPC) with a 5.9 t active target [2]
- Energy reconstruction
- 3D position reconstruction
- Particle discrimination (ER vs NR)
- Optimized for WIMP search and low-energy recoils O(10) keV

## In the dual-phase Xe TPC

- Main interaction through coherent elastic neutrino-nucleus scattering (CEvNS)
- Flavour-independent measurement
- Low energy nuclear recoils of O(1) keV



## In veto detectors

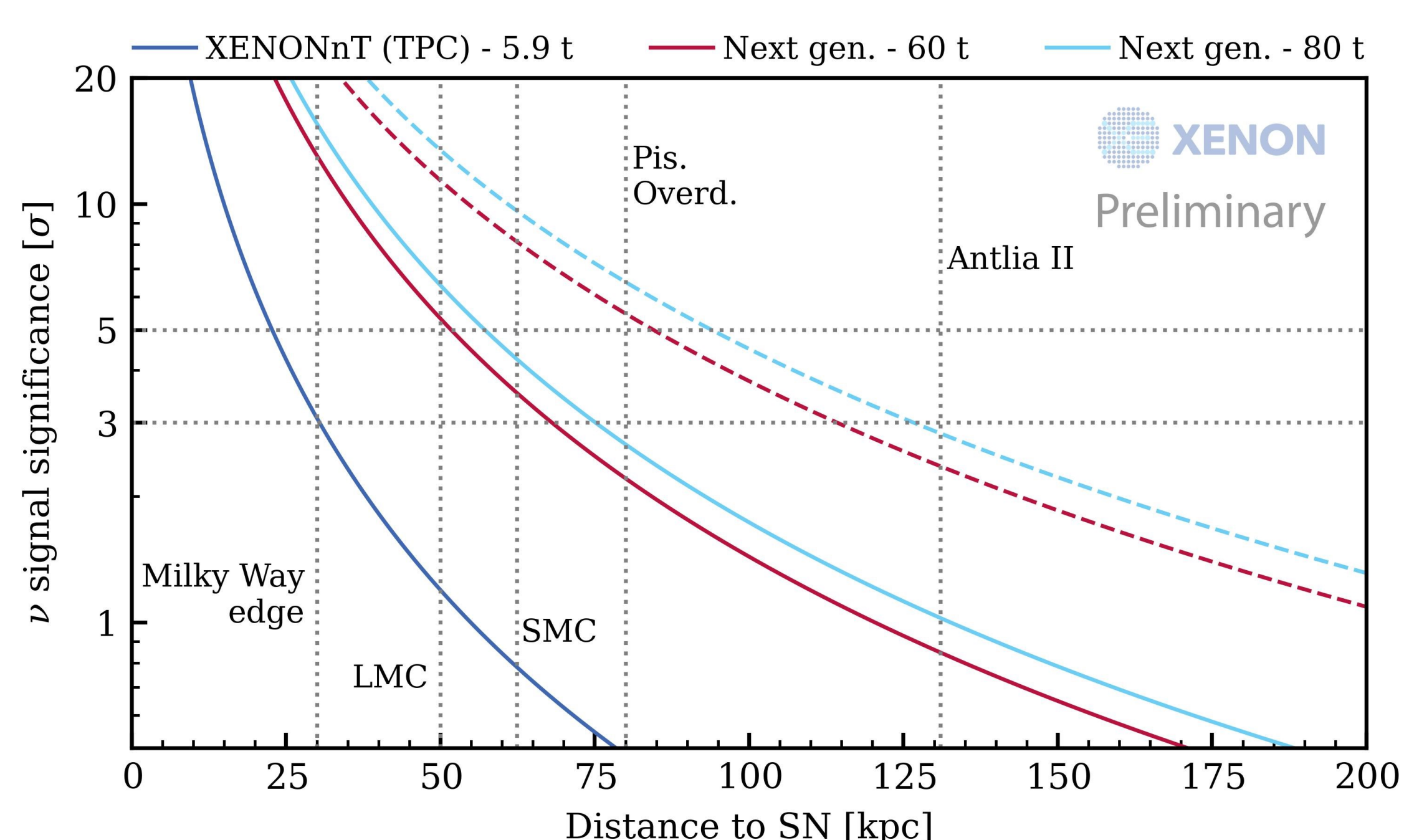
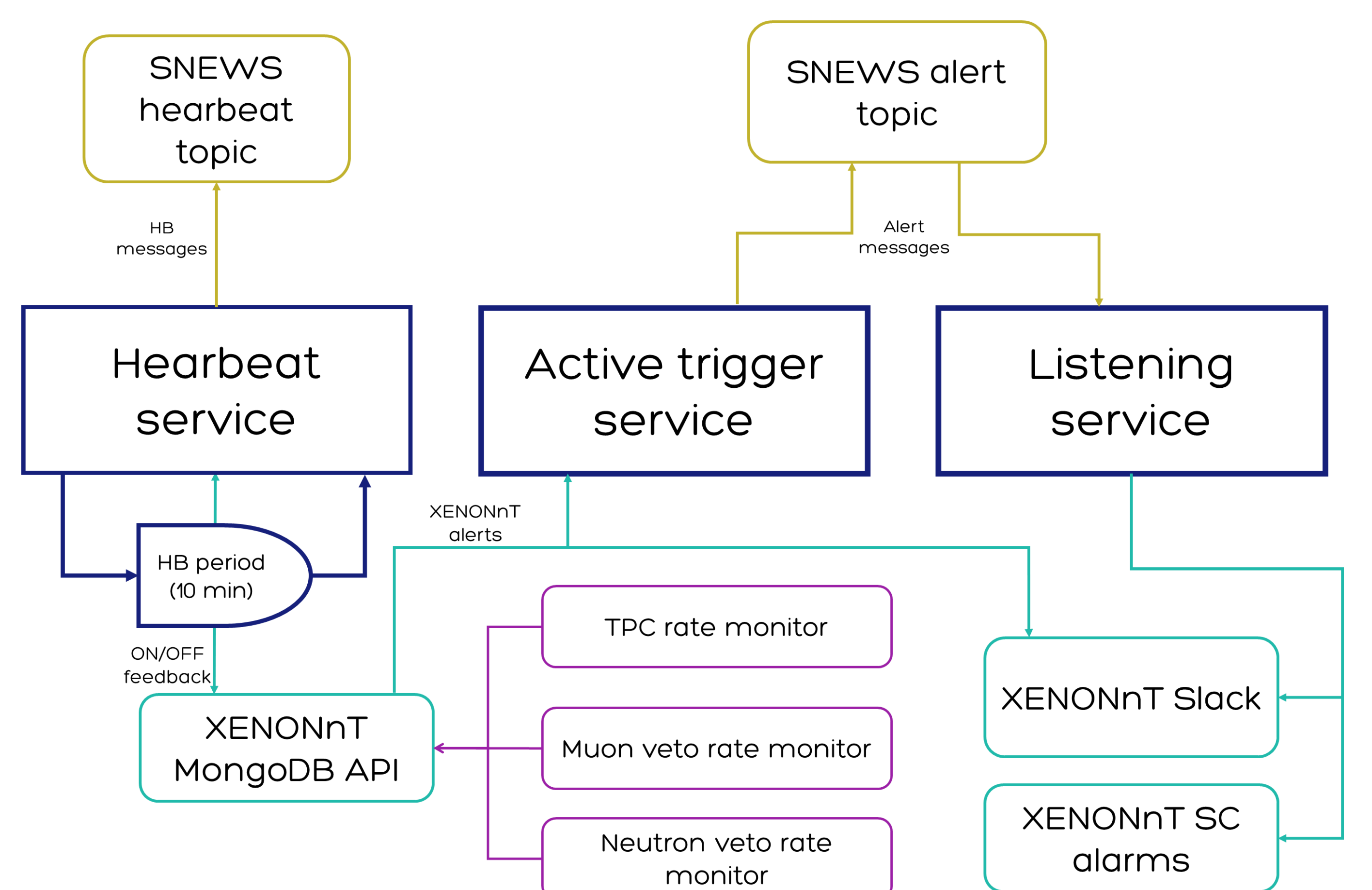


- Total of 700 t of water in two distinct nested detectors
- Main interaction through Inverse Beta Decay (IBD), producing Cerenkov light
- Expecting 100-200 interactions
- Considerably reduce the false alarm rate of the TPC-only trigger by multi-detector coincidence

## Multi-messenger astrophysics



- The SuperNova Early Warning System (SNEWS) looks for coincident triggers from neutrino experiments [3]
- XENONnT is the first DM-based experiment integrated in the upcoming SNEWS 2.0 [4]



[1] - A. Mirizzi, et al, *Supernova Neutrinos: Production, Oscillations and Detection*, Riv. Nuovo Cim. 39 (2016)  
 [2] - E. Aprile, et al. (XENON Collaboration), *The XENONnT Dark Matter Experiment*, e-print: 2402.10446  
 [3] - P. Antonioli, et al., *SNEWS: The Supernova Early Warning System*, New J.Phys. 6 (2004)  
 [4] - S. Al Kharusi, et al. (SNEWS collaboration), *SNEWS 2.0: a next-generation supernova early warning system for multi-messenger astronomy*, New J.Phys. 23 (2021)

