Probing Pair-Instability Supernovae via ⁵⁶Ni Decay Signatures

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1. Background

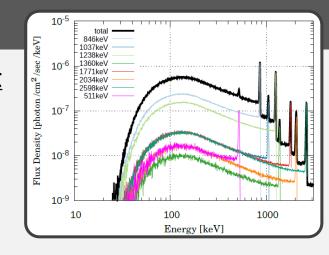
- PISNe: Thermonuclear explosions of very massive stars (He core \geq 65 M_{\odot})
- Extreme cases: up to ~60 M⊙ of 56Ni
 → strong γ-ray lines from decay chain
- No definitive detection yet;
 - γ/hard X-ray observations can directly confirm?

3. Monte Carlo γ -ray transport

- · Compton scattering,
- Photoelectric absorption,
- Pair production,

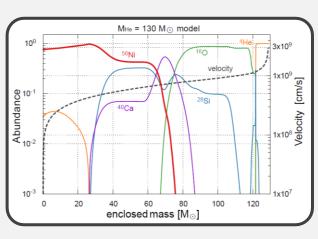
available: arXiv:2503.21744

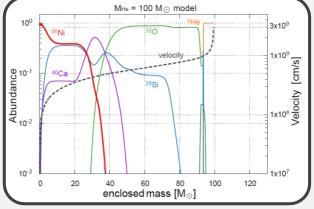
 ex.) result; at 300 days after the explosion /w 130Mo located at a distance of 100 Mpc.



2. PISN models:

He-core masses 100 & 130 M \odot (Z=10⁻⁵), computed with MESA r24.08





First γ /hard X-ray detectability study of PISNe; next-gen MeV missions can detect massive-core PISNe out to ~300 Mpc: event rate ~0.01–0.1 yr⁻¹.

4. Key Results

Focus on key ⁵⁶Co lines: 847 keV

