Local density of relic neutrinos and its implications for PTOLEMY

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NEUTRINO 2018

Based on: P. F. de Salas et al., JCAP 1709, 034 (2017), [1706.09850]

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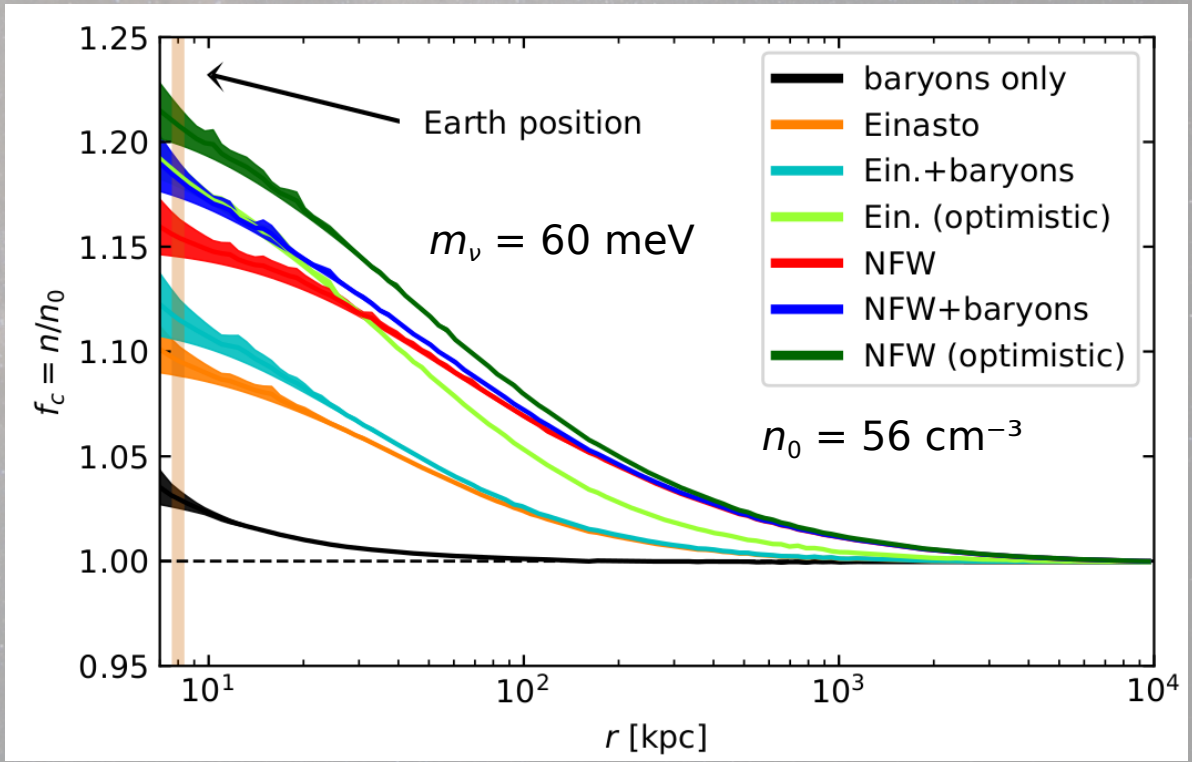
Local density of relic neutrinos

- At least two relic neutrinos are non-relativistic today ($T_{C\nu B} = 0.16$ meV)
- They clusterize under large gravitational potentials (e.g. the Milky Way)

- *N*-one-body simulations
  - Only gravitation matters
  - Matter (and neutrino) evolution not affected by neutrinos

- We follow the evolution of DM and baryons distrib.

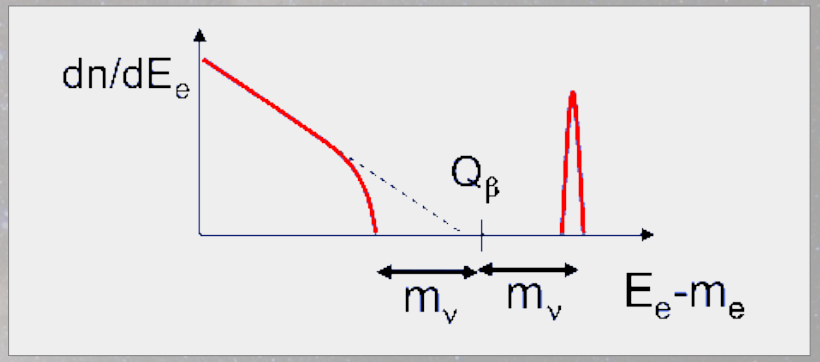


Implications for PTOLEMY

- *PonTecorvo Observatory for light, Early-Universe, Massive-neutrino Yield*
- Relic neutrino capture in tritium:

$$\nu_j + {}^3\mathrm{H} \rightarrow {}^3\mathrm{He} + e^-$$

- Peak at ~2m_ν from true β-decay endpoint
- Energy resolution comparable to m_ν



masses (meV)	matter halo	overdensity f_c | $\Gamma^{\mathrm{D}}_{\mathrm{C}\nu\mathrm{B}}$ (yr^{-1}) | $\Gamma^{\mathrm{M}}_{\mathrm{C}\nu\mathrm{B}}$ (yr^{-1}) {best fit | best fit + baryons | optimistic}		
any	any	no clustering	4.06	8.12
degenerate $m_{\nu_{1,2,3}} = 150$	NFW	2.18 | 2.44 | 2.88	8.8 | 9.9 | 11.7	17.7 | 19.8 | 23.4
	Einasto	1.68 | 1.87 | 2.43	6.8 | 7.6 | 9.9	13.6 | 15.1 | 19.7
minimal (IO) $m_{\nu_3} = 60$	NFW	1.15 | 1.18 | 1.21	4.07 | 4.08 | 4.08	8.15 | 8.15 | 8.16
	Einasto	1.09 | 1.12 | 1.18	4.07 | 4.07 | 4.08	8.14 | 8.14 | 8.15
minimal (NO) $m_{\nu_{1,2}} = 60$	NFW	1.15 | 1.18 | 1.21	4.66 | 4.78 | 4.89	9.31 | 9.55 | 9.77
	Einasto	1.09 | 1.12 | 1.18	4.42 | 4.54 | 4.78	8.84 | 9.07 | 9.55