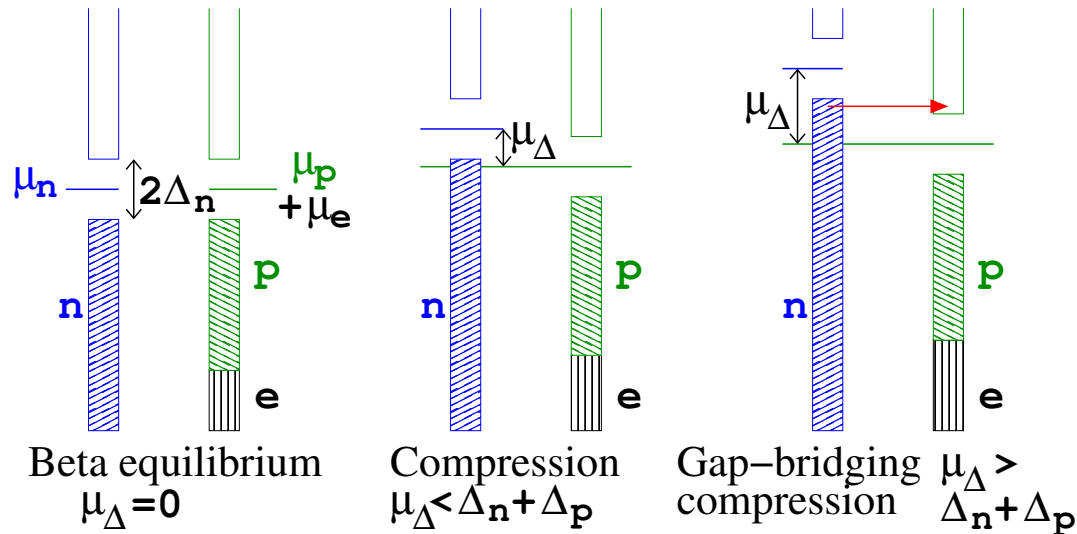


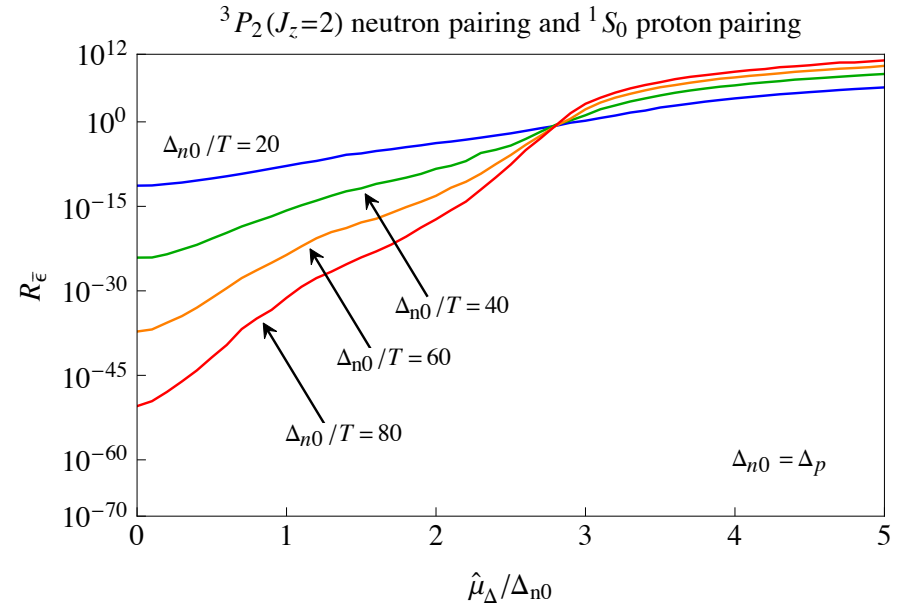
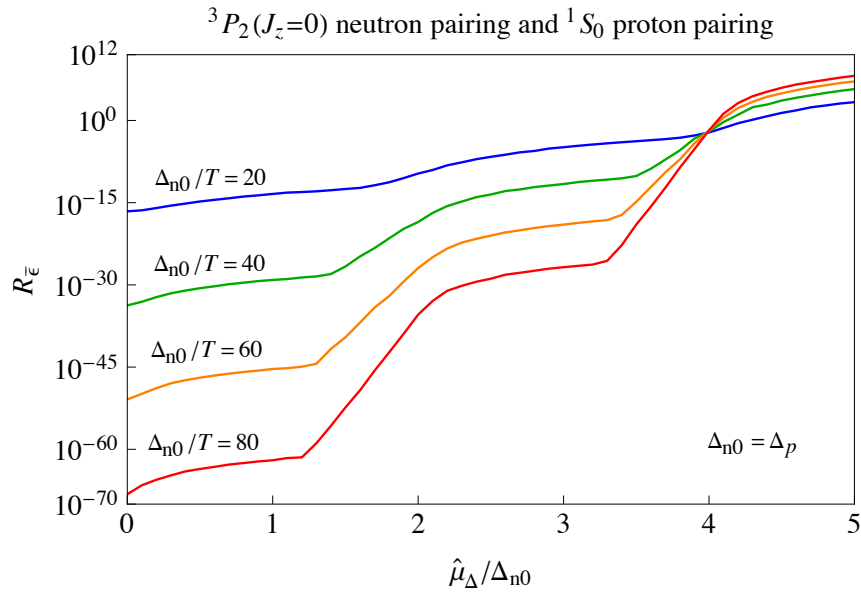
Gap Bridging enhancement of Modified Urca Process in nuclear matter

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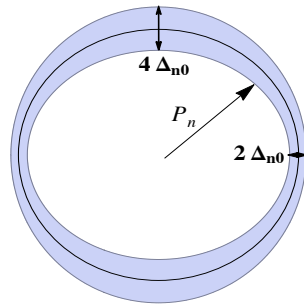
- In superfluid nuclear matter, transport properties (such as neutrino emissivity) are strongly suppressed as $\exp(-\Delta/T)$ by the gap Δ in neutron or proton spectrum.
- Density oscillation of high enough amplitude can unsuppress the exponential suppression of certain transport properties such as neutrino emissivity and bulk viscosity that are dominated by flavor changing weak processes. The mechanism is called "Gap Bridging".



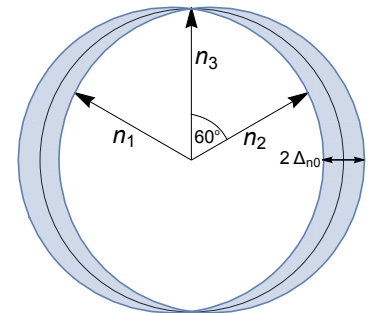
Enhancement of neutrino emissivity for Modified Urca with 3P_2 neutron pairing



$\Delta(\theta) = \Delta_0 \sqrt{1 + 3 \cos^2 \theta}$.
Gap doesn't vanish anywhere.



$\Delta = \Delta_0 \sin \theta$
Gap vanishes at the poles



Consequences:

- The enhancement of neutrino emission due to density oscillation leads to enhanced cooling of the star.
- The enhancement of bulk viscosity leads to nonlinear damping of the mode itself.