25th June 2015
Invisibles15

Helicity and Pair Correlations

A. Kartavtsev, G. Raffelt and HV,
Phys.Rev. D91 (2015), arXiv:1504.03230

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Supernovae

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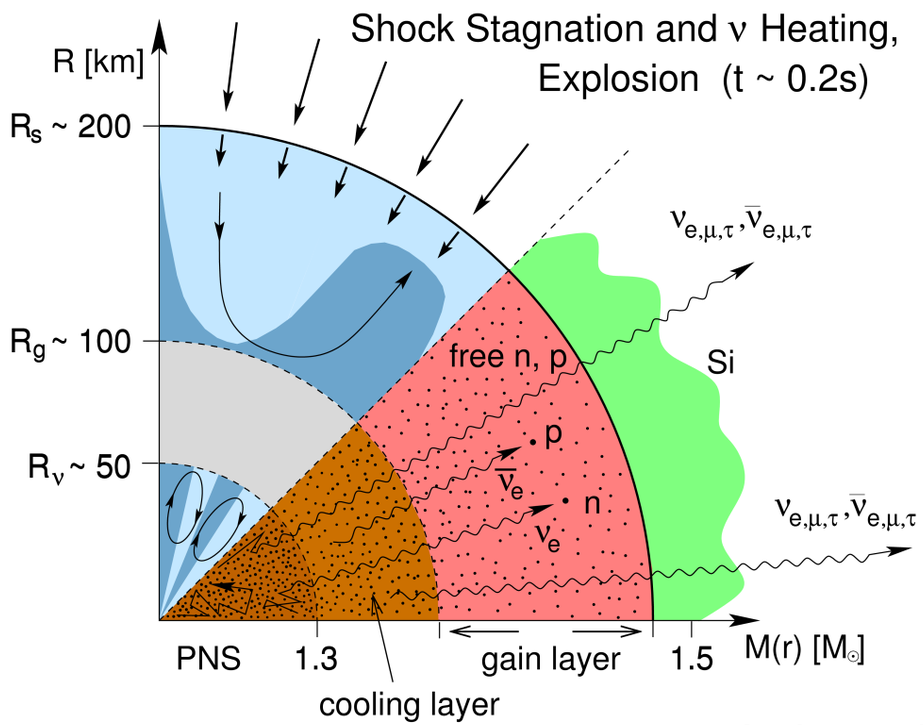
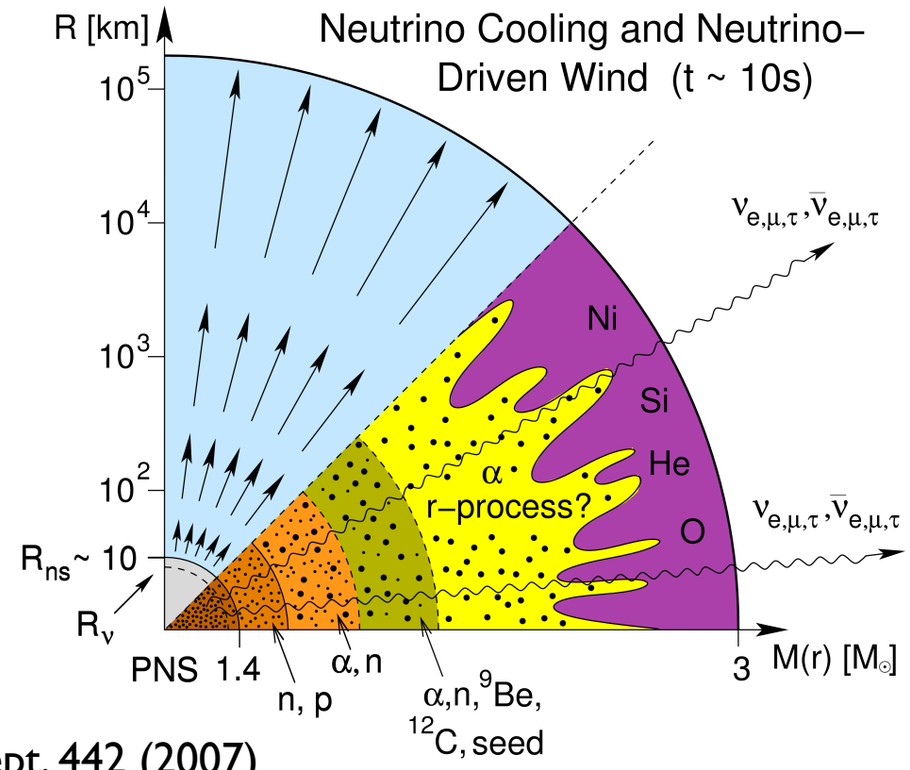
Heating



Cooling



Janka *et al.*, Phys.Rept. 442 (2007)

Flavor Oscillations

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Equation of motion:

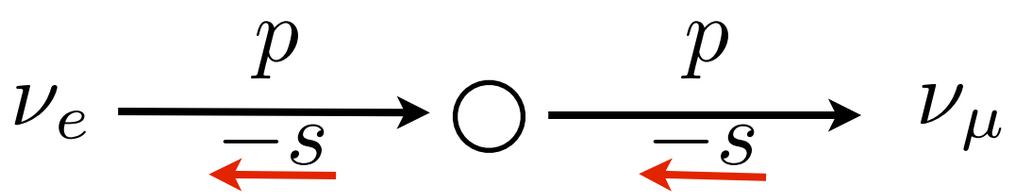
$$i\dot{\rho} = [H, \rho]$$

Density matrices:

$$\delta^3(p-k)\rho_{ij} \propto \langle a_j^\dagger(p) a_i(k) \rangle$$

Sigl, Raffelt (1993)

flavor/mass indices



Helicity Oscillations

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$$\delta^3(p-k)\rho_{ij,sh} \propto \langle a^\dagger_{j,h}(p) a_{i,s}(k)\rangle$$

Helicity Oscillations

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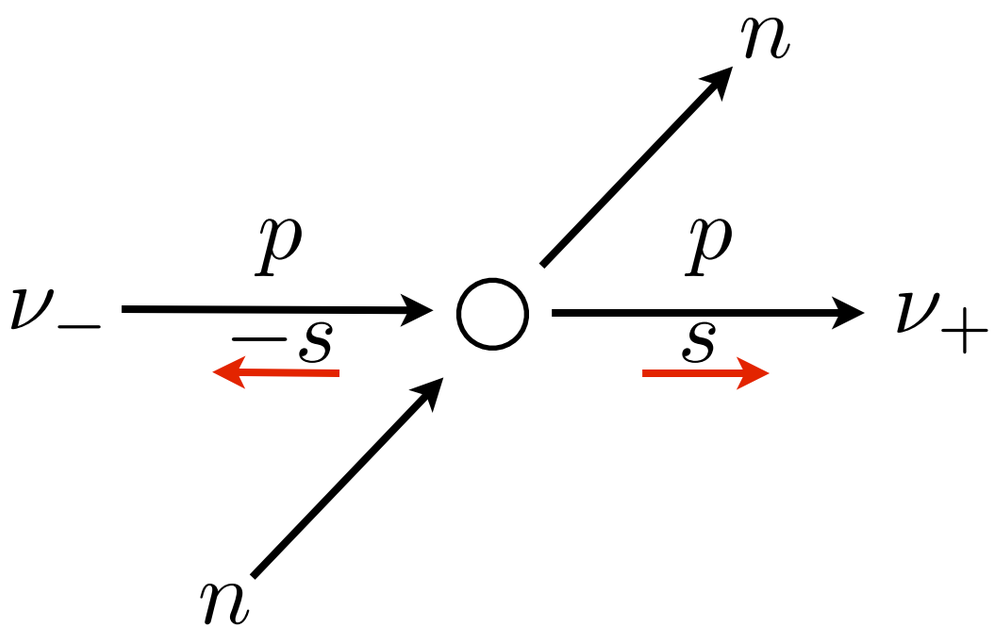
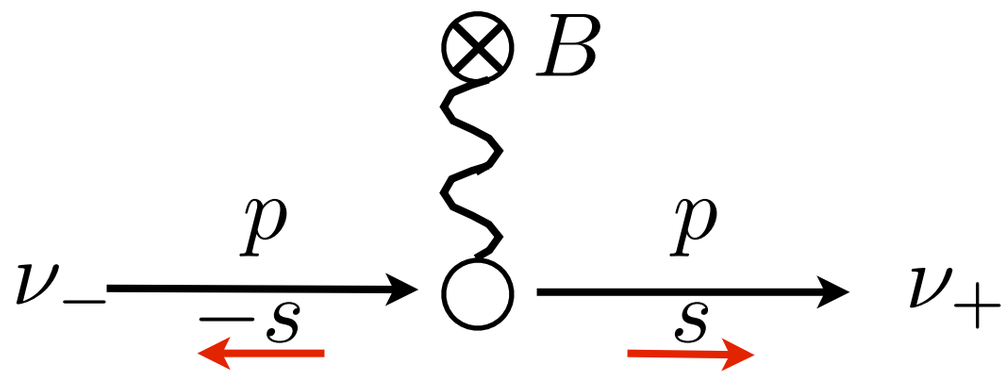
$$\delta^3(p-k)\rho_{ij,sh} \propto \langle a^\dagger_{j,h}(p) a_{i,s}(k)\rangle$$

Matter currents



Magnetic fields



Helicity Oscillations

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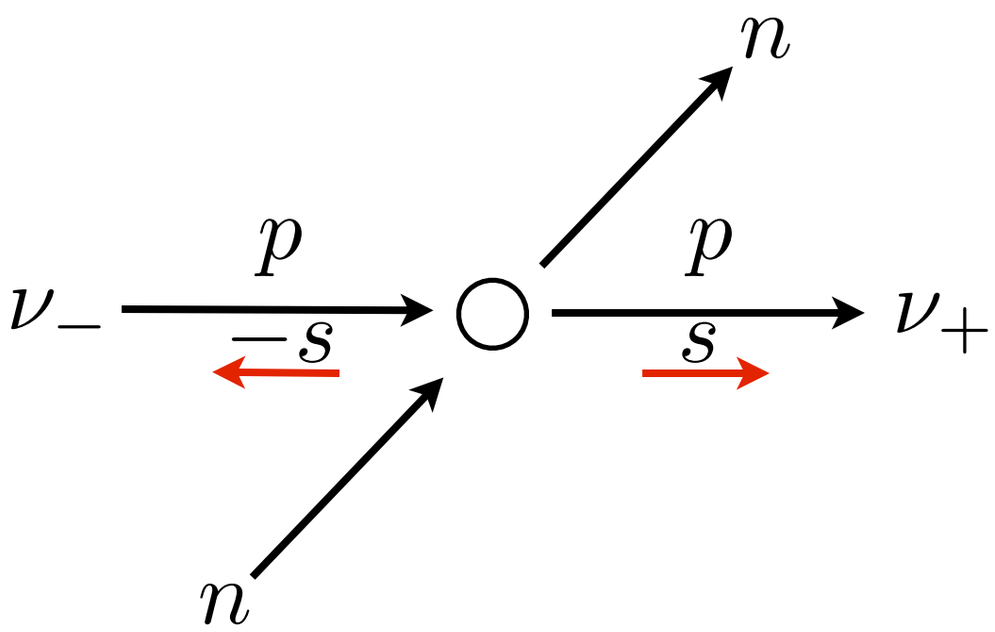
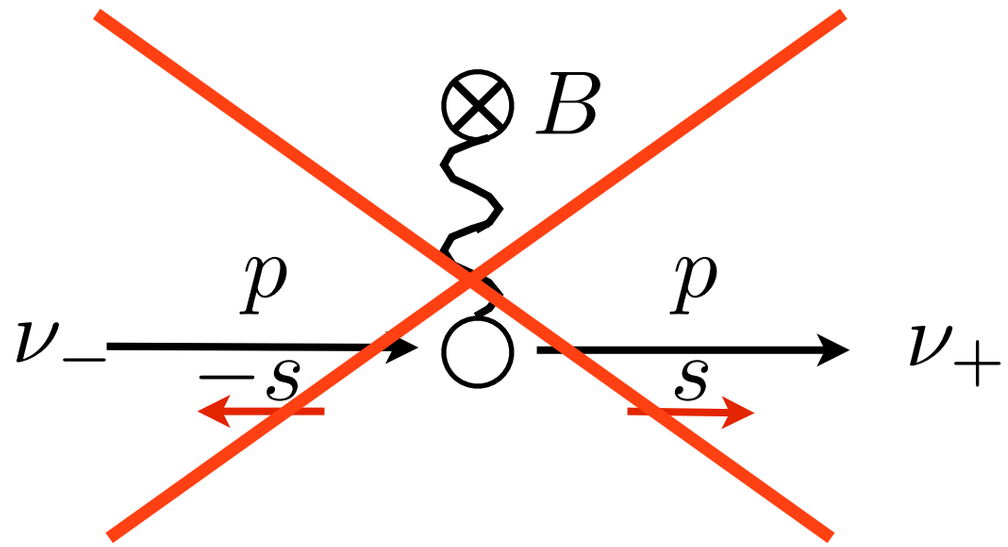
$$\delta^3(p-k)\rho_{ij,sh} \propto \langle a^\dagger_{j,h}(p) a_{i,s}(k)\rangle$$

Matter currents



Magnetic fields



Pair Correlations

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$$\delta^3(p+k)\kappa \propto \langle b(p)a(k)\rangle$$

Serreau, Volpe (2014)

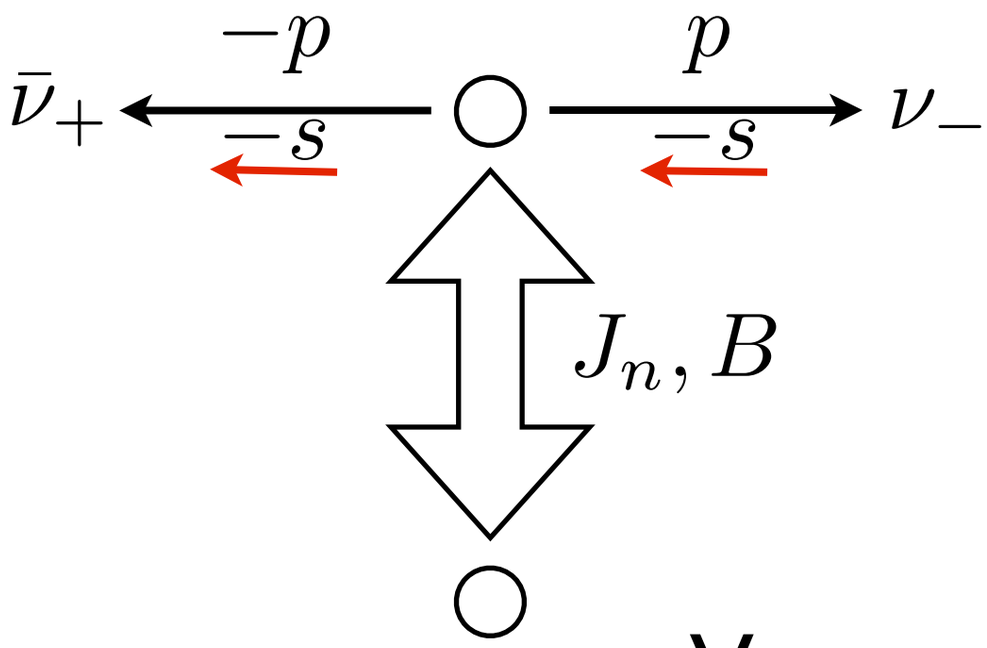
Pair Correlations

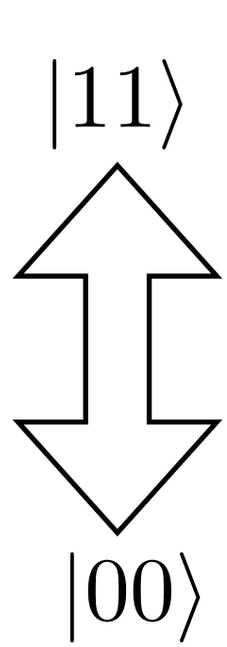
Max-Planck-Institut für Physik
(Werner-Heisenberg-Institut)

$$\delta^3(p+k)\kappa \propto \langle b(p)a(k)\rangle$$

Serreau, Volpe (2014)

$\nu - \bar{\nu}$ pair





Vacuum

Conclusion

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	Typical magnitude	Resonance?
Helicity oscillations	$\rho_{-+} \sim 10^{-11}$	Possible Vlasenko, Fuller, Cirigliano (2014)
Pair correlations	$\kappa_{-+} \sim 10^{-11}$	No Kartavtsev, Raffelt, HV (2015)