Polarization analogy in two flavours

2-ν flavors : Formalism

- Expand all matrices in terms of Pauli matrices as

$$X = \frac{I}{2} + \frac{1}{2} \sum_{i=1,2,3} \mathrm{X}_i \, \sigma_i$$

- The following vectors result from the matrices

$$\rho_{\mathrm{p}} \Leftrightarrow \mathbf{P}_\omega$$

$$H_{\mathrm{p}}^0 \Leftrightarrow \omega \, \mathbf{B}$$

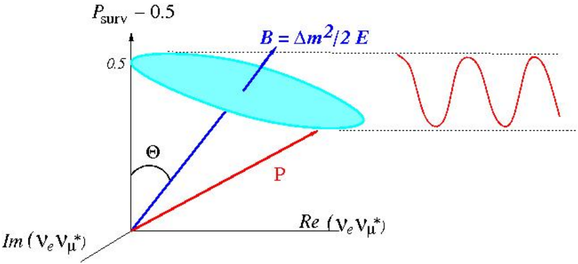
$$V \Leftrightarrow \sqrt{2} G_F N_e \; \mathbf{L} \equiv \lambda \, \mathbf{L}$$

$$H_{\mathrm{p}}^{\nu\nu} \Leftrightarrow \sqrt{2} G_F (n + \bar{n}) \int d\omega \, f(\omega) \, \mathbf{P}_\omega \, \mathrm{sgn}(\omega) \equiv \mu \, \mathbf{D}$$

- EOM resembles spin precession

$$\frac{d}{dr} \mathbf{P}_\omega = (h\omega \, \mathbf{B} + \lambda \, \mathbf{L} + \mu \, \mathbf{D}) \times \mathbf{P}_\omega \equiv \mathbf{H}_\omega \times \mathbf{P}_\omega$$

Precession of the polarization vector



- Density matrix $\rho = P_0/2 + \vec{P} \cdot \vec{\sigma}$
- Half-angle of precession $= \theta =$ mixing angle
- Different energies: same cone, different precession speeds

Precession picture of MSW resonance