

## Measurement of CPV

$$\begin{aligned}
 P_{e\mu} &\simeq \sin^2 2\theta_{13} \frac{\cos^2 \theta_{23} \sin^2[(1 \pm \hat{A})\Delta]}{\sin^2 \theta_{23} (1 \pm \hat{A})^2} \quad \alpha \equiv \frac{\Delta m_{21}^2}{\Delta m_{31}^2}, \quad \Delta \equiv \frac{\Delta m_{31}^2 L}{4E}, \quad \hat{A} \equiv \frac{2\sqrt{2}G_F n_e E}{\Delta m_{31}^2} \\
 &\stackrel{=}{=} \alpha \sin 2\theta_{13} \sin 2\theta_{12} \sin 2\theta_{23} \sin \delta_{\text{CP}} \sin(\Delta) \frac{\sin(\hat{A}\Delta) \sin[(1 \pm \hat{A})\Delta]}{\hat{A} (1 \pm \hat{A})} \\
 &\stackrel{-}{+} \alpha \sin 2\theta_{13} \sin 2\theta_{12} \sin 2\theta_{23} \cos \delta_{\text{CP}} \cos(\Delta) \frac{\sin(\hat{A}\Delta) \sin[(1 \pm \hat{A})\Delta]}{\hat{A} (1 \pm \hat{A})} \\
 &+ \alpha^2 \frac{\sin^2 \theta_{23}}{\cos^2 \theta_{23}} \sin^2 2\theta_{12} \frac{\sin^2(\hat{A}\Delta)}{\hat{A}^2}
 \end{aligned}$$

- **Antineutrinos:**  $P_{\bar{e}\bar{\mu}} = P_{e\mu}(\delta_{\text{CP}}, \rightarrow -\delta_{\text{CP}}, \hat{A} \rightarrow -\hat{A})$
- **Magic baseline:**  $\sin(\hat{A}\Delta) = 0 \Rightarrow \sqrt{2}G_F n_e(L)L = 2\pi$
- **Silver:**  $P_{e\tau} = P_{e\mu}(s_{23}^2 \leftrightarrow c_{23}^2, \sin 2\theta_{23} \rightarrow -\sin 2\theta_{23})$
- **Platinum, Superb.:**  $P_{\mu e} = P_{e\mu}(\delta_{\text{CP}}, \rightarrow -\delta_{\text{CP}})$

(Cervera et al. 2000; Freund, Huber, Lindner, 2000; Huber, Winter, 2003; Akhmedov et al, 2004)