Day-night asymmetry

$$A_{DN} = \frac{N_{day} - N_{night}}{N_{day} + N_{night}}$$

$$P_{le} = \underbrace{\cos^2\theta_m \cos^2(\theta_m - \theta)} + \underbrace{\sin^2\theta_m \sin^2(\theta_m - \theta)}$$
$$+ \underbrace{2 \cos\theta_m \sin\theta_m \cos(\theta_n - \theta)\sin(\theta_m - \theta)} \cos(2\Delta_m L)$$

$$= \cos[\theta_m - (\theta_m - \theta)]^2 - 2\cos\theta_m \sin\theta_m \cos(\theta_m - \theta)\sin(\theta_m - \theta)$$
$$(1 - \cos 2\Delta_m L)$$

$$\rightarrow \cos^2\theta - \sin 2\theta_m \sin(2\theta_m - 2\theta)\sin^2(\Delta_m L)$$

$$P_{1e} - \cos^2\theta = -\sin 2\theta_m \sin(2\theta_m - 2\theta)\sin^2(\Delta_m L)$$

$$P_{2e} - \sin^2\theta = +\sin 2\theta_m \sin(2\theta_m - 2\theta)\sin^2(\Delta_m L)$$

SMA

-1%

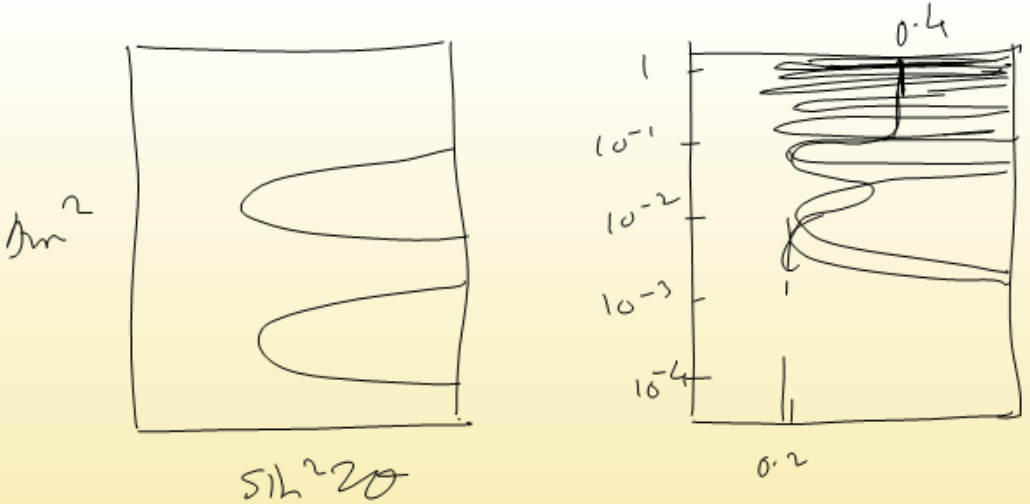
LMA

3% ✓

Assignment 3

1 a) $\sin^2 2\theta_{eff} = 4 s_{23}^2 c_{13}^2 (1 - s_{23}^2 c_{13}^2)$

b) $\sin^2 2\theta_{eff} = \sin^2 2\theta_{13} \sin^2 \theta_{23}$



$$P = \sin^2 2\theta_{13} \sin^2(\Delta_{31} L) = 0.2$$

$$P(\text{large } \Delta m^2) = \frac{1}{2} \sin^2 2\theta_{13} = 0.2$$

4

$10^{-5}\,eV^2$ ~~~ $\sin^2(\Delta_{21}L)$ → 0.5

$\Delta_{21}L \sim 10^{-2}$

$10^{-3}\,eV^2$ ~~~ $\sin^2(\Delta_{31}L)$ Δ_{32}

$\Delta_{31}L \sim 1$

$1\,eV^2$ ~~~ $\sin^2(\Delta_{41}L)$ Δ_{41} Δ_{42}

$\Delta_{41}L \sim 10^3$

0.15

$1.27 \times \frac{1 \times 0.03}{0.2}$ → 0.18