



The Daya Bay Reactor Anti-Neutrino Experiment

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Outline

- ⑥ Neutrino Oscillations (recap)
- ⑥ The Daya Bay Baseline
- ⑥ Hall Layout
- ⑥ Timeline
- ⑥ Requirements

Neutrino Oscillations

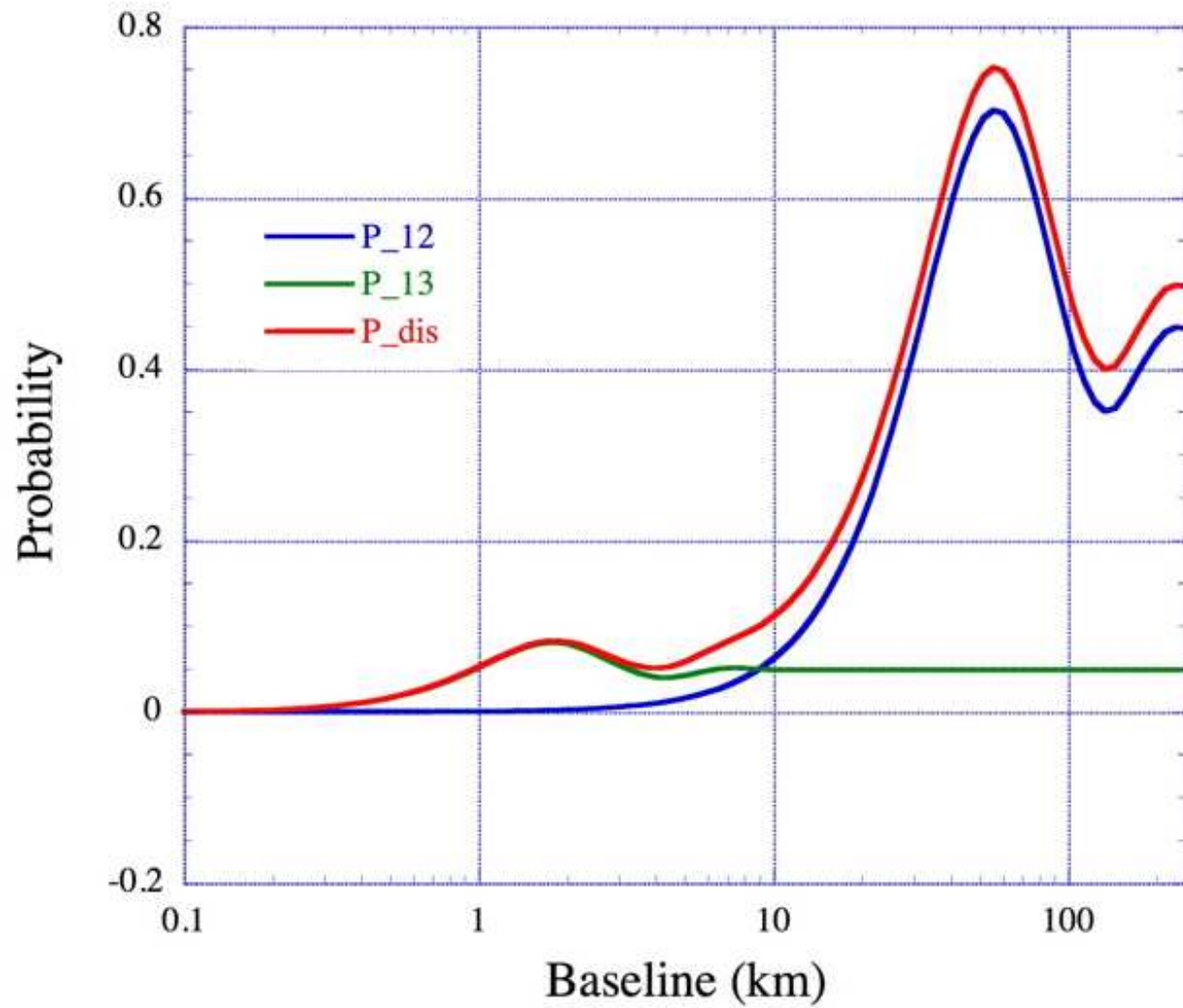
$$\begin{aligned}
 U_{\text{MNSP}} &= \begin{pmatrix} 1 & 0 & 0 \\ 0 & C_{23} & S_{23} \\ 0 & -S_{23} & C_{23} \end{pmatrix} \begin{pmatrix} C_{13} & 0 & \hat{S}_{13}^* \\ 0 & 1 & 0 \\ -\hat{S}_{13} & 0 & C_{13} \end{pmatrix} \begin{pmatrix} C_{12} & S_{12} & 0 \\ -S_{12} & C_{12} & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} e^{i\phi_1} & & \\ & e^{i\phi_2} & \\ & & 1 \end{pmatrix} \\
 &= \begin{pmatrix} C_{12}C_{13} & C_{13}S_{12} & \hat{S}_{13}^* \\ -S_{12}C_{23} - C_{12}\hat{S}_{13}S_{23} & C_{12}C_{23} - S_{12}\hat{S}_{13}S_{23} & C_{13}S_{23} \\ S_{12}S_{23} - C_{12}\hat{S}_{13}C_{23} & -C_{12}S_{23} - S_{12}\hat{S}_{13}C_{23} & C_{13}C_{23} \end{pmatrix} \begin{pmatrix} e^{i\phi_1} & & \\ & e^{i\phi_2} & \\ & & 1 \end{pmatrix}
 \end{aligned}$$

$$-C_{jk} = \cos \theta_{jk} S_{jk} = \sin \theta_{jk} \hat{S}_{13} = e^{i\delta} C P \sin \theta_{13}$$

Neutrino Oscillations

Our current knowledge of neutrino oscillations is summarized by a recent global fit of the world data to 2σ @ 95 % C.L. by Fogli et al.

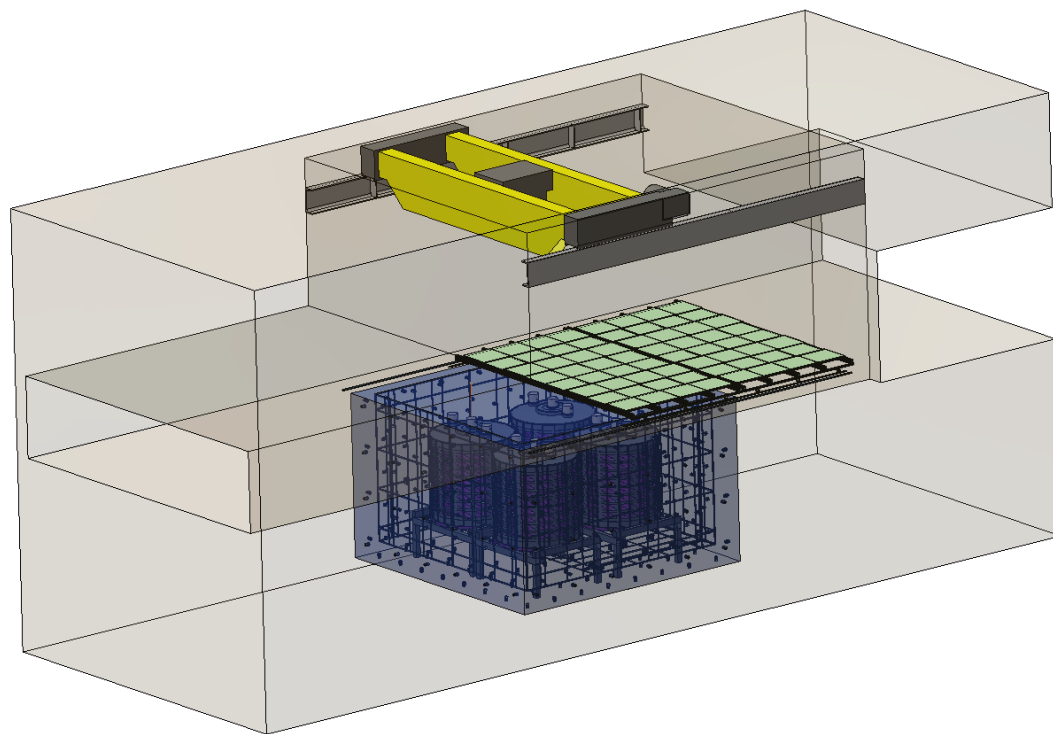
$$\begin{aligned}\Delta m_{21}^2 &= 7.92(1.00 \pm 0.09) \times 10^{-5} \text{ eV}^2 \\ \sin^2 \theta_{12} &= 0.314(1.00_{-0.15}^{+0.18}) \\ |\Delta m_{32}^2| &= 2.4(1.00_{-0.26}^{+0.21}) \times 10^{-3} \text{ eV}^2 \\ \sin^2 \theta_{23} &= 0.44(1.00_{-0.22}^{+0.41}) \\ \sin^2 \theta_{13} &= (0.9_{-0.9}^{+2.3}) \times 10^{-2}\end{aligned}$$



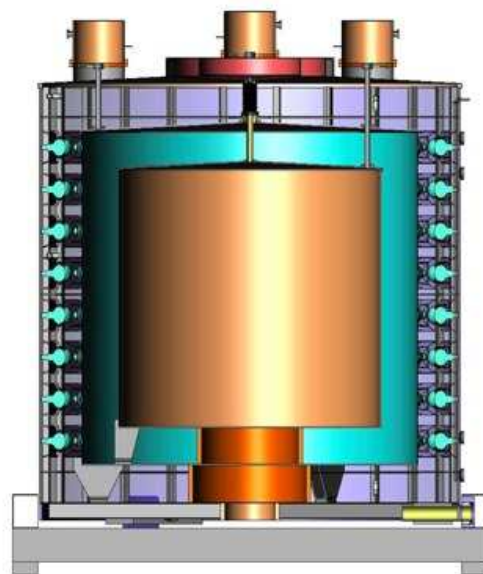
Detector Geometry



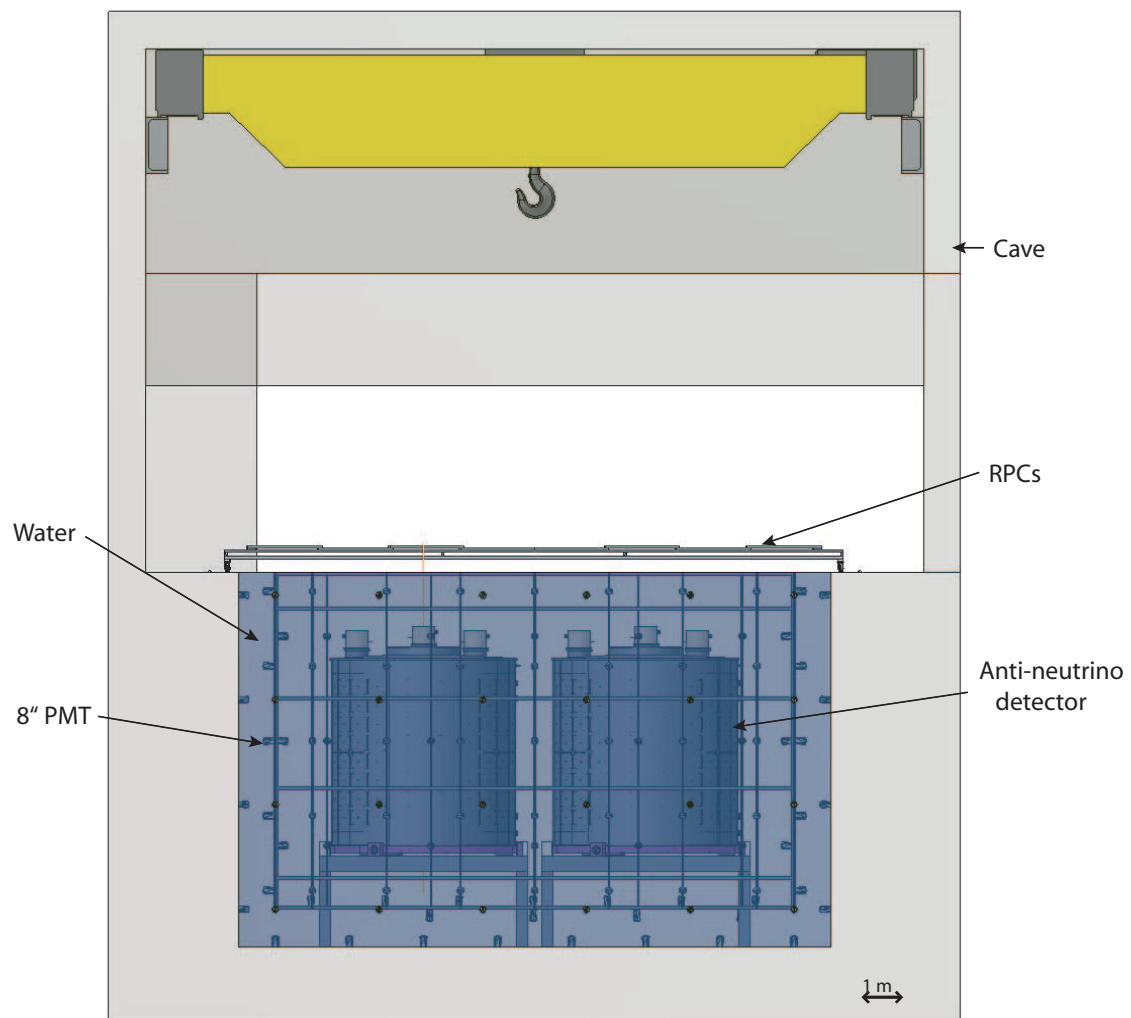
Hall layout



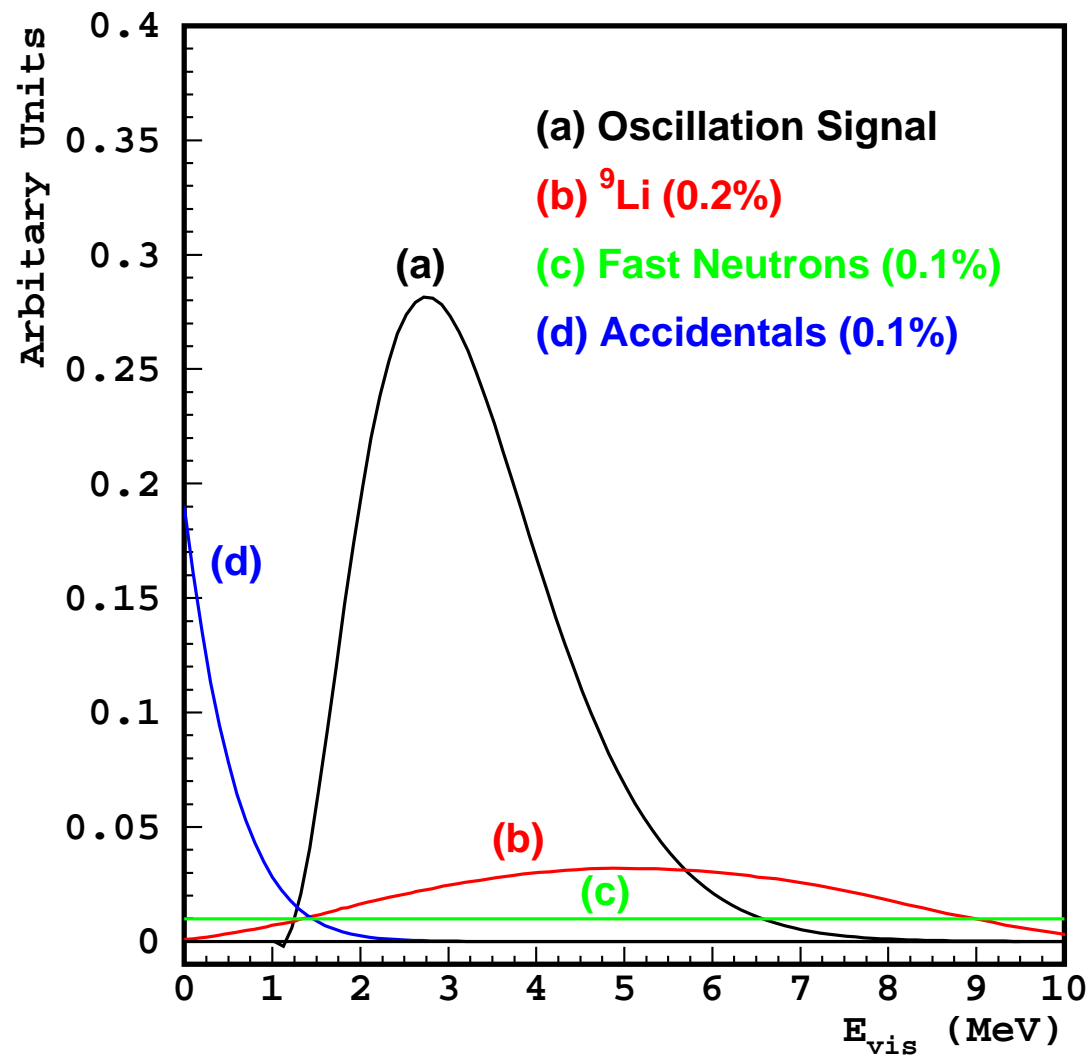
ADs



Muon System



Backgrounds



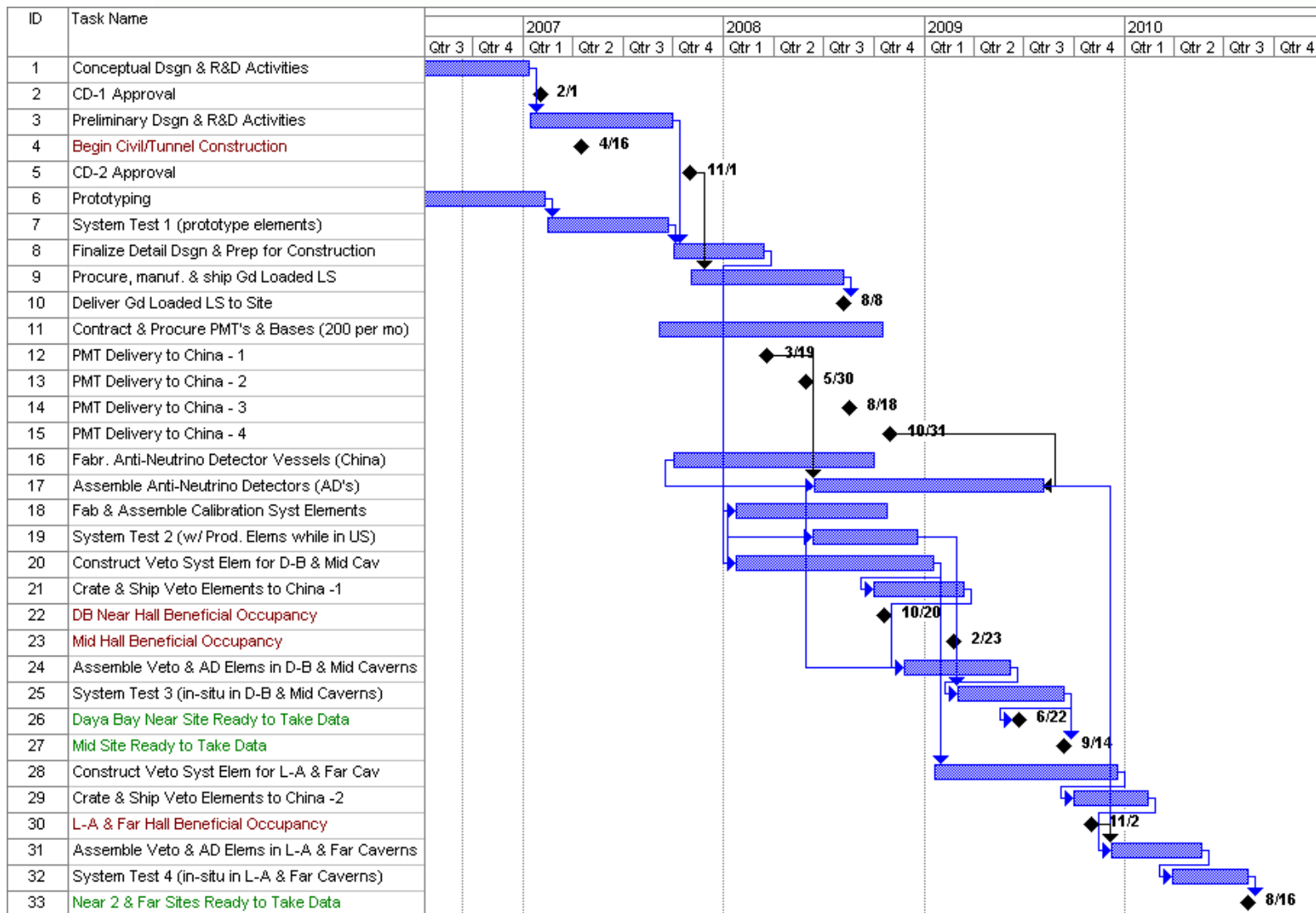
Summary of Determined Requirements:

Item	Requirement
Sensitivity in $\sin^2 2\theta_{13}$ (90% C.L.)	≤ 0.01
Standard error of $\sin^2 2\theta_{13}$	0.0061
Baseline of the far detector	≤ 2 km
Number of events at the Daya Bay near hall	650,000
Number of events at the Ling Ao near site	600,000
Number of events at the far site	170,000
Background/signal	≤ 0.09

Backups



Timeline



rates

