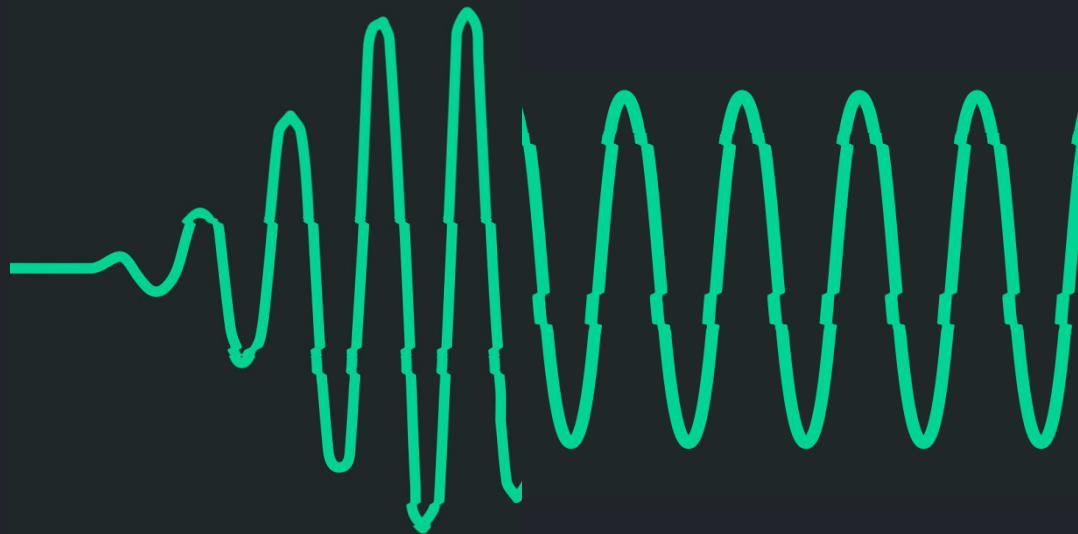
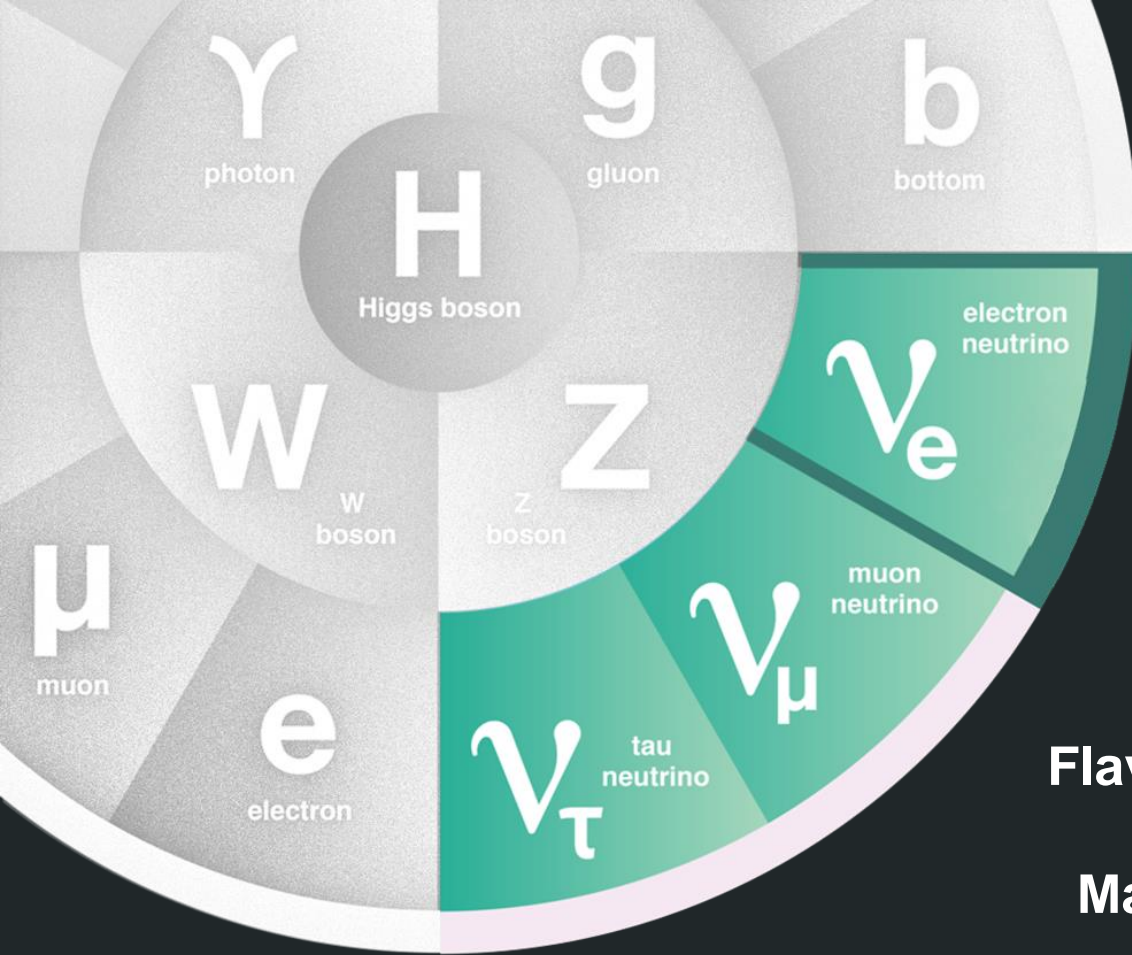


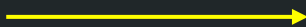
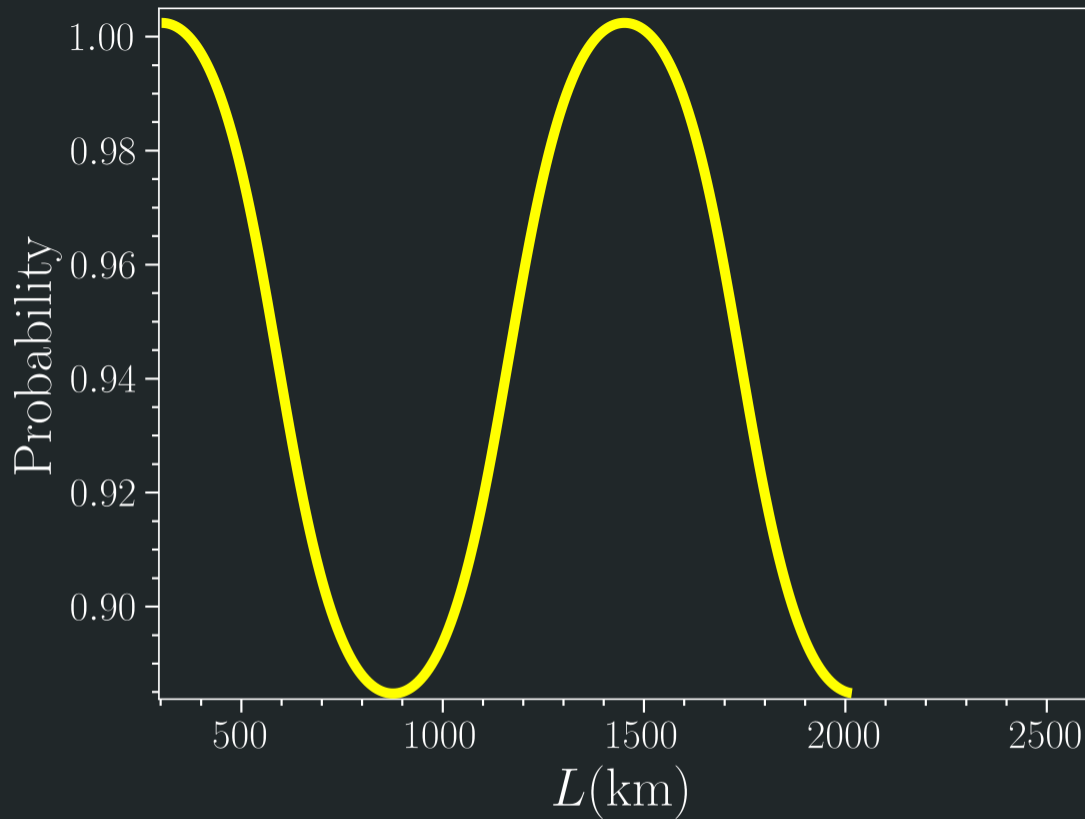
# Can neutrinos really be plane waves?

Impact of wave packet separation in low-energy sterile searches



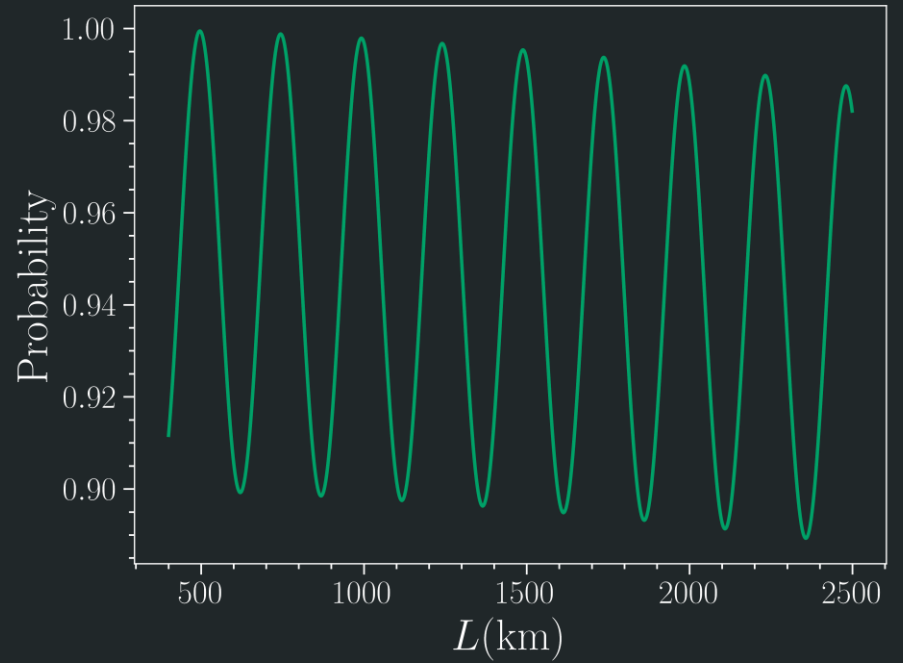


**Flavour eigenstates  
 $\neq$   
Mass eigenstates**



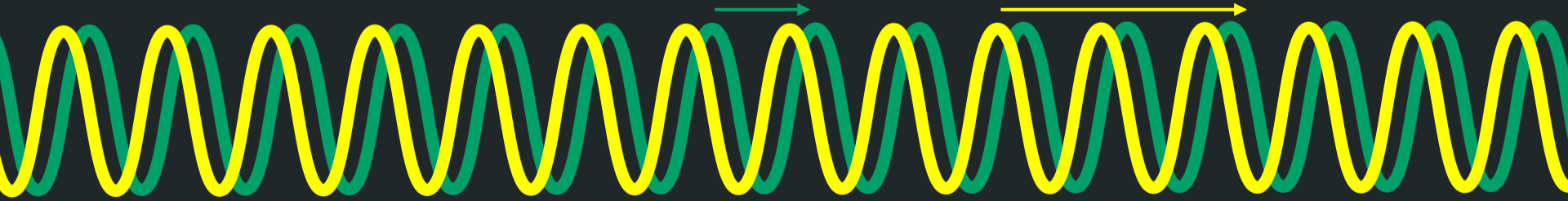
This is a simplification!

# Plane wave approximation

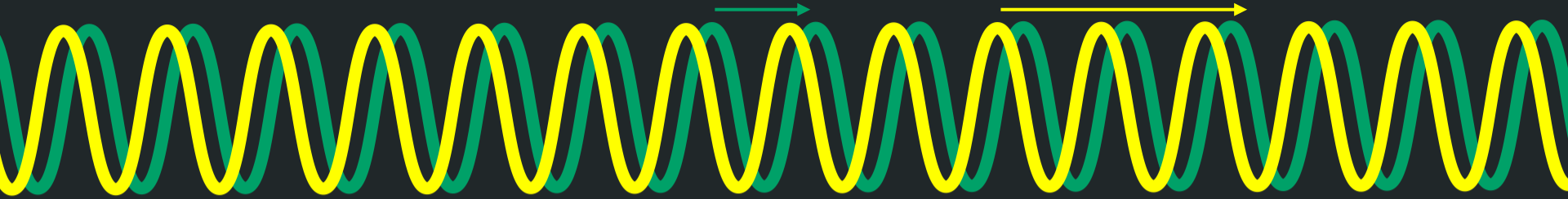


$$P_{\alpha\beta} = \sum_{j,k} U_{\alpha k}^* U_{U\alpha j} U_{\beta k} U_{\beta j}^* e^{\frac{-2\pi i L}{L_{\text{osc}}}}$$

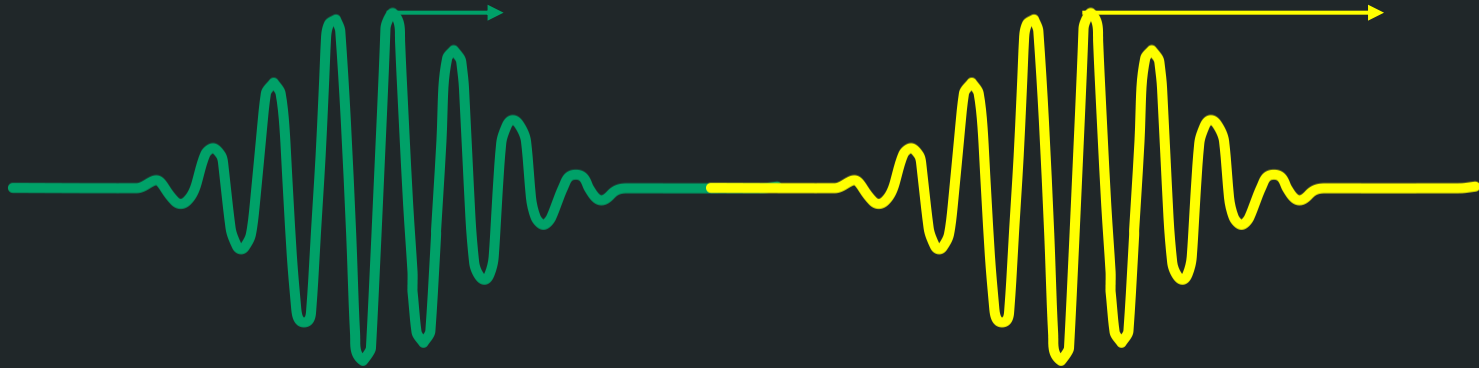
$$L_{\text{osc}} = \frac{4\pi E}{\Delta m_{kj}^2}$$



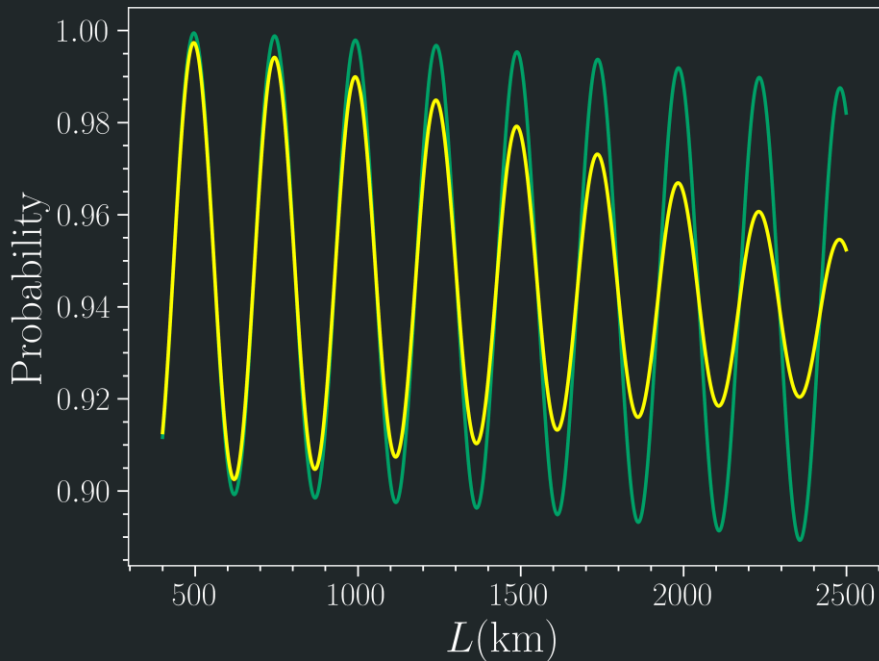
Plane waves always overlap,



Plane waves always overlap,  
wave packets can separate.

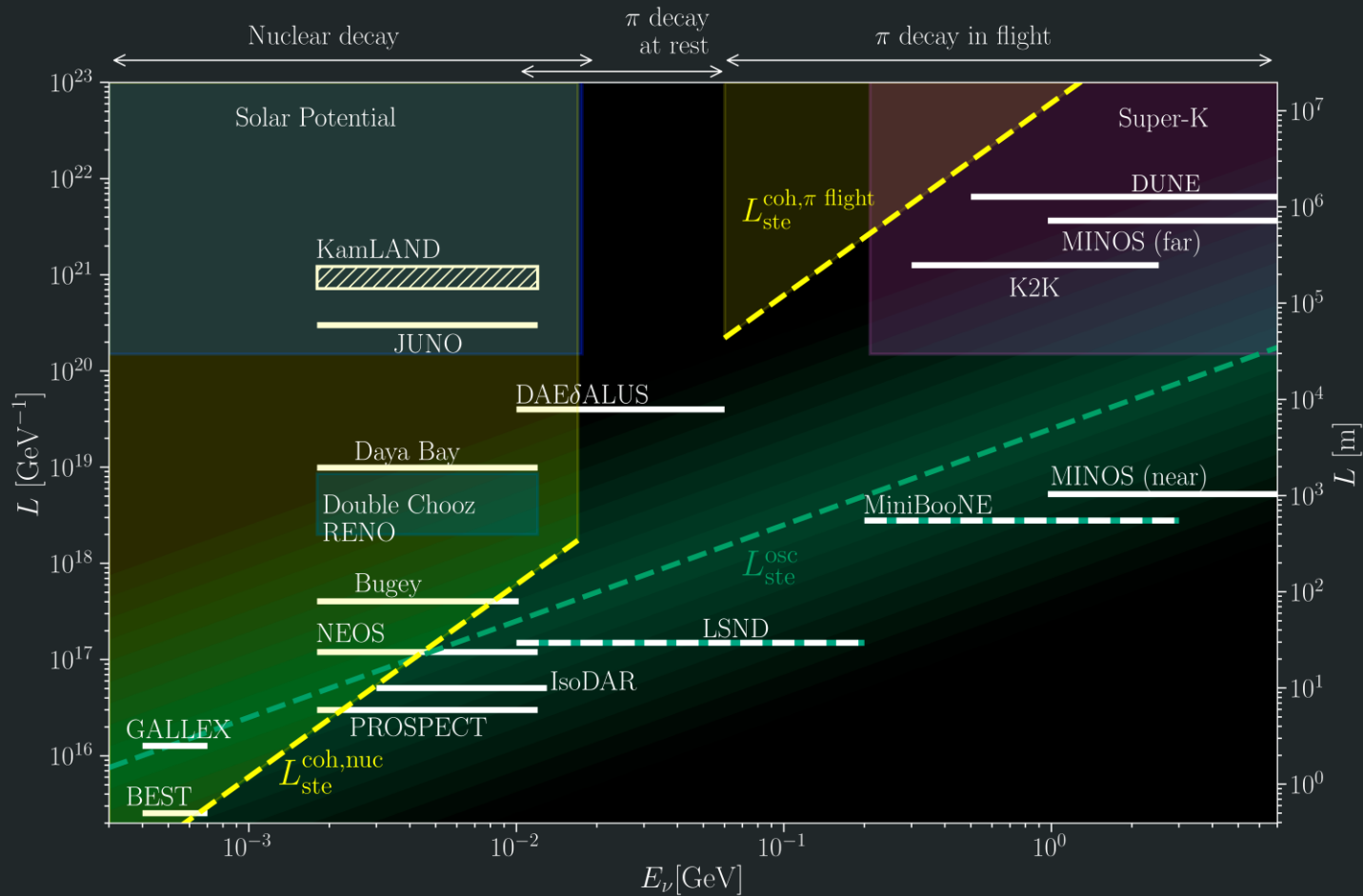


# Wave packet formalism

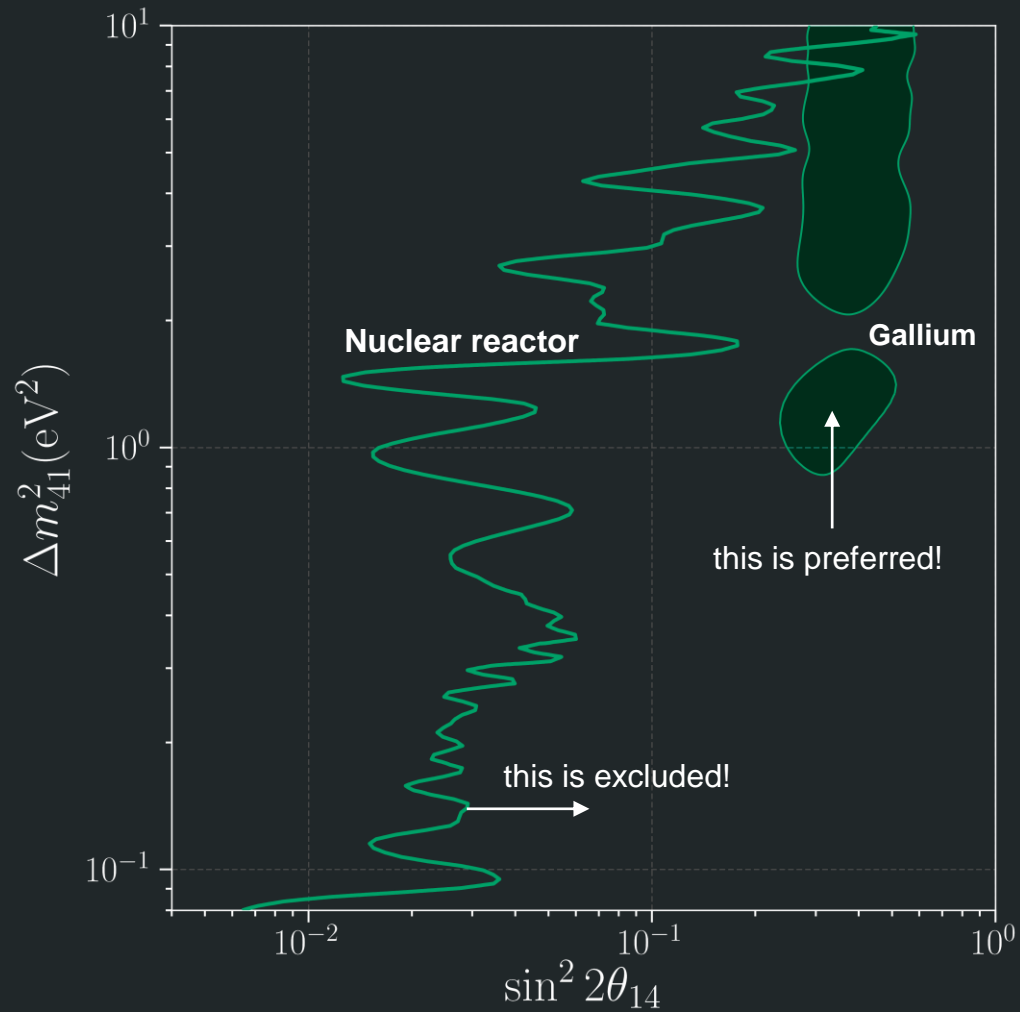


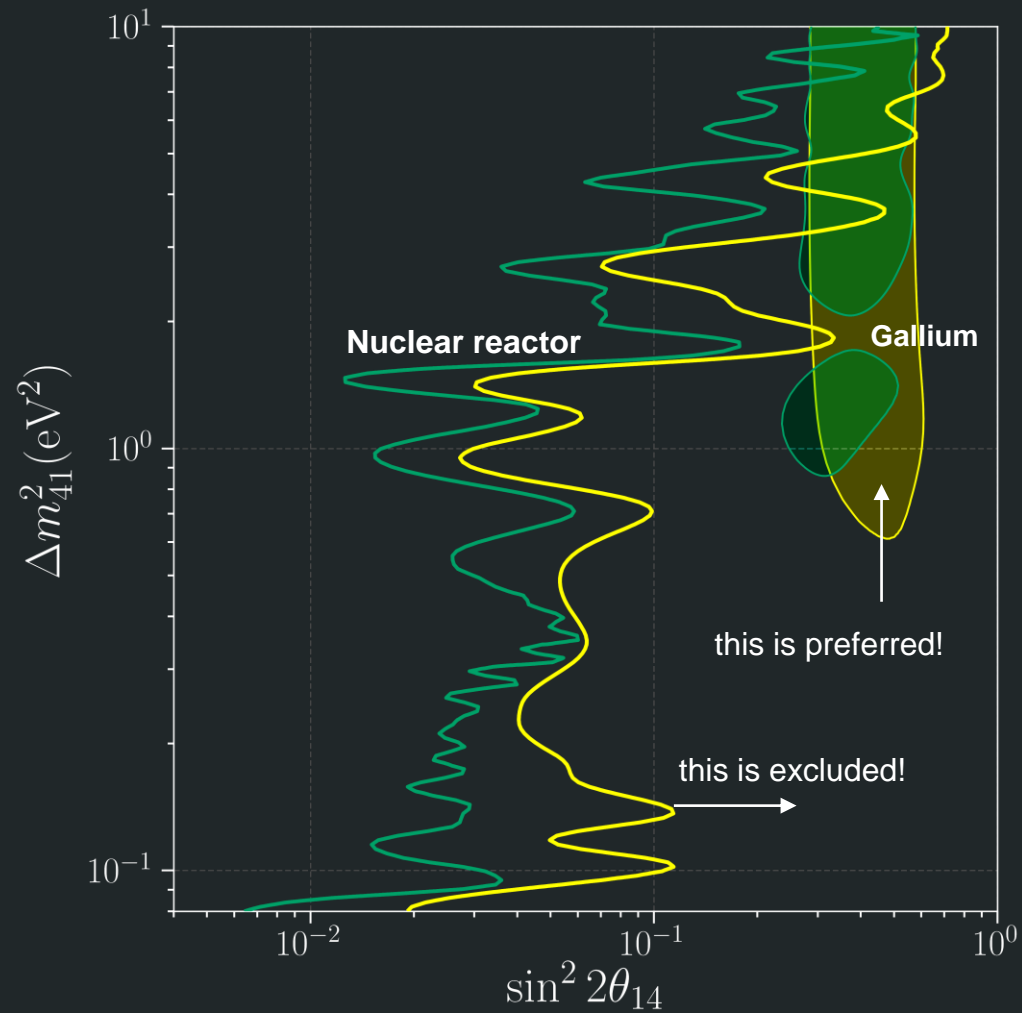
Giunti, Kim, hep-ph/9711363

$$P_{\alpha\beta} = \sum_{j,k} U_{\alpha k}^* U_{U\alpha j} U_{\beta k} U_{\beta j}^* e^{\frac{-2\pi i L}{L_{\text{osc}}}} e^{-L^2/L_{\text{coh}}^2} \quad L_{\text{osc}} = \frac{4\pi E}{\Delta m_{kj}^2} \quad L_{\text{coh}} = \frac{4\sqrt{2}E^2\sigma_x}{\Delta m_{kj}^2}$$

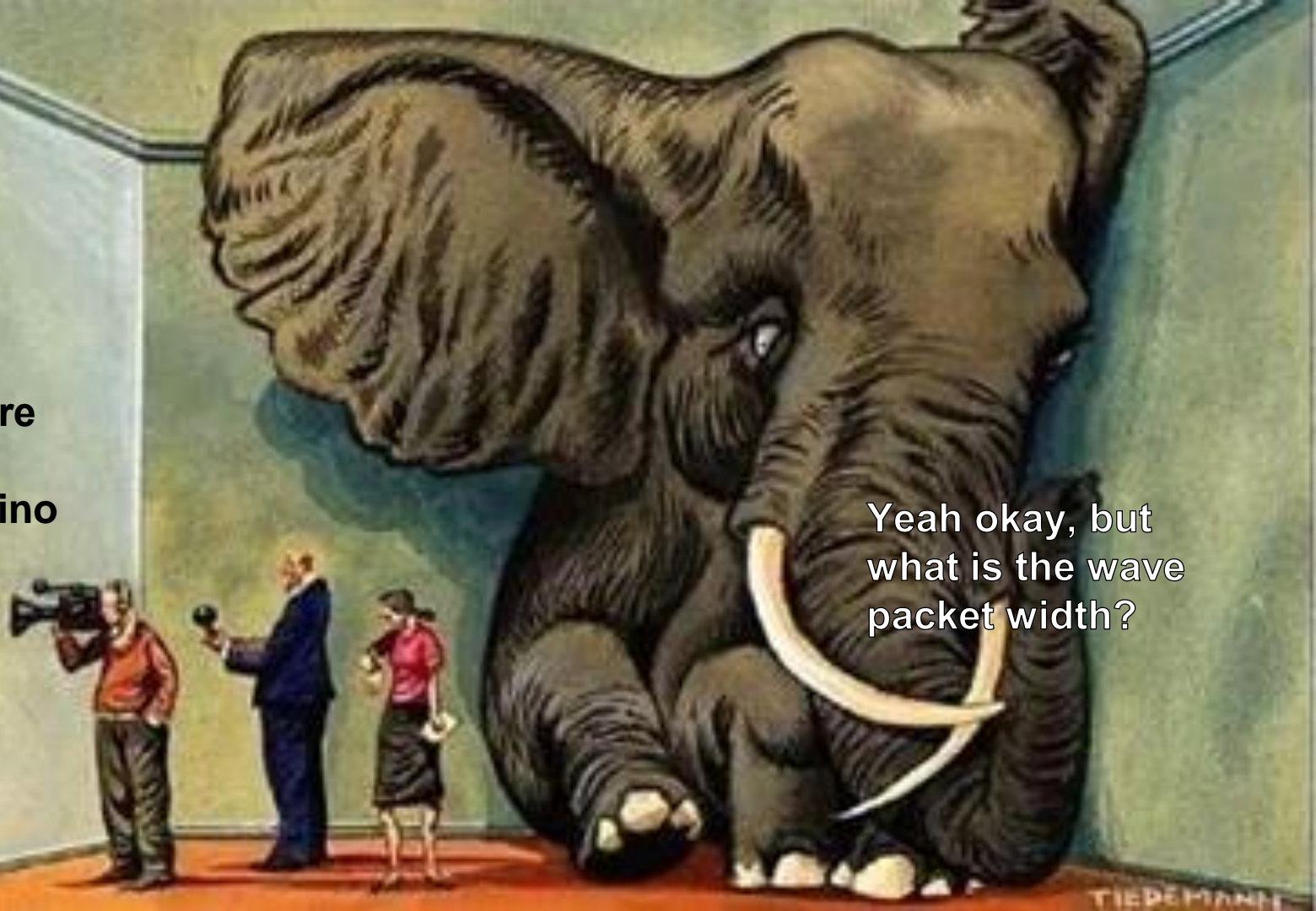






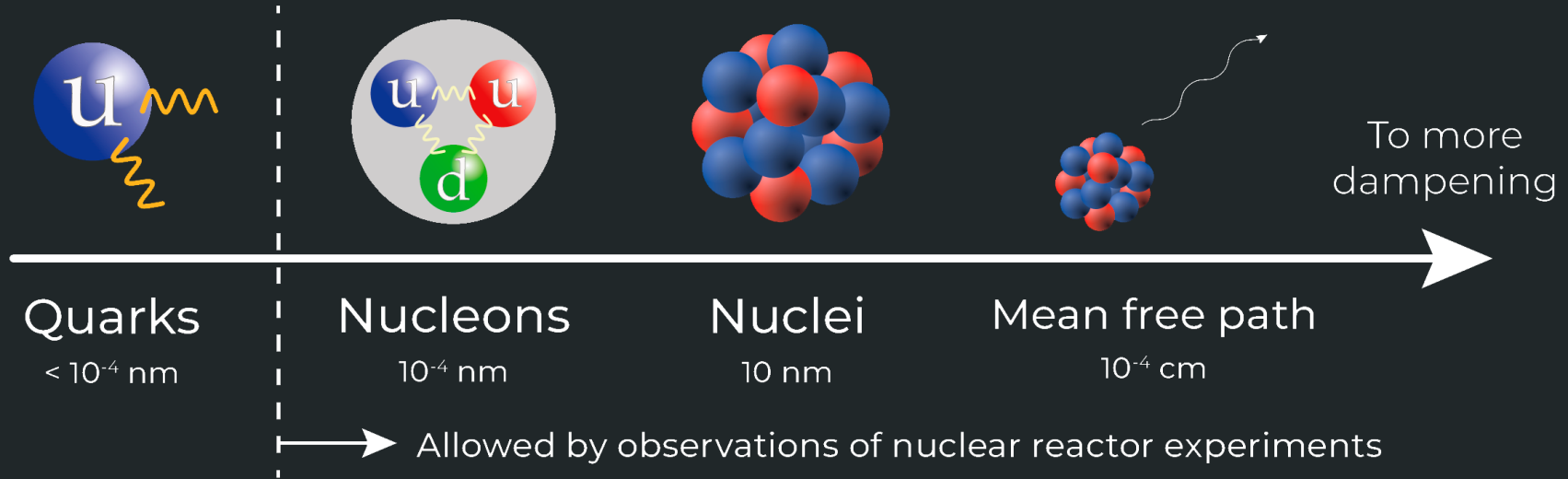


**Oh wow we're  
solving the  
sterile neutrino  
tension!**

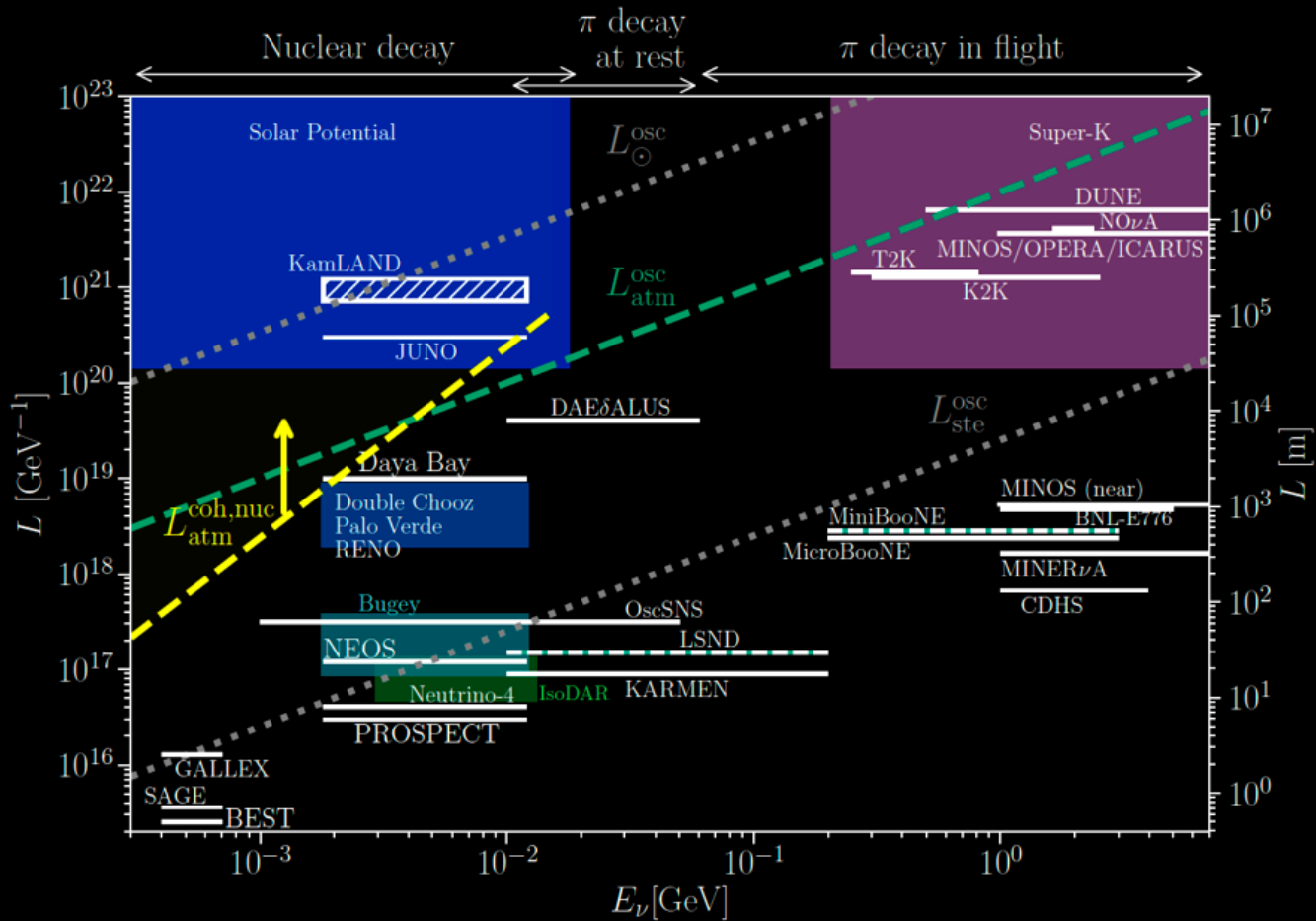


**Yeah okay, but  
what is the wave  
packet width?**

# What is the size of the wave packet?

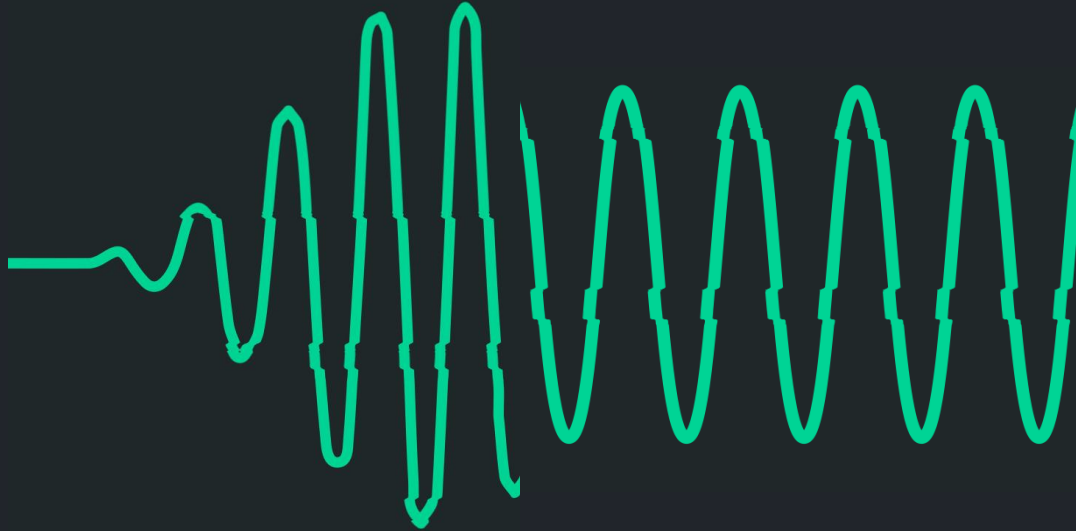


# Will JUNO shed some light?



# What will future experiments tell us?

Until then, let's not forget about the wave packet width!



I'll be glad to discuss more in my poster or you may check 2201.05108.

Thank you!