



Neutrino-nucleus coherent elastic scattering as a test of the standard model and the search for new physics.

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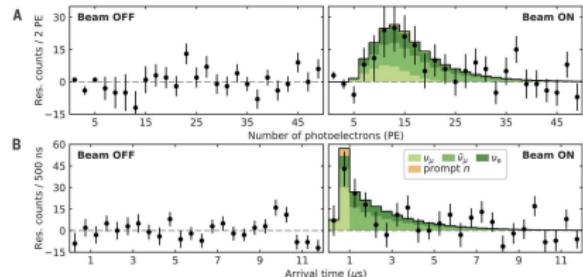
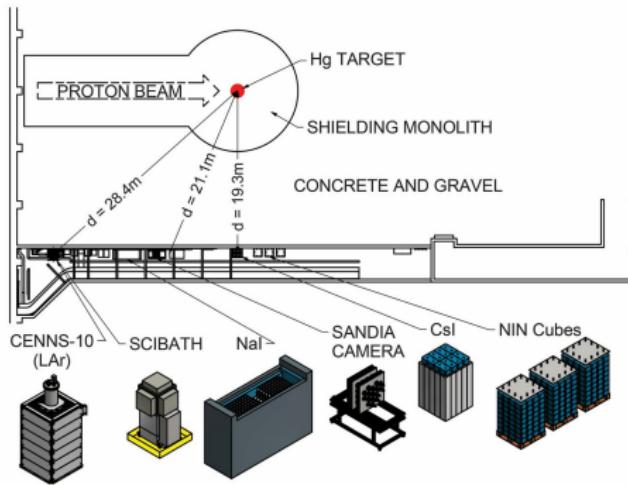
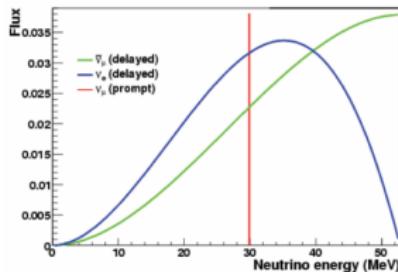
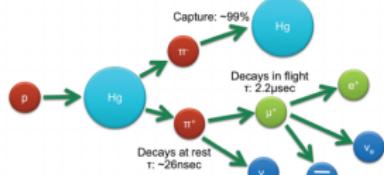
Sixth Colombian Meeting on High Energy Physics

November 29th-December 3rd, 2021

 COMHEP

First measurement of CEvNS: COHERENT collaboration

Oak Ridge National Laboratory Spallation Neutron Source (SNS)

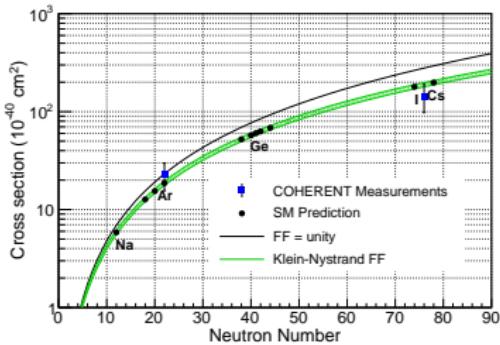
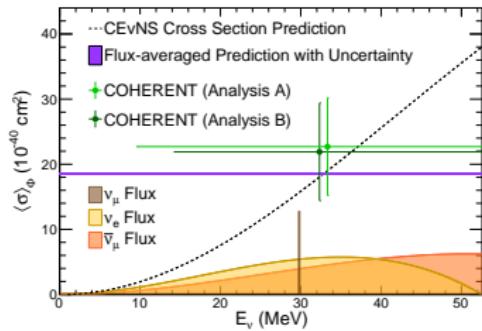


<https://science.sciencemag.org/content/357/6356/1123>

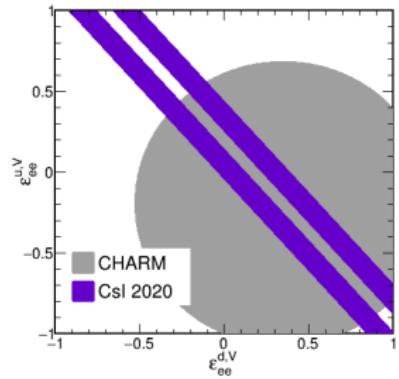
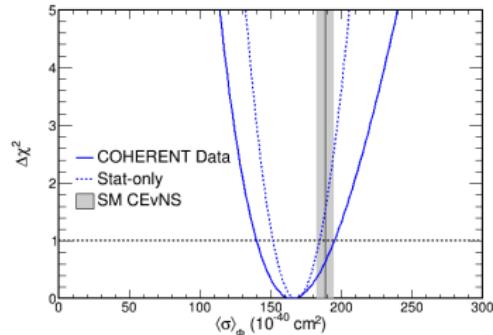
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First Measurement of Coherent Elastic Neutrino-Nucleus Scattering on Argon.

Phys.Rev.Lett. 126 (2021) 1, 012002



Measurement of the Coherent Elastic Neutrino-Nucleus Scattering Cross Section on CsI by COHERENT. arXiv:2110.07730 [hep-ex]



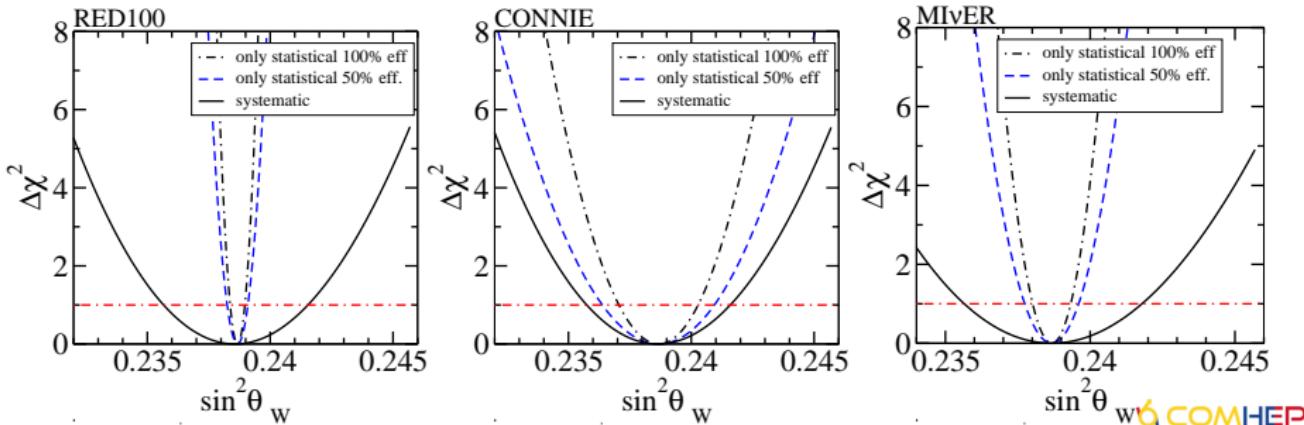
Future perspectives for a weak mixing angle measurement in CEvNS experiments

$$\left(\frac{d\sigma}{dT} \right)_{\text{SM}}^{\text{coh}} = \frac{G_F^2 M}{2\pi} \left[1 - \frac{MT}{E_\nu^2} + \left(1 - \frac{T}{E_\nu} \right)^2 \right] [Zg_V^p F_Z(q^2) + Ng_V^n F_N(q^2)]^2,$$

where

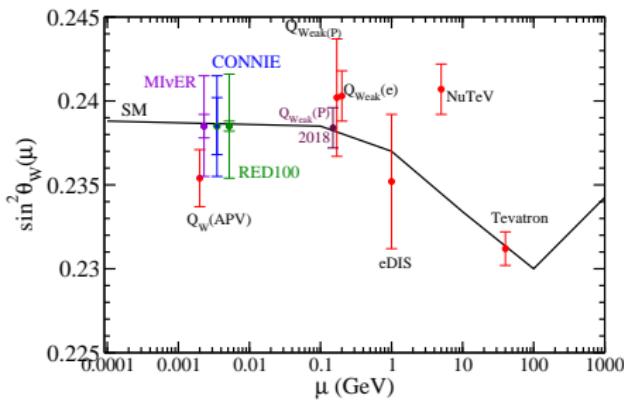
$$g_V^p = \rho_{\nu N}^{NC} \left(\frac{1}{2} - 2\hat{\kappa}_{\nu N} \hat{s}_Z^2 \right) + 2\lambda^{uL} + 2\lambda^{uR} + \lambda^{dL} + \lambda^{dR},$$

$$g_V^n = -\frac{1}{2} \rho_{\nu N}^{NC} + \lambda^{uL} + \lambda^{uR} + 2\lambda^{dL} + 2\lambda^{dR}.$$

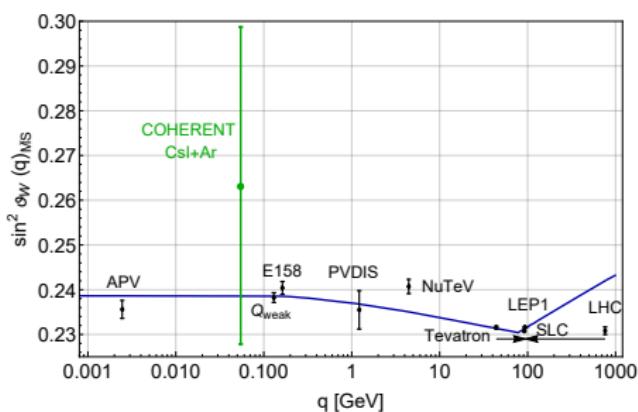


Cañas, B.C. et al., Phys.Lett.B 784 (2018) 159-162

Future perspectives for a weak mixing angle measurement in CEvNS experiments



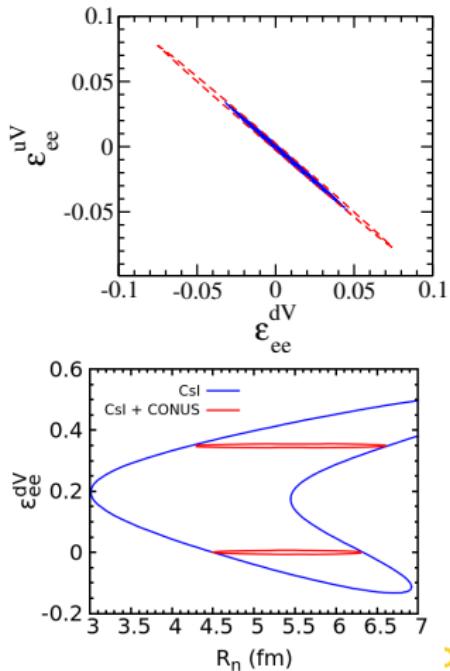
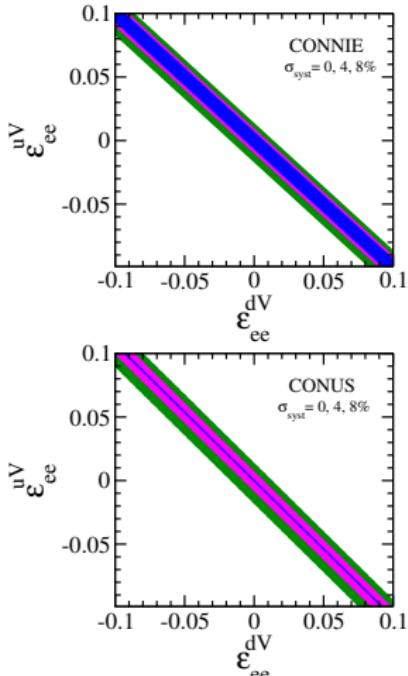
Cañas, B.C. et.al., Phys.Lett.B 784 (2018) 159-162



Cadeddu, M. et.al., Phys.Rev.D 102, 015030 (2020)

Non-standard contributions to neutrino-nucleus coherent scattering

$$\left(\frac{d\sigma}{dT} \right)_{NSI}^{coh} \simeq \frac{G_F^2 M}{\pi} \left(1 - \frac{MT}{2E_\nu^2} \right) \left\{ \left[Z \left(g_V^p + 2\varepsilon_{ee}^{uV} + \varepsilon_{ee}^{dV} \right) F_Z^V(Q^2) + N \left(g_V^n + \varepsilon_{ee}^{uV} + 2\varepsilon_{ee}^{dV} \right) F_N^V(Q^2) \right]^2 \right. \\ \left. + \sum_{\alpha} \left[Z \left(2\varepsilon_{\alpha e}^{uV} + \varepsilon_{\alpha e}^{dV} \right) F_Z^V(Q^2) + N \left(\varepsilon_{\alpha e}^{uV} + 2\varepsilon_{\alpha e}^{dV} \right) F_N^V(Q^2) \right]^2 \right\}$$



Cañas, B.C. et.al., Phys.Rev.D 101, 035012 (2020)

Conclusions

- ✓ We have computed the expected sensitivity for different CEvNS proposals and we have shown the viability of such a measurement with a reasonable accuracy. Moreover, if the systematic errors can be reduced, the measurement of the weak mixing angle from CEvNS experiments can be even better than the one coming from electron weak charge.
- ✓ We have computed the expected sensitivity to NSI for different CEvNS proposals in reactor neutrinos and showed how, in combination with SNS experiments, they can contribute to have robust measurement of the mean neutron radius while improving NSI constraints at the same time.

Thanks for your attention