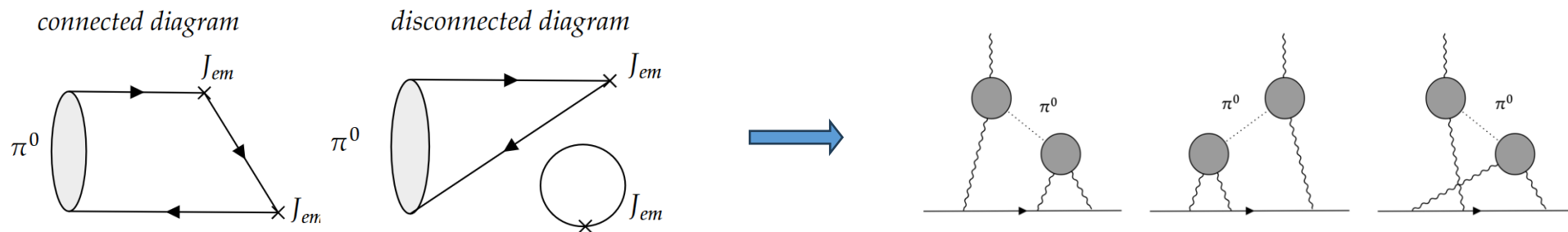


Pion TFF and pion pole contribution to HLbL

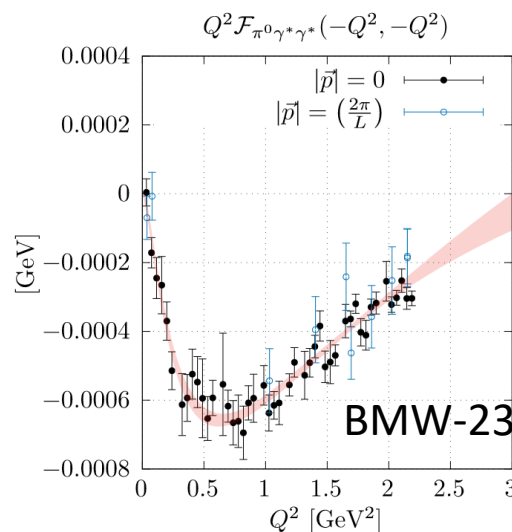
π^0 transition form factor (TFF) $\Rightarrow \pi^0$ -pole contribution to HLbL



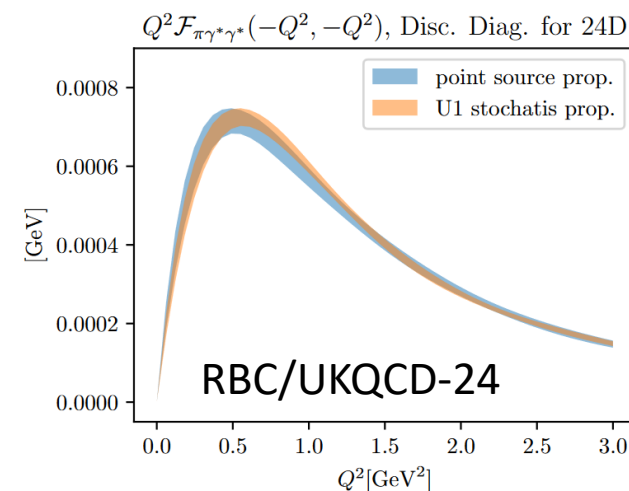
Main issue

- similar TFF shape, but **positive** vs **negative** disconnected signs
- shift $a_\mu^{\pi^0\text{-pole}}$ by $\sim 2\%$
- Comparable to current lattice uncertainties

Resolving this lattice discrepancy is essential for a controlled pion-pole HLbL prediction



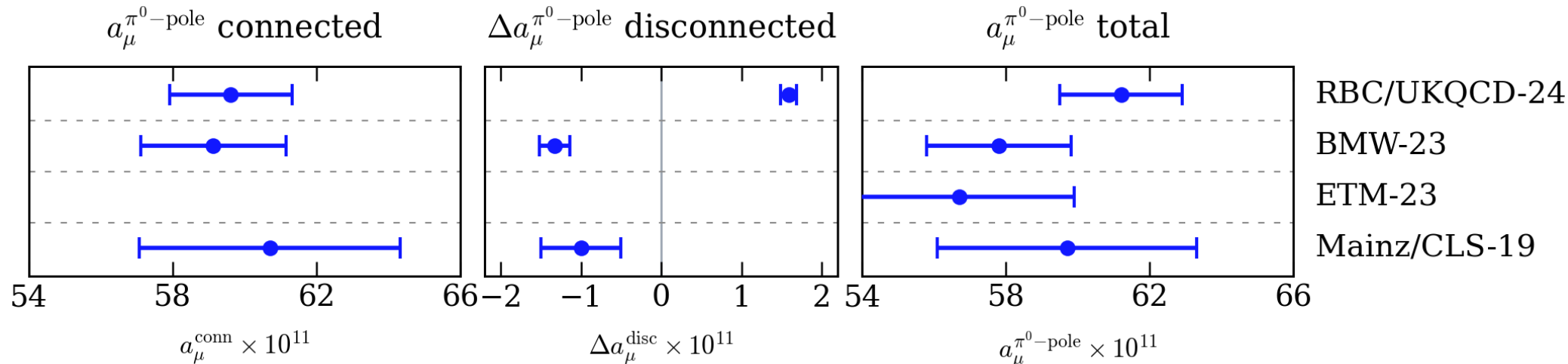
Phys.Rev.D 111 (2025) 5, 054511



Rept.Prog.Phys. 88 (2025) 8, 080501

disconnected diagram contribution to $Q^2 \mathcal{F}(-Q^2, -Q^2)$

Sign of disconnected diagram



$$a_\mu^{\pi^0\text{-pole}} = 58.8(1.1)_{\text{stat}}(1.1)_{\text{syst}}(1.6)_{\text{disc}}[2.2]_{\text{tot}} \times 10^{-11} \quad (\text{WP2025})$$

- RBC/UKQCD-24 *Rept.Prog.Phys.* 88 (2025) 8, 080501
first results with a **positive sign**, crosschecked independently within the collaboration.
- BMW-23 / Mainz-CLS-19: *PhysRevD.111.054511, PhysRevD.100.034520* **negative sign** contribution
- related work
 - JLQCD-12, RBC/UKQCD-22 : *PhysRevLett.109.182001, PhysRevLett.130.191901*
 $\Gamma(\pi^0 \rightarrow \gamma\gamma)$, **negative sign**
 - CLQCD-26 *Su. et al arXiv:2607.27868*
pion TFF at several Q^2 , suggest **positive sign**