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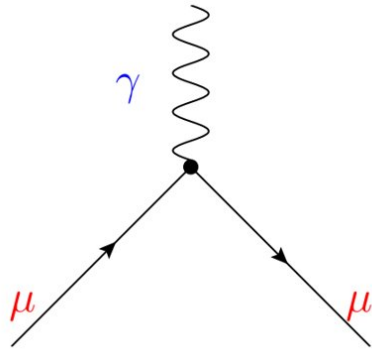
HELMHOLTZ
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A PANDA FAIR Phase-0 Experiment at MAMI

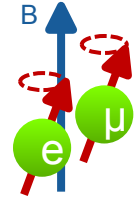
(Measurement of the Pion Transition Form Factor in virtual Primakoff Kinematics)

Sahra Wolff

Mainz, 25.11.2021



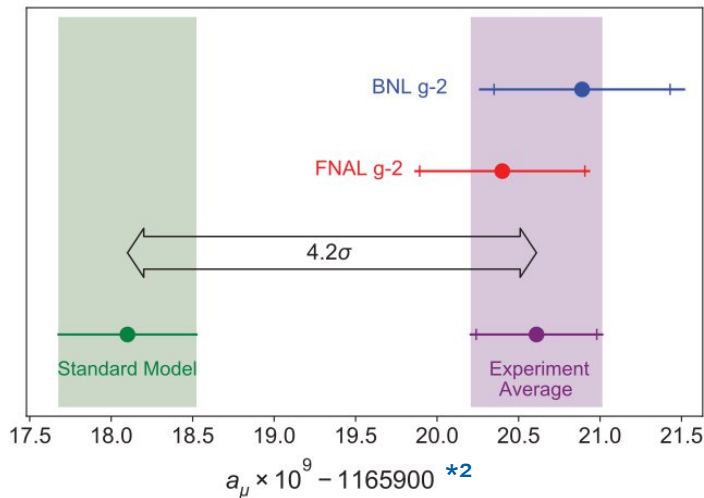
- Magnetic moment: $\vec{\mu} = g\mu_B \frac{\vec{S}}{\hbar}$
- Deviation: $a_\mu = \frac{1}{2}(g - 2)_\mu$
- Theoretical Standard Model calculation:
 $a_\mu^{\text{SM}} = (116\,591\,810 \pm 43) \times 10^{-11} \text{ *1}$



- Measurement:
 $a_\mu^{\text{exp}} = (116\,592\,061 \pm 41) \times 10^{-11} \text{ *2}$

→ Discrepancy: $\sim 4.2 \sigma$

→ Hint to physics beyond the Standard Model

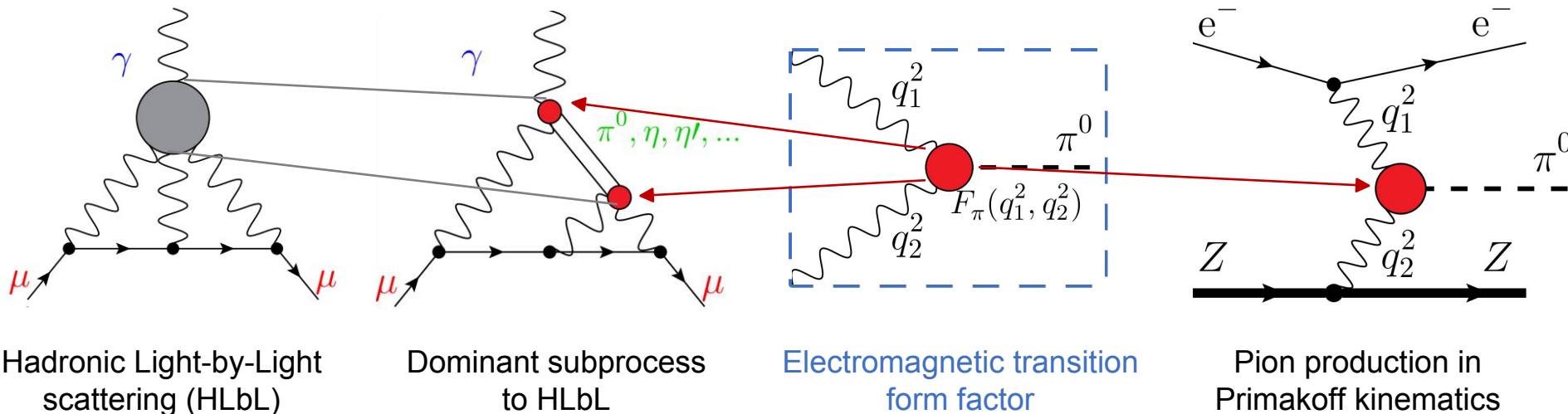


*1 T. Aoyama, N. Asmussen, M. Benayoun et al., Physics Reports 887 (2020) 1–166

*2 BNL and Fermilab combined, Phys. Rev. Lett. 126, 141801, 7 April 2021

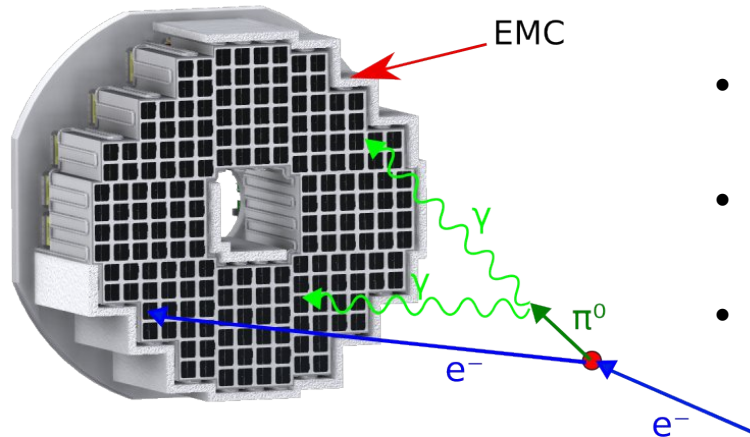
Hadronic Light-by-Light scattering gives a large contribution

$$\text{to } \Delta a_\mu^{\text{SM}} = 43 \times 10^{-11}: \Delta a_\mu^{\text{HLbL}} = 29 \times 10^{-11}^*$$



*Fred Jegerlehner. Variations on Photon Vacuum Polarization. EPJ Web Conf., 218:01003, 2019.

PANDA FAIR Phase-0 at MAMI



- Energy and position of electrons and photons can be determined by PANDA EMC
- First measurement of the virtual pion transition form factor
- Target precision: 1% for $q_1^2 = 0.01 \text{ GeV}^2$

