Monte Carlo generator Phokhara

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PHOKHARA MC generator

EVA: $e^+e^- \to \pi^+\pi^-\gamma$

- tagged photon ($\theta_\gamma > \theta_{cut}$)
- ISR at LO + Structure Function
- FSR: point-like pions

[Binner et al.]

$e^+e^- \to 4\pi + \gamma$

- ISR at LO + Structure Function

[Czyż, Kühn,2000]

F. Campanario, H.C., J. Gluza,

A. Grzelińska, M. Gunia, P. Kisza,

J. H. Kühn, E. Nowak-Kubat, T. Riemann,

G. Rodrigo, Sz. Tracz, A. Wapienik,

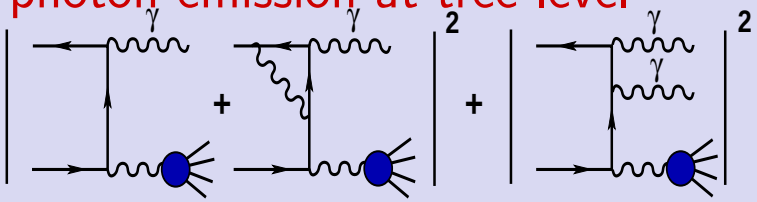
V. Yundin, D. Zhuridov

PHOKHARA 10.0: $\pi^+\pi^-$,$\mu^+\mu^-$,

4π, $\bar{N}N$, 3π, KK,$\Lambda\bar{\Lambda}$, $P\gamma$

$J/\psi, \psi(2S), \chi_{c1}, \chi_{c2}$

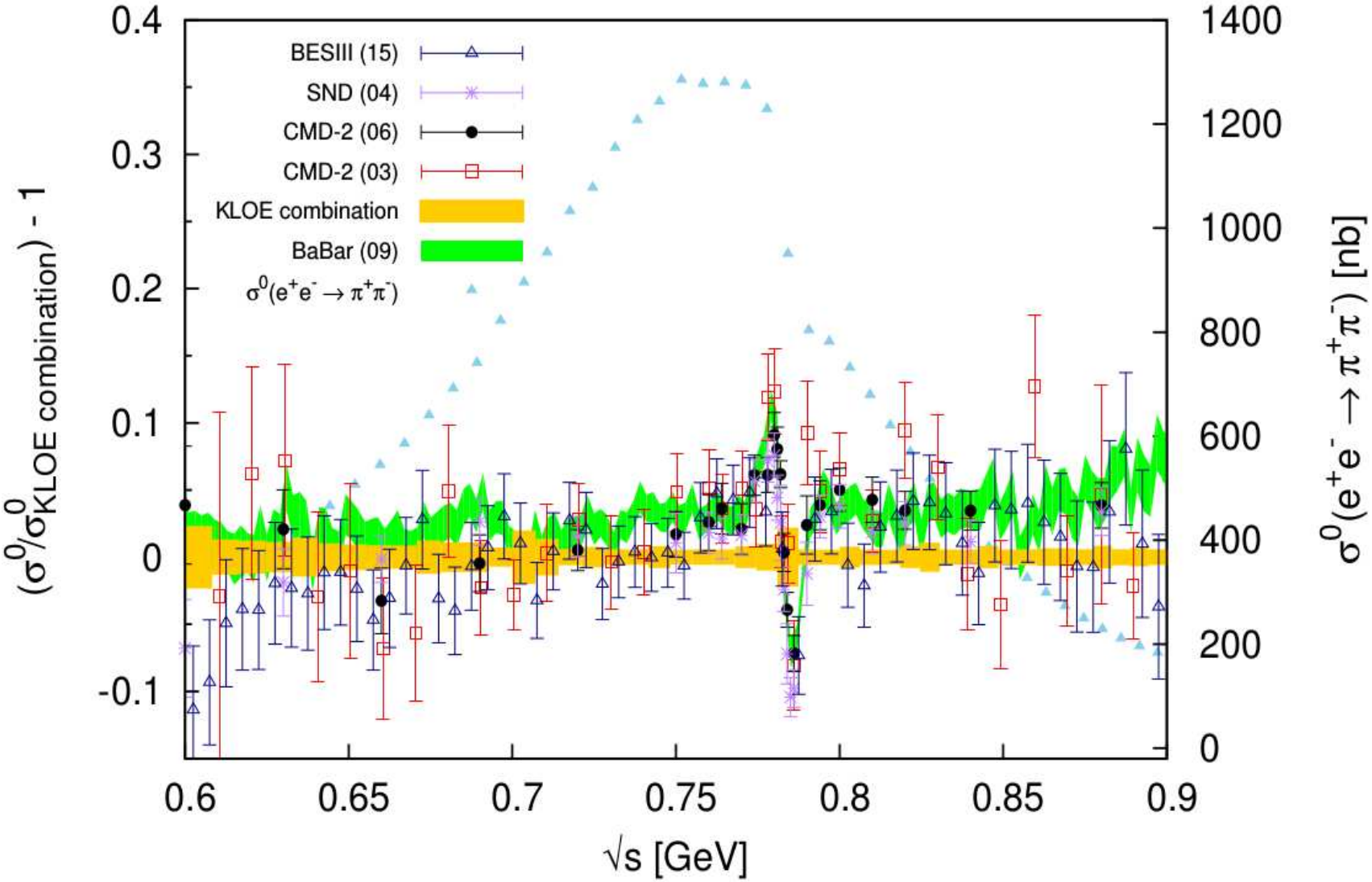
- **ISR at NLO:** virtual corrections to one photon events and two photon emission at tree level



- FSR at NLO:$\pi^+\pi^-$, $\mu^+\mu^-$,K^+K^-, $\bar{p}p$
- tagged or untagged photons
- $e^+e^- \to hadrons$ $(muons)$ ISR at NNLO
- Modular structure

http://ific.uv.es/~rodrigo/phokhara/

NLO $e^+e^- \to \pi^+\pi^-\gamma$ -motivation



KLOE: JHEP 1803 (2018) 173

NLO $e^+e^- \to \pi^+\pi^-\gamma$

Status - finished

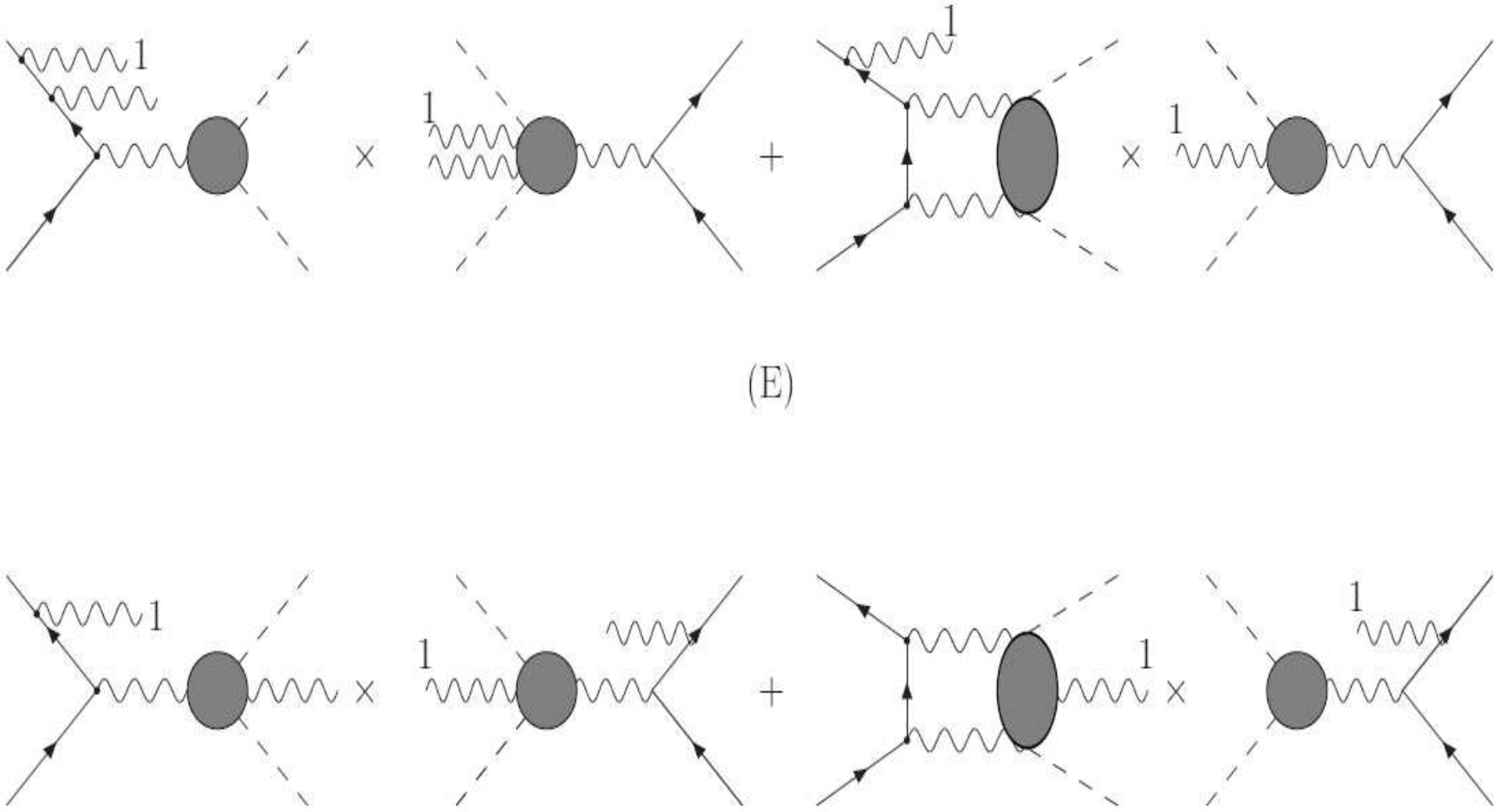
PHYSICAL REVIEW D 100, 076004 (2019)

Francisco Campanario, Henryk Czyż , Janusz Gluza, Tomasz Jeliński, German Rodrigo, Szymon Tracz, and Dmitry Zhuridov

$\Rightarrow$ sQED + form factors:
FSR at NLO and pentaboxes ready and fully tested

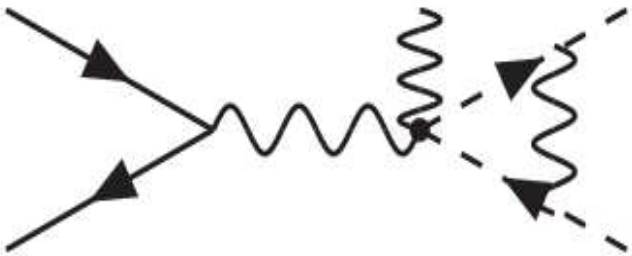
$\Rightarrow$ Phokhara10.0
http://ific.uv.es/$\sim$ rodrigo/phokhara/

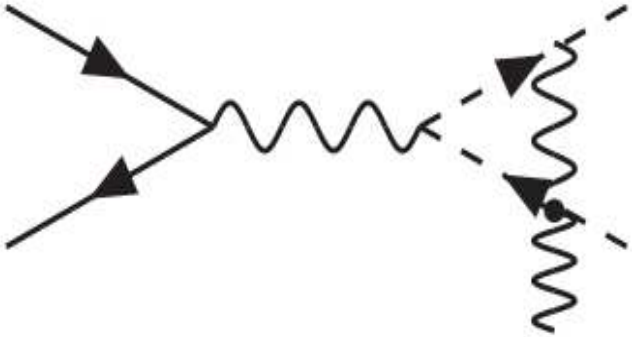
TVP(PB) for pions

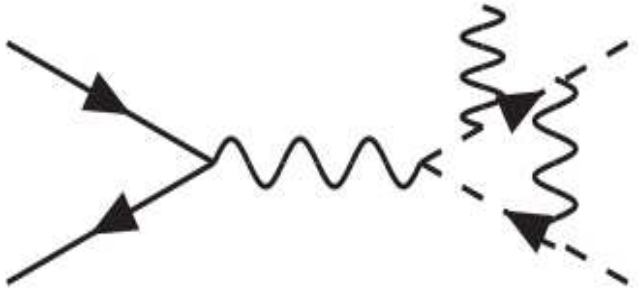


ETC.

FSR for pions

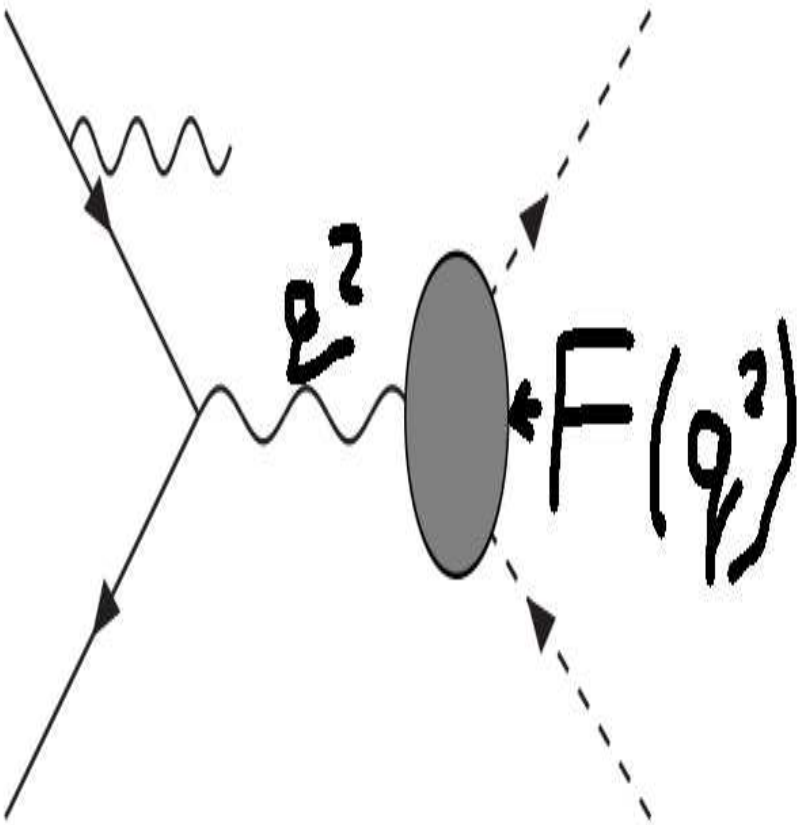




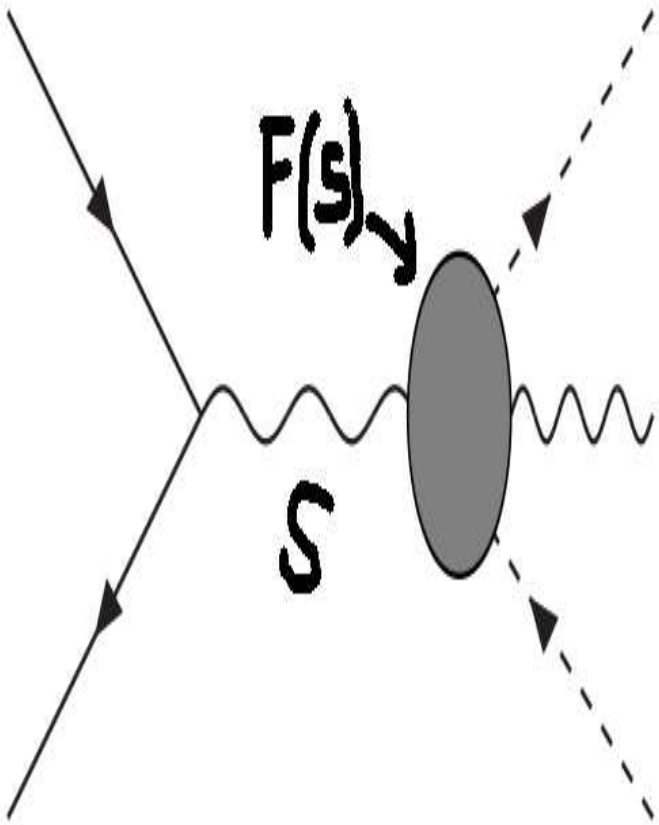


ETC.

Model assumptions

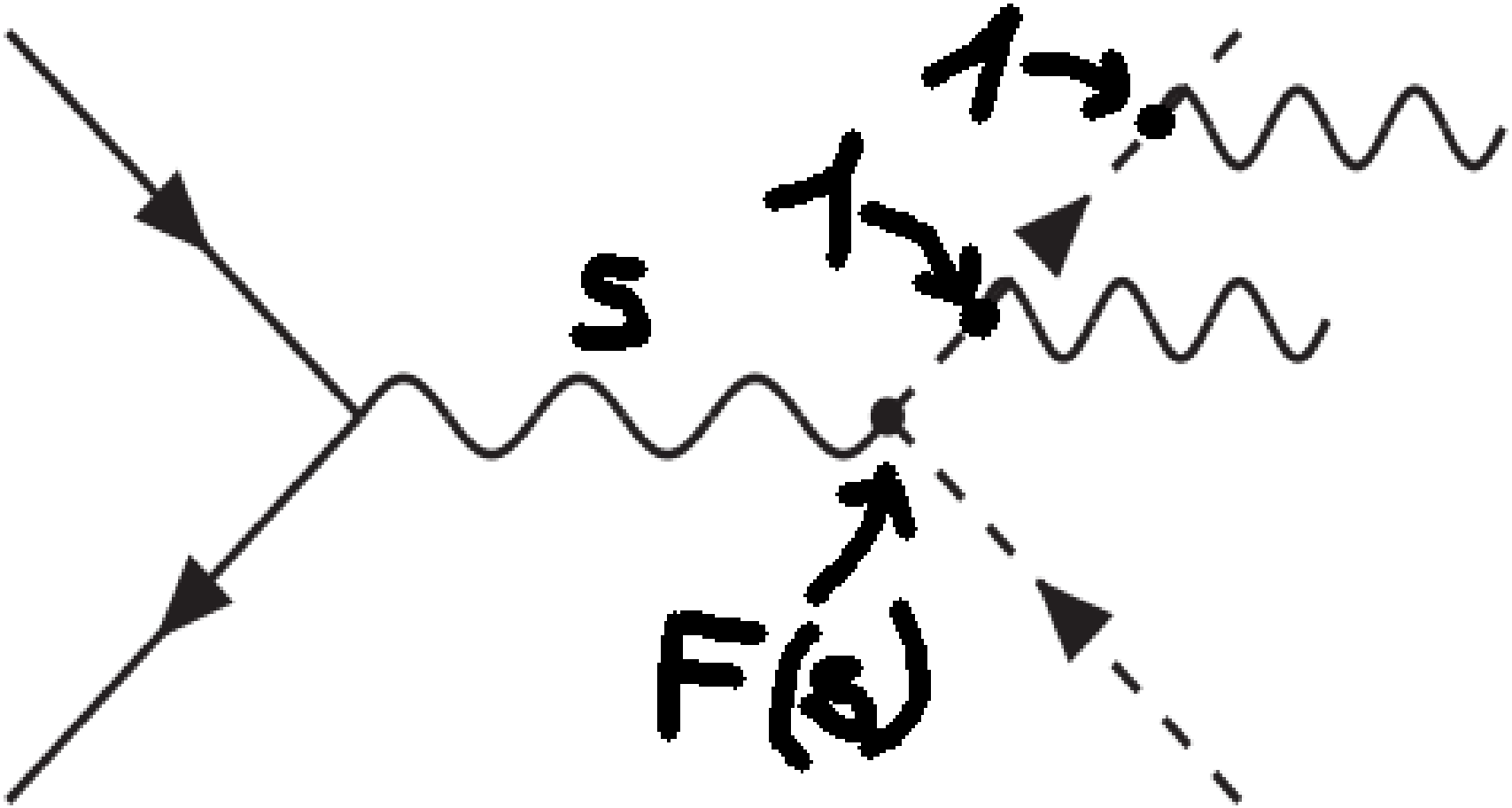


a)

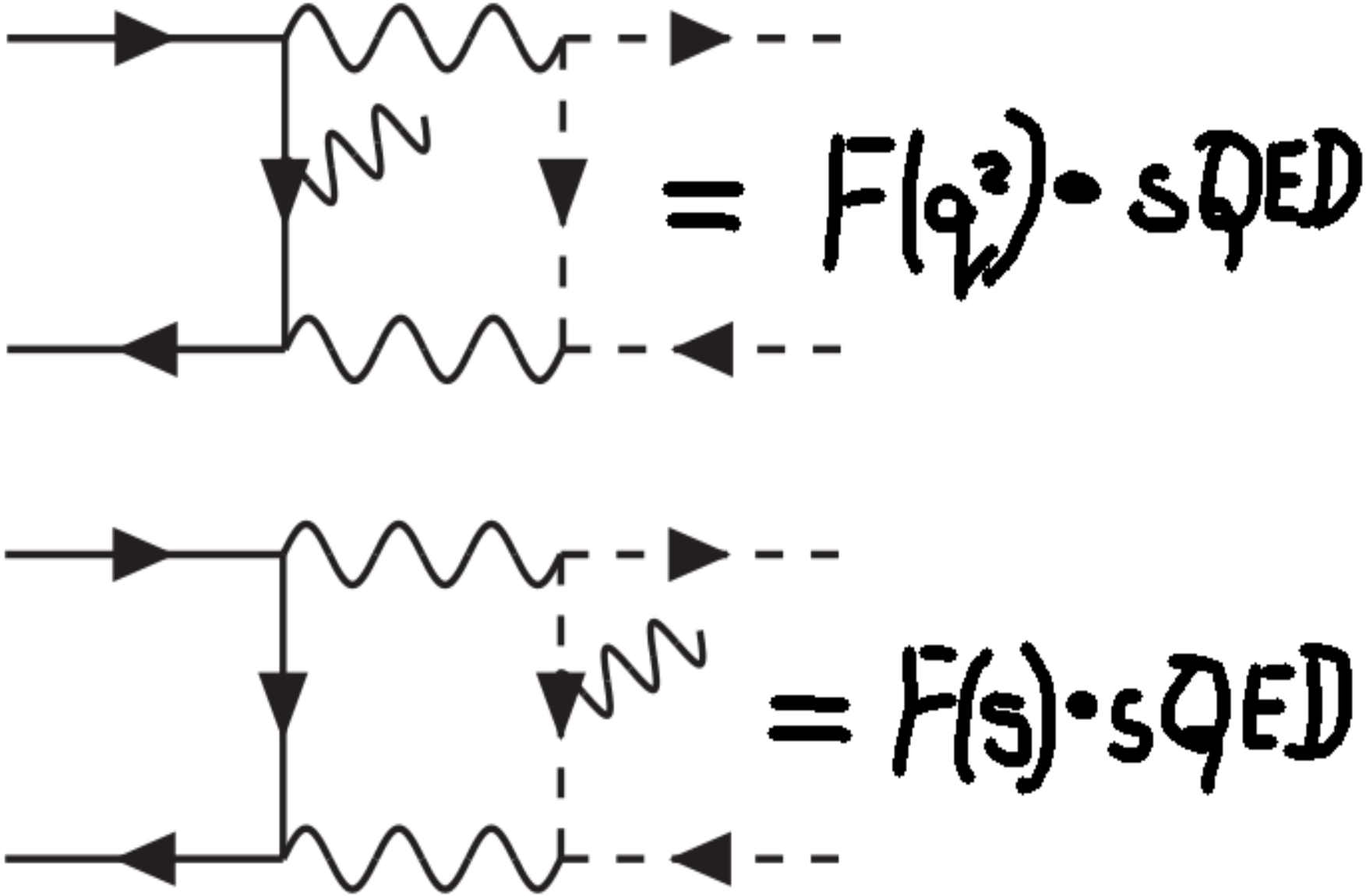


b)

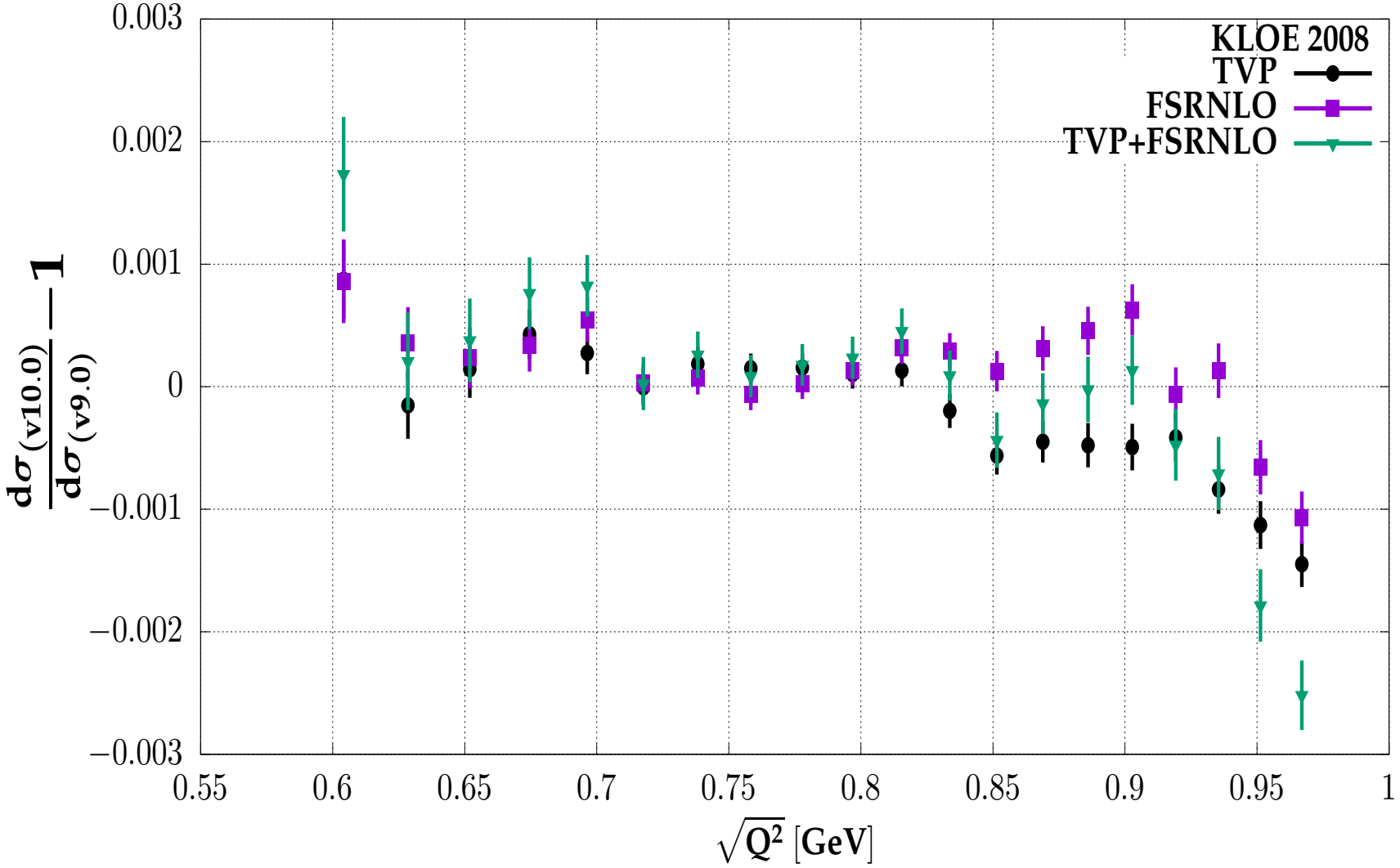
Model assumptions



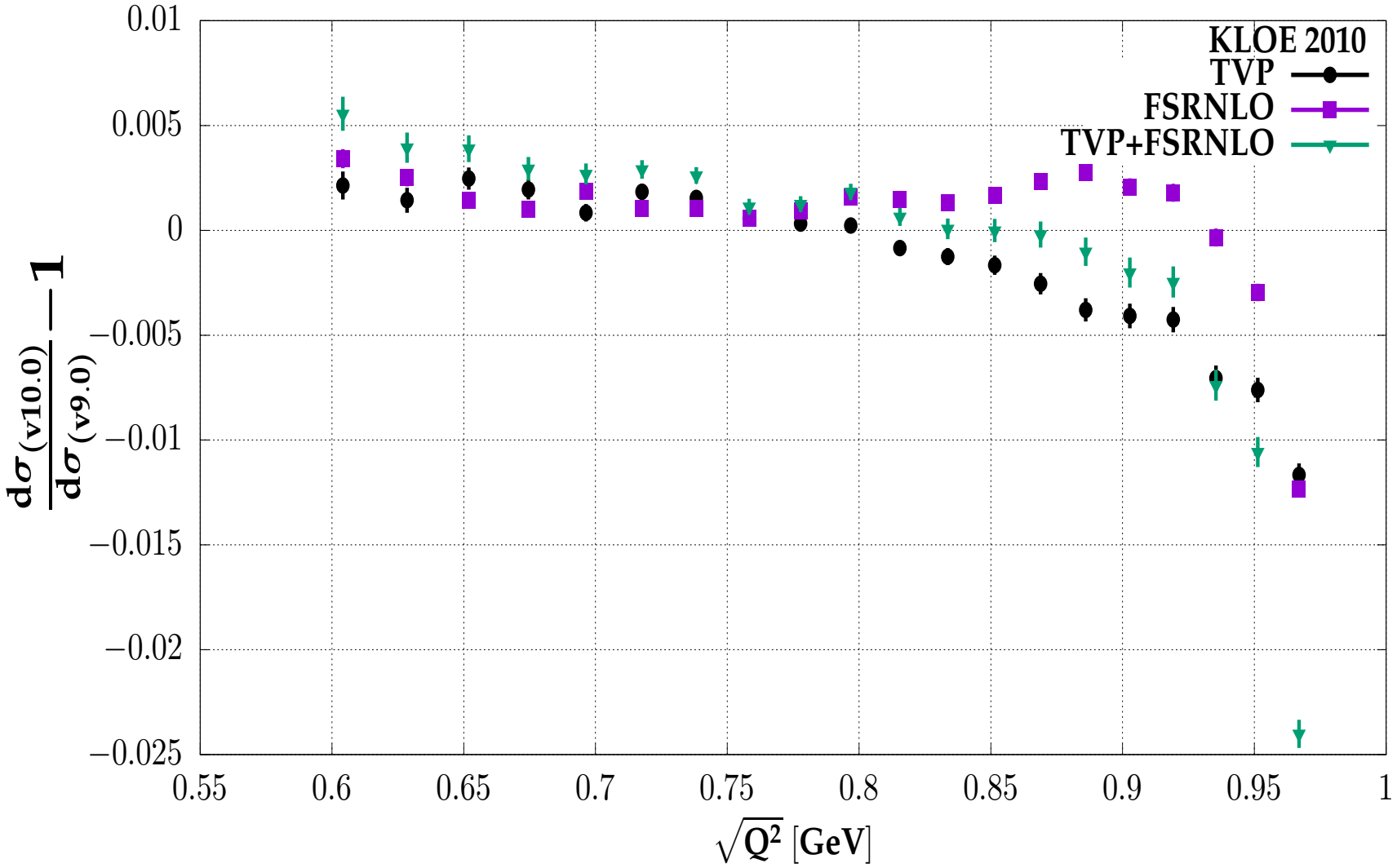
Model assumptions



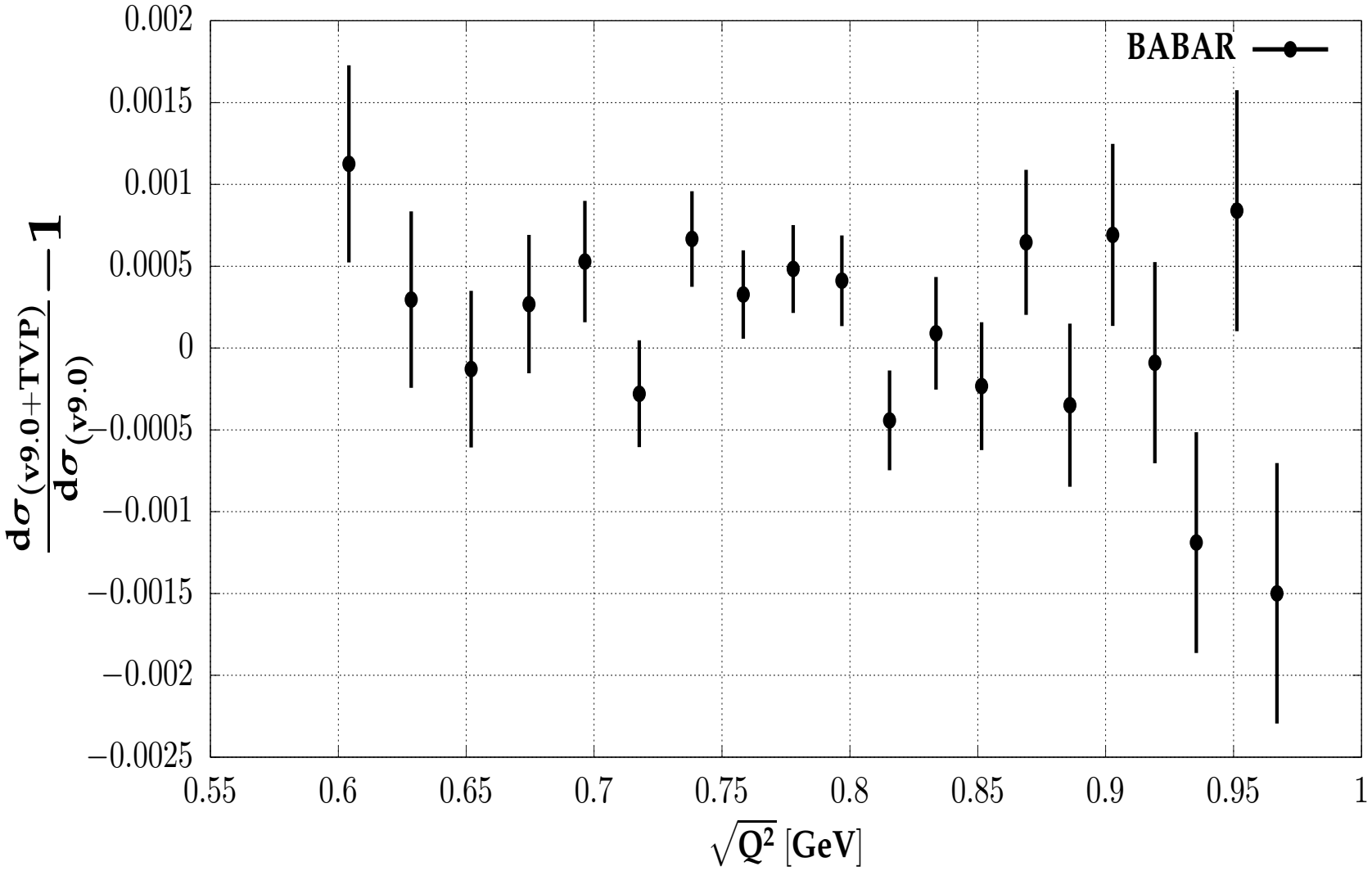
Complete NLO: KLOE-small



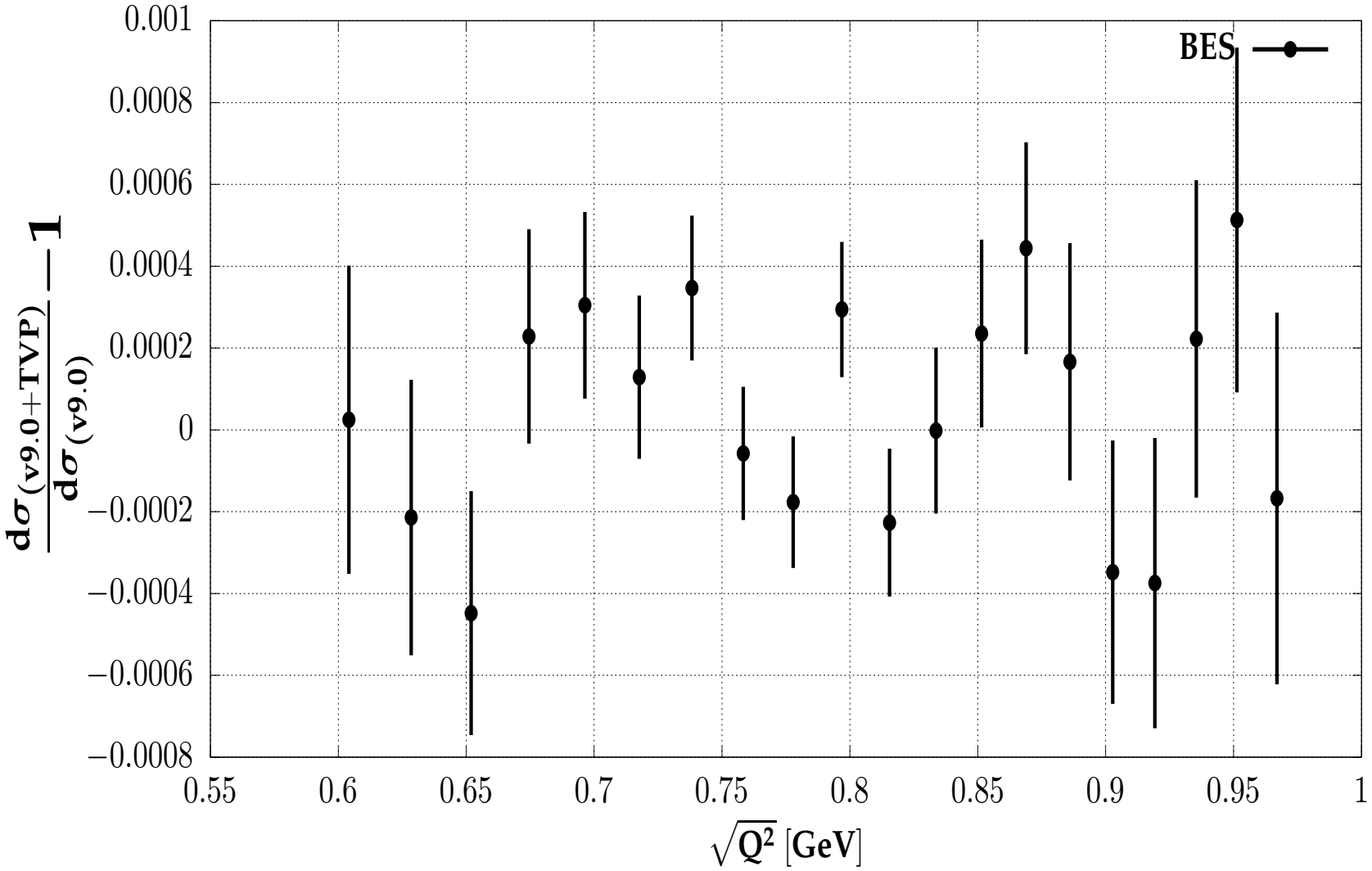
Complete NLO: KLOE-large



Complete NLO: BaBar



Complete NLO: BES



Conclusions

$\Rightarrow$ PRD 100, 076004 (2019) and JHEP 1402 (2014) 114

show that missing NLO radiative corrections

cannot be the source of the discrepancies between

the different extractions of the pion form factor

performed by BaBar, BES and KLOE

Outlook

No further development of the code is planned