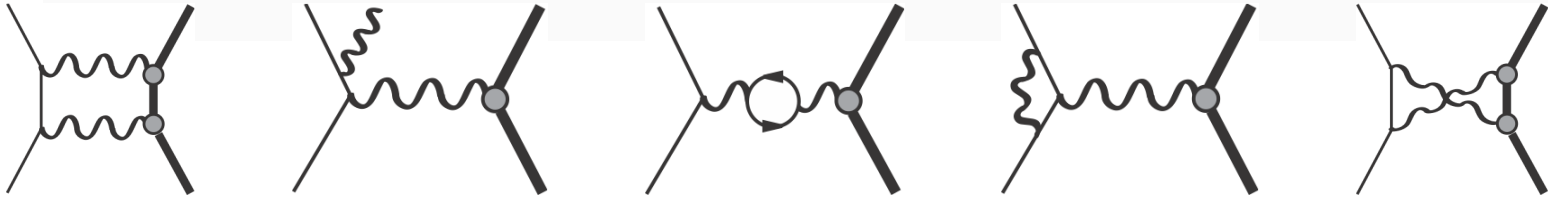
# Radiative Corrections in OLYMPUS



Axel Schmidt

Collaboration Meeting

April 13, 2012

LNS
LABORATORY FOR NUCLEAR SCIENCE

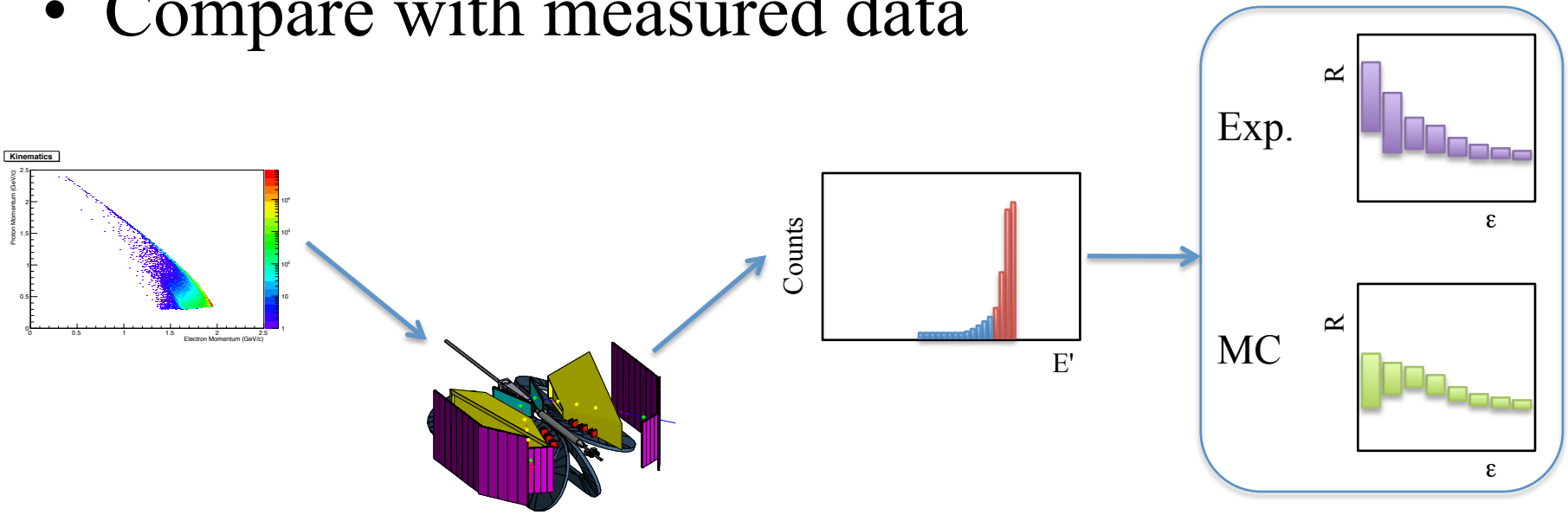
# Where do we stand?

- Radiative corrections workshops
  - July 2011 @ MIT
  - July 2012 @ PNPI
- Weekly physics meetings @ MIT
  - Library of articles on the wiki
- Some preliminary software

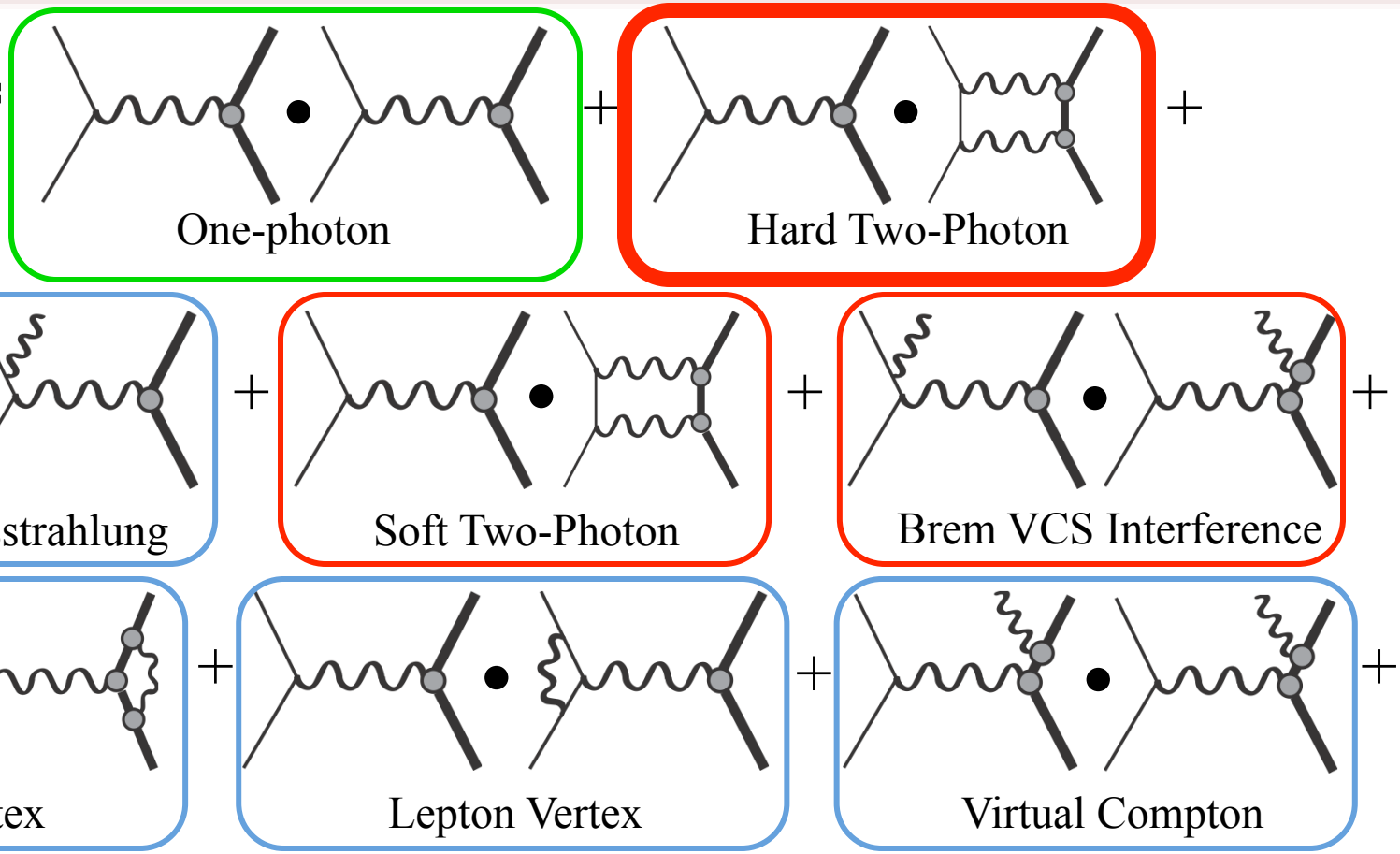
- *Lots to be done, but a clear path forward!*

# Path Forward

- Generate events in corrected distribution
- Propagate through simulation
- Analyze MC data
- Compare with measured data

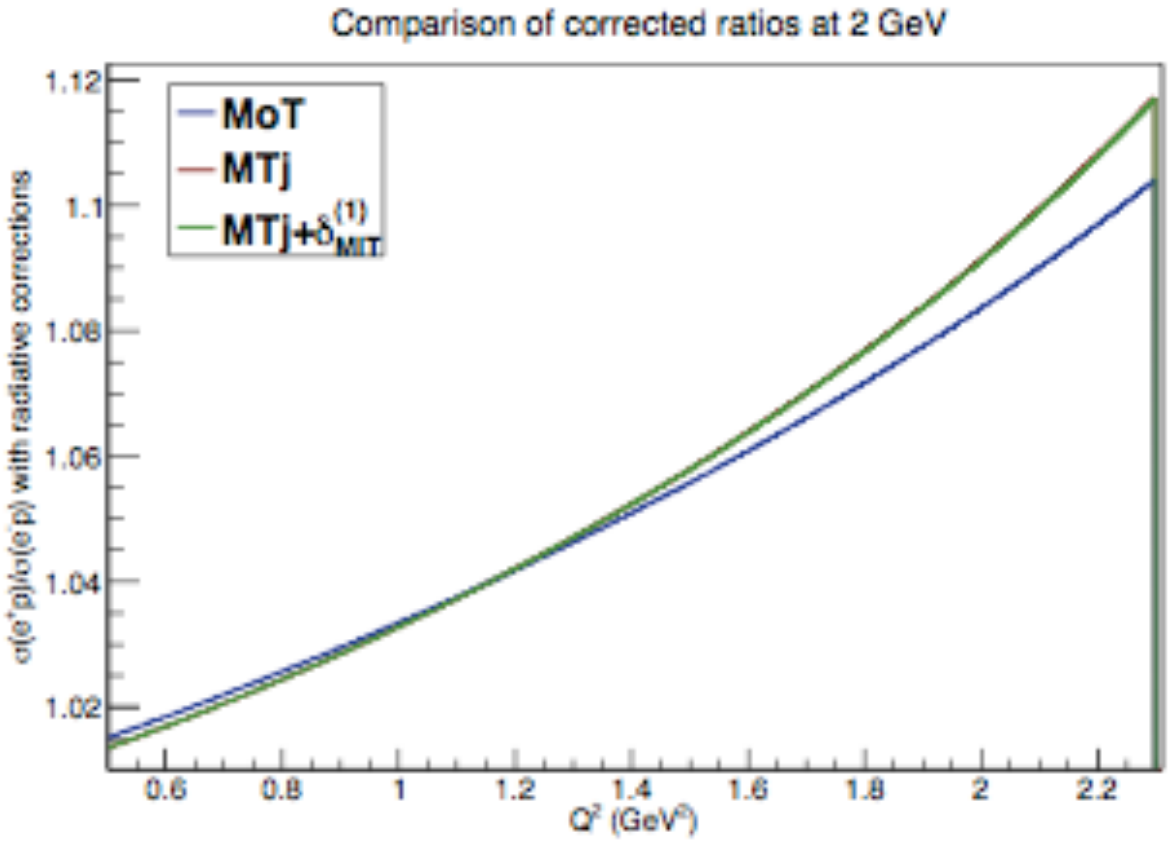


# Corrections up to order $\alpha^3$

$\sigma_{e^{+/-}p} \approx$ 


**Change sign with lepton charge sign!**

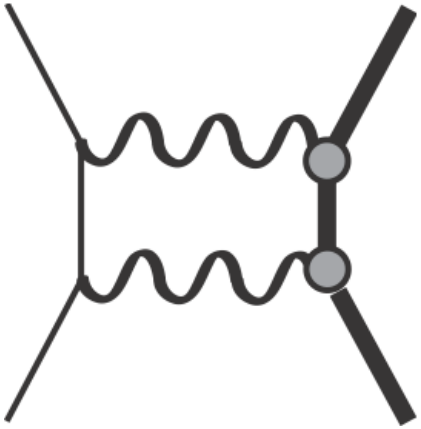
# Proton Vertex Correction




R. Russell, private communication

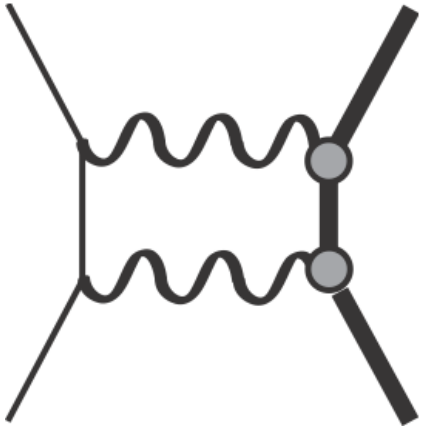
Proton vertex correction does not affect our ratio!

# Two-Photon Exchange
# Hard vs. Soft



Soft

- One photon carries little momentum
- IR divergent
- Needed to cancel brem. IR divergence



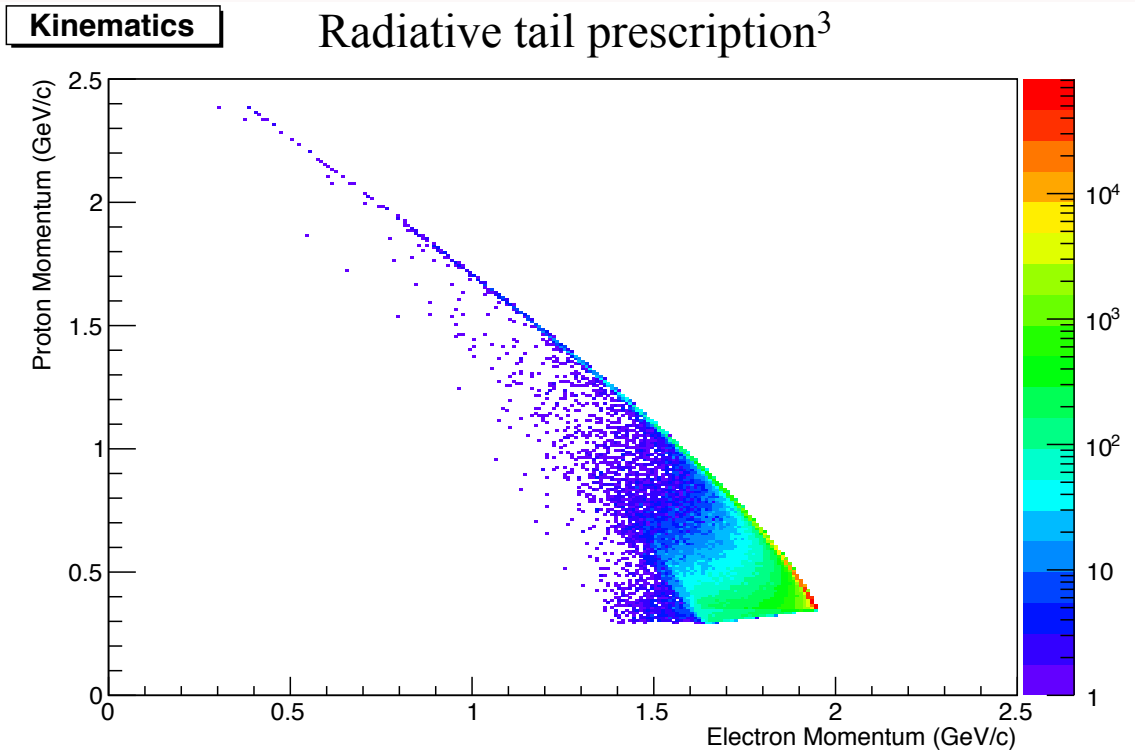
Hard

- Both photons carry momentum
- Proton current off-shell
- Intermediate state?

Distinction between them is somewhat fluid!

# Radiative Generator

- Radiative generator in development
- Accommodate multiple models
  - Mo & Tsai[1]
  - Maximon & Tjon[2]
- Exceed simple peaking approx.





1. L. W. Mo and Y. S. Tsai, Rev. Mod. Phys. **41,** 205 (1969)
2. L. C. Maximon and J. A. Tjon, Phys. Rev. C **62**, 054320 (2000)
3. M. Vanderhaeghen et. al. Phys. Rev. C **62** 025501 (2001)

# To do:

- Finish the radiative generator and implement in Monte Carlo
- Signal digitization (or at least improved modeling)
- Further analysis

*All contingent on reconstructing elastic events!*