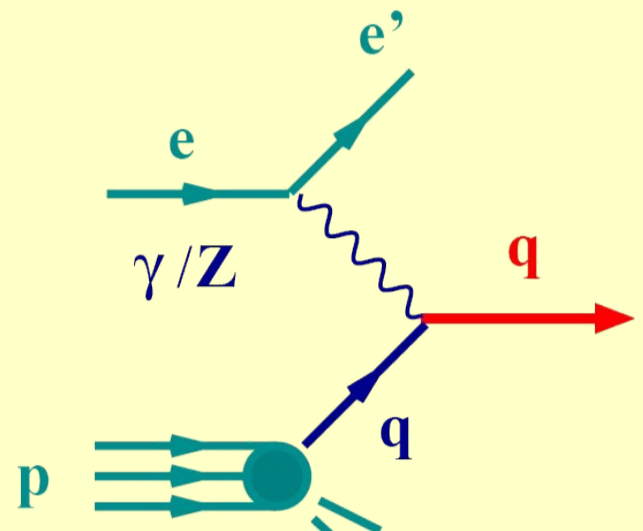


# Limit on the Effective Quark Charge Radius from Inclusive ep Scattering at HERA

Possible contribution from the BSM processes, modifying electron-quark interactions at highest  $Q^2$  values, would also be reflected in PDF fit to the data. Resulting PDF distributions would be biased and the SM predictions obtained from the fit would in fact include also some BSM contribution "hidden" in the PDFs. As a result, one could still obtain very good agreement of the data with the (biased) SM predictions and the limits on the BSM mass scales calculated with these PDFs could be artificially overestimated.  $\Rightarrow$  new approach needed.

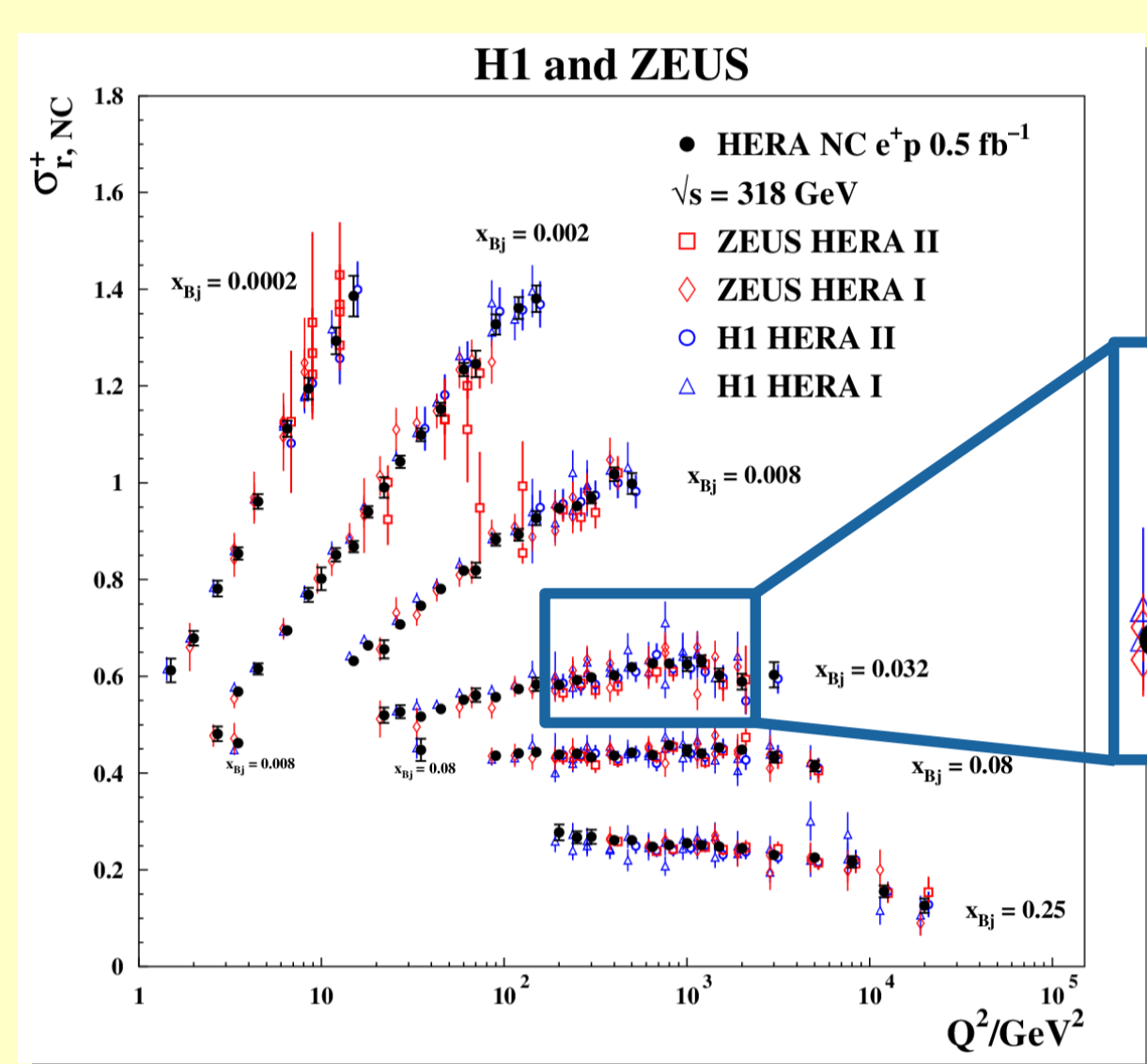
## Combined H1 and ZEUS inclusive DIS measurements

Deep Inelastic Scattering (DIS) @ HERA



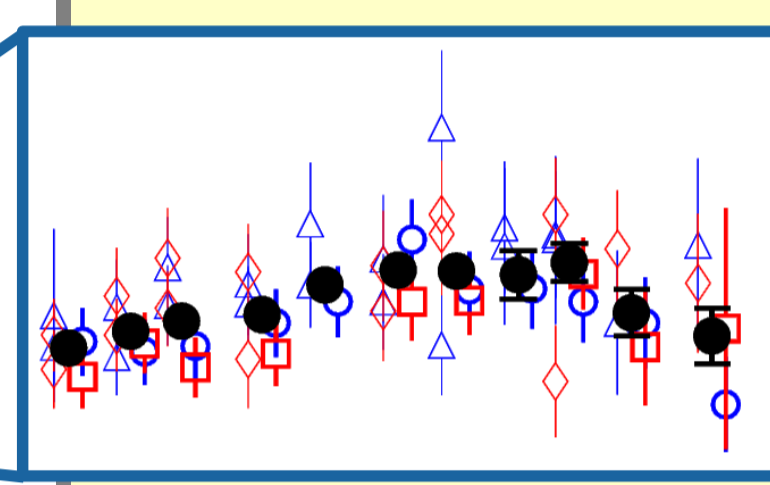
$$Q^2 = -(k - k')^2$$

$$x = \frac{Q^2}{2P \cdot q} \quad y = \frac{P \cdot q}{P \cdot k}$$



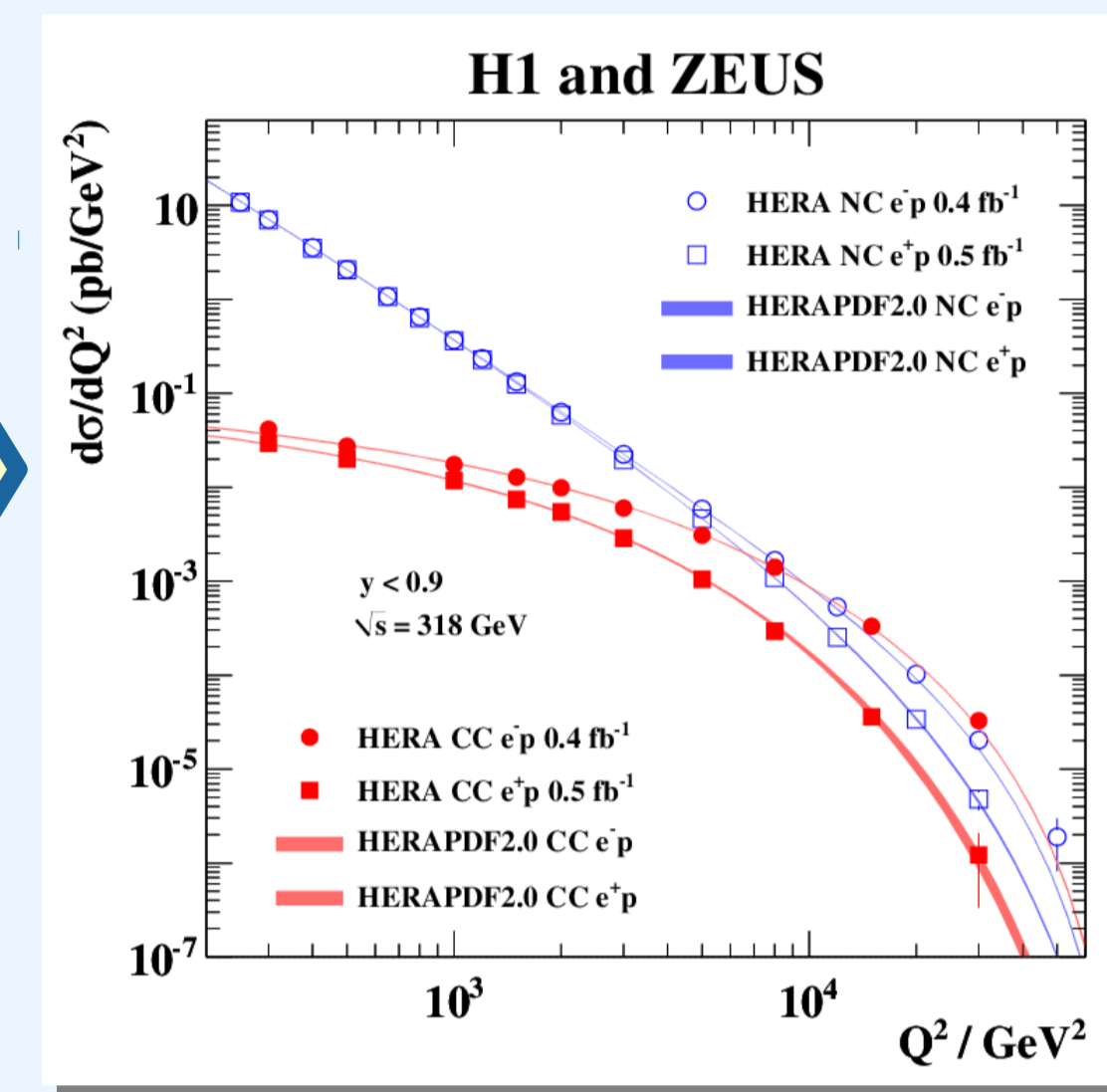
[arXiv:1506.06042]

• 1 fb-1 of data combined into one consistent data set.



• 162 correlated systematic uncertainties taken into account.

## Simultaneous fit of PDFs and $R_q$ to combined data

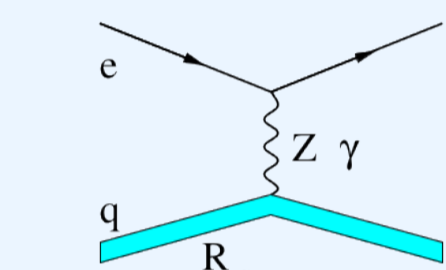


HERAPDF 2.0 PDFs parameterization



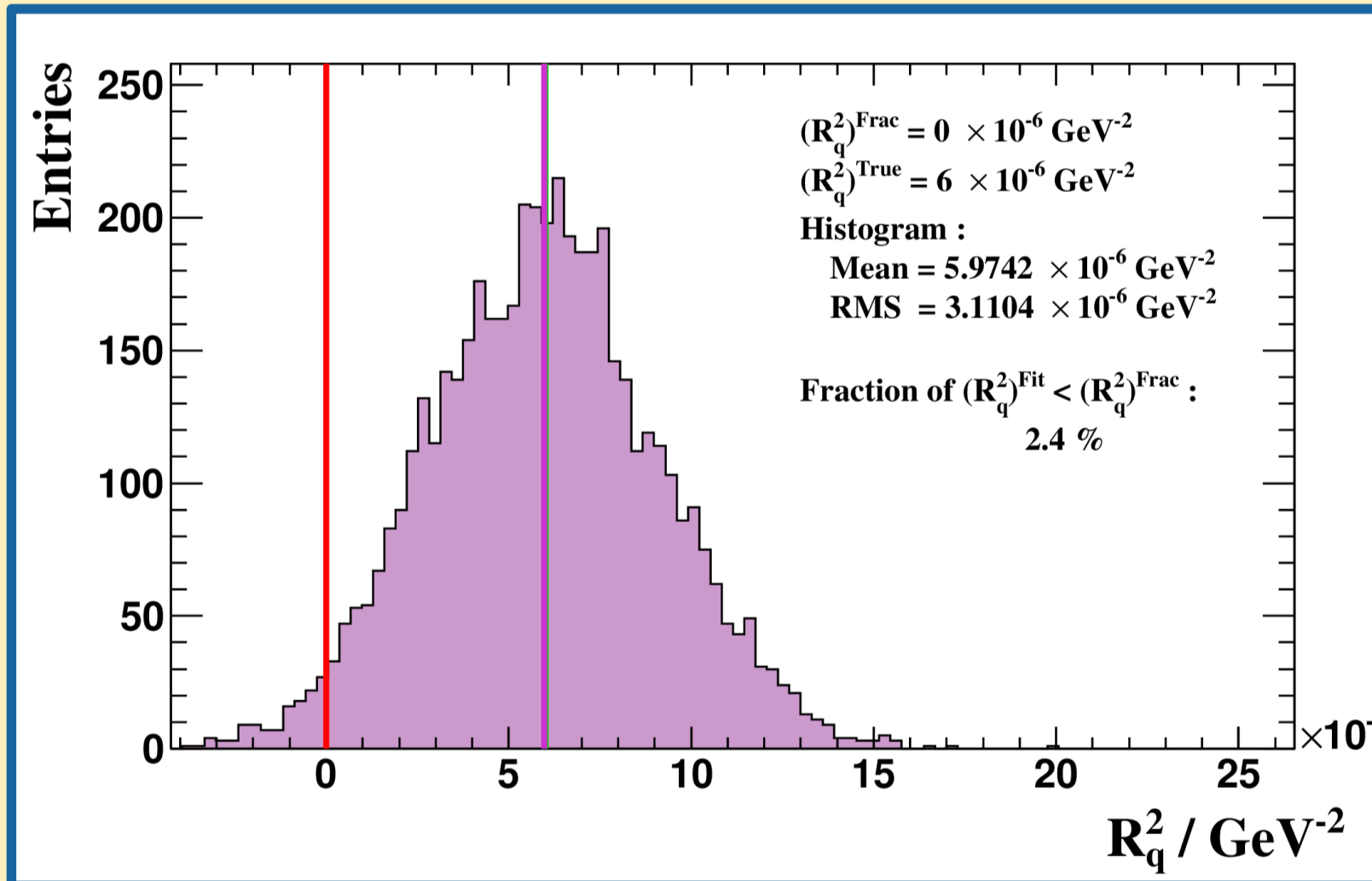
Quark form factor

$$\frac{d\sigma}{dQ^2} = \frac{d\sigma^{SM}}{dQ^2} \left(1 - \frac{R_q^2}{6} Q^2\right)^2$$

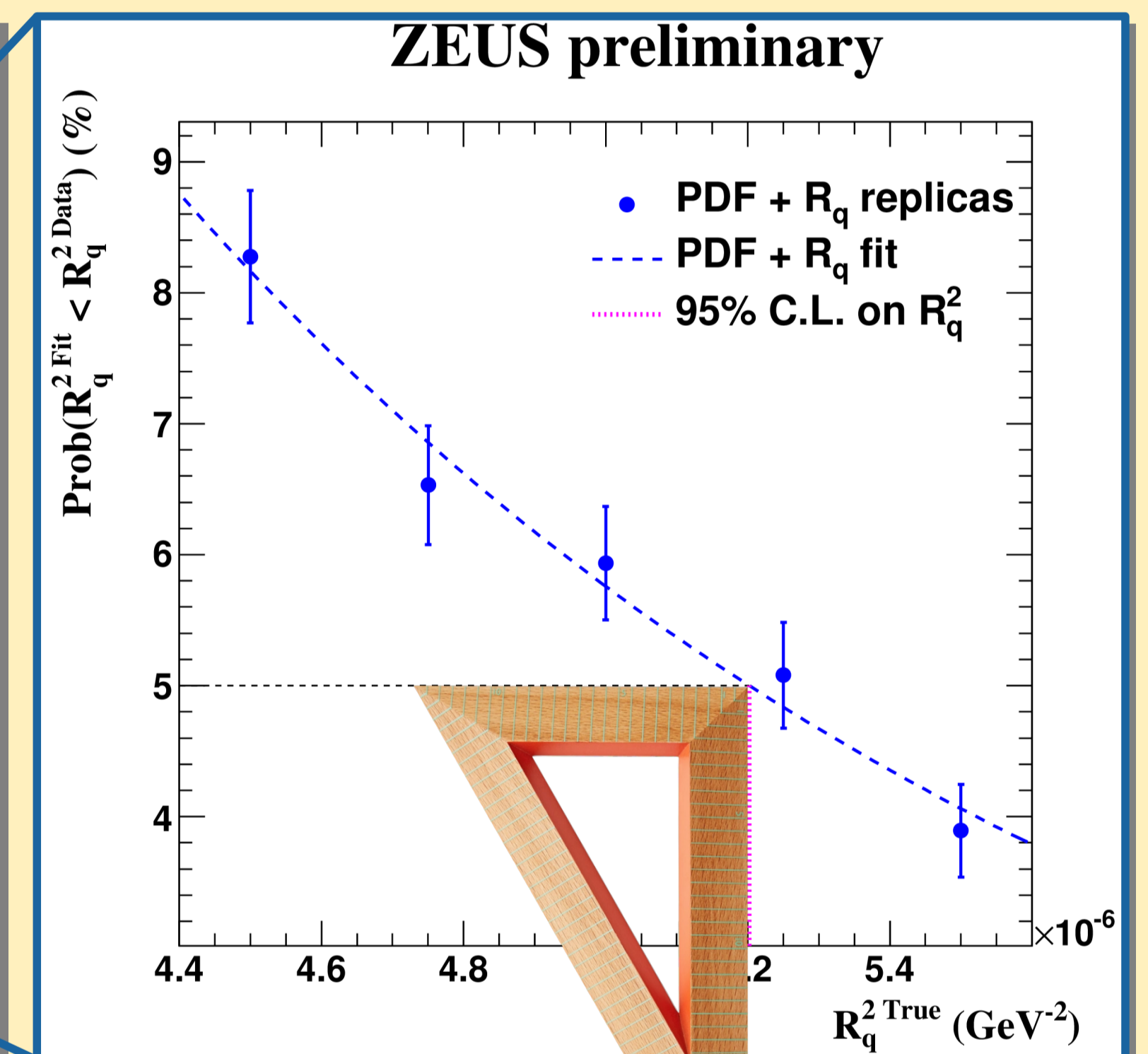
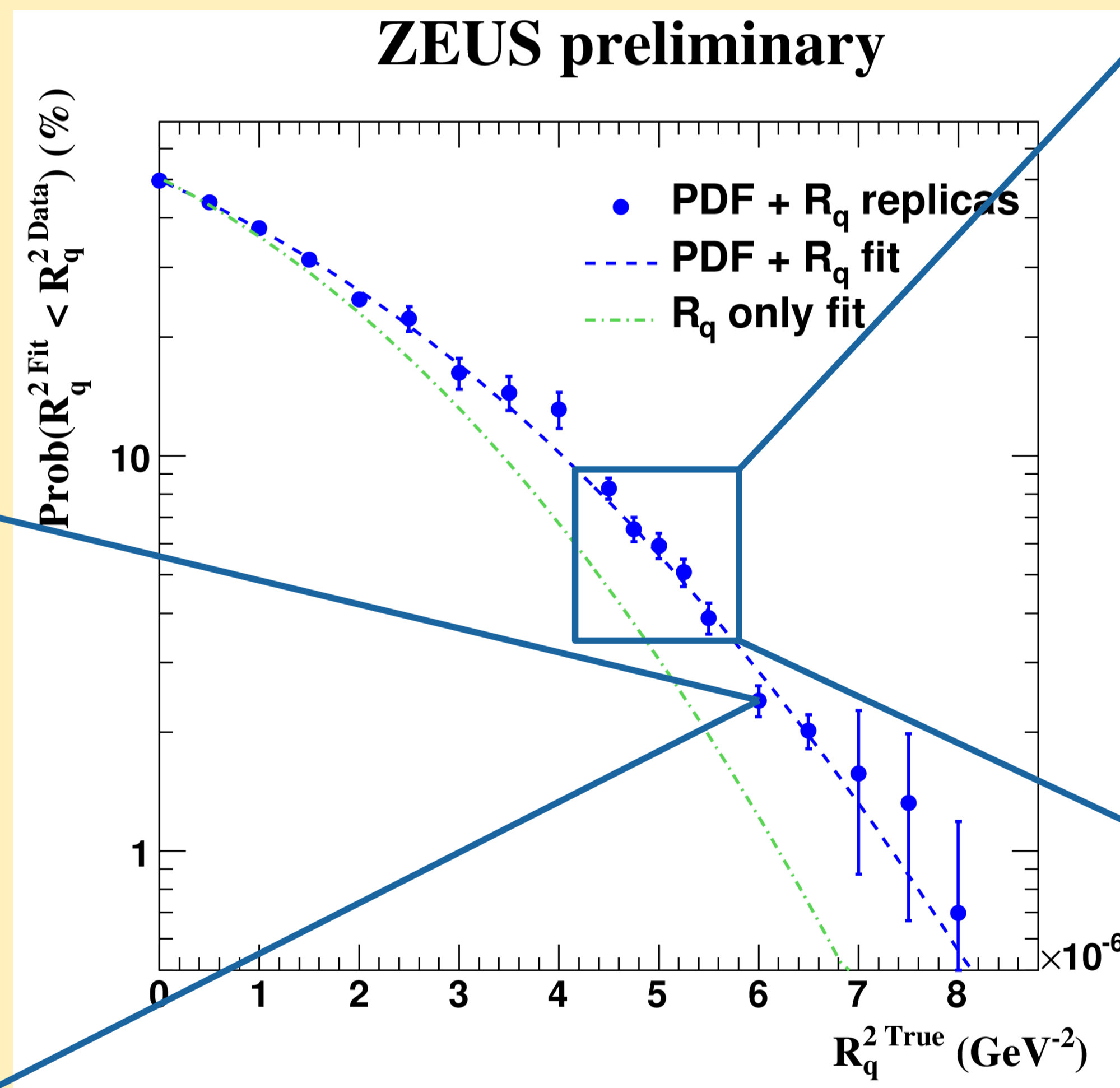


Limit extracted using HERAFitter

We use classical approach to limit determination based on generation of multiple Monte Carlo replicas of the data. For the quark radius value corresponding to 95%CL limit we expect 5% of replicas to agree with the Standard Model better than the actual data.

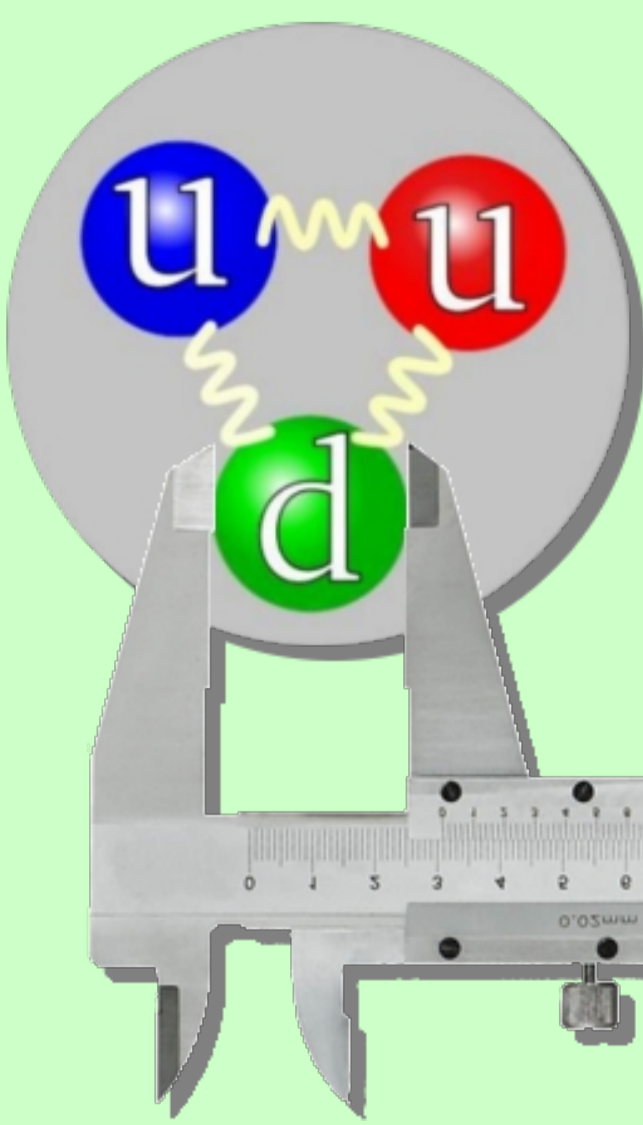


## Limit estimation



95% C.L. limit

Obtained 95% C.L. upper limit on the effective quark-charge radius:



$$R_q < 0.45 \cdot 10^{-16} \text{ cm}$$



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## ZEUS preliminary

