

HH-EW QCD analysis

I. Abt, A. Cooper-Sarkar, B. Foster, A. Geiser (?), C. Gwenlan,
V. Myronenko, O. Turkot, K. Wichmann

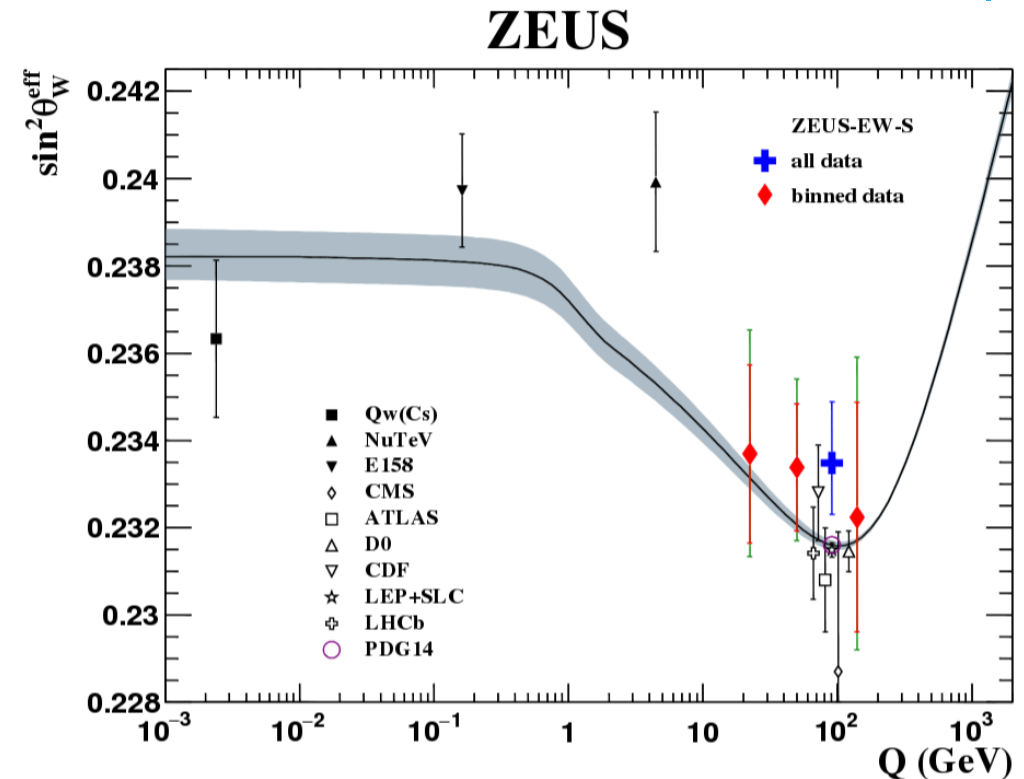
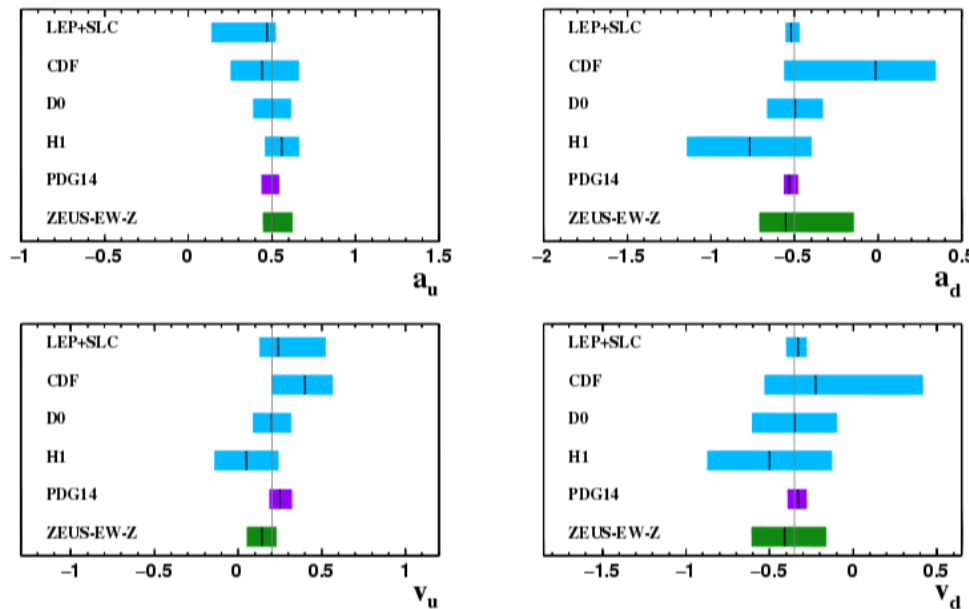
this is not a ZEUS analysis just a hobby for some of us :)

QCD + EW fits with full HERA polarised data

- Recent ZEUS analysis measured EW couplings, $\sin^2\theta$, M_W using full HERA one data, **ZEUS polarised HERAII** data and H1 unpolarised HERAII data

DESY-16-039

ZEUS

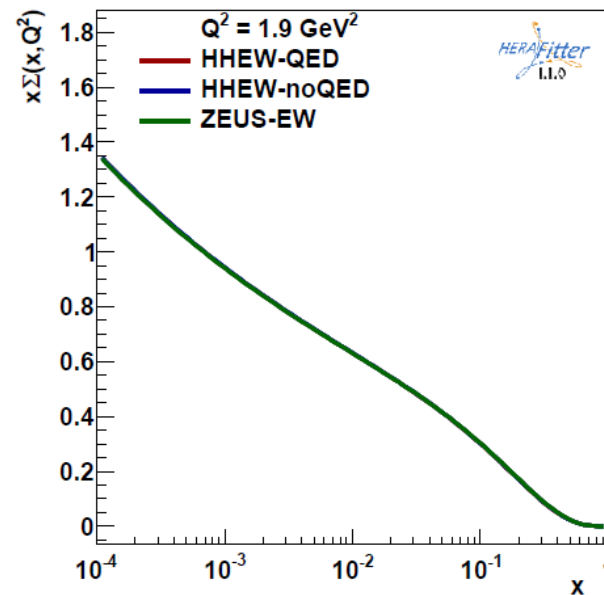
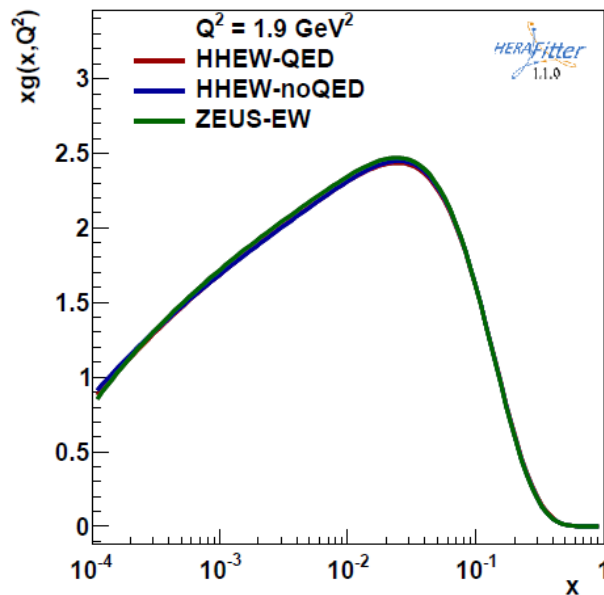
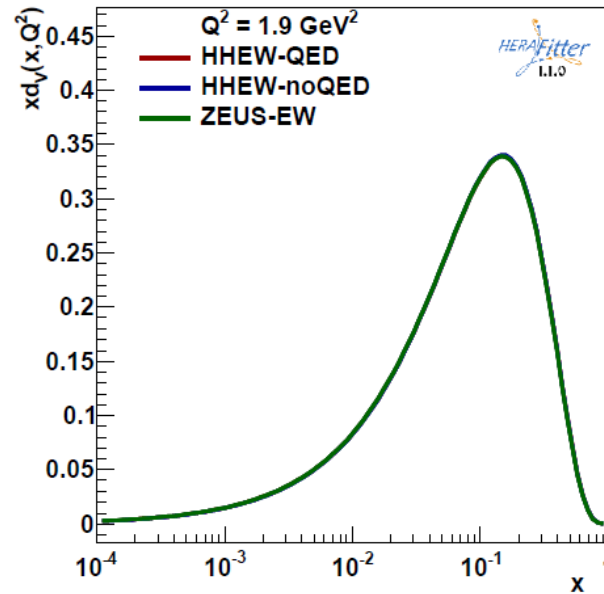
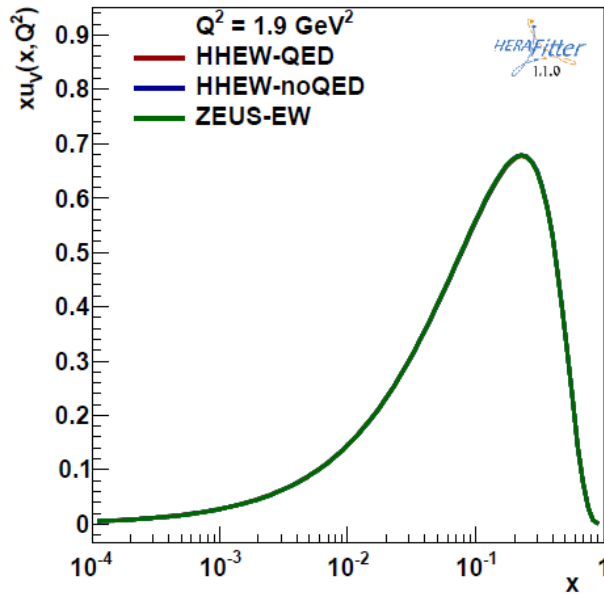


- We explored a full potential of HERA data using also **H1 polarised inclusive measurements**
 - We concentrate on couplings - highest sensitivity to polarisation

Global QCD fit

- QCD fits with settings identical to ZEUS-EW fit
 - 13 + 4 parameter fit (QCD + EW parameters)
 - RTOPT scheme
 - $f_s = 0.4, \alpha_s = 0.118$
 - $Q_{\min}^2 = 3.5 \text{ GeV}^2$
- Change for ZEUS polarised data: NC + CC, $e^{+/-}p$
 - **H1 calculated uncertainties for QED corrections - we adopt their uncertainties for ZEUS polarised data as uncorrelated**
 - For ZEUS-EW analysis this was treated as a cross-check (consistent)
 - **here part of nominal result**
 - H1 HERAII data have this uncertainty included in uncorrelated systematics

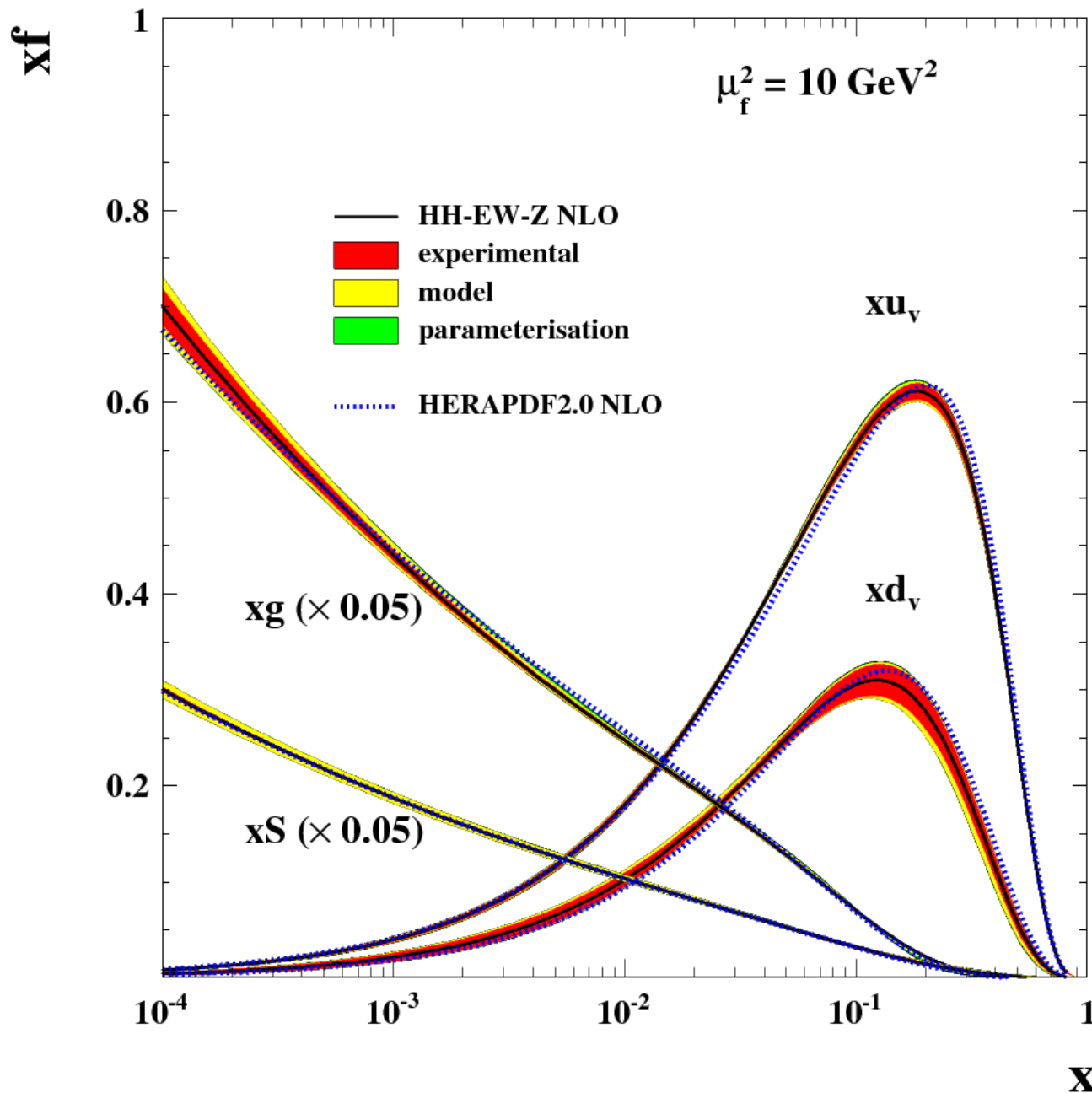
Comparison of results with ZEUS-EW & HH-EW with no QED uncertainties



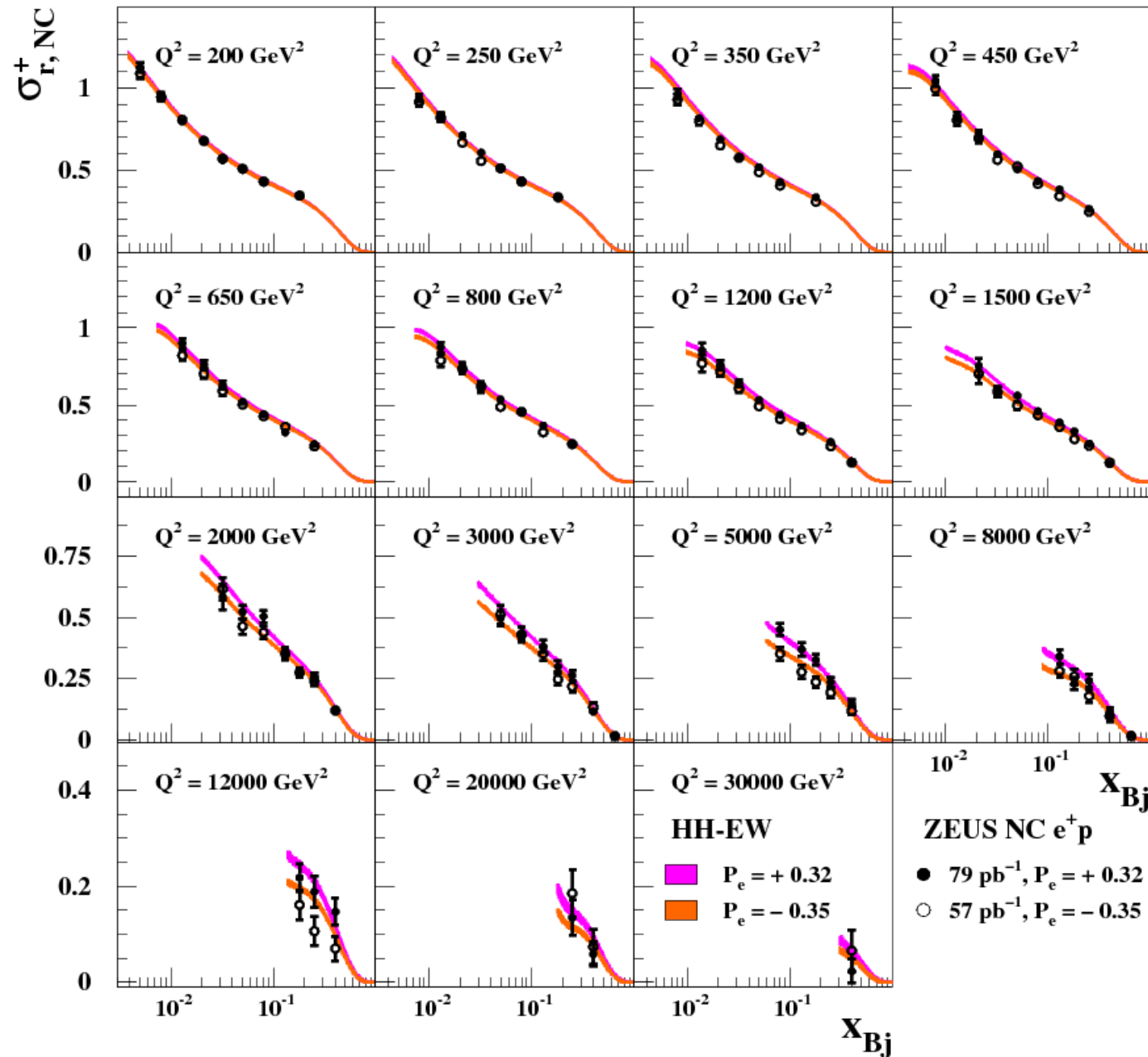
χ^2/ndof

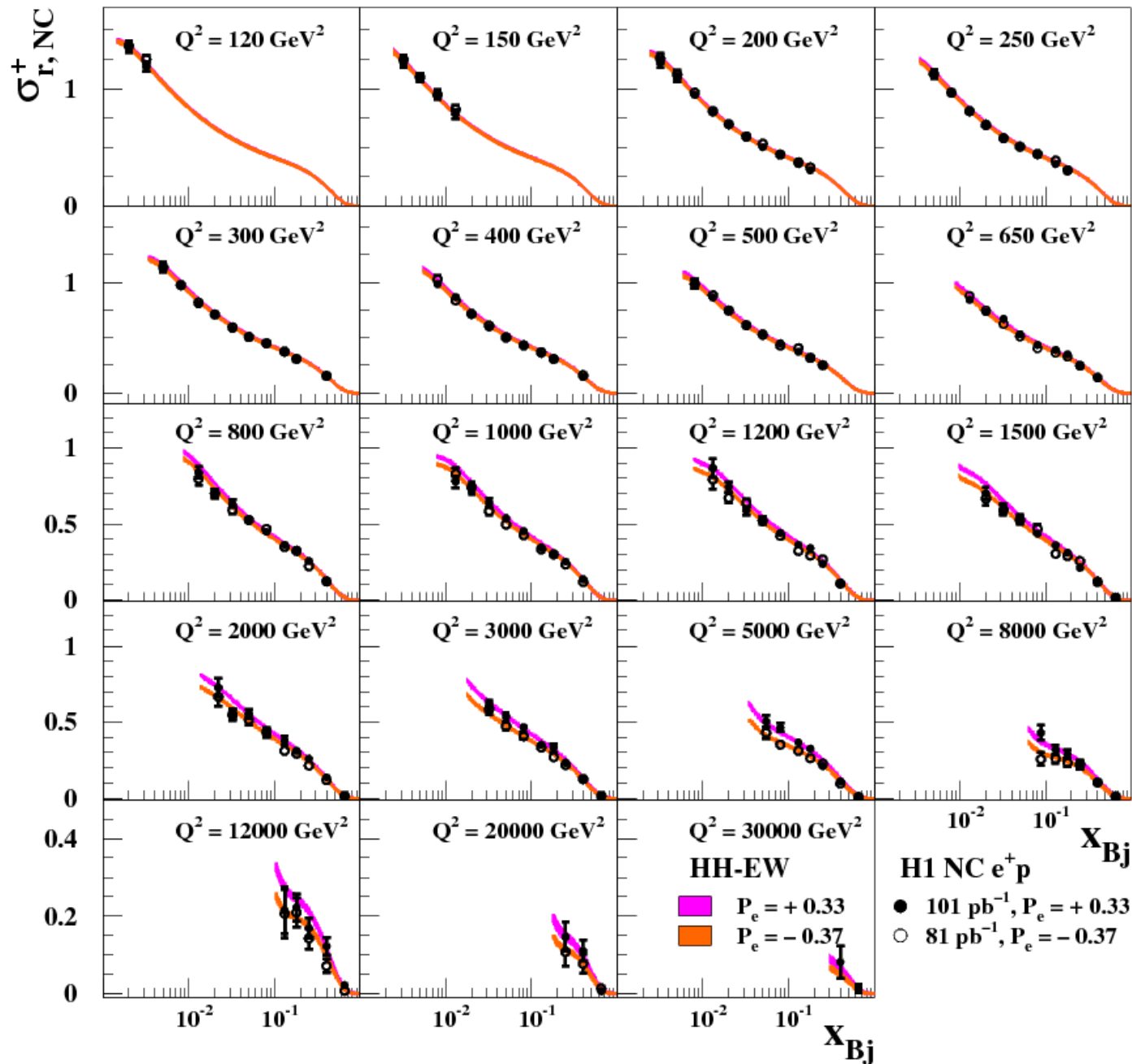
- HHEW-QED
3556/3231 \rightarrow 1.10
- HHEW-noQED
3583/3231 \rightarrow 1.11
- ZEUS-EW
3270/2925 \rightarrow 1.12

Parton densities



- Present fits are more stable with respect to model/param uncertainties than ZEUS-EW
 -> better precision





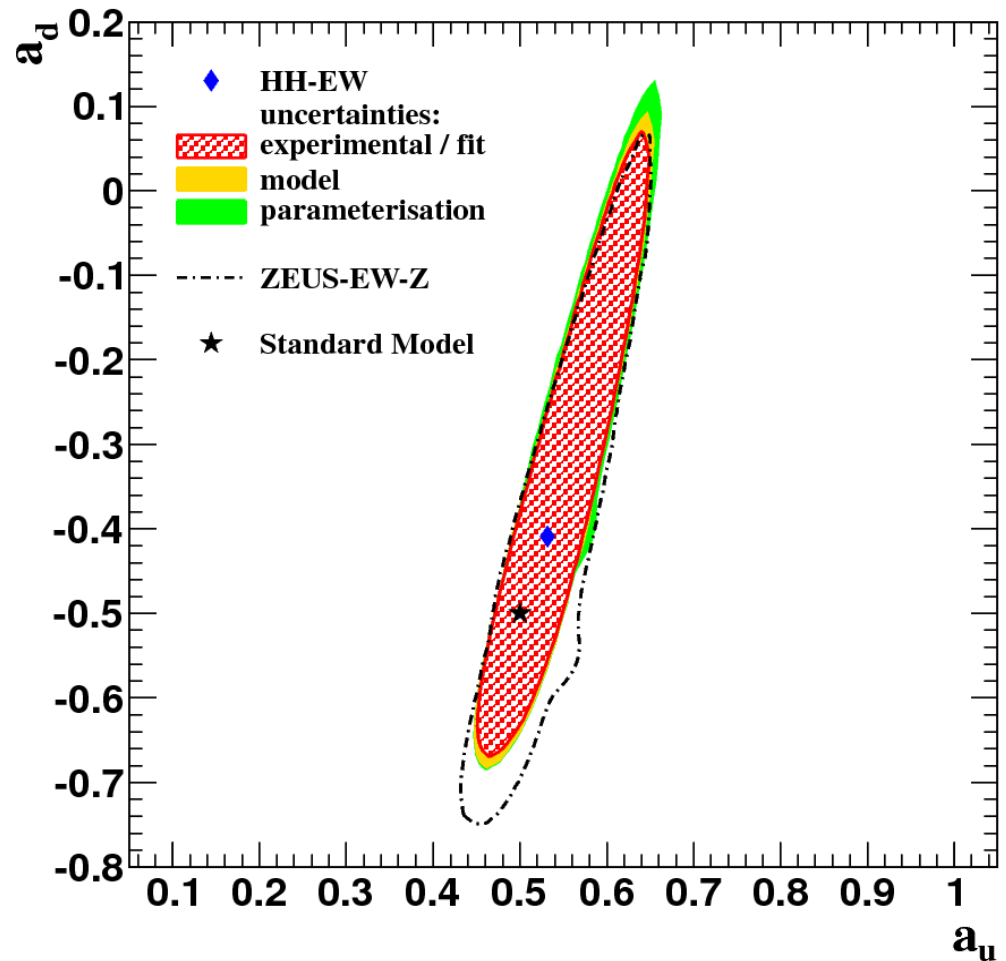
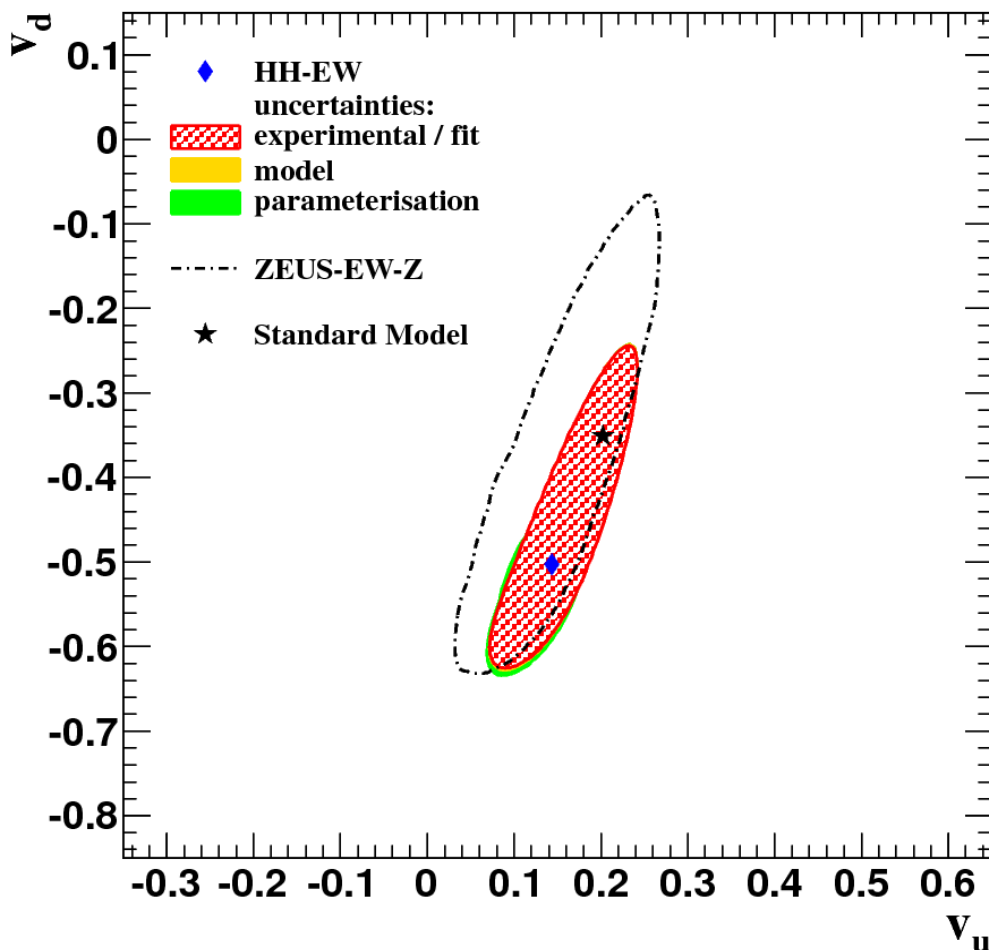
Comparison of results with ZEUS-EW & HH-EW with no QED uncertainties

- EW parameters, symmetrical uncertainties from MIGRAD/HESSE (fit uncertainties only)

	HHEW-QED	HHEW-noQED	ZEUS-EW
'auEW'	0.532 ± 0.072	0.529 ± 0.068	0.501 ± 0.056
'adEW'	-0.41 ± 0.28	-0.42 ± 0.26	-0.55 ± 0.20
'vuEW'	0.144 ± 0.060	0.146 ± 0.060	0.143 ± 0.082
'vdEW'	-0.50 ± 0.14	-0.49 ± 0.14	-0.41 ± 0.21

EW couplings

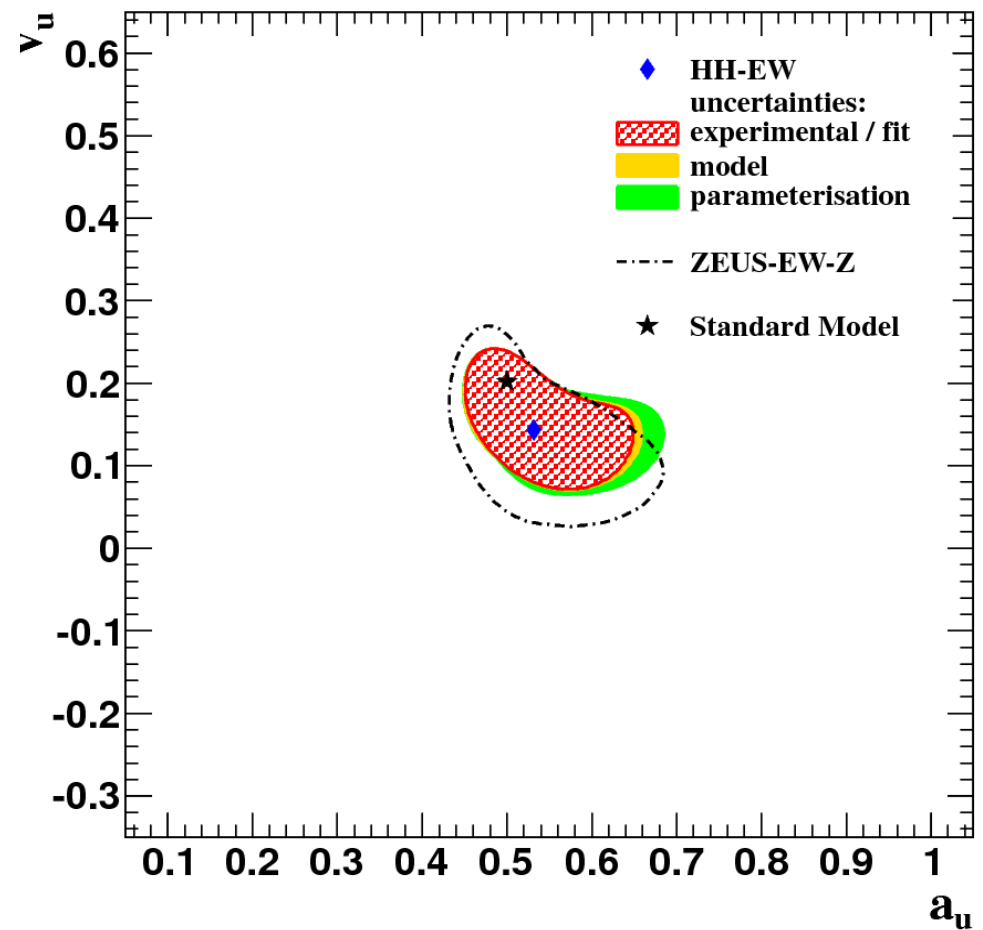
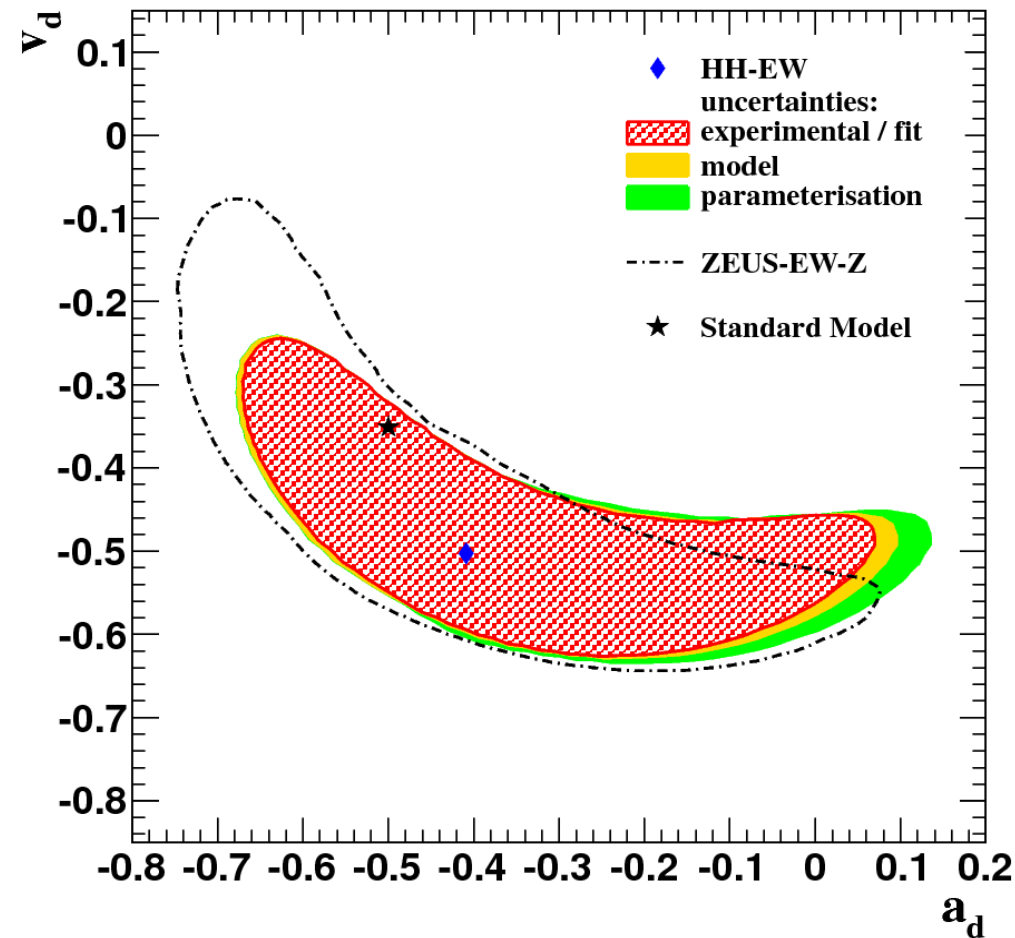
- Couplings consistent with SM and ZEUS-EW
- Vector couplings more precise**
- Not much improvement for axial couplings



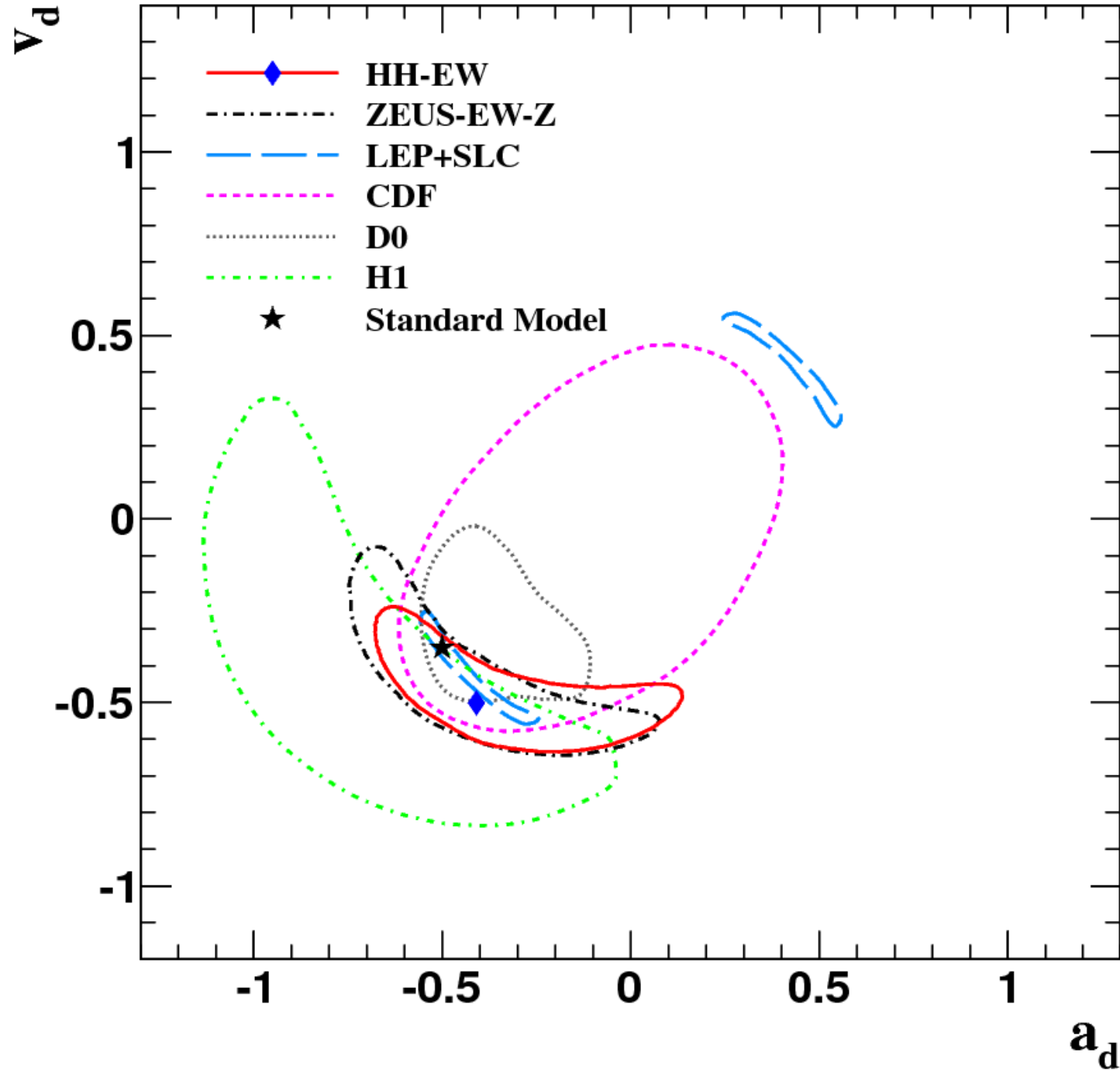
EW couplings

- Couplings consistent with SM and ZEUS-EW

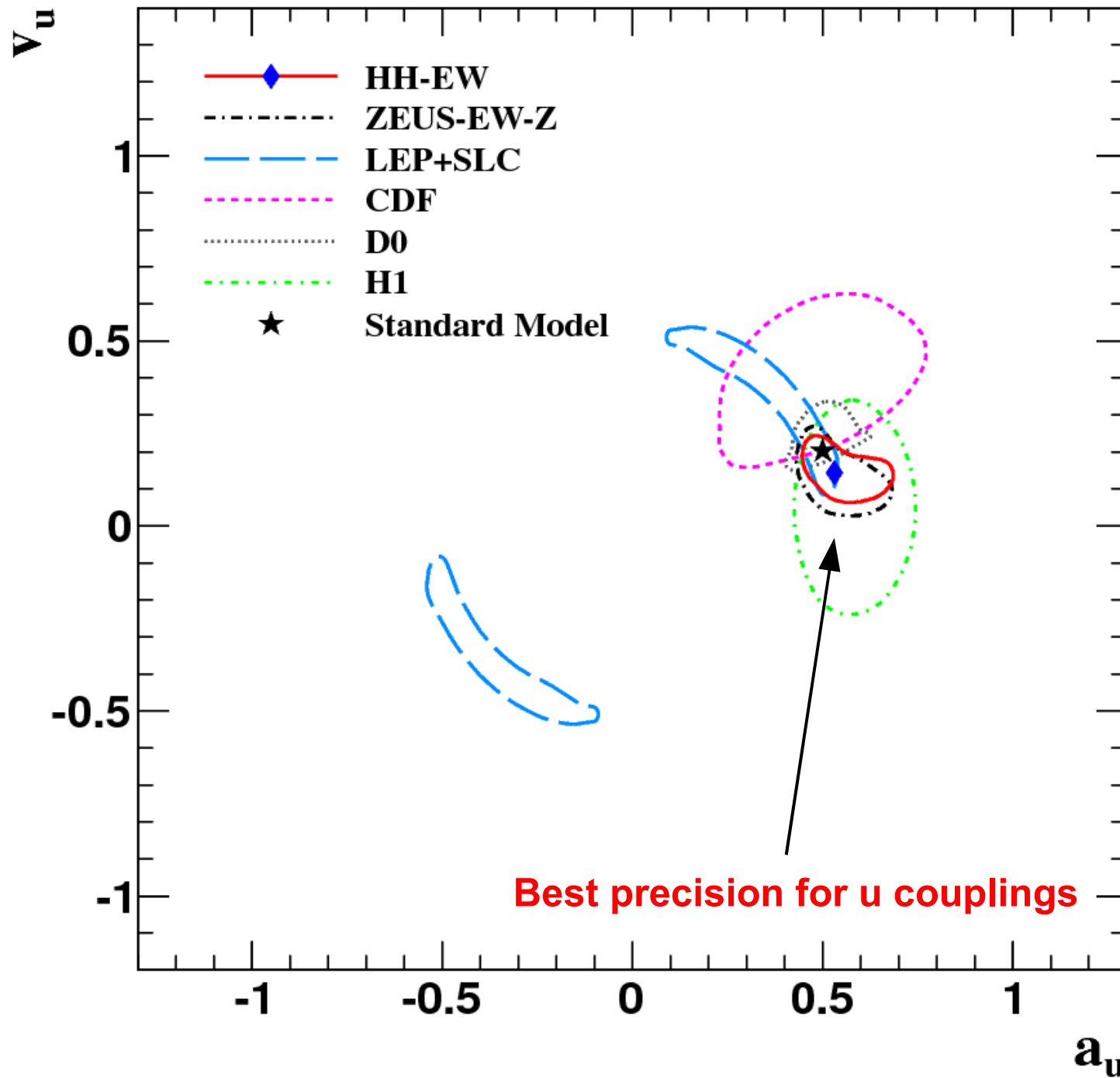
- v_u significantly better



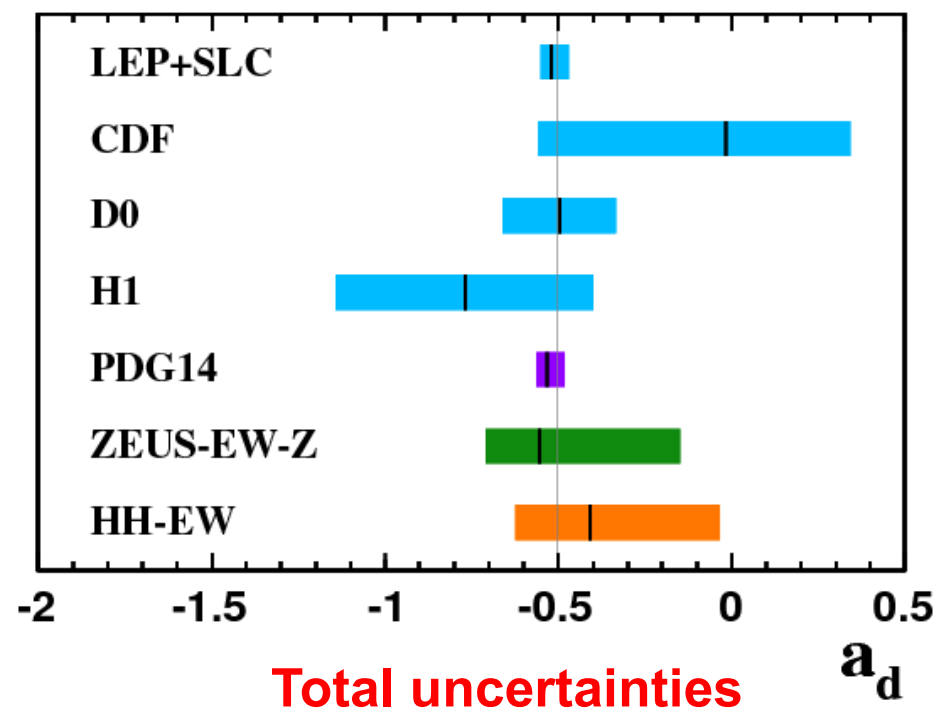
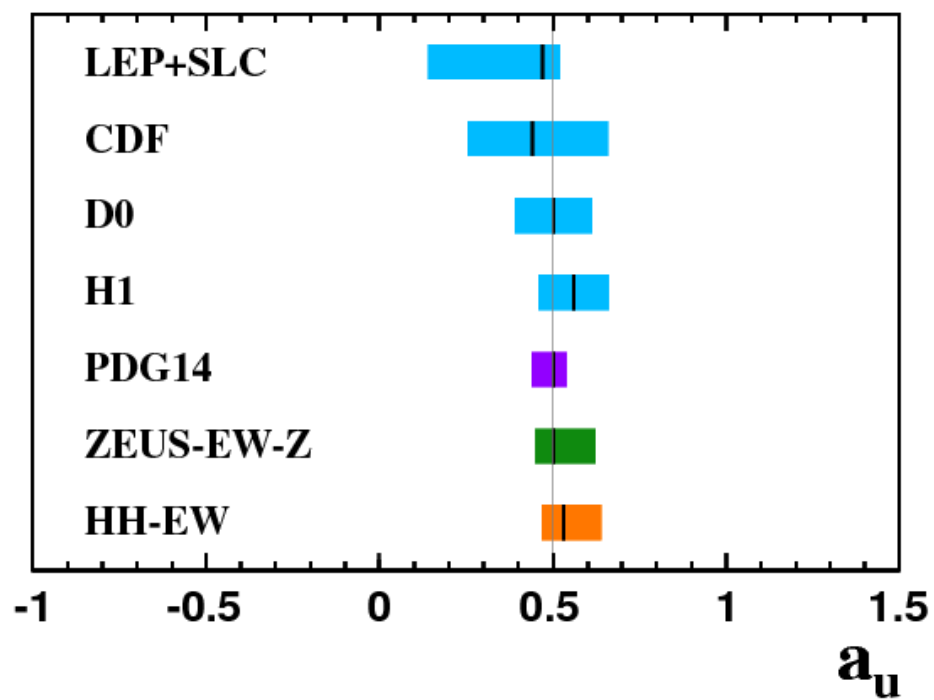
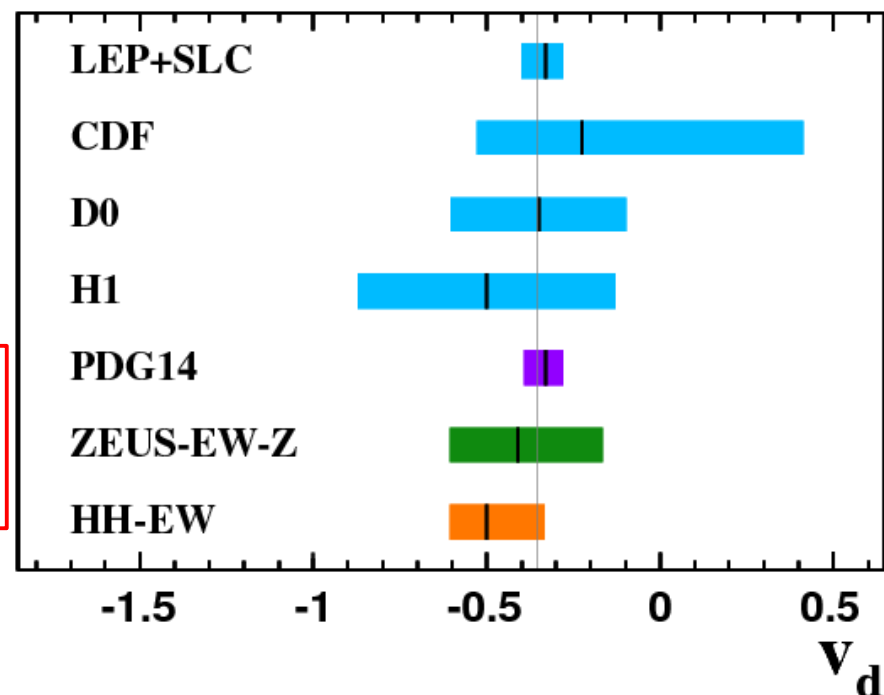
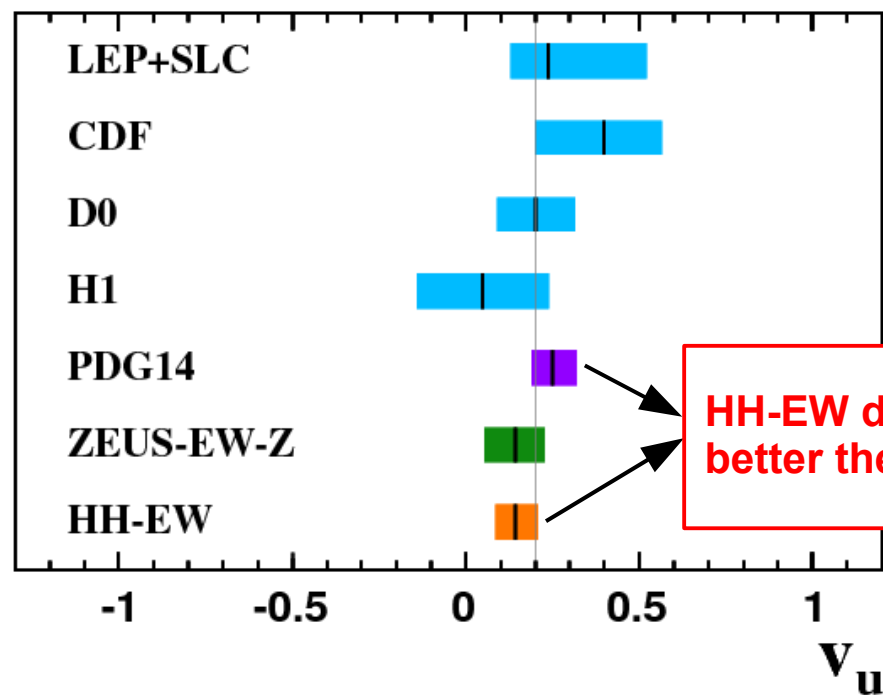
Comparison to other measurements



Comparison to other measurements



Significant improvement in vector couplings



Total uncertainties

Summary

- ZEUS & H1 polarised data used in global QCD+EW fit: HH-EW
- Setup identical to ZEUS-EW fits
 - ZEUS polarised data sets with additional uncertainties accounting for QED corrections - done H1-style
- Results consistent with ZEUS-EW and HERAPDF2.0
- Measurement on couplings only - most sensitive to adding H1 data
- Best gain of precision for vector couplings
 - V_u better than present PDG15
- -> plan to publish before DIS16

