Higgs c.s. and α_s

S.Alekhin (*Univ.* of *Hamburg* & *IHEP Protvino)*

(in collaboration with J.Blümlein and S.Moch)

HXSWG1 meeting, Les Houches, 8 Jun 2015

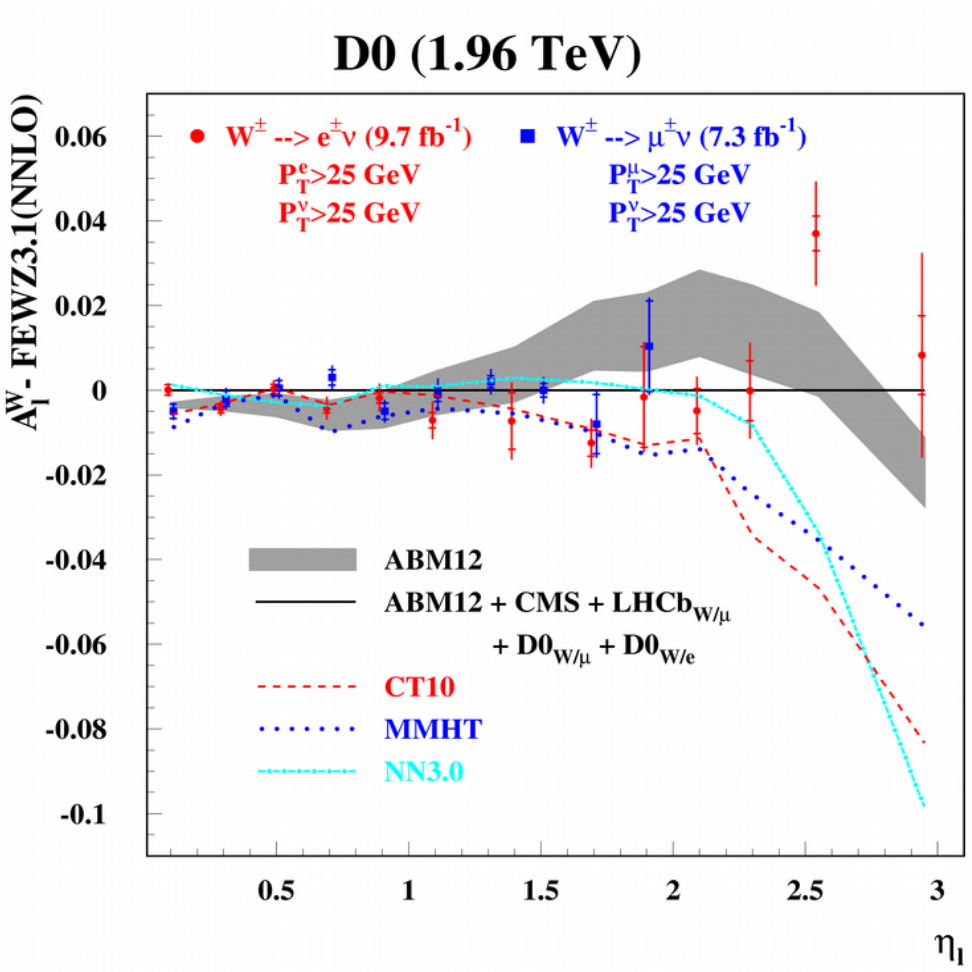
A comparison of ggF at NNLO

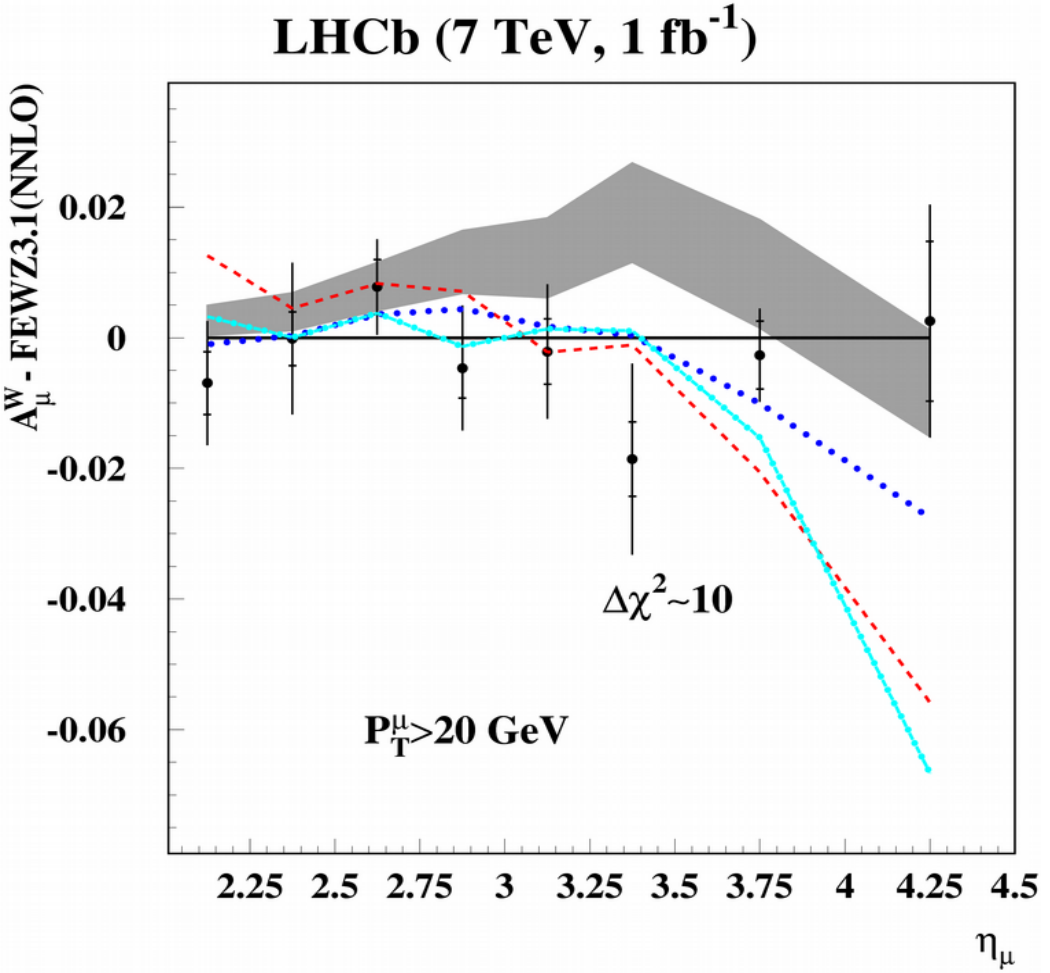
	CT14	MMHT2014	NNPDF3.0
8 TeV	18.66 pb -2.2% +2.0%	18.65 pb -1.9% +1.4%	18.77 pb -1.8% +1.8%
13 TeV	42.68 pb -2.4% +2.0%	42.70 pb -1.8% +1.3%	42.97 pb -1.9% +1.9%

The c.s. is quite stable → argument in favor of validity

How it may change with variation of α_s and what is reasonable range of this variation?

DY at large rapidity

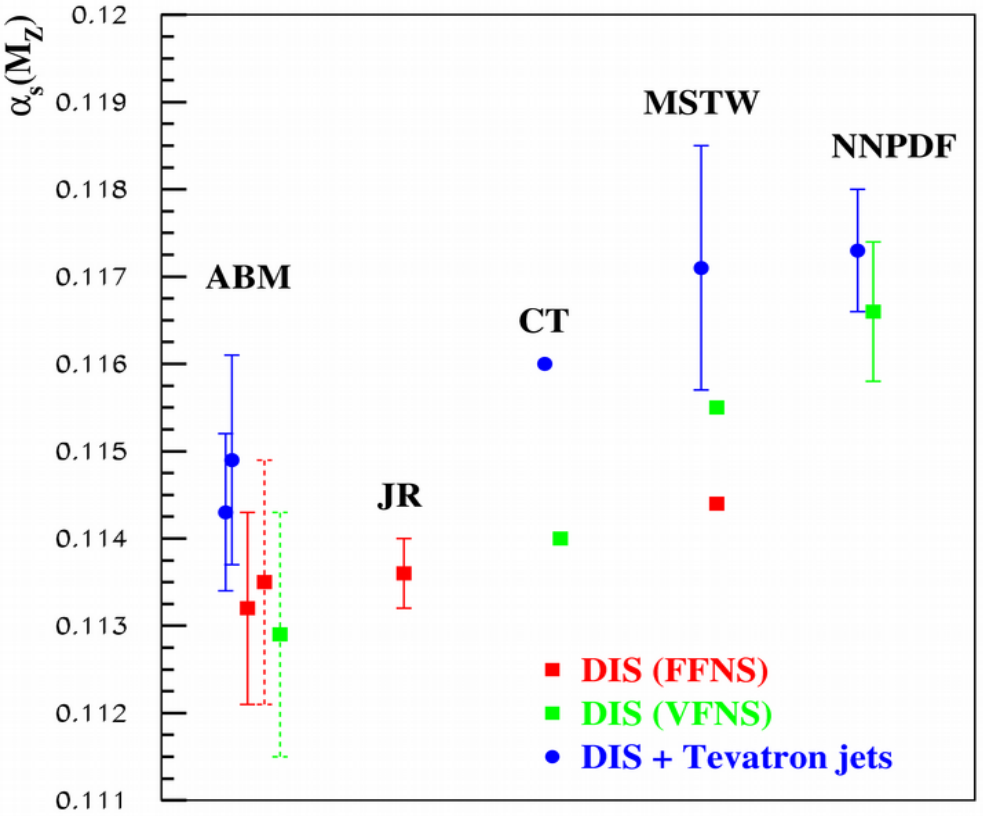


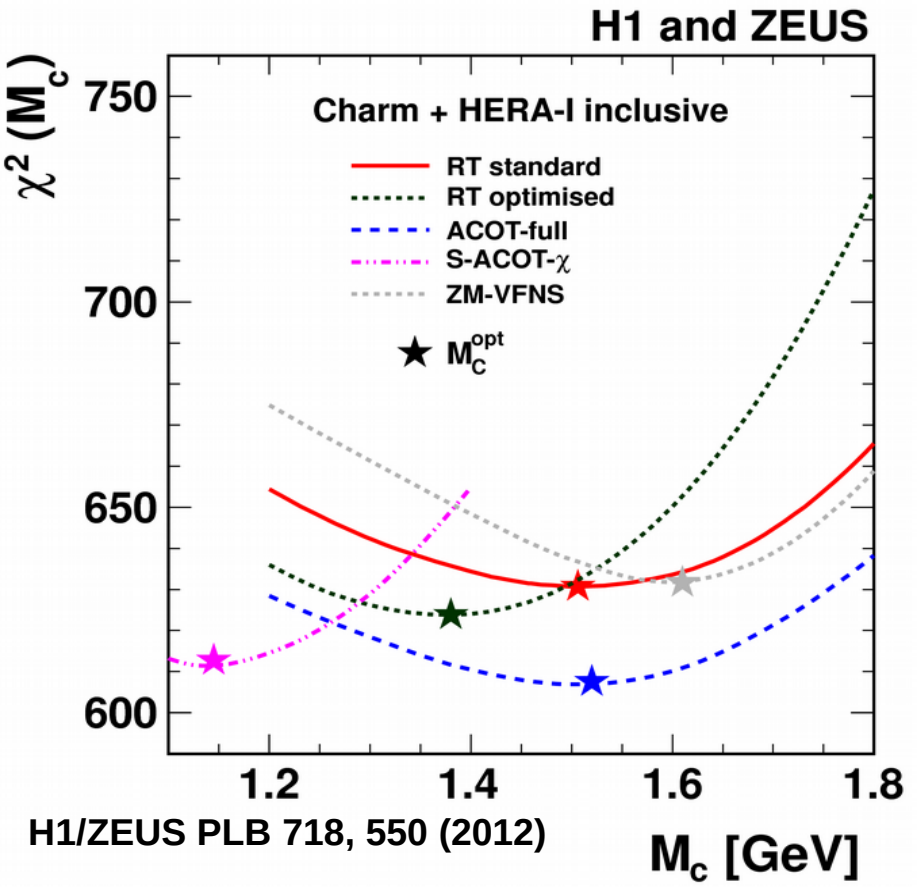


Data are sensitive to valence quarks at large x and to *sea at small x*

- Good agreement with the ABM predictions/fit in general, although some data point fluctuate significantly
- Other recent PDFs undershoot the data at large rapidity.

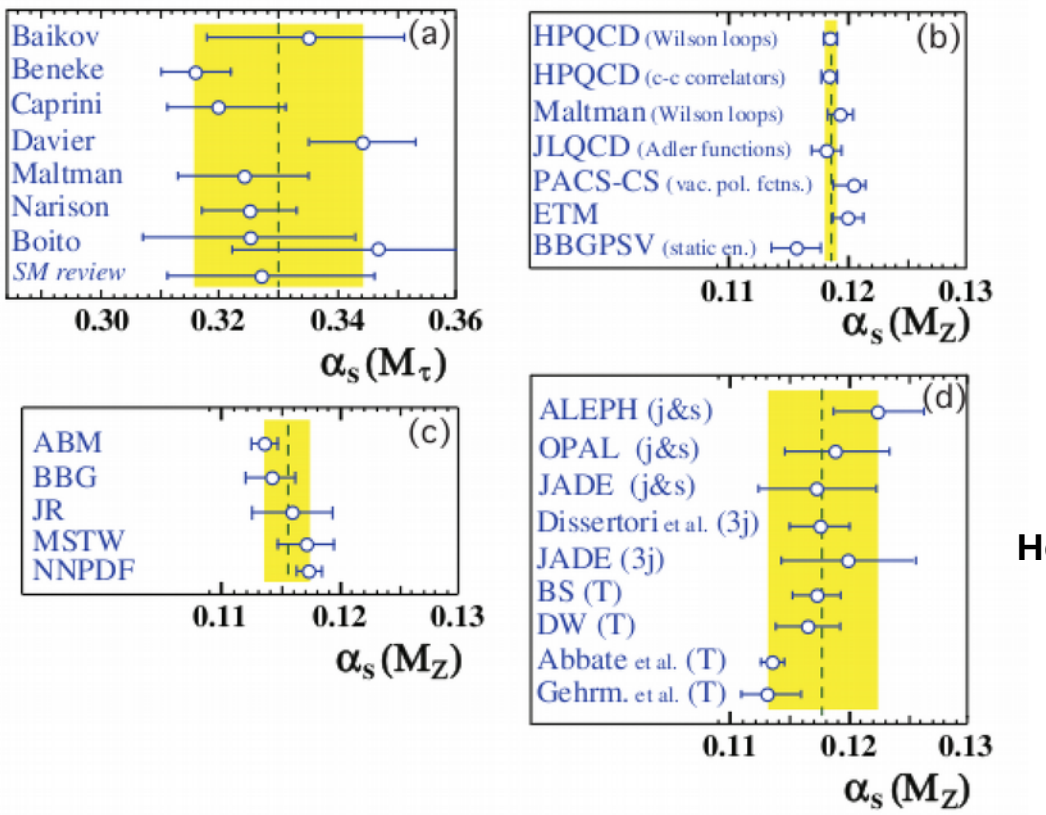
Value of α_s and m_c from PDF fits





- Value of α_s from "truely global PDF fits" is consistent with world average due to impact of jet data
- For the DIS variant of those fits big spread in α_s is observed, evidently due to difference in VFNS scheme details (cf. related spread in fitted value of m_c)
- Decrease in α_s preferred by jet data is foreseen due to impact of the NNLO corrections (10-25%) → in the MMHT14 analysis with the approximate NNLO jet K-factors $\alpha_s(M_Z)$=0.1172 is pushed up by NuTeV data on xF_3 (*iron target, power corrections, systematics due to difference in c.s. for (anti)neutrino beams)* rather by jets as earlier

Value of α_s: perspectives



$\alpha_s(M_z)=0.1172\pm0.0013$ (NLO, jets)

CMS hep-ex/1412.1633

$\alpha_s(M_z)=0.1151\pm0.003$ (NLO, t-quark)

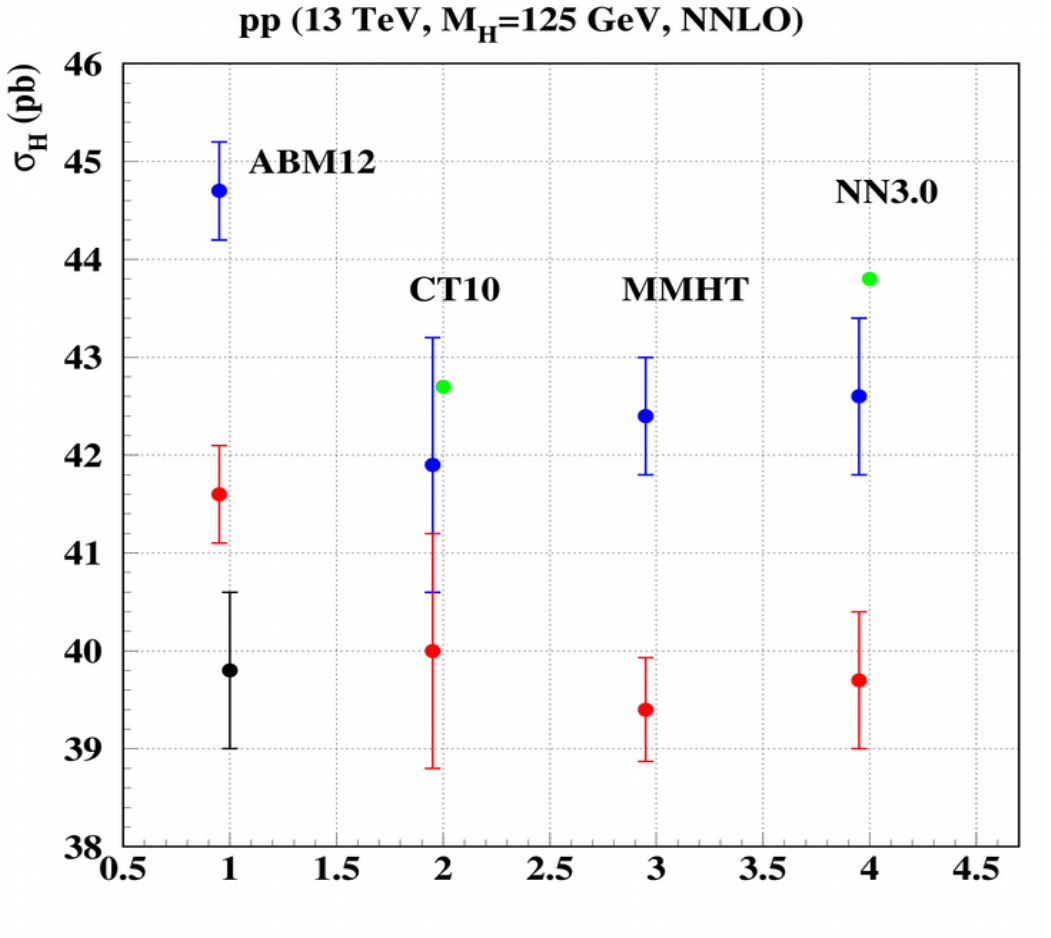
CMS hep-ex/1307.1907

$\alpha_s(M_z)=0.1123\pm0.0015$ (NNLO, e^+e^-, C-parameter)

Hoang, Kolodrubetz, Mateu, Stewart hep-ex/1501.04111

- The uncertainty in world average driven by the lattice determination is 0.0006
- Tension between lattice results and other determinations will be probably rising → more conservative estimate of the current uncertainty range is 0.115-0.118

Higgs c.s. in different scenarios



$\alpha_s(M_z)$=0.118, nominal PDFs

$\alpha_s(M_z)$=0.115, nominal PDFs

$\alpha_s(M_z)$=0.118, PDFs with $\alpha_s(M_z)$=0.115

Nominal $\alpha_s(M_z)$ and PDFs

- A spread in c.s. due to straightforward change in α_s
- Change in the gluon distribution due to change in the fit setting, which can lead both to the change in α_s and gluons → difficult to estimate in advance, roughly gives smaller effect
- Crude combination of these two gives an uncertainty of ~4 pb (10 %).

Summary

The Higgs c.s. for the LHC energy of 13 TeV with account of the uncertainty due to possible variation of $\alpha_s(M_z)$ by -0.003, within the range preferred by the LHC data on jet and t-quark production, is roughly estimated as laying in the range of 39-43 pb.