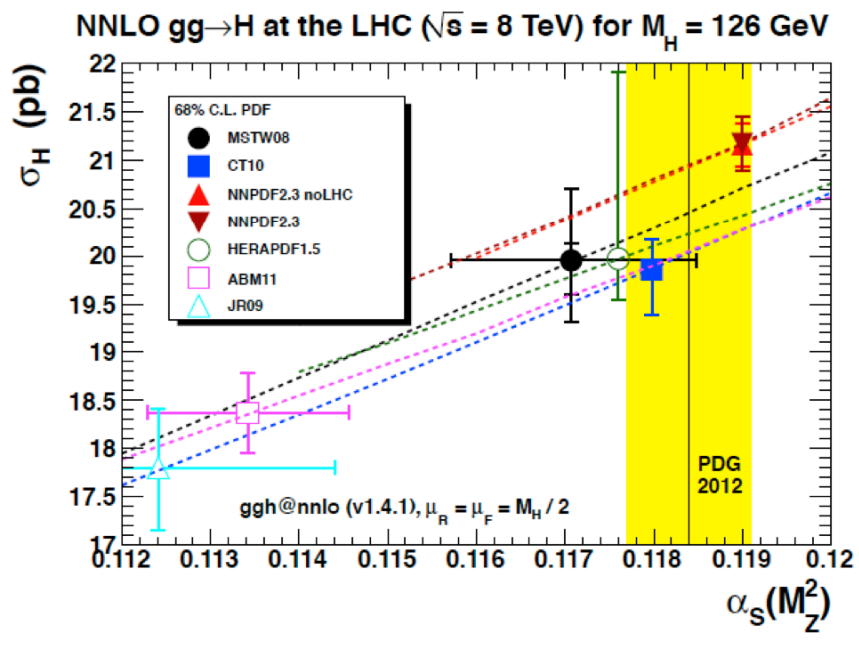
Parton Distributions for the LHC Run II

Pavel Nadolsky and Juan Rojo
PDF session conveners

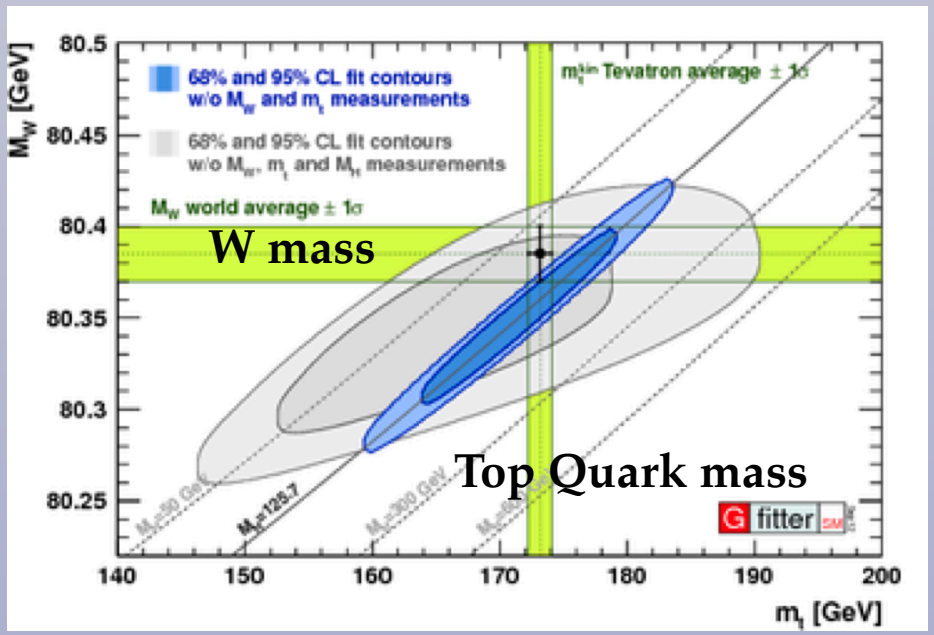
QCD Tools for LHC Physics: From 8 to 14 TeV. What is needed and why?

Fermilab, 15/11/2013

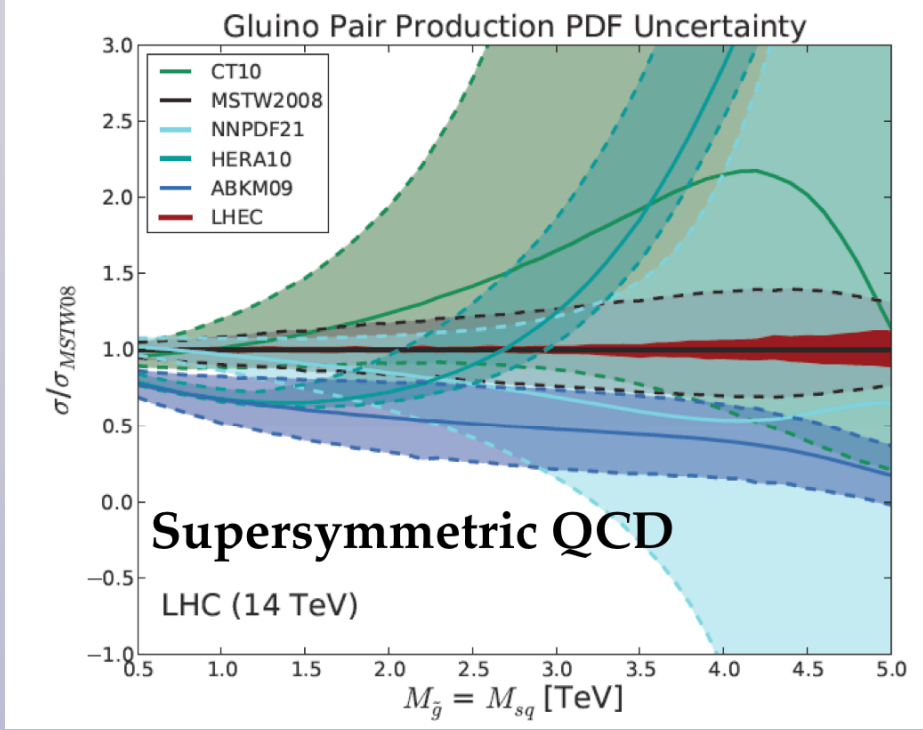
PDFs and LHC phenomenology



1) PDFs fundamental limit for Higgs boson characterization in terms of couplings



2) Very large PDF uncertainties (>100%) for new heavy particle production



3) PDFs dominant systematic for precision measurements, like W boson mass, that test internal consistency of the Standard Model

PDF measurements for LHC Run II

- **Gluon PDF from the LHC** (**Jun's talk**)
  - Inclusive jets, dijets, forward jets: *medium/large-x*
  - Isolated photons and photon+jets: *medium-x (0.01-0.03)*
  - Top quark cross-sections and differential distributions: *large-x (x>0.1)*
  - W and Z production at high p_T: *constrain the gluon in the same region as gg -> H*
- **Quark PDFs from the LHC** (**Ringaile's talk**)
  - Inclusive W and Z production and asymmetries: *quark-flavor separation*
  - W production with charm: *strangeness*
  - Off resonance Drell-Yan and W production at high mass*: very large-x antiquarks*
  - Low mass Drell-Yan production: *small-x quarks and gluons*
- **Quark PDFs for non-LHC experiments** (**Alberto's talk**)
  - Large-x data from fixed-target DIS: *large-x PDFs, d/u separation*
  - New fixed-target Drell-Yan experiments: *constraints on flavor separation*
  - Semi-inclusive DIS with tagged kaons: *handle on strangeness*
  - Intrinsic heavy quark PDFs
- **New avenues**
  - Cross-section ratios between 2.76, 7, 8 and 14 TeV: *direct handle on large-x PDFs*

PDF whishlist for the LHC Run II

- Inclusive **jets:** *full NNLO calculation*, *exp. data extending to higher pt with smaller systematics*
- Inclusive **W and Z production** and asymmetries: *update to 2012 data, correlation between W, and Z and between experiments*
- Isolated **photons and photon+jets**: *full NNLO, fast interface, experimental covariance matrix, extend high pt coverage, reduced systematics*
- **W production with charm**: *Update to 2012 data, understand ATLAS/CMS discrepancy*
- **W and Z production at high p_T**: *full NNLO, experimental measurements in format suitable for PDF analysis*
- Off resonance **Drell-Yan and W production at high mass**: *update to 8 TeV, validation of NNLO codes and electroweak corrections, photon-induced effects*
- Low mass Drell-Yan production: *Understand better theory systematics*
- **Top quark** cross-sections and differential distributions: *full NNLO for differential, update to full 8 TeV dataset*
- **Cross-section ratios** between 2.76, 7 and 8 TeV: *measure in other processes on top of jets*