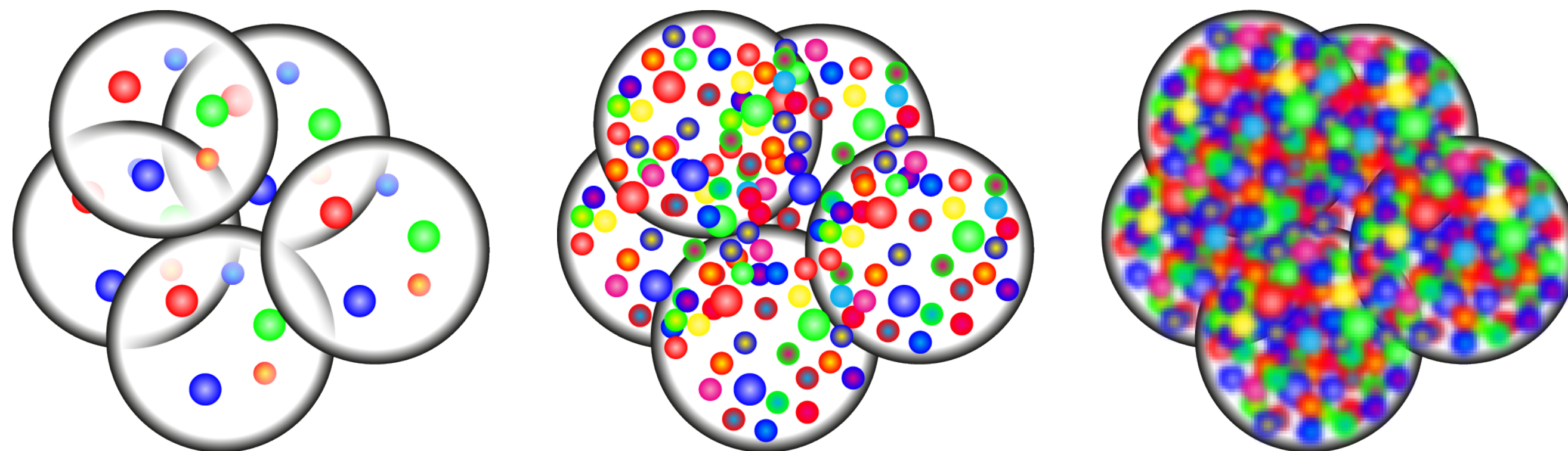
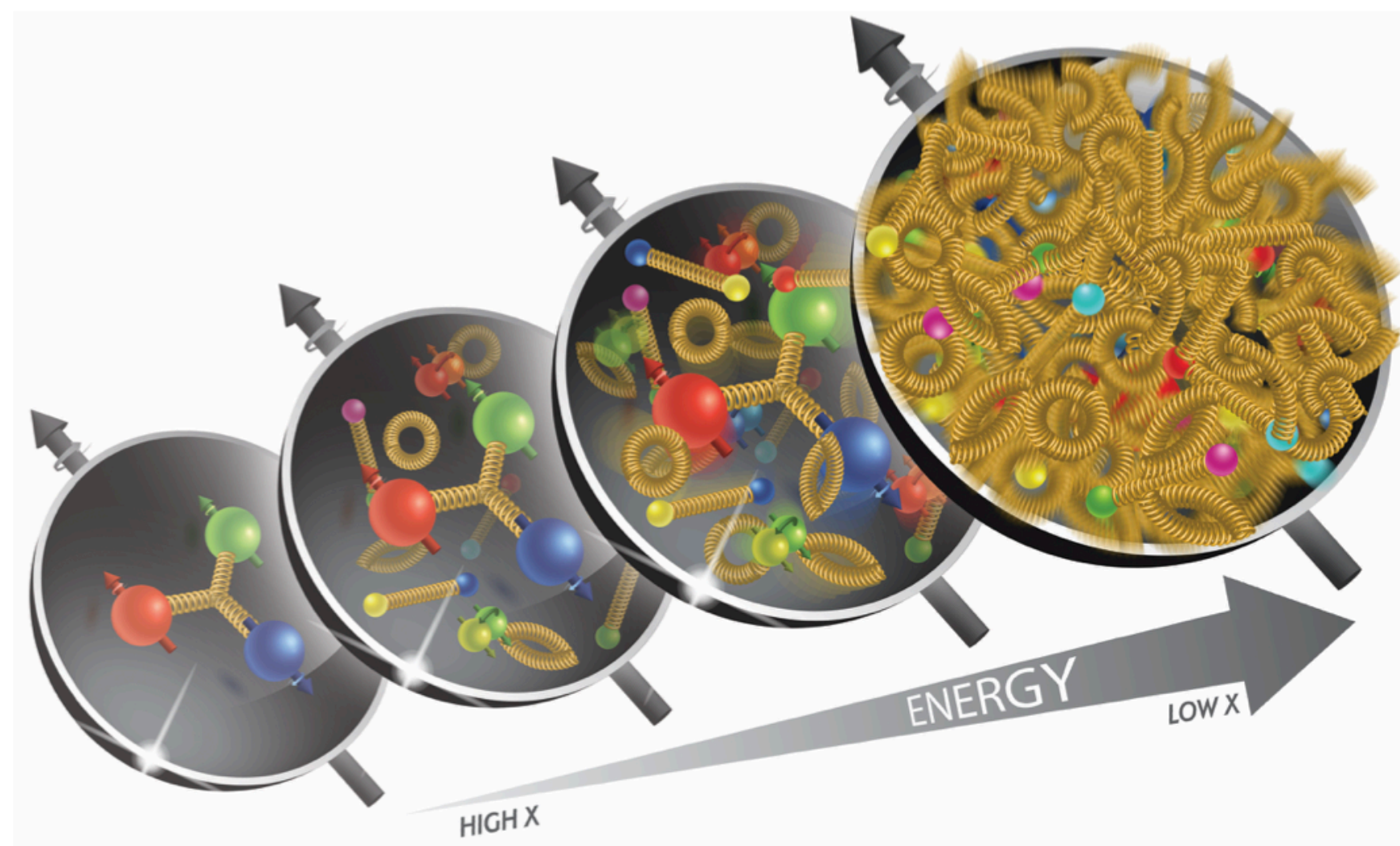
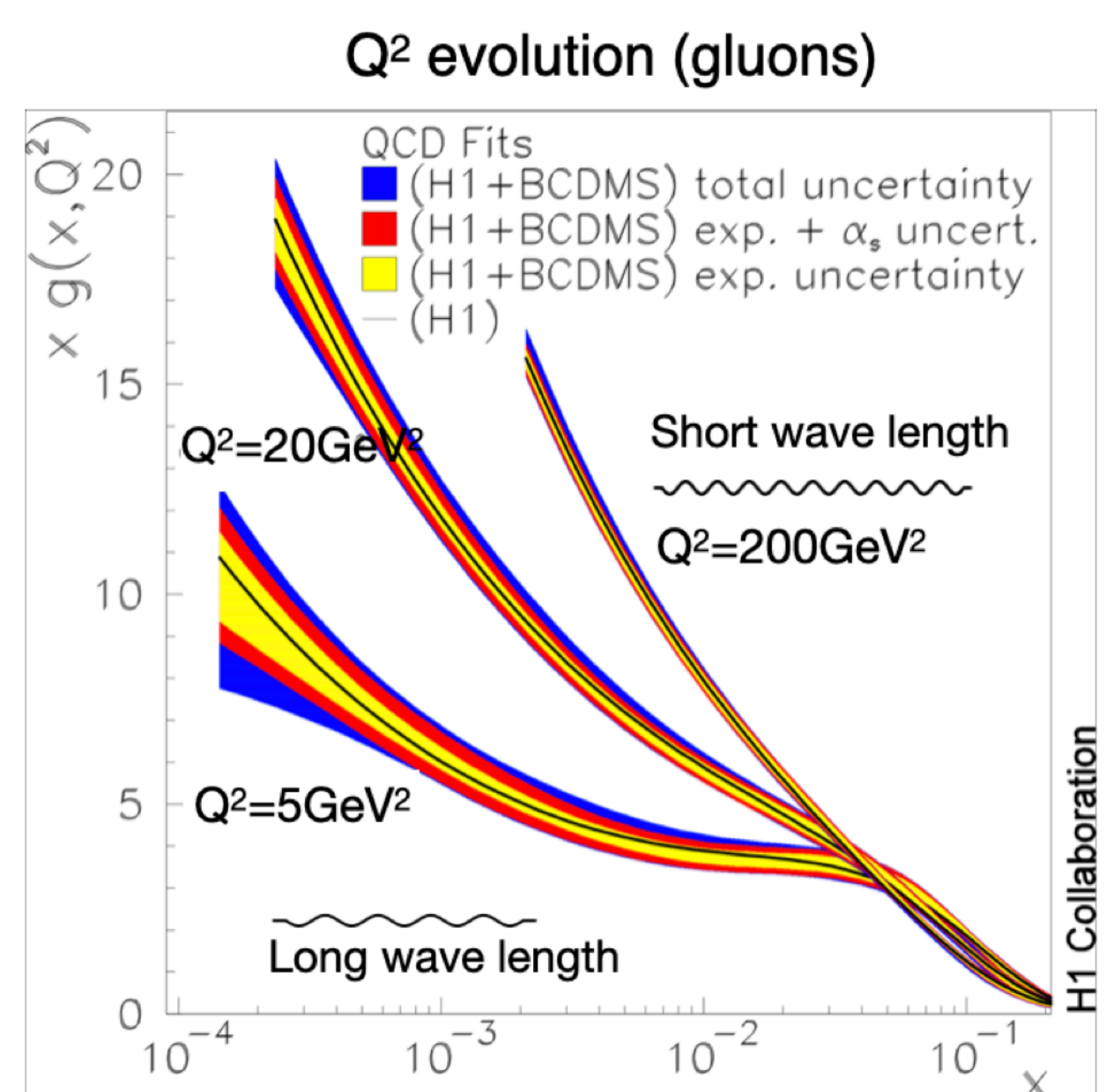
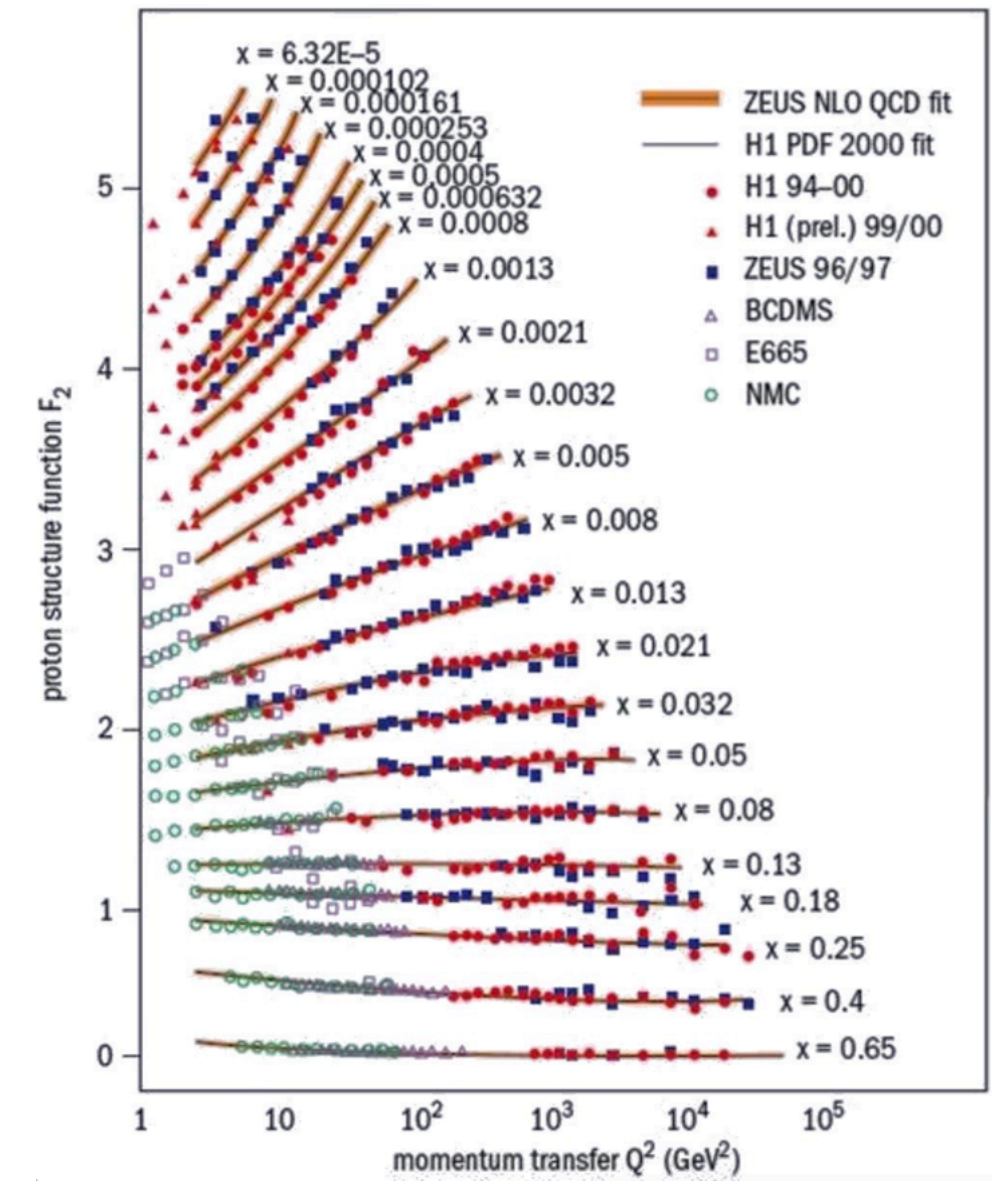
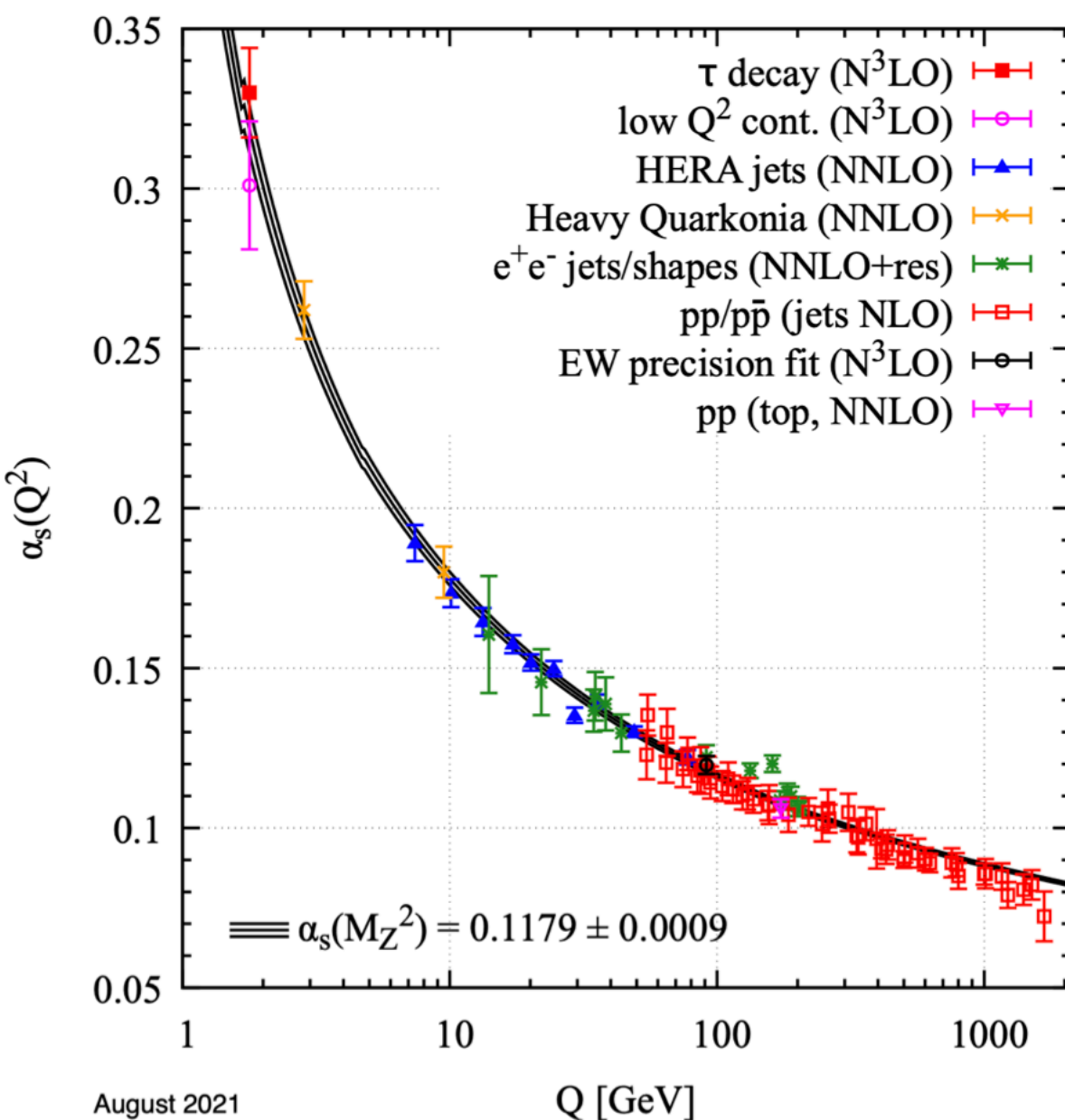


ALICE-FoCal Upgrade

Norbert Novitzky
(ORNL)

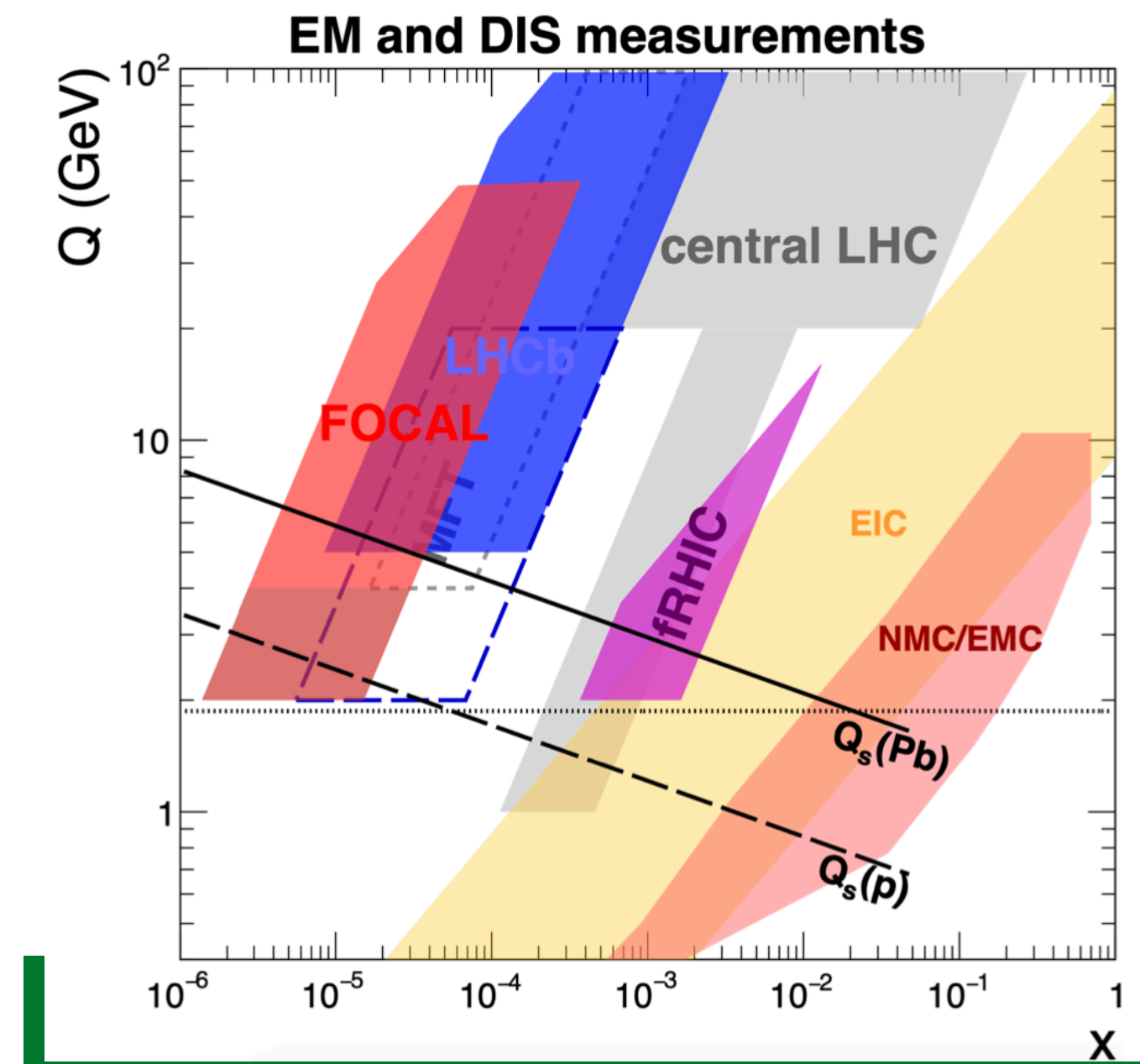
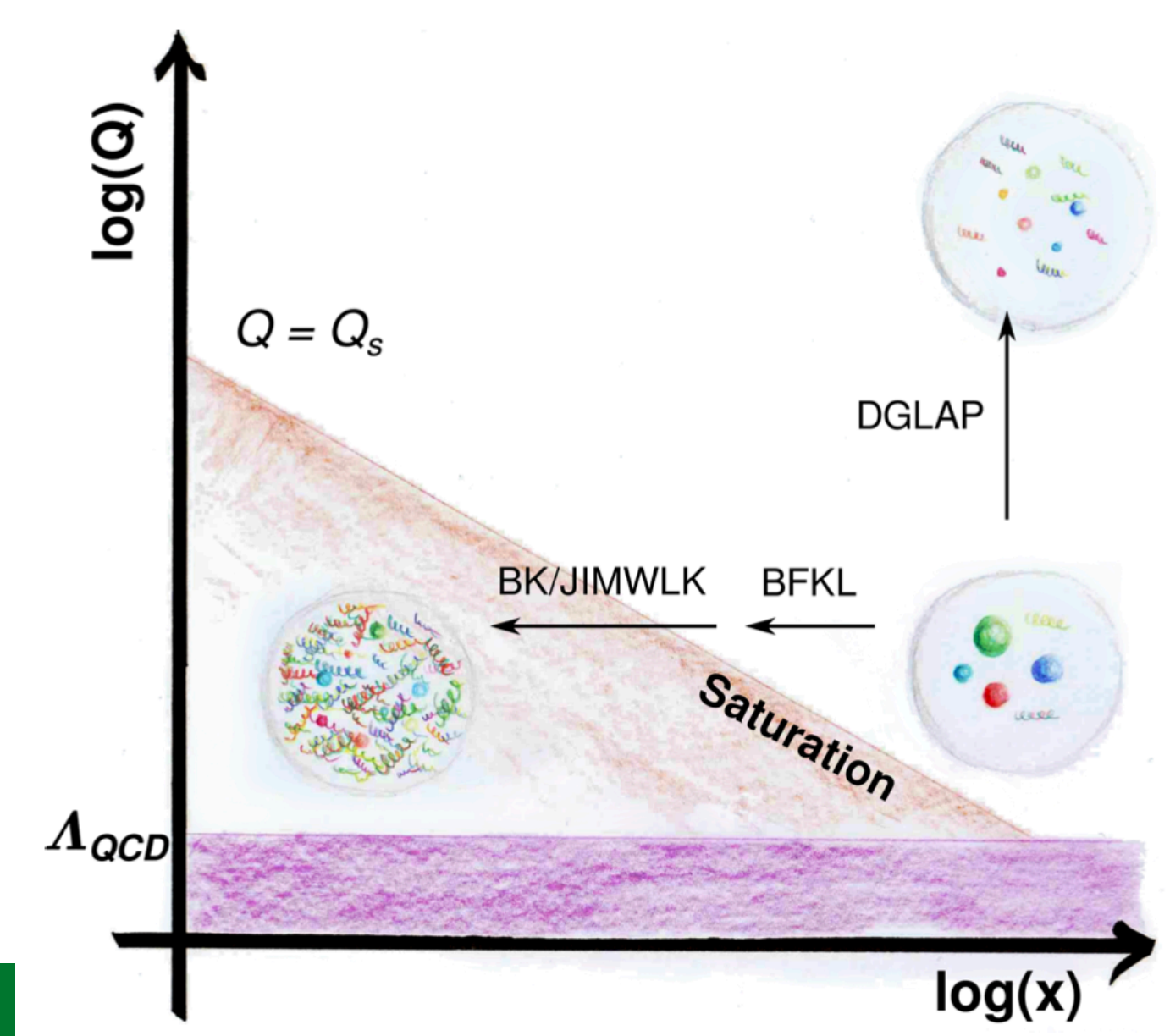


The FoCal detector mission



Understanding the QCD through the evolution of scales:

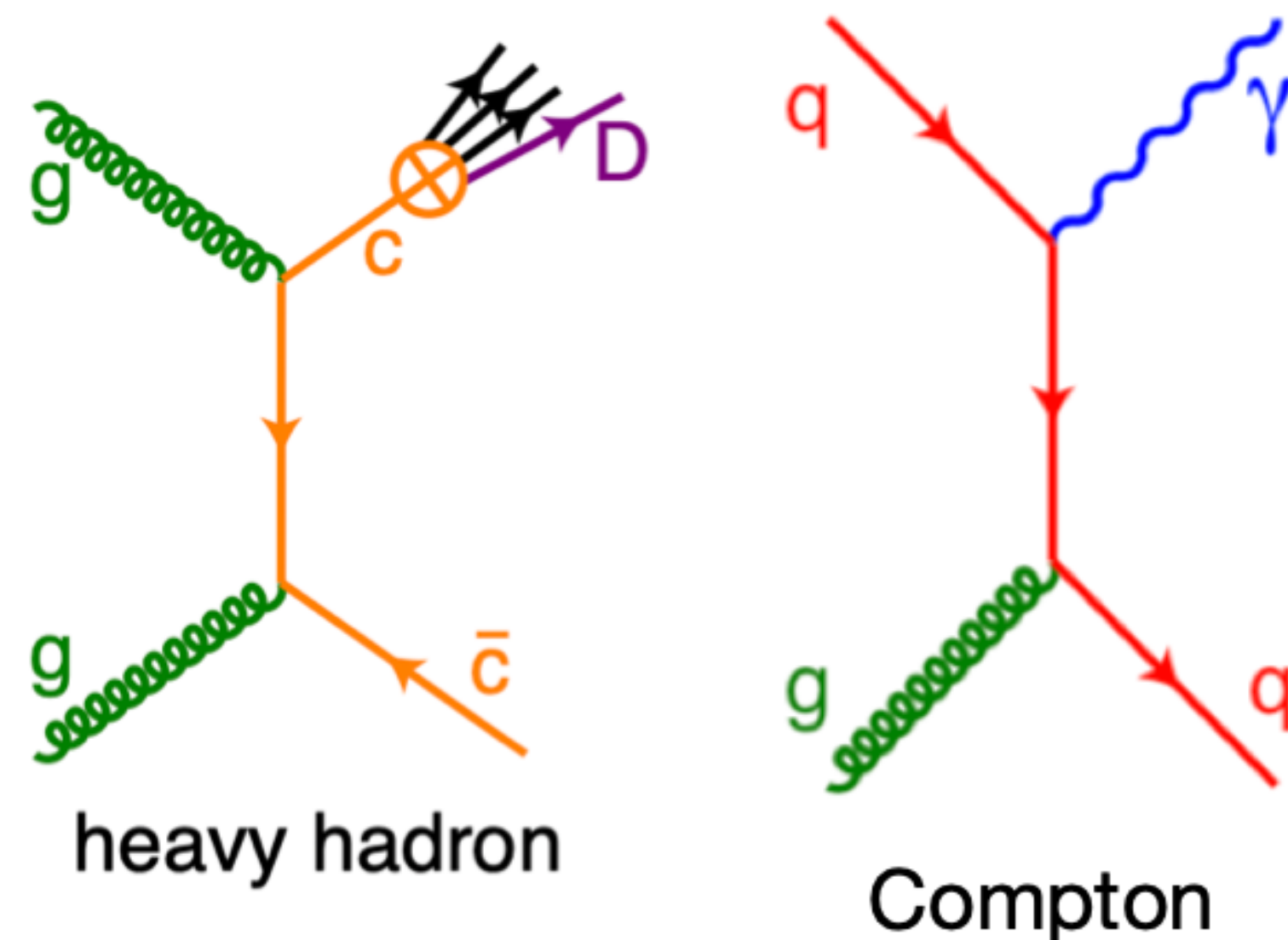
- **Detailed agreement** with the theory in α_s and F_2 is a compelling validation of the QCD
- Gluon content **increasing** with the larger Q^2
 - Larger contribution of gluons at larger collision energies



Next frontier: Saturation and non-linear QCD

- LHC provides a **unique region** of the $[Q, x]$ phase space
- Strong **connection to the EIC** physics:
 - Saturation phenomena across **orders of magnitudes** in x region
 - **Evidence** for the saturation region
 - Power law in $[Q, x]$ space?

Why FoCal is compelling



Sensitivity to gluon Parton Distribution Functions of the leading order (LO):

- **Heavy flavor** reconstruction (LHCb, ALICE-MFT)
 - Fragmentation function
 - Final state effects? Energy loss? Long range correlations?
- **Direct photon** reconstruction (ALICE-FoCal, LHCb)
 - Reduced complexity:
 - no interaction in the final state
 - no fragmentation function

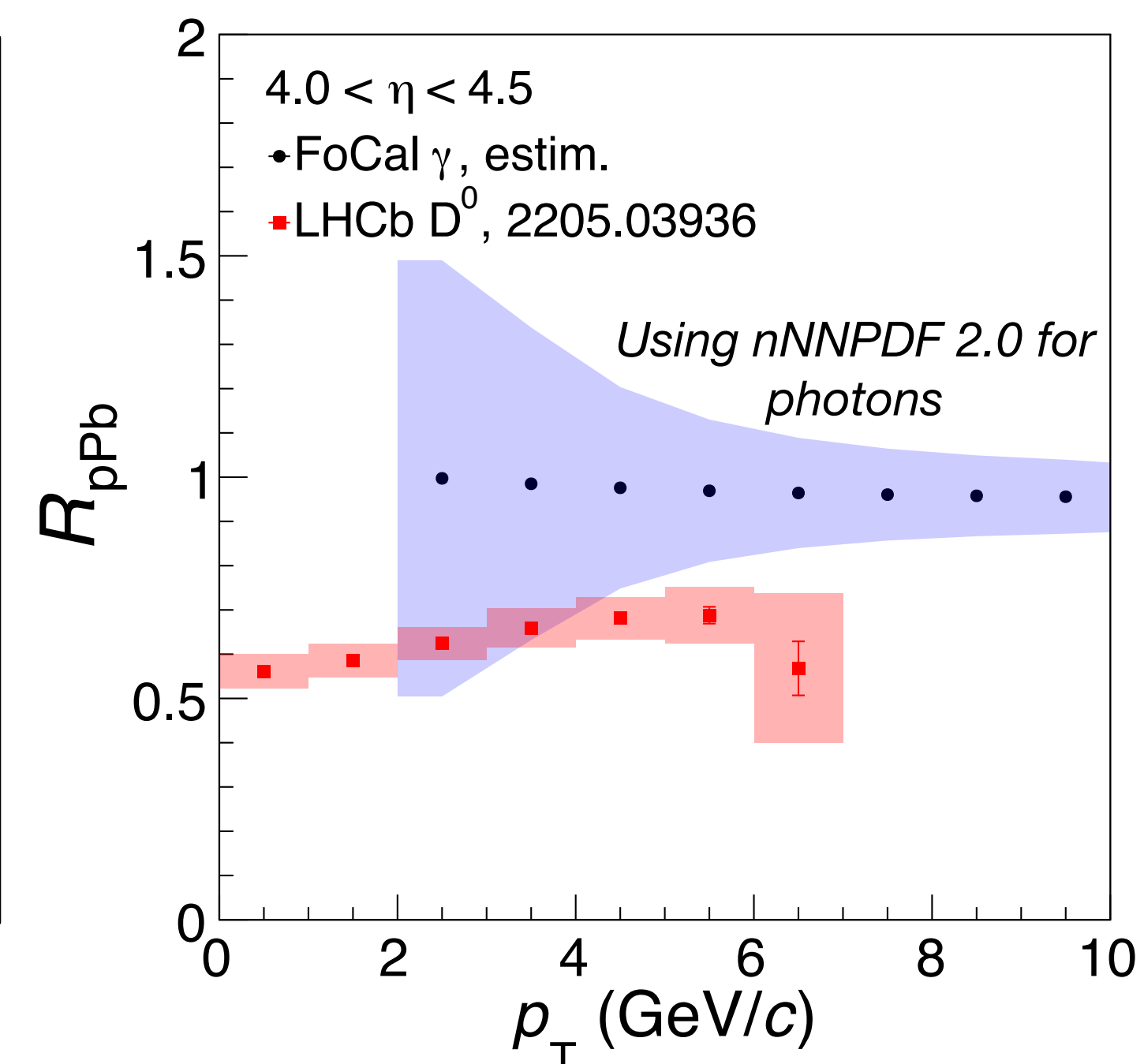
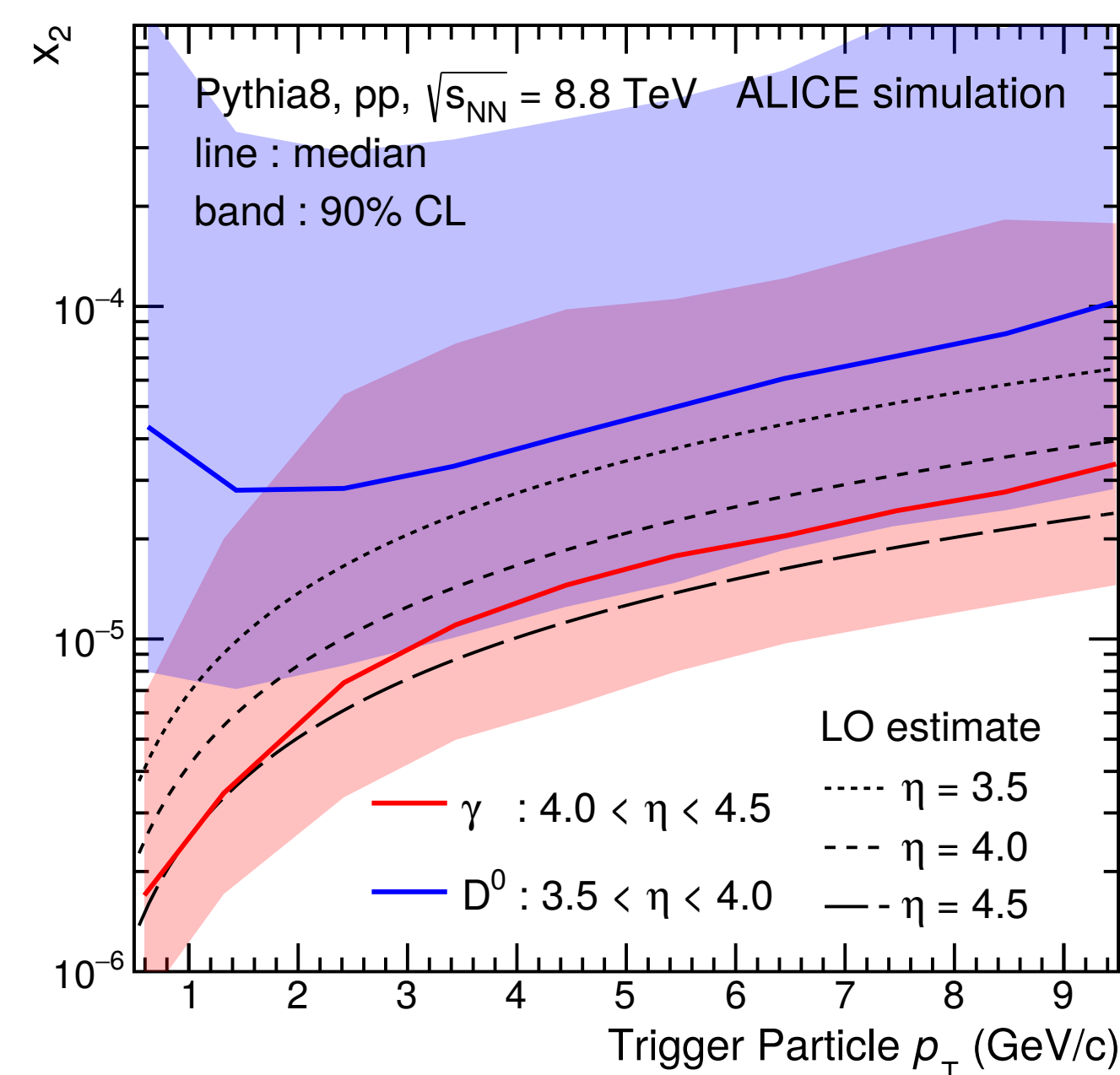
Letter of Intent: <https://cds.cern.ch/record/2719928/files/LHCC-I-036.pdf>

Direct photons are much cleaner probes to study the saturation region:

- Reach down to $x \sim 10^{-6}$ at p -Pb at 8.8 TeV
- Sensitivity to potential final state effects in the hadron distribution

ALICE-FoCal broader scope:

- Gamma-jet **correlations** in forward-forward, forward-mid-rapidity
- Studies as a function of **event multiplicity**



FoCal ongoing R&D

