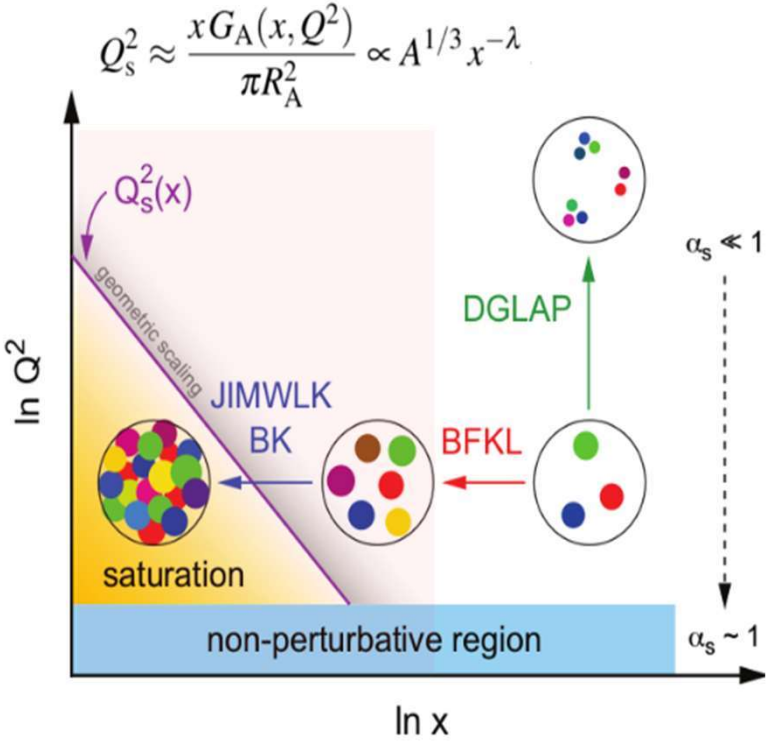
Status of the FoCal detector at ALICE

Amrit Gautam

Physics motivation: probing gluonic matter



At low x

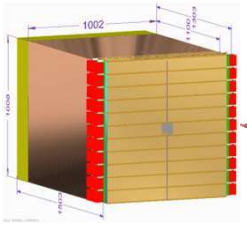
- **Gluon saturation, Color Glass Condensate**
- **Gluon shadowing**

x = Fraction of momentum carried by parton with respect to the whole nuclei
Q^2 = Square of four momentum transfer

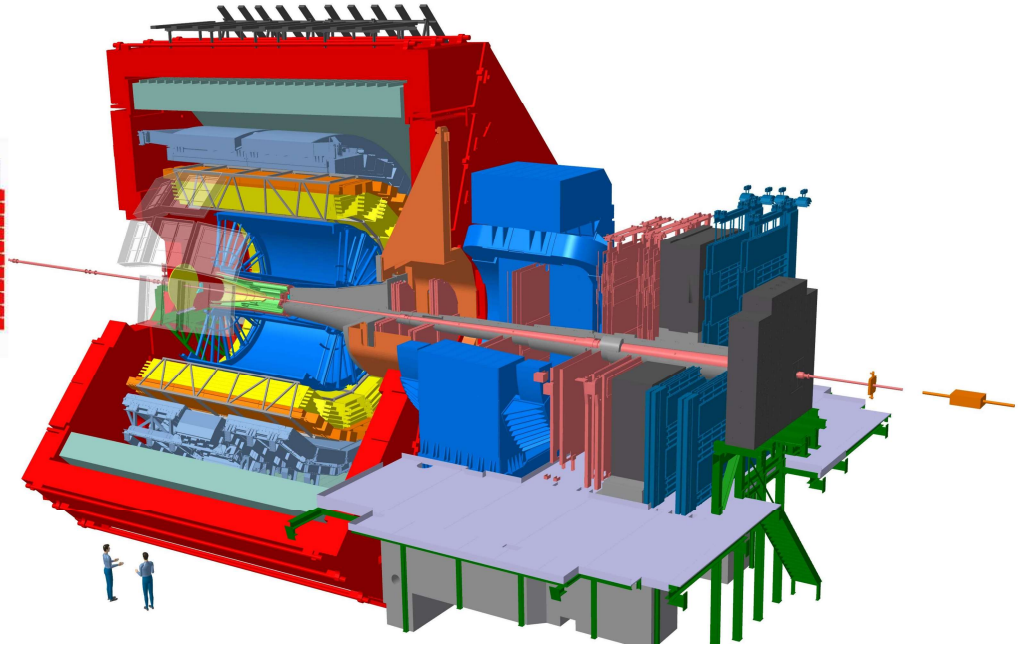
Focal upgrade at ALICE

Part of the ALICE Run 4 Upgrade (2029)

- **Pseudo Rapidity Coverage** $3.2 \leq \eta \leq 5.8$
- 7m from IP2



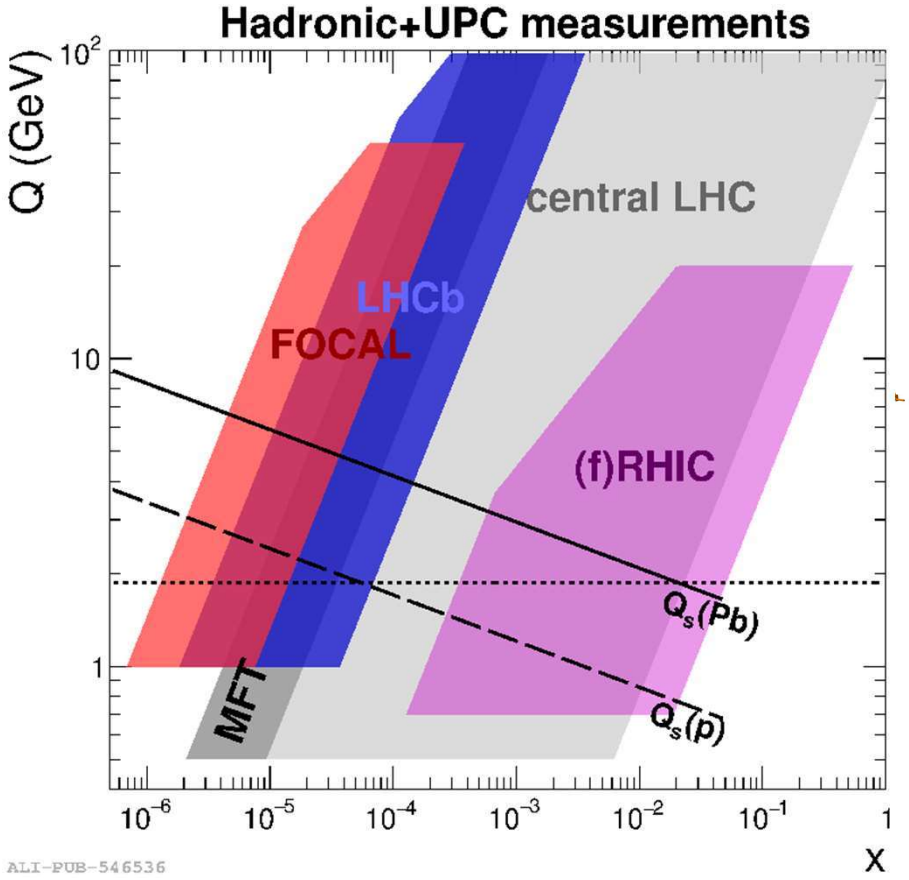
not to scale

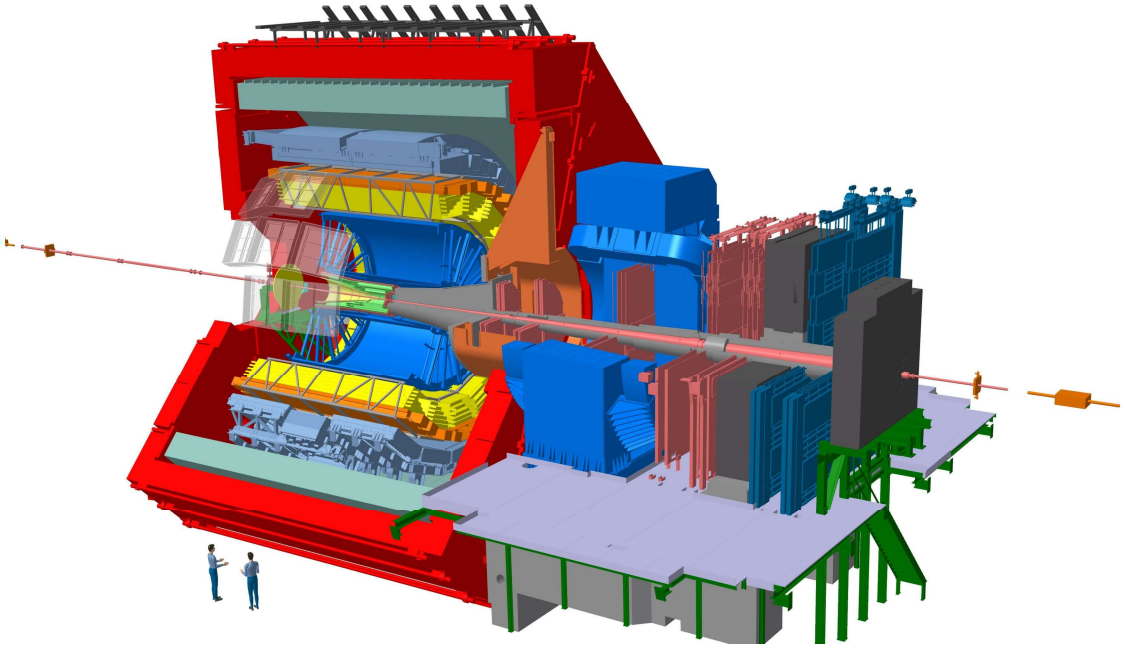


FoCal-E (Electromagnetic) + FoCal-H

- Measurement of direct photons
- Measurement of high p_t neutral pions (Pb-Pb vs p-p, p-Pb)
- Studying the dynamics of hadronic matter with photons and jets

Focal upgrade at ALICE

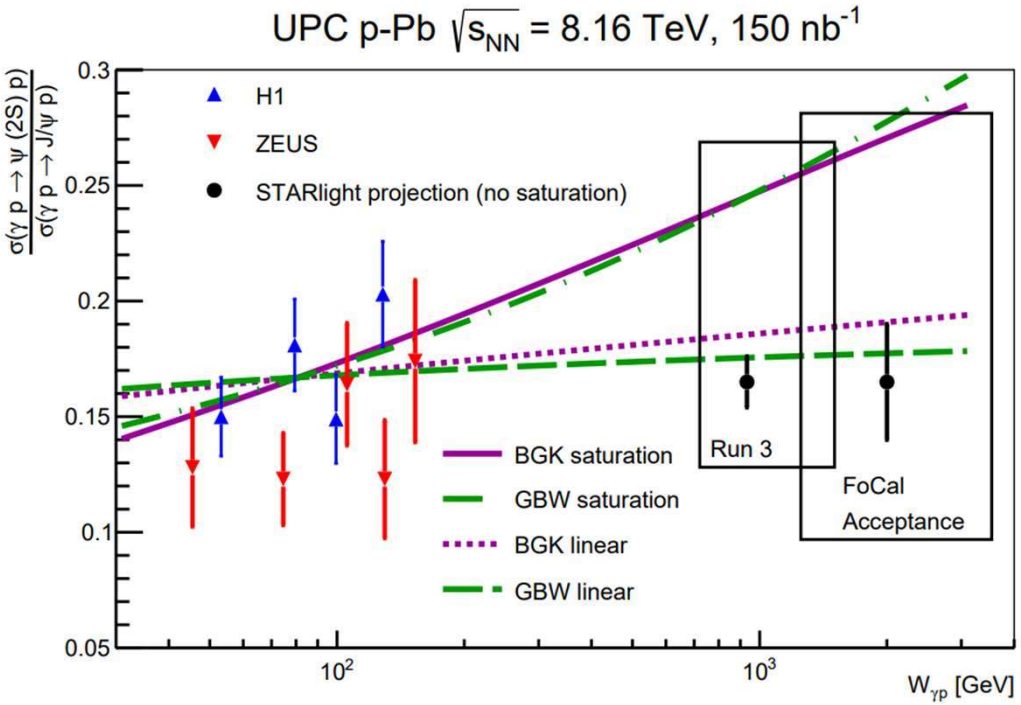




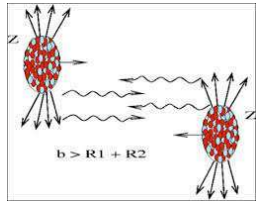
Focal extends Q-*x* range at LHC (Future Colliders)

UPC Physics using FoCal

J/ψ in UPC



$$\frac{Cross\ \text{section}\ \psi_{2s}}{Cross\ Section\ of\ J/\psi}$$ **Sensitive to Gluon Saturation**

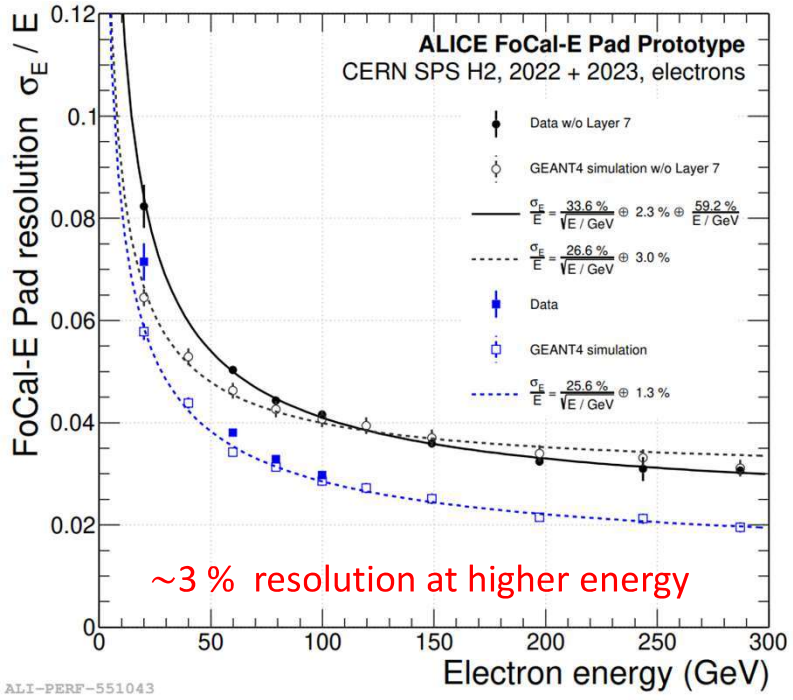


Not only UPC…

- π0 (and other neutral mesons)
- Isolated (direct) photons
- Jets and di jets
- W, Z
- …

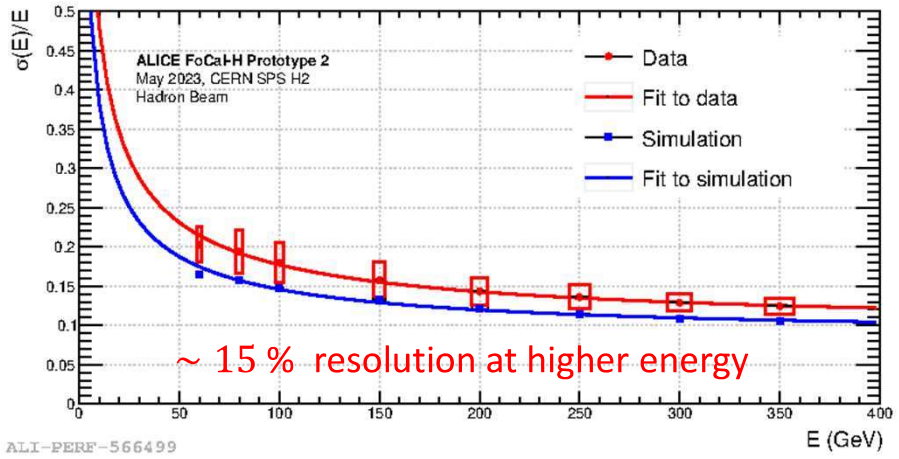
Focal energy resolution

Focal-E prototype energy resolution



Full results can be found in
arXiv:2311.07413

Focal-H prototype energy resolution



Prototypes show good energy linearity and energy resolution

Summary

- The FoCal detector will enable unique studies of low-x region for both proton and nuclei
- Multiple protypes have been tested and showed very promising results

References:

- Letter-of-Intent **CERN-LHCC-2020-009**
- Physics of the ALICE Forward Calorimeter upgrade **ALICE-PUBLIC-2023-001**
- Performance of the ALICE Forward Calorimeter upgrade **ALICE-PUBLIC-2023-004**
- Prototype electronics for the silicon pad layers of FoCal **arXiv:2302.13912**
- Test beam paper of FoCal prototypes **arXiv:2311.07413**
- Technical Design Report (**in preparation**)