# **Constraints on Matter Distribution Inside the Proton**

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Proton radial matter profile and pp overlap essential to describe Jet-Pedestal effect ...

... and multiplicity distributions







## Works surprisingly well also for p-Pb soft-hard correlations ...



Multiplicity fluctuations and the height of the jet pedestal are related by initial state (impact parameter) fluctuations



## and even for peripheral Pb-Pb ...



Number of MPI in presence of a trigger particle:

 $\mathcal{P}(N_{\rm mpi}|Y) = \frac{(1 - (1 - \alpha)^{N_{\rm mpi}})\mathcal{P}_{\rm mpi}(N_{\rm mpi})}{1 - \langle (1 - \alpha)^{N_{\rm mpi}} \rangle}$ 

#### For small $\alpha$ (rare probe):



#### Height of the jet pedestal:



**Relative height:** 



### From static round ...





Are models including spatial fluctuations consistent with measured p soft hard correlations?

p multiplicity fluctuations?

**D** Can these measurements provide additional constraints?

**D** How would Pythia pp overlap plus spatial fluctuations perform ?