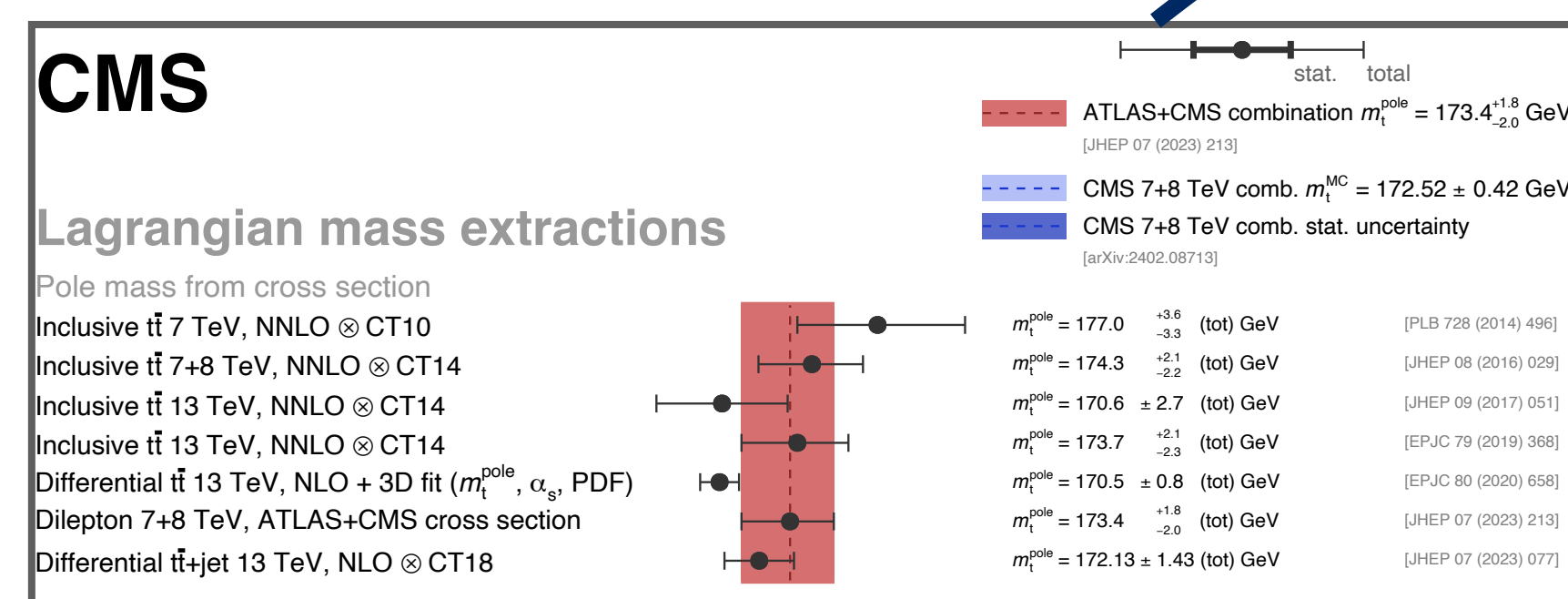


Precision meets sustainability at the LHC

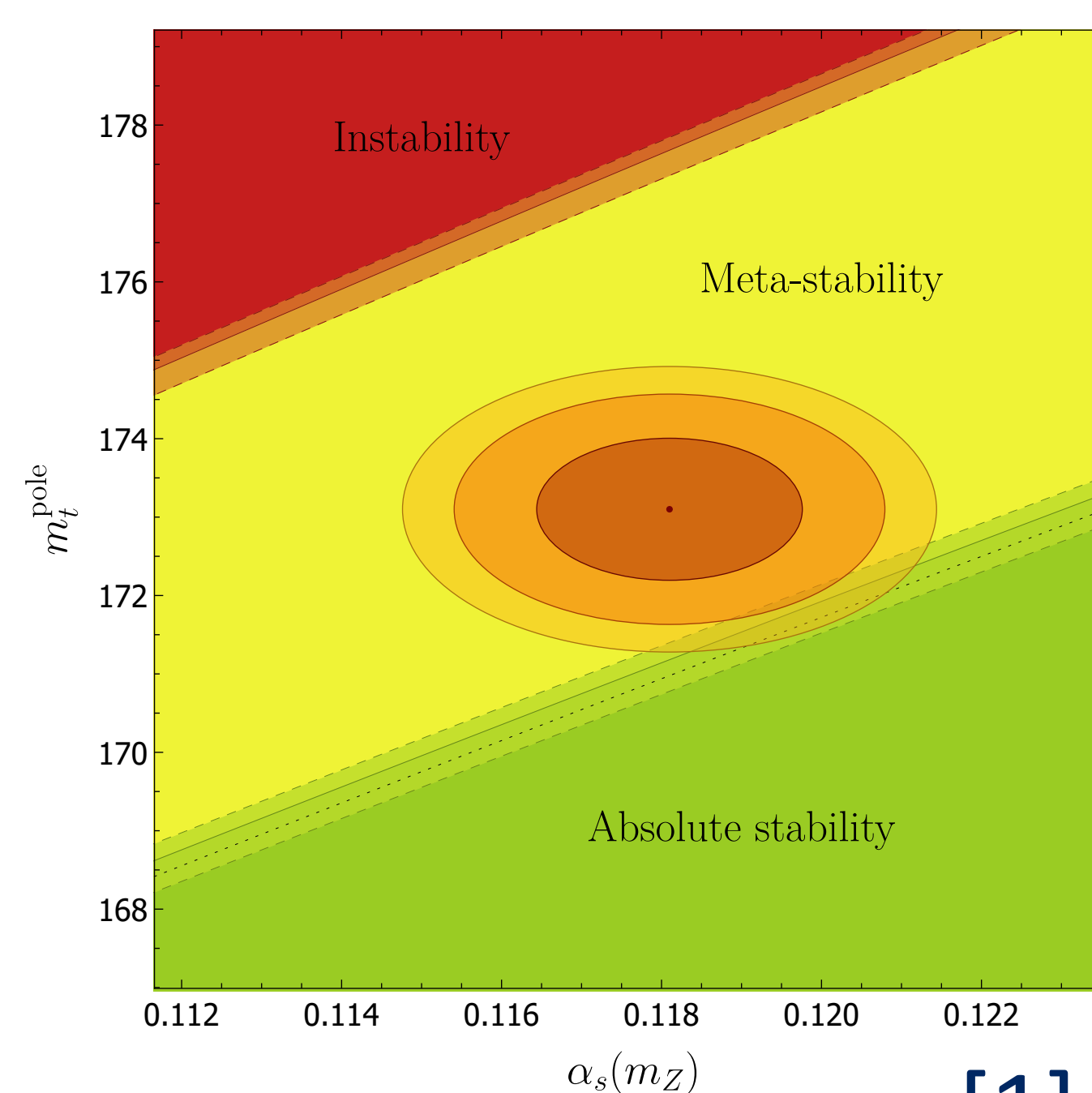
Valentina Guglielmi

Stringent test of SM validity: stability of EW vacuum of our Universe

Top quark mass



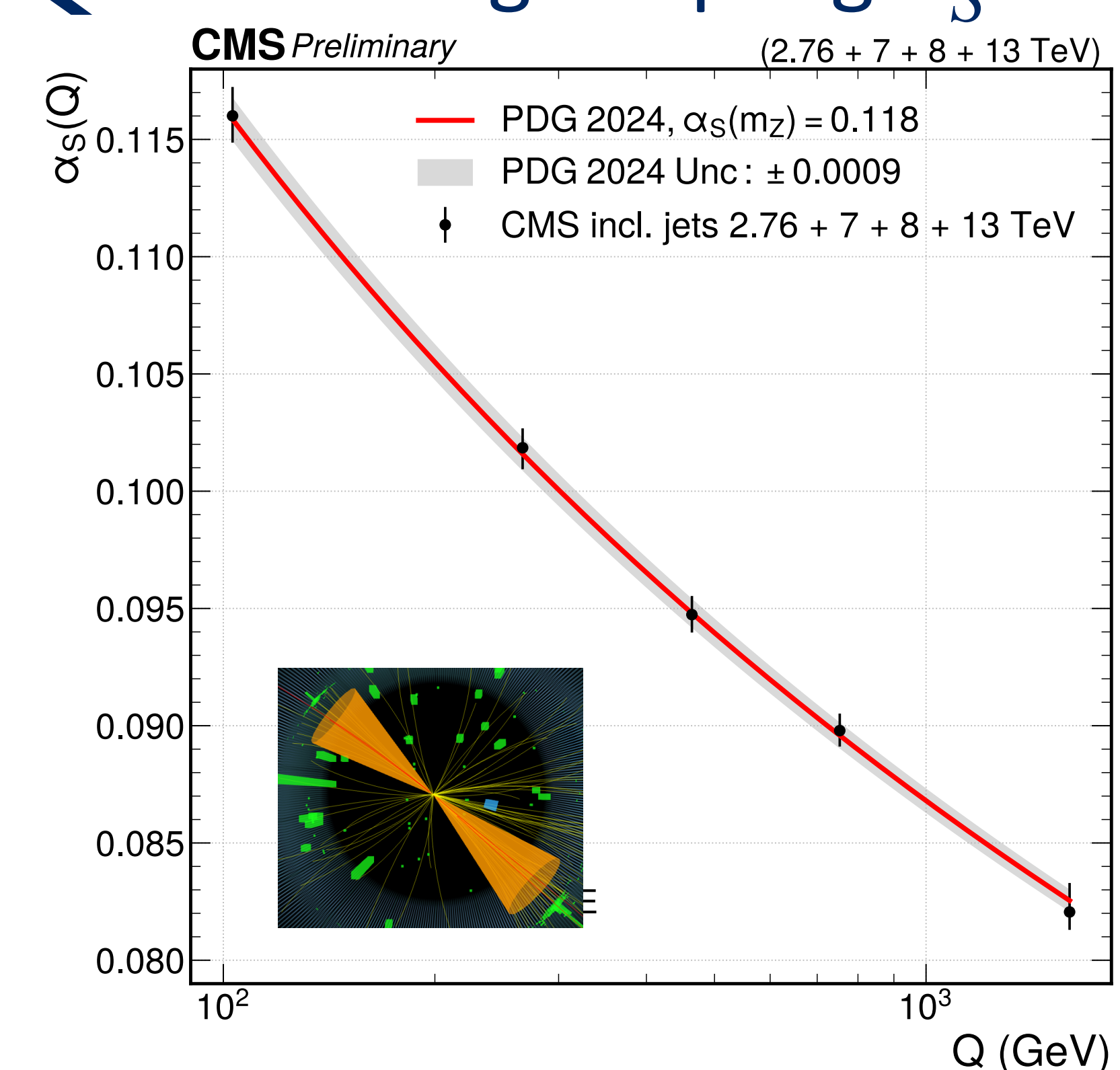
[2]



[1]

Most precise of the kind

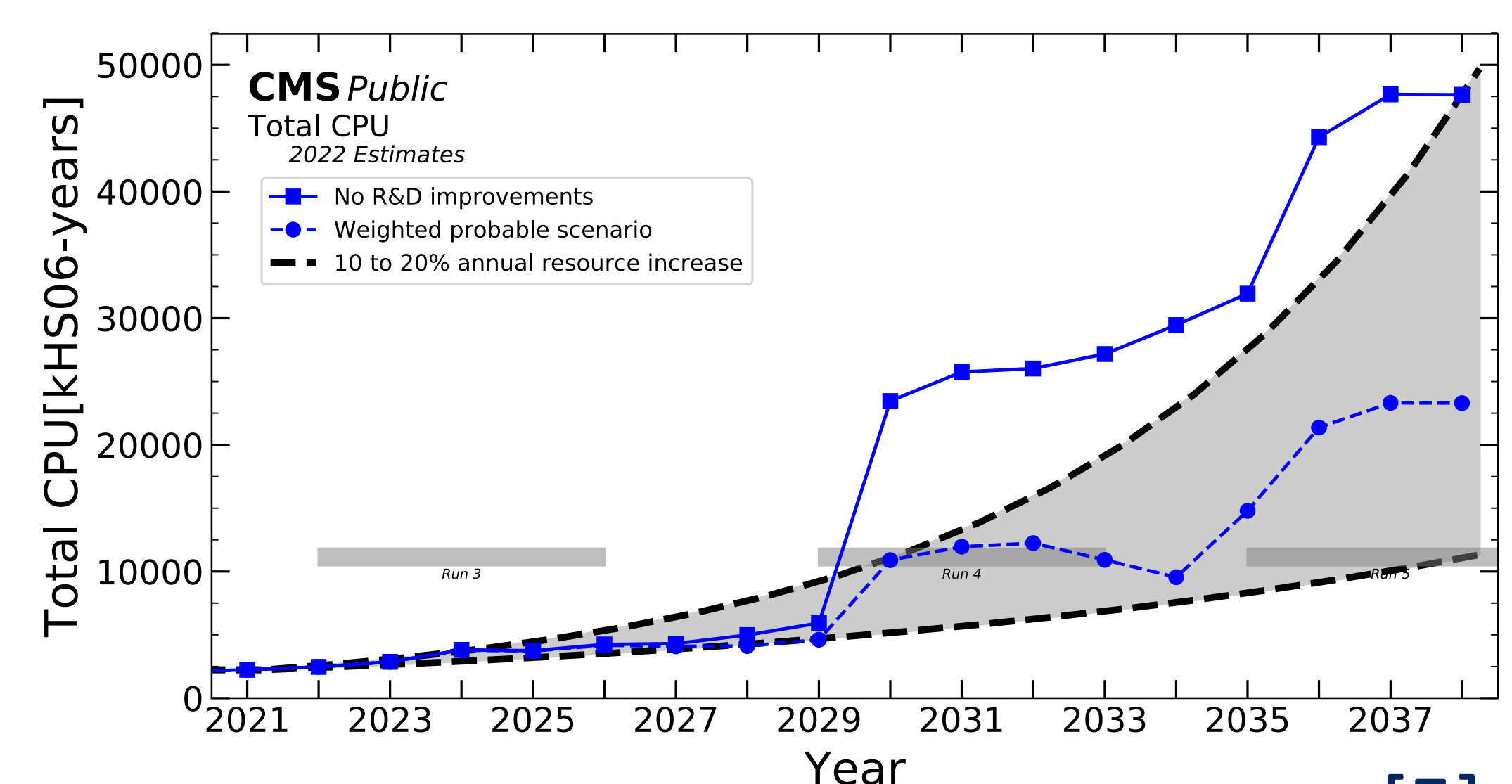
Strong coupling α_s



$$\alpha_s(m_Z) = 0.1176^{+0.0014}_{-0.0016} \quad [3]$$

Problem:

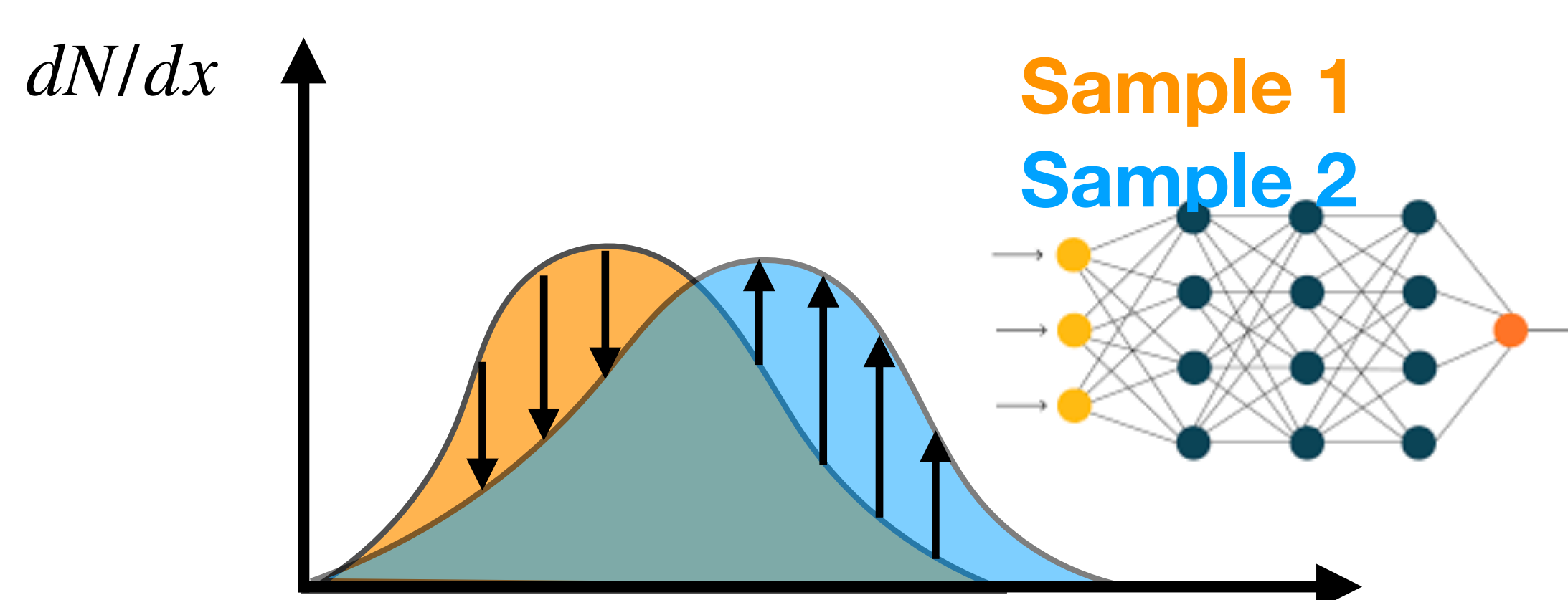
Statistics (due to computational cost) of simulations to estimate model uncertainties limits high-precision measurements



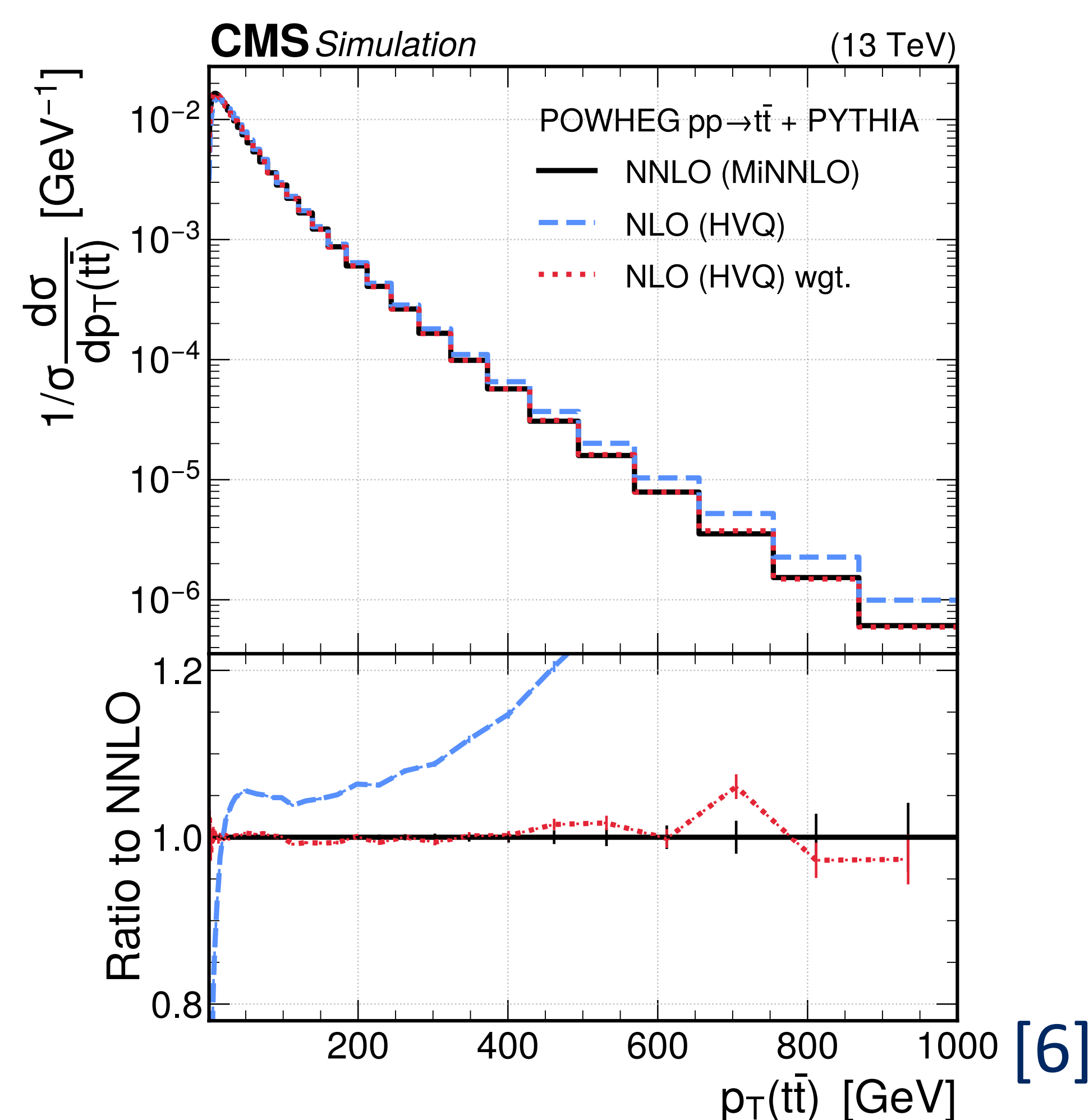
[5]

Solution: novel ML-based reweighting (DCTR method [4])

$$dN/dx \rightarrow w(x) \times dN/dx$$



- **Saving up to 75% of CPU** for each model uncertainty (no need for multiple detector simulations)
- **70% more statistics with the same CPU** for each model uncertainty
- Method already implemented in the CMS software



[6]

Valentina Guglielmi

- **3rd year PhD student (DESY)**
CMS: QCD, Top, ML
- **Master's degree in Milano-Bicocca University, Italy**
CMS: Sensor characterisation for a precision timing detector at the HL-LHC

