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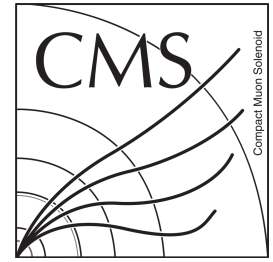

SERGIO SÁNCHEZ CRUZ
ON BEHALF OF THE CMS COLLABORATION

ICHEP 2020

MUON RECONSTRUCTION AND IDENTIFICATION PERFORMANCE WITH CMS DURING RUN 2

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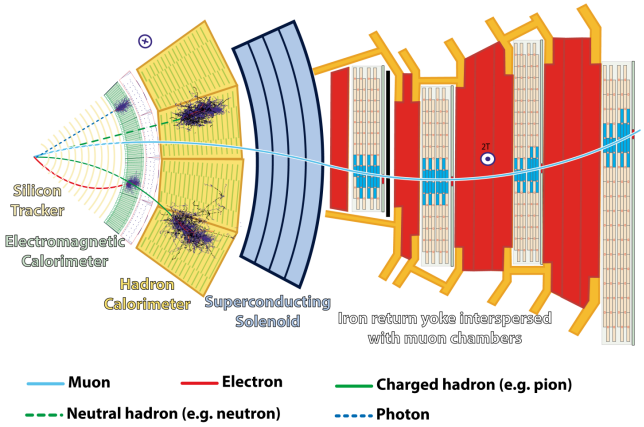


Reconstruction

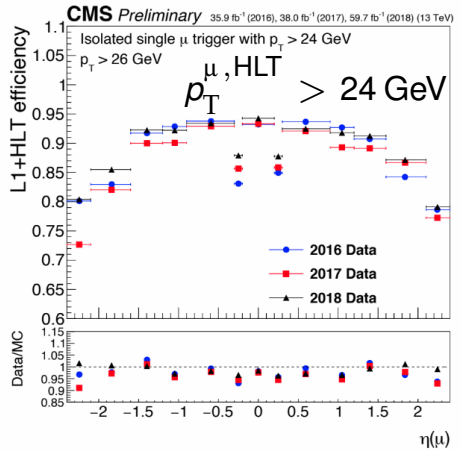
- CMS muon reconstruction combines information from the tracker and muon systems
- Different algorithms achieve $>$ 99% efficiency

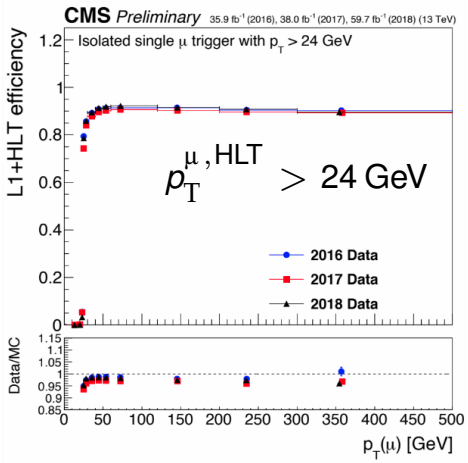
Trigger

- 3-step trigger system to efficiently select muons (L1+L2+L3)
- L1 $\Rightarrow$ dedicated hardware, coarse readout of the muon system
- L2 and L3 $\Rightarrow$ software based, full detector granularity
  - L2 $\Rightarrow$ reconstruction with the muon system (analogous to standalone reco.)
  - L3 $\Rightarrow$ refined reco. incorporating tracker
- Underwent improvements to the L3 algorithm during 2017 and 2018

Performance in data

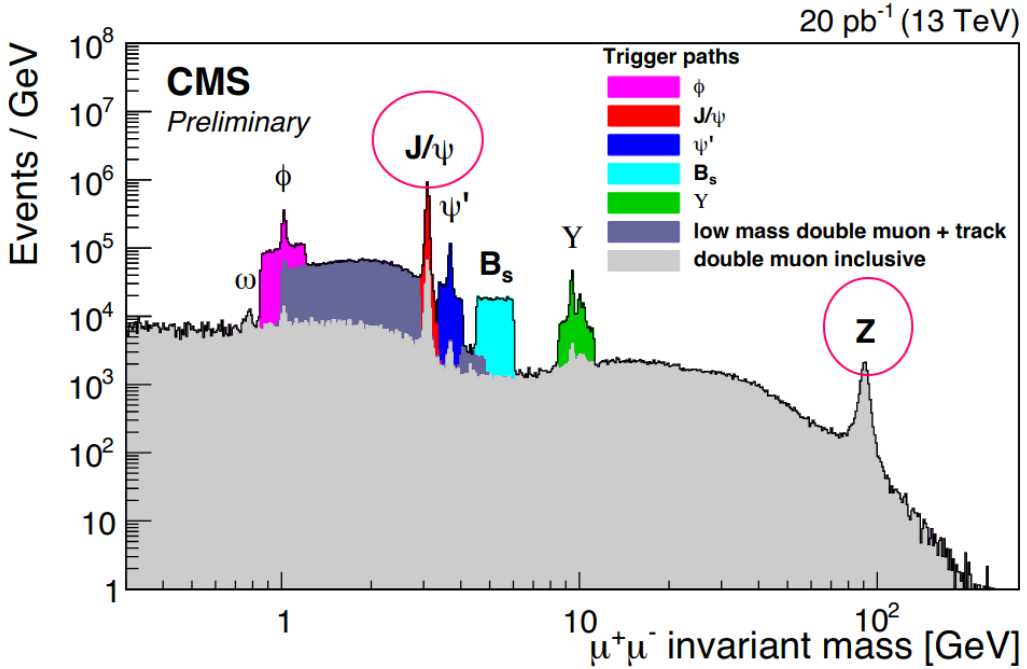
- Very high efficiency and momentum resolution
  - Efficiency above 80% in all η ranges
  - Efficiency in the p_{T} plateau above 90%
- Best performance in 2018 with L1 and L3 improvements
- Slight efficiency decrease in 2017 as adapting to the new algo

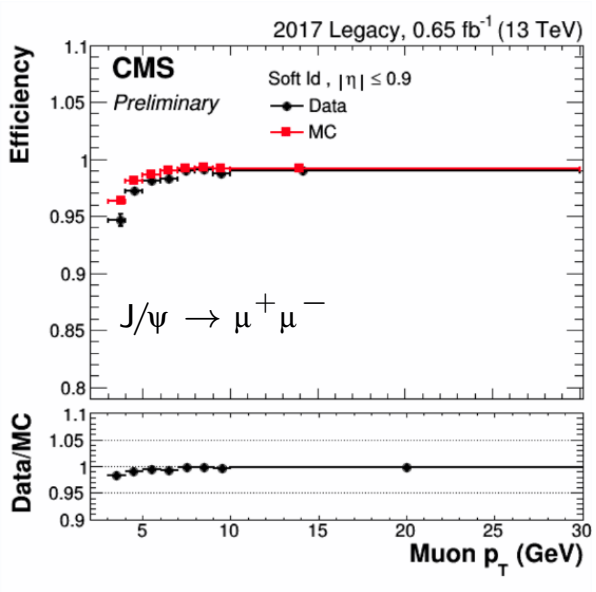


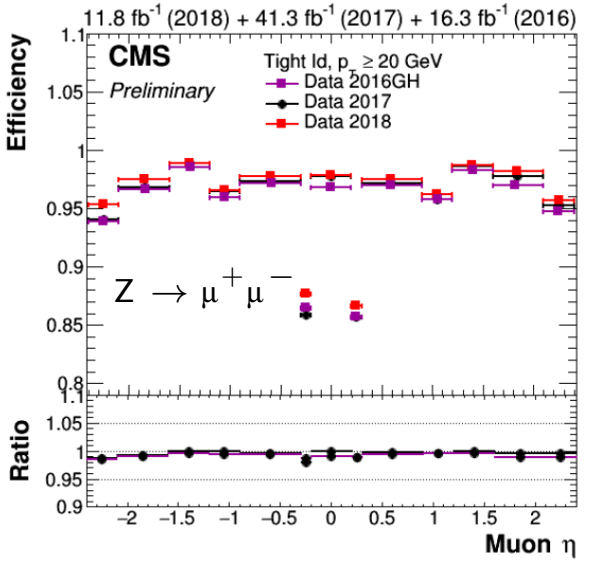


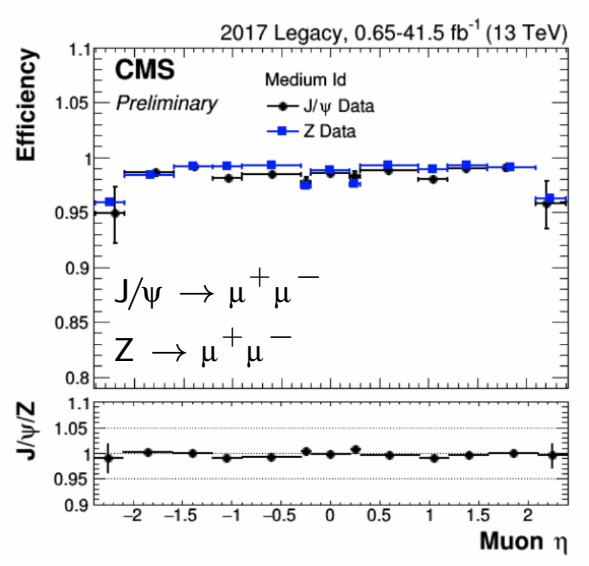
Selection efficiencies

- Efficiency is measured using $X \rightarrow \mu^+\mu^-$ resonances
- Z and J/ψ are used more commonly used
  - Alternative approach for high energy, more info at **C. Battilana's talk**
- High efficiency across all momentum and rapidity ranges
- Efficient selections between 3 and 200 GeV
- Consistent measurements between the different standard candles



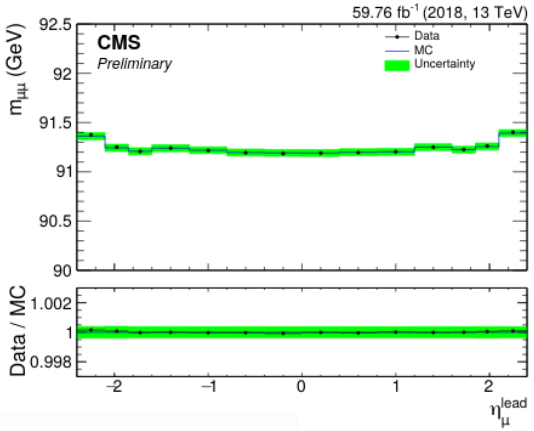


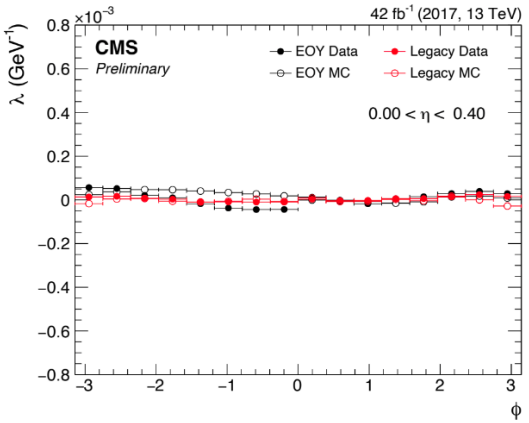


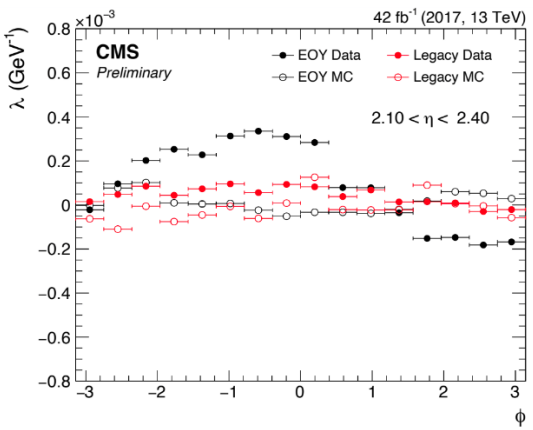


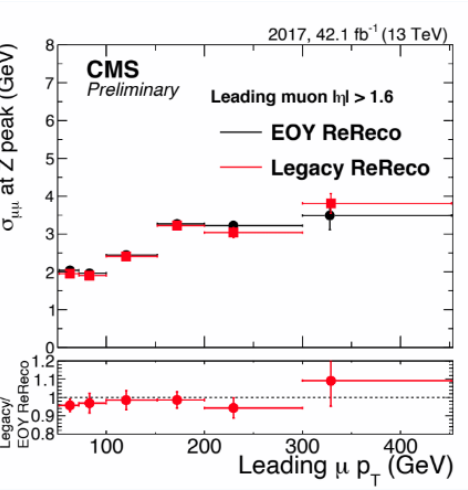
Momentum scale

- Good muon energy measurement at the Z peak, data/MC agreement $\mathcal{O}(10^{-3})$
- Additive and multiplicative corrections to the muon curvature $\rho \equiv \kappa(\eta,\phi)\rho + q\lambda(\eta,\phi)$
- λ sensitive to detector alignment
  - Correction drops from 0.4 to 0.1 TeV^{-1} with improved alignment









Resolution at high momentum

- High momentum is challeging $\Rightarrow$ less curvature and more radiation
- Dedicated strategy followed for these muons
- $m_{\mu^+\mu^-}$ width in the Z peak below GeV
- Better momentum resolution with the improved alignment in legacy dataset

More info at:

- DP-2020-040, **DP-2019-022**, **JINST 15 (2020) P02027**, **JINST 13 (2018) P06015**