



GEM Upgrade performance and Physics cases

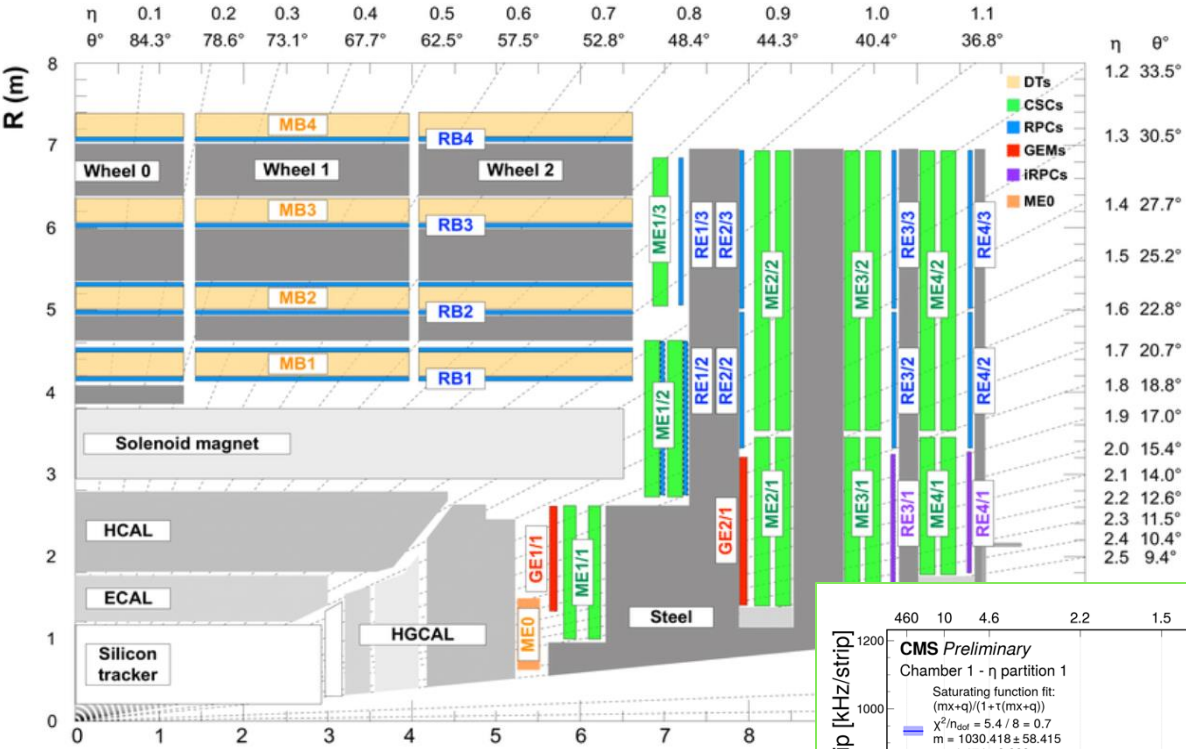
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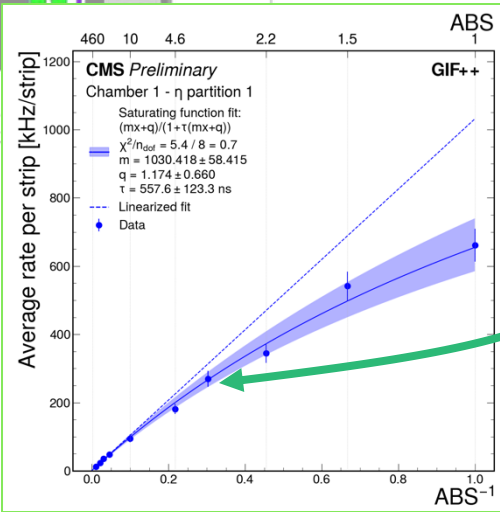
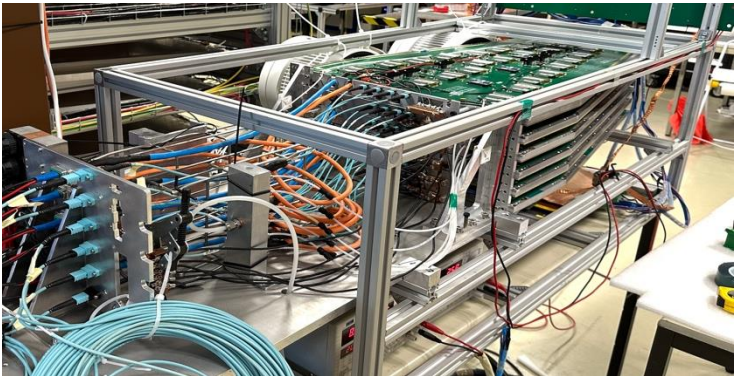
ME0 detector performances



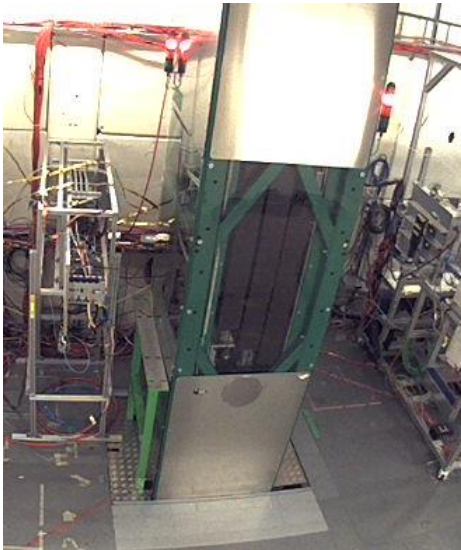
Before production starts: check performances in a high-rate radiation environment → 2022-2024: test beam at campaign GIF++

The Gamma Irradiation Facility (GIF++) provides:

- ❑ A high energy **muon beam** (~ 80 GeV)
- ❑ A radioactive source: 14 TBq ¹³⁷Cs



Able to operate the chambers up to 250 kHz/strip

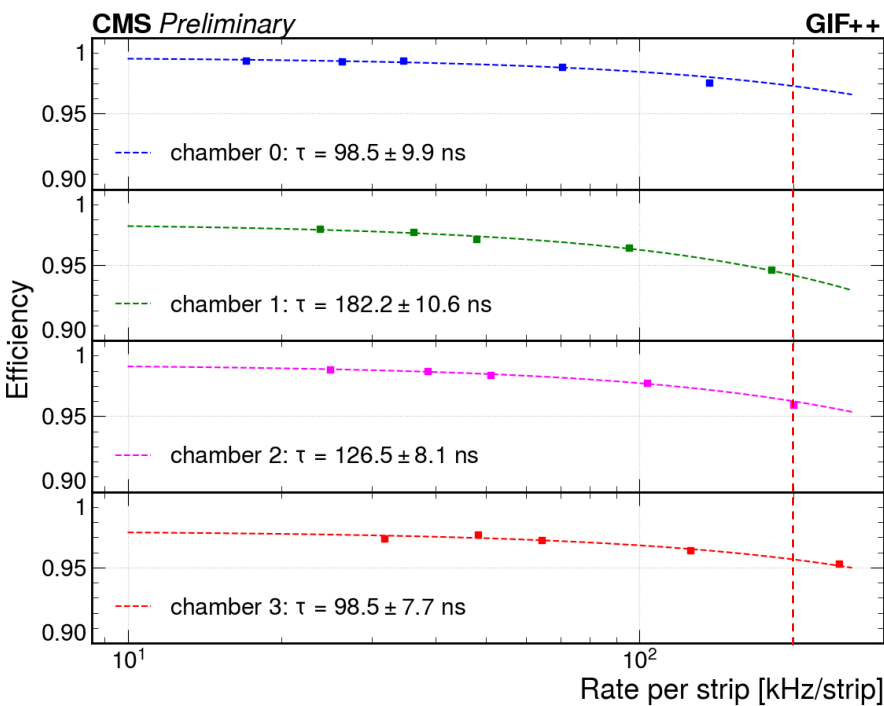


How

1 EFFICIENCY	are expected to degrade under the
2 TIME RESOLUTION	ME0 expected radiation rate?

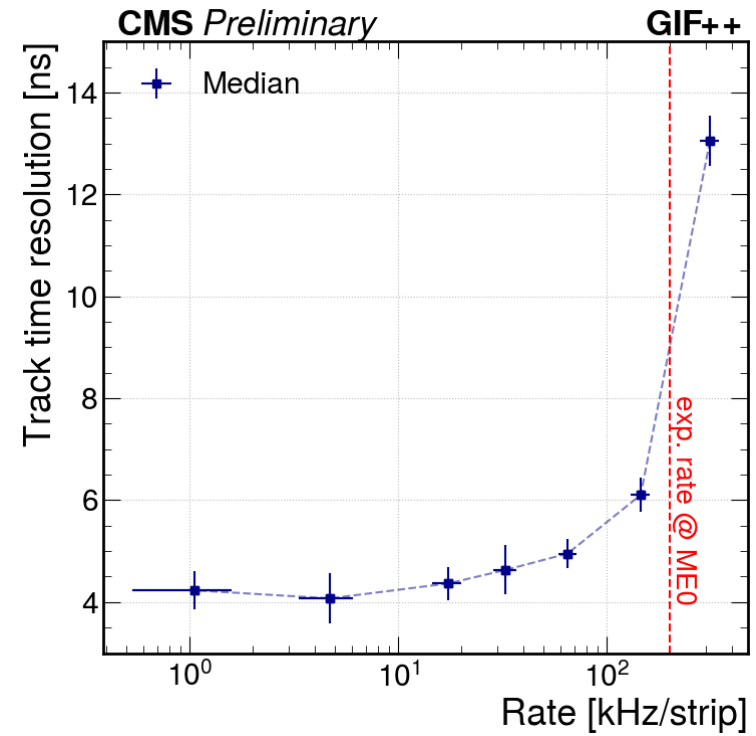
Validation of ME0 design

1 EFFICIENCY



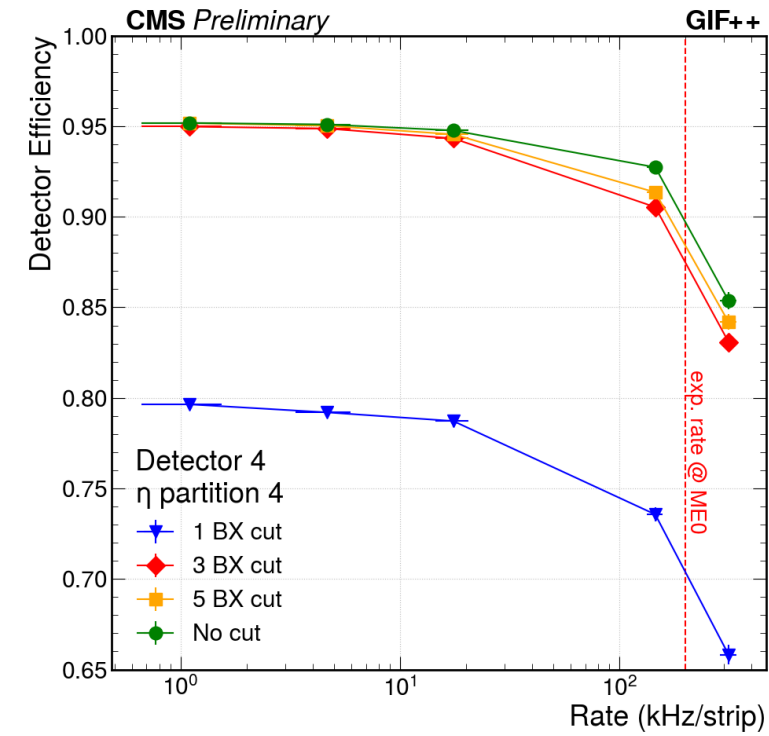
❖ Efficiency drop caused by electronics dead time

2 TIME RESOLUTION



❖ Time resolution of the stack from 4 ns (no bkg) to 8 ns (**MAX** exp. ME0 bkg)

SUMMARY



- ❖ New tracking algorithm for high rates
- ❖ 3 BX cut:
 - ❖ Good efficiency
 - ❖ Reasonable bkg excluded

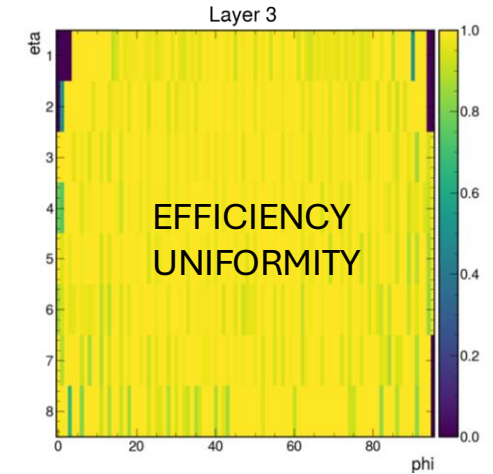
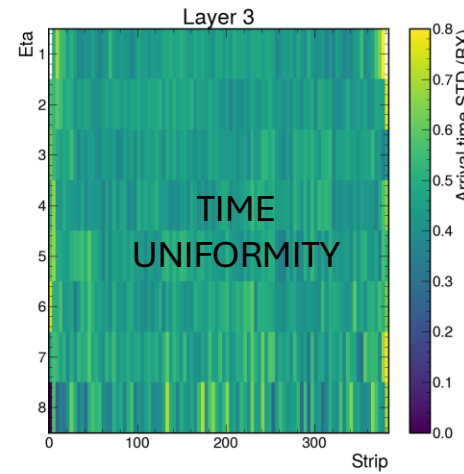
ME0 mass production: efficiency and timing with cosmic rays

Contribution to the analysis of data from cosmic stand for QC8 for ME0 stacks:

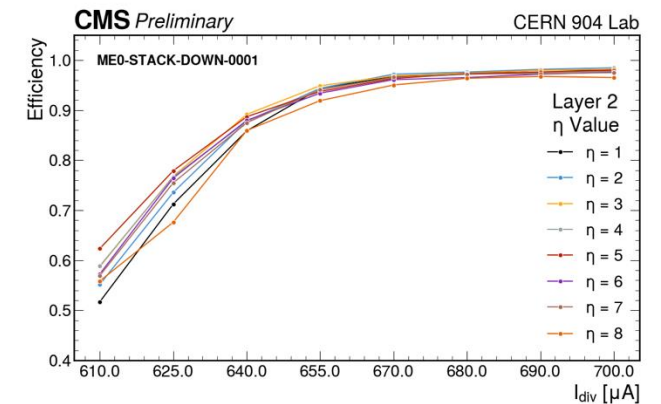
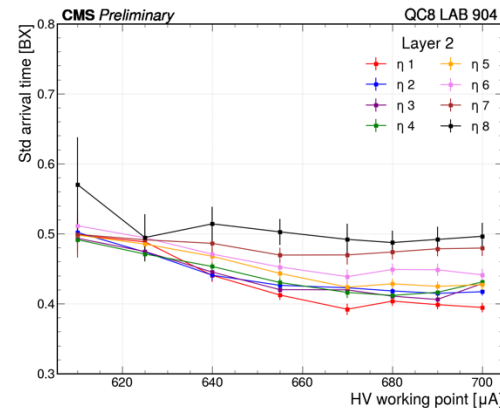
- Updated algorithm for tracking with the ME0 stack
- Developed code for the analysis of the timing performances
- Handling of the QC8 official analysis code



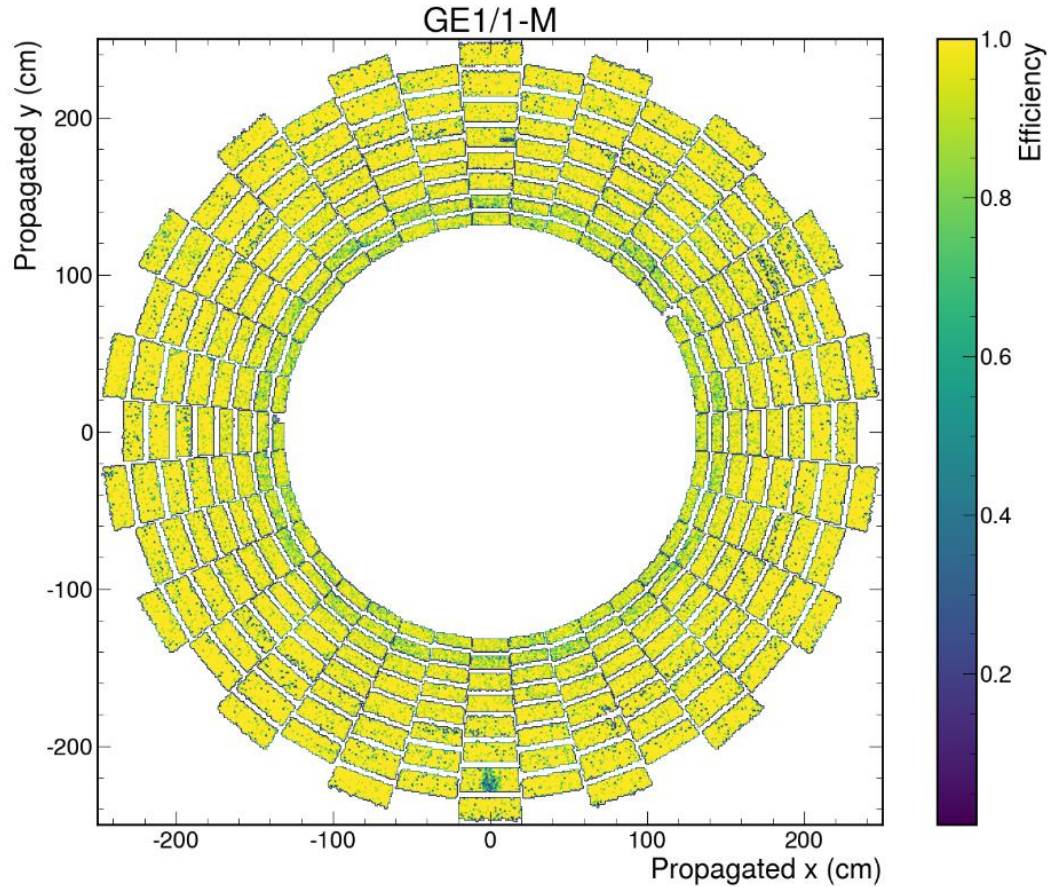
QC8 cosmic stand at lab 904



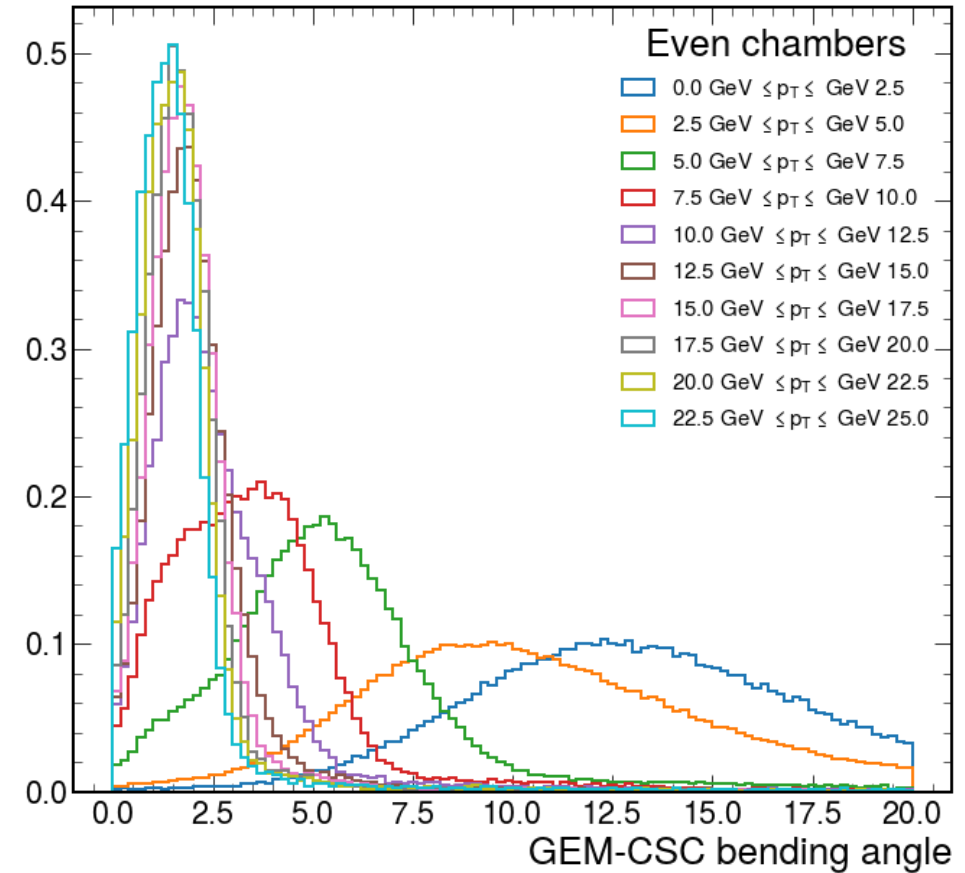
HV SCAN



GE1/1 Trigger Primitive Performance



- ❖ The **redundancy** from the two GEM layers operating in an OR configuration ensures **high overall efficiency**

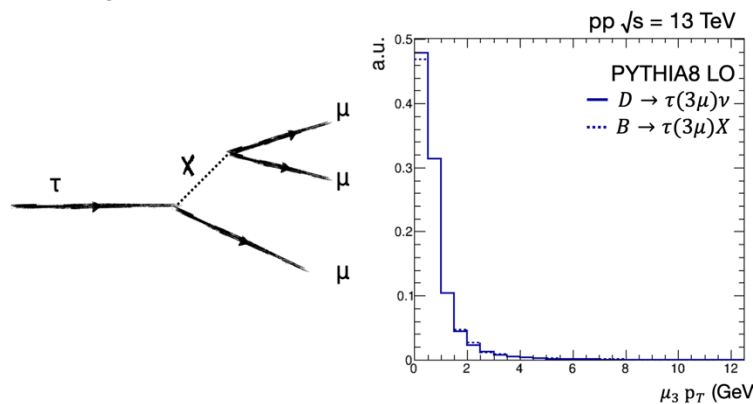


- ❖ The GEM-CSC bending angle is a valuable low- p_T muon discriminant
→ to be exploited in the future **EMTF** algorithms

- ❖ **Time resolution optimization** (~17–12 ns) is progressing well, supporting better matching with CSC ME1/1

GEM Upgrade Physics cases

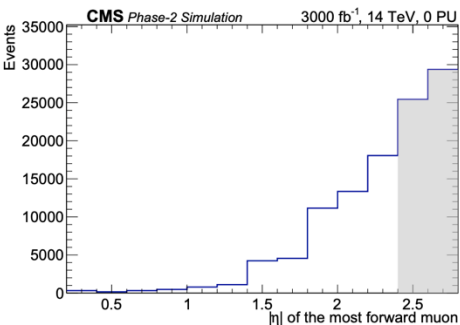
$\tau \rightarrow 3\mu$ is the golden channel for Lepton Flavor Violation at LHC



Currently involved in the analysis with Run 3 data (BPH-24-010)

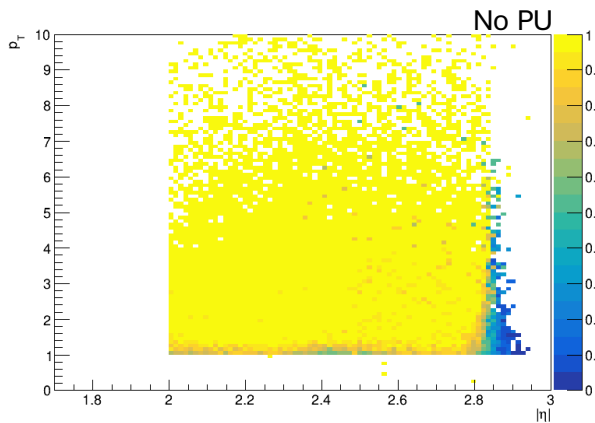
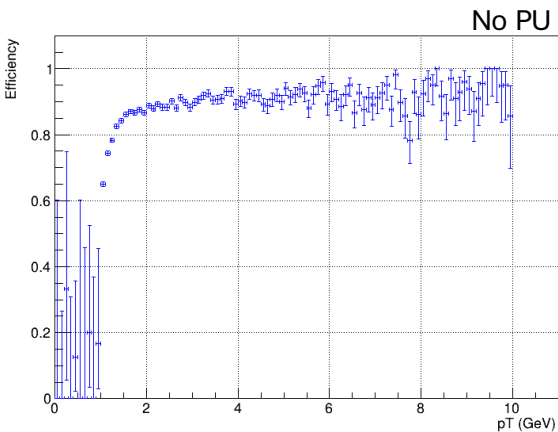
P
H
A
S
E
2

ME0 **doubles** the **signal** fiducial **acceptance**



GEM+CSC **improves** **purity** for low momentum muons

SIMULATION STUDIES



Ongoing studies on the impact of Phase-2 Pile-Up



Extended sensitivity to muons from $\tau \rightarrow 3\mu$ in Phase-2 scenario

Thank you
for your attention!

A decorative graphic consisting of four horizontal bars in dark grey, medium green, light green, and teal, stacked vertically. A large, multi-colored L-shaped bracket is positioned in the bottom right corner, with its vertical bar matching the teal bar and its horizontal bar matching the light green bar.