Illustration of the performance of the CMS tracker and reconstruction on early Run 3 data, on the example of D* meson reconstruction

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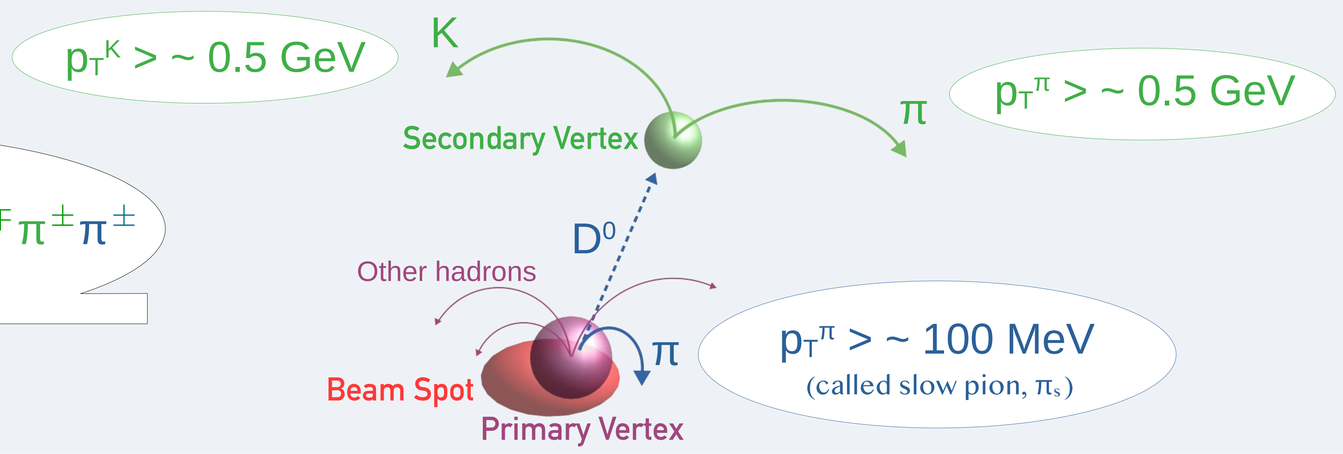
INTRODUCTION

Illustration of the readiness of CMS for data taking in Run 3 is shown with particular focus on the tracker, tracking, and vertexing performance at low transverse momenta. For this, the first distributions of a signal for charm production are given by reconstruction of D* meson on Minimum Bias data at the injection center-of-mass energy of 900 GeV in Run 3 [1].

D* MESON RECONSTRUCTION

$D^{*\pm} \rightarrow D^0 \pi^{\pm} \rightarrow K^{\mp}\pi^{\pm}\pi^{\pm}$



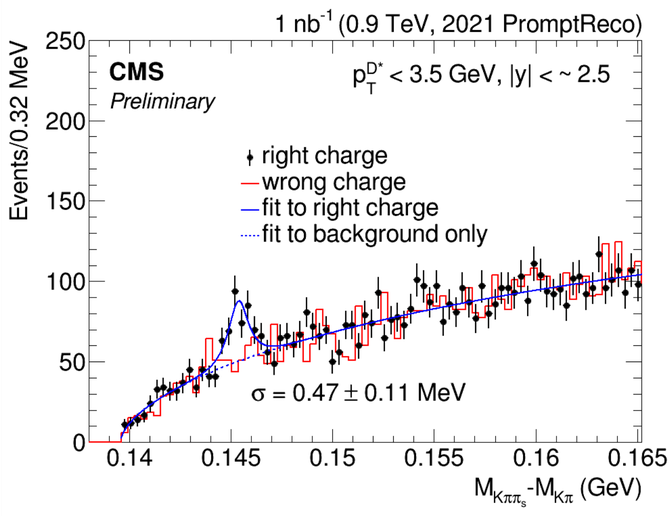
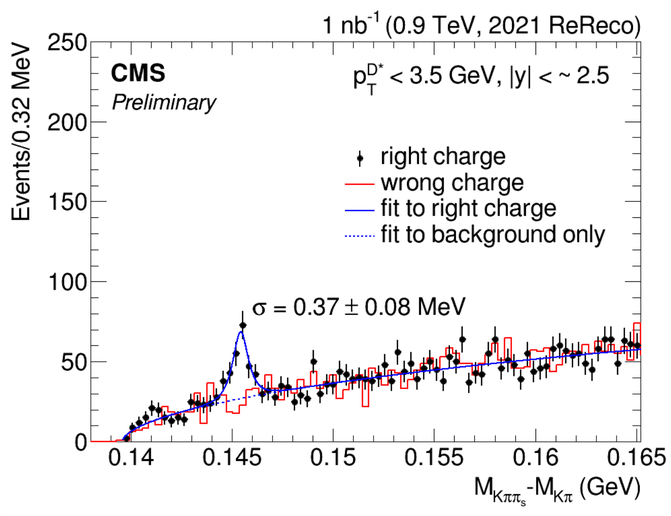
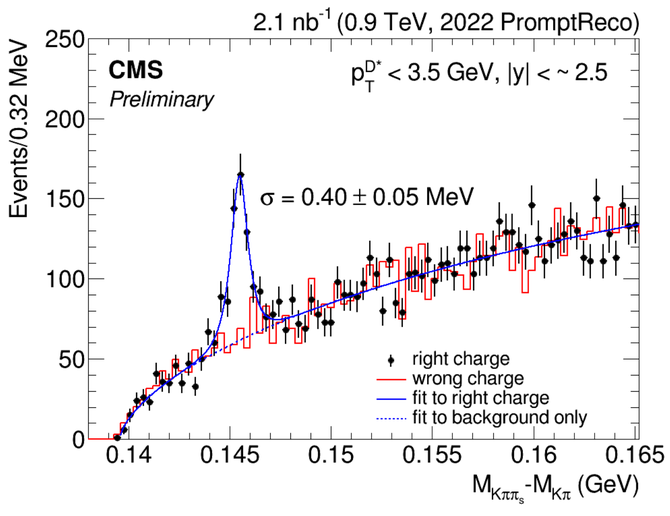
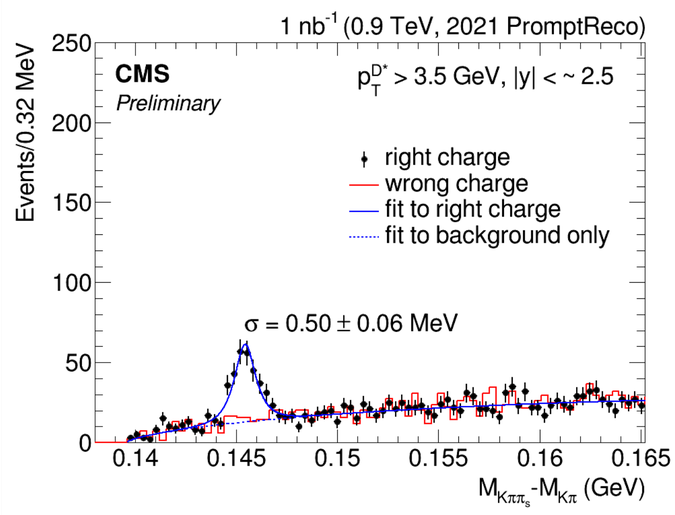
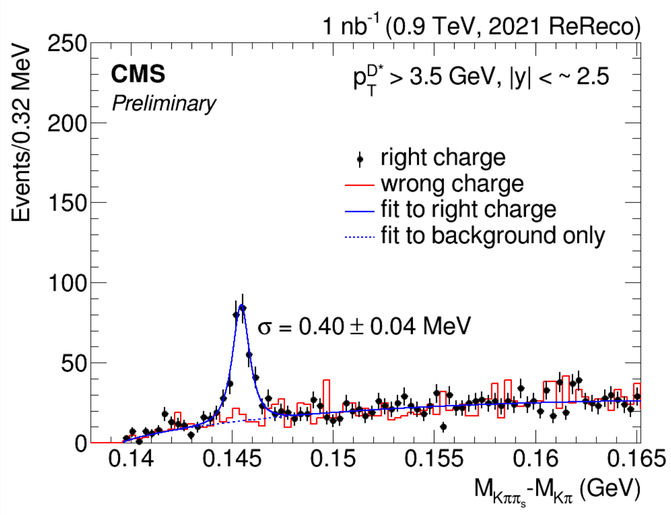
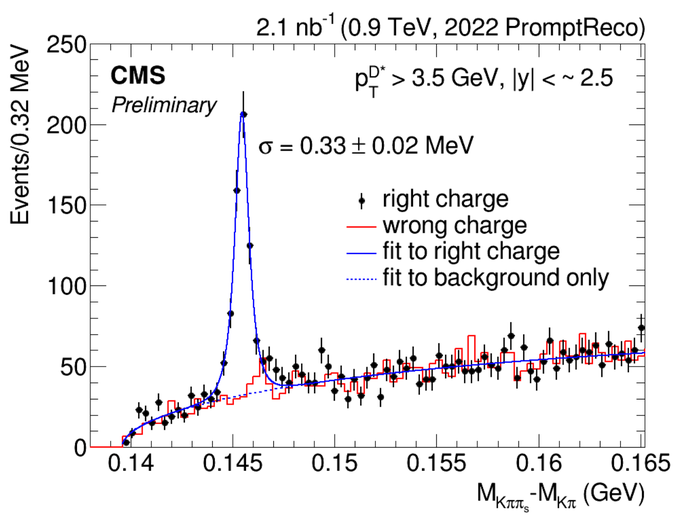
For D* signal, $M_{D^*} - M_{D^0}$ distributions (signal peak aground 0.1454 GeV with better resolution) are given by right charge, $K^{\mp}\pi^{\pm}\pi_s^{\pm}$ and wrong charge, $K^{\pm}\pi^{\pm}\pi_s^{\mp}$ (for combinatorial background only)

DATA SAMPLES

2021/22 Run 3 samples ($\sqrt{s}$ = 900 GeV):

- *2021 prompt reconstruction* – MinimumBias pilot with 1 nb^{-1}, promptly reconstructed within the first 2 days
- *2021 re-reconstruction* – MinimumBias pilot with 1 nb^{-1}, updated software (mkFit) [2] and tracker calibration [3]
- *2022 prompt reconstruction* – 900 GeV 2022 commissioning with 2.1 nb^{-1} (MinimumBias)

RESULT & CONCLUSION

	2021 prompt reconstruction	2021 re-reconstruction	2022 prompt reconstruction
$p_T^{D*} < 3.5$ GeV	 significant D* signal already	 better mass resolution and S/B than 2021 PromptReco	 similar mass resolution and S/B than 2021 ReReco
$p_T^{D*} > 3.5$ GeV	 significant D* signal already	 better mass resolution and S/B than 2021 PromptReco	 better mass resolution and S/B than 2021 ReReco

" tracker and reconstruction are ready for data taking at 13.6 TeV "

REFERENCES

[1] CMS Public Note CMS DP-2022/024
[2] Performance of Run 3 track reconstruction with the mkFit algorithm, CMS Public Note CMS DP-2022/018
[3] Tracker alignment performance in 2021, CMS Public Note CMS DP-2022/017