

KU CMS Meeting

Status report & Dstar production in PbPb collision at CMS
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L1 Trigger

- Requested new seeds to respond to 2024 condition within given bandwidth
 - ppRef - rate & efficiency [[link](#)]
 - L1_DoubleMu0_SQ
 - L1_DoubleMu2
 - L1_DoubleMu2_SQ
 - PbPb - rate & efficiency [[link](#)] (by Bayu)
 - L1_SingleMu0_Centrality_40_100_BptxAND
 - L1_SingleMu0_Centrality_30_100_BptxAND
 - L1_SingleMuOpen_Centrality_30_100_BptxAND
- All requested seeds from Dilepton have been added to the latest menu
 - JIRA - <https://its.cern.ch/jira/browse/CMSLITDPG-1314> (PbPb)
 - JIRA - <https://its.cern.ch/jira/browse/CMSLITDPG-1207> (ppRef)

L1T DQM

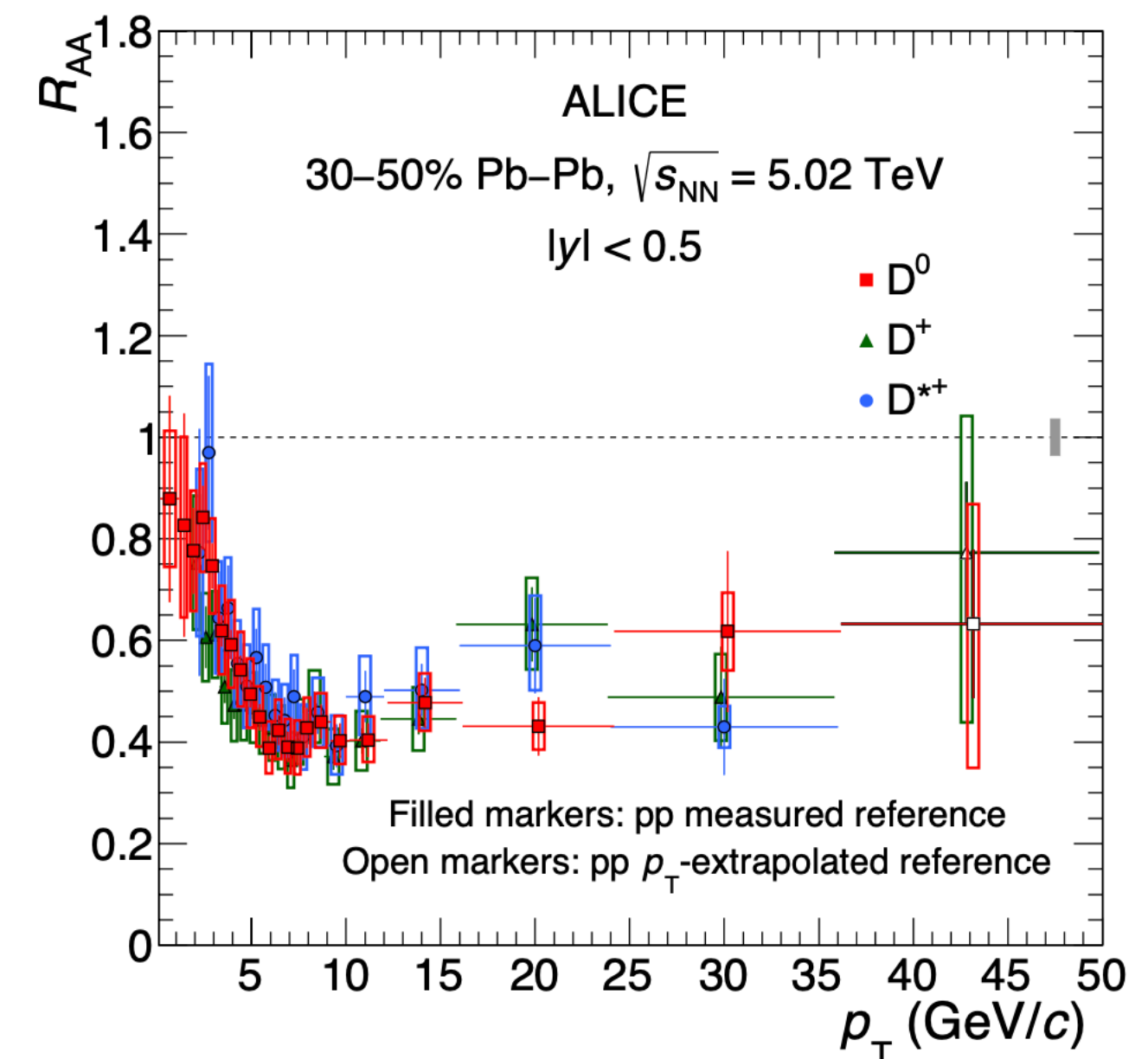
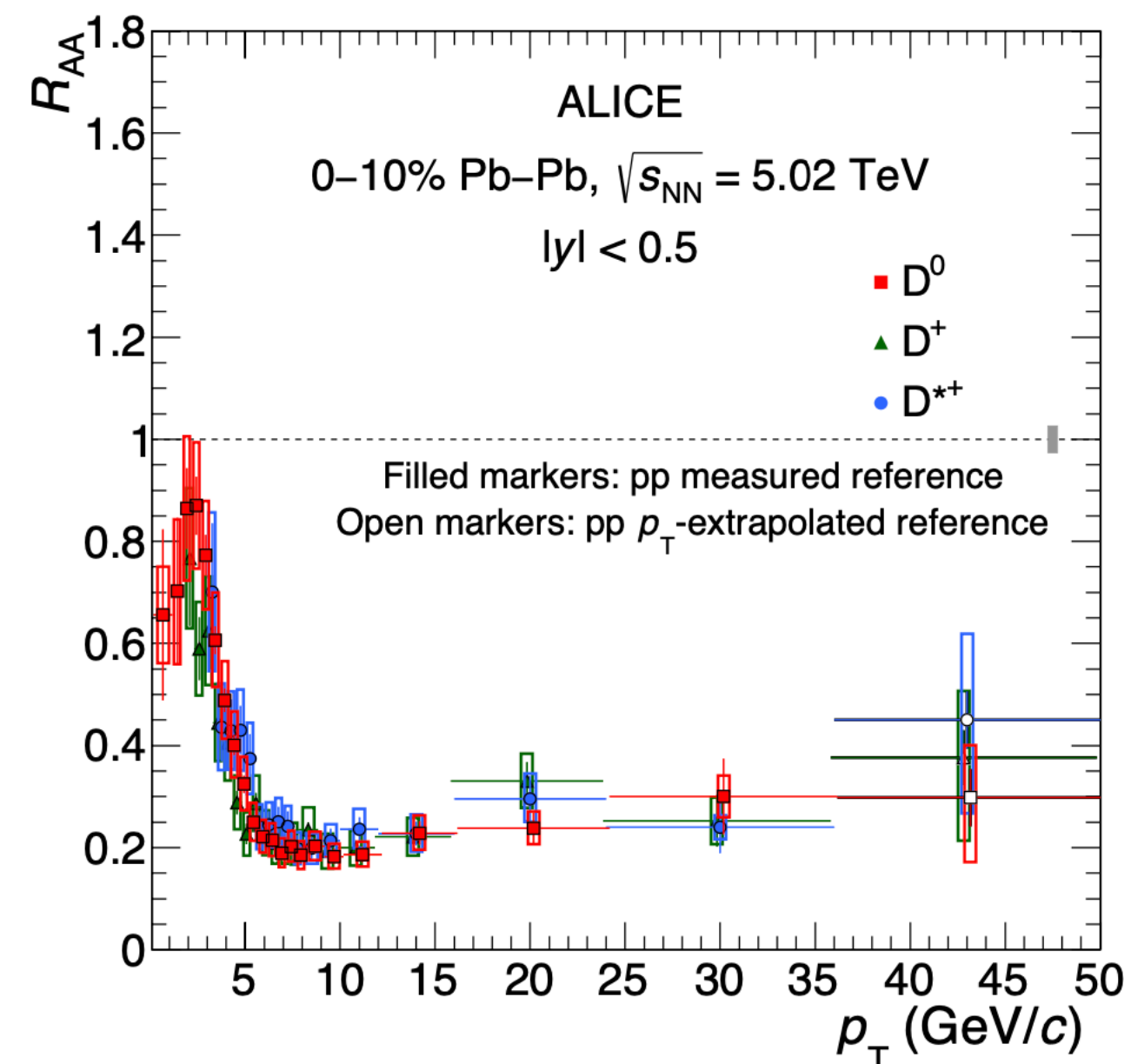
- Presentation in the last HI L1T meeting : [\[link\]](#)
- GOAL : Modify the L1T Online Timing plot code to properly display according to the Heavy Ion bunch spacing (50ns)
 - Propose new trigger L1_LastBunchInTrain_50ns & L1_FirstBunchInTrain_50ns only used for L1T DQM (not fed by HLT)
 - Confirmed by TSG
- DQM task will be over if DQM timing plot is drawn well with new seeds

Analysis Motivation

- D^* meson has exclusive decay channel
 - Clean and distinctive decay channel ($D^{*+} \rightarrow D^0\pi^+$, BR = $67.7 \pm 0.5\%$)
 - Give a small modification to existing framework
- D^* meson has a spin of 1 while the D^0 has a spin of 0
 - Sensitive to different angular momentum and polarization effects

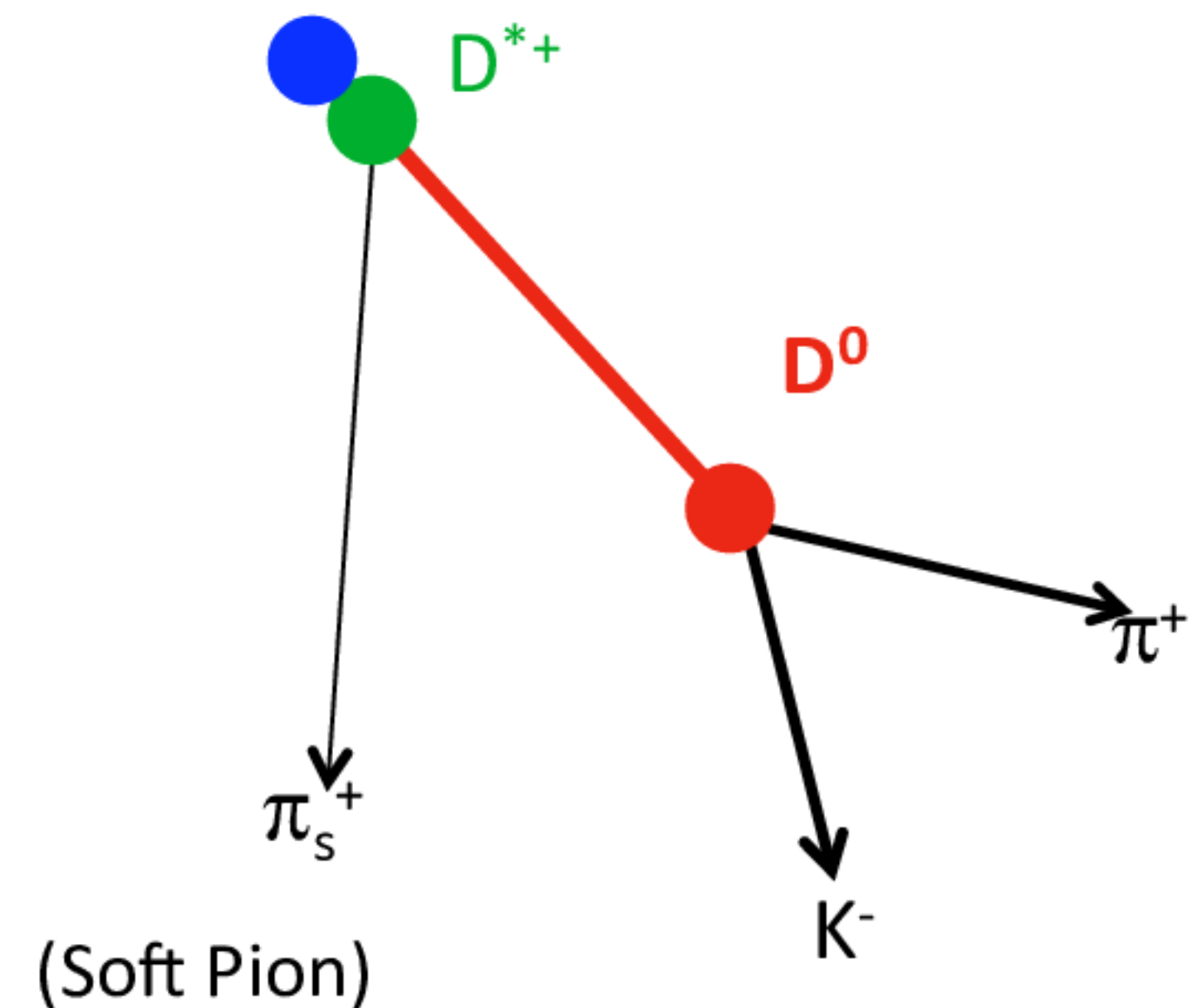
Analysis Motivation

- ALICE published Prompt D^0 , D^+ and D^{*+} production in Pb-Pb collision at $\sqrt{s_{NN}} = 5.02$ TeV [1] in 2021
 - R_{AA} and flow measurements on mid-rapidity ($|y| < 0.5$) in central (0-10 %) and semi-central (30-50 %)
 - Covering p_T up to 36 or 50 GeV
- CMS detector can provide wide rapidity coverage and large statistics at high p_T
 - This can be extended to where ALICE doesn't cover
 - Expect complementary result



Analysis strategy

- Dstar is reconstructed via hadronic channel $D^{*+} \rightarrow D^0 \pi^+ \rightarrow K^- \pi^+ \pi^+$ (+ charge conjugate)
- Reconstruct D^0
 - Weak decay ($c\tau$ is few hundred μm)
 - Decay topology of produced D^0 with BDT selection
- Reconstruct D^*
 - Same decay topology of the produced D^0 (strong decay)
 - Combining D^0 candidates with tracks
 - Exploiting BDT to maximize signal-to-background ratio



Observables

- Nuclear modification factor R_{AA}
 - Direct comparison to baseline
 - Run3 ppRef data will be available soon
- Flow (v_2, v_3 ..)
 - Probing initial condition geometry of the collision
 - Sensitivity to transport properties
- Polarization
 - Light vector meson ($J^P = 1^-$)
 - Testing polarization Induced by vorticity in non-central heavy-ion collision

Analysis plan

- Feasibility test (before going to CERN)
 - Reconstruct D^* with existing framework
 - BDT training & optimization (**on-going**)
 - Raw yield signal extraction
- Further study (coming back from CERN)
 - Acceptance & efficiency study for correction
 - Systematic studies