Analysis Task with the implementation of Hybrid Track Cuts for pp collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02\ \mathrm{TeV}$

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Objective

Modify an Analysis Task (AliAnalysisTaskMcKno): For pT leading and multiplicity in transverse region, replace the standard 2015 track cuts with the hybrid track cuts.

Weekly report

- ☑ Identify the histograms that are called in the unfolding program (response matrices, reconstructed true distributions, and so on).
- ☑ Analyze where these histograms fill in and the overall structure of the program.
- ☑ Visualize in which part of the program 50% of the statistics is selected.
- ☑ Search about the ITS and the SPD.
- ☑ Replace standard 2015 track cuts with hybrid track cuts.
- ☑ Plot the azimuthal distribution of ϕ.

AliAnalysisTaskMcKno.cxx 〉 No Selection

```
1  /**************************************************************************
2   * Copyright(c) 1998-1999, ALICE Experiment at CERN, All rights reserved. *
3   *                                                                        *
4   * Author: The ALICE Off-line Project.                                    *
5   * Contributors are mentioned in the code where appropriate.              *
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13  * provided "as is" without express or implied warranty.                  *
14  *                                                                        *
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19  **************************************************************************/
20
21 /* AliAnaysisTaskMcKno source code
22  * The analysis task produce all the histos needed for MC closure test studies
23  * Results include only the KNO properties
24  */
25
26 class TTree;
27
28 class AliPPVsMultUtils;
29 class AliESDtrackCuts;
30
31
32 #include <Riostream.h>
33 #include "TChain.h"
34 #include "TH1.h"
35 #include "TH2.h"
36 #include "TH3.h"
37 #include "TProfile.h"
38 #include "THnSparse.h"
39 #include "TVector3.h"
40 #include "TCanvas.h"
41 #include "TMath.h"
42 #include "TLegend.h"
43 #include "TList.h"
44 #include "AliLog.h"
45 #include "AliVEvent.h"
46 #include "AliVVertex.h"
47 #include "AliVTrack.h"
```

AliAnalysisTaskMcKno.cxx

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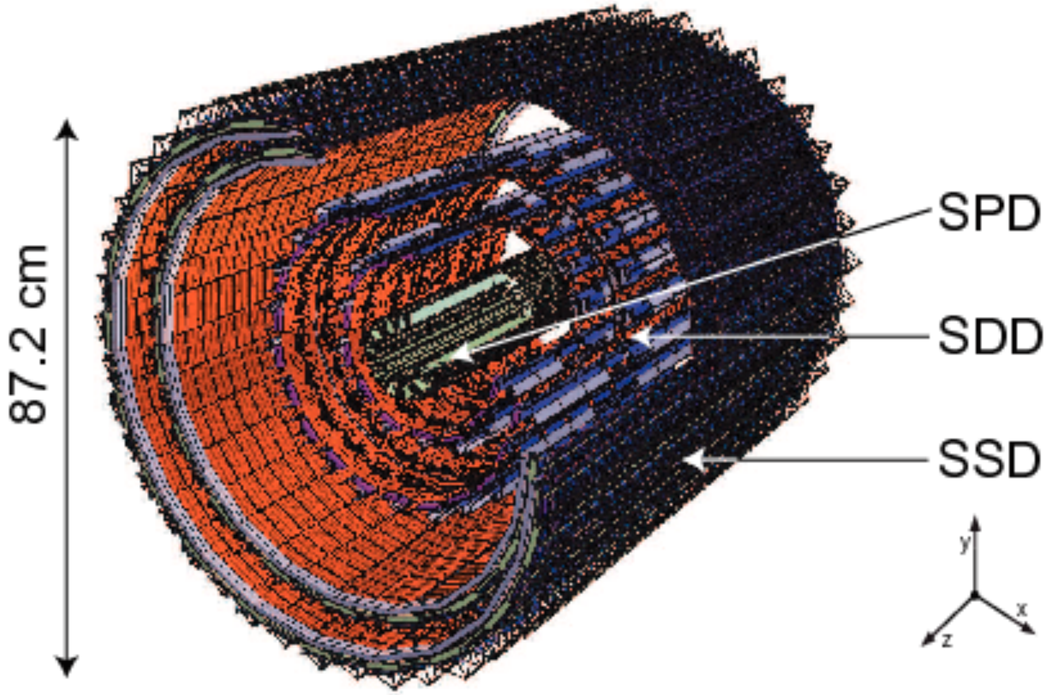
Inner Tracking System (ITS)

Basic functions:

- Determination of the primary vertex (better that 100 μm).
- Reconstruction of the secondary vertex.
  - ✦Necessary for the reconstruction of charm and hyperon decays.
- To identify and to track particles with low-momentum.



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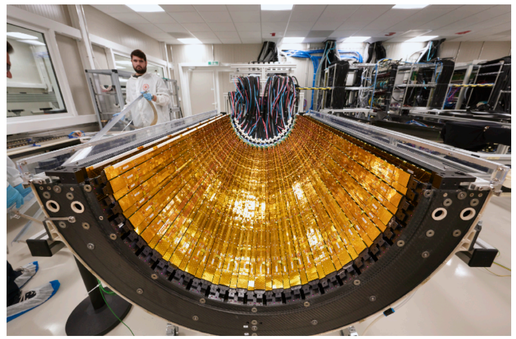
ALICE ITS

Instituto de Ciencias Nucleares UNAM

Inner Tracking System (ITS)

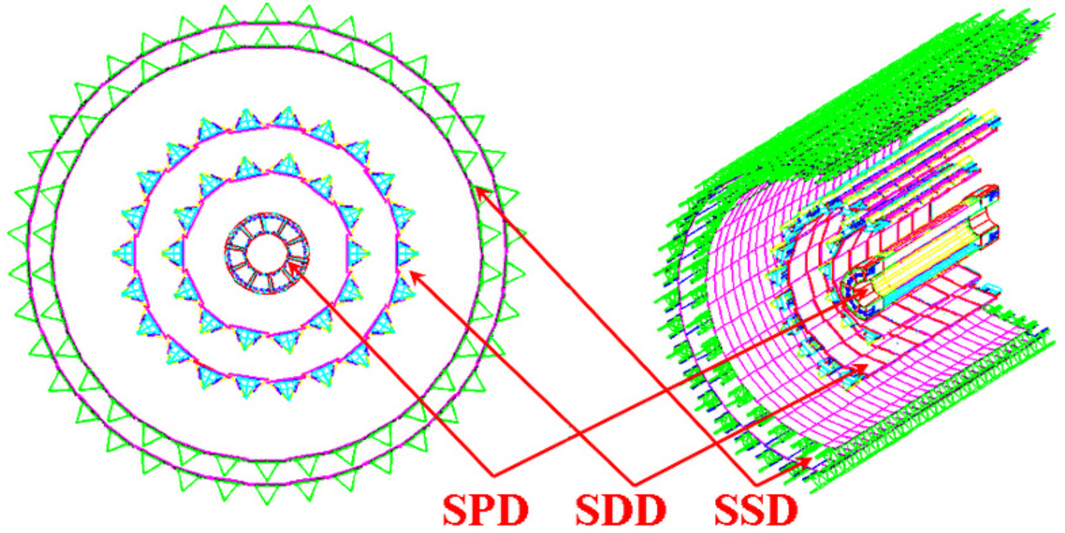


✳The central most detector

Silicon Pixel Detectors (SPD)

Silicon Drift Detectors (SDD)

Silicon Strip Detectors (SSD)



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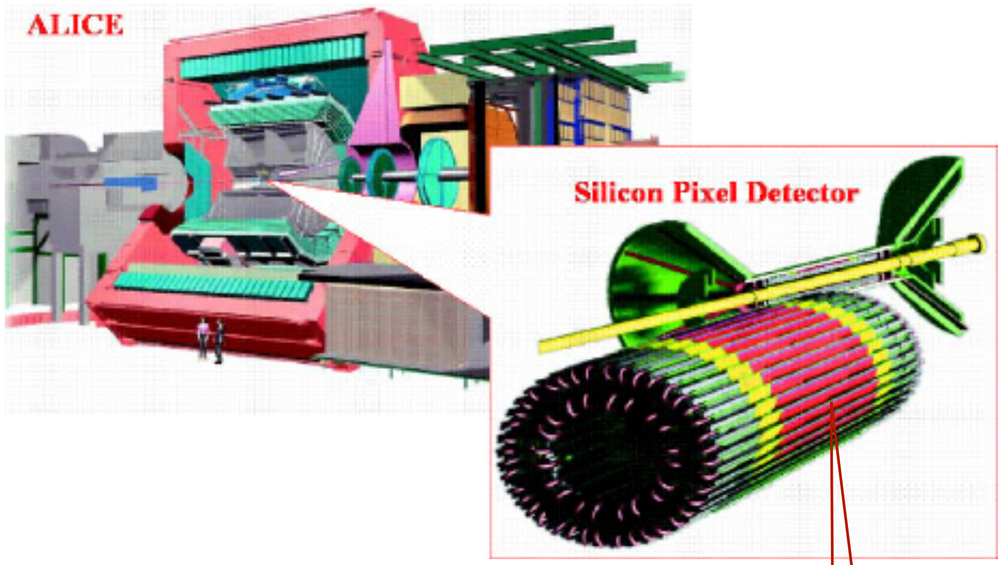
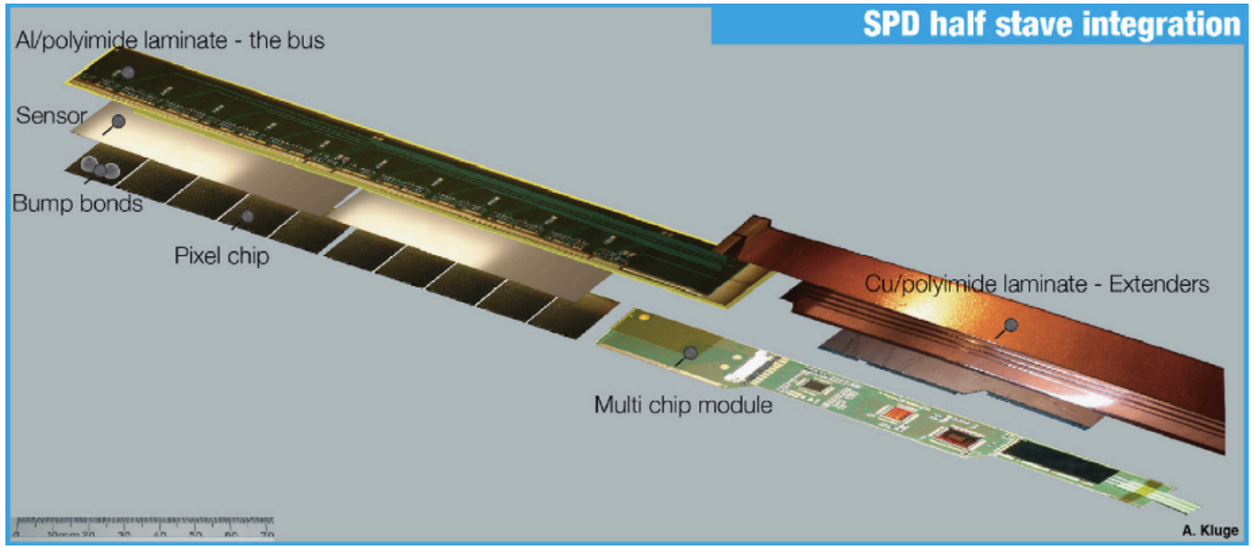
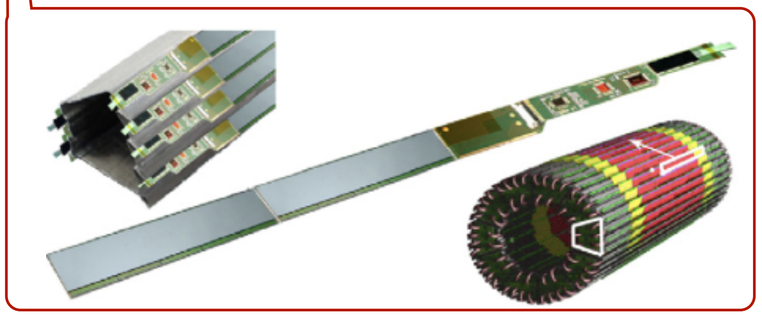
Silicon Pixel Detector (SPD)

✳The SPD contains $9.8x10^6$ pixels on 1200 reading chips covering an area of $0.2\ m^2$.



All on-detector components





✳SPD is the most internal part of ITS

Hybrid Track Cuts

The tracks need to be **rebuilt uniformly** with **good moment resolution**. To meet this uniformity requirement, ALICE contains two different classes of tracks called **hybrid tracks** that provide the desired properties when combined.

In a nutshell, hybrid tracks take **different sets of tracks** (for example, with or without the SPD) with the objective that the sum of all these contributions gives us something "flat".

Event Selection

Standard physics selection using the **kINT7 trigger**

- Track Selection (multiplicity in transverse region) $|\eta| < 0.8, p_{\mathrm{T}} > 0.5\ \mathrm{GeV}/c, 5 < p_{\mathrm{T}}^{\mathrm{leading}} < 40\ \mathrm{GeV}/c$

1	SetMinNCrossedRowsTPC(70)	Default
2	SetMinRatioCrossedRowsOverFindableClustersTPC(0.8)	Default
3	SetMaxChi2PerClusterTPC(4)	Default
4	SetAcceptKinkDaughters(kFALSE)	Default
5	SetRequireTPCRefit(kTRUE)	Default
6	SetRequireITSRefit(kTRUE)	Defined
7	SetClusterRequirementITS(AliESDtrackCuts::kSPD, AliESDtrackCuts::kOff)	Defined
8	SetMaxDCAToVertexXYPtDep("0.0105+0.0350/pt^1.1")	Default
9	SetMaxDCAToVertexZ(2)	Default
10	SetDCAToVertex2D(kFALSE)	Default
11	SetRequireSigmaToVertex(kFALSE)	Default
12	SetMaxChi2PerClusterITS(36)	Default
13	SetMaxDCAToVertexXY(2.4)	Default
14	SetMaxDCAToVertexZ(3.2)	Default

Event Selection

Standard physics selection using the **kINT7 trigger**

- Track Selection (pT leading) $|\eta| < 0.8, p_{\mathrm{T}} > 0.5\ \mathrm{GeV}/c,\ 5 < p_{\mathrm{T}}^{\mathrm{leading}} < 40\ \mathrm{GeV}/c$

1	SetMinNCrossedRowsTPC(70)	Default
2	SetMinRatioCrossedRowsOverFindableClustersTPC(0.8)	Default
3	SetMaxChi2PerClusterTPC(4)	Default
4	SetAcceptKinkDaughters(kFALSE)	Default
5	SetRequireTPCRefit(kTRUE)	Default
6	SetRequireITSRefit(kFALSE)	Defined
7	SetClusterRequirementITS(AliESDtrackCuts::kSPD, AliESDtrackCuts::kNone)	Defined
8	SetMaxDCAToVertexXYPtDep("0.0105+0.0350/pt^1.1")	Default
9	SetMaxDCAToVertexZ(2)	Default
10	SetDCAToVertex2D(kFALSE)	Default
11	SetRequireSigmaToVertex(kFALSE)	Default
12	SetMaxChi2PerClusterITS(36)	Default
13	SetMaxDCAToVertexXY(2.4)	Default
14	SetMaxDCAToVertexZ(3.2)	Default

Selection of associated pions, kaons, and protons

Cuts:

- $5 < p_{\mathrm{T}}^{\mathrm{leading}} < 40$ GeV/c ($p_{\mathrm{T}} > 0.5$ GeV/c for protons)
- $|\eta| < 0.8$
- $\mathrm{DCA}_{xy} < 0.0105 + 0.0350 p_{\mathrm{T}}^{-1.1}$
- $|n\sigma_{\mathrm{TPC}}^{i}| < 4$ for either of $i = \pi$,K,p,e
- Geometrical cut (for leading track):

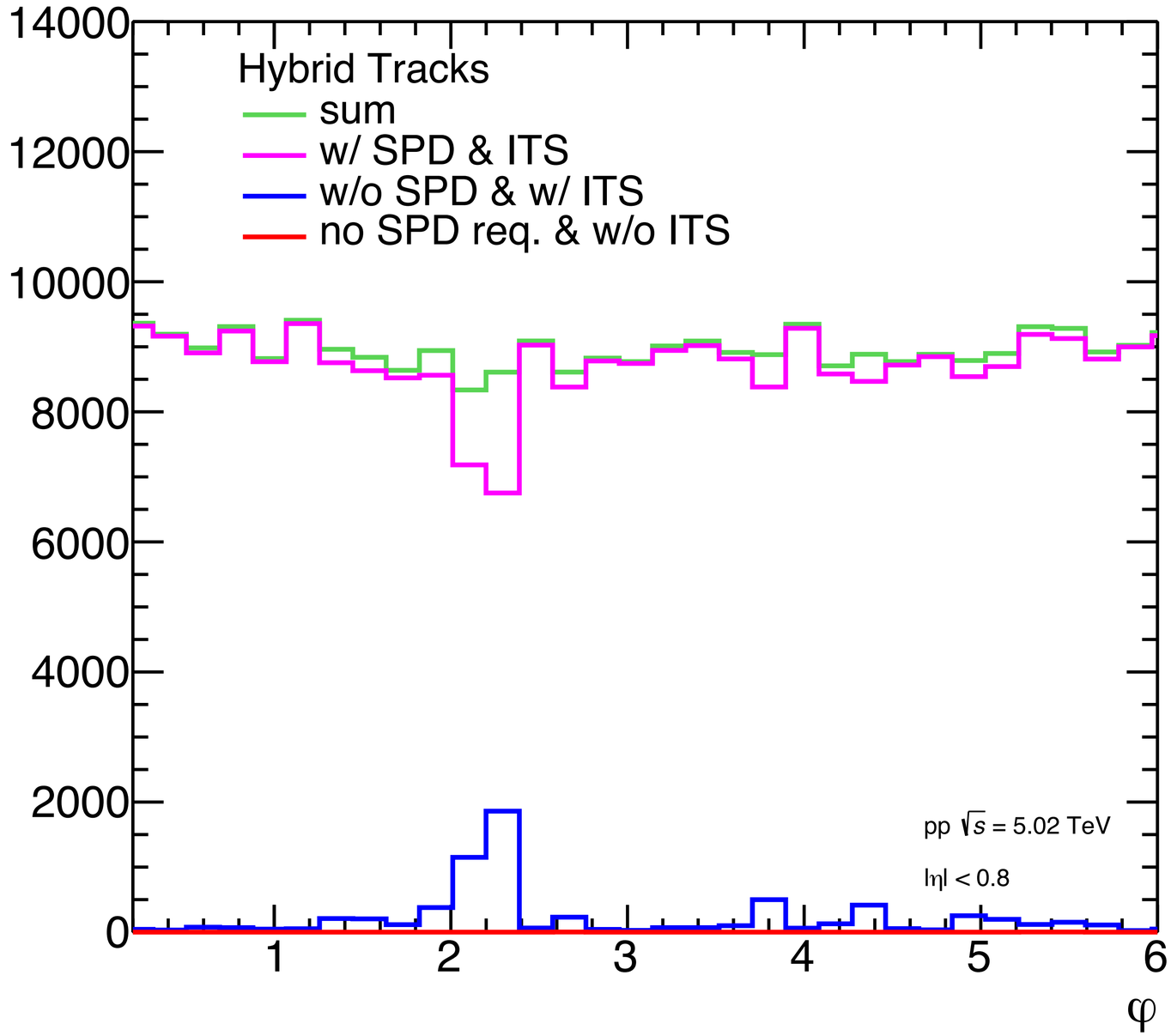
1	`SetCutGeoNcrNcl(3, 130, 1.5, 0.85, 0.7)`	Default

Detectors used:

- ITS and TPC are used for track reconstruction

Azimuthal distribution of Hybrid Tracks

- MC production cycle **LHC17e2** (62 AliESDs.root).



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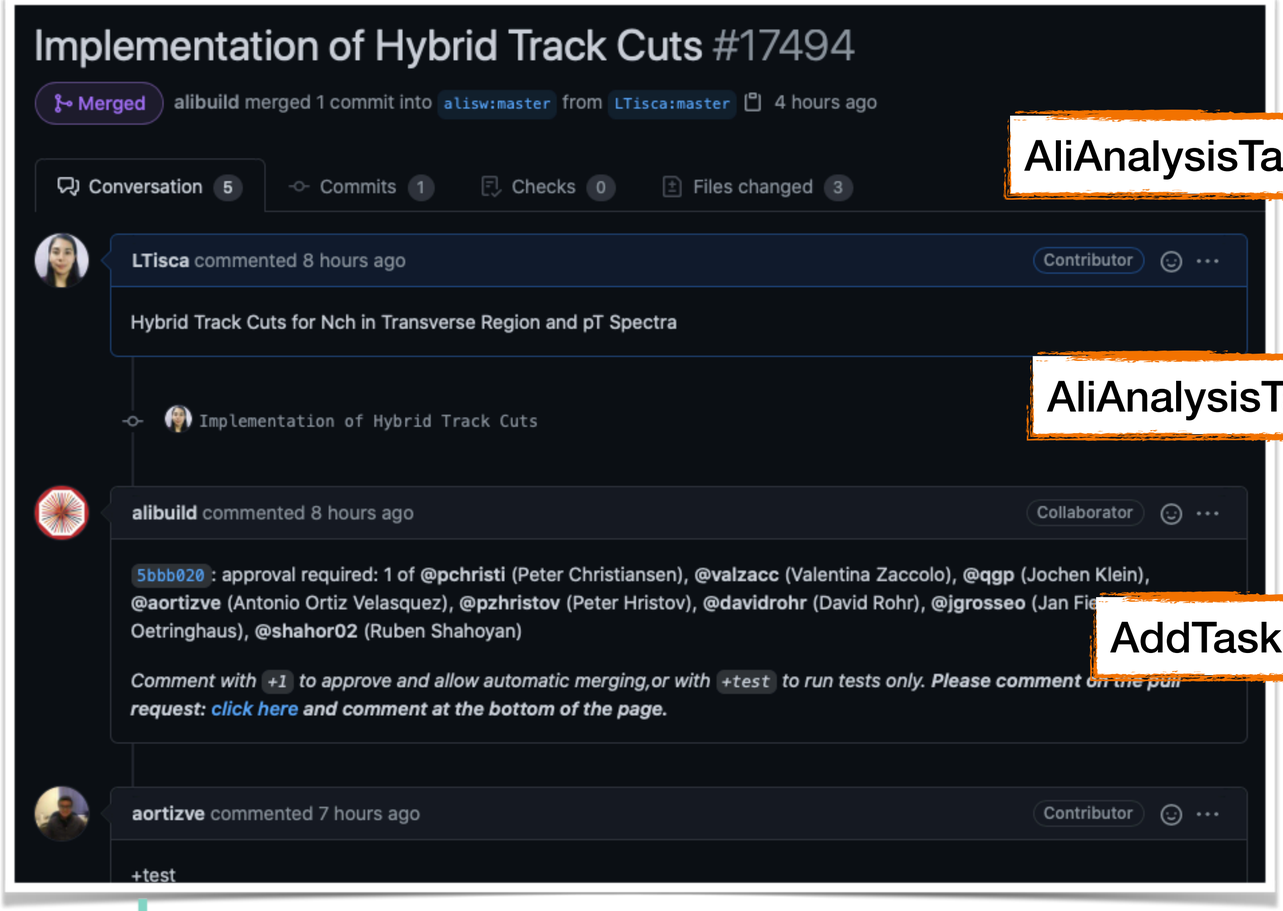
Contribution into alisw/AliPhysics

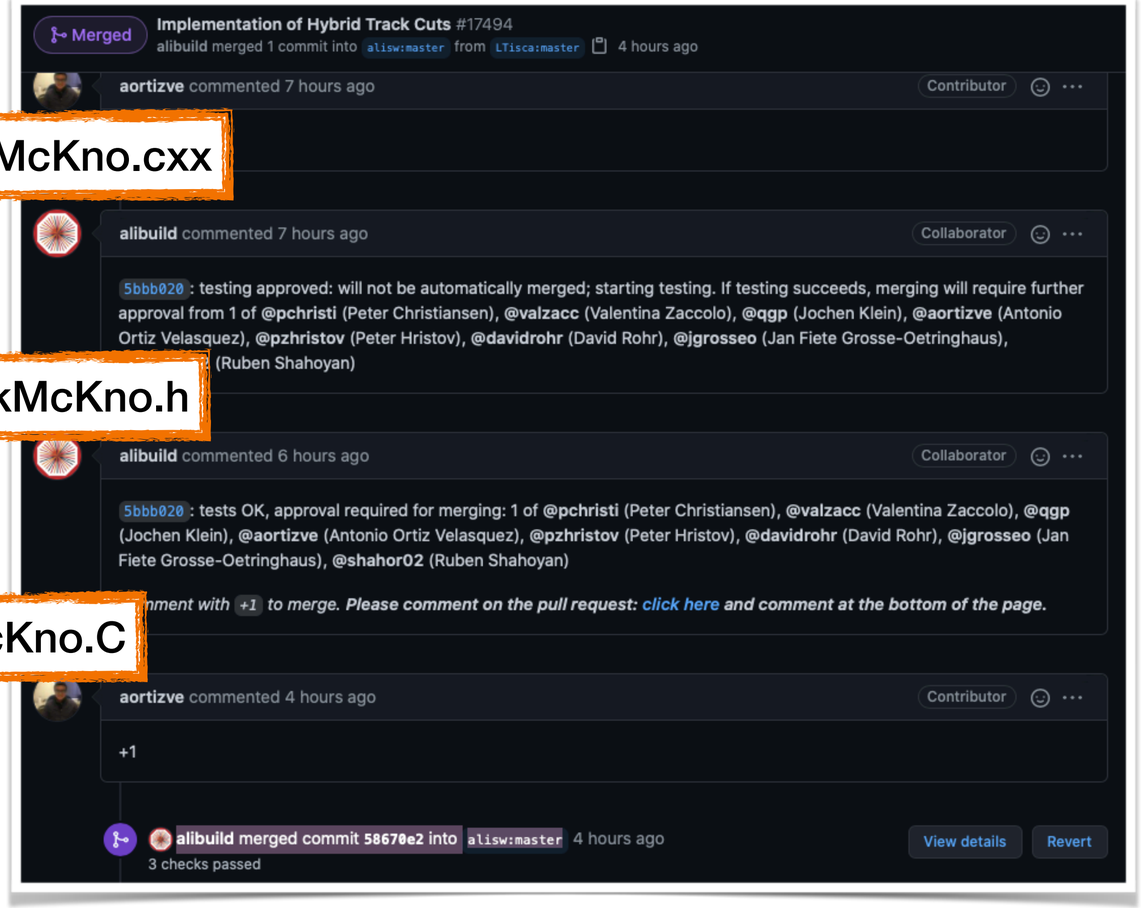
GitHub



AliAnalysisTaskMcKno.cxx

AliAnalysisTaskMcKno.h

AddTaskMcKno.C



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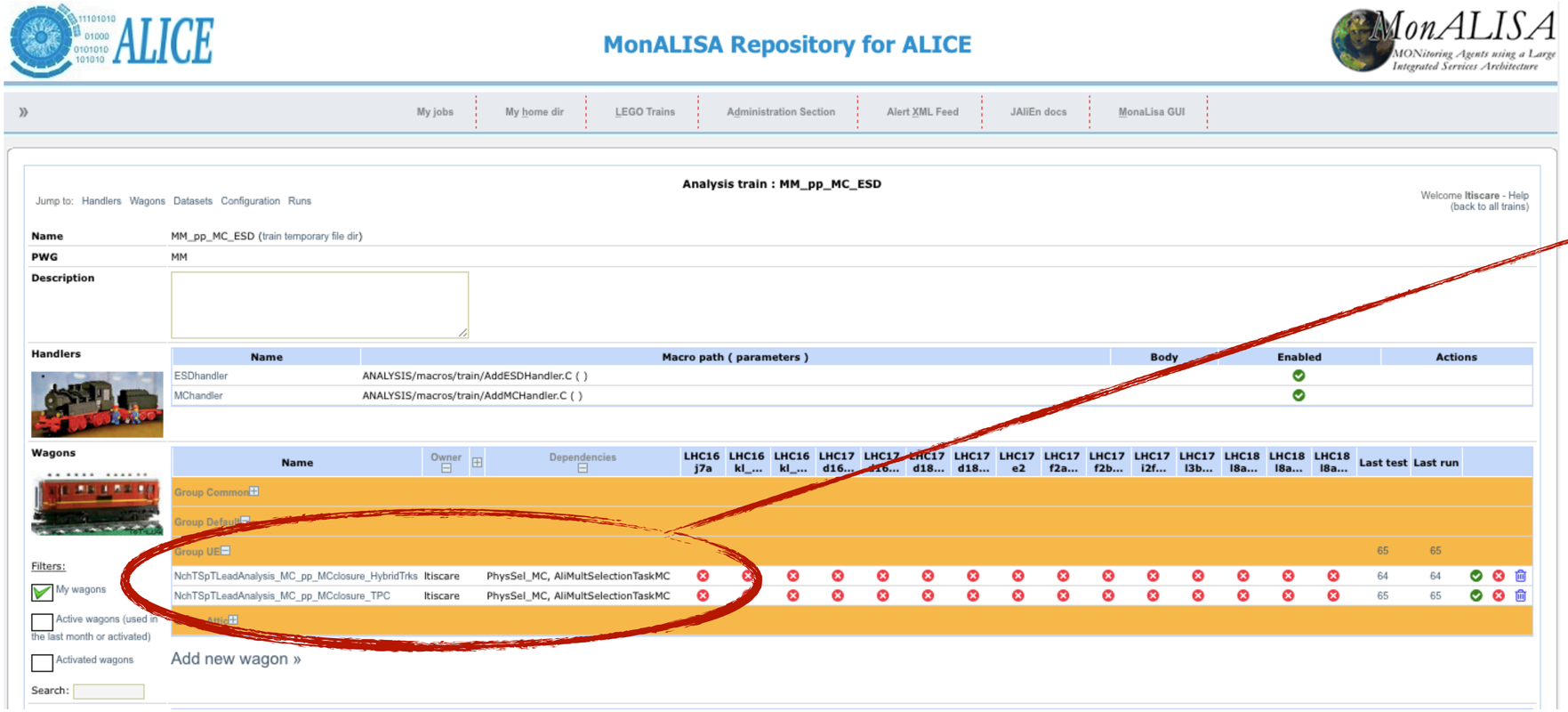
Run the wagons

MonALISA Repository



Wagons:

- NchTSpTLeadAnalysis_MC_pp_MCclosure_HybridTrks
- NchTSpTLeadAnalysis_MC_pp_MCclosure_TPC

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To do

- Wait for the statistics (data - LHC16kl_pass2 and LHC17e2).
- Compare the results of the two wagons to corroborate the analysis task.

Thank you!