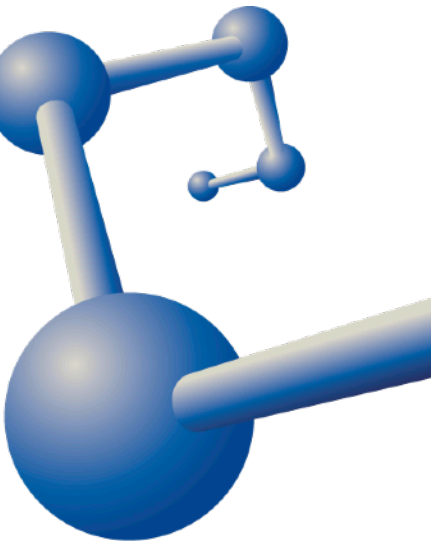




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Analysis Task with the implementation of Hybrid Track Cuts for pp collisions at $\sqrt{s_{NN}} = 5.02 \text{ TeV}$

Tutor: Dr. Antonio Ortiz Velásquez

Luz Tiscareño (UPA)

Friday, April 16th 2021

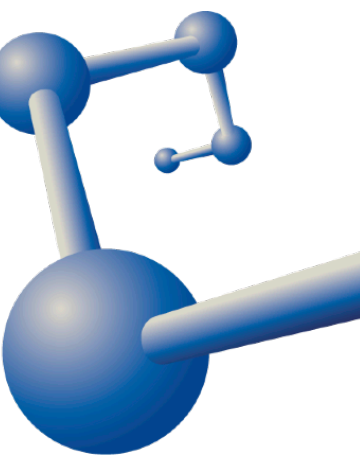


Objective



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





- ☑ 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 .

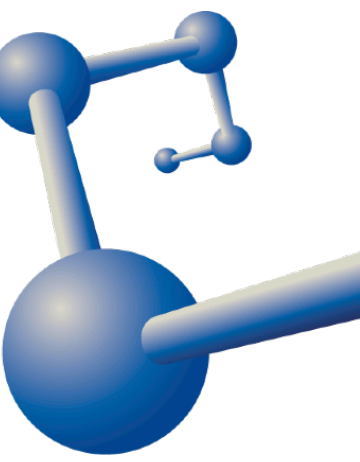
```

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.
6  *
7  * Permission to use, copy, modify and distribute this software and its
8  * documentation strictly for non-commercial purposes is hereby granted
9  * without fee, provided that the above copyright notice appears in all
10 * copies and that both the copyright notice and this permission notice
11 * appear in the supporting documentation. The authors make no claims
12 * about the suitability of this software for any purpose. It is
13 * provided "as is" without express or implied warranty.
14 *
15 * Authors:   Sushanta Tripathy (Sushanta.Tripathy@cern.ch)
16 *           Antonio Ortiz (antonio.ortiz@nucleares.unam.mx)
17 *           Ahsan Mehmood Khan(ahsan.mehmood.khan@cern.ch)
18 *           Feng Fan (Feng.Fan@cern.ch)
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"

```

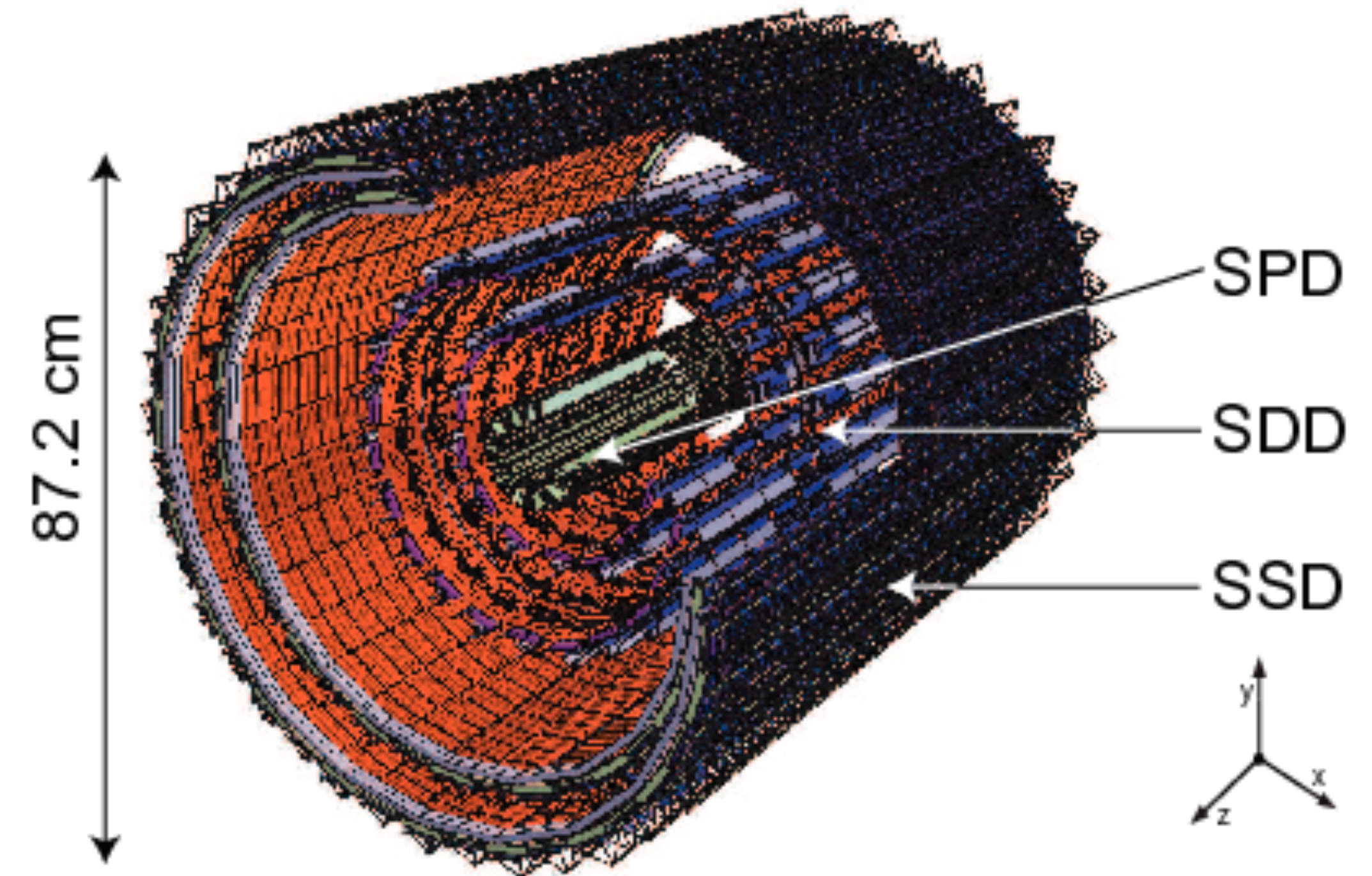
AliAnalysisTaskMcKno.cxx

Inner Tracking System (ITS)

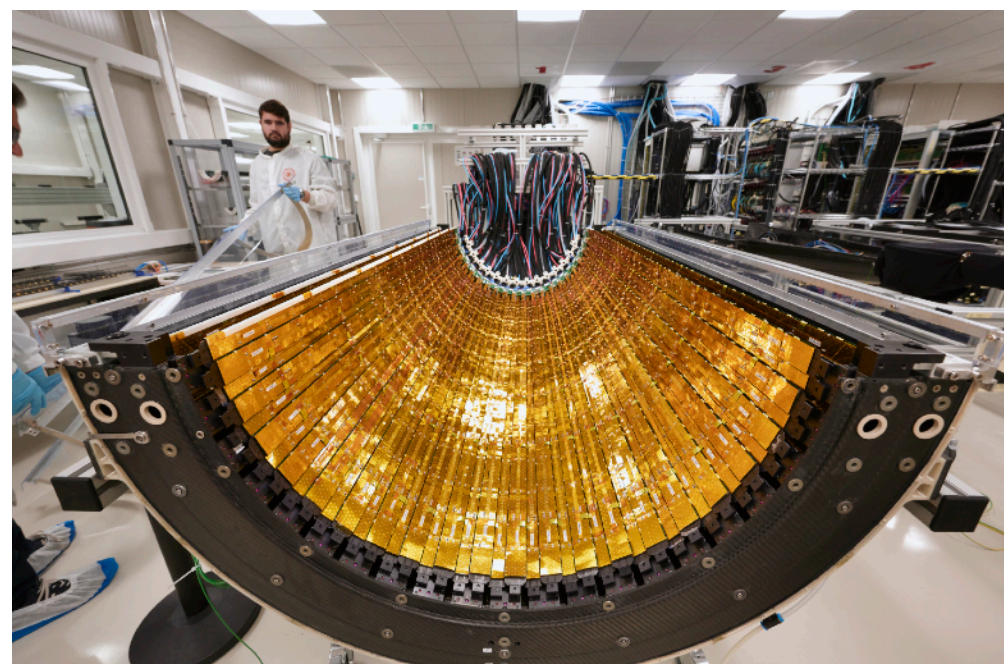


Basic functions:

- Determination of the primary vertex (better than $100 \mu m$).
- Reconstruction of the secondary vertex.
 - ♦ Necessary for the reconstruction of charm and hyperon decays.
- To identify and to track particles with low-momentum.



Inner Tracking System (ITS)

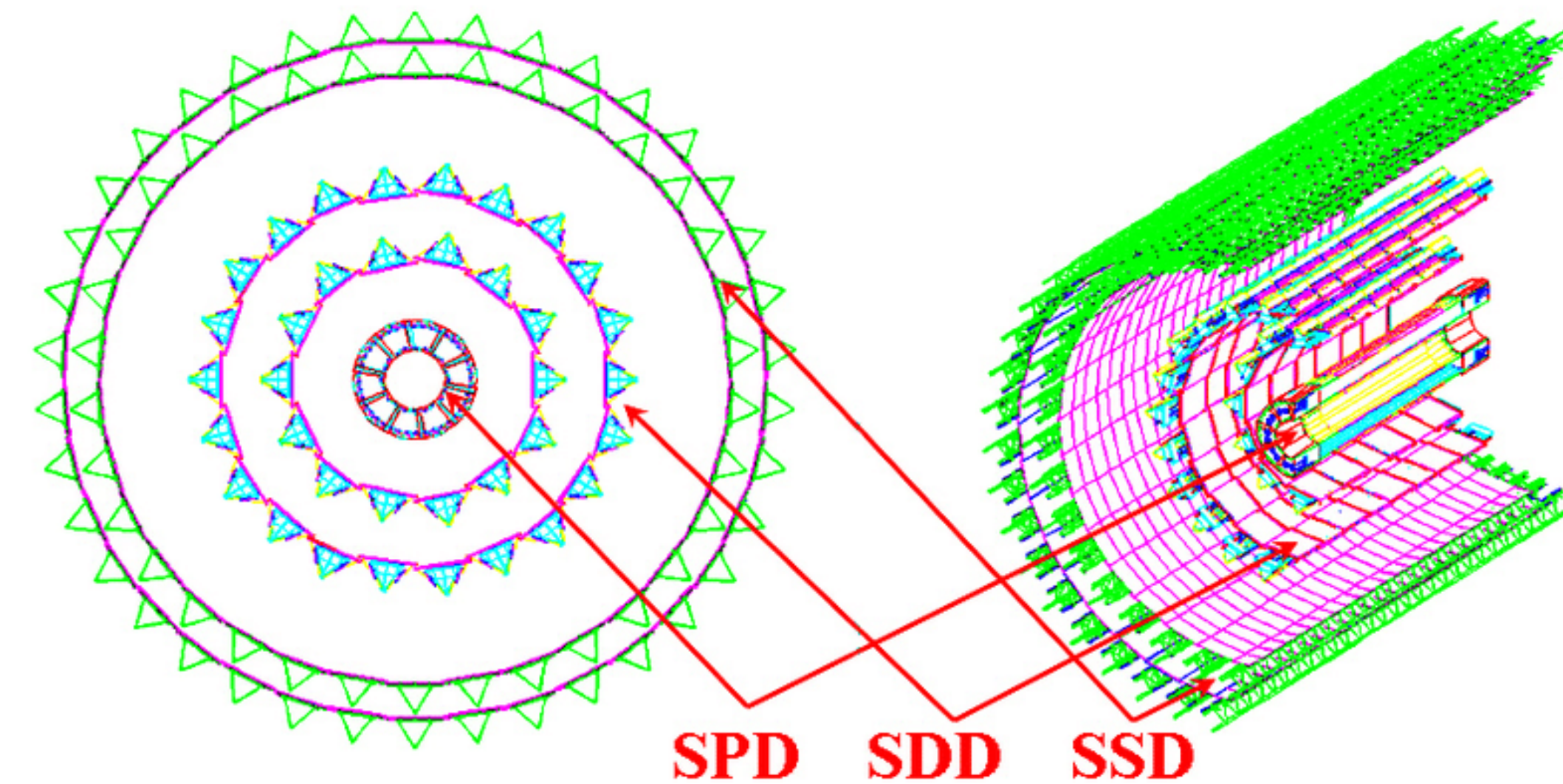


*The central most detector

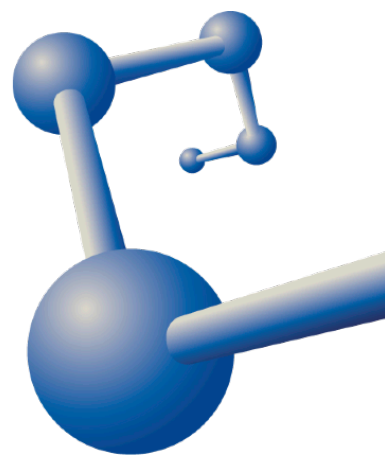
Silicon Pixel Detectors (SPD)

Silicon Drift Detectors (SDD)

Silicon Strip Detectors (SSD)

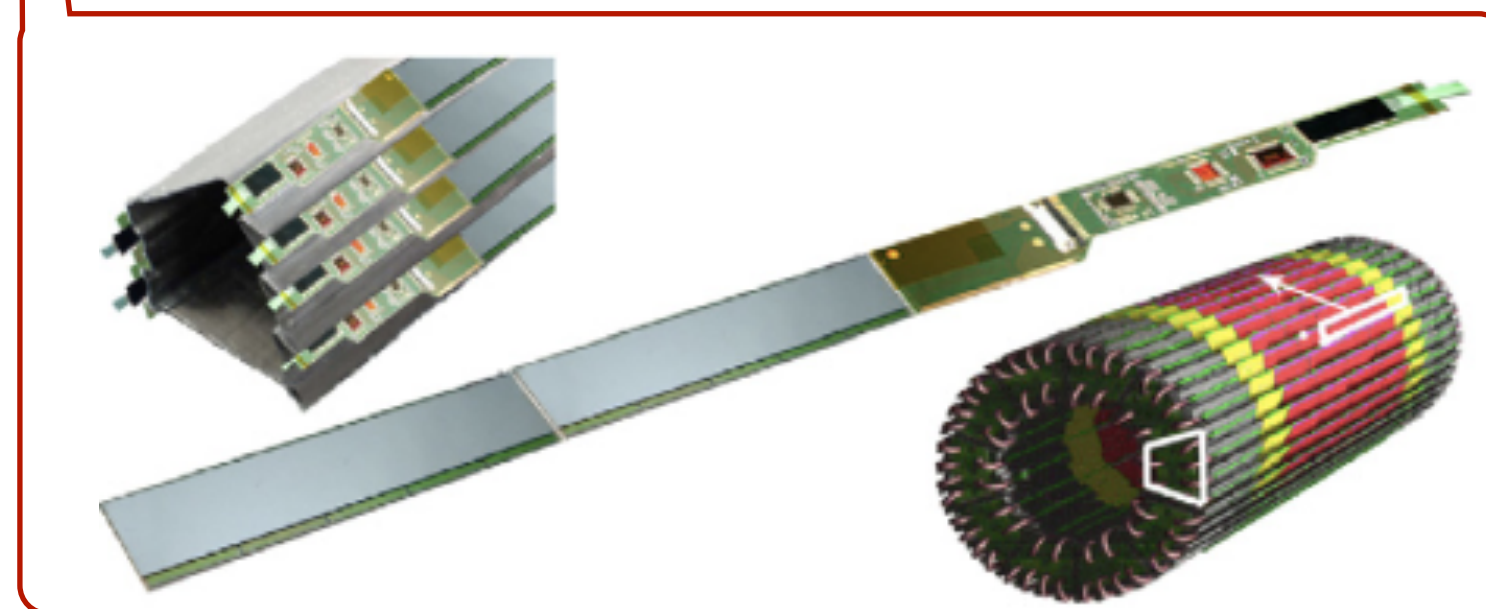
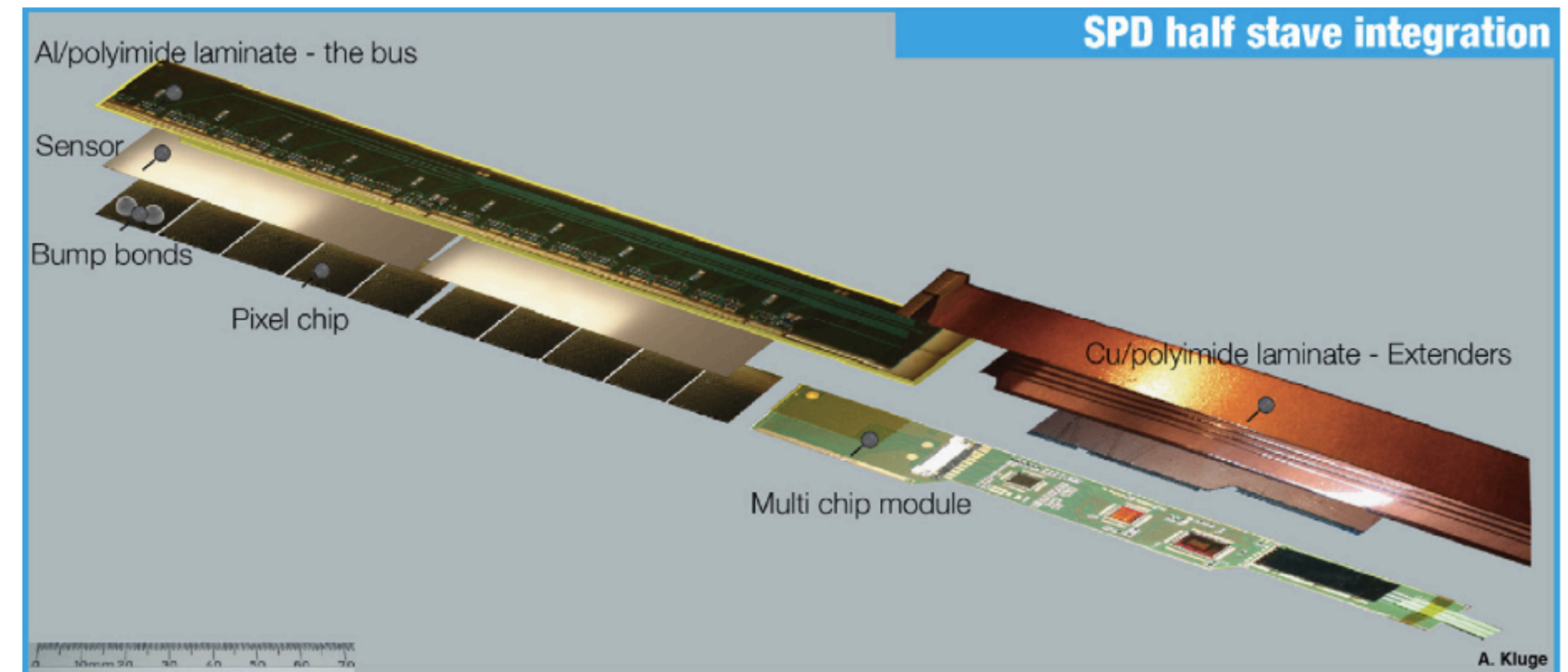
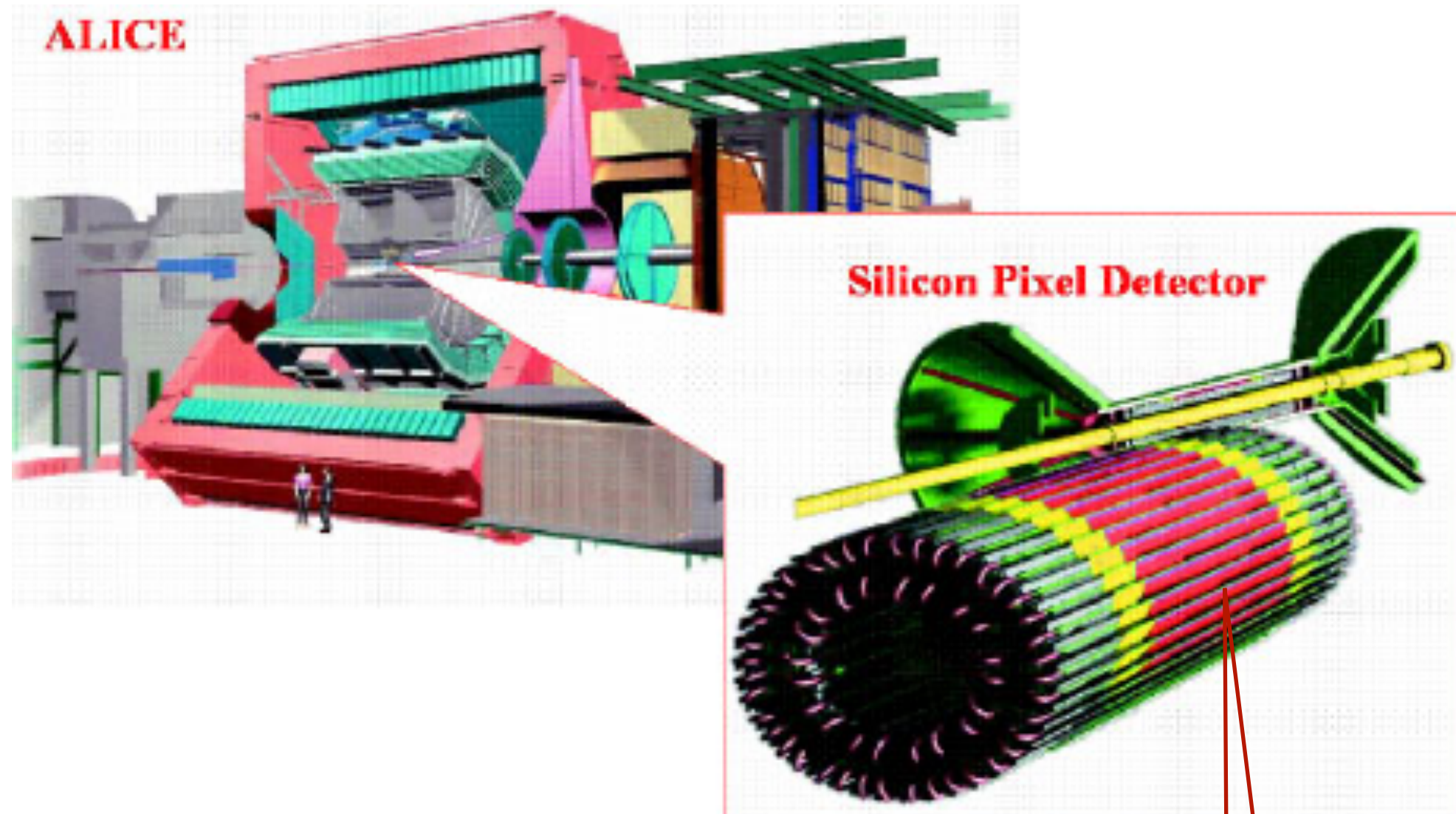


Silicon Pixel Detector (SPD)



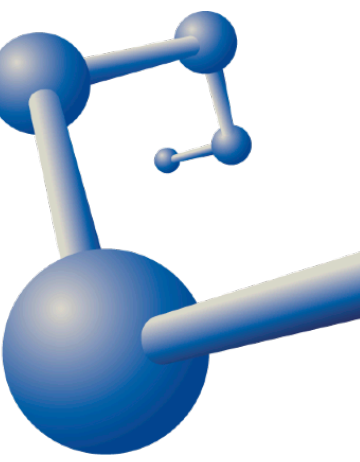
*The SPD contains 9.8×10^6 pixels on 1200 reading chips covering an area of 0.2 m^2 .

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".

Standard physics selection using the **kINT7 trigger**

▸ Track Selection (multiplicity in transverse region) $|\eta| < 0.8, p_T > 0.5 \text{ GeV}/c, 5 < p_T^{\text{leading}} < 40 \text{ GeV}/c$

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

Standard physics selection using the **kINT7 trigger**

► Track Selection (p_T leading) $|\eta| < 0.8, p_T > 0.5 \text{ GeV}/c, 5 < p_T^{\text{leading}} < 40 \text{ GeV}/c$

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:

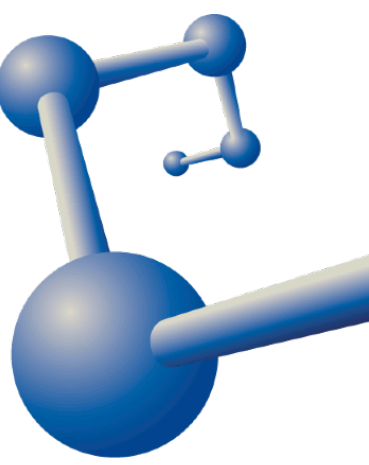
- $5 < p_T^{\text{leading}} < 40 \text{ GeV}/c$ ($p_T > 0.5 \text{ GeV}/c$ for protons)
- $|\eta| < 0.8$
- $\text{DCA}_{xy} < 0.0105 + 0.0350 p_T^{-1.1}$
- $|n\sigma_{\text{TPC}}^i| < 4$ for either of $i = \pi, K, p, e$
- Geometrical cut (for leading track):

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

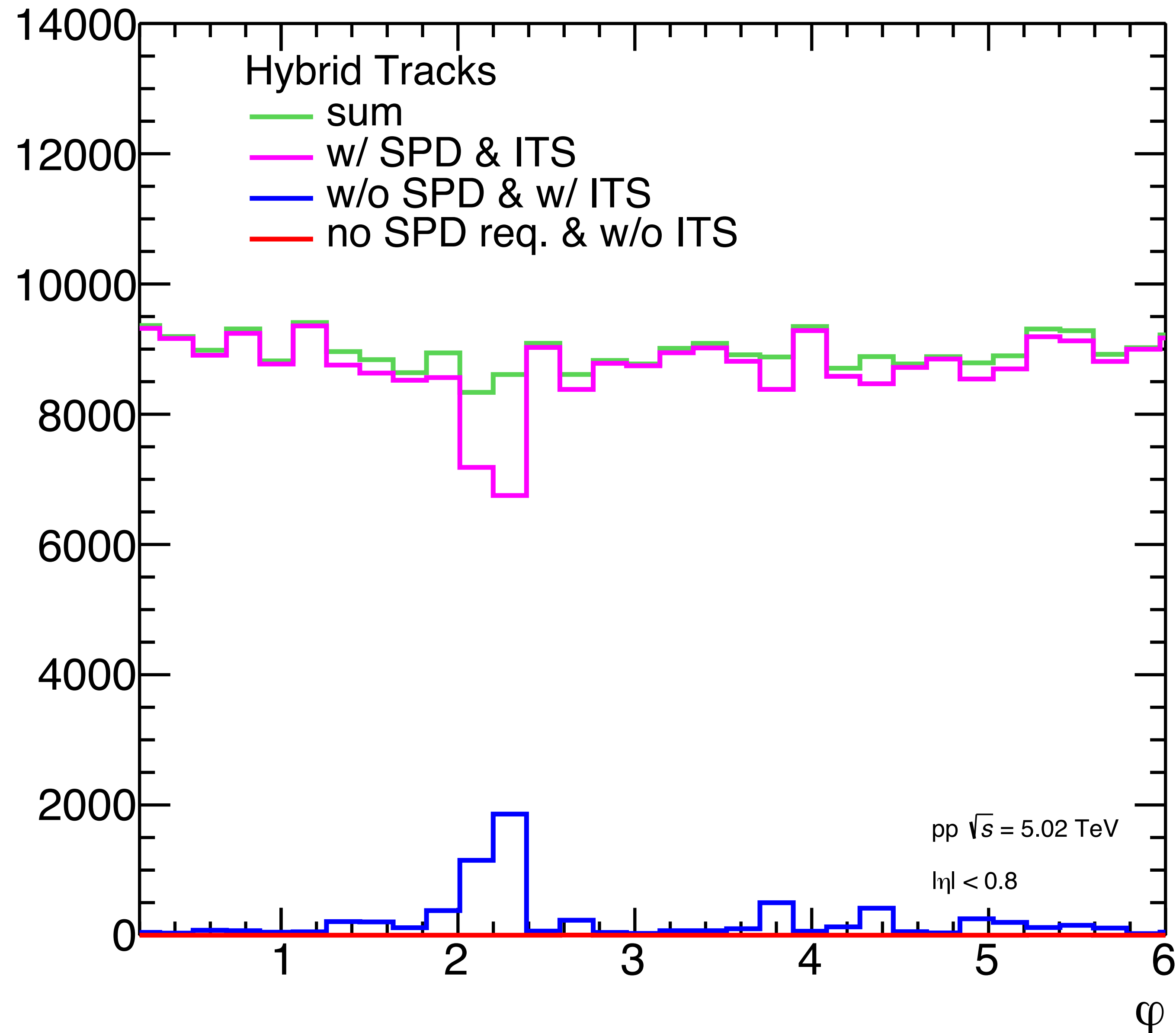
Detectors used:

- ITS and TPC are used for track reconstruction

Azimuthal distribution of Hybrid Tracks



▸ MC production cycle
LHC17e2 (62 AliESDs.root).

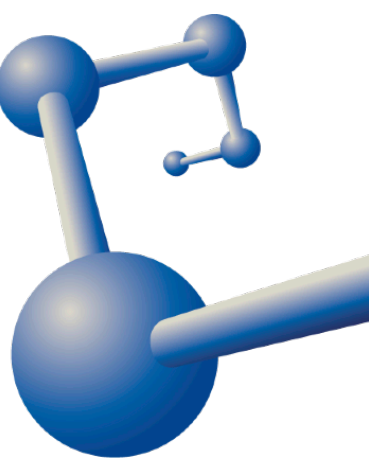




Contribution into alisw/AlIPhysics

GitHub

Instituto de Ciencias Nucleares UNAM



Implementation of Hybrid Track Cuts #17494
 Merged alibuild merged 1 commit into alisw:master from LTisca:master 4 hours ago

Conversation 5 Commits 1 Checks 0 Files changed 3

AliAnalysisTaskMcKno.cxx

LTisca commented 8 hours ago
 Contributor Hybrid Track Cuts for Nch in Transverse Region and pT Spectra

Implementation of Hybrid Track Cuts

alibuild commented 8 hours ago
 Collaborator 5bbb020 : approval required: 1 of @pchristi (Peter Christiansen), @valzacc (Valentina Zaccolo), @qgp (Jochen Klein), @aortizve (Antonio Ortiz Velasquez), @pzhrstov (Peter Hristov), @davidrohr (David Rohr), @jgrosso (Jan Fiete Grosse-Oetringhaus), @shahor02 (Ruben Shahoyan)

Comment with +1 to approve and allow automatic merging, or with +test to run tests only. Please comment on the pull request: [click here](#) and comment at the bottom of the page.

aortizve commented 7 hours ago
 Contributor +test

AliAnalysisTaskMcKno.h

alibuild commented 7 hours ago
 Collaborator 5bbb020 : testing approved: will not be automatically merged; starting testing. If testing succeeds, merging will require further approval from 1 of @pchristi (Peter Christiansen), @valzacc (Valentina Zaccolo), @qgp (Jochen Klein), @aortizve (Antonio Ortiz Velasquez), @pzhrstov (Peter Hristov), @davidrohr (David Rohr), @jgrosso (Jan Fiete Grosse-Oetringhaus), @shahor02 (Ruben Shahoyan)

alibuild commented 6 hours ago
 Collaborator 5bbb020 : tests OK, approval required for merging: 1 of @pchristi (Peter Christiansen), @valzacc (Valentina Zaccolo), @qgp (Jochen Klein), @aortizve (Antonio Ortiz Velasquez), @pzhrstov (Peter Hristov), @davidrohr (David Rohr), @jgrosso (Jan Fiete Grosse-Oetringhaus), @shahor02 (Ruben Shahoyan)

Comment with +1 to merge. Please comment on the pull request: [click here](#) and comment at the bottom of the page.

aortizve commented 4 hours ago
 Contributor +1

alibuild merged commit 58670e2 into alisw:master 4 hours ago
 3 checks passed

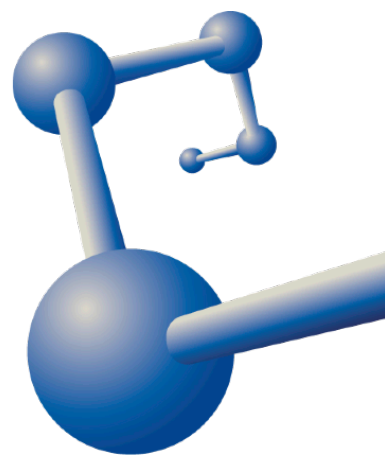
AddTaskMcKno.C





Run the wagons

MonALISA Repository



MonALISA Repository for ALICE



» My jobs My home dir LEGO Trains Administration Section Alert XML Feed JAIEn docs MonALISA GUI

Analysis train : MM_pp_MC_ESD

Welcome Itiscare - Help (back to all trains)

Jump to: Handlers Wagons Datasets Configuration Runs

Name: MM_pp_MC_ESD (train temporary file dir)
 PWG: MM
 Description:

Name	Macro path (parameters)	Body	Enabled	Actions
ESDhandler	ANALYSIS/macros/train/AddESDHandler.C ()		✓	
MChandler	ANALYSIS/macros/train/AddMCHandler.C ()		✓	

Name	Owner	Dependencies	LHC16 j7a	LHC16 kl_...	LHC16 kl_...	LHC17 d16...	LHC17 d16...	LHC17 d18...	LHC17 d18...	LHC17 e2	LHC17 f2a...	LHC17 f2b...	LHC17 i2f...	LHC17 i3b...	LHC18 l8a...	LHC18 l8a...	LHC18 l8a...	Last test	Last run
Group Common																			
Group Default																			
Group UE																		65	65
NchTSpTLeadAnalysis_MC_pp_MCclosure_HybridTrks	Itiscare	PhysSel_MC, AliMultSelectionTaskMC	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	64	64
NchTSpTLeadAnalysis_MC_pp_MCclosure_TPC	Itiscare	PhysSel_MC, AliMultSelectionTaskMC	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	65	65

Filters:
 My wagons
 Active wagons (used in the last month or activated)
 Activated wagons

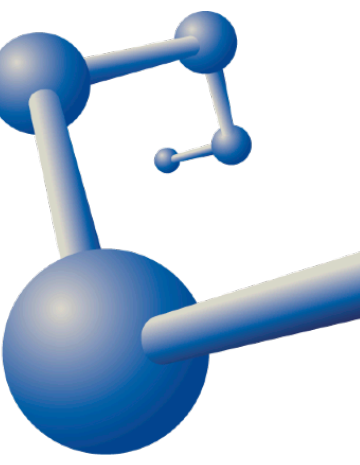
Add new wagon »

Search:

- Wagons:**
- NchTSpTLeadAnalysis_MC_pp_MCclosure_HybridTrks
 - NchTSpTLeadAnalysis_MC_pp_MCclosure_TPC



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!

