

STATUS UPDATE

What have I been up to ?

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DESY SM Meeting

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Writing Track CP Algorithms

[athena/PhysicsAnalysis/Algorithms/TrackingAnalysisAlgorithms/python/TrackingAnalysisConfig.py](#)

Track Processing Workflow:

1. Text based Config

- InDetTrackSmearingTool
- InDetTrackBiasingTool
- Define output variables

YAML Config

Main Block

1. General Settings

- inputContainer - as found in DAOD
- containerName - output name
- (postfix - distinguish collections)
- minPt, maxEta - preselection
- outputTrackSummaryInfo - additional output

2. Smearing Settings

- calibFile - for CTIDE
- smearingToolSeed - expert studies

3. Biasing Settings

- runBiasing - skip tool
- biasD0, biasZ0, biasQoverPsagitta - custom bias
- customRunNumber - manual run number

WorkingPoint

1. General Settings

- (containerName - defaults to supBlock)
- selectionName - output name
- (postfix - distinguish selections)
- AddSelectionToPreselection - filter tracks

2. Selection Settings

- cutLevel - from list of available
- additionalCuts - define new cutLevels

3. TruthFilter Settings

- runTruthFilter - skip tool
- calibFile, fFakeTight, fFakeLoose - custom Eff and Fake Rate
- trkEffSystScale - rescale systematics

TopCPToolkit/source/TopCPToolkit/share/configs/exampleInDetTracks/reco.yaml

```
1 - containerName: 'AnaTracks'
2 runBiasing: True
3 biasD0: 0.2
4 minPt: 400
5 maxEta: 2.5
6 outputTrackSummaryInfo: True
7 WorkingPoint:
8   - selectionName: 'tight'
9     cutLevel: 'tightPrimary'
10   - selectionName: 'Custom'
11     cutLevel: 'NoCut'
12   additionalCuts:
13     maxZ0: 50
14   minKinInnermostLayerMits: 1
15   runTruthFilter: True
16
```

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2. Calibration Algorithms

- InDetTrackSmearingTool
- InDetTrackBiassingTool
- Define output variables

```
92 # Set up the smearing algorithm:
93 if config.dataType() is not DataType.Data:
94     alg = config.createAlgorithm( 'CP::InDetTrackSmearingAlg', 'InDetTrackSmearingAlg' + self.postfix )
95     config.addPrivateTool( 'smearingTool', 'InDet::InDetTrackSmearingTool' )
96     if self.smearingToolSeed:
97         alg.smearingTool.Seed = self.smearingToolSeed
98     if self.calibFile:
99         alg.smearingTool.calibFileIP_CTIDE = self.calibFile
100     else:
101         if config.geometry() is LHCPeriod.Run2:
102             # Run 2 recommendations (MC20)
103             alg.smearingTool.calibFileIP_CTIDE = "InDetTrackSystematicsTools/CalibData_22_0_2022-v00/d0z0_smearing_factors_Run2_v2.root"
104         elif config.geometry() is LHCPeriod.Run3:
105             if config.campaign() is Campaign.MC23a:
106                 # 2022 recommendations (MC23a)
107                 alg.smearingTool.calibFileIP_CTIDE = "InDetTrackSystematicsTools/CalibData_25_2_2025-v00/2022_d0z0_smearing_factors_v2.root"
108             elif config.campaign() is Campaign.MC23d:
109                 # 2023 recommendations (MC23d)
110                 alg.smearingTool.calibFileIP_CTIDE = "InDetTrackSystematicsTools/CalibData_25_2_2025-v00/2023_d0z0_smearing_factors_v2.root"
111             elif config.campaign() is Campaign.MC23e:
112                 # 2024 recommendations (MC23e)
113                 alg.smearingTool.calibFileIP_CTIDE = "InDetTrackSystematicsTools/CalibData_25_2_2025-v00/2024_d0z0_smearing_factors.root"
114         else:
115             raise ValueError( 'No recommendations found for capaign \''
116                               + config.campaign().value + '\' in Run 3. '
117                               + 'Please check that the recommendations exist.' )
118     else:
119         raise ValueError( 'No recommendations found for geometry \''
120                           + config.geometry().value + '\'. Please check '
121                           + 'the configuration.' )
122     alg.inDetTracks = config.readName( self.containerName )
123     alg.inDetTracksOut = config.copyName( self.containerName )
124     alg.preselection = config.getPreselection( self.containerName, '' )
125
126 # Set up the biasing algorithm. The recommendations is to bias MC instead of unbiasing Data:
127 if config.dataType() is not DataType.Data:
128     if not self.runBiasing:
129         log.warning( 'Disabling the biasing tool for now. This should not '
130                     + 'be used in an analysis.' )
131     else:
132         if config.geometry() is LHCPeriod.Run3:
133             raise ValueError( 'Recommendations are not yet available in Run 3.' )
134         elif config.geometry() is not LHCPeriod.Run2:
135             raise ValueError( 'No recommendations found for geometry \''
136                               + config.geometry().value + '\'. Please check '
137                               + 'the configuration.' )
138         alg = config.createAlgorithm( 'CP::InDetTrackBiassingAlg', 'InDetTrackBiassingAlg' + self.postfix )
139         config.addPrivateTool( 'biasingTool', 'InDet::InDetTrackBiassingTool' )
140         if self.biasD0:
141             alg.biasingTool.biasD0 = self.biasD0
142         if self.biasZ0:
143             alg.biasingTool.biasZ0 = self.biasZ0
144         if self.biasQoverPsagitta:
145             alg.biasingTool.biasQoverPsagitta = self.biasQoverPsagitta
146         if self.customRunNumber:
147             alg.biasingTool.runNumber = self.customRunNumber
148         alg.inDetTracks = config.readName( self.containerName )
149         alg.inDetTracksOut = config.copyName( self.containerName )
150         alg.preselection = config.getPreselection( self.containerName, '' )
151
```

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2. Calibration Algorithms

- InDetTrackSmearingTool
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3. Working Point Algorithms

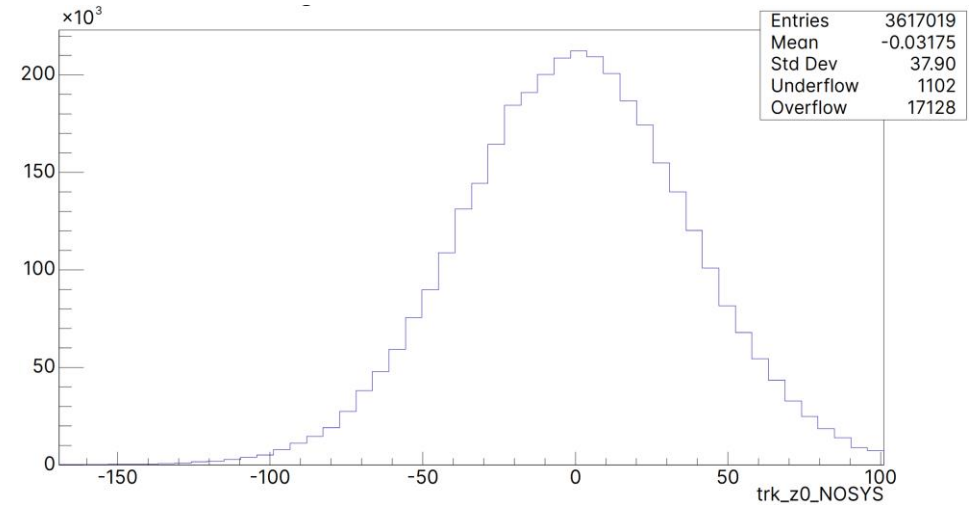
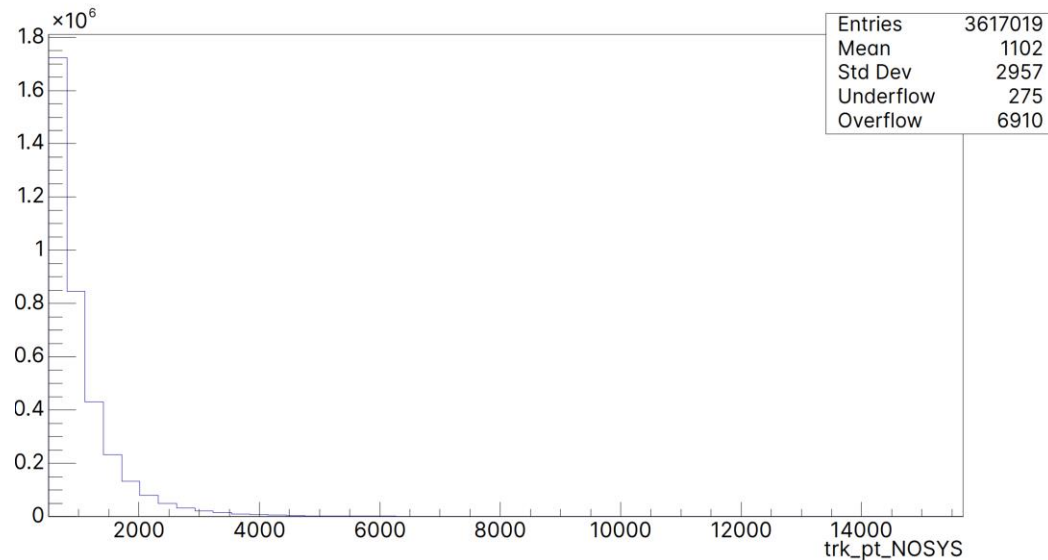
- InDetTrackSelectionTool
 - cutLevel ('TightPrimary', 'Loose', etc.)
 - additionalCuts dictionary
- InDetTrackTruthFilterTool
 - Efficiency and FakeRate variations

```
242 cutlevels = ["NoCut", "Loose", "LoosePrimary", "TightPrimary", "LooseMuon",
243             "LooseElectron", "LooseTau", "MinBias", "HILoose", "HITight",
244             "HILooseOptimized", "HITightOptimized"]
245 alg = config.createAlgorithm( 'CP::InDetTrackSelectionAlg', 'InDetTrackSelection' + postfix )
246 alg.selectionDecoration = 'selectTrack' + postfix + '_XSVSW,as_bits'
247 config.addPrivateTool( 'selectionTool', 'InDet::InDetTrackSelectionTool' )
248 if self.cutLevel is None:
249     log.warning("No selection WP chosen, not setting up InDetTrackSelectionTool.")
250 elif self.cutLevel not in cutlevels:
251     raise ValueError( 'Invalid cut level: \'' + self.cutLevel + '\', has '
252                     'to be one of: ' + ', '.join(cutlevels))
253 elif self.cutLevel in ["Loose", "TightPrimary"]:
254     alg.selectionTool.CutLevel = self.cutLevel
255 else:
256     log.warning('Using cut level: \'' + self.cutLevel + '\' that is not '
257               'meant for general use, but only expert studies.')
258     alg.selectionTool.CutLevel = self.cutLevel
259 if self.additionalCuts:
260     for cutName, value in self.additionalCuts.items():
261         setattr(alg.selectionTool, cutName, value)
262 # Set up the truth filtering algorithm:
263 if config.dataType() is not DataType.Data:
264     if not self.runTruthFilter:
265         log.warning('Disabling the TruthFilterTool.')
266     else:
267         config.addPrivateTool( 'filterTool', 'InDet::InDetTrackTruthFilterTool' )
268         config.addPrivateTool( 'filterTool.trackOriginTool', 'InDet::InDetTrackTruthOriginTool' )
269         # Set working point based on cut level
270         if self.cutLevel == "Loose":
271             alg.filterWP = "LOOSE"
272         elif self.cutLevel == "TightPrimary":
273             alg.filterWP = "TIGHT"
274         else:
275             raise ValueError( 'Attempting to set TruthFilter WP based on cut level: \''
276                             + self.cutLevel + '\' that is not supported.' )
277 # Set calibFile and fake rates based on campaign
278 if config.geometry() is LHCPeriod.Run2:
279     # Run 2 recommendations (MC20)
280     alg.filterTool.calibFileNomEff = "InDetTrackSystematicsTools/CalibData_22_0_2022-v00/TrackingRecommendations_prelim_rel22.root"
281     alg.filterTool.fFakeLoose = 0.10
282     alg.filterTool.fFakeTight = 1.00
283 elif config.geometry() is LHCPeriod.Run3:
284     if config.campaign() is Campaign.MC23a:
285         # 2022 recommendations (MC23a)
286         alg.filterTool.calibFileNomEff = "InDetTrackSystematicsTools/CalibData_22_0_2022-v00/TrackingRecommendations_prelim_rel22.root"
287         alg.filterTool.fFakeLoose = 0.40
288         alg.filterTool.fFakeTight = 1.00
289     elif config.campaign() is Campaign.MC23d:
290         # 2023 recommendations (MC23d)
291         alg.filterTool.calibFileNomEff = "InDetTrackSystematicsTools/CalibData_22_0_2022-v00/TrackingRecommendations_prelim_rel22.root"
292         alg.filterTool.fFakeLoose = 0.40
293         alg.filterTool.fFakeTight = 1.00
294     elif not (self.calibFile and self.fFakeLoose and self.fFakeTight):
295         raise ValueError( 'No efficiency recommendations found for campaign \''
296                         + config.campaign().value + '\' in Run 3. '
297                         + 'Please check that the recommendations exist.' )
298     elif not (self.calibFile and self.fFakeLoose and self.fFakeTight):
299         raise ValueError( 'No efficiency recommendations found for geometry \''
300                         + config.geometry().value + '\'. Please check '
301                         + 'the configuration.' )
302 # Set custom calibFile, fake rates, or random seed
303 if self.calibFile:
304     alg.filterTool.calibFileNomEff = self.calibFile
305 if self.fFakeLoose:
306     alg.filterTool.fFakeLoose = self.fFakeLoose
307 if self.fFakeTight:
308     alg.filterTool.fFakeTight = self.fFakeTight
309 if self.filterToolSeed:
310     alg.filterTool.Seed = self.filterToolSeed
311 if self.trkEffSystScale:
312     alg.filterTool.trkEffSystScale = self.trkEffSystScale
313 alg.inDetTracks = config.readName( self.containerName )
314 alg.preselection = config.getPreselection( self.containerName, '' )
315 config.addSelection( self.containerName, self.selectionName, alg.selectionDecoration,
316                     preselection=self.addSelectionToPreselection )
```

Summary

Status:

- Merge requests for track CP algs ([!80618](#) and [!81186](#))
- Start using tracking info for analysis



Thank you for your attention!