

Automatic MVA Evaluation

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Abstract

Evaluation plots

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2.87	RTs_Min_Mom_diff_Pt	49
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2.89	weight_std	50
2.90	RTs_Min_Pos_diff_Phi	51
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2.92	weight_mean	52
2.93	seed_Mom_Theta	52
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1 Classifiers

This section contains the GeneralOptions and SpecificOptions of all classifiers represented by an XML tree. The same information can be retrieved using the basf2_mva_info tool.

Table 1: Abbreviations of identifiers

Identifier	Abbreviation
.. /n_events_training=5000/fullTrackQualityIndicator.weights.xml	.. /n_

1.1 .. /n_events_training=5000/fullTrackQualityIndicator.weights.xml

```
<?xml version="1.0" encoding="utf-8"?>
<method>FastBDT</method>
<weightfile>./git_hash=cd1fcfc6b5beb639a4b2839a73e8b8f24bea35572/n_events_training=5000/fullTrackQualityIndicator.weights.xml</
    weightfile>
<treename>tree</treename>
<target_variable>truth</target_variable>
<weight_variable/>
<signal_class>1</signal_class>
<max_events>0</max_events>
<number_feature_variables>96</number_feature_variables>
<variable0>N_RecoTracks</variable0>
<variable1>N_PXDRecoTracks</variable1>
<variable2>N_SVDRecoTracks</variable2>
<variable3>N_CDCCRecoTracks</variable3>
<variable4>N_diff_PXD_SVD_RecoTracks</variable4>
<variable5>N_diff_SVD_CDCC_RecoTracks</variable5>
<variable6>RTs_Min_Mom_diff_Mag</variable6>
<variable7>RTs_Min_Mom_diff_Mag_idx</variable7>
<variable8>RTs_Min_Mom_diff_Pt</variable8>
<variable9>RTs_Min_Mom_diff_Pt_idx</variable9>
<variable10>RTs_Min_Pos_diff_Theta</variable10>
<variable11>RTs_Min_Pos_diff_Theta_idx</variable11>
<variable12>RTs_Min_Pos_diff_Phi</variable12>
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<variable32>Fit_Chi2</variable32>
<variable33>Fit_Ndof</variable33>
<variable34>Fit_NFailedPoints</variable34>
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<variable39>POCA_Pos_Mag</variable39>
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<variable52>CDC_FitSuccessful</variable52>
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<variable54>SVD_CDCC_CDCCwall_Pos_diff_Pt</variable54>
<variable55>SVD_CDCC_CDCCwall_Pos_diff_Theta</variable55>
<variable56>SVD_CDCC_CDCCwall_Pos_diff_Phi</variable56>
<variable57>SVD_CDCC_CDCCwall_Pos_diff_Mag</variable57>
```

```

<variable58>SVD_CDC_CDCwall_Pos_diff_Eta</variable58>
<variable59>SVD_CDC_CDCwall_Mom_diff_Z</variable59>
<variable60>SVD_CDC_CDCwall_Mom_diff_Pt</variable60>
<variable61>SVD_CDC_CDCwall_Mom_diff_Theta</variable61>
<variable62>SVD_CDC_CDCwall_Mom_diff_Phi</variable62>
<variable63>SVD_CDC_CDCwall_Mom_diff_Mag</variable63>
<variable64>SVD_CDC_CDCwall_Mom_diff_Eta</variable64>
<variable65>SVD_CDC_POCA_Pos_diff_Z</variable65>
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<variable83>weight_std</variable83>
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<variable91>smoothedChi2_std</variable91>
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<number_data_files>1</number_data_files>
<datafile0>./git_hash=cd1fcf6b5beb639a4b2839a73e8b8f24bea35572/n_events=5000/random_seed=trainingdata_0/fulltrack_qe_records.root</datafile0>
<FastBDT_version>2</FastBDT_version>
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<FastBDT_nCuts>8</FastBDT_nCuts>
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<FastBDT_randRatio>0.5</FastBDT_randRatio>
<FastBDT_flatnessLoss>-1</FastBDT_flatnessLoss>
<FastBDT_sPlot>false</FastBDT_sPlot>
<FastBDT_number_individual_nCuts>0</FastBDT_number_individual_nCuts>
<FastBDT_purityTransformation>false</FastBDT_purityTransformation>
<FastBDT_number_individualPurityTransformation>0</FastBDT_number_individualPurityTransformation>

```

2 Variables

This section contains an overview of the importance and correlation of the variables used by the classifiers. And distribution plots of the variables on the independent dataset. The distributions are normed for signal and background separately, and only the region ± 3 sigma around the mean is shown.

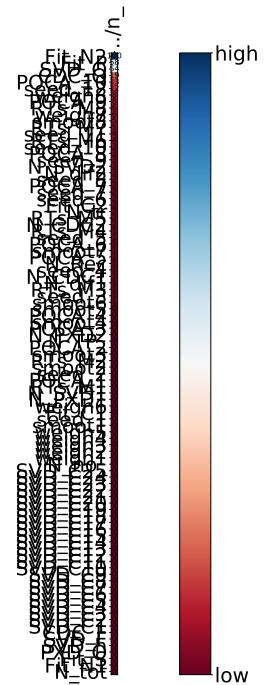
Table 2: Abbreviations of variables

Variable	Abbreviation
N_total_hits	N_tot
Fit_NFailedPoints	Fit_N1
Fit_Successful	Fit_S
PXD_QI	PXD_Q
SVD_has_SPTC	SVD_h
SVD_FitSuccessful	SVD_F
CDC_FitSuccessful	CDC_F
SVD_CDC_CDCwall_Pos_diff_Z	SVD_C1
SVD_CDC_CDCwall_Pos_diff_Pt	SVD_C2
SVD_CDC_CDCwall_Pos_diff_Theta	SVD_C3
SVD_CDC_CDCwall_Pos_diff_Phi	SVD_C4
SVD_CDC_CDCwall_Pos_diff_Mag	SVD_C5
SVD_CDC_CDCwall_Pos_diff_Eta	SVD_C6
SVD_CDC_CDCwall_Mom_diff_Z	SVD_C7

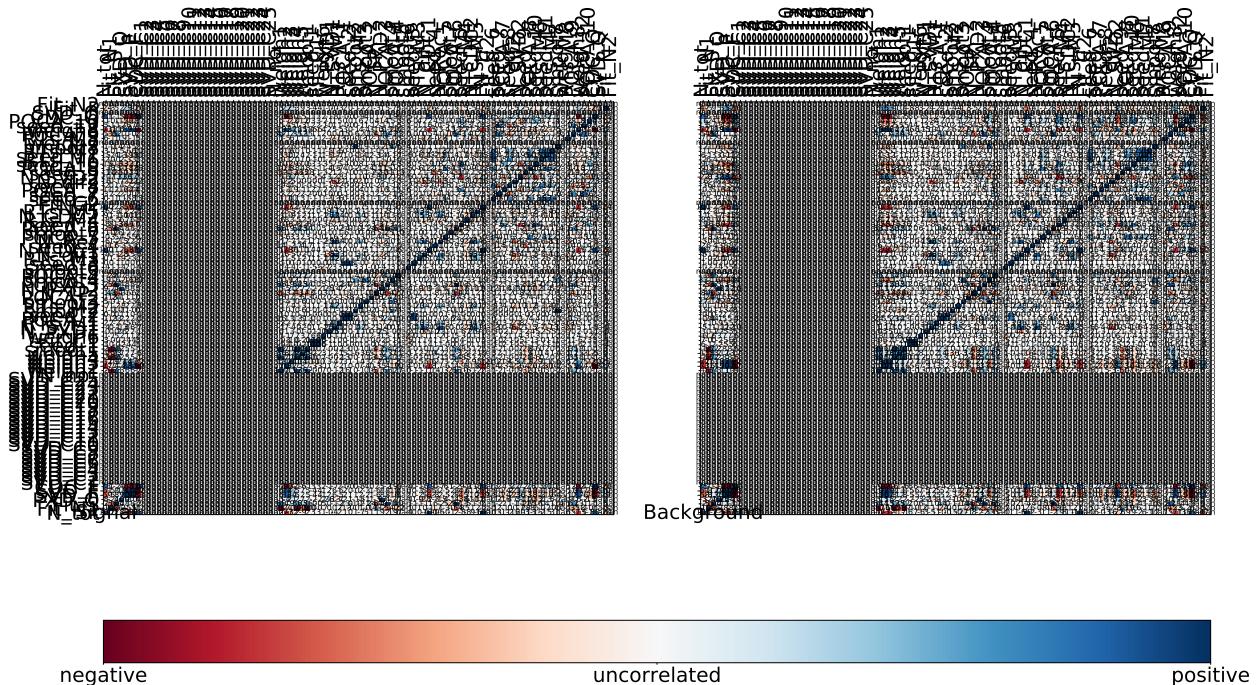
SVD_CDC_CDCwall_Mom_diff_Pt	SVD_C8
SVD_CDC_CDCwall_Mom_diff_Theta	SVD_C9
SVD_CDC_CDCwall_Mom_diff_Phi	SVD_C10
SVD_CDC_CDCwall_Mom_diff_Mag	SVD_C11
SVD_CDC_CDCwall_Mom_diff_Eta	SVD_C12
SVD_CDC_POCA_Pos_diff_Z	SVD_C13
SVD_CDC_POCA_Pos_diff_Pt	SVD_C14
SVD_CDC_POCA_Pos_diff_Theta	SVD_C15
SVD_CDC_POCA_Pos_diff_Phi	SVD_C16
SVD_CDC_POCA_Pos_diff_Mag	SVD_C17
SVD_CDC_POCA_Pos_diff_Eta	SVD_C18
SVD_CDC_POCA_Mom_diff_Z	SVD_C19
SVD_CDC_POCA_Mom_diff_Pt	SVD_C20
SVD_CDC_POCA_Mom_diff_Theta	SVD_C21
SVD_CDC_POCA_Mom_diff_Phi	SVD_C22
SVD_CDC_POCA_Mom_diff_Mag	SVD_C23
SVD_CDC_POCA_Mom_diff_Eta	SVD_C24
SVD_CDC_CDCwall_Chisq	SVD_C25
N_no_TrackPoint	N_no_
weight_max	weigh1
weight_min	weigh2
weight_median	weigh3
weight_n_zeros	weigh4
weight_lastSVDhit	weigh5
smoothedChi2_n_zeros	smoot1
seed_Charge	seed_1
Fit_Charge	Fit_C1
weight_firstCDChit	weigh6
N_PXDRecoTracks	N_PXD1
N_SVDReroTracks	N_SVD1
RTs_Min_Pos_diff_Phi_idx	RTs_M1
POCA_Mom_Phi	POCA_1
seed_Mom_Phi	seed_2
smoothedChi2_lastSVDhit	smoot2
RTs_Min_Pos_diff_Theta_idx	RTs_M2
smoothedChi2_max	smoot3
POCA_Pos_Phi	POCA_2
N_TP_noKalmanFitterInfo	N_TP_
N_PXD_hits	N_PXD2
POCA_Pos_Z	POCA_3
smoothedChi2_mean	smoot4
POCA_Pos_Theta	POCA_4
smoothedChi2_std	smoot5
smoothedChi2_firstCDChit	smoot6
seed_Pos_Phi	seed_3
RTs_Min_Mom_diff_Mag_idx	RTs_M3
N_diff_PXD_SVD_RecoTracks	N_dif1
N_CDC_hits	N_CDC1
seed_Pos_Z	seed_4
N_RecoTracks	N_Rec
POCA_Mom_Mag	POCA_5
smoothedChi2_min	smoot7
POCA_Mom_Z	POCA_6
seed_Pos_Pt	seed_5
RTs_Min_Pos_diff_Theta	RTs_M4
N_CDCRecoTracks	N_CDC2
RTs_Min_Mom_diff_Pt_idx	RTs_M5
_N_tracking_hits	_N_tr
Fit_Chisq	Fit_C2
seed_Mom_Mag	seed_6
seed_Pos_Theta	seed_7

POCA_Pos_Pt	POCA_7
seed_Mom_Z	seed_8
N_diff_SVD_CDC_RecoTracks	N_dif2
N_SVD_hits	N_SVD2
seed_Pos_Mag	seed_9
POCA_Mom_Pt	POCA_8
seed_Time	seed_10
RTs_Min_Mom_diff_Mag	RTs_M6
seed_Mom_Pt	seed_11
RTs_Min_Mom_diff_Pt	RTs_M7
smoothedChi2_median	smoot8
weight_std	weigh7
RTs_Min_Pos_diff_Phi	RTs_M8
POCA_Mom_Theta	POCA_9
weight_mean	weigh8
seed_Mom_Theta	seed_12
POCA_Pos_Mag	POCA_10
CDC_QI	CDC_Q
SVD_QI	SVD_Q
Fit_PVal	Fit_P
Fit_Ndf	Fit_N2

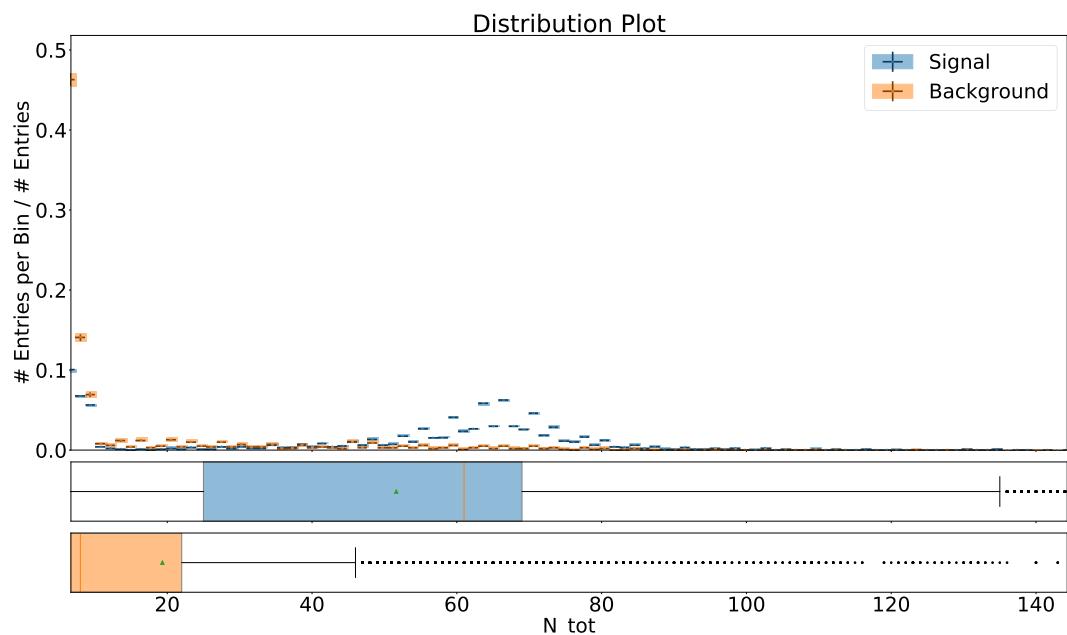
2.1 Importance



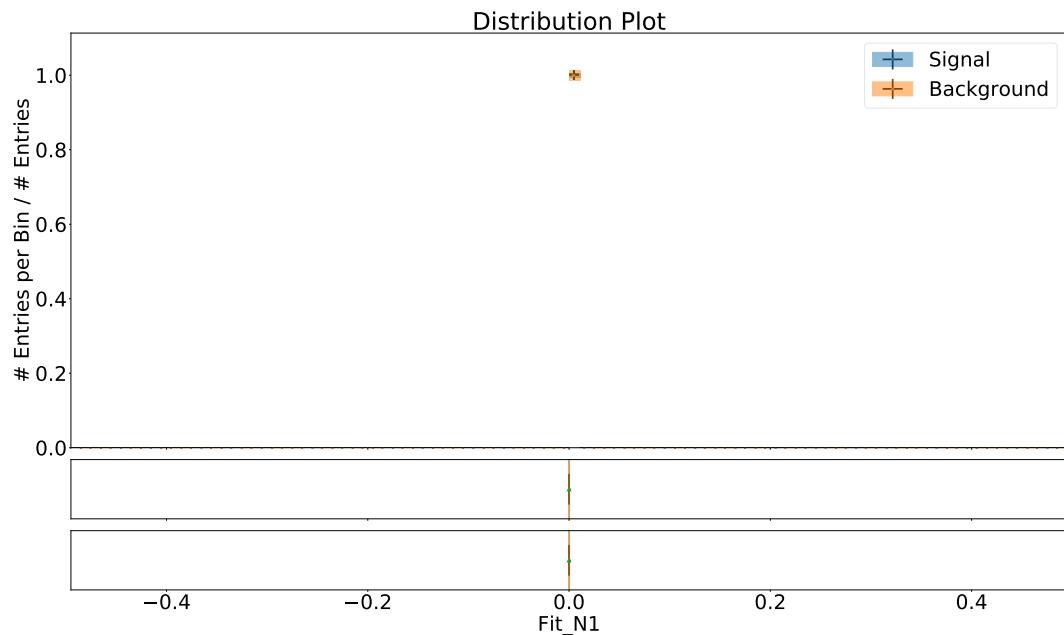
2.2 Correlation



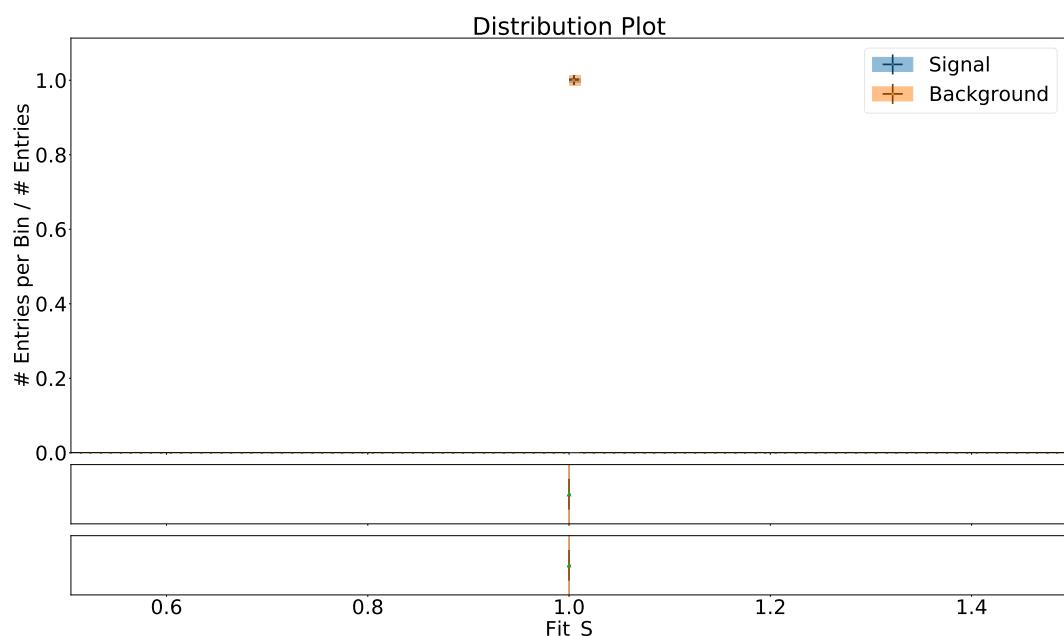
2.3 N_total_hits



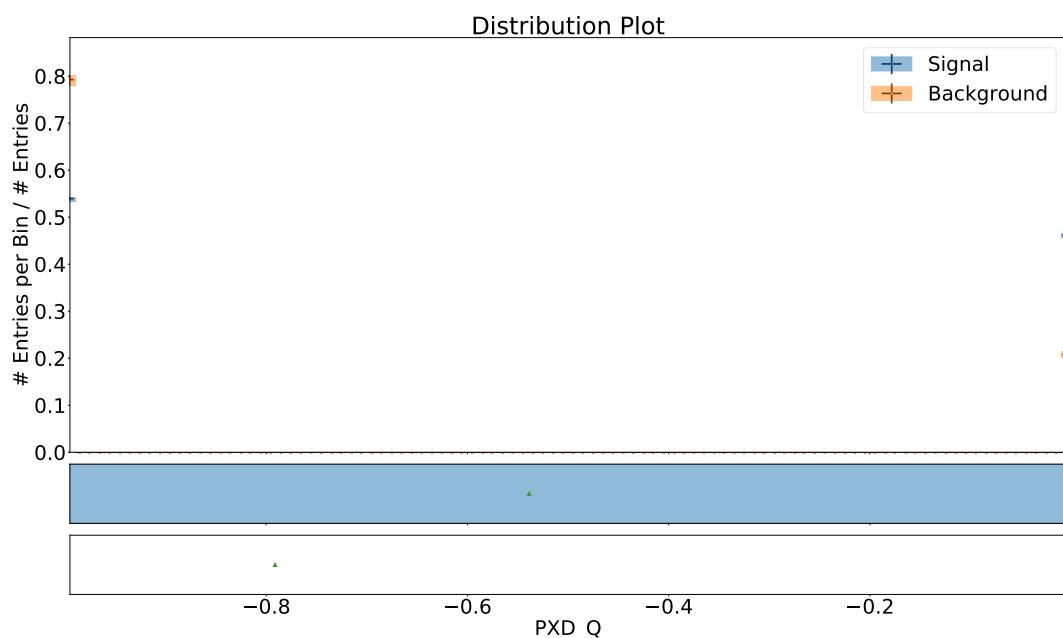
2.4 Fit_NFailedPoints



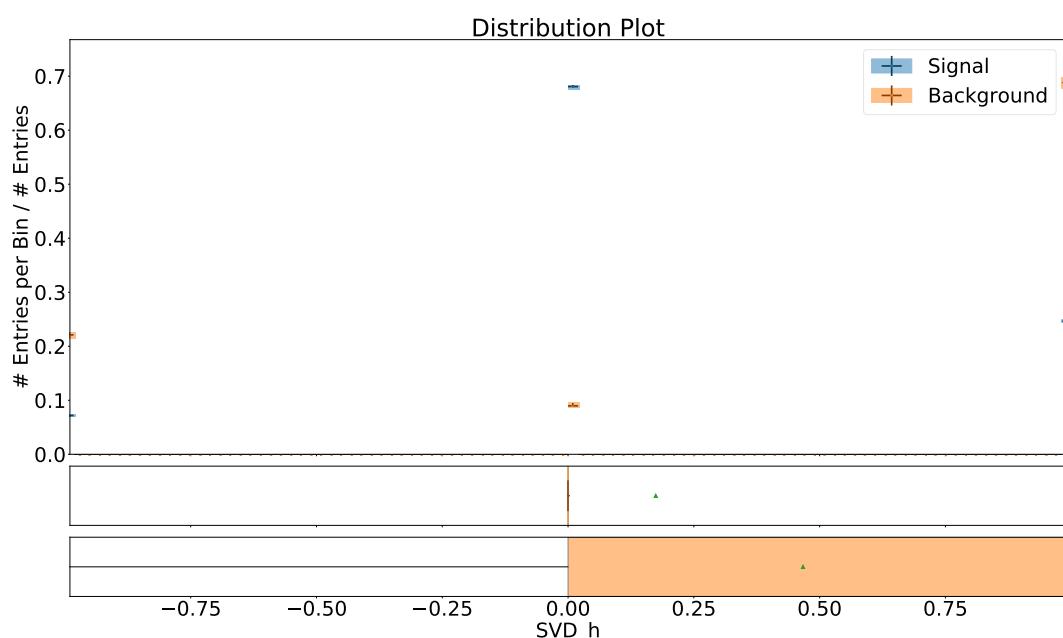
2.5 Fit_Successful



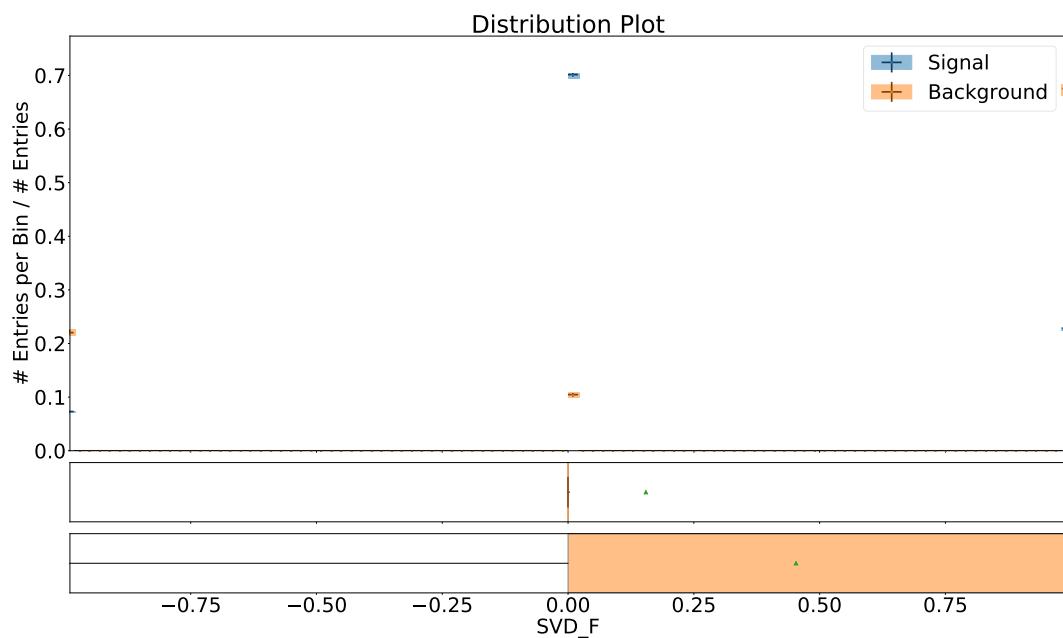
2.6 PXD_QI



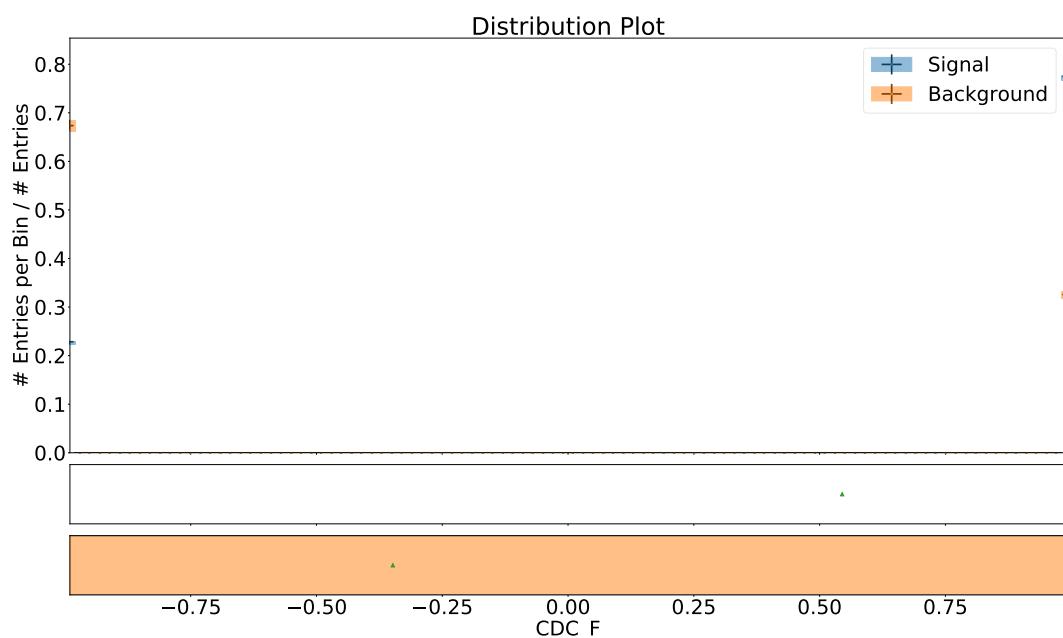
2.7 SVD_has_SPTC



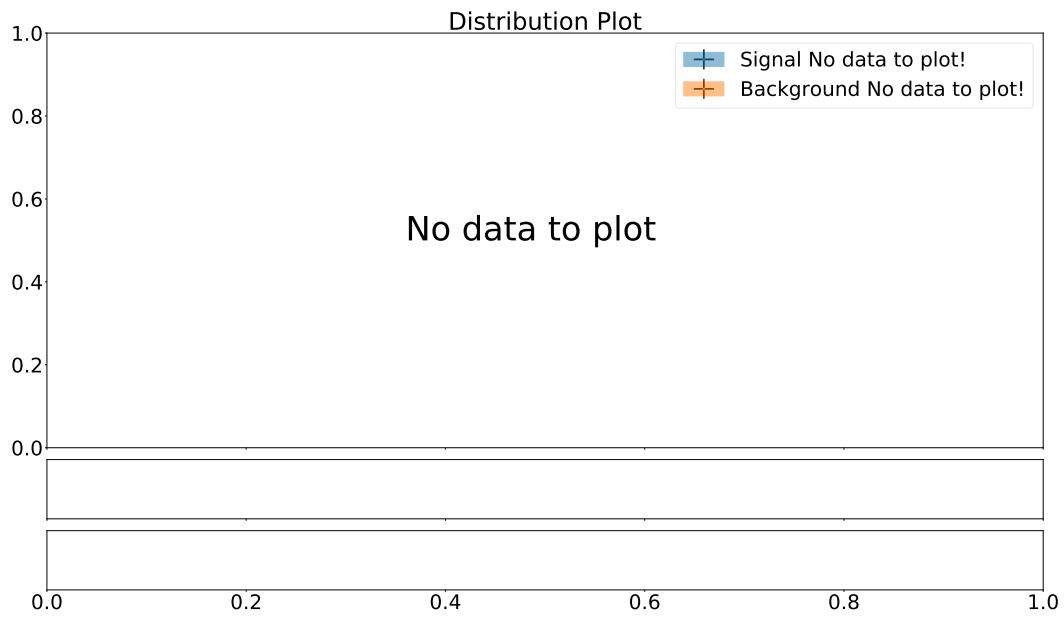
2.8 SVD_FitSuccessful



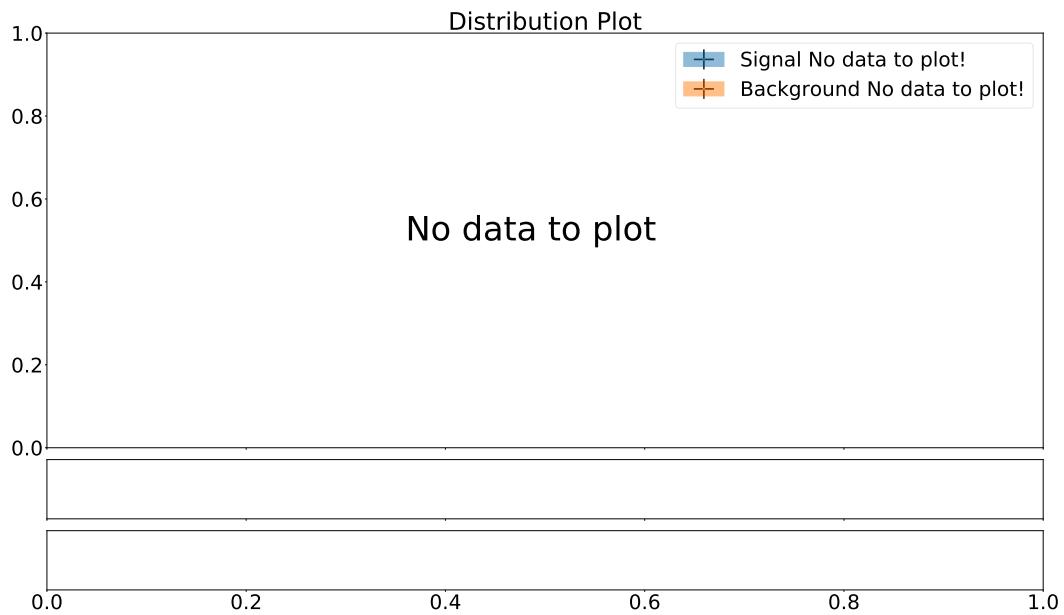
2.9 CDC_FitSuccessful



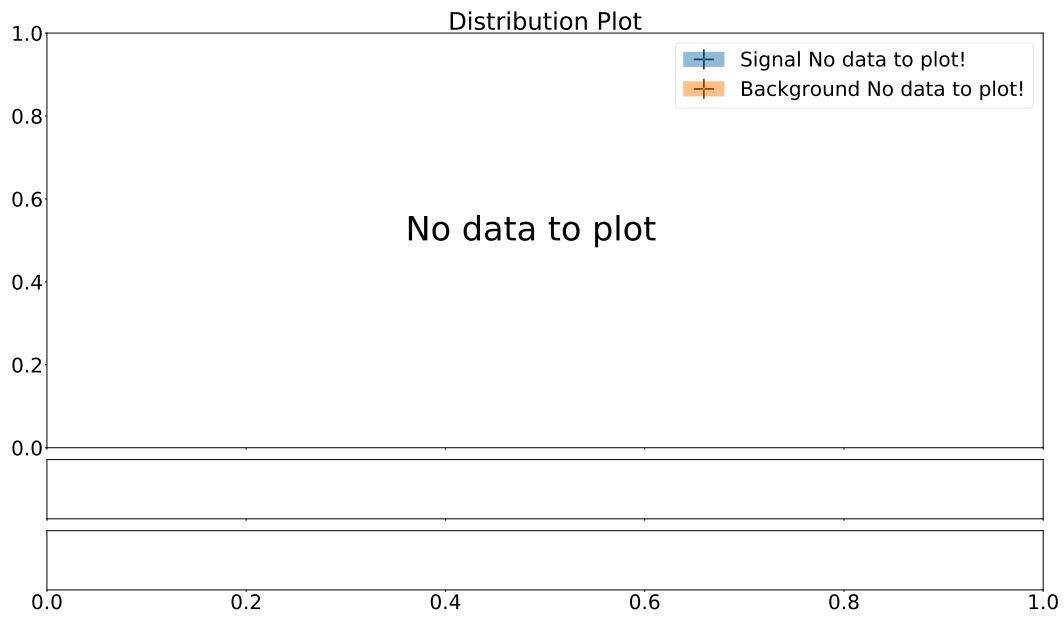
2.10 SVD_CDC_CDCwall_Pos_diff_Z



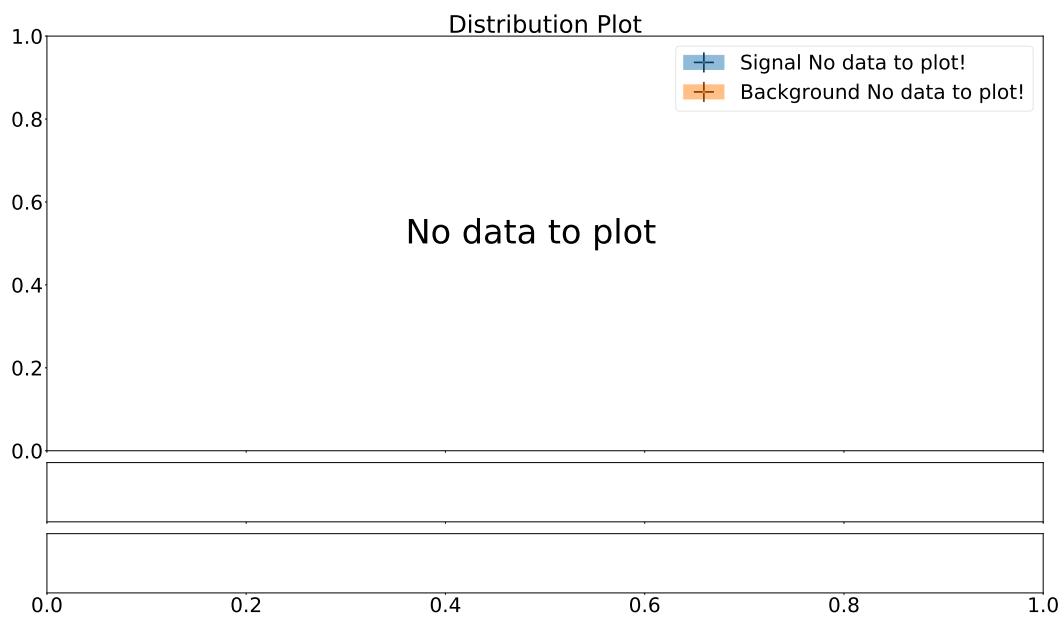
2.11 SVD_CDC_CDCwall_Pos_diff_Pt



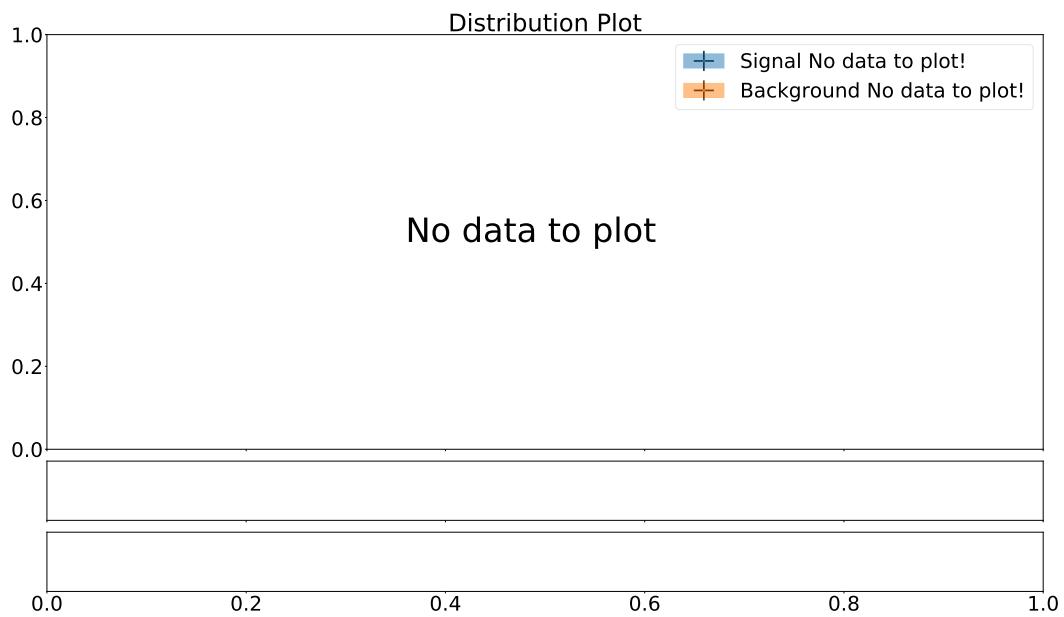
2.12 SVD_CDC_CDCwall_Pos_diff_Theta



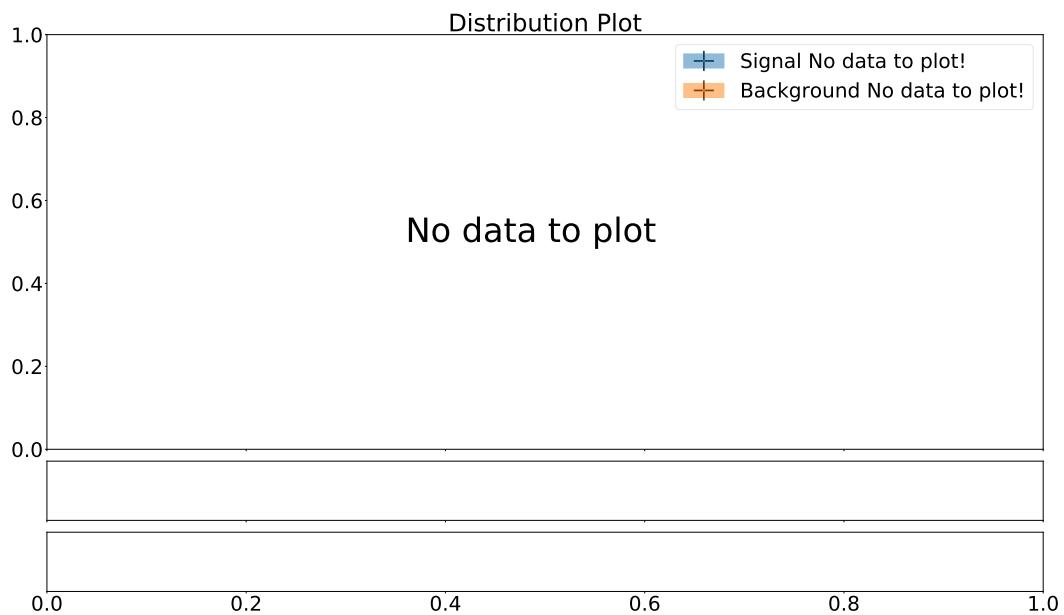
2.13 SVD_CDC_CDCwall_Pos_diff_Phi



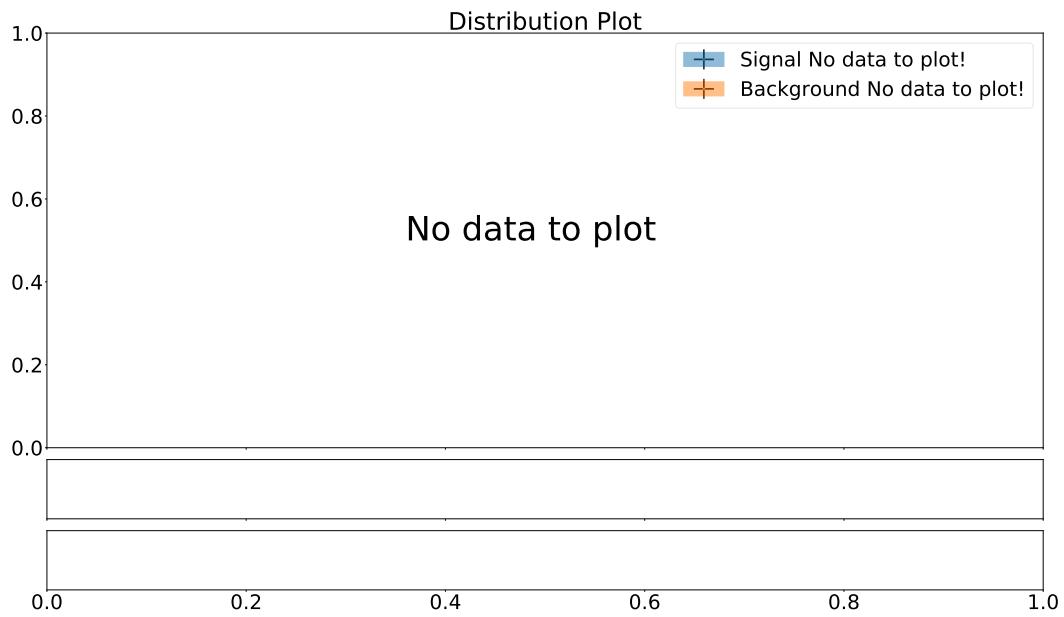
2.14 SVD_CDC_CDCwall_Pos_diff_Mag



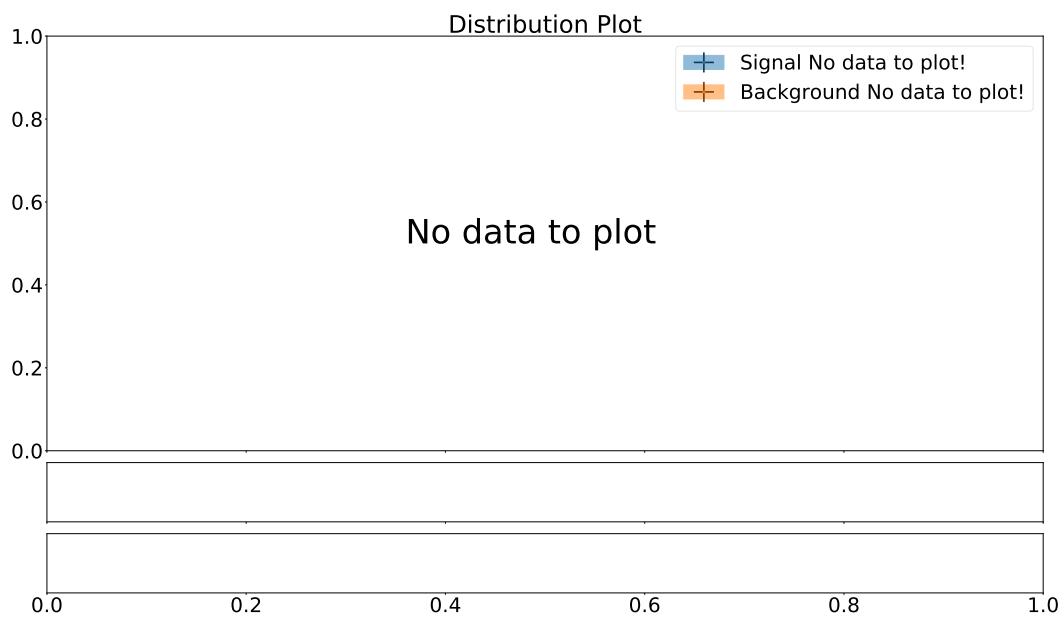
2.15 SVD_CDC_CDCwall_Pos_diff_Eta



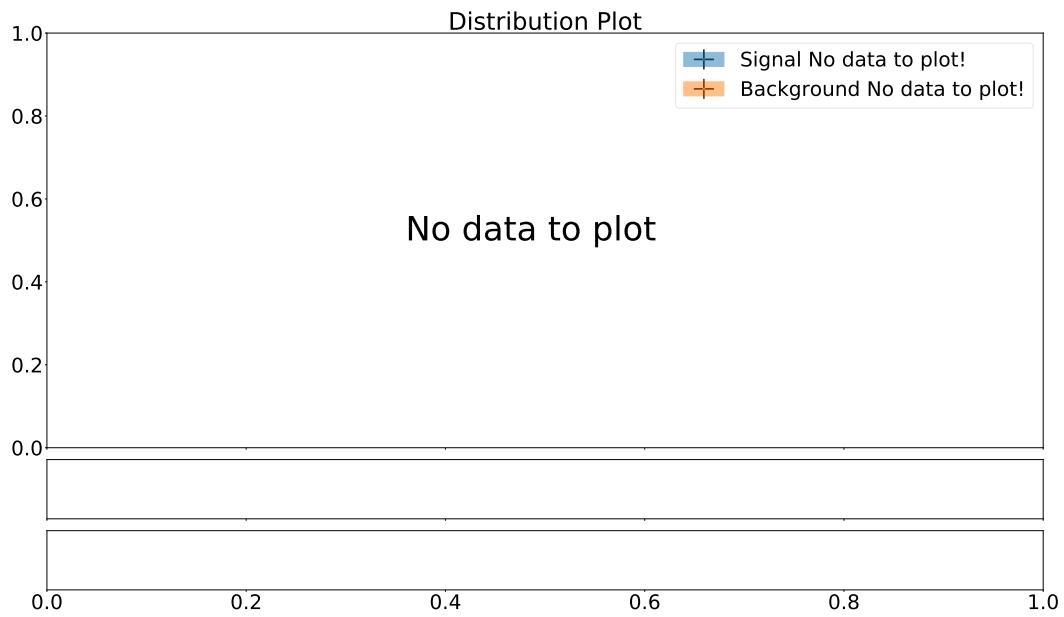
2.16 SVD_CDC_CDCwall_Mom_diff_Z



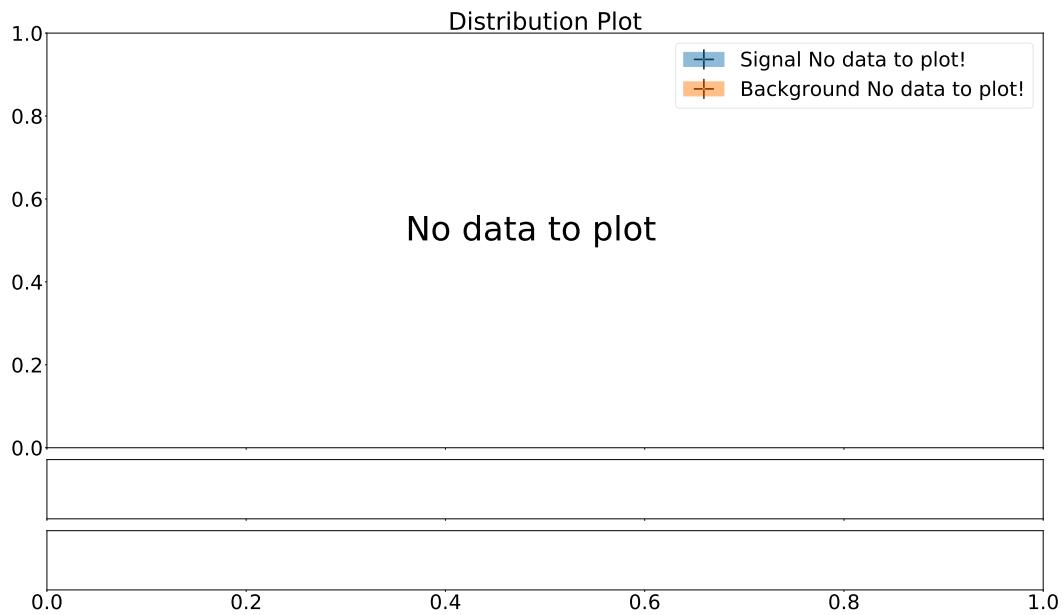
2.17 SVD_CDC_CDCwall_Mom_diff_Pt



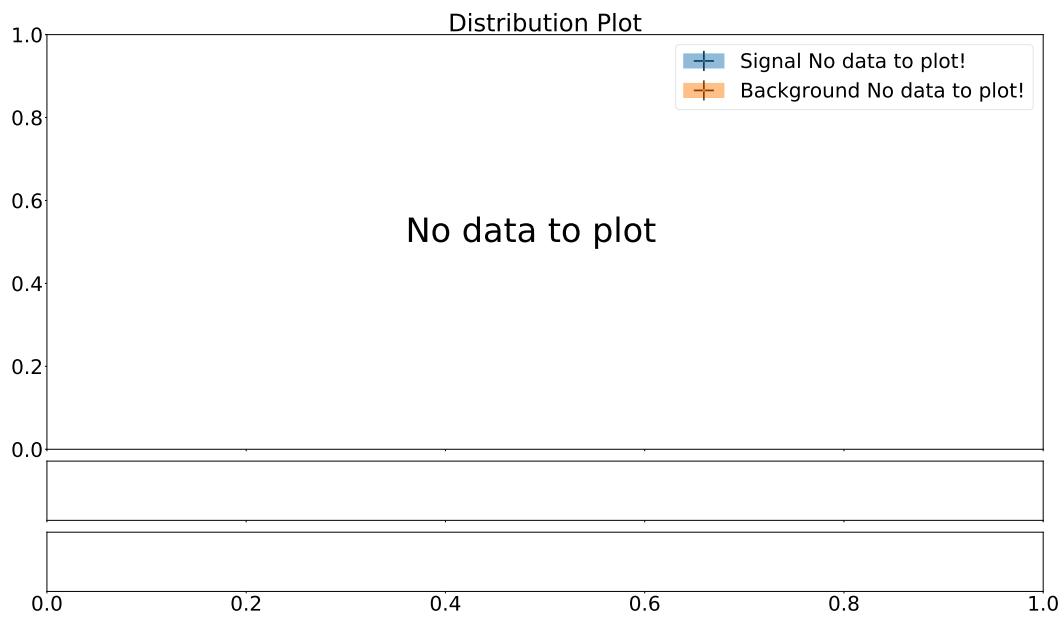
2.18 SVD_CDC_CDCwall_Mom_diff_Theta



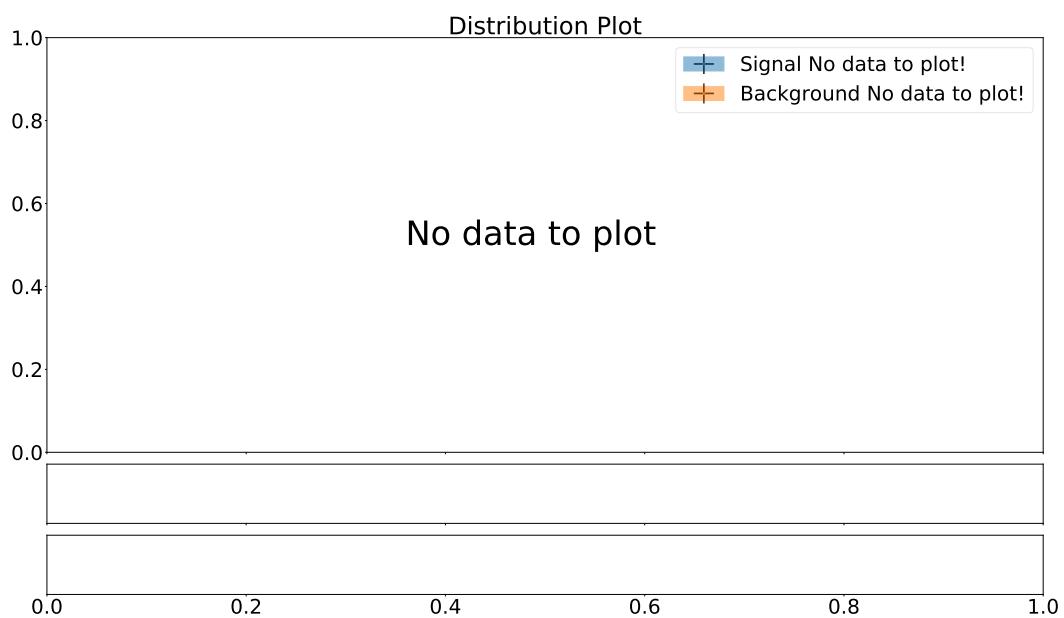
2.19 SVD_CDC_CDCwall_Mom_diff_Phi



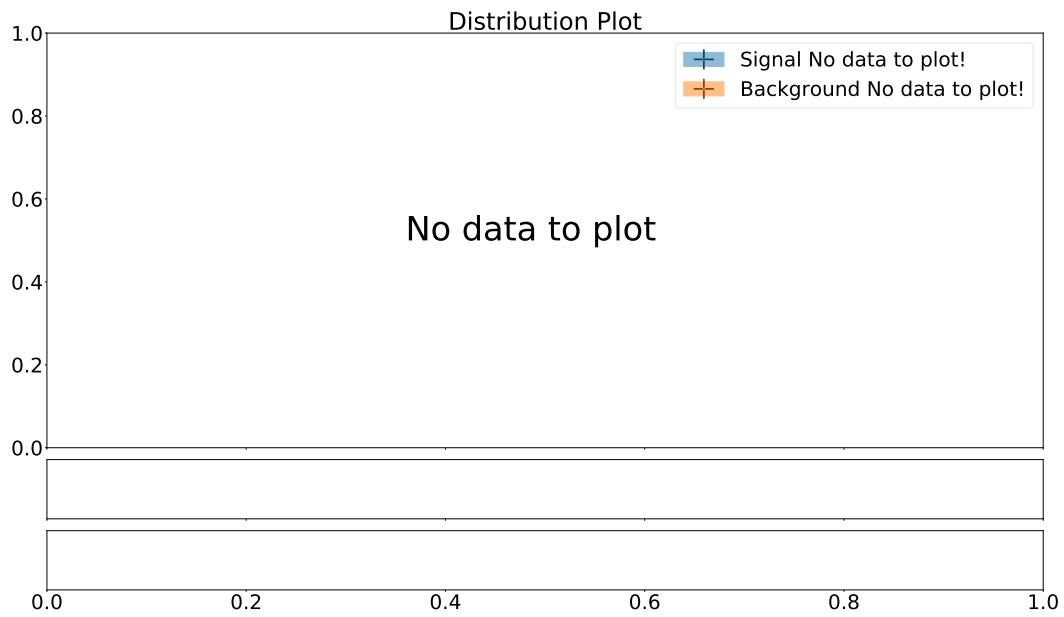
2.20 SVD_CDC_CDCwall_Mom_diff_Mag



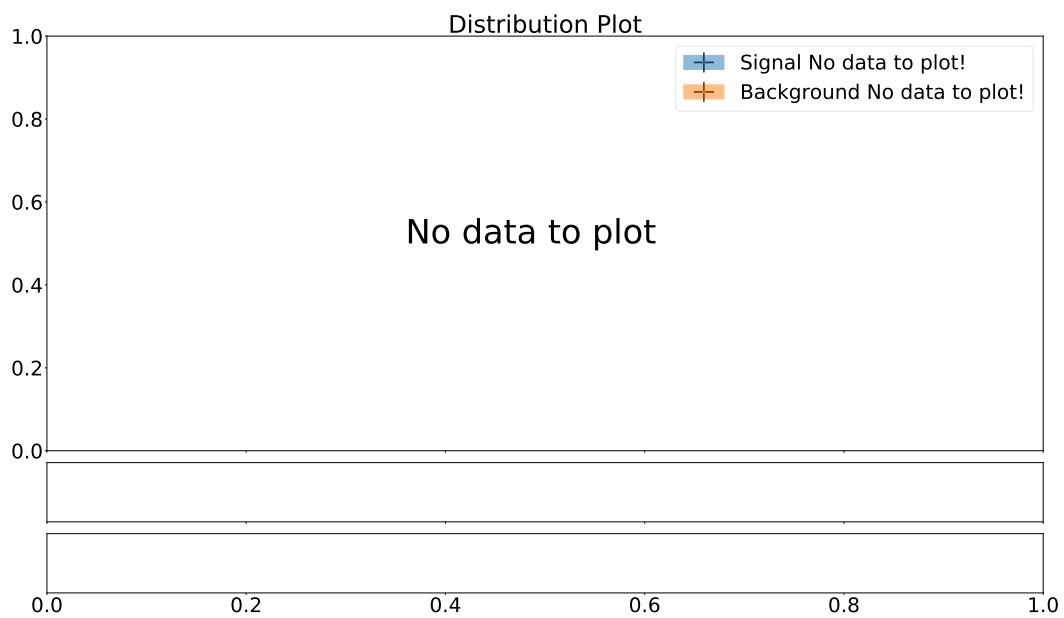
2.21 SVD_CDC_CDCwall_Mom_diff_Eta



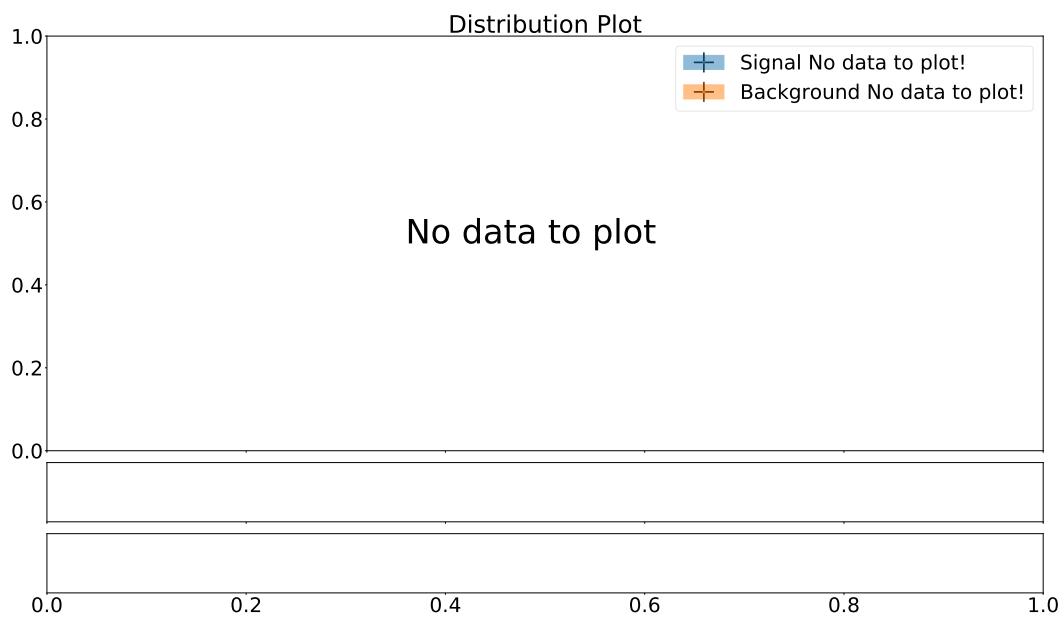
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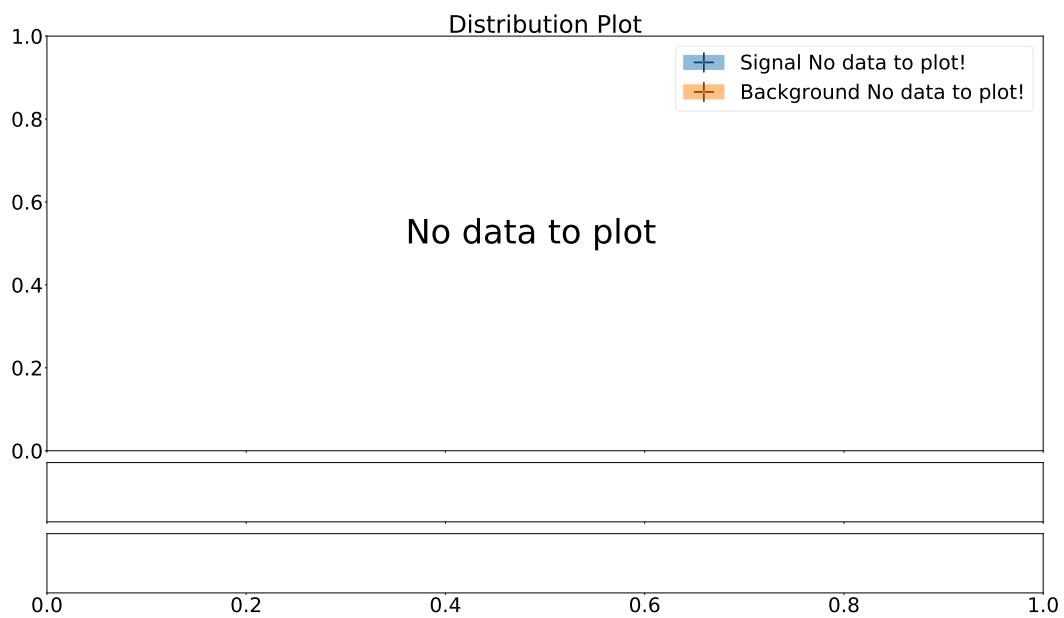
2.23 SVD_CDC_POCA_Pos_diff_Pt



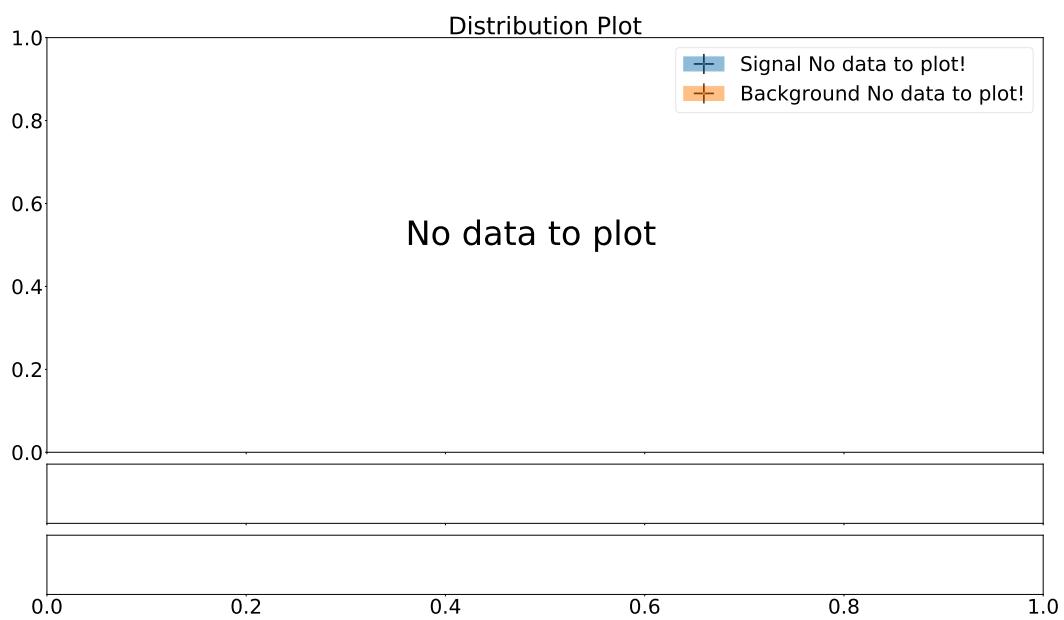
2.24 SVD_CDC_POCA_Pos_diff_Theta



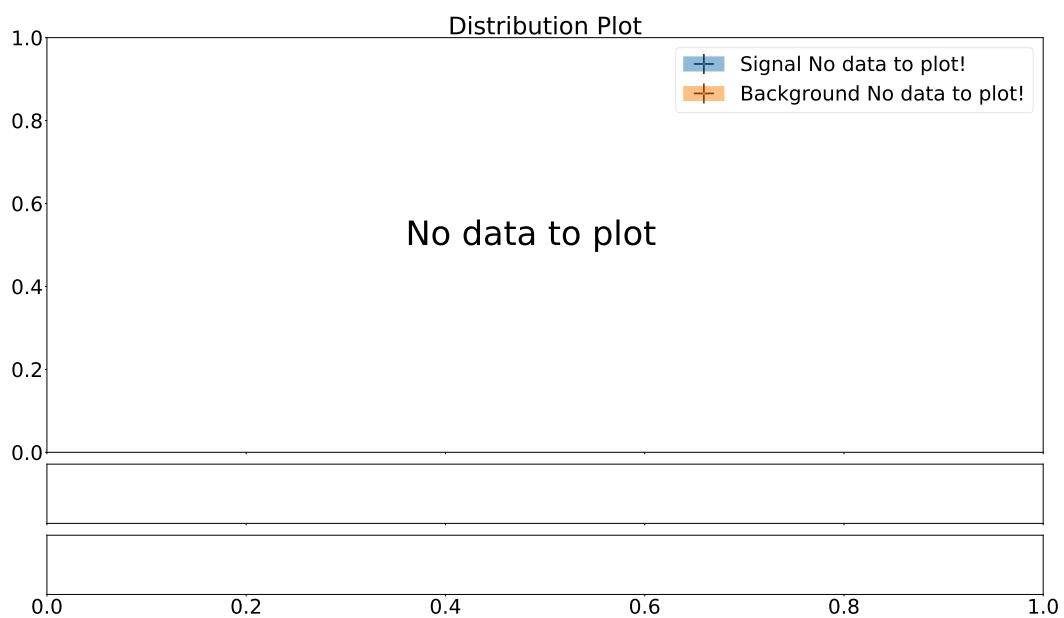
2.25 SVD_CDC_POCA_Pos_diff_Phi



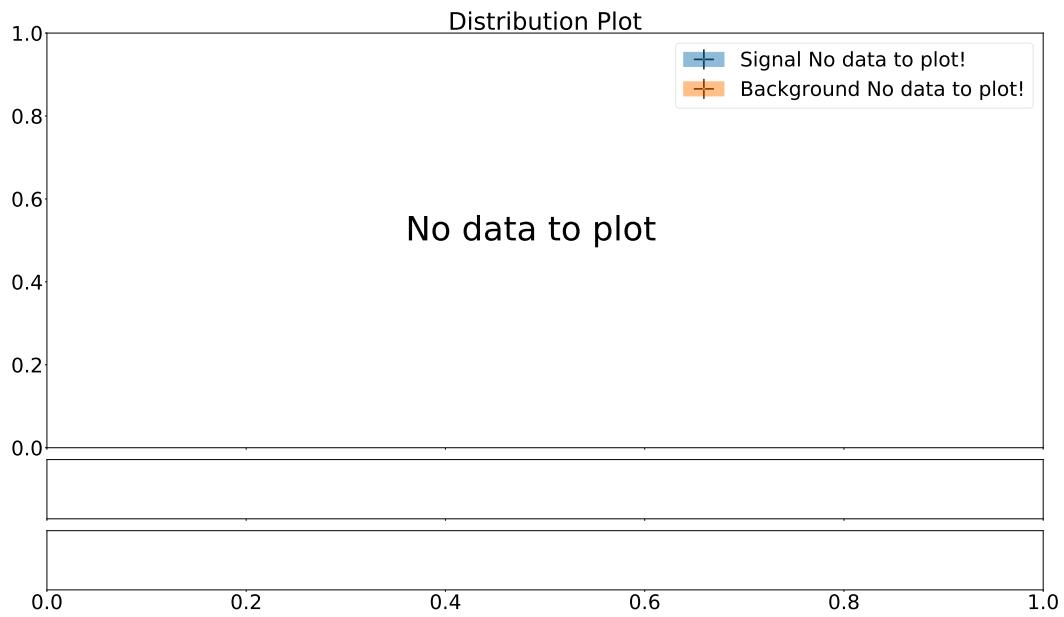
2.26 SVD_CDC_POCA_Pos_diff_Mag



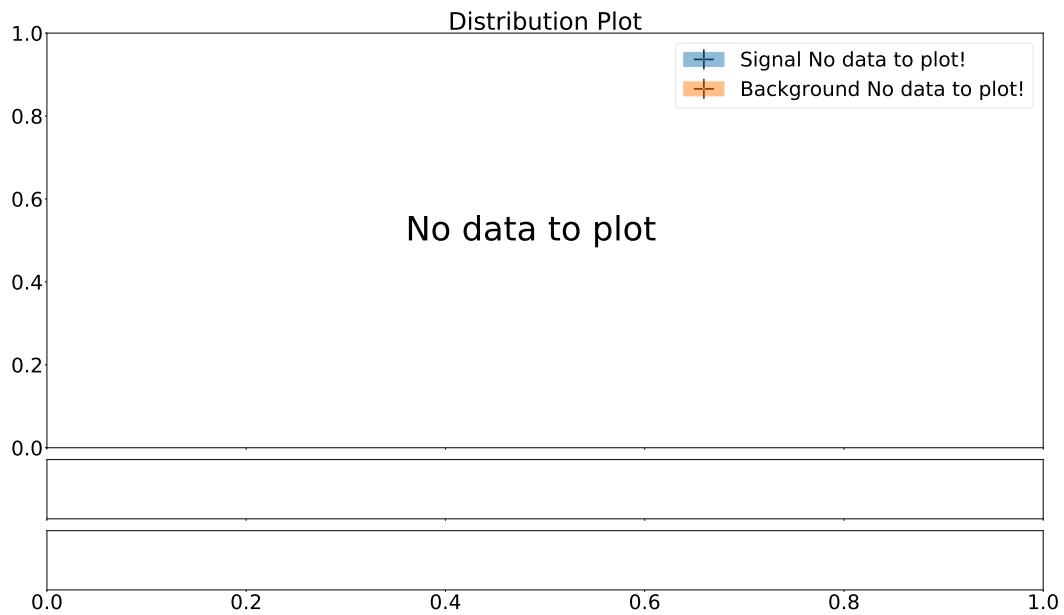
2.27 SVD_CDC_POCA_Pos_diff_Eta



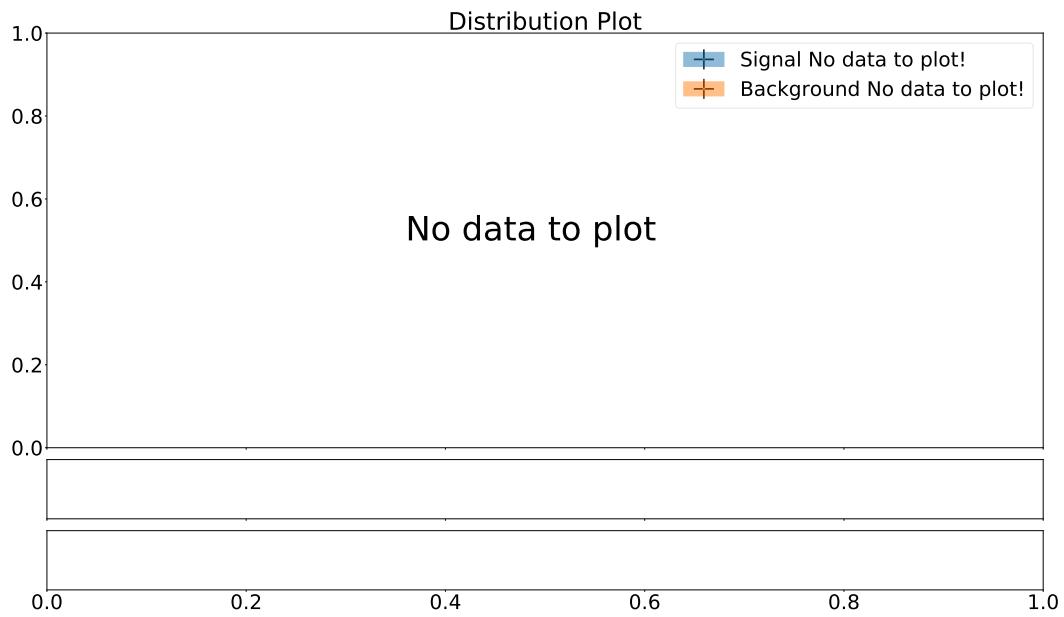
2.28 SVD_CDC_POCA_Mom_diff_Z



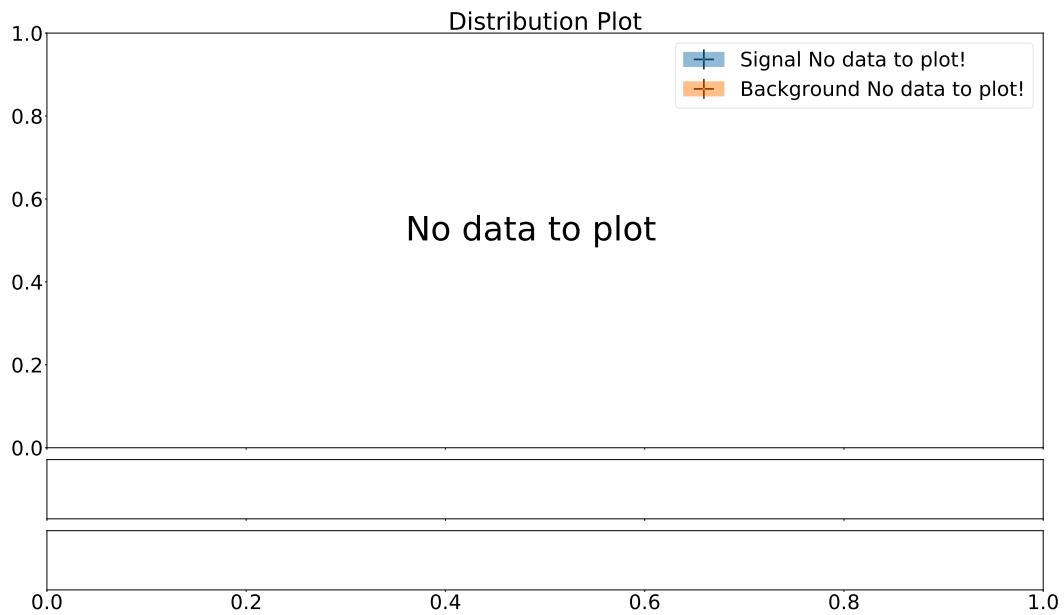
2.29 SVD_CDC_POCA_Mom_diff_Pt



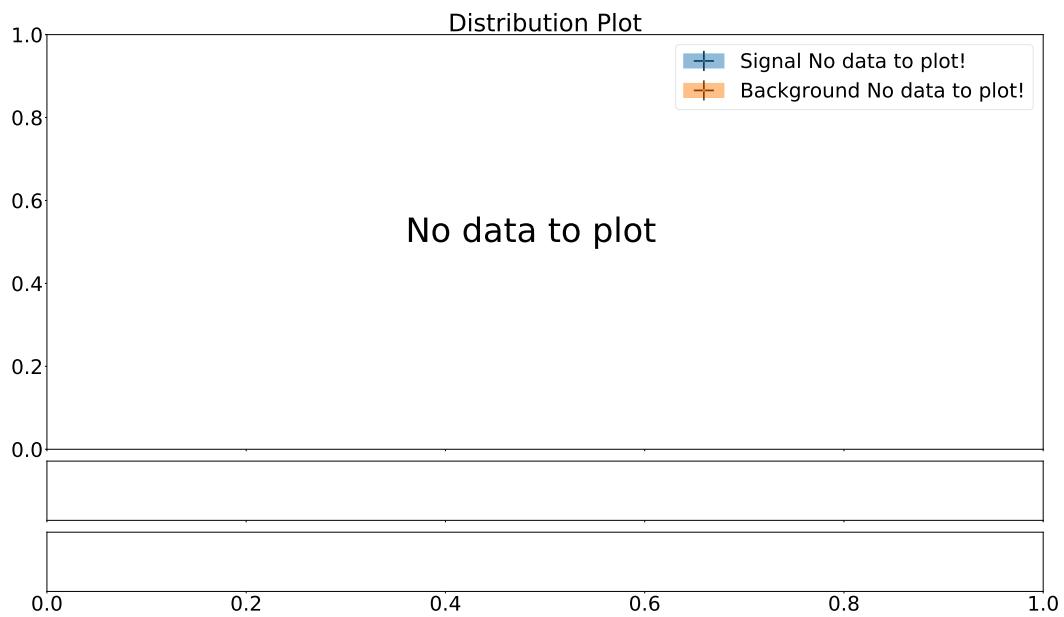
2.30 SVD_CDC_POCA_Mom_diff_Theta



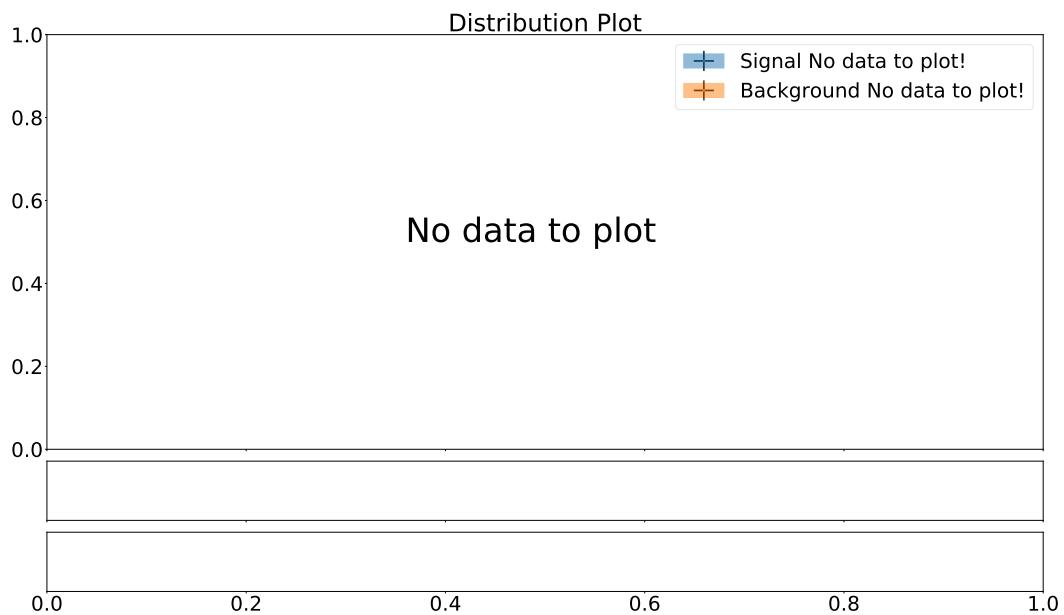
2.31 SVD_CDC_POCA_Mom_diff_Phi



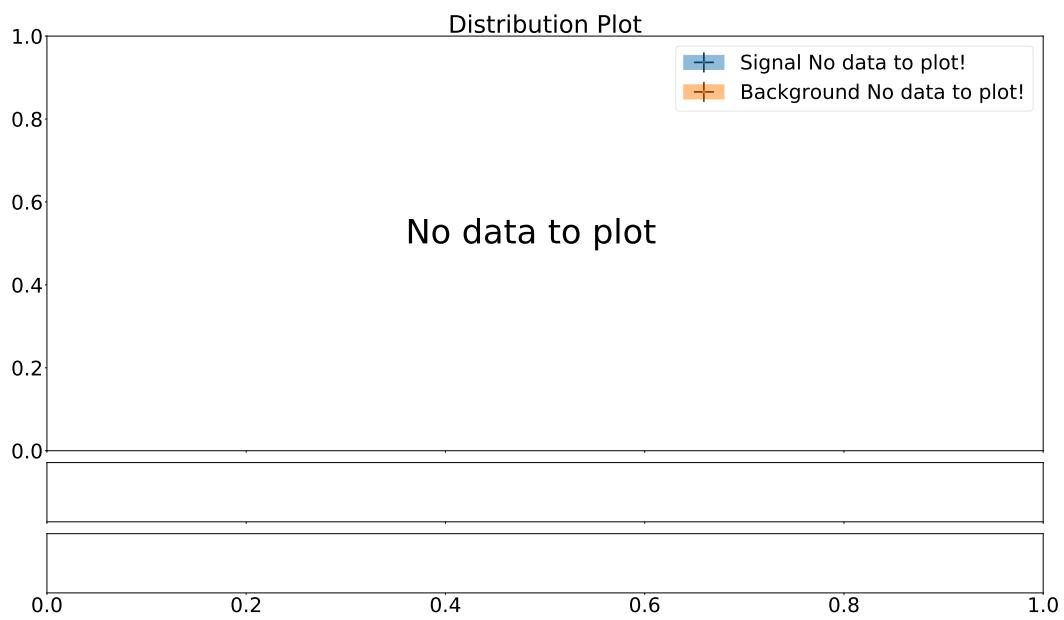
2.32 SVD_CDC_POCA_Mom_diff_Mag



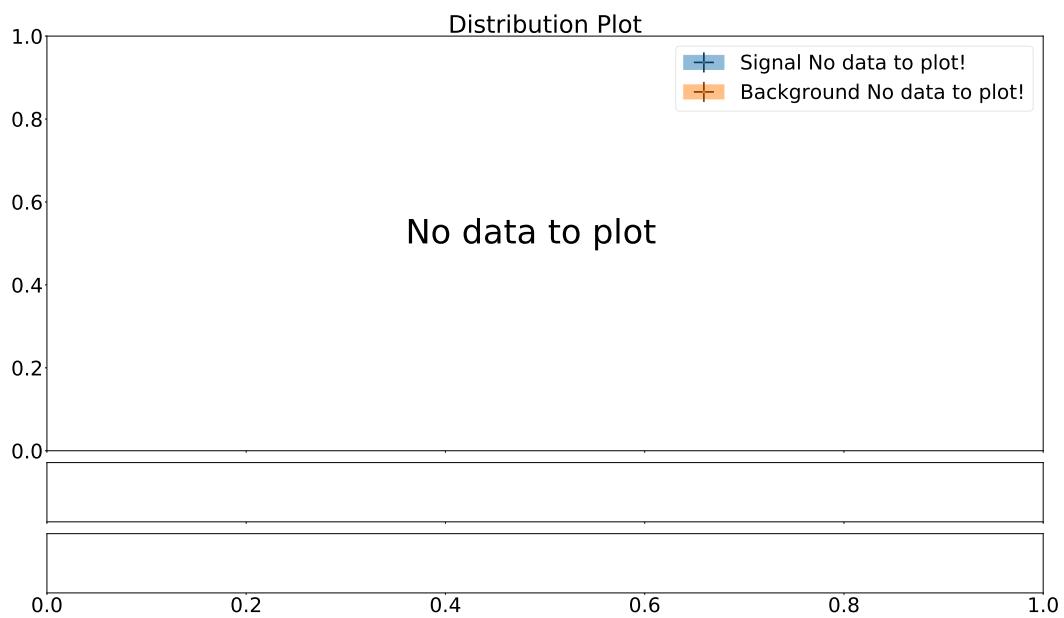
2.33 SVD_CDC_POCA_Mom_diff_Eta



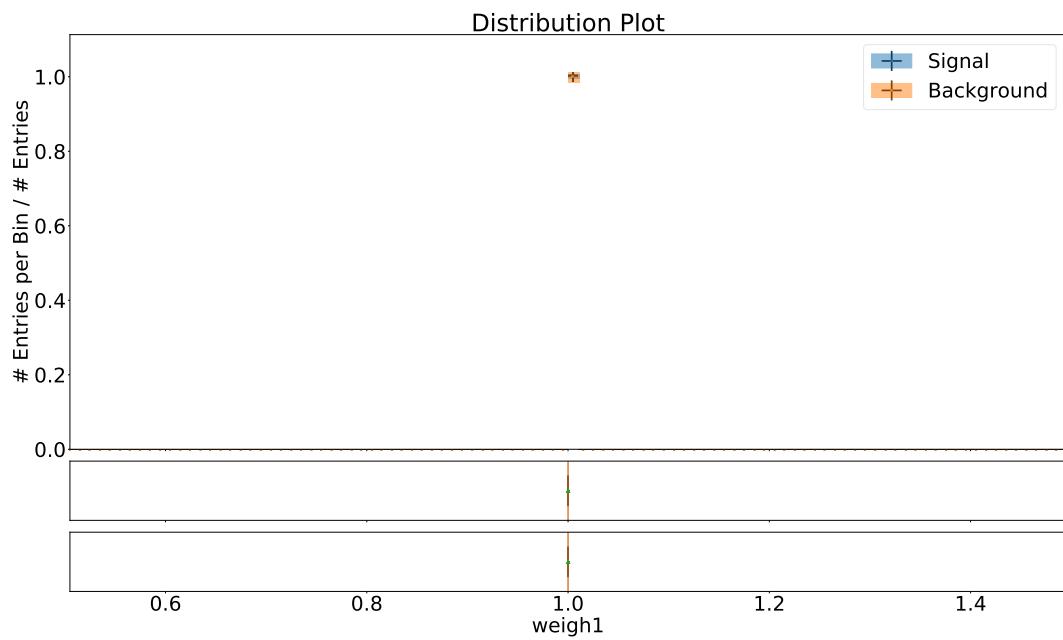
2.34 SVD_CDC_CDCwall_Chisq



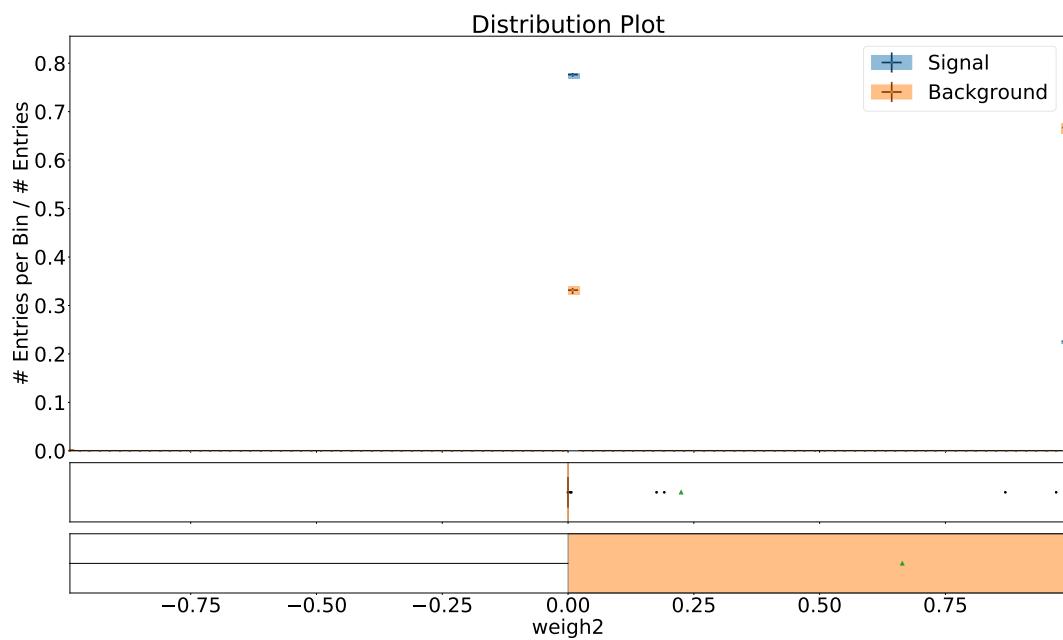
2.35 N_no_TrackPoint



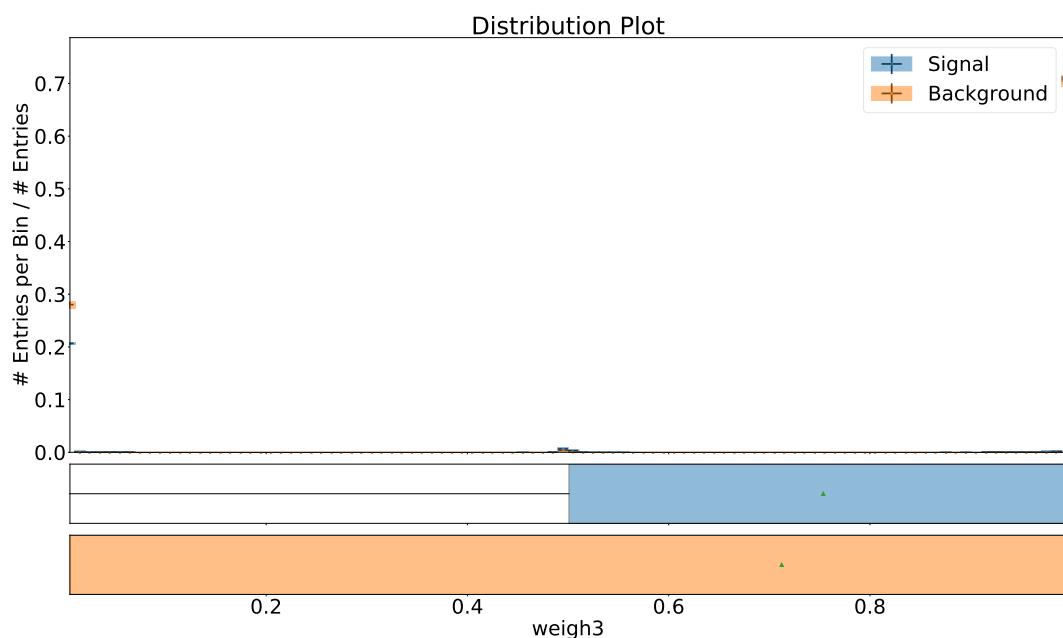
2.36 weight_max



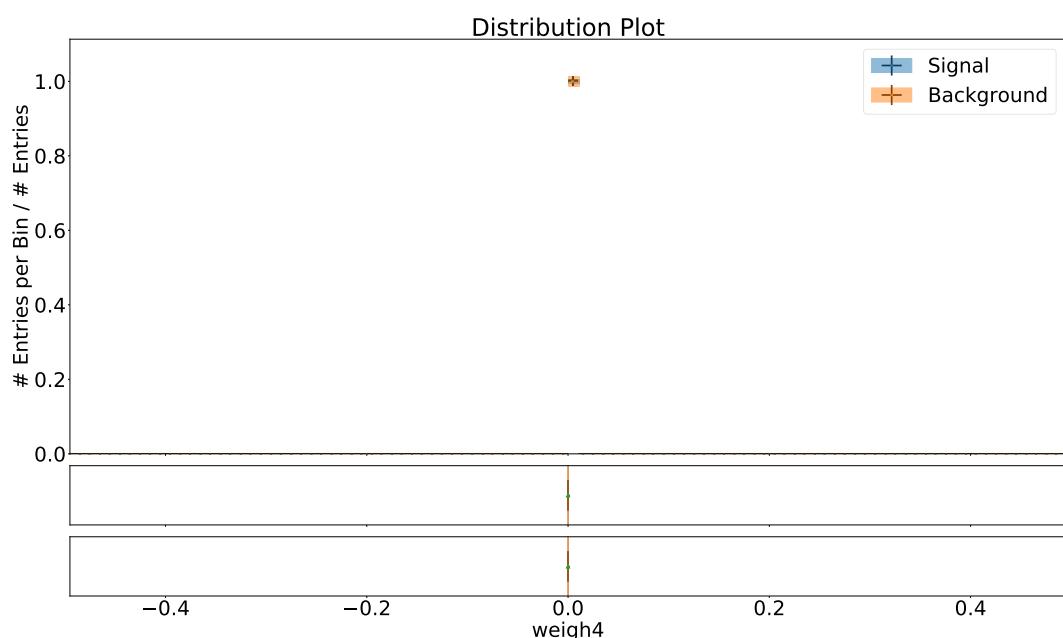
2.37 weight_min



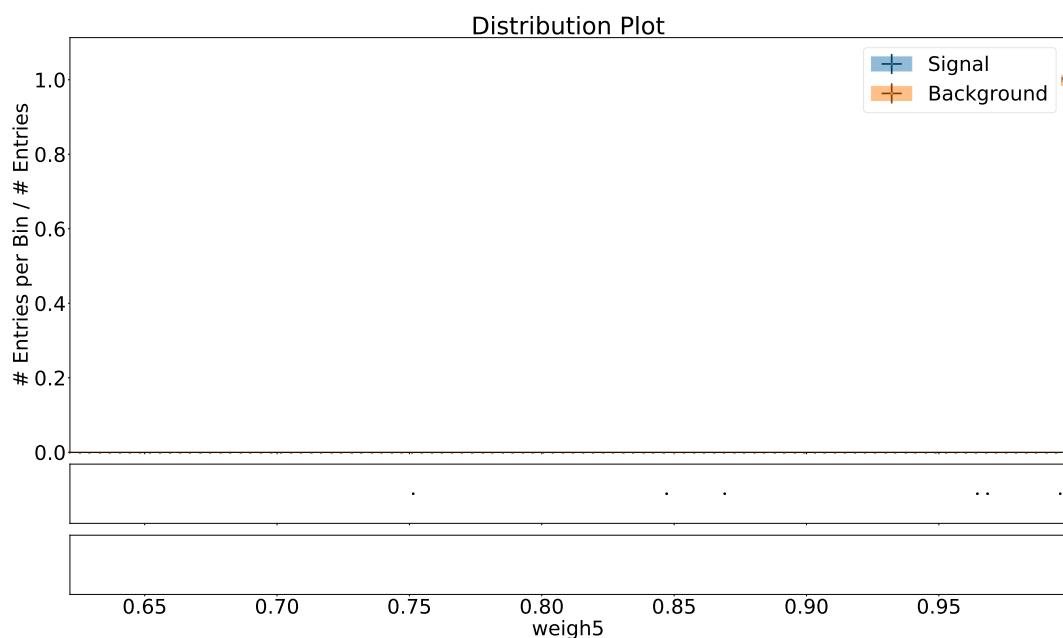
2.38 weight_median



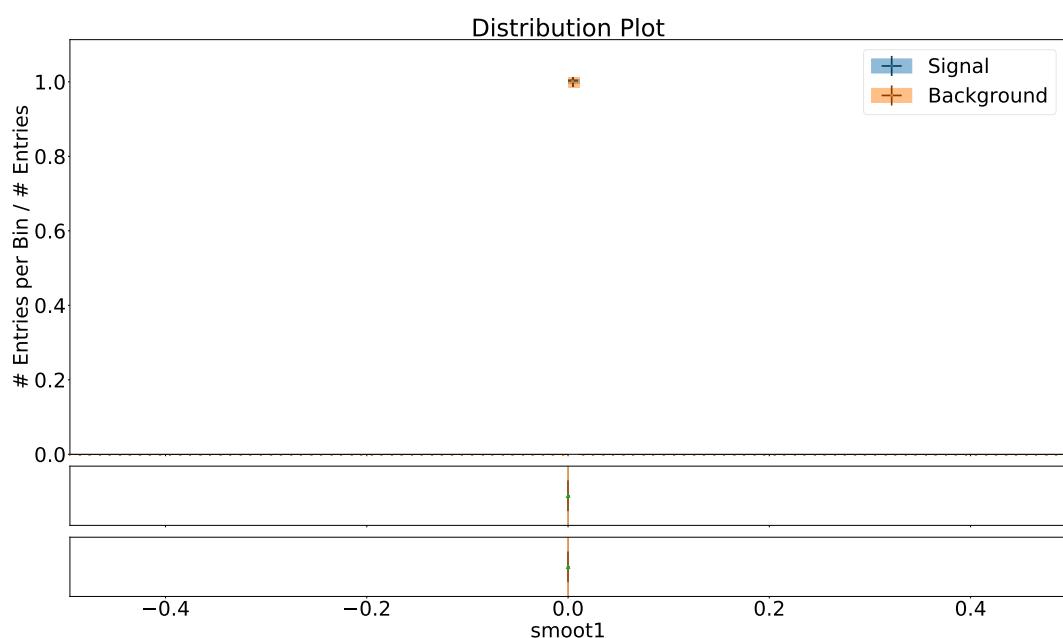
2.39 weight_n_zeros



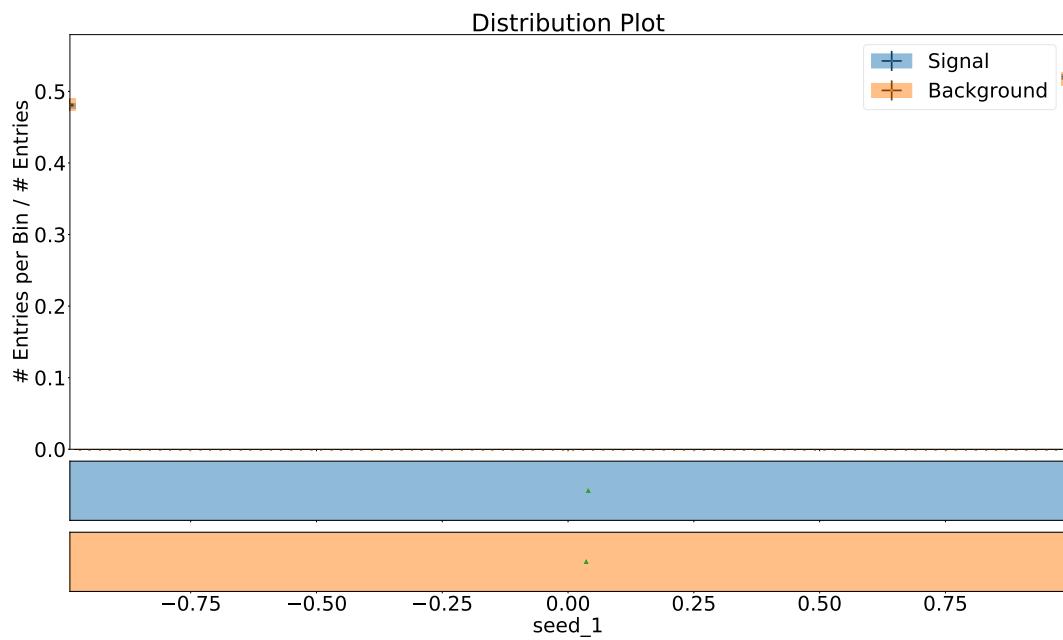
2.40 weight_lastSVDhit



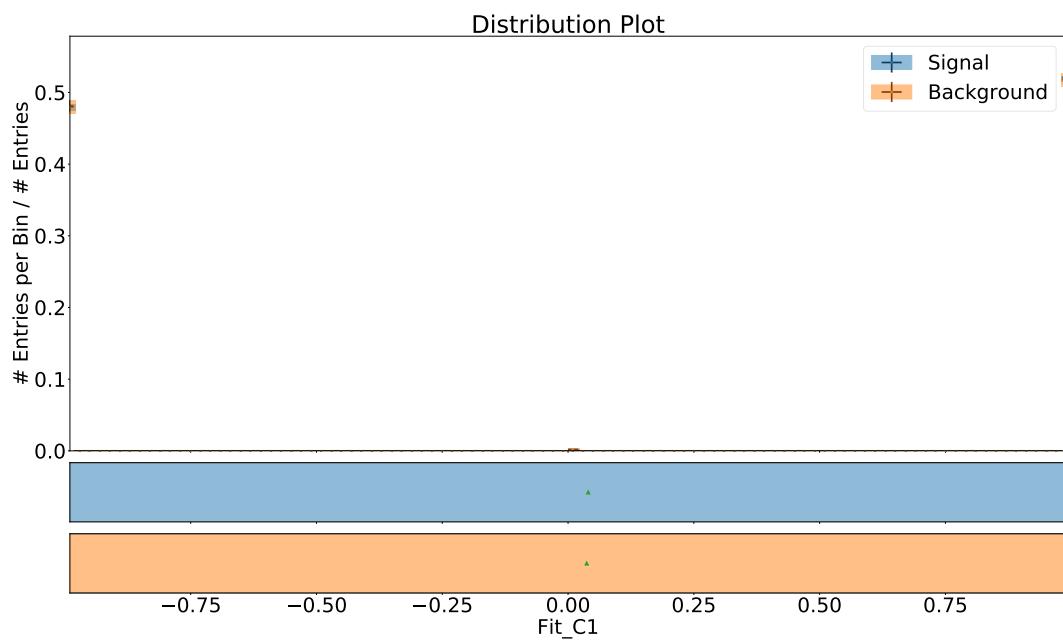
2.41 smoothedChi2_n_zeros



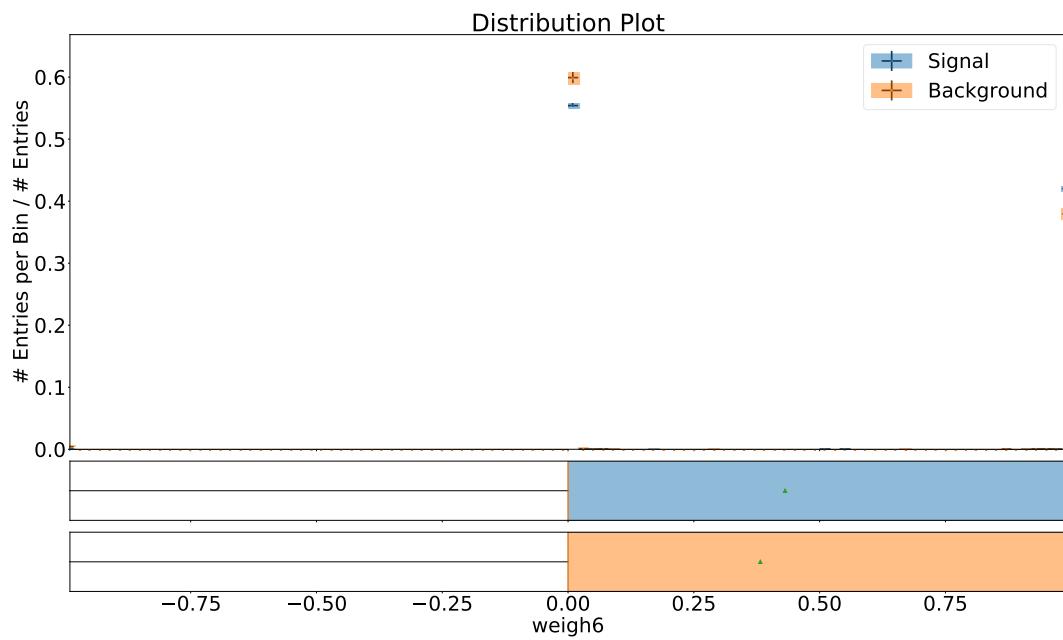
2.42 seed_Charge



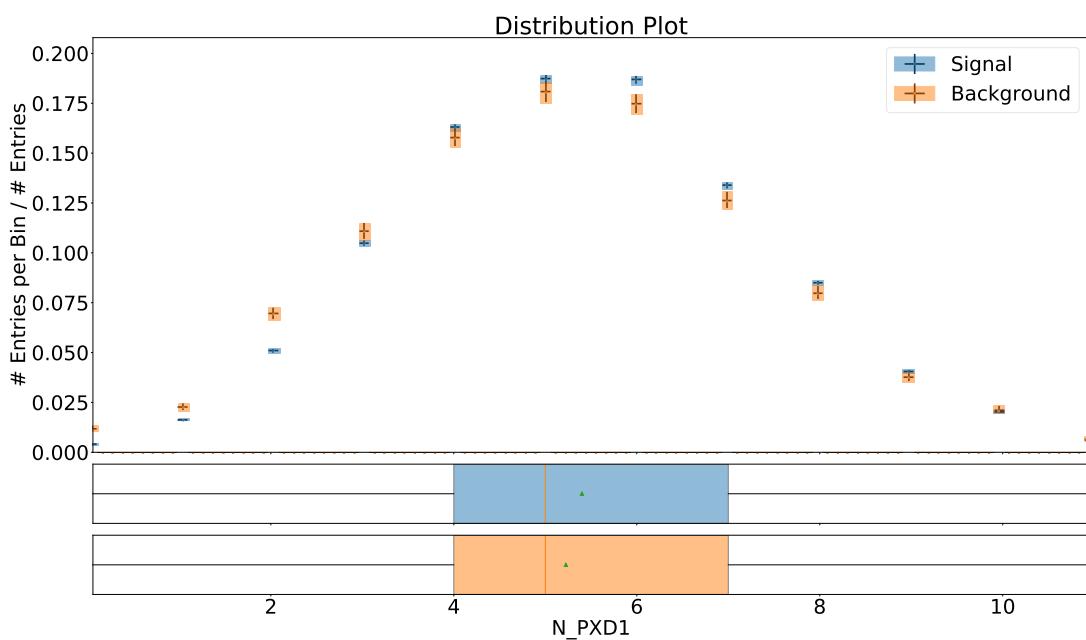
2.43 Fit_Charge



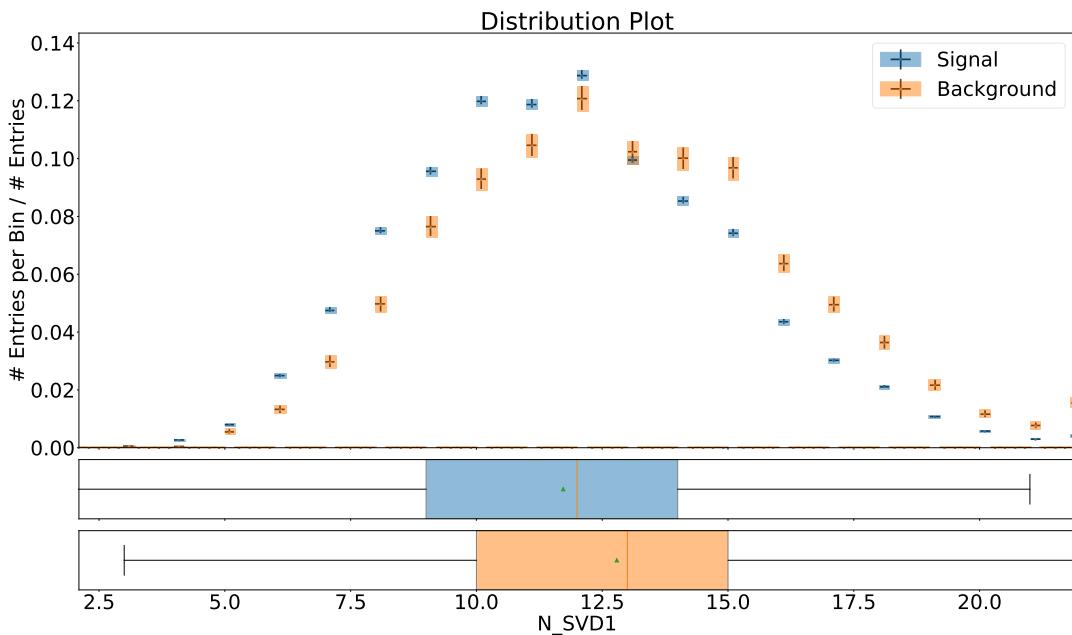
2.44 weight_firstCDChit



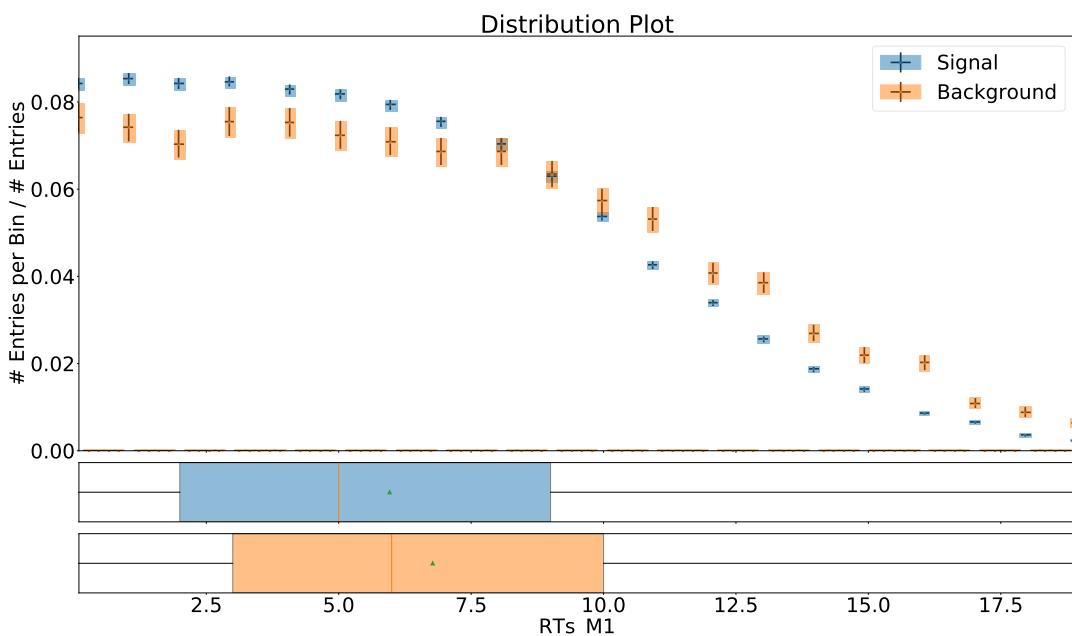
2.45 N_PXDRecoTracks



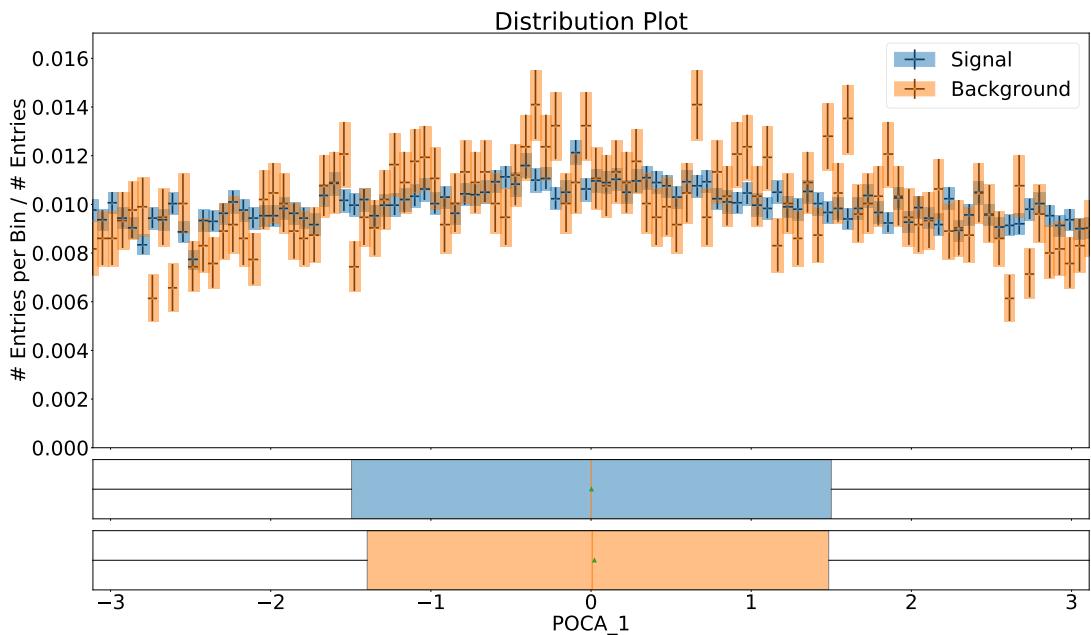
2.46 N_SVDRecoTracks



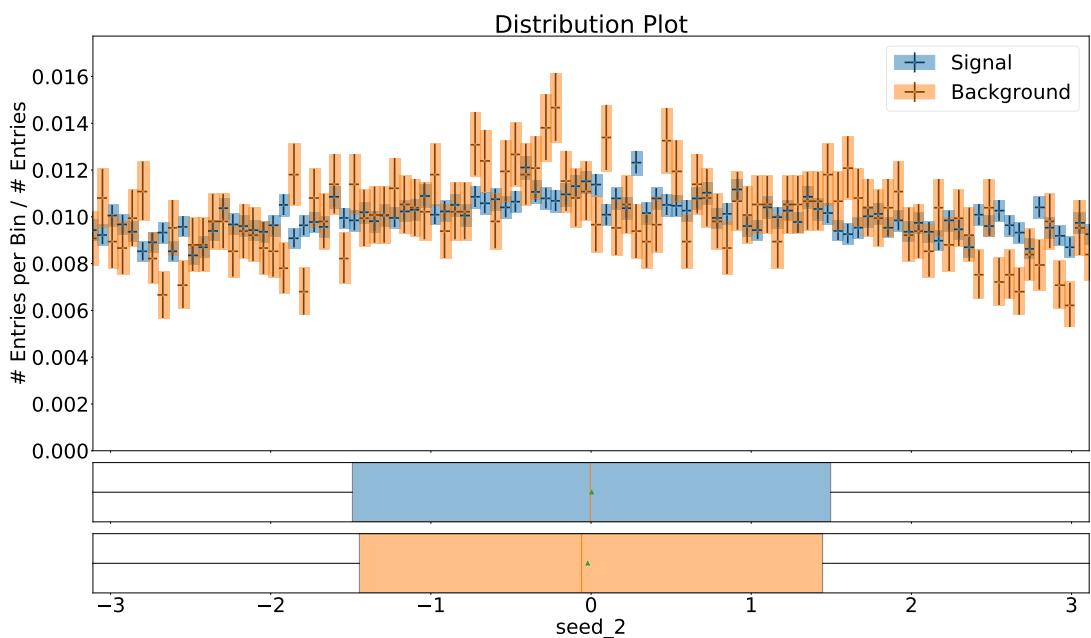
2.47 RTs_Min_Pos_diff_Phi_idx



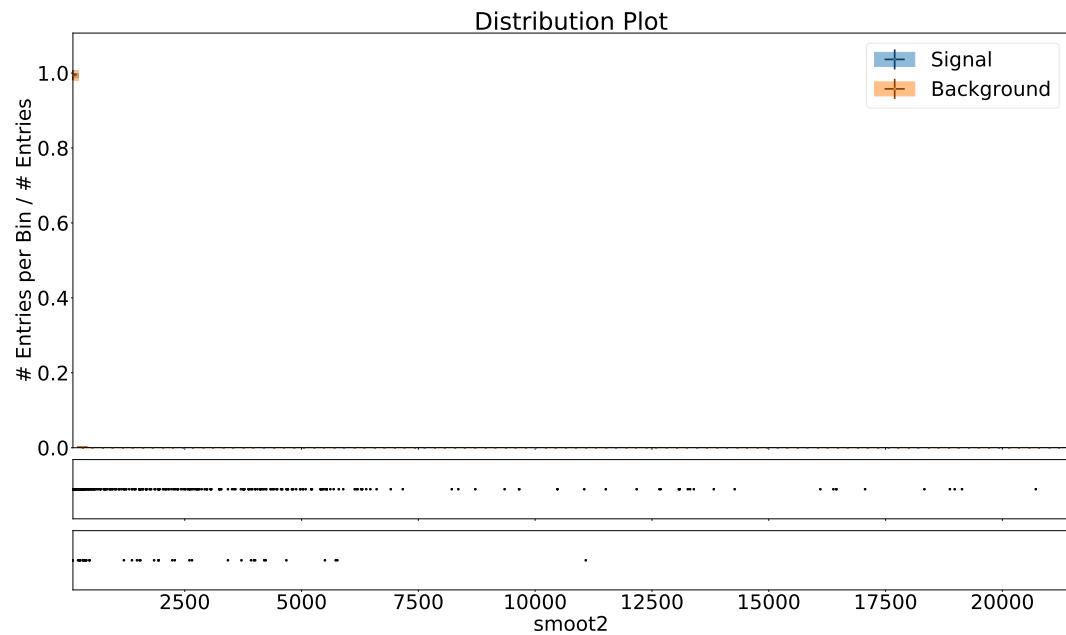
2.48 POCA_Mom_Phi



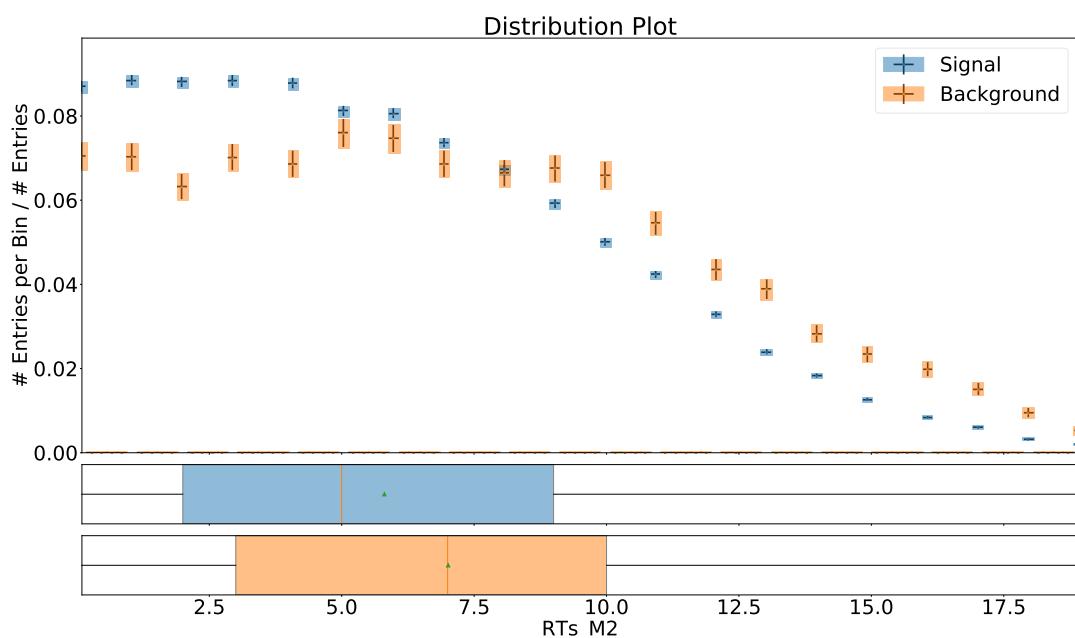
2.49 seed_Mom_Phi



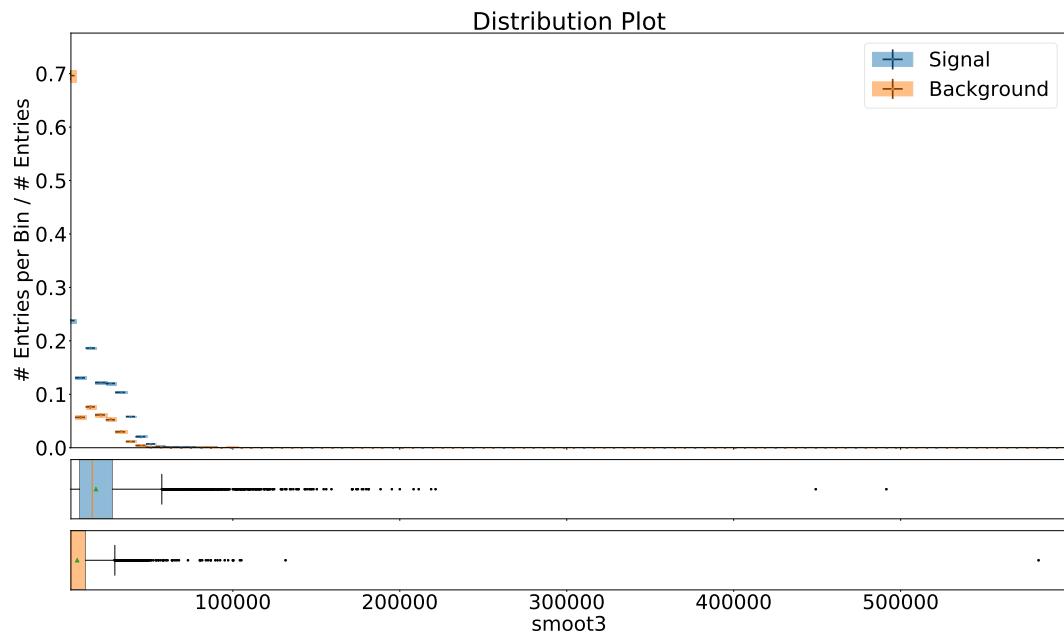
2.50 smoothedChi2_lastSVDhit



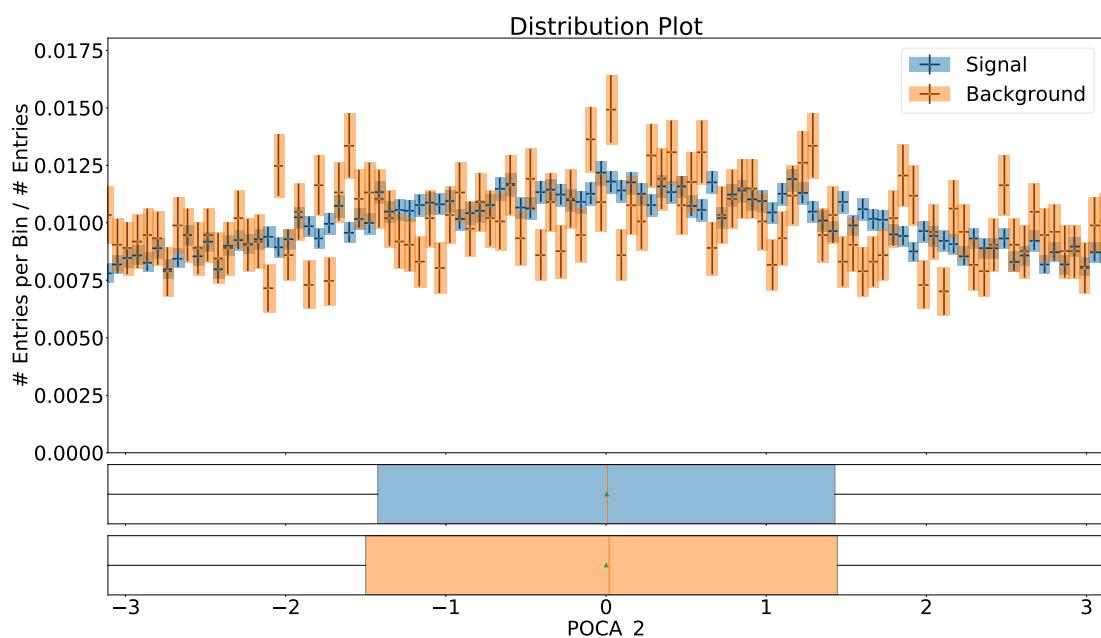
2.51 RTs_Min_Pos_diff_Theta_idx



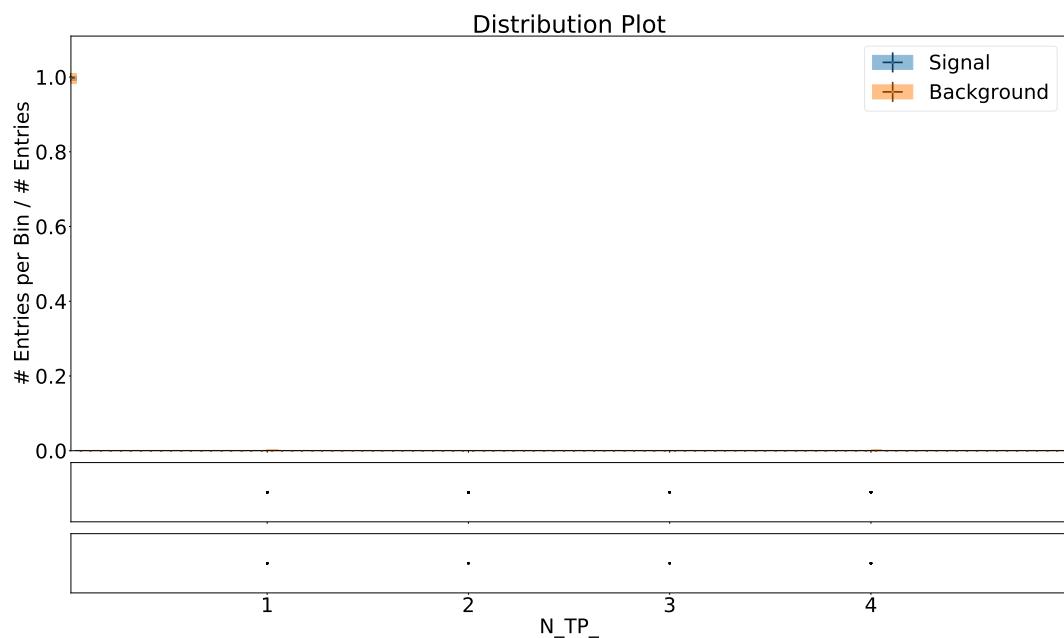
2.52 smoothedChi2_max



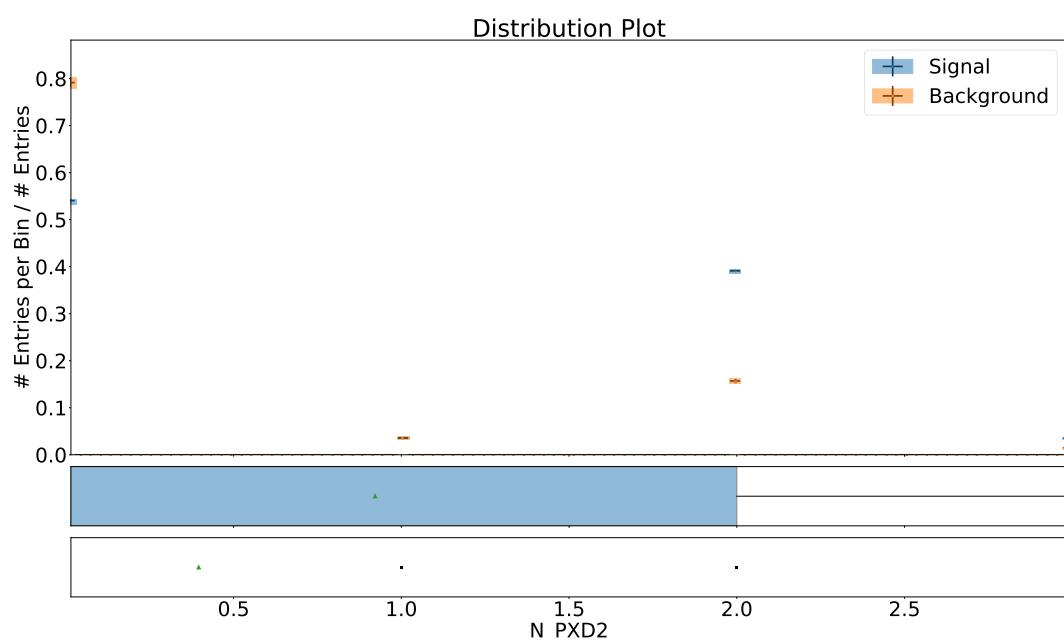
2.53 POCA_Pos_Phi



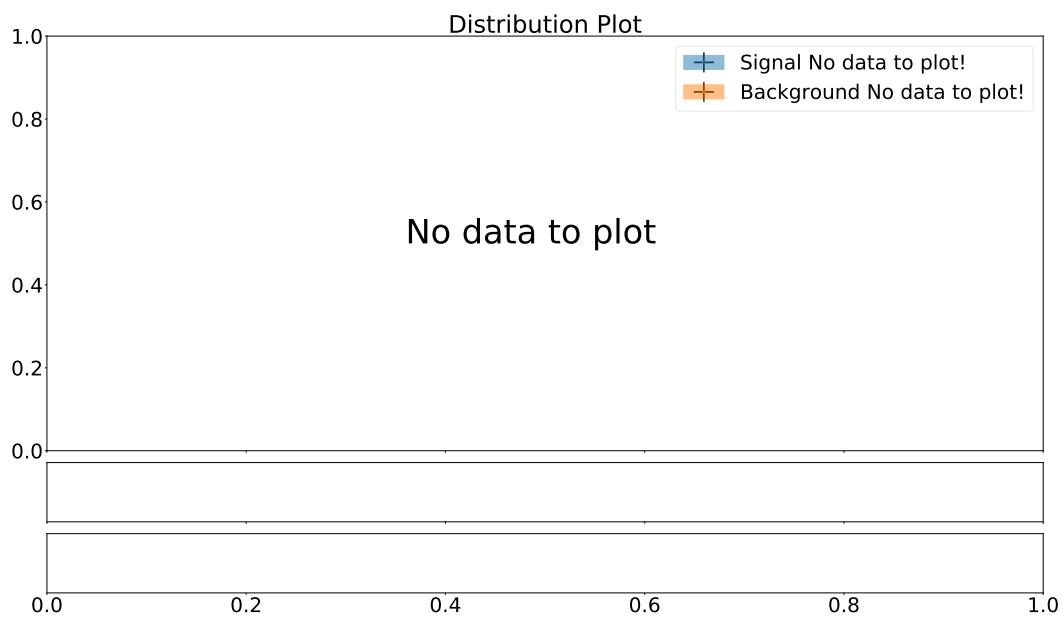
2.54 N_TP_noKalmanFitterInfo



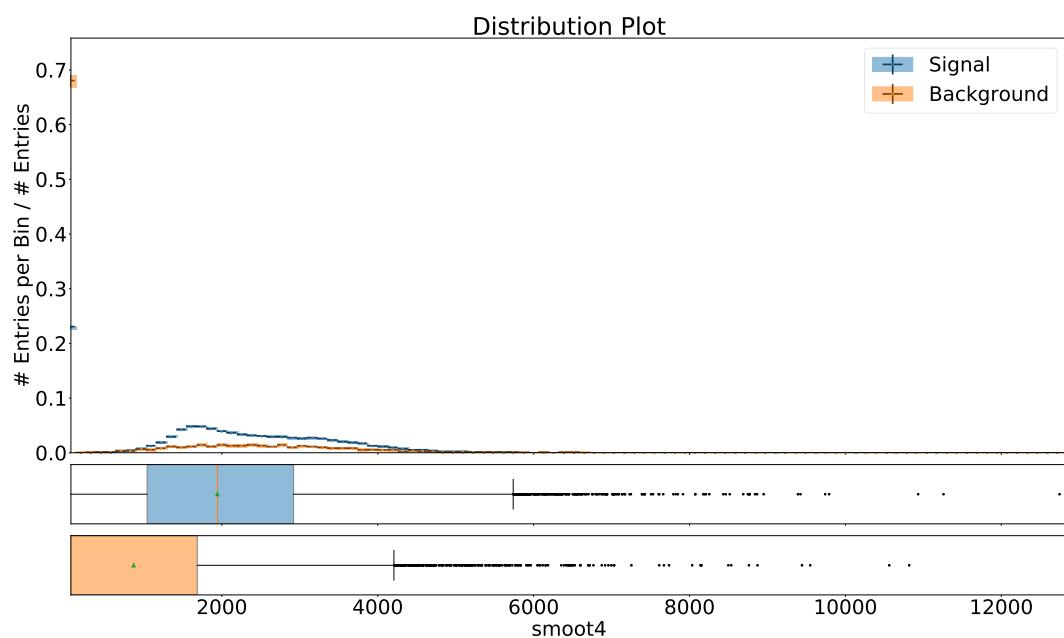
2.55 N_PXD_hits



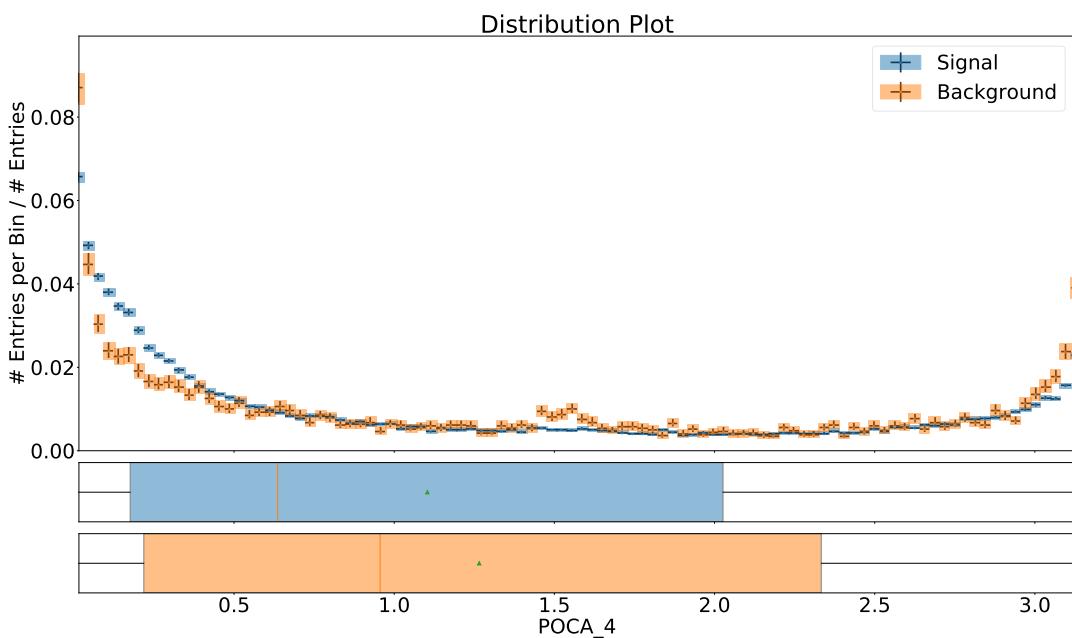
2.56 POCA_Pos_Z



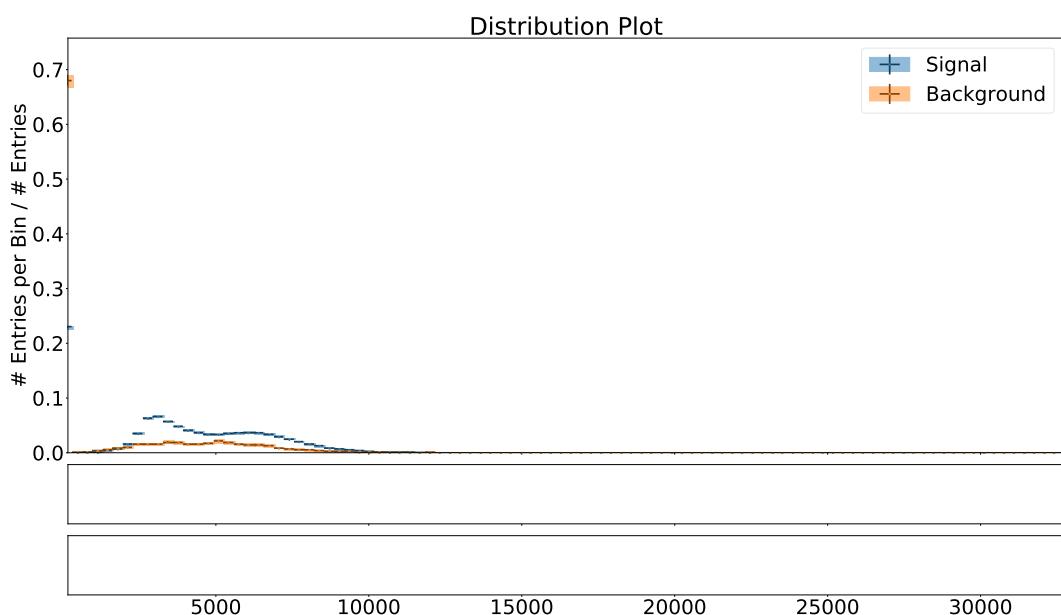
2.57 smoothedChi2_mean



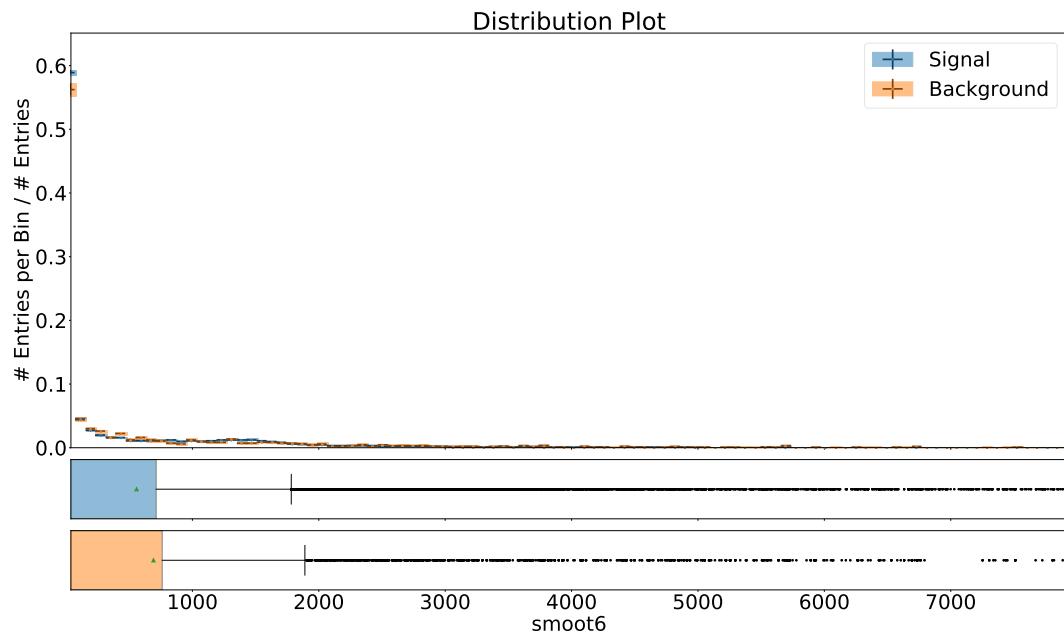
2.58 POCA_Pos_Theta



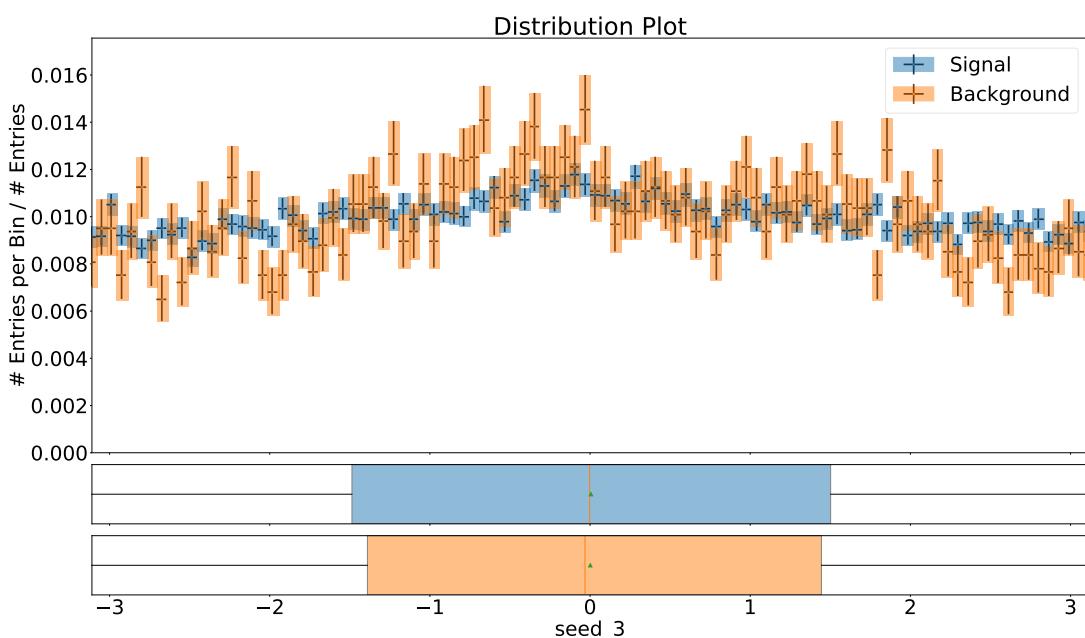
2.59 smoothedChi2_std



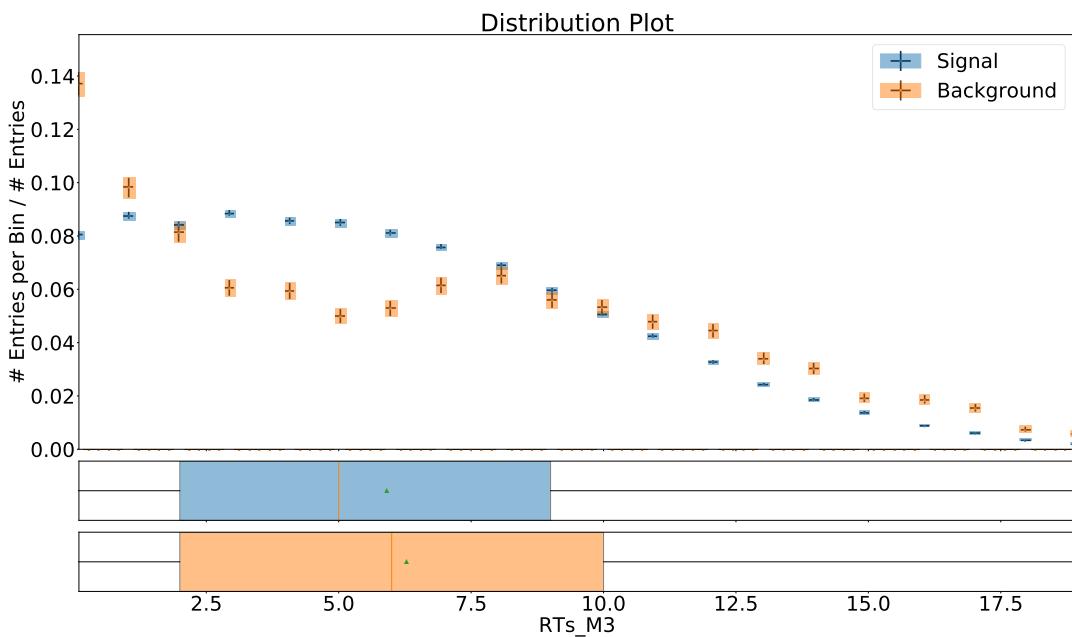
2.60 smoothedChi2_firstCDChit



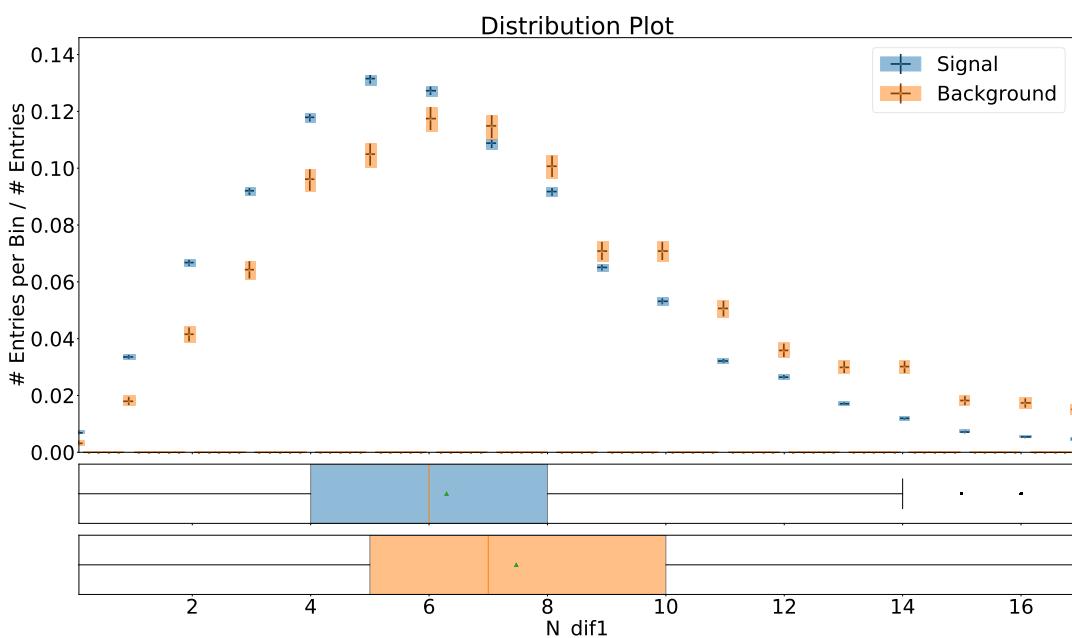
2.61 seed_Pos_Phi



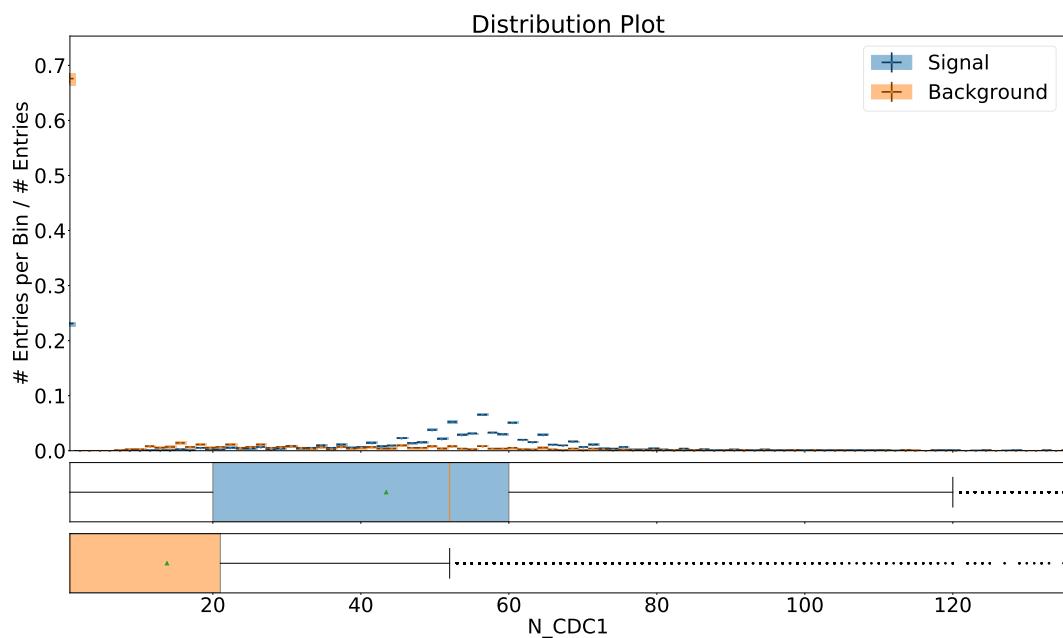
2.62 RTs_Min_Mom_diff_Mag_idx



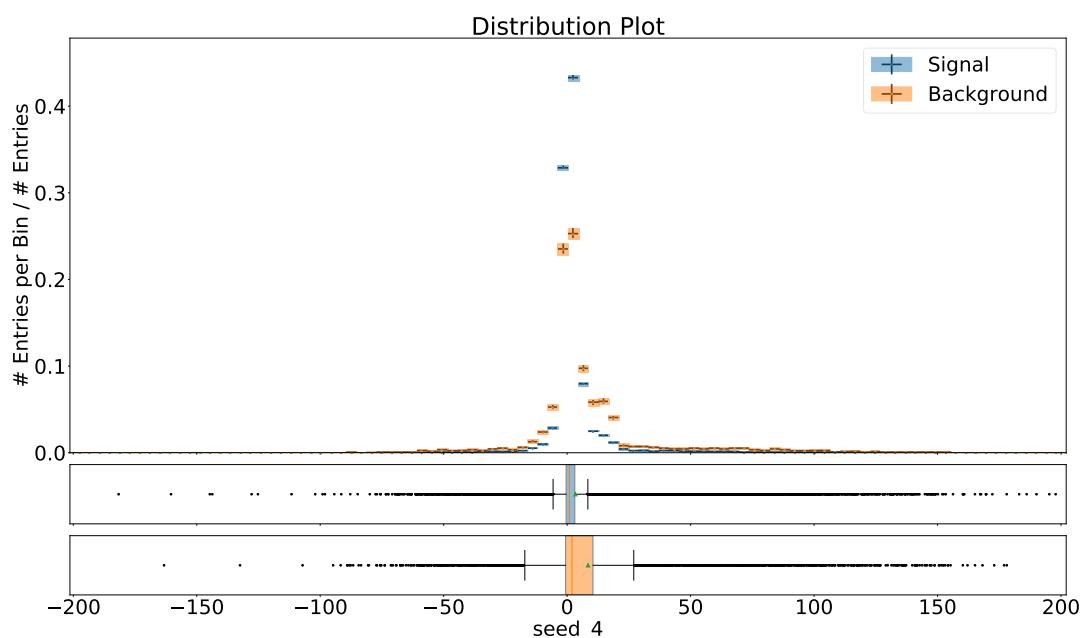
2.63 N_diff_PXD_SVD_RecoTracks



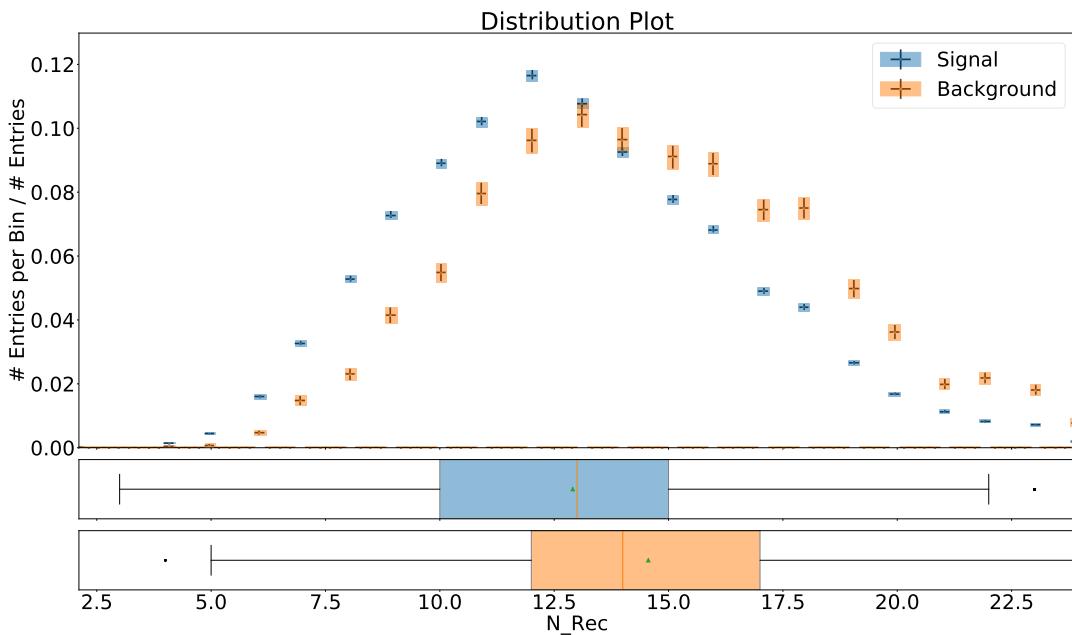
2.64 N_CDC_hits



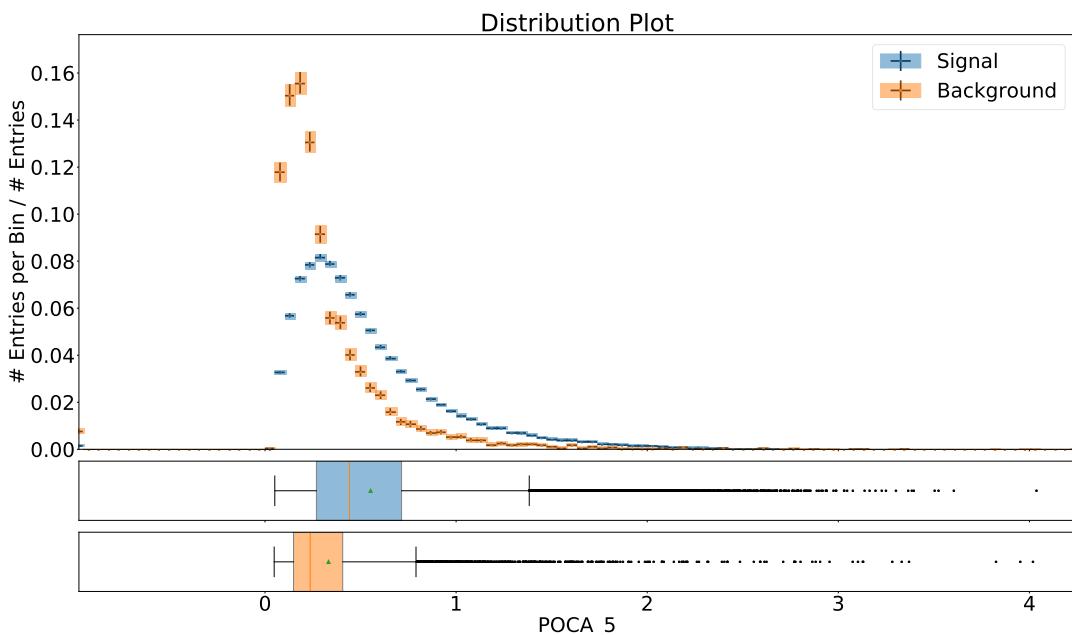
2.65 seed_Pos_Z



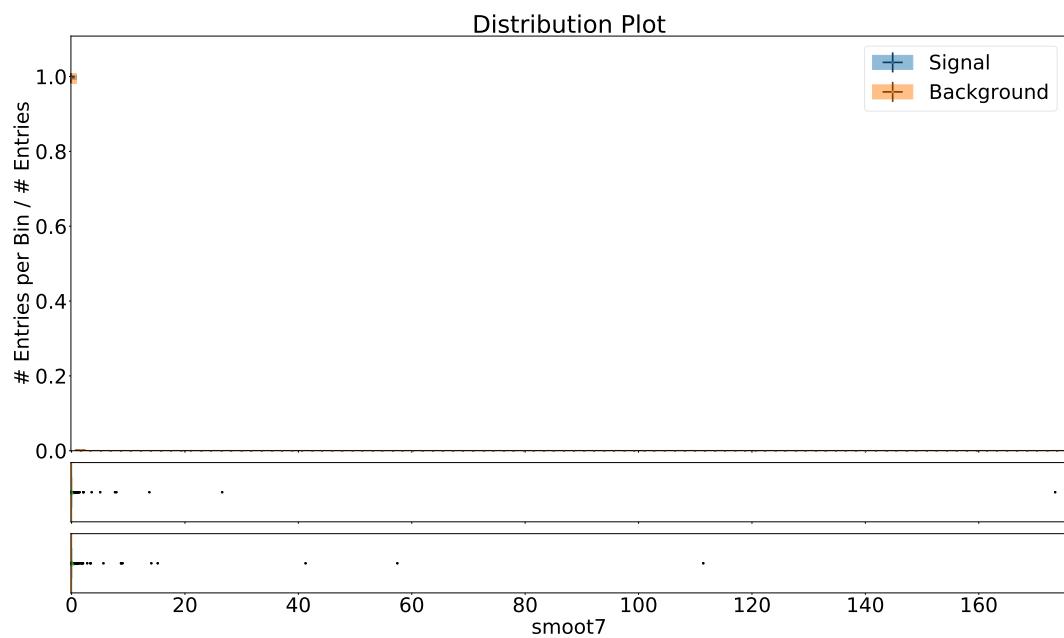
2.66 N_RecoTracks



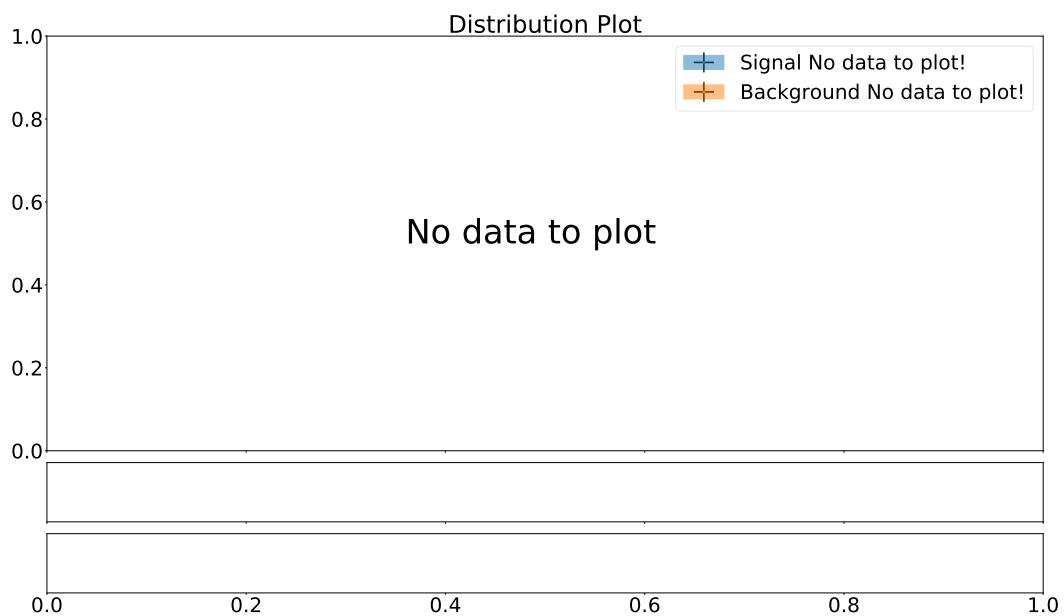
2.67 POCA_Mom_Mag



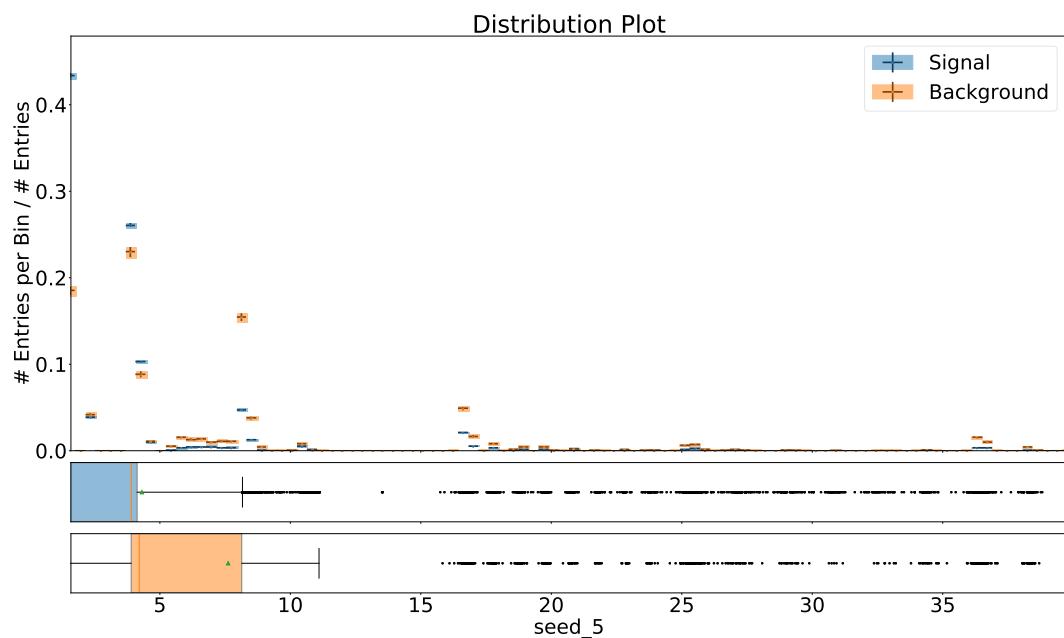
2.68 smoothedChi2_min



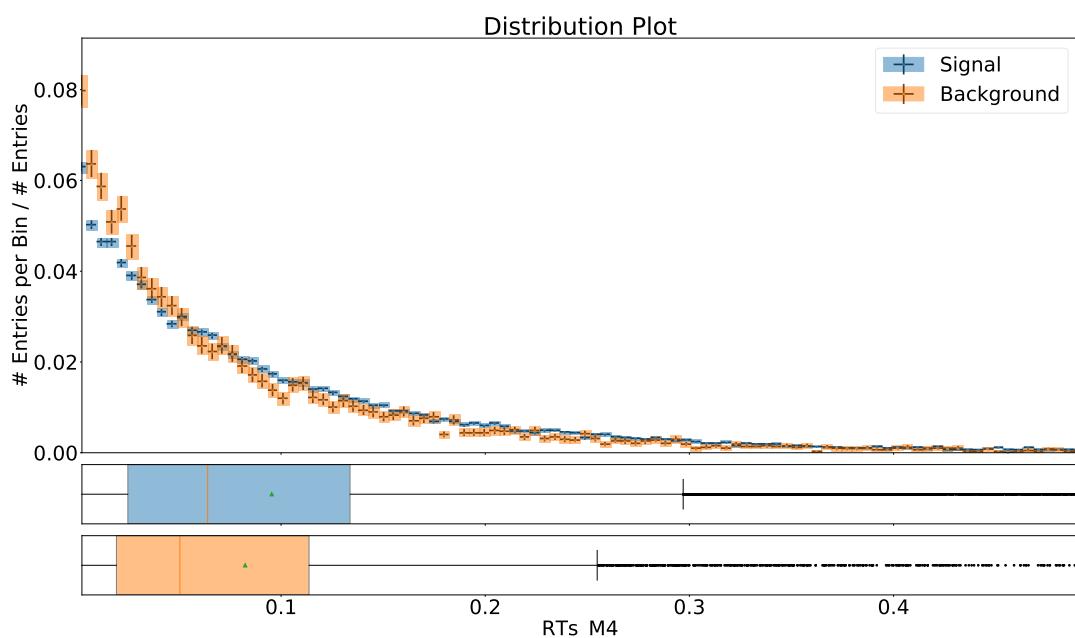
2.69 POCA_Mom_Z



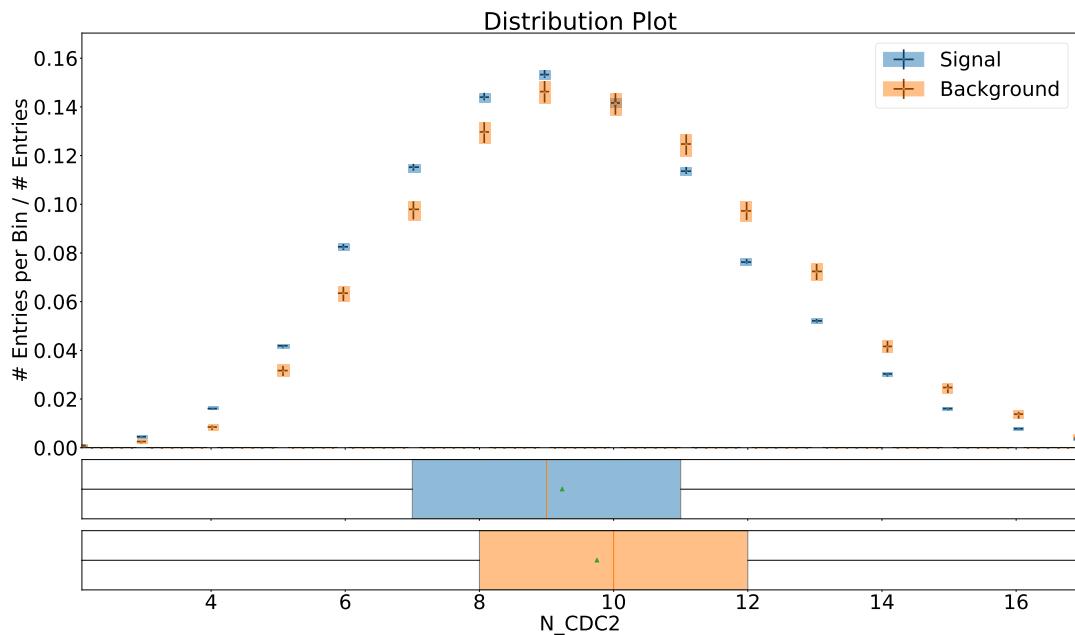
2.70 seed_Pos_Pt



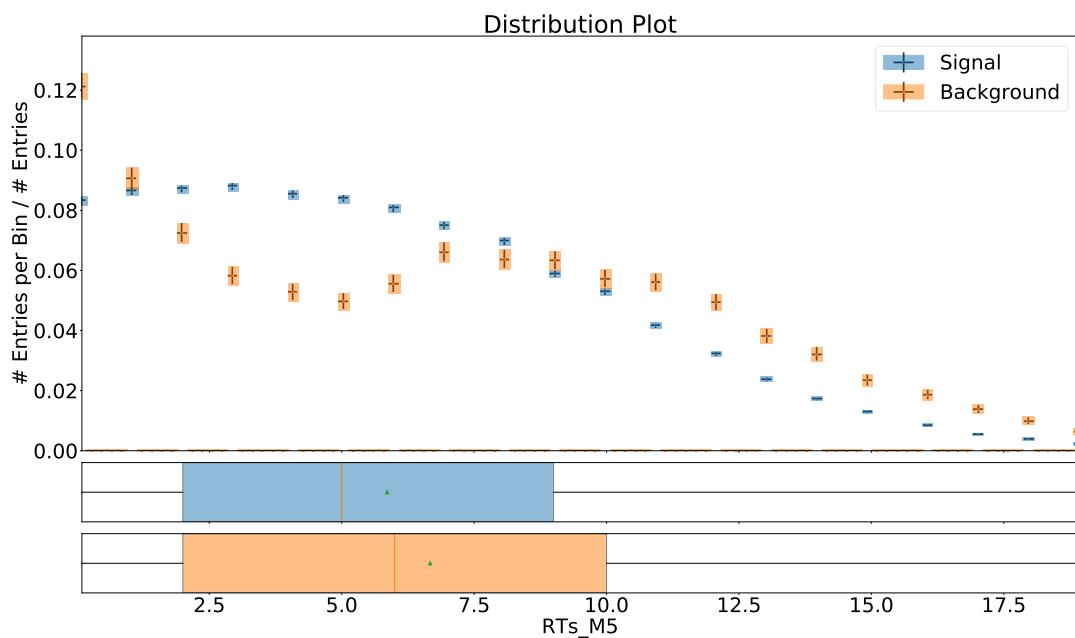
2.71 RTs_Min_Pos_diff_Theta



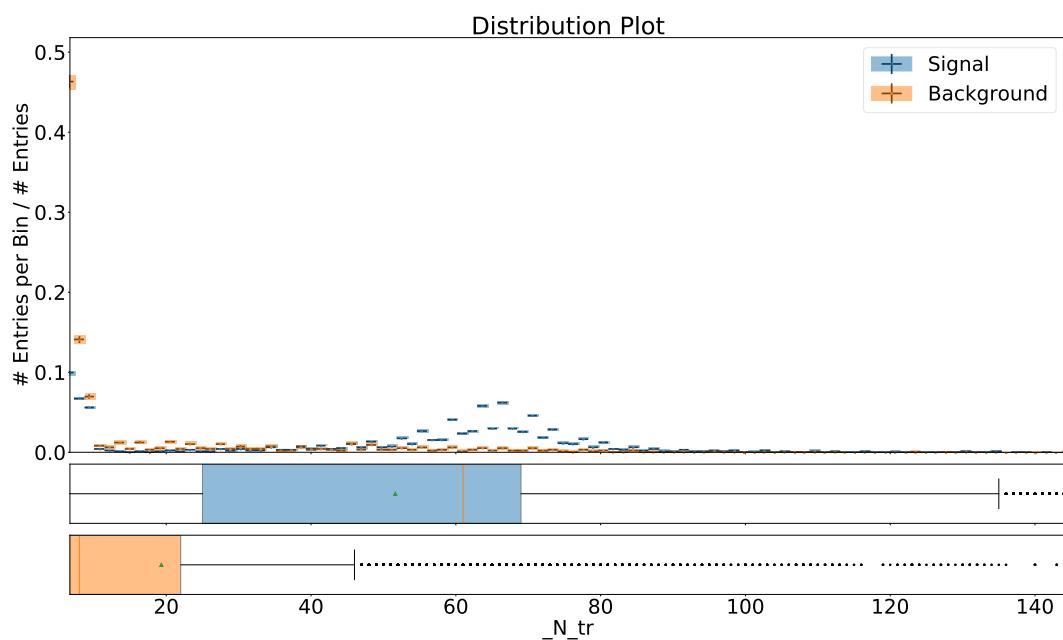
2.72 N_CDCRecoTracks



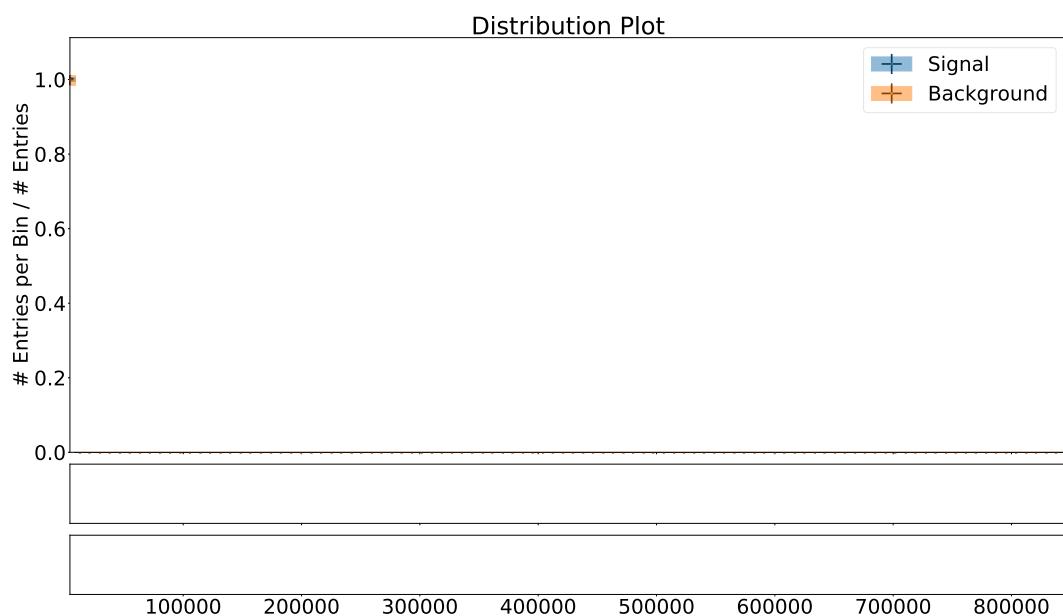
2.73 RTs_Min_Mom_diff_Pt_idx



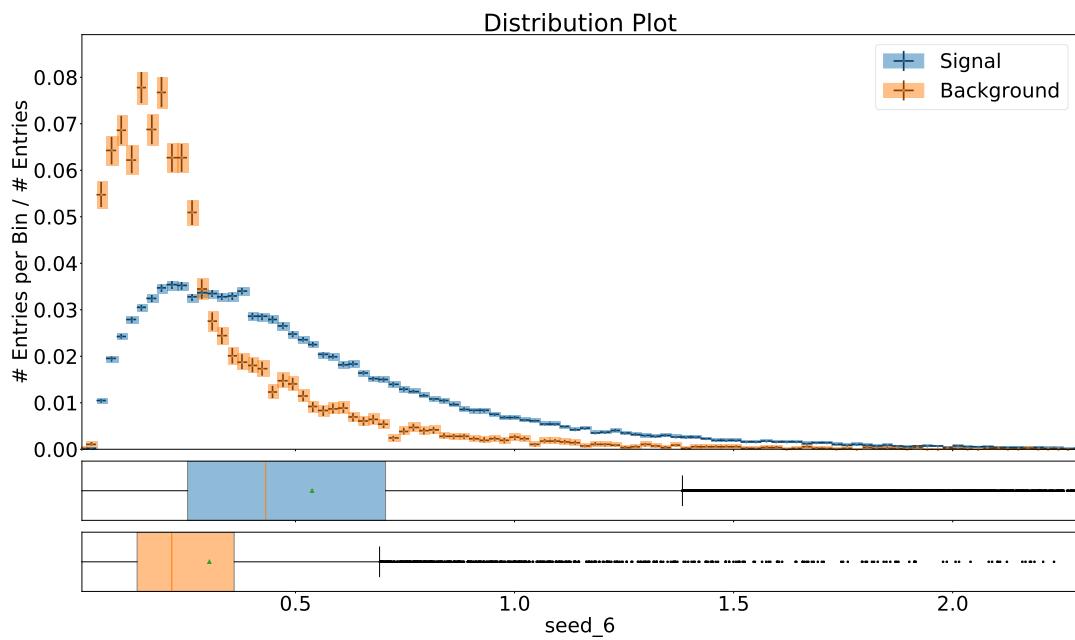
2.74 _N_tracking_hits



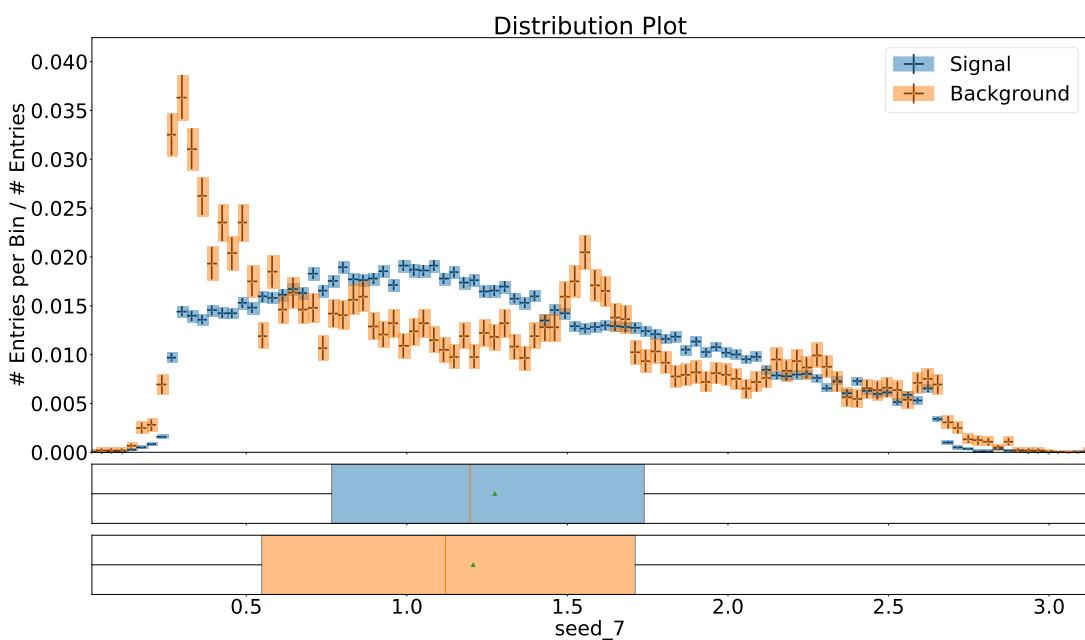
2.75 Fit_Chi2



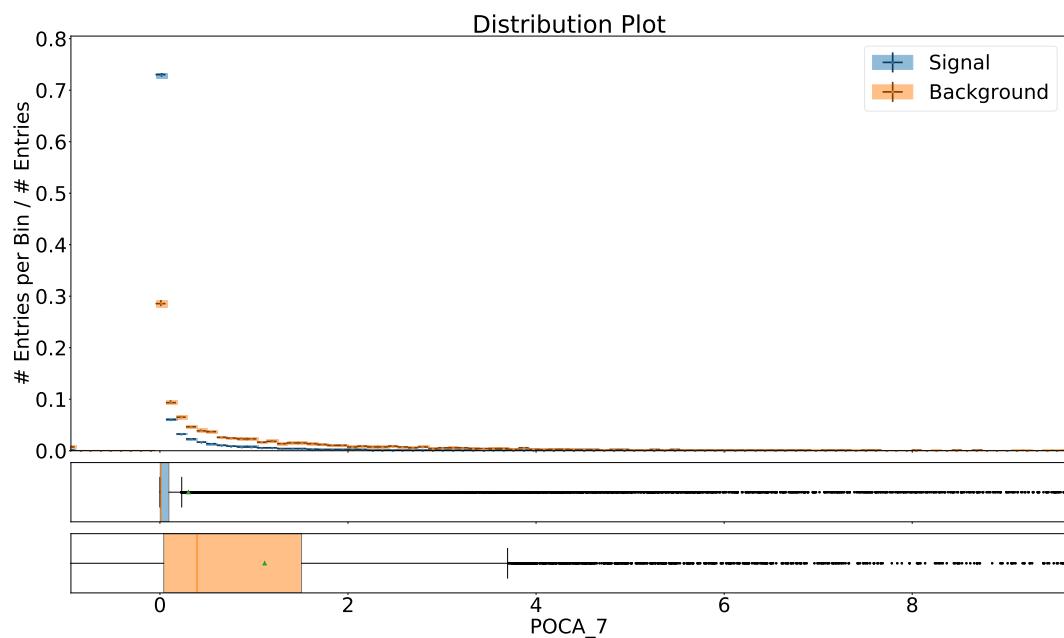
2.76 seed_Mom_Mag



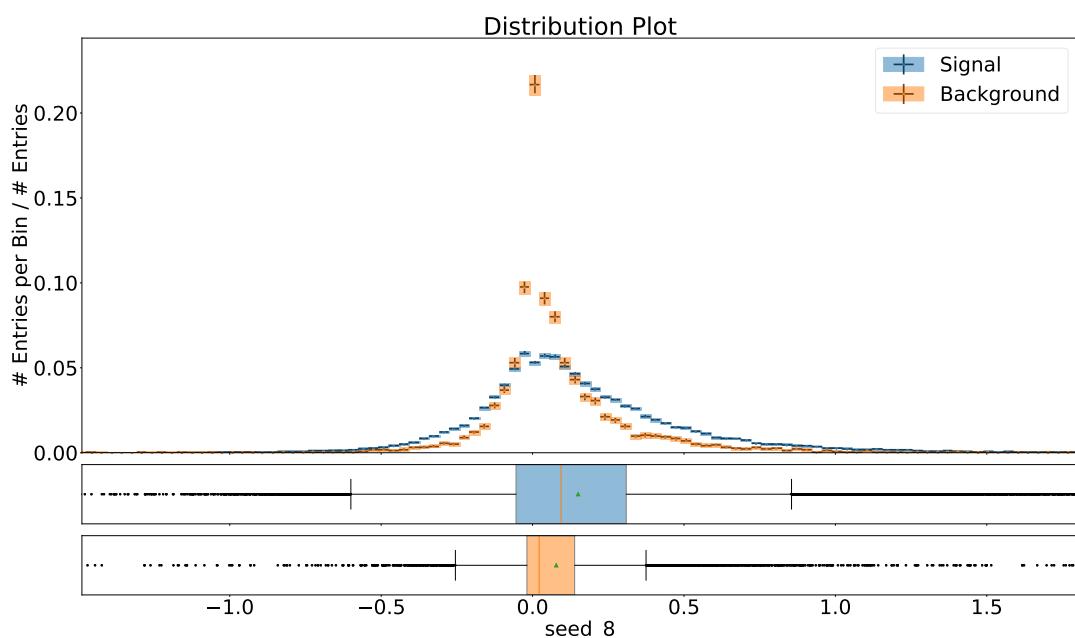
2.77 seed_Pos_Theta



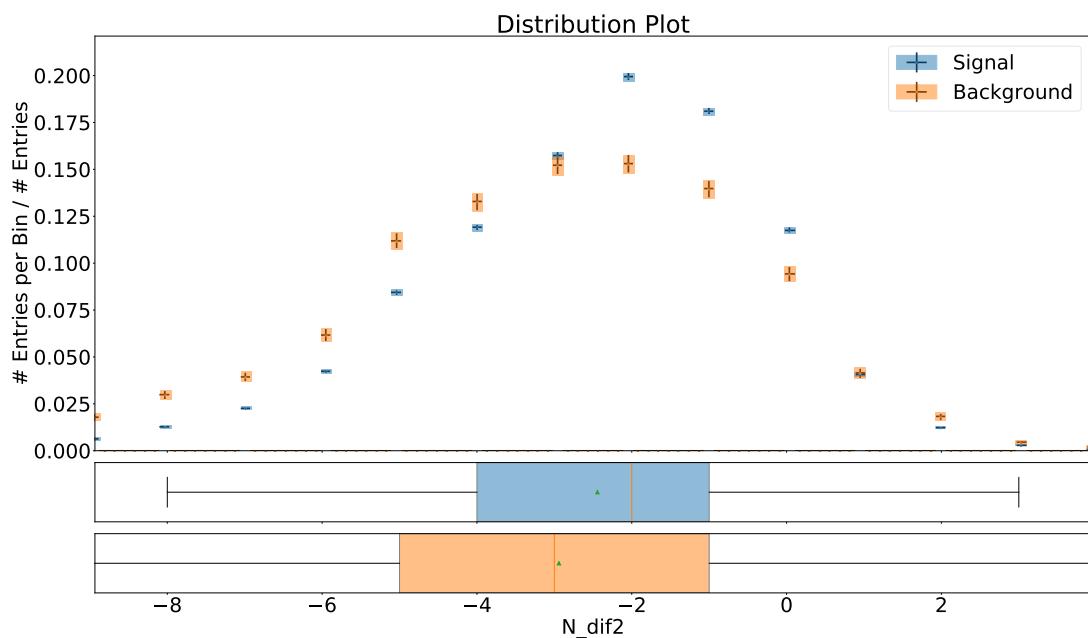
2.78 POCA_Pos_Pt



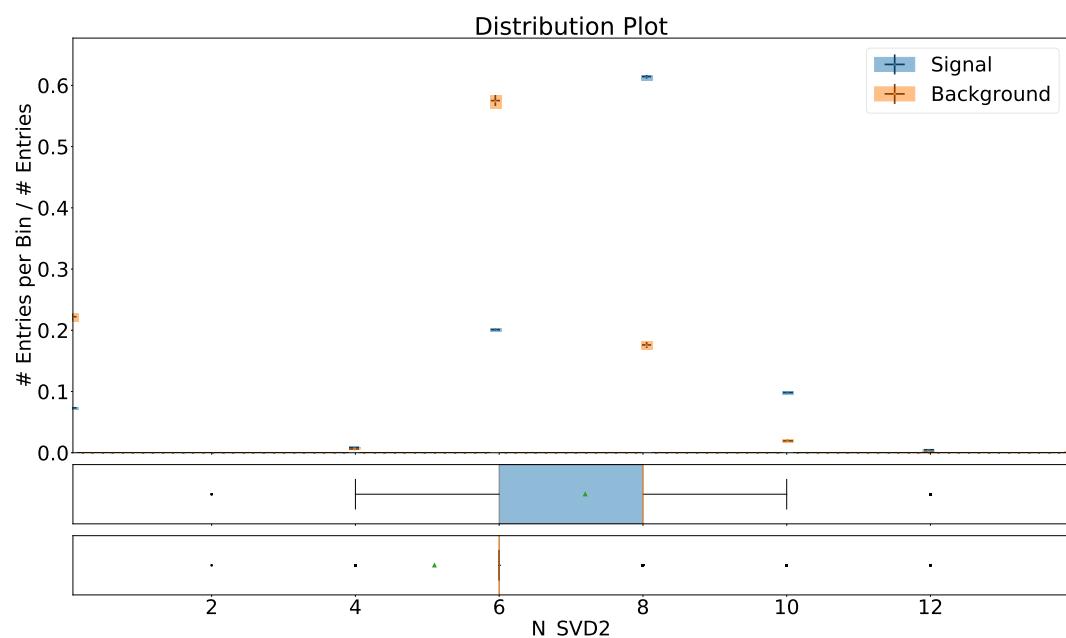
2.79 seed_Mom_Z



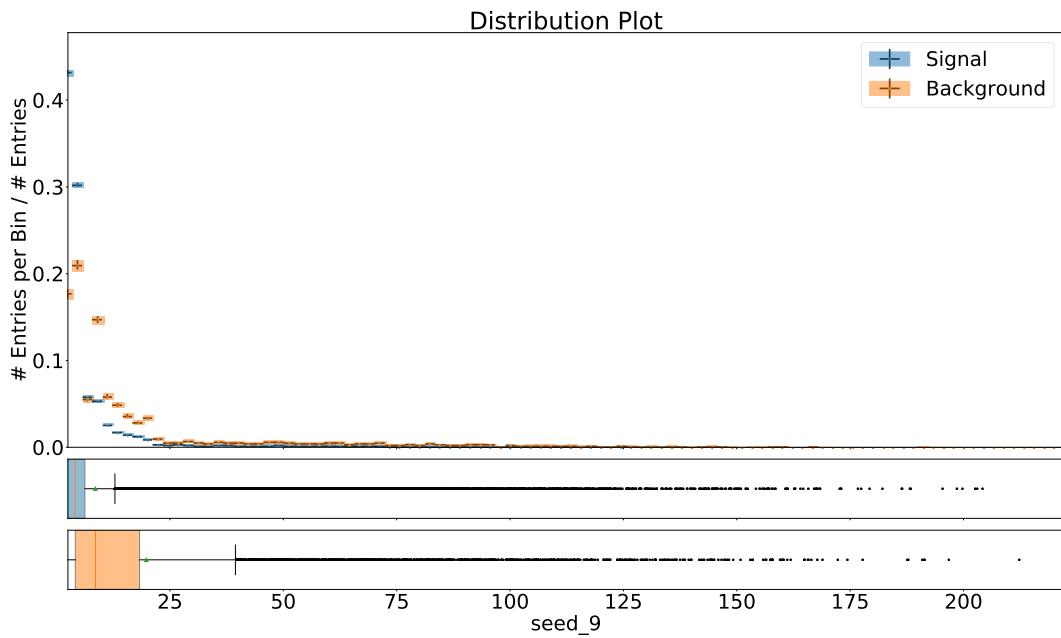
2.80 N_diff_SVD_CDC_RecoTracks



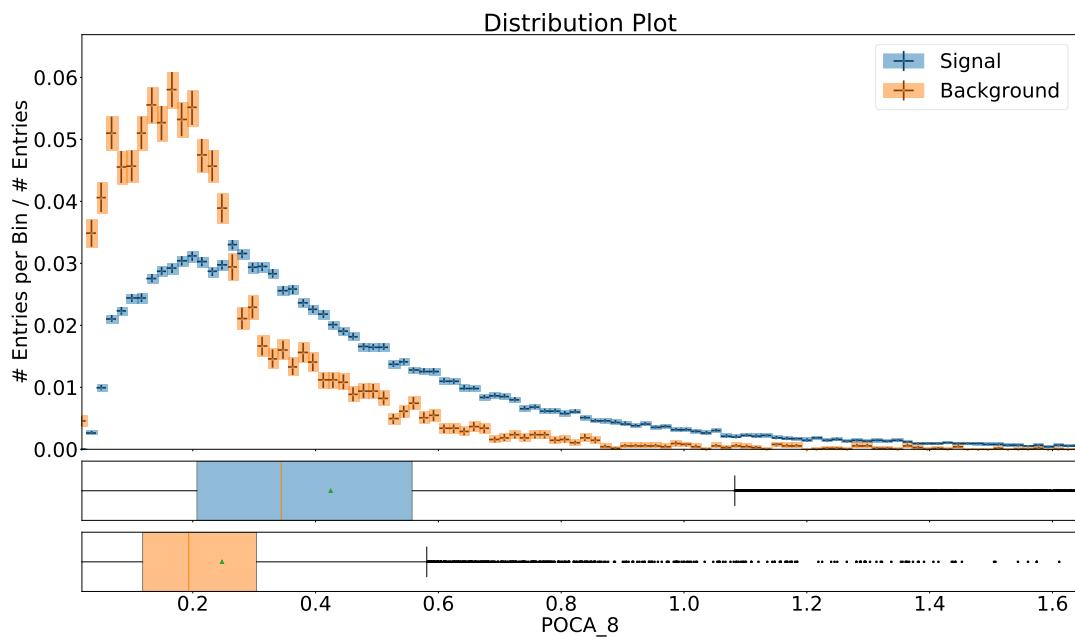
2.81 N_SVD_hits



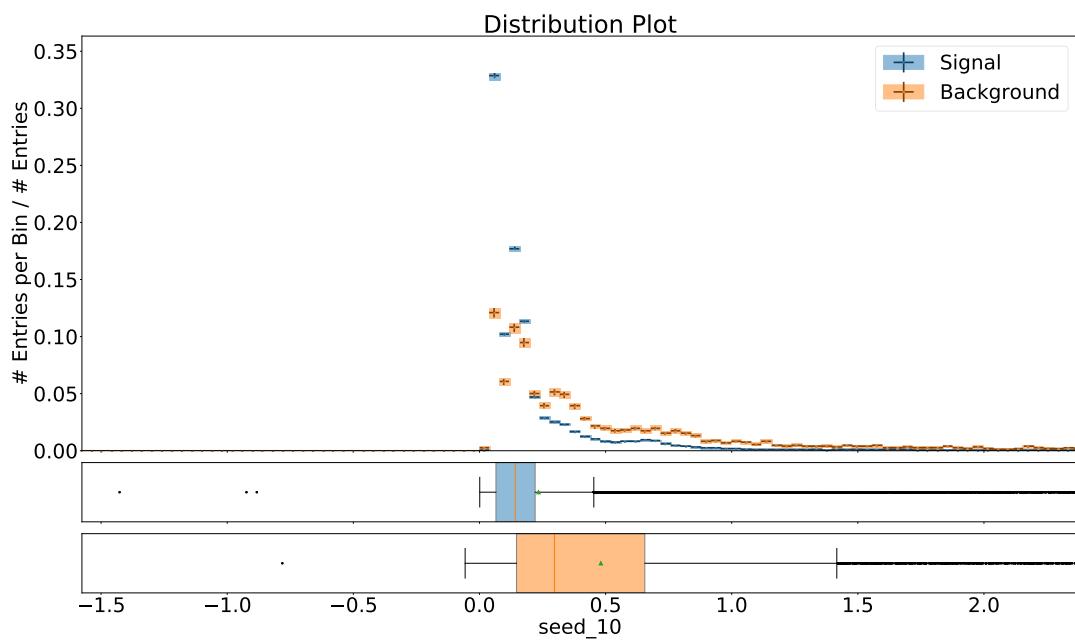
2.82 seed_Pos_Mag



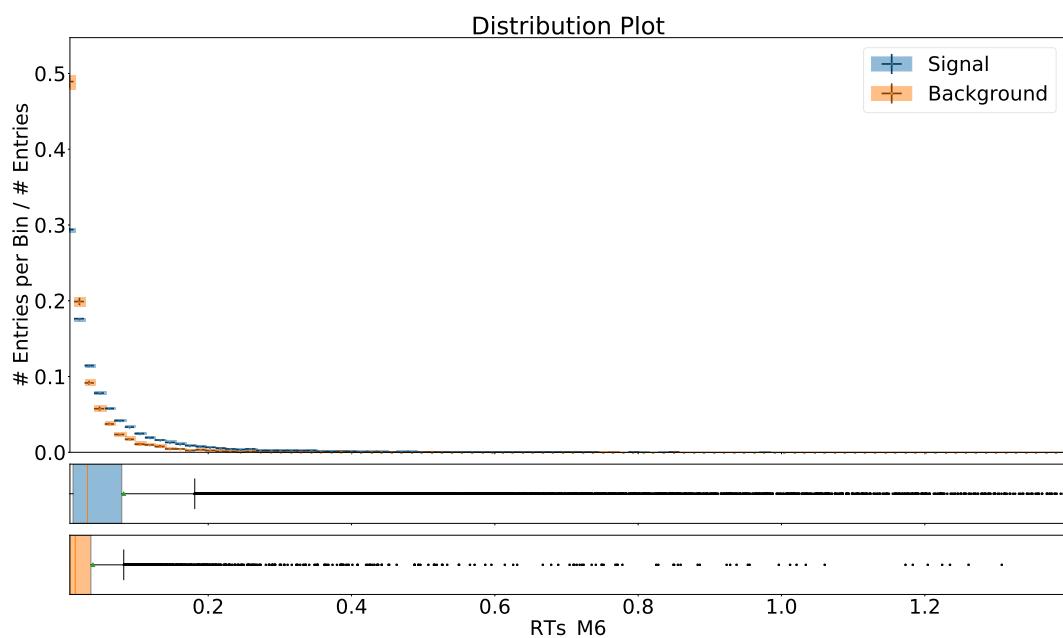
2.83 POCA_Mom_Pt



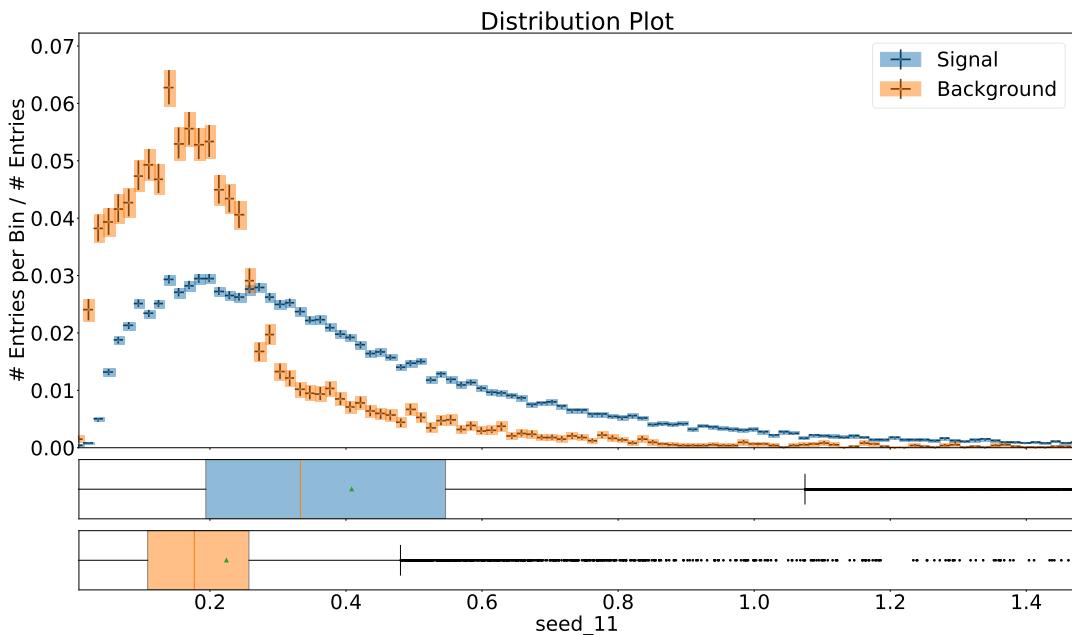
2.84 seed_Time



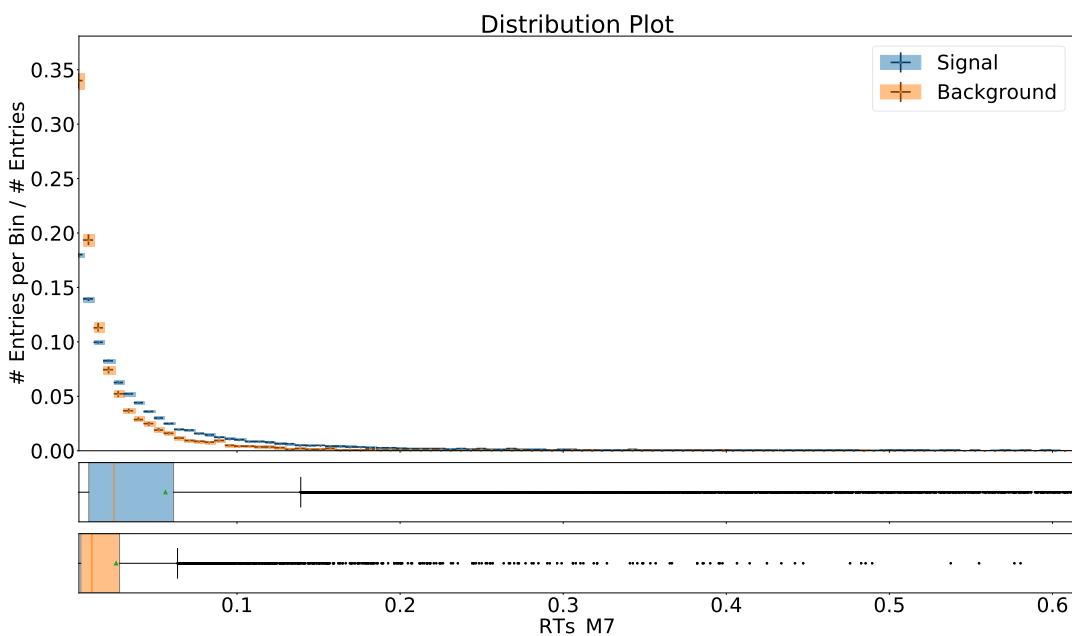
2.85 RTs_Min_Mom_diff_Mag



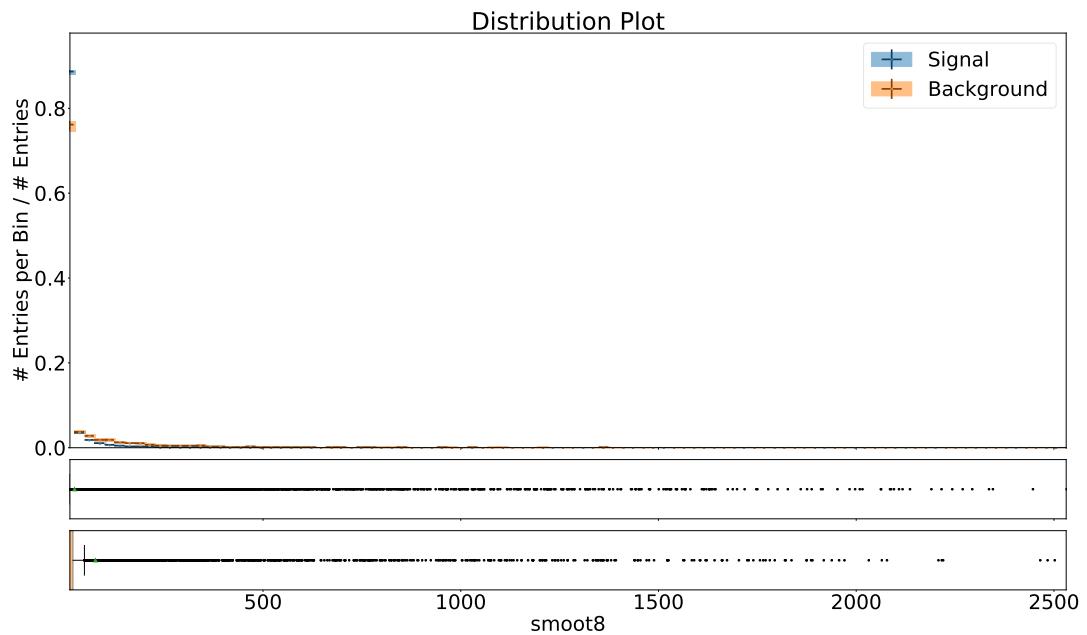
2.86 seed_Mom_Pt



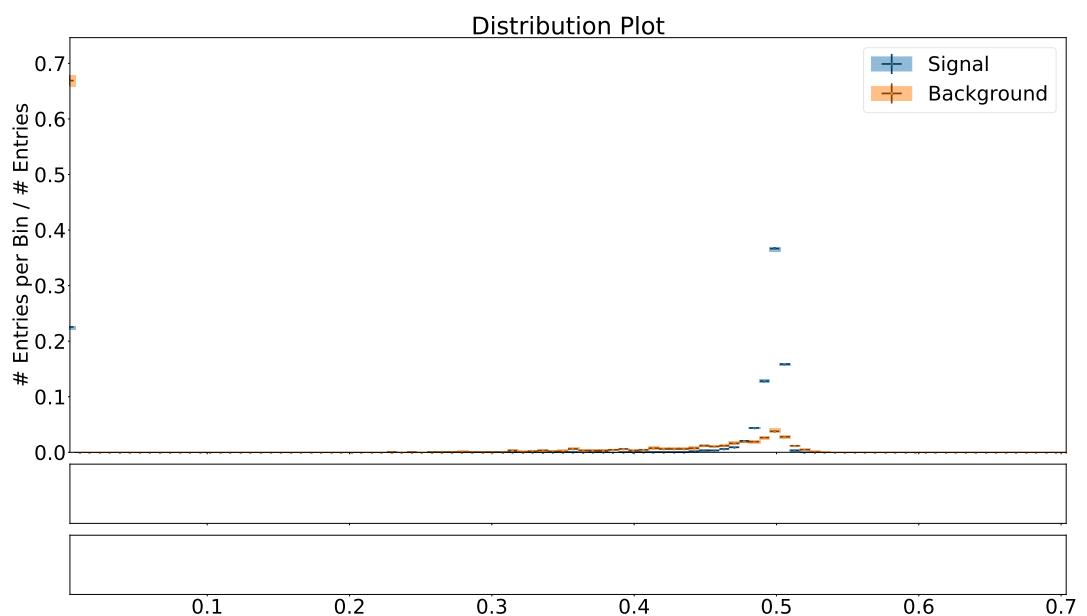
2.87 RTs_Min_Mom_diff_Pt



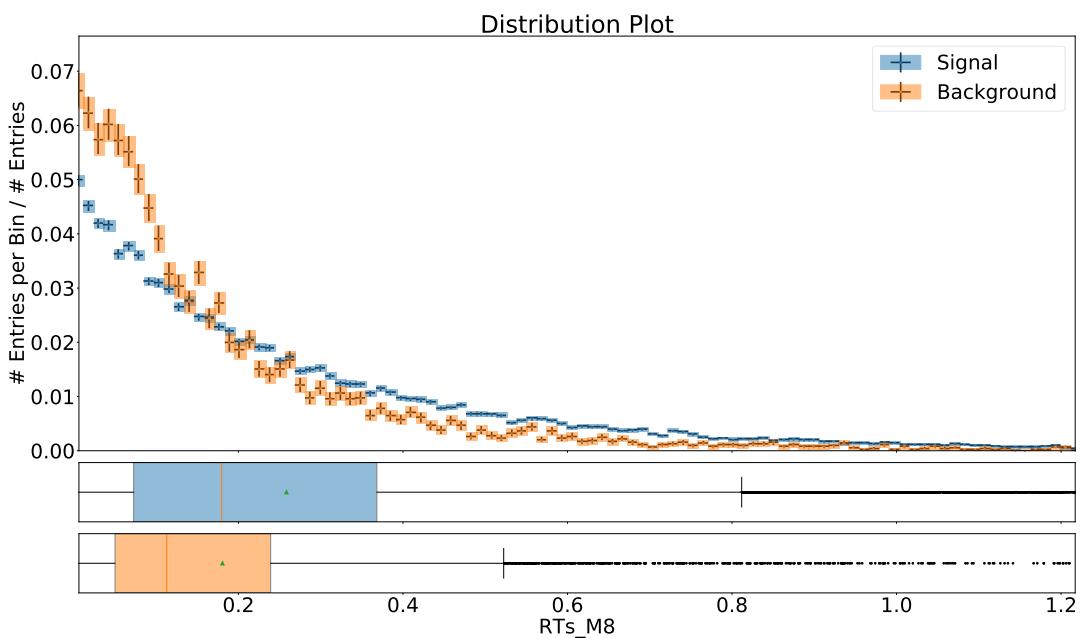
2.88 smoothedChi2_median



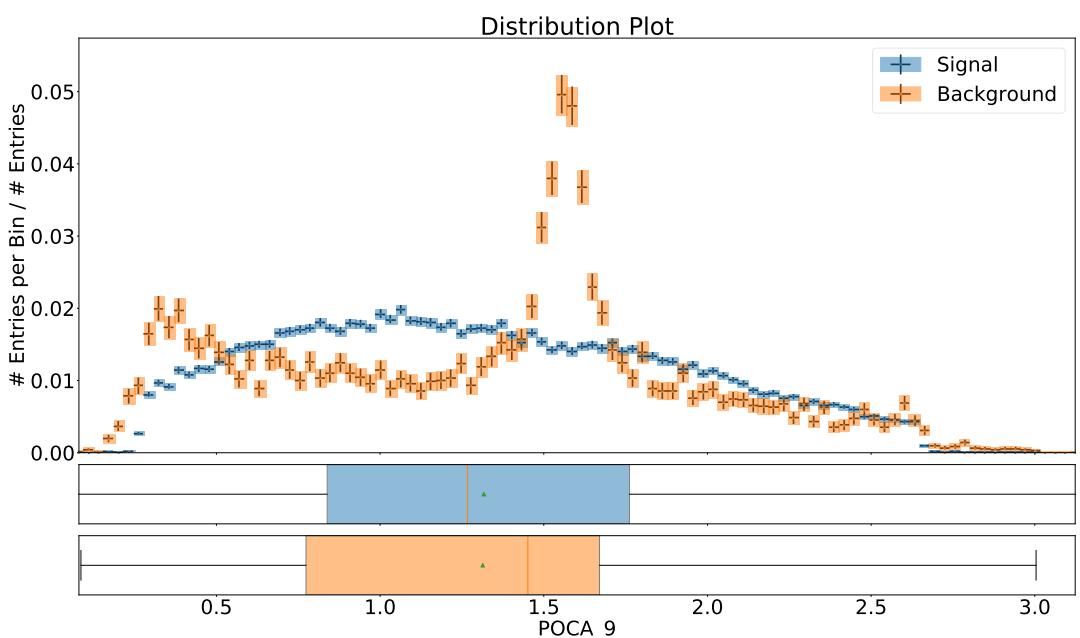
2.89 weight_std



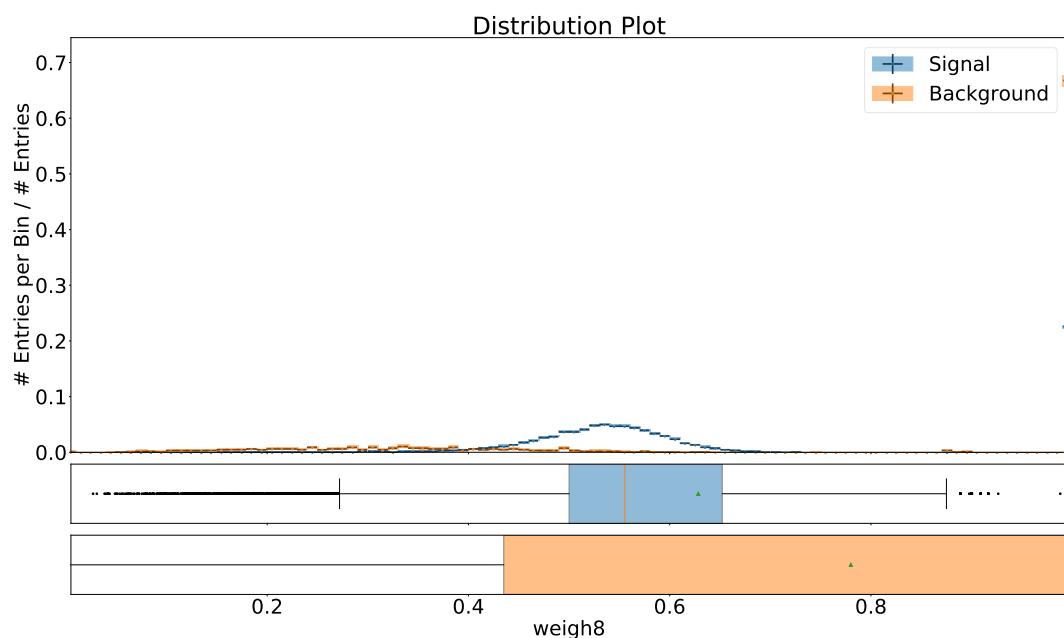
2.90 RTs_Min_Pos_diff_Phi



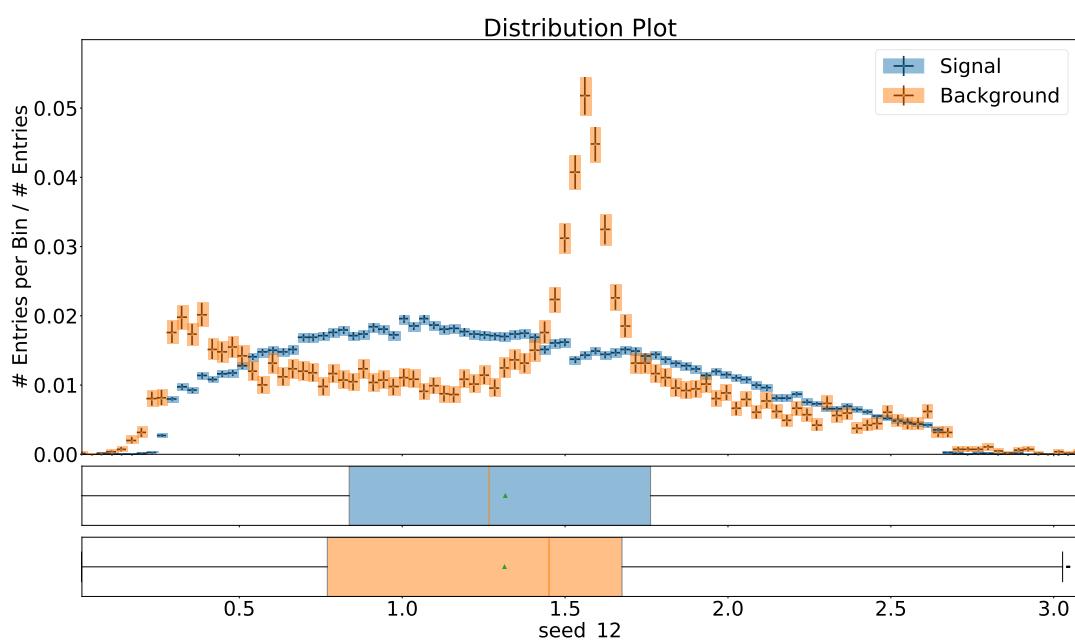
2.91 POCA_Mom_Theta



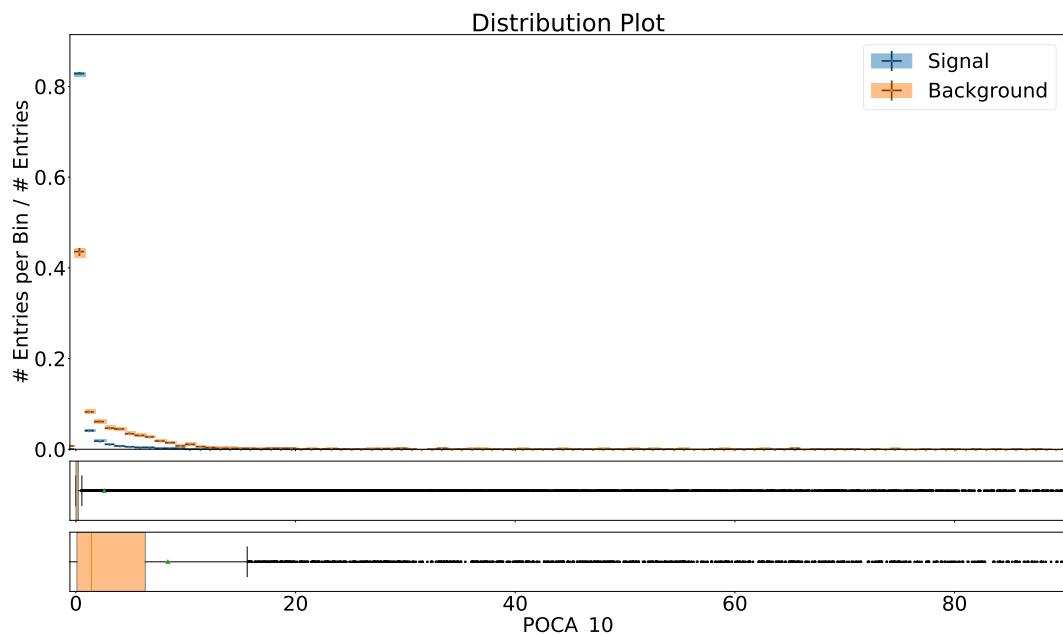
2.92 weight_mean



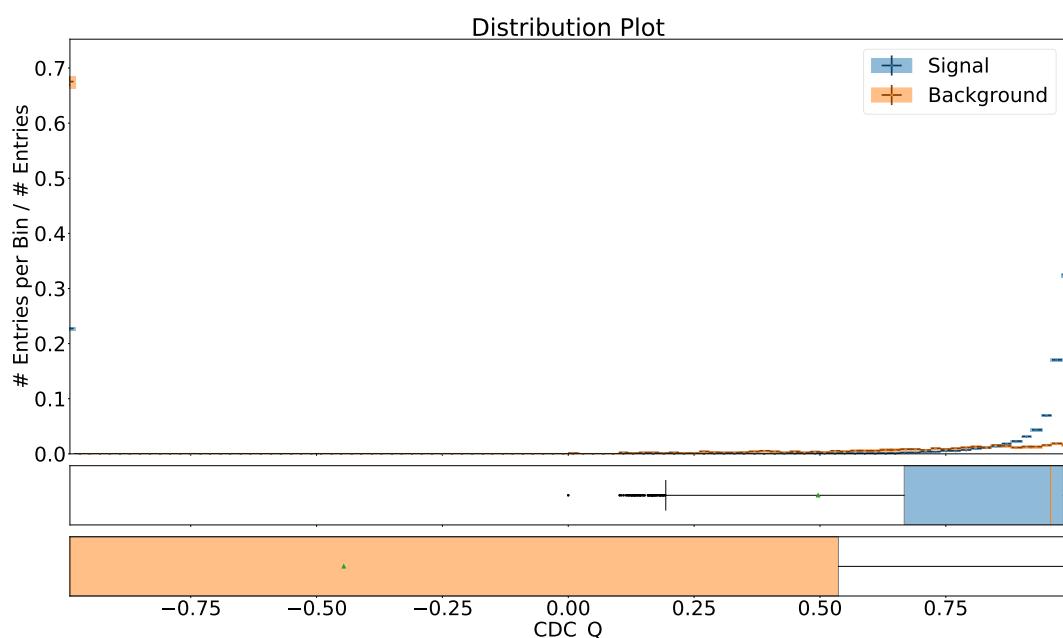
2.93 seed_Mom_Theta



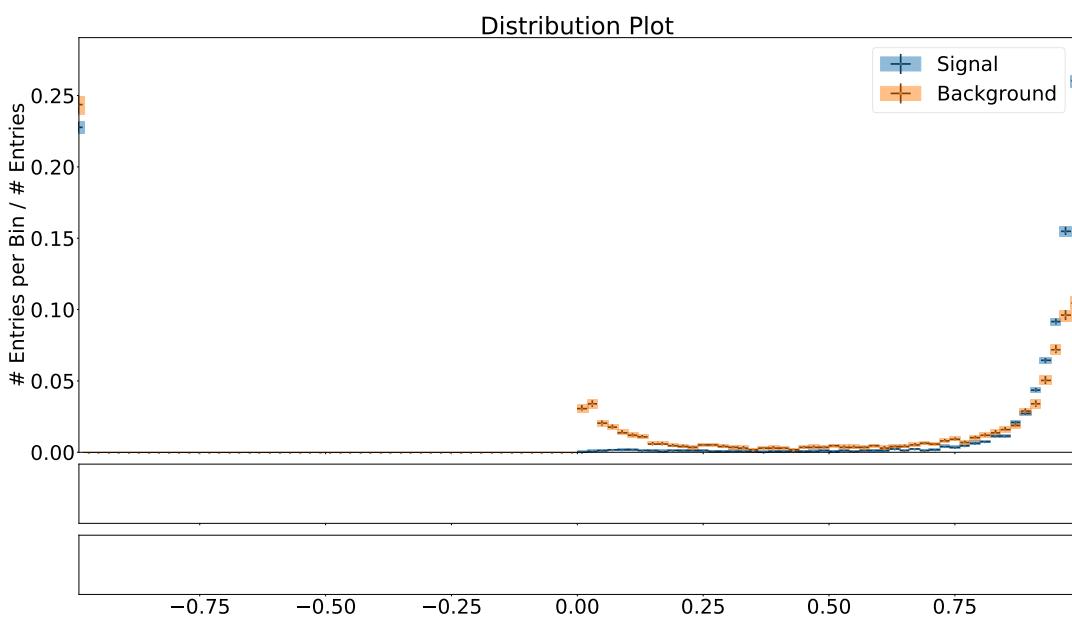
2.94 POCA_Pos_Mag



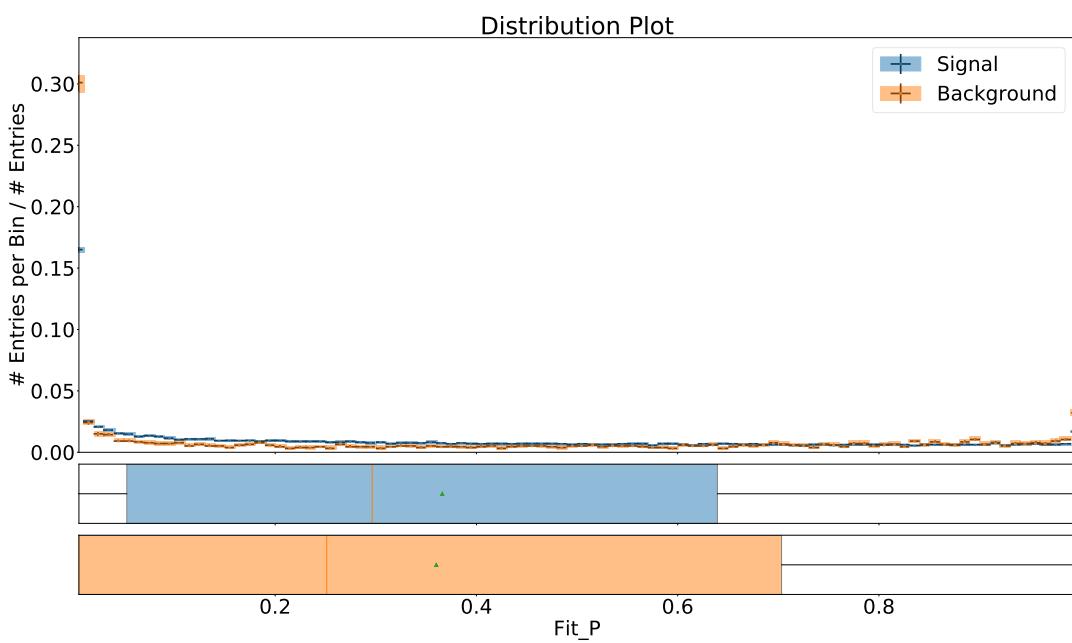
2.95 CDC_QI



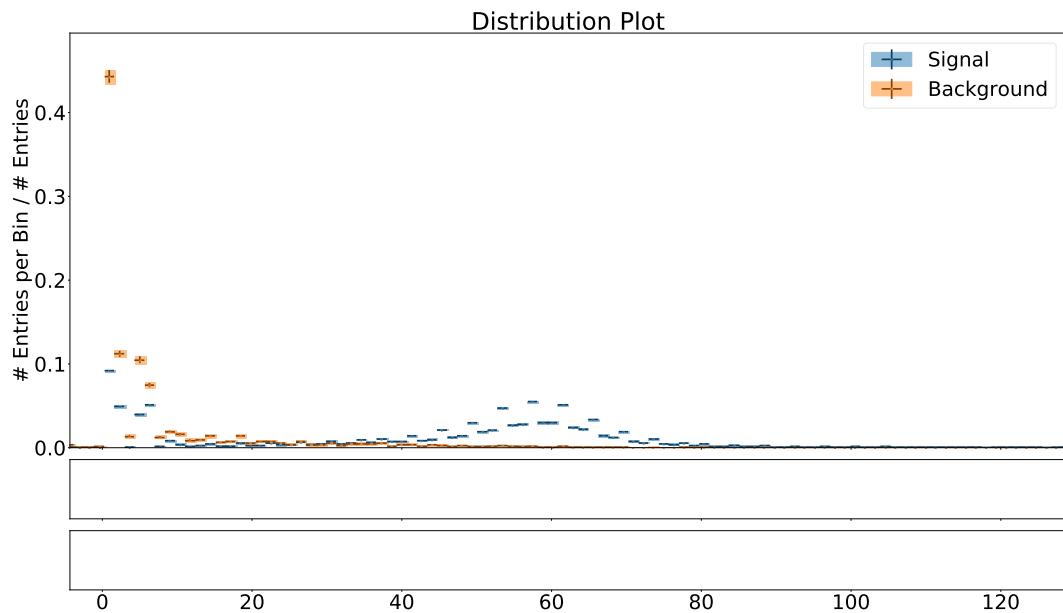
2.96 SVD_QI



2.97 Fit_PVal



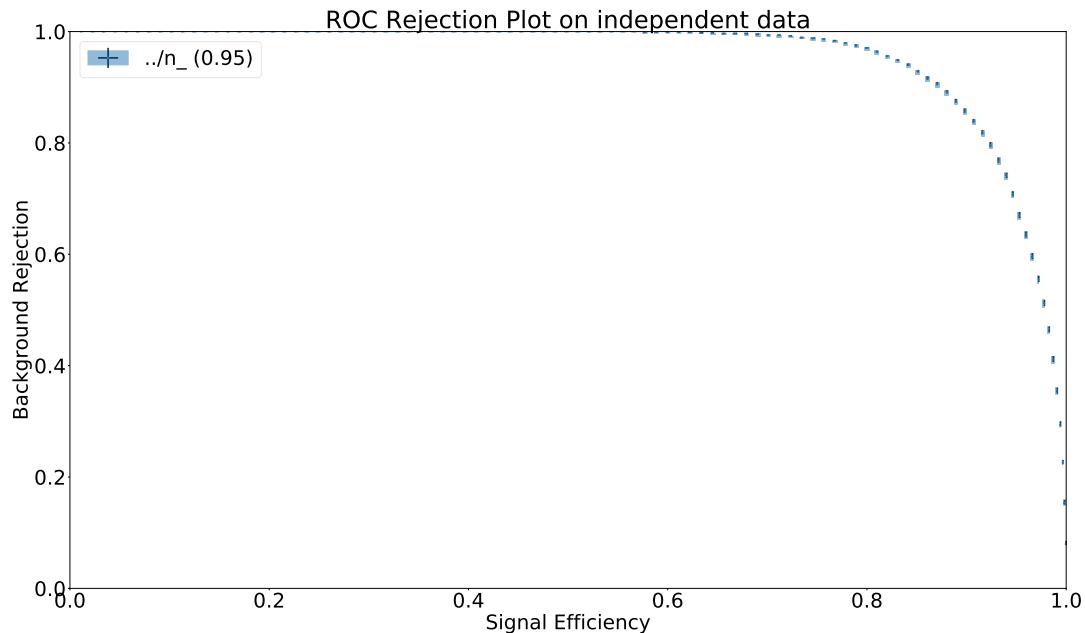
2.98 Fit_Ndf



3 Classifier Plot

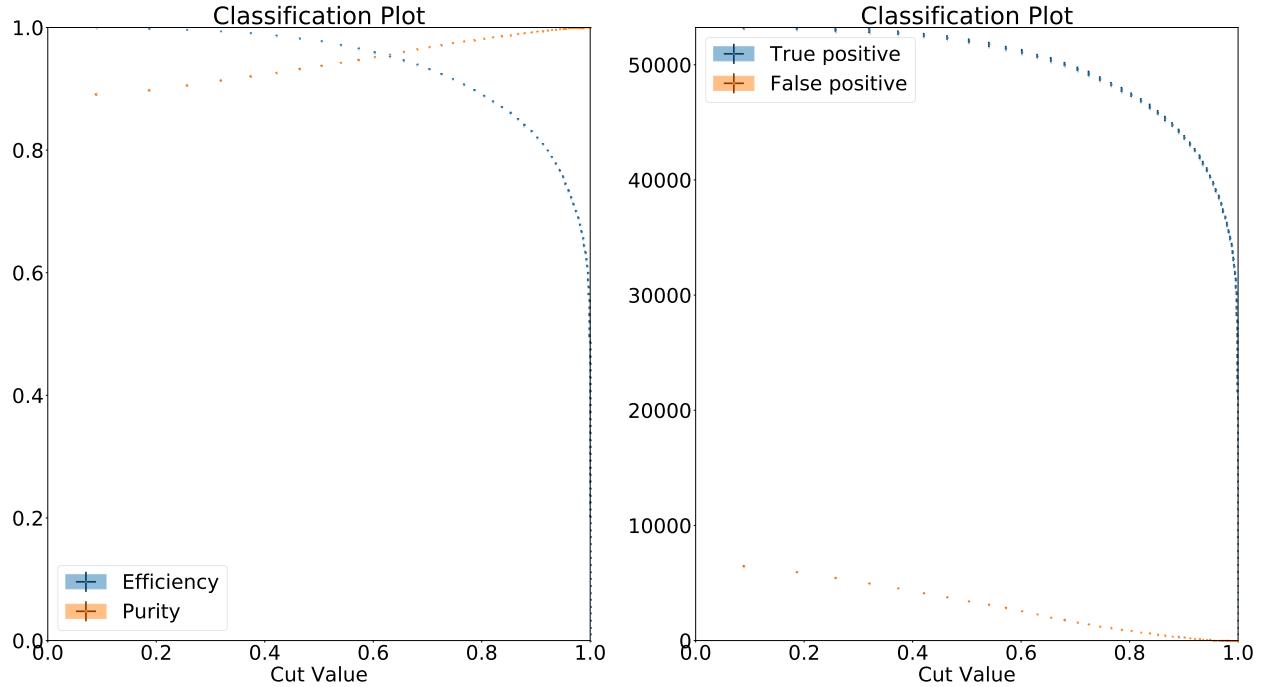
This section contains the receiver operating characteristics (ROC), purity projection, ...of the classifiers on training and independent data. The legend of each plot contains the shortened identifier and the area under the ROC curve in parenthesis.

4 ROC Plot



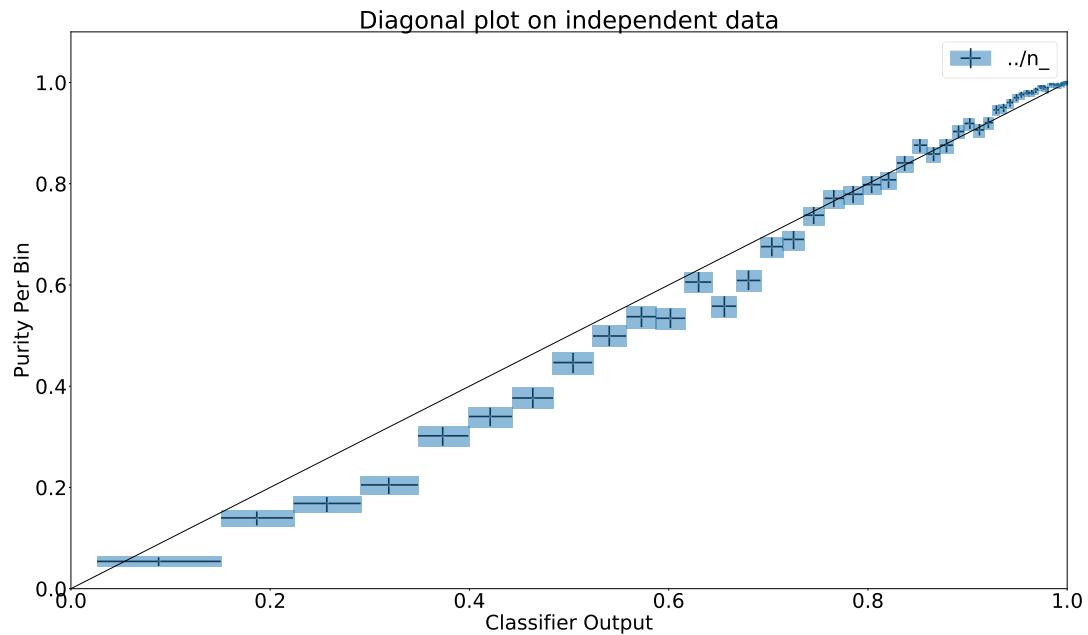
5 Classification Results

5.1 $../\mathbf{n}_-$



6 Diagonal Plot

6.1 $../\mathbf{n}_-$



7 Spectators

This section contains the distribution and dependence on the classifier outputs of all spectator variables.

Table 3: Abbreviations of spectators

Spectator	Abbreviation