First Failed Fitting Attempts

(I like the alliteration, but hate aidy :))

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Hamburg, 18.11.2024

HELMHOLTZ

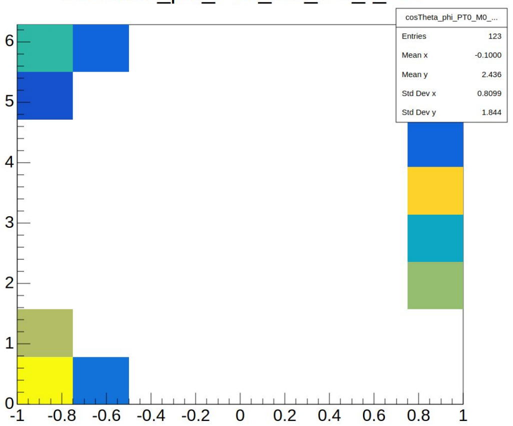
DESY.

Scans and Control Plots

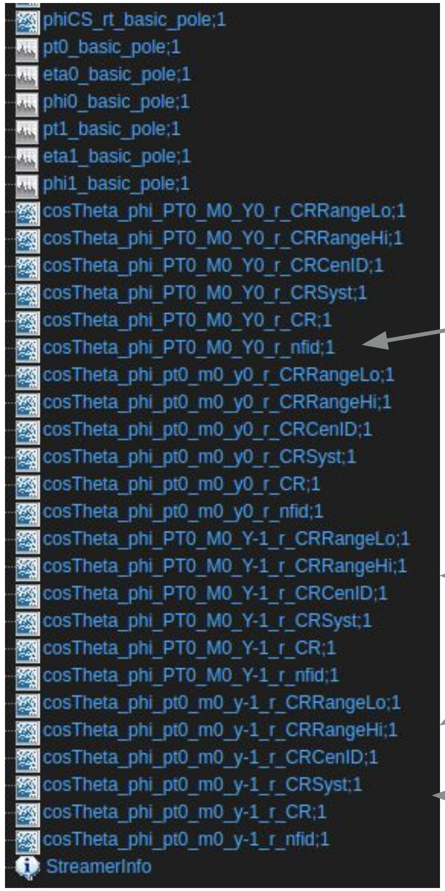
Problems with cosTheta_phi

- SR scans in *.root files,
  CR scans in *_loose.root files
  - (necessary for FakeFactors)
- somehow SR cosTheta_phi is in both root files (but empty in _loose)
  - which can cause crash because the FakeEstimator tries to overwrite a histogram
  - I only experience this crash for MY binning, not for PtY

cosTheta_phi_PT0_M0_Y-1_r_CR



hists_loose
PtY binning



```
phiCS_rt_basic_pole;1
pt0_basic_pole;1
eta0_basic_pole;1
phi0_basic_pole;1
pt1_basic_pole;1
eta1_basic_pole;1
phi1_basic_pole;1
cosTheta_phi_PT0_M0_Y0_r_CRRangeLo;1
cosTheta_phi_PT0_M0_Y0_r_CRRangeHi;1
cosTheta_phi_PT0_M0_Y0_r_CRCenID;1
cosTheta_phi_PT0_M0_Y0_r_CRSyst;1
cosTheta_phi_PT0_M0_Y0_r_CR;1
cosTheta_phi_PT0_M0_Y0_r_nfid;1
cosTheta_phi_pt0_m0_y0_r_CRRangeLo;1
cosTheta_phi_pt0_m0_y0_r_CRRangeHi;1
cosTheta_phi_pt0_m0_y0_r_CRCenID;1
cosTheta_phi_pt0_m0_y0_r_CRSyst;1
cosTheta_phi_pt0_m0_y0_r_CR;1
cosTheta_phi_pt0_m0_y0_r_nfid;1
cosTheta_phi_PT0_M0_Y-1_r_CRRangeLo;1
cosTheta_phi_PT0_M0_Y-1_r_CRRangeHi;1
cosTheta_phi_PT0_M0_Y-1_r_CRCenID;1
cosTheta_phi_PT0_M0_Y-1_r_CRSyst;1
cosTheta_phi_PT0_M0_Y-1_r_CR;1
cosTheta_phi_PT0_M0_Y-1_r_nfid;1
cosTheta_phi_pt0_m0_y-1_r_CRRangeLo;1
cosTheta_phi_pt0_m0_y-1_r_CRRangeHi;1
cosTheta_phi_pt0_m0_y-1_r_CRCenID;1
cosTheta_phi_pt0_m0_y-1_r_CRSyst;1
cosTheta_phi_pt0_m0_y-1_r_CR;1
cosTheta_phi_pt0_m0_y-1_r_nfid;1
StreamerInfo
```

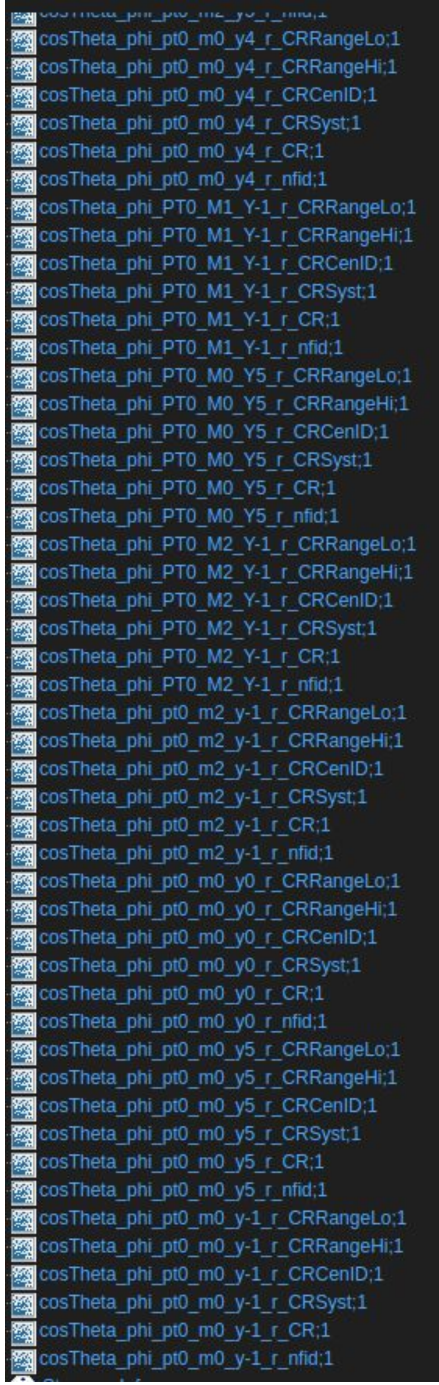
why are there more entries for YM binning than PtY binning?

why are there SR entries?

what's the difference between upper and lower case?

what is rapidity bin -1 ?

hists_loose
MY binning

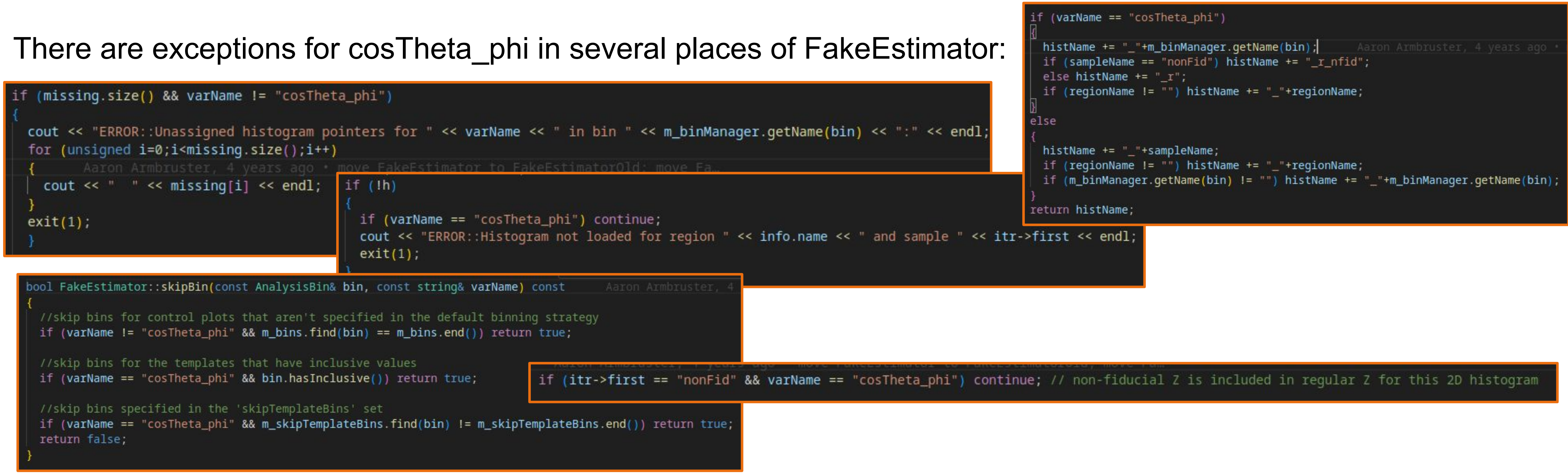


```
cosTheta_phi_pt0_m2_y5_r_nfid;1
cosTheta_phi_pt0_m0_y4_r_CRRangeLo;1
cosTheta_phi_pt0_m0_y4_r_CRRangeHi;1
cosTheta_phi_pt0_m0_y4_r_CRCenID;1
cosTheta_phi_pt0_m0_y4_r_CRSyst;1
cosTheta_phi_pt0_m0_y4_r_CR;1
cosTheta_phi_pt0_m0_y4_r_nfid;1
cosTheta_phi_PT0_M1_Y-1_r_CRRangeLo;1
cosTheta_phi_PT0_M1_Y-1_r_CRRangeHi;1
cosTheta_phi_PT0_M1_Y-1_r_CRCenID;1
cosTheta_phi_PT0_M1_Y-1_r_CRSyst;1
cosTheta_phi_PT0_M1_Y-1_r_CR;1
cosTheta_phi_PT0_M1_Y-1_r_nfid;1
cosTheta_phi_PT0_M0_Y5_r_CRRangeLo;1
cosTheta_phi_PT0_M0_Y5_r_CRRangeHi;1
cosTheta_phi_PT0_M0_Y5_r_CRCenID;1
cosTheta_phi_PT0_M0_Y5_r_CRSyst;1
cosTheta_phi_PT0_M0_Y5_r_CR;1
cosTheta_phi_PT0_M0_Y5_r_nfid;1
cosTheta_phi_PT0_M2_Y-1_r_CRRangeLo;1
cosTheta_phi_PT0_M2_Y-1_r_CRRangeHi;1
cosTheta_phi_PT0_M2_Y-1_r_CRCenID;1
cosTheta_phi_PT0_M2_Y-1_r_CRSyst;1
cosTheta_phi_PT0_M2_Y-1_r_CR;1
cosTheta_phi_PT0_M2_Y-1_r_nfid;1
cosTheta_phi_pt0_m2_y-1_r_CRRangeLo;1
cosTheta_phi_pt0_m2_y-1_r_CRRangeHi;1
cosTheta_phi_pt0_m2_y-1_r_CRCenID;1
cosTheta_phi_pt0_m2_y-1_r_CRSyst;1
cosTheta_phi_pt0_m2_y-1_r_CR;1
cosTheta_phi_pt0_m2_y-1_r_nfid;1
cosTheta_phi_pt0_m0_y0_r_CRRangeLo;1
cosTheta_phi_pt0_m0_y0_r_CRRangeHi;1
cosTheta_phi_pt0_m0_y0_r_CRCenID;1
cosTheta_phi_pt0_m0_y0_r_CRSyst;1
cosTheta_phi_pt0_m0_y0_r_CR;1
cosTheta_phi_pt0_m0_y0_r_nfid;1
cosTheta_phi_pt0_m0_y5_r_CRRangeLo;1
cosTheta_phi_pt0_m0_y5_r_CRRangeHi;1
cosTheta_phi_pt0_m0_y5_r_CRCenID;1
cosTheta_phi_pt0_m0_y5_r_CRSyst;1
cosTheta_phi_pt0_m0_y5_r_CR;1
cosTheta_phi_pt0_m0_y5_r_nfid;1
cosTheta_phi_pt0_m0_y-1_r_CRRangeLo;1
cosTheta_phi_pt0_m0_y-1_r_CRRangeHi;1
cosTheta_phi_pt0_m0_y-1_r_CRCenID;1
cosTheta_phi_pt0_m0_y-1_r_CRSyst;1
cosTheta_phi_pt0_m0_y-1_r_CR;1
cosTheta_phi_pt0_m0_y-1_r_nfid;1
```

Scans and Control Plots

Exceptions for cosTheta_phi

There are exceptions for cosTheta_phi in several places of FakeEstimator:



```
if (missing.size() && varName != "cosTheta_phi")
{
  cout << "ERROR::Unassigned histogram pointers for " << varName << " in bin " << m_binManager.getName(bin) << ":" << endl;
  for (unsigned i=0;i<missing.size();i++)
  {      Aaron Armbruster, 4 years ago • move FakeEstimator to FakeEstimatorOld; move Fa…
    cout << "  " << missing[i] << endl;
  }
  exit(1);
  }
```

```
if (!h)
{
  if (varName == "cosTheta_phi") continue;
  cout << "ERROR::Histogram not loaded for region " << info.name << " and sample " << itr->first << endl;
  exit(1);
}
```

```
if (varName == "cosTheta_phi")
{
  histName += "_"+m_binManager.getName(bin);      Aaron Armbruster, 4 years ago •
  if (sampleName == "nonFid") histName += "_r_nfid";
  else histName += "_r";
  if (regionName != "") histName += "_"+regionName;
}
else
{
  histName += "_"+sampleName;
  if (regionName != "") histName += "_"+regionName;
  if (m_binManager.getName(bin) != "") histName += "_"+m_binManager.getName(bin);
}
return histName;
```

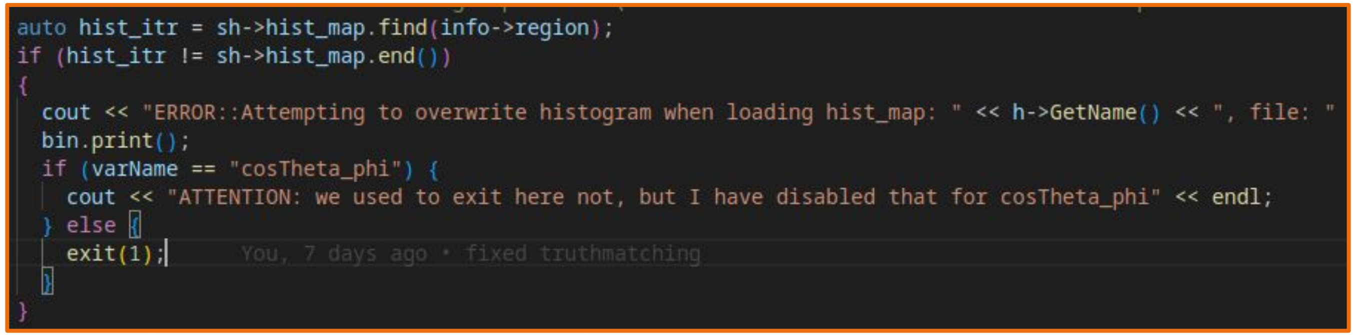
```
bool FakeEstimator::skipBin(const AnalysisBin& bin, const string& varName) const      Aaron Armbruster, 4
{
  //skip bins for control plots that aren't specified in the default binning strategy
  if (varName != "cosTheta_phi" && m_bins.find(bin) == m_bins.end()) return true;

  //skip bins for the templates that have inclusive values
  if (varName == "cosTheta_phi" && bin.hasInclusive()) return true;

  //skip bins specified in the 'skipTemplateBins' set
  if (varName == "cosTheta_phi" && m_skipTemplateBins.find(bin) != m_skipTemplateBins.end()) return true;
  return false;
}
```

```
if (itr->first == "nonFid" && varName == "cosTheta_phi") continue; // non-fiducial Z is included in regular Z for this 2D histogram
```

I just made another one, but that feels dodgy, because I don’t really not what this histograms are being used for.

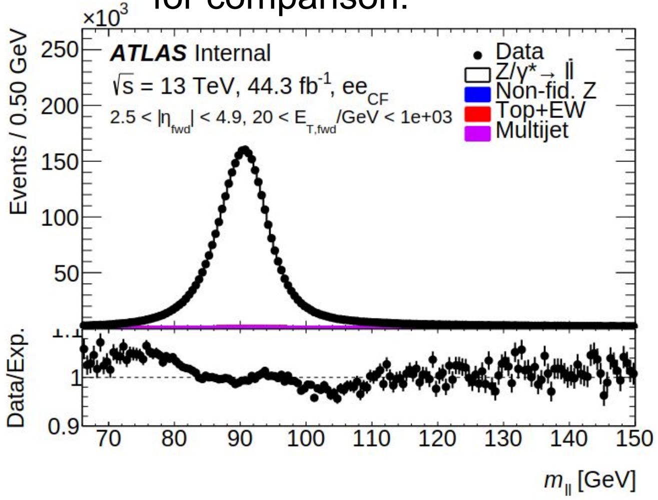


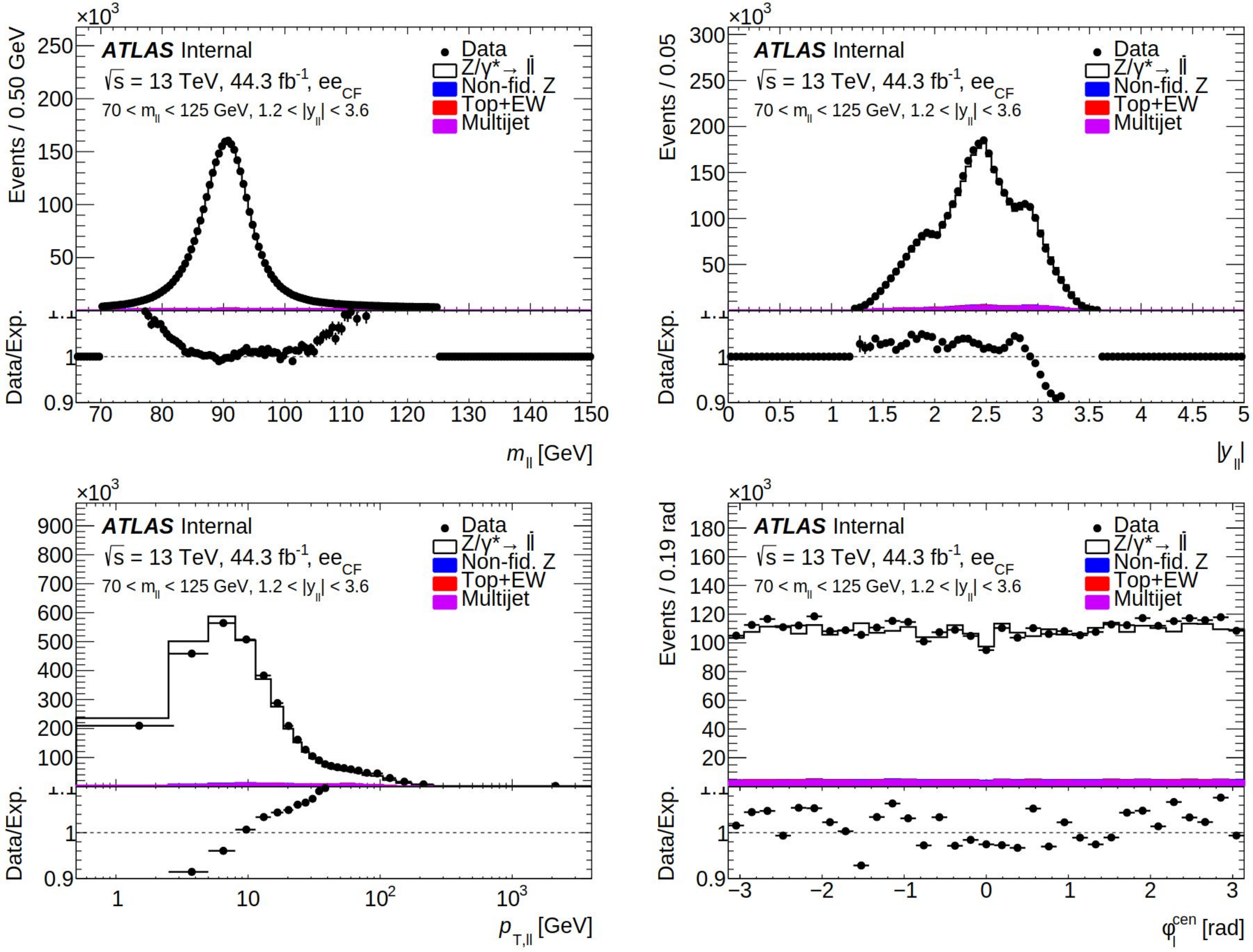
```
auto hist_itr = sh->hist_map.find(info->region);
if (hist_itr != sh->hist_map.end())
{
  cout << "ERROR::Attempting to overwrite histogram when loading hist_map: " << h->GetName() << ", file: "
  bin.print();
  if (varName == "cosTheta_phi") {
    cout << "ATTENTION: we used to exit here not, but I have disabled that for cosTheta_phi" << endl;
  } else {
    exit(1);      You, 7 days ago • fixed truthmatching
  }
}
```

Scans and Control Plots

Results (inclusive, MY binning)

with PtY binning
for comparison:

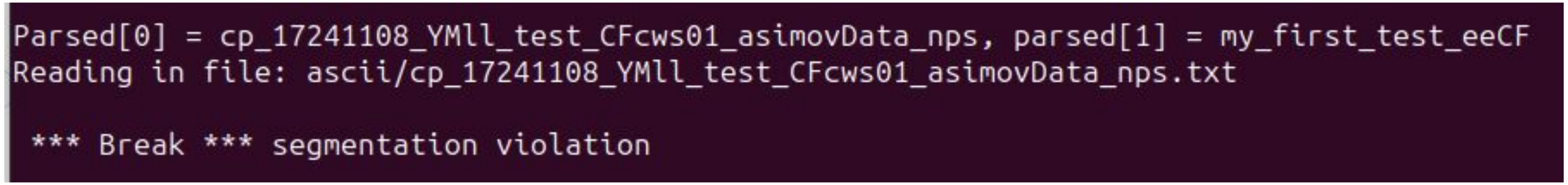




Creating Workspace and Fitting

(or trying to?)

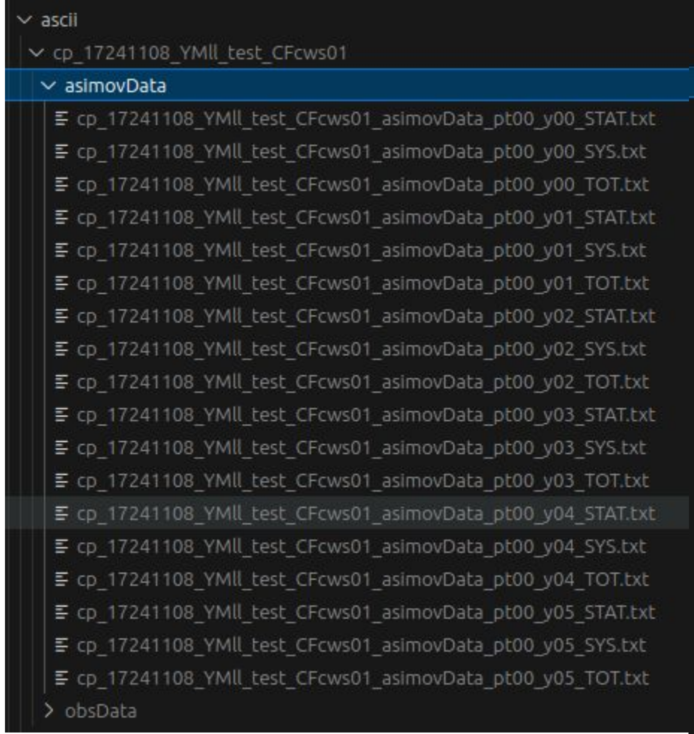
- workspace step seems to run fine now
  - (after updating ftl)
  - but I don’t know which files it should produce
- fitting also runs
  - but I don’t know which files it should produce
- drawing results:
  - root -l macros/ZAi_13TeV_plots/drawPlot_13TeV.C++(\"cp_17241108_YMll_test_CFcws01_asimovData_nps:my_first_test_eeCF\", \"0,1,2,3,4,5,6,7\", 0, \"pt:5,m:2,y:14\", \"2017\", 0, 1, \"binLabel\", -1, -1, -1, \"ytitle\", \"suffix\")
  - results in segmentation violation



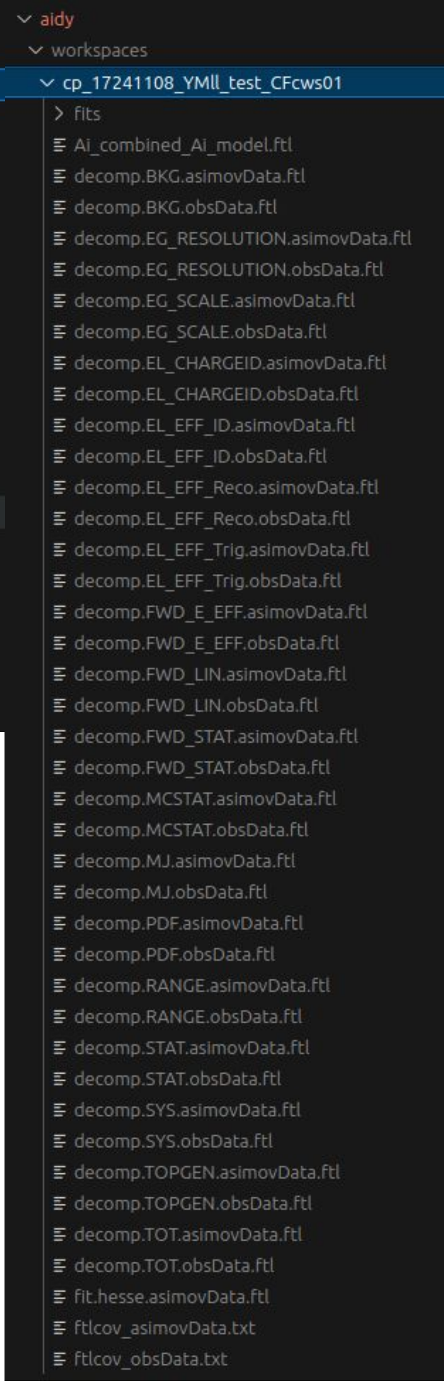
```
Parsed[0] = cp_17241108_YMll_test_CFcws01_asimovData_nps, parsed[1] = my_first_test_eeCF
Reading in file: ascii/cp_17241108_YMll_test_CFcws01_asimovData_nps.txt

 *** Break *** segmentation violation
```

  - please show me what the intermediate steps should look like, so I can bugfix 🥺
    - update: thanks Craig :)



```
∨ ascii
  ∨ cp_17241108_YMll_test_CFcws01
    ∨ asimovData
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y00_STAT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y00_SYS.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y00_TOT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y01_STAT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y01_SYS.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y01_TOT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y02_STAT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y02_SYS.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y02_TOT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y03_STAT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y03_SYS.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y03_TOT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y04_STAT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y04_SYS.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y04_TOT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y05_STAT.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y05_SYS.txt
      cp_17241108_YMll_test_CFcws01_asimovData_pt00_y05_TOT.txt
    > obsData
```



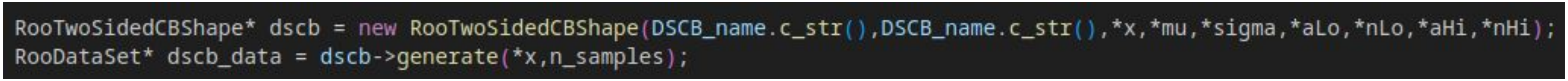
```
∨ aidy
  ∨ workspaces
    ∨ cp_17241108_YMll_test_CFcws01
      > fits
      Ai_combined_Ai_model.ftl
      decomp.BKG.asimovData.ftl
      decomp.BKG.obsData.ftl
      decomp.EG_RESOLUTION.asimovData.ftl
      decomp.EG_RESOLUTION.obsData.ftl
      decomp.EG_SCALE.asimovData.ftl
      decomp.EG_SCALE.obsData.ftl
      decomp.EL_CHARGEID.asimovData.ftl
      decomp.EL_CHARGEID.obsData.ftl
      decomp.EL_EFF_ID.asimovData.ftl
      decomp.EL_EFF_ID.obsData.ftl
      decomp.EL_EFF_Reco.asimovData.ftl
      decomp.EL_EFF_Reco.obsData.ftl
      decomp.EL_EFF_Trig.asimovData.ftl
      decomp.EL_EFF_Trig.obsData.ftl
      decomp.FWD_E_EFF.asimovData.ftl
      decomp.FWD_E_EFF.obsData.ftl
      decomp.FWD_LIN.asimovData.ftl
      decomp.FWD_LIN.obsData.ftl
      decomp.FWD_STAT.asimovData.ftl
      decomp.FWD_STAT.obsData.ftl
      decomp.MCSTAT.asimovData.ftl
      decomp.MCSTAT.obsData.ftl
      decomp.MJ.asimovData.ftl
      decomp.MJ.obsData.ftl
      decomp.PDF.asimovData.ftl
      decomp.PDF.obsData.ftl
      decomp.RANGE.asimovData.ftl
      decomp.RANGE.obsData.ftl
      decomp.STAT.asimovData.ftl
      decomp.STAT.obsData.ftl
      decomp.SYS.asimovData.ftl
      decomp.SYS.obsData.ftl
      decomp.TOPGEN.asimovData.ftl
      decomp.TOPGEN.obsData.ftl
      decomp.TOT.asimovData.ftl
      decomp.TOT.obsData.ftl
      fit.hesse.asimovData.ftl
      ftlcov_asimovData.txt
      ftlcov_obsData.txt
```

BONUS SLIDE

2018 Scan Error

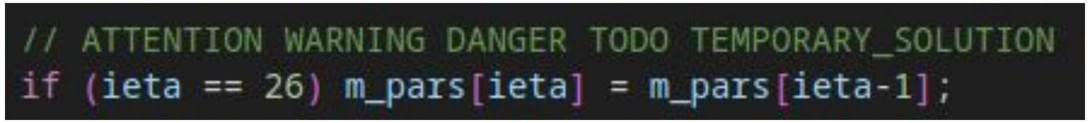
Error in <TFoam::MakeActiveList>: Integrand function is zero

- reproducible during MC scans for 2018
- traced back to FwdElectronCorrectionTool → InSitu Calibration
- only occurs for highest positive eta bin



```
RooTwoSidedCBShape* dscb = new RooTwoSidedCBShape(DSCB_name.c_str(),DSCB_name.c_str(),*x,*mu,*sigma,*aLo,*nLo,*aHi,*nHi);
RooDataSet* dscb_data = dscb->generate(*x,n_samples);
```

- temporary hack: use calibration constants from second-to-highest eta bin



```
// ATTENTION WARNING DANGER TODO TEMPORARY_SOLUTION
if (ieta == 26) m_pars[ieta] = m_pars[ieta-1];
```

Thank you

Contact

Deutsches Elektronen-
Synchrotron DESY

www.desy.de

Name Surname
Department
E-mail
Phone