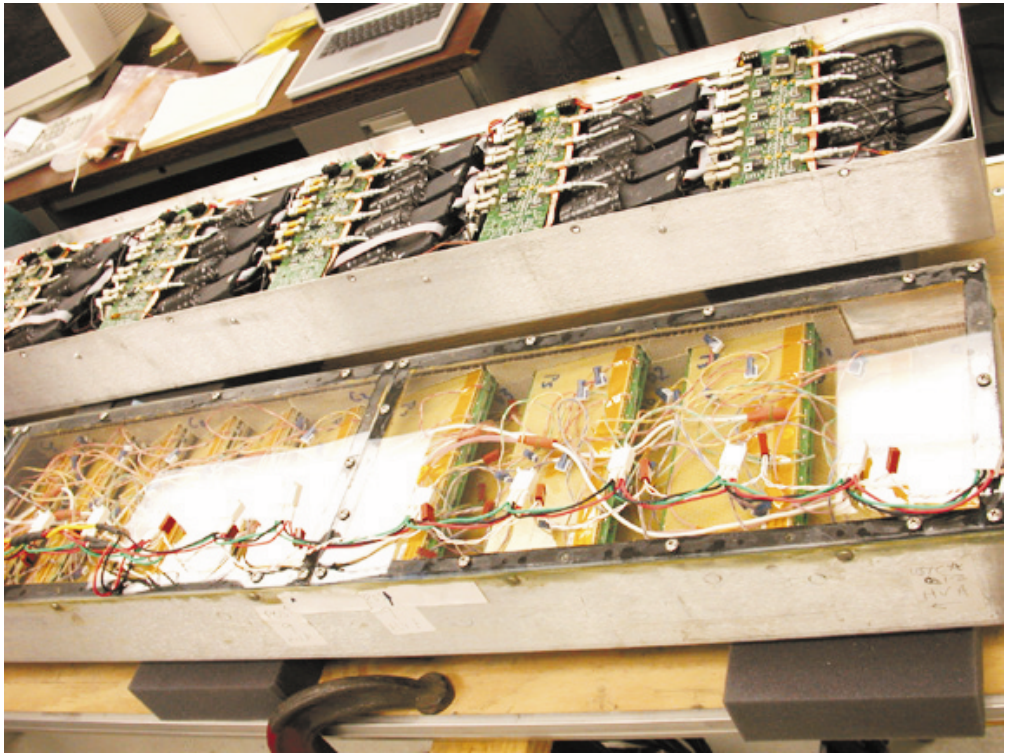


Status of TOFp and pVPD Calibrations for d+Au

W.J. Llope, Rice
STAR Collaboration Meeting
East Lansing, August 15, 2003

Start-side Corrections in dAu
- Event Classes
- "1D" approach
  - Description
  - Resolution by event class
- "2D" approach
  - Description
  - Resolution by event class
- Avg Resolution matrices by (Ne,Nw)
- Where methods are breaking down...

Stop-side Corrections in dAu
- Global offsets by event class
- Description
- TDC slope calibrations
- PID performance

Software

Summary and near-term goals

pVPD in d+Au (~9M evts)

finite rate for any combination of Ne from 1 to 3 and Nw 1 to 3.... (local trigger was “1.and.1”)

relative rate by (Ne,Nw):

	Nw=1	Nw=2	Nw=3
Ne = 1	13%	4%	0.6%
Ne = 2	18%	5%	0.7%
Ne = 3	45%	11%	1.5%

total = 100%

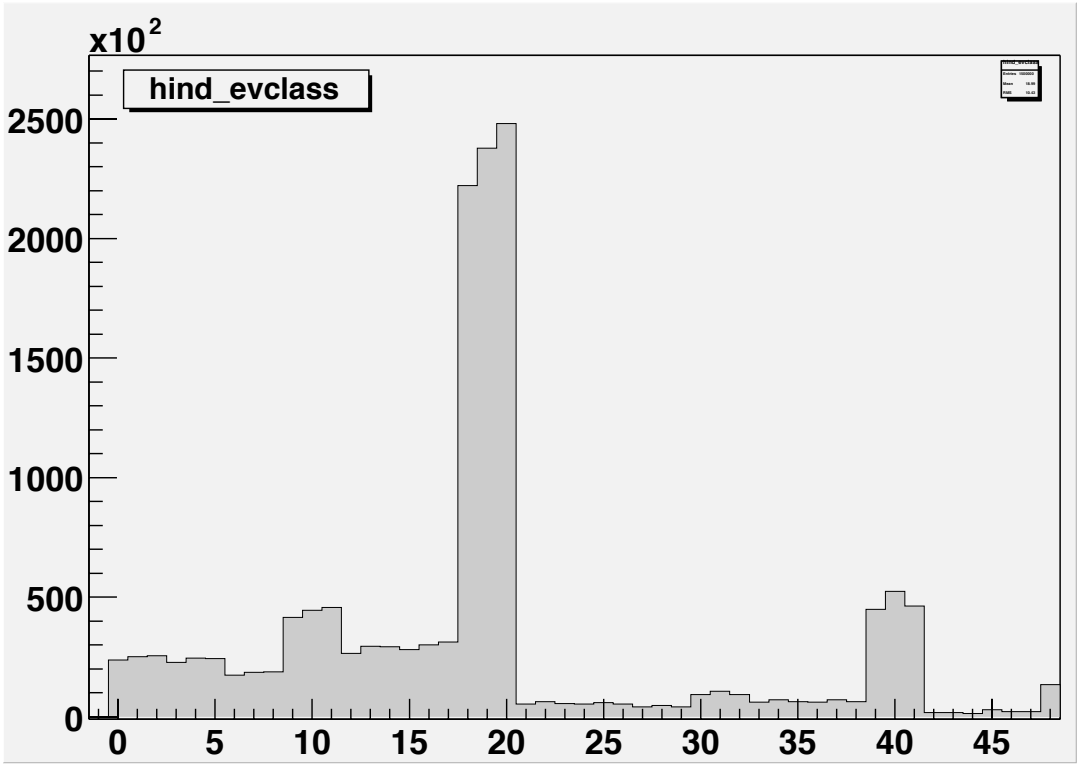
”Event Classes”

	Nw=1	Nw=2	Nw=3
Ne = 1	9	9	3
Ne = 2	9	9	3
Ne = 3	3	3	1

total = 49

Event Class Index [0-48] is unique identifier of which PMTs were live in a given event...

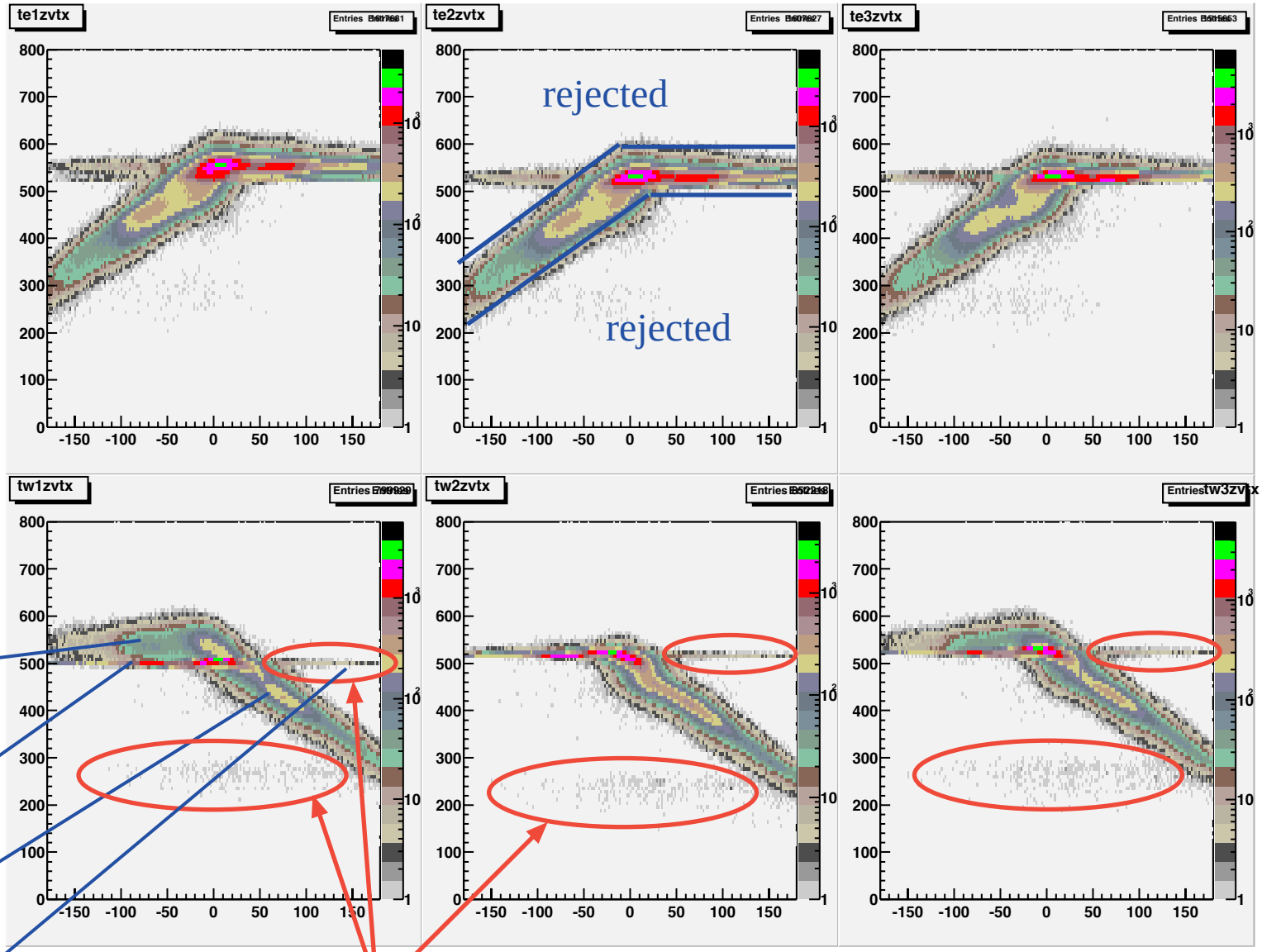
```
ind_EvClass = -1;
if (nw==1) {
        if (ne==1){ ind_EvClass =          ind_E*3  + ind_W;  } else
        if (ne==2){ ind_EvClass =   9 + indp_E*3  + ind_W;  } else
        if (ne==3){ ind_EvClass = 18 +              ind_W;  }
} else if (nw==2) {
        if (ne==1){ ind_EvClass = 21 +   ind_E*3 + indp_W; } else
        if (ne==2){ ind_EvClass = 30 + indp_E*3 + indp_W; } else
        if (ne==3){ ind_EvClass = 39 +              indp_W; }
} else if (nw==3) {
        if (ne==1){ ind_EvClass = 42 +   ind_E;    } else
        if (ne==2){ ind_EvClass = 45 + indp_E;    } else
        if (ne==3){ ind_EvClass = 48;               } }
```



Backgrounds.....

raw TDC values versus Zvtx...

(all event classes)



W1 on same side as start ch

W1 is the start ch

Start ch on East

W1 is start ch but Zvtx on wrong side!

Backgrounds: possible start chs that cannot be “in-time”....
pVPD E-W totally inconsistent w/ Zvtx...
screws up entire timing scale (i.e. stop side)...

General idea

Plot&Fit dependences of differences of (averages of) TDCs on ADC values

→ defines functions& parameters that flatten these difference distributions by definition...

The needed “start time” is the (E+W)/2 average of (average) TDC values

→ Apply the functions that flatten the differences to the averages in a consistent way...

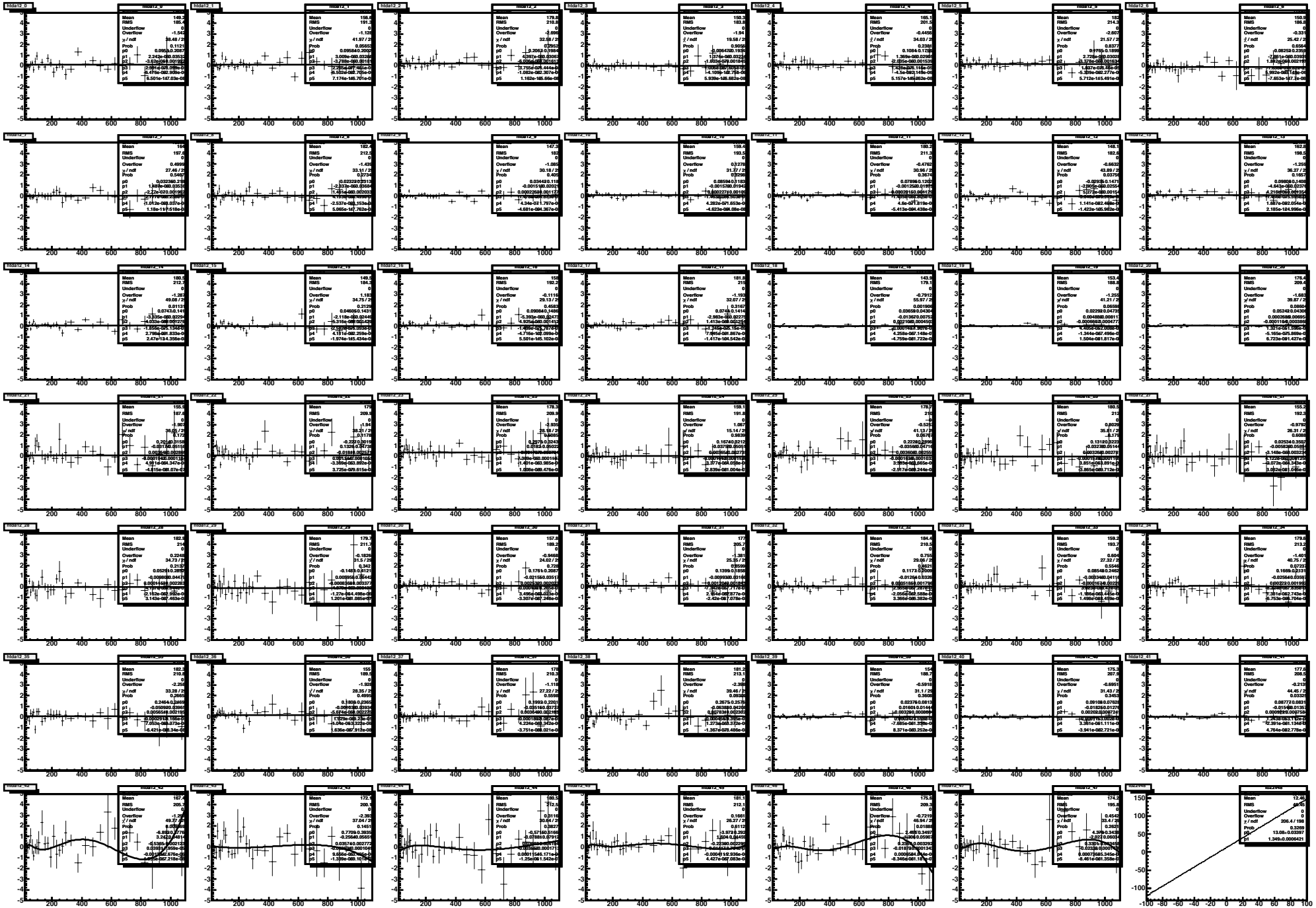
Check whether this worked by looking how the stop-side $1/\beta$-$1/\beta(\pi)$ depends on pVPD ADC values

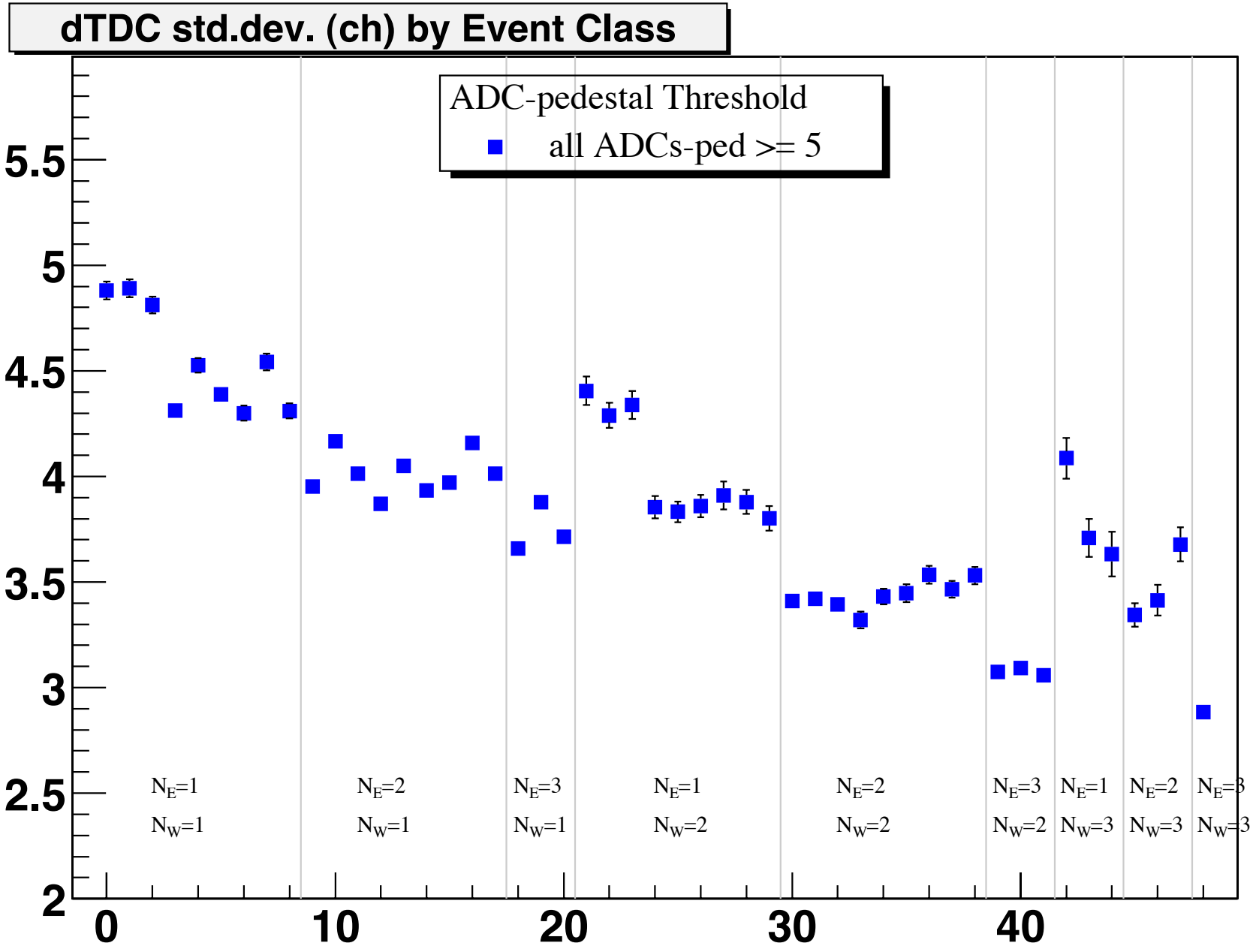
“1D approach”
reject background and define Event Class
flatten dependence of (E+W)/2 on Zvtx w/ linear fit
flatten dependence of this Zvtx residual on the various ADC values, one 1D ADC fit per pass
24 passes total

“2D approach”
reject background and define Event Class
flatten dependence of (E+W)/2 on Zvtx w/ linear fit
flatten dependence of this Zvtx residual on the various ADC values, one 2D ADC fit per pass
12 passes total

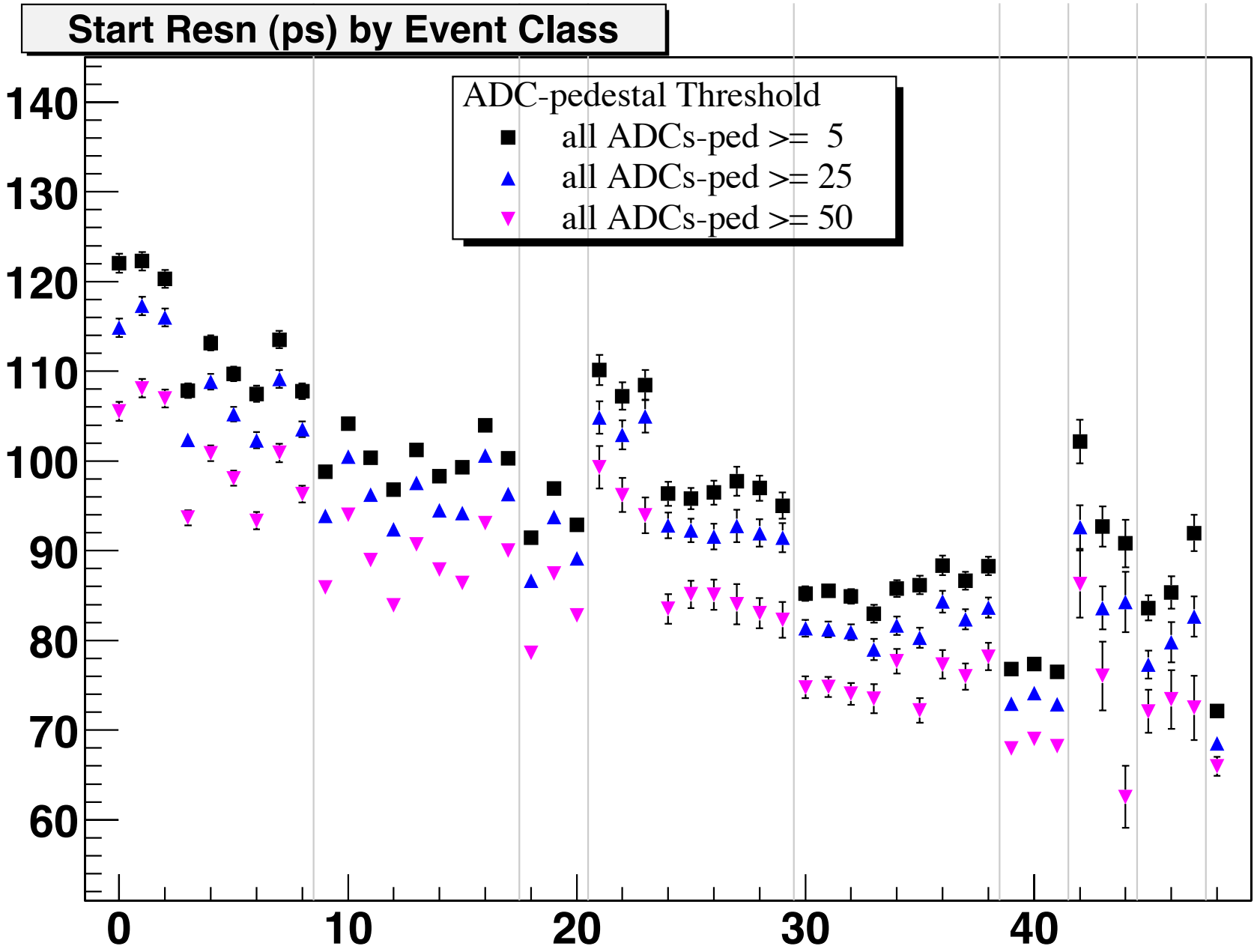
“1D” approach, Before

“1D” approach, After





note Ne=1 event classes containing pVPD detector channel 1 (East, 12 o'clock posn)....
~15% worse resn...

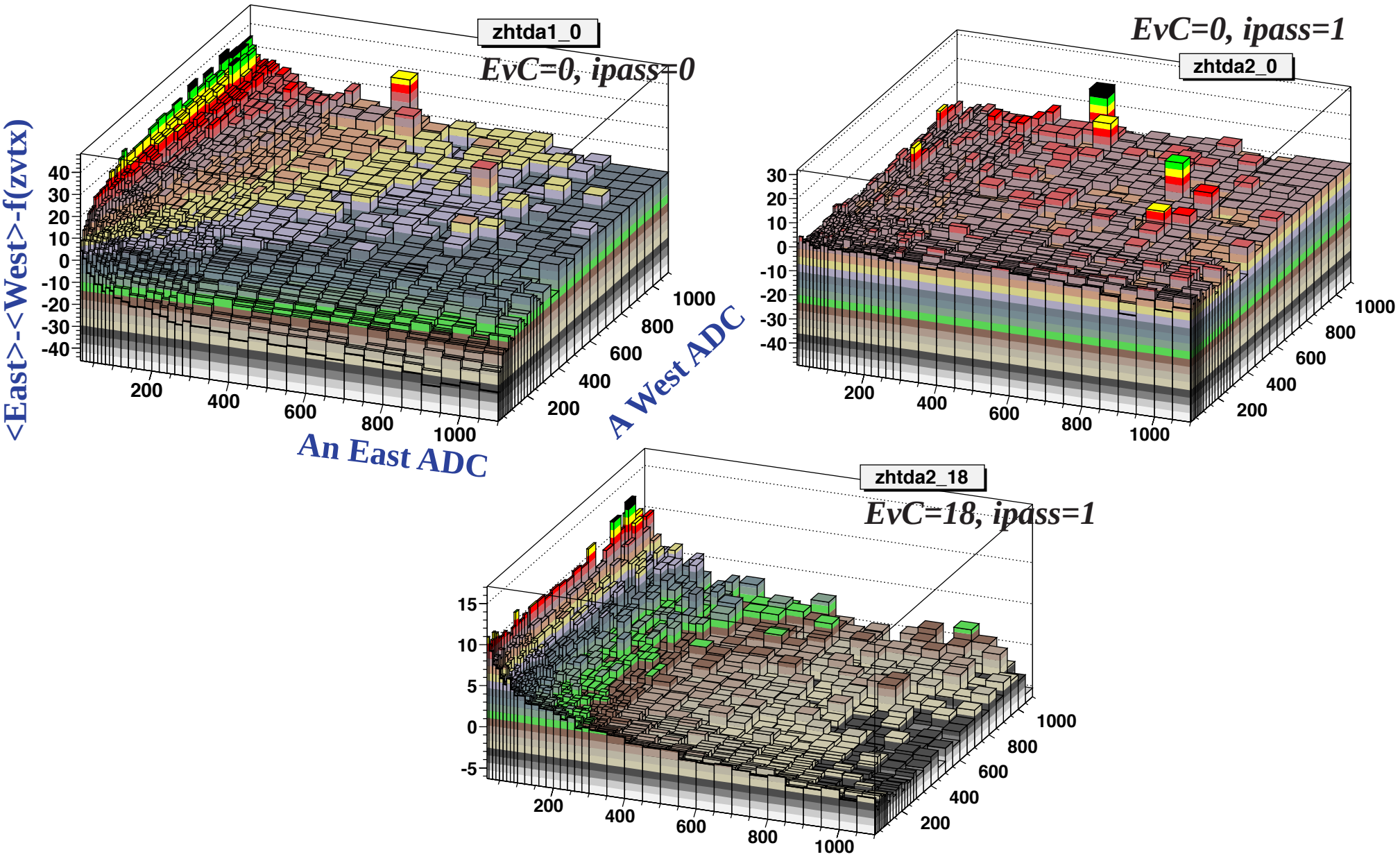


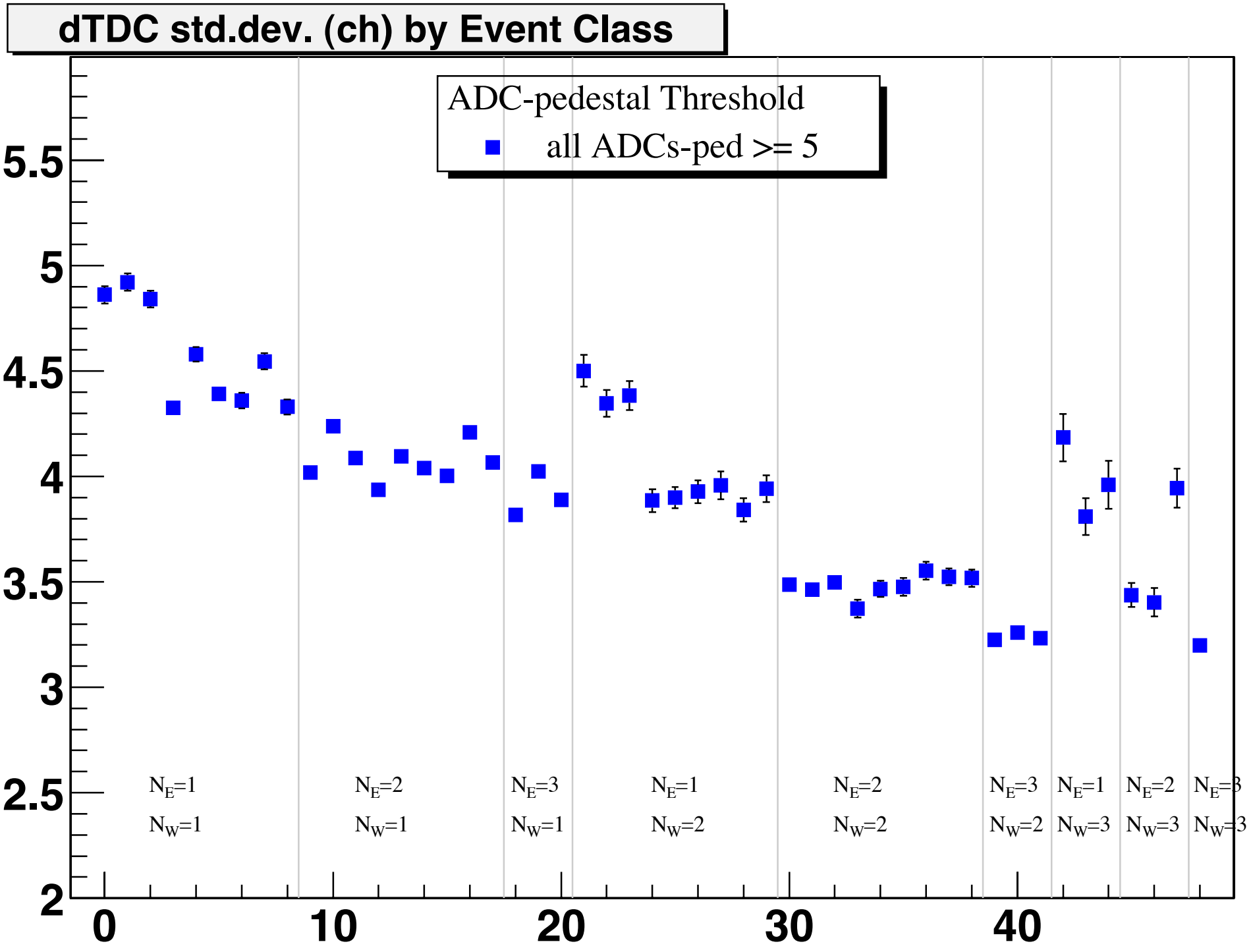
(Ne,Nw) =(3,1) avg resn = **94ps, 90ps, 82ps...**

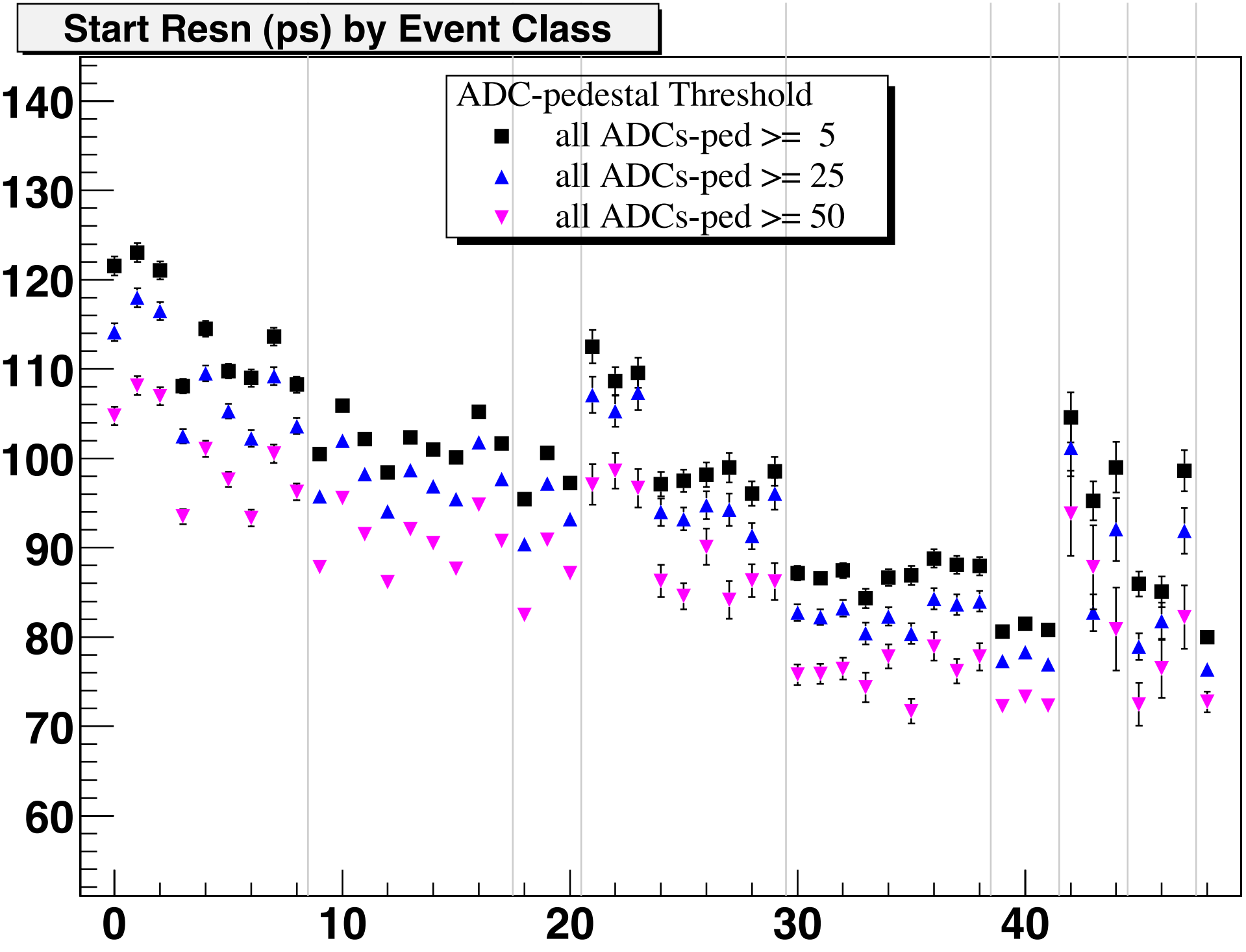
not final (~5% improvement still possible... see later slides)

“2D” approach

flatten same tdc <East>-<West> differences in specific Event classes
in given pass and Event Class, shift E by amount that depends on 2 ADCs
half the number of passes as compared to “1D” method
will give different global offsets than those from “1D” methods




dTDC std.dev. (ch) by Event Class
ADC-pedestal Threshold
all ADCs-ped >= 5
5.5
5
4.5
4
3.5
3
2.5
2
0
10
20
30
40
N_E=1 N_W=1
N_E=2 N_W=1
N_E=3 N_W=1
N_E=1 N_W=2
N_E=2 N_W=2
N_E=3 N_W=2
N_E=1 N_W=3
N_E=2 N_W=3
N_E=3 N_W=3


Start Resn (ps) by Event Class
ADC-pedestal Threshold
all ADCs-ped >= 5
all ADCs-ped >= 25
all ADCs-ped >= 50
140
130
120
110
100
90
80
70
60
0
10
20
30
40

Average Resolution by (Ne,Nw)

“1D” method

Nw \ Ne	1	2	3
1	118.8	104.9	97.2
2	106.7	92.5	81.9
3	106.5	92.9	77.3
1	109.9	96.8	90.3
2	96.5	82.6	74.3
3	90.8	80.2	69.2
1	101.6	89.7	83.5
2	88.2	76.7	69.5
3	83.4	71.0	66.4

“2D method”

Nw \ Ne	1	2	3	
1	114.3	101.9	97.7	} all ADC-ped > 5
2	101.0	87.0	80.9	
3	99.2	89.8	79.9	
1	108.9	97.8	93.6	} all ADC-ped > 25
2	98.1	82.5	77.5	
3	91.9	84.1	76.3	
1	100.2	90.7	86.8	} all ADC-ped > 50
2	90.0	76.1	72.6	
3	87.5	77.0	72.7	

more symmetric than i expected....

our threshold is at ADC-ped ~ 5ch... mip peak is at ADC-ped ~ 7-8ch...

→ **Min <PH>/threshold > 1-2**

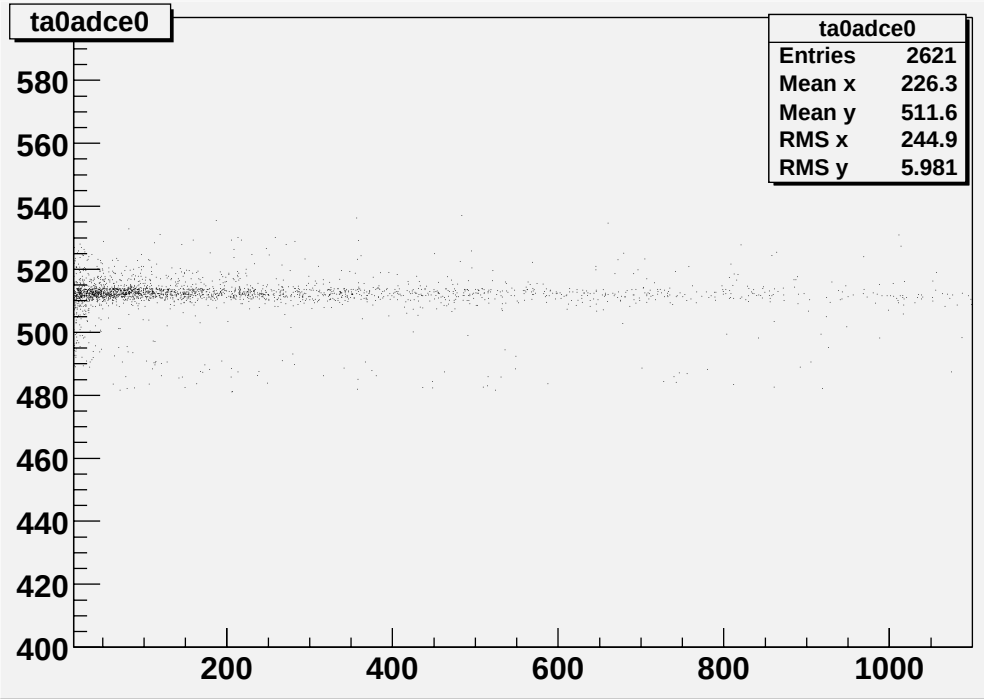
typically want **Min <PH>/threshold > 5-10** for good timing

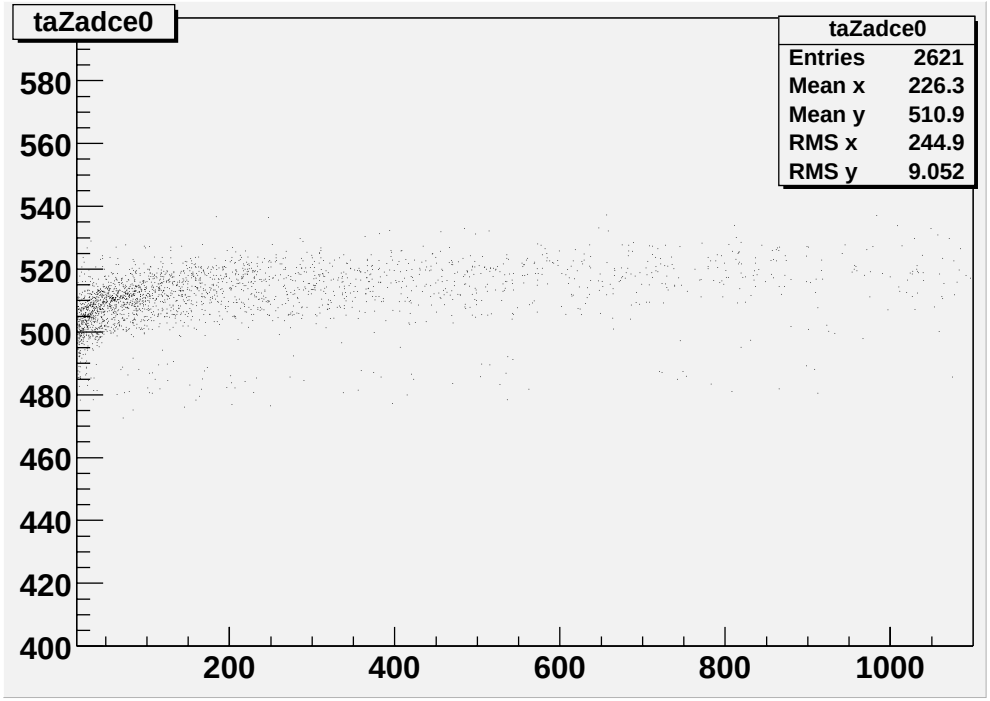
so one can trade Efficiency for Start Resn if needed....

BUT At very low ADC values, some methods are also **breaking down.**...

i.e. flattening differences of (average) TDC values does not necessarily flatten the averages...

magnitude of effect greatest in Event Classes w/ low #s of PMTs on either side....





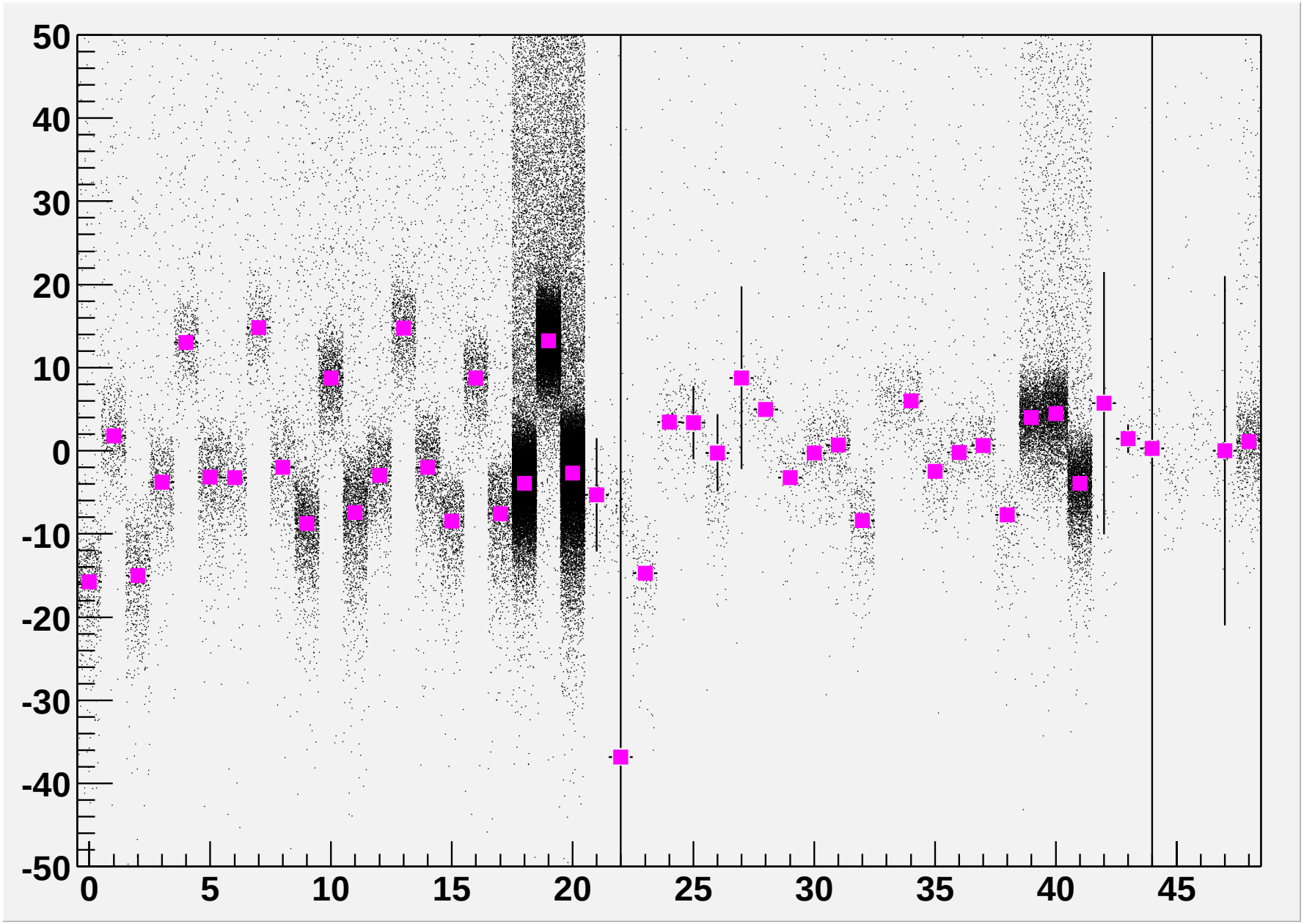
still not quite there yet.....

Event classes w/ Ne=2 or 3 and Nw=1 or 2 are almost all of the data and less sensitive to this “feature”... but i still need to fix this...

(Stop-Side) Global Offsets by Event Class

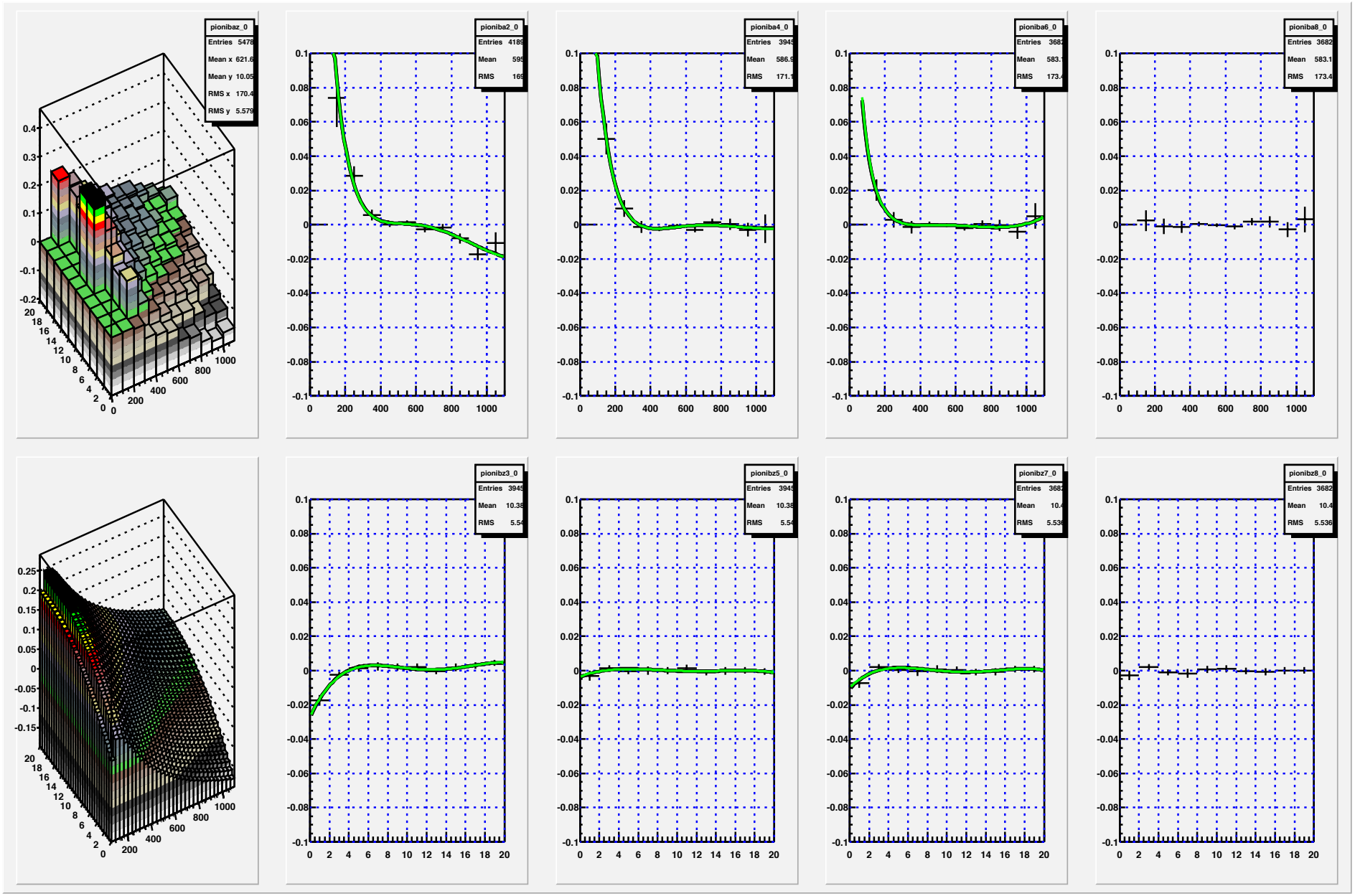
`[1/β-1/β(π)]*savg[irow]/29.98/0.05` vs. Event Class index (over all slats)

→ Offset (in TDC ch) for each (start-side) Event Class...



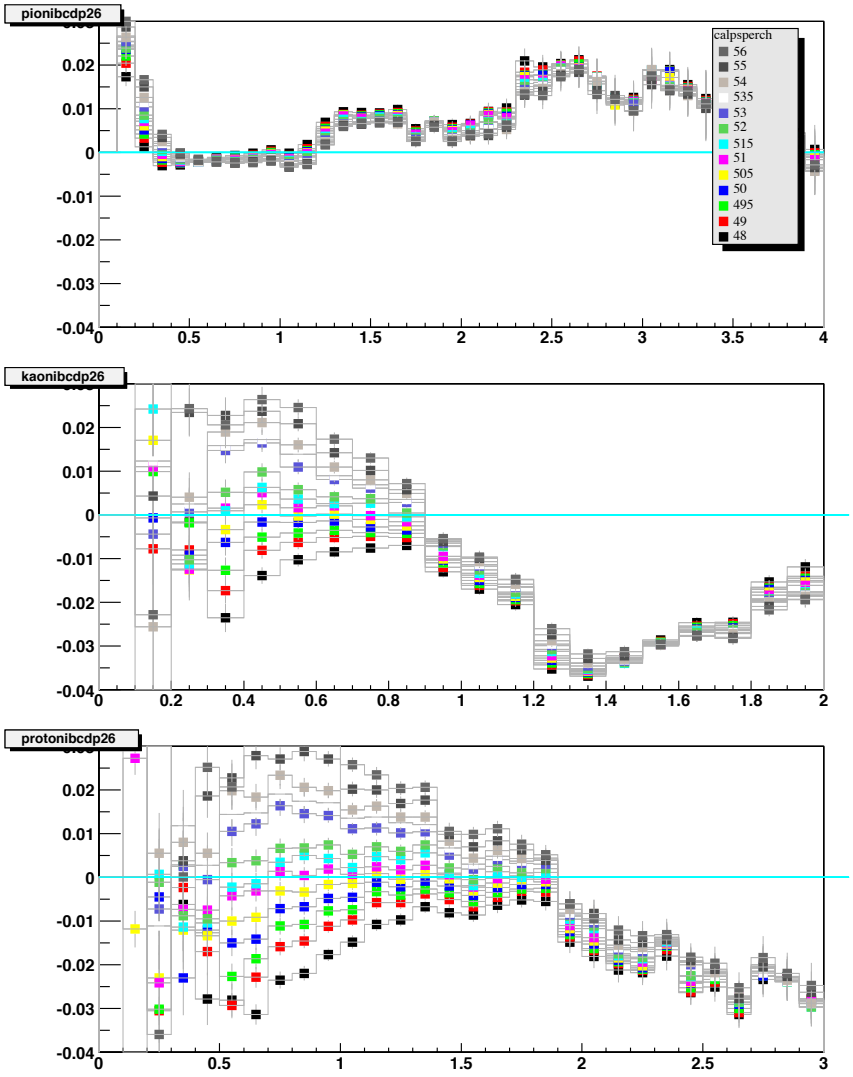
Stop-side corrections

exact same fitting&correction routines used for both run-2 and run-3

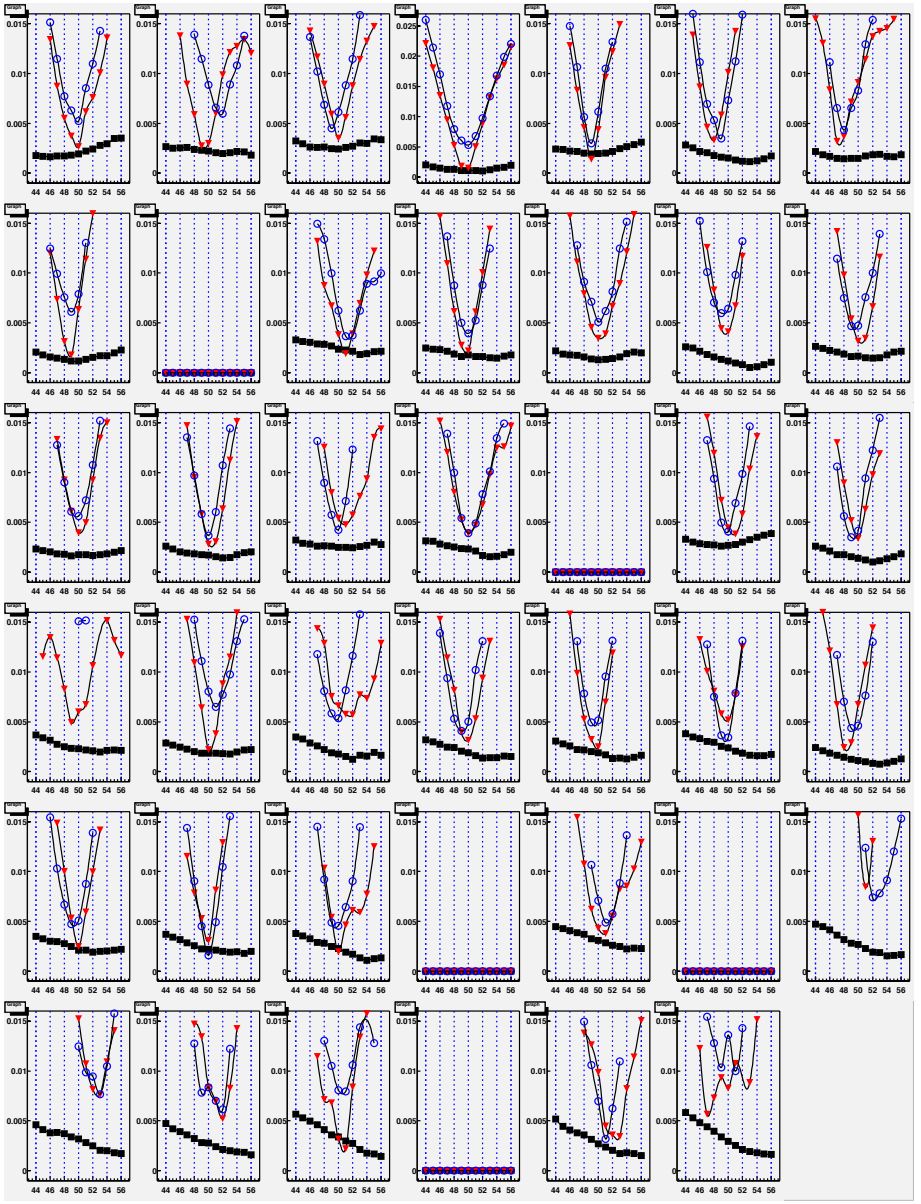


TDC Calibrations

needs ~10% of the statistics necessary to do the (Zhit,ADC) stop-side calibrations....
done solely w/ offline data
same exact technique as for Run-2 AuAu data....

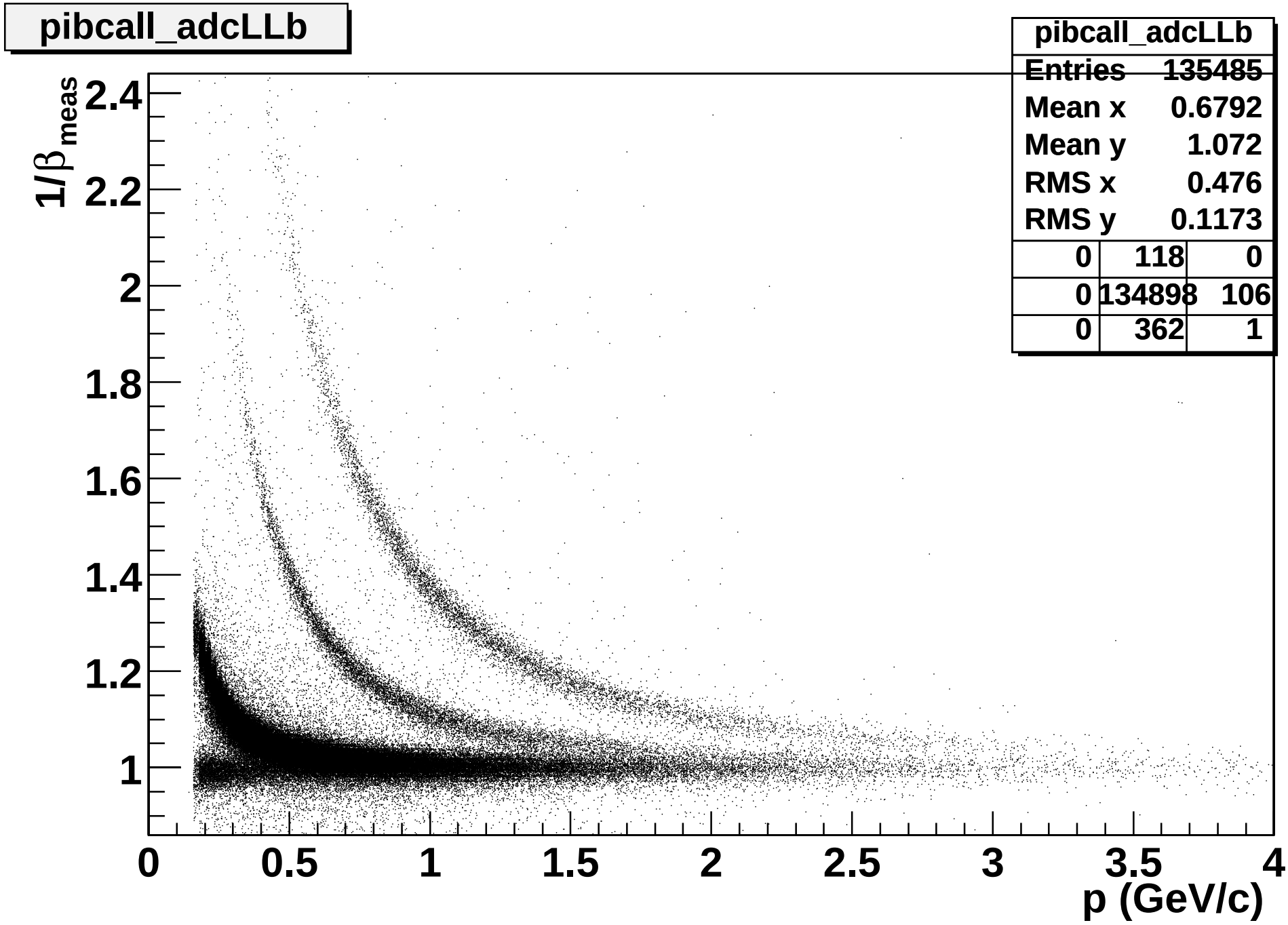


<1/β - 1/βexpected> for π
<1/β - 1/βexpected> for K
<1/β - 1/βexpected> for p



No consistency between Run-2 & Run-3 slopes (no TDCs were changed)

TDC Calibration Slope (ns/TDCch)


pibcall_adcLLb
pibcall_adcLLb
Entries 135485
Mean x 0.6792
Mean y 1.072
RMS x 0.476
RMS y 0.1173
0 118 0
0 134898 106
0 362 1
1/β meas
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0
0.5
1
1.5
2
2.5
3
3.5
4
p (GeV/c)

TCorrectData

class description - source file - inheritance tree

class TCorrectData : public TStartAuAuCent, public TStopAuAuCent, public TObject

```
public:

   TCorrectData  TCorrectData()
   TCorrectData  TCorrectData(DataType peDataType, CorrectionType peCType, Int_t pRuns, Int_t pNumberToRead, Bool_t pDoFits)
   TCorrectData  TCorrectData(const TCorrectData&)
            void ~TCorrectData()
  static TClass* Class()
 virtual TClass* IsA() const
    virtual void ShowMembers(TMemberInspector& insp, char* parent)
            void StartCorrection()
    virtual void Streamer(TBuffer& b)
            void StreamerNVirtual(TBuffer& b)
```

Data Members

```
protected:

        DataType efDataType      type of data being analyzed
  CorrectionType efCType         type of correction being applied
           Int_t fRuns           number of passes
           Int_t fNumbertoRead   number of events to analyze
          Bool_t fDoFits         enable/disable fitting
```

Class Description

```
Class to apply corrections depending on the data set and the type
of correction to be applied. Passes through the data for a set number
of times.
Correction Types -> Start and Stop
Data Types -> AuAuCent ....
```

TCorrectData() : TObject()

Default Constructor

TCorrectData(DataType peDataType,CorrectionType peCType, Int_t pRuns,Int_t pNumberToRead,Bool_t pDoFits)

constuctor to initialize the corrections

void StartCorrection()

function to do the required correction depending on the inputs

Inline Functions

```
           TClass* Class()
           TClass* IsA() const
              void ShowMembers(TMemberInspector& insp, char* parent)
              void Streamer(TBuffer& b)
              void StreamerNVirtual(TBuffer& b)
     TCorrectData TCorrectData(const TCorrectData&)
              void ~TCorrectData()
```

Last update: :$Name: $:$Id: TCorrectData.cxx

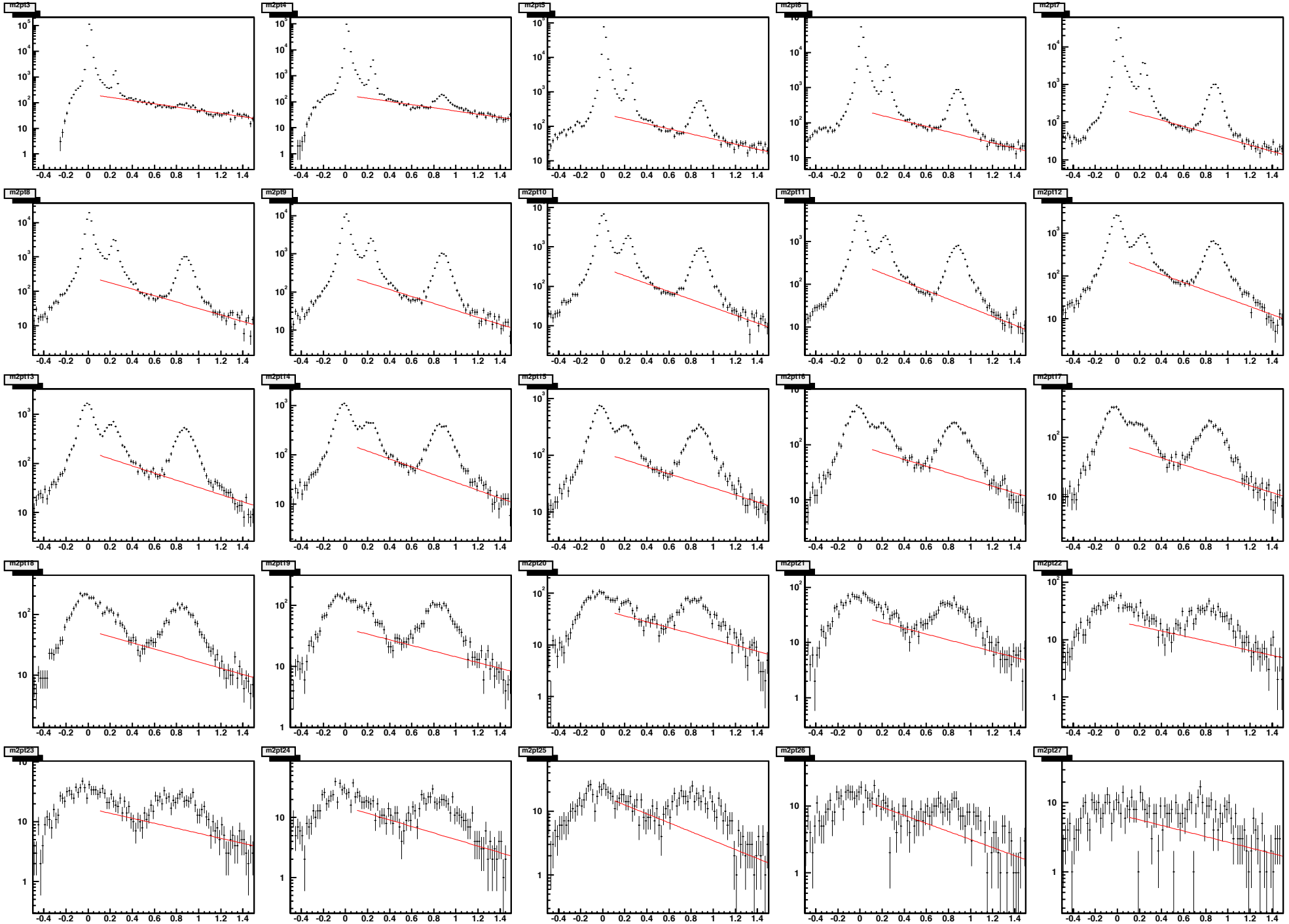
ROOT page - Class index - Top of the page

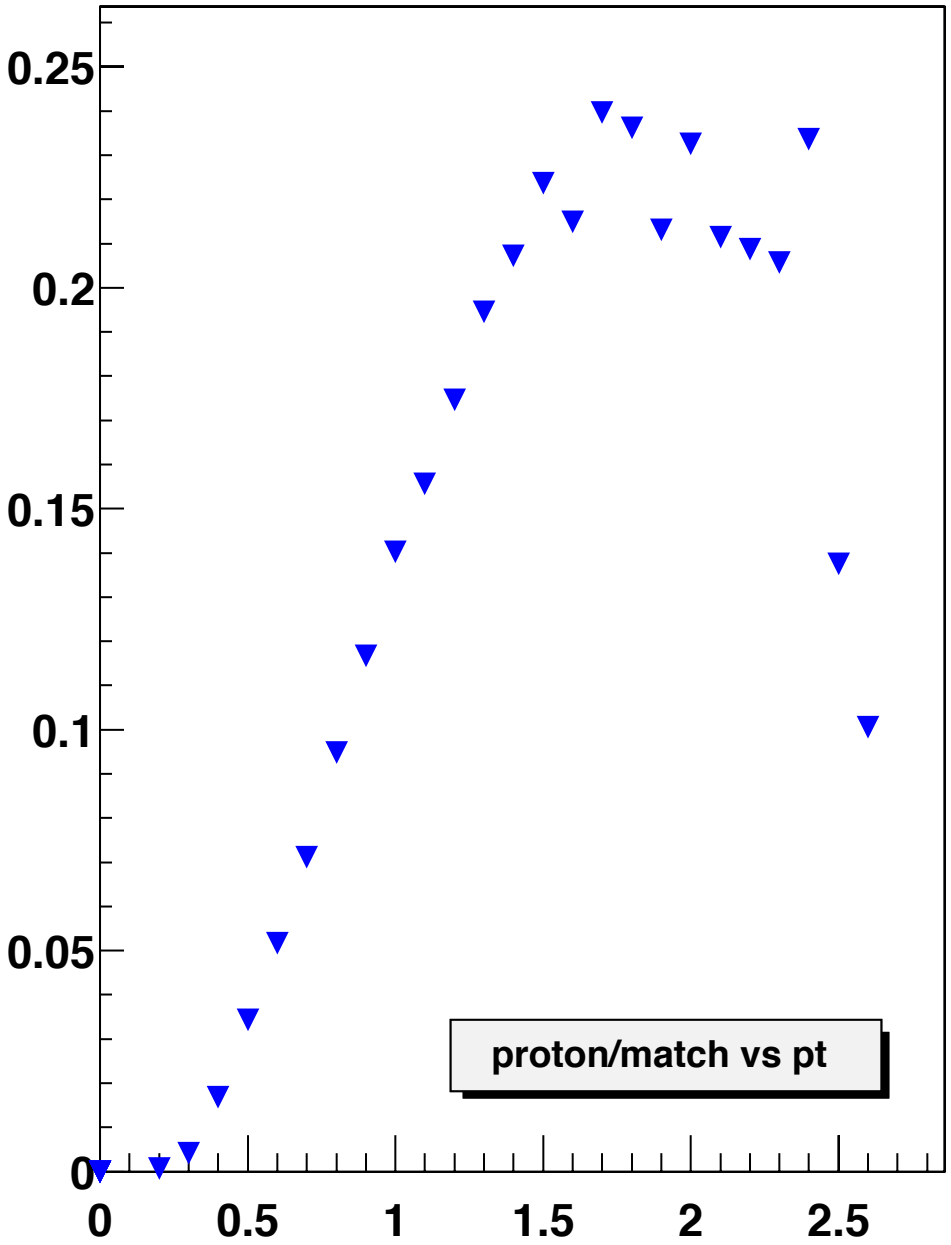
C++ versions of original CINT calibrations routines...

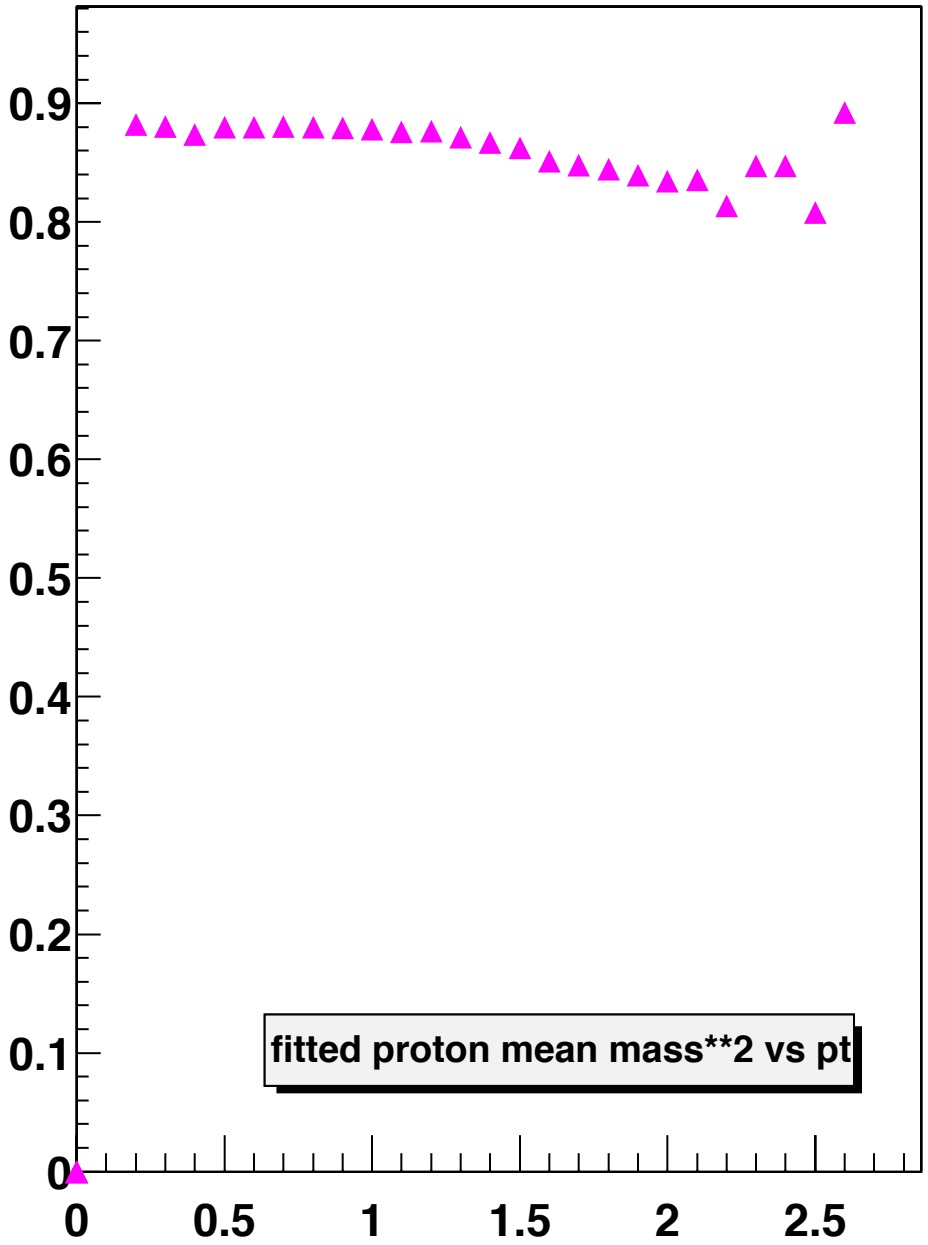
Au+Au calibrations code done...

d+Au being ported now....

Playing with Np/Nmatch ratios (Au+Au central)







Not yet preliminary.....

Near Term Goals

Fix remaining problem areas in d+Au Start corrections

Improve background treatment to mass-squared distributions
Get Np/Nh ratios for AuAu & dAu

AuAu calibration is 100% complete
→ just need efficiencies for spectra and ratios...

TOFr calibration in the TOFp Style
→ just need TOFrMatchMaker

compare TOFp and TOFr performance when using the same strategy

study TOFr performance for freon-only and compare to freon+isobutane

With both trays fully calibrated, use them as two arm PID spectrometer....