Λ^0 Digits Embedding for the Inner Tracker Optimization

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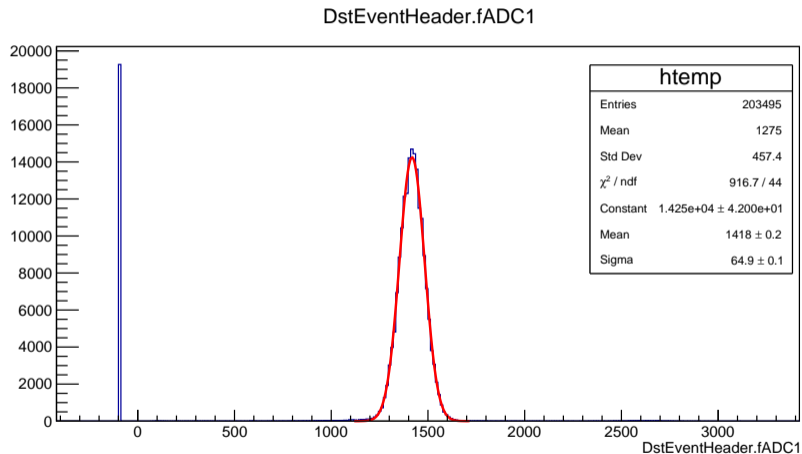
Dubna April 15, 2020

Digit Level Embedding Stages

- Create Λ^0 ROOT storage from DCMQGSM generated data sets
- Generate decay events with the storage lambdas put to the primary vertices's positions from an exp file
- Filter only reconstructable decays
- Apply signal scale normalization ?
- Embed into real events
- Measure the efficiency of the each reconstruction stage
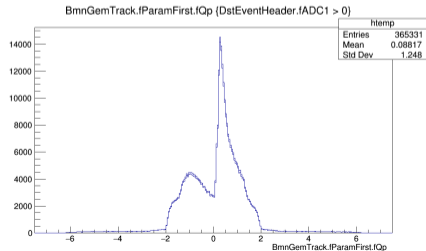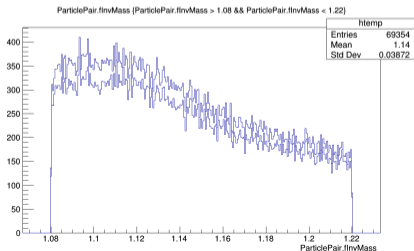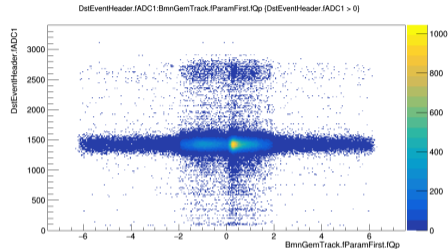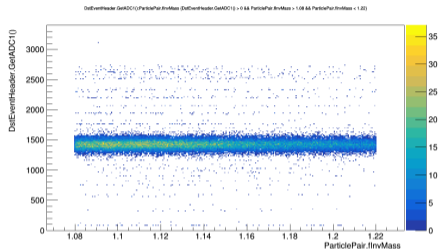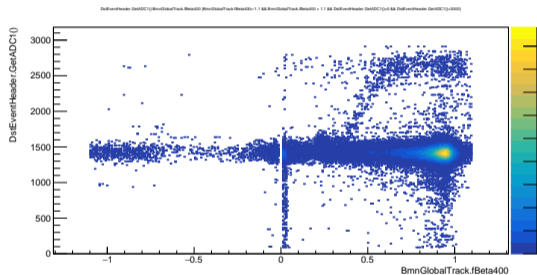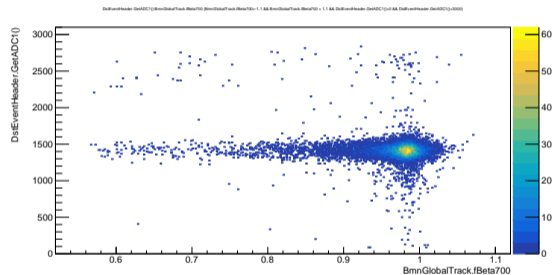- Tune tracking algorithm accordingly

Current status

- √ Fill DST Task corrected to handle BM@N trigger ADC amplitudes
- √ Add in embedding procedure cloning of all other (no inner tracker) branches
- –– Automate graphical cut application to diagrams
- ? Derive calibration constants for charge calculation from ADC amplitudes
- ∞ Refactoring code
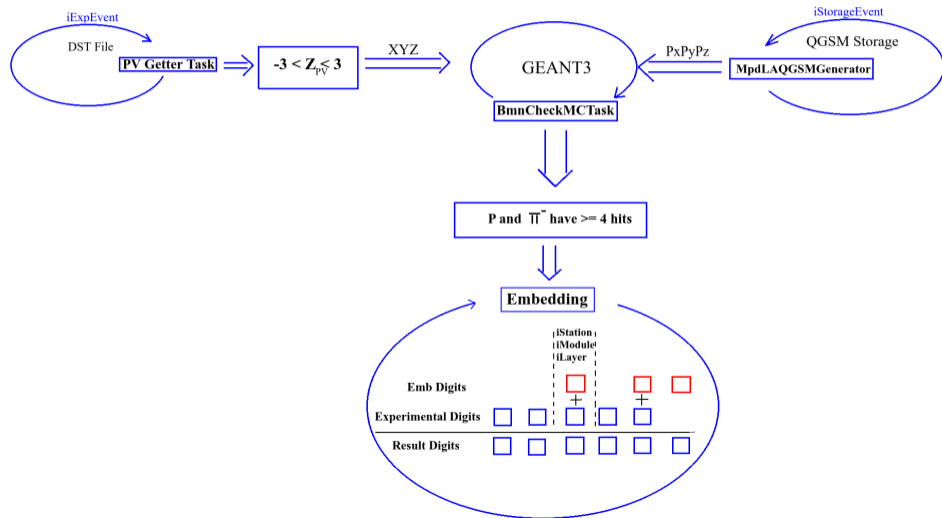
BC1 amplitude vs Identifiable parameters

DstEventHeader.fADC1

htemp	
Entries	203495
Mean	1275
Std Dev	457.4
χ^2 / ndf	916.7 / 44
Constant	1.425e+04 ± 4.200e+01
Mean	1418 ± 0.2
Sigma	64.9 ± 0.1

BC1 amplitude vs Identifiable parameters

BC1 amplitude vs β in ToF400 and ToF700

ADC1:β_{400}

ADC1:β_{700}

Backup Slides

Embedding Workflow

GEM HitMaker Efficiency Test

	BigZone	HotZone
Station = 0 iMod = 0	0.975684	0.989612
iMod = 1	0.884250	0.983110
Station = 1 iMod = 0	0.966203	0.988338
iMod = 1	0.796322	0.939690
Station = 2 iMod = 0	0.954382	0.981046
iMod = 1	0.765758	0.951376
Station = 3 iMod = 0	0.983941	0.970588
iMod = 1	0.956071	0.981878
Station = 4 iMod = 0	0.948309	0.958115
iMod = 1	0.799820	0.947141
Station = 5 iMod = 0	0.965322	0.972973
iMod = 1	0.942036	0.966245

2D stations coordinate efficiency for single protons
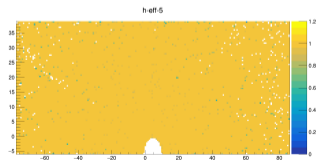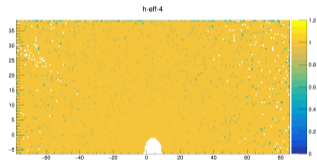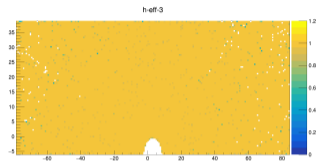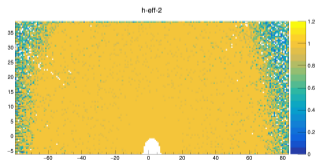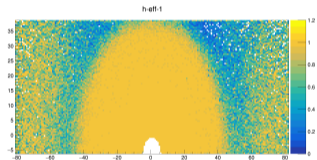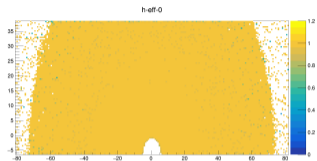
# 2D stations tan efficiency for single protons
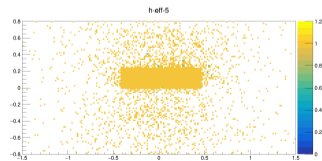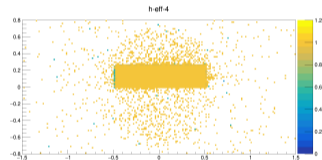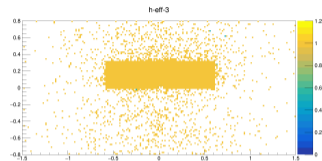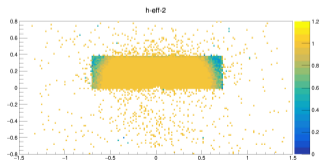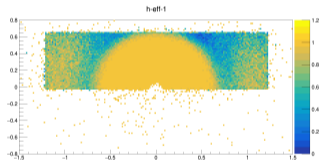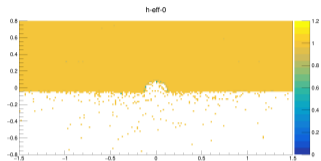
Interpolate X Y to the center of the drift area
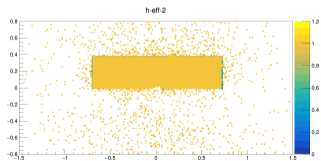
Interpolate X Y to the center of the drift area

$$x = ((FairMCPoint*)pt) -> GetX();$$
$$y = ((FairMCPoint*)pt) -> GetY();$$

$$if(mod -> GetElectronDriftDirection() == ForwardZAxisEDrift)$$
$$driftCenterShift = 0.15;$$
$$else$$
$$driftCenterShift = 0.75;$$
$$x = ((CbmStsPoint*)pt) -> GetX(z + driftCenterShift);$$
$$y = ((CbmStsPoint*)pt) -> GetY(z + driftCenterShift);$$

2D stations tan efficiency for single protons corrected
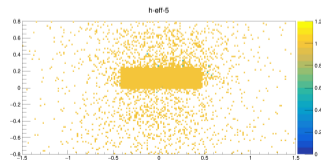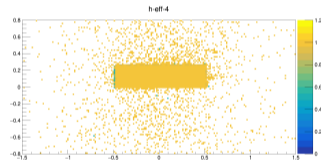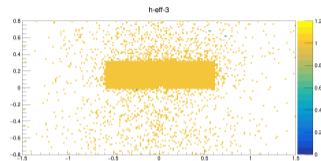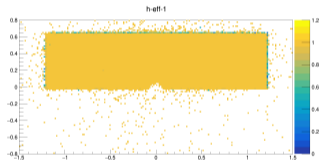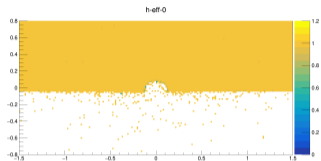
GEM HitMaker Efficiency Test

Old approach

|	BigZone	HotZone
Station = 0 iMod = 0	0.975684	0.989612
iMod = 1	0.884250	0.983110
Station = 1 iMod = 0	0.966203	0.988338
iMod = 1	0.796322	0.939690
Station = 2 iMod = 0	0.954382	0.981046
iMod = 1	0.765758	0.951376
Station = 3 iMod = 0	0.983941	0.970588
iMod = 1	0.956071	0.981878
Station = 4 iMod = 0	0.948309	0.958115
iMod = 1	0.799820	0.947141
Station = 5 iMod = 0	0.965322	0.972973
iMod = 1	0.942036	0.966245

Interpolated drift center

	BigZone	HotZone
Station = 0 iMod = 0	0.993377	0.991044
iMod = 1	0.995249	0.992347
Station = 1 iMod = 0	0.995976	0.995021
iMod = 1	0.997108	0.994269
Station = 2 iMod = 0	0.991839	0.994784
iMod = 1	0.980684	0.993042
Station = 3 iMod = 0	0.999371	1.000000
iMod = 1	0.992060	0.995150
Station = 4 iMod = 0	0.992662	0.998661
iMod = 1	0.995477	0.992465
Station = 5 iMod = 0	0.998552	0.996721
iMod = 1	0.996840	1.000000

Run 4649 BC1 vs BC2 TQDC Amps
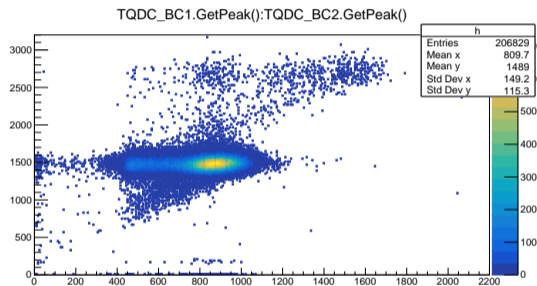
All
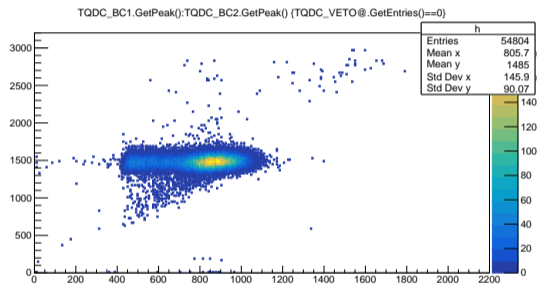
VETO filtered

Run 4649 BC1 vs EventId
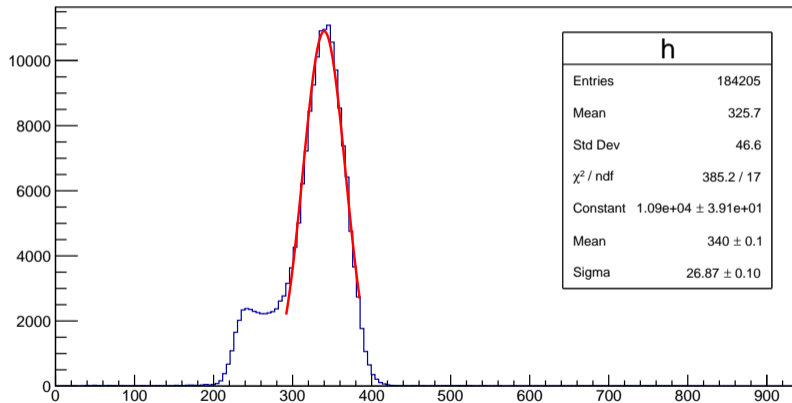

TQDC_BC1.GetPeak():BmnEventHeader.fEventId {BmnEventHeader.fEventId<40000}
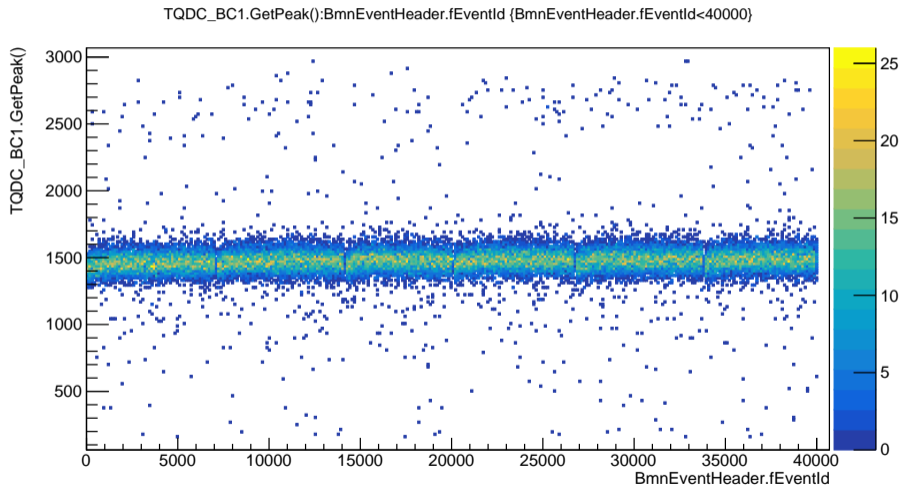
Run 4649 z^2 with default (SRC) constants

DstEventHeader.fZ2in {DstEventHeader.fZ2in>0}

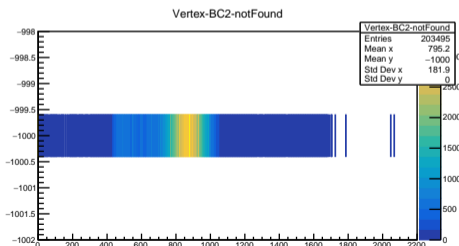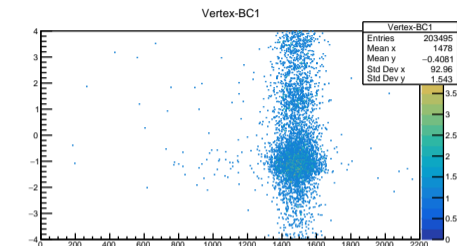| h	
Entries	184205
Mean	46.25
Std Dev	6.616
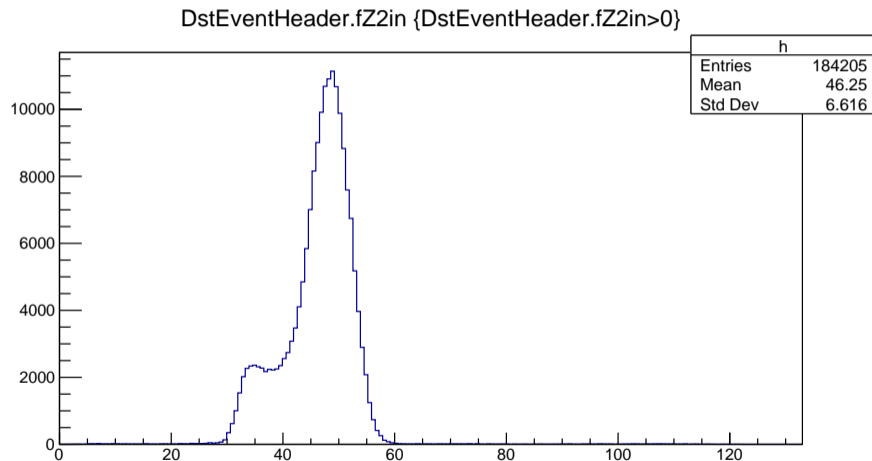
Run 4649 z^2 after simple rescale

DstEventHeader.fZ2in*324/46.0 {DstEventHeader.fZ2in>0}

h	
Entries	184205
Mean	325.7
Std Dev	46.6
χ^2 / ndf	385.2 / 17
Constant	1.09e+04 ± 3.91e+01
Mean	340 ± 0.1
Sigma	26.87 ± 0.10

Run 4649 Vertex Z vs Beam Counters
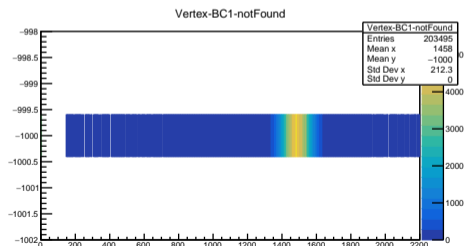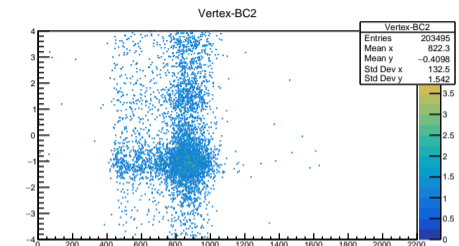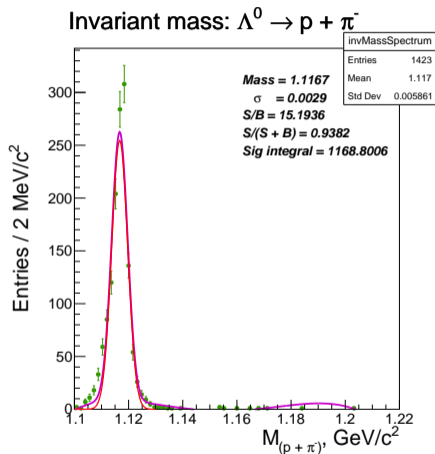
Tracking hits number dependency
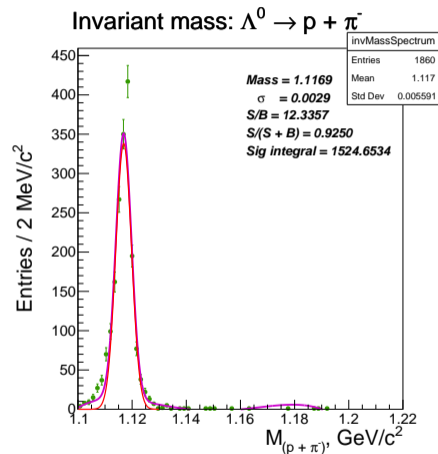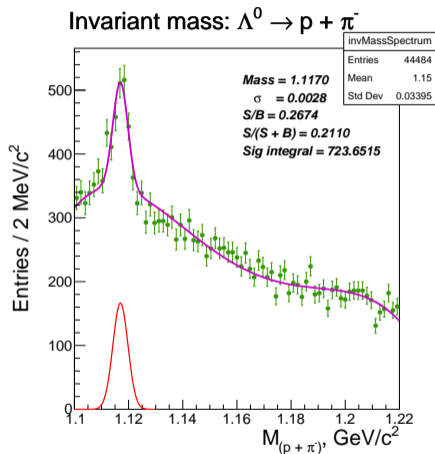

Figure: Min 4 hits

Figure: Min 5 hits

Tracking hits number dependency

Figure: Min 4 hits

Figure: Min 5 hits