

Wired Behavior of Mahi at +4BX

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Goal:

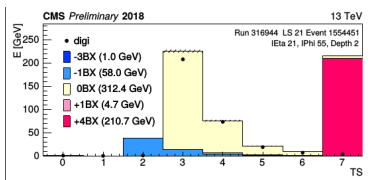
-debug Default version of MahiFit.cc and remove wired behavior at +4BX

Samples:

- Release: CMSSW release: 10_4_0_patch1
- Datasets:
 - /check
 - Run: 316944

Jae Reported

Evt=1554451 ls=21 ieta=21 iphi=55 depth=2



Event pulse fit reported by Jae

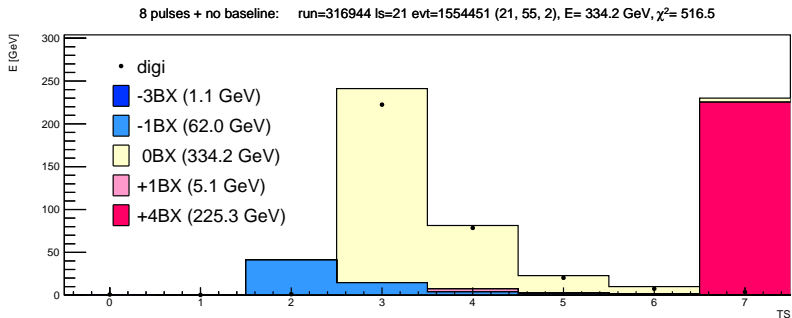
- 1 `pulseCov(iTS+nnlsWork'.maxoffset,jTS+nnlsWork'.maxoffset) += tmp;`
`pulseCov(jTS+nnlsWork'.maxoffset,iTS+nnlsWork'.maxoffset) += tmp; - - - Jae`

`pulseCov(jTS+nnlsWork'.maxoffset,iTS+nnlsWork'.maxoffset) += tmp;`
`if(iTS!=jTS)pulseCov(iTS+nnlsWork'.maxoffset,jTS+nnlsWork'.maxoffset) += tmp; - - - default`
- 2 `pulseDeriv.coeffRef(iTS+nnlsWork'.maxoffset) =`
`0.5*(nnlsWork'.pulseM[iTS+delta]+nnlsWork'.pulseP[iTS+delta])/(2*nnlsWork'.dt); - - - Jae`

`pulseDeriv.coeffRef(iTS+nnlsWork'.maxoffset) =`
`0.5*(nnlsWork'.pulseM[iTS+delta]-nnlsWork'.pulseP[iTS+delta])/(2*nnlsWork'.dt); - - - default`

- Wiered peak at +4BX
- Need to compare Jae's MahiFit.CC with default MahiFit.cc.
- Find two important difference b/w two

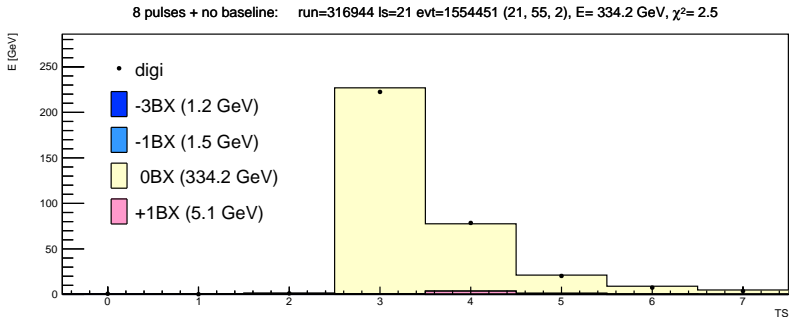
Result reproduced using default version



Event pulse fit removing first diff

- Result is reproduce using the default version of MahiFit.cc by modify the lines only in phase1Debug function in the default MahiFit.cc

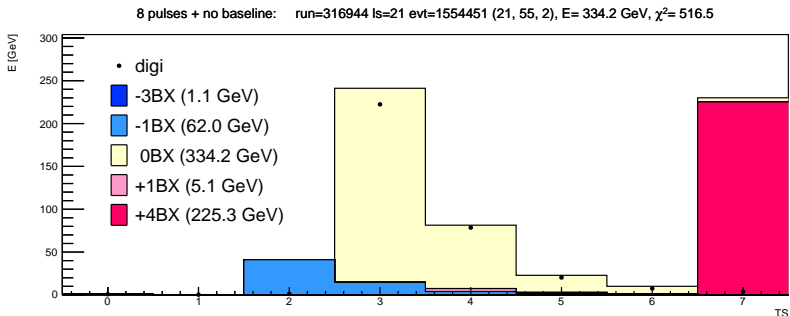
Remove first difference only in default version



Event pulse fit removing first diff

- wired behavior disappeared (so this difference responsible for wired behavior)
- this change basically avoid double counting the diagonal terms of the covariance matrices but default code seems correct

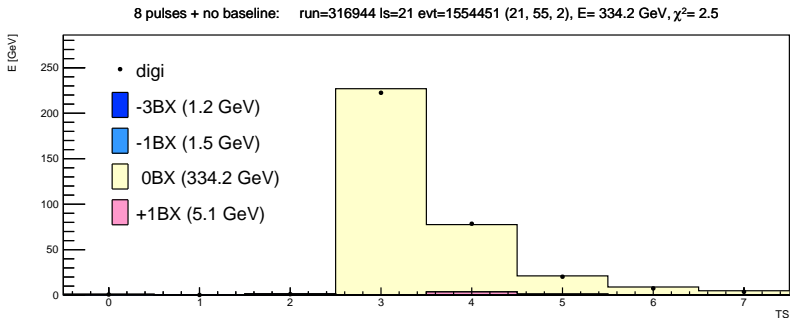
Remove second difference only in default version



Event pulse fit removing second diff

- wired behavior still there (so this difference not responsible for wired behavior)
- this change define a derivative and this is correct in Jae's file

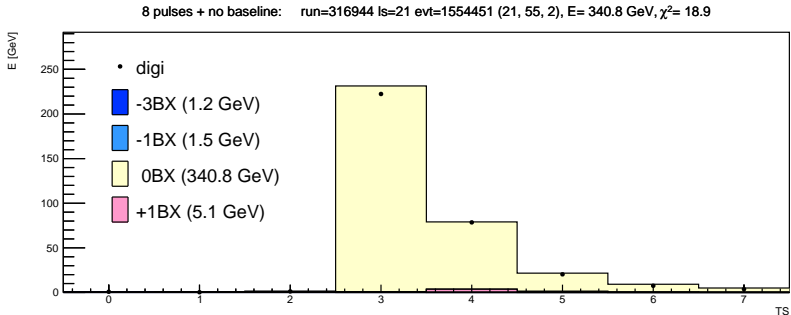
Remove both difference simultaneously in default version



Event pulse fit removing both diff

- wired behavior disappear that basically confirm that wired behavior is because of the first change only

Correction in TS loop



Event pulse fit after loop correction diff

- wired behavior disappear that basically confirm that wired behavior is because of the this bug
- The index goes from 0 to 7 (i.e. iTS is used.) while later in the loop from line 287, it goes from 1 to 8 (i.e. $iTS + \delta$ is used)

- Correction in TS loop is responsible for the wired behavior of +4BX.
- only one difference in MahiFit.CC may be responsible for the wired behavior of the +4BX also but default code looks logical i.e

```
pulseCov(iTS+nnlsWork'.maxoffset,jTS+nnlsWork'.maxoffset) += tmp;  
pulseCov(jTS+nnlsWork'.maxoffset,iTS+nnlsWork'.maxoffset) += tmp; - - - Jae  
-----  
pulseCov(jTS+nnlsWork'.maxoffset,iTS+nnlsWork'.maxoffset) += tmp;  
if(iTS!=jTS)pulseCov(iTS+nnlsWork'.maxoffset,jTS+nnlsWork'.maxoffset) += tmp; - - - default
```