Beam Test Data Analysis

Review of the Bari TKRDigi

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Review approach

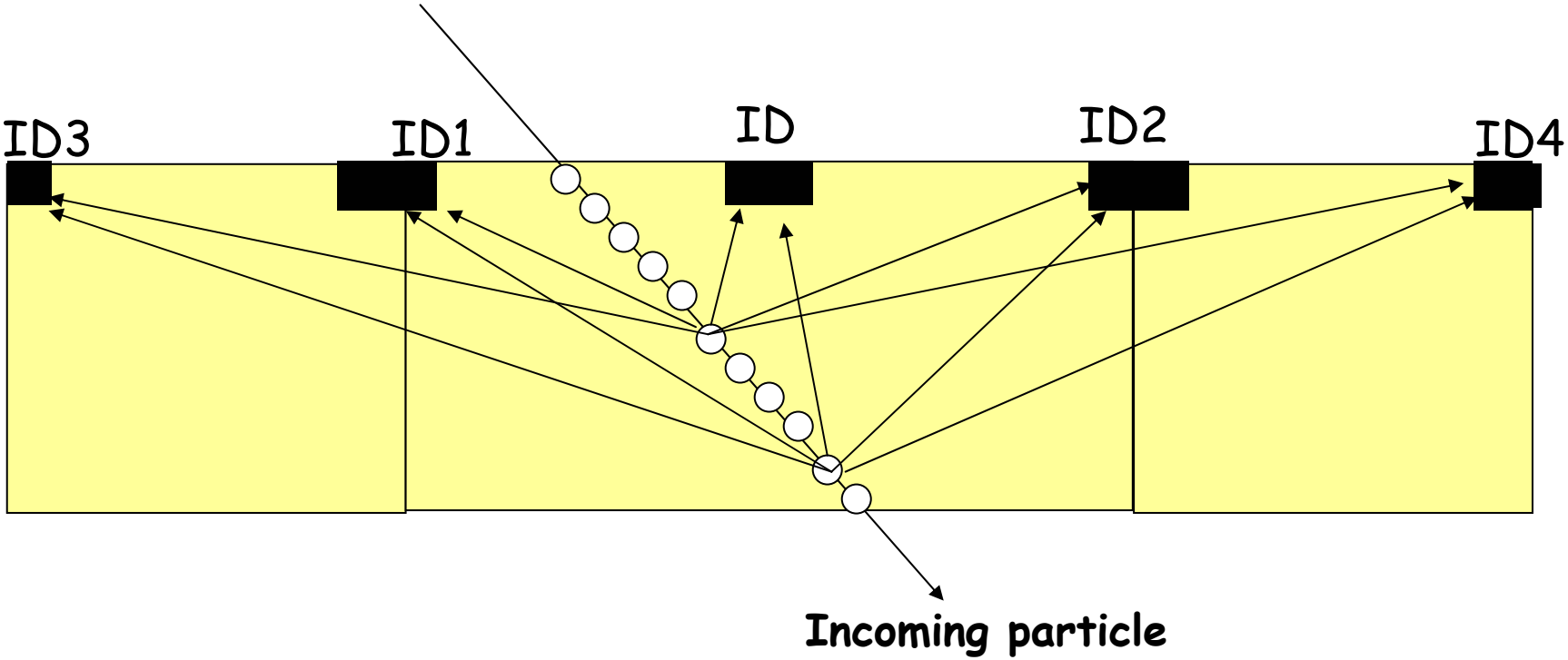
We are looking for a semplified version of TKRBariDigiAlg (not excluding the "Full simulation" version)

- **Level 0: no SSDs detailed simulation (i.e. No e-h propagation, no current signal induced on the strips and no electronic simulation).**
- **Level 1: re-introduce only the cluster propagation (in order to simulate the sharing effect alone)**
- **Level 2: re-introduce the signal simulation (current Bari Digi algorithm version)**

MC Digit simulation: Level 1 (Bari1)…

- convert the energy deposition Edep in the near strip channel to number of pairs Np=Edep/3.6eV
- The e-h pair produced in the silicon are distributed along the track and grouped into elements (called *cluster*).
  - Bari1 → 1Clus/4μm for vertical tracks
- For each cluster the initial position and charge are assigned
- We added the charge induced from each cluster (e and h) over the nearest strip ID, and so on over the strips ID+1, ID+2 , ID-1 and ID-2 .

Cluster Propagation



We added the induced charge from each cluster over the strip ID, and so on over the strips ID1, ID2, ID3, ID4 etc.

CHARGE SHARING

…MC Digit simulation: Level 1 (Bari1)

- add a fluctuation due to electronic noise of 1550 ENC by using a gaussian random number with mean=0 and σ=1550

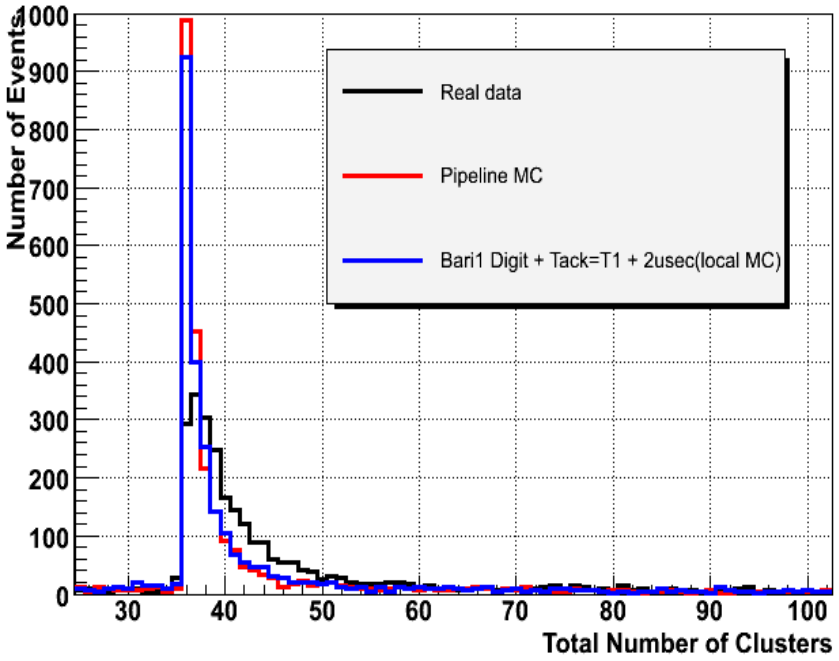
- convert the Np in charge Q unit (fC), if Np>0, otherwise set Q=0
- convert Q in voltage, by using the electronic gain and taking the saturation into account, i.e. V(mV) = min(Q(fC)*G, 1100), where G=100 mV/fC (a gain fluctution of 6% included)
- compare the voltage V with the threshold Vth of 125 mV, assuming that a most probable value of MIP is 500 mV (about 5 fC), then fire the channel strip if V>Vth
- convert Q in T1 and T2 (where ToT = T2-T1) by using parameters from PSPICE simulation
- L1Trigger Time: smaller T1 into the layer
- Hit capture: if T2(strip) > Tack, where Tack = L1Trigger + 2μs

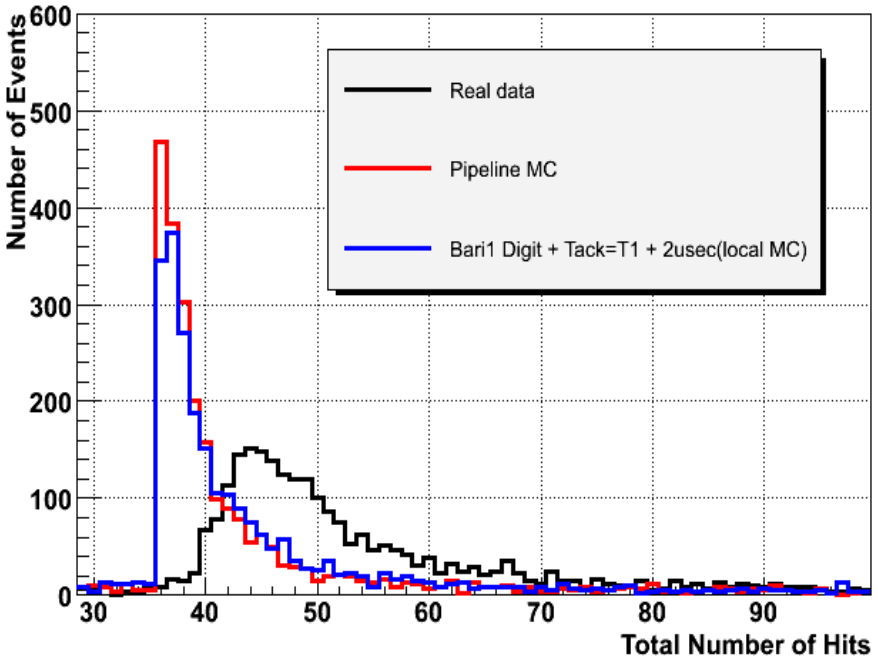
MC re-production strategy

- **TkrDigi (Bari version) v2r5p1 (BeamtestRelease-v6r0919p1)**
- **6GeV protons and 5GeV electrons (0degee) generated by ps_setup (ps_mc.root file as output) and digit, recon, merit and mc output root file produced using Gleam.**

- **No Cuts applied for today analysis (no number of Tacks etc.)**

6GeV protons (run 1423)

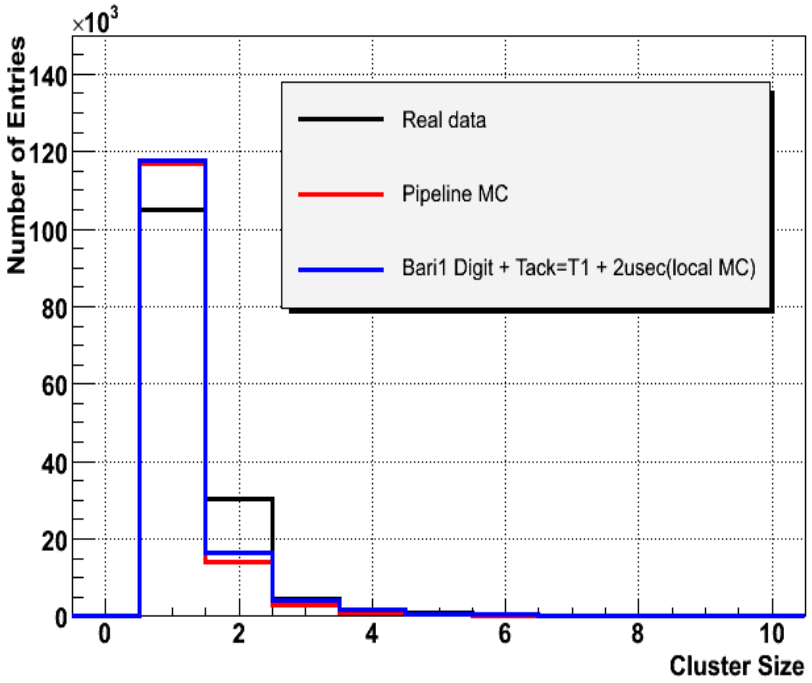




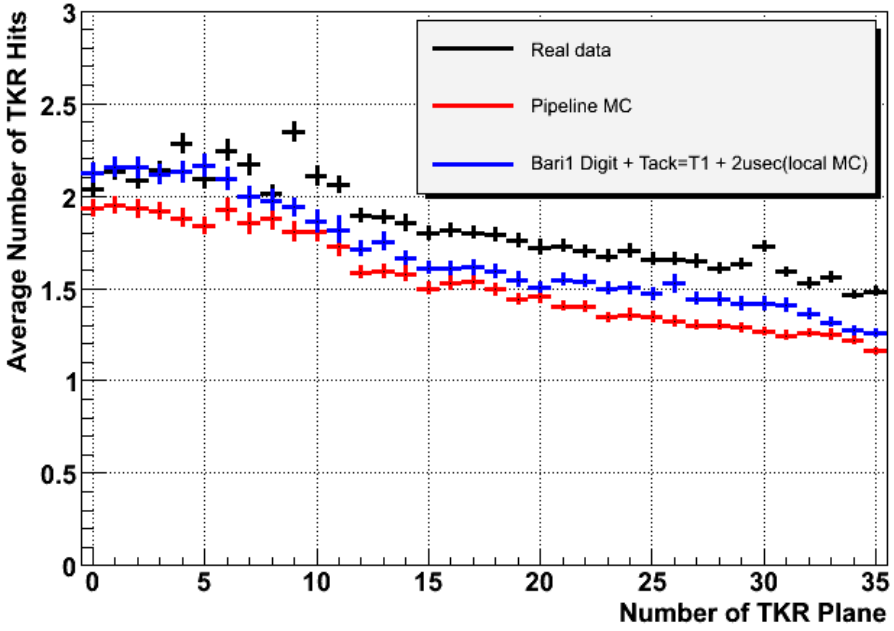
	Entries	Mean	RMS
Real data	3000	43.28	16.16
Pipeline MC	3000	39.15	14.77
Bari1	3000	40.23	14.67

	Entries	Mean	RMS
Real data	3000	50.94	17.12
Pipeline MC	3000	41.00	15.41
Bari1	3000	42.54	15.33

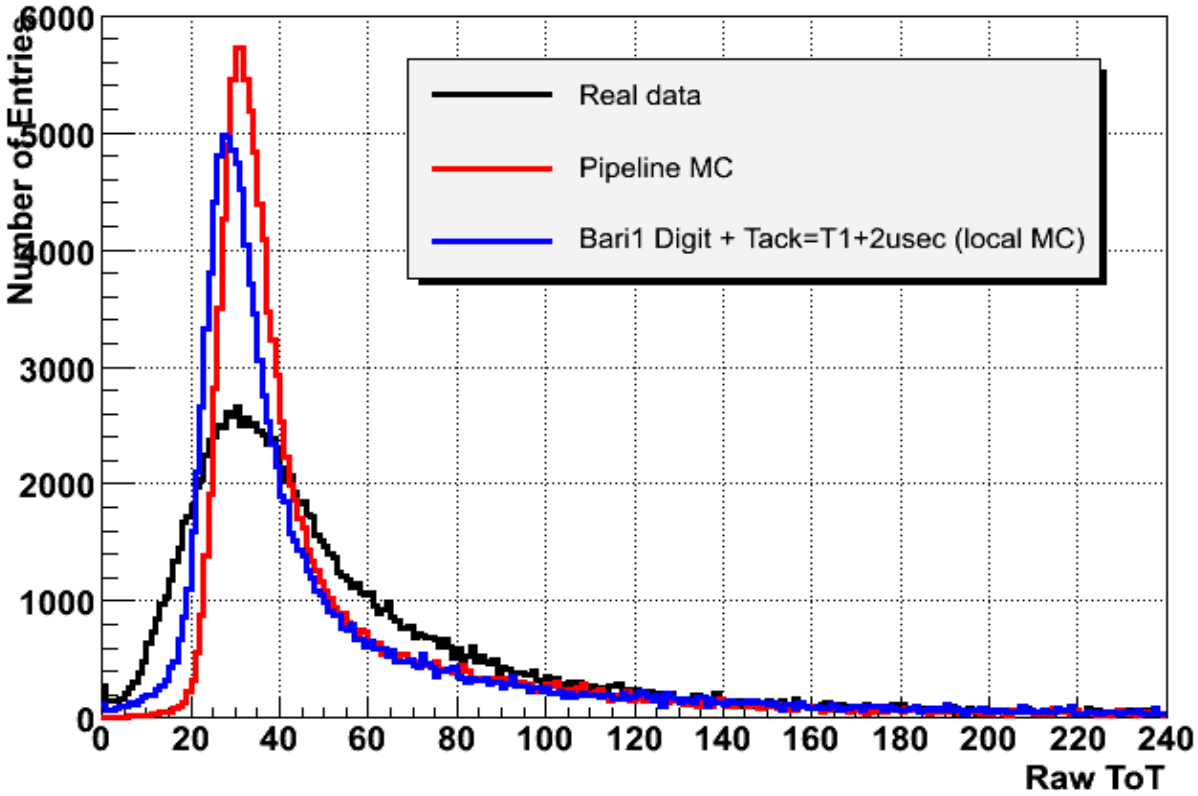
6GeV protons (run 1423)



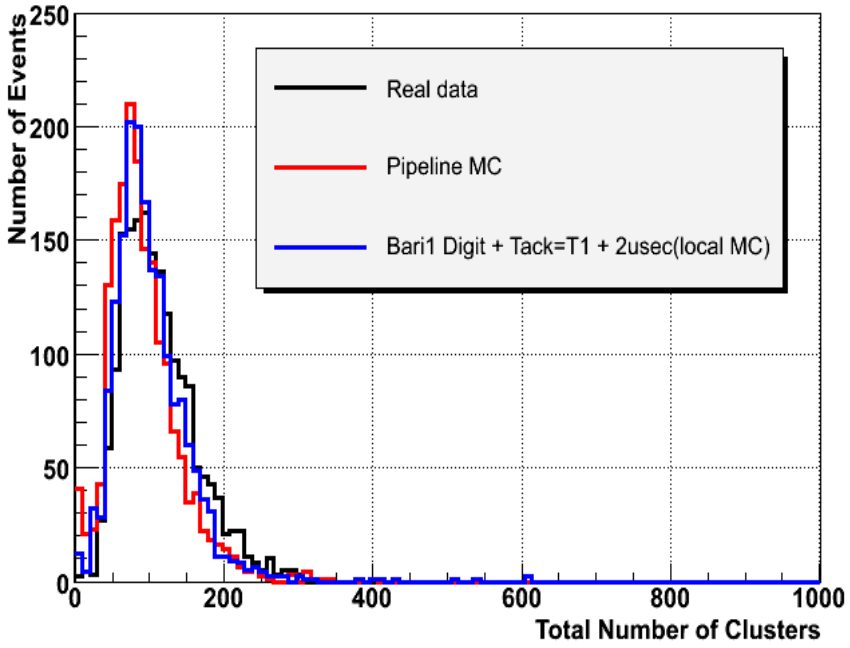
	Entries	Mean	RMS
Real data	14.3×10^5	1.38	0.82
Pipeline MC	13.6×10^5	1.22	0.78
Bari1	14.1×10^5	1.27	0.86

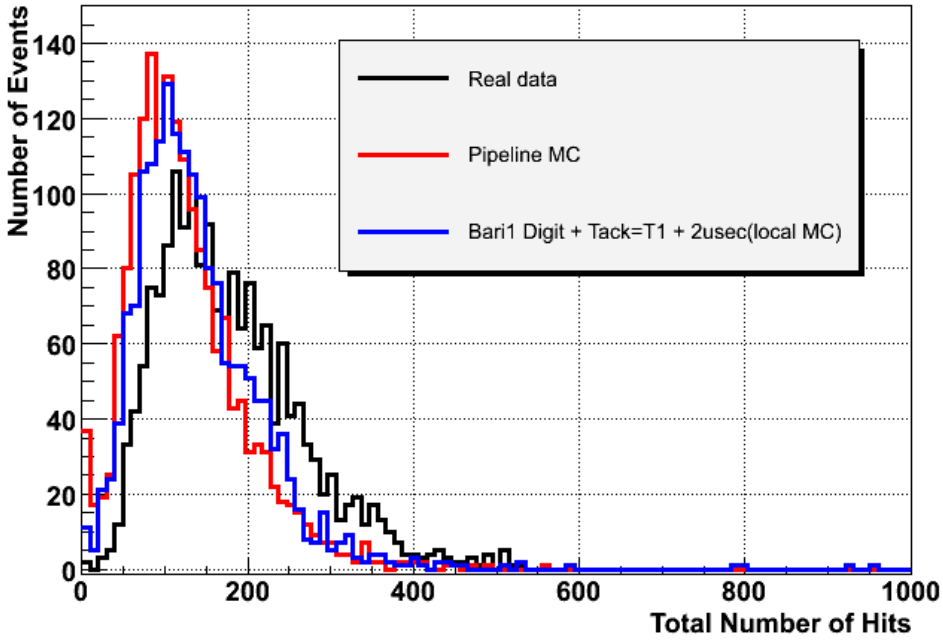


6GeV protons (run 1423)



5GeV electrons (run 1460)

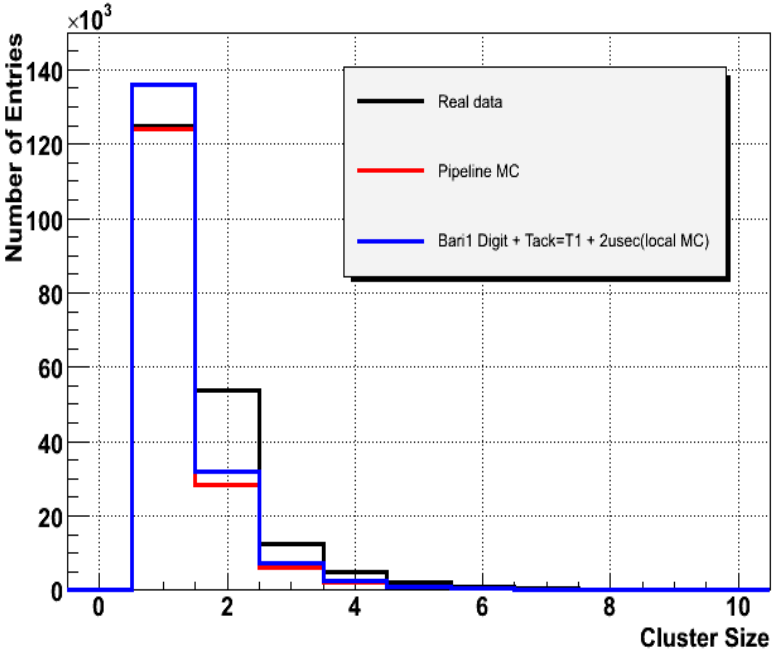




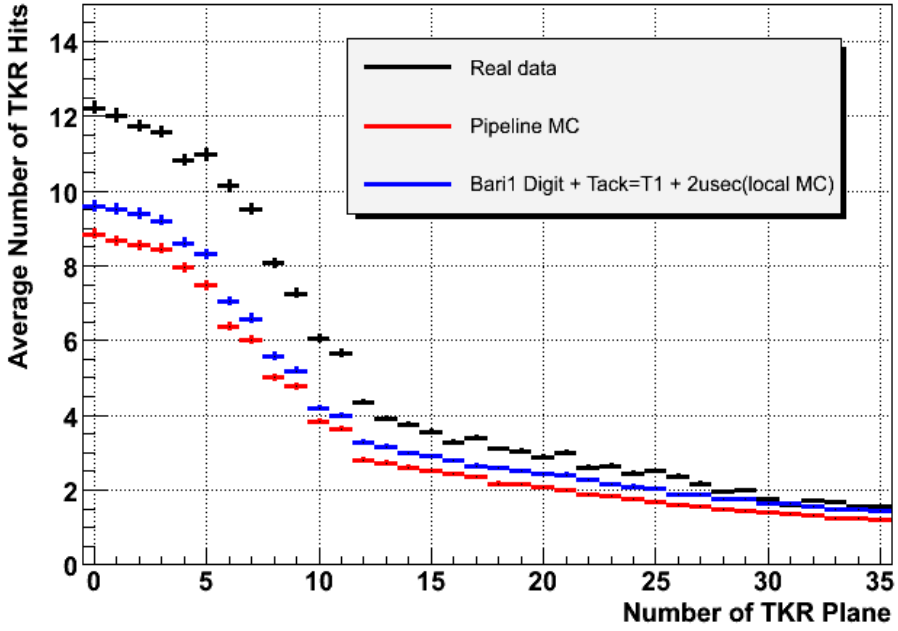
	Entries	Mean	RMS
Real data	1780	112.48	50.12
Pipeline MC	1780	91.22	46.98
Bari1	1780	101.14	51.80

	Entries	Mean	RMS
Real data	1780	178.69	86.56
Pipeline MC	1780	124.33	69.68
Bari1	1780	139.88	80.03

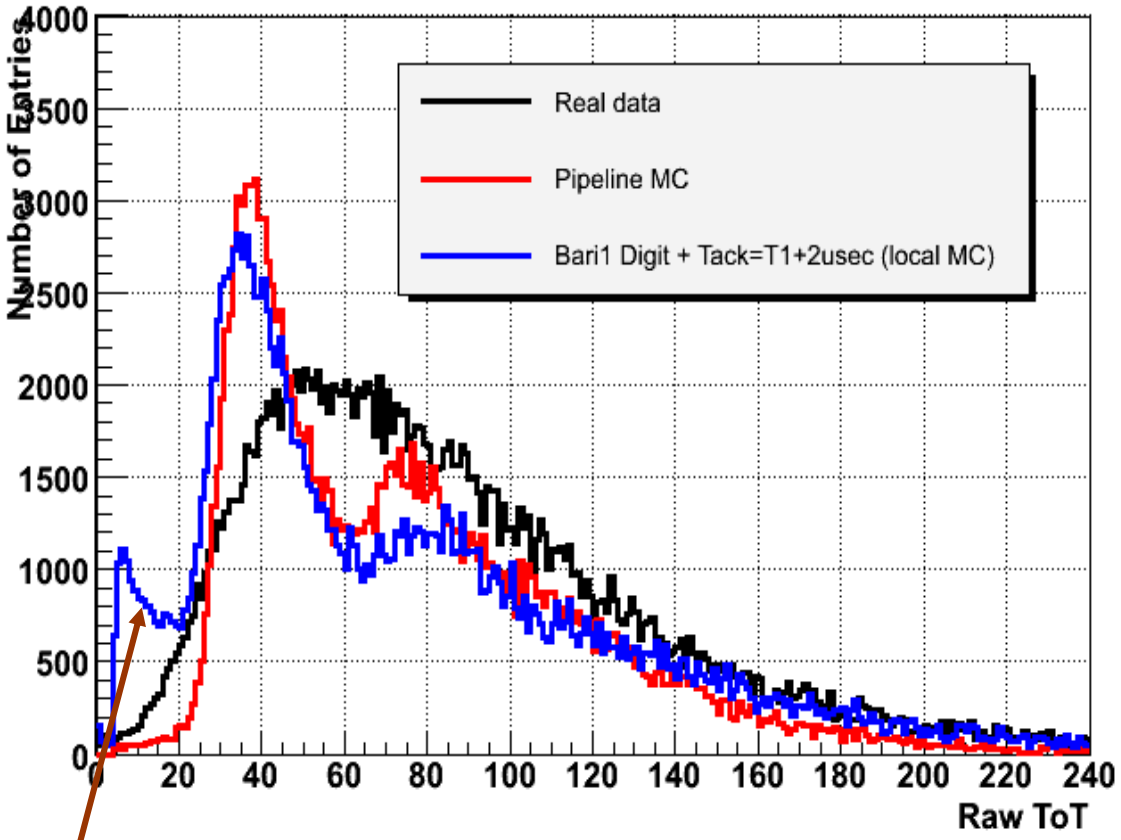
5GeV electrons (run 1460)



	Entries	Mean	RMS
Real data	20x10^5	1.59	1.08
Pipeline MC	16x10^5	1.36	0.89
Bari1	18x10^5	1.37	0.92



5GeV electrons (run 1460)



Probably some problems
In local simu ???