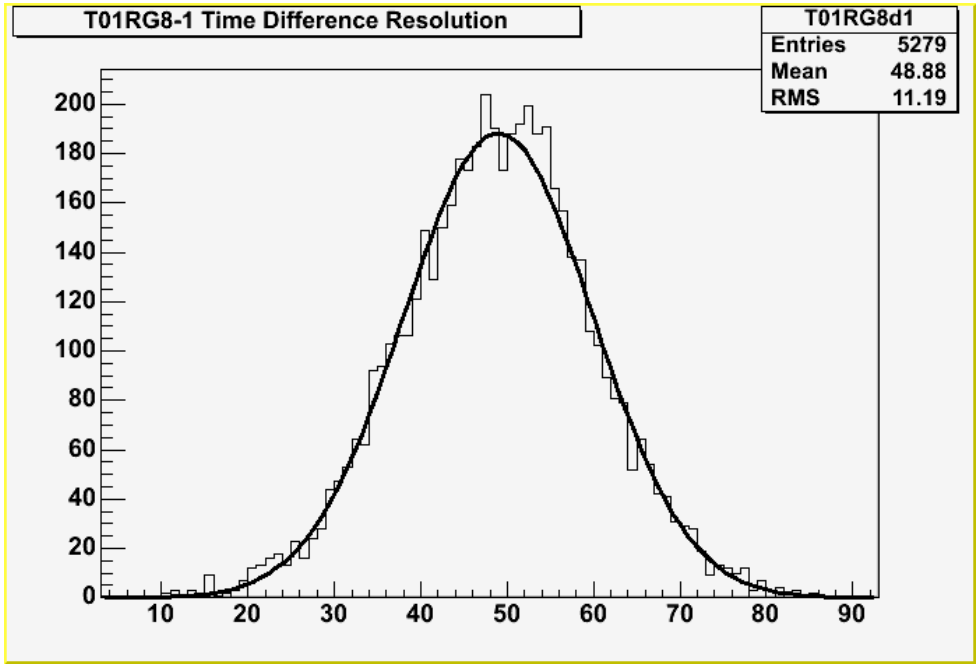
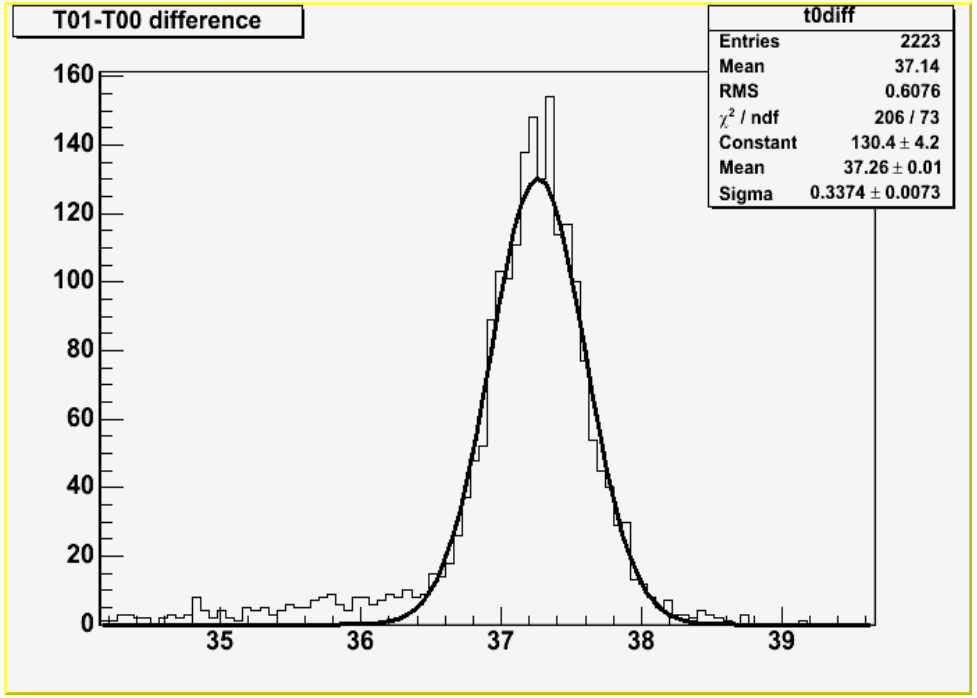
# Time of Flight
## Tim Bergfeld


- T0 Counters
- Time Resolutions
- TOF problems
- Code

# T0 Counters

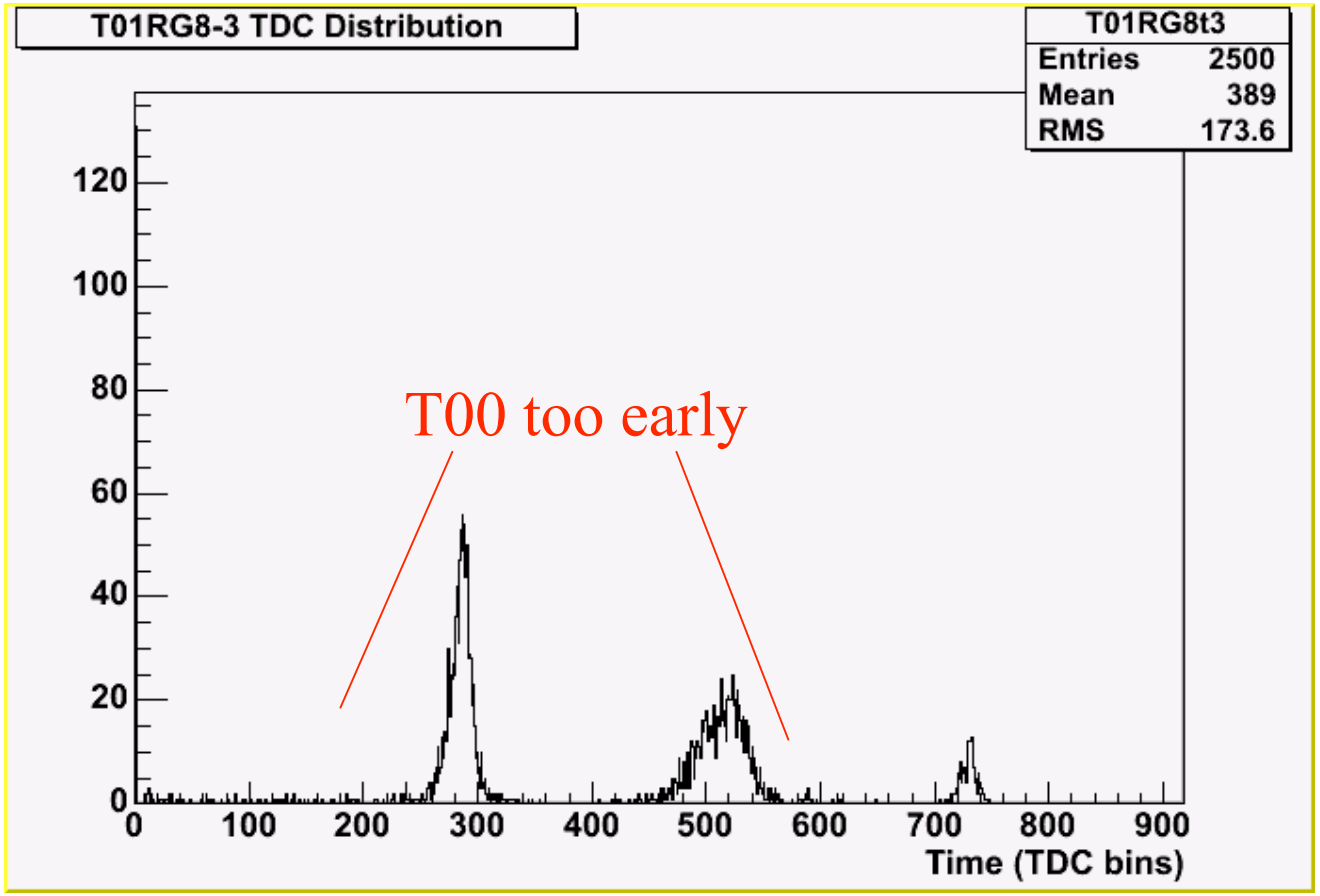



- T01 was working well at the end of the running.
  - RG8 delay giving resolutions of 82ps on $T_0$
  - **Ribbon Cable giving resolutions of 150ps on $T_0$**
- **Beam Time of Flight Measurements: T01 – T00**

  **Currently 337ps resolution. Slightly larger than T00 resolution of 320ps**
- Problems at end of running
  - T00c has noisy connection and needs new hard-line cable
  - T00 and TBD did not have ADC connections (fixed).
  - TBD needs second discriminator for timing values to get to TDCs.

# T0 Counters: Trigger Times

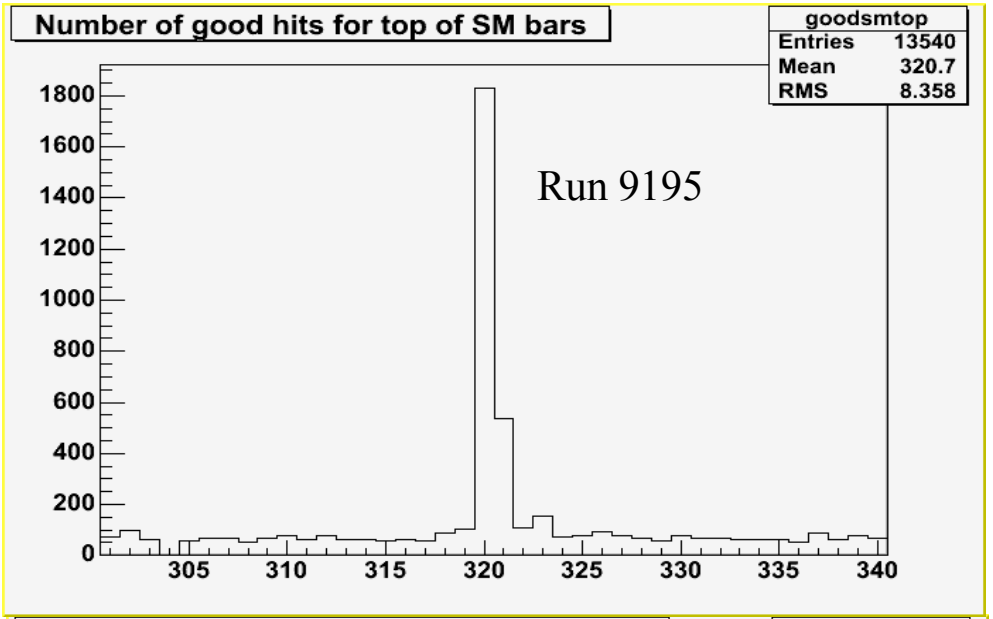


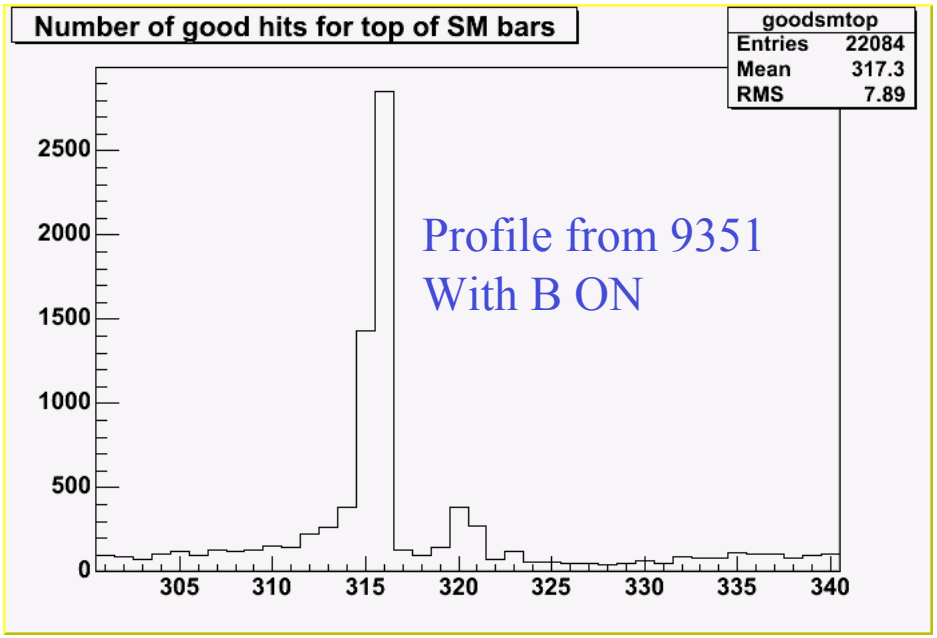

T01 PMT 3
Run:9236
Triggers:Prescales
Beam trigger : 100
Kaon/Int : 1
Pion/Int : 1
Proton/Int: 1
Counter 2/Int:1

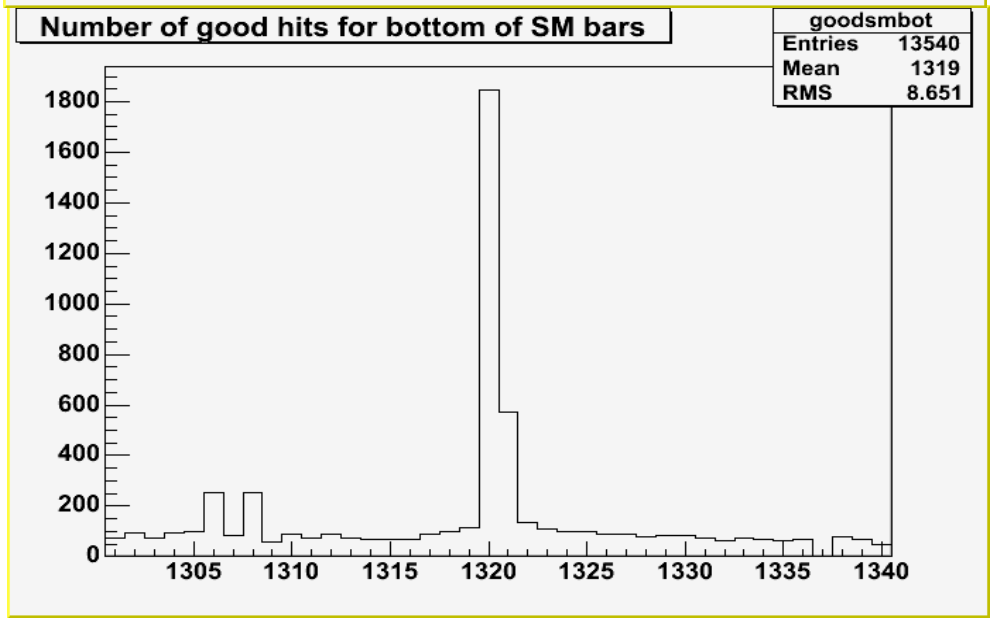
The Plot above shows the arrival times of one PMT from T01.
Conversions: 300bins = 9ns ; 525bins = 15.75 ; 725bins = 21.75
This shows the spread in trigger times with different triggers.

# TOF: Beam Profiles and Resolutions

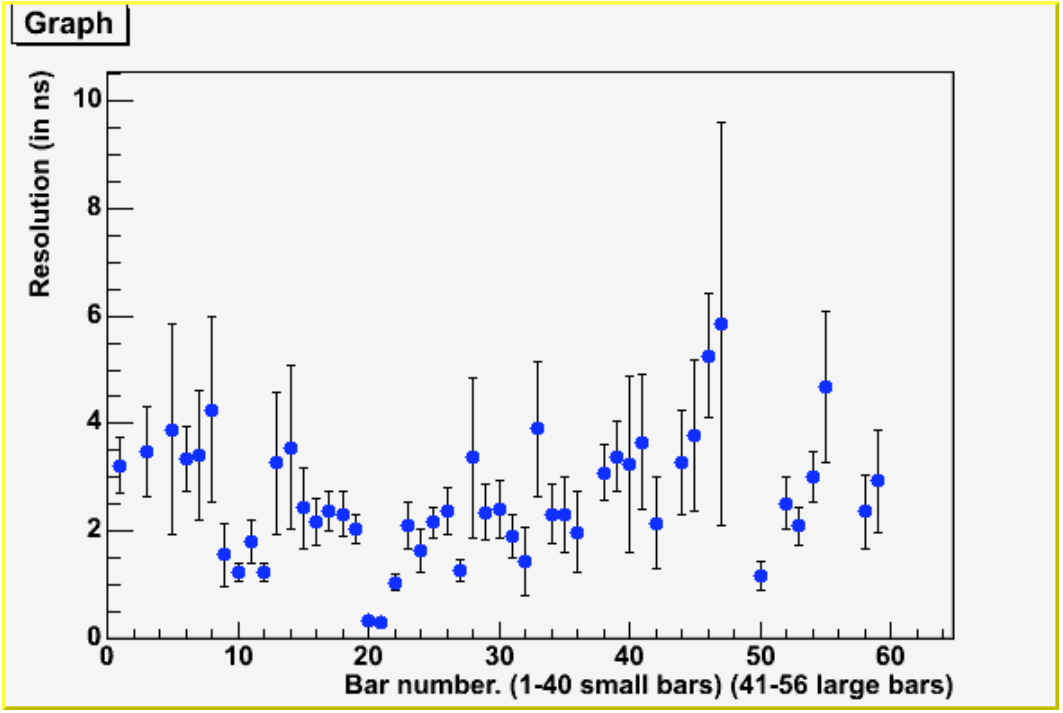
- Beam Profiles from B-Field Off data.
- Use Bar 320 which is in the center of the detector to look at uninteracted beam time resolutions.



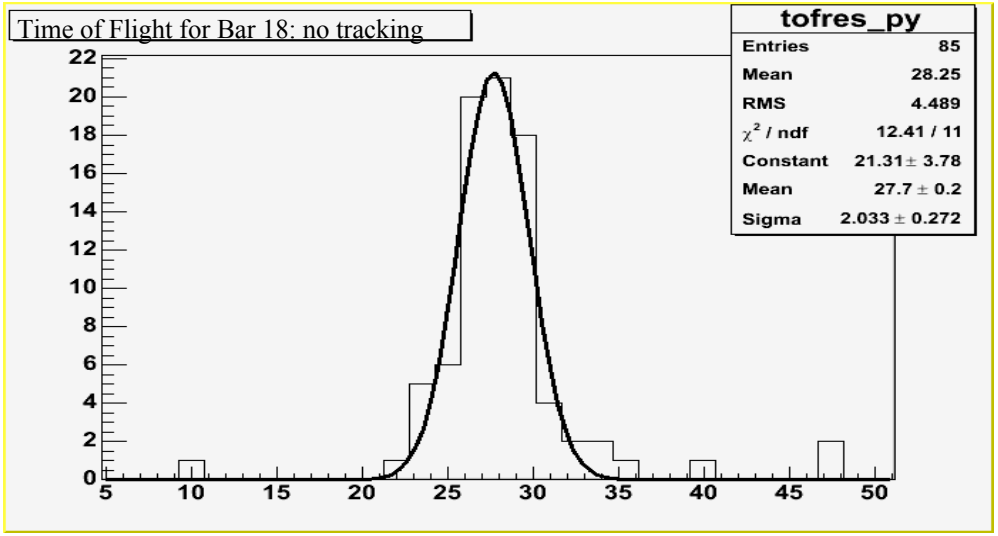



# TOF Resolutions




- Can look at every bar without worrying about where the track hit. This doesn't give good resolution. (2ns resolution).
  - Take the average of upper and lower times.
  - Subtract off the T0 time
  - Run 9195

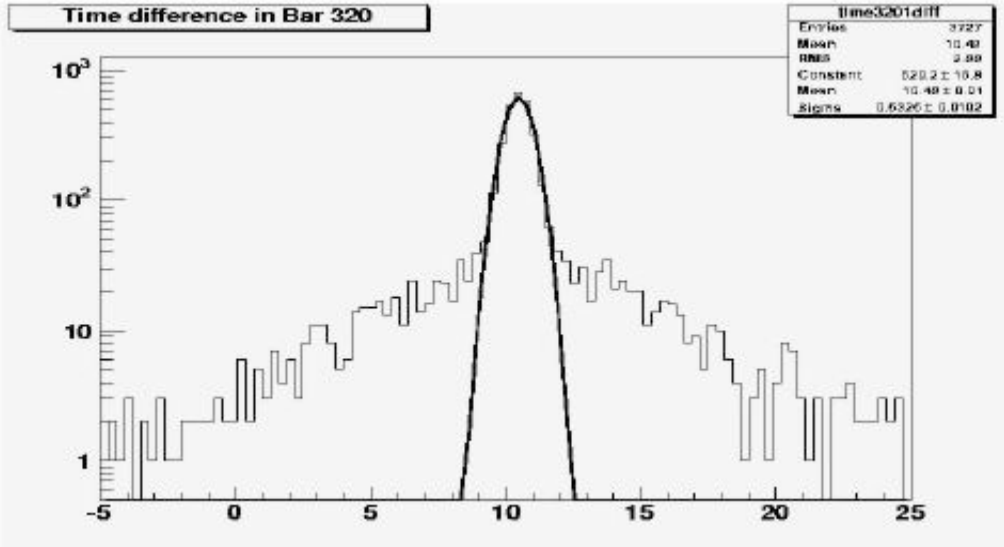


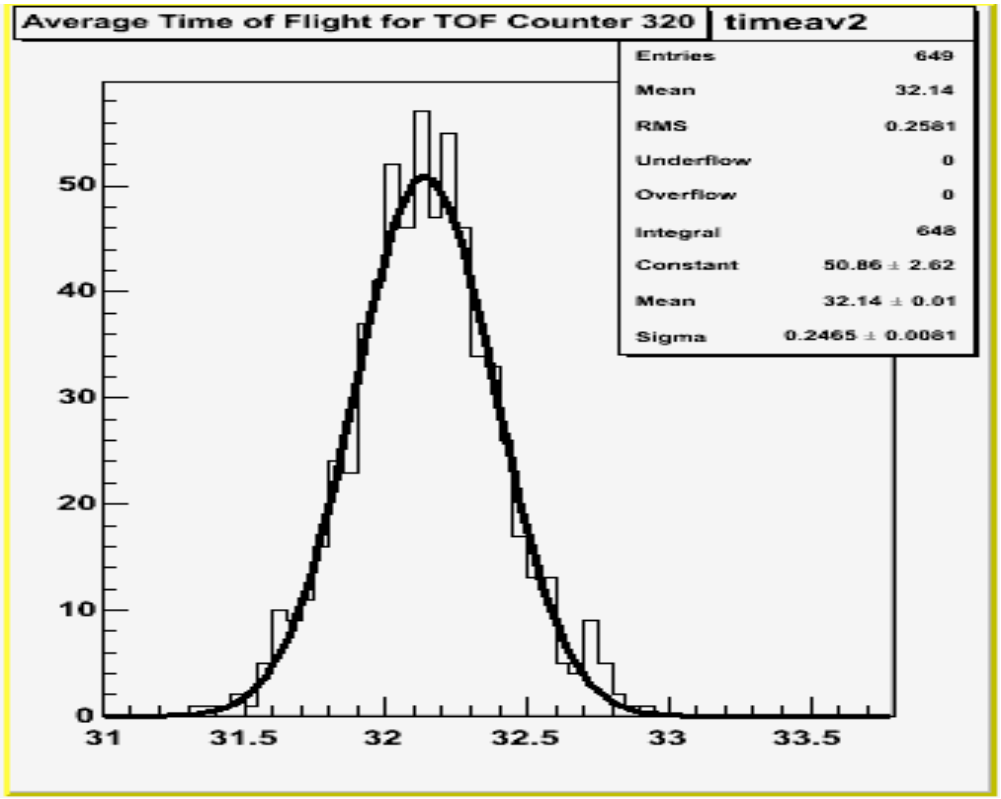
# TOF Resolutions: Beam Particles

- Center Bars have better resolution because most of the tracks are going through the center of the bar.
- Only look at events in center peak of bar:

  $T_{upper} - T_{lower}$ in peak.
- Can look only at those hits in the center of bar 320 for uninteracted beam particles.
  - Take the average of upper and lower times.
  - Subtract off the T0 time.

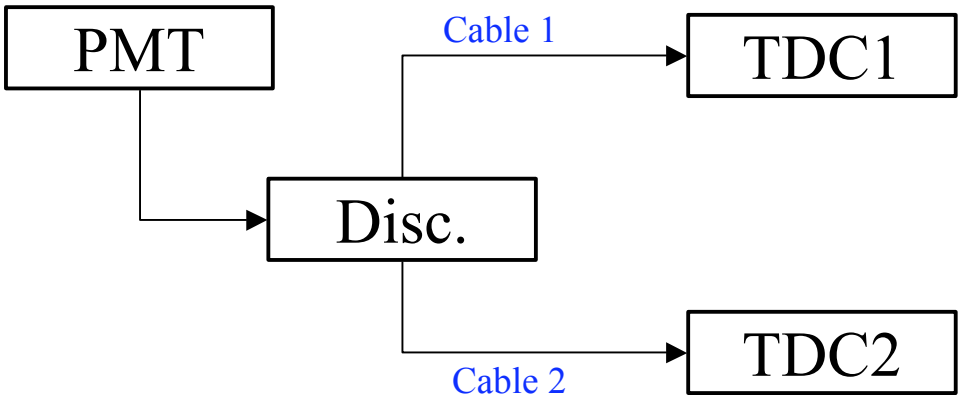
  Gives 246 ± 8ps resolution
- This value may improve as tracking gets involved



# Resolution Tests

We want to understand the effects of the long cables (~200') between the discriminator and the TDC.

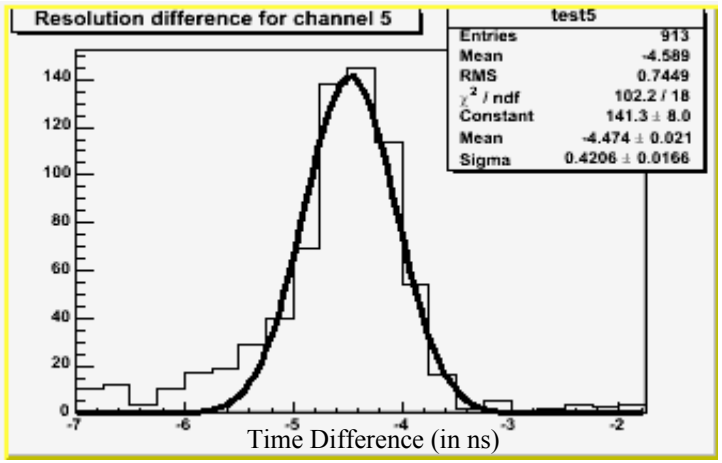



Look at the resolution of the difference of two PMT measurements traveling on different 200' or 250' cables.

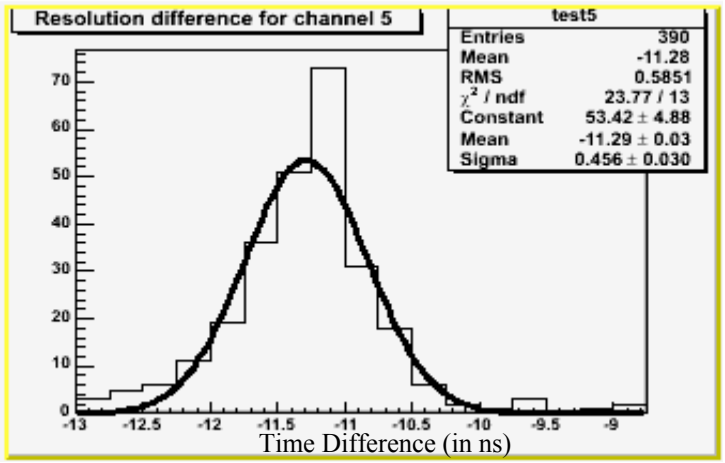
TDCs are at 250ps/bin – might be a problem.

Plot TDC1 – TDC2 for all active channels and then average results

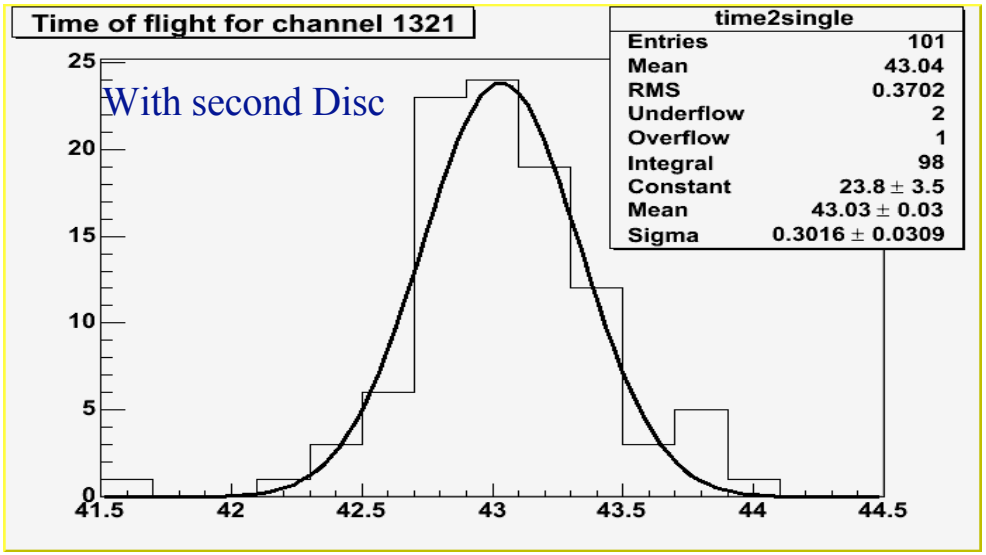
Runs: 8953 and 8952

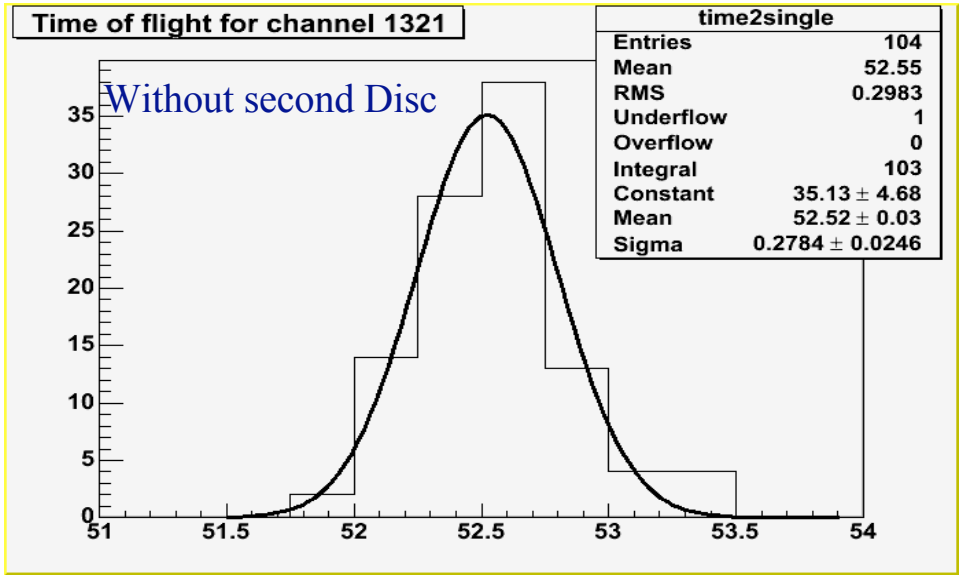



- 200 feet gives 424ps resolution on average.
- 250 feet gives 469ps resolution on average.



# Resolution Trials (2)



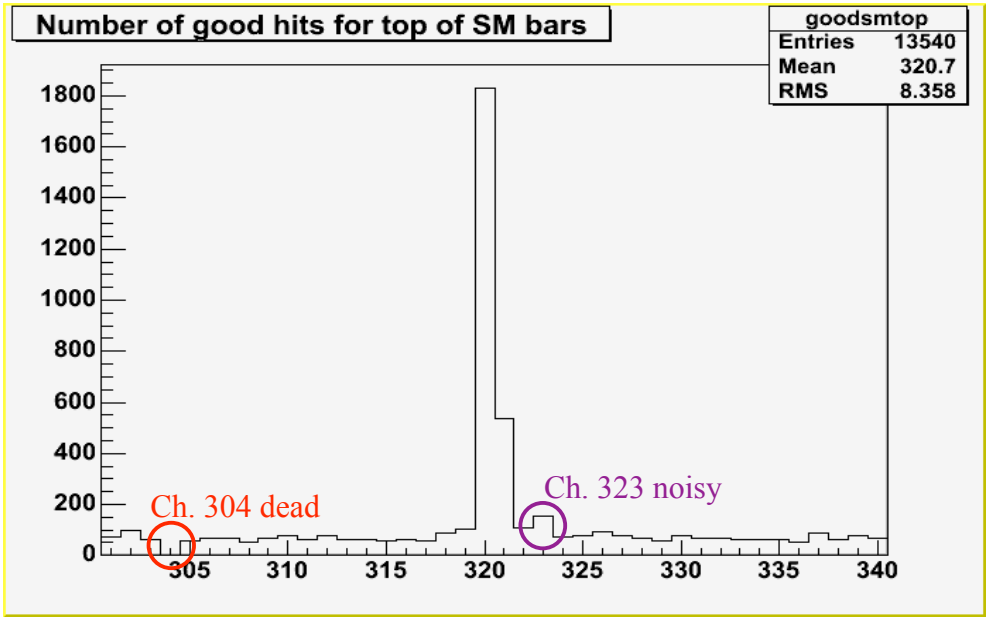

- Look at resolution of a channel with and without a second discriminator.
  - after the delay cable.
  - 30mV threshold
- Adding discriminator increased the resolution, but it is within errors.

  With: 306 ± 30

  Without: 278 ± 25

# TOF Bad Channels

- Four channels are giving problems with no signal.
- Channel 304:TDC??
  - Signal goes into TDC fine. This channel was noisy at one point and is now dead.
- Channel 1337:Found
  - Patch Panel does not pass the signal onward. Change channel in Patch Panel
- Channel 1203:TDC??
  - Signal goes into the TDC fine.
- Channel 3502:Found
  - Discriminator does not fire when signal is present. Change channel
- All but 1337 were working at the beginning of august




Bad Channel definition **for now**:

Channel is always overflow i.e. greater than 2047

Channel is always zero

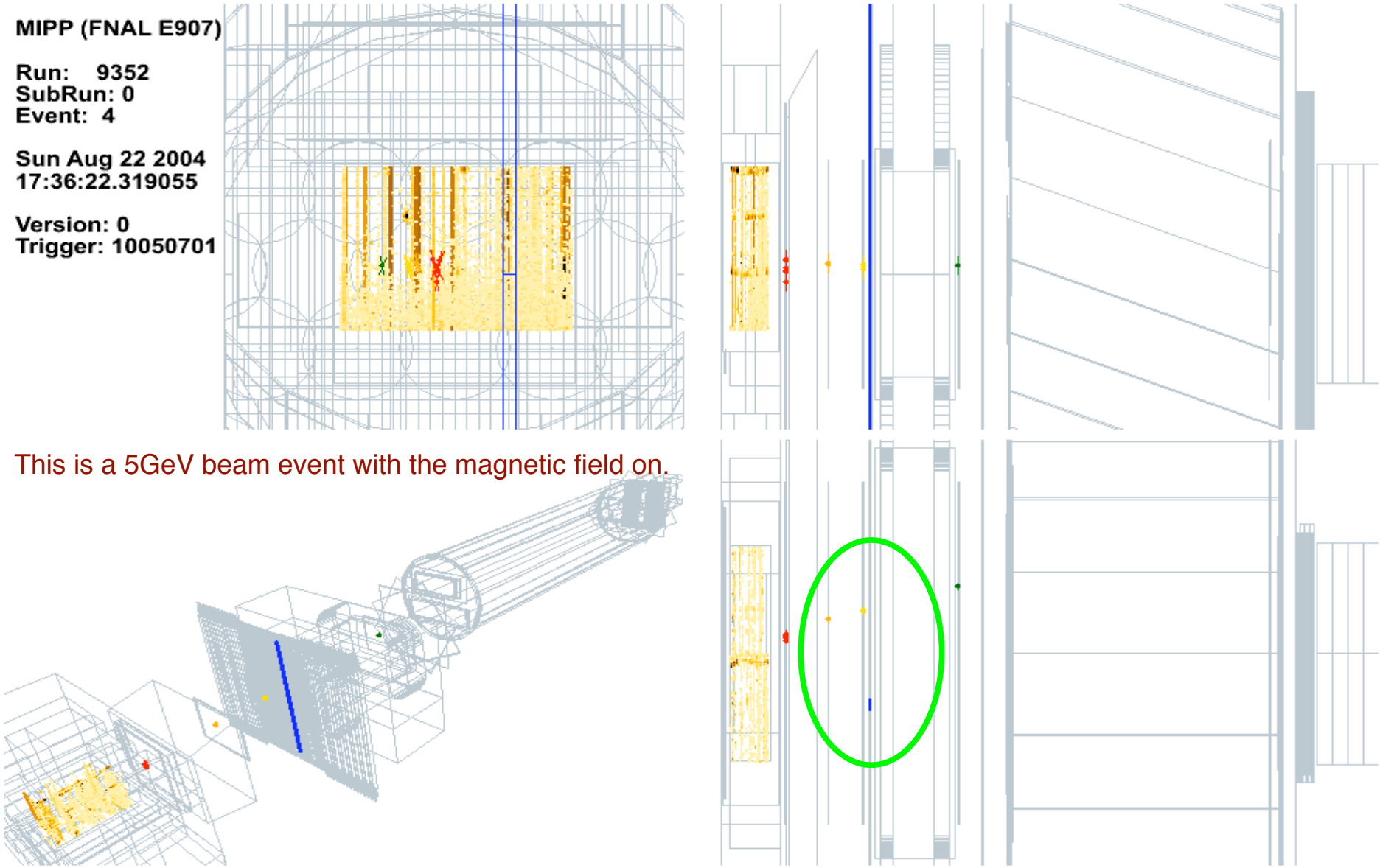
Later we will include noisy channels

TOFChan: Offline Job is working to log these channels to the database.

TOFFilter: Ofline Job to read in the channels from the database.

Database needs to finish being filled.

# TOF in the Event Display




This is a 5GeV beam event with the magnetic field on.

- TOF hit in channel 316 / 1316. This channel is on the East side of the detector, which is what it looks like in the TOF wall.
- The DC Tracks seem to point to the west side.