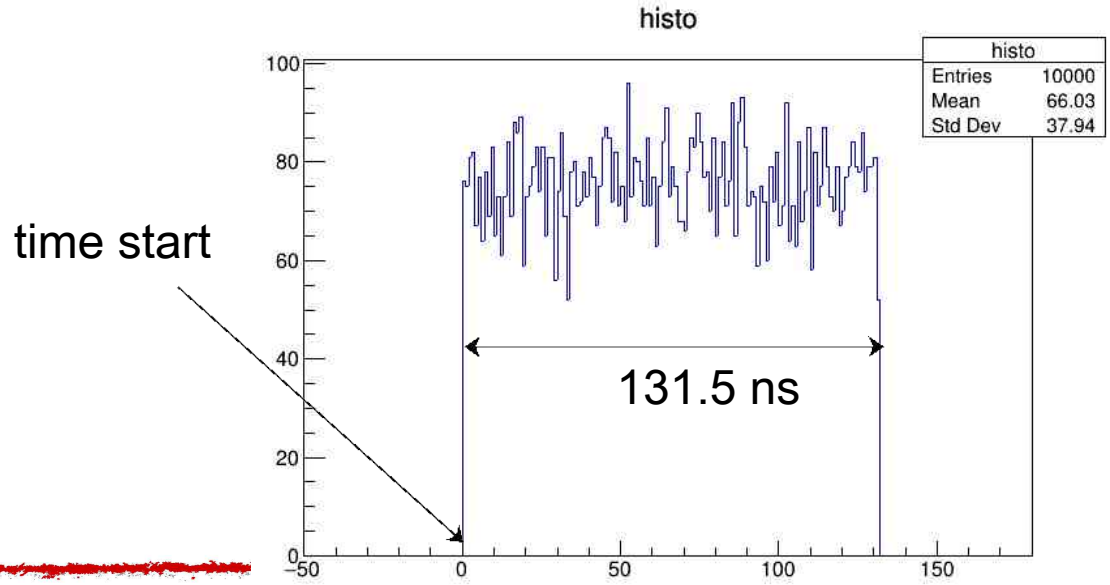
Time measurement and Time fit

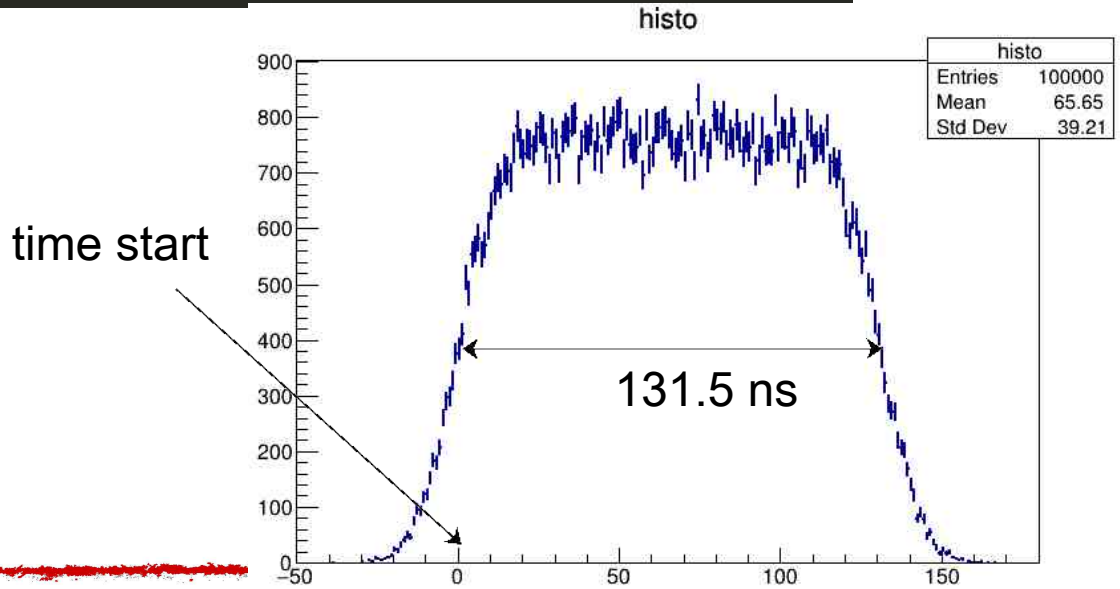
Time distribution - no diffusion

```
1
2   double gap = 5000; //µm
3   double drift_velocity = 38; //µm/ns
4   TRandom3 *r =new TRandom3();
5   TH1D *histo = new TH1D("histo","histo",230,-50,180);
6   for(int i=0;i<10000;i++) histo->Fill(r->Rndm()*gap/drift_velocity);
7   histo->Draw();
```



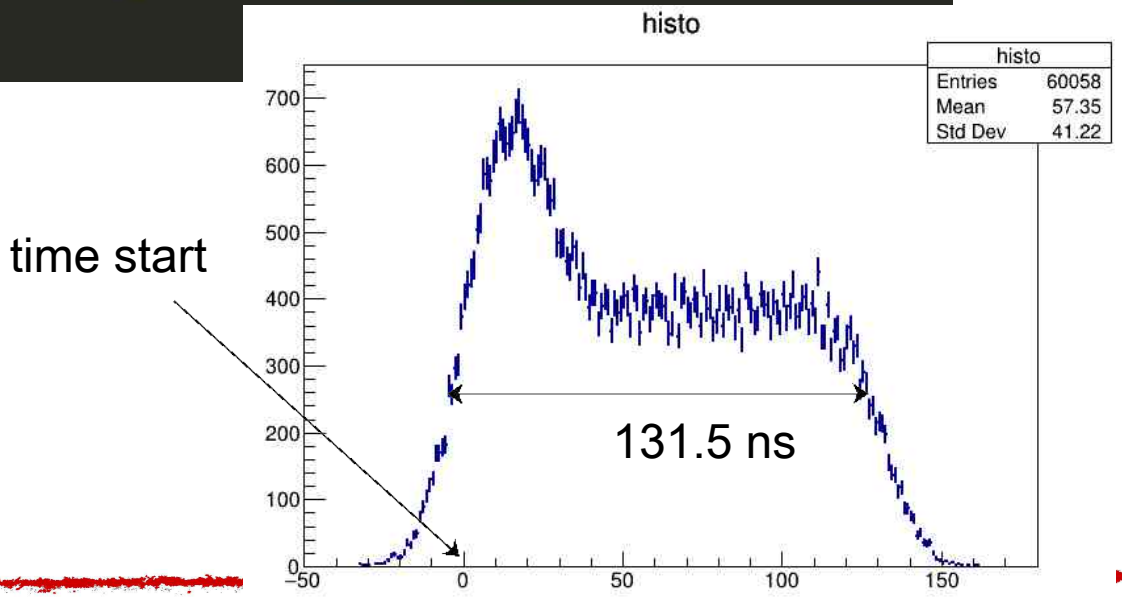
Time distribution - yes diffusion

```
8
9   double gap = 5000; //µm
10  double drift_velocity = 38; //µm/ns
11  TRandom3 *r =new TRandom3();
12  TH1D *histo = new TH1D("histo","histo",230,-50,180);
13  for(int i=0;i<100000;i++) histo->Fill(r->Gaus(r->Rndm()*gap/drift_velocity,10));
14  histo->Draw();
15
```



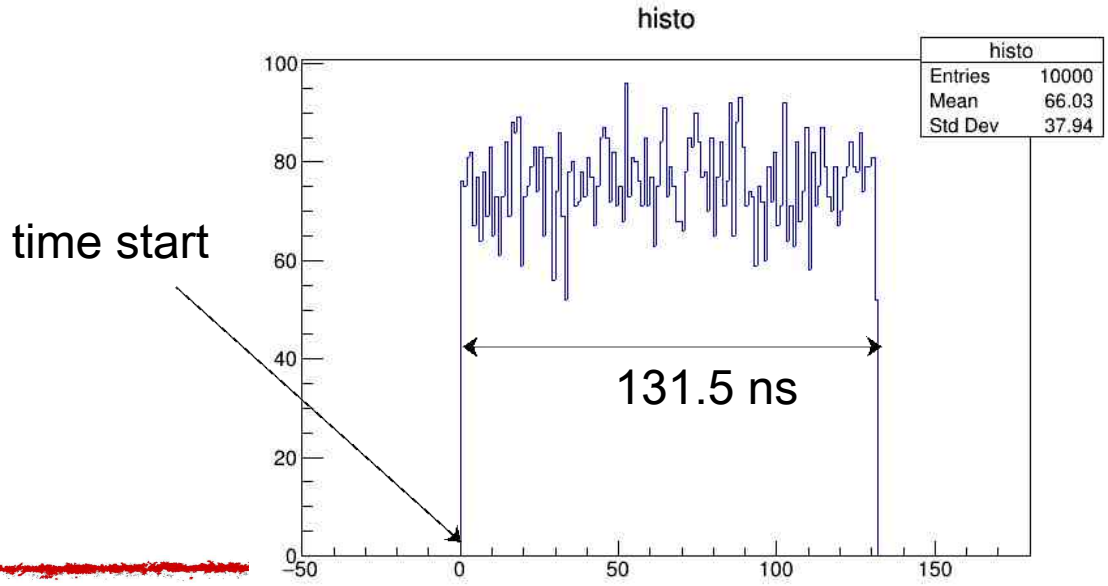
Time distribution - yes diffusion yes “electronics”

```
16
17   double gap = 5000; //µm
18   double drift_velocity = 38; //µm/ns
19   TRandom3 *r =new TRandom3();
20   TH1D *histo = new TH1D("histo","histo",230,-50,180);
21   for(int i=0;i<100000;i++) {
22     double z=r->Rndm()*gap;
23     if((z>gap/5 && r->Rndm()>0.5) || z<=gap/5) histo->Fill(r->Gaus(z/drift_velocity,10));
24   }
25   histo->Draw();
26
```



Time distribution - time measurements

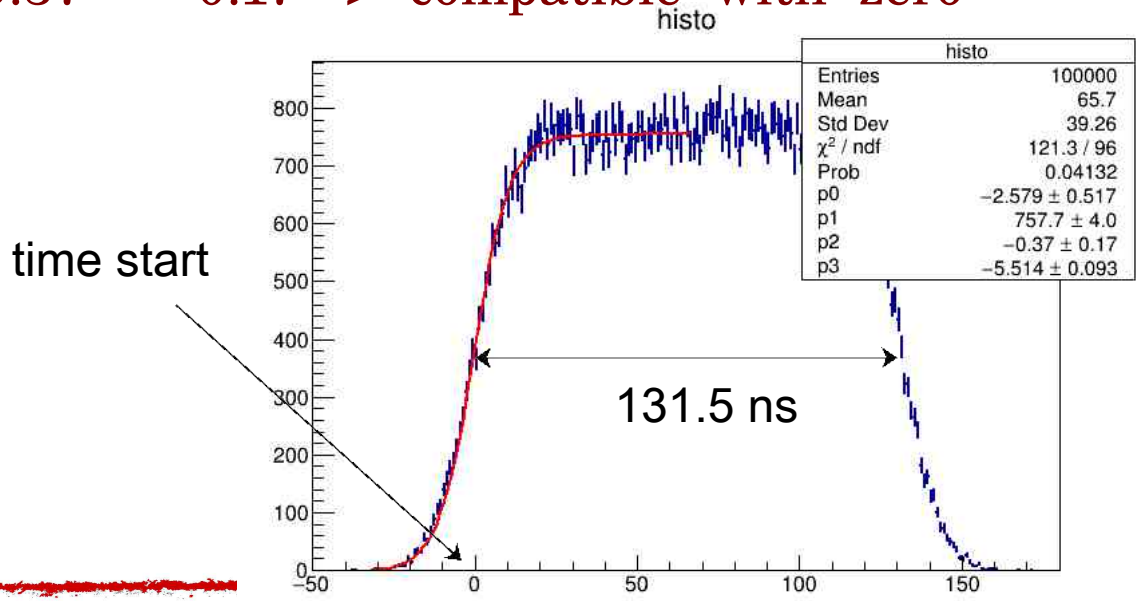
If we could remove the diffusion effects and we would have an electronics with 1ps time resolution then we could have the time distribution like a box



Time distribution - time measurements

Since the diffusion cannot be removed, we have to fix the time distribution with a Fermi-Dirac

-> par2 is the time = -0.37 +- 0.17 -> compatible with zero

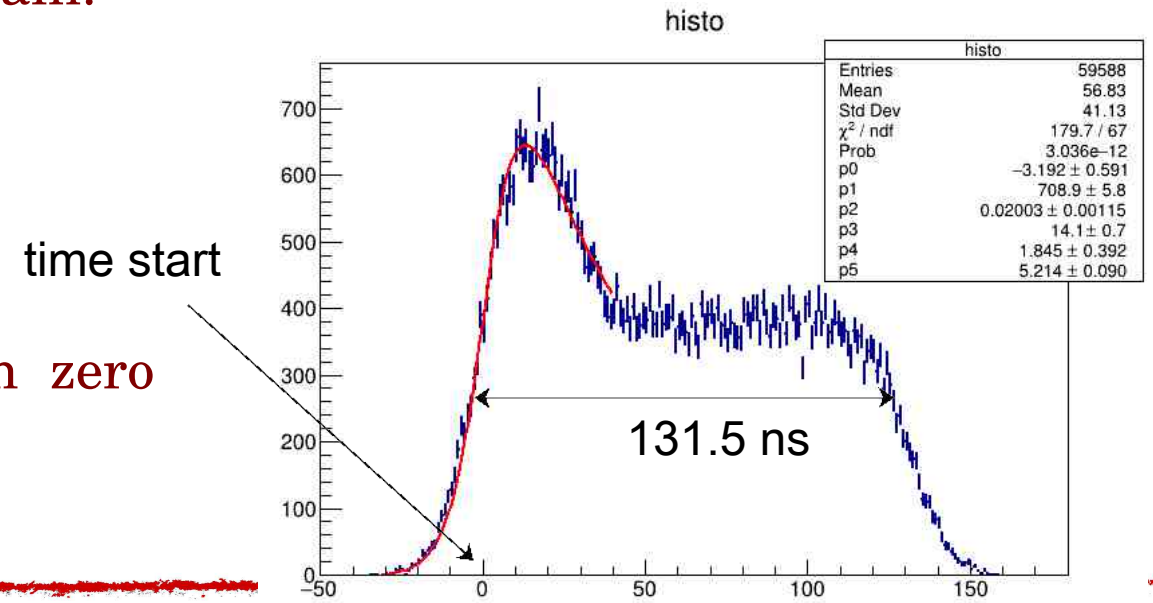


Time distribution - time measurements

If an electronics is used, some digi with larger values of time are not readout since the channel measures only the faster electron. If a Fermi-Dirac function is used to fit the time distribution we obtain:

par2 = 1.845 +- 0.392

--> NOT compatible with zero

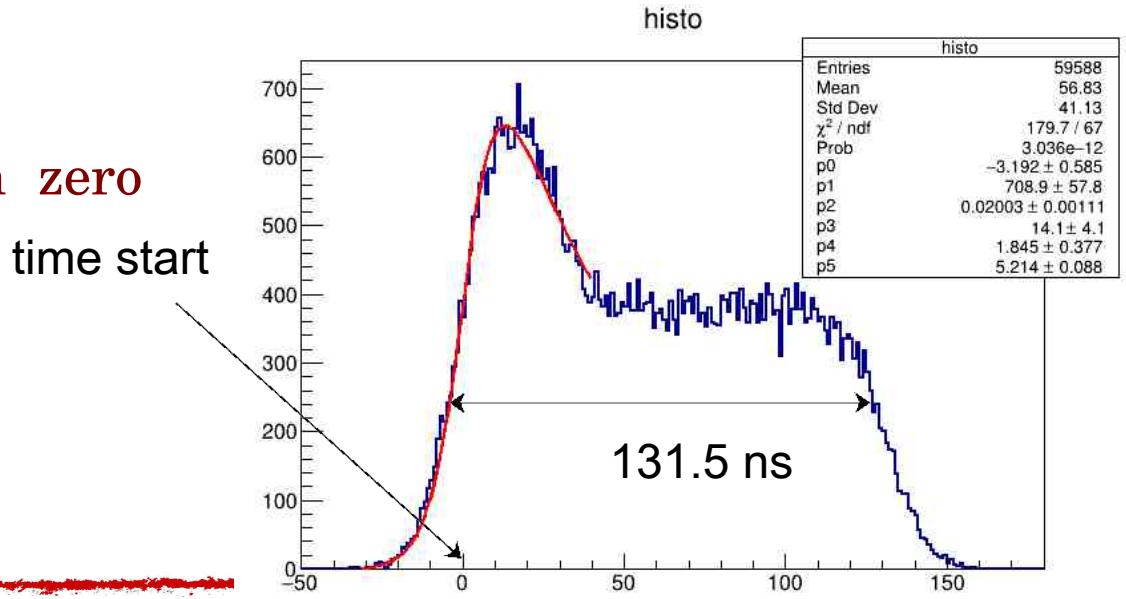


Time distribution - time measurements

If a Fermi-Dirac*Exp function is used to fit the time distribution we obtain:

par4 = 1.845 +- 0.377

--> NOT compatible with zero



Time distribution - time measurements

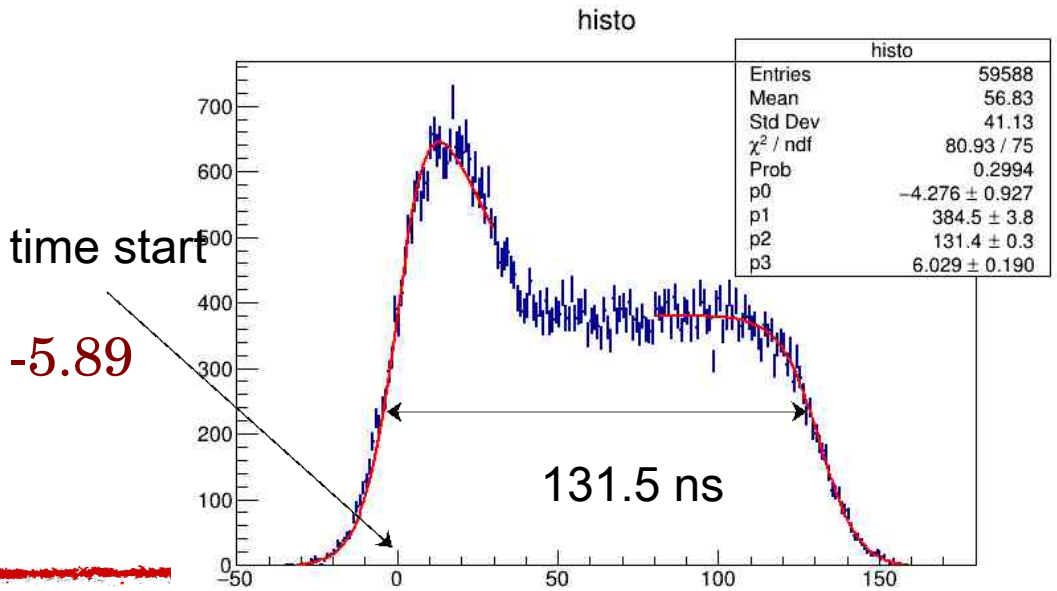
If a Fermi-Dirac*Exp function is used to fit the rising edge and a normal Fermi-Dirac to fit the falling edge we have:

time at peak = 12.962

time from fit = 1.845

time @ half max = -0.841

time @ half falling max = -5.89



Time distribution - time measurements

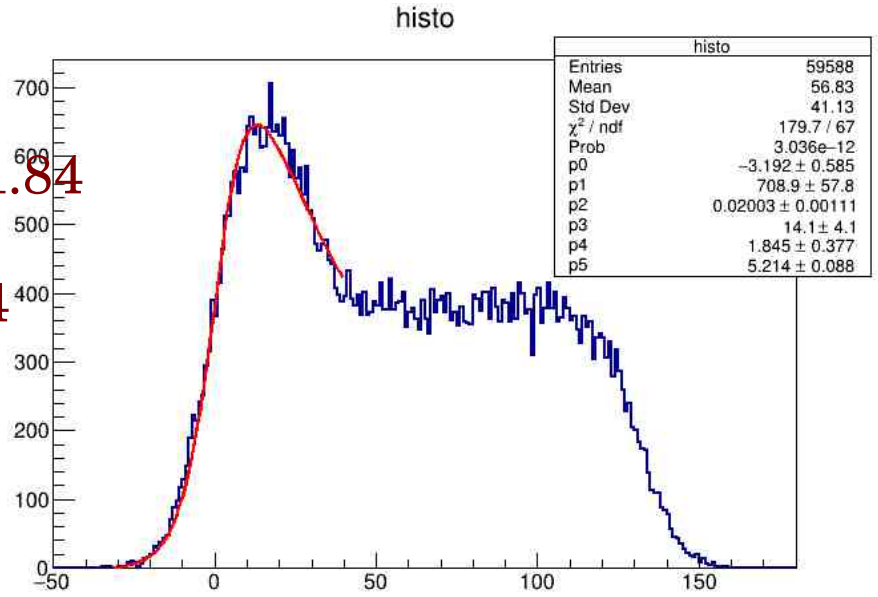
I suggest to use the time in the middle of the maximum (par1) with an error measured with a variation of 10% of the of the maximum value

time @ half max = -0.841

time @ half max minus 10% = -1.84

time @ half max plus 10% = 0.14

--> time = -0.841 +- 0.994



Time distribution - time measurements

I suggest to use the time in the middle of the maximum (par1) with an error measured with a variation of 10% of the of the maximum value

This approach has to be validated with the TIGER simulation

time @ half max = -0.841

time @ half max minus 10% = -1.84

time @ half max plus 10% = 0.14

--> time = -0.841 +- 0.994