$$B_s \to K^{*0}\overline{K}^{*0}$$

08/04/09

Reunión Anterior

- Utilizar como parámetro sólo la asimetria.

$$\widetilde{A_0}(t) \sim Pe^{-\Gamma_H t} + (1-P)e^{-\Gamma_H t}$$

$$P = \frac{1 - \mathcal{A}_{\Delta\Gamma}^{long}}{2}$$

- Revisar los errores que representados en el plot:
  - Son correctos
  - Son Incorrectos -> El error se traslada al cálculo de χ2

Determinación del error en la Asimetría ΔΓ

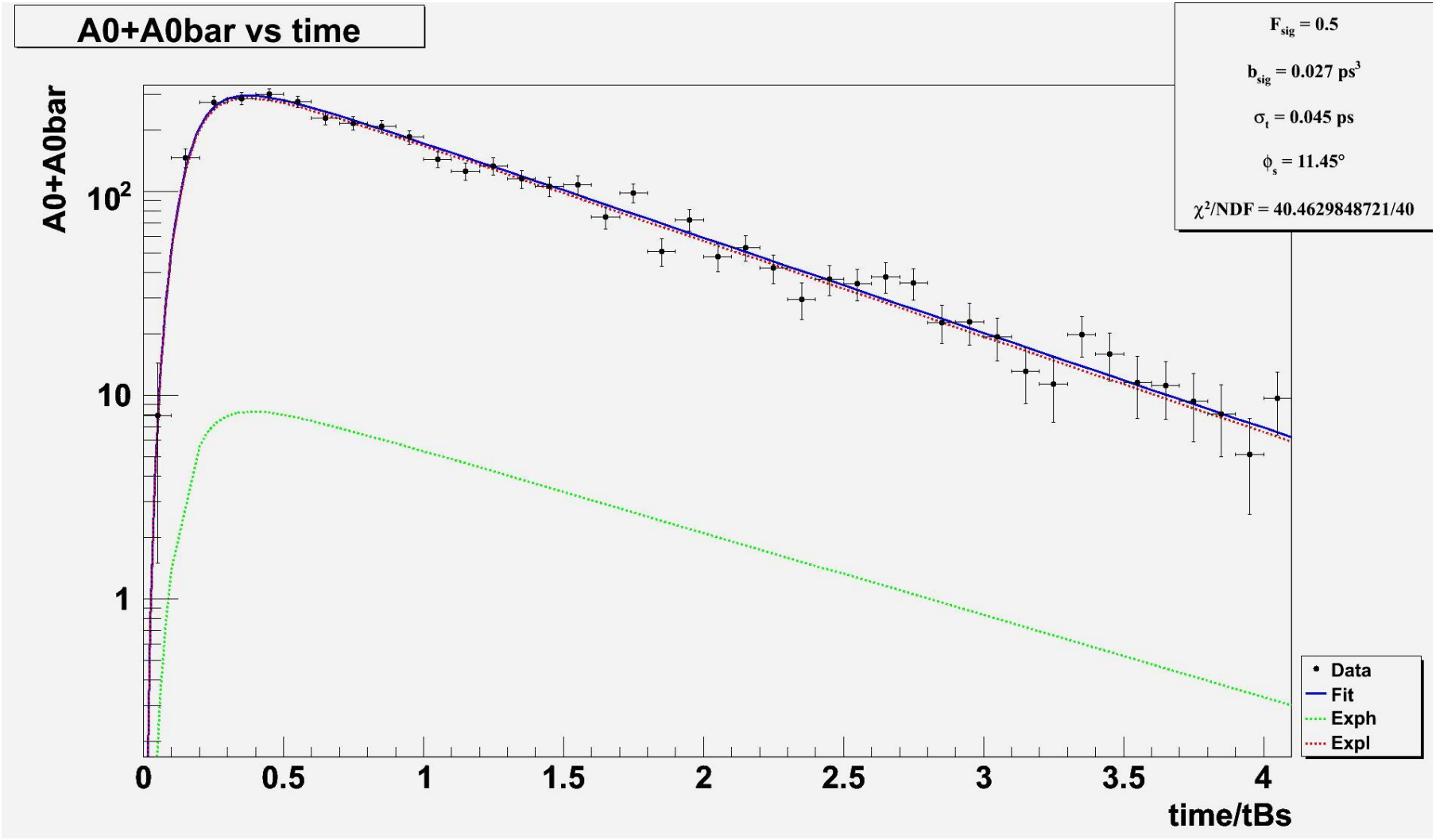
- Resultados del fit para distintos experimentos:

F_{sig}	$b_{sig}\ (ps^3)$	$\sigma_t\ (ps)$	$\phi_s\ (rad)$	$\Delta\Gamma/\Gamma_s$	$\mathcal{A}_{\Delta\Gamma}^{long}$	$s\left(\mathcal{A}_{\Delta\Gamma}^{long}\right)$	χ^2	NDF
1	0	0	0.2	0.5	0.362498	0.0555507	52.13	41
1	0	0	0.2	0.15	0.727922	0.172182	38.82	46
1	0.027	0	0.2	0.15	0.833348	0.168940	49.95	46
1	0.027	0.045	0.2	0.15	0.890206	0.170214	63.18	45
0.5	0.027	0.045	0.2	0.15	0.937278	0.729086	40.46	40

El error que tendríamos en la determinación de la asimetría sería:

$$s\left(\mathcal{A}_{\Delta\Gamma}^{long}\right) = 0.73$$

Determinación del error en la Asimetría ΔΓ



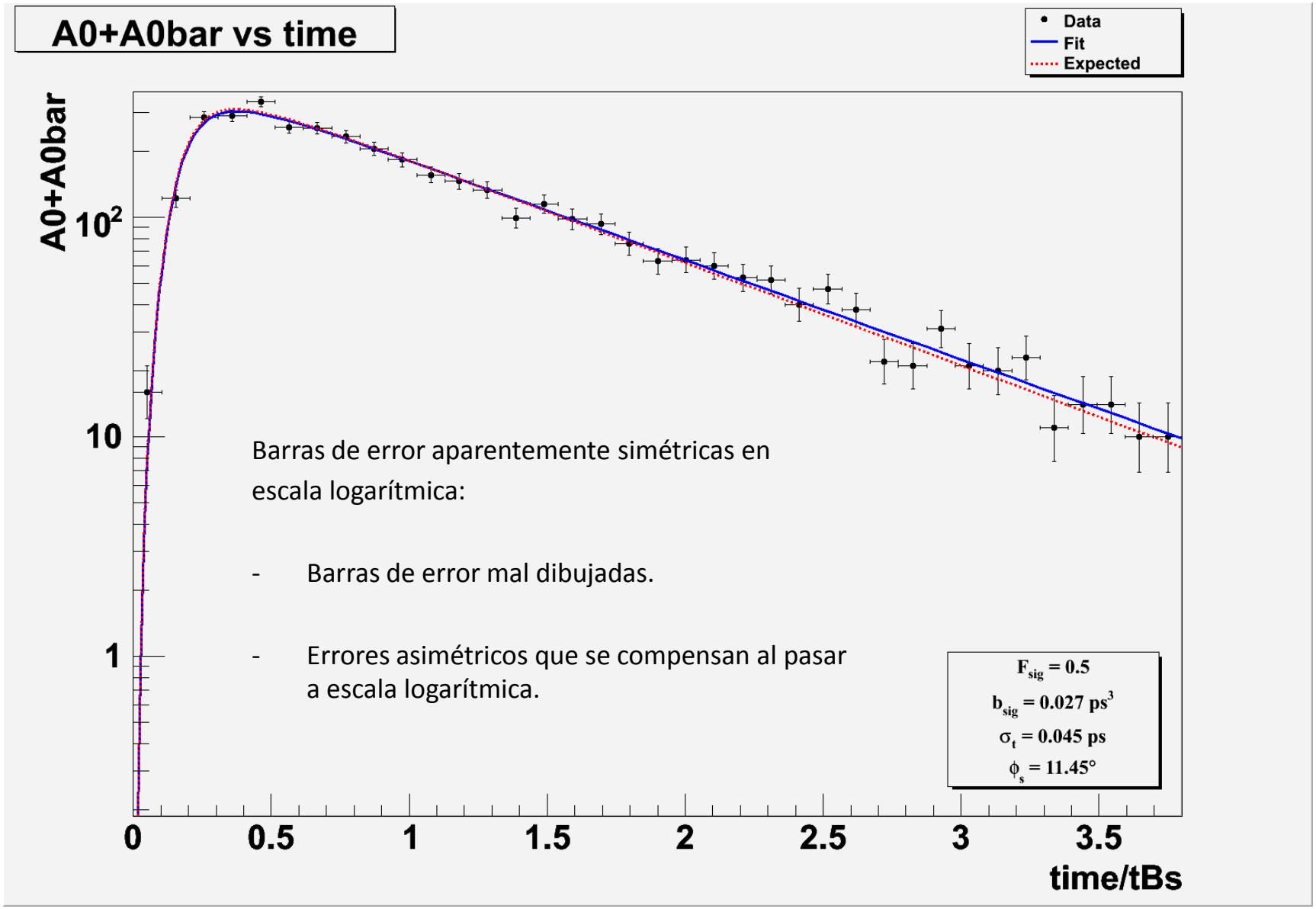
Determinación del error en la Asimetría ΔΓ

- Resultados del fit en función del valor de ϕs

Parameter	Value
F_{sig}	0.5
$b_{sig}\ (ps^3)$	0.027
$\sigma_t\ (ps)$	0.045
$\Delta\Gamma/\Gamma_s$	0.15

$\phi_s\ (^\circ)$	$cos(\phi_s)$	$\mathcal{A}_{\Delta\Gamma}^{long}$	$s\left(\mathcal{A}_{\Delta\Gamma}^{long}\right)$	χ^2	DOF
11.45	0.98	0.937278	0.729086	40.46	40
20	0.94	0.791143	0.256610	43.67	38
30	0.87	0.535613	0.256041	41.52	39
40	0.77	0.376178	0.277103	58.67	36
50	0.64	0.288864	0.240639	37.54	45
60	0.50	0.573458	0.256316	35.58	40

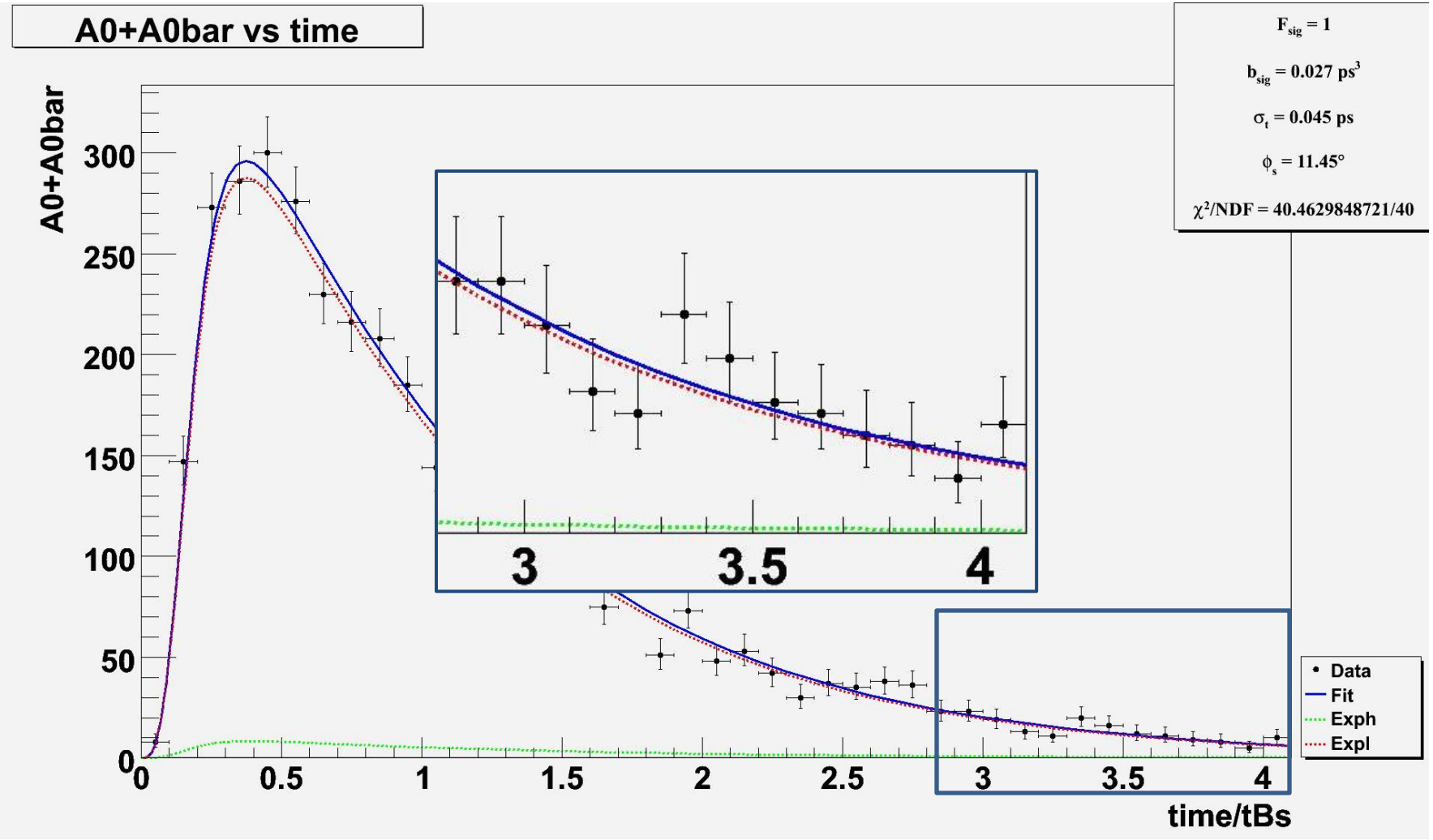
Barras de Error en el Plot



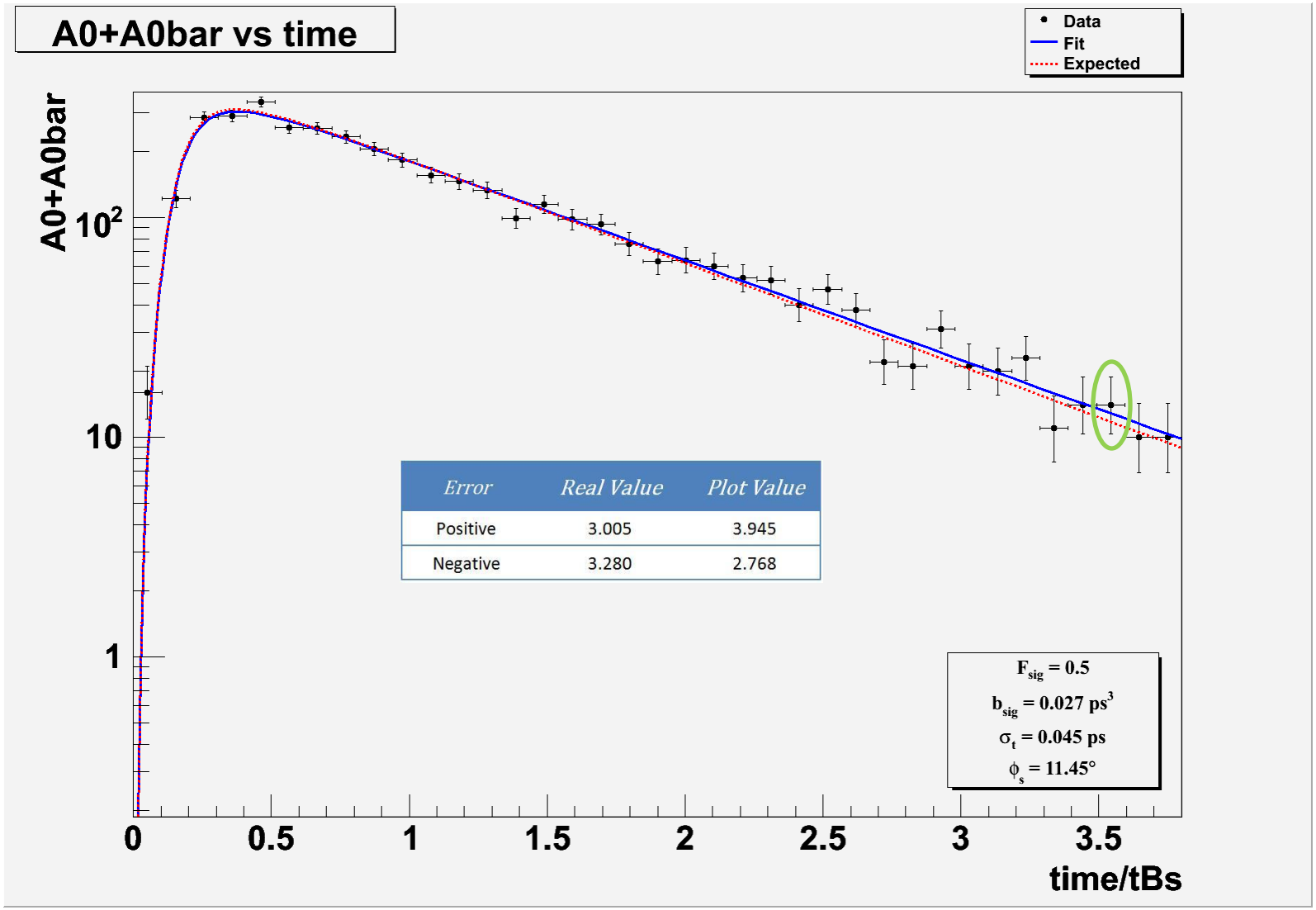
Barras de error aparentemente simétricas en escala logarítmica:

- Barras de error mal dibujadas.
- Errores asimétricos que se compensan al pasar a escala logarítmica.

Barras de Error en el Plot



Barras de Error en el Plot



Error	*Real Value*	*Plot Value*
Positive	3.005	3.945
Negative	3.280	2.768

Experimentos de control

- Comparación entre el χ2 calculado por RooFit (RooChi2Var) y una estimación:

$$\chi^2_{Cal} = \sum_{nbin} \left(\frac{N_{PDF} - N_{bin}}{\sigma_{bin}} \right)^2$$

donde: $\sigma_{bin} = \frac{(\sigma_+ + \sigma_-)}{2}$

F_{sig}	$b_{sig}\ (ps^3)$	$\sigma_t\ (ps)$	$\phi_s\ (rad)$	$\Delta\Gamma/\Gamma_s$	χ^2_{RooFit}	χ^2_{Cal}	NDF
1	0	0	0.2	0.5	52.13	52.52	41
1	0	0	0.2	0.15	38.82	39.99	46
1	0.027	0	0.2	0.15	49.95	50.17	46
1	0.027	0.045	0.2	0.15	63.18	60.52	45
0.5	0.027	0.045	0.2	0.15	40.46	39.39	40

Por hacer…

- Entender lo que ocurre con el cálculo de χ2.

- Estimar el error en la Asimetría ΔΓ a través de la medida de las otras dos:

$$\mathcal{A}_{\Delta\Gamma}^{long} = \sqrt{1 - \left(\mathcal{A}_{dir}^{long}\right)^2 - \left(\mathcal{A}_{mix}^{long}\right)^2}$$

- Código de la funcion de ajuste

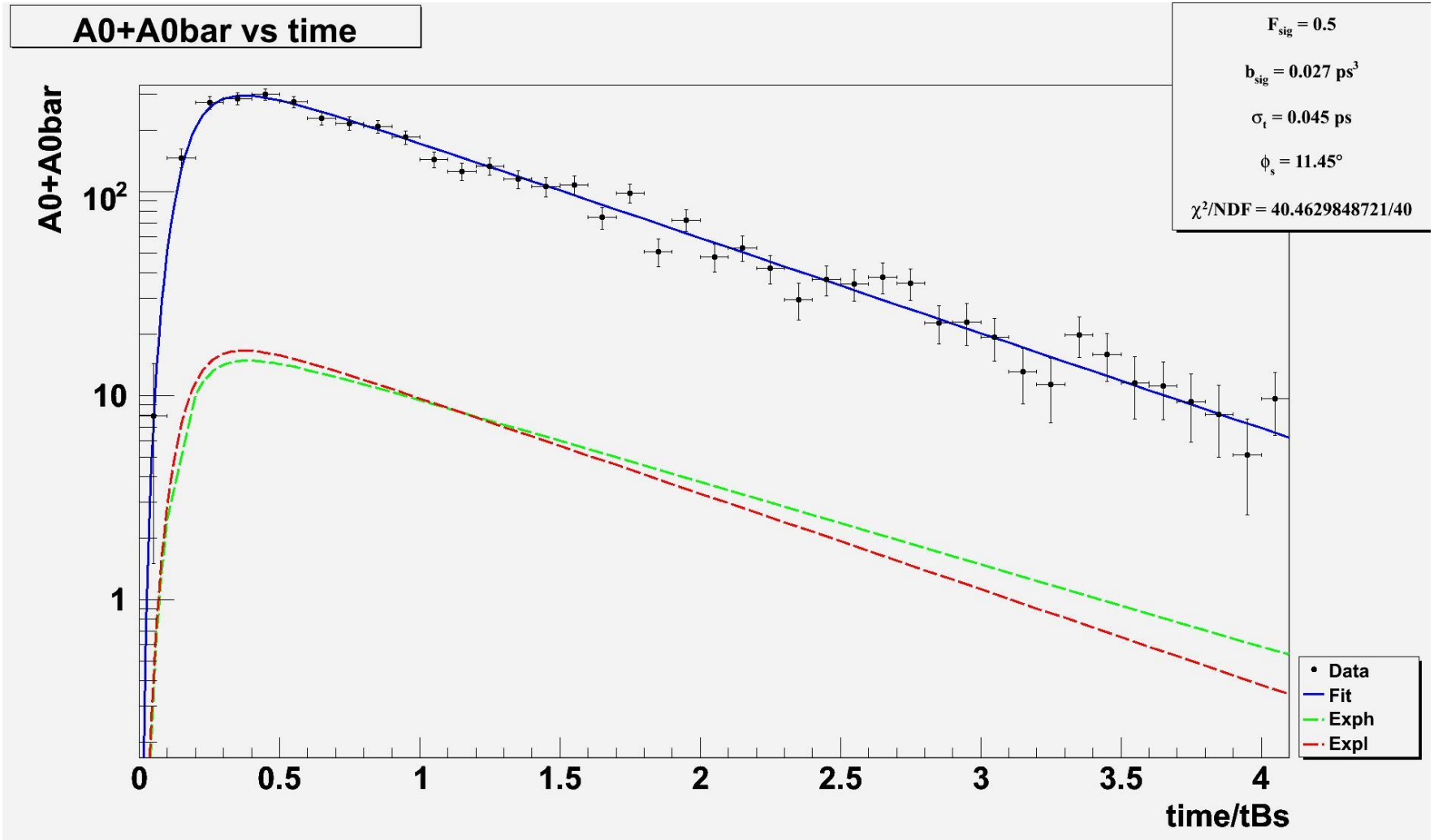
```
Double_t ExpH::evaluate() const
{
  Double_t GL = gama+gamd/2.;
  Double_t GH = gama-gamd/2.;
  Double_t Gs = gama;

  Double_t sigmat_2 = sigmat*sigmat;
  Double_t sq2 = sqrt(2);

  Double_t ght;

  if ( dt < 20*sigmat){

   ght = .5*exp(0.5*GH*(-2*dt+GH*sigmat_2))*(1.+ RooMath::erf((dt-GH*sigmat_2)/(sq2*sigmat)));

   }
  else{

   ght = exp(GH*(.5*GH*sigmat_2 - dt));

   }

  Double_t t_3 = dt*dt*dt;
  Double_t tacc;

  if (bb==0){
   tacc =1;
  }
  else{
   tacc = t_3 / (bb + t_3) ;
  }

  Double_t tterm0 = ght;

  Double_t K1 = A0_2 * tterm0 ;

  return K1*tacc ;
 }
```

- Código de la funcion de ajuste

```
Double_t ExpL::evaluate() const
 {

  Double_t GL = gama+gamd/2.;
  Double_t GH = gama-gamd/2.;
  Double_t Gs = gama;

  Double_t sigmat_2 = sigmat*sigmat;
  Double_t sq2 = sqrt(2);

  Double_t glt;

  if ( dt < 20*sigmat){

   glt = .5*exp(0.5*GL*(-2*dt+GL*sigmat_2))*(1.+ RooMath::erf((dt-GL*sigmat_2)/(sq2*sigmat)));//exp(-GL*dt);

   }
  else{
   glt = exp(GL*(.5*GL*sigmat_2 -dt));//*exp(.5*GL*sigmat_2);

   }

  Double_t t_3 = dt*dt*dt;
  Double_t tacc;

  if (bb==0){
   tacc =1;
  }
  else{
   tacc = t_3 / (bb + t_3) ;
  }

  Double_t tterm0 = glt;

  Double_t K1 = A0_2 * tterm0 ;

  return K1*tacc ;

 }
```

- Código de la funcion de ajuste

```
ADG = RooRealVar( "ADG“ , "ADG“ , 0.5 , 0. , 1.)
P = RooFormulaVar( "P“ , "(1-ADG)/2.“ , RooArgList(ADG) )

 exph = ExpH( 'exph‘ , 'exph‘ , a0_2 , gama , gamd , sigmat , btim , time )
 expl = ExpL( 'expl‘ , 'expl‘ , a0_2 , gama , gamd , sigmat , btim , time)

  model = RooAddPdf( 'model‘ , 'model‘ , exph , expl , P)
```


A0+A0bar vs time
A0+A0bar
10^2
10
1
0
0.5
1
1.5
2
2.5
3
3.5
4
time/tBs
F_{sig} = 0.5
b_{sig} = 0.027 ps^3
σ_t = 0.045 ps
ϕ_s = 11.45°
χ^2/NDF = 40.4629848721/40
Data
Fit
Exph
Expl