τ_{B^0} with Inclusive $D^*l\nu$: Study of θ Dependence

- Remind the problem:

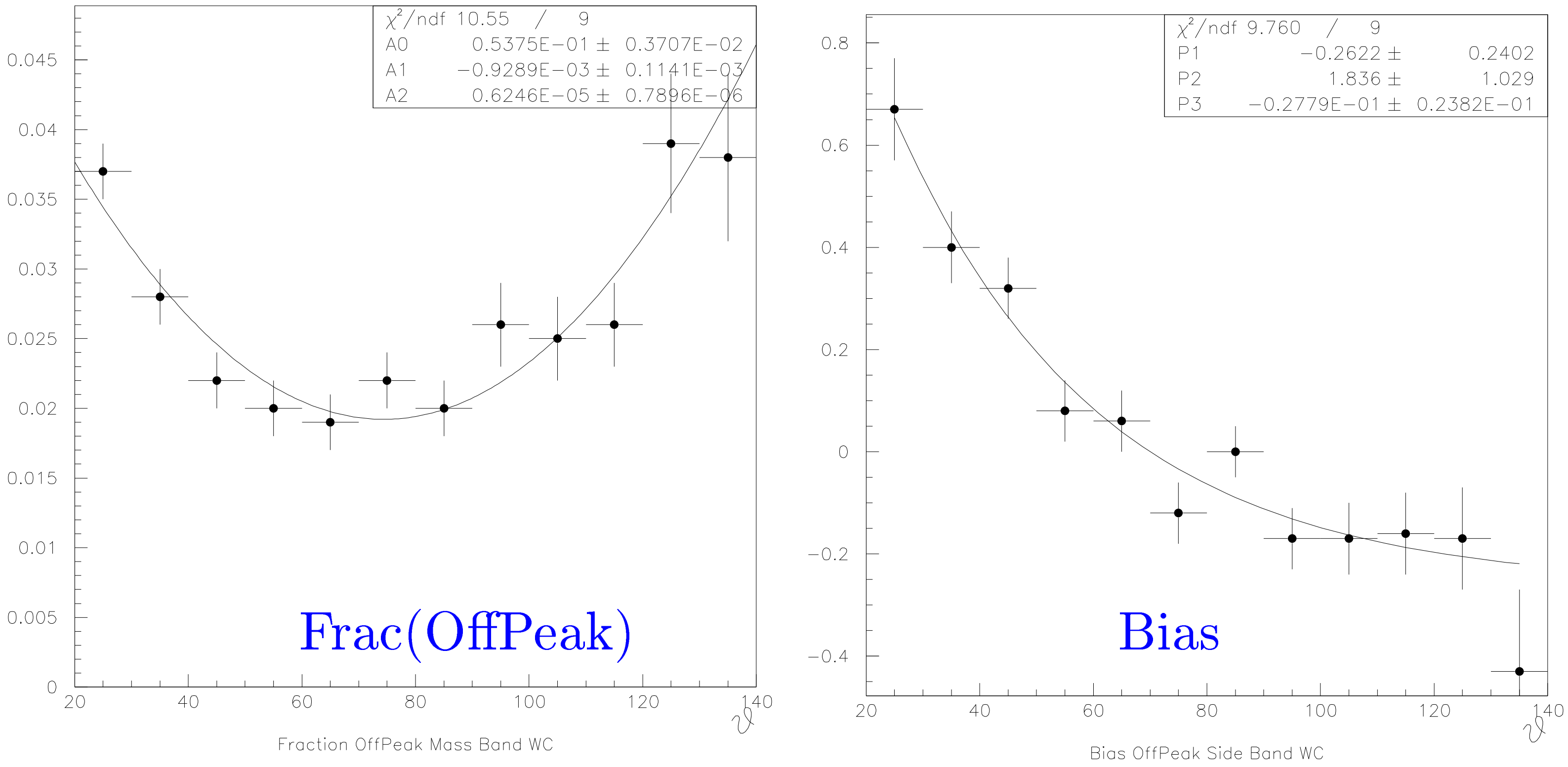
  Summer τ_{B^0} result shows instability in bins of Lepton Polar Angle.

- New approach:

  1. Study the fraction of continuum and combinatorial bkg vs θ.
  2. Study the θ dependence of the resolution function parameters for the different components (offpeak, combinatorial, signal) by fitting τ in different θ bins.
  3. Determine the proper parameterizations in the lifetime fit over the full θ spectrum.

Continuum-1

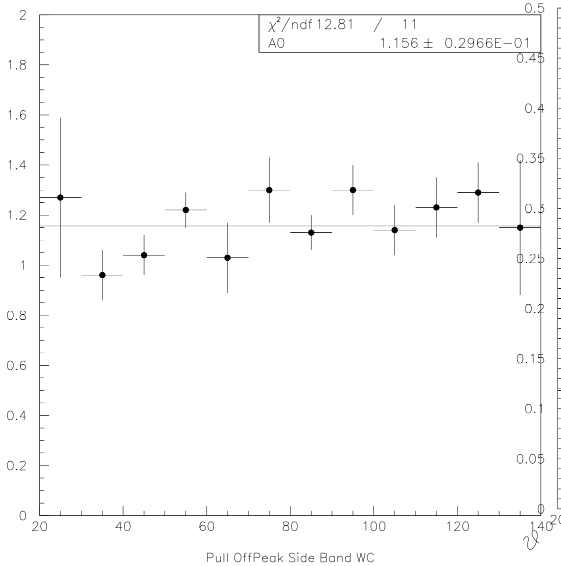
- The Offpeak Fraction shows the $1+\cos^2\theta$ QED behaviour.
- The bias behaviour is well described by an exponential.



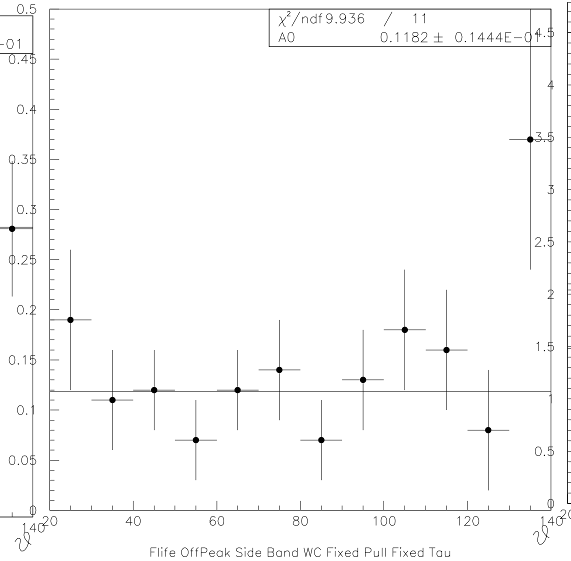
$D^*l\nu$

Continuum-2

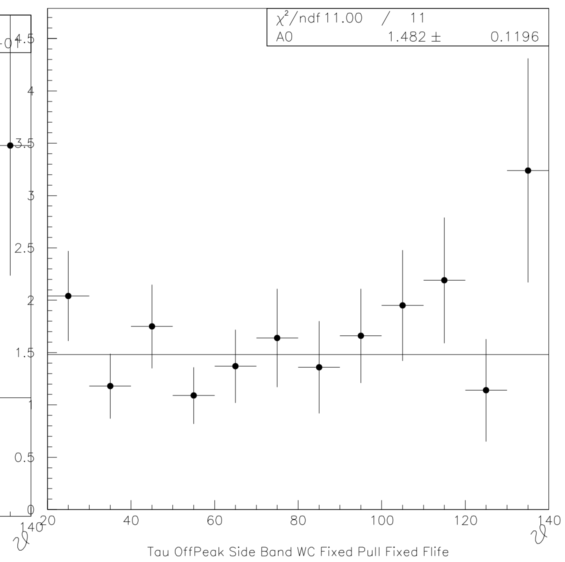
- Using the bias parameterization determined in the fit over the full θ, the other resolution function parameters (pull and fraction of living component) and the resulting lifetime are reasonably flat.



Pull



Frac(Lifetime)

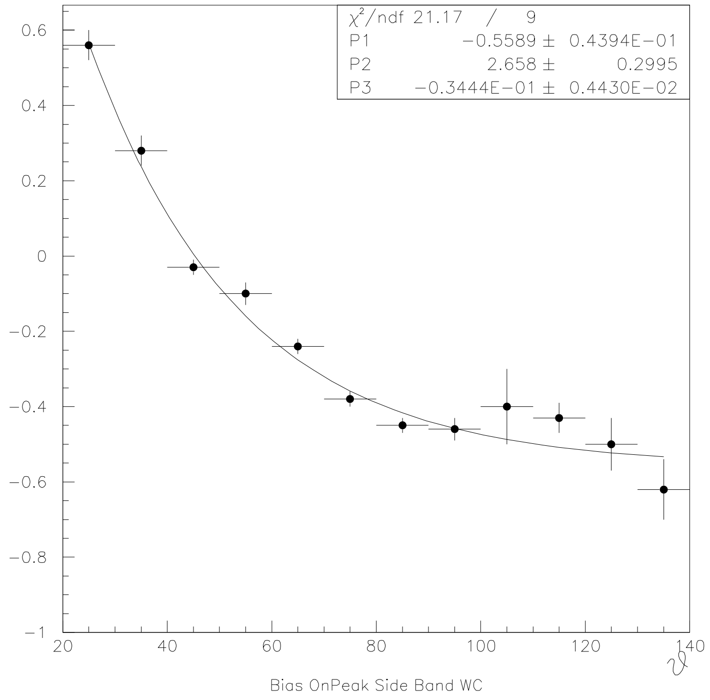


τ

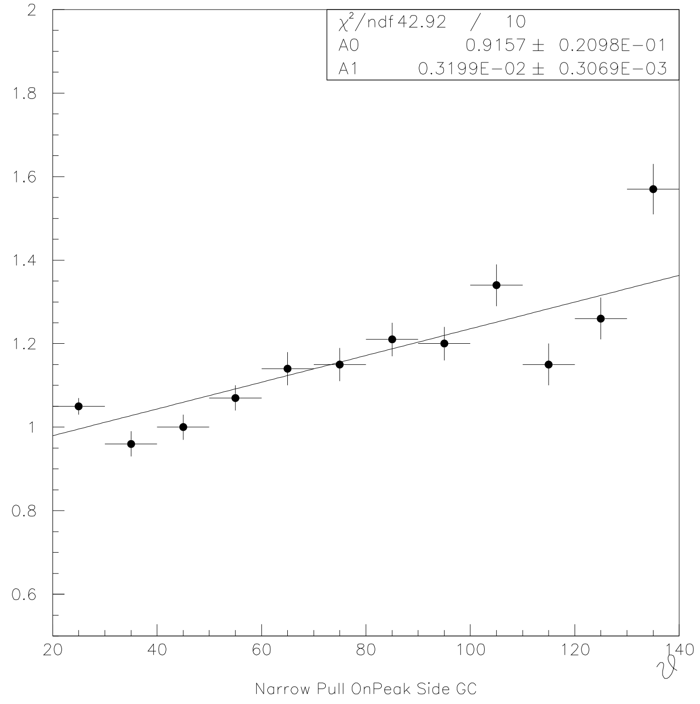
$D^*l\nu$

Combinatorial-1

- Similar bias θ dependence.
- Pull is increasing with the Lepton Polar Angle.



Bias

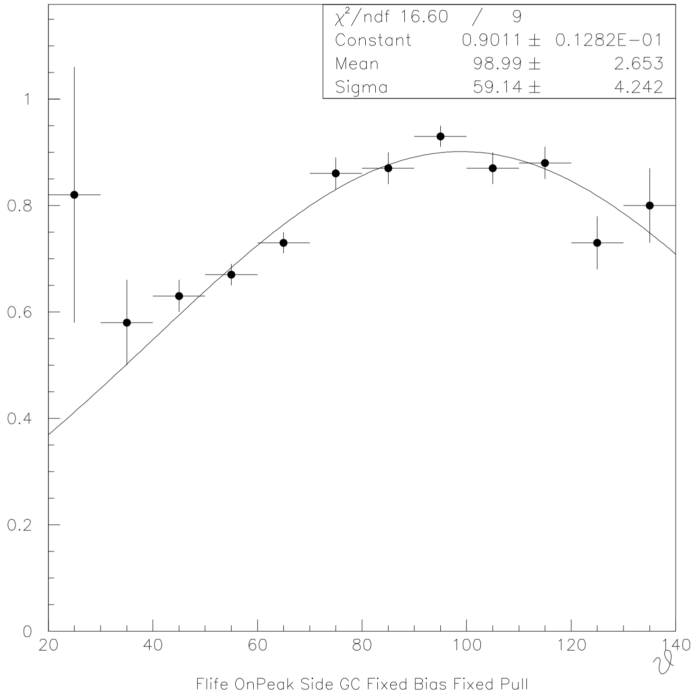


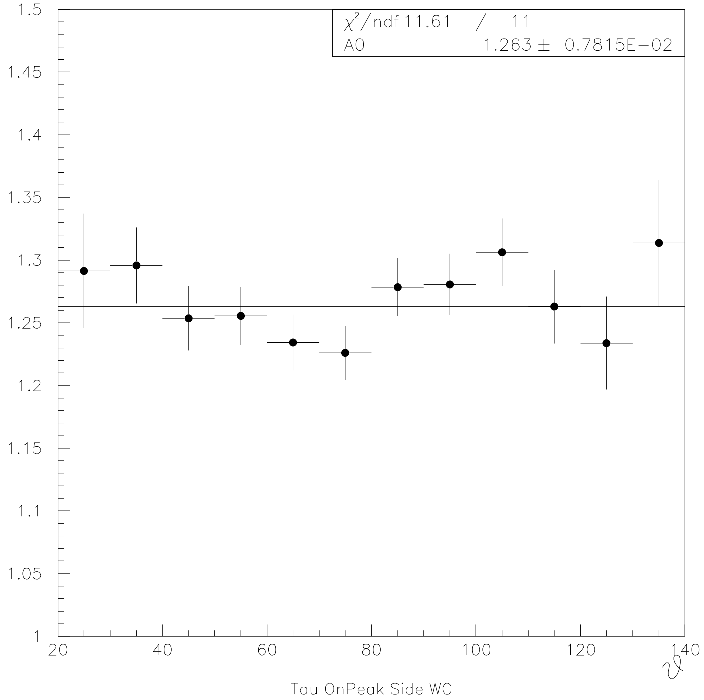
Pull

$D^*l\nu$

Combinatorial-2

- After the Bias and Pull fixing, the Fraction of living Background shows θ dependence as well.
- Fixing all the parameters and the OffPeak, the resulting Background Lifetime is flat (Full θ result $\tau = 1.27 \pm 0.01$)



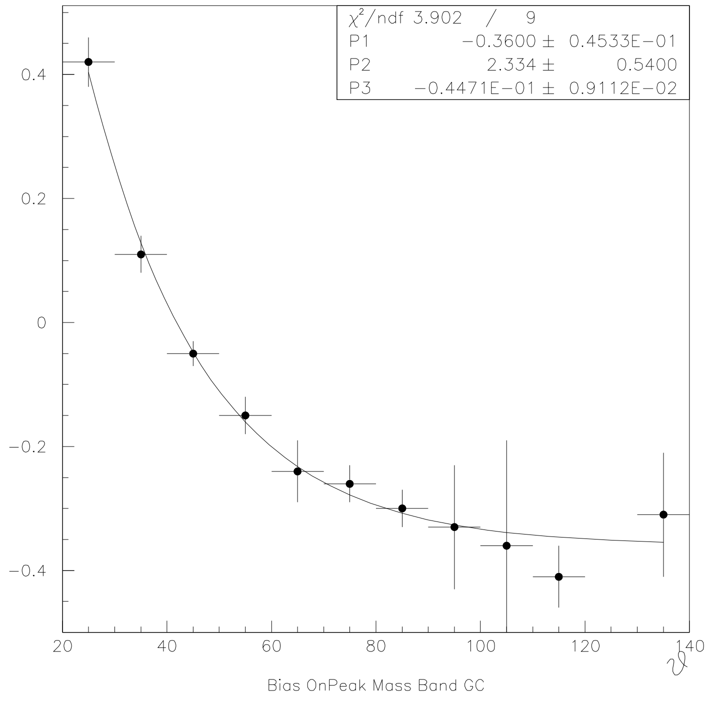


Frac(Lifetime) τ

$D^* l \nu$

Signal-1

- Signal shows a similar Bias θ dependence.

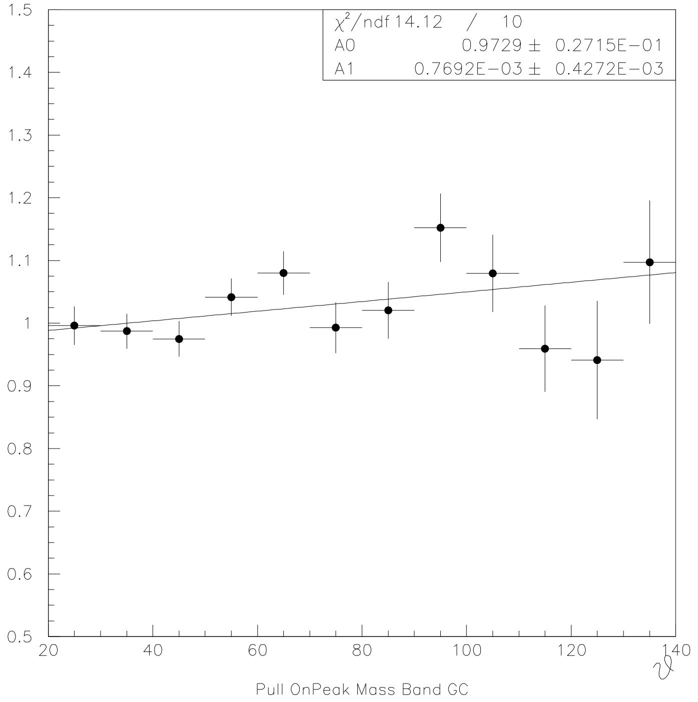


Bias

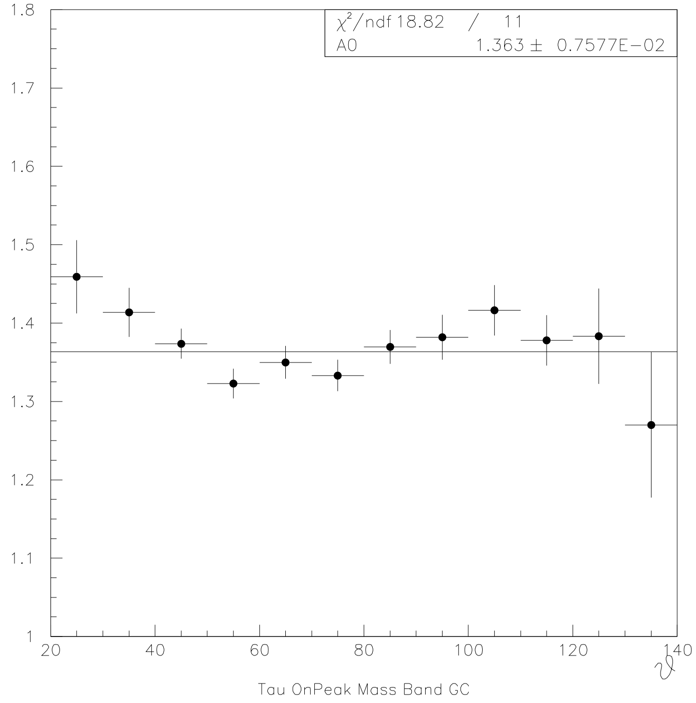
$D^* l \nu$

Signal-2

- After the Bias fixing the Lifetime is reasonably flat and the Narrow Pull shows a straight line θ dependence:



Pull



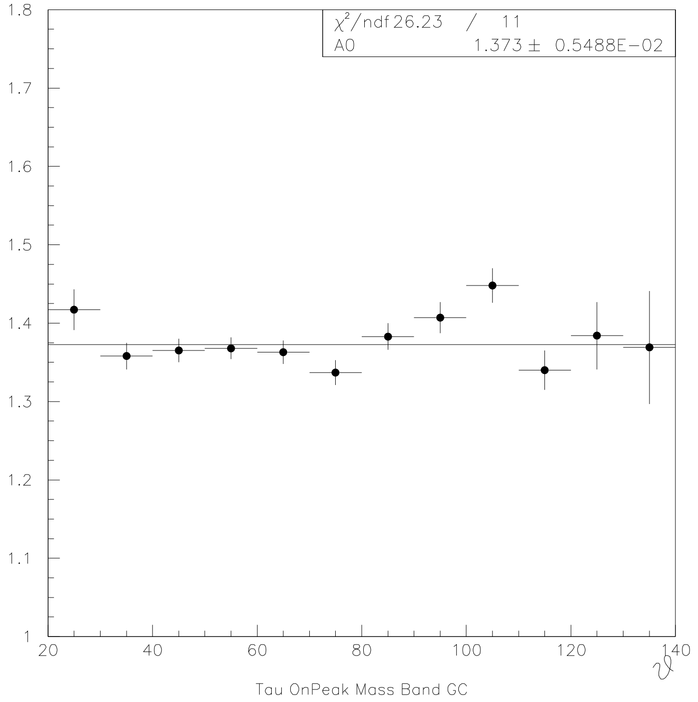
τ

$D^*l\nu$

Signal-3

- Result with the Pull Fixing:

  Warning: with the Pull parameterization the bins are correlated and therefore the errors are underestimated



τ

$D^*l\nu$

Conclusion

- Comparison of various results (BLIND):

	No θ fixing	Bias Fixing	Bias+Pull Fixing
B0 Lifetime(ps)	1.381 ± 0.011	1.363 ± 0.008	1.373 ± 0.006

- The results agree in $\sim 1.5\%$
- Statistical error is lower using θ parameterization:

  Some test to be done in the next few days (better signal/bkg separation?)
- Already present ± 0.008 ps systematic error for the method.

$D^*l\nu$