

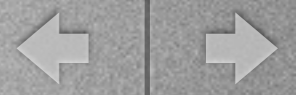


LFV and CPV in τ decays



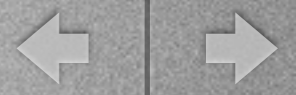
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Outline

- News since Annecy meeting
- LFV: $\tau \rightarrow \mu \gamma$ with polarization option
- Expected UL with BaBar extrapolation
- Conclusions



News Since Elba

- Minimal optimization on Polarization cuts
- Created a statistical framework for UL extraction using BaBar extrapolation
- Obtained preliminary results for UL



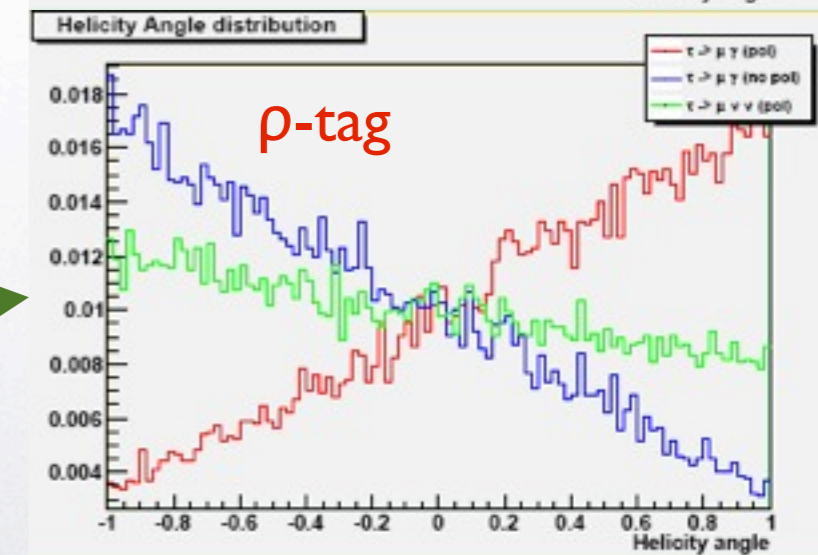
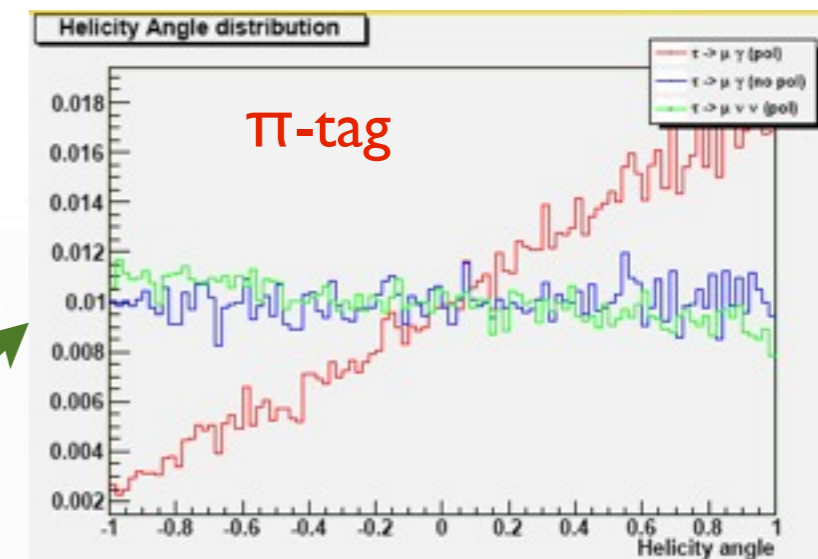
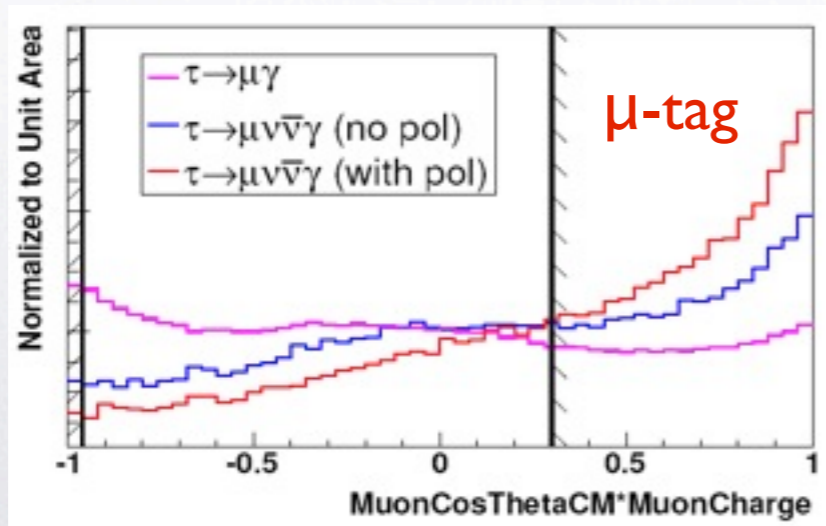
Valencia Plots

Plots from Valencia used only lepton tag and assumed di-muon bkg to be dominant.

Using Polarization a more viable option is exploit hadron tags: only one ν in the event \Rightarrow fixed helicity

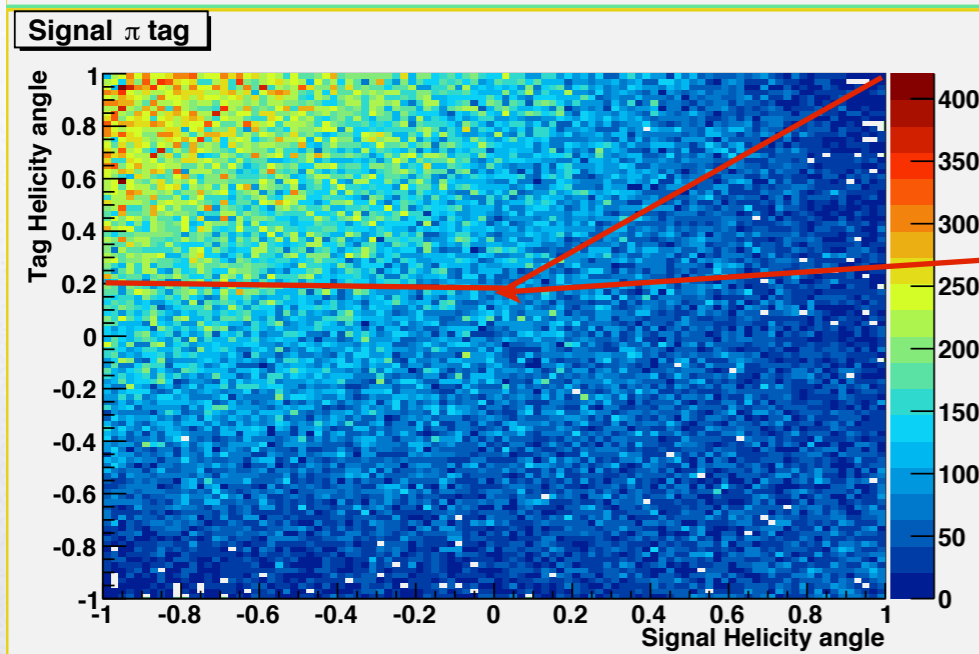
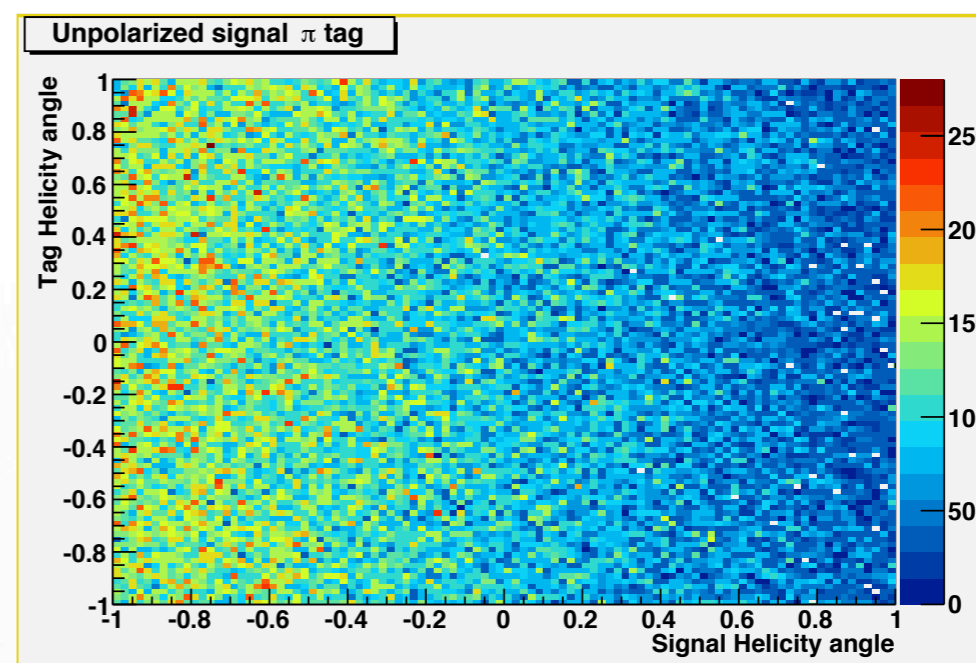
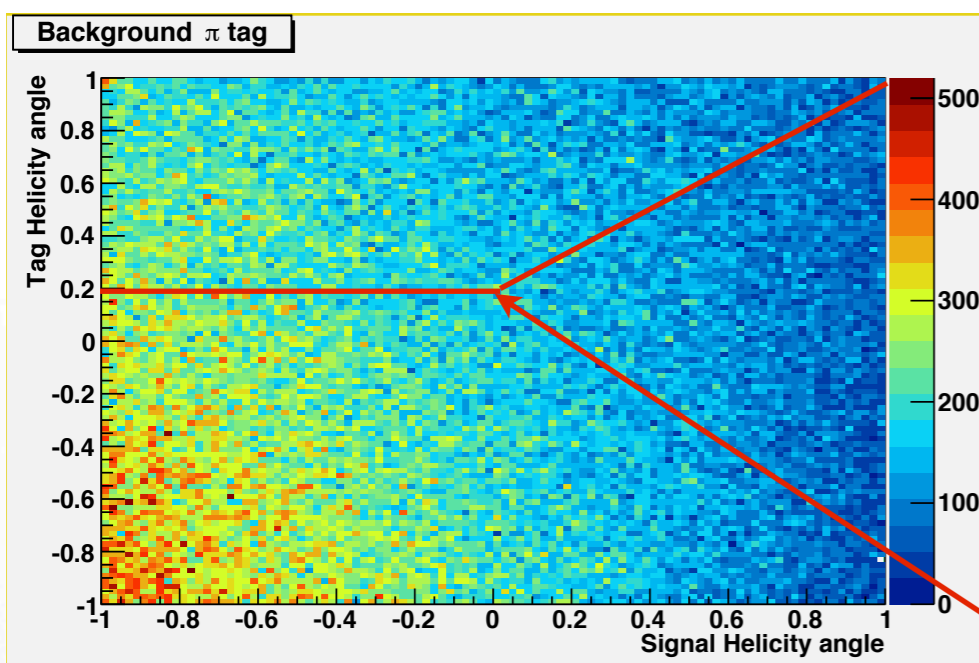
Signal helicity angle was studied for signal (both **Polarized** and **Unpolarized**) and **backgrounds**.

$$\theta_h = \tau_{\text{charge}}^{\text{tag}} \cdot \theta_{h\text{-tag}}$$





New Cuts



New Trapezoidal Cuts
eff. on signal:
41.6% π 49.4% ρ
bkg retained
11.5% π 9.8% ρ



Bkg expectation from BaBar

BaBar expects 5.1 events in the 2σ signal region

- 1.7 from lepton tags
- 1.4 from 3 hadron tags
- 2.0 from $\pi^+\rho$ tags

Strange discrepancy in BaBar:
bkg from taus should be identical
bkg from QED smaller for h-tag

96% comes from real τ decays (86% from $\mu\nu\nu\gamma$)

Need to reduce
backgrounds to
an acceptable
level

Expected bkg at SuperB:
300 events in the signal box
to be reduced thanks to:
Improved resolutions
Improved EMC coverage
~250 events expected



Polarization Effects

BaBar Expected UL 8×10^{-8}
scaling with \sqrt{L} (factor 12)
BaBar scaled Expected UL 6.4×10^{-9}

Using Polarization background drops to
 $O(15)$ events: UL scaling better than \sqrt{L}

Using a bayesian approach we may
estimate an UL given the expected bkg

UL 3.9×10^{-9} using only ρ tag

Using polarization we obtain an improvement
equivalent to a 2.6 increase in integrated
Luminosity
albeit using only 25% BF

Further improvement if effects are visible also
in lepton tags, being investigated now, diluted
effect expected



To Do

- Study of effects of polarization in lepton tag
- Make the babar analysis on our samples in order to extract the right UL
- Refine the optimization (maybe MVA may be used to exploit polarization information)



Conclusion

- UL extrapolation from BaBar data has been made: Polarization seems to give a great discovery potential (equivalent of more than factor 2 in statistics)
- Polarization variables well understood and under control, now we are ready to refine their use
- Rho tags seems to perform even better than pion tag and has larger BF
- Effects of polarization in lepton tags under study



*Thanks for your
attention*