

# Exp. Sensitivity to CKM Angles

Exp	Mode	Start	b-Events	Time [yr]
BaBar/Belle	$e^+e^-$	1999	$32 \times 10^6$	1
DCF/DØ	$p\bar{p}$	2001	$0.4 \times 10^{12}$	2 (run IIa)
BTeV	$p\bar{p}$	2005/6	$0.2 \times 10^{12}$	1
Atlas/CMS	pp	2006	$5 \times 10^{12}$	1 (3yr b-prg)
LHCb	pp	2006?	$1 \times 10^{12}$	1

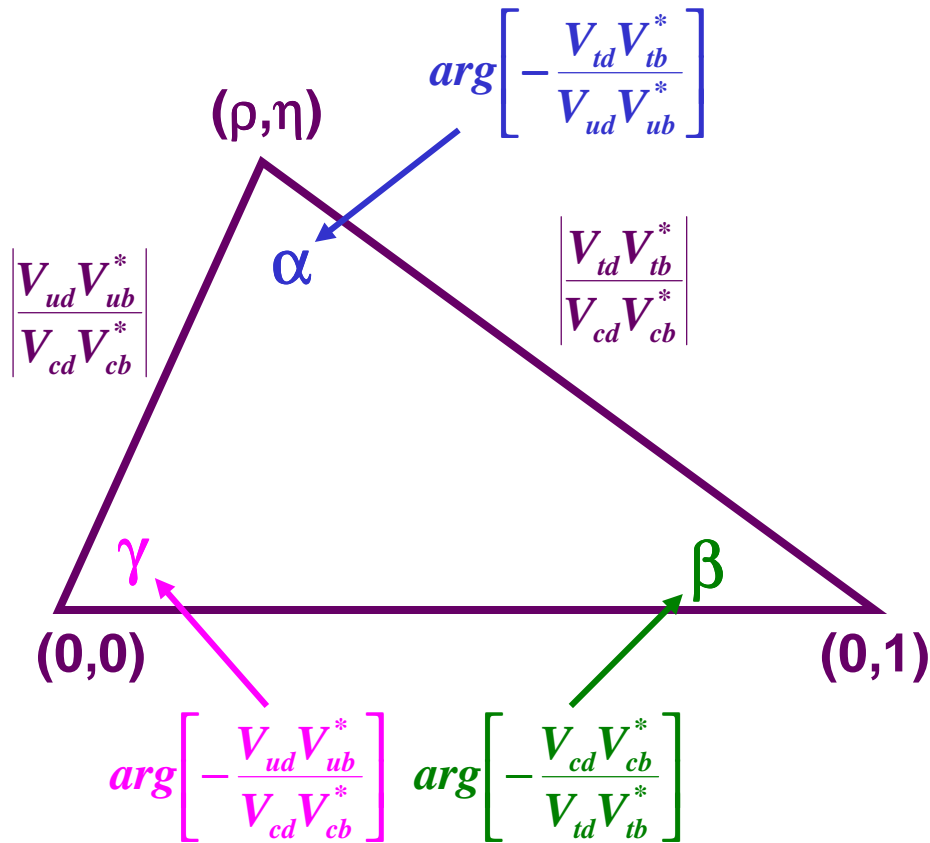
## References

- 1) BaBar Physics Book: <http://www.slac.stanford.edu/pubs/slacreports/slac-r-504.html>
- 2) Fermilab Run II B-Workshop writeup:  
<http://www-theory.lbl.gov/~ligeti/Brun2/report/drafts/>
- 3) BTeV Proposal (May 2000):  
[http://www-btev.fnal.gov/public\\_documents/btev\\_proposal/index.html](http://www-btev.fnal.gov/public_documents/btev_proposal/index.html)
- 4) “B Decays at the LHC” (1999 LHC SM Workshop):  
<http://pball.home.cern.ch/pball/bdecaypage.html>
- 5) “Present and Future CP Measurements” (UK Phenom. W’kshop 2000)  
hep-ph/0102159
- 6) + various talks

## Notes

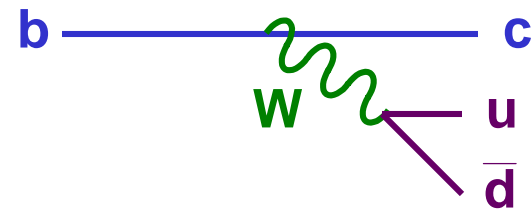
— sensitivities for single exp – usually for one year, optimistic numbers used

# Review of CKM Angles and Pitfalls

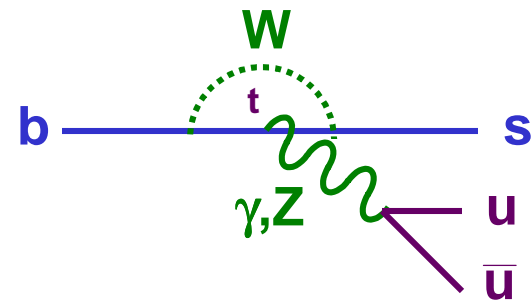


$$V_{ub} V_{ud}^* + V_{cb} V_{cd}^* + V_{tb} V_{td}^* = 0$$

## Tree Level



## Penguin



# sin 2 $\beta$ : $B_d \rightarrow J/\psi K_s$

Exp	Error	Comments
Current	$0.48 \pm 0.16$	
BaBar/Belle	0.12	
	0.08	all $B_d$ modes
CDF/DØ	0.03	Run II a
BTeV	0.025	
Atlas/CMS	0.015	
LHCb	0.021	

- Most use  $J/\psi \rightarrow l^+ l^-$ ,  $K_s \rightarrow \pi^+ \pi^-$

# $\alpha$

$B_d \rightarrow \pi^+\pi^-$ : Problems with Penguins  $\Rightarrow a_{dir}, a_{mix} \rightarrow \alpha_{eff}$

Exp	Error ( $a_{dir}, a_{mix}$ )	Comments
BaBar/Belle	0.29, 0.26	
	0.18, 0.15	3 years
Atlas/CMS	0.11, 0.14	
LHCb	0.09, 0.07	

$B_d \rightarrow \rho\pi$ : Dalitz analysis necessary

Exp	Error	Comments
BaBar/Belle	0.19, 0.26	$a_{dir}, a_{mix}$
	0.11, 0.15	3 years
BTeV	7.5°	$\alpha$ - w/ assumed $ P/T $
LHCb	2.5-5°	

# $\gamma$ and Friends

Exp	Meas	Mode	Error	Comments
BaBar/Belle	$\sin(\gamma+2\beta)$	$B_d \rightarrow D^* \pi$	0.14-0.16	$2\sigma(\sin 2\beta)$
	$\gamma$	$B_d \rightarrow K\pi$	10-20°	penguins
CDF	$\gamma, \beta$	$B_d \rightarrow \pi\pi, KK$	8°	isospin
	$\sin(\gamma+\delta)$	$B_s \rightarrow D_s K$	0.4-0.7	strong ph
BTeV	$\gamma$	$B^{0,-} \rightarrow K\pi$	<5°	
	$\gamma$	$B_s \rightarrow D_s K$	7°	
	$\gamma$	$B^- \rightarrow D^0 K^-$	7.5°	
LHC comb	$\gamma, \beta$	$B_d \rightarrow \pi\pi, KK$	4-7.5	
CMS	$\gamma$	$B_s \rightarrow J/\psi K_s$	9°	
LHCb	$\gamma$	$B_d \rightarrow DK^*$	4-19°	
	$\gamma$	$B_d \rightarrow D^+ D^-$	few°	very prelim
	$\gamma+2\beta$	$B_d \rightarrow D^* \pi$	12°	