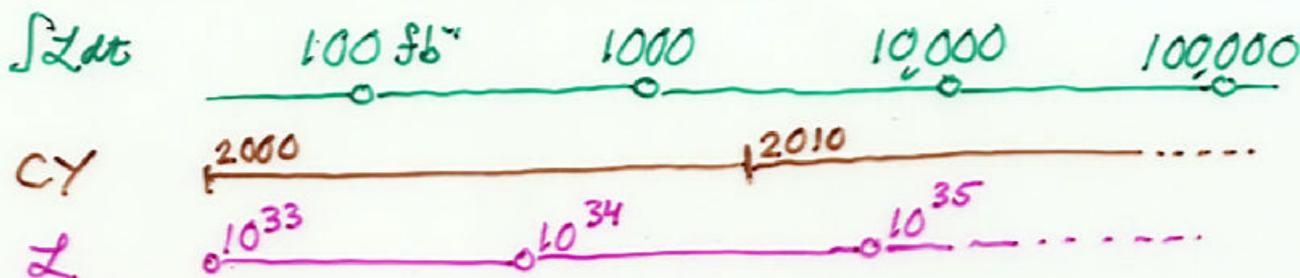


# SUMMARY: "BEYOND $10^{34}$ " (TUE. EVE.)

FOLLOW UP TO MICHIGAN WORKSHOP (IAN SHIPSEY)  
 EXPLORE LONG-RANGE POSSIBILITIES (\*\* CARD)  
 FOR HEAVY QUARK PHYSICS AT SUPER-HIGH  $\mathcal{L}$   
 INSTRUCTIONS FOR FOLLOW UP



## ① $|V_{ub}|$ Falk, Lee & Shipsey, J.A. (TV)

Limited by theoretical uncertainty  $\sim 10\%$   
 SENSITIVE TO EXP'T'L CUTS

$b \rightarrow c$  suppression:  $g^2$   $M_{HAD}$   $E_{LEP}$   $EXP$  HAPPY

Diagram showing a green arrow pointing right from  $g^2$  to  $EXP$  HAPPY, and a brown arrow pointing left from  $EXP$  HAPPY to  $THEORY$  HAPPY.

$\Rightarrow$  OPTIMIZE

ADVANCES WILL COME FROM VARIOUS SOURCES:

- LATTICE QCD
- $b \rightarrow s \gamma$  spectrum
- $D \rightarrow \pi \ell \nu$  FORM FACTOR MEAS. @ "CLEO-C"  
 $\sim$  bkg free

@  $\sim 10,000 \text{ fb}^{-1}$  EXP'L ERRORS  $\sim$  FEW %

AT THIS SAME LEVEL  $B \rightarrow \tau \nu \sim \pm \lesssim 10\%$   
 $\frac{B(B \rightarrow \tau \nu)}{\Delta m_d}$  &  $\left| \frac{V_{ub}}{V_{td}} \right|^2 \rightarrow$  similar  $pq$  region

BUT UNCERTAINTY IS  
 $\sim$  PURELY STATISTICAL

## ② $ARG(V_{ub})$ Abe, Petrak

- $K\pi \rightarrow P \otimes T$  NEUBERT-ROSMER FLEISCHER-MANNEL
- $D^* \pi \rightarrow$  direct  $\otimes$  (MIX. CSD)  $\Rightarrow$  '  $\sin(2\phi_1 + \phi_3)$

$\delta\phi_3 \sim 20^\circ$

PARTIAL RECON  $\Rightarrow$  STATS! if  $r = \frac{CP}{CPD}$  known,  $\rightarrow \pm 0.2$   
 OTHERWISE...  $D^* p$  (LONDON, SINHA, SINHA) @  $500 \text{ fb}$

PETRAK  $\sim \Upsilon(5S) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}$   
 $B_s \rightarrow D_s K$  CSD  $\otimes$  DCSD  $t$ -dep, CP tag  
 PARTIAL RECON  
 WITH 108  $\Upsilon(5S)$  PRODUCED,  $\delta\phi_3 \sim 10^\circ$   
 $\rightarrow \sim 1$  YEAR @  $10^{35}$  (@  $\Upsilon(5S)$ )

③ CKM KWON, LACKER

YONGJUN KWON  $\rightarrow \sin 2\phi_1, \sin 2\phi_2$  STD METH.  
 $\delta(\sin 2\phi_1) \sim \pm 0.02$  @ 1000  $fb^{-1}$  STAT=SYST  
 $\delta(\sin 2\phi_2) \sim \pm 0.3$  @ 500 }  $\pi\pi$   
 $\pm 0.1$  @ 2500 } G-L ISOSPIN

LACKER  $\rightarrow$  Project CKM fits to 2010  
 "remarkable metrology"

MOST STRIKING: NARROW  $\sin 2\phi_1$  SLICE  
 WILL NEED UNQUENCHED LQCD,  $\tau_V$ ,  
 $SV\bar{V}$ ,  $dV\bar{V}$ ,  $f_D$ ,  $f_{D_s}$   
 $SV\bar{V}$  challenging (like  $\tau_V$ ) +  $\tau_V$  feed thru  
 $dV\bar{V}$   $\times$  harder  
 $f_D$  AND  $f_{D_s}$  to  $\sim 1\%$  with "CLEO-c"

④ DIRECT CP, NP, ETC KWON, PETRAK

	200 $fb^{-1}$	2500 $fb^{-1}$
$A_{CP}(l^\pm l^\pm)$	$\pm 0.01$	0.003
$A_{CP}(s\gamma)$	0.03	0.01
$A_{CP}("K\pi")$	0.03	0.01

@  $\Upsilon(5S)$ ,  $\left(\frac{\Delta\Gamma}{2\Gamma}\right)_{CP} = \left(\frac{\Delta\Gamma}{2\Gamma}\right)_{S.L} \times \cos \Phi_{NP}$   $\rightarrow$   $\pm 0.2$  WITH 107  $B_s \bar{B}_s$

⑤ EXPT'L CHALLENGES (EIGEN)

DAUNTING BEYOND  $10^{34}$  .....  $10^{35}$  ?!

- RADIATION DAMAGE → DRIFT CH., CSI X-TALS  
NEED DIFF. TECHNOLOGY? ←      ↳ PURE?

20  
5/11  
2011

- ← • OCCUPANCY → Si, DR. CH., CSI, ...

SERIOUS TECHNOLOGICAL CHALLENGES FOR DETECTORS  
(DITTO FOR ACCELERATOR...)

⑥ OVERALL

- 4 ORDERS OF MAGNITUDE EXTRAPOLATION IS DIFFICULT!

- BFACTORIES: x10 GROWTH ~ 1 YEAR  
x100 ~ 5-10 YEARS

- TOMORROW'S ENTERPRISES BASED ON TODAY'S DISCOVERIES

- ⇒ GO HOME & GET TO WORK!