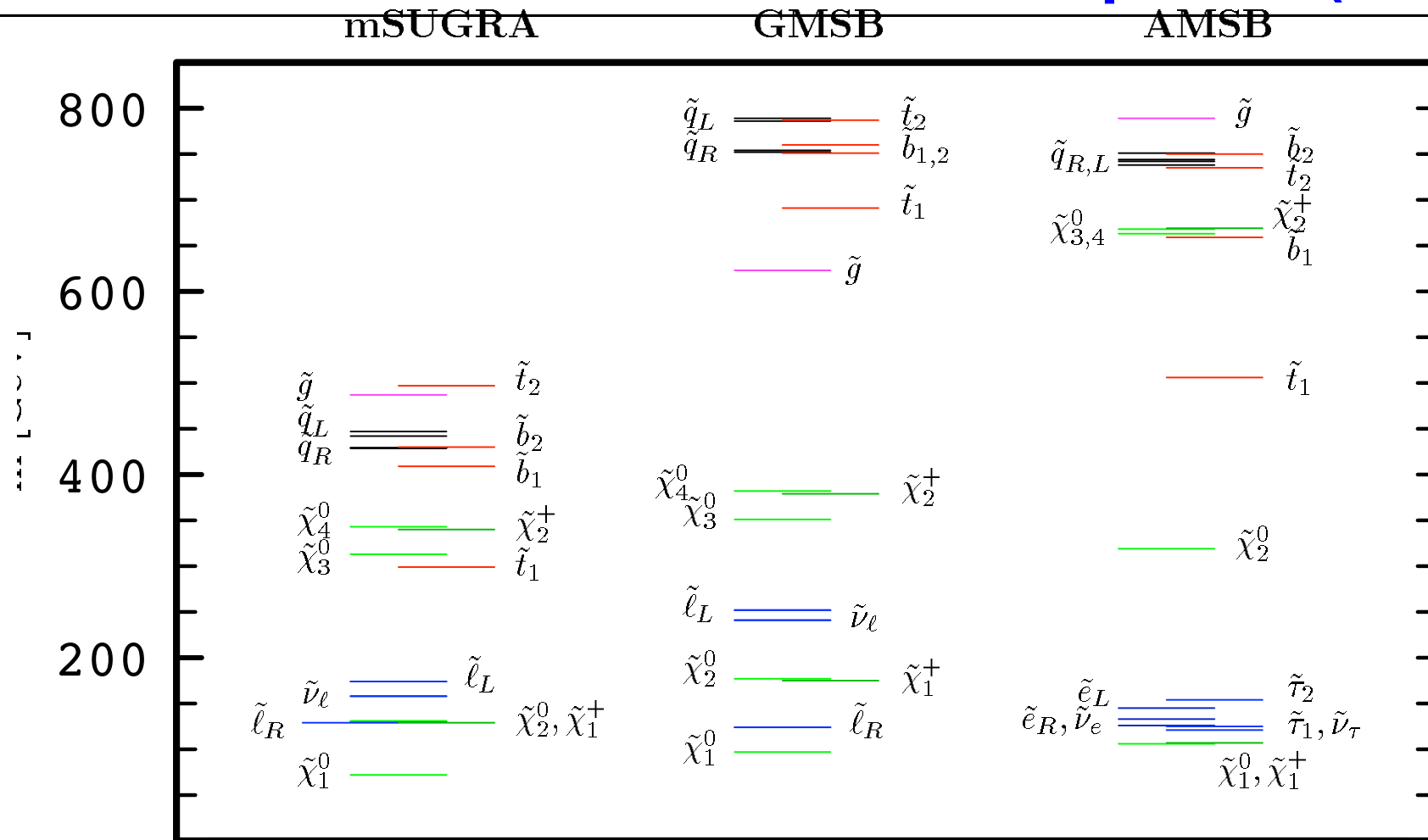


**Material zur**  
**Vorlesung "Flavorphysik"**

Gudrun Hiller, Dortmund

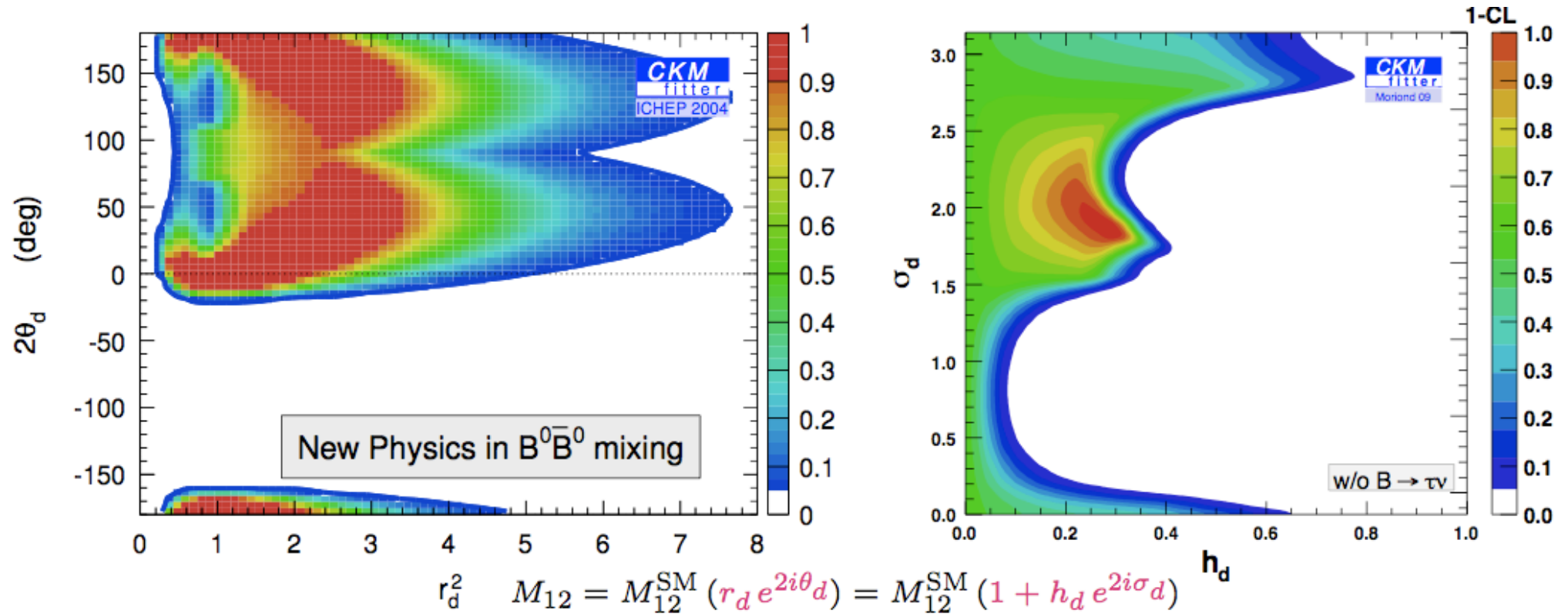
---

# MFV MSSM Spectra (in GeV)



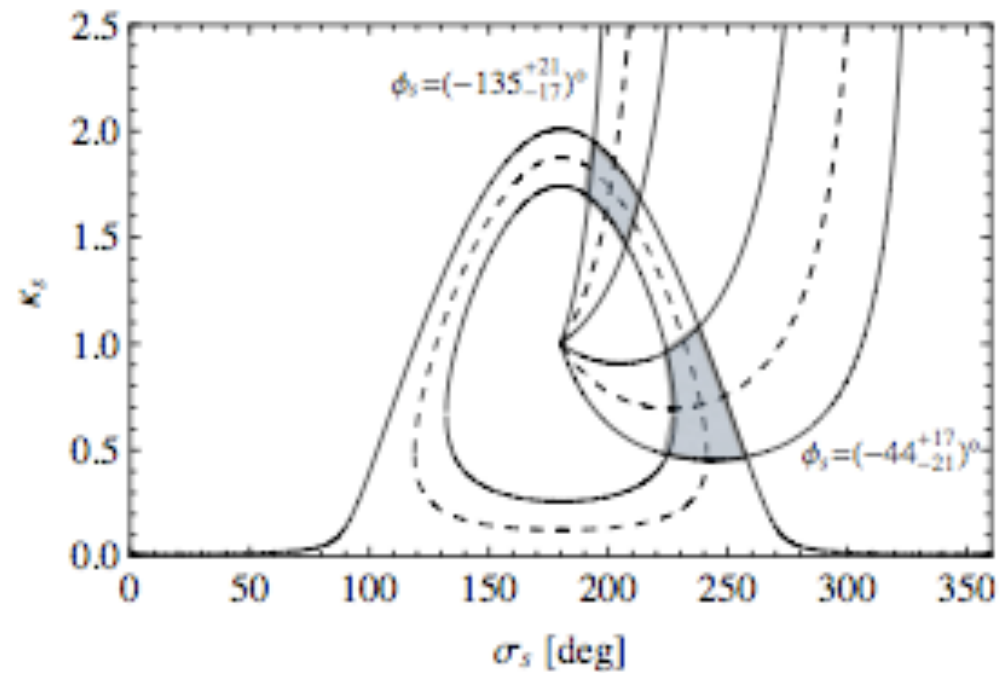
TESLA TDR Part III '01 In mSUGRA and AMSB, the lightest SUSY particle is the lightest neutralino  $\tilde{\chi}_1^0$ , and stable. In GMSB, there could be a lighter state, the gravitino (not shown).

# $B_d$ -mixing parameters; Progress 04-09

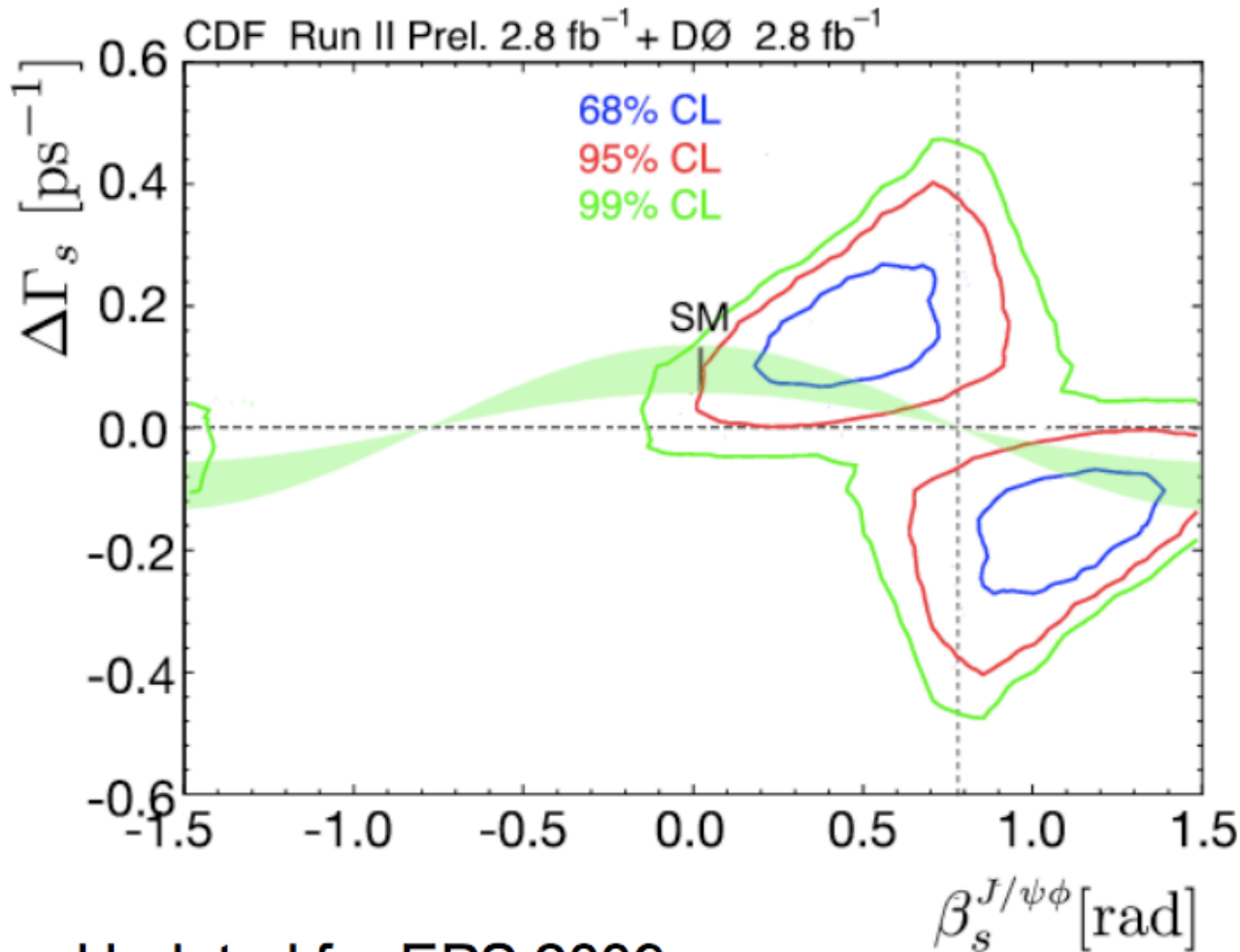


Talk by Z.Ligeti at  $V_{xb}$  09 at SLAC

$$\Delta m_s = \Delta m_s^{\text{SM}} |1 + \kappa_s e^{i\sigma_s}|$$



## Combination of CDF & D0 results



Combined likelihood finds 2.1 $\sigma$  deviation from SM

Combination including other measurements of  $\Delta\Gamma$ , e.g.  $a_{sl}$ , will be shown in Iain Bertram's talk

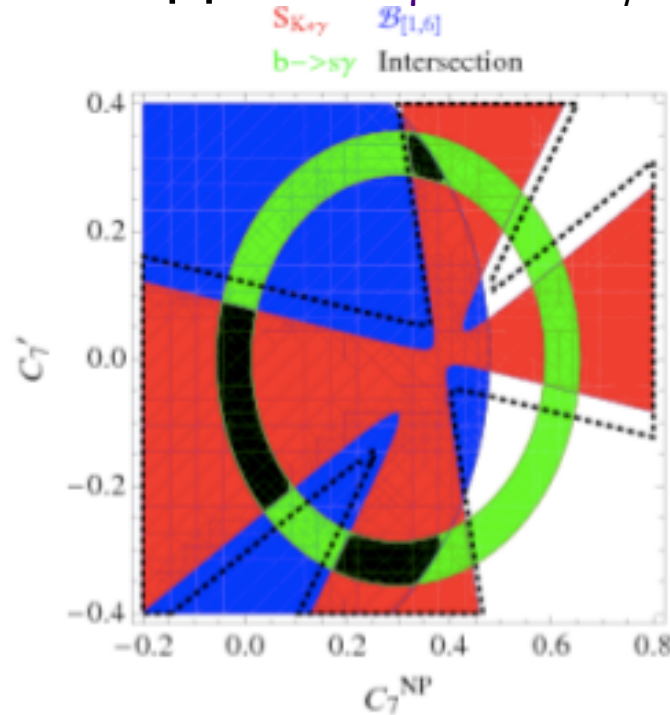
Updated for EPS 2009

<http://www-d0.fnal.gov/Run2Physics/WWW/results/prelim/B/B59/B59.pdf>

~~[http://www-cdf.fnal.gov/physics/new/bottom/090721.blessed-betas\\_combination2.8/](http://www-cdf.fnal.gov/physics/new/bottom/090721.blessed-betas_combination2.8/)~~

# FCNC $b \rightarrow s\gamma$ Dipole Couplings

SM-like  $O_7 \propto \bar{s}_L \sigma_{\mu\nu} b_R F^{\mu\nu}$  "flipped"  $O'_7 \propto \bar{s}_R \sigma_{\mu\nu} b_L F^{\mu\nu}$  0805.2525 [hep-ph]



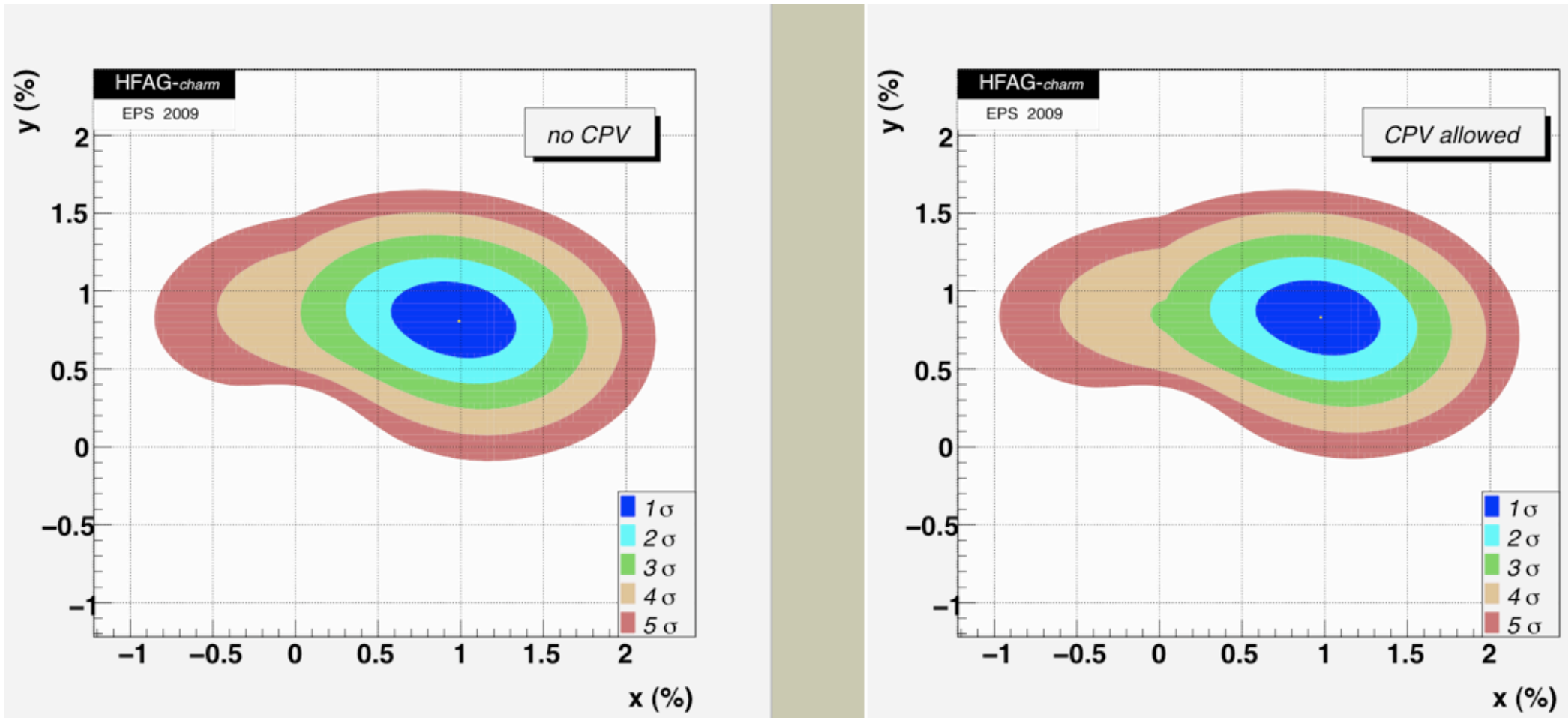
SM and MFV models:  $C'_7/C_7 \simeq m_s/m_b$

green ring:  $Br(B \rightarrow X_s \gamma) \sim |C_7|^2 + |C'_7|^2 \sim |C_7^{SM}|^2$

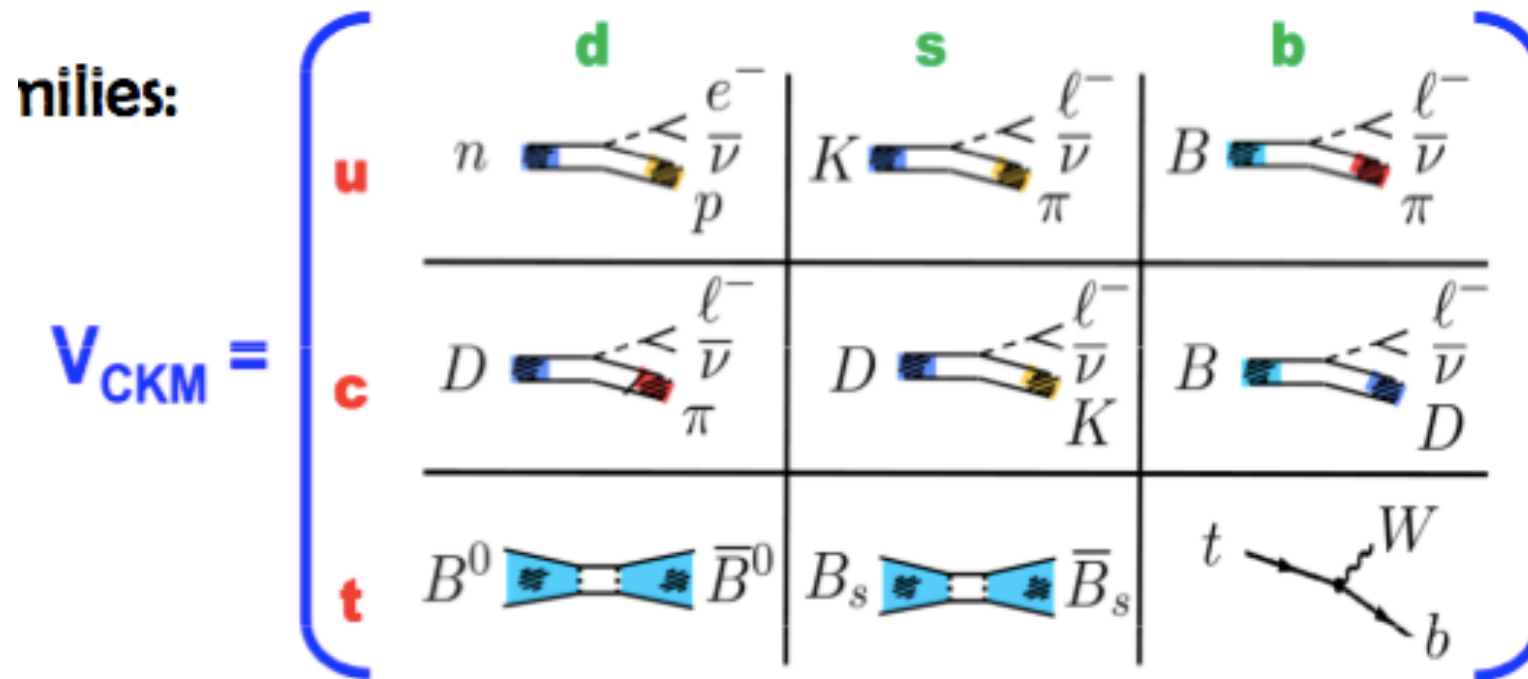
red cross: time-dependent CP-asymmetry  $B \rightarrow (K^{*0} \rightarrow K_S^0 \pi^0) \gamma$

blue area:  $Br(B \rightarrow X_s ll)$  data favor  $\text{sign}(C_7)$  to be SM like.

$$x = \Delta m/\Gamma, \quad y = \Delta\Gamma/(2\Gamma)$$



# How to measure CKM angles





# Single Top 2009- Tevatron

- Single top quark is produced via electroweak interaction **but has not been observed SO FAR**

- ◇  $\sigma_{SM}(t\text{-channel}/tqb) = 1.98 \pm 0.25 \text{ pb}$  ( $m_{top} = 175 \text{ GeV}$ )

- ◇  $\sigma_{SM}(s\text{-channel}/tb) = 0.88 \pm 0.11 \text{ pb}$  ( $m_{top} = 175 \text{ GeV}$ )

- ◇  $\sigma_{SM}(t\bar{t}) = 6.7 \pm 0.8 \text{ pb}$  (via strong interaction)

- ◇ B.W. Harris *et al.*, Phys. Rev. D 66, 054024 (2002)

- ◇ Z. Sullivan, Phys. Rev. D70, 114012 (2004)

- Test of the Standard Model

- ◇ Direct measurement of  $|V_{tb}|$

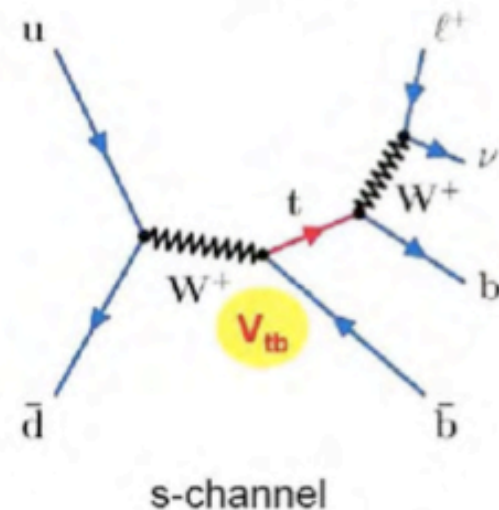
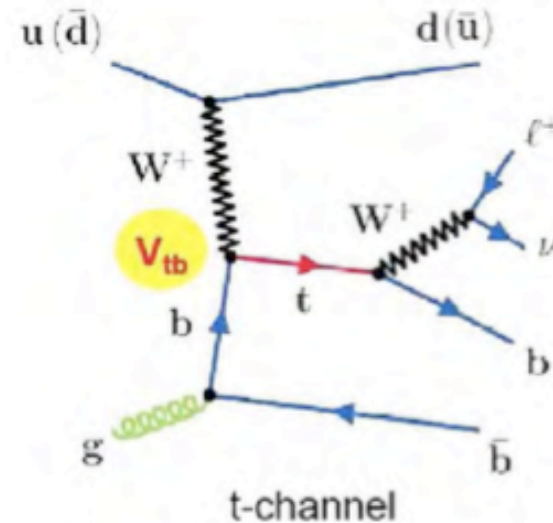
- ◇ Top quark properties: polarization, spin,  $W$  helicity,...

- ◇ Same final state as WH

- Sensitive to new physics

- ◇ Search for  $W'$ ,  $H^+$  (s-channel signature)

- ◇ Search for FCNC,...



## $V_{tb}$ Measurement

- $|V_{tb}|^2$  is proportional to the cross section
  - ◇  $V_{tb}$  is extracted from the measured cross section
  - ◇ CDF:  $|V_{tb}| = 0.91 \pm 0.11(\text{exp}) \pm 0.07(\text{th})$
  - ◇ DØ:  $|V_{tb}| = 1.07 \pm 0.12$
  - ◇ Measurement does not assume 3 generations or unitarity
- Assume SM production
  - ◇ Flat prior in  $|V_{tb}|^2$  and  $0 < |V_{tb}|^2 \leq 1$
  - ◇  $|V_{td}|^2 + |V_{ts}|^2 \ll \ll |V_{tb}|^2$
- Lower limits in  $|V_{tb}|$ 
  - ◇ CDF:  $|V_{tb}| > 0.71$  (95% C.L.)
  - ◇ DØ:  $|V_{tb}| > 0.78$  (95% C.L.)

