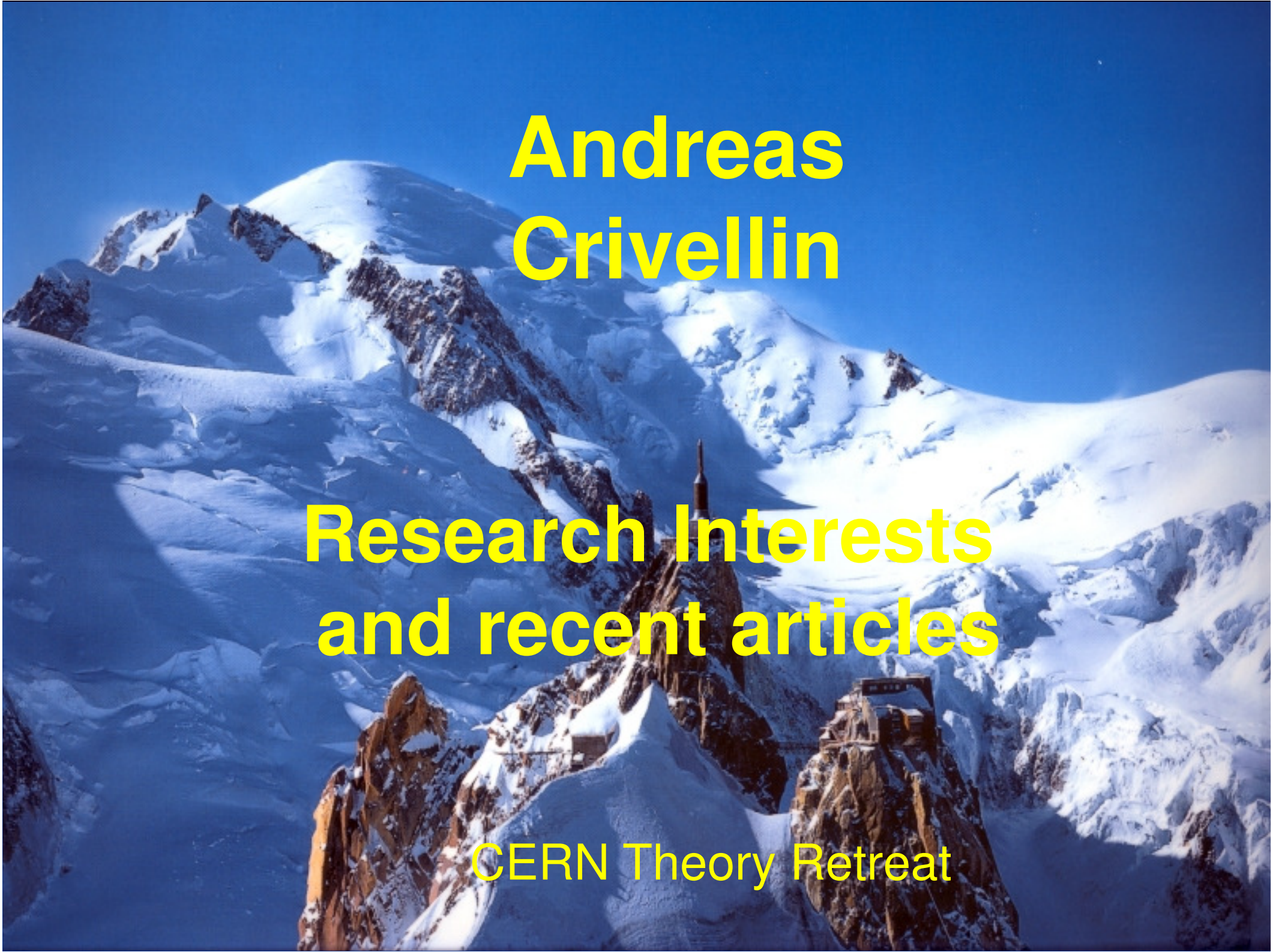

Andreas
Crivellin
Research Interests
and recent articles
CERN Theory Retreat

CV

- 2002 - 2010:
  - Diploma and PhD in Karlsruhe (advisor Ulrich Nierste)
- 2010 - 2013
  - PostDoc in Bern (Christoph Greub)
- 2013 – 2015
  - Marie Curie fellow at CERN
- Starting 2016:
  - Ambizione fellowship of the SNSF at the PSI

Research Interests

- Dark Matter
  - MSSM
  - Effective field theory approach
- Flavour Physics beyond the SM
  - MSSM
  - 2-Higgs-doublet models
  - Z' models
  - Leptoquarks
  - Effective field theory approach
- Flavour Anomalies

Publication 2015

- Higgs-bosons couplings to quarks and leptons in the supersymmetric Standard Model with a gauge singlet. By AC, Yamada. arXiv:1508.02855 [hep-ph].
- A perturbed lepton-specific two-Higgs-doublet model facing experimental hints for physics beyond the Standard Model. AC, Heeck, Stoffer. arXiv:1507.07567 [hep-ph].
- Effective Field Theory Approach to $b\to s\ell\ell(')$, $B\to K(*)\nu\nu$ and $B\to D(*)\tau\nu$ with Third Generation Couplings. Calibbi, AC, Ota.
  arXiv:1506.02661 [hep-ph]. Phys.Rev.Lett. 115 (2015) 18, 181801.
- Lepton-flavour violating B decays in generic Z' models
  AC, Hofer, Matias, Nierste, Pokorski, Rosiek.
  arXiv:1504.07928 [hep-ph]. Phys.Rev. D92 (2015) 5, 054013.
- Addressing the LHC flavor anomalies with horizontal gauge symmetries
  AC, D'Ambrosio, Heeck, arXiv:1503.03477 [hep-ph]. Phys.Rev. D91 (2015) 7, 075006.
- Light stops, blind spots, and isospin violation in the MSSM
  AC, Hoferichter, Procura, Tunstall. arXiv:1503.03478 [hep-ph]. JHEP 1507 (2015) 129.
- Flavor portal to dark matter, Calibbi, AC, Zaldívar.
  arXiv:1501.07268 [hep-ph]. Phys.Rev. D92 (2015) 1, 016004.
- Explaining h->mu\tau, B->K*mumu and B->Kmumu/B->Kee in a two-Higgs-doublet model with gauged L_mu-L_tau. AC, D'Ambrosio, Heeck.
  arXiv:1501.00993 [hep-ph]. Phys.Rev.Lett. 114 (2015) 151801.
- LHC constraints on gauge boson couplings to dark matter. AC, Haisch, Hibbs.
  arXiv:1501.00907 [hep-ph]. Phys.Rev. D91 (2015) 074028.

New Physics in the Flavour Sector?

- Deviations in $b \to s\mu^+\mu^-$
  - $B \to K^*\mu^+\mu^-$
  - $B_s \to \phi\mu^+\mu^-$
  - $B \to K\mu^+\mu^- \,/\, B \to Ke^+e^-$

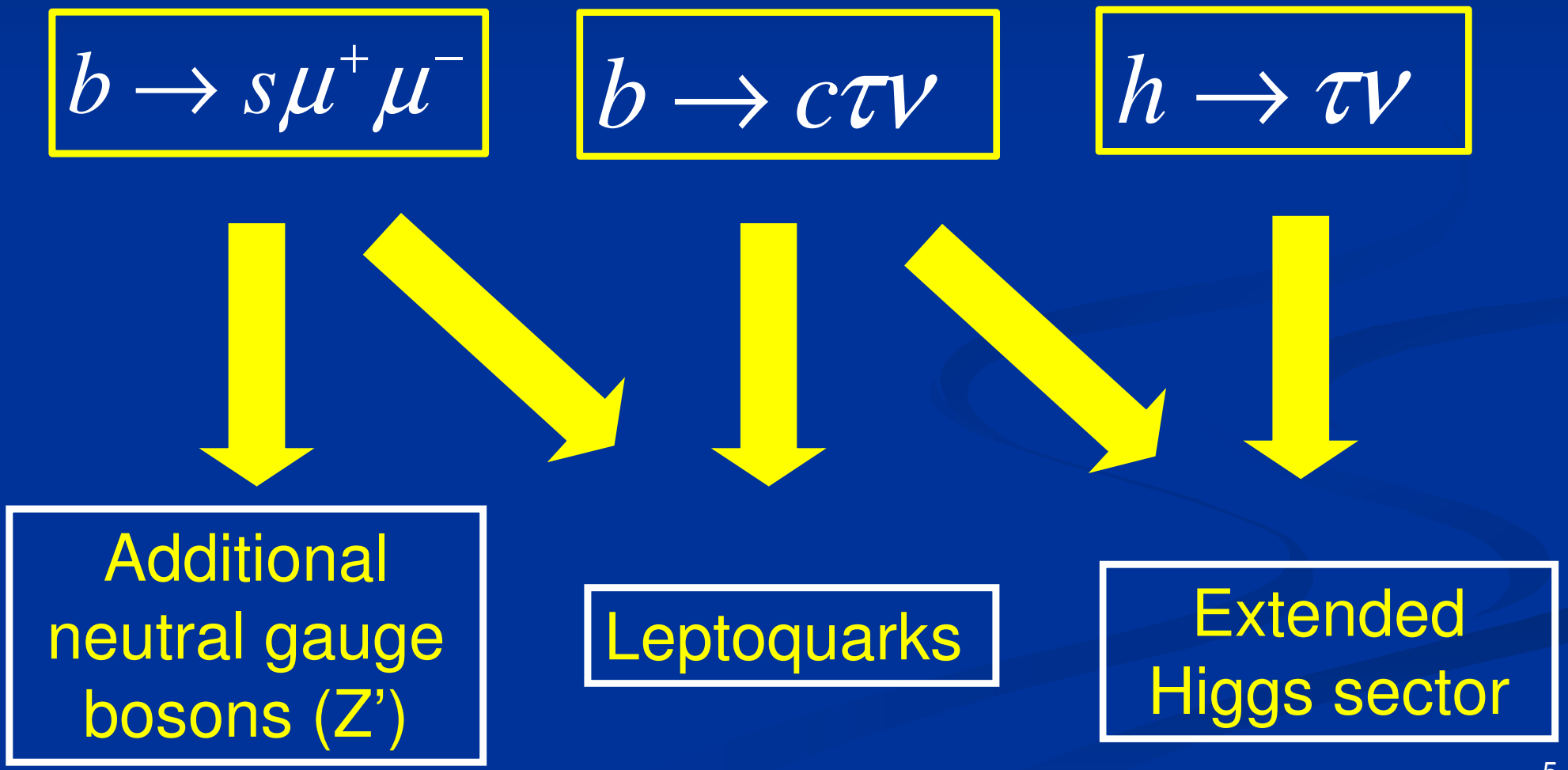
➡ Combined 4-5 σ evidence for NP

- Tauonic B decays
  - $B \to D\tau\nu$
  - $B \to D^*\tau\nu$

➡ 3.9 σ evidence for NP

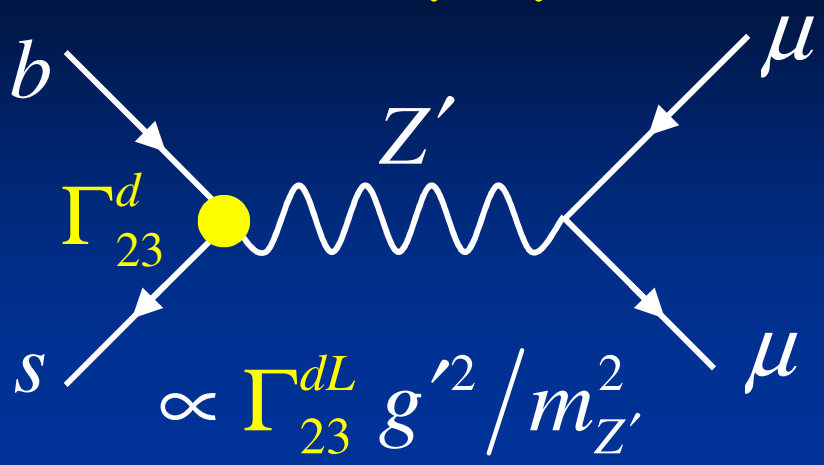
- Lepton Flavour violating Higgs decays
  - $h \to \tau\mu$ ➡ 2.6 σ different from 0

Explanations of the Flavour Anomalies



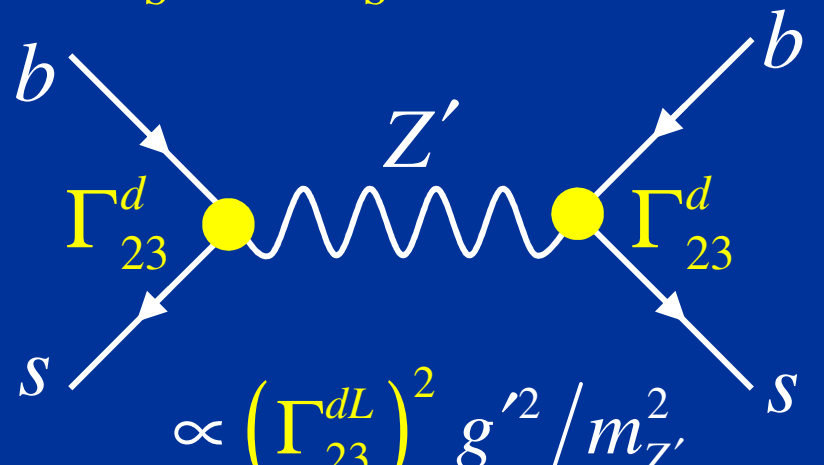
Z' model

$b \to s\mu^+\mu^-$



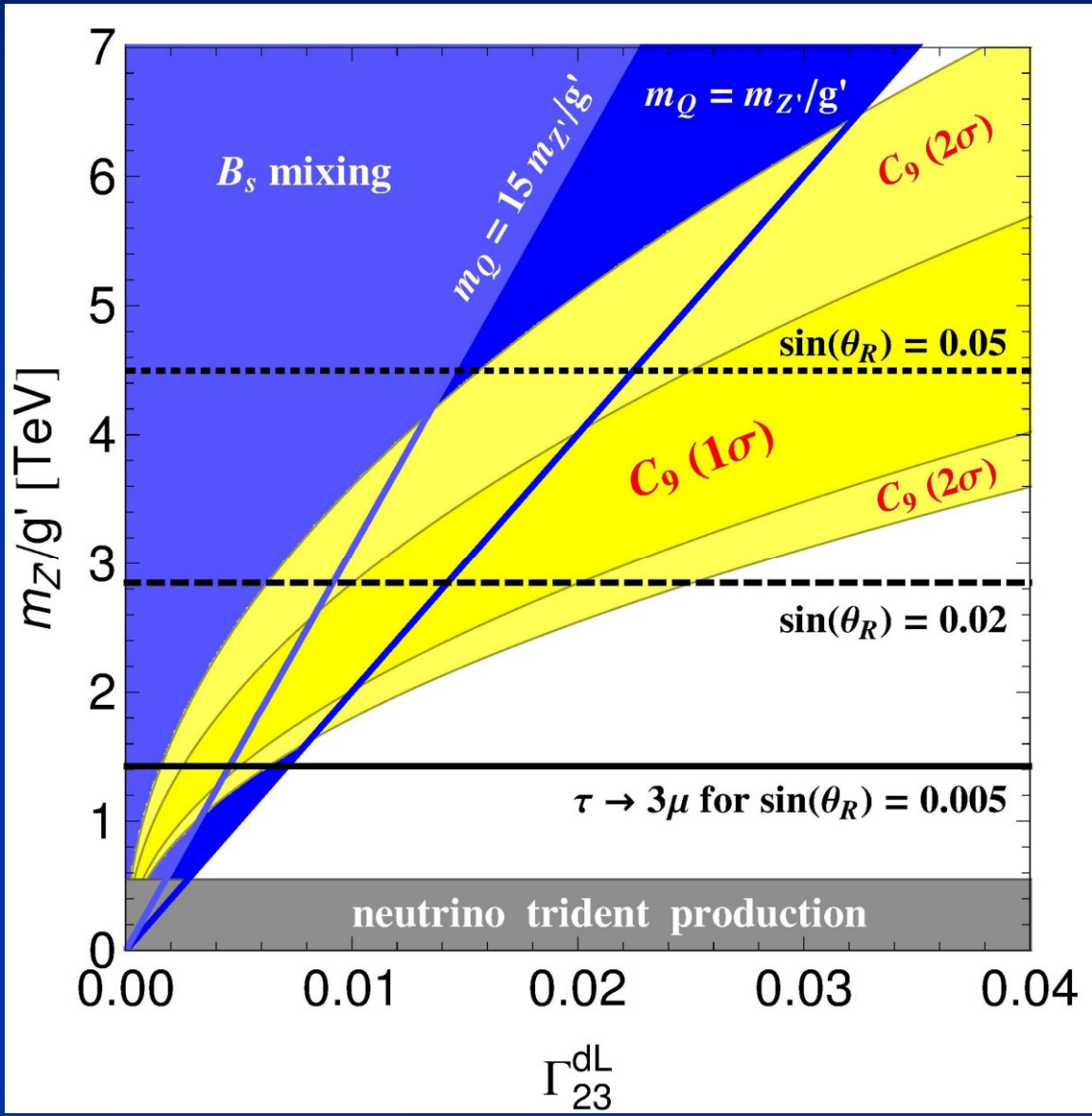
$$\propto \Gamma^{dL}_{23}\, g'^2 / m^2_{Z'}$$

$B_s - \bar{B}_s$ mixing



$$\propto \left(\Gamma^{dL}_{23}\right)^2 g'^2 / m^2_{Z'}$$

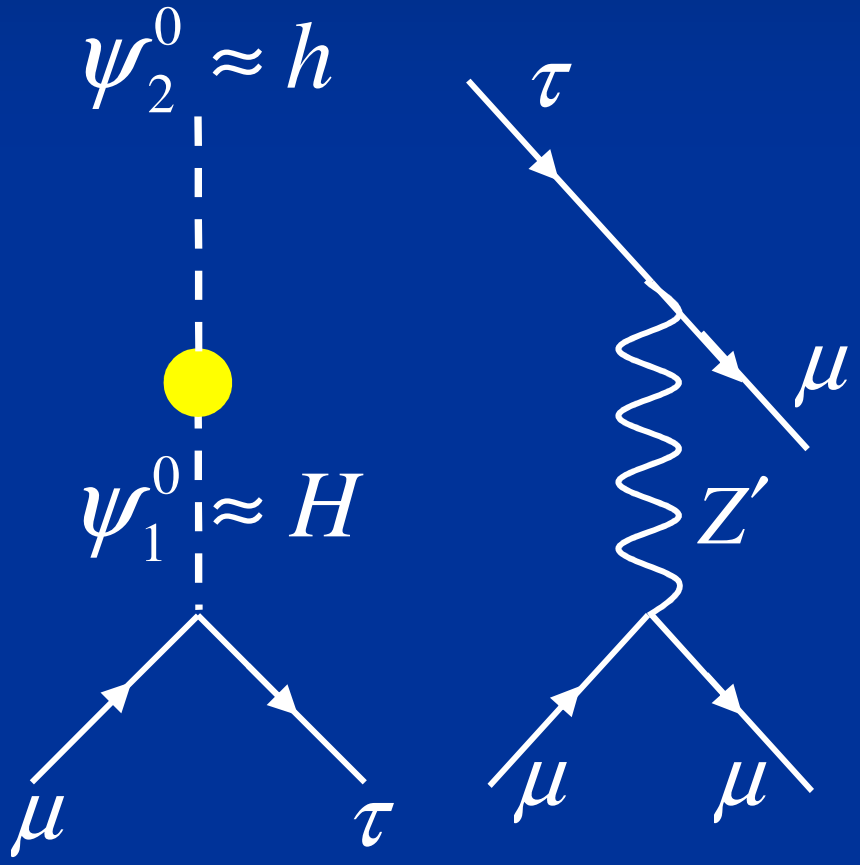
A.C., D'Ambrosio and Heeck
PRL (2015) and Phys.Rev.D (2015)



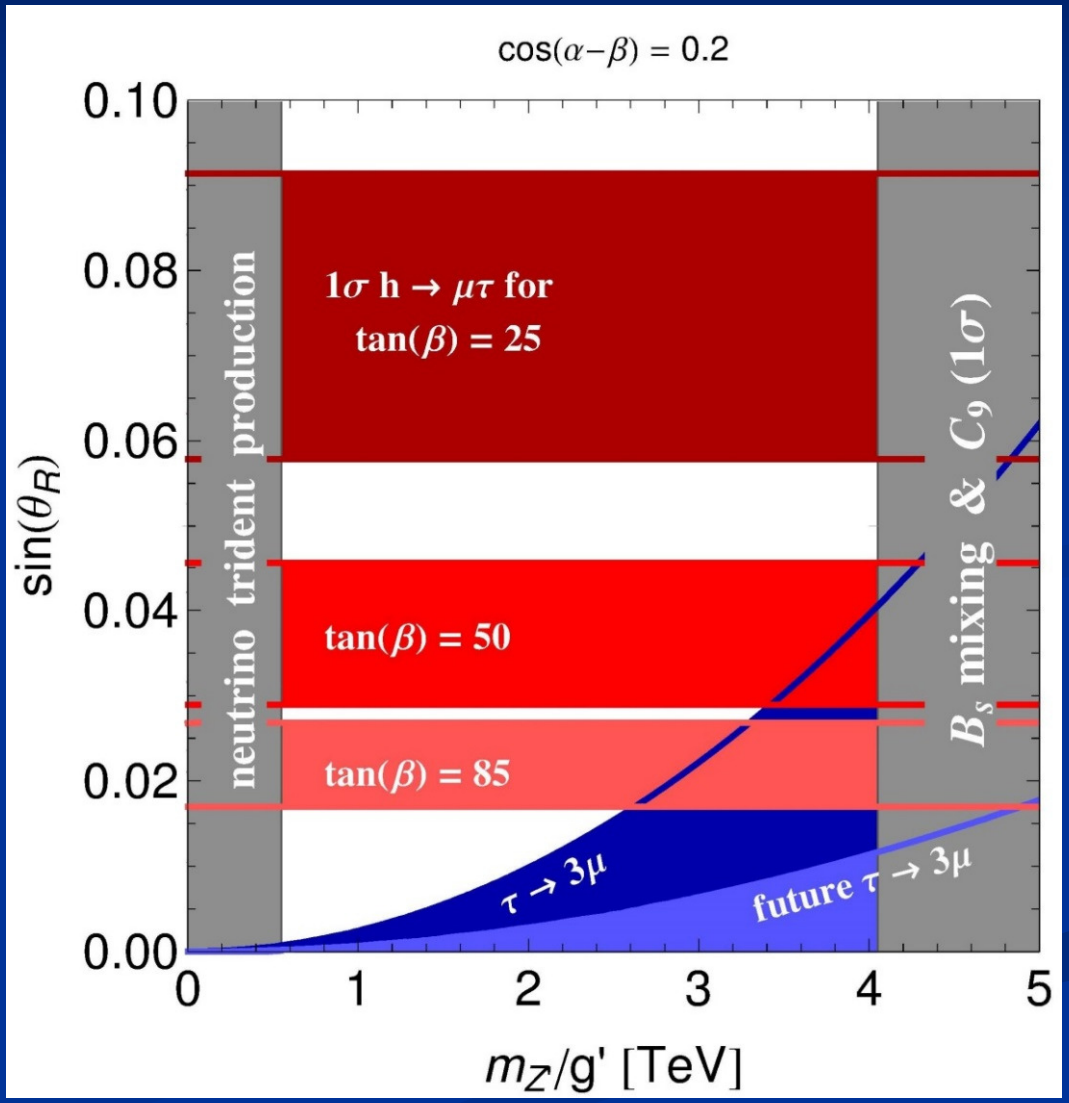
allowed regions

Z' + 2HDM

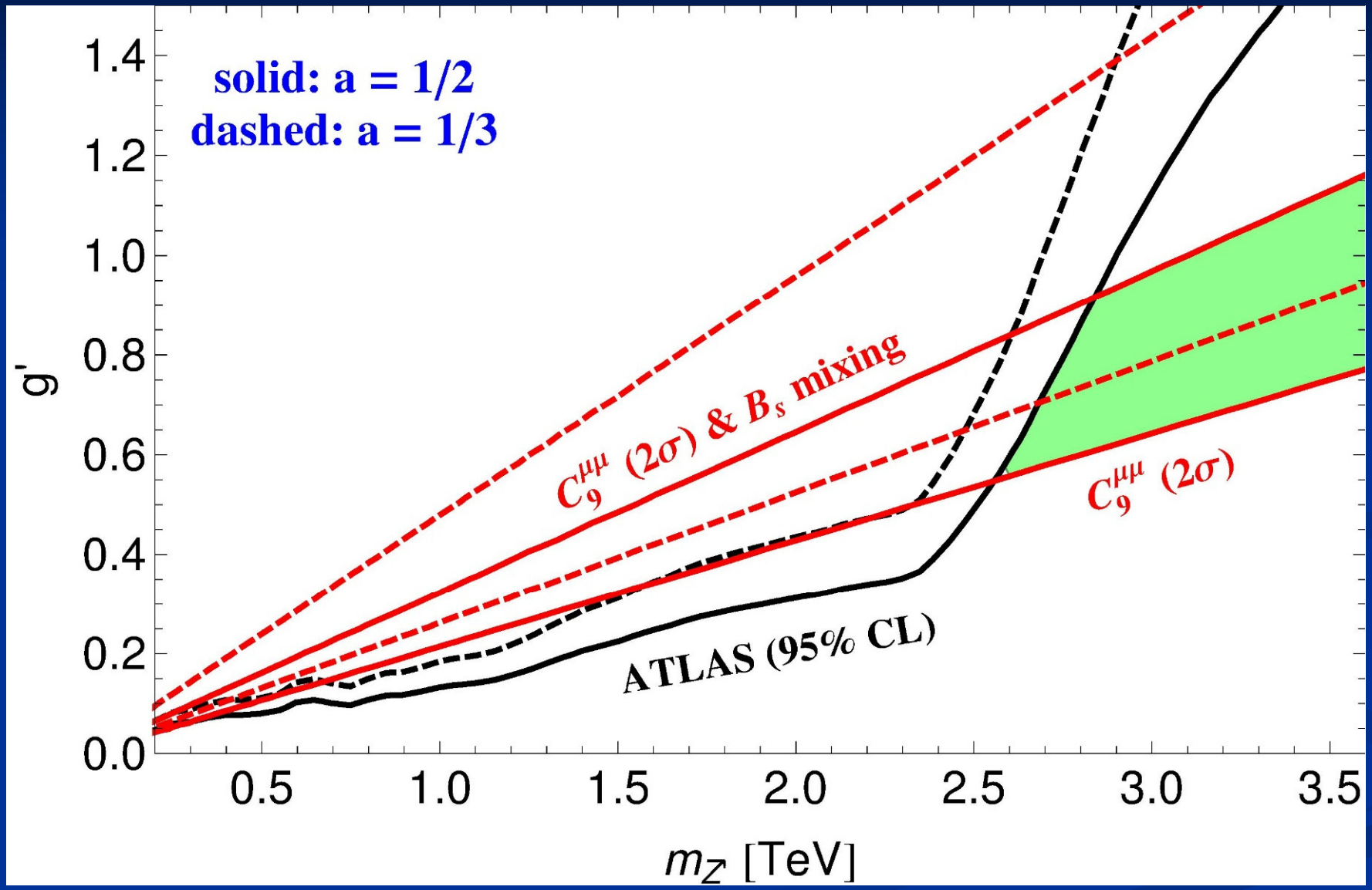
$h \to \mu\tau \quad \tau \to 3\mu$



A.C., D'Ambrosio and Heeck
PRL (2015) and Phys.Rev.D (2015)



LHC limits



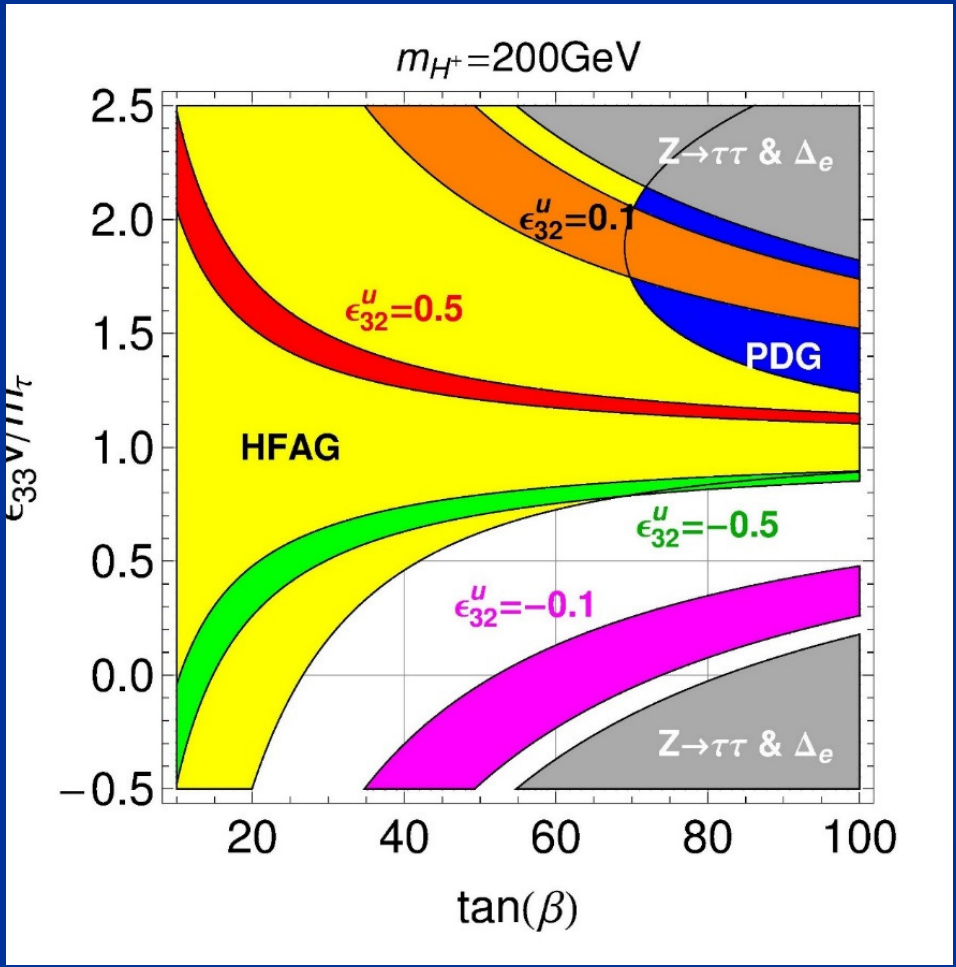
ATLAS $C_9^{\mu\mu}$ & $B_s - \overline{B}_s$ a = 1/2 allowed

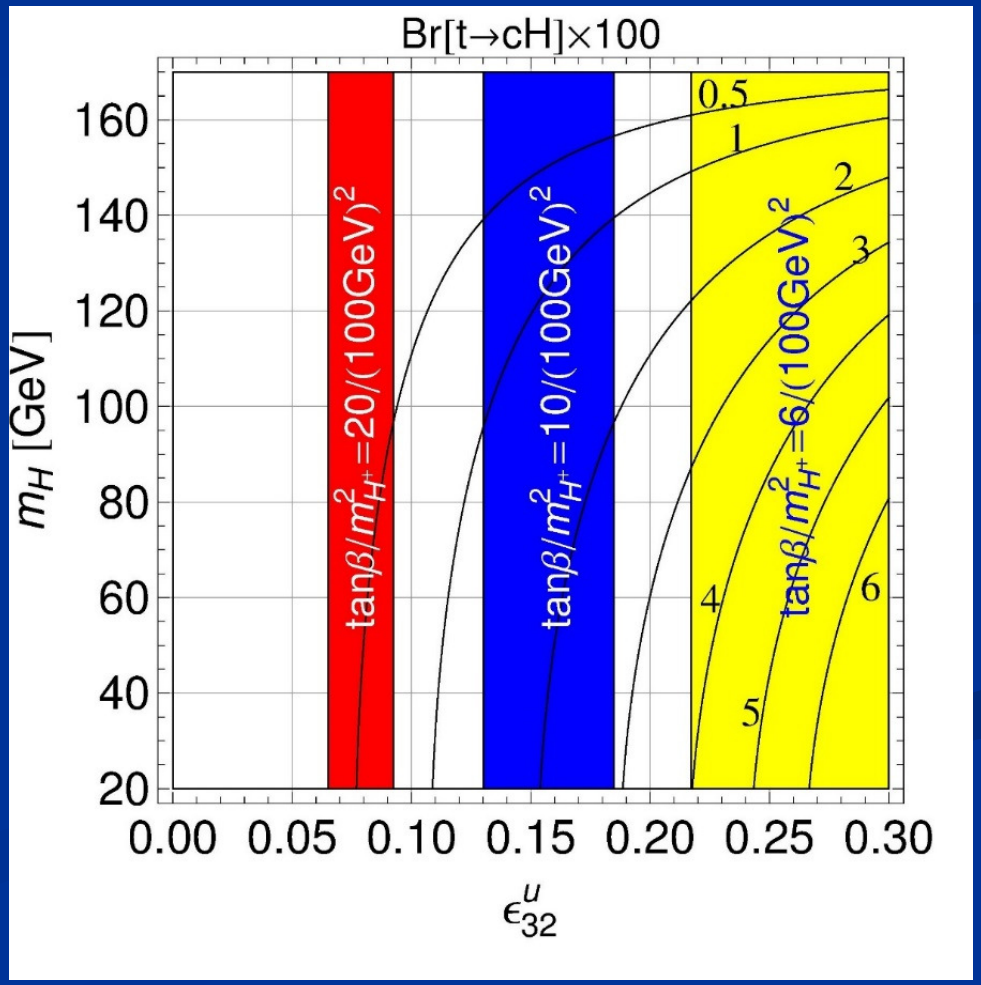
2HDM X

AC, Heeck, Stoffer arXiv:1507.07567

- Simultaneous Explanation of tauonic B decays and the anomalous magnetic moment of the muon

$t \to Hc$





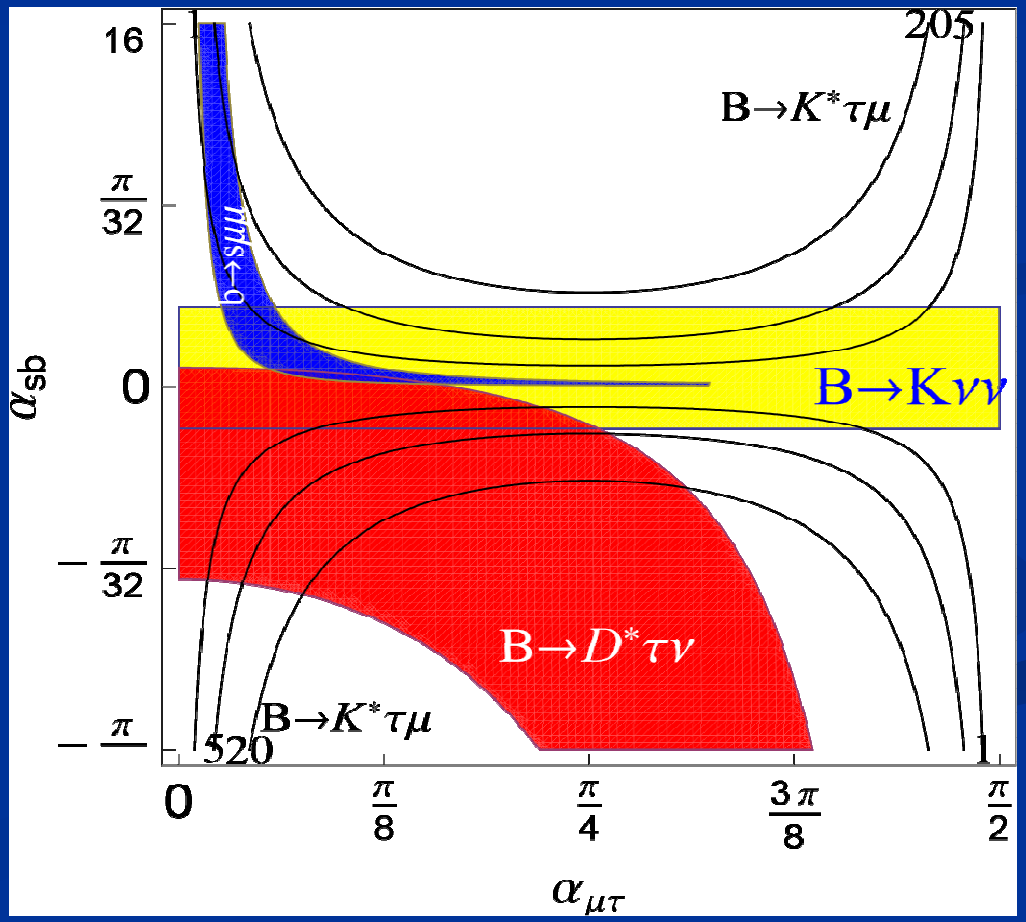
Leptoquarks

- Simultaneous Explanation of
  - $b \to c\tau\nu$
  - $b \to s\mu^+\mu^-$

$$Q^{(3)}_{llqq} = L\gamma^\mu P_L \tau^I L Q \gamma^\mu \tau_I P_L Q$$

Third generation couplings

$$C^{(3)} = \lambda^{(3)} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$



Calibbi, AC, Ota
Phys.Rev.Lett. (2015)