

Top A_{FB} and charge asymmetry in chiral $U(1)'$ model with flavored Higgs doublets

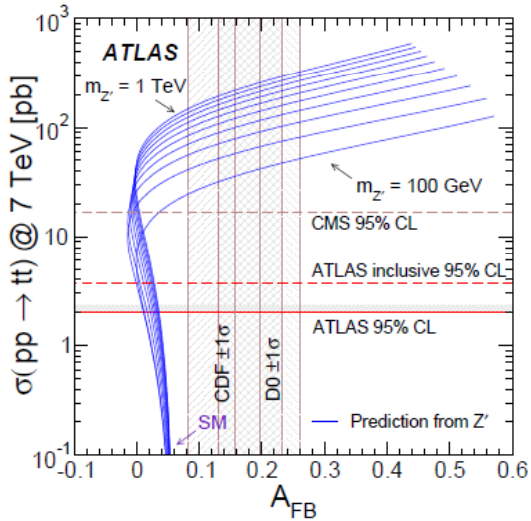
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Based on arXiv:1108.0350 [hep-ph] (to appear in PRD);
JHEP1201,147(2012);
1205.0407 [hep-ph]
with P. Ko and Yuji Omura (KIAS)

The XIth International Conference on Heavy Quarks and Leptons,
Prague, Czech Republic, June 11-15, 2012

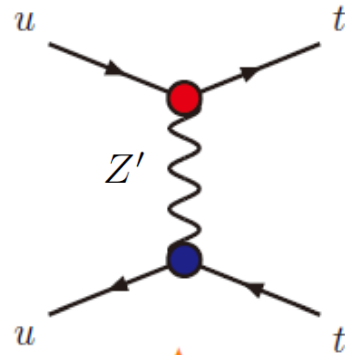
Top A_{FB} and new physics

- Top A_{FB} : the only observable with deviations from SM in top physics.



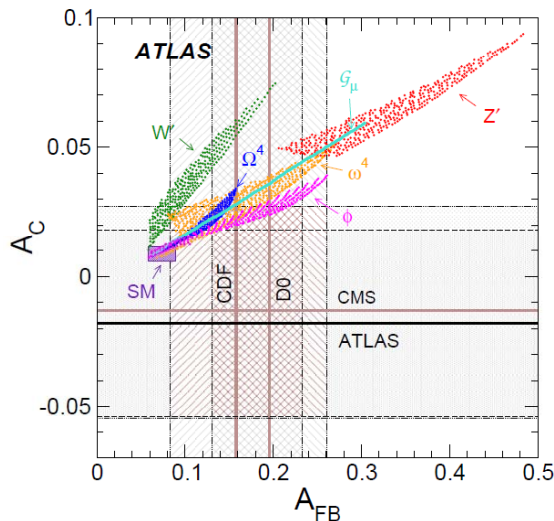
A lot of NEW PHYSICS models have been proposed.

- rather phenomenological.



$$\mathcal{L} \ni g_X Z'_\mu \bar{u} \gamma^\mu P_R t + h.c.$$

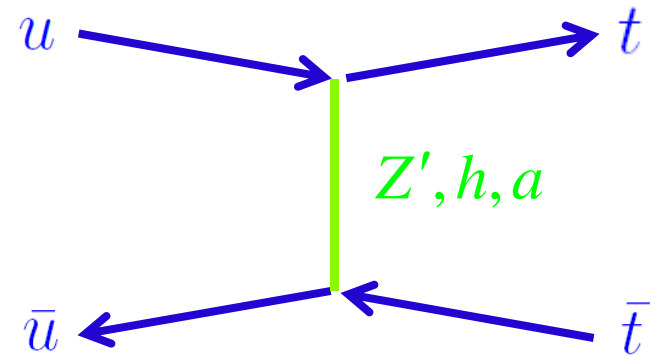
- assume large flavor-offdiagonal coupling and small diagonal couplings.



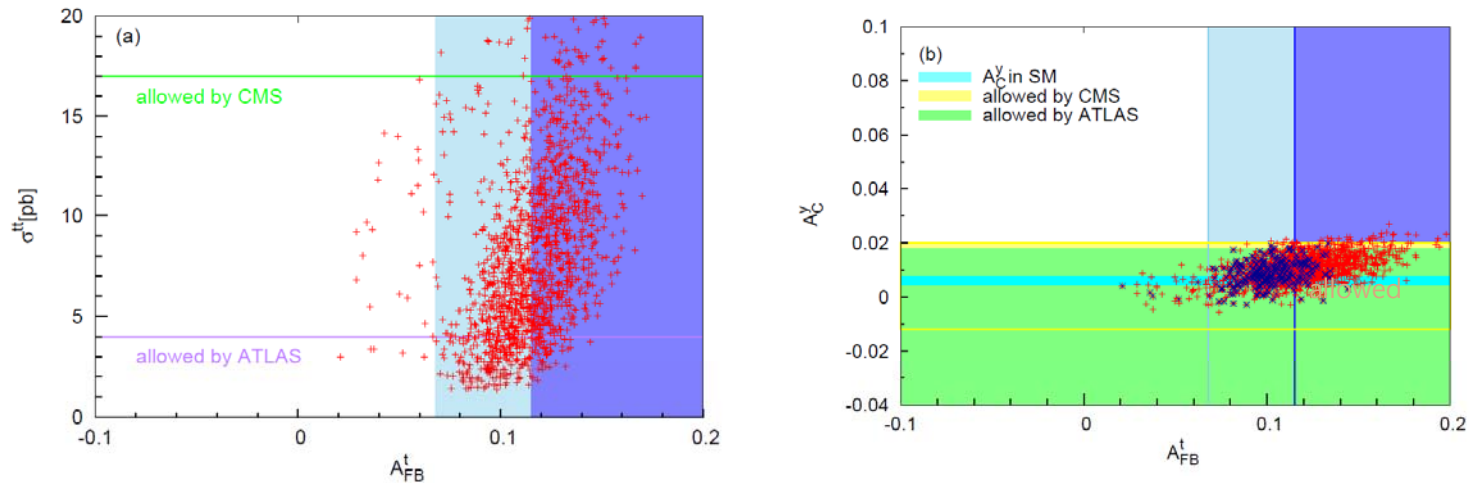
- **flavor dependent couplings** → nontrivial.
- challenging to construct a realistic model.
 - anomaly free, renormalizable, realistic Yukawa couplings.

Chiral $U(1)'$ model with flavored Higgs doublets

- the Z' is associated with some $U(1)'$ gauge symmetry.
- better be leptophobic to avoid the LEP II and Drell-Yan bounds.
- difficult to assign flavor-dependent charges to down-type quarks due to the strong constraints from FCNC experiments → **assign $U(1)'$ charges only to right-handed up-type quarks.**
- Yukawa interactions : require **additional Higgs fields charged under $U(1)'$.**
- a flavor-dependent leptophobic $U(1)'$:
anomalous.
 - introduce additional fermions to cancel the gauge anomalies.
- **Both Z' and Higgs bosons affect the top A_{FB} and charge asymmetry.**



Results and discussion



- Destructive interferences between Z' , h , and a reduce the rate for the same sign top pair production.

IMPORTANT LESSONS of OUR WORK

- mandatory to extend Higgs fields if there are new vector bosons with chiral couplings to SM fermions.
- similar to the $W_L W_L$ scattering in the intermediate vector boson model.
- also true in the W' , axigluon, and any other models if a new spin-1 particle has a chiral $U(1)'$ charge.