Top FCNC @ HL/HE-LHC

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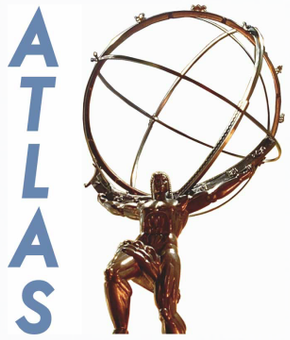


HL/HE-LHC WG1 Meeting / Top physics

May 2, 2018

1. Theoretical introduction / motivation : *0.5-1p, 2 figs*

$$\mathcal{L} = \sum_{q=u,c} [\sqrt{2} g_s \frac{\kappa_{gqt}}{\Lambda} \bar{t} \sigma^{\mu\nu} T_a (f^L_{Gq} P_L + f^R_{Gq} P_R) q G^a_{\mu\nu} +$$
$$+ \frac{g}{\sqrt{2} c_W} \frac{\kappa_{zqt}}{\Lambda} \bar{t} \sigma^{\mu\nu} (f^L_{Zq} P_L + f^R_{Zq} P_R) q Z_{\mu\nu} + \frac{g}{4 c_W} \zeta_{zqt} \bar{t} \gamma^{\mu} (f^L_{Zq} P_L + f^R_{Zq} P_R) q Z_{\mu} -$$
$$- e \frac{\kappa_{\gamma qt}}{\Lambda} \bar{t} \sigma^{\mu\nu} (f^L_{\gamma q} P_L + f^R_{\gamma q} P_R) q A_{\mu\nu} +$$
$$+ \frac{g}{\sqrt{2}} \bar{t} \kappa_{Hqt} (f^L_{Hq} P_L + f^R_{Hq} P_R) q H] + h.c.$$

- Introduce theoretical framework (TopFCNC, CompHEP)
- Focus on tgq (ATLAS: Dominic, CMS: Lev) and tZq (ATLAS: Archil, CMS: Jérémy) couplings
- *Show Feynman diagrams for the signal processes, 1x2 fig*
- Introduce EFT interpretation in the context of top FCNC
- Summarise the latest LHC Run 2 results and projections

Σ=1

2. Simulation : *0.5-1p, 0 figs*

- Describe MC generation (MEtop/MG5_aMC@NLO, CompHEP) of the signal events
- Emphasise the dominant background processes and how they are simulated (ttbar, W+jets, QCD, single top, WZ, ttZ/W) ***- overlap with the main text***
- Signal DELPHES vs full simulation comparison/discussion

Σ=2

3. Selection criteria / analysis strategy : *1p, 0 figs*

- Explain the signal topology at reconstructed level
- Motivate the baseline selection criteria, event categorisation (lepton+jets, three leptons)
- Describe any kinematic reconstruction in the event (e.g. top quark)
- Cut-and-count vs shape analysis
- Additional optimisation of the selection criteria (BDT, BNN)

Σ=4

4. Systematics : *1p, 0 figs*

- List the main sources of systematic uncertainties
- Describe the projection of systematics from Run 2, define possible scenarios *- if different from the main text*
- Explain if there are any data-driven corrections inspired by Run 2 results
- Summarise systematic effects on signal and background (possibly in a table)

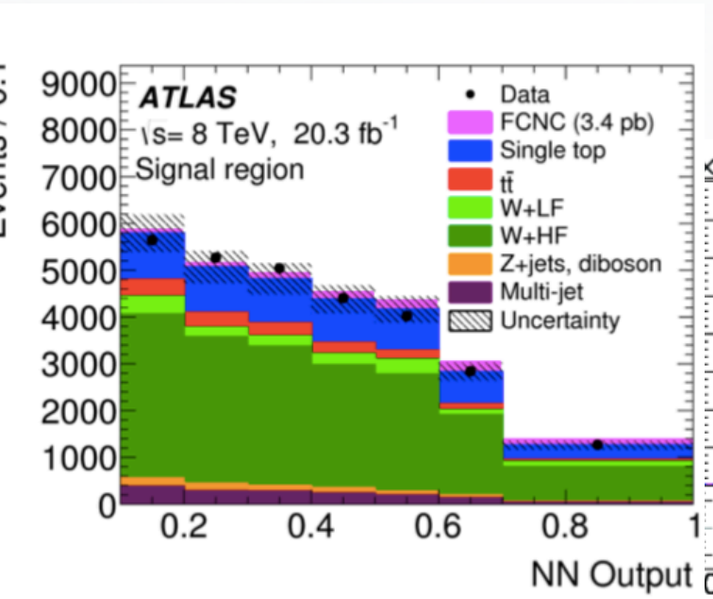
Σ=5

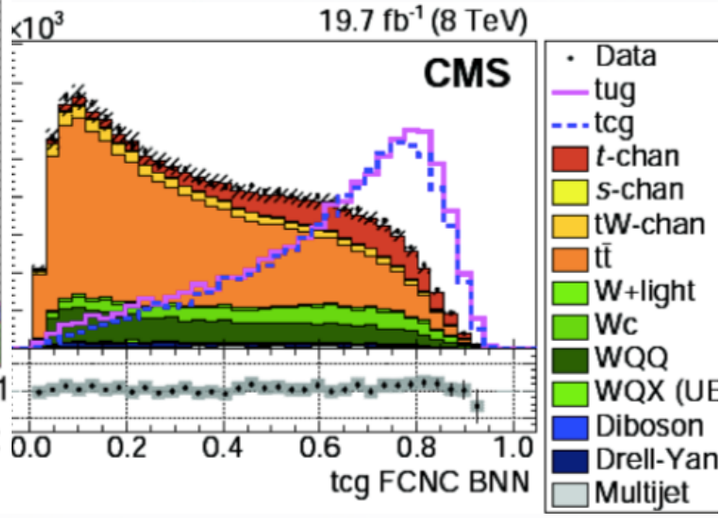
5. Results : *4p, 12 figs*

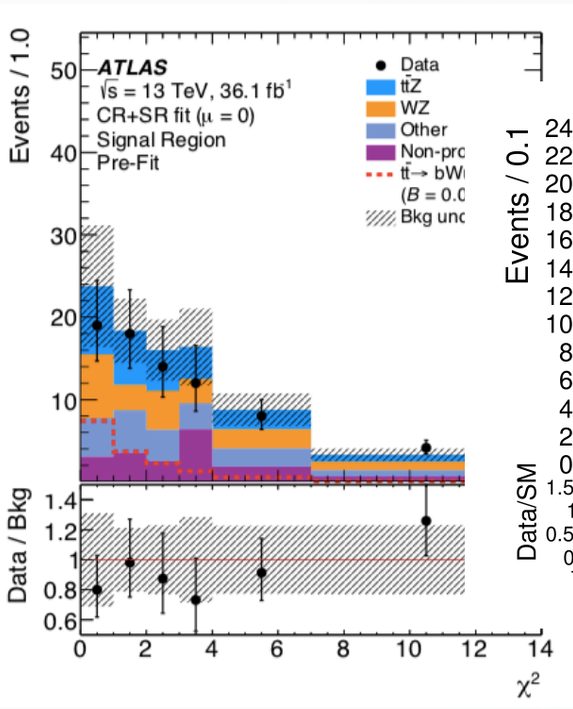
- Describe the procedure of the limit extraction
- *Show final NN discriminators optimised for the search for up and charm-FCNC couplings, 2x2 figs*
- *Show 2d limits on couplings and BRs (up vs charm), 2x2 figs*
- *Show 1d limits as a function of the integrated luminosity, 2x2 figs*
- Summarise projections for BR upper limits considering various systematics scenarios
- Constrain EFT operators from the obtained limits
- Discuss results in comparison to existing projections

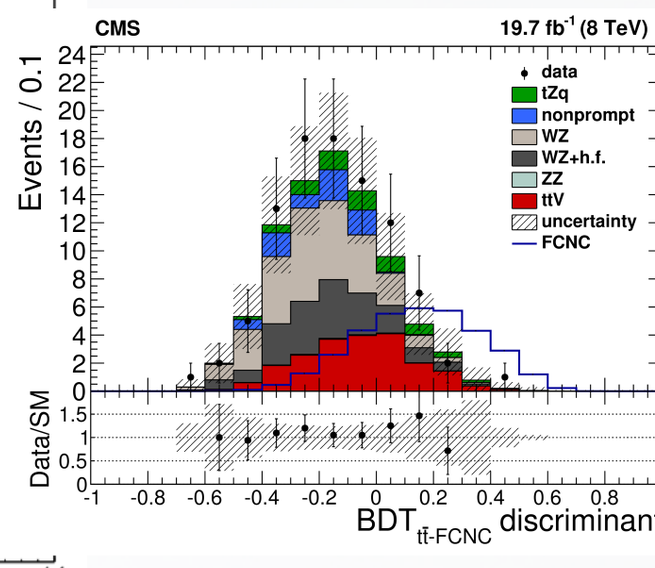
Σ=9

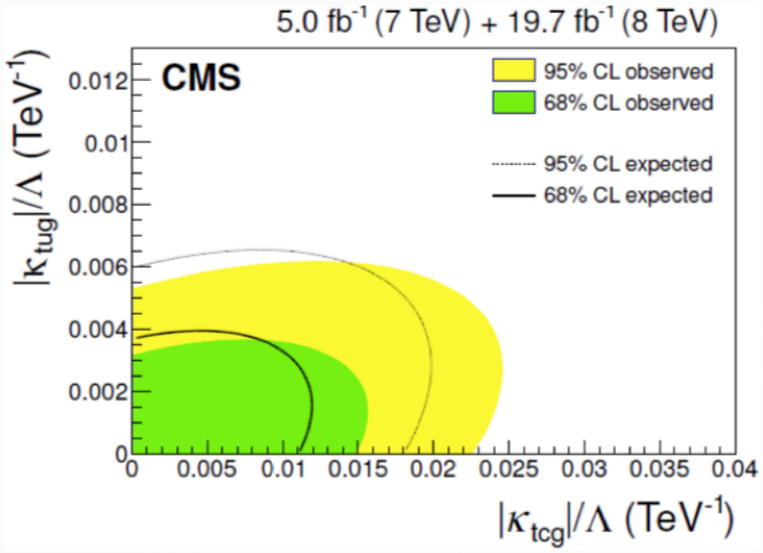
5. Results : *4p, 12 figs*

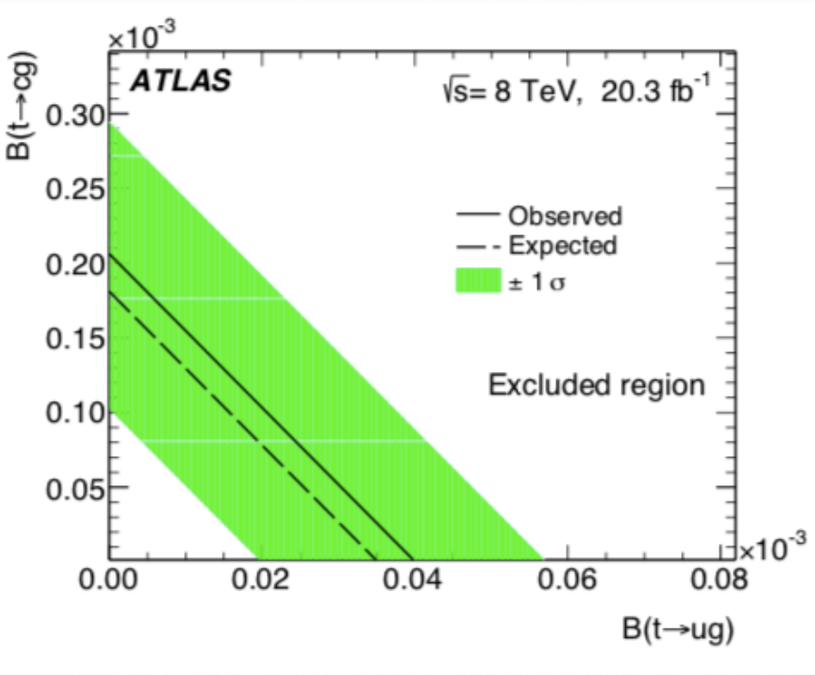


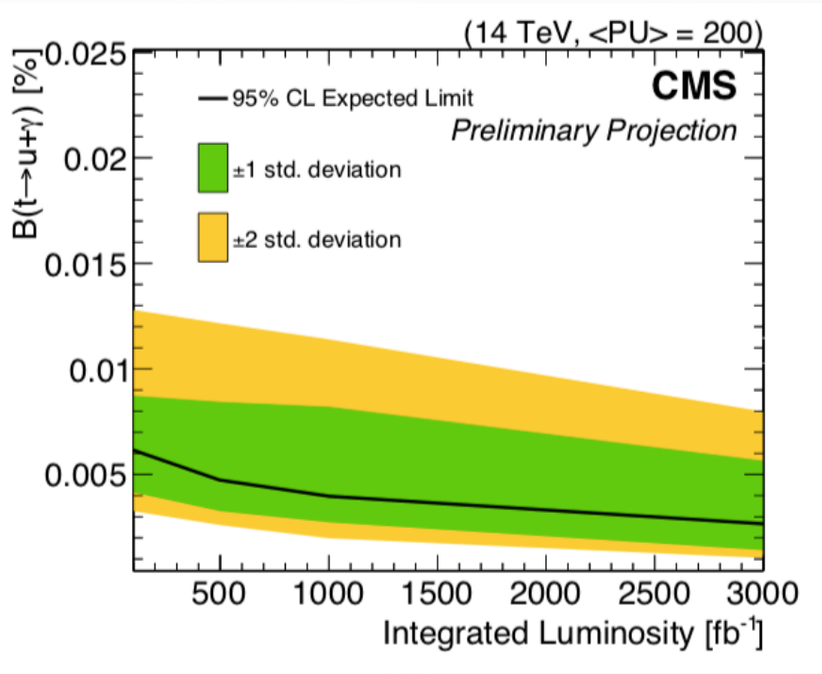












6. Conclusion : *0.5p, 0 figs*

- Summarise all obtained limits
- Wish ourselves good luck for future Phase 2 experiments

Σ=9.5