

Status of FCNC $t\bar{q}q$ search

E. Boos¹, A. Chernoded¹, L. Dudko¹, P. Mandrik²,
I. Myagkov¹, M. Perfilov¹, P. Volkov¹, G. Vorotnikov¹

¹*Lomonosov Moscow State University (SINP MSU), Moscow*

²*IHEP, Protvino*

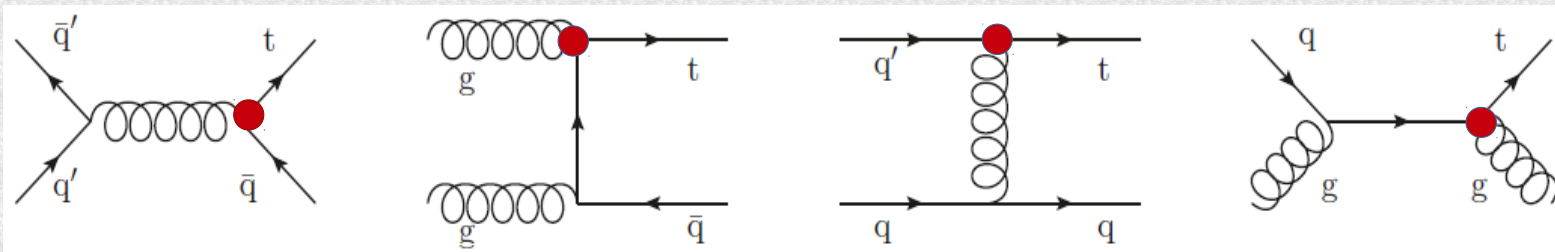
*FCC-hh physics analysis meeting,
2018, March, 15th*

FCNC "tgq" @FCC: theory

- Gluon mediated FCNC top quark production

$$g_s \frac{\kappa_{tug}}{\Lambda} \bar{u} \sigma^{\mu\nu} \frac{\lambda^a}{2} t G_{\mu\nu}^a + g_s \frac{\kappa_{tcg}}{\Lambda} \bar{c} \sigma^{\mu\nu} \frac{\lambda^a}{2} t G_{\mu\nu}^a + h.c.$$

- Representative diagrams (**wbj**-channel):



Energy, TeV	FCNC «tgu» LO CS [pb]	FCNC «tgc» LO CS [pb]
7	33.2	4.9
8	41.7	6.7
13	91.6	18.5
14	102.8	21.4
27	268.6	71.1
100	1720	575

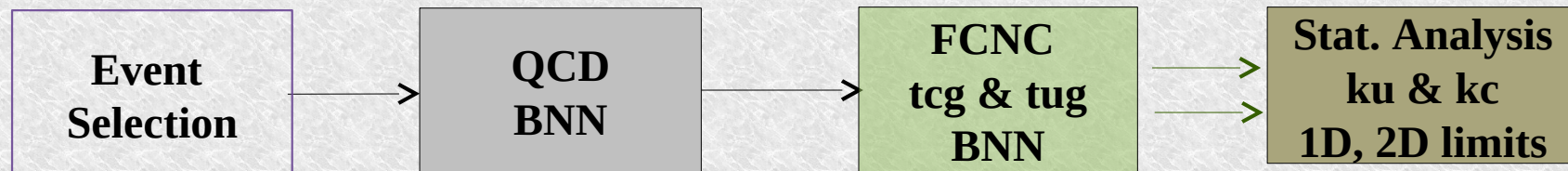
NLO CS = K* LO CS

K («tgu») = 1.52

K («tgc») = 1.4

[Phys.Rev. D72 \(2005\) 074018](https://arxiv.org/abs/hep-ph/0503122)

- Analysis scheme:



FCNC "tgq" @FCC: signal samples

- CompHEP – based generators

- two event samples with $\kappa/\Lambda=0.03 \text{ TeV}^{-1}$ values; 3.5 Mevents

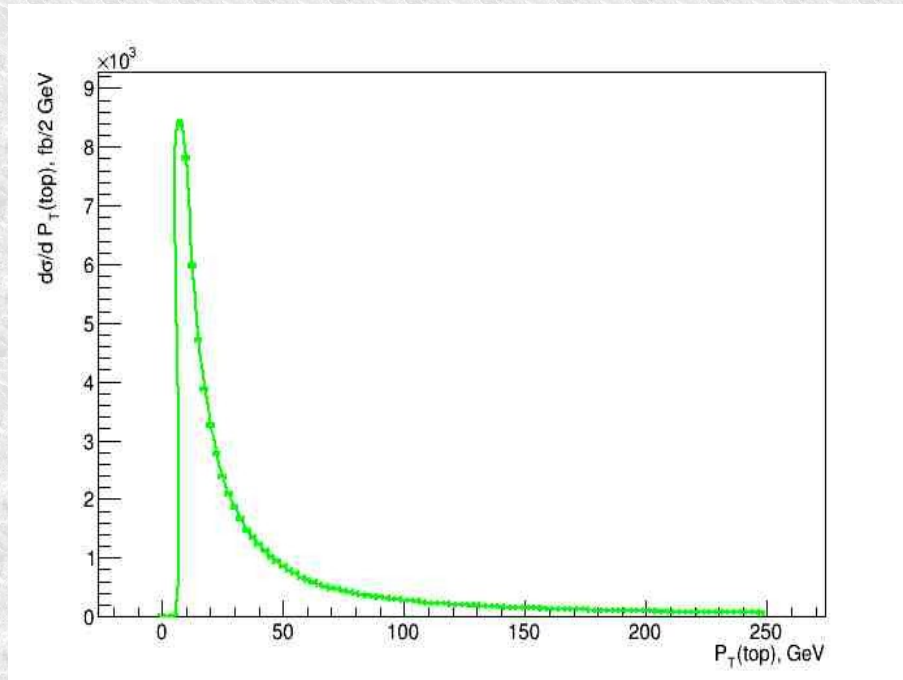
- LHE files: `/eos/experiment/fcc/hh/generation/lhe/ch_pp_wbj_fcnc_ku`

- `/eos/experiment/fcc/hh/generation/lhe/ch_pp_wbj_fcnc_kc`

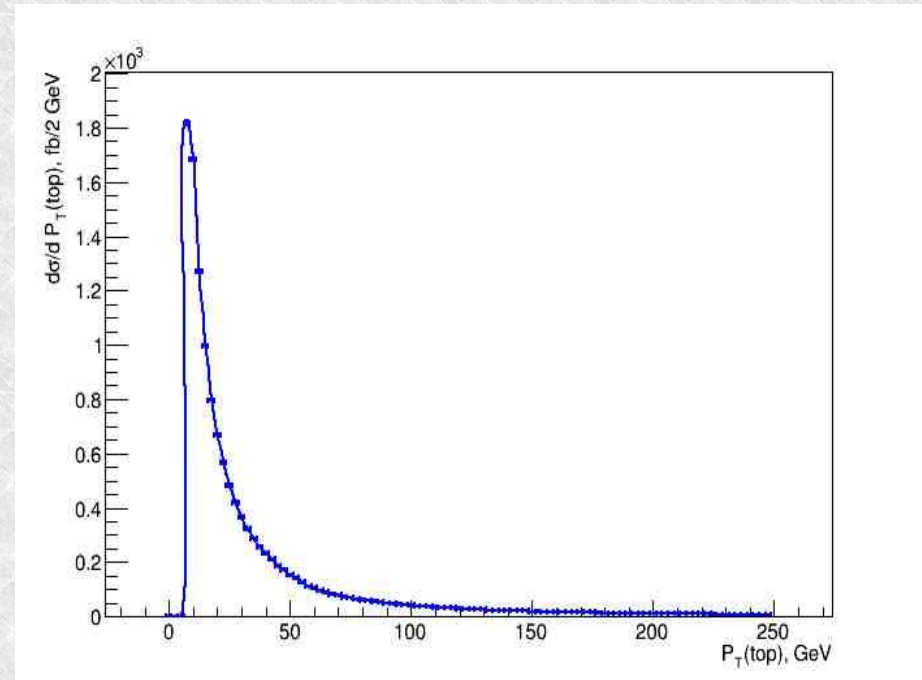
- FCCv02: `/eos/experiment/fcc/hh/generation/DelphesEvents/fcc_v02/ch_pp_wbj_fcnc_ku`

- `/eos/experiment/fcc/hh/generation/DelphesEvents/fcc_v02/ch_pp_wbj_fcnc_kc`

thanks to Clement!



FCNC
«tgu»



FCNC
«tgc»

Parton level distributions

FCNC "tgq" @FCC: background samples

- FCCv01:

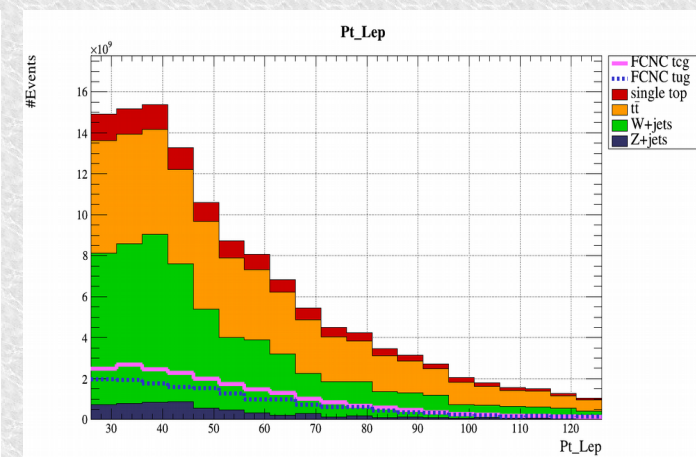
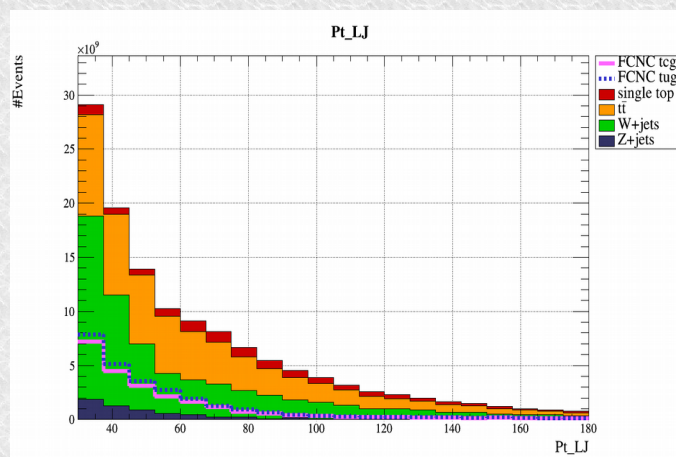
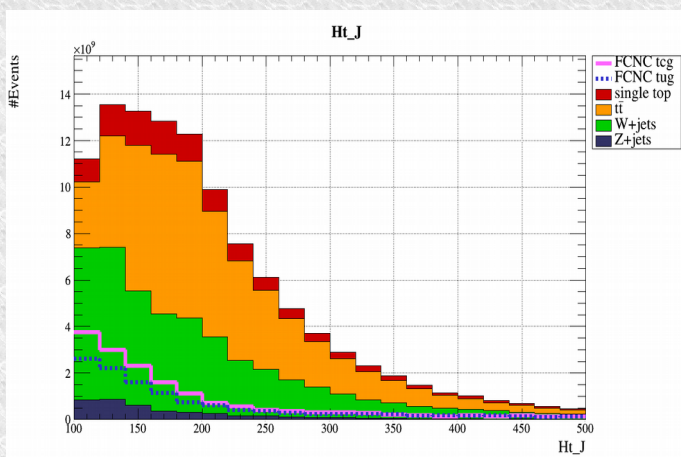
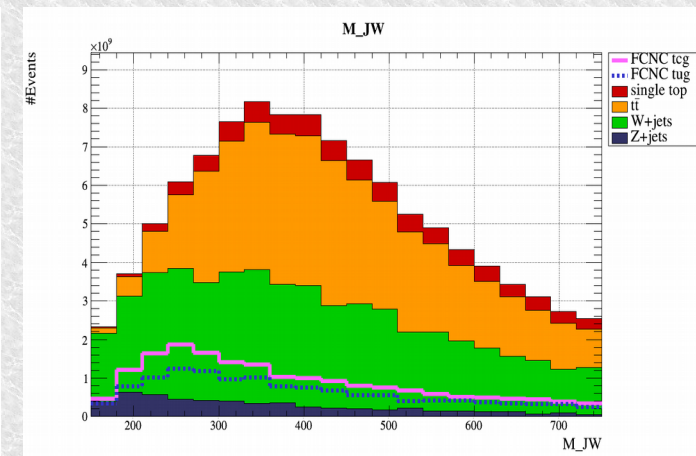
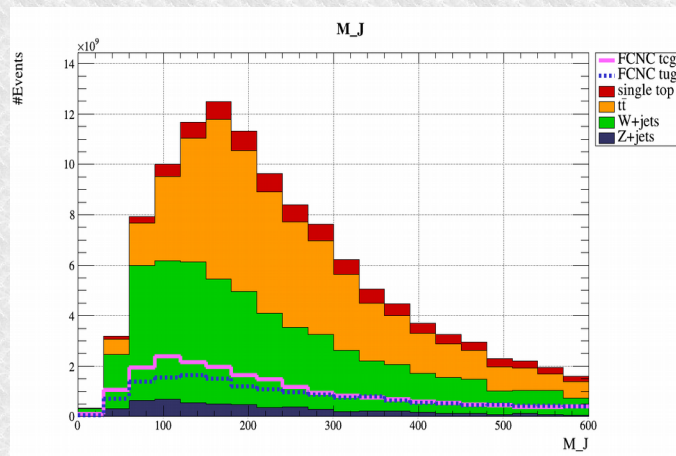
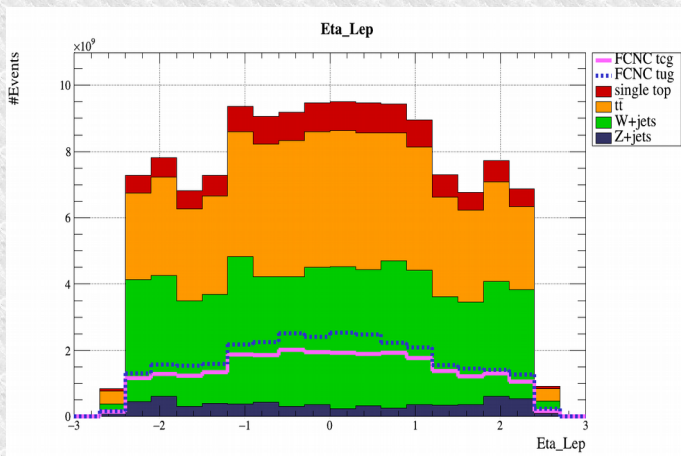
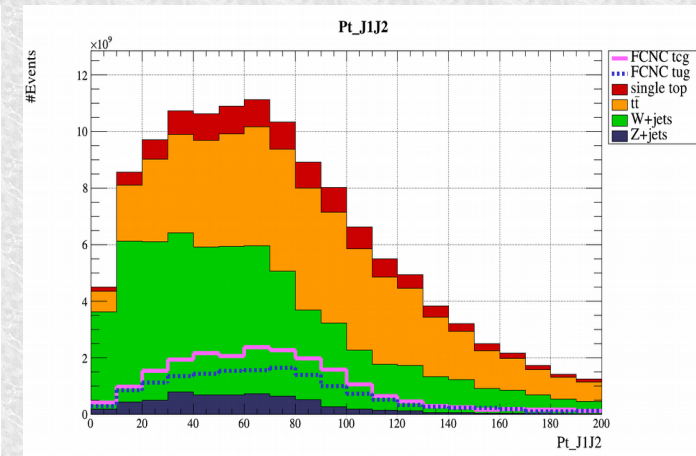
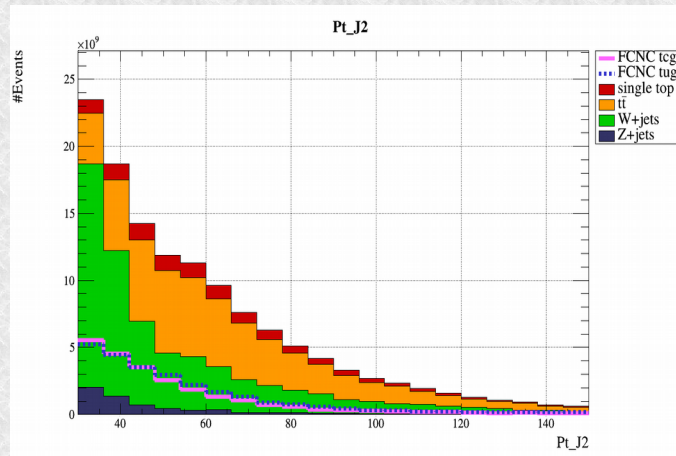
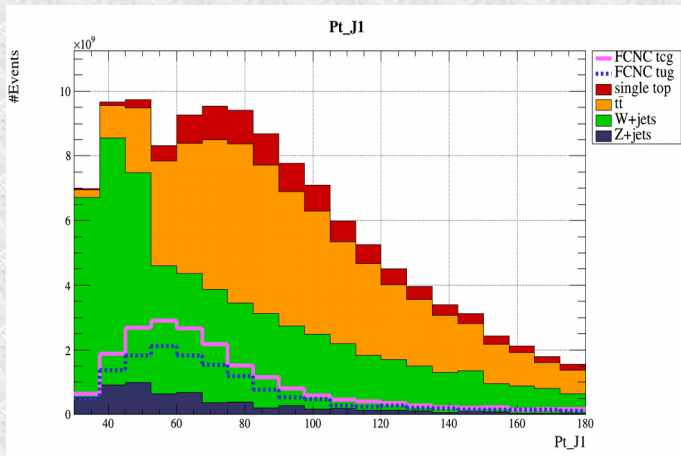
backgrounds	CS [pb]	Nevents
Single top	7524	508,176
top pair + 0/1/2 jets exclusive	4.311e+04	~9M
W+jets excl.		~5M
Z+jets excl.		~4M

- Chosen variables for BNN training:

FCNC B/DNNs

- $P_t(J1)$
- $P_t(J2)$
- $P_t(J1,J2)$
- $P_t(BJ2)$
- $P_t(LJ)$
- $P_t(Lep)$
- $P_t(J_notBest)$
- $P_t(top)_BJ1$
- $M_t(top)_BJ1$
- $\text{Eta}(Lep)$
- $M(J)$
- $M(J,W)$
- $H_t(J)$
- $N(J)$
- $Q(Lep)$
- $\text{Cos}(lep,LJ)|_{top}$
- $\text{Cos}(lep,W)|_W$

FCNC "tgq" @FCC: some distributions



FCNC "tgq" @FCC: plans

- Generate Delphes v02 events for the rest of backgrounds (Z+jets, W+jets, additional SingleTop, QCD (?!)) and the signal
- After the complete BNN trainings we proceed to the estimation of the systematic uncertainties
- Based on the shapes of the BNN outputs analysis we proceed with a statistical analysis to the final results (1D and 2D FCNCN couplings limits, limits on branching fractions)
- Write a text (format, volume?)
- Proceed with W' analysis (all .lhe files are ready)

BACKUP