

$t\bar{t}\gamma$ Study for HL-LHC

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HL/HE-LHC WG Top

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Motivation:

- sensitive to anomalous top- γ coupling or dipole moments

Manpower:

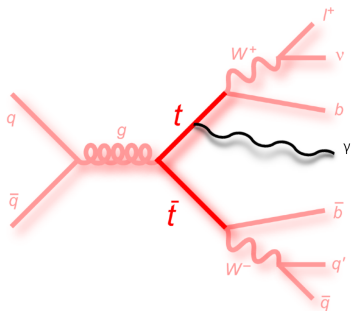
- 1 Postdoc (till June), and 3 PhDs, from Siegen
- (likely) 1 PhD from Gottingen

$t\bar{t}\gamma$ final state:

- $t\bar{t}$ final state + a photon
- both single lepton and dilepton channels

Backgrounds:

- instrumental: hadronic fake photon, electronic fake photon, fake lepton
- $X+\gamma$: $X = W, Z$, single top, other VV , fake lepton



Fiducial/Differential cross-section:

- cut-based analysis
- iterative Bayesian unfolding
- modelling of instrumental bkg's

Top EFT:

- take the above unfolded cross-section as input
- fit model: $\sigma_{SM} + "C" \Delta\sigma_1 + "C^2" \Delta\sigma_2 = \text{unfolded } \sigma$
- common naming scheme for combination of workspace with other analyses (e.g. ttV)?

Charge asymmetry:

- single lepton channel
- top quark reconstruction: KLFFitter

Fiducial/Differential cross-section:

- assume 13TeV acceptance: stat precision improves to $\sim 0.5\%$
- extrapolation of systematics to be studied

Top EFT:

- using 13TeV samples (for 14TeV, only nominal sample ready)
- expected limits, in unit of their current limits
- shape info. not yet exploited, stat uncertainty only

	OtW	OtG	OtB
sinlepton (36 fb^{-1})	0 ± 1.2	0 ± 0.54	0 ± 0.7
sinlepton (3 ab^{-1})	0 ± 0.14	0 ± 0.06	0 ± 0.077
dilepton (36 fb^{-1})	0 ± 1.9	0 ± 0.74	0 ± 1.1
dilepton (3 ab^{-1})	0 ± 0.24	0 ± 0.083	0 ± 0.13

Charge asymmetry:

- extrapolated from 100 fb^{-1} study \rightarrow roughly 10% stat precision (very preliminary, since reconstruction quality matters)

Samples:

- SM signal and $t\bar{t}$ MC available, but none of the others (for bkg samples, common production request? or privately from each group?)

Analysis framework:

- AnalysisTop framework
- ntuples successfully generated locally

KL Fitter:

- 1 PhD is starting to work on it