Plans for $pp \to t\bar{t}(+X)$ asymmetry studies

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Physics: top charge (forward-backward) asymmetry

- Difference between the angular distribution of the t and $\bar{t}$ quarks, due to interference effects between higher-order diagrams and an initial state that is not charge symmetric (valence quarks) [PhysRev**D59**(1999)054017]; sensitive to axial combinations of 4-quark operators [RevModPhys**87**(2015)421]
- Long history at the Tevatron [PhysRevLett**120**(2018)042001], and at LHC (run 1) [arχiv:1709.05327 submitted to JHEP]
- gg initial states are "background", so kinematic cuts, optimized observables [JHEP**07**(2013)179], and associated production ($t\bar{t}$ + jet [PhysRev**D86**(2012)094036], $t\bar{t}\gamma$ [JHEP**04**(2014)188], $t\bar{t}W$ [PhysLett**B736**(2014)252]) can be used to enhance the asymmetric contribution
- The large HL-LHC data sets may make measurements using the rare processes feasible, increased kinematic coverage also gives more options

Tools and schedule

$$A_{raw} = \frac{N_> - N_<}{N_> + N_<} = f \cdot (1 - 2\overline{\omega}) \cdot A \quad \text{and} \quad \sigma(A) \approx \frac{1}{(1 - 2\overline{\omega})\sqrt{f}\sqrt{N_{signal}}}$$

where f is the signal purity $N_{signal}/(N_{signal} + N_{background})$
and $\overline{\omega}$ the average mistag, *i.e.* the probability to classify a "forward" event as "backward", or the other way around

- baseline: extrapolation based on current analyses (if available), or selection from cross-section measurements, and similarly estimated purities, mistag rates, and systematic effects
- time (personpower) permitting: more realistic studies, impact of increased coverage *etc.*
- Status: bringing together interested parties and gathering inputs