Top quark working group for Snowmass 2013
Precision subgroup

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Precision top quark physics

- Top quark mass and width
- Top quark couplings
- Kinematics of top-like final states (this point overlaps with the previous ones strongly since any information about top quark properties is obtained from kinematics of top-like final states)

Top quark mass and width

- Clarify which top quark mass is quoted by the hadron-collider experiments, taking parton showers as all-orders approximation to perturbative QCD. Explain what ``PYTHIA mass'' actually means.
- Identify observables that give highest sensitivity to the top quark mass in the current measurements. Estimate leading non-perturbative corrections to these observables and their influence on the top quark mass extraction.
- Find a set of observables that are 1) short-distance (perturbative) and 2) sensitive to the top quark mass. Include NLO QCD corrections in the determination of top quark mass from these observables. Estimate the ultimate precision with which the top quark mass can be measured from such a set at the LHC and VLHC.
- Review top quark mass and width measurements at a linear collider. Clarify how improvements in m_t in conjunction with prospective improved measurements in m_W and m_H may affect indirect constraints of physics beyond the Standard Model through precision electroweak fits.

Top quark couplings

- Establish convenient parametrization of the top quark anomalous couplings to gluons, photons and electroweak gauge bosons.
- Find processes and observables (at the LHC, VLHC and ILC) that are most sensitive to the anomalous couplings.
- Develop parton-level numerical programs that describe relevant top quark production processes that include both QCD radiative corrections and anomalous couplings.
- Establish how well such couplings can be ultimately measured and understand if this leads to useful constraints for physics beyond the Standard Model.

Kinematics of top-like final states

- Understand which cross-sections and kinematic distributions in top-like final states are particularly useful for answering SM and BSM physics questions both at the LHC and beyond.
- Review advanced simulation tools that exist for such processes and kinematic distributions; establish their relative merits and shortcomings.
- Understand precision with which cross-sections and distributions in item one should be known to be useful and review precision that existing tools can actually provide.
- Understand what are the prospects for short- and long-term improvements that can be expected in theoretical description of top-like final states.