



EF03: Heavy flavor and top quark physics

https://snowmass21.org/energy/heavy_flavour

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TG meeting, August 12, 2021

Welcome back!

Energy Frontier Workshop-Restart

August 30-September 3, 2021

<https://indico.fnal.gov/event/49756/>

The goal of this EF community workshop is to regroup after the few months of pause of Snowmass activities, assess progress made so far in on-going studies, share new studies that may have been started, identify gaps in our strategies, and update the community with schedule, goals and plans for the upcoming months towards the final reports in spring/summer 2022.

EF03 parallel sessions:

8/30, 11am-12:30pm EDT: Joined session with EF01/EF04 (Top in global EFT fits)

9/2, 1-2:30pm EDT: Joined session with EF06 (Top and PDFs)

9/1, 1-2:30pm EDT: EF03 session

New Timeline

- White Paper submission to arXiv:
no later than March 15, 2022.
- Preliminary reports by the Topical Groups due:
no later than May 31, 2022.
- Preliminary reports by the Frontiers due:
no later than June 30, 2022.
- Snowmass Community Summer Study (CSS):
July, 2022 at UW-Seattle.
- All final reports by TGs and Frontiers due:
no later than September 30, 2022.
- Snowmass Book and the on-line archive documents due:
October 31, 2022.

Status: Proposed Studies at Kickoff meeting (May 2020)

- **Limits on Precision Top Mass Measurements at HL-LHC and Prospects for the 4top Process** Stephen Wimpenny
- **Dark Matter and Heavy Flavors at Colliders** Alexander Moreno Briceño **Lol**
- **Quark Spin Correlations at the HL-LHC & constraining new physics** Andreas Jung **Lol**
- **ILC: EFT fit for top and bottom EW couplings** Gauthier Durieux, Martin Perello , Roman Poeschl
- **Top mass prospects at e+e- colliders:** Esteban Fullana , Frank Simon **Lol**
- **Heavy quark studies other than top at Linear Colliders** Roman Poeschl **Lol**
- **Novel constraints on EFT in the top sector** Alexander Grohsjean, James Keaveney, **paper:** <https://arxiv.org/abs/2107.01053>

Lol: Letter of Interest

Status: Talks at EF03 TG meetings (9 meetings in 2020)

- **Top physics at a linear collider** Roman Poeschl **LoI**
- **Optimizing top-quark threshold scan using genetic algorithm** Aleksander Filip Zarnecki, Kacper Nowak **LoI**
- **New ideas for top quark mass measurements** Kaustubh Agashe **LoI**
- **Top physics at HL-LHC and HE-LHC** Clement Helsens
- **EW higher order calculations for top quark and heavy flavor production at lepton colliders** Emi Kou
- **ttW production: a very complex process** Marcos Miralles Lopez, Maria Moreno Llacer
- **A detailed comparison of QCD modelling in pp → ttW production** Manfred Kraus **LoI**
- **Top quark physics at the LHeC and FCC-eh** Christian Schwanenberger **LoI**
- **Electroweak Heavy Flavour (bottom, charm,tau) at the FCC-ee** Juan Alcaraz Maestre **LoI**
- **Top Quark Physics at FCC-ee** Jeremy Andrea **LoI**
- **Constraining heavy flavor PDFs at hadron colliders** Marco Guzzi **LoI**
- **Top quark mass measurements and their interpretations** Andre Hoang

Status: Letters of Interest (EF03 is not primary)

The IDEA Drift Chamber for a Lepton Collider

https://www.snowmass21.org/docs/files/summaries/IF/SNOWMASS21-EF3_EF4-IF3_IF5-031.pdf

detector proposal which would be useful for tracking but not specific for top or heavy flavor production

Multi-object identification with Dual-Readout Calorimeter at future e^+e^- colliders

https://www.snowmass21.org/docs/files/summaries/IF/SNOWMASS21-IF6_IF0-EF1_EF2_EF3_EF4_Philip_Chang-024.pdf

detector proposal that includes $t\bar{t}$ as an object of study

EIC studies on small systems (Bottom meson production in quark-ion collisions)

https://www.snowmass21.org/docs/files/summaries/EF/SNOWMASS21-EF7_EF3-032.pdf

Probing High Scale Physics via Standard Model Parameters

running of Higgs quartic coupling (top mass as input)

https://www.snowmass21.org/docs/files/summaries/TF/SNOWMASS21-TF8_TF5-EF3_EF5-NF3_NF0-RF4_RF0-CF1_CF3-012.pdf

See EF03 wiki for a complete list of Lols:

https://snowmass21.org/energy/heavy_flavour

Status: Talks at Joined EF01/EF03 TG meeting (January 2021)

- **Top quark mass determination at hadron colliders** Andre Hoang
- **Top sector in the Snowmass SMEFT fits:** Jorge de Blas
- **Expected sensitivity/reach of various colliders for top-coupling observables** Marcel Vos
- **Top, Higgs, Diboson and Electroweak Fit to the SMEFT** Ken Mimasu

Status

- There are on-going studies that have not been submitted as LOIs:
 - Several ATLAS and CMS studies were proposed: top mass projection update, 4-top projection, spin correlation, top EFT
 - How about other ATLAS/CMS studies?
 - EW corrections for top and bottom pair production at lepton colliders
 - What else?
- There are important missing topics not covered in LOIs:
 - We need to organize these nice ideas to make sure they get done!
 - We also need to see studies of top physics at very high energies (muon collider and FCC-hh).
 - We need additional studies for HF production, e.g., EFT studies with HF production at hadron colliders.
 - What else?

We have a good representation on our mailing list but we still need to do more to engage both experimentalists and theorists so that the relevant studies get done!

Meetings

- Top2021: <https://indico.cern.ch/event/1018454/>
- Our biweekly TG meetings on Thursdays, 1-3pm EDT will continue after Top2021 with the 1. meeting on 9/23.