First comments from physics

What does the physics need?

Note:

- This is a fully improvised presentation
- On (too) short notice
- It needs more proper reflection/discussion

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CLIC physics

High accuracy measurements of known states

- Higgs physics
- Top physics

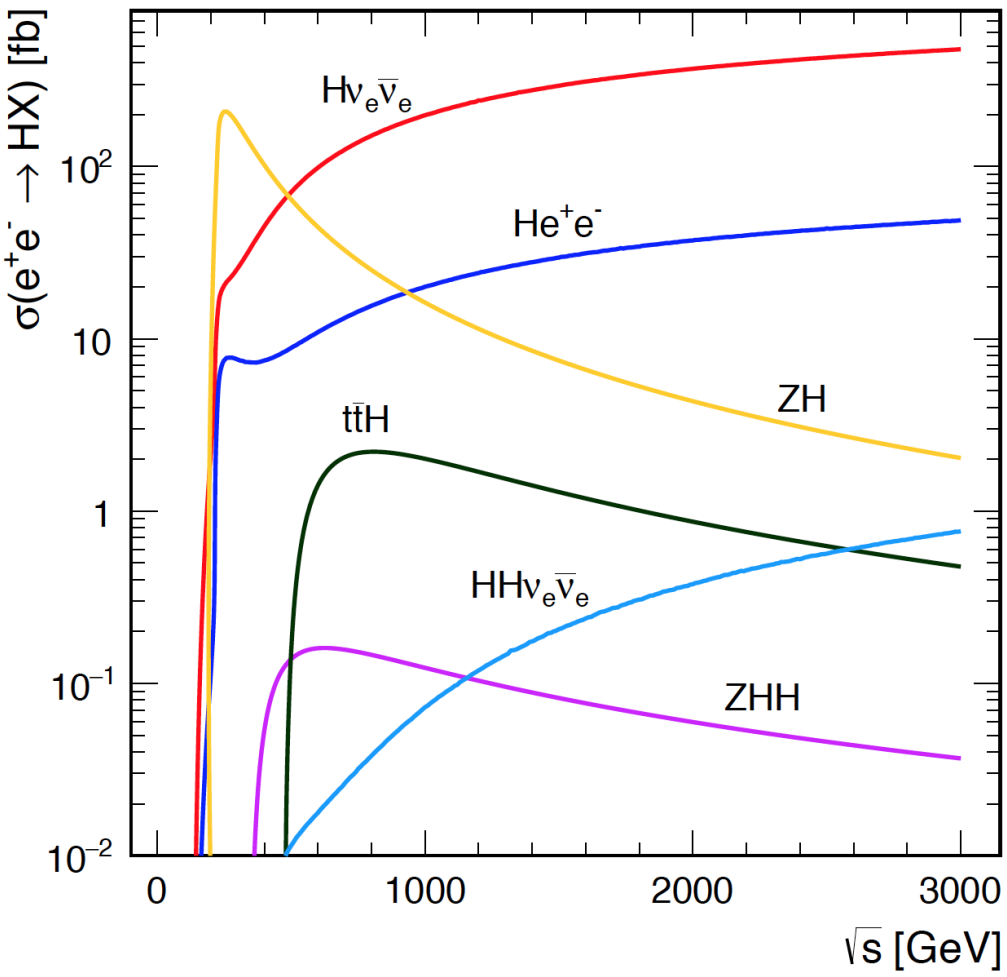
Physics beyond the standard model (BSM)

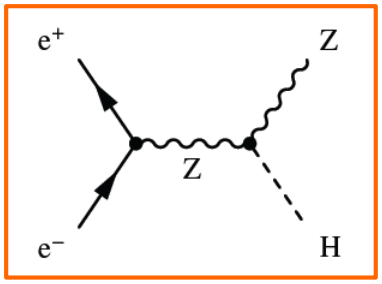
- Direct observation of new states
  - Possible new discoveries at CLIC
  - Possible new states already previously observed at LHC
- Indirect observation of BSM physics through precision measurements
  - E.g. Z', composite Higgs, accurate W mass…..

This presentation reflects only on √s (and polarisation)

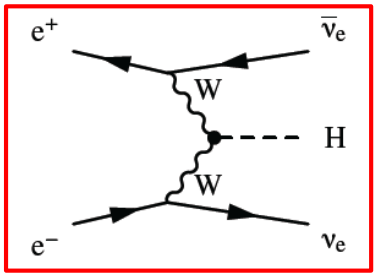
Note: there could be additional detector calibration issues. Unlikely to strongly influence √s choice, but this was never properly addressed.

Higgs physics

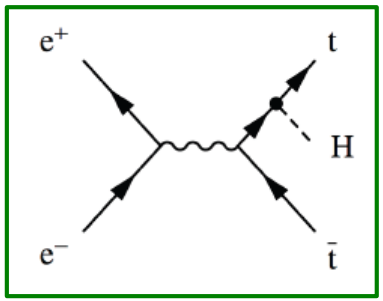




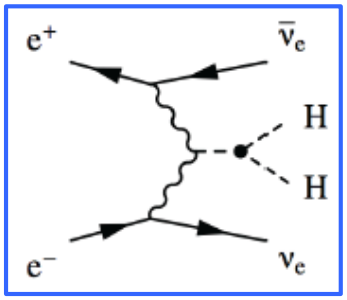
Crucial at first stage for model-independent Higgs measurement



High statistical accuracy at the high energy stages

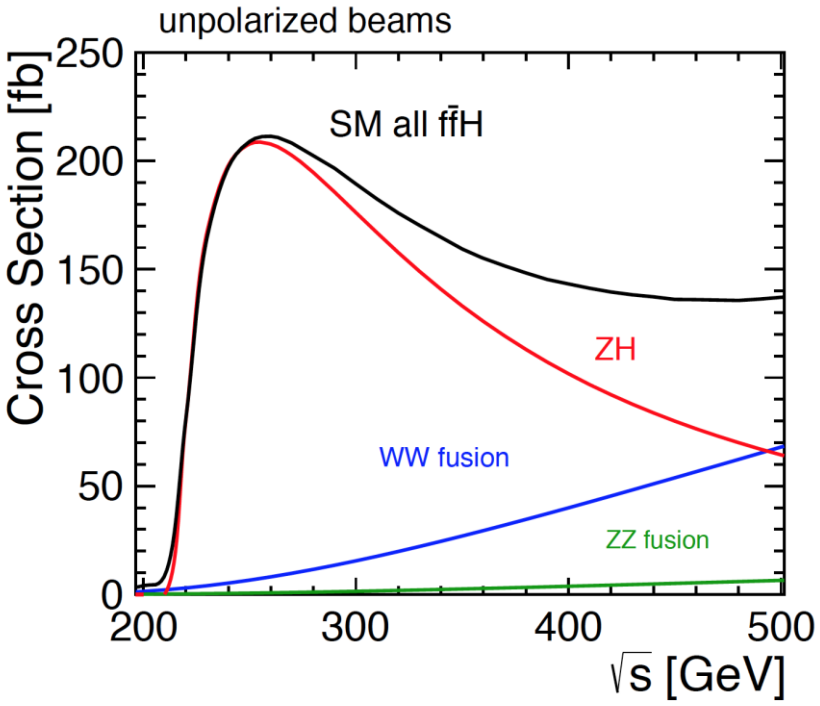


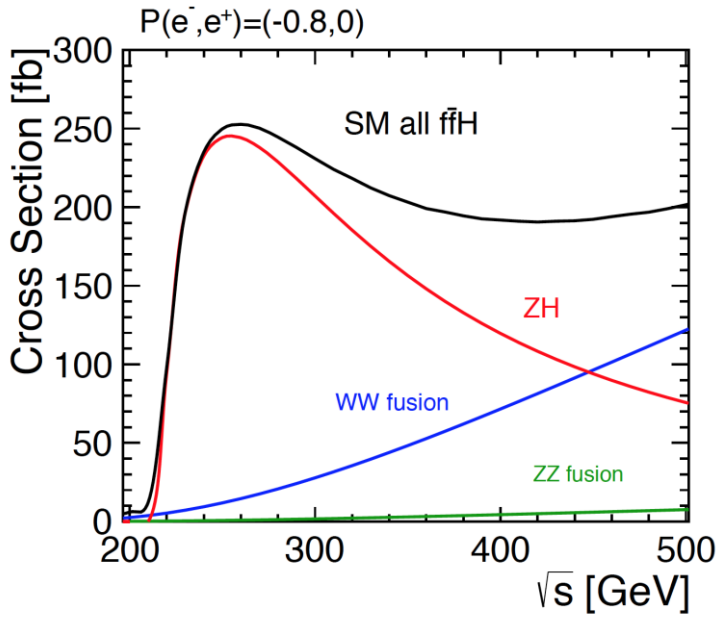
Best at ~1.4 TeV, where result is similar to 1 TeV ILC (cross section versus intLumi and event reconstruction)

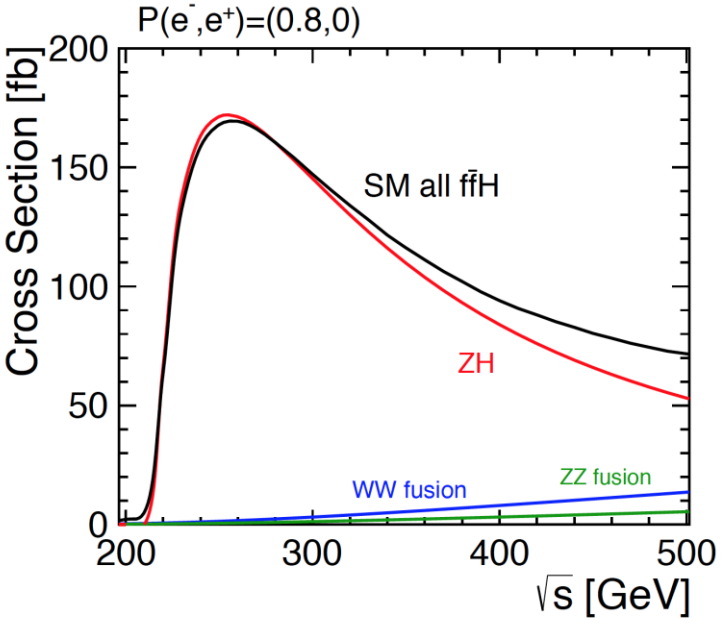


Best at 3TeV Flagship measurement for CLIC

Higgs physics at the first stage





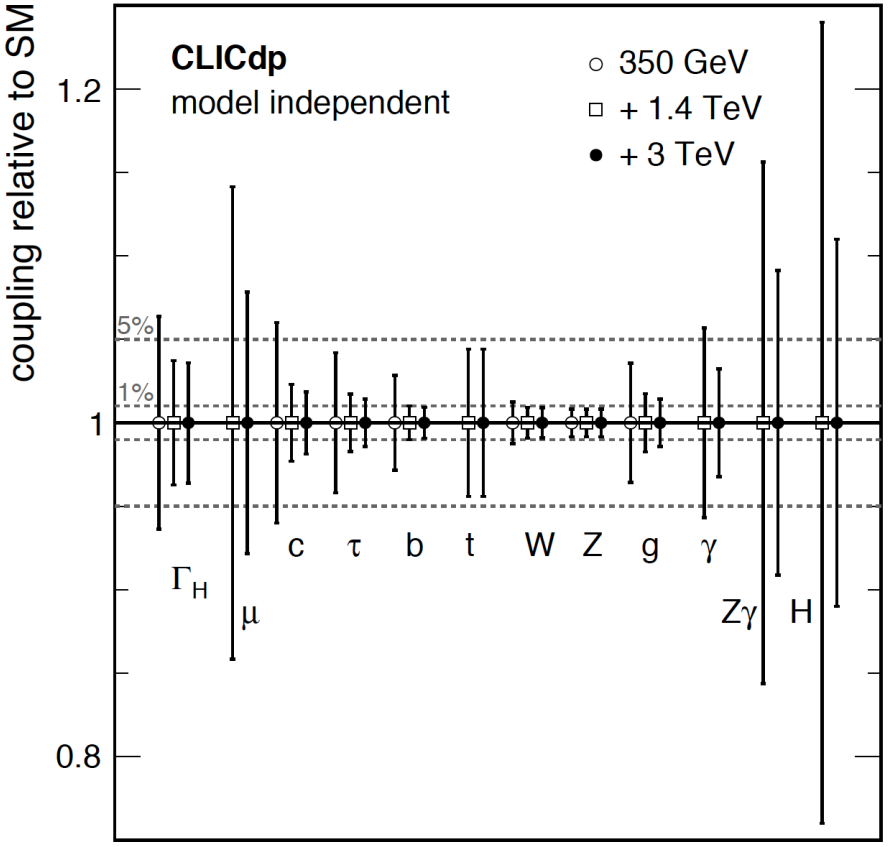


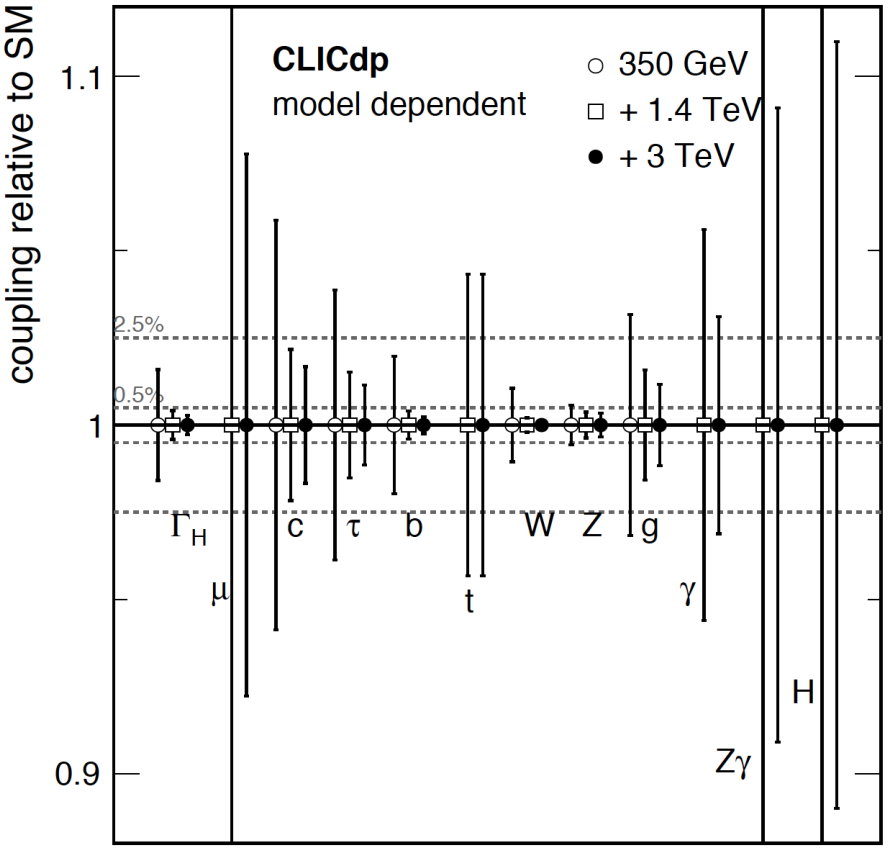
Our choice is to run at 380 GeV
to see HZ and WW-fusion + top physics

Note that -80% electron polarisation
enhances WW-fusion

With our present knowledge, we see no
good reason to run at 250 GeV.
(note: ILC and CLIC conclusions inconsistent)

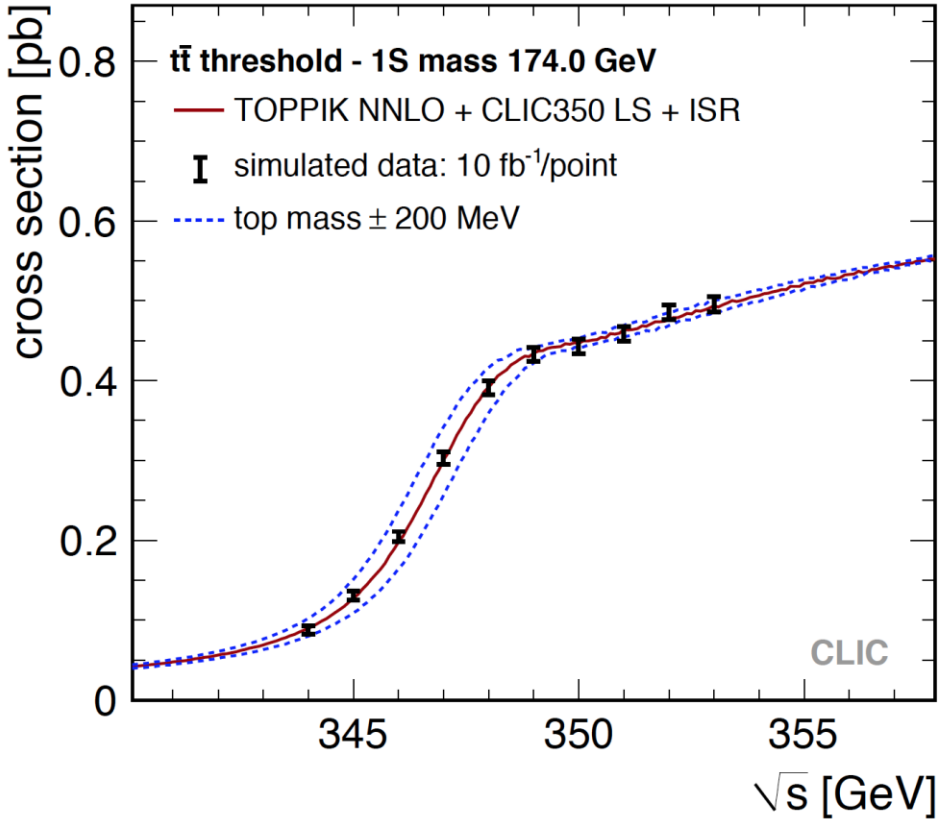
Higgs couplings

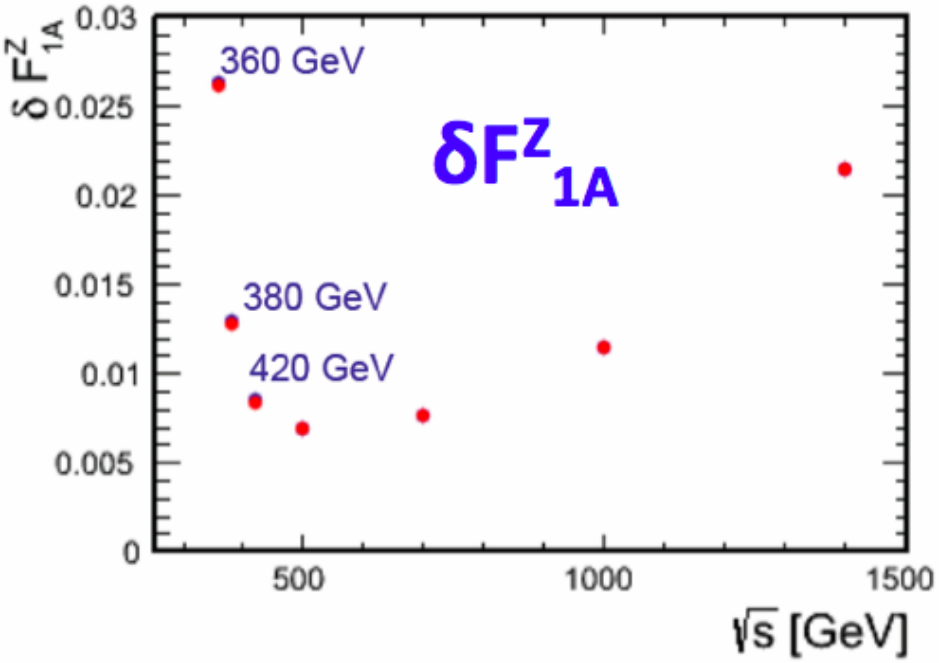




- General trend of improved statistics when going from ~1.5 TeV to 3 TeV
- Certain couplings present only modest gain when going from ~1.5 TeV to 3 TeV
- ttH requires ~1.5 TeV (but does not require to tune down to ~1 TeV or so)
- HH self coupling requires the highest energy of 3 TeV

Top physics





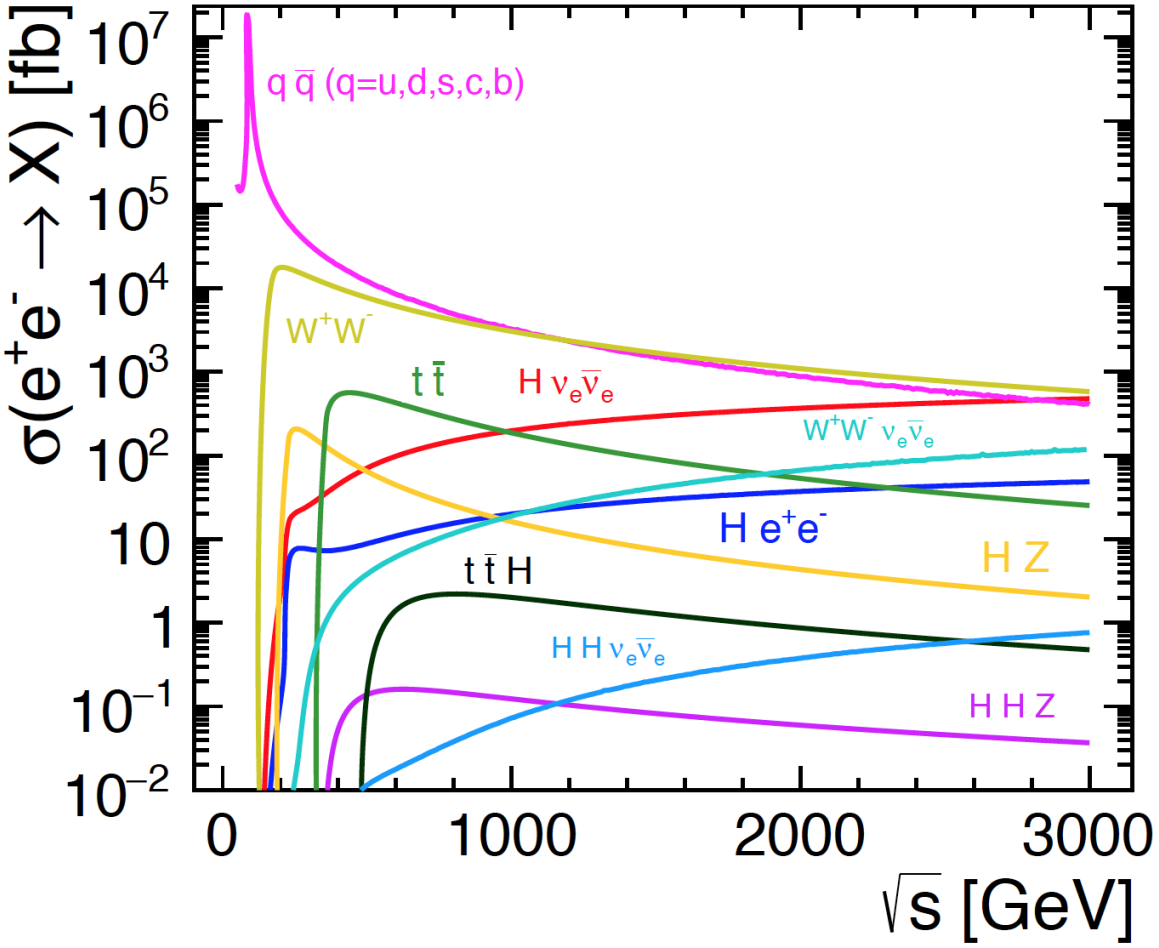
World average top mass:
~173. 2 GeV
=> Lowest √s for CLIC scan would be ~340 GeV

tt or single top events as a probe for new physics:

- A_{FB}^{t}, A_{LR}^{t} => e.g. top quark couplings to γ, Z
- Search for FCNC top decays (e.g. t → cH, t → cγ)
- V_{tb} from eγ → tbν$_e$ (at high energies, no bkg from tt evts.)
- ttH: top Yukawa coupling, Higgs CP properties
- Light stop quark search with boosted tops

Work ongoing => CLICdp overview paper foreseen for 2017

e^+e^- processes



Simply looking at the "known" physics, it took us some years to work out the CLIC potential and the corresponding running preferences.

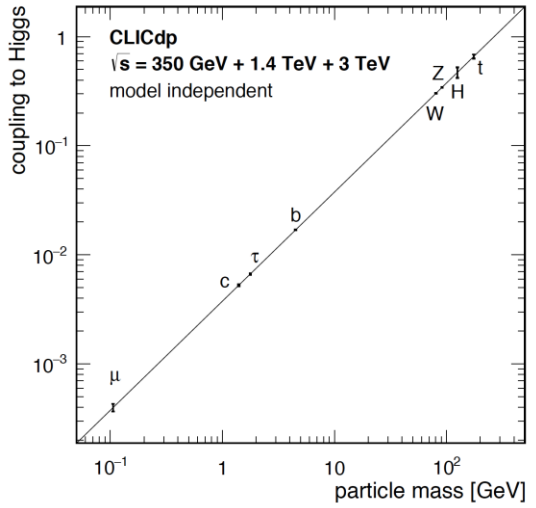
What about the "unknown"?

Backup slides

Published collaboration-wide documents

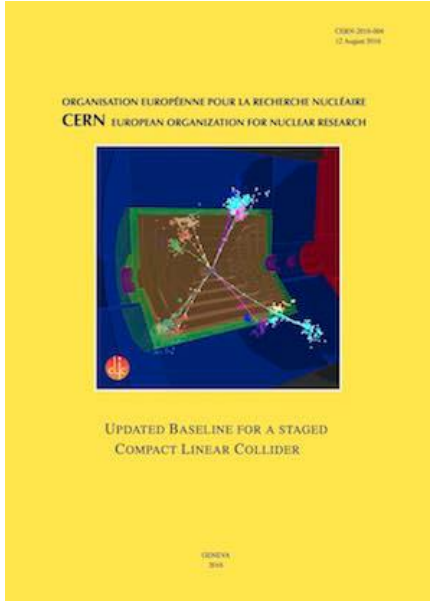
Higgs Physics at the CLIC Electron-Positron Linear Collider
40 pages, 123 authors
CLICdp collaboration paper
>25 independent full simulation Higgs analyses !

arXiv:1608.07538 on 29/8/2016
Submitted for publication in EPJC



Updated Baseline for a Staged Compact Linear Collider
57 pages, 517 authors, 63 institutes
CLIC and CLICdp collaboration paper

Published as a CERN yellow report CERN-2016-004
arXiv:1608.07537 on 29/8/2016



CLICdp documents in preparation for next European Strategy

CLICdp reports serving as ingredients for a CLIC summary report:

- Updated Baseline for a Staged Compact Linear Collider (380 GeV, 1.5 TeV, 3 TeV) ✓
  - arXiv:1608.07537, CERN-2016-004
- Higgs Physics at the CLIC Electron-Positron Linear Collider ✓
  - arXiv:1608.07538, CLICdp-Pub-2016-001 and submitted to EPJC yesterday
- The new optimised CLIC detector model CLICdet ✓
  - CLICdp note in preparation https://edms.cern.ch/document/1572676/
- An overview of CLIC top physics
  - CLIC top physics publication in 2017
- Extended BSM studies (hopefully also motivated by LHC discoveries)
  - CLIC BSM publication by 2017/2018.
- CLIC R&D report => with main CLIC technology demonstrators
  - Summary publication(s) in 2017+2018
- Plan for the period ~2019-2025 in case CLIC would be supported by next strategy
  - 2017/2018, note to be included in CLIC summary report for the Strategy