# LLP’s at CLIC

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ECFA Focus topic: LLPs - round table
29.04.2024

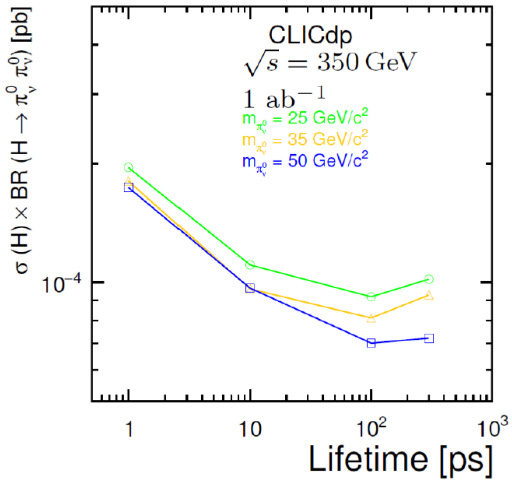
# LLP's – Hidden Valley

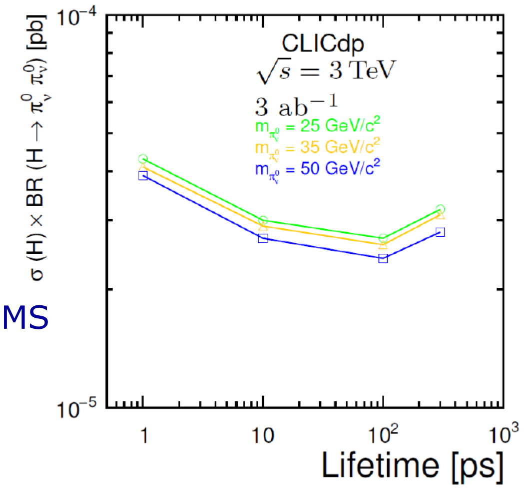
Mostly focused on LLP's in regards to Hidden Valley (MK, M. Goncerz, *IFJ PAN Krakow*)

$$H \rightarrow \pi_v^0 \pi_v^0 \rightarrow b\bar{b}b\bar{b}$$

**Analysis for two energy stages:**

- $\sqrt{s}$ = 350 GeV
  - → dominant production in Higgsstrahlung *($e^+e^- \rightarrow Z\,H$)*
  - → assumed integrated luminosity = 1 $ab^{-1}$
- $\sqrt{s}$ = 3 TeV
  - → dominant production in *WW*-fusion
  - → assumed integrated luminosity = 3 $ab^{-1}$




**Generation / simulation**

- WHIZARD 1.95 + PYTHIA 6.4
- interaction with CLIC_ILD
  - → Geant4 + MOKKA

much better limits as compared to ATLAS, CMS and LHCb results *(even after upgrades)*

Results published in 2023: *JHEP 03 (2023) 131*

# LLP's – other activity & plans

- Move Hidden Valley analysis to FCCee – CLIC-like detector model
  (MK, M. Goncerz, *IFJ PAN Krakow*)

  $\rightarrow$ collision energy of 356 GeV

  $\rightarrow$ MC samples produced for signal and background

  $\rightarrow$ possible to use existing CLIC software

  Analysis already started

Other (recent) activities related to BSM searches

- Dark Matter searches at $\sqrt{s}$ = 3 TeV (J-J. Blaising, P. Roloff, A. Sailer, U. Schnoor, *CERN*)

  $\rightarrow$ using mono-photons and polarised beams

  $\rightarrow$ dark Matter exclusion limits at 3 TeV for different models

  *CLICdp-Note-2021-001*

- Dark matter production with light mediator exchange
  (K. Mekala, F. Żarnecki, *University of Warsaw*) *Eur. Phys. J. C81 (2021) 955*

- Invisible scalar decays
  (K. Mekala, F. Żarnecki, *University of Warsaw*) *Eur. Phys. J. Plus 136 (2021) 160*