



FUTURE
CIRCULAR
COLLIDER



LLPs at the FCC-ee

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ECFA Focus Topic: LLPs - Round Table Meeting

April 29, 2024

Past and Ongoing Work

Several Masters student theses on FIPs done or in progress:

- [Sissel Bay Nielsen](#) (University of Copenhagen, 2017)
- [Rohini Sengupta](#) (Uppsala University, 2021)
- [Lovisa Rygaard](#) (Uppsala University, 2022)
- [Tanishq Sharma](#) (University of Geneva, 2022)
- [Magdalena Vande Voorde](#) (Uppsala University, 2023)
- [Dimitri Moulin](#) (University of Geneva, 2023)
- Daniel Beech (University of Cambridge, 2023)
- Sofia Giappichini (University of Perugia, 2023)
- Thomas Critchley (University of Geneva, 2024)
- John Hayward (University of Cambridge, 2024)

**FIPs are also
included in the FCC
midterm report**

Snowmass LLPs:

- [LOI](#)
- White paper ([Front. Phys. 10:967881 \(2022\)](#) / [arXiv:2203.05502](#))

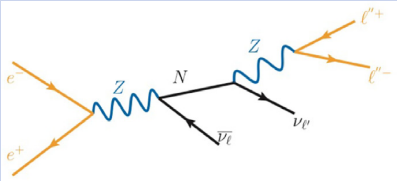
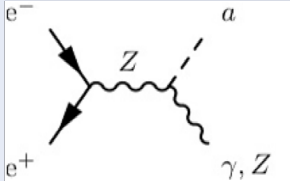
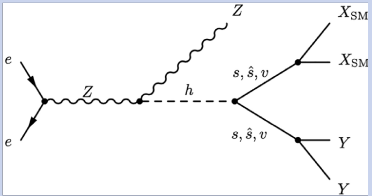
Searches for long-lived particles
at the future FCC-ee

C. B. Verhaaren¹, J. Alimena^{2*}, M. Bauer³, P. Azzi⁴, R. Ruiz⁵,
M. Neubert^{6,7}, O. Mikulenko⁸, M. Ovchinnikov⁸, M. Drewes⁹,
J. Klaric⁹, A. Blondel¹⁰, C. Rizzi¹⁰, A. Sfyrta¹⁰, T. Sharma¹⁰,
S. Kulkarni¹¹, A. Thamm¹², A. Blondel¹³, R. Gonzalez Suarez¹⁴
and L. Rygaard¹⁴

BSM group focusing on 3 physics cases:

1. Heavy Neutral Leptons (HNLs)
2. Axion-like Particles (ALPs)
3. BSM Higgs

Ongoing and Recent Efforts and Personpower

Physics scenario	FCC-ee signature	Ongoing work
Heavy neutral leptons (HNLs)	Displaced vertices 	<ul style="list-style-type: none"> • $ee\nu$ channel (Uppsala, Geneva, DESY, Cambridge) • $e\nu jj$ channel (Geneva) • μjj channel (INFN, Pavia) • $l\nu$ channel (INFN, Bologna, Perugia, KIT) • Neutrino oscillations (INFN, Pavia, KIT) • IDEA vs CLD (Northeastern, CNRS)
Axion-like particles (ALPs)	Displaced photon/ lepton pair 	<ul style="list-style-type: none"> • Via photon fusion (CBPF, CERN) • 3 photon channel (DESY)
Exotic Higgs decays	e.g. 	<ul style="list-style-type: none"> • $h \rightarrow ss \rightarrow bbbb$ (Uppsala)

Plus pheno & theory work!

If I forgot you, please send me a message!
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