

BSM discussion session

The BSM PPG group
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Question overview

1. BSM reach as a guidance for next collider choice
2. Complementarity to other programs
3. (in particular) Colliders vs Fixed Target/Forward detectors
4. BSM reach and impact of new technologies
5. Next e^+e^- does not see a discrepancy: what next?
6. Next e^+e^- does see a discrepancy: what next?

If time allows:

7. Impact of PDFs
8. Role of theory uncertainties for BSM program
9. How e^+e^- and next-to-next colliders address HEP big questions

Q1: Is there a BSM-based argument that makes one of the proposed future facilities more compelling than the others?

Q2: What are the broader implications of these benchmarks for physics beyond colliders? For example, how does the *indirect(*)* dark matter detection program complement searches at colliders?

() Direct detection in next session*

Q3: In view of the complementarity between bounds from Fixed Target (SHIP,...)/Forward Detectors (FASER,...) and the collider bounds on some of the considered benchmarks, how do you see the future of the Fixed Target/Forward Detectors program in the e^+e^- era?

Q4: What is the impact of new techniques being developed at the LHC, such as

- AI-enhanced searches (e.g. anomaly detection)
- New methodologies (e.g. scouting)
- Novel signatures (e.g., dark-sector jets, muon showers, etc.)

Q5: Suppose the next collider is a full-reach electron-positron machine (covering flavor, EW, Higgs, and top sectors), and its results are fully consistent with the Standard Model. What kinds of new physics would remain not probed for a subsequent collider operating at a parton center-of-mass energy of around 10 TeV (e.g., FCC-hh or a Muon Collider)?

Q6: Is the EFT program at a next-generation e^+e^- collider enough to establish a new physics discovery and point to the new physics scale at which the next-to-next collider should operate?

If time allows...

Q7: What is the impact of not having better knowledge of the PDFs, e.g. from LHeC, for the FCC-hh search program?

Q8: How crucial are the theory uncertainties at e^+e^- and how are we going to reduce them? Will our ultimate BSM reach be limited by our capability to interpret the result?

Q9: To what extent can we expect the big questions (hierarchy problem, baryogenesis, dark sector, origin of neutrino masses...) to be addressed by the BSM program of the next e^+e^- collider, as well as by other future colliders?