Contribution ID: **692** Type: **Poster**

Effects of Emittance Constraints on Monochromatization at Future Circular Colliders

Direct s¬channel Higgs production in e+e− collisions is of interest if the collision energy spread can be comparable to the natural width of the standard model Higgs boson. At the Future Circular e+ e¬ Collider (FCC¬ee), a monochromatization scheme could be employed in order to reduce the collision energy spread to the target value. This may be achieved by introducing a non¬zero horizontal dispersion of opposite sign for the two colliding beams at the interaction point. In this case, the beamstrahlung increases the horizontal emittance in addition to energy spread and bunch length. The vertical emittance could either be tuned to a certain minimum value, possibly limited by the diagnostics resolution, or it could scale linearly with the horizontal emittance. For the FCC¬ee at 62.5 GeV beam energy, we optimize the IP optics and beam parameters, considering these two different assumptions for the vertical emittance. We derive the maximum achievable luminosity as a function of collision energy spread for either case.

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Session Classification: FCC physics, experiments & detectors

Track Classification: FCC-ee detector & experiment