Conceptual design of the FCC-ee Beamstrahlung Dump

- The **Future Circular Collider** (FCC) study explores the feasibility of post-LHC colliders with a circumference of almost 100 km. As a first stage, a high-luminosity electron-positron collider (FCC-ee) is envisaged, with a beam energy ranging from 45.6 GeV to 182.5 GeV.
- The ring will accommodate two (or four) interaction points, where the two counter-rotating beams are brought into collision.
- Different mechanisms give rise to a high flux of secondary particles in the experimental regions, which can be detrimental for the machine, detector and other nearby systems, including electronics. The source terms include synchrotron photon production in the field of the counter-rotating beam (**Beamstrahlung**).
- Due to this **significant power carried by these photons, in the order of almost 400 kW, absorbers and shieldings are needed to mitigate the effect on sensitive equipment in addition to design the radiation dump.**
- The PhD thesis shall contribute to the **conceptual design of the dump for Beamstrahlung photons with the study on the absorber material and power deposition in dump**.
- The study can also include the investigation on the possibility of using the **intense photon beam produces by Beamstrahlung for IP diagnostics or other applications**.

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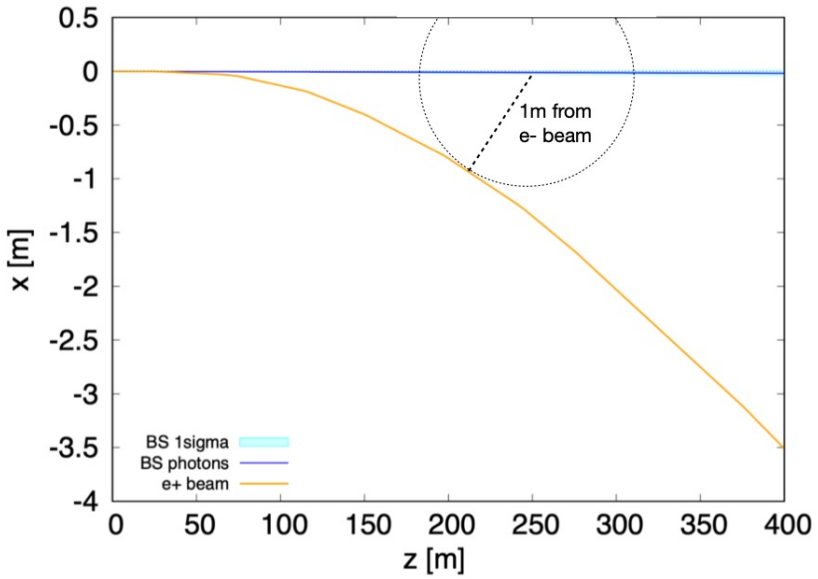
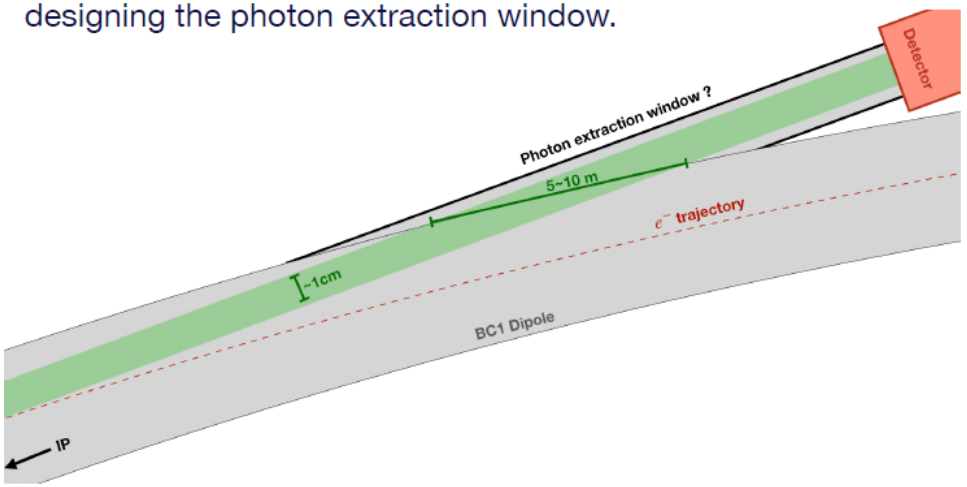
Challenge for a FCC-ee Beamstrahlung dump

- High energy and power densities, several kW/cm^3
- High average deposited power (hundreds of kW)
- Radiation damage and TID (hence shielding) in neighbouring areas
- Internal / external dumps
- Integration in the tunnel



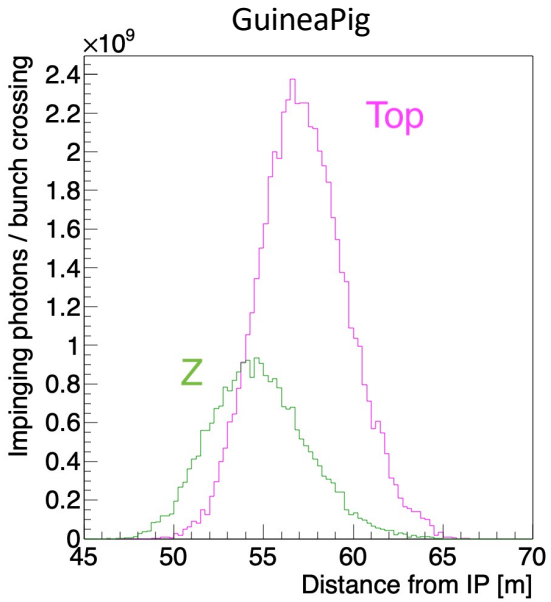
While the spot size is ~1x1cm^2, due to the very small impinging angle on the beam pipe wall (~1mrad) the region hit by the photons is **several meters long** on the longitudinal dimension, so this should be taken in consideration when designing the photon extraction window.

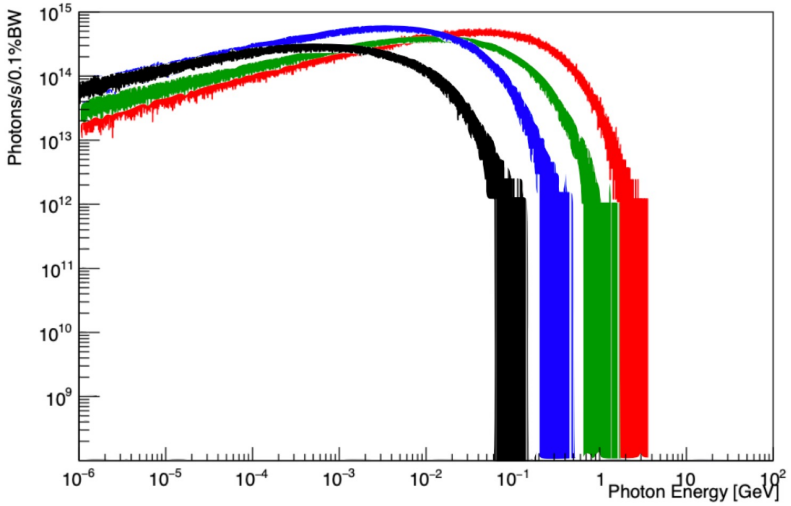


Beamstrahlung Radiation generated at the IP

Radiation from the colliding beams is very intense (370 kW over cm² section!)

	Total Power [kW]	Mean Energy [MeV]
Z	370	1.7
WW	236	7.2
ZH	147	22.9
Top	77	62.3





Beamstrahlung radiation hits the vacuum chamber at the first bend downstream the IP

Requires special beam pipe extraction line and alcove -> Beamstrahlung instrumented photon dump