Z0 running at CEPC?

And at FCCee (TeraZ)

An Update w.r.t. WP#368

CEPC TDR parameters – 50 MW upgrade

- Ring 100 km -> time one circonference = 333.3 us
- 19918 bunches -> time between crossings = 15 ns (but 10% gap -> 16.735 ns)
- Lumi = 192.10^{34} cm^{-2} s^{-1}
- Z^0 hadronic cross section = 30.5 nb; average multiplicity ~20
- #Z^0 per sec = 58560
- N_Z /crossing = $9.8x10^{-4}$
- TPC "primary electron memory" time = 35 us -> 2 hadr. Z^0 events
- TPC "primary pos. ion memory" time ~ 1 sec -> 58560 x 10 tracks /hemisphere
- ~10k primary ions/track for 1 m tracklength -> total $5.8x10^9$ primary ions
- TPC hemisphere volume = 20 m^3 = $20x10^6$ cm^3
- Primary ion density ~300 ions/cm^3

From Philippe Schwemling's talk on 14/12/2015 at Joint CEA-IHEP/Tsinghua meeting

https://indico.cern.ch/event/467955/contributions/1146290/attachments/1204735/1755443/TLEP_141215.pdf
(is also on Indico WP#369 of 07 April 2022)

- 16.8 kHz hadronic Z decays at $L=56x10^{34}$ cm^{-2} s^{-1}
- 40 e/ion pairs per cm track length
- Ion drift time of 600 ms over full TPC length

→

- L ~ $200x10^{34}$ x 4
- T2K gas: 100 ions/cm x 2.5
- Ion drift 1 sec x 1.67
- Total SCALE factor = 16.7

Ph. Schw. Simulates total track length in Z decays and from there total primary ion charge and their distribution in R and z. Calculating track distorsions using program by Keisuke Fujii/ Daisuke Arai

- 22 um with IBF*gain=1
- 44 um with IBF*gain=3
- ~750 um with scale factor 16.7
- average ion density in TPC is ~1600 ions/cm^3

(5 times more than my back-of-envelope based on 1 m tracklengths)

Electron trajectories