



FUTURE
CIRCULAR
COLLIDER

2d FCC Polarization Workshop

Sep 19 – 30, 2022
CERN
Europe/Zurich timezone

**112 registered participants (> success)
from many participating institutes from
different continents**



Future Circular Collider Technical and Financial Feasibility Study
2d FCC Energy Calibration, Polarization and Mono-chromatisation workshop

FCC EPOL WORKSHOP

19-30 September 2022 at CERN <https://indico.cern.ch/e/EPOL2022>
remote participation possible

Overview

Registration

Participant List

Privacy Information

Videoconference

Accommodation

Contact

✉ fcc.secretariat@cern.ch

Welcome to the 2d FCC Energy Calibration, Polarization and Mono-chromatisation workshop which will be held at CERN from September 19 to 30 2022. The first week of this workshop (September 19 to 23) is

**Considerable amount of information was exchanged this week already – and its only a start!
We should think and propose a follow-up organization...**

A few particular points that we learned

-- We have three high energy physics projects involving electron (e- and/or e+) polarization in storage rings

-- different physics motivations

-- center-of-mass calibration for ~on-shell EW physics at FCC

-- chirality control for off shell physics at SuperKEKb

-- chirality control for understanding spin distribution among proton constituents at EIC

-- different emphasis on transverse vs longitudinal, high precision vs high polarization etc...

-- polarization of electron beams in a storage ring is a complex matter, and not so easy to understand

-- many thanks to Georg for the luminous introduction to the topic.

-- and yes, it is worth investigating kinetic polarization of colliding beams arising from beam beam forces!

-- Nevertheless considerable know-how is being developed and tuned into codes

-- exchange between projects emphasizes **synergies – different goals but similar issues**

-- controlling spin resonances to increase polarization or eliminate interference with spin precession

-- **this is all pressing hard/stimulating** on the machine physics, alignments, diagnostics, correction procedures and optimization methods. **(WG2)** Huge progress since LEP times!

A considerable amount of very reliable information comes from the **HEP experiments themselves**. Examples:

- measurement of beam polarization from final state tau helicity measurements (SuperKEKb)
- measurement of energy spread (and other beam parameters) from $\mu\mu/ee$ pairs (even within beam phase space)

Polarimetry

- several designs for polarimeters in different projects, some with very different aims
 - resonant depolarization,
 - precise measurement of high polarization
 - precise measurement of zero polarization
 - fast measurement of spin precession

-- things that seem impossible (10^{-5} measurement!!) may not be so impossible after all 😊

Lots of subtle questions were discussed about monochromatization

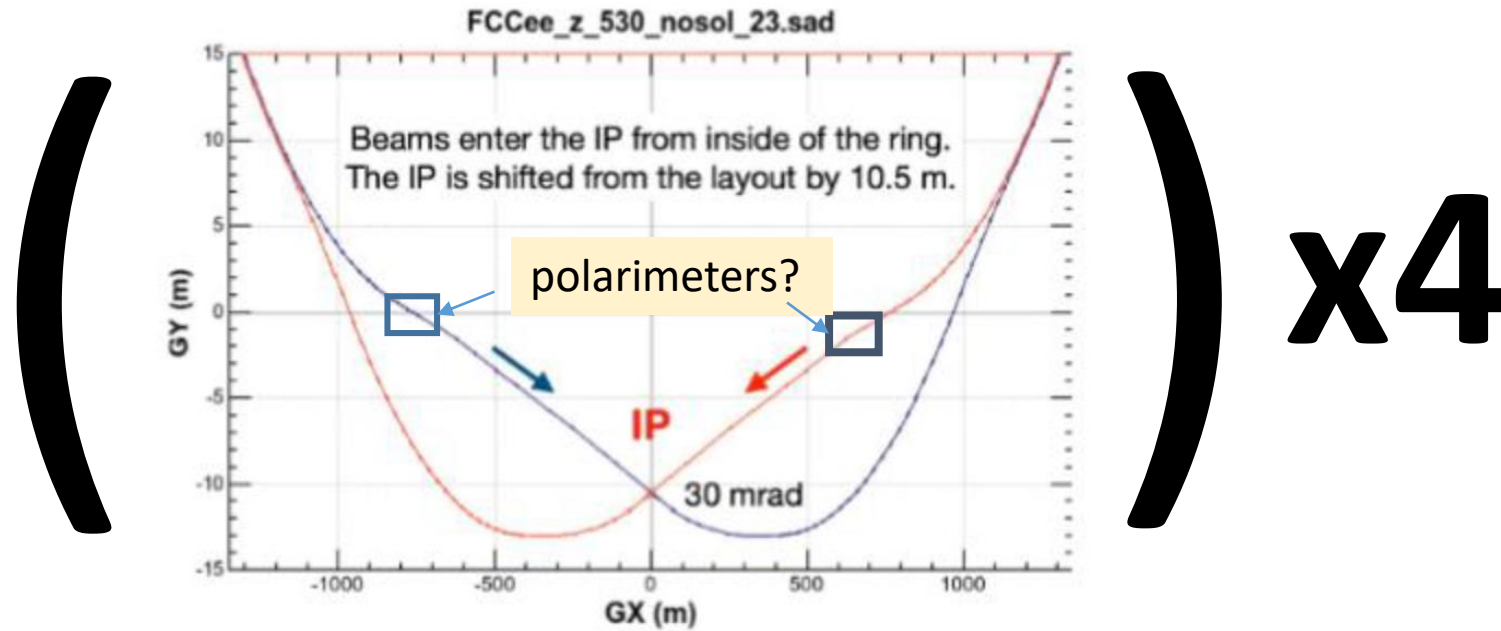
- only possible when we are face to face!

more burning questions for FCC (I)

1. How many polarimeters for FCC-ee?

-- baseline: at least two, one e+ and one e-

-- if more are really needed, consider last strong magnet before the experiments on incoming lines.



++ this might make it easier to propagate the 3D polarization measurement to the IPs.

-- lets evaluate cost and operational issues and understand the possible gains before changing the baseline of 2 (e+ and e-) polarimeters!

-- a nice place anyway. Investigate with M. Hover, K. Hanke if this is a feasible location.

2. How feasible is it to depolarize the colliding bunches continuously?

The need to control the longitudinal polarization of the colliding bunches to better than 10^{-5} was stressed by G. Wilkinson

Beam polarization grows by 10^{-6} every second [second= 10^{-6} x (250 hours= $0.9 \cdot 10^6$ s)]

→ $< 10^{-5}$ requires depolarizing every 10 seconds

Beam polarization grows by 10^{-6} every [second= 10^{-6} x (250 hours= $0.9 \cdot 10^6$ s)]

→ 10^{-5} requires depolarizing every 10 seconds !!

Can the RF kicker actually take this additional charge?

Just to tell you that many people told me :
they are really happy to participate in a real workshop where you could work, discuss and advance!!! (from Angeles Faus-Golfe)

