

2<sup>nd</sup> FCC-EIC Joint Workshop and  
4th FCC-ee MDI Workshop  
*- closing words*

Frank Zimmermann,  
FCC-ee MDI Meeting 28 October 2022

This was a fantastic two-week workshop !

**Many warm thanks to Manuela and Andrey for organizing this** so effectively and efficiently, under rather challenging circumstances

**Many thanks also to all the collaborators who came**, including numerous colleagues from **Italy, France and the US, including EIC** experts !

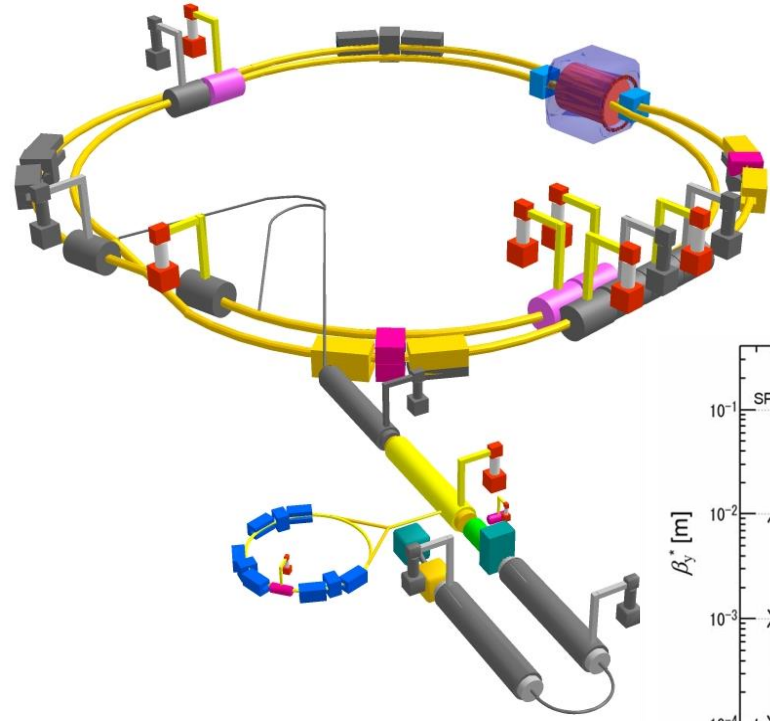
**Apologies** that I was not always present

- At least I have made it to the evening events ! 😊

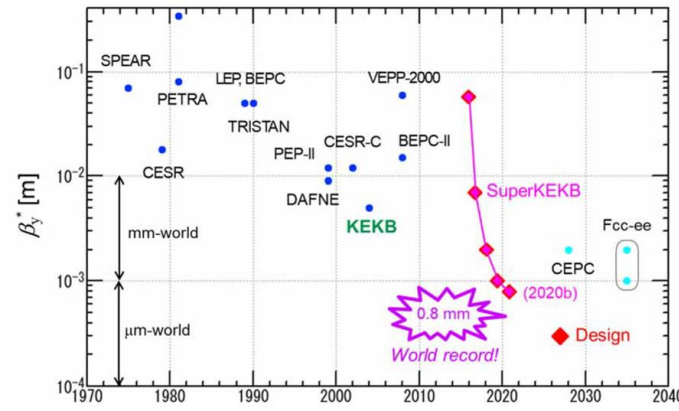
# SuperKEKB

Key FCC-ee design team members engaged in KEK International Task Force for SuperKEKB

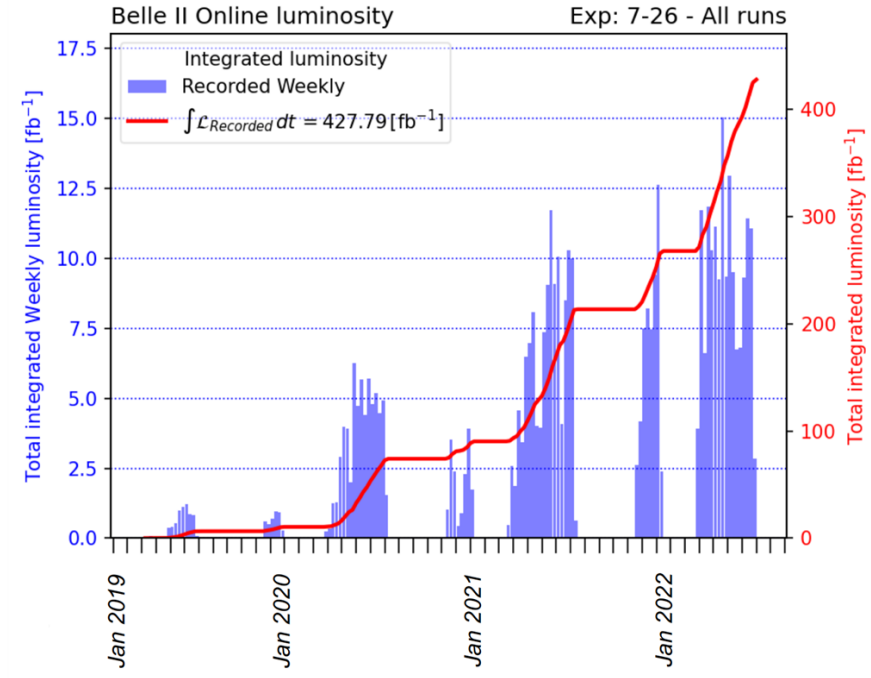
circumference 3 km



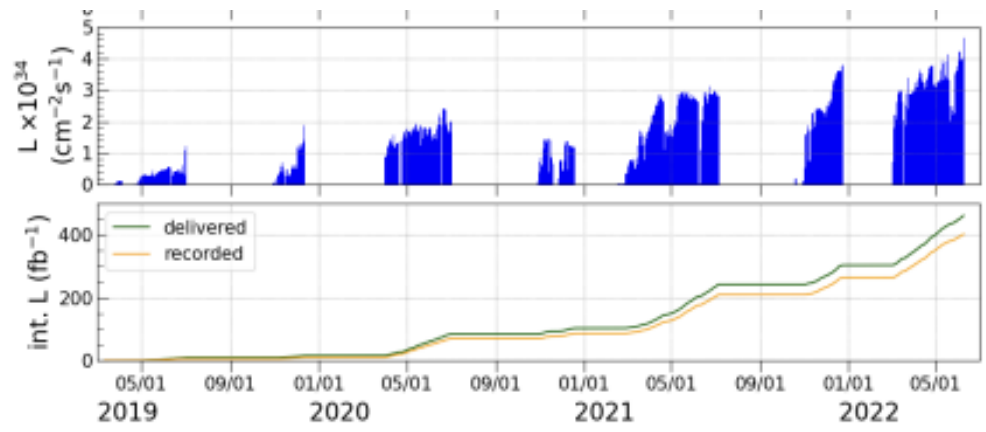
world's highest luminosity & lowest  $\beta^*$   $e^+e^-$  collider at



world record luminosity of  $4.71 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$ ,  $\beta_y^* = 1.0 \text{ mm}$  routinely, also  $\beta_y^* = 0.8 \text{ mm}$  shown – with “virtual” crab-waist collision scheme originally developed for FCC-ee (K. Oide)



total integrated luminosity so far:  $\sim 430 \text{ fb}^{-1}$  in  $\sim 3$  years





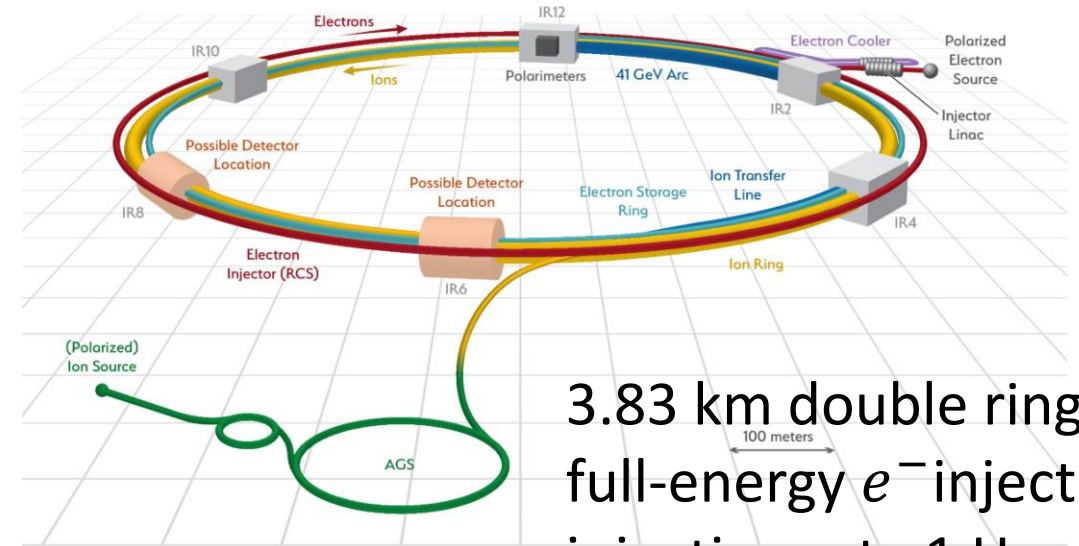
## US EIC Electron Storage Ring similar to, but more challenging than, FCC-ee

beam parameters almost identical, but twice the maximum electron beam current, or half the bunch spacing, and lower beam energy

**>10 areas of common interest identified** by the FCC and EIC design teams, addressed through joint EIC-FCC working groups, still evolving

## EIC will start beam operation about a decade prior to FCC-ee

The EIC will provide another invaluable opportunity to train next generation of accelerator physicists on an operating collider, to test hardware prototypes, beam control schemes, etc.

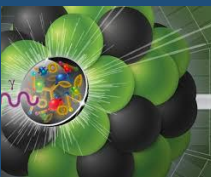


3.83 km double ring,  
full-energy  $e^-$  injection,  
injection rate 1 Hz,  
every 2 min into same  
bucket

|                                | EIC        | FCC-ee-Z       |
|--------------------------------|------------|----------------|
| Beam energy [GeV]              | 10 (18)    | 45.6 (80)      |
| Bunch population [ $10^{11}$ ] | 1.7        | 1.7            |
| Bunch spacing [ns]             | 10         | 15, 17.5 or 20 |
| Beam current [A]               | 2.5 (0.27) | 1.39           |
| SR power / beam /meter [W/m]   | 7000       | 600            |
| Critical photon energy [keV]   | 9 (54)     | 19 (100)       |

# CERN FCC – EIC collaboration, contact persons - *preliminary*

| Domain  | CERN/FCC contacts  | BNL/EIC contacts  | JLAB/EIC contacts | Other contacts FCC  | Other contacts EIC |
|---|--|---|-------------------|---|--------------------|
| <b>impedance model, instabilities, HOM, ion instability</b>         | Mauro Migliorati (INFN),<br><a href="#">Ivan Karpov (CERN)</a>       | Mike Blaskiewicz, Alexei Blednykh, <a href="#">Silvia Verdu (?)</a> | Todd Satogata     | Alexander Novokhatski (SLAC)  |                    |
| <b>polarization</b>   | Jorg Wenninger (CERN),<br><a href="#">Jacqueline Keintzel (CERN)</a> | Vadim Ptitsyn   | Todd Satogata     | Eliana Gianfelice (FNAL),<br><a href="#">Guy Wilkinson (Oxford)</a> |                    |
| <b>beam instrumentation, SR monitors (BPMs)</b>                     | Thibaut Lefevre (CERN),<br><a href="#">Manfred Wendt (CERN)</a>      | David Gassner, Dany Padrazo   | Todd Satogata     | Anke Susanne Mueller (KIT)  |                    |
| <b>beam feedback systems</b>  | Wolfgang Hofle (CERN)  | Mike Blaskiewicz (BNL),<br><a href="#">Another ?</a>                | Todd Satogata     | John Fox (SU)   |                    |
| <b>vacuum system</b>  | Roberto Kersevan, Cedric Garion (CERN)                               | Charles Hetzel  | Mark Wiseman      |   |                    |
| <b>final focus quadrupoles</b>                                      |  | Brett Parker, Holger Witte  | Walter Wittmer    | Mike Koratzinos (MIT)   |                    |
| <b>SRF</b>  | Erk Jensen, Frank Gerigk, (CERN)                                     | Kevin Smith   | Robert Rimmer     |   |                    |
| <b>MDI, IR shielding, handling equipment associated with the IR</b> | Manuela Boscolo (INFN),<br>Helmut Burkhardt (CERN)                   | Holger Witte  | Walter Wittmer    | Mike Sullivan (SLAC)  |                    |
| <b>Collimation – beam tails</b>                                     | <a href="#">Andrey Abramov (CERN)</a>                                |   |                   | <a href="#">Dmitry Shatilov (BINP)</a>                              |                    |
| <b>Beam-beam interactions (limits with multiple IPs)</b>            | <a href="#">Xavier Buffat (CERN)</a>                                 |   |                   | <a href="#">Dmitry Shatilov (BINP)</a>                              |                    |



## **1<sup>st</sup> working meeting EIC-FCC on polarized beam operation**

- CERN, 19-23 September 2022, in conjunction with the 2<sup>nd</sup> FCC EPOL workshop <https://indico.cern.ch/event/1181966/>

## **2<sup>nd</sup> FCC-EIC joint working meeting on beam dynamics, stability, impedances, feedback, vacuum and MDI**

- CERN, 17-21 October 2022, in conjunction with the FCC-ee MDI working meeting <https://indico.cern.ch/event/1186798/>

## **3<sup>rd</sup> FCC-EIC joint working meeting on SRF**

- JLAB/Washington (?), March 2023

- first steps for the FCC-ee IR mockup in Frascati – agreed on initial phase scope, cost, timeline; conclude with FCC addendum
- support structures and overall IR integration
- IR magnet cryostat design – Arnaud may help
- location of the booster: transverse distance from IP; inside / outside bypass, above or below the collider ring ? Effect of detector stray field on booster and mitigation
- location, size, shielding of beamstrahlung dump (&monitor!); distance from IP; impact on tunnel size

# upcoming workshops 2022

**FCC-ee beam instrumentation workshop**; CERN, 21-22 Nov'22

<https://indico.cern.ch/event/1209598/>

**First joint FCC - France&Italy workshop on Higgs, Top, EW, HF and SM physics**; Lyon, 21-23 November'22,

<https://indico.in2p3.fr/event/27968/>

**FCCIS Week 2022** including first meeting of FCC FS SAC chaired by Andy Parker / Cambridge U.; CERN, 5-9 Dec'22 -

<https://indico.cern.ch/event/1203316/>

**FCC Week 2023**, London, 5-9 June 2023

**mark your calendar !**



*thank you again & have a safe travel home !*