



KRAKÓW
Jan 23 – 27, 2023

<https://indico.cern.ch/event/1176398>



6th FCC PHYSICS WORKSHOP

Krakow, Jan. 23-27, 2023: <https://indico.cern.ch/event/1176398/>

— CLOSE-UP —

Christophe Grojean & Patrick Janot

Main Goals

See Patrick's talk on Monday

- get together in person
- strengthen the FCC PED community
- monitor progress since the beginning of the FCC feasibility study
- plan and prepare Mid-Term Report and Full Feasibility Study Report
- sharpen FCC physics case

many thanks to Panos Charitos



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FUTURE
CIRCULAR
COLLIDER



FCCIS – The Future Circular
Collider Innovation Study.
This INFRADEV Research and
Innovation Action project
receives funding from the
European Union's H2020
Framework Programme under
grant agreement no. 951754.

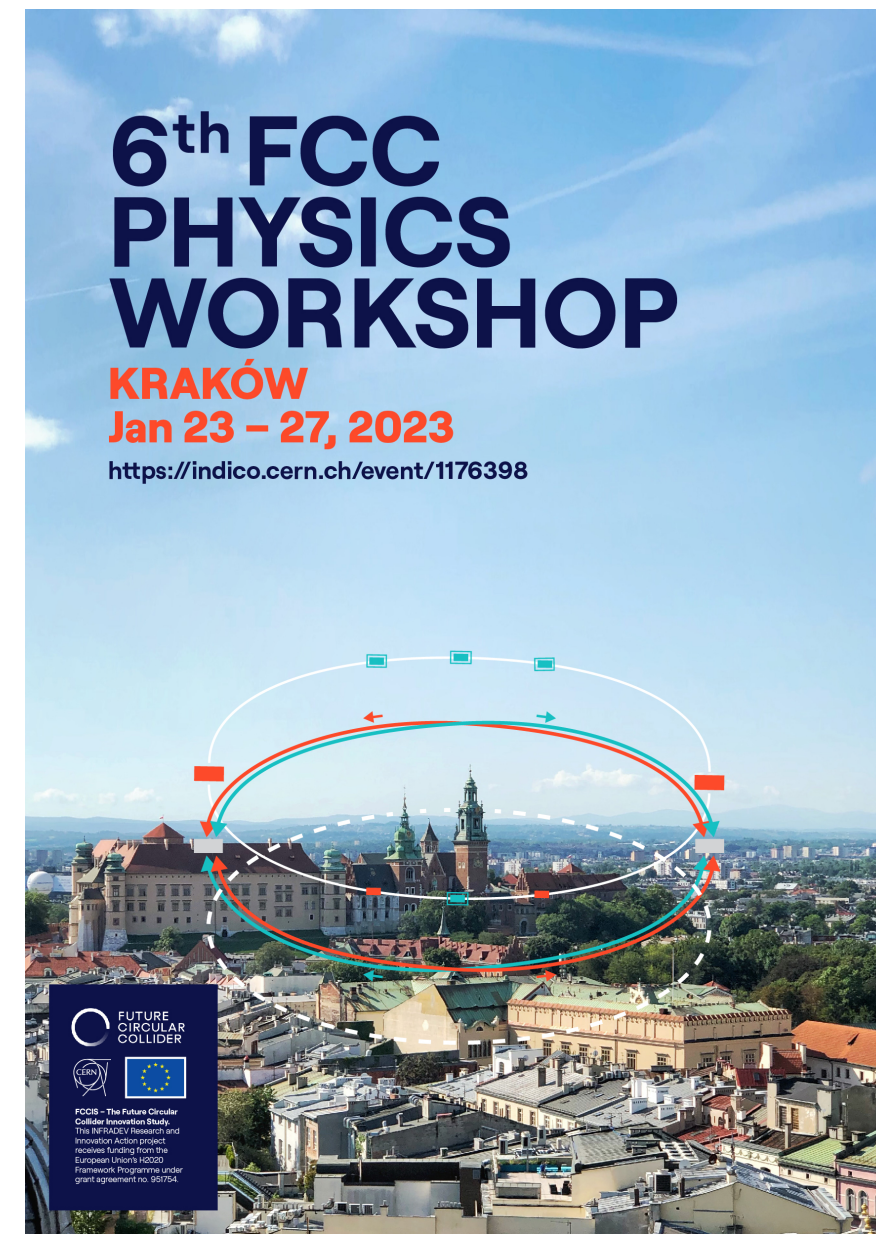
Mid-term Feasibility Report

Information received yesterday during dinner!

- 8 deliverables, each covered in a 60-page report (~500 pages in total) supplemented by **FCC notes**
- PED is the 8th deliverable, with 4 main components foreseen:
 1. Overview
 2. Documentation of the specificities of the FCC-ee and FCC-hh physics cases.
 3. Strategic plans for the improved theoretical calculations.
 4. FCC-ee Detector Requirements.
- First draft expected by June for the FCC week

The end of the workshop is only the beginning of the work!

Collectors: The posters you could have seen



A Dense Programme

- 89 talks incl. 22 talks on zoom
- 33h20' of talks/discussions
- 39 talks (15h30') for physics programme/performance
- 988 emails in my folder dedicated to the workshop (but Paolo told me that he was receiving up to 500 emails a day when he took care of ICHEP)
- Right format? At least, the fully plenary programme gave a chance to everyone to be exposed to the glory details of the FCC PED programme

Krakow FCC physics week 2023 - Tentative Schedule						
Session	Speaker	Title	Remote?	Confirmed	Topics	
Monday 23.01	Opening	Tadeusz Lesiak (IFJ PAN, PL) - 5'			1 opening	
	Mon 23.01	Marcin Chrzęszcz (IFJ PAN, PL) - 10'			1 opening	
	8:45-10:45	Michael Benedikt (CERN, CH) - 20'+10'	Status of FCC feasibility study			1 opening
		Aidan Robson (Edinburgh, UK) - 25'	ECFA Higgs factory studies and FCC feasibility studies: synergies and complementarities			1 opening
		Roberto Franceschini (Rome III, IT) - 20'+10'	FCC and muon collider: synergies and complementarities			1 opening
		Sarah Eno (Maryland U, US) - 15'+5'	US contributions to FCC after Snowmass			1 opening
		Chair: Alain Blondel (TBC)				
	Higgs	Michele Selvaggi (CERN, CH) - 20'	Higgs physics experimental overview			1 Higgs
	Mon 23.01	Jorde de Blas (Granada, ES) - 25'	Higgs coupling fits			1 Higgs
	11:15-12:50	Andrew Mehta (Liverpool U, UK) - 25'	Higgs to invisible			1 Higgs
		Ennio Salvioni (Padova, IT) - 25'	Geganbauers & Higgs Self-coupling			1 Higgs
		Chair: Gauthier Durieux				
	EW	Gauthier Durieux (CERN, CH) and Tevong You (KCL, UK) - 40'	Physics motivations			1 opening
	Mon 23.01	Alain Blondel (LPNHE, FR) - 25'	Introduction to the session and the example of the Z lineshape			1 EW
	14:10-16:30	Giovanni Guerrieri (Udine U, IT) - 25'	AFB (focus on discussion of systematics control and evaluation)			1 EW
		Johannes Bluemel (DESY, DE) - 25'	High-precision QED initial state corrections for $e^+e^- \rightarrow \gamma^*/Z^* e^+e^- \rightarrow \gamma^*/Z^* \text{ annihilation}$			1 EW
		Jean-Claude Brient (LLR, FR) - 25'	Measurement of tau polarisation			1 EW
		Chair: Roberto Tenchini				
EPOL	Guy Wilkinson (Oxford, UK) - 30'	Status and prospects for the ECAL measurements			1 EPOL	
Mon 23.01	Maciej Skrzypek (INP Krakow, PL) - 25'	Study of Theoretical Luminosity Precision for Electron Colliders at Higher Energies			1 EPOL	
17:00-19:10	Angeles Faus-Golfe (IJCLab Orsay, FR) - 25'	Status and progress on monochromatization studies			1 EPOL	
	Emmanuel Perez (CERN, CH) - 25'	Role of timing measurements in ECAL studies			1 EPOL	
	Graham Wilson (Kansas U., US) - 25'	Studies with dileptons: machine parameters and EW studies			1 EPOL	
	Chair: Alain Blondel					
Tuesday 24.01	SW	Gerardo Ganis (CERN, CH) - 20'	Introduction and status of things			1 SW
	Tues 24.01	Gerardo Ganis (CERN, CH) - 25'	Key4hep and FCC software			1 SW
	9:00-10:35	Juraj Smiesko (CERN, CH) - 25'	Analysis and visualisation			1 SW
		Andre Sailer (CERN, CH) - 25'	Tools for Monte Carlo productions			1 SW
		Chair: Paolo Giacomelli				
	Detector	Felix Sefkow (DESY, DE) - 20'	Intro by conveners			1 Detector
	Tues 24.01	Roberto Ferarri (INFN Pavia, IT) - 25'	Calorimetry			1 Detector
	11:00-13:00	Anna Collaleo (Universita e INFN Bari, IT) - 25'	Gaseous detectors			1 Detector
		Nicolo Cartiglia (INFN Torino, IT) - 25'	Silicon detectors			1 Detector
		Paul Colas (SPP Saclay, FR) - 25'	TPC operability			1 Detector
		Chair: Franco Bedeschi				
	BSM/Higgs	Giacomo Polesello (INFN, IT) - 20'	Intro by conveners			1 BSM
	Tues 24.01	Ben Allanach (Cambridge U., UK) - 25'	Exploring Z' models at FCC			1 BSM
	14:30-16:30	Biswajit Karmakar (U. Silesia, PL) - 25'	Z decay and heavy neutrinos at FCC-ee			1 BSM
		Simone Blasi (VUB, BE) - 25'	Electroweak phase transition			1 BSM
		Dave Sutherland (Glasgow, UK) - 25'	SMET vs HEFT			1 Higgs
		Chair: Ennio Salvioni				
	MDI/Detector	Manuela Boscolo (LNF, IT) - 20'	Intro by conveners			1 MDI
Tues 24.01	Francesco Francesini (LNF, IT) - 25'	Mechanical model of FCC-ee MDI			1 MDI	
17:00-19:00	Franco Bedeschi (INFN Pisa, IT) - 25'	Detectors integration in the MDI area			1 MDI	
	Andrea Ciarna (CERN, CH) - 25'	Status and Perspectives for the FCC-ee Detector Backgrounds			1 MDI	
	Anna Zaborowska (CERN, CH) - 25'	FCC-hh detector concept			1 Detector	
	Chair: Gerardo Ganis					
Wednesday 25.01	QCD	David d'Enterria (CERN, CH) - 20'	Intro by conveners			1 QCD
	Wed 25.01	Stefan Kluth (MPI Munich, DE) - 25'	Review of strong coupling at FCC-ee			1 QCD
	9:00-10:35	Pier Monni (CERN, CH) - 25'	Precision calculations at FCC-ee			1 QCD
		Simon Plaetzer (U. Graz, AT) - 25'	Monte Carlo challenges for FCC-ee and progress			1 QCD
		Chair: Andrzej Siodmok				
	JT Detector/SW	Brieuc Francois (CERN, CH) - 25'	Strategy and plans for detector software			1 D&SW
	Wed 25.01	Martin Tat (Oxford, UK) - 25'	ARC: progress update and plans towards full simulation			1 D&SW
	11:00-13:05	Vincent Boudry (LLR, FR) - 25'	Modelling signal digitisation for test calorimeters: the CALICE experience			1 D&SW
		Riccardo Farinelli (INFN Ferrara, IT) - 25'	Modelling signal digitisation for trackers			1 D&SW
		Leila Freitag and Armin Iig (UZH, CH) - 25'	Performance of an ALICE ITS3-like vertex detector for FCC-ee and progress on the IDEA vertex d			1 Detector
		Chair: Michele Selvaggi				
	Flavour/BSM	Stephane Monteil (LPC, FR) - 20'	Intro by conveners			1 Flavour
	Wed 25.01	Jure Zupan (Cincinnati, US) - 25'	Higgs and flavor (with a focus on FCNC)			1 Flavour
	14:05-16:30	Luiz Vale Silva (Valencia U, ES) - 25'	Projections of CKM global fits and meson mixings			1 Flavour
		Seddigheh Tizchang (IPM, IR) - 25'	Top FCNC			1 BSM
		Giulia Ripellino (Uppsala U., SE) - 25'	LLP experimental perspectives at FCC-ee: ALPS and exotic Higgs decays			1 BSM
		Suchita Kulkarni (Graz, U, AT) - 25'	LLP experimental perspectives at FCC-ee: HNL			1 BSM
		Chair: Giacomo Polesello				
MDI	Mogens Dam (NBI, DK) - 25'	Summary of review on civil engineering and technical infrastructure requirements for FCC experimental sites			1 MDI	
Wed 25.01	Andrea Gaddi (CERN, CH) - 25'	Lessons learnt from CMS IR mock-ups			1 MDI	
17:00-19:05	Andrey Abramov (CERN, CH) - 25'	IR beams losses			1 MDI	
	Kevin D.J. Andre (CERN, CH) - 25'	FCC-ee synchrotron radiation collimators and masks			1 MDI	
	Nikkie Deelen (CERN, CH) - 25'	Detector Stray Magnetic Fields			1 MDI	
	Chair: Manuela Boscolo					
Thursday 26.01	QCD	Andrzej Siodmok (PN, PL) - 25'	Modeling of hadronization			1 QCD
	Thurs 26.01	Loukas Gouskos (CERN, CH) - 25'	Flavour jet tagging at FCC-ee with ParticleNet			1 QCD
	9:00-9:50	Edoardo Pleier (VUB/UZH, BE/CH) - 25'	Multi-flavour taggers from transformer graph DNN		cancelled	QCD
		Chair: David d'Enterria				
	Tau	Lukas Allwicher (U. Zurich, CH) - 25'	Universality tests in tau decays			1 Flavour
	Thurs 26.01	Alberto Lusiani (SNS, IT) - 25'	Tau lifetime			1 Flavour
	10:20-12:25	Tristan Miralles (U. Clermont Auvergne, FR) - 25'	B to K* tau tau			1 Flavour
		Zbigniew Was (INP Cracow, PL) - 25'	On precise tau simulations			1 Flavour
		Priyanka Lamba (Warsaw U., PL) - 25'	Quantum information and CP measurement in H->tau tau			1 BSM
		Chair: Matthew McCullough				
	IFNC	Gregorio Bernardini (APC, FR) - 5'	Introduction			1 IFNC
	Thurs 26.01	Patrizia Azzi (INFN Padova, IT) - 15'	Opportunities in FCC Physics and Performance Studies			1 IFNC
	13:30-15:10	Mogens Dam (NBI, DK) - 15'	Opportunities in FCC Detector concepts, R&D, MDI, EPO			1 IFNC
		Gerardo Ganis (CERN, CH) - 15'	Opportunities in FCC Software developments			1 IFNC
		All - 10'	Questions and discussions			1 IFNC
		All national contacts - 30'	Summary of activities in FCC by country			1 IFNC
		Gregorio Bernardini (APC, FR) - 10'	Summary of the activities and prospects			1 IFNC
		Chair: Sarah Eno				
Friday 27.01	Higgs	Shankha Banerjee (CERN, CH) - 25'	Diboson at FCC-hh			1 Higgs
	Fri 27.01	Eleni Vryoniidou (Manchester, UK) - 25'	Higgs/Top Interplay			1 Higgs
	9:00-10:40	Ang Li (APC, FR) - 25'	Higgs mass and ZH cross-section			1 Higgs
		Giovanni Marchioni (APC, FR) - 25'	Higgs to hadrons in ZH with Z->II/vv			1 Higgs
		Chair: Jorge De Blas				
	EW	Paolo Azzurri (INFN Pisa, IT) - 25'	Measurement of the W mass			1 EW
	Fri 27.01	Lisong Chen (Karlsruhe, DE) - 25'	GRIFFIN: A C++ library for EW radiative corrections in fermion scattering and decay processes			1 EW
	11:10-12:50	Lars Roehrig (Dortmund U., DE and LPC, FR) - 25'	Synergies in top-beauty and a first look at b-tagging with exclusive decays			1 EW
		Qian Song (Pittsburgh U, US) - 25'	NNLO corrections to H+Z - 2209.07612			1 EW
		Chair: Alberto Lusiani				
	Future plans	Marc-André Pleier (BNL, US) - 15'	Brookhaven National Lab contributions to the FCC-ee			1 closing
	Fri 27.01	Matthew McCullough (CERN, CH) - 15'	Future plans: physics program			1 closing
	14:00-15:50	Patrizia Azzi (INFN Padova, IT) - 15'	Future plans: physics performance			1 closing
		Mogens Dam (NBI, DK) - 15'	Future plans: Detectors			1 closing
		Gerardo Ganis (CERN, CH) - 15'	Future plans: Software			1 closing
		Jacqueline Keintzel (CERN, CH) - 15'	Future plans: EPOL			1 closing
		Manuela Boscolo (LNF, IT) - 15'	Future plans: MDI			1 closing
		Christophe Grojean (DESY, DE) and Patrick Janot (CERN, CH) - 5'	Close-up			1 closing
	Chair: Patrick Janot					
		# Talks foreseen ->	90	22	89	
			↑ # remote	↑ # confirmed		

Many Thanks

- **Local organising committee:**

- Tadeusz Lesiak (Chair, IFJ PAN)
- Jihyun Bhom (IFJ PAN)
- **Marcin Chrzęszcz** (IFJ PAN)
- Mateusz Dyndał (AGH)
- Janusz Gluza (US)
- Stanisław Jadach (IFJ PAN)
- Jan Kalinowski (UW)
- Sebastian Kubis (PK)
- Andrzej Siódmok (UJ)

- **Local helpers:**

- Małgorzata Niewiara
- Józef Borsuk
- Iza Juszcak
- Maciej Dudek

- **FCC management team (in particular for financial support)**

- Michale Benedikt & Frank Zimmermann
- Panagiotis Charitos
- Julie Hadré

- **Scientific programme committee**

- Patrizia Azzi (INFN Padua)
- Alain Blondel (Paris-Sorbonne)
- Gregorio Bernardi (APC Paris)
- Manuela Boscolo (INFN Frascati)
- Mogens Dam (NBI Copenhagen)
- Gerardo Ganis (CERN)
- Christophe Grojean (DESY/HU)
- Clement Helsen (CERN)
- Patrick Janot (CERN)
- Jacqueline Keintzel (CERN)
- Michelangelo Mangano (CERN)
- Matthew Mccullough (CERN)
- Emmanuel Perez (CERN)
- Philipp Roloff (CERN)
- Felix Sefkow (DESY)
- Frank Simon (KIT)
- Mike Sullivan (SLAC)
- Jörg Wenninger (CERN)
- Guy Wilkinson (Oxford)

Many Thanks

All participants!



Everyone can make mistake

- *"This is the last speech I'll deliver. You won't hear me anymore"...*
- Of course, we'll ask you again, Alain, for the after-dinner speech



Last night, Tadeusz told us the Poles were not good with tunnels but they built 240 kms of them in the Salt Mine with large caverns to accommodate big detectors. They have good training to work on FCC. Let's help them!



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Let's help them!

**Have a safe trip back home.
See you in London for the FCC week,
and next year in Annecy for the Physics WS.**