Krakow and Silesia involvement in FCC project

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The teams

IFJ PAN

Leader: Marcin Chrzaszcz
Staff: Tadeusz Lesiak, Stanisław Jadach, Zbigniew Was, Andrzej Siodmok, Jihyun Bhom, Tomasz Wojton.
PhD students: Jozef Borsuk, Sergiej Antropov.

US

Leader: Janusz Gluza
Staff: Ievgen Dubovyk, Bartosz Dziewit, Jacek Holeczek
PhD students: Magda Kordiaczynska, Wojciech Flieger, Krzysztof Grzanka

FCC activity of the IFJ PAN group

Engaged since begging.
Signed MOU FCC-GOV-CC-0211 for years 2017-2020 and 2020-2023

Activity:

1. Electroweak precision measurements at the Z pole.
2. Neutrino generations phenomenology.
3. Beyond SM phenomenology.
4. Flavour Physics.
5. Development of the software needed for FCC.
6. Development of the detector concept for FCCee.

FCC activity of the University of Silesia group

Engaged since 2015.
Signed MOU CERN-US for years 2017-2020 and 2020-2023

Activity:

1. calculation of higher-order EW corrections to pseudobservables (EWPOs) and processes needed to estimate sensitivities of FCC-ee
   - 2-loop EW correction to the Z-decay
   - 3-loop EW-QCD corrections (in progress)
2. phenomenological studies for FCC-hh, FCC-eh, FCC-hh, e.g. Higgs BSM phenomenology
3. development of the software needed for FCC

Grants connected with FCC activity IFJ PAN:

- "New analysis of scientific potential of future electron-position colliders" (NCN, 2017-2020) (2018-2021)
- "Future Circular Collider Innovation Study" Horizon2020, (EU, 2021-2024)

Grants connected with FCC activity US:

- "The Z-boson resonance at three loops and New Physics effects" (2018-2021)
- "Non-standard neutrinos and CP-violating effects in the leptonic sector" (2021-2024)

Reports:

- A. Blondel et al., "Standard model theory for the FCC-ee Tera-Z stage", LINK IFJ PAN + US
- A. Blondel et al., "Theory for the FCC-ee : Report on the 11th FCC-ee Workshop Theory and Experiments", LINK IFJ PAN + US
- A. Blondel et al., "Theory Requirements and Possibilities for the FCC-ee and other Future High Energy and Precision Frontier Lepton Colliders", LINK IFJ PAN + US

Reports:

- A. Freitas et al., "Theoretical uncertainties for electroweak and Higgs-boson precision measurements at FCC-ee", LINK US
- A. Blondel et al., "FCC-ee: Your Questions Answered", LINK IFJ + US

Papers:

- QED Interference in Charge Asymmetry Near the Z Resonance at Future Electron- Positron Colliders, Physical Review D
- Interference Effects in a Very Precise Measurement of the Muon Charge Asymmetry at FCC-ee, Acta Polonica B
- Theory challenges at future lepton colliders, Acta Physica Polonica B
- Exponentiation in QED and Quasi-Stable Charged Particles, Symmetry
- Precision measurement of the Z boson to electron neutrino coupling at the future circular colliders, Physics Letters B
- QED challenges at FCC-ee precision measurements, European Physical Journal C
- The path to 0.01% theoretical luminosity precision for the FCC-ee, Physics Letters B

Papers:

- Improved Bhabha cross section at LEP and the number of light neutrino species, Physics Letters B
- HADES: A long lived particle detector concept for the FCC-ee or CEPC, European Physical Journal C
- The two-loop electroweak bosonic corrections to $\sin^2\theta^b_{eff}$", Phys. Lett. B
- Complete electroweak two-loop corrections to Z boson production and decay, Physics Letters B
- Electroweak pseudo-observables and Z-boson form factors at two-loop accuracy, JHEP

Software programs:

- BHLUMI
- KKMC
- Tauola
- FIESTA
- PlanarityTest, AMBRE, MB+quasiMC
- FOAM
- HEPLike
- GAMBIT

Backup