



# Vinca Institute of Nuclear Sciences Collaboration Contribution Proposal to FCC(ee)

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Preparatory meeting  
for the FCC International Collaboration Board,  
CERN, 9-10 September 2014

# About Vinca

- One of the largest (~450 researchers, 700 employees) and oldest institutes in the South-Eastern Europe, celebrating 66<sup>th</sup> anniversary this year.
  - The place where the first controlled nuclear fission at Balkans took place.
- Vinca Institute has the largest scientific production in Serbia
- Vinca is independent legal entity with it's own management approved by the Ministry of Science (DG, EB, etc.)
- Since a few years Vinca Institute is a member of a loose association of faculties and institutes within the University of Belgrade
  - Mainly to contribute to the education process at University and to improve its scientific output

# Vinca Experimental HEP Group

<http://www.vinca.rs/hep>

- Experience from lepton colliders (DELPHI at LEP): physics with heavy flavors, EW physics
- **Vinca is the only institute in Serbia participating in the major lepton collider projects: ILC and CLIC**
- Contributed to: TESLA TDR, ILD LoI, ILC RDR, ILC TDR
- Physics at the CLIC  $e^+e^-$  Linear Collider - Input to the Snowmass process 2013 [arXiv:1307.5288](https://arxiv.org/abs/1307.5288)
- Hosting LCWS14
  - About Vinca <http://lcws14.vinca.rs/about-vinca/>

# Vinca Experimental HEP Group cont.

- At ILC:
  - form the very beginning – TESLA project (anomalous TGCs, reconstruction with very forward detectors - FCH)
  - **Luminosity measurement including 2- $\gamma$  background, beam-induced effects – we developed novel, data driven method of integral luminosity measurement in the peak region with a permille accuracy (2 PhD)**
  - Forward region studies: identification of high-energy electrons, EM and hadronic shower separation with the very forward calorimeters

# Vinca Experimental HEP Group cont.

- At CLIC:
  - **CLICdp – Higgs studies at CLIC energy stages – BR measurements, uncertainty of Higgs couplings**
    - Higgs to  $\mu\mu$  decay at 1.4 TeV (PhD),
    - Higgs to  $ZZ$  decay at 1.4 TeV (PhD),
    - Higgs to  $WW$  decay at 350 GeV and 1.4 TeV,
    - Higgs to  $\gamma\gamma$  at 3 TeV (PhD)
  - **Integral luminosity measurement and luminosity spectrum reconstruction in the peak-region**

# Vinca Experimental HEP Group cont.

- Recent scientific output:
  - Three papers on luminosity measurement and forward region studies: JINST 8 P08012, JINST 8 P05008, JINST 5 P12002 + one in preparation.
  - 4 PhD theses (2 at ILC, 2 at CLIC)
  - Contribution to major conferences:
    - LCWS10, arXiv:1006.2539v1
    - HEP2011, PoS(EPS-HEP2011)210
    - ICHEP12, PoS (ICHEP 2012) 540
    - LCWS13, CLICdp-Conf-2014-001, <http://arxiv.org/abs/1403.6695>
    - LCWS13, <http://arxiv.org/abs/1403.7348>
    - ICHEP14

# Contribution proposal to FCC-ee

- Immediate contribution (2015-2019)
  - Integral luminosity measurement at FCC-ee
    - Including detailed study of physics and beam-induced processes
    - PhD thesis proposed
  - Next: Higgs couplings at FCC-ee ( $g_{HV V}$ ,  $V=Z, W$ , other couplings related to rare Higgs decays  $g_{H\mu\mu}$ ,  $g_{H\gamma\gamma}$ )
- Perspective
  - R&D on instrumentation of the very forward region

*Comparative studies based on experience at other projects (CLIC, ILC)*

# Manpower, funding

- Manpower
  - 1 senior scientist, 1 post-doc, 1 PhD student
  - Possibility of having another post-doc
  - Minimal FTE expected: 12 (2015-2019)
- Funding
  - Local funding agency, through the national project
- Important message based on experience with other *future* projects:

*Funding critically depends on the host-lab (in this case CERN)  
advocating towards the local funding agency*





Being the only institution in Serbia with the long-term activity at future lepton colliders, Vinca Institute would like to be recognized within the FCC-ee as a collaboration partner as we are at CLIC

**Vinca Institute is looking forward to collaborating within the FCC-ee project**