ICFA REPORT

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ICFA Report

- What is ICFA?
- *** ICFA Roles**
- * ICFA and the ILC
- * Ideal Scenario (personal view!)
- Next Steps
- *** ICFA and the Future of HEP**





What is ICFA?

- Created (1976 IUPAP) to facilitate international collaboration in the construction and use of accelerators for high energy physics.
 - To promote international collaboration in all phases of the construction and exploitation of very high energy accelerators.
 - To organize regularly world-inclusive meetings for the exchange of information on future plans for regional facilities and for the formulation of advice on joint studies and uses.
 - To organize workshops for the study of problems related to super high-energy accelerator complexes and their international exploitation and to foster research and development of necessary technology.





ICFA LC Organisation Structure (from 2016)







ICFA Current Roles

- * "To promote international collaboration in all phases of the construction and exploitation of very high energy accelerators."
 - + ILC ... or CLIC?
 - + CepC ... and SppC?
 - + CERN p-p program
 - LHC, HL-LHC, ??HE-LHC??
 - FCC
 - + High-Energy Neutrino Sources LBNF, J-Parc
 - + Factories SuperKEKB, C-Tau(Novosibirsk, IHEP)





ICFA and ILC

* ALCW2018 - Concentrate on issues around ILC

+ Why the ILC?

- Higgs Factory (ILC250)
- Upgrade capability
- Mature concept
- International participation
- Alternative
 - CLIC(380) alternative or backup?
- + Circular Alternatives
 - CepC Build in parallel? (National resources?)
 - ... FCC(ee) future dream?





ICFA and the ILC

* 2013 European Strategy for Particle Physics

The initiative from the Japanese particle physics community to host the ILC in Japan is most welcome, and European groups are eager to participate. Europe looks forward to a proposal from Japan to discuss a possible participation.





ICFA and the ILC

- 2014 P5: Use the Higgs boson as a new tool for discovery
 - Recommendation 11 : Motivated by the strong scientific importance of the ILC and the recent initiative in Japan to host it, the U.S. should engage in modest and appropriate levels of ILC accelerator and detector design in areas where the U.S. can contribute critical expertise.
 Consider higher levels of collaboration if ILC proceeds.





Higgs Factory - Other Linear Option - CLIC(380)

* CLIC - the 380GeV option in preparation, and waiting in the wings!



Higgs Factory - Circular Option - CEPC

* CEPC - the 250 GeV circular machine.







Aside ... some personal opinions

* Handling the Options:

- + CLIC / ILC ?
 - If ILC chosen, MUST be upgradable.
 - Push for tunnel design with future options!
 - Can CERN be expected to cover both p-p and e+e- future?

+ ILC /CEPC?

- Linear, circular machines have distinct development paths
- Chinese Government desire to build Chinese facilities of <u>international stature</u> (See Y. Wang talk)
 - CEPC approval chances IMPROVED with ILC approval!
- NOT a zero-sum game:
 - CEPC will add substantial resources to HEP







Necessity of a Higgs Factory - The ICFA Statement

The discovery of a Higgs boson in 2012 at the Large Hadron Collider (LHC) at CERN is one of the most significant recent breakthroughs in science and marks a major step forward in fundamental physics. Precision studies of the Higgs boson will further deepen our understanding of the most fundamental laws of matter and its interactions.

The International Linear Collider (ILC) operating at 250 GeV center-of-mass energy will provide excellent science from precision studies of the Higgs boson. Therefore, ICFA considers the ILC a key science project complementary to the LHC and its upgrade.

ICFA welcomes the efforts by the Linear Collider Collaboration on cost reductions for the ILC, which indicate that up to 40% cost reduction relative to the 2013 Technical Design Report (500 GeV ILC) is possible for a 250 GeV collider.

ICFA emphasises the extendibility of the ILC to higher energies and notes that there is large discovery potential with important additional measurements accessible at energies beyond 250 GeV.

ICFA thus supports the conclusions of the Linear Collider Board (LCB) in their report presented at this meeting and very strongly encourages Japan to realize the ILC in a timely fashion as a Higgs boson factory with a center-of-mass energy of 250 GeV as an international project1, led by Japanese initiative.

* 1 In the LCB report the European XFEL and FAIR are mentioned as recent examples for international projects.



Ottawa, November 2017



Deciding Our High Energy Future

If the second second

(Cunningly omitting years on time lines!)







From Industry Session: 3 requirements

1. Physics Driver(s)

- + Precision Higgs is a clear driver for ILC/CLIC/CEPC/FCC(ee)
- The high energy frontier pp collider
- 2. Technology
 - + ILC SCRF technology now in advanced state
 - + CLIC technology advancing but needs further development
 - Circular e+e- "relatively easy?? ... I know nothing is easy!"
 - Magnet technology for future pp collider needs considerable development

3. Resources

- + Much Major HEP Capital Spending Complete by mid-2020's
- + (New Chinese funding for CEPC!)





ICFA and the Future of HEP

- *** ICFA needs to consider the whole field.**
- * A broad spectrum of high energy machines required
- * ??? Ideal Scenario (a personal opinion!) :
 - + Europe: proton collider high energy frontier
 - + Asia: electron-positron precision frontier
 - + USA: high energy neutrino frontier
- * Future Success requires new technology
 - Can we really just make larger circular machines?
 - + Need new, more compact accelerators

Get back on the Livingston plot envelope?





Next Steps

- Implore Japan of the critical need for ILC approval.
- Critical timing Update of European Strategy for Particle Physics
 - + Japanese decision required by end of 2018
- Provide path to consider the field more holistically.
 - + We are a wholly international field.
 - There are moments when a particular nation is required to provide essential leadership for an internationally significant endeavour





ALCW Statement ??

- * Suggest re-iterating the November 2017 ICFA Statement - the current sentiment has not changed.
- Continue with a single voice to the Japanese Government of the critical need for ILC approval this year.
- * Tatsuya Nakada:
 - Need statement from Japanese government by the end of 2018:
 - the interest to *host the ILC in Japan*
 - indicating a level of <u>contribution that is substantial</u>
 - readiness to initiate discussion with interested countries.



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Urgency for Action

The international field of HEP is at a cross-roads:

* The need for strong leadership is critical.

We must continue to emphasise that the ILC "approval" this year is essential for the future prosperity of the field.



