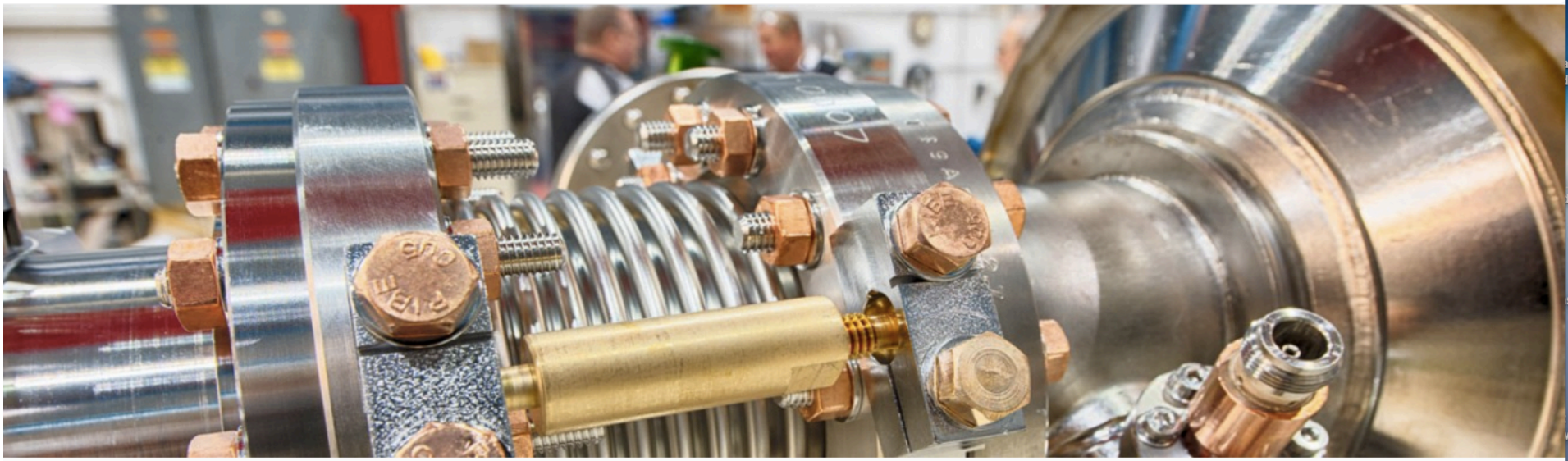
International Committee for Future Accelerators

http://icfa.fnal.gov/

ICFA

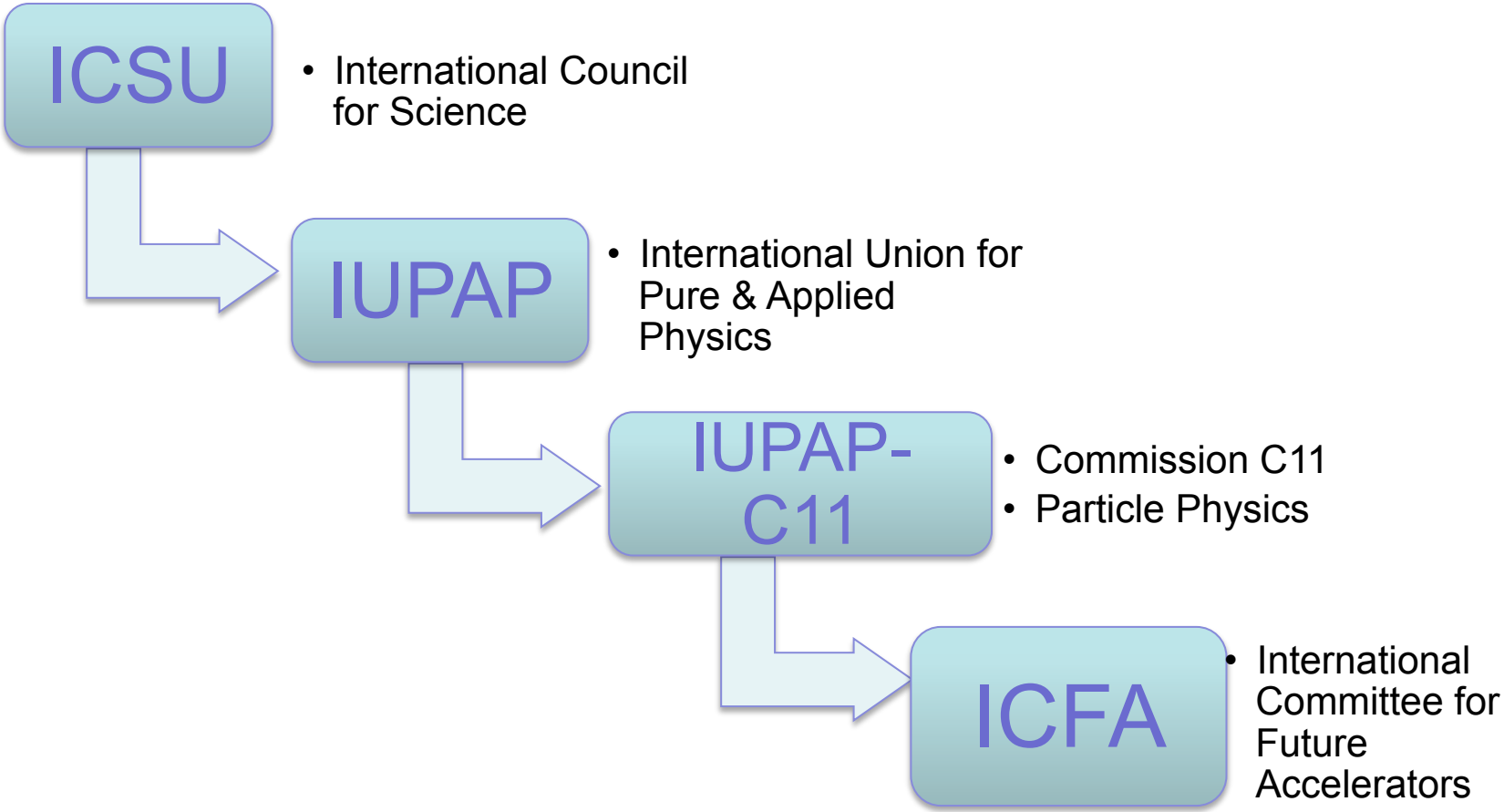
SPONSORED BY THE PARTICLES AND FIELDS COMMISSION OF IUPAP

ABOUT ▾ MEETINGS PANELS STATEMENTS LINEAR COLLIDER ACTIVITIES



International Committee for Future Accelerators

ICFA's Relationship to IUPAP and ICSU



ICFA Mandate

- ICFA was created in 1976 by the International Union of Pure and Applied Physics (IUPAP) Commission C11
  - Promote international collaboration in the construction and exploitation of accelerators for high energy physics
  - 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
  - Organize workshops for the study of problems related to super high energy accelerator complexes and their international exploitations and to foster research and development of necessary technology
- ICFA is the recognized body to represent high energy physics community on the global stage.

ICFA Current Membership

G. Taylor, Chair, Australia
P. Bhat, Secretary, USA
J. D'Hondt, CERN Member States
F. Gianotti, CERN Member States
J. Mnich, CERN Member States & Past Chair
Z. Huang, USA
N. Lockyer, USA
J. Incandela, USA
I. Koop, Russia
V. Petrov, Russia

Y. Wang, China
E. Álvarez, Other Countries
V. Matveev, Other Countries
P.A. Naik, Other Countries
T. Mori, Japan
M. Yamauchi, Japan
M. Roney, Canada
H.Schellman, Chair of IUPAP C11 (ex officio)

All regions of the world represented. Includes directors of major Particle Physics Labs.

ICFA Meetings

- Generally two meetings per year:
  1. Two-day meeting during February/March
     - Directors of all major laboratories invited
     - Allows extensive discussion on current projects and planning for future global projects
     - Previous Meeting: March 7-9, 2019 at U. Tokyo, Japan
     - Next Meeting: SLAC, USA, February, 2020
  2. During the ICHEP or Lepton-Photon conferences each year
     - Next Meeting: August ,2020, ICHEP2020, in Prague, Czech Republic
- The “ICFA Seminar” is held every three years
  - Next Seminar: Oct. 12-15, 2020, Berlin, Germany

ICFA Panels

- ICFA Panels, each with ~16 experts from around the world. Each Panel organizes its own program including workshops, newsletters, schools, etc.
  - Linear Collider Board (Chair: T. Nakada)
  - Beam Dynamics (Chair: I. Hoffmann) New Chair
  - Instrumentation Innovation & Development (Chair: I. Shipsey) New Chair
  - Advanced and Novel Accelerators (Chair: B. Carlsten) New Chair
  - Interregional Connectivity (Chair: H. Newman)
  - Data Preservation in HEP (Chair: C. Diaconu)
  - Sustainable Accelerators and Colliders (Chair: M. Seidel)
  - Neutrino Panel (Completed), Roadmap: http://icfa.fnal.gov/wp-content/uploads/ICFA-Neutrino-Panel-Roadmap-discussion-document-Final-Reversion-1-04.23.17.pdf

Panel Activities: Beam Dynamics Workshops

60th ICFA Advanced Beam Dynamics Workshop on Future Light Sources (FLS2018)
Shanghai, from 5 to 9 March, 2018,
hosted by the Shanghai Institute of Applied Physics, CAS.

The first FLS workshop was held in Grenoble, hosted by ESRF in 1996. It was followed by FLS 1999 in Argonne, FLS 2002 in Hyogo, FLS 2006 in Hamburg, FLS 2010 in Menlo Park, and FLS 2012 in Newport News.
Future: 3 years cycle

with 136 Participants

61th ICFA Advanced Beam Dynamics Workshop on High-Intensity and High- Brightness Hadron Beams, HB2018,
June 17-22, 2018, Daejeon, Korea
started in 2002 at FNAL – every even year since

62nd ICFA Advanced Beam Dynamics Workshop on High Luminosity Circular e+e- Colliders (eeFACT2018) Sept. 24-27, 2018
at Institute for Advanced Studies (IAS), Hong Kong University of Science and Technology
predecessors:
eeFACT2016 at Daresbury in the UK, HF2014 in Beijing, and HF2012 at FNAL
co-sponsored by IHEP, KEK, and the EU Horizon2020 ARIES project.

74 participants
from China (28), Japan (16), Russia (8) , US (7), Italy (6), CERN (3), Australia (2),
1 each from Turkey, France and Hong Kong.

4th ICFA Mini-Workshop on Higher Order Modes in Superconducting Cavities, HOMSC201
October 1-3, 2018 at Cornell University, Ithaca, NY, USA

HOMSC12 at the Cockcroft Institute and ASTeC, HOMSC14 at Fermilab, and HOMSC16 hosted by University of Rostock, Germany

with 27 Participants

ARIES-ICFA (Mini-) Workshop on Beam Tests and Commissioning of Low Emittance Storage Rings
February 18 – 20, 2019 at Karlsruhe Institute of technology (KIT), Karlsruhe, Germany

with 80 Participants

ICFA Mini-Workshop on

DAFNE as Open Accelerator Test Facility in the year 2020
December 17, 2018 at , Frascati Laboratory of INFN, Italy

The workshop has discussed the interest from scientists to access the DAFNE e+ e- complex, which will conclude its physics program as collider in 2020. An infrastructure almost unique, that could open as Test Facility (DAFNE-TF) to the international community for studies of accelerator technologies and beam physics, for small experiments, and to be used as a test bed for enterprises active in the sector of components for accelerators.

The Beam Dynamics Panel also publishes 2-3 significant newsletters each year.

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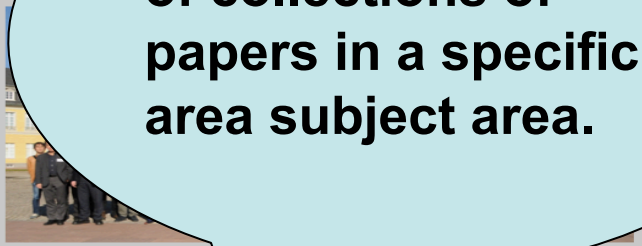

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Fantastic resource of collections of papers in a specific area subject area.

The Beam Dynamics Panel also publishes 2-3 significant newsletters each year.

Panel Activities: Sustainable Accelerators

Highlight: Workshop on Flux Trapping in s.c. accelerator cavities

8-9 November 2018, CERN, Switzerland

- Organisation & Host: CERN (F.Gerigk), 64 participants, 33 talks, two day workshop
- Supported through ARIES and Tesla Technology Collaboration (TTC),
- https://indico.cern.ch/event/741615/
- Topics:
  1. Magnetic Shielding,
  2. Flux Expulsion Efficiency,
  3. Sensitivity to Trapped Flux. applied to superconducting bulk and thin film cavities.

Highlight: Workshop on Efficient RF Sources

18-20 June 2019, Uppsala University, Sweden

- Organisation & Host: Uppsala Univ. (R.Ruber), 62 participants, two day workshop
- Supported through ARIES, industry: THALES, SIGMAPHI, Rhode&Schwarz, ...
- https://indico.uu.se/event/515/
- Topics:
  1. vacuum devices: efficient klystron, IOT, simulation methods
  2. solid state amplifiers and efficient combiners
  3. panel discussion on best practices

Upcoming Workshop ➔

5th Workshop Energy for Sustainable Science at Research Infrastructures

Paul Scherrer Institut, CH
November 28-29, 2019

https://indico.psi.ch/event/6754/

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...

- event/313/
- Topics:
  1. vacuum devices: efficient klystron, IOT, simulation methods
  2. solid state amplifiers and efficient combiners
  3. panel discussion on best practices

- **High-efficiency Klystrons**
- **HTC Magnets**
- **High Efficiency RF Cavities**
- **Solar/Wind farm as part of every new large facility?**

Upcoming Workshop ➔

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Instrumentation Innovation & Development

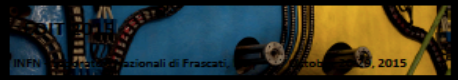
Excellence in Detectors & Instrumentation Technologies

- In collaboration with the Labs, supported organizing the EDIT schools:
- 2011 @ CERN

- 2012 @ FNAL

- 2013 @ KEK

- 2015 @ Frascati



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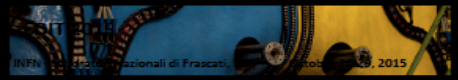
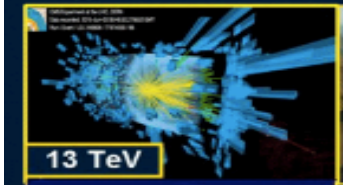


- 2018 @ FNAL

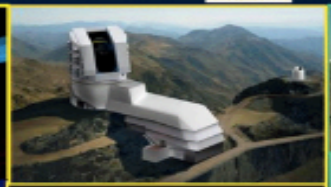
Must change detector development to be part of "Fundamental Science", quantum sensors, etc.

Future Computing and Networking for HEP:
Next Generation Systems; Work on the Digital Divide

+ INDUSTRY

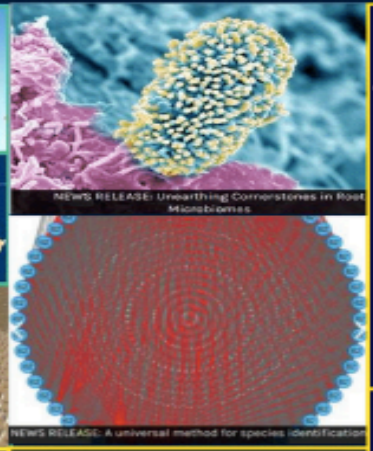


LHC



LSST

SKA



Joint Genome Institute

LHC Beyond the Higher Boson

LSST SKA

BioInformatics

Earth Observation

Gateways to a New Era

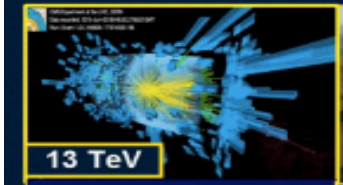
Harvey Newman, Caltech

ICFA SCIC Report, LP2019 Toronto

August 7, 2019

Future Computing and Networking for HEP:
Next Generation Systems: Work on the Digital Divide

Expect the “end of CMOS by ~2030”!
“Must embrace new technologies”



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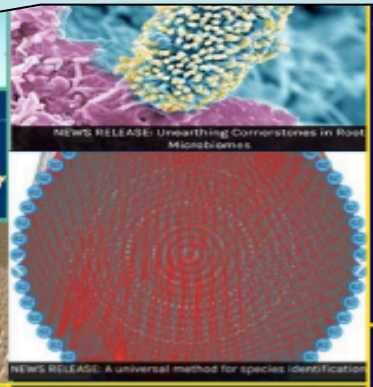

Joint Genome Institute

the Higgs Boson

LSST SKA

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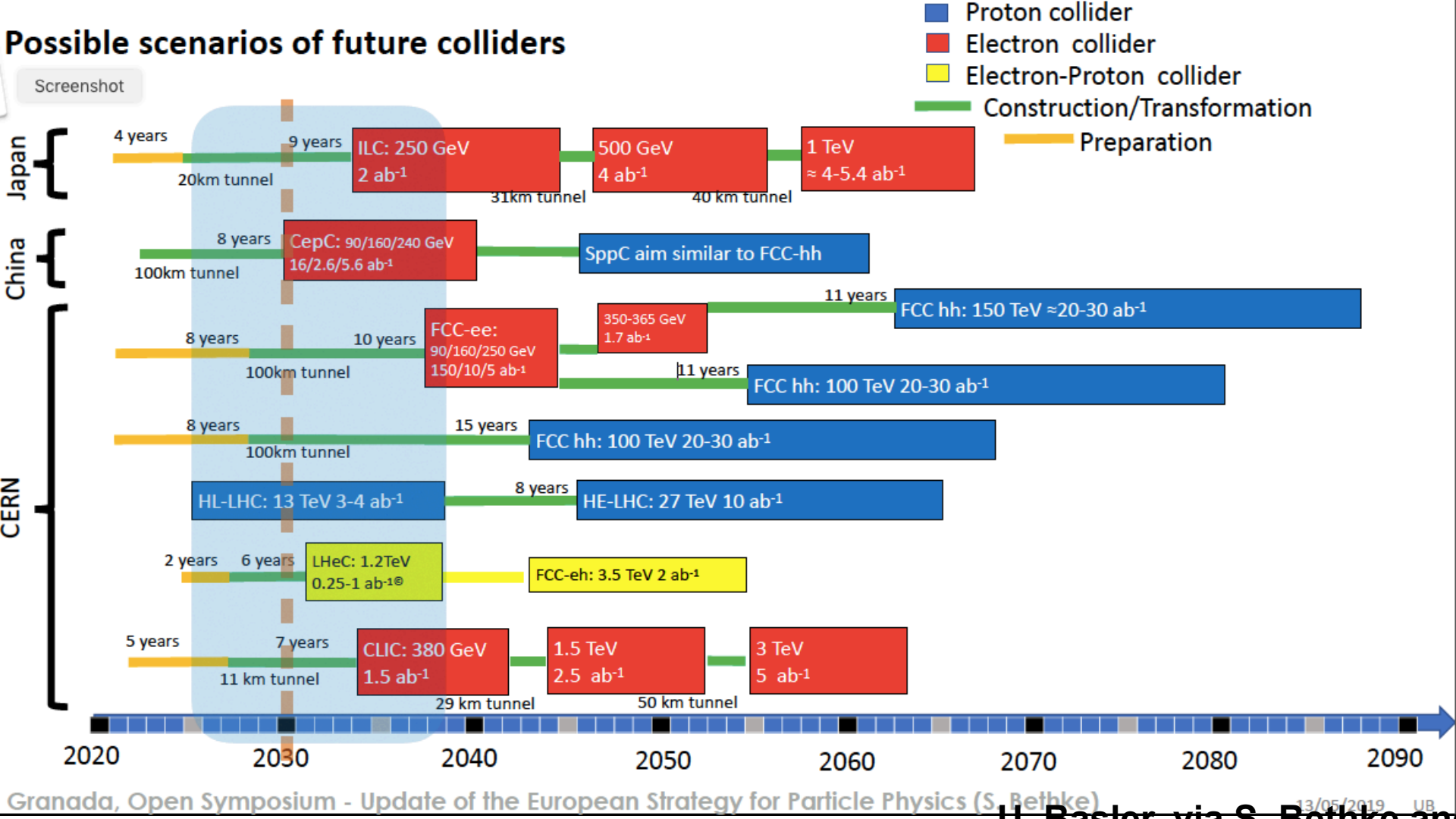
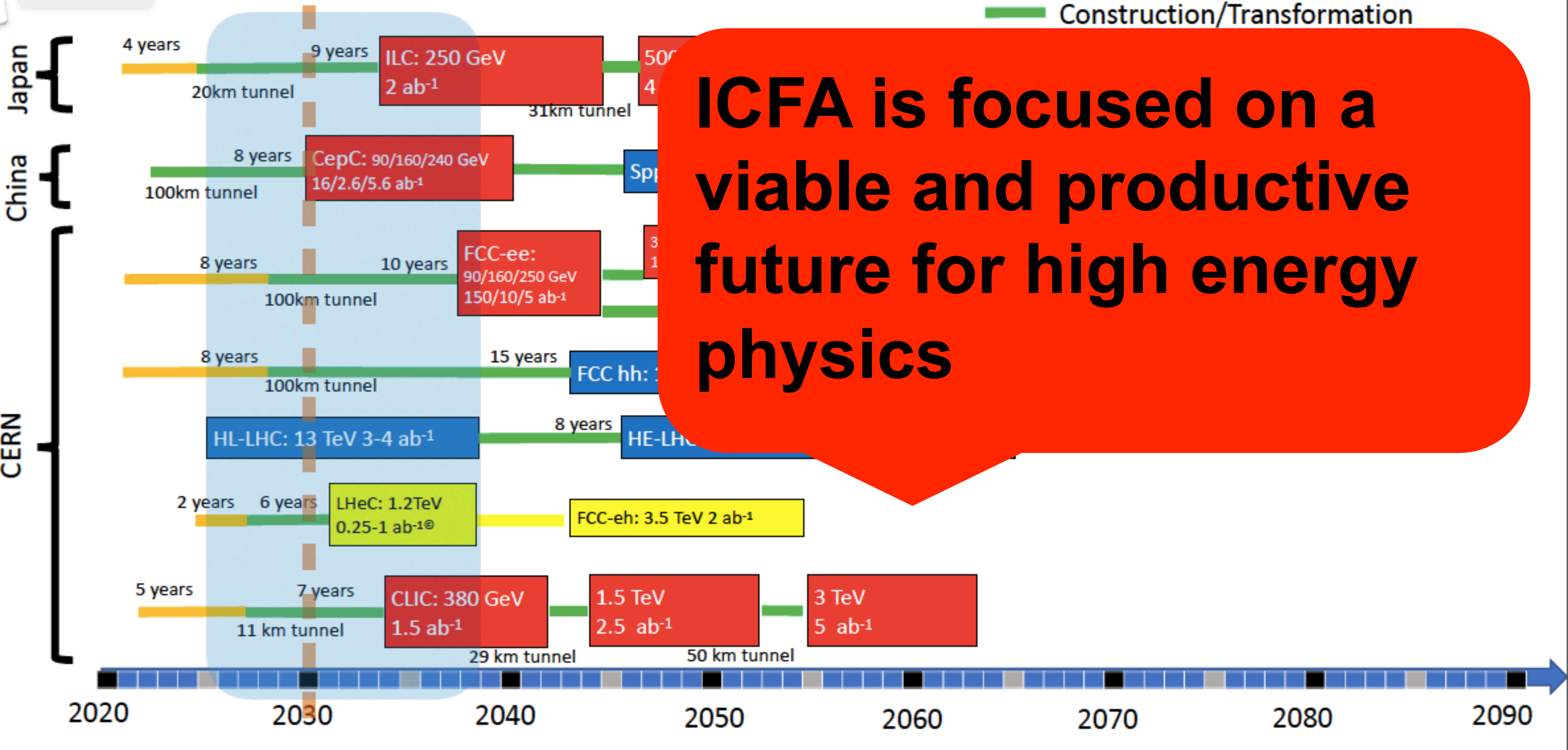
Possible scenarios of future colliders



H. Basler via S. Bethke an

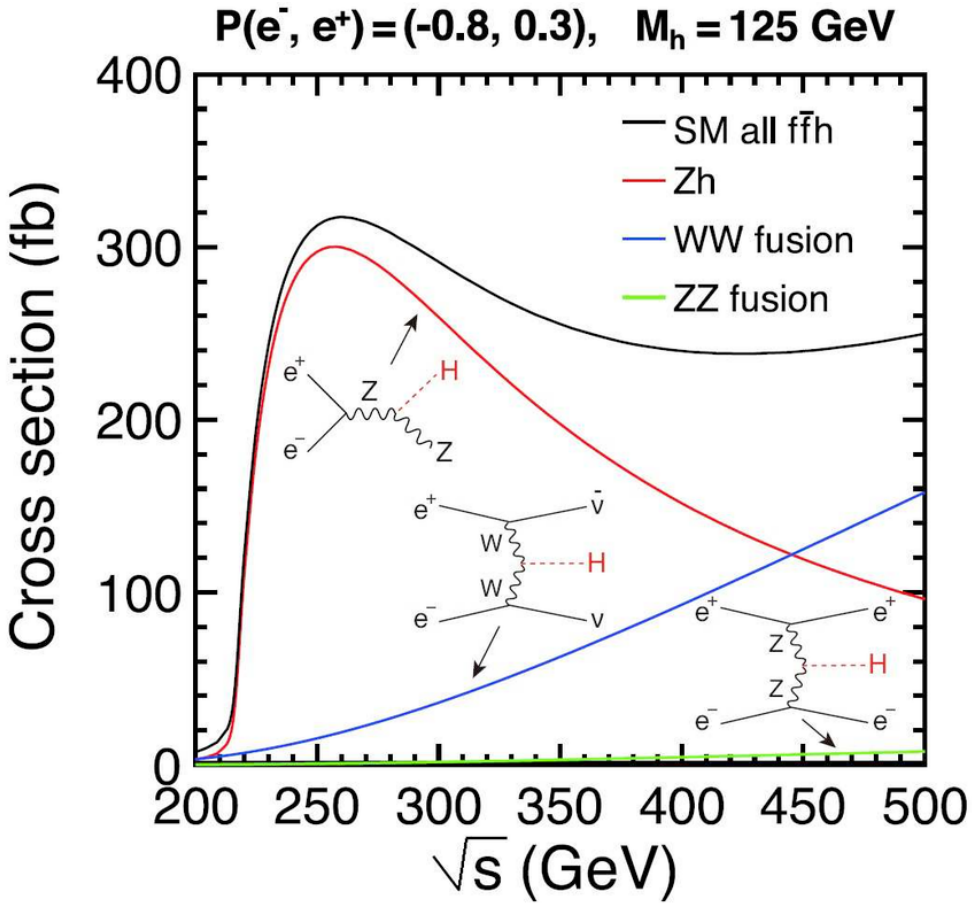
Possible scenarios of future colliders

Screenshot



ICFA is focused on a viable and productive future for high energy physics

250GeV e+e- Higgs Factory



Next Big Machine should be an e+e- collider "Higgs Factory"

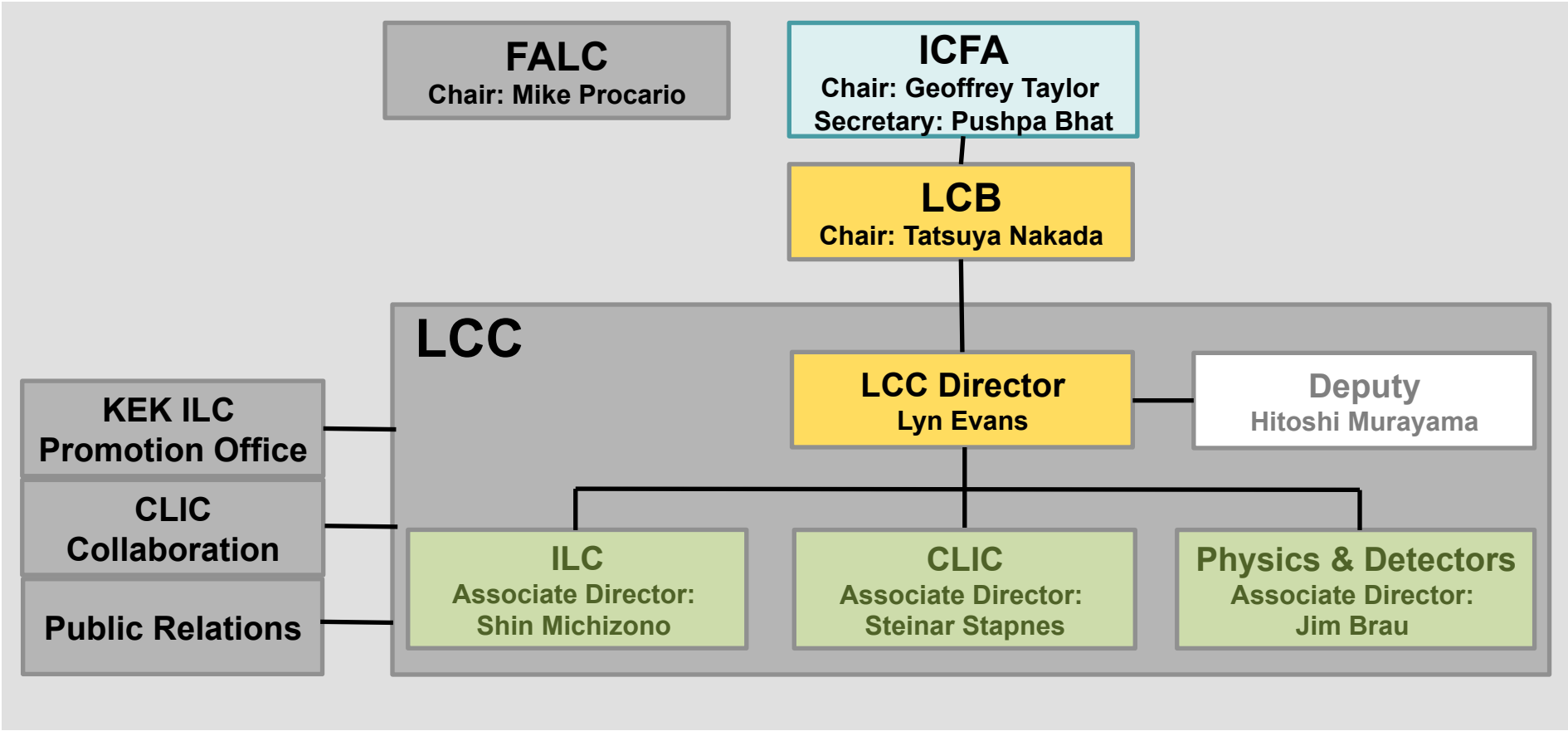
But …

Which Higgs Factory?

ICFA and the Linear Collider

- Since ~2000, ICFA has been actively engaged in efforts towards a linear electron-positron collider
  - 2002: ICFA created International Linear Collider Steering Committee (ILCSC)
  - 2003: Created International Technology Recommendation Panel (ITRP).
  - 2005 : Global Design Effort (GDE) created for ILC design & cost estimate
  - June 2013: Technical Design Report completed, incl. detectors, costs
  - 2013: ILCSC ended; Linear Collider Board (LCB) formed to oversee the Linear Collider Collaboration (LCC) includes BOTH ILC and CLIC
  - 2016: LCB/LCC mandate and structure updated
  - 2017 ICFA Statement endorsing ILC250 in Japan
  - 2019 ICFA Statement on the MEXT's view with regards to the ILC project

ICFA Linear Collider Organization



International Support for the ILC

- 2013 European Strategy for Particle Physics

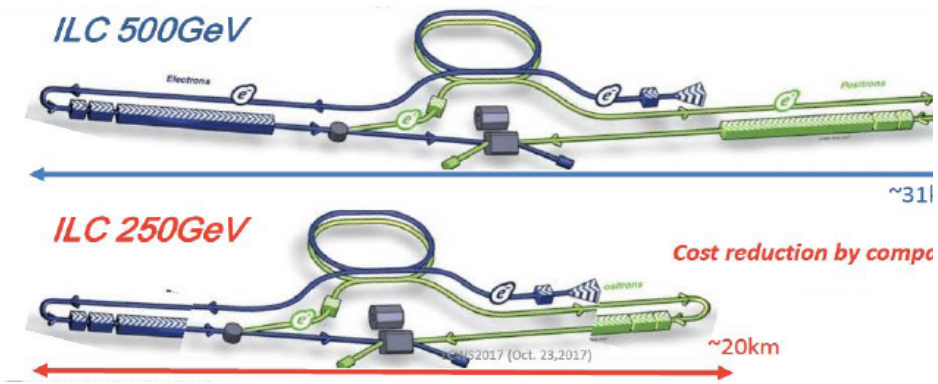
  "The initiative from the Japanese particle physics community to host the ILC in Japan is most welcome, and European groups are eager to participate. Europe looks forward to a proposal from Japan to discuss a possible participation."

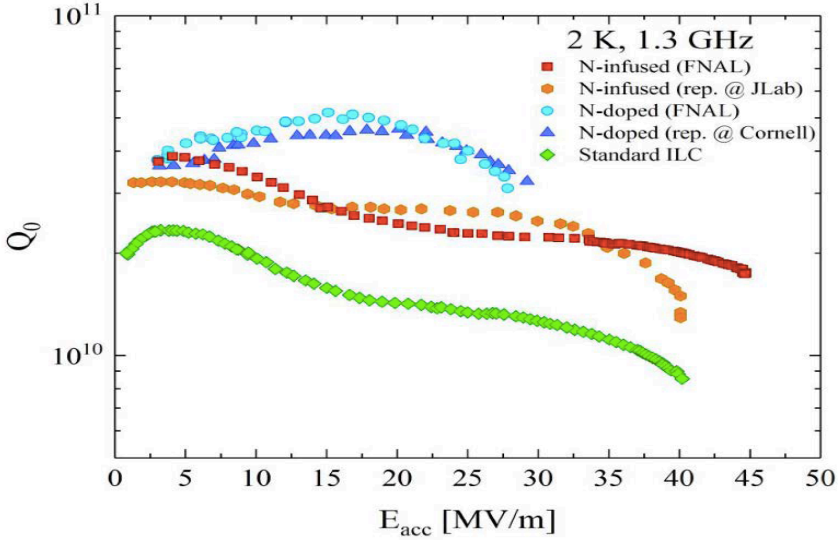
- 2014 US P5: Use the Higgs boson as a new tool for discovery

  "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".

ILC 250 Studies by the LCC

- LCC has carried out extensive studies of the accelerator design, detector and physics for 250 GeV ILC, as well as cost reduction exercises
- Cost Reduction --Technology
  - US-Japan SCRF R&D
- Cost Reduction -- Staging 250 GeV





~ cost 40% lower relative to ILC 500 TDR

The Case for ILC250

- The discovery of the Higgs boson significantly strengthened the physics case for the ILC.
- With m_H ~ 125 GeV, a 250 GeV ILC makes a very good Higgs Factory, enabling precision Higgs measurements
- ILC is a mature design and technology
  - SCRF R&D program has exceeded the ILC spec for gradient and Q0
  - European XFEL at DESY is a large-scale proto-type for the ILC
- Machine upgradable to higher energies.
  - t-tbar threshold and higher
- In meantime other proposals/technologies have matured:
  - CLIC, CEPC (Circular), FCC-ee (Circular)

ICFA (2017) Statement on the ILC

…

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 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 project, led by Japanese initiative.

Ottawa, November 2017

https://icfa.fnal.gov/wp-content/uploads/ICFA-Statement-Nov2017.pdf

ICFA Statement on MEXT's View on ILC

… its annual meeting in Tokyo, March 6-8, 2019, …(ICFA) thanks Dr. Keisuke Isogai, Director General, Research Promotion Bureau of Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT), for his inaugural presentation to the Linear Collider Board (LCB) and ICFA. …continuing interest in the ILC within MEXT and related ministries and agencies as an important milestone along the path to the ILC. …

Discovered at CERN's Large Hadron Collider in 2012…This unique particle offers a portal for understanding the fundamental laws of Nature and is expected to be a great new tool for discovery.

ICFA confirms the international consensus that the highest priority for the next global machine is a "Higgs Factory" capable of precision studies of the Higgs boson.

…options for a Higgs Factory were discussed -- the ILC, as well as other collider technologies.

ICFA reaffirms the scientific significance of the ILC and that the ILC is in a sufficient state of technical readiness for approval for construction.

….

A clear statement of Japan's position towards hosting the ILC would have had significant impact in the ongoing discussions on the formulation of the European Strategy for Particle Physics Update.

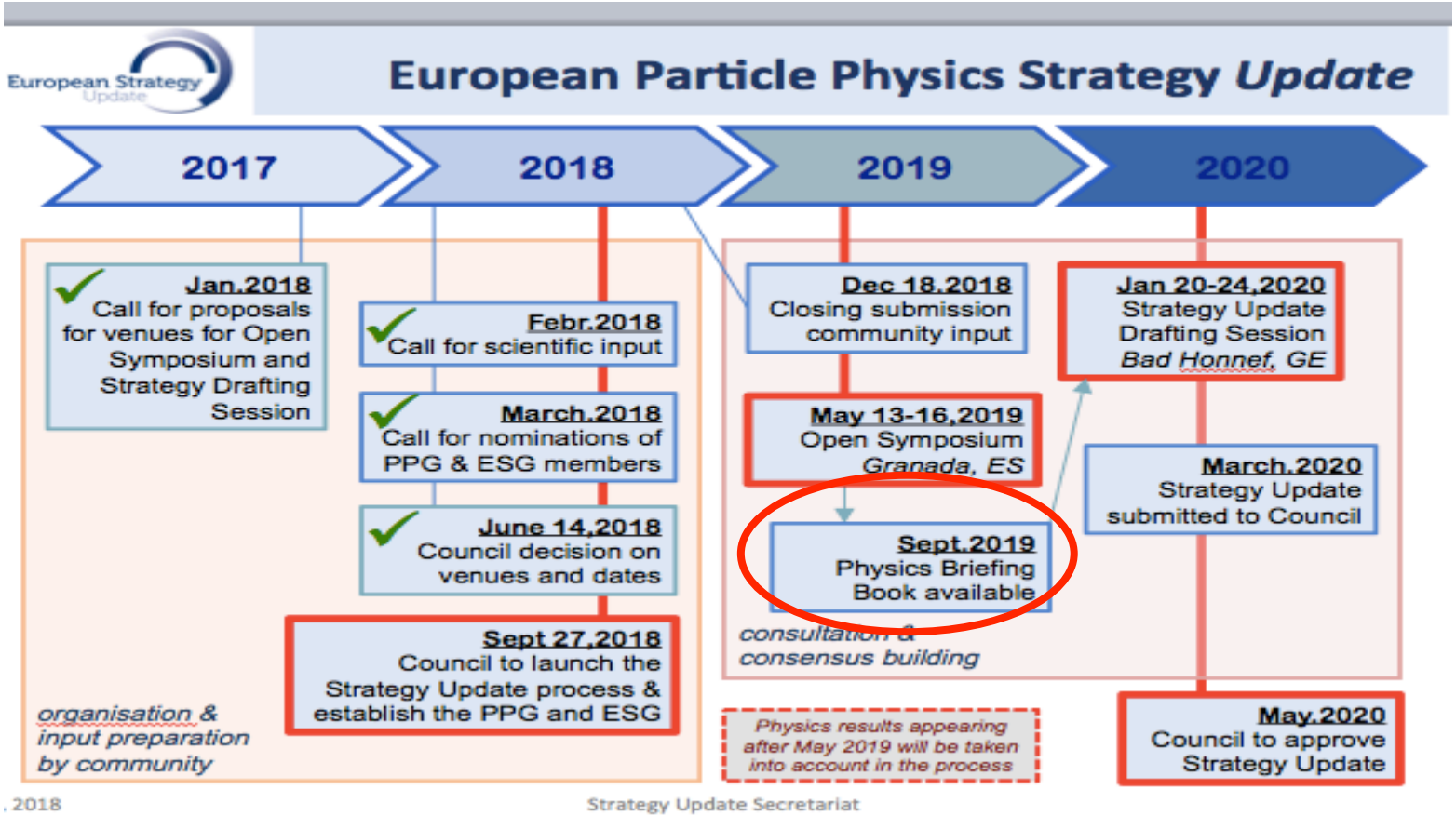
…. All options will be considered in the European Strategy for Particle Physics Update and by ICFA.

Tokyo, March 2019

https://icfa.fnal.gov/wp-content/uploads/ICFA_Tokyo_Statement_March2019.pdf

ILC Status & Recent Activities

- Project under serious consideration by the Japanese Government
  - Statement/Decision expected by the end of 2019 or early 2020
  - Japan is aware of the urgency and milestones (e.g., upcoming European Strategy Update)
- Encouraging interactions of Japanese Officials with agencies/ governments in the US and in Europe have taken place
- An International Working Group has been formed; the group is developing a report on ILC governance
- Strong ongoing efforts in Japan with outreach to public, media, science community and industry


European Strategy Update
European Particle Physics Strategy Update
2017
2018
2019
2020
Jan.2018
Call for proposals for venues for Open Symposium and Strategy Drafting Session
Febr.2018
Call for scientific input
March.2018
Call for nominations of PPG & ESG members
June 14,2018
Council decision on venues and dates
Sept 27,2018
Council to launch the Strategy Update process & establish the PPG and ESG
organisation & input preparation by community
Dec 18,2018
Closing submission community input
May 13-16,2019
Open Symposium
Granada, ES
Sept.2019
Physics Briefing Book available
consultation & consensus building
Physics results appearing after May 2019 will be taken into account in the process
Jan 20-24,2020
Strategy Update Drafting Session
Bad Honnef, GE
March.2020
Strategy Update submitted to Council
May.2020
Council to approve Strategy Update
, 2018
Strategy Update Secretariat

- US DOE, HEPAP to recommence the next P5 process over coming years to define their strategic direction.
- China has commenced the proposal process in which CEPC will be competing.
- ICFA has no funding, nor direct influence on funding agency direction, BUT
- ICFA works to promote international facilities for HEP and will continue that effort worldwide.

HEP Imperatives: ICFA focus

- Worldwide effort for e+e- Higgs Factory *must not fail!*
  - Linear or Circular
  - Asia or Europe (or Elsewhere?)
- Beyond the Higgs Factory …
- How to achieve the next Energy Frontier machine? - Beyond HL-LHC.
  - Very large tunnel!
  - Superconducting Magnets (HTC)
  - …Plasma acceleration, …
  - Technology for beyond HEP essential?
- (and perhaps beyond … muon collider? …)

ICFA View: A Global Strategy

- Promote International Collaboration, coordinate discussion of future large accelerator facilities - regional balance and global benefits
- Guided by three basic requirements
  - **(1) Physics Drivers, (2) Technology, (3) Resources**
- Energy frontier colliders
  - **Key Current Focus:**
    - **ILC in Japan (ILC and CLIC groups working together)**
    - **… but EPPSU seen as critical moment for ILC**
  - **With important support for competing proposal:**
    - **HE-LHC, CLIC, FCC at CERN**
    - **CEPC/SPPC in China**
- Accelerator-based Neutrino Program
  - **LBNF in US; J-Parc in Japan**

Acknowledgements

- Congratulations and thank you to William Trischuk and Hirohisa Tanaka, and their team, for an excellent Lepton-Photon conference.

- Thanks to Pushpa Bhat (Fermilab, ICFA) in preparing this talk and for continuing effort in support ICFA.