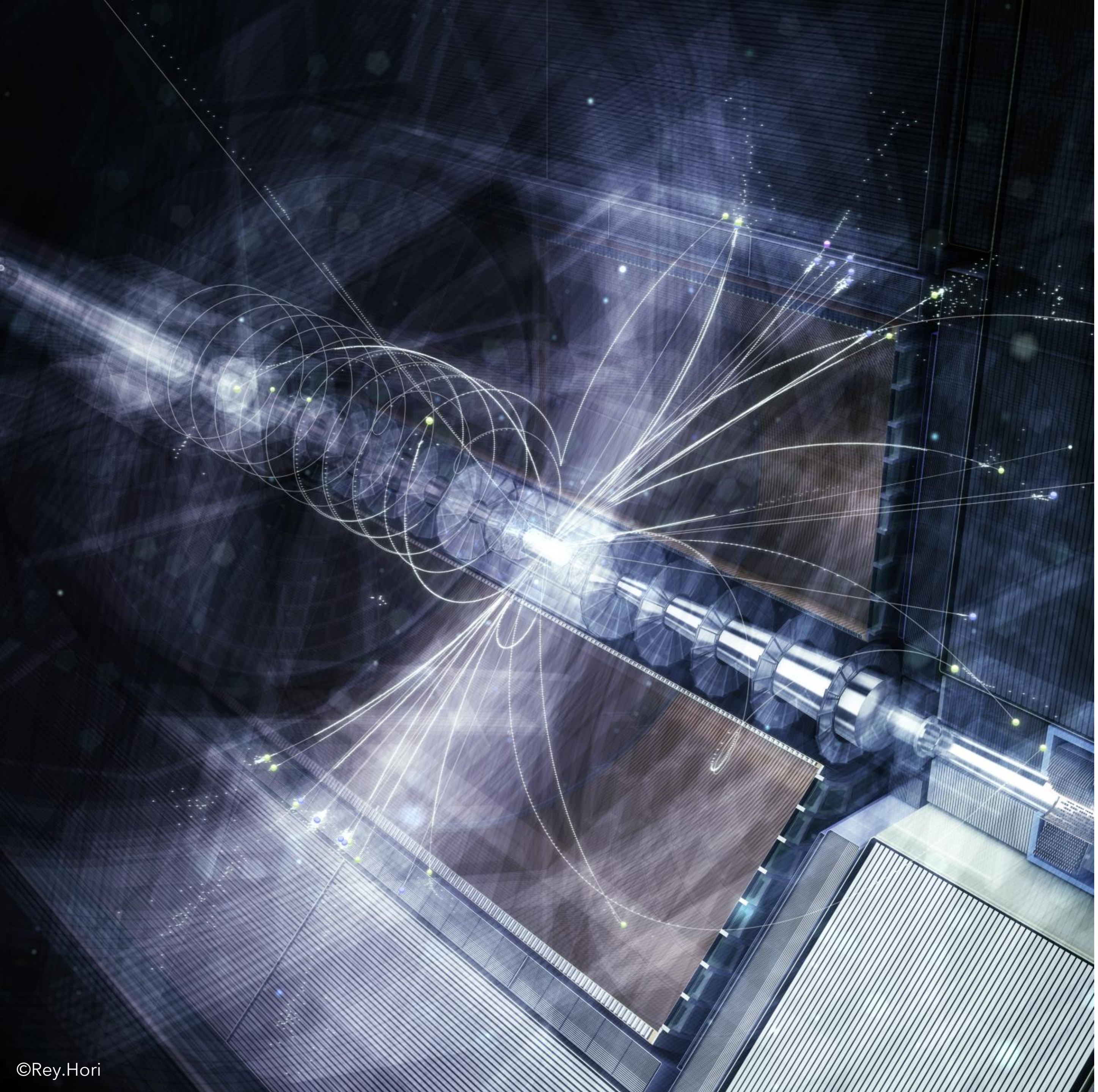


International Linear Collider: Project Status and Physics Overview

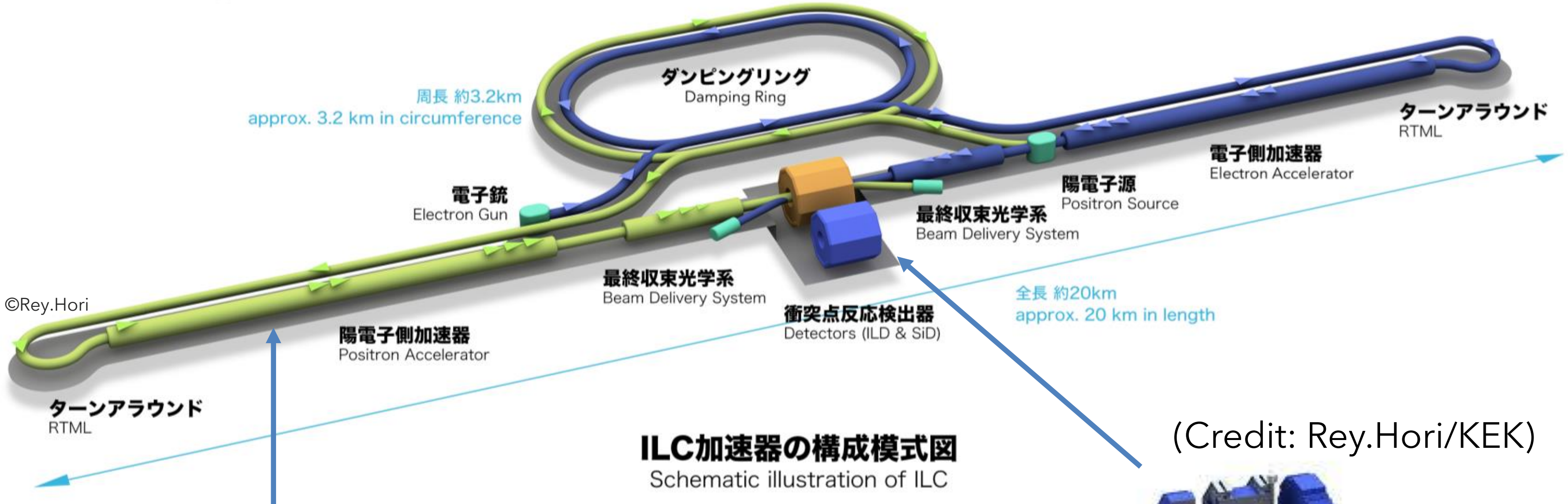
Tomohiko Tanabe
WPI Kavli IPMU, University of Tokyo

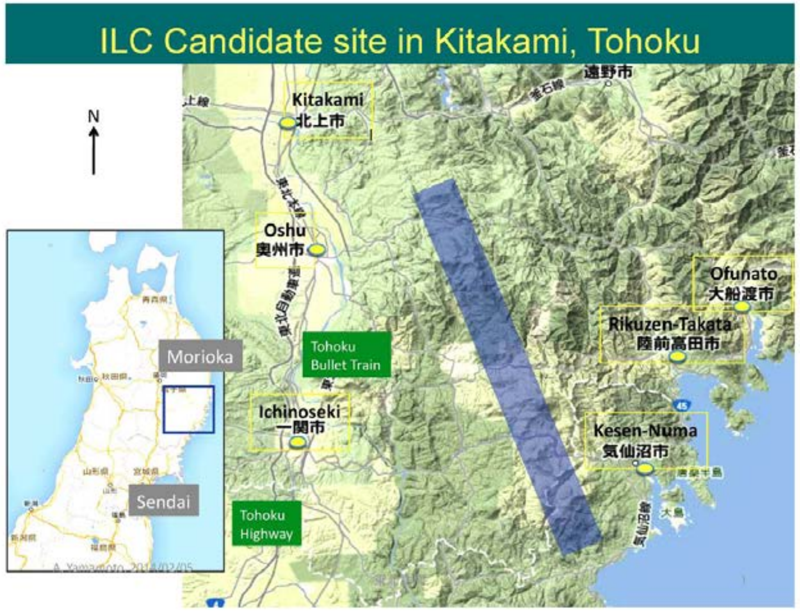
January 27, 2021

International Linear Collider

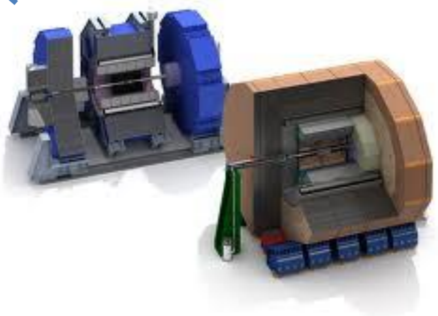
e^+e^- linear collider

Candidate Site:
Tohoku (Northeast), Japan





(Credit: Rey.Hori/KEK)



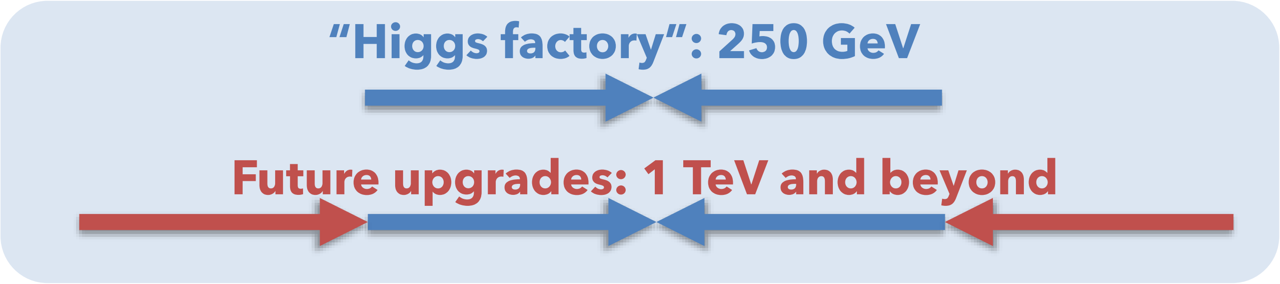
(Credit: Rey.Hori/KEK)

State-of-the-art Detector
Currently two proposals: SiD, ILD

21km underground tunnel
Superconducting RF acceleration technology:
Accelerating gradient 31.5 MV/m

Beam Polarization: P(e-) = 0.8, P(e+) = 0.3

Energy Extendibility



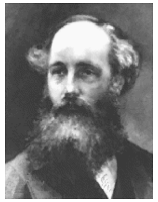
Energy Frontier in e+e- collisions for many decades to come

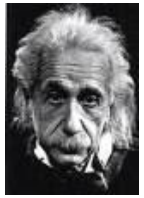
Towards the Ultimate Unification

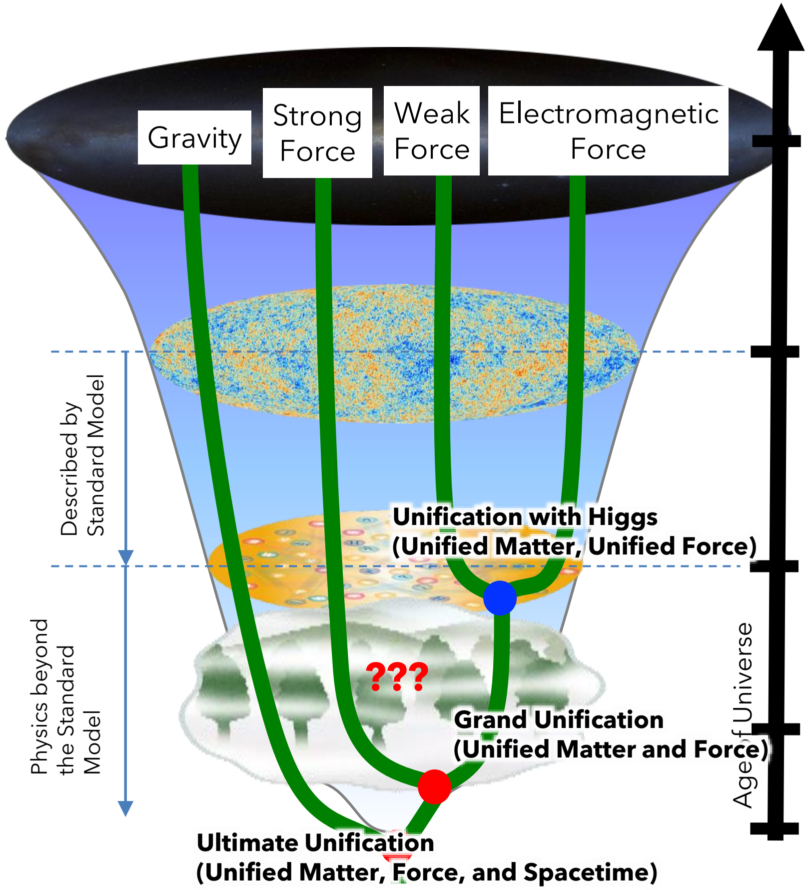
History of Physics:
A tale of unification of forces, matter, and spacetime

- Classical Mechanics unified laws of motion on Earth and of celestial bodies
- Maxwell's Equations unified electricity and magnetism
- Einstein's Theory of Relativity unified time and space, and gravity and spacetime
- Standard Model of Particle Physics unified the electromagnetic force with the weak force via the Higgs mechanism, and unified the matter fermions (leptons and quarks)


I. Newton


J.C. Maxwell


A. Einstein



History of Universe

13.8 billion yr: present day

Formation of galaxies and large structures seeded by dark matter

380,000 yr: Electrons and protons combine to form hydrogen atoms. Light cannot be used to probe before this point.

10^{-12} s: Electroweak phase transition. Vacuum expectation value becomes non-zero.

Probe the early universe by recreating its conditions (locally) with accelerators

10^{-36} s

10^{-43} s Birth of the universe

The ultimate goal is the unification of matter, forces, and spacetime.

How far can the ILC go?

Big Questions in Particle Physics

… that the Standard Model does not provide the answers for:

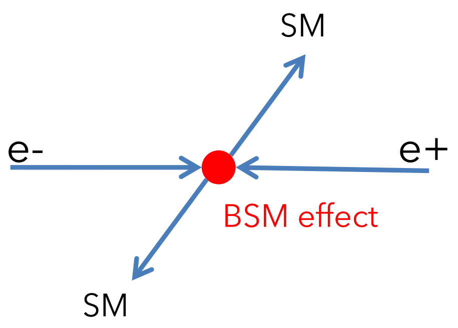
- **What is the origin of electroweak symmetry breaking?**
  - ➢ Is there new physics at the TeV scale?
    - ➢ Supersymmetry, Extra Dimensions, Composite Higgs
  - ➢ How did the Higgs field acquire a non-zero expectation value?
    - ➢ Higgs Self-coupling
- **What is the nature of Dark Matter?**
  - ➢ Supersymmetry, Dark Photons, Kaluza-Klein particles, Strong-Interacting Massive Particles, Axions
- **What happened to the anti-matter in the universe?**
  - ➢ CP violation in Higgs sector, Electroweak Baryogenesis, Leptogenesis
- **Why are there three generations of leptons and quarks?**
- **What is dark energy? How did inflation happen?**
  - ➢ Vacuum energy? Inflaton

➢ **How to create a theory of quantized gravity?**
  - ➢ Supersymmetry, Extra Dimensions (→ Quantum Gravity, Superstring Theory)
  - ➢ Gauge-Higgs unification

→ Yellow: To be probed at ILC 250 GeV, and continue probing with energy upgrades
→ Cyan: To be probed at ILC energy upgrades

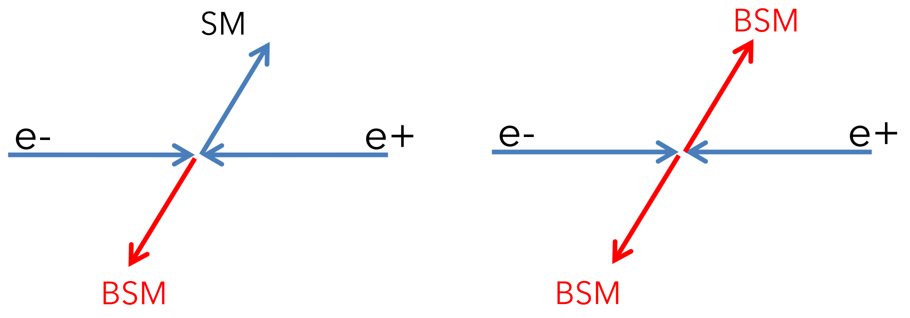
Ways to Discover New Physics

Virtual Effects



Sensitivity to new physics far beyond the collision energy

Direct Production



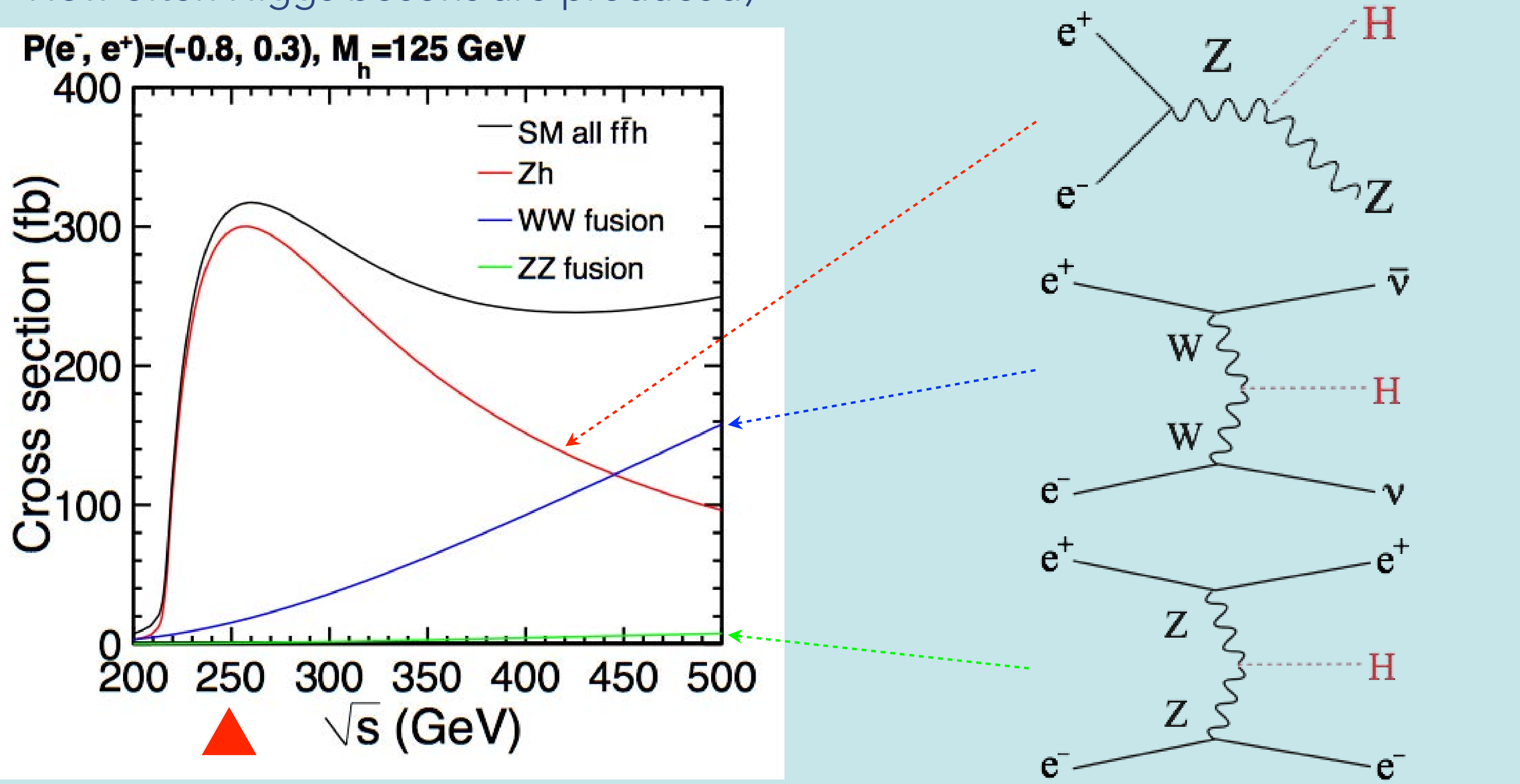
Can be discovered if produced (including invisible new particles)

Once discovered, study the phenomenon in detail
→ New laws of nature

250 GeV is Special

Single Higgs production is maximal

Production Cross Section
(=How often Higgs bosons are produced)

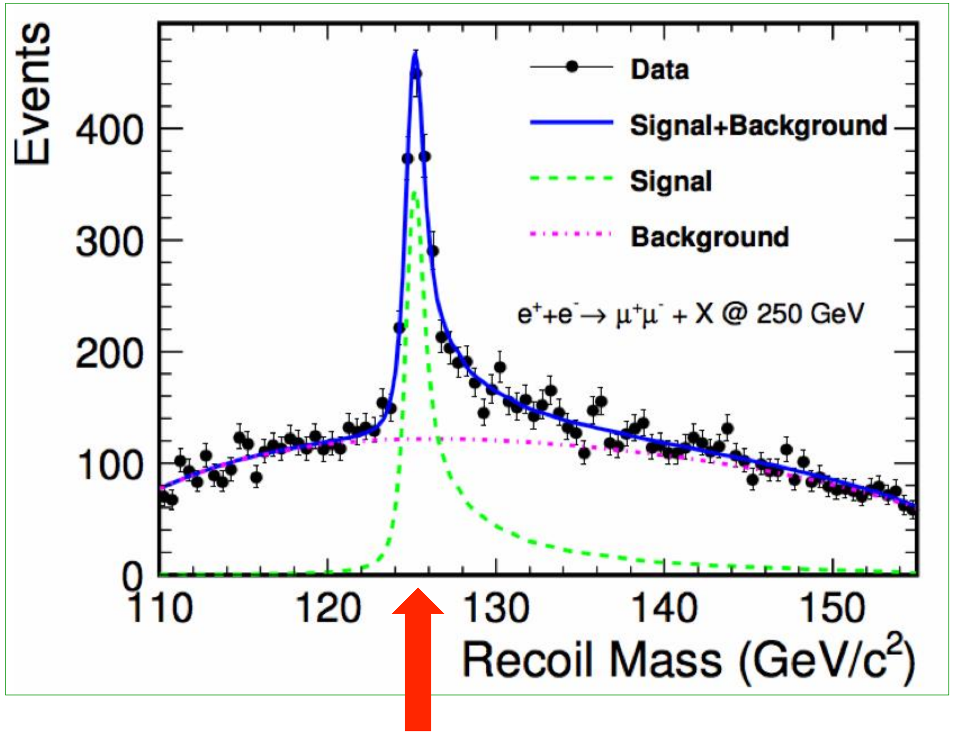


Approx. 0.5 million Higgs bosons with 2 ab^{-1} of data

Keisuke Fujii

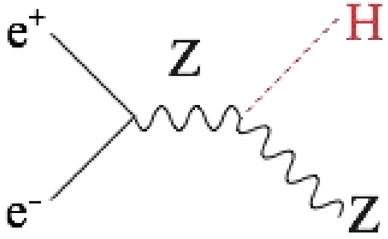
Produce many Higgs bosons, study them in detail

How does a Higgs signal look?



Yan, Watanuki, Fujii, Ishikawa et al.
Phys. Rev. D94 (2016) no.11, 113002

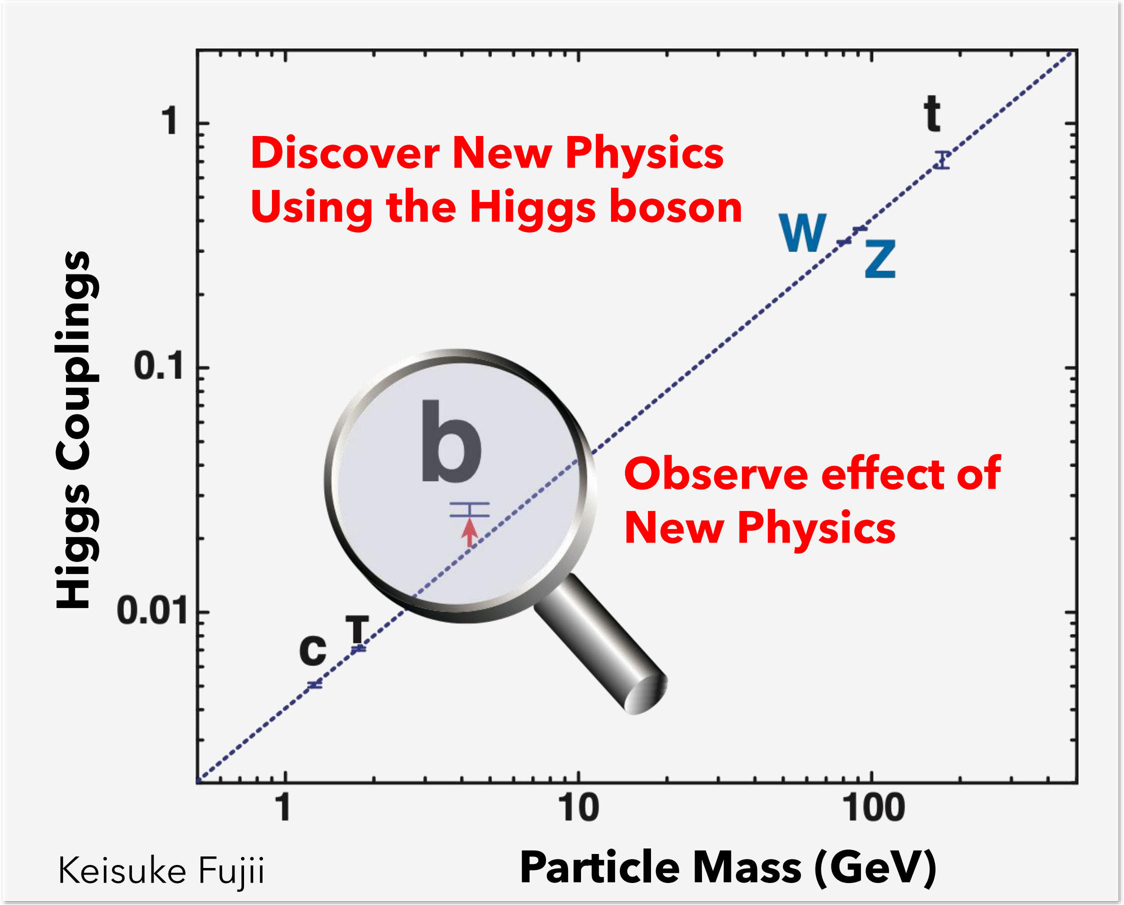
Background Events

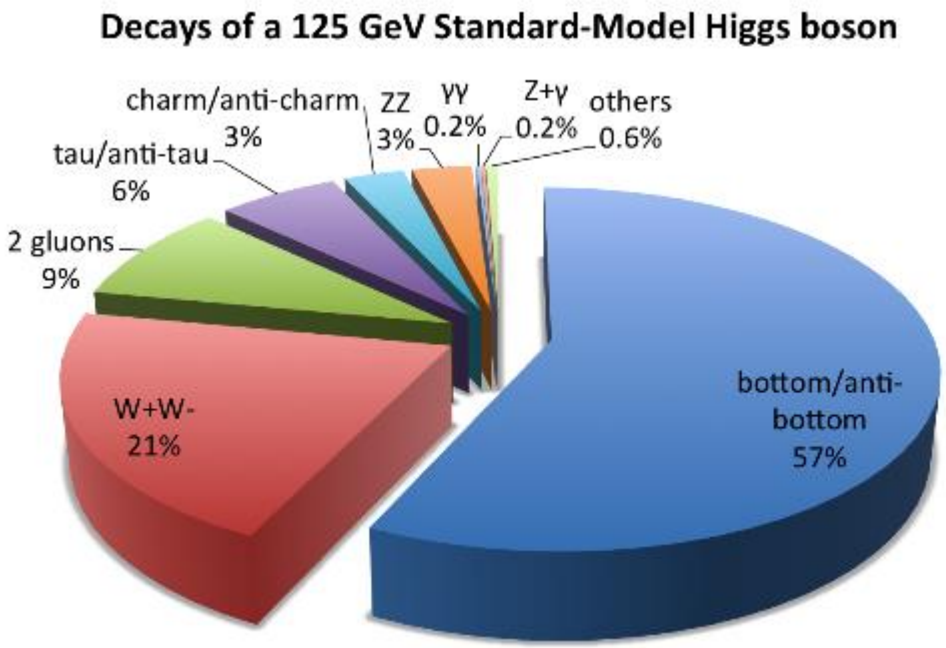


The Higgs signal events create a mass peak at 125 GeV

Higgs Couplings

Effects of new physics manifest as deviations in the Higgs couplings (strength of interactions between the Higgs and SM particle)

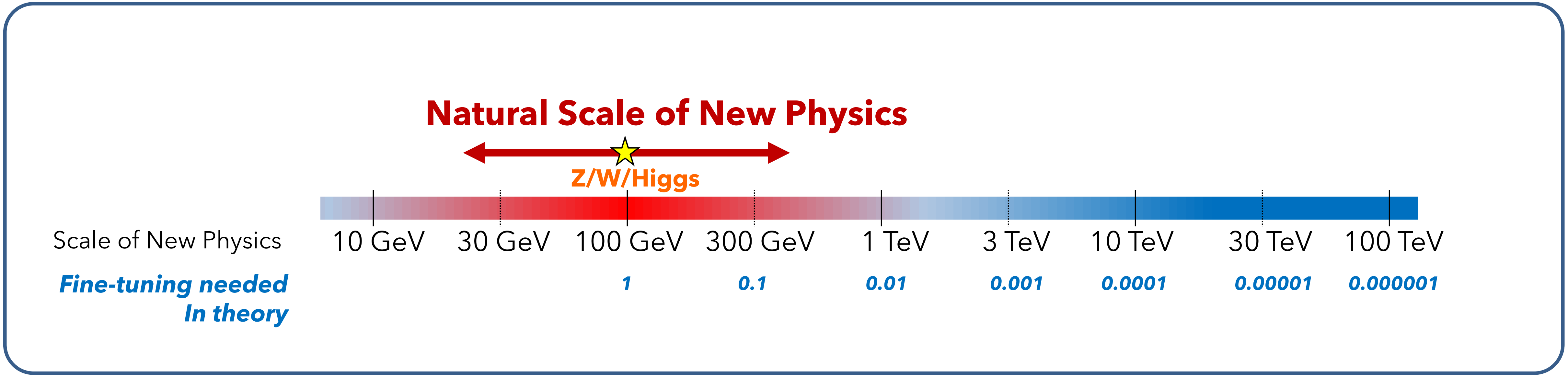




International Masterclasses for ATLAS

→ **If New Physics exists, these ratios are altered.**

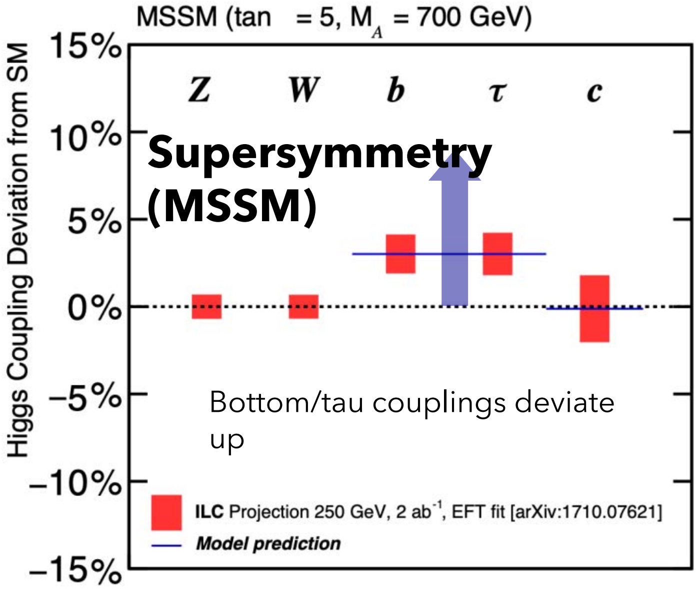
Naturalness



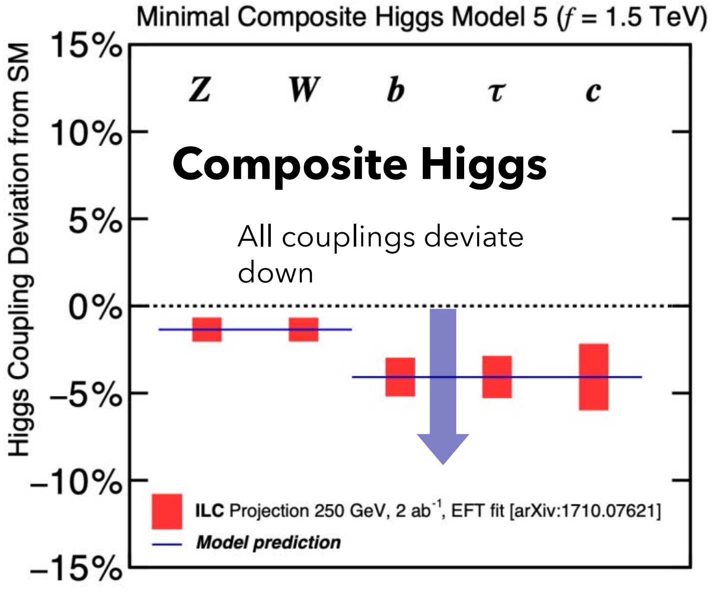
It is natural for new physics to be at the scale close to Z/W/Higgs bosons.

Higgs boson as a discovery probe

The pattern of the Higgs boson couplings provides crucial information about
The underlying new physics model.
→Discover Supersymmetry, Extra Dimensions, Composite Higgs models.
→Determine the next direction of particle physics
→Determine the next energy scale



ILC sensitivity up to 2 TeV
(Mass of the heavy Higgs boson mA)



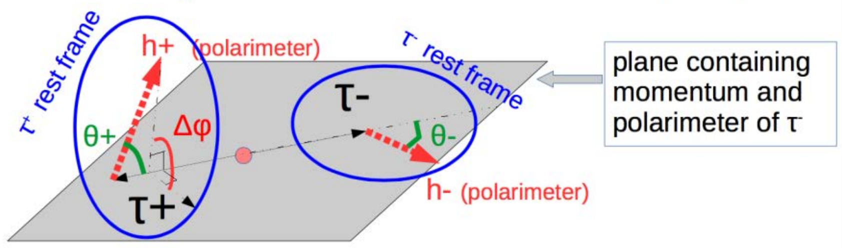
ILC sensitivity beyond 10 TeV
(In compositeness scale)

Probing CP violation in Higgs sector

Measuring CP in H → $\tau^+\tau^-$ at ILC

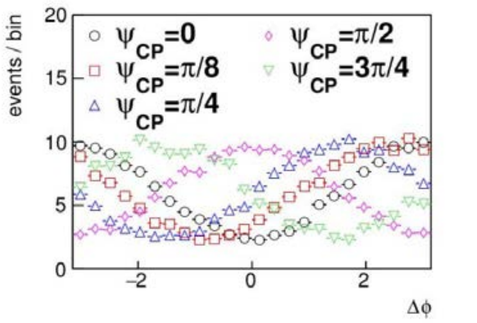
$$\mathcal{L}_{h\tau\tau} = g\bar{\tau}\left(\cos\Psi_{CP} + i\gamma_5 \sin\Psi_{CP}\right)\tau\, h$$

CP from polarimeters : taus from spin 0 parent



θ±, φ±	direction of h± with respect to τ- boost in τ± rest frame
Δφ	angle between polarimeter planes
ψ_{CP}	CP mixing angle we want to measure

Δφ at different ψ_{CP}



Δφ distribution shifts by $2\psi_{CP}$

$2ab^{-1}$ @ 250 GeV

$$\delta\Psi_{CP} \simeq 4^\circ$$

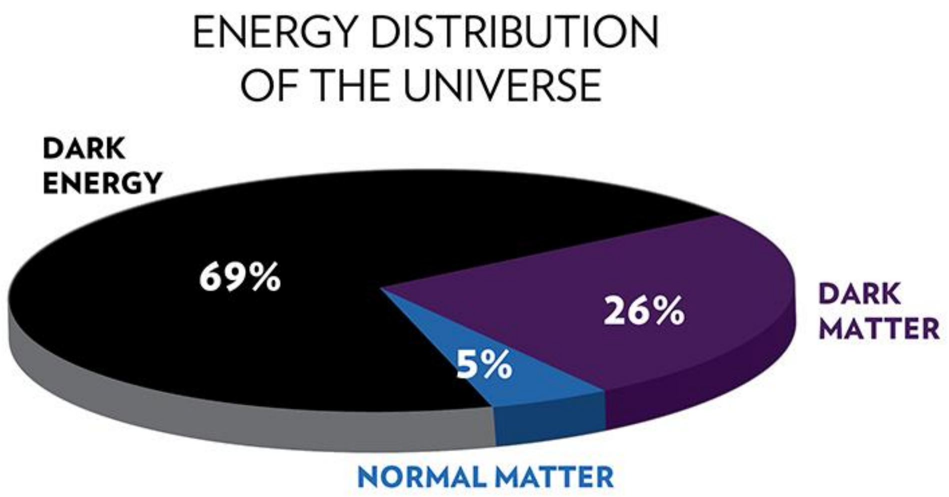
Daniel Jeans 2018

CP mixing angle precision: 4 degrees

→ Discover a new source of CP violation
→ Leads to Electroweak Baryogenesis

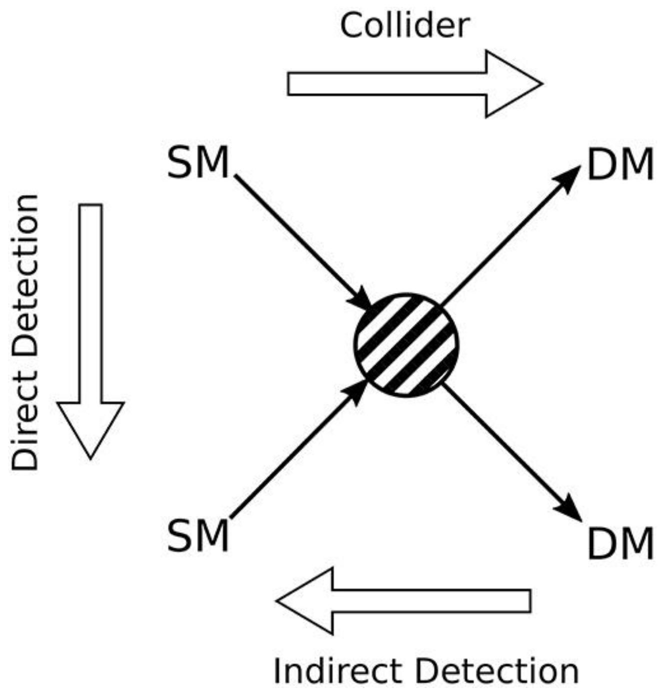
What is Dark Matter?

Dark matter accounts for five times the normal matter in the universe:



(Credit: NASA/CXC/K.Divona)

Various approaches for dark matter searches:



(Stefano Giagu)

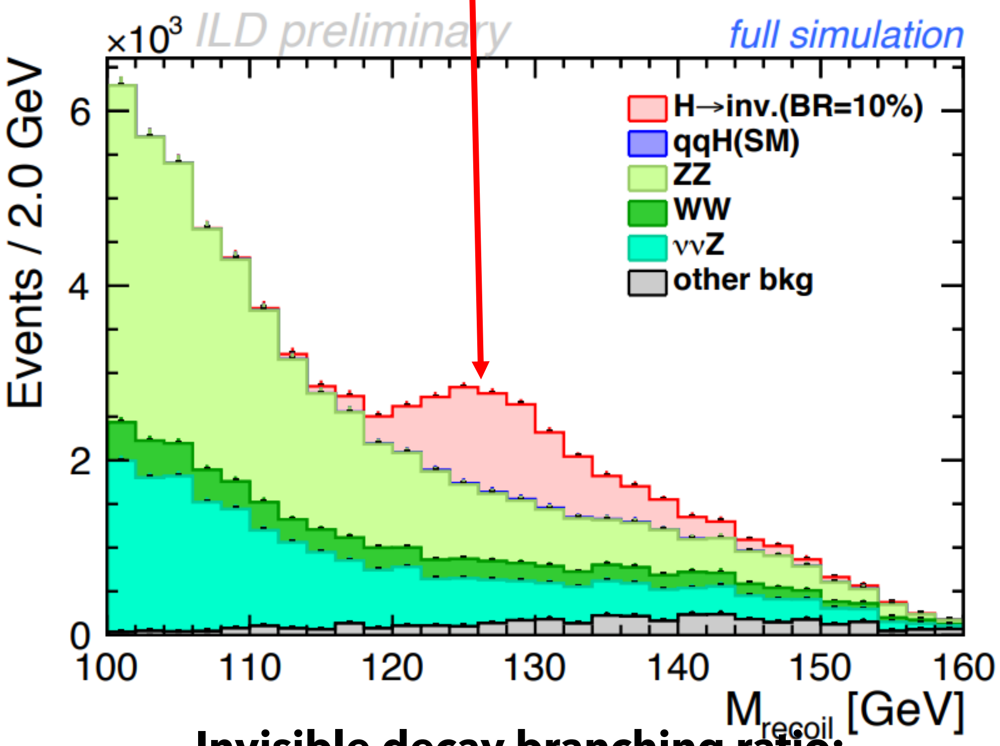
If produced in e+e- collisions, we can determine its:

- **Mass**
- **Production cross section**
- **Quantum numbers (chirality, spin, etc.)**

Higgs as a portal to dark matter

Effective for Higgs portal models (interaction between DM particle and Higgs)

Higgs decay to Dark Matter can be discovered



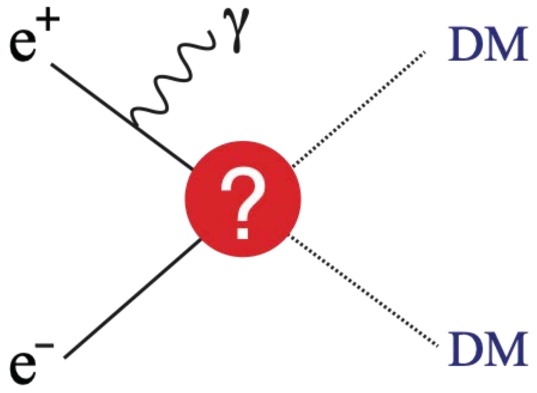
Invisible decay branching ratio: 0.3% (95% CL upper limit)

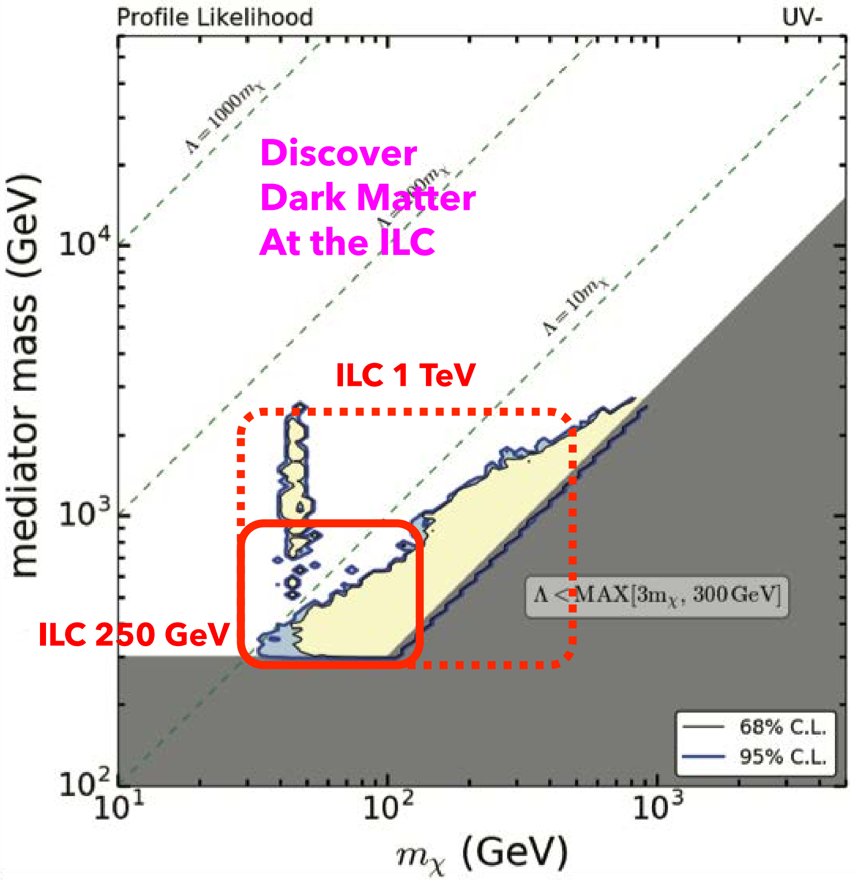
Kato, arXiv:2002.12048

Mono-Photon Search

Mono-photon dark matter search:
Sensitive to many types of dark matter

Especially effective for:
- **Dark matter that couples to leptons**
- **Dark matter that couples to Z bosons**

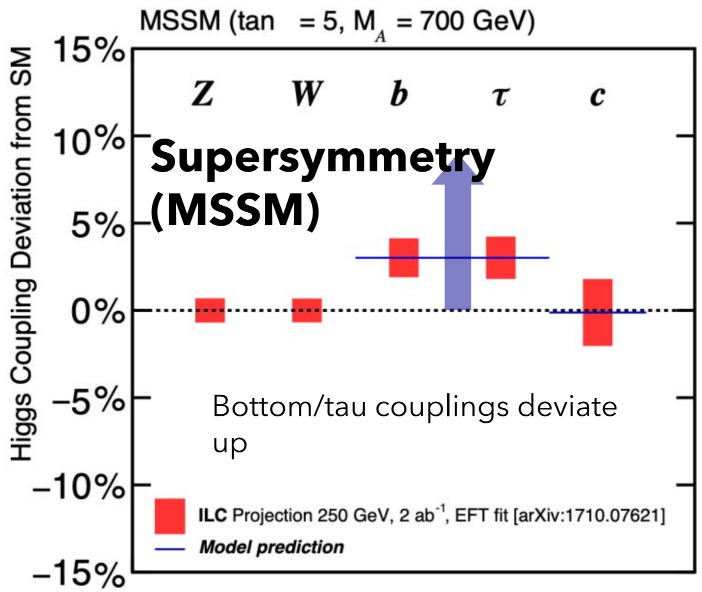




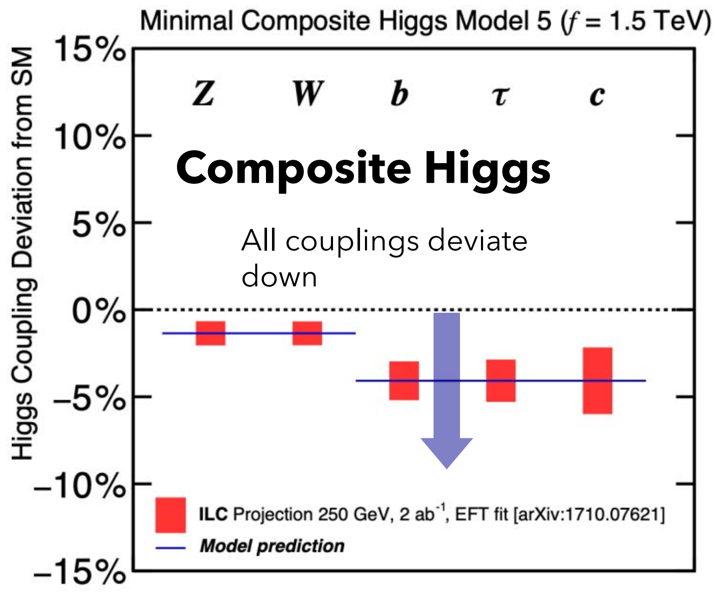
Matsumoto, Tsai, Tseng
JHEP 07 (2019) 050

Yellow: Remaining parameter space for ILC after taking into account projections for other experiments (HL-LHC, direct/indirect detection)

Higgs boson as a discovery probe



ILC sensitivity up to 2 TeV
(Mass of the heavy Higgs boson mA)



ILC sensitivity beyond 10 TeV
(In compositeness scale)

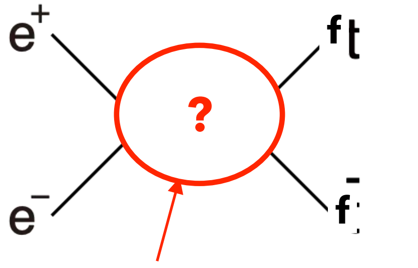
If evidence of supersymmetry, composite Higgs, or others is found, it provides us with clues about the nature of dark matter.

e.g., LSP: Lightest Supersymmetric Particle

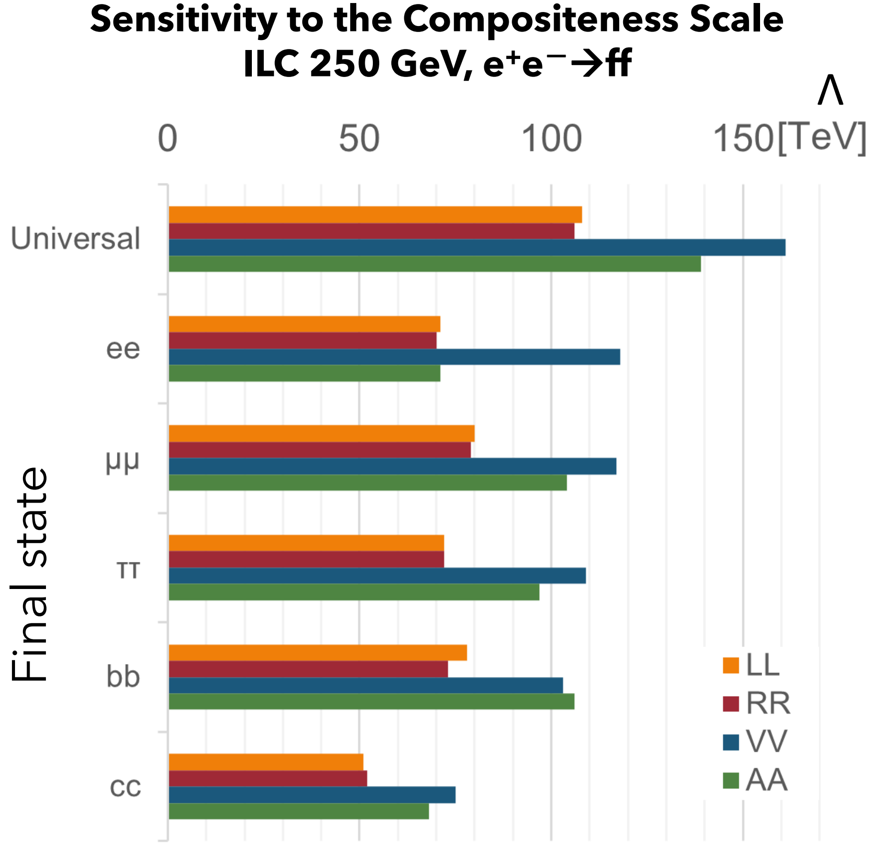
Probing O(10) TeV New Physics at ILC 250 GeV

For Fermion Pair Productions, e.g.
$e^+e^- \rightarrow \mu^+\mu^-$

Effects of compositeness / extra dimensions appear in the production rate and the angular distributions



Beam Polarization is Crucial



Based on numbers in arXiv:1908.11299

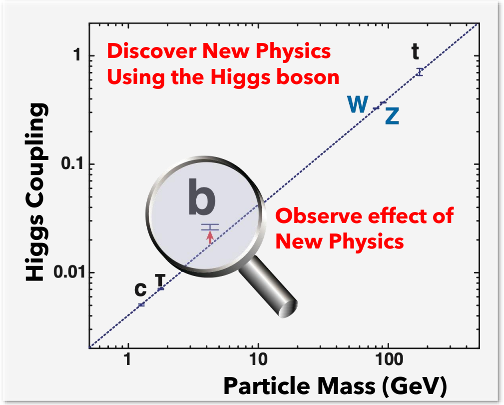
>50 TeV sensitivity

ILC 250 GeV Probes for New Physics

New Physics Using Higgs Boson

- Guaranteed Results at ILC
- Higgs Boson is Special

Total Cross Sec: e+e- → H (Z → e+e-)
Total Cross Sec : e+e- → H (Z → μ+μ-)
Total Cross Sec : e+e- → H (Z → q q)
Z Angular Distr.: e+e- → H (Z → e+e-)
Z Angular Distr.: e+e- → H (Z → μ+μ-)
Z Angular Distr.: e+e- → H (Z → q q)
Partial Cross Sections:
e+e- → (H → b b) (Z → e+e-)
e+e- → (H → c c) (Z → e+e-)
e+e- → (H → g g) (Z → e+e-)
e+e- → (H → τ+ τ-) (Z → e+e-)
e+e- → (H → μ+μ-) (Z → e+e-)
e+e- → (H → W W) (Z → e+e-)
e+e- → (H → Z Z) (Z → e+e-)
e+e- → (H → invisible) (Z → e+e-)
e+e- → (H → "exotic") (Z → e+e-)
e+e- → (H → b b) (Z → μ+μ-)
e+e- → (H → c c) (Z → μ+μ-)
e+e- → (H → g g) (Z → μ+μ-)
e+e- → (H → τ+ τ-) (Z → μ+μ-)
e+e- → (H → μ+μ-) (Z → μ+μ-)
e+e- → (H → W W) (Z → μ+μ-)
e+e- → (H → Z Z) (Z → μ+μ-)
e+e- → (H → invisible) (Z → μ+μ-)
e+e- → (H → "exotic") (Z → μ+μ-)
e+e- → (H → b b) (Z → q q)
e+e- → (H → c c) (Z → q q)
e+e- → (H → g g) (Z → q q)
e+e- → (H → τ+ τ-) (Z → q q)
e+e- → (H → μ+μ-) (Z → q q)
e+e- → (H → W W) (Z → q q)
e+e- → (H → Z Z) (Z → q q)
e+e- → (H → invisible) (Z → q q)
e+e- → (H → "exotic") (Z → q q)
Total Cross Sec. : e+e- → γ H
Photon Angular Distr. : e+e- → γ H
CP Effects
e+e- → (H → τ+ τ-) (Z → q q)
e+e- → (H → τ+ τ-) (Z → e+e-)
e+e- → (H → τ+ τ-) (Z → μ+μ-)
e+e- → (H → τ+ τ-) (Z → ν ν)
H → (W → q q) (W → q q)
H → (W → q q) (W → l ν)
H → (Z → q q) (Z → q q)
H → (Z → q q) (Z → l l)
H → (Z → l l) (Z → l l)



New Physics Using Electroweak Interactions

- Guaranteed Results at ILC
- 1,000x LEP in statistics
- Closely Related to Higgs
- Beam Polarization is crucial

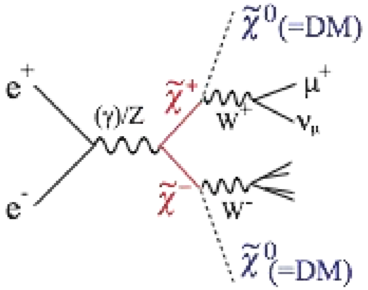
Cross Sec: e^+e^- → (W → q q) (W → q q)
Cross Sec : e^+e^- → (W → q q) (W → l ν)
Cross Sec : e^+e^- → (W → l ν) (W → l ν)
W Branching Ratio, Mass, Width:
e^+e^- → (W → q q) (W → q q)
e^+e^- → (W → q q) (W → l ν)
Triple-Gauge Couplings (CP-conserving) :
e^+e^- → (W → q q) (W → l ν)
Triple-Gauge Couplings (CP-violating):
e^+e^- → (W → q q) (W → l ν)
Cross Sec: e^+e^- → (Z → q q) (Z → q q)
Cross Sec : e^+e^- → (Z → q q) (Z → l l)
Cross Sec : e^+e^- → (Z → l l) (Z → l l)
Anomalous Triple Gauge Couplings (CP-conserving):
e^+e^- → (Z → q q) (Z → q q)
e^+e^- → (Z → q q) (Z → l l)
e^+e^- → (Z → l l) (Z → l l)
Anomalous Triple Gauge Couplings (CP-violating):
e^+e^- → (Z → q q) (Z → q q)
e^+e^- → (Z → q q) (Z → l l)
e^+e^- → (Z → l l) (Z → l l)
Cross Sec.: e^+e^- → γ Z
Photon Angular Distr. : e^+e^- → γ Z
Cross Sec. : e^+e^- → γ γ
Angular Distr. : e^+e^- → γ γ

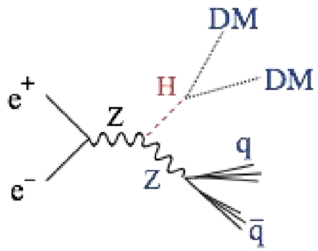
New Particle Direct Search

- Direct evidence of New Physics

New Higgs Boson Search:
e^+e^- → (Z → e^+e^-) + X
e^+e^- → (Z → $\mu^+\mu^-$) + X
e^+e^- → (Z → q q) + X
e^+e^- → A H
Charged Higgs Boson Search:
e^+e^- → H^- H^+, H → τ^+ ν, c s , c b
e^+e^- → W^- H^+
Doubly-Charged Higgs Boson Search:
e^+e^- → W^+ W^+ + X
e^+e^- → e^+e^+ + X e^+e^- → $\mu^+\mu^+$ + X
e^+e^- → $\tau^+\tau^+$ + X
Excited Lepton Search
Long-lived Particle Search
Heavy Ion Particle Search
New Particle Searches:

e^+e^- → e e + X	e^+e^- → μ μ + X
e^+e^- → τ τ + X	e^+e^- → e μ + X
e^+e^- → e τ + X	e^+e^- → μ τ + X
e^+e^- → b b + X	e^+e^- → c c + X
e^+e^- → q q + X	e^+e^- → b c + X
e^+e^- → b q + X	e^+e^- → c q + X
e^+e^- → g g + X	e^+e^- → e q + X
e^+e^- → μ q + X	e^+e^- → τ q + X
e^+e^- → W + X	e^+e^- → Z + X
e^+e^- → γ + X	





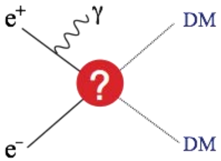
New Physics Using Two-Fermion

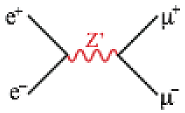
- Discover New Interaction
- 1,000x LEP in statistics
- Beam Polarization is crucial

Cross Sec. and Angular Distr. :

e^+e^- → e^+e^-	e^+e^- → $\mu^+\mu^-$
e^+e^- → $\tau^+\tau^-$	
e^+e^- → b b	e^+e^- → c c
e^+e^- → s s	e^+e^- → q q

Tau branching ratios
Tau polarization
Tau lifetime
Quark Compositeness
Lepton Compositeness
Search for Extra Dimensions





QCD / Nuclear Physics

- Guaranteed Results at ILC
- Important for understanding of background events
- Important for new particle search

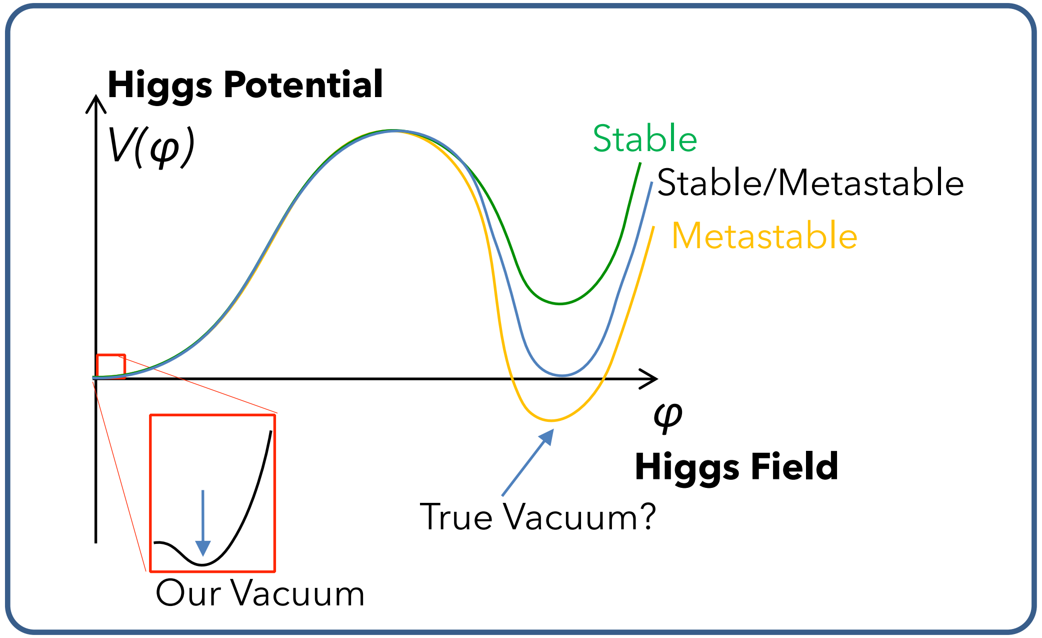
α_S (q^2) measurement
e^+e^- → b b, b b g, b b g g
e^+e^- → c c, c c g, c c g g
e^+e^- → q q, q q g, q q g g

Fragmentation Function measurement
b, c, s, q, gluon
Two-particle correlation within hadrons and hadron systems
b,c,s,u,d baryon/meson production and decay
Exotic hadron search:
Tetraquarks, pentaquarks, glueballs, etc.
Jet production in two-photon collisions
b,c,s,u,d baryon/meson production in two-photon collisions
Lepton production in two-photon collisions

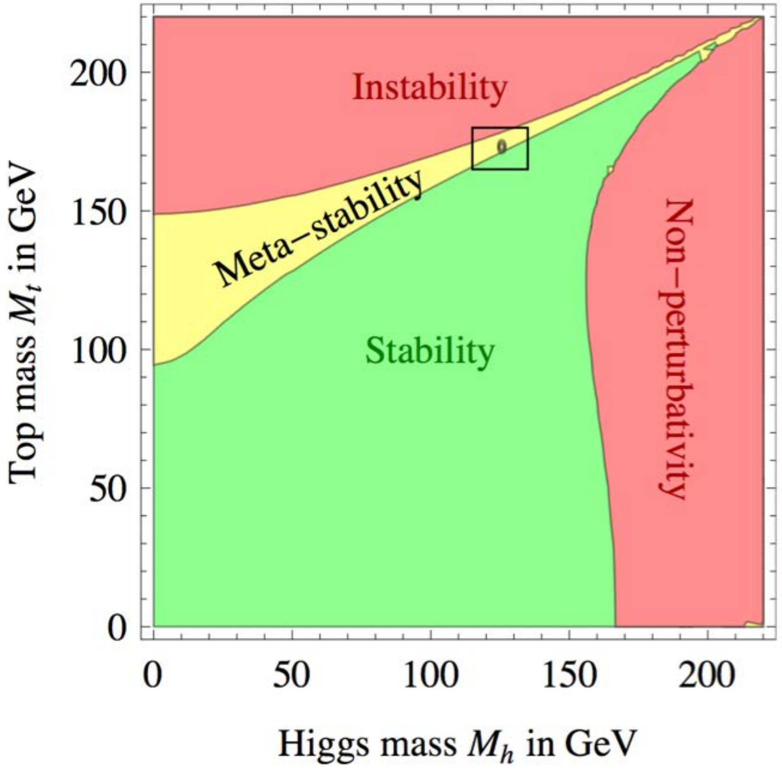
Keisuke Fujii

Vacuum Stability and Top Quark

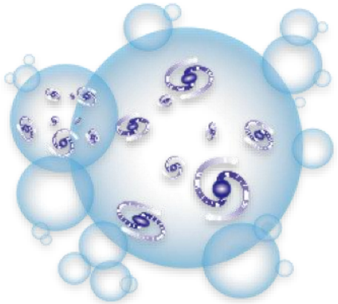
If the Standard Model turns out to be correct, the top quark mass determines the fate of our universe.



Keisuke Fujii



Degrassi, Di Vita, Elias-Miró, Espinosa, Giudice, Isidori, Strumia
JHEP 08 (2012) 098

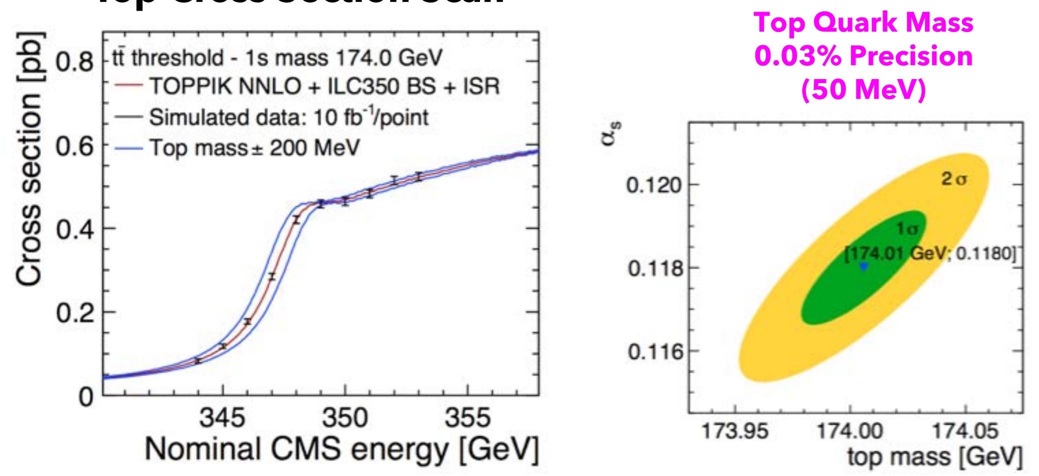


Froggatt, Nielsen (1995)
→ Top mass & Higgs mass are on the stable/metastable boundary
→ Baby Universes (Multiverse)?

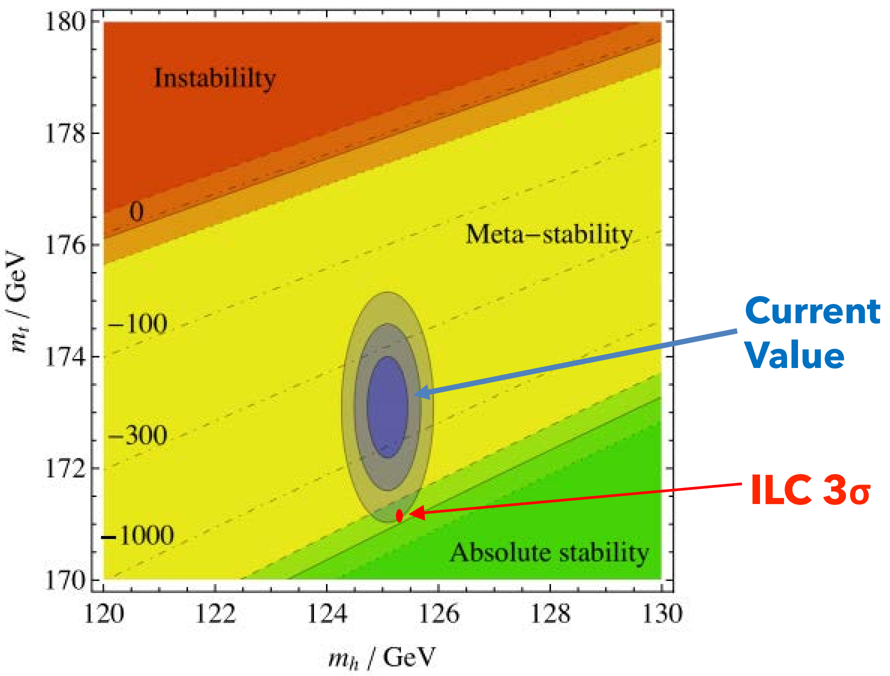
Top Mass Measurement at ILC

ILC 350 GeV

Top Cross Section Scan



Seidel, Simon, Tesar, Poss,
EPJC 73 (2013) 8, 2530



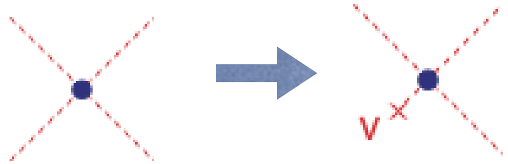
Chigusa, Moroi, Shoji
Phys. Rev. D 97, 116012 (2018)

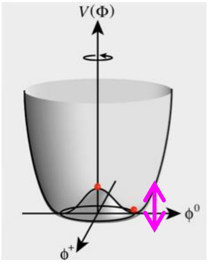
Precise Top mass measurement at ILC → Stability of the Universe

ILC 500 GeV
ILC 1 TeV

Higgs Self-Coupling

Higgs Self-coupling is direct evidence of vacuum condensation



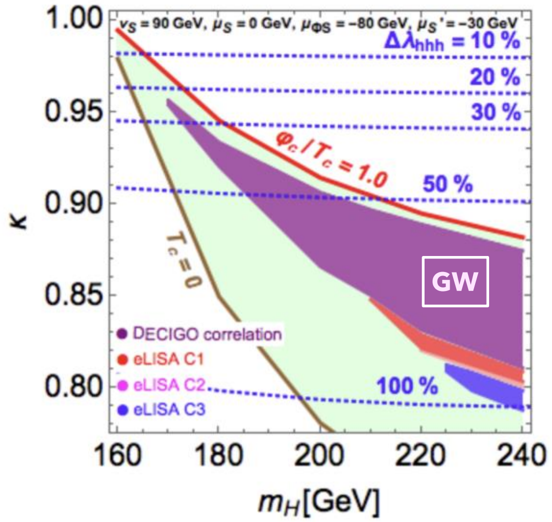


Higgs self-coupling
~depth of potential

Three-point coupling is originally absent due to gauge symmetry in the SM,
Manifests after electroweak symmetry breaking

If a large deviation is found:

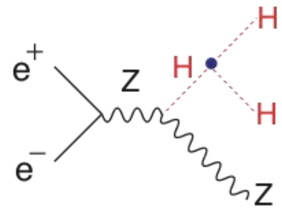
ILC + Satellite GW observation
→ Test Electroweak Baryogenesis



Fuyuto, Senaha, arXiv:1406.0433
Hashino, Kakizaki, Kanemura, Ko, Matsui, arXiv:1609.00297

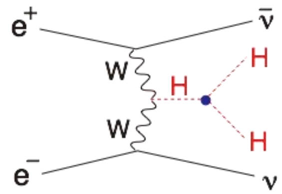
Measure Double Higgs Production:

~ 500 GeV

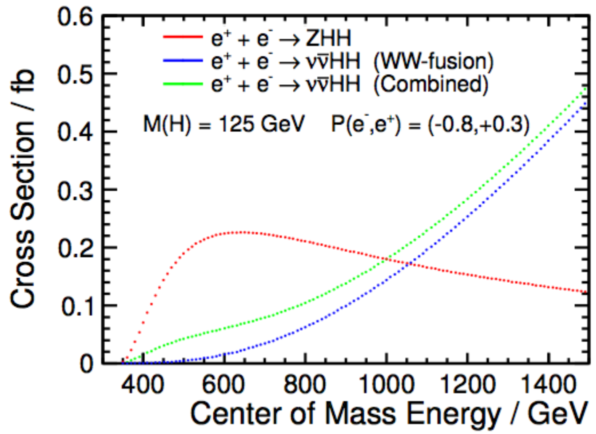


$\Delta\lambda/\lambda$ = 27%

~ 1 TeV



$\Delta\lambda/\lambda$ = 10%

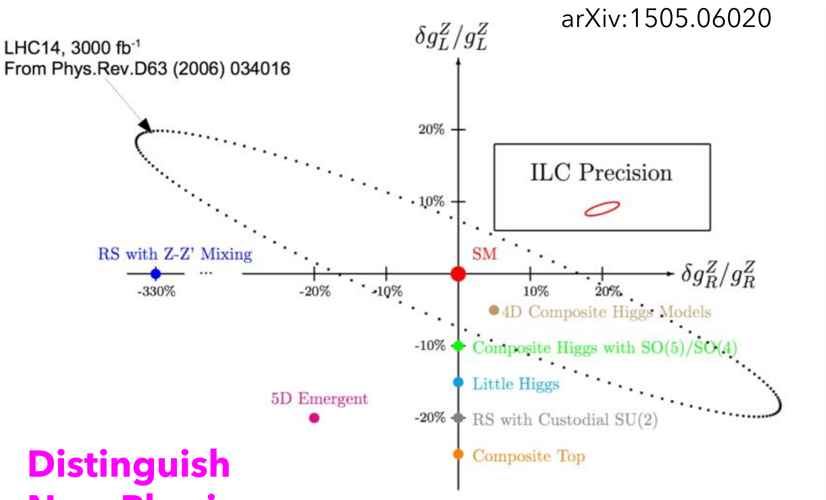


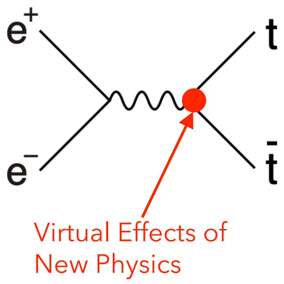
Top Electroweak Coupling / Top Yukawa Coupling

Effects of Extra Dimensions / Compositeness manifest in Top Electroweak Couplings and Top Yukawa Couplings

Top Electroweak Couplings

ILC 500 GeV is best



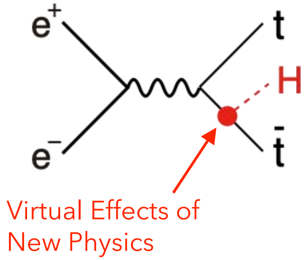


Distinguish New Physics Models

Sensitivity to typical Extra-Dimensional Scale M_{KK} ~25TeV

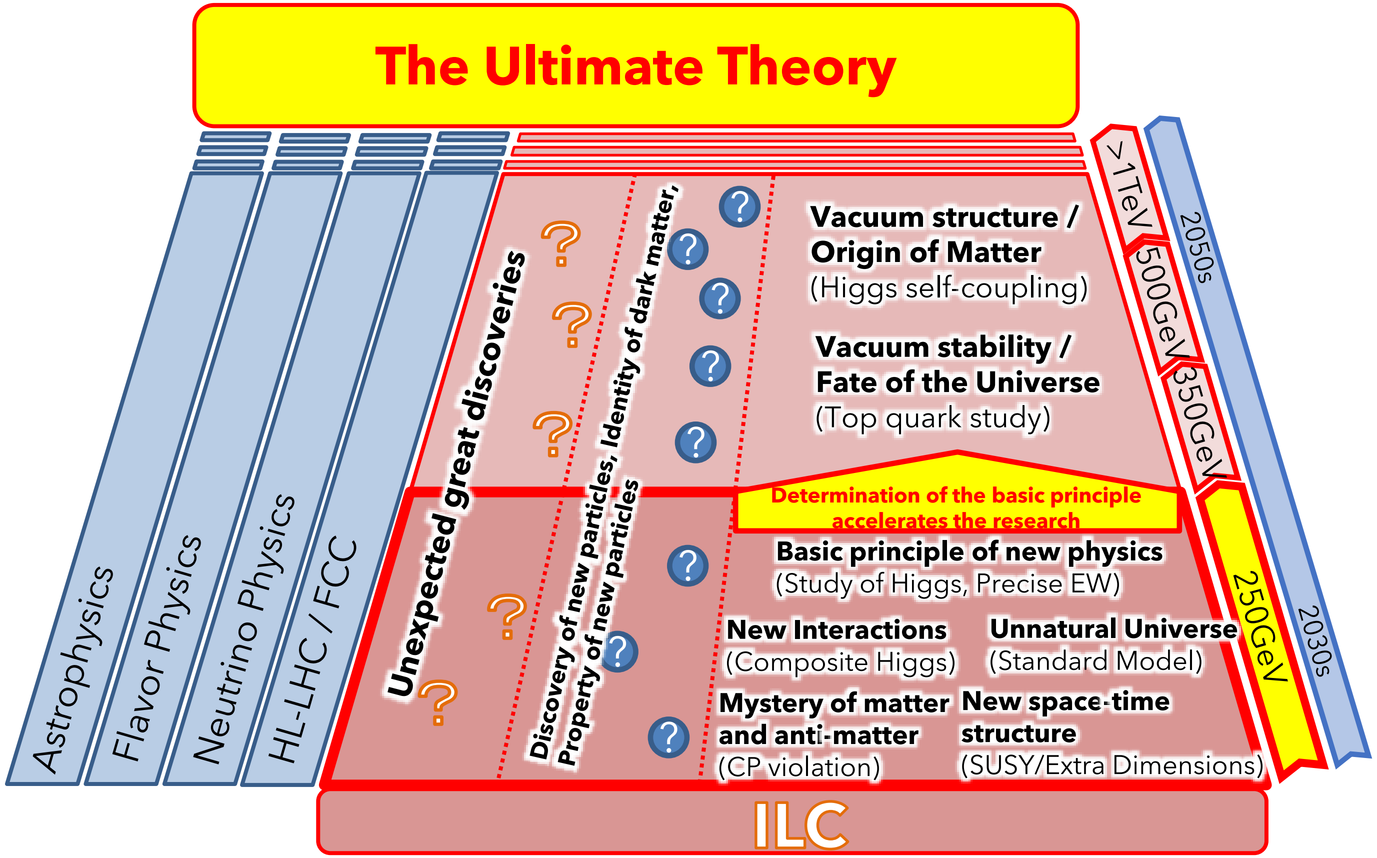
Top-Yukawa Coupling

ILC 500 GeV



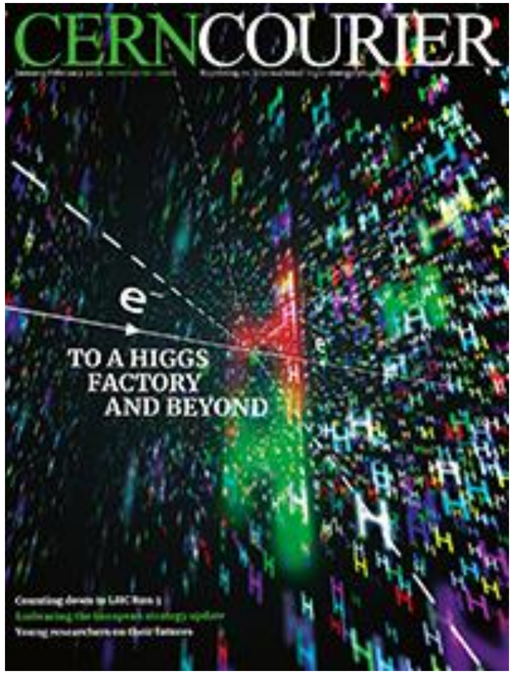
Sensitivity to typical Extra-Dimensional Scale M_{KK} ~10TeV

- ➢ The ILC will remain at the forefront of e+e- research for many decades
- ➢ Together with HL-LHC/FCC, neutrino, flavor, dark matter direct detection, astrophysics, etc., discover new physics and work toward the ultimate theory



- ➢ **Many opportunities for discoveries at the ILC**
  - Supersymmetry, Extra Dimensions, Compositeness → New Law of Nature
  - New Particles: Dark Matter, then Detailed Study of New Particles
  - Anti-matter in the Universe: New source of CP Violation
  - Vacuum Stability, Fate of Our Universe
  - Structure of Vacuum, Origin of Matter

CERN Courier
Jan/Feb 2021 Issue



Shiny linac *How an International Linear Collider in Japan might look. (credit: Rey.Hori/KEK)*

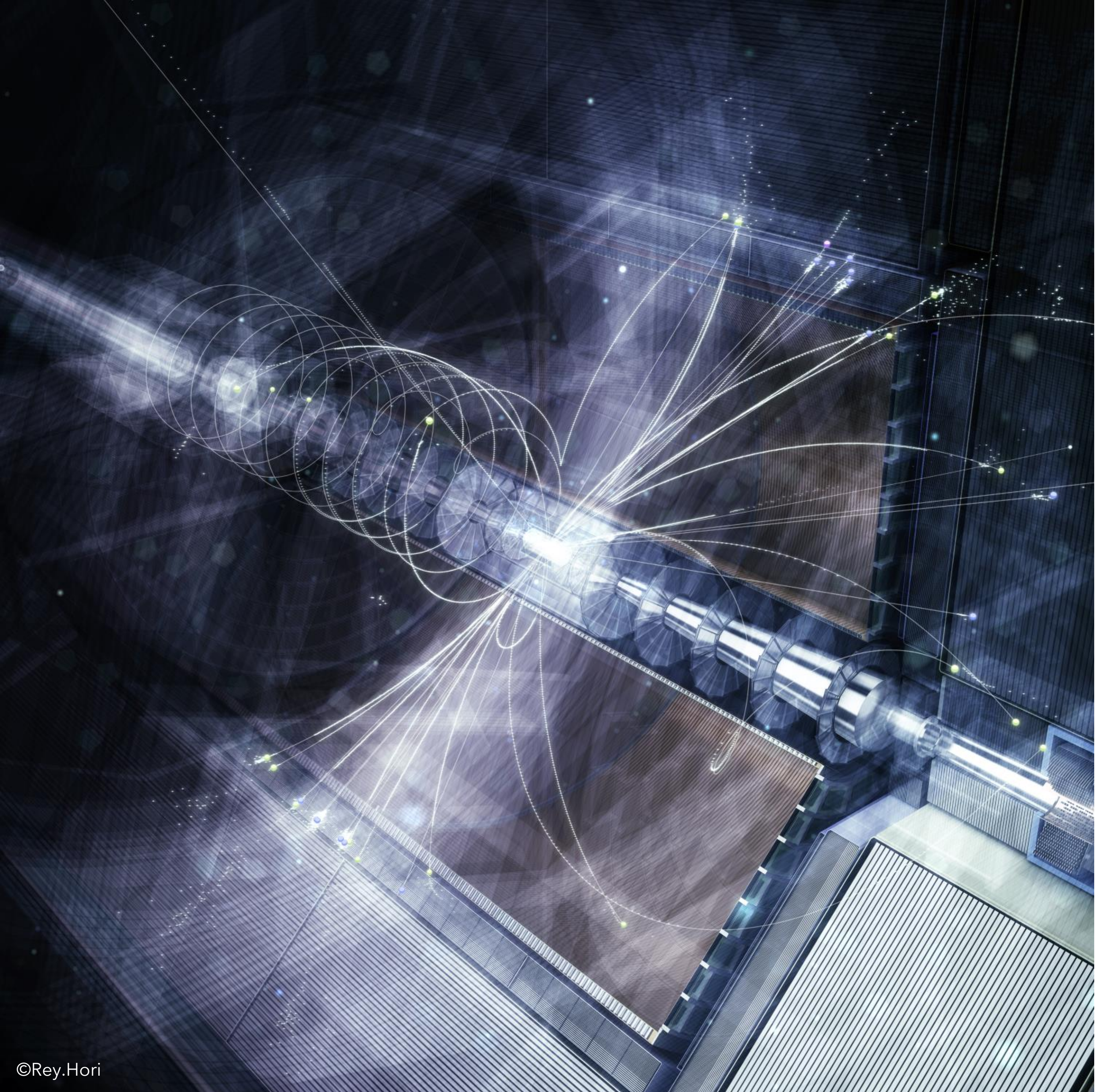
ILC: BEYOND THE HIGGS

The high-luminosity, polarised beams of the proposed International Linear Collider and the triggerless operation of its detectors offer rich physics opportunities beyond its Higgs-factory programme.

The International Linear Collider (ILC) is a proposed electron–positron linear collider with a Higgs factory operating at a centre-of-mass energy of 250 GeV (ILC250) as a first stage. Its electron and positron beams can be longitudinally polarised, and the accelerator may be extended to operate at 500 GeV up to 1 TeV, and possibly beyond. In addition, the unique time structure of the ILC beams (which would collide at short bursts of 1312 bunches with 0.554 ms spacing at a frequency of high-granularity sensors in the ILC detectors, giving unprecedented resolution in jet-energy measurements. It also results in an expected data rate of just a few GB/s, allowing collisions to be recorded without a trigger.

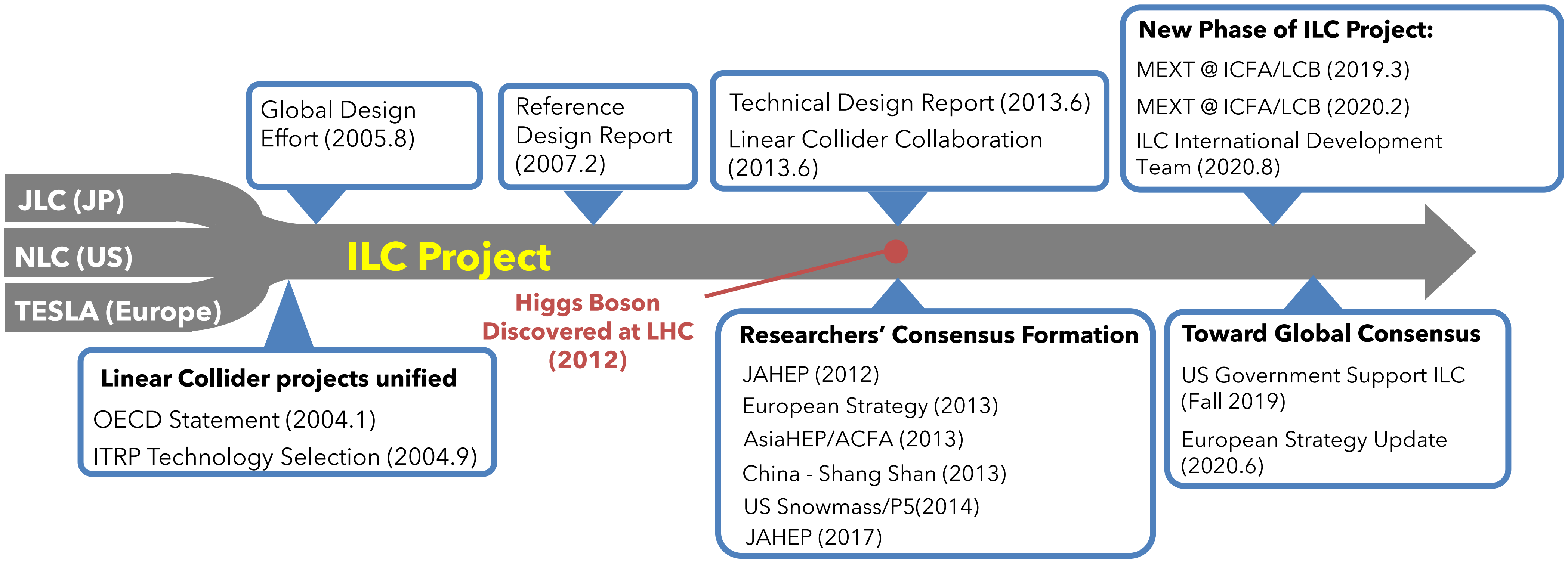
ILC250 primarily targets precision measurements of the Higgs boson (see p23). However, fully exploiting these measurements demands substantial improvement in our knowledge about many other Standard Model (SM) observables. Here, ILC250 opens three avenues:

THE AUTHORS
Jenny List *DESY,*
Jan Strube
University of Oregon and Pacific



ILC:
Project Status

Project History



Japan

Japanese Government: "Interest in the ILC project"

- Mar. 7, 2019: Ministry of Education, Culture, Sports, Science and Technology (MEXT) Presentation at ICFA/LCB meeting @ Tokyo
  "will continue to discuss the ILC project with other governments while having an interest in the ILC project"

- Feb. 20, 2020: MEXT Update Statement at ICFA/LCB meeting @ SLAC
  - Response by ICFA: https://icfa.fnal.gov/wp-content/uploads/ICFA_Statement_22Feb2020.pdf

→ ILC International Development Team (IDT) established in Aug. 2020 to plan for the ILC Pre-Laboratory (Pre-Lab)

United States

February 2020: Two Letters sent from US government expressing support for ILC in Japan

- US Deputy Secretary of State S. Biegun → JP Foreign Minister T. Motegi
- US Secretary of Energy D. Brouillette → JP Minister of State for S&T Policy N. Takemoto

Americas Workshop on Linear Colliders (Oct. 19-22, 2020)

Three speakers from US Government

NSF

DOE

Dept. of State

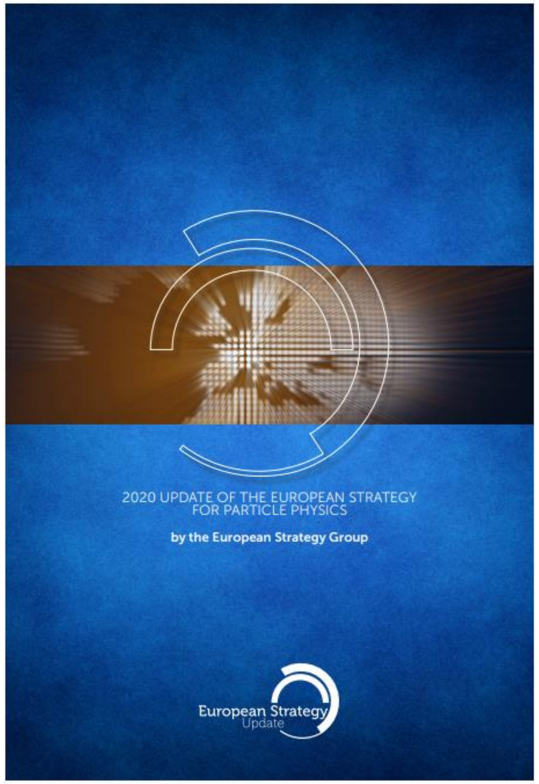
Speech Transcripts available at
https://agenda.linearcollider.org/event/8622/timetable/?view=standard

Europe

European Strategy for Particle Physics Update (Jun. 2020)
"The timely realisation of the electron-positron International Linear Collider (ILC) in Japan would be compatible with this strategy and, in that case, the European particle physics community would wish to collaborate."

6

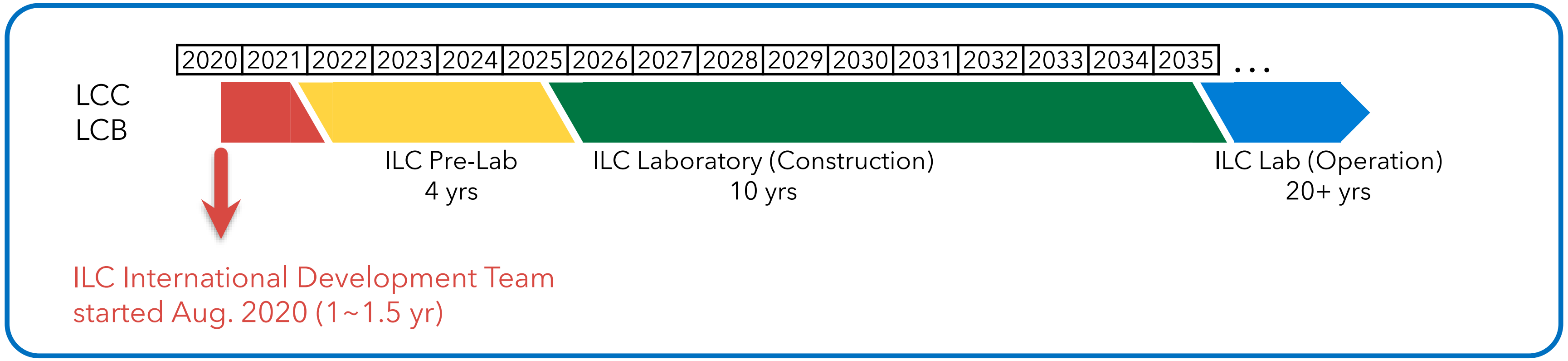
A. An ambitious next-generation collider project will require global collaboration and a long-term commitment to construction and operations by all parties. ***CERN should initiate discussions with potential major partners as part of the feasibility study for such a project being hosted at CERN. In the case of a global facility outside Europe in which CERN participates, CERN should act as the European regional hub, providing strategic coordination and technical support. Individual Member States could provide resources to the new global facility either through additional contributions made via CERN or directly through bilateral and multilateral arrangements with the host organisation.***



⇨ Anticipate breakthrough if Pre-Lab is realized

Project Timeline for ILC

Based on timeline published by KEK (June 2020)



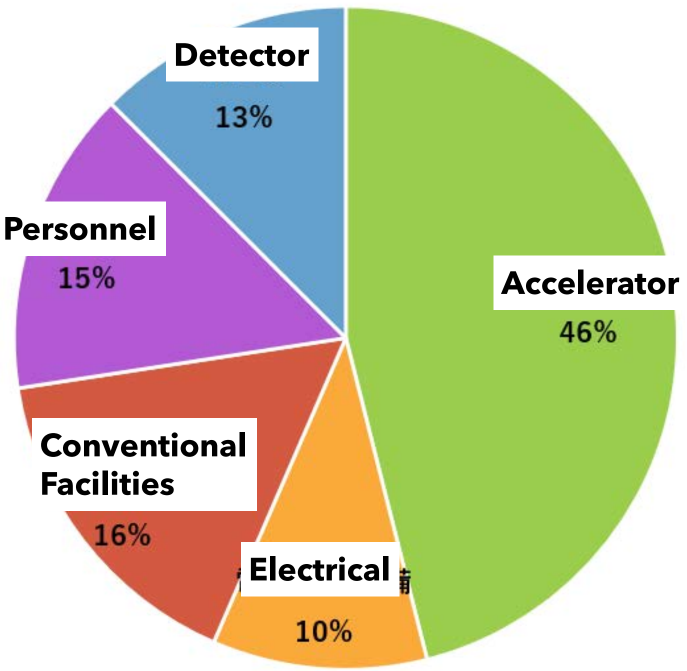
→ Commissioning mid-2030

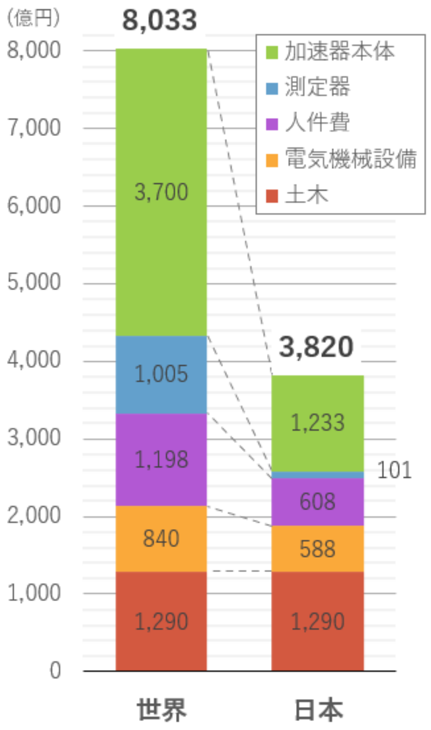

ICFA
ILC International Development Team
Executive Board
Americas Liaison Andrew Lankford (UC Irvine)
Working Group 2 Chair Shinichiro Michizono (KEK)
Working Group 3 Chair Hitoshi Murayama (UC Berkeley/U. Tokyo)
Executive Board Chair and Working Group 1 Chair Tatsuya Nakada (EPFL)
KEK Liaison Yasuhiro Okada (KEK)
Europe Liaison Steinar Stapnes (CERN)
Asia-Pacific Liaison Geoffrey Taylor (U. Melbourne)
Working Group 1
Pre-Lab Setup
Working Group 2
Accelerator
Working Group 3
Physics & Detectors

ILC Construction Cost

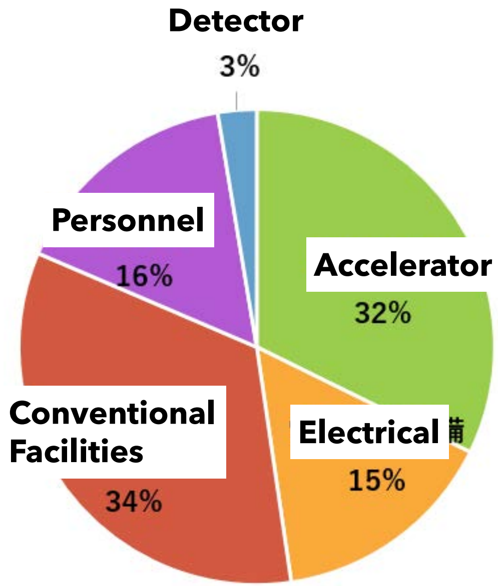
A model of international sharing

Total
8 billion USD

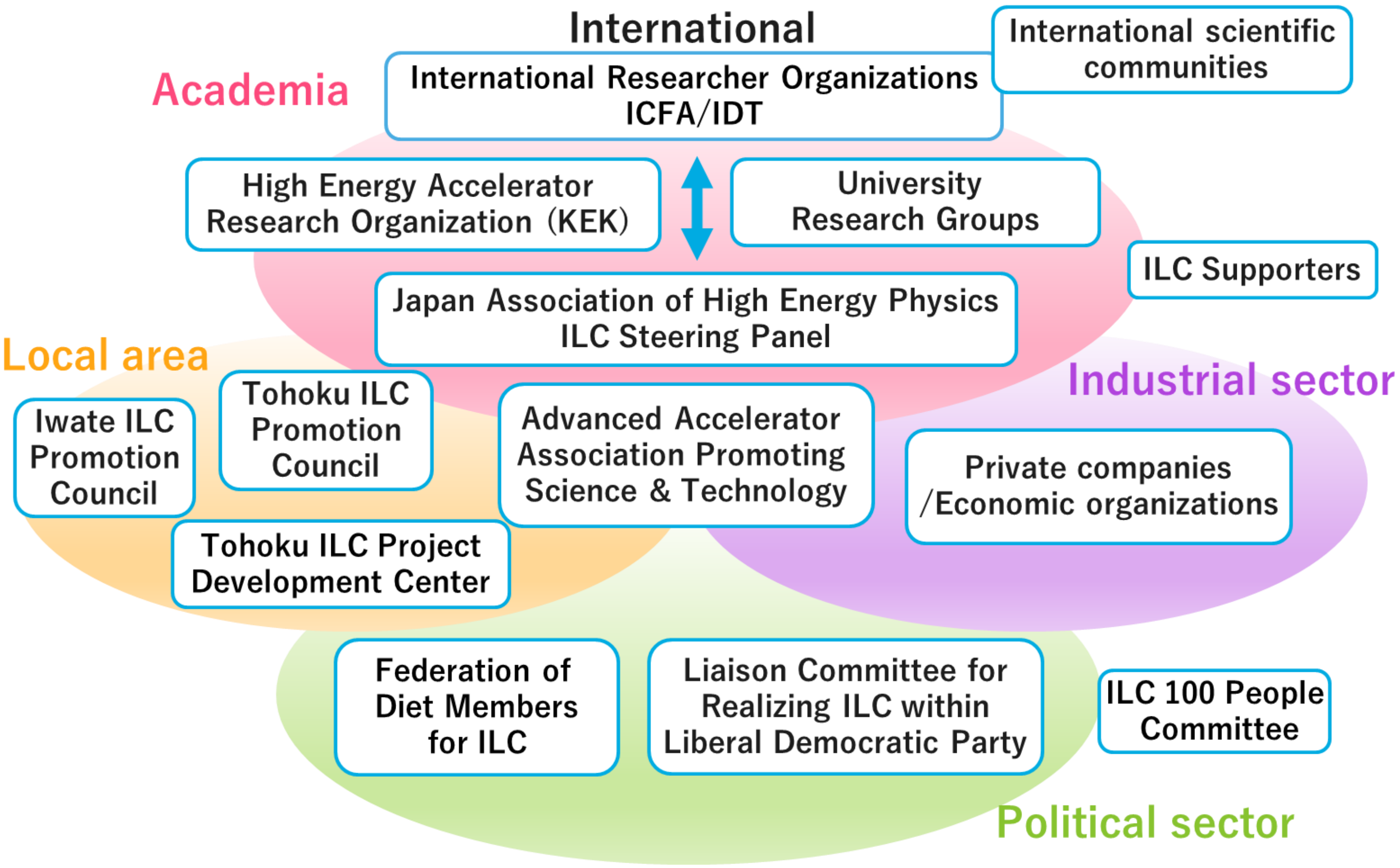




Host
4 billion USD



Organizations Promoting ILC in Japan



Tohoku ILC Project Development Center
Established Aug 2020
https://tipdc.org/en

ILC Newsline

http://newsline.linearcollider.org
December 2020 Issue

About | Current issue | Archive | Subscribe | Search | Contact

ilc newsline

24 DECEMBER 2020

PREPRINTS

ARXIV PREPRINTS

2011.12451
Study of $WW \to q\bar{q}\ell\nu$ at ILC500 with ILD

2011.04725
The see-saw portal at future Higgs Factories

2011.03551
Shining light through the Higgs portal with $\gamma\gamma$ colliders

2010.15057
Probing extended Higgs sectors by the synergy between direct searches at the LHC and precision tests at future lepton colliders

2010.05915
The Present and Future of Four Tops

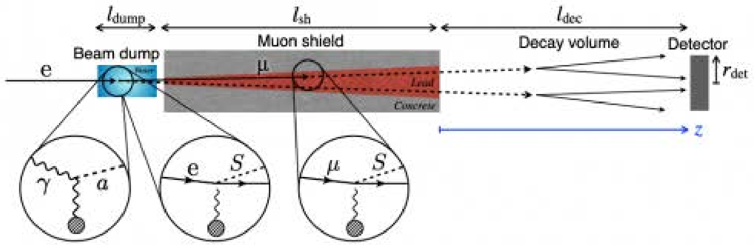
2009.13790
Search for new light particles at ILC main beam dump

TAG CLOUD

DIRECTOR'S CORNER

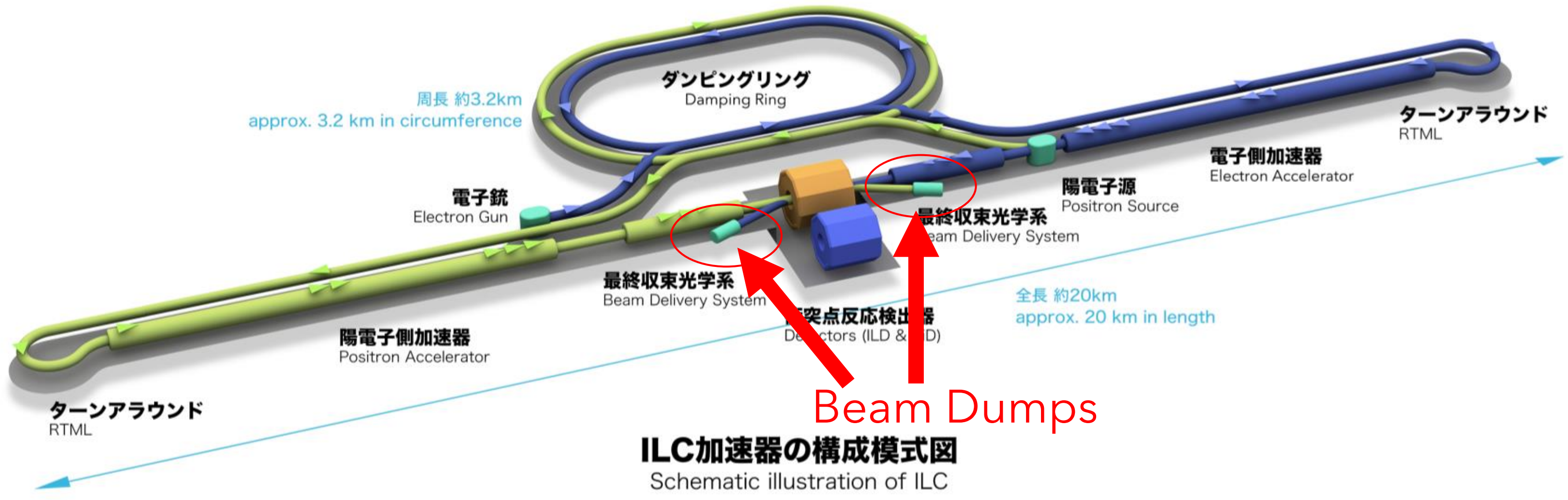
ILC++: an opportunity for all kinds of experiments

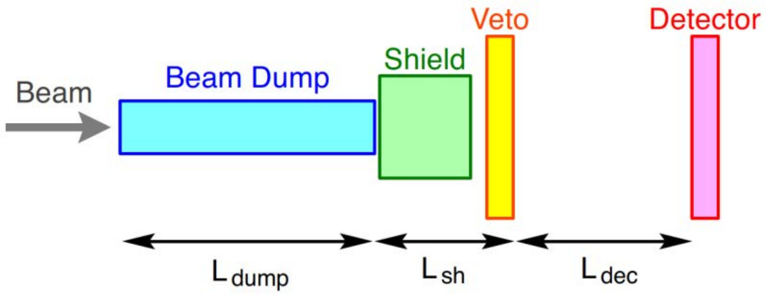
by Hitoshi Murayama

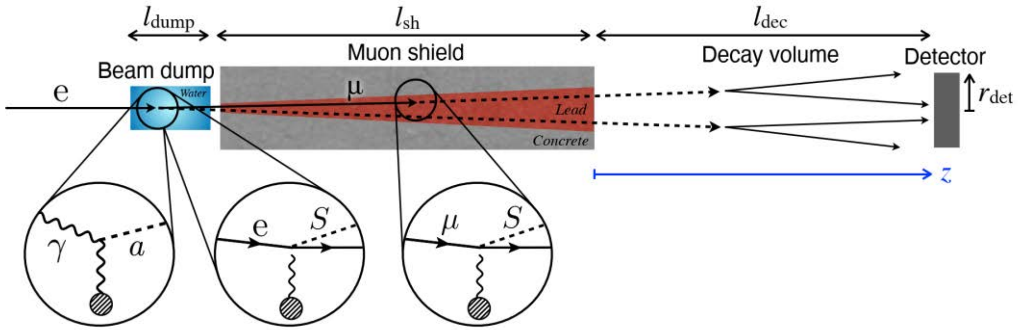


The ILC as it is planned today will offer a host of possible physics studies, writes Hitoshi Murayama, Director for Physics and Detectors in the International Development Team for the ILC. He asks: But why stop there? What else, however fancy it may seem now, can you see the ILC doing – fixed-target experiments, experiments at the beam dump or or near the interaction point? Now is the time to propose them!

Experiments at the Beam Dump?





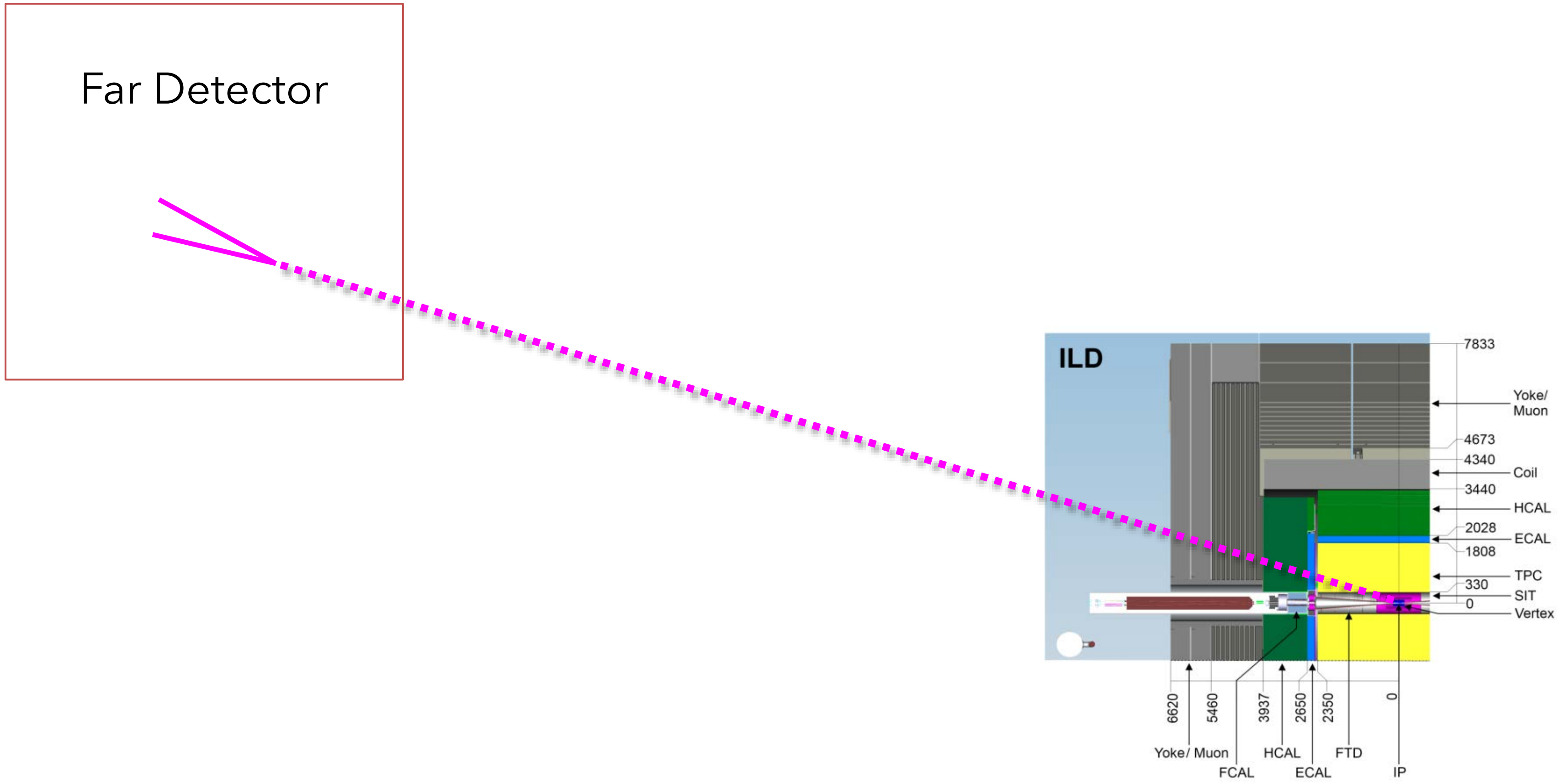


Kanemura, Moroi, TT
Phys.Lett.B 751 (2015) 25-28

Sakaki, Ueda, arXiv:2009.13790

Detector new particles produced around the beam dump

Experiments at Far Detectors?



Detect long-lived new particles produced in e+e- collisions

LHC version:
FASER, MATHULSA,

Two Workshops in 2021

International Workshop on Linear Colliders: LCWS2021
March 15-19, 2021
All virtual meeting
(Hosted by European ILC community)

Workshop on EOIs
October 26-29, 2021
Tokyo/Tsukuba, Japan
In-person meeting if the situation allows
(If not, virtual meeting)

Discussions on new ideas for experiments at the ILC

Your idea for a new experiment could soon become reality!

(Please publish and come to the workshops)

Timeline for Experiments

Under consideration by ILC-IDT

Pre-Preparatory Phase	Main Preparatory Phase				Construction
	Year 1	Year 2	Year 3	Year 4	

- Establish ILC Committee (ILC)
- Call for **Expression of Interest (EoI)**
  → Call for various ideas for experiments at the entire ILC facility
- Call for **Letters of Intent (LoI)**
  → LoIs to advance to the next step selected by ILCC
- Call for **Technical Proposal /Technical Design Report**
  → Final project selection by ILC Laboratory, proceed to construction

For more information about ILC promotion in Japan:

Document summarizing the ILC promoting activities in Japan (Jan. 16, 2021):

http://jahep-ilc.org/files/ILC_JP_update_20210116_E.pdf

Recent Progress Towards the Realization of the ILC in Japan:
Cooperative Efforts by Academia, Industry, and Local Region

January 16, 2021

JAHEP ILC Steering Panel[1]

Introduction

1. The International Linear Collider (ILC) is a large-scale project that requires global cooperation. In Japan, people not only from the academic sector, but also from the political, industrial, business sectors and local communities of the candidate site for construction and its surrounding areas, are now working together to promote the ILC in Japan and are considering the various preparations needed for the realization of the ILC.

   International discussions among governments, and politics-industry-government-academia sectors are also ongoing. Among such international activities, clear support for the ILC sited in Japan shown by the US government since the fall of 2019 has become a great driving force for the realization of the ILC.

2. This report summarizes the latest status of such efforts towards the realization of the ILC in various sectors of Japan. We will continue to report the status in future. We hope that this report will be widely shared by the research communities around the world as useful input information for international discussions.

3. On March 7, 2019, at the Linear Collider Board (LCB) meeting held in Tokyo, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) announced the view of the Japanese government regarding the ILC project. Following this, at the LCB meeting held at SLAC in the United States on February 22, 2020, MEXT and the Federation of Diet Members for the ILC reported on the progress of the project, and the Director of the Office of Science of the U.S. Department of Energy gave a speech on the views from U.S. Based on these presentations, the International Committee for Future Accelerators (ICFA) decided to advance the ILC project to the next phase by establishing the ILC International Development Team (IDT) in August 2020, whose mandate is to make preparations to establish the ILC Pre-Laboratory (Pre-Lab)[2].