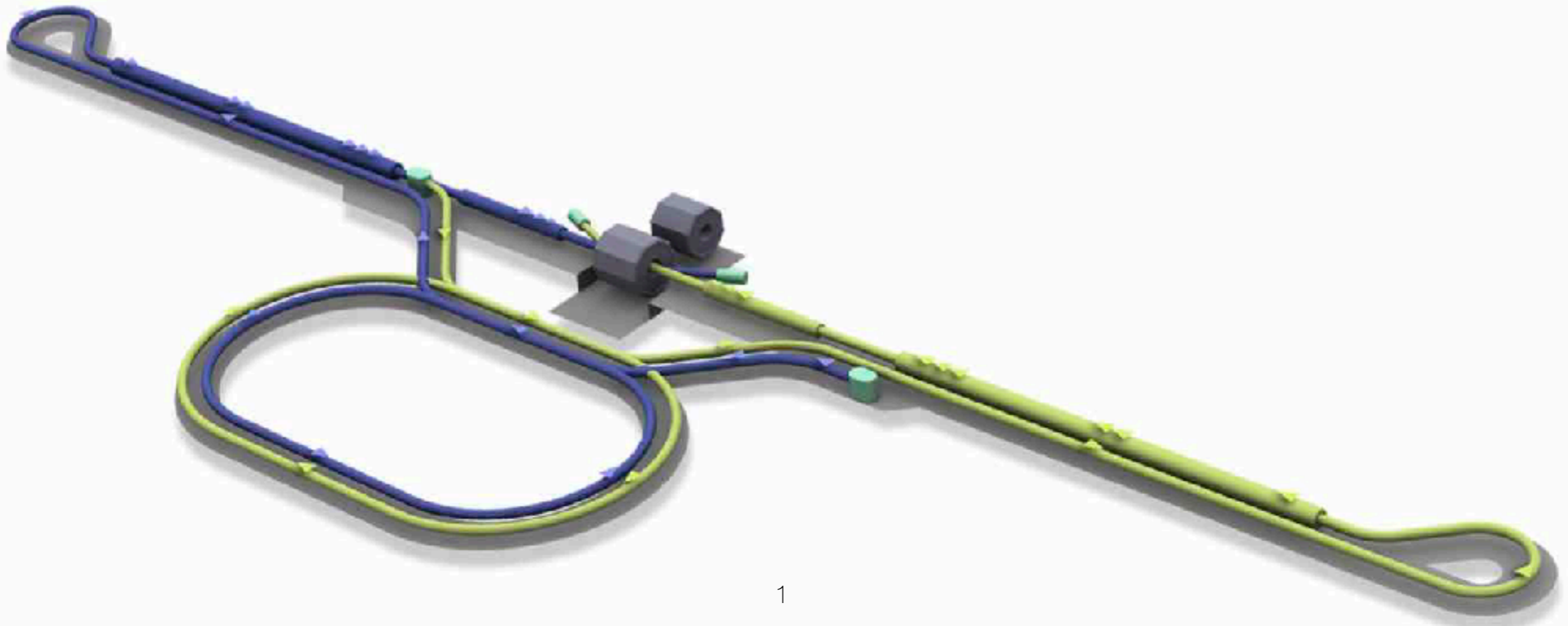


ILC IDT WG3

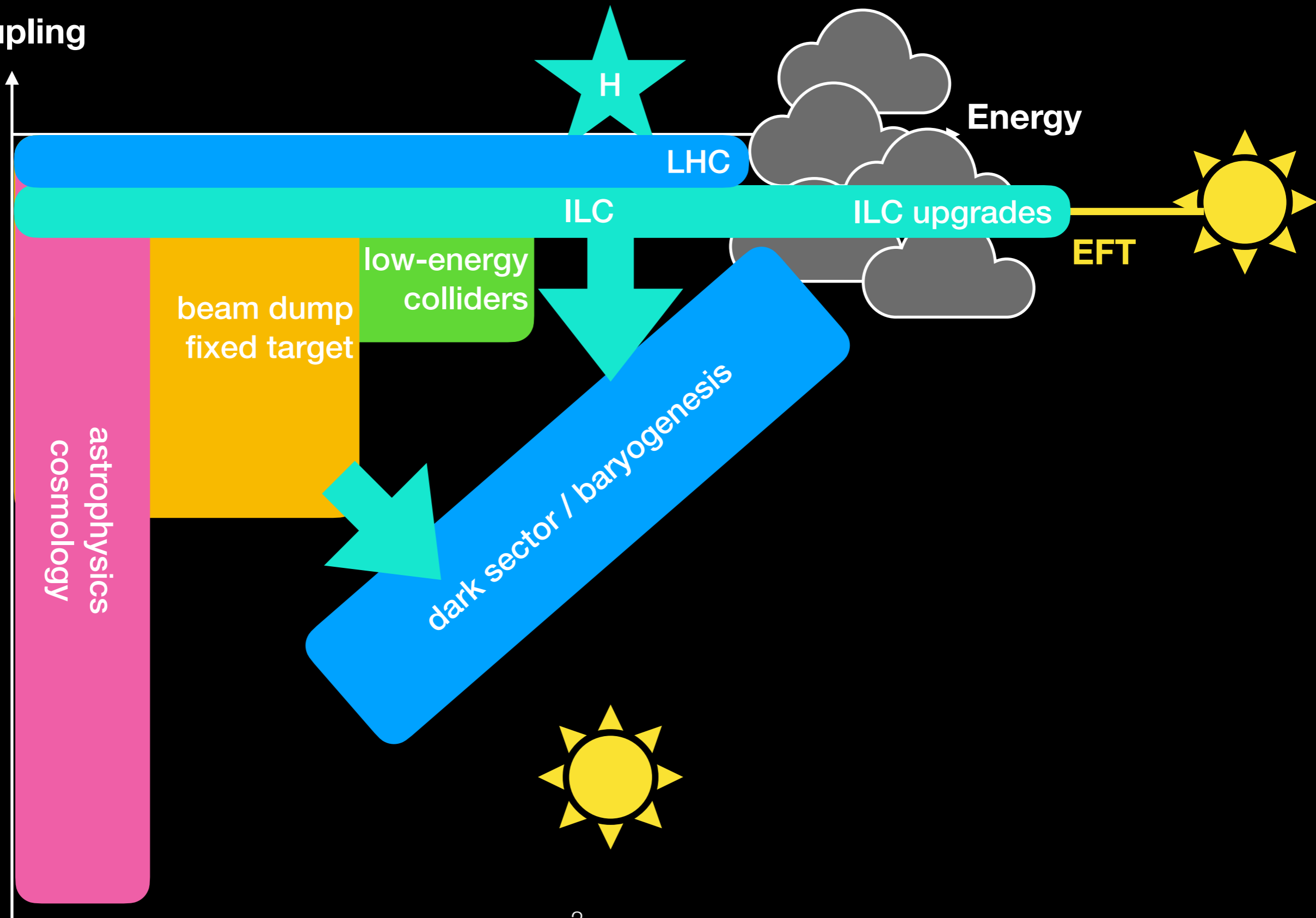
Physics & Detector

Hitoshi Murayama (Berkeley/Kavli IPMU)
LCWS 2021, Mar 17, 2021

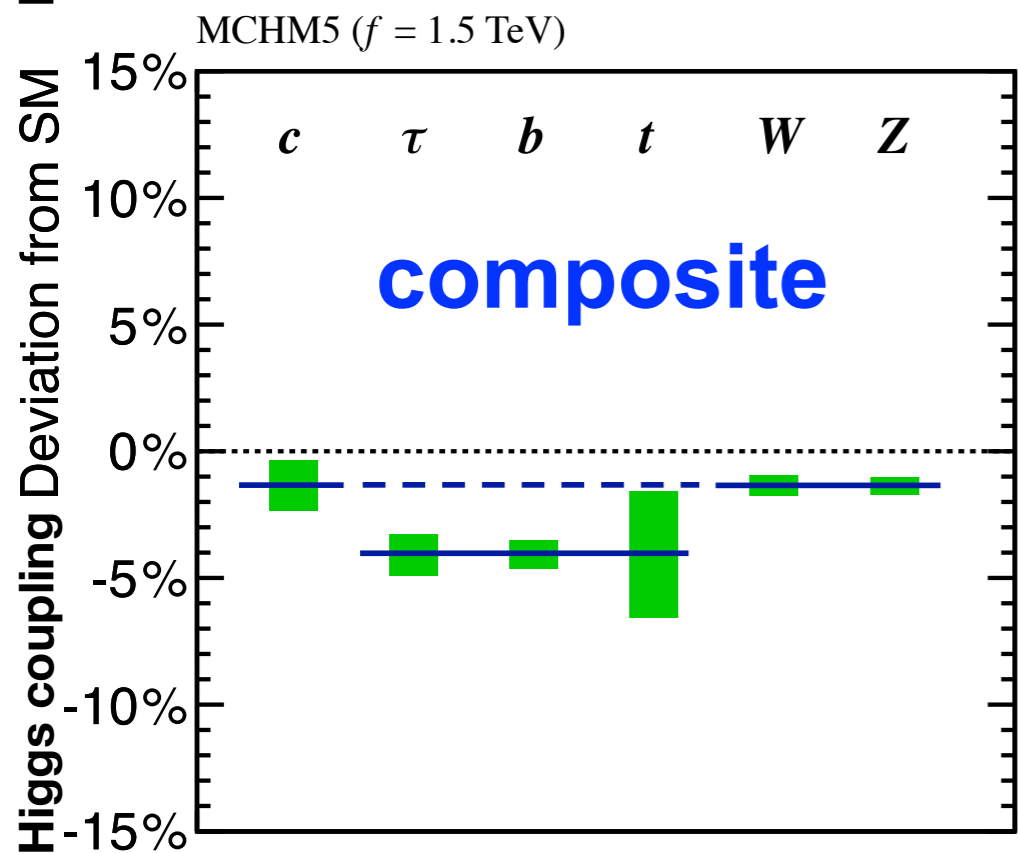
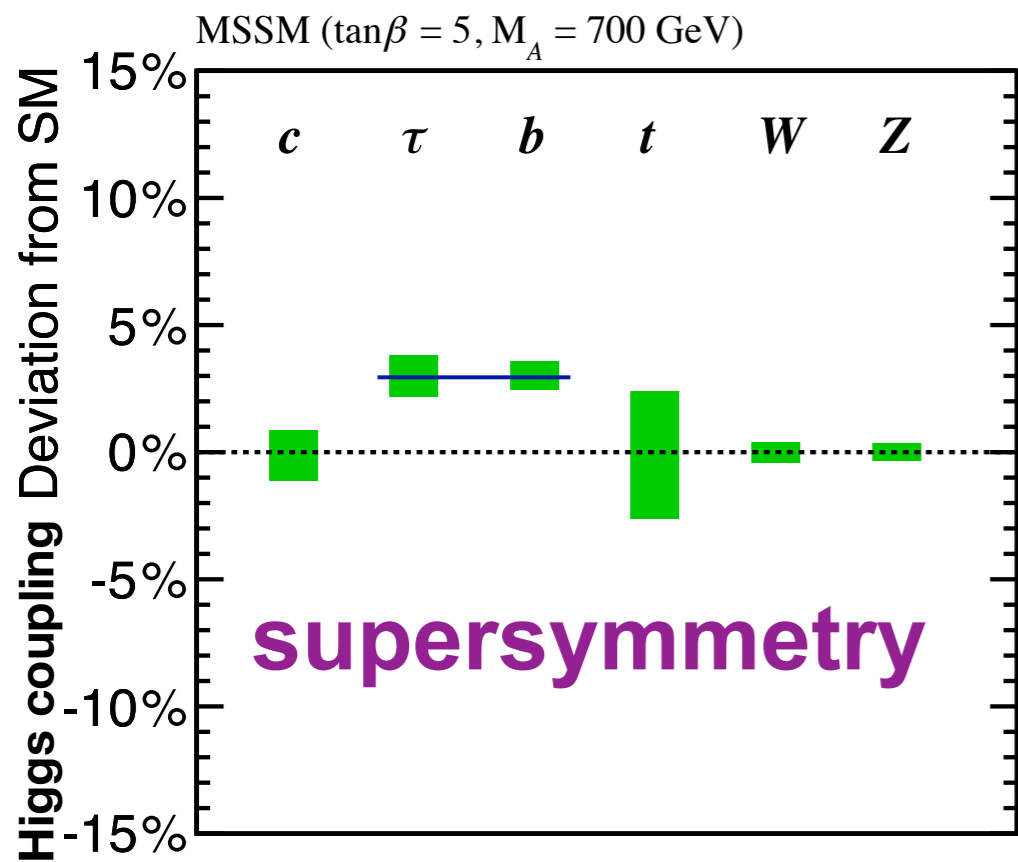


ILC++

Coupling

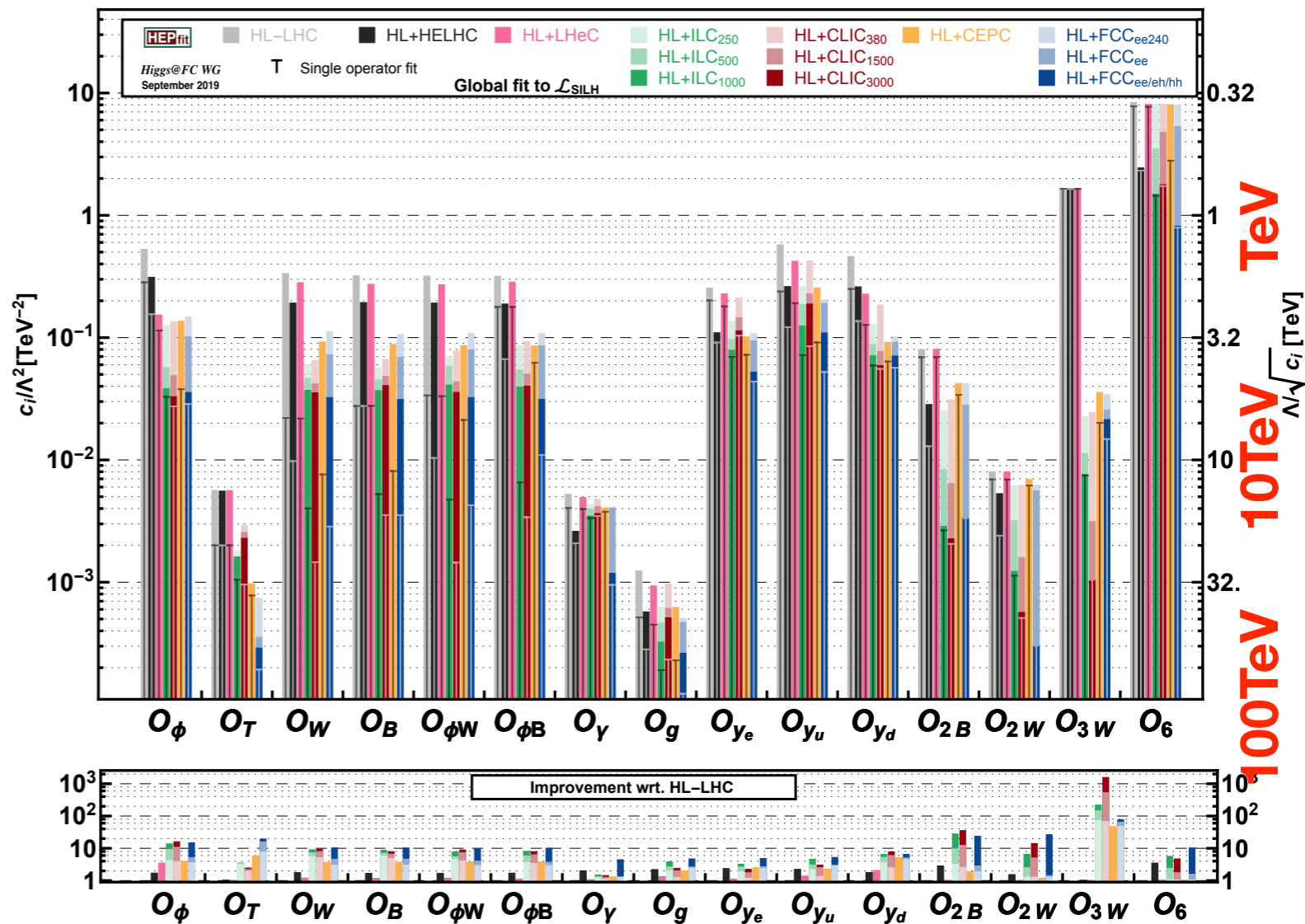


What is Higgs boson really?



What is the next energy scale?

x10 HL-LHC

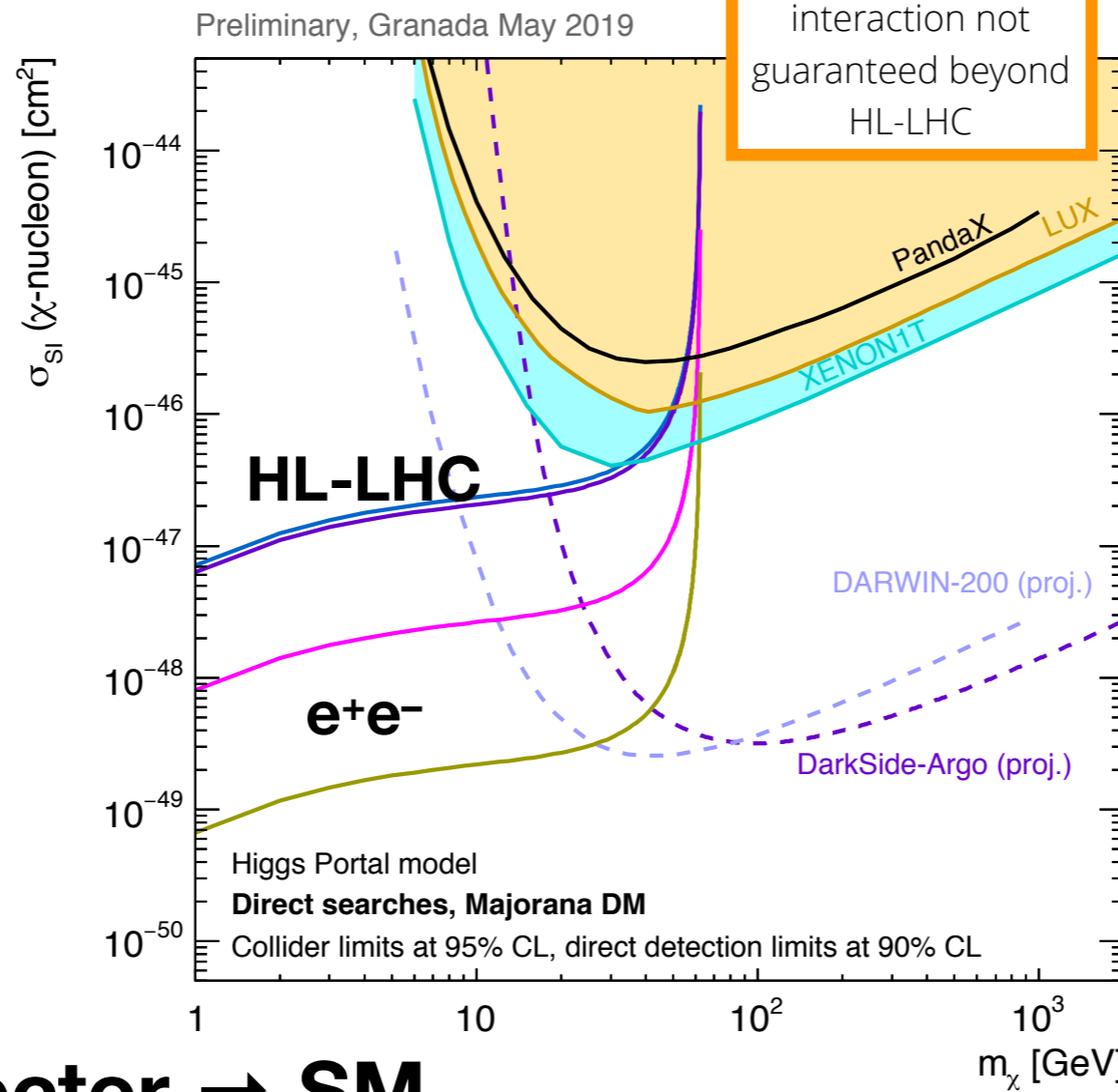


2000fb⁻¹@250GeV
200fb⁻¹@350GeV
4000fb⁻¹@500GeV

direct detection limits

Higgs decay to dark matter

x10 HL-LHC

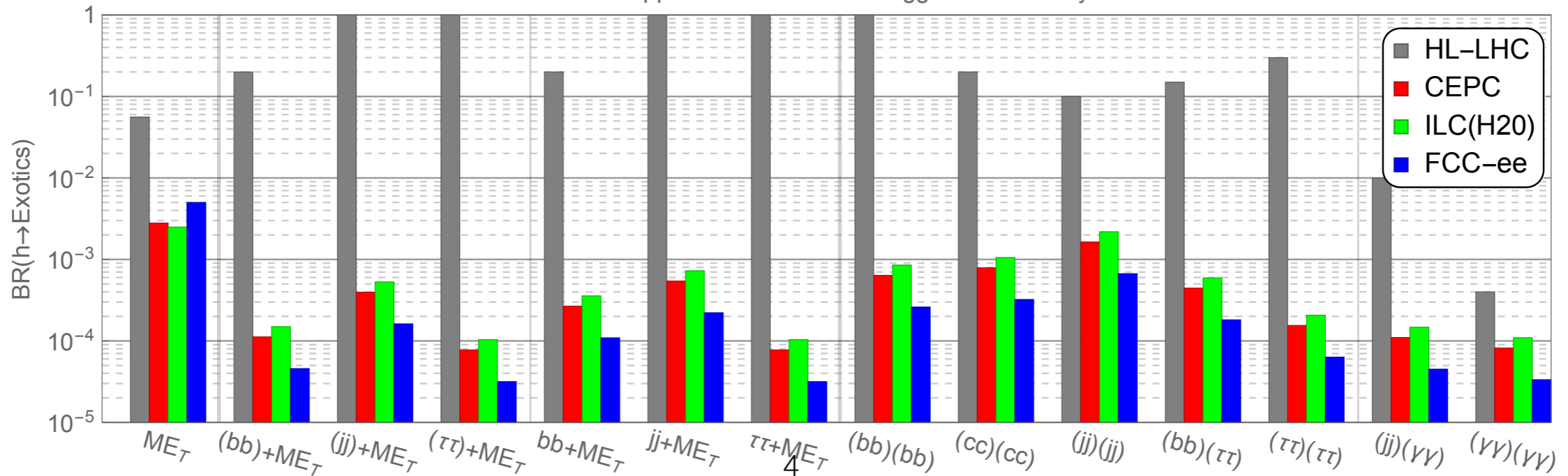


x1000-10000 HL-LHC

Higgs → dark sector → SM

95% C.L. upper limit on selected Higgs Exotic Decay BR

exotic Higgs decays



SiD

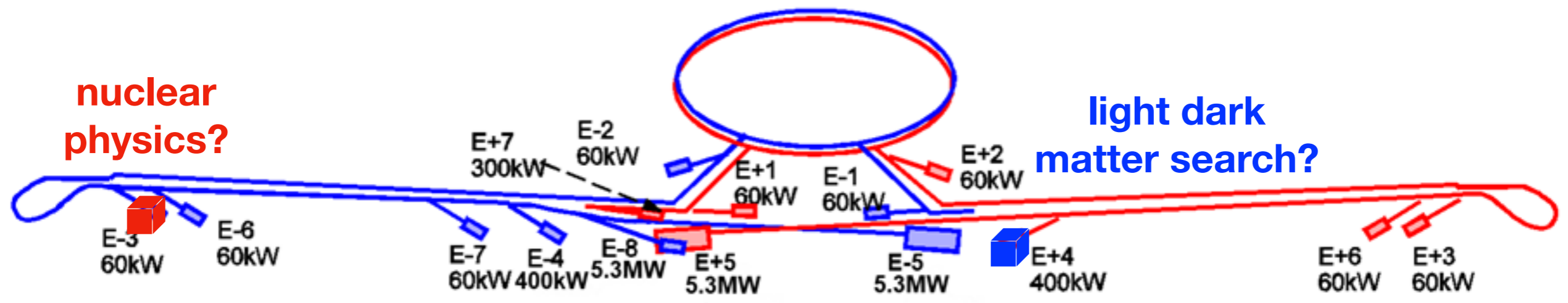
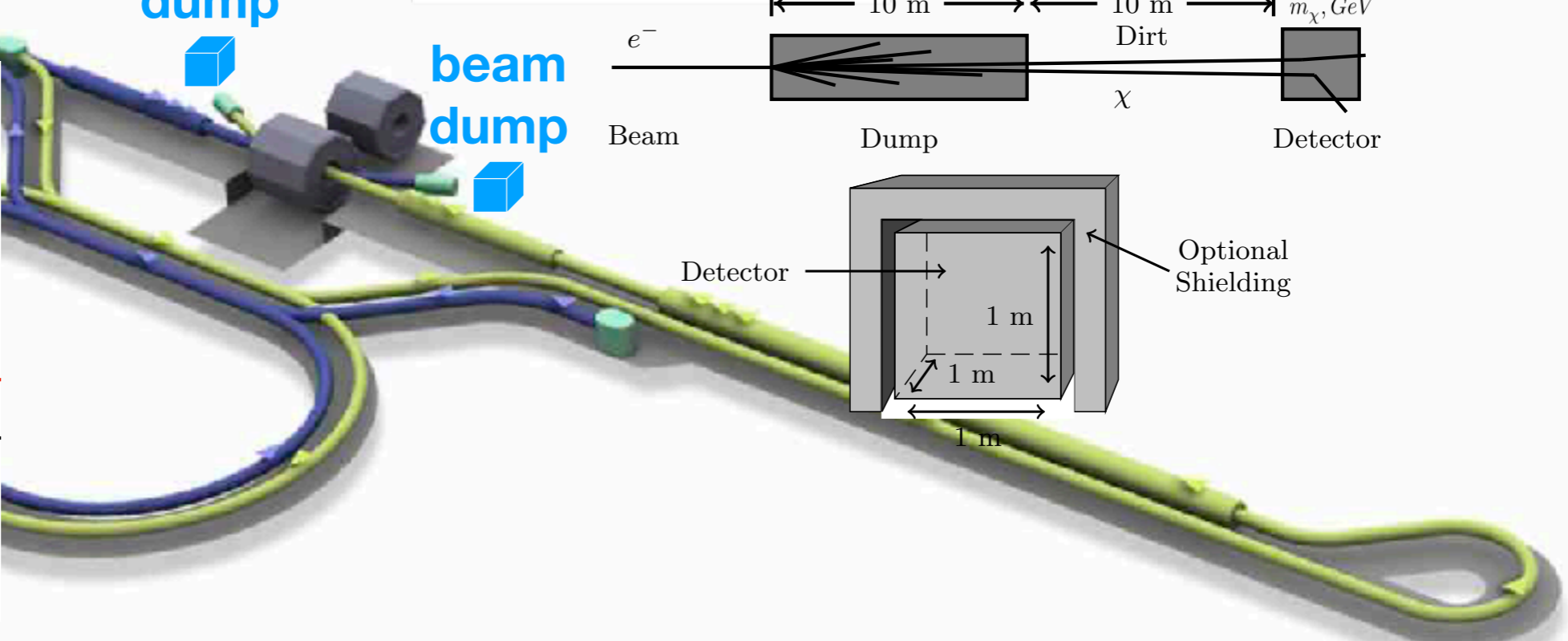
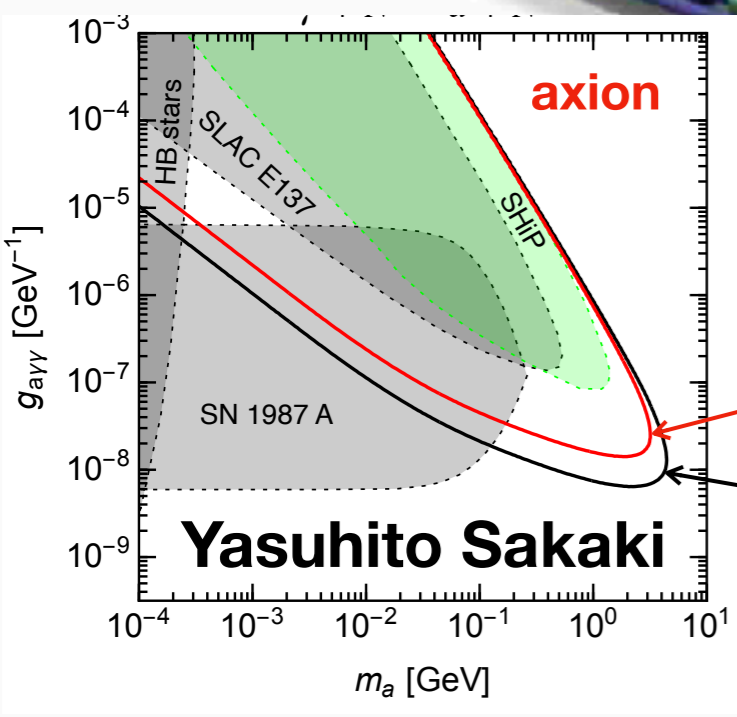
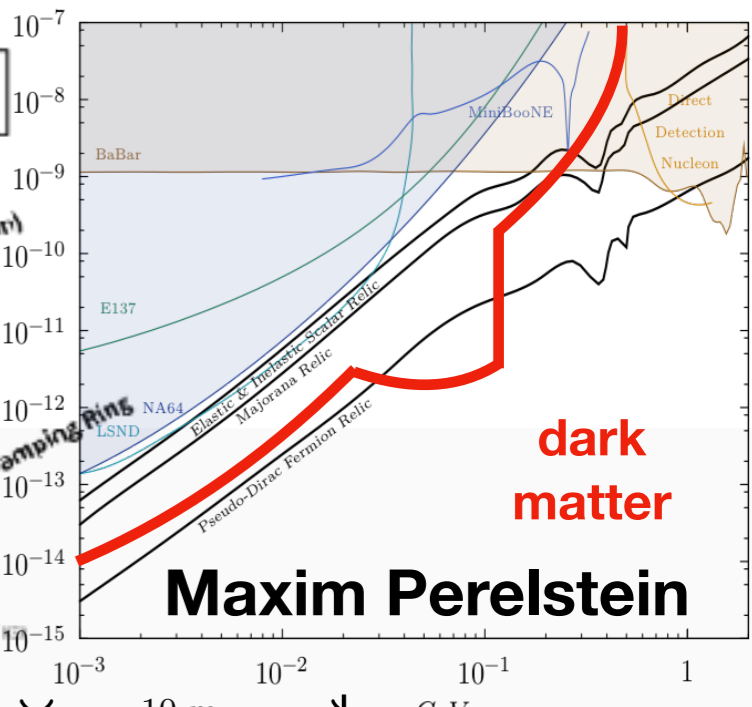
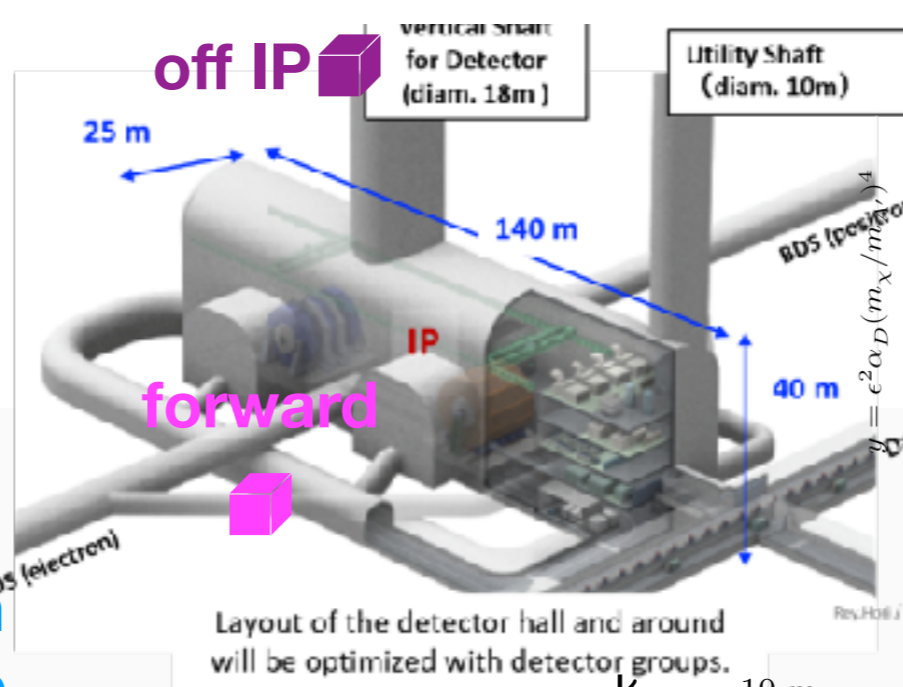
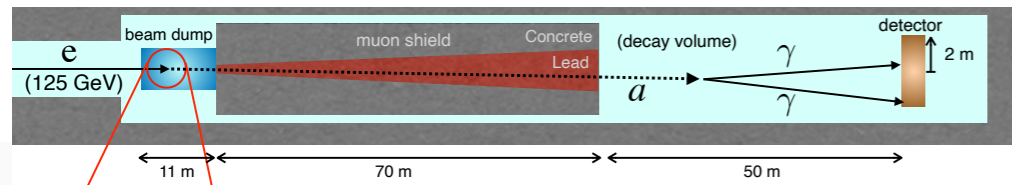
Marcel Stanitzki

ILD

Ties Behnke

Cover: Paj-Hor

optimizations?
new technologies?
new concepts?



higher energies

- main reason to go linear: extendable!

- 350GeV: $t\bar{t}$ threshold

- 400GeV: open top

- 550GeV: $t\bar{t}H$

- 1TeV: Higgs self coupling, vector boson scattering

- multi TeV: SUSY, extra dim, Z' ,

ILC Nb	35-50MV/m	0.5–1.5TeV
ILC Nb ₃ Sn	120MV/m	4TeV
CLIC	100MV/m	3TeV
PWFA DLA	1GV/m	30TeV

IDT organisation

ICFA

ILC-IDT

Executive Board

Andrew Lankford (UC Irvine): Americas Liaison

Shinichiro Michizono (KEK): Working group 2 Chair

Hitoshi Murayama (UC Berkeley/U. Tokyo): Working group 3 Chair

Tatsuya Nakada (EPFL): Executive Board Chair and Working group 1 Chair

Yasuhiro Okada (KEK): KEK Liaison

Steinar Stapnes (CERN): Europe Liaison

Geoffrey Taylor (U. Melbourne): Asia-Pacific Liaison

Working group 1
Pre-lab set-up

Working group 2
Accelerator

Working group 3
Physics & Detectors

Scientific secretary: Tomohiko Tanabe (KEK)

Communication team led by Rika Takahashi (KEK)

Unlike LCB/LCC, **ILC-IDT is focused on the ILC.**

KEK provides administrative, logistic and some financial support.

T. Nakada, 4

ICFA: International Committee for Future Accelerators

LCB: Linear Collider Board

LCC: Linear Collider Collaboration

IDT: International Development Team

Expected Timeline

triggered by sign for substantial funding for pre-lab in Japan

Timeline for the ILC experiments

- 2021 IDT calls for Eol
Necessary R&D for Eol
- 2022 ----- Assumed start of Pre-lab -----
- 2022 Eol presentation
Necessary R&D for Lol
- 2023 Lol submission and presentation
Continuation of R&D
Selection process by the ILCC
- 2024 ILCC recommendation on the first set of the projects to proceed toward TP
Necessary R&D for TP
- 2025 TP submission and presentation of the first set of experiments
Continuation of R&D
Selection process by the ILCC
- 2026 ----- Assumed start of ILC-lab -----
- 2026-27 ILCC recommendation for the first set of experiments to proceed toward TDRs
- 2027 ILC-lab approval of the first set of experiments and request to proceed toward TDRs

- Funding agencies will not provide dedicated ILC detector R&D funds before the Pre-lab being established.
- For some Eols, R&D would be needed to make Lols.
→ driving the timing for the Lol submission
- Selection process starts with the Lols.
→ driving the timing for the Lol decision
- Experiments are formally approved based on TPs.
- The ILC-lab is needed for approvals.
- Availability of resources is part of the approval criteria.
→ driving the timing for the TP decision
- These considerations are for the initial set of experiments. There could be more experiments proposed at later time.

IDT: International Development Team

Eol: Expression of Interest

Lol: Letter of Interest

TP: Technical Proposal

TDR: Technical Design Report

ILCC: ILC Committee



WG3 Organisation and mandates

Chair: Hitoshi Murayama (Berkeley/Tokyo)

Deputies: Jenny List (DESY) and Claude Vallée (Marseille)

Coordinator and Deputy coordinator(s)

Kiyotomo Kawagoe (Kyushu), Alain Bellerive (Carleton),
Ivanka Božović Jelisavčić (Belgrade)

Secretariat?

Steering Group
Subgroup conveners, Coordinator and Deputy Coordinator(s)

Speaker's bureau

Andy White (UT Arlington), Ties Behnke (DESY), Yuanning Gao (Peking), Frank Simon (MPP), Jim Brau (Oregon), Keisuke Fujii (KEK), Phil Burrows (Oxford), Francesco Forti (INFN),
Filip Zarnecki (Warsaw), Patty McBride (Fermilab), Mihoko Nojiri (KEK), CERN member, Timothy Nelson (SLAC), Kajari Mazumdar (Mumbai), Phillip Urquijo (Melbourne), Dmitri Denisov (Brookhaven)

Interface with machine

Detector and technology R&D

Software and computing

Physics potential and opportunity

Coordinate the interactions between the accelerator and facility infrastructure planning and the needs of the experiments

Provide a forum for discussion and coordination of the detector and technology R&D for the future experimental programme

Promote and provide coordination of the software development and computing planning

Encourage and develop ideas for exploiting the physics potential of the ILC collider and by use of the beams available for more specialised experiments

Karsten Buesser (DESY), Yasuhiro Sugimoto (KEK), Roman Poeschl (Orsay), US

Marcel Vos (Valencia), Katja Krueger (DESY) Petra Merkel (Fermilab), David Miller (Chicago)

Frank Gaede (DESY), Jan Strube (PNNL) Daniel Jeans (KEK)

Michael Peskin (SLAC), Junping Tian (Tokyo) Aidan Robson (Glasgow)

Open to anybody interested!

<https://linearcollider.org/team/>

MANDATE AND WORKPLAN OF IDT-WG3

Terms of reference from ICFA:

WG3 carries out the ILC physics and detector activities. It continues the study of the ILC physics capabilities and detector efforts as previously carried out under the LCC framework, reflecting the on-going progress of the field. It guides the community to be ready when the ILC Pre-Lab will establish its physics program.

WG3 Community actions

ILC is moving towards the preparatory laboratory stage (Prelab), currently envisioned to start in 2022. In order to activate the community towards preparing the Expressions of Interest for the experiments, the Physics and Detector Working Group (WG3) aims to:

- Raise awareness and interest in the ILC development and expand the community.
- Support newcomers to get involved in physics and detector studies.
- Encourage new ideas for experimentations at the ILC

While achieving this, WG3 will pay special attention to:

- support of existing activities, as basis for any growth, through the IDT period
- visibility for young scientists engaging in ILC activities
- increased diversity among conveners

<https://linearcollider.org/idt-wg3-mandate/>

WG3 Work plan

Scopes of primary interest include (but are not limited to):

General aspects:

- Prepare decisions on potential changes to the ILC baseline design (*e.g.* positron polarization, permanent magnets in the damping rings) by studying their physics and detector implications.
- Investigate possible extensions of the physics programme with non-collider options: studies on beam dump, off IP experiments, fixed-target experiments...
- Connect with WG3-related activities beyond ILC-only, *e.g.* the ECFA Higgs Factory study, ECFA Detector Roadmap, Snowmass, Key4HEP, etc

Technical aspects:

- Identify all machine/detector interface issues to be addressed by the Prelab to finalize the ILC design (*e.g.* interaction campus, experimental hall, interaction regions, operating scenario), through a forum of exchange of information between machine and detector requirements, and study their implications for the experiments design.
- Monitor the global detector R&D - in ILC detector concept groups, detector R&D collaborations, and beyond the current ILC community - and enable new efforts to introduce emerging detector technologies into the ILC experiments.
- Coordinate performance studies to assess the detector requirements of the ILC experiments as well as the relative performance of alternative detector solutions.
- Contribute to defining how the Prelab structure can best foster the detectors' final design and construction preparation in liaison with the worldwide academic bodies and industrial landscape.

<https://linearcollider.org/idt-wg3-mandate/>

Physics and Software aspects:

- Foster and guide studies of the physics potential of the ILC, thereby in particular providing the physics input for the above general and technical aspects.
- Write the ILC Snowmass White Paper, due early 2022, and work towards an ILC Physics Resource Book, target due date 2024/25
- Foster and guide the development and adoption of common software tools for ILC physics and detector design studies, and plan the computing resources and infrastructure required for the ILC Laboratory.

<https://linearcollider.org/idt-wg3-mandate/>

IDT-WG2 organization



Smooth transition to the ILC Pre-Lab

IDT EB

IDT WG2
Shin Michizono (Chair)
Benno List (Deputy)

ML&SRF

Yasuchika Yamamoto	KEK
Sergey Belomestnykh	FNAL
Nuria Catalan	CERN
Enrico Cenni	CEA
Dimitri Delikaris	CERN
Luis Garcia Tabares	CIEMAT
Rongli Geng	ORNL
Hitoshi Hayano	KEK
Bob Laxdal	Triumpf
Matthias Liepe	Cornell
Peter McIntosh	STFC
Laura Monaco	INFN Milano
Olivier Napoly	CEA
Sam Posen	FNAL
Robert Rimmer	JLAB
Marc C. Ross	SLAC
Kensei Umemori	KEK
Hans Weise	DESY
Akira Yamamoto	KEK

DR/BDS/Dump

Toshiyuki Okugi	KEK
Karsten Buesser	DESY
Philip Burrows	U. Oxford
Angeles Faus-Golre	LAL
Andrea Latina	CERN
Kiyoshi Kubo	KEK
Jenny List	DESY
Thomas Markiewicz	SLAC
Brett Parker	BNL
Ivan Podadera	CIEMAT
David L. Rubin	Cornell
Nikolay Solyak	FNAL
Nobuhiro Terunuma	KEK
Glen White	SLAC
Kaoru Yokoya	KEK
Mikhail Zobov	INFN LNF

Dump

Nobuhiro Terunuma	KEK
Toshiyuki Okugi	KEK

Sources

Kaoru Yokoya	KEK
Jim Clarke	STFC
Steffen Doebert	CERN
Joe Grames	JLAB
Hitoshi Hayano	KEK
Masao Kuriki	U. Hiroshima
Benno List	DESY
Jenny List	DESY
Gudrid Moortgat-Pick	U. Hamburg
Sabine Riemann	DESY
Peter Sievers	CERN -retired

Civil engineering

Nobuhiro Terunuma	KEK
John Andrew Osborne	CERN
Tomoyuki Sanuki	U. Tohoku

CRAB

LCWS2021 (Mar.15,2021)

4

Machine & Detector Interface

- The MDI group will focus in priority on 3 aspects:
 - the detector hall design (Yasuhiro Sugimoto)
 - the IP campus design (Karsten Buesser)
 - the machine parameters impact on the detector and its performance (Roman Poeschl)
- Possible future MDI aspects related to new Fixed-Target experiments will be followed by C.V. until relevant questions can be submitted to the MDI group.

Detector & Technology R&D

Marcel Vos, Katja Krueger, Petra Merkel, **David Miller**

- Detector design and development: this panel forms the liaison to the existing detector concepts and R&D collaborations, attracting new groups to the ILC detector R&D effort and exploring new ways to attract resources. This panel should also monitor the detector R&D of the global community and identify and review promising new detector technologies, to enable their integration into the ILC experiments.
- Detector performance studies: Monte-Carlo simulation studies to assess the benefit of new detector technologies and to compare the performance of alternative solutions. This panel has strong links to the software and physics working groups.

+Simon Spannagel

Software & Computing

Frank-Dieter Gaede, Jan Strube, Daniel Jeans

- Engage with the community at major workshops and conferences
- Encourage and support (new) detector groups running common software tools throughout the EOI/LOI process
- Prepare a software & computing plan for prelab
- Revise and update the ILC computing resource document
- Work towards a transition of the full software chain to the key4HEP ecosystem
- Include new state-of-the-art tools, simulation and reconstruction algorithms (machine learning, quantum computing...)

Physics potential and Opportunities

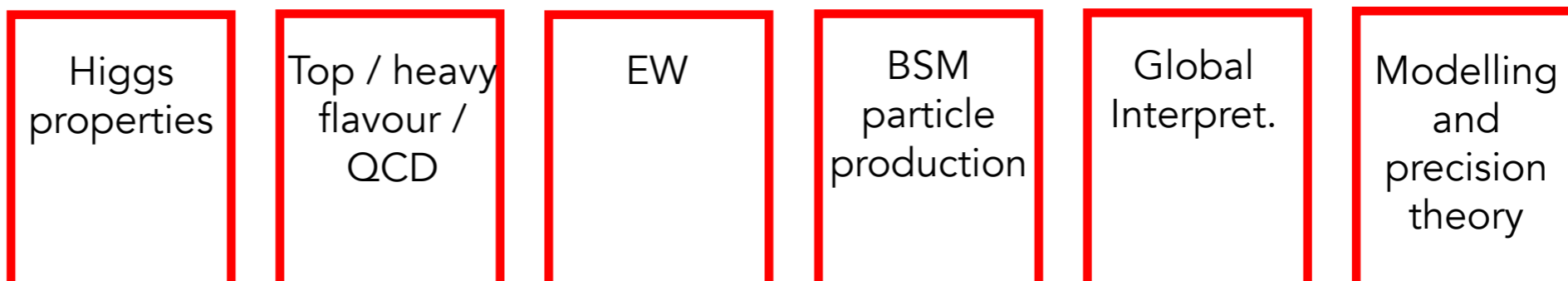
Michael Peskin

Aidan Robson

Junping Tian

Topical Groups

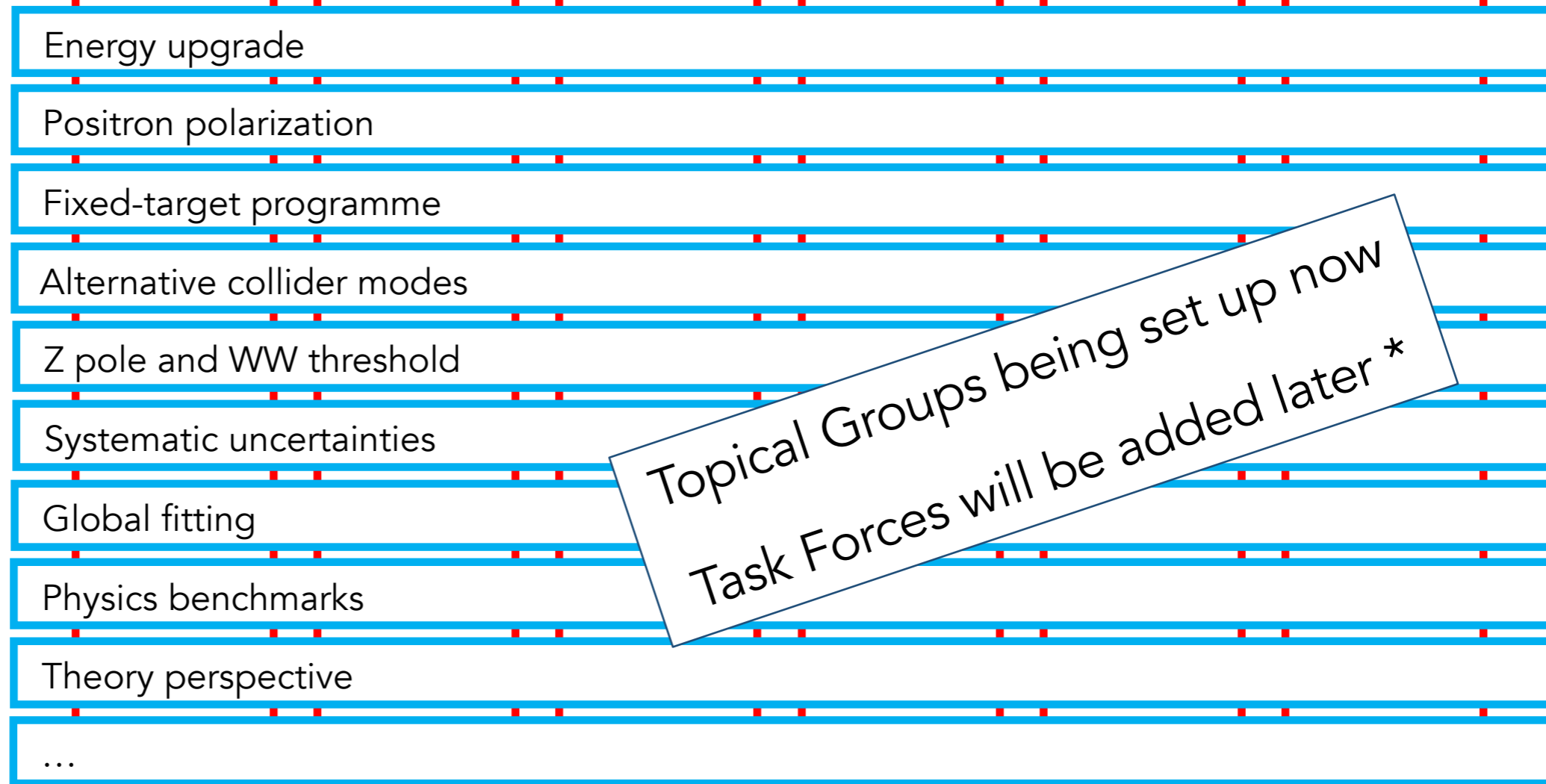
-> broad scope



Task Forces

-> specific advice

Definition / discussion ongoing; may reach across WG3 groups; may include WG2;



Topical Groups being set up now
Task Forces will be added later *

* Study Group on fixed-target / dark sector has started to meet



ILC Workshop on Potential Experiments (ILCX)

October 26–29, 2021, Tsukuba, Japan

I was informed by several people that there has been a confusion about the Eol process. While the spring **LCWS** is for **the discussion on physics that can be addressed in various ways at ILC**, the **fall workshop** is about **more concrete ideas of experiments, rather than a physics idea and sketchy detector concept, and some people behind to work on them**. For the **real Eol presentation anticipated in 2022**, one has to show **expected performance of the experiments resulted from some simulation studies and technical description of the detector**. The actual call for Eols will be “due” by then, and currently written proposals are not envisioned. The call for Eols will be triggered by a concrete sign of funding for pre-lab, and Eols are presented after the pre-lab is launched.

yours Tatsuya

monthly

ILC newsline

Rika Takahashi
(KEK)



PREPRINTS

ARXIV PREPRINTS

2102.12826
Heavy Neutrino Searches via Same-sign Lepton Pairs at the Higgs Factory

2102.08645
Leptophilic fermion WIMP ~ Role of future lepton colliders

2102.06236
Resolving a challenging supersymmetric low-scale seesaw scenario at the ILC

2101.11906
Development of a Vertex Finding Algorithm using Recurrent Neural Network

2101.11892
Influence of Furnace Baking on C-E Behavior of Superconducting Accelerating Cavities



accelerator R&D Asia ATF2
CALICE cavity cavity gradient
CERN China CLIC
DESY detector R&D
Europe European Strategy for

DIRECTOR'S CORNER



Barbara Warmbein
(DESY)

ILC Pre-Lab preparation on the accelerator

by Shinichiro Michizono

Let's talk cavities and cryomodules! Accelerator Director brings us up to date with the latest developments on the well as plans and tests for the next phase, leading to the milestone, the Engineering Design Report.

Perrine Royole-Degieux
(IN2P3)



AROUND THE WORLD

New organisation in Tohoku, the ILC's potential host region

by Rika Takahashi

Making the Tohoku area a welcoming place for the ILC and those who will live there – that is the goal of the newly established Tohoku ILC Project Development Center. It comprises 22 academic and local organisations in the north east of Japan. Atsuto Mizuki, president of the Iwate Prefectural University and former director general of KEK chairs



Leah Hesla
(Fermilab)





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247 Following 3,122 Followers

Followed by Kavli IPMU応援団, ILC通信, and Masahito Yamazaki

Tweets

Tweets & replies

Media

Likes



ILC (International Linear Collider) Retweeted



CERN Courier @CERNCourier · 16h

The high-luminosity, polarised beams of the proposed International Linear Collider and the triggerless operation of its detectors offer rich physics

Physics & Detector

- Case for ILC broader and stronger than ever
 - a lot more than Higgs factory
- urgent: determine needed infrastructure and technology
 - finalize the design of civil construction, machine parameters, and experiments in ~3 years
- new opportunities
 - beam dump, off IP, extracted beams
- new organization of working groups launched
 - please join!



ILLUSTRATION BY FLAGG

I WANT YOU
FOR IDT WG3

NEAREST RECRUITING STATION